

WSM

WORKSHOP MANUAL
TRACTOR

M8540, M9540

Kubota

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of M8540 and M9540. It is divided into three parts, "General", "Mechanism" and "Servicing".

■ General

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

■ Mechanism

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

Refer to Diesel Engine / Tractor Mechanism Workshop Manual (Code No. 9Y021-01874 / 9Y021-18201) for the one which has not been described to this workshop manual.

■ Servicing

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

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

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

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

September 2008

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SAFETY FIRST

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

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



DANGER

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



WARNING

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



CAUTION

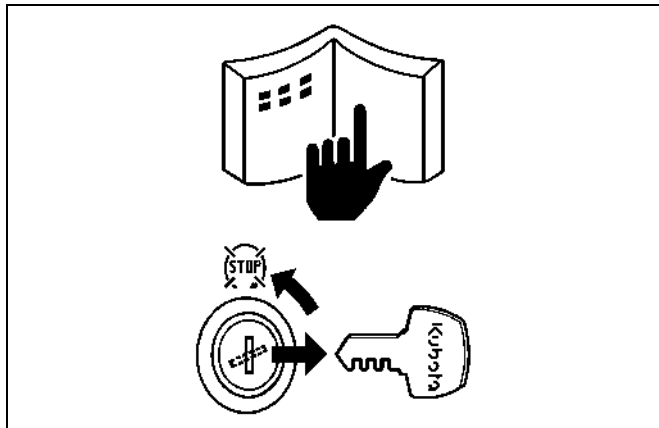
: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

■ IMPORTANT

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

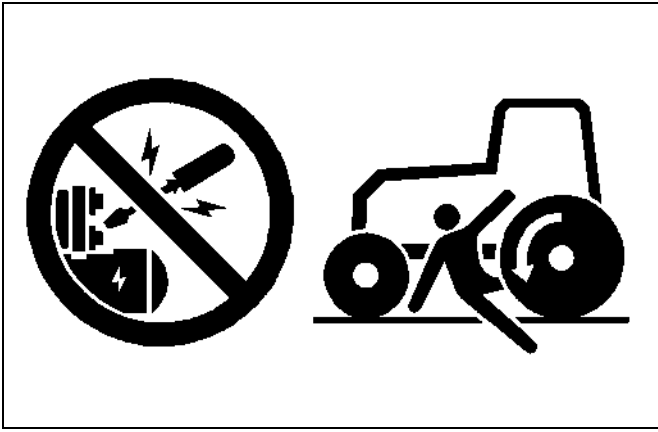
■ NOTE

: Gives helpful information.



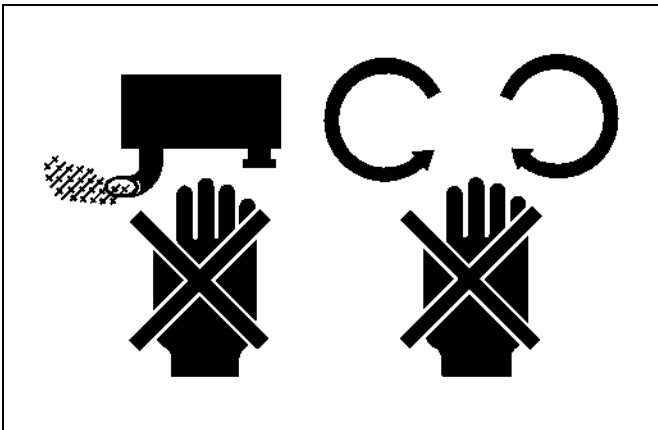
BEFORE SERVICING AND REPAIRING

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



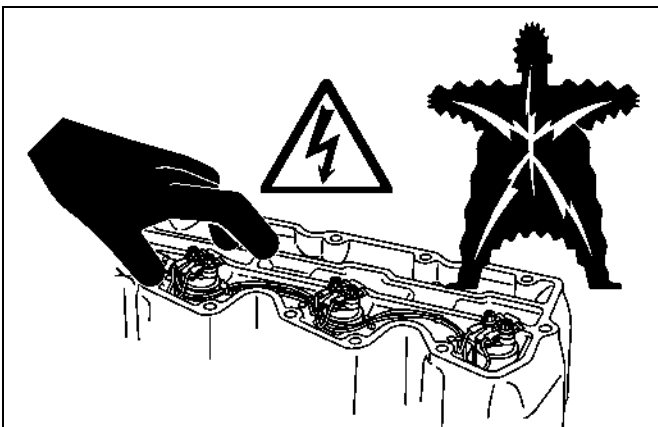
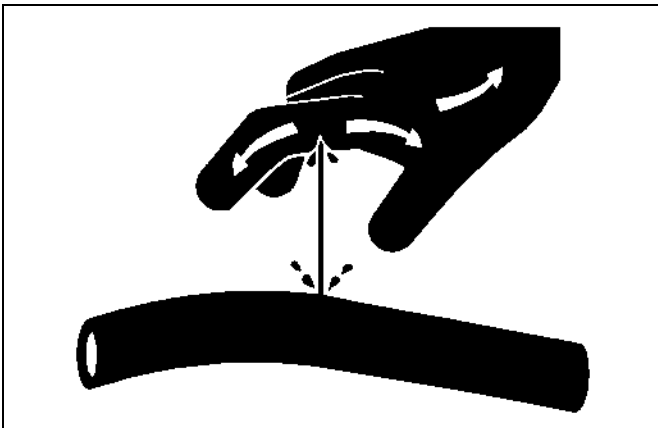
SAFETY STARTING

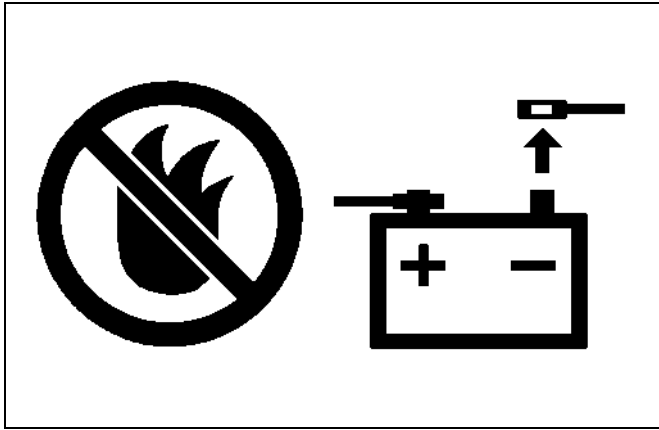
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



SAFETY WORKING

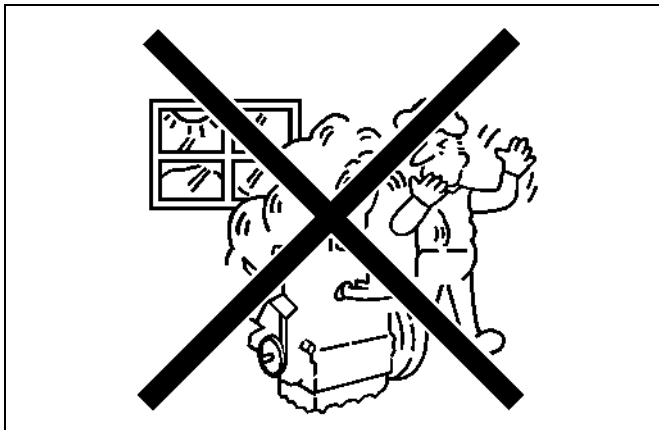
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing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





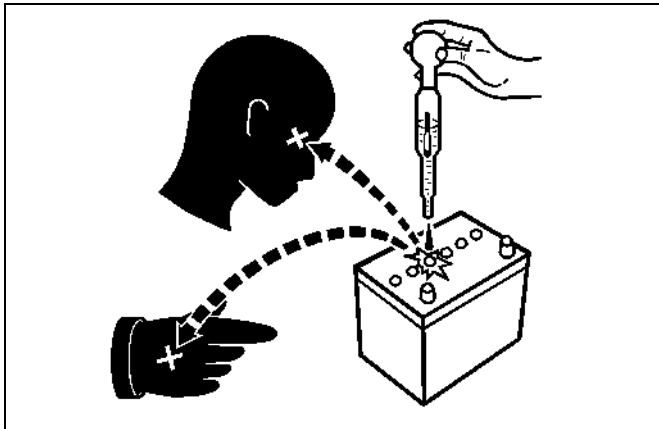
AVOID FIRES

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



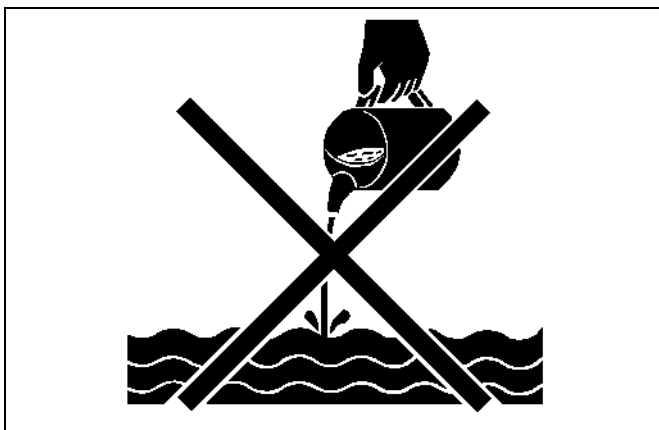
VENTILATE WORK AREA

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



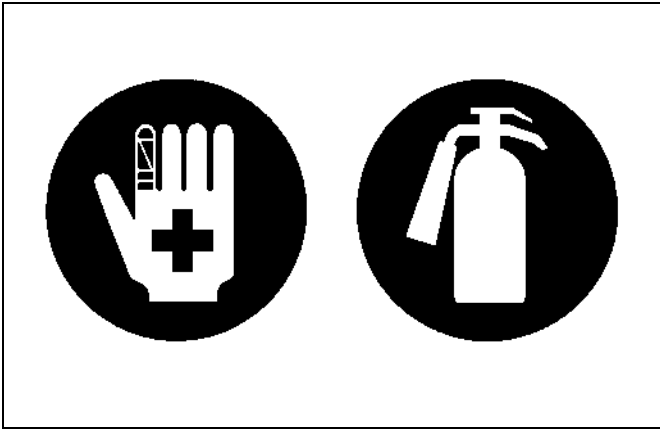
PREVENT ACID BURNS

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



DISPOSE OF FLUIDS PROPERLY

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

**PREPARE FOR EMERGENCIES**

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

SAFETY DECALS

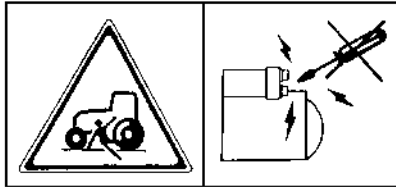
The following safety decals (pictorial safety labels) are installed on the machine.

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

■ ROPS Model

- (1) Part No. K3512-4718-1

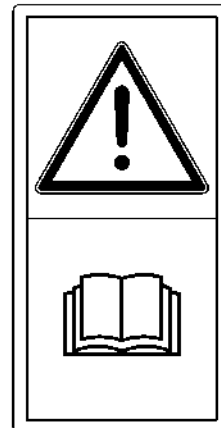
Start engine from operator's seat only.



1BDABANAP083B

- (2) Part No. TD179-3491-1

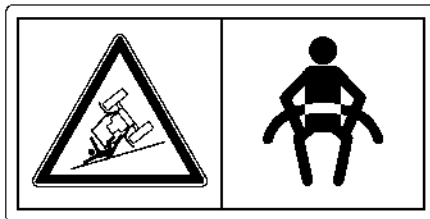
Carefully read operator's manual before handling the machine.
Observe instructions and safety rules when operating.



1AGAWAEAP088A

- (3) Part No. TD179-4902-1

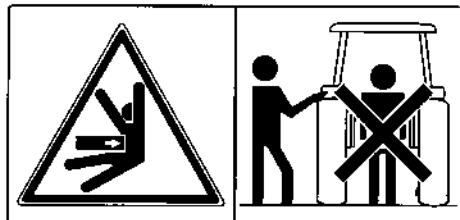
Seat belt should be used.



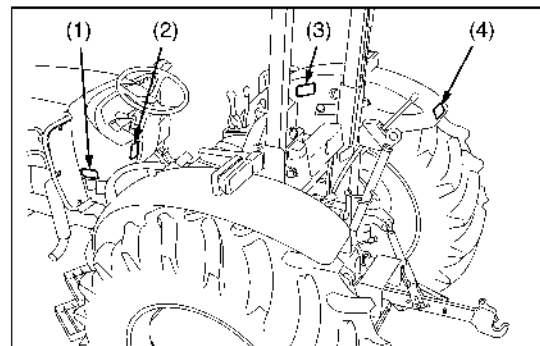
1AGAWAEAP086A

- (4) Part No. 3F240-9819-1

Do not stand by IMPLEMENT or between implement and tractor while operating remote hitch switch.



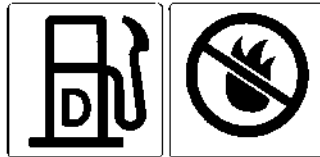
1AGAIBIAP1770



3TMACBHCP001A

(1) Part No. TA040-4956-2

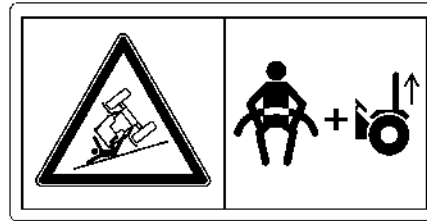
Diesel fuel only. No fire



1AGAIAZAP118A

(2) Part No. 3C294-9848-1

Always lock ROPS in upright position unless it has to be folded down to allow operation underneath trees or bushes. When ROPS is locked in upright position seat belt should be used.



1AGAIFGAP054A

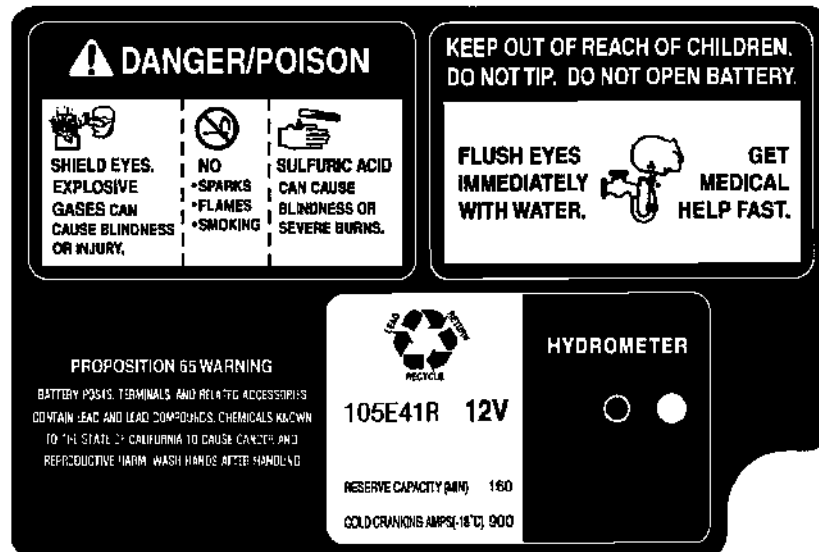
(3) Part No. 6C090-4958-2

Do not get your hands close to engine fan and fan belt.

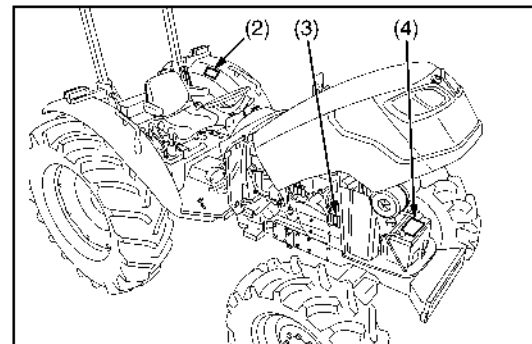
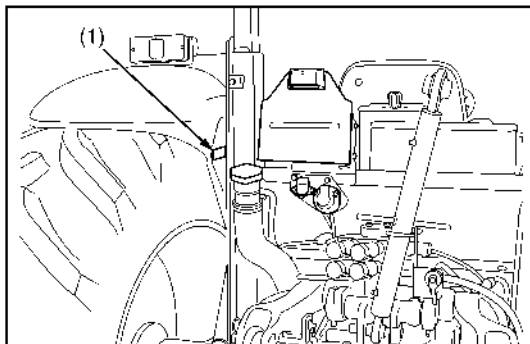


1AGAIAZAP110A

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



1AGAICHAP100A



3TMACBHCP002A

(1) Part No. 6C090-4958-2

Do not get your hands
close to engine fan and
fan belt.



1AGAIAZAP110A

(2) Part No. K3512-4719-1

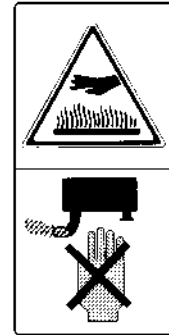
Do not touch hot surface
like muffler, etc.



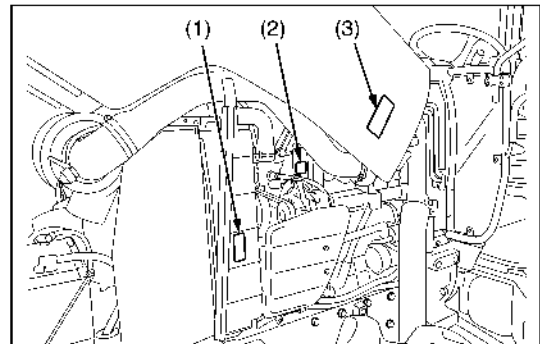
1BDABANAP080A

(3) Part No. TA040-4958-1

Do not touch hot surface
like muffler, etc.



1AGAMAAAP2400



CARE OF PICTORIAL SAFETY LABELS (PICTORIAL SAFETY LABELS)

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

3TMACBHCP003A

■ CABIN Model

(1) Part No. 6C090-4958-2

Do not get your hands close to engine fan and fan belt.



1AGAIAZAP110A

(2) Part No. K3512-4719-1

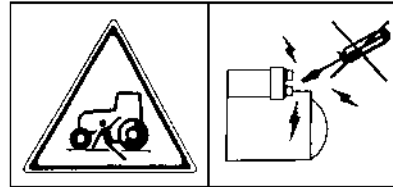
Do not touch hot surface like muffler, etc.



1BDABANAP080A

(3) Part No. K3512-4718-1

Start engine from operator's seat only.



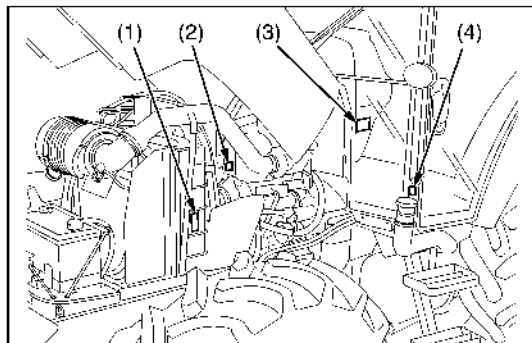
1BDABANAP083B

(4) Part No. 6C040-4741-2

No fire



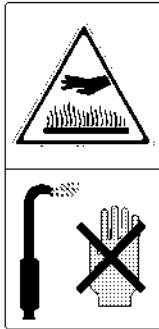
1AGAIAZAP104A



3TMACBHCP004A

(1) Part No. 32310-4958-1

Do not touch hot surface
like muffler, etc.



1AGAIAZAP071A

(2) Part No. 6C090-4958-2

Do not get your hands close
to engine fan and fan belt.



1AGAIAZAP110A

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

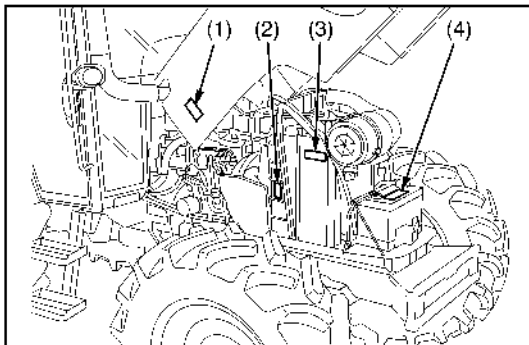
CAUTION REFRIGERANT UNDER HIGH PRESSURE Improper service methods may cause injury. Air conditioning system should be serviced by qualified personnel. See Repair Manual.		ATTENTION REFRIGERANT SOUS HAUTE PRESSION Un entretien incorrect peut provoquer des blessures. Le système de climatisation doit être entretenu par une personne qualifiée. Voir le manuel de réparation.	
Refrigerant HFC134a Max. 0.95kg (2.09lbs.) USE ONLY Min. 0.85kg (1.87lbs.)	Oil ND-OIL 8 SAE OR EQUIVALENT J-639	Refrigerant HFC134a Max. 0.95kg (2.09lbs.) UNIQUEMENT Min. 0.85kg (1.87lbs.)	Huile ND-OIL 8 SAE CO EQUIVALENT J-639
MFD. BY DENSO CORPORATION JAPAN.		FABRIQUE PAR DENSO CORPORATION JAPON.	

1AGAIDGAP074A

(4) Part No. 3C300-9892-1

! DANGER/POISON SHIELD EYES. EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY. NO • SPARKS • FLAMES • SMOKING SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS.		KEEP OUT OF REACH OF CHILDREN. DO NOT TIP. DO NOT OPEN BATTERY. FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.
PROPOSITION 65 WARNING BATTERY POSITIVE TERMINALS AND RELATED ACCESSORIES CONTAIN LEAD AND LEAD COMPOUNDS, CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND REPRODUCTIVE HARM. WASH HANDS AFTER HANDLING.		RECYCLE 105E41R 12V RESERVE CAPACITY (AH) 160 COLD CRANKING AMPS (-18°C) 900

1AGAICHAP100A



3TMACBHCP005A

(1) Part No. 3A294-9819-1

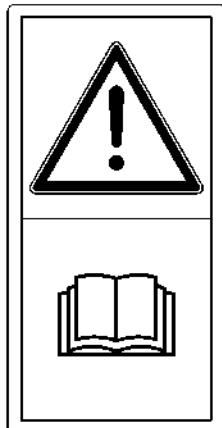
Do not stand by IMPLEMENT or between implement and tractor while operating remote hitch switch.



1AGAOCAP0130

(2) Part No. TD179-3491-1

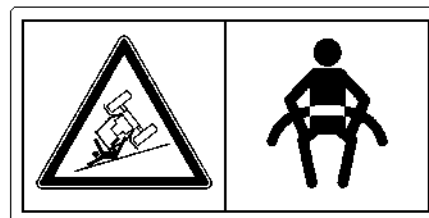
Carefully read operator's manual before handling the machine. Observe instructions and safety rules when operating.



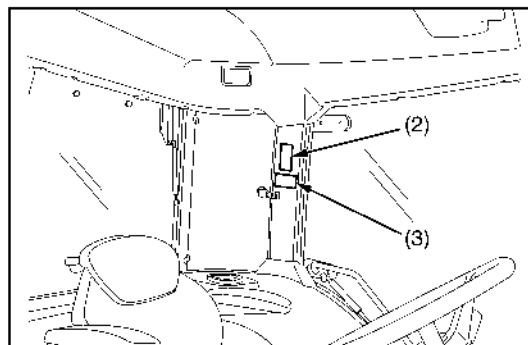
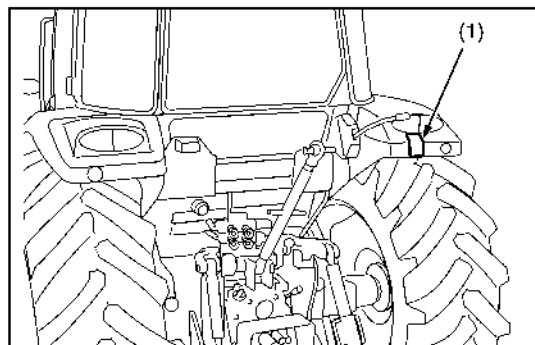
1AGAWAEP088A

(3) Part No. TD179-4902-1

Seat belt should be used.



1AGAWAEP086A

**CARE OF PICTORIAL SAFETY LABELS (PICTORIAL SAFETY LABELS)**

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

3TMACBHCP006A

SPECIFICATIONS

Model			M8540	M9540
			4WD	4WD
Engine	Model		V3800DI-TE3	
	Type		Vertical, water-cooled, 4-cycle direct injection diesel engine	
	Number of cylinders		4	
	Total displacement		3769 cm ³ (230.0 cu.in.)	
	Bore and stroke		100 × 120 mm (3.9 × 4.7 in.)	
	Rated speed		2600 min ⁻¹ (rpm)	
	Net power ^{*1}		63.7 kW (85.5 HP)	70.8 kW (95 HP)
	Gross power ^{*1}		66.7 kW (89.4 HP)	73.6 kW (98.7 HP)
	Maximum torque		282 N·m (28.8 kgf·m, 208 lbf·ft) / 1500 to 1700 min ⁻¹ (rpm)	314 N·m (32.0 kgf·m, 232 lbf·ft) / 1500 to 1700 min ⁻¹ (rpm)
	Battery capacity		12 V, RC : 160 min, CCA : 900 A	
	Fuel tank capacity	ROPS Model	90 L (23.8 U.S.gals., 19.8 Imp.gals.)	
		CABIN Model	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		3955 mm (155.7 in.)	
	Overall width (min. tread)		1975 mm (77.760 in.)	
	Overall height	ROPS Model	2560 mm (100.8 in.)	
		CABIN Model	2650 mm (104.3 in.)	
	Wheel base		2250 mm (88.6 in.)	
	Tread	Front	1514, 1554, 1608 mm (59.61, 61.18, 63.31 in.)	
		Rear	1503, 1599, 1695 mm (59.17, 62.95, 66.73 in.)	
	Minimum ground clearance	ROPS Model	470 mm (18.5 in.)	
CABIN Model		455 mm (17.9 in.)		
Weight	ROPS		3120 kg (6878 lbs)	
	CABIN		3305 kg (7286 lbs)	
Traveling system	Standard tire size	Front	360/70R24	
		Rear	480/70R34	
	Clutch		Multiple wet discs	
	Steering		Hydraulic power steering	
	Braking system		Hydraulic wet discs	
	Differential		Bevel gears with differential lock (Rear)	
Hydraulic system	Hydraulic control system		Position, draft (top link sensing) and mix control	
	Pump capacity		64.3 L (17 U.S.gals., 14 Imp.gals.) / min.	
	3-point hitch		SAE Category II	
	Max. lifting force	At lift points ^{*2}	3900 kg (8600 lbs)	
		24 in. behind lift points ^{*2}	3300 kg (7275 lbs)	
	Remote hydraulic control		Two remote valves (3rd valve option)	
System pressure		19.6 MPa (200 kgf/cm ² , 2844.7 psi)		
Traction system			Swinging drawbar, adjustable in direction	
PTO	Live PTO (Independent)	Direction of turning	Clockwise, viewed from tractor rear	
		PTO speed	6 spline : 540 min ⁻¹ (rpm) / 2035 min ⁻¹ (rpm) engine speed 6 spline : 540E min ⁻¹ (rpm) / 1519 min ⁻¹ (rpm) engine speed 21 spline : 1000 min ⁻¹ (rpm) / 2389 min ⁻¹ (rpm) engine speed	

Note : *1 : Manufacture's estimate

*2 : At lower link end with links horizontal.

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

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TRAVELING SPEEDS

(At rated engine rpm)

Model			M8540 / M9540		
Tire size (Rear)			480/70R34		
Transmission type			without Dual speed	with Dual speed	
Shuttle shift lever	Range gear shift lever	Main gear shift lever	km/h (mph)	Hi	Lo
				km/h (mph)	km/h (mph)
Forward	CREEP	1	0.43 (0.27)	0.46 (0.29)	0.39 (0.24)
		2	0.55 (0.34)	0.59 (0.37)	0.50 (0.31)
		3	0.73 (0.45)	0.78 (0.48)	0.65 (0.40)
		4	0.94 (0.58)	0.99 (0.62)	0.84 (0.52)
		5	1.16 (0.721)	1.23 (0.764)	1.04 (0.646)
		6	1.44 (0.895)	1.48 (0.920)	1.25 (0.777)
	L	1	2.8 (1.7)	3.0 (1.9)	2.5 (1.6)
		2	3.6 (2.2)	3.8 (2.4)	3.2 (2.0)
		3	4.7 (2.9)	5.0 (3.1)	4.2 (2.6)
		4	6.1 (3.8)	6.4 (4.0)	5.4 (3.4)
		5	7.5 (4.7)	8.0 (5.0)	6.7 (4.2)
		6	9.3 (5.8)	9.6 (6.0)	8.1 (5.0)
	H	1	10.8 (6.71)	11.5 (7.15)	9.6 (6.0)
		2	13.8 (8.57)	14.7 (9.13)	12.4 (7.70)
		3	18.2 (11.3)	19.4 (12.1)	16.3 (10.1)
		4	23.4 (14.5)	24.8 (15.4)	20.9 (13.0)
		5	29.0 (18.0)	30.8 (19.1)	25.9 (16.1)
		6	35.9 (22.3)	37.0 (23.0)	31.1 (20.6)

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

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(At rated engine rpm)

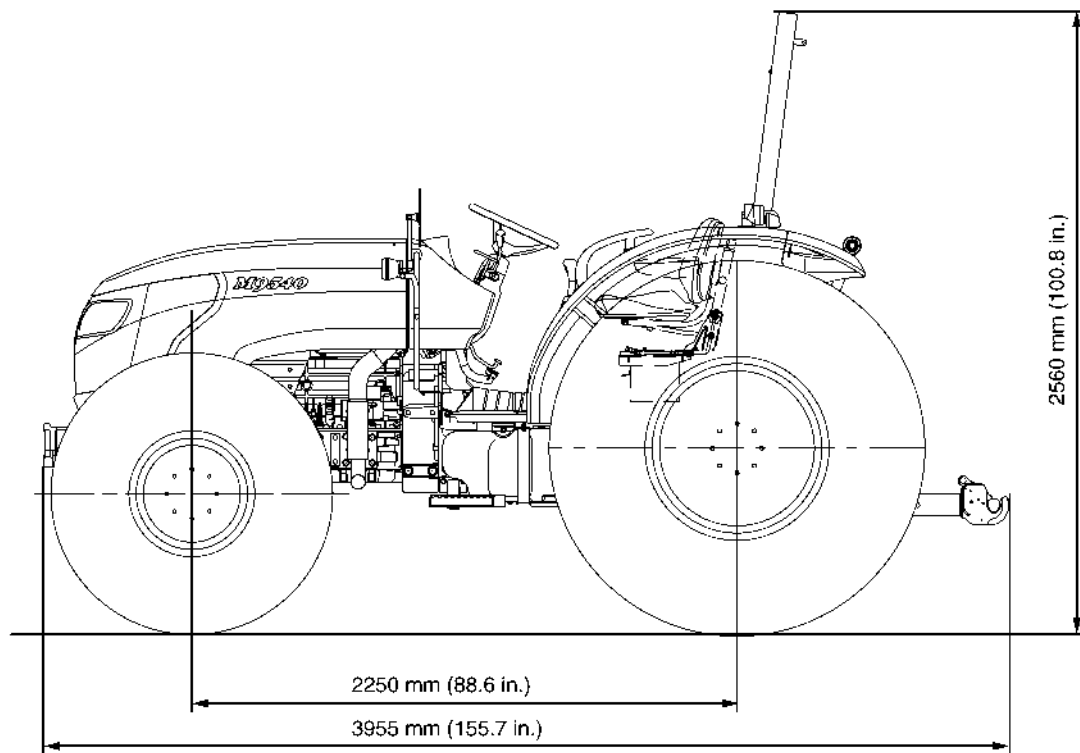
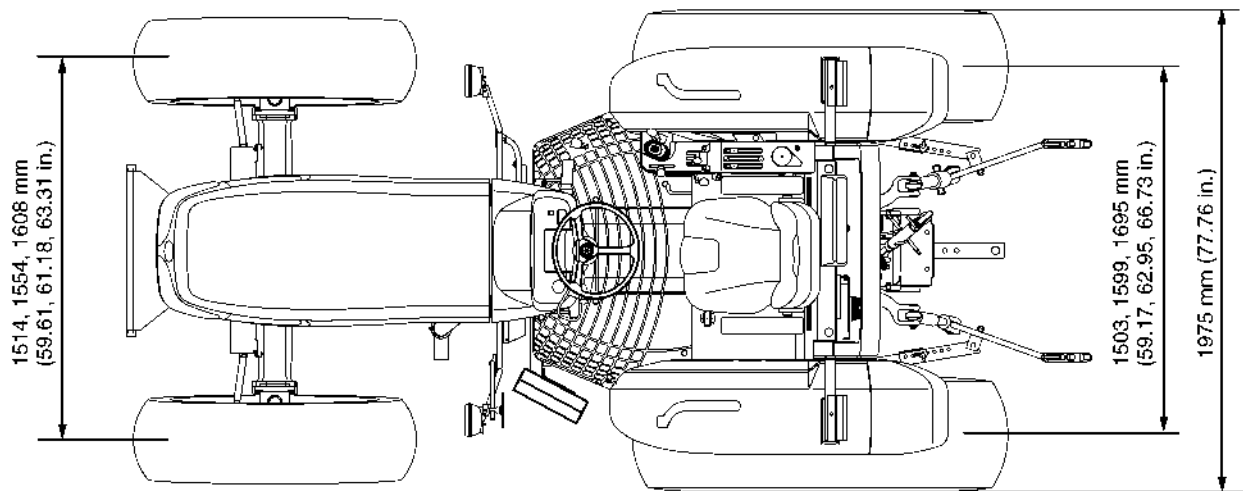
Model			M8540 / M9540		
Tire size (Rear)			480/70R34		
Transmission type			without Dual speed	with Dual speed	
Shuttle shift lever	Range gear shift lever	Main gear shift lever	km/h (mph)	Hi	Lo
				km/h (mph)	km/h (mph)
Reverse	CREEP	1	0.43 (0.27)	0.46 (0.29)	0.39 (0.24)
		2	0.55 (0.34)	0.60 (0.37)	0.50 (0.31)
		3	0.73 (0.45)	0.79 (0.49)	0.66 (0.41)
		4	0.93 (0.58)	1.01 (0.628)	0.85 (0.53)
		5	1.15 (0.715)	1.25 (0.777)	1.05 (0.652)
		6	1.43 (0.889)	1.50 (0.932)	1.26 (0.783)
	L	1	2.8 (1.7)	3.0 (1.9)	2.5 (1.6)
		2	3.6 (2.2)	3.9 (2.4)	3.3 (2.0)
		3	4.7 (2.9)	5.1 (3.2)	4.3 (2.7)
		4	6.0 (3.7)	6.5 (4.0)	5.5 (3.4)
		5	7.5 (4.7)	8.1 (5.0)	6.8 (4.2)
		6	9.3 (5.8)	9.7 (6.0)	8.2 (5.1)
	H	1	10.7 (6.65)	11.6 (7.21)	9.8 (6.1)
		2	13.8 (8.57)	14.9 (9.26)	12.5 (7.77)
		3	18.1 (11.2)	19.6 (12.2)	16.5 (10.3)
		4	23.2 (14.4)	25.1 (15.6)	21.1 (13.1)
		5	28.8 (17.9)	31.1 (20.6)	26.2 (16.3)
		6	35.7 (22.2)	37.5 (23.3)	31.5 (19.6)

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

W1034678

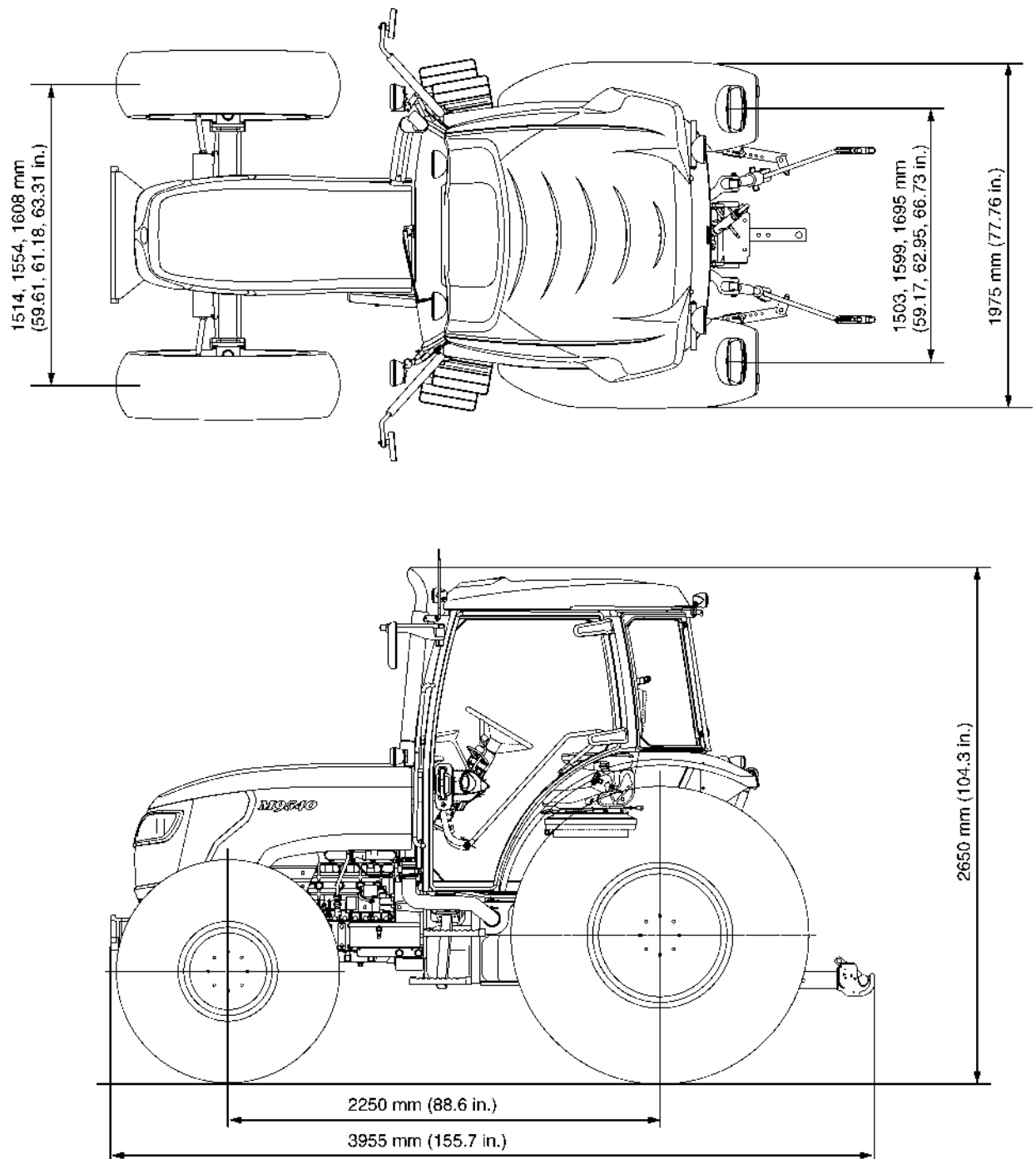
DIMENSIONS

ROPS Model



3TMACBHFP001A

CABIN Model



3TMACBHP002A

G GENERAL

GENERAL

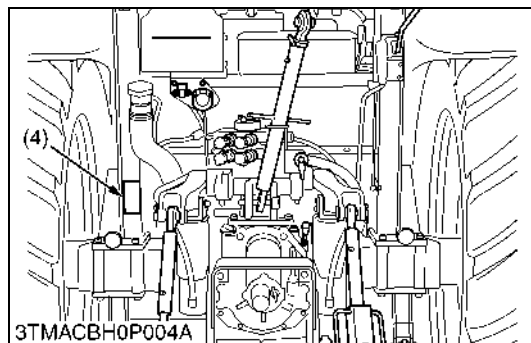
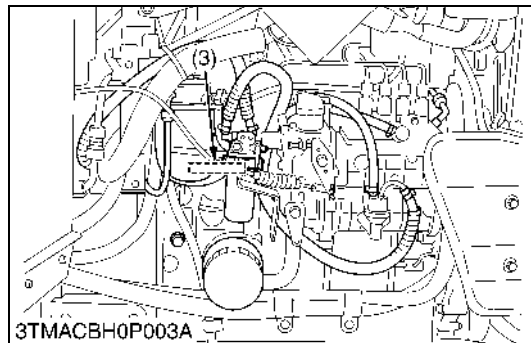
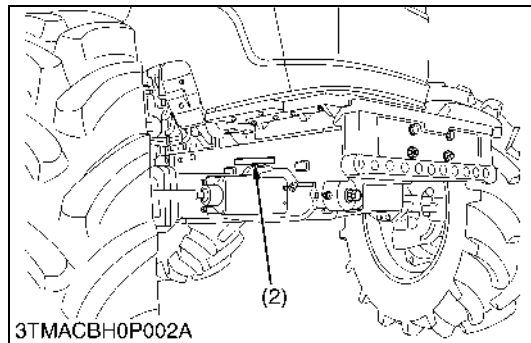
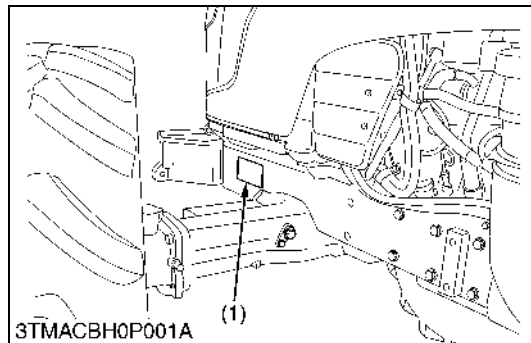
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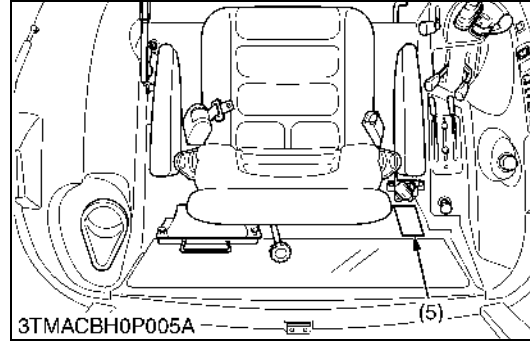
1. TRACTOR IDENTIFICATION

[1] MODEL NAME AND SERIAL NUMBERS

(1) Tractor Number



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

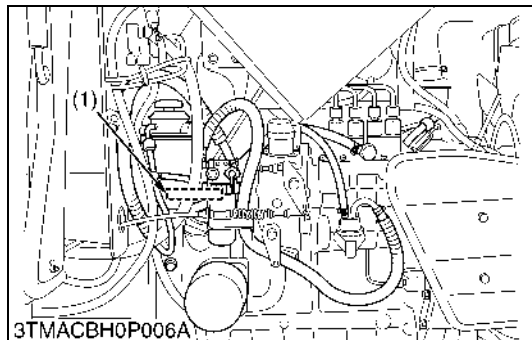


- (1) Tractor Identification Plate
- (2) Tractor Serial Number
- (3) Engine Serial Number

- (4) ROPS Identification Plate
(ROPS Serial Number)
- (5) CABIN Identification Plate
(CABIN Serial Number)

W1010800

(2) Engine Number



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. V3800-6A0001

“6” indicates 2006 and “A” indicates January.

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

(1) Engine Model and Serial Number

W1010477

[2] E3 ENGINE

[Example : Engine Model Name V3800-**E3**]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Non-Road Emission Standards continue to change. The timing or applicable date of the specific Non-Road Emission regulations depends on the engine output classification.

Over the past several years, Kubota has been supplying diesel engines that comply with regulations in the respective countries affected by Non-Road Emission regulations. For Kubota Engines, E3 will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing ###-E3 series engines, use only replacement parts for that specific E3 engine, designated by the appropriate E3 Kubota Parts List and perform all maintenance services listed in the appropriate Kubota Operator's Manual or in the appropriate E3 Kubota Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E2 engines), may result in emission levels out of compliance with the original E3 design and EPA or other applicable regulations. Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E3 engines are identified with "ET" at the end of the Model designation, on the US EPA label. Please note : E3 is not marked on the engine.

TYPE : #####

FAMILY : #####

APPROVAL NUMBER: #####/#####/#####

Kubota KUBOTA Corporation

####

(1) (2)

EMISSION CONTROL INFORMATION

THIS ENGINE MEETS 2008 EMISSION REGULATIONS FOR U.S. EPA AND CALIFORNIA NONROAD DIESEL ENGINES.

Kubota KUBOTA Corporation

MODEL : ### - **ET** ENGINE DISP : ###

FAMILY : 8 ### EGS : EM

OUTPUT : ## kW / ## rpm CATEGORY : ## - ## kW

VALVE CLEARANCE (COLD) : IN ## mm EX ## mm

INJ. TIMING : ### DEG BTDC LOW IDLE : ## - ## rpm

LOW SULFUR FUEL OR ULTRA LOW SULFUR FUEL ONLY

CONTACT KUBOTA FOR FUEL SETTING

####

3EEAEAE0P002A

Category (1)	Engine output classification	EU regulation
K	From 19 to less than 37 kW	STAGE IIIA
J	From 37 to less than 75 kW	STAGE IIIA
I	From 75 to less than 130 kW	STAGE IIIA

Category (2)	Engine output classification	EPA regulation
ET	Less than 19kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Tier 3
	From 75 to less than 130 kW	Tier 3

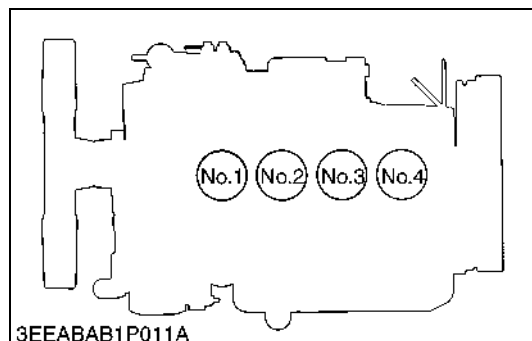
(1) EU regulation engine output classification category

(2) "E3" engines are identified with "ET" at the end of the Model designation, on the US EPA label.

"E3" designates Tier 3 and some Interim Tier 4 / Tier 4 models, depending on engine output classification.

W1031971

[3] CYLINDER NUMBER

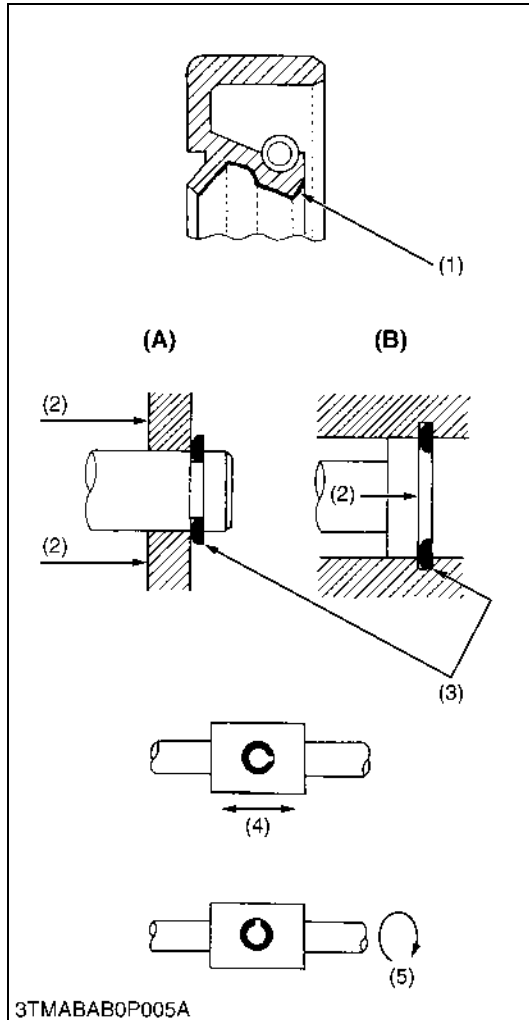


The cylinder numbers of Kubota diesel engine are designated as shown in the figure.

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

W1011077

2. GENERAL PRECAUTIONS



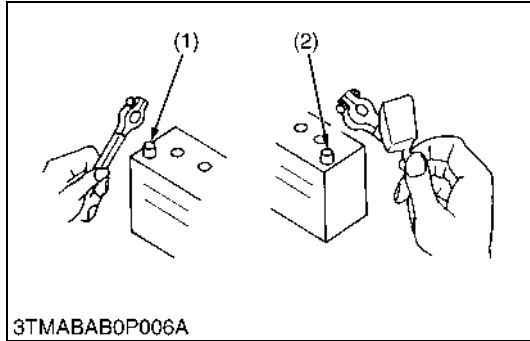
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

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

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

W1010904

3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



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

■ IMPORTANT

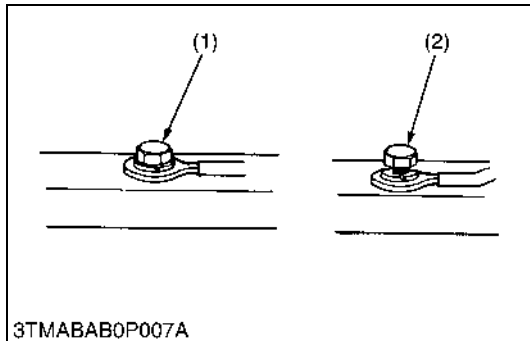
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

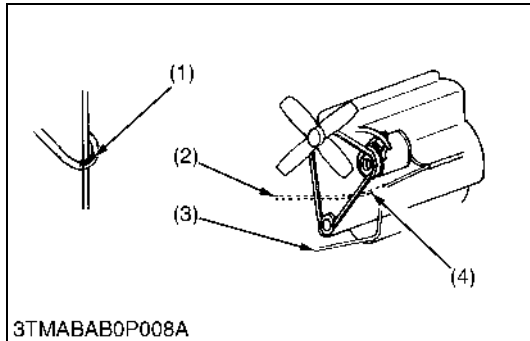


- Securely tighten wiring terminals.

(1) Correct
(Securely Tighten)

(2) Incorrect
(Loosening Leads to Faulty Contact)

W1011216

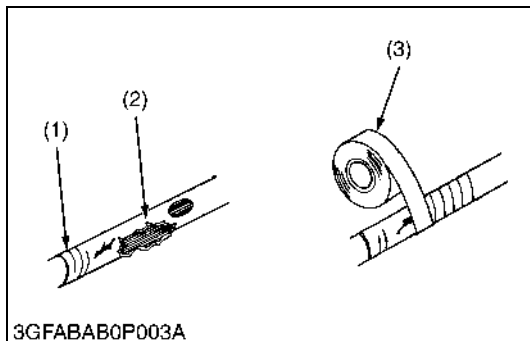


- Do not let wiring contact dangerous part.

(1) Dangerous Part
(2) Wiring (Incorrect)

(3) Wiring (Correct)
(4) Dangerous Part

W1011313

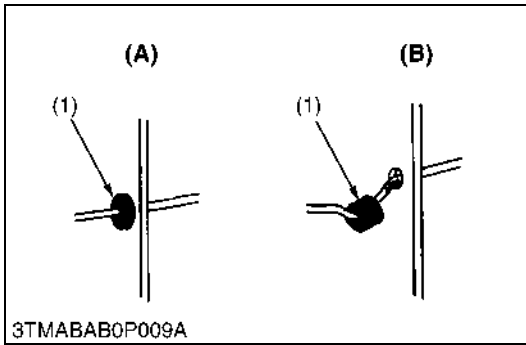


- Repair or change torn or aged wiring immediately.

(1) Aged
(2) Torn

(3) Insulating Vinyl Tape

W1012292



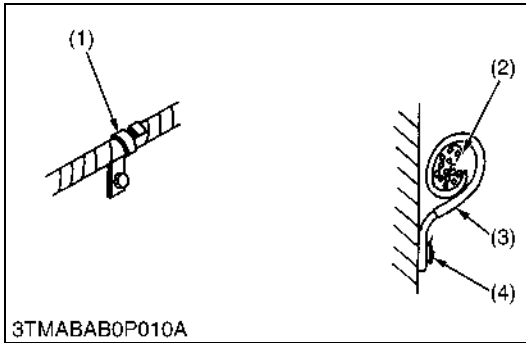
- Securely insert grommet.

(1) Grommet

(A) Correct

(B) Incorrect

W1011388



- Securely clamp, being careful not to damage wiring.

