WSM

WORKSHOP MANUAL

TRACTOR

M6800,M6800S,
M8200,M9000

Kubota

KiSC issued 03, 2008 A

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of KUBOTA Tractors M6800, M6800S, M8200 and M9000. It is divided into two parts, “Mechanism” and “Servicing” for each section except “ENGINE” section.

■ **Mechanism**

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

■ **Servicing**

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

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

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

August 2001

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.

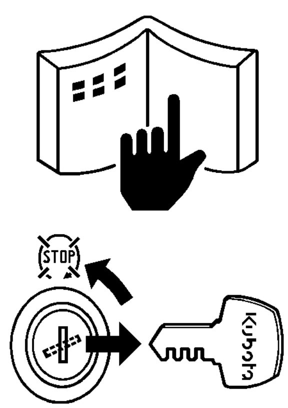
DANGER : **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

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.**

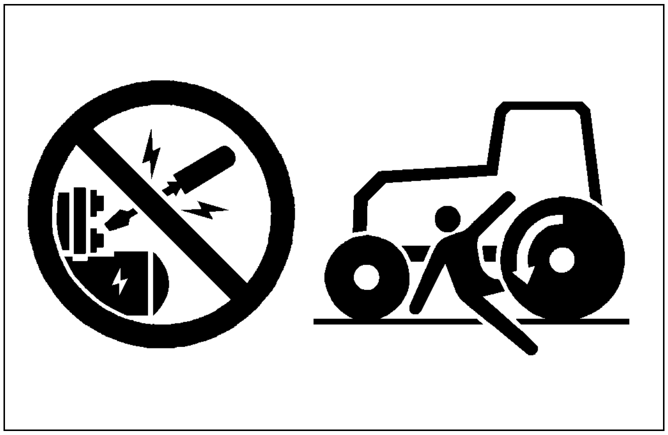
■ **IMPORTANT** : **Indicates that equipment or property damage could result if instructions are not followed.**

■ **NOTE** : **Gives helpful information.**



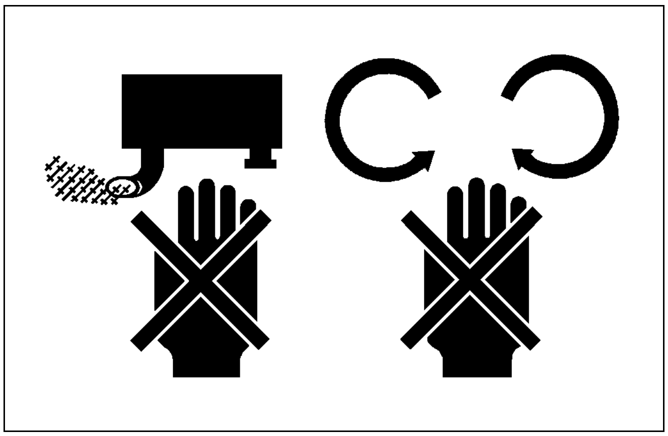
BEFORE SERVICING AND REPAIRING

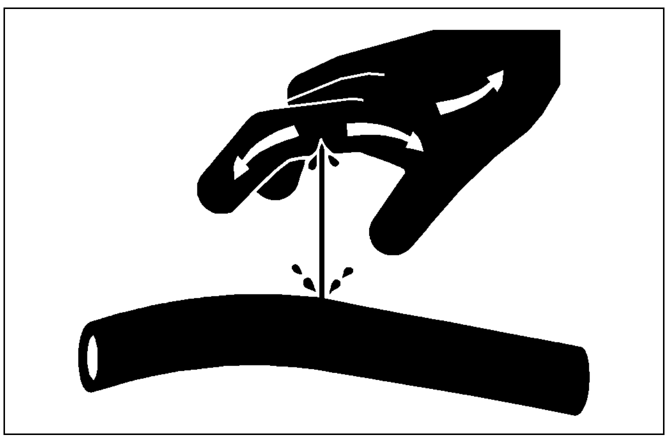
- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, and remove the key.
- Disconnect the battery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



SAFETY STARTING

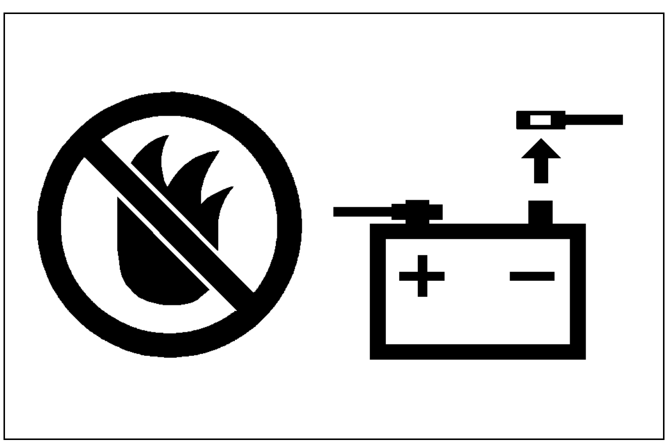
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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





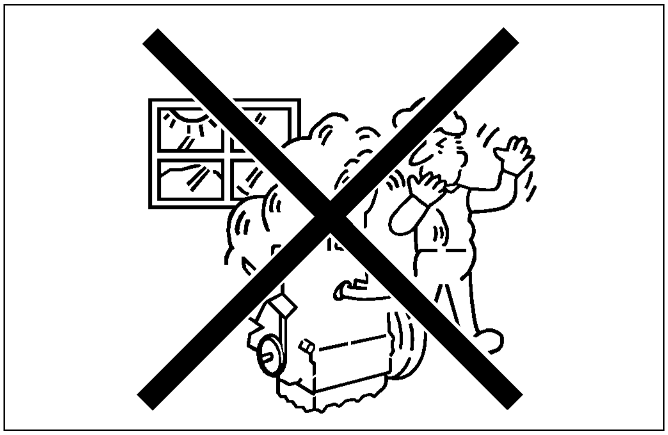
SAFETY WORKING

- 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.



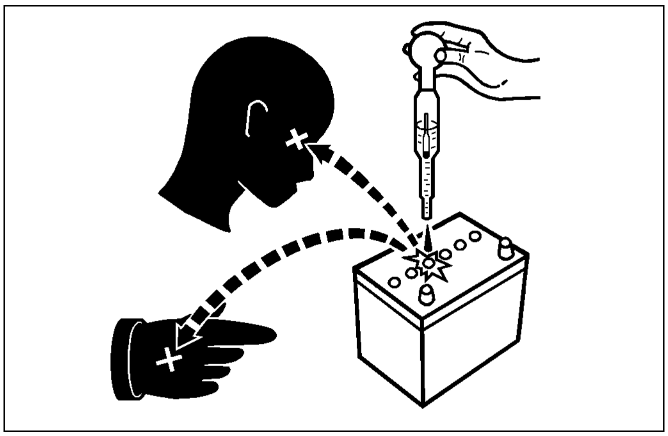
AVOID FIRES

- 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.



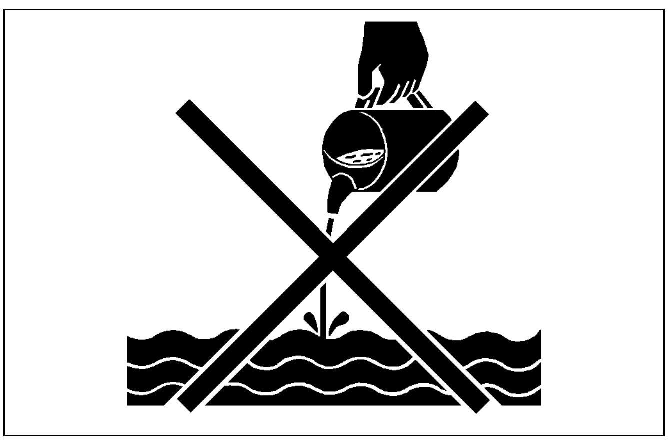
VENTILATE WORK AREA

- 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.



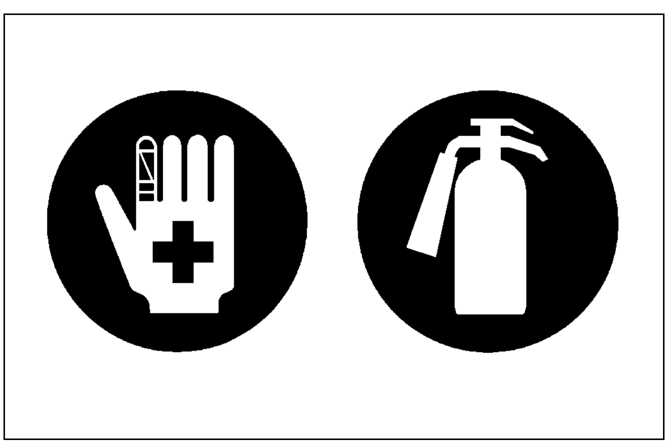
PREVENT ACID BURNS

- 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.



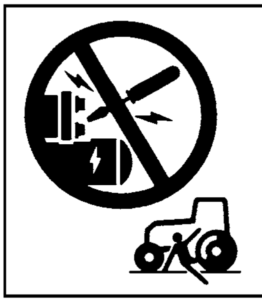
PREPARE FOR EMERGENCIES

- 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.

(1) Part No. TA040-4965-2

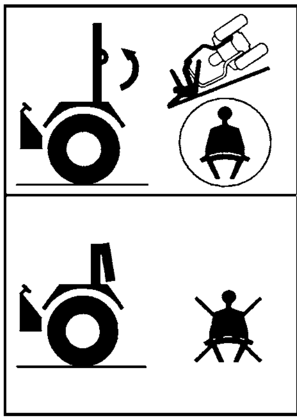


⚠ DANGER

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.

(2) Part No. 3A111-9848-2 (for North America and Oceania)

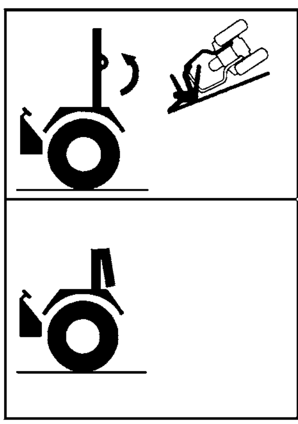


⚠ WARNING

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.

(2) Part No. 3A114-9848-1 (for Euro and Asia)



⚠ WARNING

TO AVOID INJURY OR DEATH FROM ROLL-OVER:
- Keep Roll-Over Protective Structures (ROPS) in the upright and locked position.

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.
- Raise and lock ROPS as soon as vertical clearance allows.
- Read ROPS related instructions and warnings.

(3) 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.

(5) Part No. 3A111-9544-1

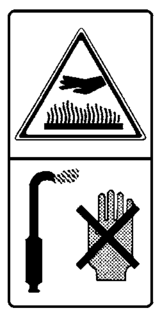
⚠ WARNING

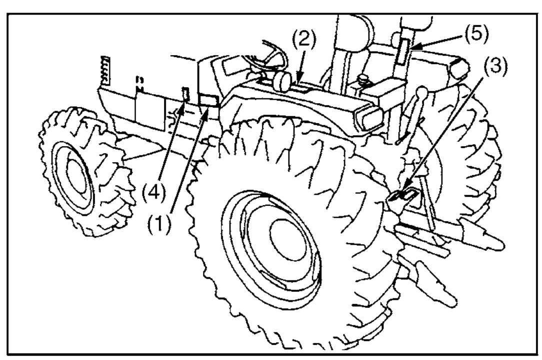
Never modify or repair a ROPS because welding, grinding, drilling or cutting any portion may weaken the structure.

⚠ CAUTION

TO AVOID INJURY WHEN RAISING OR FOLDING ROPS:
- Set parking brake and stop engine.
- Remove any obstruction that may prevent raising or folding of the ROPS.
- Do not allow any bystanders.
- Always perform function from a stable position at the rear of the tractor.
- Hold the top of the ROPS securely when raising or folding.
- Make sure all pins are installed and locked.

(4) Part No. 32310-4958-1
Do not touch hot surface like muffler, etc.





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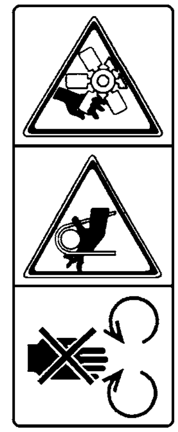
(1) Part No. 35260-3491-3

⚠ 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, set the parking brake, stop the engine and remove the key.

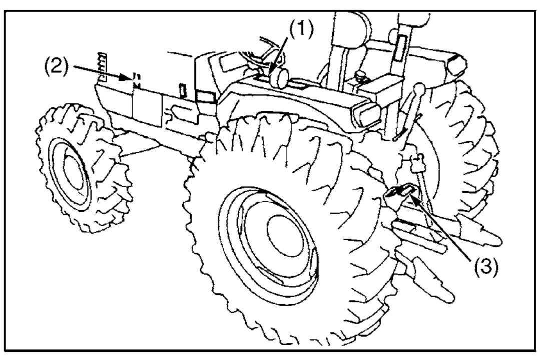
(2) Part No. 32751-4958-1
Stay clear of engine fan and fanbelt.

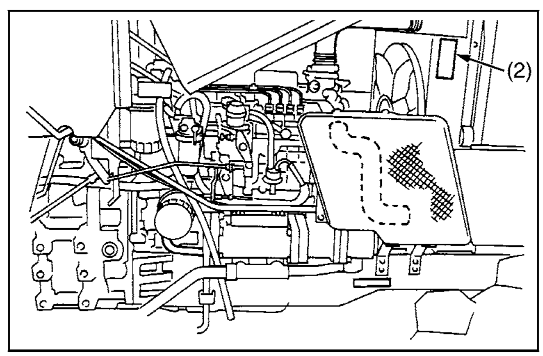


(3) Part No. TA040-4959-3

⚠ 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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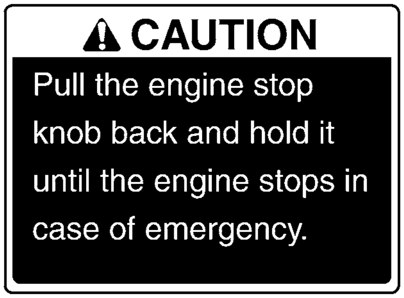
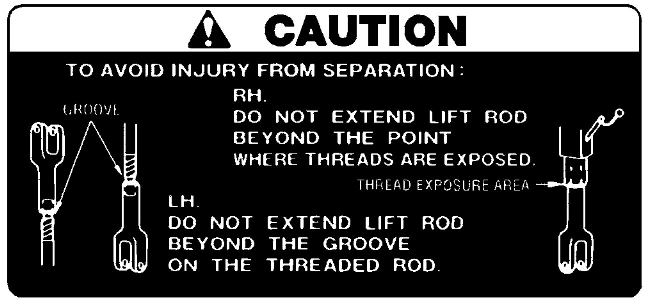
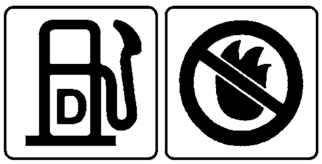
(1) Part No. 35080-6528-2



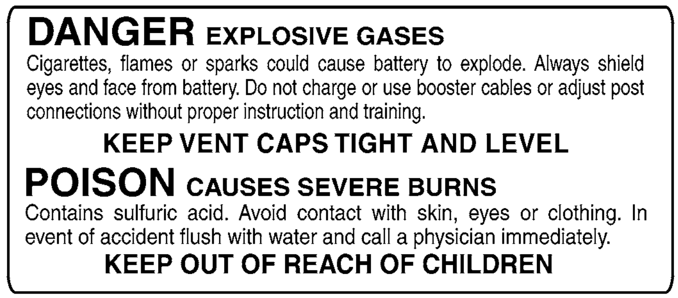
(3) Part No. 3A111-9856-3

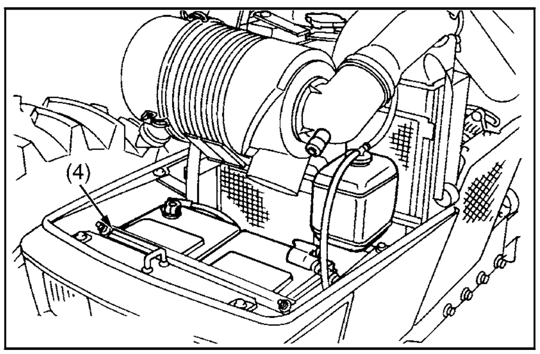


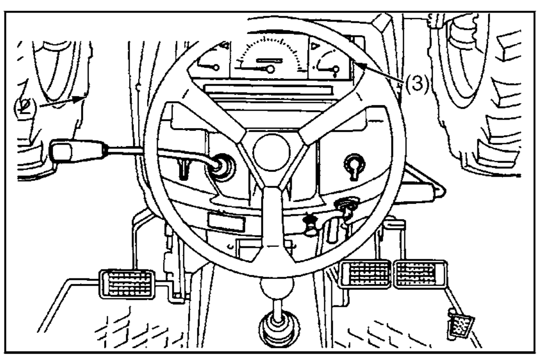
(2) Part No. TA040-4956-2

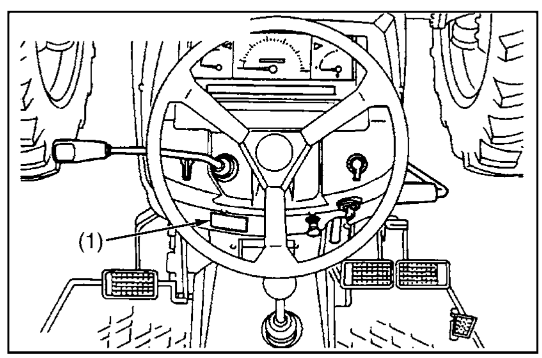


(4) Part No. 6C040-5559-1 (for Euro, Australia and Asia)









CARE OF DANGER, WARNING AND CAUTION LABELS

1. Keep danger, warning and caution labels clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels
4. If a component with danger, warning and caution labels as the replaced component.
5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

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SPECIFICATIONS

Model			M6800		M6800S	
			2WD	4WD	2WD	4WD
Engine	Model		V3300-E / V3300-E2			
	Type		Vertical, water-cooled, 4-cycle diesel engine			
	Number of cylinders		4			
	Total displacement		3318 cm^3 (202.5 cu.in.)			
	Bore and stroke		98 × 110 mm (3.9 × 4.3 in.)			
	Net power		50.8 kW (68 HP)*			
	PTO power (factory observe)		46.3 kW (62 HP)* / 2600 min^{-1} (rpm)			
	Maximum torque		235 N·m (24.0 kgf·m, 173.3 ft-lbs) / 1300 to 1500 min^{-1} (rpm)			
	Battery capacity		12 V, CCA : 1000 A			
	Fuel		Diesel fuel No. 1 [below –10 °C (14 °F], Diesel fuel No. 2-D [above –10 °C (14 °F)]			
	Fuel tank capacity		65 L (17.2 U.S.gals., 14.3 Imp.gals.)			
	Engine oil capacity		10.7 L (11.3 U.S.qts., 9.4 Imp.qts.)			
	Coolant capacity		8.5 L (9.0 U.S.qts., 7.5 Imp.qts.)			
Dimensions	Overall length		3530 mm (139.0 in.)	3420 mm (134.6 in.)	3560 mm (140.2 in.)	3525 mm (138.8 in.)
	Overall width (min. tread)		1860 mm (73.2 in.)			
	Overall height (with ROPS)		2450 mm (96.9 in.)			
	Wheel base		2050 mm (80.7 in.)			
	Tread	Front	1420 to 1820 mm (55.9 to 71.7 in.)	1420 to 1520 mm (55.9 to 59.8 in.)	1420 to 1820 mm (55.9 to 71.7 in.)	1420 to 1520 mm (55.9 to 59.8 in.)
		Rear	1420 to 1720 mm (55.9 to 67.7 in.)			
	Minimum ground clearance		430 mm (16.9 in.) (COVER TANK)		430 mm (16.9 in.) (BRACKET DRAWBAR)	
Weight (with ROPS)			2030 kg (4475 lbs)	2090 kg (4608 lbs)	2030 kg (4475 lbs)	2090 kg (4608 lbs)
Travelling system	Standard tire size	Front	9.5L-15, 7.5-16	9.5-24	9.5L-15, 7.5-16	9.5-24
		Rear	16.9-30			
	Clutch		Dry, single plate			
	Steering		Hydrostatic power steering			
	Braking system		Multiple wet disc mechanical			
	Differential		Bevel gears with differential lock (Front, Rear)			
Hydraulic system	Hydraulic control system		Position, draft and mix control			
	Pump capacity		41.3 L (43.6 U.S.qts., 36.3 Imp.qts.) / min.		38.3 L (40.5 U.S.qts., 33.7 Imp.qts.) / min.	
	Three point hitch		SAE Category I & II			
	Max. lifting force	At lift points**	2050 kg (4520 lbs)			
		24 in. behind lift points	1500 kg (3307 lbs)			
	Remote hydraulic control		One remote valve			
	System pressure		19.1 MPa (195 kgf/cm^2, 2775.4 psi)			
PTO	Live PTO (Indipen-dent)	Direction of turning	Clockwise, viewed from tractor rear			
		Standard PTO	Fixed PTO shaft type with 1 speed : 540 min^{-1} (rpm) at 2295 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2307 min^{-1} (rpm) 1000 min^{-1} (rpm) at 2471 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2307 min^{-1} (rpm) 540E min^{-1} (rpm) at 1828 min^{-1} (rpm)			

Note : * Manufacture's estimate
** At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

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Model			M8200		M9000	
			2WD	4WD	2WD	4WD
Engine	Model		V3300-TE / V3300-TE2		V3300-TIE / V3300-TIE2	
	Type		Vertical, water-cooled, 4-cycle diesel engine			
	Number of cylinders		4			
	Total displacement		3318 cm^3 (202.5 cu.in.)			
	Bore and stroke		98 × 110 mm (3.9 × 4.3 in.)			
	Net power		61.2 kW (82 HP)*		67.2 kW (90 HP)*	
	PTO power (factory observe)		54.5 kW (73 HP)* / 2600 min^{-1} (rpm)		59.7 kW (80 HP)* / 2600 min^{-1} (rpm)	
	Maximum torque		285 N·m (29.1 kgf·m, 210.2 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		311 N·m (31.7 kgf·m, 229.4 ft-lbs) / 1400 to 1600 min^{-1} (rpm)	
	Battery capacity		12 V, CCA : 1000 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		10.7 L (11.3 U.S.qts., 9.4 Imp.qts.)			
	Coolant capacity		9.0 L (9.5 U.S.qts., 7.9 Imp.qts.)			
Dimensions	Overall length		3915 mm (154.1 in.)	3800 mm (150.0 in.)	3915 mm (154.1 in.)	3800 mm (150.0 in.)
	Overall width (min. tread)		1980 mm (78.0 in.)			
	Overall height (with ROPS)		2475 mm (97.4 in.)		2500 mm (98.4 in.)	
	Wheel base		2250 mm (88.6 in.)			
	Tread	Front	1440 to 2040 mm (56.7 to 80.3 in.)	1420 to 1520 mm (55.9 to 59.8 in.)	1440 to 2040 mm (56.7 to 80.3 in.)	1520 to 1620 mm (59.8 to 63.8 in.)
		Rear	1520 to 1920 mm (59.8 to 75.6 in.)			
	Minimum ground clearance		430 mm (16.9 in.) (BRACKET DRAWBAR)		450 mm (17.7 in.) (BRACKET DRAWBAR)	
Weight (with ROPS)			2270 kg (5004 lbs)	2470 kg (5445 lbs)	2310 kg (5093 lbs)	2530 kg (5578 lbs)
Travelling system	Standard tire size	Front	7.5-18	11.2-24	7.5-18	12.4-24
		Rear	18.4-28		18.4-30	
	Clutch		Dry, single plate			
	Steering		Full hydrostatic power steering			
	Braking system		Multiple wet disc mechanical			
	Differential		Bevel gears with differential lock (Front, Rear)			
Hydraulic system	Hydraulic control system		Position, draft and mix control			
	Pump capacity	Individual flow type	41.3 L (43.6 U.S.qts., 36.3 Imp.qts.) / min.			
		Combine flow type	64.3 L (67.9 U.S.qts., 56.6 Imp.qts.) / min.			
	Three point hitch		SAE Category II			
	Max. lifting force	At lift points**	Standard : 2500 kg (5560 lbs) with assist cylinder : 3400 kg (7497 lbs)			
		24 in. behind lift points	Standard : 2100 kg (4630 lbs) with assist cylinder : 2900 kg (6395 lbs)			
	System pressure		Individual flow type pump : 19.1 MPa (195 kgf/cm^2, 2775.4 psi) Combine flow type pump : 19.6 MPa (200 kgf/cm^2, 2846.6 psi)			
PTO	Live PTO (Indipen-dent)	Direction of turning	Clockwise, viewed from tractor rear			
		PTO / engine speed	Fixed PTO shaft type with 1 speed : 540 min^{-1} (rpm) at 2205 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2035 min^{-1} (rpm) 540E min^{-1} (rpm) at 1519 min^{-1} (rpm) Interchangeable PTO shaft type : 540 min^{-1} (rpm) at 2035 min^{-1} (rpm) 1000 min^{-1} (rpm) at 2389 min^{-1} (rpm)			

Note : * Manufacture's estimate
** At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

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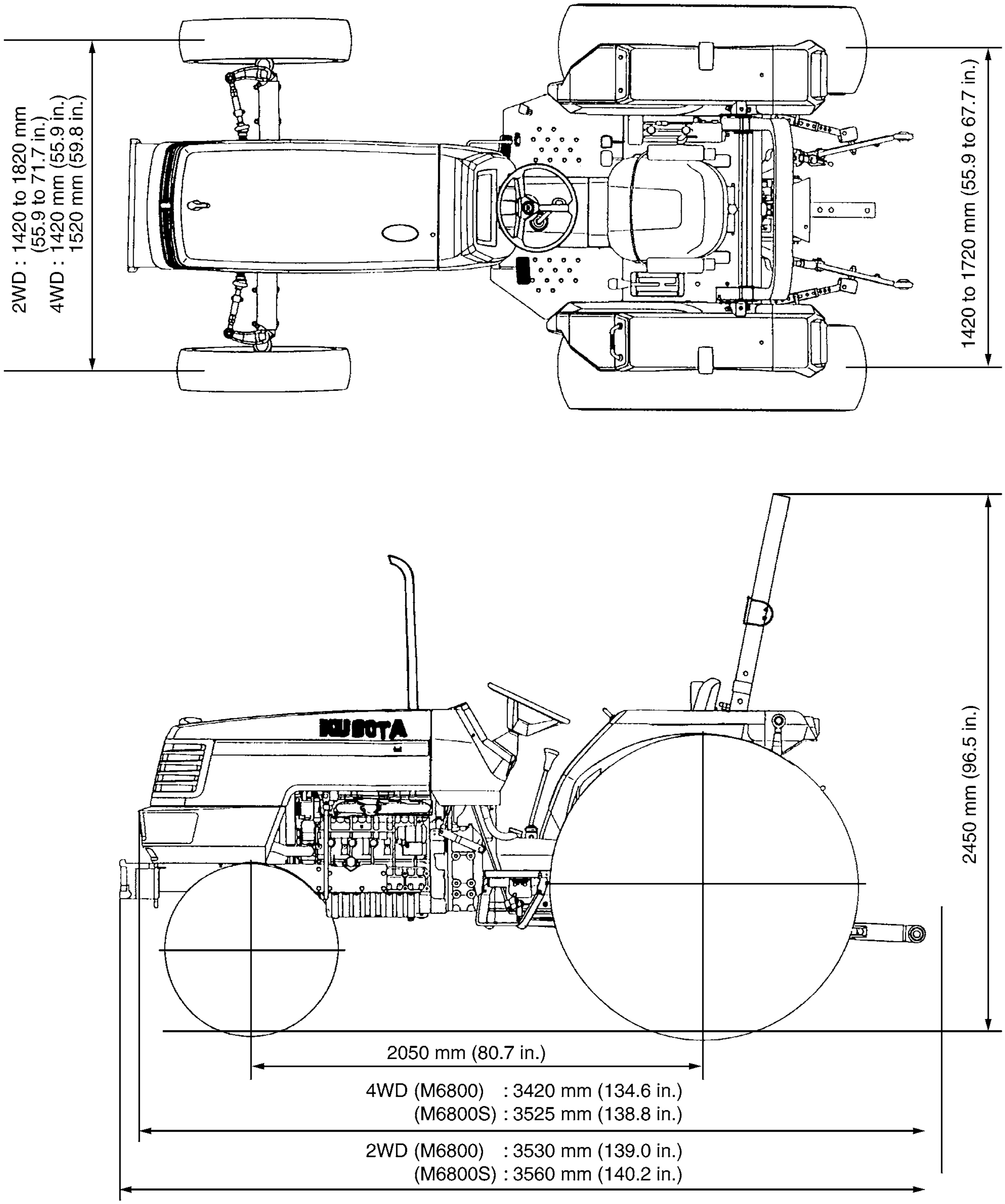
DIMENSIONS

M6800 · M6800S



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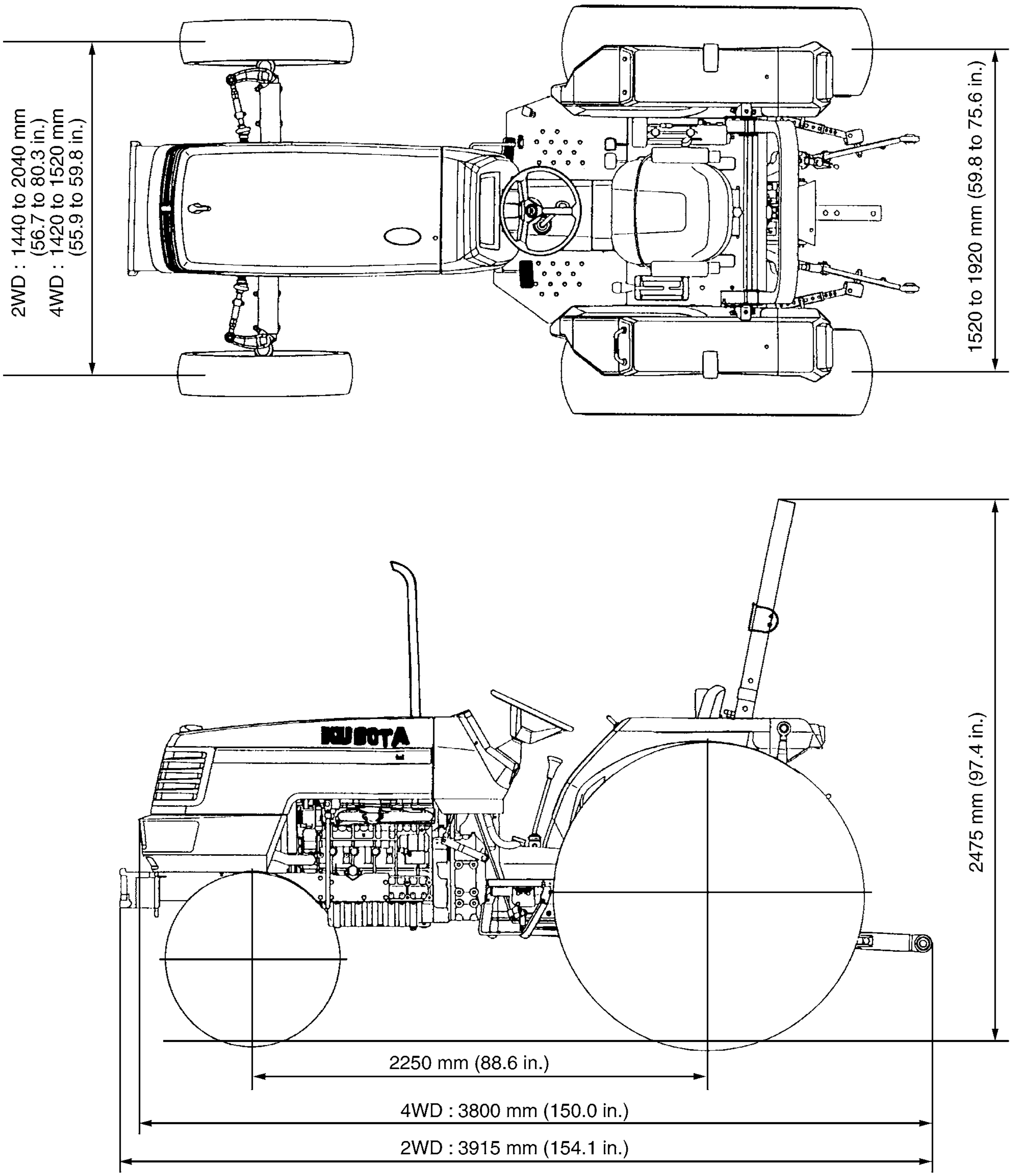
M8200



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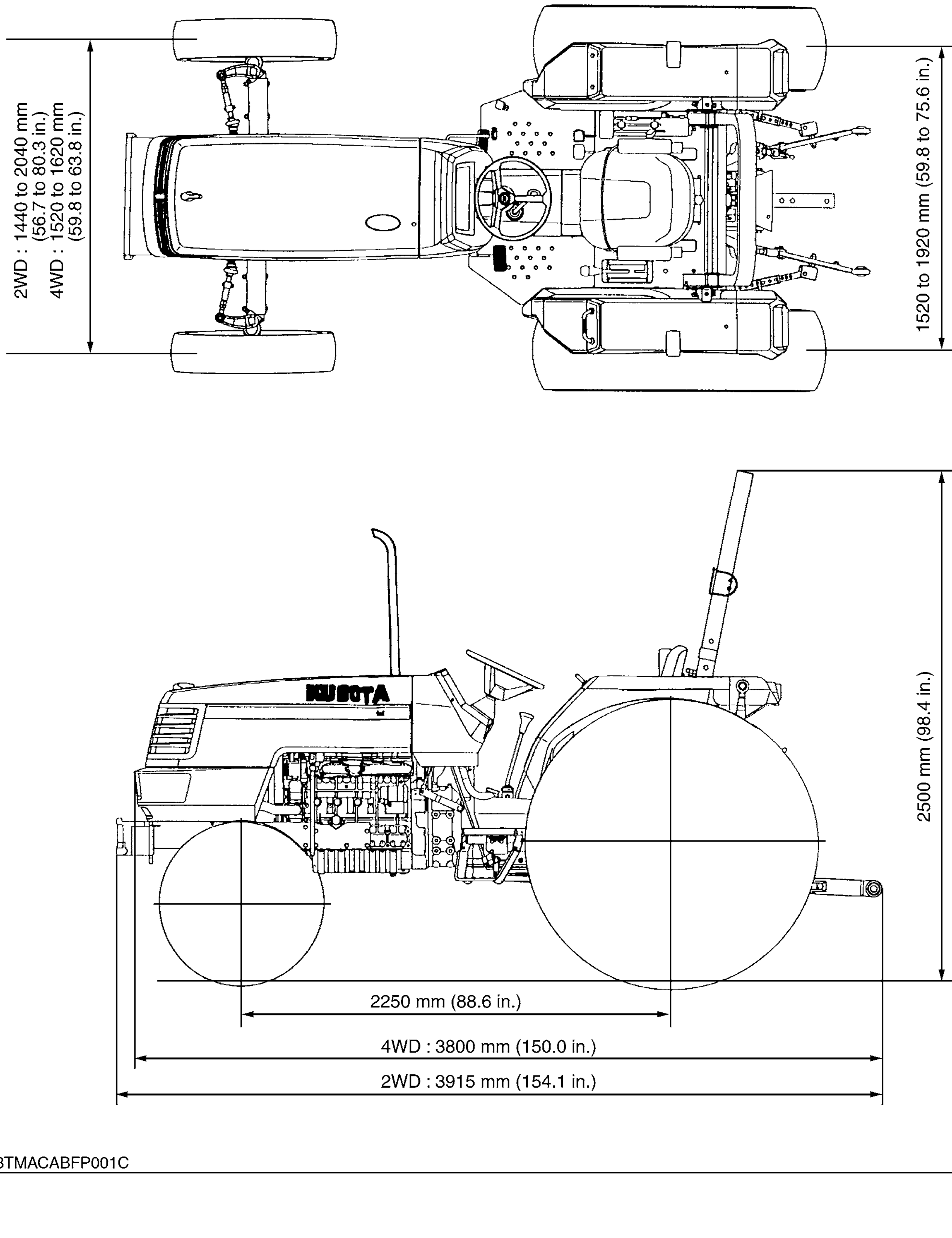
M9000



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G GENERAL

GENERAL

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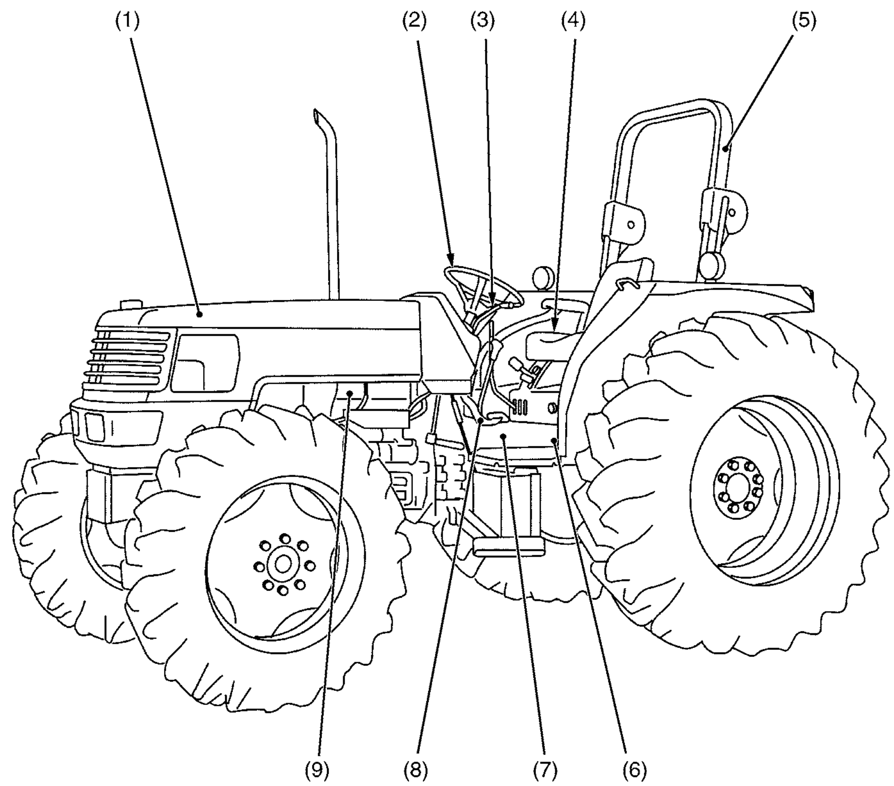
1. FEATURES



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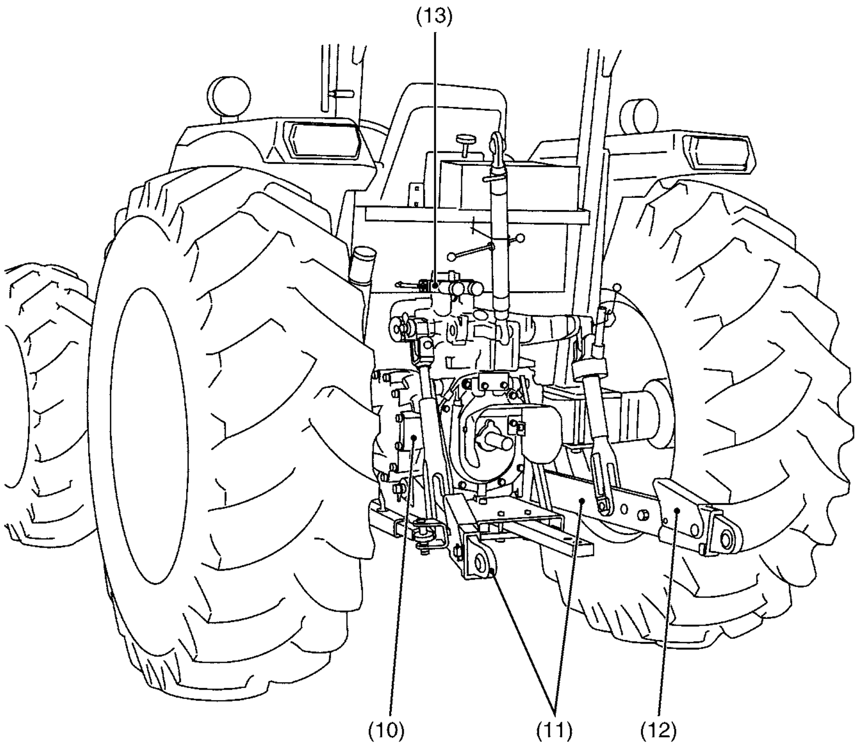
1. New Design
   Full-open Hood and Flat Top Fender
2. Hydrostatic Power Steering
3. Synchro-Shuttle
   Lo-Reverse [M6800]
   Forward-Reverse [M6800S · M8200 · M9000]
4. Hydraulic Independent PTO
5. Foldable ROPS
6. New Transmission
   [M6800]
   - Main Shift : Partially Synchronized
   - Forward 8 / Reverse 4 Speeds
   - Forward 12 / Reverse 4 Speeds (with Creep, if equipped)
   [M6800S · M8200 · M9000]
   - Main Shift : Full Synchronized
   - Forward 8 / Reverse 8 Speeds
   - Forward 12 / Reverse 12 Speeds (with Creep, if equipped)
7. Semi-Flat Deck and Rubber Mounted Deck
8. Hanging Pedal
9. New E-TVCS Diesel Engine
   Low Noise and Vibration
   High Torque Rise

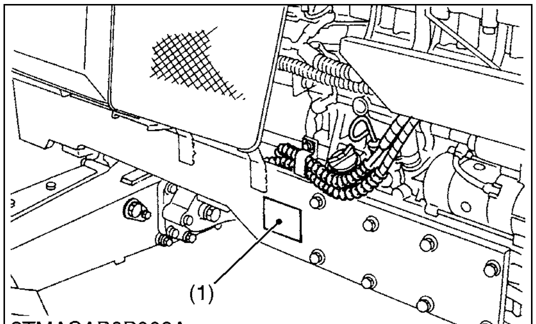


3TMACAB0P002A

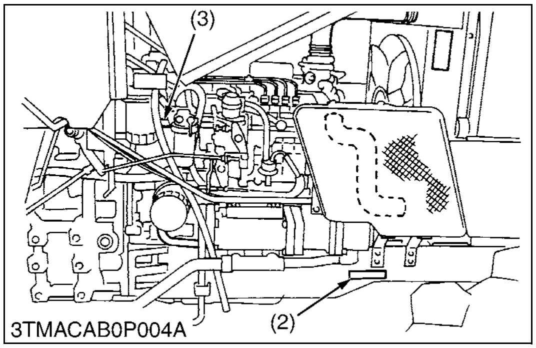
10.Wet Disc Brake
11.Three Point Hitch with Big Lift Power
12.Telescope Lower Link (M8200 · M9000)
13.Remote Valve
Self-Cancelling with Detents (Standard)
Flow Control Valve (Option)
Floating Valve with Detent (Option)

2. TRACTOR IDENTIFICATION

[1] MODEL NAME AND SERIAL NUMBERS



3TMACAB0P003A

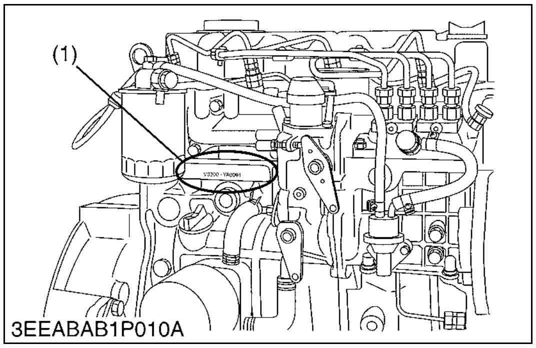


3TMACAB0P004A

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

W1010800



3EEABAB1P010A

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. V3300-YA0001

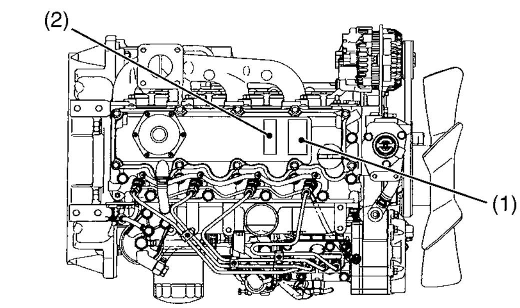
“Y” indicates 2000 and “A” indicates January.

So, YA indicates that the engine was manufactured on January, 2000.

(1) Engine Model and Serial Number

W1010477

[2] E2 ENGINE



3TMACAB0P053A

[ex.: Model Name V3300-E2]

The emission controls that have been put into effect in various countries to prevent air pollution will be stepped up. The time to enforce the regulations differs depending on the engine output classifications.

Kubota has been supplying the diesel engines conforming to the emission regulations in respective countries. Exhaust emissions regulations shift to the second stage. Kubota executed the improvement of the engine according to this regulation.

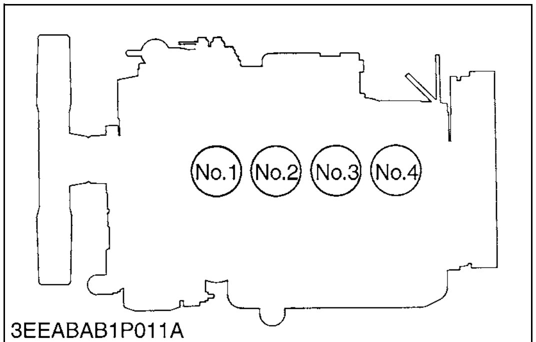
In order to discriminate the engines conforming to Tier 1 / Phase 1 requirements and those conforming to Tier 2 / Phase 2 requirements, we have adopted E2 as a new model name for the engines conforming Tier 2 / Phase 2 regulations with emission label (1) or (2).

In the after-sale services for V3300-E2, V3300-TE2 and V3300-TIE2 series engines, only use the dedicated parts for E2 models and carry out the maintenance services accordingly.

(1) Emission Label for **EPA**
(2) Emission Label for **EC**

W1113734

[3] CYLINDER NUMBER



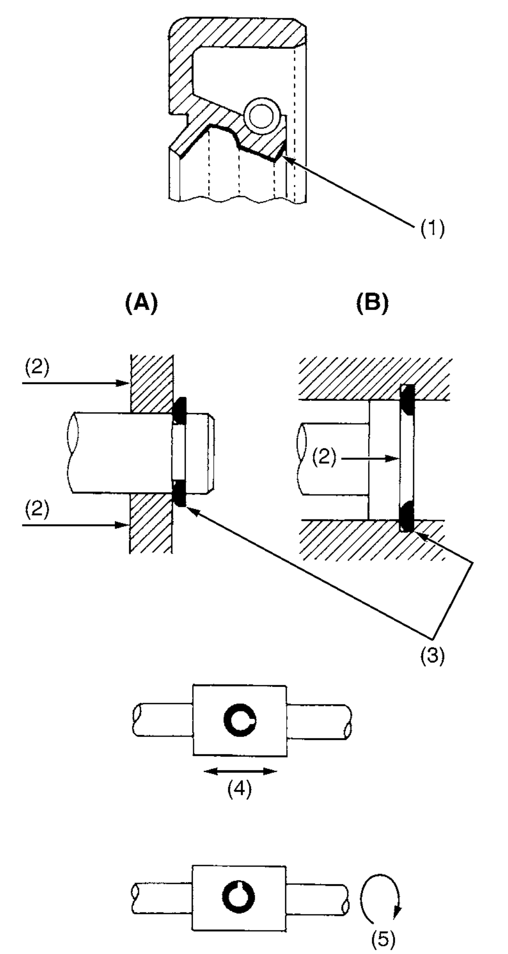
3EEABAB1P011A

The cylinder numbers of V3300-E2, V3300-TE2 and V3300-TIE2 diesel engine are designated as shown in the figure.

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

W1011077

3. GENERAL PRECAUTIONS



3TMABAB0P005A

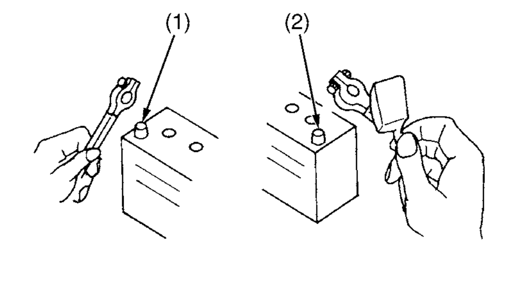
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

4. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

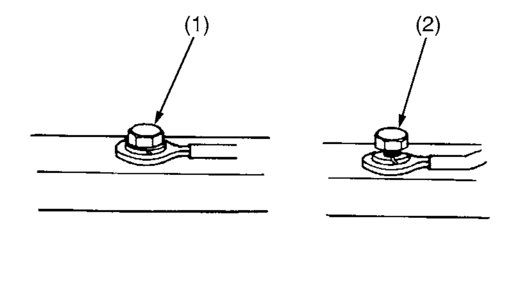
To ensure safety and prevent damage to the machine and surrounding equipment, heed the following precautions in handling electrical parts and wiring.

■ **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

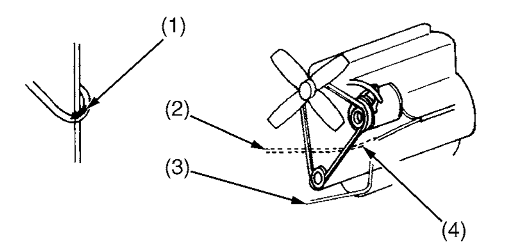


3TMABAB0P007A

- Securely tighten wiring terminals.

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

W1011216

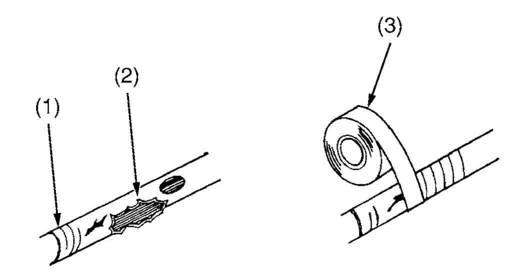


3TMABAB0P008A

- Do not let wiring contact dangerous part.

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

W1011313

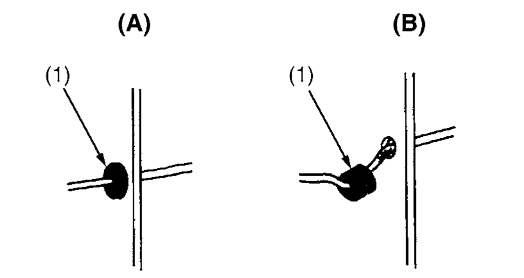


3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

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

W1012292



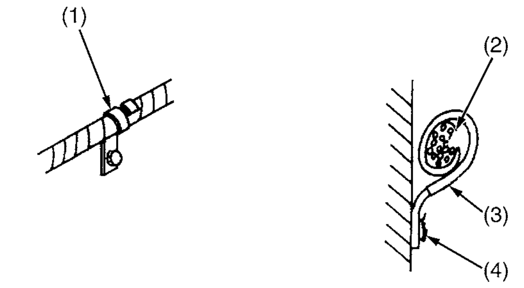
3TMABAB0P009A

- Securely insert grommet.

(1) Grommet

(A) Correct
(B) Incorrect

W1011388

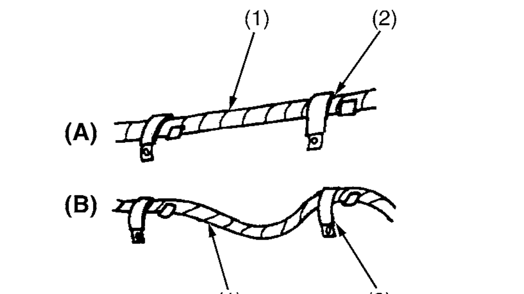


3TMABAB0P010A

- Securely clamp, being careful not to damage wiring.

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

W1011458



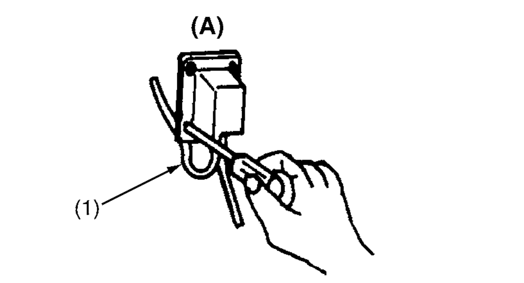
3TMABAB0P011A

- 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



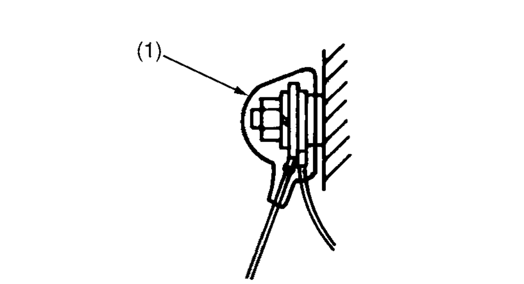
3TMABAB0P012A

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

(1) Wiring

(A) Incorrect

W1011670



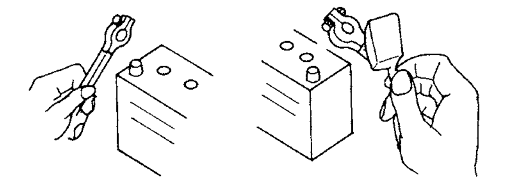
3TMABAB0P013A

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

(1) Cover
• Securely Install Cover

W1011735

[2] BATTERY



3TMABAB0P006B

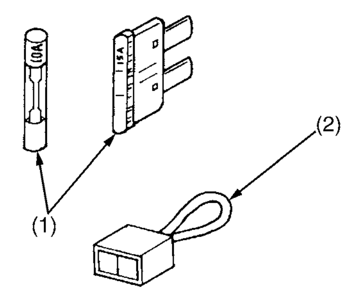
- Take care not to confuse positive and negative terminals.
- When removing battery cord, disconnect negative wire first. When installing battery cord, check for polarity and connect positive wire first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting cord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



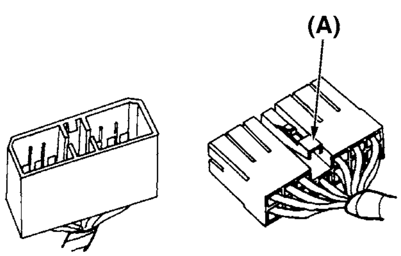
3TMABAB0P014A

- 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

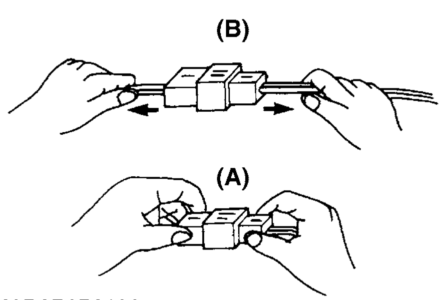


3TMABAB0P015A

- For connector with lock, push lock to separate.

(A) Push

W1012211

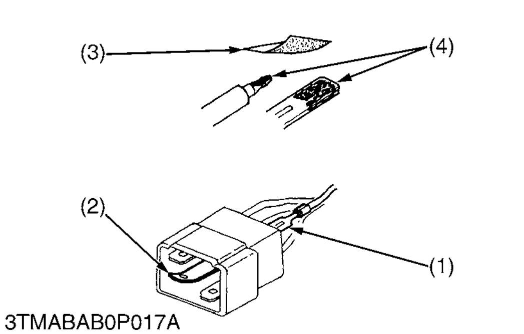


3TMABAB0P016A

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

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

W1012272

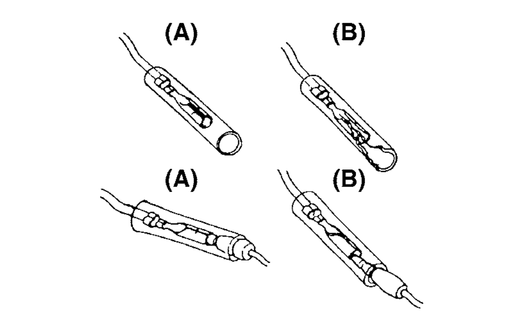


3TMABAB0P017A

- 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

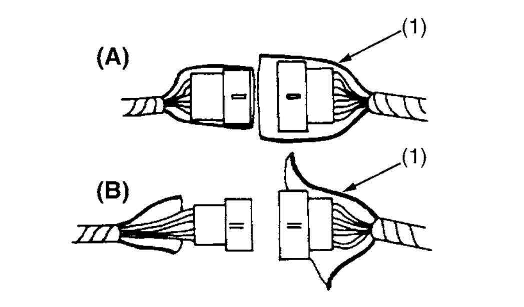


3TMABAB0P018A

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

(A) Correct
(B) Incorrect

W1012430



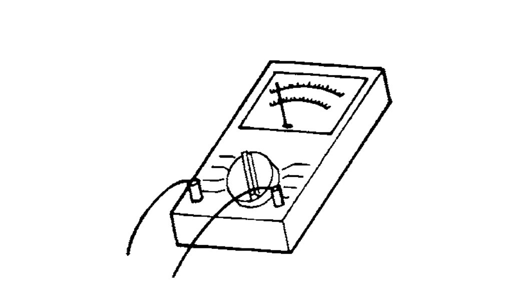
3TMABAB0P019A

- 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

5. LUBRICANTS FUEL AND COOLANT

<table>
<tr><th rowspan="2"></th><th rowspan="2">Place</th><th colspan="3">Capacity</th><th colspan="2" rowspan="2">Lubricants, fuel and coolant</th></tr>
<tr><th>M6800(S)</th><th>M8200</th><th>M9000</th></tr>
<tr><td>1</td><td>Fuel tank</td><td>65 L
17.2 U.S.gals.
14.3 Imp.gals.</td><td colspan="2">90 L
23.8 U.S.gals.
19.8 Imp.gals.</td><td colspan="2">No. 2-D diesel fuel
No. 1-D diesel fuel if temperature is below –10 °C (14 °F)</td></tr>
<tr><td>2</td><td>Coolant</td><td>8.5 L
9.0 U.S.qts.
7.5 Imp.qts.</td><td colspan="2">9.0 L
9.5 U.S.qts.
7.9 Imp.qts.</td><td colspan="2">Fresh clean water with anti-freeze</td></tr>
<tr><td>3</td><td>Engine crankcase</td><td colspan="3">10.7 L
11.3 U.S.qts.
9.4 Imp.qts.</td><td colspan="2">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</td></tr>
<tr><td>4</td><td>Transmission case</td><td>43 L
45.4 U.S.qts.
37.8 Imp.qts.</td><td colspan="2">54 L
57.0 U.S.qts.
47.5 Imp.qts.</td><td colspan="2">KUBOTA SUPER UDT fluid*</td></tr>
<tr><td>5</td><td>Front differential case oil</td><td colspan="2">5.0 L
5.3 U.S.qts.
4.4 Imp.qts.</td><td>6.0 L
6.3 U.S.qts.
5.3 Imp.qts.</td><td colspan="2" rowspan="2">KUBOTA SUPER UDT fluid or SAE80, SAE90 gear oil</td></tr>
<tr><td>6</td><td>Front axle gear case oil</td><td colspan="3">3.5 L
3.7 U.S.qts.
3.1 Imp.qts.</td></tr>
<tr><td>7</td><td>Air cleaner
(Oil bath type)</td><td colspan="3">2.0 L
2.1 U.S.qts.
1.8 Imp.qts.</td><td colspan="2">Engine oil</td></tr>
<tr><th colspan="7">Greasing</th></tr>
<tr><th></th><th>Place</th><th colspan="3">No. of greasing point</th><th>Capacity</th><th>Type of grease</th></tr>
<tr><td rowspan="8">8</td><td>Front wheel hub [2WD]</td><td colspan="3">2</td><td rowspan="7">Until grease overflows</td><td rowspan="7">Multipurpose type grease</td></tr>
<tr><td>Knuckle shaft [2WD]</td><td colspan="3">2</td></tr>
<tr><td>Front wheel case support [4WD]</td><td colspan="3">2</td></tr>
<tr><td>Front axle support [4WD]</td><td colspan="3">2</td></tr>
<tr><td>Top link</td><td colspan="3">2</td></tr>
<tr><td>Top link bracket</td><td colspan="3">2</td></tr>
<tr><td>Lift rod</td><td colspan="3">3</td></tr>
<tr><td>Battery terminal</td><td colspan="3">2</td><td>Moderate amount</td><td>Multipurpose type grease or petroleum jelly</td></tr>
</table>

* KUBOTA original transmission hydraulic fluid.

■ **NOTE**

- **Engine Oil : Oil used in the engine should have an American Petroleum Institute (API) service classification and Proper SAE Engine Oil according to the ambient 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.**

6. 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		
Unit / **Diameter**	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		
Unit / **Diameter**	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

W1048139

7. MAINTENANCE

No.	Item		Period	50	100	200	300	400	600	800	1500	3000	After purchase 1 year	After purchase 2 years	Important		Reference page
1	Engine oil		Change	★		☆											G-16
2	Engine oil filter		Replace	★				☆									G-16
3	Fuel filter		Replace					☆								@	G-27
4	Front differential case oil		Change	★					☆								G-29
5	Hydraulic oil filter		Replace	★			☆										G-17
6	Front axle gear case oil		Change	★			☆										G-29
7	Water separator		Clean					☆									G-27
8	Engine start system		Check	☆													G-19
9	Wheel bolt torque		Check	☆													G-21
10	Greasing		–		☆												G-24
11	Battery condition		Check		☆												G-21
12	Air cleaner element [Double type]	Primary element	Clean		☆										*	@	G-22
			Replace										☆		**		G-22
		Secondary element	Replace										☆				G-22
13	Air cleaner [Oil bath type]	Oil	Check	☆													G-18
		Element	Clean					☆									G-28
14	Fan belt		Adjust		☆												G-23
15	Clutch		Adjust	★	☆												G-18
16	Brake		Adjust		☆												G-23
17	Radiator hose and clamp		Check			☆											G-25
			Replace											☆			G-25
18	Power steering oil line		Check			☆											G-25
			Replace											☆			G-25
19	Fuel line		Check			☆										@	G-25
			Replace											☆			G-25
20	Toe-in		Adjust			☆											G-26
21	Greasing (2WD front wheel hub)		–					☆									G-26
22	Transmission fluid		Change	★					☆								G-17
23	Intake air line		Check			☆										@	–
			Replace											☆	***		–
24	Front axle pivot		Adjust						☆								G-29
25	Engine valve clearance		Adjust							☆							1-S19
26	Fuel injection nozzle injection pressure		Check								☆					@	1-S68
27	Injection pump		Check									☆				@	1-S67
28	Cooling system		Flush											☆			G-30, 31
29	Coolant		Change											☆			G-30, 31
30	Fuel system		Bleed										Service as required				G-32
31	Clutch housing water		Drain														G-32
32	Fuse		Replace														G-33
33	Light bulb		Replace														G-33

■ IMPORTANT

- **The jobs indicated by ★ must be done after the first 50 hours of operation.**
- *** : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.**
- **** : Every year or every 6 times of cleaning.**
- ***** : Replace only if necessary.**
- **The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the 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.

W1035769

8. CHECK AND MAINTENANCE

CAUTION

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

[1] DAILY CHECK

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

Checking

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

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

- While sitting in the operator’s seat.

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

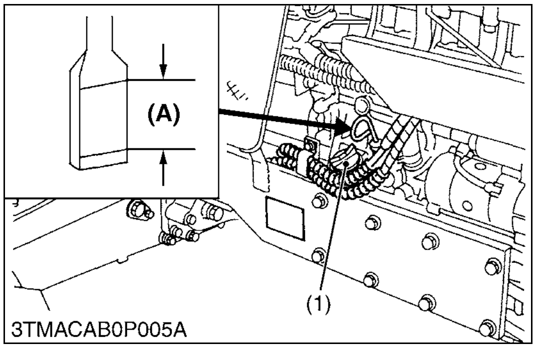
- Turning the key switch.

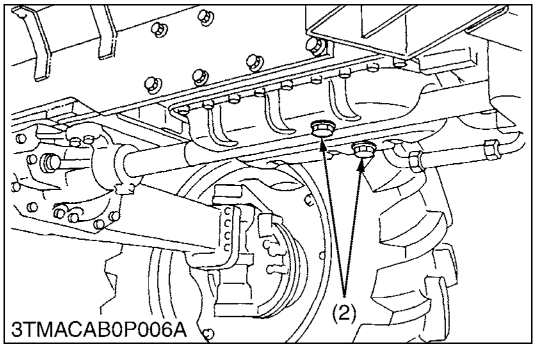
1. Check the performance of the Easy Checker lights.
2. Check head lights, tail lights and hazard light.
   Clean if necessary.
3. Check the performance of the meters and gauges.

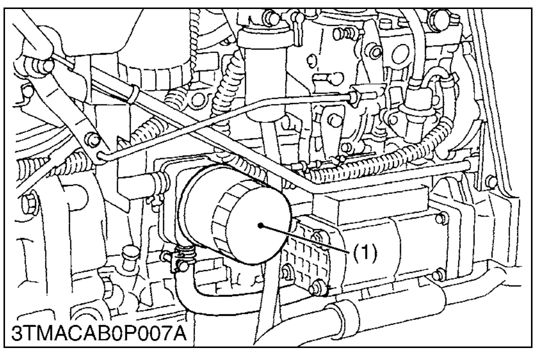
- Starting the engine.

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

[2] CHECK POINTS OF INITIAL 50 HOURS







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.
   (See **"5. LUBRICANTS, FUEL AND COOLANT"** at GENERAL Section.)

Oil capacity with filter	10.7 L 11.3 U.S.qts. 9.4 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.**

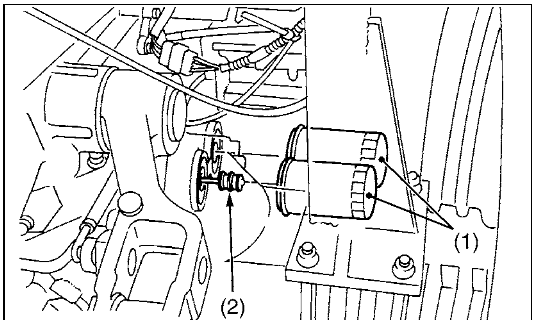
1. Remove the oil filter (1).
2. Put a film of clean engine oil on rubber seal of new filter.
3. Tighten the filter quickly until it contacts the mounting surface.
   Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases a little. 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**

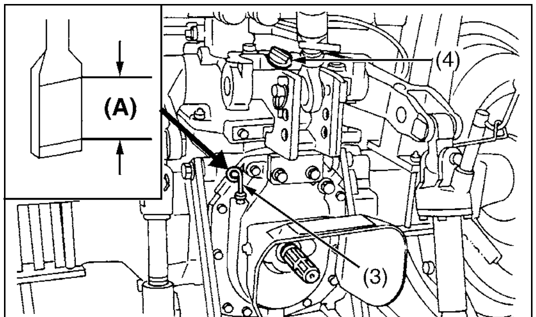
- **To prevent serious damage to the engine, use only a KUBOTA genuine filter.**

(1) Engine Oil Filter

W1021852



3TMACAB0P008A



3TMACAB0P009A

Replacing Hydraulic Oil FIlter

CAUTION

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

1. Remove the drain plug at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug.
3. Remove the two oil filters (1).
4. Clean off metal fillings with clean rags at the magnetic filters (2).
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 (3).
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.

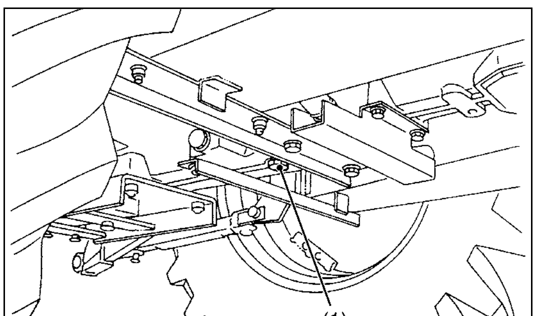
■ **IMPORTANT**

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

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

(A) Oil level is acceptable within this range.

W1022033



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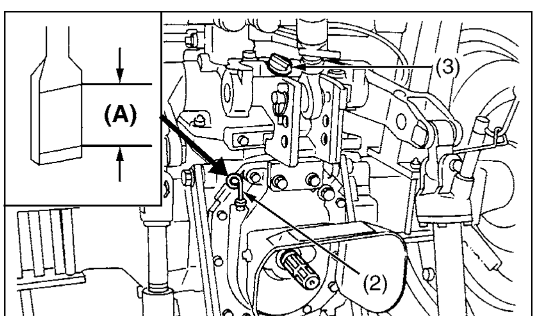


3TMACAB0P009B

Changing Transmission Fluid

CAUTION

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

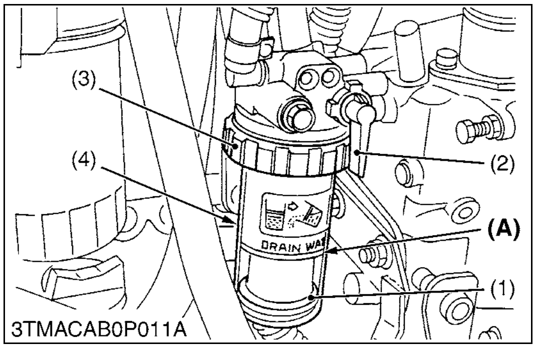
1. To drain the used oil, remove the drain plug (1) at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug.
3. Fill with the new **KUBOTA SUPER UDT** fluid up to the upper notch on the dipstick (2).
4. (See **"5. LUBRICANTS, FUEL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

Oil capacity	M6800(S)	42 L 45.4 U.S.qts. 37.8 Imp.qts.
	M8200 M9000	54 L 57.0 U.S.qts. 47.5 Imp.qts.

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

(A) Oil level is acceptable within the range.

W1022400



3TMACAB0P011A

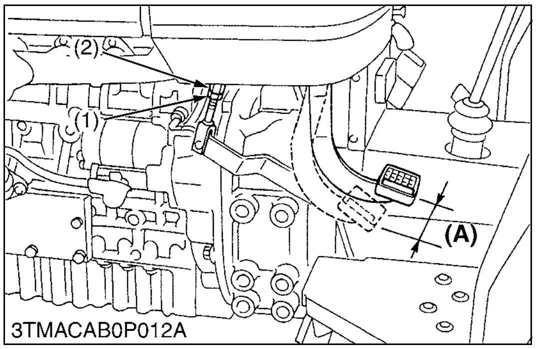
Checking Water Separator

1. As water is collected in the water separator, the red float (1) is raised.
2. When the red float (1) has reached the white line level, close the fuel cock (2), loosen the retainer ring (3), and take out and empty the cup (4). Be careful not to break the element.
3. Place the cup back into position. Vent air out of the fuel system. (See **"SERVICE AS REQUIRED"** in periodic service section.)

(1) Red Float
(2) Fuel Cock
(3) Retainer Ring
(4) Cup

(A) "WHITE LINE"

W1022648



3TMACAB0P012A

Adjusting Clutch Pedal

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

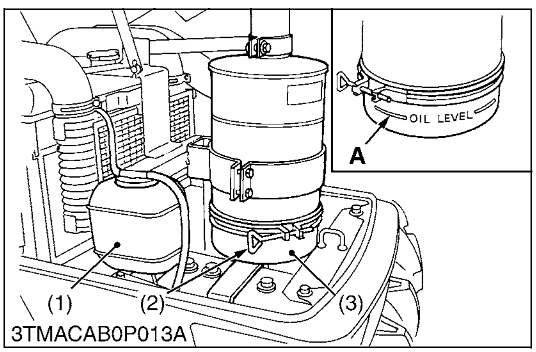
Proper clutch pedal	Free travel	35 to 45 mm (1.4 to 1.8 in.) on the pedal

(1) Lock Nut
(2) Turnbuckle

(A) Free Travel

W1022869

[3] CHECK POINTS OF EVERY 50 HOURS



3TMACAB0P013A

Checking Air Cleaner Oil Level (Oil bath type)

CAUTION

- **Be sure to stop the engine before checking the oil level.**

1. Park the machine on a flat surface.
2. Check air cleaner oil before starting the engine or 15 minutes or more after the engine has stopped.
3. Pull out the recovery tank assembly (1).
4. To check the oil level, unscrew the clamp screw (2) and remove the oil pan (3).
   Check the see that the oil level is just **"OIL LEVEL"** mark on the oil pan.
   If the level is too low, add new oil to the prescribed level.
5. If the oil contains impurities, or sediments are deposited nearly 12 mm (0.5 in.) thick on the bottom of oil pan, clean the oil pan and change the oil.

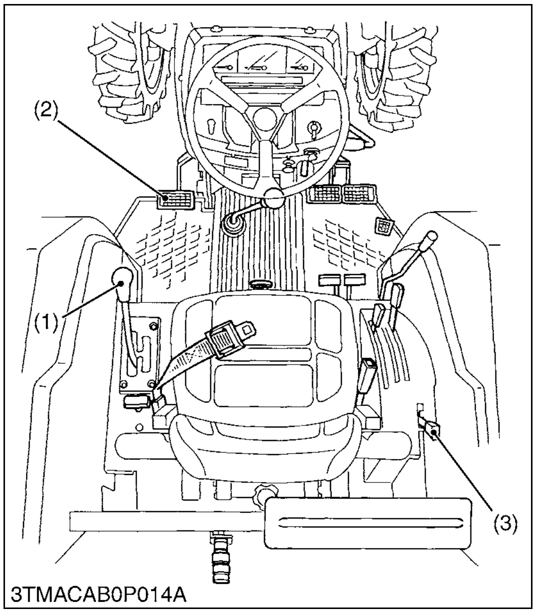
■ **IMPORTANT**

- **The clamp screw is surely tightened so that oil should not leak when the oil pan is attached.**

(1) Recovery Tank Assembly
(2) Clamp Screw
(3) Oil Pan

A : "OIL LEVEL"

W1075390



Checking Engine Start System [M6800]

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

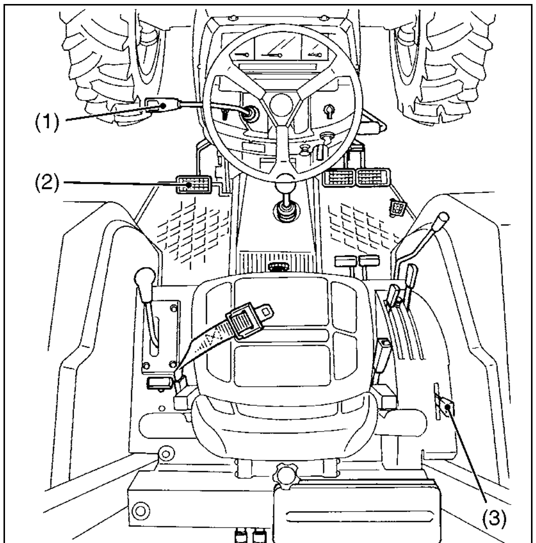
■ **Test 2 : Switch for the PTO clutch control lever.**

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 range gear shift lever (1) to the neutral position.
5. Pull out the engine stop knob and turn the key to **"START"** position.
6. The engine must not crank.
7. If it cranks, inspect the safety switch.

(1) Range Gear Shift Lever
(2) Clutch Pedal
(3) PTO Clutch Control Lever

W1023076



3TMACAB0P015A

Checking Engine Start System [M6800S · M8200 · M9000]

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. Pull out the engine stop knob and 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.**

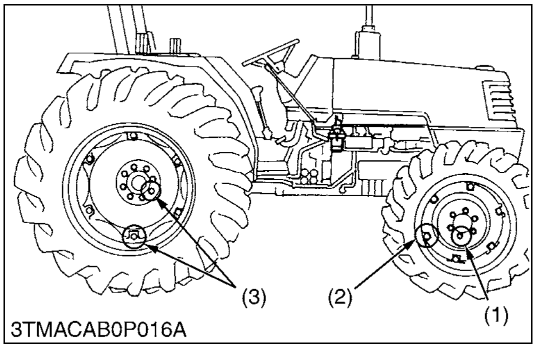
1. Sit on operator's seat.
2. Engage the PTO clutch control lever (3).
3. Depress the clutch pedal (2) fully.
4. Shift the shuttle shift lever (1) to the neutral position.
5. Pull out the engine stop knob and turn the key to **"START"** position.
6. The engine must not crank.
7. If it cranks, inspect 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 **"9. ELECTRICAL SYSTEM"**.)

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

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.**

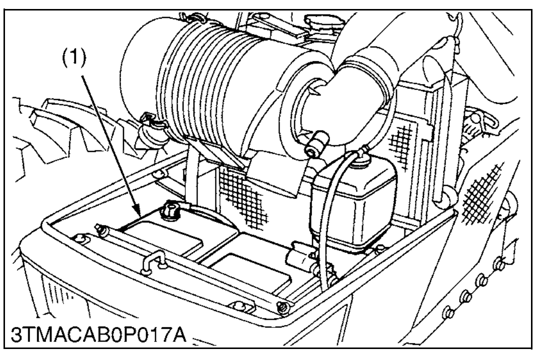
1. Check the wheel mounting nuts regularly especially when new. If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting nut	2WD	168 to 296 N·m 17.1 to 20.0 kgf·m 123.7 to 144.7 ft-lbs
		4WD	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 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 and rear disc mounting nut	2WD	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs
		4WD	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 and 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.
   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.

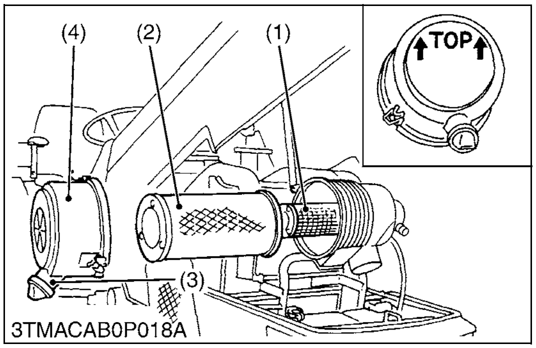
(1) Battery

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



3TMACAB0P018A

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. When replacing the air cleaner primary element (2), replace the secondary element (1) as well :
   Once a year or after every six times of cleaning, whichever comes first.

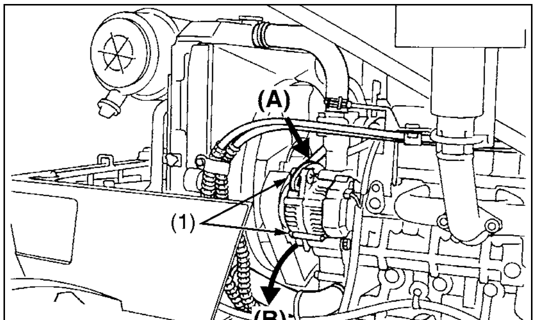
■ **IMPORTANT**
- **The air cleaner uses a dry element, never apply oil.**
- **Do not run the engine with filter element removed.**
- **Be sure to refit the dust cup with the arrow ↑ (on the rear of cup) upright. If the dust cup is improperly fitted, evacuator valve will not function and dust will adhere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



3TMACAB0P019A

Adjusting Fan Belt Tension

CAUTION

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

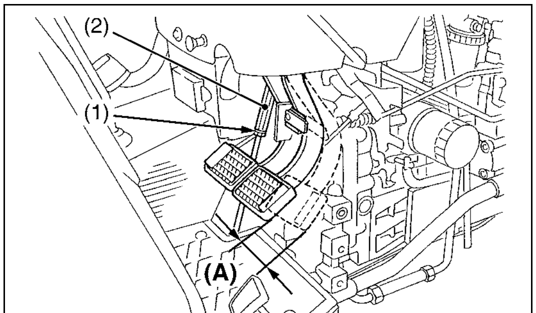
Belt tension	Factory spec.	10 to 12 mm 0.39 to 0.47 in.

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



3TMACAB0P020A

Adjusting Brake Pedal

CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**

Brake pedal free travel	Factory spec.	40 to 45 mm 1.6 to 1.8 in.

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If adjustment is needed, loosen the lock nut and turn the turnbuckle to adjust the rod length within acceptable limits.
4. Retighten the lock nut.

■ **IMPORTANT**

- **Keep the free travel in the right and left brake pedals equal.**

(1) Lock Nut
(2) Turnbuckle

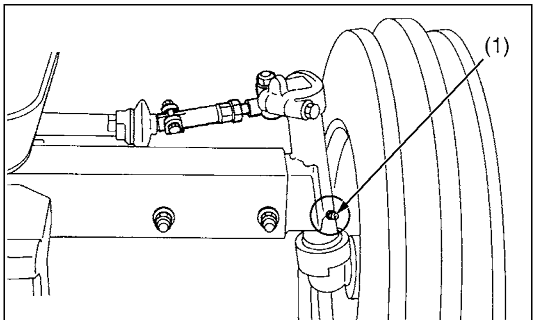
(A) Free Travel

W1025046

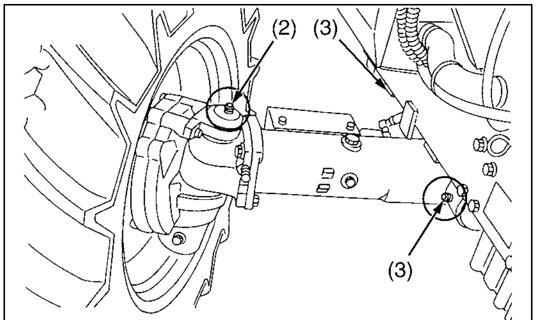
Adjusting Clutch Pedal

- See page G-18.

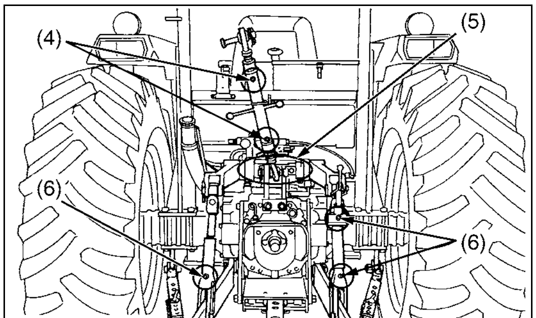
W1025213



3TMACAB0P021A



3TMACAB0P022A



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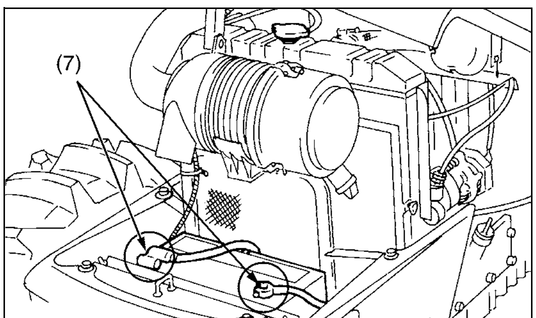


3TMACAB0P024A

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) Grease Fitting (Knuckle Shaft) [RH, LH]
(2) Grease Fitting (Front Wheel Case Support) [RH, LH]
(3) Grease Fitting (Front Axle Support)
(4) Grease Fitting (Top Link)
(5) Grease Fitting (Top Link Bracket)
(6) Grease Fitting (Lifting Rod) [RH, LH]
(7) Battery Terminals

W1025259

Checking Engine Start System

- See page G-19.

W1025522

Checking Wheel Bolt Torque

- See page G-21.

W1025583

Adjusting Clutch Pedal

- See page G-18.

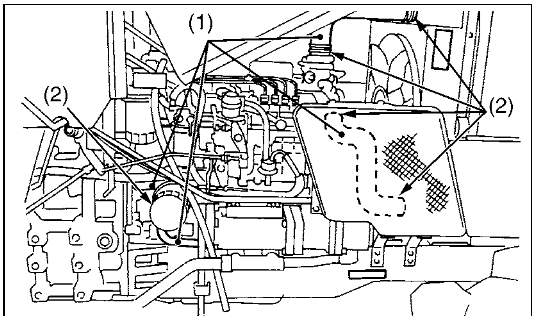
W1025628

[5] CHECK POINTS OF EVERY 200 HOURS

Changing Engine Oil

- See page G-16.

W1025684



3TMACAB0P004B

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.

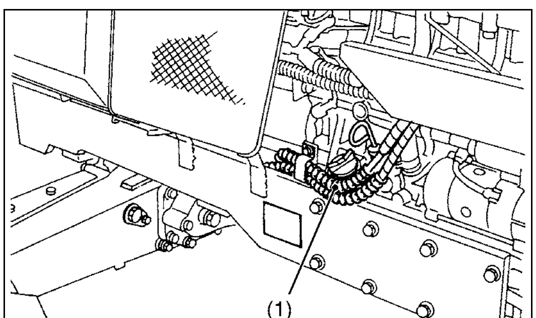
■ **Precaution at Overheating**

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. Don't stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see **"1. TROUBLESHOOTING"** at ENGINE Section, and then start again the engine.

(1) Radiator Hose (2) Clamp

W1025730



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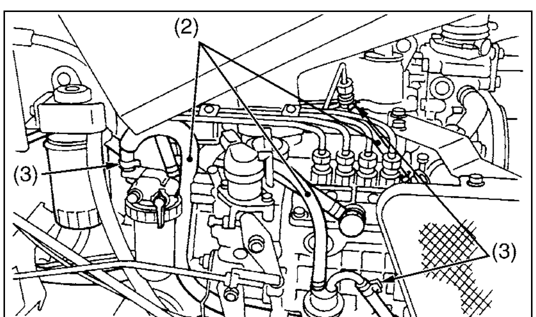

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Checking Power Steering Line and Fuel Line

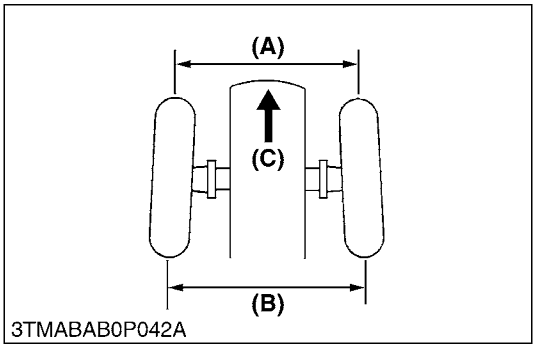
1. Check to see that all line and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

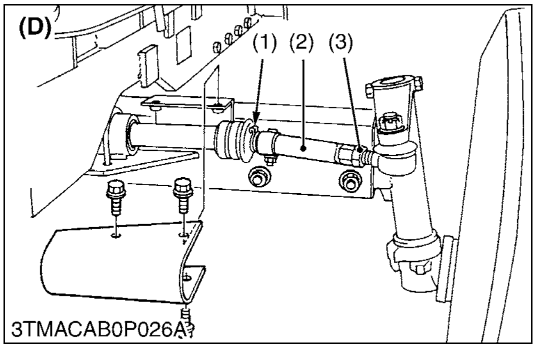
■ **NOTE**

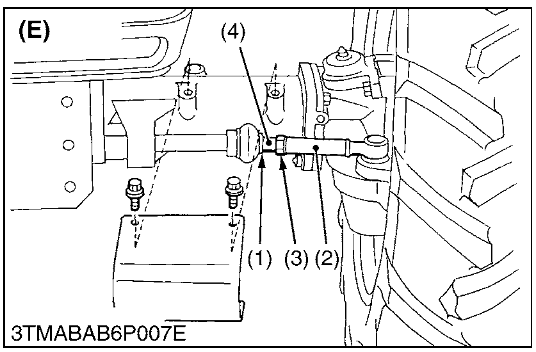
- **If the fuel line is removed, be sure to properly bleed the furl system.**
  (See "Bleeding Fuel System" in as required maintenance.)

(1) Power Steering Hose (3) Clamp
(2) Fuel Line

W1025907







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.

■ **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)
   Turn the rod end (4) to adjust until the proper toe-in measurement is obtained. (4WD)
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"
(D) 2WD
(E) 4WD

W1026029

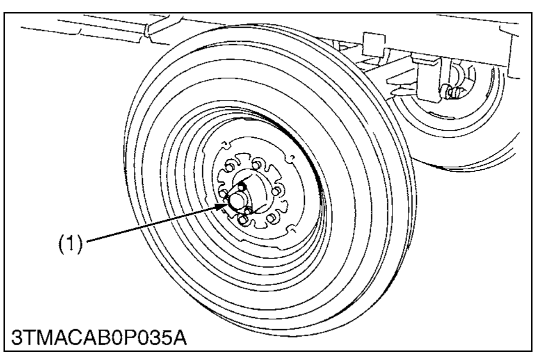
[6] CHECK POINTS OF EVERY 300 HOURS

Replacing Hydraulic Oil Filter

- See page G-17.

W1026536

[7] CHECK POINTS OF EVERY 400 HOURS

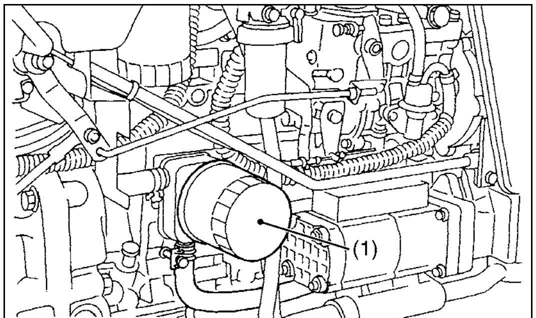


Lubricate Grease Fitting (2WD)

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

(1) Front Wheel Hub Cover

W1027029



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Replacing Engine Oil Filter

CAUTION

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

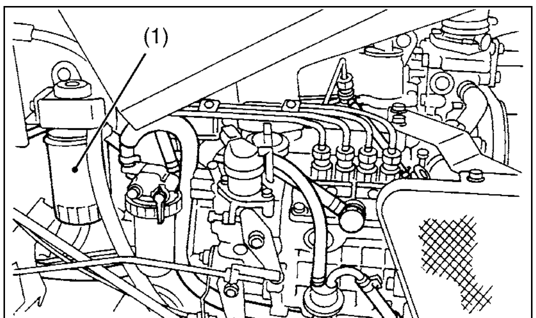
1. Remove the oil filter (1).
2. Put a film of clean engine oil on rubber seal of new filter.
3. Tighten the filter until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases a little. Make sure 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

W1026591



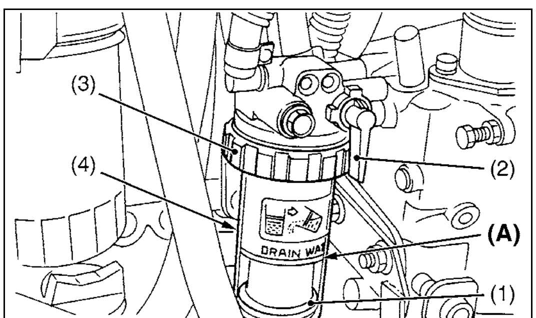
3TMACAB0P025B

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.
   (See **"Bleeding Fuel System"** in as required maintenance.)

(1) Fuel Filter

W1026760



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Checking Water Separator

1. As water is collected in the water separator, the red float (1) is raised.
2. When the red float has reached the white line level, close the fuel cock (2), loosen the retainer ring (3), and take out and empty the cup (4). Be careful not to break the element.
3. Place the cup (4) back into position. Vent air out of the fuel system.
   (See **"SERVICE AS REQUIRED"** in periodic service section.)

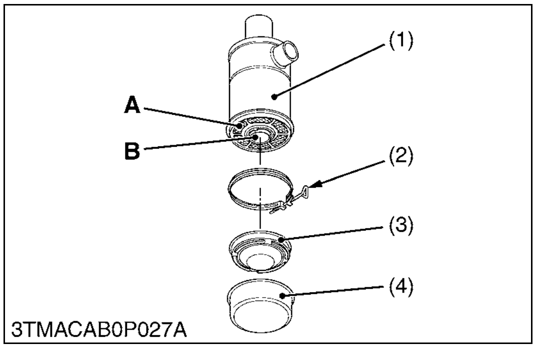
■ **IMPORTANT**

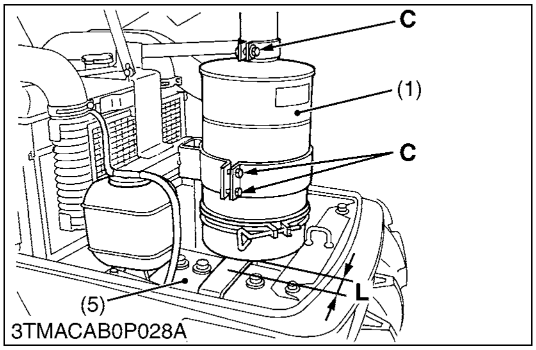
- **If water is drawn through to the fuel pump, extensive damage will occur.**

(1) Red Float
(2) Fuel Cock
(3) Retaining Ring
(4) Cup

(A) "WHITE LINE"

W1026874





Cleaning Air Cleaner Element (Oil bath type)

1. Remove the air cleaner assembly.
   Unscrew the clamp screw (2) and remove the oil pan (4).
2. Clean the element (**A**) and center tube (**B**) etc, with petroleum, and inspect lower portion of body assembly and center tube (**B**) for structural integrity.
   Replace broken, cracked, or missing parts.
3. Before assembling, dry the air cleaner and moisten each part with oil.
4. Add new oil to the prescribed level.

(When reassembling)

- Clearance (**L**) of the oil pan (4) secured.
- Tighten the each screw (**C**) are specified torque.

Tightening torque	Screw (**C**)	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.2 ft-lbs

■ **IMPORTANT**

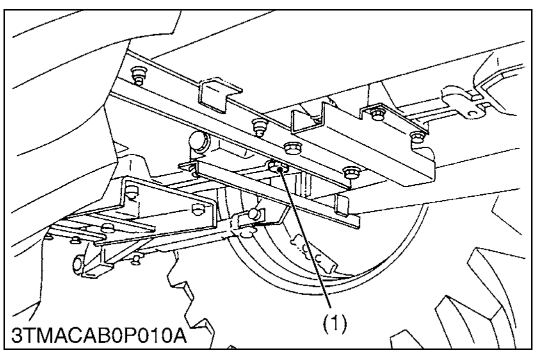
- **To prevent serious damage to the engine, use only a KUBOTA genuine pre-cleaner on the oil bath air cleaner.**

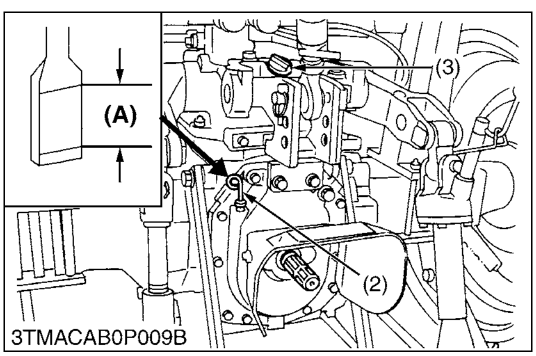
(1) Air Cleaner
(2) Clamp Screw
(3) Inner Oil Pan
(4) Oil Pan
(5) Battery

A : Element
B : Center Tube
C : Screw
L : 38.0 mm (1.5 in.)

W1076788

[8] CHECK POINTS OF EVERY 600 HOURS





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 (1).
3. Fill with the new **KUBOTA SUPER UDT** fluid up to the upper notch on the dipstick (2).
   (See **"5. LUBRICANTS, FUEL AND COOLANT"** at GENERAL Section.)
4. After running the engine for a few minutes, stop it and check the oil level again, add oil to prescribed level.

■ **IMPORTANT**

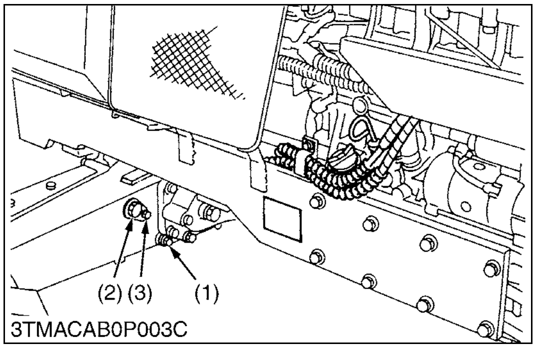
- **Do not operate the tractor immediately after changing the transmission fluid.**
- **Run the engine at medium speed for a few minutes to prevent damage to the transmission.**

Oil capacity	M6800(S)	43 L 45.4 U.S.qts. 37.8 Imp.qts.
	M8200 M9000	54 L 57.0 U.S.qts. 47.5 Imp.qts.

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

(A) Oil level is acceptable within this range.

W1027210



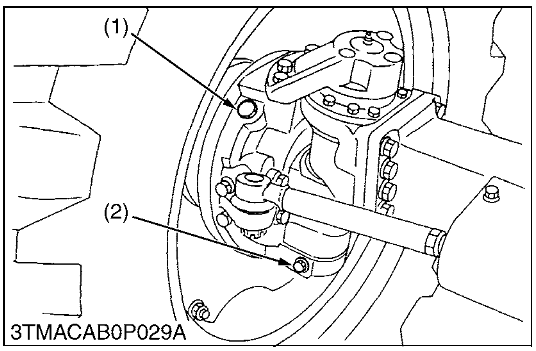
Changing Front Differential Case Oil

1. To drain the used oil, remove the drain and filling plug (1), (2) at the front differential case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug (1).
3. Remove the oil level check plug (3).
4. Fill with the new oil up to the lower rim of check plug port.
   (See **"5. LUBRICANTS, FUEL AND COOLANT"** at GENERAL Section.)
5. After filling reinstall the filling plug (2) and check plugs (3).

Oil capacity	M6800(S) M8200	5.0 L 5.3 U.S.qts. 4.4 Imp.qts.
	M9000	6.0 L 6.3 U.S.qts. 5.3 Imp.qts.

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

W1027428



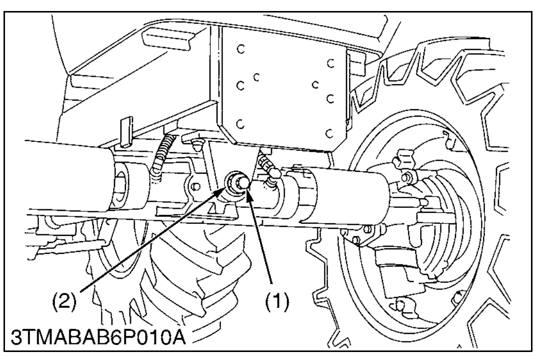
Changing Front Axle Gear Case Oil

1. To drain the used oil, remove the right and left drain plugs (2) and filling plugs (1) at the front axle gear case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs (2).
3. Fill with the new oil up to the filling plug port.
   (See **"5. LUBRICANTS, FUEL AND COOLANT"** at GENERAL Section.)
4. After filling reinstall the filling plugs (1).

Oil capacity	3.5 L 3.7 U.S.qts. 3.1 Imp.qts. for each side

(1) Filling Plug
(2) Drain Plug

W1027622



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

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) Adjusting Screw
(2) Lock Nut

W1027783

Replacing Hydraulic Oil Filter

- See page G-17.

W1027886

[9] CHECK POINTS OF EVERY 800 HOURS

Adjusting Engine Valve Clearance

1. See page 1-S19.

W1027950

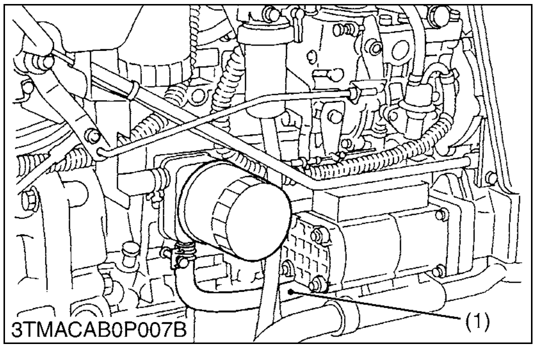
[10] CHECK POINTS OF EVERY 1 YEAR

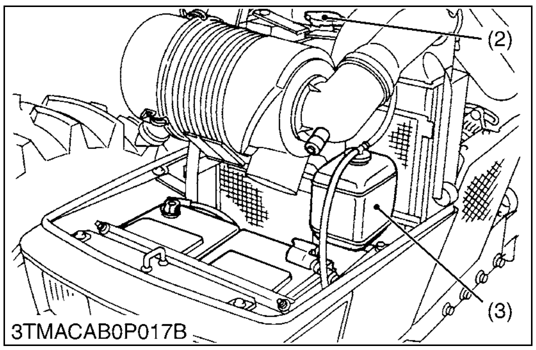
Replacing Air Cleaner Primary Element and Secondary Element

1. See **"Cleaning Air Cleaner Primary Element"** in every 100 hours maintenance.

W1028012

[11] CHECK POINTS OF EVERY 2 YEARS





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

Coolant capacity	M6800(S)	8.5 L 9.0 U.S.qts. 7.5 Imp.qts.
	M8200 M9000	9.0 L 9.5 U.S.qts. 7.9 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 (2). If the cap is loose or improperly fitted, water may lead out and the engine could overheat.**

(1) Radiator Hose
(2) Radiator Cap
(3) Recovery Tank

W1028088

Flush Cooling System and Changing Coolant (Continued)

■ **Anti-Freeze**

If coolant freezes, it can damage the cylinders and radiator. It is necessary, if the ambient temperature falls below 0 °C (32 °F), to remove coolant after operating or to add anti-freeze to it.

1. There are two types of anti-freeze available ; use the permanent type (PT) for this engine.
2. Before adding anti-freeze for the first time, clean the radiator interior by pouring fresh water and draining it a few times.
3. The procedure for mixing of water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature, basically is should be referred to SAE J1034 standard, more specifically also to SAE J814c.
4. Mix the anti-freeze with water, and then fill in to the radiator.

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

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

■ **NOTE**

- **The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.**
- **When the coolant level drops due to evaporation, add water only. In case of leakage, add anti-freeze and water in the specified mixing ratio.**
- **Anti-freeze absorbs moisture. Keep unused anti-freeze in a tightly sealed container.**
- **Do not use radiator cleaning agents when anti-freeze has been added to the coolant. (Anti-freeze contains an anti-corrosive agent, which will react with the radiator cleaning agent forming sludge which will affect the engine parts.)**

W1038591

Replacing Radiator Hose (Water Pipes)

1. Replace the hoses and clamps.
   Refer to **"Checking Radiator Hose and Hose Clamp"**.
   (See page G-25.)

W1028672

Replacing Power Steering Hose

1. Replace the hoses and clamps, if necessary.
   Refer to **"Checking Power Steering Line and Fuel Line"**.
   (See page G-25.)

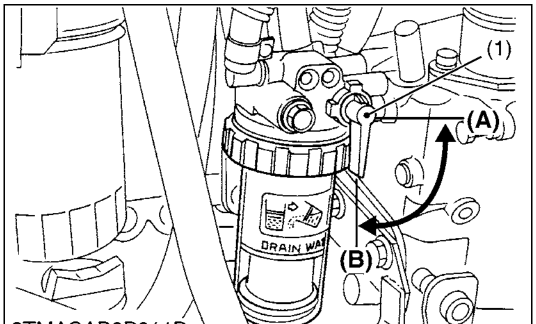
W1028718

Replacing Fuel Hose

1. Replace the fuel hoses and clamps, if necessary.
   Refer to **"Checking Power Steering Line and Fuel Line"**.
   (See page G-25.)

W1028763

[12] OTHERS



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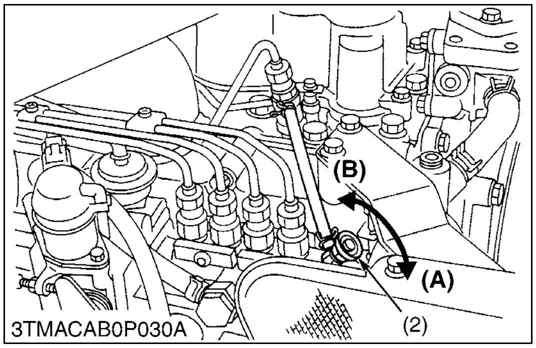

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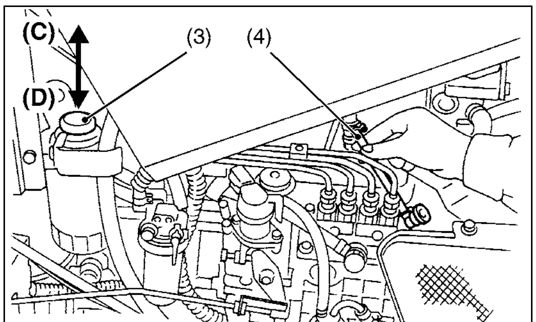

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Bleeding Fuel System

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:**

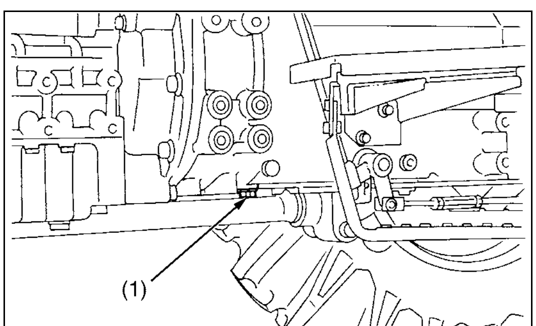
1. Make sure the fuel cock is in the **"OPEN"** position.
2. Open the air vent cock (2) on the fuel injection pump.
3. Pump the fuel pump knob (3) located on the top of the fuel filter. The fuel pump knob (3) will pump easily at first and with added resistance as air is purged from the system. To make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

■ **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.**
- **Always close the air vent cock except for bleeding fuel lines. Otherwise, engine runs irregularly or stalls frequently.**

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

W1028841



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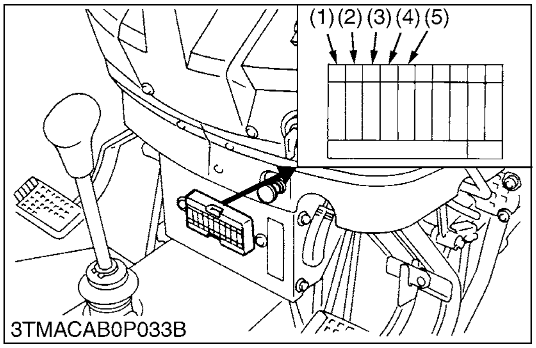
Draining Clutch Housing Water

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)

W1029193



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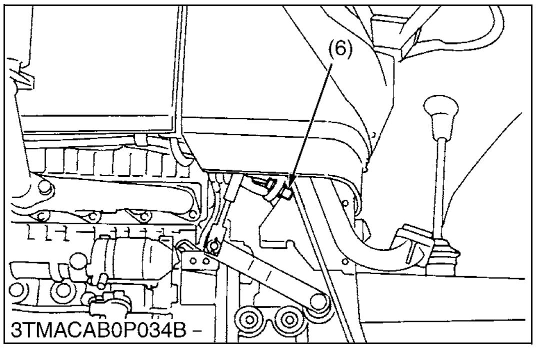

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Replacing Fuse

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

■ **IMPORTANT**

- **Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to troubleshooting section of this manual for specific information dealing with electrical problems.**

■ **Protected Circuit**

Fuse No.	Capacity (A)	Protected circuit
1	20	Main key
2	15	Head Light
3	10	Parking · Flasher (Hazard)
4	10	Work Light
5	10	Meter Panel, Seat Switch (with OPC System)
6	50 Slow-Blow Fuse	Check circuit against wrong battery connection

W1029292

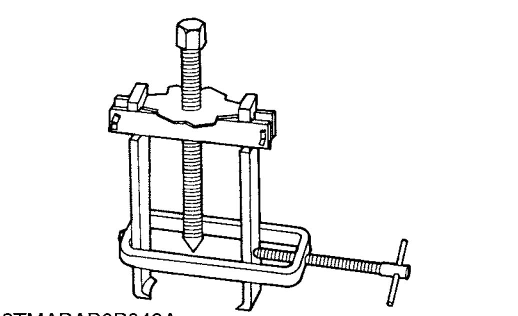
Replacing Light Bulb

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

Light	Capacity
Head lights	45 W
Tail light	8 W
Hazard light / turn signal	27 W
Instrument panel light	3.4 W
Work light	27 W

W1039659

9. SPECIAL TOOLS



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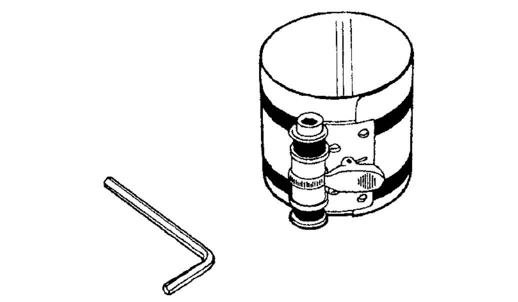
Special Use Puller Set

Code No: 07916-09032

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

W1024050



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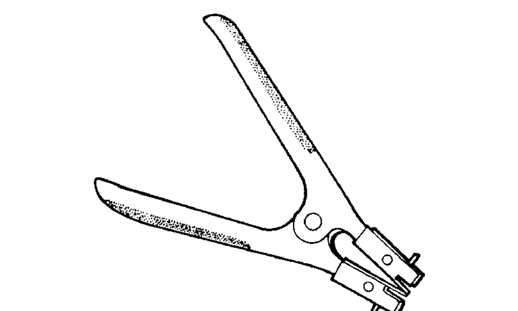
Piston Ring Compressor

Code No: 07909-32111

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

W1024100



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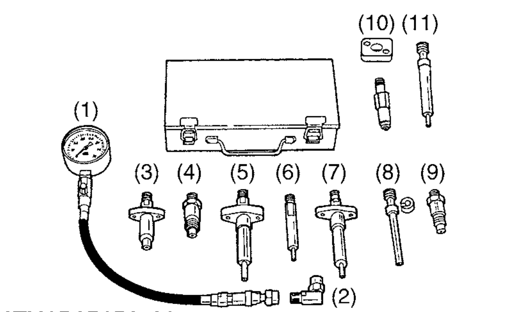
Piston Ring Tool

Code No: 07909-32121

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

W1024150



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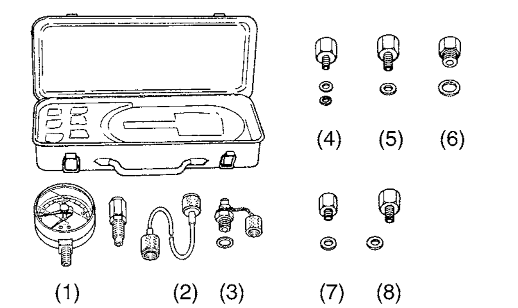
Diesel Engine Compression Tester

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



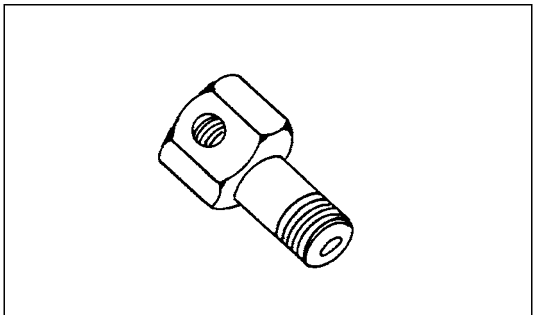
3TMABAB0P053A

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

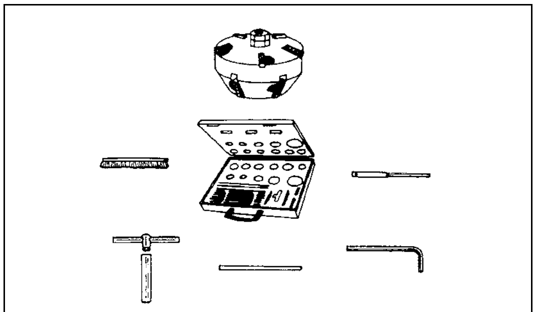
W1024318


3TMACAB0P036A

Adaptor 7

Code No: 07916-32591
Application: Use to measure lubricating oil pressure.

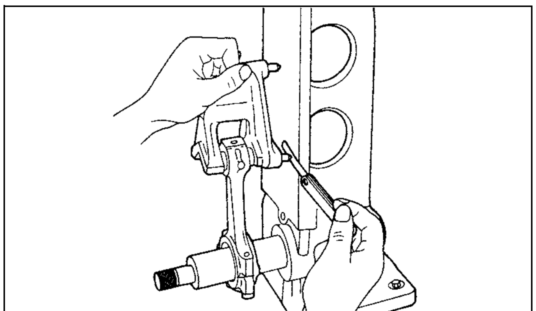
W1030102


3TMABAB0P054A

Valve Seat Cutter

Code No: 07909-33102
Application: Use to reseat valves.
Angle: 0.785 rad (45°)
0.262 rad (15°)
Diameter: 28.6 mm (1.126 in.) 38.0 mm (1.496 in.)
31.6 mm (1.244 in.) 41.3 mm (1.626 in.)
35.0 mm (1.378 in.) 50.8 mm (2.000 in.)

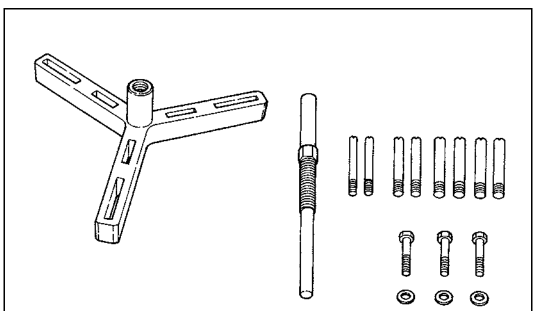
W1024458


3TMABAB0P056A

Connecting Rod Alignment Tool

Code No: 07909-31661
Application: Use to check the connecting rod alignment.
Applicable range: Connecting rod big end I.D.
30 to 75 mm (1.18 to 2.95 in.) dia.
Connecting rod length
65 to 300 mm (2.56 to 11.81 in.)

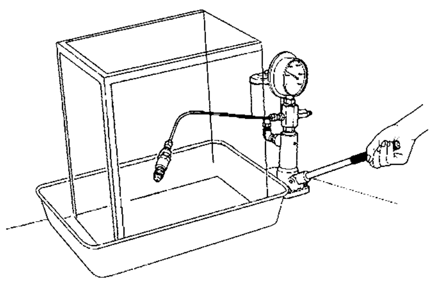
W1024583


3GFABAB0P039A

Flywheel Puller

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

W12299460


3TLABAB1P041A

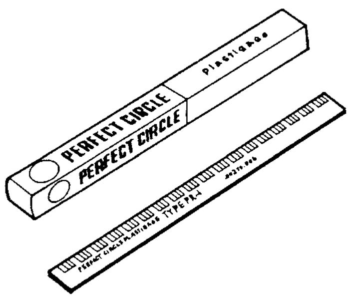
Nozzle Tester

Code No: 07909-31361

Application: Use to check the fuel injection pressure and spray pattern of nozzle.

Measuring range: 0 to 50 MPa (0 to 500 kgf/cm^2, 0 to 7000 psi)

W1024653



3TMABAB0P058A

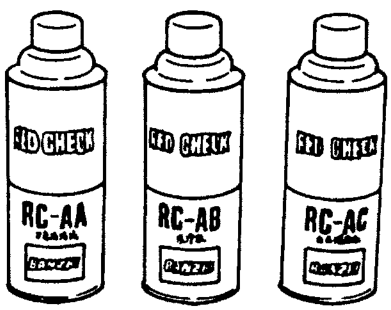
Plastigage

Code No: 07909-30241

Application: Use to check the oil clearance between crankshaft and bearing, etc.

Measuring range:
Green .... 0.025 to 0.076 mm (0.001 to 0.003 in.)
Red........ 0.051 to 0.152 mm (0.002 to 0.006 in.)
Blue .... 0.102 to 0.229 mm (0.004 to 0.009 in.)

W1024719



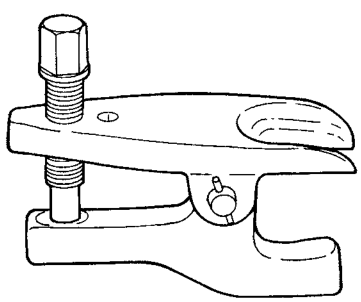
3TMABAB0P059A

Red Check

Code No: 07909-31371

Application: Use to check cracks on cylinder head, cylinder block, etc.

W1024909

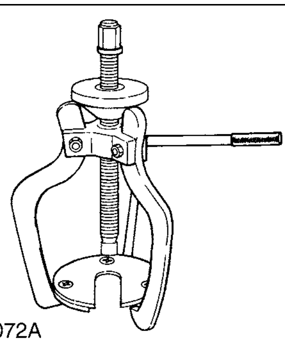

3TMABAB0P071A

Tie-rod End Lifter

Code No: 07909-39051

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

W1026472

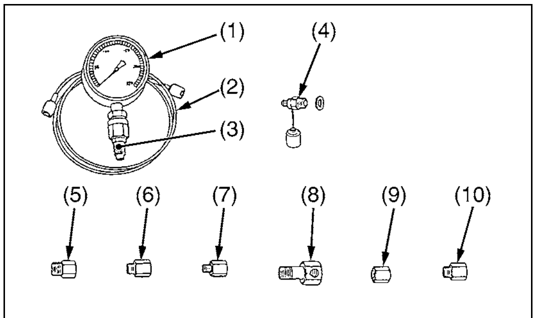

3TMABAB0P072A

Steering Wheel Puller

Code No: 07916-51090

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

W1026533



3TMABAB0P077A

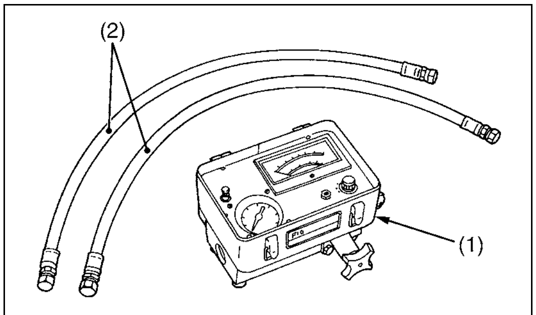
Relief Valve Pressure Tester

Code No: 07916-50045

Application: This allows easy measurement of relief set pressure.

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

W1026741



3TMABAB0P078A

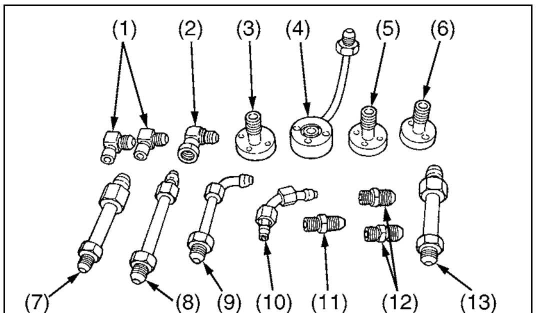
Flow Meter

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

W1031318



3TMABAB0P079A

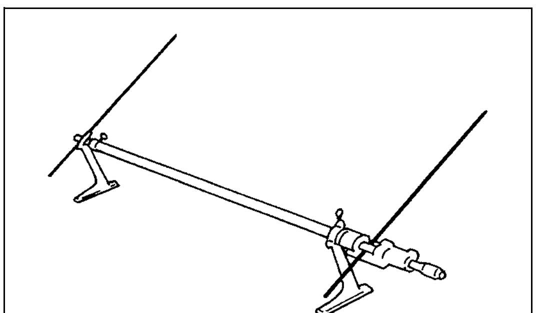
Adaptor Set for Flow Meter

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**

W1031396

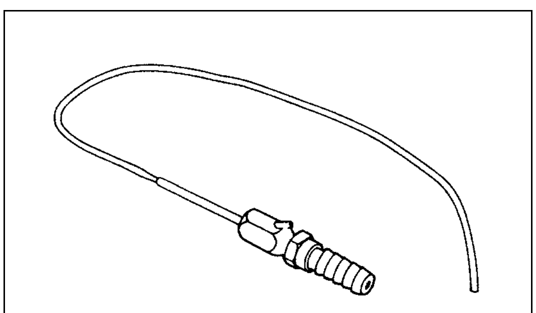

3TMABAB0P075A

Toe-in Gauge

Code No: 07909-31681

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

W1026689

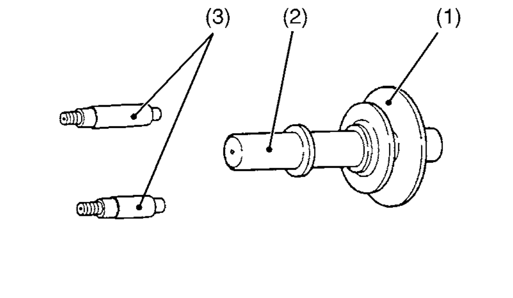

3TMABAB0P073A

Injector CH3

Code No: 07916-52501

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

W1026585



3TMACAB0P037A

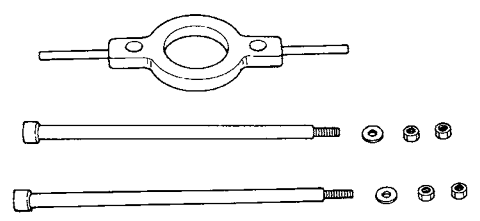
Clutch Tool B

Code No: 07916-53041

Application: Use for mounting the clutch to the flywheel.

(1) Gauge Ring
(2) Center Bar
(3) Centering Guide

W1031036



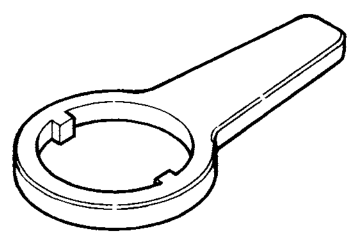
3TMABAB0P076A

Rear Axle Cover Puller

Code No: 07916-51041

Application: Use for removing a rear axle cover from rear axle.

W1073259



3TMACAB0P038A

Rear Axle Nut Wrench 85

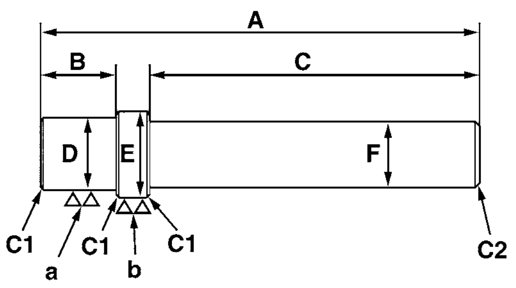
Code No: 07916-52541

Application: Use for removing and installing a rear axle nut.

W1031880

■ **NOTE**

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



3EEABAB1P038A

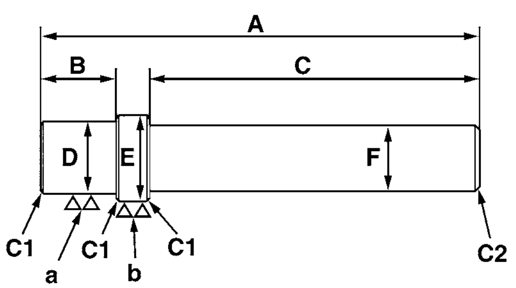
Bushing Replacing Tool

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

1. For idle gear bushing

A	196 mm (7.7165 in.)
B	37.5 mm (1.476 in.)
C	150 mm (5.9055 in.)
D	44.95 mm dia. (1.7697 in. dia.)
E	48.100 to 48.075 mm dia. (1.8937 to 1.8927 in. dia.)
F	20 mm (0.7874 in.)
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.)

W1025500



3EEABAB1P038A

Small End Bushing Replacing Tool

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

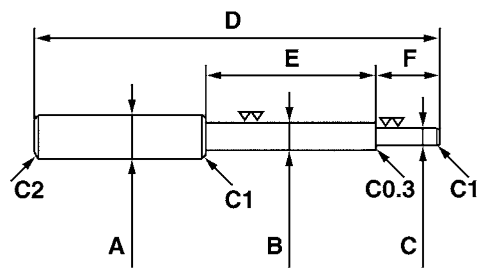
[Press out]

A	157 mm (6.1811 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.0 mm dia. (1.1811 in. dia.)
E	32.95 mm dia. (1.2972 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.)

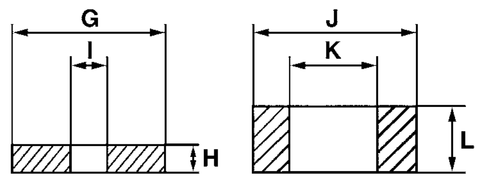
[Press fit]

A	157 mm (6.1811 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.0 mm dia. (1.1811 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.)

W1031485



3TMABAB0P063A



3TMABAB0P064A

Valve Guide Replacing Tool

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

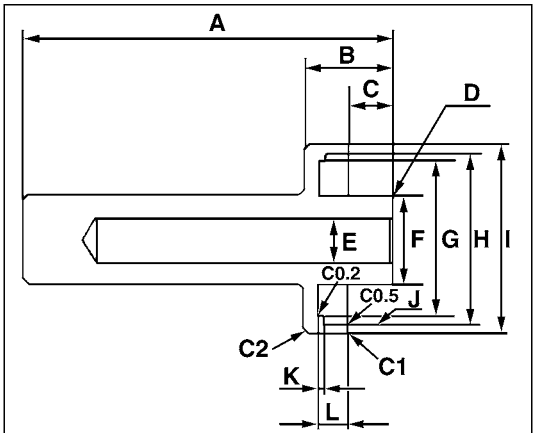
[Intake valve guide]

A	20 mm dia. (0.79 in. dia.)
B	11.7 to 11.9 mm dia. (0.460 to 0.468 in. dia.)
C	6.5 to 6.6 mm dia. (0.256 to 0.259 in. dia.)
D	225 mm (8.86 in.)
E	70 mm (2.76 in.)
F	45 mm (1.77 in.)
G	25 mm dia. (0.98 in. dia.)
H	5 mm (0.197 in.)
I	6.7 to 7.0 mm dia. (0.263 to 0.275 in. dia.)
J	20 mm dia. (0.787 in. dia.)
K	12.5 to 12.8 mm dia. (0.492 to 0.504 in. dia.)
L	8.9 to 9.1 mm (0.350 to 0.358 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.)

[Exhaust valve guide]

A	20 mm dia. (0.79 in. dia.)
B	12.96 to 12.98 mm dia. (0.510 to 0.511 in. dia.)
C	7.50 to 7.70 mm dia. (0.295 to 0.303 in. dia.)
D	225 mm (8.86 in.)
E	80 mm (3.15 in.)
F	40 mm (1.57 in.)
G	14.5 to 15.5 mm dia. (0.57 to 0.61 in. dia.)
H	5 mm (0.197 in.)
I	8.0 to 8.1 mm dia. (0.31 to 0.32 in. dia.)
J	17.5 to 18.5 mm dia. (0.689 to 0.728 in. dia.)
K	13.1 to 13.2 mm dia. (0.516 to 0.520 in. dia.)
L	9.9 to 10.1 mm (0.390 to 0.398 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.)

W1025017



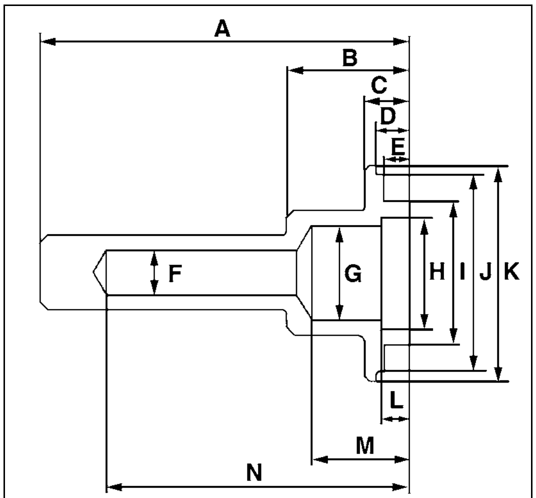
3EEABAB1P039A

Sleeve (Fan Drive Pulley Side) Replacing Tool

Application: Use to press fit the fan drive pulley sleeve.

A	125 mm (4.9212 in.)
B	30 mm (1.1811 in.)
C	15 mm (0.5905 in.)
D	Rmax = 12.5 S
E	15 mm dia. (0.5905 in. dia.)
F	30 mm dia. (1.1811 in. dia.)
G	52.9 to 53.1 mm dia. (2.0827 to 2.0906 in. dia.)
H	58.5 mm dia. (2.3031 in. dia.)
I	65 mm dia. (2.5590 in. dia.)
J	Rmax = 12.5 S
K	2 mm (0.0789 in.)
L	10 mm (0.3937 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.2	Chamfer 0.2 mm (0.0079 in.)
C0.5	Chamfer 0.5 mm (0.02 in.)

W1041128



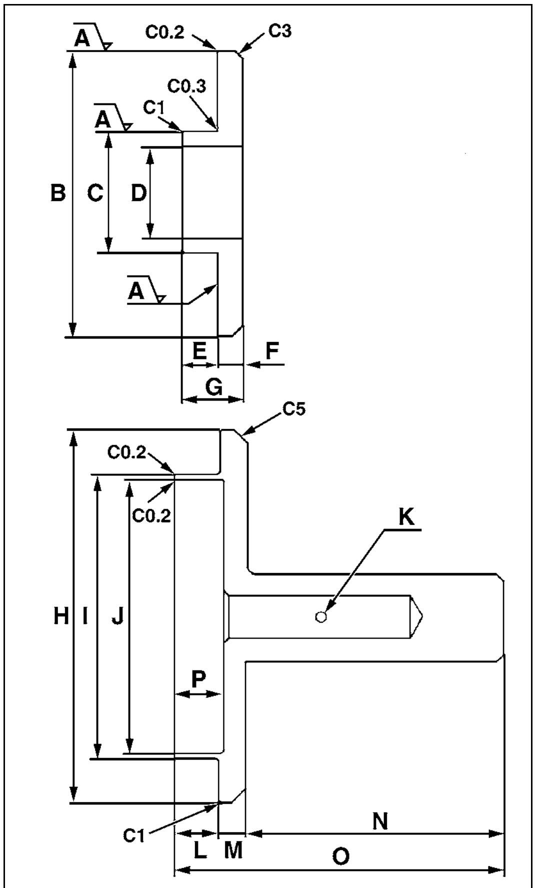
3EEABAB1P040A

Gear Case Oil Seal Replacing Tool

Application: Use to press fit the oil seal.

A	148.8 mm (5.8582 in.)
B	50 mm (1.9685 in.)
C	18.8 mm (0.7401 in.)
D	13.7 to 13.9 mm (0.5394 to 0.5472 in.)
E	11 mm (0.433 in.)
F	18 mm dia. (0.7087 in. dia.)
G	38 mm dia. (1.4961 in. dia.)
H	45 mm dia. (1.7716 in. dia.)
I	57.9 to 58.1 mm dia. (2.2795 to 2.2874 in. dia.)
J	79.5 mm dia. (3.1299 in. dia.)
K	87 mm dia. (3.452 in. dia.)
L	12 mm (0.4724 in.)
M	40 mm (1.5748 in.)
N	120 mm (4.7244 in.)

W1041529



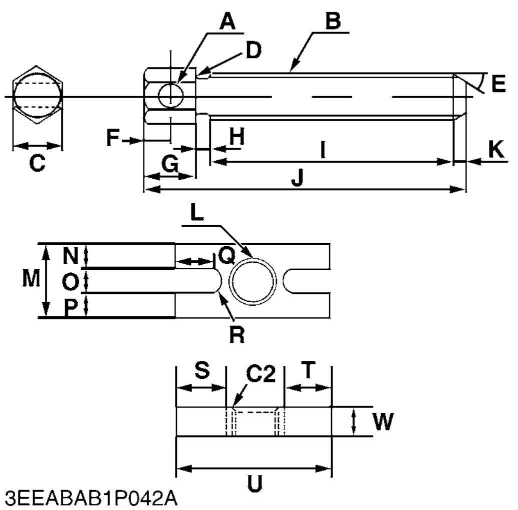
3EEABAB1P041A

Auxiliary Socket for Fixing Crankshaft Sleeve

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

A	Rmax = 12.5 S
B	94.5 to 95.0 mm dia. (3.7205 to 3.7402 in. dia.)
C	40 mm dia. (1.5748 in. dia.)
D	30 mm dia. (1.1811 in. dia.)
E	12 mm (0.4724 in.)
F	7.9 to 8.1 mm (0.3110 to 0.3189 in.)
G	20 mm (0.0787 in.)
H	130 mm dia. (5.1181 in. dia.)
I	99.4 to 99.6 mm dia. (3.9134 to 3.9213 in. dia.)
J	95.05 to 95.20 mm dia. (3.7421 to 3.7480 in. dia.)
K	3 mm dia. (0.1181 in.dia.)
L	15 mm (0.5905 in.)
M	10 mm (0.3937 in.)
N	90 mm (3.5433 in.)
O	115 mm (4.5275 in.)
P	16.9 to 17.1 mm (0.6654 to 0.6732 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C3	Chamfer 3.0 mm (0.1181 in.)
C5	Chamfer 5.0 mm (0.1969 in.)
C0.2	Chamfer 0.2 mm (0.0079 in.)
C0.3	Chamfer 0.3 mm (0.0118 in.)

W1041815



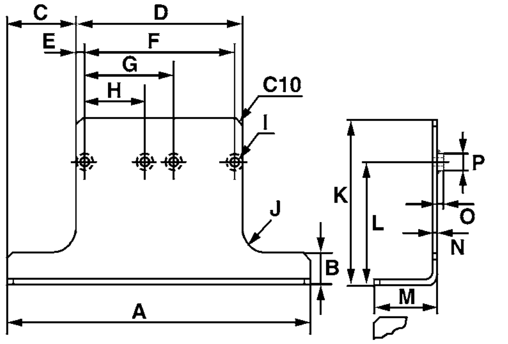
3EEABAB1P042A

Injection Pump Gear Puller

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

A	10 mm dia. (0.39 in. dia.)
B	M16 × Pitch 1.5
C	19 mm (0.75 in.)
D	0.5 mm radius (0.02 in. radius)
E	0.89 rad (50 °)
F	10 mm (0.39 in.)
G	20 mm (0.79 in.)
H	5 mm (0.20 in.)
I	95 mm (3.74 in.)
J	125 mm (4.93 in.)
K	5 mm (0.20 in.)
L	M16 × Pitch 1.5
M	30 mm (1.18 in.)
N	9.5 mm (0.3740 in.)
O	11 mm (0.4331 in.)
P	9.5 mm (0.3740 in.)
Q	15.5 mm (0.6102 in.)
R	4.5 mm radius (0.18 in. radius)
S	20 mm (0.79 in.)
T	20 mm (0.79 in.)
U	80 mm (3.1496 in.)
W	12 mm (0.47 in.)
C2	Chamfer 2.0 mm (0.079 in.)

W1033030



3TMACAB0P039A

Engine Stand

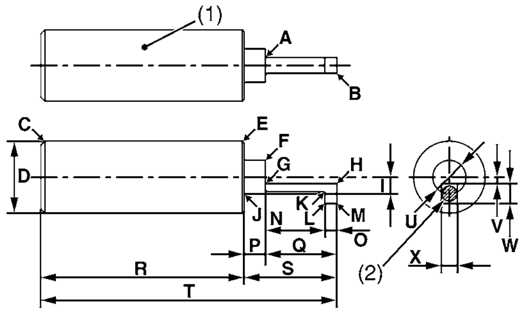
Application: Use to support engine.

■ **NOTE**

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

A	480 mm (18.90 in.)
B	50 mm (1.97 in.)
C	108.5 mm (4.272 in.)
D	263 mm (10.35 in.)
E	12.5 mm (0.492 in.)
F	237.5 mm (9.350 in.)
G	142.5 mm (5.610 in.)
H	95 mm (3.74 in.)
I	4.14 mm dia. (0.55 in. dia.)
J	40 mm (1.57 in.)
K	210 mm (8.27 in.)
L	190 mm (7.48 in.)
M	100 mm (3.94 in.)
N	6 mm (0.24 in.)
O	6 mm (0.24 in.)
P	25 mm dia. (0.98 in. dia.)
C10	Chamfer 10 mm (0.394 in.)

W1033645



3EEABAC1P118A

Jig for Governor Connecting Rod

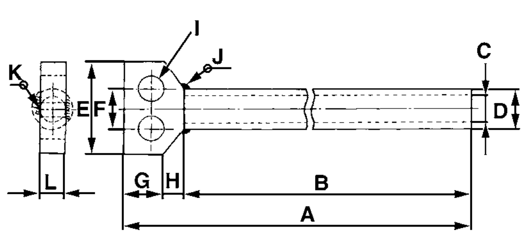
Application: Use for connecting the governor connecting rod to the rack pin of the fuel injection pump assembly.

A	R1 mm (0.0394 in. radius)
B	C0.2 mm (0.0079 in.)
C	C2 mm (0.0787 in.)
D	35 mm dia. (1.3780 in. dia.)
E	C1 mm (0.0394 in.)
F	C0.1 mm (0.0039 in.)
G	R1 mm (0.0394 in. radius)
H	C0.2 mm (0.0079 in.)
I	R8 mm (0.3150 in. radius)
J	R1 mm (0.0394 in. radius)
K	R1 mm (0.0394 in. radius)
L	C0.2 mm (0.0079 in.)
M	C0.2 mm (0.0079 in.)
N	29 mm (1.1417 in.)
O	6 mm (0.2362 in.)
P	10.7 mm (0.4213 in.)
Q	35 mm (1.3780 in.)
R	99.3 mm (3.9095 in.)
S	45.65 to 45.75 mm (1.7972 to 1.8012 in.)
T	145 mm (5.7087 in.)
U	16.15 to 16.35 mm dia. (0.6358 to 0.6437 in. dia.)
V	3 mm (0.1181 in.)
W	10 mm (0.3937 in.)
X	8 mm (0.3150 in.)

(1) Material: S45C-D

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

W1115114



3TMABAB0P086A

Draft Control Test Bar

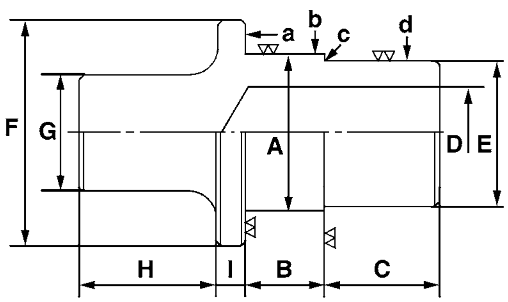
Application: Use for checking the lift range and floating range of hydraulic draft control.

■ **NOTE**

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

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	90 mm (3.54 in.)
F	30 mm (1.18 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.)

W1062519



3TMABAB0P085A

Hydraulic Arm Shaft Bushing Press-Fitting Tool

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

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**
- **Unless otherwise specified : All surface 12.5 μm (500 μin.)**

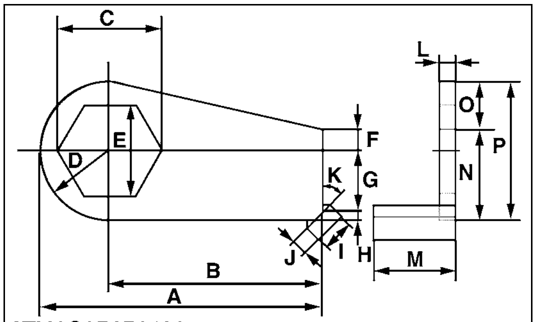
[M6800(S)]

	Right	Left
A	54.7 to 54.9 mm dia. (2.1535 to 2.1614 in. dia.)	49.7 to 49.9 mm dia. (1.9567 to 1.9646 in. dia.)
B	22.5 to 23.5 mm (0.729 to 0.767 in.)	18.5 to 19.0 mm (0.886 to 0.925 in.)
C	55 mm (2.10 in.)	60 mm (2.36 in.)
D	32 mm dia. (1.26 in. dia.)	30 mm dia. (1.18 in. dia.)
E	49.7 to 49.9 mm dia. (1.9567 to 1.9646 in. dia.)	44.7 to 44.9 mm dia. (1.7598 to 1.7677 in. dia.)
F	70 mm dia. (2.76 in. dia.)	
G	40 mm dia. (1.57 in. dia.)	
H	50 mm (1.97 in.)	
I	10 mm (0.39 in.)	
a	6.3 μm (250 μin.)	
b	6.3 μm (250 μin.)	
c	6.3 μm (250 μin.)	
d	6.3 μm (250 μin.)	

[M8200 · M9000]

	Right	Left
A	64.75 to 64.95 mm dia. (2.5492 to 2.5571 in. dia.)	69.75 to 69.95 mm dia. (2.7461 to 2.7539 in. dia.)
B	17.5 to 18.5 mm (0.6890 to 0.7283 in.)	13.5 to 14.5 mm (0.5315 to 0.5709 in.)
C	60 mm (2.3622 in.)	
D	32 mm dia. (1.26 in. dia.)	40 mm (1.5748 in.)
E	59.97 to 59.999 mm dia. (2.3610 to 2.3618 in. dia.)	64.97 to 64.99 mm dia. (2.5579 to 2.5587 in. dia.)
F	70 mm dia. (2.76 in. dia.)	
G	40 mm dia. (1.57 in. dia.)	
H	50 mm (1.97 in.)	
I	10 mm (0.39 in.)	
a	6.3 μm (250 μin.)	
b	6.3 μm (250 μin.)	
c	6.3 μm (250 μin.)	
d	6.3 μm (250 μin.)	

W1031655



3TMACAB0P040A

Locking Wrench

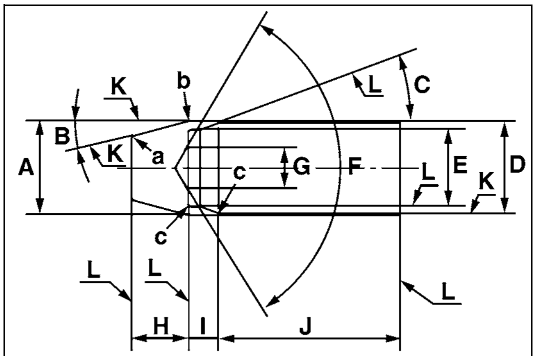
Application: Use for locking a pinion nut.

■ **NOTE**

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

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



3TMACAB0P041A

PTO Propeller Shaft Guide

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

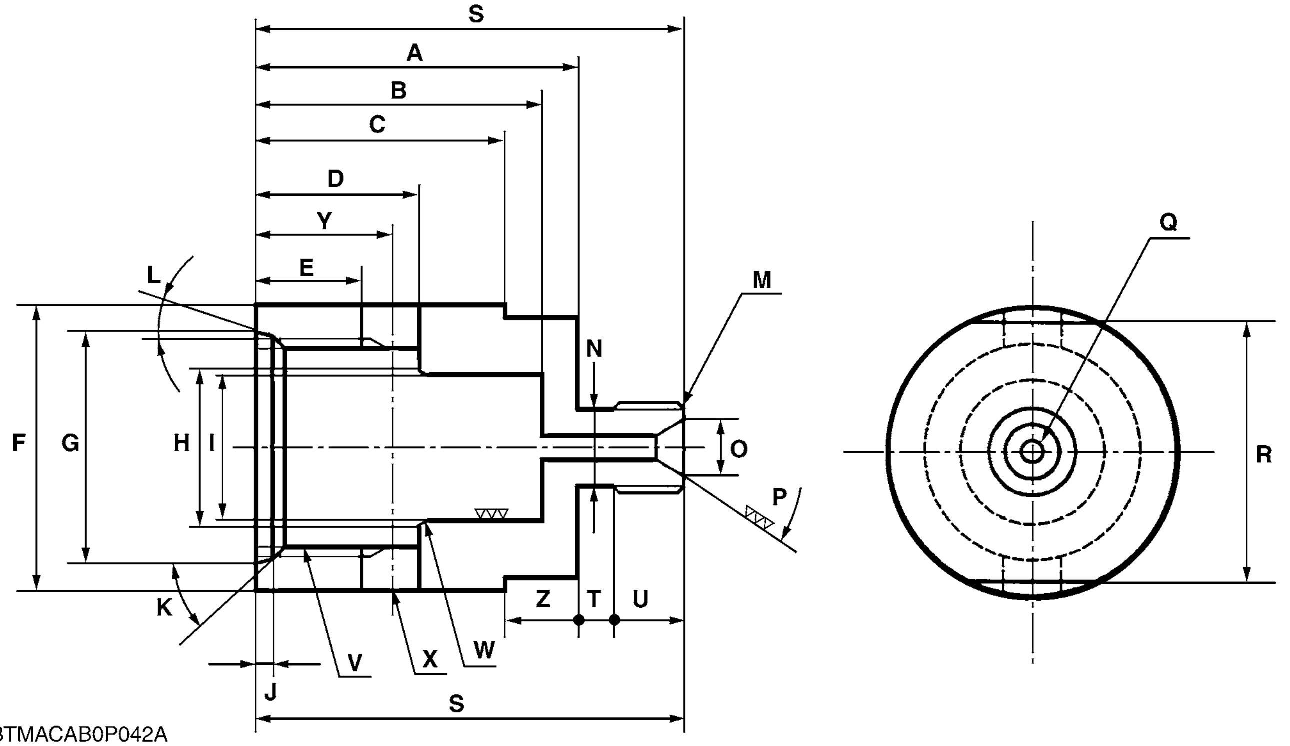
■ **NOTE**

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

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

Cylinder Safety Valve Setting Pressure Adaptor (For M8200 · M9000)



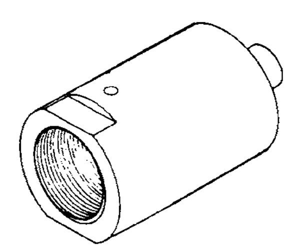
3TMACAB0P042A

Application: Use for setting the safety valve to the nozzle tester to measure cracking pressure and check oil tightness of the safety valves.

■ **NOTE**

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

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 dia. (0.63 in. dia.)	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.)



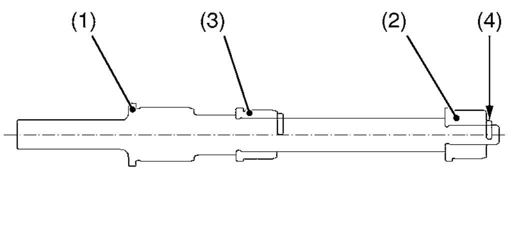
3TMACAB0P043A

Cylinder Safety Valve Setting Pressure Adaptor [For M6800(S)]

Code No: 07916-52581

Application: Use for setting the safety valve to the nozzle tester to measure cracking pressure and check oil-tightness of the safety valves.

W1035543



3EEABAB1P044A

Balancer Bushing Replacing Tool 1 Assembly

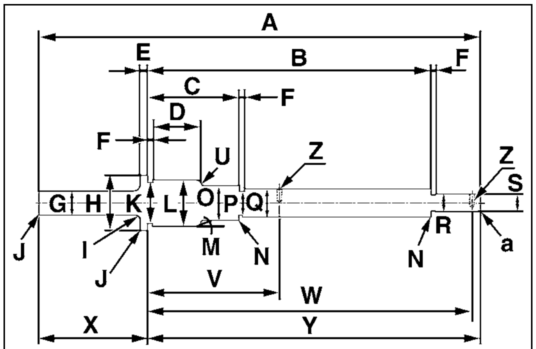
Application: Use to press fit the bushing.

■ **NOTE**

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

No.	Name of Part	Q'ty	Remarks
1	Shaft	1	–
2	Piece 1	1	–
3	Piece 2	1	–
4	Bolt	2	M6 × P1.0

W1035596



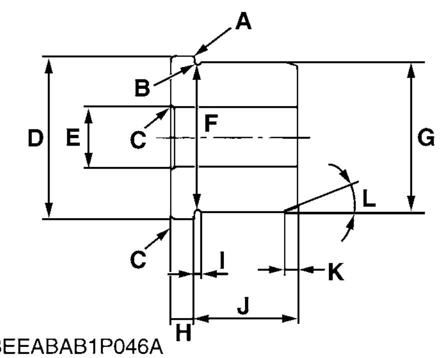
3EEABAB1P045A

Balancer Bushing Replacing Tool 1 Components Parts

1) Shaft

A	498 mm (19.61 in.)
B	318.8 to 319.2 mm (12.5726 to 12.5669 in.)
C	102.8 to 103.2 mm (4.0472 to 4.0630 in.)
D	60 mm (2.36 in.)
E	8 mm (0.31 in.)
F	5 mm (0.20 in.)
G	30 mm dia. (1.18 in. dia.)
H	65 mm dia. (2.56 in. dia.)
I	6 mm (0.24 in.)
J	Chamfer 1 mm (0.04 in.)
K	53 mm dia. (2.09 in. dia.)
L	54.7 to 54.9 mm dia. (2.1535 to 2.1614 in. dia.)
M	0.26 rad (15 °)
N	Chamfer 0.5 mm (0.02 in.)
O	41 mm dia. (1.61 in. dia.)
P	32 mm dia. (1.26 in. dia.)
Q	33.961 to 34.0 mm dia. (1.3370 to 1.3386 in. dia.)
R	18 mm dia. (0.71 in. dia.)
S	19.967 to 20.0 mm dia. (0.7861 to 0.7874 in. dia.)
U	3 mm (0.12 in.)
V	149.1 to 149.4 mm (5.8701 to 5.8819 in.)
W	365.1 to 365.4 mm (14.3740 to 14.3858 in.)
X	123 mm (4.84 in.)
Y	375 mm (14.76 in.)
Z	M6 × P1.0 depth 7 mm (0.28 in.)
a	Chamfer 2 mm (0.08 in.)

W1036035

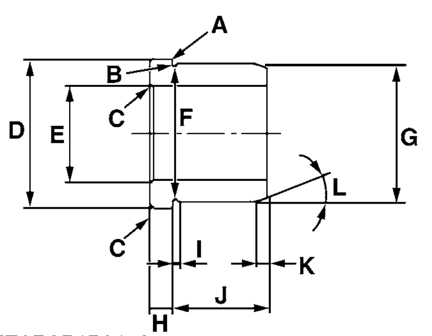


3EEABAB1P046A

2) Piece 1

A	Chamfer 0.1 mm (0.004 in.)
B	1 mm (0.04 in.)
C	Chamfer 1 mm (0.04 in.)
D	53.8 to 53.9 mm dia. (2.1181 to 2.1220 in. dia.)
E	20.02 to 20.041 mm dia. (0.7882 to 0.7890 in. dia.)
F	48 mm dia. (1.89 in. dia.)
G	49.934 to 49.94 mm dia. (1.9659 to 1.9661 in. dia.)
H	8 mm (0.31 in.)
I	2 mm (0.08 in.)
J	35 mm (1.38 in.)
K	5 mm (0.20 in.)
L	0.26 rad (15 °)

W1036402

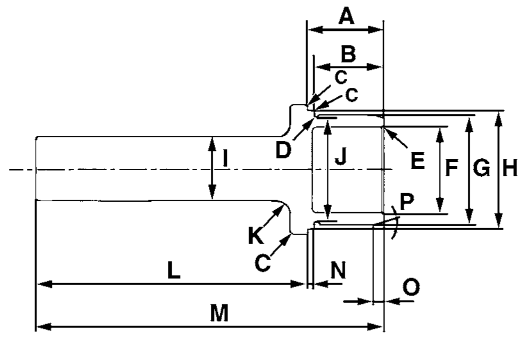


3EEABAB1P047A

3) Piece 2

A	Chamfer 0.1 mm (0.004 in.)
B	1 mm (0.04 in.)
C	Chamfer 1 mm (0.04 in.)
D	54.3 to 54.4 mm dia. (2.1378 to 2.1417 in. dia.)
E	34.025 to 34.05 mm dia. (1.3396 to 1.3406 in. dia.)
F	48.5 mm dia. (1.9094 in. dia.)
G	50.421 to 50.44 mm dia. (1.9851 to 1.9858 in. dia.)
H	8 mm (0.31 in.)
I	2 mm (0.08 in.)
J	35 mm (1.38 in.)
K	5 mm (0.20 in.)
L	0.26 rad (15 °)

W1036583



3EEABAB1P048A

Balancer Bushing Replacing Tool 2

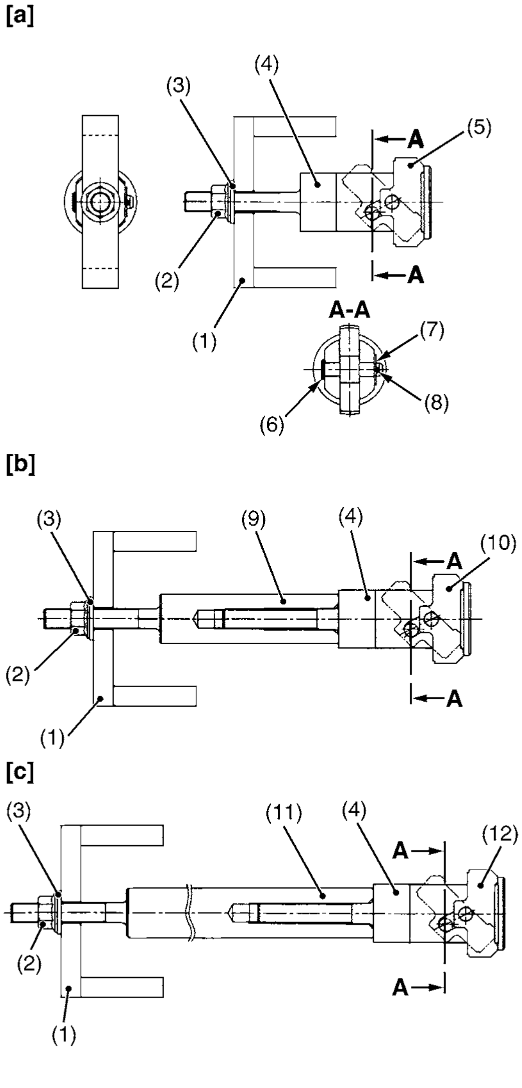
Application: Use to press fit the bushing.

■ **NOTE**

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

A	35 mm (1.38 in.)
B	33 mm (1.30 in.)
C	Chamfer 0.5 mm (0.02 in.)
D	1 mm (0.04 in.)
E	Chamfer 1 mm (0.04 in.)
F	40 mm dia. (1.57 in. dia.)
G	50.921 to 50.94 mm dia. (2.0048 to 2.0055 in. dia.)
H	54.8 to 54.9 mm dia. (2.1575 to 2.1614 in. dia.)
I	30 mm dia. (1.18 in. dia.)
J	49 mm dia. (1.93 in. dia.)
K	6 mm (0.24 in.)
L	125 mm (4.92 in.)
M	160 mm (6.30 in.)
N	3 mm (0.12 in.)
O	5 mm (0.20 in.)
P	0.26 rad (15 °)

W1036805



3EEABAB1P049A

Balancer Replacing Tools 3, 4, 5

Application: Use to press fit the bushing.

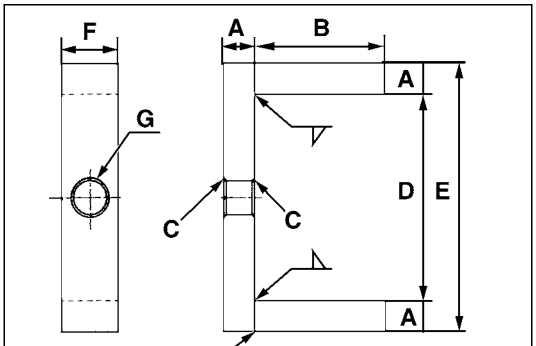
■ **NOTE**

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

No.	Name of Part	Q'ty
1	Bracket	1
2	Flange Nut	1
3	Washer	1
4	Shaft	1
5	Piece 1	1
6	Clevis	1
7	Washer	1
8	Cotter Pin	1
9	Joint 1	1
10	Piece 2	1
11	Joint 2	1
12	Piece 3	1

[a] Tool 3
[b] Tool 4
[c] Tool 5

W1037123



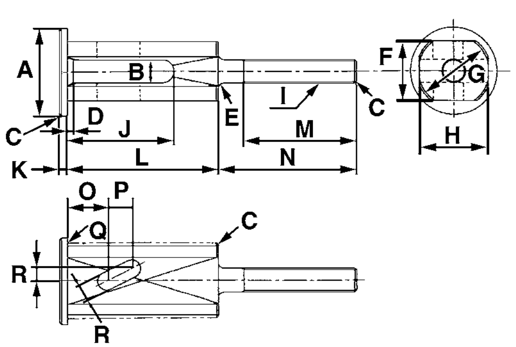
3EEABAB1P050A

Balancer Bushing Tool Components Parts

1) Bracket

A	12 mm (0.47 in.)
B	50 mm (1.97 in.)
C	Chamfer 1 mm (0.04 in.)
D	80 mm (3.15 in.)
E	104 mm (4.09 in.)
F	22 mm (0.87 in.)
G	13 mm dia. (0.51 in. dia.)

W1037894

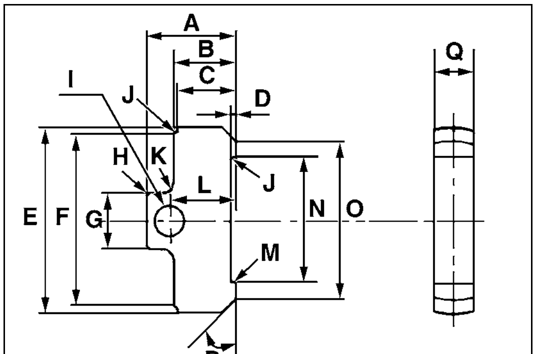


3EEABAB1P051A

2) Shaft

A	44 mm dia. (1.73 in. dia.)
B	12 mm (0.47 in.)
C	Chamfer 1 mm (0.04 in.)
D	3 mm (0.12 in.)
E	3 mm (0.12 in.)
F	30 mm (1.18 in.)
G	38 mm (1.38 in.)
H	35 mm (1.38 in.)
I	M12 × P1.25
J	53 mm (2.09 in.)
K	4 mm (0.16 in.)
L	75 mm (2.95 in.)
M	57 mm (2.24 in.)
N	70 mm (2.76 in.)
O	19.5 mm (0.77 in.)
P	12 mm (0.47 in.)
Q	0.8 mm (0.03 in.)
R	6 mm (0.24 in.)

W1037691

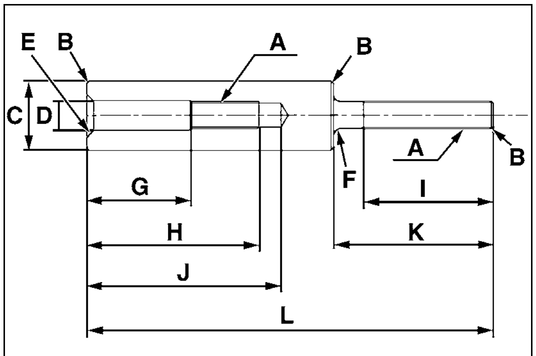


3EEABAB1P052A

3) Piece 1

A	26 mm (1.02 in.)
B	18 mm (0.71 in.)
C	16.5 to 17.0 mm (0.6496 to 0.6693 in.)
D	1.5 mm (0.06 in.)
E	54.0 to 54.2 mm dia. (2.1260 to 2.1339 in. dia.)
F	50.55 to 50.75 mm dia. (1.9902 to 1.9980 in. dia.)
G	16 mm (0.63 in.)
H	Chamfer 1 mm (0.04 in.)
I	8.5 mm dia. (0.33 in. dia.)
J	0.4 mm (0.0157 in.)
K	3 mm (0.12 in.)
L	19 mm (0.75 in.)
M	Chamfer 0.5 mm (0.02 in.)
N	36 mm (1.42 in.)
O	45 mm dia. (1.77 in. dia.)
P	0.78 rad (45 °)
Q	11.5 mm (0.45 in.)

W1038038

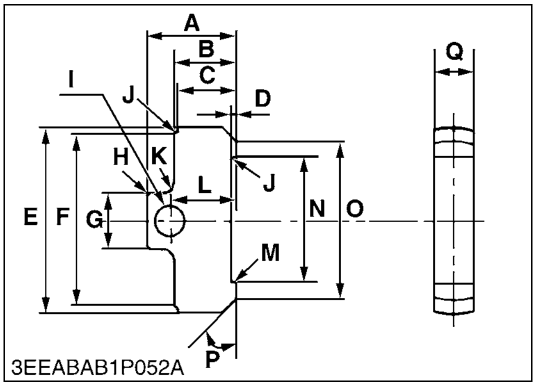


3EEABAB1P053A

4) Joint 1

A	M12 × P1.25
B	Chamfer 1 mm (0.04 in.)
C	30 mm dia. (1.18 in. dia.)
D	13 mm dia. (0.51 in. dia.)
E	Chamfer 3 mm (0.12 in.)
F	R3 mm (0.12 in. radius)
G	45 mm (1.77 in.)
H	75 mm (2.95 in.)
I	57 mm (2.24 in.)
J	85 mm (3.35 in.)
K	70 mm (2.76 in.)
L	178 mm (7.01 in.)

W1038382

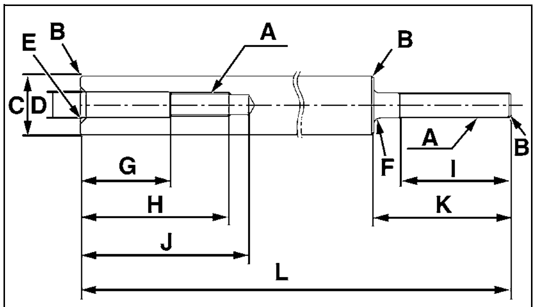


3EEABAB1P052A

5) Piece 2

A	26 mm (1.02 in.)
B	18 mm (0.71 in.)
C	16.5 to 17.0 mm (0.6496 to 0.6693 in.)
D	1.5 mm (0.06 in.)
E	53.5 to 53.7 mm dia. (2.1063 to 2.1142 in. dia.)
F	50.05 to 50.25 mm dia. (1.9705 to 1.9783 in. dia.)
G	16 mm (0.63 in.)
H	Chamfer 1 mm (0.04 in.)
I	8.5 mm dia. (0.33 in. dia.)
J	0.4 mm (0.0157 in.)
K	3 mm (0.12 in.)
L	19 mm (0.75 in.)
M	Chamfer 0.5 mm (0.02 in.)
N	36 mm (1.42 in.)
O	45 mm dia. (1.77 in. dia.)
P	0.78 rad (45 °)
Q	11.5 mm (0.45 in.)

W1038568

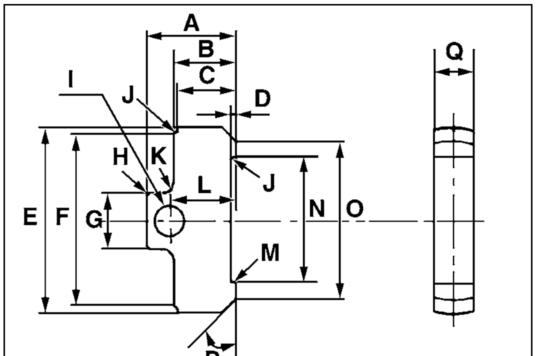


3EEABAB1P054A

6) Joint 2

A	M12 × P1.25
B	Chamfer 1 mm (0.04 in.)
C	30 mm dia. (1.18 in. dia.)
D	13 mm dia. (0.51 in. dia.)
E	Chamfer 3 mm (0.12 in.)
F	R3 mm (0.12 in. radius)
G	45 mm (1.77 in.)
H	75 mm (2.95 in.)
I	57 mm (2.24 in.)
J	85 mm (3.35 in.)
K	70 mm (2.76 in.)
L	394 mm (15.51 in.)

W1038747

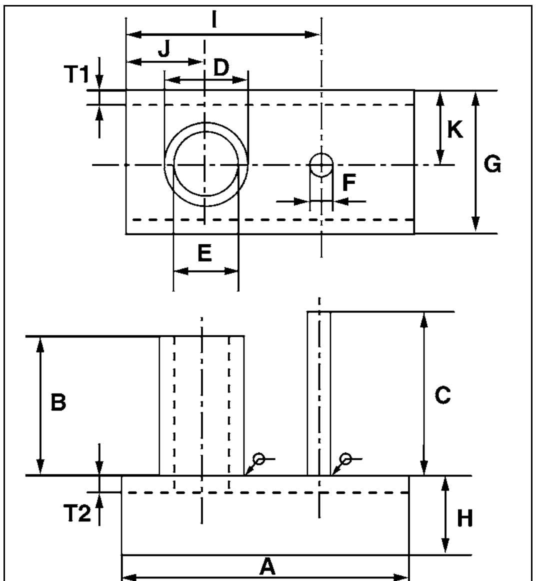


3EEABAB1P052A

7) Piece 3

A	26 mm (1.02 in.)
B	18 mm (0.71 in.)
C	16.5 to 17.0 mm (0.6496 to 0.6693 in.)
D	1.5 mm (0.06 in.)
E	53.0 to 53.2 mm dia. (2.0866 to 2.0945 in. dia.)
F	49.55 to 49.75 mm dia. (1.9508 to 1.9587 in. dia.)
G	16 mm (0.63 in.)
H	Chamfer 1 mm (0.04 in.)
I	8.5 mm dia. (0.33 in. dia.)
J	0.4 mm (0.0157 in.)
K	3 mm (0.12 in.)
L	19 mm (0.75 in.)
M	Chamfer 0.5 mm (0.02 in.)
N	36 mm (1.42 in.)
O	45 mm dia. (1.77 in. dia.)
P	0.78 rad (45 °)
Q	11.5 mm (0.45 in.)

W1038887



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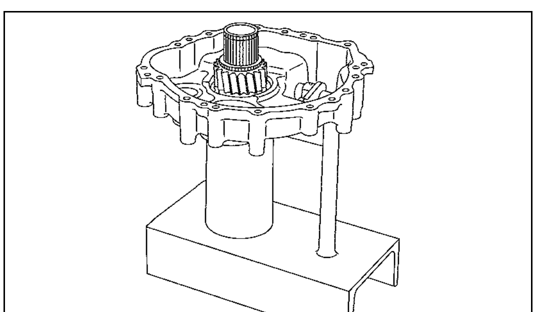

3TMACAB0P045A

Shuttle Case Assembling Stand

Application: Use for assembling the shuttle case.

■ **NOTE**

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

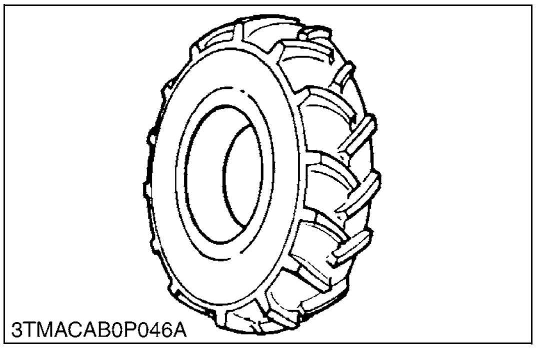
A	300 mm (11.81 in.)
B	175 mm (6.89 in.)
C	195 mm (7.68 in.)
D	85 mm dia. (3.35 in. dia.)
E	75 mm dia. (2.95 in. dia.)
F	21 mm dia. (0.83 in. dia.)
G	150 mm (5.91 in.)
H	75 mm (2.95 in.)
I	220 mm (8.665 in.)
J	80 mm (3.15 in.)
K	75 mm (2.95 in.)
T1	15 mm (0.59 in.)
T2	15 mm (0.59 in.)

W1031821

10. TIRES

[1] TYPE OF TIRES

■ **IMPORTANT**
- **Do not use tires larger than specified.**



The following tires can be mounted on models M6800(S), M8200 and M9000.

Model	Type of Tire	Front	Rear
M6800(S) [2WD]	Farm Tire	9.5L – 15, 7.5 – 16	16.9 – 30
M6800(S) [4WD]		9.5 – 24	
M8200 [2WD]		7.5 – 18	18.4 – 28
M8200 [4WD]		11.2 – 24	
M9000 [2WD]		7.5 – 18	18.4 – 30
M9000 [4WD]		12.4 – 24	

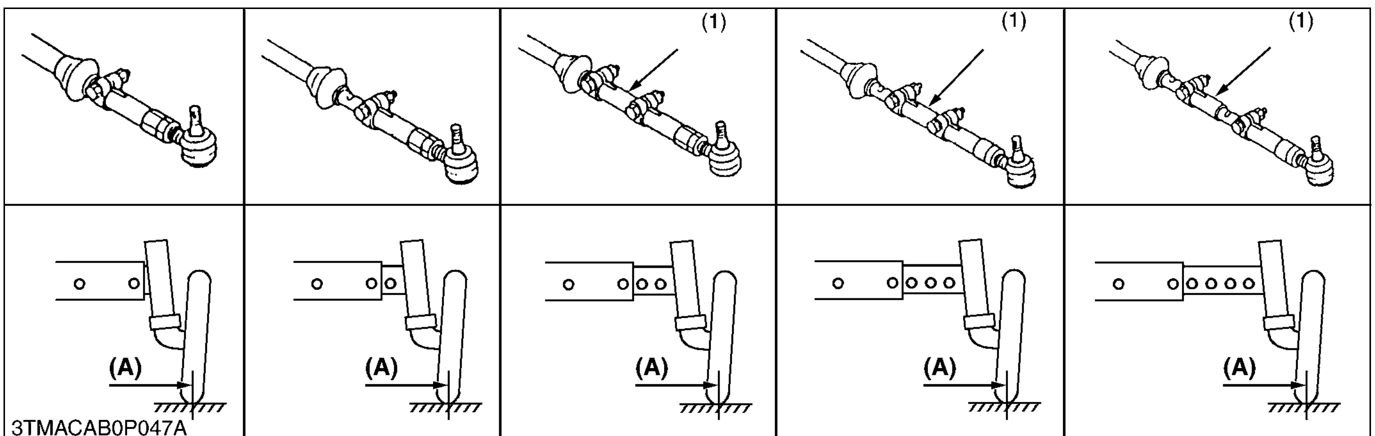
W1019656

[2] TREAD ADJUSTMENT

(1) Front Wheels [2WD]

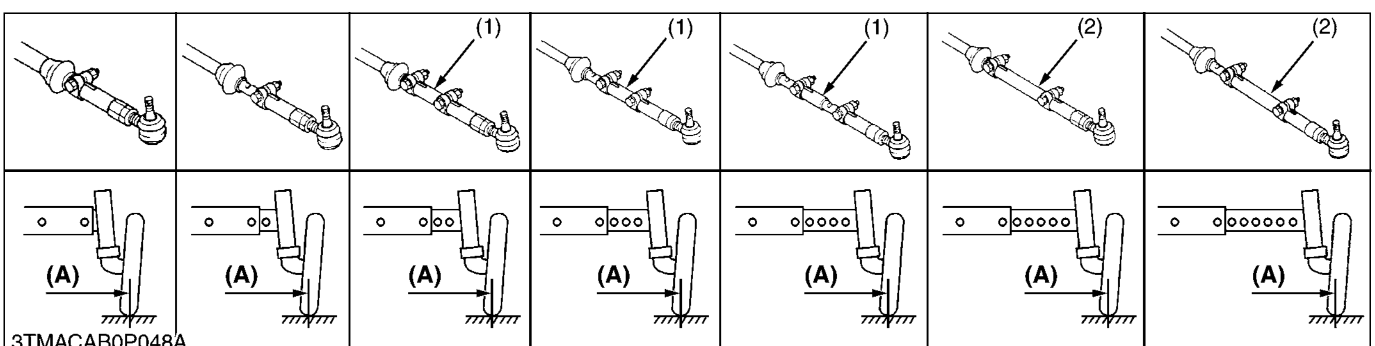
Front wheels can be adjusted.

[M6800(S)]



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.)

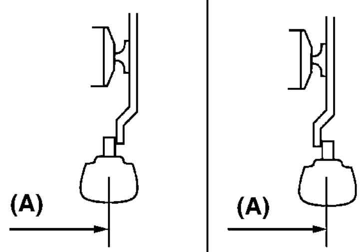
[M8200 · M9000]



1440 mm (56.7 in.)	1540 mm (60.6 in.)	1640 mm (64.6 in.)	1740 mm (68.5 in.)	1840 mm (72.4 in.)	1940 mm (76.4 in.)	2040 mm (80.3 in.)

(1) Extension 1 (a short spacer) (2) Extension 2 (a long spacer) **(A) "TREAD"**

(2) Front Wheels [4WD]



3TMACAB0P049A

M6800(S) M8200	1420 mm (55.9 in.)	1520 mm (59.8 in.)
M9000	1520 mm (59.8 in.)	1620 mm (63.8 in.)

Front wheels can be adjusted.

(A) Tread

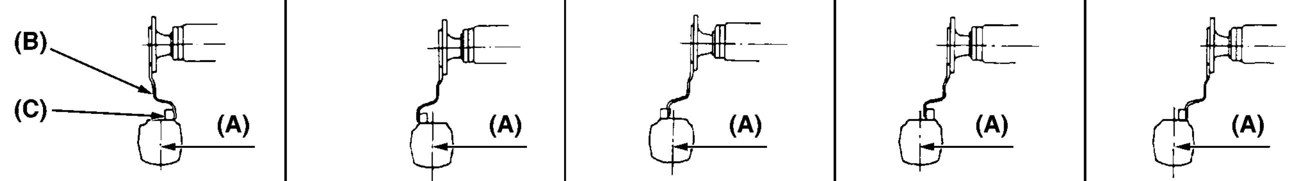
W1039833

(3) Rear Wheels

Rear tread can be adjusted in 6 steps depending on the model.
To change the tread

1. Lift the rear tires off the ground.
2. Follow the illustrations below to get the desired tread width.

16.9-30	—	1420 mm (55.9 in.)	1520 mm (59.8 in.)	1620 mm (63.8 in.)	1720 mm (67.7 in.)
18.4-28	1520 mm (59.8 in.)	1620 mm (63.8 in.)	1720 mm (67.7 in.)	1820 mm (71.7 in.)	1920 mm (75.6 in.)
18.4-30	1520 mm (59.8 in.)	1620 mm (63.8 in.)	1720 mm (67.7 in.)	1820 mm (71.7 in.)	1920 mm (75.6 in.)



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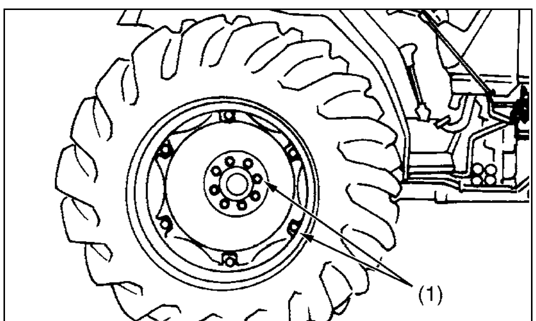

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CAUTION

- **When working on slopes or working with trailer, set the wheel tread as wide as practical for the job for maximum stability.**

■ **IMPORTANT**

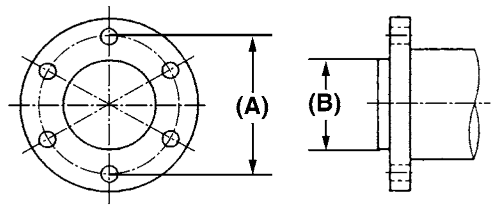
- **Always attach tires as shown in the drawings above.**
- **If not attached as illustrated, transmission parts may be damaged.**
- **Do not use tires larger than specified.**
- **When re-fitting or adjusting a wheel, tighten the nuts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter daily check service.**

(1) Rear Wheel Mounting Nut and Rear Disc Mounting Nut [Refer to "Checking Wheel Mounting Nuts Tightening Torque". (See page G-19)]

(A) Tread
(B) Rear Wheel Disc
(C) Rear Wheel Rim

W1039946

[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

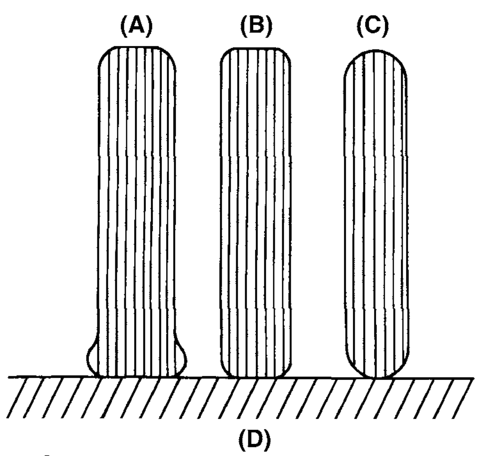
[4] TIRE PRESSURE

CAUTION

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

■ **IMPORTANT**

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



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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.

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

■ **Recommended Inflation Pressure**

- Maintain the pressure shown below for normal use.

	Tire sizes	Inflation pressure
Front	7.50 – 16	280 kPa (2.8 kgf/cm^2, 40 psi)
	7.50 – 18	280 kPa (2.8 kgf/cm^2, 40 psi)
	9.50 – 24	180 kPa (1.8 kgf/cm^2, 26 psi)
	11.2 – 24	160 kPa (1.6 kgf/cm^2, 23 psi)
	12.4 – 24	140 kPa (1.4 kgf/cm^2, 20 psi)
Rear	16.9 – 30	120 kPa (1.2 kgf/cm^2, 18 psi)
	18.4 – 28	110 kPa (1.1 kgf/cm^2, 16 psi)
	18.4 – 30	110 kPa (1.1 kgf/cm^2, 16 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

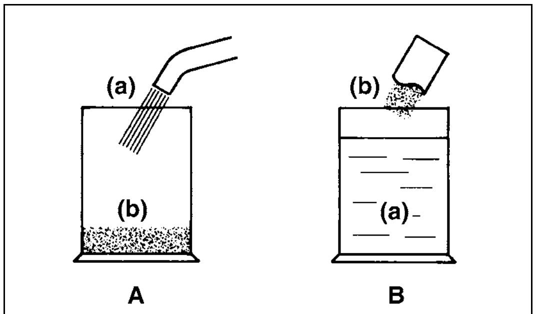
[5] TIRE LIQUID INJECTION

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

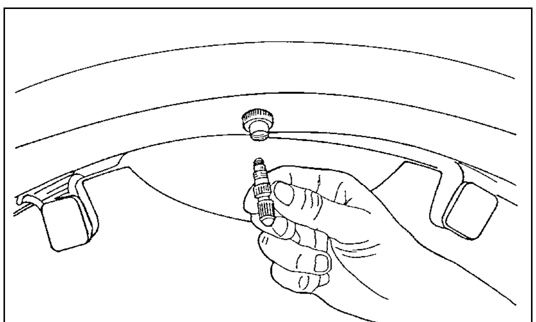
CAUTION

- **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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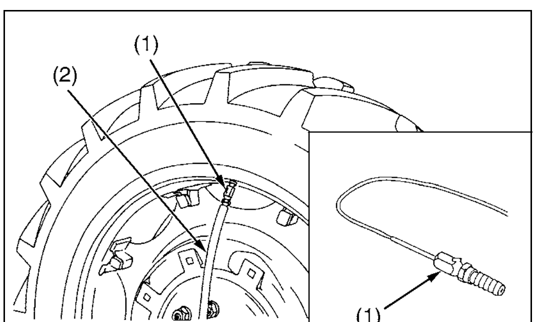

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Attaching Injector

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

Fig. 1

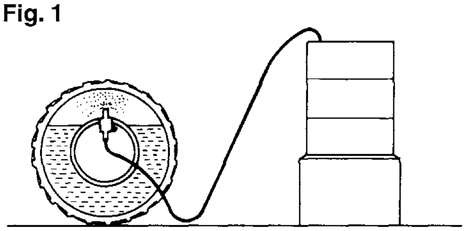


Fig. 2

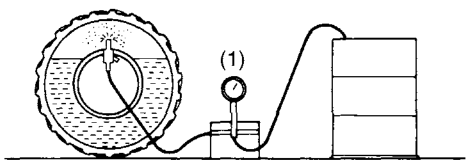
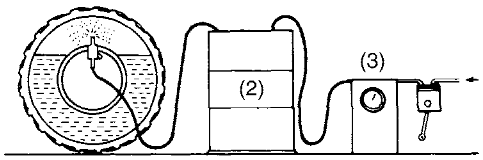


Fig. 3



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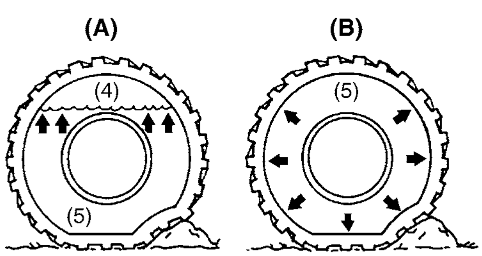

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Injection

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.**

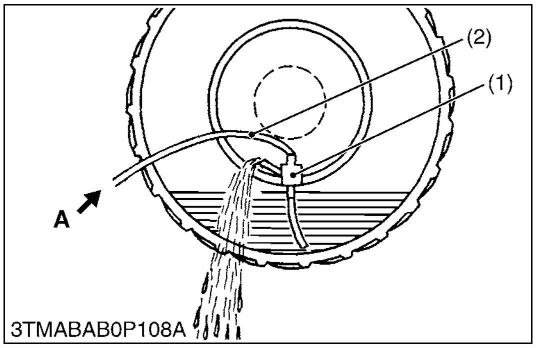
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

Tire sizes	16.9 – 30	16.9 – 34	18.4 – 28	18.4 – 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]	314 kg (693 lbs)	346 kg (762 lbs)	357 kg (786 lbs)	385 kg (848 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]	338 kg (746 lbs)	376 kg (829 lbs)	387 kg (852 lbs)	414 kg (912 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]	357 kg (787 lbs)	399 kg (880 lbs)	411 kg (907 lbs)	436 kg (960 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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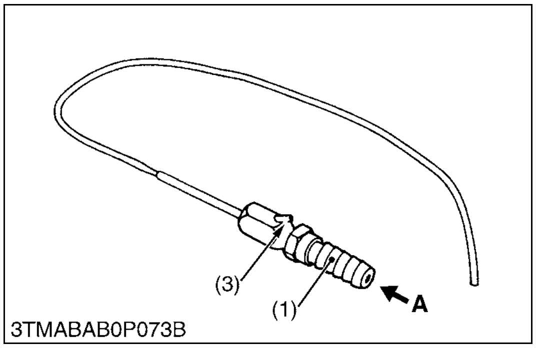

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Draining Water or Solution

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

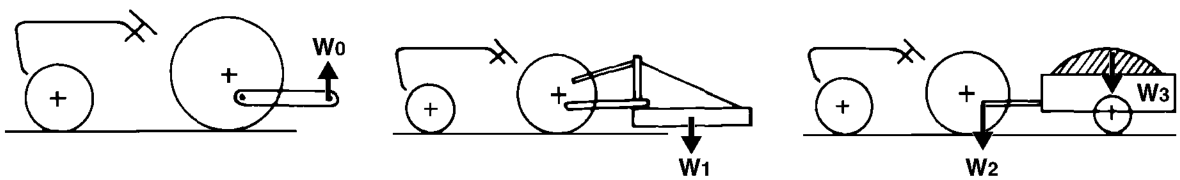
11. IMPLEMENT LIMITATIONS

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.]

<table>
<tr><th rowspan="3"></th><th colspan="3">Tread (max. width) with farm tires</th><th rowspan="3">Lower link end max. loading weight W_0</th></tr>
<tr><th colspan="2">Front</th><th rowspan="2">Rear</th></tr>
<tr><th>2WD</th><th>4WD</th></tr>
<tr><td>M6800(S)</td><td>1820 mm (71.7 in.)</td><td rowspan="2">1520 mm (59.8 in.)</td><td>1720 mm (67.7 in.)</td><td>2050 kg (4550 lbs)</td></tr>
<tr><td>M8200</td><td rowspan="2">2040 mm (80.3 in.)</td><td rowspan="2">1920 mm (75.6 in.)</td><td rowspan="2">2500 kg (5560 lbs)</td></tr>
<tr><td>M9000</td><td>1620 mm (63.8 in.)</td></tr>
</table>

<table>
<tr><th rowspan="2"></th><th colspan="3">Actual figures</th></tr>
<tr><th>Implement Weight W_1 and / or size</th><th>Max. Drawbar Load W_2</th><th>Trailer loading weight W_3 Max. capacity</th></tr>
<tr><td>M6800(S)</td><td rowspan="6">As in the following list (shown on the next page)</td><td rowspan="2">1000 kg (2200 lbs)</td><td>4500 kg (9900 lbs)</td></tr>
<tr><td>M6800(S)DT</td><td rowspan="2">5500 kg (11000 lbs)</td></tr>
<tr><td>M8200</td><td rowspan="4">1500 kg (3300 lbs)</td></tr>
<tr><td>M8200DT</td><td>6000 kg (13200 lbs)</td></tr>
<tr><td>M9000</td><td>5000 kg (11000 lbs)</td></tr>
<tr><td>M9000DT</td><td>6000 kg (13200 lbs)</td></tr>
</table>

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		M6800(S) 2WD	M6800(S) 4WD	M8200 2WD	M8200 4WD	M9000 2WD	M9000 4WD
1	Slurry Tank		Max. Tank Capacity		3000 L (790 U.S.gals. 660 Imp.gals.)		4000 L (1060 U.S.gals. 880 Imp.gals.)			
			Max. Load Capacity		4000 mm (8800 in.)		5000 mm (11000 in.)			
2	Trailer		Max. Load Capacity		4500 kg (9900 lbs)	5000 kg (11000)		6000 kg (13200 lbs)	5000 kg (11000 lbs)	6000 kg (13200 ilbs)
			Max. Drawbar Load		1000 kg (2200 lbs)		1500 kg (3300 lbs)			
3	Mower	Rotary-Cutter	Max. Cutting Width		2130 mm (84 in.)		2300 mm (90 in.)			
			Max. Weight		540 kg (1200 lbs)		600 kg (1320 lbs)			
		Flail Mower (Heavy)	Max. Cutting Width		3050 mm (120 in.)		3660 mm (144 in.)			
			Max. Weight		800 kg (1760 lbs)		1000 kg (2200 lbs)			
		Sickle Bar	Max. Cutting Width		2130 mm (84 in.)		2743 mm (108 in.)			
4	Sprayer		Max. Tank-capacity	Mid	680 L (180 U.S.gals. 150 Imp.gals.)		800 L (200 U.S.gals. 170 Imp.gals.)		1000 L (260 U.S.gals. 220 Imp.gals.)	
				Rear 3P	680 L (180 U.S.gals. 150 Imp.gals.)		800 L (200 U.S.gals. 170 Imp.gals.)		1000 L (260 U.S.gals. 220 Imp.gals.)	
				Draw-bar	3500 L (920 U.S.gals. 770 Imp.gals.)	4000 L (1300 U.S. gals. 8800 Imp.gals.)		4500 L (1200 U.S.gals. 990 Imp.gals.)		5000 L (1320 U.S.gals. 1100 Imp.gals.)
5	Rotary Tiller		Max. Tilling Width		2330 mm (91 in.)		2400 mm (96 in.)			
			Max. Weight		800 kg (1760 lbs)		1000 kg (2200 lbs)			
6	Bottom Plow		Max. Size		16 in. × 2 14 in. × 3	16 in. × 3 18 in. × 2		16 in. × 4 18 in. × 3 24 in. × 1		14 in. × 5 16 in. × 4 20 in. × 3 24 in. × 1
			Max. Weight		550 kg (1000 lbs)		650 kg (1400 lbs)	750 kg (1650 lbs)	900 kg (2000 lbs)	
7	Disc-harrow	3P Type	Max. Size		18 in. × 24	20 in. × 24		24 in. × 24		
			Max. Harrowing Width		2130 mm (84 in.)	2450 mm (96 in.)		2850 mm (112 in.)		3300 mm (130 in.)
			Max. Weight		550 kg (1000 lbs)		650 kg (1400 lbs)	750 kg (1650 lbs)	900 kg (2000 lbs)	
		Drawbar Type	Max. Harrowing Width		2750 mm (96 in.)	3050 mm (120 in.)		3660 mm (144 in.)		4300 mm (168 in.)
8	Disc Plow		Max. Size		24 in. × 3 26 in. × 2	26 in. × 3	26 in. × 3 28 in. × 3	26 in. × 4 28 in. × 4		
			Max. Weight		550 kg (1000 lbs)		650 kg (1400 lbs)	750 kg (1650 lbs)	900 kg (2000lbs)	

W1012736

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Implement</th><th rowspan="2">Remarks</th><th colspan="2">M6800(S)</th><th colspan="2">M8200</th><th colspan="2">M9000</th></tr>
<tr><th>2WD</th><th>4WD</th><th>2WD</th><th>4WD</th><th>2WD</th><th>4WD</th></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Sub Soiler</td><td>Numbers of Cultivating Tines</td><td colspan="6">2</td></tr>
<tr><td>Cultivating Depth</td><td>400 mm (16 in.)</td><td colspan="2">450 mm (18 in.)</td><td colspan="2">500 mm (20 in.)</td><td>550 mm (22 in.)</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Cultivator</td><td>Max. Width</td><td>3660 mm (144 in.)</td><td colspan="2">4270 mm (168 in.)</td><td colspan="2">4880 mm (192 in.)</td><td>5490 mm (216 in.)</td></tr>
<tr><td>Number of Rows</td><td colspan="2">4</td><td colspan="4">6</td></tr>
<tr><td>Max. Weight</td><td colspan="2">550 kg (1000 lbs)</td><td>650 kg (1400 lbs)</td><td>750 kg (1650 lbs)</td><td colspan="2">900 kg (2000 lbs)</td></tr>
<tr><td rowspan="2">11</td><td rowspan="2">Front Blade*</td><td>Max. Cutting Width</td><td>1820 mm (72 in.)</td><td colspan="2">2130 mm (84 in.)</td><td colspan="2">2430 mm (96 in.)</td><td>2600 mm (102 in.)</td></tr>
<tr><td>Max. Oil Pressure</td><td colspan="2">19.1 MPa (195 kgf/cm^2, 2773 psi)</td><td colspan="4">19.6 MPa (200 kgf/cm^2, 2844 psi)</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Rear Blade</td><td>Max. Cutting Width</td><td>1820 mm (72 in.)</td><td colspan="2">2130 mm (84 in.)</td><td colspan="2">2430 mm (96 in.)</td><td>2600 mm (102 in.)</td></tr>
<tr><td>Max. Oil Pressure</td><td colspan="2">19.1 MPa (195 kgf/cm^2, 2773 psi)</td><td colspan="4">19.6 MPa (200 kgf/cm^2, 2844 psi)</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Front Loader*</td><td>Max. Lifting Capacity</td><td colspan="2">1000 kg (2200 lbs)</td><td colspan="4">1250 kg (2750 lbs)</td></tr>
<tr><td>Max. Oil Pressure</td><td colspan="2">18.6 MPa (190 kgf/cm^2, 2702 psi)</td><td colspan="4">20.6 MPa (210 kgf/cm^2, 3000 psi)</td></tr>
<tr><td rowspan="2">14</td><td rowspan="2">Box Blade</td><td>Max. Cutting Width</td><td>1820 mm (72 in.)</td><td colspan="2">2130 mm (84 in.)</td><td>2430 mm (96 in.)</td><td>2130 mm (84 in.)</td><td>2430 mm (96 in.)</td></tr>
<tr><td>Max. Weight</td><td colspan="2">550 kg (1000 lbs)</td><td>650 kg (1400 lbs)</td><td>750 kg (1650 lbs)</td><td colspan="2">800 kg (1760 lbs)</td></tr>
<tr><td rowspan="2">15</td><td rowspan="2">Back Hoe</td><td>Max. Digging Depth</td><td colspan="2">2530 mm (100 in.)</td><td colspan="4">3050 mm (120 in.)</td></tr>
<tr><td>Max. Weight</td><td colspan="2">900 kg (2000 lbs)</td><td colspan="4">1200 kg (2650 lbs)</td></tr>
<tr><td rowspan="2">16</td><td rowspan="2">Snow Blade</td><td>Max. Width</td><td>1820 mm (72 in.)</td><td colspan="2">2130 mm (84 in.)</td><td colspan="2">2430 mm (96 in.)</td><td>2600 mm (102 in.)</td></tr>
<tr><td>Max. Weight</td><td>450 kg (1000 lbs)</td><td>5500 kg (1200 lbs)</td><td>650 kg (1400 lbs)</td><td>750 kg (1650 lbs)</td><td colspan="2">800 kg (1760 lbs)</td></tr>
</table>

■ **NOTE**

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

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

W1043839

1 ENGINE

MECHANISM

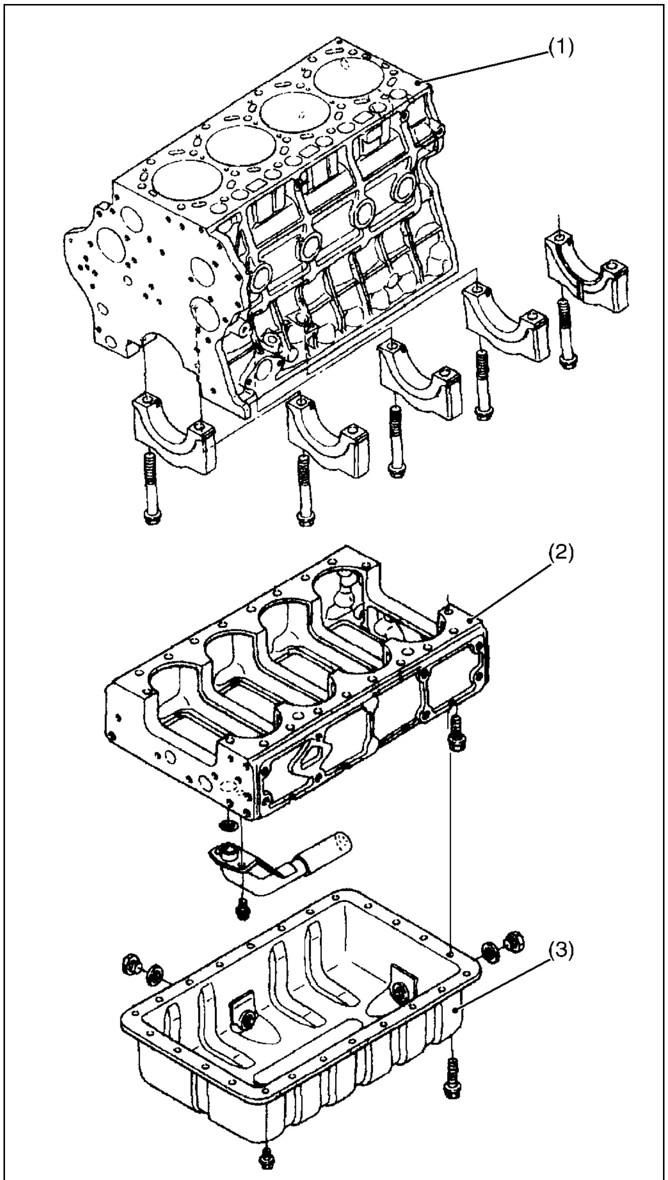
CONTENTS

NOTICE

For not above-mentioned engine mechanism information, please refer ENGINE MECHANISM WSM (97897-0187-0).

1. ENGINE BODY

[1] CYLINDER BLOCK



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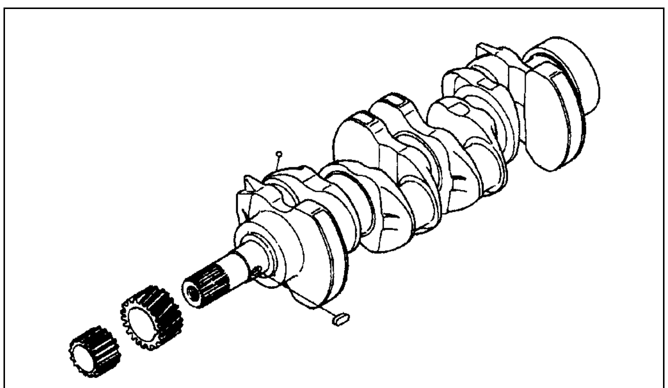
This engine employs separate type crankcases - the crankcase 1 with combustion part and the crankcase 2 which supports the crankcase 1 and reduces noise.

Since it is a hanger type, you can easily assemble / disassemble it. 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

W1012651

[2] CRANKSHAFT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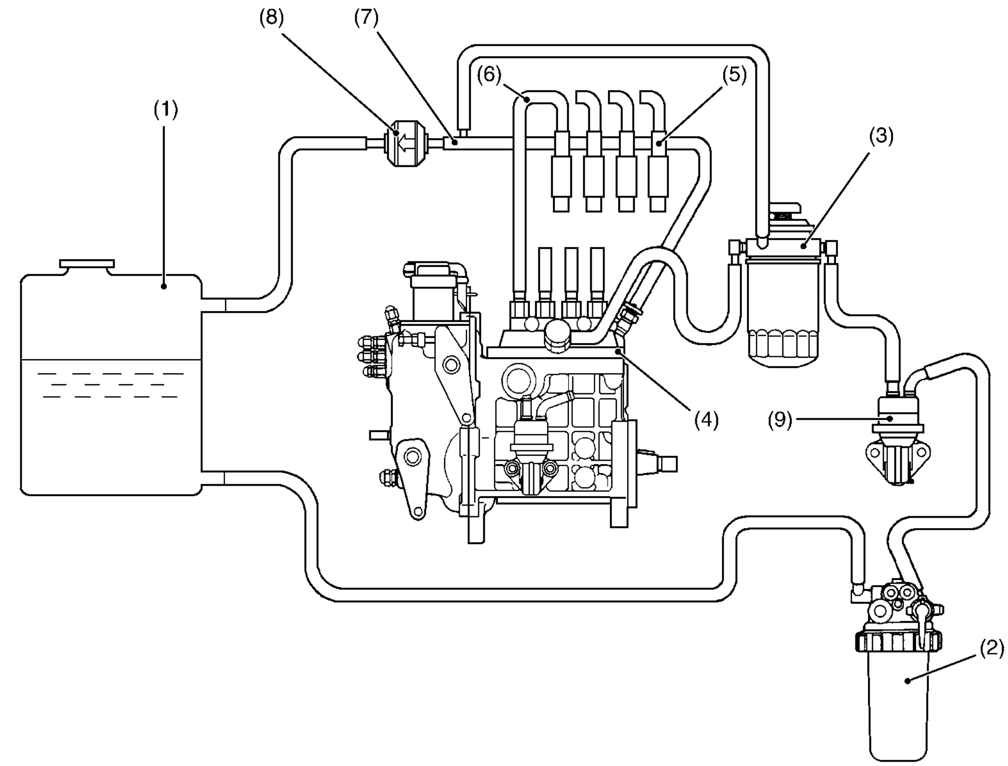
This engine adopts the half counter system and lightweight moving elements, and optimizes the oil clearance of bearings to reduce noise and vibration.

It also adopts a large diameter journal to improve rigidity and reliability, and enable large capacity P.T.O. (Power take-off).

W1012727

2. FUEL SYSTEM



3TMACAB1P002A

(1) Fuel Tank
(2) Separator
(3) Fuel Filter
(4) Injection Pump
(5) Injection Nozzle
(6) Injection Pipe
(7) Fuel Overflow Pipe
(8) Check Valve
(9) Fuel Feed Pump

W1012785

Fuel from the fuel tank (1) suck up by feed pump (9) through the separator (2) and then enter the fuel filter (3).

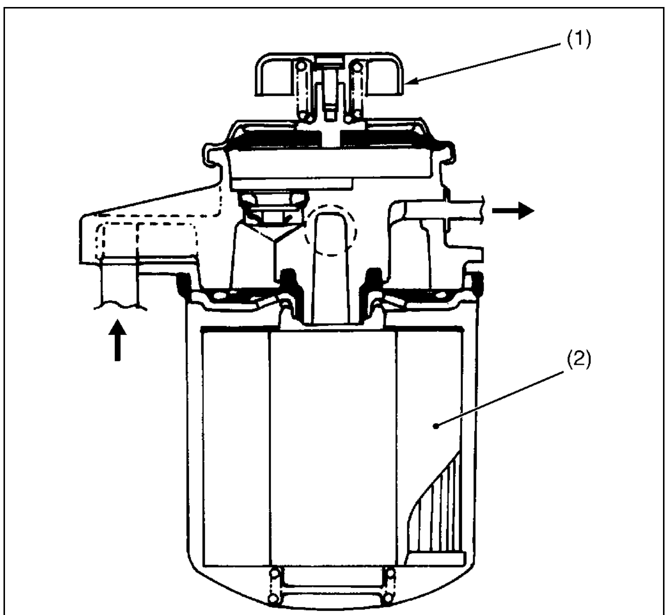
After impurities such as dirt, water etc. are removed, the fuel enter the injection pump (4) and is pressurized.

The fuel pressurized by the injection pump to the opening pressure (13.7 to 14.71 MPa, 140 to 150 kgf/cm^2, 1991 to 2062 psi) of the injection nozzle (5) is injected into the combustion chamber.

Part of the fuel fed to the injection nozzle (5) lubricates the moving parts of the plunger inside the nozzle, then returns to the fuel tank (1) through the overflow pipe (7) and check valve (8) another end of overflow pipe is connected to pump body by joint.

Thus, this system is designed to prevent mixing of air into fuel which causes hard starting.

[1] FUEL FILTER



3TMACAB1P003A

The fuel filter is installed between the fuel tank and fuel lift pump, and serves to remove dirt and impurities from the fuel.

Fuel from the fuel tank enters the outside of the filter element (2) and passes through the filter element under its own pressure. As it passes through, the dirt and impurities in the fuel are filtered out, allowing only clean fuel to enter the interior of the filter element.

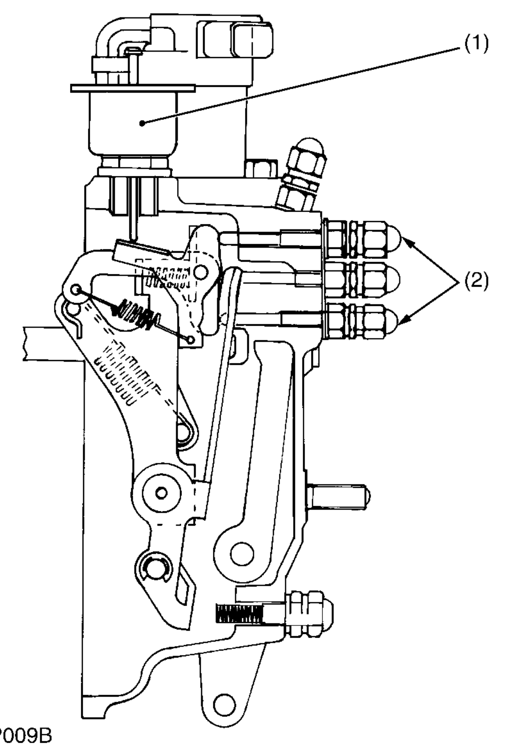
The feed pump (1) sends fuel from the fuel tank to the injection pump by applying pressure to fuel.

(1) Feed Pump
(2) Element

W1012915

3. TURBO CHARGER SYSTEM

[1] BOOST COMPENSATOR



3EEABAB1P009B

The boost compensator is controlled by the boost pressure of the control mechanism which controls transient smoke caused by oversupply of fuel when the engine starts and accelerates.

When the boost pressure is lower than working pressure of the boost actuator (1), it prevents oversupply of fuel to reduce transient smoke.

When the boost pressure is higher than working pressure of the boost actuator (1), it controls the supply of fuel to the equivalent of maximum power / rated speed output.

The boost compensator adjusting screws (2) are set and tamper-proof capped in factory, so never take off the tamper-proof cap and readjust the screws.

(1) Boost Actuator
(2) Boost Compensator Adjusting Screw

W1013012

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	–
	• Air in the fuel system	Vent air	G-32
	• Water in the fuel system	Change fuel and repair or replace fuel system	–
	• Fuel pipe clogged	Clean	–
	• Fuel filter clogged	Replace	G-27
	• Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-11
	• Fuel with low cetane number	Use specified fuel	G-12
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	–
	• Incorrect injection timing	Adjust	1-S67
	• Injection nozzle clogged	Clean	1-S68, S69
	• Injection pump malfunctioning	Repair or replace	1-S39, S67
	• Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	1-S44, S53 to S58
	• Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S22
	• Improper valve timing	Correct or replace timing gear	1-S43
	• Piston ring and cylinder worn	Replace	1-S53, S61
	• Excessive valve clearance	Adjust	1-S19
(Starter Does Not Run)	• Battery discharged	Charge	–
	• Starter malfunctioning	Repair or replace	9-S14
	• Key switch malfunctioning	Repair or replace	9-S10, S11
	• Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	• Fuel filter clogged or dirty	Replace	G-27
	• Air cleaner clogged	Clean or replace	G-22, 28
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	–
	• Injection pump malfunctioning	Repair or replace	1-S39, S67
	• Incorrect nozzle opening pressure	Adjust	1-S68
	• Injection nozzle stuck or clogged	Repair or replace	1-S69
	• Governor malfunctioning	Repair	–
	• Bearing worn out	Replace	–
	• Turbocharger shaft bent	Replace	1-S70
	• Turbocharger fin or other part damaged due to foreign matters	Replace	1-S70

W1014322

Symptom	Probable Cause	Solution	Reference Page
Either White or Blue Exhaust Gas Is Observed	• Excessive engine oil • Piston ring and liner worn or stuck • Incorrect injection timing	Reduce to specified level Repair or replace Adjust	– 1-S53, S61 1-S67
Oil Leak into Exhaust Pipe or Suction Pipe	• Waste oil pipe clogged or deformed	Repair or replace	–
Either Black or Dark Gray Exhaust Gas Is Observed	• Overload • Low grade fuel used • Fuel filter clogged • Air cleaner clogged • Deficient nozzle injection	Lessen load Use specified fuel Replace Clean or replace Repair or replace nozzle	– G-12 G-27 G-22, 28 1-S68, S69
Deficient Output	• Incorrect injection timing • Engine's moving parts seem to be seizing • Injection pump malfunctioning • Deficient nozzle injection • Compression leak • Gas leak from exhaust system • Air leak from compressor discharge side • Air cleaner dirty or clogged • Compressor wheel turning heavily	Adjust Repair or replace Repair or replace Repair or replace nozzle Check the compression pressure and repair Repair or replace Repair or replace Clean or replace Replace the turbocharger assembly	1-S67 – 1-S39, S67 1-S69 1-S17 – – G-22, 28 1-S70
Excessive Lubricant Oil Consumption	• Piston ring's gap facing the same direction • Oil ring worn or stuck • Piston ring groove worn • Valve stem and valve guide worn • Crankshaft bearing, and crank pin bearing worn • Oil leaking due to defective seals or packing	Shift ring gap direction Replace Replace piston Replace Replace Replace	1-S51 1-S51 1-S53 1-S27 1-S57 to S60 –
Fuel Mixed into Lubricant Oil	• Injection pump's plunger worn • Deficient nozzle injection • Injection pump broken	Replace the injection pump Repair or replace nozzle Replace	1-S39 1-S68 1-S39

W1014322

Symptom	Probable Cause	Solution	Reference Page
Water Mixed into Lubricant Oil	• Head gasket defective • Cylinder block or cylinder head flawed	Replace Replace	1-S22, S24 1-S25
Low Oil Pressure	• Engine oil insufficient • Oil strainer clogged • Relief valve stuck with dirt • Relief valve spring weaken or broken • Excessive oil clearance of crankshaft bearing • Excessive oil clearance of crankpin bearing • Oil passage clogged • Different type of oil • Oil pump defective	Replenish Clean Clean Replace Replace Replace Clean Use specified type of oil Repair or replace	– 1-S48 – – 1-S60 1-S58, S59 – G-11 1-S64
High Oil Pressure	• Different type of oil • Relief valve defective	Use specified type of oil Replace	G-11 –
Engine Overheated	• Engine oil insufficient • Fan belt broken or elongated • Coolant insufficient • Radiator net and radiator fin clogged with dust • Inside of radiator corroded • Coolant flow route corroded • Radiator cap defective • Overload running • Head gasket defective • Incorrect injection timing • Unsuitable fuel used	Replenish Replace or adjust Replenish Clean Clean or replace Clean or replace Replace Loosen load Replace Adjust Use specified fuel	– 1-S65 – – G-30, 31 – 1-S66 – 1-S22, S24 1-S63 G-11
Battery Quickly Discharged	• Battery electrolyte insufficient • Fan belt slips • Wiring disconnected • Rectifier defective • Alternator defective • Battery defective	Replenish distilled water and charge Adjust belt tension or replace Correct Replace Replace Replace	– 1-S67 – 9-S22 9-S18 to S22 –

W1014322

2. SERVICING SPECIFICATIONS

Cylinder Head

Item		Factory Specification	Allowable Limit
Cylinder Head Surface Flatness		–	0.05 mm 0.0020 in.
Top Clearance	V3300-E V3300-E2	0.72 to 0.90 mm 0.0283 to 0.0354 in.	–
	V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	0.92 to 1.10 mm 0.0362 to 0.0433 in.	–
Compression Pressure	V3300-E V3300-E2	4.32 MPa / 250 min^{-1} (rpm) 44 kgf/cm^2 / 250 min^{-1} (rpm) 626 psi / 250 min^{-1} (rpm)	3.26 MPa / 250 min^{-1} (rpm) 33.2 kgf/cm^2 / 250 min^{-1} (rpm) 472 psi / 250 min^{-1} (rpm)
	V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	3.92 MPa / 250 min^{-1} (rpm) 40 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)	2.99 MPa / 250 min^{-1} (rpm) 30.5 kgf/cm^2 / 250 min^{-1} (rpm) 434 psi / 250 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less

W1013874

Valves

Valve Clearance (Cold)		0.23 to 0.27 mm 0.0091 to 0.0106 in.	–
Valve Seat Width	IN.	2.12 mm 0.0835 in.	–
	EX.	2.12 mm 0.0835 in.	
Valve Seat Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Face Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Recessing	IN.	–0.2 to 0 mm –0.079 to 0 in.	–0.4 mm –0.0157 mm
	EX.	–0.05 to 0.15 mm –0.0019 to 0.0059 in.	–0.4 mm –0.0157 mm

W1023972

Valves (Continued)

Item		Factory Specification	Allowable Limit
Clearance between Valve Stem and Valve Guide (Serial No : below 3N8371)	IN.	0.035 to 0.065 mm 0.0014 to 0.0025 in.	0.1 mm 0.0039 in.
Valve Stem O.D.		6.960 to 6.975 mm 0.2740 to 0.2764 in.	–
Valve Guide I.D.		7.010 to 7.025 mm 0.2760 to 0.2765 in.	–
	EX.	0.040 to 0.070 mm 0.0016 to 0.0028 in.	0.1 mm 0.0039 in.
Valve Stem O.D.		7.960 to 7.975 mm 0.3134 to 0.3140 in.	–
Valve Guide I.D.		8.015 to 8.030 mm 0.3155 to 0.3161 in.	–
Clearance between Valve Stem and Valve Guide (Serial No : above 3N8372)	IN.	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 0.2764 in.	–
Valve Guide I.D.		7.030 to 7.045 mm 0.2768 to 0.2774 in.	–
	EX.	0.040 to 0.070 mm 0.0016 to 0.0028 in.	0.1 mm 0.0039 in.
Valve Stem O.D.		7.960 to7.975 mm 0.3134 to 0.3140 in.	–
Valve Guide I.D.		8.015 to 8.030 mm 0.3155 to 0.3161 in.	–

W1013874

Valve Timing

Intake Valve		
Open	0.24 rad (14 °) before T.D.C.	–
Close	0.61 rad (36 °) after B.D.C.	
Exhaust Valve		
Open	0.79 rad (45 °) before B.D.C.	–
Close	0.29 rad (17 °) after T.D.C.	

W1025647

Valve Spring

Item		Factory Specification	Allowable Limit
Valve Spring	Intake	35.1 to 35.6 mm 1.3819 to 1.4016 in.	34.6 mm 1.3622 in.
	Exhaust	41.7 to 42.2 mm 1.6417 to 1.6614 in.	41.2 mm 1.6220 in.
Setting load / Setting length	Intake	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.
	Exhaust	117.6 N / 35 mm 12 kgf / 35 mm 26.4 lbs / 1.3780 in.	100 N / 35 mm 10.2 kgf / 35 mm 22.5 lbs / 1.3780 in.
Tilt		–	1.0 mm 0.039 in.

W1014538

Rocker Arm

Clearance between valve arm bridge and valve arm bridge shaft	0.018 to 0.042 mm 0.0007 to 0.0017 in.	0.15 mm 0.0059 in.
Valve arm bridge I.D.	9.050 to 9.065 mm 0.3563 to 0.3556 in.	–
Valve arm bridge shaft O.D.	9.023 to 9.032 mm 0.3552 to 0.3566 in.	–
Clearance between rocker arm shaft and rocker arm	0.016 to 0.045 mm 0.0006 to 0.0018 in.	0.15 mm 0.0059 in.
Rocker arm shaft	15.973 to 15.984 mm 0.6289 to 0.6293 in.	–
Rocker arm I.D. for shaft	16.000 to 16.018 mm 0.6299 to 0.6306 in.	–

W1026474

Tappet

Clearance between tappet and guide	0.020 to 0.062 mm 0.0008 to 0.0024 in.	0.07 mm 0.0028 in.
Tappet guide I.D.	24.000 to 24.021 mm 0.9449 to 0.9457 in.	–
Tappet O.D.	23.959 to 23.980 mm 0.9433 to 0.9441 in.	–

W1026740

Push Rod

Alignment of Push Rod	–	0.25 mm 0.0098 in.

W1013973

Camshaft

Item		Factory Specification	Allowable Limit
Camshaft Side Clearance		0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Camshaft Alignment		–	0.01 mm 0.00039 in.
Cam Height	IN.	37.63 mm 1.4815 in.	37.13 mm 1.4618 in.
	EX.	38.96 mm 1.5338 in.	38.46 mm 1.5141 in.
Oil Clearance of Camshaft		0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
Camshaft Journal O.D.		45.934 to 45.950 mm 1.8084 to 1.8091 in.	–
Camshaft Bearing I.D.		46.000 to 46.025 mm 1.8110 to 1.8120 in.	–

W1016466

Timing Gear

Timing Gear Backlash		
Crank Gear - Idle Gear 1	0.049 to 0.193 mm 0.0019 to 0.0076 in.	0.22 mm 0.0087 in.
Idle Gear 1 - Cam Gear	0.049 to 0.189 mm 0.0019 to 0.0074 in.	0.22 mm 0.0087 in.
Idle Gear 1 - Idle Gear 2	0.044 to 0.185 mm 0.0017 to 0.0073 in.	0.22 mm 0.0087 in.
Idle Gear 2 - Injection Pump Gear	0.044 to 0.177 mm 0.0017 to 0.0070 in.	0.22 mm 0.0087 in.
Cam Gear - Balancer Gear 1	0.047 to 0.182 mm 0.0018 to 0.0072 in.	0.22 mm 0.0087 in.
Idle Gear - Balancer Gear 2	0.044 to 0.183 mm 0.0017 to 0.0072 in.	0.22 mm 0.0087 in.
Clearance between Idle Gear Shaft and Idle Gear Bushing	0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.10 mm 0.0039 in.
Idle Gear Bushing I.D.	45.025 to 45.050 mm 1.7726 to 1.7736 in.	–
Idle Gear Shaft 1, 2 O.D.	44.959 to 44.975 mm 1.7700 to 1.7707 in.	–
Idle Gear Side Clearance	0.15 to 0.30 mm 0.0059 to 0.0118 in.	0.9 mm 0.0354 in.

W1022015

Balancer Shaft

Item	Factory Specification	Allowable Limit
Balancer Shaft Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Balancer Shaft Alignment	–	0.02 mm 0.0008 in.
Oil Clearance of Balancer Shaft	0.070 to 0.159 mm 0.0028 to 0.0063 in.	0.2 mm 0.0079 in.
Balancer Shaft Journal O.D.	50.92 to 50.94 mm 2.0047 to 2.0055 in.	–
Balancer Bearing I.D.	51.01 to 51.08 mm 2.0083 to 2.0110 in.	–

W1027958

Piston / Piston Ring

Piston Pin Bore I.D.	30.000 to 30.013 mm 1.1811 to 1.1816 in.	30.05 mm 1.1831 in.
Clearance between Compression Ring 2 and Ring Groove	0.093 to 0.120 mm 0.0037 to 0.0047 in.	0.20 mm 0.0079 in.
Clearance between Oil Ring and Ring Groove	0.02 to 0.06 mm 0.0008 to 0.0023 in.	0.15 mm 0.0059 in.
Ring Gap		
Compression Ring 1	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Compression Ring 2	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.

W1028289

Connecting Rod

Connecting Rod Alignment	–	0.05 mm 0.0020 in.
Clearance between Piston Pin and Small End Bushing	0.020 to 0.040 mm 0.0008 to 0.0016 in.	0.15 mm 0.0059 in.
Piston Pin O.D.	30.006 to 30.011 mm 1.1813 to 1.1815 in.	–
Small End Bushing I.D.	30.031 to 30.046 mm 1.1823 to 1.1829 in.	–

W1028602

Crankshaft

Item		Factory Specification	Allowable Limit
Crankshaft Alignment		–	0.02 mm 0.00079 in.
Crankpin O.D.		52.977 to 52.990 mm 2.0857 to 2.0862 in.	–
Crankshaft Journal O.D.		74.977 to 74.990 mm 2.9518 to 2.9524 in.	–
Oil Clearance between Crankshaft Journal and Crankshaft Bearing	Below YL0485	0.034 to 0.074 mm 0.0013 to 0.0029 in.	–
	Above YL0486	0.018 to 0.062 mm 0.0007 to 0.0024 in.	–
Oil Clearance between Crank Pin and Pin Bearing	Below YN3106	0.030 to 0.063 mm 0.0012 to 0.0025 in.	–
	Above YN3107	0.018 to 0.051 mm 0.0007 to 0.0020 in.	–
Crankshaft Side Clearance		0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.

W1028928

Cylinder Bore

Cylinder Bore I.D.	98.000 to 98.022 mm 3.8582 to 3.8591 in.	98.15 mm 3.8642 in.
Oversized Cylinder Bore I.D.	98.500 to 98.522 mm 3.8780 to 3.8788 in.	98.65 mm 3.8839 in.

W1029426

Oil Pump

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 56 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	–
Clearance between Inner Rotor and Outer Rotor		0.04 to 0.16 mm 0.0016 to 0.0063 in.	0.3 mm 0.118 in.
Clearance between Outer Rotor and Pump Body		0.100 to 0.184 mm 0.0039 to 0.0072 in.	0.3 mm 0.118 in.
Clearance between Rotor and Cover		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	–

W1024567

Thermostat

Item	Factory Specification	Allowable Limit
Thermostat Valve Opening Temperature	74.5 to 78.5 °C 166.1 to 173.3 °F	–
Temperature at which Thermostat completely Opens	90 °C 194 °F	–

W1026075

Radiator

Radiator Water Tightness	Water tightness at specified pressure 137 kPa, 1.4 kgf/cm^2, 20 psi	–
Radiator Cap Air Leakage	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm^2 13 → 9 psi	–

W1030127

Fan Belt

Fan Belt Tension	10 to 12 mm / 10 kgf 0.394 to 0.472 in. / 22.1 lbs	–

W1030302

Injection Pump

Injection Timing	V3300-E V3300-TE V3300-TIE	0.26 to 0.30 rad (15 ° to 17 °) before T.D.C.	–
	V3300-E2	0.20 to 0.22 rad (11.5 ° to 12.5 °) before T.D.C.	–
	V3300-TE2	0.11 to 0.13 rad (6.5 ° to 7.5 °) before T.D.C.	–
	V3300-TIE2	0.15 to 0.17 rad (8.5 ° to 9.5 °) before T.D.C.	–
Fuel Tightness of Pump Element		–	14.7 MPa 150 kgf/cm^2 2133 psi
Fuel Tightness of Delivery Valve		More 10 seconds 14.7 → 13.7 MPa 150 → 140 kgf/cm^2 2133 → 1990 psi	5 seconds 14.7 → 13.7 MPa 150 → 140 kgf/cm^2 2133 → 1990 psi

W1027540

Injection Nozzle

Fuel Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm^2 1991 to 2133 psi	–
Fuel Tightness of Nozzle Valve Seat	When the pressure is 12.75 MPa (130 kgf/cm^2, 1849 psi), the valve seat must be fuel tightness	–

W1027594

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 “6. TIGHTENING TORQUES” at GENERAL Section.)

Item	N·m	kgf·m	ft-lbs
Turning delivry hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Front axle support mounting screw (M14 UBS)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Bonnet support mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Bonnet support frame mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Engine and clutch housing mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine and clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Cylinder head cover mounting screw	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
Idle gear mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Camshaft set screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Balancer shaft set screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Gear case cover mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Plate mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
* Cylinder head mounting screw	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
* Connecting rod screw	78.5 to 83.4	8.0 to 8.5	50.9 to 61.5
* Flywheel screw	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
PTO propeller shaft spline hub screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Flywheel housing screw	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
Crankcase 2 mounting screw	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
* Crankshaft screw (Below YN0476)	343.2 to 372.7	35.0 to 38.0	253.2 to 274.9
(Above YN0477)	255.0 to 274.6	26.0 to 28.0	188.1 to 202.5
* Main bearing case screw	137.3 to 147.1	14.0 to 15.0	101.3 to 108.5
Rocker arm bracket screw	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
Nozzle holder	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Nozzle holder assembly	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Injection pipe retaining nut	22.6 to 36.3	2.3 to 3.7	16.6 to 26.8
Glow plug	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Anti-rotation nut	2.8 to 4.0	0.29 to 0.41	2.1 to 3.0
Governor housing mounting screw	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
Boost actuator	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Injection pump mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Injection pump mounting nut	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Injection pump gear mounting nut	73.6 to 83.4	7.5 to 8.5	54.2 to 61.5
Fuel camshaft stopper mounting screw	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9
Governor weight mounting screw	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5
Starter’s terminal **B** mounting nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7
Housing clamp screw	1.5 to 2.5	0.15 to 0.25	1.1 to 1.8
Overflow pipe nut	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Oil pump cover screw	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9
Relief valve retaining screw	68.6 to 78.4	7.0 to 8.0	50.6 to 57.9
Oil cooler joint scre	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Oil switch	14.7 to 196	1.5 to 2.0	10.8 to 14.5

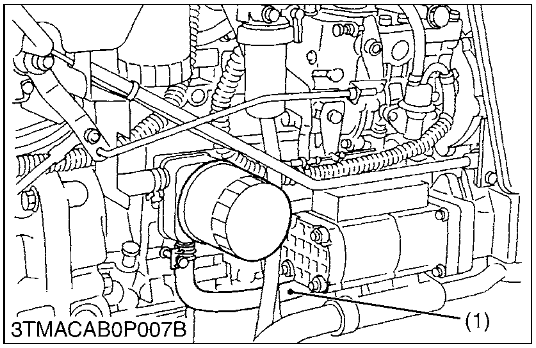
■ **NOTE**

- **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] SEPARATING ENGINE FROM TRACTOR



Draining Coolant

CAUTION

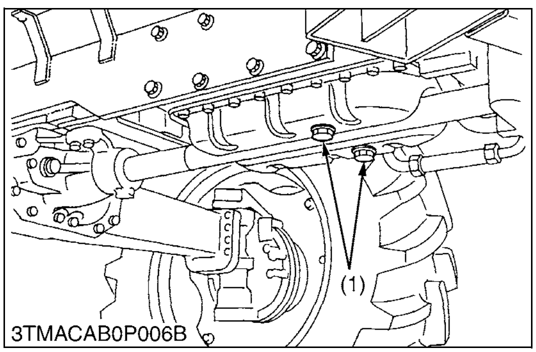
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

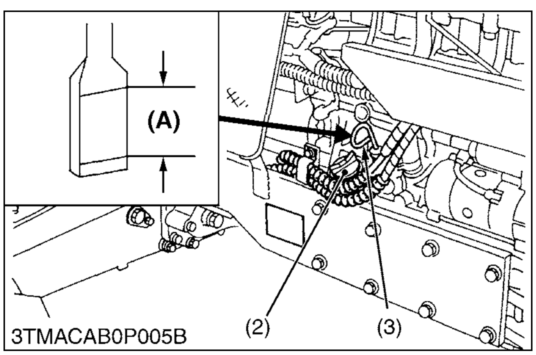
1. Stop the engine and let cool down.
2. Remove the radiator hose (1) from the engine side to drain the coolant.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator hose.

Coolant	Capacity	M6800(S)	8.5 L 9.0 U.S.qts. 7.5 Imp.qts.
		M8200 M9000	9.0 L 9.5 U.S.qts. 7.9 Imp.qts.

(1) Radiator Hose

W1015463





Draining Engine Oil

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. Remove the drain plugs (1) to drain oil.
4. After draining reinstall the drain plugs (1).

(When reassembling)

- Fill the engine oil up to the upper line on the dipstick (3).

Engine oil	Capacity	10.7 L 11.3 U.S.qts. 9.4 Imp.qts.

■ **IMPORTANT**

- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
  Refer to “5. LUBRICANTS, FUEL AND COOLANT” at GENERAL Section.

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

(A) Oil level is acceptable within this range.

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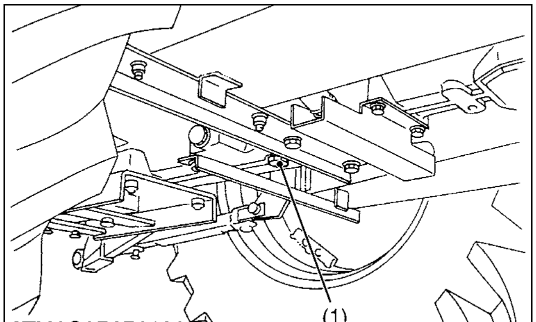

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Draining Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plug (1).
3. Drain the transmission fluid.
4. Reinstall the drain plug (1).

(When reassembling)

- Fill up from filling port after removing the filling plug until reaching the gauge.
- After running the engine for a few minutes, stop it and check the fluid level again, add fluid to prescribed level if it is not correct level.

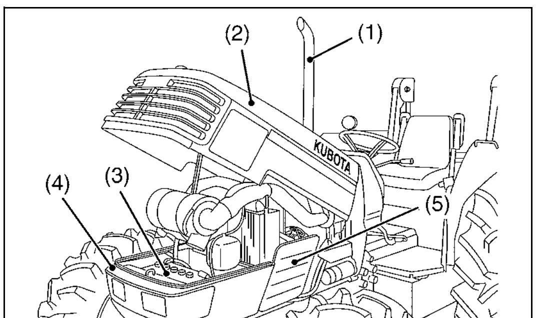
Transmission fluid	Capacity	M6800(S)	43 L 45.4 U.S.qts. 37.8 Imp.qts.
		M8200 M9000	54 L 57.0 U.S.qts. 47.5 Imp.qts.

■ **IMPORTANT**

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmisison or hydraulic system.**
- **Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.**
- **Do not mix different brands fluid together.**

(1) Drain Plug

W1016368



3TMACAB1P004A

Muffler and Bonnet

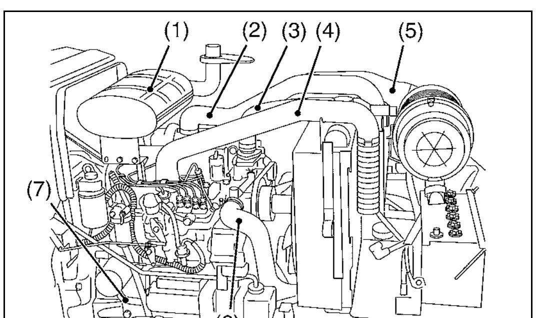
1. Remove the muffler (1).
2. Remove the bonnet (2).
3. Disconnect the battery's cable.
4. Disconnect the head light **3P** connectors.
5. Remove the front lower cover (4) and side cover (5).

■ **IMPORTANT**

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

(1) Muffler (Upper)
(2) Bonnet
(3) Battery
(4) Front Lower Cover
(5) Side Cover

W1016871



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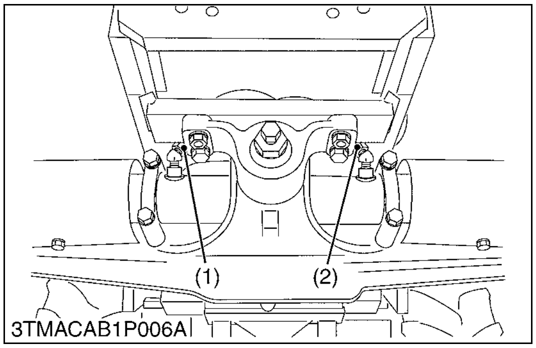
Radiator Hoses and Air Cleaner Hoses

1. Disconnect the radiator hoses (3) and (6) from engine side.
2. Disconnect the air cleaner hose (5) from the intake manifold.
3. Disconnect the hose 1 (2) and hose 2 (4) from engine side (M9000 only).
4. Disconnect the radiator hose (7).
5. Remove the delivery pipe clamp.
6. Remove the muffler (1).

(1) Muffler
(2) Hose 1
(3) Radiator Hose
(4) Hose 2
(5) Air Cleaner Hose
(6) Radiator Hose
(7) Radiator Hose

W1017028



3TMACAB1P006A

Power Steering Hoses

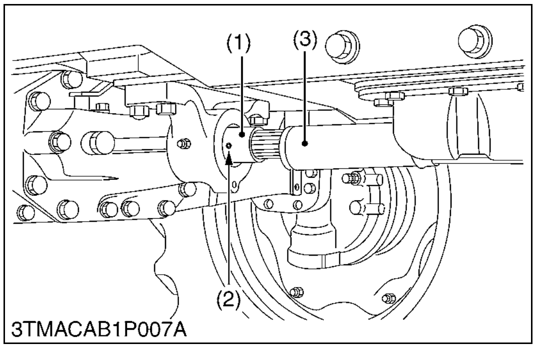
1. Disconnect the power steering hoses (1), (2).

(When reassembling)

Tightening torque	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

(1) Right Turning Delivery Hose
(2) Left Turning Delivery Hose

W1017198



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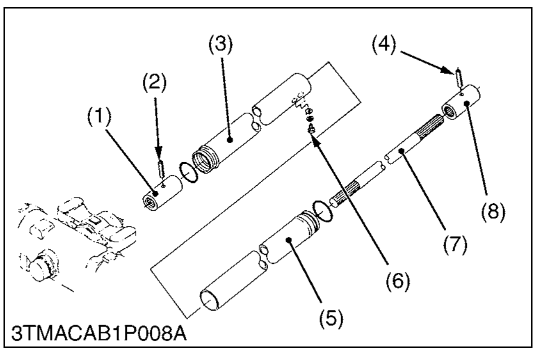

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Propeller Shaft (4WD Only)

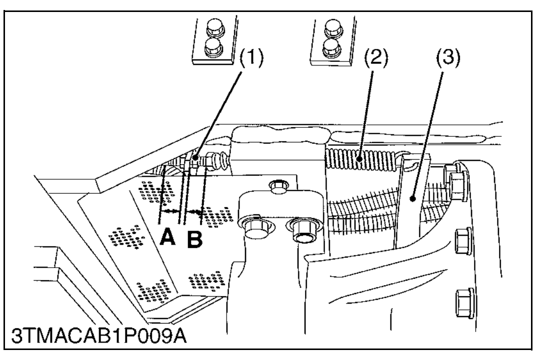
1. Slide the propeller shaft cover (3), (5) after removing the screws (6).
2. Tap out the spring pin (2), (4) and then slide the coupling (1), (8) to the front and rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (7) and pinion shaft.

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

W1017385



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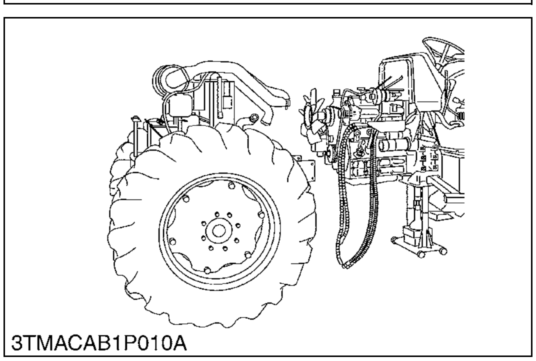
Differential Lock Spring

1. Loosen the lock nut (1).
2. Remove the spring (2) from differential lock lever (3).

Length **A** and **B**	Factory spec.	**A** = **B**

(1) Lock Nut
(2) Spring
(3) Differential Lock Lever

W1017521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Front Axle Support as a Unit

1. Check the front axle and clutch housing case are securely mounted on the disassembling stands.
2. Separate the front axle support as a unit after removing the front axle support mounting screws.

(When reassembling)

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

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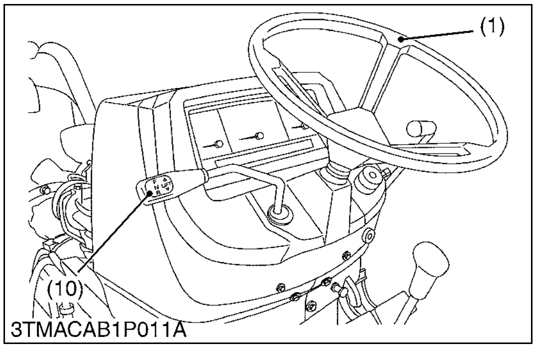
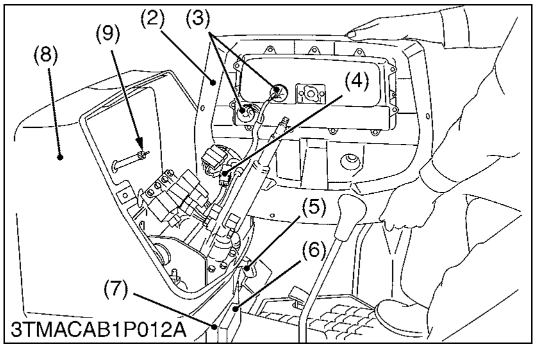


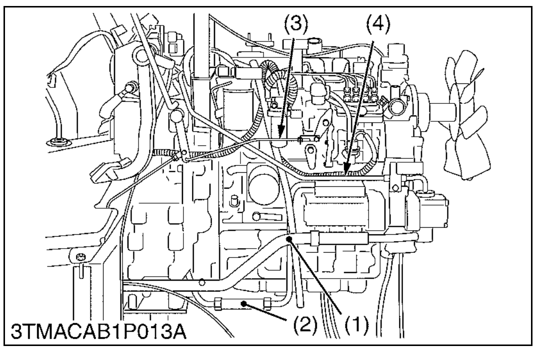


Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1) with a steering wheel puller (Code No. 07916-51090).
2. Remove the shuttle lever grip (10).
3. Remove the meter panel mounting screw and disconnect the meter cable (9).
4. Disconnect the connectors (3).
5. Disconnect the main switch connector (4) and headlight switch connector, hazard and turn signal switch connector.
6. Disconnect the engine stop cable (5) at the engine side.
7. Remove the rear bonnet (8).
8. Remove the fuse box (7) and cover (6).

(1) Steering Wheel	(6) Cover
(2) Meter Panel	(7) Fuse Box
(3) Connectors	(8) Rear Bonnet
(4) Main Switch Connector	(9) Meter Cable
(5) Engine Stop Cable	(10) Shuttle Lever Grip

W1017775

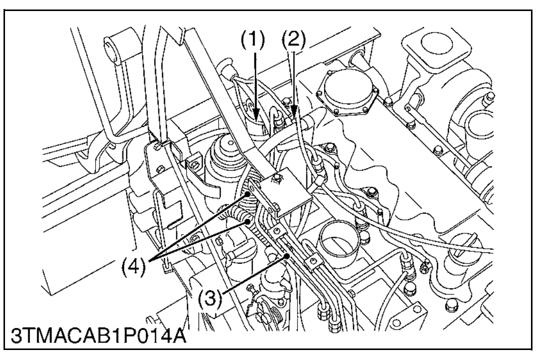


Hydraulic Pipes and Accelerator Rod

1. Remove the suction pipe (1).
2. Remove the delivery pipe (2) and (4).
3. Remove the accelerator rod (3).

(1) Suction Pipe	(3) Accelerator Rod
(2) Delivery Pipe for 3-point Hydraulic System	(4) Delivery Pipe for Power Steering

W1018078

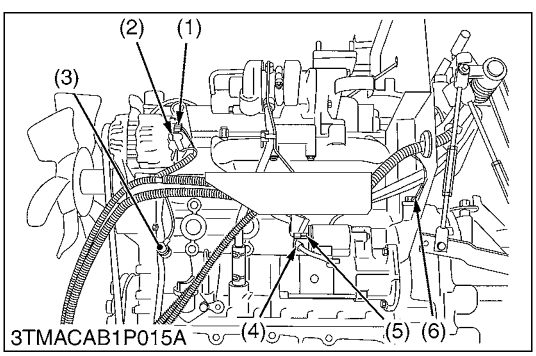


Wire Harness R.H. and Fuel Pipes

1. Disconnect the **3P** connector for solenoid valve (3).
2. Disconnect the wiring lead (2) from the glow plug.
3. Disconnect the coolant thermo sensor **1P** connector (1).
4. Remove the fuel pipes (4).

(1) Coolant Thermo Sensor **1P** Connector	(3) **3P** Connector for Solenoid Valve
(2) Wiring Lead for Glow Plug	(4) Fuel Pipes

W1017957



Wire Harness L.H.

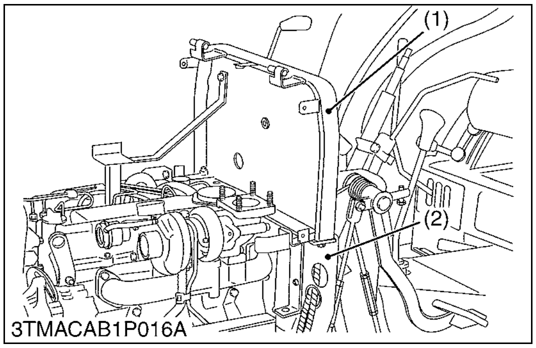
1. Disconnect the alternator **2P** connector (1) and **B** terminal (2).
2. Disconnect the starter motor **C** terminal (5) and **B** terminal (4).
3. Disconnect the engine oil pressure switch terminal (3).
4. Remove the earth wire (6).

(When reassembling)

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

(1) Alternator **2P** Connector	(4) Starter Motor **B** Terminal
(2) Alternator **B** Terminal	(5) Starter Motor **C** Terminal
(3) Engine Oil Pressure Switch Terminal	(6) Earth Wire

W1018206



Bonnect Support

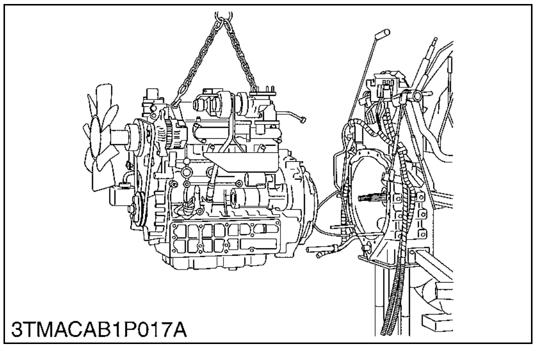
1. Remove the bonnet support (1).
2. Remove the support frame (2).

(When reassembling)

Tightening torque	Bonnet support mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
	Support frame mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Bonnet Support (2) Support Frame

W1018375



Separating Engine from Clutch Housing

1. Hoist the engine by the hoist and chain.
2. Remove the engine mounting screws and nuts, and separate the engine from the clutch housing.

(When reassembling)

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

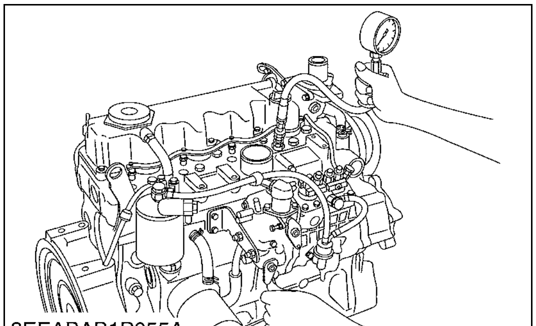
Tightening torque	Engine and clutch housing mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1018577

[2] ENGINE BODY

(1) Cylinder Head

(A) Checking and Adjusting



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Compression Pressure

1. After warming up the engine, stop it and remove the air cleaner, the muffler and all nozzle holders.
2. Install a compression tester (Code No: 07909-30208) for diesel engines to nozzle holder hole.
3. After making sure that the speed control 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.
5. If the measurement is below the allowable limit, check the cylinder, piston ring, top clearance, valve and cylinder head.
6. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.
7. If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.
8. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ **NOTE**

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

Compression pressure	Factory spec.	V3300-E V3300-E2	4.32 MPa / 250 min^{-1} (rpm) 44 kgf/cm^2 / 250 min^{-1} (rpm) 626 psi / 250 min^{-1} (rpm)
		V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	3.92 MPa / 250 min^{-1} (rpm) 40 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)
	Allowable limit	V3300-E V3300-E2	3.26 MPa / 250 min^{-1} (rpm) 33.2 kgf/cm^2 / 250 min^{-1} (rpm) 472 psi / 250 min^{-1} (rpm)
		V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	2.99 MPa / 250 min^{-1} (rpm) 30.5 kgf/cm^2 / 250 min^{-1} (rpm) 434 psi / 250 min^{-1} (rpm)

(When reassembling)

Tightening torque	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Overflow pipe assembly retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Injection pipe retaining nut	22.6 to 36.3 N·m 2.3 to 3.7 kgf·m 16.6 to 26.8 ft-lbs

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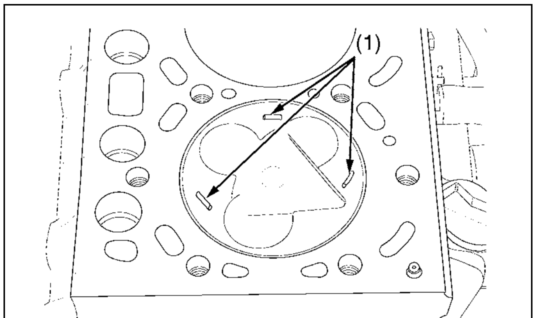

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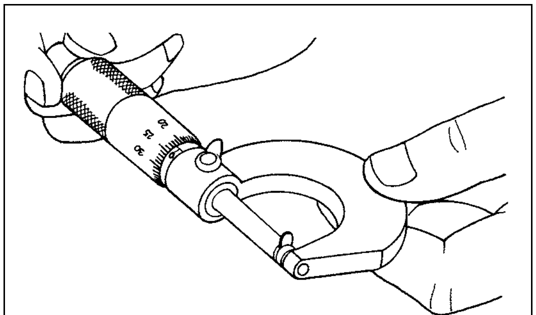
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Top Clearance

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 screw 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.

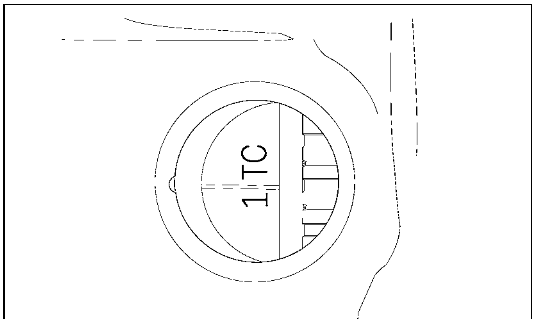
Top clearance	Factory spec.	V3300-E V3300-E2	0.72 to 0.90 mm 0.0283 to 0.0354 in.
		V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	0.92 to 1.10 mm 0.0362 to 0.0433 in.

(When reassembling)

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

(1) Fuse

W1049122



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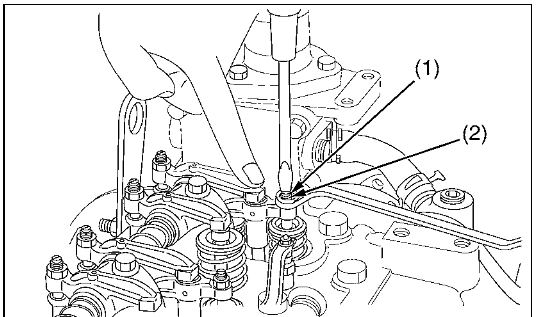

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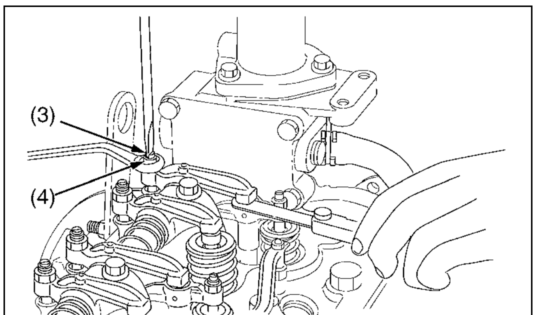

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Checking Valve Clearance

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

1. Remove the head cover.
2. Align the 1TC mark of flywheel and the convex of flywheel housing timing windows so that the first piston (gear case side) comes to the compression top dead center.
3. Before adjusting the valve clearance of intake valve, adjust the bridge to set the height of intake valve.
4. Loosen the lock nut (2) and return the adjusting screw (1).
5. Hold the rocker arm (intake side) by 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 thickness gauge between the rocker arm and the bridge head. Set the adjusting screw to the specified value, then tighten the lock nut.
7. Adjust the clearance between the rocker arm (exhaust side) and the exhaust valve to the specified value.

Valve clearance	Factory spec.	0.23 to 0.27 mm 0.0091 to 0.0106 in.

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

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

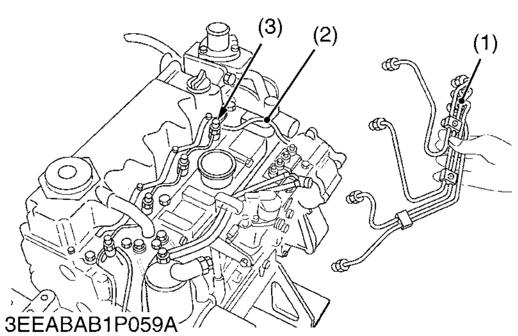
(When reassembling)

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

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

W1037215

(B) Disassembling and Assembling



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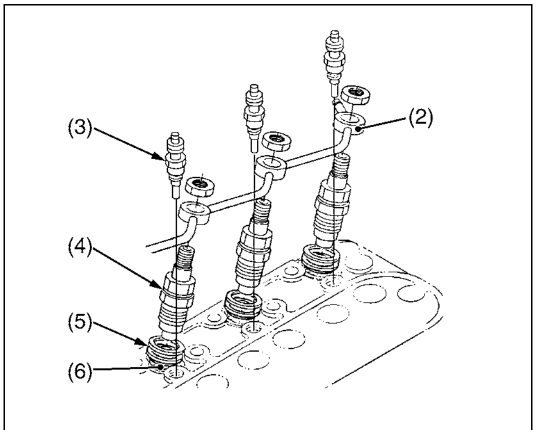

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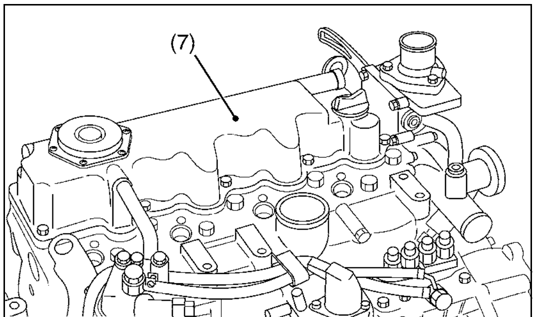

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Cylinder Head Cover and Nozzle Holder

1. Remove the injection pipes (1) and overflow pipes (2).
2. Remove the glow plugs (3).
3. Remove the nozzle holder assembly (4) and copper gaskets (5).
4. Remove the heat seal (6).
5. Remove the head cover (7).

(When reassembling)

- Check to see that the cylinder head cover gasket is not defective.
- Be sure to place the heat seal.
- Tighten the head cover mounting bolts to specified torque.
- Mount the check valve with the ↓ mark toward the tank.

Tightening torque	Cylinder head cover mounting 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 16.6 to 26.8 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 41.2 ft-lbs
	Overflow pipe assembly retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Glow plug	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1ft-lbs

(1) Injection Pipe
(2) Overflow Pipe
(3) Glow Plug
(4) Nozzle Holder Assembly
(5) Copper Gasket
(6) Head Caver
(7) Head Cover

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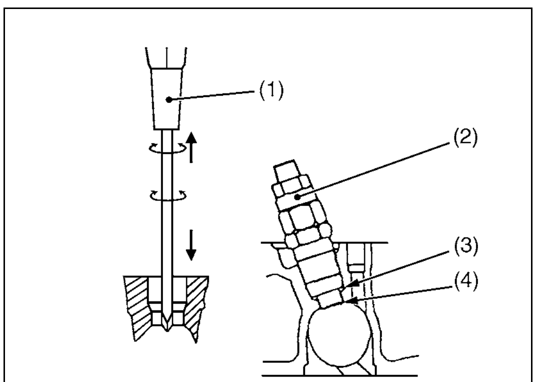

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Nozzle Heat Seal Service Removal Procedure

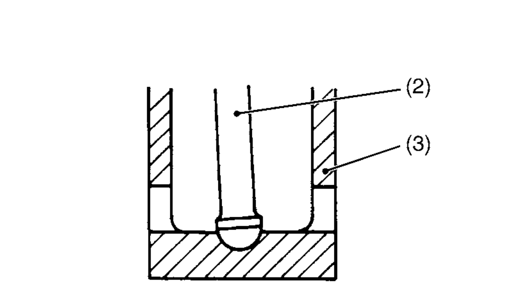
■ **IMPORTANT**

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

1. Drive screw driver lightly into the heat seal hole.
2. Turn screw driver three or four times each way.
3. While turning the screw driver, slowly pull the heat seal out together with the injection nozzle gasket (3).
   If the heat seal drops, repeat the above procedure. Heat seal (4) and injection nozzle gasket (3) must be changed when the injection nozzle is removed for cleaning or for service.

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

W1049956



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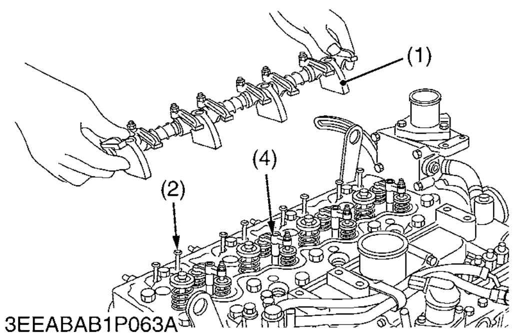

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Rocker Arm and Push Rod

1. Remove the rocker arm (1) as a unit.
2. Remove the push rods (2).
3. Remove the bridge arm (4).

(When reassembling)

- When putting the push rods onto the tappets, check to see if their ends are properly engaged with the grooves.

■ **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) Tappet
(4) Bridge Arm

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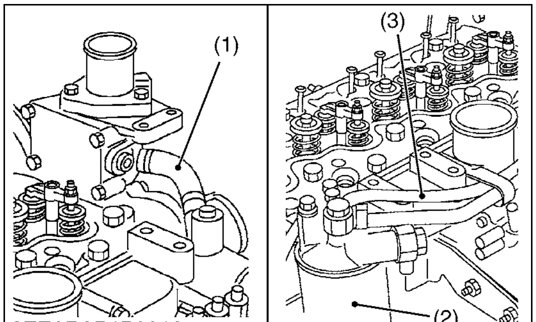

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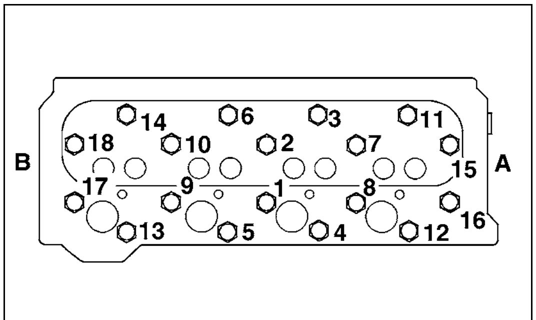

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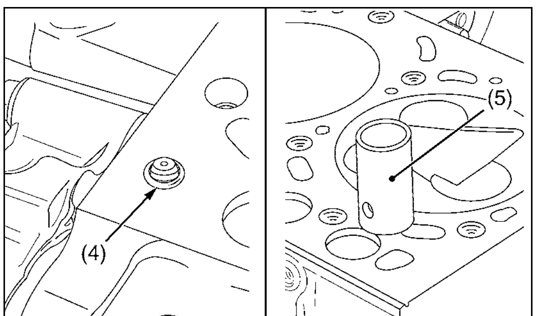

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Cylinder Head and Tappet (Engine Serial Number : below YY0470)

1. Loosen the pipe band, and remove the water return pipe (1).
2. Disconnect the fuel pipe (3) first and then the fuel filter (2).
3. Remove the IN. / EX. manifold.
4. Remove the cylinder head screw in the order of (18) to (1), and remove the cylinder head.
5. Remove the cylinder head gasket and O-ring (4).
6. Remove the tappets (5) from the crank case.

(When reassembling)

- Replace the head gasket with a new one.
- Before installing the tappets (5), apply engine oil thinly around them.
- When mounting the gasket, set it to the knock pin holes. 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, using care not to damage the O-ring (4).
- Tighten the cylinder head screw gradually in the order of (1) to (18) after applying engine oil.
- Be sure to adjust the valve clearance. See the page 1-S19.
- Retighten the cylinder head screw after running the engine for 30 minutes.
- After retighten the cylinder head screw, check and adjust the valve clearance. See the page 1-S19.

■ **IMPORTANT**

- **Cylinder Head Gasket between Engine Serial Number : below YY0470 and above YY0471 are NOT convertible. The Pistons and Piston Ring Assembly are also NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**

Engine Serial Number : below YY0470

Part Name	Part Code
	V3300-E · V3300-TE · V3300-TIE
Cylinder Head Gasket	1C010-03310

■ **NOTE**

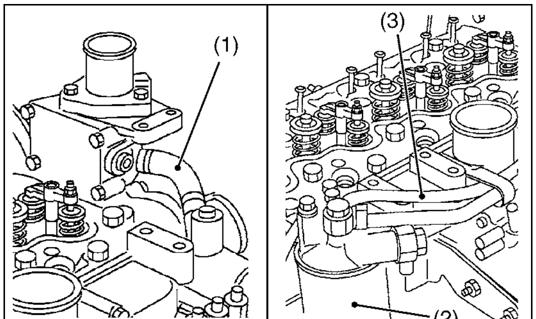
- **Mark the cylinder number to the tappets to prevent interchanging.**

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

(1) Return Pipe
(2) Fuel Filter
(3) Fuel Pipe
(4) O-ring
(5) Tappets

A : Gear Case Side
B : Flywheel Side

W1050411



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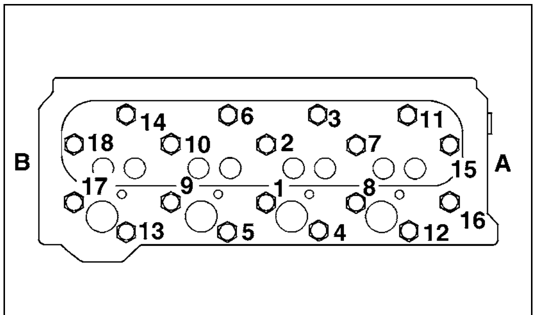

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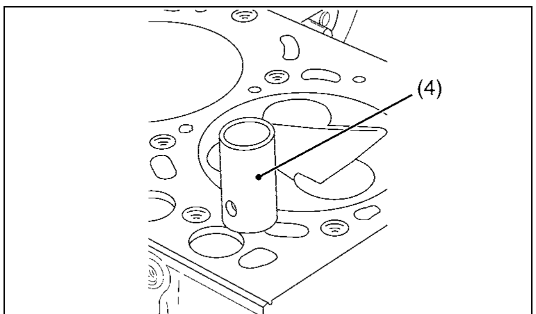

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Cylinder Head and Tappet (Engine Serial Number : above YY0471)

1. Loosen the pipe band, and remove the water return pipe (1).
2. Disconnect the fuel pipe (3) first and then the fuel filter (2).
3. Remove the IN. / EX. Manifold.
4. Remove the cylinder head screw in the order of (18) to (1), and remove the cylinder head.
5. Remove the cylinder head gasket. (O-ring is not attached to Engine Serial Number : **above YY0471**, because of metal type cylinder head gasket.)
6. Remove the tappets (4) from the crank case.

(When reassembling)

- Replace the head gasket with a new one.
- Before installing the tappets (4), apply engine oil thinly around them.
- 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 (18) after applying engine oil.
- Be sure to adjust the valve clearance. See the page 1-S19.
- In the Engine Serial Number : **above YY0471**, it is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

■ **IMPORTANT**

- **Cylinder Head Gasket between Engine Serial Number : below YY0470 and above YY0471 are NOT convertible. The Pistons and Piston Ring Assembly are also NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**
- **When replace the 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".**

■ **NOTE**

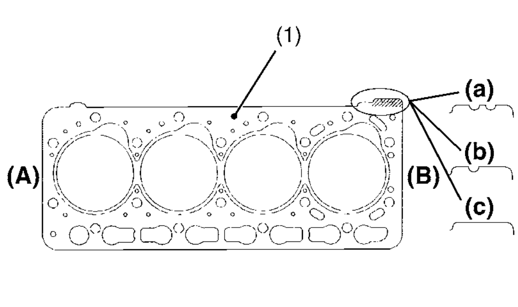
- **Mark the cylinder number to the tappets to prevent interchanging.**

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

(1) Return Pipe
(2) Fuel Filter
(3) Fuel Pipe
(4) Tappets

A : Gear Case Side
B : Flywheel Side

W1050790



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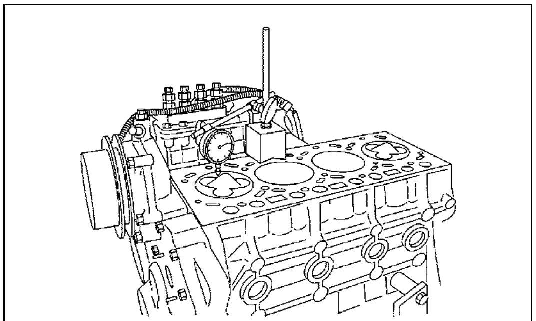

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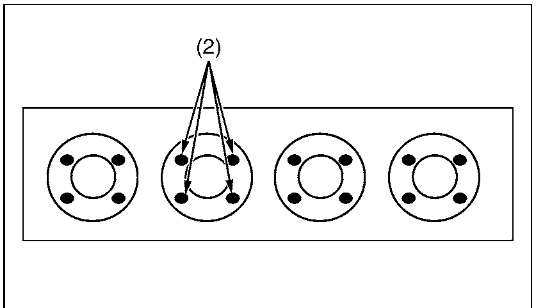

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Selecting Cylinder Head Gasket

■ **IMPORTANT**

- **Selecting cylinder head gasket is affected with above YY0471 of engine serial number.**
- **Cylinder Head Gasket between Engine Serial Number : below YY0470 and above YY0471 are NOT convertible. The Pistons and Piston Ring Assembly are also NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**

■ **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 (average of four pistons) using the dial gauge as shown in figure.
2. Select the suitable cylinder head gasket refer to the table below.

Engine Serial Number : above YY0471

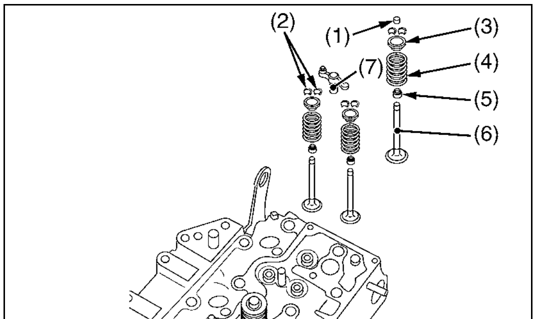
Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Part Code	Piston Head's protrusion or recessing from the level of Crankcase cylinder face. (average of 4 pistons)	
	Before tightening	After tightening		V3300-E V3300-E2	V3300-TE V3300-TE2 V3300-TIE V3300-TIE2
2 notches **(a)**	0.90 mm 0.0354 in.	0.80 mm 0.0315 in.	1C020-03310	-0.07 to +0.0490 mm -0.0028 to +0.0019 in.	-0.27 to -0.151mm -0.0110 to -0.0059 in.
1 notch **(b)**	1.00 mm 0.0394 in.	0.90 mm 0.0354 in.	1C020-03600	+0.050 to +0.149 mm -0.0020 to +0.0058 in.	-0.15 to -0.051 mm -0.0059 to -0.0020 in.
Without notch **(c)**	1.05 mm 0.0413 in.	0.95 mm 0.0374 in.	1C020-03610	+0.150 to +0.20 mm +0.0059 to +0.0078 in.	-0.05 to 0 mm -0.0019 to 0 in.

(1) Cylinder Head Gasket
(2) Measuring Poing

(a) 2 Notches
(b) 1 Notch
(c) Without Notch

(A) Gear Case Side
(B) Flywheel Side

W1022965



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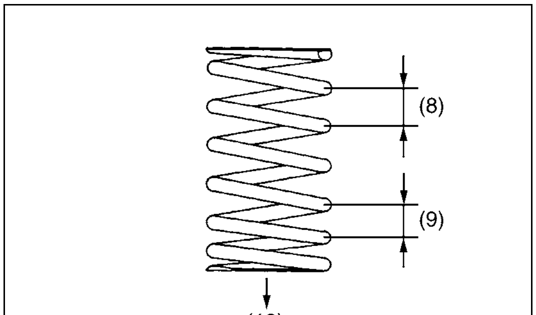

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Valve

1. Remove the valve cap (1) and the valve spring collets (2) compressing the valve spring (4) with the valve spring retainer (3).

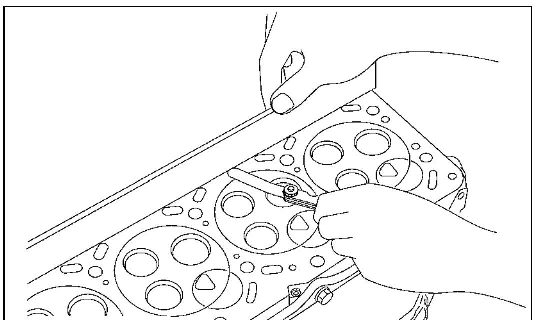
(When reassembling)

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

(1) Valve Cap
(2) Valve Spring Collet
(3) Valve Spring Retainer
(4) Valve Spring
(5) Valve Stem Seal
(6) Valve
(7) Arm Bridge
(8) Large Pitch
(9) Smaller Pitch
(10) Install the spring with its smaller-pitch end downward (at the head side)

W1053044

(C) Servicing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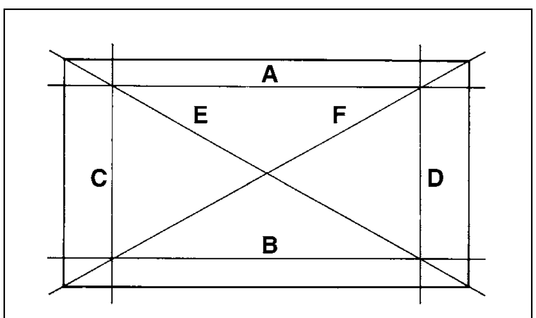

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Cylinder Head Surface Flatness

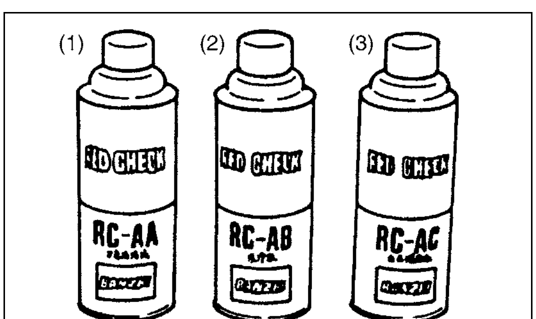
1. Thoroughly clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides (**A**), (**B**), (**C**) and (**D**) and two diagonals (**E**) and (**F**) as shown in the figure. Measure the clearance with a feeler gauge.
3. If the measurement exceeds the allowable limit, correct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

■ **IMPORTANT**

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

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.

W1061323



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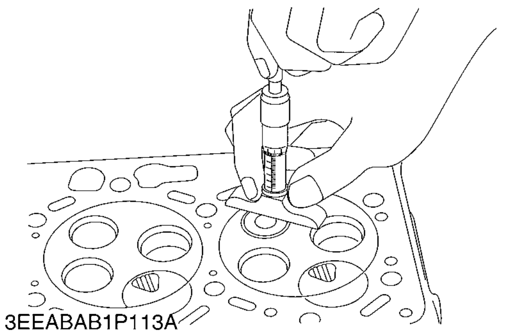
Cylinder Head Flaw

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with detergent (1).
3. Spray the cylinder head surface with the red permeative liquid (2). Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface with the detergent (1).
5. Spray the cylinder head surface with white developer (3).
6. If flawed, it can be identified as red marks.

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

W1061416



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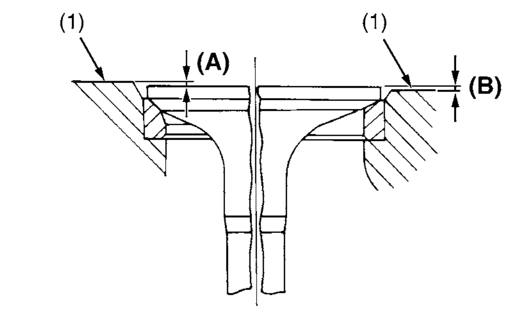

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Valve Recessing

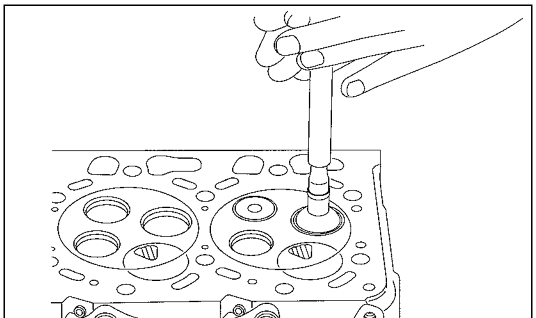
1. Clean the cylinder head, the valve face and seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
   If it still exceeds the allowable limit after replacing the valve, replace the cylinder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

Valve recessing	Factory spec.	Intake valve	(Protrusion) 0 mm (0 in.) to (recessing) 0.2 mm (0.0079 in.)
		Exhaust valve	(Protrusion) 0.15 mm (0.0059 in.) to (recessing) 0.05 mm (0.0019 in.)
	Allowable limit	(recessing) 0.4 mm (0.0157 in.)	

(1) Cylinder Head Surface

(A) Recessing
(B) Protrusion

W1061543



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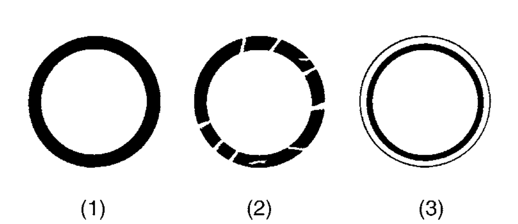

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Valve Lapping

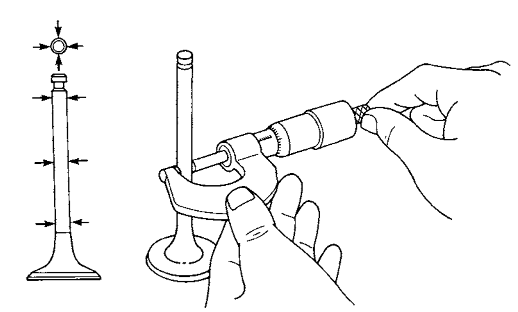
1. Apply compound evenly to the valve lapping surface.
2. Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver.
3. After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.
4. Apply prussian blue to the contact 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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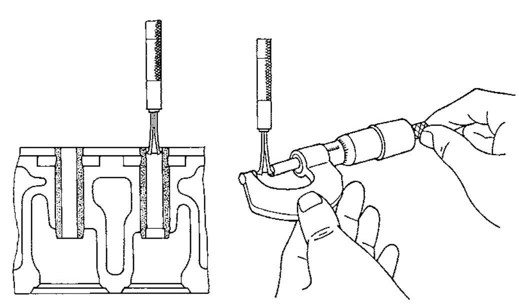

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Clearance between Valve Stem and Valve Guide

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.

(Serial No. : below 3N8371)

Clearance between valve stem and guide	Factory spec.	Intake valve	0.035 to 0.065 mm 0.0014 to 0.0025 in.
		Exhaust valve	0.040 to 0.070 mm 0.0016 to 0.0028 in.
	Allowable limit		0.1 mm 0.0039 in.

Valve stem O.D.	Factory spec.	Intake valve	6.960 to 6.975 mm 0.2740 to 0.2746 in.
		Exhaust valve	7.960 to 7.975 mm 0.3134 to 0.3140 in.

Valve guide I.D.	Factory spec.	Intake valve	7.010 to 7.025 mm 0.2760 to 0.2765 in.
		Exhaust valve	8.015 to 8.030 mm 0.3155 to 0.3161 in.

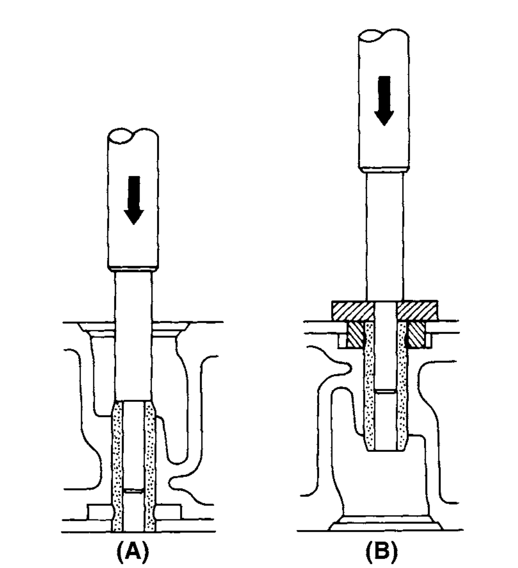
(Serial No. : above 3N8372)

Clearance between valve stem and guide	Factory spec.	Intake valve	0.055 to 0.085 mm 0.0022 to 0.0033 in.
		Exhaust valve	0.040 to 0.070 mm 0.0016 to 0.0028 in.
	Allowable limit		0.1 mm 0.0039 in.

Valve stem O.D.	Factory spec.	Intake valve	6.960 to 6.975 mm 0.2740 to 0.2746 in.
		Exhaust valve	7.960 to 7.975 mm 0.3134 to 0.3140 in.

Valve guide I.D.	Factory spec.	Intake valve	7.030 to 7.045 mm 0.2768 to 0.2774 in.
		Exhaust valve	8.015 to 8.030 mm 0.3155 to 0.3161 in.

W1061883



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Replacing Valve Guide

(When removing)

1. Using a valve guide replacing tool, press out the used valve guide.

(When installing)

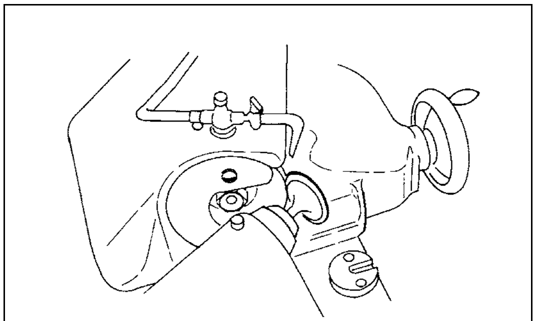
1. Clean a new valve guide, and apply engine oil to it.
2. Using a valve guide replacing tool, press in a new valve guide until it is flush with the cylinder head as shown in the figure.
3. Ream precisely the I.D. of the valve guide to the specified dimension.

■ **IMPORTANT**

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

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

W1062212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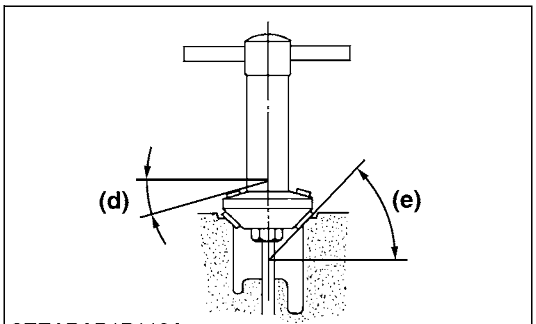

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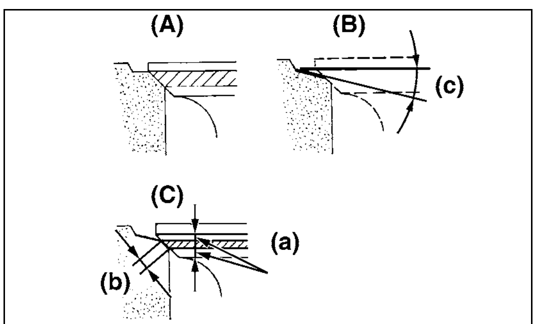

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Correcting Valve and Valve Seat

■ **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

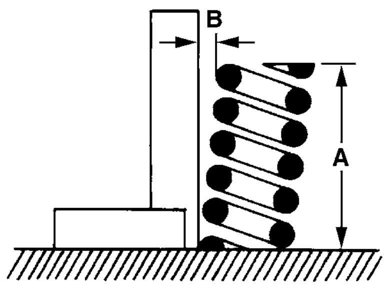
1. Correct the valve with a valve refacer.

2) Correcting Valve Seat

1. Slightly correct the seat surface with a 1.047 rad (60 °) (intake valve) or 0.785 rad (45 °) (exhaust valve) seat cutter (Code No. 07909-33102).
2. Resurface the seat surface with a 0.523 rad (30 °) valve seat cutter to intake valve seat and with a 0.262 rad (15 °) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width (2.12 mm, 0.0835 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.

(a) Identical Dimensions	**(A) Check Correct**
(b) Valve Seat Width	**(B) Correct Seat Width**
(c) 0.523 rad (30 °) or 0.262 rad (15 °)	**(C) Check Contact**
(d) 0.262 rad (15 °) or 0.523 rad (30 °)	
(e) 0.785 rad (45 °) or 1.047 rad (60 °)	

W1028350



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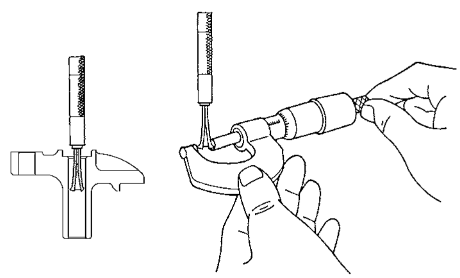
Free Length and Tilt of Valve Spring

1. Measure the free length **(A)** 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 **(B)**. If the measurement exceeds the allowable limit, replace.
3. Check the entire surface of the spring for scratches. Replace it, if any.

Free length **(A)**	Factory spec.	Intake valve	35.1 to 35.6 mm 1.3819 to 1.4016 in.
		Exhaust valve	41.7 to 42.2 mm 1.6417 to 1.6614 in.
	Allowable limit	Intake valve	34.6 mm 1.3622 in.
		Exhaust valve	41.2 mm 1.6220 in.
Tilt **(B)**	Allowable limit	1.0 mm 0.039 in.	

W1063303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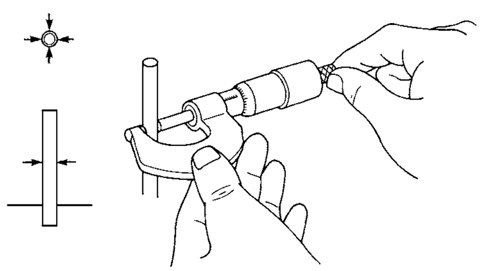
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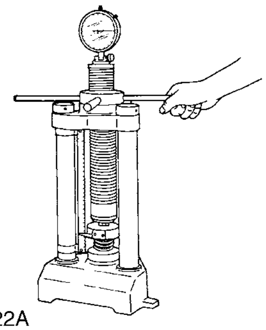
Clearance between Valve Arm Bridge and Valve Arm Bridge Shaft

1. Measure the valve arm bridge I.D. at the most wear part as shown in the figure with a small hole gauge.
2. Measure the valve arm bridge shaft O.D.. And calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bridge arm.
   If it still exceeds the allowable limit, replace the valve arm bridge shaft.

Clearance between valve arm bridge and valve arm bridge shaft	Factory spec.	0.018 to 0.042 mm 0.0007 to 0.0017 in.
	Allowable limit	0.15 mm 0.0059 in.

Valve arm bridge I.D.	Factory spec.	9.050 to 9.065 mm 0.3563 to 0.3556 in.
Valve arm bridge shaft O.D.	Factory spec.	9.023 to 9.032 mm 0.3552 to 0.3566 in.

W1107599



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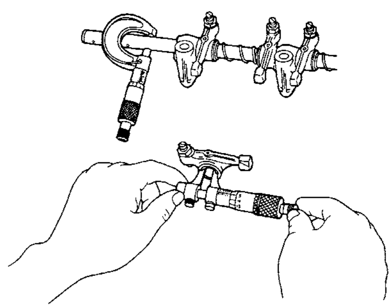
Valve Spring Setting Load

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.	Intake valve	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.256 lbs / 1.2401 in.
		Exhaust valve	117.6 N / 35 mm 12.0 kgf / 35 mm 26.4 lbs / 1.3780 in.
	Allowable limit	Intake valve	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbs / 1.2401 in.
		Exhaust valve	100.0 N / 35 mm 10.2 kgf / 35 mm 22.5 lbs / 1.3780 in.

W1063470



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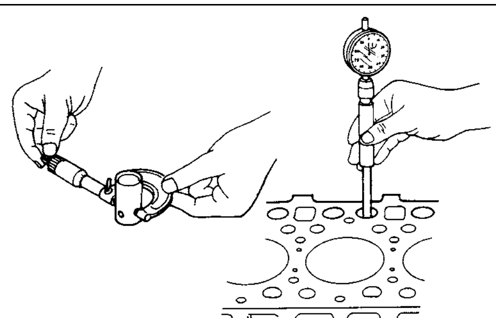
Oil Clearance between Rocker Arm Shaft and Bearing

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.	15.973 to 15.984 mm 0.6289 to 0.6293 in.
Rocker arm I.D. for shaft	Factory spec.	16.000 to 16.018 mm 0.6299 to 0.6306 in.

W1063697



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Oil Clearance between Tappet and Tappet Guide Bore

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

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

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.9433 to 0.9411 in.
Tappet guide I.D.	Factory spec.	24.000 to 24.021 mm 0.9449 to 0.9457 in.

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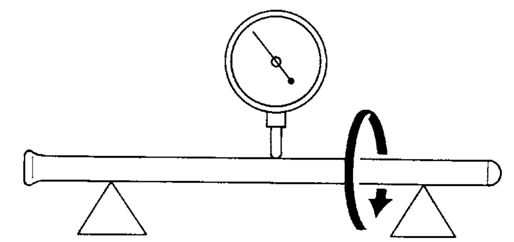
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Push Rod Alignment

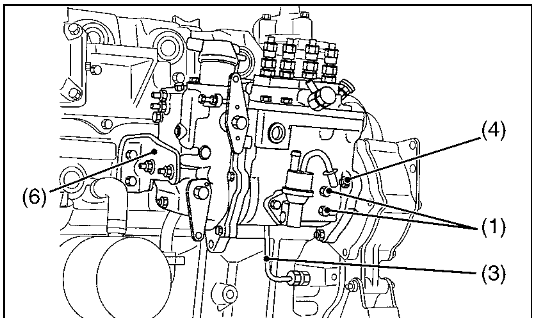
1. Place the push rod on V blocks.
2. Measure the push rod alignment.
3. If the measurement exceeds the allowable limit, replace the push rod.

Push rod alignment	Allowable limit	0.25 mm 0.0098 in.

W1093794

(2) Timing Gear

(A) Disassembling and Assembling



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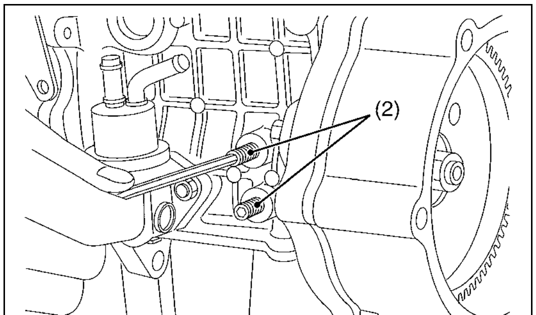

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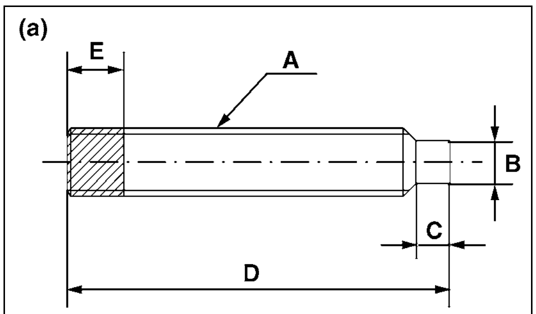

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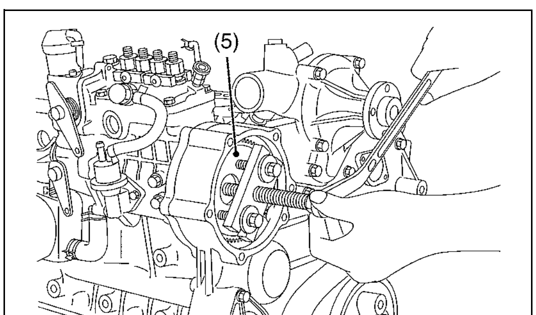

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<u>Injection Pump Unit</u>

(Removing the fuel injection pump unit)

1. Detach the gear cover for the fuel injection pump unit from the gearcase.
2. Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel.

■ **IMPORTANT**
- **Look for the align mark on the idle gear 2. Using a white marking pen or the like, put an align mark on the engaged tooth of the idle gear. 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 flange screws (1) off the injection pump unit. Have the fuel cam shaft lock screws (2) at hand.
4. Tighten the upper fuel cam shaft lock screw until it comes into contact with the fuel cam shaft. Make sure the cam shaft does not move any longer.
5. Tighten the lower fuel cam shaft lock screw until it comes into contact with the fuel cam shaft.

■ **NOTE**
- **Never overtighten the lock screws when they have come into contact with the cam shaft. 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. Loosen the injection pump gear mounting nut. Using the specific gear puller, take out the gear (5).

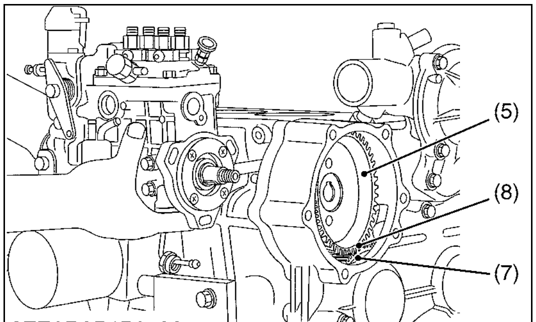
■ **NOTE**
- **Be careful not to drop the key.**

7. Disconnect the lubricating oil pipe (3).
8. Loosen the three injection pump unit mounting flange nut (4).
9. Remove the injection pump unit support (6) 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) Flange Bolt
(2) Fuel Cam Shaft Lock Bolt (Socket Set Screw Dog Point Type)
(3) Lubricating Oil Pipe
(4) Injection Pump Unit Mounting Flange Nut
(5) Injection Pump Gear
(6) Injection Pump Unit Support

W1175054



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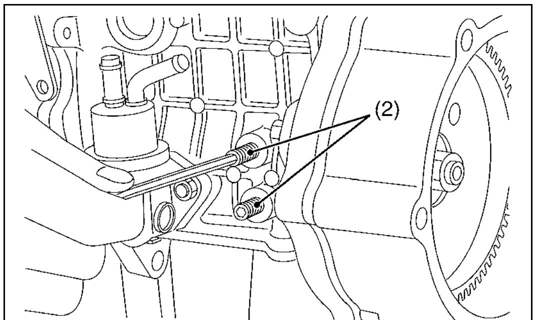

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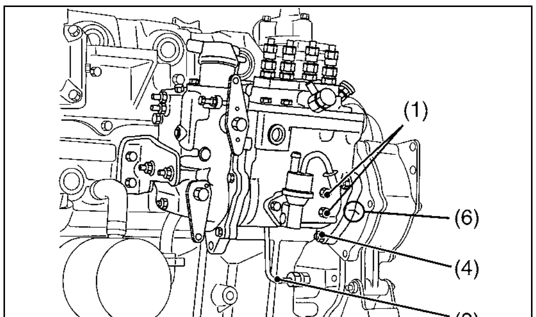

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Injection Pump Unit (Continued)

(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.
2. Place the injection pump gear (5) back into the gear case position. Make sure of aligning the align marks of the injection pump gear (5) and the idle gear 2 (7).
3. Install the injection pump unit to the injection pump gear (5).

■ **NOTE**

- **When installing the injection pump unit to the injection pump gear, make sure that the key is fit in the keyway of injection pump gear.**

4. Temporarily tighten the injection pump gear mounting nut by hand.
5. Fix the injection pump unit and tighten the injection pump gear mounting nut to the specified torque.
6. Take off the fuel cam shaft lock screws (2) and tighten the flange screws (1) for plugging.
7. Loose the injection pump unit mounting nuts (4) for aligning the injection timing.
8. Moving the injection pump unit clockwise (viewed from gear case side), align the injection timing marks (6) on the injection pump unit and on the gear case.
9. Tighten the injection pump unit mounting nut (4) to the specified torque.
10. Reconnect the lubricating oil pipe (3) and place the injection pump unit support and the gear cover of the injection pump unit.
11. Check the injection timing. (See page 1-S67.)
12. If the injection timing is not within the specification, repeat (7) to (12) again.

Tightening torque	Injection pump gear mounting nut	73.6 to 83.4 N·m 7.5 to 8.5 kgf·m 54.2 to 61.5 ft-lbs
	Injection pump unit mounting flange nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

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

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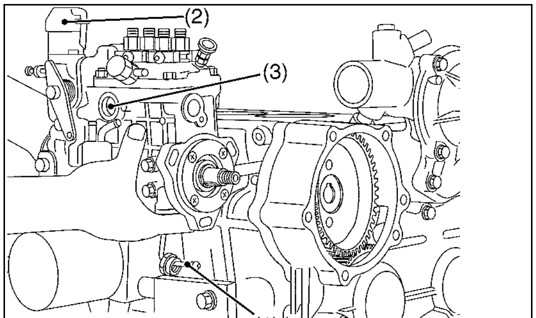

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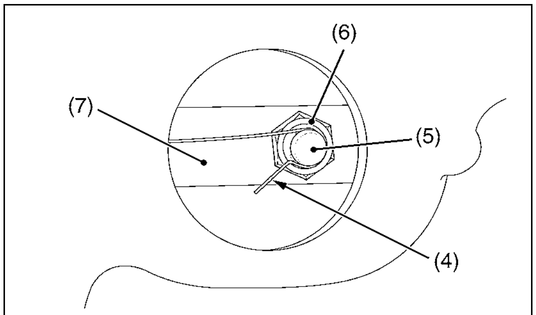

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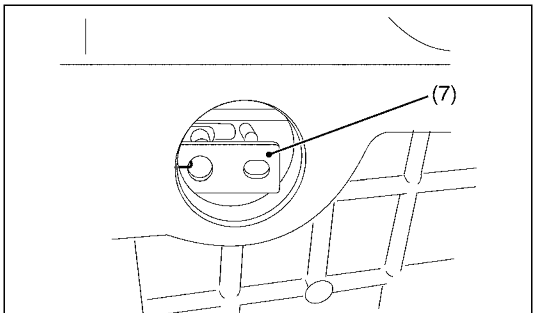

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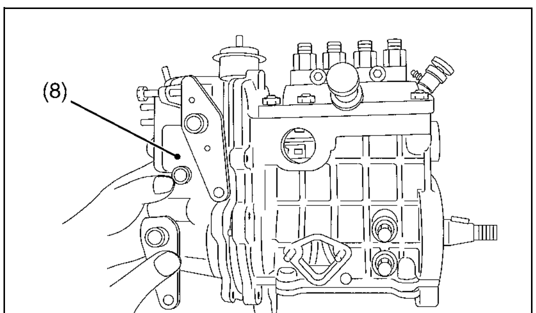

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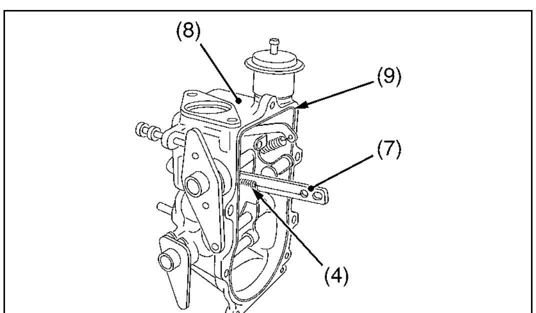

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Governor Housing Assembly

1. Remove the injection pump unit from the engine. (See page 1-S32.)
2. Remove the governor lubricating pipe (1).
3. Remove the stop solenoid (2).
4. Detach the sight cover (3) from the injection pump unit.
5. Unhook the start spring (4) from the rack pin (5) of injection pump assembly.
6. Remove the anti-rotation nut (6).

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

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

■ NOTE
- **The injection pump unit is lubricated with engine oil. So, prepare and oil pan for spilt oil.**

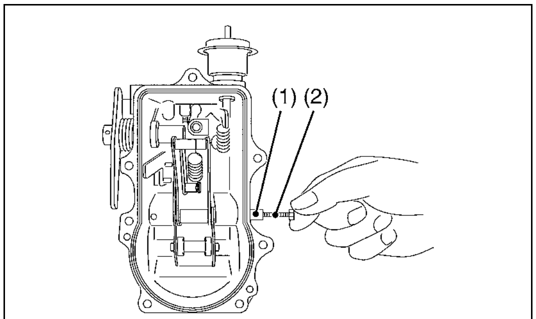
(When reassembling)
- When reassembling the inside parts, put the oil on each inside part slightly.
- After sliding on the governor connecting rod to the rack pin, tighten the nut with the specified torque with using the jig for keeping the governor connecting rod horizontal. (See the Replacing Injection 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. If not smooth, check the tightening torque of the control rod nut.

■ 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
	Anti-rotation nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 3.0 ft-lbs

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

W1137126



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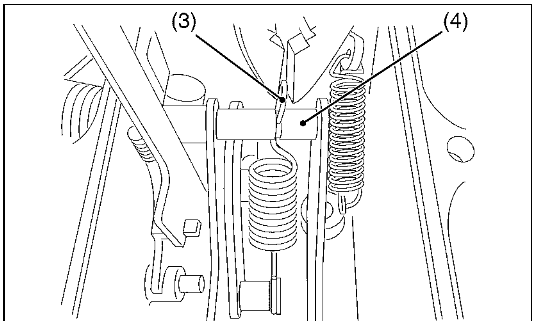

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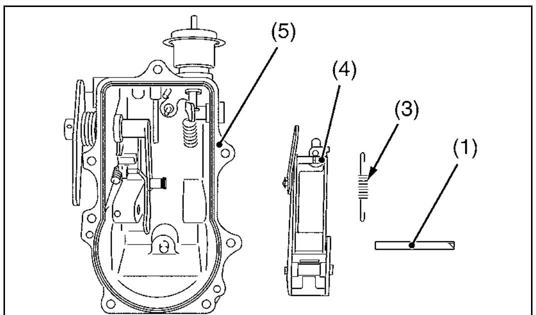

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Governor Fork Lever Assembly

1. Pull off the governor fork lever shaft (1) with the extra bolt (Dia : 4 mm, Pitch : 0.7 mm, Length : more than 25 mm) (2).
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) Governor Fork Lever Shaft
(2) Extra Bolt (Dia : 4 mm, Pitch : 0.7 mm, Length : more than 25 mm)
(3) Governor Spring
(4) Governor Fork Lever
(5) Governor Housing

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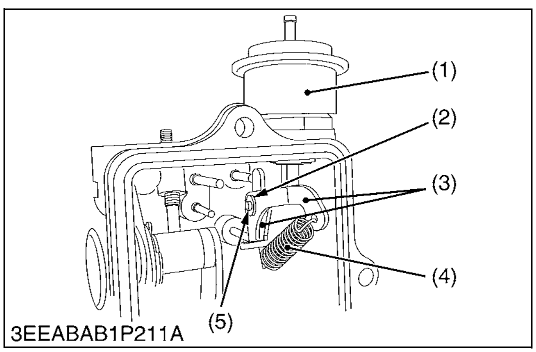

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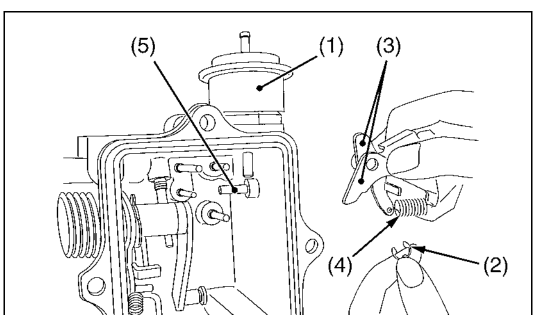

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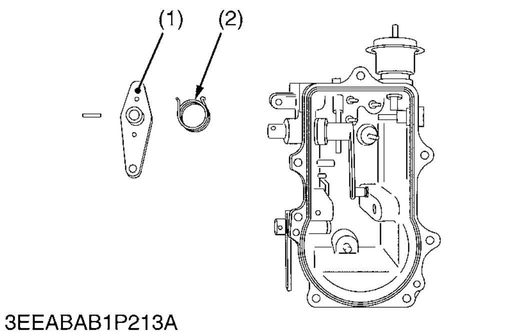
Boost Arms (If equipped Boost Compensator)

1. If necessary, remove the boost actuator (1).
2. Remove the cir-clip (2).
3. Remove the boost arms (3) and the boost spring (4) from the pin (5).

Tightening torque	Boost actuator	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 ft-lbs

(1) Boost Actuator
(2) Cir-clip
(3) Boost Arm
(4) Boost Spring
(5) Pin

W1141511



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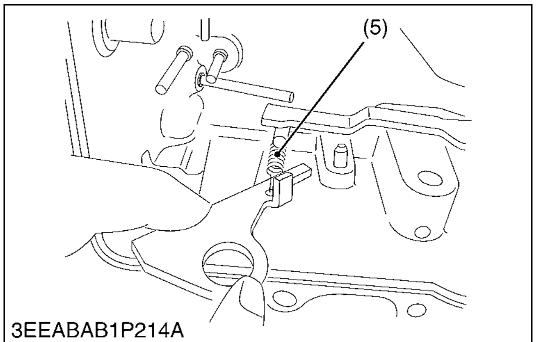
Governor Lever

1. Remove the speed control lever (1) and the return spring (2).
2. Remove the governor lever assembly (3) from the governor housing.
3. Remove the start spring (4) and the stop spring (5).

(1) Speed Control Lever
(2) Return Spring
(3) Governor Lever Assembly
(4) Start Spring
(5) Stop Spring

W1142375



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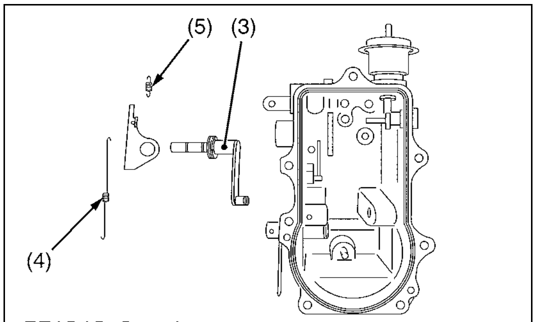

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Stop Lever

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

(1) Stop Lever
(2) Return Spring
(3) Stop Lever Shaft

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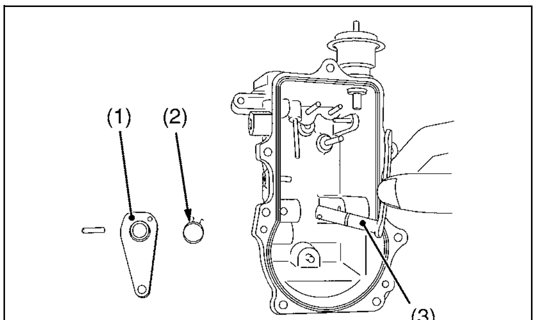

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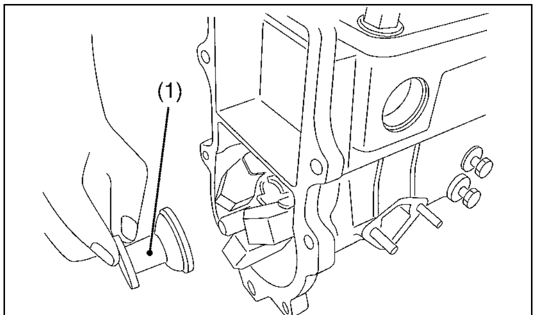

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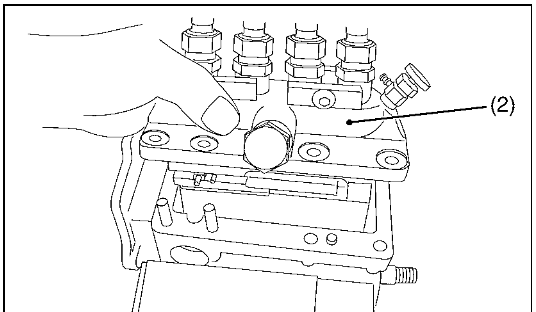

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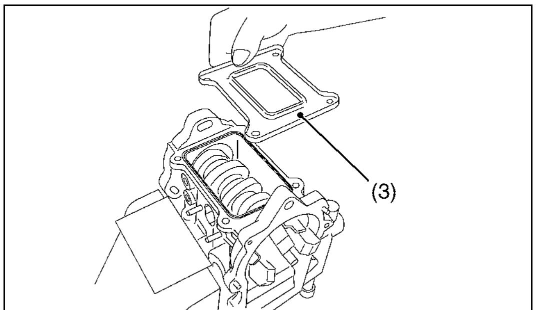

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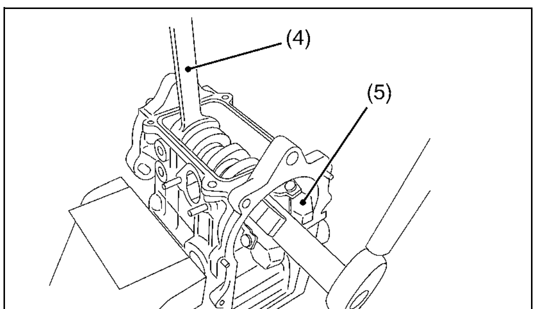

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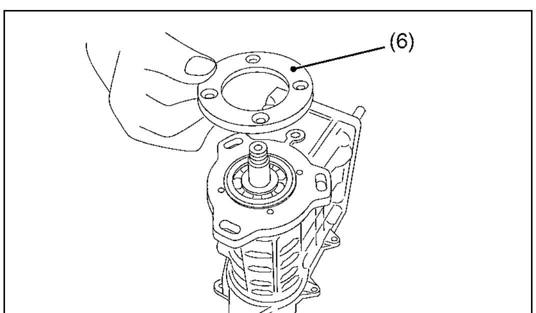

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Fuel Camshaft and Governor Weight

1. Separate the governor housing assembly from the injection pump unit. (See page 1-S34.)
2. Remove the governor sleeve (1).
3. Remove the injection pump assembly (2).
4. Remove the cover (3).
5. Remove the fuel camshaft lock bolts.
6. Fix the fuel camshaft with open end wrench (4), and remove the governor weight mounting nut and the governor weight (5).
7. Loosen the fuel camshaft stopper mounting screws and remove the fuel camshaft stopper (6).
8. Pull out the fuel camshaft (7) and bearings (8) together.
9. After removing the bearing's cir-clip (9), press out the bearings.

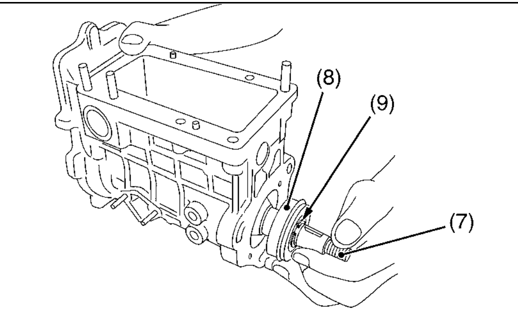
■ **NOTE**
- **Do not use the fuel camshaft lock bolts, when removing the governor weight mounting nut. Otherwise, the lock bolts or injection pump housing might get damage.**

(When reassembling)
- Press the bearings into the fuel camshaft.
- Set the cir-clip at the gear side's bearing.
- 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.
- Attach the governor weight to the fuel camshaft and tighten the governor weight mounting nut with specified torque.

Tightening torque	Injection pump mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Injection pump mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs

(1) Governor Sleeve
(2) Injection Pump Assembly
(3) Cover
(4) Open End Wrench (24 mm)
(5) Governor Weight
(6) Fuel Camshaft Stopper
(7) Fuel Camshaft
(8) Bearing
(9) Cir-clip
(10) Key Way of Fuel Camshaft

W1144178



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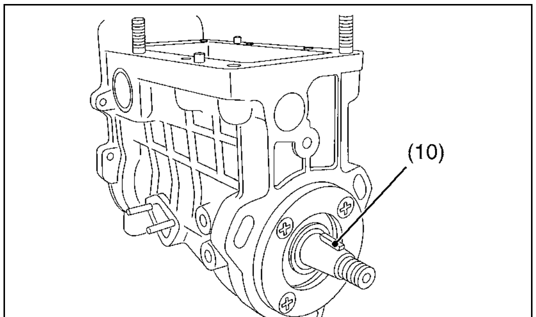

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Fuel Camshaft and Governor Weight (Continued)

(When reassembling)

- Fix the fuel camshaft with lock bolts as the key way of fuel camshaft (10) is upward.
- Install the injection pump assembly to the injection pump housing.
- Attach the O-ring and the cover and tighten the cover mounting bolts.
- 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	7.9 to 9.3 N·m 0.80 to 0.95 kgf·m 5.8 to 6.9 ft-lbs
	Governor weight mounting screw	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) Injection Pump Assembly
(3) Cover
(4) Open End Wrench (24 mm)
(5) Governor Weight
(6) Fuel Camshaft Stopper
(7) Fuel Camshaft
(8) Bearing
(9) Cir-clip
(10) Key Way of Fuel Camshaft

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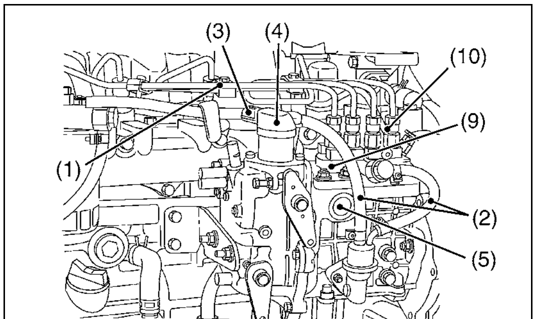

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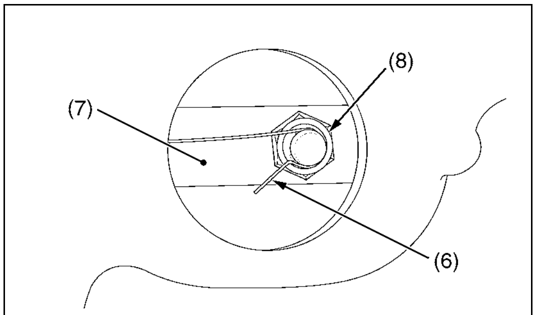

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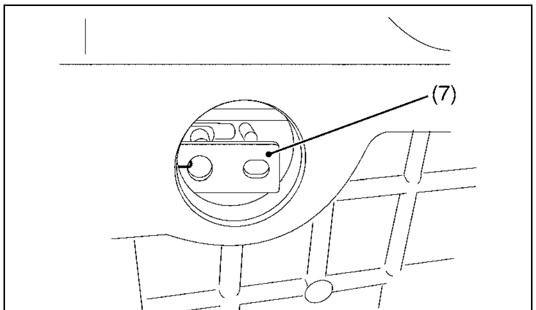

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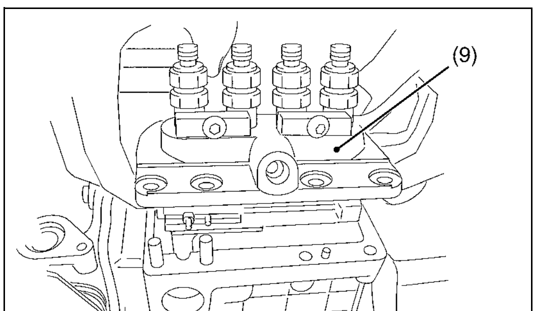

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Replacing Injection Pump Assembly (If necessary)

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

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

■ **NOTE**

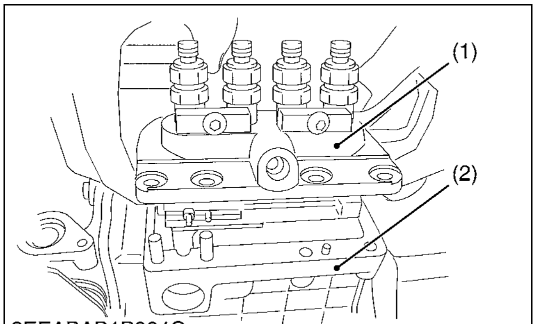
- **Be careful not to drop the anti-rotation nut (8).**
- **Be careful not to deform the starter spring.**
- **When taking out the injection pump, be careful not to hit it against the control rod.**

(When reassembling)

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

(1) Injection Pipe	(6) Starter Spring Hook
(2) Fuel Pipe	(7) Governor Connecing Rod
(3) Connector	(8) Anti-rotation Nut
(4) Stop Solenoid	(9) Injection Pump
(5) Sight Cover	(10) Fuel Overflow Pipe

W1182379



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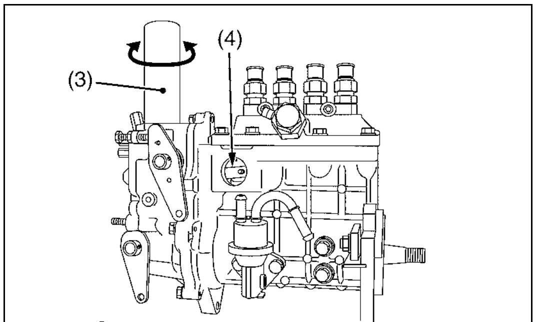

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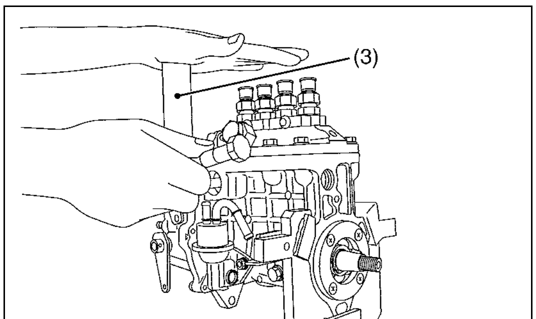

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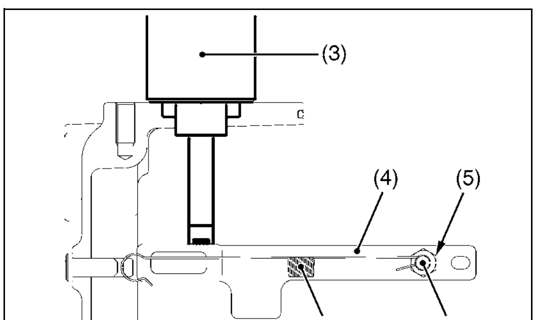

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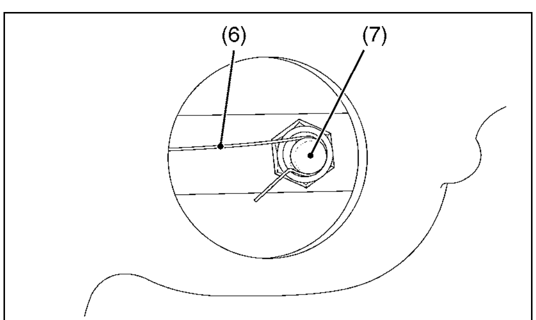

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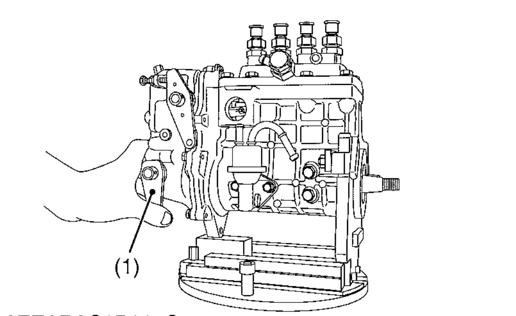
Installing Procedure of Injection Pump Assembly

1. Install the fuel injection pump assembly (1) in its unit (2), and hook the governor connecting rod to the rack pin of the fuel injection pump assembly.
2. Place the service jig (3) in the stop solenoid mounting hole of the fuel injection pump unit.
3. Make sure the permanent magnet at the tip of the service jig is attracted to the governor connecting rod (4). To do this, turn the jig a little clockwise and counterclockwise and look into the fuel injection pump unit sight hole to see if the governor connecting rod (4) moves right and left accordingly.
4. Slightly tighten the anti-rotation nut of the governor connecting rod.
5. Holding down the service jig (3) by hand, tighten up the anti-rotation nut (5) to the specified torque.
6. Hook the start spring (6) to the rack pin (7).

(1) Fuel Injection Pump Assembly
(2) Fuel Injection Pump Unit
(3) Service Jig
(4) Governor Connecting Rod
(5) Anti-rotation Nut
(6) Start Spring
(7) Rack Pin

W1097131



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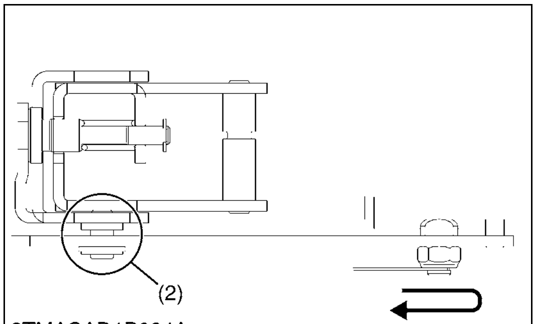

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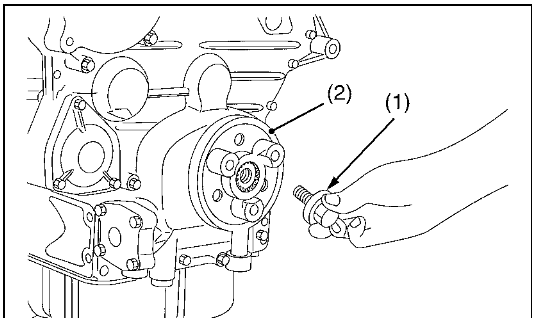
Installing Procedure (Continued)

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 anti-rotation 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	Anti-rotation nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 3.0 ft-lbs
	Injection pump mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Injection pump 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
(2) Sliding Point between Governor Fork Lever and Governor Connecting Rod

W1100620



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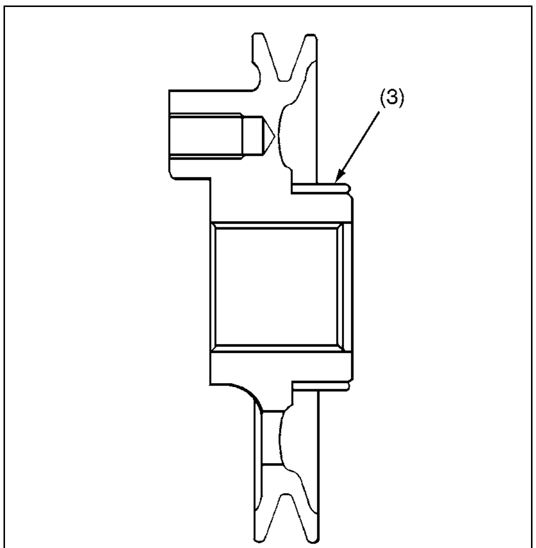

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Fan Drive Pulley

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

■ **NOTE**

- **Clean the crankshaft screw and the fan drive pulley sleeve surface thoroughly and tighten the screw securely to specified torque.**
- **Fan drive pulley sleeve is not attached to the latest products. When replace oil seal, carefully, select the oil seal in gearcase.**

Fan Drive Pulley	Oil seal in gear case	
	Type	Part Code
With Sleeve	Fabric type	1C010-04140
Sleeveless	Double lips	1C020-04140

(When reassembling)

- When press fitting the sleeve onto the fan drive pulley, warm up 150 to 200 °C (302 to 392 °F) and perform it with jigs. (Refer to **"9. SPECIAL TOOLS"** at GENERAL Section.)

(Engine Serial Number : below YN0476)

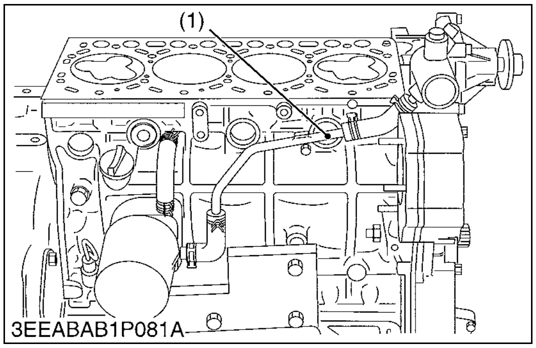
Tightening torque	Crankshaft screw	343.2 to 372.7 N·m 35.0 to 38.0 kgf·m 253.2 to 274.9 ft-lbs

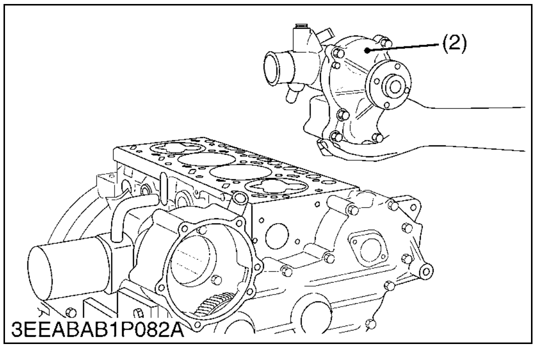
(Engine Serial Number : above YN0477)

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) Crankshaft Screw
(2) Fan Drive Pulley
(3) Fan Drive Pulley Sleeve

W1026949





Water Pump

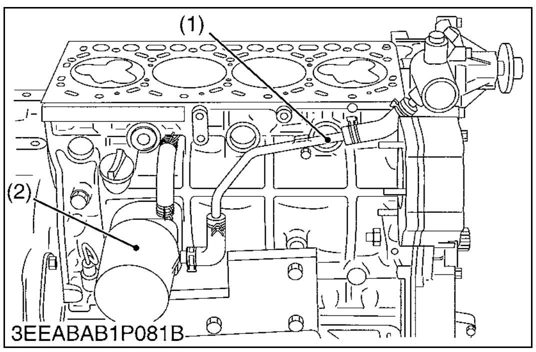
1. Remove the pipe band and the water pipe (1).
2. Remove the water pump (2).

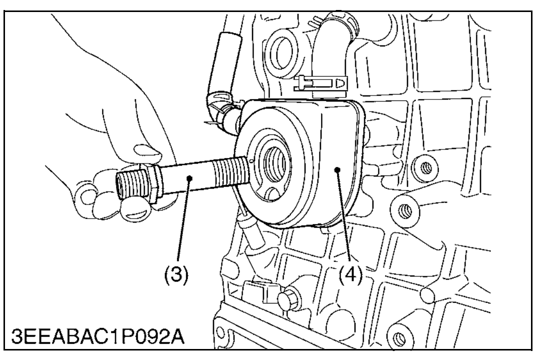
(When reassembling)

- When mounting the water pump, take care not to forget mounting the O-ring and not to let it out of position.

(1) Water Pipe
(2) Water Pump

W1027211





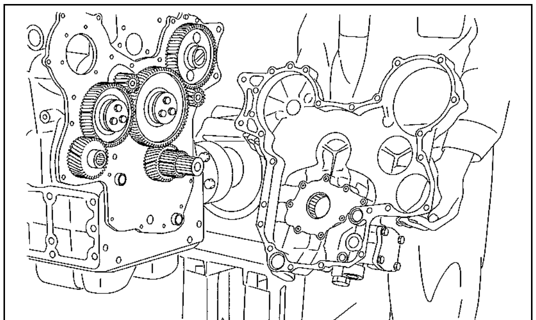
Oil Cooler

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

W1102344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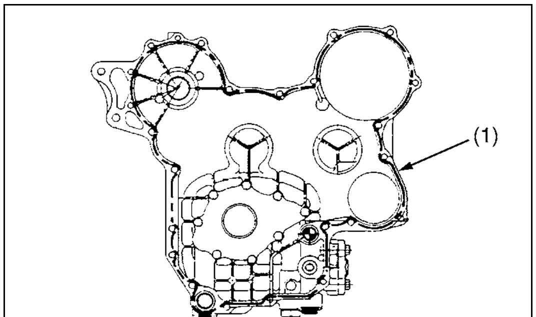

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Gear Case Cover

1. Remove the gear case cover.

(When reassembling)

- 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. (Refer to the figure on the left.)

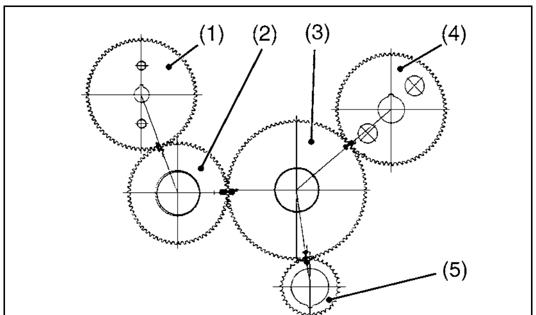
■ **NOTE**

- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**
- **Apply a liquid gasket (Three Bond 1217D) to the gear case cover.**

Tightening torque	Gear case cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Liquid Gasket

W1027332



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Idle Gear and Camshaft

1. Remove three set screws of the idle gear and draw out the idle gear 1, 2.
2. Remove two set screws of the camshaft stopper and draw out the camshaft.

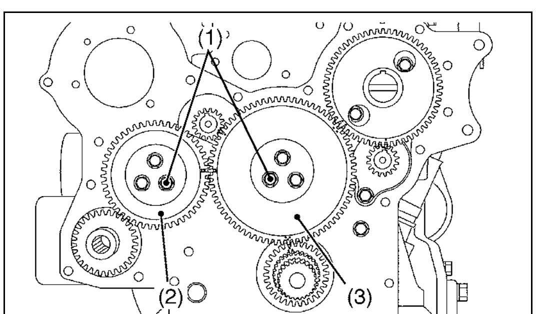
(When reassembling)

- Set the crankshaft at the top dead center of No. 1 and 4 cylinder and the camshaft key to the top position and align the marks of idle gear 1 (3) and idle gear 2 (2) to assemble them. (Refer to the figure on the left.)
- Mount the injection pump gear (1) after installing the gear case.

Tightening torque	Camshaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Idle gear mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

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

W1189797



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Idle Gear 1 and Idle Gear 2

1. Remove the idle gear mounting screw (1).
2. Draw out the idle gear (2) and (3).

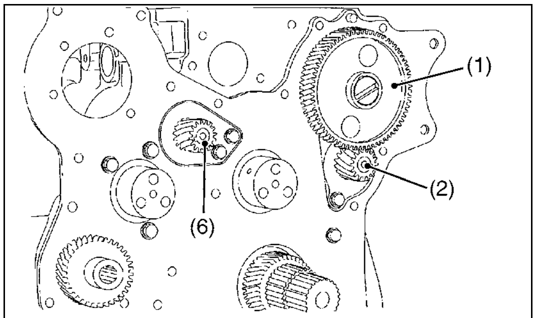
(When reassembling)

- When install the idle gear (2) and (3), 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 idle gear last.

Tightening torque	Idle gear mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Idle Gear Mounting Screw
(2) Idle Gear 2
(3) Idle Gear 1

W1027523



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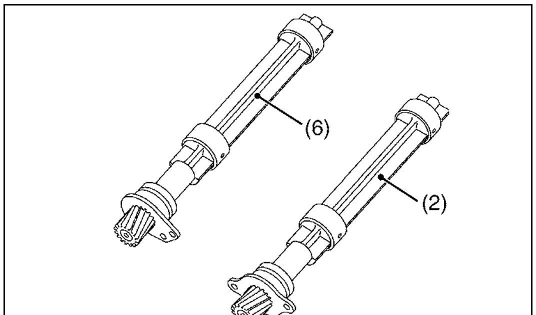

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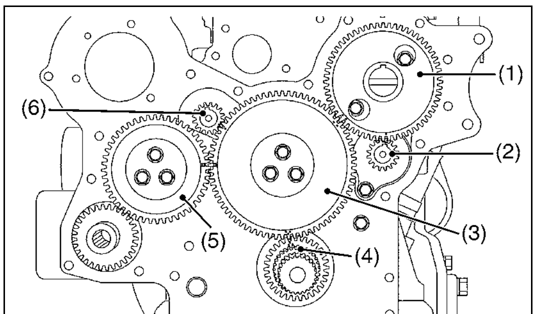

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Camshaft and Balancer Shaft

1. Remove the camshaft set screws and draw out the camshaft (1).
2. Remove the balancer shaft 1 set screws and draw out the balancer shaft 1 (2).
3. Remove the balancer shaft 2 set screws and draw out the balancer shaft 2 (6).

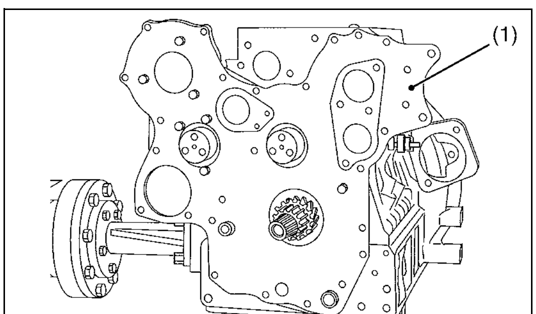
(When reassembling)

- When install the balancer shaft 1 and 2, 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 idle gear last.

Tightening torque	Camshaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Balancer shaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Camshaft
(2) Balancer Shaft 1
(3) Idle Gear 1
(4) Crank Gear
(5) Idle Gear 2
(6) Balancer Shaft 2

W1027714



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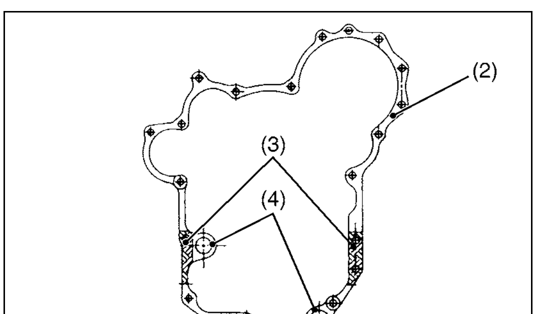

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Plate (Gear Case)

1. Remove the three plate mounting screws. Detach the plate (1).

(When reassembling)

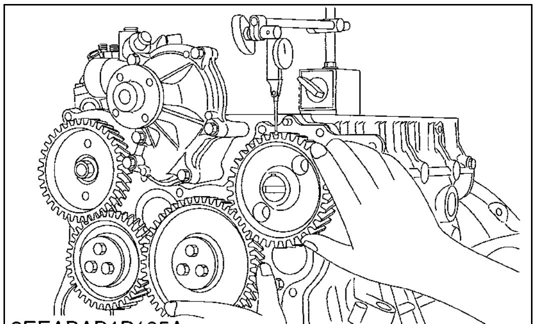
- Apply Three Bond 1217D adhesive or equivalent over the shaded zones on both sides of the gasket that will be sandwiched between the crankcase and plate.
- Be sure to fix the O-rings (4).

Tightening torque	Plate mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Plate
(2) Gasket
(3) Liquid Gasket
(4) O-ring

W1057656

(B) Servicing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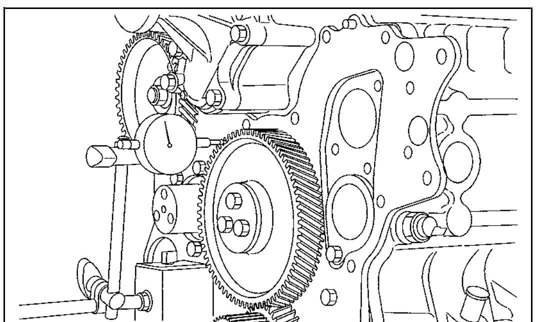
Timing Gear Backlash

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.

Crank gear – Idle gear 1	Factory spec.	0.049 to 0.193 mm 0.0019 to 0.0076 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 – Cam gear	Factory spec.	0.049 to 0.189 mm 0.0019 to 0.0074 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 – Idle gear 2	Factory spec.	0.044 to 0.185 mm 0.0017 to 0.0073 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 2 – Injection pump gear	Factory spec.	0.044 to 0.177 mm 0.0017 to 0.0070 in.
	Allowable limit	0.22 mm 0.0087 in.
Cam gear – Balancer gear 1	Factory spec.	0.047 to 0.182 mm 0.0018 to 0.0072 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 – Balancer gear 2	Factory spec.	0.044 to 0.183 mm 0.0017 to 0.0072 in.
	Allowable limit	0.22 mm 0.0087 in.

W1064048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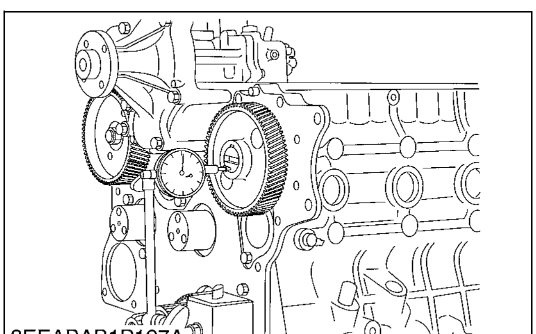
Idle Gear Side Clearance

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

Side clearance	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
	Allowable limit	0.9 mm 0.0354 in.

W1064208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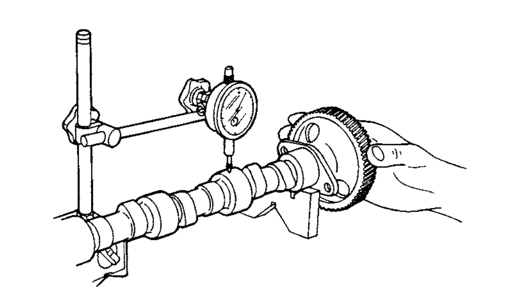
Camshaft Side Clearance

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 stopper.

End play of camshaft	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0087 in.
	Allowable limit	0.3 mm 0.0118 in.

W1064307



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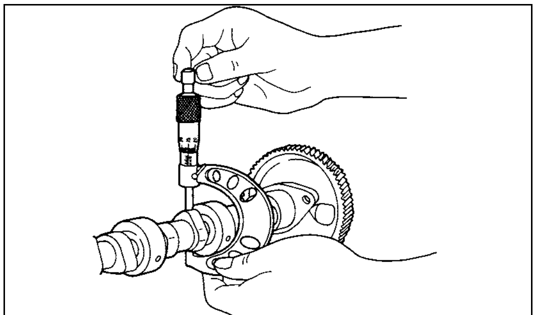
Camshaft Alignment

1. Support the camshaft 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).
3. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.00039 in.

W1064422



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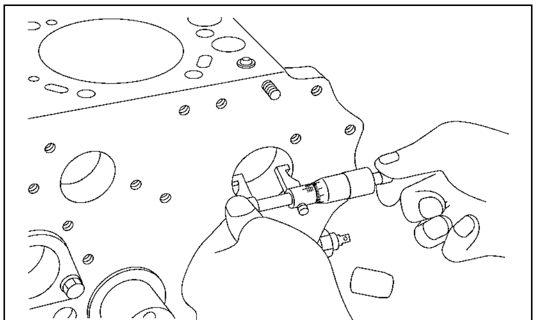
Cam Height

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	37.63 mm 1.4815 in.
		Exhaust valve	38.96 mm 1.5338 in.
	Allowable limit	Intake valve	37.13 mm 1.4618 in.
		Exhaust valve	38.46 mm 1.5141 in.

W1064551



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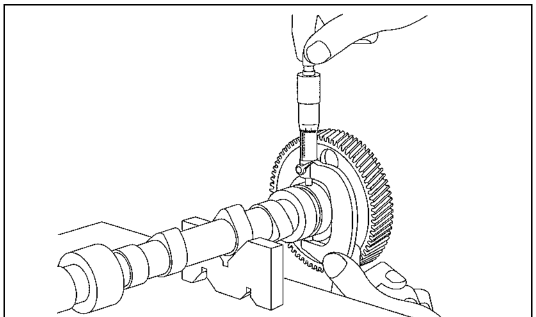

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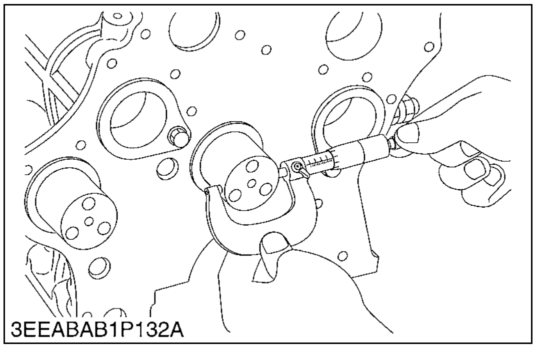
Oil Clearance of Camshaft Journal

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.
   Calculate the oil clearance.
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 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal O.D.	Factory spec.	45.934 to 45.950 mm 1.8084 to 1.8091 in.
Camshaft bearing I.D.	Factory spec.	46.000 to 46.025 mm 1.8110 to 1.8120 in.

W1064798



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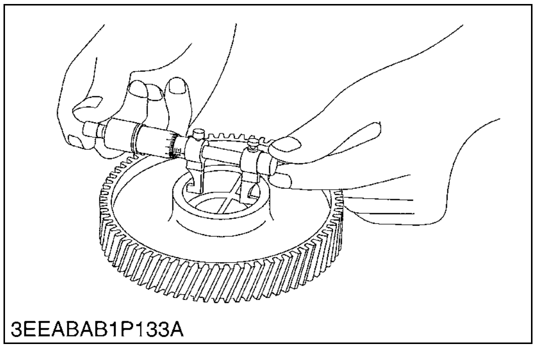

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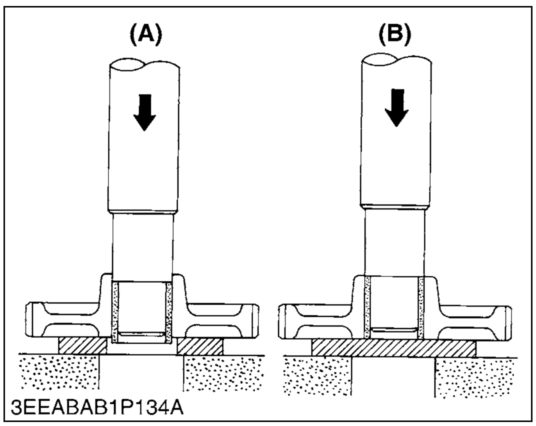
Oil Clearance between Idle Gear Shaft 1, 2 and Idle Gear 1, 2 Bushing

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

Clearance between idle gear 1, 2 shaft and idle gear 1, 2 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 1, 2 bushing I.D.	Factory spec.	45.025 to 45.050 mm 1.7726 to 1.7736 in.
Idle gear 1, 2 shaft O.D.	Factory spec.	44.959 to 44.975 mm 1.7700 to 1.7707 in.

W1064968



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Replacing Idle Gear Bushing

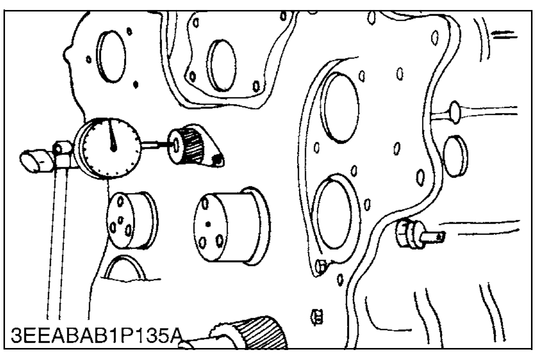
(A) (When removing)

1. Using an idle gear bushing replacing tool, press out the used bushing.

(B) (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.)

W1065138



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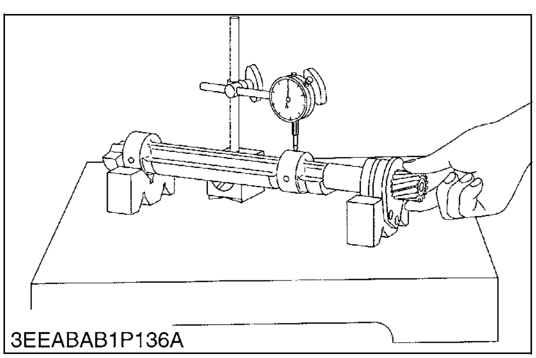
Balancer-shaft Side Clearance

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.

End play of balancer shaft	Factory spec.	0.070 to 0.220 mm 0.0028 to 0.0087 in.
	Allowable limit	0.3 mm 0.0118 in.

W1065273



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Balance-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).
3. If the misalignment exceeds the allowable limit, replace the balancer shaft.

Balancer shaft alignment	Allowable limit	0.02 mm 0.0008 in.

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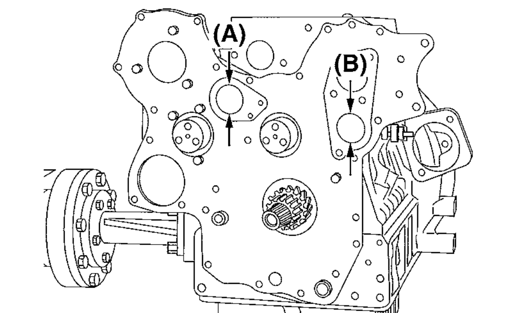

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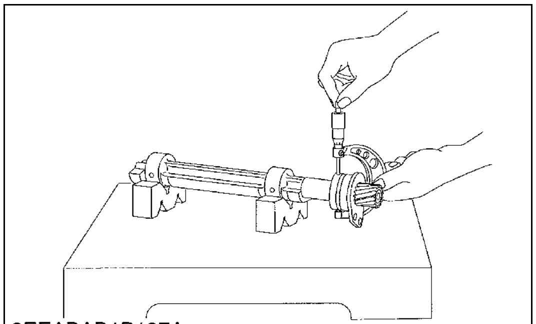
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Oil Clearance of Balancer-shaft Journal

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.

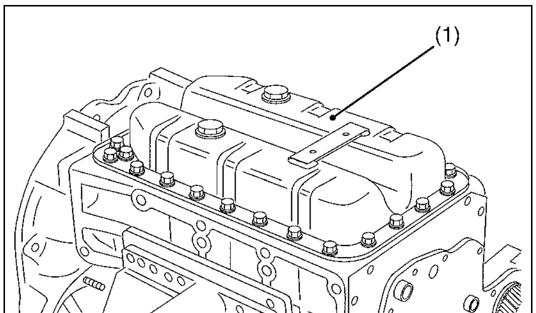
Oil clearance of balancer-shaft journal	Factory spec.	0.070 to 0.159 mm 0.0028 to 0.0063 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer-shaft journal O.D.	Factory spec.	50.92 to 50.94 mm 2.0047 to 2.0055 in.
Balancer-shaft bearing I.D.	Factory spec.	51.01 to 51.08 mm 2.0083 to 2.0110 in.

W1065581

(3) Piston and Connecting Rod

(A) Disassembling and Assembling



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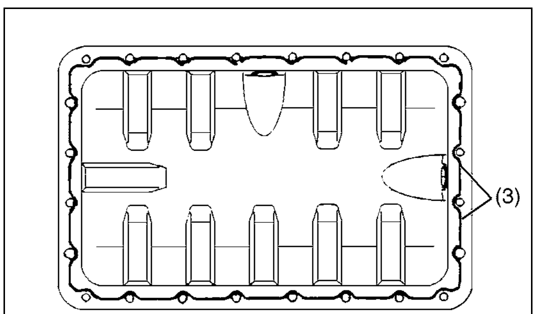

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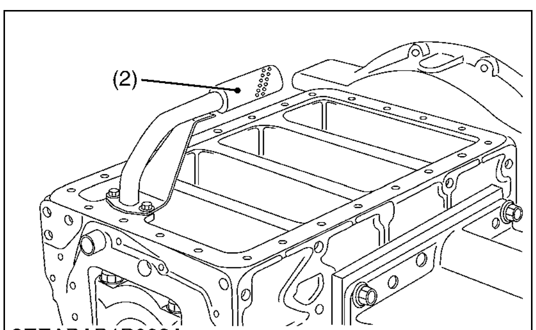

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Oil Pan and Oil Strainer

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

(When reassembling)

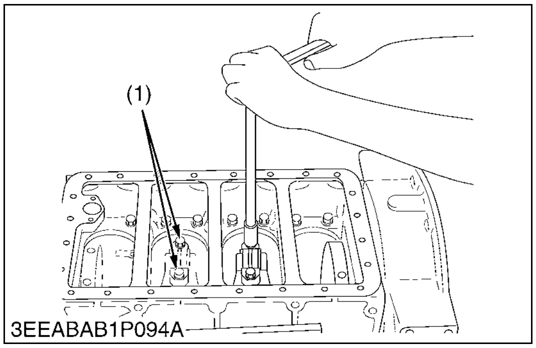
- Install the oil strainer, using care not to damage the O-ring.
- Apply liquid gasket (Three Bond 1217D) to the oil pan as shown in the figure.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Carefully apply the adhesive evenly.

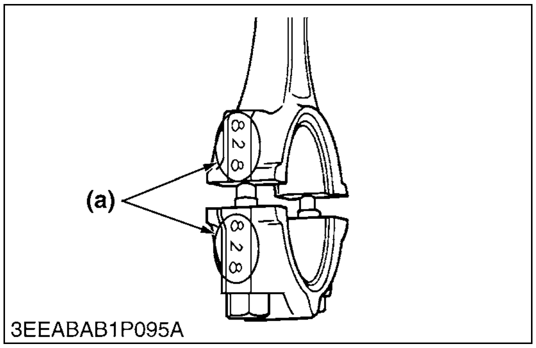
■ **NOTE**

- **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 with its central drain plug facing toward the air suction side.**

(1) Oil Pan (3) Liquid Gasket
(2) Oil Strainer

W1057949





Connecting Rod Cap

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

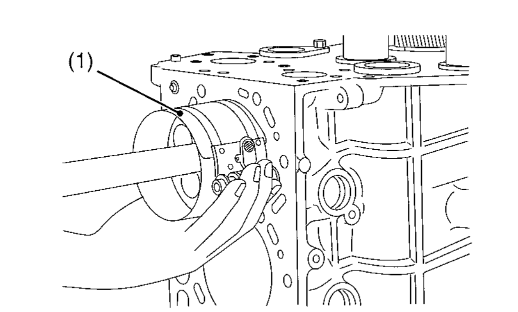
(When reassembling)

- 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 bearing again, put tally marks on the crank pin bearing and the connecting rod in order to keep their positioning.
- Fit the crank pin bearing in place : its centrally groove side toward the connecting rod, and the non-grooved side toward the cap.

Tightening torque	Connecting rod screw	78.5 to 83.4 N·m 8.0 to 8.5 kgf·m 57.9 to 61.5 ft-lbs

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

W1058252



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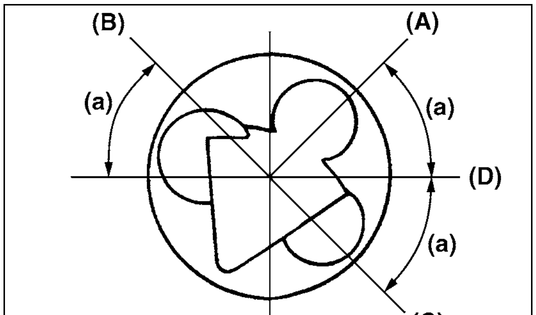

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Piston

1. Turn the flywheel and set a piston to the top dead center.
2. 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 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 the compression ring 1 on the opposite side of the combustion chamber and stagger the gaps of the compression ring 2 and oil ring marking a right angle from the gap of the compression ring 1.**
- **Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section may be scratched, causing trouble inside the liner.**
- **The Piston is NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**

Engine Serial Number : below YY0470

Part Name	Part Code	
	V3300-E	V3300-TE · V3300-TIE
Piston	1C010-21110	1C040-21110

Engine Serial Number : above YY0471

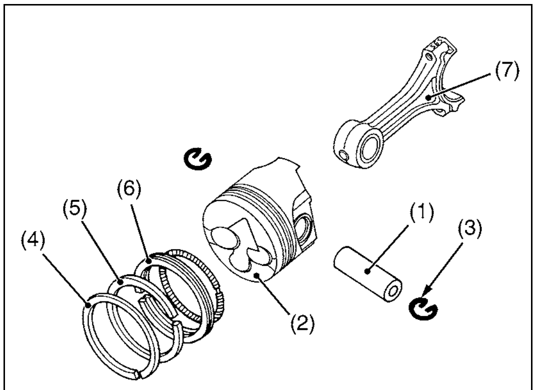
Part Name	Part Code	
	V3300-E V3300-E2	V3300-TE · V3300-TIE V3300-TE2 · V3300-TIE2
Piston	1C011-21111	1C041-21111

(1) Piston Ring Compressor

(a) 0.79 rad (45 °)

(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole

W1058433



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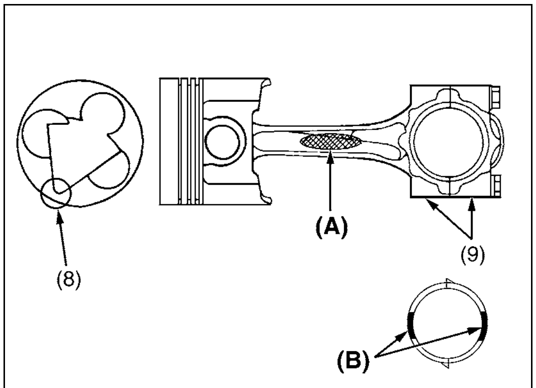

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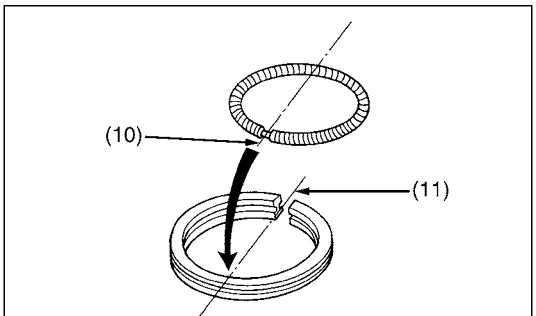

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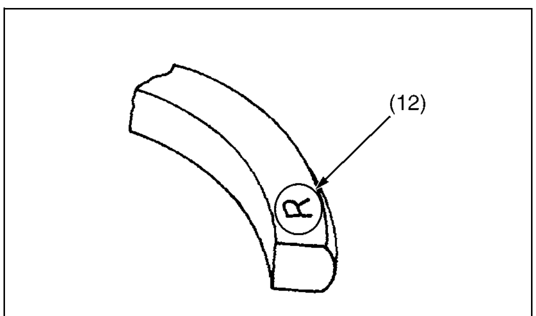

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Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Put the fan shaped concave (8) on the piston as shown in figure.
3. Remove the piston pin (1), and separate the connecting rod (7) from the piston (2).

(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 (10) on the opposite side of the oil ring gap (11).
- 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 aligning the direction of the fan shaped concave (8) of piston head and the mark (9) of connecting rod.
- 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.**
- **The Piston Ring Assembly is NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**

Engine Serial Number : below YY0470

Part Name	Part Code
	V3300-E · V3300-TE · V3300-TIE
Piston Ring Assembly	1C010-21050

Engine Serial Number : above YY0471

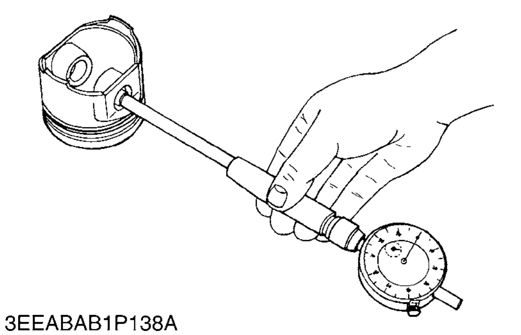
Part Name	Part Code
	V3300-E2 · V3300-TE · V3300-TIE V3300-E · V3300-TE2 · V3300-TIE2
Piston Ring Assembly	1C011-21051

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

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

W1061381

(B) Servicing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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.	30.000 to 30.013 mm 1.1811 to 1.1816 in.
	Allowable limit	30.05 mm 1.1831 in.

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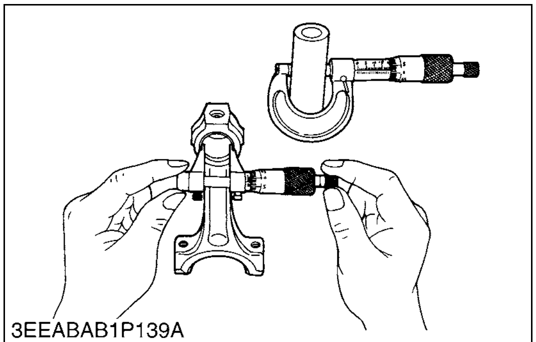
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Oil Clearance between Piston Pin and Small End Bushing

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 bore I.D.	Factory spec.	30.006 to 30.011 mm 1.1813 to 1.1815 in.
	Allowable limit	30.031 to 30.046 mm 1.1823 to 1.1829 in.

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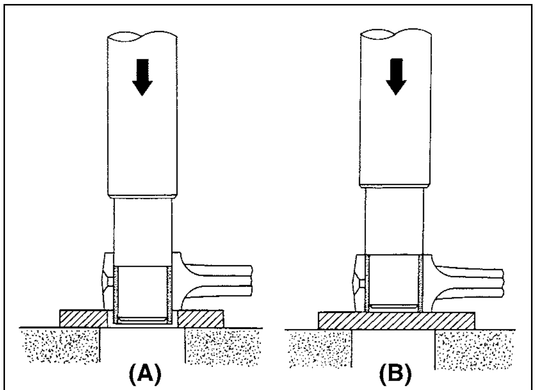

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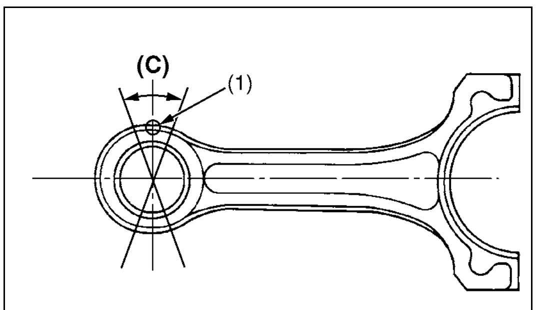

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Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool.

(When installing)

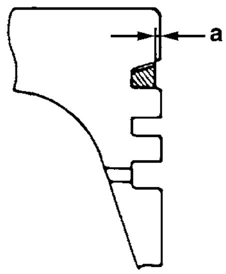
1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Insert a new bushing onto the tool and press-fit it with a press so that the seam (1) of bushing position as shown in the figure, until it is flash with the connecting rod.

(1) Seam

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

W1066057

(A)



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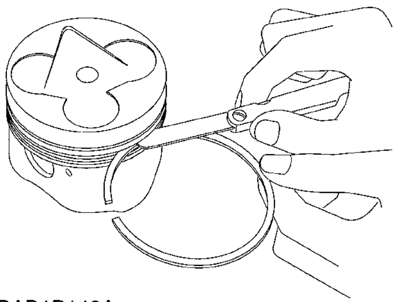
(B)



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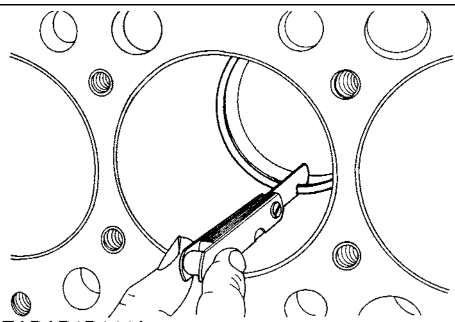

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Clearance between Piston Ring and Groove

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, replace the ring since compression leak and oil shortage result.
4. If the clearance still exceeds the allowable limit after replacing the ring, replace the piston.

Factory spec.	Compression ring 2	0.093 to 0.120 mm 0.0037 to 0.0047 in.
	Oil ring	0.020 to 0.060 mm 0.0008 to 0.0023 in.
Allowable limit	Compression ring 2	0.20 mm 0.0079 in.
	Oil ring	0.15 mm 0.0059 in.

Factory specification : **a**	More than 0.2 mm 0.079 in.

(A) Top Ring (Key Store Type) **(B) 2nd, Oil Ring**

W1066183

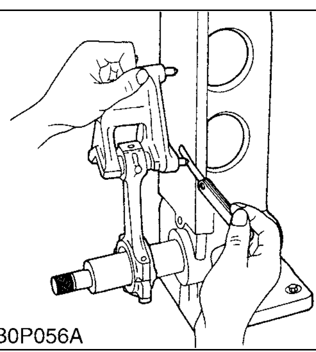
Piston Ring Gap

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

Compression ring 1, 2	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



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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.**

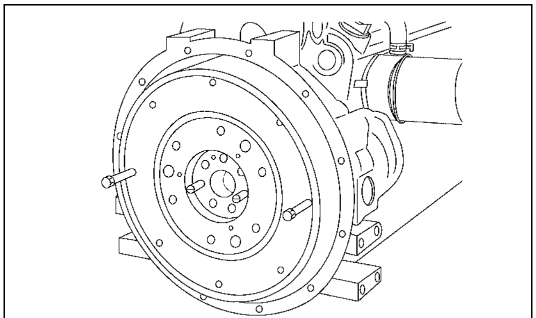
1. Remove the piston pin in the connecting rod.
2. Install the piston pin in the connecting rod.
3. Install the connecting rod on the connecting rod alignment tool (Code No. 07909-31661).
4. Put a gauge over the piston pin, and move it against the face plate.
5. If the gauge does not fit squarely against 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

(4) Flywheel and Crankshaft

(A) Disassembling and Assembling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Flywheel

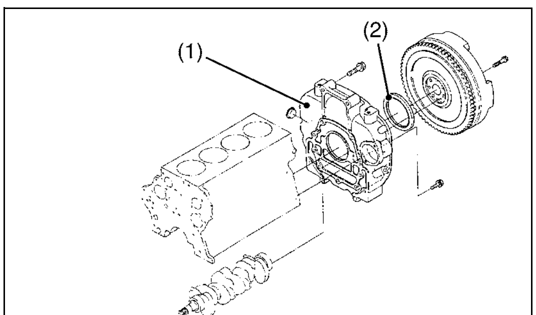
1. Install the stopper to the flywheel so that the flywheel does not turn.
2. Remove the PTO propeller shaft spline hub screws.
3. Draw out the PTO propeller shaft spline hub.
4. Remove the flywheel mounting screws.
5. Remove the flywheel.

(When reassembling)

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

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
	PTO propeller shaft spline hub screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

W1060354



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Flywheel Housing

1. Remove the flywheel housing.

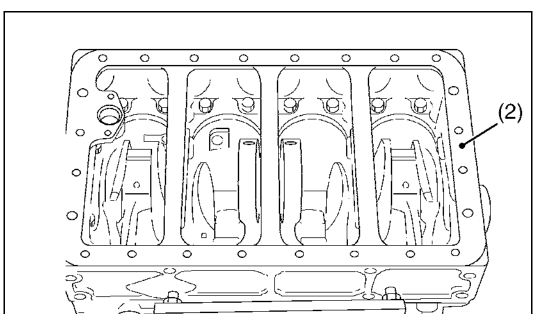
(When reassembling)

- Tighten the flywheel housing mounting screws with even force on the diagonal line.
- Make sure the crank cases 1 and 2 are clean. Install them in position, referring to the flywheel's contoured face.

Tightening torque	Flywheel housing screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) Flywheel Housing (2) Oil Seal

W1060705



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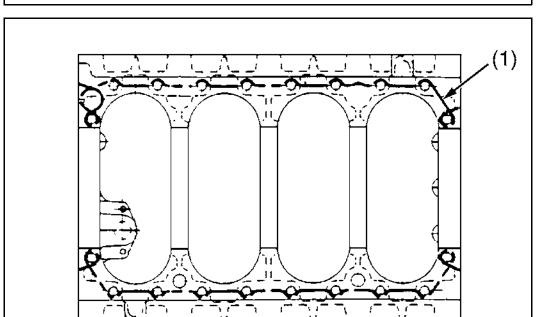

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Crankcase 2

1. Remove the crankcase 2 (2).

(When reassembling)

■ **IMPORTANT**

- **Make sure the crankcase 1 and 2 are clean.**
- **Apply liquid gasket (Three Bond 1217D) to the crankcase 2 as shown in the figure.**
- **Tighten the crankcase 2 mounting screws with even force on the diagonal line.**
- **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.**

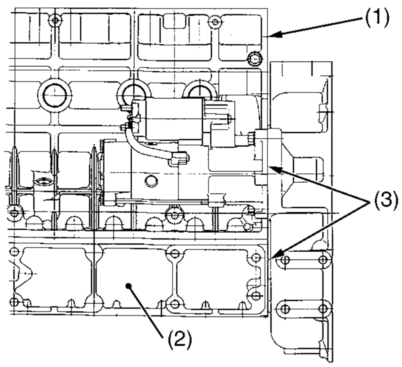
■ **NOTE**

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

Tightening torque	Crankcase 2 mounting screw	49.0 to 55.9 N·m 5.0 to 5.7 kgf·m 36.2 to 41.2 ft-lbs

(1) Liquid Gasket (2) Crankcase 2

W1060825



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Crankcase 1 and Crankcase 2

(When reassembling)

- Match the crankcase 1 and 2, referring to the flywheel's contoured face. Possible gap must be 0.05 mm (0.0020 in.) or smaller.
- Tighten up the flywheel housing first to the specified torque. This helps to minimize the level difference between the crankcase 1 and the crankcase 2 (at the flywheel side).

(1) Crankcase 1
(2) Crankcase 2
(3) Gap to be smaller than 0.05 mm (0.0020 in.)

W1061054

Crankshaft

1. Remove the main bearing case.
2. Remove the crankshaft.

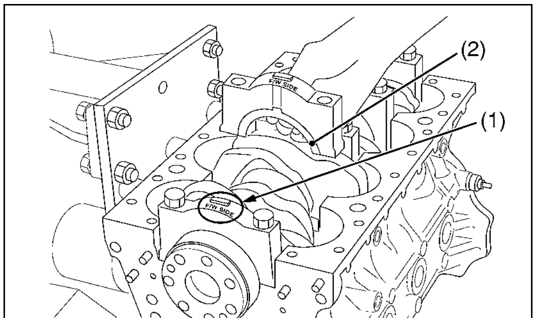
(When reassembling)

- Reassemble the main bearing case having the same number as the one engraved on the crankcase, and set the casting mark “F / W SIDE” on the main bearing case facing towards the flywheel side.
- Reassemble the thrust bearing (2), with the oil groove facing outside, into both side of the fourth main bearing case (3).
- Apply oil to the main bearing case screws and tighten them to the specified torque.

Tightening torque	Main bearing case screw	137.3 to 147.1 N·m 14.0 to 15.0 kgf·m 101.3 to 108.5 ft-lbs

(1) F / W SIDE Mark
(2) Thrust Bearing
(3) 4th Main Bearing Case

W1061157



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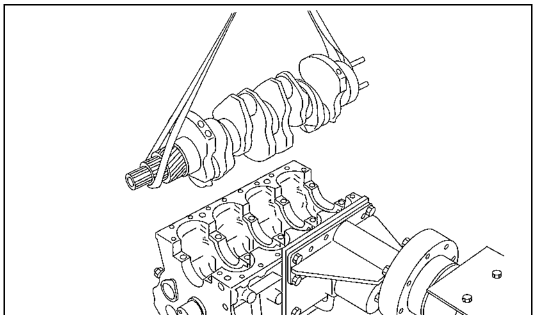
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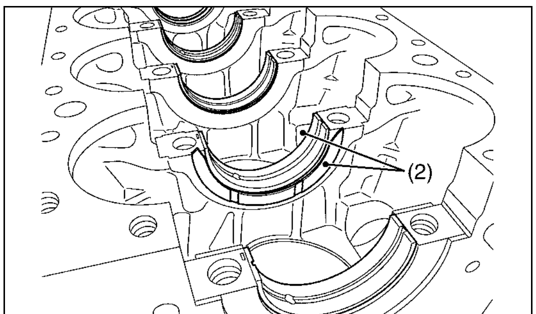

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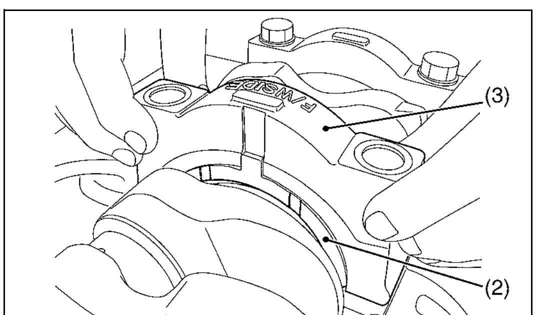

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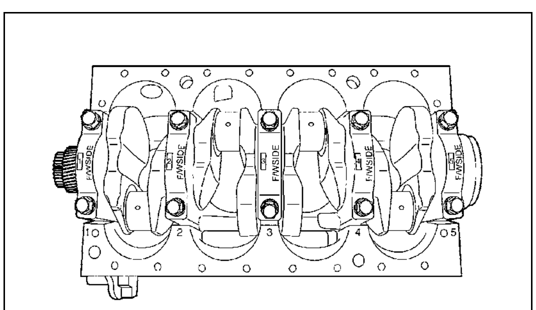
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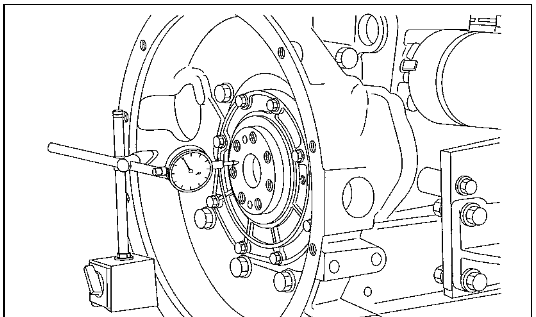
(B) Servicing



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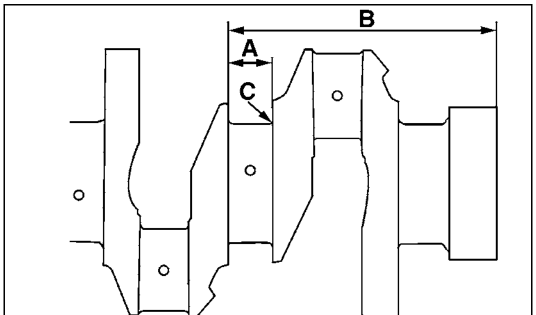

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Crankshaft Side Clearance

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

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

(Reference)

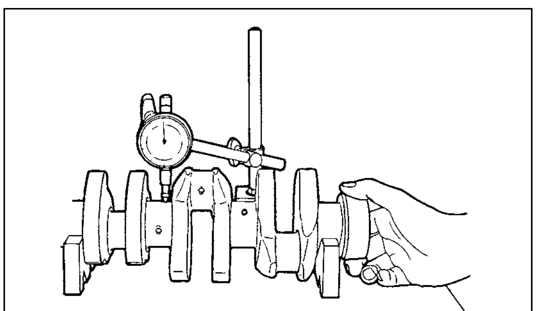
- Oversize thrust bearing

Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	1C010-23951	020 OS
	Thrust bearing 2 02	1C010-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	1C010-23961	040 OS
	Thrust bearing 1 04	1C010-23981	040 OS

- Oversize dimensions of crankshaft journal.

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	29.20 to 29.25 mm 1.1496 to 1.1515 in.	29.40 to 29.45 mm 1.1574 to 1.1594 in.
Dimension **B**	169.1 to 169.15 mm 6.6575 to 6.6594 in.	169.2 to 169.25 mm 6.6614 to 6.6634 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
(0.8-S) The crankshaft journal must be fine-finished to higher than ∇∇∇∇.		

W1066738



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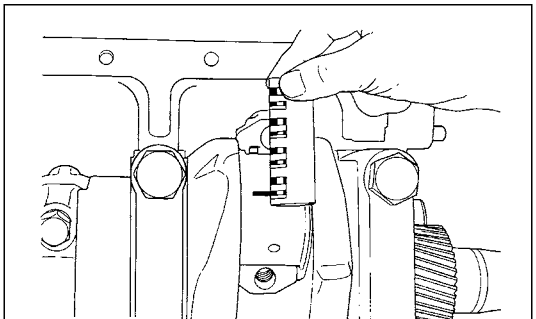
Crankshaft Alignment

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).
3. If the misalignment exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.00079 in.

W1067285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Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage (Code No. 07909-30241) 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.	52.977 to 52.990 mm 2.0857 to 2.0862 in.

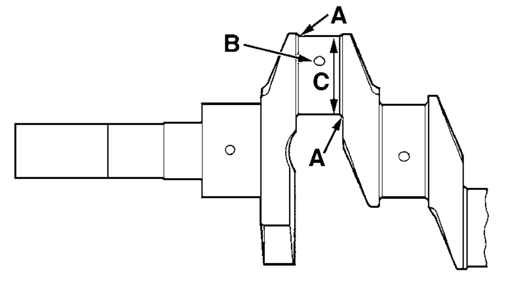
(Engine Serial Number : below YN3106)

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.030 to 0.063 mm 0.0012 to 0.0025 in.
	Allowable limit	0.20 mm 0.0079 in.

(Engine Serial Number : above YN3107)

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.018 to 0.051 mm 0.0007 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

W1067389



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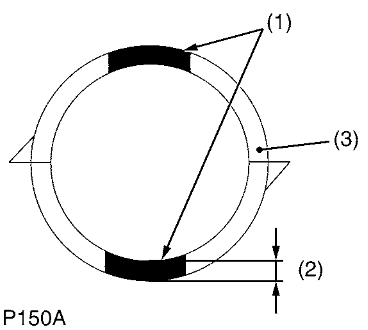

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Oil Clearance between Crankpin and Crankpin Bearing (Continued)

■ **IMPORTANT**
- **STD size crankpin bearing for V3300.**
  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	56.01 to 56.02 mm 2.2051 to 2.2055 in.	L	1C020-22311	1.500 to 1.505 mm 0.0590 to 0.0593 in.
Yellow or without color	56.00 to 56.01 mm 2.2047 to 2.2051 in.	S	1C020-22331	1.495 to 1.500 mm 0.0559 to 0.0590 in.

(Reference)
- Undersize crankpin bearing

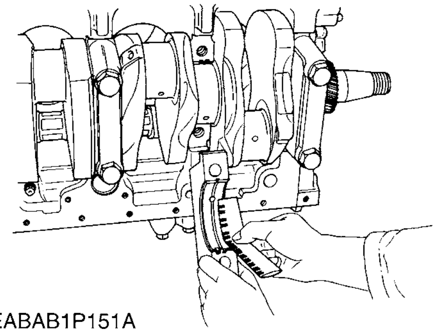
Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankpin bearing 02	1C020-22960	020 US
0.4 mm 0.016 in.	Crankpin bearing 04	1C020-22970	040 US

- Undersize dimensions of crankpin

Dimension \ Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
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
B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
C	52.777 to 52.790 mm dia. 2.0778 to 2.0783 in. dia.	52.577 to 52.590 mm dia. 2.0700 to 2.0705 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ∇∇∇∇.		

(1) ID Color
(2) Center Wall Thick
(3) Crankpin Bearing

W1067741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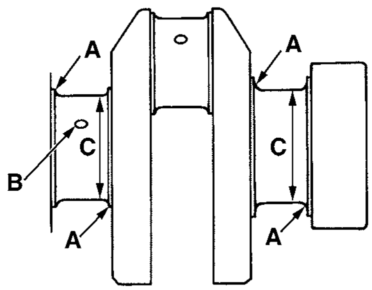

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing

1. Clean the crankshaft journal and crankshaft bearing.
2. Put a strip of press gauge (Code No.: 07909-30241) on the center of the journal.

■ **IMPORTANT**
- **Never insert the press gauge into the oil hole of the journal.**

3. Install the main bearing case and tighten the screws to the specified torque, and remove the cases 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.
6. If the same size bearing is useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

Crankshaft journal O.D.	Factory spec.	74.977 to 74.990 mm 2.9518 to 2.9524 in.

Oil clearance between crankshaft journal and crankshaft bearing	Factory spec.	0.018 to 0.062 mm 0.0007 to 0.0024 in.

(Reference)
- Undersize crankshaft bearing

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 02	1C020-23910	020 US
0.4 mm 0.016 in.	Crankshaft bearing 04	1C020-23920	040 US

- Undersize dimensions of crankshaft journal.

Undersize / Dimension	0.2 mm 0.008 in.	0.4 mm 0.016 in.
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
B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
C	74.777 to 74.790 mm dia. 2.9440 to 2.9445 in. dia.	74.577 to 74.590 mm dia. 2.9361 to 2.9366 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ▽▽▽▽.		

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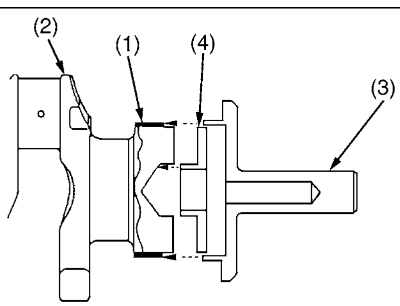

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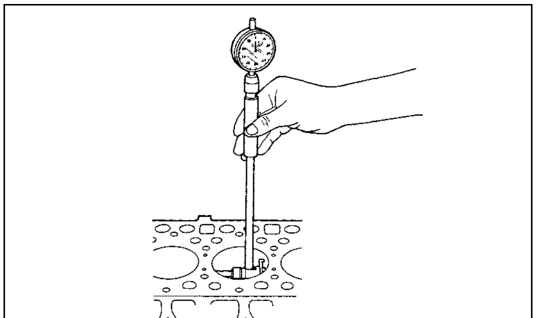
Replacing Crankshaft Sleeve

1. Remove the used crankshaft sleeve (1) using a special-use puller set (Code No.: 07916-09032).
2. Set the sleeve guide (4) to the crankshaft (2).
3. Heat a new sleeve to a temperature between 150 to 200 °C (302 to 392 °F), and fix the sleeve to the crankshaft as shown in figure.
4. Press fit the sleeve using the auxiliary socket for pushing (3).

■ **NOTE**
- **Mount the sleeve with its largely chamfered surface facing outward.**

(1) Crankshaft Sleeve
(2) Crankshaft
(3) Auxiliary Socket for Pushing
(4) Sleeve Guide

W1069911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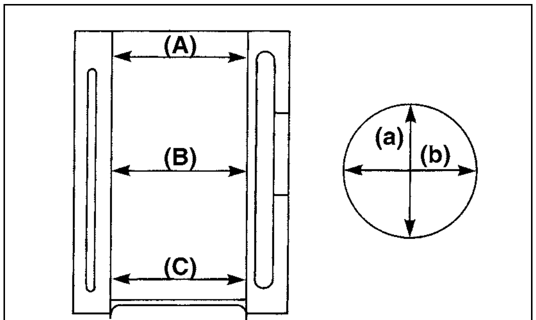

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Cylinder Wear

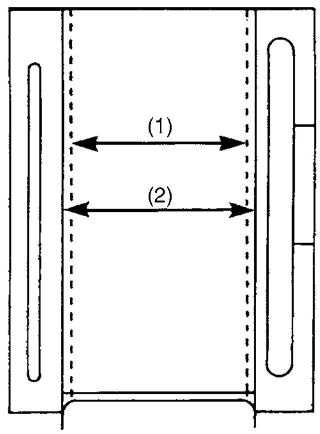
1. Measure the I.D. of the cylinder at the six positions (see figure) with a cylinder gauge to find the maximum and minimum I.D.'s.
2. Get the difference (Maximum wear) between the maxiumum and the minimum I.D.'s.
3. If the wear exceeds the allowable limit, bore and hone to the oversize dimension. (Refer 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.	98.000 to 98.022 mm 3.8582 to 3.8591 in.
	Allowable limit	98.15 mm 3.8642 in.

(A) Top
(B) Middle
(C) Bottom (Skirt)

(a) Right-angled to piston pin
(b) Piston pin direction

W1070089



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Correcting Cylinder (Oversize + 0.5 mm)

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

Cylinder I.D. (2)	Factory spec.	98.500 to 98.522 mm 3.8780 to 3.8788 in.
Maximum wear	Allowable limit	98.65 mm 3.8839 in.
Finishing	Hone to 1.2 to 2.0 μR max. ∇∇∇ (0.000047 to 0.0079 in.R max.	

2. Replace the piston and piston rings with oversize (0.5 mm) ones.

■ **IMPORTANT**

- **The Oversize Piston and Piston Ring Assembly are NOT convertible between Engine Serial Number : below YY0470 and above YY0471.**

Engine Serial Number : below YY0470

Part Name	Part Code		Marking
	V3300-E	V3300-TE V3300-TIE	
Piston	1C010-21911	1C040-21911	05 OS
Piston Ring Assembly	1C010-21091		05 OS

Engine Serial Number : above YY0471

Part Name	Part Code		Marking
	V3300-E V3300-E2	V3300-TE V3300-TE2 V3300-TIE V3300-TIE2	
Piston	1C011-21911	1C041-21911	05 OS
Piston Ring Assembly	1C011-21091		05 OS

■ **NOTE**

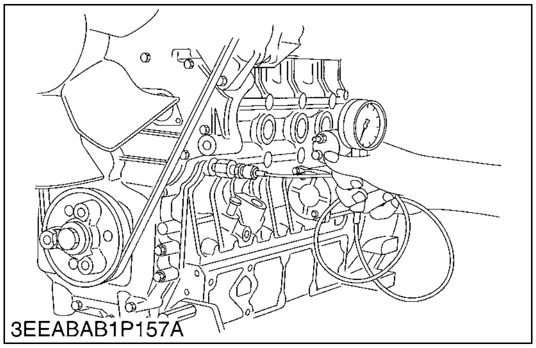
- **When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.**

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

W1070179

[3] LUBRICATING SYSTEM

(1) Checking



Engine Oil Pressure

1. Remove the oil switch and set a pressure tester (Code No. 07916-32031).
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
- Oil gallery clogged
- Excessive oil clearance of bearing
- Foreign matter in the relief valve

(When reassembling)

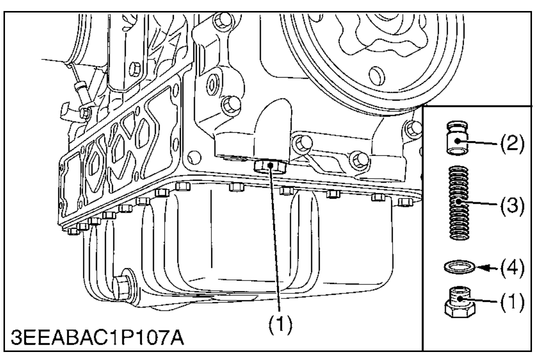
- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

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 56 psi
		Allowable limit	147.1 kPa 1.5 kgf/cm^2 21.3 psi

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

W1070581

(2) Disassembling and Assembling



Relief Valve

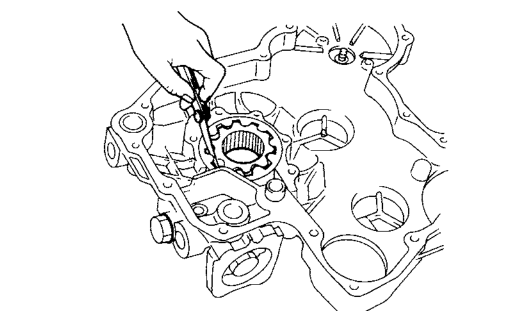
1. Remove the bolt (1).
2. Remove the relief valve (2), the spring (3) and the packing (4).

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

(1) Bolt
(2) Relief Valve
(3) Spring
(4) Packing

W1081251

(3) Servicing



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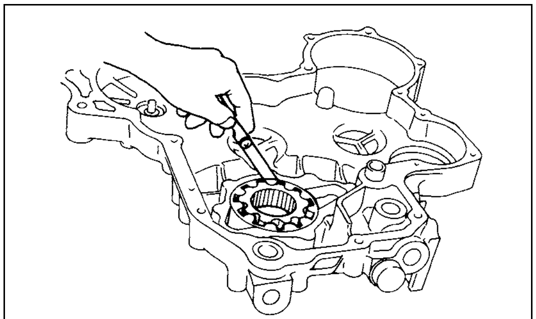
Rotor Lobe Clearance

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.	0.04 to 0.16 mm 0.0016 to 0.0063 in.
	Allowable limit	0.3 mm 0.0118 in.

W1071254



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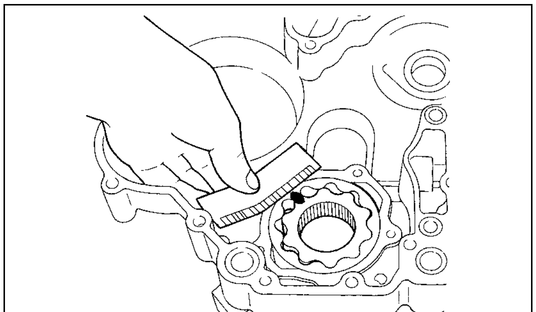
Clearance between Outer Rotor and Pump Body

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



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Clearance between Rotor and Cover

1. Put a strip of plastigage (Code No. 07909-30241) 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.

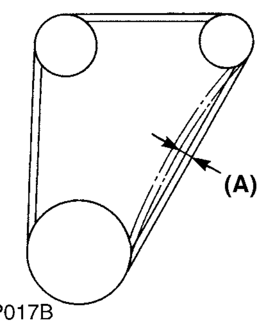
Clearance between rotor and cover	Factory spec.	0.025 to 0.075 mm 0.0010 to 0.0030 in.
	Allowable limit	0.225 mm 0.0089 in.

Tightening torque	Oil pump cover screw	7.9 to 9.3 N·m 0.80 to 0.95 kgf·m 5.8 to 6.9 ft-lbs

W1148218

[4] COOLING SYSTEM

(1) Checking and Adjusting



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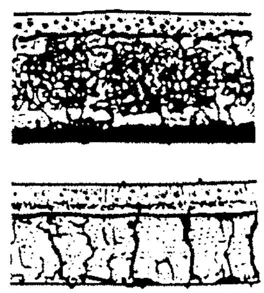
Fan Belt Tension

1. Press the fan belt between alternator and crank pulley at force of 98 N (10 kgf, 22 lbs).
   Check if the fan belt deflection is 10 to 12 mm (0.394 to 0.472 in.)
2. If the deflection is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

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

W1071459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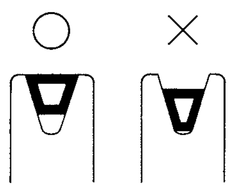
Fan Belt Damage and Wear

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

W1057475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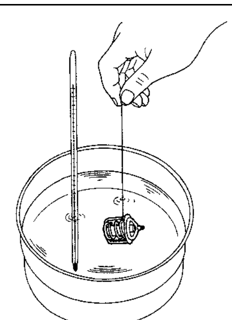
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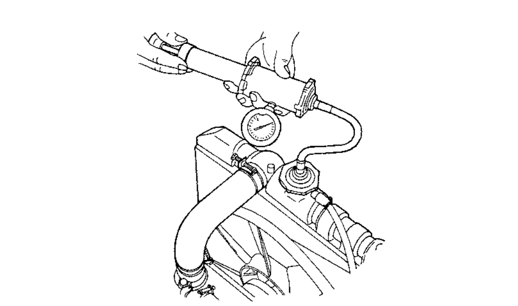
Thermostat Valve Opening Temperature

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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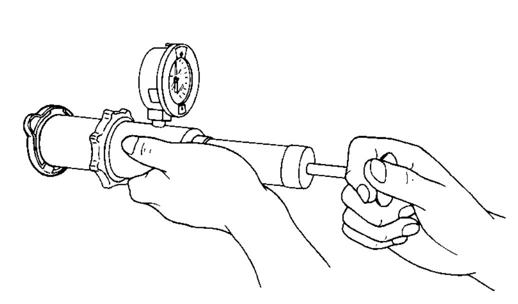
Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Set 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 cement.

W1072497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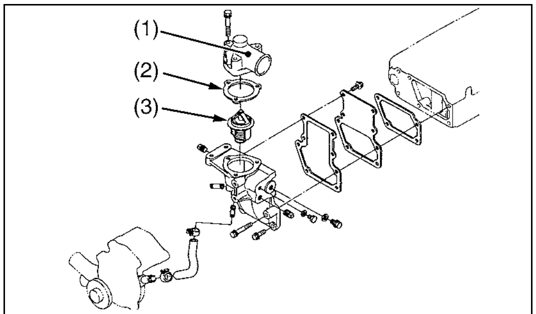
Radiator Cap Air Leakage

1. Set a radiator tester on the radiator cap.
2. 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.

W1072581

(2) Disassembling and Assembling



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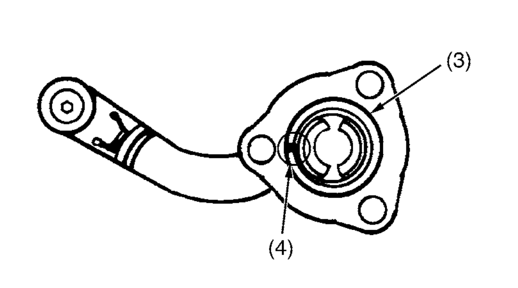

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Thermostat Assembly

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 1215 or equivalent) only at the thermostat cover side of the gasket (2).
- Attach the thermostat with its hole facing toward the air suction side.

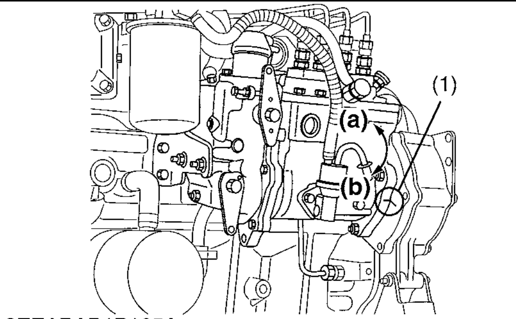
(1) Thermostat Cover
(2) Thermostat Cover Gasket
(3) Thermostat Assembly
(4) Hole

W1072747

[5] FUEL SYSTEM

(1) Checking and Adjusting

(A) Injection Pump



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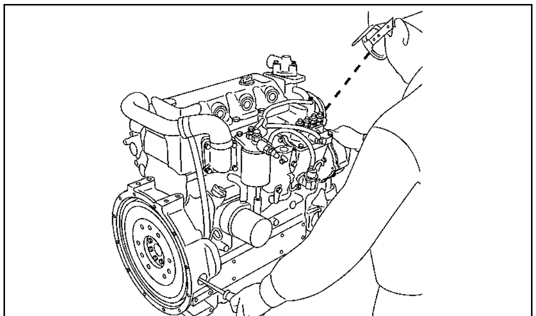

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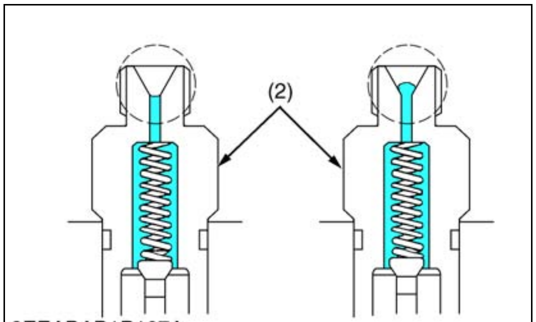

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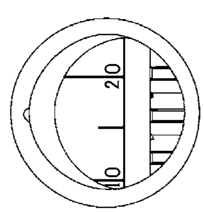

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Injection Timing

1. Make sure of matching the injection timing align mark (1) of the injection pump unit and the plate (gearcase), as shown in the illustration.
2. Remove the injection pipes.
3. Remove the stop solenoid.
4. Turn the flywheel counterclockwise (viewed from flywheel side) until the fuel fills up to the hole of the delivery valve holder (2) for No.1 cylinder.
5. 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 °).
6. Turn the flywheel counterclockwise to set at around 0.349 rad (20 °) before T.D.C..
7. Slowly turn the flywheel counterclockwise and stop turning when the fuel begins to come up, to get the present injection timing.
8. Check to see the degree on flywheel.
   The flywheel has mark “1TC”, “0.175 rad (10 °)” and “0.349 rad (20 °)” for the crank angle before the top dead center of No.1 piston.
9. 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 page 1-S32.

Injection timing	Factory spec.	V3300-E V3300-TE V3300-TIE	0.26 to 0.30 rad (15 ° to 17 °) before T.D.C.
		V3300-E2	0.20 to 0.22 rad (11.5 ° to 12.5 °) before T.D.C.
		V3300-TE2	0.11 to 0.13 rad (6.5 ° to 7.5 °) before T.D.C.
		V3300-TIE2	0.15 to 0.17 rad (8.5 ° to 9.5 °) before T.D.C.

(1) Injection Timing Align Mark
(2) Delivery Valve Holder

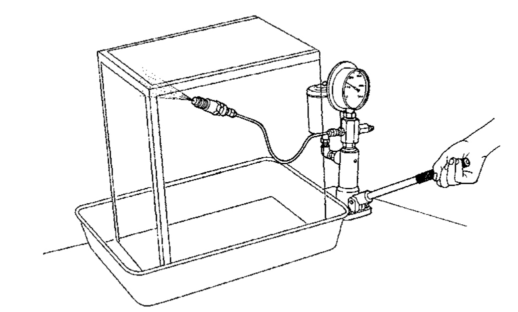
(a) Injection Timing Advanced
(b) Injection Timing Delayed

W1072910

(B) Injection Nozzle

CAUTION

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



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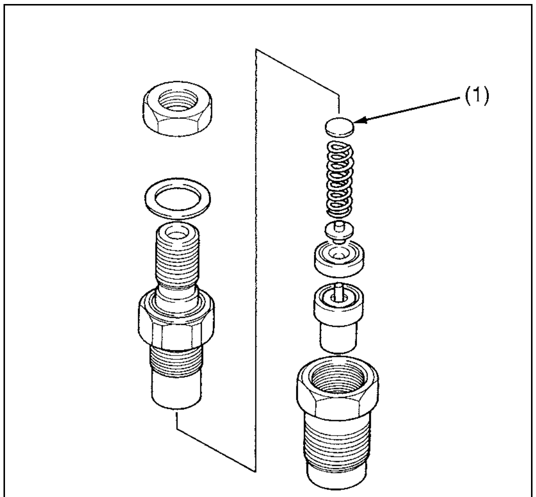

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Fuel Injection Pressure

1. Set 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 adjusting washer (1) in the nozzle holder to adjust it.

■ **NOTE**

- **Heat seal and injection nozzle gasket must be changed when the injection nozzle is remove for cleaning or for service.**

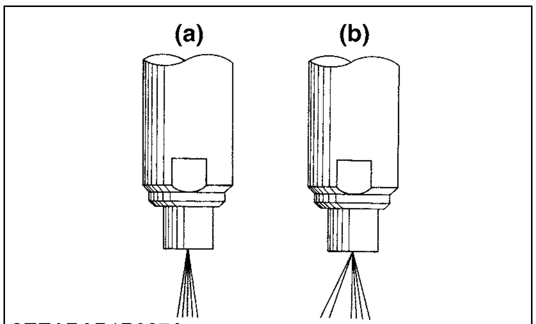
Injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm^2 1991 to 2133 psi

(Reference)

- Pressure variation with 0.01 mm (0.0004 in.) difference of adjusting washer thickness.
  Approx. 2.35 kPa (2.4 kgf/cm^2, 34 psi)

(1) Adjusting Washer

W1073251



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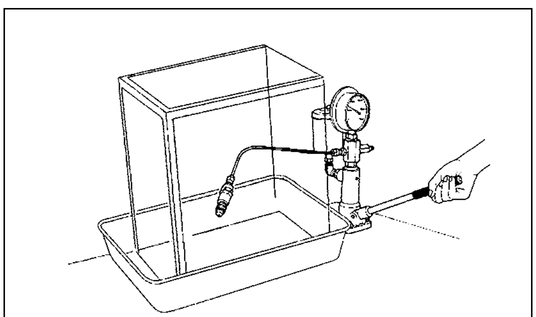
Nozzle Spraying Condition

1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361), and check the nozzle spraying condition.
2. If the spraying condition is defective, replace the nozzle piece.

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

W1073359



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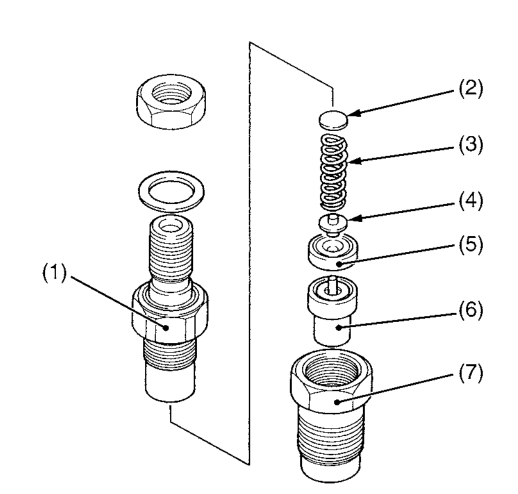
Valve Seat Tightness

1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361).
2. Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm^2, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

Injection pressure	Factory spec.	No fuel leak at 12.75 MPa 130 kgf/cm^2 1849 psi

W1073467

(2) Disassembling and Assembling



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Nozzle Holder

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

(When reassembling)

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

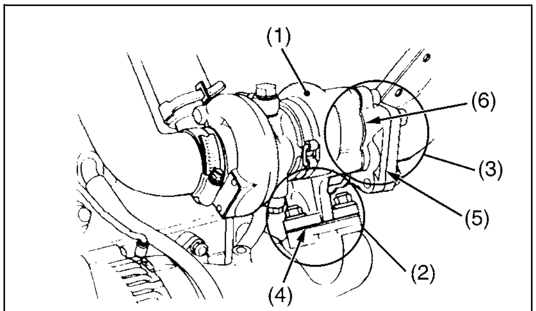
Tightening torque	Nozzle holder	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Overflow pipe nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

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

W1089102

[6] TURBOCHARGER SYSTEM

(1) Checking



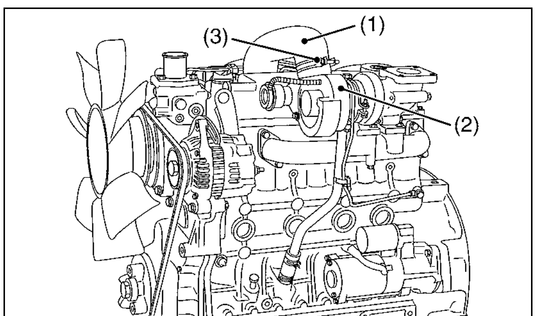
3EEABAB1P199A

Turbine Side

1. Check the exhaust port (3) and inlet port (2) side of turbine housing (1) to see if there is no exhaust gas leak.
2. If any gas leak is found, retighten the bolts and nuts or replace the gasket (4) / (5) / (6) with new one.

(1) Turbine Housing
(2) Inlet Port
(3) Exhaust Port
(4) Gasket
(5) Gasket
(6) Gasket

W1076917



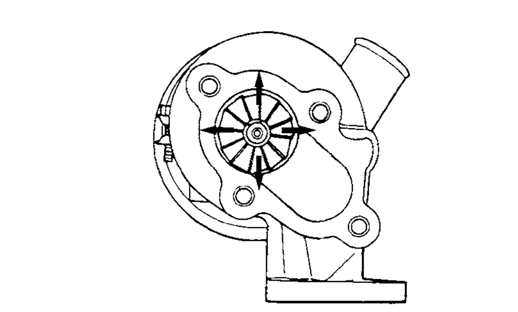
3EEABAB1P200A

Compressor Side

1. Check the inlet pipe 1 (1) of the compressor cover (2) to see if there is no air leak.
2. Check for loose connections or cracks in the suction side of the intake pipe.
3. If any air leak is found, change the clamp (3) and or inlet pipes.

(1) Inlet Pipe 1
(2) Compressor Cover
(3) Clamp

W1077032



3EEABAB1P203A

Radial Clearance

1. If the wheel contact to the housing, replace the turbocharger assembly with new one.

W1077353

(2) Disassembling and Assembling

CAUTION

- **While the engine is running and or just after it stops, the turbocharger is hot, be careful not to touch the turbocharger.**

■ **NOTE**

- **When detaching and attaching the turbocharger assembly, be very careful not to allow dust, dirt and other foreign matter in the oil pipes.**
- **When the turbocharger assembly has been replace, pour fresh engine oil through the oil filler port of the turbocharger.**
- **Before starting the engine, make sure that air cleaner is position.**

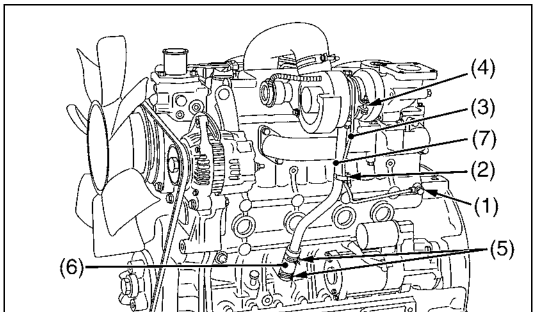
Air Cleaner and Muffler

1. Remove the intake pipe.
2. Remove the inlet pipe 1.
3. Remove the muffler.

(When reassembling)

- Replace the gaskets with new one.

W1077836



3EEABAB1P200B

Oil Pipe

1. Remove the joint screw (1) and clamp (2) and take off the pipe 1 (3).
2. Remove the bolts (4) and release the clamp (5).
3. Disconnect the oil pipe 2 (6) and pipe 4 (7).

(When reassembling)

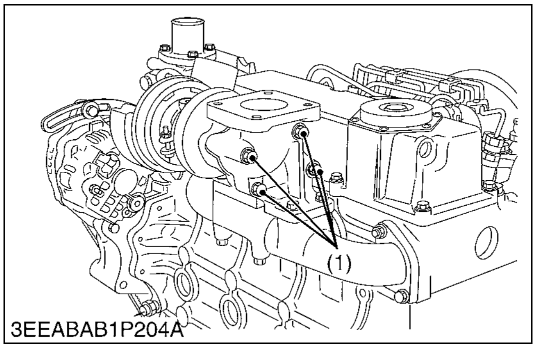
- Pour fresh engine oil through the oil filler port of the turbocharger.
- Replace the gasket with new one.
- Be careful not to allow dust, dirt and other foreign matters in the oil pipes.

■ **NOTE**

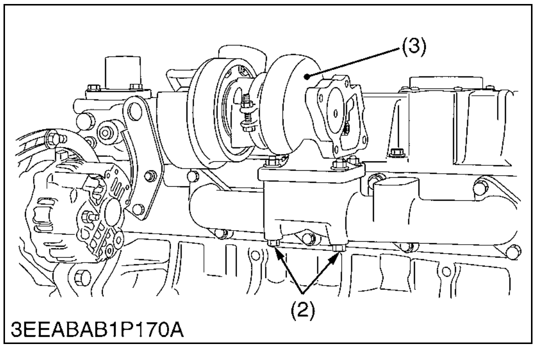
- **Tape or plug all openings to prevent foreign matters from damaging the oil cavities in the turbocharger.**

(1) Joint Screw
(2) Clamp
(3) Oil Pipe 1
(4) Bolt
(5) Clamp
(6) Oil Pipe 2
(7) Oil Clamp 4

W1077926



3EEABAB1P204A



3EEABAB1P170A

Turbocharger

1. Remove the screw (1) and bolt (2).
2. Take off the turbocharger assembly (3).

(When reassembling)

- Replace the gasket with new one.

(1) Screw
(2) Bolt
(3) Turbocharger Assembly

W1078106

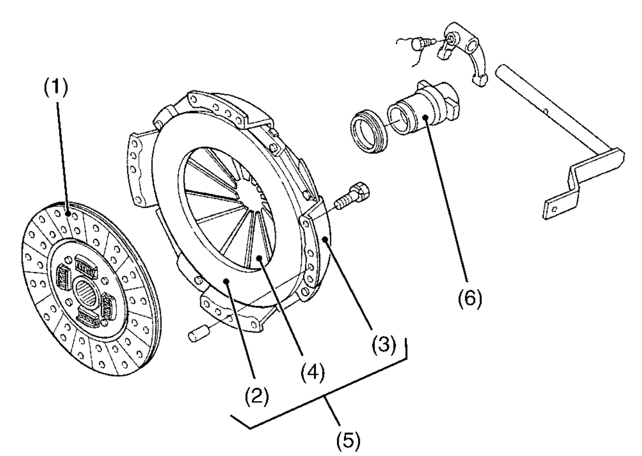
2 CLUTCH

MECHANISM

CONTENTS

1. TRAVELLING CLUTCH

[1] FEATURES



3TMACAB2P001A

This tractor is used dry single plate type clutch.

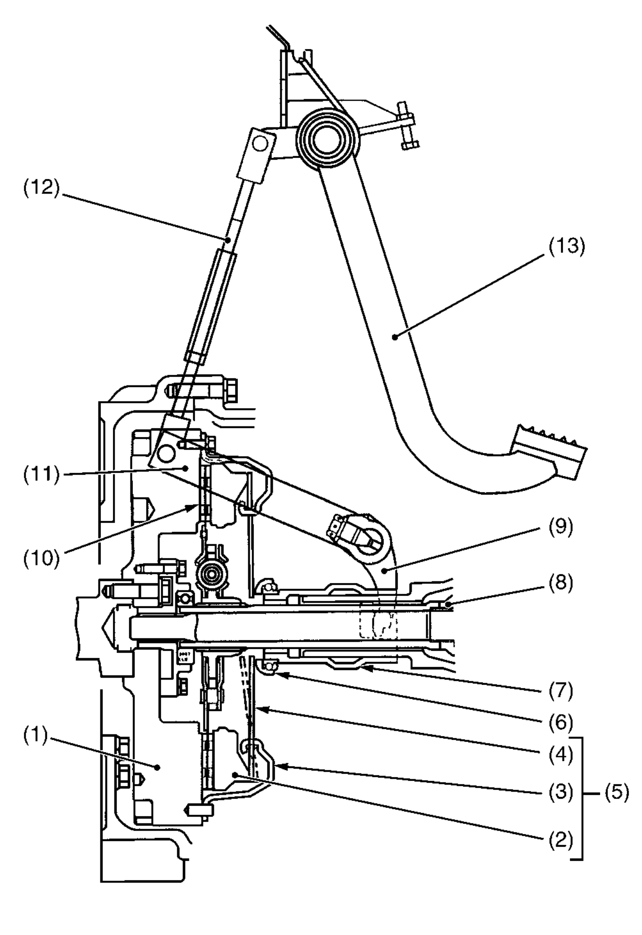
The clutch is located between the engine and transmission and is operated by stepping on the clutch pedal.

When the clutch pedal is depressed, the clutch is disengaged and when it is released, the clutch is engaged and power from the engine is transmitted to the transmission.

(1) Clutch Disc	(4) Diaphragm Spring
(2) Pressure Plate	(5) Pressure Plate Assembly
(3) Clutch Cover	(6) Release Hub

W1012651

[2] TRAVELLING CLUTCH LINKAGE



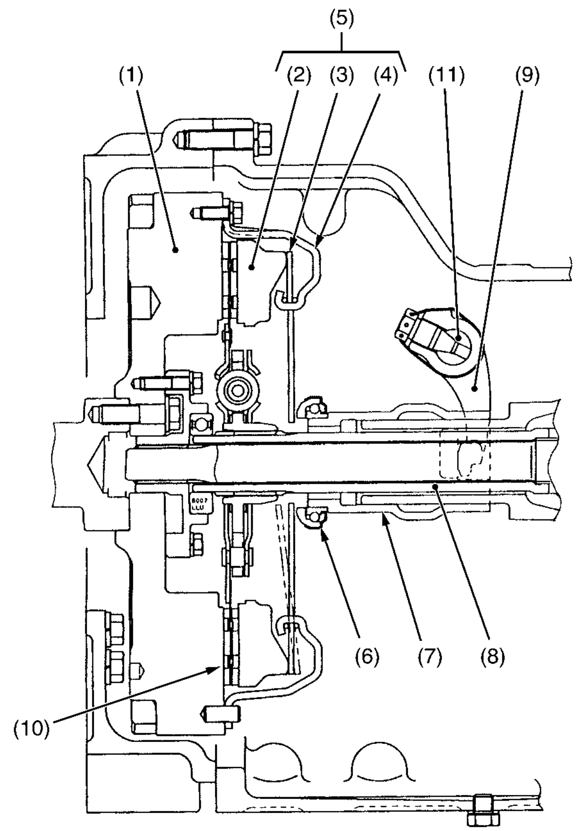
3TMACAB2P002A

This tractor uses hanging type clutch pedal to have wider space about the platform.

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

W1012740

[3] OPERATION



3TMACAB2P003A

■ **Clutch "Engaged"**

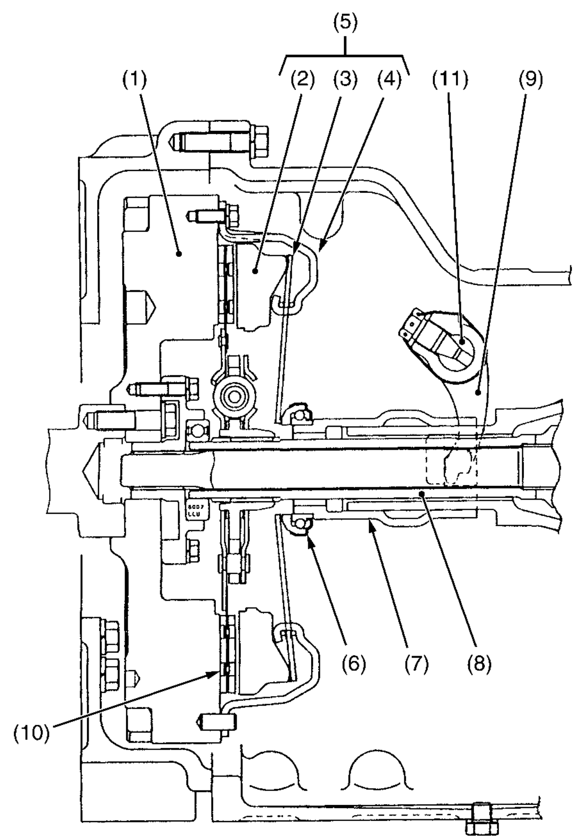
When the clutch pedal is not depressed, the clutch release bearing (6) and the fingers of diaphragm spring (3) are not connected to each other.

Accordingly, the pressure plate (2) is tightly pressed against the flywheel (1) by the diaphragm spring (3).

As a result, rotation of the flywheel (1) is transmitted to the transmission through the gear shaft (8) due to the frictional force among the flywheel (1), clutch disc (10) and pressure plate (2).

(1) Flywheel	(7) Release Hub
(2) Pressure Plate	(8) Gear Shaft
(3) Diaphragm Spring	(9) Release Fork
(4) Clutch Cover	(10) Clutch Disc
(5) Pressure Plate Assembly	(11) Clutch Lever
(6) Release Bearing	

W1012942



3TMACAB2P004A

■ **Clutch "Disengaged"**

When the clutch pedal is depressed, the clutch rod is pulled to move the clutch lever (11). Then, the release fork (9) pushes the release hub (7) and release bearing (6) toward the flywheel. Simultaneously, the release bearing (6) pushes the diaphragm spring (3).

As the pressure plate (2) is pulled by the diaphragm spring (3), the frictional force among the flywheel (1), clutch disc (10) and pressure plate (2) disappears.

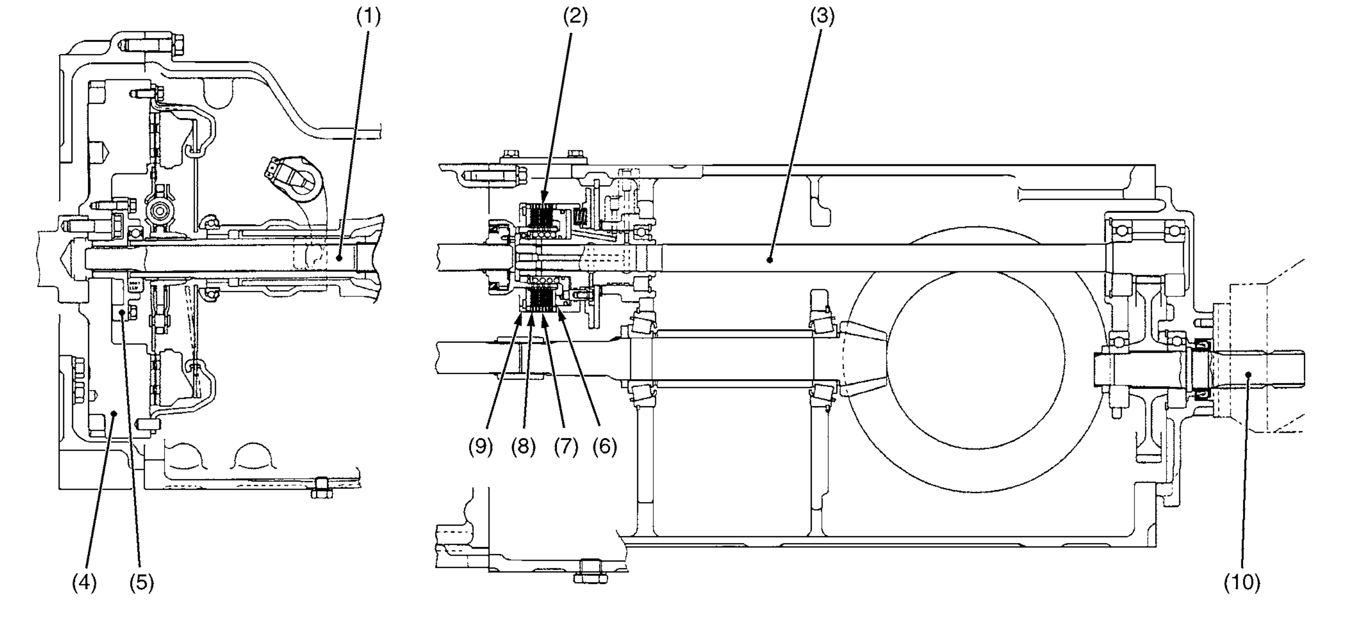
Therefore, rotation of the flywheel (1) is not transmitted to the clutch disc (10), and then the rotation of the gear shaft (8) stops.

(1) Flywheel	(7) Release Hub
(2) Pressure Plate	(8) Gear Shaft
(3) Diaphragm Spring	(9) Release Fork
(4) Clutch Cover	(10) Clutch Disc
(5) Pressure Plate Assembly	(11) Clutch Lever
(6) Release Bearing	

W1013081

2. PTO CLUTCH

[1] STRUCTURE



3TMACAB2P005A

(1) PTO Propeller Shaft
(2) PTO Clutch Pack
(3) Gear Shaft
(4) Flywheel
(5) PTO Spline Hub
(6) Clutch Piston
(7) Clutch Disc
(8) Drive Plate
(9) Pressure Plate
(10) PTO Shaft

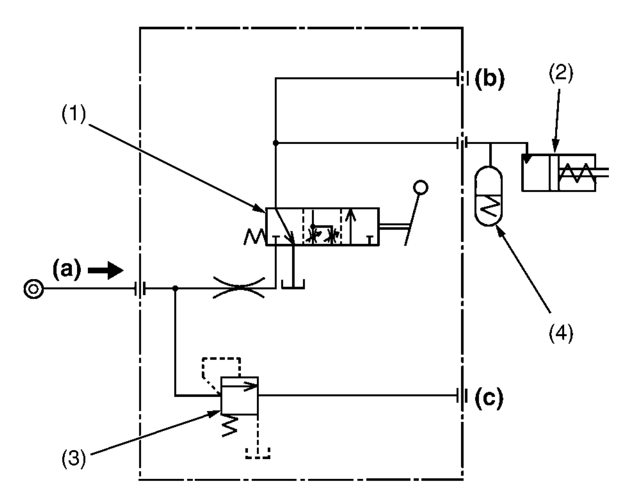
As shown in the figure above, the PTO propeller shaft (1) is splined to the spline hub (5) and is always rotated while the engine runs.

The PTO clutch pack has seven clutch discs (7), seven drive plates (8) and one pressure plate (9). The clutch piston (6) actuated by hydraulic from PTO clutch valve, tightly presses the clutch discs (7) and drive plates (8) toward the pressure plate (9).

As a result, the rotation of the PTO propeller shaft is transmitted to the gear shaft (3) through the PTO clutch pack (2).

The PTO clutch valve can be in a semi-clutching state by means of the modulating valve. Thereby, the PTO clutch is engaged very smoothly.

[2] OIL FLOW



3TMACAB2P006A

The oil from the steering controller flows into the PTO clutch valve.

When the PTO is at the disengaged position, the oil flows is stopped by the PTO clutch valve (1). When the PTO is at the engaged position, the oil flows through the PTO clutch valve (1) to the modulating valve (4) and PTO clutch pack (2) to engage it.

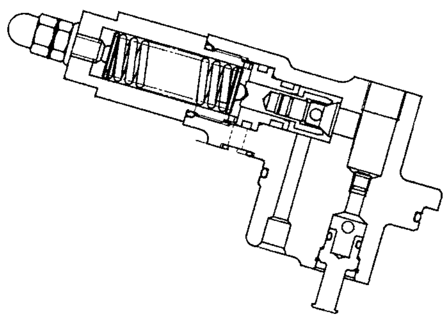
(1) PTO Clutch Valve
(2) PTO Clutch Pack
(3) Relief Valve
(4) Modulating Valve

(a) From Steering Controller
(b) Pressure Check Port
(c) Lubricating Port

W1013361

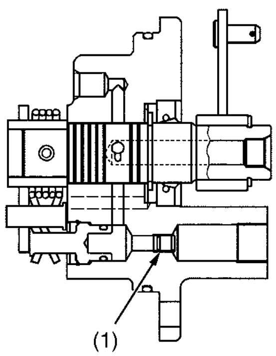
[3] PTO CLUTCH VALVE

(A)



3TMACAB2P007A

(B)



3TMACAB2P008A

PTO clutch valve is composed of the following parts.

(A) Main Relief Valve

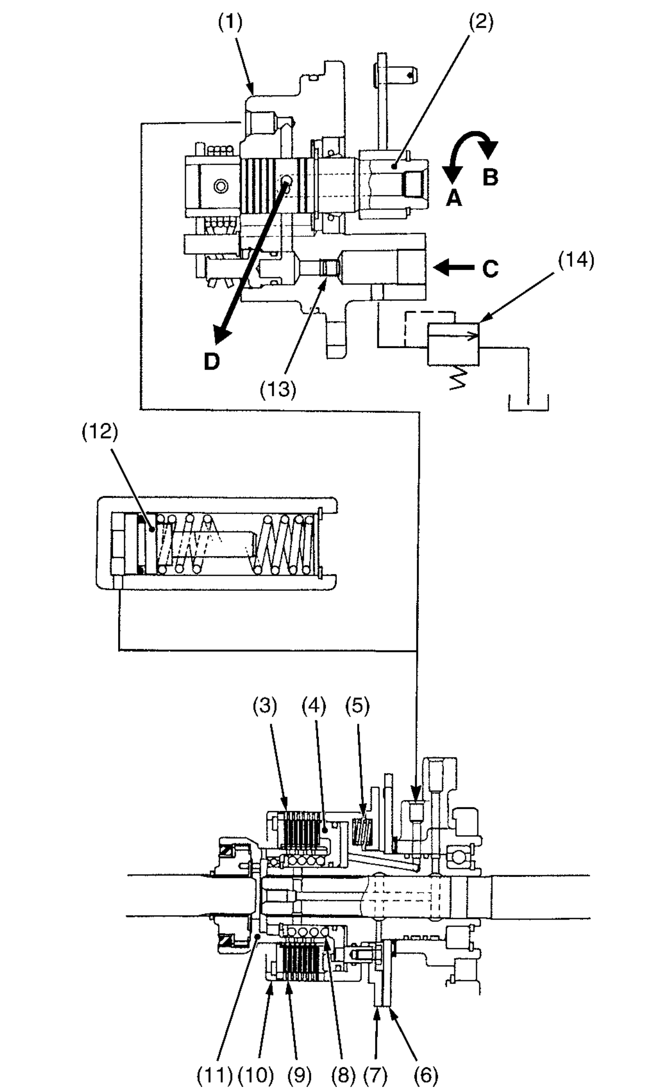
PTO clutch inner pressure is kept in approx. 2451 kPa (25 kgf/cm^2, 355 psi) by the main relief valve.

(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



3TMACAB2P009A

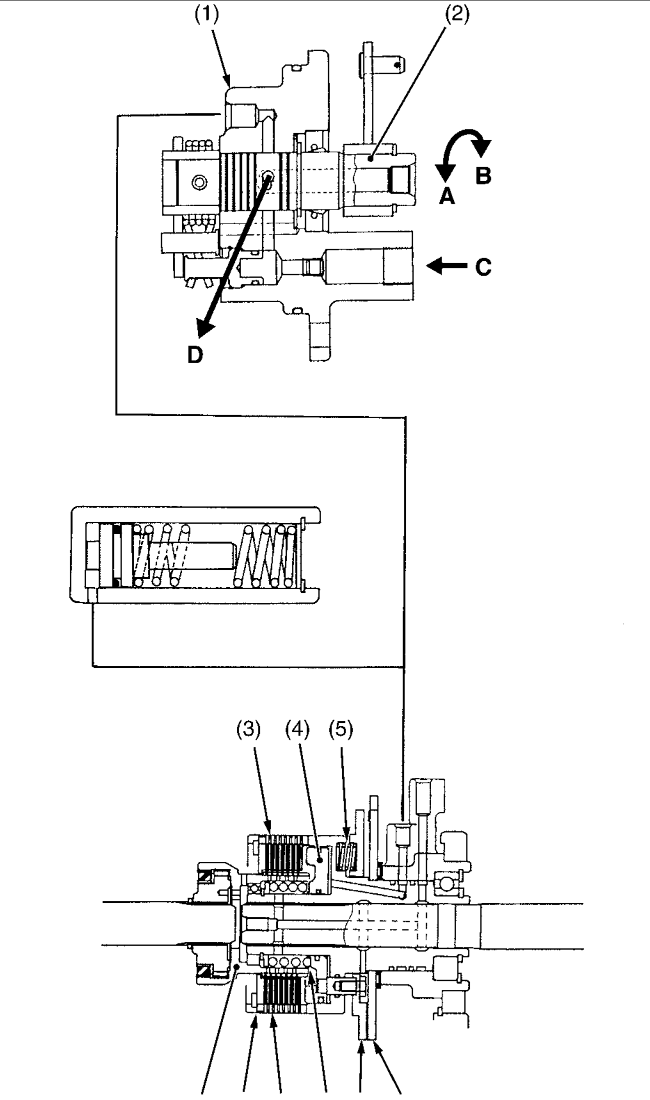
■ PTO Clutch “Engaged”

The oil from power steering controller flows into the clutch valve (1). When the PTO shift lever is set at the **“Engaged”** position, the spool (2) is turned to **A** position, then oil flows through the spool (2) into the modulating valve and the clutch pack. Oil entering the clutch pack pushes the piston (4) to engage the clutch pack. The modulating valve absorbs the engaging shock of the clutch pack.

(1) PTO Clutch Valve
(2) Spool
(3) Plate
(4) Piston
(5) Brake Spring
(6) Brake Disc
(7) Brake Plate
(8) Return Spring
(9) Clutch Discs
(10) Pressure Plate
(11) Clutch Hub
(12) Modulating Valve
(13) Orifice
(14) Relief Valve

A : Engaged Position
B : Disengaged Position
C : From Power Steering Controller
D : Drain (To the Transmission Case)

W1013563



3TMACAB2P010A

■ PTO Clutch "Disengaged"

When the PTO shift lever is set at the **"Disengaged"** position, the spool (2) is turned to **B** position, then the oil from the power steering controller is stopped by the spool (2) and the oil in the PTO clutch pack drained into the tank. Thus the piston (4) is pushed back by the return spring (8).

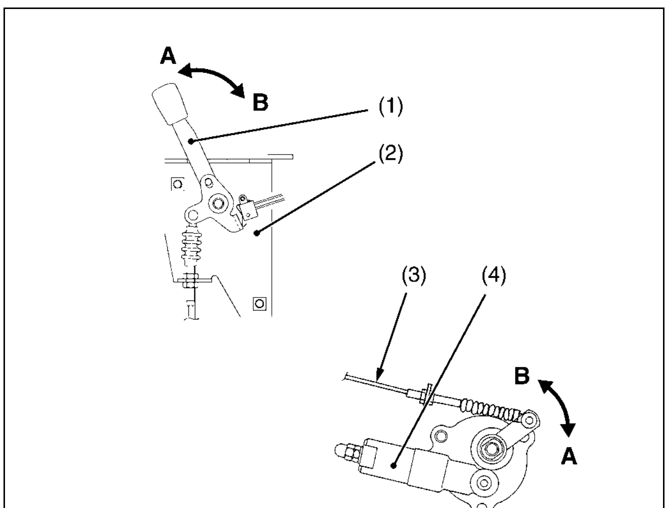
When the piston (4) is pushed back, the brake plate (7) is also moved to contact the brake disc (6) so as to stop the rotation and the drag of the PTO shaft.

(1) PTO Clutch Valve
(2) Spool
(3) Plate
(4) Piston
(5) Brake Spring
(6) Brake Disc
(7) Brake Plate
(8) Return Spring
(9) Clutch Discs
(10) Pressure Plate
(11) Clutch Hub

A : Disengaged Position
B : Engaged Position
C : From Power Steering Controller
D : Drain (To the Transmission Case)

W1013997

[4] SHIFT LINKAGE



3TMACAB2P011A

The shift lever (1) and the PTO clutch valve (4) are connected by the shift cable (3) as shown in the left figure.

When the shift leer is moved to the **B** side, the PTO clutch valve (4) is set at **"Engaged"** position. Then the oil flows to clutch pack through the PTO clutch valve (4), and the clutch pack is engaged and the PTO shaft rotates. When the shift lever is moved to the **A** side, the PTO clutch valve (4) is set at the **"Disengaged"** position.

(1) Shift Lever
(2) Lever Guide
(3) Shift Cover
(4) PTO Clutch Valve

A : Disengaged Position
B : Engaged Position

W1014355

SERVICING

CONTENTS

1. TROUBLESHOOTING

TRAVELLING CLUTCH

Symptom	Probable Cause	Solution	Reference Page
Clutch Drags	• Clutch pedal free travel excessive • Dust on clutch disc generated from clutch disc facing • Release fork broken • Clutch disc or pressure plate warped • Pressure plate worn	Adjust Remove rust Replace Replace Replace (Pressure plate assembly)	2-S4 – 2-S10 2-S11 2-S11
Clutch Slips	• Clutch pedal free travel too small • Clutch disc excessively worn • Grease or oil on clutch disc facing • Clutch disc or pressure plate warped • Diaphragm spring weaken or broken • Pressure plate worn	Adjust Replace Replace Replace Replace Replace (Pressure plate assembly)	2-S4 2-S10 2-S9 2-S11 2-S11 2-S11
Chattering	• Grease or oil on clutch disc facing • Clutch disc or pressure plate warped • Clutch disc boss spline worn or rusted • Pressure plate or flywheel face cracked or scored • Clutch disc boss spline and gear shaft spline worn • Diaphragm spring strength uneven or diaphragm spring broken	Replace Replace Replace or remove rust Replace Replace Replace	2-S9 2-S11 2-S10 1-S54, 2-S11 2-S10 2-S11
Rattle During Running	• Clutch disc boss spline worn • Release bearing worn or sticking	Replace Replace	2-S9, S10 2-S9, S10
Clutch Squeaks	• Release bearing sticking or dry • Clutch disc excessively worn	Replace or lubricate Replace	2-S10 2-S11
Vibration	• Clutch disc rivet broken • Clutch parts broken	Replace Replace	2-S11 2-S10

W1013580

PTO CLUTCH

PTO Clutch Slip	• Operating pressure is low • PTO clutch valve malfunctioning • Clutch disc or drive plate excessively worn • Deformation of piston or return plate	Adjust Repair or replace Replace Replace	2-S12 2-S13 2-S18, S20 2-S19
PTO Shaft Does Not Rotate	• PTO clutch malfunctioning • PTO propeller shaft coupling disengaged	Repair or replace Engage	2-S18 –
PTO Clutch Operating Pressure Is Low	• Transmission oil improper or insufficient • Relief valve malfunctioning	Replenish or change Adjust or replace	G-11 2-S12
PTO Clutch Drags	• Brake plate excessively worn • Return spring weaken or broken • Modulating valve malfunctioning • Deformation of plate or steel plate	Replace Replace Repair or replace Replace	2-S19 2-S19 2-S19 –

W1013718

2. SERVICING SPECIFICATIONS

TRAVELLING CLUTCH

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free Travel	35 to 45 mm 1.4 to 1.8 in.	–
Clutch Pedal Stopper Bolt	Height	18 to 20 mm 0.70 to 0.79 in.	–
Clutch Pedal Shaft to Clutch Pedal Bushing	Clearance	0.025 to 0.185 mm 0.00098 to 0.00728 in.	1.00 mm 0.0394 in.
Clutch Pedal Shaft	O.D.	27.900 to 27.975 mm 1.09842 to 1.10138 in.	–
Clutch Pedal Bushing	I.D.	28.000 to 28.085 mm 1.10236 to 1.10571 in.	–
Clutch Disc	Disc Surface to Rivet Top (Depth)	–	0.3 mm 0.012 in.
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	–	2.0 mm 0.079 in.
Pressure Plate	Flatness	–	0.2 mm 0.008 in.
Diaphragm Spring	Mutual Difference	–	0.5 mm 0.020 in.

W1013874

PTO CLUTCH

PTO Clutch Valve Condition • Engine Speed Maximum • Oil temperature 45 to 55 °C (113 to 131 °F)	Relief Valve Setting Pressure	2.45 to 2.55 MPa 25 to 26 kgf/cm^2 356 to 370 psi	–
PTO Clutch Safety Switch to Lock Plate	Clearance	26.0 to 28.0 mm 1.024 to 1.102 in.	–
PTO Clutch Disc	Thickness	1.70 to 1.90 mm 0.067 to 0.075 in.	1.55 mm 0.061 in.
PTO Steel Plate	Thickness	1.15 to 1.25 mm 0.045 to 0.049 in.	1.10 mm 0.043 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	40.5 mm 1.59 in.	37.5 mm 1.48 in.
PTO Brake Spring	Free Length	20.3 mm 0.80 in.	18.0 mm 0.71 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 “6. TIGHTENING TORQUES” at GENERAL Section.)

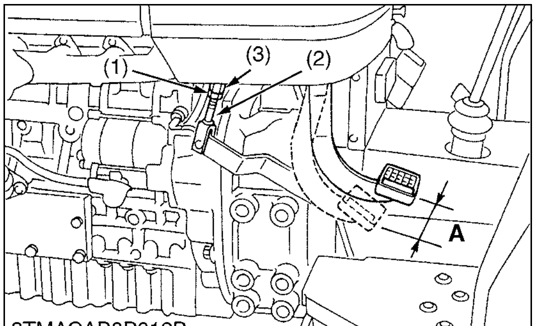
Item	N·m	kgf·m	ft-lbs
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Release fork setting screw	166.7 to 186.3	17.0 to 19.0	123.0 to 137.4
Power steering main delivery pipe and return pipe retaining nut	47.1 to 51.0	4.8 to 5.2	34.7 to 37.6
Power steering turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Steering controller mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Starter’s **B** terminal mouning nut	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7
Engine and clutch housing mounting screw, nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine and clutch housing mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Clutch housing and transmission case mounting screw, nut			
• M12, grade 11 stud bolt	52.0 to 58.8	5.3 to 6.0	38.3 to 43.4
• M12, grade 11 nut	103.0 to 117.7	10.5 to 12.0	75.9 to 86.8
• M12, grade 7 screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
• M10, grade 9 screw, nut [M6800(S)]	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Transmission case and clutch housing mounting screw, nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Clutch housing and transmission case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Transmission upper cover mounting screw [M6800(S)]	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
PTO clutch valve mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
PTO clutch holder mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Brake plate mounting screw	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
Rear wheel mounting nut	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] TRAVELLING CLUTCH

(1) Checking and Adjusting



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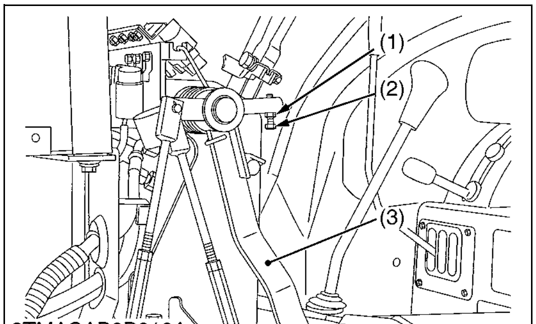
Clutch Pedal Free Travel

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

Clutch pedal free travel (**A**) on the pedal	Factory spec.	35 to 45 mm 1.4 to 1.8 in.

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

W1012214



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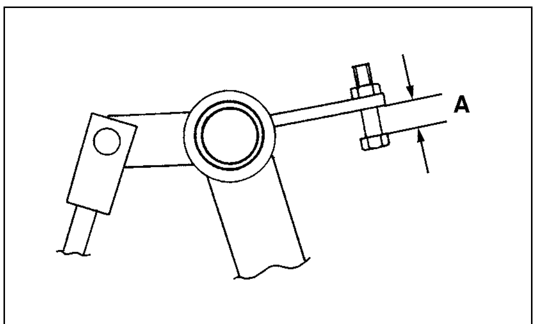

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Clutch Pedal Stopper Bolt

1. Measure the height (**A**) of stopper bolt (2).
2. If the measurement is not within the factory specifications, adjust it.
3. After adjustment, tighten the lock nut (3) firmly.

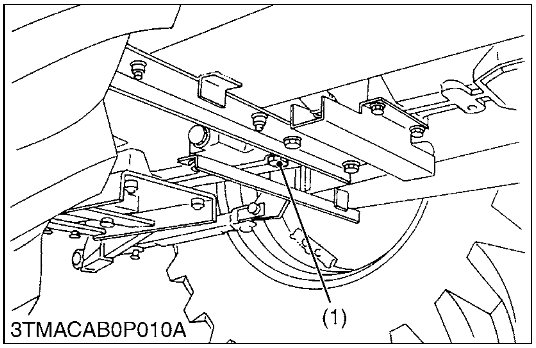
Height (**A**) of clutch pedal stopper bolt	Factory spec.	18 to 20 mm 0.70 to 0.79 in.

(1) Clutch Pedal
(2) Stopper Bolt
(3) Lock Nut

W1012374

(2) Disassembling and Assembling

(A) Separating Engine from Clutch Housing Case



Draining Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plug (1).
3. Drain the transmission fluid.
4. Reinstall the drain plug (1).

(When reassembling)

- Fill up from filling port after removing the filling plug until reaching the gauge.
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

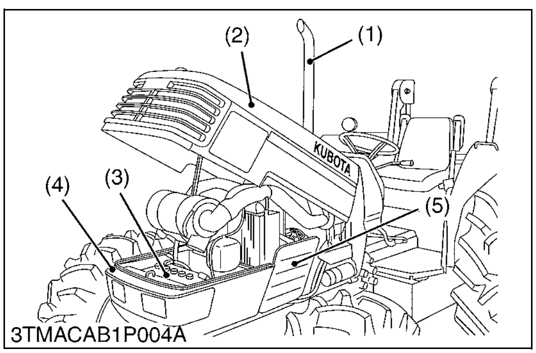
Transmission fluid	Capacity	M6800(S)	43 L 45.4 U.S.qts. 37.8 Imp.qts.
		M8200 M9000	54 L 57.0 U.S.qts. 47.5 Imp.qts.

■ **IMPORTANT**

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system.**
- **Refer to “5. LUBRICANTS, FUEL AND COOLANT” at GENERAL Section.**
- **Do not mix different brands fluid together.**

(1) Drain Plug

W1012568



Muffler and Bonnet

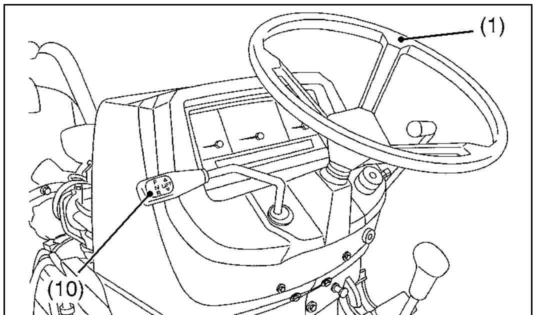
1. Remove the muffler (1).
2. Remove the bonnet (2).
3. Disconnect the battery’s cable.
4. Disconnect the head light **3P** connectors.
5. Remove the front lower cover (4) and side cover (5).

■ **IMPORTANT**

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

(1) Muffler (Upper)
(2) Bonnet
(3) Battery
(4) Front Lower Cover
(5) Side Cover

W1013060



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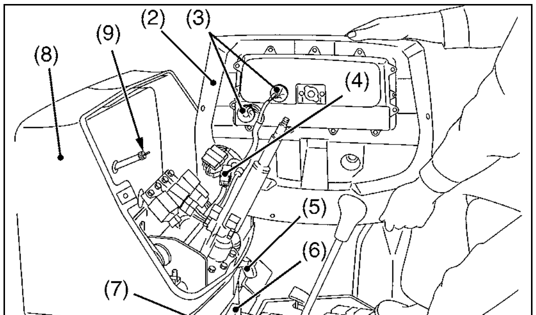


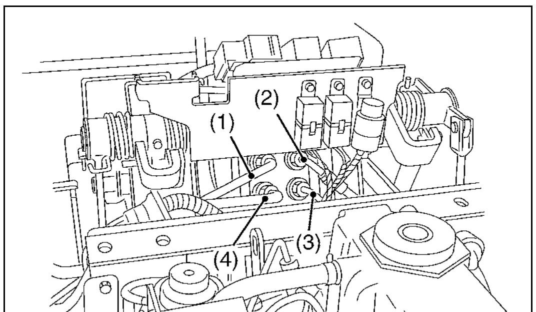
3TMACAB1P012A

Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1) with a steering wheel puller (Code No. 07916-51090).
2. Remove the shuttle lever grip (10).
3. Remove the meter panel mounting screw and disconnect the meter cable (9).
4. Disconnect the connectors (3).
5. Disconnect the main switch connector (4) and headlight switch connector, hazard and turn signal switch connector.
6. Disconnect the engine stop cable (5) at the engine side.
7. Remove the rear bonnet (8).
8. Remove the fuse box (7) and cover (6).

(1) Steering Wheel	(6) Cover
(2) Meter Panel	(7) Fuse Box
(3) Connectors	(8) Rear Bonnet
(4) Main Switch Connector	(9) Meter Cable
(5) Engine Stop Cable	(10) Shuttle Lever Grip

W1013212



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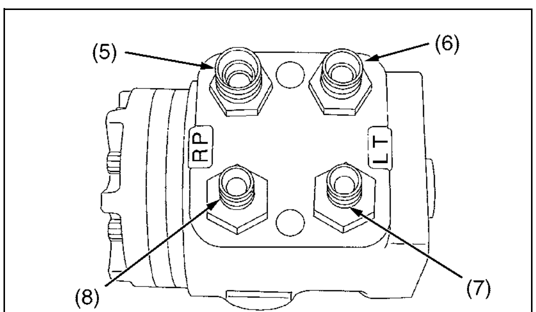


3TMACAB2P015A

Piping for Power Steering

1. Disconnect the turning delivery hoses (2) and (3).
2. Disconnect the main delivery pipe (4).
3. Disconnect the return pipe (1).
4. Remove the steering controller mounting screws.
5. Remove the steering controller.

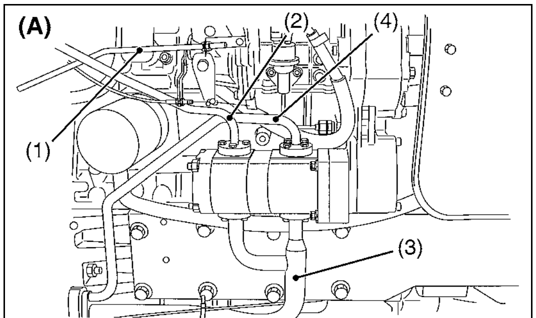
(When reassembling)

- Be sure to assemble the power steering hoses and pipes to the original position with specified torque.

Tightening torque	Main delivery pipe and return pipe retaining nut	47.1 to 51.0 N·m 4.8 to 5.2 kgf·m 34.7 to 37.6 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Steering controller mounting screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Return Pipe	(5) Pump Port
(2) Left Turning Delivery Pipe	(6) Return Port
(3) Right Turning Delivery Pipe	(7) Left Turning Port
(4) Main Delivery Pipe	(8) Right Turning Port

W1013538



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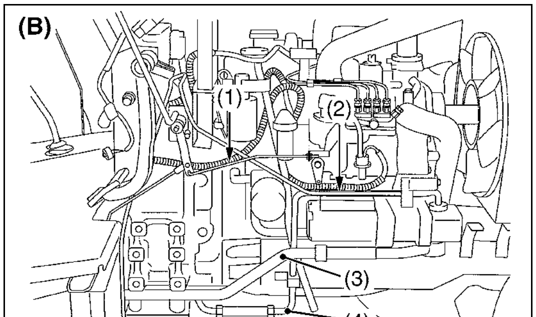


3TMACAB2P017A

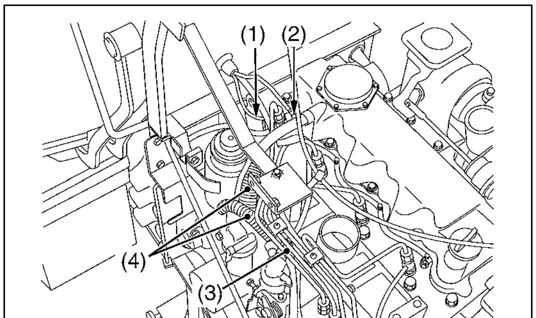
Piping for 3-Point Hydraulic System

1. Remove the accelerator rod (1).
2. Remove the suction pipe (3).
3. Remove the delivery pipe (4) for 3-point hydraulic system.
4. Remove the delivery pipe (2) for power steering.

(1) Accelerator Rod
(2) Delivery Pipe
(3) Suction Pipe
(4) Delivery Pipe

(A) Individual Flow Type
(B) Combined Flow Type

W1013791



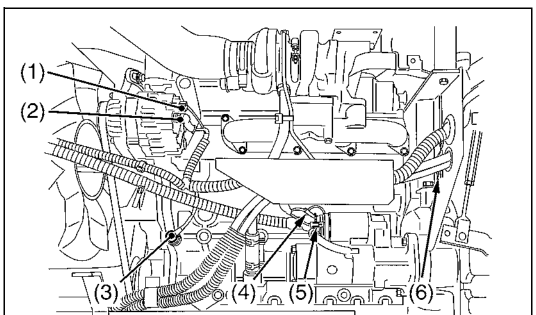
3TMACAB1P014A

Wire Harness R.H. and Fuel Pipes

1. Disconnect the **3P** connector for solenoid valve (3).
2. Disconnect the wiring lead (2) from the glow plug.
3. Disconnect the coolant thermo sensor **1P** connector (1).
4. Remove the fuel pipes (4).

(1) Coolant Thermo Sensor **1P** Connector
(2) Wiring Lead for Glow Plug
(3) **3P** Connector for Solenoid Valve
(4) Fuel Pipes

W1013985



3TMACAB2P018A

Wire Harness L.H.

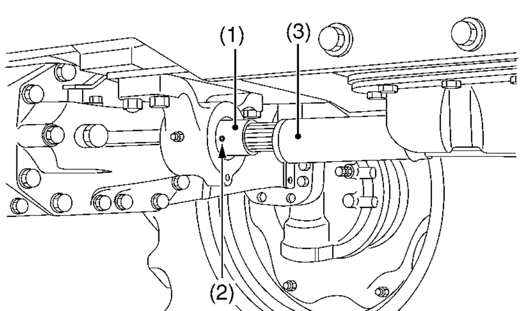
1. Disconnect the alternator **2P** connector (1) and **B** terminal (2).
2. Disconnect the starter motor **C** terminal (5) and **B** terminal (4).
3. Disconnect the engine oil pressure switch terminal (3).
4. Remove the earth wire (6).

(When reassembling)

Tightening torque	Starter's terminal **B** mounting nut	8.8 to 11.8 N·m 0.9 to 1.2 kgf·m 6.5 to 8.7 ft-lbs

(1) Alternator **2P** Connector
(2) Alternator **B** Terminal
(3) Engine Oil Pressure Switch Terminal
(4) Starter Motor **B** Terminal
(5) Starter Motor **C** Terminal
(6) Earth Wire

W1014131



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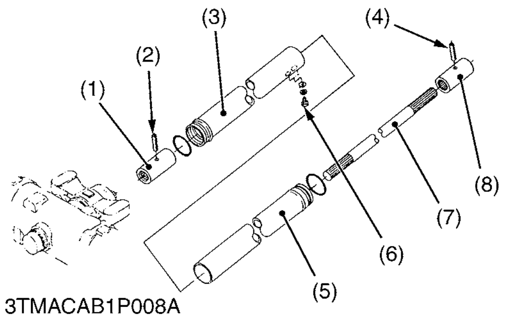


3TMACAB1P008A

Propeller Shaft (4WD Only)

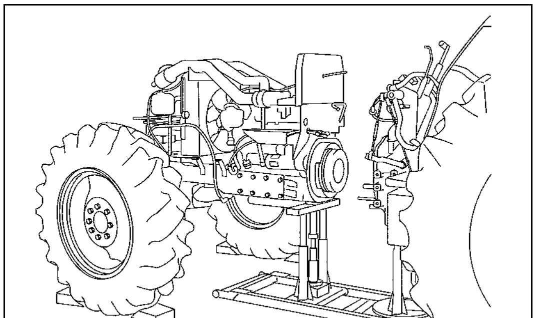
1. Slide the propeller shaft cover (3), (5) after removing the screws (6).
2. Tap out the spring pin (2), (4) and then slide the coupling (1), (8) to the front and rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (7) and pinion shaft.

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

W1014346


3TMACAB2P019A

Separating Engine from Clutch Housing

1. Check the engine and clutch housing case are securely mounted on the disassembling stands.
2. Remove the engine mounting screws and nuts, and separate the engine from the clutch housing.

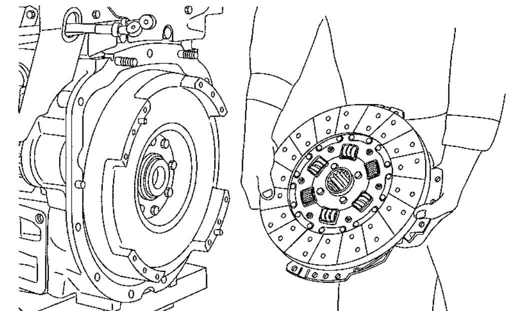
(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch 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, nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs

W1014594

(B) Separating Clutch Assembly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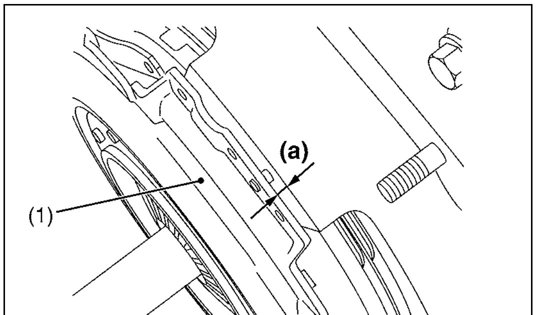

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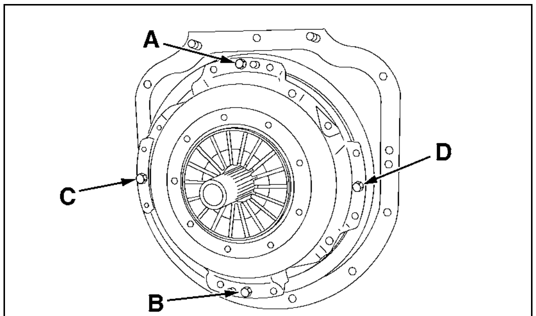

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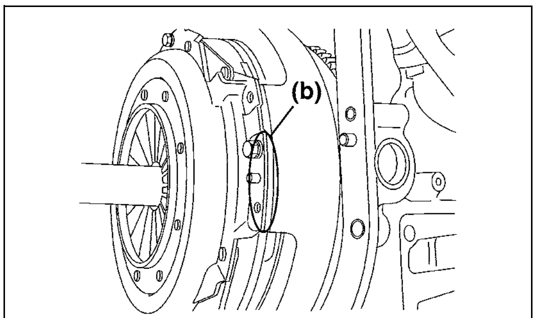

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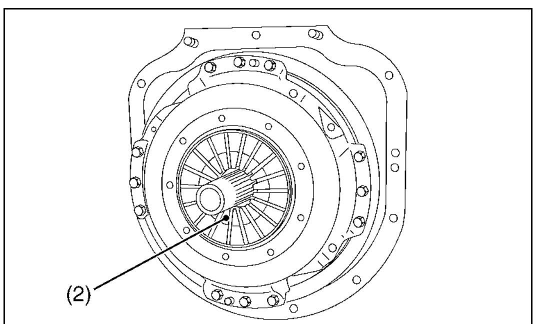


3TMACAB2P057A

Separating the Clutch Assembling

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.
- When the clutch cover (1) is mounted, there is a clearance **(a)** between the clutch cover (1) and the flywheel mounting face.
- Tighten the four screws **A**, **B**, **C** and **D** until the clutch cover comes into contact with the flywheel mounting face. Tighten the screws evenly three times in the order of **A**-**B**-**C**-**D** until no clearance **(b)** is left.
- Tighten all the other screws evenly in diagonal order.
- Tighten all the screws to their specified torques.
- Make sure that the height of diaphragm hooks spring (2) is uniform. If not, repeat steps 2, 3 and 4.

■ **IMPORTANT**

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

■ **NOTE**

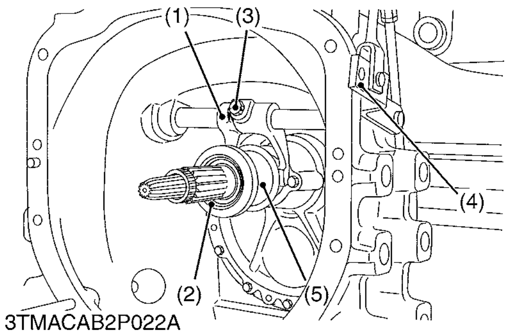
- **Do not allow grease and oil on the clutch disc facing.**

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

(1) Clutch Cover
(2) Diaphragm Spring

(a) Clearance
(b) No Clearance

W1014744



3TMACAB2P022A

Release Holder and Clutch Lever

1. Draw out the clutch release holder (5) and the release bearing (2) as a unit.
2. Remove the release fork setting screw (3).
3. Draw out the clutch lever (4) to remove the release fork (1).

(When reassembling)

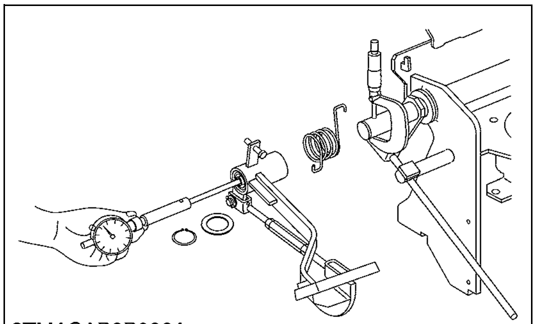
- Make sure the direction of the release fork (1) is correct.
- Apply grease to the release holder (5) and on the shaft.
- Apply grease to the bushing and clutch lever.
- After tightening the release fork setting screw to the specified torque, insert a wire through the hole on the setting screw head and bind with release fork together.

Tightening torque	Release fork setting screw	166.7 to 186.3 N·m 17.0 to 19.0 kgf·m 123.0 to 137.4 ft-lbs

(1) Release Fork
(2) Release Bearing
(3) Setting Screw
(4) Clutch Lever
(5) Release Holder

W1015025

(3) Servicing


3TMACAB2P023A

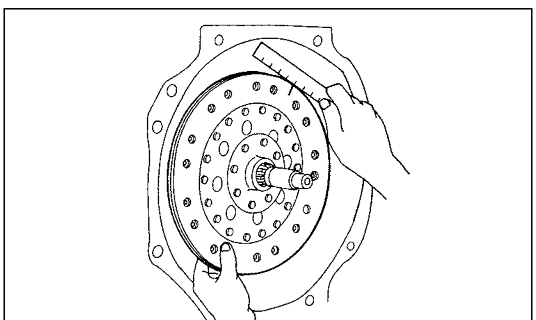
Clearance between Clutch Pedal Shaft and Pedal Bushing

1. Measure the clutch pedal shaft O.D. with an outside micrometer.
2. Measure the clutch pedal bushing I.D. with a cylinder gauge.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between clutch pedal shaft and pedal bushing	Factory spec.	0.025 to 0.185 mm 0.00098 to 0.00728 in.
	Allowable limit	1.00 mm 0.0394 in.

Clutch pedal shaft O.D.	Factory spec.	27.900 to 27.975 mm 1.09842 to 1.10138 in.
Clutch pedal bushing I.D.	Factory spec.	28.000 to 28.085 mm 1.10236 to 1.10571 in.

W1015255

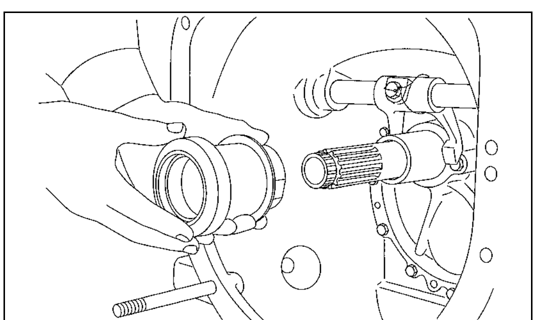

3TMABAB2P007A

Backlash between Clutch Disc Boss and Shaft

1. Mount the clutch disc to the gear 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 clutch disc.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

W1015376


3TMACAB2P024A

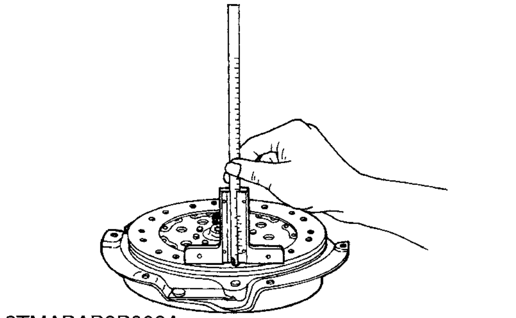
Release Bearing

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.

■ **NOTE**

- **Do not depress bearing outer race, when replacing release bearing.**
- **Do not wash the release bearing with a cleaning solvent.**

W1015573



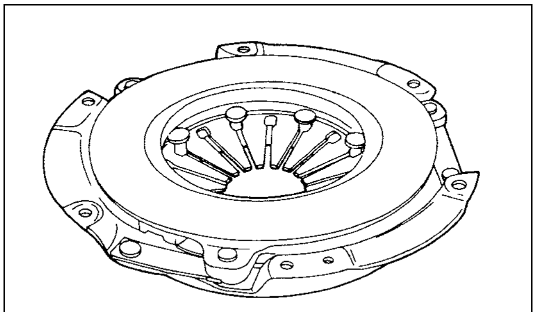
3TMABAB2P009A

Clutch Disc Wear

1. Measure the depth from clutch disc surface to the top of rivet at least 10 points with a depth gauge.
2. If the depth is less than the allowable limit, replace the disc.
3. If oil is sticking to clutch disc, or disc surface is carbonized, replace the clutch disc.
   In this case, inspect transmission gar shaft oil seal, engine rear oil seal and other points for oil leakage.

Disc surface to rivet top (Depth)	Allowable limit	0.3 mm 0.012 in.

W1015687



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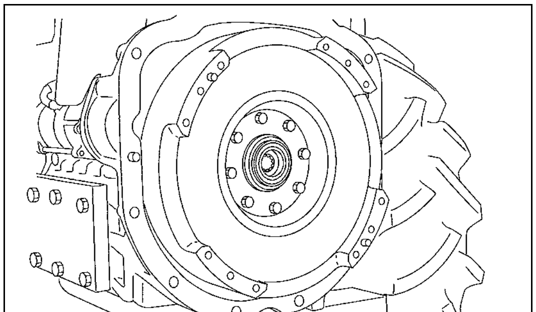


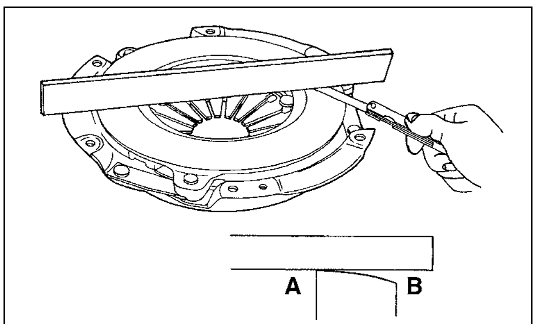
3TMACAB2P025A

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.
4. Inspect thrust rings (wire ring) for wear or damage.
   As these parts are invisible from outside, shake pressure plate assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replace as a complete assembly.

Diaphragm spring mutual difference	Allowable limit	0.5 mm 0.020 in.

W1015788



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Pressure Plate Flatness

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

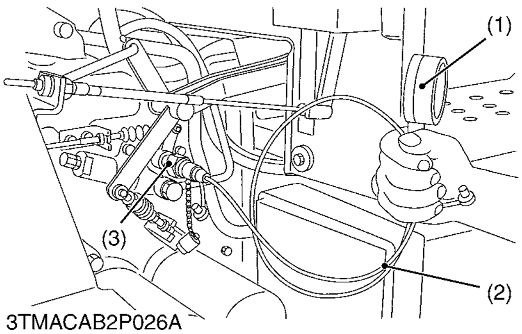
Clearance between pressure plate and straightedge	Allowable limit	0.2 mm 0.008 in.

A : Inside **B : Outside**

W1015950

[2] HYDRAULIC PTO CLUTCH

(1) Checking and Adjusting



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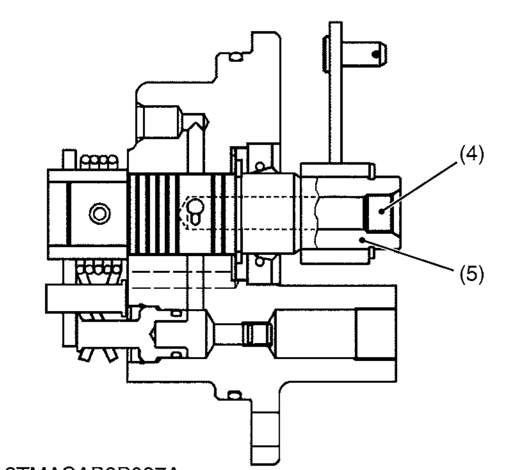

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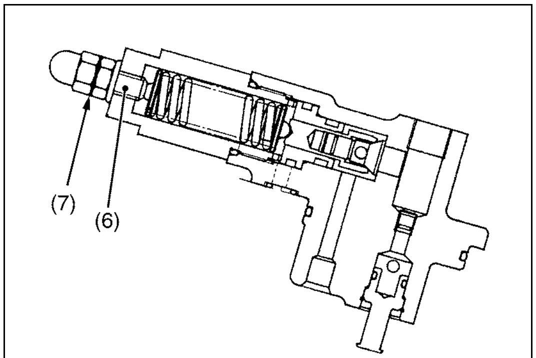


3TMACAB2P028A

Relief Valve Setting Pressure

1. Start the engine and warm up the transmission fluid, and then stop the engine.
2. Remove the plug (4) (PT 1/8) on the PTO valve spool (5).
3. Set the adaptor (PT 1/8) (Use the oil pressure tester for diesel engines, Code No. 07916-32032), threaded joint (3), cable (2) and pressure gauge (1).
4. Start the engine and set the engine speed maximum.
5. Move the PTO clutch lever to the **"ON"** position, and measure the pressure.
6. If only the pressure in the PTO clutch engaged position is low, check the hydraulic PTO clutch system.
7. If the measurement is not within the factory specifications, loosen the lock nut (7) and turn the screw (6) to adjust.

■ **IMPORTANT**
- **Do not connect the universal joint of the implement to the tractor PTO shaft while testing.**

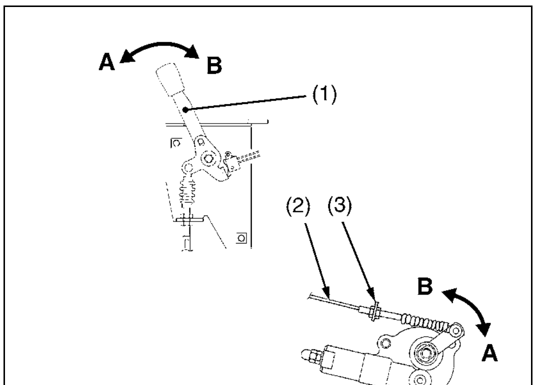
PTO pressure (When PTO shift lever is **"Engaged"** position)	Factory spec.	2.45 to 2.55 MPa 25.0 to 26.0 kgf/cm^2 356 to 370 psi
PTO pressure (When PTO shift lever is **"Dis-Engaged"** position)	Factory spec.	No pressure

Condition
- Engine speed .... Maximum
- Oil temperature ...... 45 to 55 °C
  113 to 131 °F

(Reference)
- Turn the screw (6) to clockwise direction → Pressure increase
- Turn the screw (6) to counterclockwise direction → Pressure decrease

(1) Pressure Gauge
(2) Cable
(3) Threaded Joint
(4) Plug (PT 1/8)
(5) Spool
(6) Screw
(7) Lock Nut

W1019915



3TMACAB2P029A

PTO Clutch Lever Movement

1. Stop the engine and remove the key.
2. Check the PTO clutch lever (1) on the **"ON"** and **"OFF"** position of PTO clutch lever guide.
3. If the adjustment is needed, loosen the lock nuts (3) and adjust the clutch control cable (2) length.
4. Retighten the lock nuts (3) firmly.

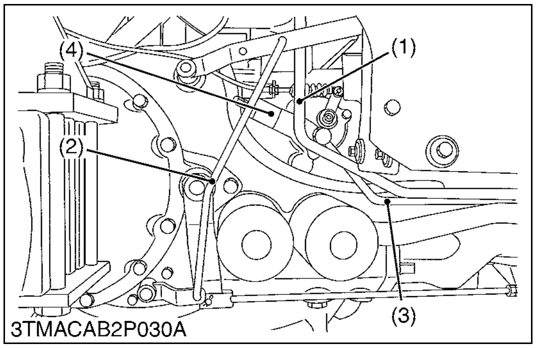
■ **IMPORTANT**
- **Do not connect the universal joint of the implement to the tractor PTO shaft while testing.**

(1) PTO Clutch Lever
(2) Clutch Control Cable
(3) Lock Nut
A : OFF
B : ON

W1020384

(2) Disassembling and Assembling

(A) Separating PTO Clutch Valve



Removing PTO Clutch Valve [M6800(S)]

1. Remove the rear tire (RH).
2. Disconnect the three point hydraulic system delivery pipe (1).
3. Remove the differential lock rod (2).
4. Disconnect the PTO delivery pipe (3).
5. Disconnect the PTO clutch cable at PTO clutch valve side.
6. Remove the PTO clutch valve (4).

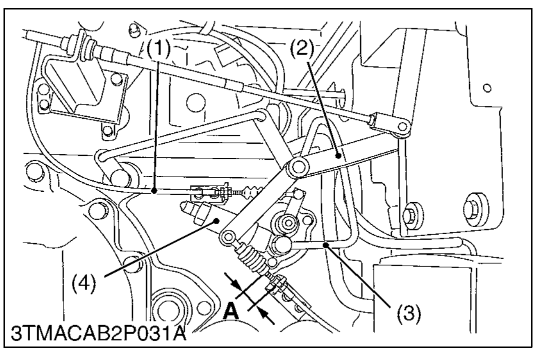
(When reassembling)

- Apply grease to the O-ring.
- Take care not to damage the O-ring.
- Replace the oil pipes (5) with new ones.
- Apply transmission oil to oil pipes.

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Three Point Hydraulic System Delivery Pipe
(2) Differential Lock Rod
(3) PTO Delivery Pipe
(4) PTO Clutch Valve

W1020925



Removing PTO Clutch Valve [M8200 · M9000]

1. Remove the rear tire (RH).
2. Remove the differential lock pedal (2).
3. Remove the PTO delivery pipe (3) for PTO clutch.
4. Disconnect the PTO clutch cable (1) at PTO clutch valve side.
5. Remove the PTO clutch valve (4).

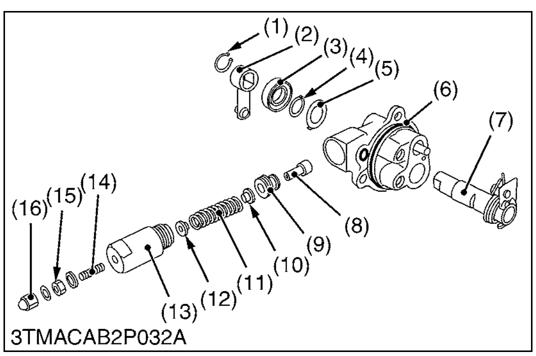
(When reassembling)

- Be sure to adjust the differential lock pedal free travel by adjusting the length **A**.

Differential lock pedal free travel	Factory spec.	20 to 30 mm 0.79 to 1.18 in.

(1) PTO Valve Cable
(2) Differential Lock Pedal
(3) Delivery Pipe
(4) PTO Valve

W1020731



Disassembling PTO Clutch Valve

1. Remove the external snap ring (1), lever (2) and oil seal (3).
2. Remove the external snap ring (4) and draw out the spool (7).
3. Remove the cap nut (16) and lock nut (15).
4. Remove the adjuster (14) and relief body (13).
5. Draw out the relief poppet (8) and relief bush (9).
6. Draw out the spring (11) and spring seat (10), (12).

(1) External Snap Ring
(2) Lever
(3) Oil Seal
(4) External Snap Ring
(5) Collar
(6) Control Valve Body
(7) Spool
(8) Relief Poppet
(9) Relief Bush
(10) Spring Seat
(11) Spring
(12) Spring Seat
(13) Relief Body
(14) Adjuster
(15) Lock Nut
(16) Cap Nut

W1021220

(B) Separating PTO Clutch

Draining Transmission Fluid

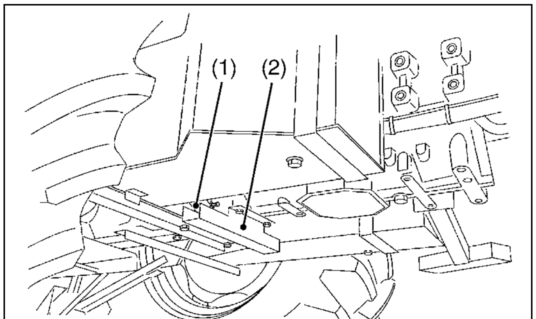
- See page 2-S5.

W1021487

Draining Fuel

- See page 3-S7.

W1021533



3TMACAB2P033A

Fuel Tank Connection Hose

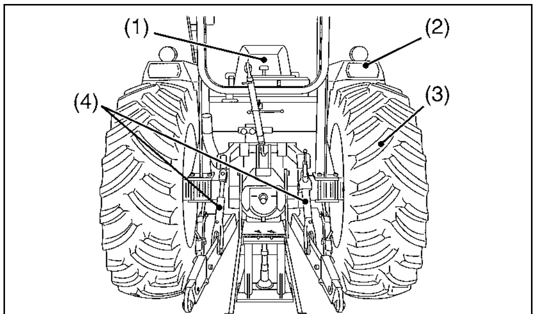
1. Remove the cover (2).
2. Remove the connection hose (1).

(When reassembling)

Tightening torque	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) Connection Hose
(2) Cover

W1021578



3TMACAB2P034A

Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

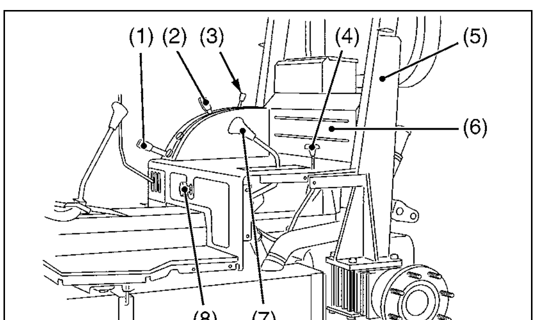
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	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

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1021709



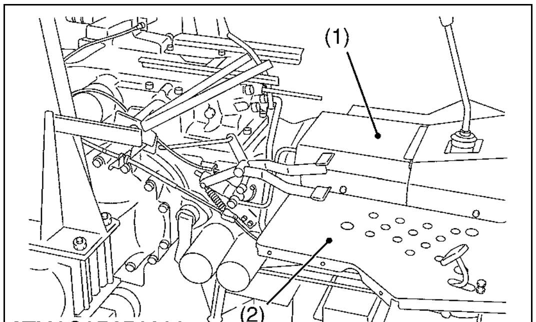
3TMACAB2P035A

Center Frame

1. Remove the remote valve wire.
2. Remove the draft and position control lever grips (1), (2).
3. Remove the auxiliary speed change lever grip (7).
4. Remove the DT shaft lever grip (4).
5. Remove the three point hitch lowering speed control grip (8) and PTO lever (3).
6. Remove the center frame (6).

(1) Position Control Lever Grip
(2) Draft Control Lever Grip
(3) PTO Lever
(4) DT Shift Lever Grip
(5) ROPS
(6) Center Frame
(7) Auxiliary Speed Change Lever Grip
(8) Three Point Hitch Lowering Speed Control Grip

W1022020



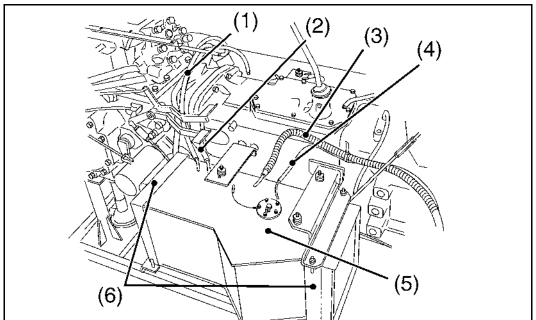
3TMACAB2P036A

Housing Cover and Steps

1. Remove the housing cover (1).
2. Remove the steps (2).

(1) Housing Cover
(2) Steps

W1022206



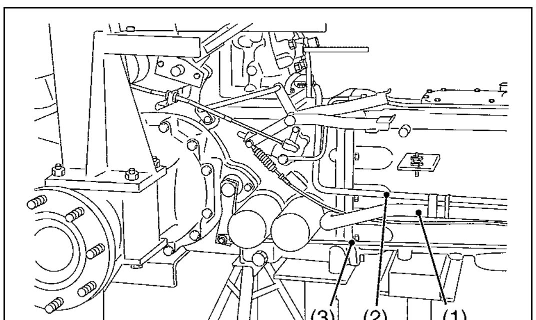
3TMACAB2P037A

Fuel Tanks

1. Remove the fuel hose (1), (2), (3), (4).
2. Remove the tank bands (6).
3. Remove the fuel tanks (5).

(1) Fuel Hose 1
(2) Fuel Hose 2
(3) Fuel Hose 3
(4) Fuel Hose 4
(5) Fuel Tank
(6) Tank Band

W1022292



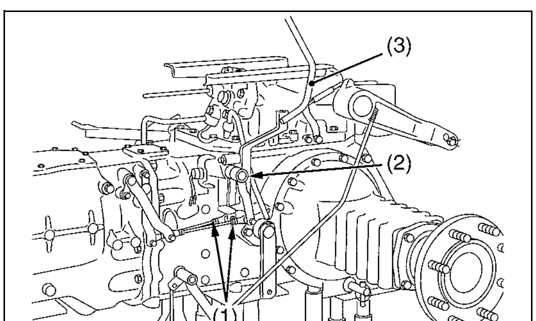
3TMACAB2P038A

Hydraulic Pipes and Brake Rods

1. Remove the suction pipe (1).
2. Remove the delivery pipe (2) for three point hydraulic system.
3. Remove the brake rods (3).

(1) Suction Pipe
(2) Delivery Pipe
(3) Brake Rod

W1022415



3TMACAB2P039A

Auxiliary Shift Lever [M6800(S)]

1. Disconnect the shift rods (1).
2. Remove the external circlip (2).
3. Take out the shift lever assembly.

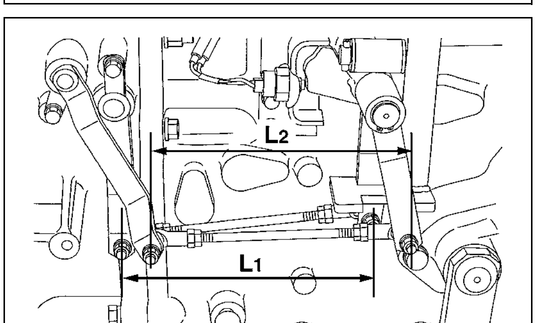
(When reassembling)

- Be sure to adjust the shift rod length.

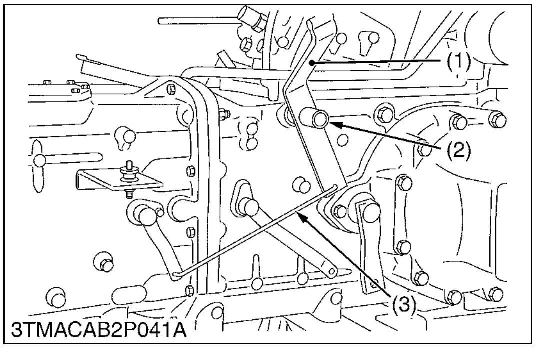
Shift rod length L_1 and L_2	Factory spec.	Approx. 209 mm 8.23 in.

(1) Shift Rod
(2) External Circlip
(3) Shift Lever

W1022714



3TMACAB2P040A



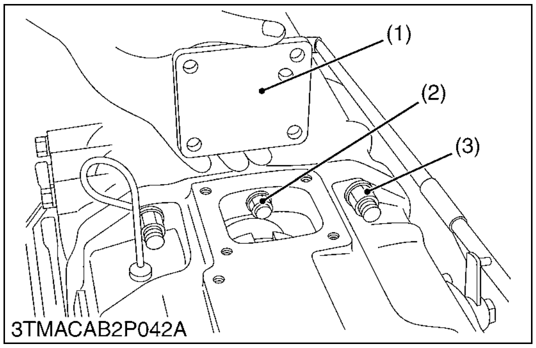
3TMACAB2P041A

Auxiliary Shift Lever [M8200 · M9000]

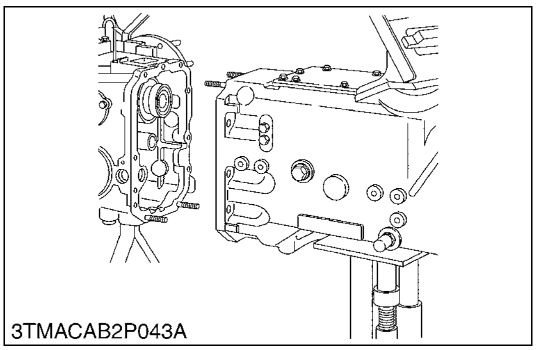
1. Remove the shift rod (3).
2. Remove the external circlip (2).
3. Take out the shift lever (1).

(1) Shift Lever
(2) External Circlip
(3) Shift Rod

W1022601



3TMACAB2P042A



3TMACAB2P043A

Separating Transmission Case [M6800(S)]

1. Remove the transmission upper cover (1).
2. Remove the transmission case mounting screws and nut, and separate the transmission case from the clutch housing.

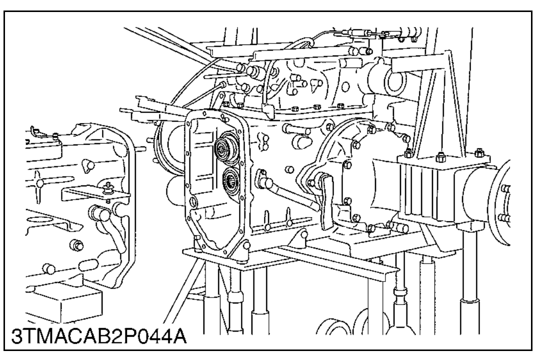
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the transmission case and clutch housing, transmission upper cover and transmission case.

Tightening torque	Transmission case and clutch housing screw, nut	M12, grade 11 nut	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
		M12, grade 7 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M10, grade 9 screw, nut (2)	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs
	Transmission case and clutch housing mounting stud bolt		38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Transmission upper cover mounting screw		23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Transmission Upper Cover
(2) Transmission Case Mounting Screw, Nut
(3) Transmission Case Mounting Nut

W1040281



3TMACAB2P044A

Separating Transmission Case [M8200 · M9000]

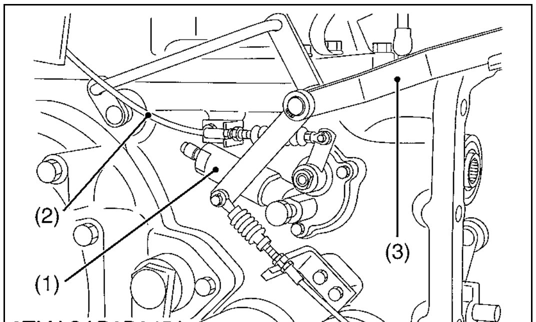
1. Check the clutch housing case and transmission case are securely mounted on the disassembling stands.
2. Remove the transmission case mounting screws and nuts.
3. Separate the transmission case from the clutch housing.