(1) Clamp

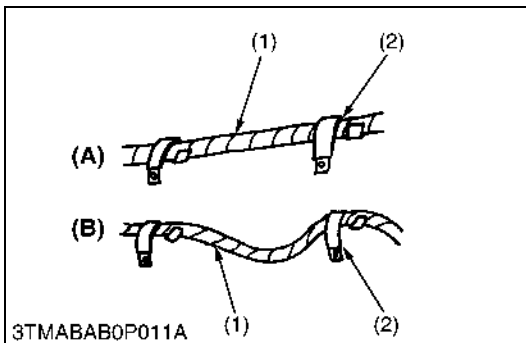
(3) Clamp

• Wind Clamp Spirally

(4) Welding Dent

(2) Wire Harness

W1011458



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

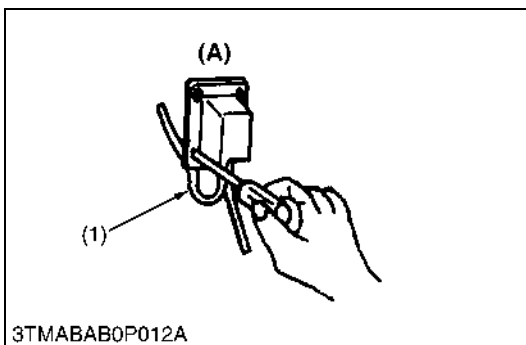
(1) Wiring

(A) Correct

(2) Clamp

(B) Incorrect

W1011587

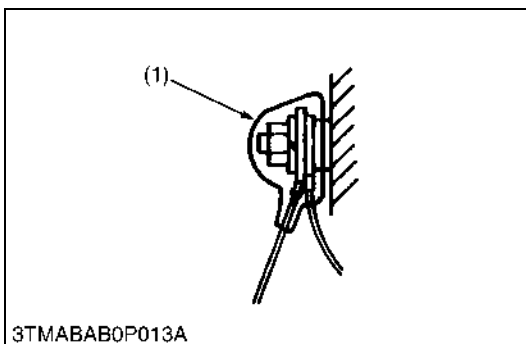


- In installing a part, take care not to get wiring caught by it.

(1) Wiring

(A) Incorrect

W1011670



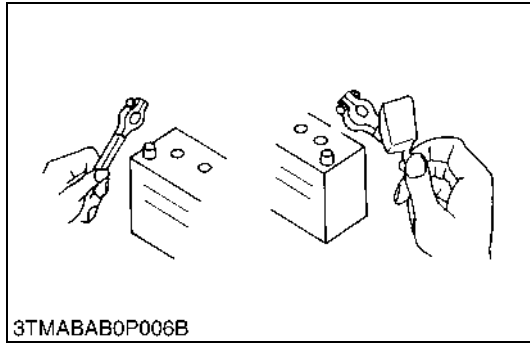
- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

(1) Cover

• Securely Install Cover

W1011735

[2] BATTERY



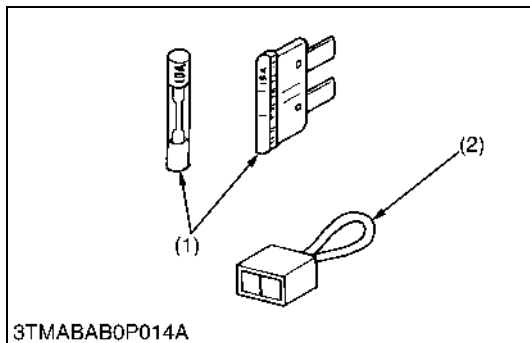
- Take care not to confuse positive and negative terminals.
- When removing battery cable, disconnect negative wire first. When installing battery cable, check for polarity and connect positive wire first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting cable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

CAUTION

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

W1011816

[3] FUSE



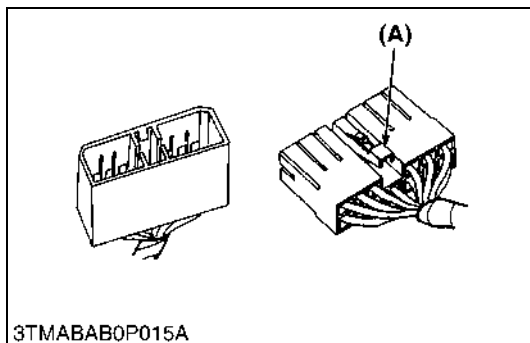
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Slow Blow Fuse

W1012092

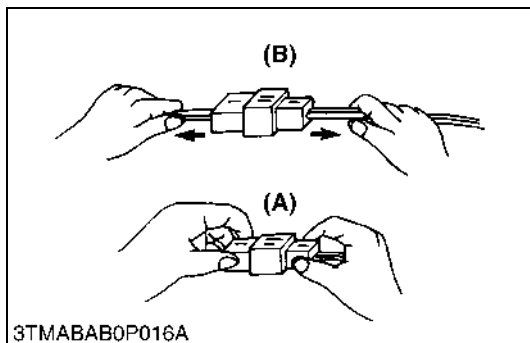
[4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

W1012211

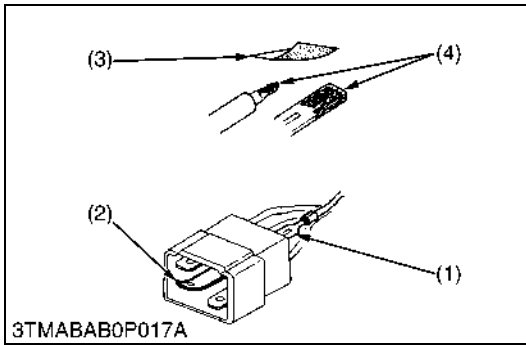


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

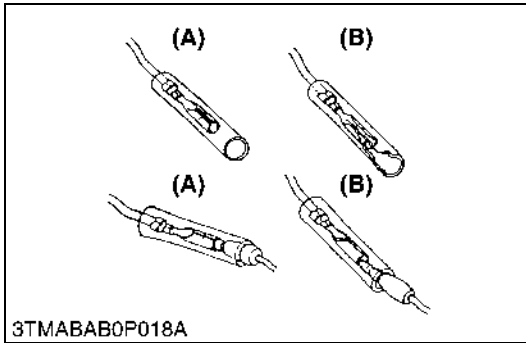
W1012272



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

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

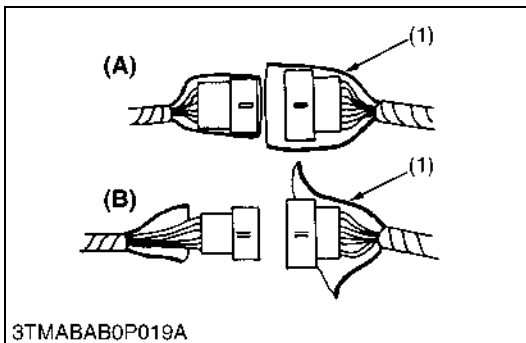
W1012346



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

(A) Correct (B) Incorrect

W1012430

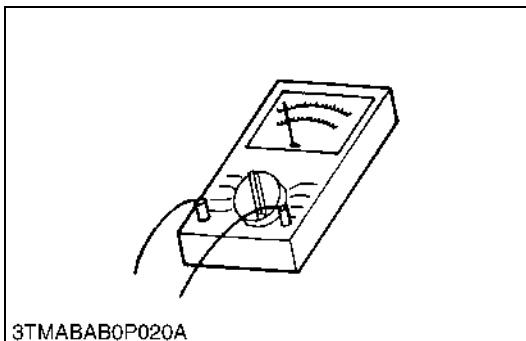


- Make certain plastic cover is large enough to cover whole connector.

(1) Cover (A) Correct
(B) Incorrect

W1012519

[5] HANDLING OF CIRCUIT TESTER



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

W1012684

4. LUBRICANTS, FUEL AND COOLANT

	Place	Capacity		Lubricants, fuel and coolant
		M8540 / M9540		
		ROPS	CABIN	
1	Fuel tank	90 L 23.8 U.S.gals. 19.8 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	Coolant	9.0 L 9.5 U.S.qts. 7.9 Imp.qts.		Fresh clean water with anti-freeze
	Recovery tank	1.0 L 1.1 U.S.qts. 0.9 Imp.qts.		
3	Washer liquid	–	1.3 L 1.4 U.S.qts. 1.1 Imp.qts.	Automobil washer liquid
4	Engine crankcase (with filter)	10.7 L 11.3 U.S.qts. 9.4 Imp.qts.		API Service Classification CF or CI-4 (External EGR type engine) Below 0 °C (32 °F) : SAE10W, 10W-30 or 15W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 15W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 15W-40
5	Transmission case	60 L 63.4 U.S.qts. 52.8 Imp.qts.		KUBOTA UDT or SUPER UDT fluid*
6	Front differential case oil	6.0 L 6.3 U.S.qts. 5.3 Imp.qts.		KUBOTA UDT or SUPER UDT fluid* or SAE80, SAE90 gear oil
7	Front axle gear case oil (one side)	3.5 L 3.7 U.S.qts. 3.1 Imp.qts.		

* KUBOTA original transmission hydraulic fluid.

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

■ NOTE

Engine Oil :

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

Fuel used	Engine oil classification (API classification)	
	Oil class of engines except external EGR	Oil class of engines with external EGR
High Sulfur Fuel (≥ 500 ppm)	CF (If the “CF-4, CG-4, CH-4, or CI-4” lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals. (approximately half))	—
Low Sulfur Fuel (< 500 ppm) or Ultra Low Sulfur Fuel (< 15 ppm)	CF, CF-4, CG-4, CH-4 or CI-4	CF or CI-4 (Class CF-4, CG-4 and CH-4 engine oils cannot be used on EGR type engines.)

EGR : Exhaust Gas Re-circulation

- The CJ-4 engine oil is intended for DPF (Diesel Particulate Filter) type engines, and cannot be used on this tractor.
W1024941

Fuel :

- Cetane number of 45 minimum. Cetane number greater than 50 is preferred, especially for temperatures below –20 °C (–4 °F) or elevations above 1500 m (5000 ft).
- If diesel fuel with sulfur content greater than 0.5 % sulfur content is used, reduce the service interval for engine oil and filter by 50 %.
- DO NOT use diesel fuel with sulfur content greater than 1.0 %.
- Diesel fuels specified to EN 590 or ASTM D975 are recommended
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87).

Transmission Oil :

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

Do not mix different brands together.

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

5. TIGHTENING TORQUES

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	 No-grade or 4T						 7T						 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6 (6 mm, 0.24 in.)	7.84 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	lbf·ft	N·m	kgf·m	lbf·ft
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1
M14 (14 mm, 0.55 in.)	62 to 73.5	6.3 to 7.5	45.6 to 54	—	—	—
M16 (16 mm, 0.63 in.)	98.1 to 112.8	10.0 to 11.5	72.3 to 83.2	—	—	—
M18 (18 mm, 0.71 in.)	172 to 201.1	17.5 to 20.5	126.5 to 148.2	—	—	—

W1048139

[3] HYDRAULIC FITTINGS

■ Hydraulic Hose Fittings

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

W1014711

■ Hydraulic Pipe Cap Nuts

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

W1014848

■ Adaptors, Elbows and Nipples

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

W1015484

6. MAINTENANCE

No.	Item		Indication on hour meter														Inter- val	Impor- tant		Refe- rence page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-22
2	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-22
3	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*4		G-27
4	Greasing	—		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-23
5	Fan belt	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
6	Brake pedal	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
7	Air cleaner element [Double type]	Primary element	Clean		☆		☆		☆		☆		☆		☆		every 100 Hr	*1		G-25
		Replace														every 1 year	*2		G-25	
		Secondary element	Replace													every 1 year			G-25	
8	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
		Replace														every 2 years			G-26	
9	Parking brake lever	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
10	Gear locked parking lever	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
11	Toe-in	Adjust				☆				☆				☆			every 200 Hr			G-29
12	Fuel tank water	Drain				☆				☆				☆			every 200 Hr			G-29
13	Power steering oil line	Check				☆				☆				☆			every 200 Hr			G-28
		Replace															every 2 years			G-28
14	Radiator hose and clamp	Check				☆				☆				☆			every 200 Hr			G-28
		Replace															every 2 years			G-28
15	Intake air line	Check				☆				☆				☆			every 200 Hr			G-28
		Replace															every 2 years	*3		G-28
16	Engine oil	Change	★					☆						☆			every 300 Hr			G-18
17	Hydraulic oil filter	Replace	★					☆						☆			every 300 Hr			G-19

W1035769

No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
18	Water separator	Clean								☆							every 400 Hr			G-32
19	Fuel filter	Replace								☆							every 400 Hr			G-32
20	Engine oil filter	Replace	★											☆			every 600 Hr			G-18
21	Transmission fluid	Change	★											☆			every 600 Hr			G-20
22	Front differential case oil	Change	★											☆			every 600 Hr			G-20
23	Front axle case oil	Change	★											☆			every 600 Hr			G-21
24	Front axle pivot	Adjust												☆			every 600 Hr			G-33
25	Engine valve clearance	Adjust															every 800 Hr			G-33
26	Fuel injection nozzle injection pressure	Check															every 1500 Hr			G-33
27	Turbocharger	Check															every 3000 Hr			G-34
28	Injection pump	Check															every 3000 Hr			G-34
29	Intake air heater	Check															every 3000 Hr			G-34
30	Cooling system	Flush															every 2 years			G-35
31	Coolant	Change															every 2 years			G-35
32	Master cylinder filter	Clean															every 2 years			G-38
33	Master cylinder kit	Replace															every 2 years			G-38
34	Equalizer kit	Replace															every 2 years			G-38
35	Brake seal 1 and 2	Replace															every 2 years			G-38
36	Lift cylinder hose	Replace															every 2 years			G-37
37	Fuel system	Bleed															Service as required			G-39
38	Brake system	Bleed																		G-39
39	Clutch housing water	Drain																		G-39
40	Fuse	Replace																		G-39
41	Light bulb	Replace																		G-40

W1028983

No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Inner air filter	Clean				☆				☆				☆			every 200 Hr			G-30
2	Fresh air filter	Clean				☆				☆				☆			every 200 Hr			G-30
3	Air conditioner condenser	Clean				☆				☆				☆			every 200 Hr			G-31
4	Air conditioner drive belt	Adjust				☆				☆				☆			every 200 Hr			G-31
5	Air conditioner pipes and hoses	Check															every 1 year			G-34
6	Cabin isolation cushion	Check															every 1 year			G-34
7	Washer liquid	Add															Service as required			G-41
8	Refrigerant (gas)	Check															Service as required			G-41

■ IMPORTANT

- The jobs indicated by ☆ must be done after the first 50 hours of operation.
- *1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- *2 : Every year or every 6 times of cleaning.
- *3 : Replace only if necessary.
- *4 : When the battery is used for less than 100 hours per year, check the battery condition by reading the indicator annually.

W1025390

7. CHECK AND MAINTENANCE



CAUTION

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

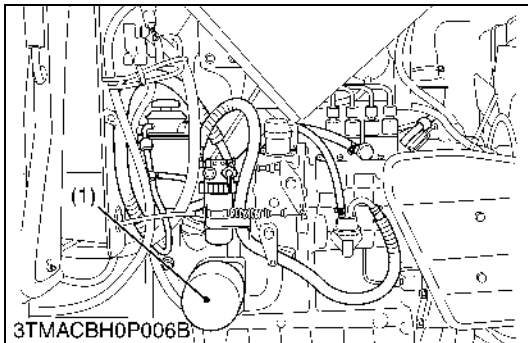
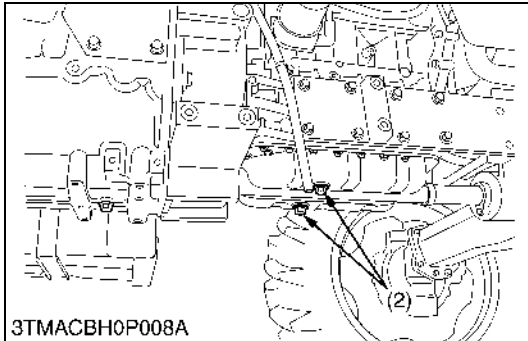
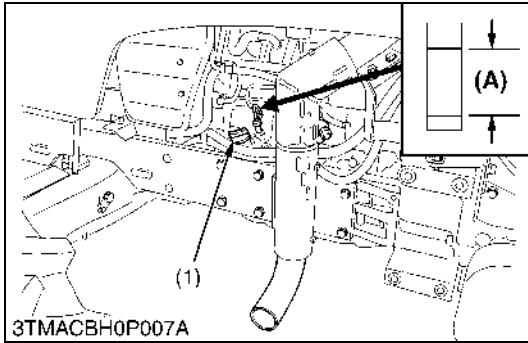
[1] DAILY CHECK

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

Checking

- Check areas where previous trouble was experienced.
 - Walk around the tractor.
1. Check the tire pressure, and check for wear and damage.
 2. Check and refueling.
 3. Check for oil and water leak.
 4. Check the engine oil level.
 5. Check the transmission fluid level.
 6. Check the coolant level.
 7. Check the condition of ROPS attaching hardware. (ROPS model).
 8. Check the washer liquid level. (CABIN model)
 9. Check the water separator.
 10. Clean the air cleaner evacuator valve.
 11. Check and clean the radiator screen, grill, oil cooler, and battery mount.
 12. Check and clean the air conditioner condenser screen. (CABIN model)
 13. Check the nuts of tires are tight.
 14. Check the number plate for damage and replace as necessary if equipped.
 15. Care of danger, warning and caution labels (pictorial safety valve).
 16. Clean around the exhaust manifold and the muffler of the engine.
- While sitting in the operator's seat.
1. Check the throttle pedal, brake pedal and clutch pedal.
 2. Check the throttle lever and shuttle lever.
 3. Check the parking brake.
 4. Check the steering wheel.
 5. Check the seat belt.
- Turning the key switch.
1. Check the performance of the easy checker lights.
 2. Check the head lights, turn signal lights, hazard lights and other light equipment. Clean if necessary.
 3. Check the performance of the meters and gauges.
- Starting the engine.
1. Check to see that the lights on the easy checker go off.
 2. Check the color of the exhaust gas.
 3. Check the brakes for proper operation.

[2] CHECK POINTS OF INITIAL 50 HOURS



Changing Engine Oil

CAUTION

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

Oil capacity with filter	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

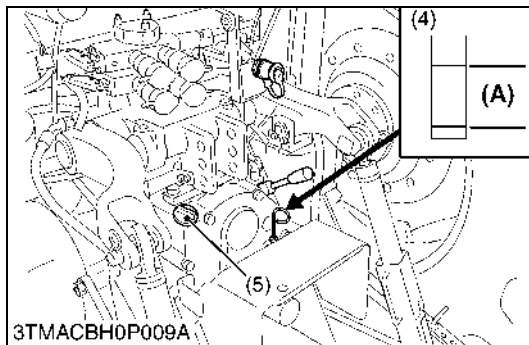
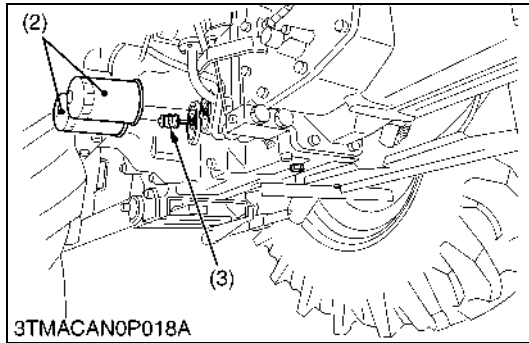
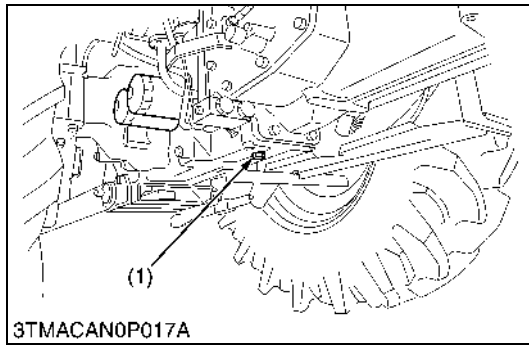
- Be sure to stop the engine before changing oil filter cartridge.
 - Allow engine to cool down sufficiently, oil can be hot and can burn.
1. Remove the oil filter (1).
 2. Put a film of clean engine oil on rubber seal of new filter.
 3. Tighten the filter quickly until it contacts the mounting surface.
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



Replacing Hydraulic Oil Filter

⚠ CAUTION

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

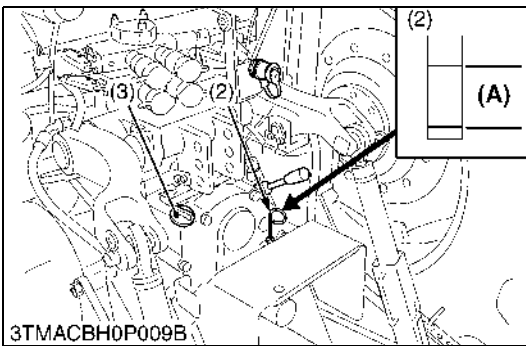
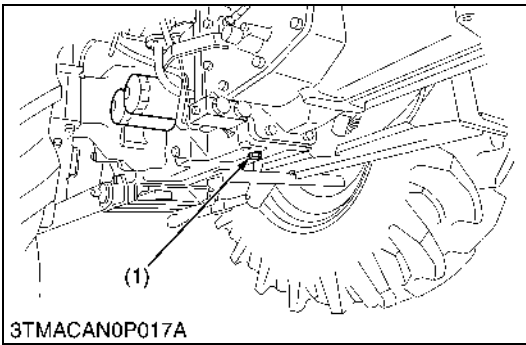
■ IMPORTANT

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

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

(A) Oil level is acceptable within this range.

W1022033



Changing Transmission Fluid

⚠ CAUTION

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

■ IMPORTANT

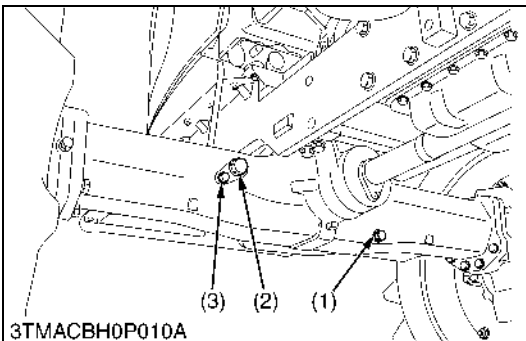
- **Do not operate the tractor immediately after changing the transmission fluid.**
Run the engine at medium speed for a few minutes to prevent damage to the transmission.

Oil capacity	60 L 63.4 U.S.qts. 52.8 Imp.qts.

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

(A) Oil level is acceptable within the range.

W1022400



Changing Front Differential Case Oil

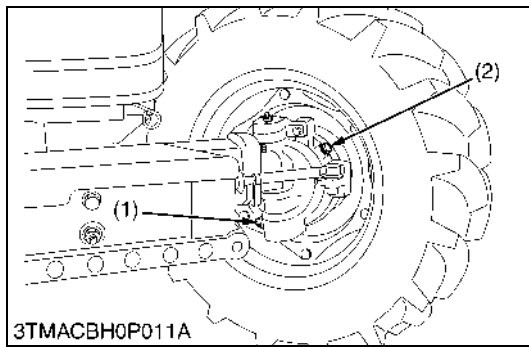
1. To drain the used oil, remove the drain and filling plug at the front differential case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug (1).
3. Remove the oil level check plug (3).
4. Fill with the new oil up to the lower rim of check plug port (3).
(Refer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

Oil capacity	6.0 L 6.3 U.S.qts. 5.3 Imp.qts.

- (1) Drain Plug
(2) Filling Plug

(3) Check Plug

W1063019



Changing Front Axle Gear Case Oil

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

NOTE

- **Check plug is not available for front axle gear case, fill the specified amount of lubricant to the front axle gear case.**

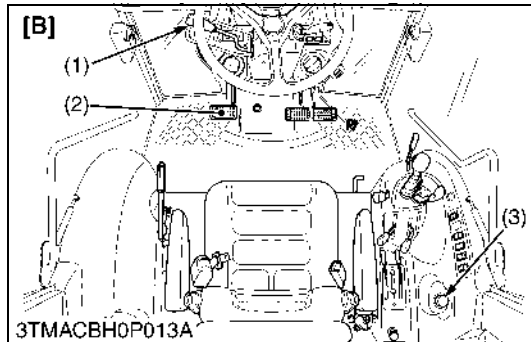
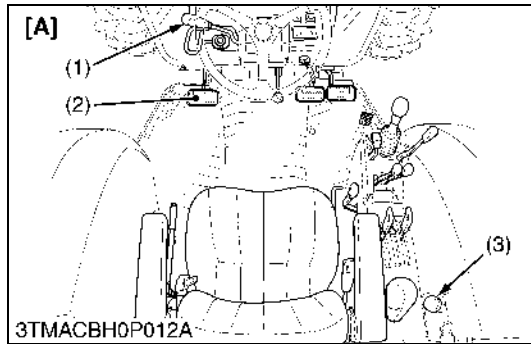
Oil capacity	3.5 L
	3.7 U.S.qts.
	3.1 Imp.qts.

(1) Drain Plug

(2) Filling Plug

W1063636

[3] CHECK POINTS OF EVERY 50 HOURS



Checking Engine Start System

⚠ CAUTION

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

■ Preparation before testing

1. Place all control levers in the “NEUTRAL” position.
2. Set the parking brake and stop the engine.

■ Test 1 : Switch for the shuttle shift lever.

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

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

⚠ WARNING

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

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

(1) Shuttle Shift Lever

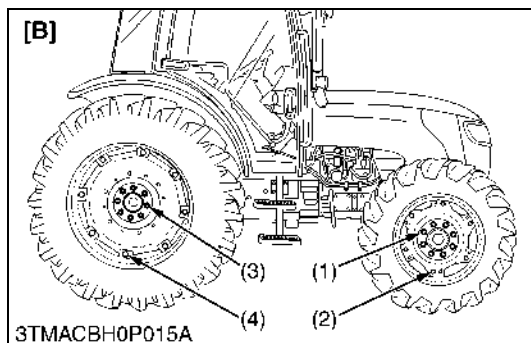
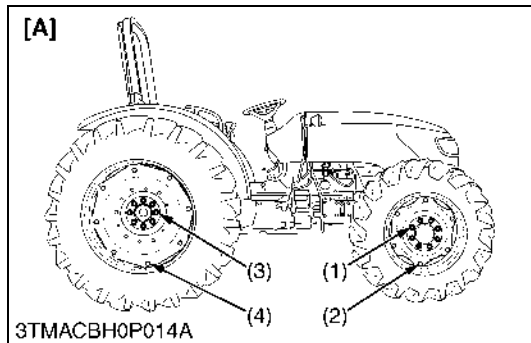
(2) Clutch Pedal

(3) PTO Clutch Control Switch

[A] ROPS Model

[B] CABIN Model

W1062967



Checking Wheel Mounting Nuts Tightening Torque

⚠ CAUTION

- Never operate tractor with a loose rim, wheel, or axle.
 - Any time bolts and nuts are loosened, retighten to specified torque.
 - Check all bolts and nuts frequently and keep them tight.
1. Check the wheel mounting nuts regularly especially when new.
If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting nut	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft
	Rear wheel mounting nut	M18	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft
	Front and rear disc mounting nut (Both steel disc and cast iron disc)	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

(1) Front Wheel Mounting Nut

(2) Front Disc Mounting Nut

(3) Rear Wheel Mounting Nut

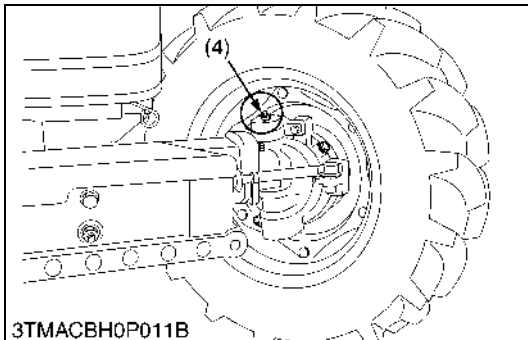
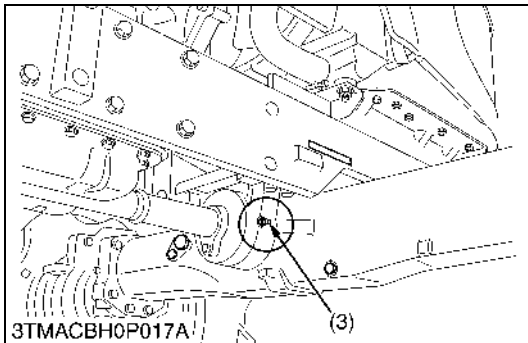
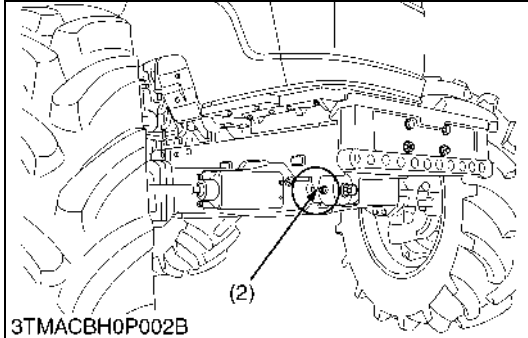
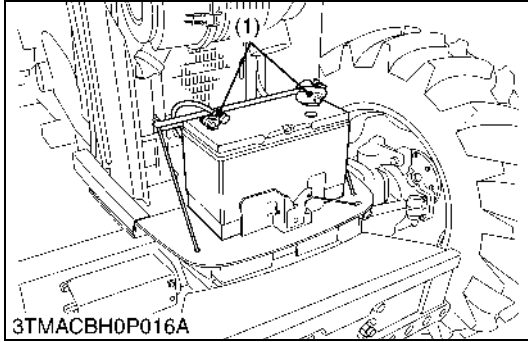
(4) Rear Disc Mounting Nut

[A] ROPS Model

[B] CABIN Model

W1023970

[4] CHECK POINTS OF EVERY 100 HOURS



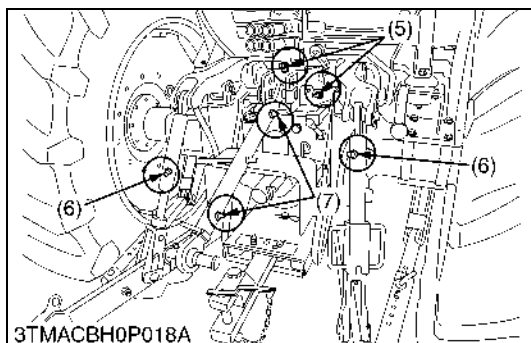
Lubricating Grease Fittings

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

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

(To be continued)

(Continued)

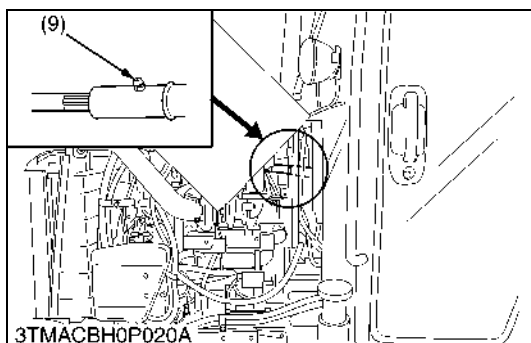
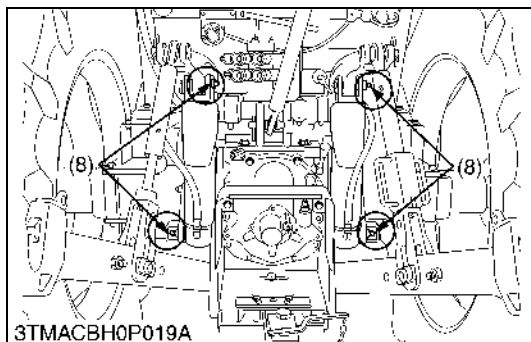


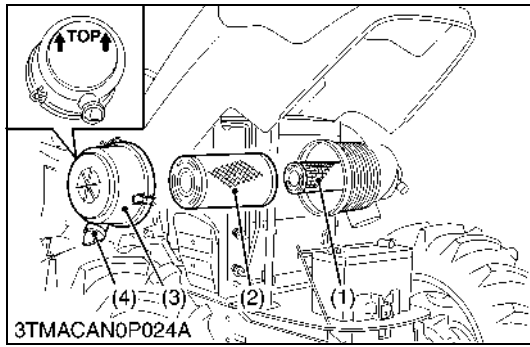
- (5) Grease Fitting (Top Link Bracket)
- (6) Grease Fitting (Lifting Rod)
- (7) Grease Fitting (Top Link)
- (8) Grease Fitting (Hydraulic Lift Cylinders Pin)

- (9) Steering Joint Shaft

[A] CABIN Model

W1025259





Cleaning Air Cleaner Element

1. Remove the air cleaner cover (3) and primary element (2).
2. Clean the primary element if:
 - When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm², 30 psi).
 - When carbon or oil adheres to the element, soak the element in detergent for 15 minutes then wash it several times in water, rinse with clean water and dry it naturally. After element is fully dried, inspect inside of the element with a light and check if it is damaged or not.
3. Replace the primary element (2) :
Once a year or after every six times of cleaning, whichever comes first.

■ IMPORTANT

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

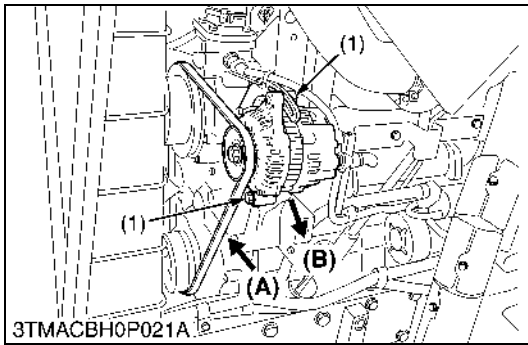
■ Evacuator Valve

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

(1) Secondary (Safety) Element
(2) Primary Element

(3) Cover
(4) Evacuator Valve

W1024610



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.

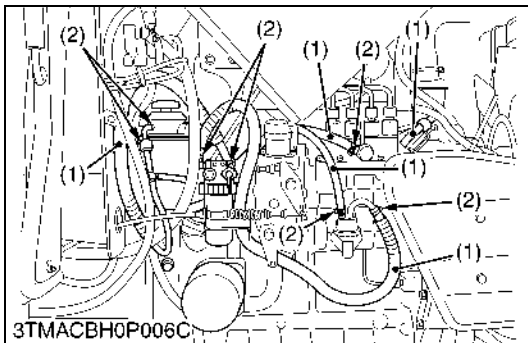
1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within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

(1) Bolt

(A) Check the belt tension

(B) To tighten

W1024843



Checking Fuel Line

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

NOTE

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

(1) Fuel Line

(2) Clamp Band

W1067279

Adjusting Brake Pedal

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

W1025046

Adjusting Parking Brake Lever

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

W1067627

Checking Gear Locked Parking Lever



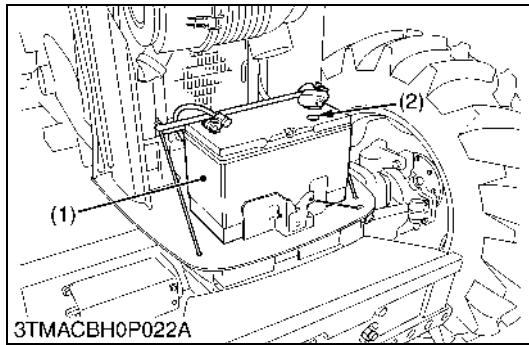
CAUTION

- Do not dismount the tractor while checking the parking brake.
1. Confirm the tractor (tractor unit only) can surely be parked on the slope of about 15 degrees (Slope that rises by 2.7 meters every 10 meters).
Always engage the parking brake before dismounting the tractor.

NOTE

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

W1066584



Checking Battery Condition

⚠ CAUTION

- Never remove the vent plugs while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately and get medical attention.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.
- Wear eye protection and rubber gloves when working around battery.

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

State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery.
White	Needs changing battery.

(1) Battery

(2) Indicator

W1024321

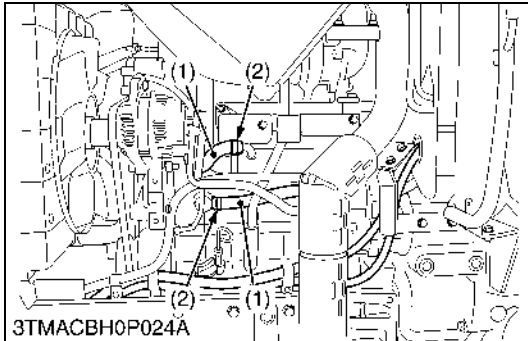
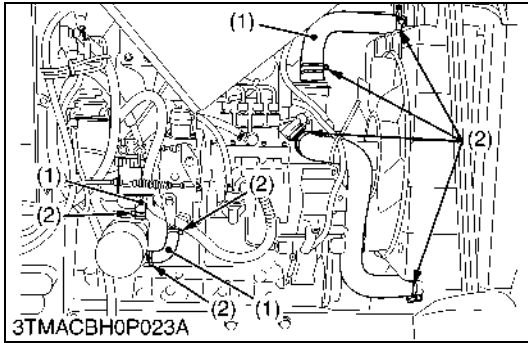
Directions for Storage

⚠ CAUTION

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

W1024462

[5] CHECK POINTS OF EVERY 200 HOURS



Checking Radiator Hose and Hose Clamp

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

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

Replace hoses and hose clamps every 2 years or earlier if checked and found that hoses are swollen, hardened or cracked.

■ Precaution at Overheating

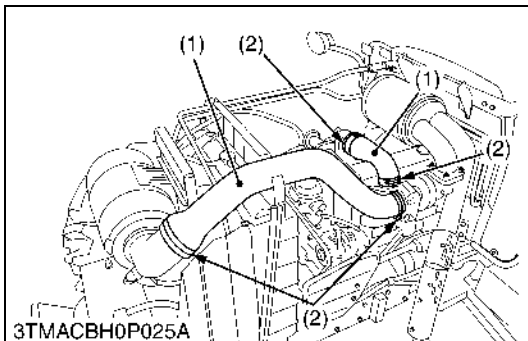
Take the following actions in the event the coolant temperature be nearly or more than the boiling point, what is called "Overheating".

1. Stop the machine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking that there gets no danger such as burn. Get rid of the causes of overheating, refer to "1. TROUBLESHOOTING" at "1. ENGINE" section, and then start again the engine.

(1) Radiator Hose

(2) Clamp

W1069560



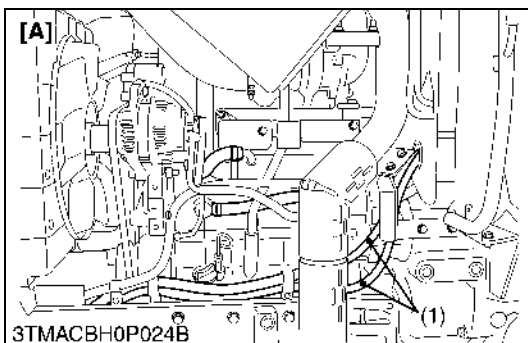
Checking Intake Air Line

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

(1) Hose

(2) Clamp

W1069940



Checking Power Steering Line

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

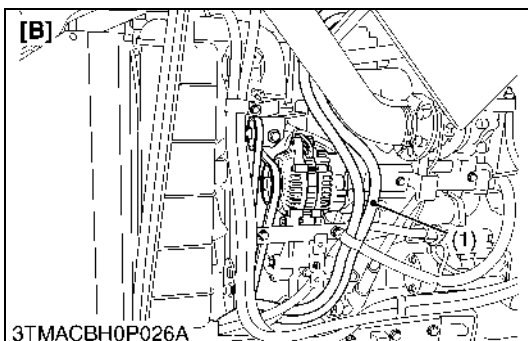
(1) Power Steering Hose

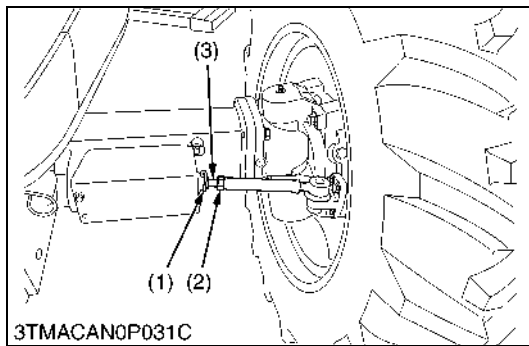
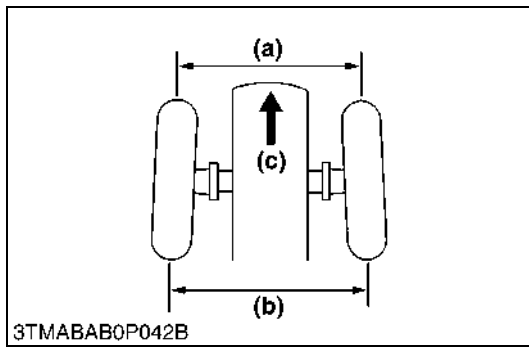
(2) Clamp

[A] ROPS Model

[B] CABIN Model

W1070096





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) (4WD)	Factory spec.	2.0 to 8.0 mm 0.08 to 0.31 in.

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

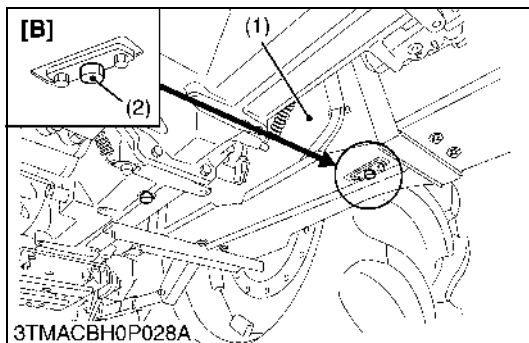
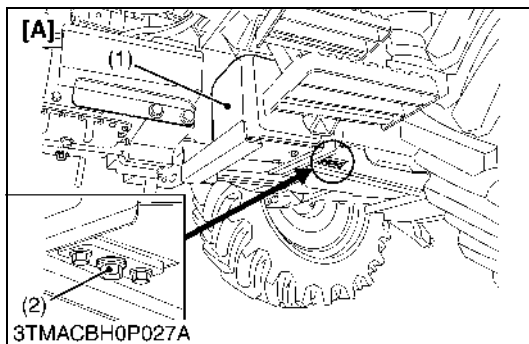
■ Toe-in Adjustment

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

- (1) Snap Ring
(2) Tie-rod Nut
(3) Tie-rod Joint

- (a) Wheel-to-wheel distance at front
(b) Wheel-to-wheel distance at rear
(c) "FRONT"

W1026029



Draining Fuel Tank Water

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

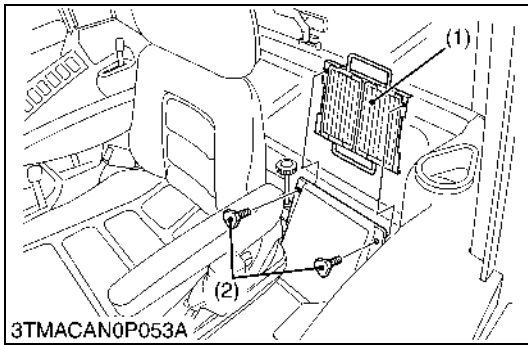
■ IMPORTANT

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

- (1) Fuel Tank
(2) Drain Plug

- [A] ROPS Model
[B] CABIN Model

W1070846



Cleaning Inner Air Filter (CABIN Model)

1. Remove the knob bolt (2) and pull out the filter (1).
2. Blow air from the direction opposite to the filter's normal air flow. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm², 30 psi).

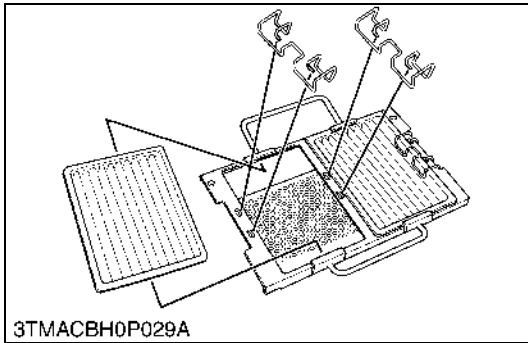
■ NOTE

- Attach the filter as the illustration.

(1) Inner Air Filter

(2) Knob Bolt

W1103342



Cleaning Air Filter (CABIN Model)

■ Fresh Air Filter

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

■ NOTE

- If the filter is very dirty :

Dip the filter in lukewarm water with mild dish washing detergent.

Move it up and down as well as left and right to loosen dirt. Rinse the filter with clean water and let it air-dry.

■ IMPORTANT

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

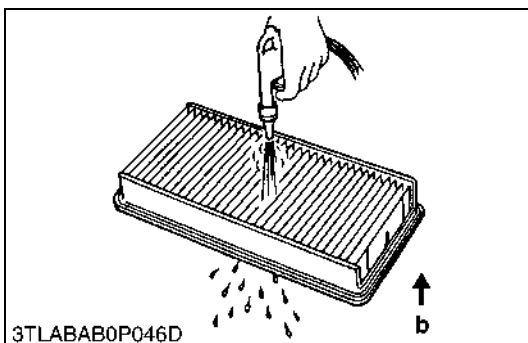
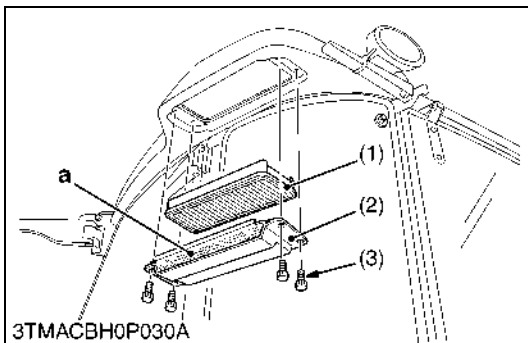
(1) Fresh Air Filter

(2) Cover

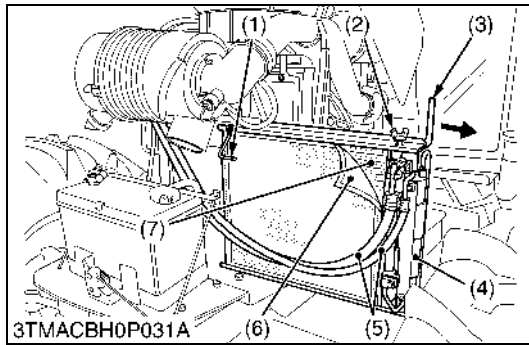
(3) Knob Bolt

a : Air Inlet Port

b : Air Conditioner Air Flow



W1019336



Checking Air Conditioner Condenser (CABIN Model)

1. Release the air conditioner hoses off the hook (1).
2. Loosen the wing nut (2).
3. Hold the handle (3), slide out the air conditioner condenser (7).
4. Check air conditioner condenser (7) and air conditioner condenser screen (6) to be sure it is clean of debris.



CAUTION

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

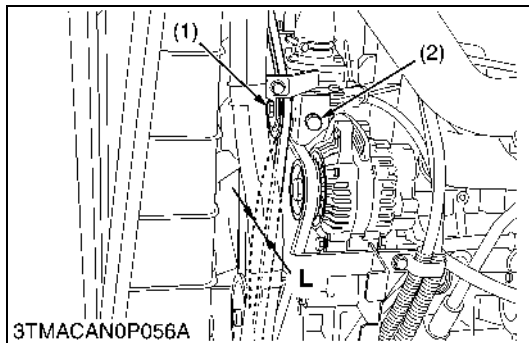
■ IMPORTANT

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

- (1) Hook
(2) Wing Nut
(3) Handle
(4) Receiver

- (5) Air Condenser Hose
(6) Air Conditioner Condenser Screen
(7) Air Conditioner Condenser

W1019699



Adjusting Air Conditioner Belt Tension (CABIN Model)



CAUTION

- Be sure to stop the engine before checking belt tension.
1. Push on the belt between the pulleys with a finger under 9.8 N (10 kgf, 22 lbf) load is appropriate.
 2. If tension is incorrect, loosen the tension pulley mounting nut (1) and turn the adjusting screw (2) to adjust the belt tension within acceptable limits.

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

- (1) Tension Pulley Mounting Nut
(2) Adjusting Screw

L : Belt Tension

W1104407

[6] CHECK POINTS OF EVERY 300 HOURS

Replacing Hydraulic Oil Filter

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

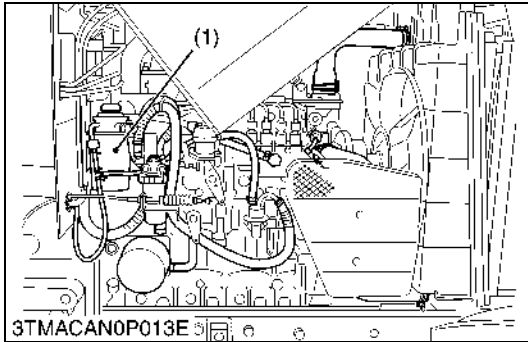
W1072600

Changing Engine Oil

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

W1071704

[7] CHECK POINTS OF EVERY 400 HOURS

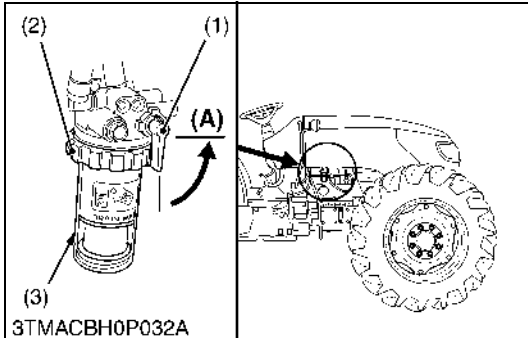


Replacing Fuel Filter

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

(1) Fuel Filter

W1026760



Cleaning Water Separator

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

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

(1) Fuel Cock

(2) Retaining Ring

(3) Cup

(4) O-ring

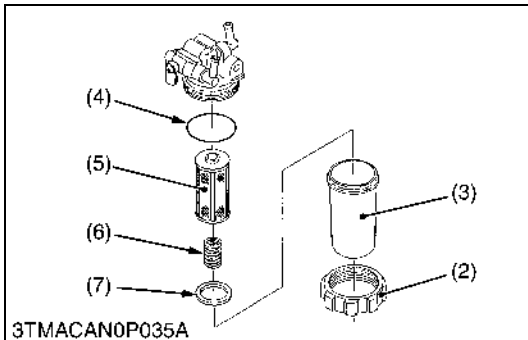
(5) Element

(6) Spring

(7) Red Float

(A) Close

W1073022



[8] CHECK POINTS OF EVERY 600 HOURS

Replacing Engine Oil Filter

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

W1074023

Changing Transmission Fluid

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

W1074077

Changing Front Differential Case Oil

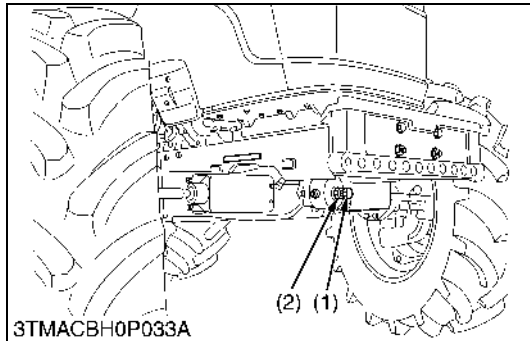
1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1074134

Changing Front Axle Gear Case Oil

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

W1074346



Adjusting Front Axle Pivot

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

■ Adjusting Procedure

1. Loosen the lock nut (2), screw in the adjusting screw (1) until seated, then tighten the screw (1) with an additional 1/6 turn. Retighten the lock nut (2).