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of transmission case and clutch housing case.

Tightening torque	Transmission case and clutch housing mounting screw, nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1022873



3TMACAB2P045A

PTO Clutch Valve

1. Remove the differential lock pedal (3).
2. Disconnect the PTO clutch valve cable (2).
3. Remove the PTO clutch valve (1).

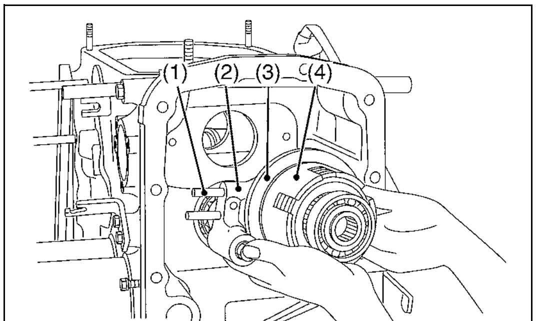
(When reassembling)

- Apply transmission fluid to O-ring.
- 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.
- Now while aligning the hydraulic pipe ends with the PTO clutch holder holes, assemble the PTO clutch valve (1) to the transmisison case.

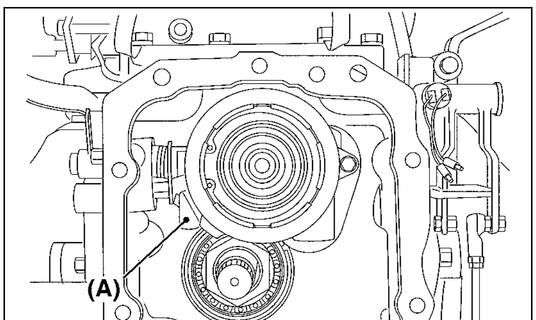
Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) PTO Clutch Valve
(2) PTO Clutch Valve Cable
(3) Differential Lock Pedal

W1023008



3TMACAB2P046A



3TMACAB2P047A

PTO Clutch and Holder

1. Remove the PTO clutch holder mounting screws.
2. Remove the PTO clutch (4) with holder.

(When reassembling)

- Apply transmission fluid to O-ring.
- Take care not to damage the hydraulic pipes (1).

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

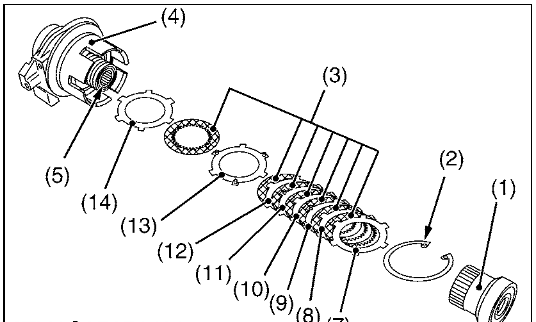
■ **IMPORTANT**

- **When reassembling the PTO clutch assembly, direct the projection part of brake plate (A) as a figure [M6800(S)].**
- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-blowing.**

(1) Hydraulic Pipe
(2) Holder
(3) Brake Plate
(4) PTO Clutch Pack

W1023169

(C) Disassembling PTO Clutch Pack



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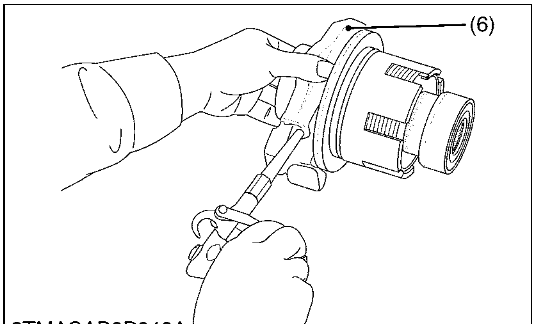

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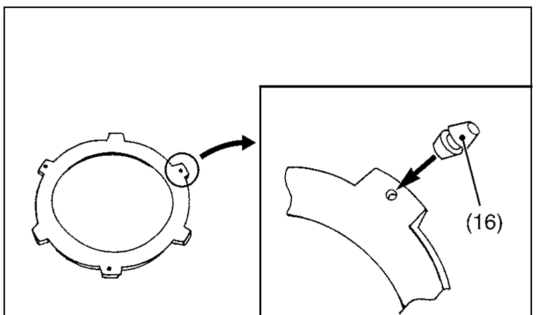


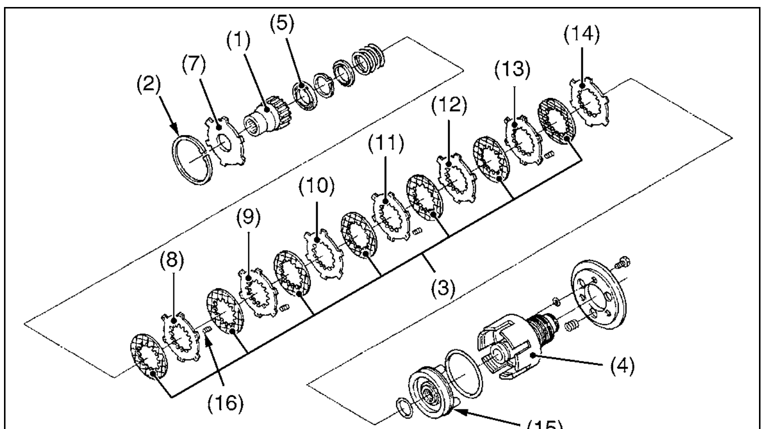
3TMABAB2P026C

Clutch Hub and Clutch Discs

1. Remove the internal snap ring (2), and then take out the clutch discs (3), the back plate (7), the steel plates (8), (9), (10), (11), (12), (13), (14), the hub (1) and the bearings (5).

(When reassembling)

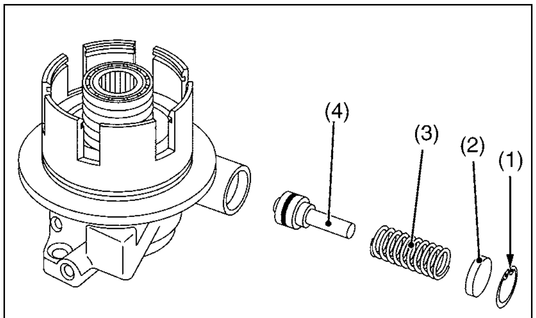
- Install the clutch discs (3) and steel plates (8), (9), (10), (11), (12), (13), (14) mutually. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (16) are (8), (9), (11), (13) and without plug rubbers (16) are (10), (12), (14).
- Do not confuse the back plate (7) and steel plates. The back plate (7) is thicker than the steel plates.
- Assemble the plug rubbers portion of the three steel plates (9), (11), (13) are same positions while assembling them, and do not pile up the plug rubbers portions of the another steel plate (8) with the steel plate (9). (Refer to figure below.)
- Apply enough transmission fluid to the discs (3).
- Confirm the moving of the piston (15) 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 figure left.)
- Assemble the steel plates with rubber (9), (11), (13) and steel plates without rubber (10), (12), (14) alternately, and steel plates are built in so that the part of rubber is not corresponding to the part of the hole.



3TMACAB2P050A

(1) Hub
(2) Internal Snap Ring
(3) Clutch Discs
(4) Clutch Case
(5) Bearing
(6) Mid Case Bearing Holder
(7) Back Plate
(8) Steel Plate (With Plug Rubbers)
(9) Steel Plate (With Plug Rubbers)
(10) Steel Plate (Without Plug Rubbers)
(11) Steel Plate (With Plug Rubbers)
(12) Steel Plate (Without Plug Rubbers)
(13) Steel Plate (With Plug Rubbers)
(14) Steel Plate (Without Plug Rubbers)
(15) Piston
(16) Plug Rubber

W1023397



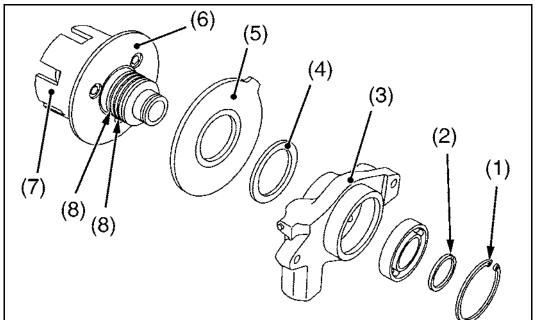
3TMACAB2P051A

Modulating Valve

1. Remove the internal snap ring (1).
2. Remove the spring seat (2).
3. Draw out the spring (3) and piston (4).

(1) Internal Snap Ring
(2) Spring Seat
(3) Spring
(4) Piston

W1024271



3TMACAB2P052A

Clutch Case

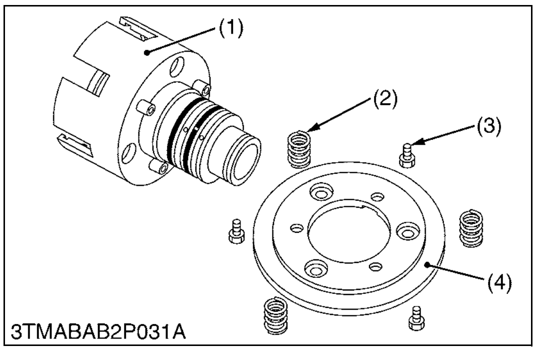
1. Remove the internal snap ring (1).
2. Remove the external snap ring (2).
3. Remove the clutch case (7) and brake disc (5).

(When reassembling)

- Direct the contact part of the brake disc (5) to the brake plate (6).
- Apply small amount of the grease to the seal rings (8).

(1) Internal Snap Ring
(2) External Snap Ring
(3) Clutch Holder
(4) Collar
(5) Brake Disc
(6) Brake Plate
(7) Clutch Case
(8) Seal Ring

W1024435



3TMABAB2P031A

Brake Plate

1. Remove the brake plate mounting screws (3) and then take out the brake plate (4) and the springs (2).

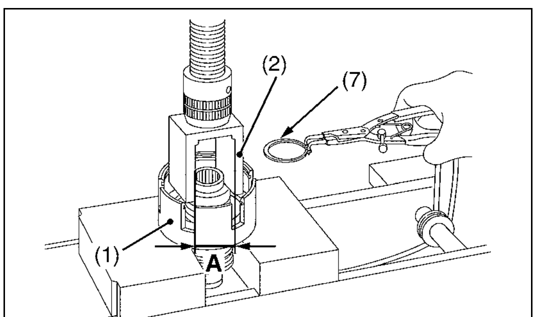
(When reassembling)

- Apply liquid lock (Three Bond 1372 or equivalent) to the brake plate mounting screws (3).

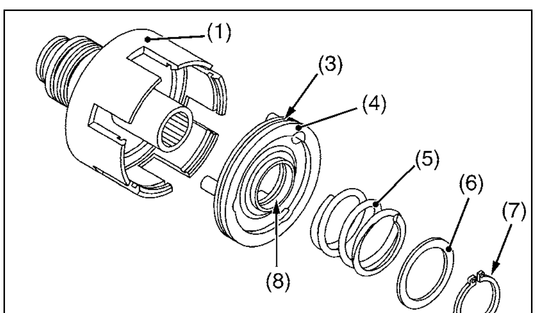
Tightening torque	Brake plate mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft-lbs

(1) Clutch Case
(2) Spring
(3) Brake Plate Mounting Screw
(4) Brake Plate

W1024606



3TMABAB2P032A



3TMABAB2P033A

Piston

1. Press the washer (6) lightly by the hand press, using the hand made jig. (Refer to the figure left.)
2. Draw out the piston (4).

(When reassembling)

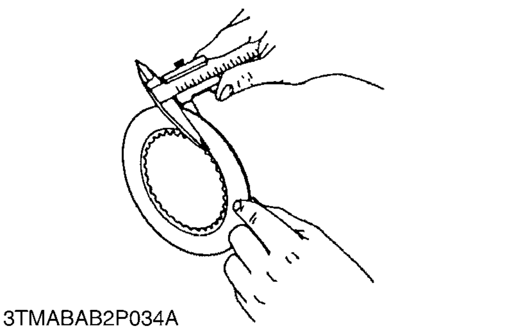
- Apply enough transmission fluid to seal rings (3) and (8).

(1) Clutch Case
(2) Jig
(3) Seal Ring
(4) Piston
(5) Spring
(6) Washer
(7) External Snap Ring
(8) Seal Ring

A : 41 mm (1.6 in.)

W1024734

(3) Servicing



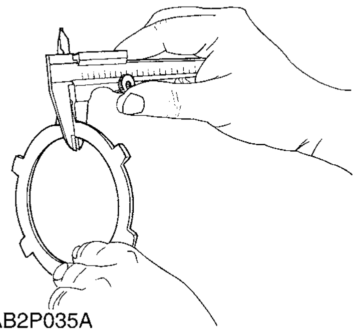
3TMABAB2P034A

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.	1.70 to 1.90 mm 0.067 to 0.075 in.
	Allowable limit	1.55 mm 0.061 in.

W1024926



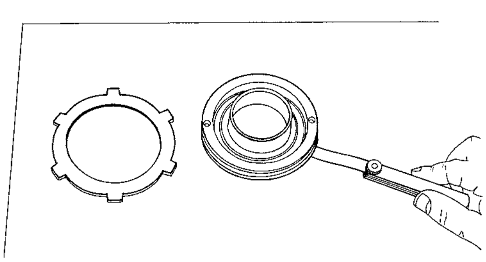
3TMABAB2P035A

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.	1.15 to 1.25 mm 0.045 to 0.049 in.
	Allowable limit	1.10 mm 0.043 in.

W1025021



3TMABAB2P036A

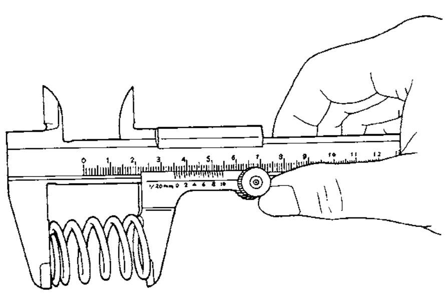
Flatness of PTO Piston and PTO Steel Plate

1. Place the part on a surface plate.
2. Check it unable 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



3TMABAB2P037A

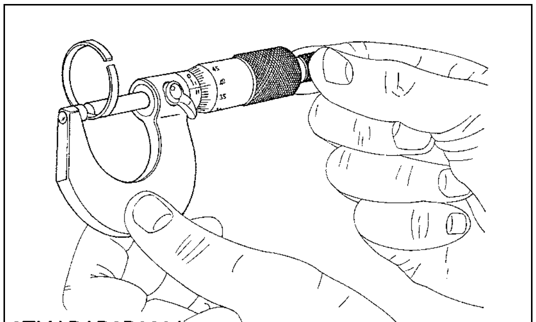
Piston Return Spring Free Length

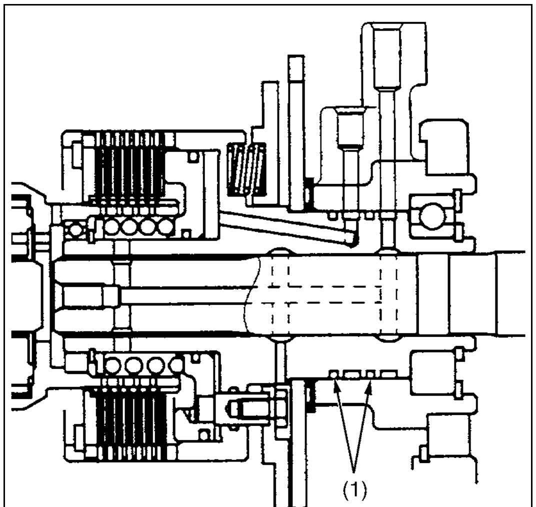
1. Measure the free length of spring with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

PTO return spring free length	Factory spec.	40.5 mm 1.59 in.
	Allowable limit	37.5 mm 1.48 in.

PTO brake spring free length	Factory spec.	20.3 mm 0.80 in.
	Allowable limit	18.0 mm 0.71 in.

W1025269


3TMABAB2P038A



3TMACAB2P053A

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

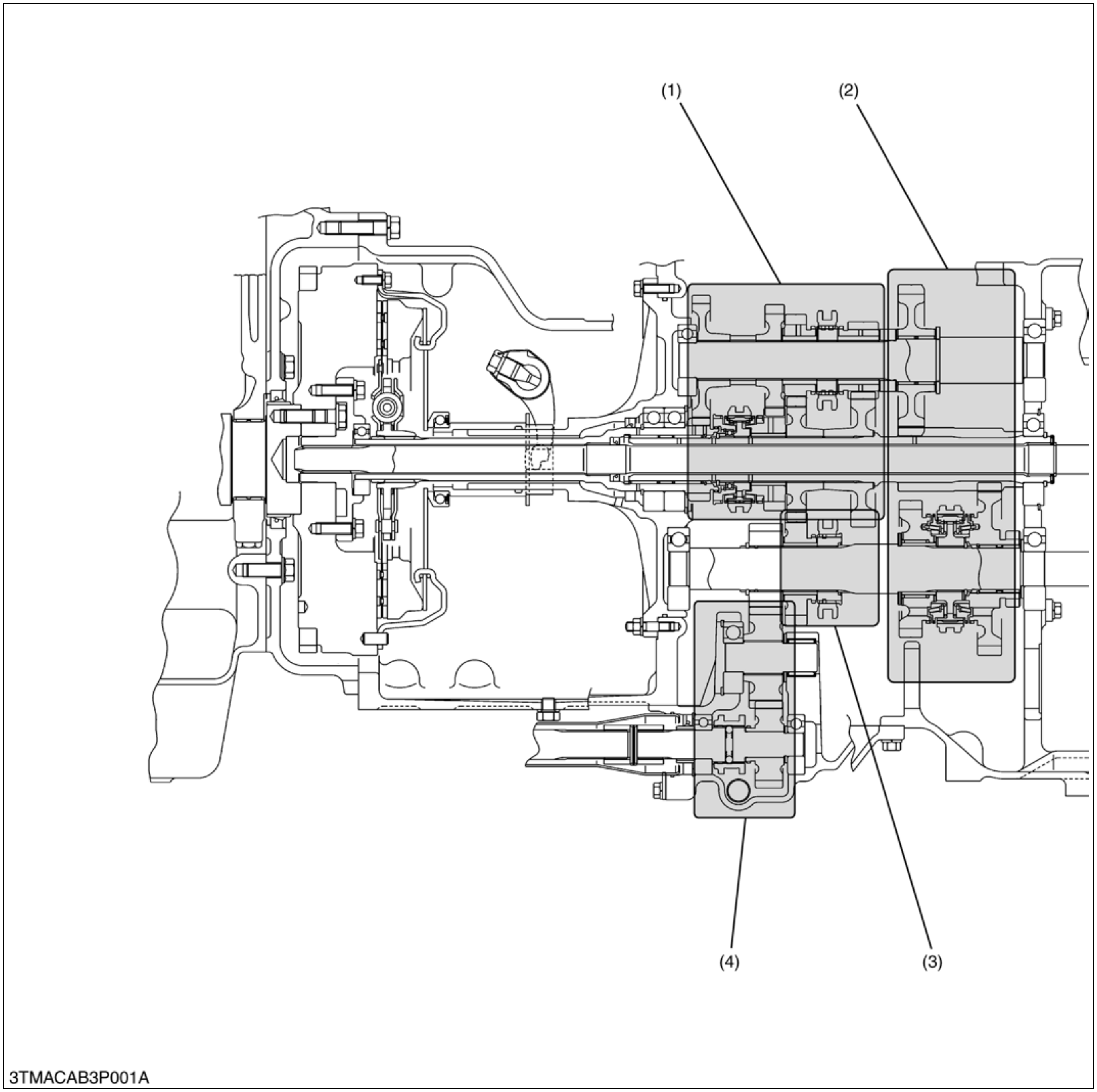
3 TRANSMISSION

MECHANISM

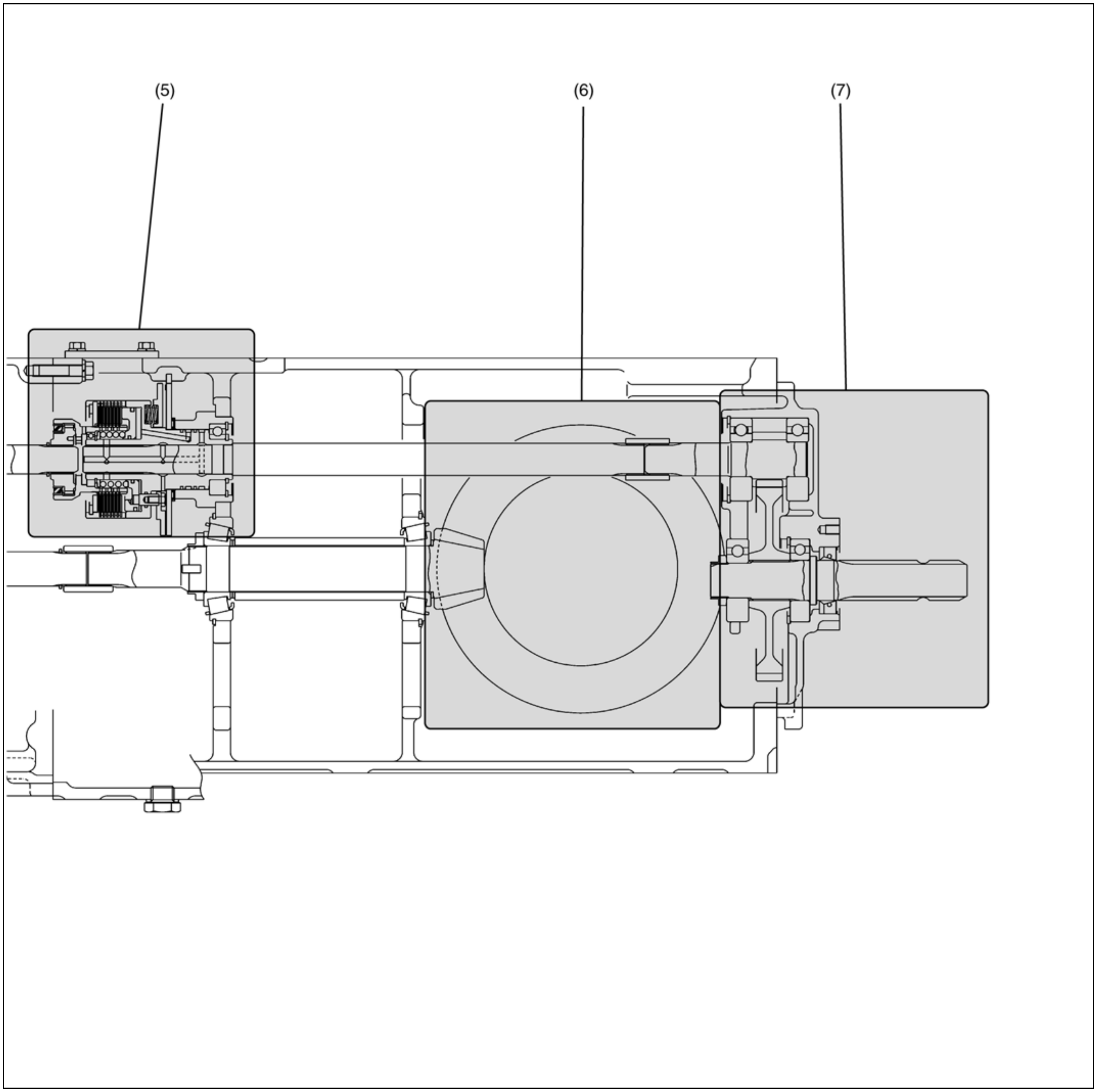
CONTENTS

1. STRUCTURE

[1] M6800

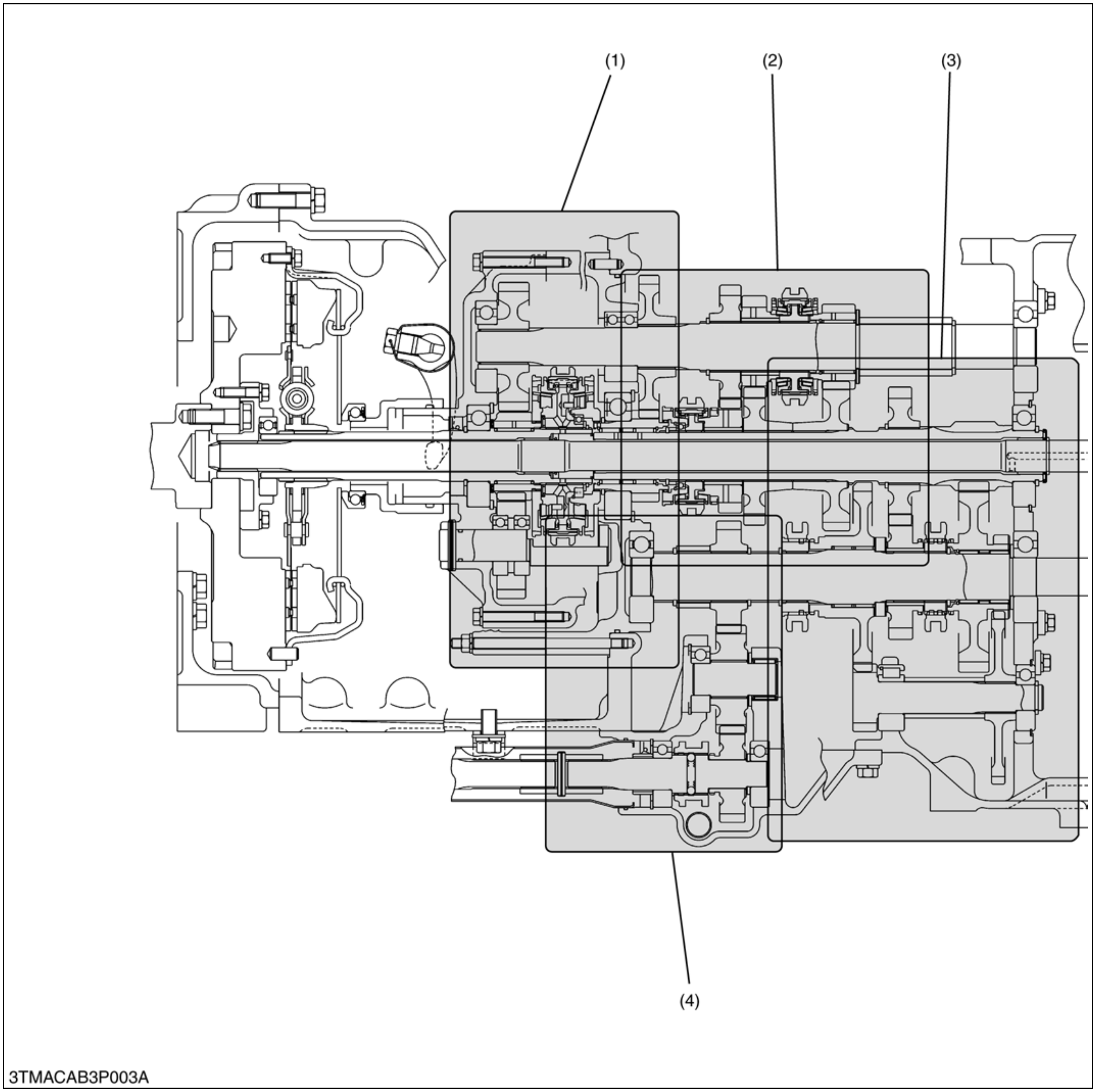


(1) Main Gear Shift Section
(2) Shuttle Shift Section (Lo-Reverse)
(3) Hi-Creep Shift Section
(4) Four Wheel Drive Section

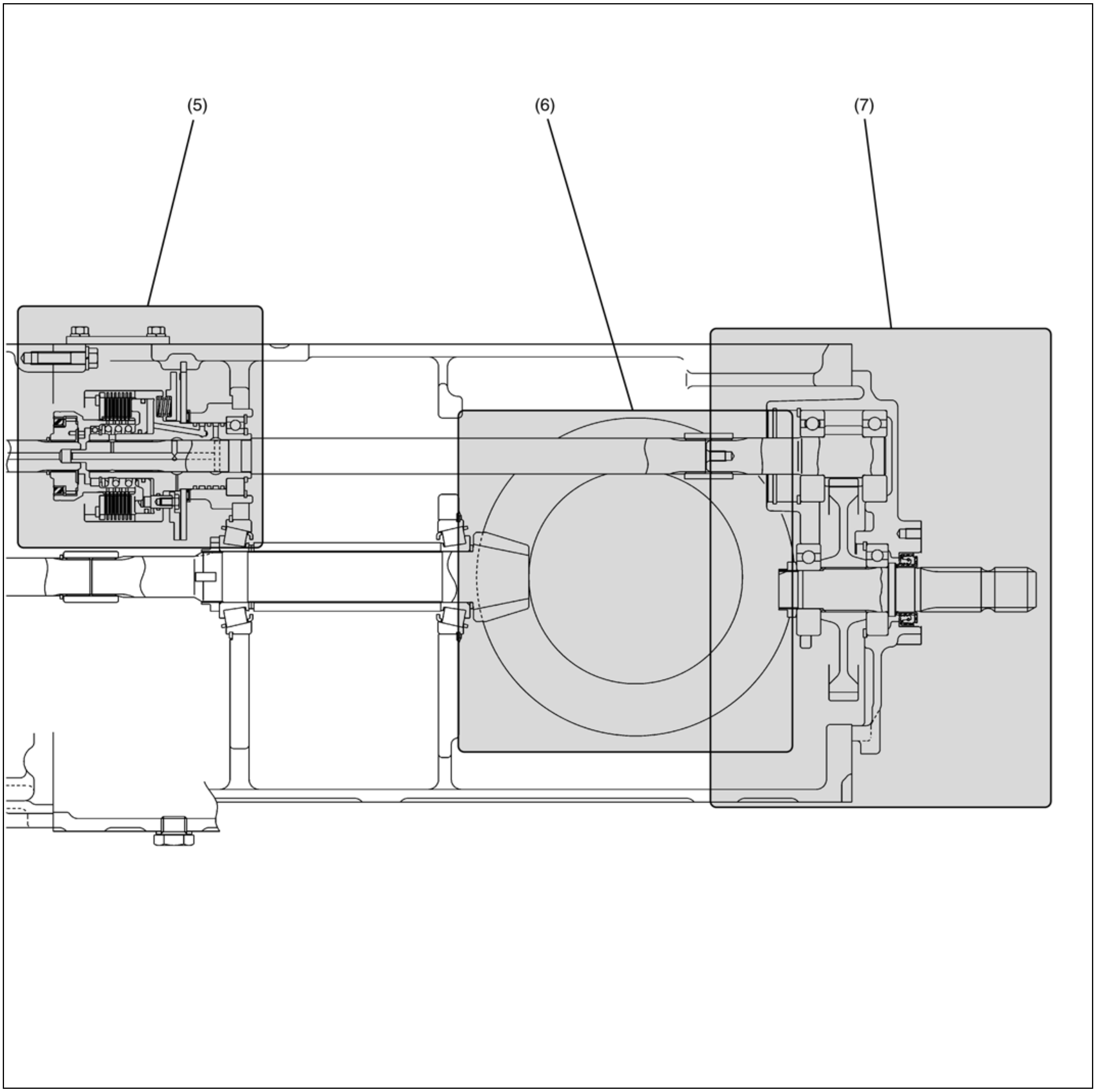


(5) PTO Clutch Section (6) Differential Gear Section (7) PTO Gear Section

[2] M6800S

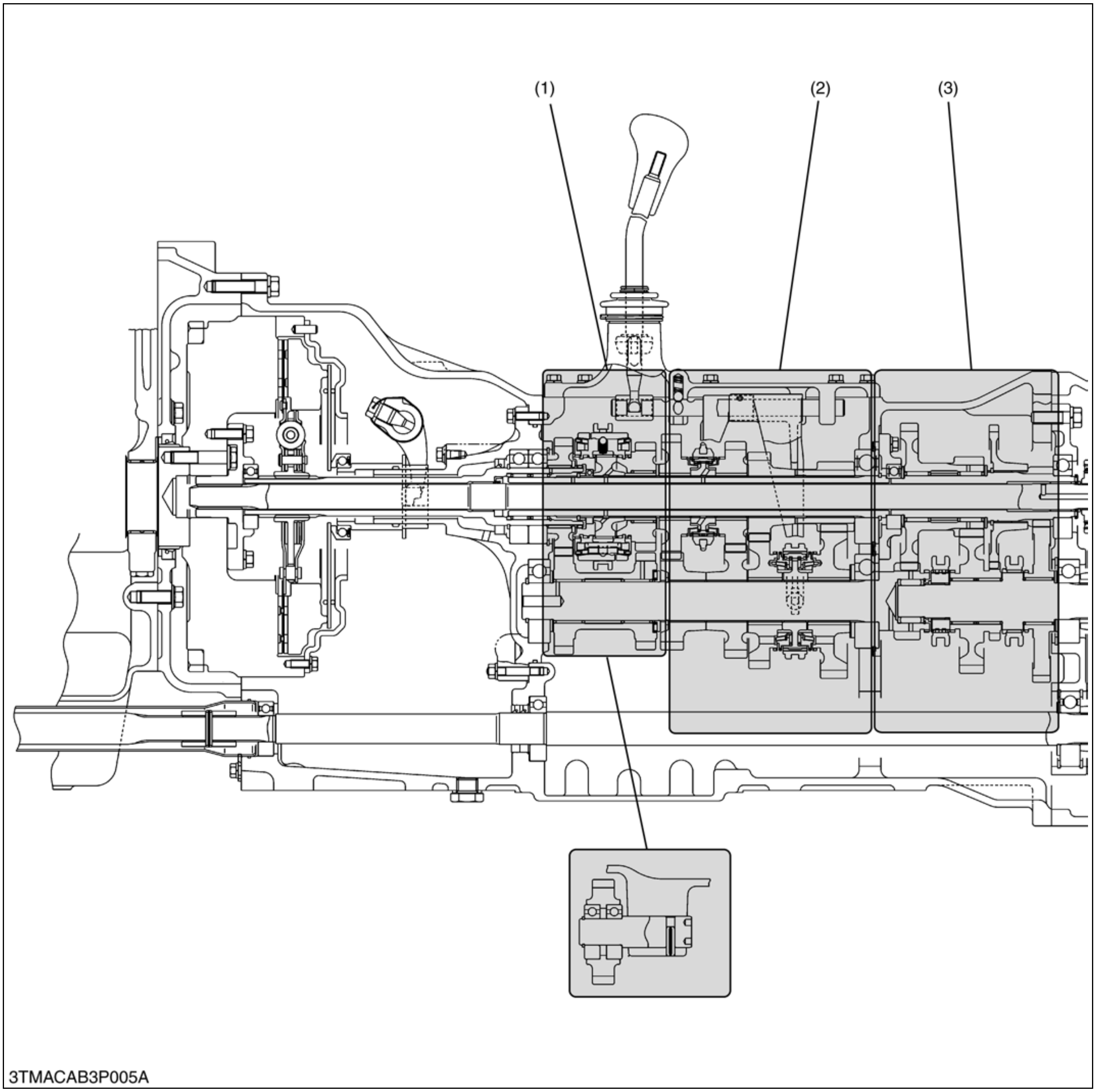


(1) Shuttle Shift Section (Forward-Reverse)
(2) Main Gear Shift Section
(3) Hi-Low, Creep (Option) Section
(4) Four Wheel Drive Section

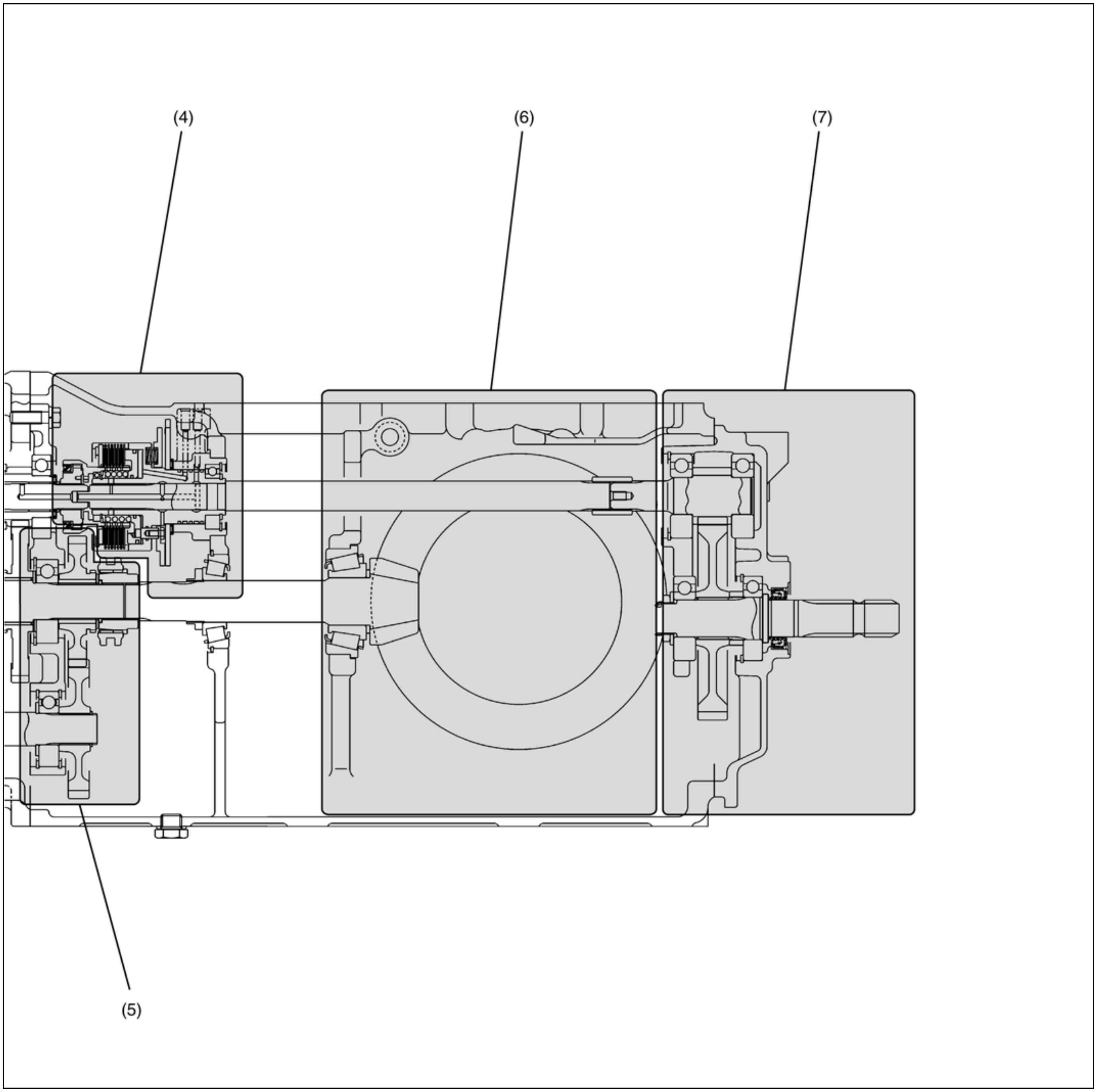


(5) PTO Clutch Section (6) Differential Gear Section (7) PTO Gear Section

[3] M8200 · M9000



(1) Shuttle Shift Section (Forward-Reverse)
(2) Main Gear Shift Section
(3) Hi-Lo, Creep Shift Section
(4) PTO Clutch Section



(5) Four Wheel Drive Section (6) Differential Gear Section (7) PTO Gear Section

The transmission consist of a series of gears and shafts show previously. It offers the most suitable speed for travelling and operation by combination of these gears. It transmits power to the front axle (4WD Type), rear axle and PTO shaft, which are classified respectively as the travelling system and PTO system.

■ Travelling System

Model M6800 is equipped a transmission with 8 forward and 4 reverses. (12 forwards and 4 reverses, if the tractor is equipped creep speed gear.)

Model M6800S, M8200 and M9000 are equipped a transmission with 8 forward and 8 reverses. (12 forwards and 12 reverses, if the tractors are equipped creep speed gear.)

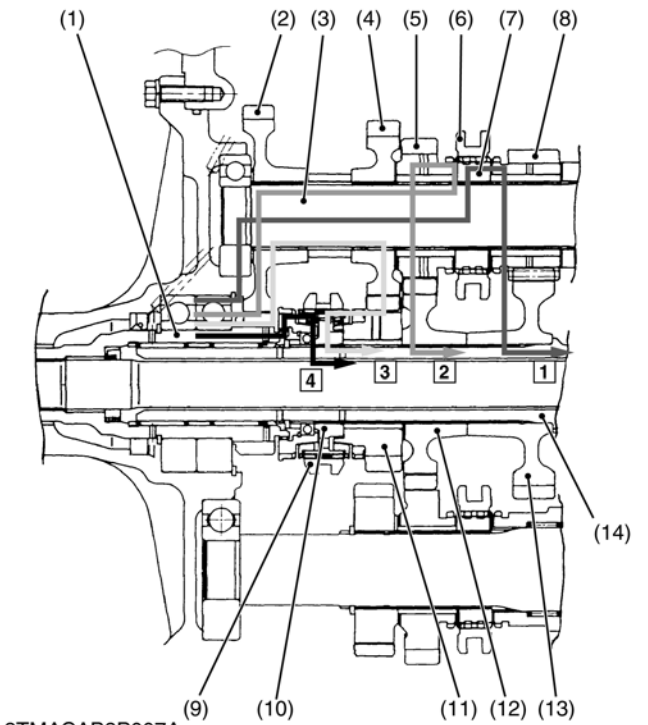
The travelling system consist of main gear shift section, shuttle shift section (Forward-Reverse), Hi-Low, Creep shift section (If equipped).

■ PTO System

All models have live PTO's (Independent PTO's) which have their own clutch controls completely separated from the travelling clutch and transmission. This means that the PTO operation is independent of the tractor travel. With this device have equipped with a hydraulic PTO clutch (wet multi-plates type clutch). (Refer to **"CLUTCH"** section.)

2. TRAVELLING SYSTEM

[1] MAIN GEAR SHIFT SECTION



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[M6800]

The main shift section uses a constant-mesh (1st - 2nd speed) type and synchromesh (3rd - 4th speed) type transmission.

Rotary power which is transmission from the engine to the gear shaft via the clutch is change in four ways by operating the main shift lever to shift the shifters, and transmits to the 2nd shaft.

The power is transmitted as follows.

■ **1st Speed**

21T Gear Shaft (1) → 34T Gear (2) → 1st Shaft (3) → Hub (7) → Shifter (6) → 19T Gear (8) → 36T Gear (13) → 2nd Shaft (14).

■ **2nd Speed**

21T Gear Shaft (1) → 34T Gear (2) → 1st Shaft (3) → Hub (7) → Shifter (6) → 17T Gear (5) → 24T Gear (12) → 2nd Shaft (14).

■ **3rd Speed**

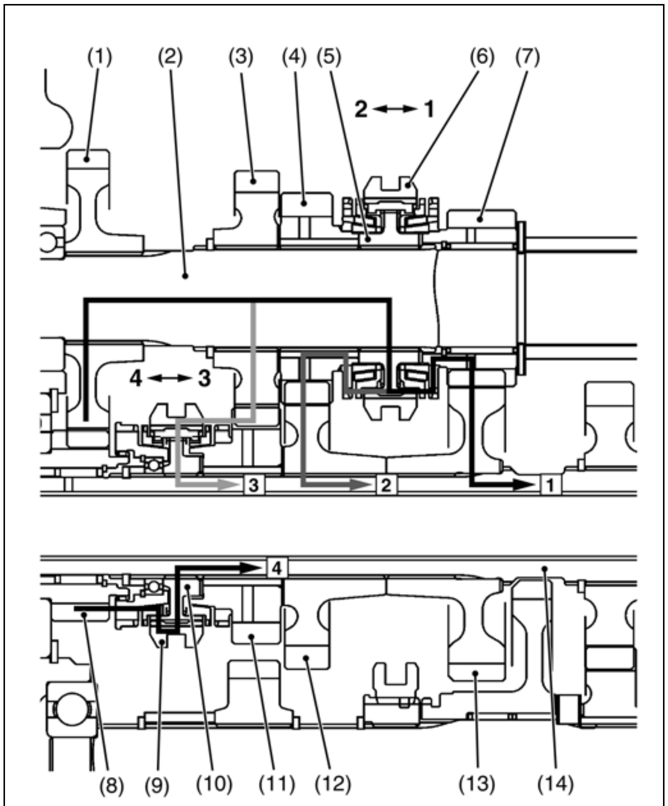
21T Gear Shaft (1) → 34T Gear (2) → 1st Shaft (3) → 25T Gear (4) → 23T Gear (11) → Shifter (9) → Hub (10) → 2nd Shaft (14).

■ **4th Speed**

21T Gear Shaft (1) → Shifter (9) → Hub (10) → 2nd Shaft (14).

(1) 21T Gear Shaft	(8) 19T Gear
(2) 34T Gear	(9) Shifter
(3) 1st Shaft	(10) Hub
(4) 25T Gear	(11) 23T Gear
(5) 17T Gear	(12) 24T Gear
(6) Shifter	(13) 36T Gear
(7) Hub	(14) 2nd Shaft

W1013055



3TMACAB3P008A

[M6800S]

The main shift section uses a synchromesh type transmission.

■ **1st Speed**

21T Gear Shaft (8) → 34T Gear (1) → 1st Shaft (2) → Hub (5) → Shifter (6) → 19T Gear (7) → 36T Gear (13) → 2nd Shaft (14).

■ **2nd Speed**

21T Gear Shaft (8) → 34T Gear (1) → 1st Shaft (2) → Hub (5) → Shifter (6) → 17T Gear (4) → 24T Gear (12) → 2nd Shaft (14).

■ **3rd Shaft**

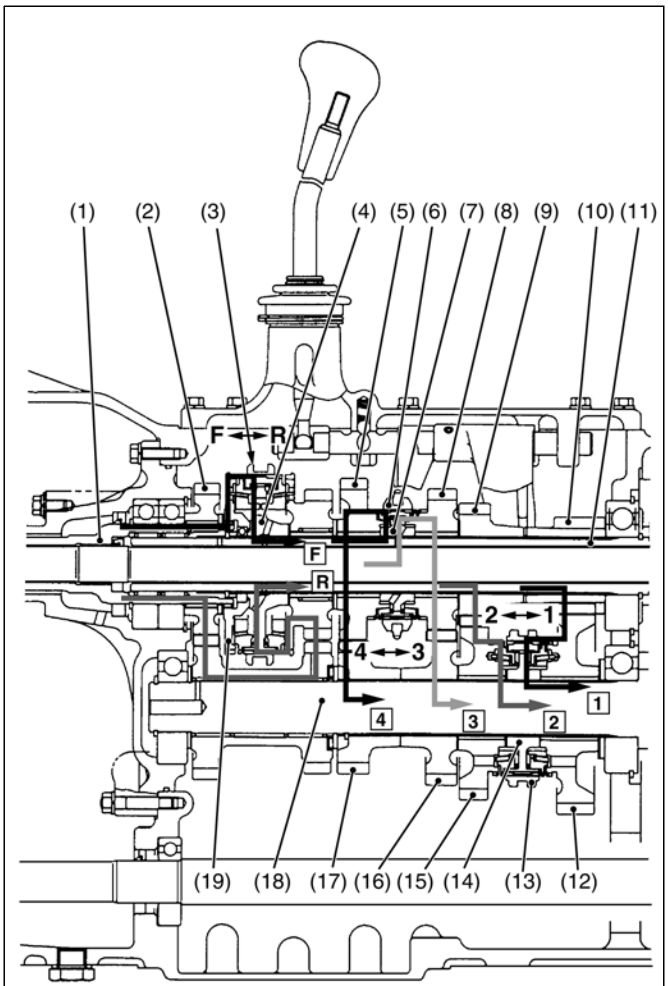
21T Gear Shaft (8) → 34T Gear (1) → 1st Shaft (2) → 25T Gear (3) → 23T Gear (11) → Shifter (9) → Hub (10) → 2nd Shaft (14).

■ **4th Speed**

21T Gear Shaft (8) → Shifter (9) → Hub (10) → 2nd Shaft (14).

(1) 34T Gear	(8) 21T Gear Shaft
(2) 1st Shaft	(9) Shifter
(3) 25T Gear	(10) Hub
(4) 17T Gear	(11) 23T Gear
(5) Hub	(12) 24T Gear
(6) Shifter	(13) 36T Gear
(7) 19T Gear	(14) 2nd Shaft

W1013285



3TMACAB3P009A

[M8200 · M9000]

The main shift section uses a synchromesh type transmission.

■ **1st Speed**

Input Shaft (1) → Holder (19) → Shifter (3) → Hub (4) → 1st Shaft (11) → 15T Gear (10) → 37T Gear (12) → Shifter (13) → Hub (14) → 18T Gear Shaft (18).

■ **2nd Speed**

Input Shaft (1) → Holder (19) → Shifter (3) → Hub (4) → 1st Shaft (11) → 20T Gear (9) → 32T Gear (15) → Shifter (13) → Hub (14) → 18T Gear Shaft (18).

■ **3rd Speed**

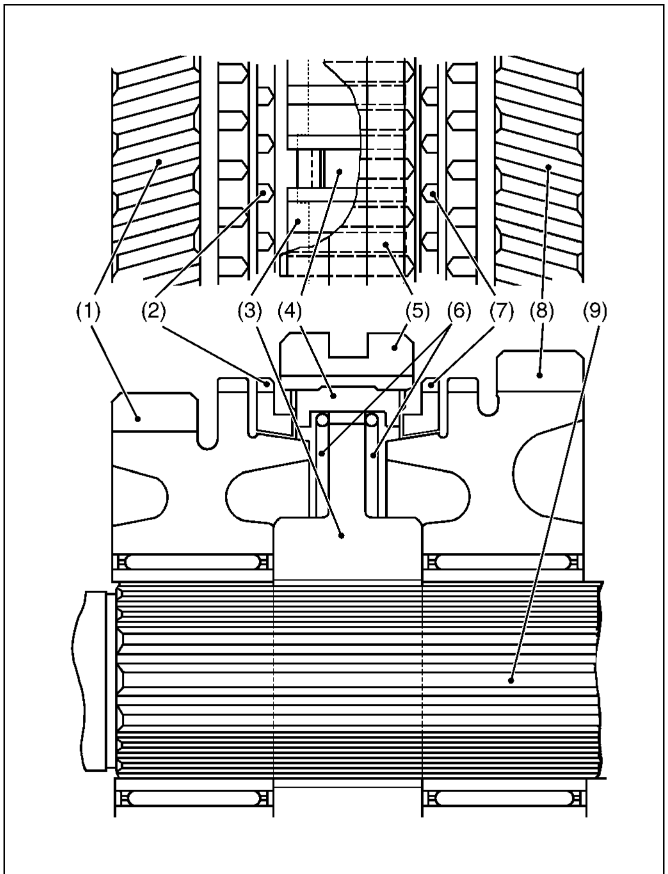
Input Shaft (1) → Holder (19) → Shifter (3) → Hub (4) → 1st Shaft (11) → Hub (7) → Shifter (6) → 26T Gear (8) → 27T Gear (16) → 18T Gear Shaft (18).

■ **4th Speed**

Input Shaft (1) → Holder (19) → Shifter (3) → Hub (4) → 1st Shaft (11) → Hub (7) → Shifter (6) → 30T Gear (5) → 23T Gear (17) → 18T Gear Shaft (18).

(1) Input Shaft	(11) 1st Shaft
(2) 28T Gear	(12) 37T Gear
(3) Shifter	(13) Shifter
(4) Hub	(14) Hub
(5) 30T Gear	(15) 32T Gear
(6) Shifter	(16) 27T Gear
(7) Hub	(17) 23T Gear
(8) 26T Gear	(18) 18T Gear Shaft
(9) 20T Gear	(19) Holder (Synchro)
(10) 15T Gear	

W1013508



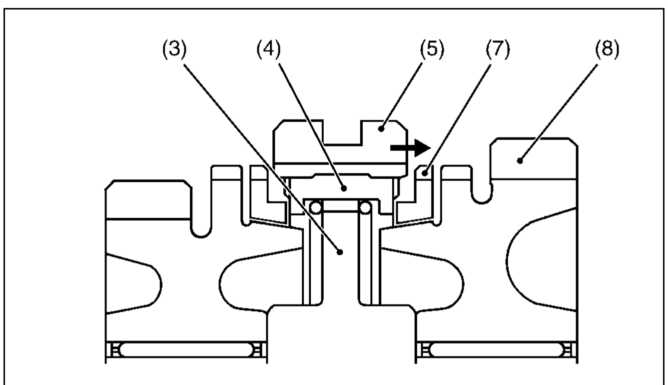
3TMACAB3P010A

■ Operation of Block-type Synchronizer

The coupling (3) is splined to the counter shaft (9) and the shifter (5) is mounted on the coupling. The two synchronizer springs (6) hold the synchronizer keys (4) out against the shifter (5). The bronze synchronizer rings (2), (7) each have three slots into which the ends of the synchronizer keys (4) fit. The inner surfaces of the synchronizer rings (2), (7) are cone-shaped and match the conical shape of the gear (1), (8) shoulders which they contact. These cone-shaped surfaces provide the frictional force to synchronize the speed of the first shaft and the gear (1), (8).

(1) Gear
(2) Synchronizer Ring
(3) Coupling
(4) Synchronizer Key
(5) Shifter
(6) Synchronizer Springs
(7) Synchronizer Ring
(8) Gear
(9) Counter Shaft

W1014654



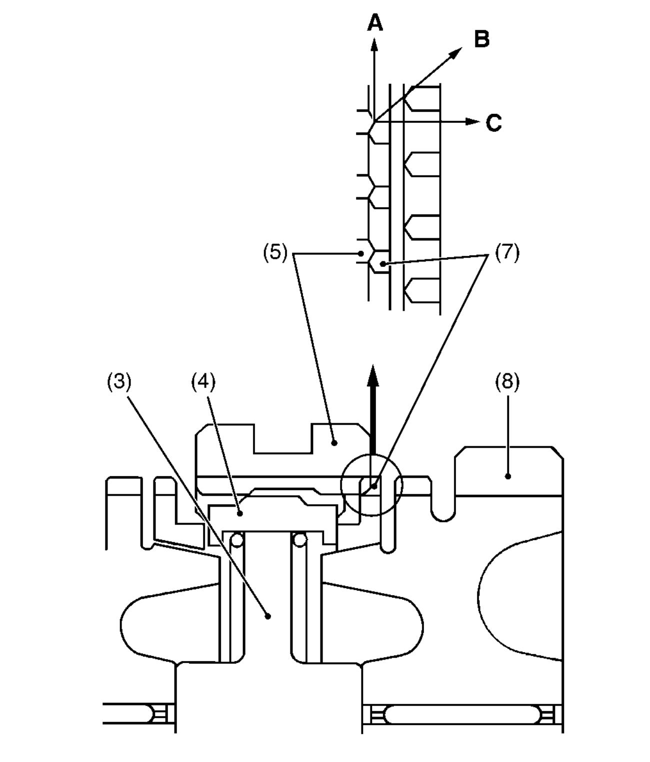
3TMACAB3P011A

● First Stage

An effort to place the main gear shift lever to the 2nd or 3rd speed causes the shifter (5) and synchronizer keys (4) to move slightly. Then, the end surface of the synchronizer key (4) presses the synchronizer ring (7) against the cone-shaped portion of the gear (8). The frictional force generated at the cone-shaped portion rotates the synchronizer ring (7), synchronizer keys (4) and coupling (3) which is splined to the counter shaft.

(3) Coupling
(4) Synchronizer Key
(5) Shifter
(7) Synchronizer Ring
(8) Gear

W1014872



3TMACAB3P012A

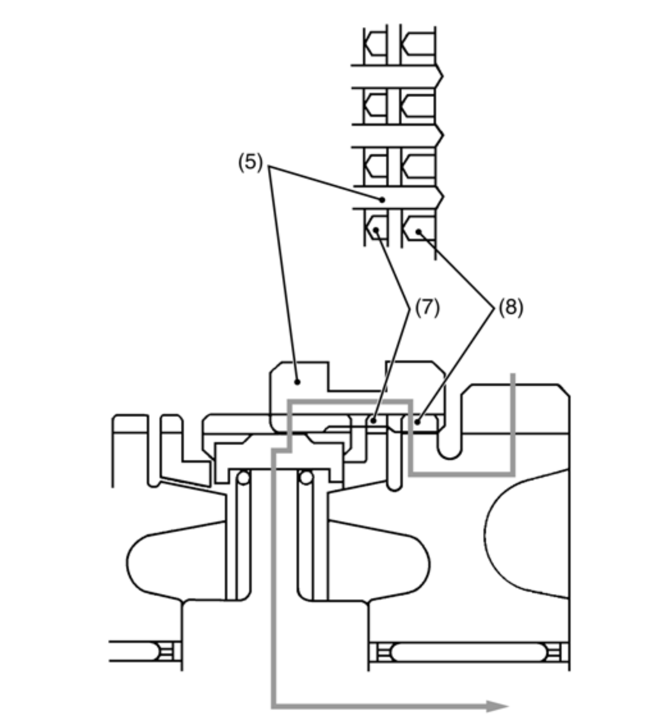
- **Second Stage**

When synchronizer keys (4) are prevented by the synchronizer ring (7) from sliding, the synchronizer keys (4) are disengaged from the shifter (5). The synchronizer keys (4) go into the grooves provided on the synchronizer ring (7), however, since the width of the grooves is wider than that of the keys, the synchronizer keys begin rotating at the same speed with the shifter (5) and coupling (3) with a time lag. In the meantime, the shifter (5) in tis sliding direction and the synchronizer ring (7) in its rotating direction press each other at their chamfered portions to synchronize the synchronizer ring (7) speed with the gear (8) speed.

(3) Coupling
(4) Synchronizer Key
(5) Shifter
(7) Synchronizer Ring
(8) Gear

A : Turning Effort
B : Composition of force
C : Force to Shift

W1015067



3TMACAB3P013A

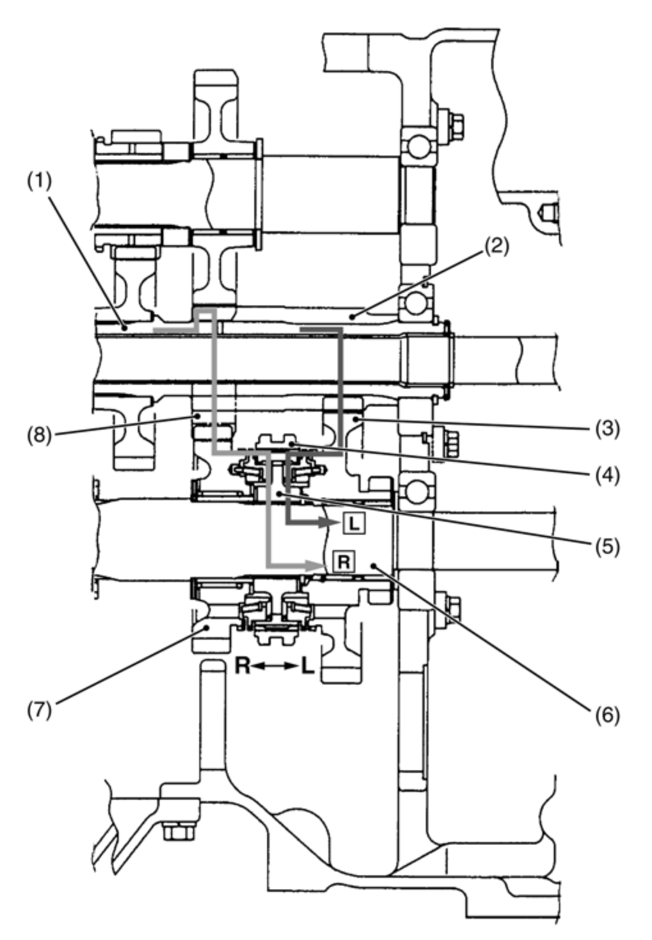
- **Final Stage**

When the shifter (5) speed becomes the same as the gear (8) speed, the force of the synchronizer ring (7) in its rotating direction is not applied to the shifter (5) and the synchronizer ring (7) rotation is no longer transmitted to the shifter (5). Therefore, the shifter (5) engages with the synchronizer ring (7) and further engages with the gear (8) for complete connection.

(5) Shifter
(7) Synchronizer Ring
(8) Gear

W1014968

[2] SHUTTLE SHIFT SECTION



3TMACAB3P014A

■ Lo-Reverse Synchro Shuttle [M6800]

The shuttle shift section allows the operators to change forward and reverse with an auxiliary speed change lever. It is used synchromesh type gear shift.

It also operates as a reduction until when shifting from forward to reverse.

When the auxiliary speed change lever is move to the **L** or **R** position, the shifter (4) is slid to the rear or front by the mechanical linkage to be engaged with the 32T (7) or 41T gear (3).

Then, the power is transmitted to the 3rd shaft (6).

The power is transmitted as follows.

● **Lo (Forward)**

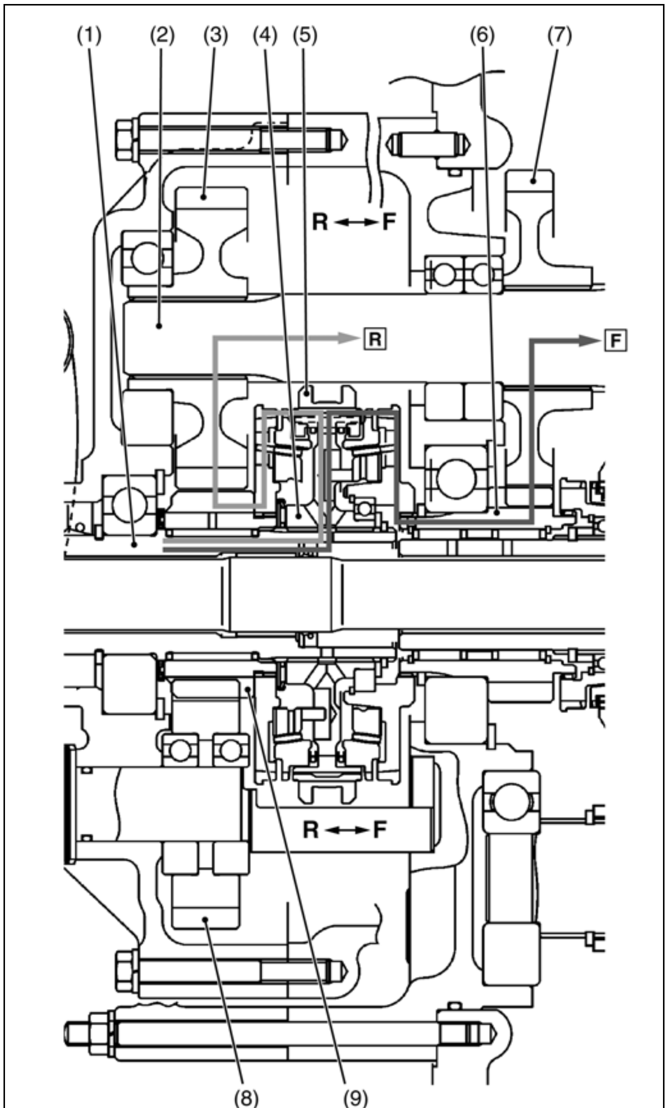
2nd Shaft (1) → 13T Gear (2) → 41T Gear (3) → Shifter (4) → Hub (5) → 3rd Shaft (6).

● **Reverse**

2nd Shaft (1) → 13T Gear (2) → 13T Gear (8) → 32T Gear (7) → Shifter (4) → Hub (5) → 3rd Shaft (6).

(1) 2nd Shaft	(5) Hub
(2) 13T Gear	(6) 3rd Shaft
(3) 41T Gear	(7) 32T Gear
(4) Shifter	(8) 13T Gear

W1015245



3TMACAB3P015A

■ **Forward-Reverse Synchro Shuttle [M6800S]**

The shuttle shift section allows the operators to change forward and reverse with a shuttle lever. It is used synchromesh type gear shift.

It also operates as a reduction until when shifting from forward to reverse.

When the shuttle lever is move to the F or R position, the shifter (5) is slid to the rear or front by the mechanical linkage to be engaged with the 21T gear shaft (6) or 20T gear (9).

Then, the power is transmitted to the 1st shaft (2).

The power is transmitted as follows.

● **Forward**

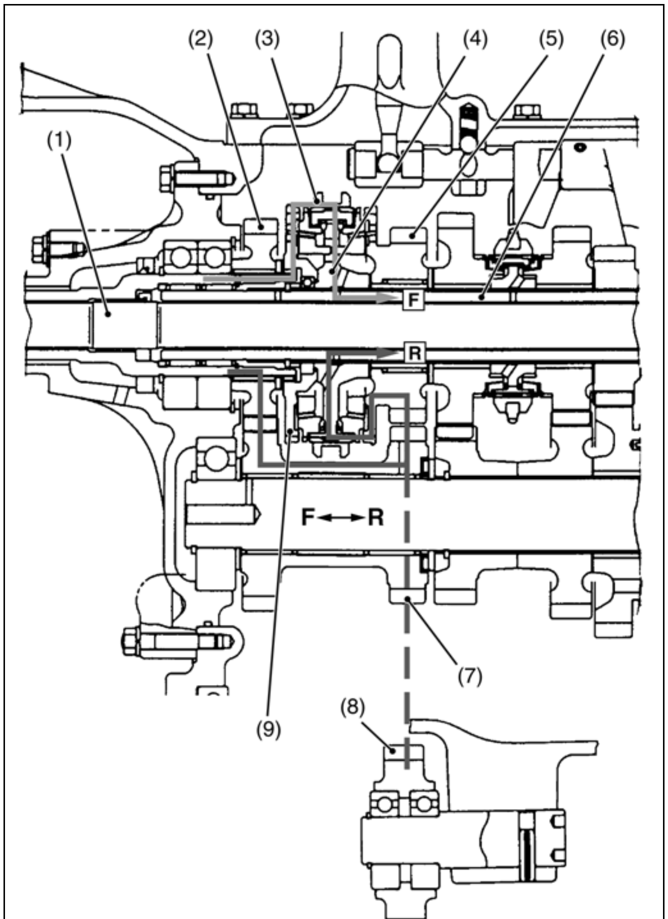
Gear Shift (1) → Hub (4) → Shifter (5) → 21T Gear Shaft (6) → 34T Gear (7) → 1st Shaft (2).

● **Reverse**

Gear Shift (1) → Hub (4) → Shifter (5) → 20T Gear (9) → 25T Gear (8) → 31T Gear (3) → 1st Shaft (2).

(1) Gear Shaft
(2) 1st Shaft
(3) 31T Gear
(4) Hub
(5) Shifter
(6) 21T Gear Shaft
(7) 34T Gear
(8) 25T Gear
(9) 20T Gear

W1013020



3TMACAB3P016A

■ Forward-Reverse Synchro Shuttle [M8200 · M9000]

The shuttle shift section allows the operators to change forward and reverse with a shuttle lever. It is used synchromesh type gear shift.

● Forward

Input Shaft (1) → Holder (9) → Shifter (3) → Hub (4) → 1st Shaft (6).

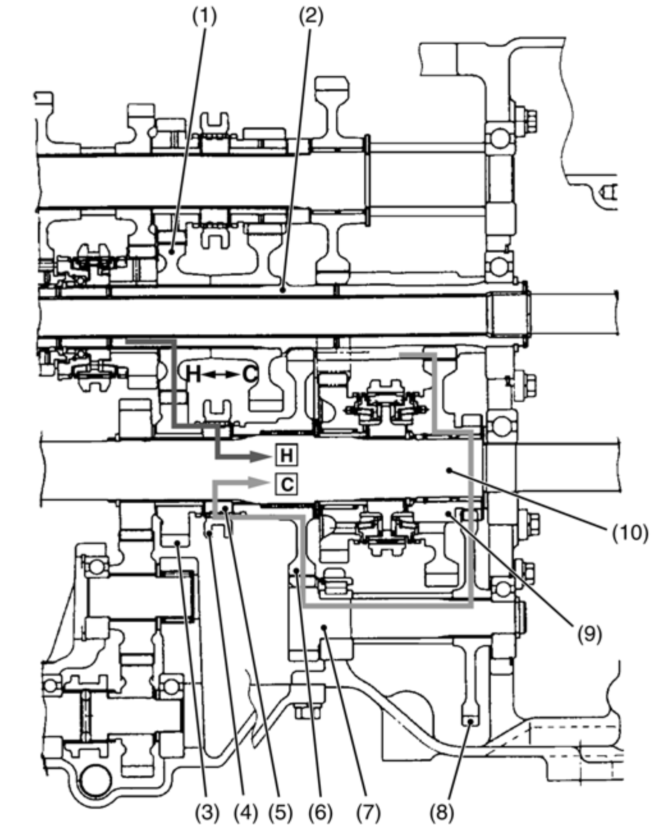
● Reverse

Input Shaft (1) → 28T Gear (2) → 25T-23T Gear (7) → 25T Gear (8) → 26T Gear (5) → Shifter (3) → Hub (4) → 1st Shaft (6).

(1) Input Shaft
(2) 28T Gear
(3) Shifter
(4) Hub
(5) 26T Gear
(6) 1st Shaft
(7) 25T-23T Gear
(8) 25T Gear
(9) Holder (Synchro)

W1015499

[3] HI-CREEP SHIFT SECTION (IF EQUIPPED)



3TMACAB3P017A

■ **Hi-Creep Shift [M6800]**

The Hi-Creep shift section allows the operator to change Hi and Creep with an auxiliary speed change lever.

When the auxiliary speed change lever is move to the Hi or Creep position, the shifter (4) is slide to the front or rear by mechanical linkage to be engaged with the 21T gear (3) or 47T gear (6).

The power is transmitted as follows.

● **Hi-Range**

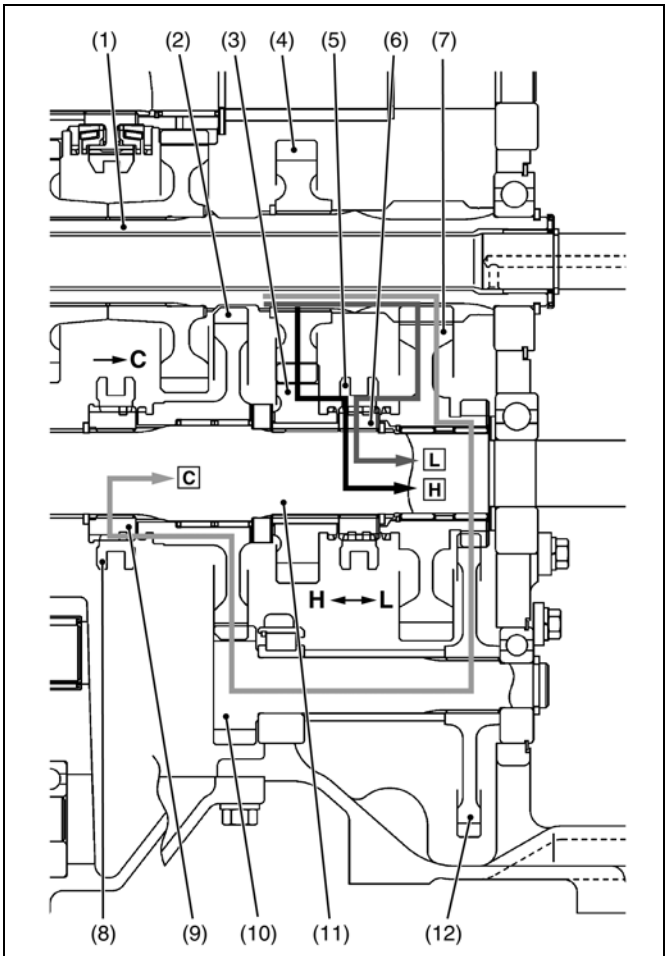
2nd Shaft (2) → 24T Gear (1) → 21T Gear (3) → Shifter (4) → Hub (5) → 3rd Shaft (10).

● **Creep Range (if equipped)**

2nd Shaft (2) → 41T-19T Gear (9) → 43T Gear (8) → 15T Gear Shaft (7) → 47T Gear (6) → Shifter (4) → Hub (5) → 3rd Shaft (10).

(1) 24T Gear
(2) 2nd Shaft
(3) 21T Gear
(4) Shifter
(5) Hub
(6) 47T Gear
(7) 15T Gear Shaft
(8) 43T Gear
(9) 41T-19T Gear
(10) 3rd Shaft

W1015974



3TMACAB3P018A

Hi-Lo, Creep Shift [M6800S]

The Hi-Lo, creep shift section allows the operator to change Hi-Low and creep with an auxiliary speed change lever is move to the Hi-Low or creep position. The Hi-Low shifter (5) is slide to the front or rear by mechanical linkage to be engaged with the 21T gear (3) or 41T-19T gear (7).

The creep shifter (8) is slide the rear 47T gear (2).

then, power is transmitted as follows.

- **Hi Range**

2nd Shaft (1) → 24T Gear (4) → 21T Gear (3) → Shifter (5) → Hub (6) → 3rd Shaft (11).

- **Low Range**

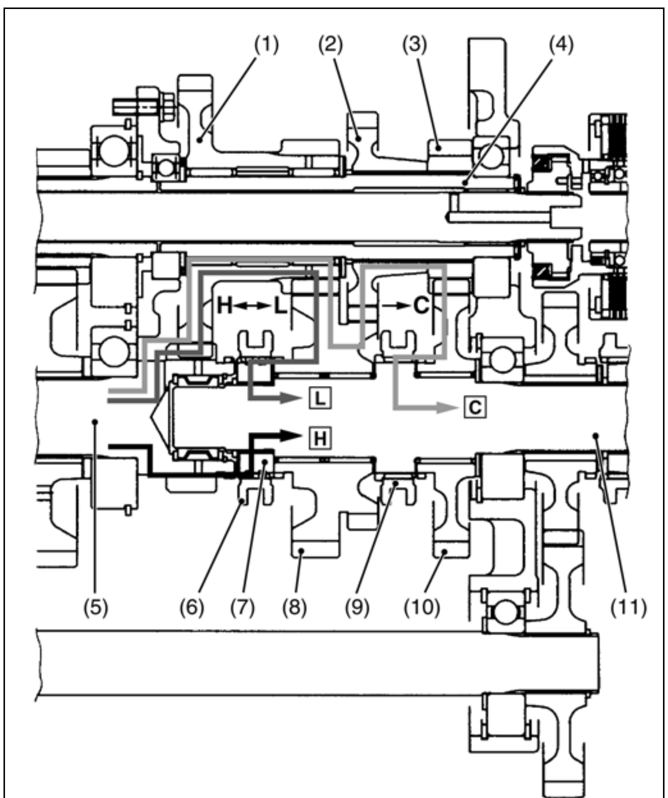
2nd Shaft (1) → 41T-19T Gear (7) → Shifter (5) → Hub (6) → 3rd Shaft (11).

- **Creep Range**

2nd Shaft (1) → 41T-19T Gear (7) → 43T Gear (12) → 15T Gear Shaft (10) → 47T Gear (2) → Shifter (8) → Hub (9) → 3rd Shaft (11).

(1) 2nd Shaft	(7) 41T-19T Gear
(2) 47T Gear	(8) Shifter
(3) 21T Gear	(9) Hub
(4) 24T Gear	(10) 15T Gear Shaft
(5) Shifter	(11) 3rd Shaft
(6) Hub	(12) 43T Gear

W1014713



3TMACAB3P019A

Hi-Lo, Creep Shift [M8200 · M9000]

- **Hi-Range**

18T Gear Shaft (5) → Shifter (6) → Hub (7) → Shaft (11).

- **Lo-Range**

18T Gear Shaft (5) → 38T-19T Gear (1) → 37T 29T Gear (8) → Shifter (6) → Hub (7) → Shaft (11).

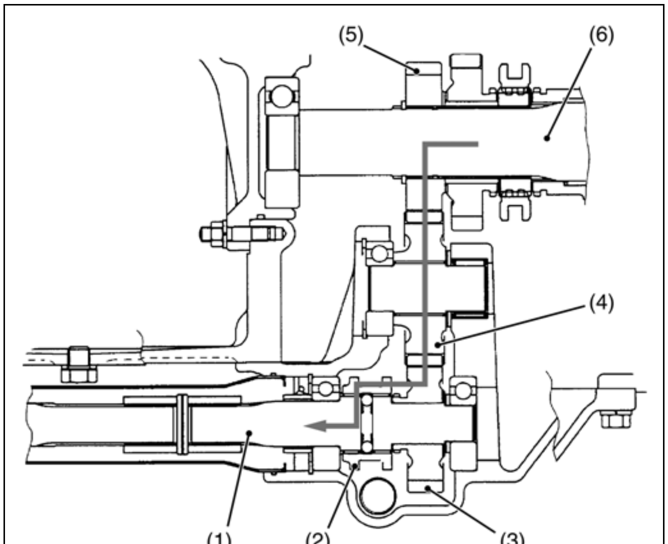
- **Creep Range (if equipped)**

18T Gear Shaft (5) → 38T-19T Gear (1) → 37T-29T Gear (8) → 27T Gear (2) → Shaft (4) → 19T Gear (3) → 37T Gear (10) → Shifter (9) → Shaft (11).

(1) 38T-19T Gear	(7) Hub
(2) 27T Gear	(8) 37T-29T Gear
(3) 19T Gear	(9) Shifter
(4) Shaft	(10) 37T Gear
(5) 18T Gear Shaft	(11) Shaft
(6) Shifter	

W1015855

[4] FOUR WHEEL DRIVE SECTION (4WD ONLY)



3TMACAB3P020A

[M6800(S)]

2 wheel drive or 4 wheel drive is selected by changing the position of shifter (2) on the propeller shaft 1 (1) using the front wheel drive lever.

When the front wheel drive lever is set to **"Disengaged"**, the shifter is in neutral and power is not transmitted to the propeller shaft 1 (1).

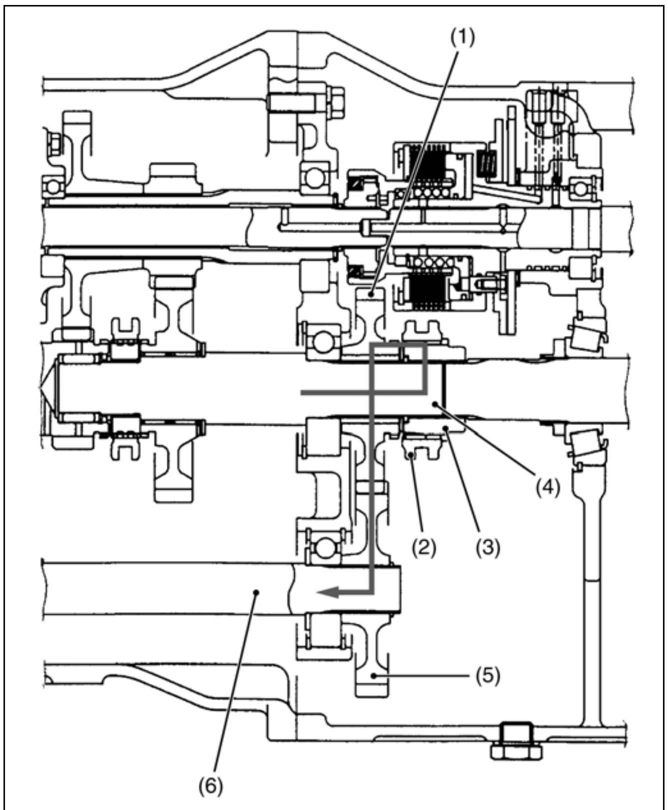
Power is transmitted as follows.

■ **4 Wheel Drive Engaged**

3rd Shaft (6) → 21T Gear (5) → 25T Gear (4) → 23T Gear (3) → Shifter (2) → Propeller Shaft 1 (1).

(1) Propeller Shaft 1	(4) 25T Gear
(2) Shifter	(5) 21T Gear
(3) 23T Gear	(6) 3rd Shaft

W1016612



3TMACAB3P021A

[M8200 · M9000]

■ **4 Wheel Drive Engaged**

Shaft (4) → Coupling (3) → Shifter (2) → 32T Gear (1) → 36T Gear (5) → Propeller Shaft (6).

(1) 32T Gear	(4) Shaft
(2) Shifter	(5) 36T Gear
(3) Coupling	(6) Propeller Shaft

W1016528

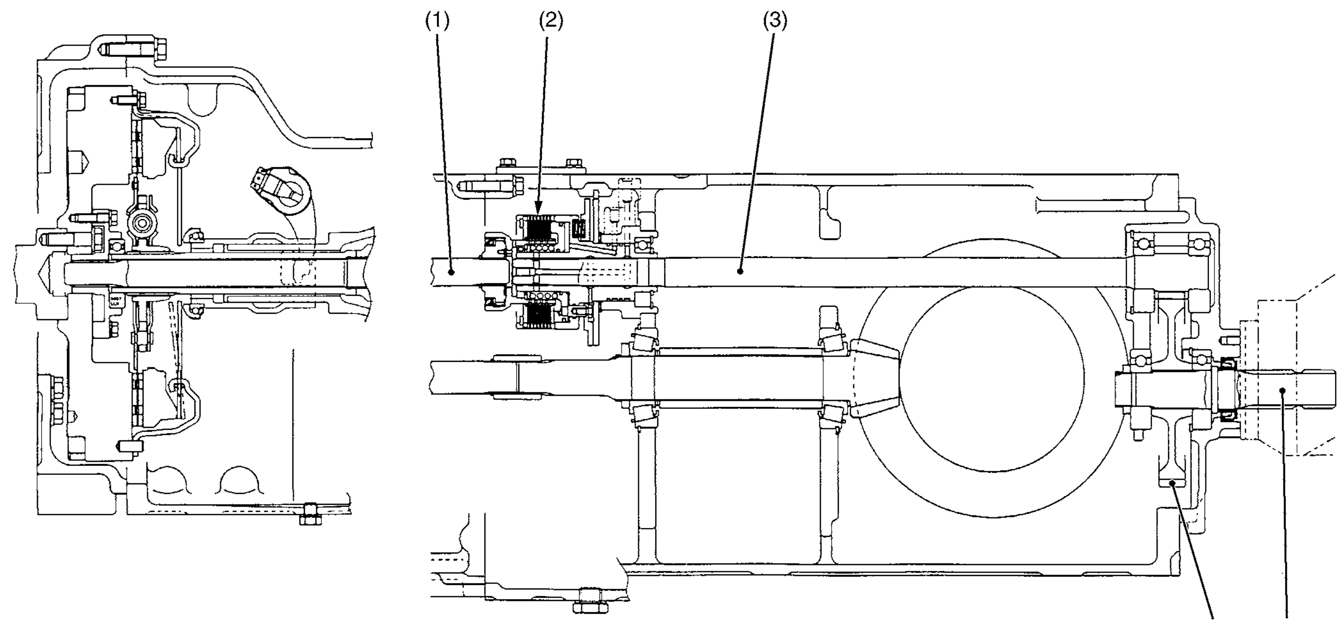
3. PTO SYSTEM

All models have Live PTO's (Independent PTO's) which have their own clutch controls completely separate from the travelling clutch and transmission.

Therefore, the PTO can operate while the tractor is stopped and also the PTO can be disengaged and engaged while the tractor is in motion.

The PTO system offers 540 min^{-1} (rpm), 1000 min^{-1} (rpm) on the rear PTO speed.

[1] FIXED PTO SHAFT TYPE WITH SINGLE SPEED (540 min^{-1} (rpm))



3TMACAB3P022A

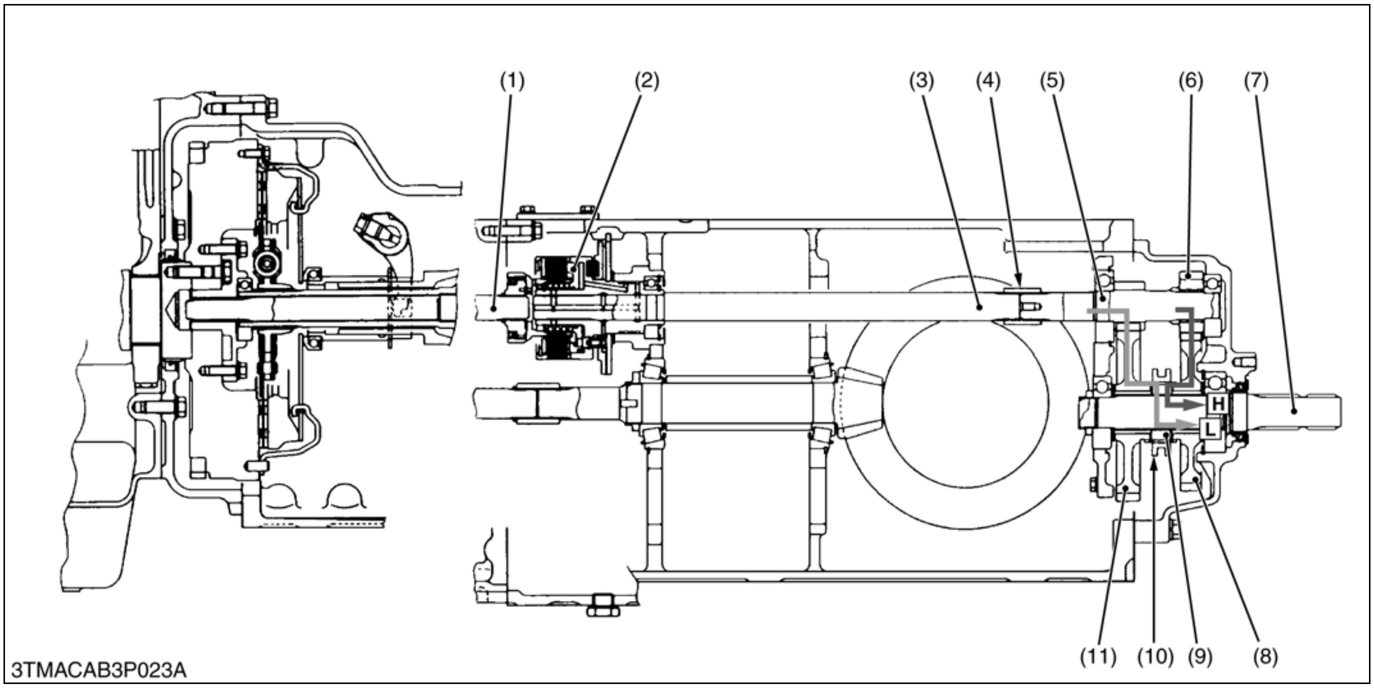
(1) PTO Propeller Shaft
(2) PTO Clutch
(3) Gear Shaft
(4) Gear
(5) PTO Shaft

By operating the PTO clutch lever from **"OFF"** to **"ON"** position to engage the PTO clutch (2), the PTO propeller shaft (1) is connected to the gear shaft (3).

So the rotation of PTO propeller shaft (1) is transmitted to the gear shaft (3), the power is transmitted as follows.

PTO Propeller Shaft (1) → PTO Clutch (2) → Gear Shaft (3) → Gear (4) → PTO Shaft (5).

[2] FIXED PTO SHAFT TYPE WITH TWO SPEEDS



(1) PTO Propeller Shaft
(2) PTO Clutch
(3) PTO Propeller Shaft 2
(4) Coupling
(5) Gear Shaft
(6) Gear
(7) PTO Shaft
(8) Gear
(9) Hub
(10) Shifter
(11) Gear

Besides neutral, two different PTO speeds are available by operating the shift lever, to shift position of the shifter (10). Power is transmitted as follows.

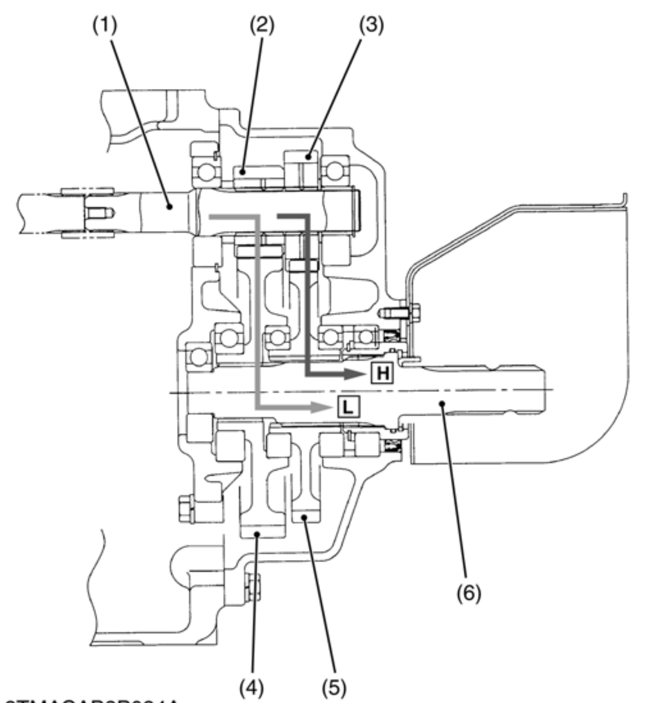
■ **Position H [540E, 1000 min^{-1} (rpm)]**

PTO Propeller Shaft (1) → PTO Clutch (2) → PTO Propeller Shaft 2 (3) → Coupling (4) → Gear Shaft (5) → Gear (6) → Gear (8) → Shifter (10) → Hub (9) → PTO Shaft (7).

■ **Position L [540 min^{-1} (rpm)]**

PTO Propeller Shaft (1) → PTO Clutch (2) → PTO Propeller Shaft 2 (3) → Coupling (4) → Gear Shaft (5) → Gear (11) → Shifter (10) → Hub (9) → PTO Shaft (7).

[3] INTERCHANGEABLE PTO SHAFT TYPE



3TMACAB3P024A

By interchanging the PTO shaft (6), two different PTO shaft speeds are available.

The power is transmitted as follows.

■ **Using 6-Spline PTO Shaft [540 min^{-1} (rpm)]**

PTO Transmitting Shaft (1) → Gear (2) → Gear (4) → PTO Shaft (6).

■ **Using 21-Spline PTO Shaft [1000 min^{-1} (rpm)]**

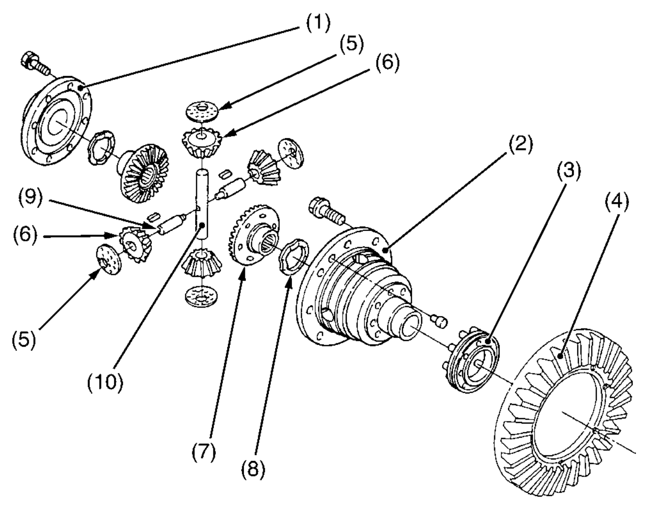
PTO Transmitting Shaft (1) → Gear (3) → Gear (5) → PTO Shaft (6).

(1) PTO Transmitting Shaft
(2) Gear
(3) Gear
(4) Gear
(5) Gear
(6) PTO Shaft

W1017341

4. DIFFERENTIAL GEAR

[1] STRUCTURE



3TMACAB3P025A

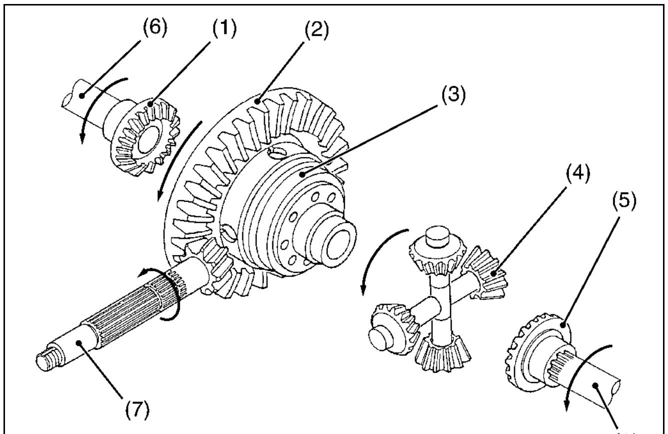
The differential gear assembly is a mechanism to provide smooth steering. It automatically provides different optimum torques to the right and left wheels according to road resistance and braking friction at the wheels.

The differential gear assembly is composed of the differential case, differential pinions, differential side gears, differential pinion shaft, ring gear etc..

(1) Differential Case Cover
(2) Differential Case
(3) Differential Lock Shifter
(4) Ring Gear
(5) Differential Pinion Washer
(6) Differential Pinion
(7) Differential Side Gear
(8) Differential Side Gear Washer
(9) Differential Pinion Shaft 2
(10) Differential Pinion Shaft

W1018394

[2] OPERATION



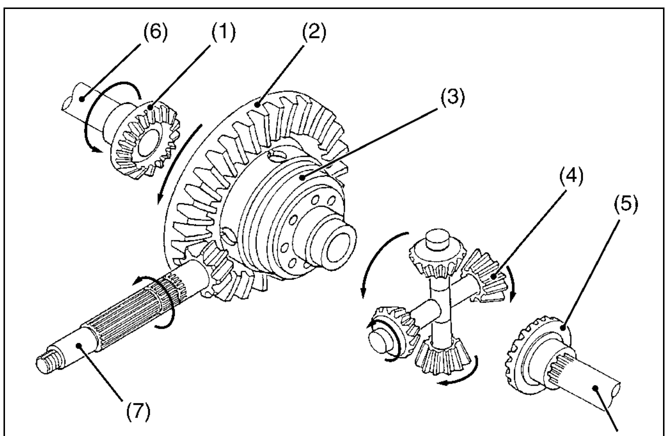
3TMACAB3P026A

■ Travelling Straight Ahead

Rotation of the spiral bevel pinion (7) is transmitted to the ring gear (2) bolted to the differential case (3). When road resistance to the right and left wheels are equal, the differential pinions (4), and differential side gears (1), (5) are carried around by the ring gear (2), and differential case (3) rotate as a unit. Differential gear shaft (6), (8) receive the same rotation and both wheels travel at the same speed.

(1) Differential Side Gear
(2) Ring Gear
(3) Differential Case
(4) Differential Pinion
(5) Differential Side Gear
(6) Differential Gear Shaft
(7) Spiral Bevel Pinion
(8) Differential Gear Shaft

W1018541



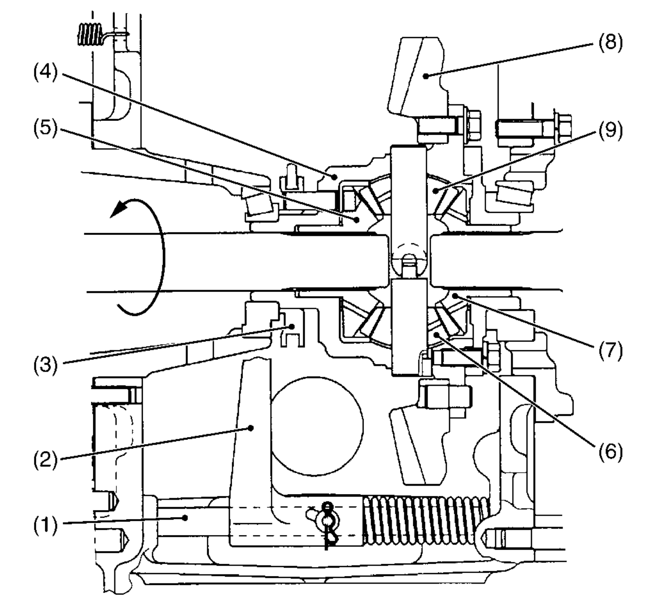
3TMACAB3P026B

■ Turning a Corner

The power from the engine on spiral bevel pinion (7) rotates ring gear (2). When turning a corner, the outer wheel must travel farther than the inner one. While differential pinions (4) rotate with the differential case (3), they spin on differential pinion shaft to transmit more rotation to one differential side gear than to the other. As one differential gear shaft rotates faster, the other rotates slower by the same amount.

(1) Differential Side Gear
(2) Ring Gear
(3) Differential Case
(4) Differential Pinion
(5) Differential Side Gear
(6) Differential Gear Shaft
(7) Spiral Bevel Pinion
(8) Differential Gear Shaft

W1018646



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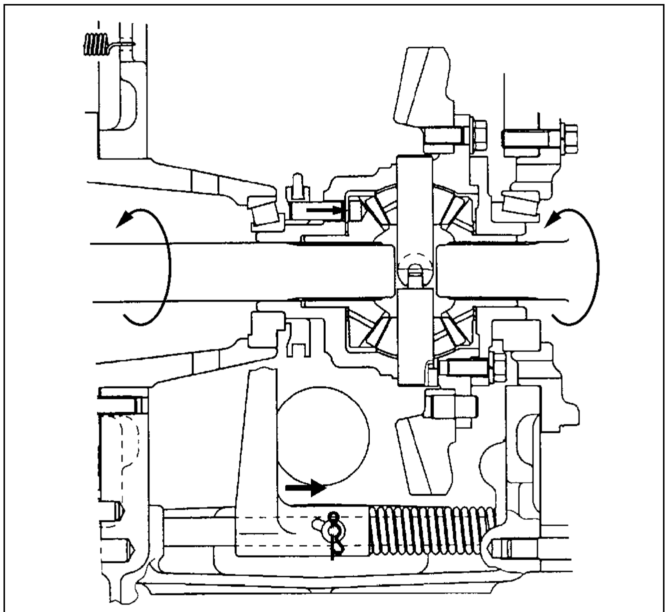
3TMACAB3P027B

■ **Differential Lock**

When resistances to the right and left tires are different due to ground conditions or type of work, the wheel with less resistance slips and prevents the tractor from moving ahead. To compensate for this, the differential lock restricts the differential function and causes both rear axles to rotate as a unit.

When the differential lock pedal is stepped on, it causes the differential lock cam shaft (1), differential lock shift fork (2) and differential lock shifter (3) are moved forward the ring gear (8).

The pins on the differential lock shifter (3) go into the holes in the differential side gear (5) through the holes in the differential case (4) to cause the differential case, differential lock shifter and differential side gear to rotate as a unit. Therefore the differential pinions (6), (9), can not rotate on their axles, and the rotation of the spiral bevel pinion is transmitted to the both rear axles evenly. It means the tractor going straight ahead.

When the drive wheels regain equal traction, the lock will disengage automatically by the force of differential lock pedal return spring, while released differential lock pedal.

(1) Differential Lock Cam Shaft
(2) Differential Lock Shift Fork
(3) Differential Lock Shifter
(4) Differential Case
(5) Differential Side Gear
(6) Differential Pinion
(7) Differential Side Gear
(8) Ring Gear
(9) Differential Pinion

W1018768

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Transmission Noise	• Transmission fluid insufficient • Improper backlash between bevel pinion shaft and bevel gear • Improper backlash between differential pinion and side gear • Collars or shims have not been installed • Bearing worn	Replenish Replace Adjust Repair Replace	G-11 3-S52, S53 3-S56 – 3-S32, S47
Gears Slip Out of Mesh	• Shifter or shift fork worn or damaged • Shift fork spring weaken or damaged • Interlock ball fallen • Synchronizer unit damaged	Replace Replace Reassemble Repair or replace	3-S33 – – 3-S33
Hard Shifting	• Shifter or shift fork worn or damaged • Shift fork rod bent • Synchronizer unit damaged	Replace Replace Repair or replace	3-S33 – 3-S33
Gears Clash When Shifting	• Synchronizer unit damaged • Clutch does not release	Repair or replace Adjust	3-S33 2-S4
Differential Lock Can Not Be Set	• Differential lock shift fork damage • Differential lock shift fork mounting spring pin damaged • Movement of differential lock shifter improperly adjusted	Replace Replace Adjust	3-S42, S43 3-S42, S43 3-S56, S57
Differential Lock Pedal Does Not Return	• Differential lock cam spring weaken or damaged • Differential shifter pin damaged	Replace Repair or replace	3-S42, S43 –

W1014322

2. SERVICING SPECIFICATIONS

[M6800]

Item		Factory Specification	Allowable Limit
Shift Fork to Shifter Groove	Clearance	0.13 to 0.40 mm 0.0051 to 0.0157 in.	0.8 mm 0.031 in.
Spiral Bevel Pinion Shaft (Old Type : With Collar)	Turning Torque	0.69 to 1.96 N·m 0.07 to 0.20 kgf·m 0.51 to 1.45 ft-lbs	–
Spiral Bevel Pinion Shaft (New Type : Without Collar)	Turning Torque	2.94 to 3.43 N·m 0.30 to 0.35 kgf·m 2.17 to 2.53 ft-lbs	–
Spiral Bevel Pinion Shaft and Differential Assembly Combined (Old Type : With Collar)	Turning Torque	2.0 to 4.4 N·m 0.20 to 0.45 kgf·m 1.5 to 3.2 ft-lbs	–
Spiral Bevel Pinion Shaft and Differential Assembly Combined (New Type : Without Collar)	Turning Torque	4.22 to 5.88 N·m 0.43 to 0.60 kgf·m 3.11 to 4.34 ft-lbs	–
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.20 to 0.30 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 0.204 mm 0.00315 to 0.00803 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	40.530 to 40.592 mm 1.59567 to 1.59811 in.	–
Differential Side Gear Boss	O.D.	40.388 to 40.450 mm 1.58008 to 1.59252 in.	–
Differential Case Cover Bore to Differential Side Gear Boss	Clearance	0.090 to 0.192 mm 0.00354 to 0.00756 in.	0.35 mm 0.0138 in.
Differential Case Cover Bore	I.D.	40.540 to 40.580 mm 1.59606 to 1.59764 in.	–
Differential Side Gear Boss	O.D.	40.388 to 40.450 mm 1.59008 to 1.59252 in.	–
Differential Pinion Shaft to Differential Pinion	Clearance	0.060 to 0.102 mm 0.00236 to 0.00402 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	I.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	–
Differential Pinion	O.D.	20.040 to 20.061 mm 0.78898 to 0.78980 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 Pedal	Free Travel	20.0 to 30.0 mm 0.79 to 1.18 in.	–
Differential Lock Shifter	Displacement	6.0 to 8.0 mm 0.236 to 0.315 in.	–

W1013874

[M6800S]

Item		Factory Specification	Allowable Limit
Shuttle Shift Rod	Length	Approx. 160 mm 6.3 in.	–
Shift Fork to Shifter Groove Shuttle	Clearance	0.20 to 0.45 mm 0.0079 to 0.0177 in.	0.80 mm 0.031 in.
Other	Clearance	0.15 to 0.40 mm 0.0059 to 0.0157 in.	0.80 mm 0.031 in.
Auxiliary Shift Rod	Length	Approx. 209 mm 8.23 in.	–
Spiral Bevel Pinion Shaft (Old Type : With Collar)	Turning Torque	0.69 to 1.96 N·m 0.07 to 0.20 kgf·m 0.51 to 1.45 ft-lbs	–
Spiral Bevel Pinion Shaft (New Type : Without Collar)	Turning Torque	2.94 to 3.43 N·m 0.30 to 0.35 kgf·m 2.17 to 2.53 ft-lbs	–
Spiral Bevel Pinion Shaft and Differential Assembly Combined (Old Type : With Collar)	Turning Torque	2.0 to 4.4 N·m 0.20 to 0.45 kgf·m 1.5 to 3.2 ft-lbs	–
Spiral Bevel Pinion Shaft and Differential Assembly Combined (New Type : Without Collar)	Turning Torque	4.22 to 5.88 N·m 0.43 to 0.60 kgf·m 3.11 to 4.34 ft-lbs	–
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case Bore (Differential Case Cover Bore) to Differential Side Gear Boss	Clearance	0.050 to 0.151 mm 0.00197 to 0.00594 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	–
Differential Case Cover Bore	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	–
Differential Side Gear Boss	O.D.	40.388 to 40.450 mm 1.59008 to 1.59252 in.	–
Differential Pinion Shaft to Differential Pinion	Clearance	0.060 to 0.102 mm 0.00236 to 0.00402 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	I.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	–
Differential Pinion	O.D.	20.040 to 20.061 mm 0.78898 to 0.78980 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.15 to 0.30 mm 0.0059 to 0.0119 in.	0.4 mm 0.016 in.
Differential Lock Pedal	Free Travel	20.0 to 30.0 mm 0.79 to 1.18 in.	–
Differential Lock Shifter	Displacement	6.0 to 8.0 mm 0.236 to 0.315 in.	–

W1094645

[M8200 · M9000]

Item		Factory Specification	Allowable Limit
Shuttle Rod	Length	268 mm 10.55 in.	–
Shift Fork to Shifter Groove	Clearance	0.13 to 0.40 mm 0.0051 to 0.0157 in.	0.8 mm 0.031 in.
Spiral Bevel Pinion Shaft	Turning Torque	3.14 to 3.63 N·m 0.32 to 0.37 kgf·m 2.31 to 2.68 ft-lbs	–
Spiral Bevel Pinion Shaft and Differential Assembly	Turning Torque	5.59 to 6.67 N·m 0.57 to 0.68 kgf·m 4.12 to 4.92 ft-lbs	–
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case Bore (Differential Case Cover Bore) to Differential Side Gear Boss	Clearance	0.070 to 0.169 mm 0.00276 to 0.00665 in.	0.35 mm 0.014 in.
Differential Case Bore	I.D.	49.070 to 49.150 mm 1.93189 to 1.93504 in.	–
Differential Case Cover Bore	I.D.	49.070 to 49.150 mm 1.93189 to 1.93504 in.	–
Differential Side Gear Boss	O.D.	48.961 to 49.000 mm 1.92760 to 1.92913 in.	–
Differential Pinion Shaft to Differential Pinion	Clearance	0.080 to 0.122 mm 0.00315 to 0.00480 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	I.D.	25.939 to 25.960 mm 1.02122 to 1.02205 in.	–
Differential Pinion	O.D.	26.040 to 26.061 mm 1.02520 to 1.02602 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 Pedal	Free Travel	20.0 to 30.0 mm 0.79 to 1.18 in.	–
Differential Lock Shifter	Clearance	1.0 to 1.5 mm 0.0394 to 0.0591 in.	–

W1011209

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 **"6. TIGHTENING TORQUES"** at GENERAL Section.)

Item	N·m	kgf·m	ft-lbs
Main delivery pipe and return pipe retaining nut	46.6 to 51.0	4.8 to 5.2	34.7 to 37.6
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Steering controller mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
DT gear case mounting screw (M6800 4WD only)	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Step mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Engine and clutch housing mounting screw, nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine and clutch housing mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Pedal frame mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Transmission upper cover mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Transmission case and clutch housing mounting screw, nut			
M12, grade 11 stud bolt	52.0 to 58.8	5.3 to 6.0	38.3 to 43.4
M12, grade 11 nut	103.0 to 117.7	10.5 to 12.0	75.9 to 86.8
M12, grade 7 screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
M10, grade 9 screw, nut [M6800(S)]	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Transmission case and clutch housing mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Speed change cover 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	130.0 to 141.0
Bearing holder 1 mounting screw and nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Bearing holder 2 mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Bearing holder 3 mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
ROPS mounting screw			
M16, grade 9 screw	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting nut	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Hydraulic cylinder assembly mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting screw and nut [M6800(S)]	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting screw [M8200 · M9000]	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Rear axle case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
PTO gear case assembly mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
PTO shaft staking nut	225.6 to 264.8	23 to 27	166.4 to 195.3
PTO gear case cover mounting screw, reamer screw (Fixed PTO shaft type with two speeds and interchangeable PTO shaft type)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Differential bearing support mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Differential case cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Spiral bevel gear UBS screw [M6800(S)]	70.6 to 90.2	7.2 to 9.2	52.1 to 66.5
Spiral bevel gear UBS screw [M8200 · M9000]	142.2 to 161.8	14.5 to 16.5	104.9 to 119.3
PTO clutch valve mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
PTO clutch holder mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3

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Item	N·m	kgf·m	ft-lbs
Spiral bevel pinion shaft staking nut [M6800(S)] (Old Type : With Collar)	274.6 to 343.2	28.0 to 35.0	202.5 to 253.2
Spiral bevel pinion shaft staking nut [M8200 · M9000] (Old Type : With Collar)	93.2 to 103.0	9.5 to 10.5	68.7 to 75.9
Starter's terminal **B** mounting nut	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7
Shuttle case assembly screw nut [M6800S]	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Shuttle case mounting screw [M6800S]			
M8, grade 7	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M8, grade 9	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Bearing retainer mounting screw [M6800(S)]	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Foldable ROPS mounting screw			
9/16-18 UNF, grade 8 screw	149.1 to 179.5	15.2 to 18.3	109.9 to 132.4

W1240087

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CLUTCH HOUSING CASE

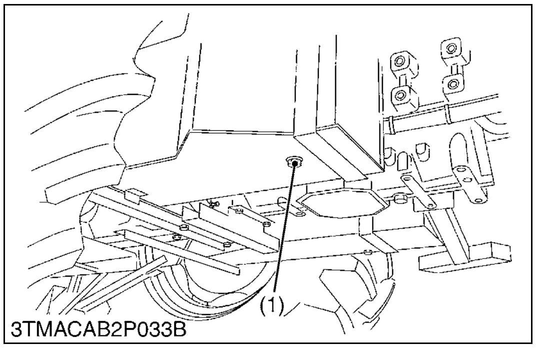
(1) Disassembling and Assembling

(A) Separating Engine and Clutch Housing Case

Draining Transmission Fluid

- See page 2-S5.

W1011903



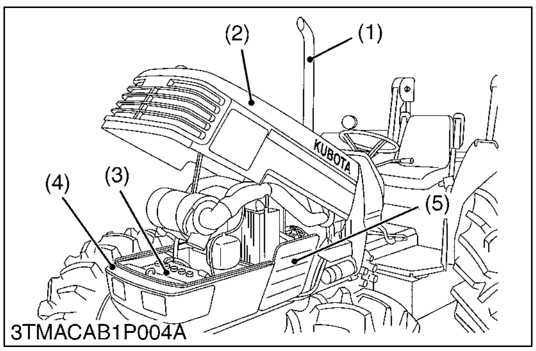
Draining Fuel

1. Place oil pans under the fuel tank.
2. Remove the drain plug (1).
3. Drain the fuel.
4. Reinstall the drain plug (1).

Capacity	M6800(S)	65 L 17.2 U.S.gals. 14.3 Imp.gals.
	M8200 M9000	90 L 23.8 U.S.gals. 19.8 Imp.gals.

(1) Drain Plug

W1011949



Muffler and Bonnet

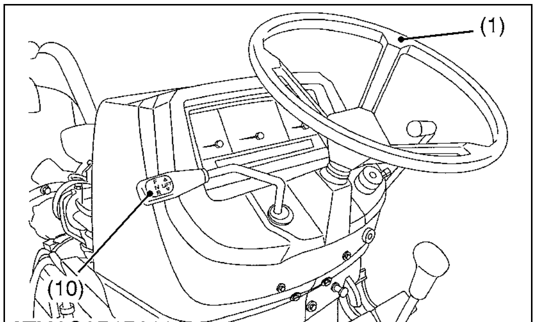
1. Remove the muffler (1).
2. Remove the bonnet (2).
3. Disconnect the battery's cable.
4. Disconnect the head light **3P** connectors.
5. Remove the front lower cover (4) and side cover (5).

■ **IMPORTANT**

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

(1) Muffler (Upper)
(2) Bonnet
(3) Battery
(4) Front Lower Cover
(5) Side Cover

W1013060



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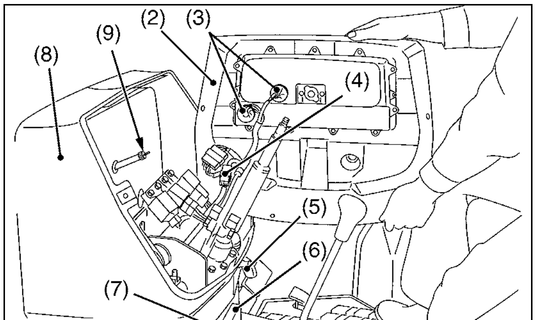

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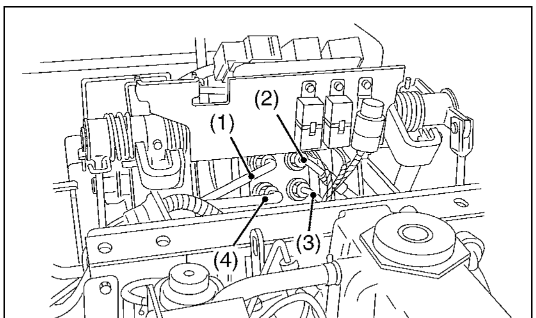
Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1) with a steering wheel puller (Code No. 07916-51090).
2. Remove the shuttle lever grip (10).
3. Remove the meter panel mounting screw and disconnect the meter cable (9).
4. Disconnect the connectors (3).
5. Disconnect the main switch connector (4) and headlight switch connector, hazard and turn signal switch connector.
6. Disconnect the engine stop cable (5) at the engine side.
7. Remove the rear bonnet (8).
8. Remove the fuse box (7) and cover (6).

(1) Steering Wheel
(2) Meter Panel
(3) Connectors
(4) Main Switch Connector
(5) Engine Stop Cable
(6) Cover
(7) Fuse Box
(8) Rear Bonnet
(9) Meter Cable
(10) Shuttle Lever Grip

W1013212



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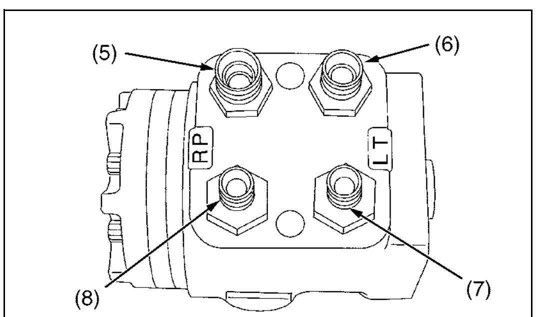

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Piping for Power Steering

1. Disconnect the turning delivery hoses (2) and (3).
2. Disconnect the main delivery pipe (4).
3. Disconnect the return pipe (1).
4. Remove the steering controller mounting screws.
5. Remove the steering controller.

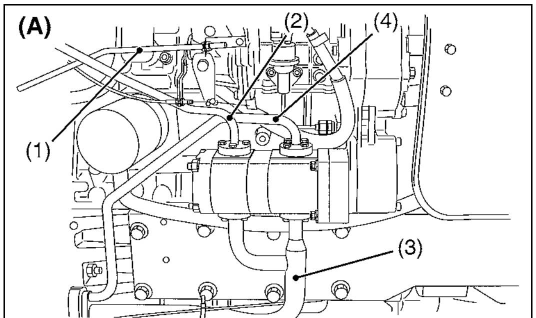
(When reassembling)

- Be sure to assemble the power steering hoses and pipes to original position with specified torque.

Tightening torque	Main delivery pipe and return pipe retaining nut	46.6 to 51.0 N·m 4.8 to 5.2 kgf·m 34.7 to 37.6 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Steering controller mounting screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Return Pipe
(2) Left Turning Delivery Pipe
(3) Right Turning Delivery Pipe
(4) Main Delivery Pipe
(5) Pump Port
(6) Return Port
(7) Left Turning Port
(8) Right Turning Port

W1012391



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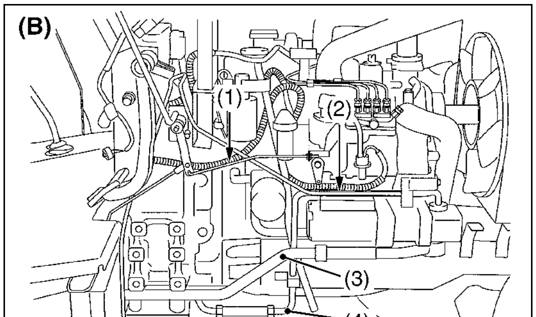

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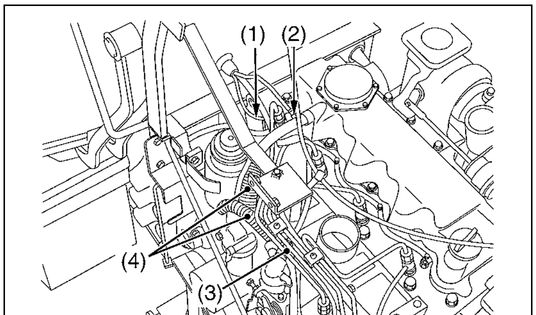
Piping for 3-Point Hydraulic System

1. Remove the accelerator rod (1).
2. Remove the suction pipe (3).
3. Remove the delivery pipe (4) for 3-point hydraulic system.
4. Remove the delivery pipe (2) for power steering.

(1) Accelerator Rod
(2) Delivery Pipe
(3) Suction Pipe
(4) Delivery Pipe

(A) Individual Flow Type
(B) Combined Flow Type

W1095471



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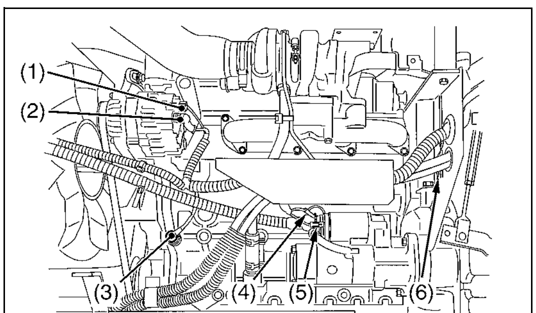
Wire Harness R.H. and Fuel Pipes

1. Disconnect the **3P** connector for solenoid valve (3).
2. Disconnect the wiring lead (2) from the glow plug.
3. Disconnect the coolant thermo sensor **1P** connector (1).
4. Remove the fuel pipes (4).

(1) Coolant Thermo Sensor **1P** Connector
(2) Wiring Lead for Glow Plug
(3) **3P** Connector for Solenoid Valve
(4) Fuel Pipes

W1013985



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Wire Harness L.H.

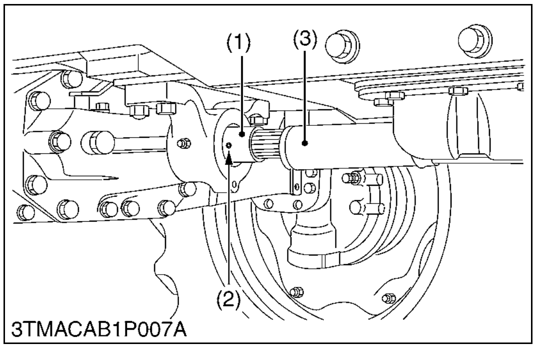
1. Disconnect the alternator **2P** connector (1) and **B** terminal (2).
2. Disconnect the starter motor **C** terminal (5) and **B** terminal (4).
3. Disconnect the engine oil pressure switch terminal (3).
4. Remove the earth wire (6).

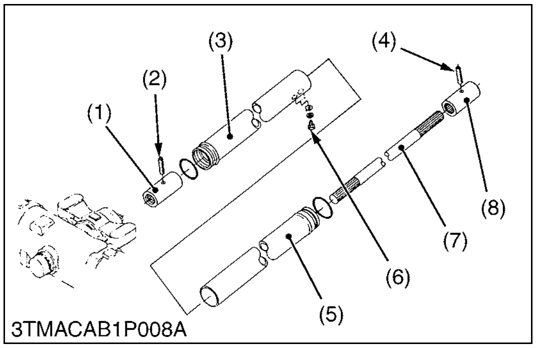
(When reassembling)

Tightening torque	Starter's terminal **B** mounting nut	8.8 to 11.8 N·m 0.9 to 1.2 kgf·m 6.5 to 8.7 ft-lbs

(1) Alternator **2P** Connector
(2) Alternator **B** Terminal
(3) Engine Oil Pressure Switch Terminal
(4) Starter Motor **B** Terminal
(5) Starter Motor **C** Terminal
(6) Earth Wire

W1014131





Propeller Shaft (4WD Only)

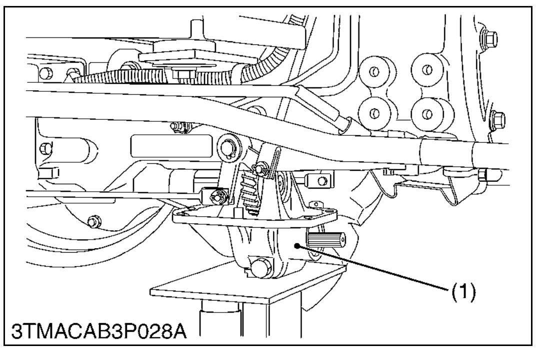
1. Slide the propeller shaft cover (3), (5) after removing the screws (6).
2. Tap out the spring pin (2), (4) and then slide the coupling (1), (8) to the front and rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (7) and couplings.

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

W1012949



DT Gear Case [M6800(S) 4WD Only]

1. Remove the DT shift rod.
2. Remove the DT gear case (1).

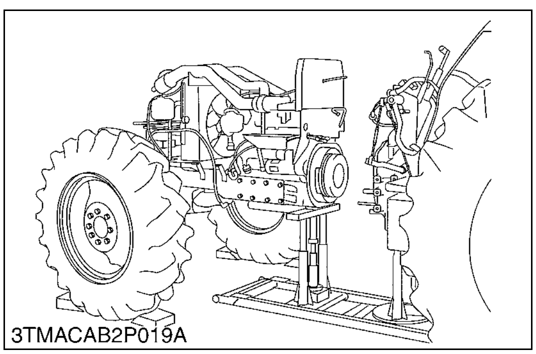
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the clutch housing and DT gear case.

Tightening torque	DT gear case mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) DT Gear Case

W1013110



Separating Engine from Clutch Housing

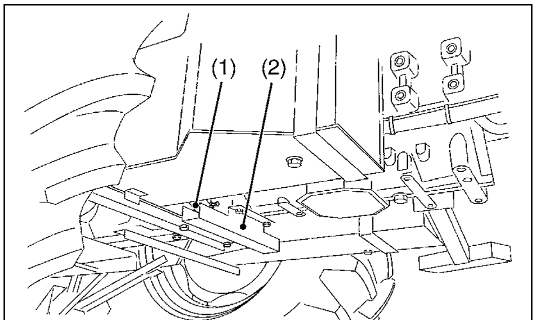
1. Check the engine and clutch housing case are securely mounted on the disassembling stands.
2. Remove the engine mounting screws and nuts, and separate the engine from the clutch housing.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch 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, nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs

W1013267



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Fuel Tank Connection Hose

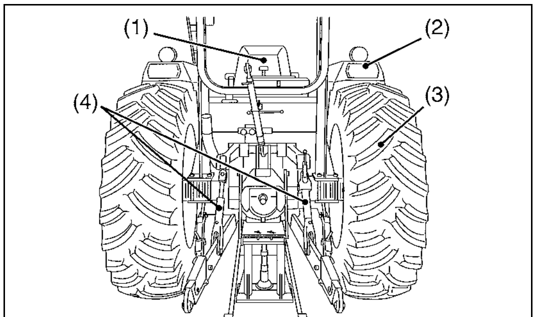
1. Remove the cover (2).
2. Remove the connection hose (1).

(When reassembling)

Tightening torque	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) Connection Hose (2) Cover

W1021578



3TMACAB2P034A

Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

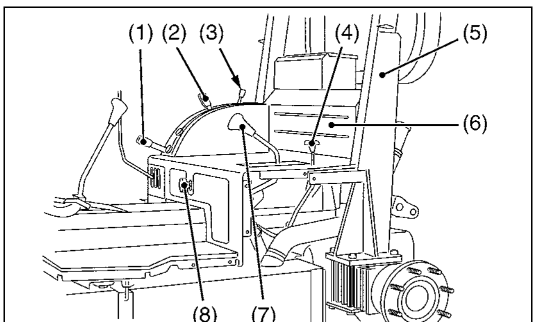
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	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

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1021709



3TMACAB2P035A

Center Frame and ROPS

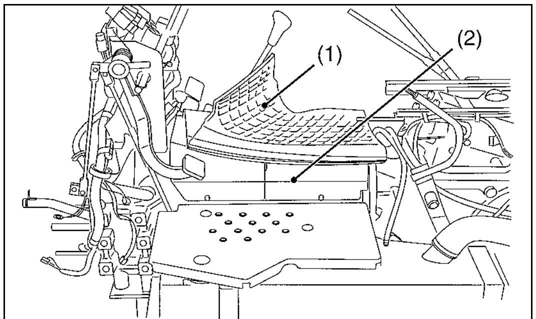
1. Remove the remote valve wire.
2. Remove the draft and position control lever grips (1), (2).
3. Remove the auxiliary speed change lever grip (7).
4. Remove the DT shaft lever grip (4).
5. Remove the three point hitch lowering speed control grip (8) and PTO lever (3).
6. Remove the center frame (6).
7. Remove the ROPS (5).

(When reassembling)

Tightening torque	ROPS mounting screw M16 grade 9 screw	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) Position Control Lever Grip
(2) Draft Control Lever Grip
(3) PTO Lever
(4) DT Shift Lever Grip
(5) ROPS
(6) Center Frame
(7) Auxiliary Speed Change Lever Grip
(8) Three Point Hitch Lowering Speed Control Grip

W1013637



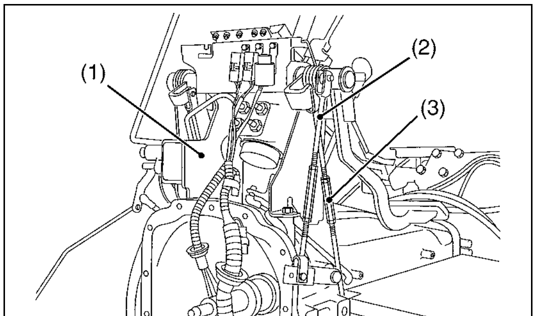
3TMACAB3P029A

Floor Mat and Housing Cover

1. Remove the floor mat (1).
2. Remove the housing cover (2).

(1) Floor Mat
(2) Housing Cover

W1013885



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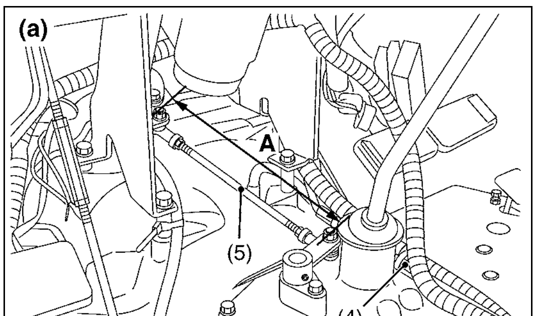


3TMACAB3P031A

Pedal Frame [M6800 · M8200· M9000]

1. Disconnect the brake rods (3) (RH and LH).
2. Disconnect the clutch rod (2).
3. Disconnect the shuttle rod (5). [M8200 · M9000 only]
4. Remove the delivery pipe (4) for PTO clutch.
5. Remove the pedal frame (1) with wire harness.

■ **IMPORTANT**

- **After reassembling the pedal frame, be sure to adjust the brake pedal travel and clutch pedal free travel.**

(When reassembling)

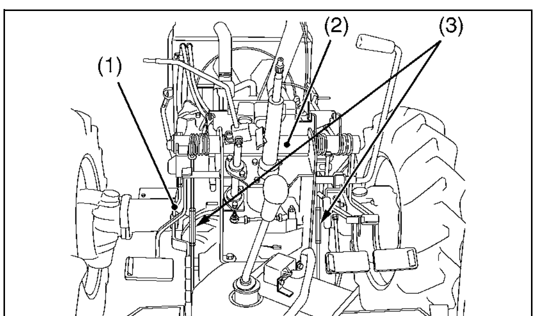
- Be sure to adjusting the shuttle shift rod.

Tightening torque	Pedal frame mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

Shuttle rod length (**A**)	Factory spec.	268 mm 10.55 in.

(1) Pedal Frame
(2) Clutch Rod
(3) Brake Rod
(4) Delivery Pipe
(5) Shuttle Rod
(a) M8200, M9000

W1014010



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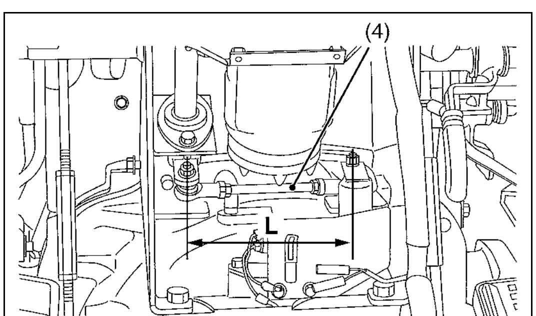


3TMACAB3P033A

Pedal Frame [M6800S]

1. Disconnect the brake rods (3).
2. Disconnect the clutch rod (1).
3. Remove the shuttle rod (4).
4. Remove the pedal frame (2) and steering controller assembly as a unit.

(When reassembling)

- Be sure to adjusting the shuttle shift rod.

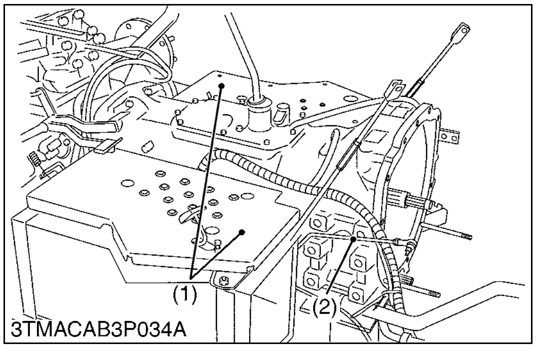
Shuttle shift rod length **L**	Factory spec.	Approx. 160 mm 6.3 in.

■ **IMPORTANT**

- **After reassembling the pedal frame, be sure to adjust the brake pedal play and clutch pedal free travel.**

(1) Clutch Rod
(2) Pedal Frame
(3) Brake Rod
(4) Shuttle Rod

W1096522

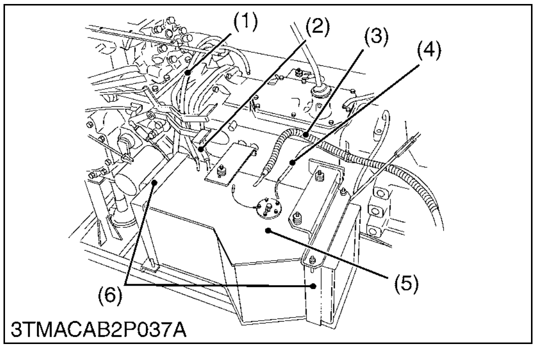


Steps

1. Disconnect the foot accelerator rod (2).
2. Remove the steps (1).

(1) Steps (2) Foot Accelerator Rod

W1014252

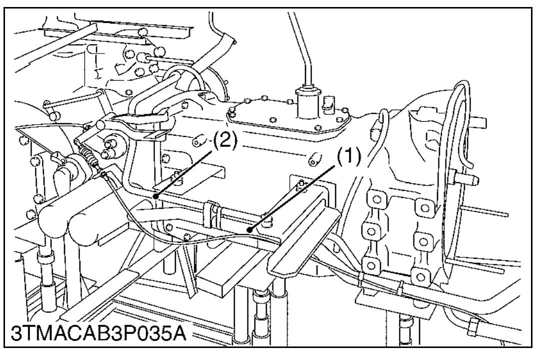


Fuel Tanks

1. Remove the fuel hose (1), (2), (3), (4).
2. Remove the tank bands (6).
3. Remove the fuel tanks (5).

(1) Fuel Hose 1
(2) Fuel Hose 2
(3) Fuel Hose 3
(4) Fuel Hose 4
(5) Fuel Tank
(6) Tank Band

W1022292

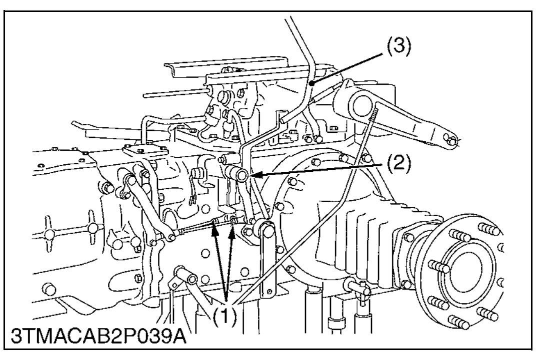


Hydraulic Pipes and Brake Rods

1. Remove the suction pipe (1).
2. Remove the delivery pipe (2) for three point hydraulic system.
3. Remove the brake rods.

(1) Suction Pipe (2) Delivery Pipe

W1022415



Auxiliary Shift Lever [M6800(S)]

1. Disconnect the shift rods (1).
2. Remove the external circlip (2).
3. Take out the shift lever assembly.

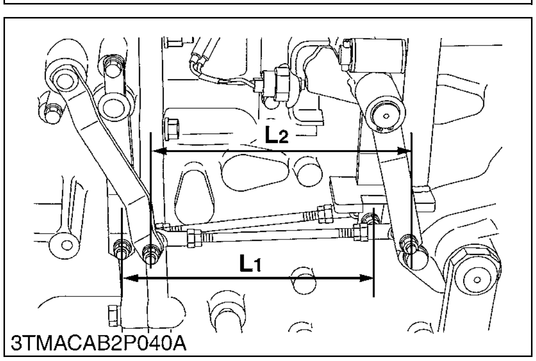
(When reassembling)

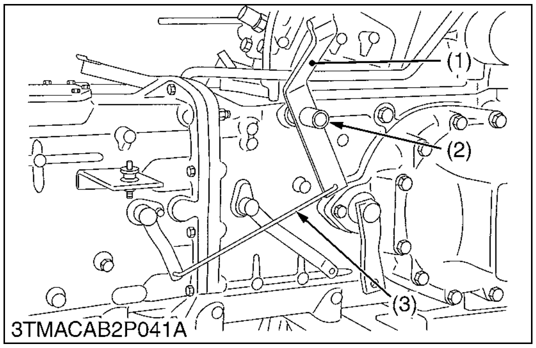
- Be sure to adjust the shift rod length.

Shift rod length **L_1** and **L_2**	Factory spec.	Approx. 209 mm 8.23 in.

(1) Shift Rod
(2) External Circlip
(3) Shift Lever

W1014671



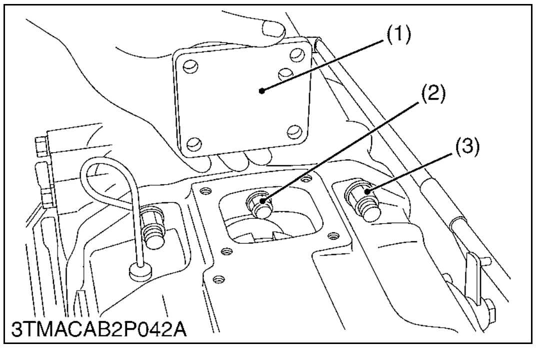


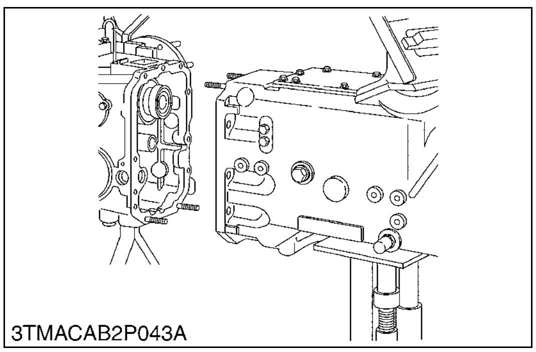
Auxiliary Shift Lever [M8200 · M9000]

1. Remove the shift rod (3).
2. Remove the external circlip (2).
3. Take out the shift lever (1).

(1) Shift Lever
(2) External Circlip
(3) Shift Rod

W1022601





Separating Transmission Case [M6800(S)]

1. Remove the transmission upper cover (1).
2. Remove the transmission case mounting screws and nut, and separate the transmission case from the clutch housing.

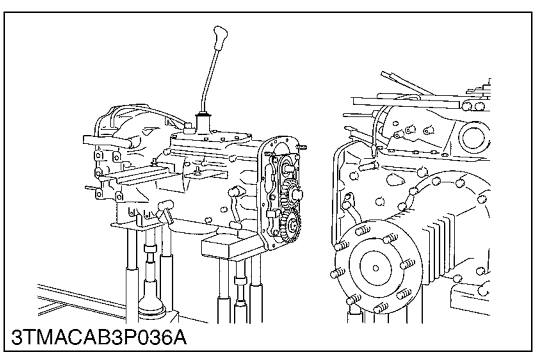
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the transmission case and clutch housing, transmission upper cover and transmission case.

Tightening torque	Transmission case and clutch housing screw, nut	M12, grade 11 nut	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
		M12, grade 7 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M10, grade 9 screw, nut (2)	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs
	Transmission case and clutch housing mounting stud bolt		38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Transmission upper cover mounting screw		23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Transmission Upper Cover
(2) Transmission Case Mounting Screw, Nut
(3) Transmission Case Mounting Nut

W1014963



Separating Transmission Case [M8200 · M9000]

1. Check 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.

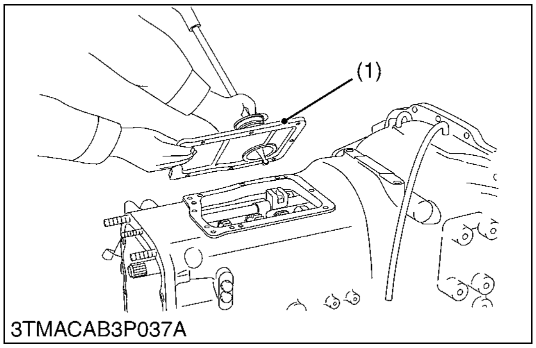
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of transmission case and clutch housing case.

Tightening torque	Transmission case and clutch housing mounting screw, nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1014832

(B) Disassembling Clutch Housing Case [M6800]



Speed Change Cover

1. Remove the speed change cover (1).

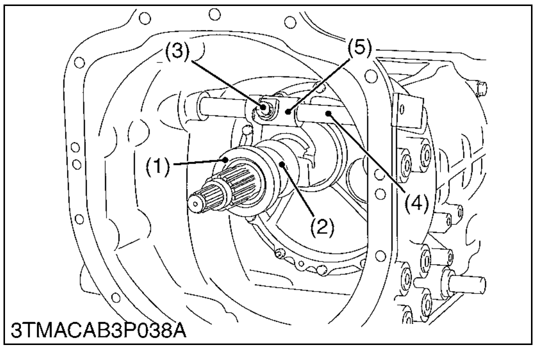
(When reassembling)

- When reassembling the speed change cover (1), set the shifter and fork in neutral position.
- Apply liquid gasket (Three Bond 1216 or equivalent) to seam of speed change cover and clutch housing.

Tightening torque	Speed change cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Speed Change Cover

W1018354



Clutch Release Bearing and Bearing Case

1. Draw out the release bearing (1) and the release hub (2) together.
2. Remove the release fork setting screw (3).
3. Draw out the control shaft (4) to take out the release fork (5).

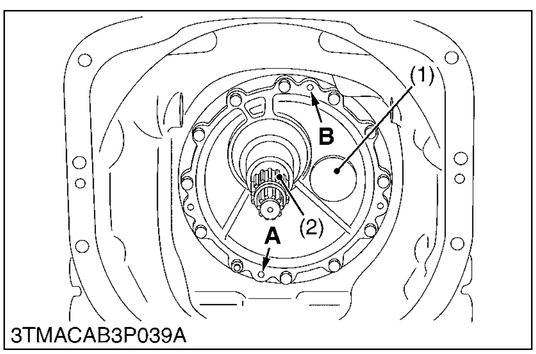
(When reassembling)

- After tightening the release fork setting screw to the specified torque, insert a wire through the holes of the setting screw head and release fork.
- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the bushing of control shaft.

Tightening torque	Release fork setting screw	166.7 to 191.2 N·m 17.0 to 19.5 kgf·m 130.0 to 141.0 ft-lbs

(1) Release Bearing
(2) Release Hub
(3) Release Fork Setting Screw
(4) Control Shaft
(5) Release Fork

W1018479



Bearing Holder

1. Remove the bearing holder (1) with the 21T gear shaft (2) by screwing M8 × Pitch 1.25 screws into holes **A** and **B**.

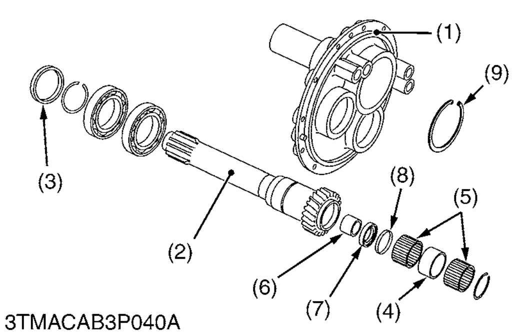
(When reassembling)

- Apply grease or transmission fluid to the O-ring.

Tightening torque	Bearing holder 1 mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Bearing Holder
(2) 21T Gear Shaft

W1018814



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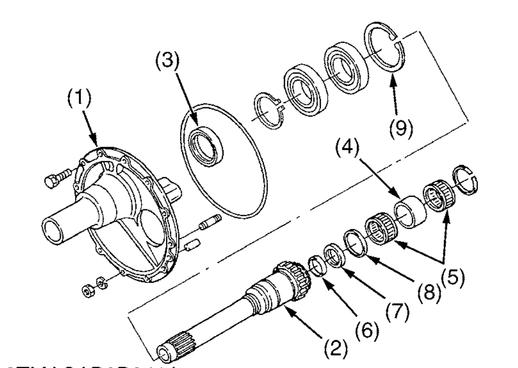

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Disassembling Bearing Holder and 21T Gear Shaft

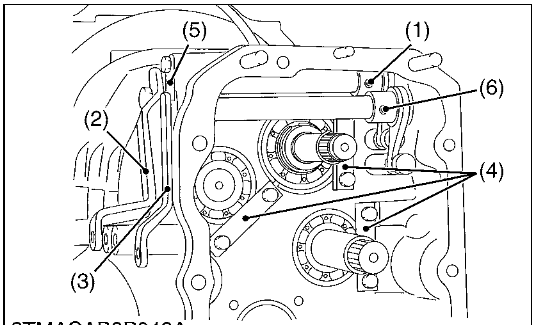
1. Remove the internal snap ring (9).
2. Tap out the 21T gear shaft with bearing.

(When reassembling)

- Take care of direction of the oil seal.
- Apply grease to the oil seal and bushing.
- Take care of the position of needle bearing and collars.
- Apply transmission fluid to the bearing.
- Put on the PTO propeller shaft guide to the PTO propeller shaft to prevent the oil seal (7) damaging. (Refer to **"9. SPECIAL TOOLS"** at GENERAL Section.)

(1) Bearing Holder
(2) 21T Gear Shaft
(3) Oil Seal
(4) Collar
(5) Needle Bearing
(6) Bushing
(7) Oil Seal
(8) Collar
(9) Internal Snap Ring

W1018950



3TMACAB3P042A

Shift Levers and Bearing Retainer

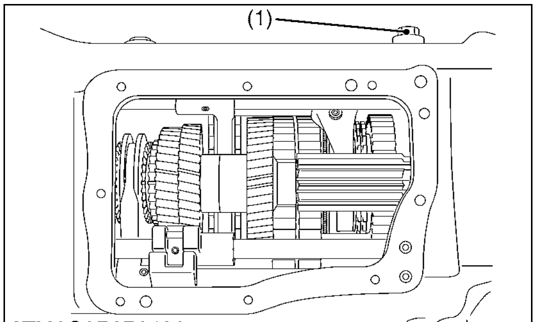
1. Remove the shift lever stopper (5).
2. Tap out the spring pin (1) from Hi-Creep shift lever (2).
3. Draw out the Hi-Creep shift lever (2).
4. Tap out the spring pin (6) from Low-Reverse shift lever (3).
5. Draw out the Low-Reverse shift lever (3).
6. Remove the bearing retainers (4).

(When reassembling)

- Apply grease to the O-ring.

(1) Spring Pin
(2) Shift Lever (H-C)
(3) Shift Lever (L-R)
(4) Bearing Retainer
(5) Stopper
(6) Spring Pin

W1019202



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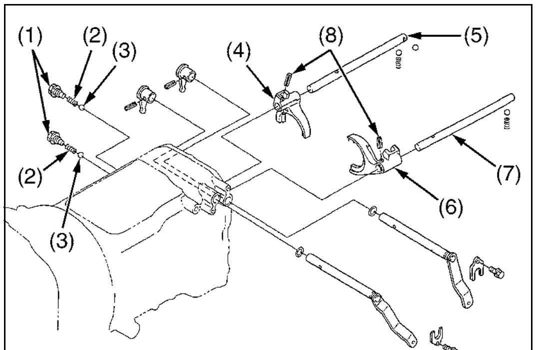

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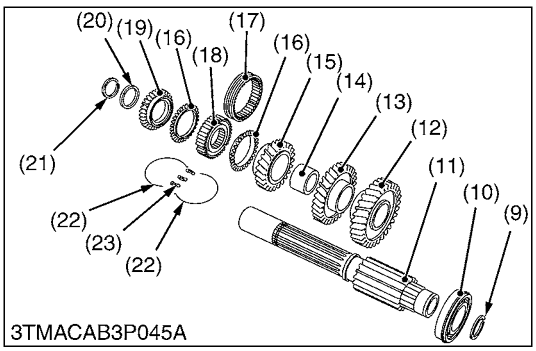


3TMACAB3P045A

Shift Rod, Forks (1-2), (3-4) and 2nd Shaft

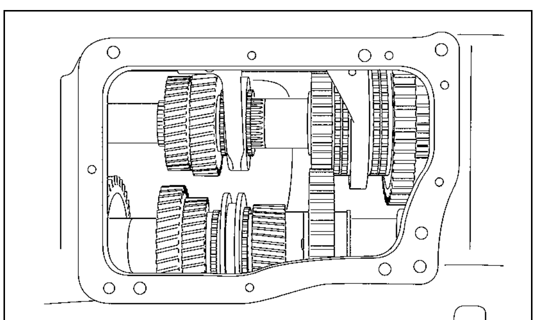
1. Remove the lock screws (1), and take out the springs (2) and balls (3).
2. Tap out the spring pins from shift forks (4) and (6).
3. Draw out the shift rod (5) and (7).
4. Take out the shift forks (4) and (6).
5. Remove the snap ring (21).
6. Take out the collar (20).
7. Remove the inner cone.
8. Tap out the 2nd shaft to the rear.

(When reassembling)

- Apply grease to the ball and spring.
- Take care of installing the inner-locking ball (3).
- Apply liquid lock (Three Bond 1324B or equivalent) to the lock screws (1).
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner surface of 23T gear (15).

(1) Lock Screw
(2) Spring
(3) Ball
(4) Shift Fork (1-2)
(5) Shift Fork Rod (1-2)
(6) Shift Fork (3-4)
(7) Shift Fork Rod (3-4)
(8) Spring Pin
(9) Snap Ring
(10) Ball Bearing
(11) 2nd Shaft
(12) 36T Gear
(13) 24T Gear
(14) Collar
(15) 23T Gear
(16) Synchronizer Ring
(17) Shifter
(18) Hub
(19) Inner Cone
(20) Collar
(21) Snap Ring
(22) Synchronizer Spring
(23) Synchronizer Key

W1019474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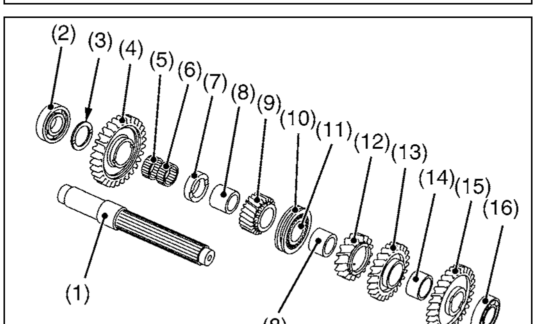


3TMACAB3P047A

1st Shaft

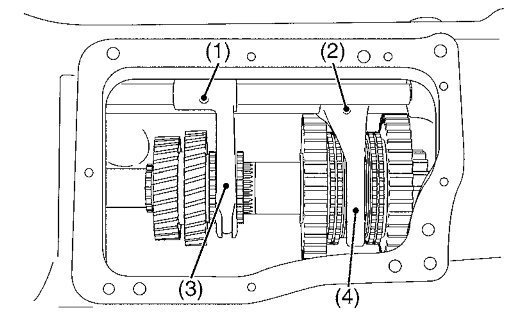
1. Tap out the 1st shaft to the front with gears.

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner surface of 19T gear (3).

(1) 1st Shaft
(2) Ball Bearing
(3) Thrust Collar
(4) 35T Gear
(5) Needle Bearing
(6) Needle Bearing
(7) Spacer
(8) Inner Ring
(9) 19T Gear
(10) Shifter
(11) Hub
(12) 17T Gear
(13) 25T Gear
(14) Collar
(15) 34T Gear

W1019941



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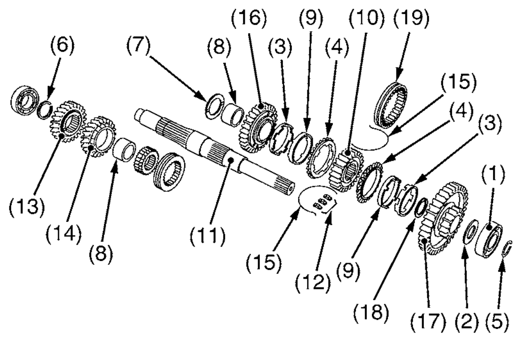
Shift Fork H-C, L-R and Shift Fork Rod H-C, L-R

1. Tap out the spring pin (1) and (2).
2. Draw out the shift rod.
3. Take out the shift fork H-C (3) and shift fork L-R (4).

(1) Spring Pin
(2) Spring Pin
(3) Shift Fork (Hi-Creep)
(4) Shift Fork (Low-Reverse)

W1020225



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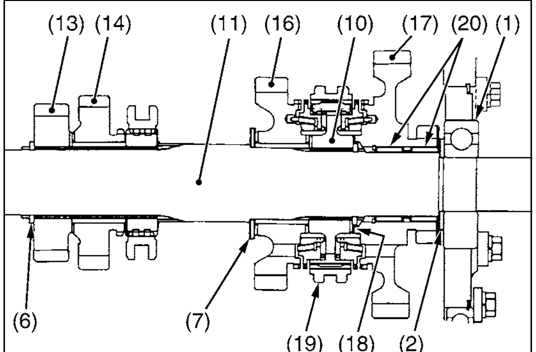

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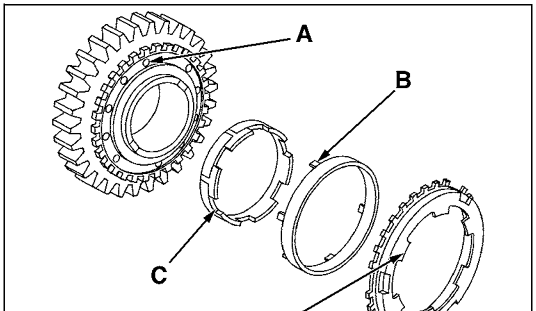

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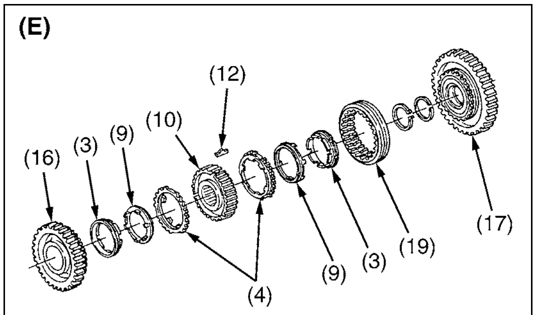

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3rd Shaft

1. Tap out the 3rd shaft with gears to the front.

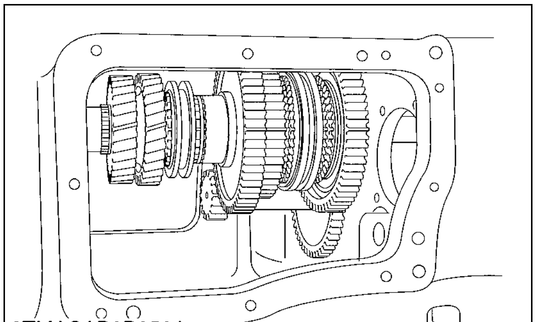
(When reassembling)

- Apply enough transmission fluid to the synchronizer portion, needle bearings (20) and thrust collars (2) and (7).
- Direct the grooved side of the thrust collar (2) to the needle bearing (20) side.
- Install the protrusion portions **(B)** of the center rings (9) to the holes **(A)** of the gear (16) and (17) firmly. (Refer to the figure left.)
- Install the protrusion portion **(D)** of the outer synchronizer rings (4) to the grooves **(C)** of the inner synchronizer rings (3). (Refer to the figure left.)
- Install the external snap ring (18) to the groove of the 3rd shaft (11) firmly.
- Install the synchronizer keys (12) in the key grooves of the outer synchronizer rings (4) firmly.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner of 21T gear (14), 32T gear (16).

(1) Bearing
(2) Thrust Collar
(3) Inner Synchronizer Ring
(4) Outer Synchronizer Ring
(5) External Snap Ring
(6) External Snap Ring
(7) Thrust Collar
(8) Inner Ring
(9) Center Ring
(10) Hub
(11) 3rd Shaft
(12) Synchronizer Key
(13) 22T Gear
(14) 21T Gear
(15) Synchronizer Key Spring
(16) 32T Gear
(17) 41T Gear
(18) External Snap Ring
(19) Shifter
(20) Needle Bearing

(A) Holes of the gear
(B) Protrusion portions of the center ring
(C) Grooves of the inner synchronizer ring
(D) Protrusion portion of the outer synchronizer ring
(E) Double Cone Type Synchromesh

W1020331



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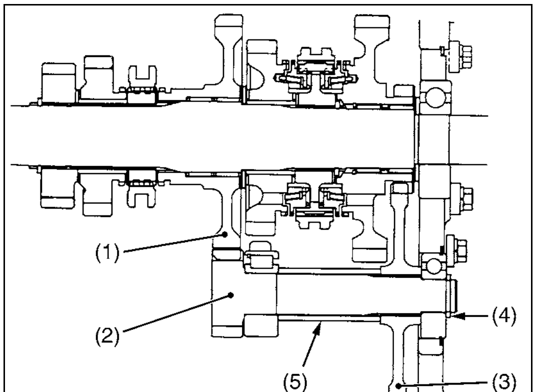


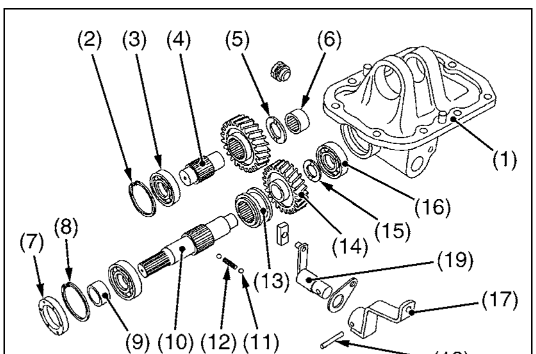
3TMACAB3P053A

Creep Gear and Gear Shaft (If equipped)

1. Tap out the 3rd shaft with gears to the front.
2. Remove the external snap ring (4).
3. Tap out the 15T gear shaft (2).
4. Take out the 43T gear and collar (5).

(1) 47T Gear
(2) 15T Gear Shaft
(3) 43T Gear
(4) External Snap Ring
(5) Collar

W1020665



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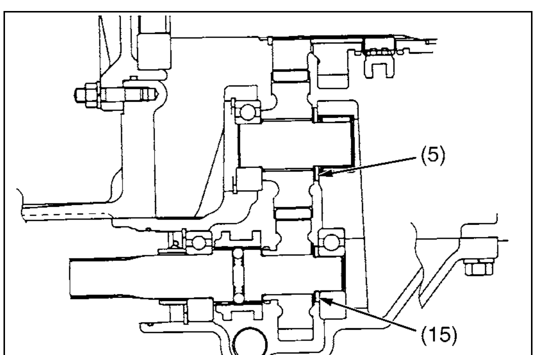


3TMACAB3P055A

Front Drive Shaft

1. Remove the gear case (1) from the clutch housing.
2. Remove the internal snap ring (2), and tap out the idle shaft (4).
3. Remove the oil seal (7) and internal snap ring (8).
4. Draw out the front drive shaft (10).
5. Remove the spring pin (18) and draw out the lever (17).
6. Draw out the shift lever (19).

■ **NOTE**

- **Take care not to fly out the balls (11) and spring (12) when take out the shifter (13).**

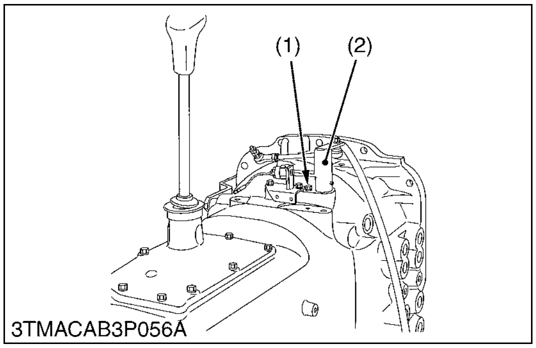
(When reassembling)

- Direct the grooved side of the thrust collars (5) and (15) to the gear side.

(1) Gear Case
(2) Internal Snap Ring
(3) Bearing
(4) Idle Shaft
(5) Thrust Collar
(6) Sleeve
(7) Oil Seal
(8) Internal Snap Ring
(9) Sleeve
(10) Front Drive Shaft
(11) Ball
(12) Spring
(13) Shifter
(14) 22T Gear
(15) Thrust Collar
(16) Bearing
(17) Lever
(18) Spring Pin
(19) Shift Lever

W1020811

(C) Disassembling Clutch Housing Case [M6800S]



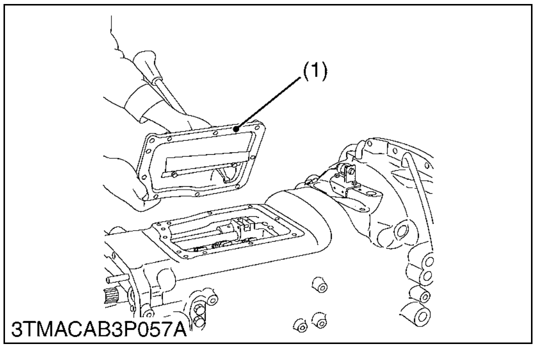
3TMACAB3P056A

Shift Lever

1. Remove the shift lever setting screw (1).
2. Remove the shift lever (2).

(1) Setting Screw (2) Shift Lever

W1014089



3TMACAB3P057A

Speed Change Cover

1. Remove the speed change cover (1).

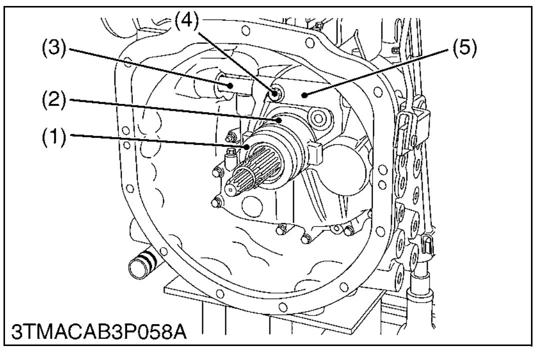
(When reassembling)

- When reassembling the speed change cover (1), set the shifter and fork in neutral position.
- Apply liquid gasket (Three Bond 1216 or equivalent) to seam of speed change cover and clutch housing.

Tightening torque	Speed change cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Speed Change Cover

W1014175



3TMACAB3P058A

Clutch Release Bearing

1. Draw out the release bearing (1) and the release hub (2) together.
2. Remove the release fork setting screw (4).
3. Draw out the control shaft (3) to take out the release fork (5).

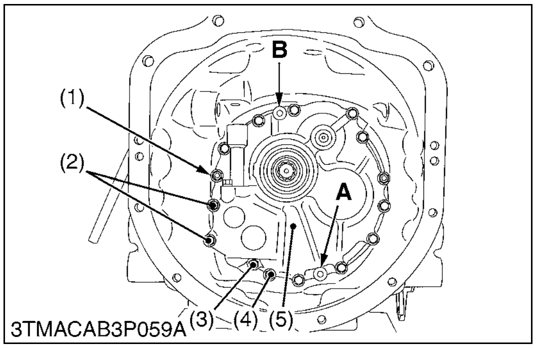
(When reassembling)

- After tightening the release fork setting screw to the specified torque, insert a wire through the holes of the setting screw head and release fork.
- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the bushing of control shaft.

Tightening torque	Release fork setting screw	166.7 to 191.2 N·m 17.0 to 19.5 kgf·m 130.0 to 141.0 ft-lbs

(1) Release Bearing
(2) Release Hub
(3) Control Shaft
(4) Release Fork Setting Screw
(5) Release Fork

W1014300



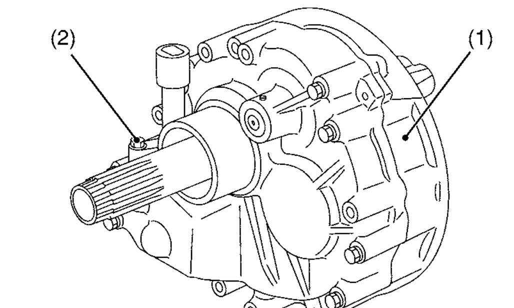
Shuttle Case Assembly

1. Loosen only two nuts (1) and five screws (grade 9 is marked) (4) and remove the shuttle case assembly (5) by screwing M8 × Pitch 1.25 screws into holes **A** and **B**. Two grade 9 screws (2) and six grade 7 screws (3) are not necessary to remove.

Tightening torque	Shuttle case mounting screw, nut	M8, grade 7 nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
		M8, grade 9 screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) Nut
(2) Grade 7 Screw
(3) Grade 9 Screw
(4) Grade 9 screw
(5) Shuttle Case Assembly

W1014587



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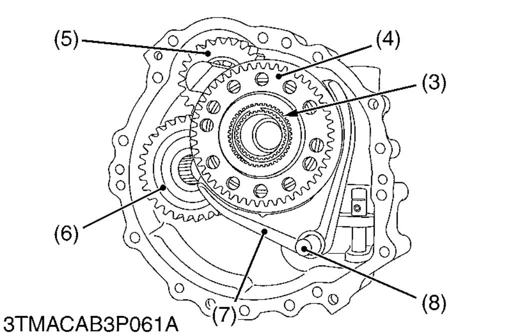

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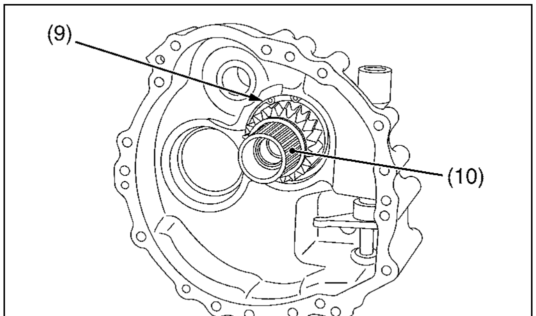

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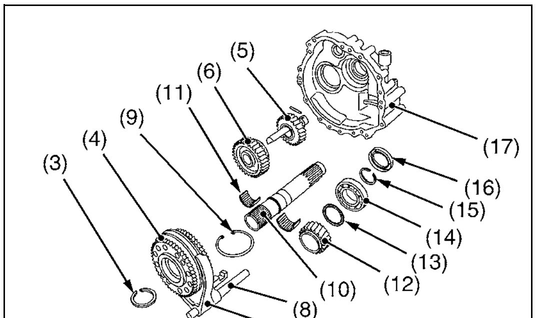

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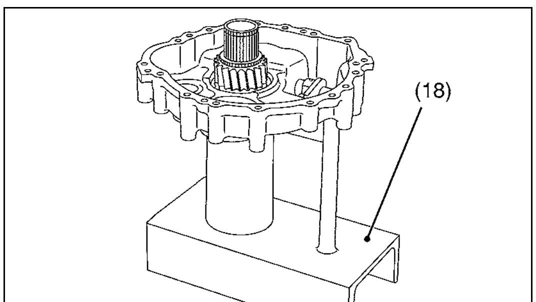


3TMACAB0P045B

Disassembling Shuttle Case Assembly

1. Remove the grade 7 and grade 9 screws.
2. Remove the shuttle case 2 (1).
3. Remove the screw (2).
4. Remove the external snap ring (3).
5. Remove the synchronizer assembly (4) with shifter (7) and shift rod (8).
6. Remove the 25T gear (5) and 31T gear (6).
7. Remove the internal snap ring (9).
8. Tap out the input shaft (10) with bearing.

(When reassembling)

- Take care of direction of the oil seal.
- Apply grease to the oil seal and bushing.
- Take care of position of needle bearing.
- Apply transmission fluid to the bearing.
- Use to shuttle case assembling stand. (Refer to **“9. SPECIAL TOOLS”** at GENERAL Section.)
- Put on the PTO propeller shaft guide to the PTO propeller shaft to prevent the oil seal (16) damaging. (Refer to **“9. SPECIAL TOOLS”** at GENERAL Section.)

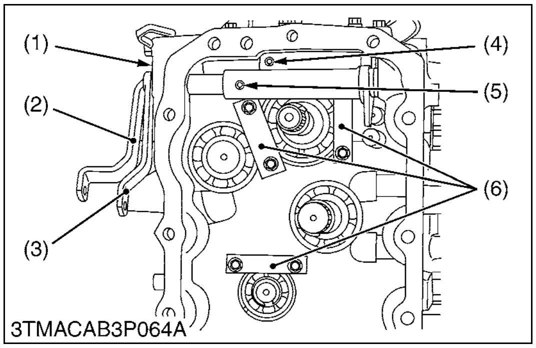
■ **NOTE**

- **After assemble the shuttle case assembly, check the operation.**

Tightening torque	Shuttle case assembling screw	M8, grade 7 nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
		M8, grade 9 screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) Shuttle Case 2
(2) Screw
(3) External Snap Ring
(4) Synchronizer Assembly
(5) 25T Gear
(6) 31T Gear
(7) Shifter
(8) Shift Rod
(9) Internal Snap Ring
(10) Input Shaft
(11) Needle Bearing
(12) 20T Gear
(13) Thrust Bearing
(14) Bearing
(15) External Snap Ring
(16) Oil Seal
(17) Shuttle Case 1
(18) Shuttle Case Assembling Stand

W1014742



Shift Levers and Bearing Retainer

1. Remove the shift lever stopper (1).
2. Tap out the spring pin (4) from Creep shift lever (2).
3. Draw out the Creep shift lever (2).
4. Tap out the spring pin (5) from Hi-Low shift lever (3).
5. Draw out the Hi-Low shift lever (3).
6. Remove the bearing retainer (6).

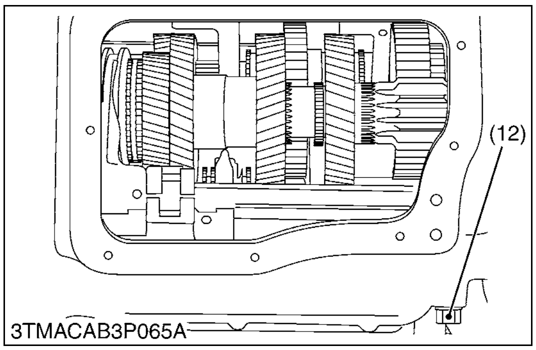
(When reassembling)

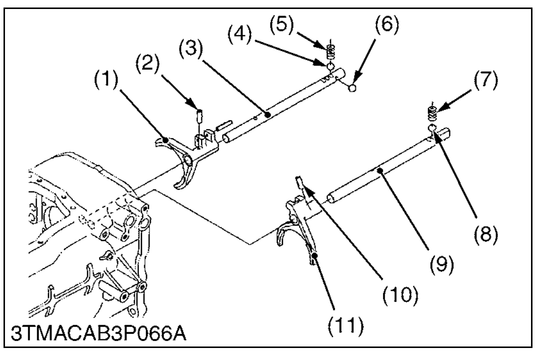
- Apply grease to the O-ring.

Tightening torque	Bearing retainer mounting screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) Stopper
(2) Shift Lever (Creep)
(3) Shift Lever (Hi-Low)
(4) Spring Pin
(5) Spring Pin
(6) Bearing Retainer

W1015413





Shift Rods and Forks (1-2), (3-4)

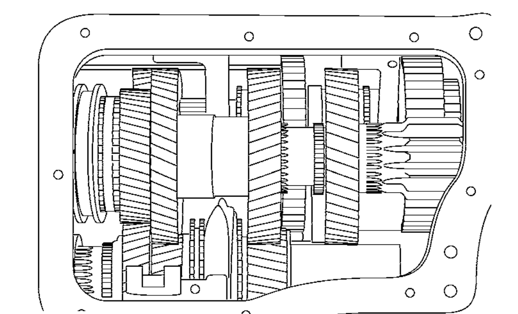
1. Remove the lock screw (12), and take out the springs (5), (7) and balls (4), (8).
2. Tap out the spring pins (2), (10) from shift forks (1) and (11).
3. Draw out the shift rod (3) and (9).
4. Take out the shift forks (1) and (11).

(When reassembling)

- Apply grease to the ball and spring.
- Take care of installing the inter-locking ball (6).
- Apply liquid lock (Three Bond 1372 or equivalent) to the lock screws (12).

(1) Shift Fork (3-4)
(2) Spring Pin
(3) Shift Fork Rod (3-4)
(4) Ball
(5) Spring
(6) Inter-locking Ball
(7) Spring
(8) Ball
(9) Shift Fork Rod (1-2)
(10) Spring Pin
(11) Shift Fork (1-2)
(12) Lock Screw

W1015695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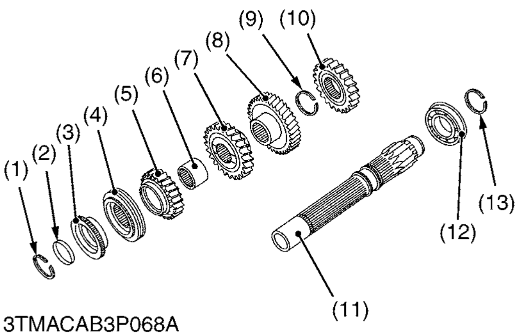

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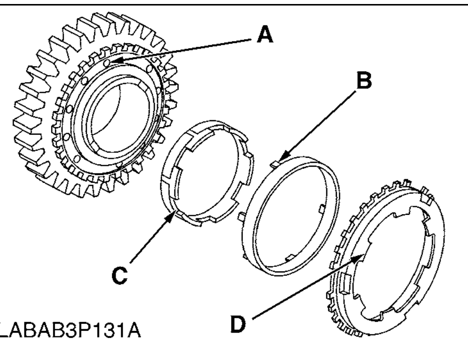
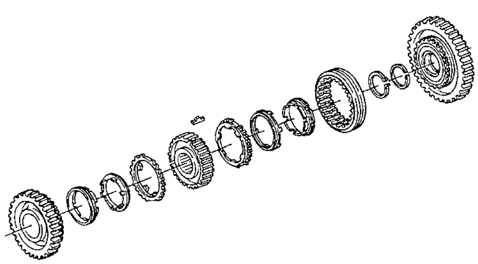


3TLABAB3P131A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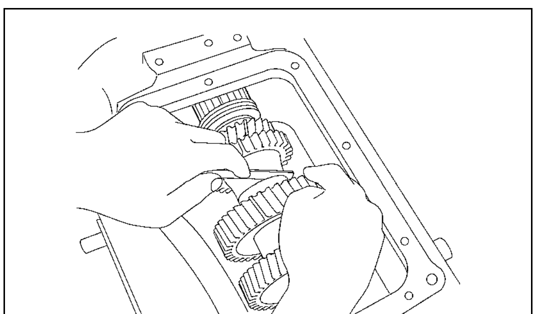

3TMACAB3P127A

2nd Shaft

1. Remove the external snap ring (1).
2. Tap out the 2nd shaft (11) to the rear.
3. Remove the external snap ring (9) with tap out the 2nd shaft (11) to the rear.

(When reassembling)

- Install the protrusion portion **(B)** of the center rings to the holes **(A)** of the gear firmly. (Refer to the figure left.)
- Install the protrusion portion **(D)** of the outer synchronizer rings to the grooves **(C)** of the inner synchronizer rings. (Refer to the figure left.)
- Install the synchronizer keys in the key groove of the outer synchronizer rings firmly.
- Adjust the clearance of the gears on the 2nd shaft by the collar (2).

Side clearance of the gear on the 2nd shaft	Factory spec.	Less than 0.3 mm 0.0118 in.

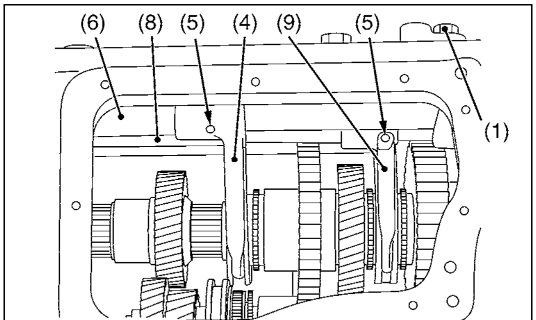
(Reference)

- Thickness of the collar (2) :
  5.8 mm (0.228 in.), 6.0 mm (0.236 in.), 6.2 mm (0.244 in.)

(1) External Snap Ring
(2) Collar
(3) Holder
(4) Synchronizer
(5) 23T Gear
(6) Inner Ring
(7) 24T Gear
(8) 36T Gear
(9) External Snap Ring
(10) 24T Gear
(11) 2nd Shaft
(12) Bearing
(13) External Snap Ring

(A) Holes of the gear
(B) Protrusion portions of the center ring
(C) Grooves of the inner synchronizer ring
(D) Protrusion portion of the outer synchronizer ring

W1016000



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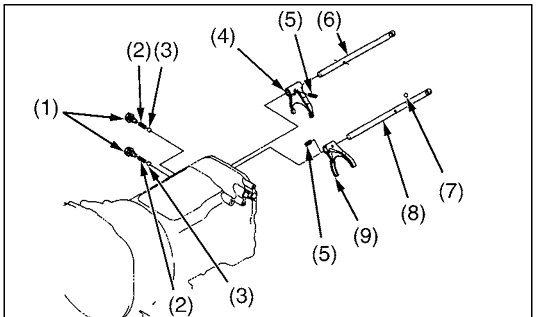


3TMACAB3P070A

Shift Fork H-L, C and Shift Fork Rod H-L, C

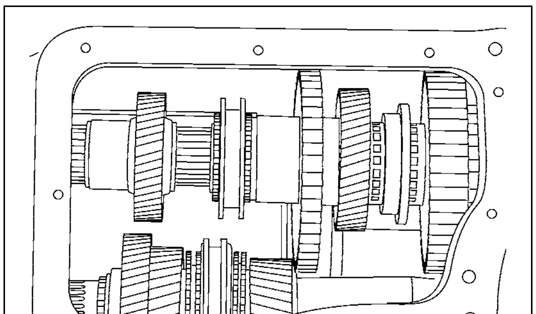
1. Remove the lock screws (1) and take out the springs (2) and balls (3).
2. Tap out the spring pin (5).
3. Draw out the shift rod (6) and (8).
4. Take out the shift fork (4) and shift fork (9).

(When reassembling)

- Apply grease to the ball and spring.
- Take care of installing the inter-locking ball (7).
- Apply liquid lock (Three Bond 1372 or equivalent) to the lock screws (1).

(1) Lock Screw
(2) Spring
(3) Ball
(4) Shift Fork (Creep)
(5) Spring Pin
(6) Shift Rod (Creep)
(7) Inter-locking Ball
(8) Shift Rod (Hi-Low)
(9) Shift Fork (Hi-Low)

W1016442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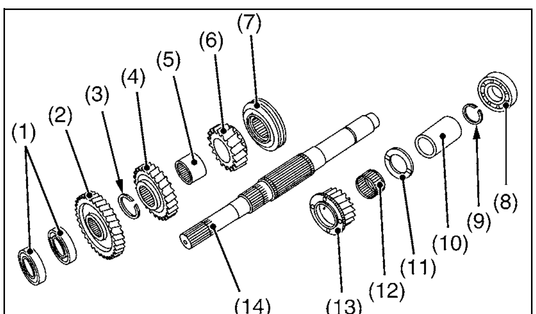

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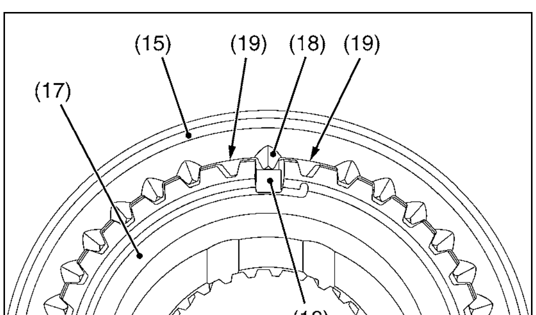


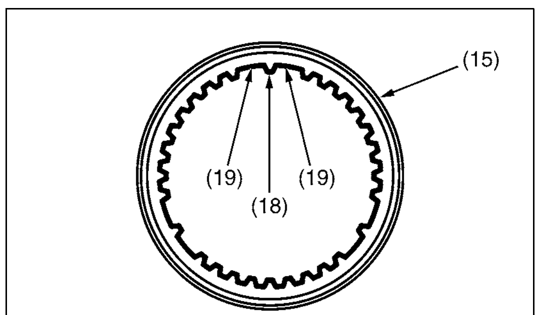
3TMACAB3P229B

1st Shaft

1. Tap out the 1st shaft to the front with gears.

(When reassembling)

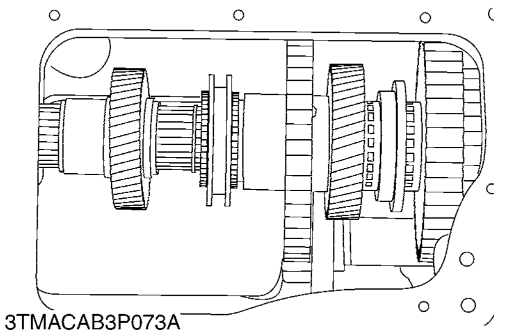
- Be sure to assemble the 3rd-4th synchronizer unit, set the spline teeth (18) on the shifter (15) to the key (16) as shown in the figure.



3TMACAB3P230B

(1) Ball Bearing
(2) 34T Gear
(3) External Snap Ring
(4) 25T Gear
(5) Inner Ring
(6) 17T Gear
(7) Synchronizer
(8) Ball Bearing
(9) External Snap Ring
(10) Collar
(11) Thrust Collar
(12) Needle Bearing
(13) 19T Gear
(14) 1st Shaft
(15) Shifter
(16) Key
(17) Hub
(18) Spline Teeth
(19) Without Spline Teeth

W1016894



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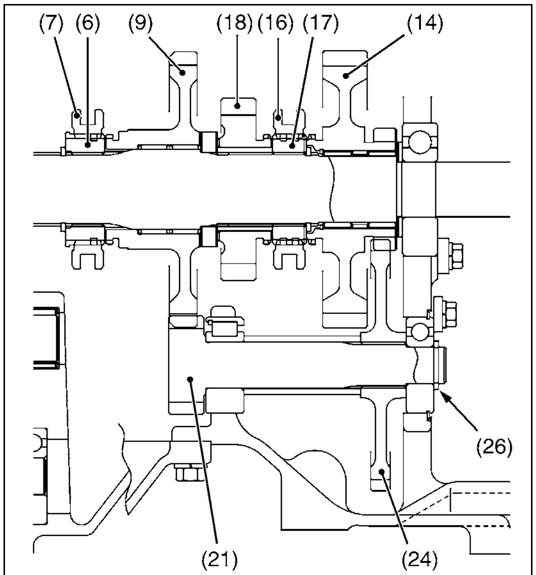

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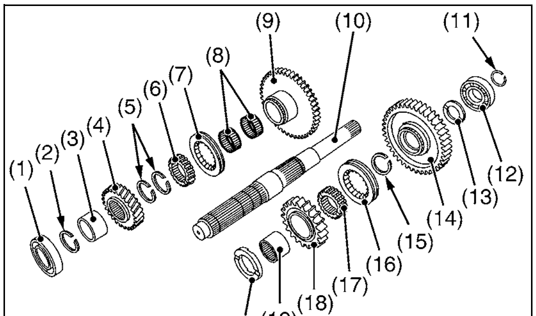

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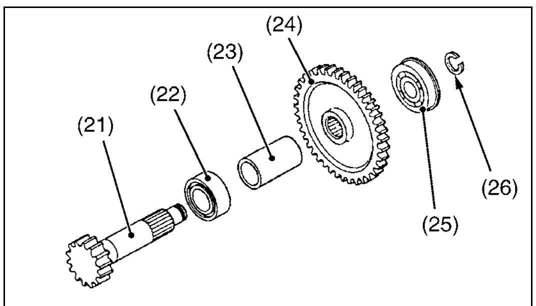


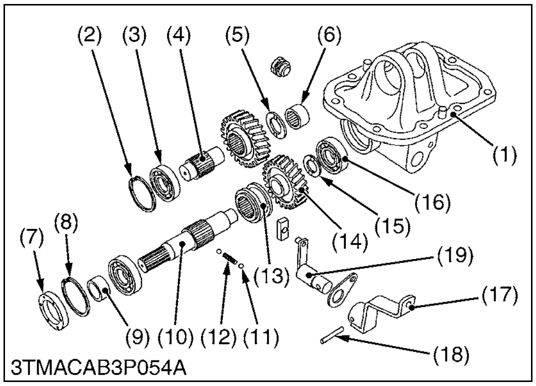
3TMACAB3P076A

Creep Gear and 3rd Shaft

1. Tap out the 3rd shaft (10) with gears to the front.
2. Remove the external snap ring (26).
3. Tap out the 15T gear shaft (21).
4. Take out the 43T gear and collar (24).

(1) Ball Bearing	(14) 41T-19T Gear
(2) External Snap Ring	(15) External Snap Ring
(3) Collar	(16) Shifter
(4) 26T Gear	(17) Hub
(5) External Snap Ring	(18) 21T Gear
(6) Hub	(19) Inner Ring
(7) Shifter	(20) Spacer
(8) Needle Bearing	(21) 15T Gear Shaft
(9) 47T Gear	(22) Ball Bearing
(10) 3rd Shaft	(23) Collar
(11) External Snap Ring	(24) 43T Gear
(12) Ball Bearing	(25) Ball Bearing
(13) Thrust Collar	(26) External Snap Ring

W1017079



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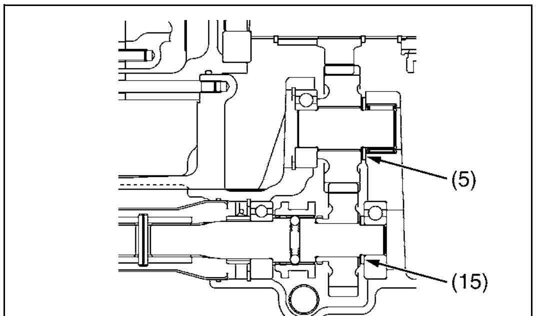


3TMACAB3P077A

Front Drive Shaft

1. Remove the gear case (1) from the clutch housing.
2. Remove the internal snap ring (2), and tap out the idle shaft (4).
3. Remove the oil seal (7) and internal snap ring (8).
4. Draw out the front drive shaft (10).
5. Remove the spring pin (18) and draw out the lever (17).
6. Draw out the shift lever (19).

■ **NOTE**

- **Take care not to fly out the balls (11) and spring (12) when take out the shifter (13).**

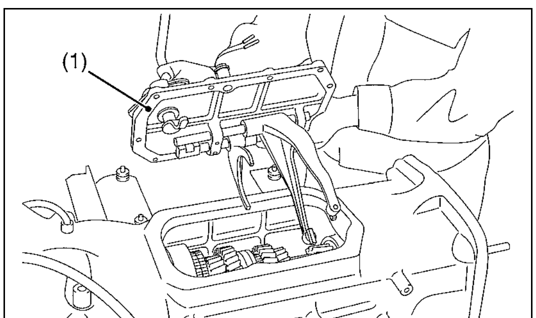
(When reassembling)

- Direct the grooved side of the thrust collars (5) and (15) to the gear side.

(1) Gear Case
(2) Internal Snap Ring
(3) Bearing
(4) Idle Shaft
(5) Thrust Collar
(6) Sleeve
(7) Oil Seal
(8) Internal Snap Ring
(9) Sleeve
(10) Front Drive Shaft
(11) Ball
(12) Spring
(13) Shifter
(14) 22T Gear
(15) Thrust Collar
(16) Bearing
(17) Lever
(18) Spring Pin
(19) Shift Lever

W1017489

(D) Disassembling Clutch Housing Case [M8200 · M9000]



3TMACAB3P078A

Speed Control Cover

1. Remove the speed change cover (1).

(When reassembling)

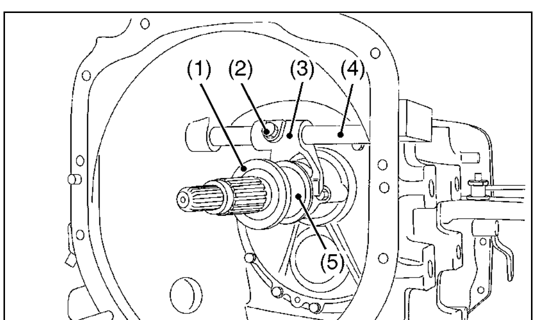
- When reassembling the speed change cover (1), set the shifter and fork in neutral position.
- Apply liquid gasket (Three Bond 1216 or equivalent) to seam of speed change cover and clutch housing.

(When reassembling)

Tightening torque	Speed change cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Speed Change Cover

W1015583



3TMACAB3P079A

Clutch Release Bearing and Bearing Case

1. Draw out the release bearing (1) and the release hub (5) together.
2. Remove the release fork setting screw (2).
3. Draw out the control shaft (4) to take out the release fork (3).

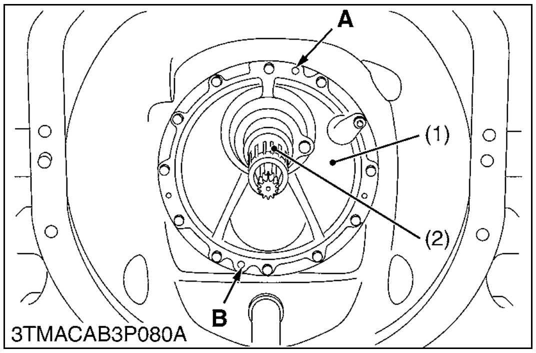
(When reassembling)

- After tightening the release fork setting screw to the specified torque, insert a wire through the holes of the setting screw head and release fork.
- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the bushing of control shaft.

Tightening torque	Release fork setting screw	166.7 to 191.2 N·m 17.0 to 19.5 kgf·m 130.0 to 141.0 ft-lbs

(1) Release Bearing
(2) Release Fork Setting Screw
(3) Release Fork
(4) Control Shaft
(5) Release Hub

W1015708



3TMACAB3P080A

Bearing Holder

1. Remove the bearing holder (1) with the shaft (2) by screwing M8 × Pitch 1.25 screws into holes **A** and **B**.

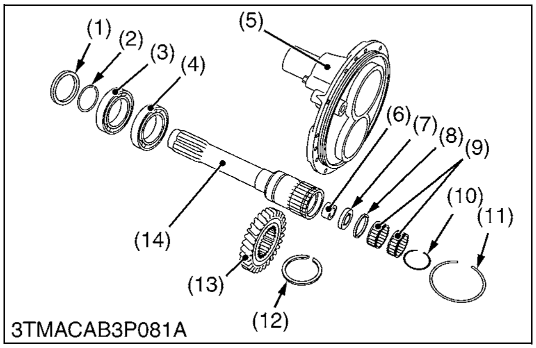
(When reassembling)

- Apply grease or transmission fluid to the O-ring.

Tightening torque	Bearing holder 1 mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Bearing Holder
(2) Shaft

W1015898



3TMACAB3P081A

Disassembling Bearing Holder and Shaft

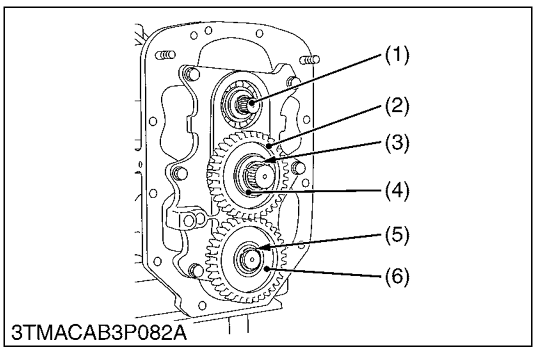
1. Remove the external snap ring (12) and 28T gear (13).
2. Remove the internal snap ring (11) and tap out the shaft (14).
3. Remove the internal snap ring (10).
4. Take out the needle bearings (8), (9).

(When reassembling)

- Take care of direction of the oil seal.
- Apply grease to the oil seal and bushing.
- Take care of the position of needle bearing and collar.
- Apply transmission fluid to the bearing.
- Put on the PTO propeller shaft guide to the PTO propeller shaft to prevent the oil seal (7) damaging. (Refer to **"9. SPECIAL TOOLS"** at GENERAL Section.)

(1) Oil Seal
(2) External Snap Ring
(3) Bearing
(4) Bearing
(5) Bearing Holder
(6) Bushing
(7) Oil Seal
(8) Collar
(9) Needle Bearing
(10) Internal Snap Ring
(11) Internal Snap Ring
(12) External Snap Ring
(13) 28T Gear
(14) Shaft

W1016111



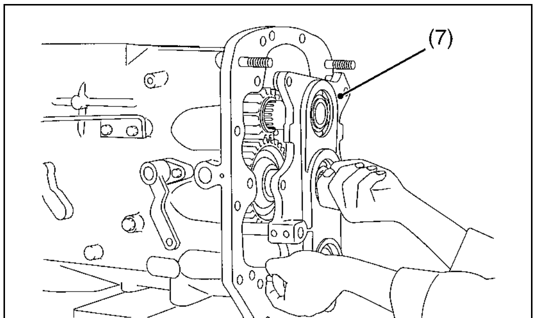
3TMACAB3P082A

Front Drive Gear

1. Remove the external snap ring (3) and 33T gear (2).
2. Remove the external snap ring (5) and 36T gear (6).
3. Draw out the PTO propeller shaft (1).

(1) PTO Propeller Shaft
(2) 33T Gear
(3) External Snap Ring
(4) Collar
(5) External Snap Ring
(6) 36T Gear

W1016408



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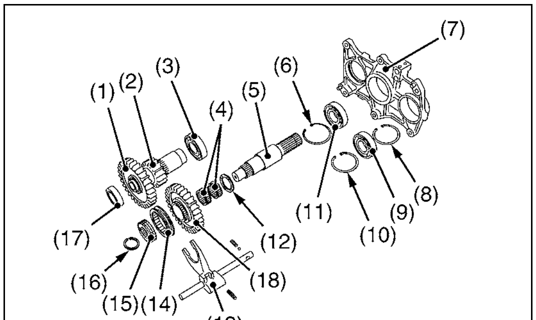


3TMACAB3P084A

Disassembling Auxiliary Shift Section

1. Take out the PTO propeller shaft.
2. Remove the bearing holder (7) mounting screw.
3. Remove the auxiliary shift section assembly.

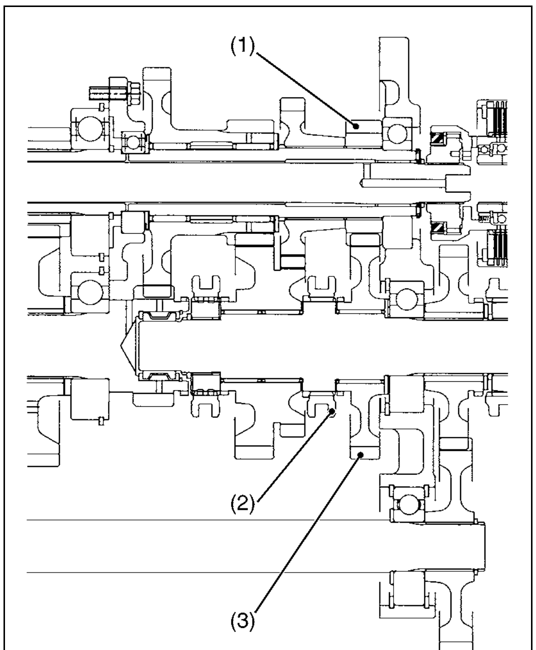
(When reassembling)

- Direct the grooved side of the thrust collar (12) to the gear side.

Tightening torque	Bearing holder 2 mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) 38T Gear
(2) 19T Gear
(3) Bearing
(4) Needle Bearing
(5) Shaft
(6) Internal Snap Ring
(7) Bearing Holder 2
(8) Internal Snap Ring
(9) Bearing
(10) Internal Snap Ring
(11) Bearing
(12) Thrust Collar
(13) Shift Fork
(14) Shifter
(15) Hub
(16) External Snap Ring

W1016531

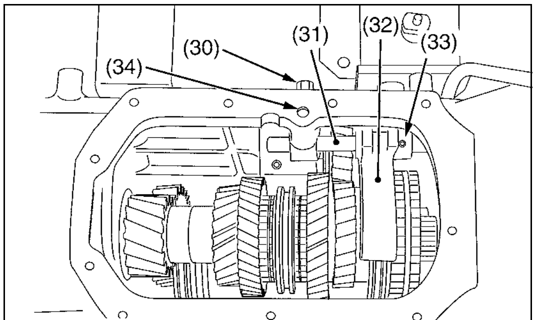


3TMACAB3P085A

Creep Section (if equipped)

(1) 19T Creep Gear
(2) Shifter
(3) 37T Creep Gear

W1016858



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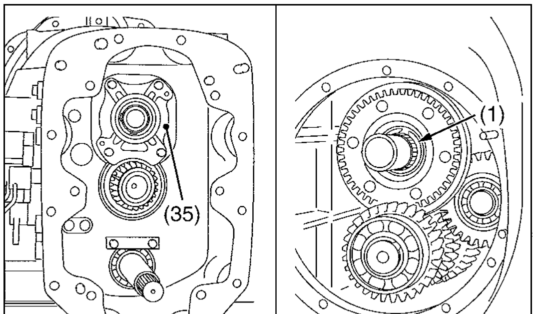
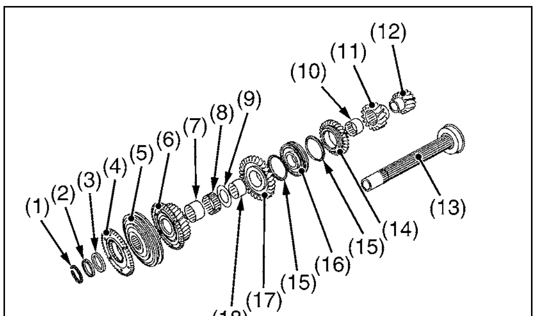


3TMACAB3P087A



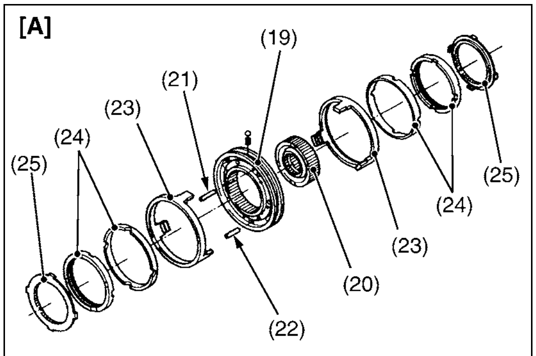
3TMACAB3P088A

1st Shaft

1. Tap out the spring pin (33) from shift fork (32).
2. Remove the bolt (30), and take out the ball and spring.
3. Take out the pin (34) and ball from hole.
4. Draw out the shift rod (31) and take out the shift fork (32).
5. Remove the bearing holder 3 (35).
6. Remove the external snap ring (1).
7. Tap out the 1st shaft (13) to the rear.
8. Take out the gears.

(1) External Snap Ring
(2) Collar
(3) Bearing
(4) Synchro Holder
(5) Synchronizer Unit
(6) 26T Gear
(7) Inner Race
(8) Needle Bearing
(9) Thrust Collar
(10) Inner Race
(11) 20T Gear
(12) 15T Gear
(13) 1st Shaft
(14) 26T Gear
(15) Synchronizer Ring
(16) Shifter Assembly
(17) 30T Gear
(18) Inner Race
(19) Shifter
(20) Hub
(21) Synchronizer Pin 1
(22) Synchronizer Pin 2
(23) Synchronizer Ring
(24) Inner Core
(25) Retainer
(26) Shifter
(27) Key
(28) Spring
(29) Hub
(30) Bolt
(31) Shift Rod
(32) Shift Fork
(33) Spring Pin
(34) Pin
(35) Bearing Holder 3

W1016921



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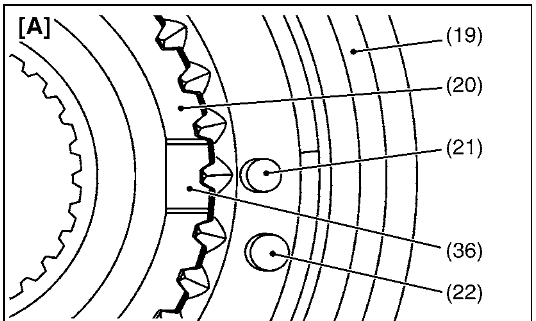

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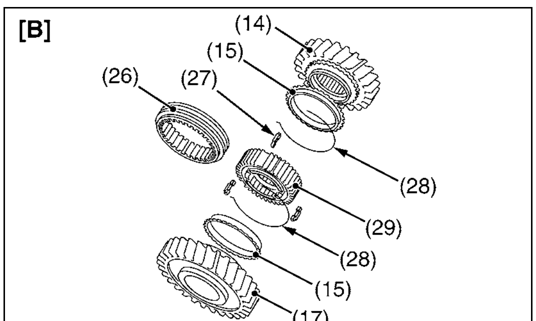

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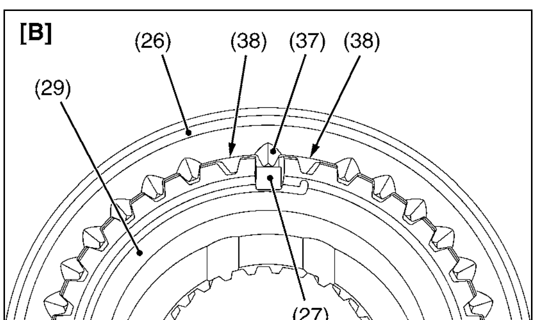

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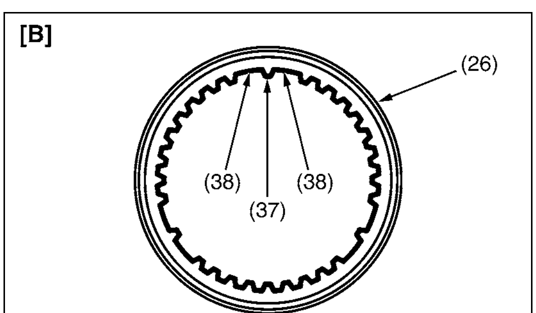


3TMACAB3P230A

1st Shaft (Continued)

(When reassembling)

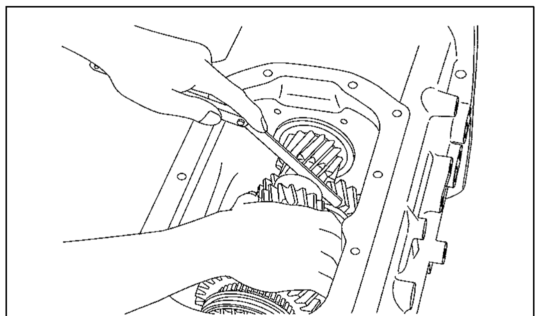
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner surface of 26T gear (14) and 30T gear (17).
- Be sure to assembling the F-R synchronizer unit, align the oil groove (36) on the hub (20) and synchronizer pin 1 (21) as shown in the figure.
- Be sure to assemble the 3rd-4th synchronizer unit, set the spline teeth (37) on the shifter (26) to the key (27) as shown in the figure.
- Adjust the clearance of the gears on the 1st shaft by the collar (2).

Tightening torque	Bearing holder 3 mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

Side clearance of the gear on the 1st shaft	Factory spec.	Less than 0.3 mm 0.0118 in.

(Reference)

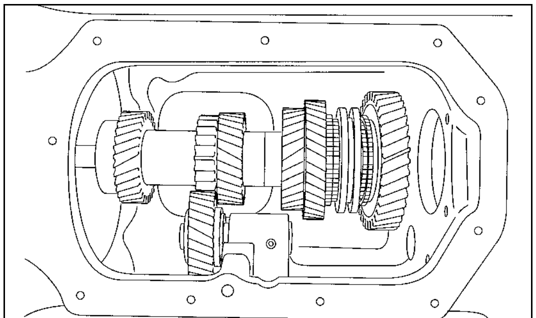
- Thickness of the collar (2) :
  5.8 mm (0.228 in.), 6.0 mm (0.236 in.), 6.2 mm (0.244 in.)


3TMACAB3P128A

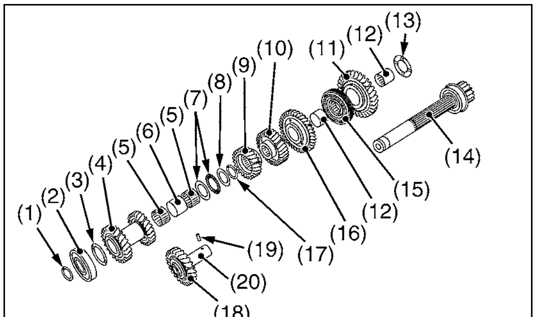
(1) External Snap Ring
(2) Collar
(3) Bearing
(4) Synchro Holder
(5) Synchronizer Unit
(6) 26T Gear
(7) Inner Race
(8) Needle Bearing
(9) Thrust Collar
(10) Inner Race
(11) 20T Gear
(12) 15T Gear
(13) 1st Shaft
(14) 26T Gear
(15) Synchronizer Ring
(16) Shifter Assembly
(17) 30T Gear
(18) Inner Race
(19) Shifter
(20) Hub
(21) Synchronizer Pin 1
(22) Synchronizer Pin 2
(23) Synchronizer Ring
(24) Inner Core
(25) Retainer
(26) Shifter
(27) Key
(28) Spring
(29) Hub
(30) Bolt
(31) Shift Rod
(32) Shift Fork
(33) Spring Pin
(34) Pin
(35) Bearing Holder 3
(36) Oil Groove
(37) Spline Teeth
(38) Without Spline Teeth

[A] F-R Synchronizer Unit
[B] 3rd-4th Synchronizer Unit

W1234674



3TMACAB3P091A



3TMACAB3P092A

18T Gear Shaft and 25T Idle Gear

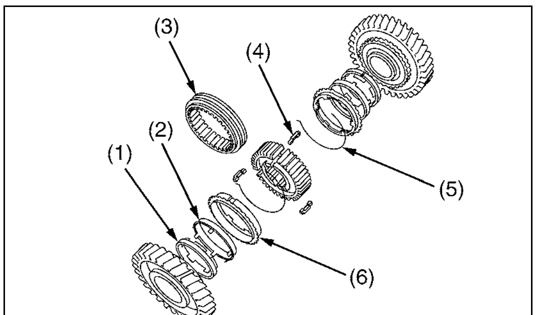
1. Remove the external snap ring (1) and ball bearing (2).
2. Take out the 25T-23T gear (4).
3. Remove the external snap ring (17).
4. Tap out the 18T gear shaft (14) to the rear.
5. Tap out the spring pin (19).
6. Tap out the 25T idle gear shaft (18).

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner surface of 32T gear (16), 37T gear (11).
- Direct the grooved side of thrust collar (13) to the gear side.

(1) External Snap Ring
(2) Bearing
(3) Collar
(4) 25T-23T Gear
(5) Needle Bearing
(6) Collar
(7) Thrust Needle Bearing
(8) Thrust Collar
(9) 23T Gear
(10) 27T Gear
(11) 37T Gear
(12) Inner Race
(13) Thrust Collar
(14) 18T Gear Shaft
(15) Synchronizer Unit
(16) 32T Gear
(17) External Snap Ring
(18) 25T Idle Gear
(19) Spring Pin
(20) 25T Idle Gear Shaft

W1017627

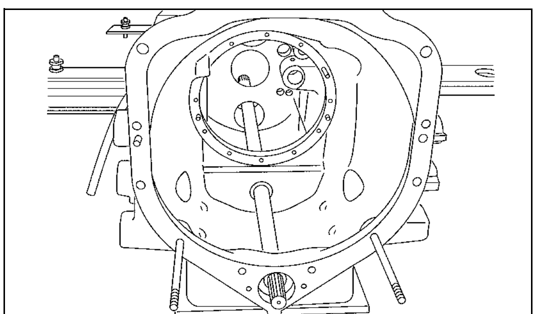


3TMACAB3P093A

Synchronizer Unit

(1) Inner Synchronizer Ring
(2) Center Ring
(3) Shifter
(4) Synchronizer Key
(5) Synchronizer Key Spring
(6) Outer Synchronizer Ring

W1018172



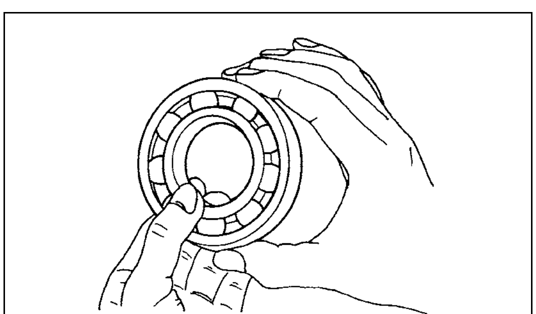
3TMACAB3P094A

DT Propeller Shaft

1. Tap out the DT propeller shaft to the rear.

W1018294

(2) Servicing

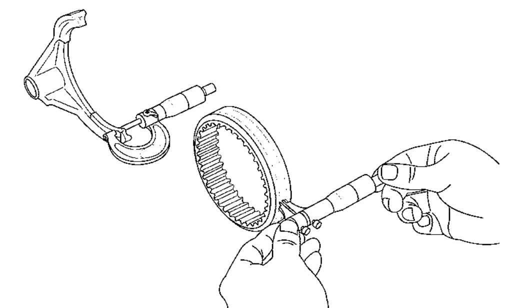


3TMABAB3P015A

Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1026450



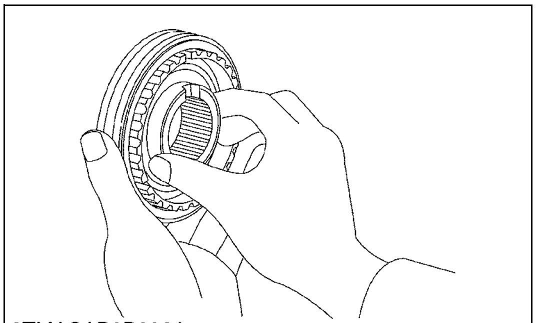
3TMACAB3P095A

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 shifter groove	M6800S (Shuttle) F-R	Factory spec.	0.20 to 0.45 mm 0.0079 to 0.0177 in.
		Allowable limit	0.80 mm 0.031 in.
	M6800S (Others)	Factory spec.	0.15 to 0.40 mm 0.0059 to 0.0157 in.
		Allowable limit	0.80 mm 0.031 in.
	M6800 M8200 M9000 (All)	Factory spec.	0.13 to 0.40 mm 0.0051 to 0.0157 in.
		Allowable limit	0.80 mm 0.031 in.

W1021243

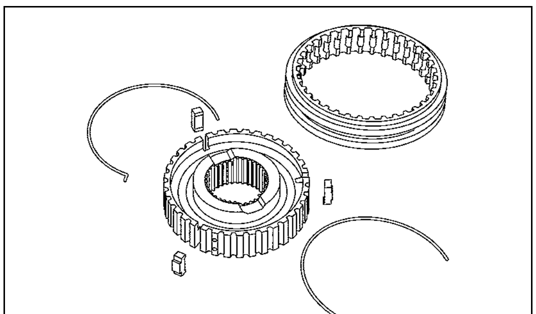


3TMACAB3P096A

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.

W1021385



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.

W1021482

[2] TRANSMISSION CASE

(1) Disassembling and Assembling

(A) Separating Clutch Housing Case and Transmission Case

Draining Transmission Fluid

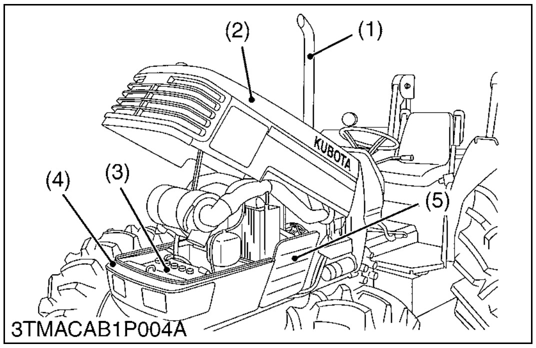
- See page 2-S5.

W1021652

Draining Fuel

- See page 3-S7.

W1021606



3TMACAB1P004A

Muffler and Bonnet

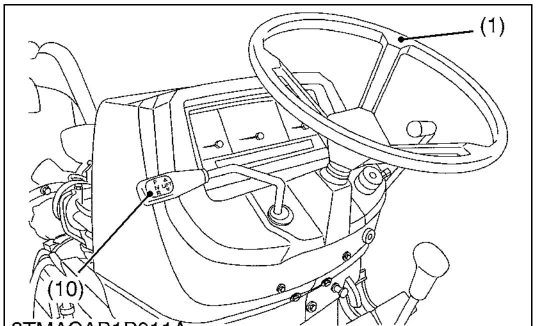
1. Remove the muffler (1).
2. Remove the bonnet (2).
3. Disconnect the battery's cable.
4. Disconnect the head light **3P** connectors.
5. Remove the front lower cover (4) and side cover (5).

■ **IMPORTANT**

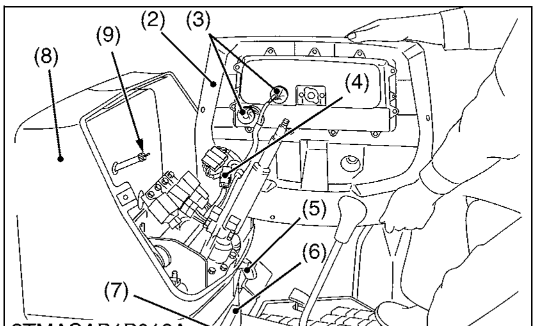
- **When disconnecting the battery cords, disconnect the grounding cord first. When connecting, positive cord first.**

(1) Muffler (Upper)
(2) Bonnet
(3) Battery
(4) Front Lower Cover
(5) Side Cover

W1076942



3TMACAB1P011A



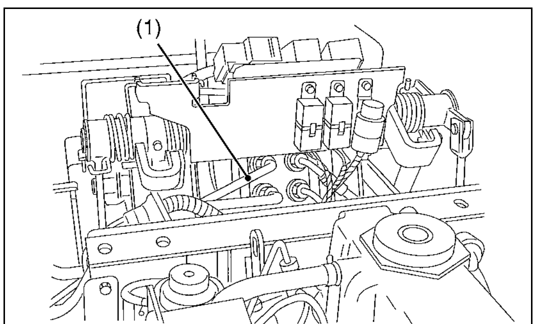
3TMACAB1P012A

Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1) with a steering wheel puller (Code No. 07916-51090).
2. Remove the shuttle lever grip (10).
3. Remove the meter panel mounting screw and disconnect the meter cable (9).
4. Disconnect the connectors (3).
5. Disconnect the main switch connector (4) and headlight switch connector, hazard and turn signal switch connector.
6. Disconnect the engine stop cable (5) at the engine side.
7. Remove the rear bonnet (8).
8. Remove the fuse box (7) and cover (6).

(1) Steering Wheel
(2) Meter Panel
(3) Connectors
(4) Main Switch Connector
(5) Engine Stop Cable
(6) Cover
(7) Fuse Box
(8) Rear Bonnet
(9) Meter Cable
(10) Shuttle Lever Grip

W1021833



3TMACAB2P014B

Delivery Pipe for PTO Clutch Valve (Return Pipe)

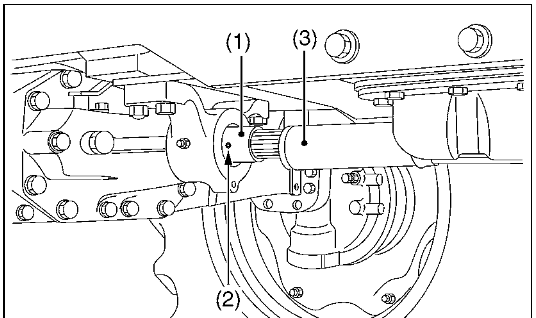
1. Disconnect the return pipe (1) for PTO clutch valve.

(When reassembling)

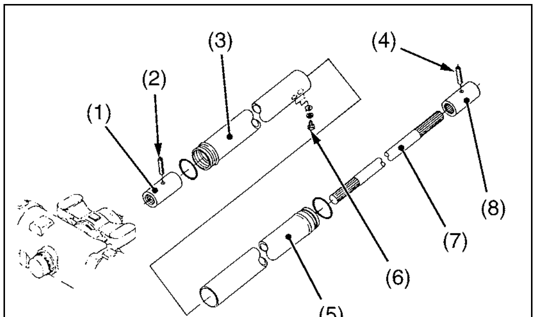
Tightening torque	Return pipe retaining nut	46.6 to 51.0 N·m 4.8 to 5.2 kgf·m 34.7 to 37.6 ft-lbs

(1) Return Pipe

W1022023



3TMACAB1P007A



3TMACAB1P008A

Propeller Shaft (4WD Only)

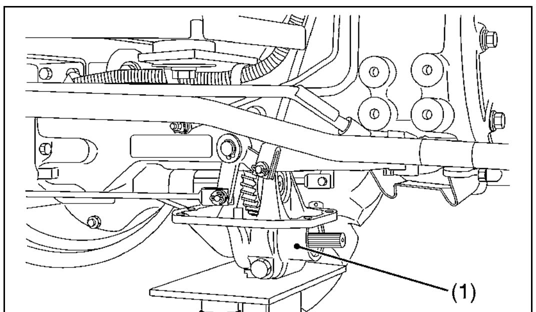
1. Slide the propeller shaft cover (3), (5) after removing the screws (6).
2. Tap out the spring pin (2), (4) and then slide the coupling (1), (8) to the front and rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (7) and couplings.

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

W1023157



3TMACAB3P028A

DT Gear Case [M6800(S) 4WD Only]

1. Remove the DT shift rod.
2. Remove the DT gear case (1).

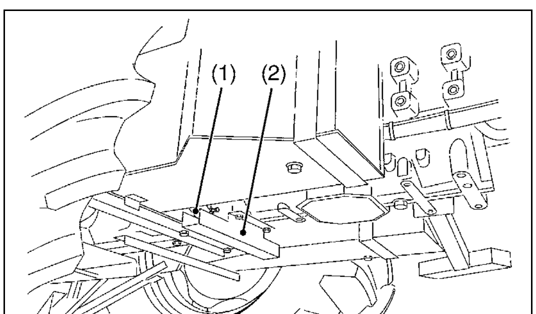
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the clutch housing and DT gear case.

Tightening torque	DT gear case mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) DT Gear Case

W1022271



3TMACAB2P033A

Fuel Tank Connection Hose

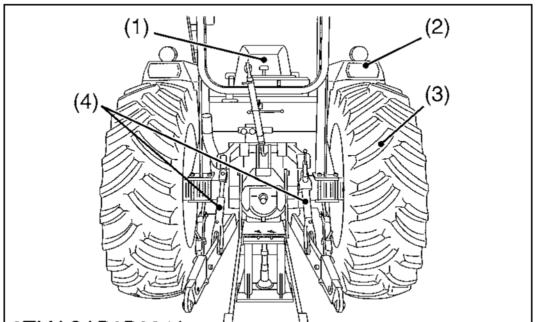
1. Remove the cover (2).
2. Remove the connection hose (1).

(When reassembling)

Tightening torque	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) Connection Hose
(2) Cover

W1022841



3TMACAB2P034A

Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

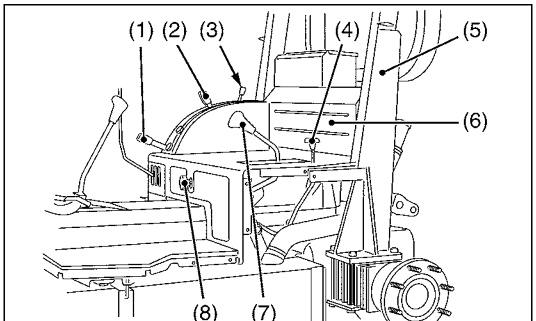
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	Rear wheel mounting nut	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.0 ft-lbs

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1022972



3TMACAB2P035A

Center Frame and ROPS

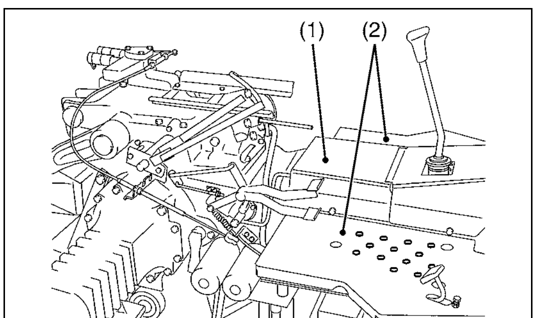
1. Remove the remote valve wire.
2. Remove the draft and position control lever grips (1), (2).
3. Remove the auxiliary speed change lever grip (7).
4. Remove the DT shaft lever grip (4).
5. Remove the three point hitch lowering speed control grip (8) and PTO lever (3).
6. Remove the center frame (6).
7. Remove the ROPS (5).

(When reassembling)

Tightening torque	ROPS mounting screw M16 grade 9 screw	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.0 ft-lbs

(1) Position Control Lever Grip
(2) Draft Control Lever Grip
(3) PTO Lever
(4) DT Shift Lever Grip
(5) ROPS
(6) Center Frame
(7) Auxiliary Speed Change Lever Grip
(8) Three Point Hitch Lowering Speed Control Grip

W1022649



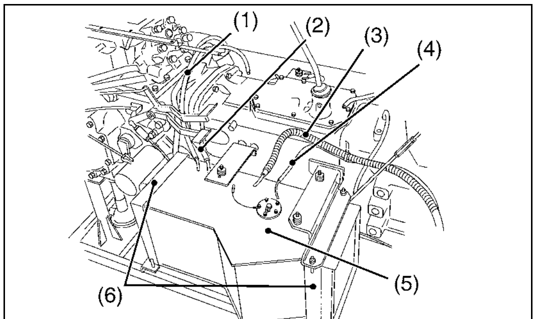
3TMACAB3P098A

Housing Cover and Steps

1. Remove the housing cover (1).
2. Remove the steps (2).

(1) Housing Cover
(2) Steps

W1023337



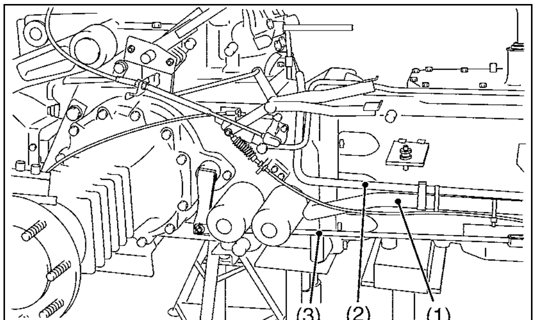
3TMACAB2P037A

Fuel Tanks

1. Remove the fuel hose (1), (2), (3), (4).
2. Remove the tank bands (6).
3. Remove the fuel tanks (5).

(1) Fuel Hose 1
(2) Fuel Hose 2
(3) Fuel Hose 3
(4) Fuel Hose 4
(5) Fuel Tank
(6) Tank Band

W1023492



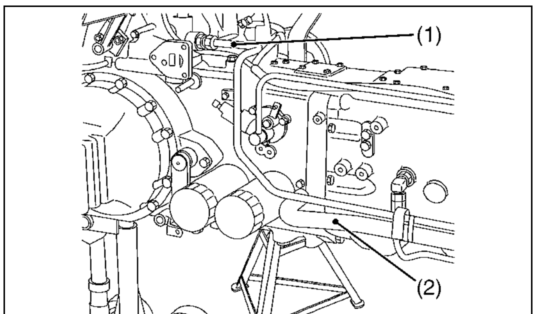
3TMACAB3P099A

Hydraulic Pipes and Brake Rods

1. Remove the suction pipe (1).
2. Remove the delivery pipe (2) for three point hydraulic system.
3. Remove the brake rods (3).

(1) Suction Pipe
(2) Delivery Pipe
(3) Brake Rod

W1023606



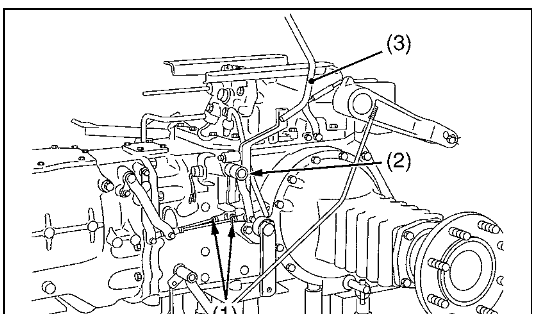
3TMACAB3P100A

Hydraulic Pipes [M6800S]

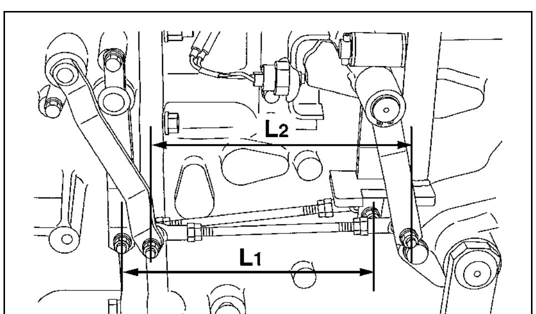
1. Remove the suction pipe (2).
2. Remove the delivery pipe (1) for the three point hydraulic system.

(1) Delivery Pipe
(2) Suction Pipe

W1106837



3TMACAB2P039A



3TMACAB2P040A

Auxiliary Shift Lever [M6800(S)]

1. Disconnect the shift rods (1).
2. Remove the external circlip (2).
3. Take out the shift lever assembly.

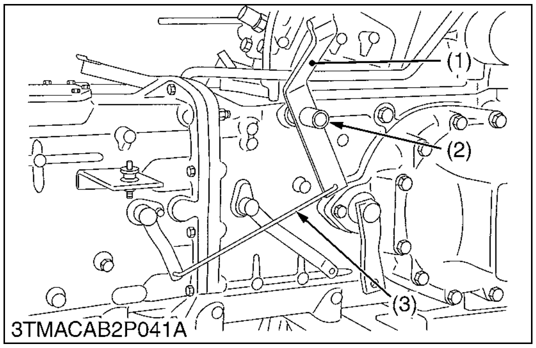
(When reassembling)

- Be sure to adjust the shift rod length.

Shift rod length **L_1** and **L_2**	Factory spec.	Approx. 209 mm 8.23 in.

(1) Shift Rod
(2) External Circlip
(3) Shift Lever

W1023796

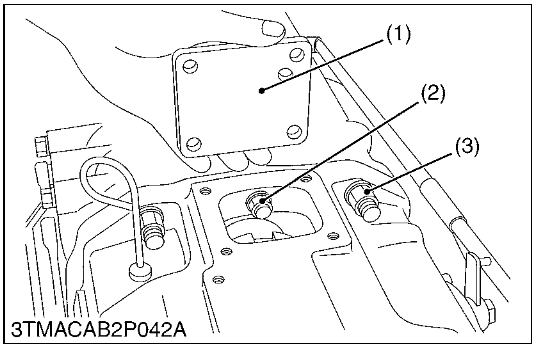


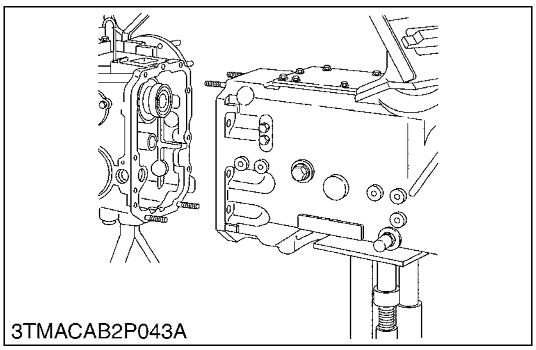
Auxiliary Shift Lever [M8200 · M9000]

1. Remove the shift rod (3).
2. Remove the external circlip (2).
3. Take out the shift lever (1).

(1) Shift Lever
(2) External Circlip
(3) Shift Rod

W1023701





Separating Transmission Case [M6800(S)]

1. Remove the transmission upper cover (1).
2. Remove the transmission case mounting screws and nut, and separate the transmission case from the clutch housing.

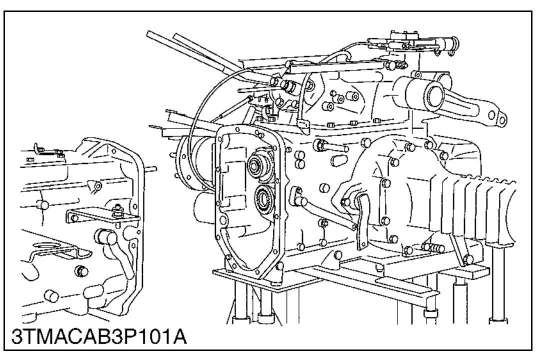
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the transmission case and clutch housing, transmission upper cover and transmission case.

Tightening torque	Transmission case and clutch housing screw, nut	M12, grade 11 nut	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
		M12, grade 7 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M10, grade 9 screw, nut (2)	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs
	Transmission case and clutch housing mounting stud bolt		38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Transmission upper cover mounting screw		23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Transmission Upper Cover
(2) Transmission Case Mounting Screw, Nut
(3) Transmission Case Mounting Nut

W1024061



Separating Transmission Case [M8200 · M9000]

1. Check 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.

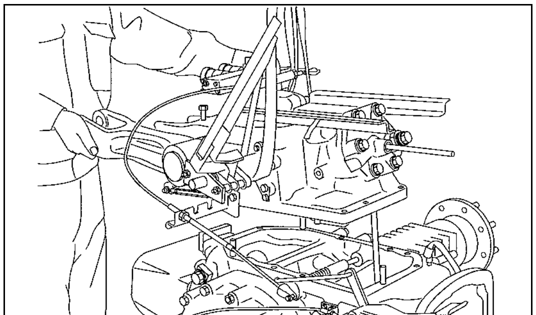
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of transmission case and clutch housing case.

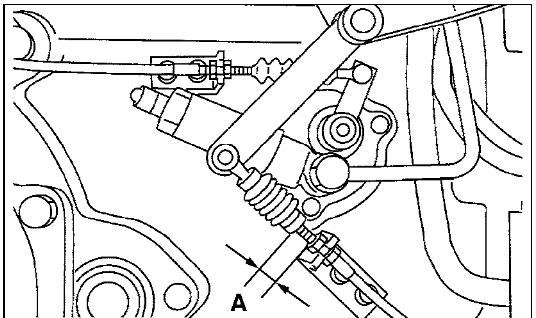
Tightening torque	Transmission case and clutch housing mounting screw, nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1023951

(B) Disassembling Transmission Case



3TMACAB3P102A



3TMACAB3P103A

Hydraulic Cylinder Assembly

1. Remove the lift rods from lift arms.
2. Remove the hydraulic cylinder assembly mounting screws and nuts.
3. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then remove it.

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.
- Be sure to adjust the differential lock pedal free travel by adjusting the length **A**.

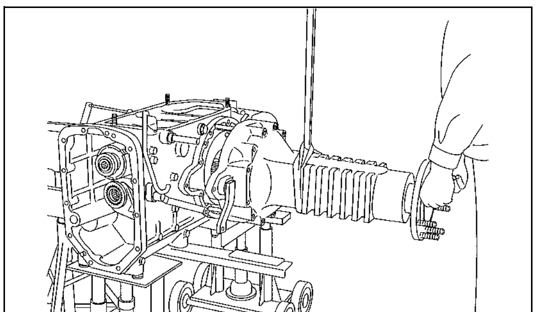
Tightening torque	Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

Differential lock pedal free travel	Factory spec.	20.0 to 30.0 mm 0.79 to 1.18 in.

■ **NOTE**

- **Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod.**

W1024286



3TMACAB3P104A

Rear Axle L.H.

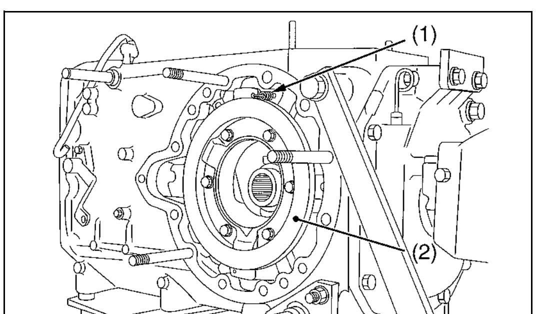
1. Remove the rear axle case mounting screws and nuts.
2. Support the rear axle assembly with nylon lift strap and hoist, and then remove it.

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	M6800 (S)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M8200 M9000	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

W1024457



3TMACAB3P105A

Brake Cam Plate

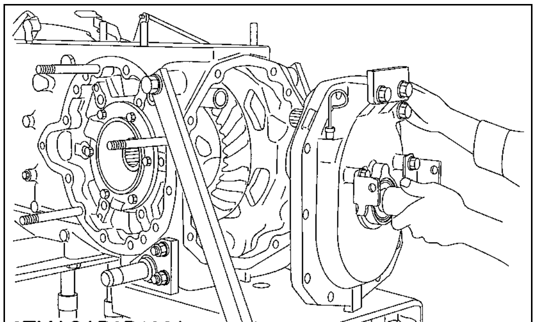
1. Remove the return spring (1).
2. Remove the brake cam plate (2).

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)

(1) Return Spring (2) Brake Cam Plate

W1024679


3TMACAB3P106A

PTO Gear Case Assembly

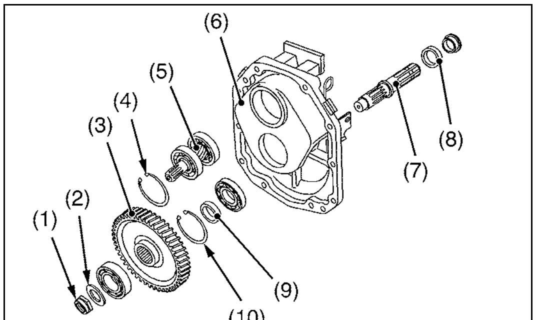
1. Remove the PTO gear case and PTO drive shaft as a unit.

(When reassembling)

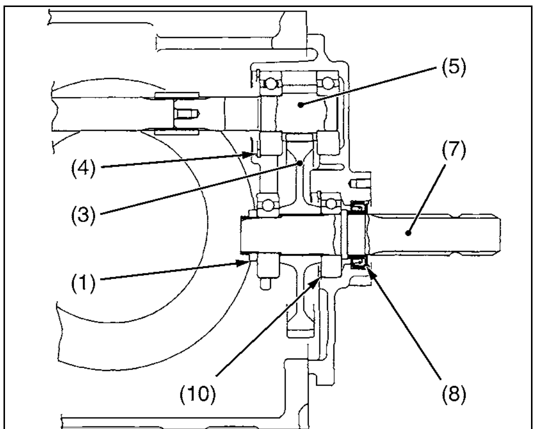
- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the PTO gear case and transmission case.

Tightening torque	PTO gear case assembly mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1024794



3TMACAB3P107A



3TMACAB3P108A

Disassembling PTO Gear Case Assembly [Fixed PTO Shaft Type with Single Speed]

1. Remove the stake of the staking nut and remove the staking nut (1).
2. Tap out the PTO shaft (7).
3. Remove the internal snap ring (4).
4. Draw out the gear shaft (5).

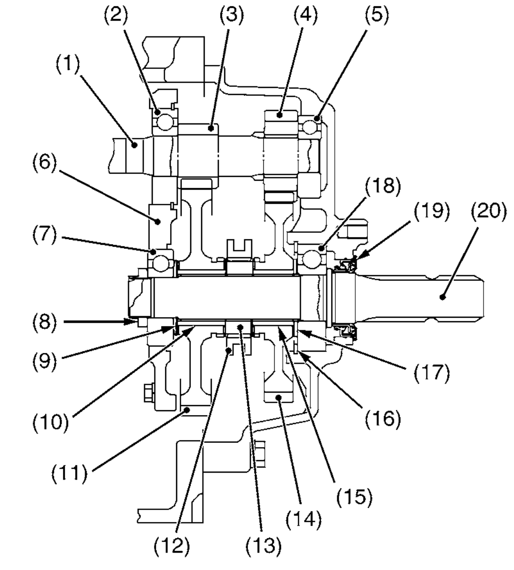
(When reassembling)

- Assembling the oil seal (8) with correct direction.
- Apply grease to the oil seal.
- Replace the staking nut with a new one, and after tightening it to specified torque, stake it firmly.