Tightening torque	Lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 lbf·ft

(1) Adjusting Screw

(2) Lock Nut

W1027783

[9] CHECK POINT OF EVERY 800 HOURS

Adjusting Engine Valve Clearance

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

W1027950

[10] CHECK POINT OF EVERY 1500 HOURS

Checking Fuel Injection Nozzle (Injection Pressure)

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

W1075043

[11] CHECK POINTS OF EVERY 3000 HOURS

Checking Turbocharger

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

W1075136

Checking Injection Pump

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

W1074724

Checking Fuel Injection Timing

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

W1074768

Checking Intake Air Heater

1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

W1074973

[12] CHECK POINTS OF EVERY 1 YEAR

Replacing Air Cleaner Primary Element and Secondary Element

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

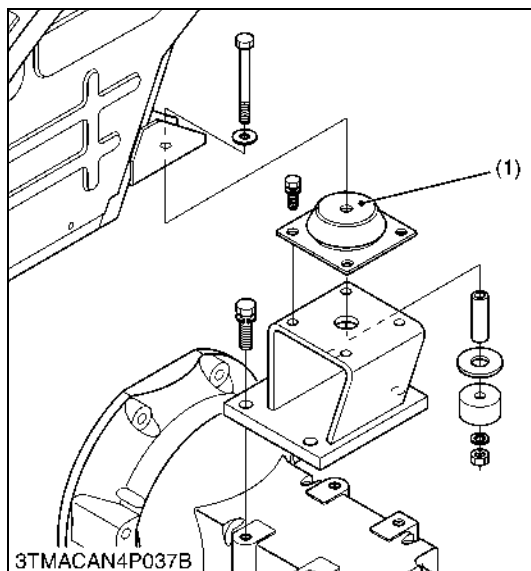
W1028012



Checking Air Conditioner Pipe and Hose (CABIN Model)

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

W1105842



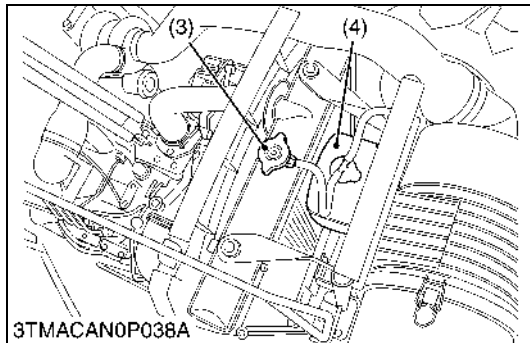
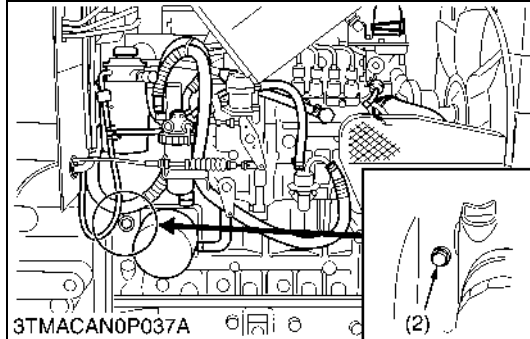
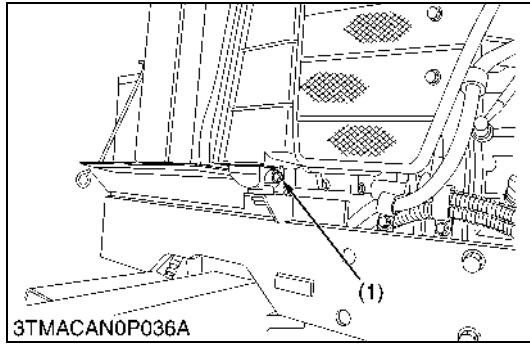
Checking Cabin Isolation Cushion (CABIN Model)

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

(1) Isolation Cushion

W1105936

[13] CHECK POINTS OF EVERY 2 YEARS



Flush Cooling System and Changing Coolant

CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**
1. Stop the engine and let cool down.
 2. To drain the coolant, open the radiator drain plug (1) and remove the drain plug (2) and radiator cap (3). The radiator cap (3) must be removed to completely drain the coolant.
 3. After all coolant is drained, install the drain plug (1) and (2) securely.
 4. Fill with clean water and cooling system cleaner.
 5. Follow directions of the cleaner instruction.
 6. After flushing, fill with clean water and anti-freeze until the coolant level is just below the radiator cap. Install the radiator cap (3) securely.
 7. Fill with clean water and anti-freeze up to the upper line of recovery tank (4).
 8. Start and operate the engine for few minutes.
 9. Stop the engine. Check coolant level and add coolant if necessary.
 10. Properly dispose of used coolant.

Coolant capacity	Engine block and radiator	9.0 L 9.5 U.S.qts. 7.9 Imp.qts.
	Recovery tank	1.0 L 1.1 U.S.qts. 0.9 Imp.qts.

IMPORTANT

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

- (1) Drain Plug (Radiator)
(2) Drain Plug (Crankcase)

- (3) Radiator Cap
(4) Recovery Tank

W1028088

Flush Cooling System and Changing Coolant (Continued)**■ Anti-Freeze****CAUTION**

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

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

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

■ IMPORTANT

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

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

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

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

W1052897

5. Adding the LLC
 - (1) Add only water if the mixture reduces in amount by evaporation.
 - (2) If there is a mixture leak, add the LLC of the same manufacture and type in the same mixture percentage.

*Never add any long-life coolant of different manufacture. (Different brands may have different additive components, and the engine may fail to perform as specified.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anticorrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

■ **NOTE**

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

W1053945

Replacing Radiator Hose (Water Pipes)

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

W1054349

Replacing Intake Air Line

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

W1034887

Replacing Fuel Hose

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

W1054573

Replacing Power Steering Hose

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

W1054527

Replacing Lift Cylinder Hose

1. Replace the lift cylinder hoses.

W1052639



Cleaning Master Cylinder Filter

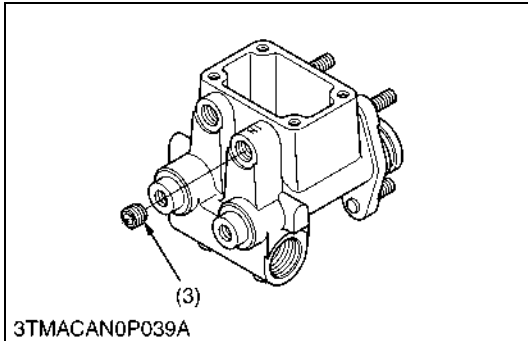
1. Remove the master cylinder pipe (2) from the master cylinder assembly (1).
2. Remove the filter (3) using the screwdriver.
3. Clean the filter (3) with kerosene and blow with air.

Tightening torque	Master cylinder pipe and return pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

- (1) Master Cylinder Assembly
(2) Master Cylinder Pipe

(3) Filter

W1078654



Replacing Parking Brake Cable

1. To check and adjusting for brake pedal, refer to "4. CHECKING, DISASSEMBLING AND SERVICING" at "5. BRAKES" section.

W1079055

Replacing Master Cylinder Kit

1. To check and adjusting for brake pedal, refer to "4. CHECKING, DISASSEMBLING AND SERVICING" at "5. BRAKES" section.

W1079117

Replacing Equalizer Kit

1. To check and adjusting for brake pedal, refer to "4. CHECKING, DISASSEMBLING AND SERVICING" at "5. BRAKES" section.

W1079171

Replacing Brake Seal 1 and 2

1. To check and adjusting for brake pedal, refer to "4. CHECKING, DISASSEMBLING AND SERVICING" at "5. BRAKES" section.

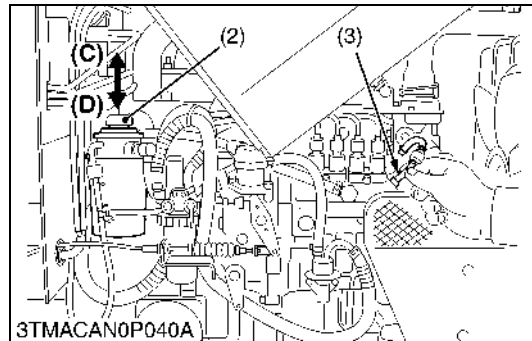
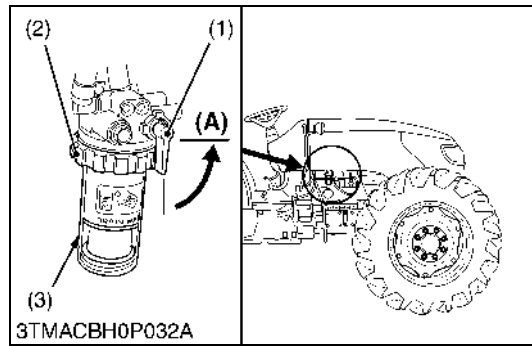
W1079225

Replacing Air Conditioner Hose

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

W1106052

[14] OTHERS



Bleeding Fuel System

Air must be removed:

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

■ Bleeding procedure is as follows:

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

■ IMPORTANT

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

- (1) Fuel Cock
(2) Fuel Pump Knob
(3) Fuel Overflow Hose

- (A) Close
(B) Open
(C) Up
(D) Down

W1055254

Bleeding Brake System

1. Refer to "4. CHECKING, DISASSEMBLING AND SERVICING" at "5. BRAKES" section.

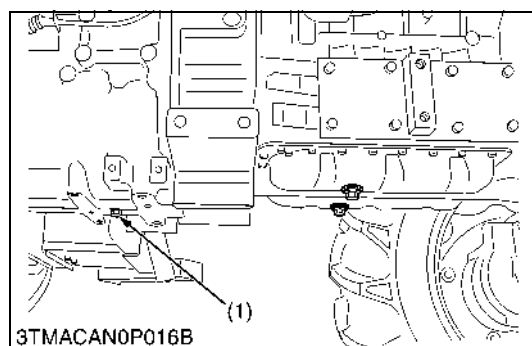
W1079671

Draining Clutch Housing Water

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

- (1) Drain Plug (Water)

W1055587



Replacing Fuse (ROPS Model)

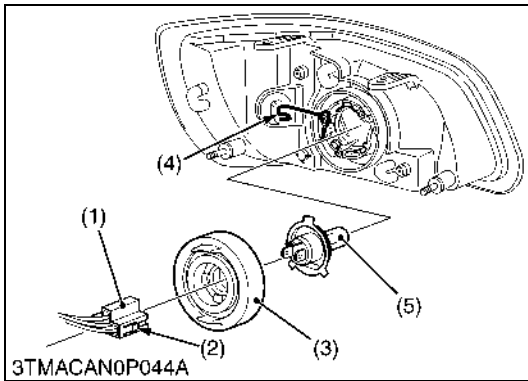
1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

W1029292

Replacing Fuse (CABIN Model)

1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

W1073497



Replacing Light Bulb



CAUTION

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

Head lights

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

Other lights

1. Detach the lens and replace the bulb.

IMPORTANT

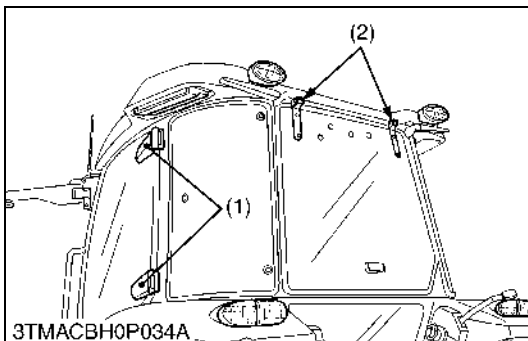
- Be sure to use a new bulb of the specified wattage.
- Never touch the bulb surface (glass) with bare hands. Fingerprints, for example, may break the bulb.

Light	Capacity	Remark
Head lights	12V, 55 / 60 W (H4)	
Turn signal / Hazard lights (Front)	12V, 21 W	
Turn signal / Hazard lights (Rear)	12V, 21 W	
Front work light	12 V, 21 W	
Work light (for outer roof)	12 V, 55 W	CABIN Model
Dome light (Room lamp)	12 V, 5 W	CABIN Model
Front position light	12 V, 10 W	
Number plate light	12 V, 10 W	

- (1) Electrical Connector
(2) Lock Button
(3) Rubber Boot

- (4) Clamping Fixture
(5) Bulb

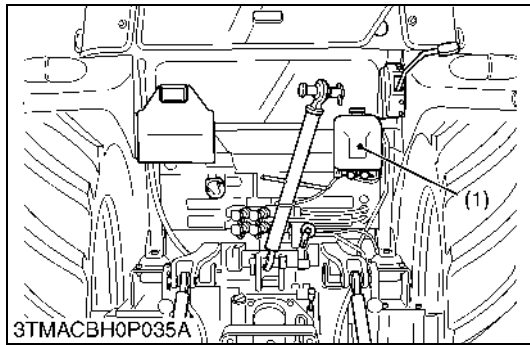
W1080544



Lubricating Points (CABIN Model)

- (1) Door Hinge (2) Rear Window Hinge

W1120093



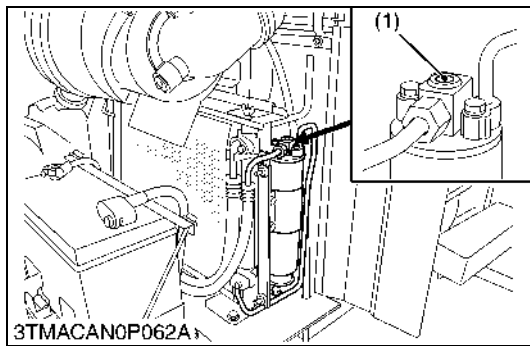
Adding Washer Liquid (CABIN Model)

1. Add a proper amount of automobile washer liquid.

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

(1) Washer Liquid Tank

W1120170



Checking Refrigerant (Gas) (CABIN Model)



CAUTION

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

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

■ Checking Procedure

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

■ IMPORTANT

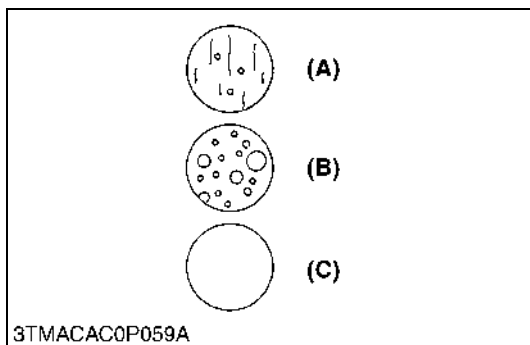
- Charge only with R134a not R12 refrigerant (gas).

(1) Sight Glass

(A) Proper : Little or no air bubbles in the refrigerant flow.

(B) Low : Lots of air bubbles in the refrigerant flow (air bubbles or foam passing continuously).

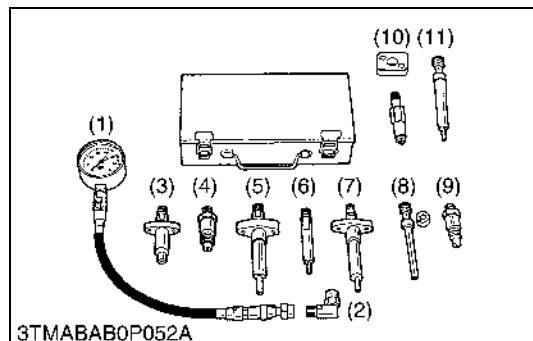
(C) Overfull or no refrigerant : Colorless and transparent.



W1120282

8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE



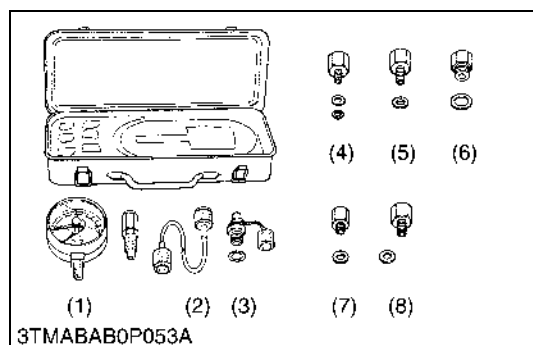
Diesel Engine Compression Tester

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

W10242000



Oil Pressure Tester

Code No.: 07916-32032

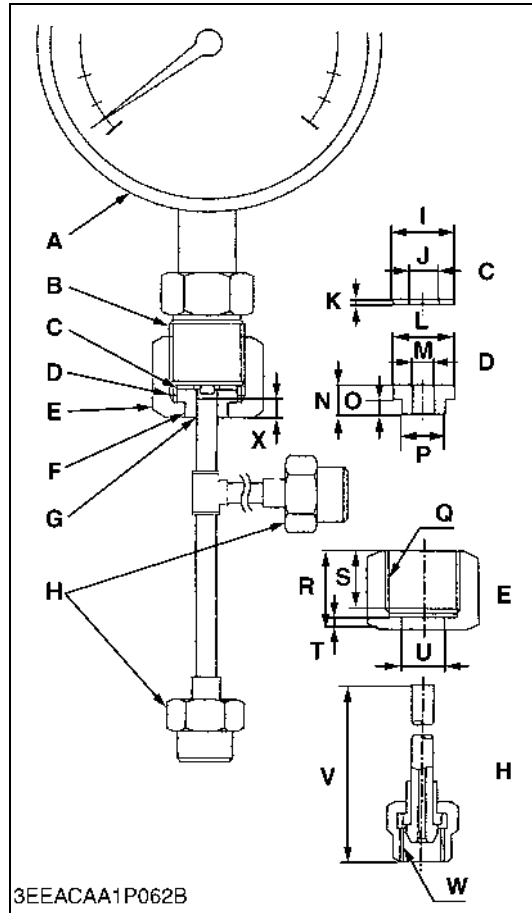
Application: Use to measure lubricating oil pressure.

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

W10243180

■ NOTE

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

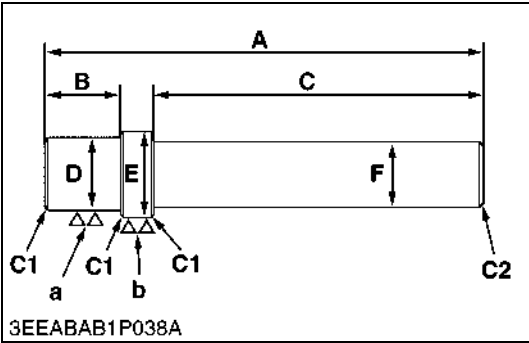


Injection Pump Pressure Tester

Application: Use to check fuel tightness of injection pumps.

A	Pressure gauge full scale : More than 29.4 MPa (300 kgf/cm ² , 4267 psi)
B	PF 1/2
C	Copper gasket
D	Flange (Material : Steel)
E	Hex. nut 27 mm (1.06 in.) across the plat
F	Adhesive application
G	Fillet welding on the enter circumference
H	Retaining nut
I	17 mm dia. (0.67 in. dia.)
J	8 mm dia. (0.31 in. dia.)
K	1.0 mm (0.039 in.)
L	17 mm dia. (0.67 in. dia.)
M	6.10 to 6.20 mm dia. (0.2402 to 0.2441 in. dia.)
N	8 mm (0.31 in.)
O	4 mm (0.16 in.)
P	11.97 to 11.99 mm dia. (0.4713 to 0.4720 in. dia.)
Q	PF 1/2
R	23 mm (0.91 in.)
S	17 mm (0.67 in.)
T	4 mm (0.16 in.)
U	12.00 to 12.02 mm dia. (0.4724 to 0.4732 in. dia.)
V	100 mm (3.94 in.)
W	M12 × P1.5
X	5 mm (0.20 in.)

W10252400



Small End Bushing Replacing Tool

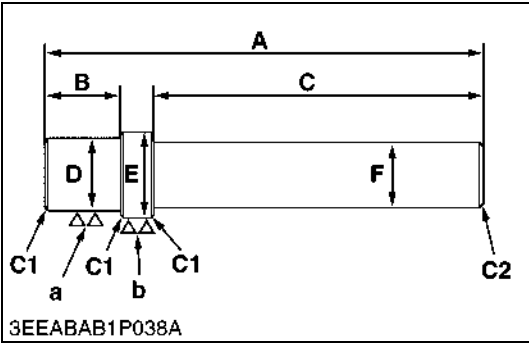
Application: Use to press out and to press fit the small end bushing.
[Press out]

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 (0.00025 in.)
b	6.3 μm (0.00025 in.)
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 (0.00025 in.)
b	6.3 μm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

W1031485

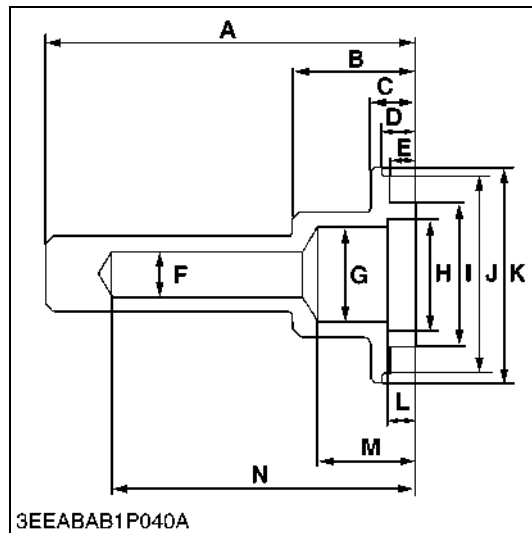


Idle Gear Bushing Replacing Tool

Application: Use to press out and to press fit the 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	48.075 to 48.100 mm dia. (1.8927 to 1.8937 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

W10440400

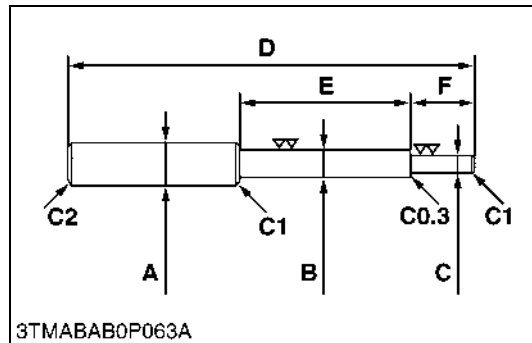


Gear Case Oil Seal Replacing Tool

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

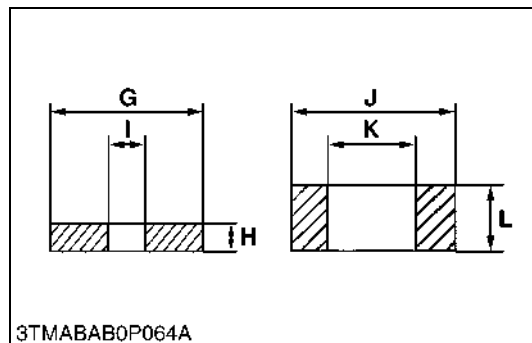


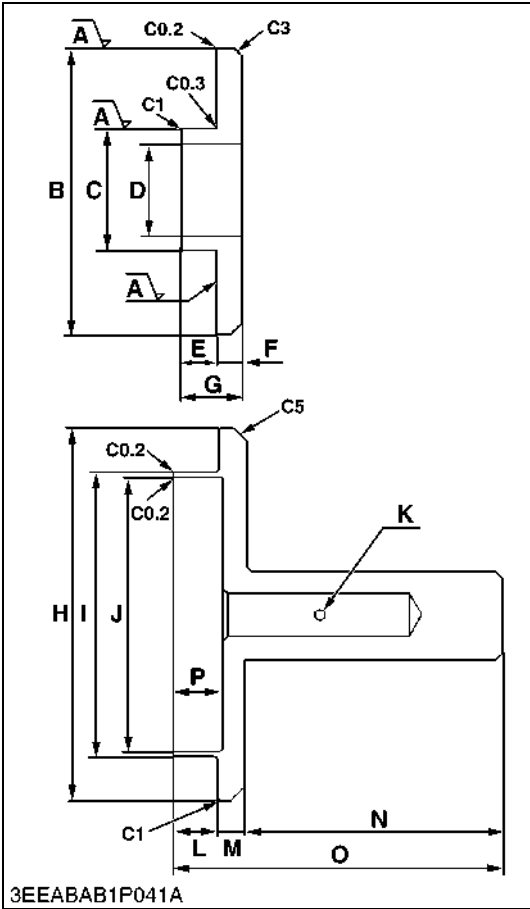
Valve Guide Replacing Tool

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

W1045889



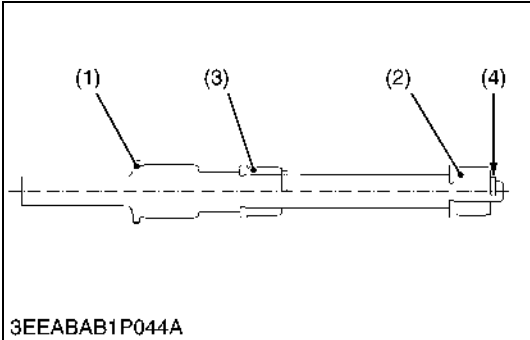


Auxiliary Socket for Fixing Crankshaft Sleeve

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

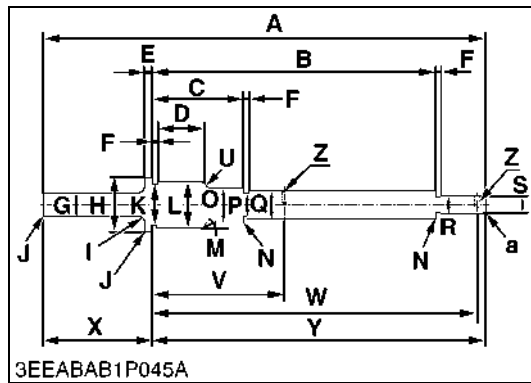


Balancer Bushing Replacing Tool 1 Assembly

Application: Use to press fit the bushing.

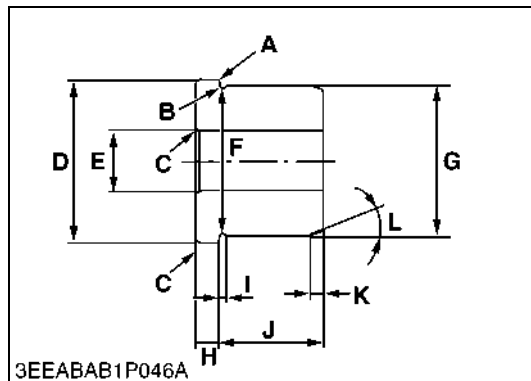
No.	Name of Part	Q'ty	Remarks
1	Shaft	1	–
2	Piece 1	1	–
3	Piece 2	1	–
4	Bolt	2	M6 × P1.0

W1035596

**Balancer Bushing Replacing Tool 1 Components Parts****1) Shaft**

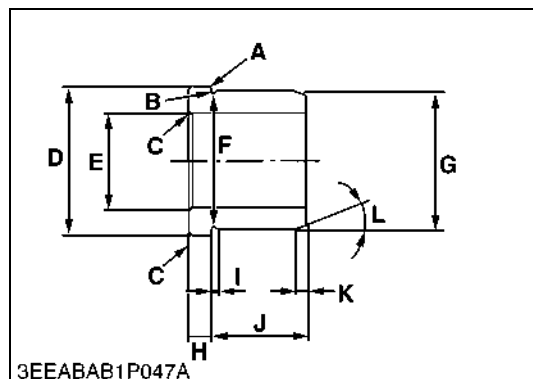
A	498 mm (19.61 in.)
B	318.8 to 319.2 mm (12.5726 to 12.5669 in.)
C	102.8 to 103.2 mm (4.0472 to 4.0630 in.)
D	60 mm (2.36 in.)
E	8 mm (0.31 in.)
F	5 mm (0.20 in.)
G	30 mm dia. (1.18 in. dia.)
H	65 mm dia. (2.56 in. dia.)
I	6 mm (0.24 in.)
J	Chamfer 1 mm (0.04 in.)
K	53 mm dia. (2.09 in. dia.)
L	54.7 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

**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 °)

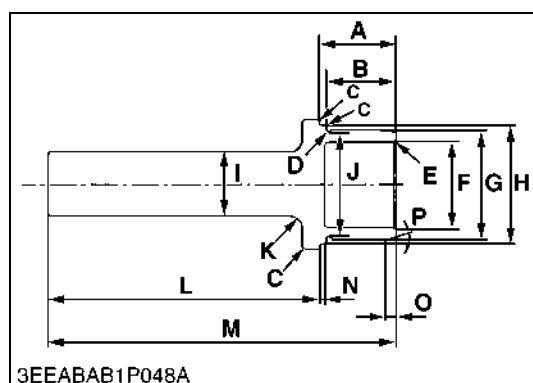
W1036402



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 °)

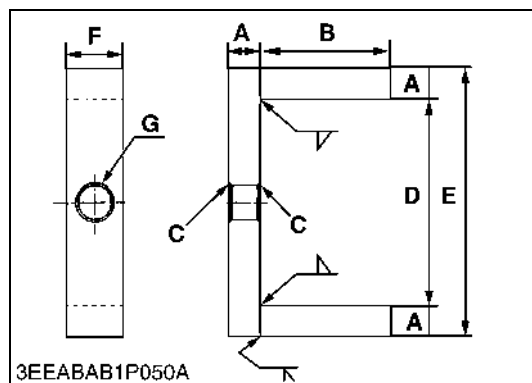
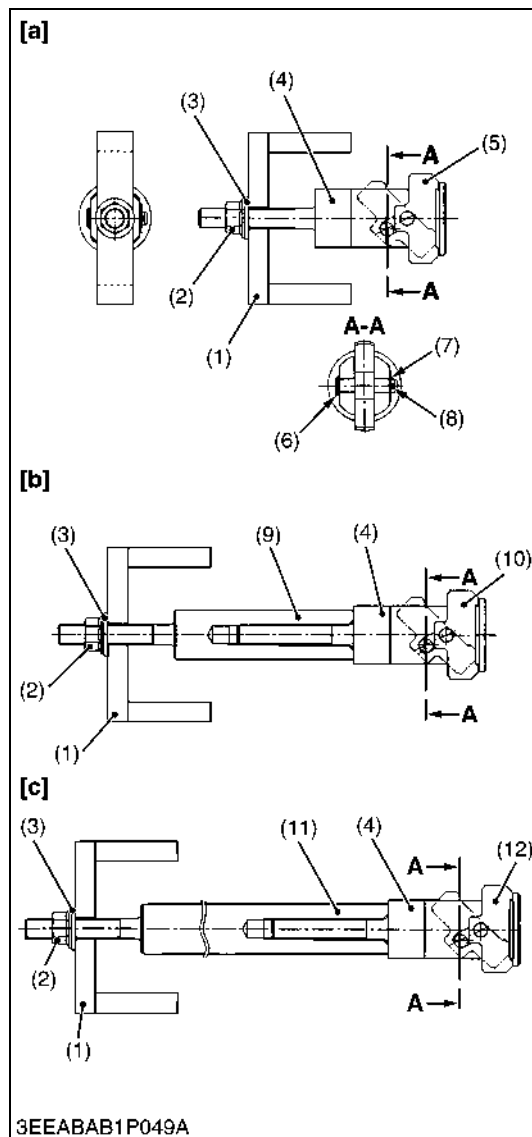
W1036583

**Balancer Bushing Replacing Tool 2**

Application: Use to press fit the bushing.

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



Balancer Replacing Tools 3, 4, 5

Application: Use to press fit the bushing.

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

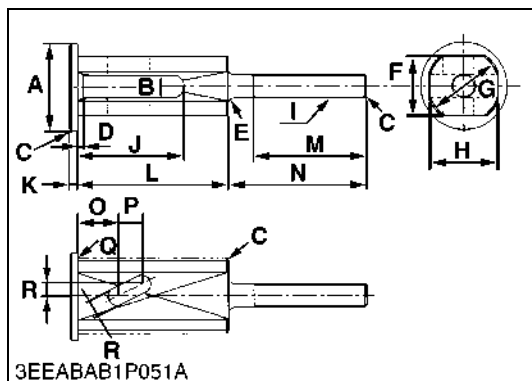
W1037123

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.)

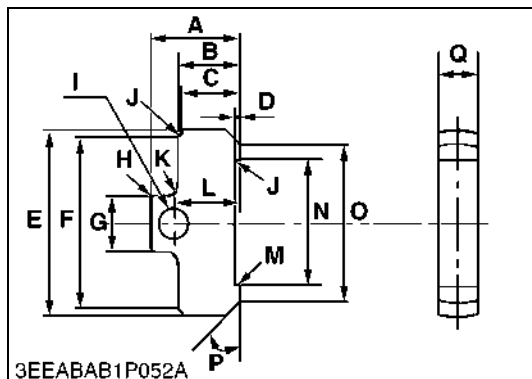
W1037894



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.)

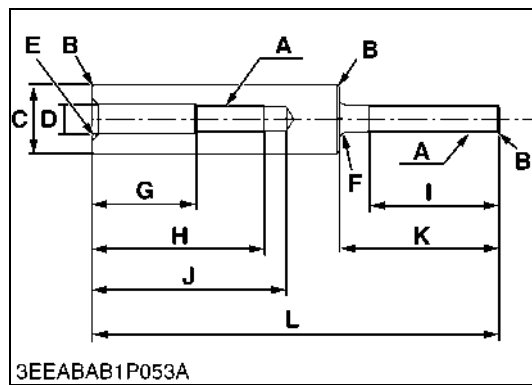
W1037691



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.)

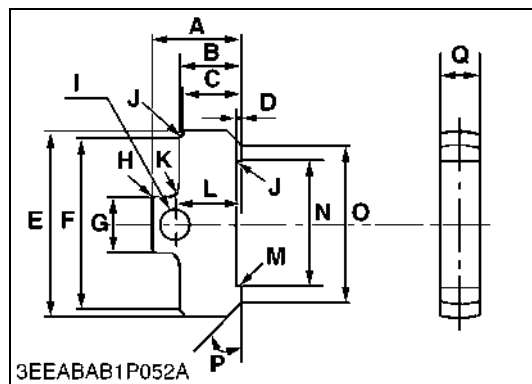
W1038038



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.)

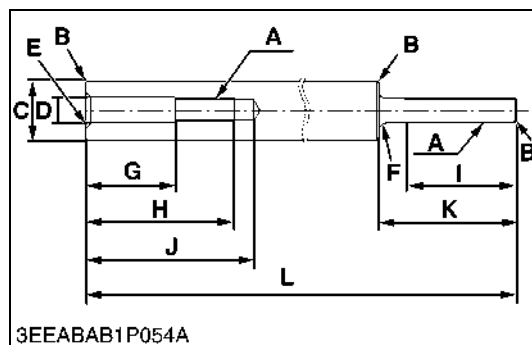
W1038382



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.)

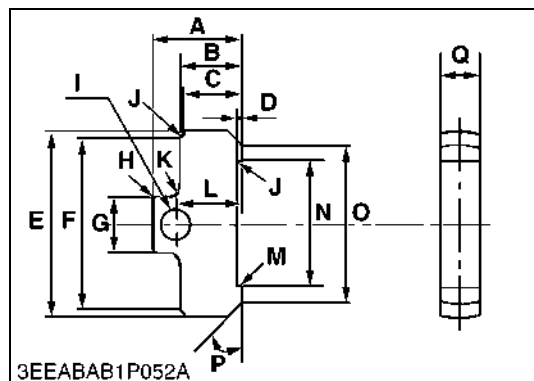
W1038568



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.)

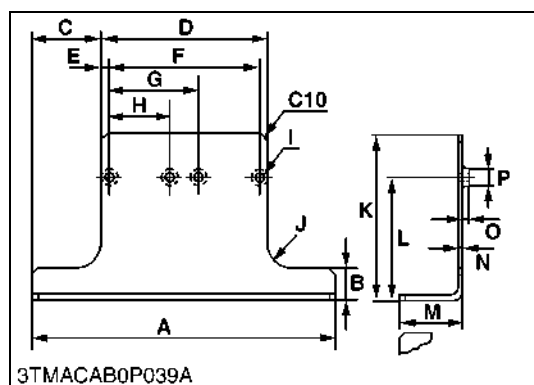
W1038747



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.)

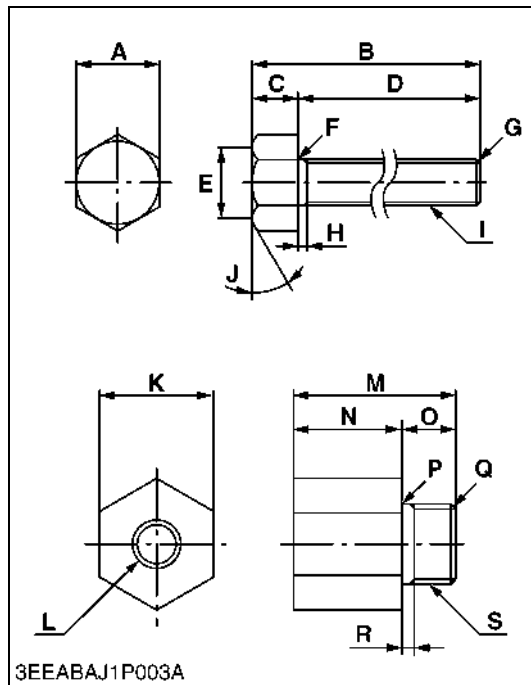
W1038887

**Engine Stand**

Application: Use to support engine.

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.)

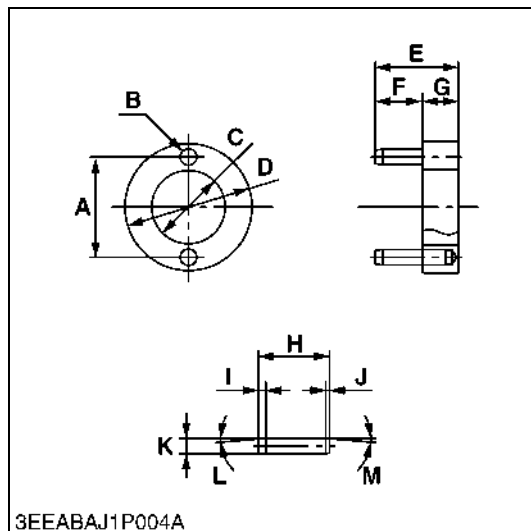
W1033645

**Timer Gear Puller**

Application: Use for removing the timer gear from governor shaft.

A	27 mm (1.1 in.)
B	130 mm (5.12 in.)
C	15 mm (0.59 in.)
D	115 mm (4.53 in.)
E	26 mm dia. (1.0 in. dia.)
F	0.8 mm radius (0.03 in. radius)
G	Chamfer 1 mm (0.04 in.)
H	Less than 3 mm (Less than 0.1 in.)
I	M14 x Pitch 1.5
J	0.52 rad (30 °)
K	32 mm (1.3 in.)
L	M14 x Pitch 1.5
M	45 mm (1.8 in.)
N	30 mm (1.2 in.)
O	15 mm (0.59 in.)
P	0.8 mm radius (0.03 in. radius)
Q	Chamfer 1 mm (0.04 in.)
R	Less than 3 mm (Less than 0.1 in.)
S	M24 x Pitch 1.5

W1040379

**Timer 0° Restoring Jig**

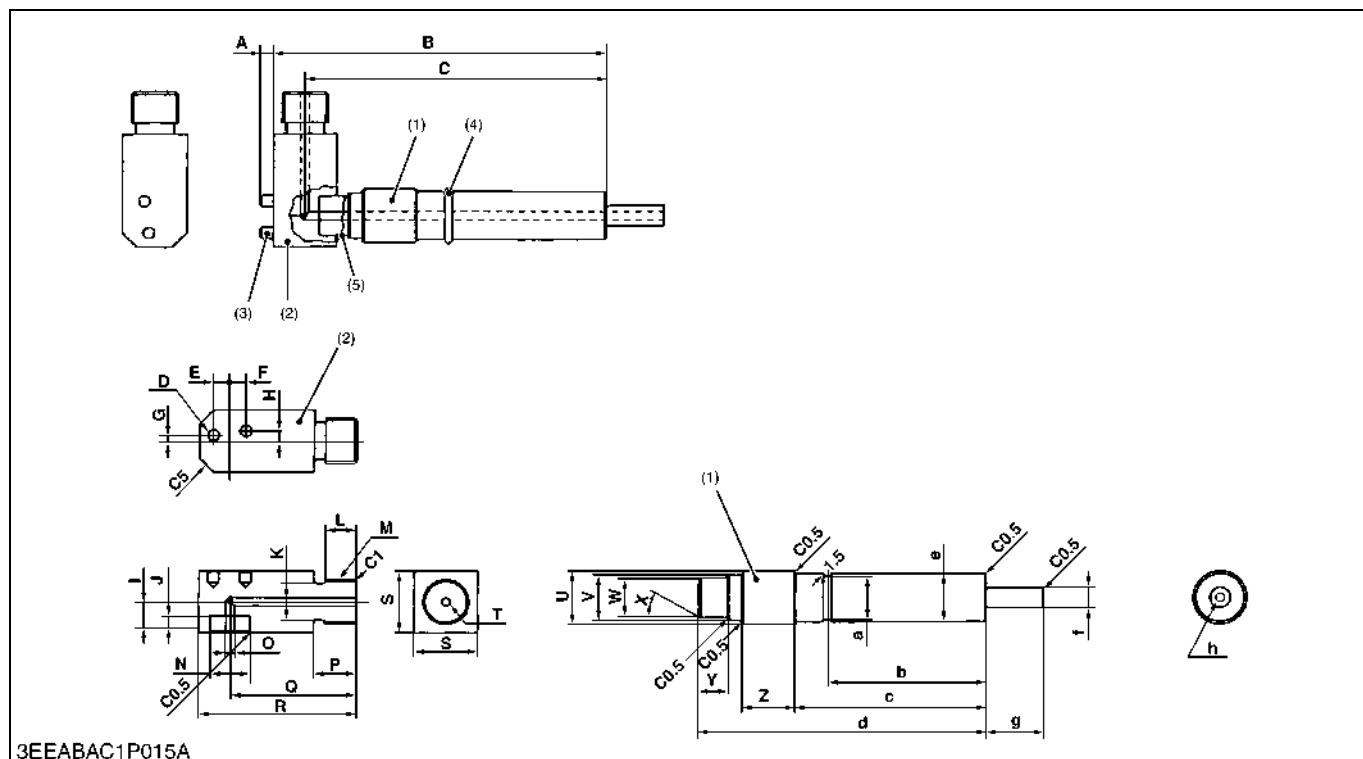
Application: Use for restoring 0° in the timer gear.

A	50.98 to 51.02 mm (2.007 to 2.008 in.)
B	8 mm dia. depth 12 mm (0.31 in. dia. depth 0.472 in.)
C	37 mm dia. (1.5 in. dia)
D	65 mm dia. (2.6 in. dia)
E	42 mm (1.7 in.)
F	24 mm (0.94 in.)
G	18 mm (0.71 in.)
H	36 mm (1.4 in.)
I	3.5 mm (0.14 in.)
J	1.5 mm (0.059 in.)
K	8 mm dia. (0.31 in. dia.)
L	0.09 rad (5 °)
M	0.09 rad (5 °)

W1040485

Nozzle Adaptor for Measuring Cylinder Compression Pressure

Application: Use for measuring diesel engine compression pressure.



A	5 mm (0.1969 in.)	T	3 mm dia., 44.5 to 45 mm depth (0.1181 in. dia., 1.7520 to 1.7717 in. depth)
B	115.9 to 116.1 mm (4.5630 to 4.5709 in.)	U	19 mm dia. (0.7480 in. dia.)
C	105 mm (4.1339 in.)	V	16 mm dia. (0.6299 in. dia.)
D	4 mm dia., 4 mm depth (0.1575 in. dia., 0.1575 in. depth)	W	14 mm dia. (0.5512 in. dia.)
E	6 mm (0.2362 in.)	X	0.524 rad. (30°)
F	5.3 mm (0.2087 in.)	Y	10 mm (0.3937 in.)
G	1.9 mm (0.0748 in.)	Z	19 mm (0.7480 in.)
H	3.5 mm (0.1378 in.)	a	14.94 to 15 mm dia. (0.5882 to 0.5906 in. dia.)
I	11.6 to 12.1 mm (0.4567 to 0.4764 in.)	b	55 mm (2.1654 in.)
J	6 to 6.1 mm (0.2362 to 0.2402 in.)	c	66 mm (2.5984 in.)
K	13 mm dia. (0.5118 in. dia.)	d	100 to 100.1 mm (3.9370 to 3.9409 in.)
L	11 mm (0.4331 in.)	e	16.89 to 17 mm dia. (0.6650 to 0.6693 in. dia.)
M	5/8-18UNF-2B	f	7.1 to 7.2 mm dia. (0.2795 to 0.2835 in. dia.)
N	14.0 to 14.011 mm dia. (0.5512 to 0.5516 in. dia.)	g	20.3 to 20.5 mm (0.7992 to 0.8071 in.)
O	3 mm dia. (0.1181 in. dia.)	h	3 mm dia. (0.1181 in. dia.)
P	15 mm (0.5906 in.)	C0.5	Chamfer 0.5 mm (Chamfer 0.0197 in.)
Q	44 mm (1.7323 in.)	C1	Chamfer 1 mm (Chamfer 0.0394 in.)
R	55 mm (2.1654 in.)	C5	Chamfer 5 mm (Chamfer 0.1969 in.)
S	22 mm (0.8661 in.)		

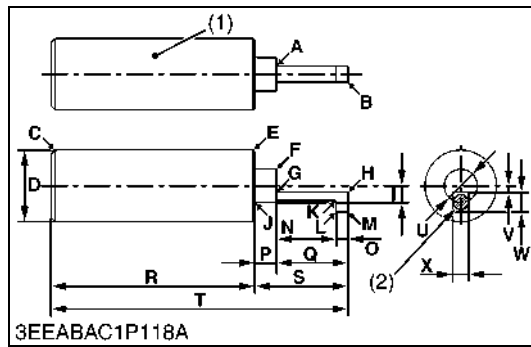
(1) Material SS400

(3) Pin 05012-00408

(4) O-ring 04811-00150

(5) Arc welding

(2) Material S43C-D



Jig for Governor Connecting Rod

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

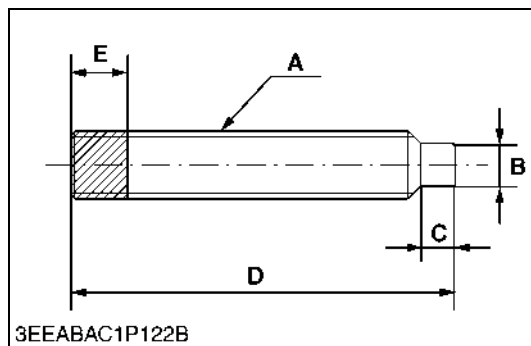
A	1 mm (0.0394 in.)
B	C0.2 mm (0.0079 in.)
C	C2 mm (0.0787 in.)
D	35 mm dia. (1.3780 in. dia.)
E	C1 mm (0.0394 in.)
F	C0.1 mm (0.0039 in.)
G	1 mm (0.0394 in.)
H	C0.2 mm (0.0079 in.)
I	R8 mm (0.3150 in.)
J	1 mm (0.0394 in.)
K	1 mm (0.0394 in.)
L	C0.2 mm (0.0079 in.)
M	C0.2 mm (0.0079 in.)
N	29 mm (1.1417 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 (0.6358 to 0.6437 in.)
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

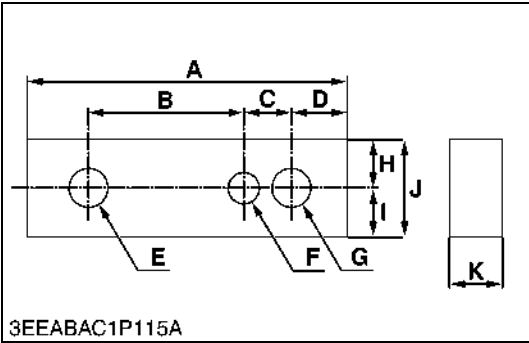


Fuel Camshaft Lock Screw

For locking fuel camshaft.

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

W1049757



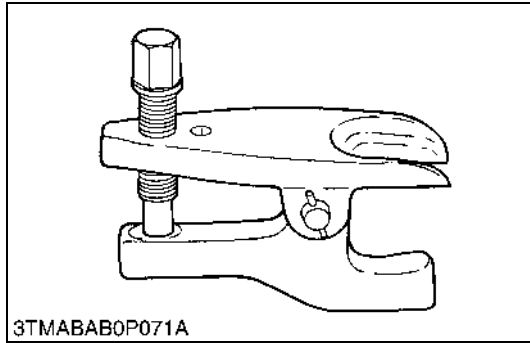
Tool for Aligning the Crankcase 1 and 2

Application: Use for aligning the crankcase 1 and 2.

A	115 mm (4.53 in.)
B	56 mm (2.2 in.)
C	17 mm (0.67 in.)
D	20 mm (0.79 in.)
E	14 mm dia. (0.55 in. dia.)
F	11 mm dia. (0.43 in. dia.)
G	14 mm dia. (0.55 in. dia.)
H	17.5 mm (0.689 in.)
I	17.5 mm (0.689 in.)
J	35 mm (1.4 in.)
K	19 mm (0.75 in.)

W1047882

[2] SPECIAL TOOLS FOR TRACTOR

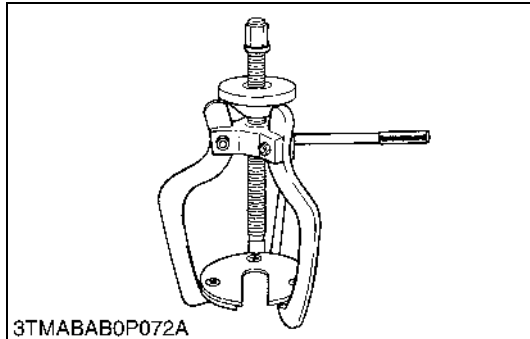


Tie-rod End Lifter

Code No.: 07909-39051

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

W10264720

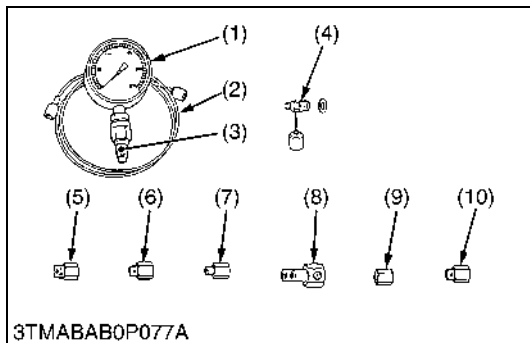


Steering Wheel Puller

Code No.: 07916-51090

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

W10265330



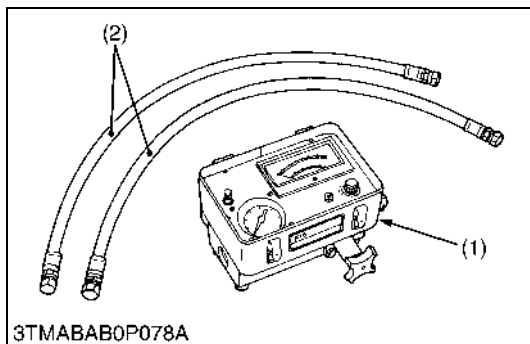
Relief Valve Pressure Tester

Code No.: 07916-50045

Application: This allows easy measurement of relief set pressure.

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

W10267410



Flow Meter

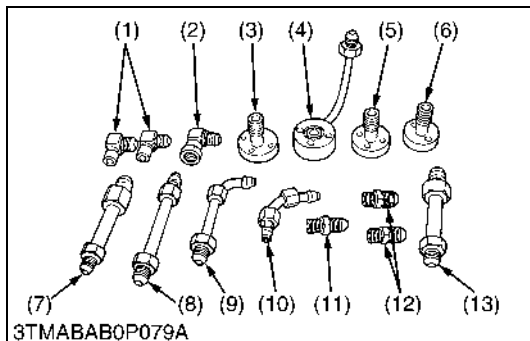
Code No.: 07916-52791 (Flow Meter)

07916-52651 (Hydraulic Test Hose)

Application: This allows easy testing of hydraulic system.

(1) Flow Meter	(2) Hydraulic Test Hose

W10313180



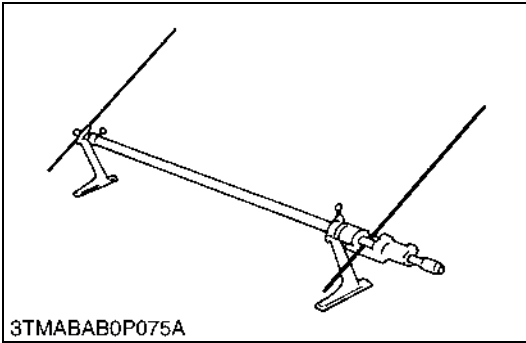
Adaptor Set for Flow Meter

Code No.: 07916-54031

Application: Use for testing the hydraulic system.

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

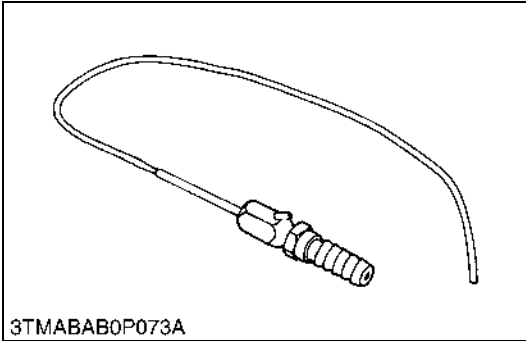
W10313960

**Toe-in Gauge**

Code No.: 07909-31681

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

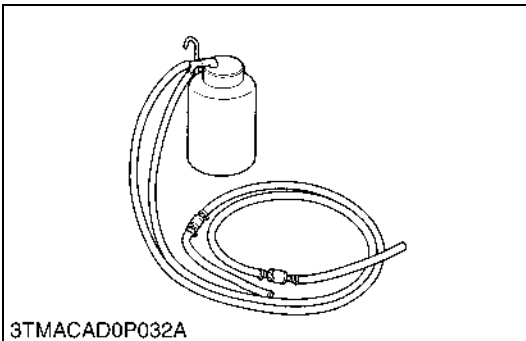
W10266890

**Injector CH3**

Code No.: 07916-52501

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

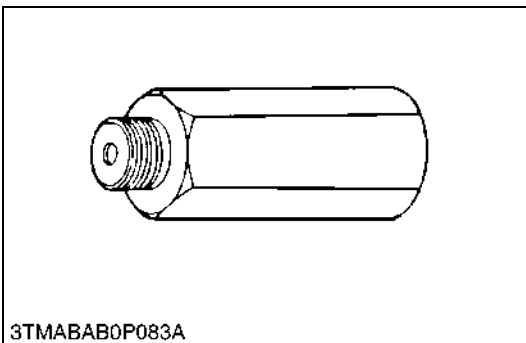
W10265850

**Brake Air Bleeder**

Code No.: 07916-54001

Application: This allows easy air bleed of the hydraulic brake.