Tightening torque	PTO shaft staking nut	225.6 to 264.8 N·m 23 to 27 kgf·m 166.4 to 195.3 ft-lbs

(1) Staking Nut
(2) Collar
(3) Gear
(4) Internal Snap Ring
(5) Gear Shaft
(6) Gear Case
(7) PTO Shaft
(8) Oil Seal
(9) Collar
(10) Internal Snap Ring

W1024887



3TMACAB3P109A

Disassembling PTO Gear Case [Fixed PTO Shaft Type with Two Speeds]

1. Remove the PTO case cover mounting screws and then remove the PTO gear case cover (6).
2. Remove the stake of the staking nut (8), and then remove it.
3. Remove the bearing (7) by using the bearing puller.
4. Tap out the PTO shaft to the rear side.
5. Remove the gears (11), (14), thrust collars (9), (17), inner rings (10), (15), hub (13) and shifter (12).
6. Pull out the PTO drive shaft (1) as a unit.
7. Remove the PTO shift fork parts and PTO shift lever parts.

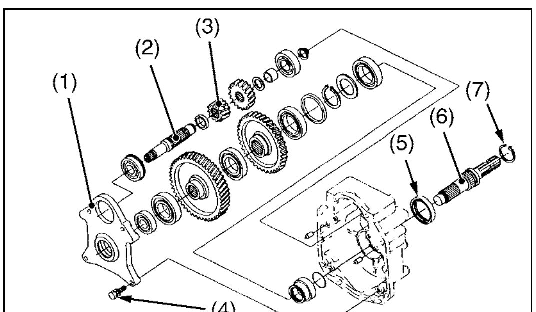
(When reassembling)

- Reinstall the reamer screw at correct position to mount the PTO cover case.
- Direct the grooves of thrust collars (9), (17) to the inner rings (10), (15) sides.
- Replace the PTO shaft staking nut (8) with new one, and stake it firmly after tightening.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner rings (10) and (15).
- Apply grease to the oil seal (19) and O-ring.

Tightening torque	PTO shaft staking nut	225.6 to 264.8 N·m 23 to 27 kgf·m 166.4 to 195.3 ft-lbs
	PTO gear case cover mounting screws and reamer screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) PTO Drive Shaft
(2) Ball Bearing
(3) Gear
(4) Gear
(5) Ball Bearing
(6) PTO Gear Case Cover
(7) Ball Bearing
(8) Stake Nut
(9) Thrust Collar
(10) Inner Ring
(11) Gear
(12) Shifter
(13) Hub
(14) Gear
(15) Inner Ring
(16) Internal Snap Ring
(17) Thrust Collar
(18) Ball Bearing
(19) Oil Seal
(20) PTO Shaft

W1107950



3TMACAB3P110A

Disassembling PTO Gear Case [Interchangeable PTO Shaft Type]

1. Remove the PTO gear case cover mounting screws (4), and then remove the PTO gear case cover (1).
2. Remove the internal snap ring (7), and then draw out the PTO shaft (6) to the rear side.
3. Pull out the PTO drive shaft (2) as a unit.
4. Disassemble the PTO drive and gears.

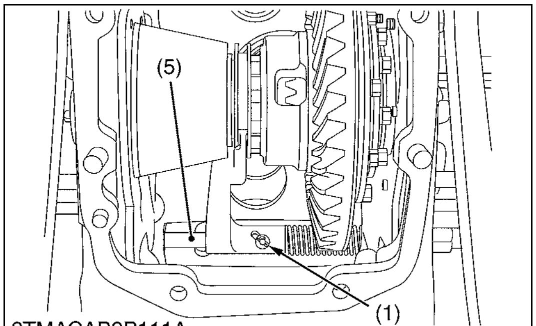
(When reassembling)

- Assembling the gear (3) with correct direction.
- Apply grease to the oil seal (5) and O-ring.
- After the PTO shaft (6) has been assembled, turn the PTO shaft by hand to make sure it moves smoothly.

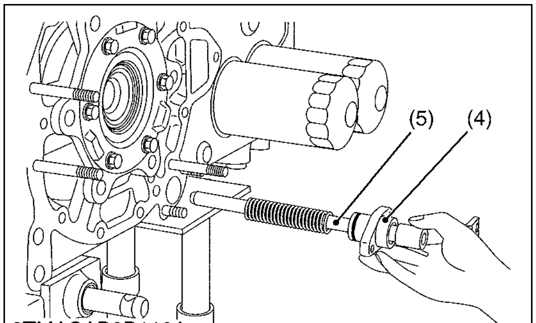
Tightening torque	PTO gear case cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) PTO Gear Case Cover
(2) PTO Drive Shaft
(3) Gear
(4) Screws
(5) Oil Seal
(6) PTO Shaft
(7) Internal Snap Ring

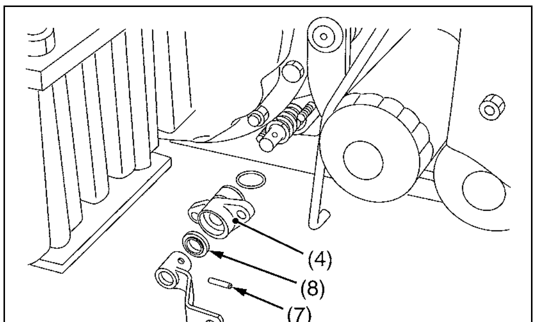
W1110137



3TMACAB3P111A



3TMACAB3P112A



3TMACAB3P113A

Differential Lock Fork [M6800(S)]

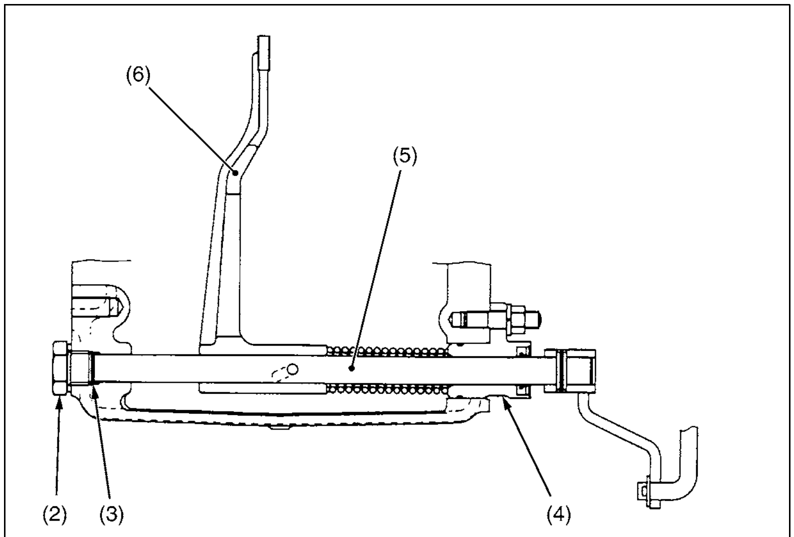
1. Remove the clevis pin (1).
2. Remove the plug (2) and take out the adjusting shims (3).
3. Remove the spring holder mounting nuts.
4. Tap out the differential lock shaft (5) with the spring holder (4).

■ **NOTE**

- **Taking out the differential lock fork (6), after remove the differential assembly.**
- **When replacing the oil seal only, tap out the differential lock lever spring pin (7), then remove the spring holder (4) and replace the oil seal (8).**

(When reassembling)

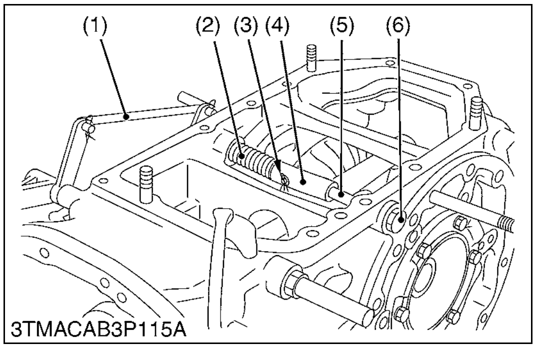
- Apply grease to the oil seal.



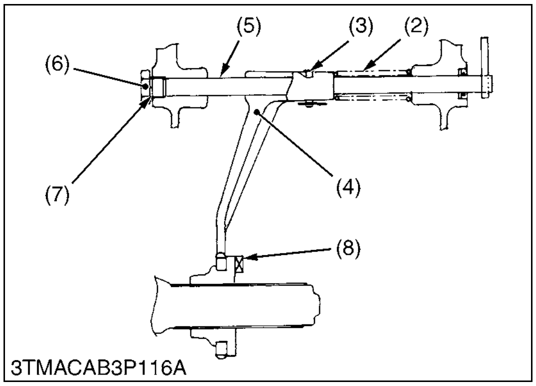
3TMACAB3P114A

(1) Clevis Pin	(5) Differential Lock Shaft
(2) Plug	(6) Differential Lock Fork
(3) Adjusting Shim	(7) Spring Pin
(4) Spring Holder	(8) Oil Seal

W1025426



3TMACAB3P115A



3TMACAB3P116A

Differential Lock Fork [M8200 · M9000]

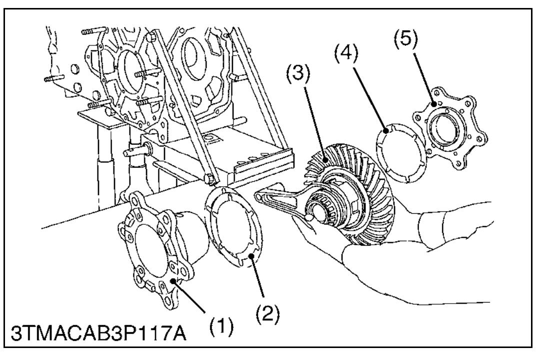
1. Remove the differential lock rod (1).
2. Remove the clevis pin (3) and plug (6).
3. Draw out the differential lock shaft (5).
4. Take out the differential lock fork (4) and spring (2).

(When reassembling)

- Apply grease to the oil seal.

(1) Differential Lock Rod
(2) Spring
(3) Clevis Pin
(4) Differential Lock Fork
(5) Differential Lock Shaft
(6) Plug
(7) Shim
(8) Differential Lock Clutch

W1025234



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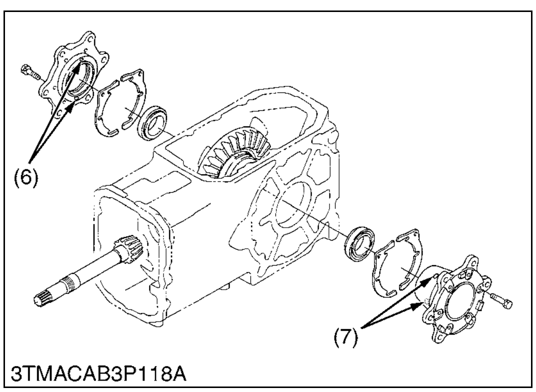


3TMACAB3P118A

Differential Gear Assembly [M6800(S)]

1. Remove the differential support (1), (5), noting the number of left and right shims (2), (4).
2. Take out the differential gear assembly (3) from transmission case.

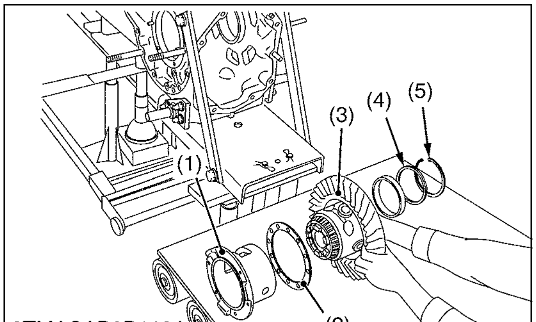
(When reassembling)

- Be sure to adjust the turning torque of spiral bevel pinion shaft and differential assembly combined. (See page 3-S50, S51.)
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft. (See page 3-S52, S53.)
- When installing the differential support to the transmission, be sure to reassemble it as shown in the figure.

Tightening torque	Differential bearing support mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Differential Support
(2) Shim
(3) Differential Assembly
(4) Shim
(5) Differential Support
(6) Oil Hole
(7) Oil Hole

W1025952



3TMACAB3P119A

Differential Gear Assembly [M8200 · M9000]

1. Remove the differential support (1), noting the number of shims (2).
2. Take out the differential gear assembly (3) from transmission case.
3. Remove the internal snap ring (5) noting the number of shims (4).

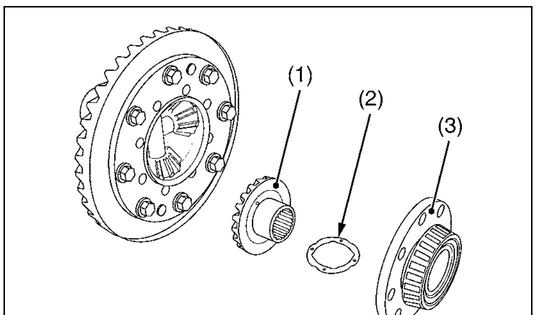
(When reassembling)

- Be sure to adjust the turning torque of spiral bevel pinion shaft and differential assembly combined. (See page 3-S50, S51.)
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft. (See page 3-S52, S53.)

Tightening torque	Differential bearing support mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Differential Support
(2) Shim
(3) Differential Gear Assembly
(4) Shim
(5) Internal Snap Ring

W1025771



3TMABAB3P033A

Differential Case Cover and Differential Side Gear

1. Remove the differential case cover (3).
2. Remove the differential side gear (1) and differential side gear washer (2).

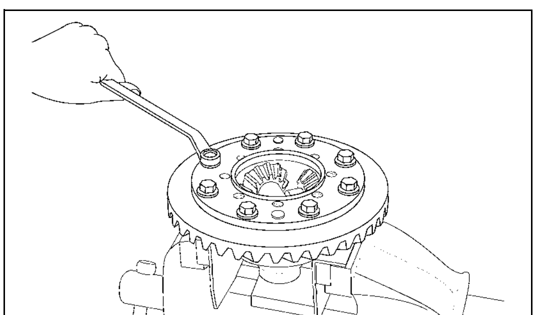
(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gear boss.

Tightening torque	Differential 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

(1) Differential Side Gear
(2) Differential Side Gear Washer
(3) Differential Case Cover

W1026252


3TMABAB3P034A

Spiral Bevel Gear

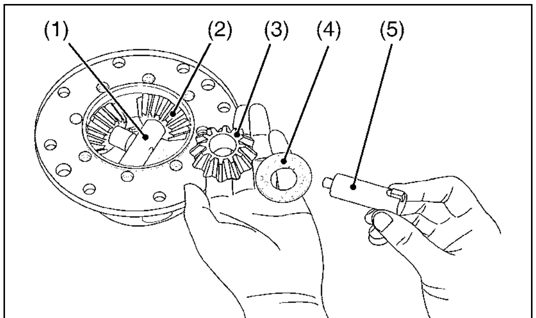
1. Remove the spiral bevel gear.

(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 1372 or equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	M6800 (S)	70.6 to 90.2 N·m 7.2 to 9.2 kgf·m 52.1 to 66.5 ft-lbs
		M8200 M9000	142.2 to 161.8 N·m 14.5 to 16.5 kgf·m 104.9 to 119.3 ft-lbs

W1026408



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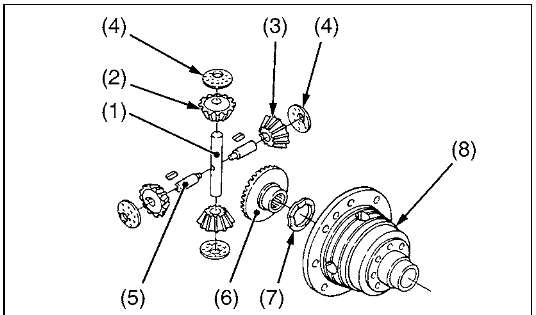

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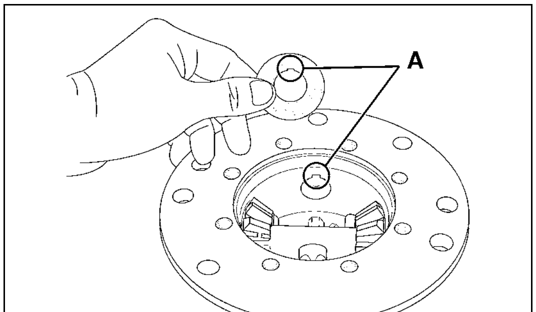


3TMABAB3P037A

Differential Pinion Shaft and Differential Pinion

1. Draw out the differential pinion shaft 2 (5), and take out the differential pinion (3) and differential pinion washer (4).
2. Draw out the differential pinion shaft (1), and take out the differential pinion (2) and differential pinion washer.

■ **NOTE**

- **Arrange the parts to know their original position.**

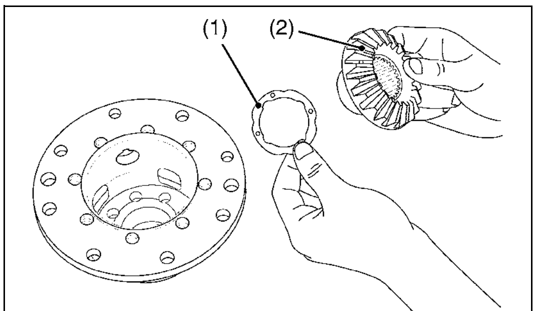
(When reassembling)

- Check the differential pinions (2) and (3), and pinion shaft (1) and (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.

(1) Differential Pinion Shaft
(2) Differential Pinion
(3) Differential Pinion
(4) Differential Pinion Washer
(5) Differential Pinion Shaft 2
(6) Differential Side Gear
(7) Differential Side Gear Washer
(8) Differential Case

(A) Fit Groove

W1026545



3TMABAB3P038A

Differential Side Gear

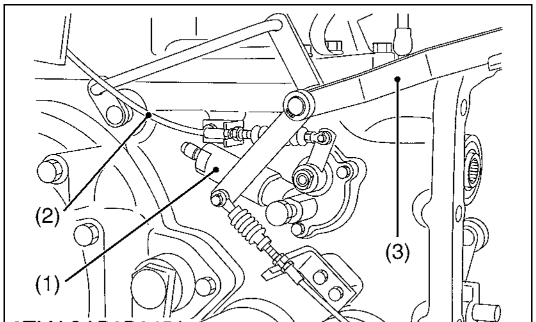
1. Take out the differential side gear (2) and differential side gear washer (1).

(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

W1026929



3TMACAB2P045A

PTO Clutch Valve

1. Remove the differential lock pedal (3).
2. Disconnect the PTO clutch valve cable (2).
3. Remove the PTO clutch valve (1).

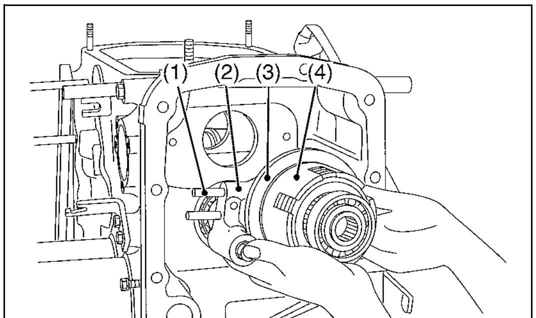
(When reassembling)

- Apply transmission fluid to O-ring.
- 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.
- Now while aligning the hydraulic pipe ends with the PTO clutch holder holes, assemble the PTO clutch valve (1) to the transmission case.

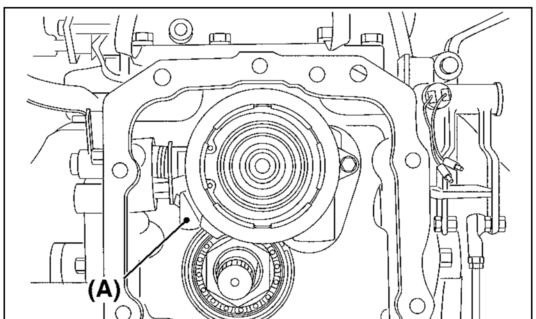
Tightening torque	PTO clutch valve mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) PTO Clutch Valve
(2) PTO Clutch Valve Cable
(3) Differential Lock Pedal

W1023008



3TMACAB2P046A



3TMACAB2P047A

PTO Clutch and Holder

1. Remove the PTO clutch holder mounting screws.
2. Remove the PTO clutch (4) with holder.

(When reassembling)

- Apply transmission fluid to O-ring.
- Take care not to damage the oil pipes (1).

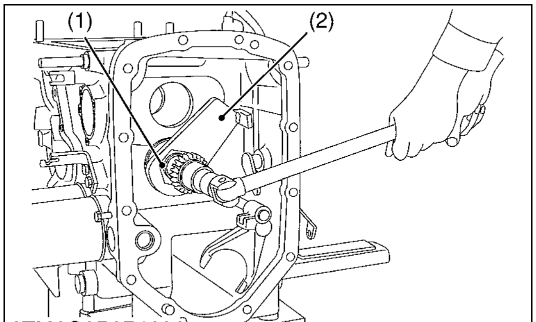
Tightening torque	PTO clutch holder mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

■ **IMPORTANT**

- **When reassembling the PTO clutch assembly, direct the projection part of brake plate (A) as a figure [M6800(S)].**
- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-blowing.**

(1) Oil Pipe
(2) Holder
(3) Brake Plate
(4) PTO Clutch Pack

W1027164



3TMACAB3P120A

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)

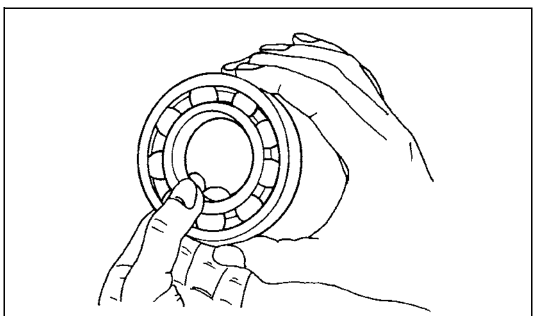
- Replace the staking nut with a new one, and be sure to adjust the turning torque of spiral bevel pinion shaft only. (See page 3-S48, S49.)
- Stake the staking nut after installing the differential assembly.

Tightening torque	Spiral bevel pinion shaft staking nut	M6800(S) (Old type)	274.6 to 343.2 N·m 28.0 to 35.0 kgf·m 202.5 to 253.2 ft-lbs
		M6800(S) (New type)	117.7 to 127.5 N·m 12.0 to 13.0 kgf·m 86.8 to 84.0 ft-lbs
		M8200 M9000	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 ft-lbs

(1) Staking Nut (2) Locking Wrench

W1027338

(2) Servicing

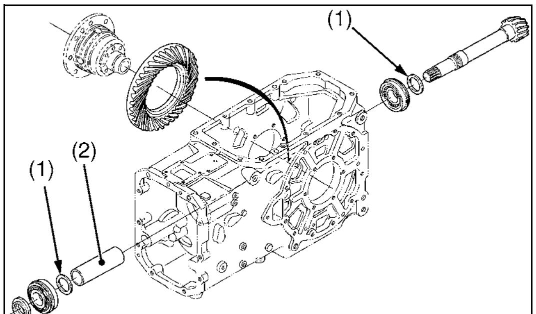

3TMABAB3P015A

Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1027578

■ **IMPORTANT**
- **When reassembling spiral bevel pinion shaft and differential assembly, be sure to adjust the following.**
  - **Turning torque of spiral bevel pinion shaft only.**
  - **Turning torque of spiral bevel pinion shaft and differential assembly combined.**
  - **Backlash and tooth contact between spiral bevel pinion shaft and spiral bevel gear.**
  - **There are 2 types of constituent parts for bevel pinion shaft assembly. (with collar : old type, without collar : new type)**



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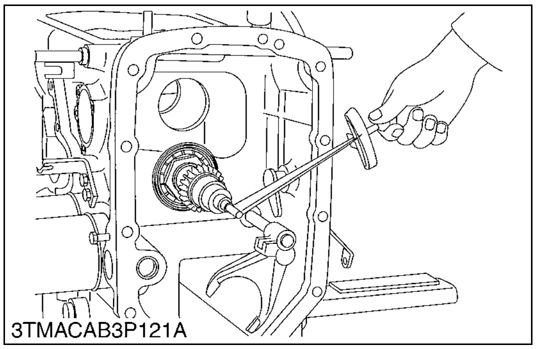
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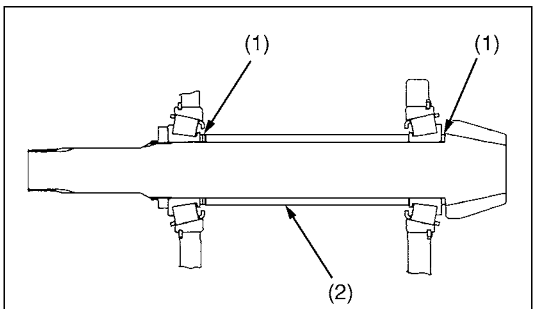


3TMACAB3P122B

Turning Torque of Spiral Bevel Pinion Shaft Only (Old Type : With Collar)

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut with locking wrench and turning wrench.
2. After striking the bevel pinion shaft to the front and rear, retighten the staking nut to specified torque.
3. Measure the turning torque of spiral bevel pinion shaft.
4. If the measurement is not within the factory specifications, adjust with the adjusting collar 1 (1).

Turning torque	Factory spec.	M6800 (S)	0.69 to 1.96 N·m 0.07 to 0.20 kgf·m 0.51 to 1.45 ft-lbs
		M8200 M9000	3.14 to 3.63 N·m 0.32 to 0.37 kgf·m 2.31 to 2.68 ft-lbs

(When reassembling)

Tightening torque	Staking nut	M6800 (S)	274.6 to 343.2 N·m 28.0 to 35.0 kgf·m 202.5 to 253.2 ft-lbs
		M8200 M9000	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 ft-lbs

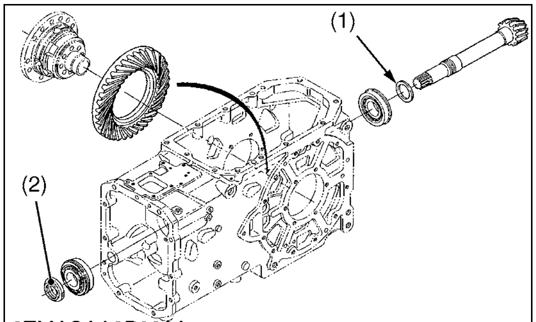
(Reference)
- Thickness of adjusting collar (1) :

M6800(S)		M8200 · M9000
1.00 mm (0.039 in.) 1.50 mm (0.059 in.) 1.70 mm (0.067 in.) 1.75 mm (0.069 in.) 1.80 mm (0.071 in.) 1.90 mm (0.075 in.)	2.00 mm (0.079 in.) 2.10 mm (0.083 in.) 2.20 mm (0.087 in.) 2.25 mm (0.089 in.) 2.30 mm (0.091 in.)	0.80 mm (0.032 in.) 1.00 mm (0.039 in.) 1.20 mm (0.047 in.) 1.40 mm (0.055 in.) 1.60 mm (0.063 in.)

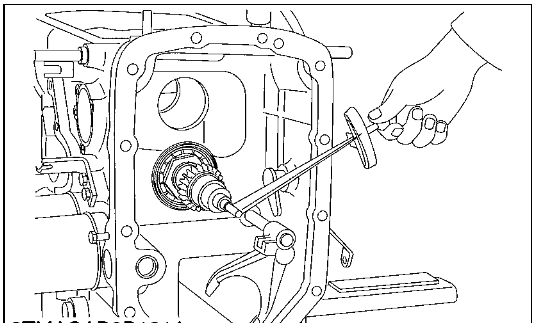
■ **NOTE**
- **Stake the staking nut after performing adjustments described in the following pages.**

(1) Adjusting Collar 1 (2) Collar

W1027711



3TMACAA3P038A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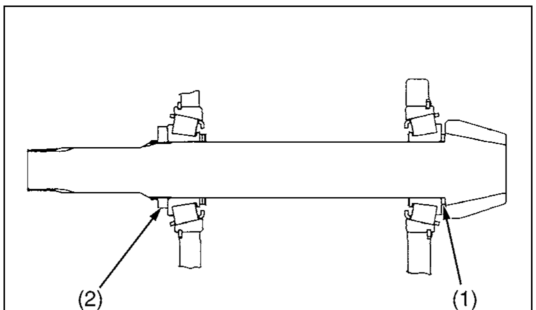


3TMACAD3P074A

Turning Torque of Spiral Bevel Pinion Shaft Only (New Type : Without Collar)

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut (2) with locking wrench and turning wrench.
2. After striking the bevel pinion shaft to the front and rear, retighten the staking nut (2) 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 (2).

Turning torque	Factory spec.	M6800 (S)	2.94 to 3.43 N·m 0.30 to 0.35 kgf·m 2.17 to 2.53 ft-lbs
		M8200 M9000	3.14 to 3.63 N·m 0.32 to 0.37 kgf·m 2.31 to 2.68 ft-lbs

(When reassembling)

Tightening torque	Staking nut (2)	M6800 (S)	117.7 to 127.5 N·m 12.0 to 13.0 kgf·m 86.8 to 84.0 ft-lbs
		M8200 M9000	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 ft-lbs

(Reference)

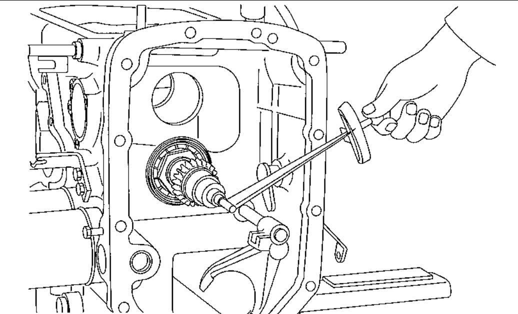
- Thickness of adjusting collar (1) : 2.8 mm (0.110 in.)
  3.0 mm (0.118 in.)
  3.2 mm (0.126 in.)
  3.4 mm (0.134 in.)
  3.6 mm (0.142 in.)

■ **NOTE**

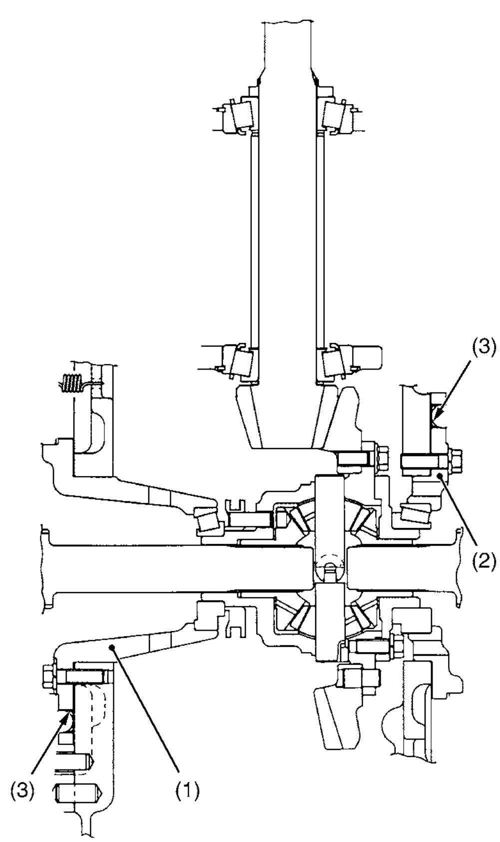
- **Stake the staking nut after performing adjustments described in the following pages.**

(1) Adjusting Collar 1　(2) Staking Nut

W1071401



3TMACAB3P121A



3TMACAB3P123A

Turning Torque of Spiral Bevel Pinion Shaft and Differential Assembly Combined (Old Type : With Collar)

1. Reassemble the differential assembly with left and right shims (3) same as before disassembling.
2. Check that there is a backlash. If there is no backlash, move a left shim to the right.

(Reference)

- If the thickness of shims is not known, refer to the following.
- Reassemble the differential assembly with no shim at bearing support **L** (1) side and with an adequate number of shims at bearing support **R** (2) side. And proceed to the next step.

3. Measure the turning torque by turning the spiral bevel pinion shaft, and then add a shim to the bearing support **R** (2) if the turning torque exceeds the factory specifications, or remove a shim from there if the turning torque is less than the factory specifications.
4. And repeat the above procedure until the turning torque becomes the factory specifications.

Turning torque	Factory spec.	M6800 (S)	2.0 to 4.4 N·m 0.20 to 0.45 kgf·m 1.5 to 3.2 ft-lbs
		M8200 M9000	5.59 to 6.67 N·m 0.57 to 0.68 kgf·m 4.12 to 4.92 ft-lbs

(When reassembling)

Tightening torque	Staking nut	M6800 (S)	274.6 to 343.2 N·m 28.0 to 35.0 kgf·m 202.5 to 253.2 ft-lbs
		M8200 M9000	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 ft-lbs

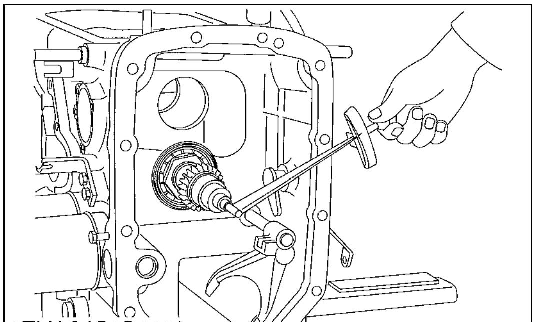
(Reference)

- Thickness of adjusting shims :

0.1 mm (0.004 in.)	0.5 mm (0.020 in.)
0.3 mm (0.012 in.)	

(1) Bearing Support **L**
(2) Bearing Support **R**
(3) Shim

W1028150



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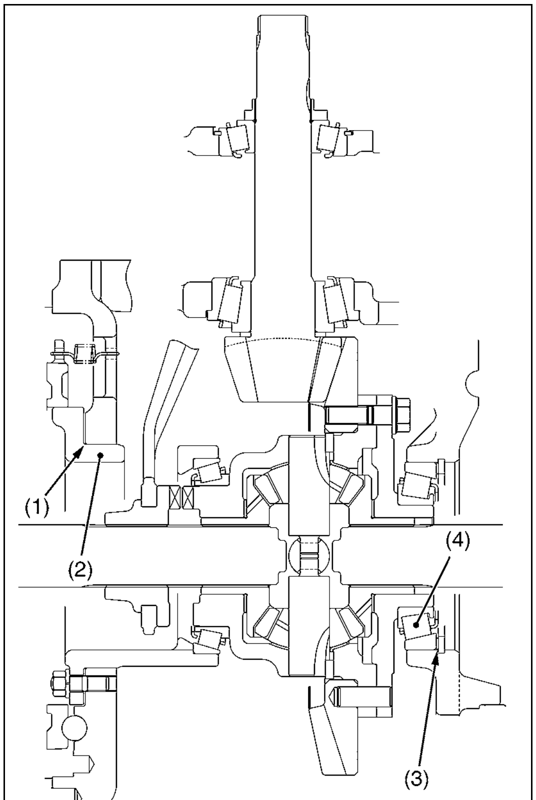


3TMACAD3P075A

Turning Torque of Spiral Bevel Pinion Shaft and Differential Assembly Combined (New Type : Without Collar)

1. Reassemble the differential assembly with shim 1 (1) and shim 2 (3) same as before disassembling.
2. Check that there is a backlash. If there is no backlash, remove a shim 2 (3) and add a shim 1 (1).

(Reference)

- If the thickness of shims is not known, refer to the following.
- Reassemble the differential assembly with no shim at bearing support **L** (2) side and with an adequate number of shims at bearing **R** (4) side. And proceed to the next step.

3. Measure the turning torque by turning the spiral bevel pinion shaft, and then remove a shim from the bearing **R** (4) if the turning torque exceeds the factory specifications, or add a shim to there if the turning torque is less than the factory specifications.
4. And repeat the above procedure until the turning torque becomes the factory specifications.

Turning torque	Factory spec.	M6800 (S)	4.22 to 5.88 N·m 0.43 to 0.60 kgf·m 3.11 to 4.34 ft-lbs
		M8200 M9000	5.59 to 6.67 N·m 0.57 to 0.68 kgf·m 4.12 to 4.92 ft-lbs

(When reassembling)

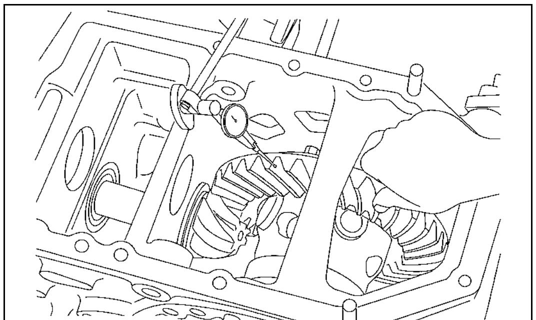
Tightening torque	Staking nut	M6800 (S)	117.7 to 127.5 N·m 12.0 to 13.0 kgf·m 86.8 to 84.0 ft-lbs
		M8200 M9000	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 ft-lbs

(Reference)

- Thickness of adjusting collar (1) : 0.1 mm (0.004 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)
- Thickness of adjusting shim 2 (3) : 0.7 mm (0.028 in.)
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) Shim 1
(2) Bearing Support **L**
(3) Shim 2
(4) Bearing **R**

W1071700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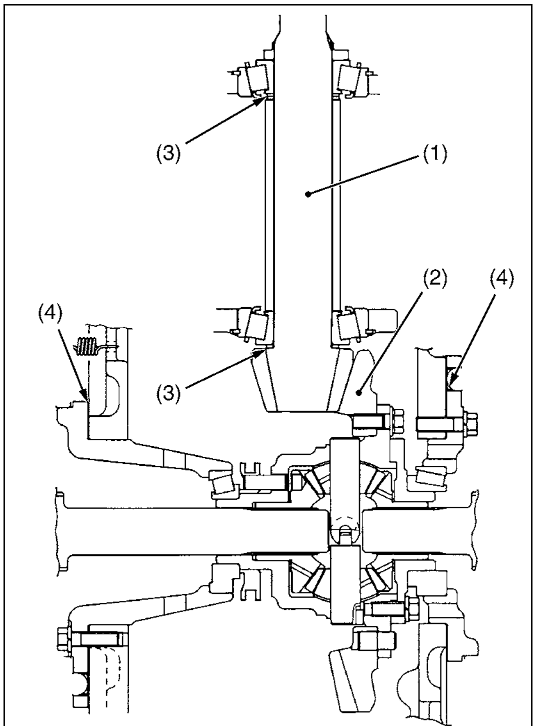


3TMACAB3P125A

Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft

1. Set the dial indicator (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 (2) by hand.
3. When the backlash is too large, decrease the number of shims in the side of the spiral bevel gear, and insert the shims in opposite side. When the backlash is too small, decrease the number of shims in the side of the differential case, and insert and removed shims in the opposite side.
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.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of shims (4) :

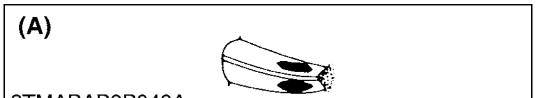
0.1 mm (0.004 in.)	0.5 mm (0.020 in.)
0.3 mm (0.012 in.)	

- Thickness of collar (3) :

M6800(S)		M8200 · M9000
1.00 mm (0.039 in.) 1.50 mm (0.059 in.) 1.70 mm (0.067 in.) 1.75 mm (0.069 in.) 1.80 mm (0.071 in.) 1.90 mm (0.075 in.)	2.00 mm (0.079 in.) 2.10 mm (0.083 in.) 2.20 mm (0.087 in.) 2.25 mm (0.089 in.) 2.30 mm (0.091 in.)	0.80 mm (0.032 in.) 1.00 mm (0.039 in.) 1.20 mm (0.047 in.) 1.40 mm (0.055 in.) 1.60 mm (0.063 in.)

(1) Spiral Bevel Pinion Shaft
(2) Spiral Bevel Gear
(3) Adjusting Collar 1
(4) Shim

W1028688



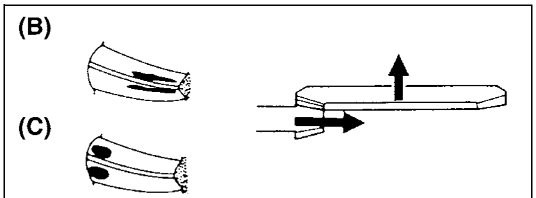
3TMABAB3P043A

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.

(A) Proper Contact

W1018747



3TMABAB3P044A

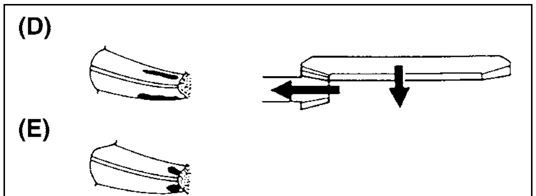
Replace the adjusting collar 1 (3) with thicker one to move the spiral bevel pinion shaft backward.

And place the left side shim to the right to move the spiral bevel gear rightward.

Repeat above until the proper tooth contact and backlash are achieved.

(B) Shallow Contact **(C) Heel Contact**

W1018900



3TMABAB3P045A

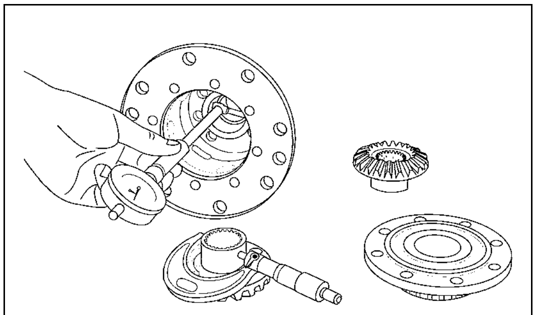
Replace the adjusting collar 1 (3) with a thinner one to move the spiral bevel pinion shaft forward.

And place the right side shim to the left to move the spiral bevel gear leftward.

Repeat above until the proper tooth contact and backlash are achieved.

(D) Deep Contact **(E) Toe Contact**

W1018973


3TMABAB3P046A

Clearance between Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and differential case cover.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

[M6800]

Clearance between differential case bore and differential side gear boss	Factory spec.	0.080 to 0.204 mm 0.00315 to 0.00803 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory spec.	40.530 to 40.592 mm 1.59567 to 1.59811 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

Clearance between differential case cover bore and differential side gear boss	Factory spec.	0.090 to 0.192 mm 0.00354 to 0.00756 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case cover bore I.D.	Factory spec.	40.540 to 40.580 mm 1.59606 to 1.59764 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

[M6800S]

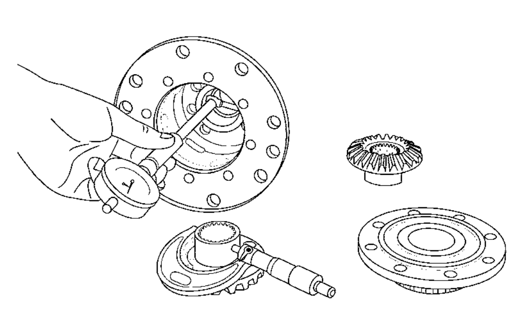
Clearance between differential case bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

Clearance between differential case cover bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case cover bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

W1029389


3TMABAB3P046A

Clearance between Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss (Continued)

[M8200 · M9000]

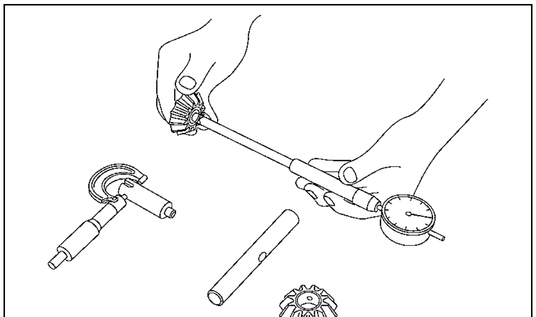
Clearance between differential case bore and differential side gear boss	Factory spec.	0.070 to 0.169 mm 0.00276 to 0.00665 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case bore I.D.	Factory spec.	49.070 to 49.150 mm 1.93189 to 1.93504 in.
Differential side gear boss O.D.	Factory spec.	48.961 to 49.000 mm 1.92760 to 1.92913 in.

Clearance between differential case cover bore and differential side gear boss	Factory spec.	0.070 to 0.169 mm 0.00276 to 0.00665 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case cover bore I.D.	Factory spec.	49.070 to 49.150 mm 1.93189 to 1.93504 in.
Differential side gear boss O.D.	Factory spec.	48.961 to 49.000 mm 1.92760 to 1.92913 in.

W1117980


3TMABAB3P047A

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.

[M6800(S)]

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.060 to 0.102 mm 0.00236 to 0.00402 in.
	Allowable limit	0.25 mm 0.0098 in.

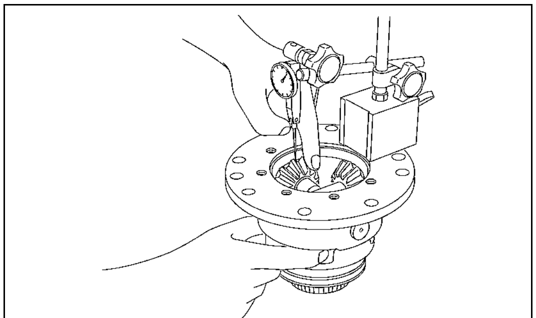
Differential pinion shaft O.D.	Factory spec.	19.959 to 19.980 mm 0.78579 to 0.78661 in.
Differential pinion I.D.	Factory spec.	20.040 to 20.061 mm 0.78898 to 0.78980 in.

[M8200 · M9000]

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.080 to 0.122 mm 0.00315 to 0.00480 in.
	Allowable limit	0.25 mm 0.010 in.

Differential pinion shaft O.D.	Factory spec.	25.939 to 25.960 mm 1.02122 to 1.02205 in.
Differential pinion I.D.	Factory spec.	26.040 to 26.061 mm 1.02520 to 1.02602 in.

W1029788


3TMABAB3P019A

Backlash between Differential Pinion and Differential Side Gear

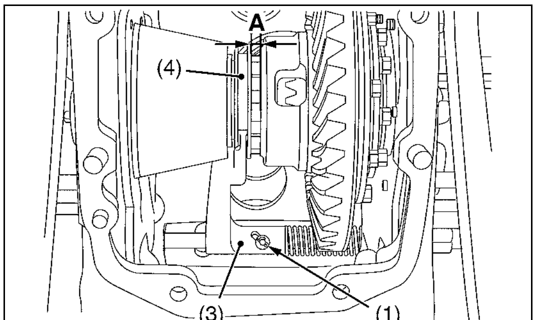
1. Set a dial indicator (lever type) on the tooth of the differential pinion.
2. Hold the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement is not within the factory specifications, adjust with the differential side gear washer.

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.) 1.7 mm (0.067 in.)
  1.6 mm (0.063 in.) 1.8 mm (0.071 in.)
  2.0 mm (0.079 in.)

W1030074

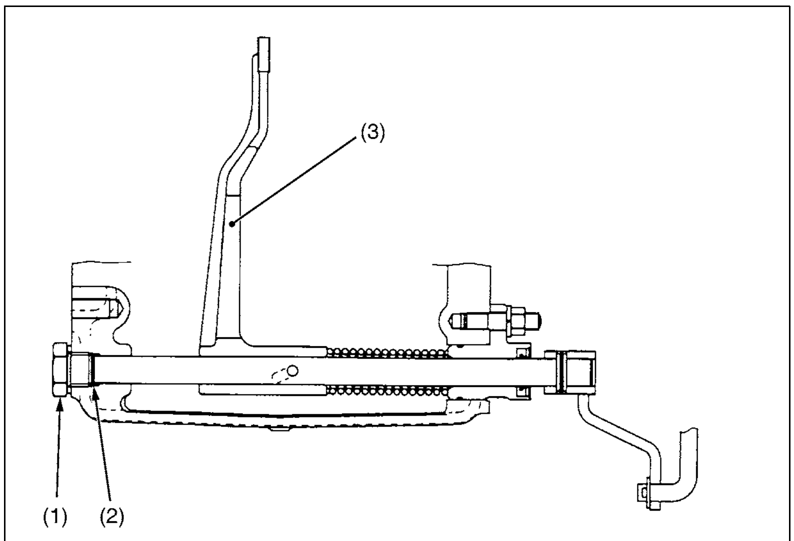


3TMACAB3P111B

Displacement of Differential Lock Shifter [M6800(S)]

1. Measure the displacement (**A**) of the shift fork (3) by pushing down the differential lock pedal as far as not to bend the shift fork to get the displacement of the differential lock shifter (4).
2. If the measurement is not within the factory specifications, adjust with the differential lock adjusting shim (2).

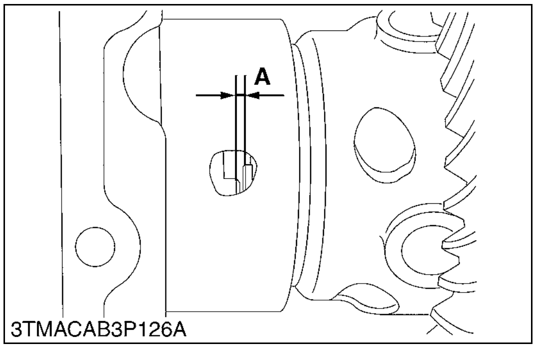
Displacement (**A**) of differential lock shifter	Factory spec.	6.0 to 8.0 mm 0.236 to 0.315 in.



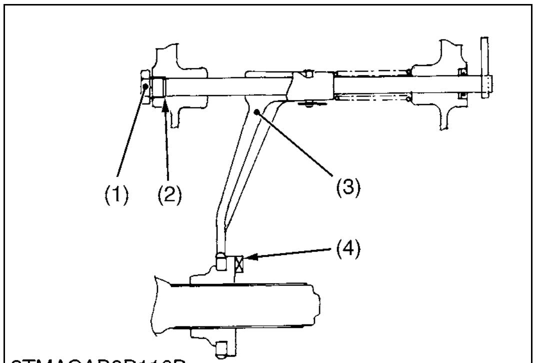
3TMACAB3P114B

(1) Plug
(2) Adjusting Shim
(3) Shift Fork
(4) Differential Lock Shifter

W1030206



3TMACAB3P126A



3TMACAB3P116B

Clearance of Differential Lock Shifter [M8200 · M9000]

1. Measure the clearance (**A**) 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 (**A**)	Factory spec.	1.0 to 1.5 mm 0.0394 to 0.0591 in.

(1) Plug
(2) Adjusting Shim (0.5 mm, 0.0197 in.)
(3) Shift Fork
(4) Differential Lock Shifter

W1030398

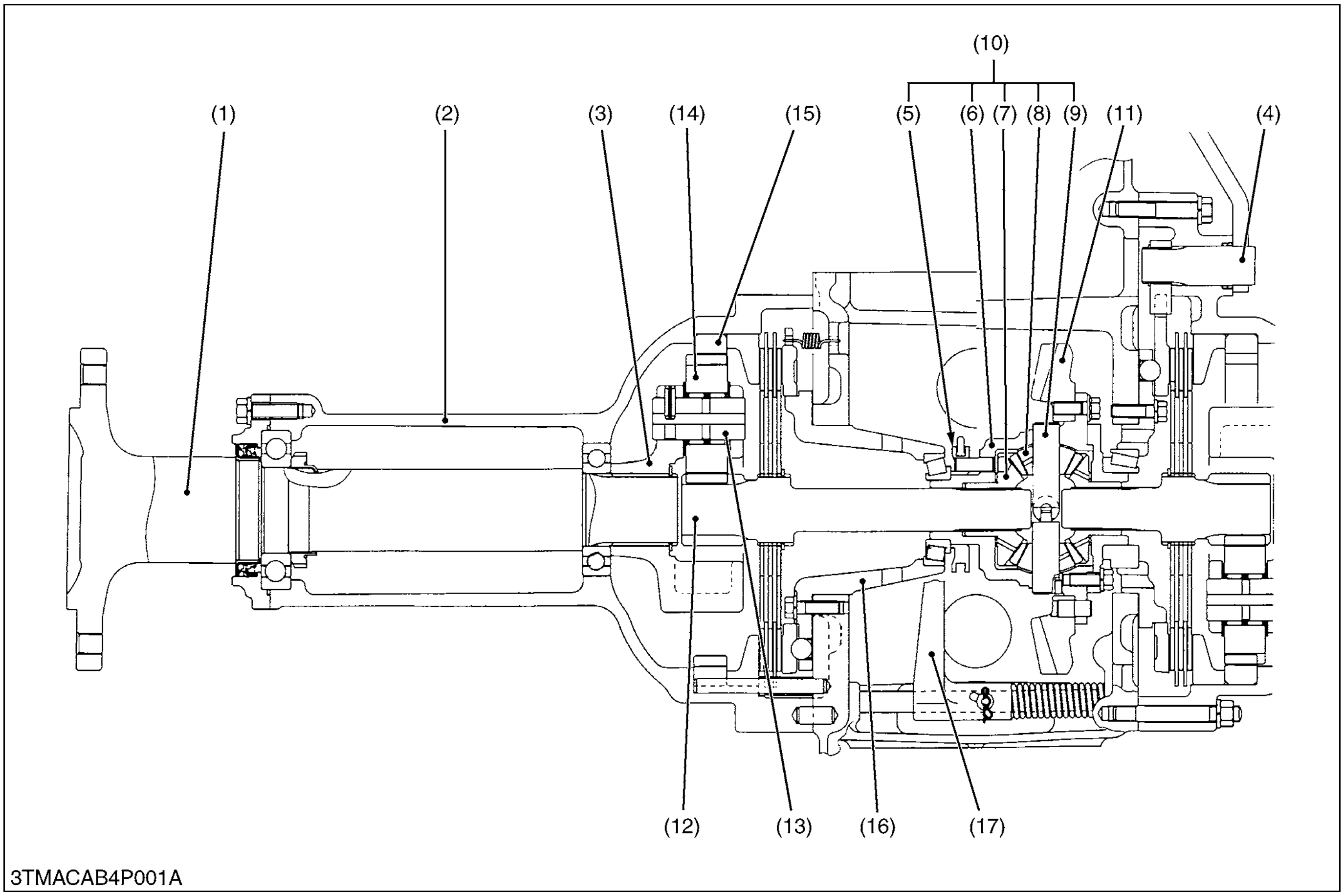
4 REAR AXLE

MECHANISM

CONTENTS

1. FEATURES

[M6800(S)]

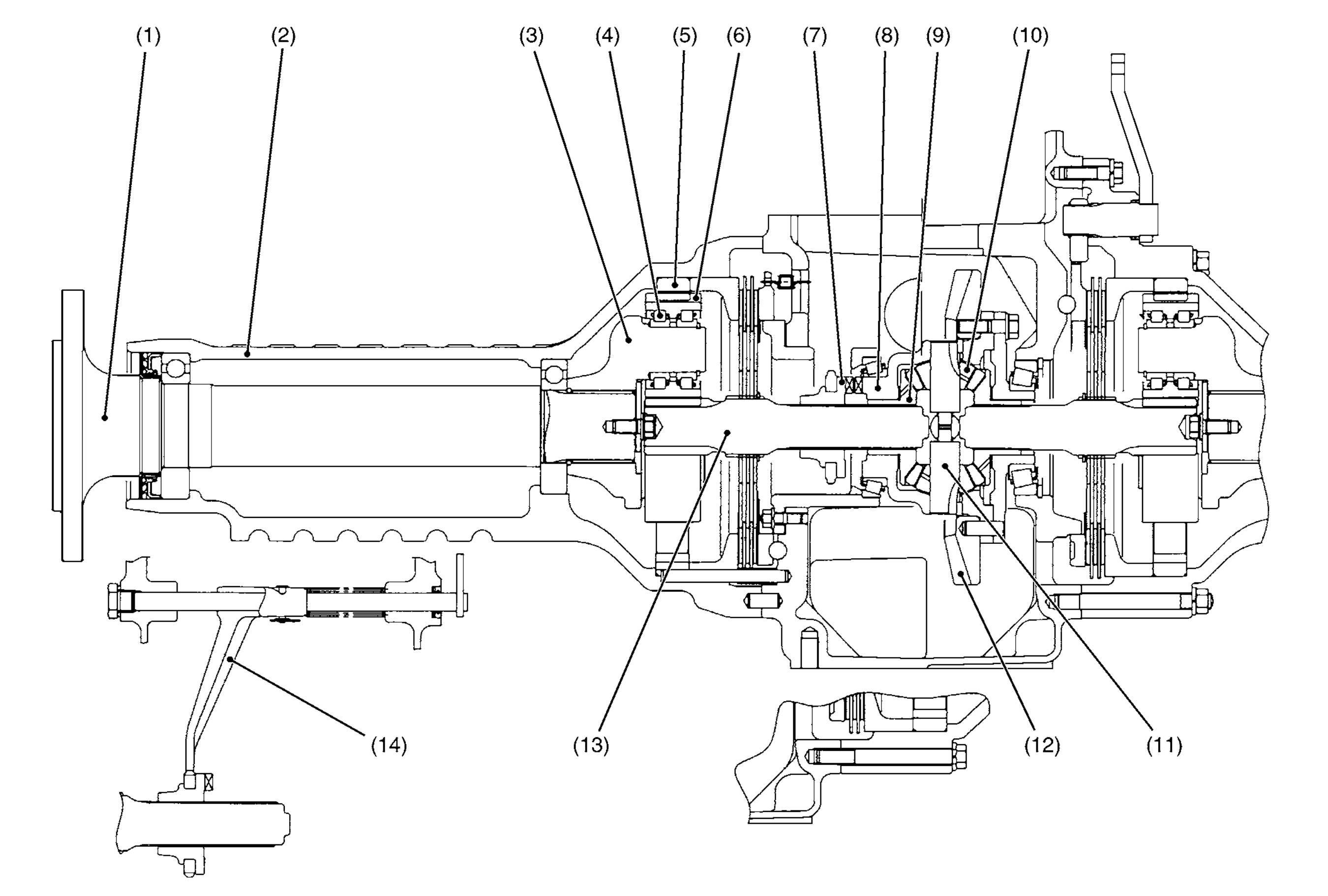


(1) Rear Axle
(2) Rear Axle Case
(3) Planetary Gear Support
(4) Brake Cam Shaft
(5) Differential Lock Shifter
(6) Differential Case
(7) Differential Side Gear
(8) Differential Pinion Gear
(9) Differential Pinion Shaft
(10) Differential Gear
(11) 39T Bevel Gear
(12) Brake Shaft (13T Gear)
(13) Planetary Gear Pin
(14) 25T Planetary Gear
(15) 65T Internal Gear
(16) Differential Bearing Support
(17) 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.

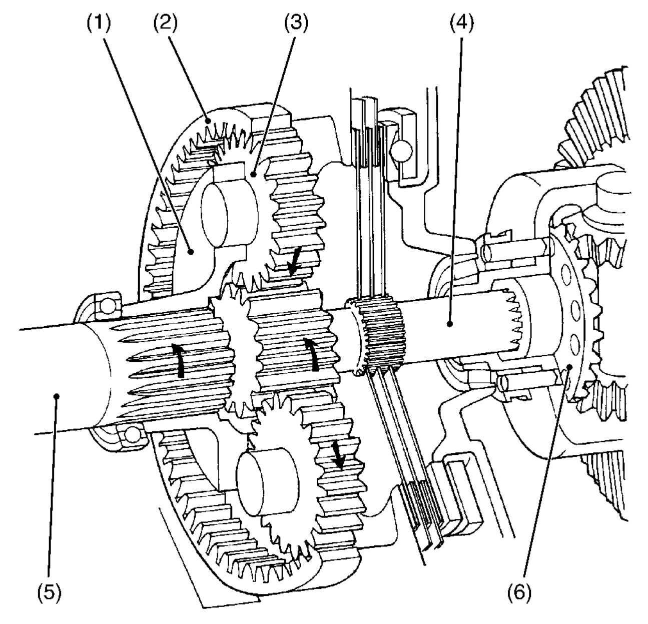
The rear axles (1) are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

[M8200 · M9000]



(1) Rear Axle
(2) Rear Axle Case
(3) Planetary Gear Support
(4) Bearing
(5) 65T Internal Gear
(6) 26T Planetary Gear
(7) Differential Lock
(8) Differential Case
(9) Differential Side Gear
(10) Differential Pinion Gear
(11) Differential Pinion Shaft
(12) 35T Bevel Gear
(13) Brake Shaft (12T Gear)
(14) Differential Lock Shift Fork

2. FINAL REDUCTION SYSTEM



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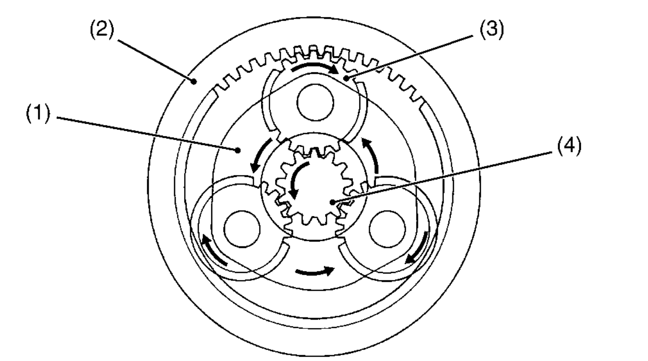

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The final reduction system has a planetary gear system. It is compact, and is durable under heavy loads since torque loads are spread over three gears, decreasing the load on each tooth. And this system also spreads the load evenly around the circumference of the system, eliminating the sideways stress on the shafts.

Power, transmitted from the differential side gear (6) to the brake shaft (4), drives the three planetary gears (3). Since the 65T internal gear (2) is fixed to the rear axle case, the planetary gears move around the teeth of the internal gear while rotating on their axes. The movement of the planetary gears around the internal gear is transmitted to the rear axle (5) through the planetary gear support (1). As a result, the planetary gear support (1) and rear axle (5) rotate in the same direction as the brake shaft (4), but at a reduced speed and increased torque.

(1) Planetary Gear Support
(2) Internal Gear
(3) Planetary Gear
(4) Brake Shaft
(5) Rear Axle
(6) Differential Side Gear

W1012831

SERVICING

CONTENTS

1. TROUBLESHOOTING

[M6800(S)]

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	• Improper backlash between planetary gear and internal gear • Bearing worn • Insufficient or improper type of transmission fluid used	Replace Replace Replenish or change	4-S7 – G-11
Noise while Turning	• Needle bearings or planetary gear shafts worn or broken	Replace	4-S8

W1013580

[M8200 · M9000]

Excessive or Unusual Noise at All Time	• Improper backlash between planetary gear and internal gear • Bearing worn • Insufficient or improper type of transmission fluid used	Replace Replace Replace	4-S7, S8 – G-11

W1013718

2. SERVICING SPECIFICATIONS

Type 1: M6800(S)

Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.08 to 0.30 mm 0.0032 to 0.0118 in.	0.5 mm 0.020 in.
Planetary Gear 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 0.048 mm 0.00035 to 0.00189 in.	0.30 mm 0.0118 in.
Planetary Gear Shaft	O.D.	31.989 to 32.000 mm 1.25941 to 1.25984 in.	–
Planetary Gear	I.D.	39.000 to 39.025 mm 1.53543 to 1.53641 in.	–
Needle	O.D.	3.494 to 3.500 mm 0.13756 to 0.13780 in.	–

W1013874

Type 1 : M8200 · M9000

Internal Gear to Planetary Gear	Backlash	0.08 to 0.30 mm 0.0032 to 0.0118 in.	0.5 mm 0.020 in.
Planetary Gear 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 0.048 mm 0.00035 to 0.00189 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.	42.009 to 42.025 mm 1.65390 to 1.65453 in.	–
Needle	O.D.	5.994 to 6.000 mm 0.23559 to 0.23622 in.	–

W1020963

Type 2 : M8200 · M9000

Internal Gear to Planetary Gear	Backlash	0.08 to 0.30 mm 0.0032 to 0.0118 in.	0.5 mm 0.020 in.

W1013973

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 **"6. TIGHTENING TORQUES"** at GENERAL Section.)

Item	N·m	kgf·m	ft-lbs
ROPS mounting screw			
M16, grade 9 screw	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting stud bolt	98.1 to 112.8	10.0 to 11.5	72.3 to 83.2
Rear wheel mounting nut	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear axle case mounting screw and nut			
M12 screw and nut [M6800(S)]	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
M14 screw [M8200 · M9000]	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Rear axle cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle nut [M6800(S)]	539.4 to 637.5	55 to 65	397.8 to 470.1
Retainer (planetary gear support) mounting screw [M8200·M9000]	89.2 to 104.0	9.1 to 10.6	65.8 to 76.7

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

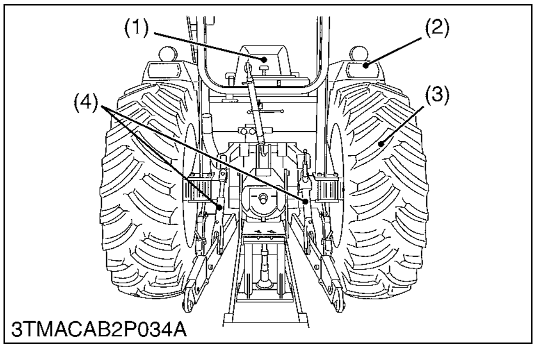
[1] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case from Transmission Case

Draining Transmission Fluid

- See page 2-S5.

W1011635



Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

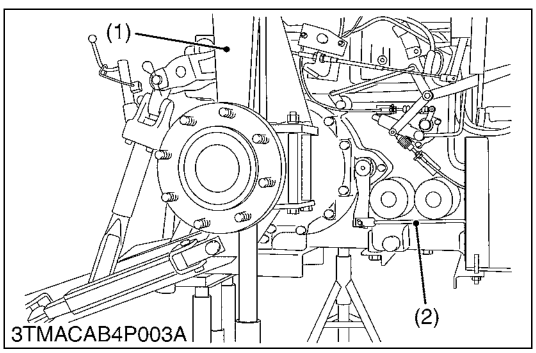
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	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

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1011471



ROPS and Brake Rod

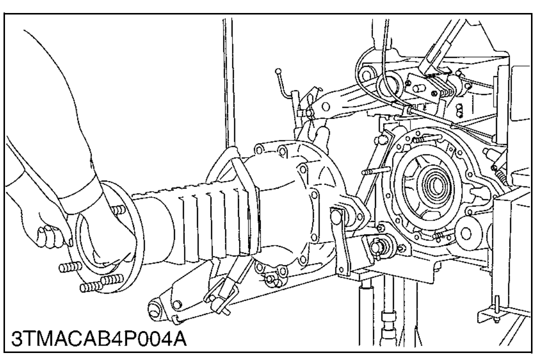
1. Remove the ROPS under frame (R.H.) (1).
2. Remove the brake rod (R.H.) (2).
3. Remove the differential lock rod (if separating right side), (M6800 only).
4. Remove the DT shift rod (if separating left side).
5. Remove the fuel tank (if separating left side).

(When reassembling)

Tightening torque	ROPS 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 Frame (R.H.)
(2) Brake Rod (R.H.)

W1011687



Rear Axle Case

1. Remove the rear axle case mounting screws and nuts.
2. Support the rear axle case with nylon lift strap and hoist.
3. Separate the rear axle case from transmission case.

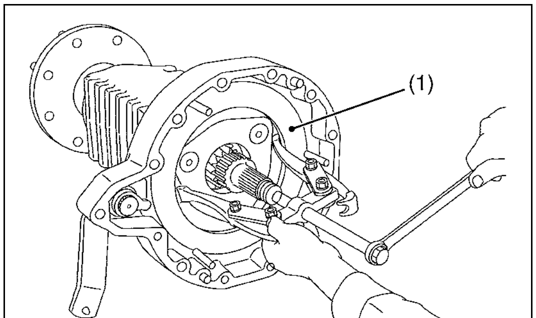
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	M6800 (S)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M8200 M9000	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

W1011857

(2) Disassembling Rear Axle Case [Type 1 : M6800(S) · M8200 · M9000]



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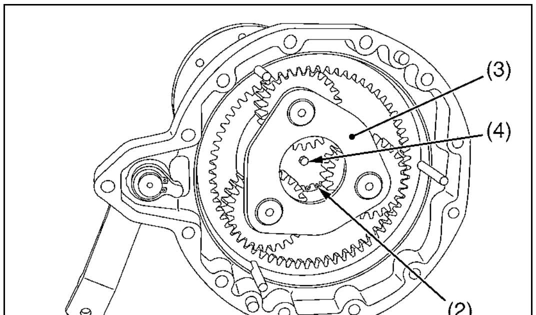


3TMACAB4P021A

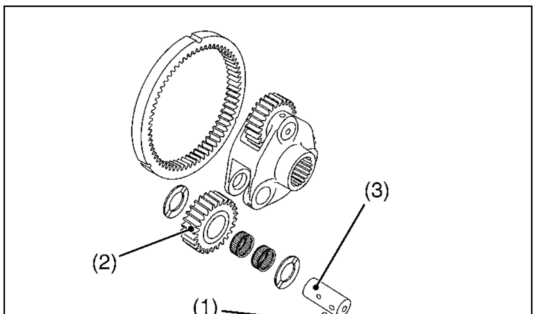
Brake Plate and Planetary Gear Support

1. Remove the brake plate (1).
2. Remove the external snap ring (2) (M6800(S)) or the retainer mounting screw (4) (M8200, M9000).
3. Carefully remove the planetary gear support (3).

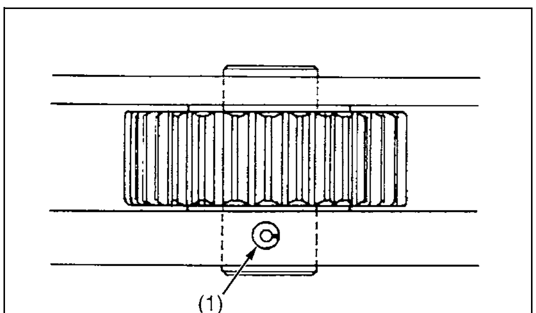
Tightening torque	Retainer mounting screw	89.2 to 104.0 N·m 9.1 to 10.6 kgf·m 65.8 to 76.7 ft-lbs

(1) Brake Plate
(2) External Snap Ring (M6800(S))
(3) Planetary Gear Support
(4) Retainer Mounting Screw (M8200, M9000)

W1012659



3TMACAB4P007A



3TMACAB4P008A

Planetary Gear

1. Tap the spring 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 spring pin from the planetary gear shaft.

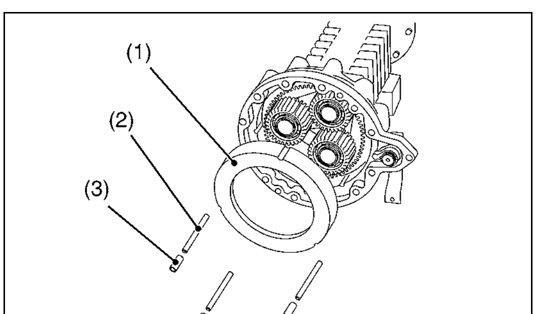
(When reassembling)

- Apply transmission fluid to the inner surface of planetary gear (2).
- Tap in the spring pin (1) as shown in the figure.

(1) Spring Pin
(2) Planetary Gear
(3) Planetary Gear Shaft

W1012932

(3) Disassembling Rear Axle Case [Type 2 : M8200 · M9000]



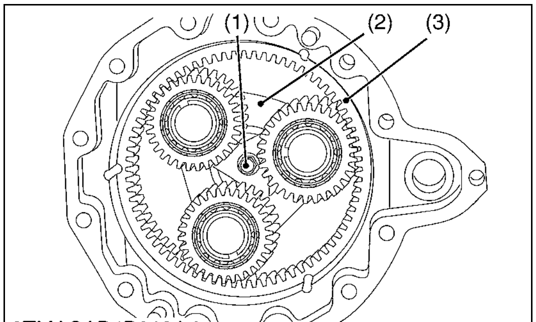
3TMACAB4P012A

Brake Plate

1. Remove the collars (3).
2. Remove the pins (2).
3. Remove the brake plate (1).

(1) Brake Plate
(2) Pin
(3) Collar

W1012002



3TMACAB4P013A

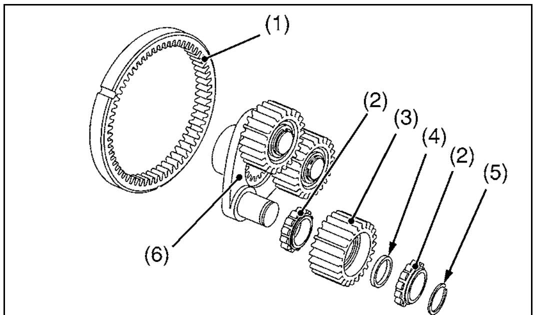
Planetary Gear Support

1. Remove the retainer mounting screw (1).
2. Carefully remove the planetary gear support (2).
3. Remove the internal gear (3).

Tightening torque	Retainer mounting screw	89.2 to 104.0 N·m 9.1 to 10.6 kgf·m 65.8 to 76.7 ft-lbs

(1) Retainer Mounting Screw
(2) Planetary Gear Support
(3) Internal Gear

W1012266



3TMACAB4P014A

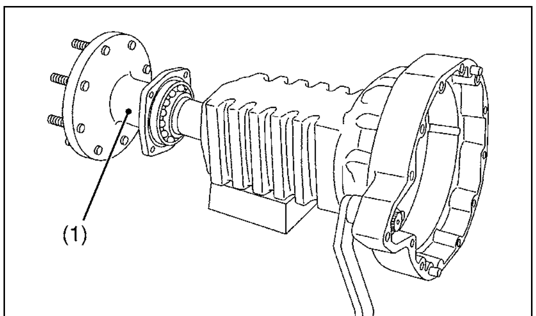
Planetary Gear

1. Remove the external snap ring (5).
2. Remove the planetary gear (3) with a puller.

(1) Internal Gear
(2) Bearing
(3) Planetary Gear
(4) Collar
(5) External Snap Ring
(6) Planetary Gear Support

W1012409

(4) Rear Axle Shaft [M6800(S)]



3TMACAB4P009A

Rear Axle

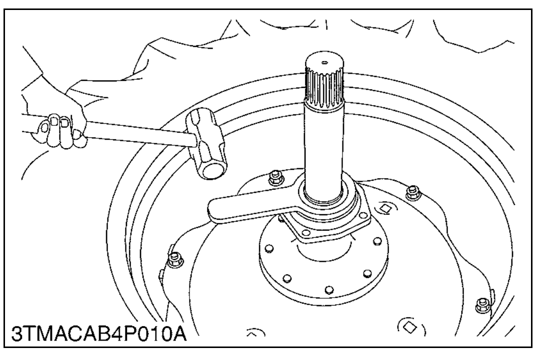
1. Unscrew the rear axle cover mounting screws, and remove the rear axle (1).

(When reassembling)

Tightening torque	Rear axle 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) Rear Axle

W1013104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Rear Axle Nut

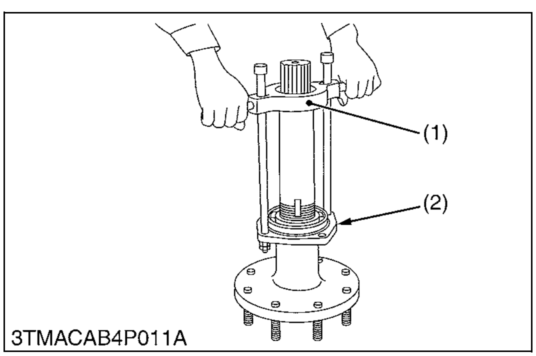
1. Fix the rear axle on the repair table or set to the rear wheel.
2. Remove the stake on the rear axle nut.
3. Remove the rear axle nut with a rear axle wrench 85 (Code No. 07916-52541).

(When reassembling)

- Replace the rear axle nut with a new one, and stake it firmly after tightening.

Tightening torque	Rear axle nut	539.4 to 637.5 N·m 55 to 65 kgf·m 397.8 to 470.1 ft-lbs

W1013218



3TMACAB4P011A

Rear Axle Cover

1. Remove the rear axle cover (2) with a rear axle cover puller (1) (Code No. 07916-51041).

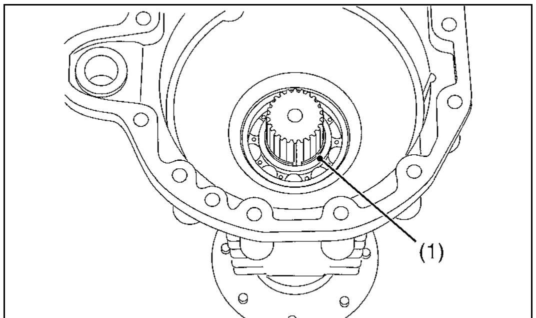
(When reassembling)

- Apply grease to the oil seal lips.

(1) Rear Axle Cover Puller
(2) Rear Axle Cover

W1013445

(5) Rear Axle Shaft [M8200 · M9000]



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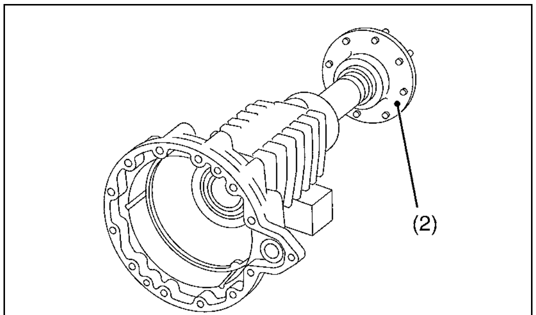


3TMACAB4P016A

Rear Axle

1. Remove the external snap ring (1).
2. Tap out the rear axle (2).

(When reassembling)

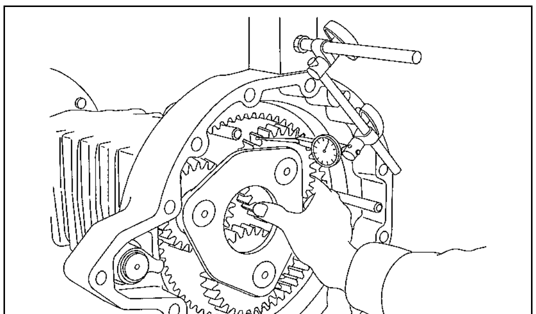
- Apply grease to the seal lips.

(1) External Snap Ring (2) Rear Axle

W1012533

[2] SERVICING

(1) Type 1 [M6800(S) · M8200 · M9000]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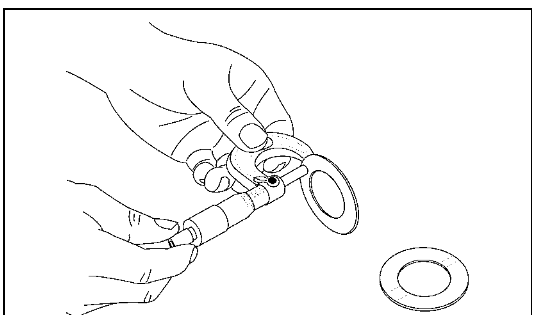
Backlash between Internal Gear and Planetary Gear

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.	0.08 to 0.30 mm 0.0032 to 0.0118 in.
	Allowable limit	0.5 mm 0.020 in.

W1013592

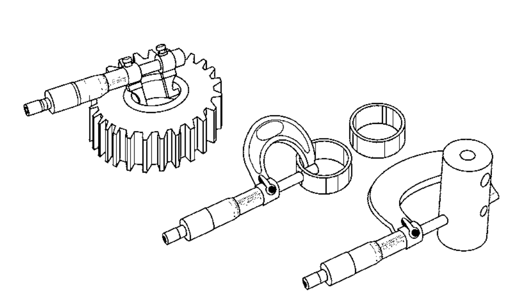

3TMACAB4P018A

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

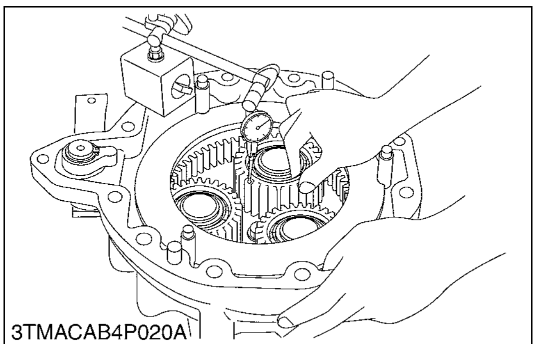
1. Measure the planetary gear shaft O.D. (rubbing surface).
2. Measure the planetary gear I.D. (rubbing surface).
3. Measure the O.D. of the two needles installed diagonally in the needle bearing.
4. Calculate the clearance.
5. (Clearance = Planetary gear I.D. – {(2 × Needle O.D.) + Planetary gear shaft 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 0.048 mm 0.00035 to 0.00189 in.
	Allowable limit	0.30 mm 0.0118 in.

Planetary gear shaft O.D.	Factory spec.	M6800(S)	31.989 to 32.000 mm 1.25941 to 1.25984 in.
		M8200 M9000	29.991 to 30.000 mm 1.18075 to 1.18110 in.
Planetary gear I.D.	Factory spec.	M6800(S)	39.000 to 39.025 mm 1.53543 to 1.53641 in.
		M8200 M9000	42.009 to 42.025 mm 1.65390 to 1.65453 in.
Needle O.D.	Factory spec.	M6800(S)	3.494 to 3.500 mm 0.13756 to 0.13780 in.
		M8200 M9000	5.994 to 6.000 mm 0.23559 to 0.23622 in.

W1013795

(2) Type 2 [M8200 · M9000]


3TMACAB4P020A

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.	0.08 to 0.30 mm 0.0032 to 0.0118 in.
	Allowable limit	0.5 mm 0.020 in.

W1014081

5 BRAKES

MECHANISM

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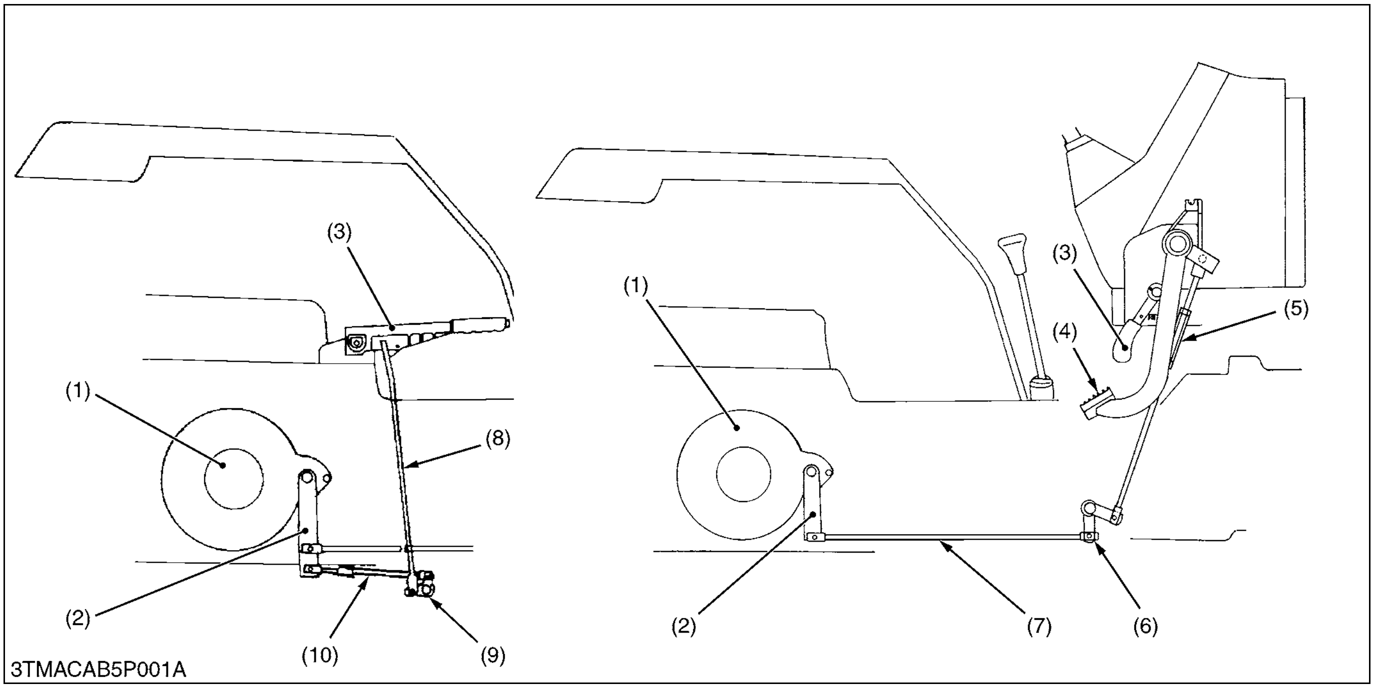
1. FEATURES



(1) Brake Case
(2) Brake Cam Lever
(3) Parking Brake Lever
(4) Brake Pedal
(5) Brake Rod
(6) Brake Lever
(7) Turnbuckle
(8) Parking Brake Rod
(9) Parking Brake Lever
(10) Parking Brake Rod

This is used hanging type brake pedals to have wider space of the platform.

Independent mechanical wet disc brakes are used for the right and left travelling 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 travelling brakes. Pulling the parking brake lever (3) results in the same state as that obtained when the brake pedals are pressed.

■ **Features of Wet Disc Brakes**

1. Reduced disc wear

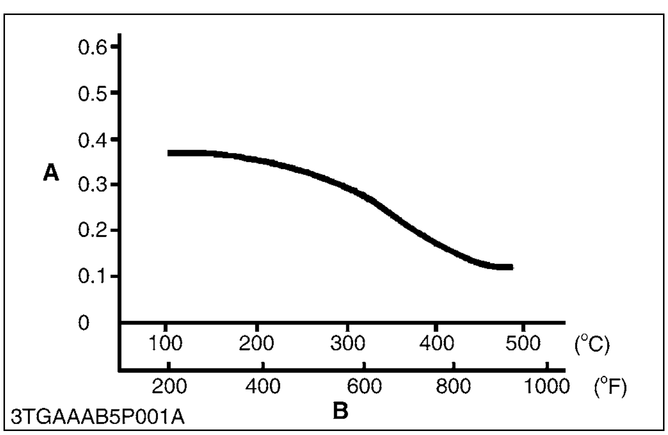
Although wet discs are worn by approx. several tens of microns depending on the accuracy of parts during the initial contact in initial period of 50 hours or so, almost no wear occurs afterwards. This means that very little brake adjustments are required.

2. Stable braking

Since the brake discs are immersed in transmission oil, **Fade*** is rarely caused even after repeated braking and stable braking force is obtained.

3. Pedal stroke does not change under influence of heat

Unlike internal expanding type brakes, the drum-to-shoe clearance of the wet disc brake does not increase due to thermal expansion and the increased pedal stroke does not result. Thus, the wet disc brake provides a constant pedal stroke.



*** Fade**

Fade is a phenomenon of braking force loss caused by the heat generated in repeated braking. Generally, the friction coefficient of brake disc tends to lower and the braking force reduces with the rise of the temperature of the brake disc.

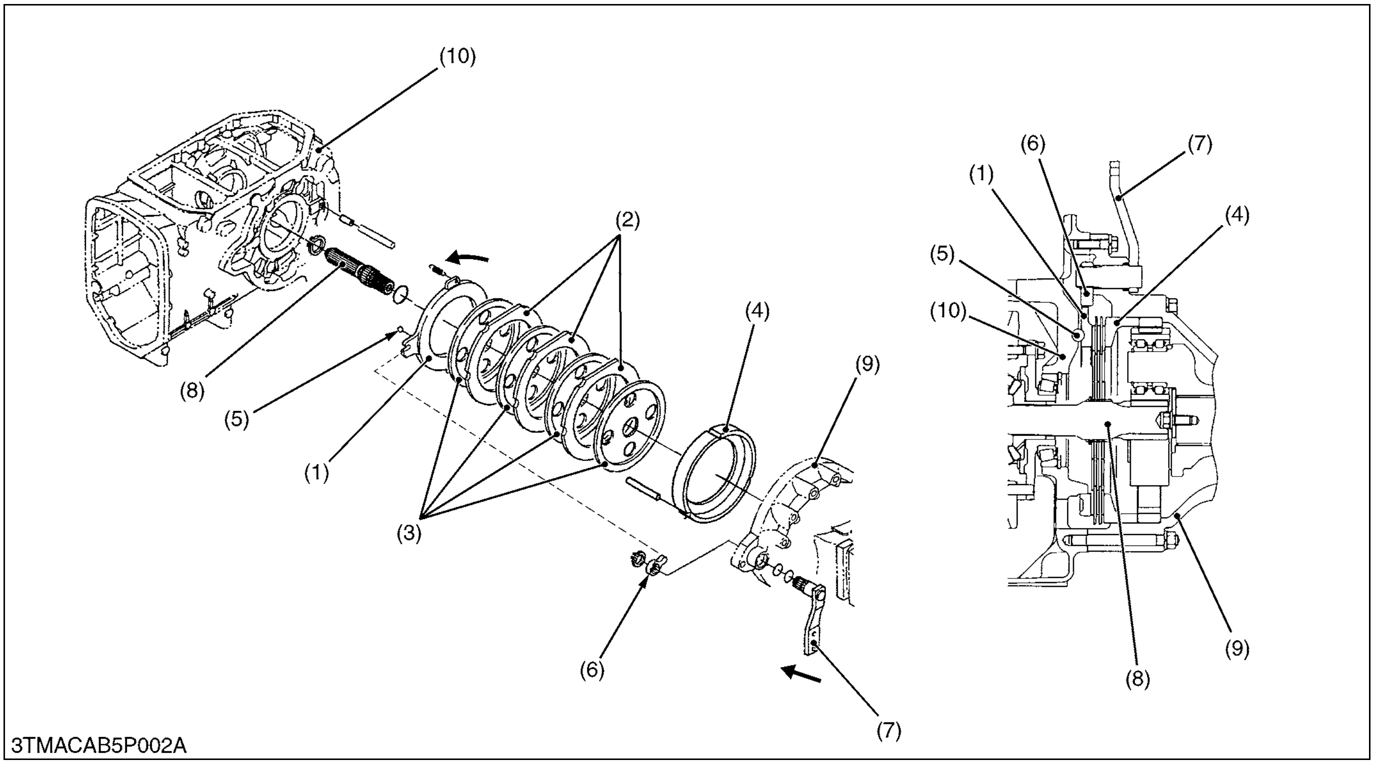
(Reference)

- Relationship between temperature and friction coefficient of brake disc.

A : Friction Coefficient (μ) **B : Temperature**

W1012831

2. OPERATION



(1) Cam Plate
(2) Steel Plate
(3) Brake Disc
(4) Brake Case
(5) Steel Ball
(6) Brake Cam
(7) Brake Cam Lever
(8) Brake Shaft
(9) Rear Axle Case
(10) Transmission Case

The brakes are provided on the brake shaft (8) through which power is transmitted to the final reduction system. The brakes are incorporated in the rear axle case (9) filled with transmission oil. They are designed to brake when the brake discs (3), spline-coupled and rotating with the brake shaft, are pressed against the brake case by cam plate (1) with the cam mechanism incorporating steel balls (5). For greater braking force, brake discs (4) are provided at the right and left sides respectively, and the brake (2) fixed to the rear axle case are arranged between the brake discs.

■ **During braking**

When the brake pedal is pressed, the linkage causes the brake cam lever (7) to move in the direction of allow through the brake rod. At the same time, the brake cam (6) spline-couples with the brake cam lever also moves. Due to this force, cam plate (1) moves in the direction of arrow. Since the steel balls (5) are set in the grooves of transmission case (10), cam plate (1) is pushed out against the brake discs (3), causing braking with the friction force created.

(Reference)

	No. of brake disc	No. of steel plate
M6800(S)	3	2
M8200 M9000	4	3

W1013431

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Uneven Braking Force	• Brake pedal free travel unevenly adjusted • Brake disc worn • Cam plate warped	Adjust Replace Replace	5-S4 5-S7 5-S7
Brake Drags	• Brake pedal free travel too small • Ball holes of cam plate for uneven wear • Brake pedal return spring weaken or broken • Brake cam rusted	Adjust Replace Replace Repair	5-S4 5-S7 – 5-S7
Poor Braking Force	• Brake pedal free travel excessive • Brake disc worn • Cam plate worn • Brake cam or lever damaged • Transmission fluid improper	Adjust Replace Replace Replace Change	5-S4 5-S7 5-S7 5-S6 G-11

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	40 to 45 mm 1.6 to 1.8 in.	–
Parking Brake Rod (Hand Lever Type Parking Brake Model)	Length [M6800(S)]	158 to 162 mm 6.2 to 6.4 in.	–
	[M8200 · M9000]	178 to 182 mm 7.0 to 7.2 in.	–
Brake Pedal Shaft to Brake Pedal Bushing	Clearance	0.025 to 0.185 mm 0.00098 to 0.00728 in.	1.00 mm 0.0394 in.
Brake Pedal Shaft	O.D.	27.900 to 27.975 mm 1.09842 to 1.10138 in.	–
Brake Pedal Bushing	I.D.	28.000 to 28.085 mm 1.10236 to 1.10571 in.	–
Cam Plate	Flatness	–	0.3 mm 0.012 in.
Cam Plate and Ball	Height [M6800(S)]	22.45 to 22.55 mm 0.8839 to 0.8879 in.	22.00 mm 0.8661 in.
	[M8200 · M9000]	25.45 to 25.55 mm 1.0020 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	2.25 to 2.35 mm 0.0886 to 0.0925 in.	1.5 mm 0.059 in.
Brake Plate	Flatness	–	0.3 mm 0.012 in.

W1013874

3. TIGHTENING TORQUES

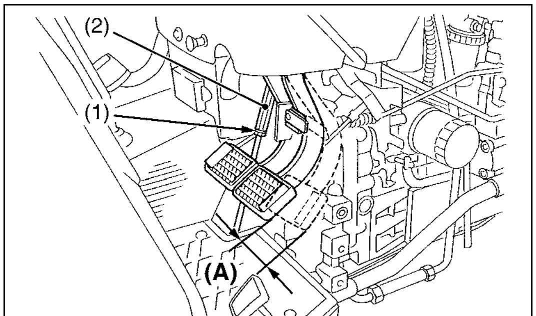
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to **"6. TIGHTENING TORQUES"** at GENERAL Section.)

Item	N·m	kgf·m	ft-lbs
ROPS mounting screw			
M16, grade 9 screw	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting stud bolt	98.1 to 112.8	10.0 to 11.5	72.3 to 83.2
Rear wheel mounting nut	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear axle case mounting screw and nut			
M12 screw and nut [M6800(S)]	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
M14 screw [M8200 · M9000]	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5

W1011250

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



3TMACAB0P020A

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 **(A)** at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut (1) and turn the turnbuckle (2) to adjust the rod length within acceptable limits.

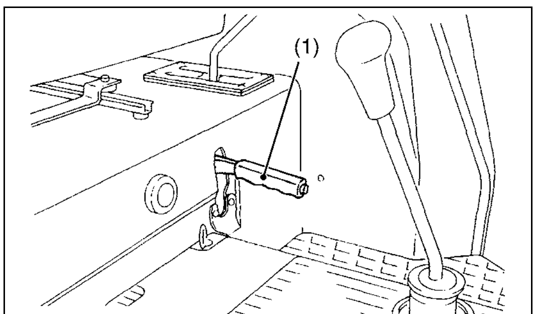
Brake pedal free travel **(A)**	Factory spec.	40 to 45 mm 1.6 to 1.8 in.

■ **IMPORTANT**

- **Keep the free travel in the right and left brake pedals equal.**

(1) Lock Nut
(2) Turnbuckle

W1011350



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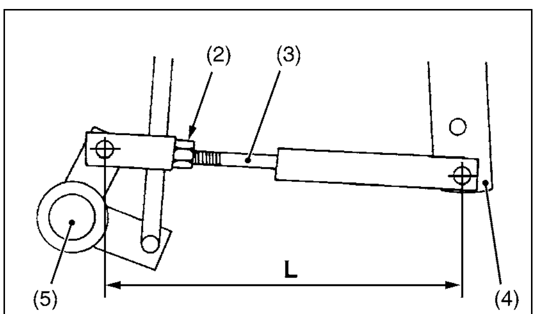


3TMACAB5P004A

Parking Brake Lever Free Play

CAUTION

- **Stop the engine and chock the wheels before checking parking brake.**

1. Release the parking brake lever (1).
2. Loosen the lock nut (2) on the parking brake rod (3).
3. Adjust the parking brake and length to achieve the reference value.
4. Tighten the lock nut (2).
5. Pull the parking brake lever (1) just one notch and make sure the parking brake shaft (5) is activated.

(Reference)

Parking brake rod length **L**	M6800(S)	158 to 162 mm 6.2 to 6.4 in.
	M8200 M9000	178 to 182 mm 7.0 to 7.2 in.

■ **NOTE**

- **After adjusting the parking brake lever free play**
  - **Right and left parking brake for even braking.**
  - **With the parking brake released, make sure that the right and lefet tires do not drag on.**

(1) Parking Brake Lever
(2) Lock Nut
(3) Parking Brake Rod
(4) Brake Lever
(5) Parking Brake Shaft

W1014578

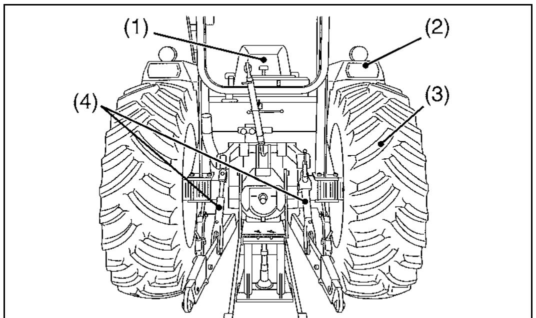
[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case from Transmission Case

Draining Transmission Fluid

- See page 2-S5.

W1011635



3TMACAB2P034A

Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

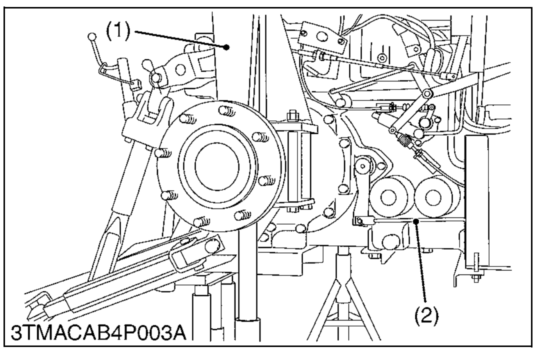
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	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

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1011471



3TMACAB4P003A

ROPS and Brake Rod

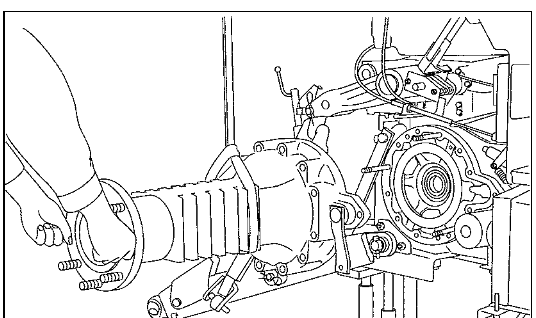
1. Remove the ROPS under frame (R.H.) (1).
2. Remove the brake rod (R.H.) (2).
3. Remove the differential lock rod (if separating right side), (M6800, M6800S).
4. Remove the DT shift rod (if separating left side).
5. Remove the fuel tank (if separating left side).

(When reassembling)

Tightening torque	ROPS 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 Frame (R.H.)
(2) Brake Rod (R.H.)

W1011687


3TMACAB4P004A

Rear Axle Case

1. Remove the rear axle case mounting screws and nuts.
2. Support the rear axle case with nylon lift strap and hoist.
3. Separate the rear axle case from transmission case.

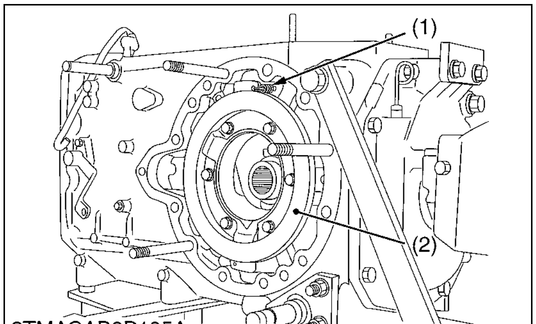
(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw	M6800 (S)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		M8200 M9000	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

W1011852

(2) Disassembling Brake Case



3TMACAB3P105A

Brake Cam Plate

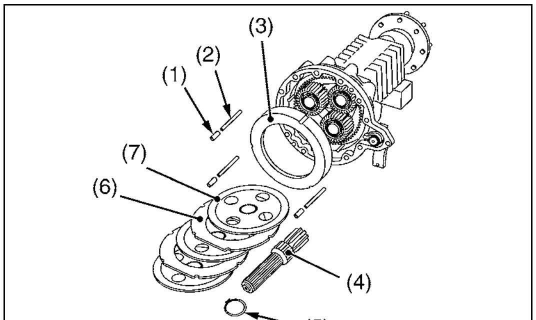
1. Remove the return spring (1).
2. Remove the brake cam plate (2).

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)

(1) Return Spring
(2) Brake Cam Plate

W1011995



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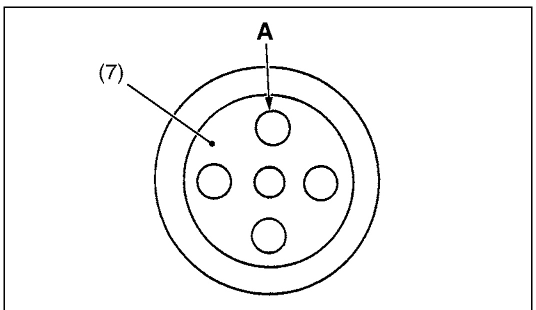


3TMACAB5P013A

Brake Shaft, Brake Disc and Brake Plate

1. Draw out the brake shaft (4) with brake disc (7).
2. Remove the external snap ring (5).
3. Remove the brake plate (6).

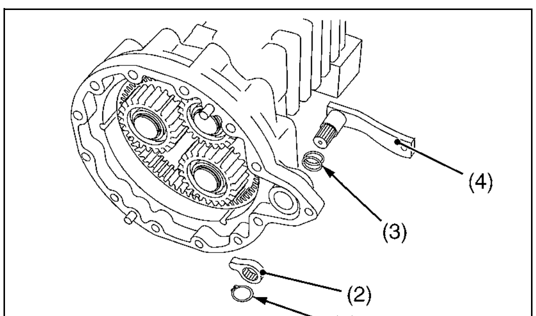
(When reassembling)

- Place the brake discs (7) so that the holes **"A"** of the all discs should be overlapped.

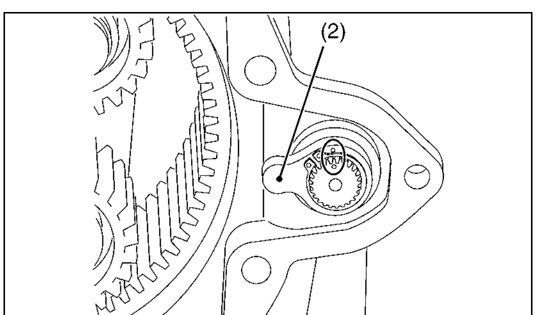
(1) Collar
(2) Pin
(3) Brake Plate
(4) Brake Shaft
(5) External Snap Ring
(6) Brake Plate
(7) Brake Disc

A : Hole

W1012102



3TMACAB5P006A



3TMACAB5P007A

Brake Cam and Brake Cam Lever

1. Remove the external snap ring (1).
2. Remove the brake cam (2) and brake cam lever (4).

(When reassembling)

- Apply grease to the O-ring (3) and take care not to damage the O-ring.

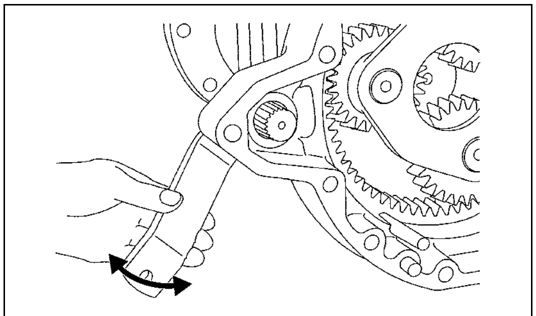
■ **IMPORTANT**

- **Install the brake cam (2) to brake cam lever, aligning the marks on them.**

(1) External Snap Ring
(2) Brake Cam
(3) O-ring
(4) Brake Cam Lever

W1012335

[3] SERVICING

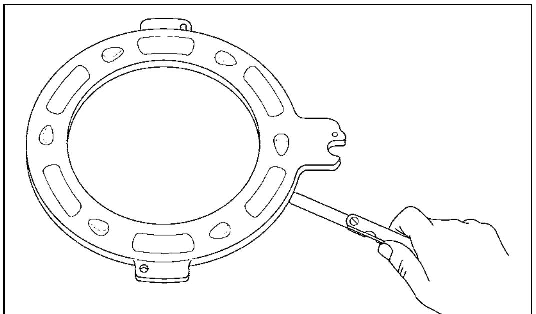


3TMACAB5P008A

Brake Cam Lever Movement

1. Move the brake cam lever by hand to check the movement.
2. If the movement is heavy, refine the brake cam with emery paper.

W1012594



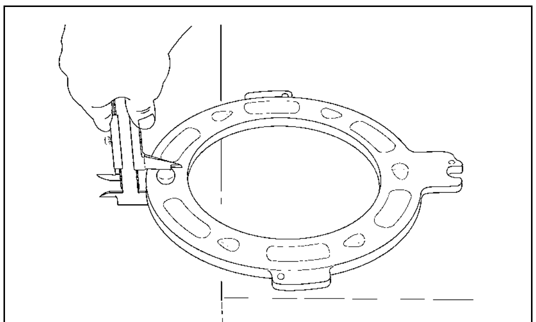
3TMACAB5P009A

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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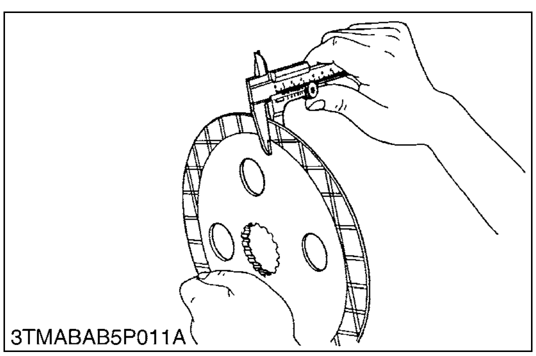
Height of Cam Plate and Ball

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.	M6800 (S)	22.45 to 22.55 mm 0.8839 to 0.8879 in.
		M8200 M9000	25.45 to 25.55 mm 1.0020 to 1.0059 in.
	Allowable limit	M6800 (S)	22.00 mm 0.8661 in.
		M8200 M9000	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

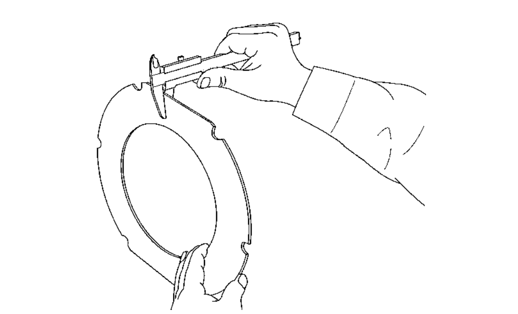
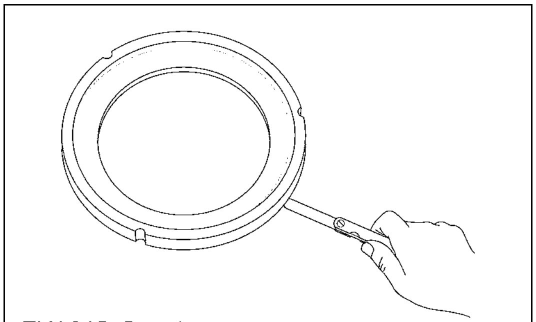

3TMACAB5P011A

Plate Wear

1. Measure the plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Plate thickness	Factory spec.	2.25 to 2.35 mm 0.0886 to 0.0925 in.
	Allowable limit	1.5 mm 0.059 in.

W1013054


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

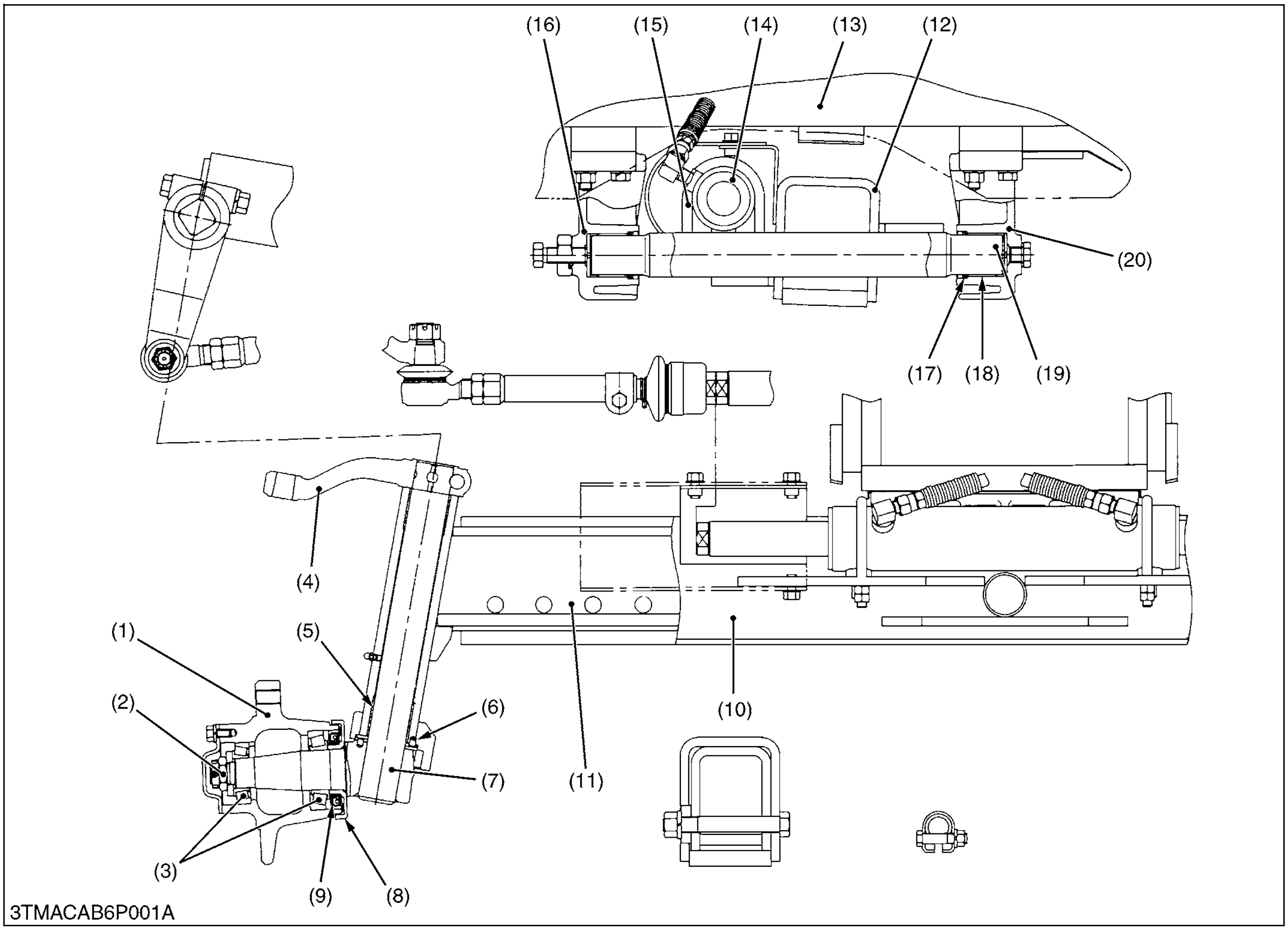
MECHANISM

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.

[1] 2 WHEEL DRIVE TYPE

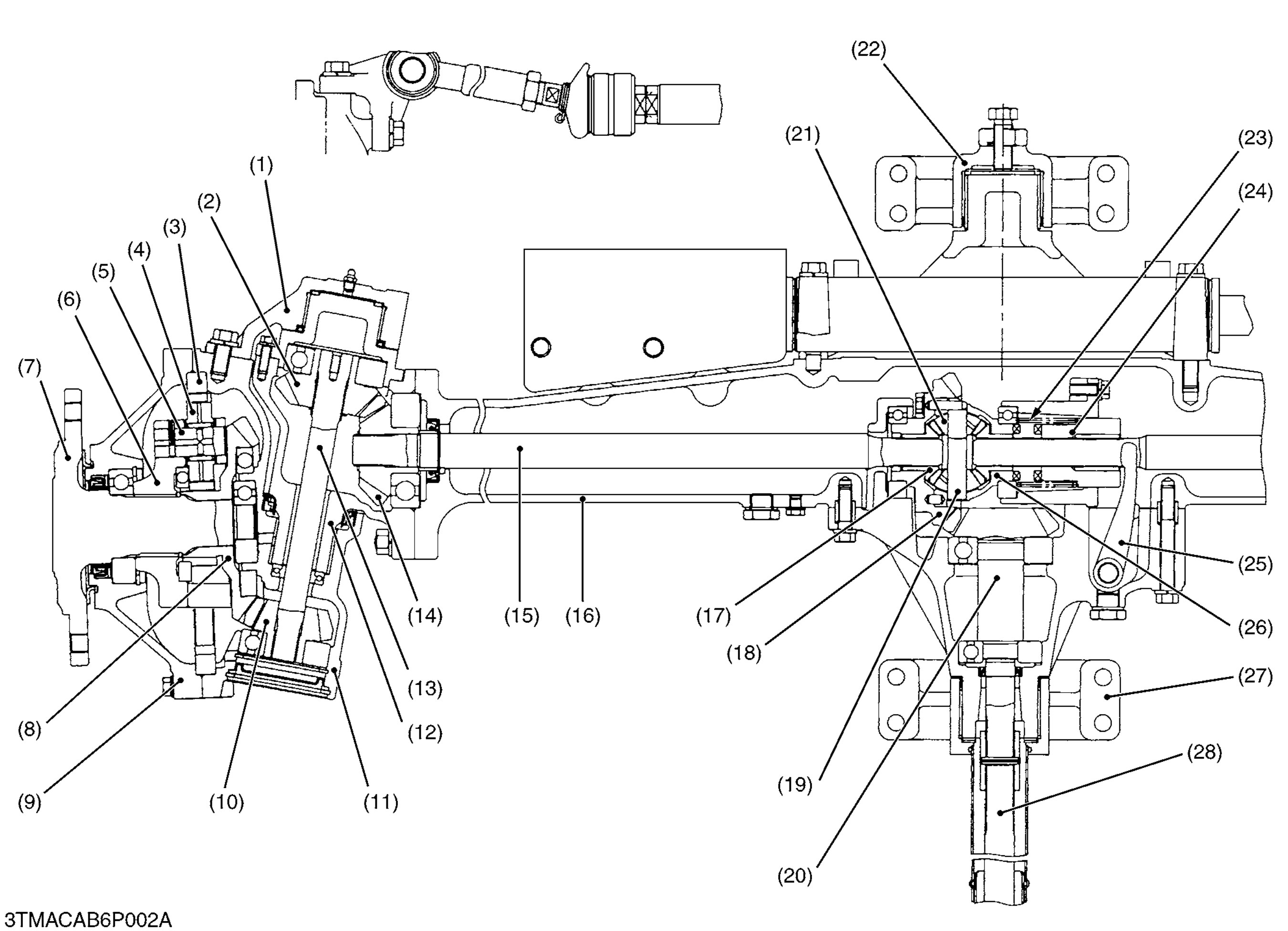


(1) Front Wheel Hub
(2) Slotted Nut
(3) Taper Roller Bearing
(4) Knuckle Arm
(5) Knuckle Shaft Bushing
(6) Knuckle Shaft Dowel Pin
(7) Knuckle Shaft
(8) Knuckle Dust Proof Cover
(9) Knuckle Stub Gasket
(10) Front Axle Middle
(11) Front Axle
(12) Front Axle Support
(13) Front Axle Bracket
(14) Power Steering 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 type 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 TYPE

[M6800(S)]



(1) Front Axle Case Support	(8) 34T Bevel Gear	(15) Differential Yoke Shaft	(22) Bracket (Front)
(2) 19T Bevel Gear	(9) Front Axle Case Cover	(16) Front Differential Case	(23) Differential Lock Spring
(3) 63T Internal Gear	(10) 13T Bevel Gear	(17) Differential Side Gear	(24) Differential Lock Clutch
(4) 22T Planetary Gear	(11) Front Axle Case	(18) 27T Bevel Gear	(25) Differential Lock Lever
(5) Planetary Gear Pin	(12) Bevel Gear Case	(19) Pinion Shaft	(26) Differential Case
(6) Planetary Gear Support	(13) Bevel Gear Shaft	(20) 18T Bevel Pinion Shaft	(27) Bracket (Rear)
(7) Front Axle	(14) 18T Bevel Gear	(21) Differential Pinion Gear	(28) Propeller Shaft

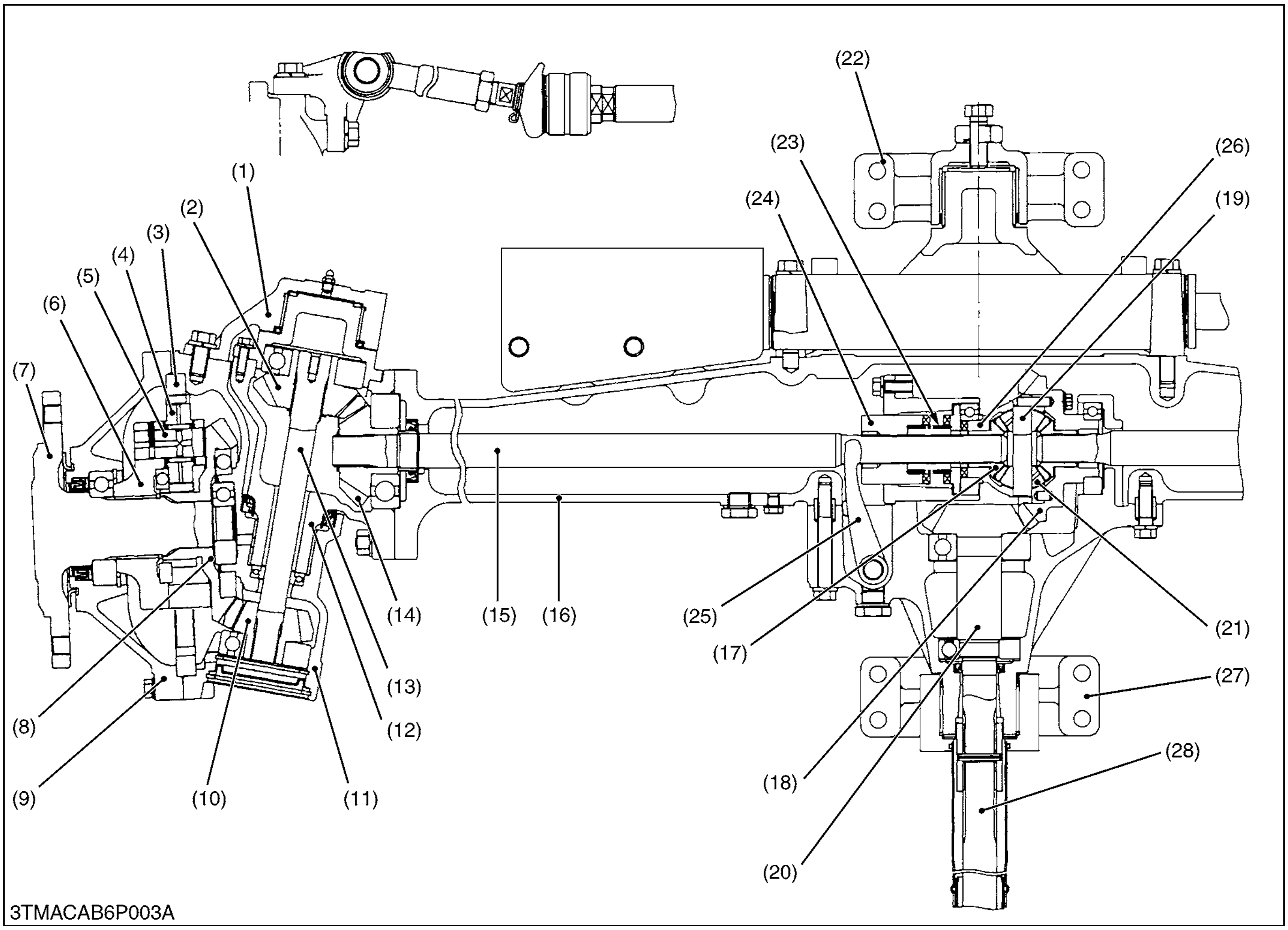
The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft (28) and to the bevel pinion shaft (20), then to the bevel gear (18) after that to the differential gear.

The power through the differential is transmitted to the differential yoke shaft (15), and to the bevel gear shaft (13) in the front axle case (11).

The revolution is greatly reduced by the bevel gears (10), (8), then the power is transmitted to the axle (7).

The differential system allows each wheel to rotate at a different speed to make turning easier.

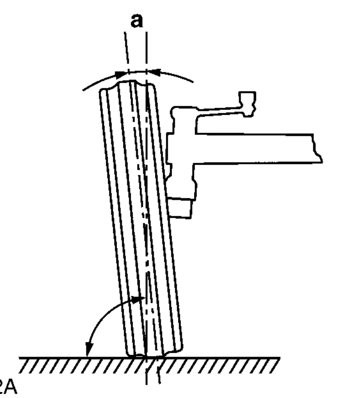
[M8200 · M9000]



(1) Front Axle Case Support
(2) 19T Bevel Gear
(3) 63T Internal Gear
(4) 22T Planetary Gear
(5) Planetary Gear Pin
(6) Planetary Gear Support
(7) Front Axle
(8) 34T Bevel Gear
(9) Front Axle Case Cover
(10) 13T Bevel Gear
(11) Front Axle Case
(12) Bevel Gear Case
(13) Bevel Gear Shaft
(14) 18T Bevel Gear
(15) Differential Yoke Shaft
(16) Front Differential Case
(17) Differential Side Gear
(18) 27T Bevel Gear
(19) Pinion Shaft
(20) 18T Bevel Pinion Shaft
(21) Differential Pinion Gear
(22) Bracket (Front)
(23) Differential Lock Spring
(24) Differential Lock Clutch
(25) Differential Lock Lever
(26) Differential Case
(27) Bracket (Rear)
(28) Propeller Shaft

2. FRONT WHEEL ALIGNMENT

To assure smooth mobility or maneuverability and enhance stable and straight running, the front wheels are mounted at an angle to the right, left and forward directions. This arrangement is referred to as the Front Wheel Alignment.



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■ Camber

The front wheels are tilted from the vertical as viewed from the front, upper wheels are spreader than lower ones.

This inclination is called camber (**a**). Camber reduces bending or twisting of the front axle caused by vertical load or running resistance, and also maintains the stability in running.

Camber	2WD	0.035 rad 2 °
	4WD	0.035 rad 2 °

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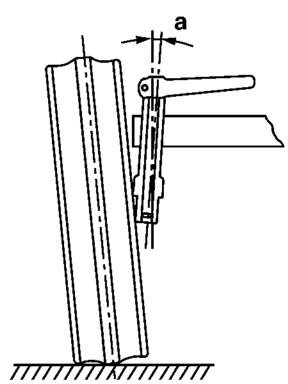

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■ Kingpin Angle

The Kingpin is titled from the vertical as viewed from the front.

This angle is called kingpin angle (**a**). As with the camber, kingpin angle reduces rolling resistance of the wheels, and prevents any shimmy motion of the steering wheel.

It also reduces steering effort.

Kingpin angle	2WD	0.175 rad 10 °
	4WD	0.218 rad 12.5 °

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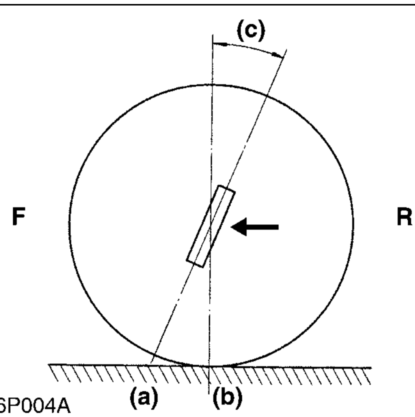

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■ Caster

The kingpin is titled forward as viewed from the side. The point (**b**) of the wheel center line is behind the point (**a**) of the kingpin shaft center line.

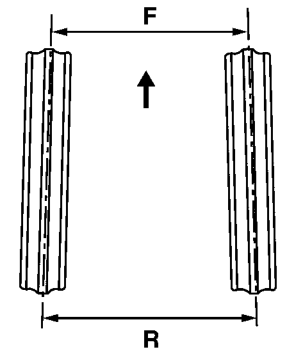
This inclination is called caster (**c**). Caster helps provide steering stability.

As with the kingpin inclination, caster reduces steering effort.

Camber	2WD	0.035 rad 2 °
	4WD	0.026 rad 1.5 °

F : Front **R : Rear**

W1013142



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■ Toe-in

Viewing the front wheels from above reveals that the distance between the toes of the front wheels is smaller than that between the heels.

It is called toe-in. The front wheels tend to roll outward due to the camber, but toe-in offsets it and ensures parallel rolling of the wheels. Another purpose of toe-in is to prevent excessive and uneven wear of tires.

Toe-in	2WD	1 to 5 mm 0.04 to 0.20 in.
	4WD	2 to 8 mm 0.08 to 0.32 in.

F : Front **R : Rear**

W1013242

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	• Tire pressure uneven • Improper toe-in adjustment (improper alignment) • Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive [4WD Type] • Front axle rocking force too small • Front wheel sway excessive • Tie-rod end loose • Air sucked in power steering circuit • Knuckle shaft bushings worn [2WD Type]	Adjust Adjust Replace Adjust Replace Tighten Bleed Replace	G-58 6-S6 6-S20 6-S7 6-S6 6-S11, S12 7-S8 6-S18
Front Wheels Can Not Be Driven [4WD Type]	• Propeller shaft broken • Front wheel drive gears in transmission broken • Front differential gear broken • Shift fork broken • Coupling displaced	Replace Replace Replace Replace Reassemble	6-S9 – 6-S17, S19, S20 – 6-S9
Noise [4WD Type]	• Gear backlash excessive • Oil insufficient • Bearings damaged or broken • Gears damaged or broken	Adjust or replace Replenish Replace Replace	– G-11 – –

W1014322

2. SERVICING SPECIFICATIONS

[2WD TYPE]

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	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	5.0 mm 0.197 in.	–
	Radial Sway	5.0 mm 0.197 in.	–
Front Axle	Swing Angle	0.157 to 0.227 rad 9 to 13 °	–
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 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.	–
Knuckle Shaft Thrust Collar	Thickness	3.0 mm 0.12 in.	–
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	–

W1013874

[4WD TYPE]

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2.0 to 8.0 mm 0.078 to 0.315 in.	–
Front Wheel	Steering Angle	0.840 to 0.873 rad 48 to 50 °	–
	Axial Sway	5.0 mm 0.197 in.	–
	Radial Sway	4.0 mm 0.157 in.	–
Bevel Gear Case and Stopper	Clearance	Below 0.5 mm 0.02 in.	–
Front Axle	Swing Angle	0.122 to 0.192 rad 7 to 11 °	–
	Rocking Force	98 to 147 N 10 to 15 kgf 22 to 33 lbs	–
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	I.D.	32.025 to 32.050 mm 1.26083 to 1.26181 in.	–
Differential Side Gear	O.D.	31.959 to 31.975 mm 1.25823 to 1.25886 in.	–
Differential Pinion Shaft to Differential 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.	–
Bevel Pinion Shaft to Bevel Gear	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 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.
Bearing Retainer	O.D.	64.970 to 65.000 mm 2.55787 to 2.55906 in.	–
Bevel Gear Case	O.D.	49.975 to 50.000 mm 1.96752 to 1.96850 in.	–
Internal Gear to Planetary Gear	Backlash	0.10 to 0.30 mm 0.0039 to 0.0118 in.	0.5 mm 0.020 in.

W1013874

[4WD TYPE] (Continued)

Item		Factory Specification	Allowable Limit
Planetary Gear, Needle Bearing and Shaft	Clearance	0.009 to 0.046 mm 0.00035 to 0.00181 in.	0.3 mm 0.012 in.
Shaft	O.D.	24.991 to 25.000 mm 0.98390 to 0.98425 in.	–
Planetary Gear	I.D.	33.009 to 33.025 mm 1.29957 to 1.30020 in.	–
Needle	O.D.	3.994 to 4.000 mm 0.15724 to 0.15748 in.	–
Thrust Collar	Thickness	1.55 to 1.65 mm 0.0610 to 0.0650 in.	1.0 mm 0.039 in.
Front Differential Case Boss (Internal Ring)	O.D.	65.000 to 65.030 mm 2.55906 to 2.56024 in.	–
Pinion Shaft Case Cover Boss (Pinion Bearing Case Boss)	O.D.	65.000 to 65.030 mm 2.55906 to 2.56024 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 **"6. TIGHTENING TORQUES"** at GENERAL Section.)

[2WD TYPE]

Item	N·m	kgf·m	ft-lbs
Cylinder cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Front wheel mounting nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Steering cylinder mounting nut	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Steering cylinder mounting lock nut	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Front axle middle and front axle (right, left) tightening bolt and nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Tie-rod end lock nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
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
Front wheel hub slotted nut	29.4 to 39.2	3.0 to 4.0	21.7 to 28.9
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
Front axle bracket mounting screw	103.0 to 117.7	10.5 to 12.0	75.9 to 86.8
Front axle bracket mounting nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

W1012736

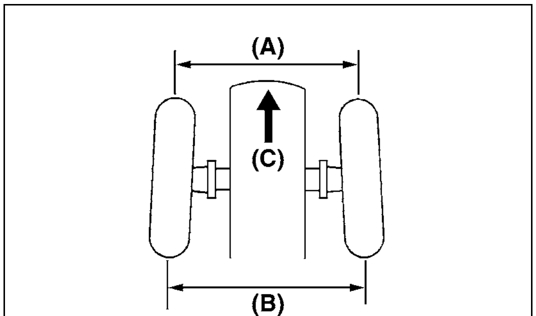
[4WD TYPE]

Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Front wheel mounting nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Cylinder cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Front wheel rim and disc mounting screw	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Front bracket and rear bracket mounting screw	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Front bracket and rear bracket mounting nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Tie-rod end slotted nut	156.9 to 176.5	16.0 to 18.0	115.7 to 130.2
Tie-rod end lock nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Tie-rod joint and steering cylinder mounting screw	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Knuckle arm mounting screw (M12)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
(M14)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Bevel gear case mounting screw (M12, UBS · 9T)	127.5 to 142.2	13.0 to 14.5	94.0 to 104.9
(M14, 7T)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
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
Front wheel case support mounting screw			
(M12, UBS · 9T)	127.5 to 142.2	13.0 to 14.5	94.0 to 104.9
(M14, 9T)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Bearing retainer mounting screw (M8)	23.5 to 27.5	2.4 to 2.8	17.4 to 20.2
Front wheel case cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Pinion bearing case mounting screw (M12, UBS · 9T)	103.0 to 117.7	10.5 to 12.0	75.9 to 86.8
(M14, 7T)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Differential bearing support mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Spiral bevel gear mounting UBS screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Steering cylinder mounting screw	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5

W1011053

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



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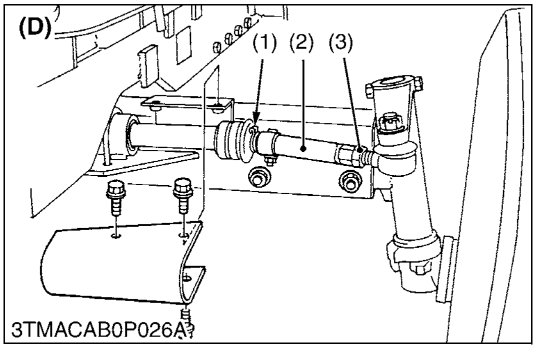

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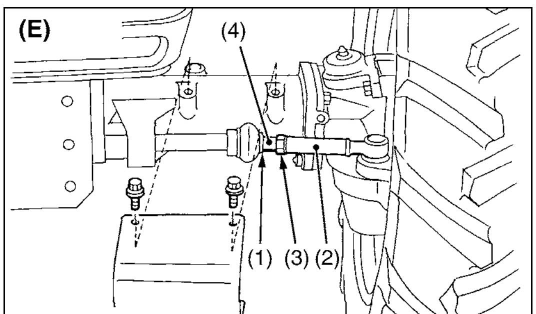

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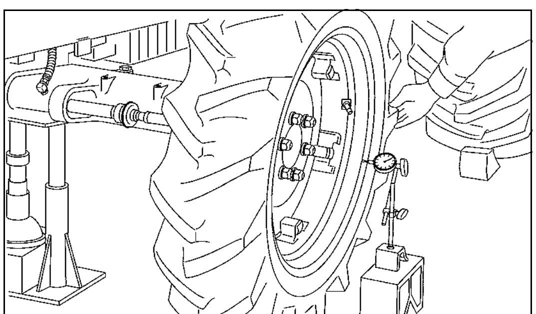
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Adjusting Toe-in

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

Tightening torque	Tie-rod end lock nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 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"
(D) 2WD Type
(E) 4WD Type

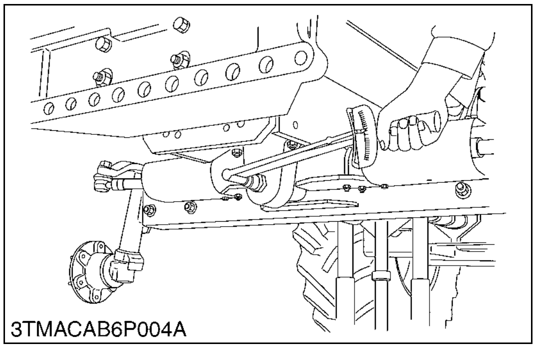
W1022542

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	Factory spec.	Less than 5.0 mm 0.197 in.

W1012092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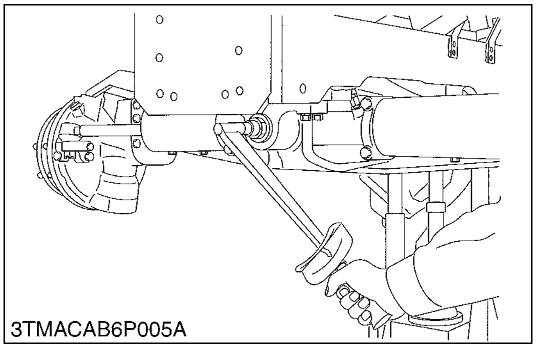
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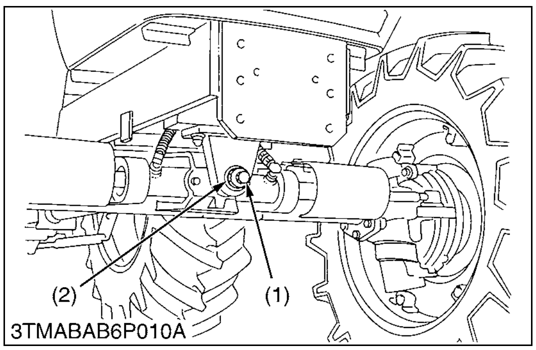

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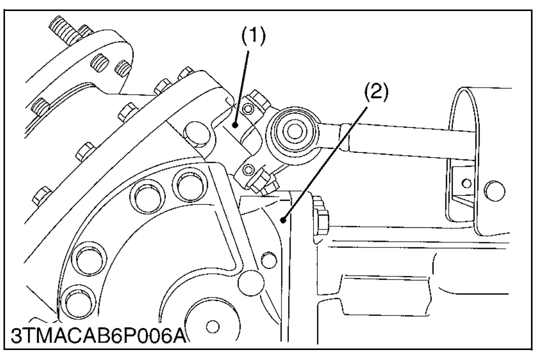
Adjusting Front Axle Pivot

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

W1012203



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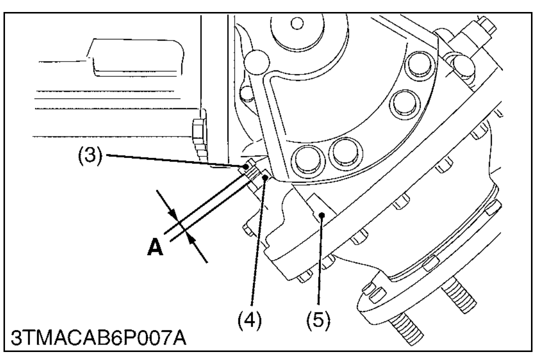


3TMACAB6P007A

Adjusting between Bevel Gear Case and Stopper [4WD Type]

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	Factory spec.	Below 0.5 mm 0.02 in.

Length (**A**)	Reference	9.0 mm 0.35 in.

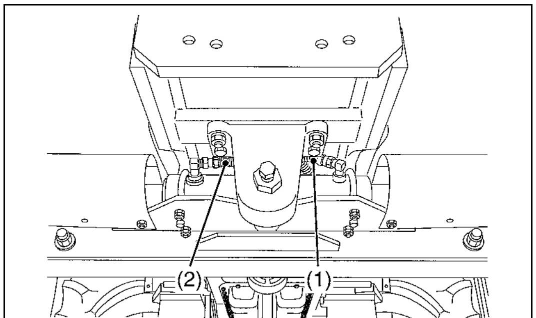
(1) Knuckle Arm
(2) Bevel Gear Case
(3) Stopper
(4) Lock Nut
(5) Front Gear Case

A : Length

W1012461

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle [2WD Type]



3TMACAB6P008A

Front Wheel and Power Steering Hoses

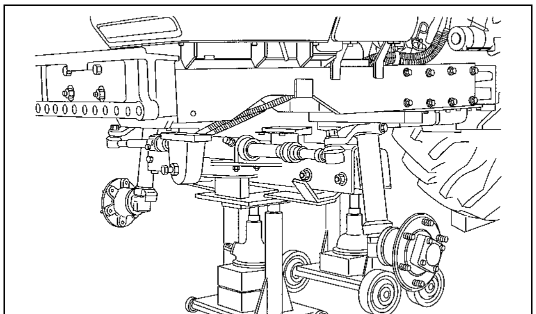
1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Loosen the front wheel mounting nuts.
3. Lift the front axle and remove the front wheels.
4. Disconnect the power steering hoses (1), (2).

(When reassembling)

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Front wheel mounting nut	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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Front Axle

1. Place a disassembly stand under the front axle case and support it with a jack.
2. Remove the bracket (front) mounting screws and nuts.
3. Remove the bracket (rear) mounting screws and nuts.
4. Separating the front axle from front axle bracket.

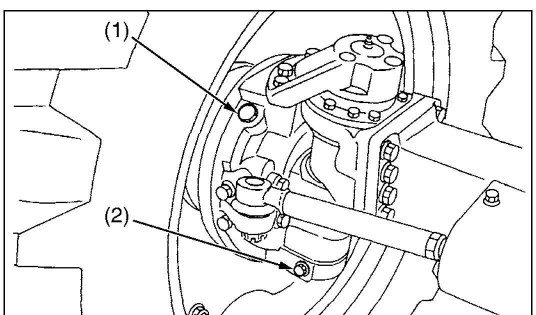
(When reassembling)

Tightening torque	Bracket mounting nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Bracket mounting screw	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs

■ **IMPORTANT**
- **Be sure to adjust the front axle pivot.**

W1012918

(2) Separating Front Axle [4WD Type]



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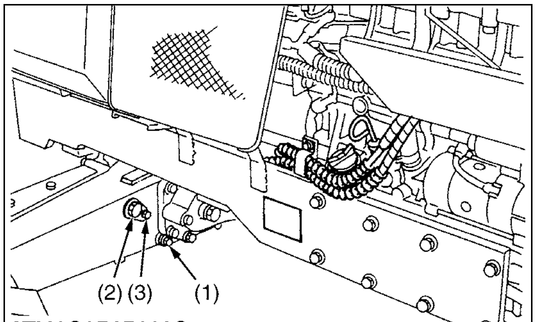
Draining Front Axle Gear Case (Right and Left)

1. Place oil pans underneath the front axle gear case.
2. Remove the drain plug (2) and filling port plug (1) to drain the oil.
3. After draining, reinstall the drain plug (2) and filling port plug (1).

Oil capacity	3.5 L 3.7 U.S.qts. 3.1 Imp.qts.

(1) Filling Port Plug (2) Drain Plug

W1013103



3TMACAB0P003C

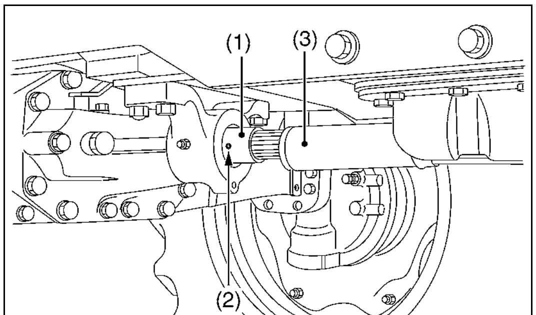
Draining Front Differential Case Oil

1. Place oil pan underneath the differential case.
2. Remove the drain plug (1) and filling plug (2) to drain the oil.
3. After draining, reinstall the drain plug (1) and filling plug (2).

Oil capacity	M6800(S) M8200	5.0 L 5.3 U.S.qts. 4.4 Imp.qts.
	M9000	6.0 L 6.3 U.S.qts. 5.3 Imp.qts.

(1) Drain Plug
(2) Filling Plug
(3) Oil Level Check Plug

W1013245



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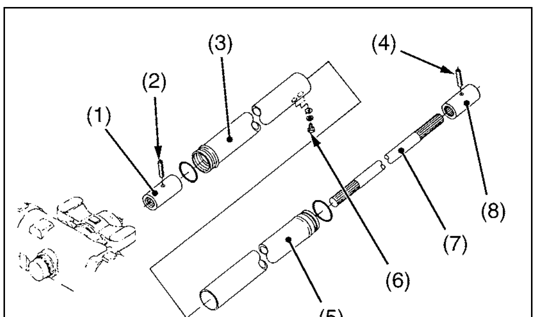

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Propeller Shaft

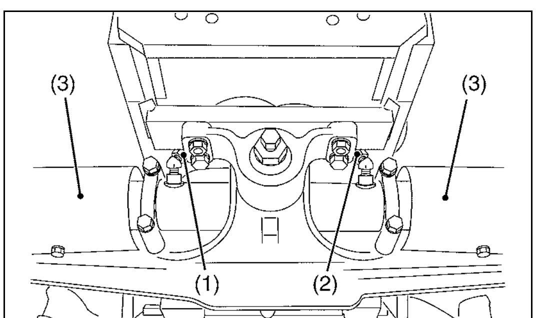
1. Slide the propeller shaft cover (3), (5) after removing the screws (6).
2. Tap out the spring pin (2), (4) and then slide the coupling (1), (8) to the front and rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (7) and pinion shaft.

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

W1024467



3TMACAB1P006B

Front Wheel and Power Steering Hoses

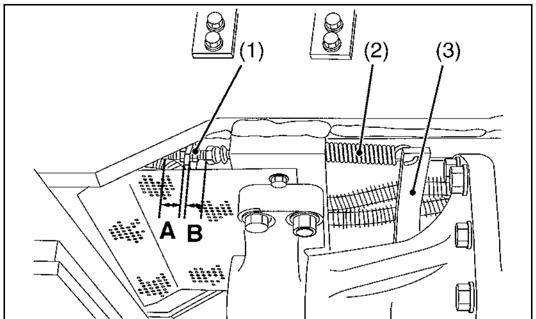
1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Loosen the front wheel mounting nuts.
3. Lift the front axle and remove the front wheels.
4. Remove the cylinder cover (3).
5. Disconnect the power steering hoses (1), (2).

(When reassembling)

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 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
	Front wheel mounting nut	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
(3) Cylinder Cover

W1013645



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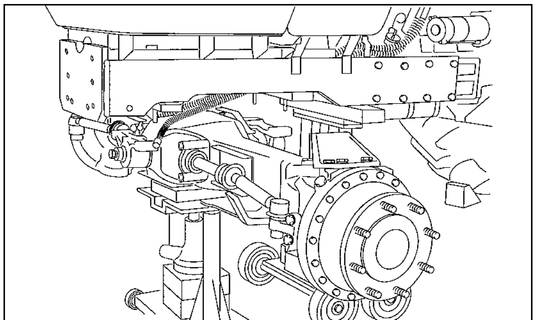
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Front Axle

1. Place a disassembling stand under the front axle case and support it with a jack.
2. Loosen the lock nut (1) and remove the spring (2).
3. Remove the bracket (front) mounting screws and nuts.
4. Remove the bracket (rear) mounting screws and nuts.
5. Separate the front axle from front axle bracket.

(When reassembling)

- Be sure to adjust the length of **A** and **B**.

Length	Factory spec.	**A** = **B**

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

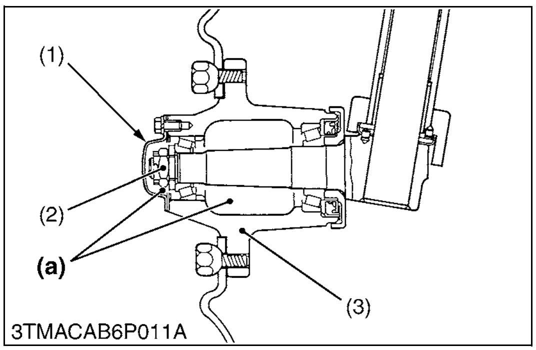
■ **IMPORTANT**

- **Be sure to adjust the front axle pivot.**

(1) Lock Nut
(2) Spring
(3) Differential Lock Lever

W1013843

(3) Disassembling Front Axle [2WD Type]



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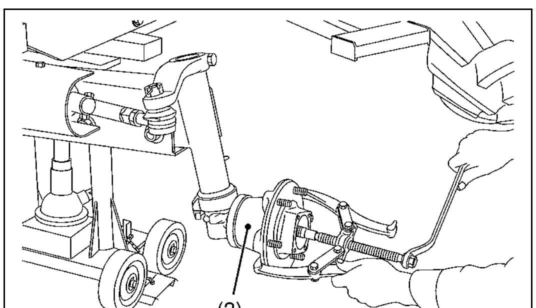


3TMACAB6P012A

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

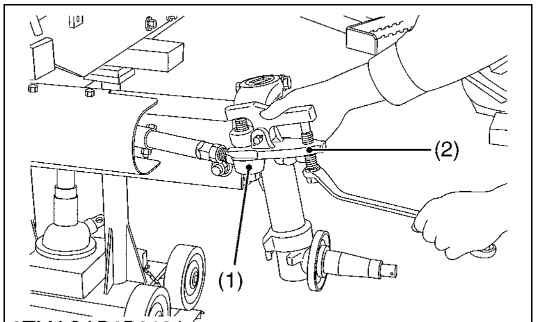
■ **IMPORTANT**

- **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
(a) Grease

W1014230



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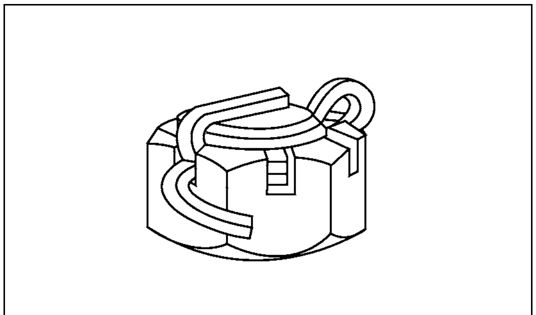
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Tie-rod

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.

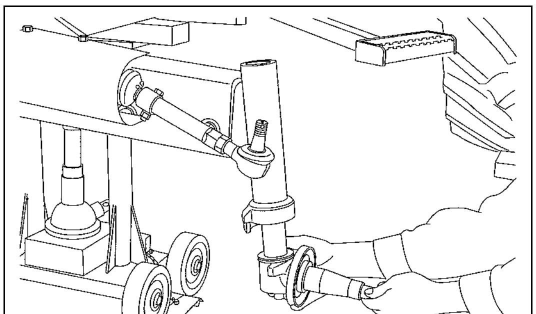
(When reassembling)

- 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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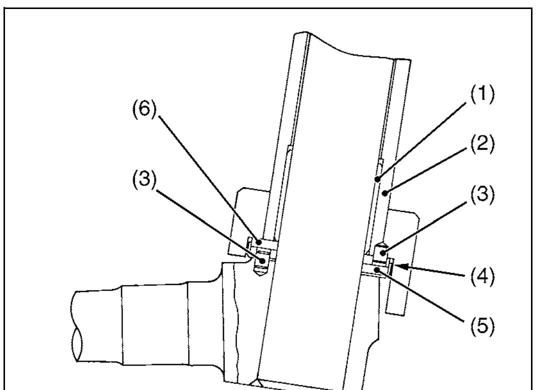


3TMACAB6P015A

Knuckle Shaft

1. Remove the knuckle arm and draw out the knuckle shaft from the front axle.

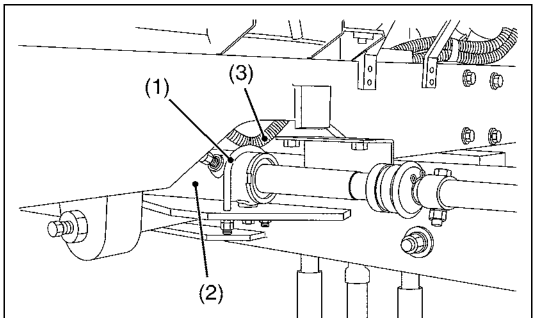
(When reassembling)

- 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



3TMACAB6P016A

Steering Cylinder

1. Remove the cylinder cover.
2. Disconnect the power steering hoses (3).
3. Remove the cylinder clamps (1).
4. Take out the steering cylinder (2).

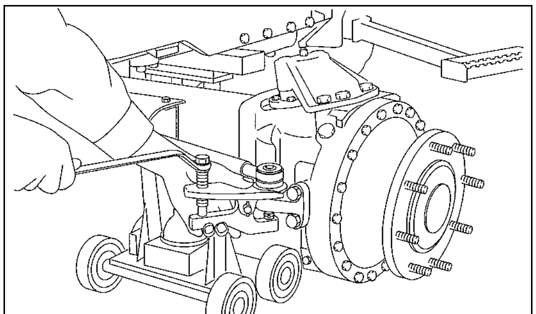
(When reassembling)

Tightening torque	Steering cylinder mounting nut	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Steering cylinder mounting 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

(1) Cylinder Clamp
(2) Steering Cylinder
(3) Power Steering Hose

W1014942

(4) Disassembling Front Axle [4WD Type]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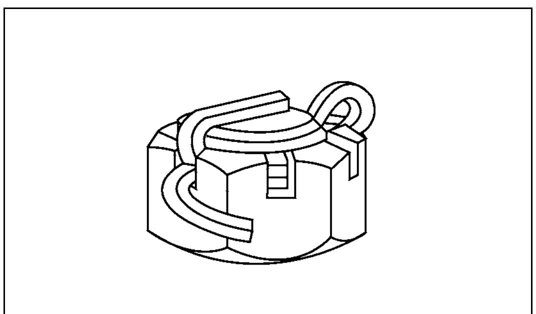

3TMABAB6P017A

Tie-rod

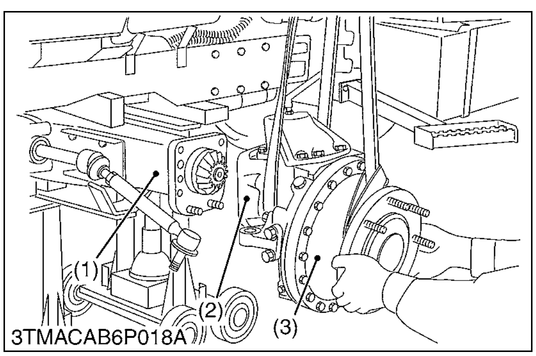
1. Pull out the cotter pin and remove the tie-rod end slotted nuts.
2. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(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
	Knuckle arm mounting screw (M12)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Knuckle arm mounting screw (M14)	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

W1015246



3TMACAB6P018A

Separation of Front Differential Case and 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).

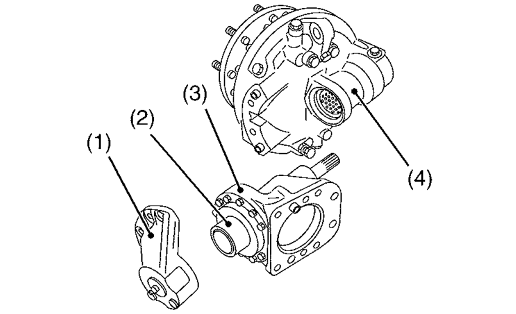
(When reassembling)

- 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 (M12, UBS screw 9T)	127.5 to 142.2 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 ft-lbs
	Bevel gear case mounting screw M14, 7T	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

(1) Front Differential Case
(2) Bevel Gear Case
(3) Front Wheel Case

W1015400



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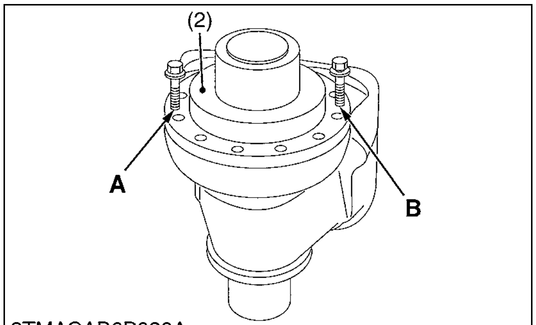

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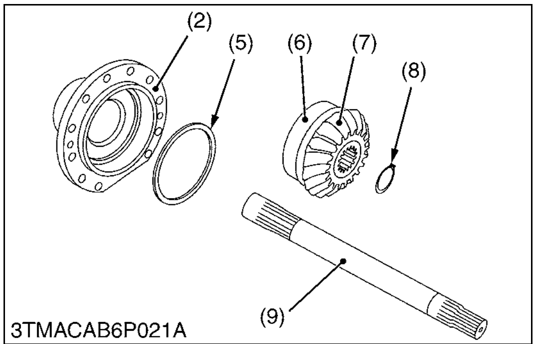

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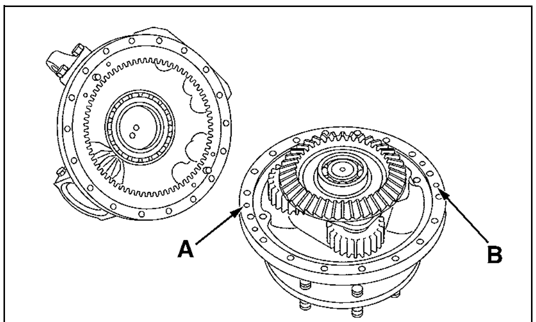


3TMACAB6P022A

Bevel Gear Case

1. Separate the bevel gear case (3) from front wheel case (4).
2. Remove the front wheel case support (1).
3. Loosen the bearing retainer (2) mounting screws.
4. Remove the bearing retainer (2) by screwing M8 screw into holes **A** and **B**.
5. Remove the external snap ring (8).
6. Draw out the bevel gear (7) and bevel gear shaft (9).
7. Take out the shim (5).

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to the bevel gear case.
- 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 M14, 9T	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs
	Front wheel case support mounting screw (M12, UBS screw 9T)	127.5 to 142.2 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 ft-lbs
	Bearing retainer mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs

(1) Front Wheel Case Support
(2) Bearing Retainer
(3) Bevel Gear Case
(4) Front Wheel Case
(5) Shim
(6) Bearing
(7) Bevel Gear
(8) External Snap Ring
(9) Bevel Gear Shaft

W1015548

Front Wheel Case Cover

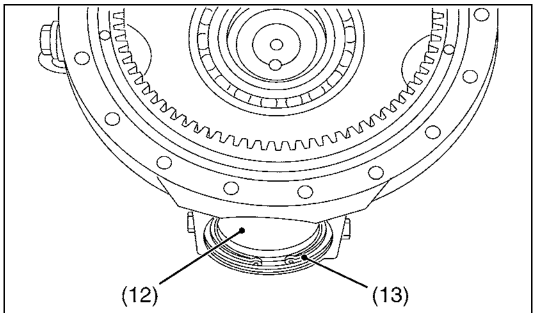
1. Remove the front wheel case cover from the front wheel case by screwing M10 screws into hole **A** and **B**.

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to the front wheel case cover.

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

W1016102



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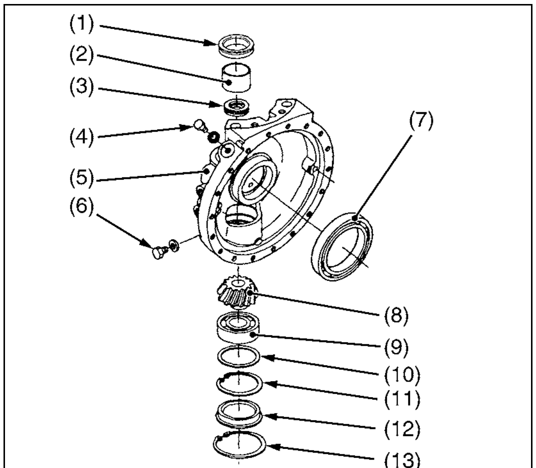

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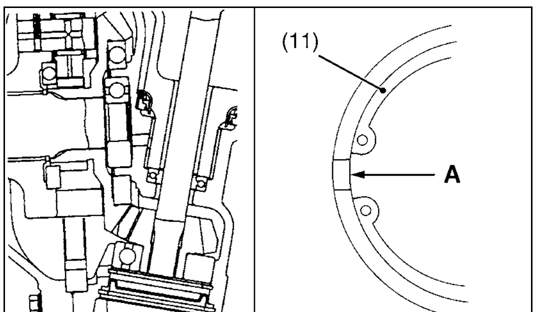


3TMACAB6P025A

Front Wheel Case

1. Remove the internal snap ring (13).
2. Remove the cap (12) which is installed in the bottom of front wheel case.
3. Remove the internal snap ring (11) and take out the adjusting shims (10).
4. Tap the bevel gear to downward, and take out the bevel gear (8) and bearing (9) as a unit.

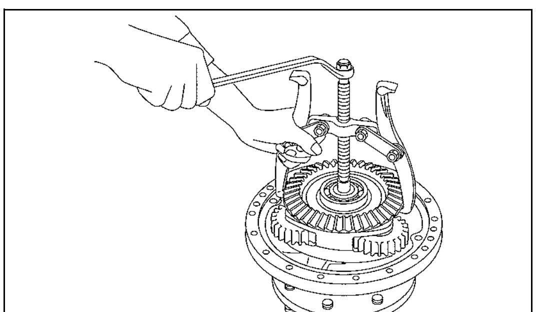
(When reassembling)

- Apply grease to the front wheel case DX bushing (2).
- Apply grease to the oil seal.
- Install the oil seal (1) to the front wheel case so that its lips faces the inward.
- Install the internal snap ring (11) as shown in the figure left side so that align the gap of internal snap ring (11) and by-pass hole (**A**).
- Apply gear oil to the cap.

(1) Oil Seal
(2) DX Bushing
(3) Thrust Ball Bearing
(4) Plug
(5) Front Wheel Case
(6) Plug
(7) Ball Bearing
(8) Bevel Gear
(9) Ball Bearing
(10) Shim
(11) Internal Snap Ring
(12) Cap
(13) Internal Snap Ring

A : By-pass Hole

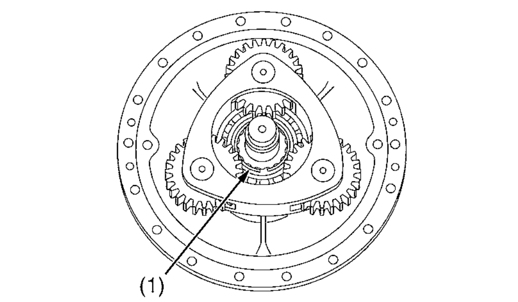
W1016239


3TMACAB6P026A

Bevel Gear

1. Remove the bevel gear and bearing with a puller.

W1016676



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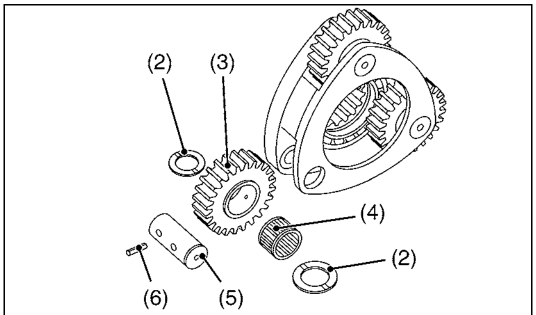

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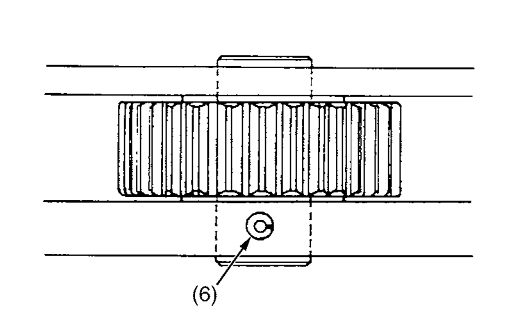


3TMACAB4P008B

Planetary Gear

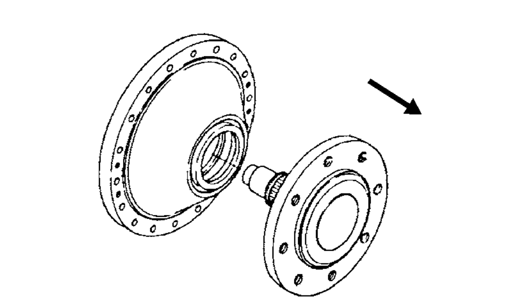
1. Remove the external snap ring (1).
2. Remove the planetary gear support assembly.
3. Tap the spring pin (6) into the planetary gear shaft (5).
4. Draw out the planetary gear shaft (5), and remove the planetary gear (3).
5. Tap out the spring pin (6) from the planetary gear shaft (5).

(When reassembling)

- Apply gear oil to the needle bearing (4).
- Tap in the spring pin (6) as shown in the figure left.

(1) External Snap Ring
(2) Thrust Collar
(3) Planetary Gear
(4) Needle Bearing
(5) Planetary Gear Shaft
(6) Spring Pin

W1016767


3TMACAB6P029A

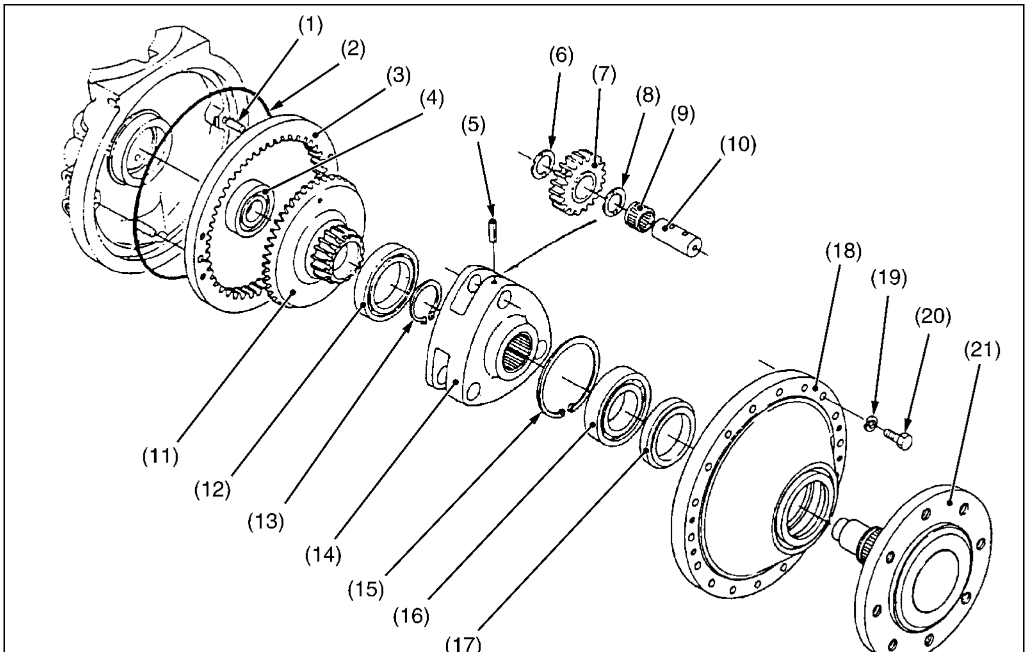
Front Axle

1. Tap out the front axle from front wheel case cover.

(When reassembling)

- Apply grease to the front axle oil seal.

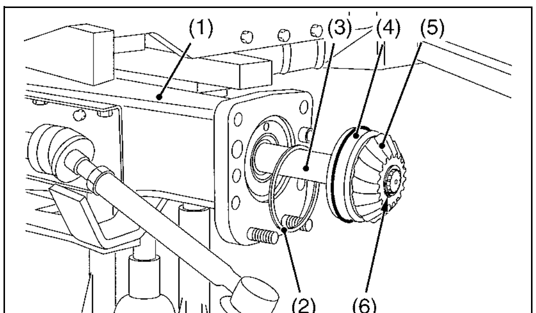
W1017050



3TMACAB6P030A

(1) Straight Pin
(2) O-ring
(3) Internal Gear
(4) Ball Bearing
(5) Spring Pin
(6) Thrust Collar
(7) Planetary Gear
(8) Thrust Collar
(9) Needle Bearing
(10) Planetary Gear Shaft
(11) Bevel Gear
(12) Ball Bearing
(13) External Snap Ring
(14) Planetary Gear Support
(15) Internal Snap Ring
(16) Ball Bearing
(17) Oil Seal
(18) Front Wheel Case Cover
(19) Spring Washer
(20) Bolt
(21) Front Axle

W1027216



3TMACAB6P031A

Bevel Gear and Differential Yoke Shaft

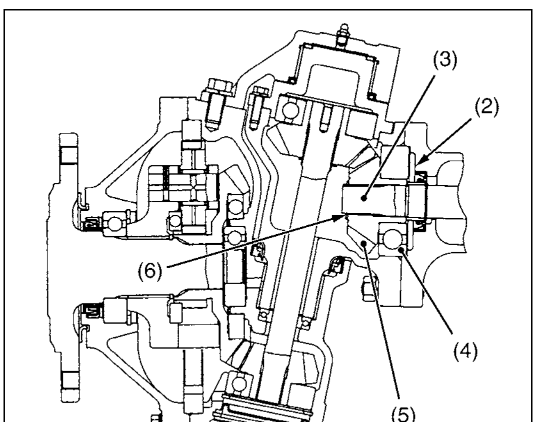
1. Remove the bevel gear (5), bearing (4) and differential yoke shaft (3) as a unit from the differential case (1).
2. Remove the external snap ring (6) and remove the bevel gear (5).

(When reassembling)

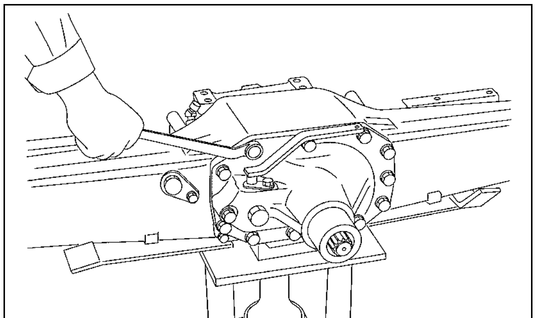
- Install the adjusting shims (2) correctly noting their location.
- Apply liquid gasket (Three Bond 1216 or equivalent) to the front differential case (1).

(1) Differential Case	(4) Bearing
(2) Shim	(5) 18T Bevel Gear
(3) Yoke Shaft	(6) External Snap Ring

W1017490



3TMACAB6P032A

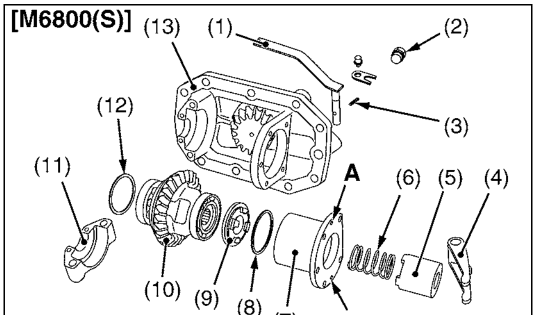

3TMACAB6P033A

Pinion Bearing Case

1. Remove the pinion bearing case mounting screws.
2. Remove the pinion bearing case.

Tightening torque	Pinion bearing case mounting screw	M12 screw · 9T	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
		M14 screw · 7T	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

W1017645



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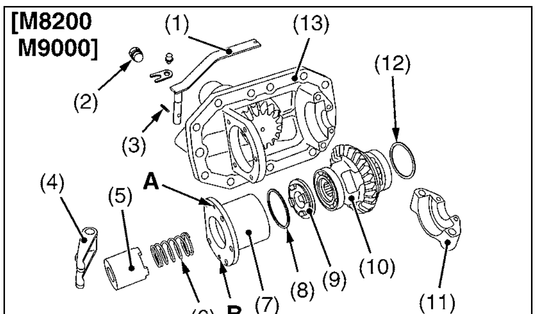


3TMACAB6P035A

Differential Assembly

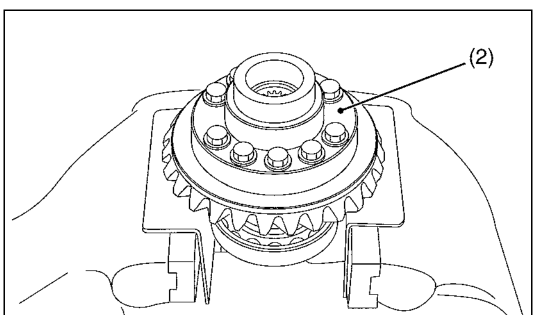
1. Remove the plug (2), and tap out the spring pin (3).
2. Draw out the differential lock lever shaft (1).
3. Remove the differential lock lever (4).
4. Take out the differential lock clutch 1 (5) and spring (6).
5. Remove the bearing support 1 (7) mounting screws.
6. Remove the bearing support 1 (7) by screwing M8 screws in to hole **A** and **B**.
7. Remove the bearing support 2 (11).
8. Remove the differential assembly (10) from the pinion bearing case (13), noting the shims (12).

(When reassembling)

Tightening torque	Differential bearing support mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Differential Lock Lever Shaft
(2) Plug
(3) Spring Pin
(4) Differential Lock Lever
(5) Differential Lock Clutch 1
(6) Spring
(7) Bearing Support 1
(8) Shim
(9) Differential Lock Clutch 2
(10) Differential Assembly
(11) Bearing Support 2
(12) Shim
(13) Pinion Bearing Case

W1017837



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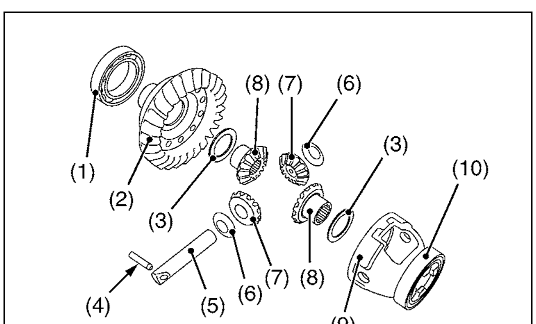


3TMACAB6P037A

Spiral Bevel Gear

1. Remove the spiral bevel gear UBS screws.
2. Tap out the spiral bevel gear (2) from the differential gear case.

(When reassembling)

- Apply lock tight (Three Bond 1324B or equivalent) to the spiral bevel gear UBS screws.

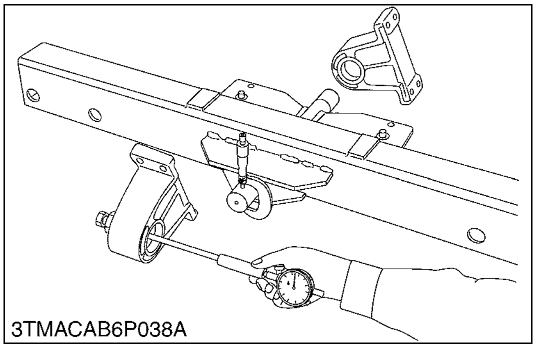
Tightening torque	Spiral bevel gear UBS screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) Bearing
(2) 27T Spiral Bevel Gear
(3) Differential Side Gear Washer
(4) Pin
(5) Differential Pinion Shaft
(6) Differential Pinion Washer
(7) Differential Pinion Gear
(8) Differential Side Gear
(9) Differential Case
(10) Bearing

W1018192

[3] SERVICING

(1) 2WD Type


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.

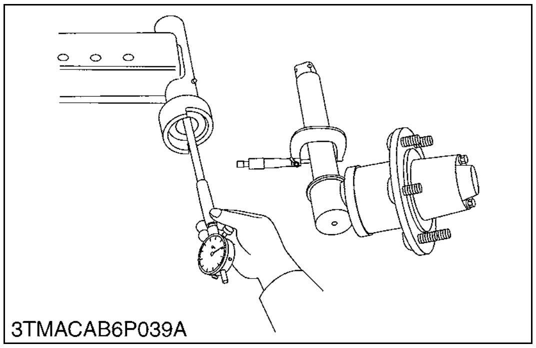
Clearance between front axle middle boss and bracket bushing	Factory spec.	0.050 to 0.150 mm 0.00197 to 0.00590 in.
	Allowable limit	0.35 mm 0.0138 in.

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.

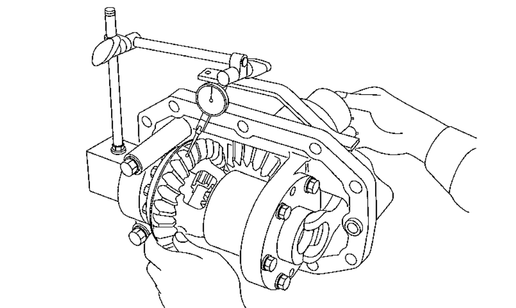
Knuckle shaft O.D.	Factory spec.	37.975 to 38.000 mm 1.49508 to 1.49606 in.
Bushing I.D.	Factory spec.	38.020 to 38.100 mm 1.49685 to 1.50000 in.

(When replacing bushing)

- Remove the bushing with a bushing puller set (Code No. 07916-51011).

W1018596

(2) 4WD Type



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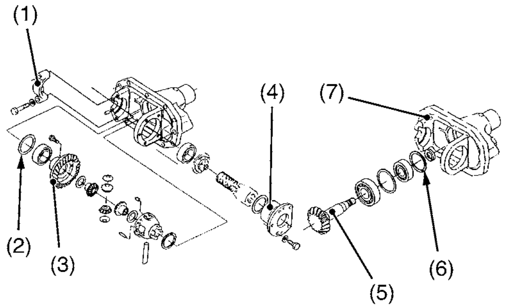

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(A)

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 (5) and moving the bevel gear (3) by hand.
3. If the backlash exceeds the allowable limit, adjust with the shim (2).
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 (3).
6. Turn the bevel pinion shaft (5), while pressing a wooden piece 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 shims (2) :

0.1 mm (0.004 in.)	0.8 mm (0.031 in.)
0.2 mm (0.008 in.)	1.0 mm (0.039 in.)
0.4 mm (0.012 in.)	1.2 mm (0.047 in.)

- Thickness of adjusting shims (6) :

0.1 mm (0.004 in.)	0.4 mm (0.012 in.)
0.2 mm (0.008 in.)	1.6 mm (0.063 in.)

- Backlash changer per 0.1 mm (0.004 in.) shim : Approx. 0.05 mm (0.002 in.)

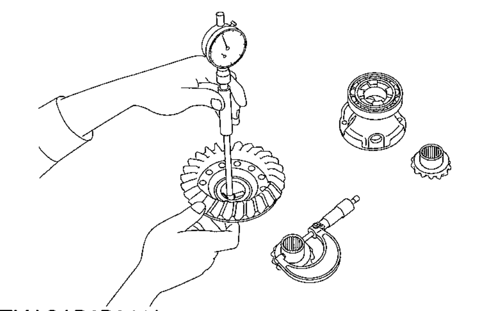
■ **IMPORTANT**

- **Adjust the tooth contact with shims (2) and (6) so that the spiral bevel pinion shaft may not contact with the differential case.**

(1) Differential Bearing Support 2
(2) Shim
(3) Bevel Gear
(4) Differential Bearing Support 1
(5) Bevel Pinion Shaft
(6) Shim
(7) Pinion Bearing Case

(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


3TMACAB6P044A

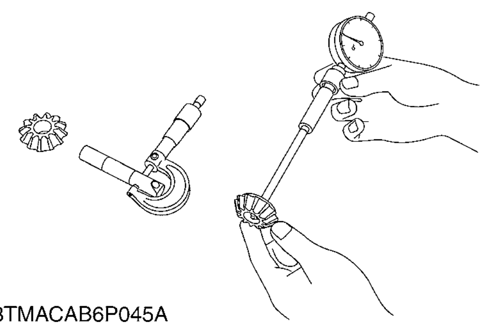
Clearance between Differential Case and Differential Side Gear

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

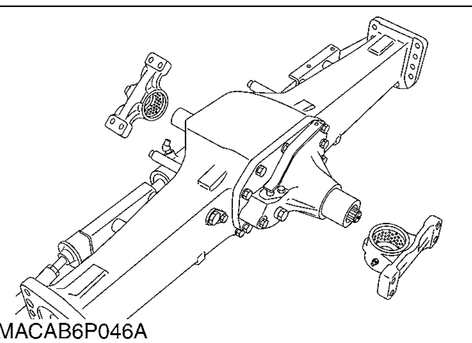
Clearance between Differential Pinion Shaft and Pinion Gear

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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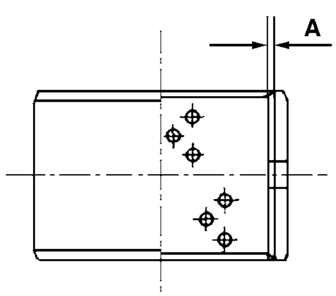

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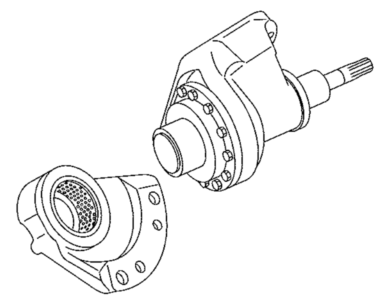
Front Bracket and Rear Bracket Bushing

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 (**A**), replace it.

Front bracket and rear bracket bushing	Alloy thickness (**A**)	0.57 mm 0.0224 in.

Pinion bearing case O.D.	Factory spec.	65.000 to 65.030 mm 2.55906 to 2.56024 in.
Front differential case boss O.D.	Factory spec.	65.000 to 65.030 mm 2.55906 to 2.56024 in.

W1020171



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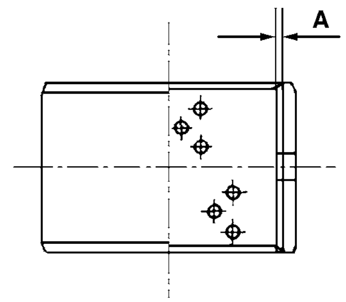


3TAAAAB8P033A

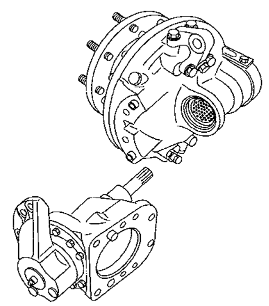
Bearing Retainer and Front Wheel Case Support Bushing

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 (**A**), replace it.

Front wheel case support bushing	Alloy thickness (**A**)	0.57 mm 0.0224 in.

Bearing retainer O.D.	Factory spec.	64.970 to 65.000 mm 2.55787 to 2.55906 in.

W1020339



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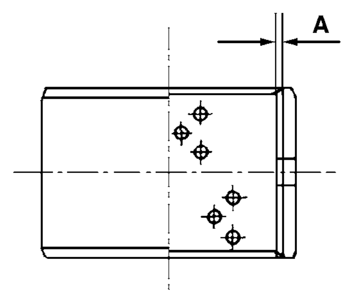

3TAAAAB8P033A

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 (**A**), replace it.

Front wheel case bushing	Alloy thickness (**A**)	0.57 mm 0.0224 in.

Bevel gear case O.D.	Factory spec.	49.975 to 50.000 mm 1.96752 to 1.96850 in.

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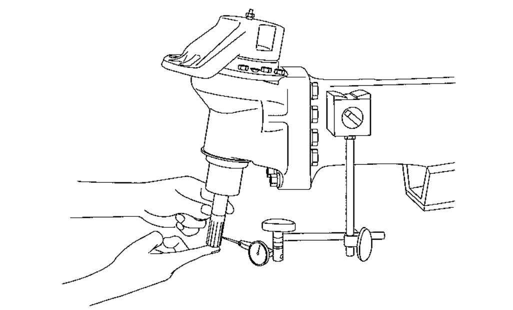

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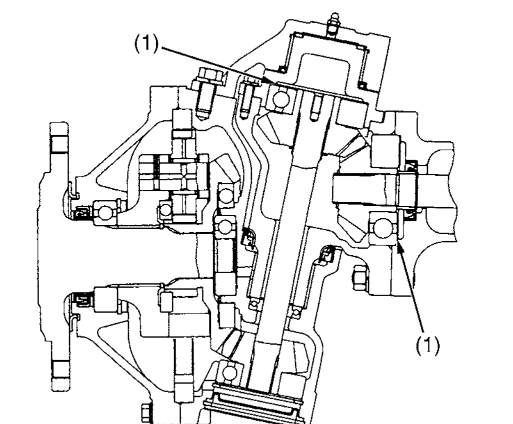

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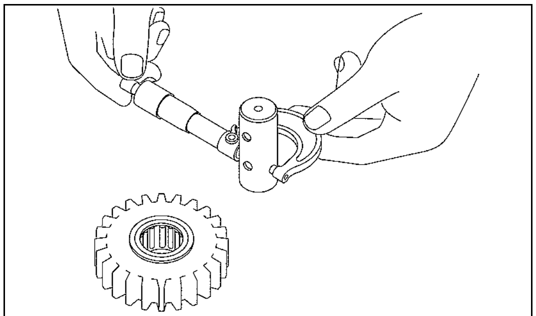

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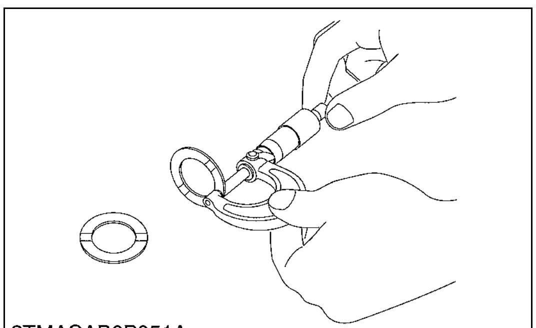

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Backlash of Bevel Gear in Bevel Gear Case

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 × 2

4. If the backlash exceeds the allowable limit, adjust with the shims (1).

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.)	0.8 mm (0.031 in.)
0.2 mm (0.008 in.)	1.0 mm (0.039 in.)
0.4 mm (0.012 in.)	1.2 mm (0.047 in.)

- Backlash changer per 0.1 mm (0.004 in.) shim :
  Approx. 0.04 mm (0.015 in.)

(1) Shim

W1020677

Clearance between Planetary Gear and Shaft

1. Measure the planetary gear I.D. and the planetary gear shaft O.D. (rubbing surface).
2. Measure the O.D. of two needles installed diagonally in the needle bearing.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace them.

Clearance between planetary gear and shaft	Factory spec.	0.009 to 0.046 mm 0.00035 to 0.00181 in.
	Allowable limit	0.3 mm 0.012 in.

Planetary gear I.D.	Factory spec.	33.009 to 33.025 mm 1.29957 to 1.30020 in.
Shaft O.D.	Factory spec.	24.991 to 25.000 mm 0.98390 to 0.98425 in.
Needle O.D.	Factory spec.	3.994 to 4.000 mm 0.15724 to 0.15748 in.

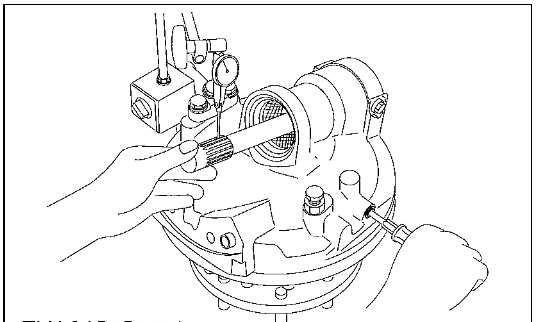
W1021047

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	1.0 mm 0.039 in.

W1021223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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.

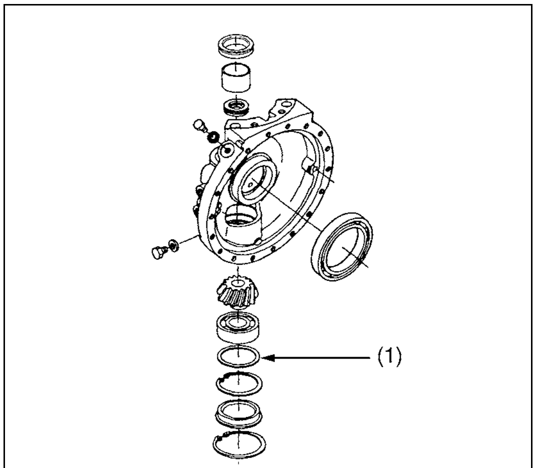
Backlash = Play × 2

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) :

0.1 mm (0.004 in.)	1.2 mm (0.047 in.)
0.2 mm (0.008 in.)	1.8 mm (0.070 in.)
0.4 mm (0.012 in.)	2.0 mm (0.078 in.)
0.8 mm (0.031 in.)	2.3 mm (0.090 in.)
1.0 mm (0.039 in.)	



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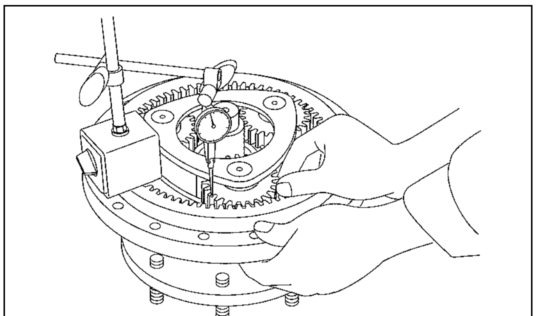
(1) Shim

W1021810

Backlash between Internal Gear and Planetary Gear


3TMACAB6P053A

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.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gear and planetary gear	Factory spec.	0.10 to 0.30 mm 0.0039 to 0.0118 in.
	Allowable limit	0.5 mm 0.020 in.

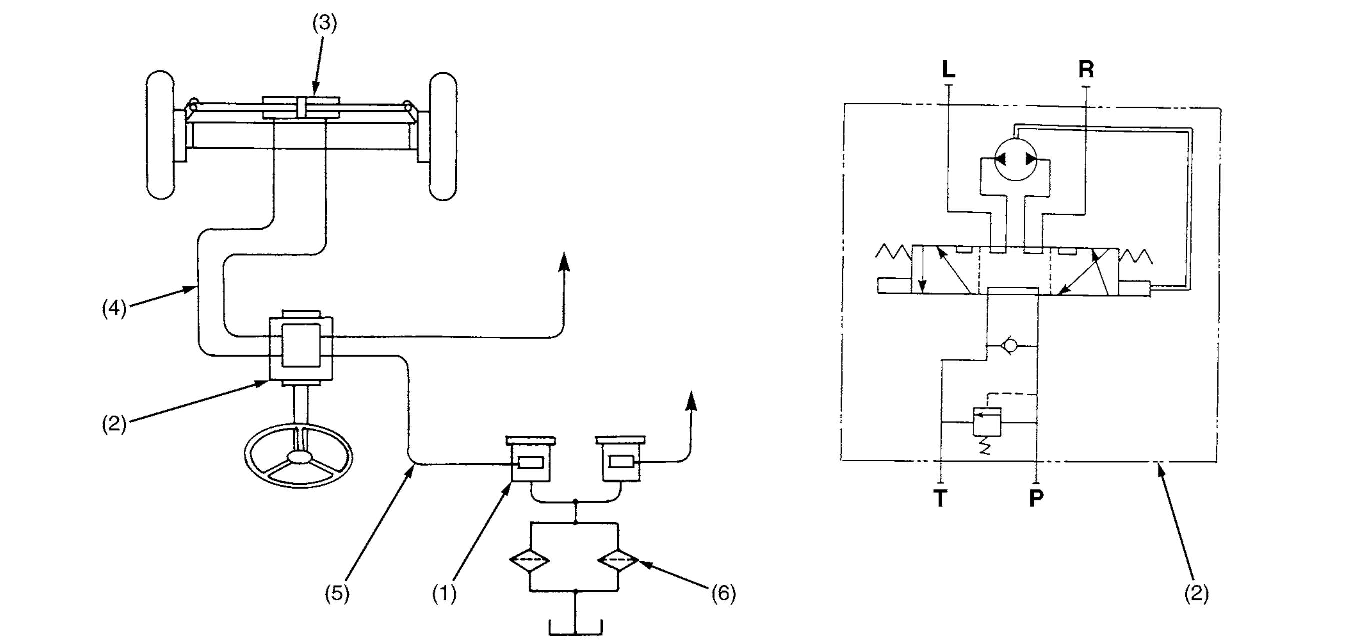
W1022069

7 STEERING

MECHANISM

CONTENTS

1. STEERING MECHANISM



3TMACAB7P001A

(1) Hydraulic Pump
(2) Steering Controller
(3) Steering Cylinder
(4) Power Steering Hose
(5) Power Steering Pipe
(6) Magnet Filter

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.

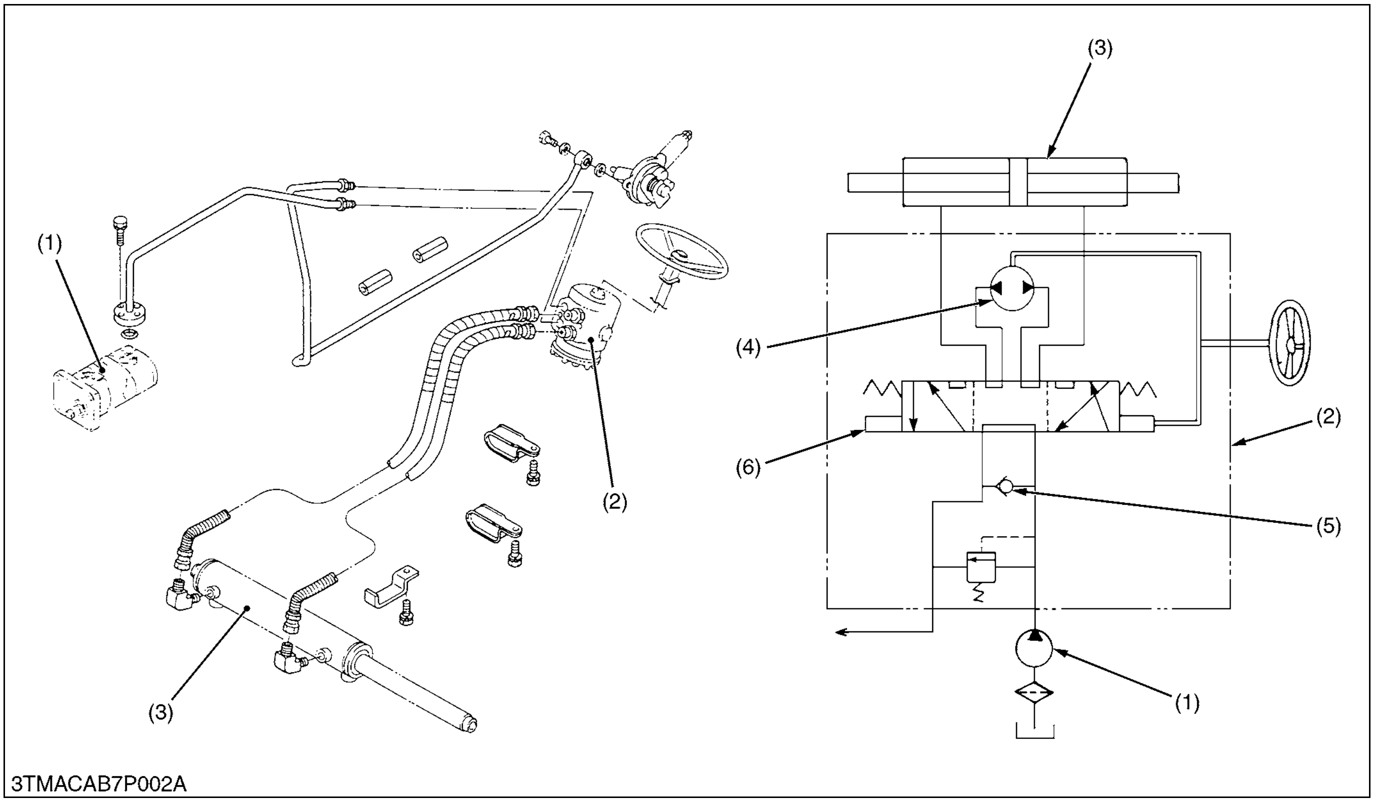
With the load reaction type power steering, the steering wheel returns almost to the straight forward position as with an automobile when the operator releases his hands from the steering wheel.

(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.

2. POWER STEERING HYDRAULIC CIRCUIT



(1) Hydraulic Pump
(2) Steering Controller
(3) Steering Cylinder
(4) Gerotor
(5) Check Valve
(6) Control Valve

■ **Hydraulic Oil Flow**

When the engine starts, the hydraulic pump (1) of the power steering system pressure-feeds the oil drawn from the transmission case through the suction pipe.

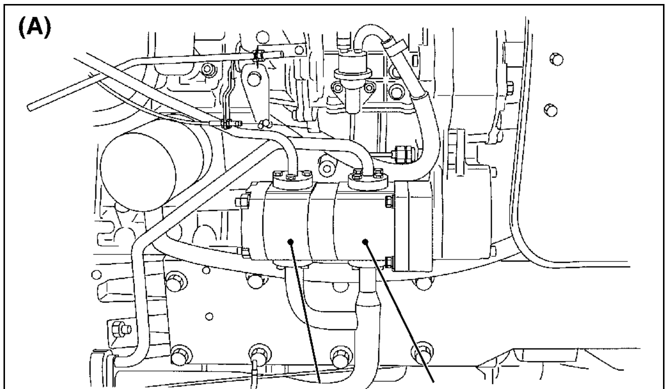
The oil which has entered steering controller (2) is directed to control valve (6).

As the steering wheel is turned, control valve (6) operates and the oil passes through gerotor (4) and into steering cylinder (3). The cylinder rod then moves to control the directional movement of the front wheels.

Return oil from steering cylinder (3) passes through control valve (6) is sent to the PTO clutch valve.

When the engine is not operating, and the steering wheel is turned, gerotor (4) rotates to supply oil to steering cylinder (3). Thus the machine can be steered manually.

3. POWER STEERING SYSTEM HYDRAULIC PUMP



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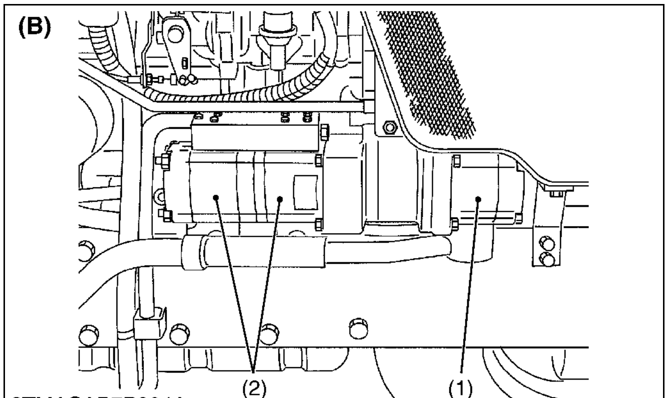

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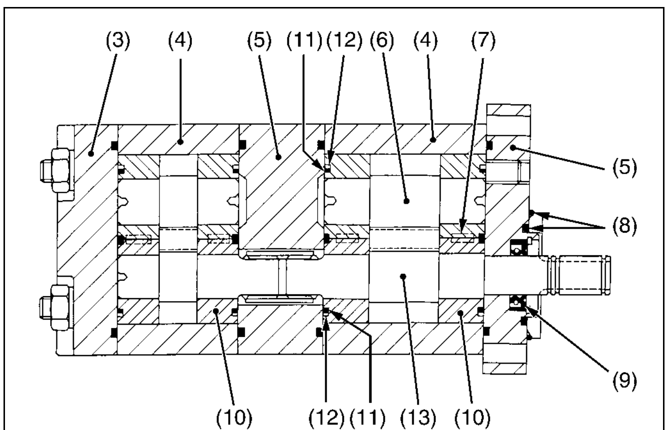

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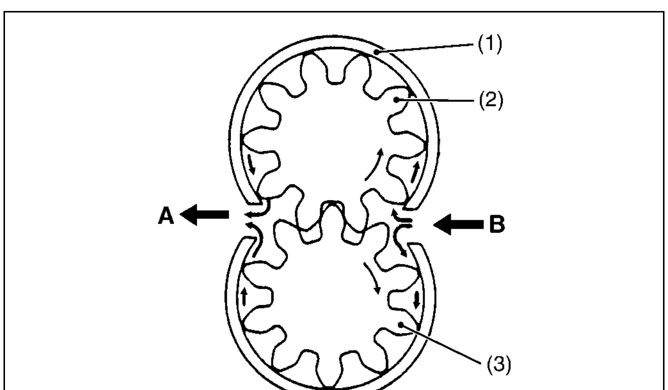
The power steering system hydraulic pump pressure-feeds the oil sucked from the transmission case to the steering cylinder through the steering controller.

The hydraulic pump is driven by the idle gear.

(1) Power Steering System Hydraulic Pump
(2) Three Point Hydraulic System Hydraulic Pump
(3) Cover
(4) Housing
(5) Flange
(6) Driven Gear
(7) Key
(8) O-ring
(9) Oil Seal
(10) Bushing
(11) Seal Element
(12) Backup Element
(13) Drive Gear

(A) Individual Flow Type
(B) Combined Flow Type

W1012937



3TRAAAA8P003A

■ **Operation of Hydraulic Pump**

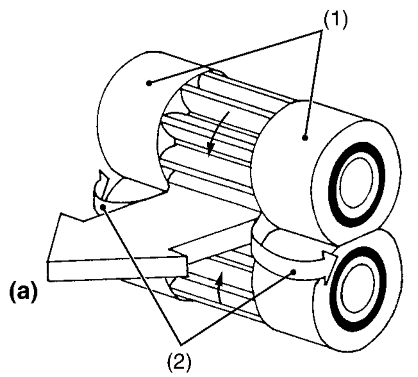
The hydraulic pump has two meshing gears (2), (3) whose teeth run close to the casing (1). One gear is a drive gear (2) which drives the driven gear (3).

When the drive gear is driven in the direction of the arrow by the crankshaft, the gears trap oil between the gear teeth and the casing. The trapped oil is carried around to the outlet. The higher the engine speed, the more the pump discharge.

(1) Casing
(2) Drive Gear
(3) Driven Gear

A : Outlet
B : Inlet

W1013098



3TRAAAA8P004A

■ **Pressure Loading System**

The pressure loading system automatically decreases the clearance between the gear and the bushing (1). A small amount of pressure oil is fed behind the bushings, pressing them against the gears and forming a tighter seal against leakage.

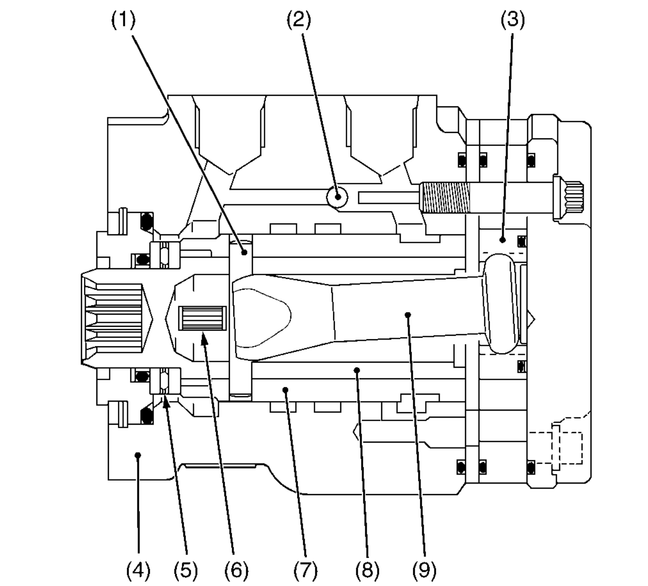
Therefore, leakage from the delivery side (high pressure) to the inlet side (low pressure) does not increase even if the pressure on the delivery side increases.

(1) Bushing
(2) Loading Pressure

(a) Outlet

W1013183

4. STEERING CONTROLLER



3TRAAAA7P019A

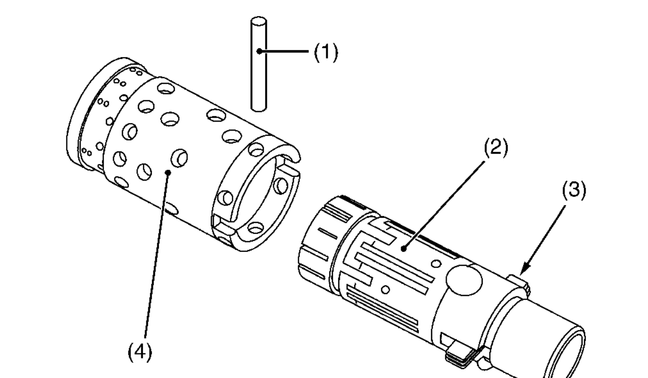
The steering controller mainly consists of a control valve, a metering device and a relief valve.

The metering device comprises a set of special gear called **"Gerotor"**.

(1) Dowel Pin
(2) Check Valve
(3) Gerotor
(4) Housing
(5) Bearing Assembly
(6) Centering Spring
(7) Sleeve
(8) Spool
(9) Drive Shaft

W1013356

[1] CONTROL VALVE



3TRAAAA7P020A

The control valve is a rotating spool type. When the steering wheel is not turned, the valve is kept in the neutral position by the centering spring (3).

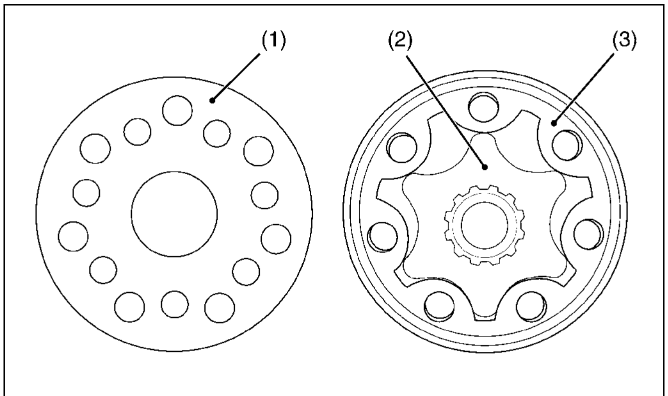
Then, the oil flow from the hydraulic pump to the steering cylinder and from the steering cylinder to the transmission case is shut off. Oil from the hydraulic pump is sent to the transmission case through the control valve.

When the steering wheel is turned clockwise or counterclockwise, the control valve, together with the gerotor, changes the direction of oil flow to the steering cylinder according to the direction, the steering wheel was turned.

(1) Dowel Pin
(2) Spool
(3) Centering Spring
(4) Sleeve

W1013481

[2] METERING DEVICE (GEROTOR)



All oil sent from the hydraulic pump to the steering cylinder, passes through the metering device (Gerotor).

Namely, when the rotor is drive, three chambers suck in oil due to volumetric change in the pump chambers formed between the rotor (2) and the stator (3), while oil is discharged from other three chambers. On the other hand, rotation of the steering wheel is directly transmitted to the rotor through the steering shaft, spool, drive shaft, etc..

Accordingly, the gerotor serves to supply the steering cylinder with oil, amount of which corresponds to the rotation of the steering wheel. The wheels are thus turned by the angle corresponding to the rotation of the steering wheel.

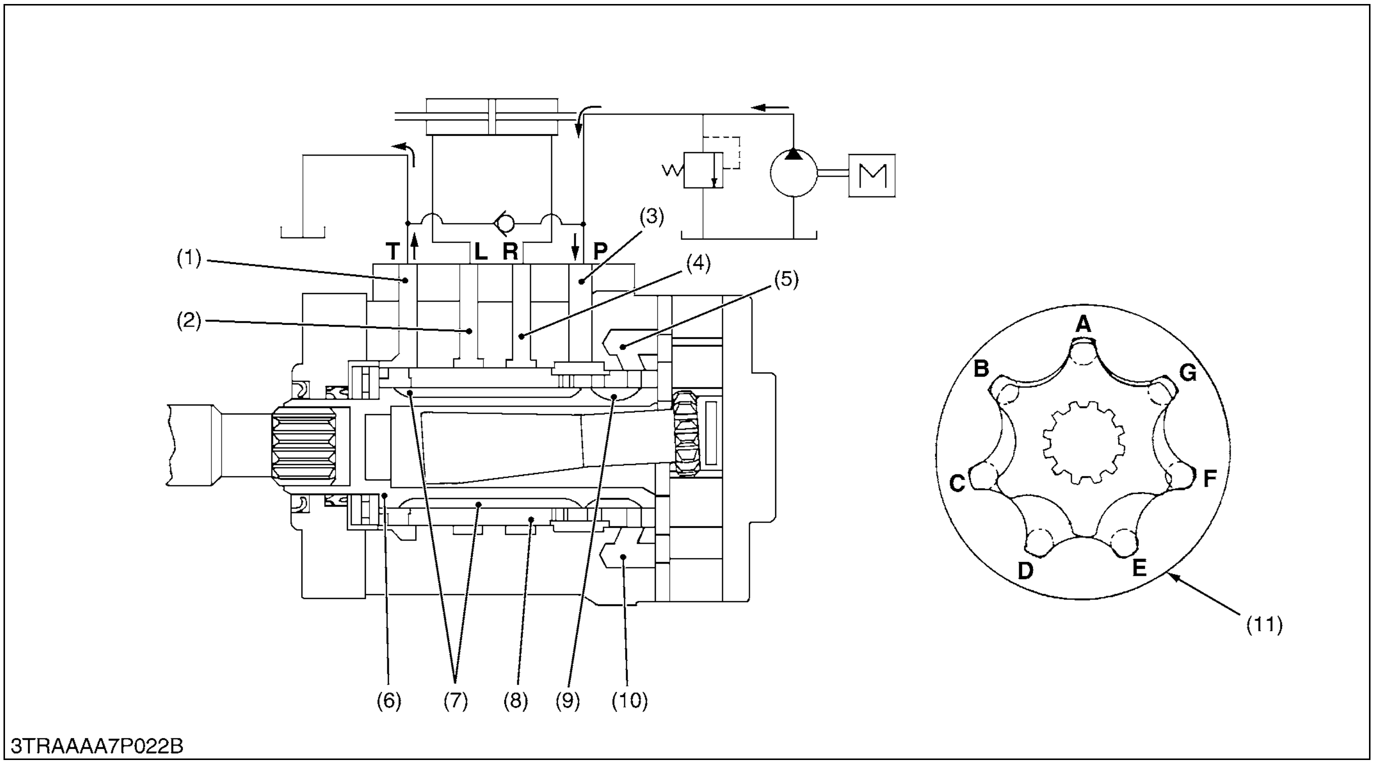
When the engine stops or the hydraulic pump malfunctions, the gerotor functions as a manual trochoid pump, which makes manual steering possible. Oil discharge per rotor revolution is approx. 80 cc/cev (4.88 cu.in./rev).

(1) Distributor Plate
(2) Rotor
(3) Stator

W1013572

[3] OIL FLOW

■ Neutral Position



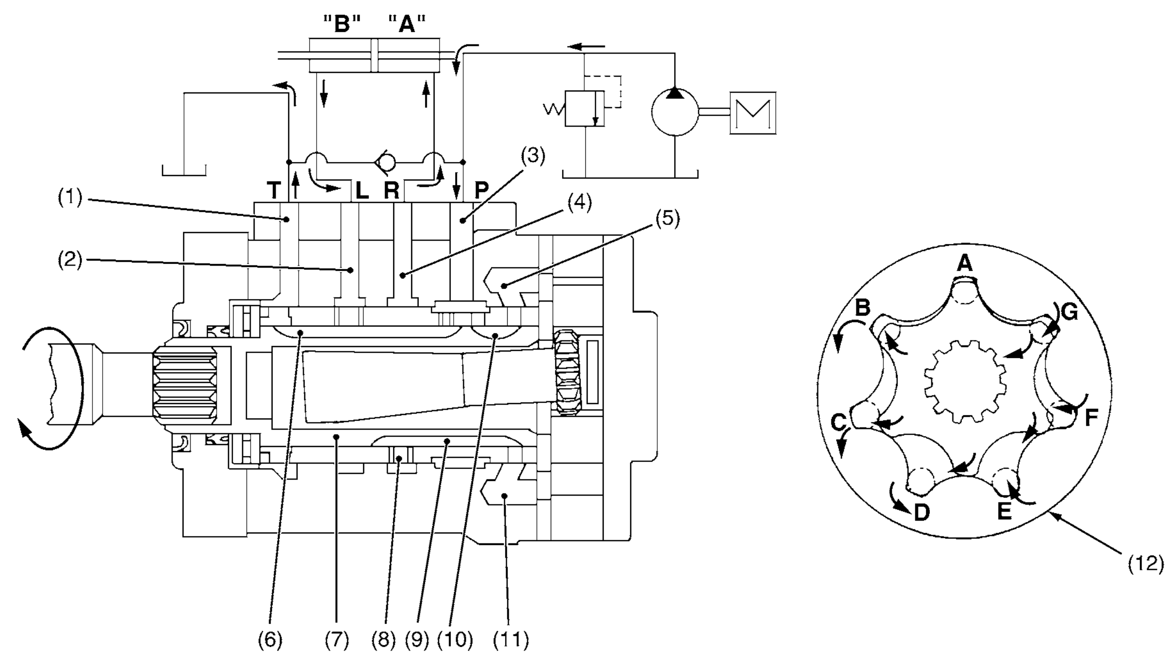
(1) Passage	(4) Passage	(7) Spool Groove	(10) Passage
(2) Passage	(5) Passage	(8) Sleeve	(11) Gerotor
(3) Passage	(6) Spool	(9) Spool Groove	

When the steering wheel is not turned, the control valve is kept in neutral position by the centering spring.

Oil, sent from the hydraulic pump to pump port **P**, returns to the transmission case from tank port **T**, passing through the passage (3), spool groove (7), and passage (1).

The cylinder ports **L** and **R** are blocked by the sleeve. So the piston does not act, when affected by and external force, due to which the wheels are held running straight forward or turning at a given angle.

■ Right Turning



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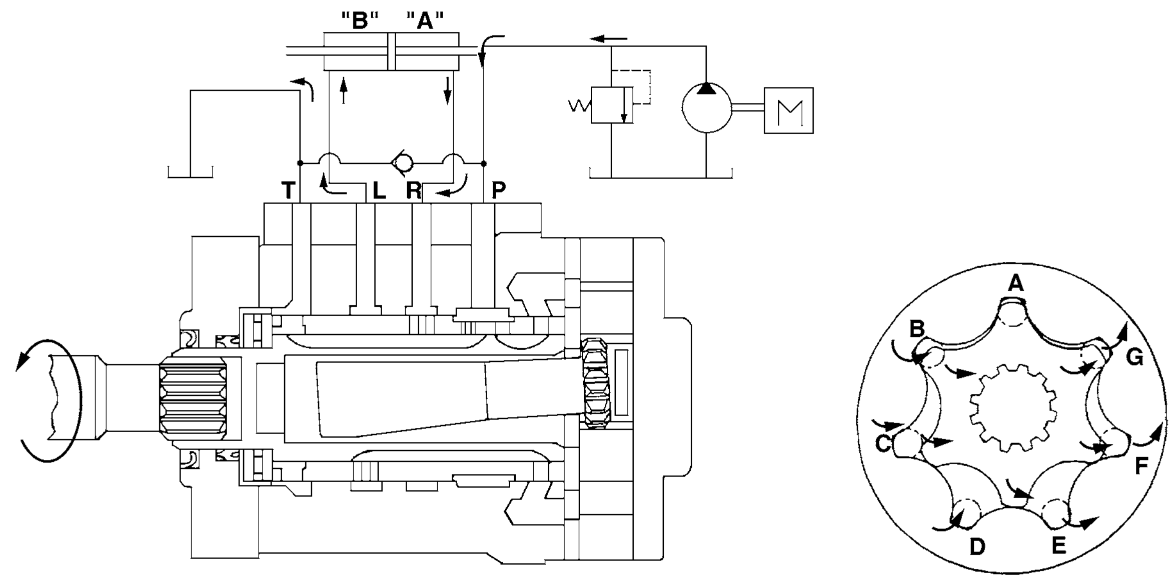
(1) Passage	(4) Passage	(7) Spool	(10) Spool Groove
(2) Passage	(5) Passage	(8) Sleeve	(11) Passage
(3) Passage	(6) Spool Groove	(9) Passage	(12) Gerotor

1. When the operator attempts to turn the steering wheel clockwise, only the spool (7) is rotated a small amount overcoming the force of the centering spring, thereby causing a relative displacement between the spool (7) and the sleeve (8). As a result, while the passage from the passage (3) to the spool groove (6) is throttled, the passage from (3) to (1) and (5) is opened, forming a passage to the three pump chambers **E**, **F** and **G** (in sucking-in state) of the gerotor. At the same time, a passage is formed from the three chambers **B**, **C** and **D** (in oil discharging state) of the gerotor to the cylinder port **R** through the passages (11), (9) and (4).
2. Oil pressure generated at this time in the three chambers **E**, **F** and **G** of the gerotor, that is oil pressure generated in the spool groove (10), is set depending on the extent of throttling from (3) to (6). The extent of throttling increases as the relative displacement between the spool (7) and the sleeve (8) increases. Accordingly, at small relative displacements, oil pressure generated in the three chambers **E**, **F** and **G** of the gerotor is too low to move the piston overcoming road resistance. When the relative displacement increases to such an extent that oil pressure generated in the three chambers **E**, **F** and **G** rises up to the operating pressure, the rotor rotates and oil in the three chambers **B**, **C** and **D** of the gerotor which are in the discharging state is pressure-fed to the cylinder chamber **"A"** to steer. On the other hand, oil discharged from the cylinder chamber **"B"** returns to the oil tank from tank port **T**, after following through the passages (2), (6) and (1) from the cylinder port **L**.
3. When the steering wheel is turned, a relative displacement develops and generates operating pressure corresponding to the road resistance, and the spool (7) and sleeve (8) rotate as the steering wheel is turned. As already described, the gerotor serves as a metering device so that the wheels are turned to the angle corresponding to the turn of the steering wheel.
4. When the steering wheel is stopped, a relative displacement between the spool (7) and the sleeve (8) becomes zero due to the function of the centering spring, and the neutral state is restored.

■ Left Turning



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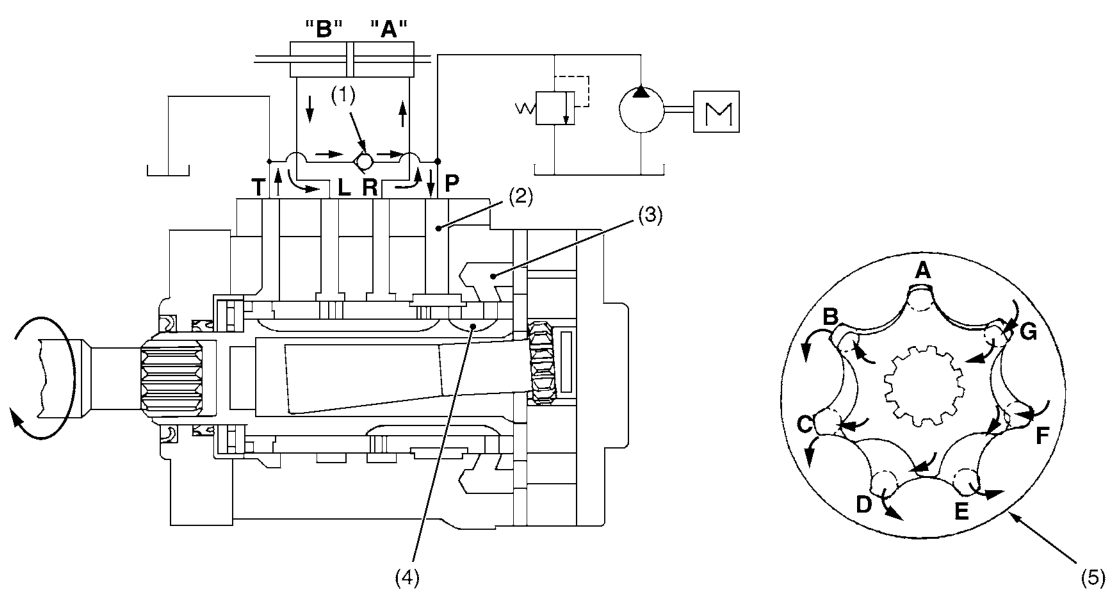
Operation mechanism for left turning is the same as that for right turning, except for directions of oil flow from and to the steering cylinder.

■ Manual Operation



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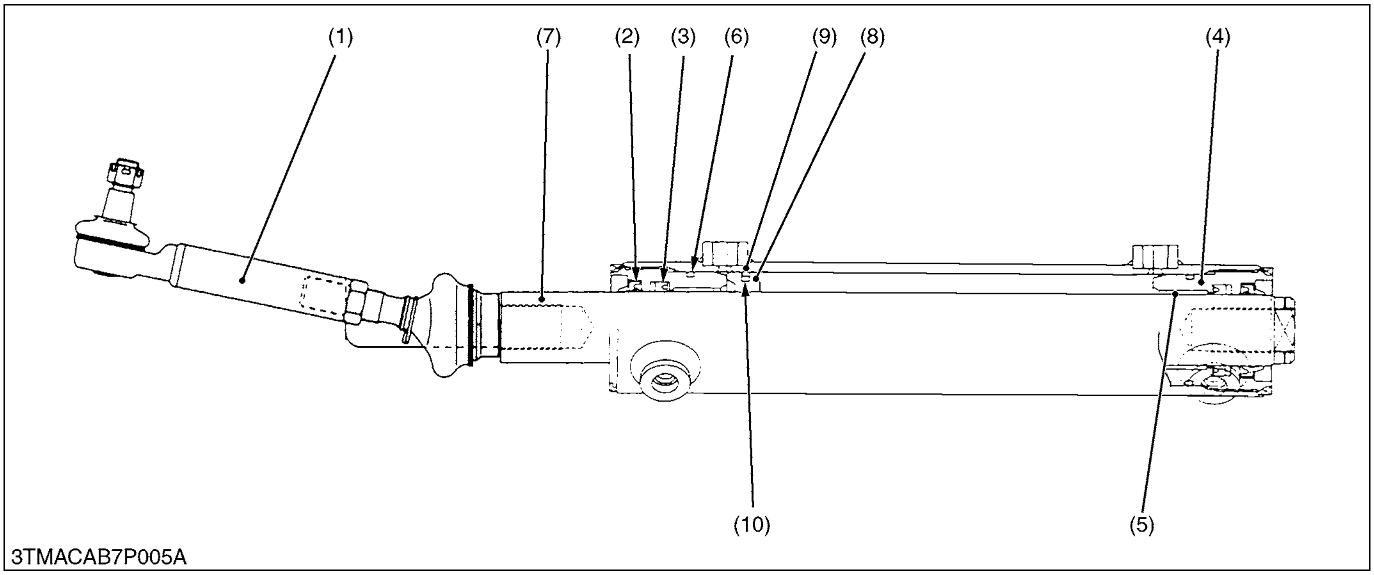
(1) Check Valve
(2) Passage
(3) Passage
(4) Spool Groove
(5) Gerotor

As already described, in the case of manual operation the gerotor functions as a hand-operated trochoid pump. Accordingly, when the rotor in the gerotor is driven by steering force, oil is sucked from the oil tank through the check valve provided in the housing, passage (2), spool groove (4) and passage (3). And oil is pressure-fed to the cylinder, and flows through the same route as in power steering operation. (The illustration shows right turning.)

5. STEERING CYLINDER



(1) Rubber Boots
(2) Scraper Seal
(3) Oil Seal
(4) Guide
(5) Bushing
(6) O-ring
(7) Rod
(8) Piston
(9) Slipper Seal
(10) O-ring

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 body improper assembled • Pipe broken	Reassemble Replace	7-S11, S12, S13 –
Hard Steering	• Oil improper • Hydraulic pump malfunctioning • Relief valve malfunctioning • Control valve (spool and sleeve) malfunctioning • Oil leak due to seal damaged	Change with specified oil Replace Replace Repair or replace Replace	G-11 7-S5, S6 7-S9 7-S11, S12, S13 –
Steering Force Fluctuates	• Control valve malfunctioning • Air sucked in pump due to leaking or missing of oil • Air sucked in pump from suction circuit	Replace Replenish Repair	7-S11, S12, S13 G-11 –
Heavy Steering Especially in the Beginning of Steering	• Control valve malfunctioning	Repair or replace	7-S11, S12, S13
Steering Wheel Turns Spontaneously When Released	• Control valve malfunctioning	Repair or replace	7-S11, S12, S13
Front Wheels Wander to Right and Left	• Control valve malfunctioning • Air sucked in pump due to lack of oil • Air sucked in pump from suction circuit • Insufficient bleeding • Cylinder malfunctioning	Repair or replace Replenish Repair Bleed Repair or replace	7-S11, S12, S13 G-11 – 7-S8 7-S13 to S16
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 • Air sucked in due to lack of oil	Bleed Replenish	7-S8 G-11
Noise	• Air sucked in pump due to lack of oil • Air sucked in pump from suction circuit • Pipe deformed	Replenish Repair Replace	G-11 – –
Oil Temperature Increases Rapidly	• Relief valve malfunctioning	Replace	7-S9
Front Wheels Vibrate	• Mechanical connections or wheel bearings worn	Replace defective parts	–

W1014322

2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition • Engine Speed Approx. 2600 min^{-1} (rpm) • Rated Pressure 17.7 MPa 180 kgf/cm^2 2560 psi • Oil Temperature 45 to 55 °C 113 to 131 °F	Delivery	Above 20.8 L/min. 5.5 U.S.gals./min. 4.6 Imp.gals./min.	17.3 L/min. 4.6 U.S.gals./min. 3.8 Imp.gals./min.
Housing Bore	Depth of Scratch	–	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft	O.D.	–	17.968 mm 0.7074 in.
Bushing	Length	–	18.965 mm 0.74665 in.

W1013874

STEERING CONTROLLER

Relief Valve Setting Pressure Condition • Oil Temperature 50 to 60 °C 122 to 140 °F	At Idling Engine Speed	Above 12.3 MPa 125 kgf/cm^2 1779.1 psi	–
	At Maximum Engine Speed	Below 18.1 MPa 185 kgf/cm^2 2633.1 psi	–

W1013973

STEERING CYLINDER

Steering Cylinder	I.D. [M6800(S)-2WD]	50.000 to 50.062 mm 1.96850 to 1.97094 in.	50.100 mm 1.97244 in.
	[M6800(S)-4WD, M8200, M9000]	55.000 to 55.074 mm 2.16535 to 2.16827 in.	55.100 mm 2.16929 in.
Rod to Bushing	Clearance [M6800(S)-2WD]	0.009 to 0.127 mm 0.00035 to 0.00500 in.	0.135 mm 0.00531 in.
	[M6800(S)-4WD, M8200, M9000]	0.010 to 0.140 mm 0.00039 to 0.00551 in.	0.25 mm 0.00984 in.

W1013973

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 **“6. TIGHTENING TORQUES”** at GENERAL Section.)

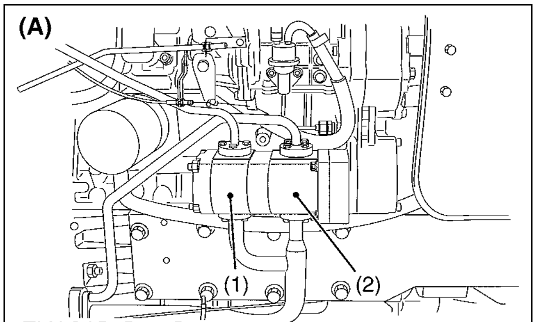
Item	N·m	kgf·m	ft-lbs
Hydraulic pipe mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Hydraulic pump assembly mounting screw and nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Housing cover mounting nut	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Main delivery pipe and return pipe retaining nut	47.1 to 51.0	4.8 to 5.2	34.7 to 37.6
Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Steering controller mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Gerotor assembly mounting screw (5/16’)	25.5 to 28.4	2.6 to 2.9	18.8 to 21.0
Tie-rod end slotted nut [2WD]	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Tie-rod end slotted nut [4WD]	156.9 to 176.5	16.0 to 18.0	115.7 to 130.2
Steering cylinder bracket mounting screw [4WD]	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Steering cylinder mounting nut [2WD]	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Steering cylinder mounting lock nut [2WD]	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Guide assembly	142.2 to 152.0	14.5 to 15.5	104.9 to 112.1
Cylinder cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Cylinder bracket mounting screw	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Tie-rod joint lock nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] POWER STEERING HYDRAULIC PUMP

(1) Checking and Adjusting



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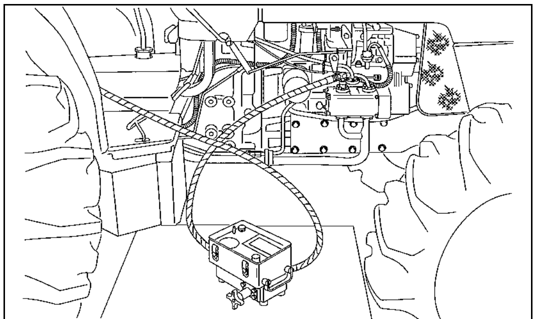
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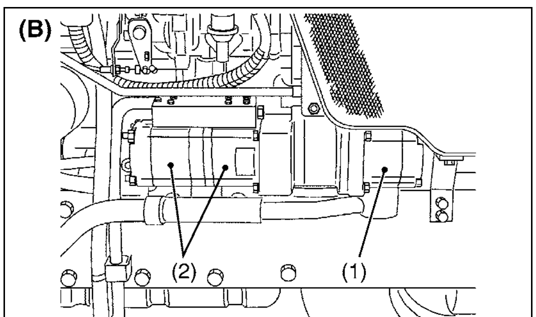

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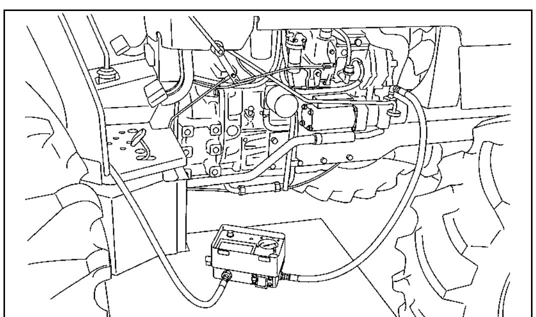
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<u>**Hydraulic Flow Test**</u>

■ **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.**

1. Disconnect the delivery pipe which is connected from hydraulic pump to steering controller.
2. Install the adaptor **53** and **54** to the pump discharge port. [Adaptor **53** and **54** are included in adaptor set (Code No. 07916-54301).]
3. Connect the hydraulic test hose to the adaptor **53** and flowmeter inlet port.
4. Connect the other hydraulic test hose to the flowmeter outlet and put the end of the hose into the transmission oil port.
5. Open the flowmeter loading valve completely. (Turn counterclockwise.)
6. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
7. 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. 50 °C (122 °F).
8. Open the loading valve completely.
9. Set the engine speed. (Refer to condition.)
10. Read and note the pump delivery at no pressure.
11. Slowly close the loading valve to increase rated pressure. (Refer to condition.) As the load is increased, engine speed drops, therefore, reset the engine speed.
12. Read and note the pump delivery at rated pressure.
13. Open the loading valve completely and stop the engine.
14. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition
- Engine speed .... Approx. 2600 min^{-1} (rpm)
- Rated pressure .... 17.7 MPa
  180 kgf/cm^2
  2560 psi
- Oil temperature .... 45 to 55 °C
  113 to 131 °F

Hydraulic pump delivery at no pressure	Factory spec.	21.2 L/min. 5.6 U.S.gals./min. 4.7 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	20.8 L/min. 5.5 U.S.gals./min. 4.6 Imp.gals./min.
	Allowable limit	17.3 L/min. 4.6 U.S.gals./min. 3.8 Imp.gals./min.

(1) Power Steering Pump
(2) Three Point Hydraulic Pump

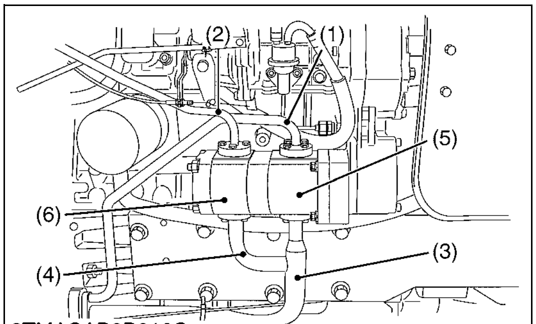
(A) Individual Flow Type
(B) Combined Flow Type

W1011741

(2) Disassembling and Assembling

■ **IMPORTANT**

- **The hydraulic pump is precision machined and assembled : if disassembled once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assembled except when emergency repair is unavoidable.**
- **When repair is required, flow the disassembly and servicing procedures shown below with utmost care.**
- **Be sure to test the hydraulic pump with a flowmeter before disassembling.**
- **After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.**



3TMACAB2P016C

Removing Three Point System Hydraulic Pump and Power Steering Hydraulic Pump [Individual Flow Type]

1. Disconnect the delivery pipe (1), (2) from the hydraulic pump.
2. Disconnect the suction pipe (3), (4) from the hydraulic pump.
3. Remove the hydraulic pump assembly mounting screws and nuts.
4. Take out the hydraulic pump assembly.

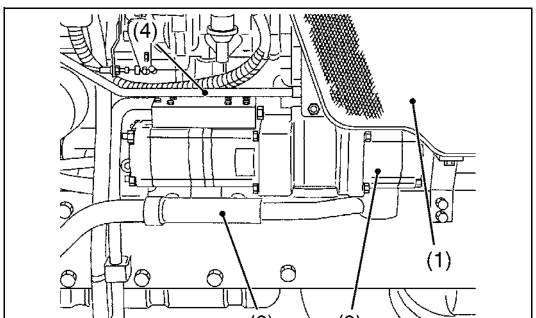
(When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Hydraulic pipe mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Delivery Pipe (Three Point Hydraulic Pump)
(2) Delivery Pipe (Power Steering Pump)
(3) Suction Pipe (Three Point Hydraulic Pump)
(4) Suction Pipe (Power Steering Pump)
(5) Three Point Hydraulic Pump
(6) Power Steering Pump

W1012283



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Removing Power Steering Pump [Combined Flow Type]

1. Remove the side cover (1).
2. Disconnect the suction pipe (3) from the hydraulic pump (2).
3. Disconnect the delivery pipe (4) from the hydraulic pump (2).
4. Remove the hydraulic pump (2) assembly mounting screws.
5. Take out the hydraulic pump (2) assembly.