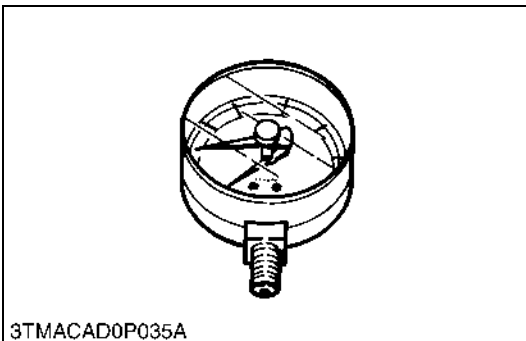
W10516480

**Relief Valve Setting Pressure Adaptor G**

Code No.: 07916-52751

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

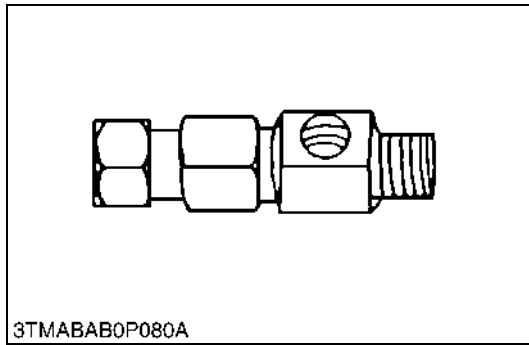
W10623960

**Pressure Gauge 50**

Code No.: 07916-52961

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

W10518650

**Power Steering Adaptor**

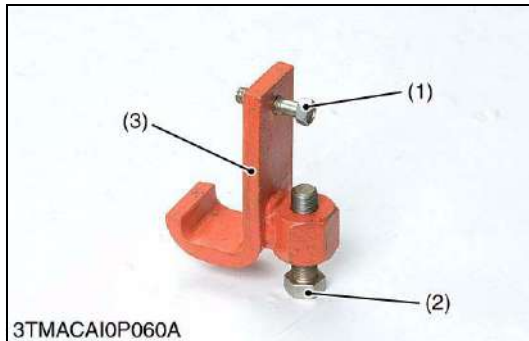
Code No.: 07916-54021

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

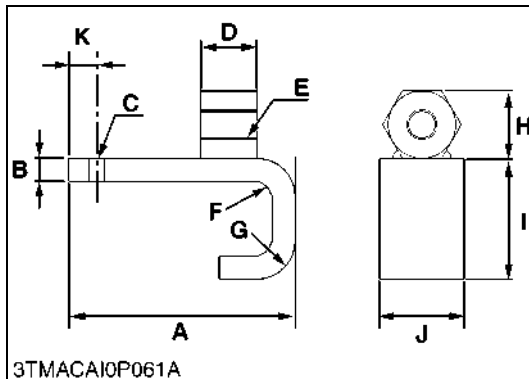
W10442870

NOTE

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

**Front Axle Rocking Restrictor**

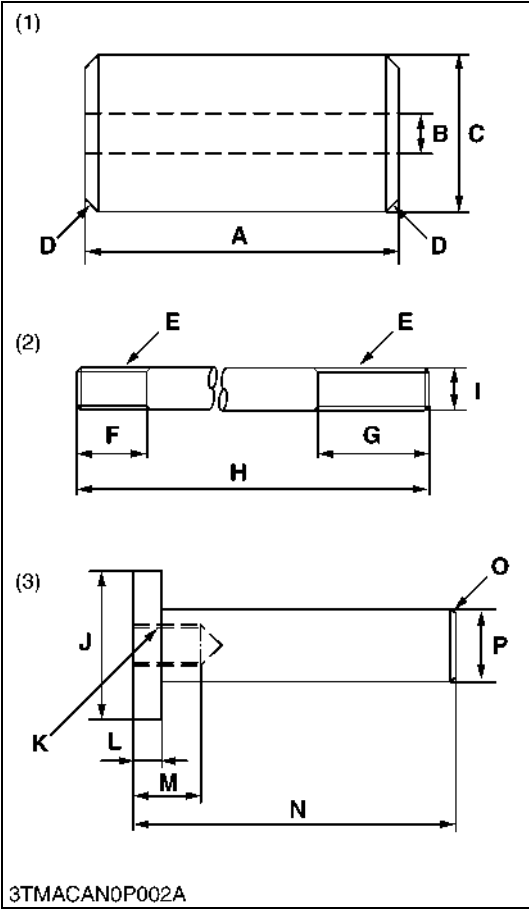
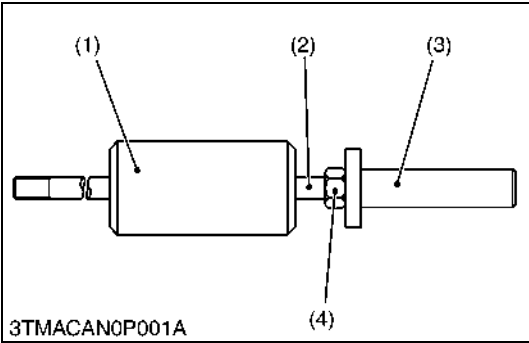
A	120 mm (4.72 in.)
B	12 mm (0.72 in.)
C	M10 × P1.25
D	30 mm (1.18 in.)
E	M16 × P1.5
F	10 mm (0.39 in.)
G	20 mm (0.79 in.)
H	36 mm (1.42 in.)
I	64 mm (2.52 in.)
J	45 mm (1.77 in.)
K	20 mm (0.79 in.)



- (1) Screw
M10 × P1.25 × L50 mm (2 in.)
- (2) Screw
M16 × P1.5 × L50 mm (2 in.)

(3) Rocking Restrictor

W10545380



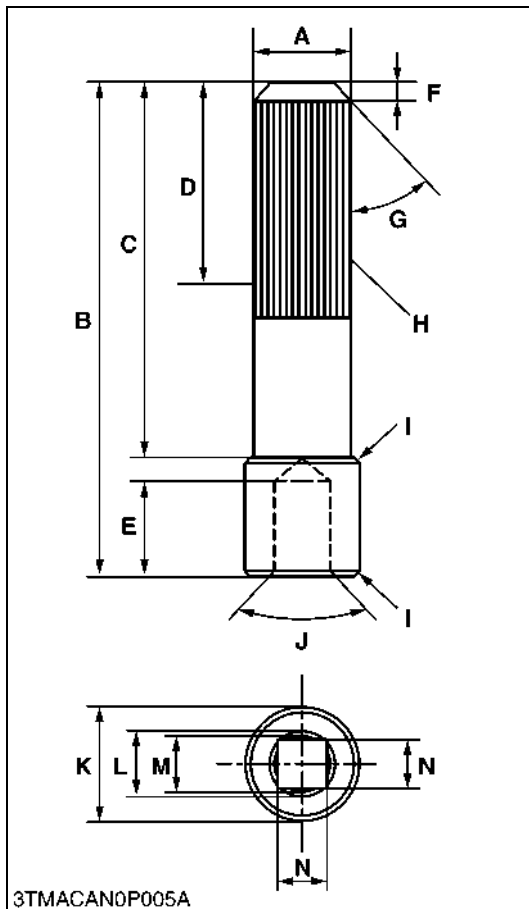
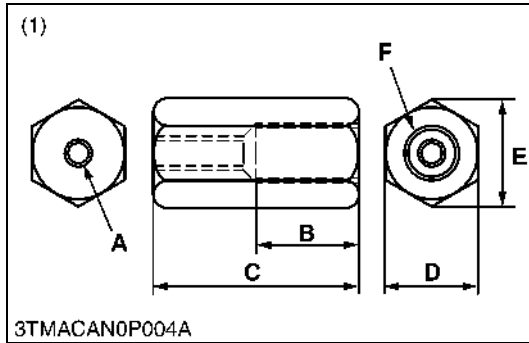
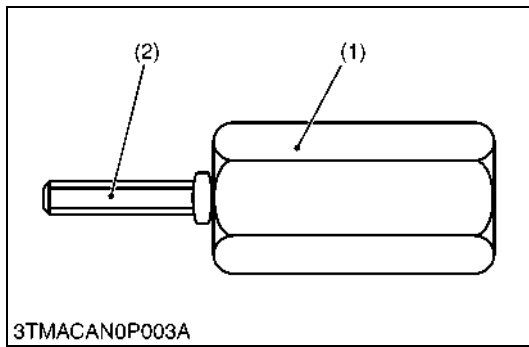
Sliding Hammer

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

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

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

W10532280



Adaptor (M6) for Sliding Hammer

Application : Use to removing the front axle bevel pinion shaft with sliding hammer.

A	M6 x P1.0
B	25 mm (0.98 in.)
C	50 mm (1.97 in.)
D	23 mm (0.91 in.)
E	27 mm (1.06 in.)
F	M14 x P1.5

(1) Adaptor (M6)

(2) Stud Bolt (M6 x P1.0)

W10124150

LSD Adaptor

Application : Use for measuring the turning torque of LSD.

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

(Involute Spline)

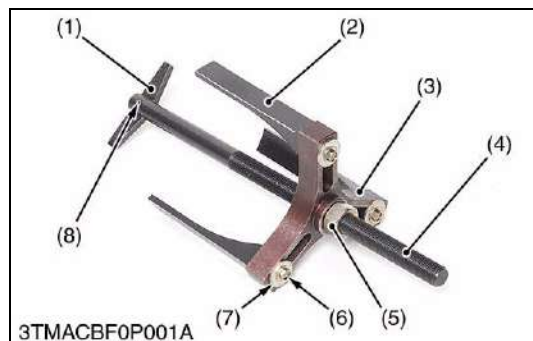
- EXTERNAL 25 x 24Z x 1.0 m x 30

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

(Reference)

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

W1088756

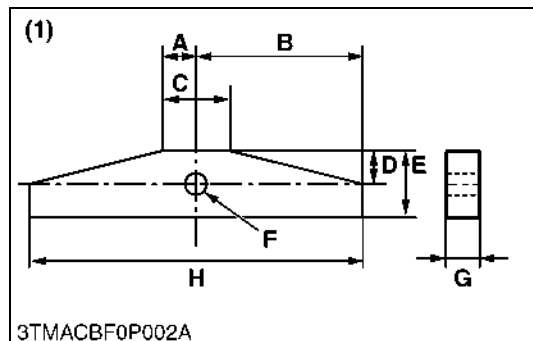


Hydraulic Clutch Spring Compressor

Application: Use exclusively for pushing the spring, to remove the circlip for hydraulic clutch.

(1) Tool 4 (Plate)	(5) Nut (M x P1.5)
(2) Tool 3 (Clow)	(6) Screw (M5 x P1.0 - L10mm)
(3) Tool 1 (Body)	(7) Washer (M5)
(4) Tool 2 (Center Bar)	(8) Spring Pin (5.0 mm Dia. - L16 mm)

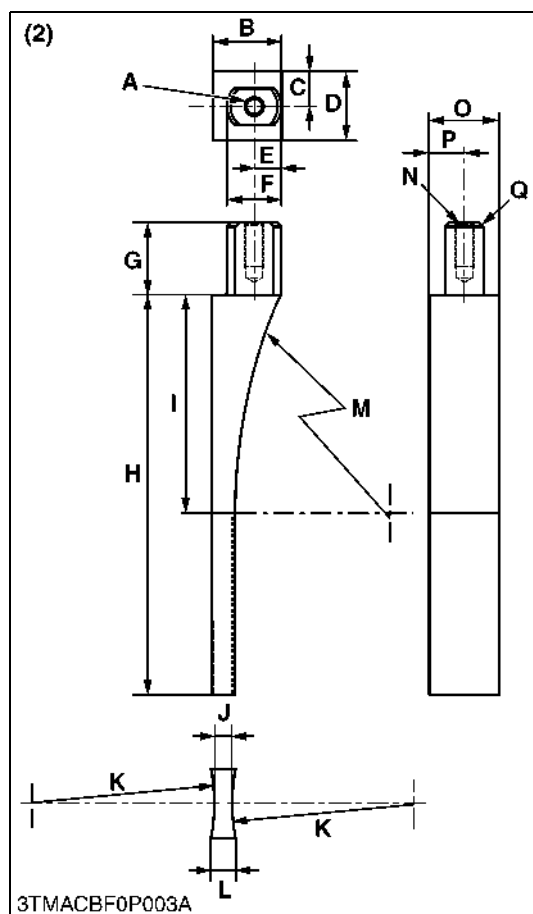
W1022578



(1) Tool 4 (Plate)

A	8 mm (0.3 in.)
B	40 mm (1.6 in.)
C	16 mm (0.63 in.)
D	8 mm (0.3 in.)
E	16 mm (0.63 in.)
F	5.2 mm dia. (0.20 in. dia.)
G	5.70 to 5.90 mm (0.225 to 0.232 in.)
H	80 mm (3.1 in.)

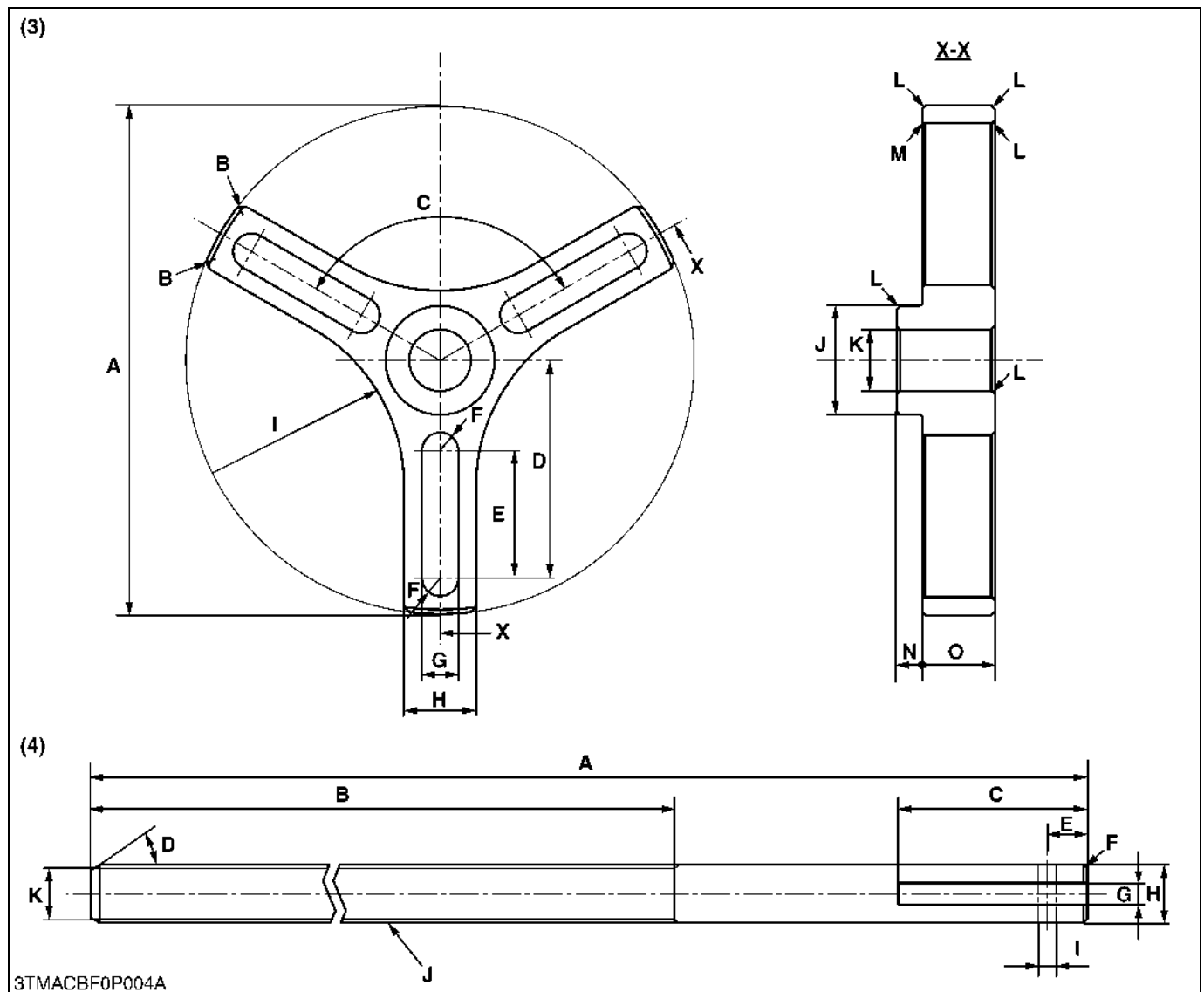
W1023213



(2) Tool 3 (Clow) : 3 pcs.

A	M5 x P1.0 x 12 mm depth (0.47 in. depth)
B	19 mm (0.75 in.)
C	5 mm (0.2 in.)
D	9.73 to 10.0 mm (0.383 to 0.393 in.)
E	7.5 mm (0.30 in.)
F	15 mm dia. (0.59 in. dia.)
G	20.05 to 20.10 mm (0.7894 to 0.7913 in.)
H	110 mm (4.33 in.)
I	60 mm (2.4 in.)
J	5 mm (0.2 in.)
K	50 mm (2.0 in.)
L	6.8 mm (0.27 in.)
M	Radius 150 to 160 mm (5.91 to 6.29 in.)
N	4.2 mm dia. x 15 mm depth (0.17 in. dia. x 0.59 in. depth)
O	19 mm (0.75 in.)
P	9.5 mm (0.37 in.)
Q	Chamfer 1.0 mm (0.039 in.)

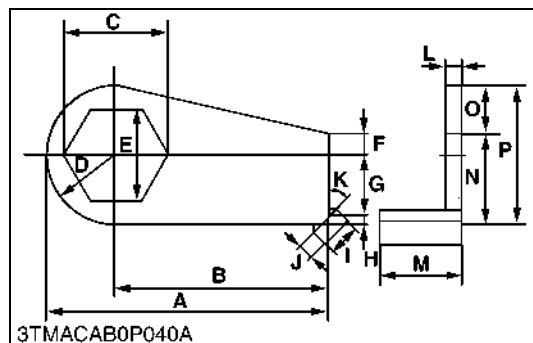
W1023692

**(3) Tool 1 (Body)**

A	140 mm dia. (5.51 in. dia.)	I	Radius 50 mm (2.0 in.)
B	Radius 3 mm (0.1 in.)	J	30 mm dia. (1.2 in. dia.)
C	2.09 rad (120 °)	K	17 mm dia. (0.67 in. dia.)
D	60 mm (2.4 in.)	L	Chamfer 1.0 mm (0.039 in.)
E	35 mm (1.4 in.)	M	Chamfer 0.5 mm (0.02 in.)
F	Radius 5 mm (0.2 in.)	N	7 mm (0.3 in.)
G	10.00 to 10.27 mm (0.3937 to 0.4043 in.)	O	20 mm (0.79 in.)
H	20 mm (0.79 in.)	X (X-X)	View direction

(4) Tool 2 (Center Bar)

A	330 mm (13.0 in.)	G	6.00 to 6.58 mm (0.237 to 0.259 in.)
B	210 mm (8.27 in.)	H	16 mm dia. (0.63 in. dia.)
C	52 mm (2.0 in.)	I	5.00 to 5.18 mm dia. (0.197 to 0.203 in. dia.)
D	0.52 rad (30 °)	J	M16 x P1.5 mm
E	11 mm (0.43 in.)	K	13 mm dia. (0.51 in. dia.)
F	Chamfer 1.0 mm (0.039 in.)		

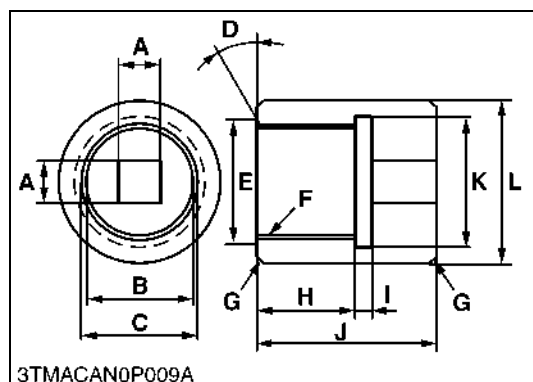


Locking Wrench

Application : Use for locking pinion nut.

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

W1034911



Bevel Gear Shaft (8T) Tool

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

A	12.75 to 12.90 mm square (0.50 to 0.51 in. square)
B	32.500 to 32.525 mm dia. (1.2795 to 1.2805 in. dia.)
C	35 mm dia. (1.378 in. dia.)
D	0.52 rad (30 °)
E	35.1 to 35.5 mm dia. (1.38 to 1.39 in. dia.)
F	Involute spline (refer to below)
G	Chamfer 1.0 mm (0.039 in.)
H	30 mm (1.18 in.)
I	5 mm (0.19 in.)
J	55 mm (2.17 in.)
K	40 mm dia. (1.57 in. dia.)
L	50 mm dia. (1.97 in. dia.)

(Involute Spline)

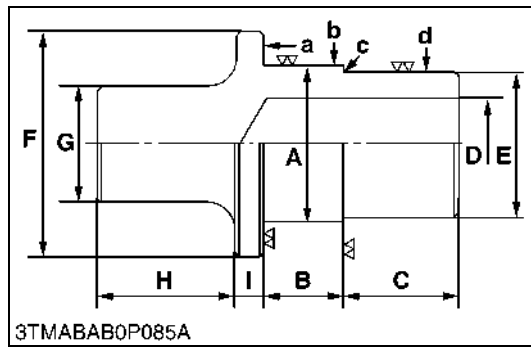
- INTERNAL 35 x 26Z x 1.25 m x 20

Coefficient of profile shifting		+0.800
Tool	Tooth form	Stub tooth
	Module	1.250
	Pressure angle	0.35 rad (20 °)
Number of teeth		26
Diameter of basic pitch circle		32.50 mm
Tooth thickness	Grade	Class a
	Between pin diameter	30.084 to 30.156 mm (Pin diameter = 2.50 mm)

(Reference)

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

W1015236



Hydraulic Arm Shaft Bushing Press-Fitting Tool

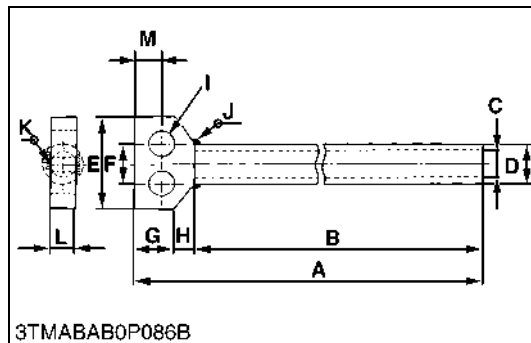
Application : Use for replacing the hydraulic arm shaft bushings in the hydraulic cylinder body.

NOTE

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

A	54.85 to 54.95 mm (2.159 to 2.163 in.)
B	11 mm (0.43 in.)
C	60 mm (2.36 in.)
D	30 mm (1.18 in.)
E	48.85 to 48.95 mm (1.923 to 1.927 in.)
F	78 mm dia. (3.07 in. dia.)
G	40 mm dia. (1.57 in. dia.)
H	50 mm (1.97 in.)
I	20 mm (0.79 in.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
c	6.3 μm (0.00025 in.)
d	6.3 μm (0.00025 in.)

W10316550

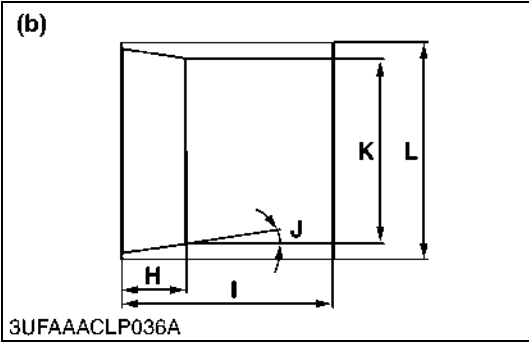
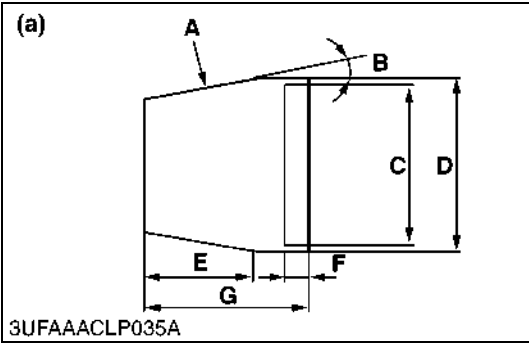


Draft Control Test Bar

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

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

W1062519

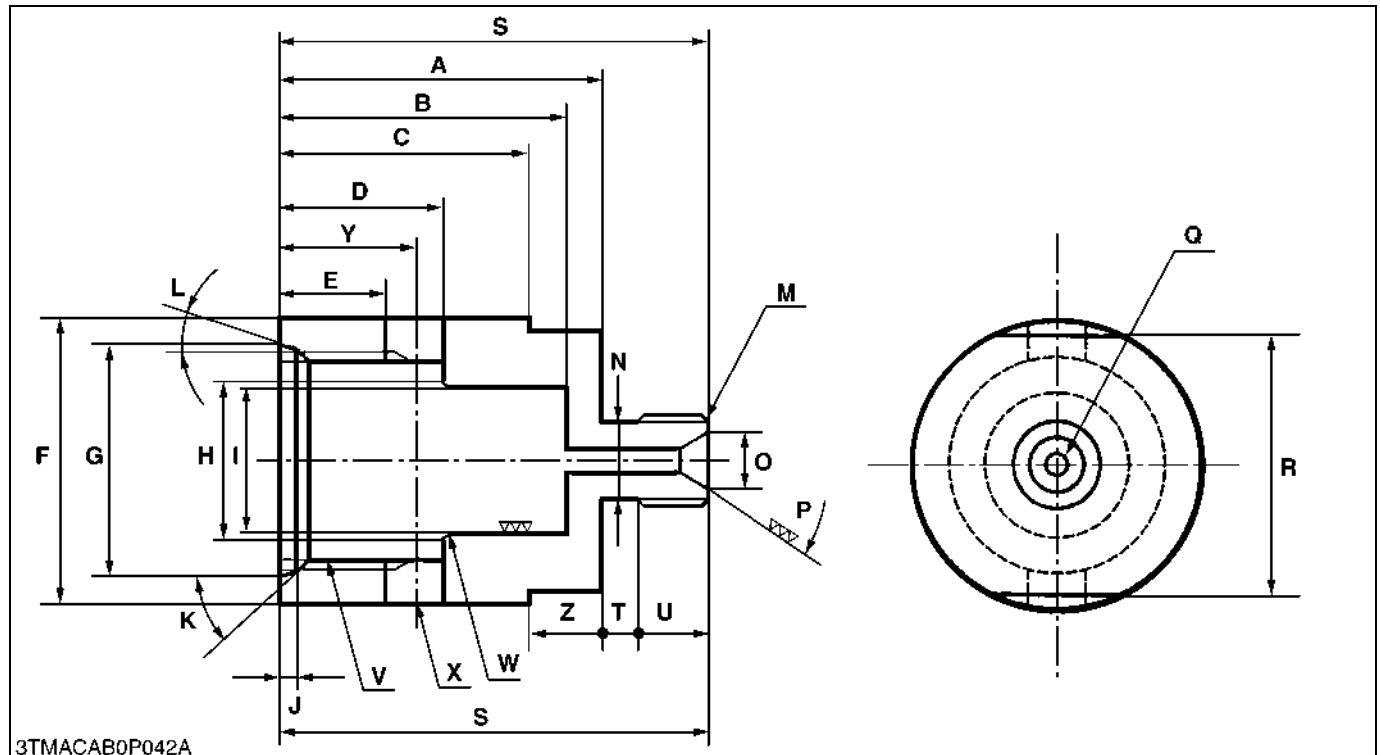


Hydraulic Cylinder Piston Sealing Tool

Application :
Tool (a) : Use for installing the piston seals to the piston.
Tool (b) : Use for installing the piston to the cylinder.

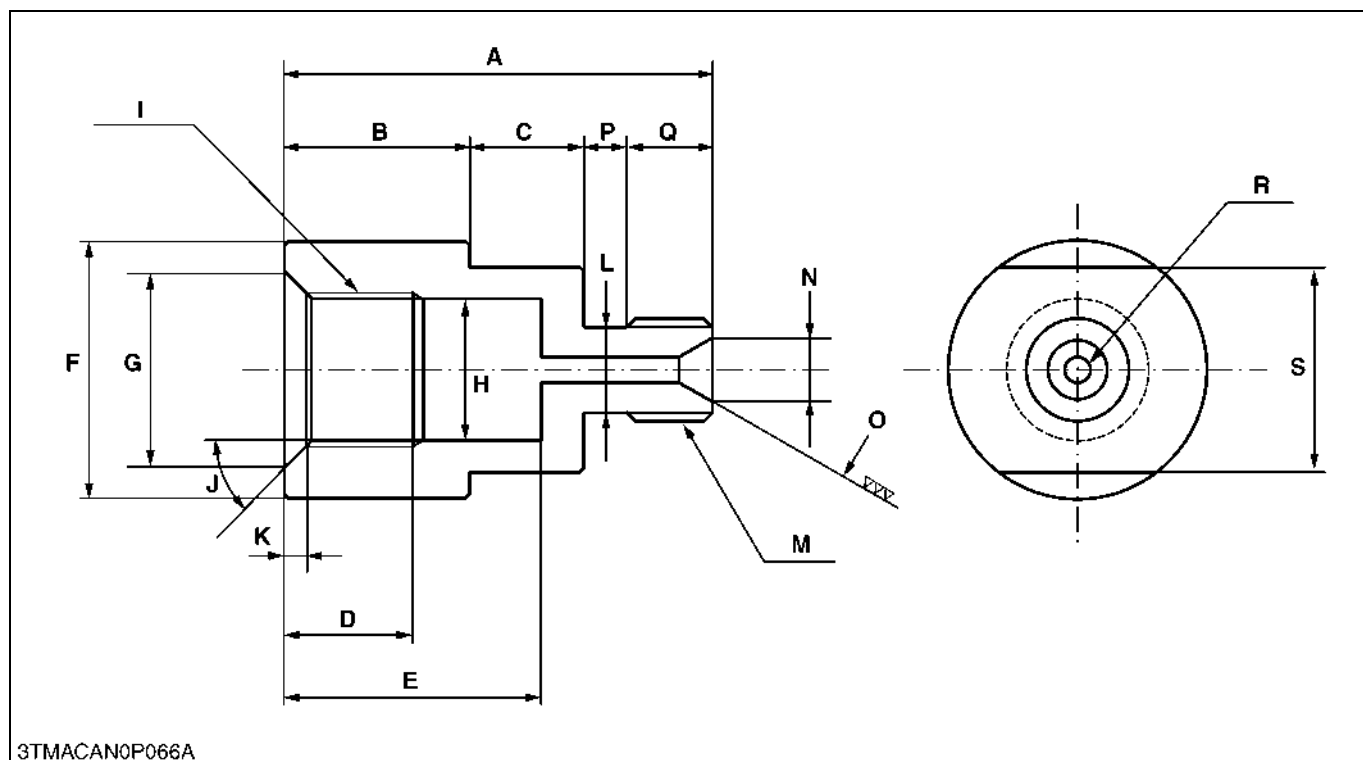
Cylinder Size	60 mm (2.36 in.)	65 mm (2.56 in.)	75 mm (2.95 in.)
A	80 √	80 √	80 √
B	0.16 rad (9.0 °)	0.16 rad (9.0 °)	0.16 rad (9.0 °)
C	60.18 mm (2.369 in.)	65.18 mm (2.566 in.)	75.18 mm (2.960 in.)
D	61.18 mm (2.409 in.)	66.18 mm (2.606 in.)	76.18 mm (2.999 in.)
E	42 mm (1.7 in.)	42 mm (1.7 in.)	42 mm (1.7 in.)
F	10 mm (0.39 in.)	10 mm (0.39 in.)	10 mm (0.39 in.)
G	58.5 mm (2.30 in.)	58.5 mm (2.30 in.)	58.5 mm (2.30 in.)
H	14 mm (0.55 in.)	14 mm (0.55 in.)	14 mm (0.55 in.)
I	35 mm (1.4 in.)	35 mm (1.4 in.)	35 mm (1.4 in.)
J	0.12 rad (7.0 °)	0.12 rad (7.0 °)	0.12 rad (7.0 °)
K	60.0 mm (2.36 in.)	65.0 mm (2.56 in.)	75.0 mm (2.95 in.)
L	68.9 mm (2.71 in.)	73.9 mm (2.91 in.)	83.9 mm (3.30 in.)

W1045740

Cylinder Safety Valve Setting Pressure Adaptor

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

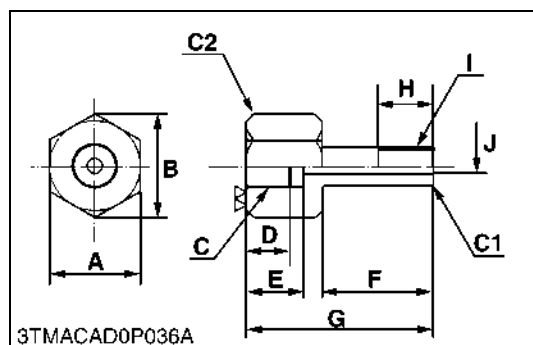
A	45 mm (1.77 in.)	N	10 mm dia. (0.39 in. dia.)
B	40 mm (1.58 in.)	O	7.5 mm dia. (0.3 in. dia.)
C	35 mm (1.38 in.)	P	1.05 rad (60 °)
D	23 to 23.3 mm (0.9055 to 0.9713 in.)	Q	3 mm dia. (1.18 in. dia.)
E	16 mm (0.63 in.)	R	36 mm (1.18 in.)
F	40 mm dia. (1.58 in. dia.)	S	60 mm (2.36 in.)
G	32.4 to 32.7 mm dia. (1.2756 to 1.2874 in. dia.)	T	5 mm (0.20 in.)
H	21 mm dia. (0.83 in. dia.)	U	10 mm (0.39 in.)
I	20 to 20.05 mm dia. (0.7874 to 0.7894 in. dia.)	V	M30 × P1.5
J	2.5 to 2.59 mm (0.0984 to 0.1097 in.)	W	0.52 rad (30 °)
K	0.79 rad (45 °)	X	8 mm dia. (0.32 in. dia.)
L	0.26 rad (15 °)	Y	19 mm (0.75 in.)
M	M12 × P1.5	Z	10 mm (0.39 in.)

Oil Cooler Relief Valve Setting Pressure Adaptor

3TMACAN0P066A

Application: Use to adapt the oil cooler relief valve to the nozzle tester to measure cracking pressure and test check on the oil cooler relief valve.

A	50 mm (2.0 in.)	H	16.5 mm (0.650 in.)	N	7.5 mm dia. (0.30 in. dia.)
B	22 mm (0.87 in.)	I	M18 × P1.5	O	1.0 rad (60 °)
C	13 mm (0.51 in.)	J	0.79 rad (45 °)	P	5 mm (0.2 in.)
D	15 mm (0.59 in.)	K	2.5 mm (0.039 in.)	Q	10 mm (0.39 in.)
E	30 mm (1.2 in.)	L	10 mm dia. (0.39 in. dia.)	R	3 mm dia. (0.1 in. dia.)
F	30 mm (1.2 in.)	M	M12 × P1.5	S	24 mm (0.94 in.)
G	23 mm (0.91 in.)				



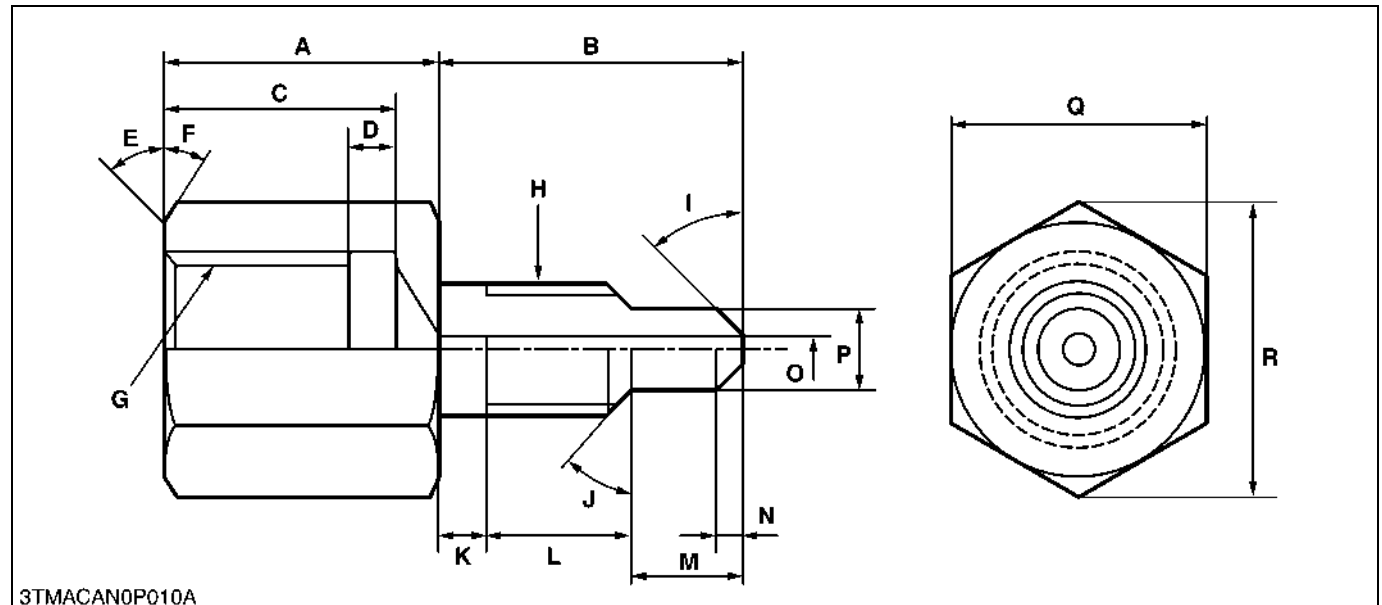
3TMACAD0P036A

Valve Adaptor

Application: Use for measuring the system pressure of shuttle valve, system pressure relief pressure, 4WD valve, PTO valve and dual hi-lo valve.

A	24 mm (0.94 in.)
B	27.7 mm (1.09 in.)
C	PS1/4
D	11 mm (0.43 in.)
E	15 mm (0.59 in.)
F	40 mm (1.57 in.)
G	60 mm (2.36 in.)
H	15 mm (0.59 in.)
I	PT1/8
J	4 mm dia. (0.15 in. dia.)
C1	Chamfer 1 mm (0.039 in.)
C2	Chamfer 2 mm (0.079 in.)

W1039227

Hydraulic Brake Adaptor

3TMACAN0P010A

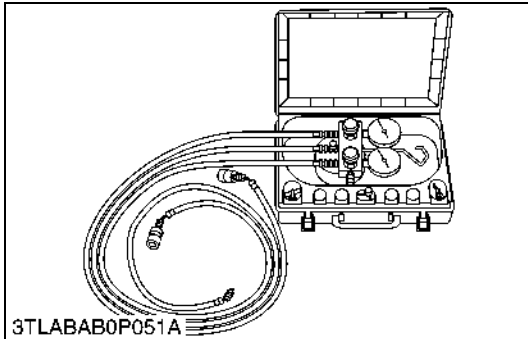
Application: Use for testing the hydraulic brake oil linkage.

A	18 mm (0.71 in.)	G	PS 1/4	M	4 mm (0.16 in.)
B	15 mm (0.59 in.)	H	M7 x P1.0	N	2 mm (0.079 in.)
C	15 mm (0.59 in.)	I	0.79 rad (45 °)	O	2 mm dia. (0.079 in. dia.)
D	3 mm (0.12 in.)	J	0.79 rad (45 °)	P	5 mm dia. (0.20 in. dia.)
E	0.79 rad (45 °)	K	6 mm (0.24 in.)	Q	17 mm (0.67 in.)
F	0.52 rad (30 °)	L	5 mm (0.20 in.)	R	19.6 mm (0.77 in.)

[3] SPECIAL TOOLS FOR AIR CONDITIONER UNIT

■ NOTE

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

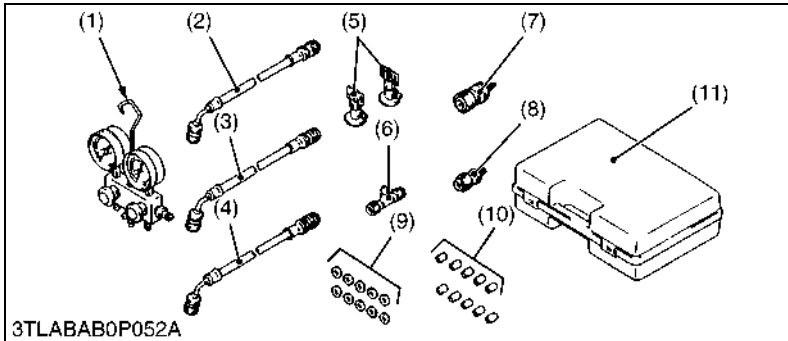


Air Conditioner Service Tool

Code No.: DENSO.CO. 95048-00061

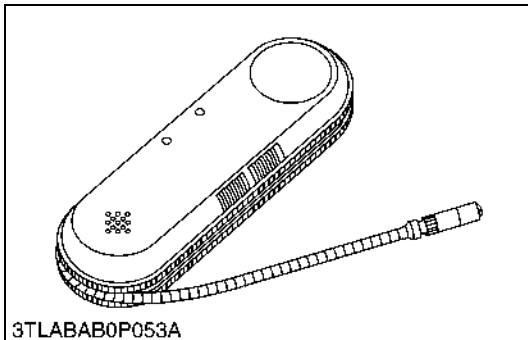
Application: Use for charging, testing or discharging the air conditioning system.

W1013507



(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

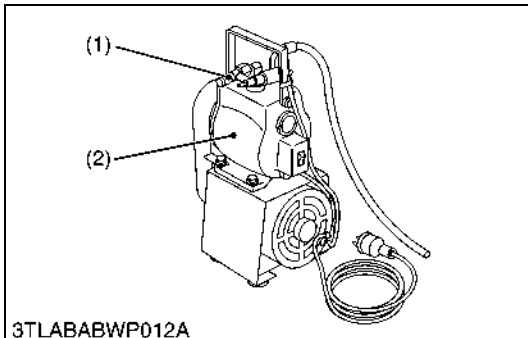


Electric Gas Leak Tester

Code No.: DENSO.CO. 95146-00060

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

W1013817



Vacuum Pump

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

Application: Use for evacuating the air conditioning system.

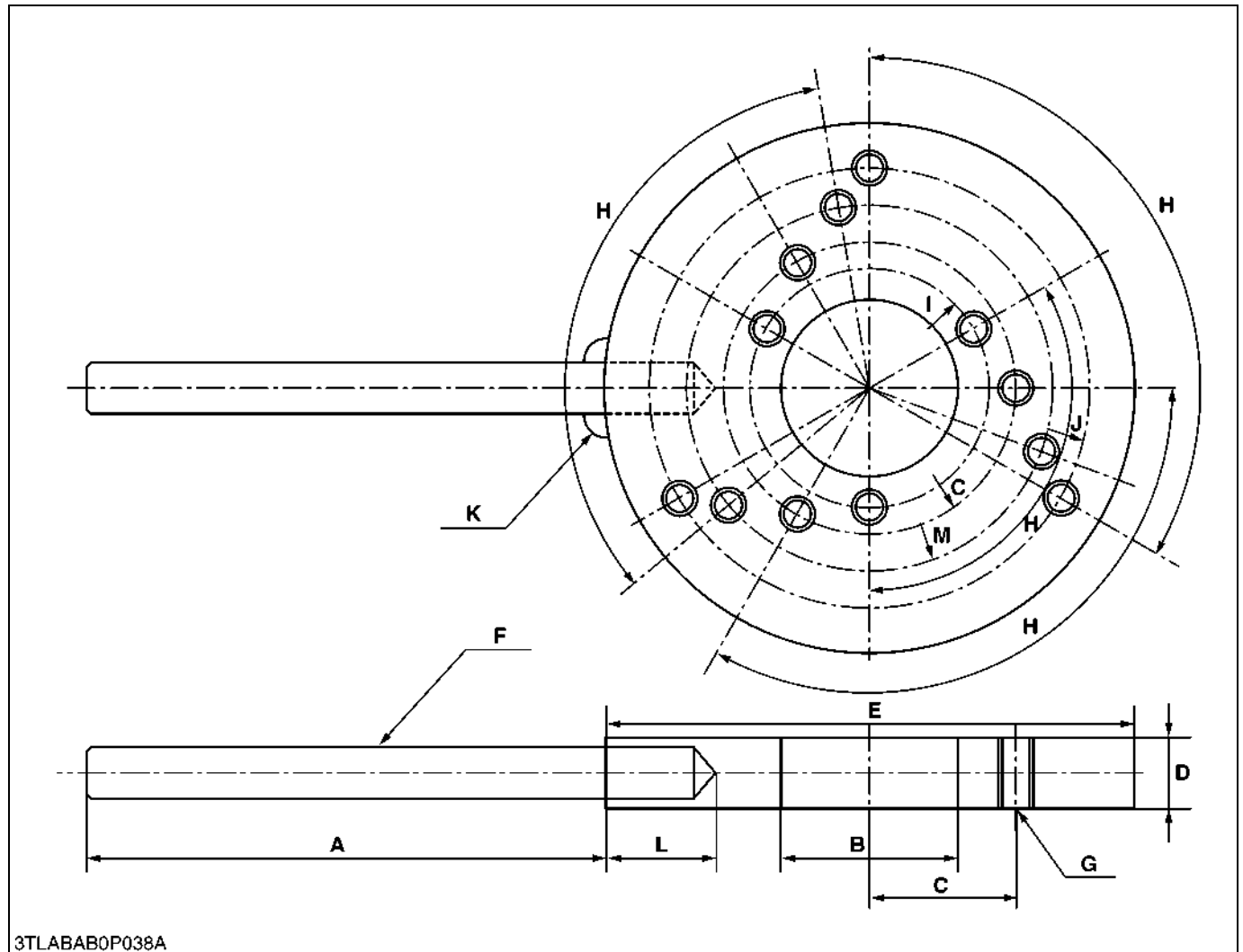
(1) Adaptor (For 134a)

(2) Vacuum Pump

W1013764

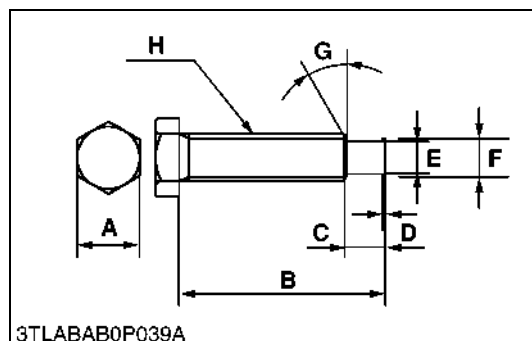
■ NOTE

- The following special tools are not provided, make them referring to the figure.
- Stopper Magnet Clutch (For A/C Compressor)**



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

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



Stopper Bolt (for A/C Compressor)

Application : Use with the stopper magnet clutch.

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

W1065437

9. TIRES



WARNING

To avoid personal injury:

- Do not attempt to mount a tire on a rim. This should be done by a qualified person with the proper equipment.
- Always maintain the correct tire pressure. Do not inflate tires above the recommended pressure show in the operator's manual.

■ IMPORTANT

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

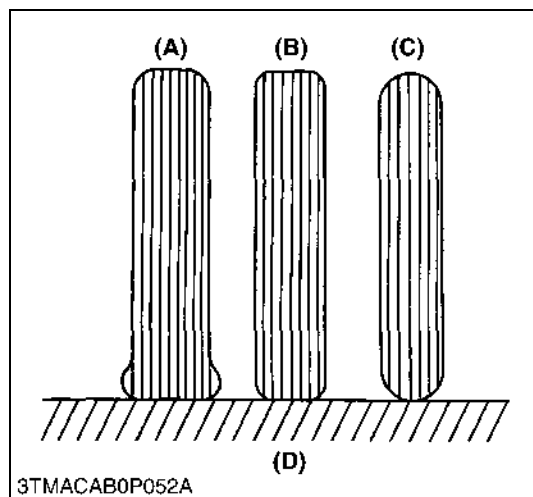
■ NOTE

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

[1] TIRE SIZE AND INFLATION PRESSURE

■ IMPORTANT

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



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

■ Recommended Inflation Pressure

- Maintain the pressure shown below for normal use.

	Tire sizes	Inflation pressure
Front	9.5-24	180 kPa (1.8 kgf/cm ² , 26 psi)
	320 / 85R20 (12.4-20)	140 kPa (1.4 kgf/cm ² , 20 psi)
	320 / 70R24	140 kPa (1.4 kgf/cm ² , 20 psi)
	320 / 85R24 (12.4-24)	140 kPa (1.4 kgf/cm ² , 20 psi)
	360 / 70R24	160 kPa (1.6 kgf/cm ² , 23 psi)
Rear	420 / 85R30 (16.9-30)	120 kPa (1.2 kgf/cm ² , 18 psi)
	420 / 85R30 (16.9-30)	120 kPa (1.2 kgf/cm ² , 18 psi)
	460 / 85R34 (18.4-30)	110 kPa (1.1 kgf/cm ² , 16 psi)
	420 / 85R34 (16.9-34)	120 kPa (1.2 kgf/cm ² , 18 psi)
	480 / 70R34	120 kPa (1.2 kgf/cm ² , 18 psi)

■ NOTE

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

(A) Insufficient
(B) Standard

(C) Excessive
(D) Ground

W1027488

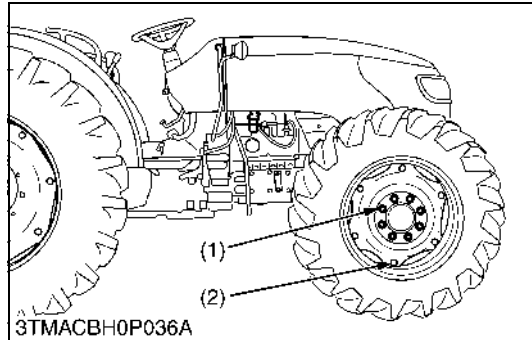
[2] TREAD ADJUSTMENT



CAUTION

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

(1) Front Wheels



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

To change the tread width

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

■ IMPORTANT

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

■ NOTE

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

Toe-in		Factory spec.	2.0 to 8.0 mm 0.08 to 0.31 in.
Tightening torque	Front wheel mounting nut	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft
	Front disc mounting nut (Both steel disc and cast iron disc)	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

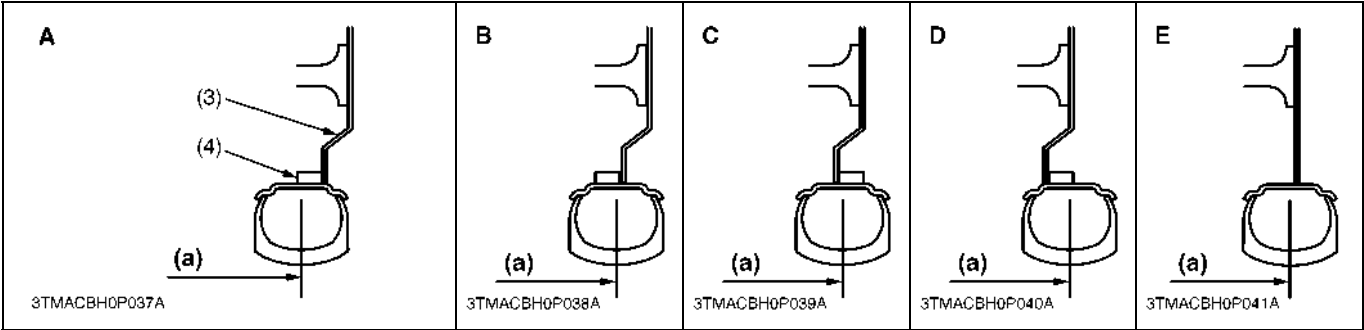
(1) Front Wheel Mounting Nut

(2) Front Disc Mounting Nut

W1039833

(To be continued)

(Continued)



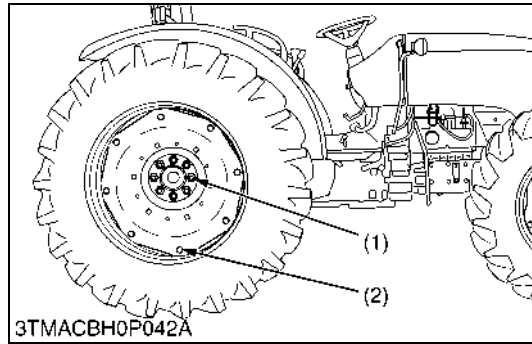
Tread (a)	A	B	C	D	E
320/85R20	1569 mm 61.77 in.	1656 mm 65.20 in.	–	–	
320/70R24	–	1515 mm 59.65 in.	1555 mm 61.22 in.	1609 mm 63.35 in.	
320/85R24	1566 mm 61.65 in.	1652 mm 61.50 in.	–	–	
360/70R24	–	1514 mm 59.61 in.	1554 mm 61.18 in.	1608 mm 63.31 in.	
44 x 18.00-20	–	–	–	–	1614 mm 63.54 in.

(3) Front Wheel Disc

(4) Front Wheel Rim

(a) Tread

(2) Rear Wheels



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

To change the tread width

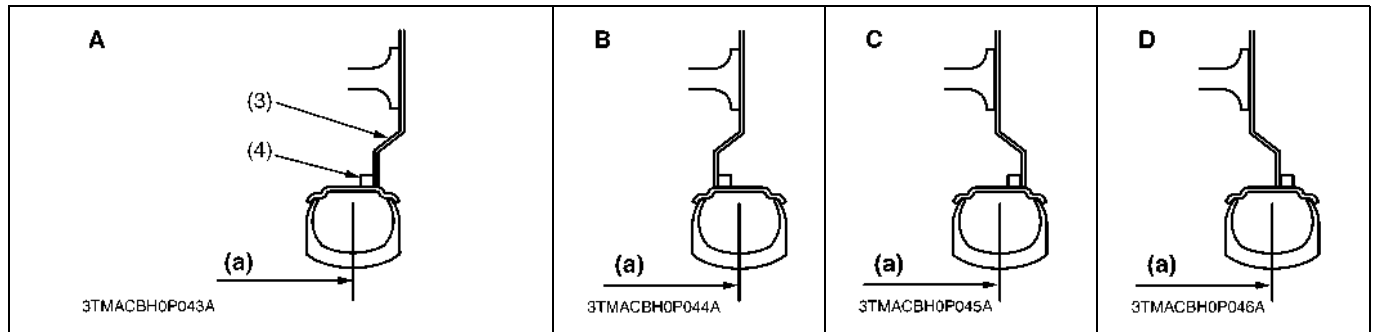
1. Remove the wheel rim and / or disc mounting bolts.
2. Change the position of the rim and disc (right and left) to the desired position, and tighten the bolts.

■ IMPORTANT

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

Tightening torque	Rear wheel mounting nut	M18	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft
	Rear disc mounting nut (Both steel disc and cast iron disc)	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

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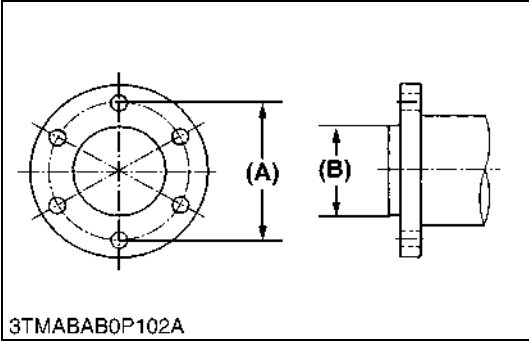


Tread (a)	A	B	C	D
420/85R30	—	1504 mm 59.21 in.	1594 mm 62.76 in.	1707 mm 67.20 in.
460/85R30	—	1546 mm 60.87 in.	1552 mm 61.10 in.	1752 mm 68.98 in.
420/85R34	—	1503 mm 59.17 in.	1599 mm 62.95 in.	1695 mm 66.73 in.
180/70R34	—	1503 mm 59.17 in.	1599 mm 62.95 in.	1695 mm 66.73 in.
23.1-26	1488 mm 58.58 in.	—	—	—

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

(a) Tread

[3] WHEEL HUB



	Front wheel hub	Rear wheel hub
Screw circle diameter (A)	203.2 mm (8 in.)	203.2 mm (8 in.)
Number of screws	8	8
Screws	M16 × P1.5	M18 × P1.5
Hub pilot diameter (B)	152.4 mm (6 in.)	152.4 mm (6 in.)

W1043392

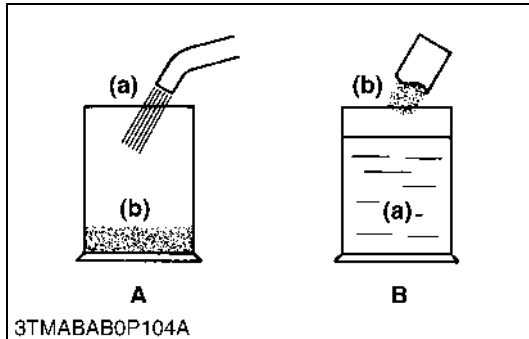
[4] TIRE LIQUID INJECTION

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.



Preparation of Calcium Chloride Solution

⚠ CAUTION

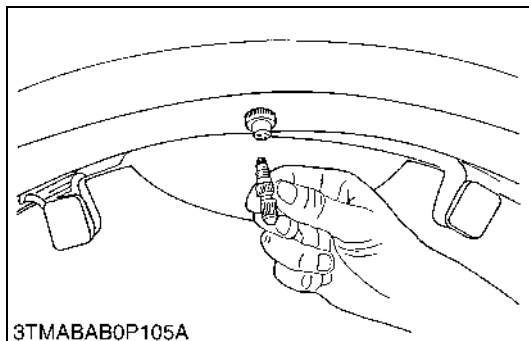
- When making a calcium chloride solution, do not pour water over calcium chloride since this results in chemical reaction which will cause high temperature. Instead add a small amount of calcium chloride to the water at a time until the desired solution is achieved.

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) CaCl₂ (Calcium Chloride)

W1033083



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

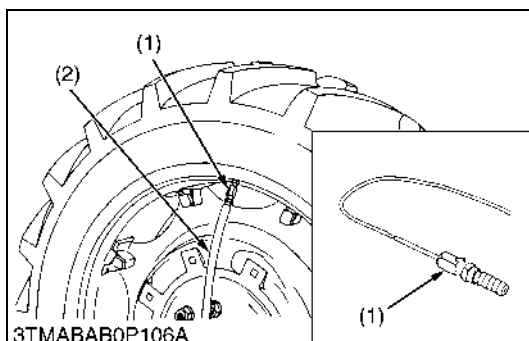


Fig. 1

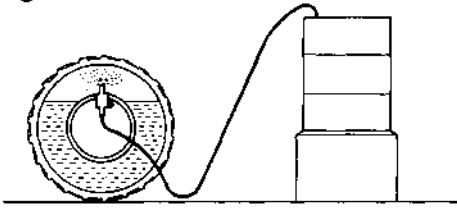


Fig. 2

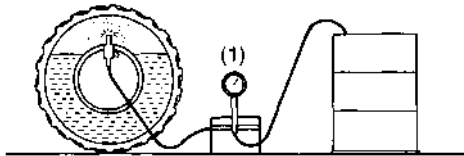
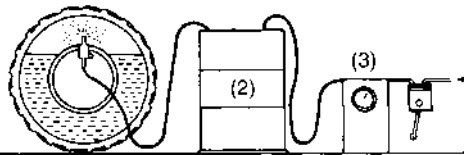


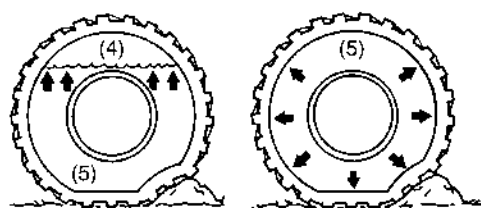
Fig. 3



3TMABAB0P111A

(A)

(B)



3TMABAB0P107A

Injection



CAUTION

- When a calcium chloride solution is used, cool it before pouring it into the tire.
- Do not fill tires with water or solution more than 75 % of full capacity (to the valve stem level).

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.

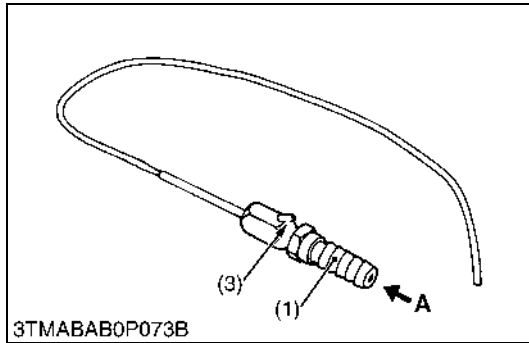
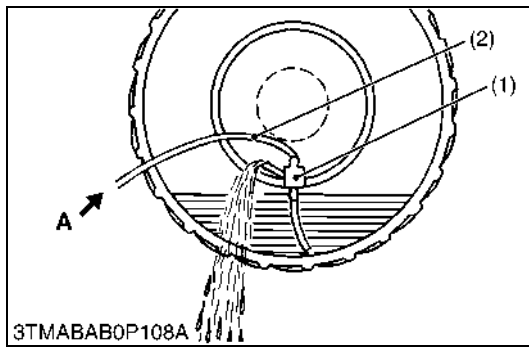
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

Tire sizes	480/70R34
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]	417 kg (919 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]	457 kg (1010 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]	490 kg (1080 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



Draining Water or Solution

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

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

A : Compressed Air

W1045167

10. IMPLEMENT LIMITATIONS

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

	Tread (max. width) with farm tires		Lower link end max. loading weight W_0
	Front	Rear	
M8540	1610 mm (63.39 in.)	1905 mm (75.00 in.)	3900 kg (8600 lbs)
M9540			

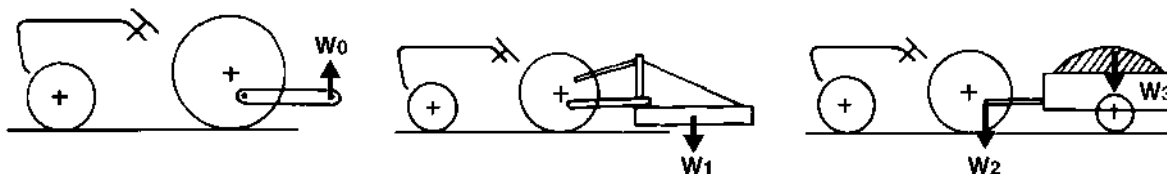
	Actual figures		
	Implement Weight W_1 and / or size	Max. Drawbar Load W_2	Trailer loading weight W_3 Max. capacity
M8540	As in the following list (shown on the next page)		
M9540			

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



3TMABAB0P109A

■ NOTE

- Implement size may vary depending on soil operating conditions.

[1] IMPLEMENT CAPACITY

No.	Implement		Remarks		M8540	M9540
1	Slurry Tank		Max. Tank Capacity		4000 L (1060 U.S.gals., 880 Imp.gals.)	
			Max. Load Capacity		5000 kg (11000 lbs)	
2	Trailer		Max. Load Capacity		Refer to the [2] TRAILER LOAD CAPACITY.	
			Max. Drawbar Load		Refer to the [2] TRAILER LOAD CAPACITY.	
3	Mower	Rotary-Cutter	Max. Cutting Width		2300 mm (90 in.)	
			Max. Weight		600 kg (1320 lbs)	
		Flail Mower (Heavy)	Max. Cutting Width		3660 mm (144 in.)	
			Max. Weight		1000 kg (2200 lbs)	
		Sickle Bar	Max. Cutting Width		2743 mm (108 in.)	
4	Sprayer		Max. Tank-capacity	Mid	800 L (211 U.S.gals., 176 Imp.gals.)	1000 L (260 U.S.gals., 220 Imp.gals.)
				Rear 3-point Hitch	800 L (211 U.S.gals., 176 Imp.gals.)	1000 L (260 U.S.gals., 220 Imp.gals.)
				Draw-bar	4500 L (1200 U.S.gals. 990 Imp.gals.)	5000 L (1320 U.S.gals. 1100 Imp.gals.)
5	Rotary Tiller		Max. Tilling Width		2400 mm (96 in.)	
			Max. Weight		1000 kg (2200 lbs)	
6	Bottom Plow		Max. Size		16 in. × 4 18 in. × 3 24 in. × 2	14 in. × 5 16 in. × 4 20 in. × 3 24 in. × 1
			Max. Weight		750 kg (1650 lbs)	900 kg (2000 lbs)
7	Disc-harrow	3-point Hitch Type	Max. Size		24 in. × 24	
			Max. Harrowing Width		2850 mm (112 in.)	3300 mm (130 in.)
			Max. Weight		750 kg (1650 lbs)	900 kg (2000 lbs)
		Drawbar Type	Max. Harrowing Width		3660 mm (144 in.)	4300 mm (168 in.)
8	Disc Plow		Max. Size		26 in. × 4 28 in. × 4	
			Max. Weight		750 kg (1650 lbs)	900 kg (2000 lbs)

W1012736

No.	Implement	Remarks	M8540	M9540
9	Sub Soiler	Numbers of Cultivating Tines	2	
		Cultivating Depth	500 mm (20 in.)	550 mm (22 in.)
10	Cultivator	Max. Width	4880 mm (192 in.)	5490 mm (216 in.)
		Number of Rows	6	
		Max. Weight	750 kg (1650 lbs)	900 kg (2000 lbs)
11	Front Blade ^{*1, *2}	Max. Cutting Width	2430 mm (96 in.)	2600 mm (102 in.)
		Max. Oil Pressure	19.6 MPa (200 kgf/cm ² , 2844 psi)	
12	Rear Blade	Max. Cutting Width	2430 mm (96 in.)	2600 mm (102 in.)
		Max. Oil Pressure	19.6 MPa (200 kgf/cm ² , 2844 psi)	
13	Front Loader ^{*1, *2}	Max. Lifting Capacity	1350 kg (2976 lbs)	
		Max. Oil Pressure	20.5 MPa (209 kgf/cm ² , 2973 psi)	
14	Box Blade	Max. Cutting Width	2430 mm (96 in.)	
		Max. Weight	750 kg (1650 lbs)	800 kg (1760 lbs)
15	Back Hoe ^{*2}	Max. Digging Depth	3050 mm (120 in.)	
		Max. Weight	1200 kg (2650 lbs)	
16	Snow Blade	Max. Width	2430 mm (96 in.)	2600 mm (102 in.)
		Max. Weight	750 kg (1650 lbs)	800 kg (1760 lbs)

■ **NOTE**

- Implement size may vary depending on soil operating conditions.

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

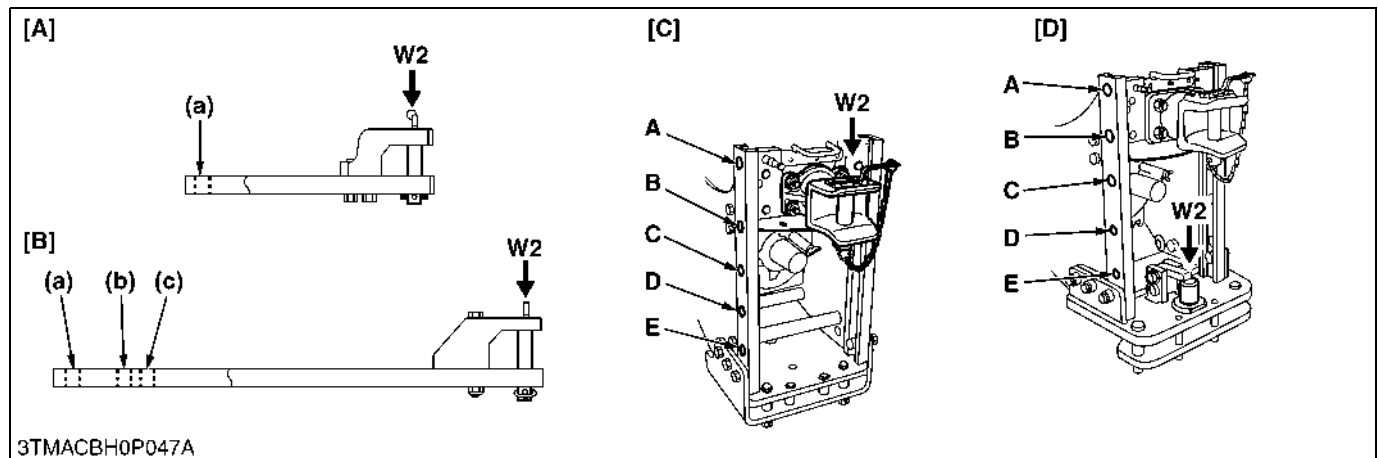
***2 : Need subframe.**

W1043839

[2] TRAILER LOAD CAPACITY

		Drawbar			High-hitch				Piton-fix
		Short	Long		Normal	Automatic	CUNA C	CUNA D2	
Vertical load W2	A	1500 kg 3307 lbs	600 kg 1320 lbs		580 kg 1280 lbs	560 kg 1230 lbs	590 kg 1300 lbs	590 kg 1300 lbs	1800 kg 3968 lbs
	B	–	800 kg 1760 lbs		830 kg 1830 lbs	810 kg 1790 lbs	850 kg 1870 lbs	850 kg 1870 lbs	–
	C	–	900 kg 1980 lbs		1050 kg 2315 lbs	1010 kg 2227 lbs	1060 kg 2337 lbs	1070 kg 2359 lbs	–
	D	–	–		1280 kg 2822 lbs	1240 kg 2734 lbs	1310 kg 2888 lbs	1320 kg 2910 lbs	–
	E	–	–		1550 kg 3417 lbs	1500 kg 3307 lbs	1500 kg 3307 lbs	1600 kg 3527 lbs	–
Trailer loading weight max. capacity W3	Unbraked towable mass	3000 kg 6614 lbs	3000 kg 6614 lbs		3000 kg 6614 lbs	3000 kg 6614 lbs	3000 kg 6614 lbs	3000 kg 6614 lbs	3000 kg 6614 lbs
	Independently braked mass	8000 kg 17640 lbs	8000 kg 17640 lbs		8000 kg 17640 lbs	8000 kg 17640 lbs	6000 kg 13230 lbs	8000 kg 17640 lbs	8000 kg 17640 lbs
	Inertia-braked towable mass							8000 kg 17640 lbs	8000 kg 17640 lbs
	Towable mass when fitted with hydraulic or pneumatic braking	12000 kg 26455 lbs	(a)	10000 kg 22046 lbs	12000 kg 26455 lbs	12000 kg 26455 lbs		12000 kg 26455 lbs	12000 kg 26455 lbs
			(b)	13500 kg 29762 lbs					
(c)			14000 kg 30865 lbs						

W1080903



[A] Drawbar / Short Type

[B] Drawbar / Long Type

[C] High-hitch

[D] Piton-fix

■ NOTE

- When the tractor is equipped with piton-fix, the E hole of high-hitch cannot use.

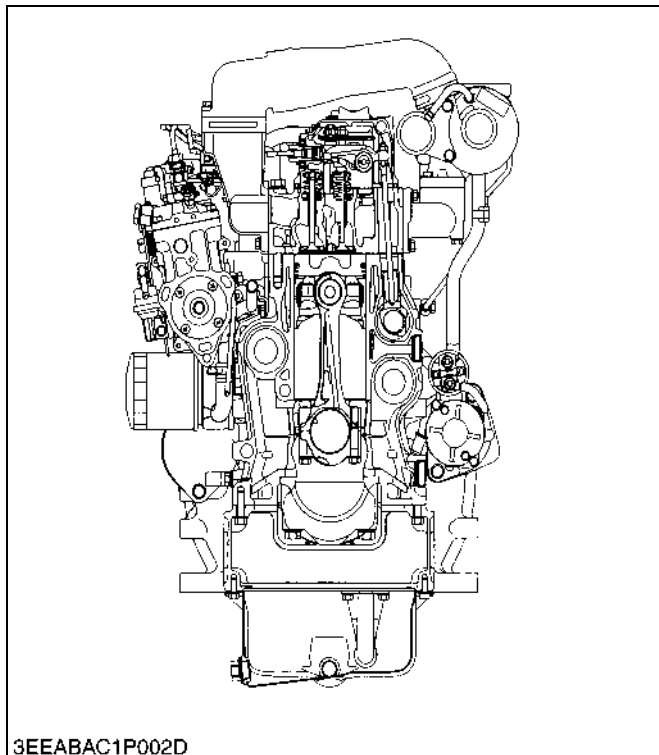
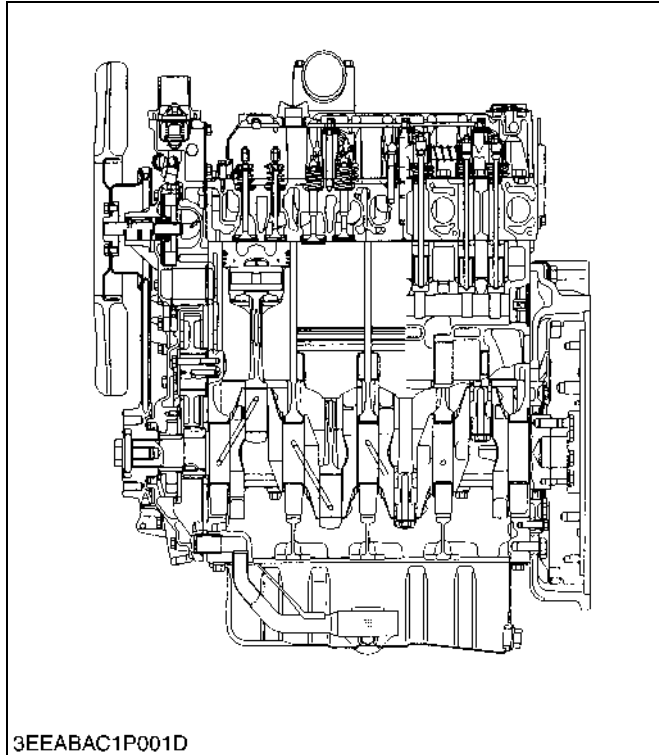
1 ENGINE

MECHANISM

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1. FEATURE



The V3 series DI engine are the vertical type 4-cycle diesel engine featuring the advanced performances shown below.

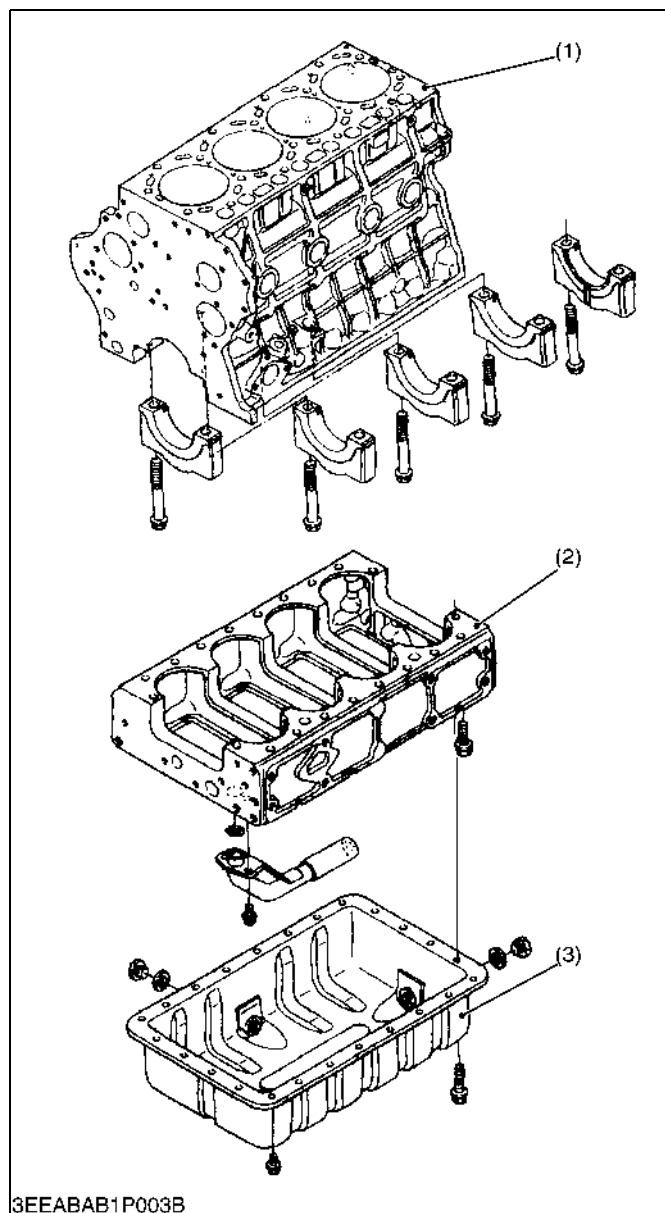
This is a small sized, high power and environment conscious engine, which employs the four valve system, two inlet valves with double ports, and two exhaust valves with the new E-CDIS. Thus, this engine achieves high combustion efficiency and complies with various regulations of exhaust gas.

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

W1013043

2. ENGINE BODY

[1] CYLINDER BLOCK



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

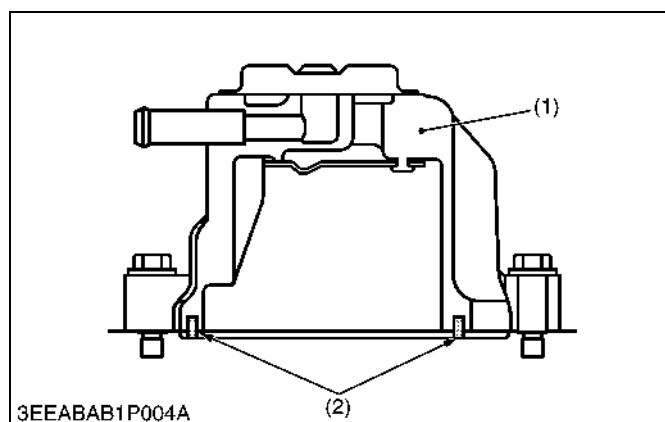
Since it is a hanger type, you can easily assemble / disassemble it. The cylinder is a linerless type which enables good cooling operation, less strain and good abrasion resistance.

- (1) Crankcase 1
- (2) Crankcase 2

- (3) Oil Pan

W1013119

[2] HALF-FLOATING HEAD COVER



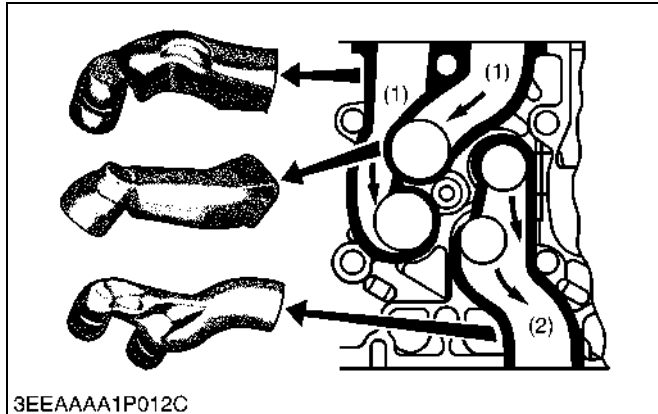
The rubber packing is fitted in to maintain the head cover 0.5 mm (0.02 in.) or so off the cylinder head. This arrangement helps reduce noise coming from the cylinder head.

- (1) Cylinder Head Cover

- (2) Rubber Packing

W1013327

[3] CYLINDER HEAD



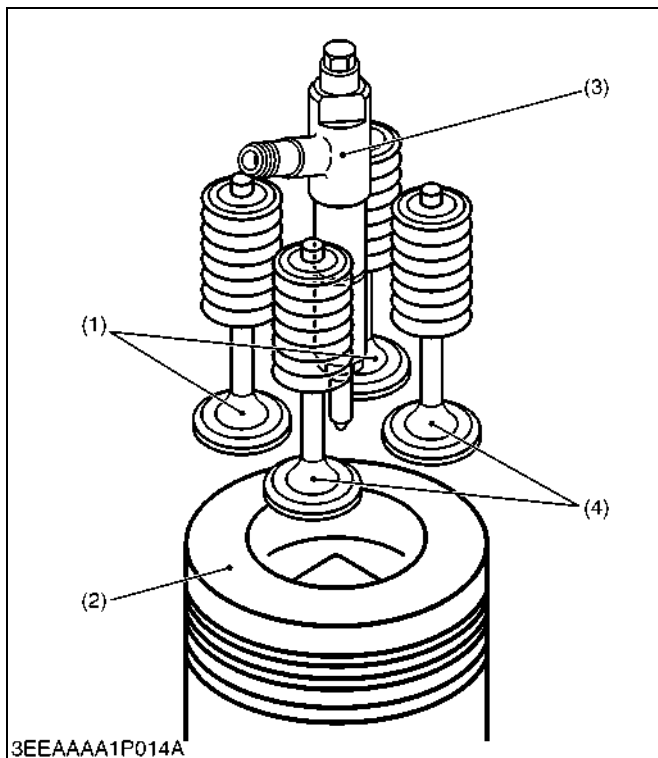
This engine employs four valve system, the cylinder head is provided with double intake passage in order to ensure appropriate air suction and give an optimum swirl.

(1) Intake

(2) Exhaust

W1013336

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



V3 series DI engine adopts the Center Direct Injection System (E-CDIS), in which the injection nozzle is positioned upright at the center of the cylinder.

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

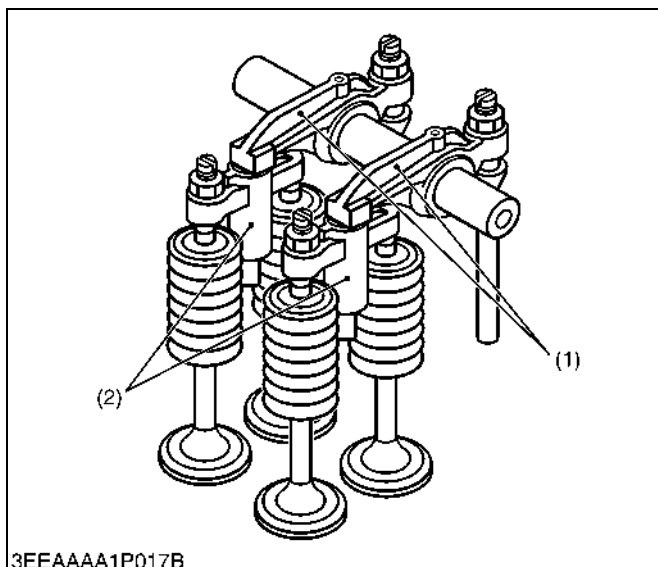
(1) Exhaust Valves

(3) Injection Nozzle

(2) Piston

(4) Intake Valves

W11094950



V3 series DI engine has two intake valves and two exhaust valves per each cylinder.

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

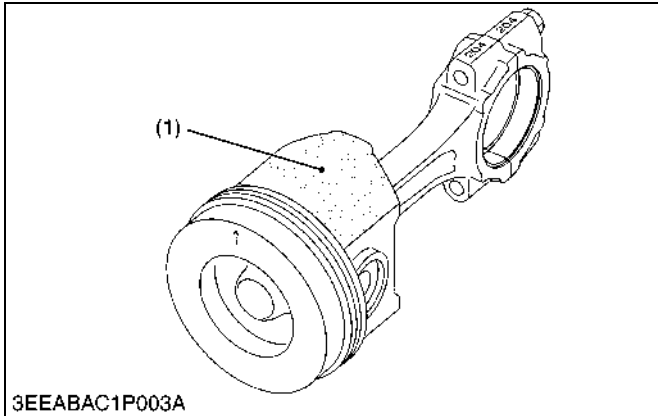
The bridge arm then contacts both intake valves or both exhaust valves and causes two valves to open simultaneously.

(1) Rocker Arm

(2) Bridge Arm

W1014724

[5] PISTON



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

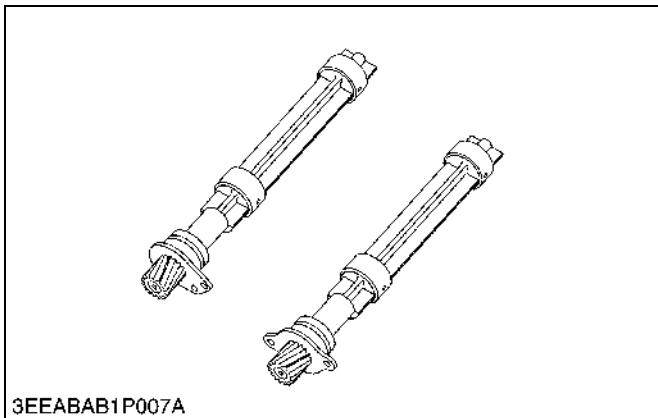
★Molybdenum disulfide (MoS₂)

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

(1) Molybdenum Disulfide

W1015665

[6] BUILT-IN DYNAMIC BALANCER



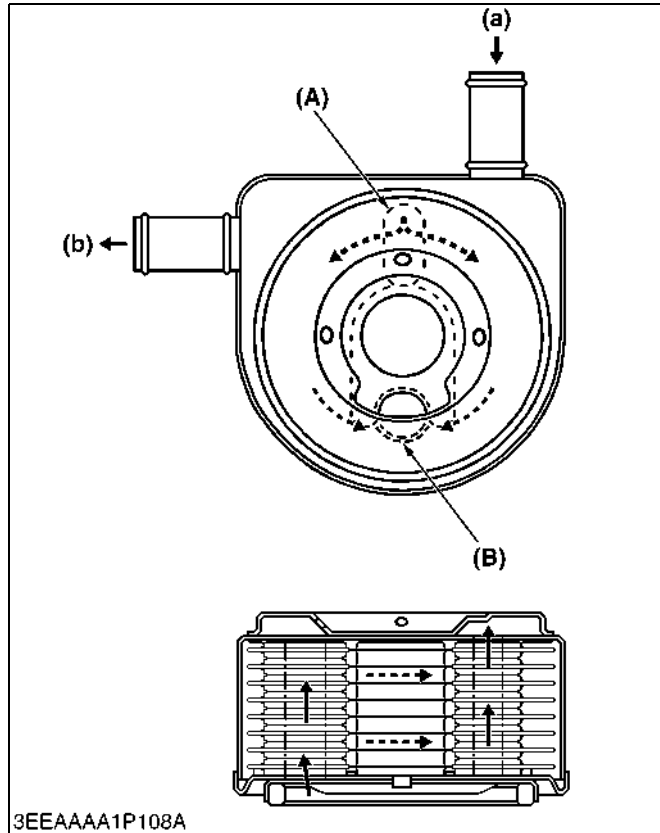
Engine are sure to vibrate by piston's reciprocation. Theoretically, three-cylinder engines are much less prone to cause vibration than four-cylinder ones (second inertia, etc.). However, any engine has many moving parts in addition to its pistons and cannot be completely free from vibration.

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

W1013617

3. LUBRICATING SYSTEM

[1] OIL COOLER



V3 series engine has a water-cooled oil cooler that not only cools hot oil, but also warms the cool engine oil shortly after start up.

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

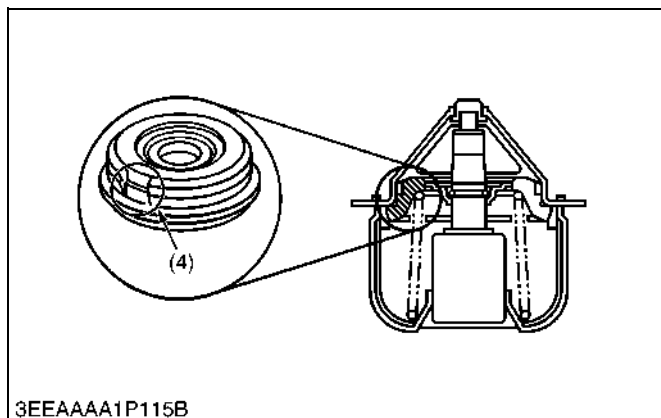
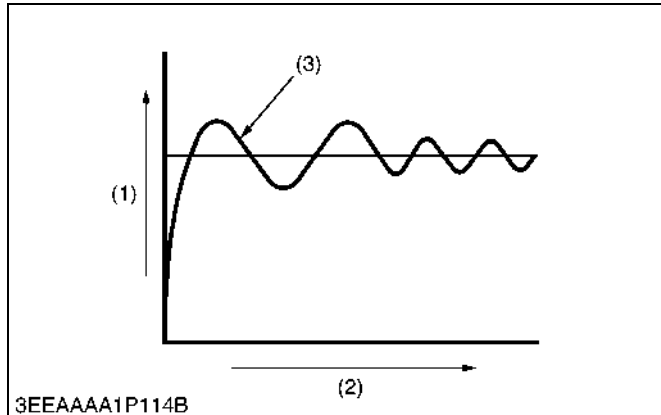
(A) Oil Inlet Port
(B) Oil Outlet Port

(a) Coolant Inlet Port
(b) Coolant Outlet Port

W10344770

4. COOLING SYSTEM

[1] THERMOSTAT



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

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

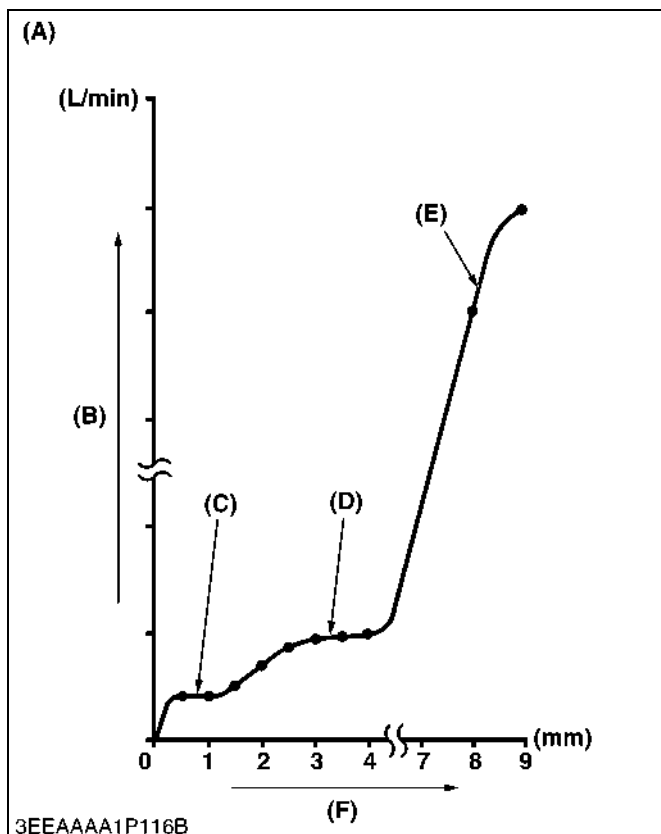
A repeated cycle of such overshoot and undershoot phenomena is called the water temperature hunting. This hunting problem may adversely affect the cooling system parts, and also the engine and its related components.

To cope with this trouble, the V3 series engine is equipped with the flow control thermostat. The valve has a notch to control the coolant flowrate smoothly in small steps.

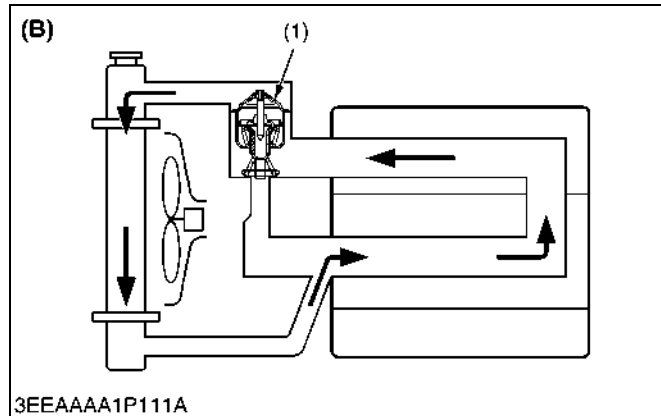
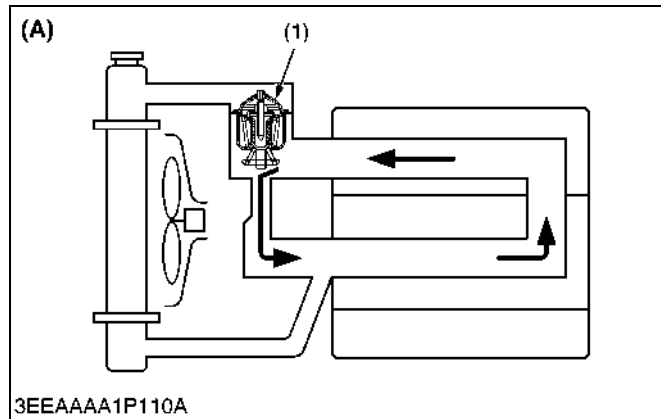
- (1) Coolant Temperature
- (2) Time
- (3) Overshoot
- (4) Notch

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

W1013684



[2] BOTTOM BYPASS SYSTEM



Bottom bypass system is introduced in V3 series for improving the cooling performance of the radiator.

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

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

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

(1) Thermostat

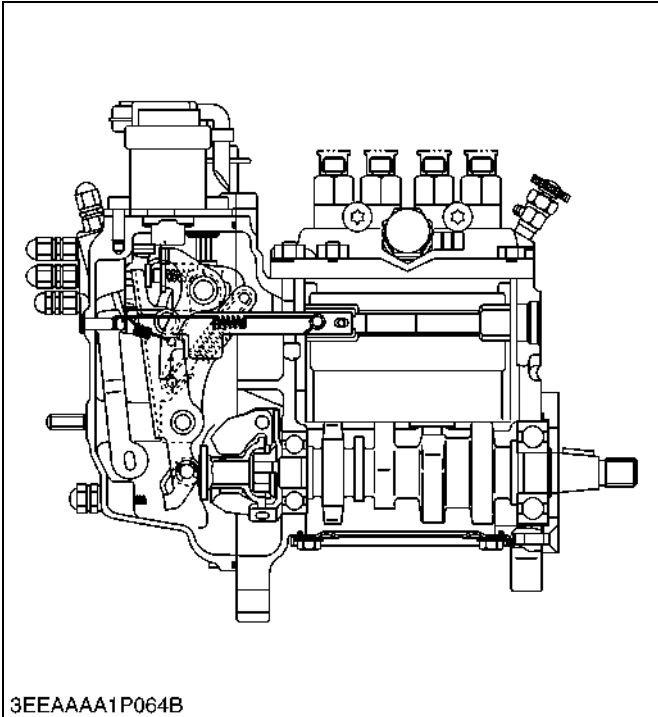
(A) Bypass Opened

(B) Bypass Closed

W1013406

5. FUEL SYSTEM

[1] GOVERNOR



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

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

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

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

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

W1013830

■ At Start

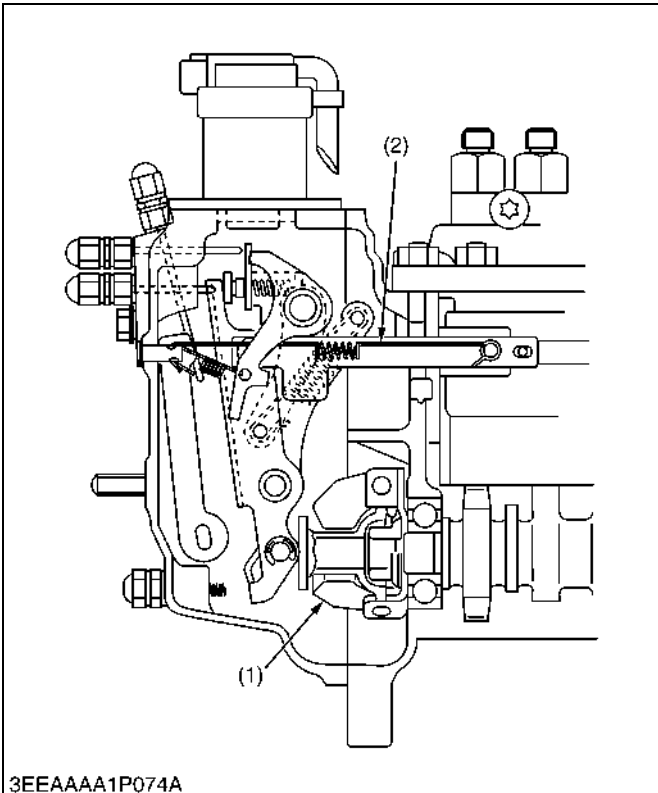
The stop solenoid (energized-to-run type) is powered to release the stop lever.

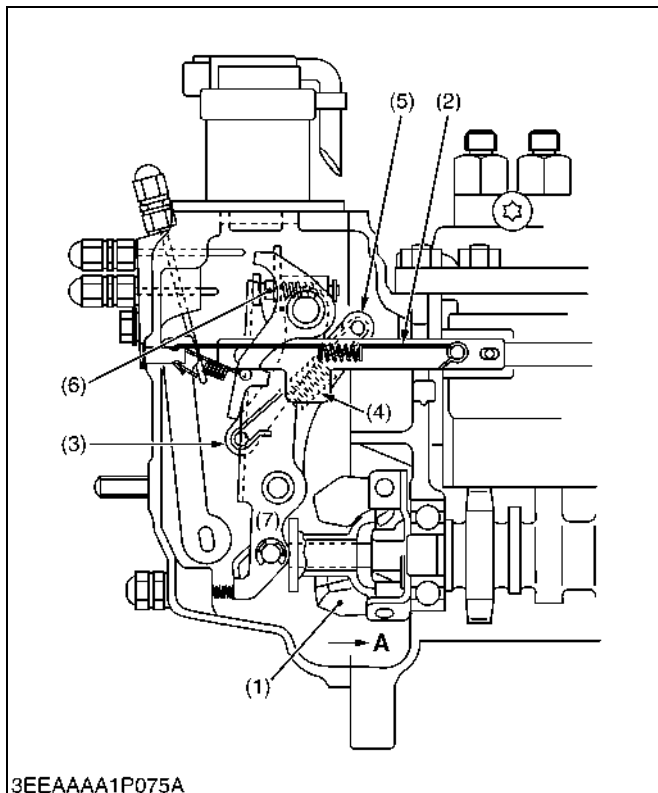
As no centrifugal force is applied to flyweight (1), low tension of start spring (2) permits control rack to move the starting position, supplying the amount of fuel required to start the engine.

(1) Flyweight

(2) Start Spring

W1013967





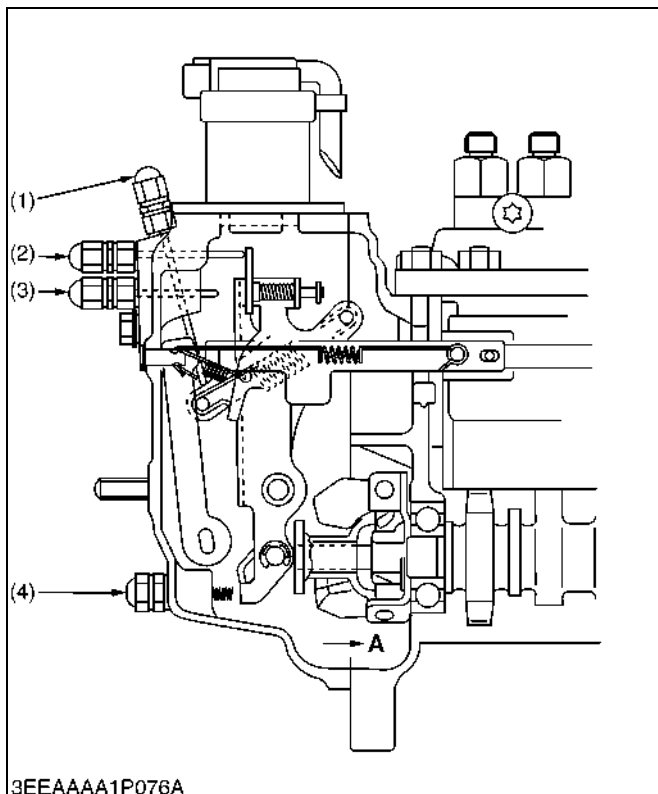
■ At Idling

Turn the speed control lever (3) clockwise to idle the engine. It tensions the governor spring (4) to pull the fork lever 2 (5).

When the fork lever 2 is pulled, it moves the torque spring pin (6) and the fork lever 1 (7) in the direction of the arrow **A** to restrain the weight. In combination with the start spring tension, it is balanced with the centrifugal force of flywheel weight to keep idling.

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

W1014034



■ At rated speed with full load and overload

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

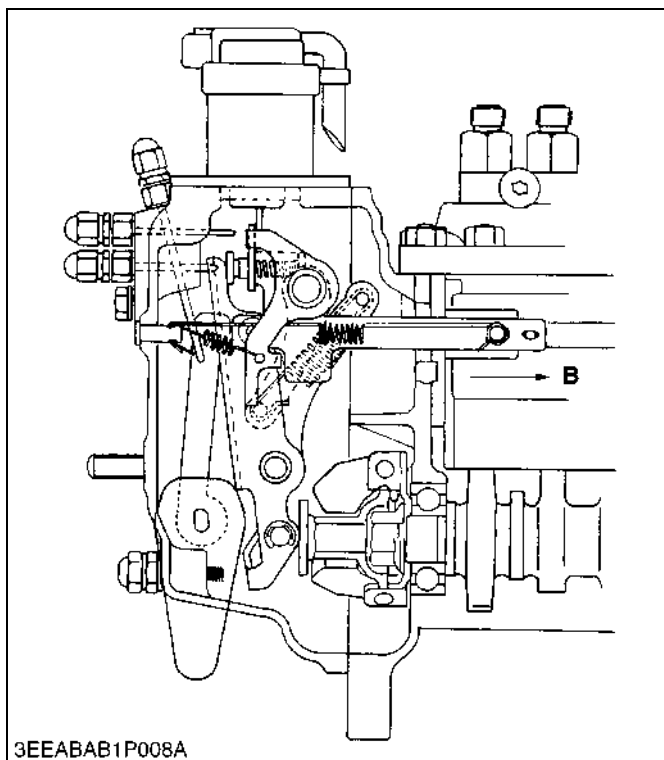
The fork lever 2 moves until it reaches the output limiting bolt to keep rated rotation and rated output.

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

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

(1) No-load Maximum Rotation	(3) Torque Limiting Bolt
(2) Output Limiting Bolt	(4) Idling Adjusting Bolt

W1014276



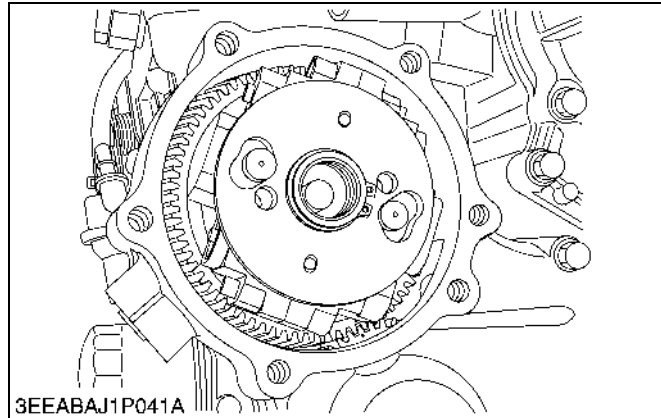
■ To stop engine

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

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

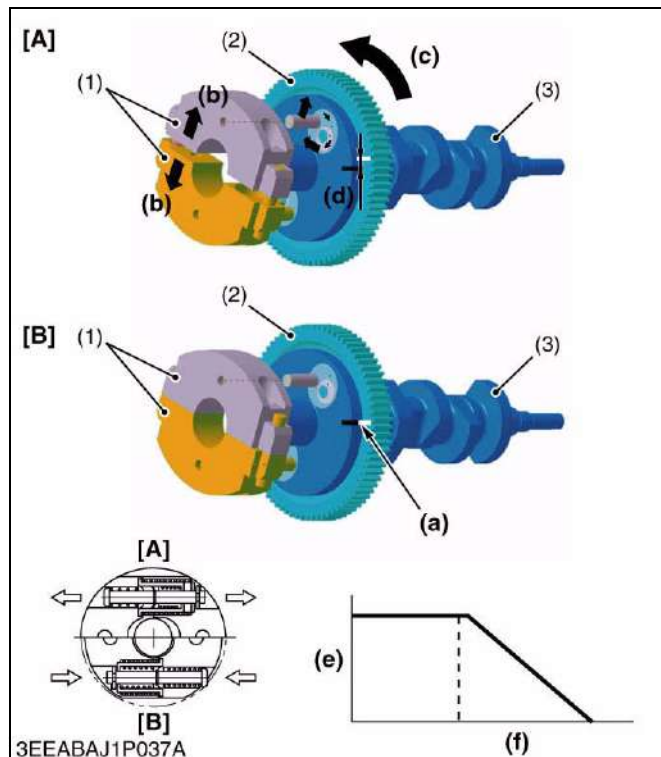
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[2] MECHANICAL TIMER WITH COLD START ADVANCE FUNCTION



This device makes the fuel injection timing advanced by engine oil temperature and engine rpm in order to improve the engine cold start-ability and reduce the blue white smoke.