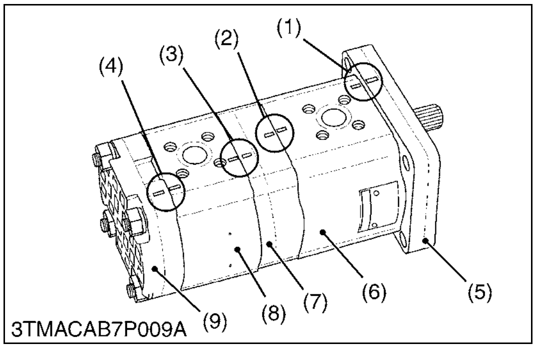
(When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Hydraulic pipe mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Side Cover
(2) Power Steering Pump
(3) Suction Pipe
(4) Delivery Pipe

W1012475



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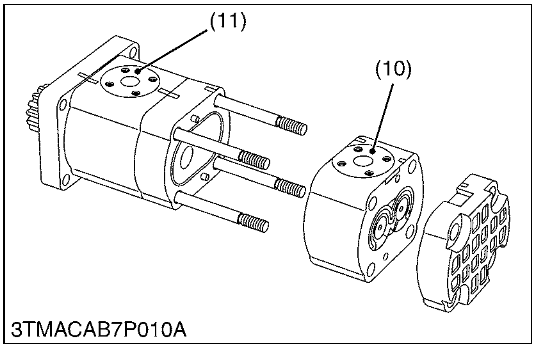


3TMACAB7P010A

Separating Power Steering Hydraulic Pump [Individual Flow Type]

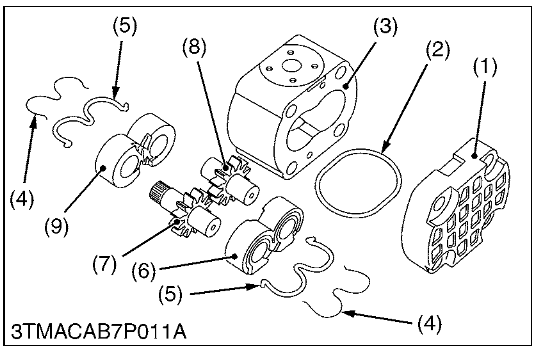
1. Put the parting marks (1), (2), (3), (4) on the flange (5), front housing (6), center plate (7), housing (8) and housing cover (9).
2. Unscrew the housing cover mounting nuts and separate the power steering pump (10) from the three point system hydraulic pump (11).

(When reassembling)

Tightening torque	Housing cover mounting nut	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) Parting Mark
(3) Parting Mark
(4) Parting Mark
(5) Flange
(6) Front Housing (Three Point System Hydraulic Pump)
(7) Center Plate
(8) Housing (Power Steering Pump)
(9) Housing Cover
(10) Power Steering Pump
(11) Three Point System Hydraulic Pump

W1012665



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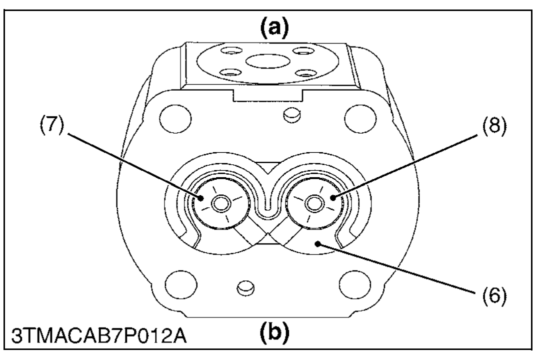


3TMACAB7P012A

Disassembling Power Steering Hydraulic Pump

1. Remove the housing cover (1).
2. Remove the backup elements (4) and seal elements (5).
3. Take out bushings (6), (9) and gears (7), (8).

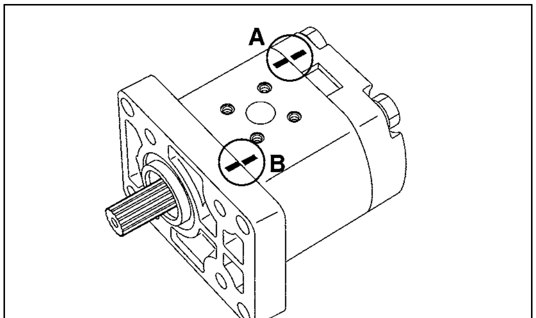
(When reassembling)

- Install the driven gear (8), noting its direction as shown in the figure.
- When installing the bushings (6) and (9), be sure to reassemble them to the each original position.
- 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).

(1) Housing Cover
(2) O-ring
(3) Housing
(4) Backup Element
(5) Seal Element
(6) Bushing
(7) Drive Gear
(8) Driven Gear
(9) Bushing

(a) Inlet
(b) Outlet

W1013065



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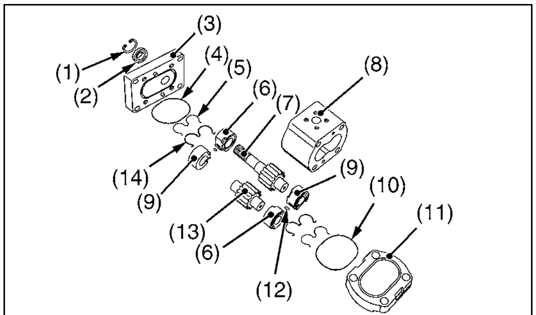

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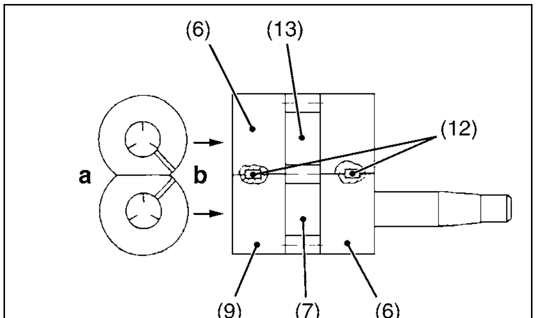


3TMACAB7P015A

Disassembling Power Steering Hydraulic Pump [Combined Flow Type]

1. Put parting mark (**A**), (**B**), on the flange (3), housing (8) and housing cover (11).
2. Remove the housing cover (11) and housing (8).
3. Remove the backup elements (5).
4. Take out the bushings (6), (9) and gears (7), (13).

(When reassembling)

- Install the driven gear (13), noting its direction as shown in the figure.
- When installing the bushings (6) and (9), be sure to reassemble them to the each original position.
- 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).

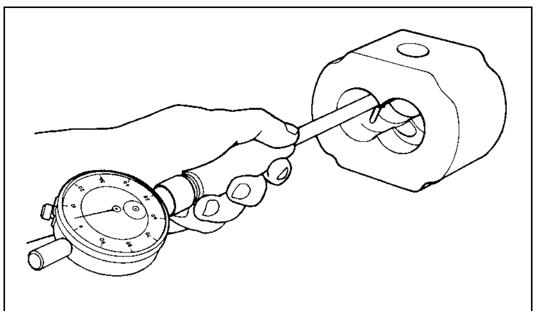
Tightening torque	Housing cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

(1) Internal Snap Ring
(2) Oil Seal
(3) Flange
(4) O-ring
(5) Backup Element
(6) Bushing
(7) Drive Gear
(8) Housing
(9) Bushing
(10) O-ring
(11) Housing Cover
(12) Key
(13) Driven Gear
(14) Seal Element

A : Parting Mark
B : Parting Mark
a : Inlet
b : Outlet

W1013304

(3) Servicing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Housing Bore

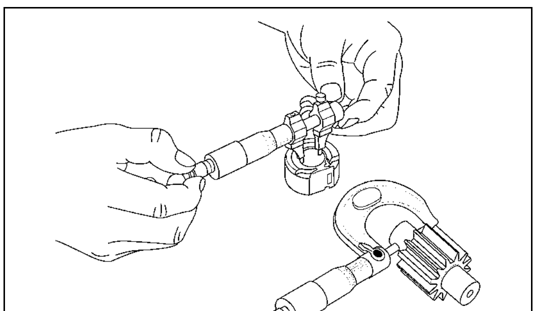
1. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
2. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.

(Reference)

- Use a cylinder gauge to measure the housing I.D..

W1013805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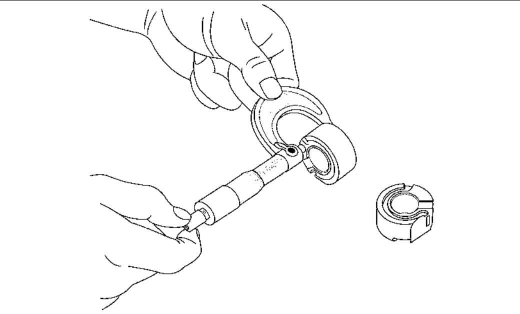
Clearance between Bushing and Gear Shaft

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

Clearance between bushing and gear shaft	Allowable limit	0.15 mm 0.0059 in.

Gear shaft O.D.	Allowable limit	17.968 mm 0.7074 in.

W1013925



3TMACAB7P017A

Bushing Length

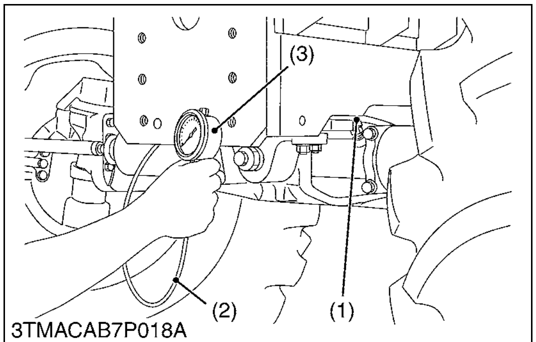
1. Measure the bushing length with an outside micrometer.
2. If the length is less than the allowable limit, replace it.

Bushing length	Allowable limit	18.965 mm 0.74665 in.

W1014047

[2] RELIEF VALVE

(1) Checking and Adjusting



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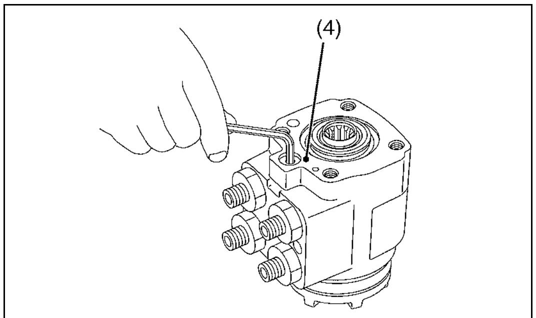


3TMACAB7P019A

Relief Valve Setting Pressure

1. Disconnect the delivery hose 1 (or 2) 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 1779.1 psi
		At maximum engine speed	Below 18.1 MPa 185 kgf/cm^2 2633.1 psi

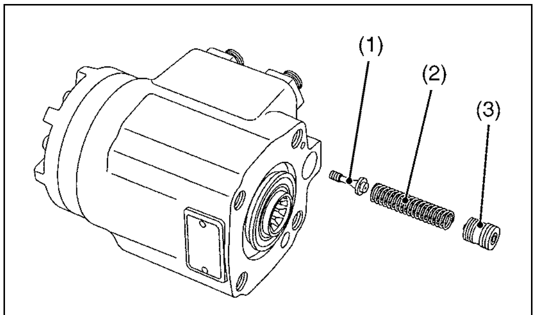
Condition

- 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) Disassembling and Assembling



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Relief Valve Assembly

1. Remove the adjust plug (3) and draw out the spring (2) and poppet (1).

(When reassembling)

- Take care not to damage the O-ring.

■ **IMPORTANT**

- **After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure. (Refer to page 7-S8.)**

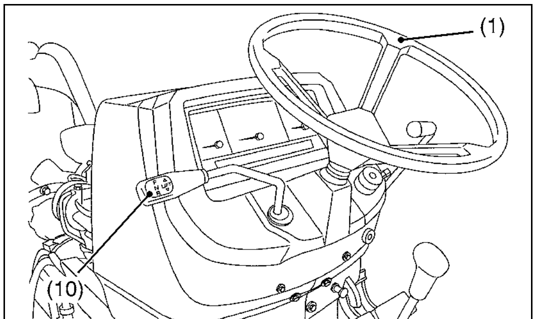
(1) Poppet
(2) Spring
(3) Adjust Plug

W1014644

[3] STEERING CONTROLLER

(1) Disassembling and Assembling

(A) Removing Steering Controller



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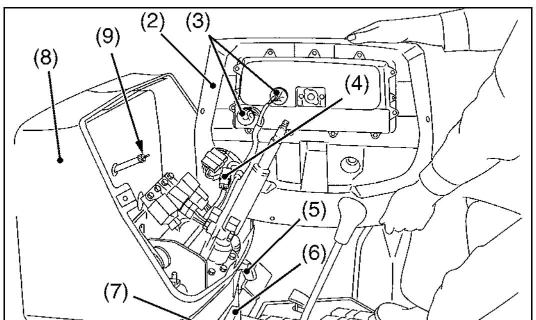

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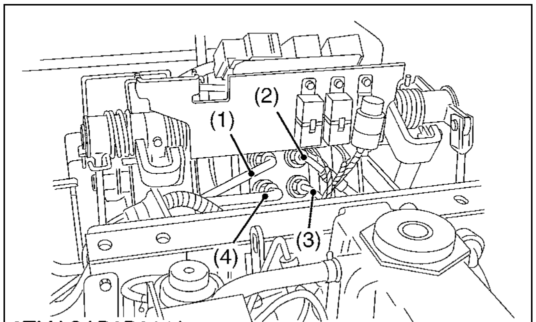
Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1) with a steering wheel puller (Code No. 07916-51090).
2. Remove the shuttle lever grip (10).
3. Remove the meter panel mounting screw and disconnect the meter cable (9).
4. Disconnect the connectors (3).
5. Disconnect the main switch connector (4) and headlight switch connector, hazard and turn signal switch connector.
6. Disconnect the engine stop cable (5) at the engine side.
7. Remove the rear bonnet (8).
8. Remove the fuse box (7) and cover (6).

(1) Steering Wheel
(2) Meter Panel
(3) Connectors
(4) Main Switch Connector
(5) Engine Stop Cable
(6) Cover
(7) Fuse Box
(8) Rear Bonnet
(9) Meter Cable
(10) Shuttle Lever Grip

W1020745



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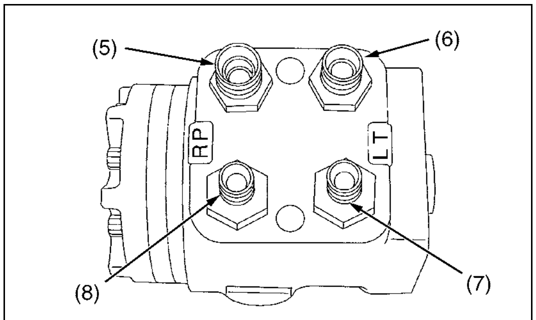


3TMACAB2P015A

Piping for Power Steering

1. Disconnect the turning delivery hoses (2) and (3).
2. Disconnect the main delivery pipe (4).
3. Disconnect the return pipe (1).
4. Remove the steering controller mounting screws.
5. Remove the steering controller.

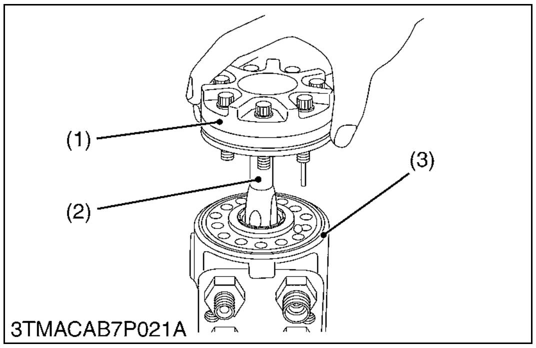
(When reassembling)

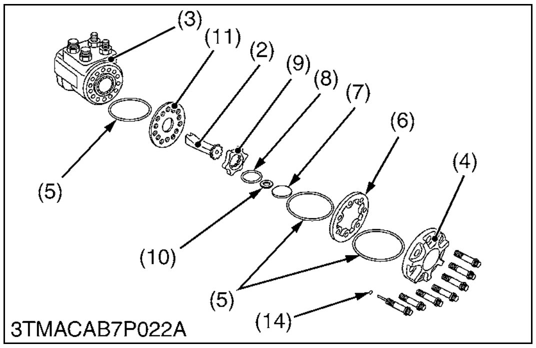
Tightening torque	Main delivery pipe and return pipe retaining nut	47.1 to 51.0 N·m 4.8 to 5.2 kgf·m 34.7 to 37.6 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Steering controller mounting screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

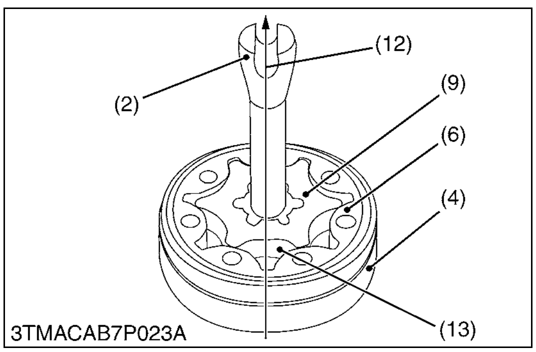
(1) Return Pipe
(2) Left Turning Delivery Pipe
(3) Right Turning Delivery Pipe
(4) Main Delivery Pipe
(5) Pump Port
(6) Return Port
(7) Left Turning Port
(8) Right Turning Port

W1020930

(B) Disassembling 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 drive 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 drive 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 drive 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

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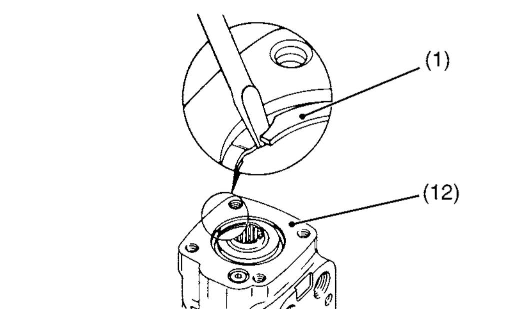

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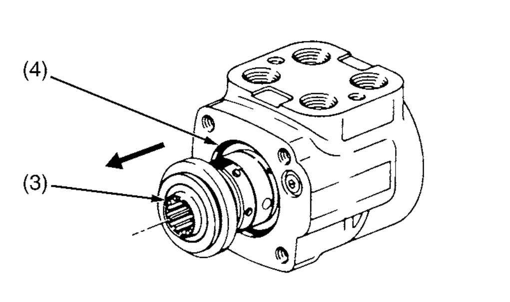

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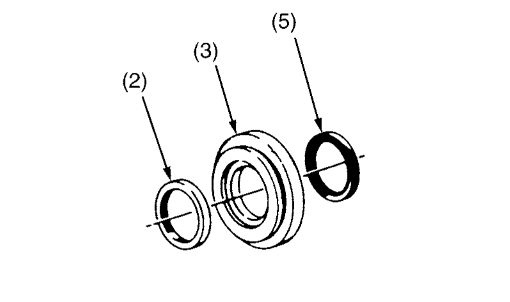

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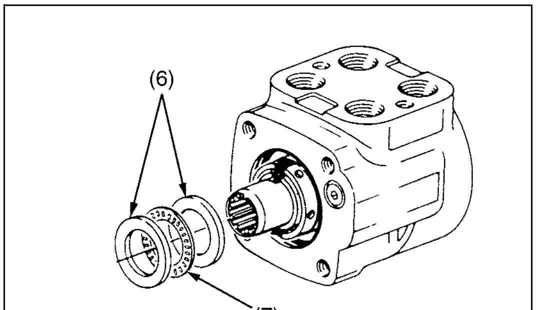

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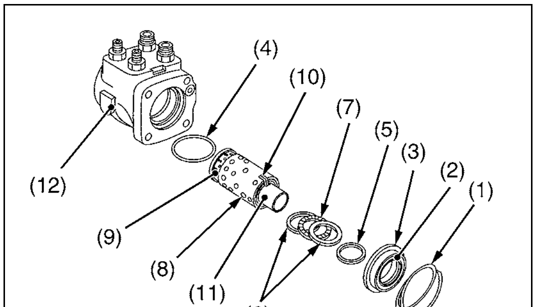

3TMACAB7P028A

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	(7) Needle Bearing
(2) Dust Seal	(8) Pin
(3) Seal Grand Bushing	(9) Sleeve
(4) O-ring	(10) Centering Spring
(5) Quad Ring Seal	(11) Spool
(6) Bearing Race	(12) Housing

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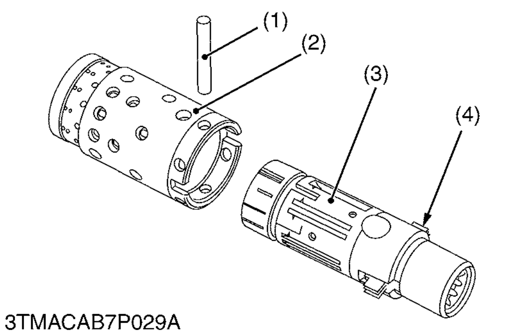


3TMACAB7P029A

Sleeve and Spool

1. Draw out the dowel pin (1).
2. Draw out the spool (3) from the sleeve (2).
3. Push out the centering spring (4).

■ **IMPORTANT**

- **As the clearance between the sleeve (2) and spool (3) is very narrow, draw out the spool by turning it slowly with due care.**

(When reassembling)

- For easier assembly, first insert a couple of centering springs assembled back to back and then fit springs in one after another.
- Align the centering spring notch with the sleeve notch.

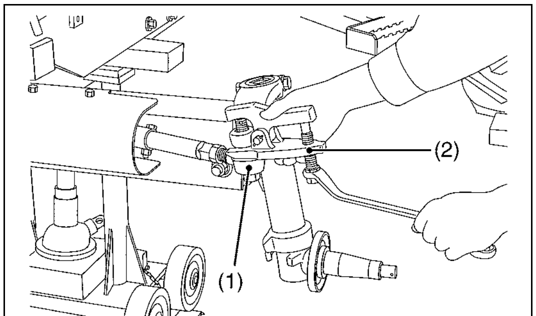
(1) Dowel Pin
(2) Sleeve
(3) Spool
(4) Centering Spring

W1016334

[4] STEERING CYLINDER

(1) Disassembling and Assembling

(A) 2WD Type



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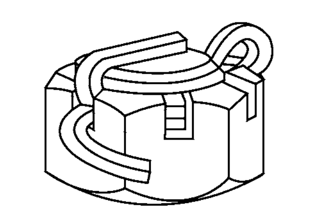

3TMABAB6P017A

Tie-rod

1. Pull out the cotter pin and loosen the tie-rod end slotted 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.

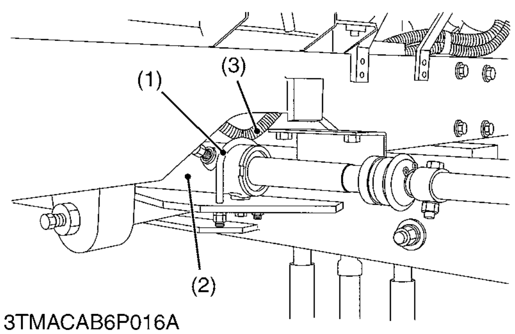
(When reassembling)

- 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
	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

(1) Tie-rod
(2) Tie-rod End Lifter

W1022966



3TMACAB6P016A

Steering Cylinder

1. Remove the cylinder cover.
2. Disconnect the power steering hoses (3).
3. Remove the cylinder clamps (1).
4. Take out the steering cylinder (2).

(When reassembling)

Tightening torque	Steering cylinder mounting nut	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Steering cylinder mounting 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

(1) Cylinder Clamp
(2) Steering Cylinder
(3) Power Steering Hose

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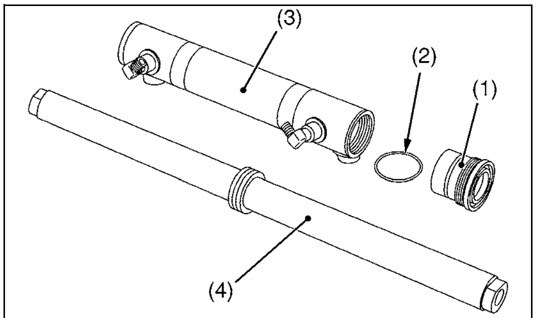


3TMACAB7P030A

Disassembling Steering Cylinder

1. Carefully clamp the cylinder in a vise.
2. Remove the guide assembly (1) and draw out the piston rod (4).

(When reassembling)

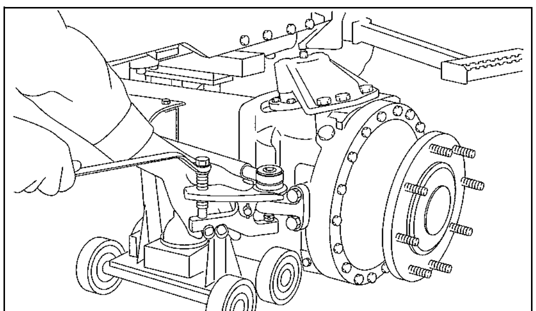
- Apply transmission fluid to the oil seal and O-ring.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) on the screw of guide when tighten it.
- After tightening the guide assembly to the specified torque, stake the cylinder firmly.

Tightening torque	Guide assembly	142.2 to 152.0 N·m 14.5 to 15.5 kgf·m 104.9 to 112.1 ft-lbs

(1) Guide Assembly
(2) O-ring
(3) Cylinder
(4) Piston Rod

W1016971

(B) 4WD Type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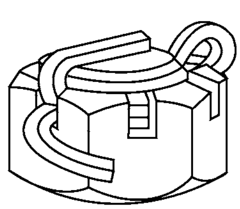
3TMABAB6P017A

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
	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

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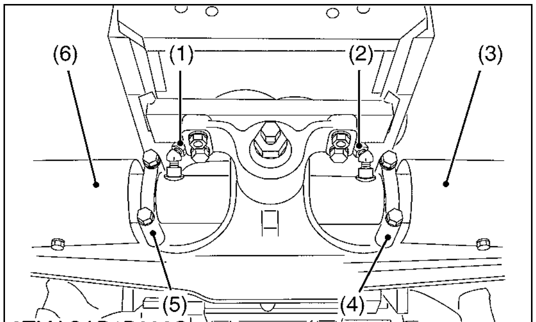


3TMACAB1P006C

Power Steering Hoses and Cylinder

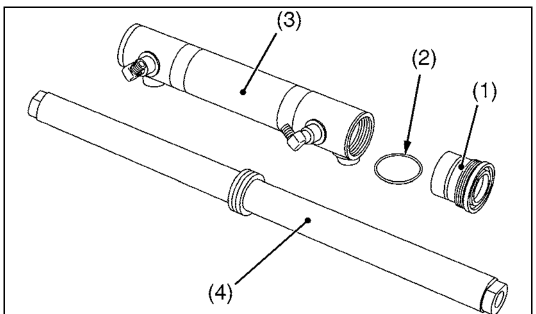
1. Remove the cylinder cover (3), (6).
2. Disconnect the power steering hoses (1), (2).
3. Remove the cylinder bracket (4), (5).
4. Take out the cylinder.

(When reassembling)

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 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
	Cylinder bracket mounting screw	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

(1) Power Steering Hose
(2) Power Steering Hose
(3) Cylinder Cover
(4) Cylinder Bracket
(5) Cylinder Bracket
(6) Cylinder Cover

W1017289



3TMACAB7P030A

Disassembling Steering Cylinder

1. Carefully clamp the cylinder in a vise.
2. Remove the guide assembly (1) and draw out the piston rod (4).

(When reassembling)

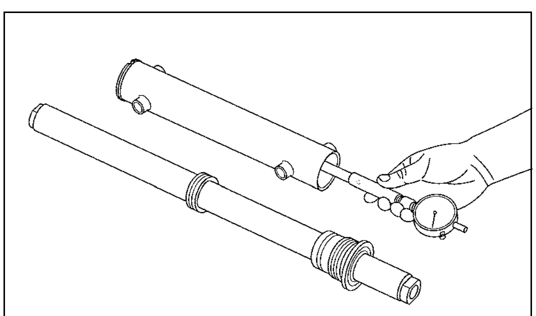
- Apply transmission fluid to the oil seal and O-ring.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) on the screw of guide when tighten it.
- After tightening the guide assembly to the specified torque, stake the cylinder firmly.

Tightening torque	Guide assembly	142.2 to 152.0 N·m 14.5 to 15.5 kgf·m 104.9 to 112.1 ft-lbs

(1) Guide Assembly
(2) O-ring
(3) Cylinder
(4) Piston Rod

W1017601

(2) 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. exceed the allowable limit, replace the cylinder barrel.

Steering cylinder I.D.	Factory spec.	M6800 (S) 2WD	50.000 to 50.062 mm 1.96850 to 1.97094 in.
		M6800 (S)4WD M8200 M9000	55.000 to 55.074 mm 2.16535 to 2.16827 in.
	Allowable limit	M6800 (S) 2WD	50.100 mm 1.97244 in.
		M6800 (S)4WD M8200 M9000	55.100 mm 2.16929 in.

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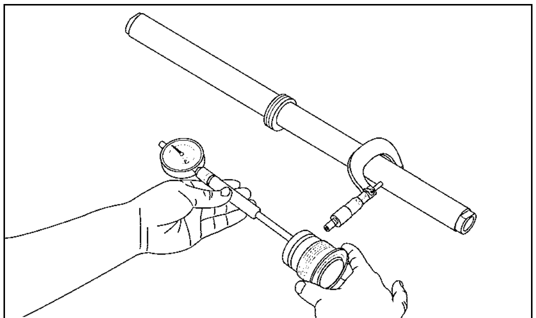

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Clearance between Rod and Bushing

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	Factory spec.	M6800 (S) 2WD	0.009 to 0.127 mm 0.00035 to 0.00500 in.
		M6800 (S)4WD M8200 M9000	0.010 to 0.140 mm 0.00039 to 0.00551 in.
	Allowable limit	M6800 (S) 2WD	0.135 mm 0.00531 in.
		M6800 (S)4WD M8200 M9000	0.250 mm 0.00984 in.

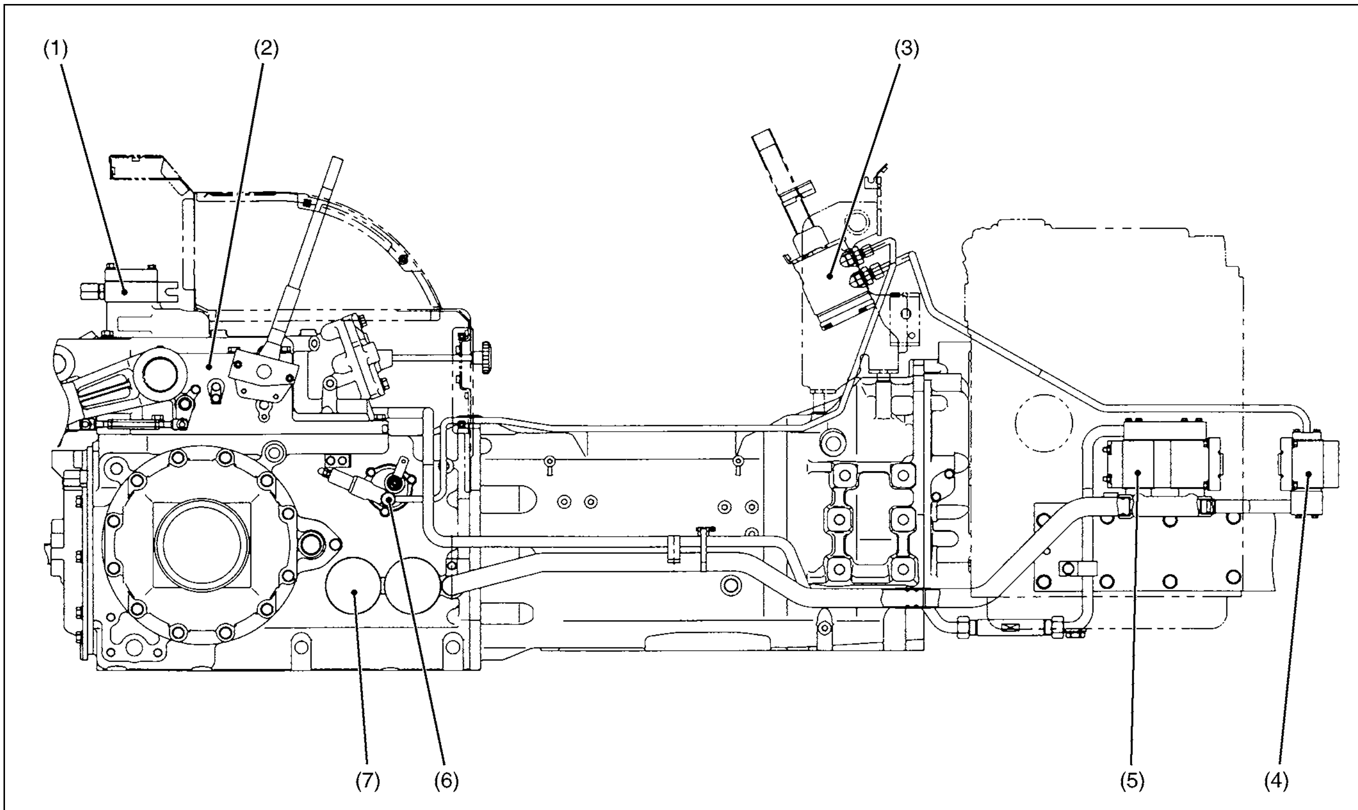
W1017904

8 HYDRAULIC SYSTEM

MECHANISM

CONTENTS

1. THREE POINT HYDRAULIC SYSTEM



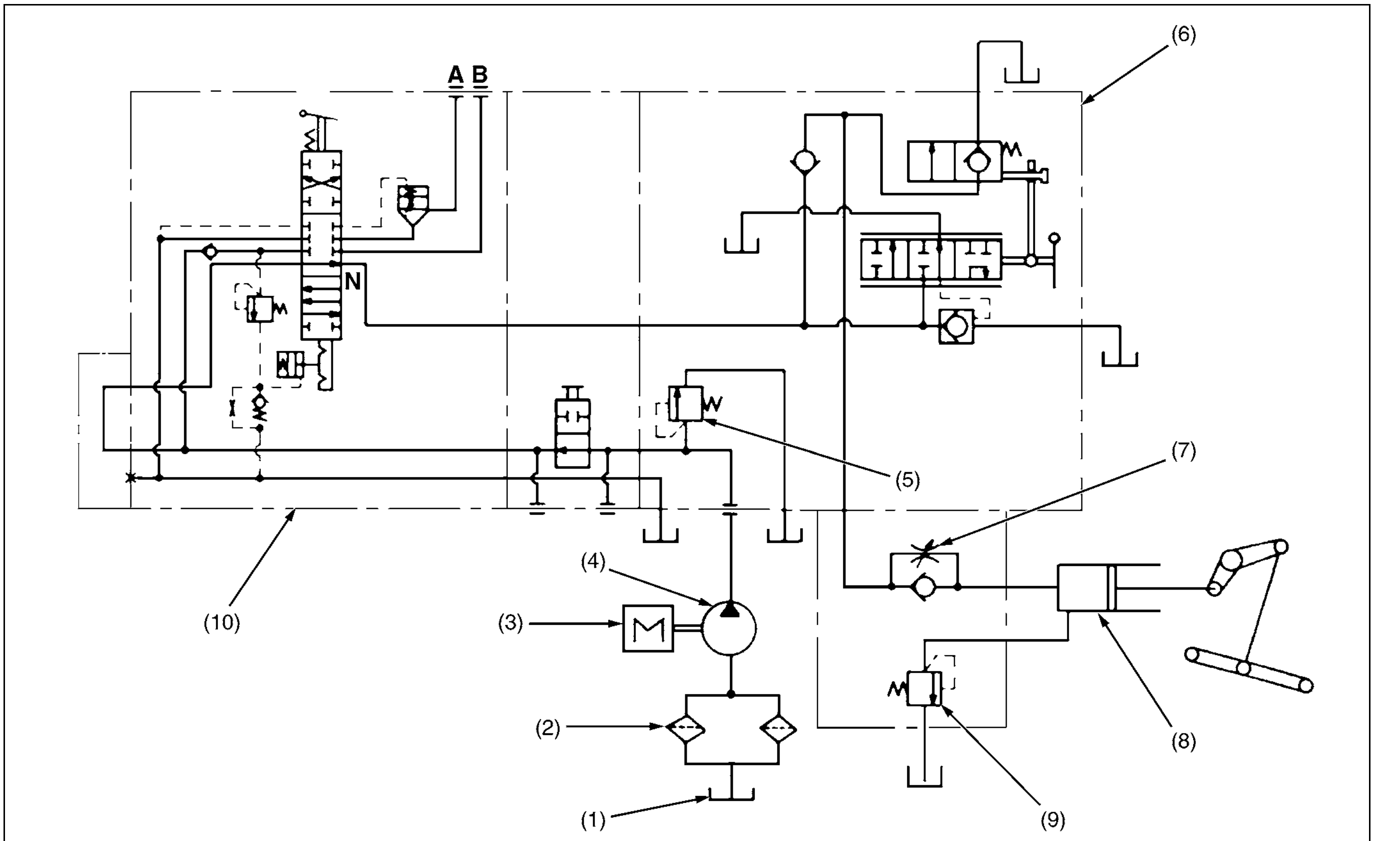
(1) Auxiliary Control Valve
(2) Hydraulic Cylinder Body
(3) Power Steering Controller
(4) Hydraulic Pump for Power Steering
(5) Hydraulic Pump for Three Point Hydraulic System
(6) PTO Control Valve
(7) Oil Filter Cartridge

The hydraulic system of these tractors are composed of the main components as shown in the figure.

- To raise and lower the implement connected to the three point hitch. For this motion, the position control valve and the linkage installed on the hydraulic cylinder body provide three different applications : position control, draft control and mix control.
- Take out hydraulic power from the hydraulic cylinder body to operate an implement's hydraulic actuator.
- Take out hydraulic power from the quick couplers for the implements with either single acting or double acting actuators. In this case, the implement's cylinders can be actuated by operating the auxiliary control valves.

2. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM

[M6800(S)]

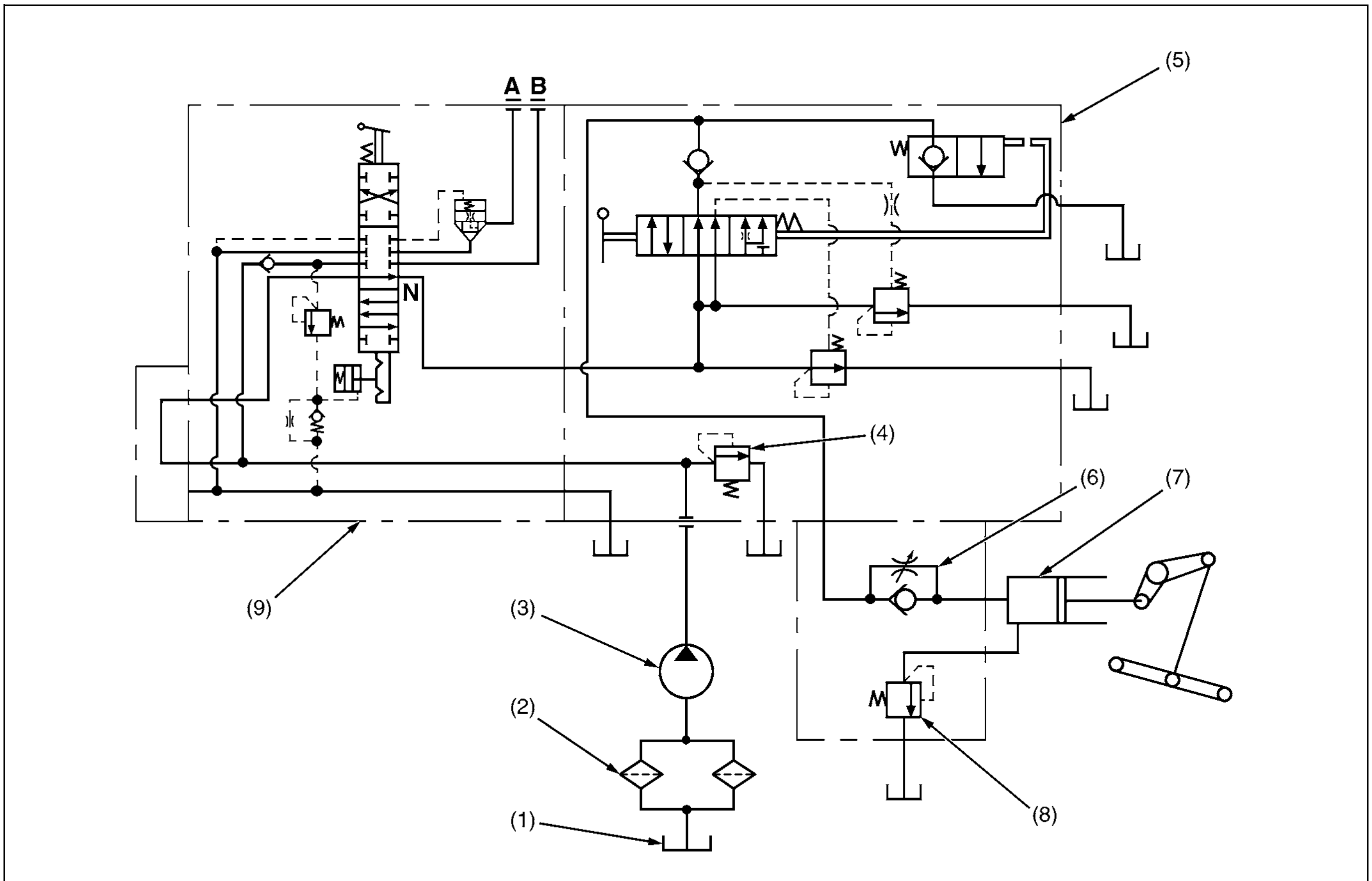


3TMACAB8P002A

(1) Oil Tank (Transmission Case)
(2) Hydraulic Oil Filter Cartridge
(3) Engine
(4) Hydraulic Pump
(5) Relief Valve
(6) Control Valve
(7) Lowering Speed Adjusting Valve
(8) Hydraulic Cylinder
(9) Cylinder Safety Valve
(10) Auxiliary Control Valve
A : To Implement Cylinder
B : To Implement Cylinder
N : N Port

1. When the engine is started, the hydraulic pump (4) is rotated to suck oil from transmission case (1) through the suction pipe.
   Supplied oil is filtered by the hydraulic oil filter cartridge (2).
2. Filtered oil is forced out by the hydraulic pump to the auxiliary control valve (10) through the delivery pipe.
3. With the auxiliary control valve (10) in neutral position, oil is channelled from **“N”** port to the control valve (6).
4. The hydraulic system has a relief valve (5) which restricts the maximum pressure in the circuit.
   The hydraulic cylinder (8) has a cylinder safety valve (9) to relieve shock pressure due to heavy implement bounce.
5. The control valve is actuated by the mechanical linkage for **“Position control”** or **“Draft control”** or both (**“Mix control”**).
6. These tractors have one single / double acting auxiliary control valve as standard equipment.

[M8200 · M9000]

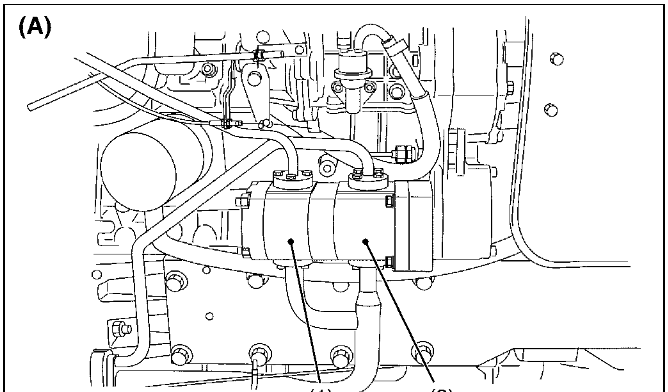


(1) Oil Tank (Transmission Case)
(2) Hydraulic Oil Filter Cartridge
(3) Hydraulic Pump
(4) Relief Valve
(5) Control Valve
(6) Lowering Speed Adjusting Valve
(7) Hydraulic Cylinder
(8) Cylinder Safety Valve
(9) Auxiliary Control Valve

A : To Implement Cylinder
B : To Implement Cylinder
N : N Port

1. When the engine is started, the hydraulic pump (3) is rotated to suck oil from transmission case (1) through the suction pipe.
   Supplied oil is filtered by the hydraulic oil filter cartridge (2).
2. Filtered oil is forced out by the hydraulic pump to the auxiliary control valve (9) through the delivery pipe.
3. With the auxiliary control valve (9) in neutral position, oil is channelled from **"N"** port to the control valve (5).
4. The hydraulic system has a relief valve (4) which restricts the maximum pressure in the circuit.
   The hydraulic cylinder (7) has a cylinder safety valve (8) to relieve shock pressure due to heavy implement bounce.
5. The control valve is actuated by the mechanical linkage for **"Position control"** or **"Draft control"** or both **"Mix control"** (combining position control with draft control).
6. These tractors have one single / double acting auxiliary control valve as standard equipment.

3. HYDRAULIC PUMP



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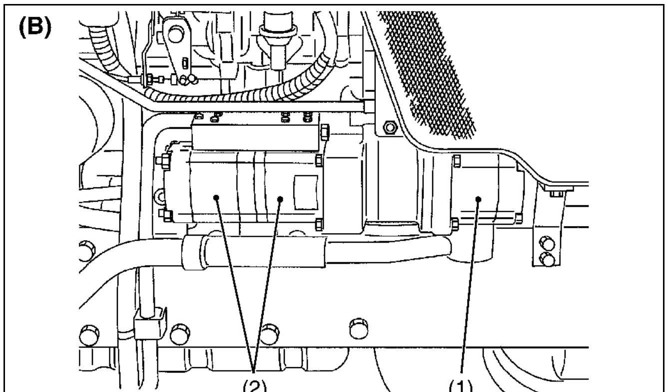

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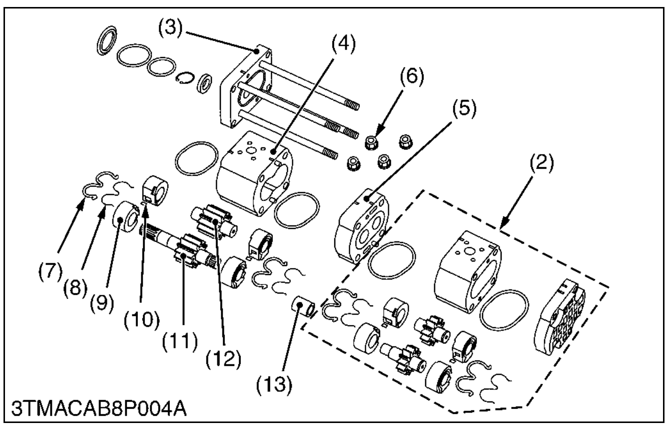

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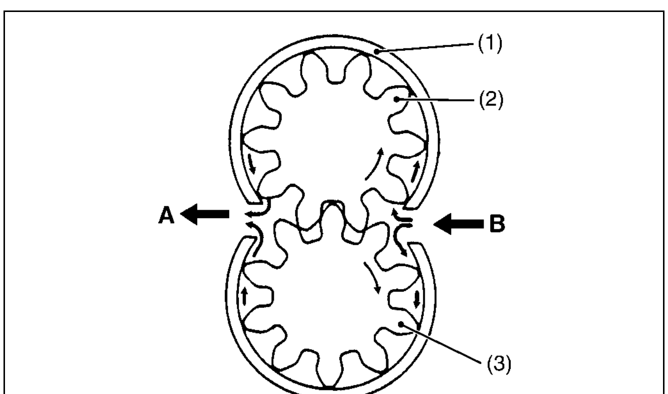
The three point system hydraulic pump pressure feds the oil drawn from the transmission case through the oil filter to the control valve.

The three point system hydraulic pump is driven by the idle gear 2.

(1) Three Point System Hydraulic Pump
(2) Power Steering Pump
(3) Flange
(4) Front Housing
(5) Center Plate
(6) Nut
(7) Seal Element
(8) Backup Element
(9) Bushing
(10) Key
(11) Drive Gear
(12) Driven Gear
(13) Coupling

(A) Individual Flow Type
(B) Combined Flow Type

W1013181



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■ Operation of Hydraulic Pump

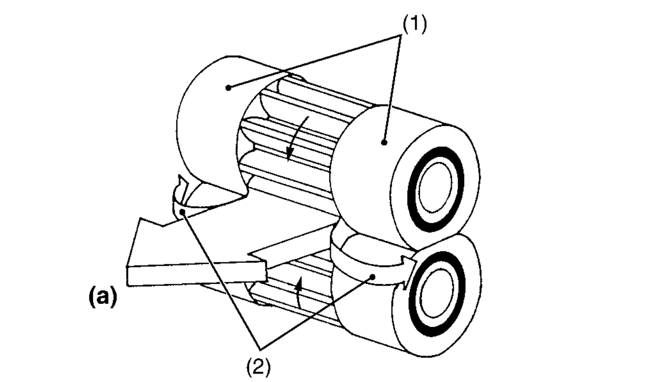
The hydraulic pump has two meshing gears (2), (3) whose teeth run close to the casing (1). One gear is a drive gear (2) which drives the driven gear (3).

When the drive gear is driven in the direction of the arrow by the crankshaft, the gears trap oil between the gear teeth and the casing. The trapped oil is carried around to the outlet. The higher the engine speed, the more the pump discharge.

(1) Casing
(2) Drive Gear
(3) Driven Gear

A : Outlet
B : Inlet

W1020519



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■ Pressure Loading System

The pressure loading system automatically decreases the clearance between the gear and the bushing (1). A small amount of pressure oil is fed behind the bushings, pressing them against the gears and forming a tighter seal against leakage.

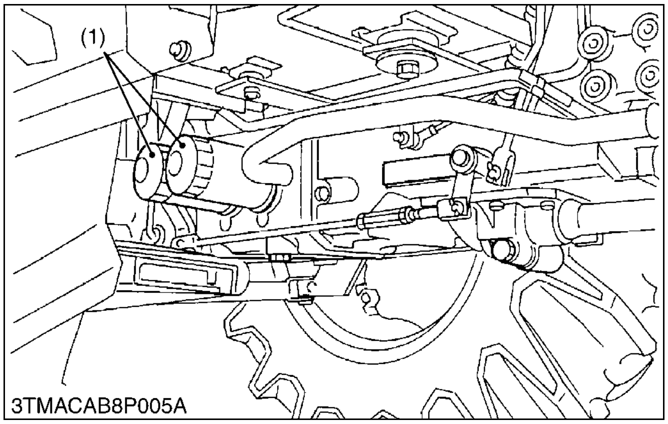
Therefore, leakage from the delivery side (high pressure) to the inlet side (low pressure) does not increase even if pressure on the delivery side increases.

(1) Bushing
(2) Loading Pressure

(a) Outlet

W1013442

4. OIL FILTER



Two oil filter are located in parallel at the pump suction line. A permanent magnet, servicing as a magnet filter, is inserted in the paper type element of each cartridge, which ensures a filtration degree of β60 or BETA60 = 2.5 (MIN)*

* This is authorized by ISO / 4572 Filter Element Multi Pass Test.

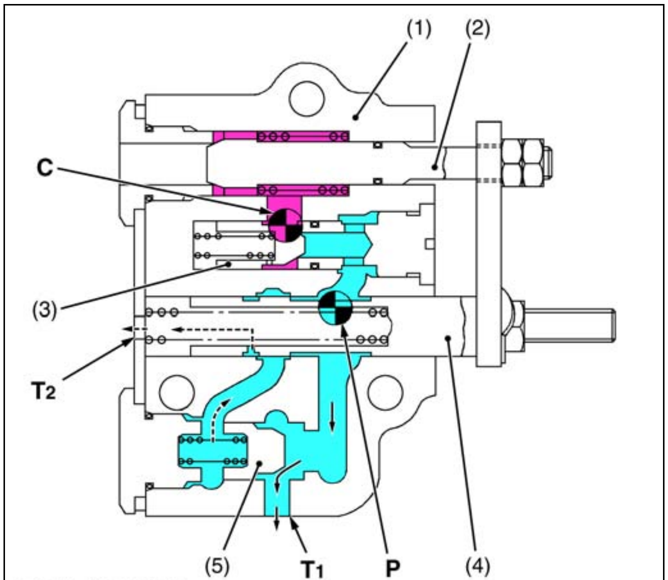
βa = (The number of particles which are more than μm diameter before passage filter) / (The number of the same size of particles after passing filter)

(1) Hydraulic Oil Filter Cartridge

W1013541

5. POSITION CONTROL VALVE

[1] M6800(S)



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■ Neutral

Oil forced into the control valve through the **P** port pushes open the unload valve (5) and then returns to the transmission case through the **T1** port.

Oil behind the unload valve (5) returns to the transmission case through the spool (4) and the **T2** port.

Since the check valve (3) and poppet valve (2) are closed, oil in the hydraulic cylinder does not flow to the transmission case. Thus, the implement remains at its fixed position.

(1) Valve Body
(2) Poppet Valve
(3) Check Valve
(4) Spool
(5) Unload Valve

C : C (Cylinder) Port
P : P (Pump) Port
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (To Transmission Case)

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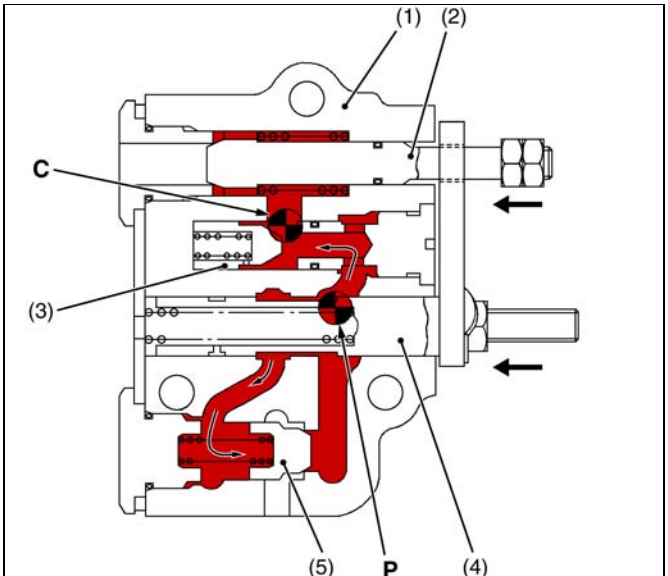

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■ Lift

When the control lever is set to the **"LIFT"** position, the spool (4) is pushed to the left.

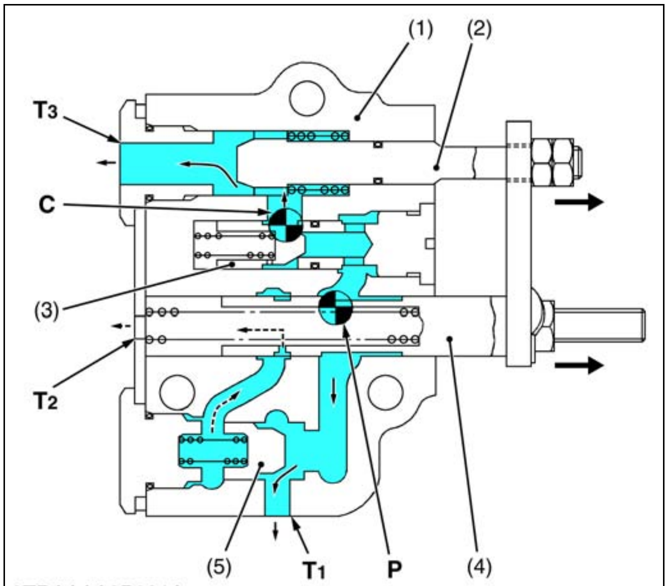
The oil forced into the control valve through the **P** port is directed to the back of the unload valve (5) to close it.

The oil pushes open the check valve (3), and flows into the hydraulic cylinder through the **C** port to lift the implement.

(1) Valve Body
(2) Poppet Valve
(3) Check Valve
(4) Spool
(5) Unload Valve

C : C (Cylinder) Port
P : P (Pump) Port

W1013790



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■ **Down**

When the control lever is moved to the **"DOWN"** position, the spool (4) is pulled out to the right, and the poppet valve (2) is also pulled out.

Oil in the hydraulic cylinder is forced out to the transmission case through the **T_3** port by the weight of the implement, causing the implement to lower.

Oil forced into the control valve through the **P** port pushes open the unload valve (5) as in neutral and returns to the transmission case through the **T_1** port.

(1) Valve Body	**C : C (Cylinder) Port**
(2) Poppet Valve	**P : P (Pump) Port**
(3) Check Valve	**T_1 : T_1 Port (To Transmission Case)**
(4) Spool	**T_2 : T_2 Port (To Transmission Case)**
(5) Unload Valve	**T_3 : T_3 Port (To Transmission Case)**

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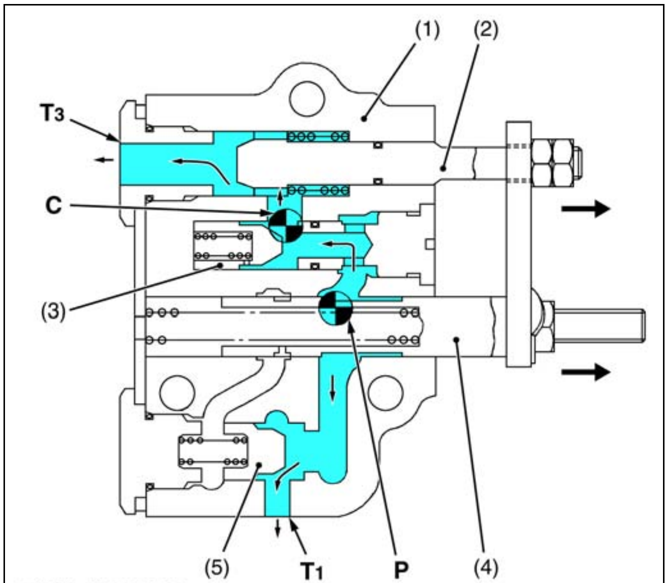

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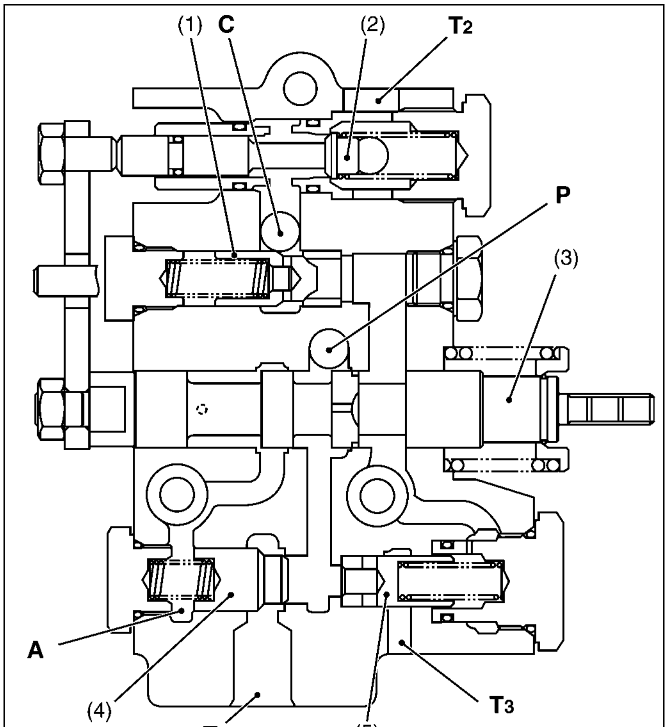
■ **Floating**

When the position control lever is moved to its lowest position, the spool (4) is maintained at the **"DOWN"** position. When the implement is at its lowest position, the hydraulic cylinder is in no-load condition, and oil forced out by the hydraulic pump pushes open both the unload valve (5) and check valve (3). Thus, oil flows freely in the valves.

(1) Valve Body	**C : C (Cylinder) Port**
(2) Poppet Valve	**P : P (Pump) Port**
(3) Check Valve	**T_1 : T_1 Port (To Transmission Case)**
(4) Spool	**T_2 : T_2 Port (To Transmission Case)**
(5) Unload Valve	**T_3 : T_3 Port (To Transmission Case)**

W1014097

[2] M8200 · M9000



3TMACAB8P006A

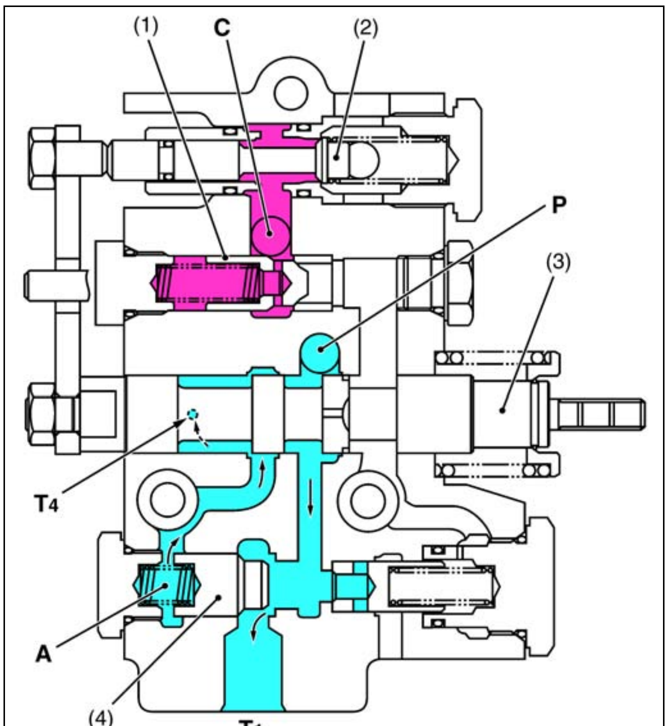
The control valve is composed as shown figure left.

The spool (3) is moved by the operating the position control lever. The positions of the spool movement makes four kinds of circuit such as **"Neutral"**, **"Lifting"**, **"Lowering"** and **"Floating"**.

Feature of this control valve is smooth operation by built-in shockless mechanism.

(1) Poppet 1	**P : Pump Port**
(2) Poppet 3	**C : Cylinder Port**
(3) Spool	**T_1 : Tank Port 1**
(4) Unload Poppet 1	**T_2 : Tank Port 2**
(5) Unload Poppet 2	**T_3 : Tank Port 3**
	A : Chamber A

W1014330



3TRAAAA8P038A

■ Neutral

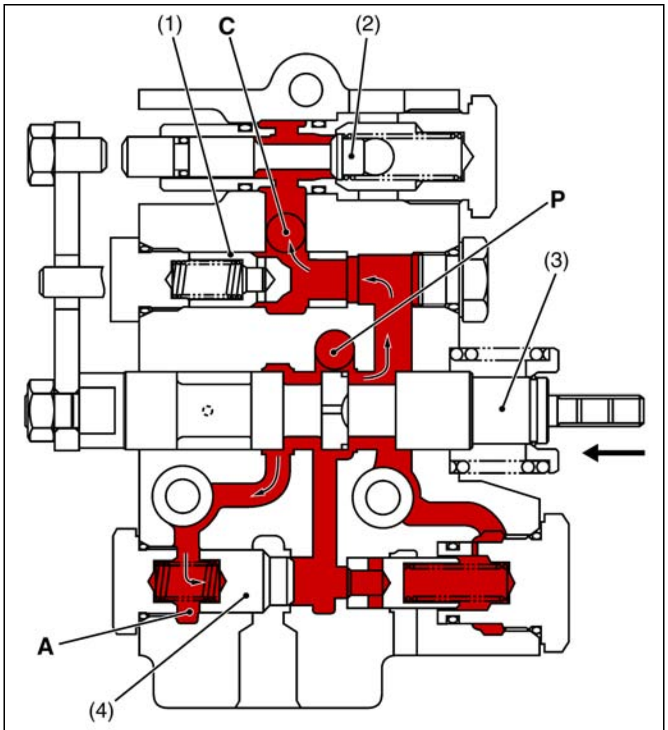
Pressurize oil flows at the **P** port, pushes open unload poppet 1 (4) and returns to tank from **T_1** port.

The oil in the chamber **A** behind the unload poppet 1 (4) returns to the tank through the clearance between spool (3) and **T_4** port at the valve body. The oil in the hydraulic cylinder does not flow out because the circuit is cut off by the actions of poppet 1 (1), poppet 3 (2).

This allows the implement to be kept at a steady height.

(1) Poppet 1	**P : Pump Port**
(2) Poppet 3	**C : Cylinder Port**
(3) Spool	**T_1 : Tank Port 1**
(4) Unload Poppet 1	**T_4 : Tank Port 4**
	A : Chamber A

W1014478



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■ **Lift**

When the control lever is moved to **"UP"**, spool (3) is pushed by the spool operating lever, forming a circuit with the **P** port and chamber **A**.

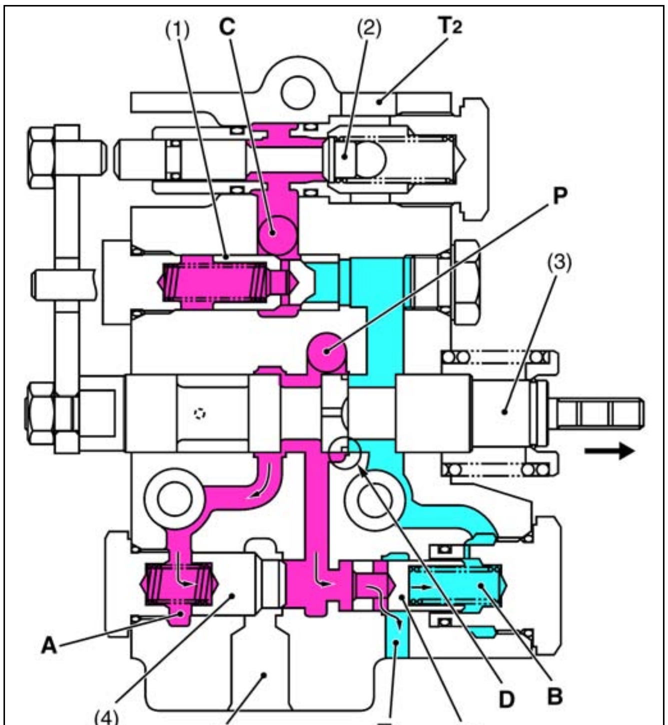
The pressurized oil thus flows into the chamber **A** and closes unload poppet 1 (4).

The pressure in the circuit slowly rises, pushing open poppet 1 (1), and the hydraulic oil flows into the hydraulic cylinder from the **C** port, lifting the implement.

(1) Poppet 1
(2) Poppet 3
(3) Spool
(4) Unload Poppet 1

P : Pump Port
C : Cylinder Port
A : Chamber A

W1014620



3TRAAAA8P040A

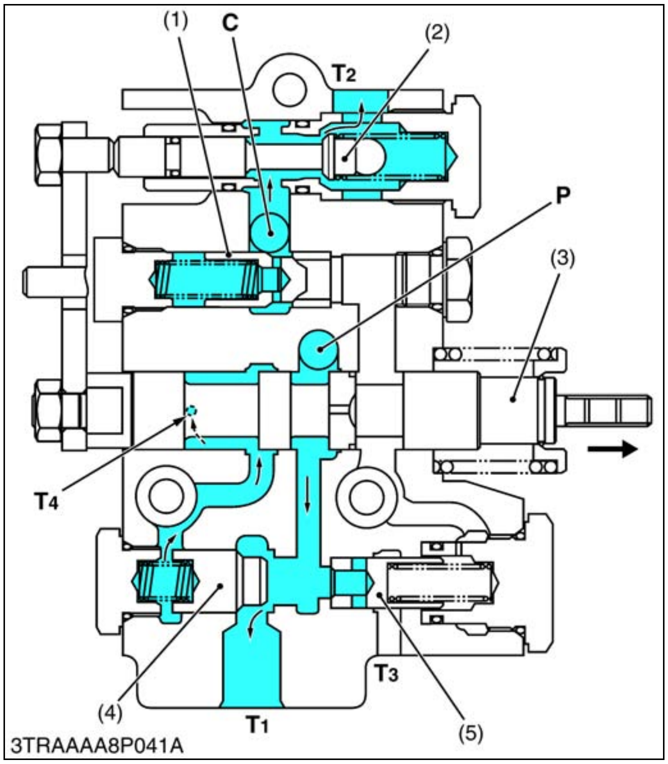
■ **Lift to Neutral (Acting the Shockless Mechanism)**

In returning from **Lifting** to **Neutral**, the spool (3) is pulled back to the arrow-mark direction. When the **Neutral** position comes near, the tapered part **D** of the spool (3) makes the pressure difference at the **P** port and **C** port. Therefore, the poppet 1 (1) gradually closes, and absorbs any shock at lifting stop. In that case, since oil is remained in the chamber **A** of the unload poppet 1 (4), the unload poppet 1 (4) does not open. However, the unload poppet 2 (5) opens because of low pressure in chamber **B**, and then the oil from the pump returns to the transmission case through **T3** port.

(1) Poppet 1
(2) Poppet 3
(3) Spool
(4) Unload Poppet 1
(5) Unload Poppet 2

P : Pump Port
A : Chamber A
B : Chamber B
C : Cylinder Port
D : Tapered Part
T1 : Tank Port 1
T2 : Tank Port 2
T3 : Tank Port 3

W1014845



■ **Down**

When the control lever is moved to **Down**, spool (3) moves to arrow-mark direction, and push the poppet 3 (2). It forms a circuit with the **C** port and **T2** port.

The oil in the hydraulic cylinder is forced out by the weight of the implement, and returns to the tank through the **C** port and **T2** port, lowering the implement. The pressurized oil pushes open unload poppet 1 (4) and returns to the tank from **T1** port.

■ **Floating**

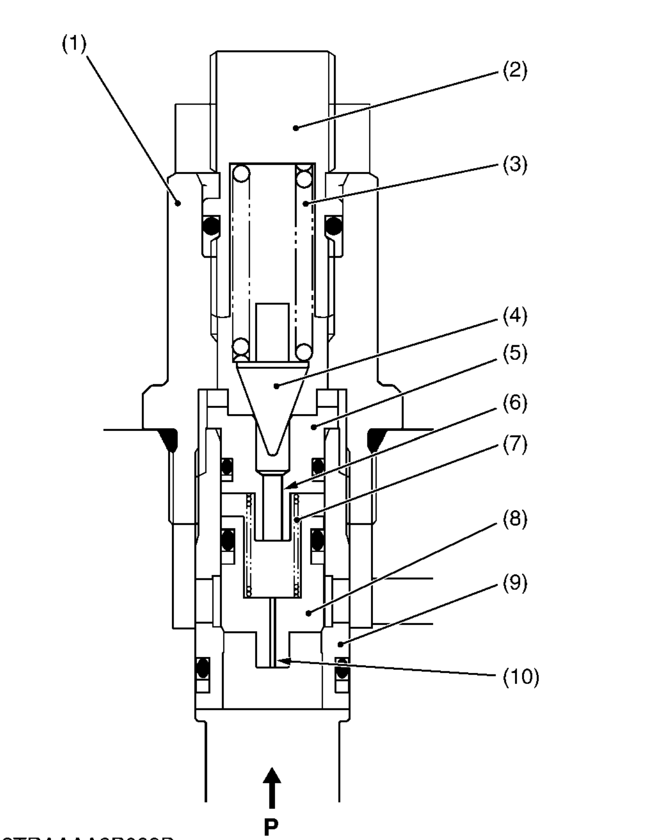
When the control lever is lowest position, spool (3) and poppet 3 (2) keeps same as lowering position. The hydraulic cylinder is unloading condition. Therefore pressurized oil pushes open unload poppet 1 (4), poppet 1 (1) and returns to transmission case.

(1) Poppet 1
(2) Poppet 3
(3) Spool
(4) Unload Poppet 1
(5) Unload Poppet 2

P : Pump Port
C : Cylinder Port
T1 : Tank Port 1
T2 : Tank Port 2
T3 : Tank Port 3
T4 : Tank Port 4

W1015085

6. RELIEF VALVE



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■ Relief Valve

M6800(S), M8200 and M9000 use a pilot-operated relief valve. This relief valve is suitable for a high pressure and large volumetric flow, and has better pressure override performance than direct acting relief valves.

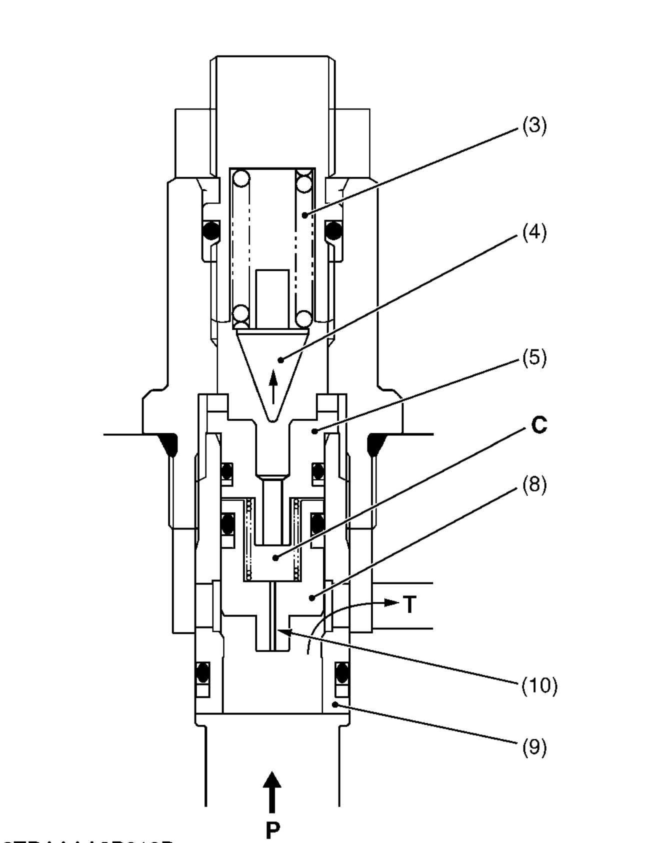
This relief valve consists of a pilot valve (4) and main valve (8). The pilot valve (4) is a trigger which controls the main valve (8).

When the oil pressure in the circuit is lower than the setting pressure, the pilot valve (4) and main valve (8) are closed by the spring (3) and (7).

(1) Relief Valve Body
(2) Adjuster
(3) Spring
(4) Pilot Valve
(5) Valve Seat
(6) Sensing Passage
(7) Spring
(8) Main Valve
(9) Valve Seat
(10) Passage

P : P Port

W1015305



3TRAAAA8P010B

■ Relief Valve in Operation

As the oil pressure in the circuit rises, so does the pressure in the chamber **"C"**. When it reaches the pilot valve setting pressure, the pilot valve (4) opens. This releases oil in the chamber **"C"** to the transmission case. Accordingly the oil in the circuit flows to the chamber **"C"** through the passage (10).

The resulting pressure drop in the chamber **"C"** causes the main valve (8) open. The oil in the circuit then flows out to the transmission case, preventing any further rise in pressure. The relief valve close again when the oil pressure in the circuit drops below the setting pressure.

(Reference)

- Relief valve setting pressure

Use for Individual Flow Type Pump	Use for Combine Flow Type Pump
18.6 to 19.1 MPa 190 to 195 kgf/cm^2 2702 to 2773 psi	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi

Condition

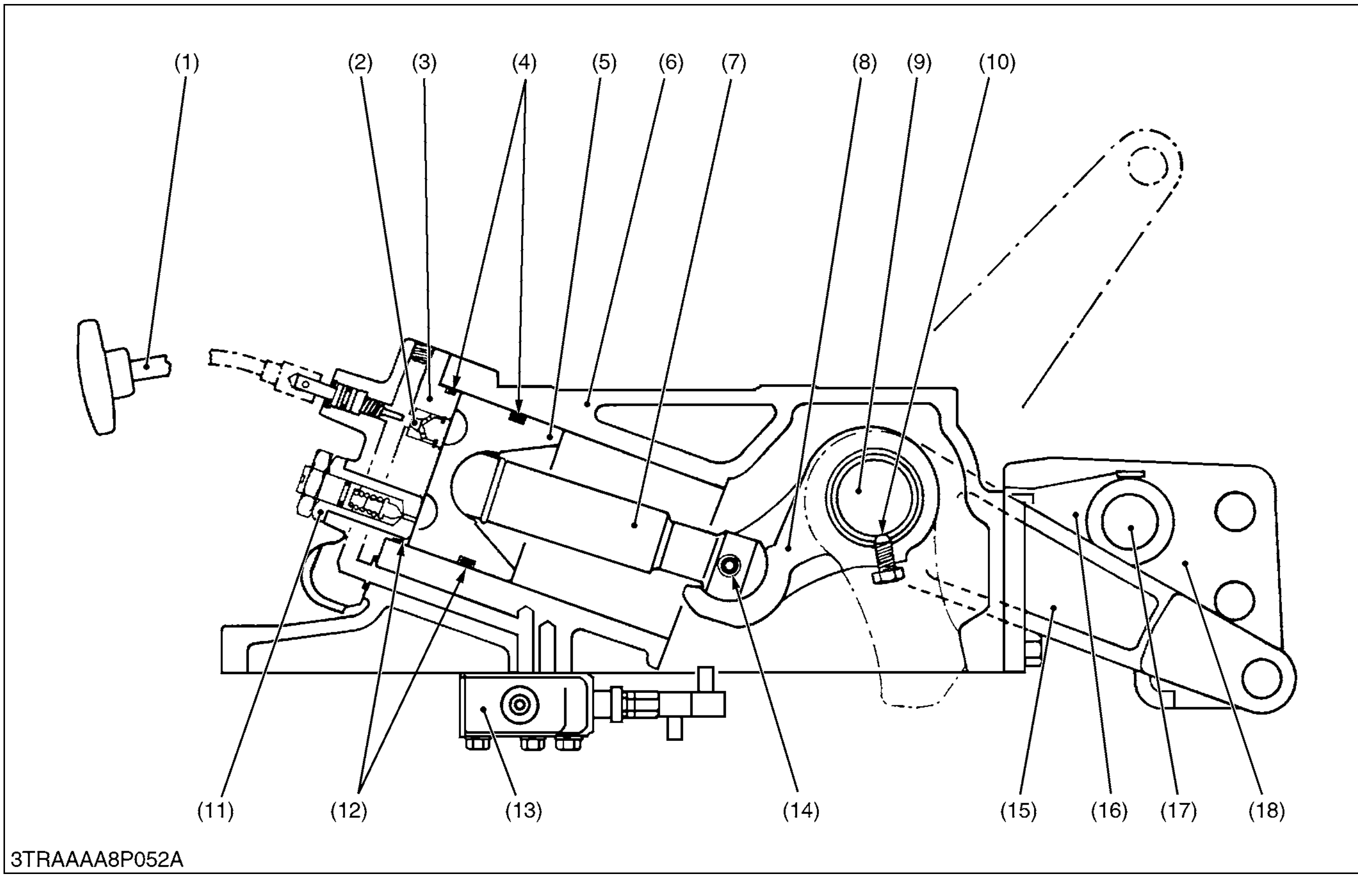
- Engine speed .... Maximum
- Oil temperature .... 45 to 55 °C
  113 to 131 °F

(3) Spring
(4) Pilot Valve
(5) Valve Seat
(8) Main Valve
(9) Valve Seat
(10) Passage

(C) Chamber "C"
P : P Port
T : T Port

W1015453

7. HYDRAULIC CYLINDER



(1) Lowering Speed Adjusting Knob
(2) Lowering Speed Adjusting Valve
(3) Hydraulic Cylinder Cover
(4) O-ring
(5) Hydraulic Piston
(6) Hydraulic Cylinder
(7) Hydraulic Rod
(8) Hydraulic Arm
(9) Hydraulic Arm Shaft
(10) Setting Screw
(11) Cylinder Safety Valve
(12) Backup Ring
(13) Position Control Valve
(14) Spring Pin
(15) Lift Arm
(16) Top Link Bracket
(17) Torsion Bar
(18) Top Link Holder

The main components of the hydraulic cylinder are shown in the figure above.

While the lift arm (15) is rising, oil from the hydraulic pump flows into the hydraulic cylinder (6) through the control valve (13). Then oil pushes the hydraulic piston (5) out.

While the lift arm is lowering, oil in the hydraulic cylinder is discharged to the transmission case through the control valve (13) by the weight of the implement.

At this time, the lowering speed of the implement can be controlled by the lowering speed adjusting valve (2) on the hydraulic cylinder cover (3). Turning the lowering speed adjusting knob (1) clockwise decreases the lowering speed, and counterclockwise increases it.

When the lowering speed adjusting valve (2) is completely closed, the lift arm is held at its position since oil in the hydraulic cylinder is sealed between the piston and the valve.

8. LINKAGE MECHANISM

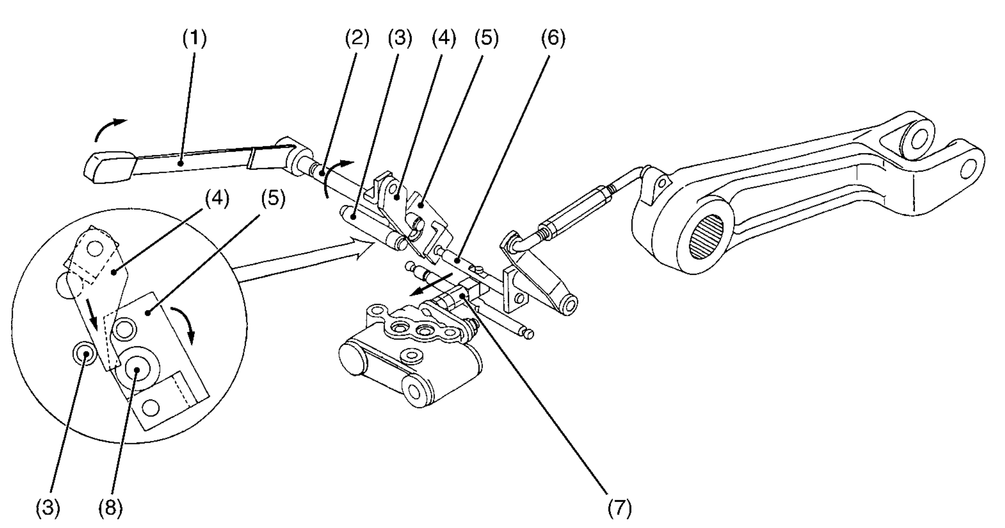
[1] M6800(S)

(1) Position Control

Position control is a linkage mechanism to raise or lower the implement attached to the tractor in proportion to the movement of the position control lever.

The implement can be positioned at any height by moving the position control lever. Fine position adjustment is also easy.

■ **Lift**



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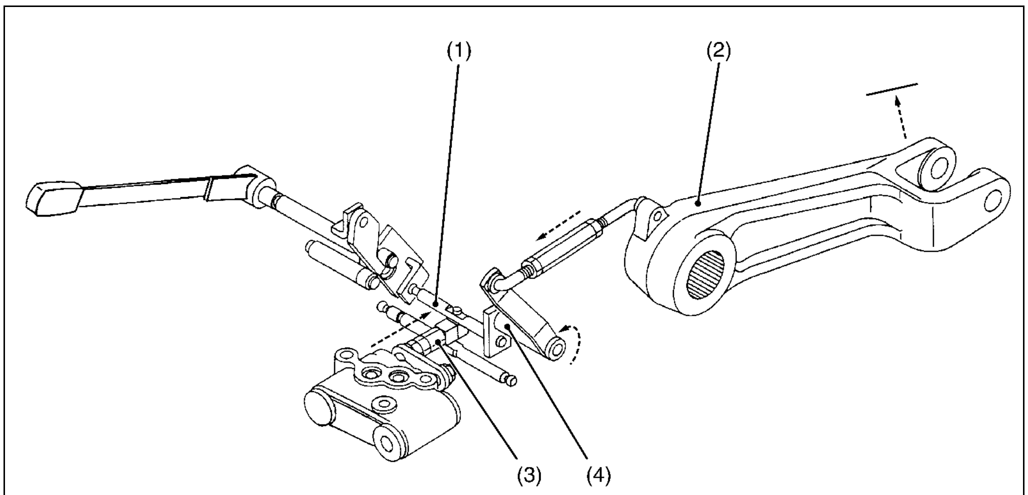
(1) Position Control Lever
(2) Lever Shaft
(3) Fulcrum 1
(4) Cam Link
(5) Link
(6) Spool Drive Lever
(7) Spool
(8) Fulcrum 2

W1015984

1. When the position control elver (1) is moved to the **“LIFT”** position, the lever shaft (2) rotates and press down the cam link (4) between the fulcrum 1 (3) and link (5).
   The link (5) rotates around the fulcrum 2 (8) and pushes the spool (7) by the spool drive lever (6), opening the **“LIFT”** circuit.



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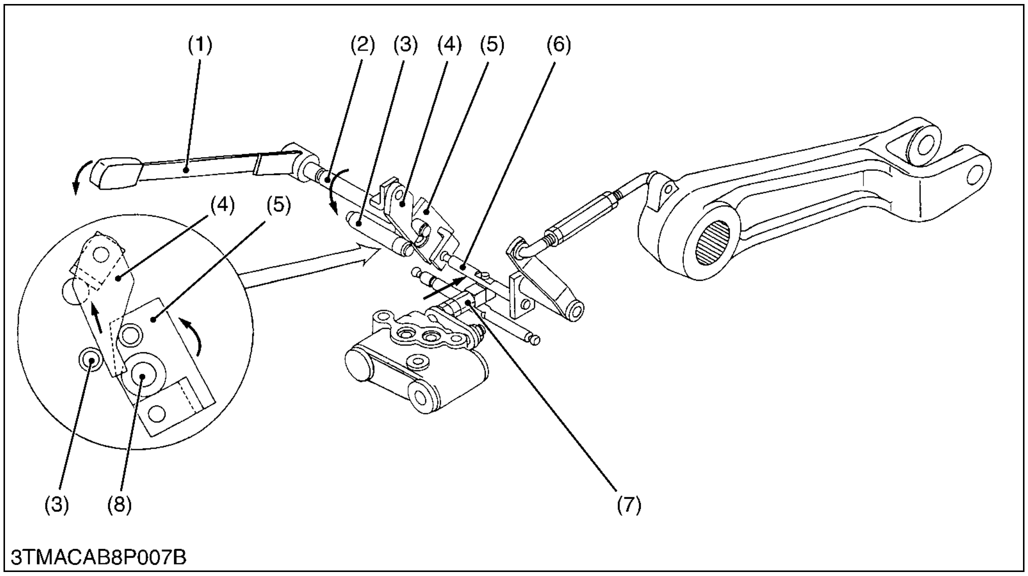
(1) Spool Drive Lever
(2) Lift Arm
(3) Spool
(4) Feedback Shaft

W1016089

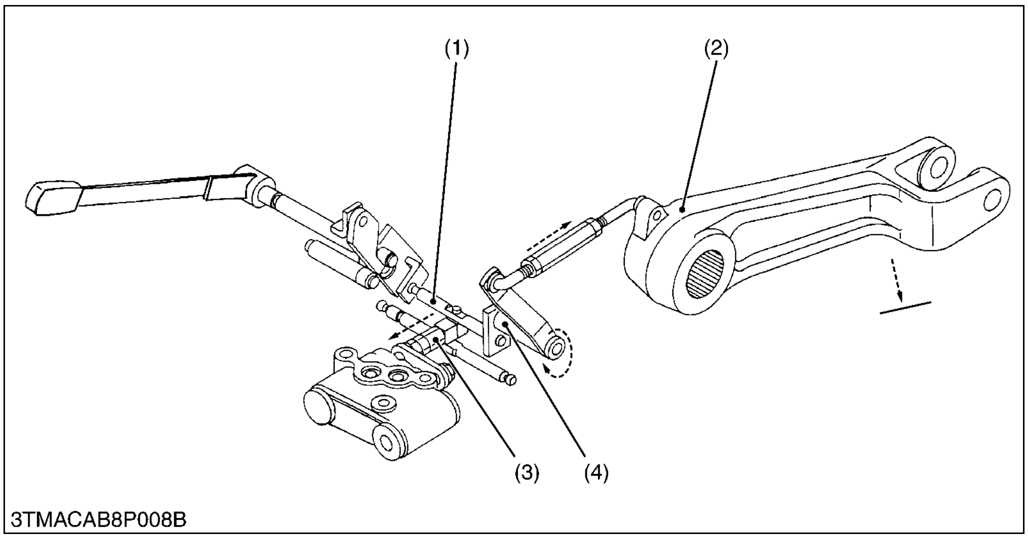
2. When the lift arm (2) moves upward, feedback shaft (4) rotates and pulls the spool (3) by the spool drive lever (1). The lift arm stops when the spool returns to the neutral position.

■ **Down**



(1) Position Control Lever
(2) Lever Shaft
(3) Fulcrum 1
(4) Cam Link
(5) Link
(6) Spool Drive Lever
(7) Spool
(8) Fulcrum 2

1. When the position control lever (1) is moved to the **“DOWN”** position, the lever shaft (2) rotates and pull up the cam link (4) between the fulcrum 1 (3) and link (5).
   The link (5) rotates around the fulcrum 2 (8) and pull the spool (7) out by the spool drive lever (6), opening the **“DOWN”** circuit.



(1) Spool Drive Lever
(2) Lift Arm
(3) Spool
(4) Feedback Shaft

2. When the lift arm (2) moves downward, feedback shaft (4) rotates and push the spool (3) by the spool drive lever (1).
   The lift arm stops when the spool returns to the neutral position.

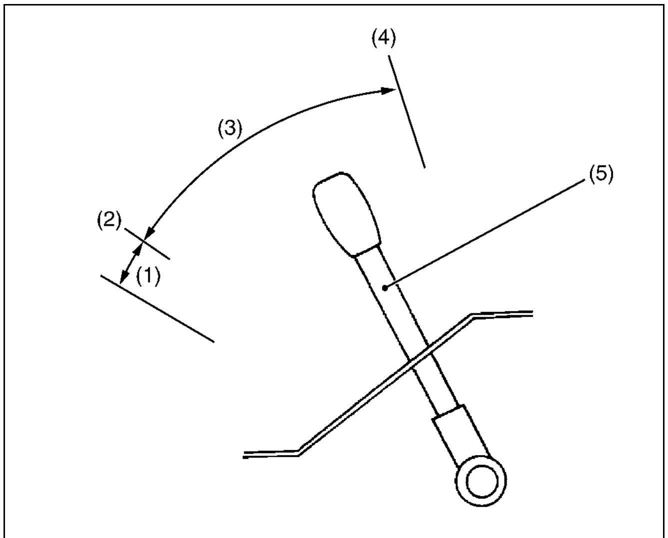
(2) Draft Control

Draft control is a system which maintain a constant traction load, and is suited for the work which needs heavy traction load such as plowing.

The implement is automatically raised when its traction load is increased, and lowers when the traction load is decreased. By maintaining a constant load level, it prevents the tractor from slipping and being loaded excessively.

The setting traction load can be adjusted by changing the position of the draft control lever (5).

The draft control system uses the same control valve as the position control system. The traction load applied to the tractor is sensed and is fed back to the control valve by means of the other linkage mechanism.



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With this type of draft control, operation is as described below according to the position of the draft control lever.

1. When the draft control lever is positioned in the floating range, the implement lowers to the ground.
2. When the draft control lever is positioned in the draft control range, work is performed as follows.
   - As the traction load applied to the tractor from the implement increases, the implement is raised.
   - As the traction load decreases, the implement lowers to the position at which it matches the setting traction load.
3. When the implement is raised as described in 2 above, the force to raise the implement is applied to the rear wheels so that the ground pressure of the wheels is momentarily increased to prevent slippage.

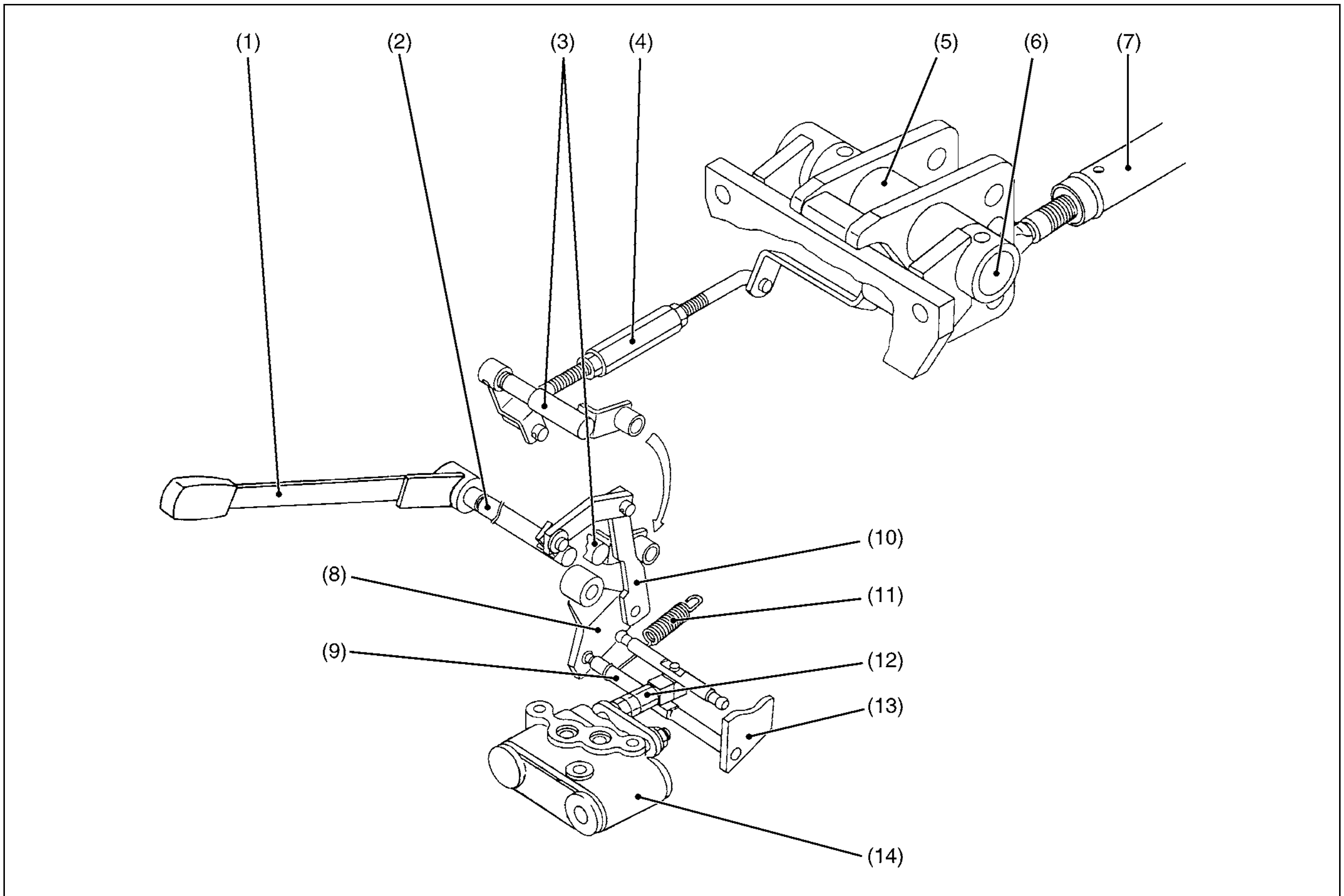
(Reference)

- When the draft control is used, the position control lever should be set at **"FLOATING"** range.
- If the position control lever is set at working range, both control systems operate performing mix control system. (See **"(3) Mixed Control"**.)

(1) Floating Range
(2) Deep
(3) Draft Range
(4) Shallow
(5) Draft Control Lever

W1016418

■ Draft Control Operation



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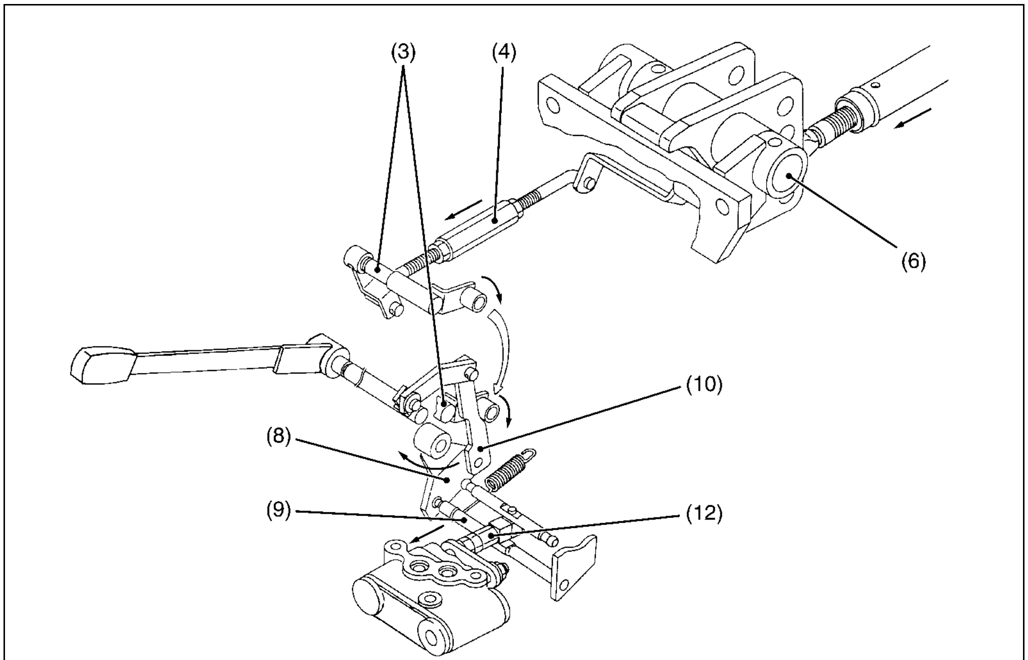
(1) Draft Control Lever	(5) Top Link Holder	(9) Spool Drive Lever	(12) Spool
(2) Lever Shaft	(6) Torsion Bar	(10) Link 1	(13) Fixed Arm
(3) Feedback Shaft	(7) Top Link	(11) Spring	(14) Control Valve
(4) Feedback Rod	(8) Link 2		

1. The traction load applied to the tractor from the implement act as a torsional force to the torsion bar (6) via the top link (7) and top link holder (5). When the torsion bar (6) is twisted, its displacement is transmitted to the feedback shaft (3) to rotate via the feedback rod (4). The feedback shaft rotates and push the link 1 (10) to rotate the link 2 (8). The end of the spool drive lever (9) is connected to the link 2 (8) and the other end is hold by the fixed arm (13), pulling out or pushing in the spool (12) by the rotation of the link 2 (8).
   The spring (11) is pulling the spool drive lever (9) to keep the link 1 (10) coming in contact with the feedback shaft (3).
   The angle of the link 1 (10) is controlled by the draft control lever (1) via the lever shaft (2).



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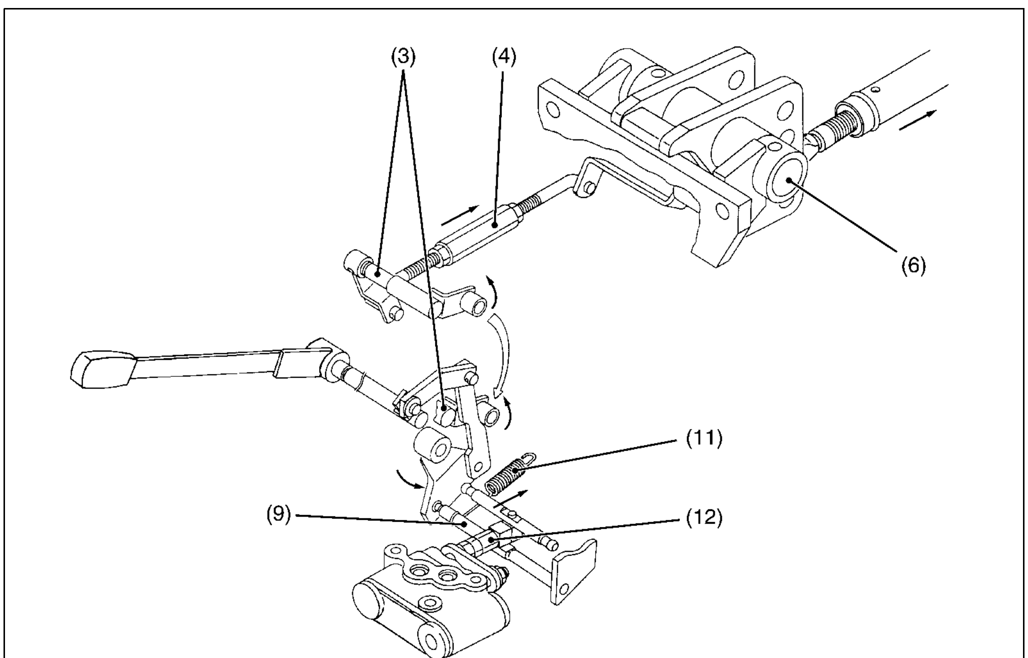
(3) Feedback Shaft
(4) Feedback Rod
(6) Torsion Bar
(8) Link 2
(9) Spool Drive Lever
(10) Link 1
(12) Spool

W1016812

2. When the traction load increases, the torsion bar (6) is twisted, and its displacement is transmitted to the feedback shaft (3) via the feedback rod (4). The feedback shaft (3) rotates clockwise and push the link 1 (10) to rotate the link 2 (8) clockwise.
   The link 2 (8) pushes the spool (12) in via the spool drive lever (9) and the **"LIFT"** circuit is formed.
   As the implement is raised and the traction load decreases, the torsion bar (6) is restored to return the spool (12) to neutral.



3TMACAB8P010B

(3) Feedback Shaft
(4) Feedback Rod
(6) Torsion Bar
(9) Spool Drive Lever
(11) Spring
(12) Spool

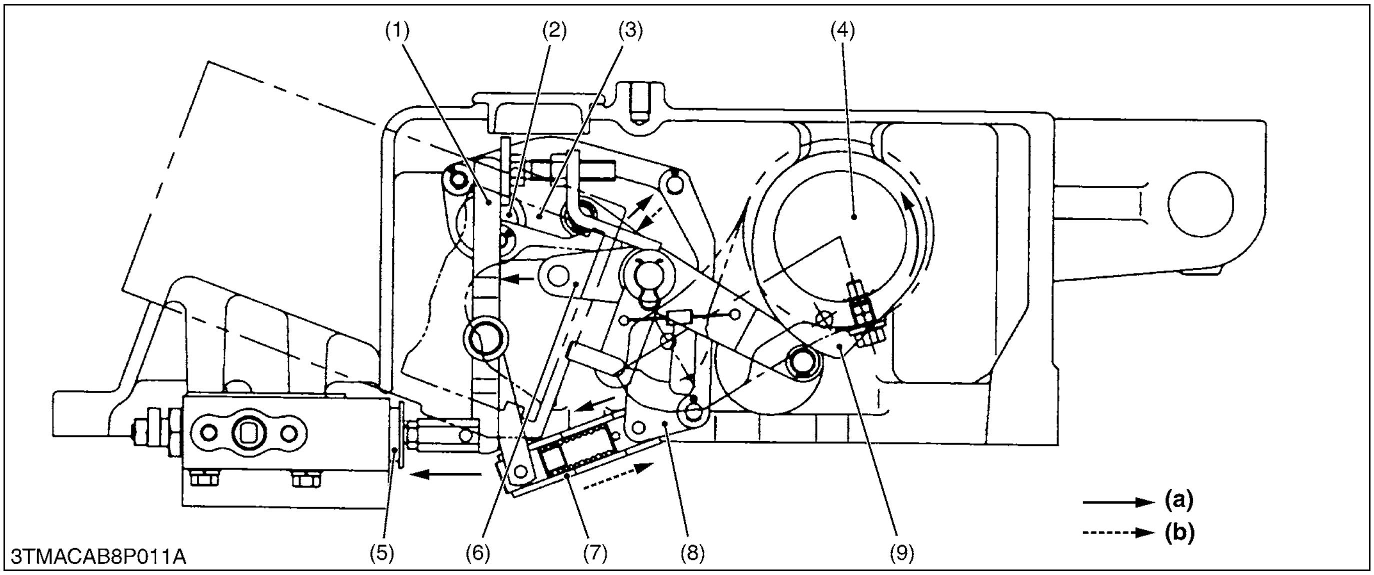
W1016928

3. When the traction load decreases, the torsion bar (6) is restored and its displacement is transmitted to the feedback shaft (3) via the feedback rod (4). As the feedback shaft (3) rotates counterclockwise, the spool drive lever (9) pulls the spool (12) out by the spring (11) to form the **"DOWN"** circuit.
   As the implement lowers and the traction load increases, the torsion bar (6) is twisted to return the spool (12) to neutral.

[2] M8200 · M9000

(1) Position Control

Position control is a system to raise and lower the implement proportionally to the movement of the position control lever. With this system, the implement can be raised or lowered to any position desired by changing the position of the control lever and fine adjustment is also easy. When using the position control, the draft control lever should be set to the lowest position.



(1) Spool Retainer	(4) Hydraulic Arm Shaft	(7) Holder	**(a) Motion for Raising**
(2) Position Control Shaft	(5) Spool	(8) Connector	**(b) Motion for Feed-back**
(3) Position Connector	(6) Position Balancer	(9) Position Cam	

■ **Raising**

1. When the position control lever is moved to the **Raising** direction, the position control shaft (2) rotates clockwise to move the position connector (3) to the left.
2. Since the position balancer (6) is prevented by the position cam (9) from moving, the connector (8) rotates clockwise as the position connector (3) moves. Thereby the holder (7) and spool retainer (1) are pushed against the spool (5), and the spool (5) is forced in the control valve. As a result, a **Raising** circuit is formed.
3. When the lift arm moves upward, the hydraulic arm shaft (4) and position cam (9) rotate counterclockwise. As a result, the position balancer (6) is also rotated counterclockwise. Accordingly, as the connector (8) does not press the spool retainer (1), the spool (5) is forced out by the return spring in the control valve (feedback mechanism).
4. When the spool (5) returns to the neutral position, the lift arms stop rising. This results in raising of the lift arm in proportion to the movement of the position control lever.

■ **Lowering**

1. When the control lever is moved to the **Lowering** direction, the position control shaft (2) rotates counterclockwise to move the position connector (3) to the right.
2. As the position connector (3) moves, the connector (8) does not press the spool retainer (1) and the spool (5) is forced out by the return spring in the control valve. As a result, a **Lowering** circuit is formed.
3. When the lift arms move downward, the hydraulic arm shaft (4) and position cam (9) rotate clockwise, causing the position balancer (6) and connector (8) to press the holder (7) and spool retainer (1). Thereby, the spool (5) is forced in (feedback mechanism).
4. When the spool (5) returns to the neutral position, the lift arms stop rising. This results in lowering of the lift arms in proportion to the movement of the position control lever.

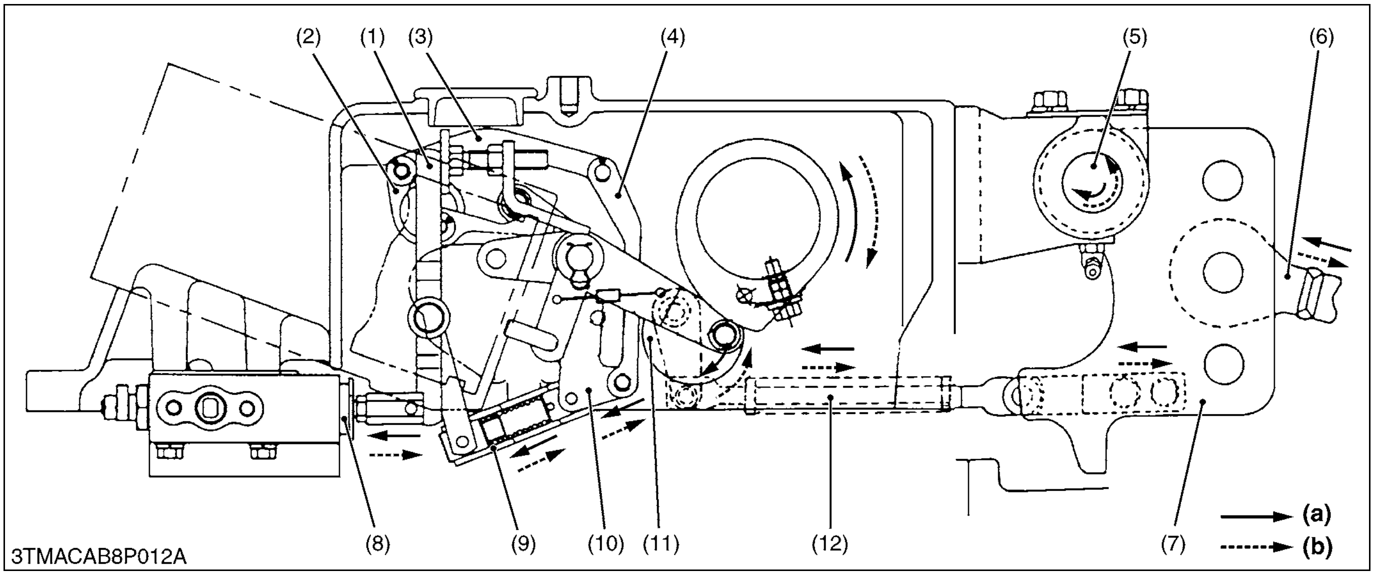
(2) Draft Control

Draft control is a system in which the lift arms (implement) automatically rise when the implement's traction load is increased and lower when the traction load is decreased. By maintaining a constant traction load, it prevents the tractor from slipping and over-load.

There are two types of traction load sensing system: top link sensing system and lower link sensing system. These tractor are equipped with the top link sensing type.

When using the draft control, the draft control lever should be set in the draft range, and the position control lever should be set at the lowest position.

■ **Draft Control System**



(1) Spool Retainer
(2) Draft Control Shaft
(3) Draft Link
(4) Draft Link 2
(5) Torsion Bar
(6) Top Link
(7) Top Link Bracket
(8) Spool
(9) Holder
(10) Connector
(11) Draft Cam
(12) Draft Control Rod

(a) Motion when traction load increases
(b) Motion when traction load decreases

1. When the draft control lever is moved to the draft range, the draft control shaft (2) rotates clockwise and draft link 2 (4) approaches to the draft cam (11).

(Reference)

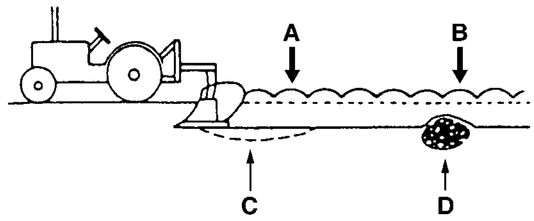
- Draft control sensitivity can be regulated by changing the distance between draft link 2 (4) and the draft cam (11) using the draft control lever.

2. Traction load of the implement acts as torsion force to the torsion bar (5) via the top link bracket (7).
   When traction load increases, the torsion bar is twisted depending on the load, and this twist is transmitted to the draft control rod (12), draft cam (11), draft link 2 (4), connector (10), holder (9), and spool holder (1), thereby causing the spool (8) to be forced in.
   As a result, a **Raising** circuit is formed.
3. As the lift arms (implement) are raised, traction load reduces. Therefore, the draft control rod (12) returns. As a result of this, the spool (8) is forced out by the return spring which allows a **Lowering** circuit to be formed again, thereby causing the lift arm to move downward.

(Reference)

- The spring installed inside the holder (9) is a safety device which functions when the draft control rod (12) is pushed in excess of the specified spool stroke.

(3) Mixed Control



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Mixed control is a system combining position control with draft control.

When traction load increases, the draft control functions to raise the lift arms (implement). When traction load reduces, the lift arms (implement) lower to the height set by the position control only, when traction load increases, slippage or engine stop may occur unless the implement is raised.

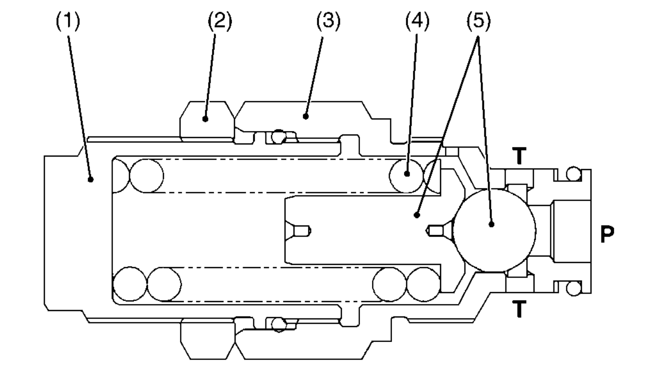
With the draft control only, plowing depth cannot be kept constant if soil hardness changes greatly.

The mixed control serves to eliminate such disadvantages.

A : Position Controlled
B : Draft Controlled
C : Not Deep Even in Soft Soil
D : Shallow where Resistance Occurs

W1017580

9. CYLINDER SAFETY VALVE (SURGE RELIEF VALVE)



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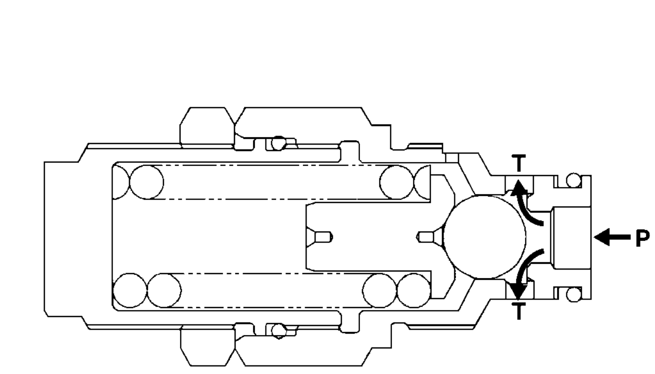

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The cylinder safety valve is located on the cylinder cover of the three point hydraulic system. These tractors use a direct acting relief valve, which is suitable for low volume and less frequent operations.

This valve has a fast response, makes it ideal for relieving shock pressure caused by heavy implement bounce and thereby reducing the possibility of damage to three point hydraulic system components.

If pressure in the cylinder becomes too great, oil pressure forces the valve (5) off the seat of valve body (3), compressing the disc springs (4) and allows oil to flow to the transmission case through the **T** port.

(Reference)

- Cylinder safety valve setting pressure :

M6800(S)	M8200 · M9000
20.6 to 21.6 MPa 210 to 220 kgf/cm^2 2987 to 3129 psi	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3556 psi

(1) Adjusting Plug
(2) Lock Nut
(3) Valve Body
(4) Spring
(5) Valve

T : T Port (To Transmission Case)
P : P Port (From Cylinder)

W1017841

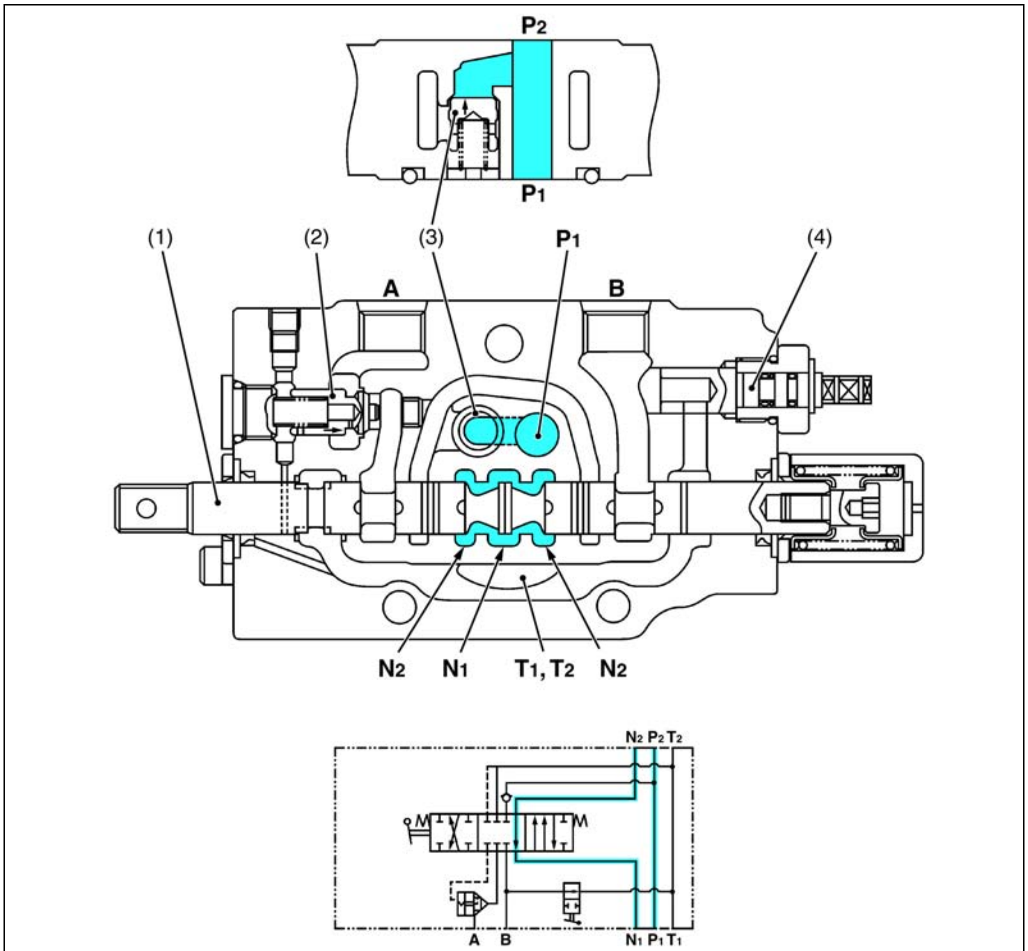
10. AUXILIARY CONTROL VALVE

If necessary, hydraulic power for implements can be taken out using auxiliary control valves and quick couplers.

■ **IMPORTANT**
- **When taking out hydraulic power, replenish transmission oil in the quantity equal to the flow rate required for the implement cylinder.**

[1] SINGLE / DOUBLE ACTING TYPE

■ **Neutral**



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(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Selecting Valve

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1018160

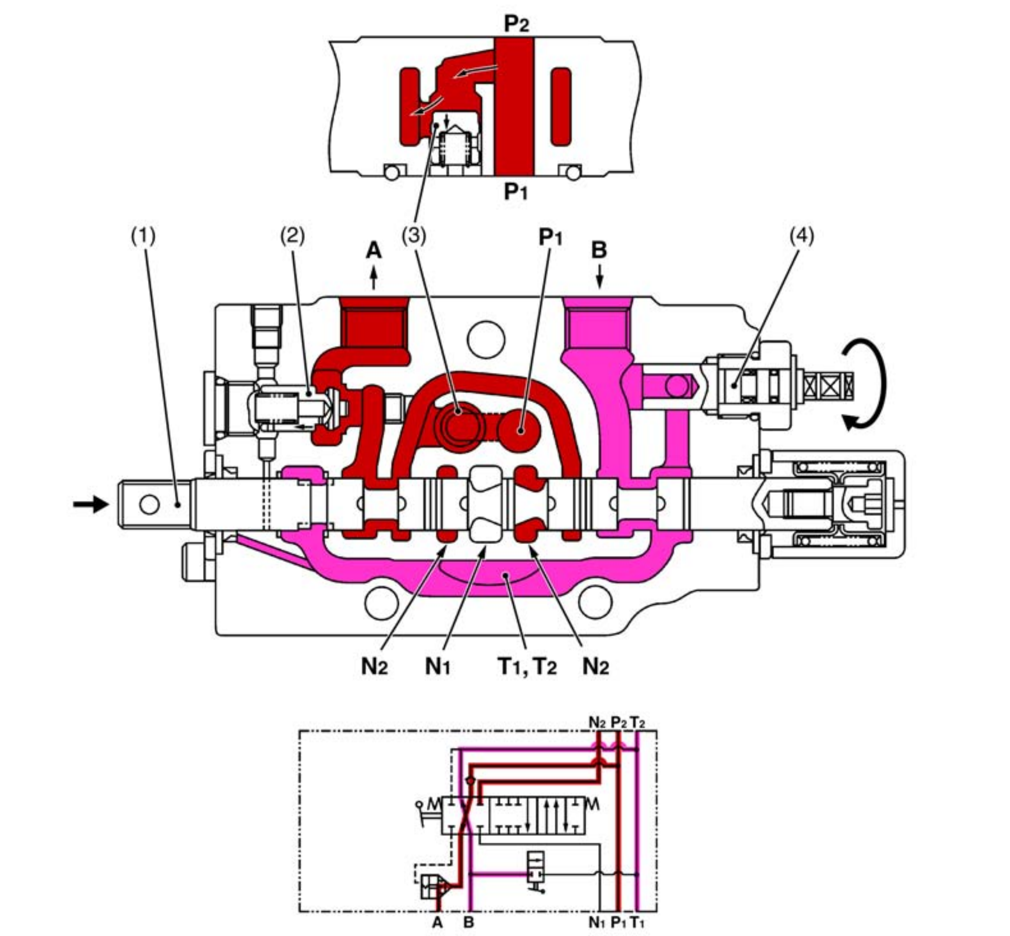
Pressure-fed oil from the hydraulic pump is delivered into the **P_1** port.

As the passage from the **P_1** port to the **A** port or **B** port is blocked by the spool (1), the oil in the **P_1** port flows across the valve body to **P_2** port.

When the double acting auxiliary control valve is in neutral mode, the oil flows from **P_2** port to **N_2** port via the auxiliary control valve and its cover to **N_2** port.

Then, the oil in the **N_2** port flows along the notched section of the spool (1) to the **N_1** port to the transmission case.

■ Lift (Double Acting)



3TRAAAA8P084A

(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Selecting Valve

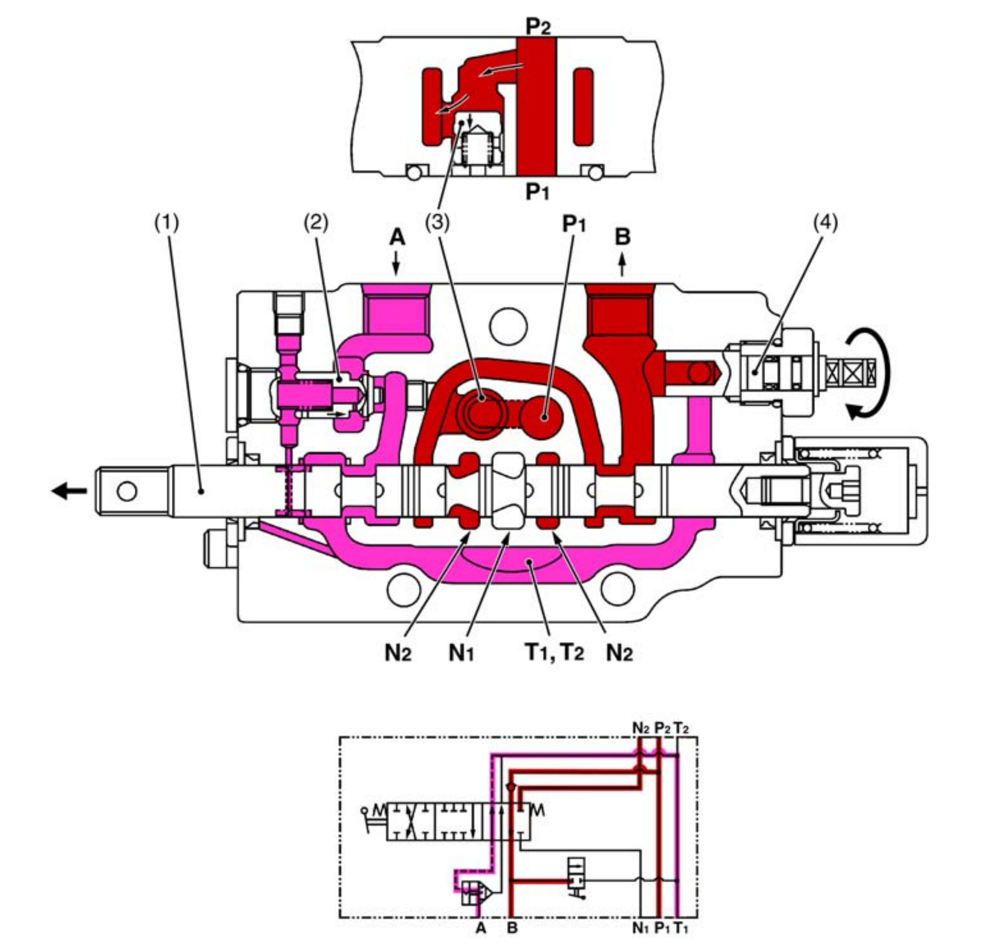
A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1022496

When the auxiliary control valve is used in double acting mode, the selecting valve (4) is turned clockwise to close the passage from selecting valve (4) to **T1** port.

When the spool (1) moves to right, the oil passage from **N2** port to **N1** port is blocked by the spool (1). Then, the pressure-fed oil in the **P1** port opens the check valves (2), (3) and flows to implement cylinder via **A** port. The return oil from implement cylinder flows from **B** port to the transmission case through **T1** port.

■ Down (Double Acting)



3TRAAAA8P085A

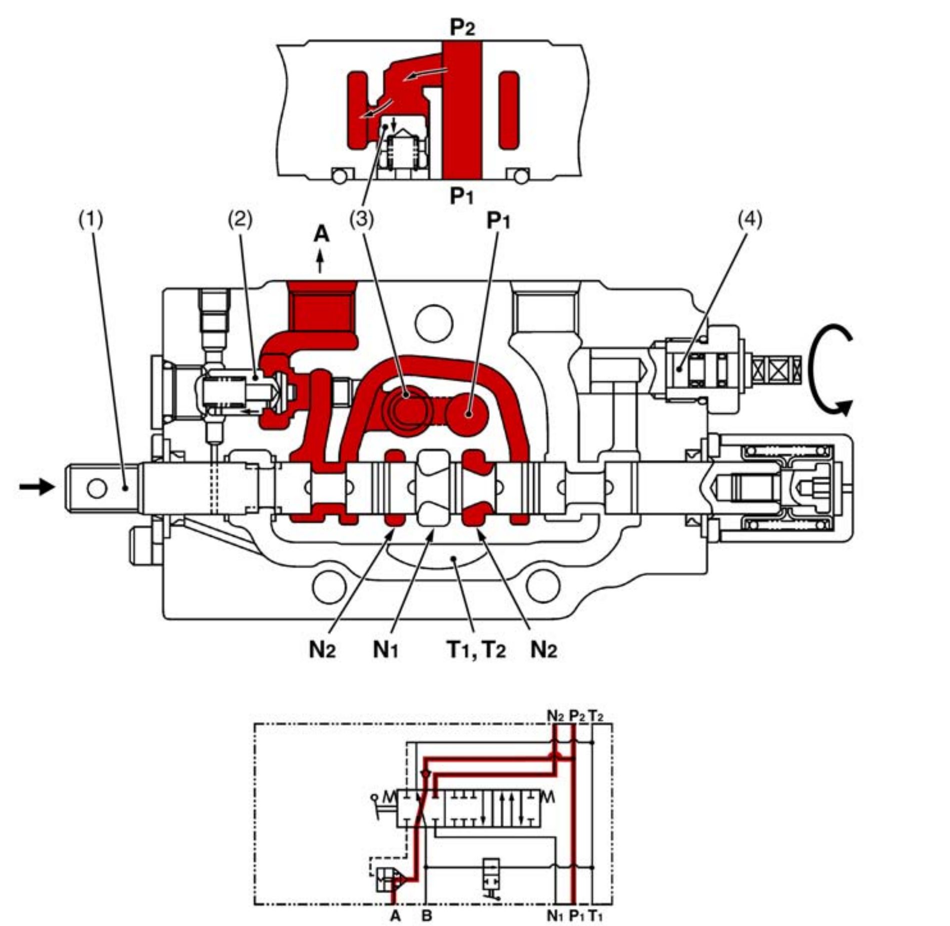
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Selecting Valve

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1022739

When the spool (1) moves to left, the oil passage from **N_2** port to **N_1** port is blocked by the spool (1). Then, the pressure-fed oil in the **P_1** port opens the check valve 2 (3) and flows to implement cylinder via **B** port. The return oil from implement cylinder flows from **A** port to the transmission case through **T_1** port.

■ Lift (Single Acting)



3TRAAAA8P086A

(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Selecting Valve

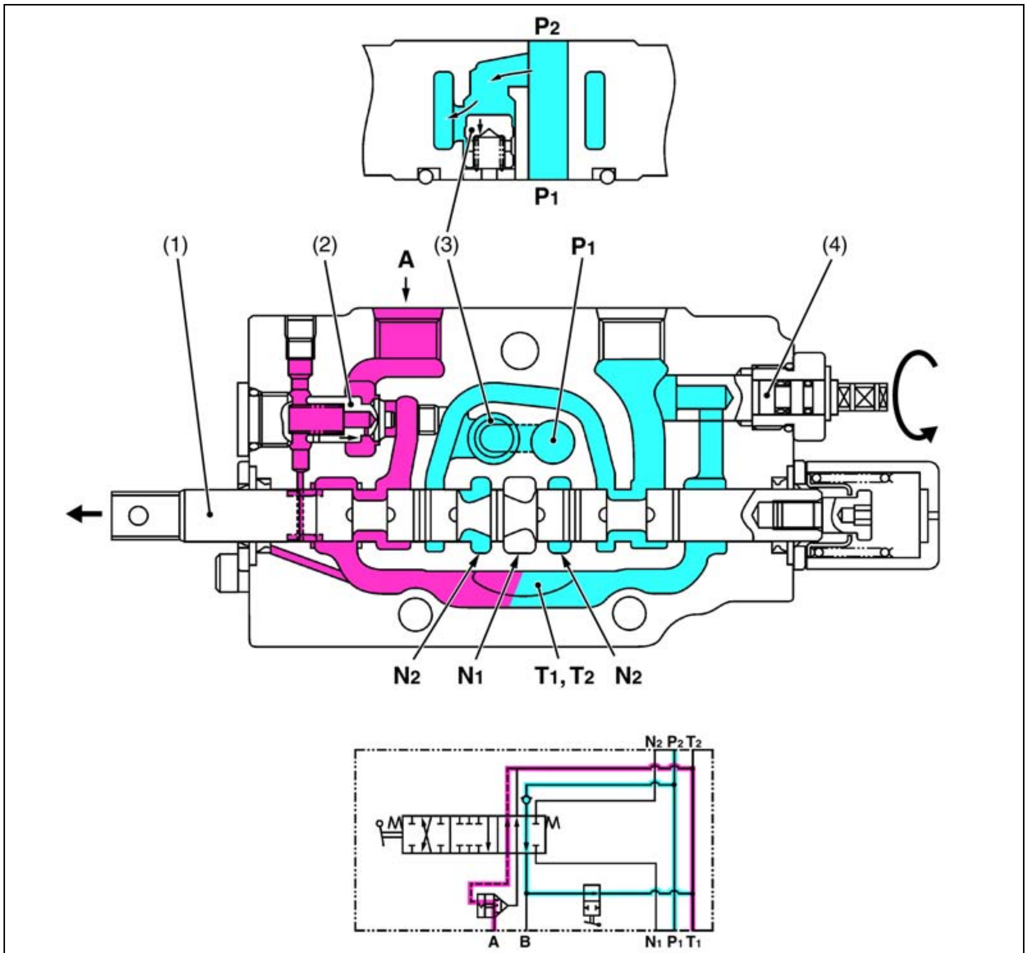
A : **A Port**
B : **B Port**
P1 : **P1 Port (From Hydraulic Pump)**
P2 : **P2 Port (To Auxiliary Control Valve)**
N1 : **N1 Port (To Transmission Case)**
N2 : **N2 Port (From Auxiliary Control Valve)**
T1 : **T1 Port (To Transmission Case)**
T2 : **T2 Port (From Auxiliary Control Valve)**

W1022945

When the auxiliary control valve is used in single acting mode, the selecting valve (4) is turned counterclockwise to open the passage from selecting valve (4) to **T1** port.

When the spool (1) moves to right, the oil passage from **N2** port to **N1** port is blocked by the spool (1). Then, the pressure-fed oil in the **P1** port opens the check valves (2), (3) and flows to implement cylinder via **A** port.

■ Down (Single Acting)



3TRAAAA8P087A

(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Selecting Valve

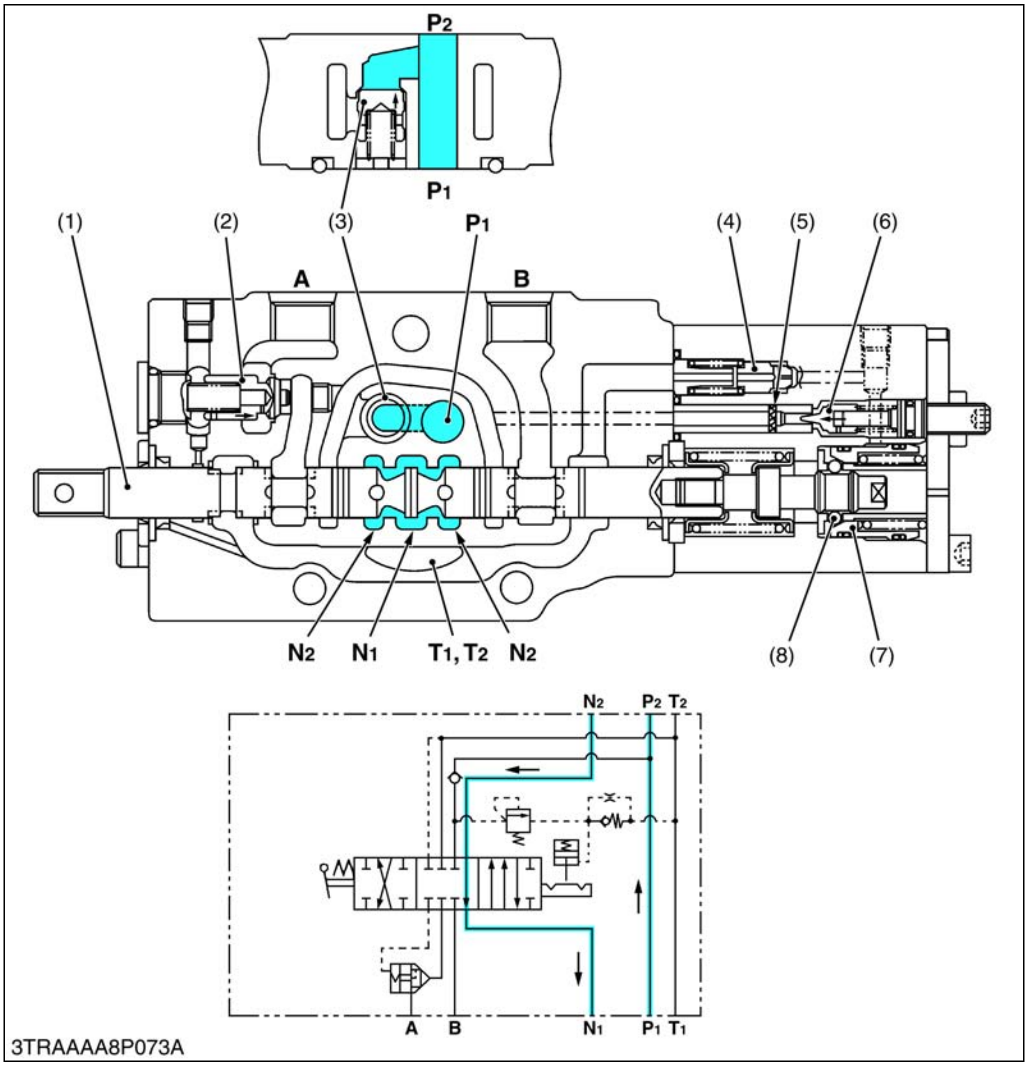
A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1023097

When the spool (1) moves to left, the oil passage from **N2** port to **N1** port is blocked by the spool (1). Then, the pressure-fed oil in the **P1** port opens the check valve 2 (3) and flows to transmission case through selecting valve (4) and **T1, T2** port. And the return oil from implement cylinder flows from **A** port to the transmission case through **T1** port.

[2] SELF-CANCELLING WITH DETENT (STANDARD)

■ Neutral



(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Plunger
(5) Filter
(6) Poppet
(7) Detent Piston
(8) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1023455

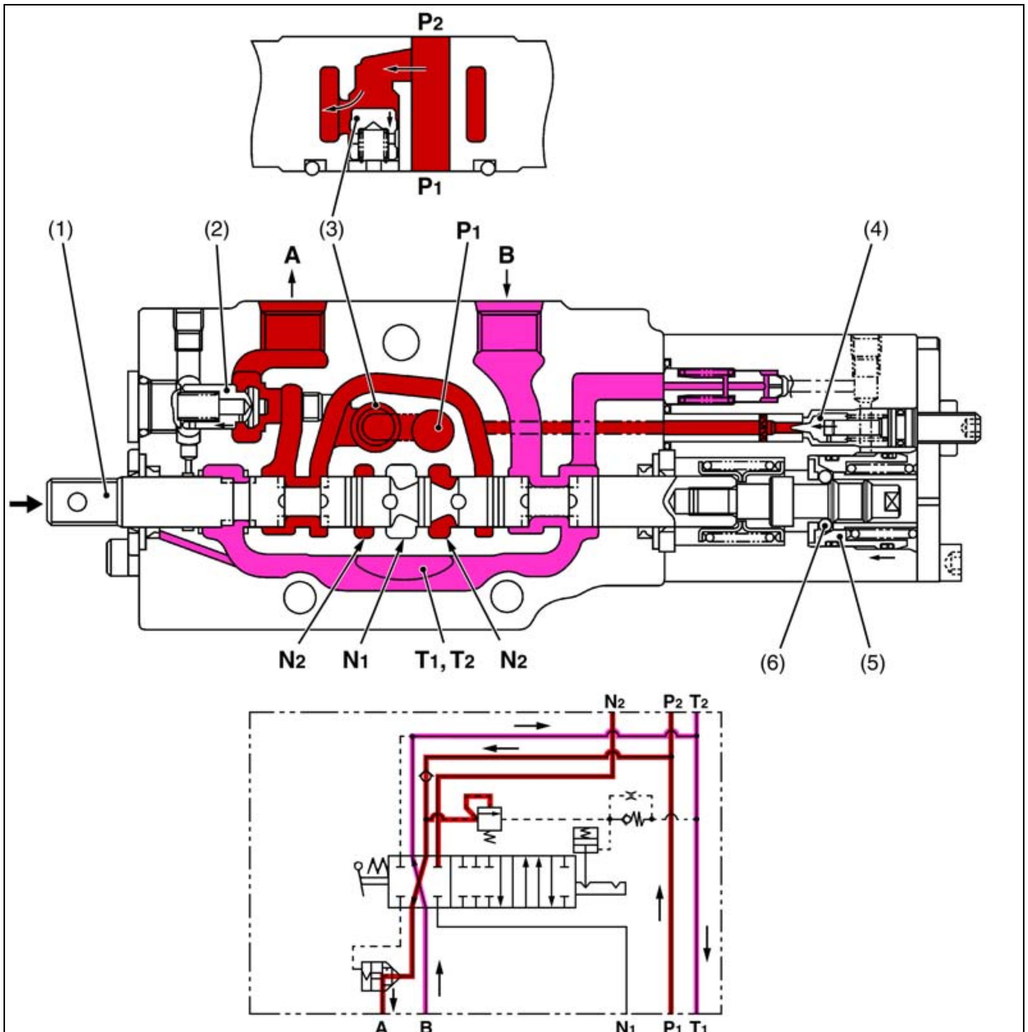
Pressure-fed oil from the hydraulic pump is delivered into the **P_1** port.

As the passage from the **P_1** port to the **A** port or **B** port is blocked by the spool (1), the oil in the **P_1** port flows across the valve body to **P_2** port.

When the auxiliary control valve is in neutral, the oil flows from **P_2** port to **N_2** port via the another auxiliary control valve and its cover.

Then, the oil in the **N_2** port flows along the notched section of the spool (1) to the **N_1** port to the transmission case.

■ Lift-1 (When Spool is Held at "UP" Position by Detent)



3TRAAAA8P074A

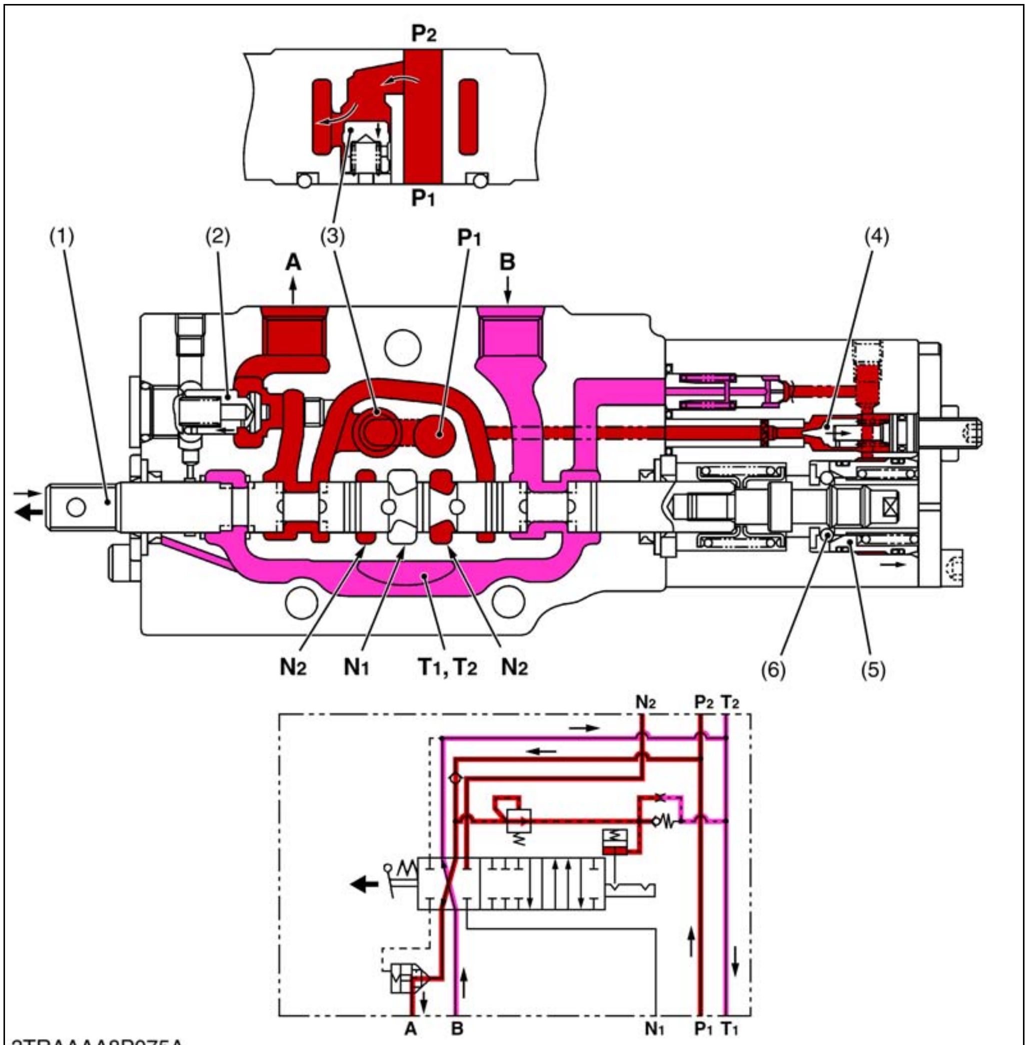
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1023737

When the spool (1) moves to right, the detent piston (5) and detent ball (6) hold the spool (1) at the **LIFT** position as shown in the figure. The pressure-fed oil in the **P_1** port opens the check valves (2), (3) and flows to implement cylinder via **A** port. The return oil from implement cylinder flows from **B** port to the transmission case through **T_1** port.

■ Lift-2 (When “UP” Position is Self-Cancelled)



3TRAAAA8P075A

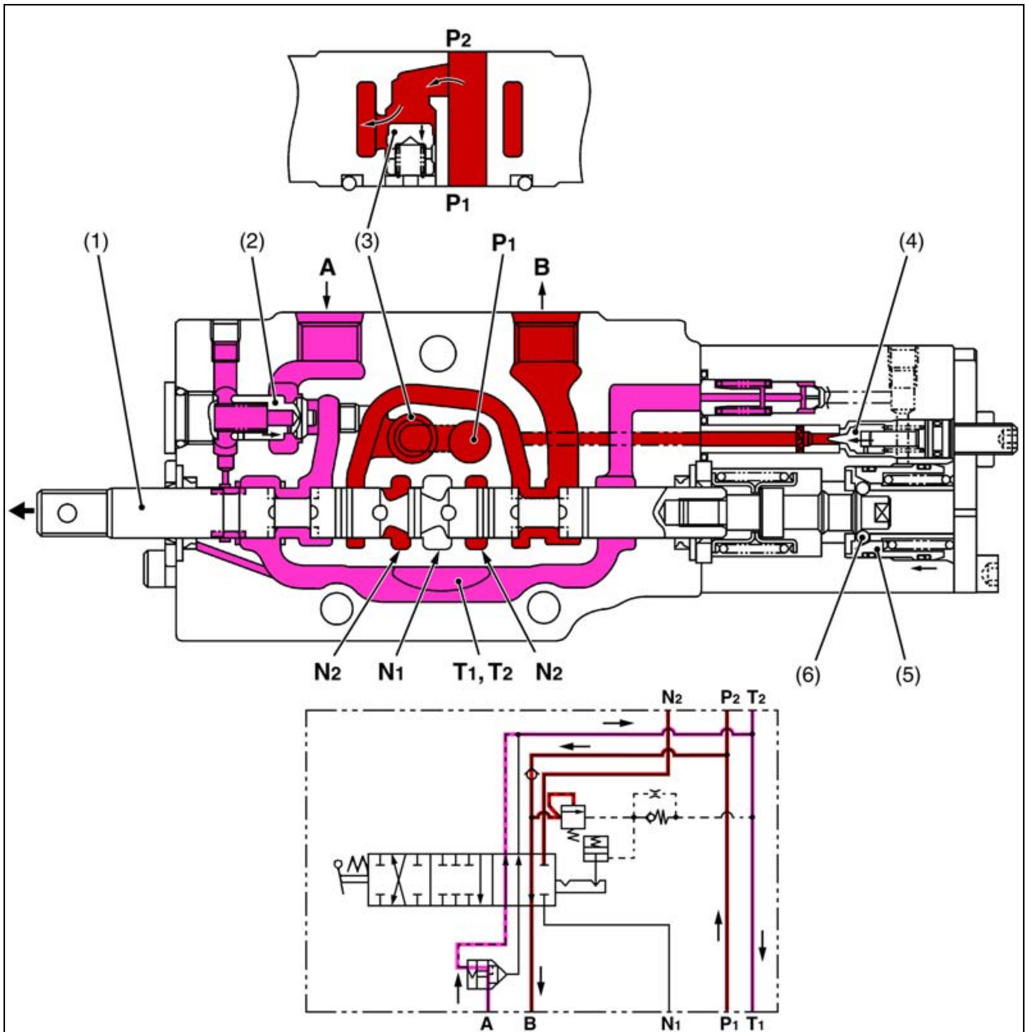
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1023930

As the implement cylinder rises to its uppermost position, pressure at **P1** port increases. When this pressure exceeds the poppet setting pressure, the pressure-fed oil opens the poppet (4) and moves the detent piston (5) to right. As a result, the spool (1) is returned to **NEUTRAL** position by the tension of spring while the detent balls (6) are moved outside.

■ **Down-1 (When Spool is Held at "Down" Position by Detent)**



3TRAAAA8P076A

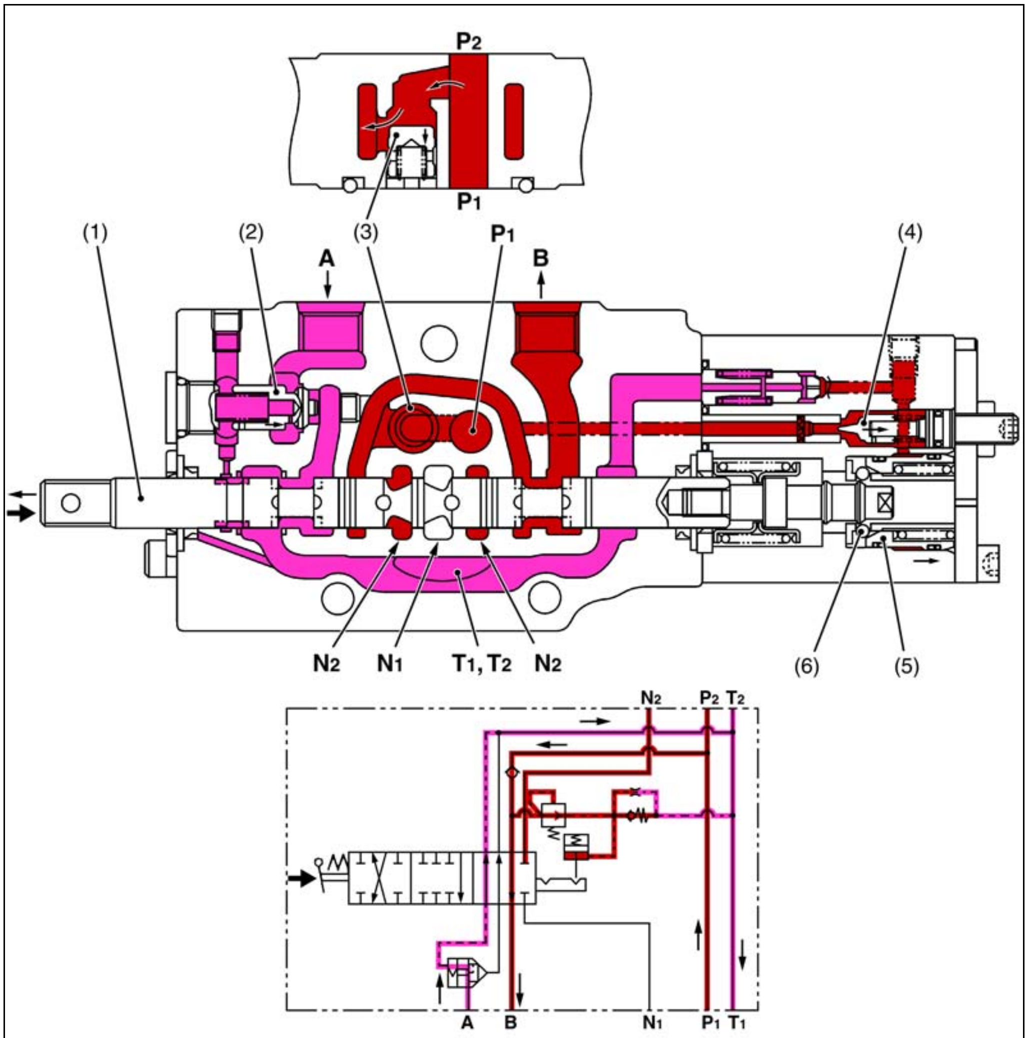
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1024107

When the spool (1) moves to left, the detent piston (5) and detent ball (6) hold the spool (1) at the **DOWN** position as shown in the figure. The pressure-fed oil in the **P1** port opens the check valve 1 (2) and flows to implement cylinder via **B** port. The return oil from implement cylinder flows from **A** port to the transmission case through **T1** port.

■ **Down-2 (When "Down" Position is Self-Cancelled)**



3TRAAAA8P077A

(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

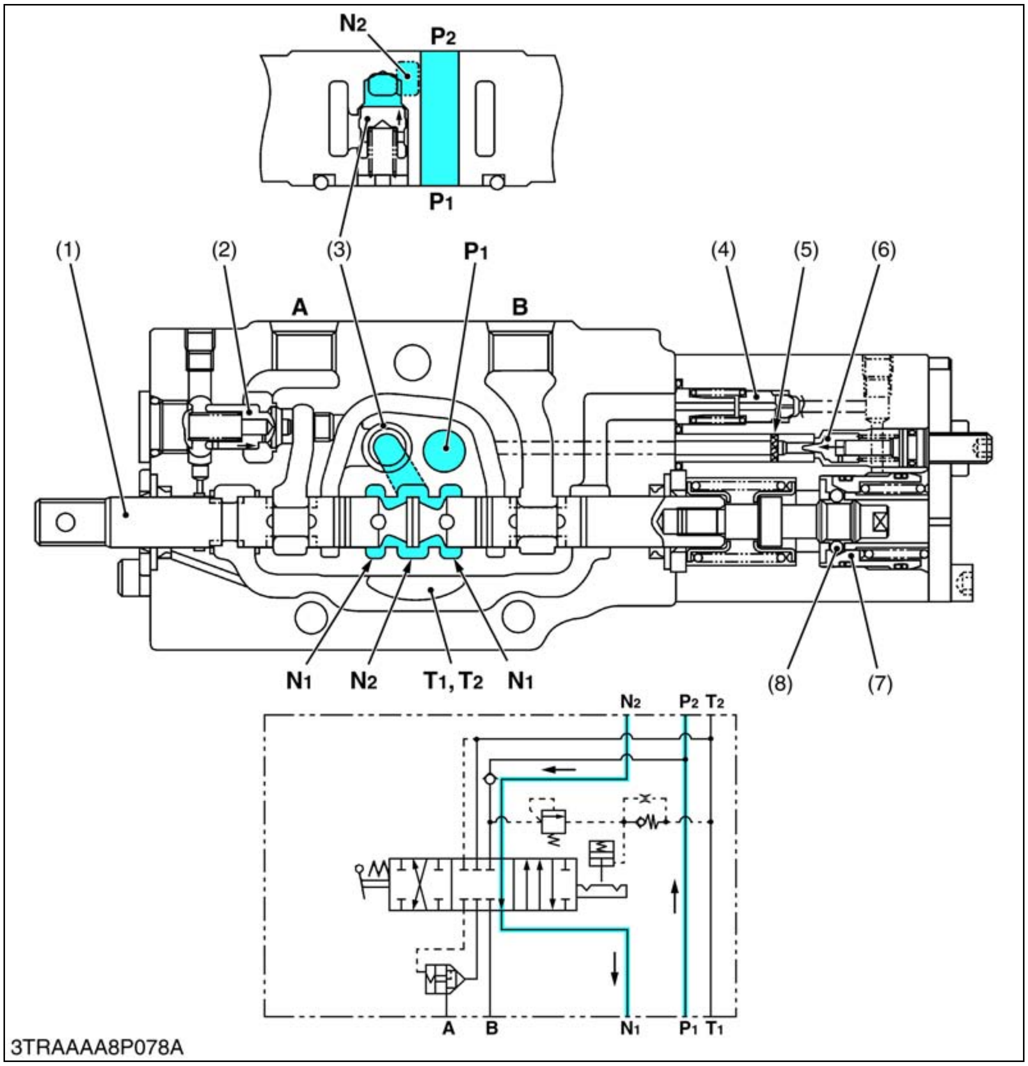
A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1024273

As the implement cylinder lowers to its downmost position, pressure at **P1** port increases. When this pressure exceeds, the poppet setting pressure, the pressure-fed oil opens the poppet (4) and moves the detent piston (5) to right. As a result, the spool (1) is returned to **NEUTRAL** position by the tension of spring while the detent balls (6) are moved outside.

[3] SELF-CANCELLING WITH DETENT (IF EQUIPPED)

■ Neutral



(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Plunger
(5) Filter
(6) Poppet
(7) Detent Piston
(8) Detent Ball

A : A Port
B : B Port
P1 : P1 Port (From Hydraulic Pump)
P2 : P2 Port (To Auxiliary Control Valve)
N1 : N1 Port (To Transmission Case)
N2 : N2 Port (From Auxiliary Control Valve)
T1 : T1 Port (To Transmission Case)
T2 : T2 Port (From Auxiliary Control Valve)

W1025730

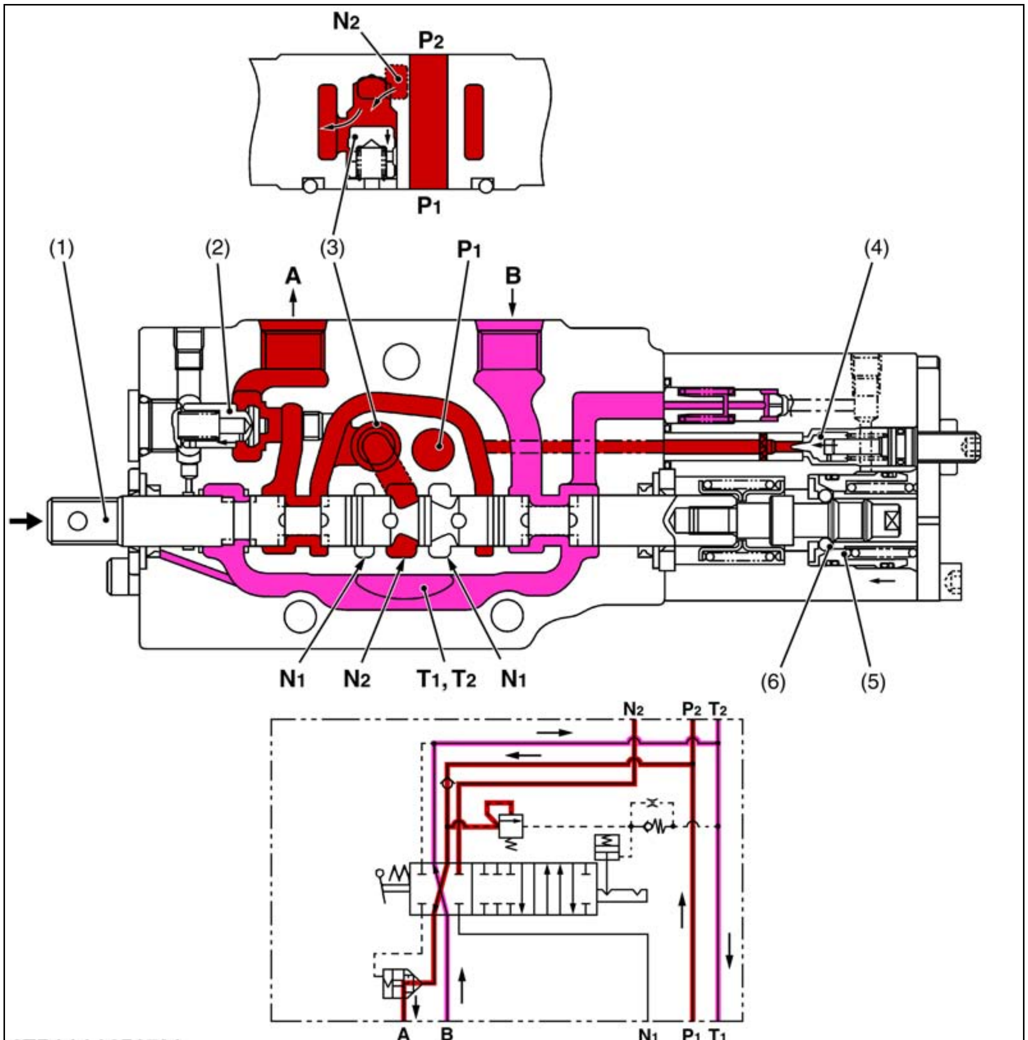
Pressure-fed oil from the hydraulic pump is delivered into the **P1** port.

As the passage from the **P1** port to the **A** port or **B** port is blocked by the spool (1), the oil in the **P1** port flows across the valve body to **P2** port.

When the auxiliary control valve is in neutral, the oil flows from **P2** port to **N2** port via the another auxiliary control valve and its cover.

Then, the oil in the **N2** port flows along the notched section of the spool (1) to the **N1** port to the transmission case.

■ Lift-1 (When Spool is Held at “UP” Position by Detent)



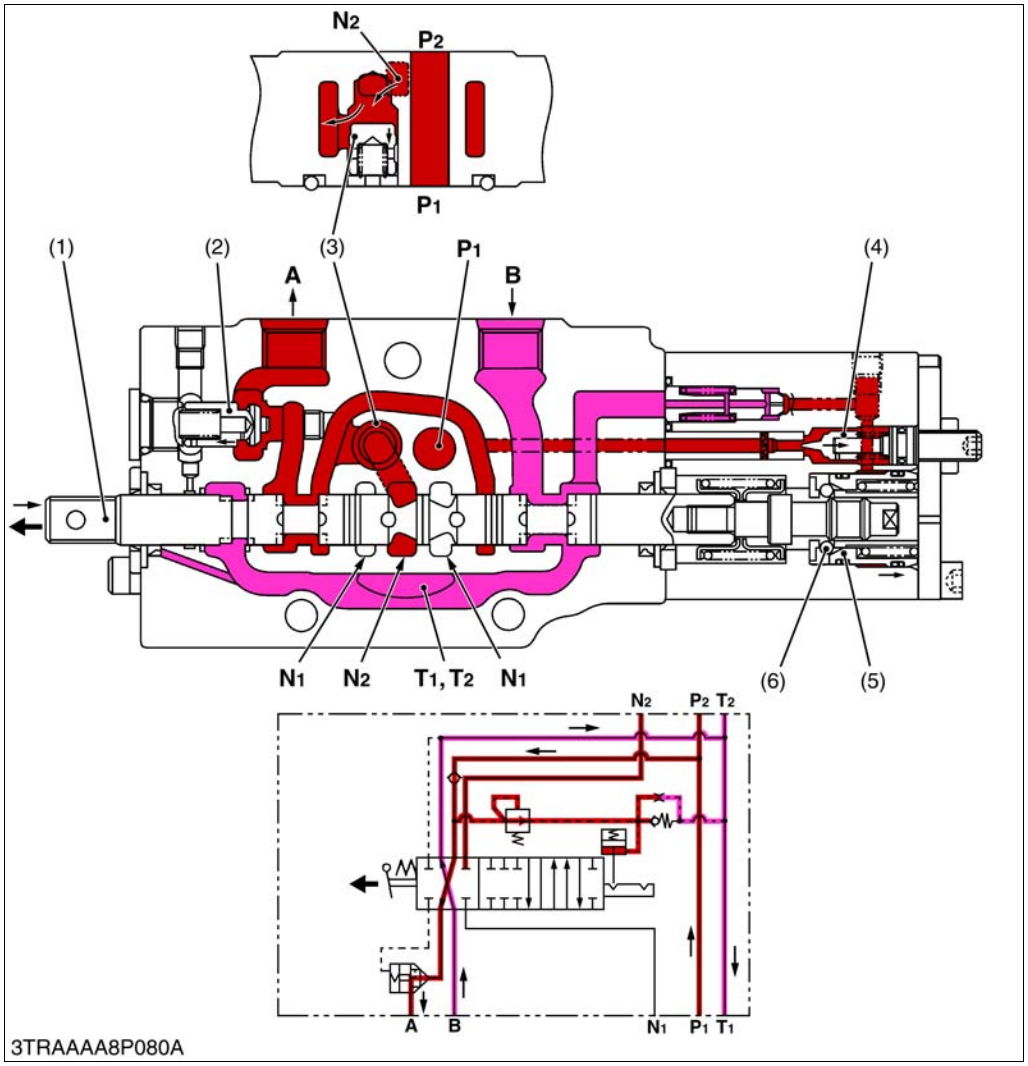
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1026284

When the spool (1) moves to right, the detent piston (5) and detent ball (6) hold the spool (1) at the **LIFT** position as shown in the figure. The pressure-fed oil in the **P_1** port opens the check valves (2), (3) and flows to implement cylinder via **A** port. The return oil from implement cylinder flows from **B** port to the transmission case through **T_1** port.

■ Lift-2 (When "UP" Position is Self-Cancelled)



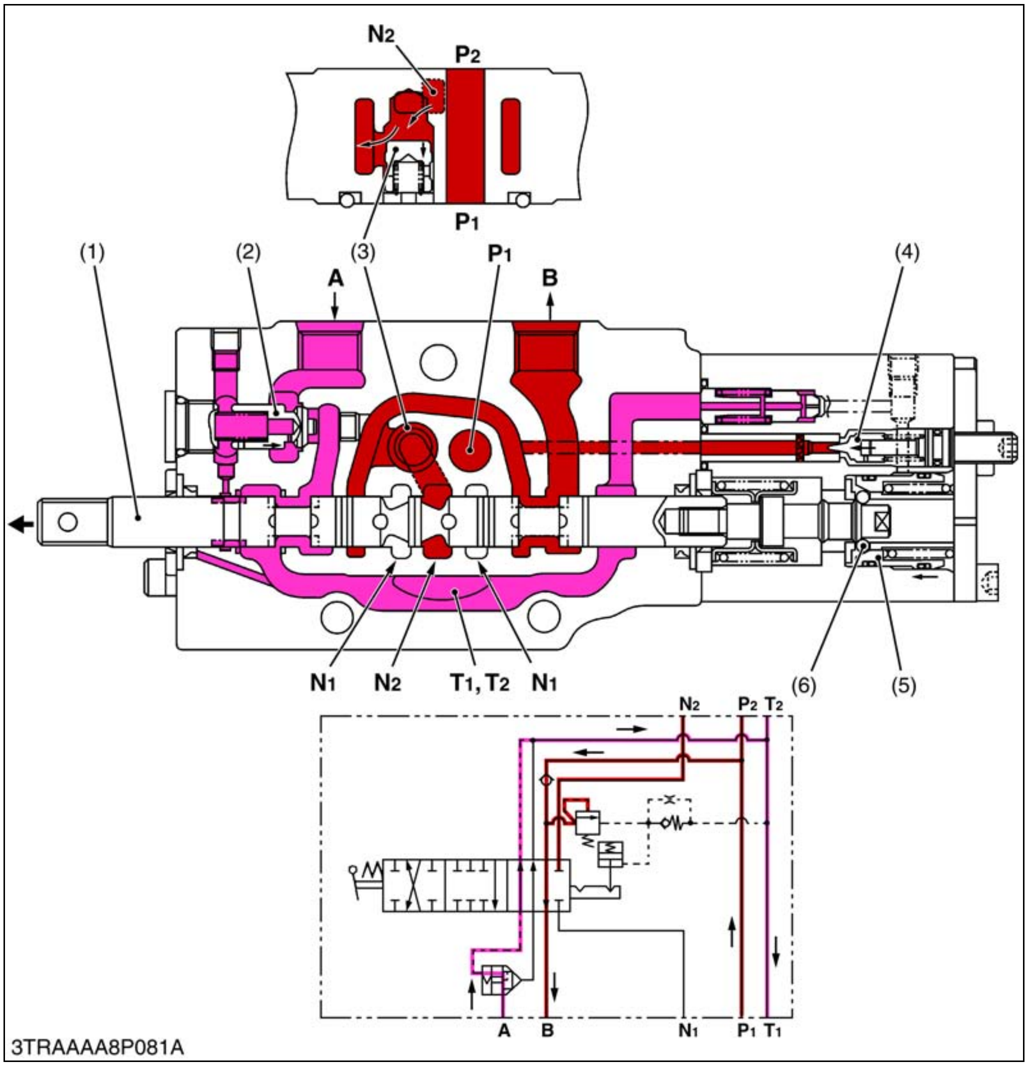
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1026479

As the implement cylinder rises to its uppermost position, pressure at **P_1** port increases. When this pressure exceeds the poppet setting pressure, the pressure-fed oil opens the poppet (4) and moves the detent piston (5) to right. As a result, the spool (1) is returned to **NEUTRAL** position by the tension of spring while the detent balls (6) are moved outside.

■ **Down-1 (When Spool is Held at "Down" Position by Detent)**



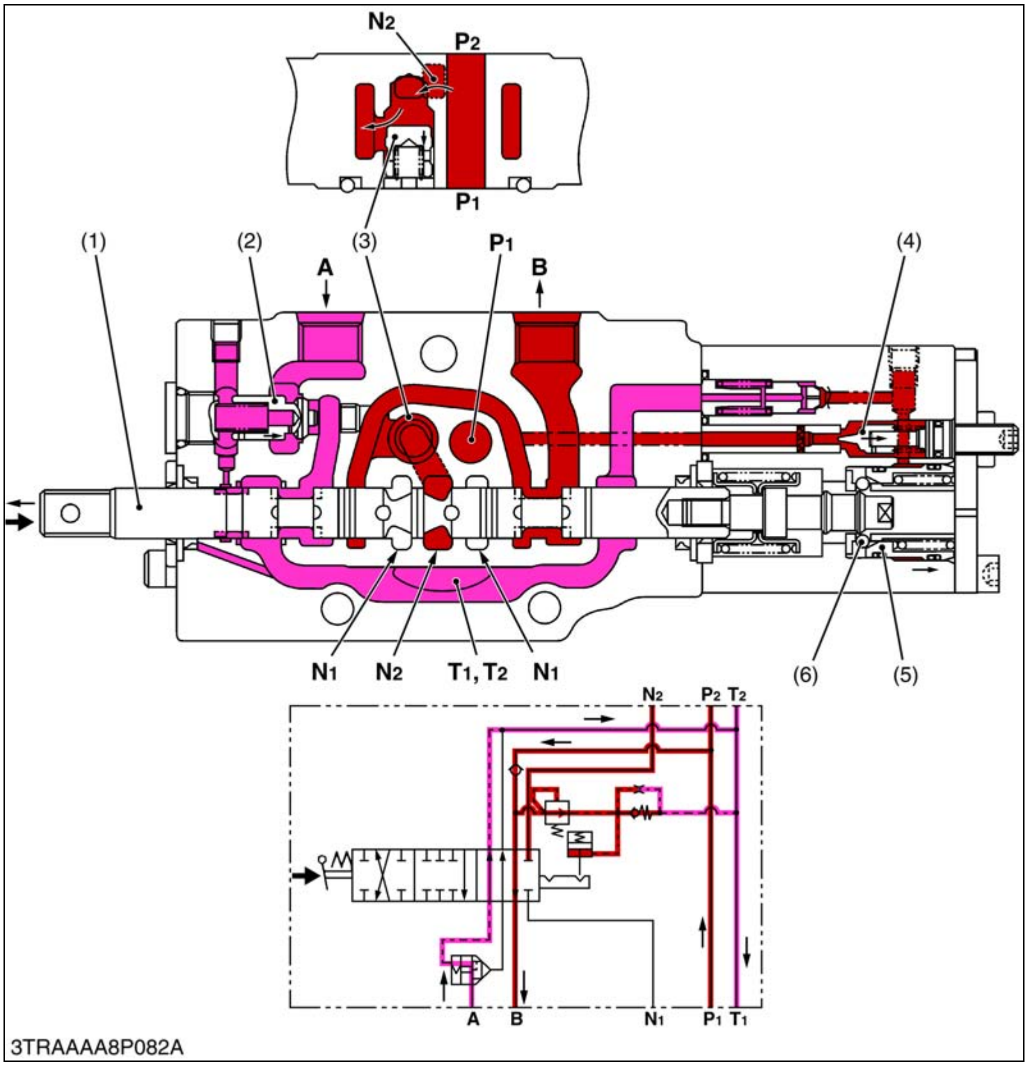
(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1026632

When the spool (1) moves to left, the detent piston (5) and detent ball (6) hold the spool (1) at the **DOWN** position as shown in the figure. The pressure-fed oil in the **P_1** port opens the check valve 1 (2) and flows to implement cylinder via **B** port. The return oil from implement cylinder flows from **A** port to the transmission case through **T_1** port.

■ Down-2 (When “Down” Position is Self-Cancelled)



(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Poppet
(5) Detent Piston
(6) Detent Ball

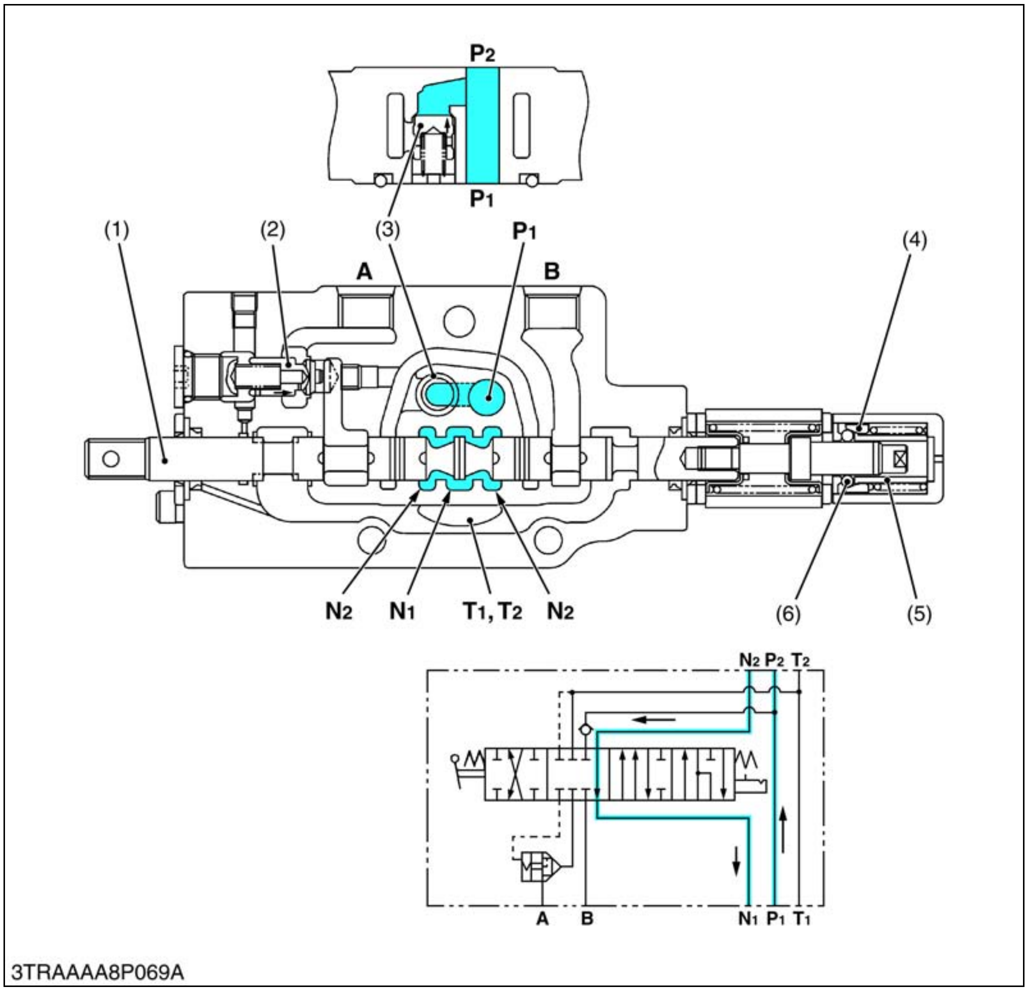
A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1026805

As the implement cylinder lowers to its downmost position, pressure at **P_1** port increases. When this pressure exceeds, the poppet setting pressure, the pressure-fed oil opens the poppet (4) and moves the detent piston (5) to right. As a result, the spool (1) is returned to **NEUTRAL** position by the tension of spring while the detent balls (6) are moved outside.

[4] FLOATING WITH DETENT (IF EQUIPPED)

■ Neutral



(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Detent Ring
(5) Detent Bushing
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1026961

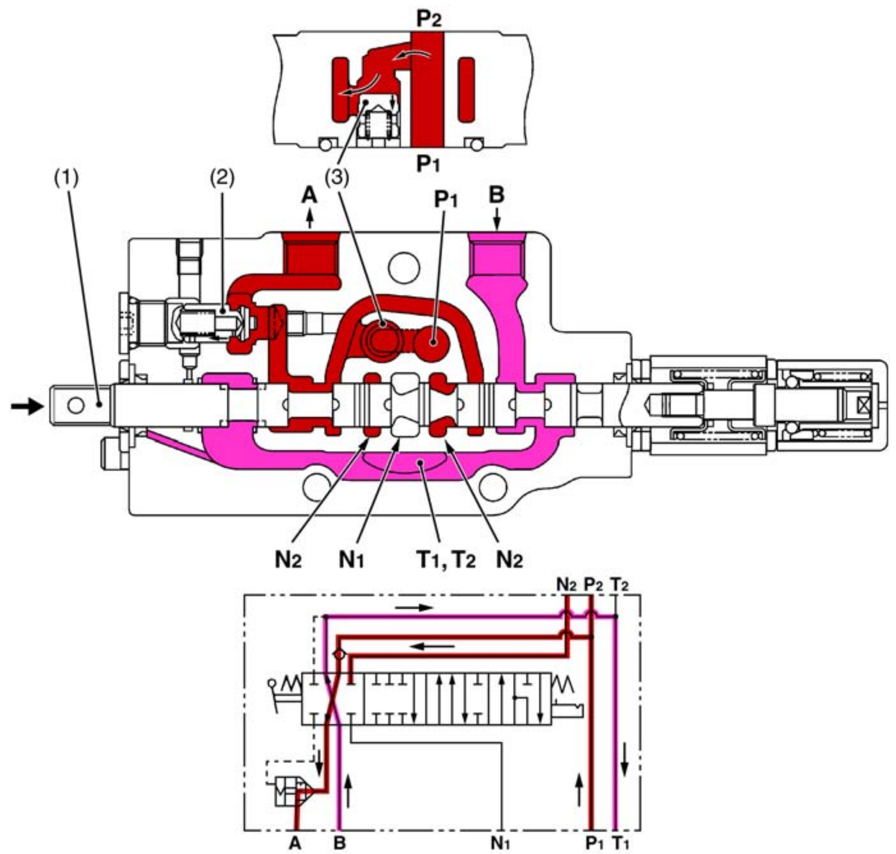
Pressure-fed oil from the hydraulic pump is delivered into the **P_1** port.

As the passage from the **P_1** port to the **A** port or **B** port is blocked by the spool (1), the oil in the **P_1** port flows to **P_2** port across the valve body.

When the auxiliary control valve is in neutral, the oil flows from **P_2** port through the auxiliary control valve and cover.

Then, the oil in the **N_2** port flows along the notched section of the spool (1) to the **N_1** port which leads to the transmission case.

■ Lift



3TRAAAA8P070A

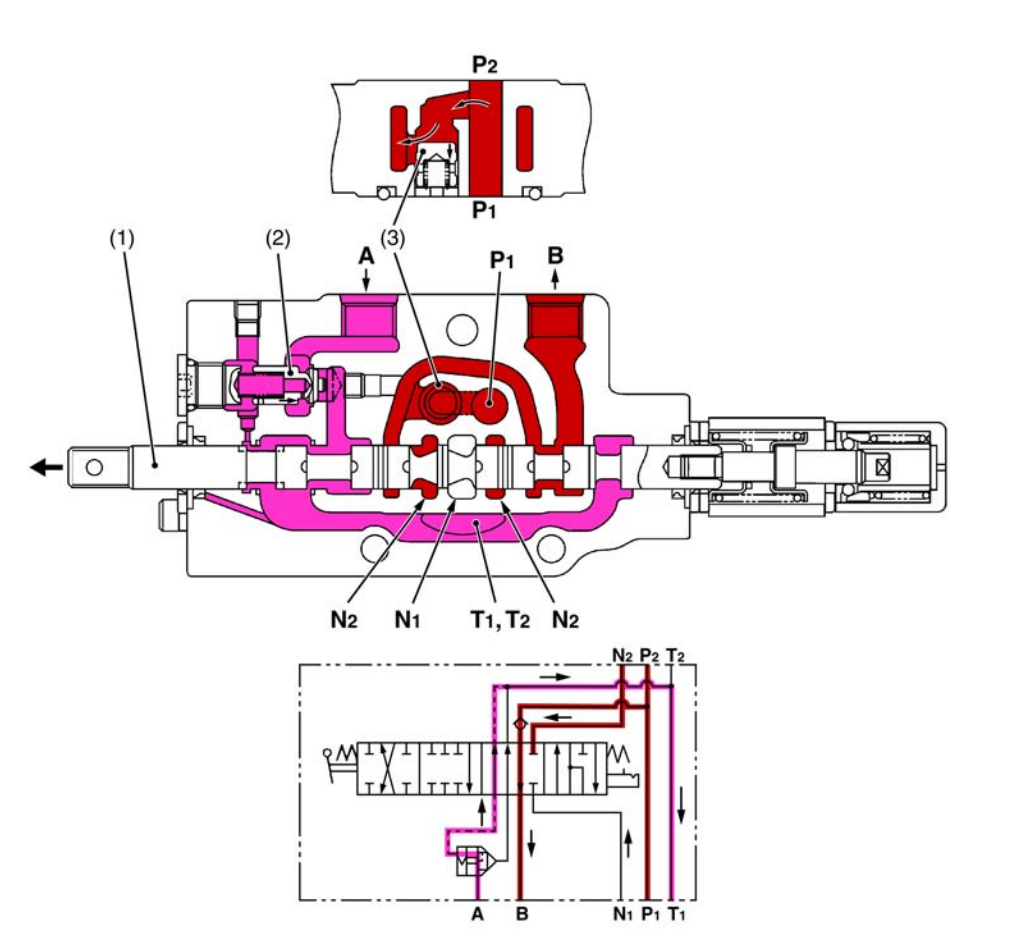
(1) Spool
(2) Check Valve 1
(3) Check Valve 2

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1027450

When the spool (1) moves to the right, the oil passage from **N_2** port to **N_1** port is blocked by the spool (1). Therefore, the pressure-fed oil in the **P_1** port opens the check valves (2), (3) and flows to implement cylinder via **A** port. The return oil from implement cylinder flow from **B** port through the **T_1** port to the transmission case.

■ **Down**



3TRAAAA8P071A

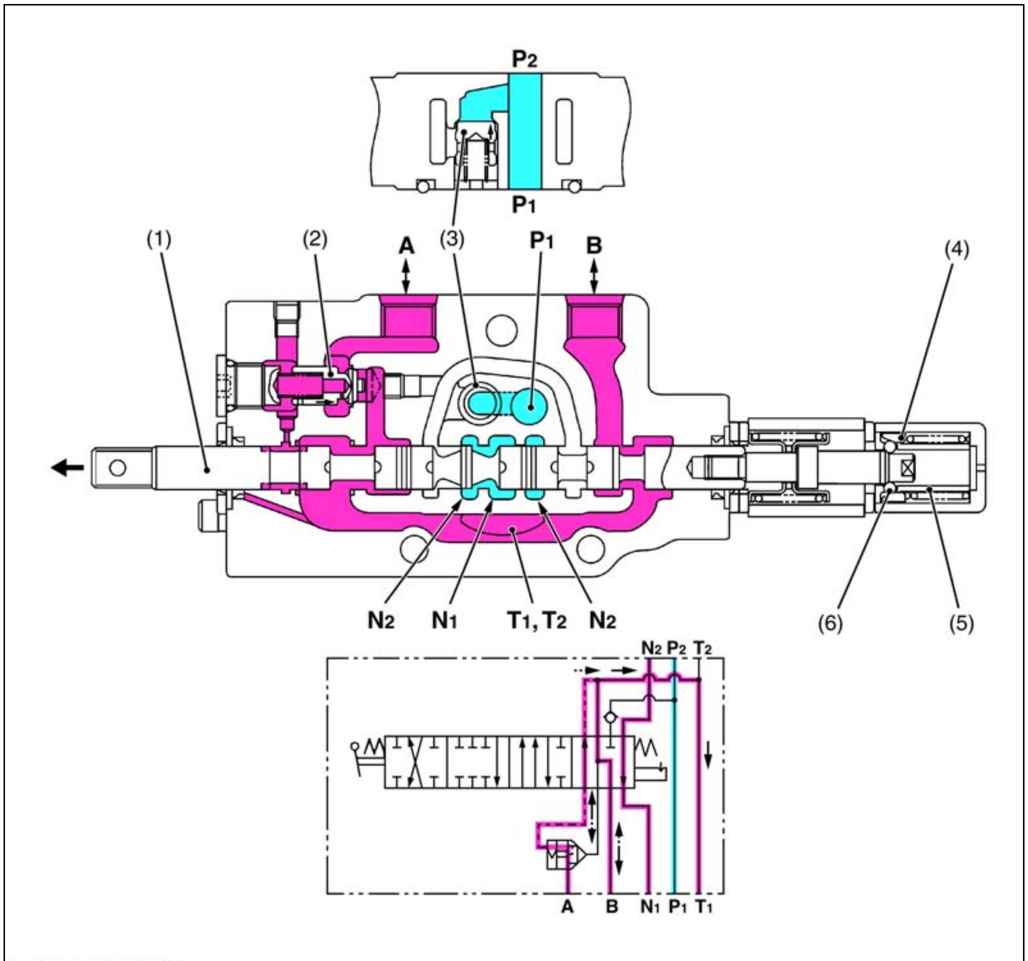
(1) Spool
(2) Check Valve 1
(3) Check Valve 2

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1027607

When the spool (1) moves to the left, the oil passage from **N_2** port to **N_1** port is blocked by the spool (1). Then, the pressure-fed oil in the **P_1** port opens the check valve 2 (3) and flows to implement cylinder via **B** port. The return oil from implement cylinder flow from **A** port through the **T_1** port to the transmission case.

■ Floating



3TRAAAA8P072A

(1) Spool
(2) Check Valve 1
(3) Check Valve 2
(4) Detent Ring
(5) Detent Bushing
(6) Detent Ball

A : A Port
B : B Port
P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

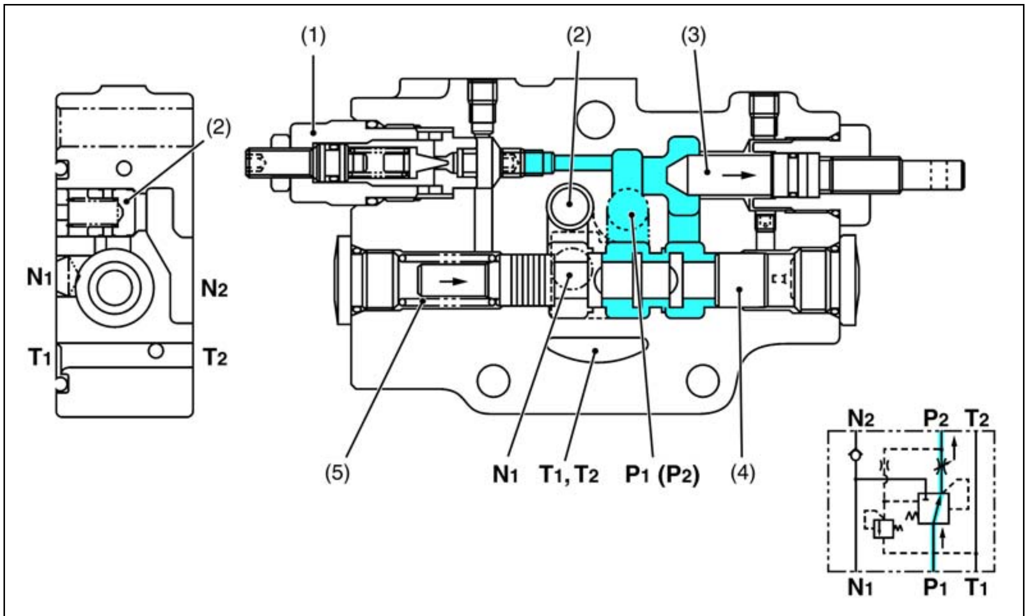
W1027793

When the spool (1) moves to extreme left, the detent ring (4) and detent ball (6) hold the spool (1) at the float position as shown in the figure. The pressure-fed oil from the hydraulic pump flows to transmission case through **N_2** port and **N_1** port. And, the **A** port and **B** port lead to the **T_1** port along the notched sections of the spool (1). This result in the attached implement to follow the contour of the terrain.

[5] FLOW CONTROL VALVE (IF EQUIPPED)

Flow control valve is installed in hydraulic systems to control the quantity of fluid flowing to auxiliary control valves by needle valve.

The needle valve may be used to regulate the speed of a hydraulic cylinder.



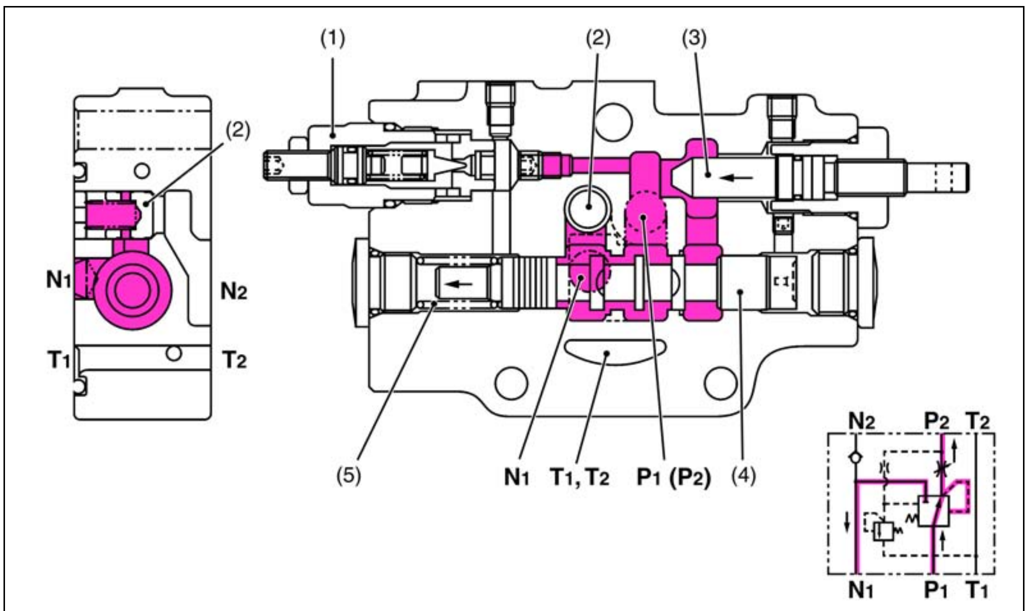
3TRAAAA8P099A

(1) Relief Valve
(2) Check Valve
(3) Needle Valve
(4) Spool
(5) Spring

P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1027940

When the needle valve (3) is wide opened, oil from pump is sent to the **P_2** port only.



3TRAAAA8P100A

(1) Relief Valve
(2) Check Valve
(3) Needle Valve
(4) Spool
(5) Spring

P_1 : P_1 Port (From Hydraulic Pump)
P_2 : P_2 Port (To Auxiliary Control Valve)
N_1 : N_1 Port (To Transmission Case)
N_2 : N_2 Port (From Auxiliary Control Valve)
T_1 : T_1 Port (To Transmission Case)
T_2 : T_2 Port (From Auxiliary Control Valve)

W1028118

When the needle valve (3) is partly closed, pressure in a **P_1** port increases and spool (4) moves to the left. Therefore, oil flowed from the pump is sent to the **N_1** port and **P_2** port.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rises (Not Noise)	• Control linkage improperly assembled or damaged	Repair or replace	8-S13 to S18
	• Control valve malfunctioning (unload valve, spool, check valve, poppet valve)	Repair or replace	8-S22 to S26
	• Control valve broken	Replace	8-S22 to S26
	• Control valve improperly adjusted	Adjust	8-S22 to S26
	• Relief valve spring damaged	Replace	8-S19, S20
	• Hydraulic piston O-ring, cylinder damaged	Replace	8-S28, S29
	• Safety valve damaged	Replace	8-S27
(Noise)	• Transmission fluid improper or insufficient	Change or replenish	G-11
	• Oil filter clogged	Replace	G-17
	• Relief valve setting pressure too low	Adjust	8-S19, S20
	• Relief valve spring weak or damaged	Replace	8-S19, S20
	• Hydraulic pump malfunctioning	Repair or replace	8-S6 to S12
Implement Does Not Reach Maximum Height	• Position rod and feedback rod improperly adjusted	Adjust	8-S13 to S18
	• Draft rod and feedback rod improperly adjusted	Adjust	8-S13 to S18
	• Lever stopper position improper	Adjust	–
Implement Does Not Lower	• Control valve malfunctioning	Repair or replace	8-S22 to S26
	• Spool damaged	Replace	8-S23, S26
	• Poppet valve improperly adjusted (Adjusting screw of poppet valve)	Adjust	8-S23, S26
	• Lowering speed adjusting valve closed	Open	–
Implement Drops by Weight	• Hydraulic cylinder worn or damaged	Replace	8-S31
	• Hydraulic piston O-ring worn or damaged	Replace	8-S28, S29
	• Safety valve damaged	Replace	8-S27
	• Lowering speed adjusting valve damaged	Replace	8-S30
	(Control valve malfunctioning)		
	• Check valve seat surface damaged	Replace	
	• Check valve O-ring damaged	Replace	8-S24, S26
	• Poppet valve seat surface damaged	Replace	8-S24, S26
	• Poppet valve O-ring damaged	Replace	8-S23, S26
			8-S23, S26
Implement Hunts (Moves Up and Down)	• Poppet valve, poppet seat surface damaged	Replace	8-S23, S26
	• Check valve, check valve seat surface damaged	Replace	8-S24, S26
	• Control valve O-ring worn or damaged	Replace	8-S22, S24
Draft Control Malfunctioning	• Draft control linkage improperly adjusted	Adjust	8-S13 to S18
	• Torsion bar weak or broken	Replace	–

W1014322

2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP [Individual Flow Type]

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition • Engine Speed Approx. 2600 min^{-1} (rpm) • Rated Pressure 18.6 MPa 190 kgf/cm^2 2702 psi • Oil Temperature 50 to 60 °C 122 to 140 °F	Delivery Pump 1 (Front Side for Hydraulic) Pump 2 (Rear Side for Power Steering)	Above 38.3 L/min. 10.1 U.S.gals./min. 8.43 Imp.gals./min. Above 20.8 L/min. 5.5 U.S.gals./min. 4.6 Imp.gals./min.	31.9 L/min. 8.4 U.S.gals./min. 7.0 Imp.gals./min. 17.3 L/min. 4.6 U.S.gals./min. 3.8 Imp.gals./min.
Housing Bore	Depth of Scratch	–	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft	O.D.	–	17.968 mm 0.7074 in.
Bushing	Length	–	18.965 mm 0.74665 in.

W1010757

HYDRAULIC PUMP [Combined Flow Type]

Hydraulic Pump Condition • Engine Speed Approx. 2600 min^{-1} (rpm) • Rated Pressure 19.1 MPa 195 kgf/cm^2 2773 psi • Oil Temperature 50 to 60 °C 122 to 140 °F	Delivery Pump 1 (Front Side)	Above 59.1 L/min. 15.6 U.S.gals./min. 13.0 Imp.gals./min.	48.2 L/min. 12.7 U.S.gals./min. 10.6 Imp.gals./min.
Housing Bore	Depth of Scratch	–	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft	O.D.	–	17.968 mm 0.7074 in.
Bushing	Length	–	18.965 mm 0.74665 in.

W1012168

RELIEF VALVE [Individual Flow Type]

Item		Factory Specification	Allowable Limit
Relief Valve Condition • Engine Speed Maximum • Oil Temperature 45 to 55 °C 113 to 131 °F	Setting Pressure	18.6 to 19.1 MPa 190 to 195 kgf/cm^2 2702 to 2773 psi	–

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RELIEF VALVE [Combined Flow Type]

Relief Valve Condition • Engine Speed Maximum • Oil Temperature 45 to 55 °C 113 to 131 °F	Setting Pressure	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi	–

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CYLINDER SAFETY VALVE [M6800(S)]

Cylinder Safety Valve	Opening Pressure	21.1 to 22.6 MPa 215 to 230 kgf/cm^2 3058 to 3271 psi	–

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CYLINDER SAFETY VALVE [M8200 · M9000]

Cylinder Safety Valve	Opening Pressure	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3356 psi	–

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HYDRAULIC CYLINDER [M6800(S)]

Cylinder Bore	I.D.	90.000 to 90.050 mm 3.54330 to 3.54527 in.	90.15 mm 3.5492 in.
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.049 to 0.154 mm 0.00193 to 0.00606 in.	0.50 mm 0.0197 in.
	Clearance (Left)	0.049 to 0.149 mm 0.00193 to 0.00587 in.	0.50 mm 0.0197 in.
Hydraulic Arm Shaft	O.D. (Right)	49.950 to 49.975 mm 1.96653 to 1.96752 in.	–
	O.D. (Left)	44.950 to 44.975 mm 1.76968 to 1.77067 in.	–
Bushing	I.D. (Right)	50.024 to 50.104 mm 1.96944 to 1.97259 in.	–
	I.D. (Left)	45.024 to 45.099 mm 1.77259 to 1.77555 in.	–
Plate and Spool Joint	Distance	62.0 to 63.0 mm 2.44 to 2.48 in.	–

W1011310

HYDRAULIC CYLINDER [M8200 · M9000]

Item		Factory Specification	Allowable Limit
Cylinder Bore	I.D.	100.036 to 100.071 mm 3.93843 to 3.93980 in.	100.15 mm 3.94291 in.
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.140 to 0.250 mm 0.00551 to 0.00984 in.	0.50 mm 0.0197 in.
	Clearance (Left)	0.140 to 0.250 mm 0.00551 to 0.00984 in.	0.50 mm 0.0197 in.
Hydraulic Arm Shaft	O.D. (Right)	59.970 to 60.000 mm 2.36102 to 2.36220 in.	–
	O.D. (Left)	64.970 to 65.000 mm 2.55787 to 2.55906 in.	–
Bushing	I.D. (Right)	60.140 to 60.220 mm 2.36772 to 2.37087 in.	–
	I.D. (Left)	65.140 to 65.220 mm 2.56457 to 2.56772 in.	–
Plate and Spool Joint	Distance	32.5 to 33.5 mm 1.28 to 1.32 in.	–

W1013874

CONTROL LINKAGE [M6800(S)]

Stopper to Top Link Bracket	Clearance	7.0 to 8.0 mm 0.276 to 0.315 in.	–
Position Control Feedback Rod	Length	Approx. 125 mm 4.92 in.	–
Draft Control Rod	Length	Approx. 215 mm 8.46 in.	–

W1013973

CONTROL LINKAGE [M8200 · M9000]

Stopper to Top Link Bracket	Clearance	7.5 to 8.5 mm 0.295 to 0.335 in.	–
Draft Control Lever (The point where the lift arms begin to rise)	Point from Top Position	Approx. 50 mm 1.97 in.	–
Draft Control Rod	Length (Reference)	Approx. 172 mm 6.77 in.	–

W1011509

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 **"6. TIGHTENING TORQUES"** at GENERAL Section.)

Item		N·m	kgf·m	ft-lbs
Control valve mounting screw		19.6 to 23.5	2.0 to 2.4	14.5 to 17.4
Cylinder safety valve		39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Cylinder safety valve lock nut		58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
Hydraulic arm setting screw		39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Relief valve		34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Auxiliary control valve mounting screw	M8 screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
	M10 screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Hydraulic cylinder assembly mounting screw and nut		77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Hydraulic pump assembly mounting screw and nut		23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Hydraulic pipe mounting screw		17.7 to 20.6	1.8 to 2.2	13.0 to 15.9
Housing cover mounting nut		39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Bracket guide mounting screw		23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Rear wheel mounting nut		259.9 to 304.0	26.5 to 31.0	191.7 to 224.2

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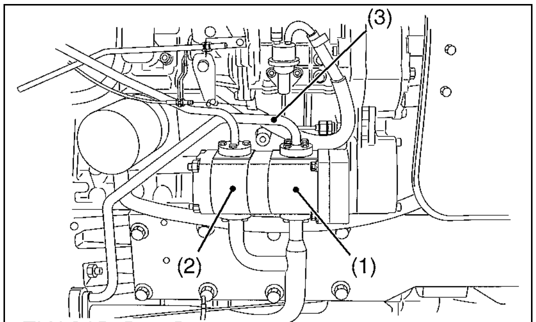
4. CHECKING, DISASSEMBLING AND SERVICING

[1] HYDRAULIC PUMP

(1) Checking



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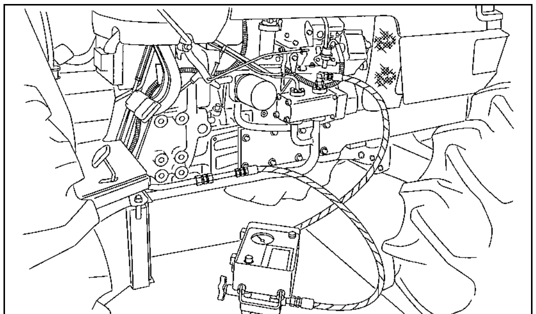
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Hydraulic Flow Test [Individual Flow Type]

■ **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.**

1. Disconnect the delivery pipe (3) which is connected from hydraulic pump (1) to hydraulic cylinder.
2. Install the adaptor **53** and **54** to the pump discharge port. [Adaptor **53** and **54** are included in adaptor set (Code No. 07916-54301).]
3. Install the adaptor **64** to the delivery pipe joint. [Hydraulic adaptor **64** is included in adaptor set (Code No. 07916-54031.)]
4. Connect the hydraulic test hose to the adaptor **53** and flowmeter inlet port.
5. Connect the other hydraulic test hose to the flowmeter outlet port and to hydraulic adaptor **64**.
6. Open the flowmeter loading valve completely. (Turn counterclockwise.)
7. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
8. 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. 50 °C (122 °F).
9. Open the loading valve completely.
10. Set the engine speed. (Refer to condition.)
11. Read and note the pump delivery at no pressure.
12. Slowly close the loading valve to increase rated pressure. (Refer to condition.) As the load is increased, engine speed drops, therefore, reset the engine speed.
13. Read and note the pump delivery at rated pressure.
14. Open the loading valve completely and stop the engine.
15. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition

- Engine speed .... Approx. 2600 min^{-1} (rpm)
- Rated pressure .... 18.6 MPa (190 kgf/cm^2, 2702 psi)
- Oil temperature .... 50 to 60 °C
  122 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 41.7 L/min. 11.0 U.S.gals./min. 9.2 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	38.3 L/min. 10.1 U.S.gals./min. 8.43 Imp.gals./min.
	Allowable limit	31.9 L/min. 8.4 U.S.gals./min. 7.0 Imp.gals./min.

(1) Pump (for 3P Hydraulic)
(2) Pump (for Power Steering)
(3) Delivery Pipe

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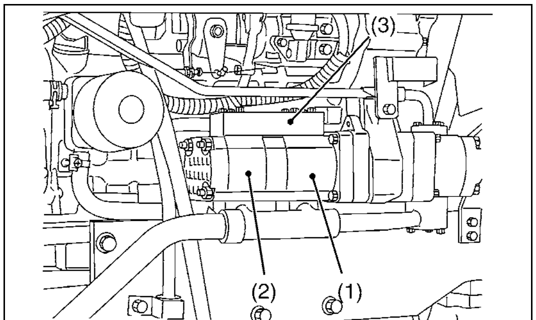

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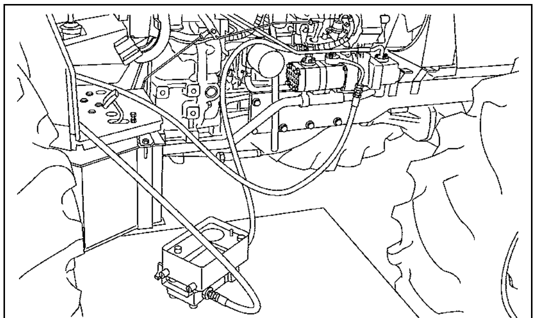
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Hydraulic Flow Test [Combined Flow Type]

■ **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.**

1. Remove the delivery pipe (3).
2. Install the adaptor **53** and **54** to the pump 2 (2) or pump 1 (1) discharge port. [Adaptor **53** and **54** are included in adaptor set (Code No. 07916-54301).]
3. Install the adaptor **64** to the delivery pipe joint. [Hydraulic adaptor **64** is included in adaptor set (Code No. 07916-54031.)]
4. Connect the hydraulic test hose to the adaptor **53** and flowmeter inlet port.
5. Connect the other hydraulic test hose to the flowmeter outlet port and to hydraulic adaptor **64**.
6. Install the adaptor **61** to the pump 1 (1) or pump 2 (2), discharge port. [Adaptor **61** is included in adaptor set (Code No. 07916-54031).]
7. Connect the hydraulic hose to the adaptor **61** and put the end of the hose into the transmission oil port.
8. Open the flowmeter loading valve completely. (Turn counterclockwise.)
9. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
10. 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. 50 °C (122 °F).
11. Open the loading valve completely.
12. Set the engine speed. (Refer to condition.)
13. Read and note the pump delivery at no pressure.
14. Slowly close the loading valve to increase rated pressure. (Refer to condition.) As the load is increased, engine speed drops, therefore, reset the engine speed.
15. Read and note the pump delivery at rated pressure.
16. Open the loading valve completely and stop the engine.
17. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

(1) Pump 1
(2) Pump 2
(3) Delivery Pipe

W1013247

Hydraulic Flow Test [Combined Flow Type] (Continued)

Condition

- Engine speed .... Approx. 2600 min^{-1} (rpm)
- Rated pressure .... 19.1 MPa
  195 kgf/cm^2
  2773 psi
- Oil temperature .... 50 to 60 °C
  122 to 144 °F

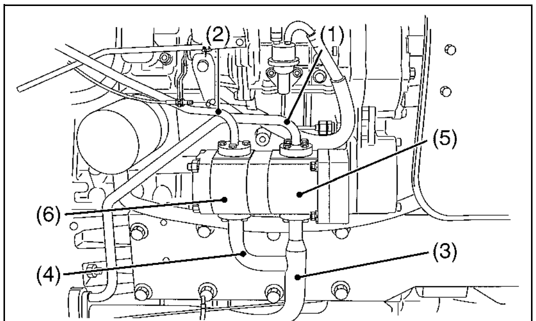
Hydraulic pump delivery at no pressure	Factory spec.	Above 62.5 L/min. 16.5 U.S.gals./min. 13.8 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	59.1 L/min. 15.6 U.S.gals./min. 13.0 Imp.gals./min.
	Allowable limit	48.2 L/min. 12.7 U.S.gals./min. 10.6 Imp.gals./min.

W1013724

(2) Disassembling and Assembling

■ **IMPORTANT**

- **The hydraulic pump is precision machined and assembled : if disassembled once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assembled except when emergency repair is unavoidable.**
- **When repair is required, flow the disassembly and servicing procedures shown below with utmost care.**
- **Be sure to test the hydraulic pump with a flowmeter before disassembling.**
- **After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.**



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Removing Hydraulic Pump [Individual Flow Type]

1. Disconnect the delivery pipe (1), (2) from the hydraulic pump.
2. Disconnect the suction pipe (3), (4) from the hydraulic pump.
3. Remove the hydraulic pump assembly mounting screws and nuts.
4. Take out the hydraulic pump assembly.

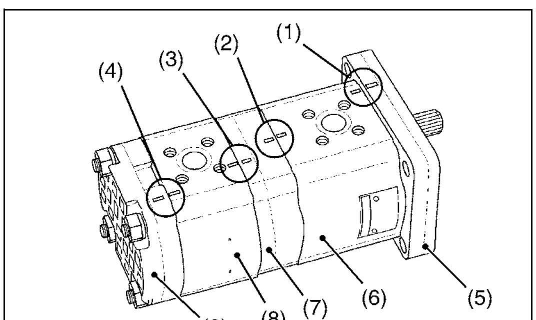
(When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Hydraulic pipe mounting screw	17.7 to 20.6 N·m 1.8 to 2.2 kgf·m 13.0 to 15.9 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Delivery Pipe (Three Point Hydraulic Pump)
(2) Delivery Pipe (Power Steering Pump)
(3) Suction Pipe (Three Point Hydraulic Pump)
(4) Suction Pipe (Power Steering Pump)
(5) Three Point Hydraulic Pump
(6) Power Steering Pump

W1014719



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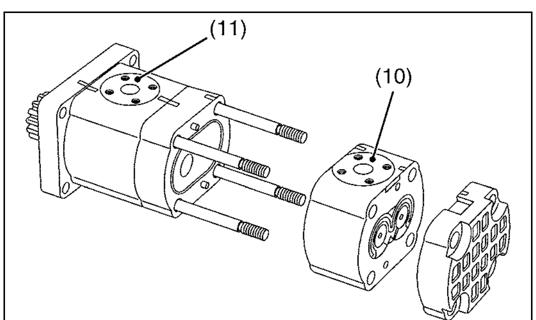

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Separating Three Point System Hydraulic Pump [Individual Flow Type]

1. Put the parting marks (1), (2), (3), (4) on the flange (5), front housing (6), center plate (7), housing (8) and housing cover (9).
2. Unscrew the housing cover mounting nuts and separate the three point system hydraulic pump (11) from the power steering pump (10).

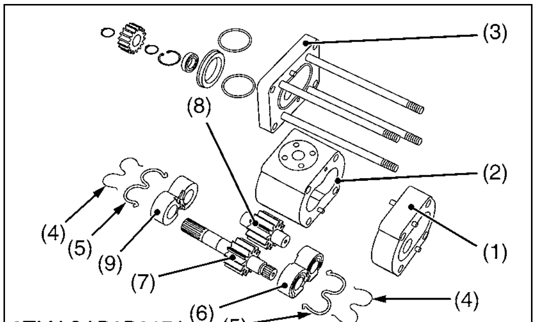
(When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Housing cover mounting nut	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) Parting Mark
(3) Parting Mark
(4) Parting Mark
(5) Flange
(6) Front Housing (Three Point System Hydraulic Pump)
(7) Center Plate
(8) Housing (Power Steering Pump)
(9) Housing Cover
(10) Power Steering Pump
(11) Three Point System Hydraulic Pump

W1014912



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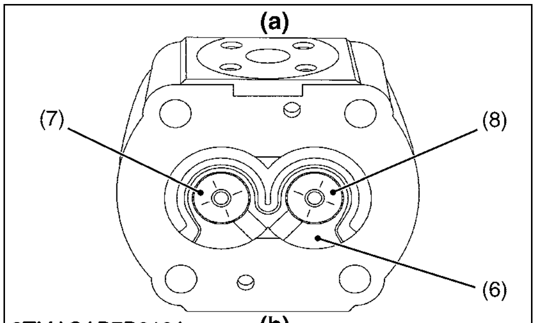

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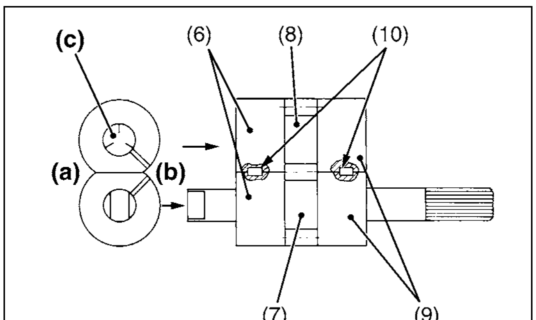

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Disassembling Three Point System Hydraulic Pump [Individual Flow Type]

1. Remove the flange (3) and center plate (1).
2. Remove the backup element (4) and seal element (5).
3. Remove the bushings (6) and (9).
4. Remove the drive gear (7) and driven gear (8).

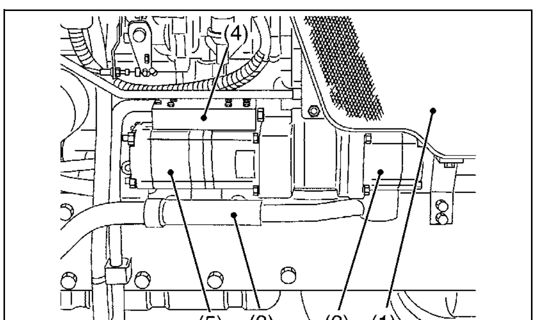
(When reassembling)

- When installing the bushing (6) and (9), be sure to reassemble them to the each original position and direct bushing grooves to inlet side as shown in the figure.
- Install the driven gear (8) in the correct direction as shown in the figure.
- Take care not to damage the seal element (5), backup element (4) and O-ring.
- Take care not to lose or damage the keys (10) joining the two bushings.

(1) Center Plate
(2) Housing
(3) Flange
(4) Backup Element
(5) Seal Element
(6) Bushing
(7) Drive Gear
(8) Driven Gear
(9) Bushing
(10) Key

(a) Inlet
(b) Outlet

W1015085



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Removing Three Point System Hydraulic Pump [Combined Flow Type]

1. Remove the side cover (1).
2. Disconnect the suction pipe (3) from the power steering hydraulic pump (2) and (5).
3. Disconnect the delivery pipe (4) from the hydraulic pump (5).
4. Remove the hydraulic pump (5) assembly mounting screws.
5. Take out the hydraulic pump (5) assembly.

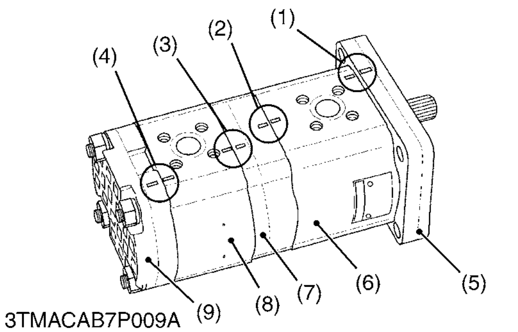
(When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Hydraulic pipe mounting screw	17.7 to 20.6 N·m 1.8 to 2.2 kgf·m 13.0 to 15.9 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Side Cover
(2) Power Steering Hydraulic Pump
(3) Suction Pipe
(4) Delivery Pipe
(5) Three Point System Hydraulic Pump

W1015532



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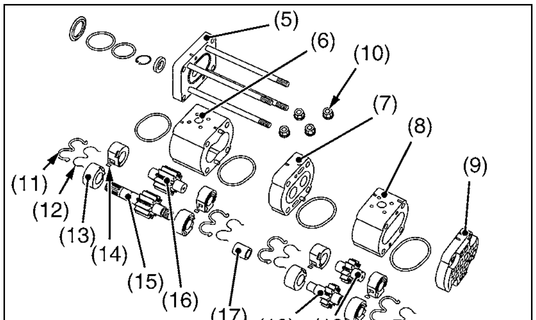

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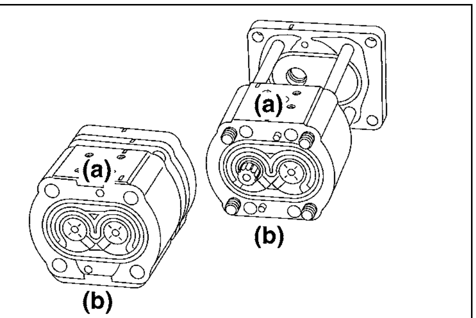

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Disassembling Tandem Pump [Combined Flow Type]

1. Put a parting mark (1), (2), (3), (4) on the flange (5), front flange (6), center plate (7), housing (8) and cover (9).
2. Unscrew the mounting nuts (10), and separate the cover (9), housing (8), center plate (7) and front housing (6) from the mounting flange (5).
3. Remove the backup elements (12) and seal elements (11).
4. Remove the bushings (13) and keys (14).
5. Remove the drive gear (15), (18) and driven gear (16), (19).

(When reassembling)

- Install the driven gear (16), (19), noting its original direction. (See figure.)
- When installing the bushings (13), be sure to reassemble them to each original position and direct bushing grooves to inlet side. (See figure.)
- Use care not to damage the oil seal, seal element (11), backup element (12) and O-rings.
- After reassembly, check the smooth rotation of the hydraulic pump (for example, mount arm an approx. 100 mm long to the driven gear and rotate its arm slowly for smooth rotation).

Tightening torque	Housing cover mounting nut	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

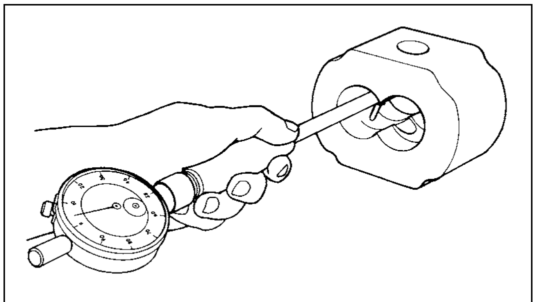
(1) Parting Mark
(2) Parting Mark
(3) Parting Mark
(4) Parting Mark
(5) Flange
(6) Front Housing
(7) Center Plate
(8) Housing
(9) Cover
(10) Nuts
(11) Seal Elements

(12) Backup Elements
(13) Bushings
(14) Keys
(15) Drive Gear
(16) Driven Gear
(17) Coupling
(18) Drive Gear
(19) Driven Gear

(a) Inlet
(b) Outlet

W1015724

(3) Servicing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Housing Bore

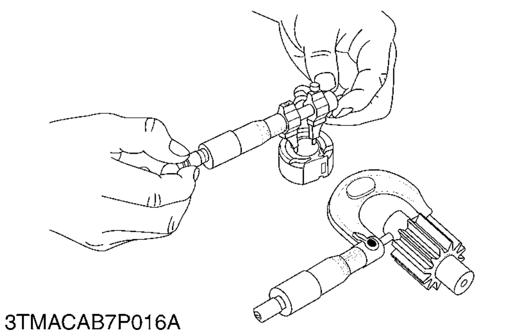
1. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
2. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.

(Reference)

- Use a cylinder gauge to measure the housing I.D..

W1032896


3TMACAB7P016A

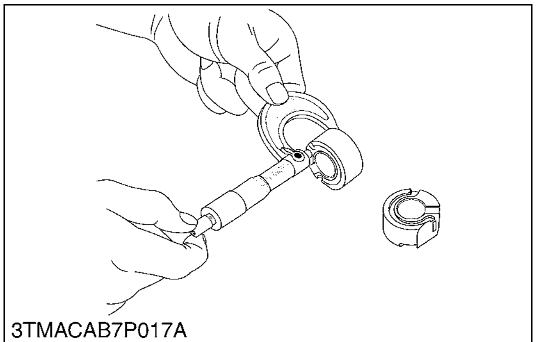
Clearance between Bushing and Gear Shaft

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

Clearance between bushing and gear shaft	Allowable limit	0.15 mm 0.0059 in.

Gear shaft O.D.	Allowable limit	17.968 mm 0.7074 in.

W1046334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Bushing Length

1. Measure the bushing length with an outside micrometer.
2. If the length is less than the allowable limit, replace it.

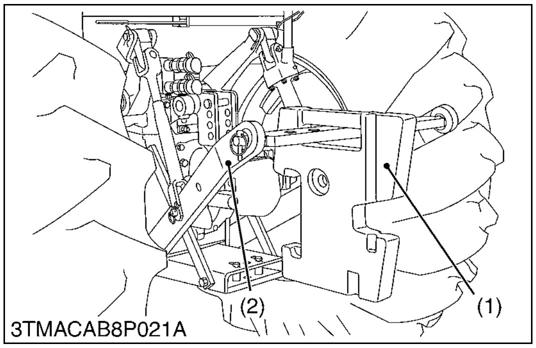
Bushing length	Allowable limit	18.965 mm 0.74665 in.

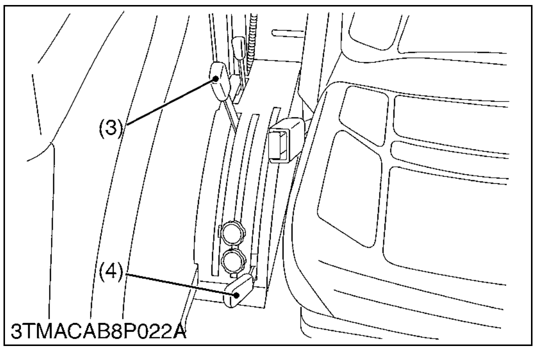
W1033614

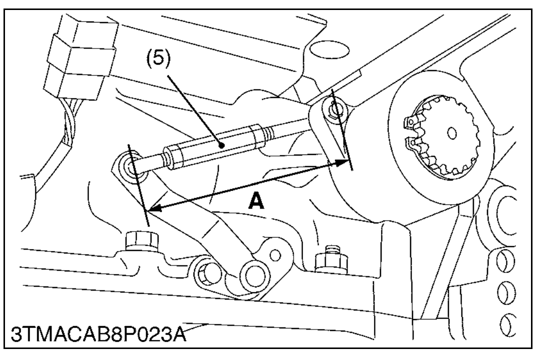
[2] POSITION CONTROL AND DRAFT CONTROL LINKAGE

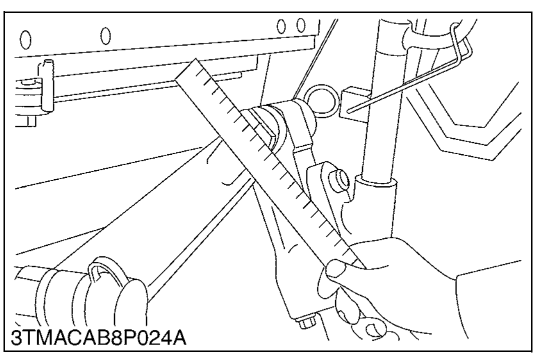
(1) Checking and Adjusting

(A) M6800(S)









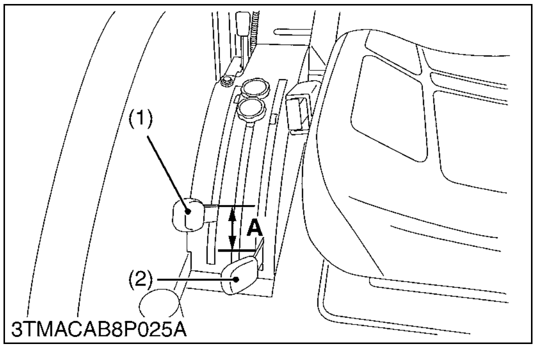
Adjusting Uppermost Position of Lift Arm

1. Attach the weight (1) of 490 N (50 kgf, 110 lbs) to the end of lower link (2).
2. Set the position control lever (3) and draft control lever (4) to the lowest position.
3. Start the engine, and set the engine speed at the 1000 min^{-1} (rpm).
4. Set the position control lever (3) to the uppermost position.
5. Shorten the feedback rod by turning the turnbuckle (5) until the relief valve begins to be operated.
6. From the feedback rod position obtained above 5, turn the turnbuckle by 1.5 turn to lengthen the feedback rod, then tighten the lock nut.
7. Move the position control lever down then all the way up. Stop the engine and check that the lift arm has 5 to 20 mm (0.20 to 0.79 in.) play upward on its edge.
8. If the specified play is not obtained, repeat from 4 again.

Position control feedback rod **A**	Factory spec.	Approx. 125 mm 4.92 in.

(1) Weight
(2) Lower Link
(3) Position Control Lever
(4) Draft Control Lever
(5) Turnbuckle

W1018250



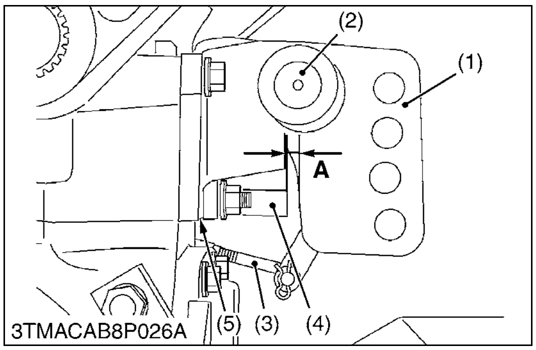
Checking Floating Position

1. Attach the weight of 490 N (50 kgf, 110 lbs) to the end of lower link.
2. Set the position control lever (1) and draft control lever (2) to the lowest position, and set the engine speed at the maximum.
3. Gradually move the position control lever (1) until the lower link begins to rise.
4. Check the distance **A**.
5. If the specified play is not obtained, readjust the feedback rod. (Refer to Adjusting of uppermost position section.)

Distance **A**	Factory spec.	10 to 50 mm 0.39 to 1.97 in.

(1) Position Control Lever (2) Draft Control Lever

W1018957



Adjusting Top Link Bracket

1. Measure the clearance **A** between the stopper (4) and top link bracket (1).
   If the clearance is not within the factory specifications, adjust with the shims (5) between the stopper (4) and top link bracket (1).

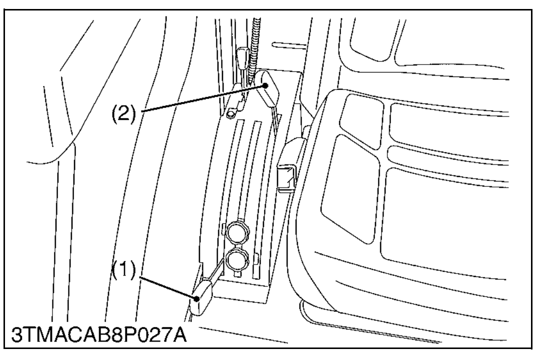
Clearance **A**	Factory spec.	7.0 to 8.0 mm 0.276 to 0.315 in.

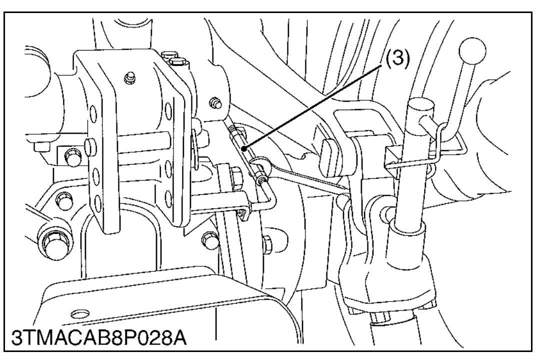
(Reference)

- Thickness of shim (5) : 0.5 mm (0.020 in.)

(1) Top Link Bracket
(2) Torsion Bar
(3) Draft Control Rod
(4) Stopper
(5) Shim

W1019136





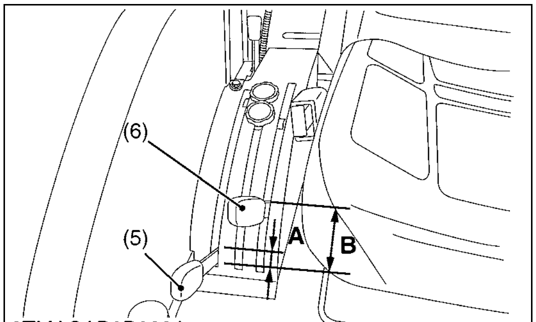
Adjusting Draft Control Rod

1. Attach a weight of approx. 490 N (50 kgf, 110 lbs) to the end of the lower link.
2. Set the position control lever (1) to the lowest position.
3. Start the engine and set the speed at 1000 min^{-1} (rpm).
4. Set the draft control lever (2) to the uppermost position.
5. Lengthen the draft control rod (3) by turning the turnbuckle until the relief valve begins to be operated.
6. From the draft control rod position obtained above 5, turn the turnbuckle by 1/2 turn to shorten the draft control rod, then tighten the lock nut.

Draft control rod length	Factory spec.	Approx. 215 mm 8.46 in.

(1) Position Control Lever
(2) Draft Control Lever
(3) Draft Control Rod

W1019342



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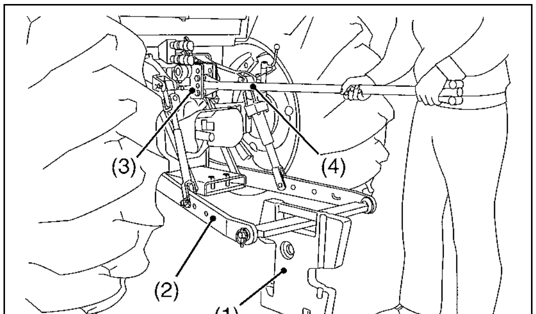


3TMACAB8P030A

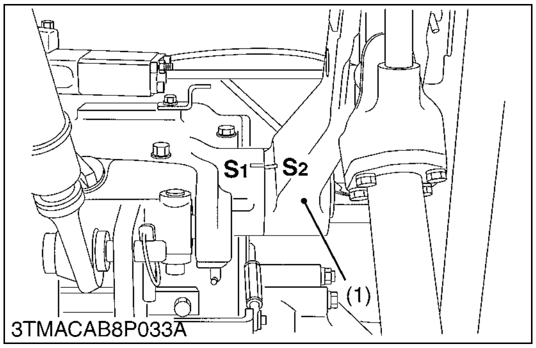
Checking Floating Position

1. Attach the weight (1) of 490 N (50 kgf, 110 lbs) to the end of lower link (2).
2. Set the position control lever (5) and draft control lever (6) to the lowest position.
3. Attach the test bar (4) (refer to **"9. SPECIAL TOOLS"** at GENERAL Section) to the top link bracket (3).
4. Start the engine, and set the engine speed at the maximum.
5. Set the draft control lever upward by approx. 10 mm **A** (0.39 in.) from the lowest position.
6. Press the test bar (4) downward until the top link bracket (3) comes in contact with the stopper.
7. Confirm that the lower link (draft control) will not operate.
8. Set the draft control lever upward by approx. 50 mm **B** (1.97 in.) from the lowest position.
9. Press the test bar (4) downward until the top link bracket (3) comes in contact with the stopper.
10. Confirm that the lower link begin to rise.
11. After adjustment, tighten the lock nut firmly.
12. If the specified play is not obtained, readjust the feedback rod. (Refer Adjusting Draft Control Position Section.)

(1) Weight
(2) Lower Link
(3) Top Link Bracket
(4) Test Bar
(5) Position Control Lever
(6) Draft Control Lever

W1019552

(B) M8200 · M9000



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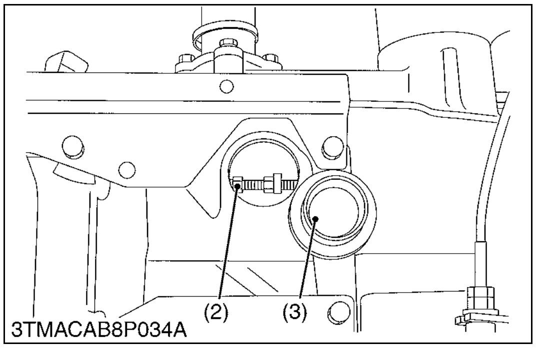

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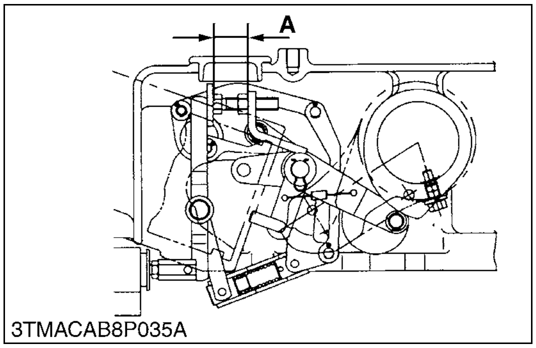

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Adjusting the Uppermost Position of Lift Arm

1. Move the position and draft control levers all the way down.
2. Raise the lift arm (1) to the top dead center by hand, and mark the hydraulic cylinder housing and the lift arm with $\mathbf{S_1}$ and $\mathbf{S_2}$ respectively.
3. Attach a weight of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
4. Start the engine and set the speed at 1000 min^{-1} (rpm).
5. Move the draft control lever all the way up, and measure the offset which is the distance between $\mathbf{S_1}$ and $\mathbf{S_2}$.
6. If the offset is not within the factory specifications, remove the plug (3) and adjust the distance **A** by adjusting screw (2).

■ **NOTE**

- **When the offset is smaller, loosen the adjusting screw (2), and when larger, tighten it.**
  After adjusting the adjusting screw (2), secure it with the lock nut.

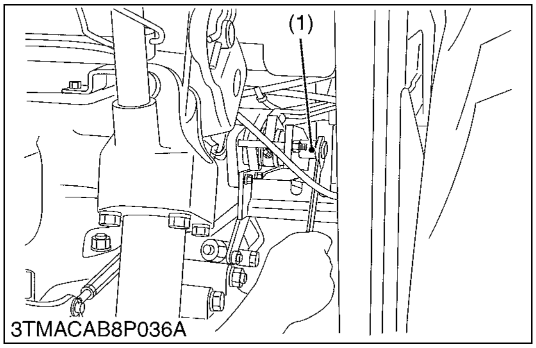
Offset $\mathbf{S_1}$ and $\mathbf{S_2}$	Factory spec.	3.0 to 4.0 mm 0.118 to 0.157 in.

(Reference)

Distance **A**	Factory spec.	Approx. 37.0 mm 1.46 in.

(1) Lift Arm
(2) Adjusting Screw
(3) Plug

W1016709



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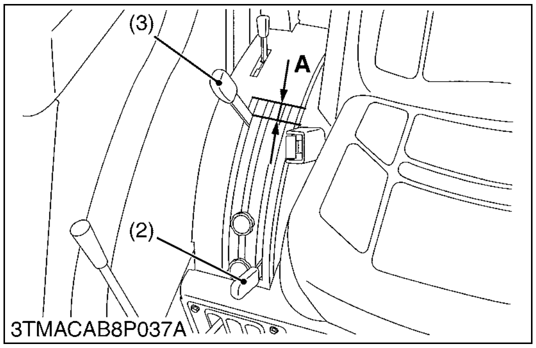

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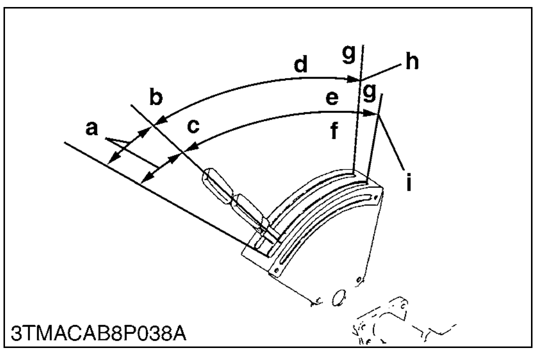


3TMACAB8P038A

Adjusting Position Control Lever

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 speed at 1000 min^{-1} (rpm).
3. Move the draft control lever (2) all the way down and shift the position control lever (3) downward by approx. 20 mm (0.79 in.) (**A**) from the lever guide upper end.
4. Turn the position control shaft (1) with an open end wrench so as to adjust the offset within the factory specifications (Refer to **"Adjusting the Uppermost Position of Lift Arm"** on page 8-S16).
5. Secure the position control lever (3) all the way down position to check that the floating range can be obtained.