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■ Thermal control

When the engine rpm is low and engine oil temperature is under 30 °C, the fuel injection timing is max. advanced.

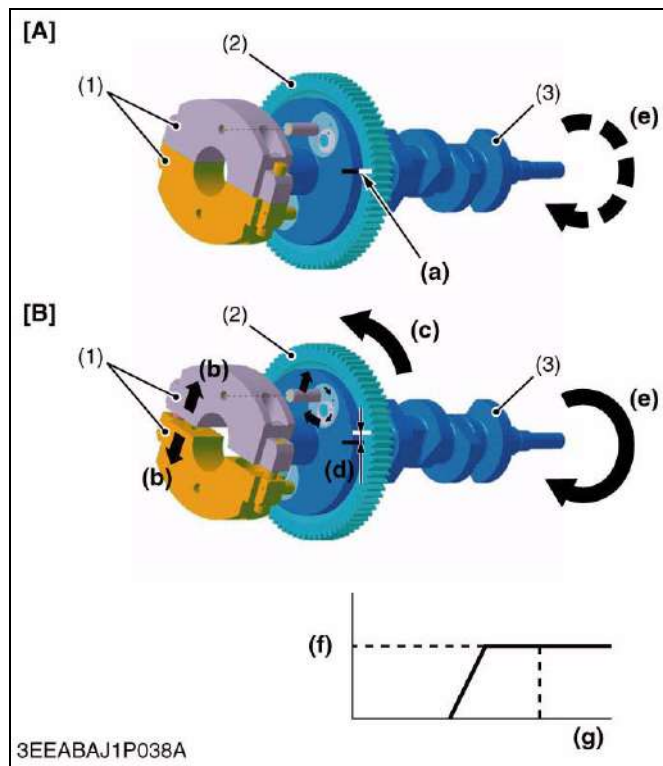
When the engine rpm is low and engine oil temperature is higher than 70 °C, the fuel injection timing advance is 0 degree.

The fuel injection timing advance by engine oil temperature is controlled with shape memory (storage) spring.

- (1) Timer Flyweight
- (2) Injection Pump Gear
- (3) Fuel Camshaft

- (a) No Gap Between Timer and Injection Pump Gear
- (b) Spring Force
- (c) Advanced Injection Timing
- (d) Gap Between Timer and Injection Pump Gear
- (e) Advanced Injection Timing (degree)
- (f) Engine Oil Temperature

W1017478



■ Speed control

If the engine rpm is higher than a certain rpm, the fuel injection timing advance by engine oil temperature does not work. At that time, the quantity of advance timing is variably changed by centrifugal force of the timer flyweights which meets engine rpm.

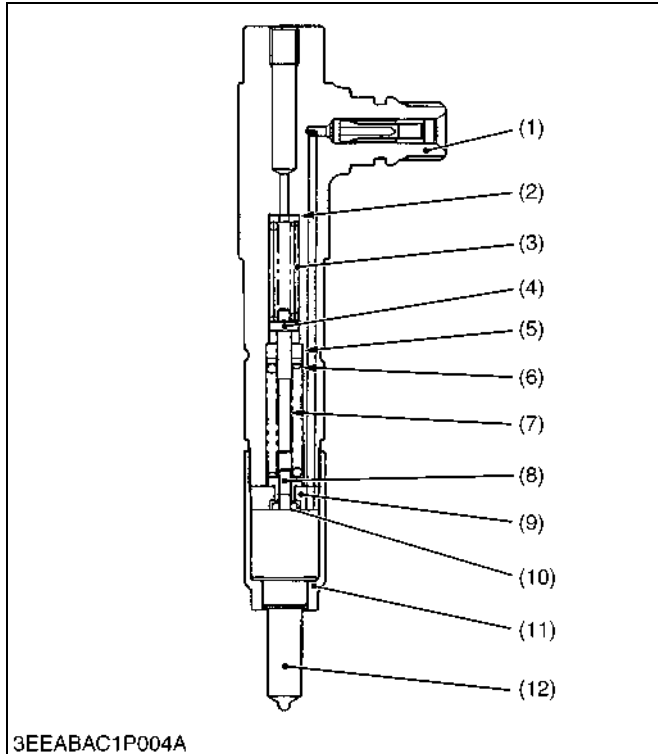
- (1) Timer Flyweight
- (2) Injection Pump Gear
- (3) Fuel Camshaft

- [A] At Low rpm
- [B] At High rpm

- (a) No Gap Between Timer and Injection Pump Gear
- (b) Centrifugal Force
- (c) Advanced Injection Timing
- (d) Gap Between Timer and Injection Pump Gear
- (e) Rotation
- (f) Advanced Injection Timing (Degree)
- (g) Engine rpm

W1017759

[3] 2 STAGE DI NOZZLE



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

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

■ Features

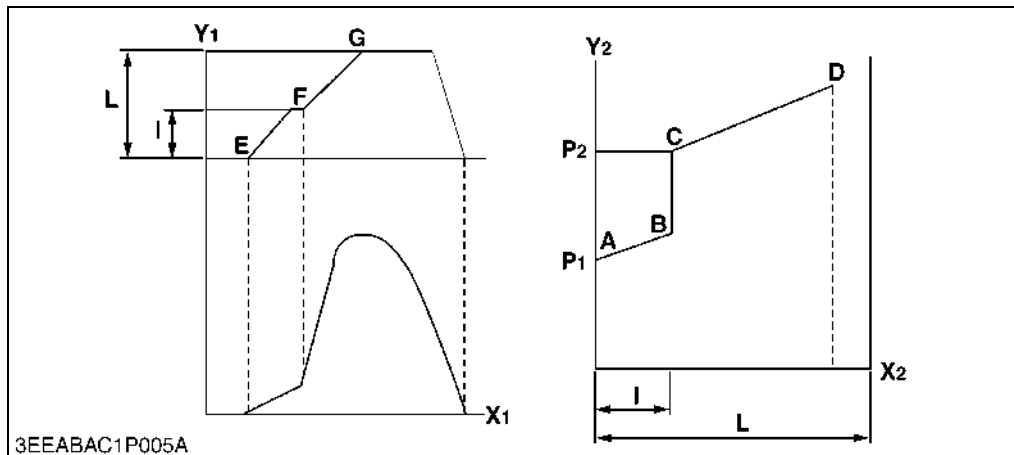
The two-spring nozzle holder limits needle valve lift at initial valve opening to throttle the injection quantity. Main injection occurs when the in-line pressure has increased sufficiently to move the needle valve through its full lift.

This gives the following features.

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

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

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- A-B : First Spring's Set Force
- B-C-D : Combined Force of First and Second Springs
- P1 : First Opening Pressure
- P2 : Second Opening Pressure
- L : Full Needle Valve Lift
- I : Needle Valve Pre-lift
- X1 : Cam Angle (°)
- Y1 : Injection Rate (mm³/°)
- X2 : Needle Valve Lift (mm)
- Y2 : In-line Pressure

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■ First opening pressure

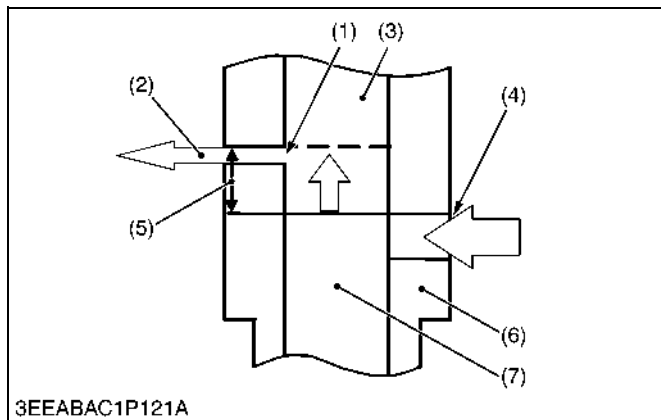
The force of the high pressure fuel delivered by the injection pump acts to push the needle valve up. When this force exceeds the set force of the first spring, the nozzle's needle valve pushes the first pushrod up and the valve opens. (First opening pressure is represented by point E in the left hand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

■ Second opening pressure

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

When the high pressure fuel (ie, in-line pressure) overcomes the combined forces of the first and second springs, the needle valve is again lifted and main injection can begin. (Second opening pressure is represented by point F in the bottom left hand figure and B to C in the bottom right hand figure.)

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



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

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

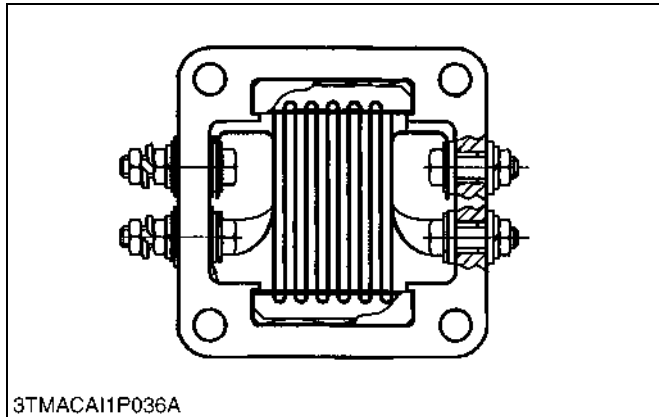
The latter function serves to keep down the initial injection rate and keep up the later injection rate, which cuts down on NOx and PM as well.

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

W1014969

6. INTAKE SYSTEM

[1] INTAKE AIR HEATER



The intake air heater is introduced in order to further improve the starting performance and to reduce the white smoke at cold starting.

The intake air heater is mounted on the intake manifold. In this new construction, there is no need to arrange any glow plug on the cylinder head. This means that a multi-valve design can be implemented and that the starting performance and serviceability are enhanced.

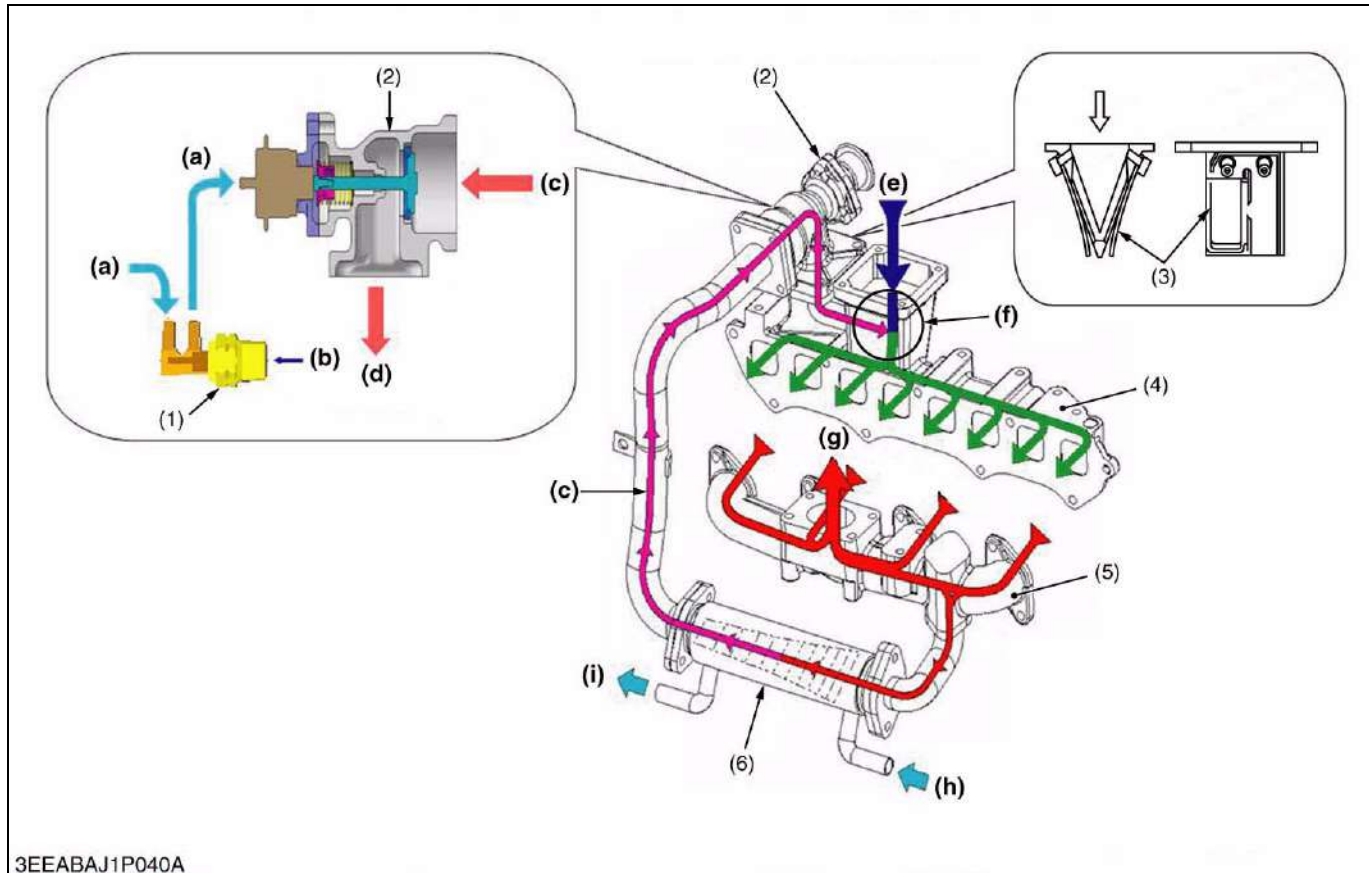
W1015544

7. EXHAUST GAS RECIRCULATION (EGR) SYSTEM

[1] GENERAL

In order to meet with the strict emission regulations, Kubota has adopted the EGR on the V3800DI-T-E3. The nitrogen oxide (NOx) which is a hazardous component in exhaust gas is generated by oxidation of nitrogen in the air, due to rise of the combustion temperature in cylinders. The EGR is a system in which the exhaust gas with lean oxygen is cooled and returned to cylinders again in order to lower the combustion temperature. As a result, NOx can be decreased.

(1) External / Mechanical EGR



- (1) Thermo Valve
- (2) Mechanical EGR Valve
- (3) Reed Valve

- (4) Intake Manifold
- (5) Exhaust Manifold
- (6) EGR Cooler

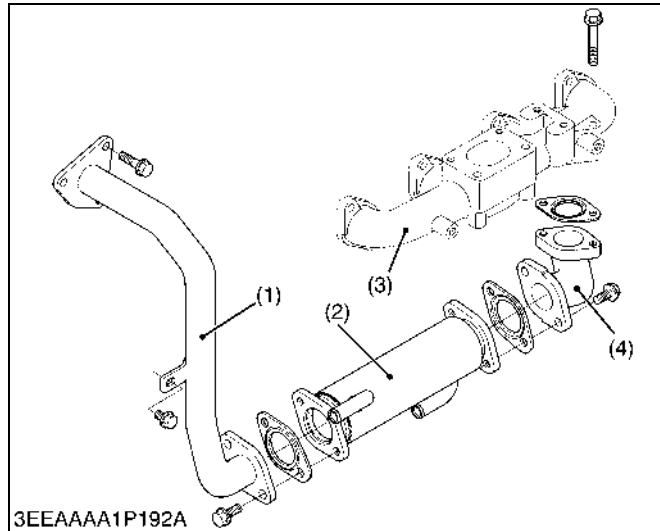
- (a) Boost Pressure
- (b) Coolant Temperature
- (c) Cooled EGR Gas
- (d) To The Intake Manifold
- (e) Fresh Air

- (f) Cooled EGR Gas Merges with Fresh Air
- (g) Exhaust
- (h) Coolant Inlet
- (i) Coolant Outlet

External / Mechanical EGR consists of water cooled EGR cooler, mechanical EGR valve, reed valve and thermo valve.

When the coolant temperature is getting higher, thermo valve is open and the boost pressure of intake manifold gets to reach the diaphragm of mechanical EGR valve.

If the coolant temperature is high, but the boost pressure is low, the EGR valve does not open. If coolant temperature is high, boost pressure is also high, EGR valve is open and cooled EGR gas through the water cooled EGR cooler flows into the intake manifold. And the reed valve between EGR valve and intake manifold prevents the fresh air flowing into EGR system.

(A) EGR Cooler

The EGR (Exhaust Gas Recirculation) cooler is used to lower combustion temperature and efficiently cool EGR gas, with the aim of reducing the NOx that is in the exhaust gas of diesel engine.

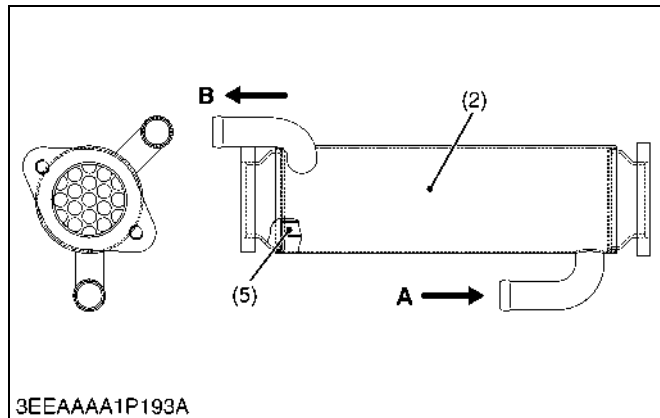
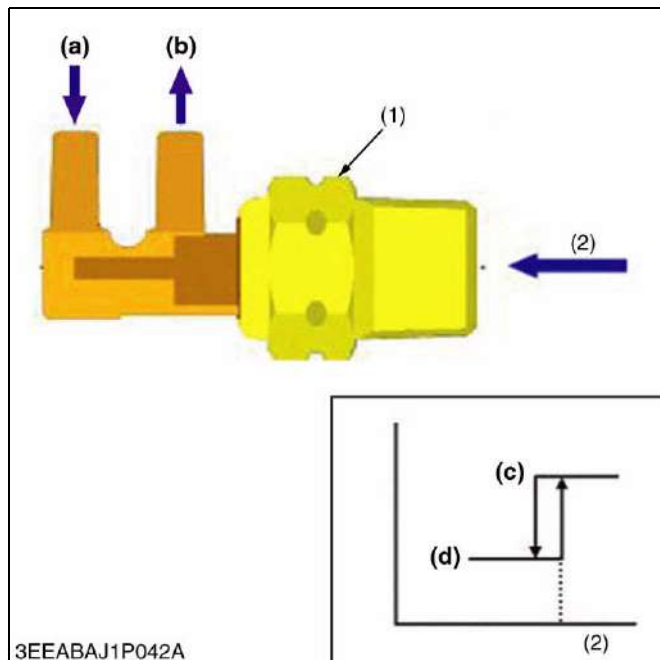
The EGR cooler is placed between the exhaust manifold and the intake manifold of the engine and returns the cooled exhaust gases to the engine suction side.

The EGR cooler has resistant to clogging up, compact and efficient tubes internally.

- (1) Pipe
- (2) EGR Cooler
- (3) Exhaust Manifold
- (4) Flange
- (5) Tube

- A Coolant Inlet Port**
- B Coolant Outlet Port**

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**(B) Thermo Valve**

Thermo valve controls boost pressure "ON / OFF" for the EGR valve.

If the coolant temperature is low, thermo valve is closed, so that boost pressure does not reach to the EGR valve.

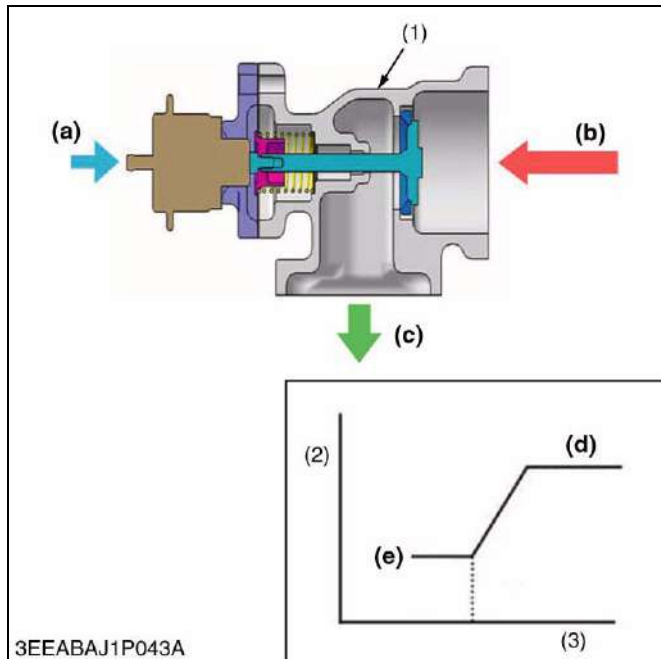
If the coolant temperature is high, thermo valve is open, so that boost pressure reaches to the EGR valve.

- (1) Thermo Valve
- (2) Coolant Temperature

- (a) Boost Pressure From Intake Manifold**
- (b) Boost Pressure To EGR Valve**
- (c) Open**
- (d) Close**

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(C) Mechanical EGR Valve



Mechanical EGR valve controls the flow of cooled EGR gas to the intake manifold.

If the boost pressure is low, EGR valve is closed, so cooled EGR gas does not flow to the intake manifold.

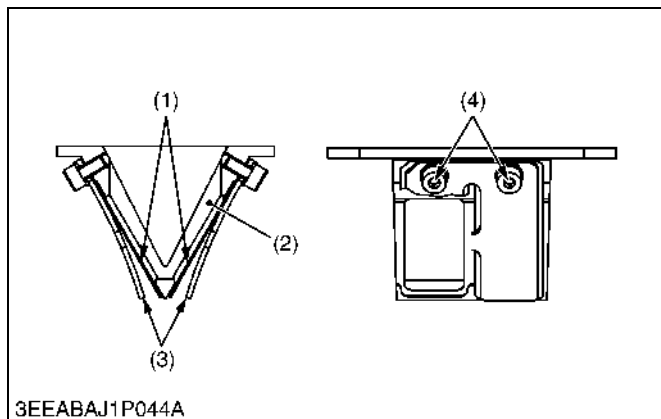
If the boost pressure is getting higher, EGR valve is opening and cooled EGR gas is flowing to the intake manifold.

- (1) Mechanical EGR Valve
- (2) EGR Valve Lift
- (3) Boost Pressure

- (a) Boost Pressure From Intake Manifold
- (b) Cooled EGR Gas
- (c) Cooled EGR Gas To The Intake Manifold
- (d) Open
- (e) Close

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(D) Reed Valve



The reed valve is provided at the confluence of exhaust gas after passing the EGR valve, and intake air. It operates by the pressure difference between inside of the crankcase and the atmosphere, and prevents backflow of the mixture of exhaust gas and intake air generated by the piston and valves. It is used as the secondary air introduction device for the countermeasure against exhaust gas of four-cycle engines.

- (1) Valve
- (2) Case

- (3) Stopper
- (4) Screw

W1176594

SERVICING

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(5) Cylinder.....	1-S78
(6) Oil Pump	1-S78

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	G-9
	Air in the fuel system	Vent air	G-39
	Water in the fuel system	Change fuel and repair or replace fuel system	G-9, 29
	Fuel hose clogged	Clean or replace	G-26
	Fuel filter clogged	Replace	G-32
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-9
	Fuel with low cetane number	Use specified fuel	G-9, 10
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S39
	Incorrect injection timing	Adjust	1-S19
	Fuel camshaft worn	Replace	
	Injection nozzle clogged	Repair or replace	1-S21, 39
	Injection pump malfunctioning	Repair or replace	1-S21, 52
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	—
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw and nozzle holder	1-S39, 40, 41, 42
	Improper valve timing	Correct or replace timing gear	1-S56
	Piston ring and cylinder worn	Replace	1-S73, 74, 78
	Excessive valve clearance	Adjust	1-S15
	Stop solenoid malfunctioning	Replace	9-S17
Starter Does Not Run	Battery discharged	Charge	9-S9
	Starter malfunctioning	Repair or replace	9-S16
	Key switch malfunctioning	Replace	9-S13
	Wiring disconnected	Connect	—

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Symptom	Probable Cause	Solution	Reference Page
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S39
	Injection pump malfunctioning	Repair or replace	1-S19, 52
	Incorrect nozzle opening pressure	Repair or replace	1-S21, 39
	Injection nozzle stuck or clogged	Repair or replace	1-S21, 39
	Governor malfunctioning	Repair	1-S44
	Turbocharger bearing worn out	Replace the turbocharger assembly	1-S36
	Turbocharger shaft bent	Replace the turbocharger assembly	1-S36
	Turbocharger fin or other part damaged due to foreign matters	Replace the turbocharger assembly	1-S36
Either White or Blue Exhaust Gas Is Observed	Excessive engine oil	Reduce to specified level	G-18
	Piston ring and cylinder worn or stuck	Repair or replace	1-S73, 74, 78
	Incorrect injection timing	Adjust	1-S19
Oil Leak into Exhaust Pipe or Suction Pipe	Waste oil pipe clogged or deformed	Repair or replace	1-S36
	Turbocharger's piston ring seal faulty	Replace the turbocharger assembly	1-S36
Either Black or Dark Gray Exhaust Gas Is Observed	Overload	Reduce the load	—
	Low grade fuel used	Use specified fuel	G-9, 11
	Fuel filter clogged	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Deficient nozzle injection	Repair or replace nozzle	1-S21, 39

W1014322

Symptom	Probable Cause	Solution	Reference Page
Deficient Output	Incorrect injection timing	Adjust	1-S19
	Engine's moving parts seem to be seizing	Repair or replace	–
	Injection pump malfunctioning	Repair or replace	1-S19, 52
	Deficient nozzle injection	Repair or replace nozzle	1-S21, 39
	Compression leak	Check the compression pressure and repair	1-S39, 40, 41, 42
	Gas leak from exhaust system	Repair or replace	1-S36
	Air leak from compressor discharge side	Repair or replace	1-S36
	Air cleaner dirty or clogged	Clean or replace	G-25
	Compressor wheel turning heavily	Replace the turbocharger assembly	1-S36
Excessive Lubricant Oil Consumption	Piston ring's gap facing the same direction	Shift ring gap direction	1-S59
	Oil ring worn or stuck	Replace	1-S60, 73
	Piston ring groove worn	Replace piston	1-S60, 73
	Valve stem and valve guide worn	Replace	1-S66
	Crankshaft bearing and crank pin bearing worn	Replace	1-S75, 76, 77
	Oil leaking due to defective seals or packing	Replace	–
Fuel Mixed into Lubricant Oil	Injection pump's plunger worn	Repair or replace	1-S20, 52
	Deficient nozzle injection	Repair or replace nozzle	1-S21, 39
	Injection pump broken	Replace	1-S20, 52
Water Mixed into Lubricant Oil	Head gasket defective	Replace	1-S39, 42
	Cylinder block or cylinder head flawed	Replace	1-S64
Low Oil Pressure	Engine oil insufficient	Replenish	G-9
	Oil strainer clogged	Clean	1-S58
	Relief valve stuck with dirt	Clean	1-S55
	Relief valve spring weaken or broken	Replace	1-S55
	Excessive oil clearance of crankshaft bearing	Replace	1-S77
	Excessive oil clearance of crankpin bearing	Replace	1-S76
	Excessive oil clearance of rocker arm	Replace	1-S68
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-9
	Oil pump defective	Replace	1-S78

W1014322

Symptom	Probable Cause	Solution	Reference Page
High Oil Pressure	Different type of oil	Use specified type of oil	G-9
	Relief valve defective	Replace	1-S55
Engine Overheated	Engine oil insufficient	Replenish	G-9
	Fan belt broken or elongated	Replace or adjust	1-S16
	Coolant insufficient	Replenish	G-35
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	G-35
	Coolant flow route corroded	Clean or replace	G-35
	Radiator cap defective	Replace	1-S17
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S41, 42
	Incorrect injection timing	Adjust	1-S19
	Unsuitable fuel used	Use specified fuel	G-9
Battery Quickly Discharged	Battery electrolyte insufficient	Replace	–
	Fan belt slips	Adjust belt tension or replace	1-S16
	Wiring disconnected	Connect	–
	Rectifier defective	Replace	9-S47
	Alternator defective	Replace	9-S47
	Battery defective	Replace	–

W1014322

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Cylinder Head Surface	Flatness	—	0.05 mm 0.0020 in.
Top Clearance		0.701 to 0.930 mm 0.0276 to 0.0366 in.	—
Compression Pressure		3.47 MPa / 250 min ⁻¹ (rpm) 35.4 kgf/cm ² / 250 min ⁻¹ (rpm) 503 psi / 250 min ⁻¹ (rpm)	2.56 MPa / 250 min ⁻¹ (rpm) 26.1 kgf/cm ² / 250 min ⁻¹ (rpm) 371 psi / 250 min ⁻¹ (rpm)
Variance Among Cylinders		—	10 % or less
Valve Seat	Angle (Intake)	1.0 rad 60 °	—
	Angle (Exhaust)	0.79 rad 45 °	—
	Width (Intake)	1.6 to 2.0 mm 0.063 to 0.078 in.	—
	Width (Exhaust)	2.3 to 2.6 mm 0.091 to 0.10 in.	—
Valve Face	Angle (Intake)	1.0 rad 60 °	—
	Angle (Exhaust)	0.79 rad 45 °	—
Valve Recessing	Intake	0.6 to 0.8 mm 0.024 to 0.031 in.	1.2 mm 0.0472 in.
	Exhaust	0.850 to 1.05 mm 0.0335 to 0.0413 in.	1.2 mm 0.0472 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Valve Stem to Valve Guide	Clearance (Intake)	0.055 to 0.085 mm 0.0022 to 0.0033 in.	0.1 mm 0.0039 in.
Valve Stem	O.D. (Intake)	6.960 to 6.975 mm 0.2741 to 0.2746 in.	—
Valve Guide	I.D. (Intake)	7.030 to 7.045 mm 0.2768 to 0.2773 in.	—
Valve Stem to Valve Guide	Clearance (Exhaust)	0.055 to 0.085 mm 0.0022 to 0.0033 in.	0.1 mm 0.0039 in.
Valve Stem	O.D. (Exhaust)	6.960 to 6.975 mm 0.2740 to 0.2746 in.	—
Valve Guide	I.D. (Exhaust)	7.030 to 7.045 mm 0.2768 to 0.2773 in.	—
Valve Clearance (Cold)		0.23 to 0.27 mm 0.0091 to 0.010 in.	—
Intake Valve Timing	Open	0.24 rad (14 °) before T.D.C.	—
	Close	0.63 rad (36 °) after B.D.C.	—
Exhaust Valve Timing	Open	0.79 rad (45 °) before B.D.C.	—
	Close	0.30 rad (17 °) after T.D.C.	—
Valve Spring	Free Length (Intake)	35.1 to 35.6 mm 1.39 to 1.40 in.	34.6 mm 1.36 in.
	Free Length (Exhaust)	35.1 to 35.6 mm 1.39 to 1.40 in.	34.6 mm 1.36 in.
	Tilt	—	1.0 mm 0.039 in.
Valve Spring	Setting Load / Setting Length (Intake)	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.2401 in.
	Setting Load / Setting Length (Exhaust)	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.2401 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Rocker Arm Shaft to Rocker Arm	Clearance	0.016 to 0.045 mm 0.00063 to 0.0017 in.	0.15 mm 0.0059 in.
Rocker Arm Shaft	O.D.	15.973 to 15.984 mm 0.62886 to 0.62929 in.	—
Rocker Arm	I.D.	16.000 to 16.018 mm 0.62993 to 0.63062 in.	—
Valve Arm Bridge and Valve Arm Bridge Shaft	Clearance	0.018 to 0.042 mm 0.00071 to 0.0016 in.	0.15 mm 0.0059 in.
Valve Arm Bridge	I.D.	9.050 to 9.065 mm 0.3563 to 0.3568 in.	—
Valve Arm Bridge Shaft	O.D.	9.023 to 9.032 mm 0.3552 to 0.3556 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Clearance	0.020 to 0.062 mm 0.00079 to 0.0024 in.	0.07 mm 0.003 in.
Tappet Guide Bore	I.D.	24.000 to 24.021 mm 0.94489 to 0.94570 in.	—
Tappet	O.D.	23.959 to 23.980 mm 0.94327 to 0.94409 in.	—
Camshaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0086 in.	0.3 mm 0.012 in.
	Alignment	—	0.01 mm 0.0004 in.
Cam Height	Intake	37.63 mm 1.481 in.	37.13 mm 1.462 in.
	Exhaust	38.96 mm 1.534 in.	38.46 mm 1.514 in.
Camshaft	Oil Clearance	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 1.8085 to 1.8090 in.	—
Camshaft Bearing	I.D.	46.000 to 46.025 mm 1.8111 to 1.8120 in.	—

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Timing Gear	Idle Gear 1 to Crank Gear	Backlash 0.0490 to 0.193 mm 0.00193 to 0.00759 in.	0.22 mm 0.0087 in.
	Idle Gear 1 to Cam Gear	Backlash 0.0490 to 0.189 mm 0.00193 to 0.00744 in.	0.22 mm 0.0087 in.
	Idle Gear 1 to Idle Gear 2	Backlash 0.0440 to 0.185 mm 0.00174 to 0.00728 in.	0.22 mm 0.0087 in.
	Idle Gear 2 to Injection Pump Gear	Backlash 0.0440 to 0.177 mm 0.00174 to 0.00696 in.	0.22 mm 0.0087 in.
	Cam Gear to Balancer Gear 1	Backlash 0.0470 to 0.182 mm 0.00185 to 0.00716 in.	0.22 mm 0.0087 in.
	Idle Gear 1 to Balancer Gear 2	Backlash 0.0440 to 0.183 mm 0.00174 to 0.00720 in.	0.22 mm 0.0087 in.
Idle Gear Shaft 1, 2 to Idle Gear 1, 2 Bushing		Oil Clearance 0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.10 mm 0.0039 in.
Idle Gear 1, 2 Bushing		I.D. 45.025 to 45.050 mm 1.7727 to 1.7736 in.	—
Idle Gear 1, 2 Shaft		O.D. 44.959 to 44.975 mm 1.7701 to 1.7706 in.	—
Idle Gear		Side Clearance 0.15 to 0.30 mm 0.0059 to 0.011 in.	0.9 mm 0.04 in.
Balancer Shaft		Side Clearance 0.070 to 0.22 mm 0.0028 to 0.0086 in.	0.3 mm 0.01 in.
Balancer Shaft		Alignment —	0.02 mm 0.0008 in.
Balancer Shaft		Oil Clearance 0.070 to 0.159 mm 0.00276 to 0.00625 in.	0.2 mm 0.008 in.
Balancer Shaft Journal		O.D. 50.920 to 50.940 mm 2.0048 to 2.0055 in.	—
Balancer Bearing		I.D. 51.01 to 51.08 mm 2.008 to 2.011 in.	—
Piston Pin Bore		I.D. 30.000 to 30.013 mm 1.1811 to 1.1816 in.	30.05 mm 1.1831 in.
Top Ring to Ring Groove		Clearance 0.05 to 0.09 mm 0.002 to 0.003 in.	0.15 mm 0.0059 in.
Second Ring to Ring Groove		Clearance 0.0930 to 0.120 mm 0.00367 to 0.00472 in.	0.20 mm 0.0079 in.
Oil Ring to Ring Groove		Clearance 0.020 to 0.060 mm 0.00079 to 0.0023 in.	0.15 mm 0.0059 in.

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Piston Ring Gap	Top Ring	0.30 to 0.45 mm 0.012 to 0.017 in.	1.25 mm 0.0492 in.
	Second Ring	0.30 to 0.45 mm 0.012 to 0.017 in.	1.25 mm 0.0492 in.
	Oil Ring	0.25 to 0.45 mm 0.0099 to 0.017 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Piston Pin to Small End Bushing	Clearance	0.020 to 0.040 mm 0.00079 to 0.0015 in.	0.15 mm 0.0059 in.
Piston Pin	O.D.	30.006 to 30.011 mm 1.1814 to 1.1815 in.	—
Small End Bushing	I.D.	30.031 to 30.046 mm 1.1824 to 1.1829 in.	—
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.012 in.	0.50 mm 0.020 in.
	Alignment	—	0.02 mm 0.0008 in.
Crankshaft Journal to Crankshaft Bearing	Oil Clearance	0.018 to 0.062 mm 0.00071 to 0.0024 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	74.977 to 74.990 mm 2.9519 to 2.9523 in.	—
Crank Pin to Pin Bearing	Oil Clearance	0.018 to 0.051 mm 0.00071 to 0.0020 in.	0.20 mm 0.0079 in.
Crank Pin	O.D.	52.977 to 52.990 mm 2.0857 to 2.0862 in.	—
Cylinder Bore	I.D.	100.000 to 100.022 mm 3.9370 to 3.9379 in.	100.150 mm 3.9429 in.
Cylinder Bore (Oversize)	I.D.	100.500 to 100.522 mm 3.95670 to 3.95755 in.	100.650 mm 3.96260 in.

W10138740

LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	—	50 kPa 0.5 kgf/cm ² 7 psi
	At Rated Speed	200 to 390 kPa 2.0 to 4.0 kgf/cm ² 29 to 56 psi	150 kPa 1.5 kgf/cm ² 21 psi
Engine Oil Pressure Switch	Working Pressure	40 to 50 kPa 0.4 to 0.6 kgf/cm ² 6 to 8 psi	—
Inner Rotor to Outer Rotor	Clearance	0.04 to 0.16 mm 0.0016 to 0.0062 in.	0.3 mm 0.01 in.
Outer Rotor to Pump Body	Clearance	0.100 to 0.184 mm 0.00394 to 0.00724 in.	0.3 mm 0.01 in.
Inner Rotor to Cover	Clearance	0.025 to 0.075 mm 0.00099 to 0.0029 in.	0.225 mm 0.00866 in.
Relief Valve	Working Pressure	887 kPa 9.04 kgf/cm ² 129 psi	—

W10139730

COOLING SYSTEM

Thermostat	Valve Opening Temperature	74.5 to 78.5 °C 166.1 to 173.3 °F	—
	Valve Opening Temperature (Opened Completely)	90 °C 194 °F	—
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 90 → 60 kPa 0.9 → 0.6 kgf/cm ² 10 → 9 psi	—
Fan Belt	Tension	10 to 12 mm / 98 N 0.40 to 0.47 in. / 98 N (10 kgf, 22 lbf)	—

W10135990

FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Timing		0.0917 to 0.117 rad (5.25 to 6.75 °) before T.D.C.	—
Pump Element	Fuel Tightness	—	18.63 MPa 190.0 kgf/cm ² 2702 psi
Delivery Valve	Fuel Tightness	10 seconds 18.63 → 17.65 MPa 190.0 → 180.0 kgf/cm ² 2702 → 2560 psi	5 seconds 18.63 → 17.65 MPa 190.0 → 180.0 kgf/cm ² 2702 → 2560 psi
Fuel Injection Nozzle	Injection Pressure (1st stage)	18.63 to 19.61 MPa 190.0 to 200.0 kgf/cm ² 2702 to 2845 psi	—
	Injection Pressure (2nd stage)	23.54 to 24.52 MPa 240.0 to 250.0 kgf/cm ² 3414 to 3556 psi	—
	Valve Seat Tightness	When the pressure is 16.67 MPa (170.0 kgf/cm ² , 2418 psi), the valve seat must be fuel tightness.	—

W10139730

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Nozzle holder clamp nut	18 to 20	1.8 to 2.1	13 to 15
Overflow pipe assembly retaining screw	9.8 to 11.2	1.0 to 1.15	7.24 to 8.31
Cylinder head cover screw	6.9 to 11.2	0.7 to 1.15	5.1 to 8.31
Injection pipe retaining nut	23 to 36	2.6 to 3.7	17 to 26
Oil switch taper screw	15 to 19	1.5 to 2.0	11 to 14
Injection pump unit mounting nut	18 to 20	1.8 to 2.1	13 to 15
Power steering delivery hose nut	23 to 27	2.3 to 2.8	17 to 20
Starter's B terminal mounting nut	9.8 to 11	1.0 to 1.2	7.3 to 8.6
Intake air heater terminal mounting nut	3.5 to 5.3	0.35 to 0.55	2.6 to 3.9
Oil cooler pipe retaining nut	49 to 68	5.0 to 7.0	37 to 50
Front frame mounting screw (M14, 9T, UBS)	167 to 196	17.0 to 20.0	123 to 144
Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Master cylinder hose and return hose retaining nut	23 to 27	2.3 to 2.8	17 to 20
Oil cooler return pipe nut	49 to 68	5.0 to 7.0	37 to 50
Delivery pipe retaining nut	49 to 68	5.0 to 7.0	37 to 50
Damper disc mounting screw	48 to 55	4.9 to 5.7	36 to 41
Thermo valve	30 to 39	3.0 to 4.0	22 to 28
Rocker arm bracket screw	49 to 55	5.0 to 5.7	36.2 to 41
*Cylinder head mounting screw	98.1 to 107	10.0 to 11.0	72.4 to 79.5
Timer gear mounting nut	74 to 83	7.5 to 8.5	55 to 61
Injection pump gear mounting nut	74 to 83	7.5 to 8.5	55 to 61
Governor housing mounting screw	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Anti-rotation nut	2.8 to 4.0	0.29 to 0.41	2.1 to 2.9
Injection pump mounting screw	24 to 27	2.4 to 2.8	18 to 20
Injection pump mounting nut	18 to 20	1.8 to 2.1	13 to 15
Fuel camshaft stopper mounting screw	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8
Governor weight mounting nut	63 to 72	6.4 to 7.4	47 to 53
*Crankshaft screw	255 to 274	26.0 to 28.0	188 to 202
Oil cooler joint screw	40 to 44	4.0 to 4.5	29 to 32
Gear case cover mounting screw (7T)	24 to 27	2.4 to 2.8	18 to 20
Gear case cover mounting screw (10T)	33 to 36	3.3 to 3.7	24 to 26
Relief valve retaining screw	69 to 78	7.0 to 8.0	51 to 57
Idle gear mounting screw	24 to 27	2.4 to 2.8	18 to 20
Camshaft set screw	24 to 27	2.4 to 2.8	18 to 20
Balancer shaft set screw	24 to 27	2.4 to 2.8	18 to 20

■ NOTE

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

Item	N·m	kgf·m	lbf·ft
Plate mounting screw	24 to 27	2.4 to 2.8	18 to 20
Oil pan mounting screw (Length : 165 mm (6.5 in.))	74 to 78	7.5 to 8.0	55 to 57
Oil pan mounting screw (Length : 25 mm (1.0 in.))	49 to 55	5.0 to 5.7	37 to 41
*Connecting rod screw	79 to 83	8.0 to 8.5	58 to 61
*Flywheel screw	98.1 to 107	10.0 to 11.0	73.4 to 79.5
Flywheel housing mounting screw (M14, USB)	167 to 196	17.0 to 20.0	123 to 144
Flywheel housing mounting screw (M12, 9T)	103 to 117	10.5 to 12.0	76.0 to 86.8
Crankcase 2 mounting screw	49 to 55	5.0 to 5.7	37 to 41
*Main bearing case screw	138 to 147	14.0 to 15.0	102 to 108
Oil pump cover screw	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8

■ **NOTE**

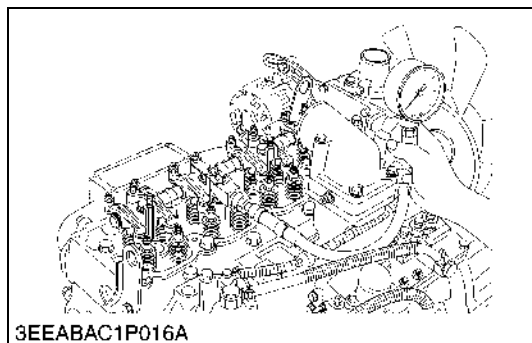
- For “*” marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

1. After warming up the engine, stop it and remove the air cleaner, the muffler, high pressure pipes, cylinder head cover, overflow pipe, all nozzle holders and all nozzle gaskets.
2. Install a compression tester (Code No: 07909-30207) and nozzle adaptor for diesel engines to nozzle holder hole.
3. After making sure that the speed lever is set at the stop position (Non-injection), run the engine at 200 to 300 min⁻¹ (rpm) with the starter.
4. Read the maximum pressure. Measure the pressure more than twice.

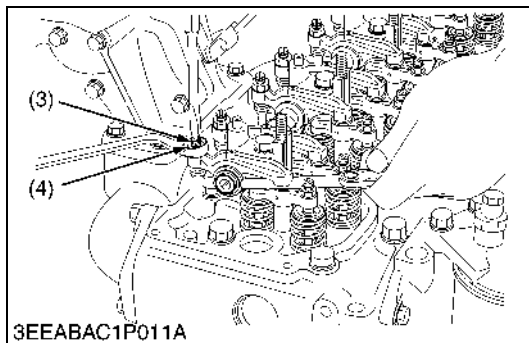
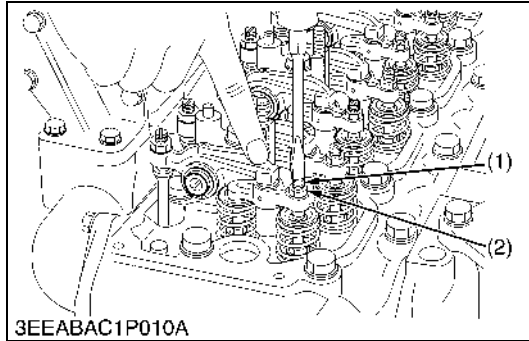
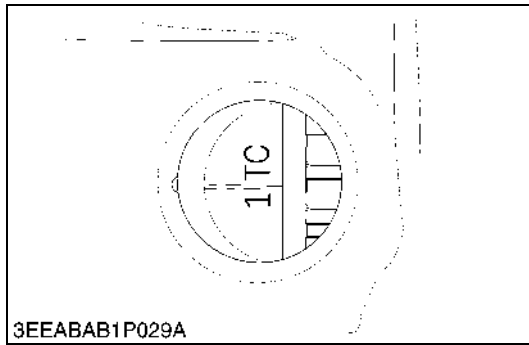
■ NOTE

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

Compression pressure	Factory spec.	3.47 MPa / 250 min ⁻¹ (rpm) 35.4 kgf/cm ² / 250 min ⁻¹ (rpm) 503 psi / 250 min ⁻¹ (rpm)
	Allowable limit	2.56 MPa / 250 min ⁻¹ (rpm) 26.1 kgf/cm ² / 250 min ⁻¹ (rpm) 371 psi / 250 min ⁻¹ (rpm)

Tightening torque	Nozzle holder clamp nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Overflow pipe assembly retaining screw	9.8 to 11.2 N·m 1.0 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Cylinder head cover screw	6.9 to 11.2 N·m 0.7 to 1.15 kgf·m 5.1 to 8.31 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

W1048776



Checking Valve Clearance

■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.
- Remove the high pressure pipes and the head cover.
 - 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.
 - Before adjusting the valve clearance, adjust the bridge evenly to the valve stem.
 - Loosen the lock nut (2) and adjust with screw (1).
 - Slightly push the rocker arm 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.
 - 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.

Valve clearance	Factory spec.	0.23 to 0.27 mm 0.0091 to 0.010 in.

■ NOTE

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

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

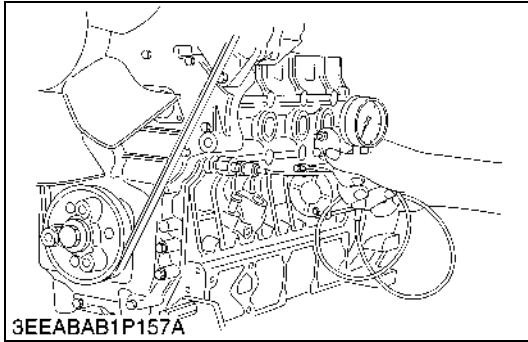
Tightening torque	Cylinder head cover screw	6.9 to 11.2 N·m 0.7 to 1.15 kgf·m 5.1 to 8.31 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

- (1) Adjusting Screw
(2) Lock Nut

- (3) Adjusting Screw
(4) Lock Nut

W1047000

(2) Lubricating System



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 clogged
 - Oil gallery clogged
 - Excessive oil clearance
 - Foreign matter in the relief valve

(When reassembling)

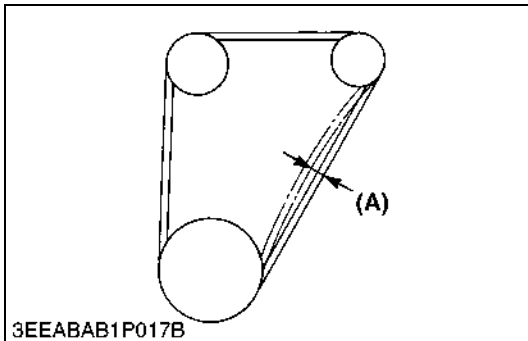
- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

Engine oil pressure	At idle speed	Allowable limit	50 kPa 0.5 kgf/cm ² 7 psi
	At rated speed	Factory spec.	200 to 390 kPa 2.0 to 4.0 kgf/cm ² 29 to 56 psi
		Allowable limit	150 kPa 1.5 kgf/cm ² 21 psi

Tightening torque	Oil switch taper screw	15 to 19 N·m 1.5 to 2.0 kgf·m 11 to 14 lbf·ft

W10349520

(3) Cooling System



Fan Belt Tension

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

Deflection (A)	Factory spec.	10 to 12 mm 0.40 to 0.47 in.

(A) Deflection

W1021011



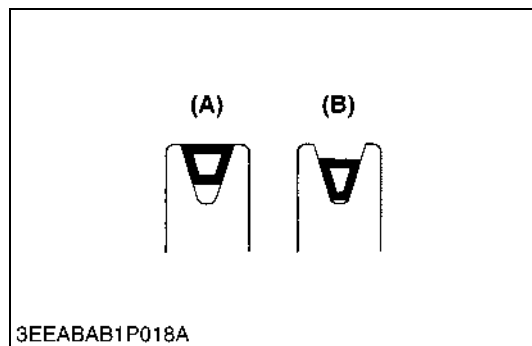
Fan Belt Damage and Wear

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

(A) Good

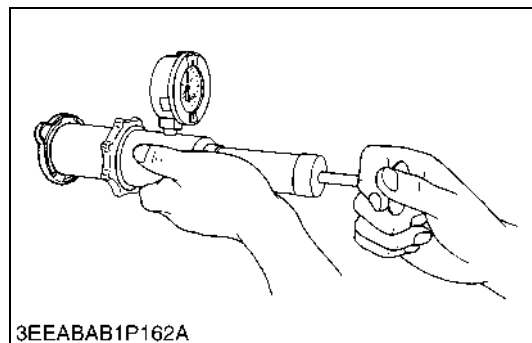
(B) Bad

W1021108



CAUTION

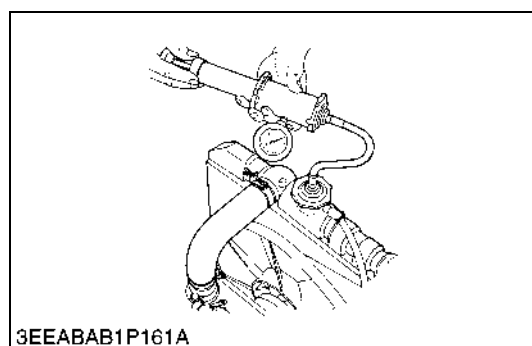
- When removing the radiator cap, wait at least ten minutes after the engine has stopped and cooled down. Otherwise, hot water may gush out, scalding nearby people.



Radiator Cap Air Leakage

1. Set a radiator tester on the radiator cap.
2. Set a radiator tester.
Apply the specified pressure of 88 kPa (0.9 kgf/cm², 13 psi).
3. Check if the pressure drop to less than 59 kPa (0.6 kgf/cm², 9 psi) in 10 seconds.
4. If the pressure is less than the factory specification, replace it.