(Reference)

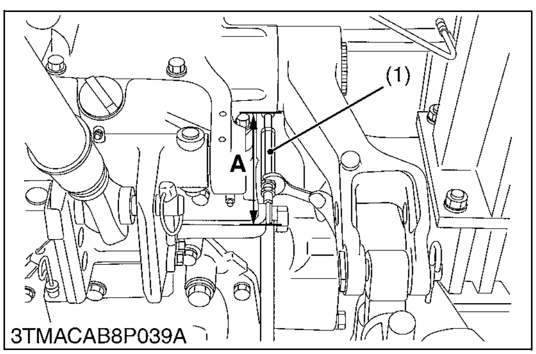
- The specification of the floating range (**a**) is 50.0 to 90.0 mm (1.97 to 3.54 in.) from lever guide lower end.
  If the floating range (**a**) is not within the specification, readjust the **"Adjusting Position Control Lever"**.

Length **A**	Factory spec.	ROPS model	20.0 mm 0.79 in.
		Cabin model	25.0 mm 0.98 in.

(1) Position Control Shaft
(2) Draft Control Lever
(3) Position Control Lever

A : 20.0 mm (0.79 in.)
a : Floating Range
b : Down
c : Deep
d : Position Range
e : Shalow
f : Draft Range
g : Up
h : Position Control
i : Draft Control

W1016991



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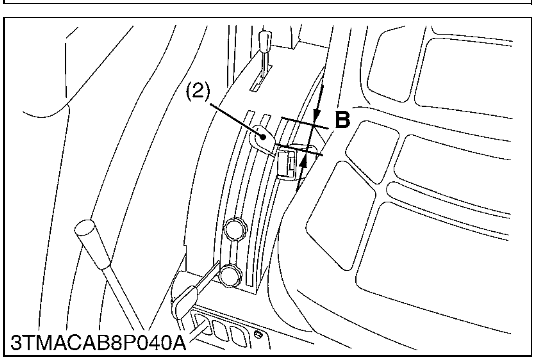


3TMACAB8P040A

Adjusting Draft Control Rod

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 speed at 1000 min^{-1} (rpm).
3. Move the position control lever and draft control lever (2) all the way down.
4. Slowly shift the draft control lever (2) to lever guide upper end and check the point where the lift arms begin to rise.
5. If the point of draft control lever (2) where the lift arms begin to rise is not within the range **B**, adjust the length of the draft control rod (1).

■ **NOTE**

- **After adjusting the draft control rod (1), secure the turnbuckle by the lock nuts.**

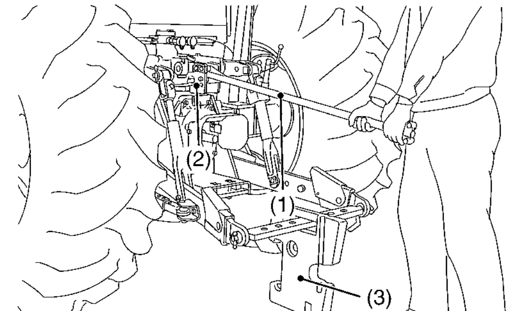
Draft control rod length **A**	Reference value	Approx. 172.0 mm 6.77 in.

Point **B** of draft control lever from lever guide upper end	Factory spec.	50.0 mm 1.97 in.

(1) Draft Control Rod
(2) Draft Control Lever

A : Draft Control Rod Length
B : 50 mm (1.97 in.)

W1017318



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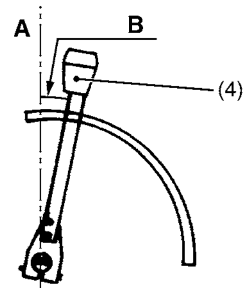

3TMACAB8P042A

Lifting Range Check

1. Attach the weight (3) of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Attach the test bar (1) (refer to **"9. SPECIAL TOOL"** at GENERAL Section) to the top link bracket (2).
3. Start the engine and set the speed at 1000 min^{-1} (rpm).
4. Move the position control lever all the way down.
5. Shift the draft control lever (4) downward by approx. 15.0 mm (0.59 in.) : ROPS model, 35 mm (1.38 in.) : Cabin model from the lever guide upper end.
6. Raise the test bar (1) until the top link bracket (2) comes in contact with the bracket stopper.
7. While raising the test bar, check to see that the lift arms do not lower.
8. If the lift arms lower at this point, lengthen the draft control rod.

Lifting range **B**	Factory spec.	ROPS model	15.0 mm 0.59 in.
		Cabin model	35.0 mm 1.38 in.

(1) Test Bar
(2) Top Link Bracket
(3) Weight
(4) Draft Control Lever

A : Lever Guide Upper End
B : Lifting Range

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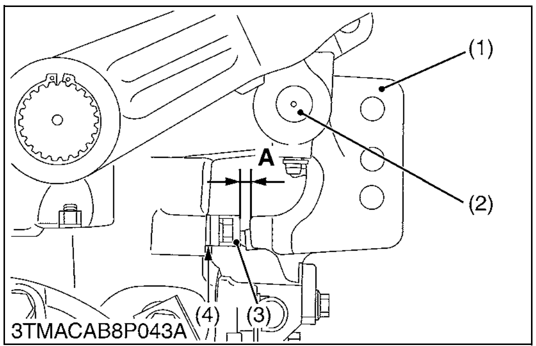

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Adjusting Top Link Bracket

1. Measure the clearance (**A**) between the stopper (3) and top link bracket (1).
   If the clearance is not within the factory specifications, adjust with the shims (4) between the stopper (3) and top link bracket (1).

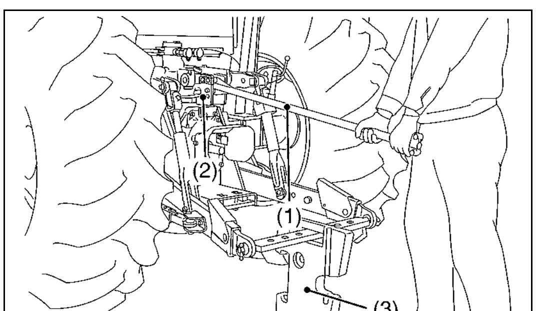
Clearance (**A**)	Factory spec.	7.5 to 8.5 mm 0.295 to 0.335 in.

(Reference)

- Thickness of shim (4) : 0.5 mm (0.020 in.), 1.0 mm (0.040 in.)

(1) Top Link Bracket
(2) Torsion Bar
(3) Stopper
(4) Shim

W1018097



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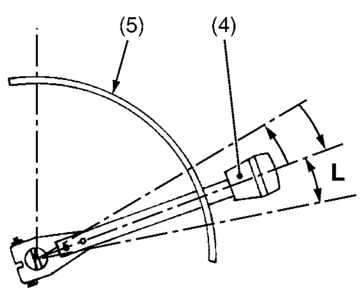

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Floating Range Check

1. Attach the weight (3) of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Attach the test bar (1) (refer to **"9. SPECIAL TOOLS"** at GENERAL Section) to the top link bracket (2).
3. Start the engine and set the speed at 1000 min^{-1} (rpm).
4. Move the draft and position control lever all the way down.
5. Press the test bar (1) downward until the top link bracket (2) comes in contact with the stopper.
6. Slowly shift the draft control lever (4) upward until the lift arms begin to rise. Then slowly shift the draft control lever (4) downward until the lift arms begin to down, measure the travel distance **L** of the draft control lever (4) on the lever guide (5).
7. If **L** is shorter than 15 mm (0.591 in.), shorten the draft control rod.

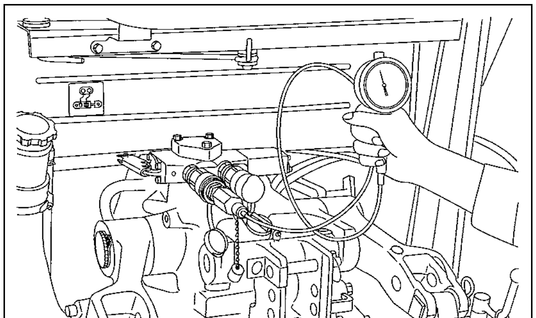
Floating range **L**	Factory spec.	More than 15.0 mm 0.59 in.

(1) Test Bar
(2) Top Link Bracket
(3) Weight
(4) Draft Control Lever
(5) Lever Guide
L : Floating Range

W1017829

[3] RELIEF VALVE

(1) Checking and Adjusting



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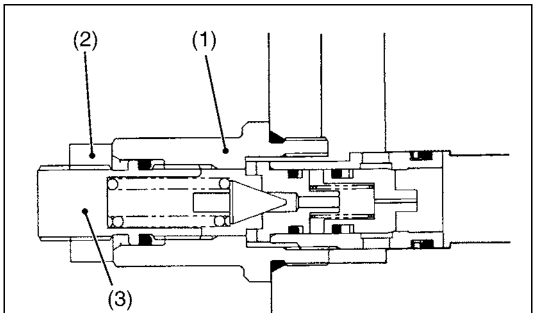


3TMACAB8P046A

<u>Relief Valve Setting Pressure Test Using Pressure Tester (Coupler) [M8200, M9000]</u>

1. Set the Relief Valve Set Pressure Adaptor **G** (Code No. 07916-52751) to the half male of the quick coupler and then set a pressure gauge (Code No. 07916-50321), 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).

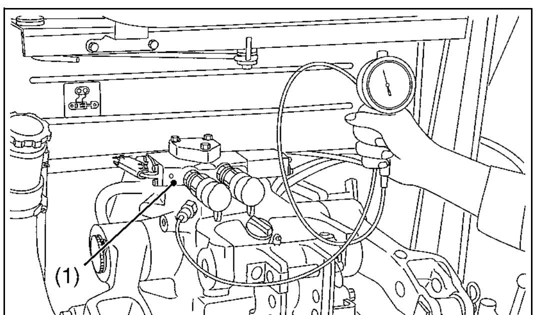
Condition

- Engine speed .... Maximum
- Oil temperature .... 45 to 55 °C
  113 to 131 °F

Relief valve setting pressure	Factory spec.	Use for individual flow type	18.6 to 19.1 MPa 190 to 195 kgf/cm^2 2702 to 2773 psi
		Use for combined flow type	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi

(1) Relief Valve
(2) Lock Nut
(3) Adjuster

W1020001



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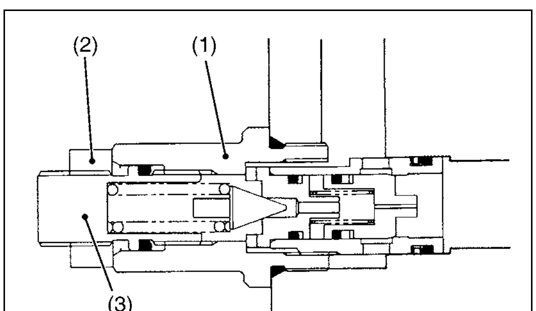


3TMACAB8P046A

<u>Relief Valve Setting Pressure Test Using Pressure Tester (Cylinder Block) [M8200, M9000]</u>

1. Set the Relief Valve Set Pressure Threaded Joint (Code No. 07916-50341) to the hydraulic cylinder body, and then set a pressure gauge (Code No. 07916-50321), 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).

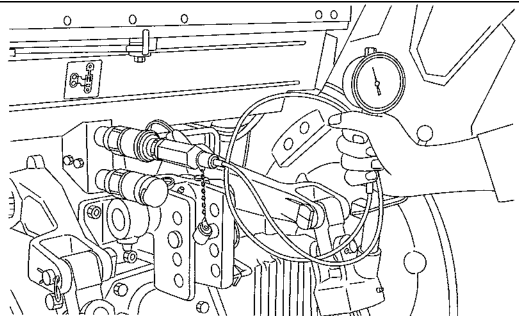
Condition

- Engine speed .... Maximum
- Oil temperature .... 45 to 55 °C
  113 to 131 °F

Relief valve setting pressure	Factory spec.	Use for individual flow type	18.6 to 19.1 MPa 190 to 195 kgf/cm^2 2702 to 2773 psi
		Use for combined flow type	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi

(1) Relief Valve
(2) Lock Nut
(3) Adjuster

W1020225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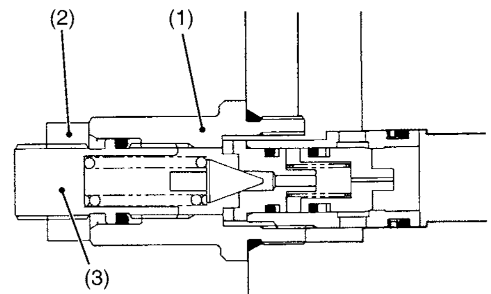

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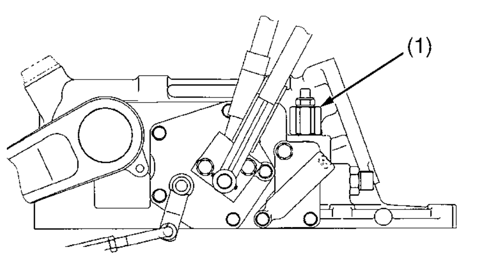


3TMACAB8P049A

Relief Valve Setting Pressure Test Using Pressure Tester (Coupler) [M6800(S)]

1. Set the Relief Valve Set Pressure Adaptor **G** (Code No. 07916-52751) to the half male of the quick coupler and then set a pressure gauge (Code No. 07916-50321), 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

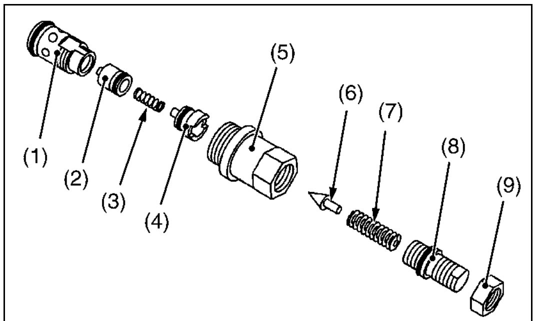
- Engine speed .... Maximum
- Oil temperature .... 45 to 55 °C
  113 to 131 °F

Relief valve setting pressure	Factory spec.	18.6 to 19.1 MPa 190 to 195 kgf/cm^2 2702 to 2773 psi

(1) Relief Valve
(2) Lock Nut
(3) Adjuster

W1020510

(2) Disassembling and Assembling



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Relief Valve

1. Remove the lock nut (9).
2. Remove the adjuster (8), and draw out the spring (7) and then pilot valve (6).
3. Remove the valve seat (1), and draw out the valve seat (4), the spring (3) and the main valve (2).

(When reassembling)

- Take care not to damage the O-rings.

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.**

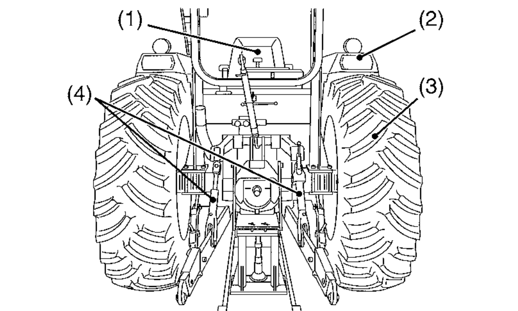
(1) Valve Seat
(2) Main Valve
(3) Spring
(4) Valve Seat
(5) Valve Body
(6) Pilot Valve
(7) Spring
(8) Adjuster
(9) Lock Nut

W1020796

[4] HYDRAULIC CYLINDER AND POSITION CONTROL VALVE

(1) Disassembling and Assembling

(A) Separating Hydraulic Cylinder Assembly



3TMACAB2P034A

Rear Wheel and Fenders

1. Place disassembling stand under the transmission case.
2. Remove the three point linkage (4).
3. Remove the rear wheel (3).
4. Disconnect the **6P** connector for hazard and tail light.
5. Disconnect the jumper leads for PTO safety switch.
6. Remove the fenders (2).
7. Remove the seat (1).

(When reassembling)

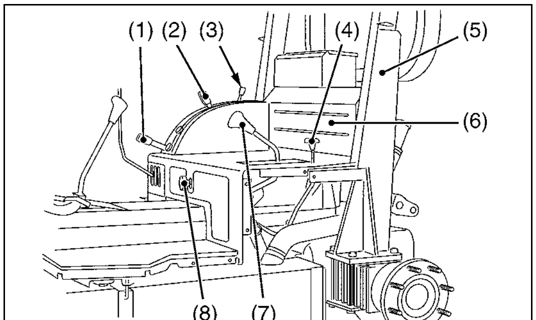
■ **IMPORTANT**

- **Be sure to assemble the seat switch 2P connector to the harness connector with Red / Green and Orange / White color wire. (If equipped OPC system.) (Refer to 9. ELECTRICAL SYSTEM.)**

Tightening torque	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

(1) Seat
(2) Fender
(3) Rear Wheel
(4) Three Point Linkage

W1021709



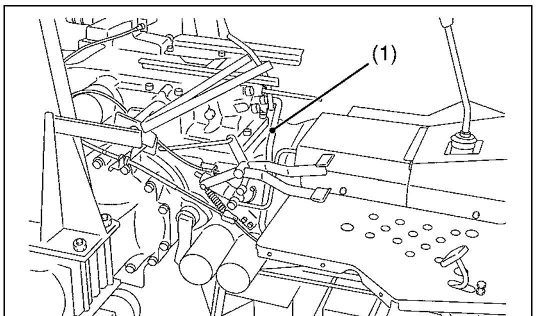
3TMACAB2P035A

Center Frame

1. Remove the remote valve wire.
2. Remove the draft and position control lever grips (1), (2).
3. Remove the auxiliary speed change lever grip (7).
4. Remove the DT shift lever grip (4).
5. Remove the three point hitch lowering speed control grip (8) and PTO lever (3).
6. Remove the center frame (6).

(1) Position Control Lever Grip
(2) Draft Control Lever Grip
(3) PTO Lever
(4) DT Shift Lever Grip
(5) ROPS
(6) Center Frame
(7) Auxiliary Speed Change Lever Grip
(8) Three Point Hitch Lowering Speed Control Grip

W1037302



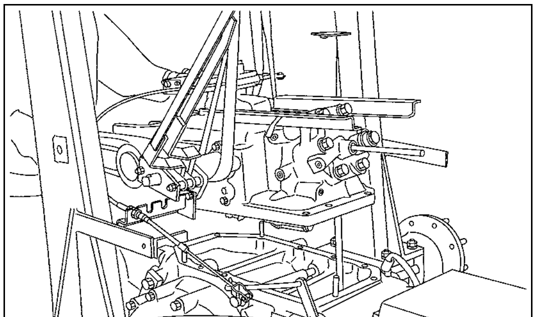
3TMACAB2P036B

Hydraulic Pipe

1. Disconnect the delivery pipe (1).

(1) Delivery Pipe

W1021488



3TMACAB8P051A

Hydraulic Cylinder Assembly

1. Disconnect the draft control rod from the top link bracket.
2. Remove the lift rods from lift arms.
3. Remove the hydraulic cylinder assembly mounting screws and nuts.
4. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then remove it.

(When reassembling)

- Apply liquid gasket (Three Bond 1216 or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.

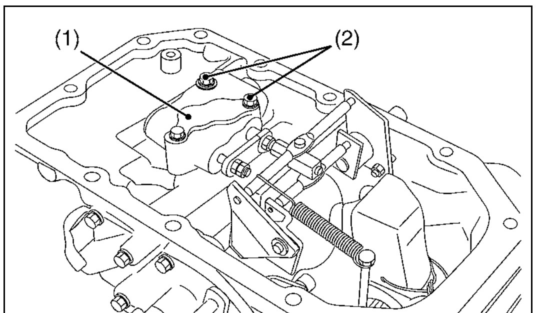
Tightening torque	Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

■ **NOTE**

- **Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod.**

W1021614

(B) Disassembling Position Control Valve [M6800(S)]



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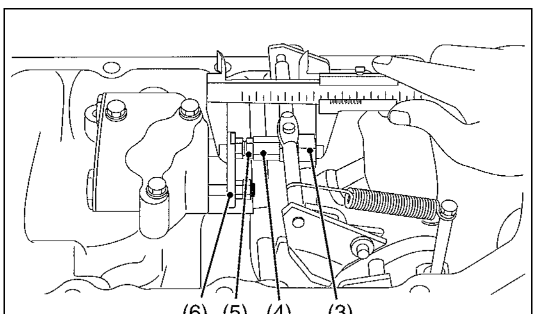


3TMACAB8P053A

Removing Control Valve

1. Remove the control valve mounting screws (2).
2. Remove the control valve (1).

■ **NOTE**

- **Do not loosen adjusting section at the end of the spool unless necessary.**

(When reassembling)

- If the spool joint (3) is removed, be sure to adjust its position according to the following procedure.

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

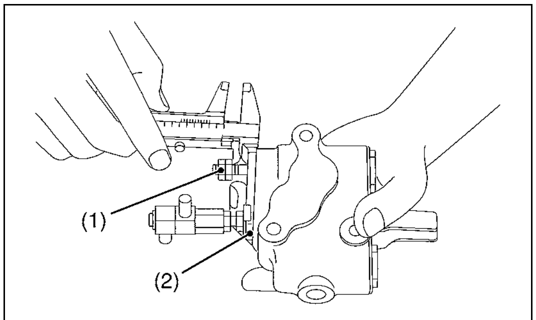
■ **Adjusting Spool Joint**

1. Measure the distance between plate (6) and spool joint (3).
2. If the measurement is not within the factory specifications, loosen the lock nut (5) and adjust by the turnbuckle (4).

Distance between plate and spool joint	Factory spec.	62.0 to 63.0 mm 2.44 to 2.48 in.

(1) Control Valve
(2) Control Valve Mounting Screw
(3) Spool Joint
(4) Turnbuckle
(5) Lock Nut
(6) Plate

W1023171



3TMACAB8P054A

Recording Distance between Plate and Lock Nut

■ **NOTE**

- **Before disassembling spool, be sure to record the lock nut position.**

1. Press the plate (2) on to the valve body, and measure the distance between the plate (2) and lock nut (1) for poppet valve.

(When reassembling)

- After assembling the control valve, be sure to check the function of it by air-blowing.
  If neutral, lift and down circuit can not be obtained properly, adjust the position of lock nut following the instructions given below.
  If the function is proper, stake the lock nut with a punch.

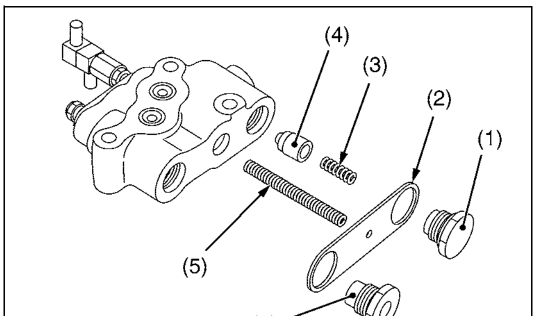
■ **Adjusting Lock Nut**

1. Turn the adjusting nuts all the way in, apply compressed air to the pump port while covering the cylinder port.
2. Move the adjusting nuts slowly out until you hear a loud hiss of air (unload valve opens).
3. Turn the nuts another 1/4 turn and lock.

Tightening torque	Lock Nut	17.7 to 21.6 N·m 1.8 to 2.2 kgf·m 13.0 to 15.9 ft-lbs

(1) Lock Nut (2) Plate

W1023463



3TMACAB8P055A

Plug and Unload Valve

1. Secure the control valve with a vise.
2. Remove the seat plug (6) for poppet valve.
3. Remove the plug (1) for unload valve (4).
4. Remove the plate (2) and return spring (5).
5. Draw out the spring (3) and unload valve (4).

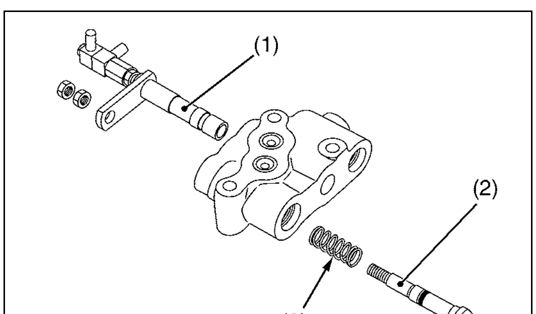
(When reassembling)

- Install the plug, noting O-ring.

Tightening torque	Plug	68.6 to 88.3 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 ft-lbs

(1) Plug
(2) Plate
(3) Spring
(4) Unload Valve
(5) Return Spring
(6) Plug

W1038229



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Spool and Poppet Valve

1. Remove the lock nut for poppet valve (2).
2. Draw out the spool (1).
3. Push the poppet valve toward the seat plug to remove.

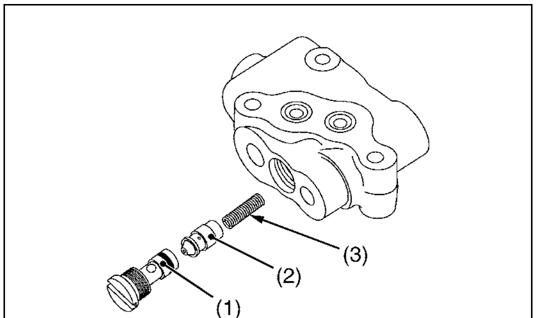
(When reassembling)

- Install the poppet valve, noting O-ring and backup ring.
- Install the lock nut so that the distance between the plate and lock nut is same as the recorded valve before disassembling the spool.

Tightening torque	Lock nut	17.7 to 21.6 N·m 1.8 to 2.2 kgf·m 13.0 to 15.9 ft-lbs

(1) Spool
(2) Poppet Valve
(3) Spring

W1023915



3TMACAB8P057A

Check Valve

1. Remove the seat plug (1).
2. Draw out the spring (3) and check valve (2).

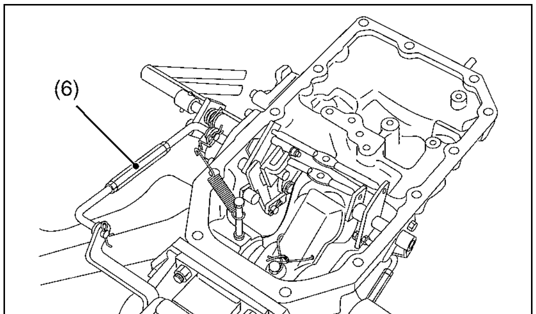
(When reassembling)

- Install the plug, noting O-ring.
- After tightening the seat plug, stake it with a punch.

Tightening torque	Seat plug	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

(1) Seat Plug
(2) Check Valve
(3) Spring

W1024218



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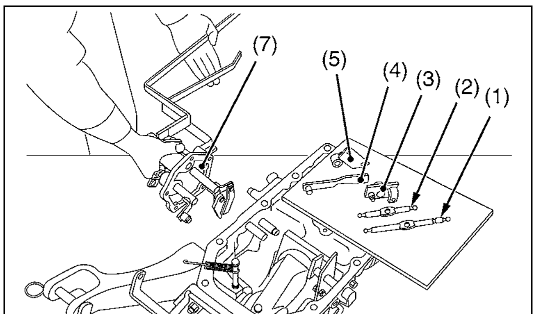


3TMACAB8P059A

Position and Draft Linkage

1. Remove the draft feedback rod (6).
2. Remove the spool drive levers (1), (2) and links (3), (4), (5).
3. Remove the bracket guide mounting screws.
4. Remove the bracket guide assembly (7).

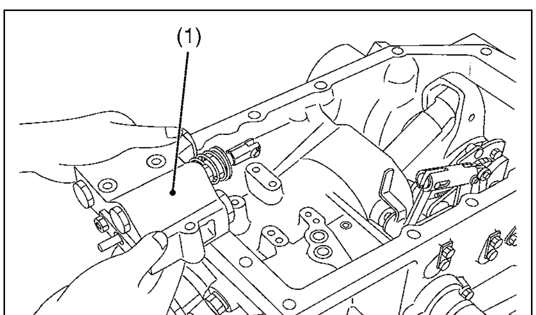
(When reassembling)

Tightening torque	Bracket guide mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Spool Drive Lever
(2) Spool Drive Lever
(3) Link
(4) Link
(5) Link
(6) Draft Feedback Rod
(7) Bracket Guide Assembly

W1024395

(C) Disassembling Position Control Valve [M8200 · M9000]



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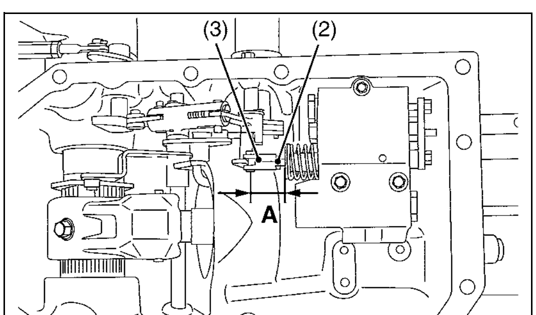


3TMACAB8P061A

Removing Control Valve

1. Remove the control valve mounting screw.
2. Remove the control valve (1).

■ **NOTE**

- **Do not loosen adjusting section at the end of the spool unless necessary.**

(When reassembling)

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

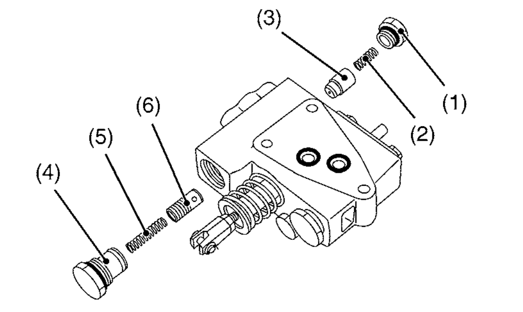
Length **A**	Factory spec.	32.5 to 33.5 mm 1.28 to 1.32 in.

■ **Adjusting Spool Joint**

1. Measure the distance (**A**).
2. If the measurement is not within the factory specifications, loosen the lock nut and adjust by the turnbuckle.

(1) Control Valve
(2) Lock Nut
(3) Turnbuckle

W1021781



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Plug and Unload Valve

1. Secure the control valve with a vise.
2. Remove the seat plug 1 (1) for unload poppet 1 (3).
3. Draw out the spring (2) for unload poppet 1 (3).
4. Remove the seat plug 2 (4) for unload poppet 2 (6).
5. Draw out the spring (5) and unload poppet 2 (6).

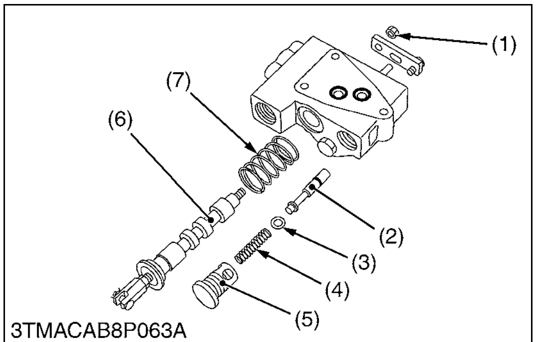
(When reassembling)

- 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
(2) Spring
(3) Unload Poppet 1
(4) Seat Plug
(5) Spring
(6) Unload Poppet 2

W1022038



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Spool and Poppet Valve

1. Remove the lock nut (1) for spool (6).
2. Draw out the spool (6).
3. Remove the seat plug (5) for poppet valve (2).
4. Draw out the spring (4), collar (3) and poppet valve (2).

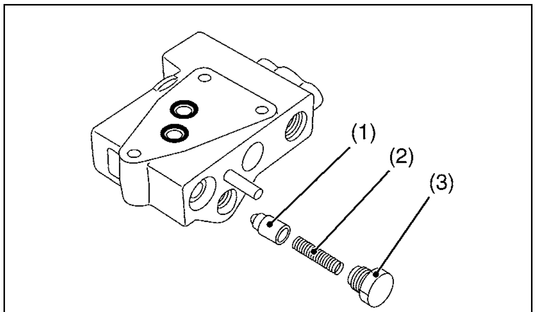
(When reassembling)

- Install the poppet valve, noting O-ring and backup ring.

Tightening torque	Seat plug	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 ft-lbs
	Lock nut	15.7 to 19.6 N·m 1.6 to 2.0 kgf·m 11.6 to 14.5 ft-lbs

(1) Lock Nut
(2) Poppet Valve
(3) Collar
(4) Spring
(5) Seat Plug
(6) Spool
(7) Spring

W1022351



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Check Valve

1. Remove the seat plug (3).
2. Draw out the spring (2) and check valve (1).

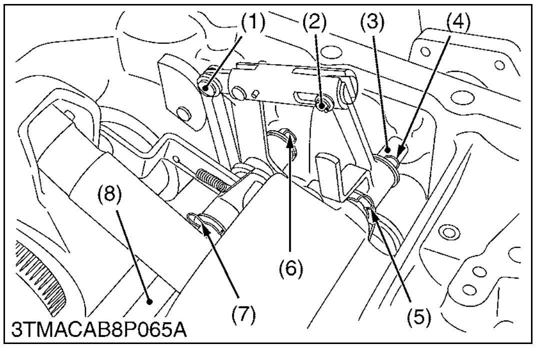
(When reassembling)

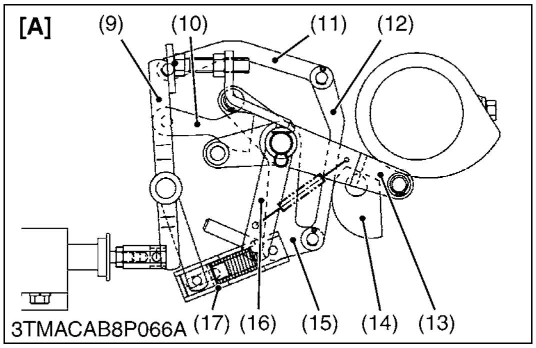
- Install the plug, noting O-ring.

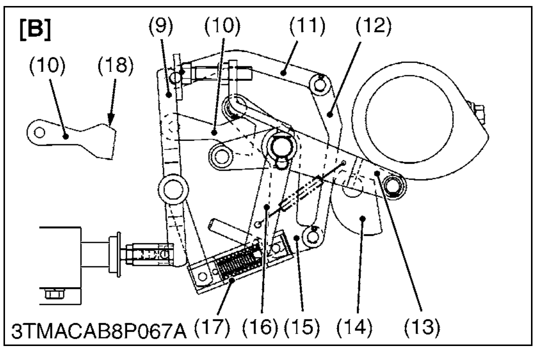
Tightening torque	Seat plug	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft-lbs

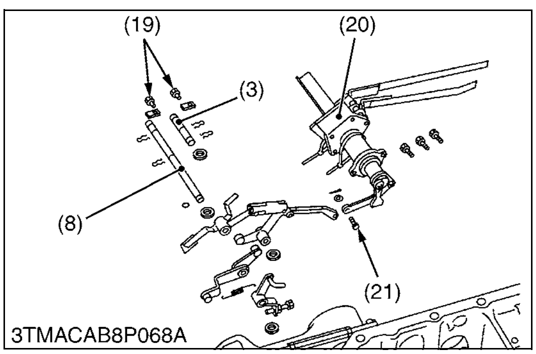
(1) Check Valve
(2) Spring
(3) Seat Plug

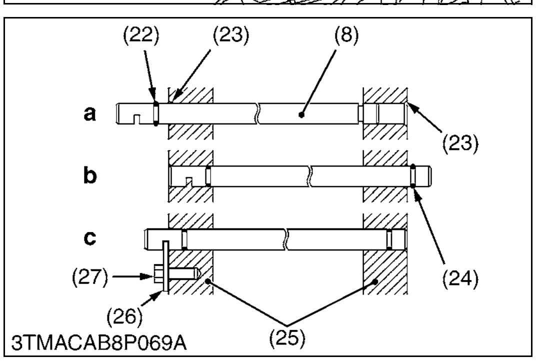
W1022670











Position and Draft Linkage

(Reference)

- Serial No. information

	Type A	Type B
M8200 2WD	Below 10806	Above 10807
M8200 4WD	Below 53210	Above 53211
M9000 2WD	Below 10938	Above 10939
M9000 4WD	Below 55105	Above 55106

- In Type **A** and Type **B**, holder assembly (17), feed back link (16), and position connector (10) are different parts.
- An attachment direction varies in the holder assembly (17) with the type **A** and **B** as shown in figure.

A : Type A

1. Remove the clevis pin (1).
2. Remove the circlip (4), (5), (6), (7).
3. Remove the stopper (19) and draw out the rod (3).
4. Remove the stopper (19) and draw out the rod (8). To remove the O-ring (22) and (23) order by **c** → **b** → **a** as shown in figure.
5. Take out the linkage.
6. Remove the bracket guide assembly (20).

B : Type B

1. Remove the clevis pin (2).
2. Remove the circlip (3), (4), (5), (6).
3. Remove the stopper (19) and draw out the rod (3).
4. Remove the stopper (19) and draw out the rod (8). To remove the O-ring (22) and (23) order by **c** → **b** → **a** as shown in figure.
5. Remove the cotter pin (21).
6. Take out the linkage.
7. Remove the bracket guide assembly (20).

(When reassembling)

- When install the rods, noting O-ring.
- Apply transmission oil to the O-ring.
- When installing the rod (8), **a** → **b** → **c** let the fix position of O-ring (22) go to the outside of the hydraulic cylinder body (25) with the process alternately, and O-ring (24) is assembled into the rod. (As shown in figure.)
- When assemble the position connector (10) notched section (18) upward (It is upward the condition that it is attached to the tractor). (Type **B**)
- According to procedure of Type **B** when exchange for hydraulic link improved in serial No. of Type **A** and already exchanged.

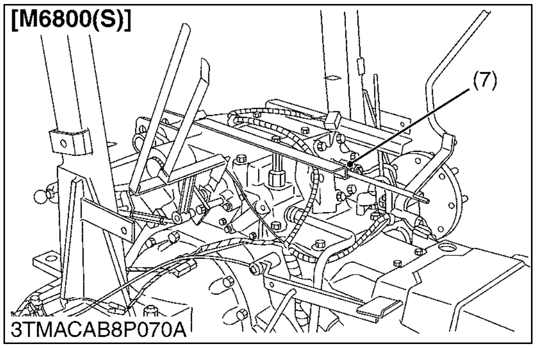
Tightening torque	Bracket guide mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

(1) Clevis Pin
(2) Clevis Pin
(3) Rod
(4) Circlip
(5) Circlip
(6) Circlip
(7) Circlip
(8) Rod
(9) Spool Retainer
(10) Position Connector
(11) Draft Link 1
(12) Draft Link 2
(13) Position Balancer
(14) Draft Cam
(15) Connector
(16) Feed Back Link
(17) Holder Assembly
(18) Notched Section
(19) Stopper
(20) Bracket Guide
(21) Cotter Pin
(22) O-ring
(23) Chamfer
(24) O-ring
(25) Hydraulic Cylinder Body
(26) Stopper
(27) Screw

[A] Type A
[B] Type B

W1022805

(D) Disassembling Cylinder Safety Valve



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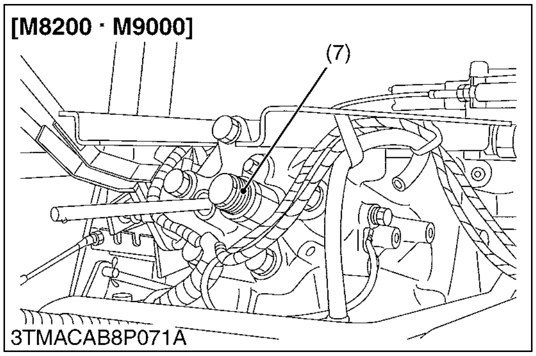

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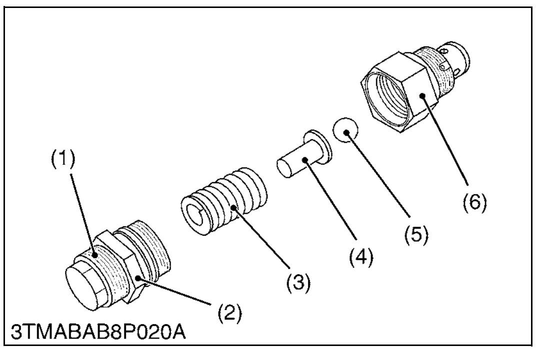

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Cylinder Safety Valve

1. Remove the cylinder safety valve assembly (7).
2. Secure the cylinder safety valve assembly in a vise.
3. Loosen the lock nut (2), and remove the adjust screw (1).
4. Draw out the spring (3), seat (4), and ball (5).

(When reassembling)

- Install the cylinder safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.

Tightening torque	Cylinder safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs
	Cylinder 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

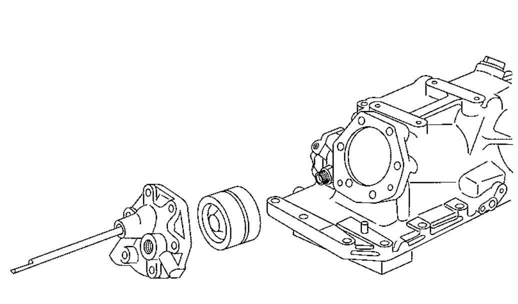
■ **IMPORTANT**

- **After disassembling and assembling the cylinder safety valve assembly, be sure to check the operating pressure.**

(1) Adjust Screw
(2) Lock Nut
(3) Spring
(4) Seat
(5) Ball
(6) Housing
(7) Safety Valve Assembly

W1024851

(E) Disassembling Hydraulic Cylinder Assembly [M6800(S)]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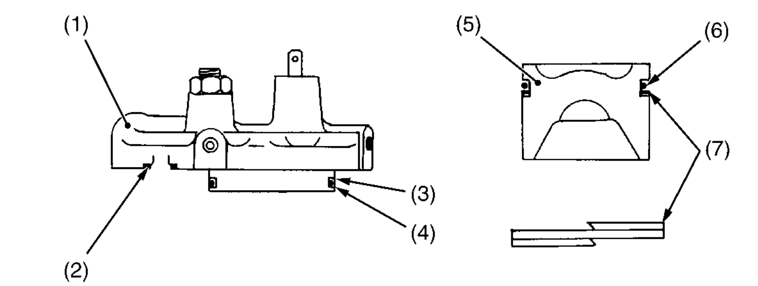
Hydraulic Cylinder Cover and Hydraulic Piston

1. Remove the hydraulic cylinder cover (1).
2. Push out the hydraulic piston (5) from the hydraulic cylinder.

(When reassembling)

- Install the hydraulic piston, noting O-ring (6) and backup ring (7).
- Install the hydraulic cylinder cover, noting O-ring (2), (4) and backup ring (3).
- Apply grease to the hydraulic piston bottom contacts with hydraulic rod.



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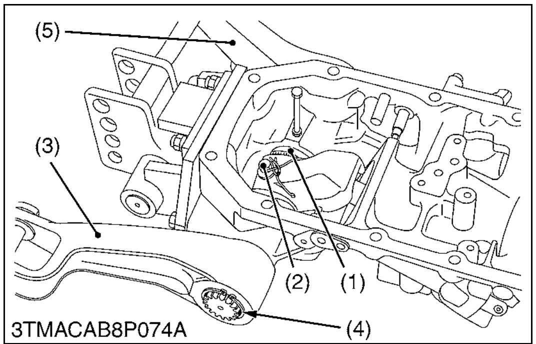
(1) Hydraulic Cylinder Cover
(2) O-ring
(3) Backup Ring
(4) O-ring
(5) Hydraulic Piston
(6) O-ring
(7) Backup Ring

W1025896



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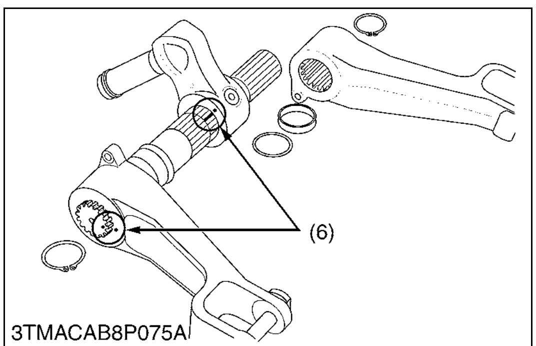

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Lift Arm and Hydraulic Arm Shaft

1. Disconnect the feedback rod from the lift arm L.H. (3).
2. Remove the wire and unscrew the setting screw (2).
3. Remove the external snap ring (4).
4. Draw out the hydraulic arm shaft (1) and lift arm R.H. (5) as a unit.
5. Remove the collar and O-ring.

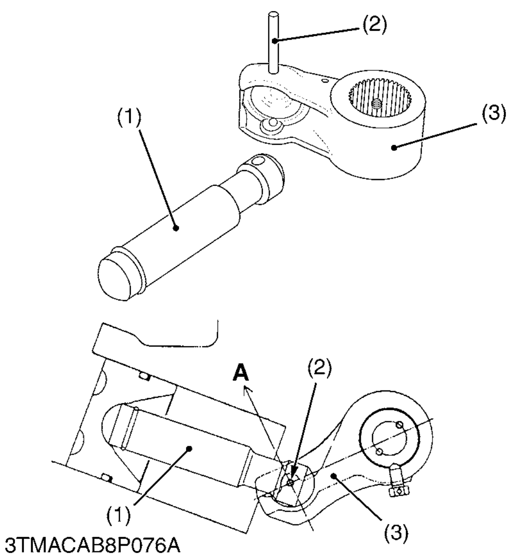
(When reassembling)

- Align the alignment marks (6) of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks of the lift arm and hydraulic arm shaft.
- Apply grease to the right and left bushings of hydraulic cylinder body and O-ring.
- Take care not to damage the O-ring.
- After tightening the hydraulic arm setting screw to the specified torque, insert a wire through the holes of the screw head and hydraulic arm.

Tightening torque	Hydraulic arm setting screw	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 ft-lbs

(1) Hydraulic Arm Shaft
(2) Setting screw
(3) Lift Arm L.H.
(4) External Snap Ring
(5) Lift Arm R.H.
(6) Alignment Mark

W1043344



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Hydraulic Arm and Hydraulic Rod

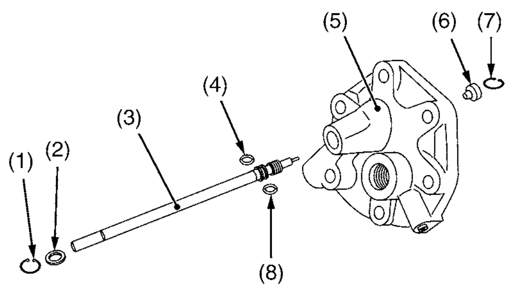
1. Remove the spring pin (2), and separate the hydraulic arm (3) and the hydraulic rod (1).

(When reassembling)

- Apply grease to the joints of the hydraulic arm, hydraulic rod, set pin and piston.
- Be sure to fix the spring pin (2), its sprits must face the direction **A** as shown in figure.

(1) Hydraulic Rod
(2) Spring Pin
(3) Hydraulic Arm

W1044245



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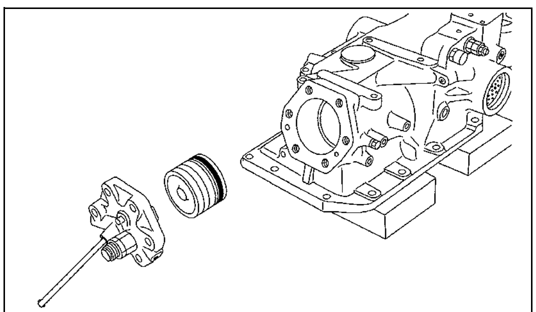
Lowering Speed Adjusting Valve

1. Remove the internal snap ring (3) and adjusting screw (1).
2. Remove the internal snap ring (8), and draw out the poppet valve (7).

(1) Adjusting Screw
(2) Hydraulic Cylinder Cover
(3) Internal Snap Ring
(4) Plane Washer
(5) O-ring
(6) O-ring
(7) Poppet Valve
(8) Internal Snap Ring

W1026321

(F) Disassembling Hydraulic Cylinder Assembly [M8200 · M9000]

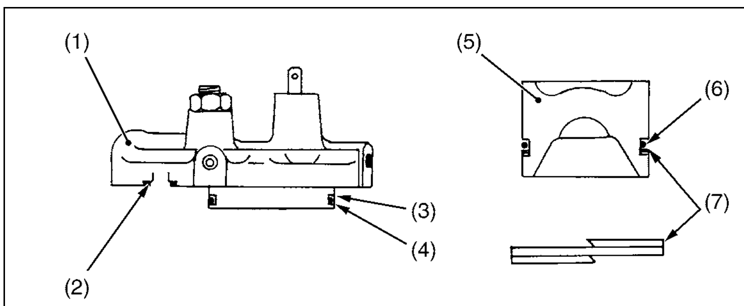

3TMACAB8P078A

Hydraulic Cylinder Cover and Hydraulic Piston

1. Remove the hydraulic cylinder cover (1).
2. Push out the hydraulic piston (5) from the hydraulic cylinder.

(When reassembling)

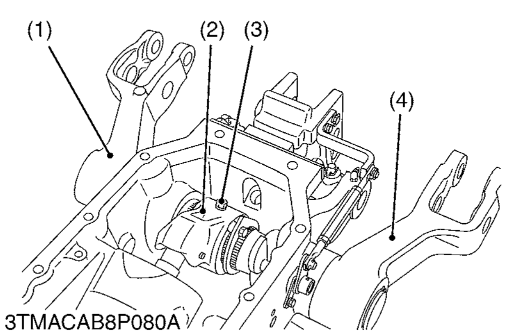
- Install the hydraulic piston, noting O-ring (6) and backup ring (7).
- Install the hydraulic cylinder cover, noting O-ring (2), (4) and backup ring (3).
- Apply grease to the hydraulic piston bottom contacts with hydraulic rod.



3TMACAB8P079A

(1) Hydraulic Cylinder Cover
(2) O-ring
(3) Backup Ring
(4) O-ring
(5) Hydraulic Piston
(6) O-ring
(7) Backup Ring

W1025116



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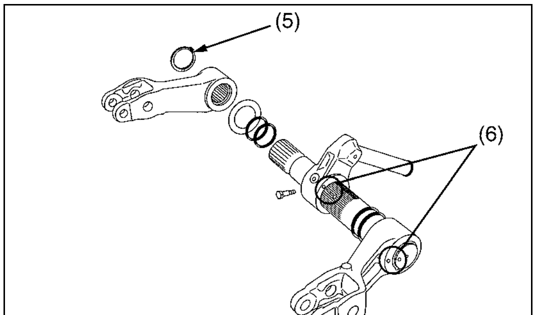


3TMACAB8P081A

Lift Arm and Hydraulic Arm Shaft

1. Remove the wire and unscrew the setting screw (3).
2. Remove the external snap ring (5) and lift arm L.H. (1).
3. Draw out the hydraulic arm shaft (2) and lift arm R.H. (4) as a unit.
4. Remove the collar and O-ring.

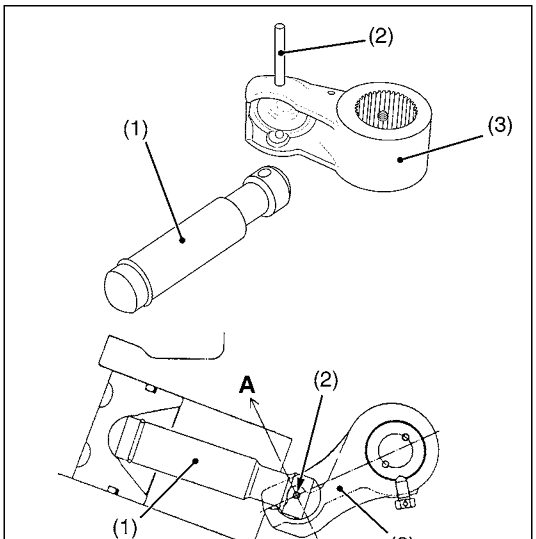
(When reassembling)

- Align the alignment marks of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks of the lift arm and hydraulic arm shaft.
- Apply grease to the right and left bushings of hydraulic cylinder body and O-ring.
- Take care not to damage the O-ring.
- After tightening the hydraulic arm setting screw to the specified torque, insert a wire through the holes of the screw head and hydraulic arm.

Tightening torque	Hydraulic arm setting screw	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 ft-lbs

(1) Lift Arm L.H.
(2) Hydraulic Arm Shaft
(3) Setting screw
(4) Lift Arm R.H.
(5) External Snap Ring
(6) Alignment Mark

W1025303



3TMACAB8P076A

Hydraulic Arm and Hydraulic Rod

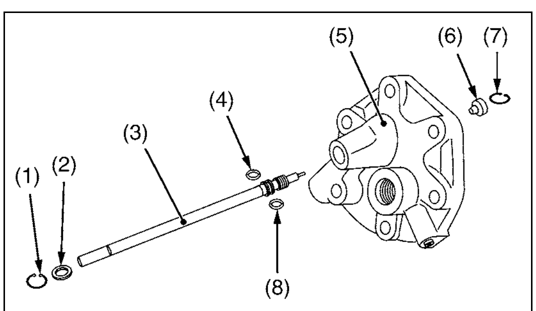
1. Remove the spring pin (2), and separate the hydraulic arm (3) and the hydraulic rod (1).

(When reassembling)

- Apply grease to the joints of the hydraulic arm, hydraulic rod, set pin and piston.
- Be sure to fix the spring pin (2), its sprits must face the direction **A** as shown in figure.

(1) Hydraulic Rod
(2) Spring Pin
(3) Hydraulic Arm

W1067003



3TMACAB8P077A

Lowering Speed Adjusting Valve

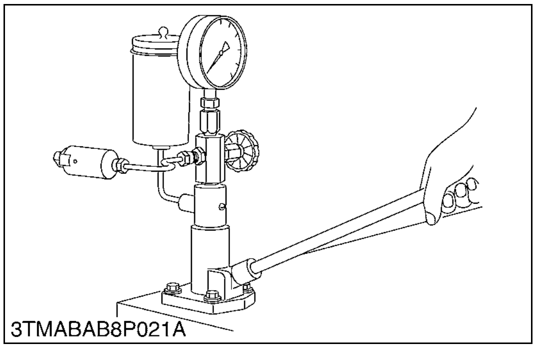
1. Remove the internal snap ring (1) and adjusting screw (3).
2. Remove the internal snap ring (7), and draw out the poppet valve (6).

(1) Internal Snap Ring
(2) Plane Washer
(3) Adjusting Screw
(4) O-ring
(5) Hydraulic Cylinder Cover
(6) Poppet Valve
(7) Internal Snap Ring
(8) O-ring

W1025764

(2) Servicing

(A) Cylinder Safety Valve



Operating Pressure of Cylinder Safety Valve

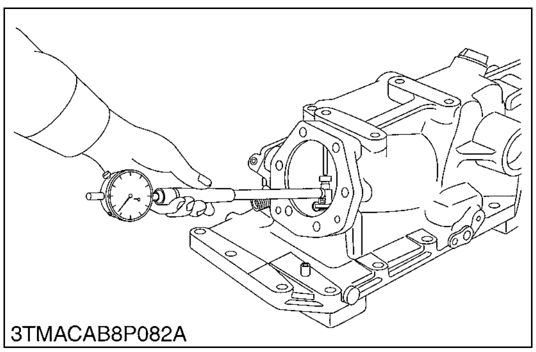
1. Attach the cylinder safety valve to an injection nozzle tester with a safety valve setting adaptor. (Refer to **"9. SPECIAL TOOLS"** at GENERAL Section.)
2. Measure the operating pressure of the cylinder safety valve.
3. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw. (See page 8-S27.)
4. After adjustment, tighten the lock nut firmly.

Cylinder safety valve operating pressure	Factory spec.	M6800 (S)	21.1 to 22.6 MPa 215 to 230 kgf/cm^2 3058 to 3271 psi
		M8200 M9000	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3556 psi

■ **NOTE**
- **Use specified transmission fluid (refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section) to test the operating pressure of the cylinder safety valve.**

W1026531

(B) Hydraulic Cylinder Assembly



Hydraulic Cylinder Bore

1. Check the cylinder internal surface for scoring or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace it.

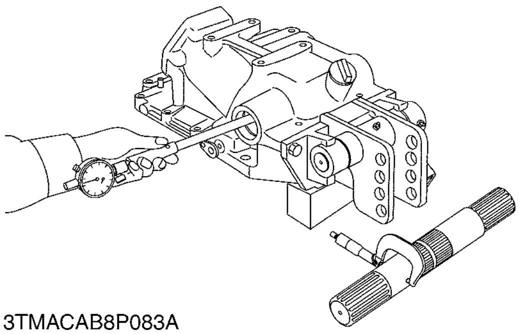
[M6800(S)]

Cylinder I.D.	Factory spec.	90.000 to 90.050 mm 3.54330 to 3.54527 in.
	Allowable limit	90.15 mm 3.5492 in.

[M8200 · M9000]

Cylinder I.D.	Factory spec.	100.036 to 100.071 mm 3.93843 to 3.93980 in.
	Allowable limit	100.15 mm 3.94291 in.

W1026740


3TMACAB8P083A

Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

[M6800(S)]

Clearance between hydraulic arm shaft and bushing (Right side)	Factory spec.	0.049 to 0.154 mm 0.00193 to 0.00606 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Right side)	Factory spec.	49.950 to 49.975 mm 1.96653 to 1.96752 in.
Bushing I.D. (After press-fitted) (Right side)	Factory spec.	50.024 to 50.104 mm 1.96944 to 1.97259 in.

Clearance between hydraulic arm shaft and bushing (Left side)	Factory spec.	0.049 to 0.149 mm 0.00193 to 0.00587 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Left side)	Factory spec.	44.950 to 44.975 mm 1.76968 to 1.77067 in.
Bushing I.D. (After press-fitted) (Left side)	Factory spec.	45.024 to 45.099 mm 1.77259 to 1.77555 in.

[M8200 · M9000]

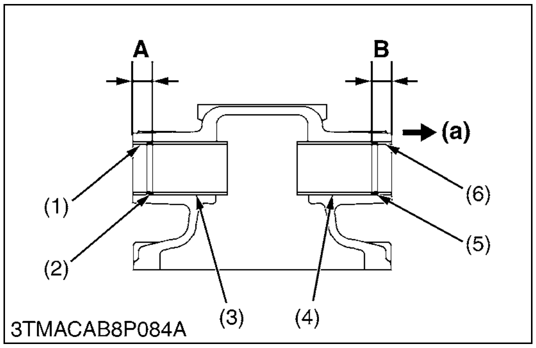
Clearance between hydraulic arm shaft and bushing (Right side)	Factory spec.	0.140 to 0.250 mm 0.00551 to 0.00984 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Right side)	Factory spec.	59.970 to 60.000 mm 2.36102 to 2.36220 in.
Bushing I.D. (After press-fitted) (Right side)	Factory spec.	60.140 to 60.220 mm 3.36772 to 2.37087 in.

Clearance between hydraulic arm shaft and bushing (Left side)	Factory spec.	0.140 to 0.250 mm 0.00551 to 0.00984 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Left side)	Factory spec.	64.970 to 65.000 mm 2.55787 to 2.55906 in.
Bushing I.D. (After press-fitted) (Left side)	Factory spec.	65.140 to 65.220 mm 2.56457 to 2.56772 in.

W1026937



Clearance between Hydraulic Arm Shaft and Bushing (Continued)

(When reassembling)

- When press-fitting a new bushing with a press-fitting tool (Refer to **"9. SPECIAL TOOLS"** at GENERAL Section), observe the dimensions described in the figure.
- When press-fitting a new bushing, apply transmission fluid to the hydraulic cylinder liner boss and bushing.
- When press-fitting a new bushing, press-fit it so that each seam faces up.

Press-fit location of bushing	Factory spec.	M6800 (S)	A	14.5 to 15.5 mm 0.5708 to 0.6102 in.
			B	22.5 to 23.5 mm 0.8858 to 0.9252 in.
		M8200 M9000	A	13.5 to 14.5 mm 0.5315 to 0.5709 in.
			B	17.5 to 18.5 mm 0.6890 to 0.7283 in.

(1) Collar (Left)
(2) O-ring
(3) Bushing (Left)
(4) Bushing (Right)
(5) O-ring
(6) Collar (Right)

(a) Right Side
*** Flush the end of collar with the end of hydrualic cylinder body.**

W1027811

9 ELECTRICAL SYSTEM

MECHANISM

CONTENTS

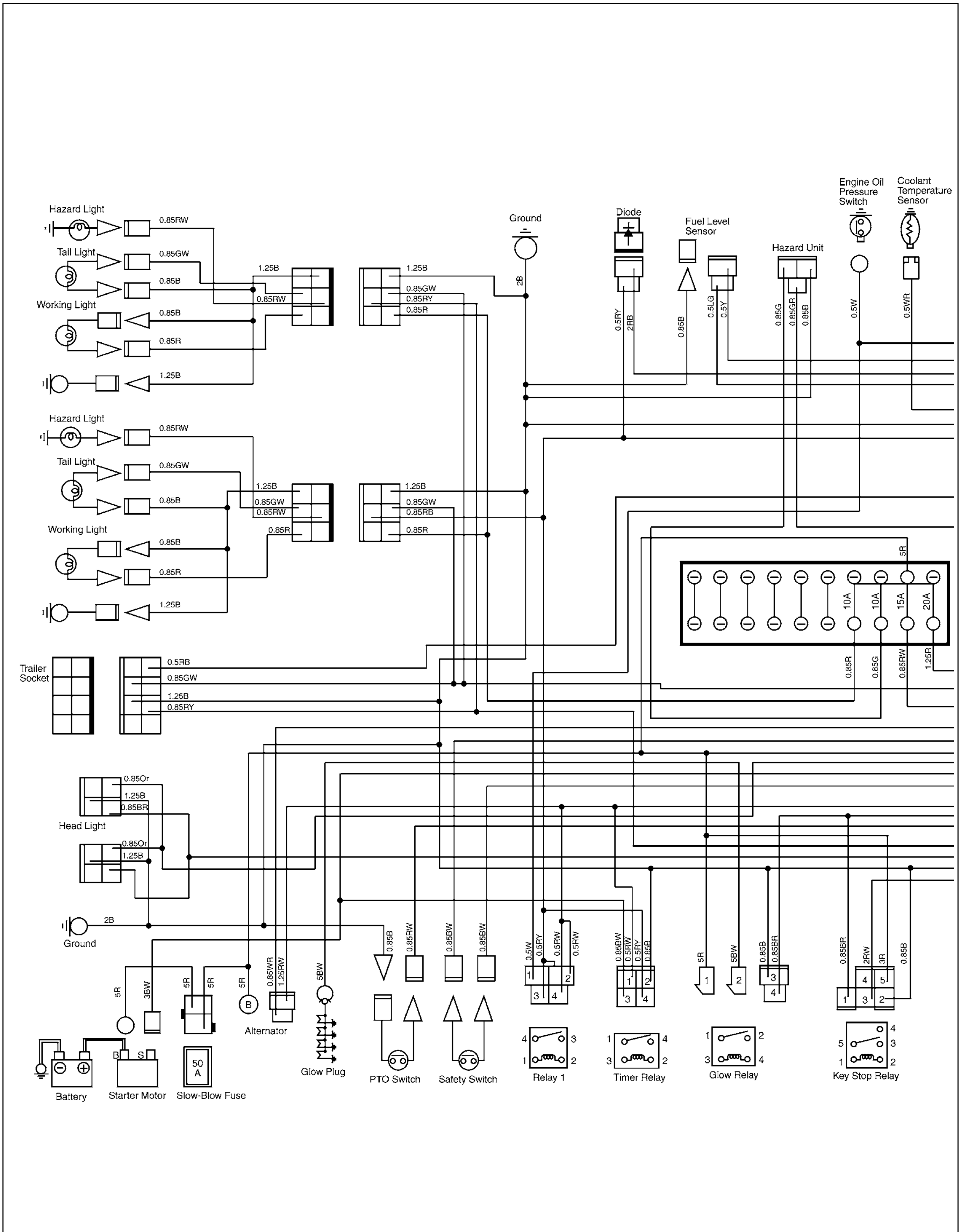
1. WIRING DIAGRAM

Color of Wiring

B .... Black	B/Y .... Black / Yellow	Or/W .... Orange / White
G .... Green	Br/B .... Brown / Black	R/B .... Red / Black
L .... Blue	Br/Y .... Brown / Yellow	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 / Purple	Lg/B .... Light Green / Blue	Y/R .... Yellow / Red
B/R .... Black / Red	Lg/W .... Light Green / White	
B/W .... Black / White	Lg/Y .... Light Green / Yellow	

W1019456

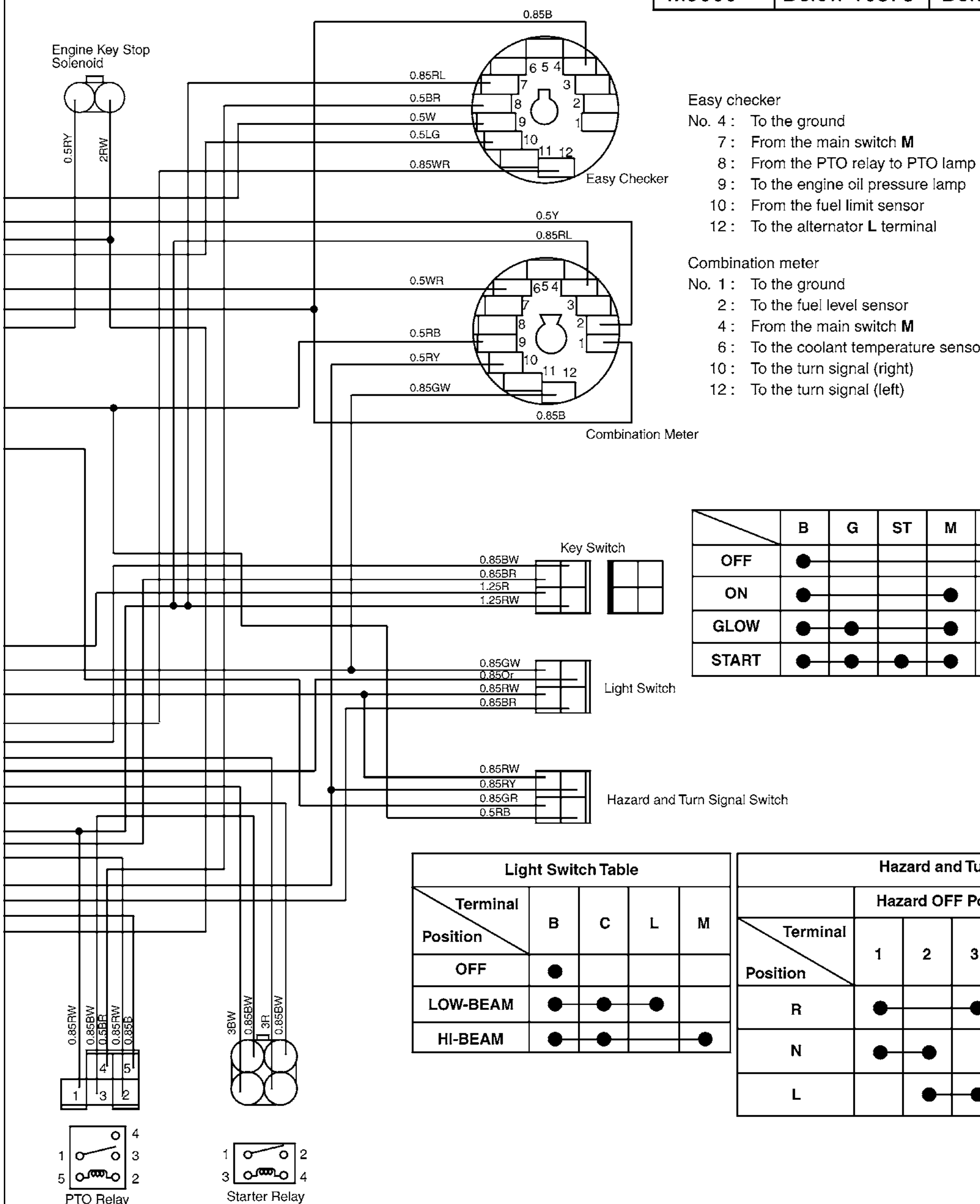
■ For North America (Old Type)



3TMACAB9P001A

Serial No. Affected

Model	2WD	4WD
M6800(S)	Below 10793	Below 50957
M8200	Below 10412	Below 50784
M9000	Below 10373	Below 50839



Easy checker
No. 4 : To the ground
7 : From the main switch **M**
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : From the fuel limit sensor
12 : To the alternator **L** terminal

Combination meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch **M**
6 : To the coolant temperature sensor
10 : To the turn signal (right)
12 : To the turn signal (left)

	B	G	ST	M	OFF
OFF	●				●
ON	●			●	
GLOW	●	●		●	
START	●	●	●	●	

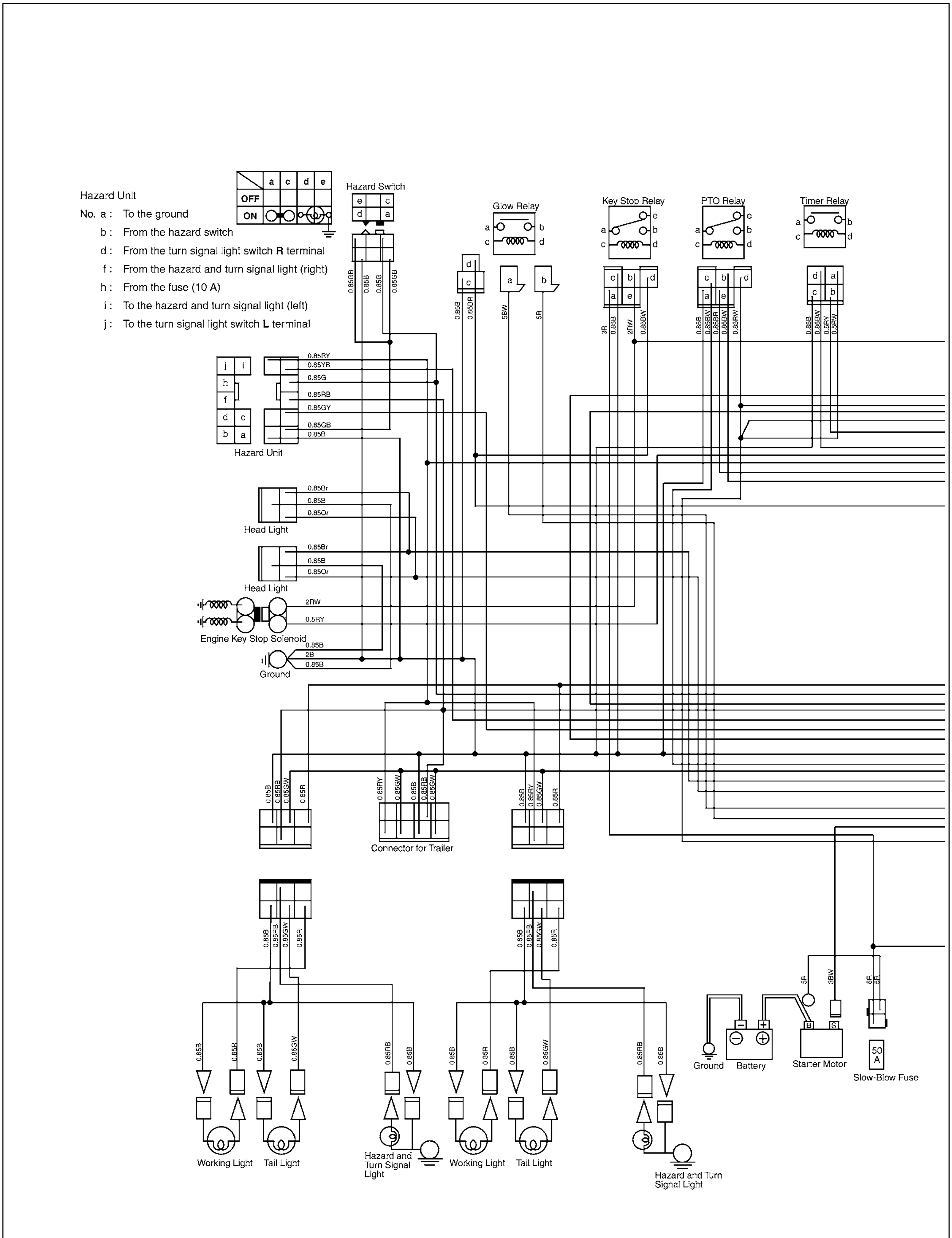
Light Switch Table

Position \ Terminal	B	C	L	M
OFF	●			
LOW-BEAM	●	●	●	
HI-BEAM	●	●		●

Hazard and Turn Signal Switch

Position \ Terminal	Hazard OFF Position 1	2	3	4	Hazard ON Position 1	2	3	4
R	●		●		●	●	●	●
N	●	●			●	●	●	
L		●	●		●	●	●	●

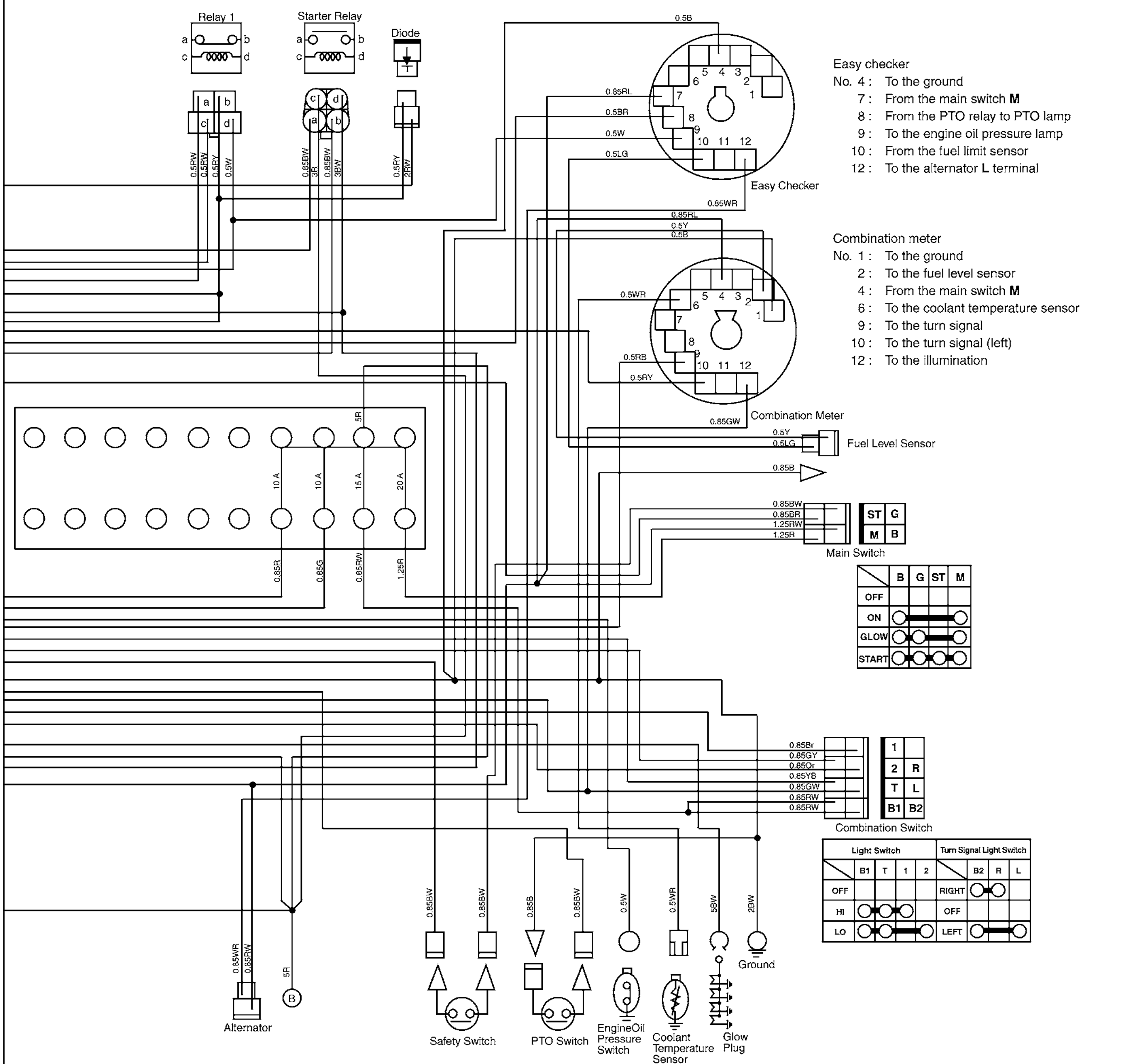
■ For North America (New Type)



3TMACAB9P003A

Serial No. Affected

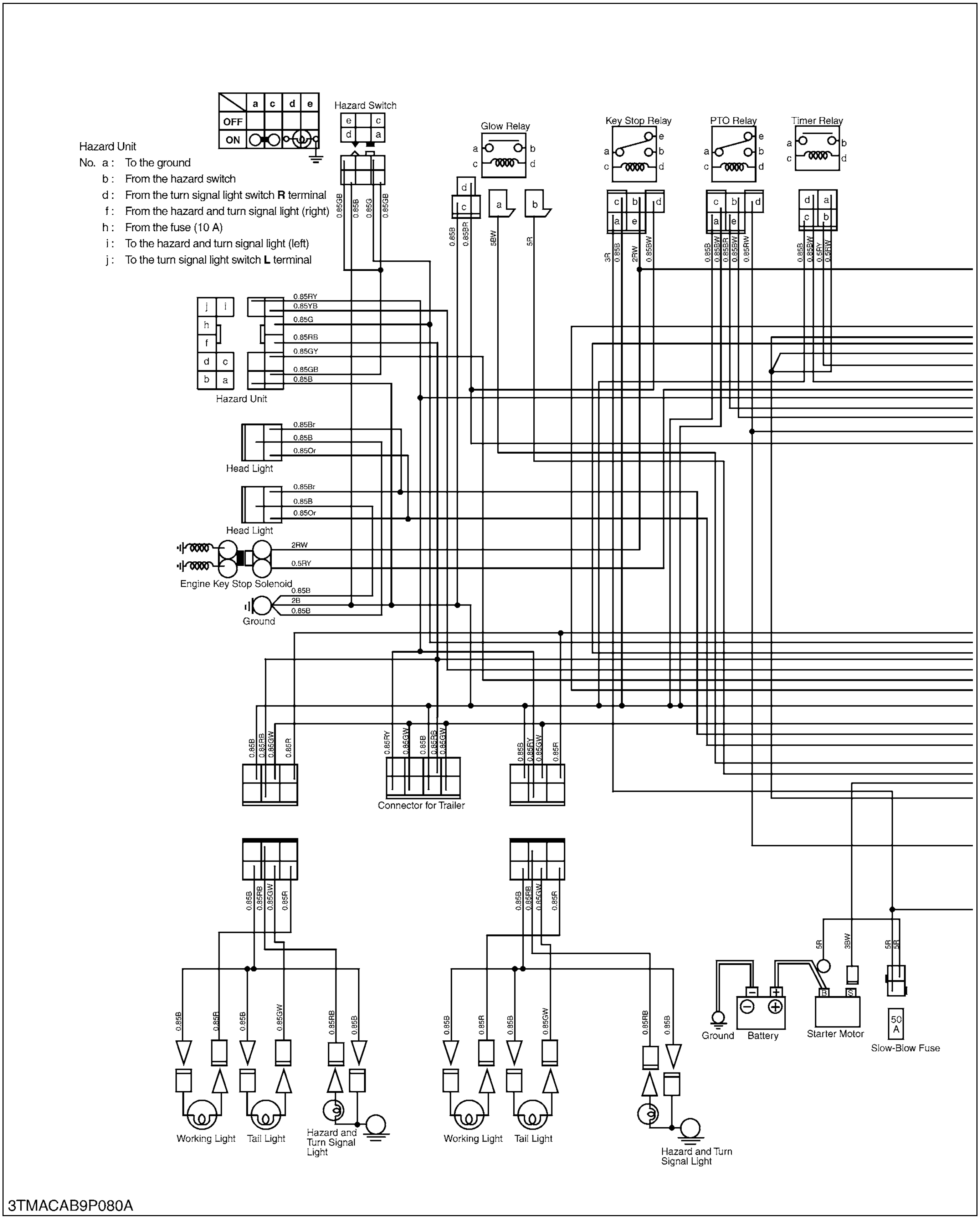
Model	2WD	4WD
M6800(S)	Above 10794	Above 50958
M8200	Above 10413	Above 50785
M9000	Above 10374	Above 50840

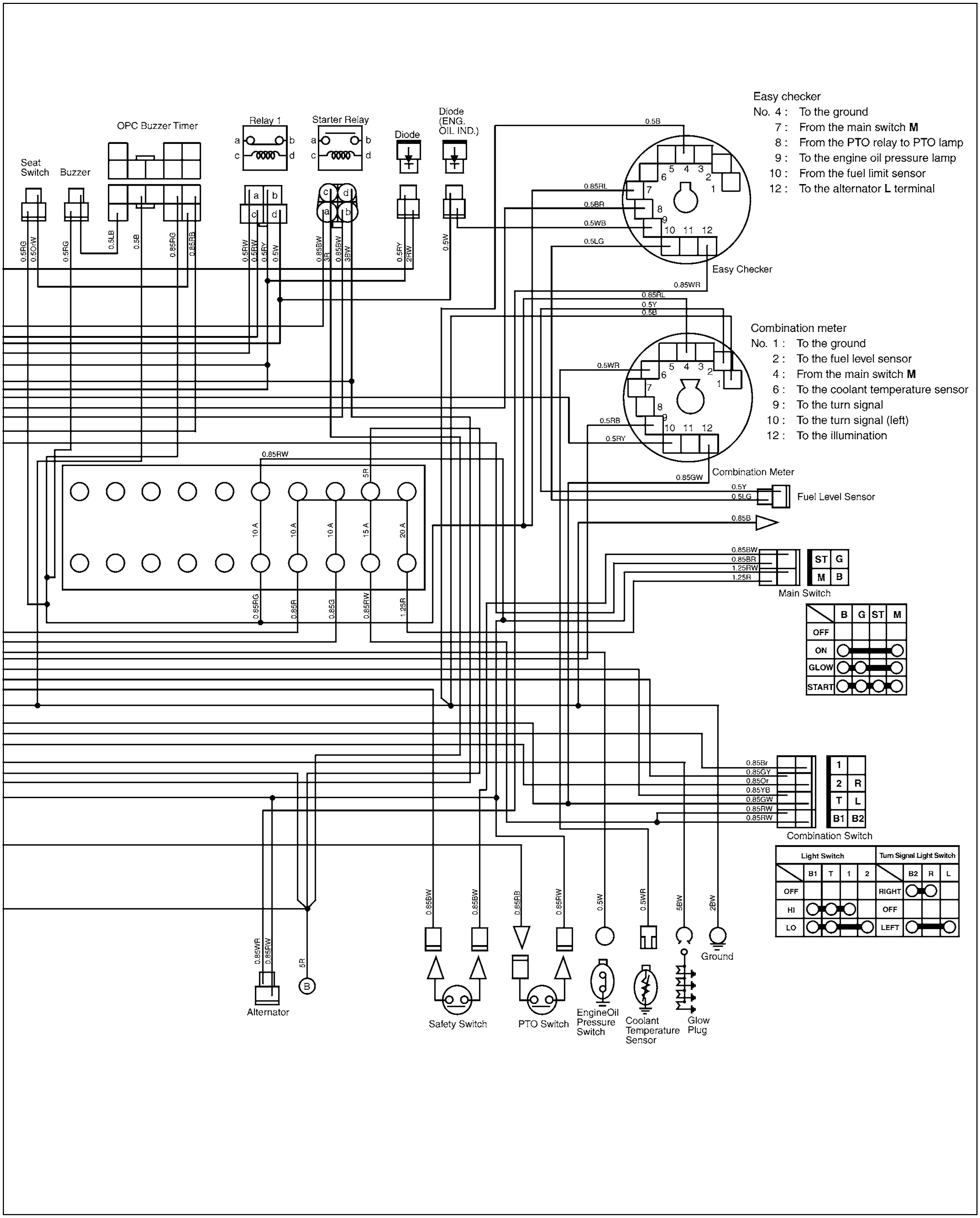


Easy checker
No. 4 : To the ground
7 : From the main switch **M**
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : From the fuel limit sensor
12 : To the alternator **L** terminal

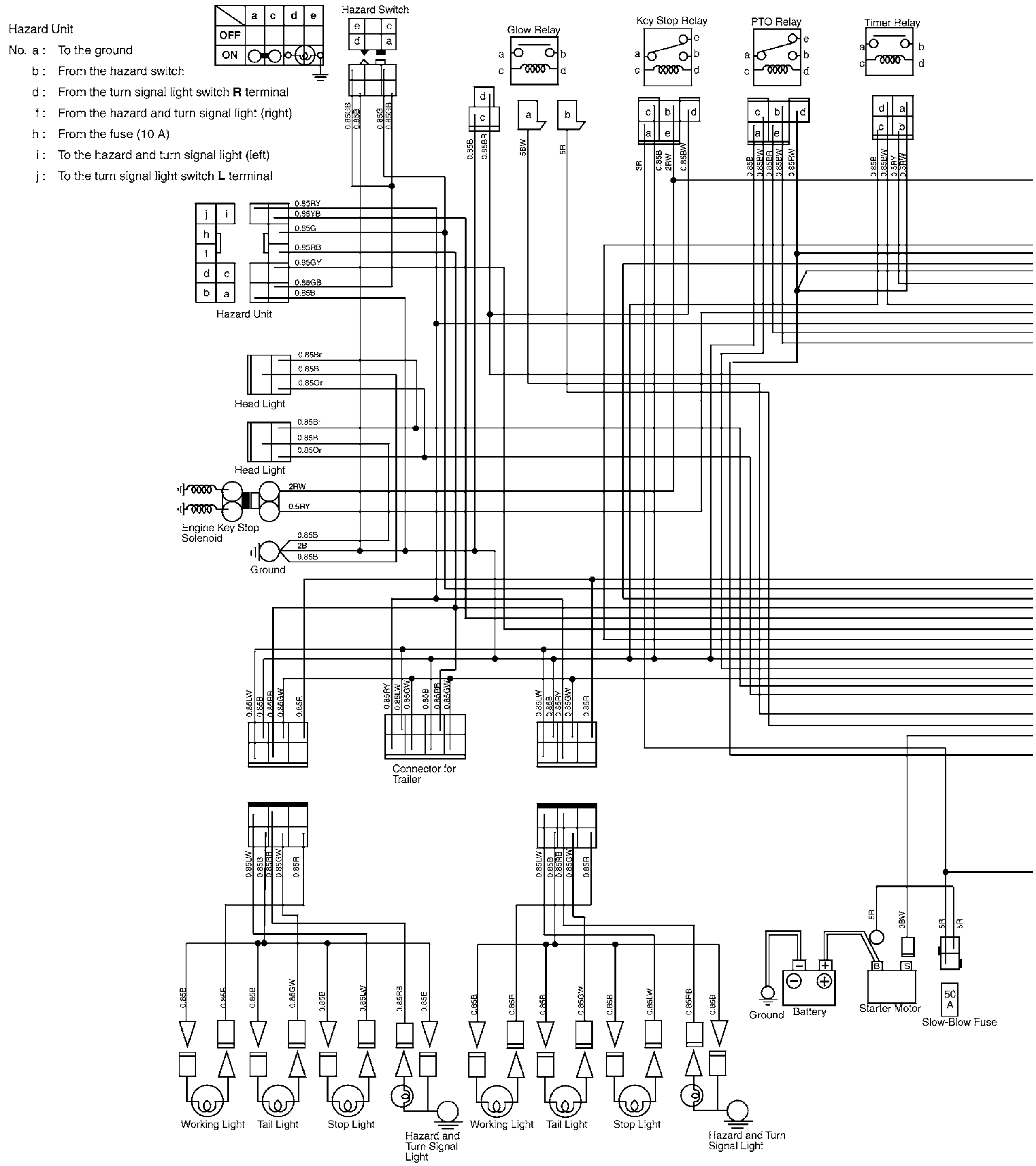
Combination meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch **M**
6 : To the coolant temperature sensor
9 : To the turn signal
10 : To the turn signal (left)
12 : To the illumination

■ For North America (with OPC)

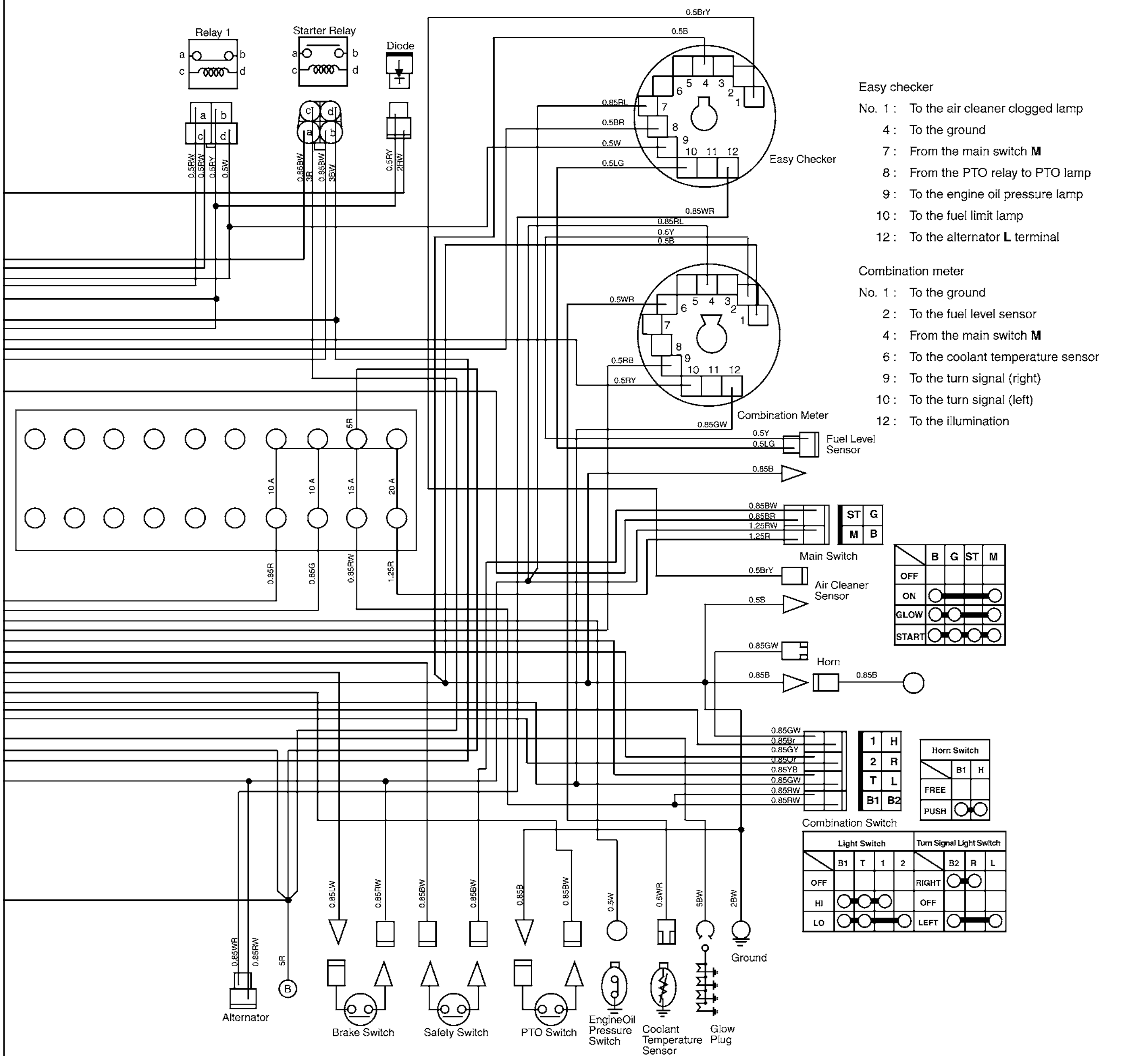



Easy checker
No. 4 : To the ground
7 : From the main switch M
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : From the fuel limit sensor
12 : To the alternator L terminal
Combination meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch M
6 : To the coolant temperature sensor
9 : To the turn signal
10 : To the turn signal (left)
12 : To the illumination
Seat Switch
Buzzer
OPC Buzzer Timer
Relay 1
Starter Relay
Diode
Diode (ENG. OIL IND.)
Easy Checker
Combination Meter
Fuel Level Sensor
Main Switch
B G ST M
OFF
ON
GLOW
START
Combination Switch
Light Switch
Turn Signal Light Switch
B1 T 1 2
B2 R L
OFF
HI
LO
RIGHT
OFF
LEFT
10 A
10 A
10 A
15 A
20 A
Alternator
Safety Switch
PTO Switch
EngineOil Pressure Switch
Coolant Temperature Sensor
Glow Plug
Ground

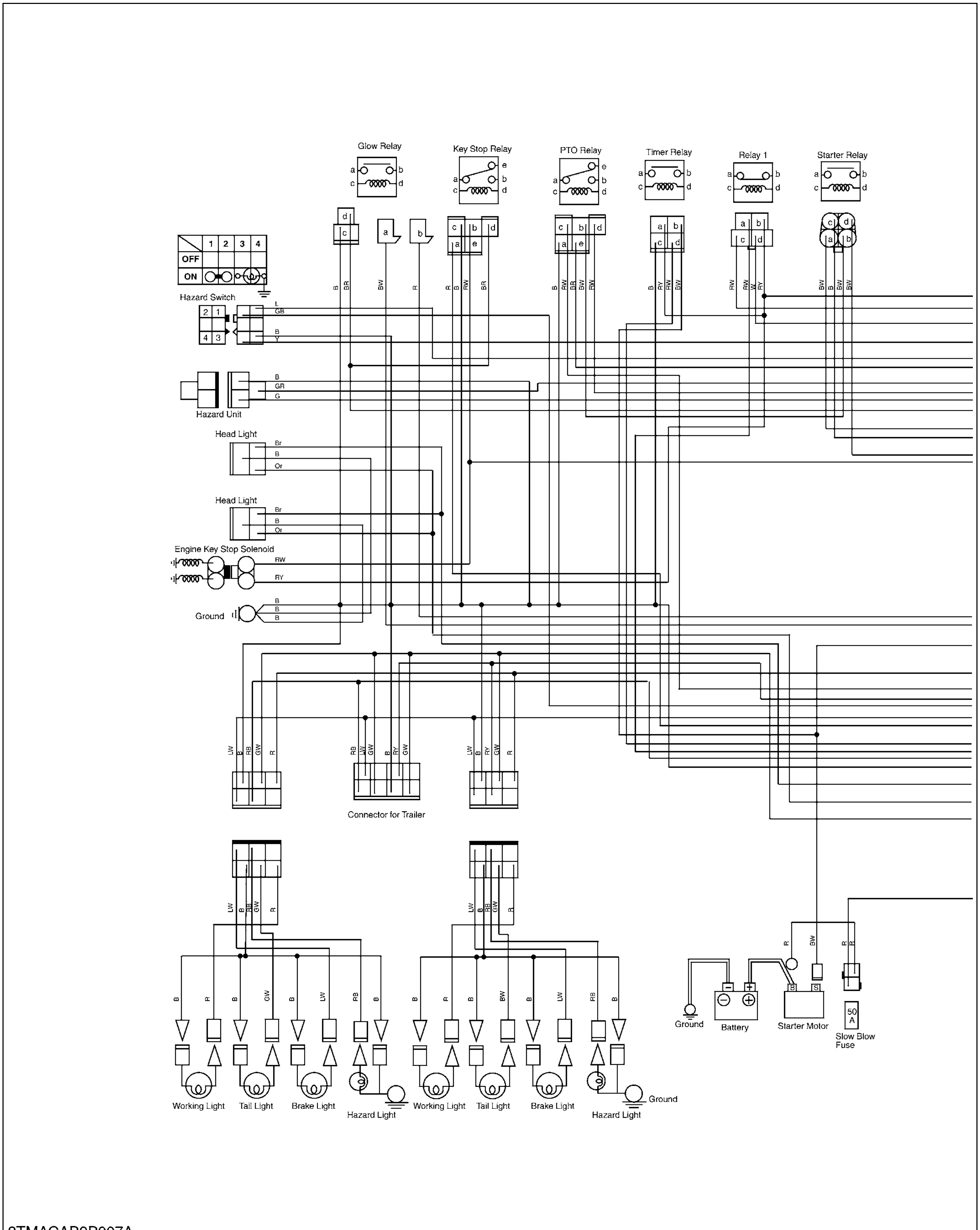
■ For Oceania



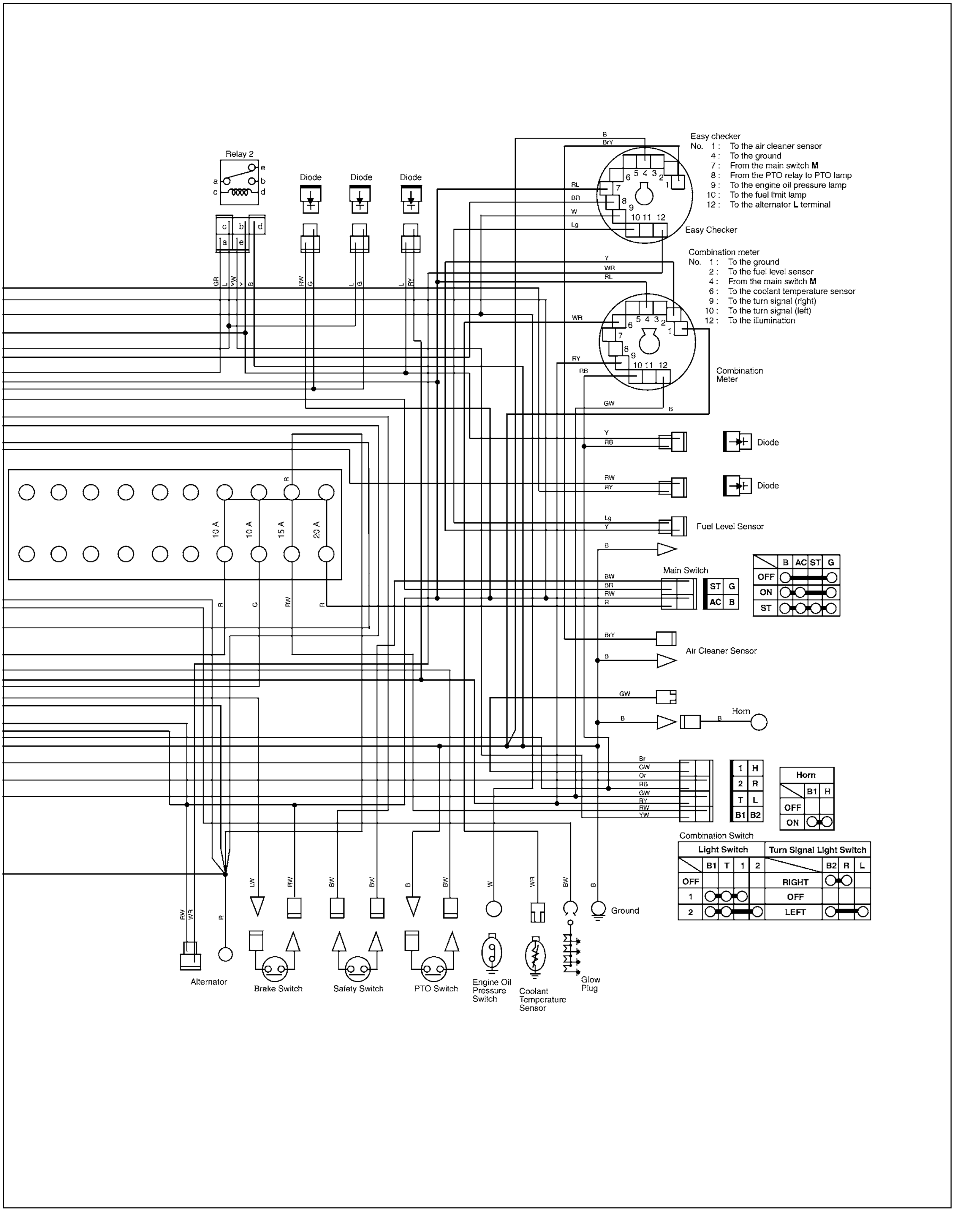
3TMACAB9P005A


Relay 1
Starter Relay
Diode
Easy Checker
Combination Meter
Fuel Level Sensor
Main Switch
Air Cleaner Sensor
Horn
Combination Switch
Horn Switch
Light Switch
Turn Signal Light Switch
Alternator
Brake Switch
Safety Switch
PTO Switch
EngineOil Pressure Switch
Coolant Temperature Sensor
Glow Plug
Ground
10 A
10 A
15 A
20 A
Easy checker
No. 1 : To the air cleaner clogged lamp
4 : To the ground
7 : From the main switch M
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : To the fuel limit lamp
12 : To the alternator L terminal
Combination meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch M
6 : To the coolant temperature sensor
9 : To the turn signal (right)
10 : To the turn signal (left)
12 : To the illumination
OFF
ON
GLOW
START
FREE
PUSH
HI
LO
RIGHT
LEFT

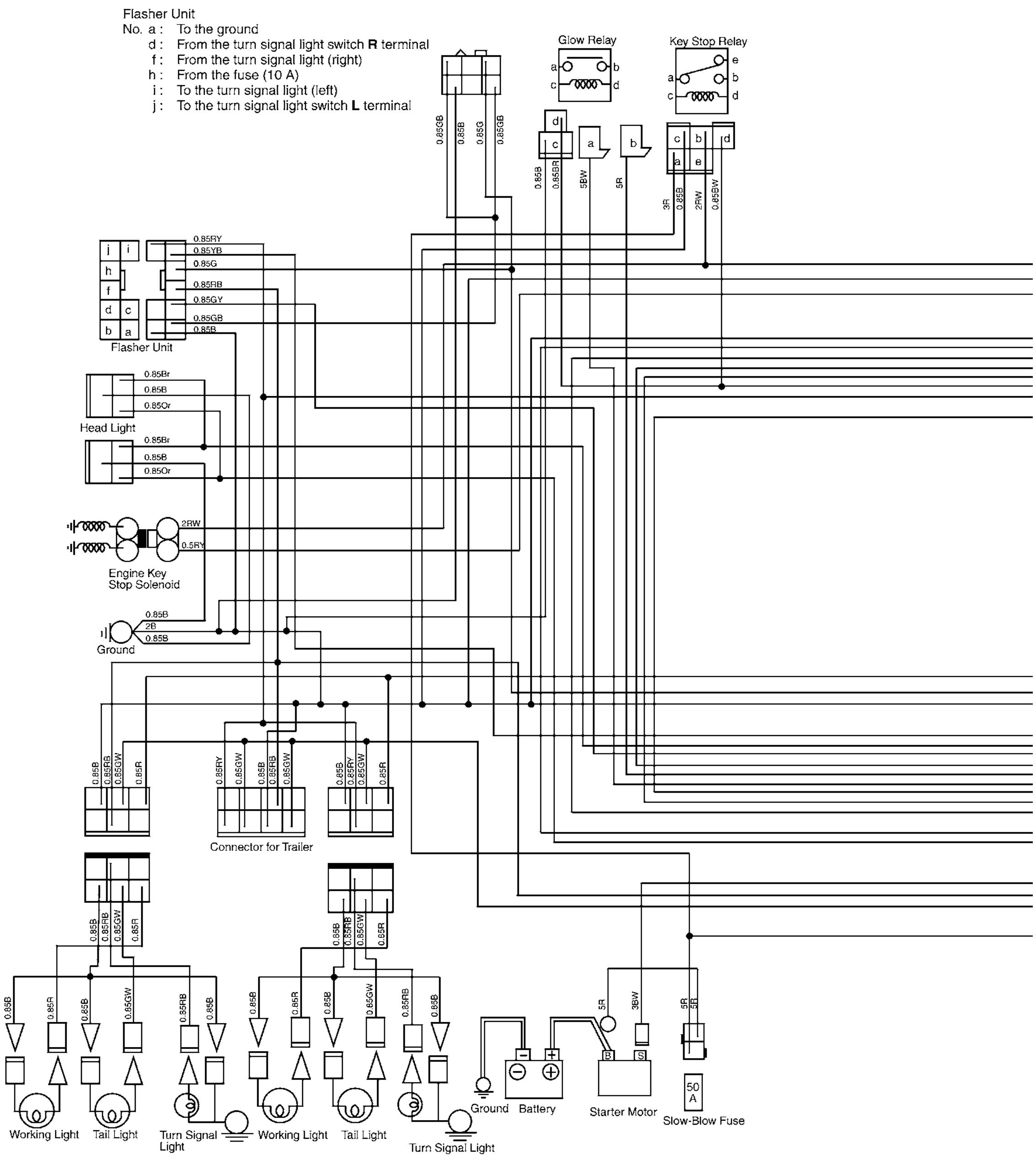
■ For Euro



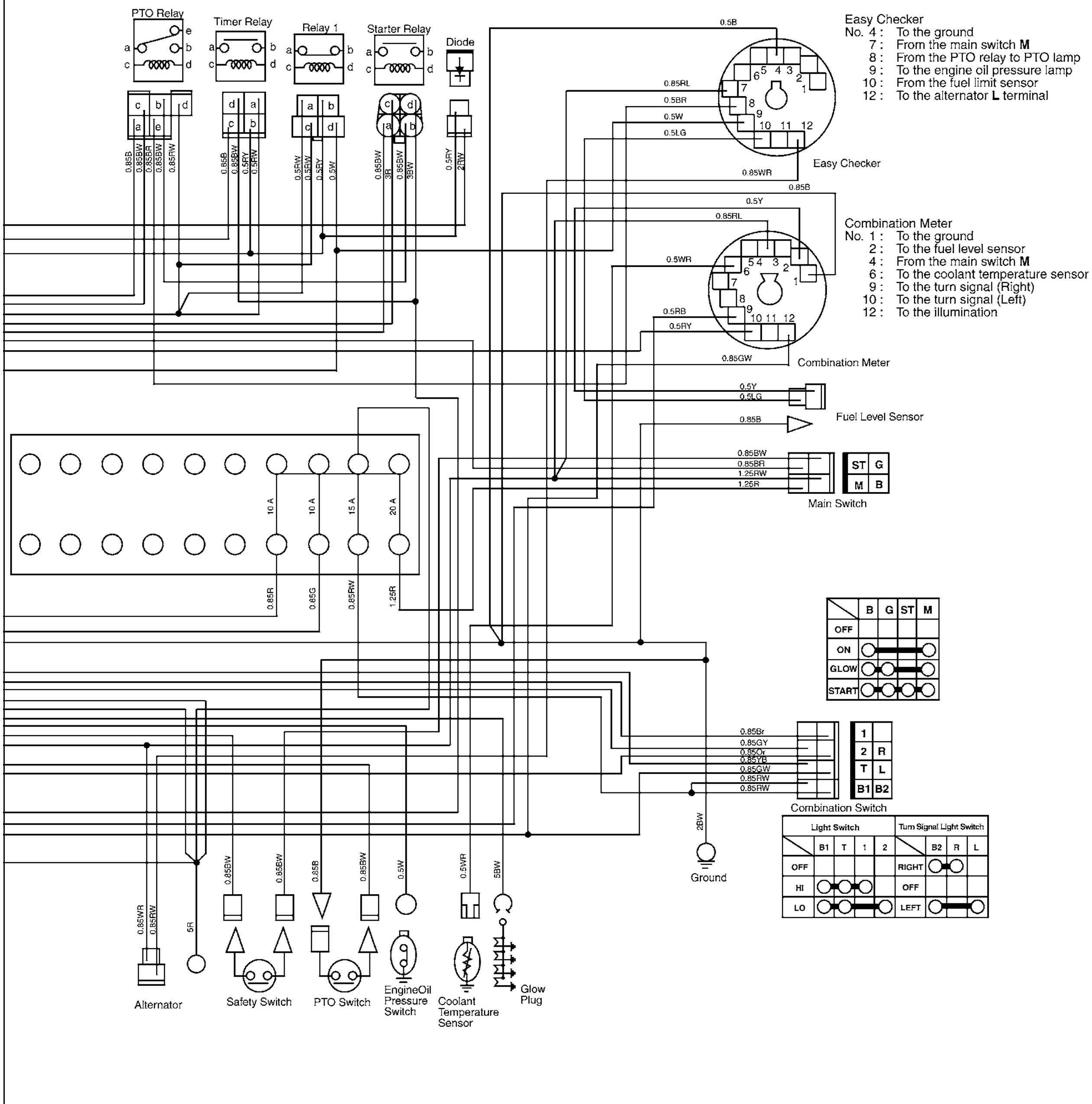
3TMACAB9P007A


Relay 2
Diode
Diode
Diode
Easy checker
No. 1 : To the air cleaner sensor
4 : To the ground
7 : From the main switch M
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : To the fuel limit lamp
12 : To the alternator L terminal
Easy Checker
Combination meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch M
6 : To the coolant temperature sensor
9 : To the turn signal (right)
10 : To the turn signal (left)
12 : To the illumination
Combination Meter
Diode
Diode
Fuel Level Sensor
Main Switch
Air Cleaner Sensor
Horn
Combination Switch
Light Switch
Turn Signal Light Switch
Ground
Alternator
Brake Switch
Safety Switch
PTO Switch
Engine Oil Pressure Switch
Coolant Temperature Sensor
Glow Plug
10 A
10 A
15 A
20 A

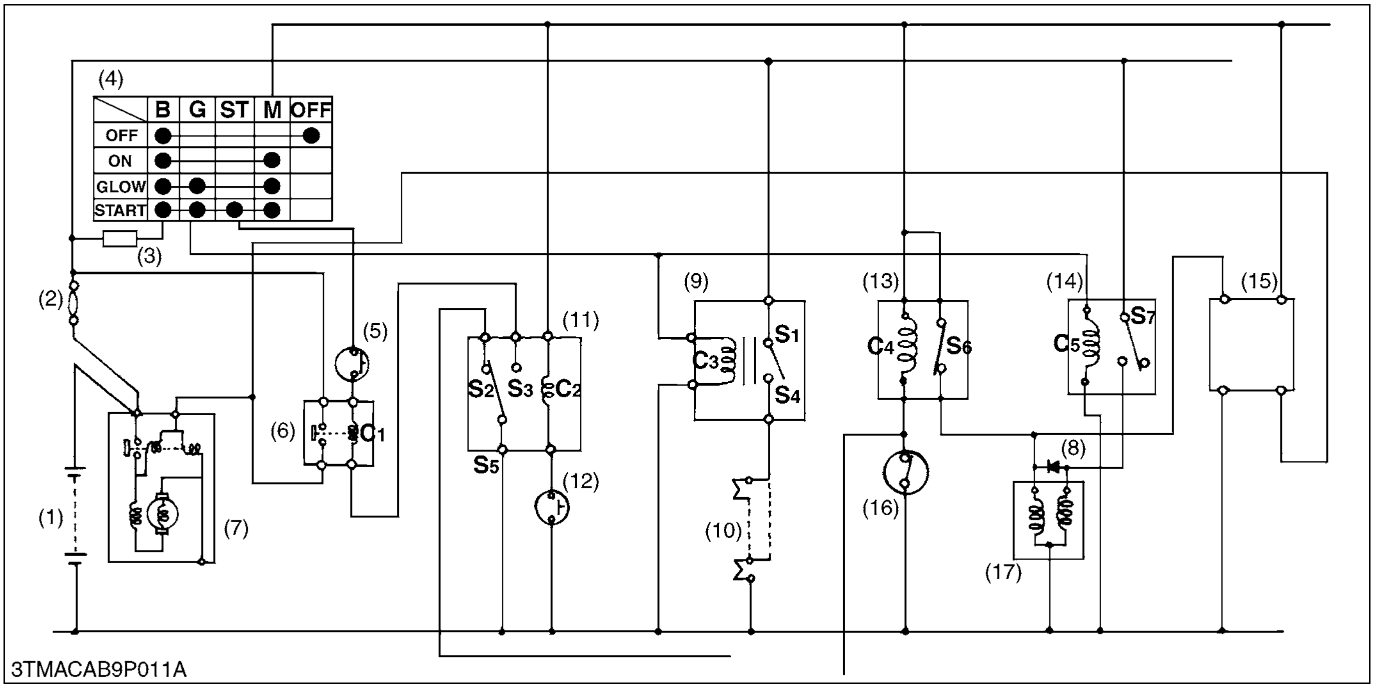
■ For Asia and other country



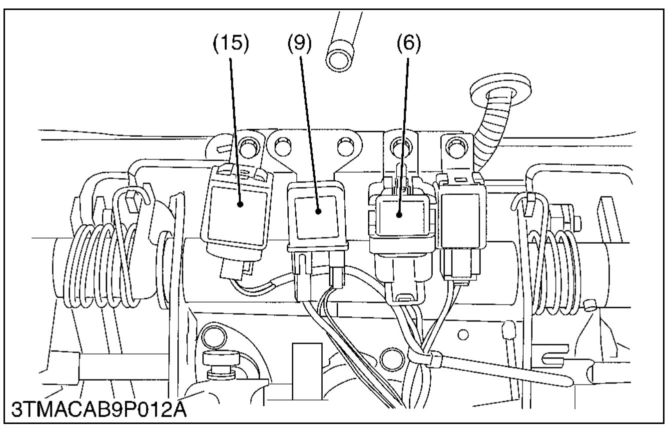
3TMACAB9P009A

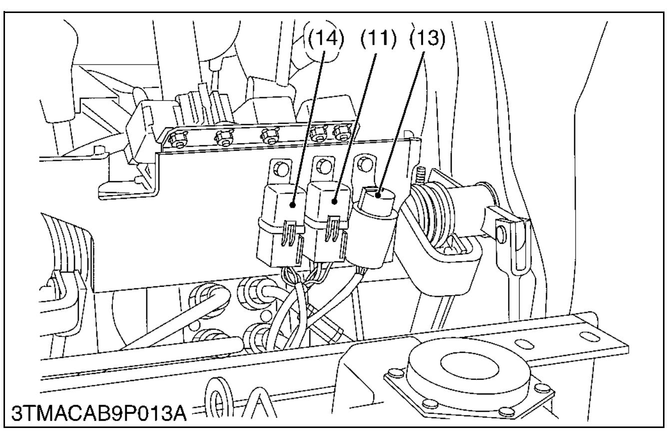

PTO Relay
Timer Relay
Relay 1
Starter Relay
Diode
Easy Checker
No. 4 : To the ground
7 : From the main switch M
8 : From the PTO relay to PTO lamp
9 : To the engine oil pressure lamp
10 : From the fuel limit sensor
12 : To the alternator L terminal
Easy Checker
Combination Meter
No. 1 : To the ground
2 : To the fuel level sensor
4 : From the main switch M
6 : To the coolant temperature sensor
9 : To the turn signal (Right)
10 : To the turn signal (Left)
12 : To the illumination
Combination Meter
Fuel Level Sensor
Main Switch
10 A
10 A
15 A
20 A
OFF
ON
GLOW
START
Combination Switch
Light Switch
Turn Signal Light Switch
RIGHT
HI
LO
LEFT
Ground
Alternator
Safety Switch
PTO Switch
EngineOil Pressure Switch
Coolant Temperature Sensor
Glow Plug

2. STARTING SYSTEM



(1) Battery	(6) Starter Relay	(10) Glow Plug	(14) Relay 1
(2) Slow Blow Fuse	(7) Starter Motor	(11) PTO Relay	(15) Timer Relay
(3) Fuse (20 A)	(8) Diode	(12) PTO Switch	(16) Engine Oil Pressure Switch
(4) Main Switch	(9) Glow Relay	(13) Key Stop Relay	(17) Fuel Cut-off Solenoid
(5) Safety Switch			





There are four key positions, **OFF**, **ON**, **PREHEAT (GLOW)**, and **START**.

When the main switch is set to **PREHEAT (GLOW)**, **B** terminal of the main switch is connected to **G** and **AC (M)** terminals. Consequently, battery current flows to coil **C_3** of the glow relay (9), and the relay contact point **S_4** is turned on. This makes the glow plugs red-hot.

When the main switch (4) is set to **START** under the condition that the range gear shift lever is in neutral position and the safety switch (5) is turned on and PTO clutch lever is in **OFF** position (PTO switch (12) is **ON**.).

B terminal of the main switch is connected **G**, **ST** and **AC (M)** terminals.

Consequently, battery current flows to coil **C_1** of the starter relay (6) and PTO relay (11) contact point **S_3** of the PTO relay (11) (When the PTO switch is set to **ON**, battery current flows to coil **C_2** and **S_5** is turned to **ON**.) and coil **C_3** of the glow plug relay at the same time, and relay contact points **S_1** and **S_4** are turned on.

This actuates starter motor (7) and keeps the glow plugs red-hot.

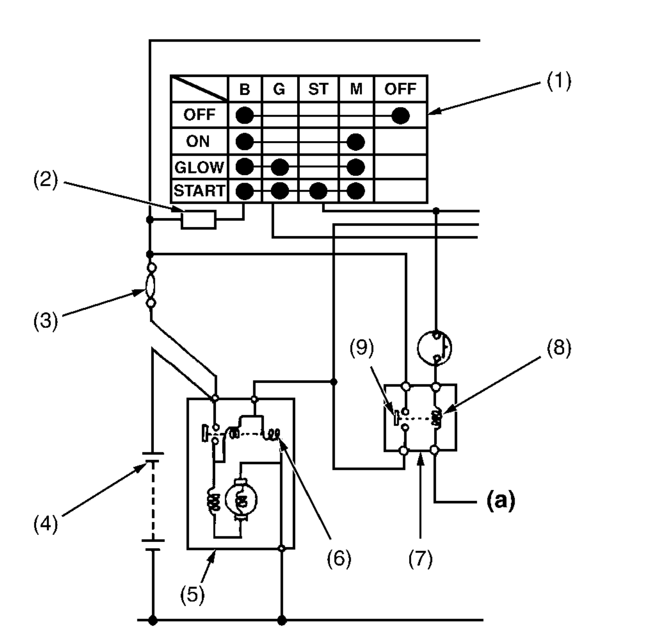
At this time, battery current flows to coil **C_5** of the relay 1 (14) and relay contact point **S_7** is turned on.

Battery current to flows to pull-in coil and holding coil of fuel cut-off solenoid (17) to pull the plunger at engine starting position.

When the main switch is released after starting the engine, the main switch returns to **ON** automatically.

W1012830

[1] STARTER MOTOR



3TMACAB9P014A

■ Starter Relay

The starter relay (7) is mounting on this starter (5) to prevent the contact of the main switch (1) burning out when the main switch is switched.

Current from the main switch flows only the starter relay coil (8), and the relay contact (9) is pulled to **ON** position by electromagnetic force.

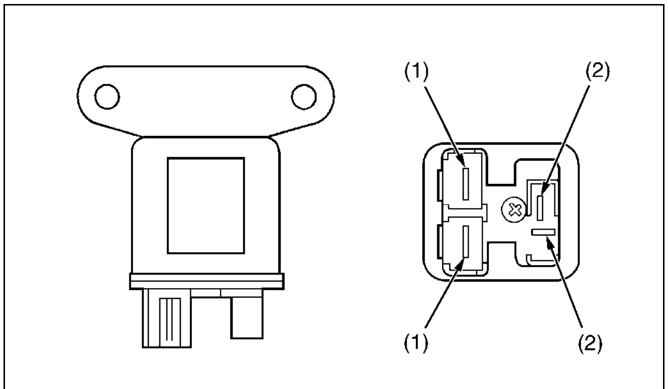
Therefore, current from the battery (4) flows directly to the pull-in coil and holding coil (6) of this starter. As a result, its durability is much better.

(1) Main Switch
(2) Fuse (20 A)
(3) Slow Blow Fuse
(4) Battery
(5) Starter
(6) Holding and Pull in Coil
(7) Starter Relay
(8) Starter Relay Coil
(9) Relay Contact

(a) PTO Relay

W1013470

[2] GLOW CONTROL SYSTEM



3EEAAAA1P147A

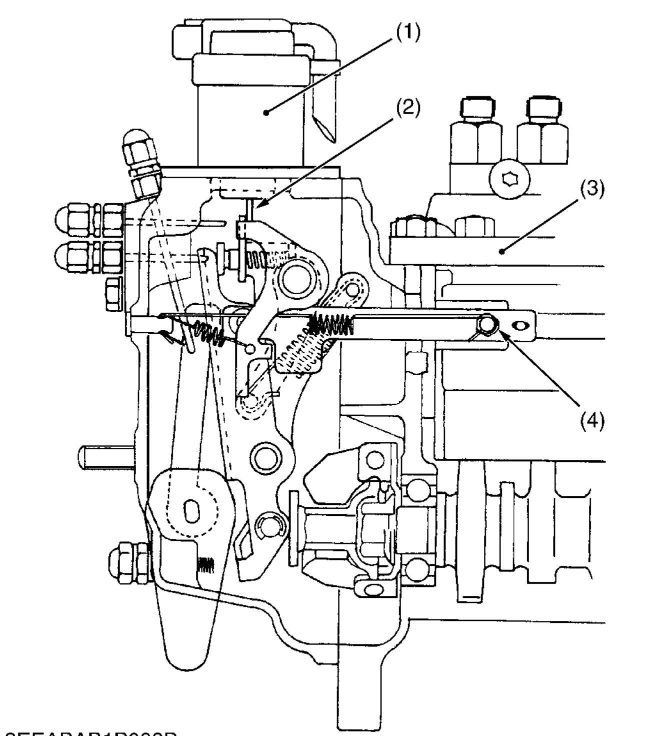
■ Glow Relay

The glow relay is actuated by the signal from the glow controller and supplies the battery power to the glow plug directly.

(1) Contact Point
(2) Coil

W1013374

3. ENGINE KEY SWITCH SHUT-OFF SYSTEM



3EEABAB1P008B

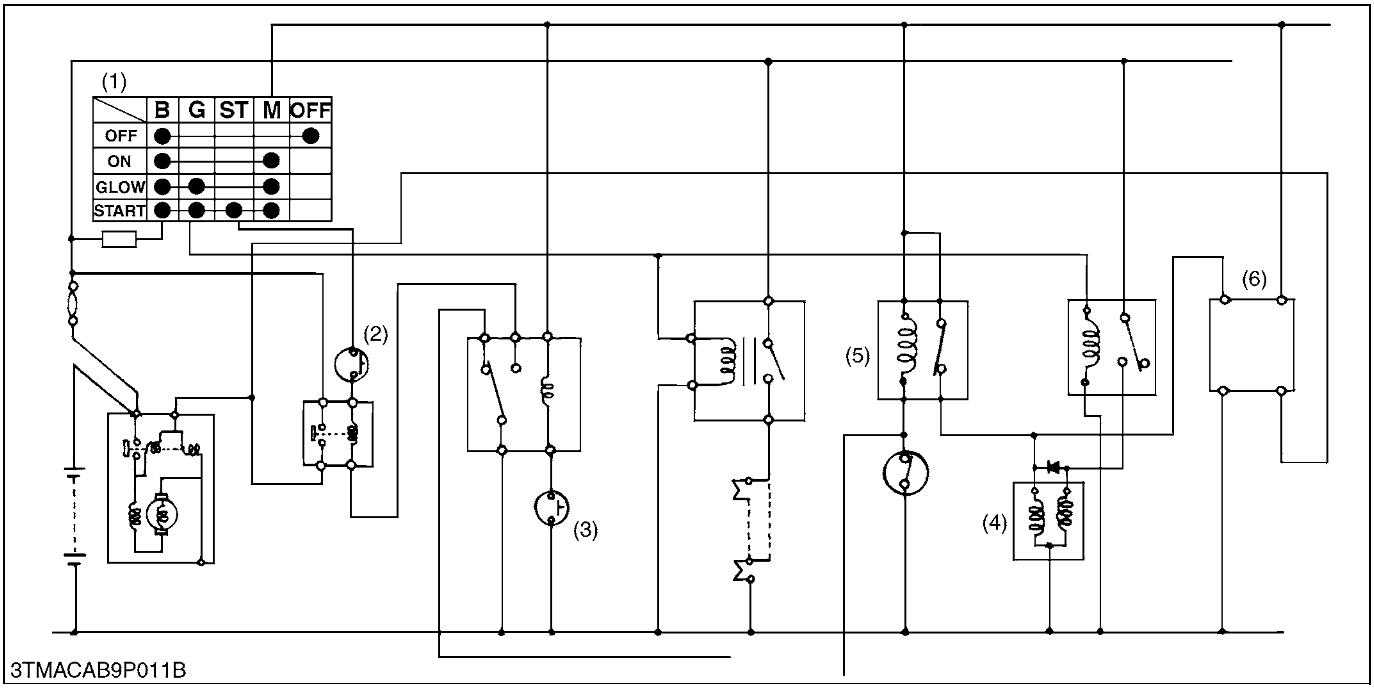
The fuel cut-off solenoid is located at the top of the injection pump (3).

When the main switch is turned to **START** position, the push rod (2) is pulled to top side by solenoid (1) for control rack (4) to starting position.

When the main switch is turned to **OFF** position, the push rod (2) is moved back to down side by the spring in the solenoid (1) for control rack to stop position.

(1) Fuel Cut-off Solenoid
(2) Push Rod
(3) Injection Pump
(4) Control Rack

W1013842



(1) Main Switch
(2) Safety Switch
(3) PTO Switch
(4) Fuel Cut-off Solenoid
(5) Key Stop Relay
(6) Timer Relay

■ **"START" Position**

When the main switch (1) is turned to **START** position, the current of the starter motors **S** terminal goes to **PULL** terminal of fuel cut-off solenoid (4) through the key stop relay (5). And current flows from timer relay (6) to hold terminal of fuel cut-off solenoid (4) for approx. 10 seconds.

During the discharging period, the current flows as follows.

Battery → Main Switch (1) → Timer Relay (6) → Fuel Cut-off Solenoid (4) → Ground.

■ **"OFF" Position**

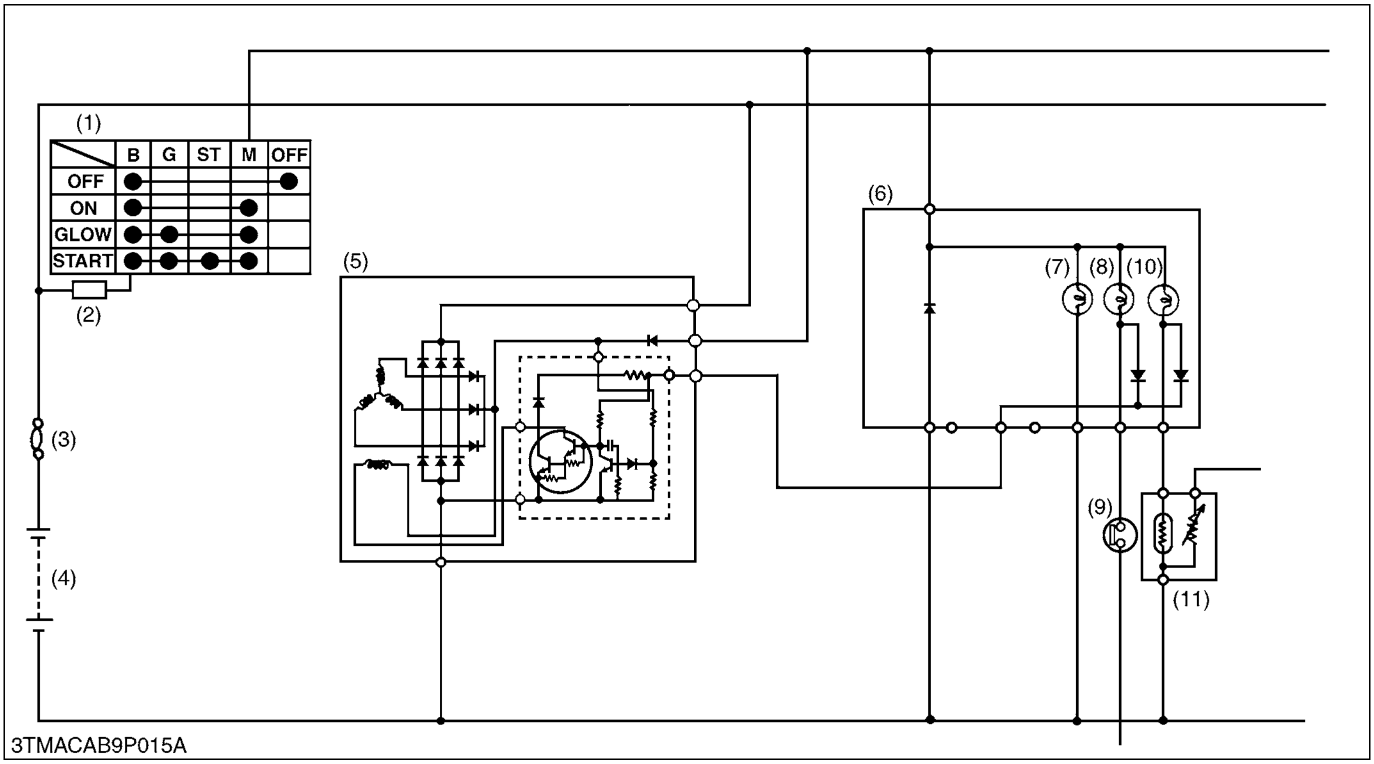
When the main switch (1) is turned to **OFF** position, the current is cut-off on hold terminal of the fuel cut-off solenoid (4).

Then, the control rack of the injection pump is pushed to no injection position by the spring of fuel cut-off solenoid.

■ **"ON" Position**

When the main switch (1) is turned to **ON** position, the current is only **HOLD** terminal of the fuel cut-off solenoid (4) to hold the start position of the control rack.

4. CHARGING SYSTEM



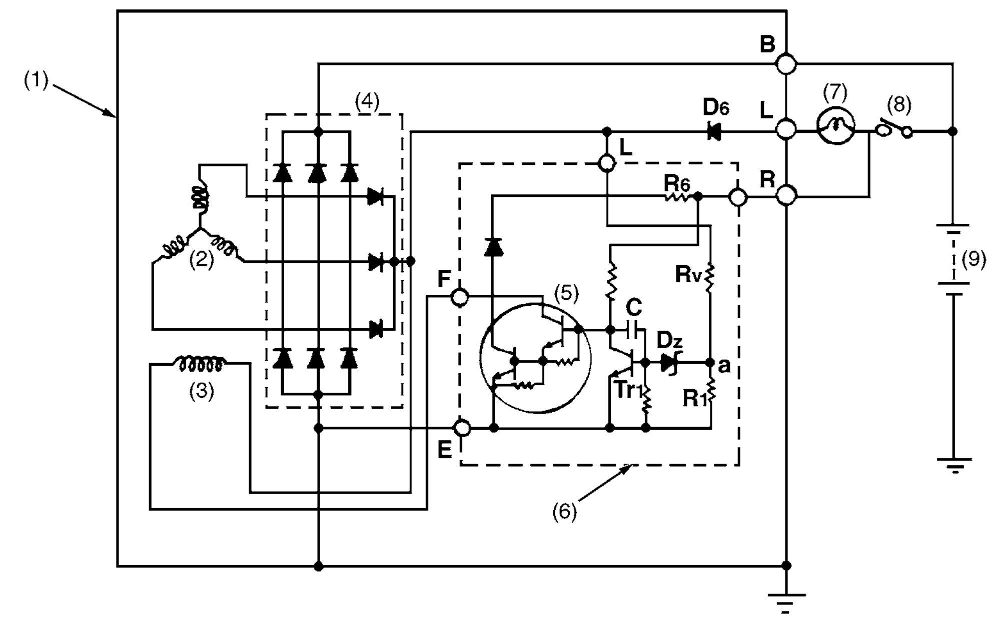
(1) Main Switch	(4) Battery	(7) PTO Lamp	(10) Fuel Limit Lamp
(2) Fuse (20 A)	(5) Alternator	(8) Engine Oil Pressure Lamp	(11) Fuel Limit Sensor
(3) Slow Blow Fuse	(6) Panel Board	(9) Engine Oil Pressure Switch	

The charging system supplies electric power for various electrical devices and also charges the battery while the engine runs.

This alternator has IC regulator.

If the alternator is not charging the battery, both engine oil pressure lamp (8) and fuel limit lamp (10) in the panel board (6) will come on.

[1] IC REGULATOR



3TRAAAA9P010A

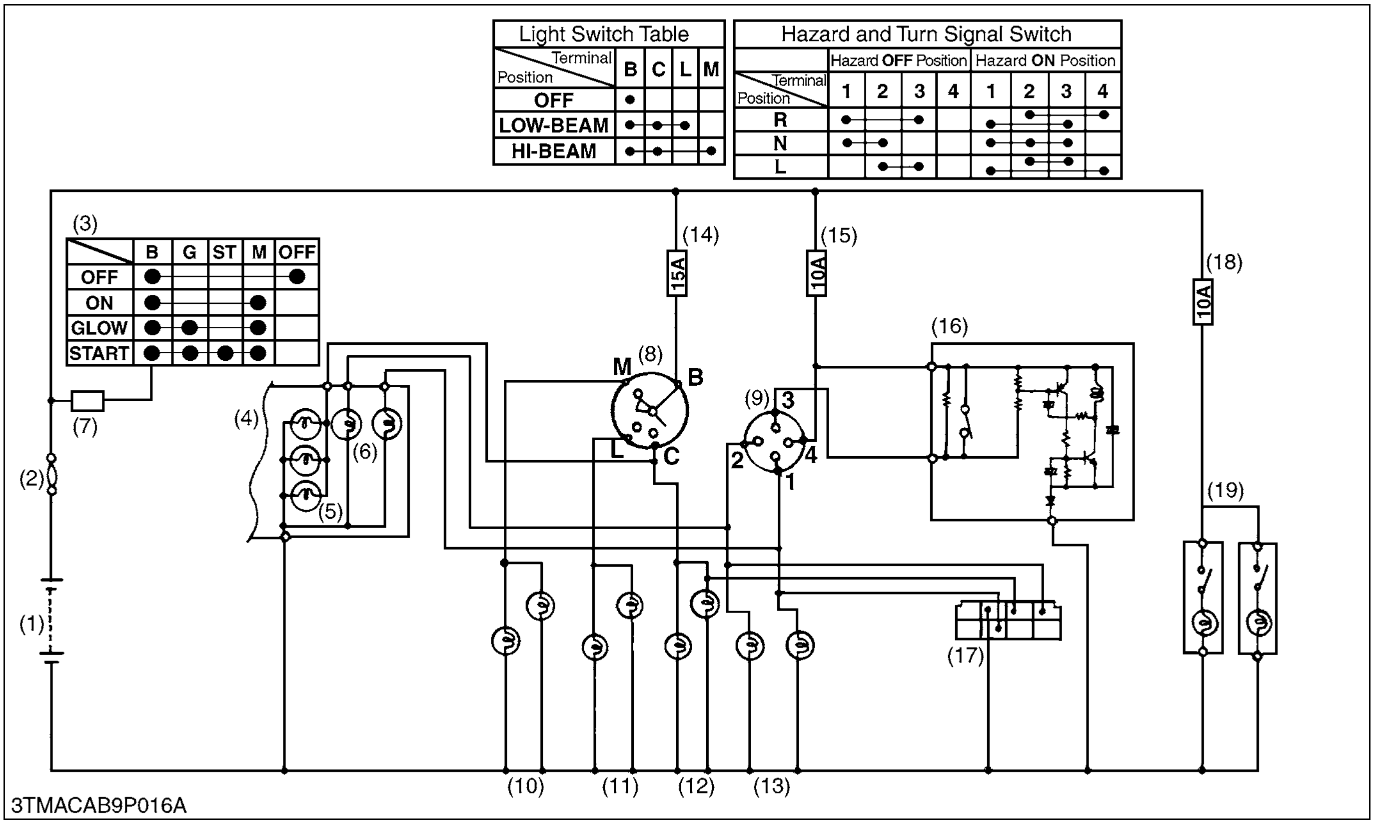
(1) Alternator
(2) Stator Coil
(3) Field Coil
(4) Trio Diode
(5) Power Transistor
(6) IC Regulator
(7) Charge Lamp
(8) Main Switch
(9) Battery

1. When the main switch (8) is turned on, the base current of the power transistor starts flowing.
   Battery → Main Switch (8) → Terminal (R) → Power Transistor's (5) Base → Power Transistor's (5) Emitter → Ground.
2. Now the power transistor (5) is energized, causing the field current to flow.
   Battery → Main Switch (8) → Charge Lamp (7) – Terminal (L) · Resistance **R6** → Field Coil (3) → Power Transistor (5) → Ground.
3. The engine gets started and the alternator starts generating electricity. The base current and field current, mentioned above, are both supplied by the alternator. The field current flows as follows.
   Trio Diode (4) → Field Coil (3) → Power Transistor (5) → Ground.
4. If the alternator-generated voltage is too low, the terminal voltage (divided by resistors **Rv** and **R1**, electric potential at point **"a"**) of the Zener diode **Dz** is lower than the Zener voltage. This means that no current flows into the diode **Dz** and that the transistor **Tr1** is shut off.
5. In this state, the generated voltage gets higher. When the voltage applied to the Zener diode **Dz** exceeds the Zener voltage, current starts flowing into the diode **Dz**. This current is the base current of transistor **Tr1**.
   Terminal (L) → Resistor **Rv** → Point **"a"** → Diode **Dz** → Base of Transistor **Tr1** → Emitter of Transistor **Tr1** → Ground.
6. Now the transistor **Tr1** is energized. In this state, the collector and emitter of transistor **Tr1** makes a sort of short-circuit between the base and emitter of the power transistor (5). The base current of the power transistor stops flowing, causing the power transistor (5) to turn off. The field current is therefore cut off, reducing the generated voltage.
7. In this way, the voltage begin applied to the Zener diode **Dz** drops below the Zener voltage. The diode **Dz** first and then the transistor **Tr1** are therefore turned off again. This causes the base current to flow in the power transistor (5) again. This transistor is energized to make the field current and raise the generated voltage. The above steps 5., 6., 7. are repeated to turn on and off the field current and control the alternator voltage.
8. The capacitor **C** is intended to keep the transistor **Tr1** functioning stably. To do this, repples of the alternator output and surges at ignition are suppressed. The reverse-current preventive diode **D6** serves to block the current that would flow from the trio diode through terminal **L** to the machine's cabling.

5. LIGHTING SYSTEM

[1] DESTINATION

(1) For North America and Oceania



(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) Panel Board
(5) Panel Board Illumination
(6) Indication Lamp
(7) Fuse (20 A)
(8) Head Light Switch
(9) Hazard Light Switch
(10) Tail Lamp
(11) Head Light (Hi)
(12) Head Light (Lo)
(13) Hazard Light
(14) Fuse (15 A)
(15) Fuse (15 A)
(16) Hazard Unit
(17) Connector for Trailer
(18) Fuse (10 A)
(19) Working Light (Option)

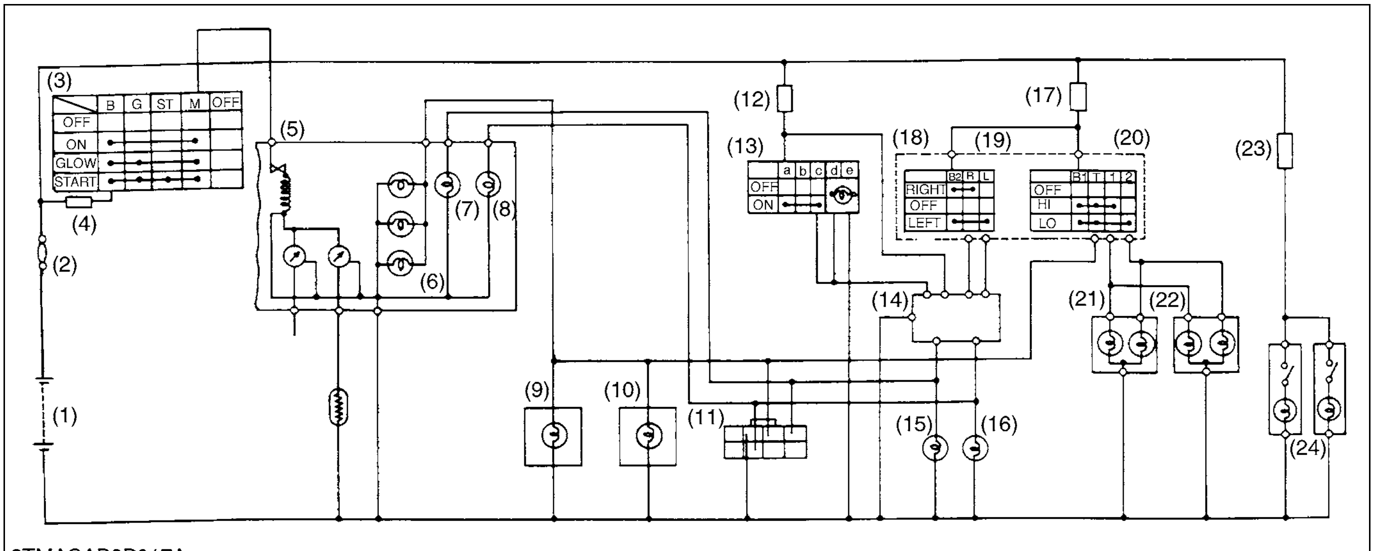
The lighting system consists of a head light circuit, a hazard light circuit and a working light circuit (option).

(2) For North America

■ **NOTE**

- **Serial No. affected are as below.**

Model	2WD	4WD
M6800(S)	Above 10794	Above 50958
M8200	Above 10413	Above 50785
M9000	Above 10374	Above 50840

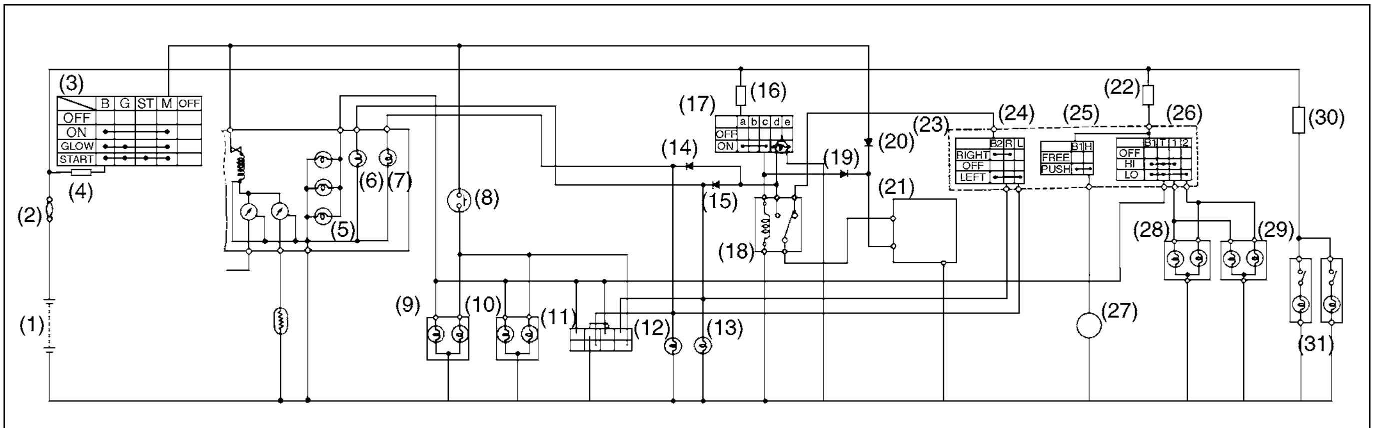


3TMACAB9P017A

(1) Battery
(2) Slow-Blow Fuse
(3) Main Switch
(4) Fuse (20 A)
(5) Panel Board
(6) Panel Illumination
(7) Hazard and Turn Signal Indicator (L.H.)
(8) Hazard and Turn Signal Indicator (R.H.)
(9) Tail Light (L.H.)
(10) Tail Light (R.H.)
(11) Connector for Trailer
(12) Fuse (10 A)
(13) Hazard Switch
(14) Hazard Unit
(15) Hazard and Turn Signal Light (L.H.)
(16) Hazard and Turn Signal Light (R.H.)
(17) Fuse (15 A)
(18) Combination Switch
(19) Turn Signal Light Switch
(20) Light Switch
(21) Head Light
(22) Head Light
(23) Fuse (10 A)
(24) Working Light (Option)

The lighting system consists of a head light circuit, a turn signal light circuit, a hazard light circuit and working light circuit (option).

(3) For Euro

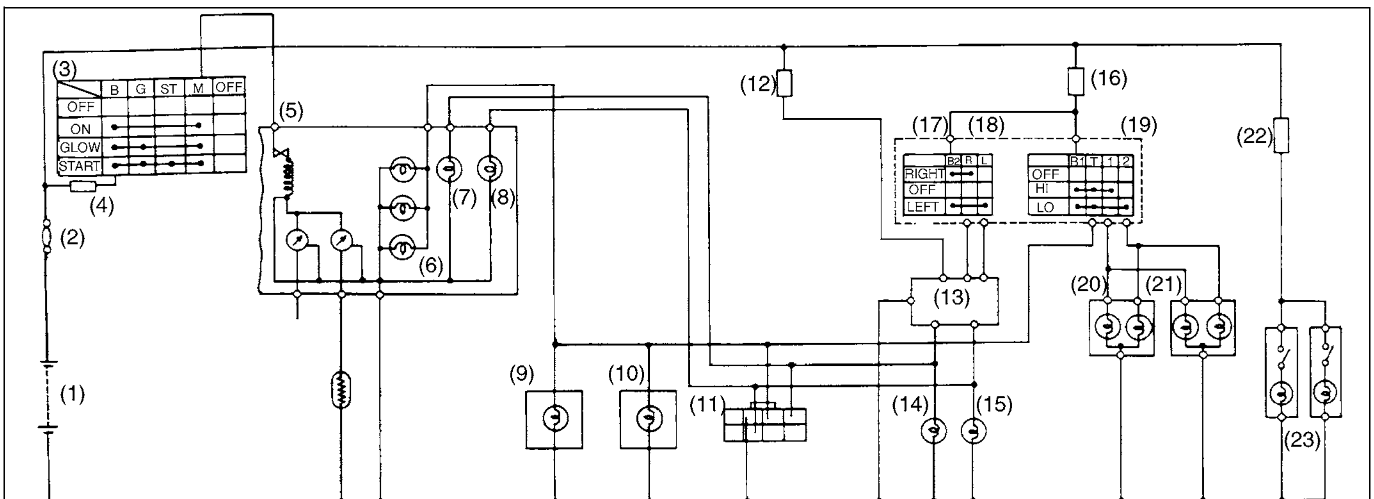


3TMACAB9P018A

(1) Battery
(2) Slow-Blow Fuse
(3) Main Switch
(4) Fuse (20 A)
(5) Panel Board Illumination
(6) Hazard and Turn Signal Indicator (L.H.)
(7) Hazard and Turn Signal Indicator (R.H.)
(8) Brake Switch
(9) Stop and Tail Light (L.H.)
(10) Stop and Tail Light (R.H.)
(11) Connector for Trailer
(12) Hazard and Turn Signal Light (L.H.)
(13) Hazard and Turn Signal Light (R.H.)
(14) Diode
(15) Diode
(16) Fuse (10 A)
(17) Hazard Switch
(18) Relay 2
(19) Diode
(20) Diode
(21) Hazard Unit
(22) Fuse (15 A)
(23) Combination Switch
(24) Turn Signal Light Switch
(25) Horn Switch
(26) Light Switch
(27) Horn
(28) Head Light
(29) Head Light
(30) Fuse (10 A)
(31) Working Light

The lighting system consists of a head light circuit, a stop light circuit, a turn signal light circuit, a hazard light circuit and a working light circuit.

(4) For Asia and Other Country

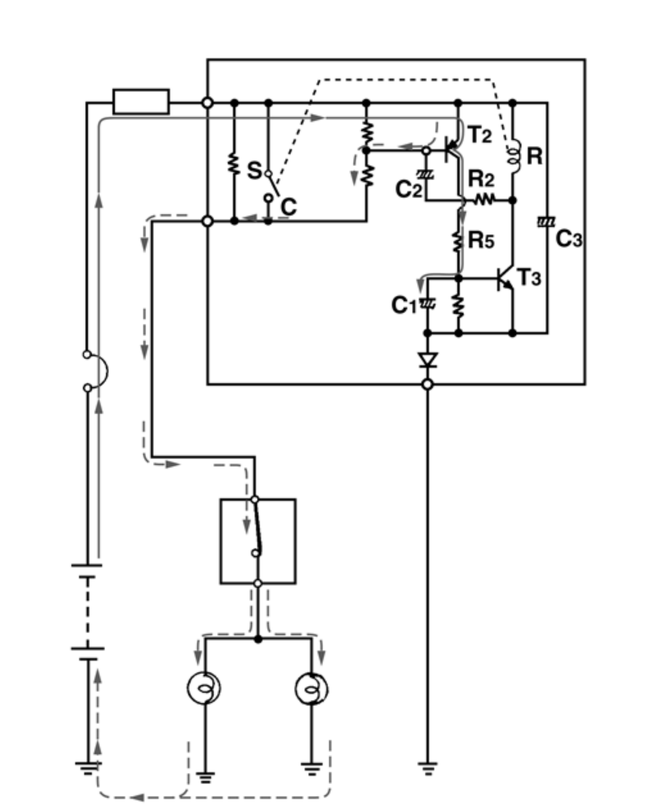


3TMACAB9P019A

(1) Battery
(2) Slow-Blow Fuse
(3) Main Switch
(4) Fuse (20 A)
(5) Panel Board
(6) Panel Illumination
(7) Turn Signal Indicator (L.H.)
(8) Turn Signal Indicator (R.H.)
(9) Tail Light (L.H.)
(10) Tail Light (R.H.)
(11) Connector for Trailer
(12) Fuse (10 A)
(13) Flasher Unit
(14) Turn Signal Light (L.H.)
(15) Turn Signal Light (R.H.)
(16) Fuse (15 A)
(17) Combination Switch
(18) Turn Signal Light Switch
(19) Light Switch
(20) Head Light
(21) Head Light
(22) Fuse (10 A)
(23) Working Light

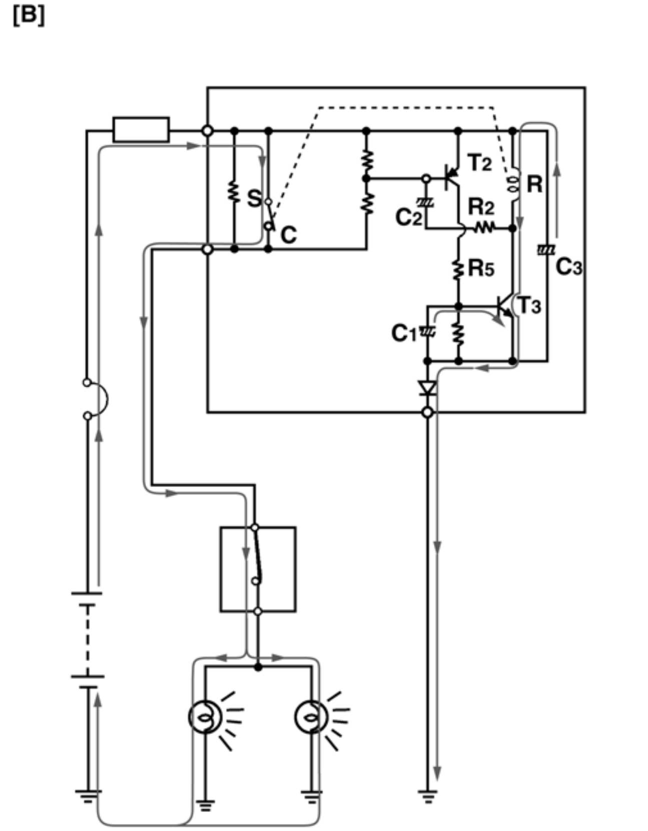
The lighting system consists of a head light circuit, a turn signal light circuit, and working light circuit.

[A]



3TMACAB9P020A

[B]



3TMACAB9P021A

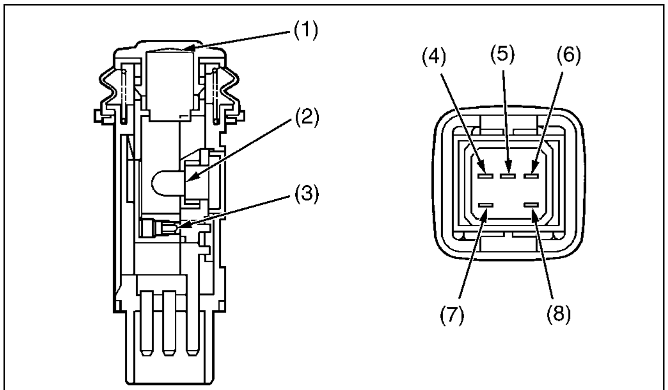
■ **Hazard Unit (for North America)**

The hazard unit, consisting of a capacitor, transistors, diodes, resistors and the other parts, sends intermittent current to the hazard lights. Intermittent current is generated in the following sequence.

1. When the hazard switch is turned **OFF**, voltage from the battery is applied to capacitors **C2** and **C3**, causing the capacitor always to be overcharged and the circuit to be opened.
2. When the hazard switch is turned **ON**, the capacitor **C2** starts discharging. When the discharged voltage of the capacitor **C2** is lower than the voltage of battery and the potential difference becomes large, the base current of the transistor **T2** increases and turn on the transistor **T2**.
3. Battery current flowing through the transistor **T2** goes through the resistor **R5** and charges the capacitor **C1**.
4. When the capacitor **C1** is fully charged, the current from the resistor **R5** becomes the base current of the transistor **T3** and turn on the transistor **T3**.
5. When the transistor **T3** is turned on, battery current magnetizes the coil **R**. As the contact **S** is drawn to be connected with the terminal **C**, the battery current flows through the hazard switch and turns on the hazard lights.
6. When the hazard light is lighted, all the battery current flow through the contact **S** and will not flow through the coil **R**. But, the current discharged from the capacitor **C1** becomes the base current to maintain the transistor **T3** in **ON** mode. Current discharged from the capacitor **C3** flows through the coil **R** and keeps the hazard lights turned on.
7. When the capacitor **C1** completes discharging, no base current is present in the transistor **T3**, turning off the transistor **T3**. Then the current from the capacitor **C3** to the coil **R** is shut off, causing the contact **S** to move away from the terminal **C**, and the hazard lights are turned off.
8. The capacitor **C1** controls the time from turning on to turning off the light, while the capacitor **C2** and resistor **R2** control the lighting time.

[A] When the Hazard Lights "OFF"
[B] When the Hazard Lights "ON"

W1024533



3TRAAAA9P014B

■ **Hazard Switch (for North America, Oceania and Euro)**

■ **NOTE**

- **Serial No. affected of North America models are as below.**

Model	2WD	4WD
M6800(S)	Above 10794	Above 50958
M8200	Above 10413	Above 50785
M9000	Above 10374	Above 50840

This is a pushing type switch to turn on the hazard lights. The lamp (2) in the switch is lighted up by the current from outside of the switch, when the switch is **"ON"**. The circuit in the switch is shown below.

Terminal	**a**	**b**	**c**	**Lamp**	
				d	**e**
OFF		●	●	●	●
ON	●		●	●	●

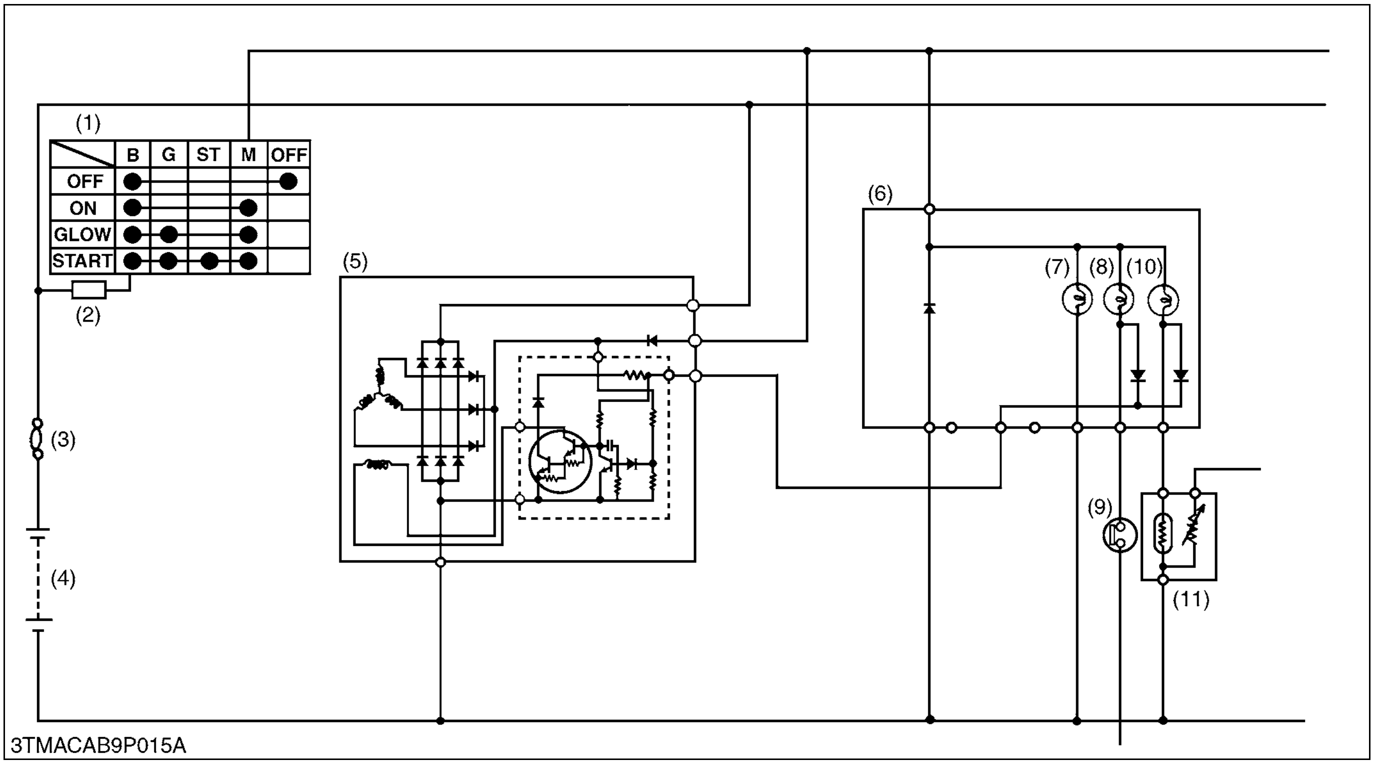
(1) Lens
(2) Lamp
(3) Contact Portion
(4) Terminal **a**
(5) Terminal **b**
(6) Terminal **d**
(7) Terminal **c**
(8) Terminal **e**

W1015017

6. EASY CHECKER

[1] DESTINATION

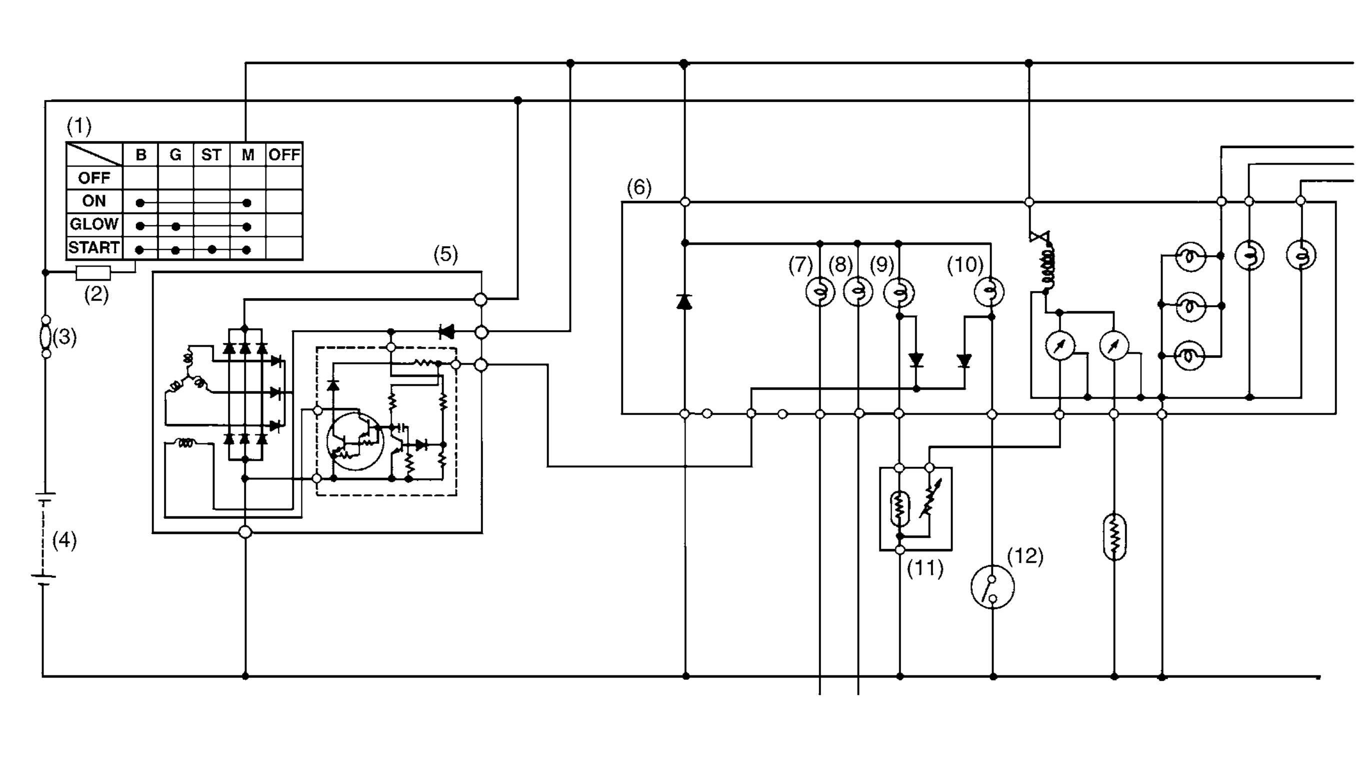
(1) For North America, Oceania, Asia and Other Country



(1) Main Switch
(2) Fuse (20 A)
(3) Slow Blow Fuse
(4) Battery
(5) Alternator
(6) Panel Board
(7) PTO Lamp
(8) Engine Oil Pressure Lamp
(9) Engine Oil Pressure Switch
(10) Fuel Limit Lamp
(11) Fuel Limit Sensor

The operator must check the conditions of the tractor before and during operation. To facilitate checking, the Easy Checker-combination of lamps on the panel board is provided.

(2) For Euro

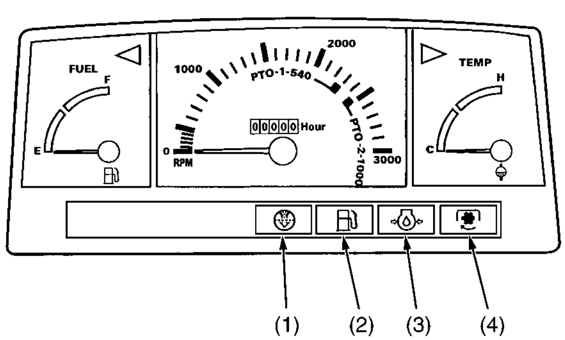


3TMACAB9P022A

(1) Main Switch
(2) Fuse (20 A)
(3) Slow Blow Fuse (50 A)
(4) Battery
(5) Alternator
(6) Panel Board
(7) PTO Lamp
(8) Engine Oil Pressure Lamp
(9) Fuel Limit Lamp
(10) Air Cleaner CLogged Lamp
(11) Engine Oil Pressure Switch
(12) Fuel Limit Sensor

The operator must check the conditions of the tractor before and during operation. To facilitate checking, the Easy Checker-combination of lamps on the panel board is provided.

[2] INDICATION ITEMS



3TMACAB9P023A

(1) Air Cleaner Clogged Lamp (for Euro and Oceania Model Only)

Light up when the air cleaner is clogged.

(2) Fuel level

Alarm against fuel level drop.

Light up when remaining fuel quantity is less than approx. 10 L (2.6 U.S.gals., 2.2 Imp.gals.)

(3) Engine oil pressure

Alarm against the low engine oil pressure.

(4) Power take off operation

Light up when the PTO clutch is engaged.

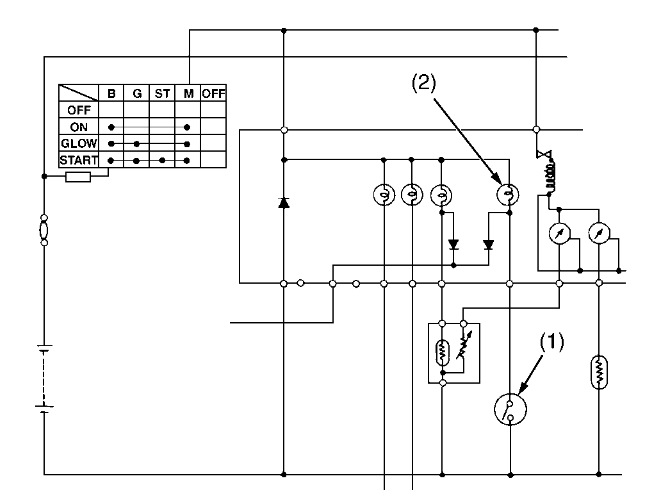
(5) Charging circuit malfunction

There is no special lamp to worn of charging circuit malfunction, but the lamps (2) and (3) light simultaneously to indicate the operator that charging is improper.

(1) Air Cleaner Clogged Lamp
(2) Fuel Level Lamp
(3) Engine Oil Pressure Lamp
(4) Power Take Off Operation Lamp

W1026840

[3] AIR CLEANER CLOGGED LAMP (FOR EURO AND OCEANIA MODEL ONLY)

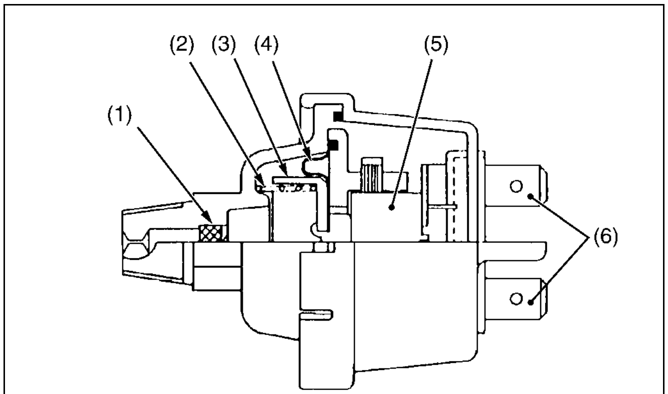


3TMACAB9P024A

When the air cleaner is clogged and the negative pressure of the suction air increases, the air cleaner sensor (1) is turned **ON**, causing the current to flow from the main switch and the lamp (2) is lighted.

(1) Air Cleaner Sensor
(2) Air Cleaner Clogged Lamp

W1027025



3TMACAB9P025A

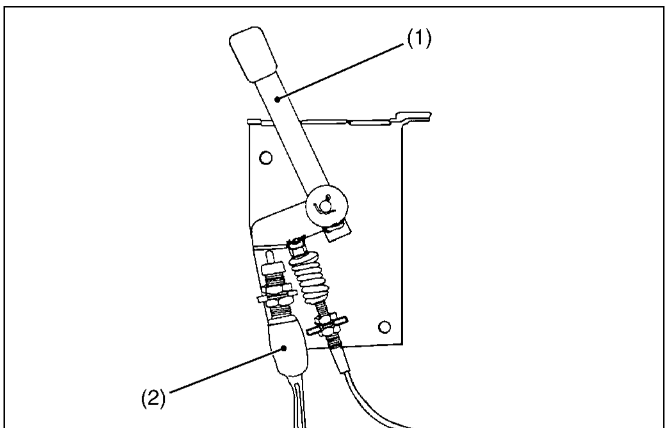
■ **Air Cleaner Sensor**

The micro switch (5) is normally opened. When the air cleaner is clogged, the negative pressure is created in the outlet port of air cleaner and the diaphragm (4) is attracted. And the micro switch is turned on when the negative pressure exceeds approx. 6.22 kPa (635 mmAq.).

(1) Filter
(2) Spring
(3) Guide
(4) Diaphragm
(5) Micro Switch
(6) Terminal

W1027285

[4] PTO CLUTCH LEVER OPERATION



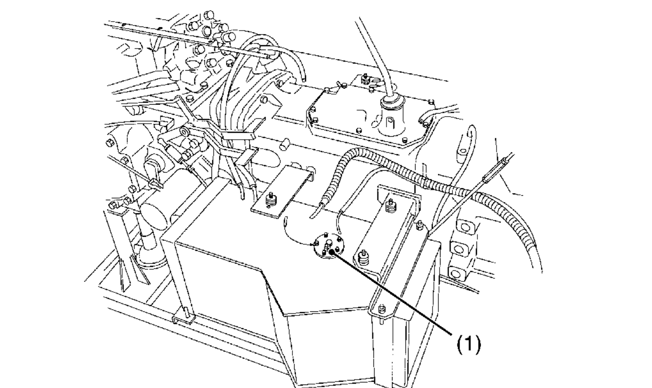
3TRAAAA9P028B

PTO clutch lamp inform an operator that PTO clutch lever is engaged. This system consists of a PTO clutch lamp on the panel board and a switch is operated by a PTO clutch lever.

(1) PTO Clutch Lever
(2) PTO Switch

W1016350

[5] INSUFFICIENT FUEL

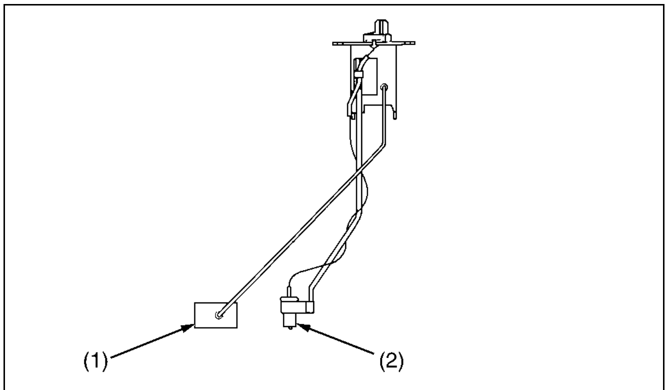


3TMACAB9P026A

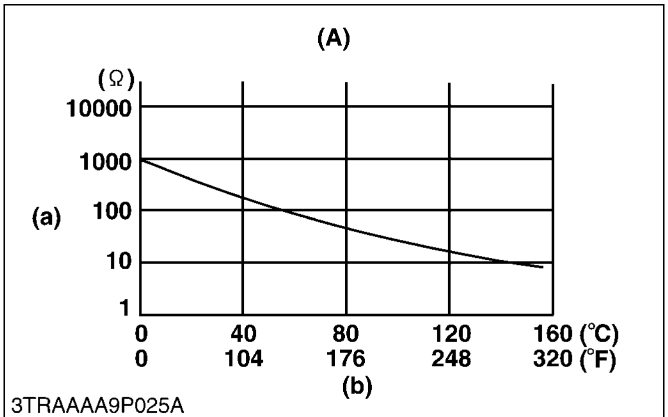
Insufficient fuel is detected by the fuel limit sensor (thermistor) installed in the fuel tank.

(1) Fuel Unit

W1016421



3TRAAAA9P024A



3TRAAAA9P025A

■ Fuel Limit Sensor (Thermistor)

Thermistor is a kind of resistor whose resistance varies with the temperature.

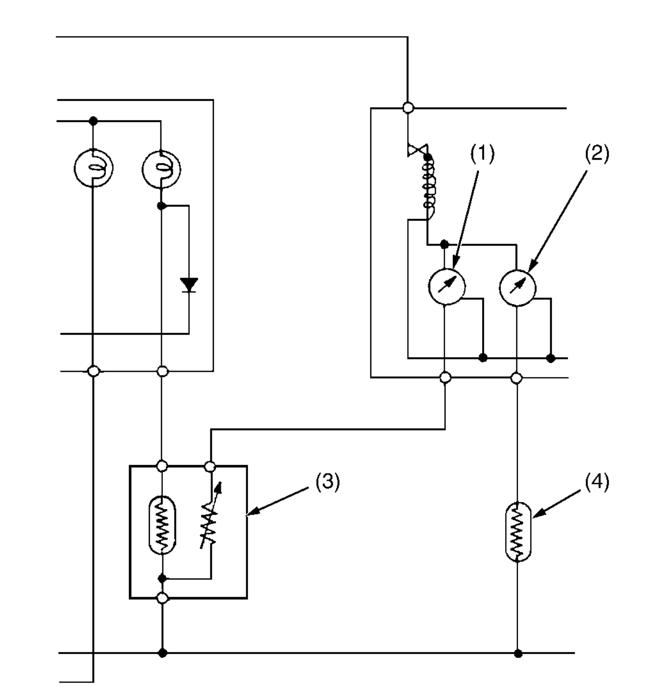
It has a large resistance in fuel as it is cooled. But in the air, it is heated by flowing current, and as the temperature rises, the resistance decreases, which in turn further increases the current and decreases the resistance. After a certain period of time, calorific values (temperature) of heat radiation and heat generation are balanced. (Testing must be done under this equilibrium.)

(1) Float
(2) Thermistor

(A) Characteristics of Thermistor
(a) Resistance
(b) Temperature

W1016471

7. GAUGES



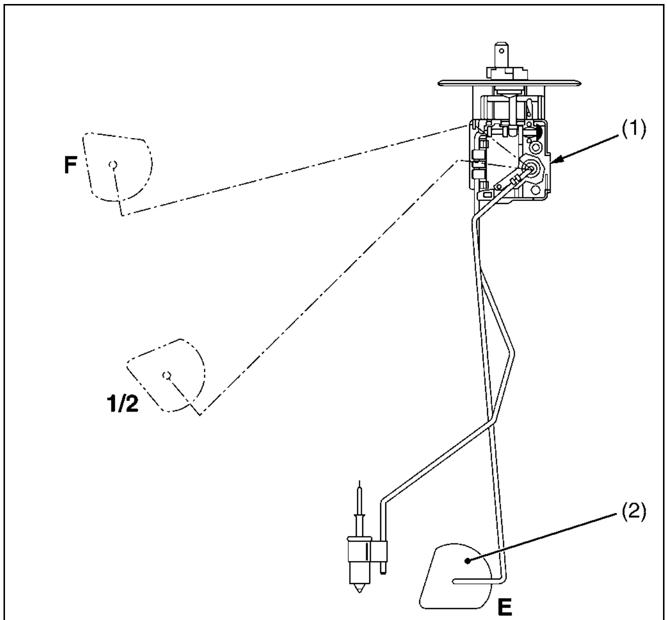
3TMACAB9P027A

The fuel quantity and coolant temperature are indicated by the ammeters. The ammeters indicate each amperate flowing through the fuel level sensor (3) for the fuel quantity detection and through the coolant temperature sensor (4) for the coolant temperature detection.

(1) Fuel Gauge
(2) Coolant Temperature Gauge
(3) Fuel Level Sensor
(4) Coolant Temperature Gauge

W1016784

[1] SENSOR



3TRAAAA9P033B

■ **Fuel Level Sensor**

The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

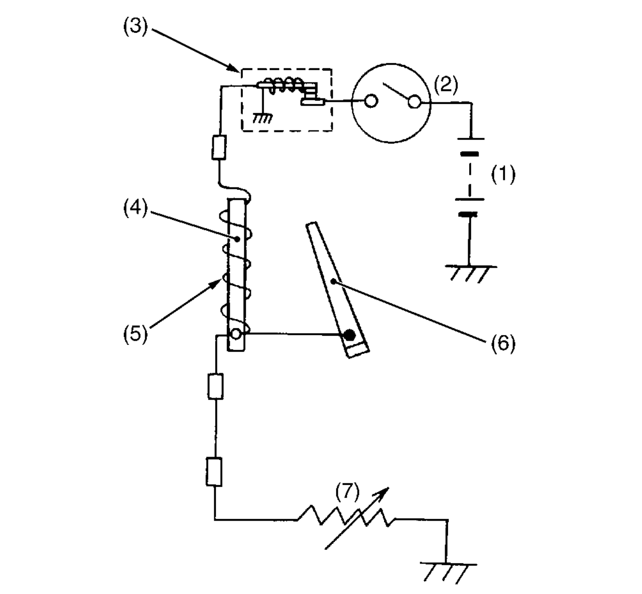
As the float (2) lowers, the resistance of the variable resistor (1) varies. The relation between the amount of fuel and the resistance is as follows.

F	1/2	E
1 to 5 Ω	Approx. 32.5 Ω	108 to 112 Ω

(1) Variable Resistor
(2) Float

W1016525

[2] GAUGE



3TMACAB9P028A

Both the fuel gauge and coolant temperature gauge use bimetal types.

When the main switch (2) is turned **ON**, the current controlled by the resistance of the sensor (7) flows through the circuit and is grounded.

This current heats the heat wire (5), causing the bimetal (4) to deflect in proportion to the current, thereby swinging the indicating needle (6) connected to the bimetal (4).

When the main switch (2) is turned **OFF**, the indicating needle (6) returns to its original position.

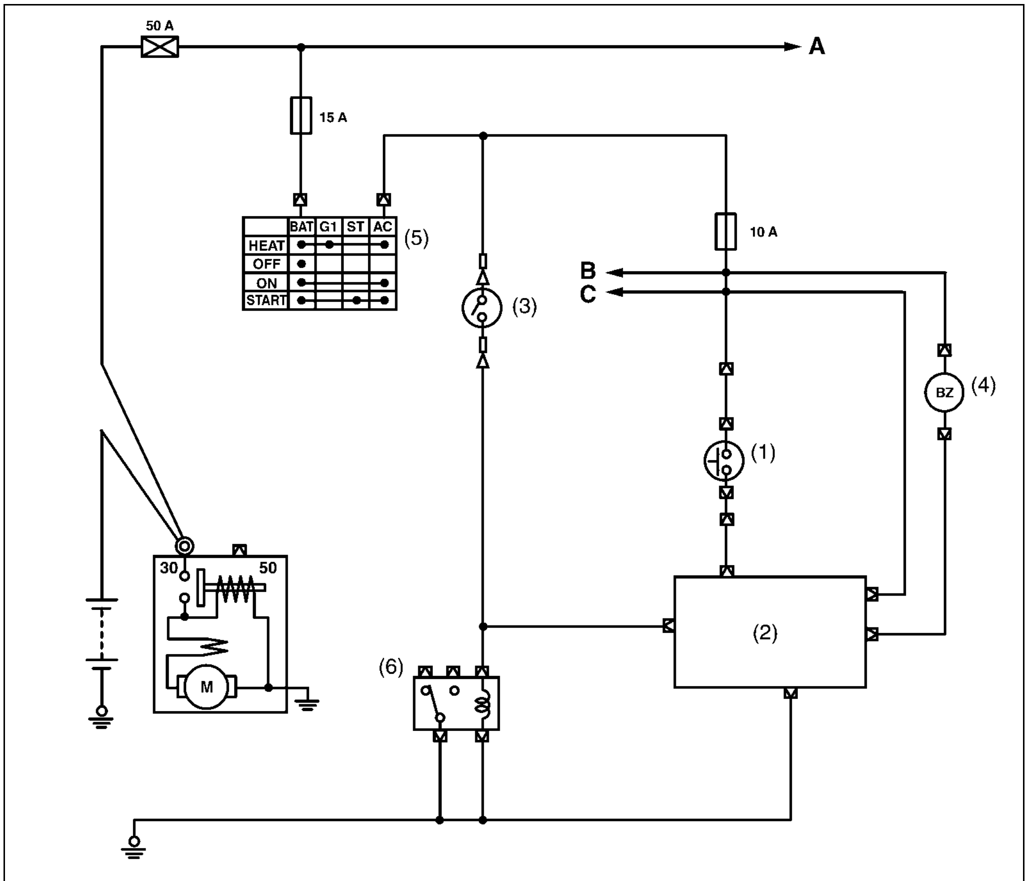
The voltage regulator (3) is installed so as to prevent errors due to voltage fluctuation.

(1) Battery
(2) Main Switch
(3) Voltage Regulator
(4) Bimetal
(5) Heat Wire
(6) Indicating Needle
(7) Sensor

W1017215

8. OPC (OPERATOR PRESENCE CONTROL) (IF EQUIPPED)

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT



3TMACAB9P073A

(1) Seat Switch
(2) OPC Buzzer Timer
(3) PTO Switch
(4) Buzzer
(5) Main Switch
(6) PTO Relay

A : To Alternator B Terminal
B : To Meter
C : To Easy Checker

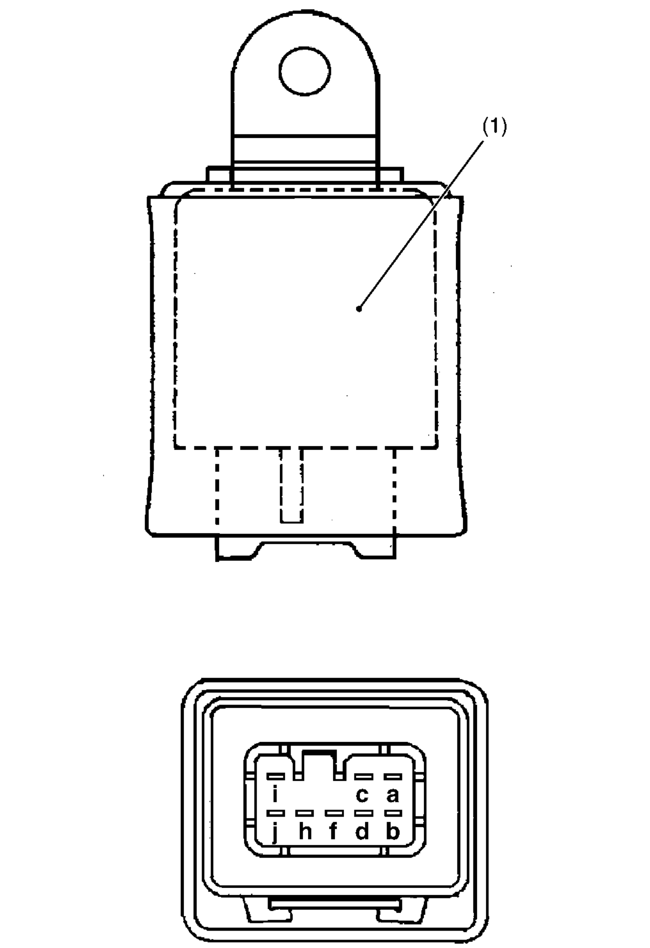
W1032141

The 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 (1), OPC buzzer timer (2), PTO switch (3) and buzzer (4).

■ **Electric Circuit**

1. When sitting on the seat in the state of the main switch **ON**, the battery voltage passes the seat switch (1) and the OPC buzzer timer (2).
2. When standing from the operator's seat, the circuit from the seat switch (1) to the OPC buzzer timer is cut. However, if the PTO clutch lever is set at **ON** position, the circuit from the battery to the OPC buzzer timer (2) is formed with the PTO switch (3).
3. When standing from the seat while shifting the PTO clutch lever at **ON** position, the circuit from battery to the buzzer (4) is flowed, and the buzzer is whistled.



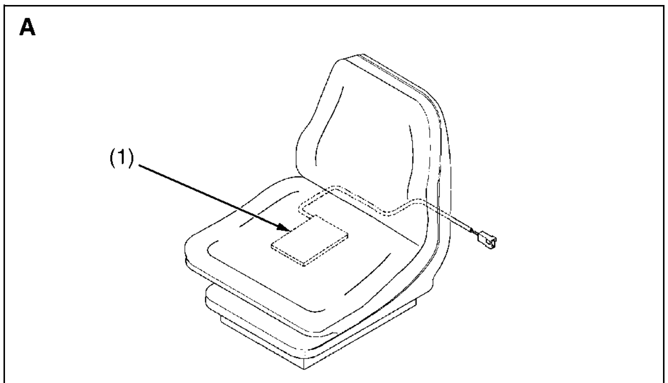
3TMACAI9P061A

■ OPC Buzzer Timer

After the current supply cuts from seat switch, the OPC buzzer timer (1) adopted for this system has maintained the state of **ON** position for whistling the buzzer about 10 seconds.

(1) OPC Buzzer Timer

W1032783



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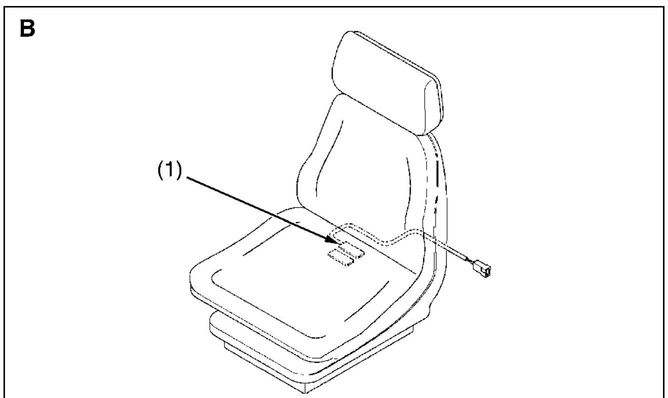

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■ Seat Switch

The seat switch (1) has **ON** and **OFF** positions.

When operator sits the seat, the seat switch is **ON** state.

(1) Seat Switch

A : ROPS Model
B : CABIN Model

W1032240

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	• Battery discharged or defective • Battery positive cable disconnected or improperly connected • Battery negative cable disconnected or improperly connected • Slow-Blow fuse blown	Recharge or replace Repair or replace Repair or replace Replace	9-S7 to S9 9-S7 9-S7 –
Fuse Blown Frequently	• Short-circuited	Repair or replace	–

W1014322

BATTERY

Symptom	Probable Cause	Solution	Reference Page
Battery Discharges Too Quickly	• Battery defective • Alternator defective • Wiring harness disconnected or improperly connected (between battery positive terminal and alternator **B** terminal) • Cooling fan belt slipping	Recharge or replace Repair or replace Repair or replace Adjust tension	9-S7 to S9 9-S18 to S22 – 1-S65

W1013718

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	• Battery discharged or defective • Slow blow fuse blown • Starter relay defective • Safety switch defective • PTO switch improperly adjusted or defective • Wiring harness disconnected or improperly connected (between main switch **ST** terminal and PTO switch, between PTO switch and safety switch, between safety switch and starter relay, between starter relay and ground, between main switch **B** terminal and starter relay, between starter relay and starter motor **S** terminal, between battery positive terminal and starter motor **B** terminal) • Starter motor defective • Main switch defective	Recharge or replace Replace Replace Replace Repair or replace Repair or replace Repair or replace Replace	9-S7 to S9 – 9-S12 9-S13 9-S13 – 9-S14 9-S10, S11

W1013718

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light When Main Switch Is Turned ON	• Fuse blown • Wiring harness disconnected or improperly connected (between main switch **AC** terminal and panel board, between panel board and alternator **L** terminal)	Replace Repair or replace	– –
Charging Lamp Does Not Go OFF When Engine Is Running	• Short circuit between alternator **L** terminal lead and chassis • Alternator defective	Repair or replace Repair or replace	– 9-S18 to S22

W1013718

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head Light Does Not Light	• Fuse blown (15 A) • Bulb blown • Wiring harness disconnected or improperly connected (between main switch **B** terminal and combination switch **B1** terminal, between combination switch **1** terminal and head light, between combination switch **2** terminal and head light)	Replace Replace Repair or replace	– – –
Illumination Light Does Not Light	• Fuse blown (15 A) • Bulb blown • Wiring harness disconnected or improperly connected (between combination switch **T** terminal and panel board)	Replace Replace Repair or replace	– – –
Tail Light Does Not Light	• Fuse blown (15 A) • Wiring harness disconnected or improperly connected (between combination switch **T** terminal and tail light)	Replace Repair or replace	– –
Stop Light Does Not Light (for Euro and Oceania Model)	• Fuse blown (15 A) • Brake switch defective • Bulb blown • Wiring harness disconnected or improperly connected (between main switch and brake switch, between brake switch and stop light) • Ground of stop lights are improperly connected	Replace Replace Replace Repair or replace Repair	– 9-S29 – – –
Hazard and Turn Signal Light Does Not Light	• Fuse blown (10 A) • Bulb blown • Wiring harness disconnected or improperly connected (between main switch **M** terminal and hazard unit, between relay 2 and hazard lamps, between hazard unit and relay 2, between relay 2 and turn signal light switch, between turn signal light switch **R** or **L** terminal and hazard lamps) • Hazard unit defective • Hazard switch defective • Turn signal switch defective	Replace Replace Repair or replace Replace Replace Replace	– – – 9-S28, S29 9-S24, S27, S28 9-S22 to S24
Hazard and Turn Signal Indicator Lamp Does Not Light	• Bulb blown • Wiring harness disconnected or improperly connected.	Replace Repair or replace	– –
Hazard and Turn Signal Light Does Not Go ON and OFF	• Hazard unit defective	Replace	9-S28, S29
Work Light Does Not Light	• Fuse blown • Bulb blown • Wiring harness disconnected or improperly connected (between starter motor **B** terminal and work light)	Replace Replace Repair or replace	– – –

W1013580

HORN (For Euro and Oceania Model)

Symptom	Probable Cause	Solution	Reference Page
Horn Does Not Sound When Horn Button Is Pushes	• Horn switch defective • Horn defective • Wiring harness disconnected or improperly connected (between combination switch terminal **H** terminal and horn)	Replace Replace Repair or replace	– 9-S22 –

W1013580

EASY CHECKER

Engine Oil Pressure Lamp Lights Up When Engine Is Running	• Engine oil pressure too low • Engine oil insufficient • Engine oil pressure switch defective • Short circuit between engine oil pressure switch lead and chassis • Circuit in panel board defective	Repair engine Replenish Replace Repair Replace	1-S63 G-11 9-S30 – –
Engine Oil Pressure Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running	• Bulb blown • Engine oil pressure switch defective • Wiring harness disconnected or improperly connected (between panel board and engine oil pressure switch) • Circuit in panel board defective	Replace Replace Repair or replace Replace	– 9-S30 – –
Air Cleaner Clogged Lamp Lights Up (for Euro and Oceania Model)	• Air cleaner clogged • Air cleaner sensor defective • Short circuit between air cleaner sensor lead and chassis • Circuit panel board defective	Clean or replace Replace Repair or replace Replace	G-22 9-S31 – –
Air Cleaner Clogged Lamp Does Not Light When Air Cleaner Clogged (for Euro and Oceania Model)	• Bulb blown • Air Cleaner sensor defective • Wiring harness disconnected or improperly connected (between panel board and air cleaner sensor, between air cleaner sensor and ground)	Replace Replace Repair or replace	– 9-S31 –

W1013718

ENGINE KEY SWITCH SHUT-OFF SYSTEM

Engine Does Not Stop When Main Switch Is Turned OFF	• Fuse blown (15 A) • Key stop relay defective • Wiring harness disconnected or improperly connected • Relay 1 defective • Key stop relay defective	Replace Replace Repair or replace Replace Replace	– – – – –
Engine Does Not Start	• Fuse blown (15 A) • Timer relay defective • Fuel solenoid defective • Relay 1 defective • Oil switch defective • Key stop relay defective	Replace Replace Replace Replace Replace Replace	– – – – 9-S30 –

W1013580

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	• Fuel gauge defective • Fuel level sensor (tank unit) defective • Wiring harness disconnected or improperly connected (between panel board and fuel level sensor) • Circuit in panel board defective	Replace Replace Repair or replace Replace	9-S32 9-S32 – –
Coolant Temperature Gauge Does Not Function	• Coolant temperature gauge defective • Coolant temperature sensor defective • Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor) • Circuit in panel board defective	Replace Replace Repair or replace Replace	– 9-S32 9-S32 –

W1011593

OPC (If equipped)

Buzzer Does Not Buzz	• Fuse blown (10 A) • Buzzer defective • OPC buzzer timer defective • Seat switch defective • Wiring harness disconnected or improperly connected (between OPC buzzer timer and seat switch, buzzer and OPC buzzer timer)	Replace Replace Replace Replace Repair or replace	– 9-S35 9-S33 9-S34 –

W1013718

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

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

GLOW PLUG

Glow Plug	Resistance	Approx. 1.0 Ω	–

W1011815

FUEL LEVEL SENSOR

Float at Uppermost Position	Resistance	1.0 to 5.0 Ω	–
Float at Lowermost Position	Resistance	103 to 117 Ω	–

W1013973

COOLANT TEMPERATURE SENSOR

Coolant Temperature at 120 °C (248 °F)	Resistance	Approx. 16 Ω	–
Coolant Temperature at 80 °C (176 °F)	Resistance	Approx. 50 Ω	–
Coolant Temperature at 50 °C (122 °F)	Resistance	Approx. 149 Ω	–

W1013973

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 **"6. TIGHTENING TORQUES"** at 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, DISASSEMBLING AND SERVICING

CAUTION

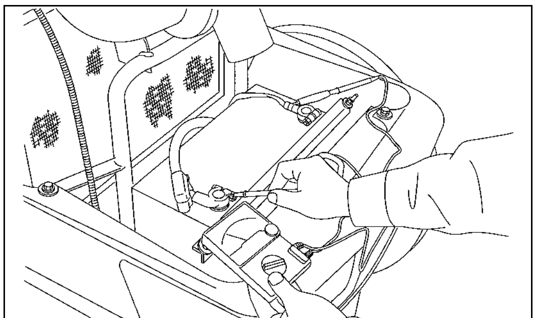
- **To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the ground cable is attached to the negative terminal.**
- **Never remove the battery cap while the engine is running.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered 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 tractor is to be operated for a short time without battery (using a slave battery for starting), do not, under any circumstances, interrupt the circuit by switching off the key switch before stopping the engine by pulling engine stop knob. Use additional current (lights) while engine is running.**
- **Insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.**

[1] BATTERY

(1) Checking



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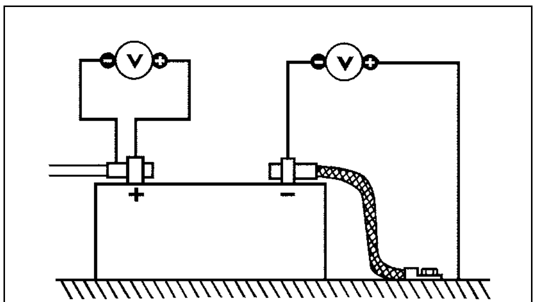
Battery Voltage

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

W1013072



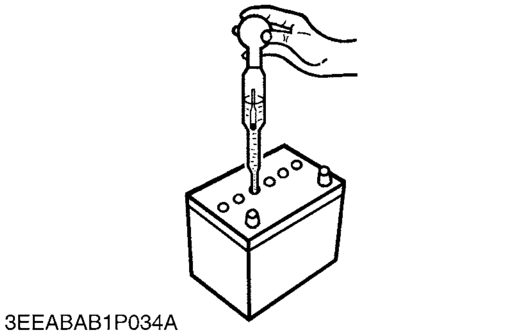
3TMABAB9P001A

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

W1012663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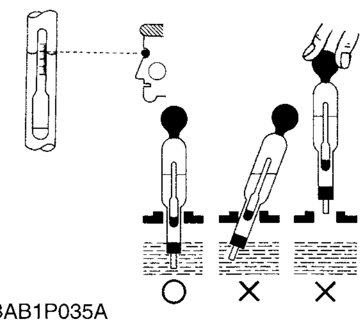
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Battery Specific Gravity

1. Check the specific gravity of the electrolyte in each cell with a hydrometer.
2. When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned in (Reference).
3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity differs between any two cells by more than 0.05, replace the battery.

■ **NOTE**

- **Hold the hydrometer tube vertical without removing it from the electrolyte.**
- **Do not suck too much electrolyte into the tube.**
- **Allow the float to move freely and hold the hydrometer at eye level.**
- **The hydrometer reading must be taken at the highest electrolyte level.**

(Reference)

- Specific gravity slightly varies with temperature. To be exact, the specific gravity decreases by 0.0007 with an increase of 1 °C (0.0004 with an increase of 1 °F) in temperature, and increases by 0.0007 with a decreases of 1 °C (0.0004 with a decrease of 1 °F).
  Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula :
  - Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature – 20 °C)
  - Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature – 68 °F)

Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

At an electrolyte temperature of 20 °C (68 °F)

W1012763

(2) Servicing

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 charging battery, remove battery vent plugs.**
- **When disconnecting the cable from the battery, start with the negative terminal first. When connecting the cable to the battery, start with the positive terminal first.**
- **Never check battery charge by placing a metal object across the posts.**
- **Use a voltmeter or hydrometer.**

1) Slow Charging

1. Add distilled water if the electrolyte level is low. When charging, the amount of electrolyte should be slightly lower than the specified level to prevent overflow.
2. Connect the battery to the charging unit, following the manufacturer's instructions.
3. As the electrolyte generates gas while charging, remove all port caps.
4. The electrolyte temperature must not exceed 40 °C (105 °F) during charging.
   If it exceed 40 °C (105 °F), decrease the charging amperage or stop charging for a while.
5. When charging several batteries in series, charge at the rate of the smallest battery in the line.

2) Quick Charging

1. Determine the proper charging current and charging time with the tester attached to the quick charger.
2. Determine the proper charging current as 1/1 of the battery capacity. If the battery capacity exceeds 50 Ah, consider 50 A as the maximum.

■ **Precaution for Operating a Quick Charger**

- Operation with a quick charger differs according to the type.
  Consult the instruction manual and use accordingly.

Battery type	130E41R
Volts (V)	12 V

W1013599

Directions for Storage

1. When shutting down the tractor for long periods of time, remove the battery from the tractor, adjust the electrolyte to the proper level, and after fully charging, 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)

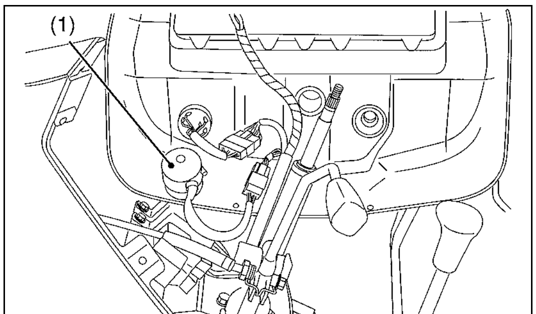
- Self-discharge Rate

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

W1014052

[2] STARTING SYSTEM

(1) Checking



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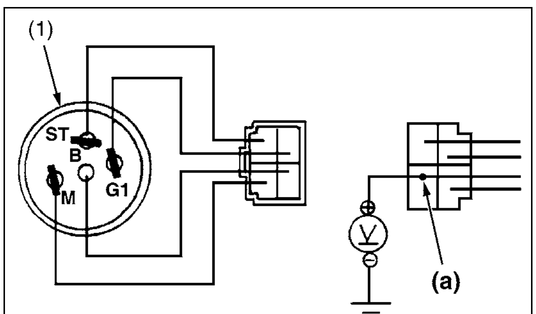
Main Switch

1. Remove the steering wheel.
2. Remove the meter panel, and disconnect the hourmeter cable and the main switch connectors after turning the main switch off.
3. Perform the following checking.

(1) Main Switch

W1014271



3TMACAB9P031A

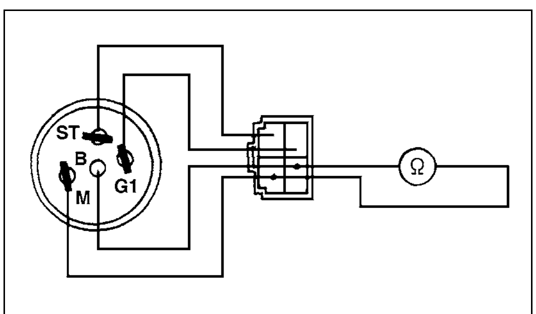
Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B** terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector **B** terminal – Chassis	Approx. battery voltage

(1) Main Switch **(a) From Battery Positive Terminal**

W1014366



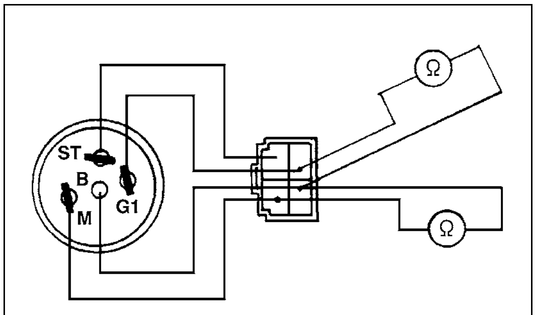
3TMACAB9P032A

Main Switch Key at ON Position

1. Turn the main switch on.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **M** terminal.
3. If 0 ohm is not indicated, the **B** – **M** contacts of the main switch are faulty.

Resistance	**B** terminal – **M** terminal	0 Ω

W1014494



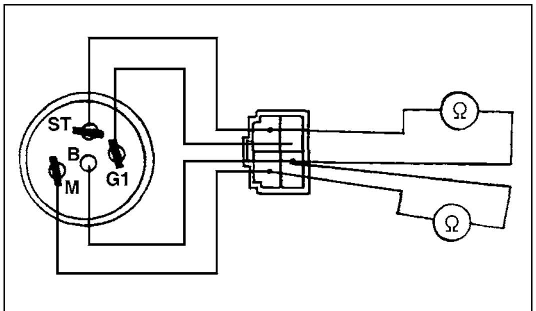
3TMACAB9P033A

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 **B** terminal and the **G1** terminal and across **B** terminal and **M** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	**B** terminal – **G1** terminal	0 Ω
	B terminal – **M** terminal	0 Ω

W1014641



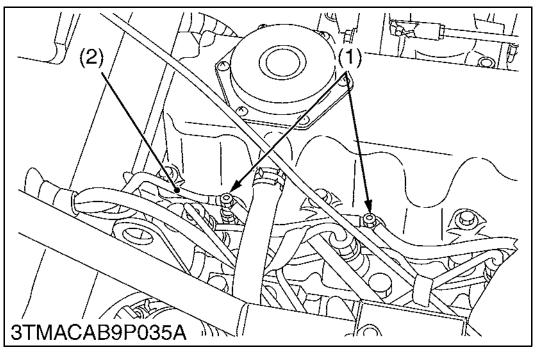
3TMACAB9P034A

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 **B** terminal and the **ST** terminal and across **B** terminal and the **M** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	**B** terminal – **ST** terminal	0 Ω
	B terminal – **M** terminal	0 Ω

W1014907



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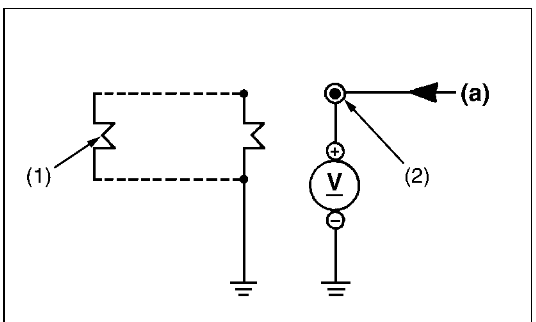

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Pre-heating (Lead Terminal Voltage)

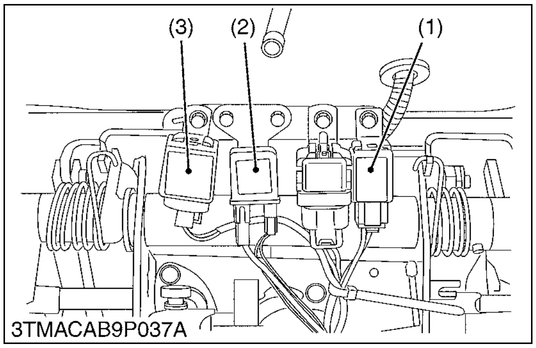
1. Disconnect the wiring lead (2) from glow plug after turning the main switch off.
2. Turn the main switch to the **PREHEAT** position, and measure the voltage across the lead terminal and the chassis.
3. Make sure that the main gear shift lever is in the neutral position and engage the auxiliary speed change lever to **Hi** or **Lo** position.
4. Turn the main switch to the **START** position, and measure the voltage with a voltmeter across the lead terminal and the chassis.
5. If the voltage at either position differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage (Lead terminal – Chassis)	Main switch at **PREHEAT**	Approx. battery voltage
	Main switch at **START**	Approx. battery voltage

(1) Glow Plug
(2) Wiring Lead

(a) From Main Switch G1 Terminal and Glow Relay

W1015078



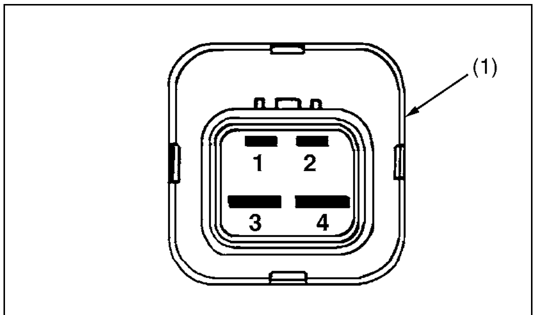
3TMACAB9P037A

Starter Relay

1. Remove the starter relay (1).
2. Apply battery voltage across terminals **3** and **4**, and check for continuity across terminals **1** and **2**.
3. If continuity is not established across terminals **1** and **2**, renew the starter relay.

(1) Starter Relay
(2) Glow Relay
(3) Timer Relay

W1015319



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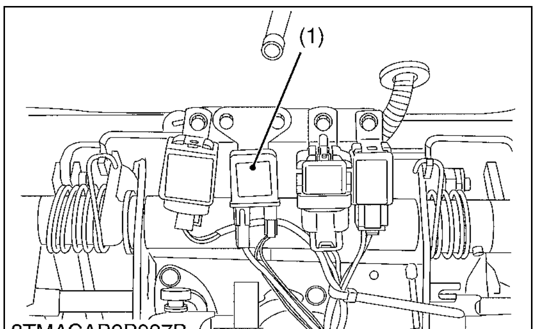


3TMACAB9P037B

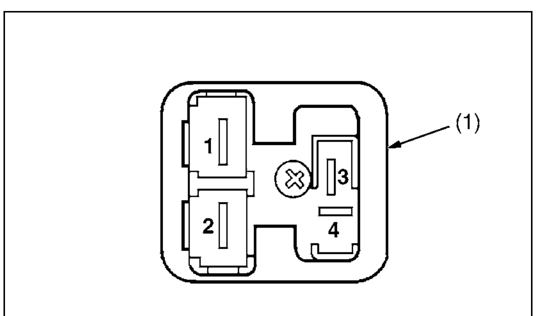
Glow Relay

1) Connector Voltage

1. Turn the main switch off.
2. Disconnect the **1P** connectors and **2P** connector from glow relay (1).
3. Measure the voltage with a voltmeter across the **1P** connector **R** terminal (Positive) and chassis (Negative).
4. If the voltage differs from the battery voltage, the wiring harness is faulty.
5. Turn the main switch on.
6. Measure the voltage with a voltmeter across the **2P** connector **RW** terminal (Positive) and chassis (Negative).
7. If the voltage differs from the battery voltage, the wiring harness is faulty.

(1) Glow Relay

W1015566



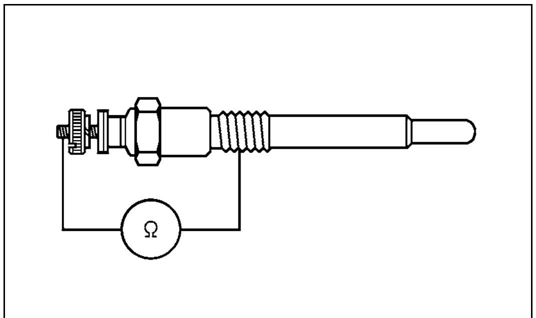
3TMACAB9P039A

2) Glow Relay Test

1. Remove the glow relay (1).
2. Apply battery voltage across terminals **3** and **4**, and check for continuity across terminals **1** and **2**.
3. If continuity is not established across terminals **1** and **2**, replace the glow relay (1).

(1) Glow Relay

W1015778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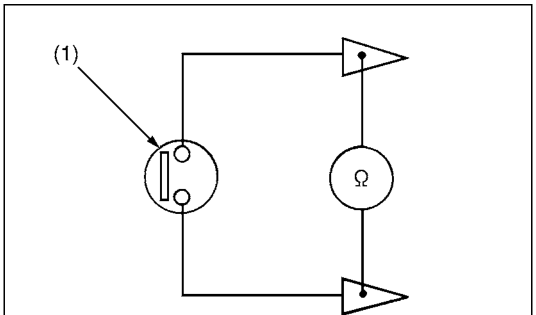
Glow Plug

1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and the 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, the glow plug is faulty.

Glow plug resistance	Factory spec.	Approx. 1.0 Ω

W1015115



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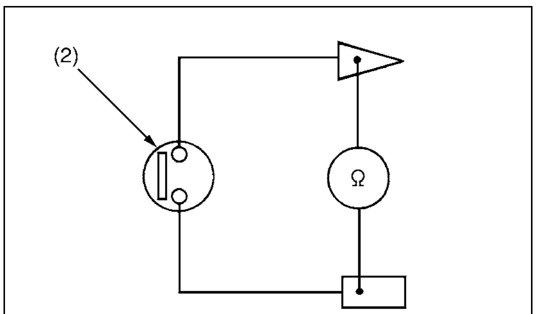

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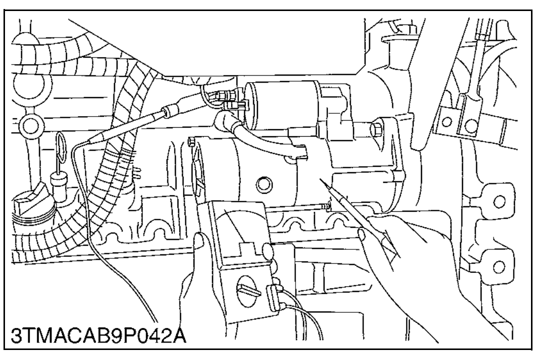
Safety Switch and PTO Clutch Safety Switch

1. Remove the safety switch (PTO clutch safety switch) leads.
2. Connect the circuit tester to the safety switch (PTO clutch safety switch) leads.
3. Measure the resistance between leads.
4. If the safety switch (PTO clutch safety switch) is defective, replace it.

Resistance (Across switch terminal)	When switch push is pushed	0 Ω
	When switch push is released	Infinity

(1) Safety Switch (2) PTO Clutch Safety Switch

W1016075

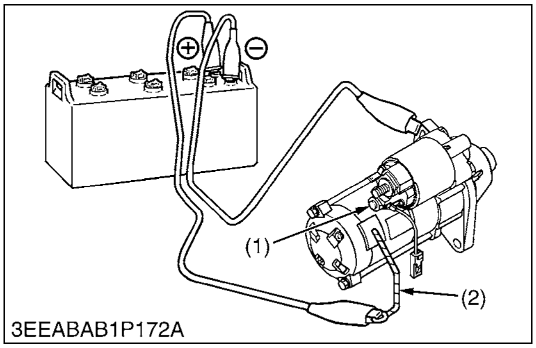

3TMACAB9P042A

Starter Motor B Terminal Voltage

1. Measure the voltage with a voltmeter across the **B** terminal 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

W1016256



Motor Test

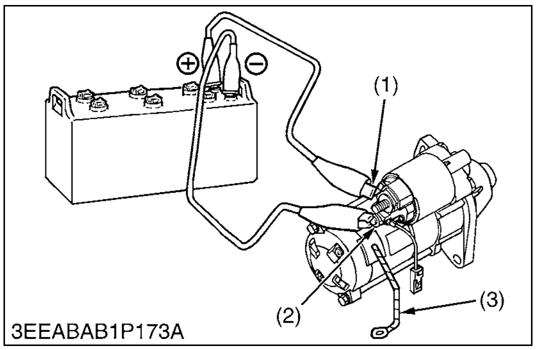
CAUTION

- **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 **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (2) from the starter **C** terminal (1).
5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post.
7. If the motor does not run, check the motor.

(1) **C** Terminal (2) Connecting Lead

W1016350



Magnetic Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter **C** terminal (2).
5. Connect a jumper lead from the starter **S** terminal (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter **C** terminal (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

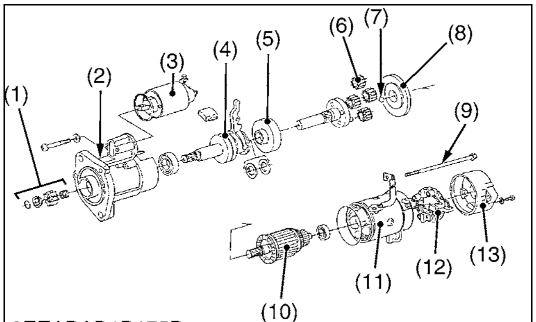
■ **NOTE**

- **This test should be carried out for a short time, about 3 to 5 seconds.**

(1) **S** Terminal (3) Connecting Lead
(2) **C** Terminal

W1016561

(2) Disassembling and Assembling



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.**

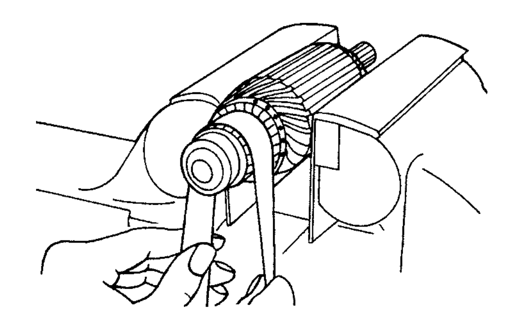
■ **NOTE**
- **Do not damage to the brush and commutator.**

(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

W1016803

(3) Servicing

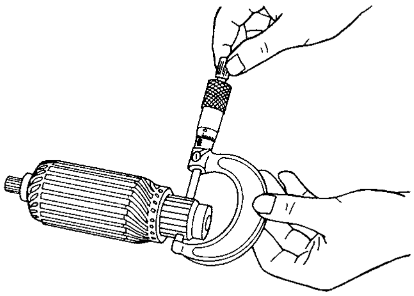

3EEABAB1P182A

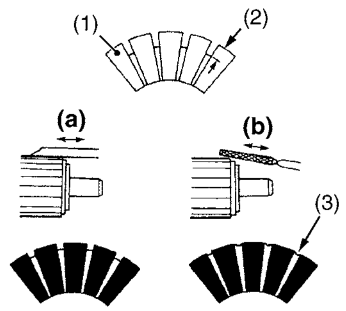
Commutator and Mica

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.


3EEABAB1P183A



3EEABAB1P184A

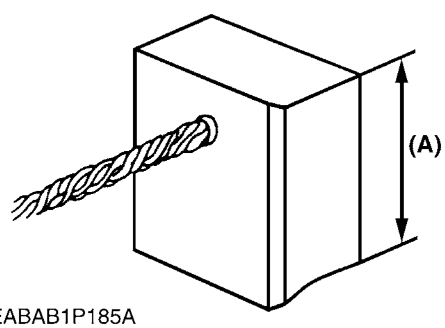
(1) Segment
(2) Depth of Mica
(3) Mica

(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.



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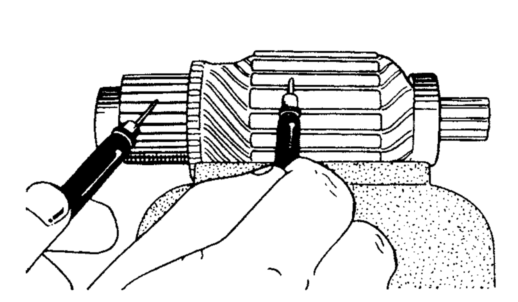
Brush length (**A**)	Factory spec.	18.0 mm 0.7086 in.
	Allowable limit	11.0 mm 0.4331 in.

W1017544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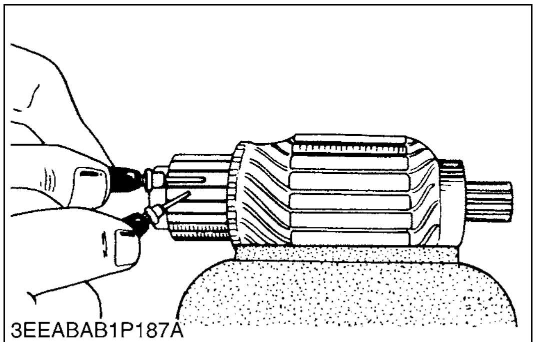
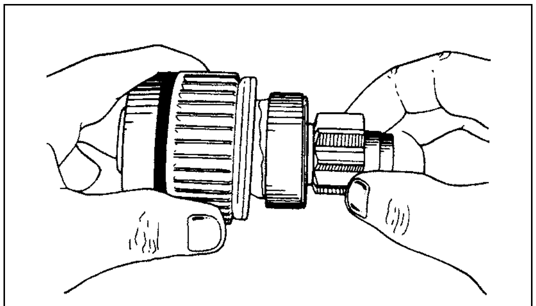

3EEABAB1P187A

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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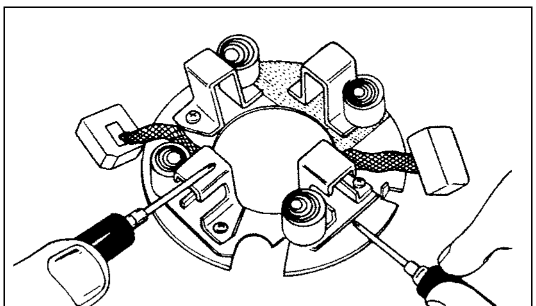
Overrunning Clutch

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

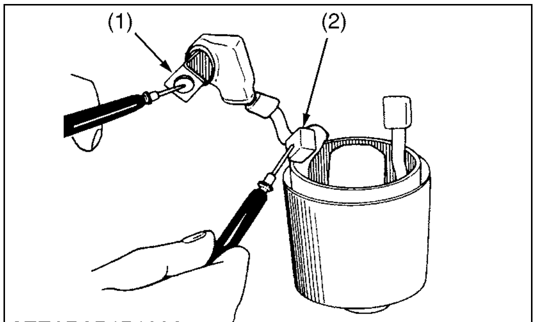

3EEABAB1P189A

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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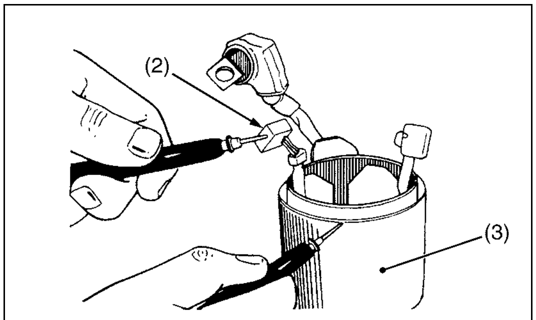


3EEABAB1P191A

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.

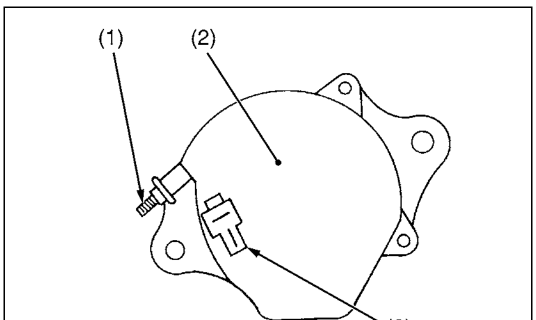
Resistance	Lead (1) – Brush (2)	0 Ω
	Brush (2) – Yoke (3)	Infinity

(1) Lead
(2) Brush
(3) Yoke

W1018015

[3] CHARGING SYSTEM

(1) Checking



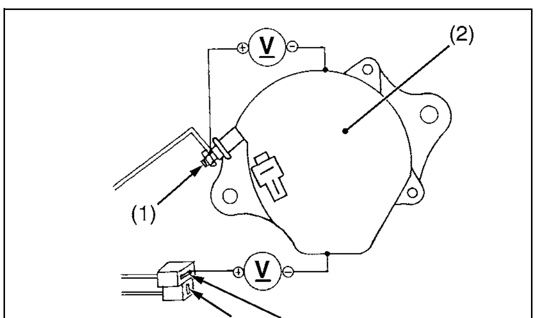
3TMABAB9P016A

Alternator

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

(1) **B** Terminal
(2) Alternator
(3) **2P** Connector

W1018175



3TMABAB9P017A

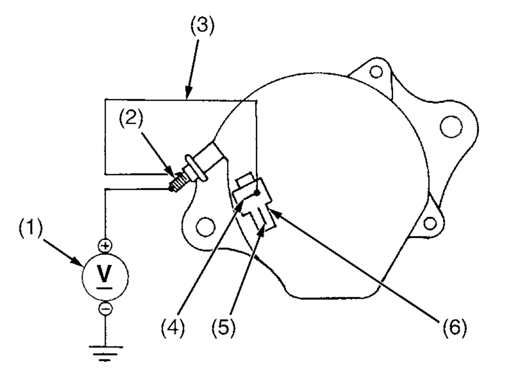
Connector Voltage

1. Turn the main switch **OFF**. Measure the voltage between the **B** terminal (1) and the chassis.
2. Turn the main switch **ON**. Measure the voltage between the **IG** terminal (3) and the chassis.

Voltage (Main switch at **OFF**)	**B** terminal – Chassis	Approx. battery voltage
Voltage (Main switch at **ON**)	**IG** terminal – Chassis	Approx. battery voltage

(1) **B** Terminal
(2) Alternator
(3) **IG** Terminal
(4) **L** Terminal

W1018279



3TMABAB9P018A

No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (3) between **IG** terminal (4) and **B** terminal (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 **B** terminal (2) and the chassis.
6. If the measurement is less than the factory specification, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V

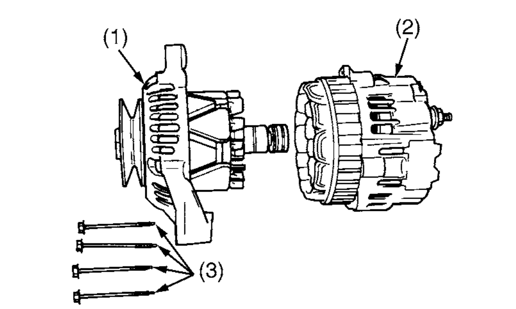
(Reference)

- 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) **B** Terminal
(3) Jumper Lead
(4) **IG** Terminal
(5) **L** Terminal
(6) **2P** Terminal

W1018478

(2) Disassembling and Assembling



3EEABAB1P176A

Front Bracket

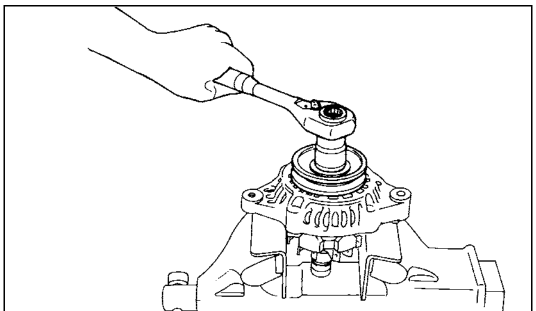
1. Remove the 4 screws.
2. Separate the front bracket (1) and the rear bracket (2) from each other.

■ **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

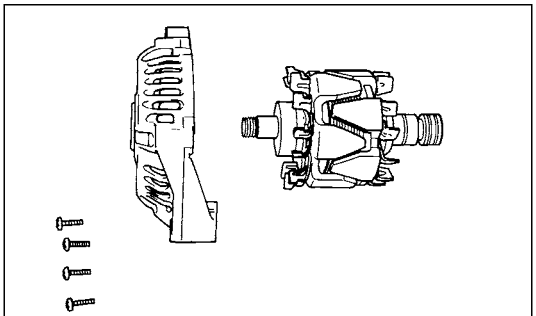

3EEABAB1P177A

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

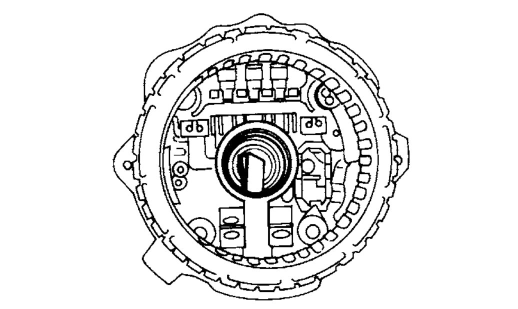
W1018613


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

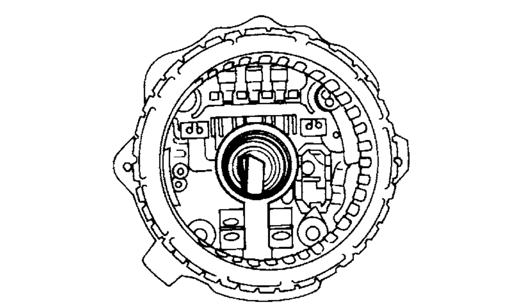


3EEABAB1P179A

Brush

1. When the rotor is detached, the 2 brushes are found to stretch out of the shaft hole.

W1018748



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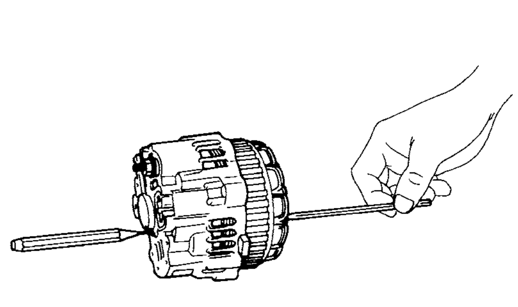

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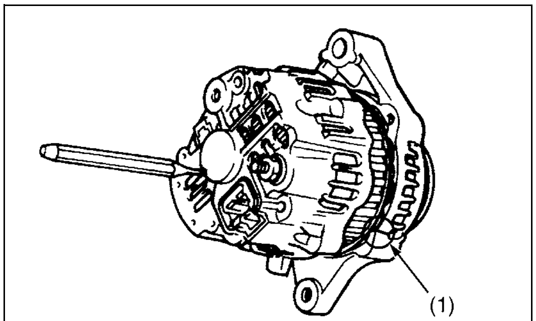


3EEABAB1P181A

Reassembling the Brush

1. Fit the brush with its sliding face in the clockwise direction when viewed from front.

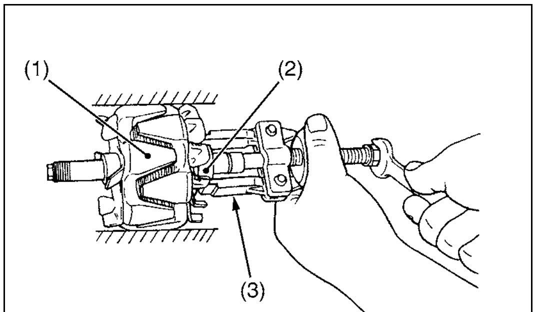
■ **IMPORTANT**

- **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



3TMABAB9P028A

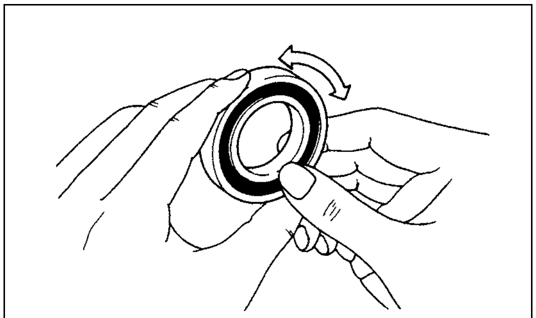
Bearing at Slip Ring Side

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

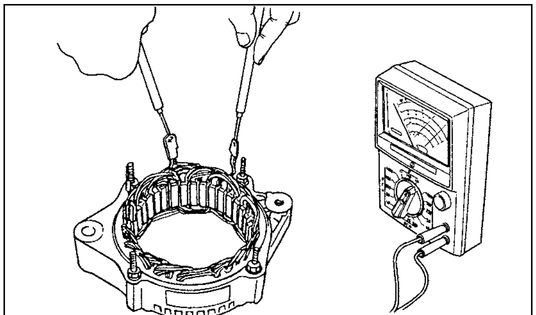
(3) Servicing


3EEABAB1P192A

Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

W1019790

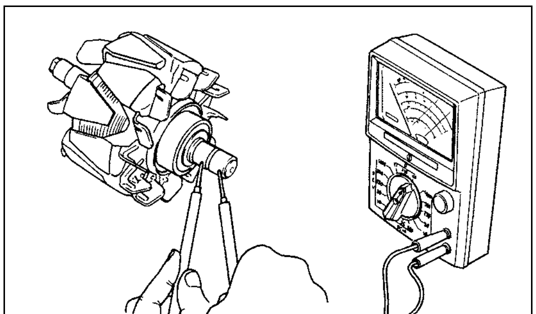

3EEABAB1P193A

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

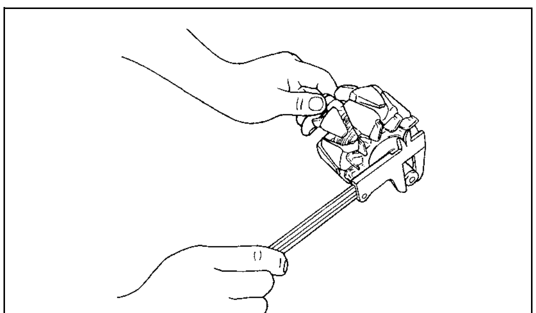

3EEABAB1P194A

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

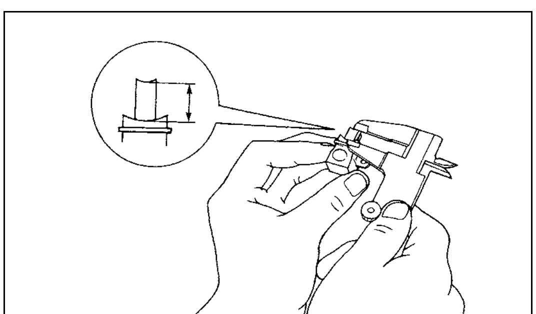

3EEABAB1P195A

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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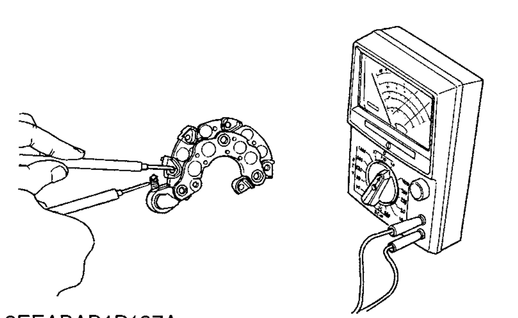
Brush Wear

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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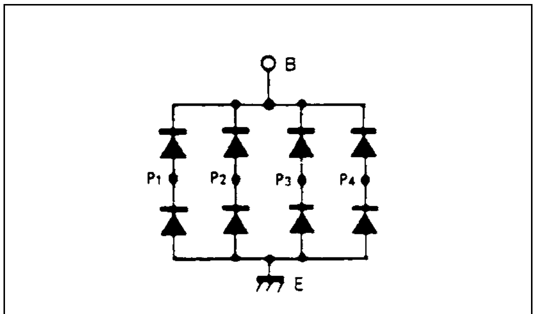

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Rectifier

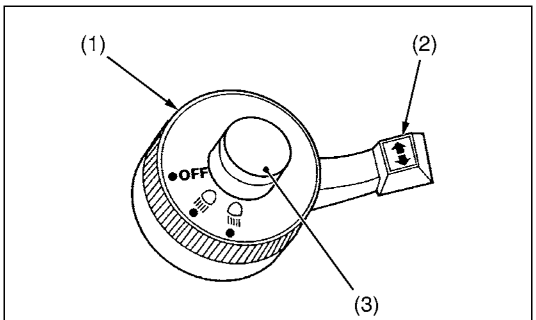
1. Check the continuity across each diode of rectifier with an ohmmeter.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

W1020452

[4] LIGHTING SYSTEM

(1) Checking

(A) Combination Switch Type



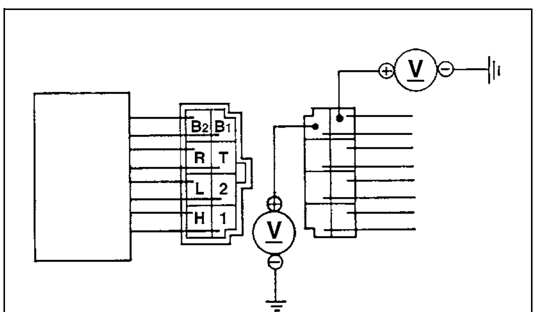
3TMACAB9P043A

Combination Switch

1. Remove the switch board, and disconnect the combination switch connector after turning the main switch off.
2. Perform the following checkings.

(1) Light Switch
(2) Turn Signal Light Switch
(3) Horn Switch

W1041514



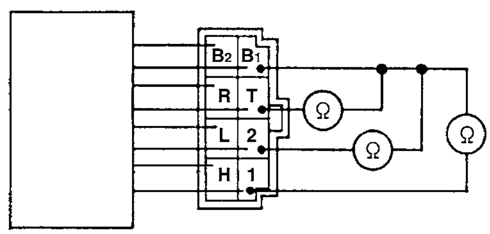
3TLABAB9P041A

1) Connector Voltage

1. Disconnect the **8P** connector from the combination switch.
2. Measure the voltage with a voltmeter across the connector **B**$_1$ terminal to chassis and the **B**$_2$ terminal to chassis when the main switch is **"OFF"** position.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	Main switch at **"OFF"** posiiton	**B**$_1$ terminal – Chassis	Battery voltage
		B$_2$ terminal – Chassis	

W1041711



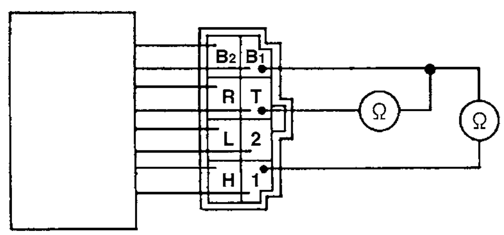
3TLABAB9P042A

2) Light Switch Continuity when Setting Switch at OFF Position

1. Disconnect the combination switch connector.
2. Set the light switch to the **OFF** position.
3. Measure the resistance with an ohmmeter across the **B_1** terminal to the **T** terminal, the **B_1** terminal to the terminal **1** and the **B_1** terminal to the terminal **2**.
4. If infinity is not indicated, the head light switch is faulty.

Resistance (Switch at **OFF** position)	**B_1** terminal – **T** terminal	Infinity
	B_1 terminal – **1** terminal	
	B_1 terminal – **2** terminal	

W1042584



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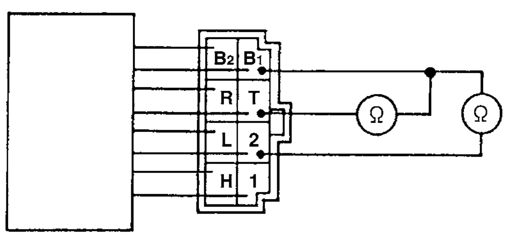
3) Light Switch Continuity when Setting Switch at HIGH-BEAM Position

1. Measure the resistance with an ohmmeter across the **B_1** terminal to the **T** terminal and the **B_1** terminal to the terminal **1**.
2. If 0 ohm is not indicated, the head light switch is faulty.

Resistance (Switch at **HIGH-BEAM** position)	**B_1** terminal – **T** terminal	0 Ω
	B_1 terminal – **1** terminal	

W1043473



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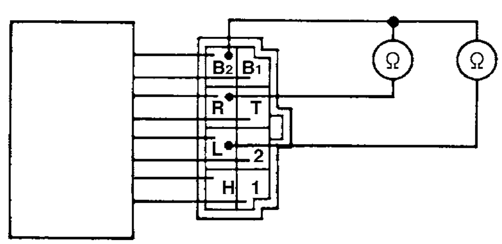
4) Light Switch Continuity when Setting Switch at LOW-BEAM Position

1. Measure the resistance with an ohmmeter across the **B_1** terminal to the **T** terminal and the **B_1** terminal to the terminal **2**.
2. If 0 ohm is not indicated, the head light switch is faulty.

Resistance (Switch at **LOW-BEAM** position)	**B_1** terminal – **T** terminal	0 Ω
	B_1 terminal – **2** terminal	

W1044119



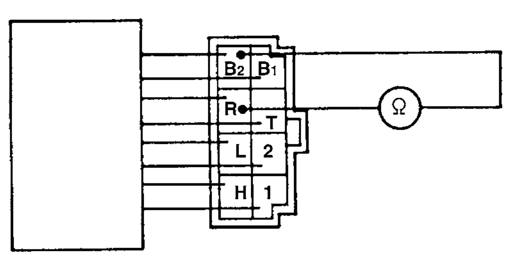
3TLABAB9P045A

5) Turn Signal Light Switch when Setting Switch Knob at OFF Position

1. Set the turn signal light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B_2** terminal to the **R** terminal and the **B_2** terminal to the **L** terminal.
3. If infinity is not indicated, the turn signal light switch is faulty.

Resistance (Switch at **OFF** position)	**B_2** terminal – **R** terminal	Infinity
	B_2 terminal – **L** terminal	

W1044501



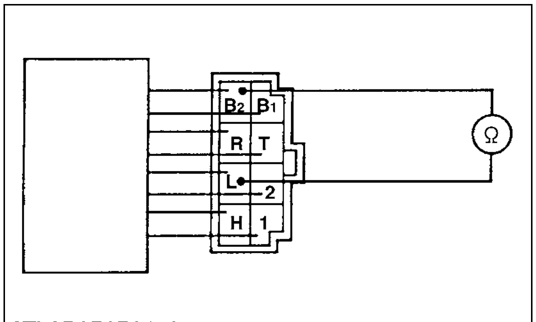
3TLABAB9P046A

6) Turn Signal Light Switch when Setting Switch Knob at R Position

1. Set the turn signal light switch to the **R** position.
2. Measure the resistance with an ohmmeter across the **B_2** terminal to the **R** terminal.
3. If 0 ohm is not indicated, the turn signal light switch is faulty.

Resistance (Switch at **R** position)	**B_2** terminal – **R** terminal	0 Ω

W1044955



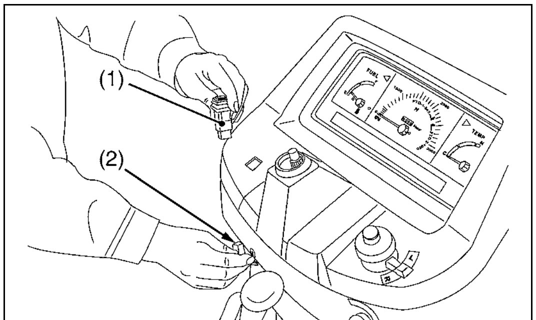
3TLABAB9P047A

7) Turn Signal Light Switch when Setting Switch Knob at L Position

1. Set the turn signal light switch to the **L** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal to the **L** terminal.
3. If 0 ohm is not indicated, the turn signal light switch is faulty.

Resistance (Switch at **L** position)	**B2** terminal – **L** terminal	0 Ω

W1045932



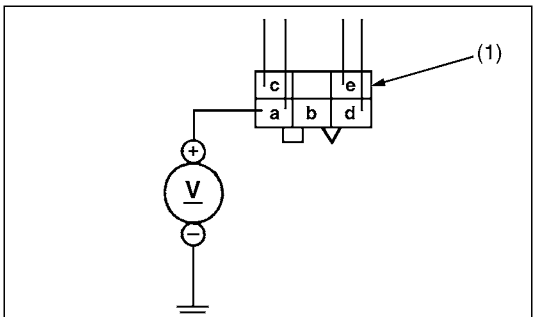
3TMACAB9P044A

Hazard Switch (If equipped)

1. Remove the meter panel and disconnect the **6P** connector (2) from hazard switch (1) after disconnect the battery negative code.
2. Remove the hazard switch (1).
3. Perform the following checking.

(1) Hazard Switch
(2) **6P** Connector

W1046485



3TMACAB9P045A

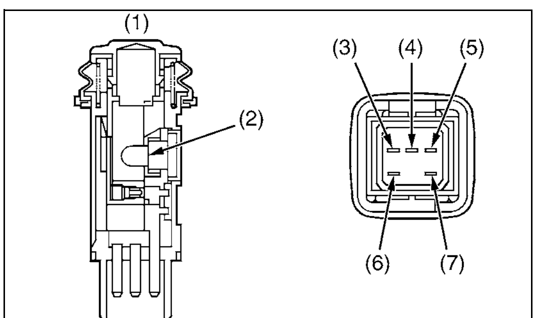
1) Connector Voltage

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) **6P** Connector

W1046902



3TMABAB9P033A

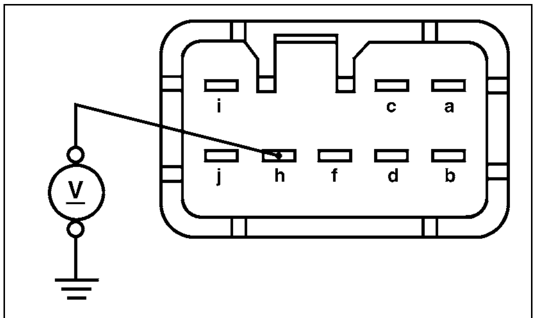
2) Hazard Switch Continuity

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
(3) Terminal **a**
(4) Terminal **b**
(5) Terminal **d**
(6) Terminal **c**
(7) Terminal **e**

W1047271



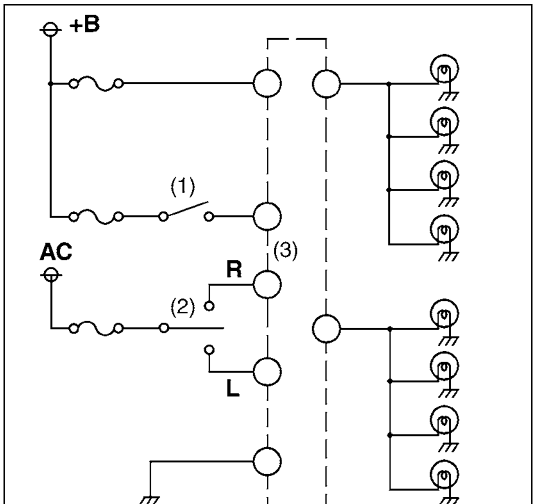
3TAAAAB9P046A

Hazard Unit (for North America and Oceania)

1. Disconnect the connector from the hazard unit.
2. Measure the voltage with a voltmeter across the terminal **h** and chassis.
3. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal **h** – Chassis	Approx. battery voltage

W1047788



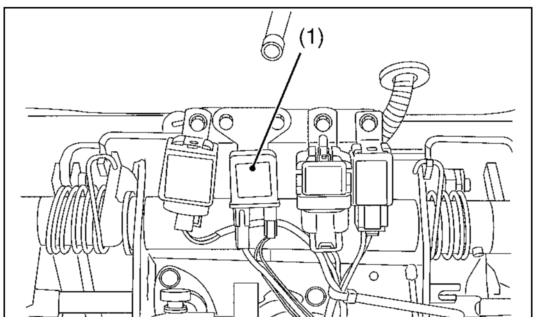
3TAAAAB9P047A

Hazard Unit Actuation Test

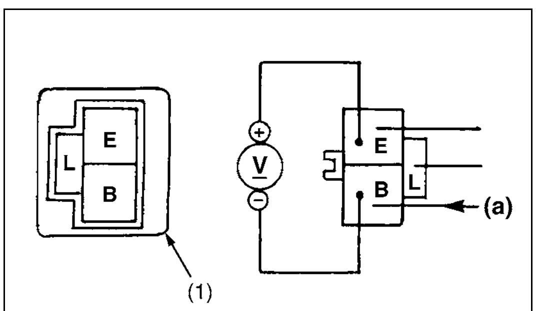
1. Set the hazard switch to the **ON** position, and make sure the hazard light gives 60 to 85 flashes for a minute.
2. With the main switch and the hazard switch at the **ON** positions, respectively, move the turn signal switch to the left. Make sure that the right-hand light stays on and the left-hand light gives flashes earlier (by about 20 flashes) than when the hazard lamp is activated. Then move the turn signal switch to the right and make sure the corresponding actions take place.
3. Now set the main switch to the **ON** position and move the turn signal switch alone. Make sure the same actions as above result.
4. If both the hazard switch and the turn signal switch function but the above actions do not take place, replace the hazard unit with new one.

(1) Hazard Switch
(2) Turn Signal Switch
(3) Hazard Unit

W1048275



3TMACAB9P037B



3TMACAB9P046A

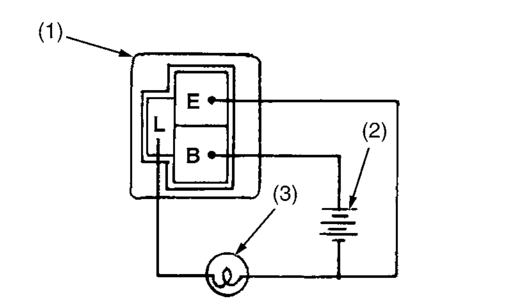
Hazard Unit Connector Voltage (for Euro)

1. Disconnect the connector from the hazard unit after disconnect the negative cord from the battery.
2. Connect the negative cord to the battery.
3. Set the main switch to **ON** position.
4. Measure the voltage with a voltmeter across the connector **B** terminal and **E** terminal.
5. If the voltage differs from the battery voltage, the main switch, fuse or wiring harness is faulty.

Voltage	**B** terminal – **E** terminal	Approx. battery voltage

(1) Hazard Unit
(a) From Main Switch M Terminal

W1048869



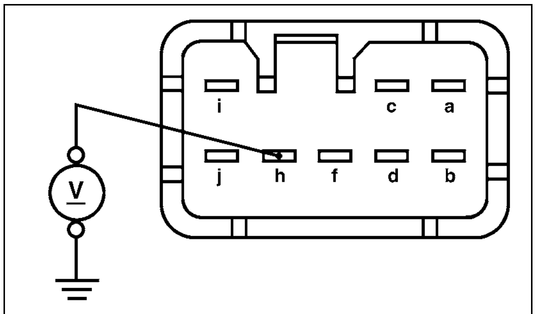
3TMACAB9P047A

Hazard Unit Test (for Euro)

1. Remove the hazard unit from the tractor.
2. Connect jumper leads from the **L** terminal to the bulb (3), and from the bulb to the battery negative terminal.
3. Connect jumper lead from the **B** terminal to the battery positive terminal.
4. Connect jumper lead from the **E** terminal to the battery negative terminal.
5. If the bulb does not flicker, the hazard unit is faulty.

(1) Hazard Unit
(2) Battery (12 V)
(3) Bulb (27 W)

W1049494



3TAAAAB9P046A

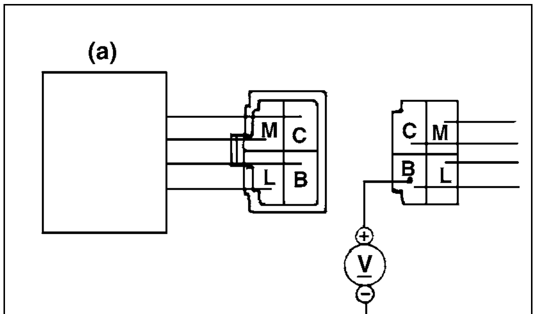
Flasher Unit (If equipped)

1. Disconnect the connector from the flasher unit.
2. Measure the voltage with a voltmeter across the terminal **h** and chassis.
3. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal **h** – Chassis	Approx. battery voltage

W1049665

(B) Head Light, Hazard and Turn Signal Switch Type



3TMACAB9P048A

Head Light Switch

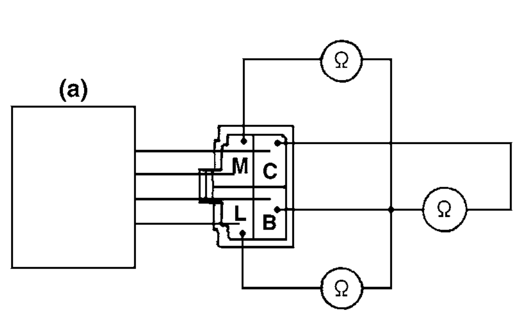
1) Connector Voltage

1. Disconnect the connector from the head light switch.
2. Measure the voltage with a voltmeter across the connector **B** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	**B** – Chassis	Approx. battery voltage

(a) Head Light Switch

W1019689



3TMACAB9P049A

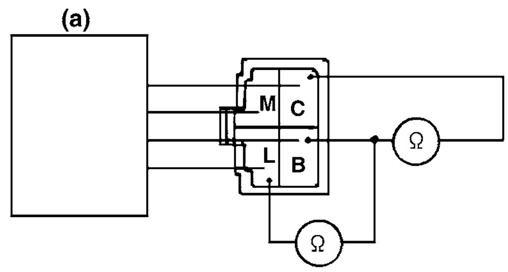
2) Head Light Switch Continuity when Setting Switch Knob at OFF Position

1. Disconnect the connector from the head light switch.
2. Set the light switch knob to the **OFF** position.
3. Measure the resistance with an ohmmeter across the **B** terminal and the **C** terminal, the **B** terminal and the **L** terminal and the **B** terminal and the **M** terminal.
4. If infinity is not indicated, the head light switch is faulty.

Resistance (switch knob at **OFF** position)	**B** – **C**	Infinity
	B – **L**	Infinity
	B – **M**	Infinity

(a) Head Light Switch

W1019939



3TMACAB9P050A

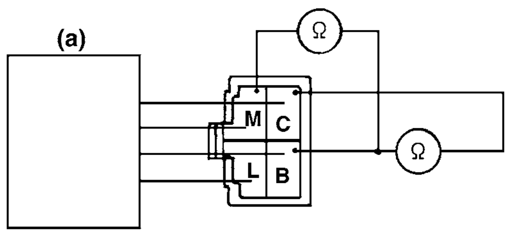
3) Head Light Switch Continuity when Setting Switch Knob at LOW-BEAM Position

1. Measure the resistance with an ohmmeter across the **B** terminal and the **C** terminal and the **B** terminal and the **L** terminal.
2. If 0 ohm is not indicated, the head light switch is faulty.

Resistance (switch knob at **LOW-BEAM** position)	**B** – **C**	0 Ω
	B – **L**	0 Ω

(a) Head Light Switch

W1019800



3TMACAB9P051A

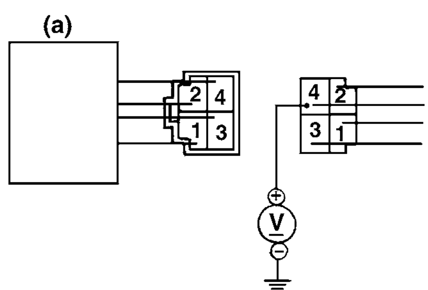
4) Head Light Switch Continuity when Setting Switch Knob at HI-BEAM Position

1. Measure the resistance with an ohmmeter across the **B** terminal and the **C** terminal and the **B** terminal and the **M** terminal.
2. If 0 ohm is not indicated, the head light switch is faulty.

Resistance (switch knob at **HI-BEAM** position)	**B** – **C**	0 Ω
	B – **M**	0 Ω

(a) Head Light Switch

W1020063



3TMACAB9P052A

Hazard and Turn Signal Switch

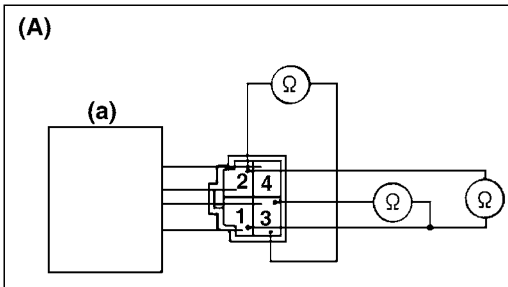
1) Connector Voltage

1. Disconnect the connector from the hazard and turn signal switch.
2. Measure the voltage with a voltmeter across the **4** terminal and chassis.
3. If the battery voltage is not indicated, the fuse or wiring harness is faulty.

Voltage	**4** – Chassis	Battery voltage

(a) Hazard and Turn Signal Switch

W1020548



3TMACAB9P053A

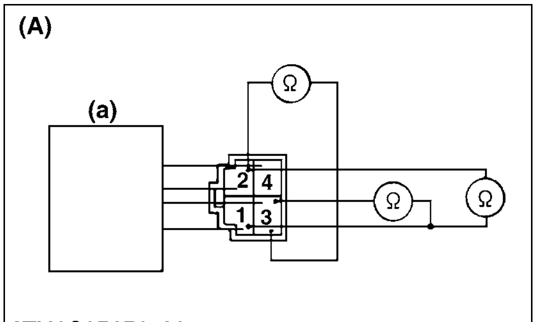
2) Hazard OFF Position

1. Set the switch knob to the hazard **OFF** position.
2. Check the continuities with an ohmmeter across the terminals **1** and **2** with the switch knob set to the **N** position, across the terminals **1** and **3** with the switch knob set to the **R** position, and across the terminals **2** and **3** with the switch knob set to the **L** position.
3. If these do not conduct or any value is indicated, the switch is faulty.

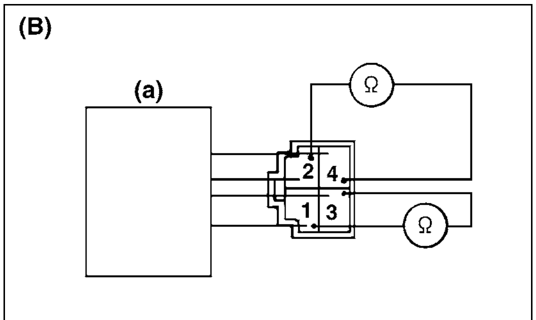
Resistance	Reference value	Switch knob at **N** position	Across terminals **1** and **2**	0 Ω
		Switch knob at **R** position	Across terminals **1** and **3**	0 Ω
		Switch knob at **L** position	Across terminals **2** and **3**	0 Ω

(A) Hazard OFF Position **(a) Hazard and Turn Signal Switch**

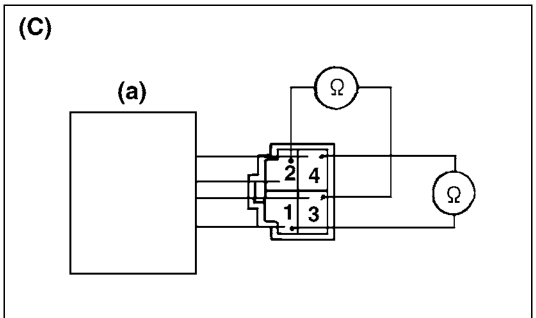
W1020687



3TMACAB9P053A



3TMACAB9P054A



3TMACAB9P055A

3) Hazard Switch at ON Position

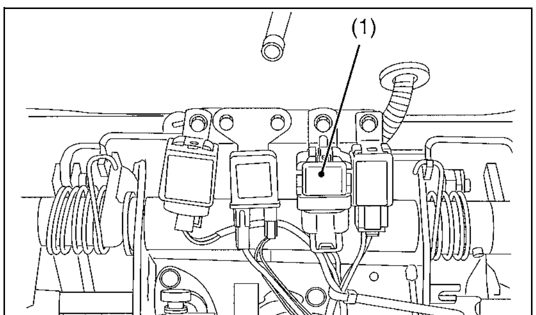
1. Set the hazard switch knob to the hazard **ON** position.
2. Check the continuities with an ohmmeter across the terminals **1** and **2**, terminals **2** and **3**, terminals **1** and **3** with the switch knob set to the **N** position, across the terminals **1** and **3**, terminals **2** and **4** with the switch knob set to the **R** position, across the terminals **1** and **4**, terminals **2** and **3** with the switch knob set to the **L** position.
3. If these do not conduct or any value is indicated, the switch is faulty.

Resistance	Reference value	Switch knob at **N** position	Across terminals **1** and **2** **2** and **3** **1** and **3**	0 Ω
		Switch knob at **R** position	Across terminals **1** and **3** **2** and **4**	0 Ω
		Switch knob at **L** position	Across terminals **1** and **4** **2** and **3**	0 Ω

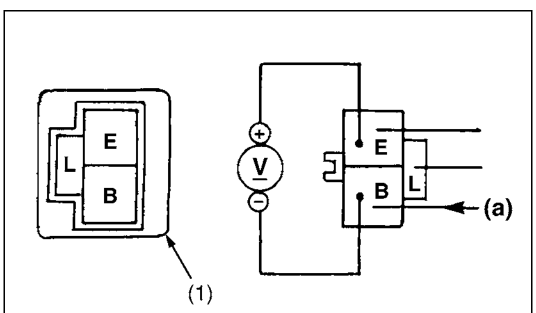
(A) Hazard ON Position, Switch Knob at N Position
(B) Hazard ON Position, Switch Knob at R Position
(C) Hazard ON Position, Switch Knob at L Position

(a) Hazard and Turn Signal Switch

W1021004



3TMACAB9P037C



3TMACAB9P046A

Hazard Unit Connector Voltage

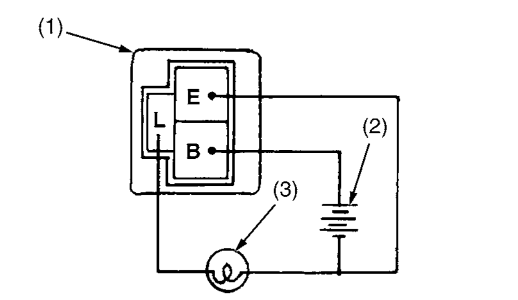
1. Disconnect the connector from the hazard unit after disconnect the negative cord from the battery.
2. Connect the negative cord to the battery, and measure the voltage with a voltmeter across the connector **B** terminal and **E** terminal.
3. If the voltage differs from the battery voltage, the main switch, fuse or wiring harness is faulty.

Voltage	**B** terminal – **E** terminal	Approx. battery voltage

(1) Hazard Unit

(a) From Main Switch B Terminal

W1021552



3TMACAB9P047A

Hazard Unit Test

1. Remove the hazard unit from the tractor.
2. Connect jumper leads from the **L** terminal to the bulb, and from the bulb to the battery negative terminal.
3. Connect jumper lead from the **B** terminal to the battery positive terminal.
4. Connect jumper lead from the **E** terminal to the battery negative terminal.
5. If the bulb does not flicker, the hazard unit is faulty.

(1) Hazard Unit
(2) Battery (12 V)
(3) Bulb (27 W)

W1021734

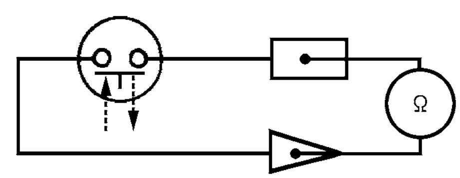
(C) Brake Switch (If equipped)

Brake Switch

1) Wiring Harness

1. Disconnect the leads from the brake switch.
2. Connect the wiring harness lead terminals to each other and turn the main switch on.
3. If the stop lights do not light, the fuse, wiring harness or bulb is faulty.

W1050616



3TMACAB9P056A

2) Brake Switch Continuity

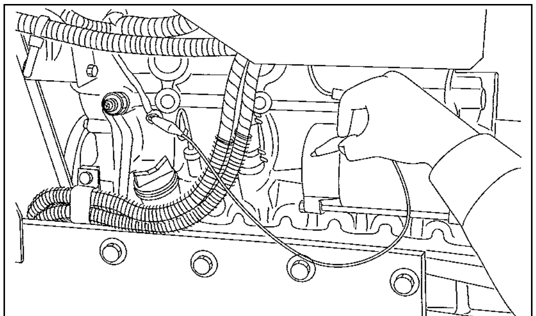
1. Be sure to check that the brake pedal linkage actuates the switch pull.
2. Check the continuity with an ohmmeter across the switch terminals.
3. If it does not conduct or any value is indicated when the switch is pulled, the switch is faulty.
4. If infinity is not indicated when the switch is released, the switch is faulty.

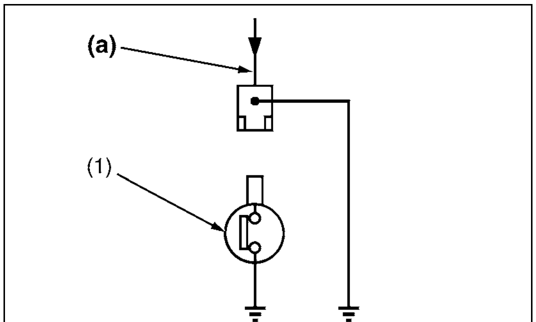
Resistance (Across switch terminals)	Reference value	When switch is pulled	0 Ω
		When switch is released	Infinity

W1050826

[5] WARNING LAMPS

(1) Checking


3TMACAB9P057A



3TMABAB9P037A

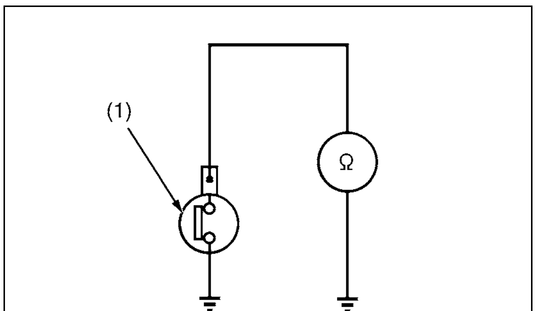
Engine Oil Pressure Switch Panel Board and Wiring Harness

1. Disconnect the lead from the engine oil pressure switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and conenct a jumper lead from the lead to the chassis.
3. If the engine oil pressure indicator lamp does not light, the panel board circuit or the wiring harness is faulty.

(1) Engine Oil Pressure Switch

(a) From Oil Pressure Lamp

W1051446



3TMABAB9P038A

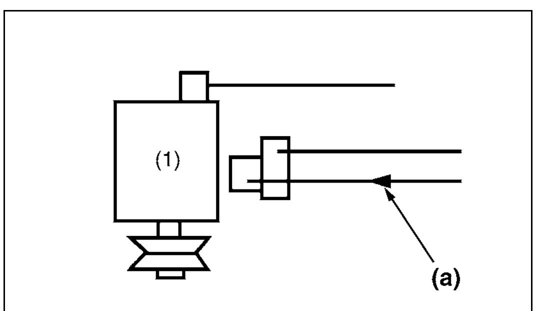
Engine Oil Pressure Switch Continuity

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

W1022159



3TMABAB9P039A

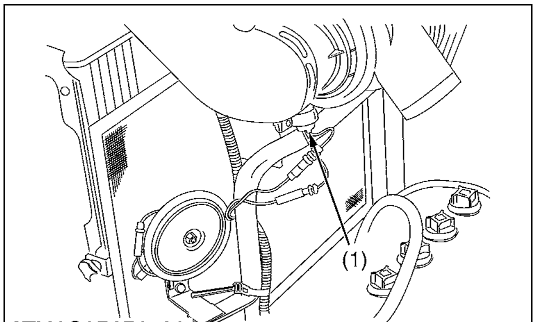
Charging Circuit (Panel Board and Wiring Harness)

1. Disconnect the **2P** connector from the alternator after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the wiring harness connector terminal (**WR**) to the chassis.
3. If the charge lamp does not light, the panel board circuit, alternator, wiring harness, or fuse is fault.

(1) Alternator

(a) From Charge Lamp

W1022342



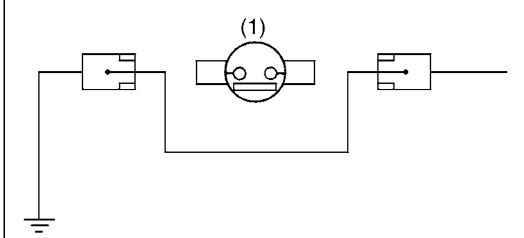
3TMACAB9P058A

Air Cleaner Sensor Panel Board and Wiring Harness (for Oceania and Euro)

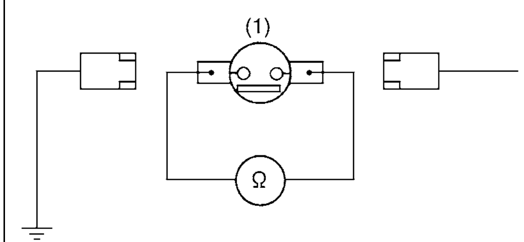
1. Disconnect the leads from the air cleaner sensor (1) after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead between the leads.
3. If the air cleaner clogged lamp does not light, the panel board circuit or wiring harness is faulty.

(1) Air Cleaner Sensor

W1050130



3TMACAB9P059A



3TMACAB9P060A

Air Cleaner Sensor Continuity (for Oceania and Euro)

1. Disconnect the leads from the air cleaner sensor (1) after turning the main switch **OFF**.
2. Measure the resistance with an ohmmeter across the air cleaner sensor terminals.
3. If infinity is not indicated, the sensor is faulty.

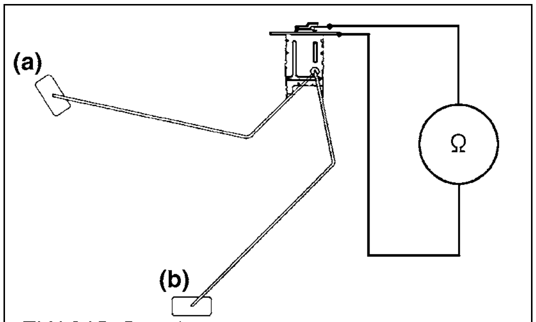
Resistance (Across sensor terminals)	In normal state	Infinity

(1) Air Cleaner Sensor

W1052230

[6] GAUGES

(1) Checking



3TMACAB9P061A

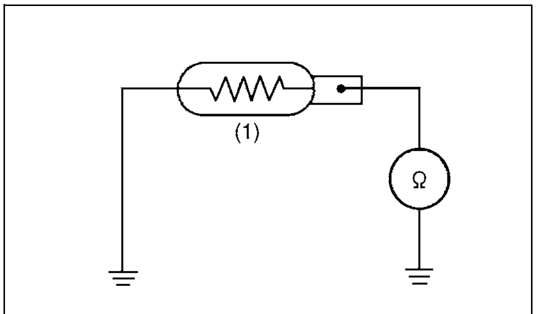
Fuel Level Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the measurement are not indicated, the sensor is faulty.

Resistance (Sensor terminal – Its body)	Factory spec.	Float at uppermost position	1.0 to 5.0 Ω
		Float at lowermost position	103 to 117 Ω

(a) Float at Uppermost Position **(b) Float at Lowermost Position**

W1022582



3TMABAB9P042A

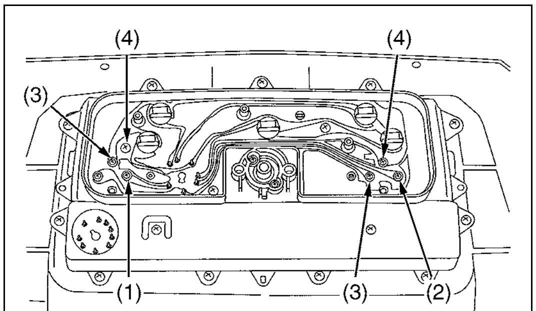
Coolant Temperature Sensor Continuity

1. Measure the resistance with an ohmmeter across the sensor terminal and the chassis.
2. If the measurement is not indicated, the sensor is faulty.

Resistance (Sensor terminal – Chassis)	Factory spec.	Approx. 16 Ω at 120 °C (248 °F) Approx. 50 Ω at 80 °C (176 °F) Approx. 149 Ω at 50 °C (122 °F)

(1) Coolant Temperature Sensor

W1022725



3TMACAB9P062A

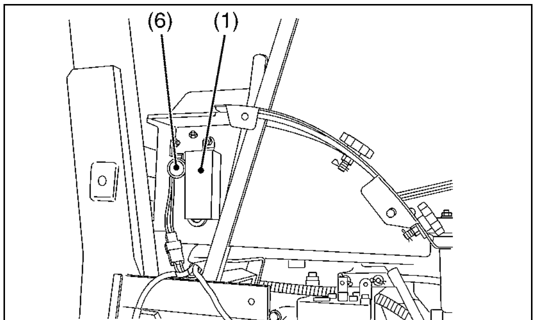
Fuel Gauge and Coolant Temperature Gauge Continuity

1. Remove the panel board from the tractor.
2. Check the continuity with an ohmmeter across the **FU** terminal (2) and **IG** terminal (3) and across the **FU** terminal (2) and **GND** terminal (4).
3. If infinity is indicated, the fuel gauge is faulty.
4. Check the continuity with an ohmmeter across the **TU** terminal (1) and **IG** terminal (3) and across the **TU** terminal (1) and **GND** terminal (4).
5. If infinity is indicated, the coolant temperature gauge is faulty.

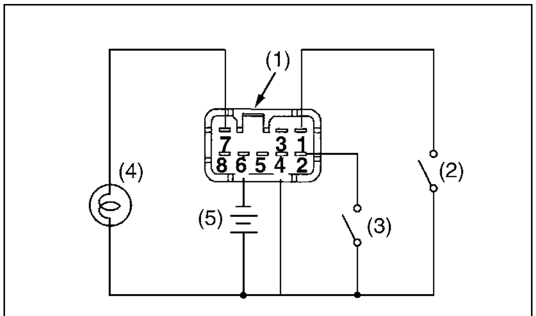
(1) **TU** Terminal
(2) **FU** Terminal
(3) **IG** Terminal
(4) **GND** Terminal

W1022869

[7] OPC (IF EQUIPPED)



3TMACAB9P075A



3TMACAI9P021A

OPC Buzzer Timer

1. Remove the buzzer timer (1). (Testing connections as shown in figure.)
2. Connect the jumper lead across the battery positive terminal and **4** terminal.
3. Connect the jumper lead with switch **1** (2) across the battery positive terminal and **1** terminal.
4. Connect the jumper lead with switch **2** (3) across the battery positive terminal and **2** terminal.
5. Connect the jumper lead with bulb across the battery positive terminal and **7** terminal.
6. Connecting the jumper lead across the battery negative terminal and 6 terminal.

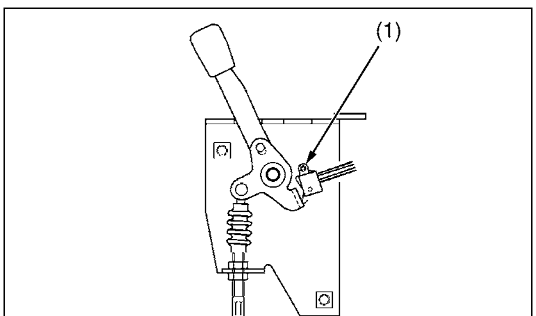
(Testing)

7. When both switch 1 (2) and switch 2 (3) are turned **OFF**, the bulb (4) lights **ON** for approx. 10 second.
8. When both switch 1 (2) and switch 2 (3) are turned **ON**, the bulb (4) lights **OFF**.
9. When one switch is turned **ON** and other switch is turned **OFF**, the bulb lights **ON**.
10. If the above mentioned conditions are not followed, replace it.

(1) OPC Buzzer Timer
(2) Switch 1 (Seat Switch)
(3) Switch 2 (PTO Safety Switch)
(4) Bulb (Instead of Buzzer)
(5) Battery
(6) Buzzer

1 to 8 : Terminal

W1096472



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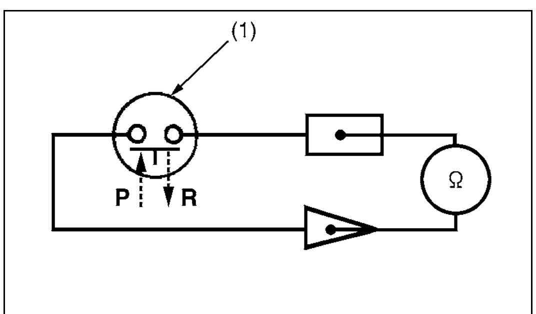


3TMACAB9P056D

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 **ON**.
3. If the indicator do not light, the fuse, wiring harness or bulb is faulty.

2) PTO Switch Continuity

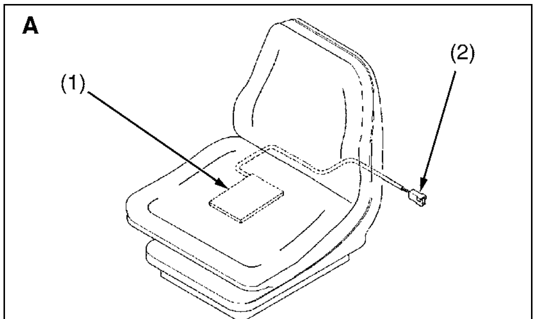
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Reference (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

W1096568



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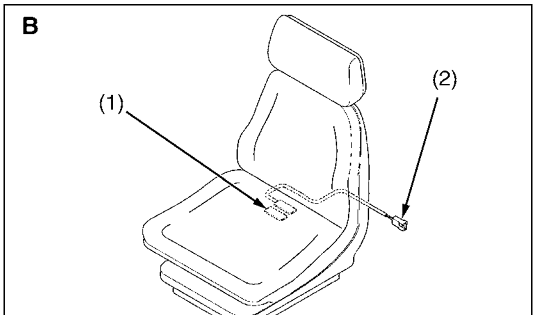

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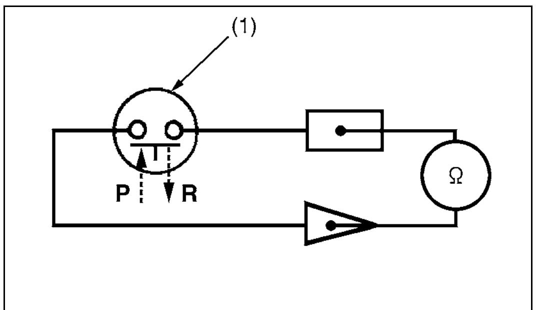

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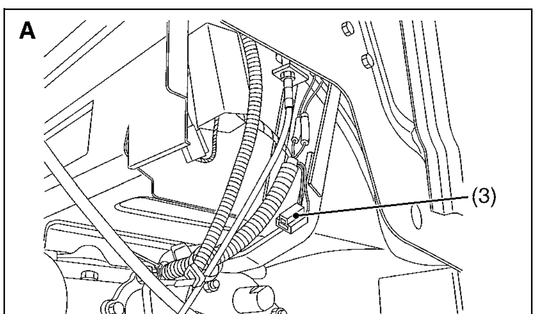

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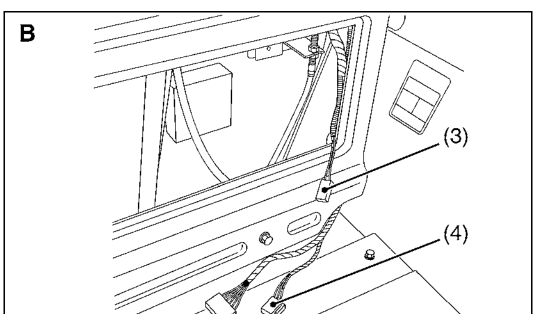


3TMACAB9P079A

Seat Switch

1. Disconnect the seat switch **2P** connector (2) from the 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.

(When reassembling)

■ **IMPORTANT**

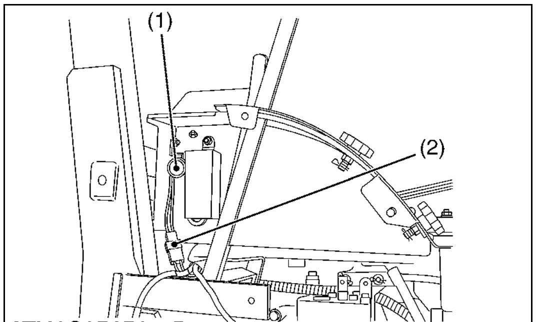
- **Be sure to assemble the seat switch 2P connector (2) to the harness connector (3) with Red / Green and Orange / White color wire.**
- **Do not connect the seat switch 2P connector (2) to the loader plug (electric power outlet) connector (4). (CABIN Model)**

Reference (Across switch terminals)	Reference value	When switch is pushed (**P**)	ROPS Model	0 Ω
			CABIN Model	Approx. 22 Ω
		When switch is released (**R**)		Infinity

(1) Seat Switch
(2) Seat Switch **2P** Connector
(3) Harness Connector
(4) Loader Plug Connector

P : Pushed
R : Released
A : ROPS Model
B : CABIN Model

W1096623



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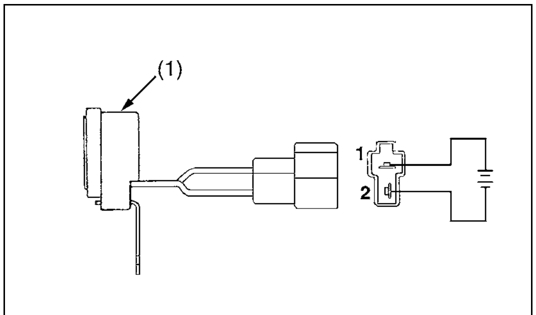


3TMACAI9P023A

Buzzer

1. Remove the buzzer (1).
2. Connect the jumper lead across the battery positive terminal and **1** terminal of connector.
3. Connect the jumper lead across the battery negative terminal and **2** terminal of connector.
4. If the buzzer does not whistle, replace it.

(When reassembling)

■ **IMPORTANT**

- **Be sure to assemble the buzzer 2P connector (2) to the harness connector with Red / Green and Blue / Black color wire.**

(1) Buzzer
(2) Buzzer **2P** Connector

W1098287

10 CABIN

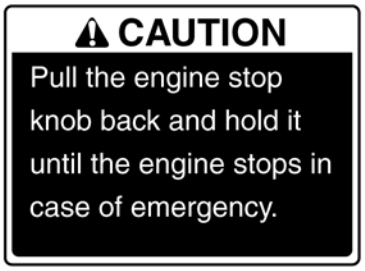
SAFETY DECALS

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 numer is listed in the parts list.

■ **NOTE**

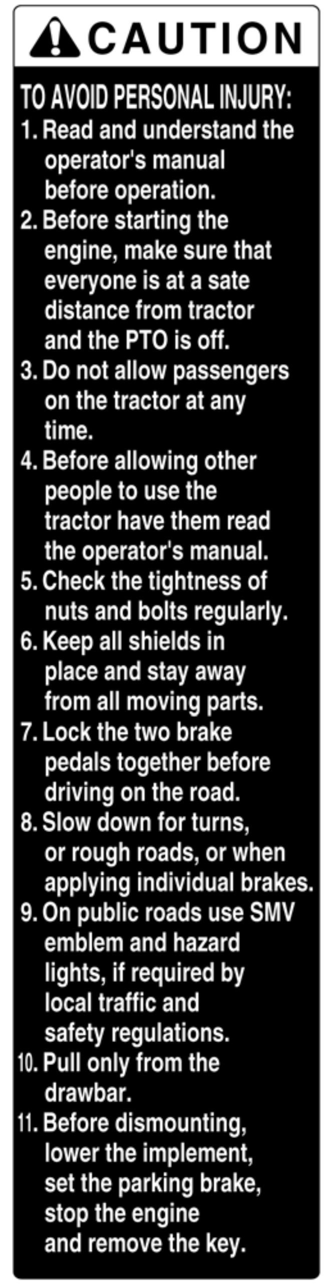
- **Only labels applied to places other than where they are applied on tractors with no cabin are mentioned.**

(1) Part No. 35080-6528-2

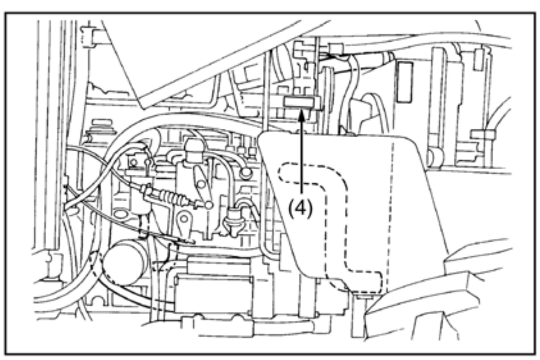


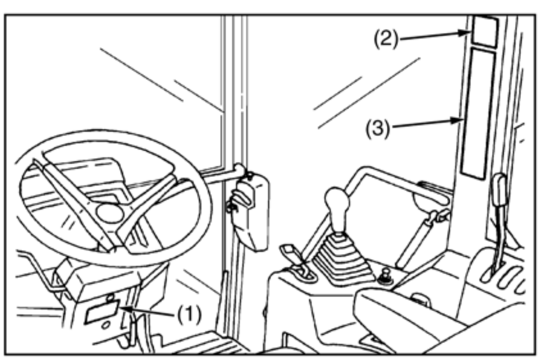
(2) Part No. TA040-4902-1
(for North America and Oceania)

(3) Part No. 3F240-9836-1



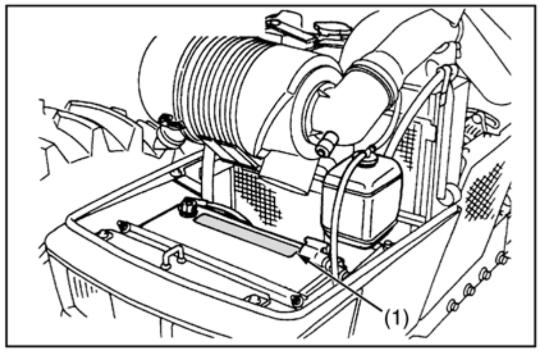
(4) Part No. TA040-7295-1





3TMACABCP004A

(1) Part No. 3A999-1275-1 (for North America)



3TMACABCP005A

SPECIFICATIONS

Model			M6800SQ 2WD	M6800SQ 4WD
Engine	Model		V3300-E / V3300-E2	
	Type		Vertical, water-cooled, 4-cycle diesel engine	
	Number of cylinders		4	
	Total displacement		3318 cm^3 (202.5 cu.in.)	
	Bore and stroke		98 × 110 mm (3.9 × 4.3 in.)	
	Net power		50.8 kW (68 HP)*	
	PTO power (factory observe)		46.3 kW (62 HP)* / 2600 min^{-1} (rpm)	
	Maximum torque		235 N·m (24.0 kgf·m, 173.3 ft-lbs) / 1300 to 1500 min^{-1} (rpm)	
	Battery capacity		12 V, CCA : 1000 A	
	Fuel		Diesel fuel No. 1 [below –10 °C (14 °F], Diesel fuel No. 2-D [above –10 °C (14 °F)]	
	Fuel tank capacity		95 L (25.1 U.S.gals., 20.9 Imp.gals.)	
	Engine oil capacity		10.7 L (11.3 U.S.qts., 9.4 Imp.qts.)	
	Coolant capacity		8.5 L (9.0 U.S.qts., 7.1 Imp.qts.)	
Dimensions	Overall length		3635 mm (143.1 in.)	3600 mm (141.7 in.)
	Overall width (min. tread)		1860 mm (73.2 in.)	
	Overall height (with CABIN)		2520 mm (99.2 in.)	
	Wheel base		2125 mm (83.7 in.)	
	Tread	Front	1420 to 1820 mm (55.9 to 71.7 in.)	1420 mm, 1520 mm (55.9 in., 59.8 in.)
		Rear	1420 to 1720 mm (55.9 to 67.7 in.)	
	Minimum ground clearance		440 mm (17.3 in.) (BRACKET DRAWBAR)	
Weight (with CABIN)			2270 kg (5005 lbs)	2330 kg (5138 lbs)
Travelling system	Standard tire size	Front	9.5L-15, 7.5-16	9.5-24
		Rear	16.9-30	
	Clutch		Dry, single plate	
	Steering		Hydrostatic power steering	
	Braking system		Multiple wet disc mechanical	
	Differential		Bevel gears with differential lock (Front, Rear)	
Hydraulic system	Hydraulic control system		Position, draft and mix control	
	Pump capacity		38.3 L (40.5 U.S.qts., 33.7 Imp.qts.) / min.	
	Three point hitch		SAE Category I & II	
	Max. lift force	At lift points	2050 kg (4520 lbs) at lower link end with links horizontal	
		24 in. behind lift points	1500 kg (3307 lbs)	
	Remote hydraulic control		One remote valve (Two for Canada model)	
	System pressure		18.6 to 19.1 MPa (190 to 195 kgf/cm^2, 2704 to 2775 psi)	
Traction system			Swinging drawbar, adjustable in direction	
PTO	Live PTO (Indipen-dent)	Direction of turning	Clockwise, viewed from tractor rear	
		Standard PTO	Fixed PTO shaft type with 1 speed : 540 min^{-1} (rpm) at 2295 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2307 min^{-1} (rpm) 1000 min^{-1} (rpm) at 2471 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2307 min^{-1} (rpm) 540E min^{-1} (rpm) at 1828 min^{-1} (rpm)	

Note : * Manufacture's estimate
** The overall length showing 2WD type is with front weight bracket and 4WD type is without front weight bracket.
The company reserves the right to change the specifications without notice.

W10281170

Model			M8200Q		M9000Q	
			2WD	4WD	2WD	4WD
Engine	Model		V3300-TE / V3300-TE2		V3300-TIE / V3300-TIE2	
	Type		Vertical, water-cooled, 4-cycle diesel engine			
	Number of cylinders		4			
	Total displacement		3318 cm^3 (202.5 cu.in.)			
	Bore and stroke		98 × 110 mm (3.9 × 4.3 in.)			
	Net power		61.2 kW (82 HP)*		67.2 kW (90 HP)*	
	PTO power (factory observe)		54.5 kW (73 HP)* / 2600 min^{-1} (rpm)		59.7 kW (80 HP)* / 2600 min^{-1} (rpm)	
	Maximum torque		285 N·m (29.1 kgf·m, 210.2 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		311 N·m (31.7 kgf·m, 229.4 ft-lbs) / 1400 to 1600 min^{-1} (rpm)	
	Battery capacity		12 V, CCA : 1000 A			
	Fuel		Diesel fuel No. 1 [below –10 °C (14 °F], Diesel fuel No. 2-D [above –10 °C (14 °F)]			
	Fuel tank capacity		110 L (29.1 U.S.gals., 24.2 Imp.gals.)			
	Engine oil capacity		10.7 L (11.3 U.S.qts., 9.4 Imp.qts.)			
	Coolant capacity		9.0 L (9.5 U.S.qts., 7.9 Imp.qts.)			
Dimensions	Overall length**		Refer to next page			
	Overall width (min. tread)		1980 mm (78.0 in.)			
	Overall height (with CABIN)		Refer to next page			
	Wheel base		2250 mm (88.6 in.)			
	Tread	Front	1440 to 2040 mm (56.7 to 80.3 in.)	1420 to 1520 mm (55.9 to 59.8 in.)	1440 to 2040 mm (56.7 to 80.3 in.)	1520 to 1620 mm (59.8 to 63.8 in.)
		Rear	1520 to 1920 mm (59.89 to 75.6 in.)			
	Minimum ground clearance		430 mm (16.9 in.) (BRACKET DRAWBAR)		450 mm (17.7 in.) (BRACKET DRAWBAR)	
Weight (with CABIN)			Refer to next page			
Travelling system	Standard tire size		Refer to next page			
	Clutch		Single dry plate			
	Steering		Hydrostatic power steering			
	Braking system		Multiple wet disc mechanical			
	Differential		Bevel gears with differential lock (Front, Rear)			
Hydraulic system	Hydraulic control system		Position, draft and mix control			
	Pump capacity	Individual flow type	41.6 L (44.0 U.S.qts., 36.6 Imp.qts.) / min.			
		Combine flow type	64.3 L (67.9 U.S.qts., 56.6 Imp.qts.) / min.			
	Three point hitch		SAE Category II			
	Max. lift force	At lift points**	Standard : 2500 kg (5560 lbs) with assist cylinder : 3400 kg (7497 lbs)			
		24 in. behind lift points	Standard : 2100 kg (4630 lbs) with assist cylinder : 2900 kg (6395 lbs)			
	System pressure		Individual flow type pump : 19.1 MPa (195 kgf/cm^2, 2775.4 psi) Combine flow type pump : 19.6 MPa (200 kgf/cm^2, 2846.6 psi)			
PTO	Live PTO (Indipen-dent)	Direction of turning	Clockwise, viewed from tractor rear			
		PTO / engine speed	Fixed PTO shaft type with 1 speed : 540 min^{-1} (rpm) at 2205 min^{-1} (rpm) Fixed PTO shaft type with 2 speeds : 540 min^{-1} (rpm) at 2035 min^{-1} (rpm) 540E min^{-1} (rpm) at 1519 min^{-1} (rpm) Interchangeable PTO shaft type : 540 min^{-1} (rpm) at 2035 min^{-1} (rpm) 1000 min^{-1} (rpm) at 2389 min^{-1} (rpm)			

Note : * Manufacture's estimate
** The overall length showing 2WD type is with front weight bracket and 4WD type is without front weight bracket.
The company reserves the right to change the specifications without notice.

W10319630

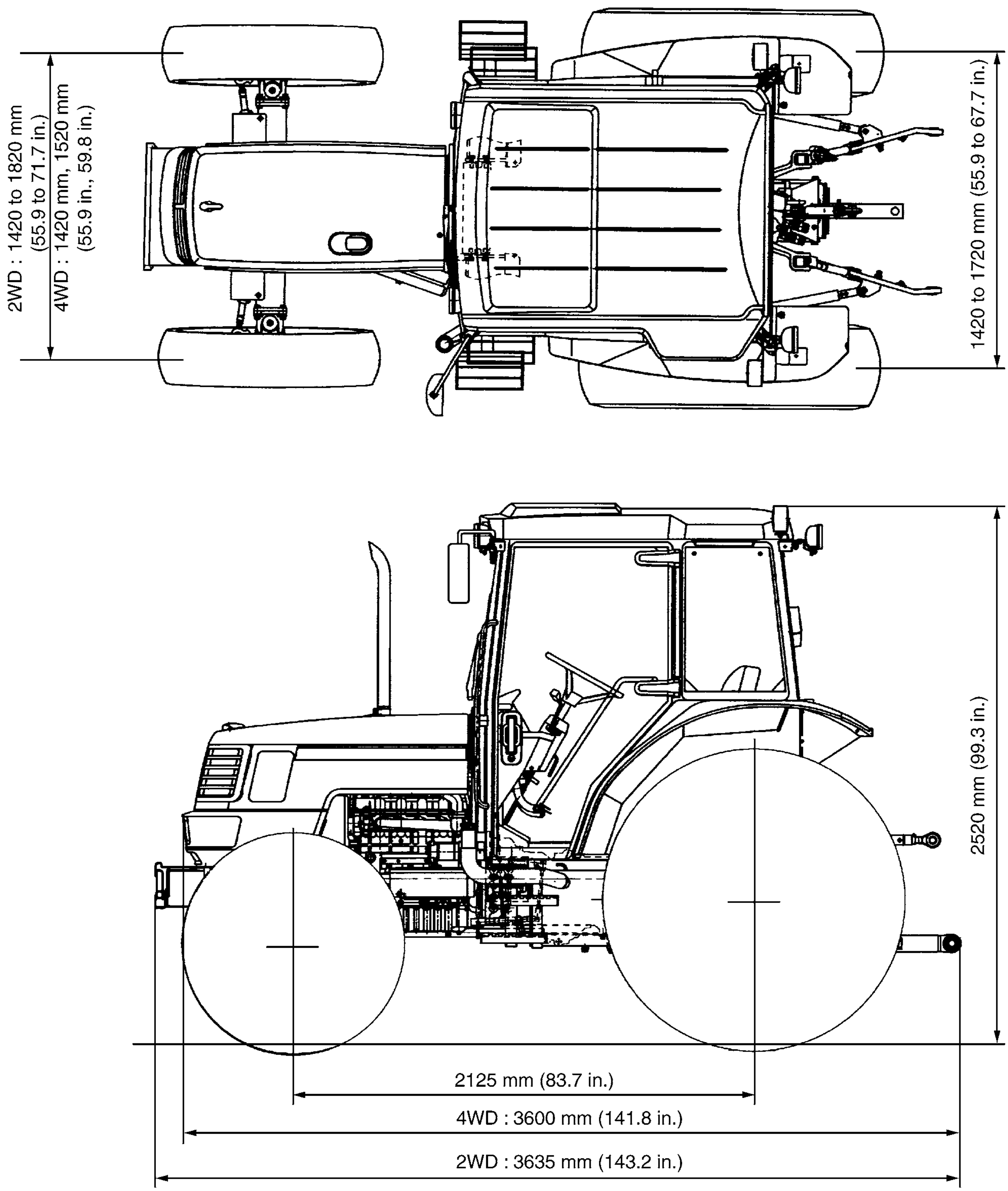
(Continued)

Model			Destination	M8200Q		M9000Q	
				2WD	4WD	2WD	4WD
Dimensions	Overall length**		North America	3875 mm (152.6 in.)	3805 mm (149.8 in.)	3875 mm (152.6 in.)	3845 mm (151.4 in.)
			Oceania	–	3805 mm (149.8 in.)	–	3845 mm (151.4 in.)
			Euro	–	3875 mm (152.6 in.)	–	3875 mm (152.6 in.)
	Overall height (with CABIN)		North America	2480 mm (97.6 in.)		2530 mm (99.6 in.)	
			Oceania	–	2530 mm (99.9 in.)	–	2555 mm (100.6 in.)
			Euro	–	2480 mm (97.6 in.)	–	2530 mm (99.6 in.)
Weight (with CABIN)			North America	2540 kg (5600 lbs)	2740 kg (6040 lbs)	2580 kg (5690 lbs)	2800 kg (6175 lbs)
			Oceania	–	3135 kg (6913 lbs)	–	3165 kg (6979 lbs)
			Euro	–	3135 kg (6913 lbs)	–	3165 kg (6979 lbs)
Travelling system	Standard tire size	Front	North America	7.5-18	11.2-24	7.5-18	12.4-24
			Oceania	–	11.2-24	–	12.4-24
			Euro	–	11.2-24	–	12.4-24
		Rear	North America	18.4-28		18.4-30	
			Oceania	–	18.4-30	–	16.9-34
			Euro	–	18.4-28	–	18.4-30

W10315550

DIMENSIONS

M6800SQ



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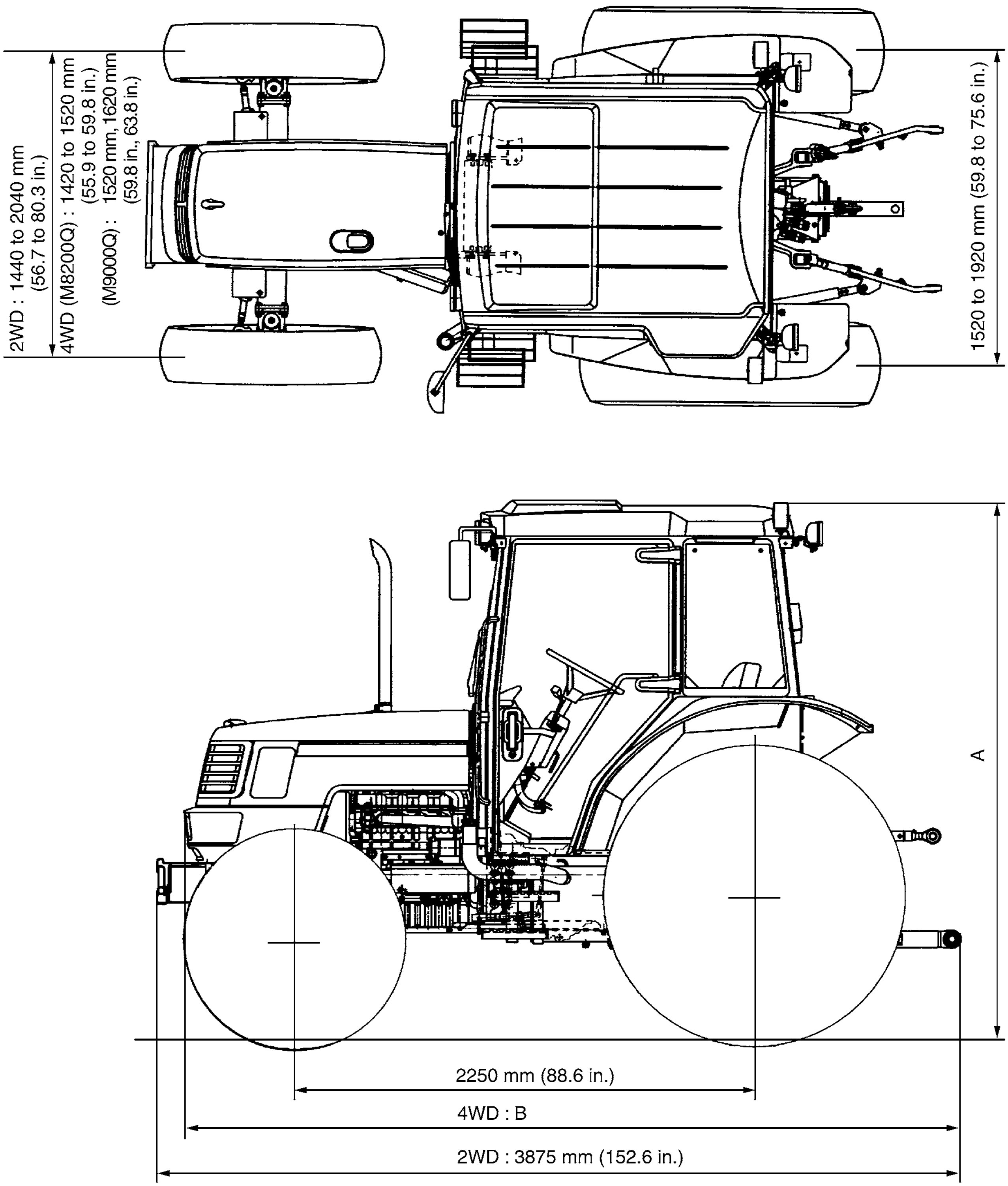
M8200Q · M9000Q



3TMACABFP002B

Destination	North America		Oceania		Euro	
Model	M8200Q	M9000Q	M8200Q	M9000Q	M8200Q	M9000Q
Overall height (**A**)	2480 mm (97.6 in.)	2530 mm (99.6 in.)	2530 mm (99.6 in.)	2555 mm (100.6 in.)	2480 mm (97.6 in.)	2530 mm (99.6 in.)
Overall length (**B**) : 4WD	3805 mm (149.8 in.)	3845 mm (151.4 in.)	3805 mm (149.8 in.)	3845 mm (149.8 in.)	3875 mm (152.6 in.)	

GENERAL

CONTENTS

1. LUBRICANTS FUEL AND COOLANT

	Place	Capacity			Lubricants, fuel and coolant
		M6800SQ	M8200Q	M9000Q	
1	Fuel	95 L 25.1 U.S.gals. 20.9 Imp.gals.	110 L 29.1 U.S.gals. 24.2 Imp.gals.		No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below –10 °C (14 °F)
2	Washer liquid	1.3 L 1.4 U.S.qts. 1.1 Imp.qts.			Automobile washer liquid
3	Transmission case	43 L 45.5 U.S.qts. 37.8 Imp.qts.	52 L 54.9 U.S.qts. 45.8 Imp.qts.		KUBOTA SUPER UDT fluid

2. MAINTENANCE CHECK LIST

No.	Item	Period	Service Interval									After purchase		Important		Reference page
			50	100	200	300	400	600	800	1500	3000	1 year	2 years			
1	Inner air filter	Clean			☆									*		10-G5
2	Fresh air filter	Clean			☆									*		10-G5
3	Air conditioner condenser	Check			☆											10-G5
4	Air conditioner belt tension	Adjust			☆											10-G5
5	Air conditioner pipes and hoses	Check										☆				10-G6
6	CAB isolation cushion	Check										☆				10-G6
7	Washer liquid	Add										Service as required				10-G6
8	Refrigerant (gas)	Check														10-S22
9	Lubricating door and rear window hinge	–														10-G6

■ **IMPORTANT**

- *** : Air filter should be cleaned more often in dusty conditions than in normal conditions.**

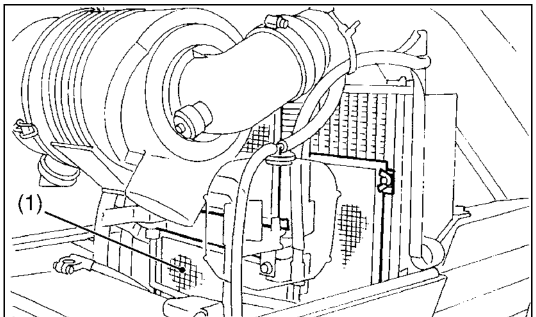
W1035769

3. 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



3TMACABWP053A

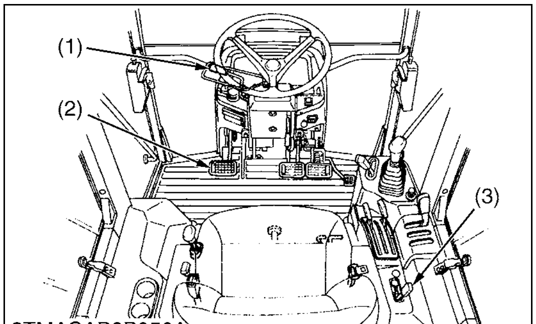
Cleaning Air Conditioner Condenser Screen

1. Roll up the air conditioner condenser screen (1) from below and clean.
2. Finally straighten the mesh down along the condenser.

(1) Air Conditioner Condenser Screen

W1012475

[2] CHECK POINTS OF EVERY 50 HOURS



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Checking Engine Start System [M6800S · M8200 · M9000]

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. Pull out the engine stop knob and 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. Pull out the engine stop knob and turn the key to **"START"** position.
6. The engine must not crank.
7. If it cranks, inspect the safety switch.

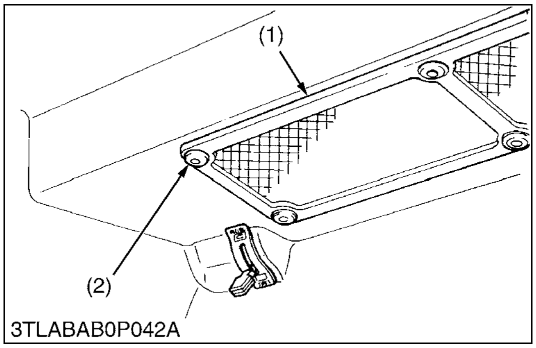
■ **Test 3 : Checking Operator Presence Control (OPC) System**

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 **"9. ELECTRICAL SYSTEM"**.)

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

W1062967

[3] CHECK POINTS OF EVERY 200 HOURS

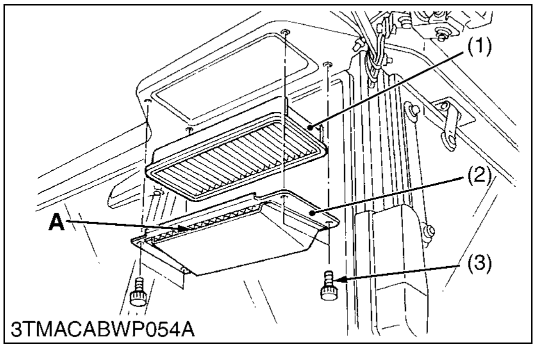


Cleaning Inner Air Filter

1. Remove the inner air filter (1), and blow air from the direction opposite to the filter's normal flow.

(1) Inner Air Filter (2) Push-rivet

W1012589



Cleaning Fresh Air Filter

1. Remove the knob bolts (3) and pull out filter (1).

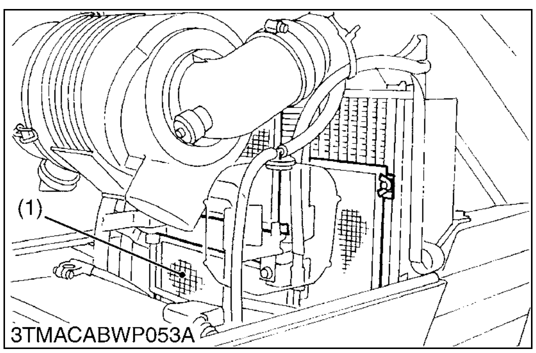
■ **NOTE**

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

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

(A) Air Inner Port

W1012659

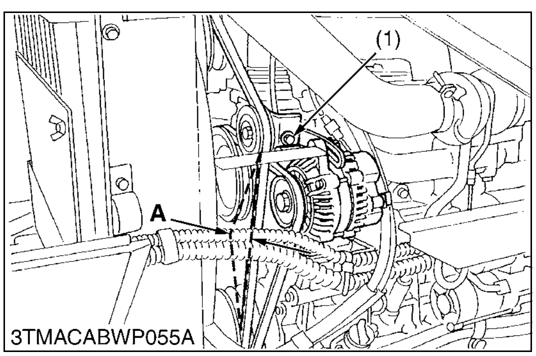


Checking Air Conditioner Condenser

1. Check the air conditioner condenser (1).
2. If dust and dirt, wash off all dirt and dust from the condenser (1) with a soft brush, use care not to damage or bend the fins.

(1) Air Conditioner Condenser

W1012792



Adjusting Air Conditioner Belt Tension

CAUTION

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

1. Stop the engine and remove the key.
2. Apply 98 N (10 kgf, 22 lbs) pressure to the belt between the pulleys.
3. If tension is incorrect, adjust the belt tension.
4. If belt is damaged, replace it.

Air conditioner belt tension	Factory spec.	A deflection of between 10 to 12 mm (0.39 to 0.47 in.) when the belt is pressed in the middle of the span

(1) Adjusting Bolt **(A) Deflection**

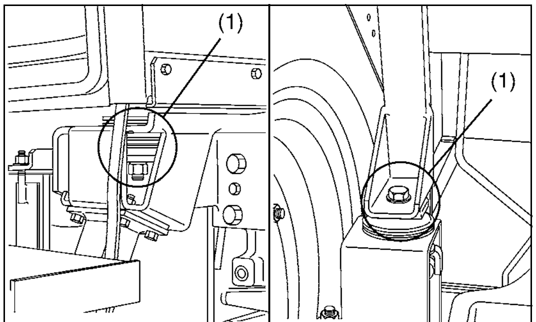
W1012867

[4] CHECK POINTS OF EVERY 1 YEAR

Checking Air Conditioner Pipe and Clamp

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.

W1031047



3TMACABWP056A

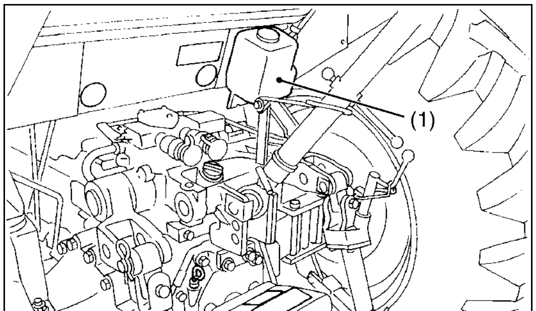
Checking Cabin Isomount

1. Check the isomounts (1) for any breakage or fatigue.
2. Replace them if they have deteriorated.

(1) Isomount

W1013119

[5] OTHERS



3TMACABWP057A

Adjusting Washer Liquid

1. Add a proper amount of automobile washer liquid when it is necessary.

Washer liquid tank	Capacity	1.3 L 1.4 U.S.qts. 1.1 Imp.qts.

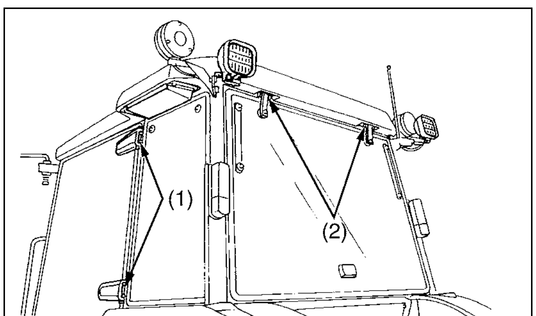
(1) Washer Liquid Tank

W1013206

Checking Amount of Refrigerant (gas)

1. See page 10-S22.

W1031295



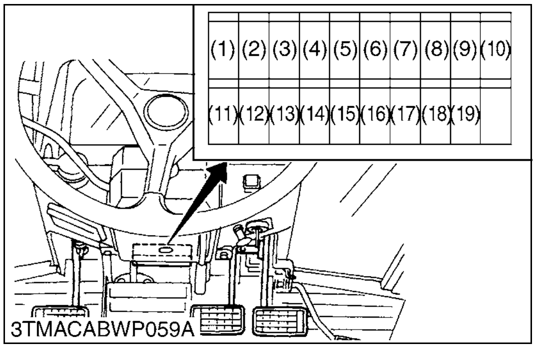
3TMACABWP058A

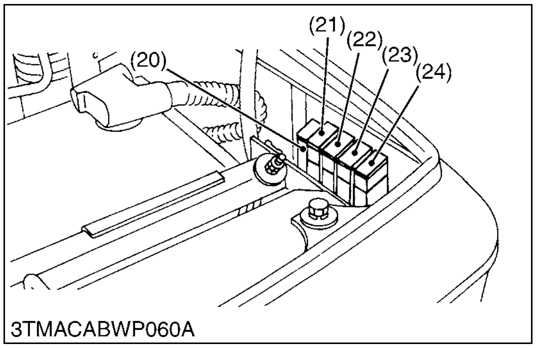
Lubricating Door and Rear Window Hinge

1. Apply a small amount of lubricating liquid to the following points when it is necessary.

(1) Door Hinge (2) Rear Window Hinge

W1013334





Replacing Fuse

■ **NOTE**

- **Affected serial number as below.**
  M6800SQ : Below 20868
  M6800SDTQ : Below 62880
  M8200Q : Below 10798
  M8200DTQ : Below 53142
  M9000Q : Below 10915
  M9000DTQ : Below 54966

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

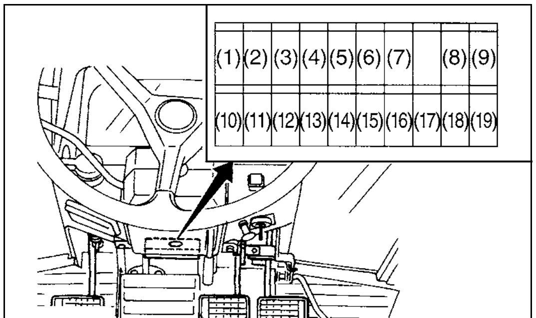
■ **IMPORTANT**

- **Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to troubleshooting section of this manual for specific information dealing with electrical problems.**

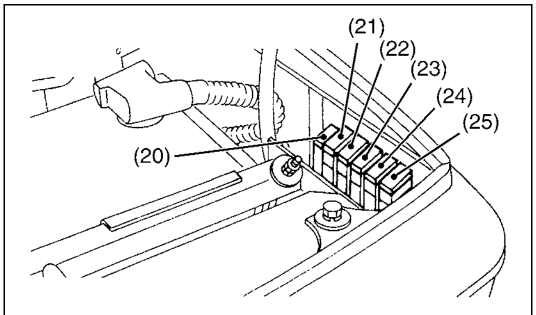
■ **Protected Circuit**

Fuse No.	Capacity (A)	Protected circuit
1	15	Flasher (Hazard)
2	10	Dome light
3	10	Air con. (Compressor)
4	20	Air con. (Fan motor)
5	5	Air con. (Control)
6	15	Wiper
7	5	Radio
8	15	Key stop
9	15	Spare
10	20	Spare
11	10	Engine panel
12	15	Turn signal, Stop lamp
13	15	Auxiliary power
14	15	Head light, Tail lamp, Horn
15	20	(Rear) Deffogger (if equipped)
16	20	(Side) Deffogger (if equipped)
17	15	Work light (Front)
18	15	Work light (rear)
19	15	Cigarette lighter
20	65 Slow-Blow Fuse	Check circuit against wrong battery connection
	75 Slow-Blow Fuse (if equipped)	
21	30	Battery
22	30	Accessory
23	30	Main key
24	30	Deffogger (if equipped)

W1023184



3TMACABWP061A



3TMACABWP062A

Replacing Fuse (Continued)

■ **NOTE**

- **Affected serial number as below.**
  M6800SQ : Above 20869
  M6800SDTQ : Above 62881
  M8200Q : Above 10799
  M8200DTQ : Above 53143
  M9000Q : Above 10916
  M9000DTQ : Above 54967

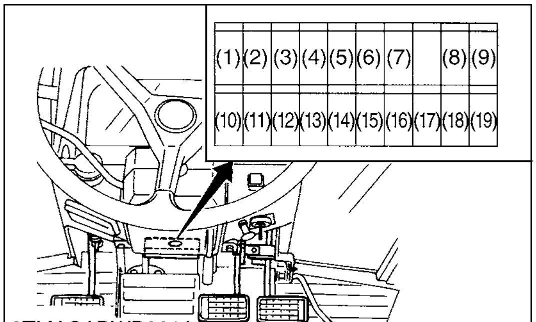
1. The tractor electrical system is protected from potential damage by fuses.
   A blown fuse indicates that there is an overload or short somewhere in the electrical system.
2. If any of the fuses should blow, replace with a new one of the same capacity.

■ **IMPORTANT**

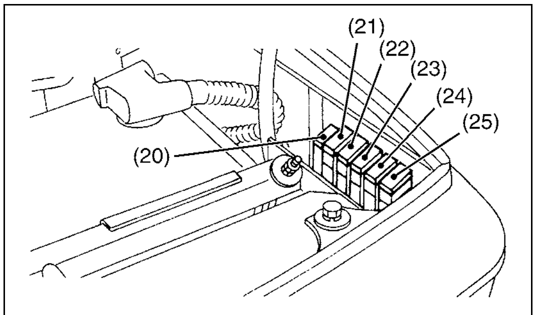
- **Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to troubleshooting section of this manual for specific information dealing electrical problems.**

FUSE No.	CAPACITY (A)	Protected circuit
(1)	15	Flasher (Hazard)
(2)	10	Dome light
(3)	10	Air conditioner (Compressor)
(4)	25	Air conditioner (Fan motor)
(5)	5	Air conditioner (Control)
(6)	15	Wiper
(7)	5	Radio
(8)	15	Spare
(9)	25	Spare
(10)	10	Engine panel
(11)	15	Turn signal, Stop lamp
(12)	15	Auxiliary power
(13)	15	Head light, Tail lamp, Horn
(14)	20	(Rear) Deffogger (if equipped)
(15)	20	(Side) Deffogger (if equipped)
(16)	15	Work light (Front)
(17)	15	Work light (Rear)
(18)	15	Cigarette lighter
(19)	20	Spare (if equipped)
(20)	65 Slow blow fuse 75 Slow blow fuse (if equipped)	Check circuit against wrong battery connection
(21)	30	Battery
(22)	30	Accessory
(23)	30	Main key
(24)	30	Air conditioner (Fan motor)
(25)	30	Deffogger (if equipped)

W1019843



3TMACABWP061A



3TMACABWP062A

Replacing Fuse (Continued) (with OPC System)

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

■ **IMPORTANT**

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

FUSE No.	CAPACITY (A)	Protected circuit
(1)	15	Flasher (Hazard)
(2)	10	Dome light
(3)	10	Air conditioner (Compressor)
(4)	25	Air conditioner (Fan motor)
(5)	5	Air conditioner (Control)
(6)	15	Wiper
(7)	5	Radio
(8)	15	Spare
	10	Meter panel, seat switch (for Canada)
(9)	25	Spare
(10)	10	Engine
(11)	15	Turn signal, Stop lamp
(12)	15	Auxiliary power
(13)	15	Head light, Tail lamp, Horn
(14)	10	Meter panel, seat switch
	20	(Rear) Deffogger (if equipped) (for Canada)
(15)	20	(Side) Deffogger (if equipped) (for Canada)
(16)	15	Work light (Front)
(17)	15	Work light (Rear)
(18)	15	Cigarette lighter
(19)	20	Spare (if equipped)
(20)	65 Slow blow fuse	Check circuit against wrong battery connection
	75 Slow blow fuse (if equipped)	
(21)	30	Battery
(22)	30	Accessory
(23)	30	Main key
(24)	30	Air conditioner (Fan motor)
(25)	30	Deffogger (if equipped)

W1023654

Replacing Light Bulb

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

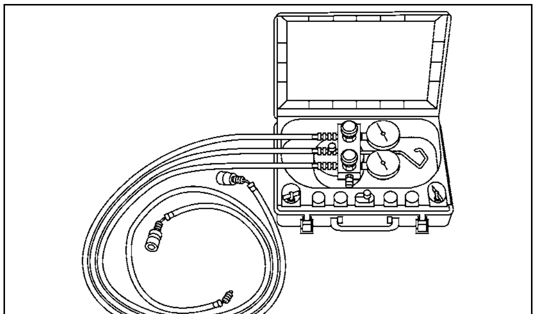
Light	Capacity
Head lights	45/45 W
Tail light	8 W
Turn signal light	15 W
Hazard light	27 W
Instrument panel light	3.4 W
Easy checker	1.4 W, 3 W
Work light	55 W
Dome light (Room lamp)	10 W

W1039659

4. SPECIAL TOOLS

■ **NOTE**

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



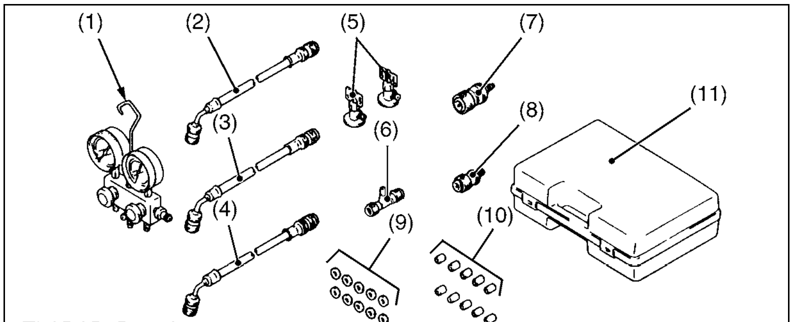
3TLABAB0P051A

Air Conditioner Service Tool

Code No: DENSO CO. 95048-00061

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

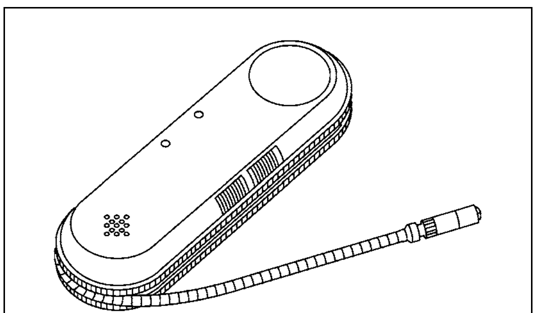
W1013507



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



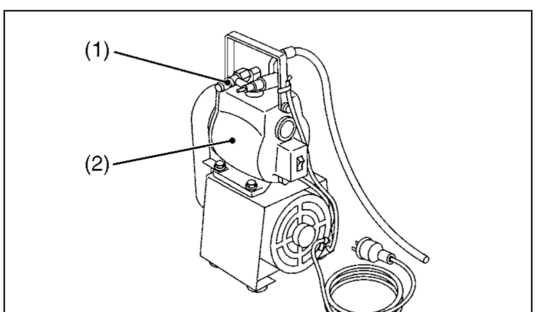
3TLABAB0P053A

Electric Gas Leak Tester

Code No: DENSO CO. 95146-00060

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

W1013817



3TLABABWP012A

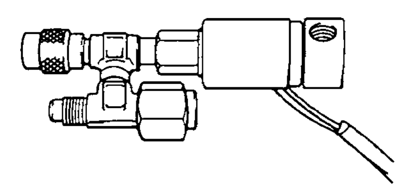
Vacuum Pump

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



3TLABAB0P054A

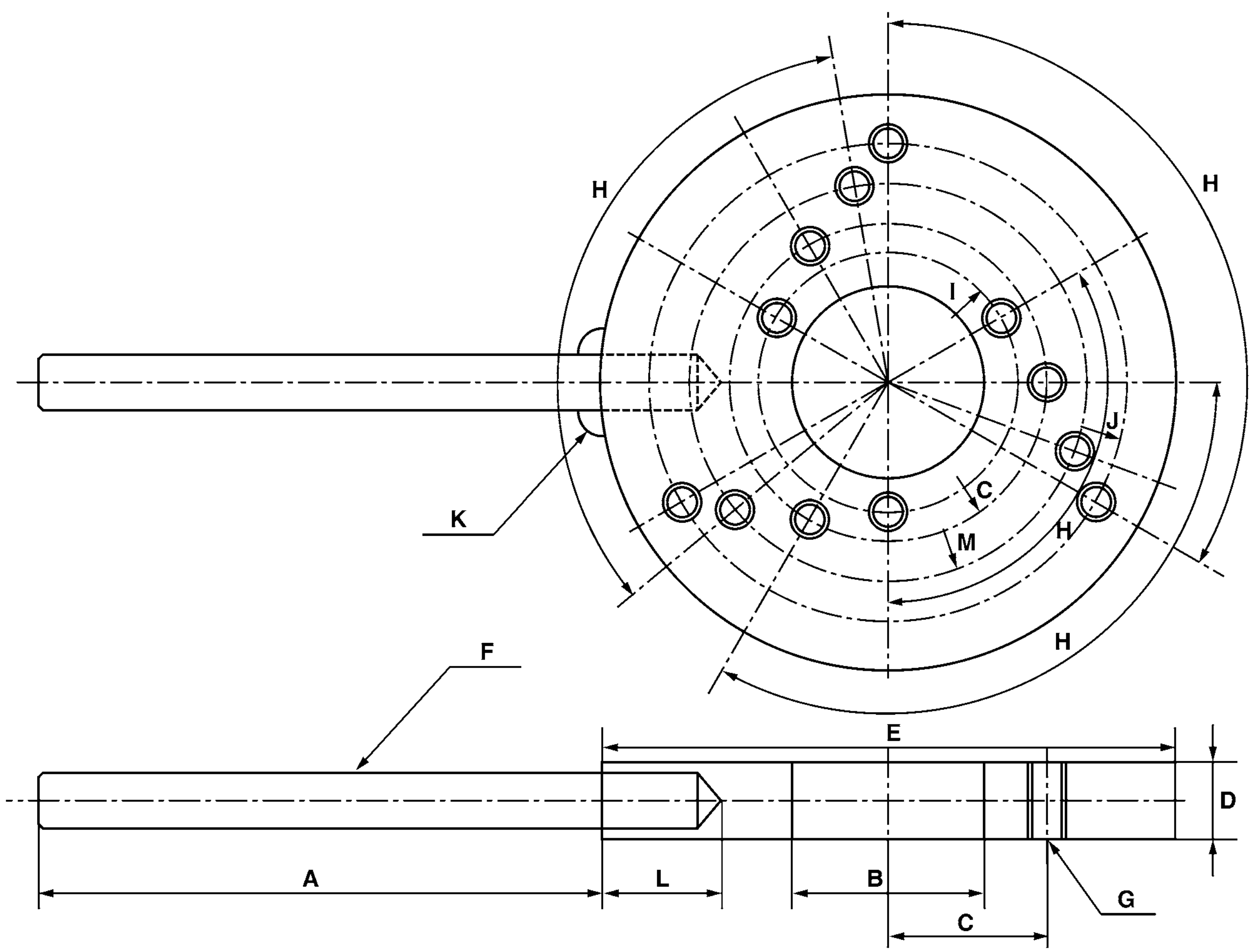
Adaptor (For R134a)

Code No: DENSO CO. 95048-10190 (AC220V)
95048-10200 (AC240V)

Application: Use for evacuating the air conditioning system.

W1013888

Stopper Magnet Clutch (For A/C Compressor)



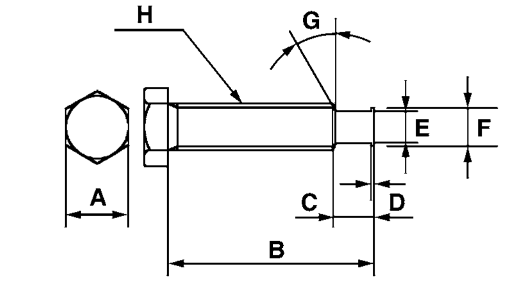
3TLABAB0P038A

Application: Use for loosen and tighten the magnet clutch mounting nut.

■ **NOTE**

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

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



3TLABAB0P039A

Stopper Bolt (for A/C Compressor)

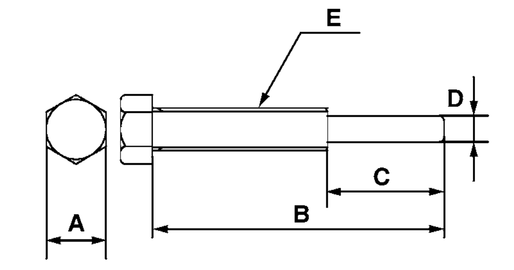
Application: Use with the stopper magnet clutch.

■ **NOTE**

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

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



3TLABAB0P040A

Remover Magnet Clutch (for A/C Compressor)

Application: Use to remove the hub plate or center piece.

■ **NOTE**

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

A	12 mm (0.47 in.)
B	55 mm (2.16 in.)
C	20 mm (0.79 in.)
D	5 mm dia. (0.20 in. dia.)
E	M8 × P1.25

W1066199

MECHANISM

CONTENTS

1. WIRING DIAGRAM

Color of Wiring

B .... Black	B/Y .... Black / Yellow	Or/W .... Orange / White
G .... Green	Br/B .... Brown / Black	R/B .... Red / Black
L .... Blue	Br/Y .... Brown / Yellow	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 / Purple	Lg/B .... Light Green / Blue	Y/R .... Yellow / Red
B/R .... Black / Red	Lg/W .... Light Green / White	
B/W .... Black / White	Lg/Y .... Light Green / Yellow	

W1019456

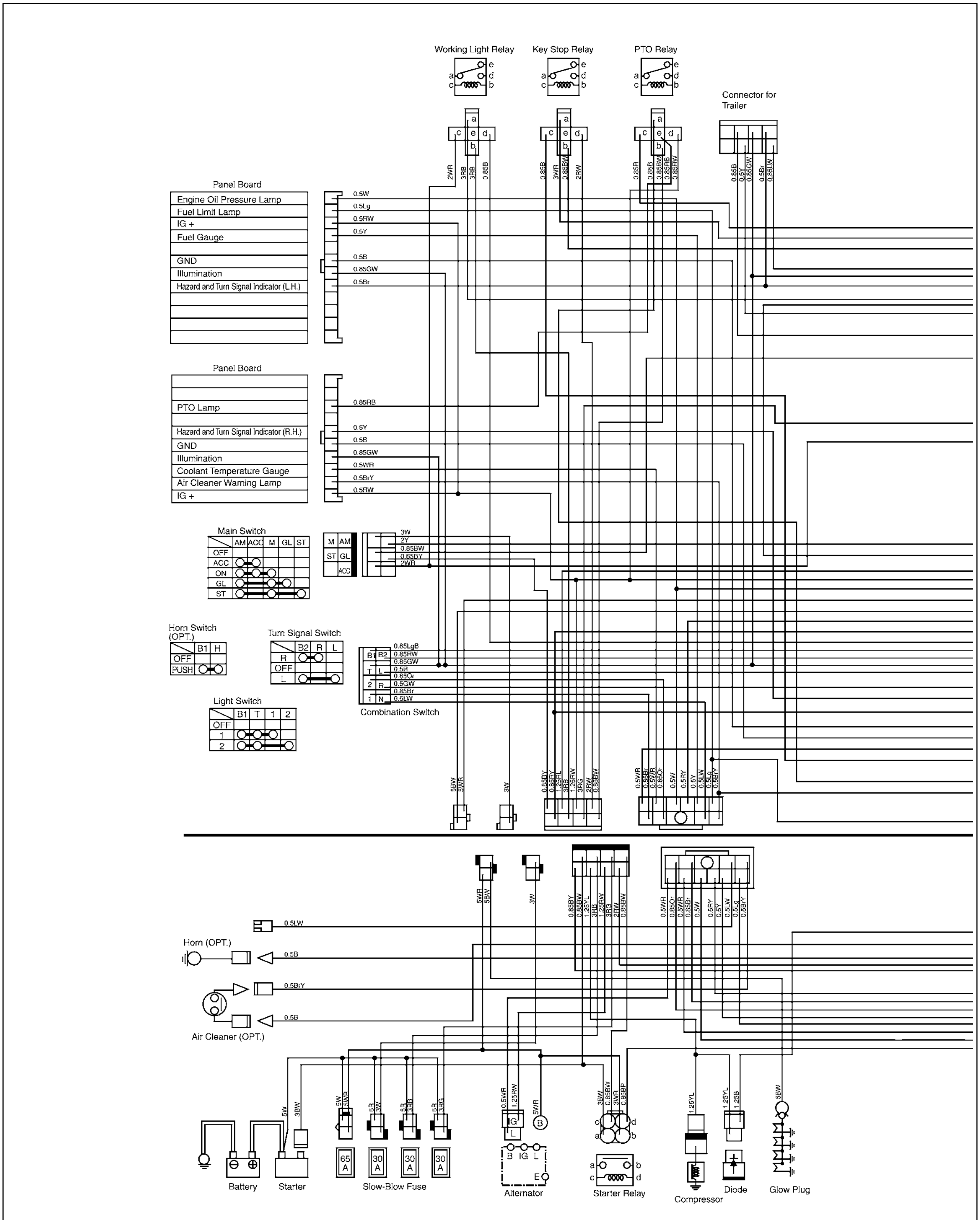
■ **NOTE**

- **There are three types (Type 1, Type 2 and Type 2 with OPC) of wiring diagram for CABIN Model that is devided by serial number as follow.**

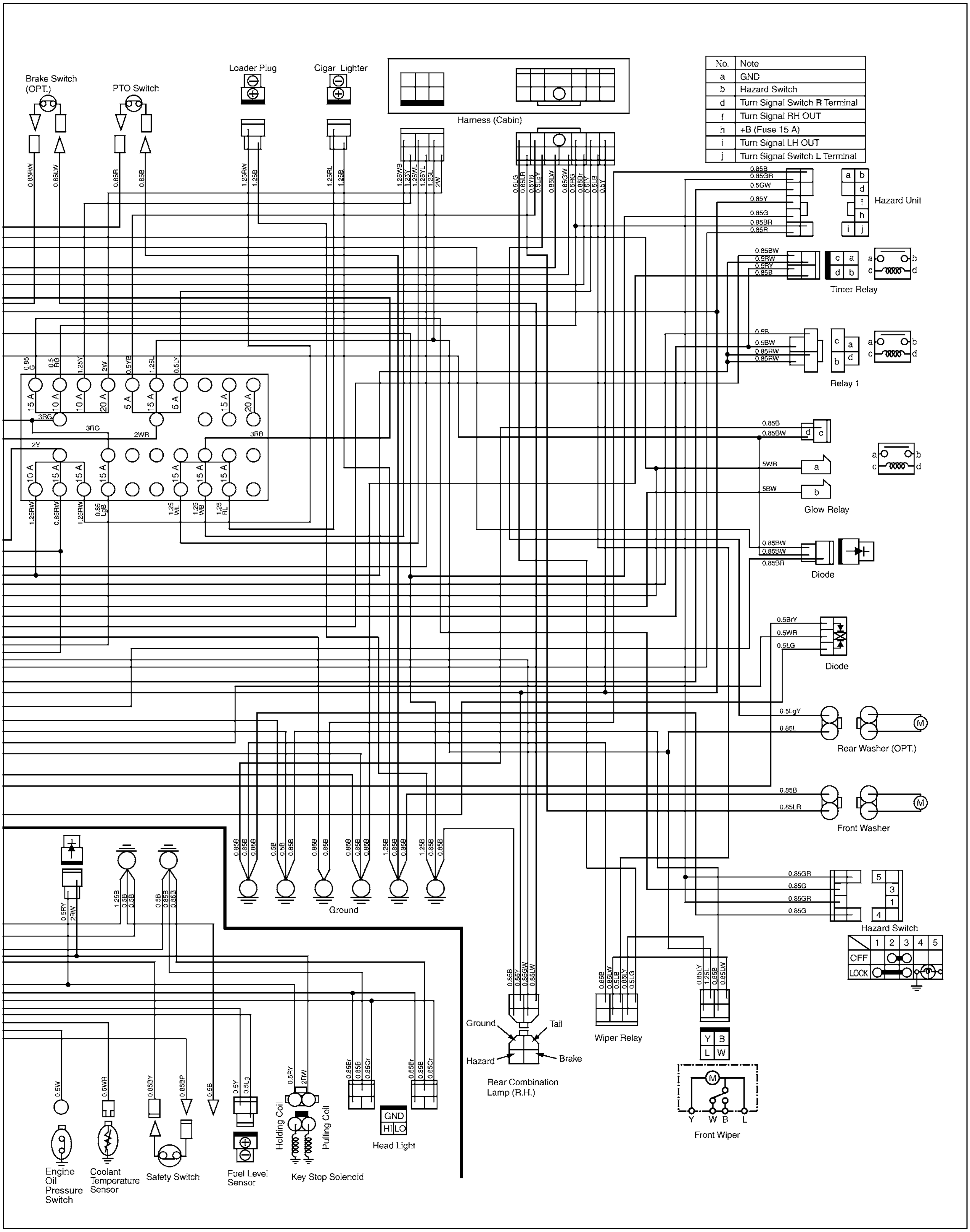
Model	Serial number			Remark
	Type 1	Type 2	Type 2 with OPC	
M6800SQ	Below 20868	20869 to 21892	Above 21893	U.S.A., Oceania
M6800SDTQ	Below 63152	63153 to 67127	Above 67128	U.S.A., Canada, Oceania, Euro
M8200Q	Below 10798	10799 to 11138	Above 11139	U.S.A.
M8200DTQ	Below 54966	54967 to 55145	Above 55146	U.S.A., Canada, Oceania, Euro
M9000Q	Below 10915	10916 to 11606	Above 11607	U.S.A.
M9000DTQ	Below 54966	54967 to 60824	Above 60825	U.S.A., Canada, Oceania, Euro

W1015278

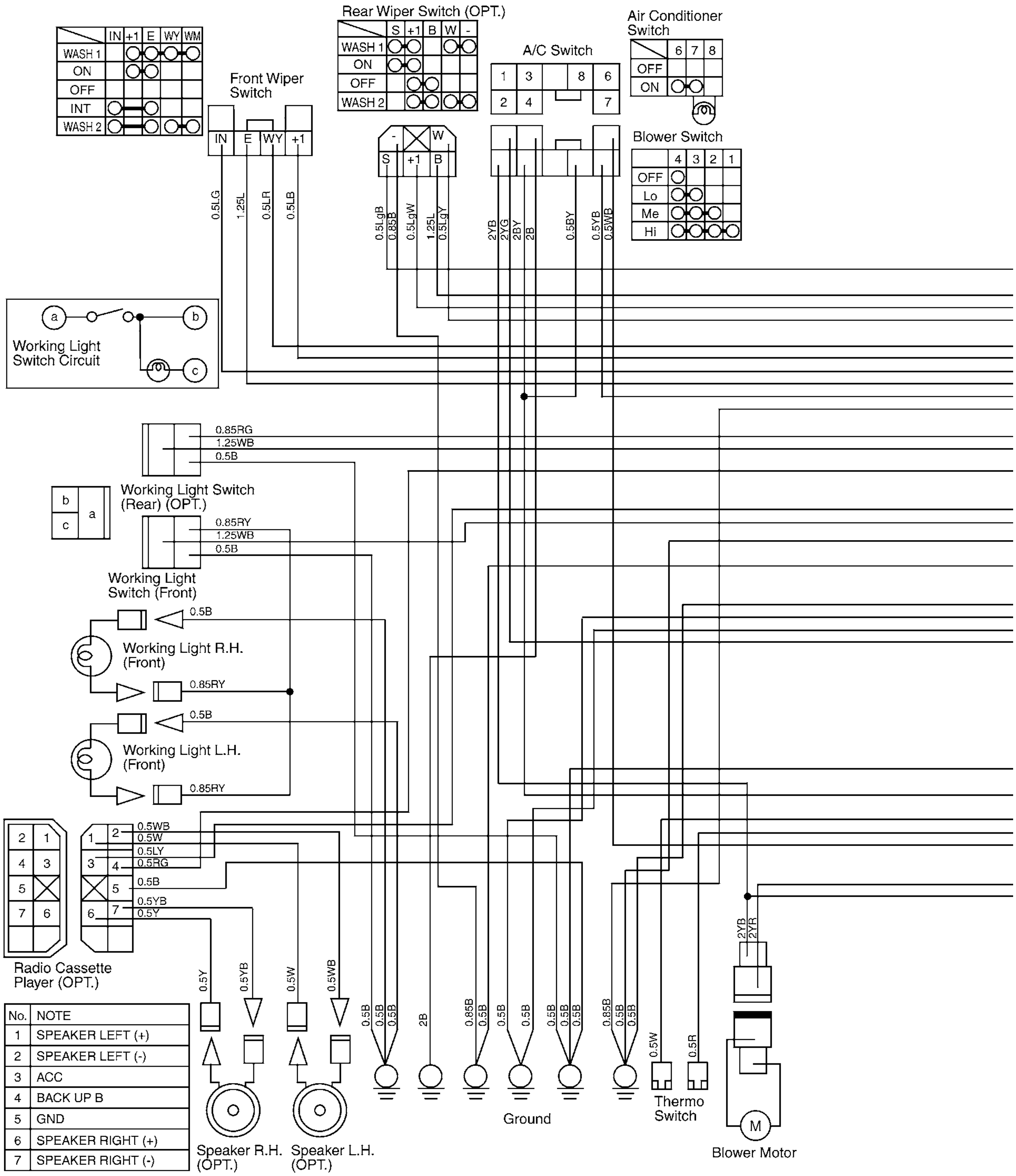
■ For U.S.A. and Oceania (Body)
Type 1



3TMACABWP001A

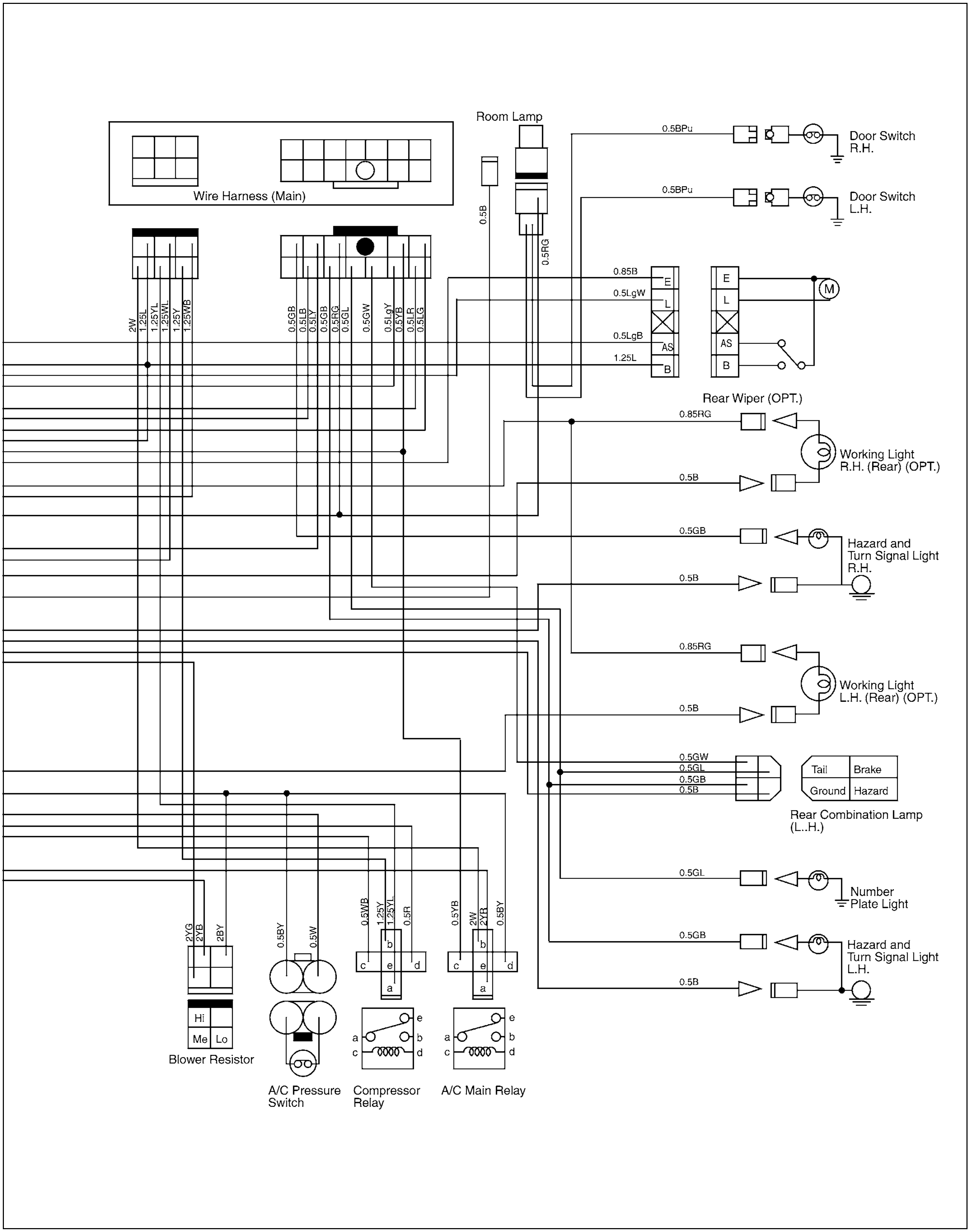

Brake Switch (OPT.)
PTO Switch
Loader Plug
Cigar Lighter
Harness (Cabin)
No. Note
a GND
b Hazard Switch
d Turn Signal Switch R Terminal
f Turn Signal RH OUT
h +B (Fuse 15 A)
i Turn Signal LH OUT
j Turn Signal Switch L Terminal
Hazard Unit
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer (OPT.)
Front Washer
Hazard Switch
OFF
LOCK
Ground
Wiper Relay
Rear Combination Lamp (R.H.)
Ground
Tail
Hazard
Brake
Front Wiper
Head Light
GND
HI LO
Engine Oil Pressure Switch
Coolant Temperature Sensor
Safety Switch
Fuel Level Sensor
Key Stop Solenoid
Holding Coil
Pulling Coil

■ For U.S.A. and Oceania (Cabin)
Type 1

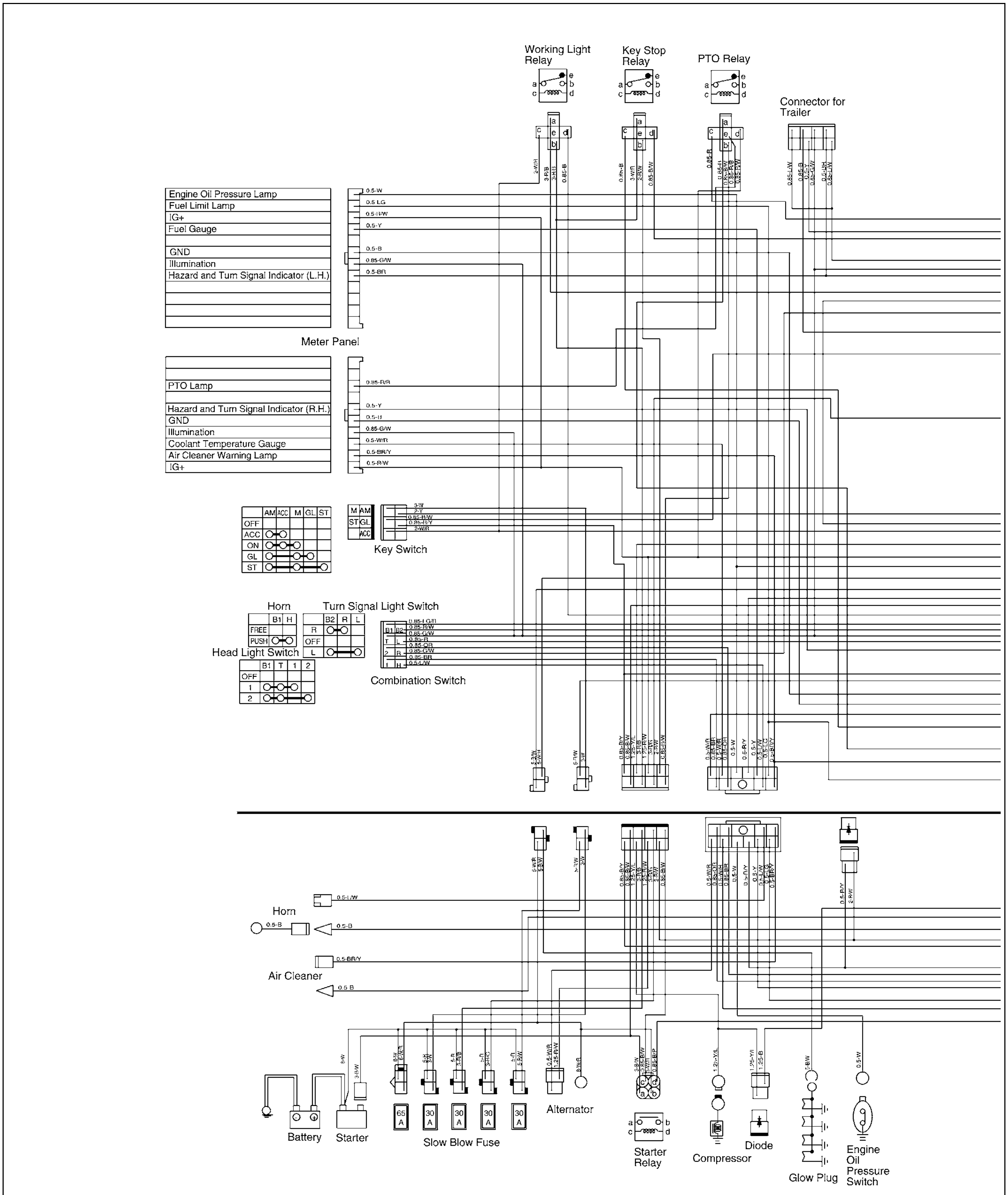


No.	NOTE
1	SPEAKER LEFT (+)
2	SPEAKER LEFT (-)
3	ACC
4	BACK UP B
5	GND
6	SPEAKER RIGHT (+)
7	SPEAKER RIGHT (-)

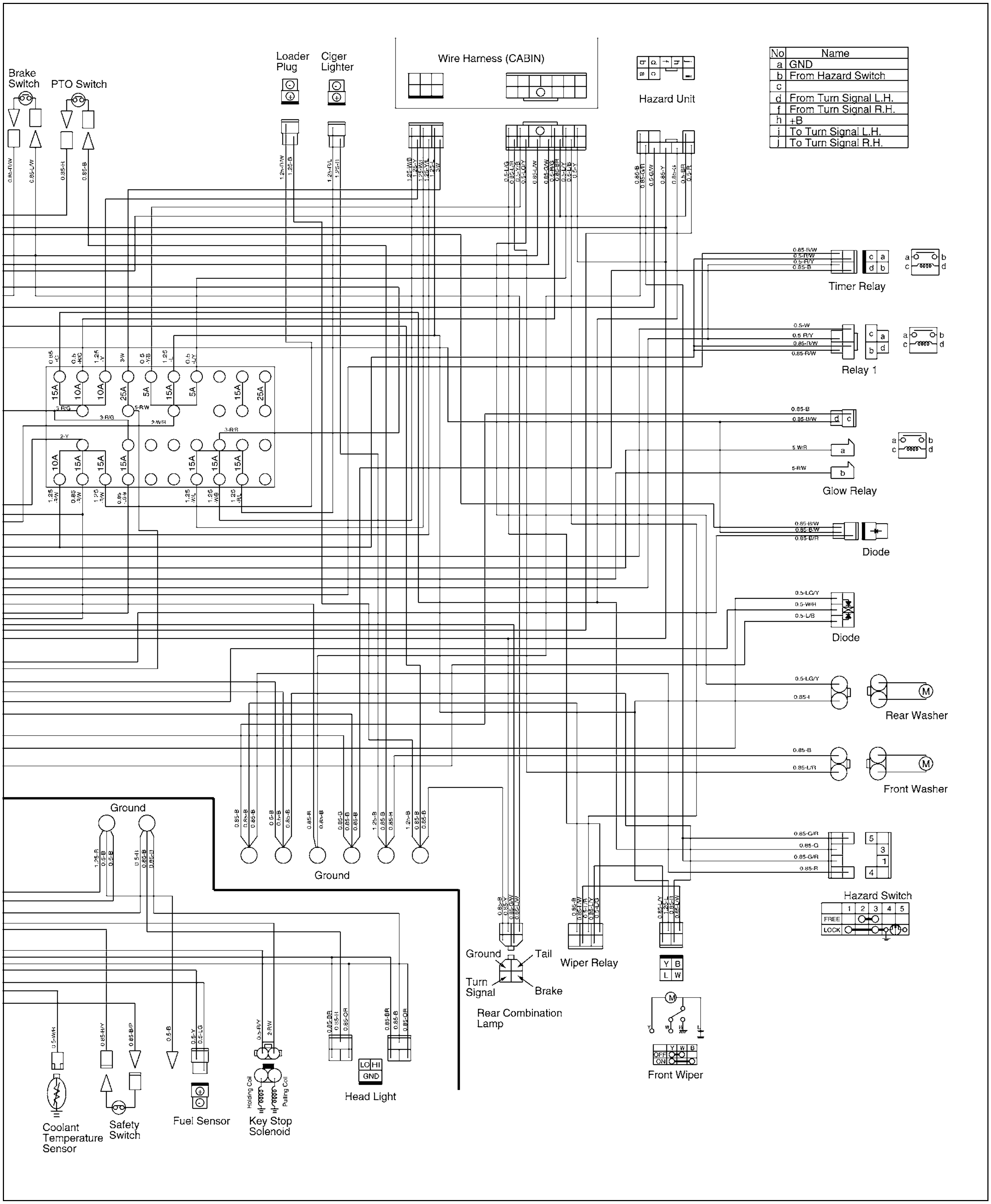
3TMACABWP003A


Room Lamp
Wire Harness (Main)
Door Switch R.H.
Door Switch L.H.
Rear Wiper (OPT.)
Working Light R.H. (Rear) (OPT.)
Hazard and Turn Signal Light R.H.
Working Light L.H. (Rear) (OPT.)
Tail
Brake
Ground
Hazard
Rear Combination Lamp (L..H.)
Number Plate Light
Hazard and Turn Signal Light L.H.
Blower Resistor
A/C Pressure Switch
Compressor Relay
A/C Main Relay

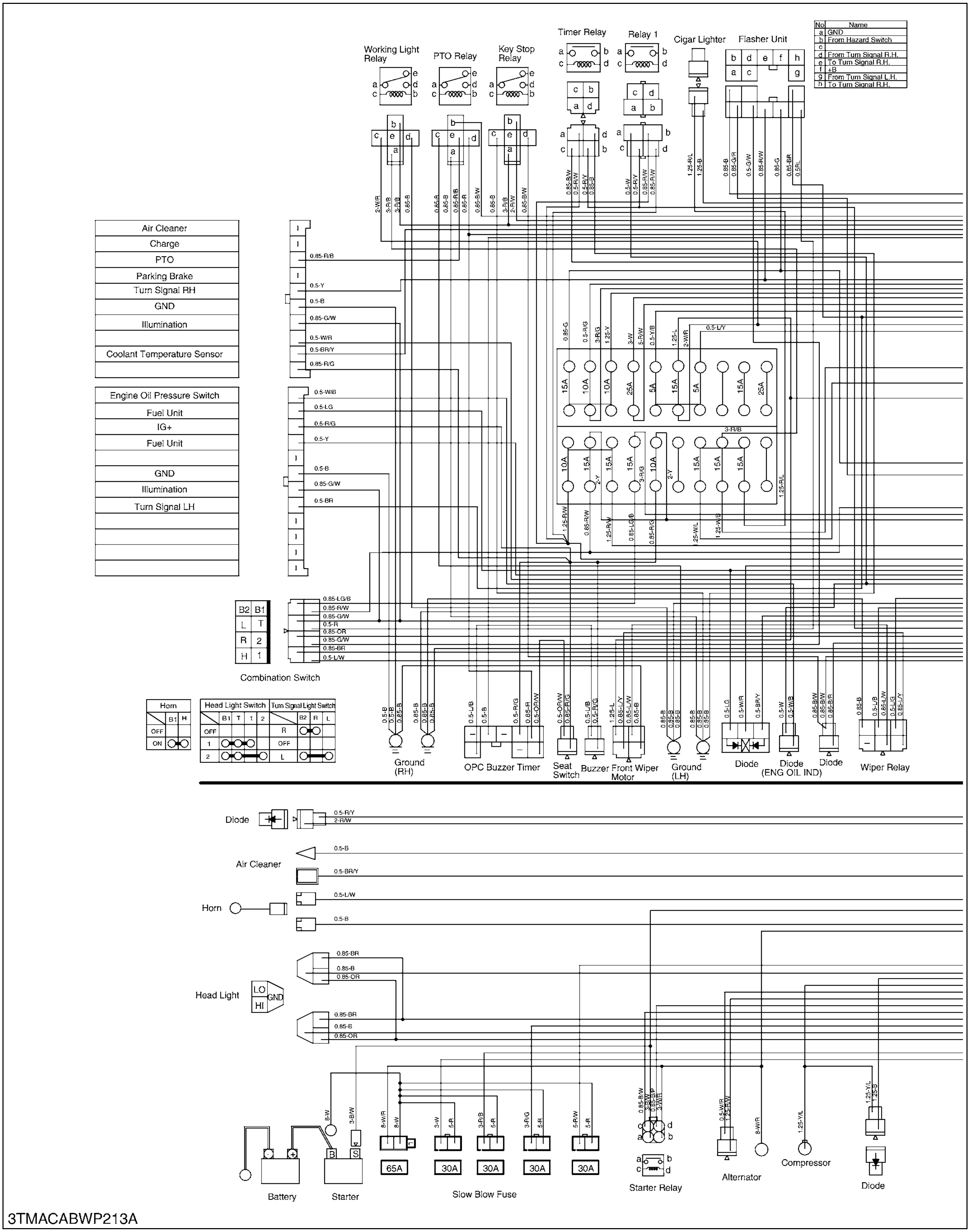
■ For U.S.A. and Oceania (Body)
Type 2

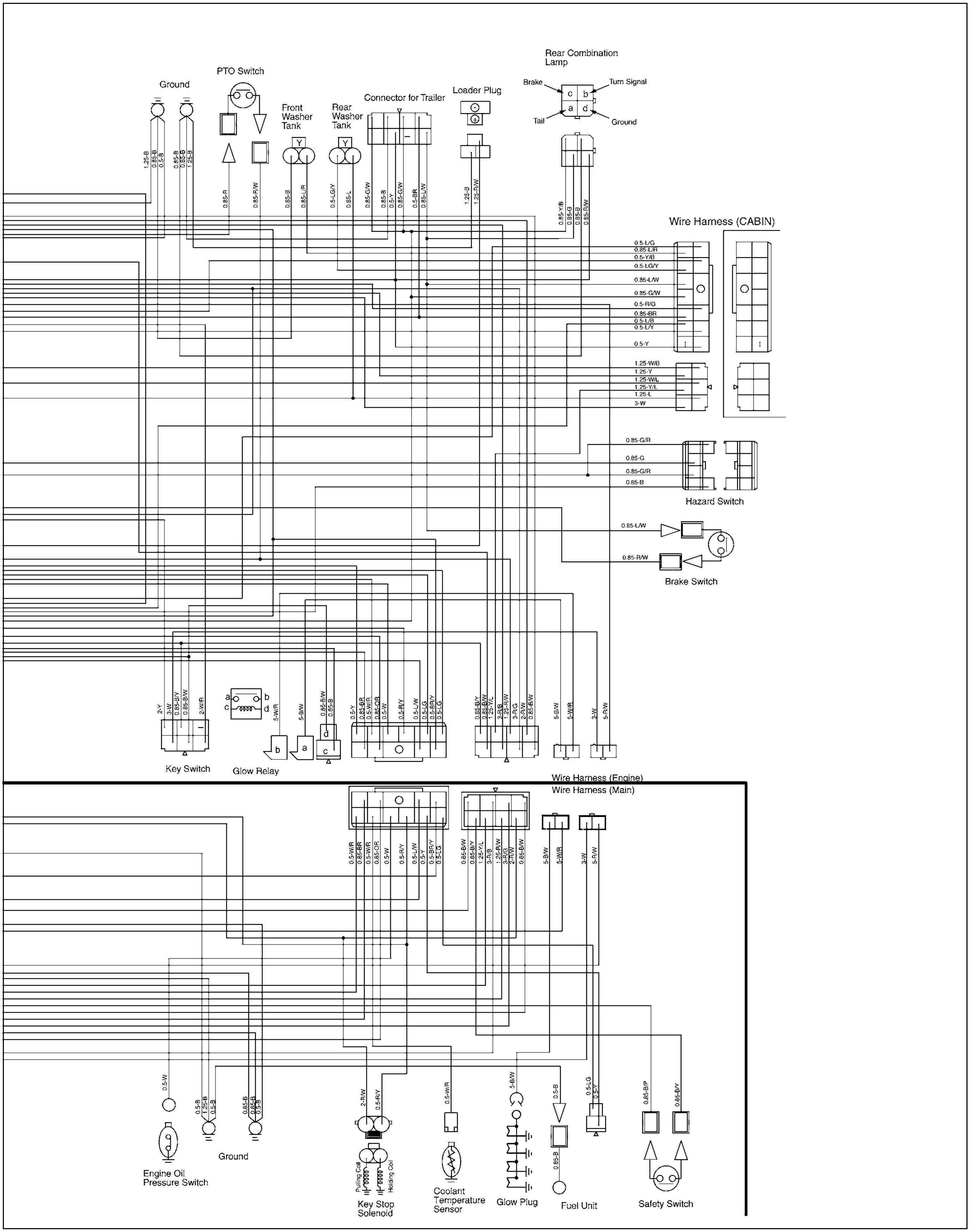


3TMACABWP005A

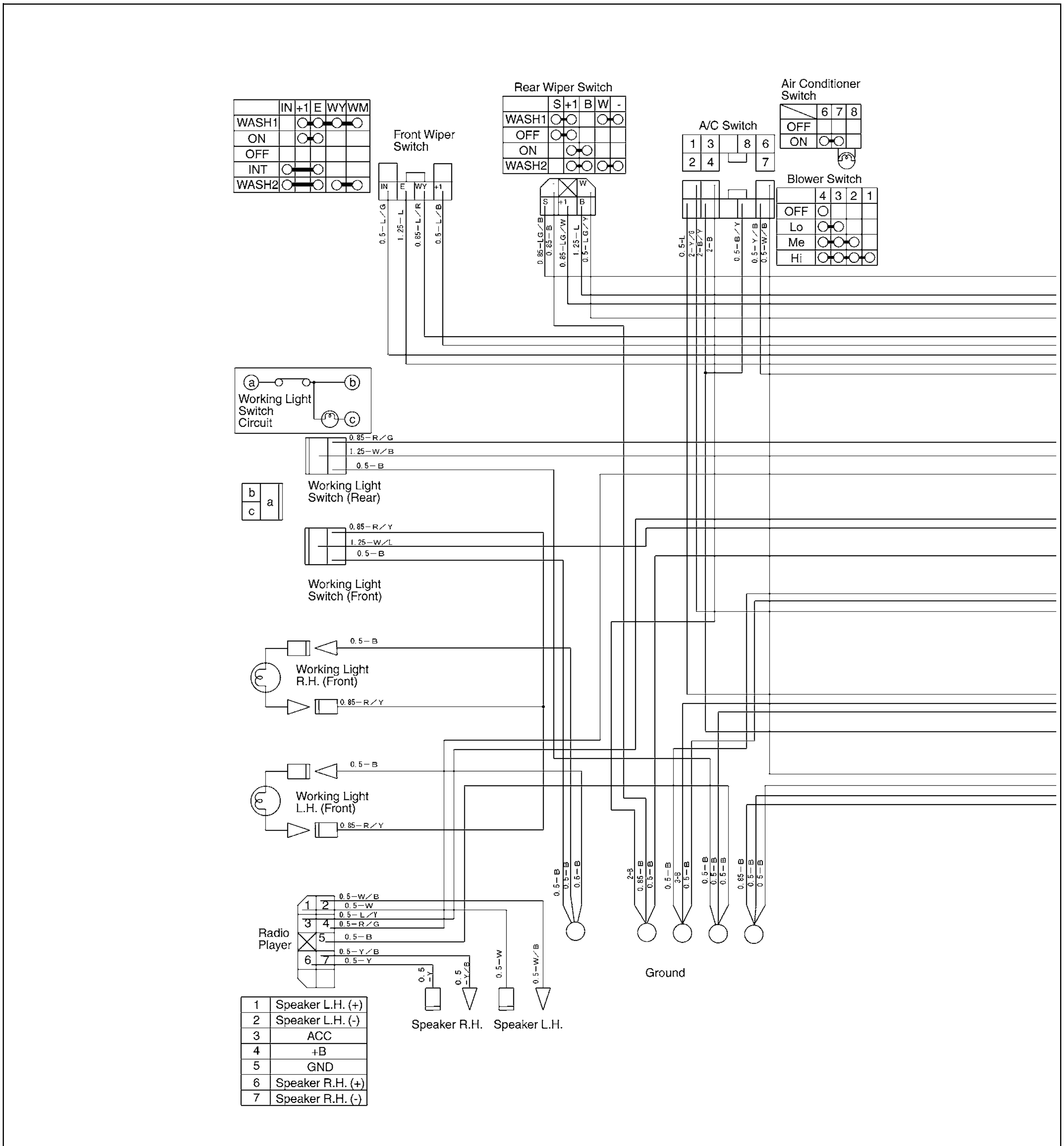

Brake Switch
PTO Switch
Loader Plug
Ciger Lighter
Wire Harness (CABIN)
Hazard Unit
No | Name
a | GND
b | From Hazard Switch
c |
d | From Turn Signal L.H.
f | From Turn Signal R.H.
h | +B
i | To Turn Signal L.H.
j | To Turn Signal R.H.
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer
Front Washer
Hazard Switch
FREE
LOCK
Ground
Ground
Ground
Tail
Turn Signal
Brake
Rear Combination Lamp
Wiper Relay
Front Wiper
Coolant Temperature Sensor
Safety Switch
Fuel Sensor
Key Stop Solenoid
Head Light

■ For U.S.A. and Oceania (Body) Type 2 (with OPC)

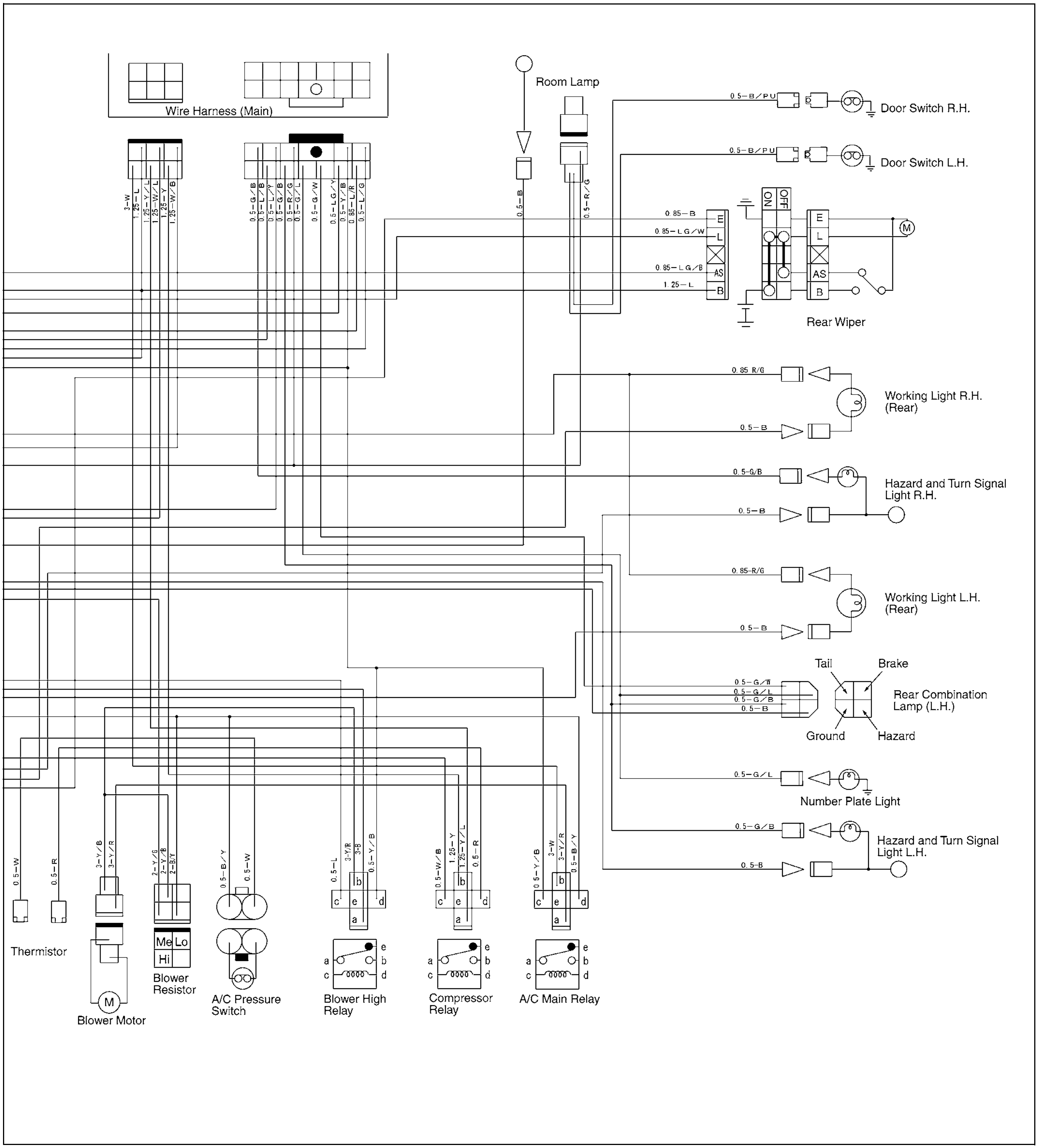



Rear Combination Lamp
Brake
Turn Signal
Tail
Ground
PTO Switch
Ground
Front Washer Tank
Rear Washer Tank
Connector for Trailer
Loader Plug
Wire Harness (CABIN)
Hazard Switch
Brake Switch
Key Switch
Glow Relay
Wire Harness (Engine)
Wire Harness (Main)
Engine Oil Pressure Switch
Ground
Key Stop Solenoid
Pulling Coil
Holding Coil
Coolant Temperature Sensor
Glow Plug
Fuel Unit
Safety Switch

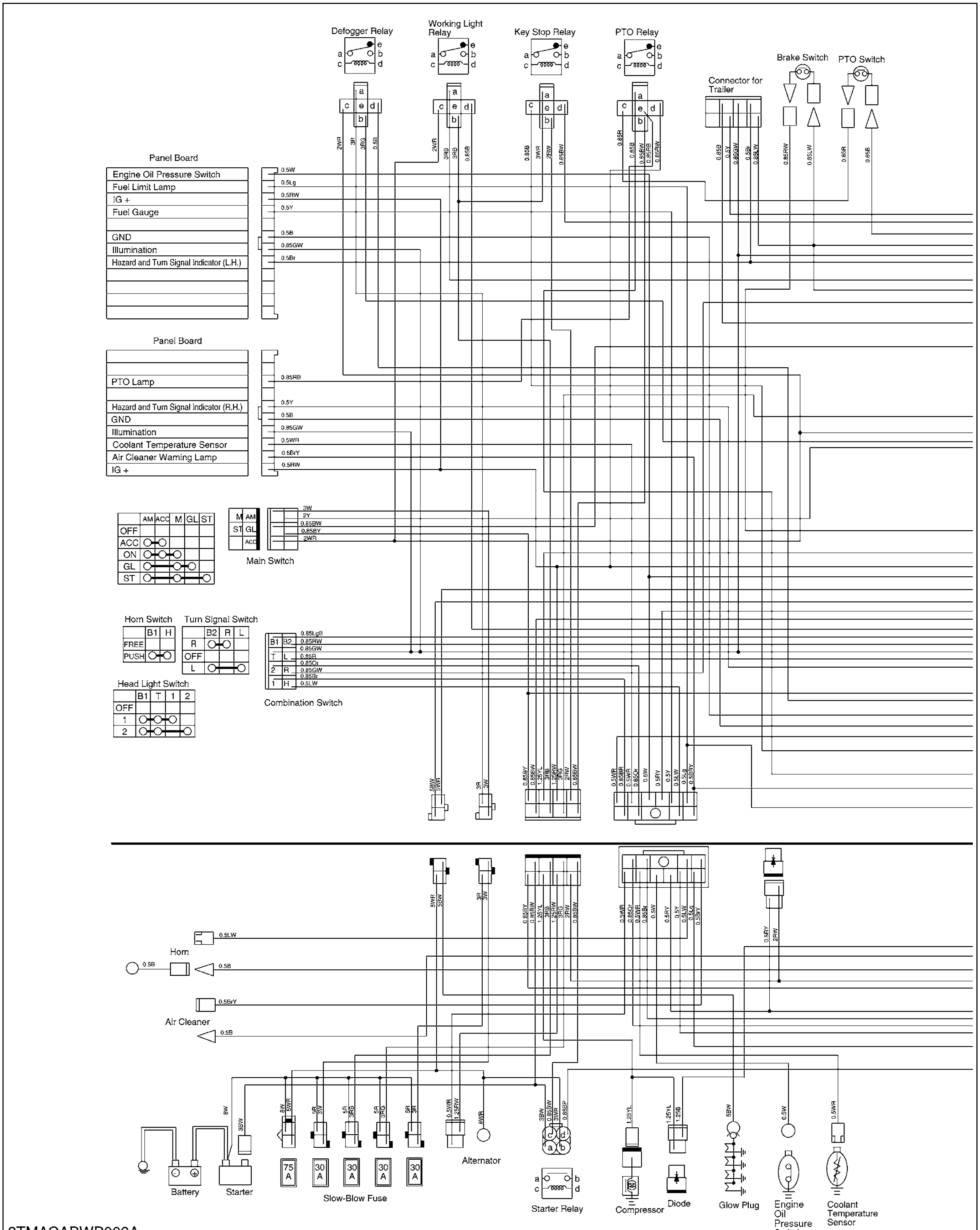
■ For U.S.A. and Oceania (Cabin)
Type 2



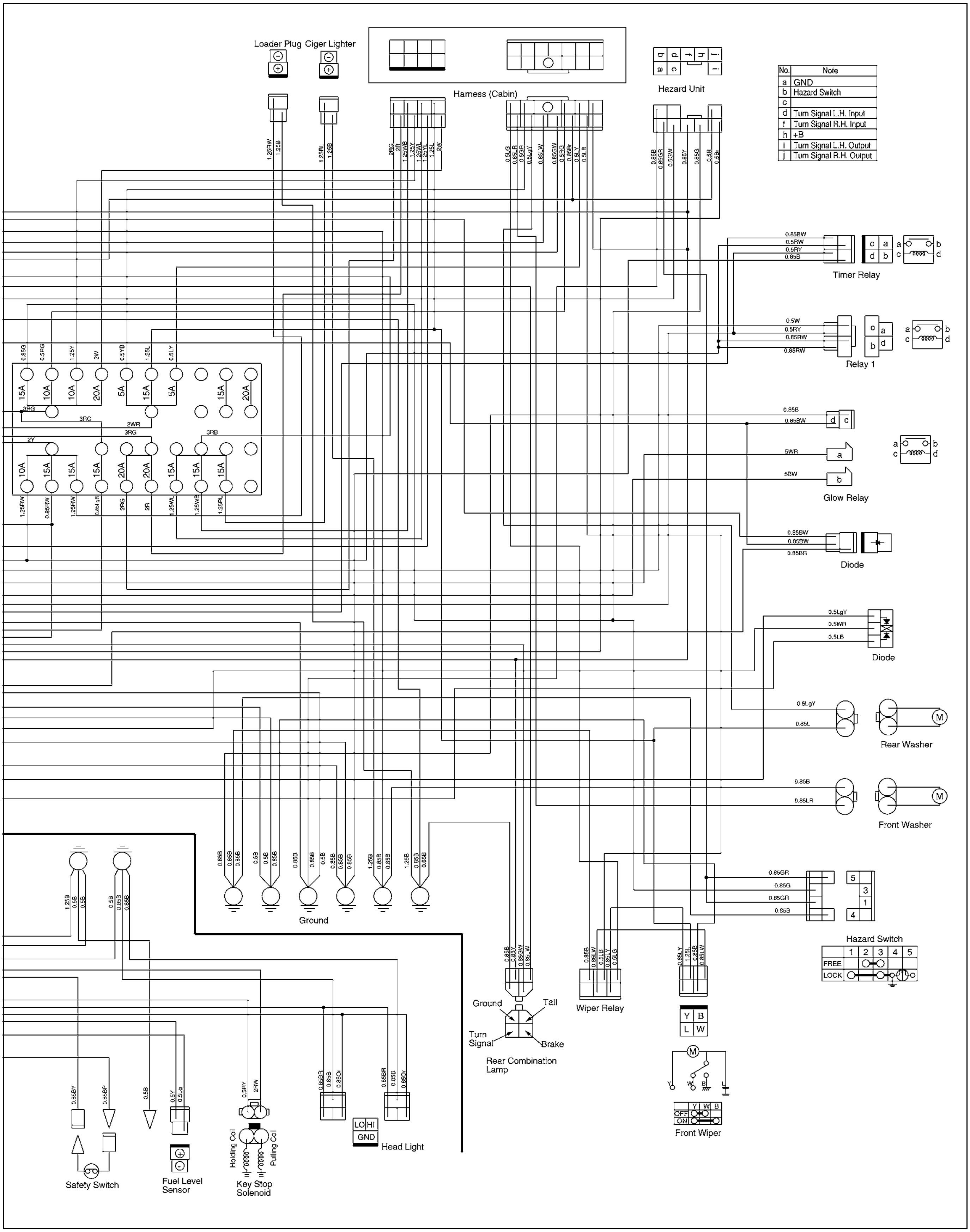
3TMACABWP007A


Wire Harness (Main)
Room Lamp
Door Switch R.H.
Door Switch L.H.
Rear Wiper
Working Light R.H. (Rear)
Hazard and Turn Signal Light R.H.
Working Light L.H. (Rear)
Tail
Brake
Rear Combination Lamp (L.H.)
Ground
Hazard
Number Plate Light
Hazard and Turn Signal Light L.H.
Thermistor
Blower Motor
Blower Resistor
A/C Pressure Switch
Blower High Relay
Compressor Relay
A/C Main Relay

For Canada (Body)
Type 1

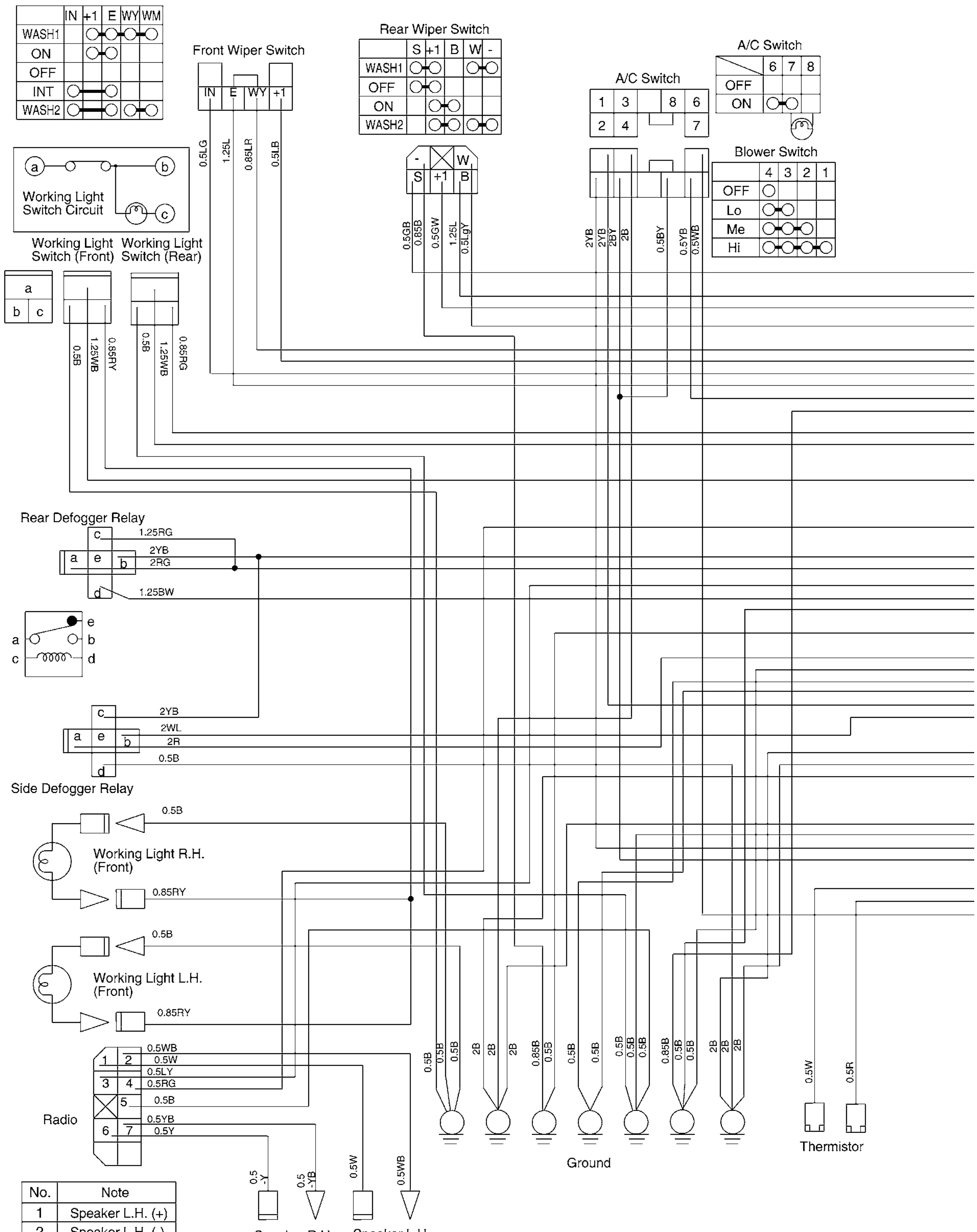


3TMACABWP009A



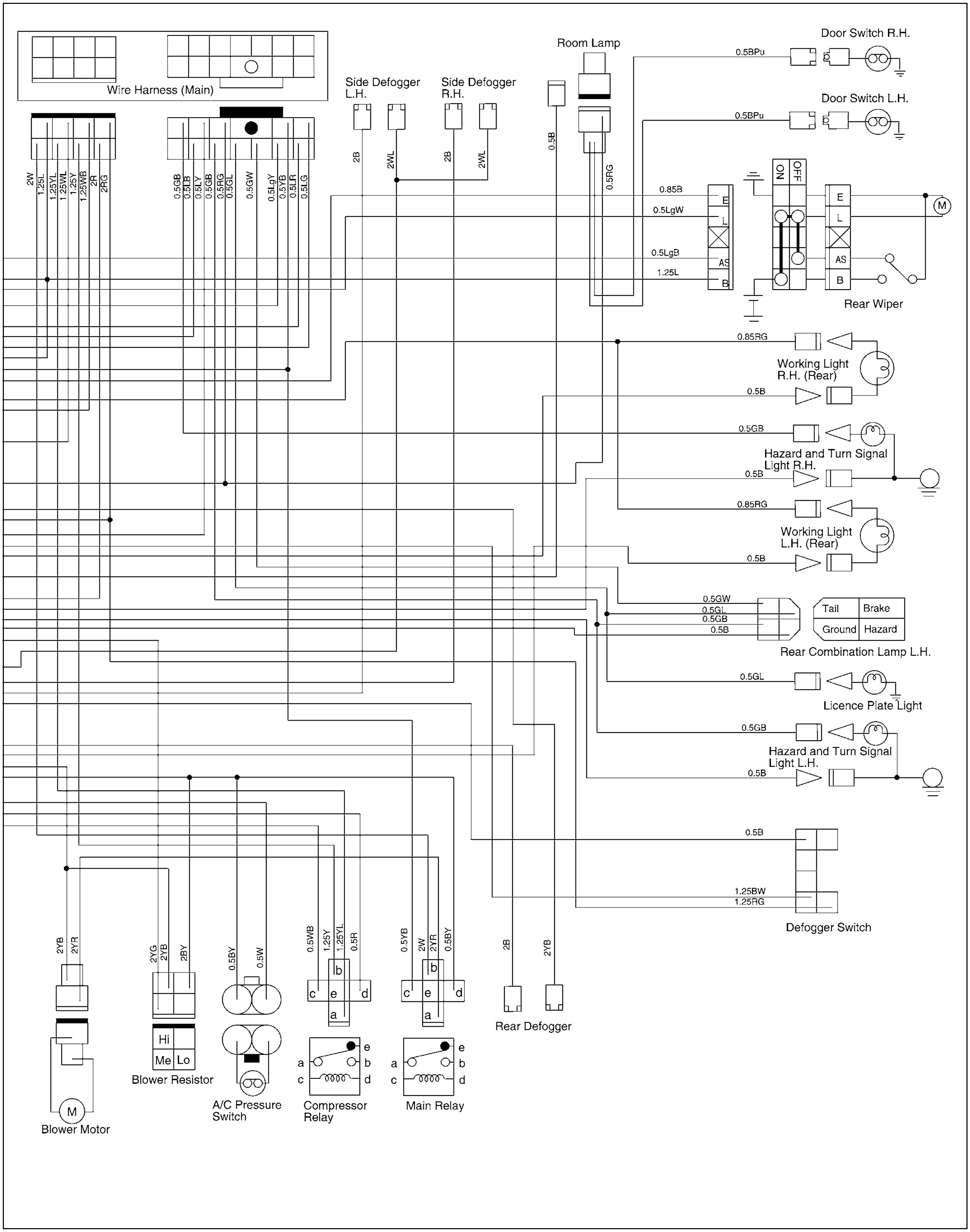
Loader Plug
Ciger Lighter
Harness (Cabin)
Hazard Unit
No. Note
a GND
b Hazard Switch
c
d Turn Signal L.H. Input
f Turn Signal R.H. Input
h +B
i Turn Signal L.H. Output
j Turn Signal R.H. Output
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer
Front Washer
Hazard Switch
FREE
LOCK
Ground
Ground
Tail
Turn Signal
Brake
Rear Combination Lamp
Wiper Relay
Front Wiper
OFF
ON
Safety Switch
Fuel Level Sensor
Holding Coil
Pulling Coil
Key Stop Solenoid
LO HI
GND
Head Light

■ For Canada (Cabin)
Type 1

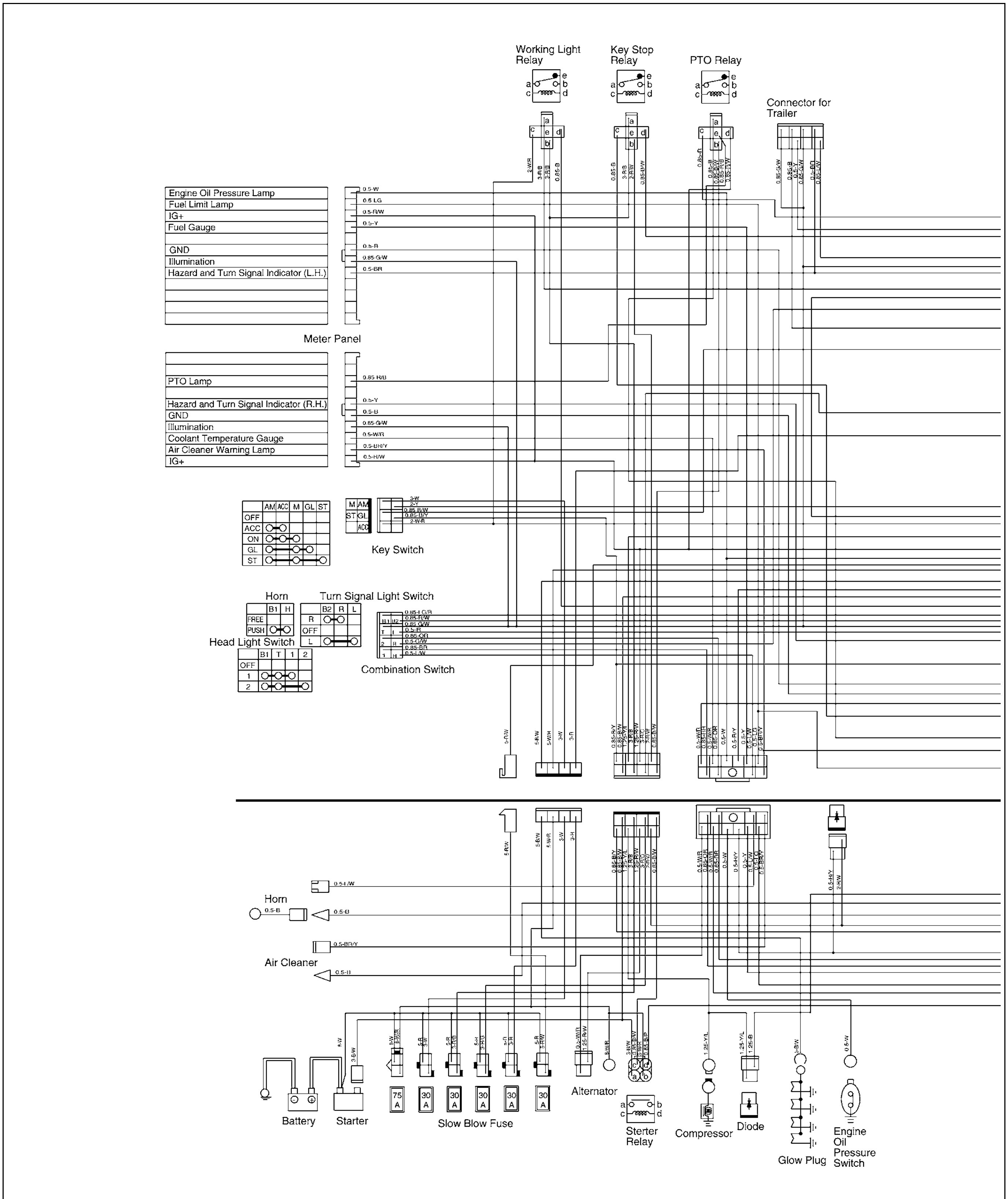


No.	Note
1	Speaker L.H. (+)
2	Speaker L.H. (-)
3	ACC
4	+B
5	GND
6	Speaker R.H. (+)
7	Speaker R.H. (-)

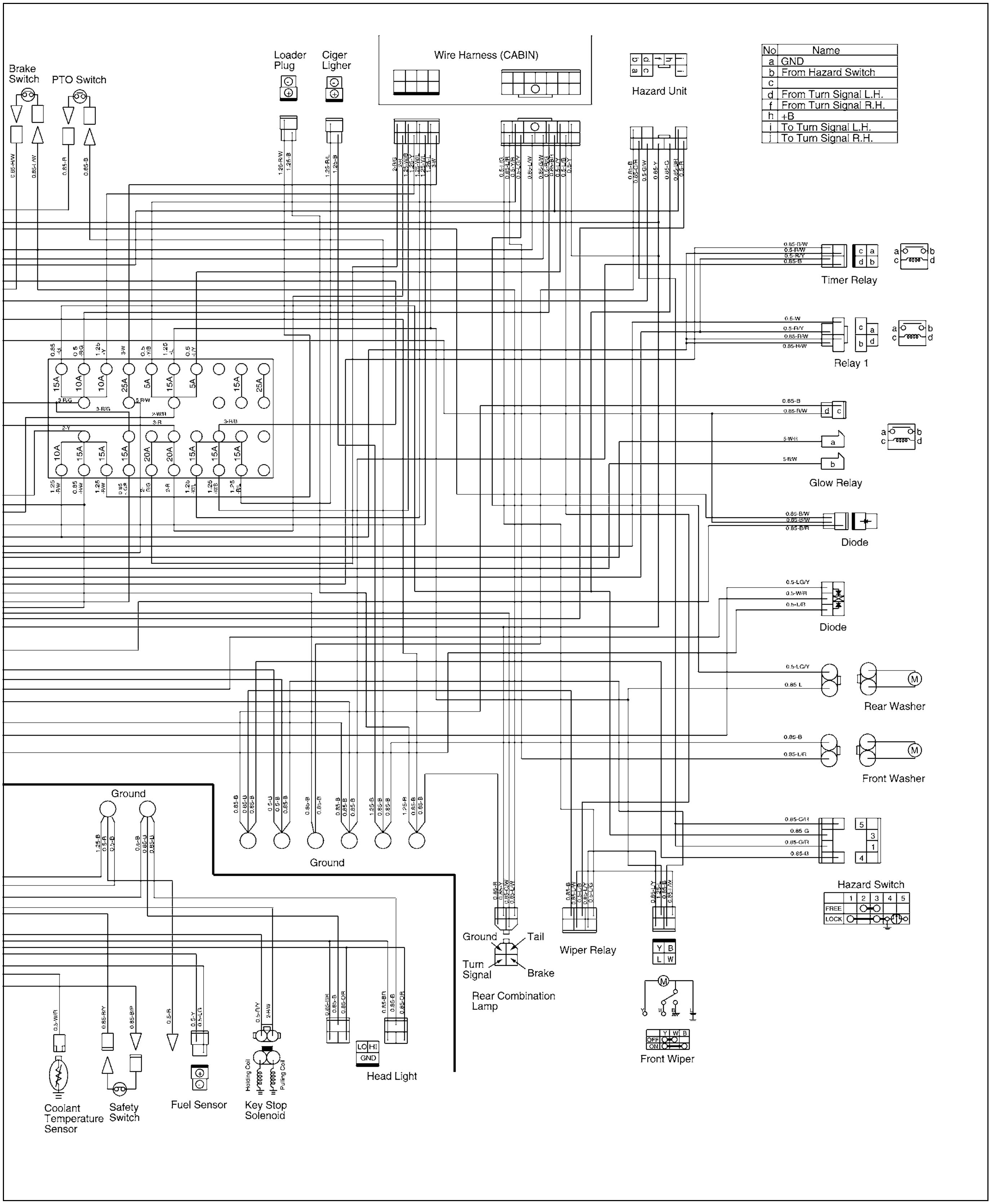
3TMACABWP011A


Wire Harness (Main)
Side Defogger L.H.
Side Defogger R.H.
Room Lamp
Door Switch R.H.
Door Switch L.H.
Rear Wiper
ON
OFF
Working Light R.H. (Rear)
Hazard and Turn Signal Light R.H.
Working Light L.H. (Rear)
Tail
Brake
Ground
Hazard
Rear Combination Lamp L.H.
Licence Plate Light
Hazard and Turn Signal Light L.H.
Defogger Switch
Rear Defogger
Blower Motor
Blower Resistor
Hi
Me
Lo
A/C Pressure Switch
Compressor Relay
Main Relay
0.5BPu
0.85B
0.5LgW
0.5LgB
1.25L
0.85RG
0.5B
0.5GB
0.5GW
0.5GL
1.25BW
1.25RG
2W
1.25L
1.25YL
1.25WL
1.25Y
1.25WB
2R
2RG
0.5LB
0.5LY
0.5RG
0.5LgY
0.5YB
0.5LR
0.5LG
2B
2WL
2YB
2YR
2YG
2BY
0.5BY
0.5W
0.5WB
0.5R
0.5YB
0.5BY

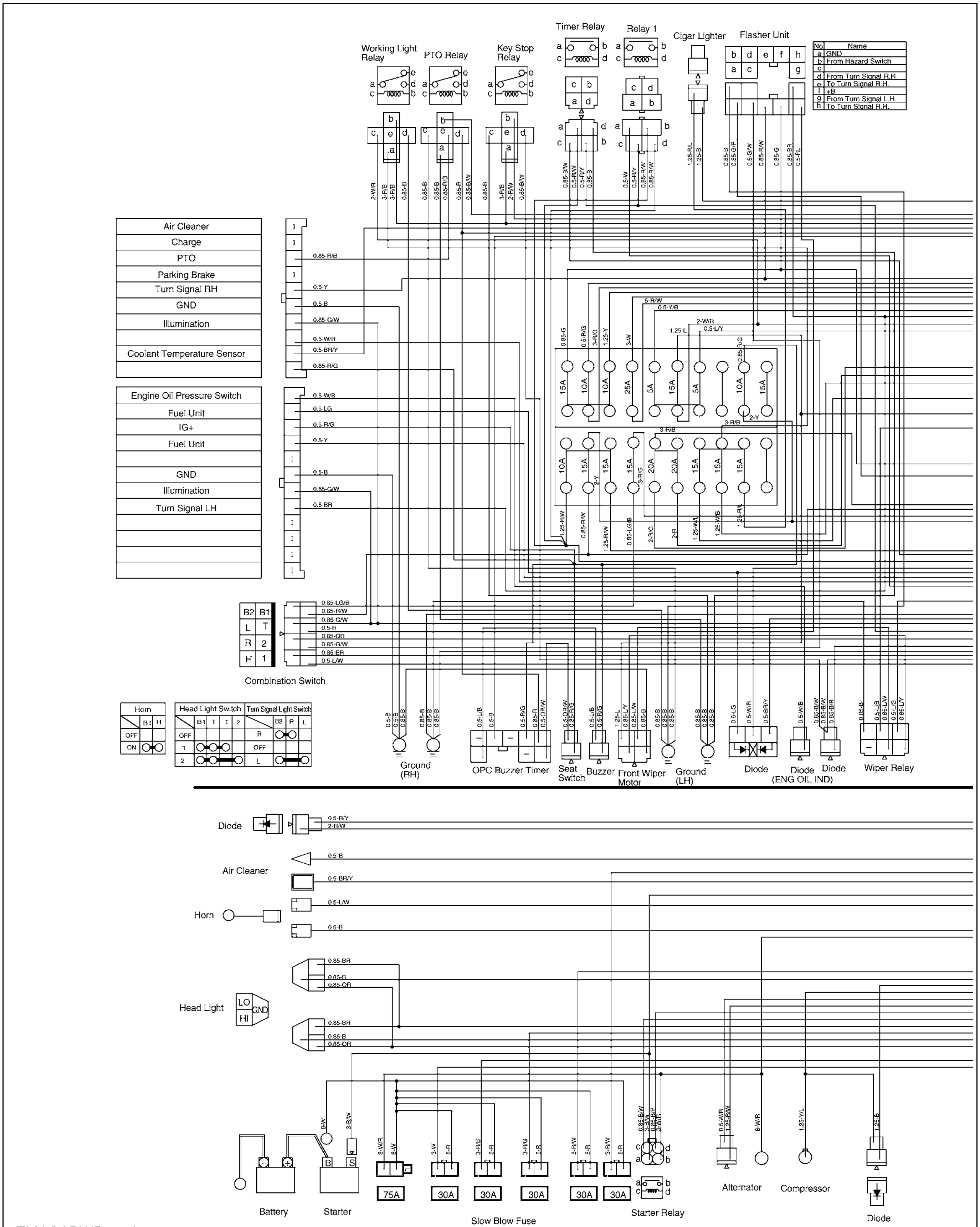
■ For Canada (Body)
Type 2



3TMACABWP013A

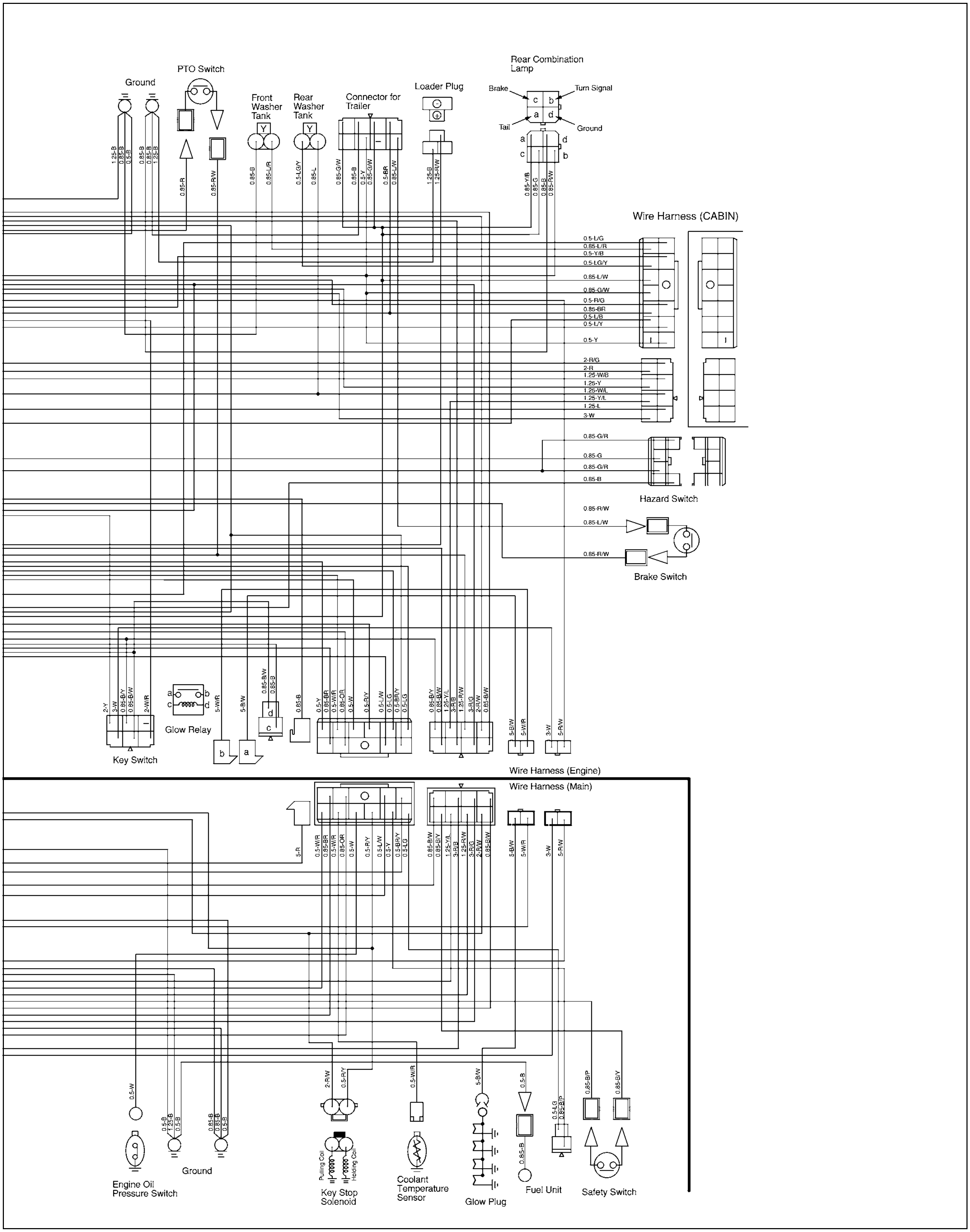

Brake Switch
PTO Switch
Loader Plug
Ciger Lighter
Wire Harness (CABIN)
Hazard Unit
No Name
a GND
b From Hazard Switch
c
d From Turn Signal L.H.
f From Turn Signal R.H.
h +B
i To Turn Signal L.H.
j To Turn Signal R.H.
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer
Front Washer
Hazard Switch
FREE
LOCK
Ground
Ground
Ground
Tail
Turn Signal
Brake
Rear Combination Lamp
Wiper Relay
Front Wiper
OFF
ON
Head Light
LO
HI
GND
Coolant Temperature Sensor
Safety Switch
Fuel Sensor
Key Stop Solenoid
Holding Coil
Pulling Coil
15A
10A
10A
25A
5A
15A
5A
15A
25A
10A
15A
15A
15A
20A
20A
15A
15A
15A

For Canada (Body)
Type 2 (with OPC)

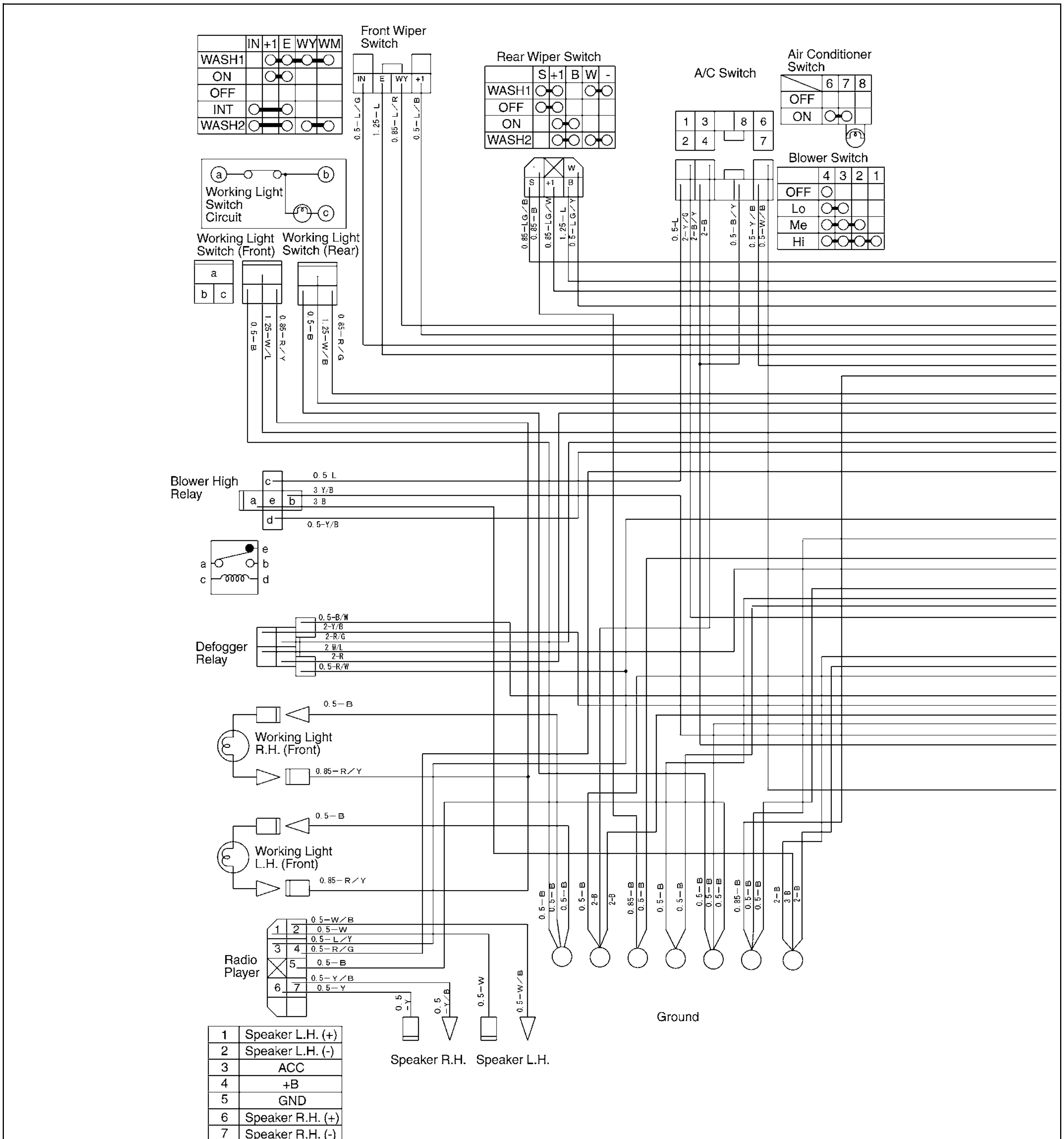


No	Name
a	GND
b	From Hazard Switch
c	
d	From Turn Signal R.H.
e	To Turn Signal R.H.
f	+B
g	From Turn Signal L.H.
h	To Turn Signal R.H.

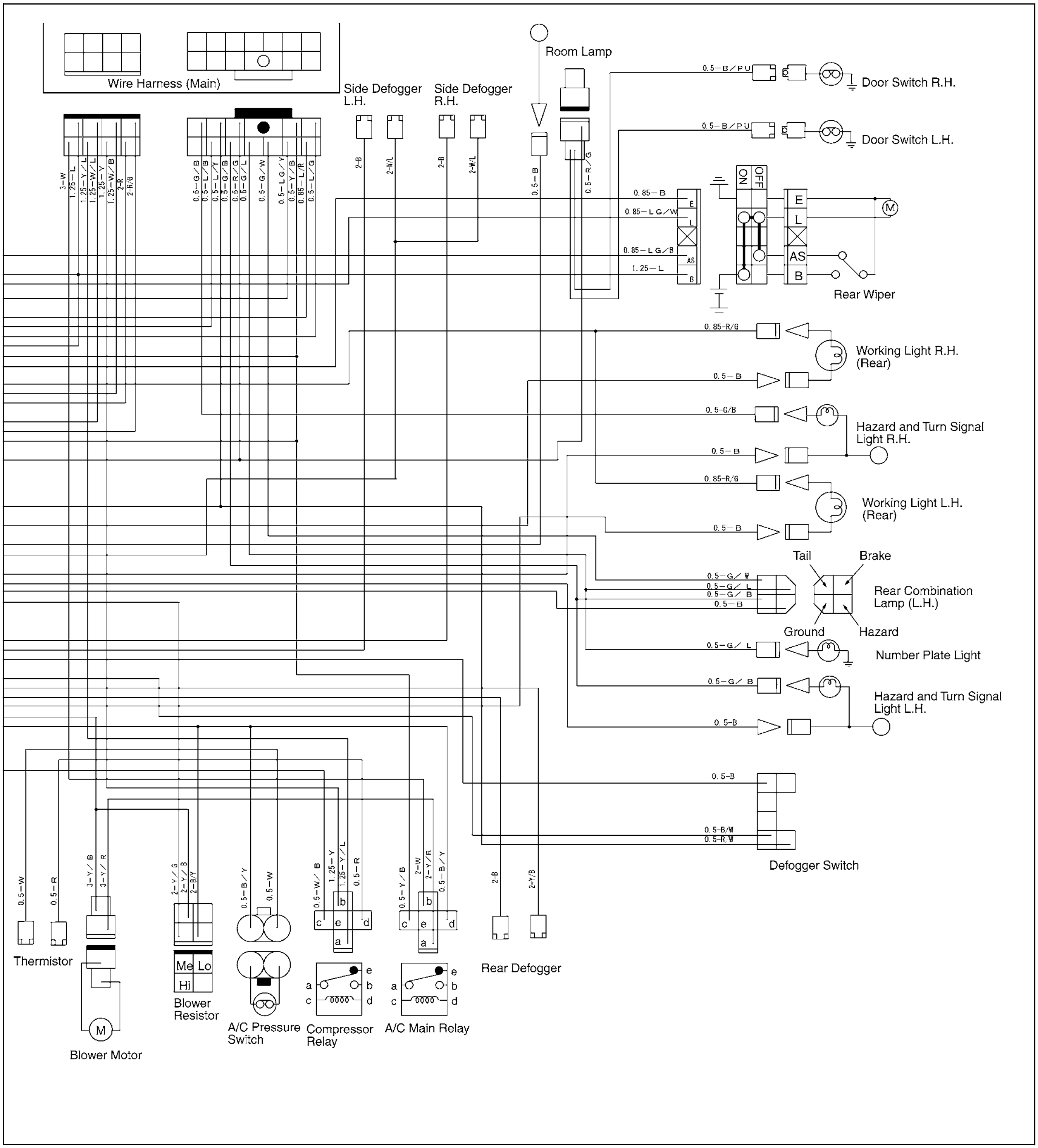
3TMACABWP215A


Ground
PTO Switch
Front Washer Tank
Rear Washer Tank
Connector for Trailer
Loader Plug
Rear Combination Lamp
Brake
Turn Signal
Tail
Ground
Wire Harness (CABIN)
Hazard Switch
Brake Switch
Key Switch
Glow Relay
Wire Harness (Engine)
Wire Harness (Main)
Engine Oil Pressure Switch
Ground
Key Stop Solenoid
Pulling Coil
Holding Coil
Coolant Temperature Sensor
Glow Plug
Fuel Unit
Safety Switch

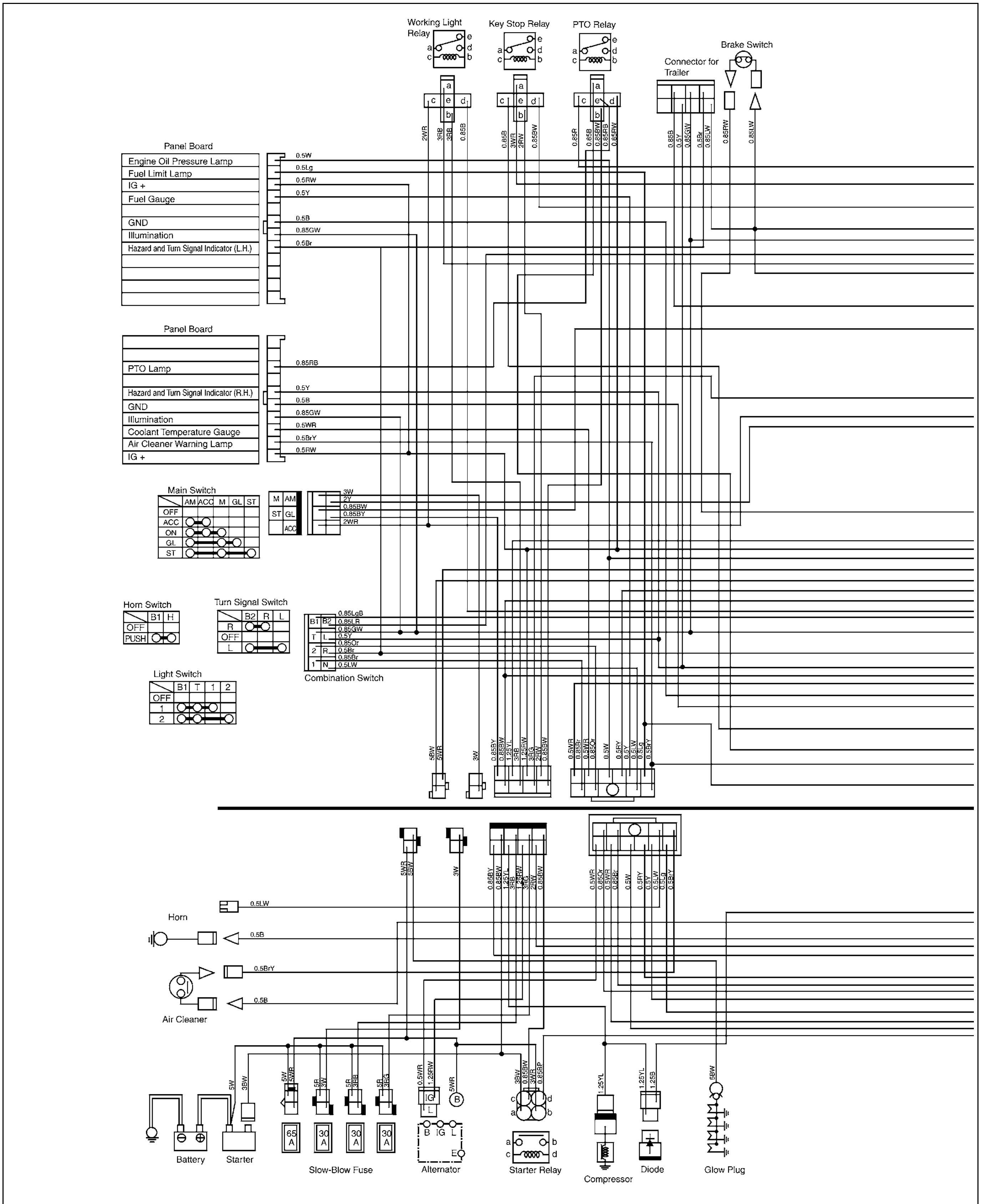
■ For Canada (Cabin)
Type 2



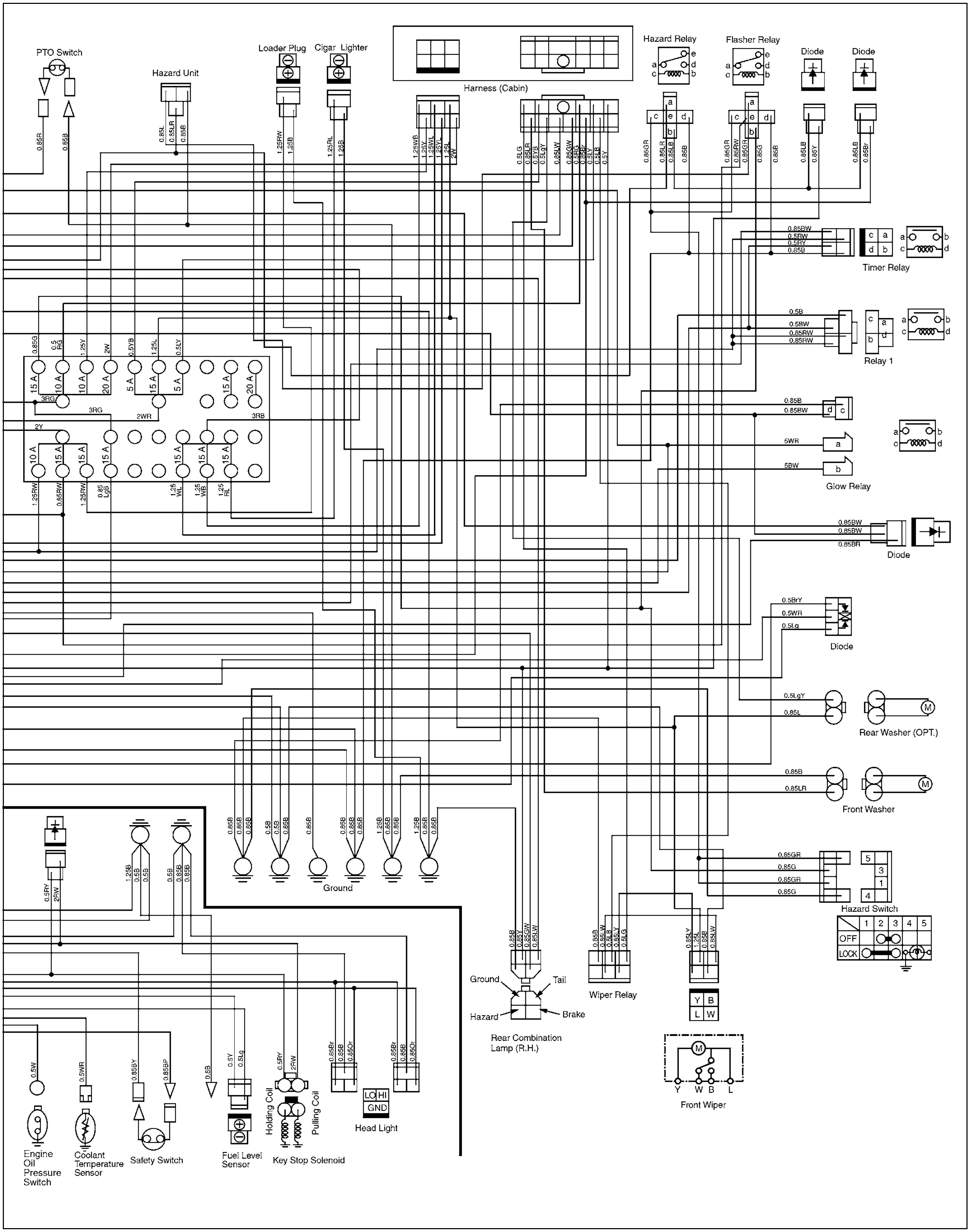
3TMACABWP015A


Wire Harness (Main)
Side Defogger L.H.
Side Defogger R.H.
Room Lamp
Door Switch R.H.
Door Switch L.H.
Rear Wiper
Working Light R.H. (Rear)
Hazard and Turn Signal Light R.H.
Working Light L.H. (Rear)
Tail
Brake
Rear Combination Lamp (L.H.)
Ground
Hazard
Number Plate Light
Hazard and Turn Signal Light L.H.
Defogger Switch
Thermistor
Blower Motor
Blower Resistor
A/C Pressure Switch
Compressor Relay
A/C Main Relay
Rear Defogger

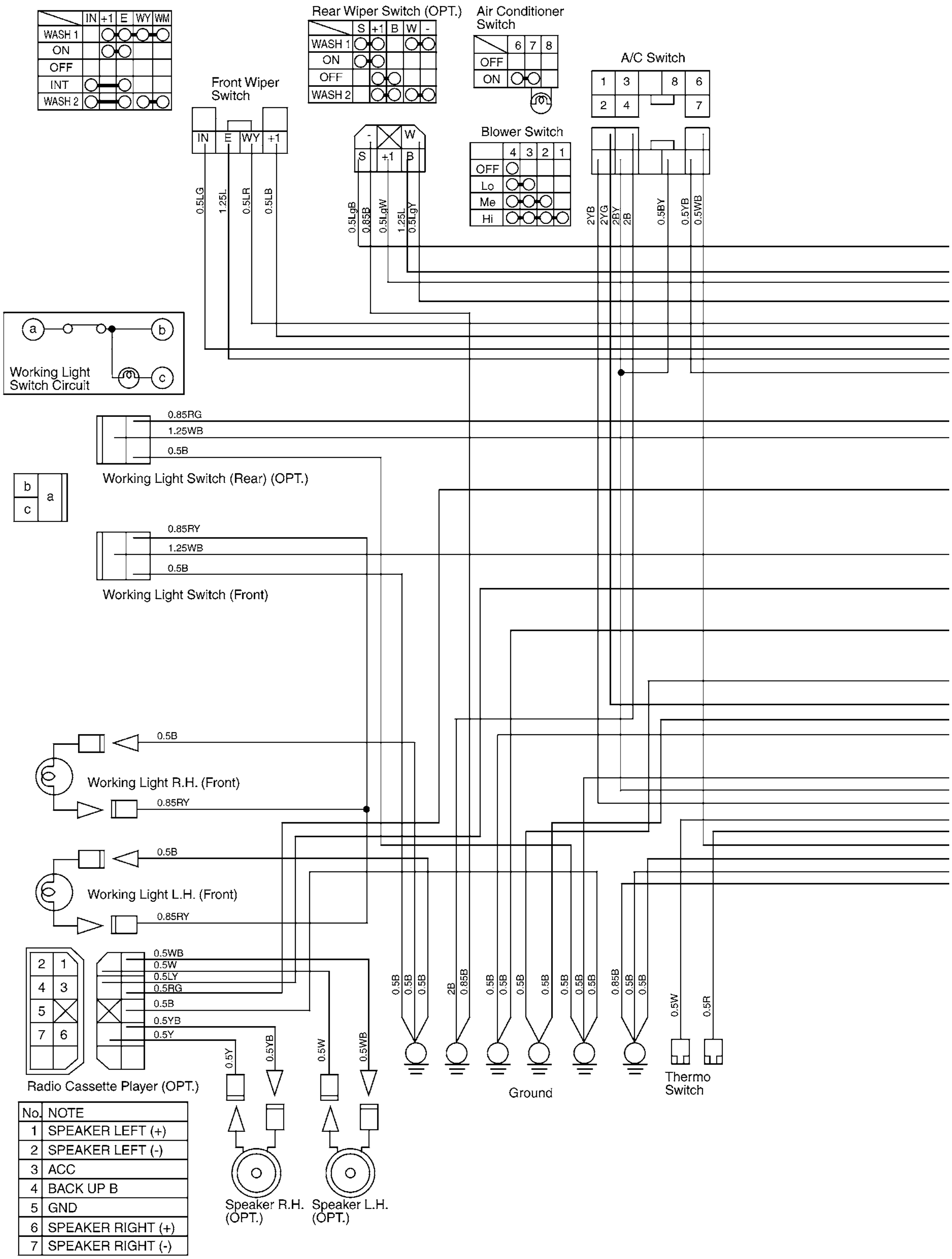
■ For Euro (Body)
Type 1



3TMACABWP017A

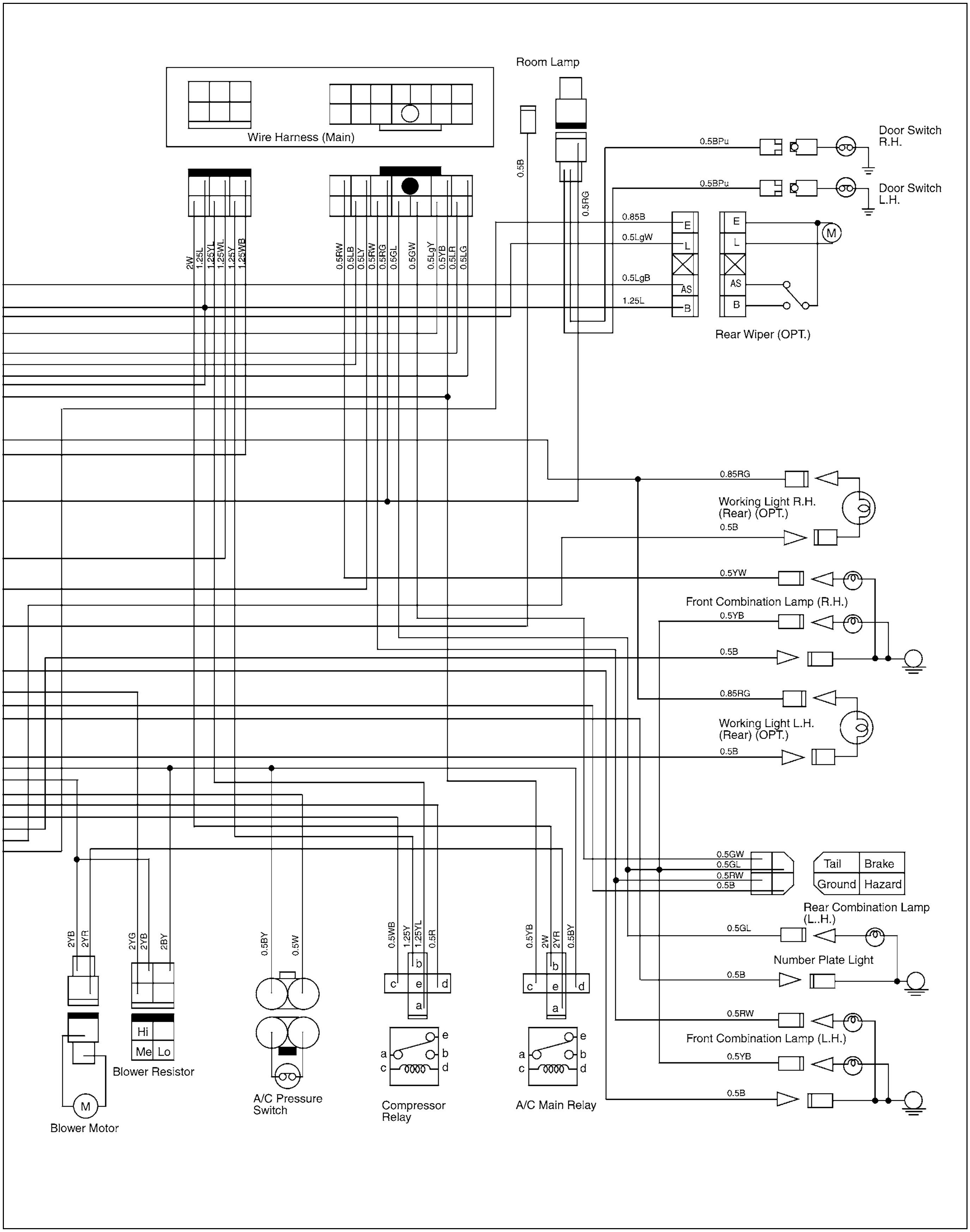

PTO Switch
Hazard Unit
Loader Plug
Cigar Lighter
Harness (Cabin)
Hazard Relay
Flasher Relay
Diode
Diode
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer (OPT.)
Front Washer
Hazard Switch
OFF
LOCK
Ground
Tail
Hazard
Brake
Rear Combination Lamp (R.H.)
Wiper Relay
Front Wiper
Ground
Engine Oil Pressure Switch
Coolant Temperature Sensor
Safety Switch
Fuel Level Sensor
Holding Coil
Pulling Coil
Key Stop Solenoid
Head Light
LO
HI
GND

■ For Euro (Cabin)
Type 1

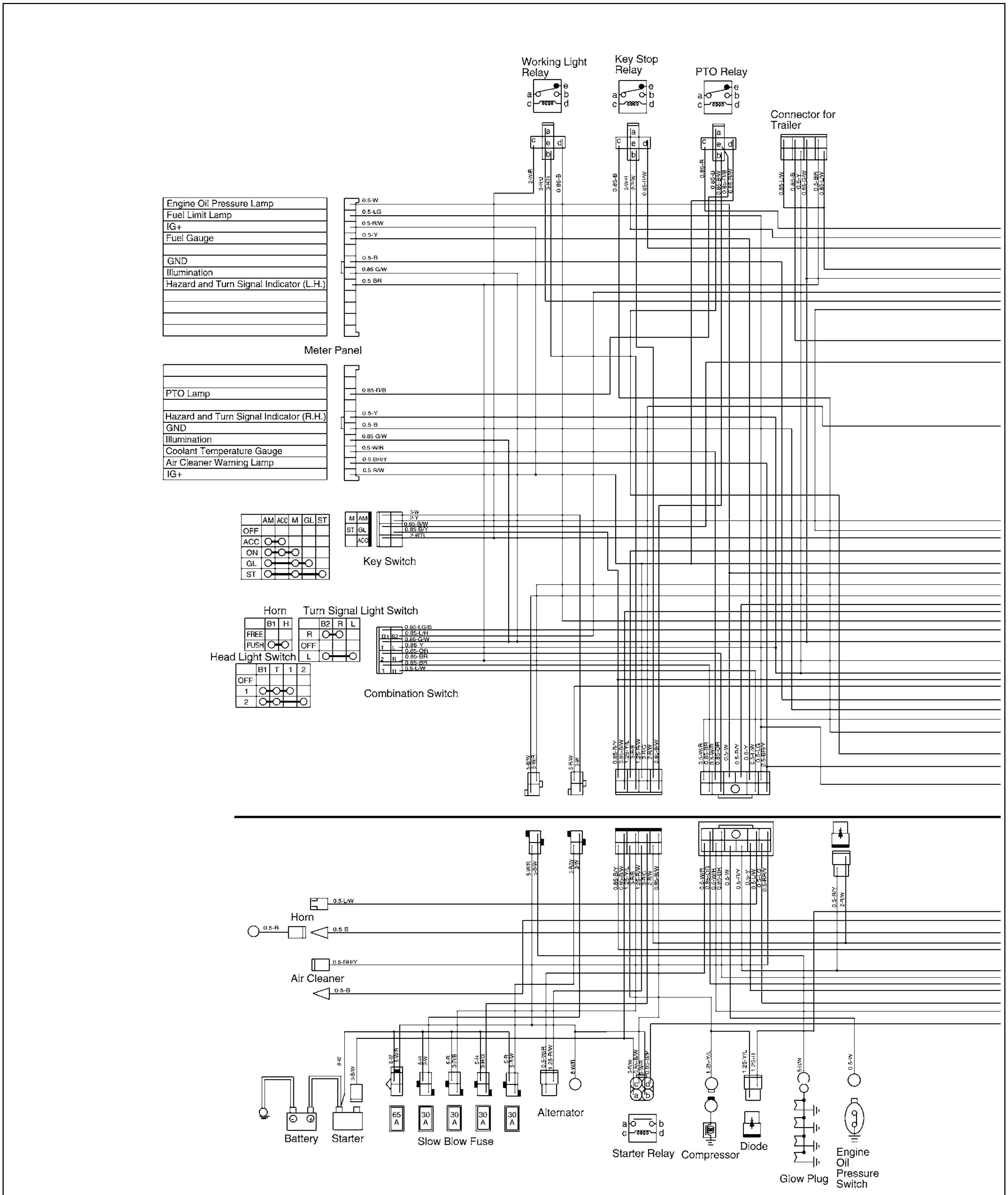


No.	NOTE
1	SPEAKER LEFT (+)
2	SPEAKER LEFT (-)
3	ACC
4	BACK UP B
5	GND
6	SPEAKER RIGHT (+)
7	SPEAKER RIGHT (-)

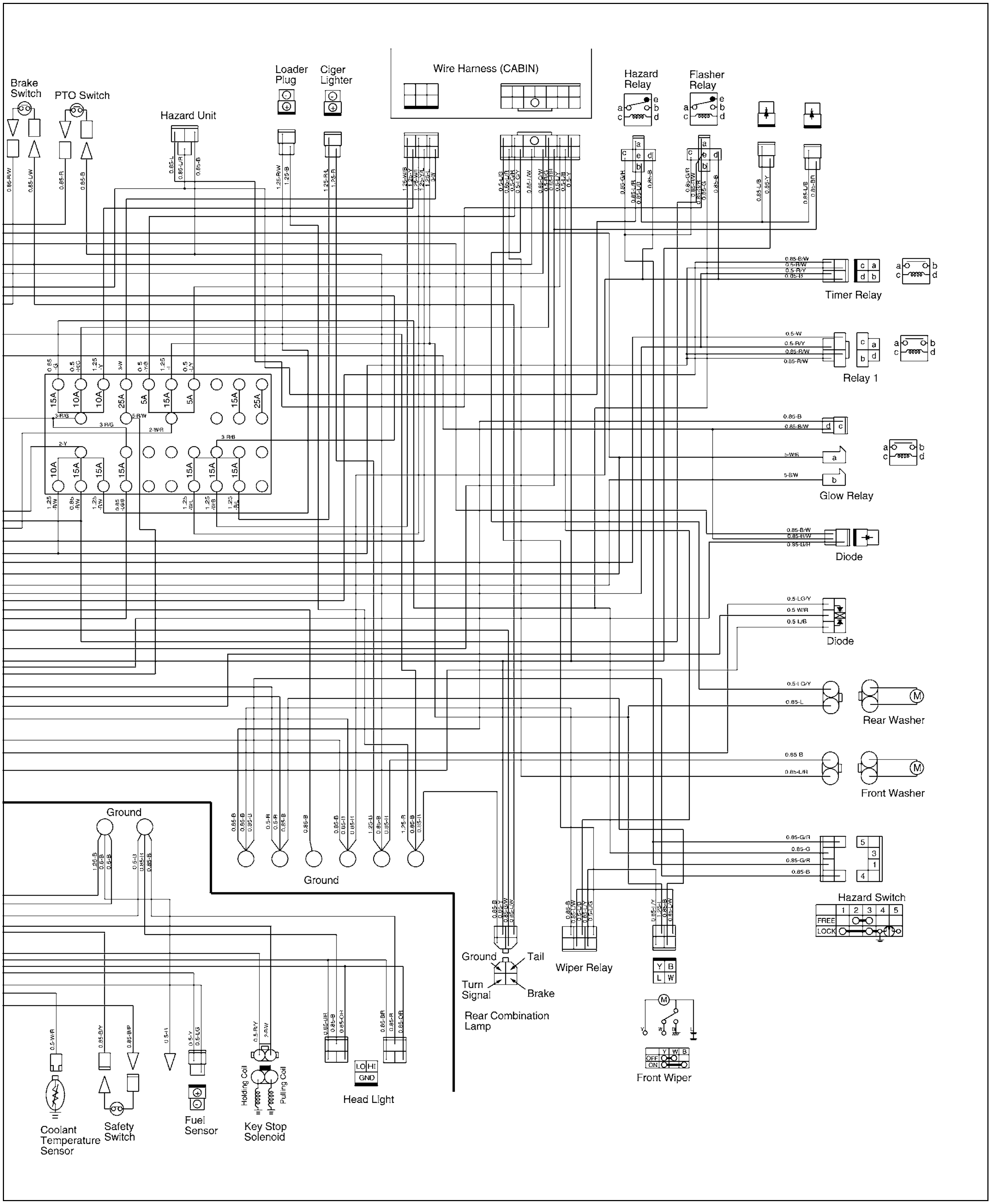
3TMACABWP019A


Wire Harness (Main)
Room Lamp
Door Switch R.H.
Door Switch L.H.
Rear Wiper (OPT.)
Working Light R.H. (Rear) (OPT.)
Front Combination Lamp (R.H.)
Working Light L.H. (Rear) (OPT.)
Tail
Brake
Ground
Hazard
Rear Combination Lamp (L..H.)
Number Plate Light
Front Combination Lamp (L.H.)
Blower Resistor
Blower Motor
A/C Pressure Switch
Compressor Relay
A/C Main Relay
2W
1.25L
1.25YL
1.25WL
1.25Y
1.25WB
0.5RW
0.5LB
0.5LY
0.5RW
0.5RG
0.5GL
0.5GW
0.5LgY
0.5YB
0.5LR
0.5LG
0.5B
0.5RG
0.5BPu
0.85B
0.5LgW
0.5LgB
1.25L
0.85RG
0.5YW
0.5YB
0.5GW
0.5GL
0.5RW
0.5B
2YB
2YR
2YG
2BY
0.5BY
0.5W
0.5WB
1.25Y
1.25YL
0.5R
0.5YB
2W
2YR
0.5BY
Hi
Me
Lo
M
E
L
AS
B
a
b
c
d
e

■ For Euro (Body)
Type 2

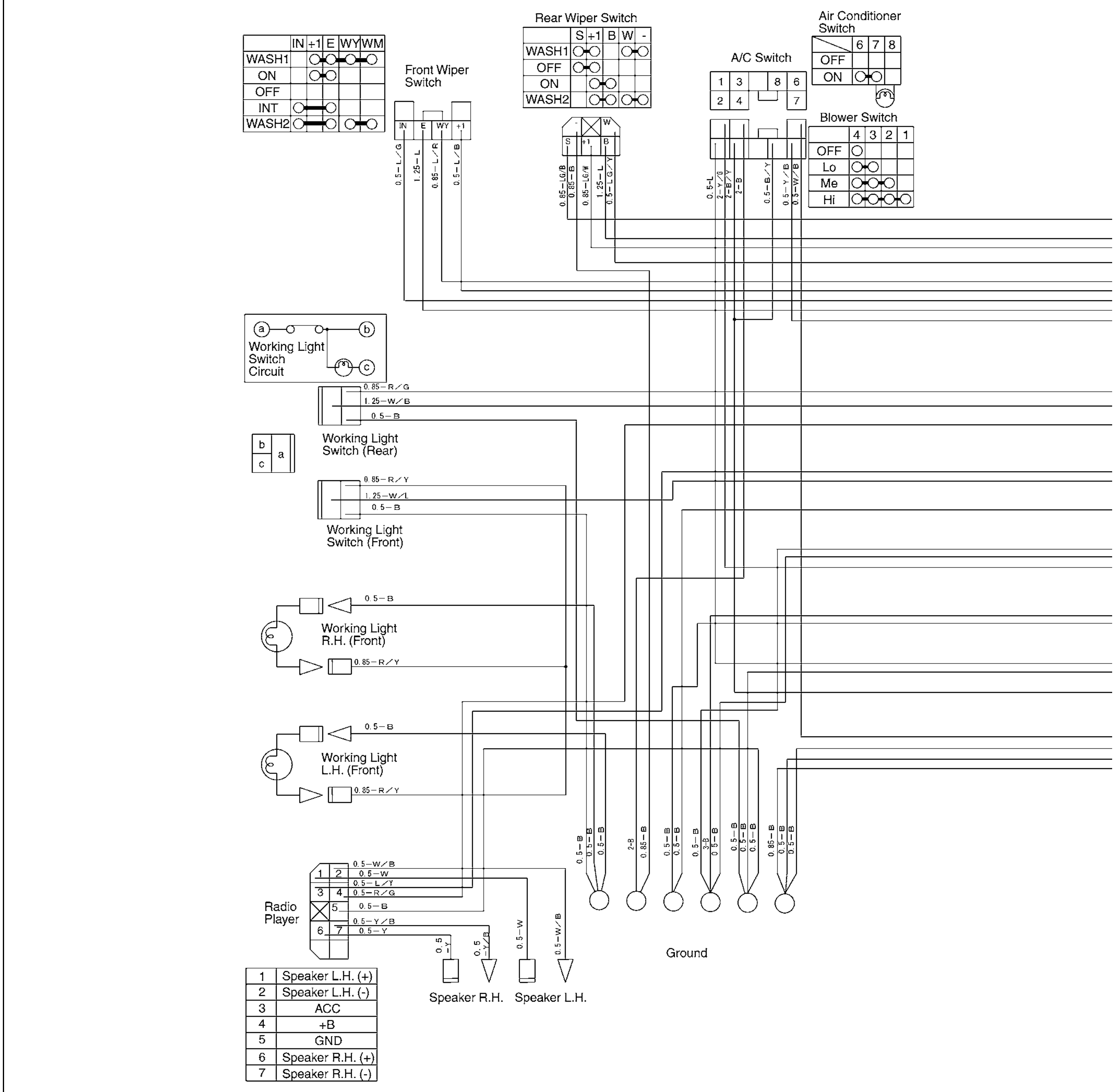


3TMACABWP021A

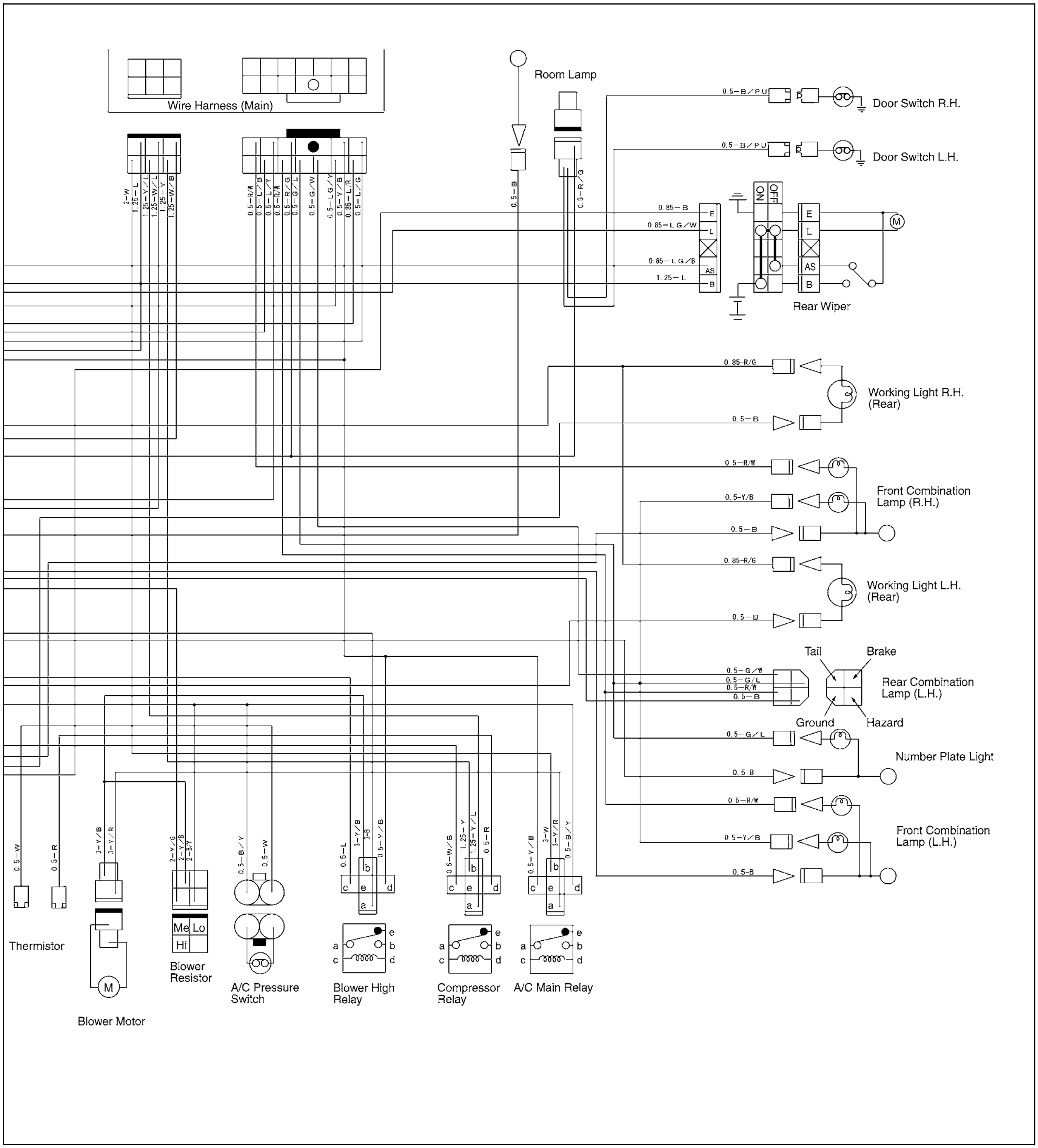


Brake Switch
PTO Switch
Hazard Unit
Loader Plug
Ciger Lighter
Wire Harness (CABIN)
Hazard Relay
Flasher Relay
Timer Relay
Relay 1
Glow Relay
Diode
Diode
Rear Washer
Front Washer
Hazard Switch
FREE
LOCK
Ground
Ground
Ground
Tail
Turn Signal
Brake
Rear Combination Lamp
Wiper Relay
Front Wiper
OFF
ON
Head Light
LO
HI
GND
Coolant Temperature Sensor
Safety Switch
Fuel Sensor
Key Stop Solenoid
Holding Coil
Pulling Coil

■ For Euro (Cabin)
Type 2

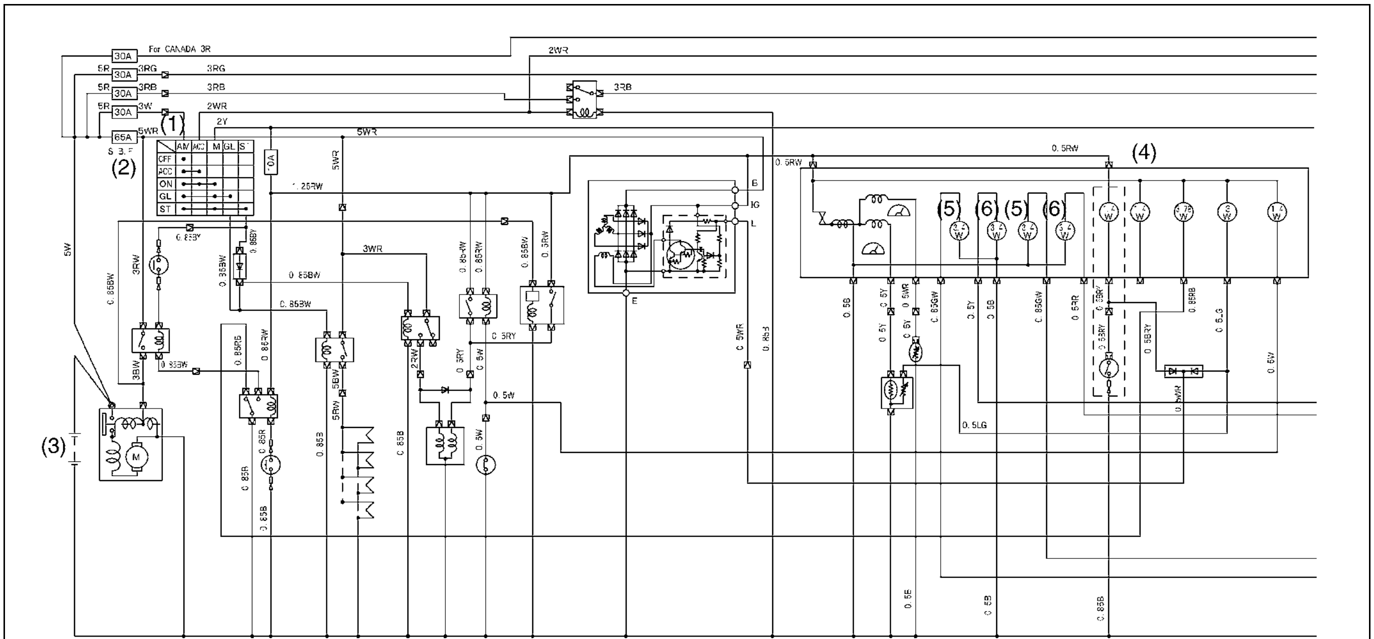


3TMACABWP023A

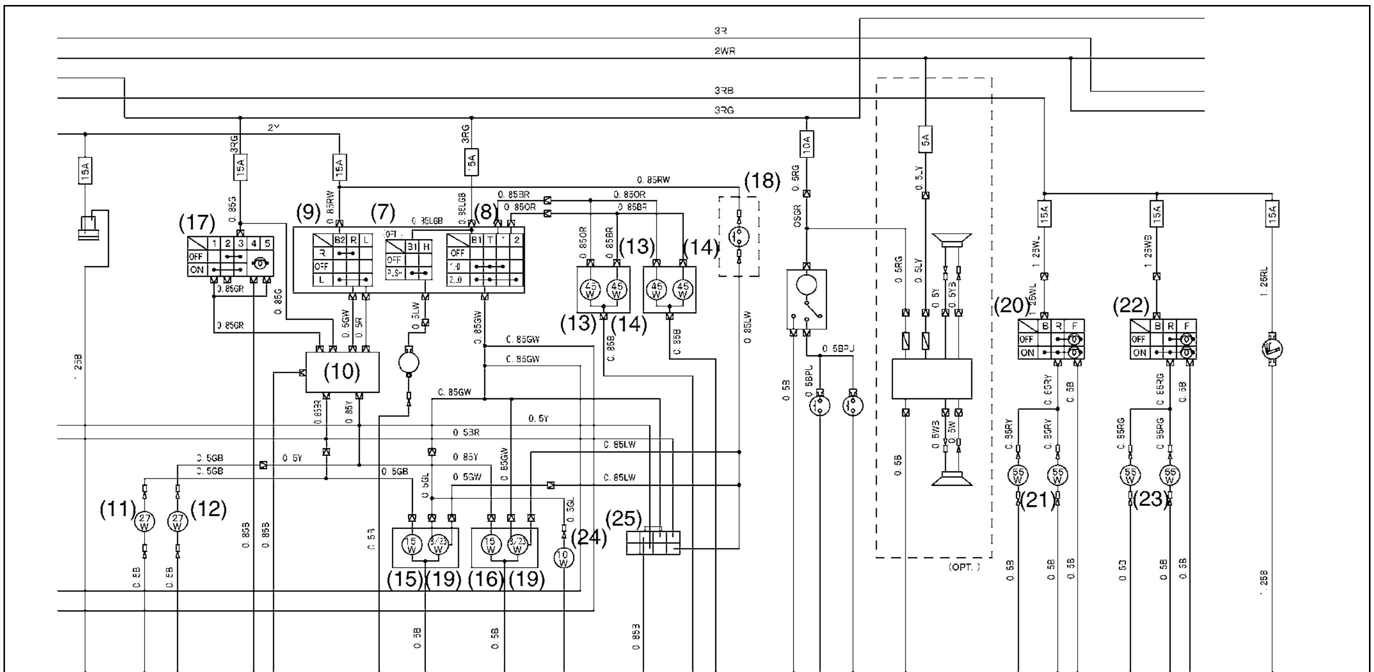

Wire Harness (Main)
Room Lamp
Door Switch R.H.
Door Switch L.H.
ON
OFF
Rear Wiper
Working Light R.H. (Rear)
Front Combination Lamp (R.H.)
Working Light L.H. (Rear)
Tail
Brake
Rear Combination Lamp (L.H.)
Ground
Hazard
Number Plate Light
Front Combination Lamp (L.H.)
Thermistor
Blower Motor
Blower Resistor
A/C Pressure Switch
Blower High Relay
Compressor Relay
A/C Main Relay

2. LIGHTING SYSTEM

■ **For North America and Oceania**



3TMACABWP025A

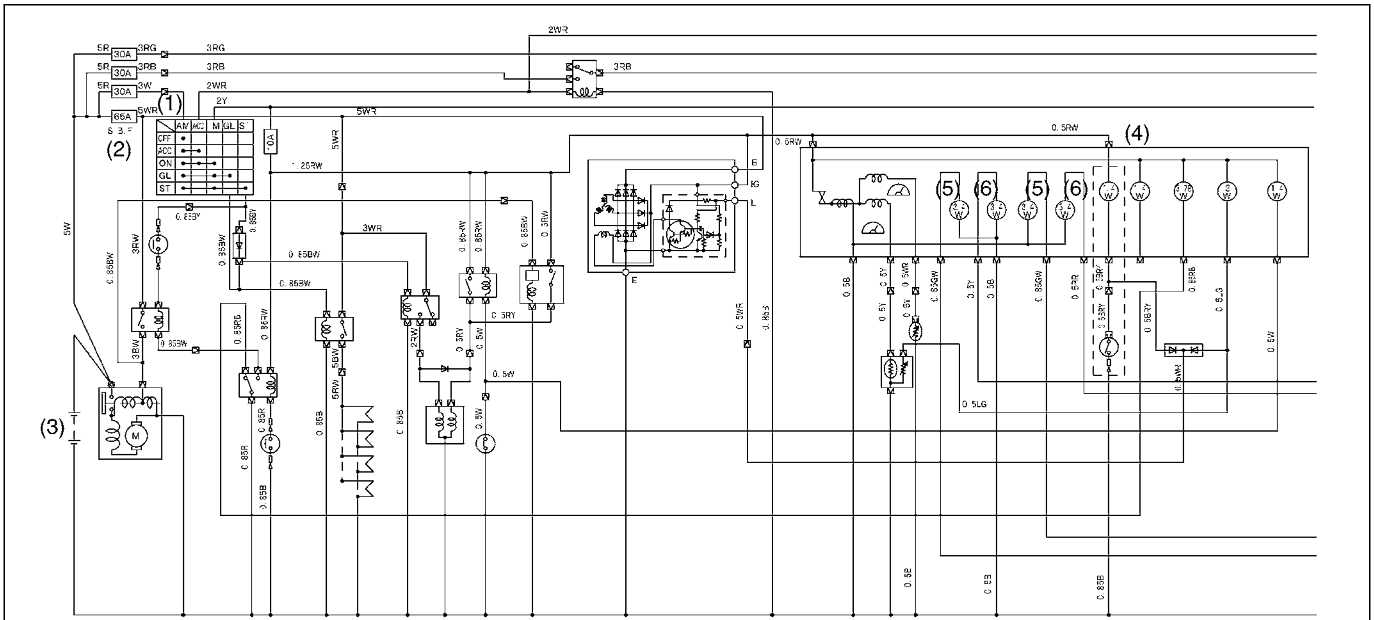


3TMACABWP026A

(1) Main Switch
(2) Slow Blow Fuse
(3) Battery
(4) Panel Board
(5) Illuminations
(6) Hazard and Turn Signal Indicators
(7) Combination Switch
(8) Light Switch
(9) Turn Signal Light Switch
(10) Hazard Unit
(11) Hazard and Turn Signal Light (L.H.)
(12) Hazard and Turn Signal Light (R.H.)
(13) Head Lights (HIGH-beam)
(14) Head Lights (LOW-beam)
(15) Combination Light (L.H.)
(16) Combination Light (R.H.)
(17) Hazard Switch
(18) Brake Switch
(19) Tail Lights
(20) Working Light Switch (Front)
(21) Working Lights (Front)
(22) Working LIght Switch (Rear)
(23) Working Light (Rear)
(24) Number Plate Light
(25) Connector for Trailer

The lighting system consists of combination switch (7) (light switch (8), turn signal light switch (9) and horn switch (if equipped)), head lights (13) and (14), tail lights (19), illuminations (5), hazard and turn signal lights (11) and (12), hazard unit (10), hazard switch (17), brake switch (18), working light switches (20) and (22), working lights (21) and (23), number plate light (24) and etc..

■ For Euro



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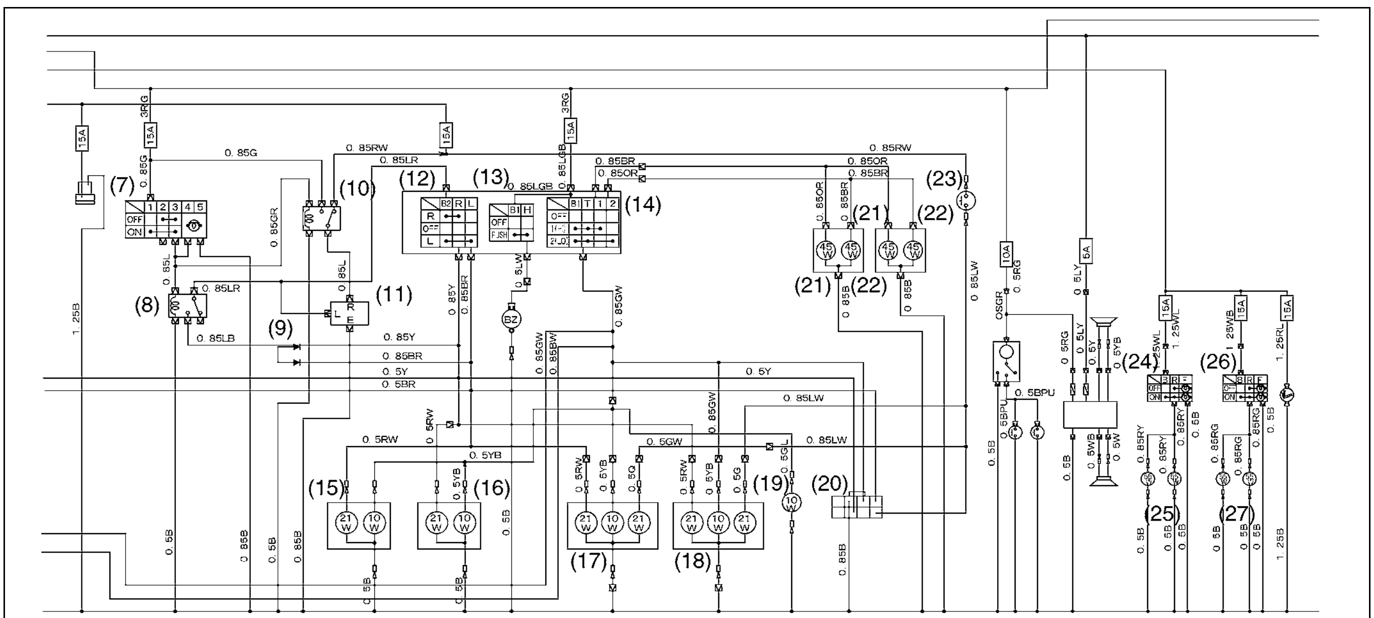
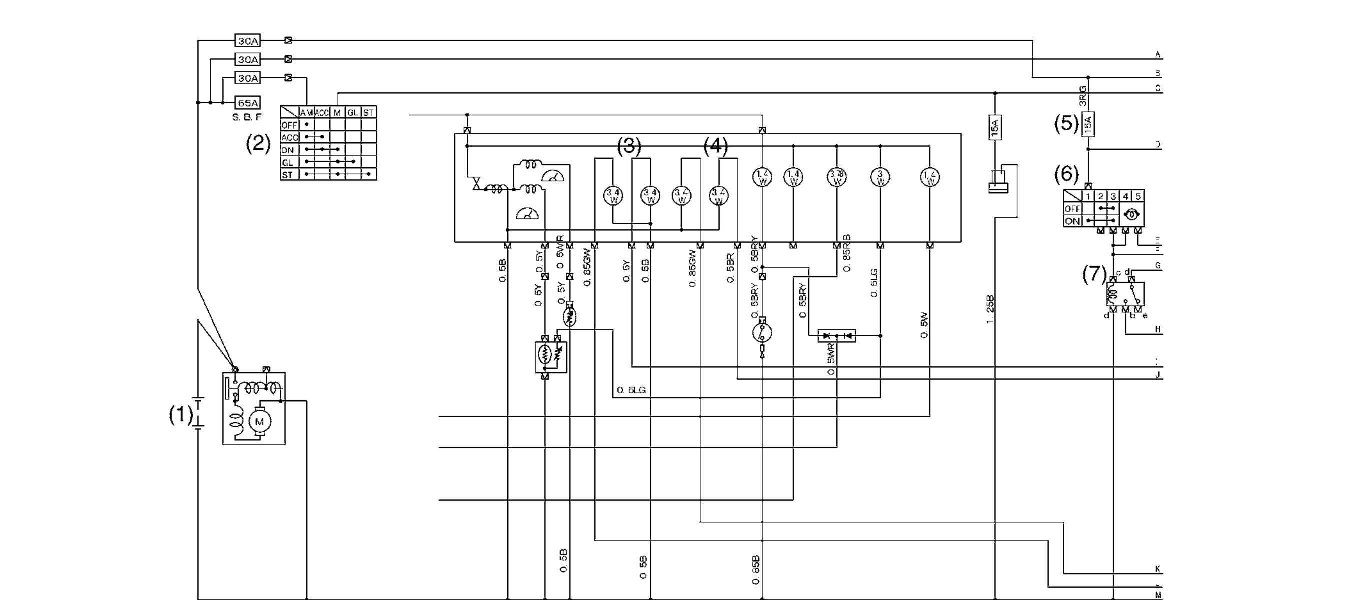


3TMACABWP028A

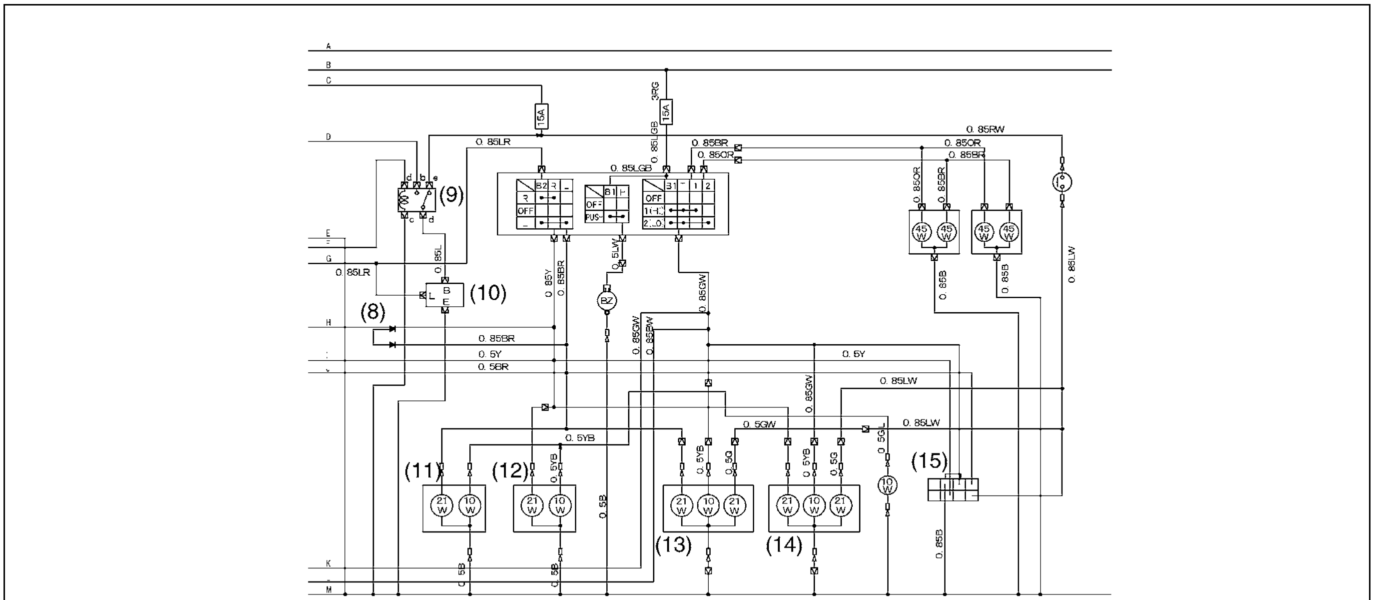
(1) Main Switch
(2) Slow Blow Fuse
(3) Battery
(4) Panel Board
(5) Illuminations
(6) Hazard and Turn Signal Indicators
(7) Hazard Switch
(8) Hazard Relay
(9) Diodes
(10) Flasher Relay
(11) Hazard Unit
(12) Turn Signal Light Switch
(13) Combination Switch
(14) Light Switch
(15) Front Combination Lamp (L.H.)
(16) Front Combination Lamp (R.H.)
(17) Rear Combination Lamp (L.H.)
(18) Rear Combination Lamp (R.H.)
(19) Number Plate Light
(20) Connector for Trailer
(21) Head Light (HIGH-beam)
(22) Head Lights (LOW-beam)
(23) Brake Switch
(24) Working Light Switch (Front)
(25) Working Light (Front)
(26) Working Light Switch (Rear)
(27) Working Light (Rear)

The lighting system consists of combination switch (13) (light switch (14), turn signal light switch (12) and horn switch), head lights (21) and (22), front combination lamp (15) and (16), rear combination lamp (17) and (18), hazard switch (7), hazard relay (8), diode (9), flasher relay (10), hazard unit (11), hazard and turn signal indicators (6), number plate light (19), connector for trailer (20), brake switch (23), working light switch (24) and (26), working lights (25) and (27), and etc..

■ Hazard Light Circuit



3TMACABWP029A



3TMACABWP030A

(1) Battery
(2) Slow Blow Fuse (30 A)
(3) Hazard and Turn Signal Indicator (R.H.)
(4) Hazard and Turn Signal Indicator (L.H.)
(5) Fuse (15 A)
(6) Hazard Switch
(7) Hazard Relay
(8) Diodes
(9) Flasher Relay
(10) Hazard Unit
(11) Front Combination Lamp (L.H.)
(12) Front Combination Lamp (R.H.)
(13) Rear Combination Lamp (L.H.)
(14) Rear Combination Lamp (R.H.)
(15) Connector for Trailer

1. Turn on the hazard switch (6) to connect the terminal **1** and the terminal **3** in the hazard switch electrically.
2. The current from the terminal **3** of hazard switch (6) passes through the terminal **c** of hazard relay (7) and the terminal **d** of flasher relay (9).
3. When a current is fed through the terminal **c** of hazard relay (7), the coil is energized to connect the terminal **a** and the terminal **b**.
4. When a current is fed through the terminal **d** of flasher relay (9), the coil is energized to connect the terminal **a** and the terminal **b**.
5. When the current passes through the terminal **B** of hazard unit (10), the flash signal is output from the terminal **L**.
6. This flash signal passes through the terminal **a** and terminal **b** of hazard relay (7) to make each hazard and turn signal indicators (3) and (4), front combination lamps (11) and (12), and rear combination lamps (13) and (14) flash. The hazard light circuit takes a priority over the turn signal light circuit.

3. AIR CONDITIONER SYSTEM

The air conditioner system operates using R134a refrigerant.

■ **NOTE**

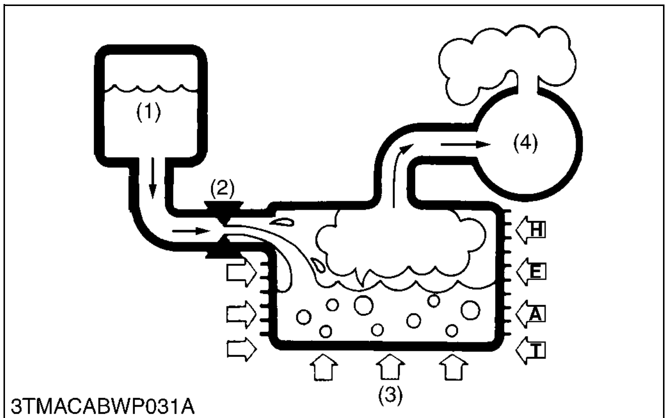
- **There are three types (Type 1, Type 2 and Type 3) of air conditioner system that is devided by serial number as below.**
- **As for air conditioner system of type 2 and type 3, the compressor changes from swash plate type to scroll type and the blower high relay is newly adapted.**

Model	Serial Number		
	Type 1 (Swash plate type compressor)	Type 2 (Scroll type compressor)	Type 3 (New scroll type compressor)
M6800SQ	Below 20892	20893 to 21578	Above 21579
M6800SDTQ	Below 63129	63130 to 65762	Above 65763
M8200Q	Below 10798	10799 to 11018	Above 11019
M8200DTQ	Below 53142	53143 to 54363	Above 54364
M8200HDQ	–	Below 54287	Above 54288
M9000Q	Below 10913	10914 to 11322	Above 11323
M9000DTQ	Below 54965	54966 to 58436	Above 58437
M9000HDQ	–	Below 58281	Above 58282

W1015704

[1] PRINCIPLES OF AIR CONDITIONER

(1) Expansion and Evaporation



3TMACABWP031A

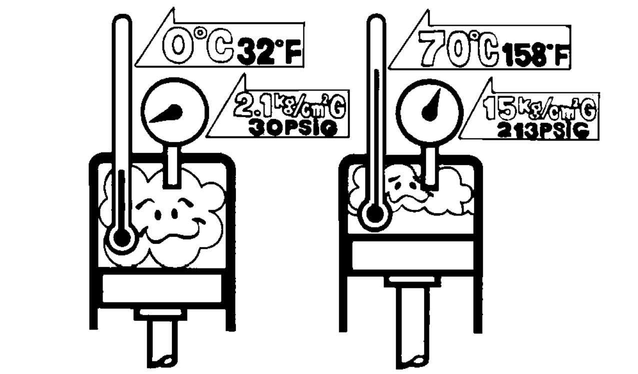
In the mechanical refrigeration system, the cool air is made by the following methods.

1. The high temperature and high pressure liquid refrigerant is stored in the container which is called receiver (1).
2. Then, the liquid refrigerant is released to evaporator (3) through a small hole, called expansion valve (2). At this time, temperature and pressure of the liquid refrigerant are lowered too, and some of the liquid refrigerant is changed to vapor.
3. The low temperature and low pressure refrigerant flows into the container, called evaporator. In the evaporator, the liquid refrigerant evaporates and removes heat from the surrounding air.

(1) Receiver
(2) Expansion Valve
(3) Evaporator
(4) Pump

W1014127

(2) How to Condense Gaseous Refrigerant into Liquid



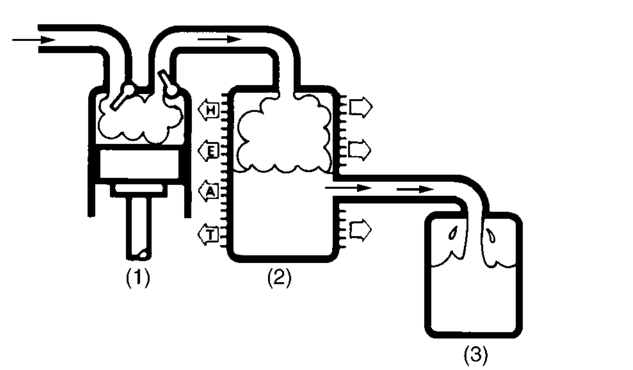
3TMACABWP032A

The mechanical refrigerant system changes the refrigerant from the gaseous state to the liquid state while it is passing through the evaporator.

When gas is compressed, both temperature and pressure increase. For example, when gaseous refrigerant is compressed from 0.21 MPa (2.1 kgf/cm^2, 30 psi) to 1.47 MPa (15 kgf/cm^2, 213 psi), temperature of the gaseous refrigerant rises from 0 °C (32 °F) to 70 °C (158 °F). The boiling point of refrigerant at 1.47 MPa (15 kgf/cm^2, 213 psi) is 62 °C (144 °F). So the temperature (70 °C, 158 °F) of compressed gaseous refrigerant is higher that the surrounding air. Therefore, the gaseous refrigerant can be converted into liquid state, releasing heat until its temperature drops to the boiling point. For example, 1.47 MPa (15 kgf/cm^2, 213 psi), 70 °C (158 °F) gaseous refrigerant can be liquefied by lowering the temperature by approx. 8 °C (46 °F).