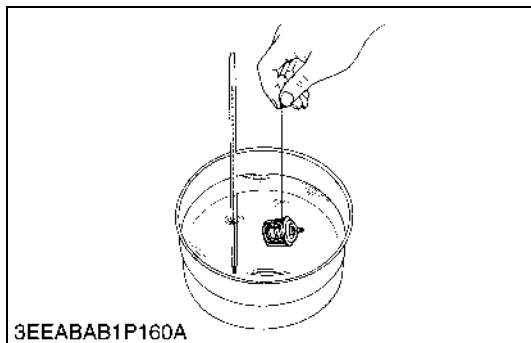
W1021320



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/cm², 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

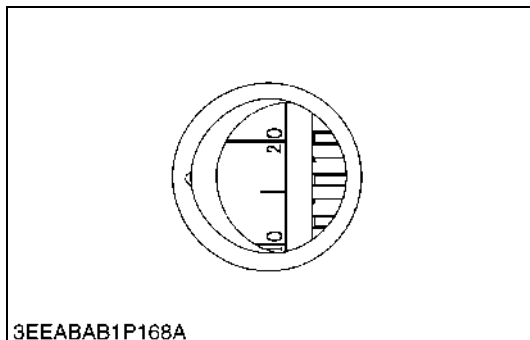
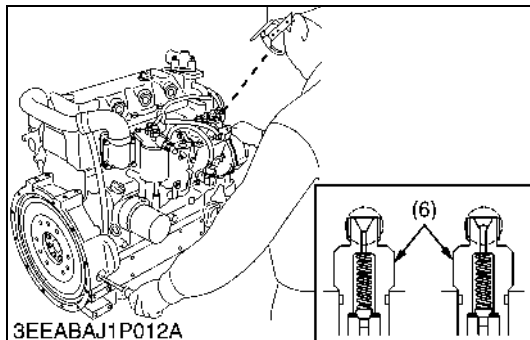
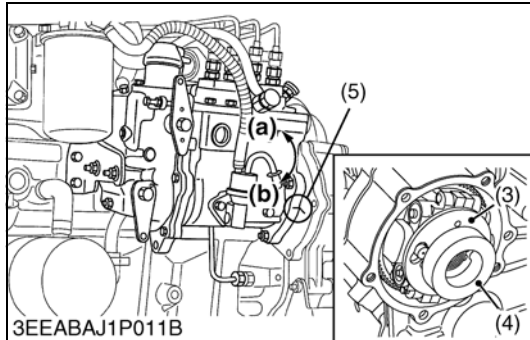
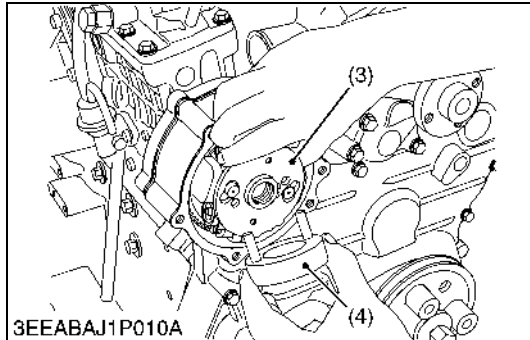
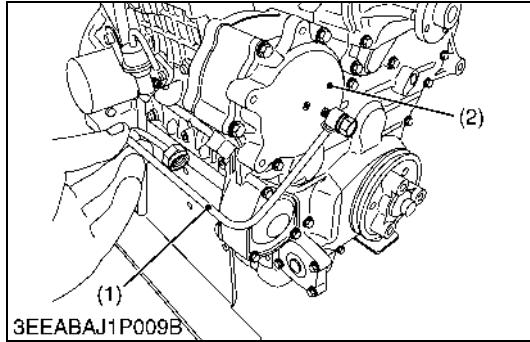
**Thermostat Valve Opening Temperature**

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

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

W1071639

(4) Fuel System



Injection Timing

1. Remove the timer gear lubricating pipe (1).
2. Remove the gear case cover (2).
3. Set the timer 0° restoring jig (4) to the timer gear (3).
4. Make sure of matching the injection timing align mark (5) of the injection pump unit and the plate (gearcase), as shown in the illustration.
5. Remove the injection pipes.
6. Remove the stop solenoid.
7. Turn the flywheel counterclockwise (viewed from flywheel side) until the fuel fills up to the hole of the delivery valve holder (6) for No.1 cylinder.
8. After the fuel fills up to the hole of the delivery valve holder for No.1 cylinder, turn back (clockwise) the flywheel around 1.6 rad (90°).
9. Turn the flywheel counterclockwise to set at around 0.35 rad (20°) before T.D.C..
10. Slowly turn the flywheel counterclockwise and stop turning when the fuel begins to come up, to get the present injection timing.
11. Check to see the degree on flywheel.
The flywheel has mark "1TC", "10" and "20" for the crank angle before the top dead center of No.1 piston.
12. If the injection timing is not within the specification, rotate the injection pump unit to adjust the injection timing.

■ IMPORTANT

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

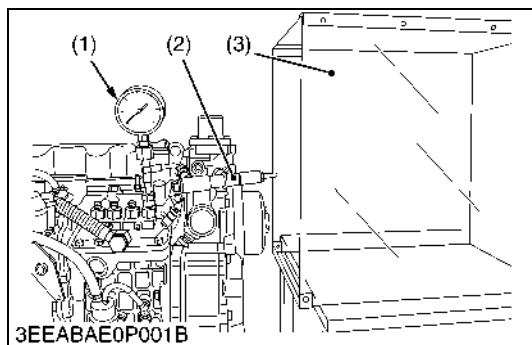
Injection timing	Factory spec.	V3800DI-T-E3	0.0917 to 0.117 rad (5.25° to 6.75°) before T.D.C.

Tightening torque	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft
	Injection pump unit mounting nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

- (1) Timer Gear Lubricating Pipe
 (2) Gear Case Cover
 (3) Timer Gear
 (4) Timer 0° Restoring Jig
 (5) Injection Timing Align Mark
 (6) Delivery Valve Holder

- (a) Injection Timing Advanced
 (b) Injection Timing Retarded

W1225920



Fuel Tightness of Pump Element

1. Remove the engine stop solenoid.
2. Remove the injection pipes.
3. Install the injection pump pressure tester (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1). (Refer to the figure.)
5. Set the speed control lever to the maximum speed position.
6. Run the starter to increase the pressure.
7. If the pressure can not reach the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

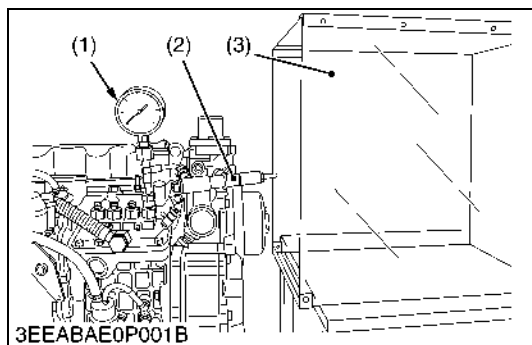
Fuel tightness of pump element	Allowable limit	18.63 MPa 190.0 kgf/cm ² 2702 psi

NOTE

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

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

W1017430



Fuel Tightness of Delivery Valve

1. Remove the engine stop solenoid.
2. Remove the injection pipes.
3. Set a pressure tester (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the fuel injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1).
5. Run the starter to increase the pressure.
6. Stop the starter when the fuel jets from the injection nozzle. After that, turn the flywheel by the hand and raise the pressure to approx. 18.63 MPa (190 kgf/cm², 2702 psi).
7. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 18.63 to 17.65 MPa (from 190 to 180 kgf/cm², from 2702 to 2560 psi).
8. Measure the time needed to decrease the pressure from 18.63 to 17.65 MPa (from 190 to 180 kgf/cm², from 2702 to 2560 psi).
9. If the measurement is less than allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Fuel tightness of delivery valve	Factory spec.	10 seconds 18.63 → 17.65 MPa 190.0 → 180.0 kgf/cm ² 2702 → 2560 psi
	Allowable limit	5 seconds 18.63 → 17.65 MPa 190.0 → 180.0 kgf/cm ² 2702 → 2560 psi

NOTE

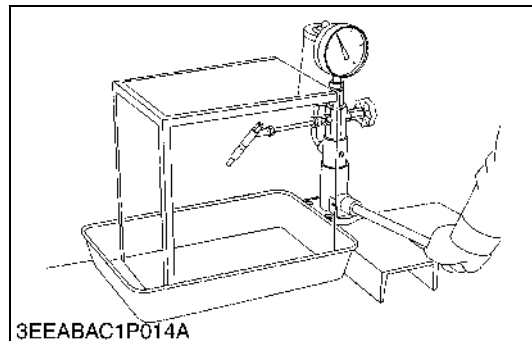
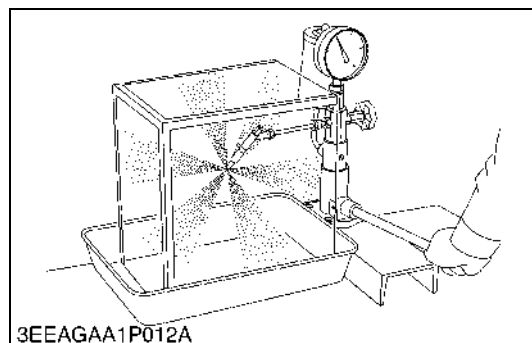
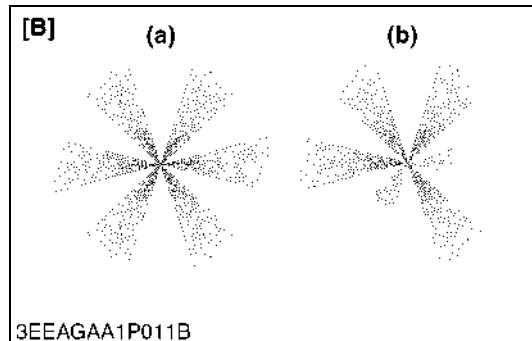
- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

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

W1017786

**CAUTION**

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

**Nozzle Spraying Condition**

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

(a) Good

(b) Bad

W10371670

Checking Nozzle 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 injection nozzle assembly or repair at Denso service shop.

NOTE

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

Injection pressure	Factory spec.	1st stage	18.63 to 19.61 MPa 190.0 to 200.0 kgf/cm ² 2702 to 2845 psi

W1037280

Valve Seat Tightness

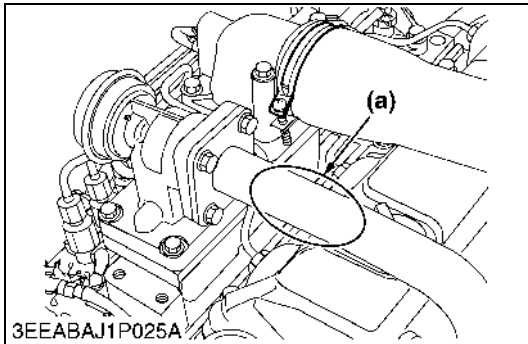
1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 16.67 MPa (170 kgf/cm², 2418 psi) for 10 seconds.
3. If any fuel leak is found, replace the injection nozzle assembly or repair at Denso service shop.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa 170.0 kgf/cm ² 2418 psi

W10374150

(5) EGR System

(A) Checking the function of EGR system

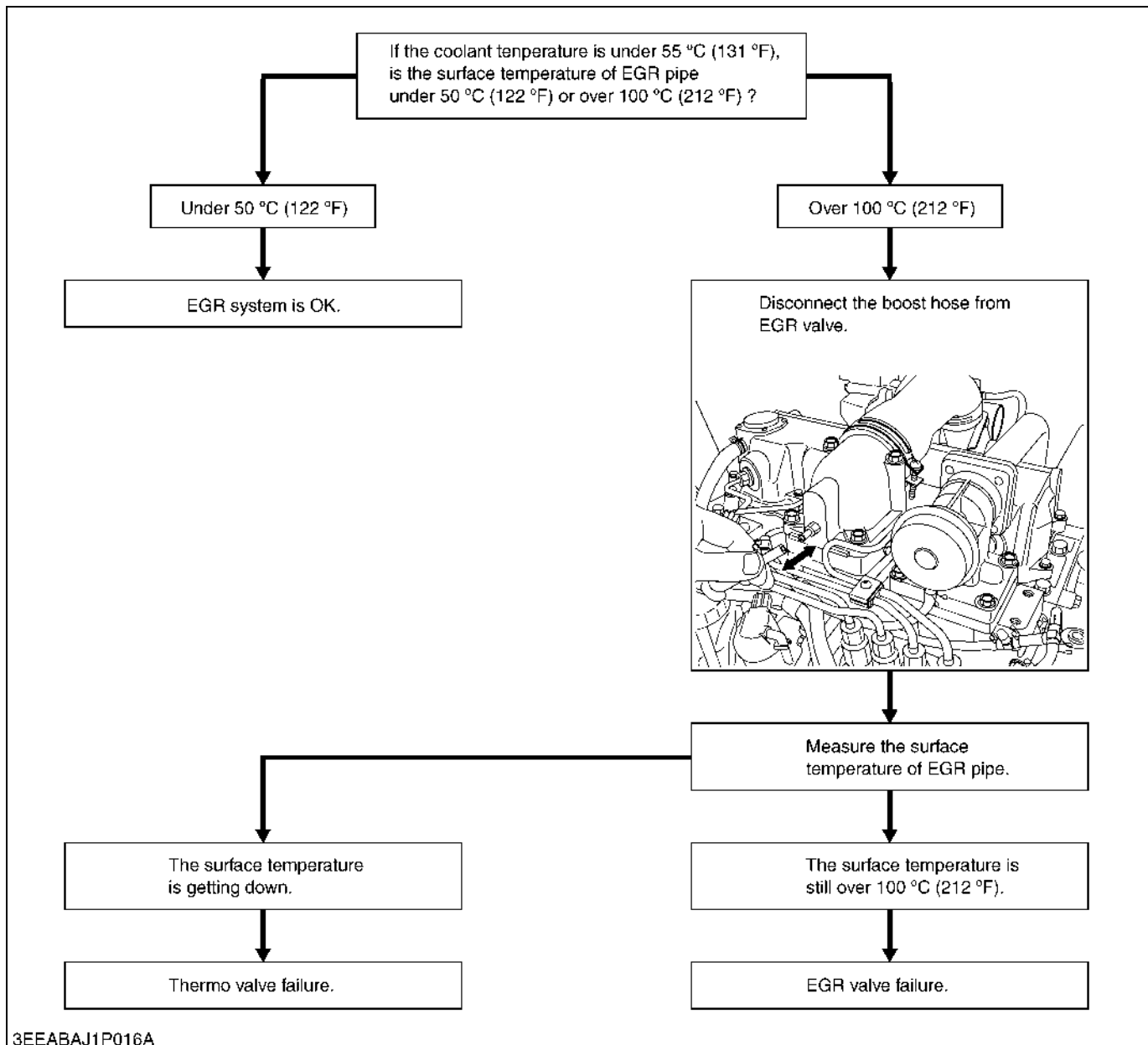


1. Check the coolant temperature and monitor the coolant temperature while checking 1) and 2).
2. If the coolant temperature is already 55 °C (131 °F), cool down the engine.
3. Start the engine and go to check 1) immediately.
4. After completing checking 1), arrange the coolant temperature is getting over 70 °C (158 °F).
5. If the coolant temperature is over 70 °C (158 °F), go to check 2).

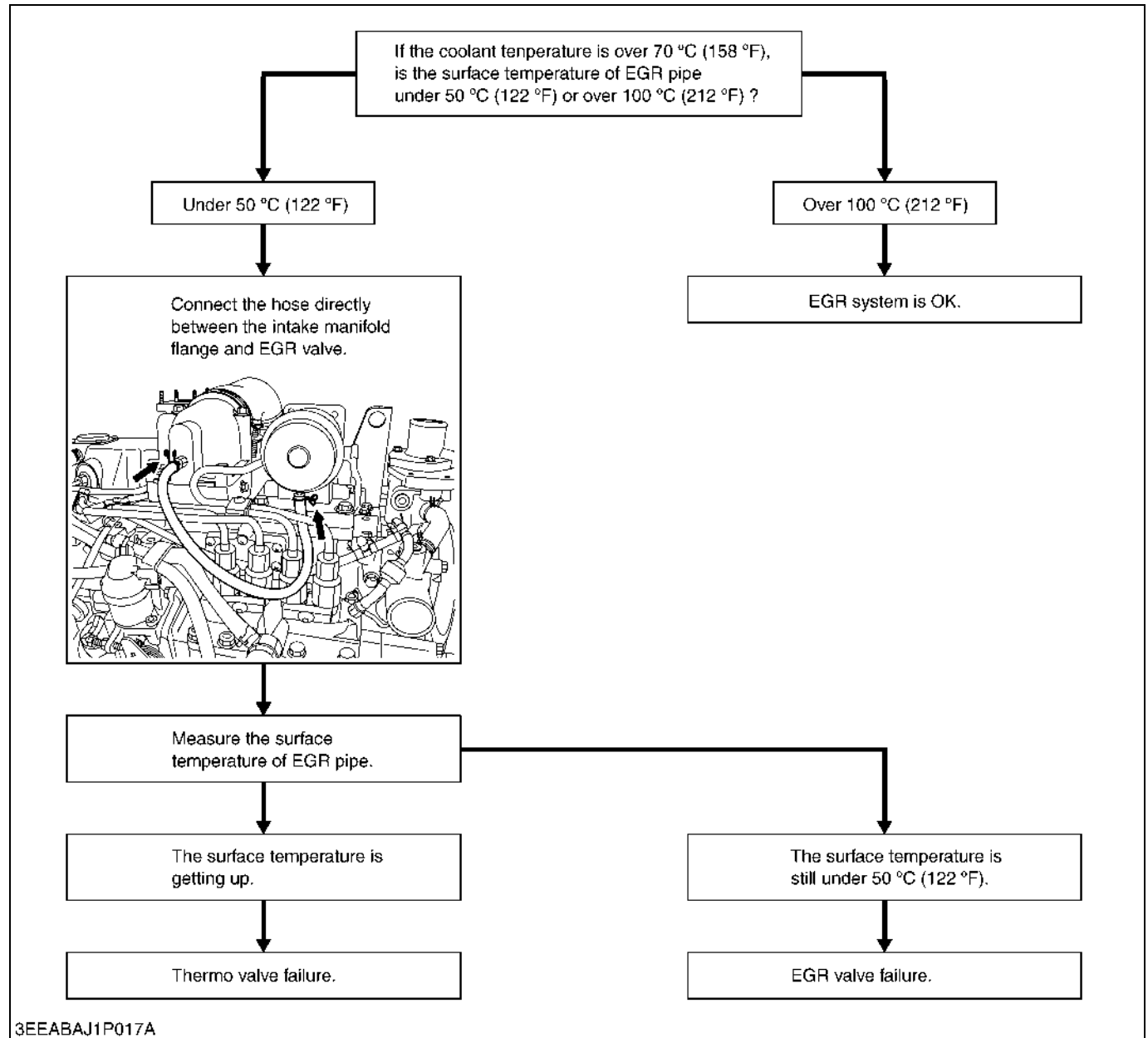
(a) Measuring Place of EGR Pipe
Surface Temperature

W1177055

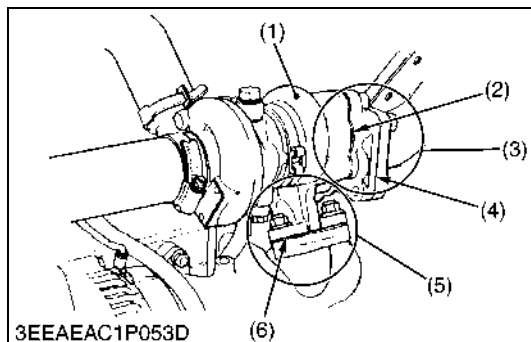
1) If the coolant temperature is under 55 °C (131 °F), the surface temperature of EGR pipe must be under 50 °C (122 °F).



2) If the coolant temperature is over 70 °C (158 °F), the surface temperature of EGR pipe must be over 100 °C (212 °F).



(6) Turbocharger

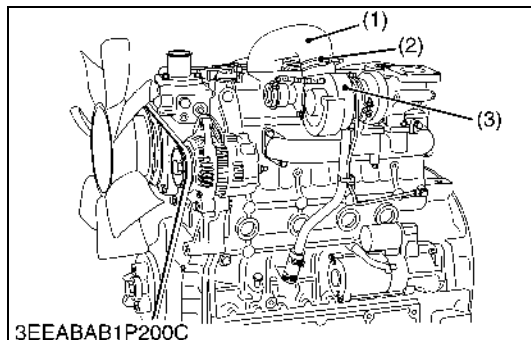


Turbine Side

1. Check the exhaust port (3) and inlet port (5) 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 (2) / (4) / (6) with new one.

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

W1076917

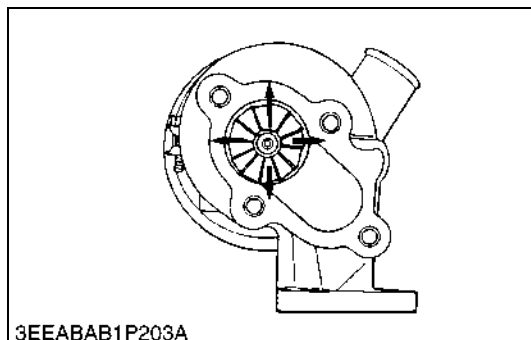


Compressor Side

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

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

W1077032



Radial Clearance

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

W1077353

[2] PREPARATION

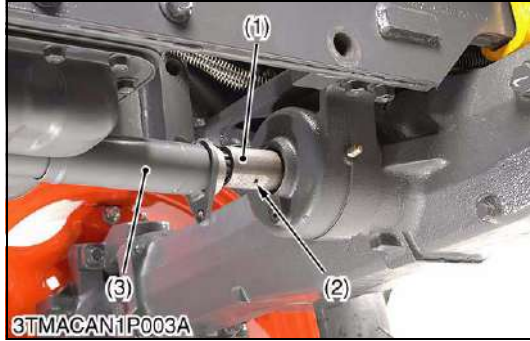
(1) Lubricant and Coolant

Draining Coolant and Engine Oil

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

W1051987

(2) 4WD Propeller Shaft and Power Steering Hose



Propeller Shaft

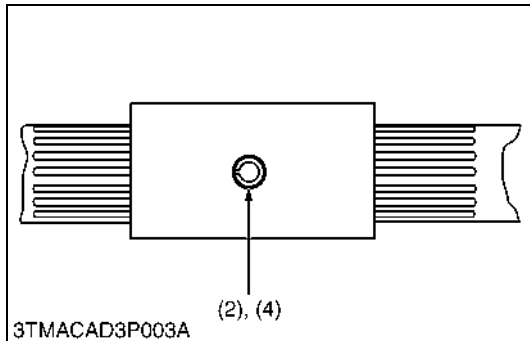
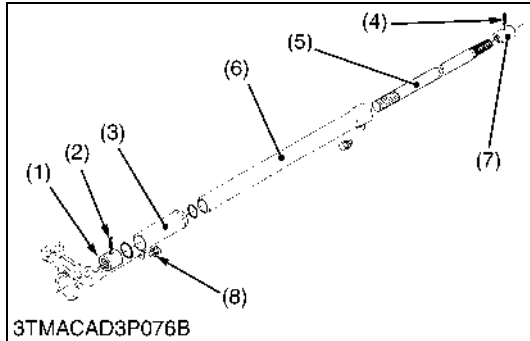
1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

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

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

W1027651



Power Steering Hose

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

(When reassembling)

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

Tightening torque	Power steering delivery hose nut	23 to 27 N·m
		2.3 to 2.8 kgf·m
		17 to 20 lbf·ft

(1) Power Steering Cylinder

(2) Power Steering Delivery Hose

W1055595



Front Axle Support as a Unit

1. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOL" at "G. GENERAL" section) to the front axle bracket.

(1) Front Axle Rocking Restrictor

W1063409

[3] SEPARATING ENGINE (ROPS MODEL)

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



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connectors (2) for head lights.
3. Disconnect the damper (3).
4. Remove the bonnet (1).

■ IMPORTANT

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

(1) Bonnet

(3) Damper

(2) Connector

W1052591



Cover, Power Steering Hose and Wire Harness for L.H. Side

1. Remove the side cover (1) both side.
2. Remove the power steering hose bands (2).
3. Disconnect the wire harness (6) from starter (5), alternator (4), water temperature switch (3) and engine oil pressure switch (7).

(When reassembling)

Tightening torque	Starter's B terminal mounting nut	9.8 to 11 N·m 1.0 to 1.2 kgf·m 7.3 to 8.6 lbf·ft

■ NOTE

- There are three bands for power steering hose. Hose band under the radiator is not in photo.

(1) Side Cover

(5) Starter Motor

(2) Power Steering Hose Band

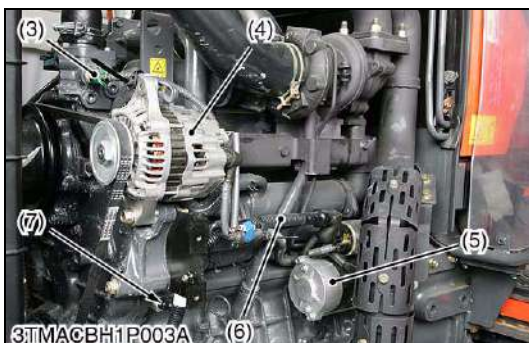
(6) Wire Harness

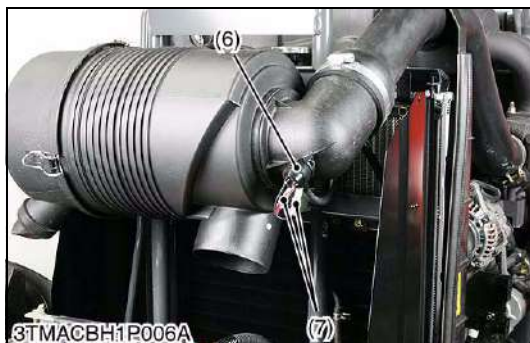
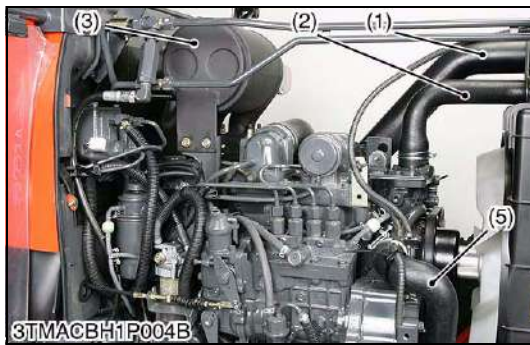
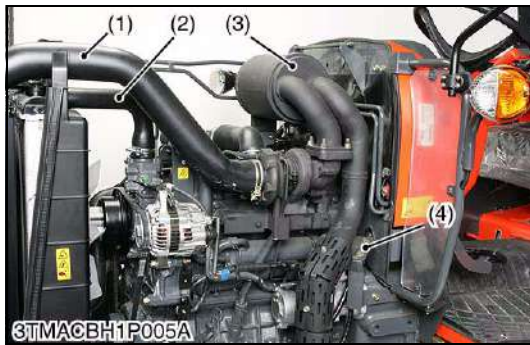
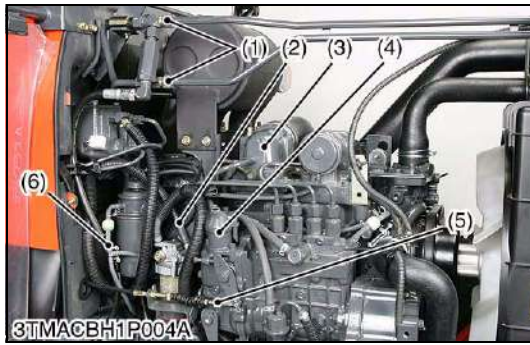
(3) Water Temperature Switch

(7) Engine Oil Pressure Switch

(4) Alternator

W1056614





Cover, Oil Cooler Pipe, Fuel Hoses, Accelerator Wire and Wire Harness for R.H. Side

1. Disconnect the fuel hose (2) from separator and fuel overflow hose (6).
2. Disconnect the oil cooler pipe retaining nut (3).
3. Disconnect the wire harness from air heater (3), engine stop solenoid (4) and engine speed sensor (7).
4. Disconnect the accelerator wire (5).

(When reassembling)

- Be sure to assemble the accelerator wire cover.

Tightening torque	Oil cooler pipe retaining nut	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft
	Intake air heater terminal mounting nut	3.5 to 5.3 N·m 0.35 to 0.55 kgf·m 2.6 to 3.9 lbf·ft

(1) Oil Cooler Pipe Retaining Nut	(5) Accelerator Wire
(2) Fuel Hose	(6) Overflow Hose
(3) Air Heater	(7) Engine Speed Sensor
(4) Engine Stop Solenoid	

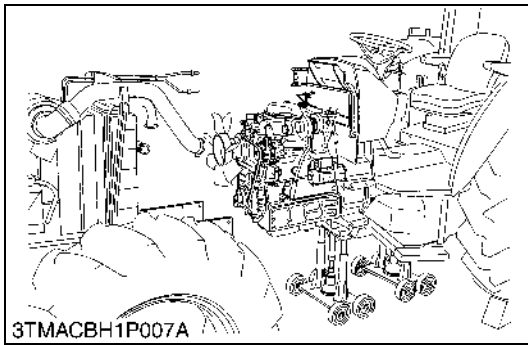
W1058342

Muffler, Radiator Hose and Air Cleaner Hose

1. Remove the muffler pipe stay (4) and remove the muffler (3) with muffler pipe.
2. Disconnect the air cleaner hose (1).
3. Disconnect the radiator upper hose (2) and lower hose (5).
4. Disconnect the **1P** connectors (7) from the air cleaner switch.

(1) Air Cleaner Hose	(5) Radiator Lower Hose
(2) Radiator Upper Hose	(6) Air Cleaner Switch
(3) Muffler	(7) 1P Connector
(4) Muffler Stay	

W1020518



Front Axle Support as a Unit

1. Make sure the clutch housing case and front frame are securely mounted on the disassembling stands.
2. Remove the front frame mounting screws and separate the front axle as a unit from the engine.

(When reassembling)

Tightening torque	Front frame mounting screw (M14, 9T, UBS)	167 to 196. N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft

- (1) Front Axle Rocking Restrictor

W1021090

(2) Removing Engine from Tractor

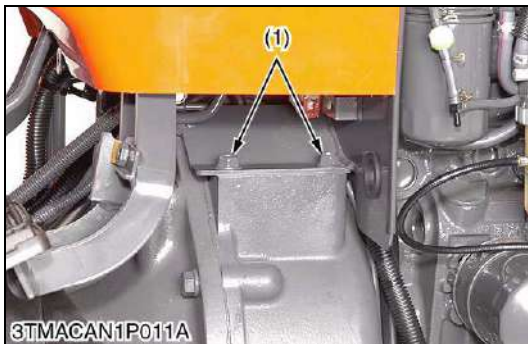


Steering Support Under Cover

1. Remove the steering support under cover (1).

- (1) Steering Support Under Cover

W1062013

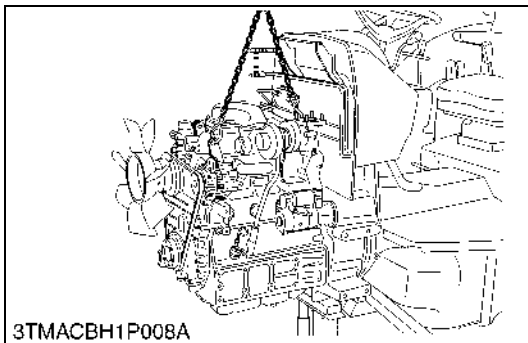


Steering Support Screw

1. Unscrew the steering support screws (1) both on sides.

- (1) Steering Support Screw

W1061160



Separating Engine from Clutch Housing

1. Hoist the engine using 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 (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft

W1063840

[4] SEPARATING ENGINE (CABIN MODEL)

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



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connector (3) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1).
5. Remove the both side covers (2).

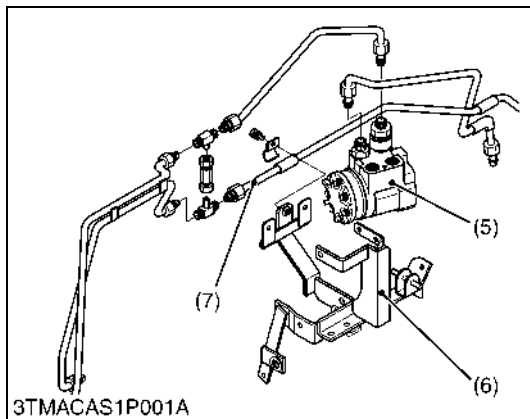
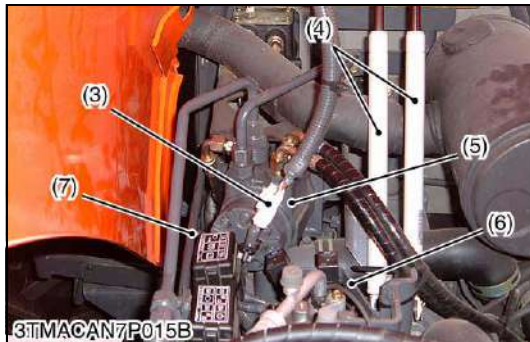
(When reassembling)

- The connector (3) should be placed within the space of controller pipe (7), power steering controller (5) and stay (6).

■ **IMPORTANT**

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

(1) Bonnet	(5) Power Steering Controller
(2) Side Cover	(6) Stay
(3) Connector	(7) Controller Pipe
(4) Damper	



W1095434



Muffler Pipe

1. Remove the muffler pipe (1).

(1) Muffler Pipe

W1095571

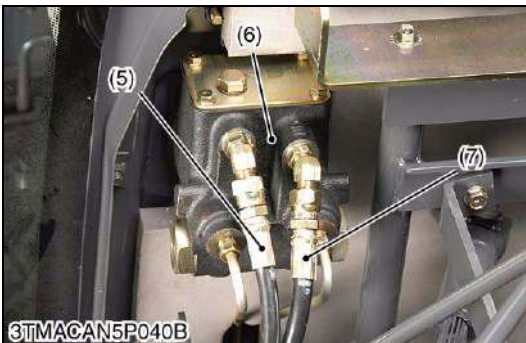


Hydraulic Pipes, Hoses and Heater Hoses

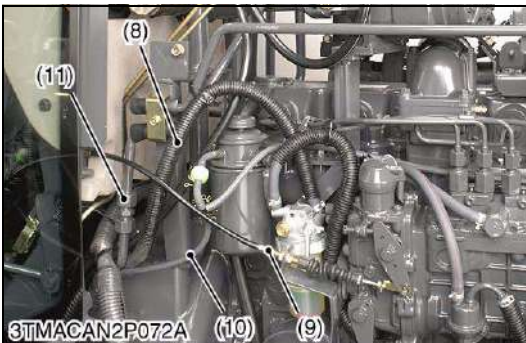
1. Disconnect the power steering delivery hose 1 (3) and 2 (1) from controller (4).
2. Disconnect the master cylinder hose (7) and master cylinder return hose (5) from the brake master cylinder (6).
3. Remove the accelerator wire (9).
4. Remove the fuel hose (8) and fuel return hose (10).
5. Disconnect the oil cooler return pipe retaining nut (11).

(When reassembling)

- Be sure to assemble the power steering delivery hose to original position. (The power steering hose with blue tape (2) fix to rear joint.)

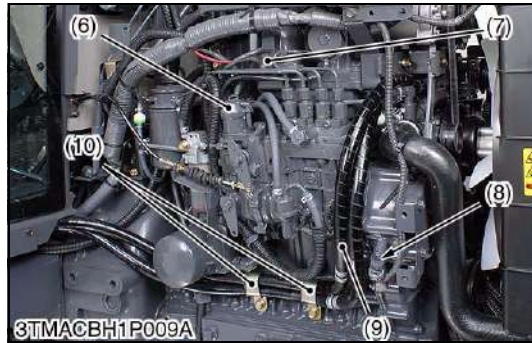
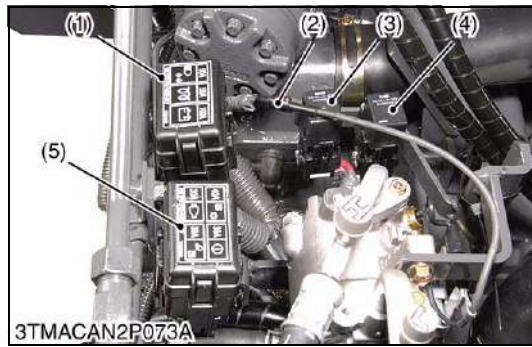


Tightening torque	Power steering delivery hose 1 and 2 retaining nut	23 to 27 N·m 2.3 to 2.8 kgf·m 17 to 20 lbf·ft
	Master cylinder hose and return hose retaining nut	23 to 27 N·m 2.3 to 2.8 kgf·m 17 to 20 lbf·ft
	Oil cooler return pipe retaining nut	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft



(1) Power Steering Delivery Hose 2	(7) Master Cylinder Hose
(2) Blue Tape	(8) Fuel Hose
(3) Power Steering Delivery Hose 1	(9) Accelerator Wire
(4) Controller	(10) Fuel Hose (Return)
(5) Master Cylinder Return Hose	(11) Oil Cooler Return Pipe Retaining Nut
(6) Brake Master Cylinder	

W1095987



Wire Harness, Heater Hoses and Tool Box

1. Remove the fuse box (1) and (5) from stay.
2. Remove the relay (3) and (4) from stay.
3. Disconnect the compressor switch **1P** connector (2).
4. Remove the **3P** connector from stop solenoid (6) and remove the connector from engine speed sensor (8).
5. Remove the clamps (10) and disconnect the heater hoses (9) and drain the coolant.
6. Disconnect the terminal from air heater (7).
7. Remove the intake hose (11) from turbocharger.
8. Disconnect the harness from water temperature sensor (12), alternator (13), starter (14) and engine oil pressure switch (15).

(When reassembling)

- Assemble the heater hoses as align the both white mark.

(1) Fuse Box (Slow Blow)	(9) Heater Hose
(2) 1P Connector	(10) Clamp
(3) Relay	(11) Intake Hose
(4) Relay	(12) Water Temperature Sensor
(5) Fuse Box	(13) Alternator
(6) Stop Solenoid	(14) Starter
(7) Air Heater	(15) Engine Oil Pressure Switch
(8) Engine Speed Sensor	(16) Tool Box

W1096401

Hydraulic Pipe and U-joint

1. Disconnect the delivery pipe retaining nut (3).
2. Remove the U-joint retaining screw (1) and slide out the U-joint (2).

(When reassembling)

Tightening torque	Delivery pipe retaining nut	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft

(1) U-joint Retaining Screw	(3) Delivery Pipe Retaining Nut
(2) U-joint	

W1096819



Compressor, Condenser and Receiver Drier

1. Remove the air intake hose.
2. Remove the air conditioner belt.
3. Remove the compressor with stay, condenser and receiver drier without removing the air conditioner hoses.

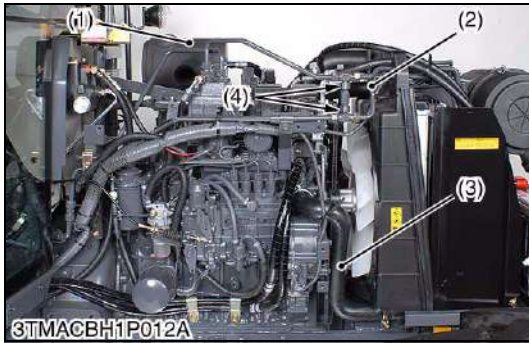
(When reassembling)

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

■ NOTE

- **Without discharging the refrigerant from system (refer to “6. [2] DISASSEMBLING AND ASSEMBLING” at “10. CABIN” section).**
- **With discharging the refrigerant from system (refer to “5. [2] DISCHARGING, EVACUATING AND CHARGING” at “10. CABIN” section).**

W1098475



Muffler, Radiator Hoses and Oil Cooler Pipe

1. Remove the muffler (1).
2. Disconnect the radiator upper hose (2) and lower hose (3).
3. Disconnect the oil cooler pipe retaining nut (4)

(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft

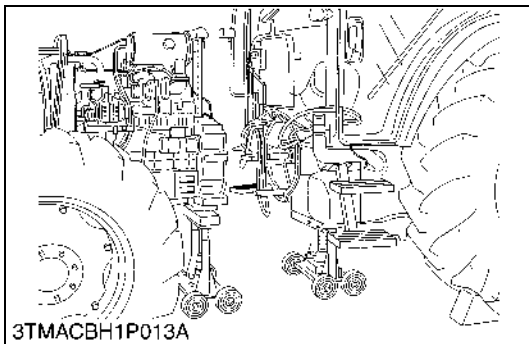
(1) Muffler

(3) Radiator Lower Hose

(2) Radiator Upper Hose

(4) Oil Cooler Pipe Retaining Nut

W1097714



Front Axle Support as a Unit

1. Make sure the clutch housing case and front frame are securely mounted on the disassembling stands.
2. Remove the front frame mounting screws and separate the front axle as a unit from the engine.

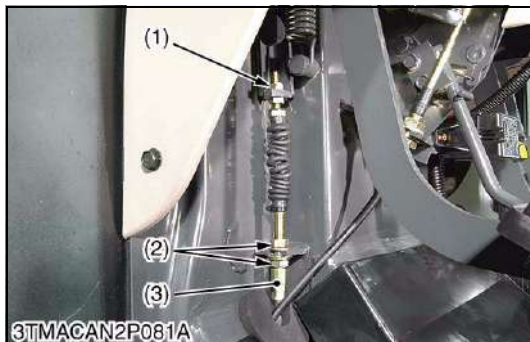
(When reassembling)

Tightening torque	Front frame mounting screw (M14, 9T, UBS)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft

(1) Front Axle Rocking Restrictor

W1097852

(2) Separating Engine



Fuel Filling Port, Floor Mat and Floor Cover

1. Remove the fuel filling port (1) mounting screw.
2. Remove the floor mat 1 (2) and 2 (3).
3. Remove the floor cover (4).

(1) Fuel Filling Port
(2) Floor Mat 1

(3) Floor Mat 2
(4) Floor Cover

W1098638

Clutch Wire Cable

1. Remove the clutch wire cable nut (1).
2. Loosen the cable retaining nut (2).
3. Remove the clutch wire cable (3) and draw out the cable to outside of cabin.

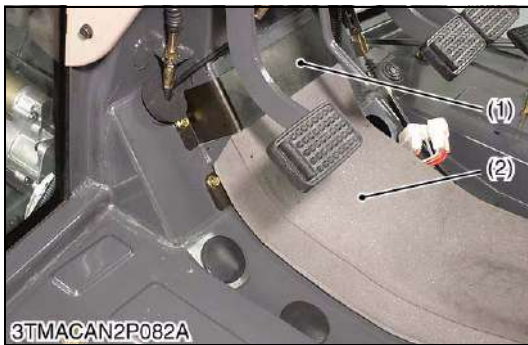
(When reassembling)

- Adjust the clutch pedal free travel after assembling (refer to "4. CHECKING AND ADJUSTING" at "2. CLUTCH" section).

(1) Clutch Wire Cable Nut
(2) Cable Retaining Nut

(3) Clutch Wire Cable

W1099130

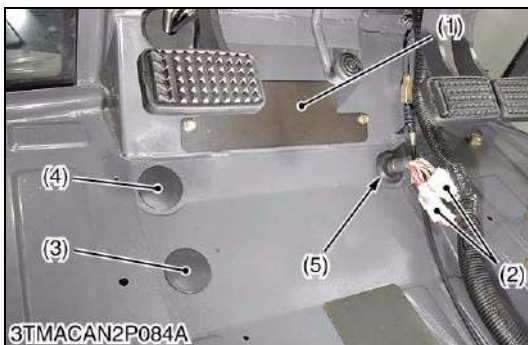
**Duct**

1. Remove the duct retainer (1).
2. Remove the seat under cover 2 (3) and remove the duct mounting screw (4).
3. Remove the duct (2).

(1) Duct Retainer
(2) Duct

(3) Seat Under Cover 2
(4) Duct Mounting Screw

W1099469

**Cover Plate and Rubber Plugs**

1. Remove the cover plate (1).
2. Remove the rubber plug (3) and (4).
3. Disconnect the connectors (2) and draw out the rubber plug (5) with harness to outside of cabin.

(1) Cover Plate
(2) Connector
(3) Rubber Plug

(4) Rubber Plug
(5) Rubber Plug

W1099659

(3) Separating Engine from Clutch Housing Case**Separating Engine from Clutch Housing**

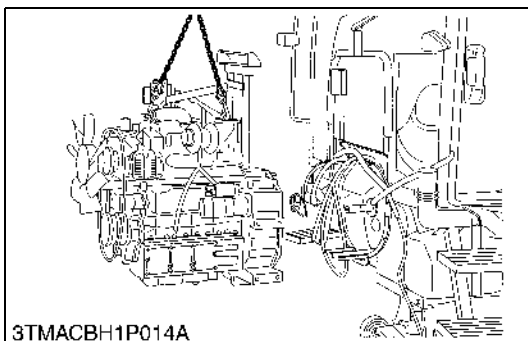
1. Hoist the engine using the hoist and chain.
2. Remove the engine mounting screws and nut, and separate the engine from the clutch housing.

(When reassembling)

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

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

W1101378



[5] REMOVING EXTERNAL COMPONENTS

(1) Damper Disc



Damper Disc (Hydraulic Shuttle Model)

1. Remove the damper disc (1).

(When reassembling)

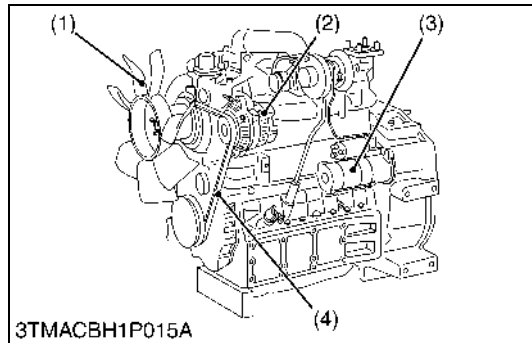
- Direct the shorter end of the damper disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the spline.

Tightening torque	Damper disc mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

(1) Damper Disc

W1099731

(2) External Parts



Fan, Starter and Alternator (ROPS Model)

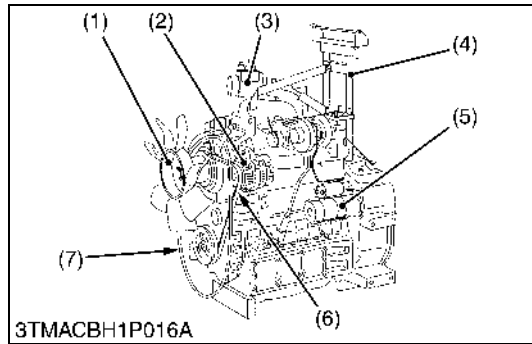
1. Remove the fan (1) and fan belt (4).
2. Remove the alternator (2).
3. Remove the starter (3).

(When reassembling)

- Adjust the fan belt tension refer to "[1] CHECKING AND ADJUSTING" in this section.

(1) Fan	(3) Starter
(2) Alternator	(4) Fan Belt

W1028793



Fan, Starter, Alternator and Power Steering Controller (CABIN Model)

1. Remove the air conditioner drive belt (7).
2. Remove the fan (1) and fan belt (6).
3. Remove the alternator (2) and starter (5).
4. Remove the power steering controller (3).
5. Remove the bonnet stay (4).

(When reassembling)

- Adjust the fan belt tension refer to "[1] CHECKING AND ADJUSTING" in this section.
- Adjust the air conditioner drive belt tension refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.

(1) Fan	(5) Starter
(2) Alternator	(6) Fan Belt
(3) Power Steering Controller	(7) Air Conditioner Drive Belt
(4) Bonnet Stay	

W1077327

(3) Turbocharger

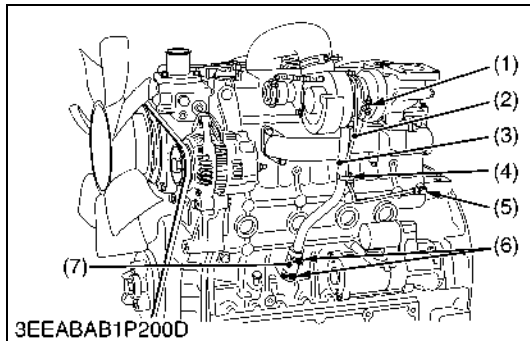


CAUTION

- 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 in position.



Oil Pipe

1. Remove the cover (8).
2. Remove the joint bolt (5) and clamp (4) and take off the pipe 1 (2).
3. Remove the bolts (1) and release the clamp (6).
4. Disconnect the oil pipe 2 (7) and pipe 4 (3).

(When reassembling)

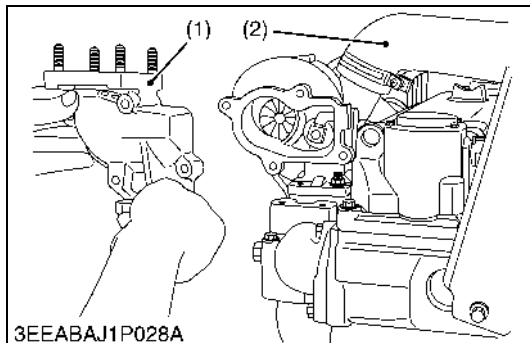
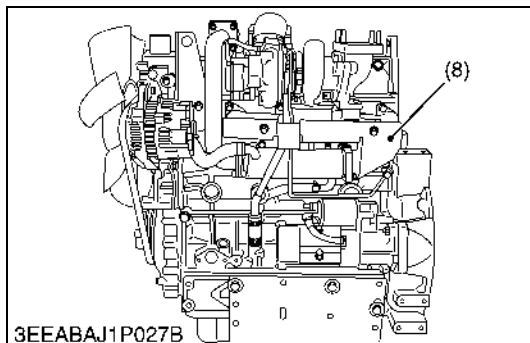
- Pour fresh engine oil through the oil filler port of the turbocharger.
- Replace the gasket with new one.
- Be careful not to allow dust, dirt and other foreign matters in the oil pipes.

NOTE

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

(1) Bolt	(5) Joint Bolt
(2) Oil Pipe 1	(6) Clamp
(3) Oil Pipe 4	(7) Oil Pipe 2
(4) Clamp	(8) Cover

W1025983



Turbocharger

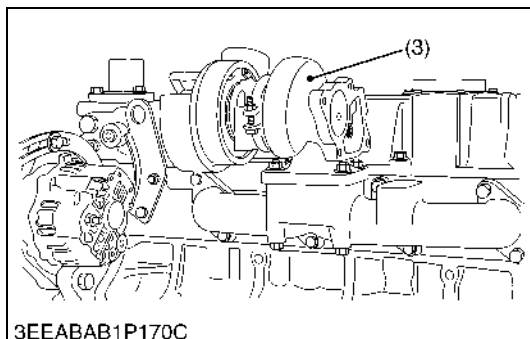
1. Remove the turbocharger flange (1).
2. Remove the inlet hose (2).
3. Remove the turbocharger assembly (3).

(When reassembling)

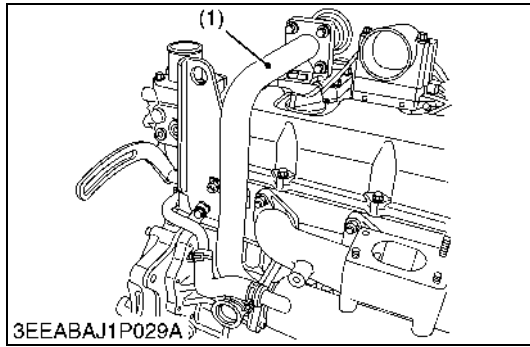
- Replace the gasket with new one.

(1) Turbocharger Flange	(3) Turbocharger Assembly
(2) Inlet Hose	

W1078106



(4) Exhaust Gas Recirculation (EGR)



EGR Pipe

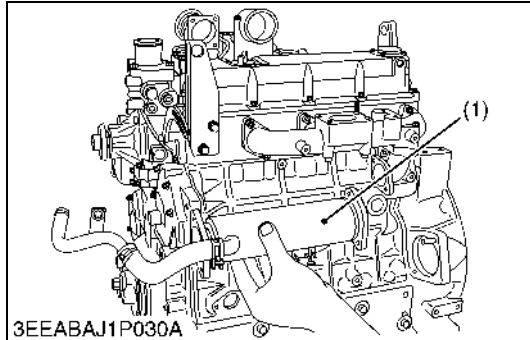
1. Remove the EGR pipe (1).

(When reassembling)

- Replace the gaskets with new ones.

(1) EGR Pipe

W1184151



EGR Cooler

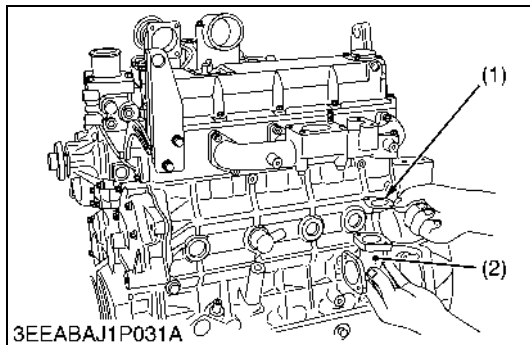
1. Remove the EGR cooler (1).