W1014290

(3) Condensing Gaseous



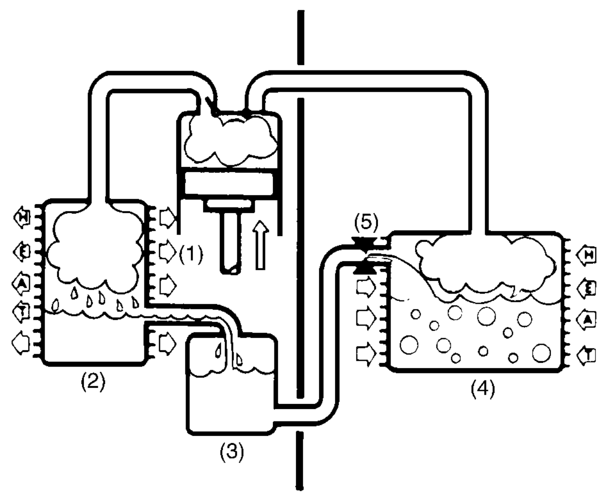
3TMACABWP033A

In the mechanical refrigeration system, the liquefaction of refrigerant is achieved by raising the pressure and then by lowering the temperature. The gaseous refrigerant which leaves the evaporator is compressed by the compressor (1). In the condenser (2) the compressed gaseous refrigerant releases heat to the surrounding air and it condenses back into liquid. And then the liquid refrigerant returns to the receiver (3).

(1) Compressor
(2) Condenser
(3) Receiver

W1014360

(4) Refrigeration Cycle



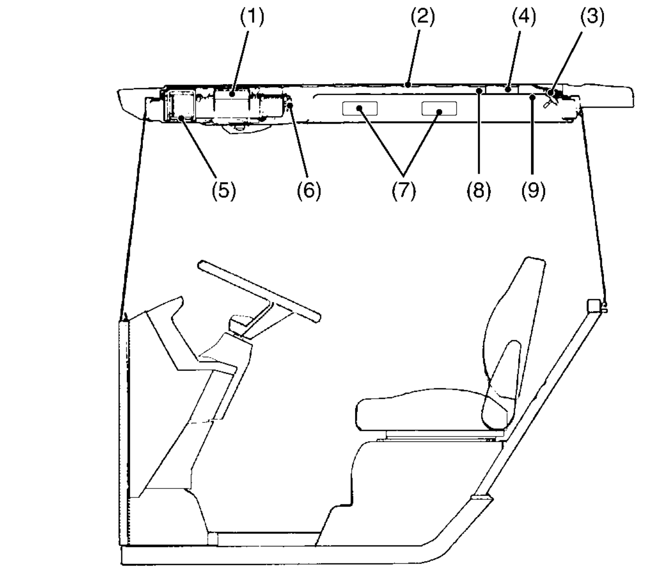
3TMACABWP034A

1. The compressor (1) discharges high temperature and high pressure refrigerant that contains the heat absorbed from the evaporator (4) plus the heat created by the compressor in a discharge stroke.
2. This gaseous refrigerant flows into the condenser (2). In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
3. This liquid refrigerant flows into the receiver (3) which stores and filters the liquid refrigerant till the evaporator requires the refrigerant.
4. By the expansion valve (5), the liquid refrigerant changes into low temperature, low pressure liquid and gaseous mixture.
5. This cold and foggy refrigerant flows to evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air steam passing through the evaporator core is transferred to the refrigerant.
   All the liquid will change into gaseous refrigerant in the evaporator and only heat-laden gaseous refrigerant is drawn into the compressor. Then the process is repeated again.

(1) Compressor
(2) Condenser
(3) Receiver
(4) Evaporator
(5) Expansion Valve

W1014482

[2] OUTLINE OF AIR CONDITIONING SYSTEM



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The machine is equipped with a thin large-capacity air conditioner with outside air intake. Through the inside air filter (9) as well as the outside air filter (4), the roof (8) and reaches the air conditioner unit (1). The air is cooled and dehumidified by this unit.

The resulting air is heated to a comfortable level. In this way, the air being blown via the blow port can be kept at comfortable temperature and humidity.

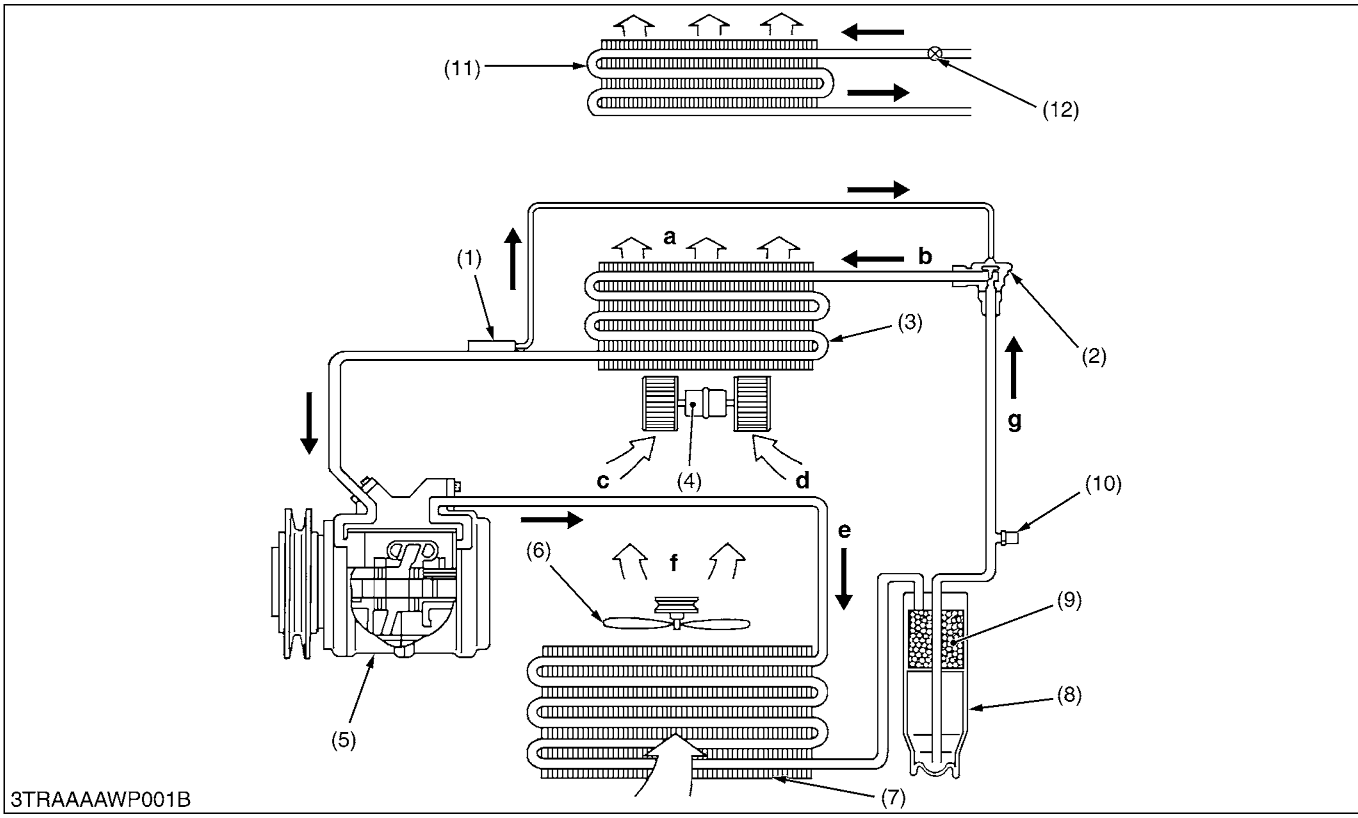
The 3 front blow ports (5) can be opened and closed using the center knob of each port. The 4 side blow ports (7) are opened and closed using the mode lever on the control panel (6). With these ports open or closed, you can feel your head cool and your feet warm.

		Type 1 (Swash plate type compressor)	Type 2 and 3 (Scroll type compressor)
Capacity (Cooling)	Factory spec.	2.44 kW	3.3 kW
Capacity (Warming)	Factory spec.	3.84 kW	4.34 kW
Kinds of refrigerant (Charge amount)	Factory spec.	R134a 900 to 1000 g 1.98 to 2.21 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	

(1) Air Conditioner Unit
(2) Outer Roof
(3) Inside / Outside Air Selection Damper
(4) Outside Air Filter
(5) Front Blow Port
(6) Control Panel
(7) Side Blow Port
(8) Inner Roof
(9) Inside Air Filter

W1014918

[3] REFRIGERATION SYSTEM



(1) Heat Sensitizing Tube
(2) Expansion Valve
(3) Evaporator
(4) Blower Motor
(5) Compressor
(6) Engine Cooling Fan
(7) Condenser
(8) Receiver
(9) Desiccant
(10) Pressure Switch
(11) Heater Core
(12) Water Valve

(a) Cold Air
(b) Low Pressure, Low Temperature Mist
(c) Cabin Interior Air
(d) Cabin Interior Air
(e) High Pressure, High Temperature Gas
(f) Hot Air
(g) Liquid

The refrigerant cycle of air conditioning system is as follows.

1. The gaseous refrigerant evaporated through the evaporator (3) is compressed in the compressor (5) to approx. 1.47 MPa (15 kgf/cm^2, 213 psi) and is also raised in temperature to approx. 70 °C (158 °F) and delivered to the condenser (7).
2. The gaseous refrigerant is cooled down through the condenser (7) to approx. 50 °C (122 °F) and delivered to the receiver (8) in the liquid state.
   At this time, heat removed from the cabin interior is extracted by means of the condenser (7).
3. The liquid refrigerant is collected in the receiver (8) for a certain period. At this time moisture are removed from the refrigerant by desiccant (9).
4. The liquid refrigerant after removing moisture and dust is jetted out of the small hole of the expansion valve (2) into the evaporator (3) as if it were distributed by an atomizer. Thus, the refrigerant is reduced in both pressure and temperature, and becomes easy to evaporate.
5. The refrigerant evaporates at 0 °C (32 °F) vigorously, taking heat from the surface of the pipes in the evaporator (3).
6. At this time, warm air in a cabin is drawn into the evaporator (3) by the blower motor and is passed over those pipes, transferring its heat to the refrigerant for evaporation. The air thus cooled is distributed to the cabin. (That is heat in a cabin is taken by the evaporator.)

(Reference)

- Since warm air in a cabin is cooled suddenly, water in the air is liquefied and removed, which means dehumidification is also performed.

7. The gaseous refrigerant from the evaporator (3) after having performed the cooling action is returned to the compressor (5), and is compressed to liquefy it (high pressure and high temperature). This cycle is repeated.
8. The air coming from the evaporator is fed to the air mixing doors, by which part of the air is introduced into the heater core (11). In doing so, the air temperature can be adjusted to a comfortable level. The air mixing doors are controlled through the cable connected with the control panel.

(1) Compressor

The compressor is installed to on the engine and is driven by crank pulley through a belt.

The compressor is a pump designed to raise the pressure of refrigerant. Raising the pressure means raising the temperature. High temperature refrigerant vapor will condense rapidly in the condenser by releasing heat to the surrounding.

(Reference)

■ Compressor Oil

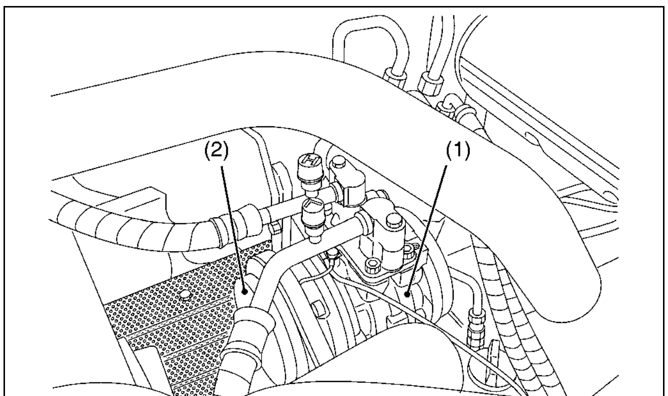
The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 doesn't dissolve in R134a, so it doesn't circulate through the cycle, and the lifespan of the compressor is considerably 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.

Compressor	Quantity (Total)	Brand Name
Swash plate type compressor (Type 1)	120 to 135 cc 0.127 to 0.143 U.S.qts. 0.106 to 0.119 Imp.qts.	DENSO CO. ND-OIL 8 <PAG* oil>
Scroll type compressor (Type 2)	60 to 100 cc 0.063 to 0.106 U.S.qts. 0.053 to 0.088 Imp.qts.	
Scroll type compressor (Type 3)	50 to 70 cc 0.053 to 0.074 U.S.qts. 0.044 to 0.062 Imp.qts.	

*PAG : Polyalkyleneglycol (Synthetic oil)

(A) Swash Plate Type Compressor (Type 1)



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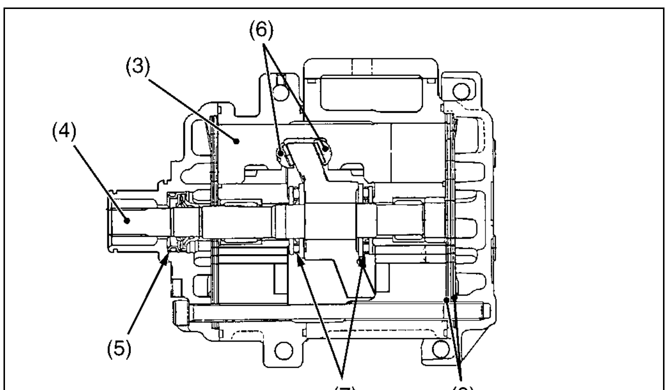

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A number of paired piston at set on the swash plate in an interval of 1.26 rad (72 degrees) for 10 cylinders compressor. When one side of a piston is in a compression stroke, the other is in a suction stroke.

(1) Magnetic Clutch
(2) Shaft Seal
(3) Pressure Relief Valve
(4) Rear Housing
(5) Piston
(6) Cylinder
(7) Swash Plate
(8) Front Housing

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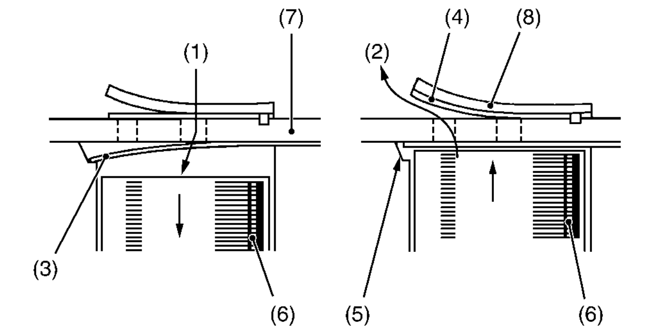

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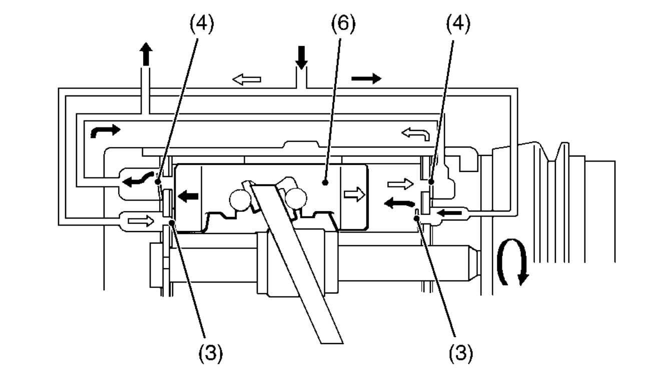

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When the pressure inside piston becomes negative as the piston is lowered, the low pressure gas flows through the suction hole of the valve plate (7) to force down the suction valve (3), thereby sending refrigerant into each cylinder. The deflecting width of the suction valve (3) is determined by the notch in the cylinder (suction valve stopper) (5). When the piston goes into the compression stroke and the pressure exceeds that of high pressure side, the discharge valve (4) is pushed up to send out the high pressure gas from the compressor.

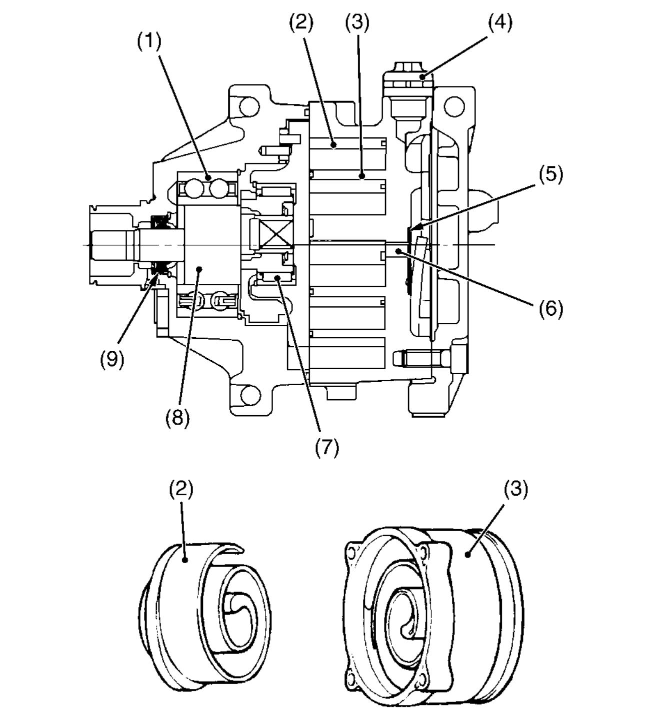
After the compression stroke is completed and the piston goes into the suction stroke, the high pressure gas on the discharge side holds the discharge valve to prevent the back flow of the gas from the high pressure side. In this way, the difference of high and low pressure can be maintained inside of the compressor.

The **R** type compressor has 5 pairs (10 cylinders) of pistons secured to the swash plate which is secured diagonally on the shaft. As the shaft rotates, the piston (6) reciprocates in the same direction as the shaft. Cylinders are arranged respectively on both sides of a pair of pistons and when the cylinder on one side is in compression stroke, the cylinder on the other side goes into suction stroke.

(1) Suction
(2) Discharge
(3) Suction Valve
(4) Discharge Valve
(5) Notch
(6) Piston
(7) Valve Plate
(8) Retainer

W1052996

(B) Scroll Type Compressor (Type 2 and Type 3)



3TRAAAAWP005A

The scroll type compressor is composed of a pair of swirl shaped fixed scroll (3) and movable scroll (2).

The fixed scroll (3) combines with housing, and movable scroll (2) rotates with the shaft (8). Therefore, the capacity of the space partitioned with both scroll changes. As a result, the refrigerant is inhaled and compressed.

(1) Bearing
(2) Movable Scroll
(3) Fixed Scroll
(4) Service Valve for High Pressure
(5) Discharge Valve
(6) Discharge Port
(7) Bearing
(8) Shaft
(9) Shaft Seal

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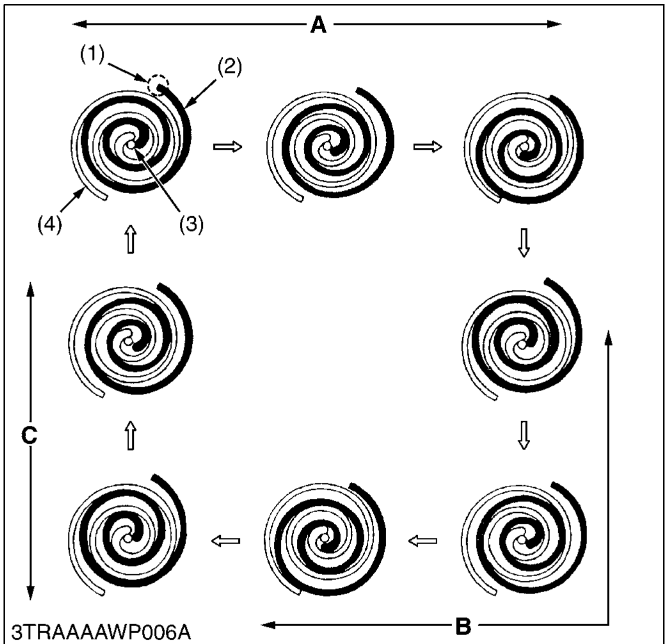

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■ Operation

When the capacity between fixed scroll (4) increases along with rotational movement of movable scroll (2), the refrigerant is inhaled from the suction port (1). In addition, the refrigerant is compressed by rotational movement of movable scroll (2).

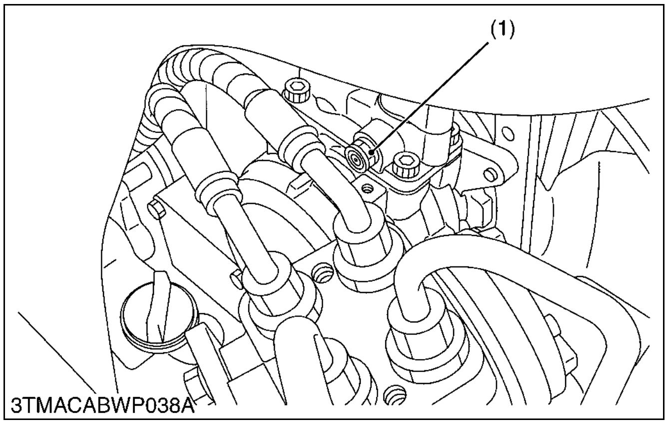
When the refrigerant pressure rises, the discharge valve is pushed open and the refrigerant gas is discharged. In this type, the refrigerant gas is discharged once in each rotation of the compressor shaft.

(1) Suction Port
(2) Movable Scroll
(3) Discharge Port
(4) Fixed Scroll

A : Suction Stroke
B : Compression Stroke
C : Discharge Stroke

W10138560

(C) Pressure Relief Valve



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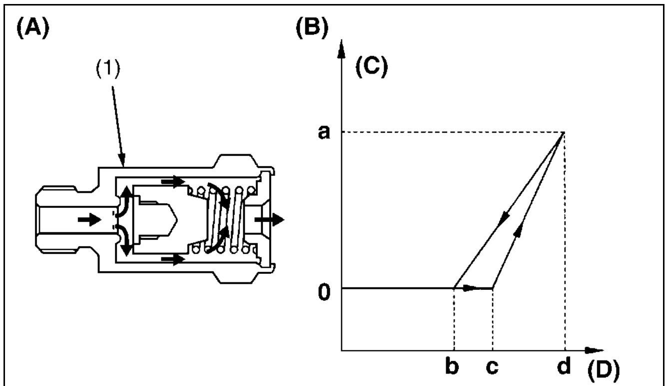


3TRAAAAWP008A

If the high pressure is abnormally high, the pressure relief valve open, and the refrigerant is released into the atmosphere, and the system is maintained. At the time, all of the refrigerant in the system is released into the atmosphere.

Even in the worst case, the outflow of refrigerant is stopped at the minimum limit.

(Reference)

- In normal operation, the high pressure switch is triggered first and the compressor stops, so the pressure relief valve is not triggered so easily.

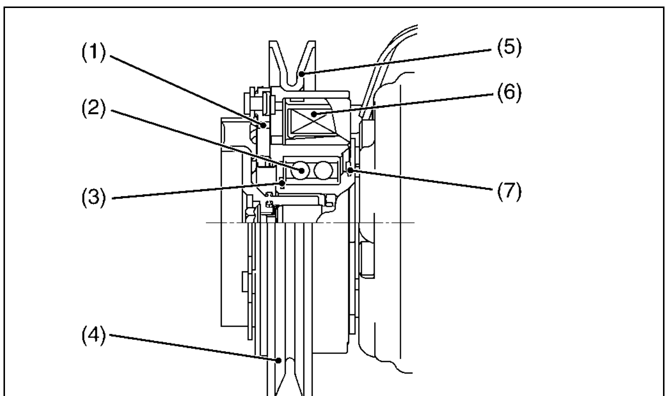
(1) Pressure Relief Valve

(a) 113 L/min., 27.2 U.S.gals./min., 24.86 Imp.gals./min.
(b) 2.76 MPa, 28.1 kgf/cm^2, 399.7 psi
(c) 3.43 MPa, 35.0 kgf/cm^2, 497.8 psi
(d) 4.14 MPa, 42.4 kgf/cm^2, 603.1 psi

(A) Gas Ejection Route When Operating
(B) Operation Characteristic
(C) Leakage Quantity
(D) Pressure

W1021726

(D) Magnetic Clutch



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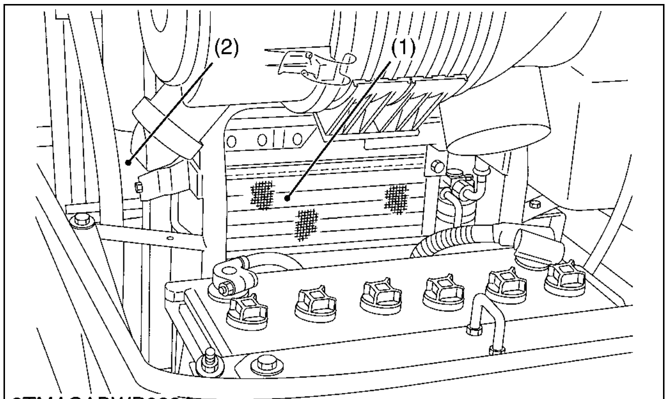
A magnetic clutch is used to engage and disengage the compressor from the engine. Main components are stator (6) and rotor with pulley (5), and pressure plate (1) to engage the drive pulley (4) and compressor magnetically.

The stator is fixed on the compressor housing, and the pressure plate is attached to the compressor shaft. Two ball bearings are used between the inner surface of the rotor and the front housing of the compressor.

(1) Pressure Plate
(2) Ball Bearing
(3) Snap Ring
(4) Pulley
(5) Rotor with Pulley
(6) Stator
(7) Snap Ring

W1053520

(2) Condenser



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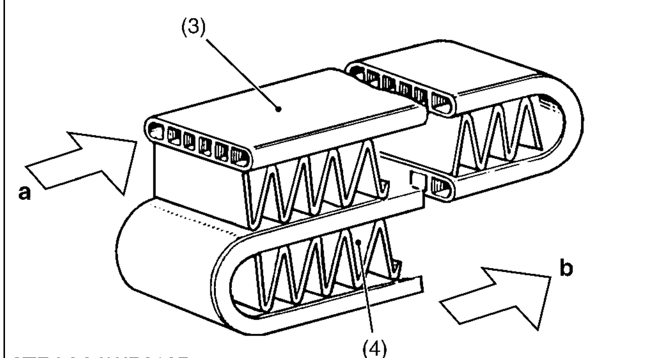
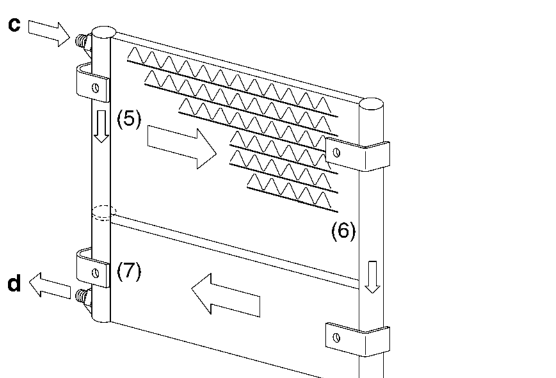


3TRAAAAWP012B



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The condenser (1) is installed to the front of radiator (2) to enable forcible cooling by the air drawn in by the engine radiator fan.

The condenser is used for the purpose of cooling and robbing the heat from the refrigerant gas, which has been compressed by the compressor into high temperature, high pressure gas, so as to change this gas into liquid refrigerant.

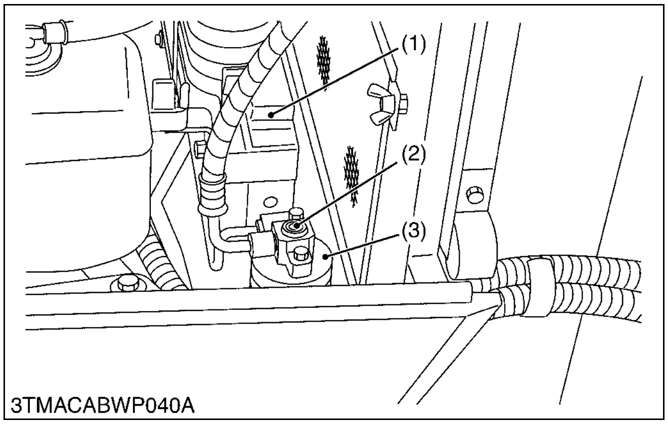
The heat given off by the gaseous refrigerant in the condenser is the sum of the heat absorbed at the evaporator and the heat of work required by the compressor to compress the refrigerant. The greater the amount of heat give off in the condenser, the greater will be the cooling effect attainable by the evaporator.

(1) Condenser
(2) Radiator
(3) Tube
(4) Fin
(5) Vapor
(6) Liquefying
(7) Liquefied

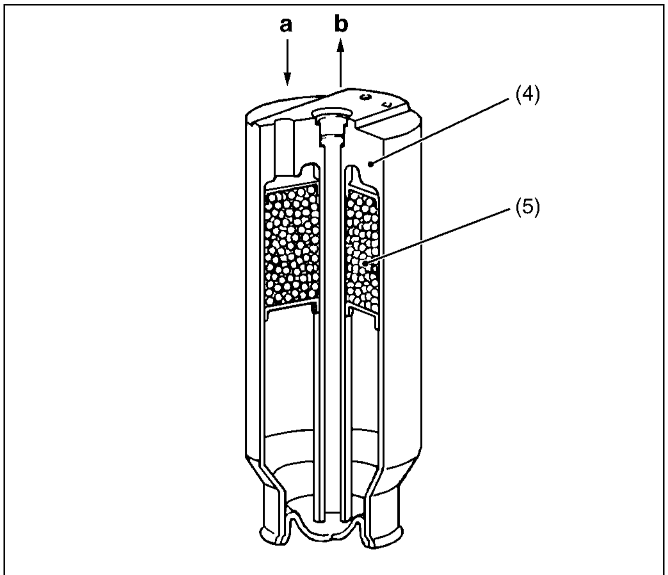
a : Gaseous Refrigerant
b : Liquid Refrigerant
c : Heated Vapor from Compressor (70 °C, 158 °F)
d : Cooled Liquid to Receiver (50 °C, 122 °F)

W1054237

(3) Receiver



3TMACABWP040A



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The receiver (3) serves the purpose of storing the liquid refrigerant. The amount of the liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver stores excess amount of refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus, maintaining the optimum flow of refrigerant within the system.

The receiver includes a desiccant (5). It has the job of removing moisture as the refrigerant circulates within the system.

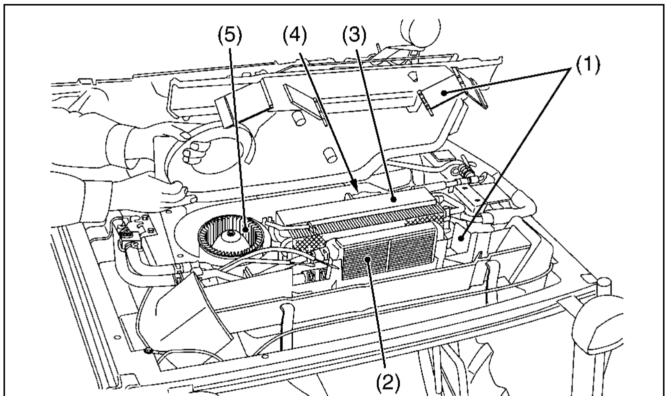
The sight glass (2) is installed on the top of receiver. Amount of refrigerant to be charged is very important for the efficiency of air conditioner. The sight glass is used to check the amount of refrigerant. If large flow of bubbles can be seen in the sight glass, there is insufficient refrigerant charged. If so, replenish the refrigerant to the proper level.

(1) Condenser
(2) Sight Glass
(3) Receiver
(4) Receiver Body
(5) Desiccant

a : IN
b : OUT

W1016742

(4) Air Conditioner Unit



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Air conditioner unit (1) consists of evaporator (3), expansion valve (4), heater core (2), blower (5), etc..

(1) Air Conditioner Unit
(2) Heater Core
(3) Evaporator
(4) Expansion Valve
(5) Blower

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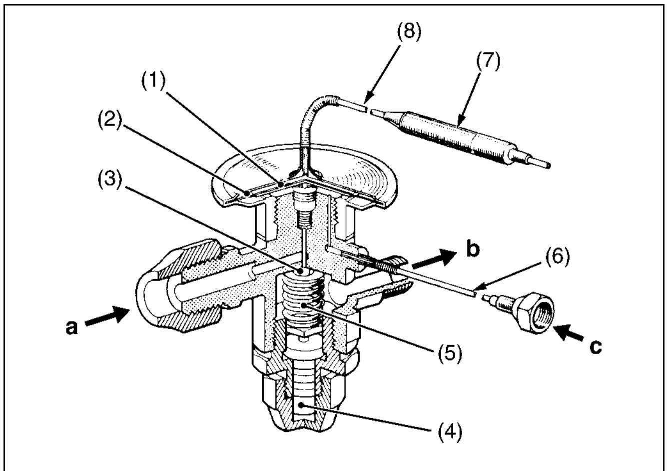

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■ Expansion Valve

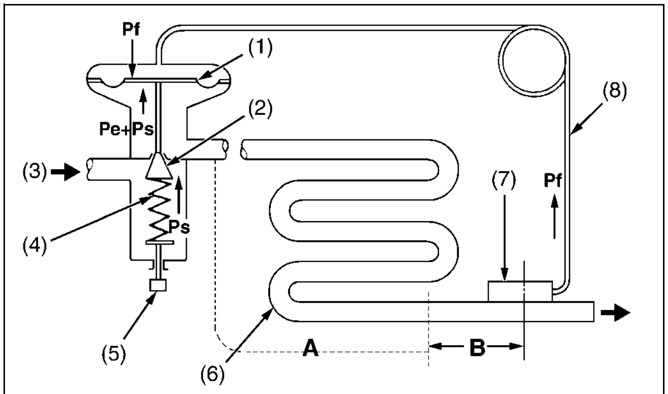
The expansion valve restricts the flow of liquid refrigerant as it passes through the expansion valve and delivers sprayed refrigerant to the evaporator for facilitating refrigerant evaporation.

The cabin interior will not be cooled sufficiently if the expansion valve outlet is too small. If it is too wise, frost will be produced on the evaporator, decreasing cooling efficiency. Thus the size of this small spray hole has to be controlled according to various conditions.

(1) Diaphragm Chamber
(2) Diaphragm
(3) Needle
(4) Adjusting
(5) Pressure Spring
(6) Tube
(7) Heat Sensitizing Tube
(8) Capillary Tube

a : From Receiver
b : To Evaporator
c : From Evaporator

W1017045



3TRAAAAWP018A

When the vapor pressure of the operating system is stable, **Pf = Pe + Ps** condition will prevail. The needle valve opening at this time will be stationary and constant refrigerant flow will be maintained.

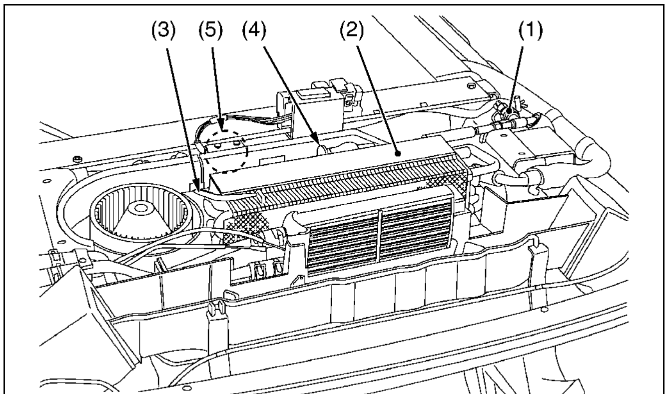
In the evaporator installing expansion valve, the refrigerant in the outlet is always in superheated vapor form for certain length (part **B** in the figure). If the cooling load increases (inlet air temperature of evaporator becomes high), the refrigerant will vaporize faster and cause the length of the superheated vapor part (**B**) to become longer. Thus, the pressure in the heat sensitizing tube (7) rises and increases the needle valve opening, resulting in larger flow of the refrigerant into evaporator. Conversely, if the amount of refrigerant in the evaporator becomes greater, the length of the superheated vapor part (**B**) will become shorter. The pressure in the heat sensitizing tube will drop and decrease the needle valve (2) opening.

(1) Diaphragm
(2) Needle Valve
(3) Refrigerant Inlet
(4) Spring
(5) Adjusting Screw
(6) Evaporator Tube
(7) Heat Sensitizing Tube
(8) Capillary Tube

A : Saturated Vapor Part
B : Superheated Vapor Part

Pf : Gas pressure in sensitizing tube
Ps : Spring pressure
Pe : Vapor pressure in evaporator

W1017312



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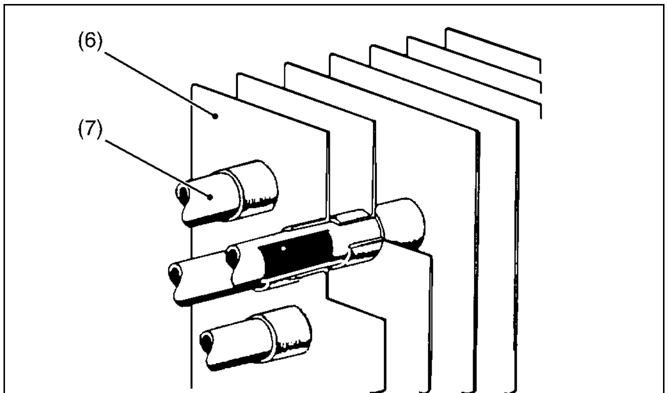


3TRAAAAWP022B

■ Evaporator

The purpose of evaporator (2) is just opposite to that of the condenser. The state of refrigerant immediately after the expansion valve (4) is 100 % liquid. As soon as the liquid pressure drops, it starts to boil, and in doing so, absorbs heat. This heat is removed from the air passing over the cooling fins of the evaporator and causes the air to cool.

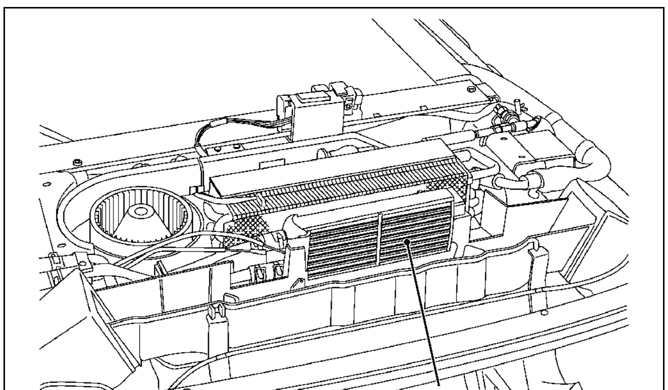
If too much refrigerant is sent into the evaporator, it will not boil away so easily. Also, the evaporator filled with liquid refrigerant eliminates a place for the refrigerant to properly vaporize, which is necessary in order to take on heat. A flooding condition of the evaporator will allow an excess of liquid refrigerant to leave the evaporator and may cause serious damage to the compressor.

If too little refrigerant is sent into the evaporator, again the evaporator will not cool because the refrigerant will vaporize, or boil off, long before it passes through the evaporator.

Refrigerant properly metered into the evaporator should allow for 100 % liquid just after the expansion valve, and 100 % gas at the outlet.

(1) Pressure Switch
(2) Evaporator
(3) Capillary Tube
(4) Expansion Valve
(5) Thermostat
(6) Fin
(7) Tube

W1017487



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■ Heater Core

The heater-sauce of heater utilizes coolant which becomes high temperature by heat of engine.

The inlet port of heater core is connected to the delivery side of engine water pump by a rubber hose, and the water valve is installed on the inlet port of heater core. Also, the outlet port of heater core is connected to the engine cylinder block.

The heater core (1) is one of the heat exchangers like evaporator or condenser, and heat is exchanged between heated coolant passing through the core and air in the cabin or fresh outdoor air. Thus, air is heated.

(1) Heater Core

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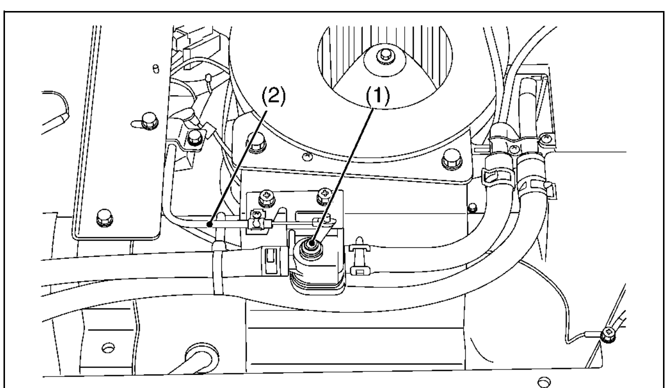

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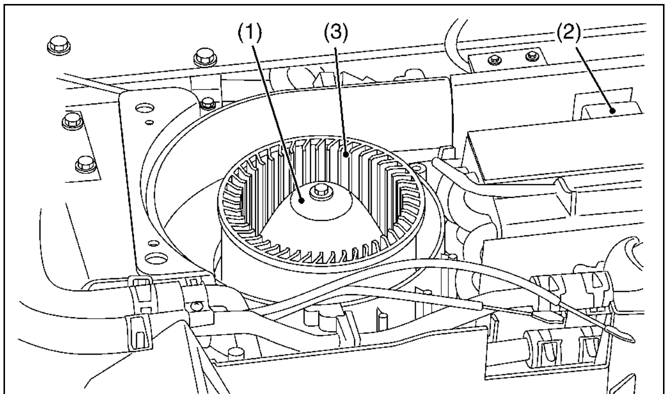
■ Water Valve

The hot water valve (1) is connected with the hot water valve cable (2) and controlled with the temperature control lever on the control panel. This lever is used to adjust the flow rate of hot water going into the heater.

Set the temperature control lever to the **COOL** position and the hot water valve gets closed, allowing no hot water flow. The hot water valve is built in at the right-hand top of the center pillar.

(1) Hot Water Valve
(2) Hot Water Valve Cable

W1017761



3TRAAAAWP027B

■ **A/C Blower**

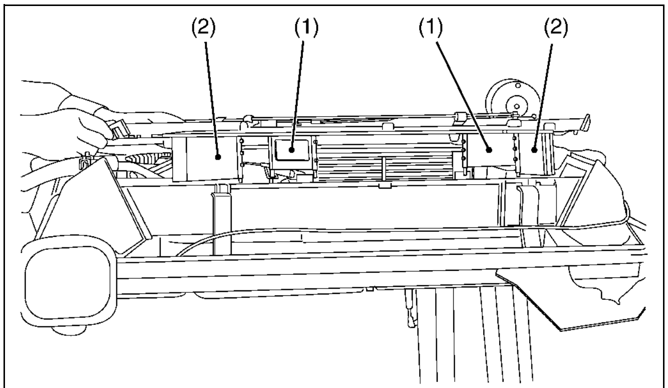
The blower is incorporated in the right-hand space of the air conditioner unit. It blows cool, warm of fresh air via the front and side blow ports into the cabin.

The speed of the blower motor (1) can be adjusted in 3 steps by the resistor (2).

The blower fan (3) 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) Resistor
(3) Blower Fan

W1017834



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■ **Air Mixed Door · Mode Door**

The air mixing doors (1) are fit at both sides of the heater in the air conditioner unit. The temperature control lever on the control panel is used to open and close the doors. Set this lever to the rightmost (**WARM**) position, and the air mixing doors get fully closed. All the air that is passing through the evaporator is heated up and fed to the blow ports. As this lever moves to the left (toward the **COOL** position), the air mixing doors open themselves gradually. This means that there will be more air not being heated. The hot water valve gradually closes at the same time, and the blown-air temperature will drop accordingly. Most of the air that does not pass through the heater but comes through the air mixing doors is blown out of the side blow ports. This helps you feel your head cool and your feet warm.

The mode doors (2) are provided at the inlets of the ducts that run to the right- and left-side blow ports, and are used to open and close the side blow ports.

(1) Air Mixing Door
(2) Mode Door

W1018010

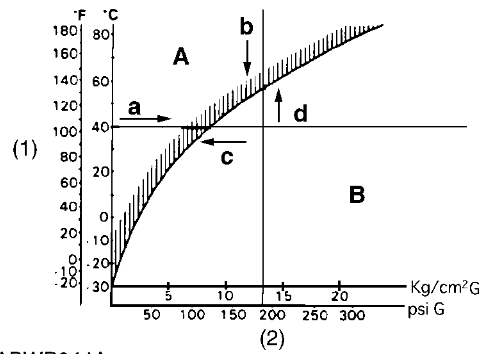
(5) Refrigerant

■ **Refrigerant R134a**

■ **IMPORTANT**

- **The air conditioning system operates using R134a refrigerant. This substance does not contain any chlorine atoms, so it does not have a detrimental effect on the ozone in the Earth's atmosphere.**
- **Even so, the refrigerant must never be discharged straight into the air. It must be trapped in a recycling machine.**
  Refrigerant stored in a recycling unit may be re-used at any time.
- **The recycling machine used to do this must be of a type suitable for handling R134a refrigerant.**
- **R134a has a corrosive effect on copper as well as various seals and components used in the R12 system. For this reason, never use R134a refrigerant in a system that has previously used R12. Before replacing any component, it is vital to check whether it is compatible with the type of refrigerant used.**

W1018097



3TMACABWP044A

■ Refrigerant Properties

Water boils at 100 °C (212 °F) under atmospheric pressure, but R134a boils at –26.5 °C (–15.7 °F) and its freezing points is –101 °C (–149.8 °F) below zero under atmospheric pressure.

If R134a were exposed and released to the air under normal room temperature and atmospheric pressure, it would absorb the heat from the surrounding air and boil immediately changing into gas. Also R134a is easily condensed back into liquid under the pressurized condition by removing heat from it.

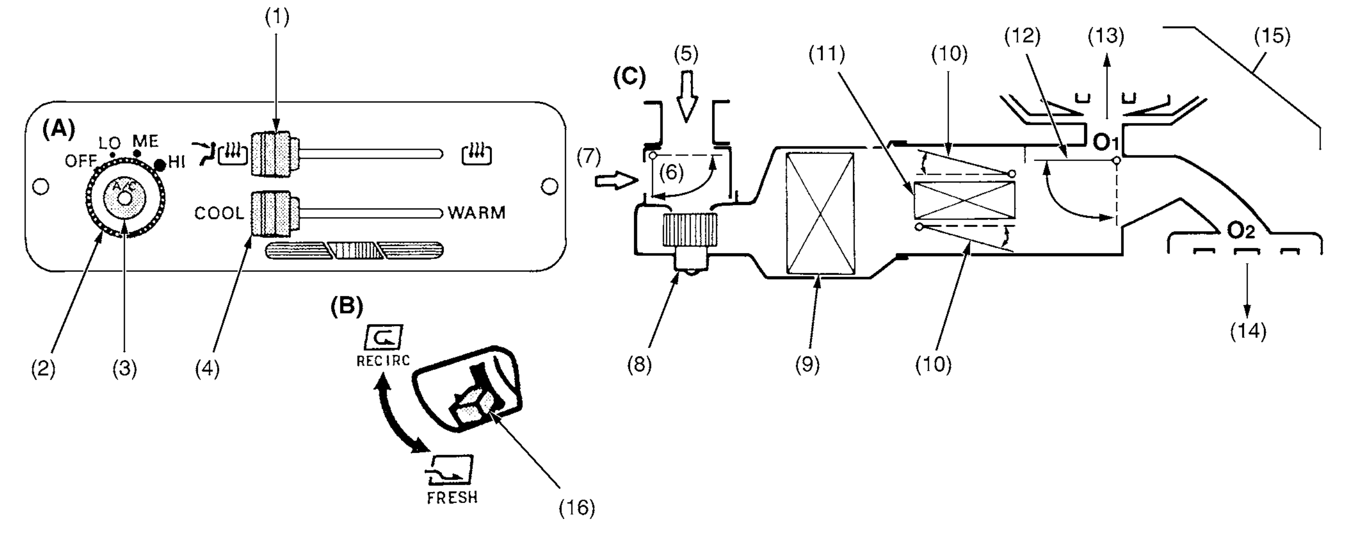
The characteristic curve of R134a which expresses the relation between the temperature and pressure is shown in the figure left. The graph itself indicates the boiling point of R134a under each temperature and pressure. On the graph, the upper portion above the curve is gaseous state of R134a and the lower portion below the curve is liquid state of R134a. The gaseous refrigerant can be converted into the liquid refrigerant by raising the pressure without changing the temperature or decreasing the temperature without changing the pressure. (See (**a**) and (**b**) in the figure.) Conversely, the liquid refrigerant can be converted in to the gaseous refrigerant by lowering the pressure without changing the temperature, or by raising the temperature without changing the pressure. (See (**c**) and (**d**).)

(1) Temperature
(2) Gauge Pressure

A : GAS
B : LIQUID

W1018191

[4] SYSTEM CONTROL



3TLABABWP083A

(1) Air Mode Lever
(2) Blow Switch
(3) Air Conditioner Switch
(4) Temperature Control Lever
(5) Fresh Air
(6) Air Intake Door D1
(7) Recirculated Air
(8) Blower
(9) Evaporator
(10) Temperature Door D2 (Air Mixed Door)
(11) Heater
(12) Air Outlet Door D3 (Mode Door)
(13) DEFOGGER
(14) FACE
(15) DEF and FACE
(16) Air Selection Lever

(A) Control Plate
(B) Air Selection Lever
(C) Block Diagram of Air Flow Passage
O1 :Front air outlet
O2 :Side air outlet

1) Selection of recirculated air (7) or fresh air (5) is done with door D1.

■ **RECIRC**

By setting the air selection lever (16) in rear control panel to **RECIRC** position, door **D1** (6) shuts the flesh air inlet port. Air inside the cabin is recirculated.

■ **FRESH**

By moving the air selection lever (16) to **FRESH** position, door **D1** opens the flesh air inlet port. Outside air comes into cabin.

2) Temperature control of outlet air is done with door D2.

■ **COOL**

By setting the temperature control lever (4) in control panel to **COOL** position, door **D2** (10) is moved to close water valve. The air flows to door **D3** (12) side without passing the heater core.

■ **WARM**

By moving the temperature lever to **WARM** position door **D2** is moved to open water valve. The air flows to door **D3** (12) side passing through the heater core.

3) Outlet air flow is controlled by door D3.

Moving the air mode lever (1) opens and shuts door **D3** and establishes the air passage according to the lever position.

■ **DEF + FACE**

By moving the mode lever to **DEF + FACE** position, the door **D3** is moved to establish the air passages to outlets **O1** and **O2**. Air comes out from both outlets.

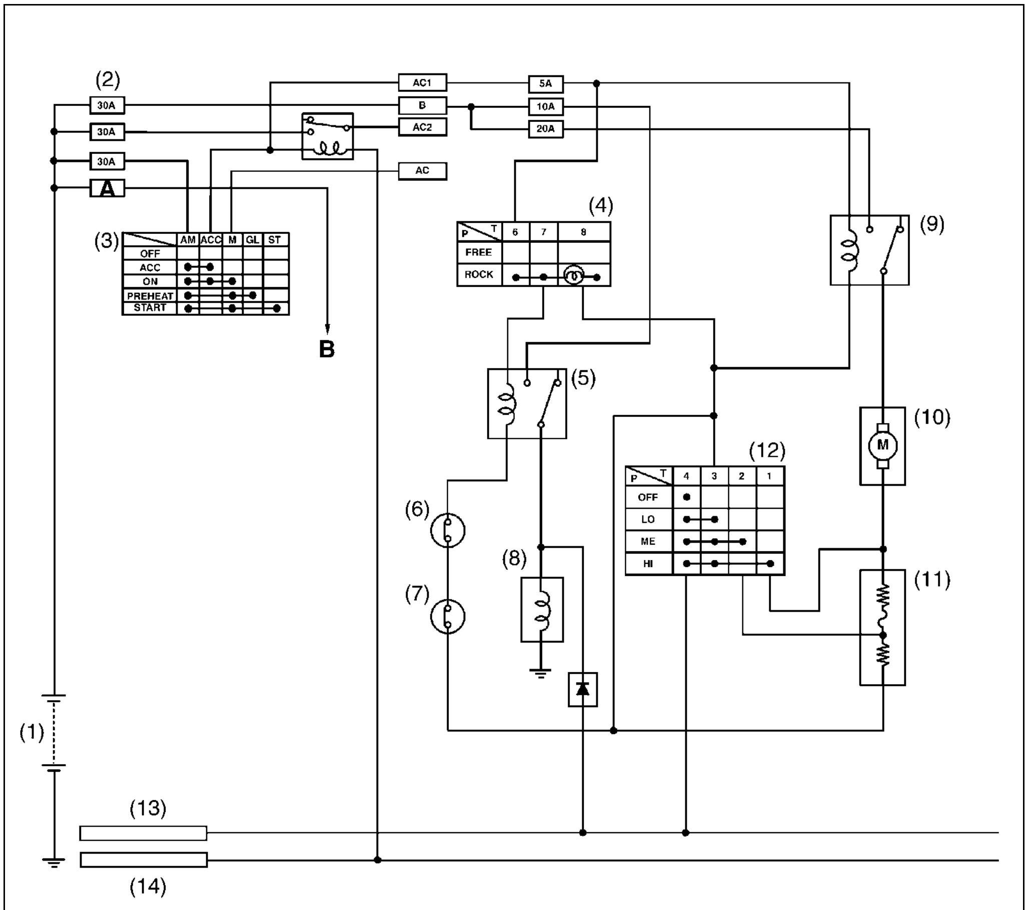
■ **DEF**

Moving the mode lever to **DEF** position, door **D3** is moved to set up the air passage to outlet **O1**. Air comes out from outlet **O1**.

[5] ELECTRICAL SYSTEM

(1) Electrical Circuit

(A) Type 1 (Swash Plate Type Compressor)



3TMACABWP045A

(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) A/C Switch (Air Conditioner)
(5) Compressor Relay
(6) Thermo Switch
(7) A/C Pressure Switch
(8) Compressor
(9) A/C Main Relay
(10) Blower Motor
(11) Blower Resistance
(12) Blower Switch
(13) Cabin Harness
(14) Main Harness

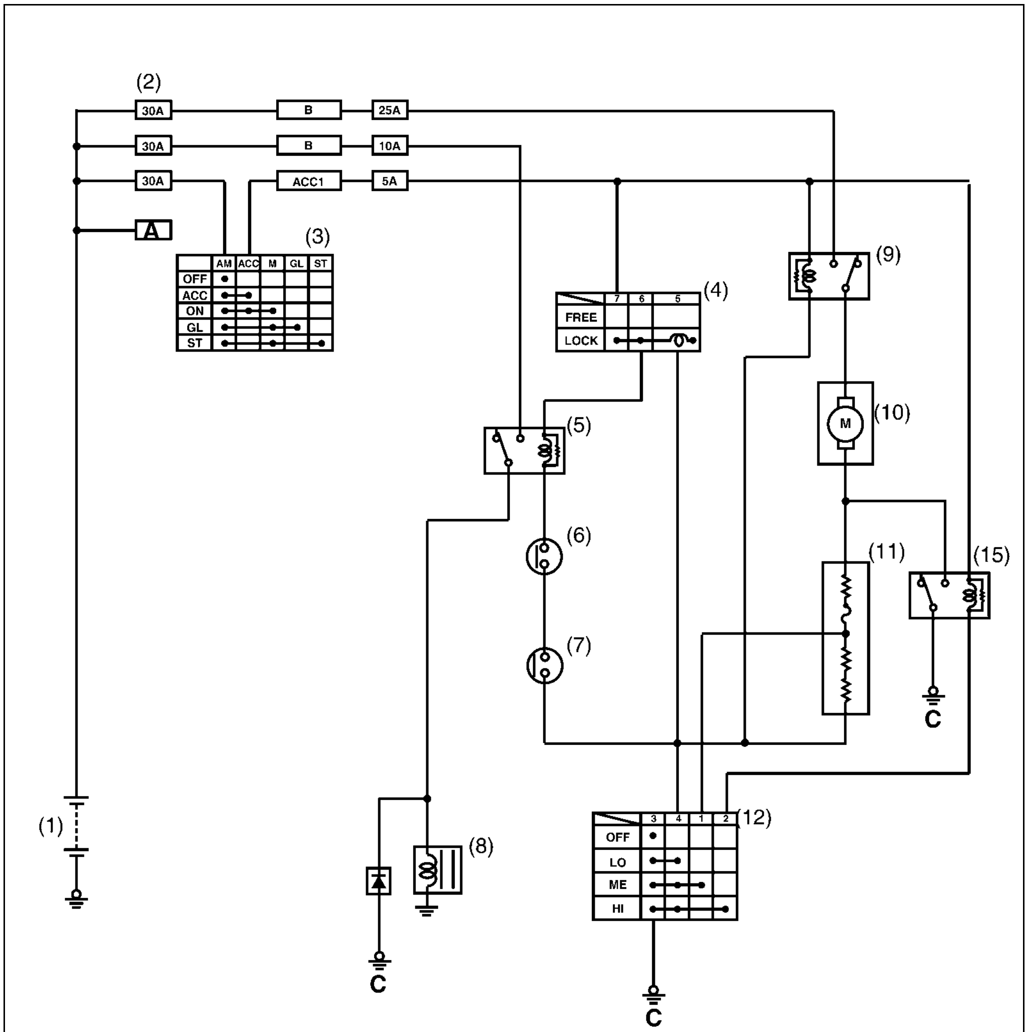
A : 65 A for except Canada
75 A for Canada
B : To Alternator

W1024897

The process of magnetic clutch being engaged is shown below.

Main Switch (3) **ON** → A/C Switch (4) **ON** → Blower Switch (12) **ON** (Low, medium or High) → Compressor Relay (5) **ON** → Thermo Switch (6) **ON** (the thermostat temperature is more than 4 °C (39.2 °F)) → A/C Pressure Switch (7) **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.

(B) Type 2 and Type 3 (Scroll Type Compressor)



3TMACABWP046A

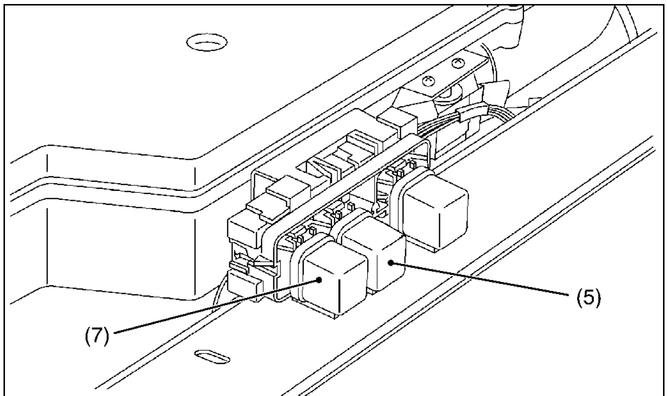
(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) A/C Switch (Air Conditioner)
(5) Compressor Relay
(6) Thermo Switch
(7) A/C Pressure Switch
(8) Compressor
(9) A/C Main Relay
(10) Blower Motor
(11) Blower Resistance
(12) Blower Switch
(13) Cabin Harness
(14) Main Harness
(15) Blower High Relay
A : 65 A for except Canada
75 A for Canada
B : To Alternator

W1055327

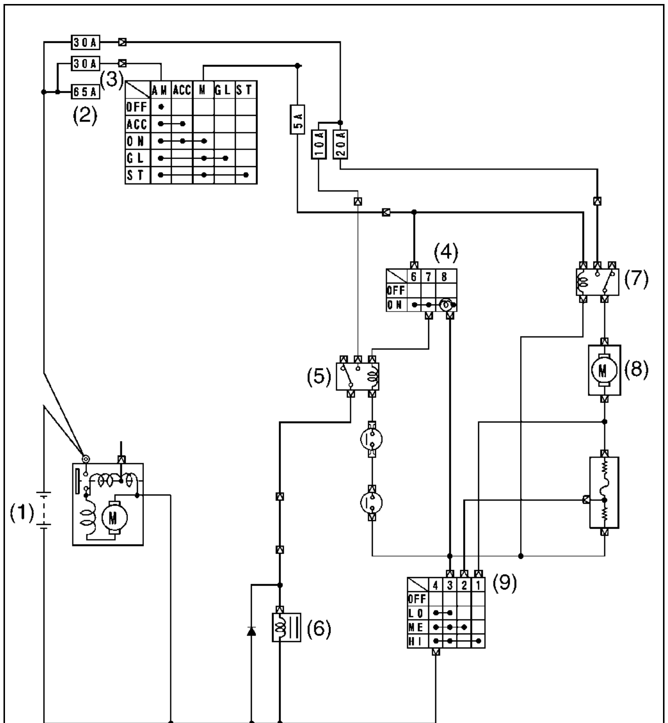
The process of magnetic clutch being engaged is shown below.

Main Switch (3) **ON** → A/C Switch (4) **ON** → Blower Switch (12) **ON** (Low, medium or High) → Compressor Relay (5) **ON** → Thermo Switch (6) **ON** (the thermostat temperature is more than 4 °C (39.2 °F)) → A/C Pressure Switch (7) **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) Air Conditioner Main Relay and Compressor Relay



3TMACABWP047A



3TMACABWP048A

Remove the outer roof and the relays are visible at the ceiling center of the cabin : A/C main relay (7) and compressor relay (5). The blower fan is adjusted for the air flow rate by a signal from the fan switch on the control panel.

Among the air conditioner components, current flows to the blower motor (8) and magnetic clutch. If all of these current were to be passed 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 could result in a discharged battery.

To protect against such trouble, A/C main relay (7) has been provided. A/C main relay (7) has been made so that when current flows through its coil, the contact close to supply the power from the battery. By employing A/C main relay (7), 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 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) A/C Switch
(5) Compressor Relay
(6) Compressor
(7) A/C Main Relay
(8) Blower Motor
(9) Blower Switch

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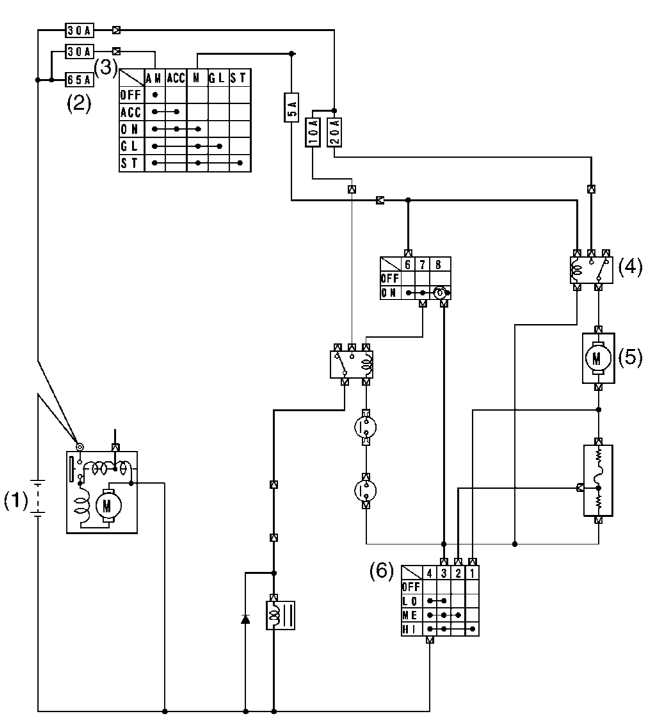
(3) Blower Switch



3TMACABWP048B

The wind of blower can be changed in 3 positions (Low, Medium and High) by changing the blower switch (6) position.

■ **Blower Switch is "OFF" Position**

When the blower switch (6) is in **OFF** position, even if the main switch (3) is turned to **ON** position, the A/C blower relay (4) does not operate.

(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) A/C Blower Relay
(5) Blower Motor
(6) Blower Switch

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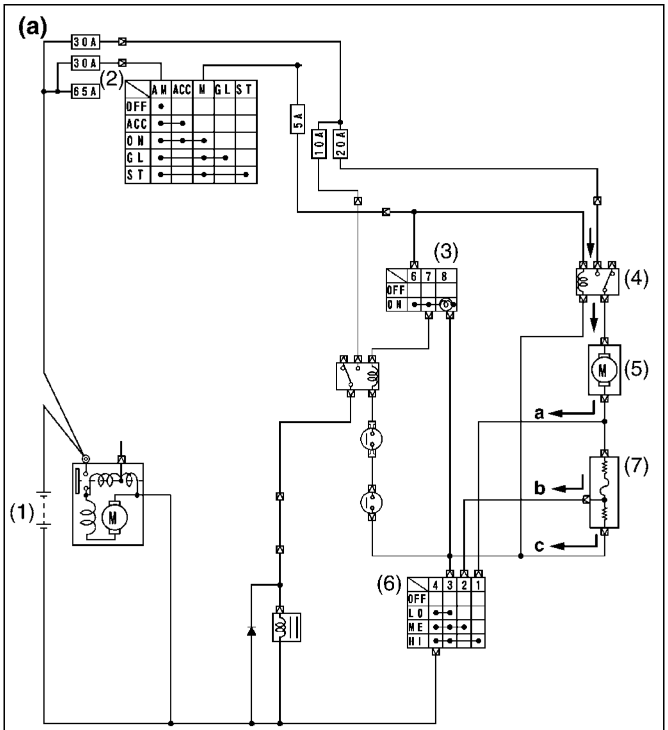
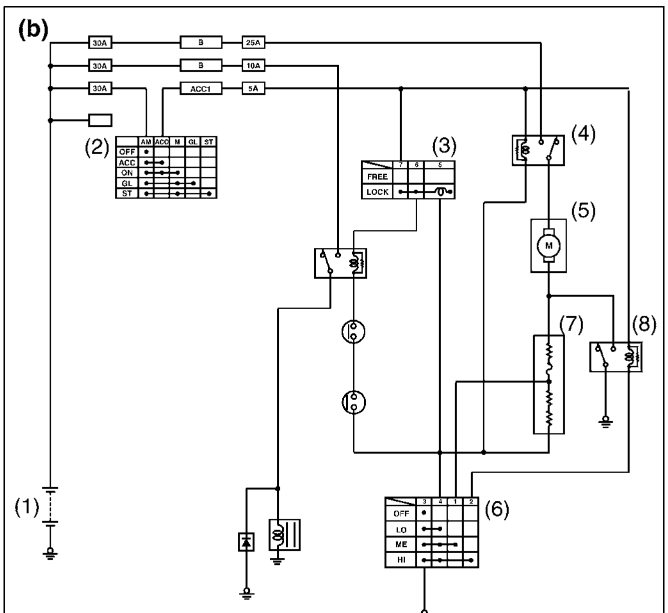


3TMACABWP048C



3TMACABWP049A

■ When Blower Switch is in · (Low), • (Medium) or ● (High) Position

When the main switch (2) and blower switch (6) is turned **ON**, the current flows from battery (1) to A/C main relay's coil and A/C main relay (4) is turned **ON**. As the A/C main relay (4) is turned **ON**, the current from battery (1) flows to the blower switch (6) through the blower motor (5) as follows.

(a) Type 1 (Swash Plate Type Compressor)

"·" (Low) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower Resistor (7) → Blower Switch (6) → Ground.

"•" (Medium) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower Resistor (7) → Blower Switch (6) → Ground.

"●" (High) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower Switch (6) → Ground.

(b) Type 2 (Scroll Type Compressor)

"·" (Low) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower Resistor (7) → Blower Switch (6) → Ground.

"•" (Medium) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower Resistor (7) → Blower Switch (6) → Ground.

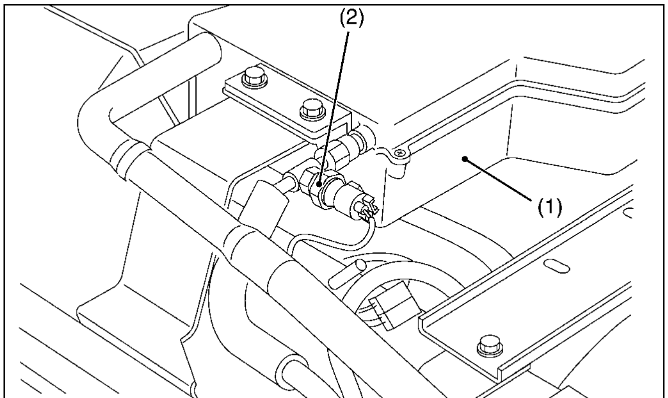
"●" (High) Position

Battery (1) → Slow Blow Fuse → Fuse → A/C Main Relay (4) → Blower Motor (5) → Blower High Relay (8) → Blower Switch (6) → Ground.

(1) Battery
(2) Main Switch
(3) A/C Switch
(4) A/C Main Relay
(5) Blower Motor
(6) Blower Switch
(7) Blower Resistor
(8) Blower High Relay
(a) Type 1 (Swash Plate Type Compressor)
(b) Type 2 (Scroll Type Compressor)

W1056014

(4) Pressure Switch



3TRAAAAWP029A

The pressure switch detects the pressure in the refrigerant cycle, and when something is wrong, turns off the magnetic clutch to prevent the component from troubling. This system has dual type pressure switch (2), and this switch controls low pressure cut and high pressure cut.

(1) A/C Unit
(2) Pressure Switch

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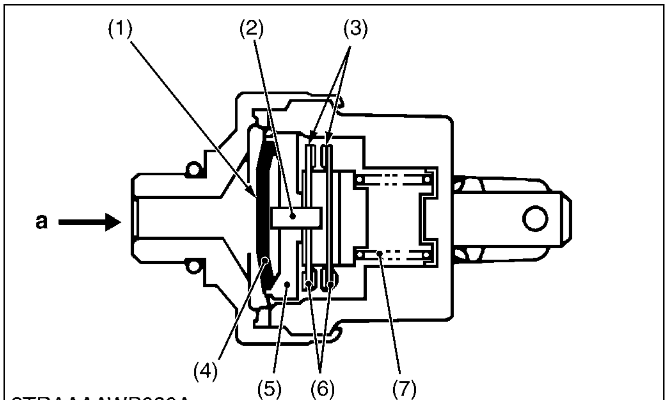


3TRAAAAWP030A

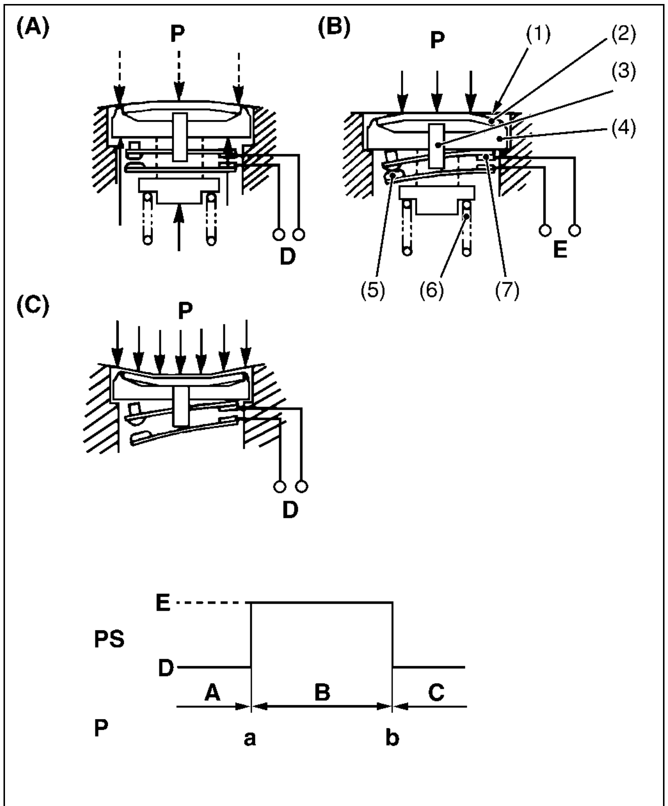
1) Pressure Switch (Dual Type)

The pressure switch is installed in inlet line (liquid line) between receiver and expansion valve.

The contact of pressure switch is normally open type.

(1) Diaphragm
(2) Pin
(3) Terminal
(4) Belleville Spring
(5) Plate
(6) Movable Contact
(7) Spring
a : Pressure

W1020479



■ **OFF Position (A : When the Refrigerant Pressure is Low)**

The pressure switch detects the pressure drop when the refrigerant leaks from the system causing compressor seizure. When pressure of refrigerant is less than specified pressure, the switch is turned **OFF** and disengages magnetic clutch.

■ **ON Position (B : When the Refrigerant Pressure is Normal)**

When the pressure in the inlet line is between 0.196 MPa (2.0 kgf/cm^2, 28.4 psi) and 3.14 MPa (32 kgf/cm^2, 455 psi), the switch is turned **ON** (the pressure is normal condition), and engages magnetic clutch.

■ **OFF Position (C : When the Refrigerant Pressure is High)**

When the pressure in the inlet line is higher than specified pressure, the switch is turned **OFF**, and disengages magnetic clutch.

(Reference)

- Setting pressure
  OFF (Low pressure side) :
  Less than approx. 0.196 MPa (2.0 kgf/cm^2, 28.4 psi)
  ON (Normal pressure) :
  Between approx. 0.196 MPa (2.0 kgf/cm^2, 28.4 psi). to 3.14 MPa (32 kgf/cm^2, 455 psi)
  OFF (High pressure side)
  More than approx. 3.14 MPa (32 kgf/cm^2, 455 psi)

(1) Diaphragm
(2) Belleville Spring
(3) Pin
(4) Plate
(5) Terminal
(6) Spring
(7) Contact

A : Refrigerant Pressure is Low
B : Refrigerant Pressure is Normal
C : Refrigerant Pressure is High
D : OFF
E : ON
P : Pressure
PS :Pressure Switch
a : 0.196 MPa (2.0 kgf/cm^2, 28.4 psi)
b : 3.14 MPa (32 kgf/cm^2, 455 psi)

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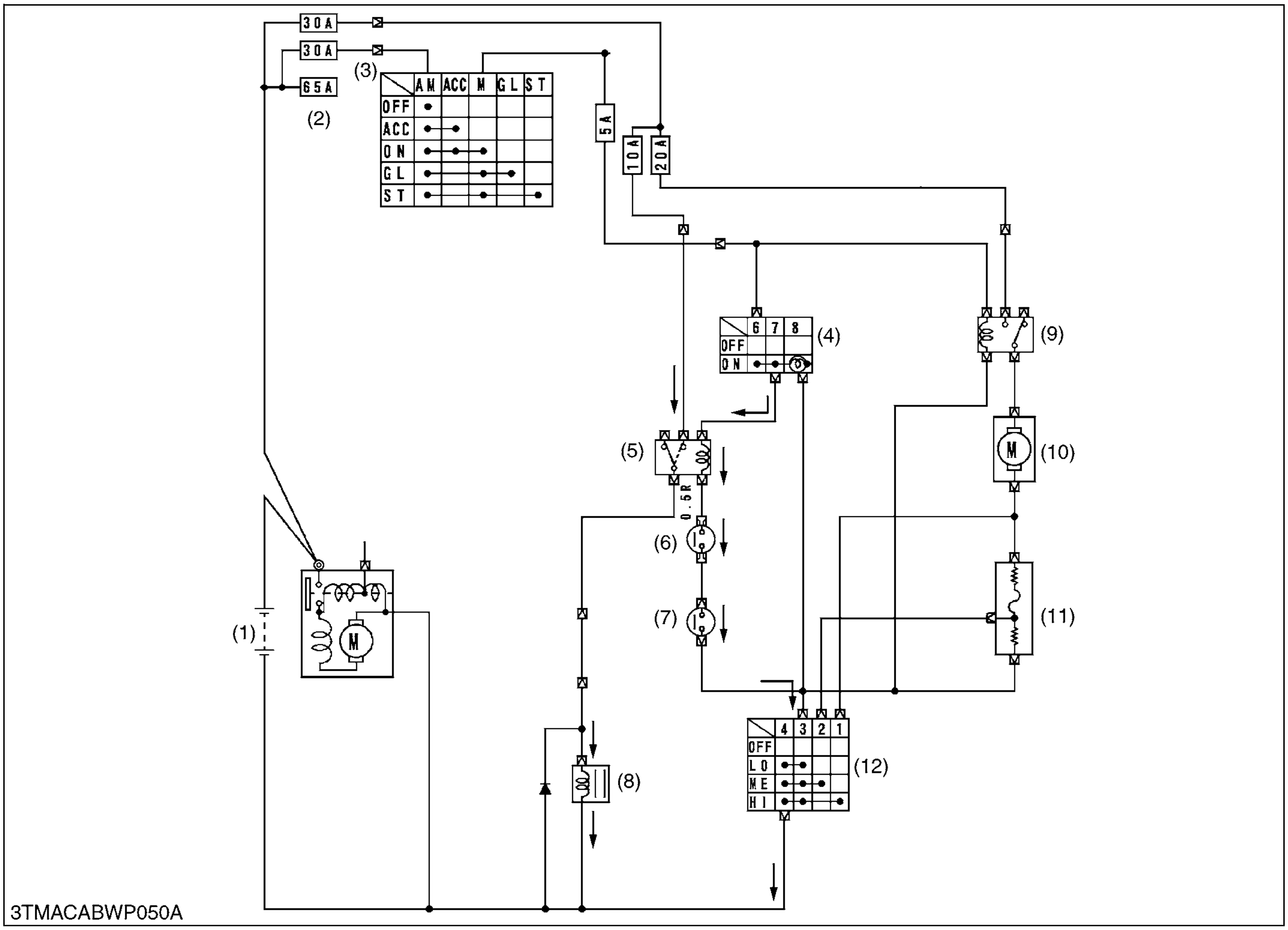
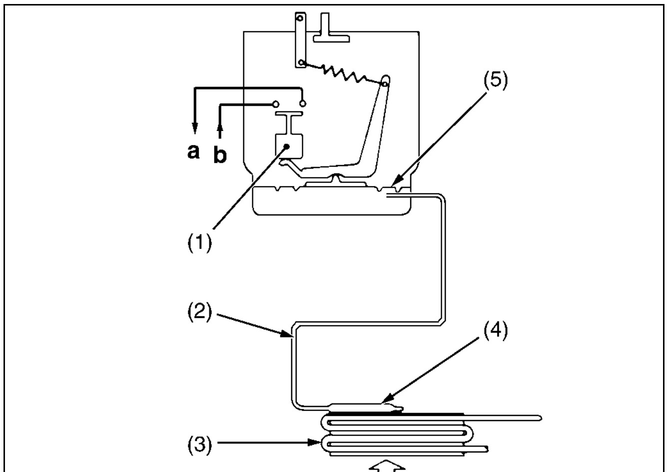


(1) Battery	(4) A/C Switch	(7) A/C Pressure Switch	(10) Blower Motor
(2) Slow Blow Fuse	(5) Compressor Relay	(8) Compressor	(11) Blower Resistance
(3) Main Switch	(6) Thermo Switch	(9) A/C Main Relay	(12) Blower Switch

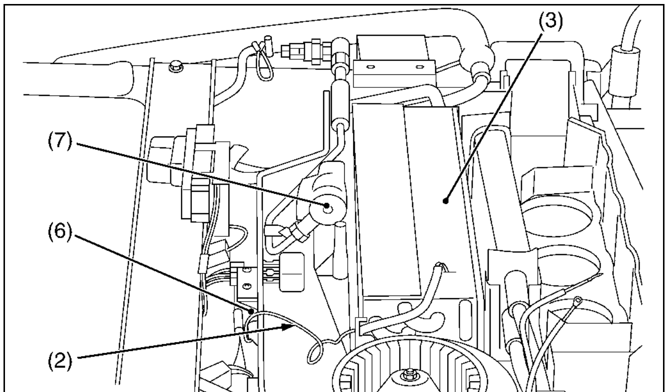
2) Circuit

The circuit of magnetic clutch including the pressure switches is as shown in the figure. All switches are connected in series. The magnetic clutch can be turned **ENGAGED** when the blower switch (12) and the A/C switch (4) are turned **ON** under the condition that both the pressure switch (7) and the thermo switch (6) are turned **ON**.

(5) Thermostat



3TRAAAAWP033B



3TMACABWP051A

If the evaporator fin temperature, that is, refrigerant vaporizing temperature, drops below 0 °C (32 °F), frost or ice will form on the fins, causing a decrease in air flow and lowering cooling capacity. To prevent such frosting, and also to allow setting cabin interior to desired temperature, a thermostat has been installed.

In this system, gas type thermostat is used.

The gas type thermostat has a capillary tube which is filled with special gas. The capillary tube is connected to the diaphragm chamber. The tip of the capillary tube is positioned on the evaporator fins.

When the evaporator fins temperature is higher than setting temperature of the thermostat, the micro switch in the thermostat is turned **ON** by increasing the pressure in the diaphragm chamber. When the evaporator fins temperature is low, such is in winter season, the micro switch is turned **OFF** because of the pressure in the diaphragm chamber and spring tension drops, thus turning **OFF** the magnetic clutch to prevent the evaporator from frosting.

(Reference)

- Thermostat setting temperature
  OFF .... Approx. 1 °C (34 °F)
  ON .... Approx. 4.5 °C (40.1 °F)

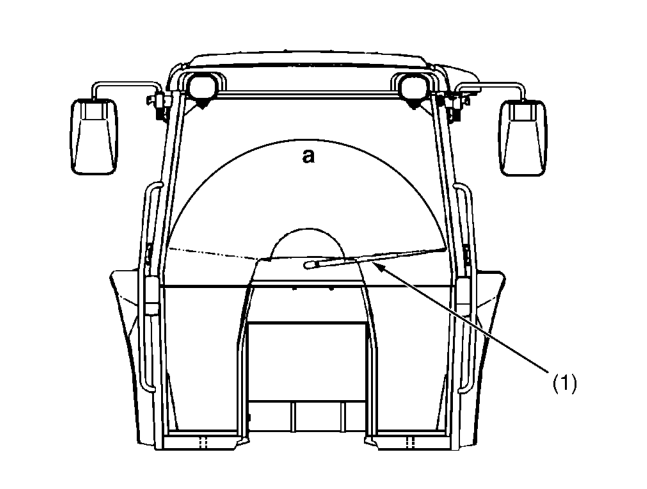
(1) Micro Switch
(2) Capillary Tube
(3) Evaporator
(4) Heat Sentizing Tube
(5) Diaphragm
(6) Thermo Switch
(7) Expansion Valve

a : To Magnetic Clutch
b : From A/C Switch

W1021336

4. WINDSHIELD WIPER

[1] FRONT WINDSHIELD WIPER



3TMACABWP052A

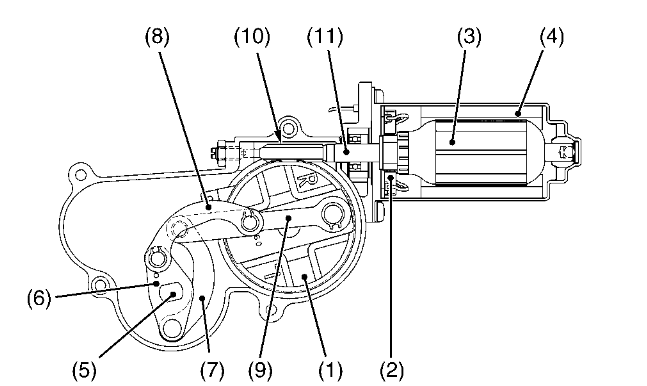
Front wiper motor is of the ferrite magnet type and possesses the function to stop the wiper arm (1) at a designed position.

The wiper linkage changes rotating motion of the output shaft of the motor into reciprocating movement, which moves the wiper arm (1). The wiper arm (1) uses a pantograph system, so the wiper blade keeps a certain angle (perpendicular) continuously although the wiper arm (1) moves.

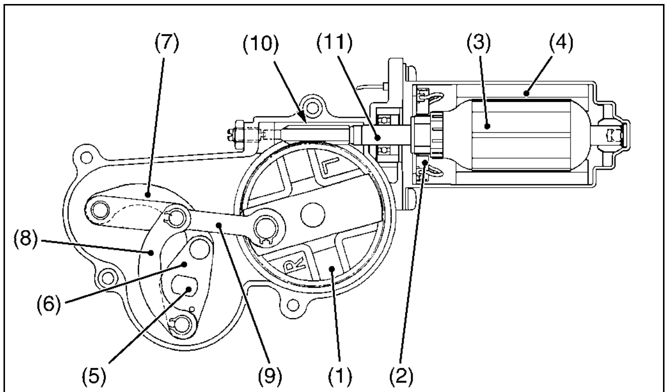
Wiping angle of the wiper arm (1) is 2.90 rad (166 °). The wiper blade is for flat glass, and length of blade rubber is 400 mm (15.6 in.).

(1) Wiper Arm **a : 2.90 rad (166 °)**

W1021771



3TRAAAAWP035B



3TRAAAAWP036B

■ **Front Wiper Motor**

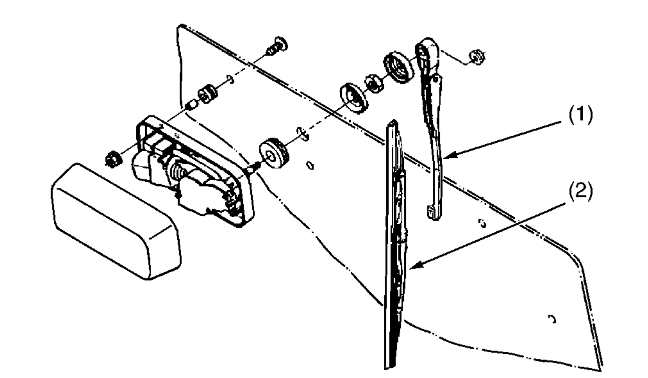
The front wiper motor is so designed as a field that cylindrical barium ferrite magnet (4) is fixed in the motor housing, in which armature (3) is mounted. Worm gear (10) is machined around armature shaft (11), and rotating speed of the armature is reduced by means of helical gear (1) and is transferred to motor shaft.

As the helical gear is turning, lever (6) which is attached to arm shaft (5) is oscillated by the function of rod (9), crank **A** (7) and crank **B** (8).

(1) Helical Gear
(2) Brush
(3) Armature
(4) Magnet
(5) Arm Shaft
(6) Lever
(7) Crank **A**
(8) Crank **B**
(9) Rod
(10) Worm Gear
(11) Armature Shaft

W1021840

[2] REAR WINDSHIELD WIPER



3TRAAAAWP039B

Rear wiper motor is of the ferrite magnet type and possesses the function to stop the wiper arm (1) at a desired position as same as the front wiper motor. Rotating speed is constant. The linkage mechanism which changes rotating movement of the crankshaft to oscillating movement of the wiper arm is provided in the motor, and the wiper arm is directly connected to the motor-output shaft. Wiping angle of the wiper arm is 1.92 rad (110 °). The wiper blade (2) is for flat glass, and the length of blade rubber is 425 mm (16.7 in.).

(1) Wiper Arm (2) Wiper Blade

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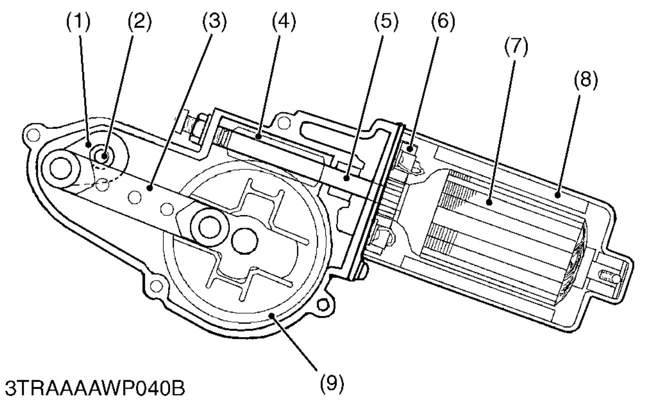


3TRAAAAWP040B

■ **Rear Wiper Motor**

The rear wiper motor has basically the same structure with that of the front wiper motor, but it has two brushes only, so there is no such mechanism to change the rotating speed.

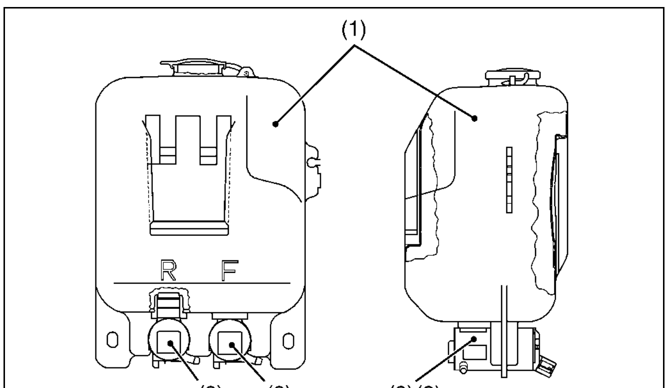
As the helical gear is turning, segment arm (6) which is attached to the arm shaft (5) is oscillated by the function of rod (7).

Rear Wiper Motor Specifications	
Motor type	Ferrite magnet type
Wiper angle	1.57 rad (90 °)
Rating voltage	12 V
Rating load current	Less than 3 A
No load current	Less than 2 A
Rotating speed (No load period) (Load period)	 36 to 50 min^{-1} (rpm) 32 to 44 min^{-1} (rpm) 0.59 N·m Load 0.06 kgf·m 0.434 ft-lbs

(1) Helical Gear
(2) Brush
(3) Armature
(4) Barium Ferrite Magnet
(5) Arm Shaft
(6) Segment Arm
(7) Rod
(8) Worm Gear
(9) Armature Shaft

W1022076

[3] WINDOW WASHER



3TRAAAAWP043A

The window washer is of the electric washer using a small size high speed motor and consists of tank, pump, nozzle and etc..

The washer tank is installed in rear side of cabin and its capacity is 1.3 L (1.4 U.S.qts., 1.6 Imp.qts.).

Washer pump is mounted under the tank, and is driven by a motor. When the motor starts running, washer is drawn through the suction inlet and discharged through the discharge outlet to the washer nozzle.

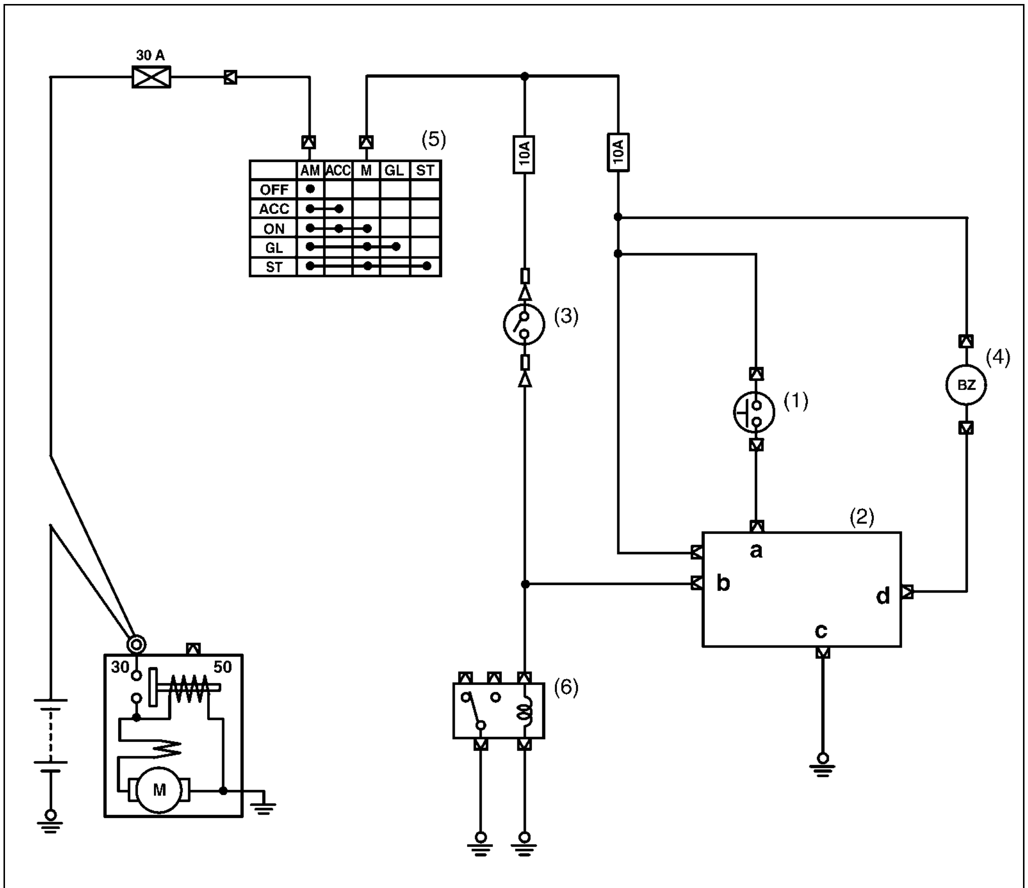
(1) Tank
(2) Pump (Rear) (OPTION)
(3) Pump (Front)

W1022315

5. OPC (OPERATOR PRESENCE CONTROL) (IF EQUIPPED)

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT

■ **NOTE**
- **Refer to “8. OPC system” at section 9 Electrical System.**



(1) Seat Switch
(2) OPC Buzzer Timer
(3) PTO Switch
(4) Buzzer
(5) Main Switch
(6) PTO Relay

W1032141

The 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 (1), OPC buzzer timer (2), PTO switch (3) and buzzer (4).

■ **Electric Circuit**

1. When sitting on the seat in the state of the main switch **ON**, the battery voltage passes the seat switch (1) and the OPC buzzer timer (2).
2. When standing from the operator’s seat, the circuit from the seat switch (1) to the OPC buzzer timer is cut. However, if the PTO clutch lever is set at **ON** position, the circuit from the battery to the OPC buzzer timer (2) is formed with the PTO switch (3).
3. When standing from the seat while shifting the PTO clutch lever at **ON** position, the circuit from battery to the buzzer (4) is flowed, and the buzzer is whistled.

SERVICING

CONTENTS

1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	• Bearing of compressor worn or damaged	Replace	10-S29
	• Valves in compressor damaged	Replace	–
	• Belt slipping	Adjust or replace	10-G5
	• Compressor bracket mounting screws loosen	Tighten	–
	• Piping resonant	Tighten or add clamp	–
(Compressor OFF)	• Blower defective	Repair or replace	10-S33
	• Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	10-S29

W1013580

AIR CONDITIONING SYSTEM

Does Not Cool (No Air Flow)	• Fuse blown	Replace	–
	• A/C main relay defective	Repair or replace	10-S33
	• Blower high relay detective	Replace	10-S35
	• Blower motor defective	Replace	10-S34
	• Blower switch defective	Replace	10-S34
	• Wiring harness disconnected or improperly connected	Repair	–
(Compressor Does Not Rotate)	• Fuse blown	Replace	–
	• Magnetic clutch defective	Repair or replace	10-S29 to S32
	• A/C switch defective	Replace	10-S36
	• Pressure switch defective	Replace	10-S37
	• Belt slipping	Adjust or replace	10-G5
(Others)	• Insufficient refrigerant	Check with manifold gauge	10-S14
	• Expansion valve defective	Replace	–
	• Compressor defective	Replace	10-S30
Insufficient Cooling (Insufficient Air Flow)	• Air filter clogged	Clean or replace	10-G5
	• Evaporator frosted	Clean or replace thermo switch	10-S44
	• Blower motor defective	Replace	10-S34
	• Blower resistor defective	Replace	10-S35
(Many Bubbles in Sight Glass)	• Insufficient refrigerant	Check with manifold gauge	10-S15
	• Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	10-S12
	• Air mixed in	Check with manifold gauge	10-S15
(No Bubbles in Sight Glass)	• Too much refrigerant	Check with manifold gauge	10-S15

W1013718

AIR CONDITIONING SYSTEM (Continued)

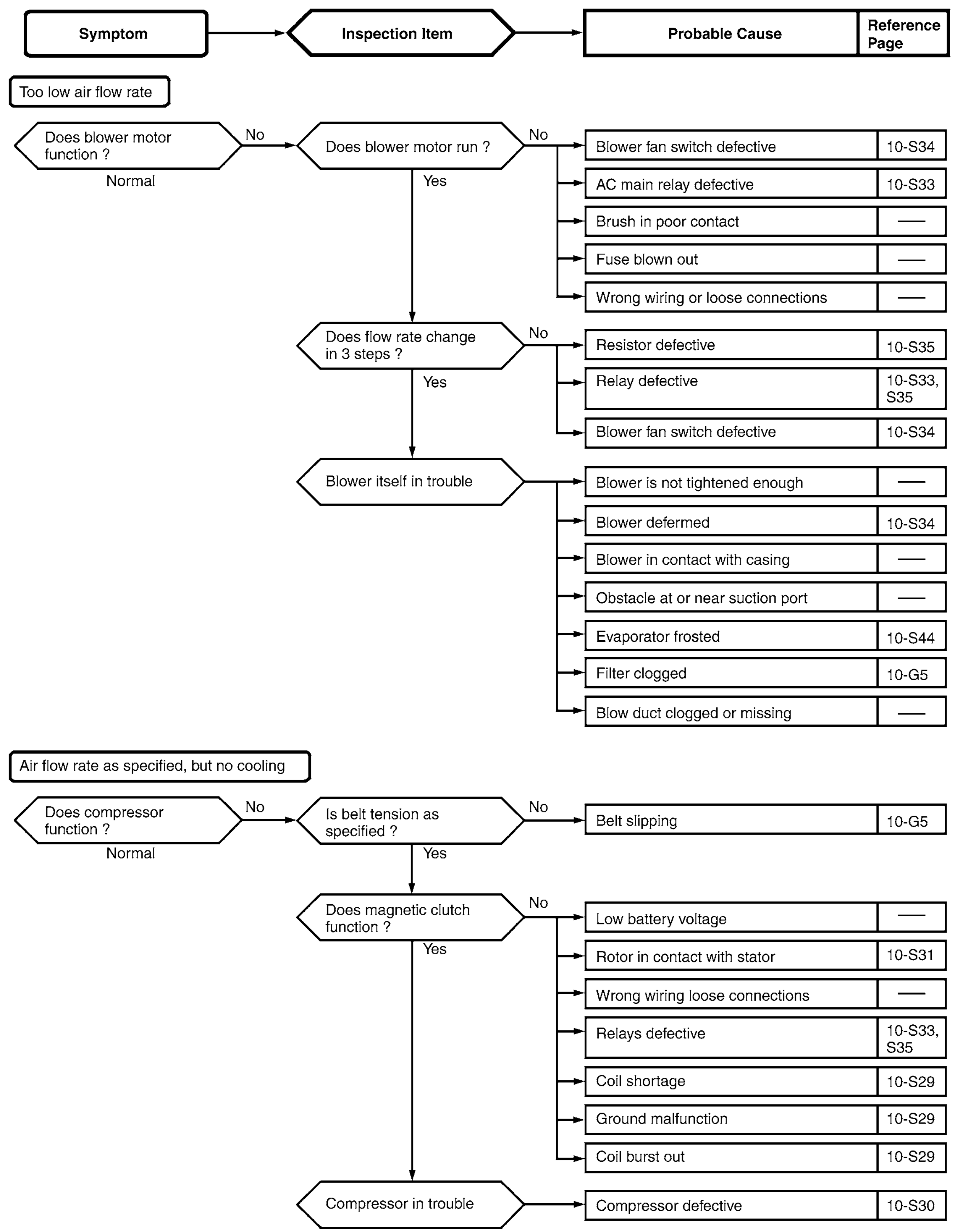
Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	• Belt slipping • Magnetic clutch defective • Compressor defective	Adjust or replace Repair or replace Replace	10-G5 10-S29 to S32 10-S30
(Others)	• Thermostat defective • Water valve defective • Condenser fin clogged with dust • Expansion valve defective	Replace Replace Clean Replace	– – 10-G4 –
Insufficient Heating	• Water valve defective • Air mix door malfunctioning • Insufficient coolant	Replace Adjust control cable Replenish	– 10-S39 G-11
Insufficient Cooling (Compressor Does Not Rotate Properly)	• Belt slipping • Magnetic clutch defective • Compressor defective	Adjust or replace Repair or replace Replace	10-G5 10-S29 to S32 10-S30
(Others)	• Condenser fin clogged with dust • Expansion valve defective	Clean Replace	10-G4 –

W1013580

WINDSHIELD WIPER

Windshield Wiper Does Not Operate	• Wiring defective • Fuse blown (Short-circuit, burnt component inside motor or other part for operation) • Wiper motor defective (Broken armature, worn motor brush or seized motor shaft) • Wiper switch defective • Foreign material interrupts movement of link mechanism • Wiper arm seized or rusted	Check and repair Correct cause and replace Replace Replace Repair Lubricate or replace	– 10-G7 to G9 10-S38, S41, S47 10-S38, S46 – 10-S41, S50
Windshield Wiper Operating Speed Is Too Low	• Wiper motor defective (Short-circuit of motor armature, worn motor brush or seized motor shaft) • Low battery voltage • Humming occurs on motor in arm operating cycle due to seized arm shaft • Wiper switch contact improper	Replace Recharge or replace Lubricate or replace Replace	10-S38, S41, S47 – – 10-S38, S46
Windshield Wiper Does Not Stop Correctly	• Wiper motor defective (Contaminated auto-return contacts or improper contact due to foreign matter)	Replace	10-S38, S41, S47

W1010962



3TLABABWP001B

Symptom	Inspection Item		Probable Cause	Reference Page
Is cycle pressure as specified ? (No)	Is high-pressure level as specified ? (No)	too high	Refrigerant overcharged	10-S15
			Condenser clogged with dust and dirt	—
			Air mixed	10-S15
		too low	Refrigerant too short	10-S15
			Compressor discharge valve damaged	—
			Compressor gasket damaged	—
			Low-pressure pipe in trouble (Cracked or clogged)	10-S43
	Yes → Is low-pressure level as specified ? (No)	too high	Refrigerant overcharged	10-S15
			Heat-sensitive tube in poor contact	—
			Expension valve too open	—
		too low	Refrigerant too short	10-S15
			Gas leak at heat-sensitive tube	—
			Evaporator frosted	10-S44
			Low-pressure pipe in trouble (Cracked or clogged)	10-S43
			Expension valve clogged	—
	Yes → Are both high-pressure and low-pressure levels as specified ? (No)	too high	Refrigerant overcharged	10-S15
		too low	Refrigerant too short	10-S15
Normal	Normal			
Is temperature well controlled ? (No)	Does temperature control lever function ?	No	Wire poorly fixed	10-S39, S40
			Wire wrongly laid	10-S39, S40
	Yes → Is water valve openness as specified ?	No	Valve wrongly open at Max **COOL** position	10-S39, S40
			Cable wrongly set	10-S39, S40
			Cable disconnected	10-S39, S40
	Yes → Is air mixing door openness as specified ?	No	Damper lever wrongly set	10-S39
			Cable disconnected	10-S39, S40
	Yes → Is heater hose laid as specified ?	No	Hose caught	10-S44
			Hose twisted or bent	10-S44
Normal	Normal			
Check water leakage (Abnormal)	Is there water leak in cabin ?	No	Drain hose disconnected	—
			Drain hose bent	—
			Heater hose in poor connection	10-S44
Normal → Check two points (in cabin's right-hand front and back) for drainage of water resulting from dehumidifying.	Normal			

3TMACABWP124A

WASHER MOTOR

Symptom	Probable Cause	Solution	Reference Page
Washer Motor Does Not Operate	• Fuse blown	Correct cause and replace	–
	• Washer switch defective	Replace	10-S38, S47
	• Washer motor defective	Replace	–
	• Wiring defective	Repair	–
Washer Motor Operate but Washer Fluid Is Not Ejected	• No washer fluid	Replenish	–
	• Clogged washer nozzle	Clean or replace	–

W1011118

OPC (If equipped)

Symptom	Probable Cause	Solution	Reference Page
Buzzer Does Not Buzz	• Fuse blown (10 A)	Replace	–
	• Buzzer defective	Replace	9-S35
	• OPC buzzer timer defective	Replace	9-S33
	• Seat switch defective	Replace	9-S34
	• Wiring harness disconnected or improperly connected (between OPC buzzer timer and seat switch, buzzer and OPC buzzer timer)	Repair or replace	–

W1013718

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Air-gap of A/C Compressor Magnet Clutch	Swash Plate Type Compressor	0.25 to 0.50 mm 0.010 to 0.020 in.	–
	Scroll Type Compressor	0.35 to 0.65 mm 0.014 to 0.022 in.	–
Refrigerating Cycle (Refrigerating Cycle is Normal Operating) Condition • Engine Speed : Approx. 1500 min^{-1} (rpm) • Ambient Temperature : 30 to 35 °C 86 to 95 °F • Blower Switch : **PURGE** Position	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 (0.39 to 0.47 in.) deflection at 98 N (10 kgf, 22 lbs) of force	–
Proper Clutch Pedal	Free Travel	35 to 45 mm 1.38 to 1.77 in.	–
Proper Brake Pedal	Free Travel	40 to 45 mm 1.57 to 1.77 in.	–
Shift Rod (M6800SQ)	Length	Approx. 275 mm 10.8 in.	–
Shift Rod (M8200Q, M9000Q)	Length	Approx. 155 mm 6.10 in.	
Hydraulic Control Rod Position and Draft Rod (M6800SQ)	Length	Approx. 362 mm 14.25 in.	–
Hydraulic Control Rod Position and Draft Rod (M8200Q, M9000Q)	Length	Approx. 264 mm 10.39 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 **"6. TIGHTENING TORQUES"** at GENERAL Section.)

Item	N·m	kgf·m	ft-lbs
Cabin mounting screws and nuts	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Cabin bracket mounting screws			
M12 screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
M14 screw	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Compressor mounting screw	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Compressor bracket mounting screws			
Screws to inlet manifold	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Screws to water flange	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Clutch mounting nut (swash plate type compressor)	14.7 to 24.5	1.5 to 2.5	10.8 to 18.1
Clutch mounting screw (scroll type compressor)	10.8 to 16.2	1.10 to 1.65	8.0 to 11.9
High pressure pipe screw and retainer nut			
between compressor and condenser (High pressure pipe 1)			
screw	7.8 to 11.8	0.8 to 1.2	5.8 to 8.7
retaining nut	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
between condenser and receiver			
screw	3.9 to 6.9	0.4 to 0.7	2.9 to 5.1
retaining nut	11.8 to 14.7	1.2 to 1.5	8.7 to 10.8
between receiver and A/C unit (High pressure pipe 2)			
retaining nut	11.8 to 14.7	1.2 to 1.5	8.7 to 10.8
Low pressure pipe			
between A/C unit and compressor			
screw (M6800SQ)	7.8 to 11.8	0.8 to 1.2	5.8 to 8.7
(M8200Q · M9000Q)	3.9 to 6.9	0.4 to 0.7	2.9 to 5.1
retaining nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Wiper arm mounting nut (Front)	6.37 to 9.32	0.65 to 0.95	4.7 to 6.9
Wiper arm mounting nut (Rear)	7.8 to 9.3	0.8 to 0.95	5.79 to 6.87
Main delivery hose retaining nut	47.1 to 51.0	4.8 to 5.2	34.7 to 37.6
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
A/C unit mounting screws (M6)	3.9 to 6.9	0.4 to 0.7	2.9 to 5.1
A/C unit mounting screws (M8)	9.8 to 15.7	1.0 to 1.6	7.23 to 11.6
Rear wiper motor mounting screw	7.8 to 9.3	0.8 to 0.95	5.79 to 6.87

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.**

(Reference)

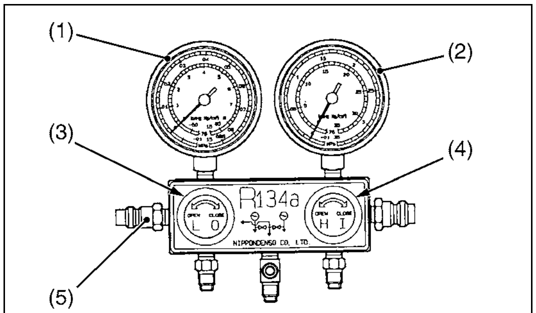
Replacing Parts	Replenish Quantity		Brand Name
	Type 1 (swashplate Type)	Type 2 and 3 (Scroll Type Compressor)	
Condenser	40 cc 0.042 U.S.qts. 0.036 Imp.qts.	20 cc 0.021 U.S.qts. 0.018 Imp.qts.	DENSO CO. ND-OIL 8 <PAG* oil>
Evaporator	40 cc 0.042 U.S.qts. 0.036 Imp.qts.	20 cc 0.021 U.S.qts. 0.018 Imp.qts.	
Receiver	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	
Hose	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	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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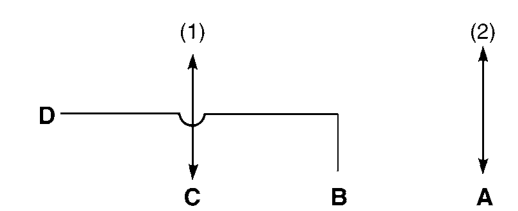
The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (3) and **HI** is for the high pressure side valve (4). By opening or closing the high and low pressure hand valves, the following circuits are established.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **LO** Pressure Side Valve
(4) **HI** Pressure Side Valve
(5) Schrader Valve

W1013107



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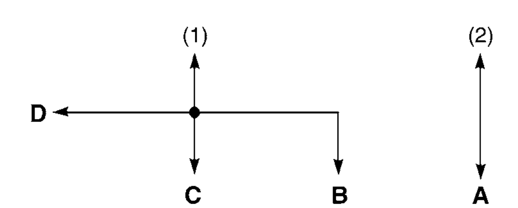
■ **When LO Pressure Side Valve and HI Pressure Side Valve are Closed**

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**

- **Schrader valve (D) must be opened.**

W1013376



3TLABABWP005A

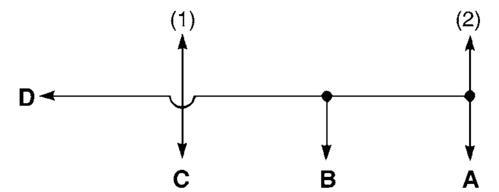
■ **When LO Valve is Opened and HI Valve is Closed**

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.**

W1013454



3TLABABWP006A

■ **When LO Valve is Closed and HI Valve is Opened**

Two circuits are established.

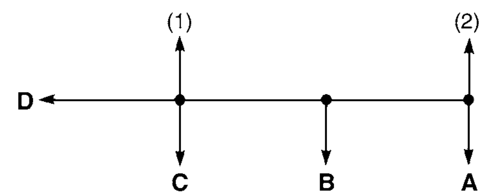
Port (**C**) → **HI** pressure gauge (2)
→ Port (**B**)
→ Port (**D**) (Schrader valve must be opened)

Port (**A**) → **LO** pressure gauge (1)

■ **NOTE**

- **Schrader valve (D) must be opened.**

W1013304



3TLABABWP007A

■ **When LO and HI Valve are Opened**

Circuits are established.

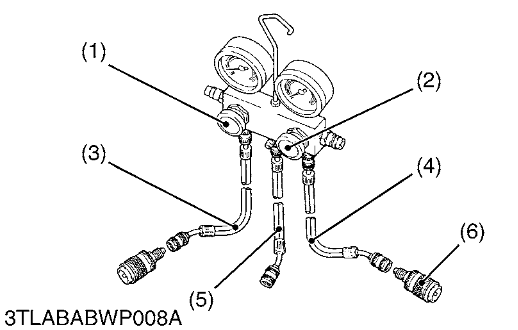
Port (**A**) → **HI** pressure gauge (2)
→ **LO** pressure gauge (1)
→ Port (**B**)
→ Port (**C**)
→ Port (**D**) (Schrader valve must be opened)

■ **NOTE**

- **Schrader valve (D) must be opened.**

W1013864

(2) Refrigerant Charging Hose



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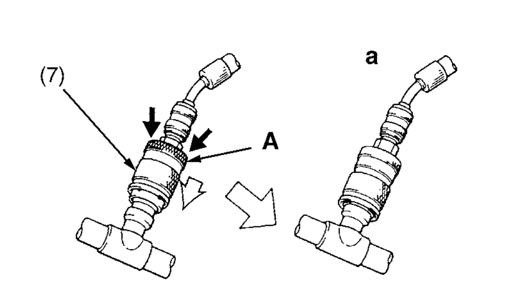

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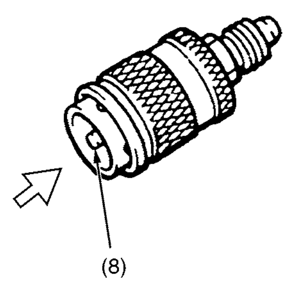

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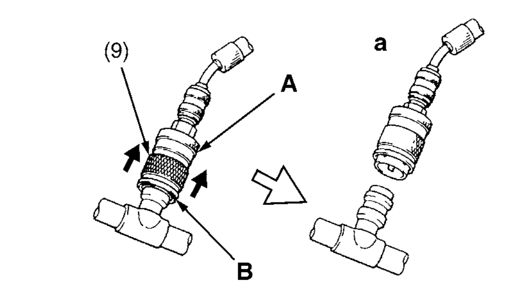


3TLABABWP011A

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 (3) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (4) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (6) into the charging valve, and push on part **A** until a click is heard.

■ **NOTE**

- **When connecting, push carefully so the pipe doesn't 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**

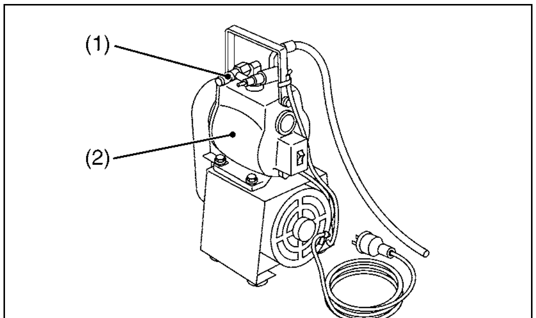
- **After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.**

(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Blue Hose
(4) Red Hose
(5) Green Hose
(6) Quick Disconnect Adaptor
(7) Sleeve
(8) Pusher
(9) Sleeve

a : CLICK

W1014039

(3) Vacuum Pump Adaptor



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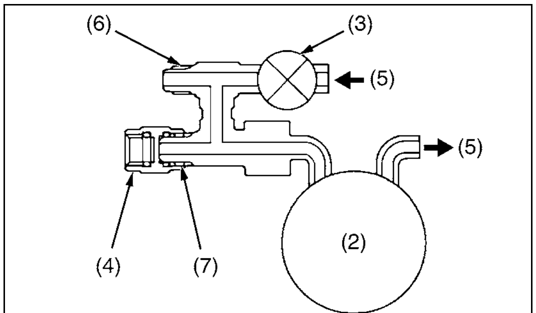


3TLABABWP013A

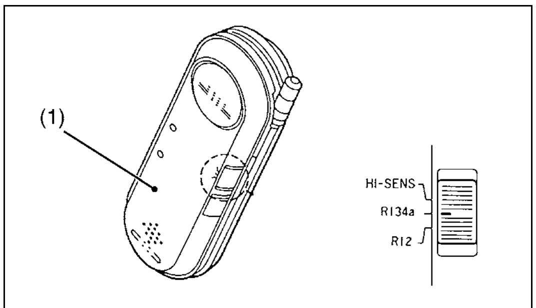
Objective of the Vacuum Pump Adaptor

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) Magnetic Valve
(4) Blind Cap
(5) Air
(6) For R134a
(7) For R12

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)

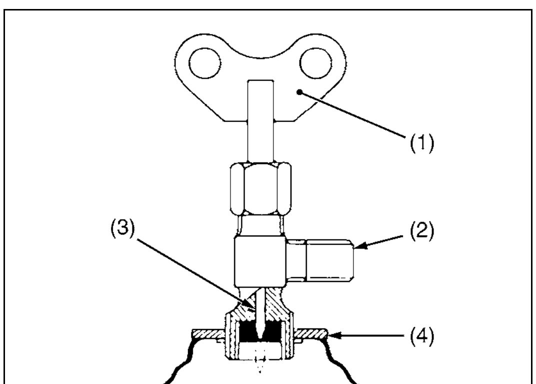
Leak tester with halide torch

- 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



3TLABABWP015A

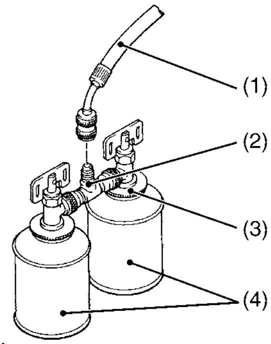
The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows :

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) (4) 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) Needle
(4) Disc

W1015014

(6) T-joint



3TLABABWP016A

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)	(3) Can Tap Valve
(2) T-joint	(4) Refrigerant Container

W1015169

(7) R134a Refrigerant Recovery and Recycling Machine

When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine. (Don’t 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

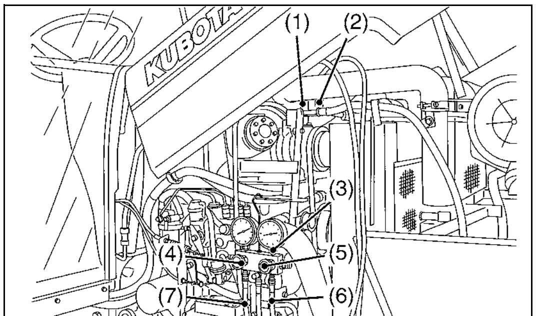
[1] CHECKING WITH MANIFOLD GAUGE

■ **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



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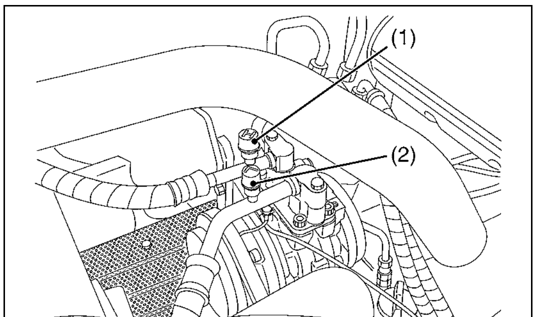

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Manifold Gauge Connecting and Test Preparation

1. Close the manifold gauge **HI** and **LO** pressure side valve (5), (4) tightly.
2. Connect the charging hose (6) (red) to the **HI** pressure side charging valve (1) and connect the charging hose (7) (blue) to the **LO** pressure side charging valve (2).

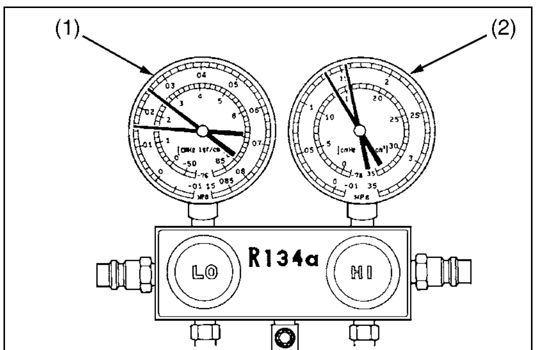
■ **NOTE**

- **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 lever to **maximum cooling** position.
5. Set the blower switch to **HI** position.

(1) **HI** Pressure Side Charging Valve
(2) **LO** Pressure Side Charging Valve
(3) Manifold Gauge
(4) **LO** Pressure Side Valve
(5) **HI** Pressure Side Valve
(6) Charging Hose (Red)
(7) Charging Hose (Blue)

W1015662



3TLABABWP019A

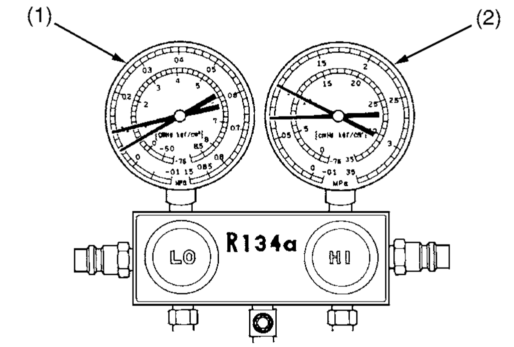
Normal Operating

If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.2 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



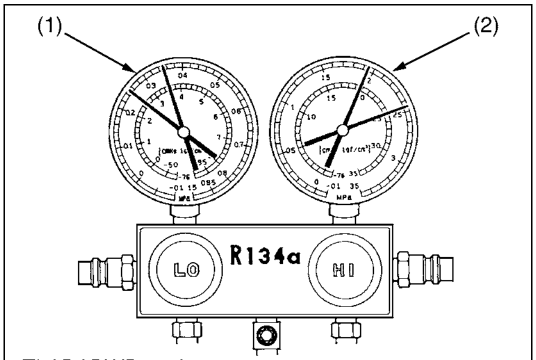
3TLABABWP020A

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 0.1 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 (see page 10-S12) and repair.
   - Recharge refrigerant to the proper level. (See page 10-S20.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1016070



3TLABABWP021A

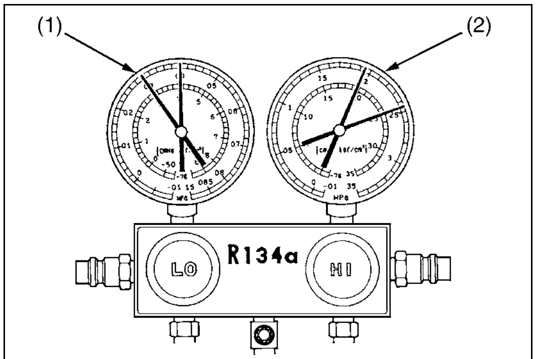
Excessive Refrigerant or Insufficient Condenser Cooling

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1) : 0.2 to 0.35 MPa
     (2.0 to 3.5 kgf/cm^2, 28 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. (See page 10-G5.)
   - Adjust air conditioner belt to proper tension. (See page 10-G5.)
   - If the above two items are in normal condition, check refrigerant quantity. (See page 10-S22.)

■ **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

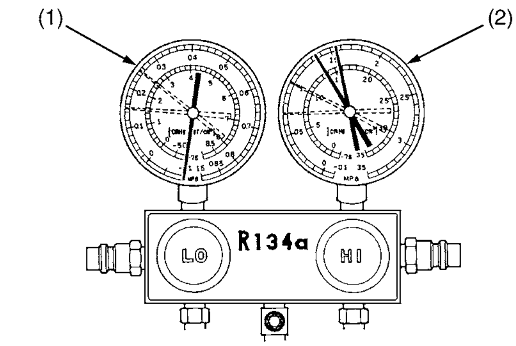
Air Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1) : 0.2 to 0.35 MPa
     (2.0 to 3.5 kgf/cm^2, 28 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. (See page 10-S19, S20.)

■ **NOTE**
- **The above cycle can be seen when the cycle is charged without evacuation.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1016771



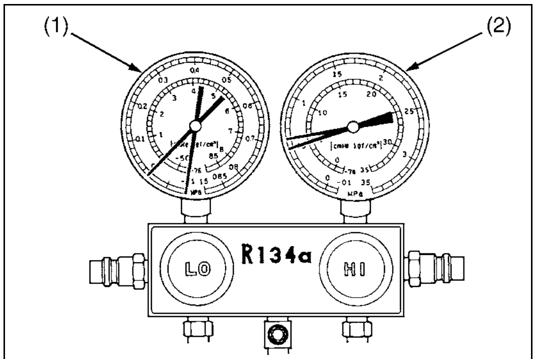
3TLABABWP023A

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. (See page 10-S19.)
   - Recharge new refrigerant to the proper level. (See page 10-S20.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1017013



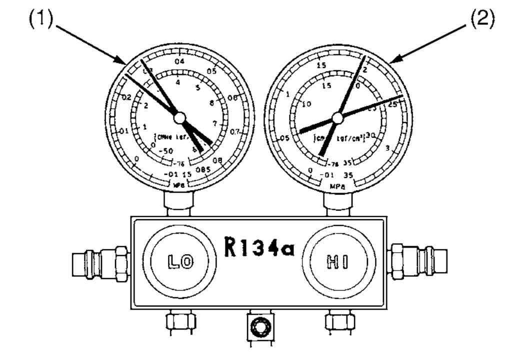
3TLABABWP024A

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)
   - Frost or dew formed on piping at front and rear sides of expansion valve or receiver.
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. (See page 10-S19, S20, S21.)
   - If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1017346



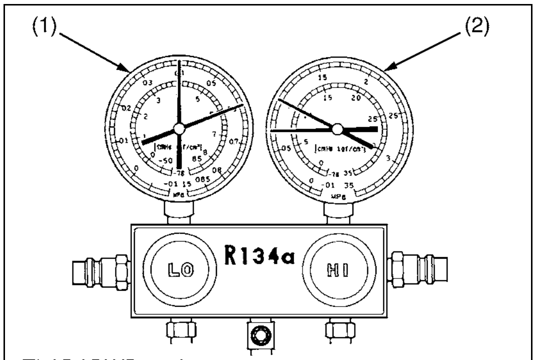
3TLABABWP025A

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
     (3.0 to 4.0 kgf/cm^2, 42.71 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



3TLABABWP026A

Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1) pressure too high : 0.39 to 0.59 MPa (4 to 6 kgf/cm^2, 56.9 to 85.3 psi)
   - **HI** pressure side (2) pressure too low : 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. (See page 10-S30.)

■ **NOTE**
- **Manifold gauge indications (left side figure) at faulty compressing by compressor.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

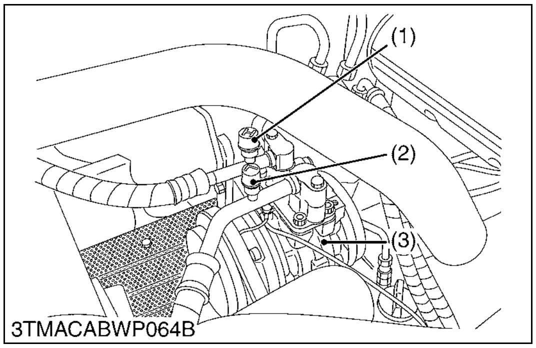
W1017960

[2] DISCHARGING EVACUATING AND CHARGING

■ **IMPORTANT**

- **When discharging, evacuating or charging the refrigerating system, be sure to observe the "PRECAUTION AT REPAIRING REFRIGERANT CYCLE". (See page 10-S8.)**

(1) Discharging the System



Prepare for the R134a refrigerant recovery and recycling machine.

1. Connect low pressure side hose (blue) from the recovery and recycling machine to **LO** pressure side charging valve (2) on the compressor (3). Connect high pressure side hose (red) to **HI** pressure side charging valve (1) on the compressor (3).
2. Follow the manufacturers instructions and discharge the system.

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine. Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 systems to prevent compressor damage.**

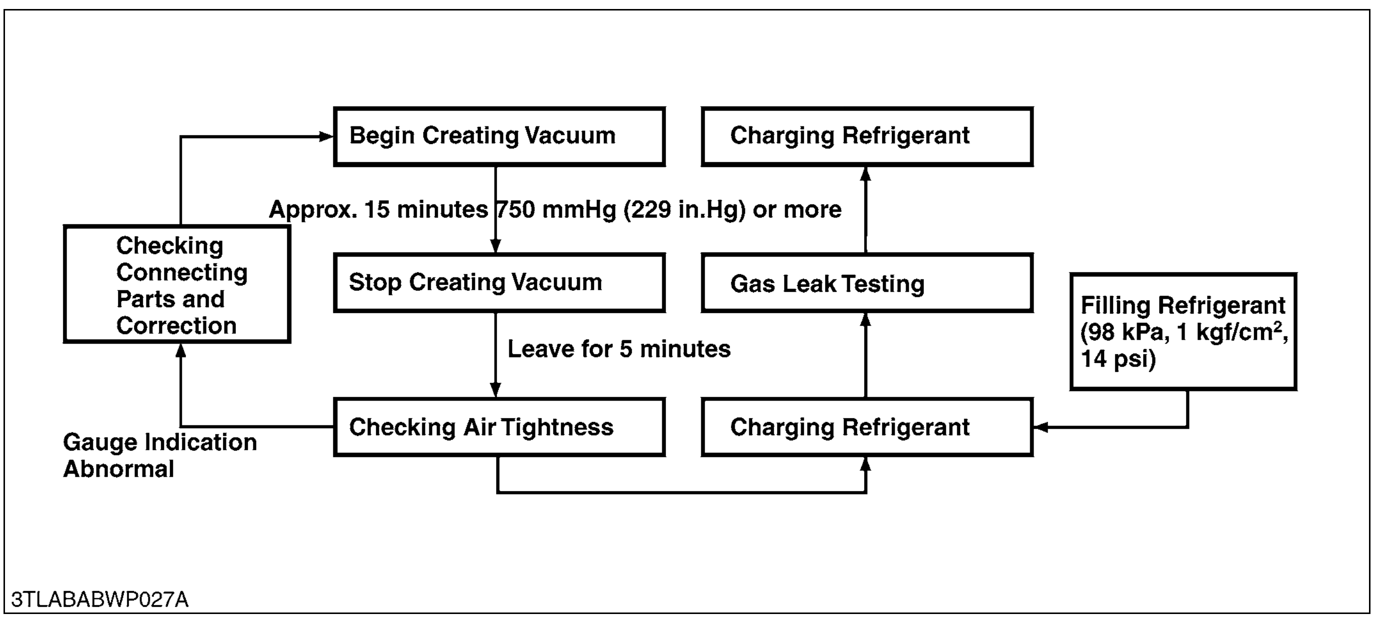
CAUTION

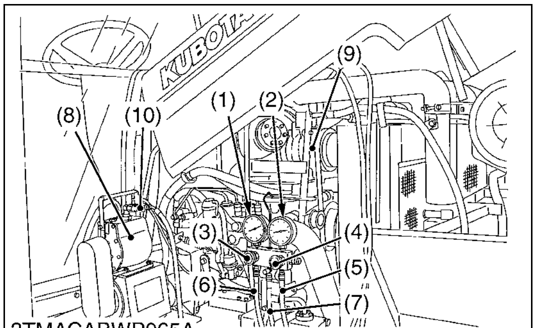
- **Protect fingers with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.**

(1) **HI** Pressure Side Charging Valve
(2) **LO** Pressure Side Charging Valve
(3) Compressor

W1018328

(2) Evacuating the System





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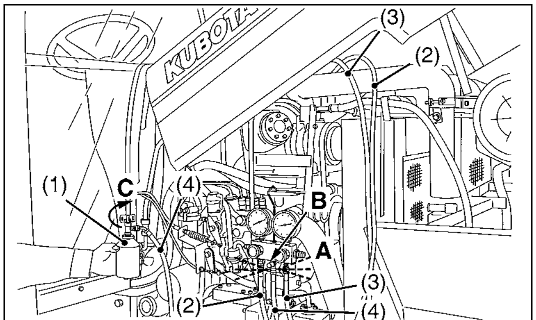
Evacuating the System

1. Discharge refrigerant from the system by R134a refrigerant recovery and recycling machine. (Refer to **"Discharging the system"**.)
2. Connect the charging hose (5) (red) to the **HI** pressure side charging valve and connect the charging hose (6) (blue) to the **LO** pressure side charging valve.
3. Connect the center charging hose (7) (green) to a vacuum pump inlet.
4. Open both valves (3), (4) of manifold gauge fully. Then run the vacuum pump (8) 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 (8) and close both valves (3), (4) of manifold gauge fully.
6. Wait for over 5 minutes with the **HI** and **LO** pressure side valves (4), (3) 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) **LO** Pressure Side Valve (Close)
(4) **HI** Pressure Side Valve (Open)
(5) Red Hose
(6) Blue Hose
(7) Green Hose
(8) Vacuum Pump (Running)
(9) Compressor
(10) Vacuum Pump Adaptor

W1018495

(3) Charging the System



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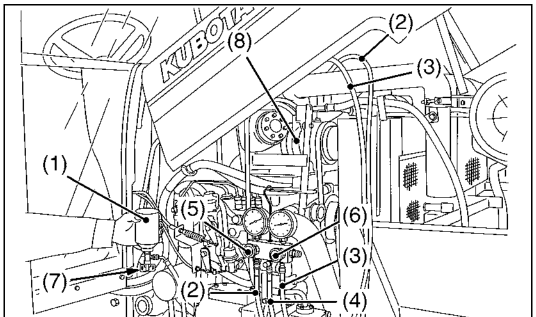


3TMACABWP067A

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 (6), (5) of manifold gauge after the system is evacuated completely.
2. Connect the center charging hose (4) to the can tap valve (7) fitting, and then loosen the center charging hose 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 (6) 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**

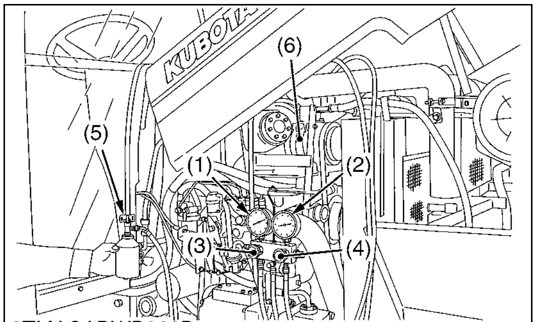
- **If LO pressure gauge does not show a reading, the system is clogged and must be repaired.**

5. Close the **HI** pressure side valve (6) of manifold gauge and can tap valve of refrigerant container.

(1) Refrigerant Container (R134a)
(2) Blue Hose
(3) Red Hose
(4) Green Hose
(5) **LO** Pressure Side Valve (Close)
(6) **HI** Pressure Side Valve (Open)
(7) Can Tap Valve (Open)
(8) Compressor

A : Air Purge
B : Loosen the Nut
C : Open the Can Tap Valve

W1018931



3TMACABWP066B

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 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 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 valve (3) of manifold gauge and the can tap valve (5) 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 valve (3) of manifold gauge and can tap valve (5), then stop the engine.
6. Check for gas leak with an electric gas leak tester (see page 10-G11).

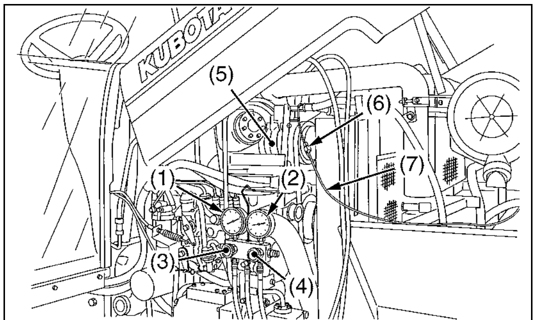
(Reference)

- Specified amount of refrigerant (total) :
  900 to 1000 g (1.98 to 2.21 lbs) [Refrigerant R134a]
- 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) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **LO** Pressure Valve (Open)
(4) **HI** Pressure Valve (Close)
(5) Can Tap Valve
(6) Compressor (Running)

W1019245

(4) Checking Charge Refrigerant Amount



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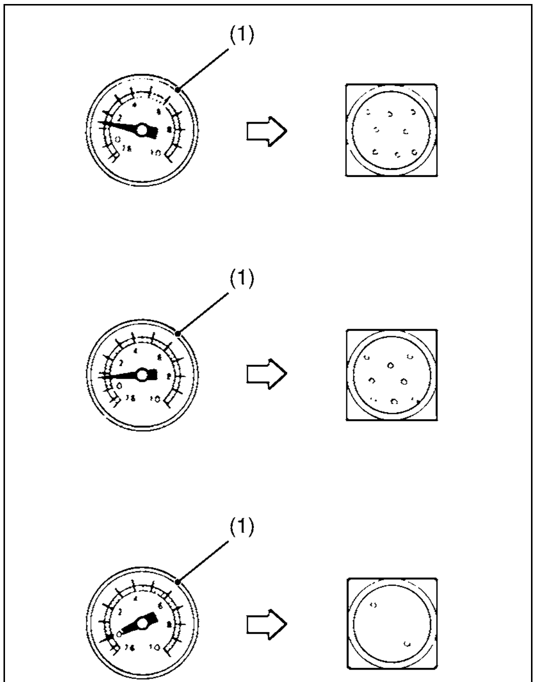


3TLABABWP031A

After charging the refrigerant, check for amount of charging refrigerant as follows.

■ **NOTE**

- **The pressure on the following checking are 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 (6) of magnetic clutch.
2. Start the engine and set a approx. **1500 min^{-1} (rpm)**.
3. Connect the **1P** connector (6) 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 becomes as stated below depending on refrigerant charged amount.

A : 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.

B : 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).

C : 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.

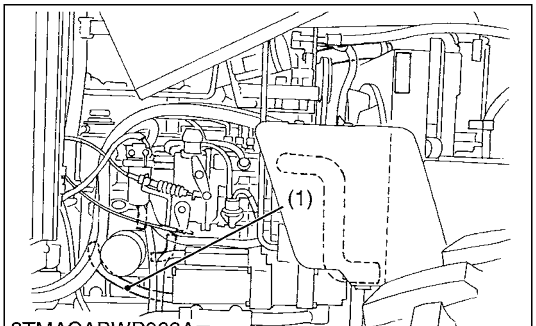
(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **LO** Pressure Valve (Close)
(4) **HI** Pressure Valve (Close)
(5) Compressor (Running)
(6) **1P** Connector
(7) To Battery

W1019604

6. CHECKING, DISASSEMBLING AND SERVICING

[1] SEPARATING CABIN FROM TRACTOR BODY

(1) Disassembling and Assembling



3TMACABWP069A

Draining Coolant

CAUTION

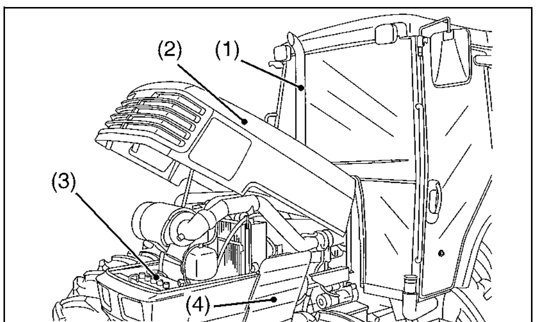
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. Remove the radiator hose (1) from the engine side to drain the coolant.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator hose.

Coolant	Capacity	M6800SQ	8.5 L 9.0 U.S.qts. 7.5 Imp.qts.
		M8200Q M9000Q	9.0 L 9.51 U.S.qts. 7.9 Imp.qts.

(1) Radiator Hose

W1010799



3TMACABWP070A

Preparation 1

1. Remove the muffler (1).
2. Remove the bonnet (2).
3. Disconnect the battery's cable.
4. Remove the side cover (4).

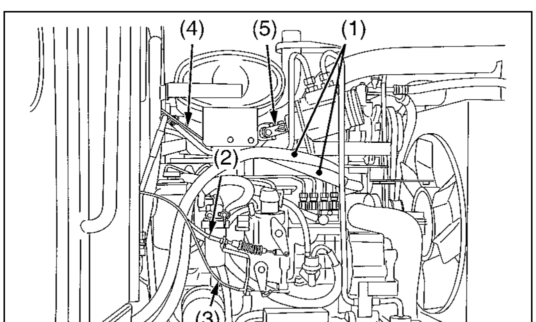
(1) Muffler
(2) Bonnet
(3) Battery
(4) Side Cover

W1010954

Discharging Refrigerant

1. Refer to **"Discharging the System"**. (See page 10-S18.)

W1020852



3TMACABWP071A

Preparation 2

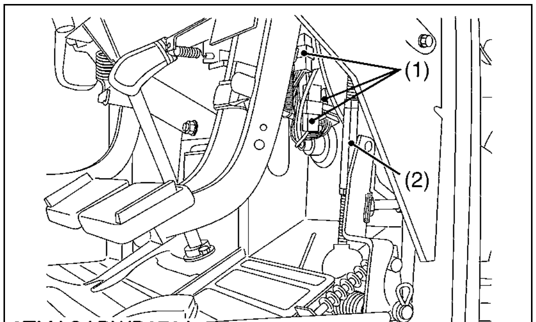
1. Disconnect the heater hoses (1).
2. Disconnect the accelerator wire (2) and engine stop wire (3).
3. Disconnect the hour meter cable (4).
4. Pull out the steering joint (5).

(When reassembling)

- Connect the heater hose with blue paint one which comes from cabin to the radiator lower hose side.

(1) Heater Hose
(2) Accelerator Wire
(3) Engine Stop Wire
(4) Hour Meter Cable
(5) Steering Joint

W1020910



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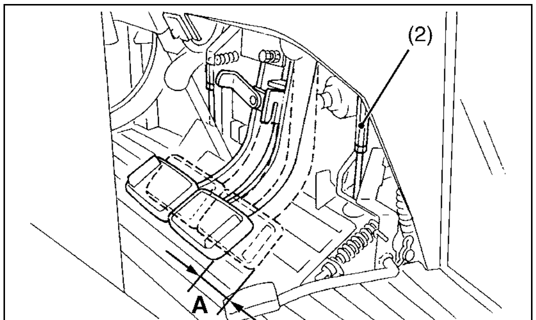

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Preparation 3

1. Disconnect the connectors (1) and pull out it from cabin.
2. Disconnect the brake rod R.H. (2) from turnbuckle and remove it.

(When reassembling)

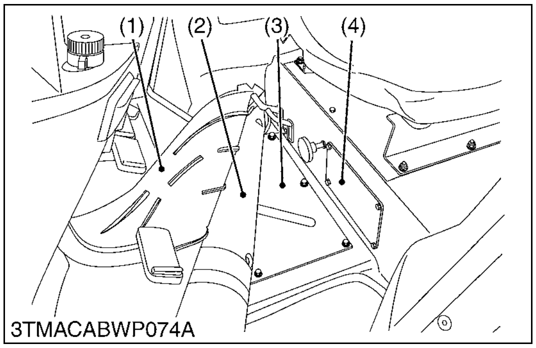
- Be sure to adjust the brake pedal free travel.

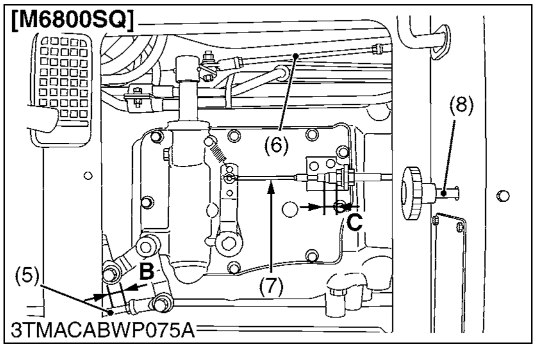
Proper brake pedal free travel (**A**)	Factory spec.	40 to 45 mm (1.57 to 1.77 in.) in the pedal Keep the free travel in the right and left brake pedals equal.

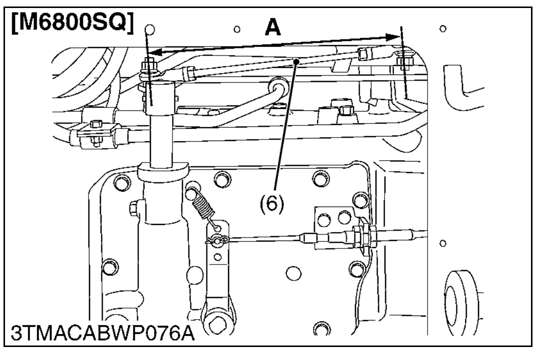
(1) Connector
(2) Brake Rod R.H.

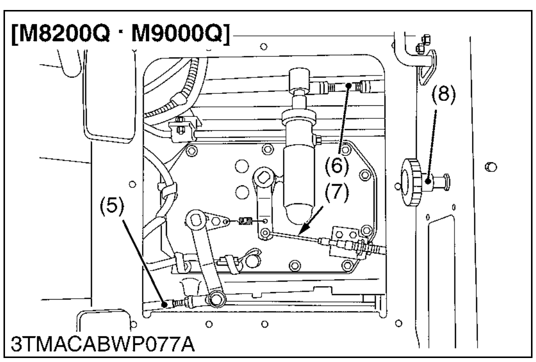
A : Brake Pedal Free Travel

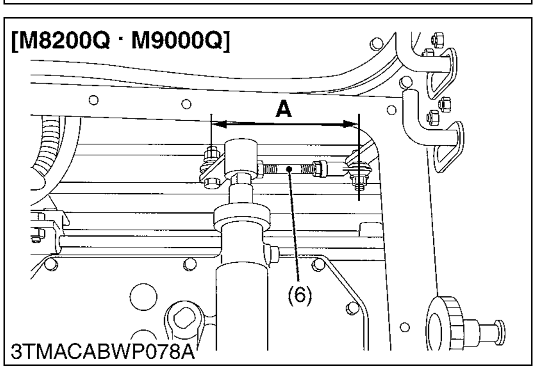
W1021042











Preparation 4

1. Remove the floor mat 1 (1), floor mat 2 (2) and cover 1 (3), cover 2 (4).
2. Disconnect the shuttle shift rod (5) and main shift rod (6).
3. Disconnect the shift wire (7).
4. Disconnect the lowering speed adjusting rod (8).

(When reassembling)

- Be sure to adjust the main shift rod length (**A**), if necessary.

Shift rod length (**A**)	Factory spec.	M6800SQ	Approx. 275 mm 10.8 in.
		M8200Q M9000Q	Approx. 155 mm 6.10 in.

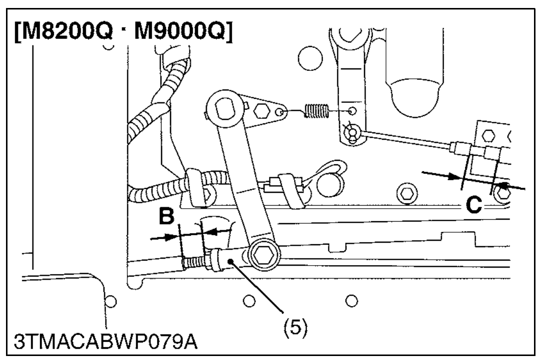
- Be sure to adjust the length (**B**) and (**C**) (both sides) of shuttle shift rod (5) and shift wire (7), if necessary.

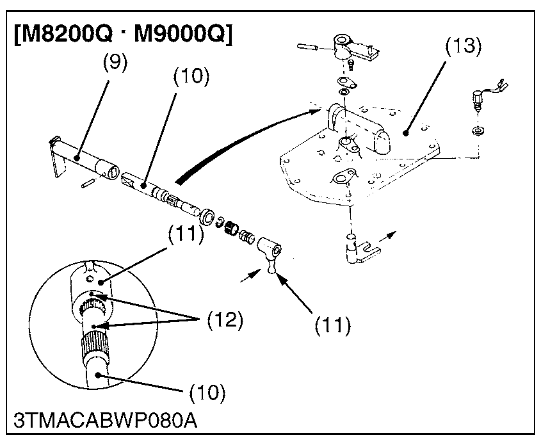
Shuttle rod length (**B**)	Factory spec.	Approx. 10.0 mm 0.39 in.
Shuttle wire length (**C**)	Factory spec.	Approx. 10.0 mm 0.39 in.

■ **NOTE**

(When reassembling)

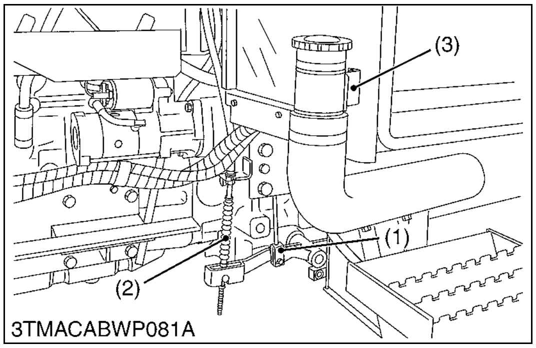
- When install the shaft (10) to the cam (11), be sure to align the alignment mark (12) in the figure left.

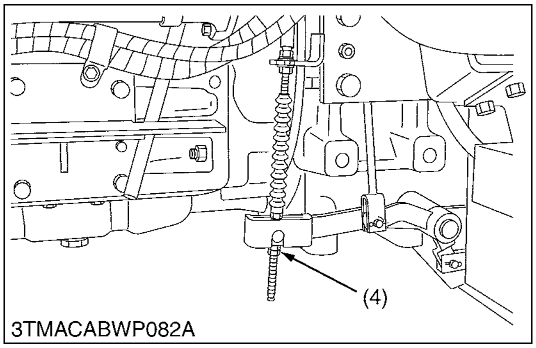




(1) Floor Mat 1
(2) Floor Mat 2
(3) Cover 1
(4) Cover 2
(5) Shuttle Shift Rod
(6) Main Shift Rod
(7) Shift Wire
(8) Lowering Speed Adjusting Rod
(9) Lever
(10) Shaft
(11) Cam
(12) Alignment Mark
(13) Speed Change Cover

W1021299





Preparation 5

1. Disconnect the brake rod L.H. (1) from turnbuckle and remove it.
2. Disconnect the clutch cable (2).
3. Remove the cap stay (3).

(When reassembling)

- Be sure to adjust the clutch pedal free travel.

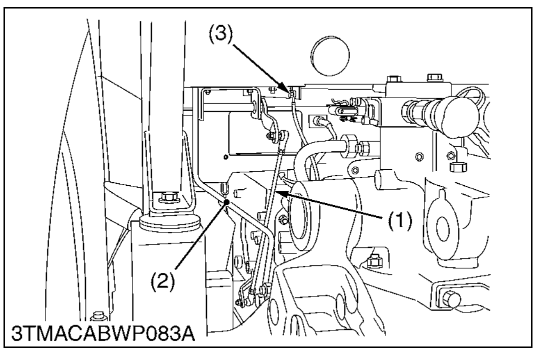
Proper clutch pedal free travel	Factory spec.	35 to 45 mm (1.38 to 1.77 in.) on the pedal

(Adjusting Procedure)

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. If adjustment is needed, loosen the lock nut (4) and adjust the cable length within acceptable limits.
4. Retighten the lock nut (4).

(1) Brake Rod L.H.
(2) Clutch Cable
(3) Cap Stay
(4) Lock Nut

W1021892



Preparation 6

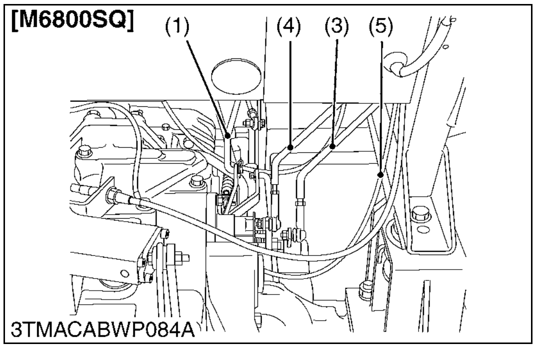
1. Disconnect the auxiliary speed change rod (1).
2. Disconnect the DT shift rod (2).
3. Disconnect the earth harness (3).

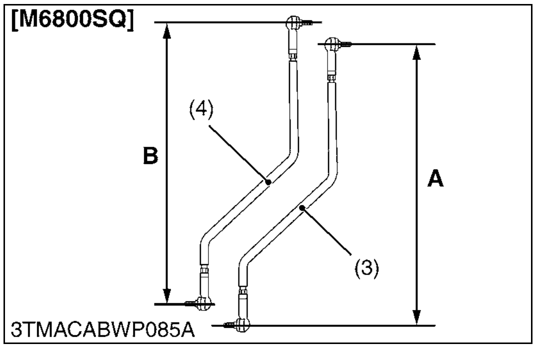
(When reassembling)

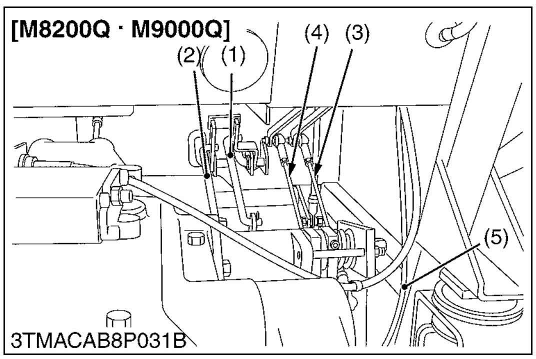
Auxiliary Speed Change Rod (H-2)	Reference	469 mm 18.46 in.
Auxiliary Speed Change Rod (Creep)	Reference	430 mm 16.93 in.

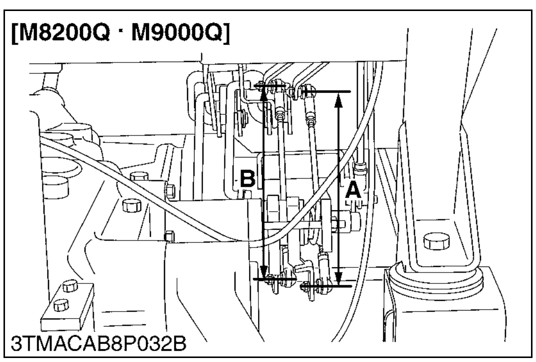
(1) Auxiliary Speed Change Rod
(2) DT Shift Rod
(3) Earth Harness

W1022265









Preparation 7

1. Disconnect the differential lock rods (1), (2).
2. Disconnect the position control rod (3) and draft control rod (4).
3. Disconnect the PTO wire (5).

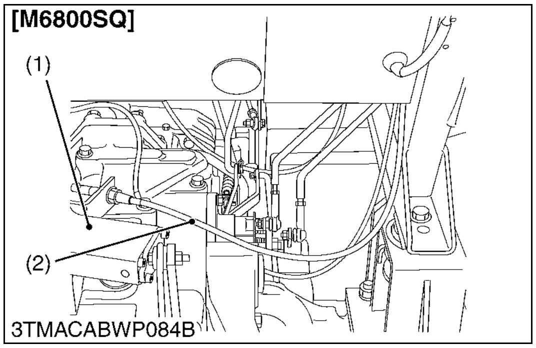
(When reassembling)

- Be sure to adjust the position rod length **A** and draft rod length **B**.

Position rod length (**A**) and draft rod length (**B**)	Factory spec.	M6800SQ	Approx. 362 mm 14.25 in.
		M8200Q M9000Q	Approx. 264 mm 10.39 in.

(1) Differential Lock Rod (Front)
(2) Differential Lock Rod (Rear)
(3) Position Control Rod
(4) Draft Control Rod
(5) PTO Wire

W1022378



Preparation 8

1. Disconnect the auxiliary control valve wire (2).

■ **NOTE**

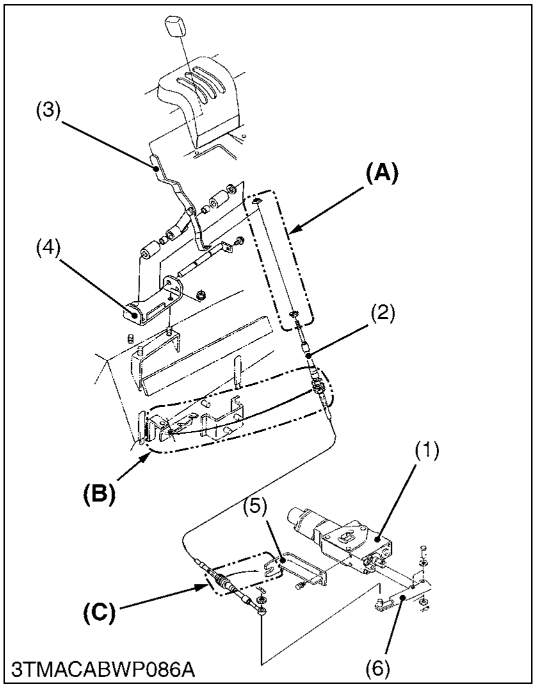
- **Available auxiliary control valves are as table below.**

Abbreviation	Type of auxiliary control valve
SCD	Self-Cancelling Detent Valve
SCD/FC	Self-Cancelling Detent with Flow Control Valve
S/D	Single or Double Acting Valve
FD	Floating Detent Valve

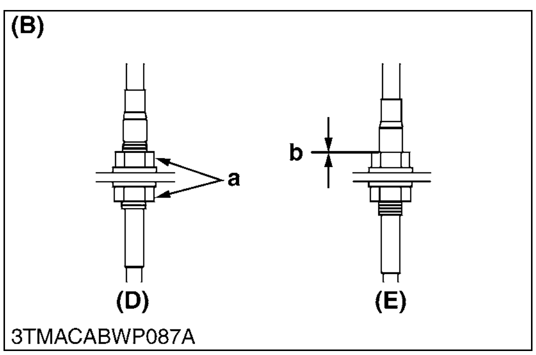
(When reassembling)

- Be sure to fix the auxiliary control valve wire (2) within allowance wire stroke **S_1**, and clearance **S_2** properly.

Allowance wire stroke : **S_1**	Factory spec.	5.0 to 7.0 mm 0.20 to 0.28 in.
Clearance between operation lever and stopper : **S_2**	Factory spec.	0.0 to 1.0 mm 0.0 to 0.04 in.

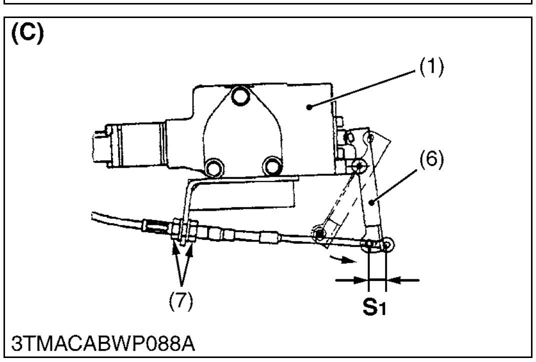


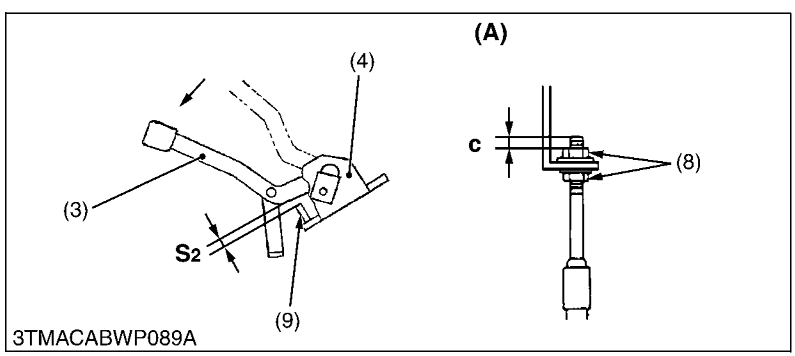
1. Secure the wire fixing position **B** according to the type of the valve as shown in figure.
2. Temporarily secure the wire fixing position **C** at the center of the thread allowance to the holder (5).
3. Pull the auxiliary control valve support (6) and the auxiliary control valve wire (2) all the way, and finely adjust the allowance wire stroke **S_1** within the factory specification, with fixing nuts (6) of fixing position **C**. (Keep the fixing position **A** open.)
   Tighten the fixing nuts (7) securely.
4. Connect the auxiliary control valve's wire end to the auxiliary control valve support (6).
5. Connect the auxiliary control valve's wire end to the operation lever (3). (Fixing position **A**)
6. Pull the operation lever (3) and finely adjust the clearance **S_2** within the factory specification, with fixing nuts (8) of fixing position **A**.



■ **NOTE**

- **If the bracket (4) has not welded the stopper (9), adjust the thread length of c to 5.0 mm (0.20 in.) with fixing nuts (8) at fixing position A.**

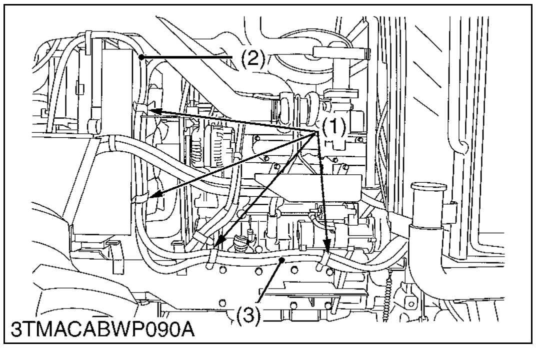




(1) Auxiliary Control Valve
(2) Auxiliary Control Valve Wire
(3) Operation Lever
(4) Bracket
(5) Holder
(6) Auxiliary Control Valve Support
(7) Fixing Nut
(8) Fixing Nut
(9) Stopper

(A) Fixing Position A
(B) Fixing Position B
(C) Fixing Position C
(D) SCD, SCD/FC, SD Type Valve
(E) FD Type Valve
a : Center
b : 0.0 mm (0.0 in.)
c : 5.0 mm (0.20 in.)

W1055302



3TMACABWP090A

Preparation 9

1. Remove the hose clamps (1).
2. Disconnect the low pressure pipe (3) from receiver.
3. Disconnect the high pressure pipe (2) from compressor.

■ **IMPORTANT**

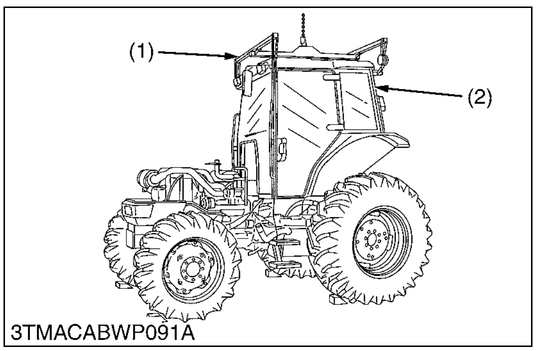
- **Be sure to seal the low and high pressure pipe joint ports to keep dry condition for the receiver.**

(When reassembling)

Tightening torque	Low pressure pipe retaining nut	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.7 to 10.8 ft-lbs
	High pressure pipe 2 mounting screw	7.8 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs

(1) Hose Clamp
(2) High Pressure Pipe 2
(3) Low Pressure Pipe

W1022608



3TMACABWP091A

Dismounting Cabin

1. Set the cabin dismounting tool (1).
2. Remove the cabin mounting bolts and nuts.
3. Dismounting the cabin from tractor body (2).

(When reassembling)

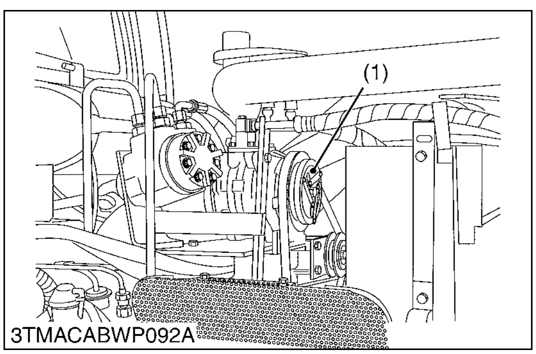
Tightening torque	Cabin mounting screws and nuts	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

(1) Dismounting Tool
(2) Cabin Body

W1022857

[2] COMPRESSOR

(1) Checking



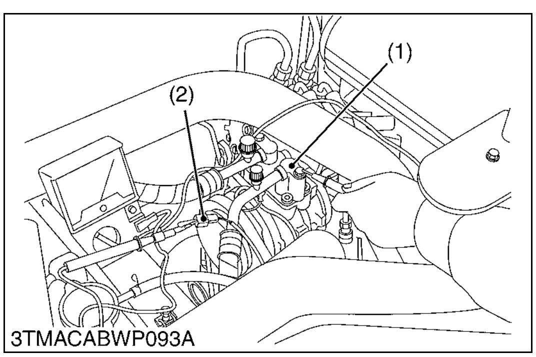
3TMACABWP092A

Operation of Magnetic Clutch

1. Start the engine.
2. Check whether abrasion of abnormal noise is heard when only the magnetic clutch pulley is running while the A/C switch is turned **OFF**.
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

W1023036



3TMACABWP093A

Stator Coil

1. Measure the resistance of the stator coil with an ohmmeter across the **1P** connector of magnetic clutch and stator body.
2. If the measurement is not within the factory specifications, replace the stator coil.

Stator coil resistance	Factory spec.	3.0 to 3.4 Ω

(1) Stator Body
(2) **1P** Connector

W1023168

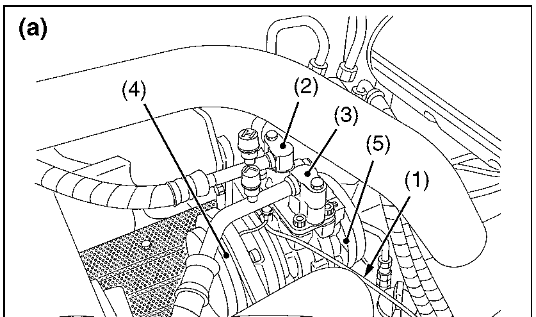
(2) Disassembling and Assembling

■ **NOTE**

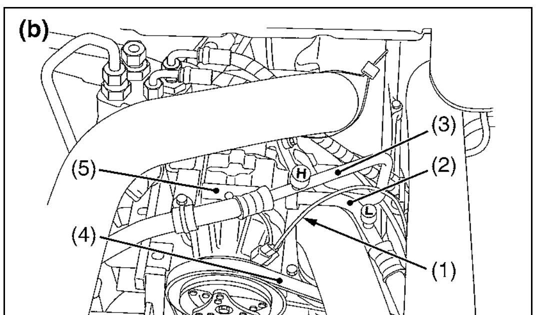
- **There are two type of compressors, one is swash plate type, the other one is scroll type. Affected serial number as below.**

Model	Serial Number		
	Type 1 (Swash plate type compressor)	Type 2 (Scroll type compressor)	Type 3 (New scroll type compressor)
M6800SQ	Below 20892	20893 to 21578	Above 21579
M6800SDTQ	Below 63129	63130 to 65762	Above 65763
M8200Q	Below 10798	10799 to 11018	Above 11019
M8200DTQ	Below 53142	53143 to 54363	Above 54364
M8200HDQ	–	Below 54287	Above 54288
M9000Q	Below 10913	10914 to 11322	Above 11323
M9000DTQ	Below 54965	54966 to 58436	Above 58437
M9000HDQ	–	Below 58281	Above 58282

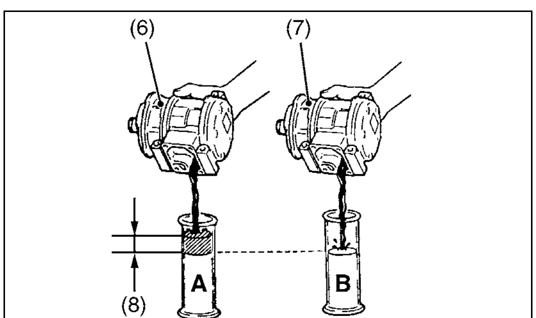
W1093089



3TMACABWP064C



3TMACABWP094A



3TLABABWP034A

__Compressor Assembly__

1. Discharge the refrigerant from the system. (Refer to **“Discharging the System”** : See page 10-S18.)
2. Disconnect the low pressure pipe (suction) (3) and high pressure pipe (discharge) (2) from the compressor, then cap the open fittings immediately to keep moisture out of the system.
3. Disconnect the **1P** connector (1) of magnetic clutch.
4. Remove the air conditioner belt (4) and remove the compressor (5).

(When reassembling)

- After reassembling the compressor, be sure to adjust the air conditioner belt tension (see page 10-G5) and recharge the refrigerant to the system. (Refer to **“Charging the System”** : See page 10-S20.)
- 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).

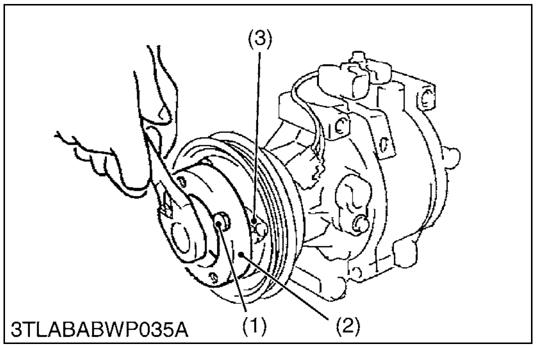
(When replacing compressor)

- When replacing the compressor with a new one, meet the oil amount with old one.

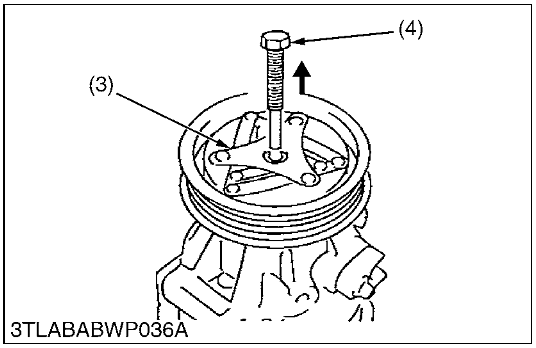
Tightening torque	High pressure pipe and low pressure pipe mounting screw	7.8 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs
	Compressor mounting screws	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

(1) **1P** Connector Harness
(2) High Pressure Pipe
(3) Low Pressure Pipe
(4) Air-conditioner Belt
(5) Compressor
(6) New Compressor
(7) Old Compressor
(8) Remove the Excess Oil (**A**-**B**)
(a) Swash Plate Type Compressor
(b) Scroll Type Compressor

W1063524



3TLABABWP035A



3TLABABWP036A

Hub Plate or Center Piece

1. Three stopper bolts (1) are set in stopper magnet clutch (2) at the position corresponding to the shape of compressor. (See page 10-G13.)
2. The stopper magnet clutch (2) is hung on hub plate (3) and it is fixed that the compressor rotates.
3. Remove the magnet clutch mounting screw or nut.
4. Remove the hub plate (3) (scroll type compressor) or center piece (swash plate type compressor).
   - Scroll type compressor is used remover magnet clutch (4). (See page 10-G13.)
5. Remove the shims.

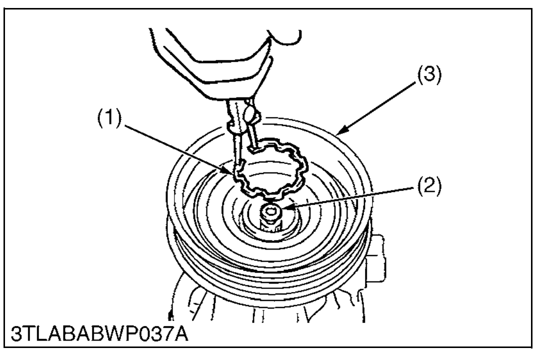
(When reassembling)

- Do not apply grease or oil on the hub plate facing.
- Do not use the screw or nut again.
- It is confirmed to turn rotor by hand after assembling and not contact with stator and center piece.
- Check and adjust the air gap before tight the magnet clutch mounting screw or nut to the specified torque.

Tightening torque	Clutch mounting nut (swash plate type compressor)	14.7 to 24.5 N·m 1.5 to 2.5 kgf·m 10.8 to 18.1 ft-lbs
	Clutch mounting screw (scroll type compressor)	10.8 to 16.2 N·m 1.10 to 1.65 kgf·m 8.0 to 11.9 ft-lbs

(1) Stopper Bolt
(2) Stopper Magnet Clutch
(3) Hub Plate
(4) Remover Magnet Clutch

W1065952



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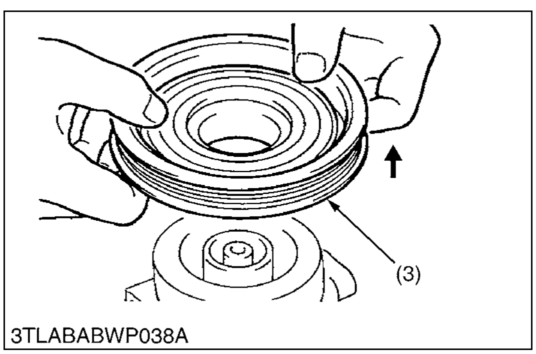


3TLABABWP038A

Rotor

1. Remove the cir-clip (1).
2. Remove the rotor (3).

(When reassembling)

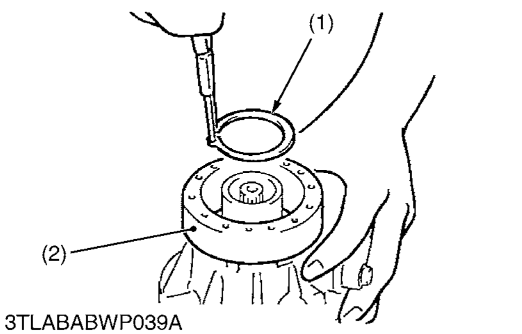
- Do not use the cir-clip again.
- Assemble the cir-clip for the tapered side to become outside of rotor.
- The width of expanding of cir-clip is set in boss of shaft as a minimum.

(Reference)

Type of compressor	Code No. for circlip
Swashplate type	T0070-87310
Scroll type	T1065-87450

(1) Cir-Clip
(2) Shim
(3) Rotor

W1066765



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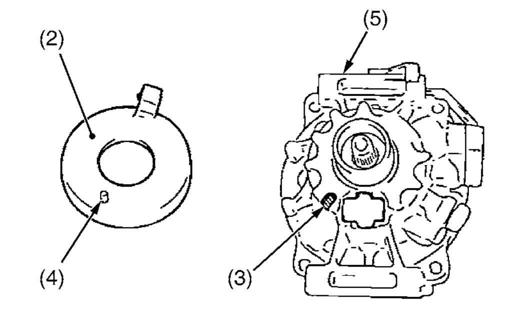


3TLABABWP040A

Stator

1. Remove the lead wire from compressor body.
2. Remove the external circlip (1) (scroll type compressor).
3. Remove the stator (2).

(When reassembling)

- Do not use the cir-clip again.
- Assemble the cir-clip for the tapered side to become outside of front housing.
- The width of expanding of cir-clip is set is boss of shaft as a minimum.
- Match and assemble the concave part (3) of the front housing (5) and the pin (4) of stator.

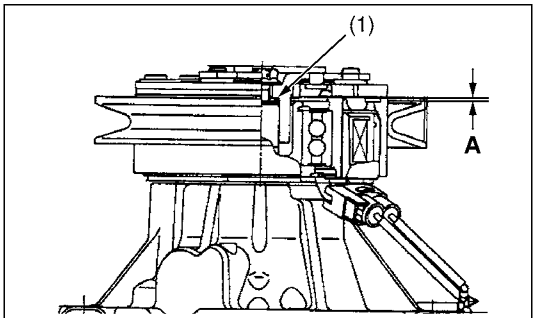
(Reference)

Type of compressor	Code No. for circlip
Swash plate type	T0070-87440
Scroll type	T1065-87440

(1) External Circlip
(2) Stator
(3) Concave Part
(4) Pin
(5) Front Housing

W1067502

(3) Servicing



3TLABABWP041A

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 is added or deleted.

Air-gap	Swash plate type compressor	Factory spec.	0.25 to 0.50 mm 0.010 to 0.020 in.
	Scroll type compressor		0.35 to 0.65 mm 0.014 to 0.022 in.

(Reference)

	Adjustment shim for swash plate type compressor	Adjustment shim for scroll type compressor
0.10 mm (0.0039 in.)	T0070-87340	T1065-87340
0.15 mm (0.0059 in.)	T0070-87350	T1065-87350
0.40 mm (0.016 in.)	T0070-87360	T1065-87360
0.60 mm (0.024 in.)	T0070-87370	T1065-87370
1.0 mm (0.0394 in.)	T0070-87380	T1065-87380

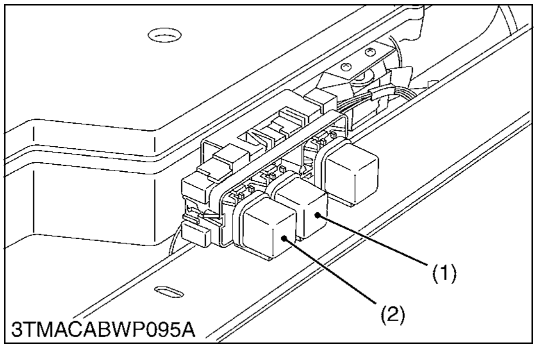
(1) Shim
A : Air-Gap

W1068278

[3] AIR CONDITIONING SYSTEM AND FRONT WINDSHIELD WIPER

(1) Checking

(A) Air Conditioner Unit



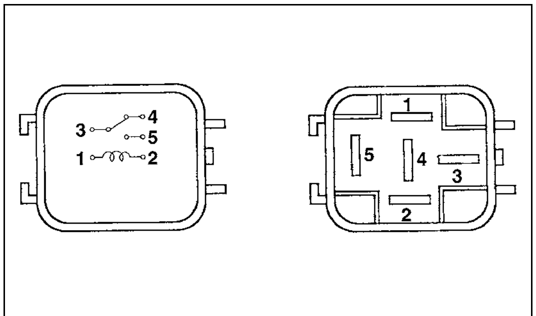
3TMACABWP095A

1) Connector Voltage (A/C Main Relay, Compressor Relay)

1. When turning the main switch **"ON"** and voltage across the **1** terminal and chassis should be approx. battery voltage.
2. The voltage across the **4** terminal and chassis should be approx. battery voltage.

(1) Compressor Relay (2) A/C Main Relay

W1024046



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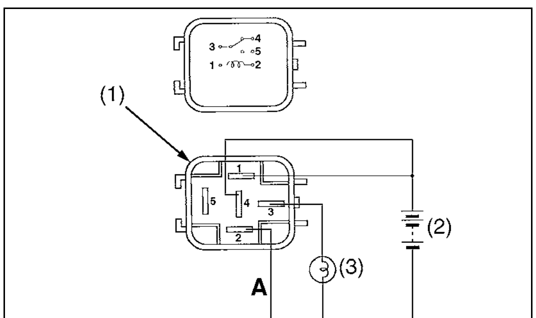


3TMACABWP097A

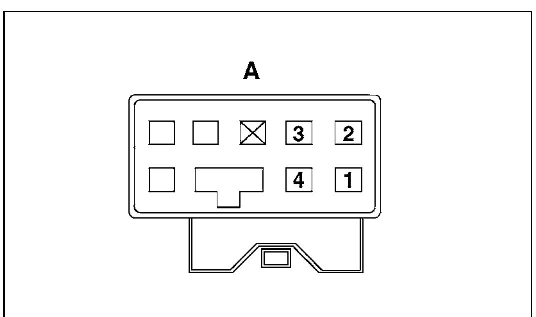
2) Relay Test (A/C Main Relay, Compressor Relay)

1. Remove the relay (1).
2. Connect the battery (2) and bulb (3) with the relay (1) as shown in the figure left.
3. If the bulb on when disconnecting the jumper lead (**A**) from the relay terminal and if the bulb off when connecting the jumper lead (**A**) to the relay **2** terminal, the relay is proper.

(1) Relay (3) Bulb
(2) Battery **A : Jumper Lead**

W1024182

(B) Blower Switch



3TMACABWP098A

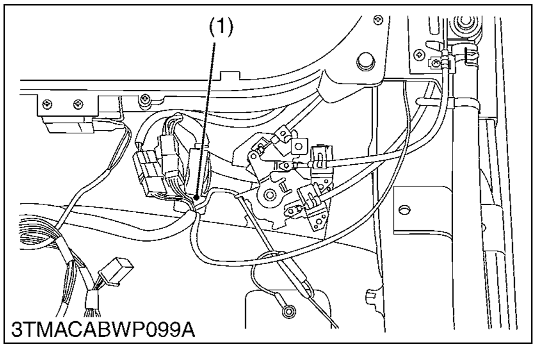
Connector Voltage

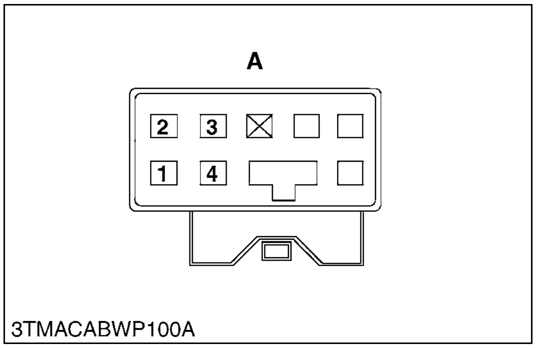
1. Disconnect the blower switch connector **8D**.
2. Turn the main switch **ON** position.
3. Measure the voltage with a voltmeter across the connector **3** terminal and **4** terminal.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay, fuse or main switch is faulty.

Voltage	**3** terminal – **4** terminal	Approx. battery voltage

A : Wire Harness Side Connector 8D

W1021363





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.

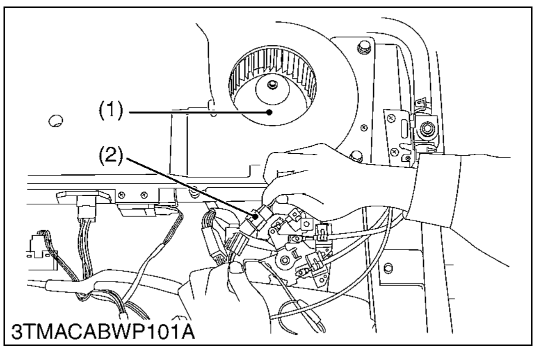
Position \ Terminal		4	3	2	1
Blower switch	OFF	●			
	Low	●——	●		
	Medium	●——	●——	●	
	High	●——	●——	——	●

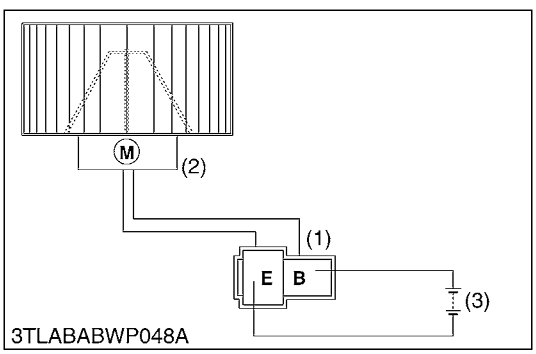
(1) Blower Switch

A : Switch Side

W1021517

(C) Blower Motor





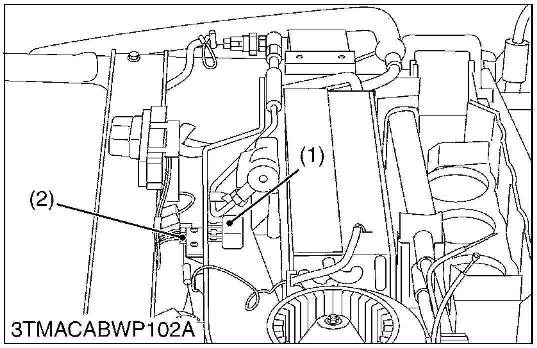
Blower Motor Test

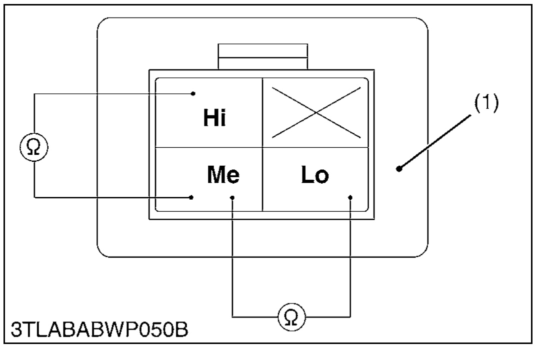
1. Remove the outer roof.
2. Turn the blower motor (1) by hand and check whether it turns smoothly.
3. Disconnect the connector (2) of blower motor (1).
4. Connect a jumper lead from battery (3) positive terminal to connector **B** terminal.
5. Connect a jumper lead from battery negative terminal to connector **E** terminal momentarily.
6. If the blower motor does not run, check the motor.

(1) Blower Motor
(2) Blower Motor Connector
(3) Battery (12 V)

W1024850

(D) Blower Resistor





Blower Resistor Check

1. Disconnect the **4P** connector (2) for blower resistor (1).
2. Measure the resistance with an ohmmeter across the **Hi** terminal and **Me** terminal, and across the **Lo** terminal and **Me** terminal.
3. If the factory specifications are not indicated, renew blower resistor.

Resistance	Factory spec.	**Hi** terminal – **Me** terminal	Approx. 0.9 Ω
		Lo terminal – **Me** terminal	Approx. 1.8 Ω

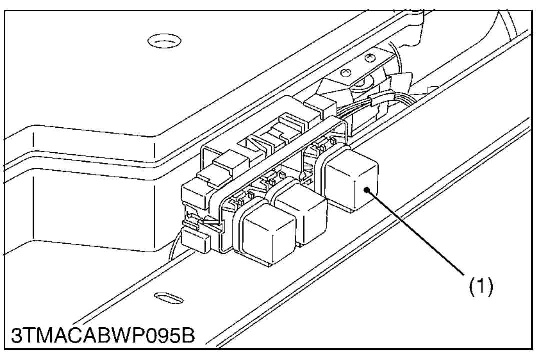
(1) Blower Resistor (2) Blower Resistor Connector

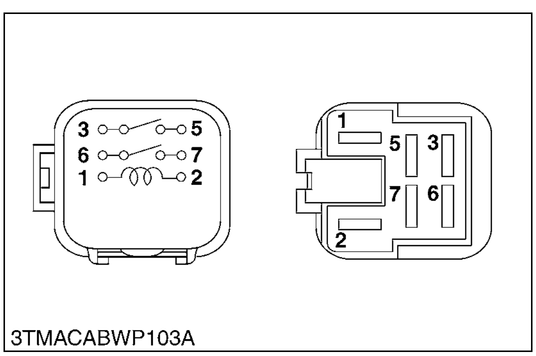
W1025049

(E) Blower High Relay

■ **NOTE**

- **Affected serial number of blower high relay as below**
  M6800SQ : Above 20869
  M6800SDTQ : Above 62881
  M8200Q : Above 10799
  M8200DTQ : Above 53143
  M9000Q : Above 10916
  M9000DTQ : Above 54967



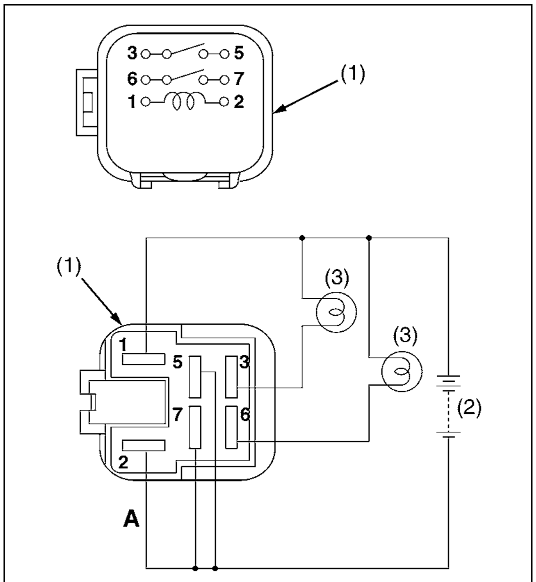


1) Connector Voltage

1. When turning the main switch **“ON”** and voltage across the **1** terminal and chassis should be approx. battery voltage.
2. The voltage across the **5**, **7** terminal and chassis should be approx. battery voltage.

(1) Blower High Relay

W1047635



3TMACABWP104A

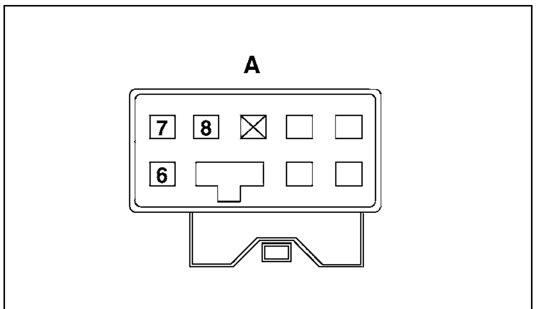
2) Relay Test

1. Remove the relay (1).
2. Connect the battery (2) and bulbs (3) with the relay (1) as shown in the figure left.
3. If the bulb on when connecting the jumper lead (**A**) from the relay **2** terminal and if the bulb off when disconnecting the jumper lead (**A**) to the relay **2** terminal, the relay is proper.

(1) Relay
(2) Battery
(3) Bulb
A : Jumper Lead

W1050140

(F) A/C Switch



3TMACABWP098B

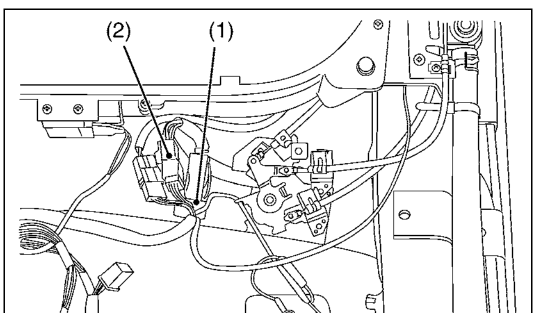
Connector Voltage

1. Disconnect the A/C switch connector **8D**.
2. Turn the main switch **ON** position.
3. Measure the voltage with a voltmeter across the connector **6** terminal and **7** terminal.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay or fuse is faulty.

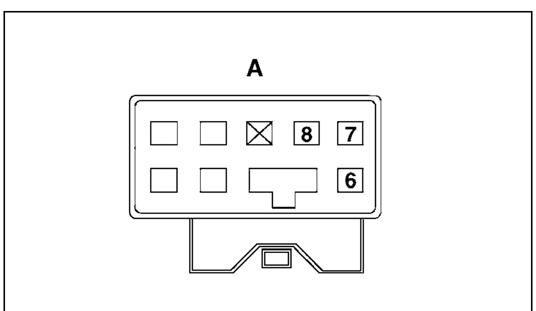
Voltage	**6** terminal – **7** terminal	Approx. battery voltage

A : Wire Harness Side Connector 8D

W1022722



3TMACABWP099B



3TMACABWP100B

A/C Switch Check

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below is not indicated, check the switch.

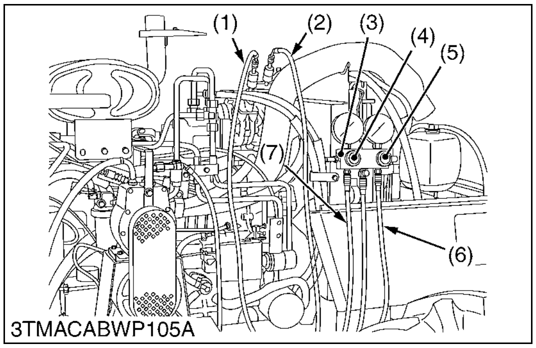
Position \ Terminal		6	7	8
A/C switch	**OFF** *2			
	ON *1	●	●	●

*1 : Push the AC switch button on **ON** position.
*2 : Push again the A/C switch button to **OFF** position.

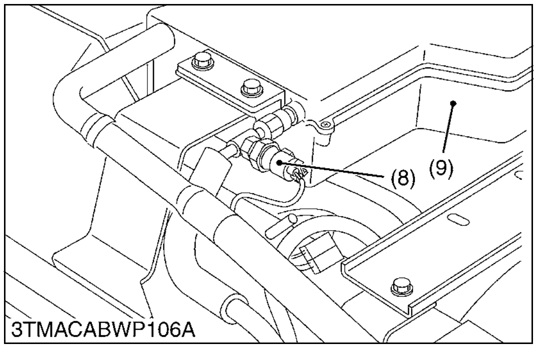
(1) A/C Switch
(2) A/C Switch Connector
A : A/C Switch Side

W1022871

(G) A/C Pressure Switch



3TMACABWP105A



3TMACABWP106A

HI Pressure Side

1. Connect the manifold gauge (3) to compressor as following procedure.
   Close the **HI** and **LO** pressure valves (5), (4) of manifold gauge tightly, and connect the charging hoses (red and blue) (6), (7) to the respective compressor service valves. (Refer to **HANDLING OF SERVICE TOOLS** : See page 10-S9.)

■ **NOTE**

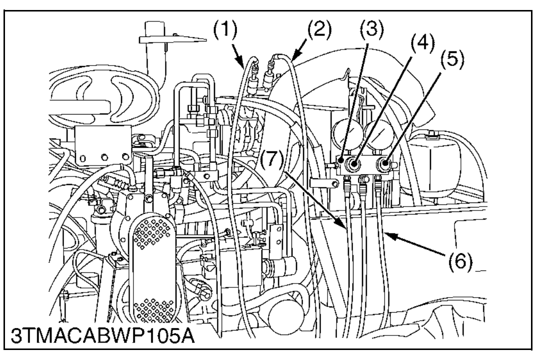
- **Be sure to blow out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.**

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 dual switch (8) 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.

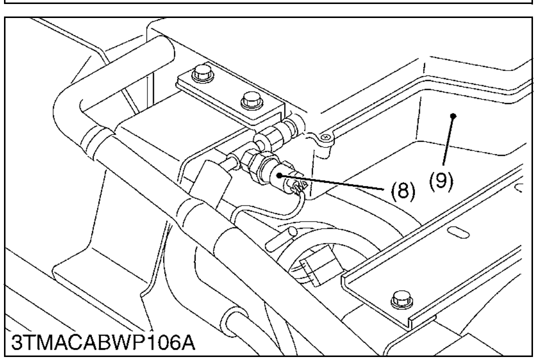
Setting Pressure	Factory spec.	Dual switch **OFF**	More than approx. 3.14 MPa 32 kgf/cm^2 455 psi

(1) **HI** (High Pressure Side) Charging Valve
(2) **LO** (Low Pressure Side) Charging Valve
(3) Manifold Gauge
(4) **LO** Pressure Valve
(5) **HI** Pressure Valve
(6) Charging Hose (Red)
(7) Charging Hose (Blue)
(8) Pressure Switch
(9) Air Conditioner Unit

W1023174



3TMACABWP105A



3TMACABWP106A

LO Pressure Side

1. Disconnect **2P** connector 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)

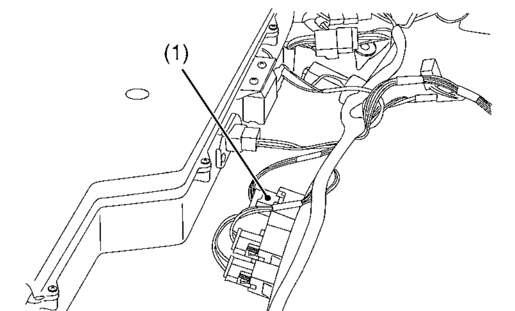
Setting Pressure	Factory spec.	Dual switch **OFF**	Less than approx. 0.196 MPa 2.0 kgf/cm^2 28.4 psi

- The resistance of dual switch is 0 ohm in normal running, but is becomes infinity if the pressure is abnormal (out of factory spec.). Because the dual switch starts to work.

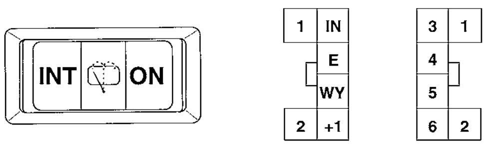
(1) **HI** (High Pressure Side) Charging Valve
(2) **LO** (Low Pressure Side) Charging Valve
(3) Manifold Gauge
(4) **LO** Pressure Valve
(5) **HI** Pressure Valve
(6) Charging Hose (Red)
(7) Charging Hose (Blue)
(8) Pressure Switch
(9) Air Conditioner Unit

W1023511

(H) Front Windshield Wiper



3TMACABWP107A



3TMACABWP108A

Front Wiper Switch

1. Remove the outer roof, and disconnect the front wiper connector (1).
2. Perform the following checkings **1)** and **2)**.

1) Connector Voltage

1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector **4** terminal and chassis.
3. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness, fuse or main switch is faulty.

Voltage	**4** terminal – Chassis	Approx. battery voltage

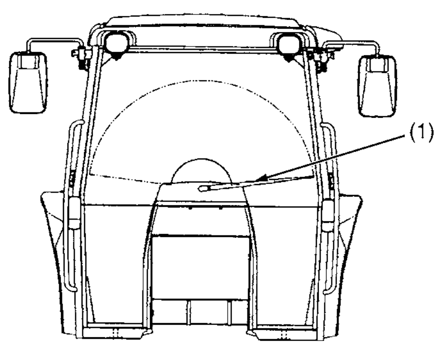
2) Front Wiper Switch

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is faulty.

	IN	+1	E	WY	WM
WASH I		●	●	●	●
ON		●	●		
OFF					
INT	●		●		
WASH II	●		●	●	●

(1) Front Wiper Switch Connector

W1027032



3TMACABWP109A

Front Wiper Motor

1. Raise up the front wiper arm (1).
2. Turn the main switch **ON**.
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.

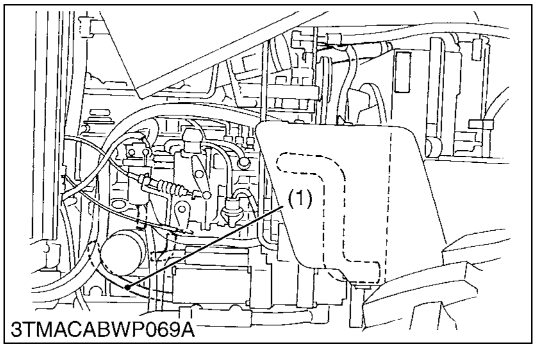
No load rotating speed	Factory spec.	33 to 43 times / min.

(1) Wiper Arm

W1027872

(2) Disassembling and Assembling

(A) Removing Air Conditioner Unit and Front Wiper Motor



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let it cool down.
2. Remove the hose (1) to drain the coolant. When removing 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 hose.

Coolant	Capacity	M6800SQ	8.5 L 9.0 U.S.qts. 7.5 Imp.qts.
		M8200Q M9000Q	9.0 L 9.51 U.S.qts. 7.9 Imp.qts.

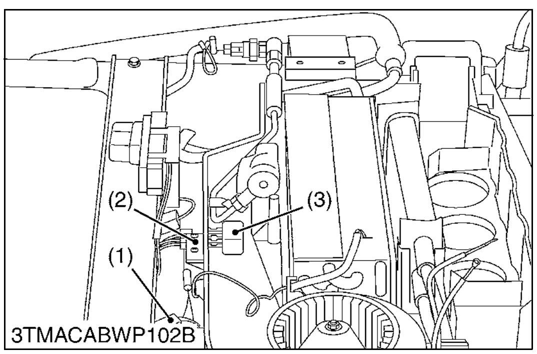
(1) Hose

W1030473

Discharging Refrigerant

1. Refer to **"Discharging the System"**. (See page 10-S18.)

W1030630

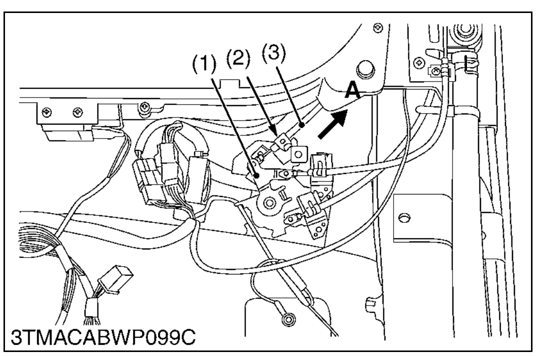


Preparation 1

1. Remove the outer roof.
2. Disconnect the battery negative cable.
3. Disconnect the A/C blower motor connector (1).
4. Disconnect the **4P** connector for A/C blower resistor (2).

(1) A/C Blower Motor Connector
(2) A/C Blower Resistor
(3) A/C Blower Resistor Connector

W1030681



Air Mixing Door Control Cable (Blue Cable)

1. Disconnect the air mixing door control cable (3) from the damper lever (1) of air conditioner control panel side.

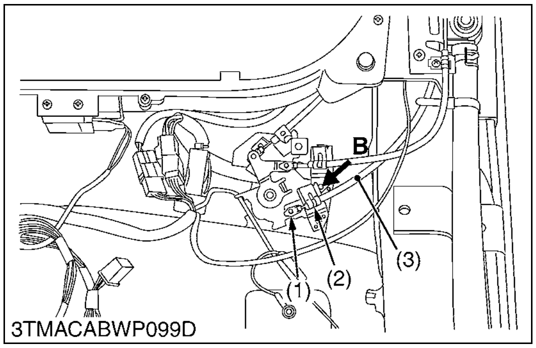
(When reassembling)

- Set the damper lever (1) of the air conditioner unit at **MAX HOT** position. Reconnect the cable.
- Move the control to **MAX HOT** position. Fit the inner cable in position, and press the fix the outer cable by the cable clip (2) in the direction of arrow (**A**) as shown at left.
- Move the temperature control lever several times, and finally set it to **MAX HOT** position to make sure the damper lever is at **HOT** position too.

(1) Damper Lever
(2) Cable Clip
(3) Air Mixing Door Control Cable

A : Direction of Pulling Outer Cable

W1030814



A/C Mode Door Control Cable (Yellow Cable)

1. Disconnect the air conditioner mode door control cable (3) from the def. control lever (1) of A/C control panel side.

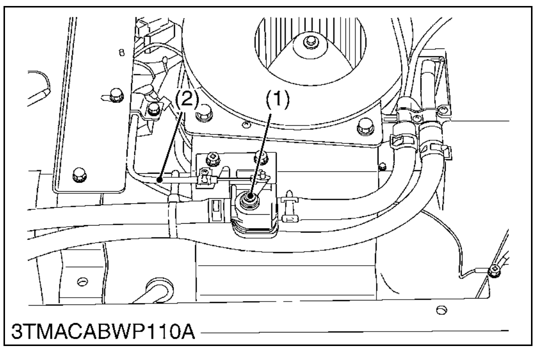
(When reassembling)

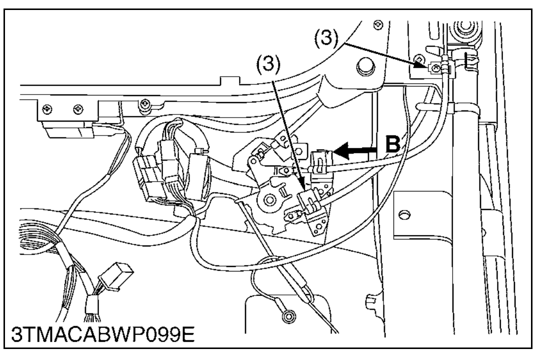
- Set the air conditioner unit to **DEF** mode position and reconnect the cable (3).
- Set the control at **DEF** position. Fit the inner cable in position, and press and fix the outer cable by the cable clip (2) in the direction of arrow (**B**) as shown at left.
- Move the mode lever several times and finally set it to **DEF** position to make sure the air conditioner unit is at **DEF** mode position.
- Lay and fix the mode door control cable over the water valve cable.

(1) DEF. Control Lever
(2) Cable Clip
(3) Mode Door Control Cable

B : Direction of Pushing Outer Cable

W1030982





Water Valve Control Cable (White Cable)

1. When disconnecting the water valve cable (2), follow the next reassembly procedure.

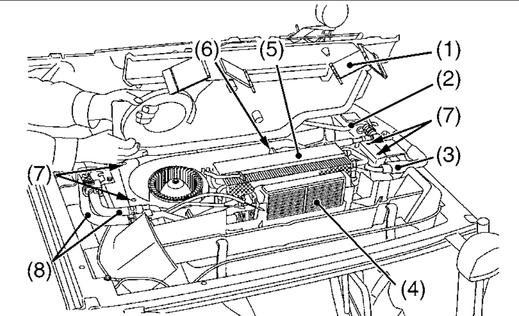
(When reassembling)

- Fully close the water valve (1) and reconnect the cable (2).
- Set the control at **MAX COOL** position. Fit the inner cable in position, and press and fix the outer cable by the cable clip (3) in the direction of arrow (**B**) as shown at left.
- Move the temperature control lever several times to make sure the water valve is fully closed at **MAX COOL** position.
- Do not allow the water valve cable to bend just away from the control, not to get caught by the outer roof.

(1) Water Valve
(2) Water Valve Control Cable
(3) Cable Clip

B : Direction of Pushing Outer Cable

W1031274



3TMACABWP111A

Air Conditioning Unit

1. Remove the unit cover (1).
2. Disconnect the heater hoses (8).
3. Disconnect the cooler pipe (liquid) (2) and cooler pipe (suction side) (3).
4. Remove the five screws (7) and take off the unit.
5. Remove the duct hoses.

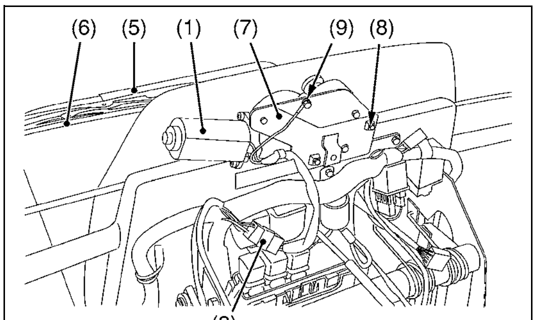
(When reassembling)

- When reconnecting the cooler pipes with the unit, apply compressor oil (DENSO CO. ND-OIL8) to O-rings.
- When remounting the unit, tighten five screws by hand and finally retighten them after aligning the inner roof duct with the unit duct.

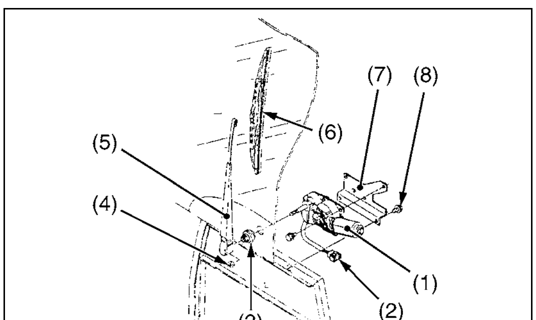
Tightening torque	A/C unit mounting screw (M6)	3.9 to 6.9 N·m 0.4 to 0.7 kgf·m 2.9 to 5.1 ft-lbs
	A/C unit mounting screw (M8)	9.8 to 15.7 N·m 1.0 to 1.6 kgf·m 7.23 to 11.6 ft-lbs
	Low pressure pipe (Cooler pipe (suction)) retaining nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
	High pressure pipe 1 (Cooler pipe (liquid)) retaining nut	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.7 to 10.8 ft-lbs

(1) Unit Cover
(2) High Pressure Pipe 2 (Cooler Pipe (Liquid)) (High Pressure)
(3) Low Pressure Pipe (Cooler Pipe (Suction Side))
(4) Heater Core
(5) Evaporator
(6) Expansion Valve
(7) Screws
(8) Heater Hoses

W1031466



3TMACABWP112A



3TMACABWP113A

Front Wiper Motor

1. Remove the steering wheels and steering post under covers.
2. Remove the meter panel.
3. Remove the panel under cover.
4. Disconnect the front wiper motor **4P** connector (2).
5. Remove the wiper arm mounting nut (4) and wiper arm (5).
6. Remove the wiper link cap (3).
7. Disconnect the earth lead setting screw.
8. Remove the front wiper motor bracket (7) mounting screw (8), then take out the front wiper motor (1).

(When reassembling)

Tightening torque	Wiper arm mounting nut	6.37 to 9.32 N·m 0.65 to 0.95 kgf·m 4.7 to 6.9 ft-lbs

(1) Front Wiper Motor
(2) Front Wiper Motor Connector (**4P**)
(3) Wiper Link Cap
(4) Nut
(5) Wiper Arm
(6) Wiper Blade
(7) Wiper Motor Mounting Bracket
(8) Wiper Motor Bracket Mounting Screw
(9) Ground Wire Mounting Screw

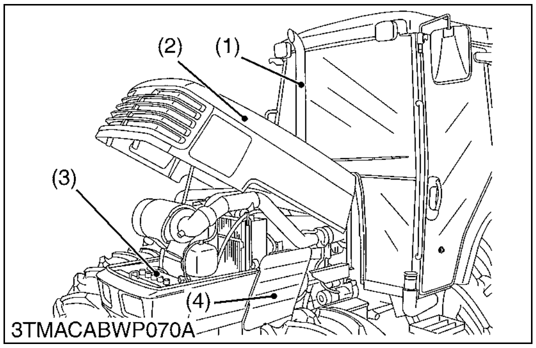
W1031898

(B) Removing Air Conditioner Pipes

Discharging Refrigerant

1. Refer to **"Discharging the System"**. (See page 10-S18.)

W1032195

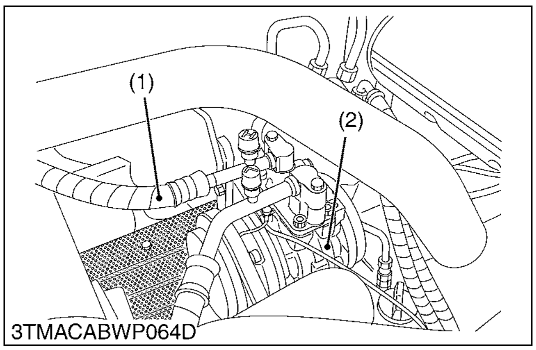


Muffler and Bonnet

1. Disconnect the battery cable (3).
2. Remove the muffler (1).
3. Remove the bonnet (2).
4. Remove the side cover (4).

(1) Muffler
(2) Bonnet
(3) Battery Cable
(4) Side Cover

W1032248



High Pressure Pipe 1

1. Disconnect the high pressure pipe 1 (1) from the compressor (2) and cap the open fittings immediately to keep moisture out of the system.

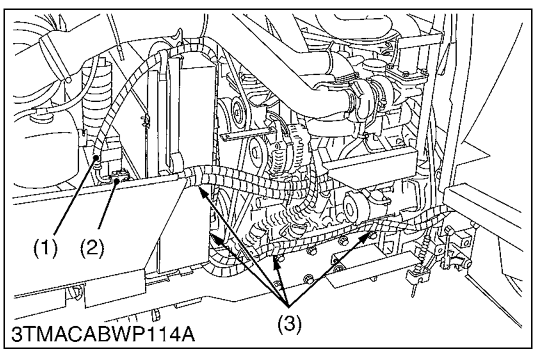
(When reassembling)

- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	High pressure pipe 1 mounting screw (Compressor side)	7.8 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs

(1) High Pressure Pipe 1
(2) Compressor

W1032372



High Pressure Pipe 2

1. Remove the pipe clamps (3).
2. Disconnect the high pressure hose 2 (1) from the receiver (2) and cap the open fittings immediately to keep moisture out of the system.

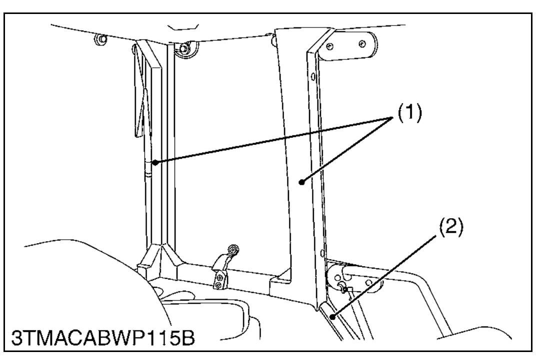
(When reassembling)

- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them

Tightening torque	High pressure pipe 2 mounting screw (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 2
(2) Receiver
(3) Clamp

W1032488

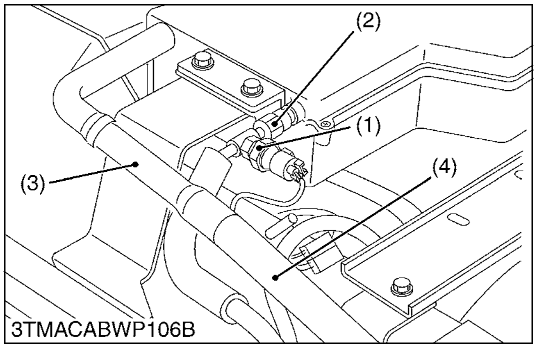


Inner Covers

1. Remove the inner covers (1) and (2).

(1) Inner Cover (Upper)
(2) Inner Cover (Lower)

W1032629



Removing High Pressure and Low Pressure Pipes

1. Remove the outer roof.
2. Disconnect the pressure switch (1) connector.
3. Disconnect the high pressure pipe 2 (2), then cap the open fitting immediately to keep moisture out of the system.
4. Remove the rubber (3) and disconnect the low pressure pipe (4), then cap the open fittings immediately to keep moisture out of the system.
5. Pull out the pressure pipes (2) and (4) from the bottom of the cabin.
6. Take out the pressure pipes (2) and (4).

(When reassembling)

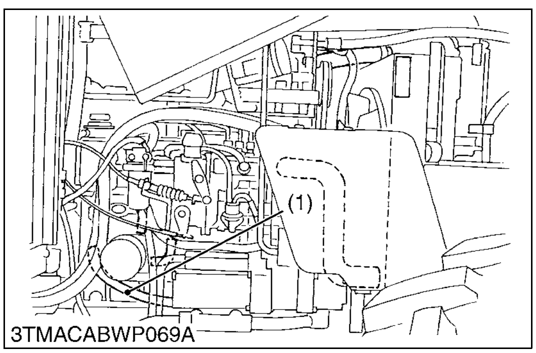
- Replace the rubber (3) with a new one.
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	High pressure pipe 2 retaining nut	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.7 to 10.8 ft-lbs
	Low pressure pipe retaining nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) Pressure Switch
(2) High Pressure Pipe 2
(3) Rubber
(4) Low Pressure Pipe

W1032723

(C) Removing Heater Hoses



Draining Coolant

CAUTION

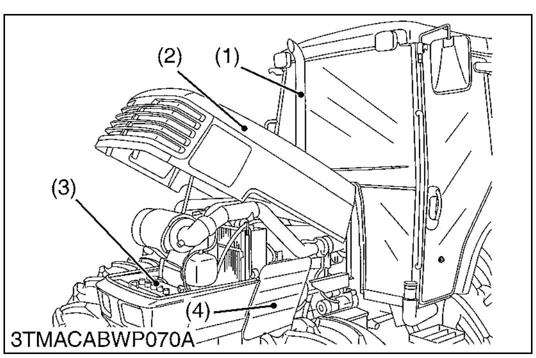
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let it cool down.
2. Remove the hose (1) to drain the coolant. When removing 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 hose.

Coolant	Capacity	M6800SQ	8.5 L 9.0 U.S.qts. 7.5 Imp.qts.
		M8200Q M9000Q	9.0 L 9.51 U.S.qts. 7.9 Imp.qts.

(1) Hose

W1033087

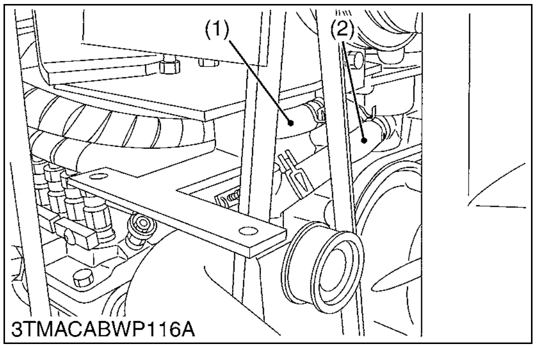


Muffler and Bonnet

1. Disconnect the battery cable (3).
2. Remove the muffler (1).
3. Remove the bonnet (2).
4. Remove the side cover (4).

(1) Muffler
(2) Bonnet
(3) Battery Cable
(4) Side Cover

W1033217



Heater Hoses

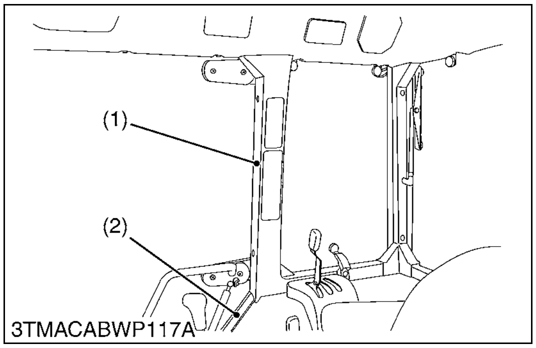
1. Disconnect the heater hoses (1), (2), and take out them under the cabin.

■ **NOTE**

- **Connect the heater hose (1) to the heat hose which comes from cabin with blue painted hose.**

(1) Heater Hose 1 (2) Heater Hose 2

W1033326

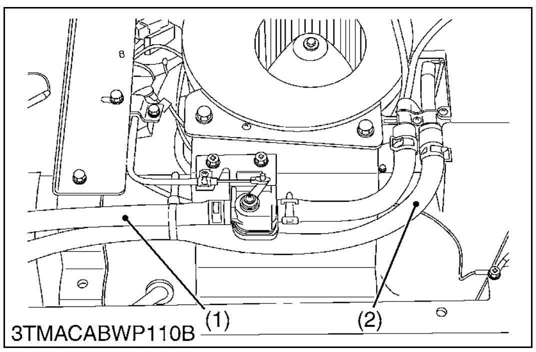


Inner Covers

1. Remove the inner covers (1) and (2).

(1) Inner Cover (Upper) (2) Inner Cover (Lower)

W1033483



Removing Heater Hoses

1. Remove the outer roof.
2. Disconnect the heater hoses (1), (2).
3. Pull out the heater hoses (1), (2) from the bottom of the cabin.
4. Take out the heater hoses (1), (2).

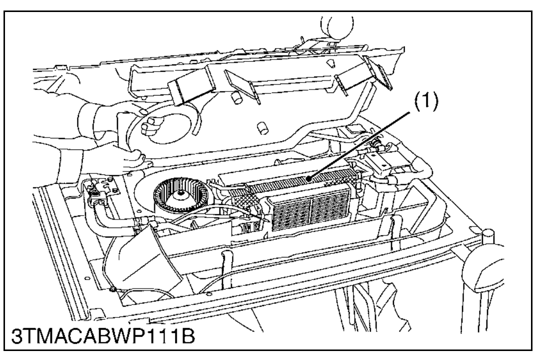
(When reassembling)

- 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 hose (2) to the original position.

(1) Heater Hose 1 (2) Heater Hose 2 with Blue Paint

(3) Servicing

(A) Air Conditioning Unit



Evaporator

1. Check whether white powder or dust is attached to the evaporator (1). If they are attached, wash them off with warm water and blow them off with compressed air.

■ **NOTE**

- **In case the evaporator is cleaned with warm water, cap the evaporator pipe ends so that water does not enter it.**

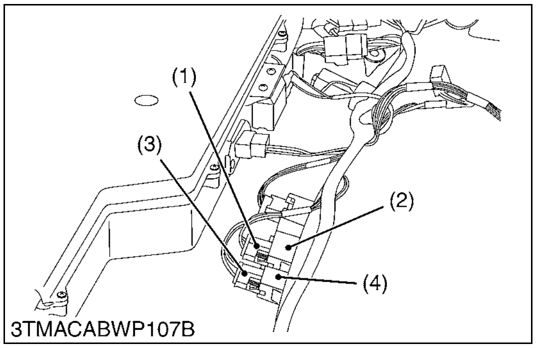
(1) Evaporator

W1033741

[4] LIGHTING SYSTEM

(1) Checking

(A) Working Light

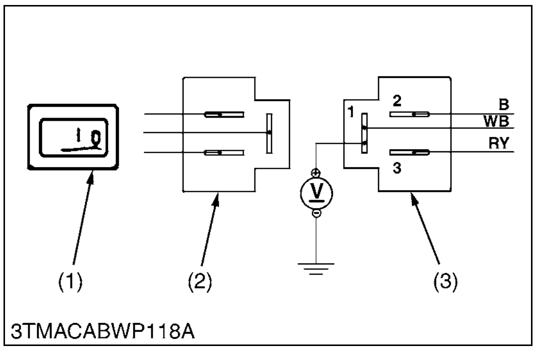


Working Light Switch

1. Remove the outer roof, and disconnect the working light switch connector (1) from the switch (2) connector.
2. Perform the following checkings **1)** and **2)**.

(1) Working Light Switch Connector (Front)
(2) Working Light Switch (Front)
(3) Working Light Switch Connector (Rear)
(4) Working Light Switch (Rear)

W1033864



1) Connector Voltage

1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector **1** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	**1** terminal – Chassis	Approx. battery voltage

2) Working Light Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated.

Position \ Terminal		1	2	3
Working light switch	**OFF**		●	●
	ON	●	●	●

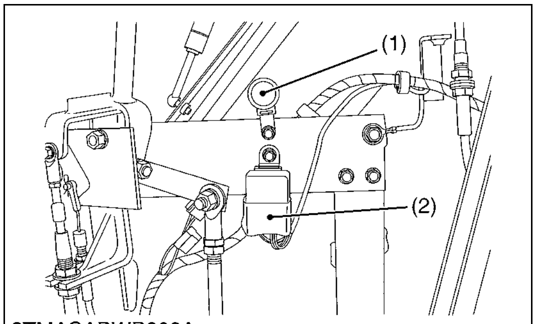
(1) Working Light Switch
(2) Working Light Switch Connector (Switch Side)
(3) Working Light Switch Connector (Wiring Harness Side)

W1033980

[5] OPC (OPERATOR PRESENCE CONTROL) SYSTEM (IF EQUIPPED)

(1) Checking

(A) OPC Timer



3TMACABWP209A

OPC Buzzer Timer and Seat Switch

1. Refer to 9.Electrical System.

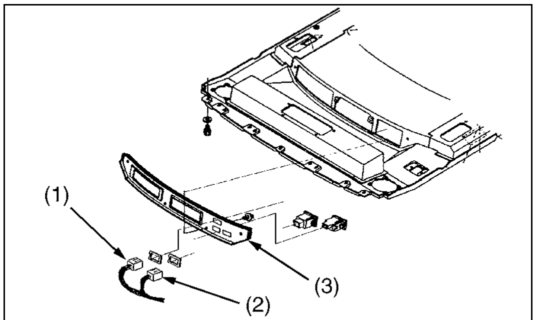
(1) Buzzer
(2) OPC Buzzer Timer

W1093824

[6] OTHERS

(1) Checking

(A) Rear Windshield Wiper



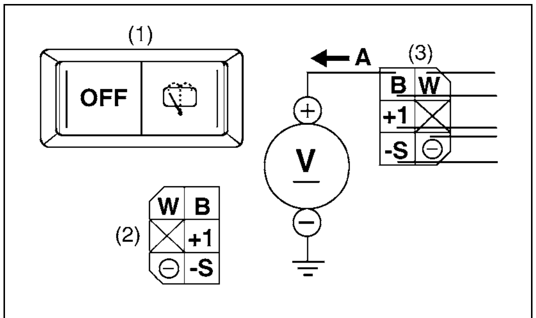
3TMACABWP119A

Rear Wiper Switch

1. Remove the inner panel (3), and disconnect the rear wiper switch connector (2).
2. Perform the following checkings **1)** and **2)**.

(1) Front Wiper Switch Connector
(2) Rear Wiper Switch Connector
(3) Inner Panel

W1034410



3TMACABWP120A

1) Connector Voltage

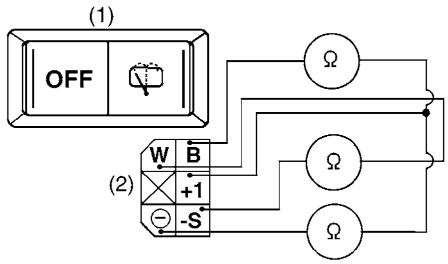
1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector terminal **B** and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	**B** terminal – Chassis	Approx. battery voltage

(1) Rear Wiper Switch
(2) Rear Wiper Switch Connector (Switch Side)
(3) Rear Wiper Switch Connector (Wiring Harness Side)

A : From Main Switch AC Terminal

W1034520



3TMACABWP121A

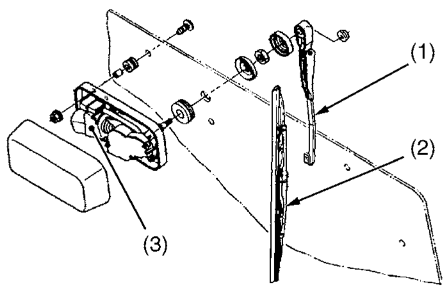
2) Rear Wiper Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position \ Terminal		-S	+1	B	W	⊖
Front wiper switch	WASH I	●	●		●	●
	OFF	●	●			
	ON		●	●		
	WASH II		●	●	●	●

(1) Rear Wiper Switch
(2) Rear Wiper Switch Connector (Switch Side)

W1034723



3TMACABWP122A

Rear Wiper Motor

1. Raise up the rear wiper arm (1).
2. Turn the main switch **ON**.
3. Push the rear 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 (3) assembly.

No. of wiper arm swing frequency at no load	Factory spec.	36 to 50 times / min.

(1) Wiper Arm
(2) Wiper Blade
(3) Wiper Motor

W1035084

(2) Disassembling and Assembling

(A) Cab Windshield

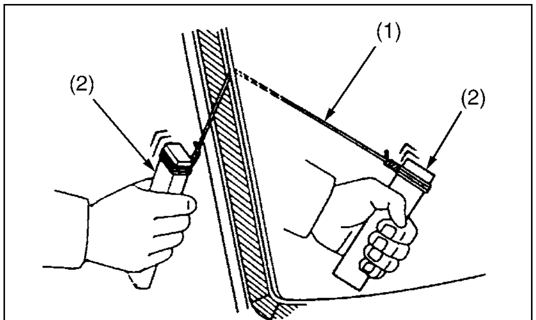
Preparation

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

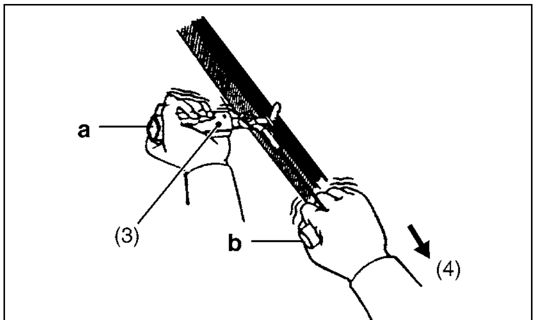
■ **NOTE**

- **Sika Tack-Ultrafast and cleaner No. 1 are made by Sika Corporation.**
- **These materials can't be provided by Kubota Corporation.**
- **Therefore, please find the local made equivalent materials in your country and use them when you need.**

W1035271



3TLABABWP073A



3TLABABWP074A

Before Replacing Windshields (1)

[In case of using piano wire (When glass is clacked)]

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

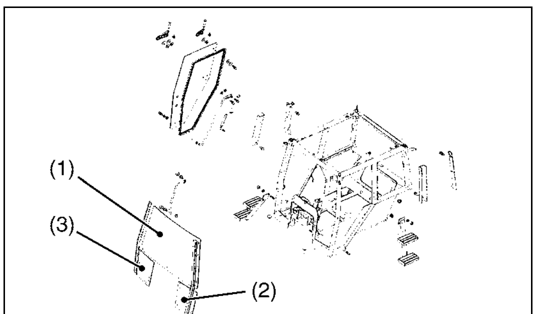
Before Replacing Windshields (2)

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.

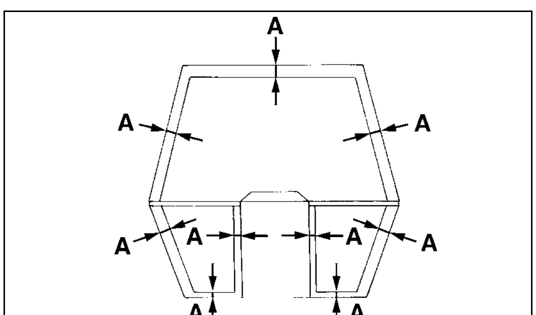
■ **NOTE**

- **Remove the bond completely.**

W1035852



3TMACABWP123A



3TLABABWP076C

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.

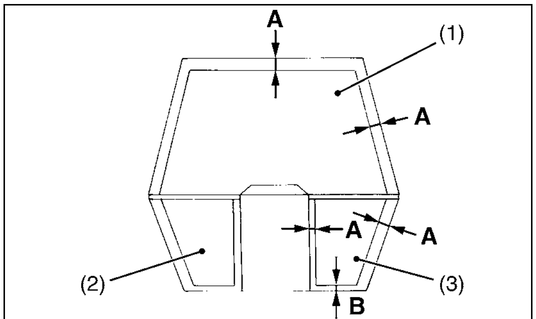
■ **NOTE**

- **If not cleaning the glass, it may result in adhesive failure.**

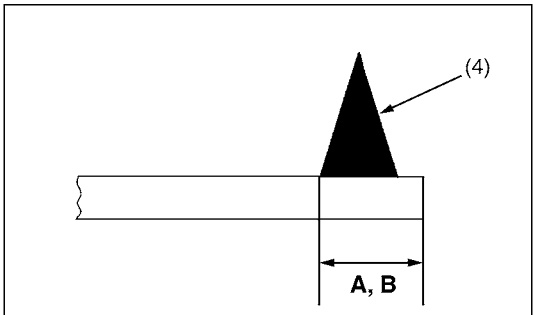
(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)

A : 25 mm (1.0 in.)

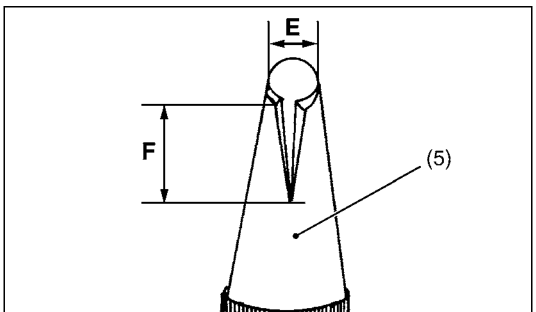
W1035931



3TLABABWP076D



3TLABABWP078C



3TLABABWP079C

Applying Sika Tack-Ultrafast

1. Apply a Sika Tack-Ultrafast (or equivalent) on the glasses as shown in the figure left.

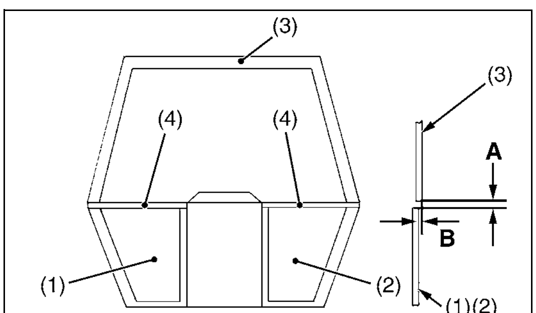
■ **NOTE**

- **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.**

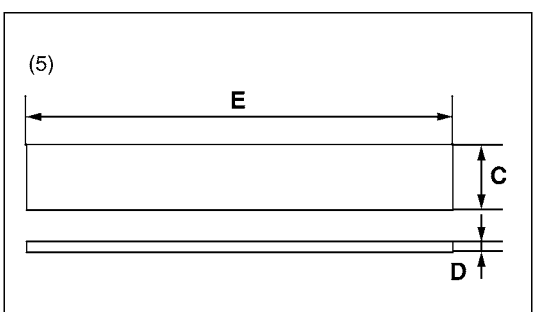
(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)
(4) Sika Tack-Ultrafast
(5) Jig

A : 10 mm (0.39 in.)
B : 12 mm (0.47 in.)
E : Dia. 8 mm (0.31 in.)
F : 12 mm (0.47 in.)

W1036159



3TLABABWP080B



3TLABABWP081B

Installing Windshield

1. Install the lower (left or right) windshield (1), (2) to the cabin and fix it with a gummed taped.
   Leave it for one hour.
2. Set the upper windshield (3) to the cabin and fix it with a gummed tape.
   Leave it for one hour.
3. Install the H rubber (4) between the lower and upper windshield.

■ **NOTE**

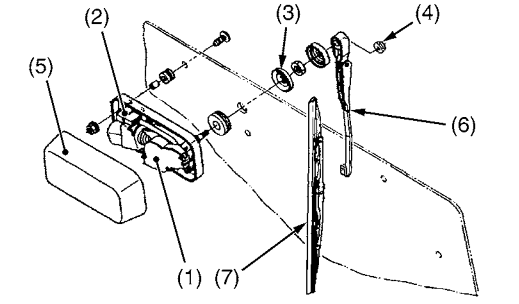
- **Use a jig A (5) shown in the figure to create even clearance (5 mm (0.2 in.) approx.) between the lower and upper windshield.**
- **The level unevenness between the upper and lower windshields should be –1 to +1 mm (–0.04 to +0.04 in.) or less at the glass surface.**
- **When the gummed tape is removed, the glass may be displaced. In this case fix it again.**
- **Remove the gummed tape (adhesive tape) little by little to confirm the bonding condition.**

(1) Lower Windshield (Right)
(2) Lower Windshield (Left)
(3) Upper Windshield
(4) H Rubber
(5) Jig A

A : 5 mm (0.2 in.)
B : –1.0 to +1.0 mm (–0.04 to +0.04 in.)
C : 20 mm (0.79 in.)
D : 5 mm (0.2 in.)
E : 300 mm (11.81 in.)

W1036353

(B) Rear Windshield Wiper



3TMACABWP122B

Rear Wiper Motor

1. Remove the wiper motor cover (5).
2. Disconnect the rear wiper motor **4P** connector (2).
3. Remove the wiper arm mounting nut (4) and wiper arm (6).
4. Remove the wiper link cap (3) and nut.
5. Remove the rear wiper motor mounting screws, then take out the rear wiper motor (1).

Tightening torque	Wiper arm mounting nut	7.8 to 9.3 N·m 0.8 to 0.95 kgf·m 5.79 to 6.87 ft-lbs
	Wiper motor mounting screw	7.8 to 9.3 N·m 0.8 to 0.95 kgf·m 5.79 to 6.87 ft-lbs

(1) Rear Wiper Motor
(2) Rear Wiper Motor Connector
(3) Wiper Link Cap
(4) Nut
(5) Wiper Motor Cover
(6) Wiper Arm
(7) Wiper Blade

W1036761

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