(When reassembling)

- Replace the gaskets with new ones.

(1) EGR Cooler

W1185665



EGR Cooler Flange

1. Remove the EGR cooler flange (2).

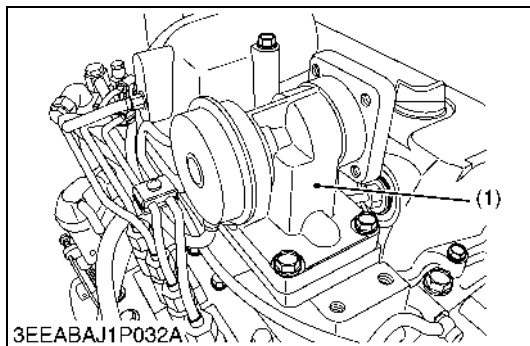
(When reassembling)

- Replace the gaskets with new ones.

(1) Gasket

(2) EGR Cooler Flange

W1187006



EGR Valve

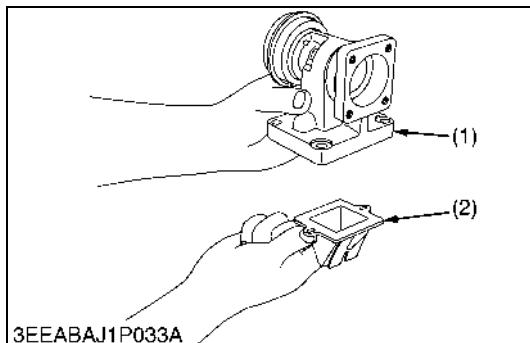
1. Remove the EGR valve (1).

(When reassembling)

- Replace the gaskets with new ones.

(1) EGR Valve

W1188318



Reed Valve

1. Remove the reed valve (2) from the EGR valve (1).

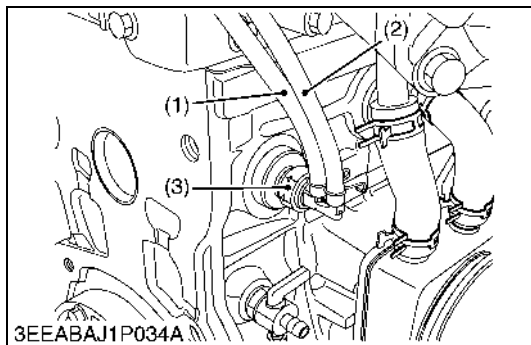
(When reassembling)

- Replace the gasket with new ones.

(1) EGR Valve

(2) Reed Valve

W1188708

**Thermo Valve (If necessary)**

1. Disconnect hoses (1), (2).
2. Remove the thermo valve (3).

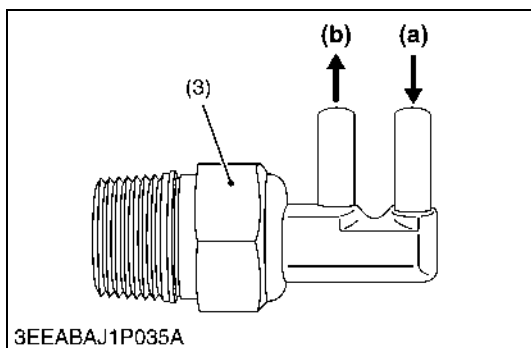
NOTE

- If you drop the thermo valve (3), replace the thermo valve (3) with new one.

(When reassembling)

- Securely connect the hoses (1), (2).

Tightening torque	Thermo valve	30 to 39 N·m 3.0 to 4.0 kgf·m 22 to 28 lbf·ft



(1) Hose to EGR Valve

(2) Hose from Intake Manifold Flange

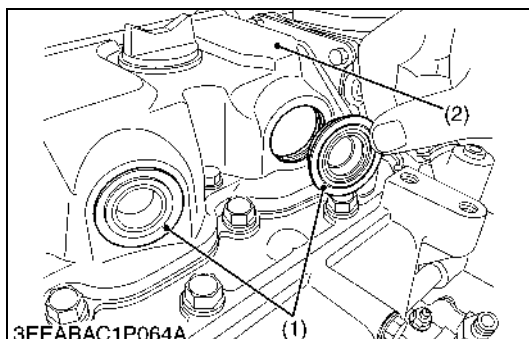
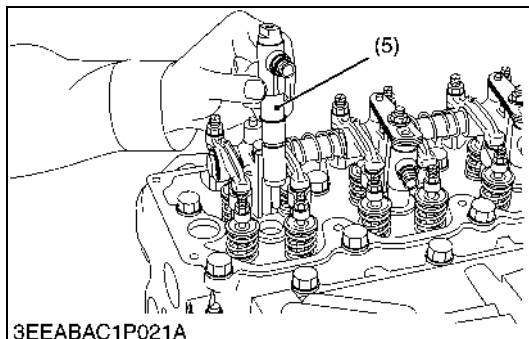
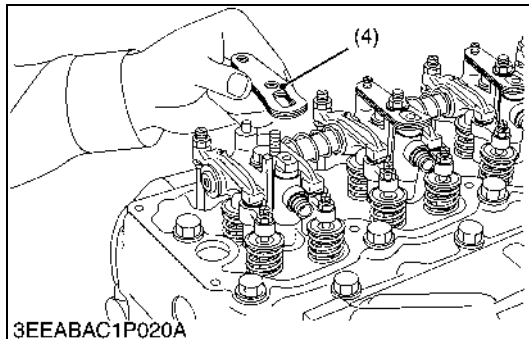
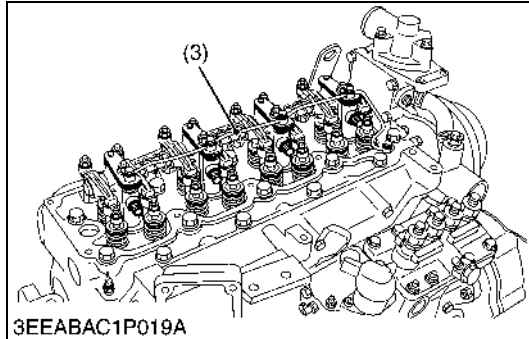
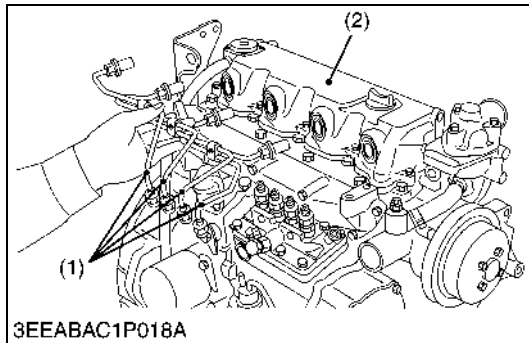
(3) Thermo Valve

(a) **Boost Pressure from Intake Manifold**(b) **Boost Pressure to EGR Valve**

W1188855

[6] DISASSEMBLING AND ASSEMBLING

(1) Cylinder Head and Valves



Cylinder Head Cover and Nozzle Holder

1. Remove the injection pipes (1).
2. Remove the cylinder head cover (2).
3. Remove the over flow pipe (3).
4. Remove the nozzle holder clamps (4), nozzle holder assembly (5) and nozzle gaskets.

(When reassembling)

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

Tightening torque	Nozzle holder clamp nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Overflow pipe assembly retaining screw	9.8 to 11.2 N·m 1.0 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Cylinder head cover screw	6.9 to 11.2 N·m 0.70 to 1.15 kgf·m 5.1 to 8.31 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

- (1) Injection Pipe
(2) Head Cover
(3) Overflow Pipe

- (4) Nozzle Holder Clamps
(5) Nozzle Holder Assembly

W1049737

Injection Nozzle Oil Seal (if necessary)

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

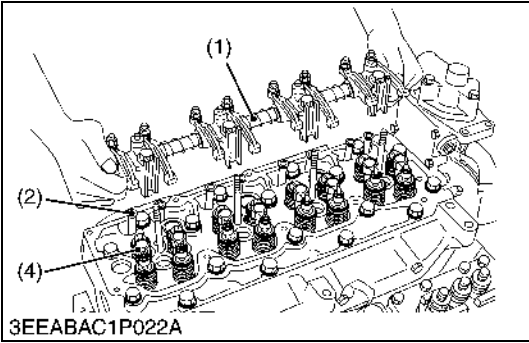
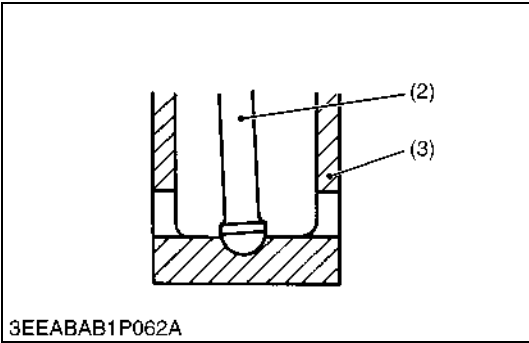
(When reassembling)

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

- (1) Injection Nozzle Oil Seal

- (2) Cylinder Head Cover

W1054100



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.**

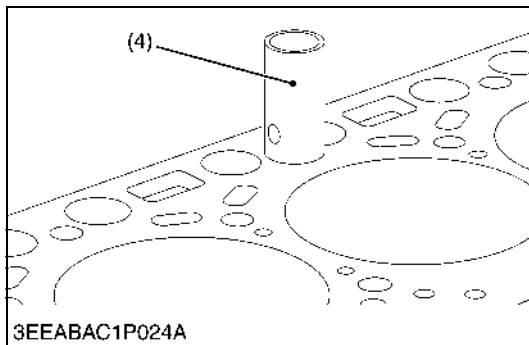
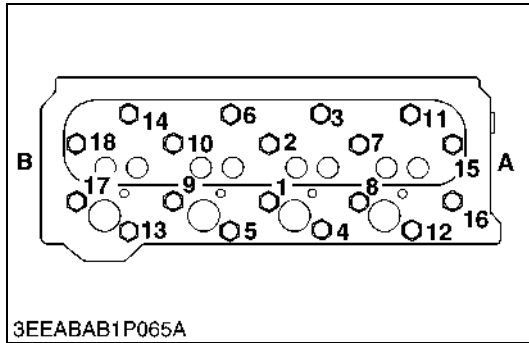
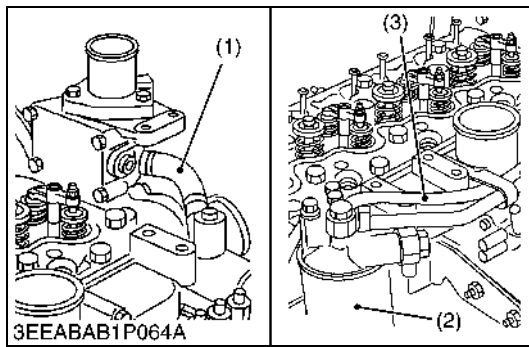
Tightening torque	Rocker arm bracket screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

- (1) Rocker Arm

(2) Push Rod
- (3) Tappet

(4) Bridge Arm

W1050212



Cylinder Head and Tappet

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.
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 "Valve Clearance".
- It is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

■ IMPORTANT

- 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

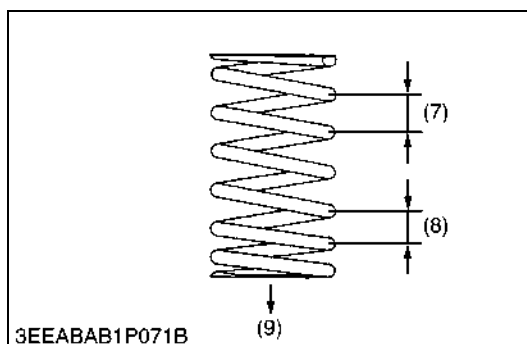
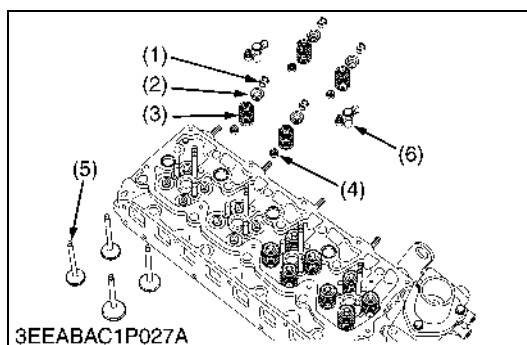
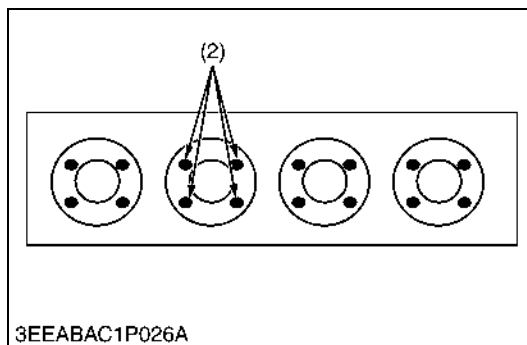
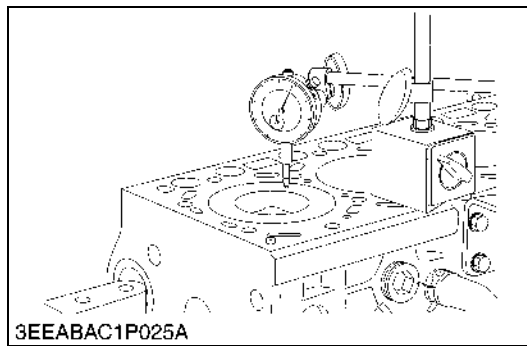
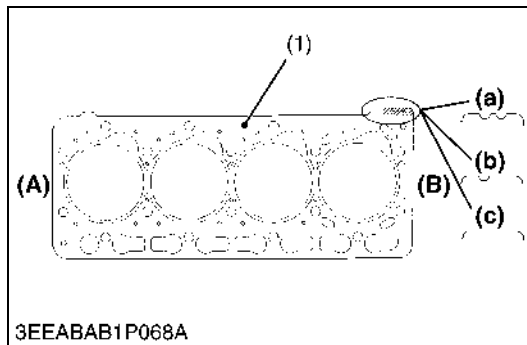
- Mark the cylinder number to the tappets to prevent interchanging.

Tightening torque	Cylinder head mounting screw	98.1 to 107 N·m 10.0 to 11.0 kgf·m 72.4 to 79.5 lbf·ft

- (1) Return Pipe
(2) Fuel Filter
(3) Fuel Pipe
(4) Tappet

A : Gear Case Side
B : Flywheel Side

W1170923



Selecting Cylinder Head Gasket

Replacing the Cylinder Head Gasket

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

Selecting the Cylinder Head Gasket

- Select the cylinder head gasket (1) thickness to meet with the top clearance when replacing the piston, piston pin bush, connecting rod or crankpin bearing.
1. Measure the piston head's protrusion or recessing from the crankcase cylinder face 4 spots per each piston and (average of four pistons) using the dial gauge as shown in figure.
 2. Select the suitable cylinder head gasket refer to the table below.

Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Part Code	Piston Head's protrusion or recessing from the level of crankcase cylinder face. (average of 4 pistons)
	Before tightening	After tightening		
2 notches (a)	0.90 mm 0.035 in.	0.80 mm 0.031 in.	1G514-03310	-0.07 to +0.049 mm -0.0028 to +0.0019 in.
1 notch (b)	1.00 mm 0.0394 in.	0.90 mm 0.035 in.	1G514-03600	+0.050 to +0.149 mm +0.0020 to +0.0058 in.
Without notch (c)	1.05 mm 0.0413 in.	0.95 mm 0.037 in.	1G514-03610	+0.150 to +0.20 mm +0.0059 to +0.0078 in.

(1) Cylinder Head Gasket

(2) Measuring Point

(A) Gear Case Side

(B) Flywheel Side

(a) 2 Notches

(b) 1 Notch

(c) Without Notch

W1022965

Valve

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

(When reassembling)

- Install the 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 Spring Collet

(2) Valve Spring Retainer

(3) Valve Spring

(4) Valve Stem Seal

(5) Valve

(6) Arm Bridge

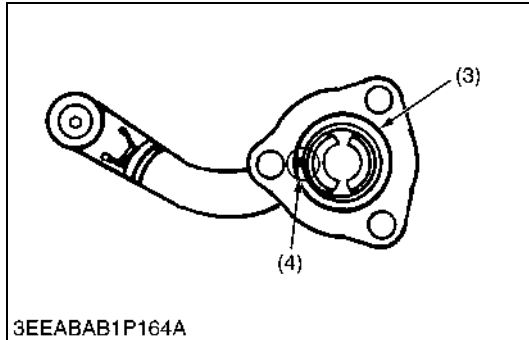
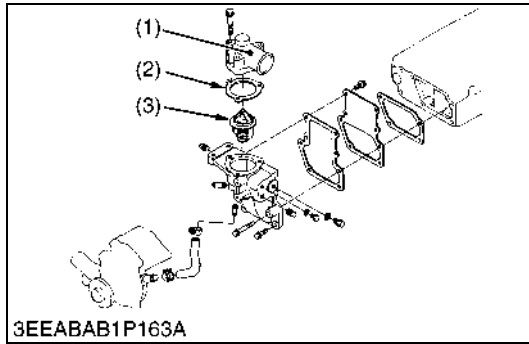
(7) Large Pitch

(8) Smaller Pitch

(9) Install the spring with its smaller-pitch end downward (at the head side)

W1053044

(2) Thermostat



Thermostat Assembly

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

(When reassembling)

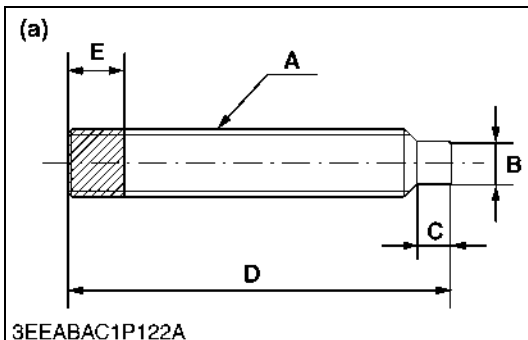
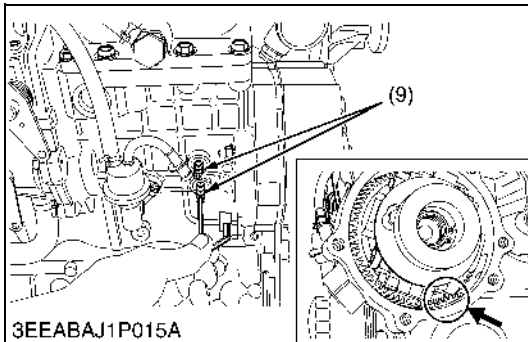
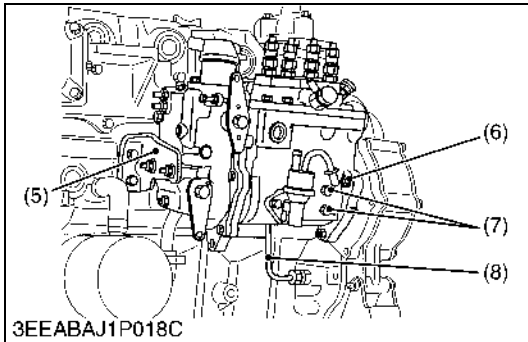
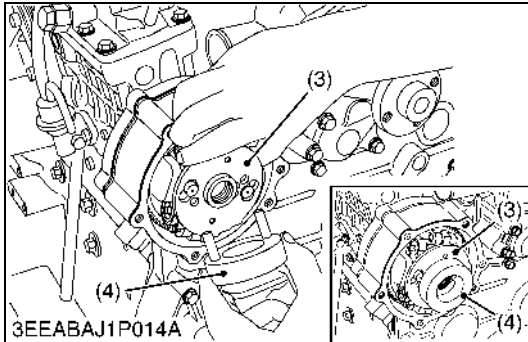
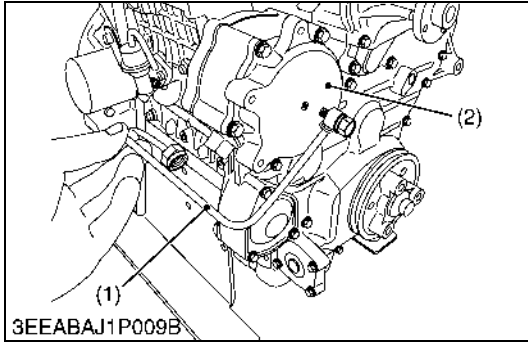
- Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (2).
- Attach the thermostat with its hole facing toward the air suction side.

(1) Thermostat Cover
(2) Thermostat Cover Gasket

(3) Thermostat Assembly
(4) Hole

W1072747

(3) Injection Pump Unit



Injection Pump Unit

(Removing the fuel injection pump unit)

1. Remove the timer lubricating pipe (1).
2. Remove the gear cover (2) for the fuel injection pump unit from the gearcase.
3. Set the timer 0 ° restoring jig (4) to the timer gear (3).
4. Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper.

■ IMPORTANT

- Look for the align mark on the idle gear 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

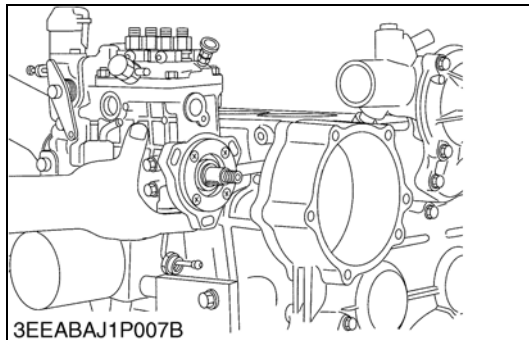
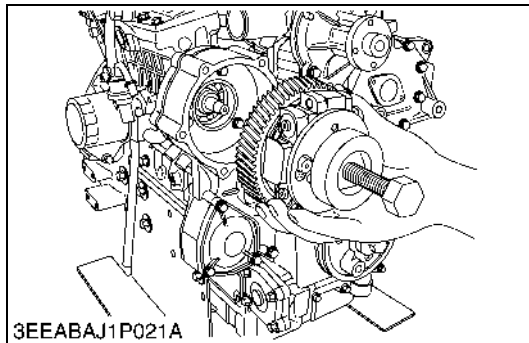
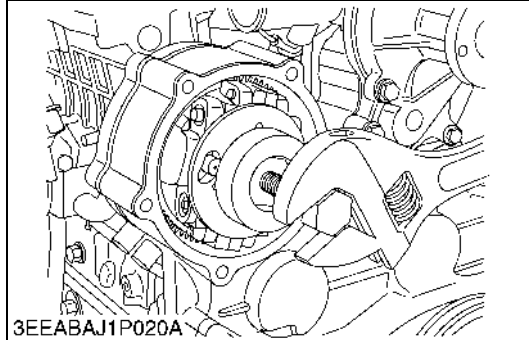
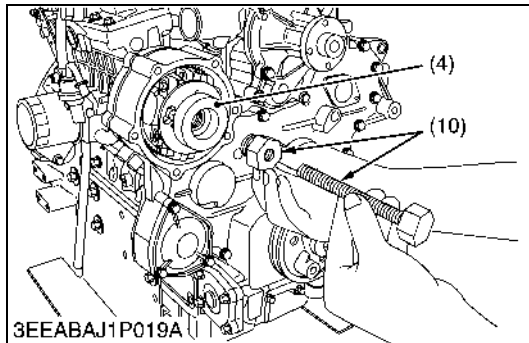
- When the already existing align marks align with each other, there is no need to put another align mark.
5. Unscrew the two plugs (7) of the injection pump unit.
 6. Tighten the upper fuel camshaft lock screw (9) until it comes into contact with the fuel camshaft. Make sure the camshaft does not move any longer.
 7. Tighten the lower fuel camshaft lock screw (9) until it comes into contact with the fuel camshaft.

■ NOTE

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

A	M8 × Pitch 1.25
B	5.0 mm dia. (0.20 in. dia.)
C	4.0 mm (0.16 in.)
D	45 mm (1.8 in.)
E	10 mm (0.39 in.) : Conspicuously Painted

(To be continued)



(Continued)

8. Remove the timer gear mounting nut and washer.

9. Set the timer gear puller (10).

10. Remove the timer gear (3).

■ NOTE

• **Be careful not to drop the key.**

11. Disconnect the lubricating oil pipe (8).

12. Loosen the three injection pump unit mounting nut (6).

13. Remove the injection pump unit support (5) and take out the injection pump unit.

(1) Time Lubricating Pipe

(2) Gear Cover

(3) Timer Gear

(4) Timer 0 ° restoring jig

(5) Injection Pump Unit Support

(6) Injection Pump Unit Mounting Nut

(7) Plug

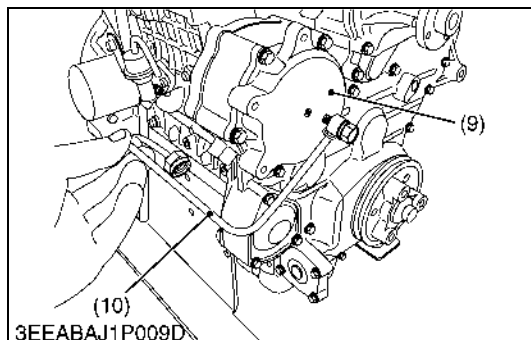
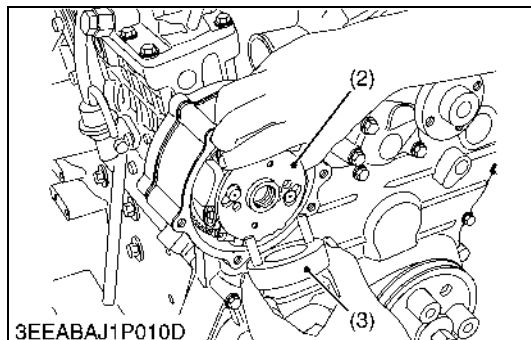
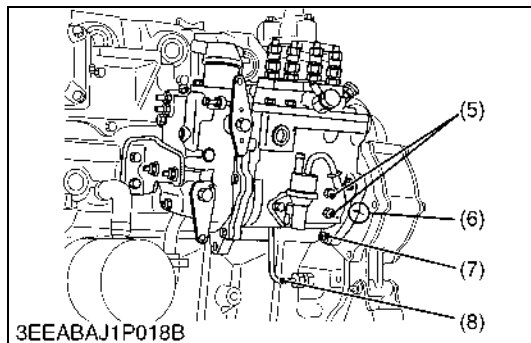
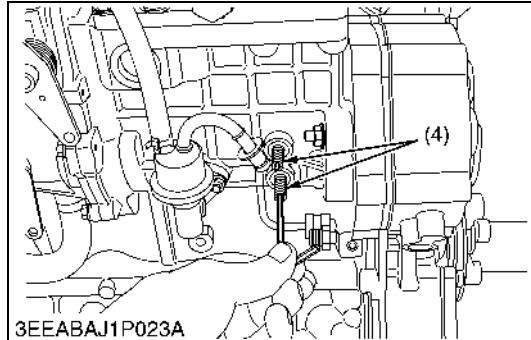
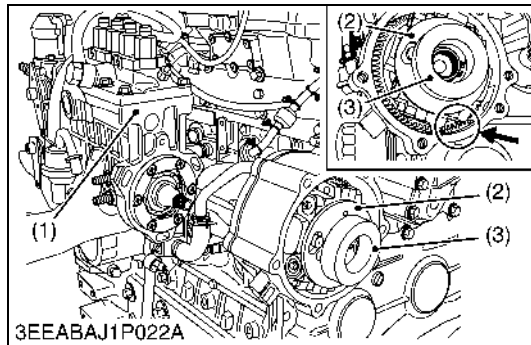
(8) Lubricating Oil Pipe

(9) Fuel Camshaft Lock Screw

(Socket Set Screw Dog Point Type)

(10) Timer Gear Puller

(To be continued)



(Continued)

(Reassembling the fuel injection pump unit)

1. Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper.
2. Set the timer 0° restoring jig (3) to the timer gear (2).
3. Place the timer gear (2) back into the gear case position. Make sure of aligning the align marks of the timer gear and the idle gear 2.
4. Install the injection pump unit (1) to the timer gear (2).

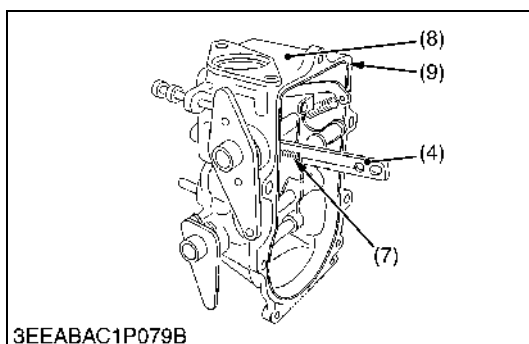
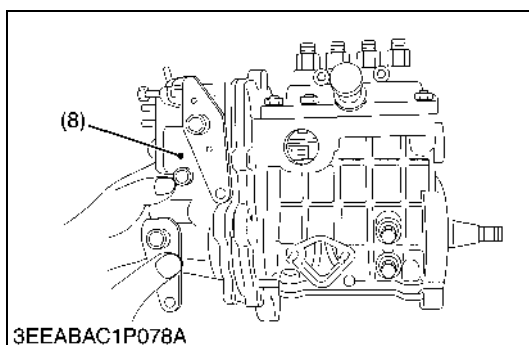
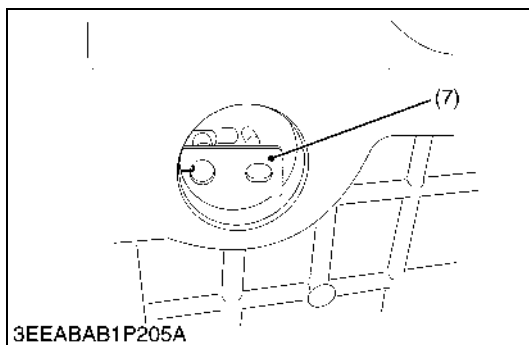
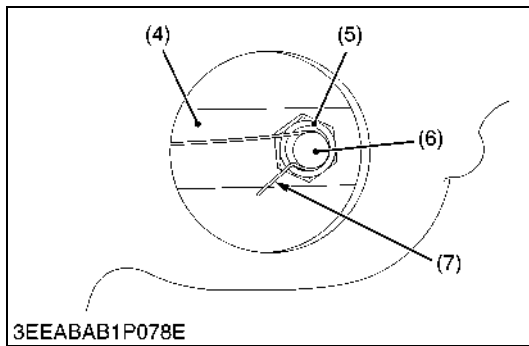
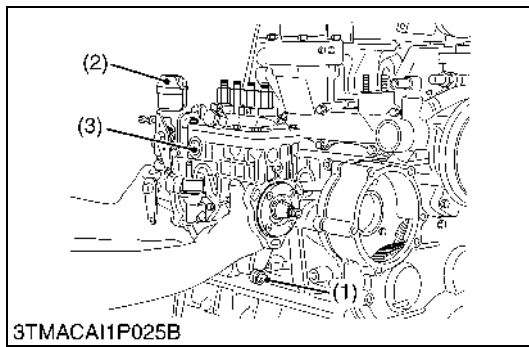
■ NOTE

- **When installing the injection pump unit to the timer gear, make sure that the key is fit in the keyway of timer gear.**
5. Temporarily tighten the timer gear mounting nut by hand.
 6. Fix the injection pump unit and tighten the timer gear mounting nut to the specified torque.
 7. Take off the fuel camshaft lock screws (4) and tighten the plugs (5) for plugging.
 8. Loose the injection pump unit mounting nuts (7) for aligning the injection timing.
 9. 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.
 10. Tighten the injection pump unit mounting nut (7) to the specified torque.
 11. Reconnect the lubricating oil pipe (8) and place the injection pump unit support.
 12. Remove the flywheel stopper.
 13. Check the injection timing. (See the "Injection Timing".)
 14. If the injection timing is not within the specification, repeat (7) to (12) again.
 15. Remove the timer 0° restoring jig (3) from the timer gear (2).
 16. Set the gear cover (9) and the timer lubricating pipe (10).

Tightening torque	Timer gear mounting nut	74 to 83 N·m 7.5 to 8.5 kgf·m 55 to 61 lbf·ft
	Injection pump unit mounting nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Injection Pump Unit	(5) Plug
(2) Timer Gear	(6) Align Mark
(3) Timer 0° restoring jig	(7) Injection Pump Unit Mounting Nut
(4) Fuel Camshaft Lock Screw (Socket Set Screw Dog Point Type)	(8) Lubricating Oil Pipe
	(9) Gear Cover
	(10) Timer Lubricating Pipe

W1191026



Governor Housing Assembly

1. Remove the injection pump unit from the engine. (See the "Injection Pump Unit".)
 2. Remove the governor lubricating pipe (3).
 3. Remove the stop solenoid (3).
 4. Detach the sight cover (2) from the injection pump unit.
 5. Unhook the start spring (7) from the rack pin (6) of injection pump assembly.
 6. Remove the nut (5).
- **NOTE**
- **Be careful not to drop the nut inside.**
7. Slide off the governor connecting rod (4) from the rack pin of injection pump assembly.
 8. For convenient sake, temporarily hook the start spring on the rack pin hole of the governor connecting rod.
 9. Remove the governor housing mounting screws.
 10. Detach the governor housing assembly (8) from the injection pump unit.

(When reassembling)

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

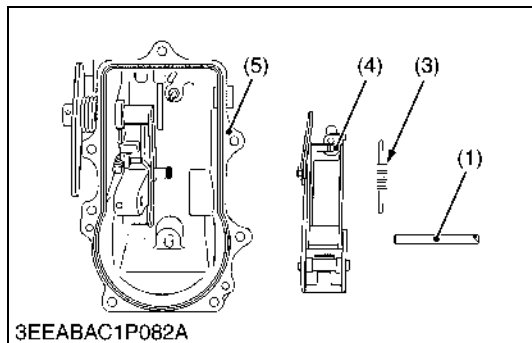
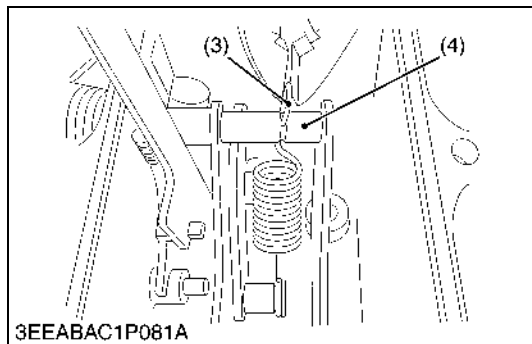
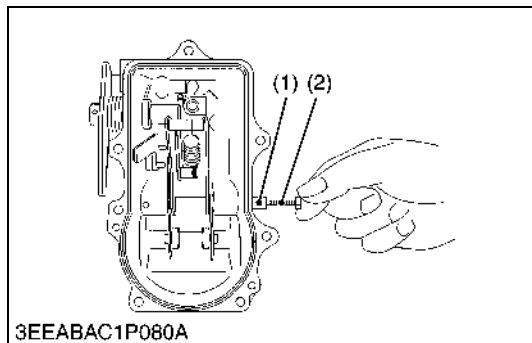
■ NOTE

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

Tightening torque	Governor housing mounting screw	9.8 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Anti-rotation nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 2.9 lbf·ft

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

W1137126



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)

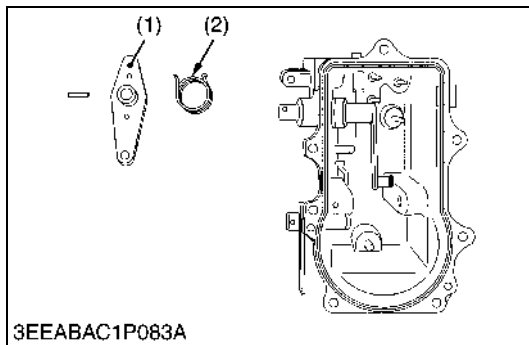
- After reassembling the governor housing assembly, check the movement of the governor fork lever assembly, the speed control lever and the stop lever.

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

W1139749

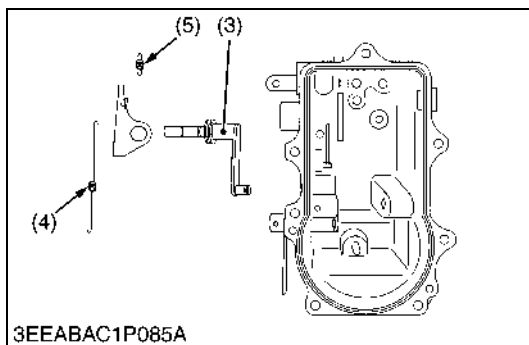
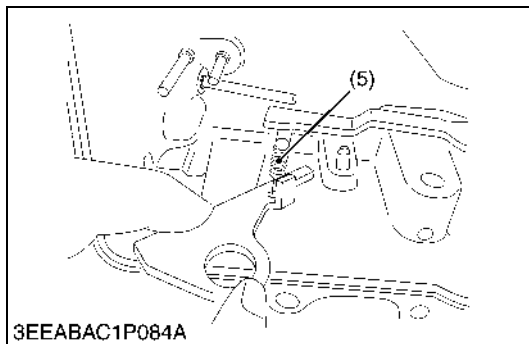


Governor Lever

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

W1142375

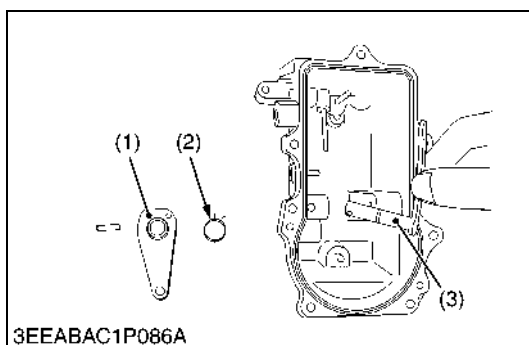


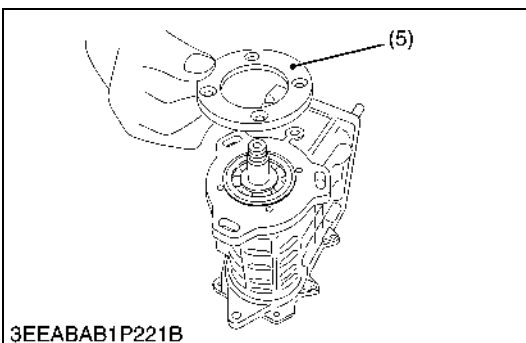
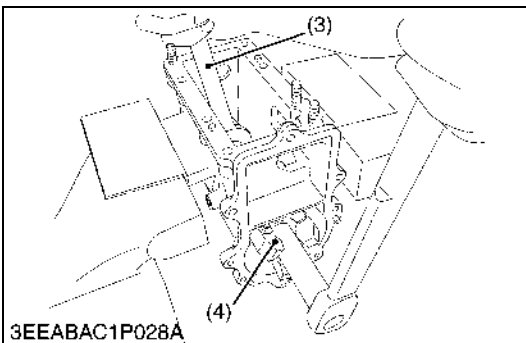
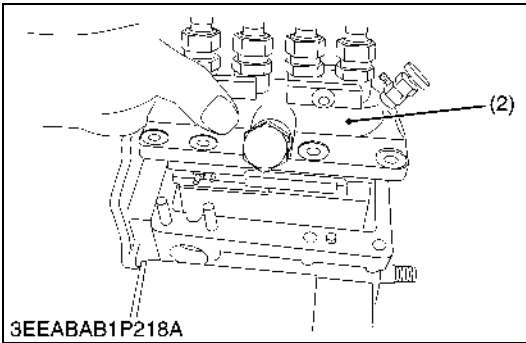
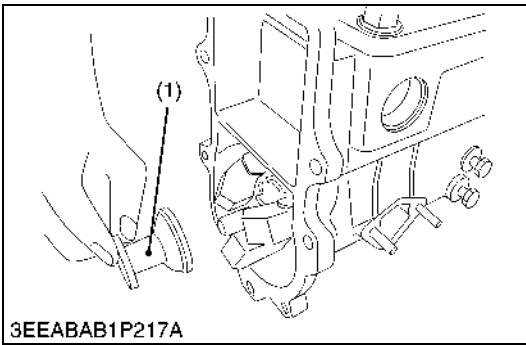
Stop Lever

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

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

W1143531





Fuel Camshaft and Governor Weight

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

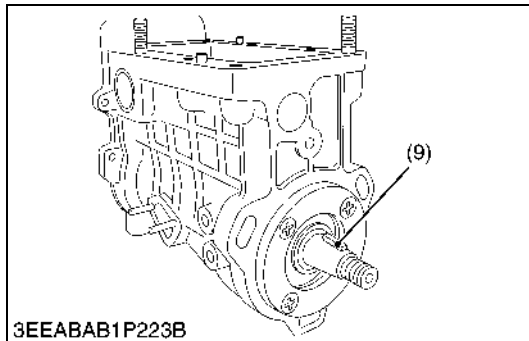
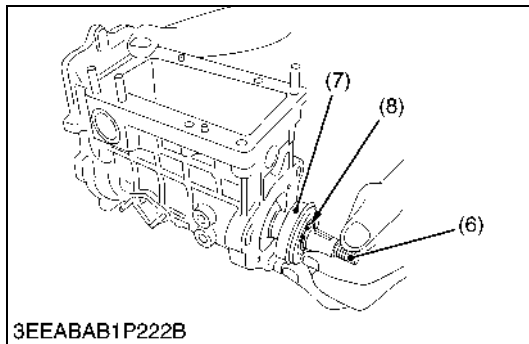
(When reassembling)

- 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	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Injection pump mounting nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Governor Sleeve	(6) Fuel Camshaft
(2) Injection Pump Assembly	(7) Bearing
(3) Open End Wrench (22 mm)	(8) Cir-clip
(4) Governor Weight	(9) Key Way of Fuel Camshaft
(5) Fuel Camshaft Stopper	

(To be continued)



(Continued)

(When reassembling)

- Fix the fuel camshaft with lock bolts as the key way of fuel camshaft (9) 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.

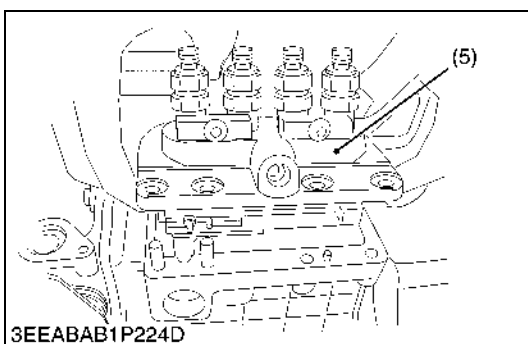
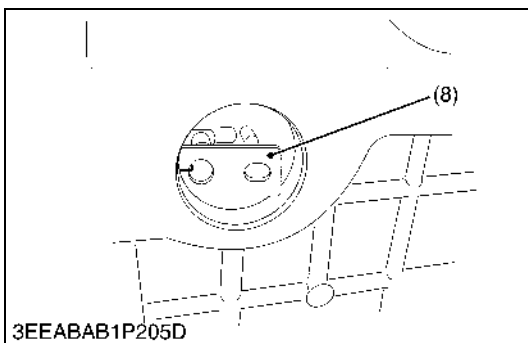
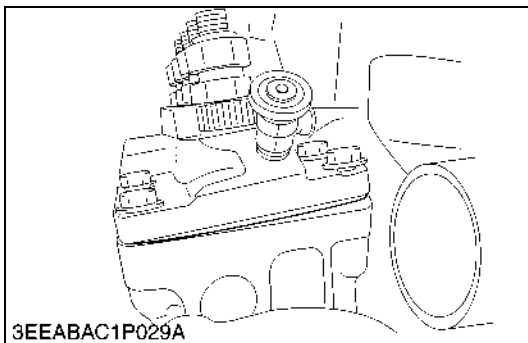
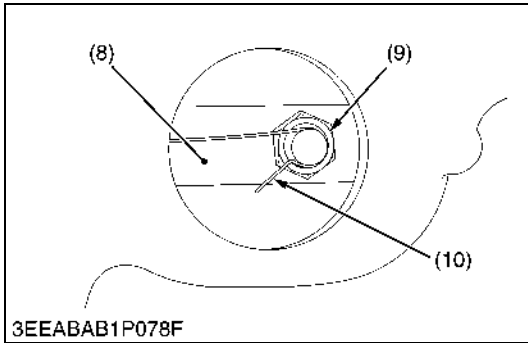
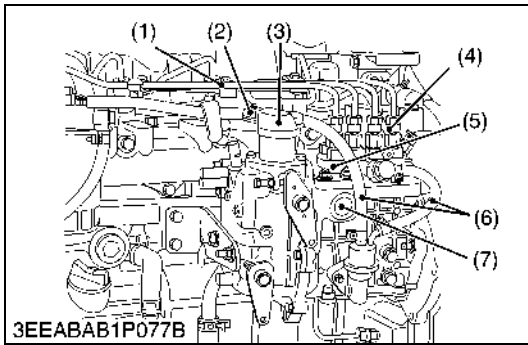
NOTE

- **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 6.8 lbf·ft
	Governor weight mounting nut	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft

(1) Governor Sleeve	(6) Fuel Camshaft
(2) Injection Pump Assembly	(7) Bearing
(3) Open End Wrench (22 mm)	(8) Cir-clip
(4) Governor Weight	(9) Key Way of Fuel Camshaft
(5) Fuel Camshaft Stopper	

W1144178



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 (6) and fuel overflow pipe (4).
3. Disconnect the connector (2) from the stop solenoid. Then remove the stop solenoid (3).
4. Detach the sight cover (7) from the injection pump unit.
5. Unhook the start spring (10), and remove the anti-rotation nut (9).
6. Just loosen the injection pump assembly mounting screws and nuts like the figure, which the injection pump assembly keeps tilted.
7. Slide off the governor connecting rod (8) from the rack pin of injection pump assembly.
8. Remove the injection pump mounting screws and nuts, and take out the injection pump assembly (5).

■ NOTE

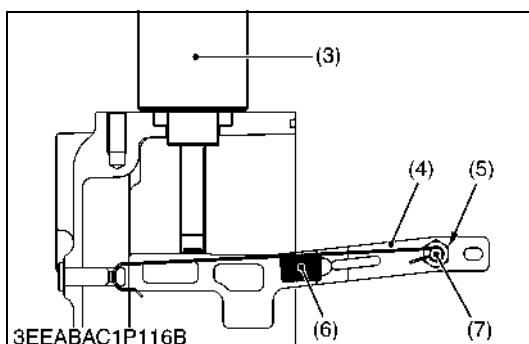
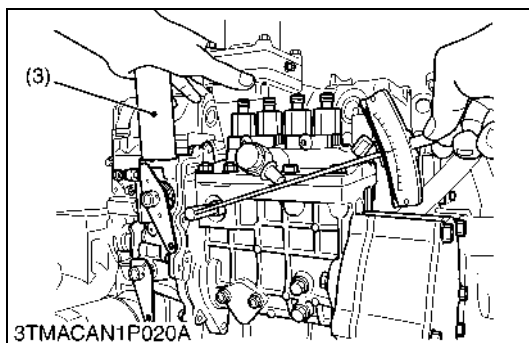
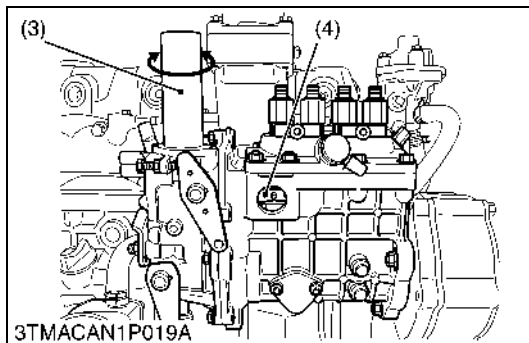
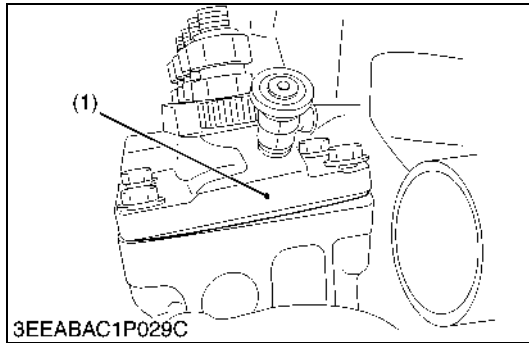
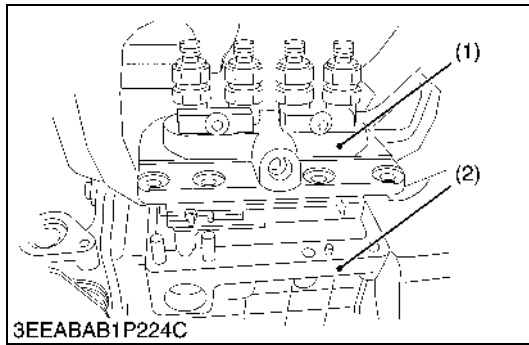
- Be careful not to drop the anti-rotation nut (9).
- Be careful not to deform the start spring.
- When taking out the injection pump assembly, be careful not to hit it against the governor connecting rod.

(When reassembling)

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

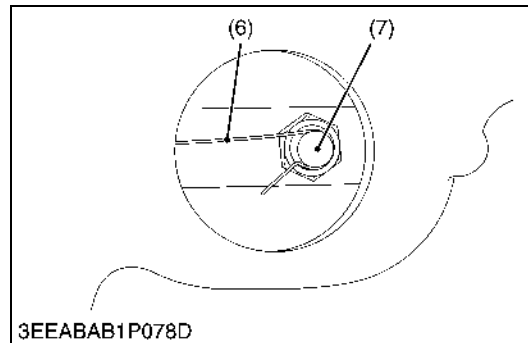
(1) Injection Pipe	(6) Fuel Pipe
(2) Connector	(7) Sight Cover
(3) Stop Solenoid	(8) Governor Connecting Rod
(4) Fuel Overflow Pipe	(9) Anti-Rotation Nut
(5) Injection Pump Assembly	(10) Start Spring

W1182379



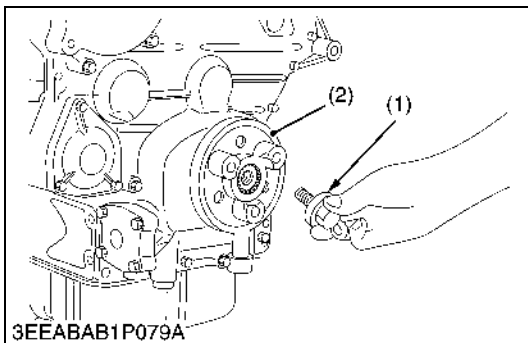
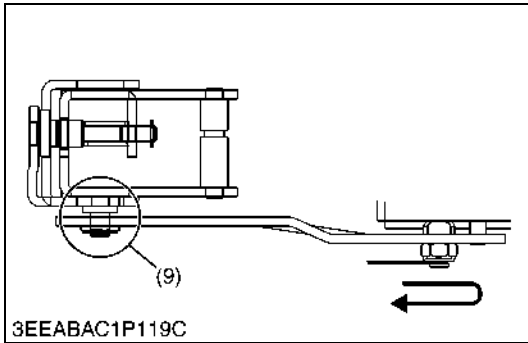
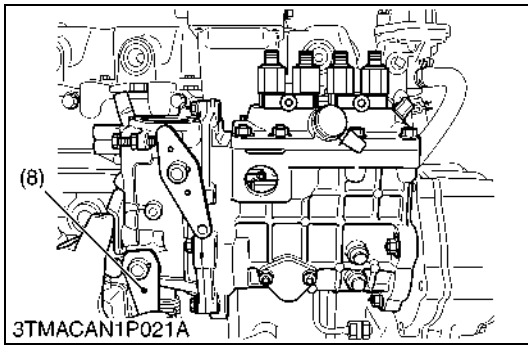
Installing Procedure of Injection Pump Assembly

1. Install the fuel injection pump assembly (1) in its unit (2), and tighten the mounting screws and nuts like the figure, which the injection pump assembly (1) keeps tilted.
2. Hook the governor connecting rod (4) to the rack pin of the injection pump assembly (1).
3. Tighten the mounting screws and nuts with the specified torque, not to slide off the governor connecting rod (4) from the rack pin.
4. Place the service jig (3) in the stop solenoid mounting hole of the fuel injection pump unit.
5. 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.
6. Slightly tighten the anti-rotation nut of the governor connecting rod.
7. Holding down the service jig (3) by hand, tighten up the anti-rotation nut (5) to the specified torque.
8. Hook the start spring (6) to the rack pin (7).



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

W1069371



Installing Procedure of Injection Pump Assembly (Continued)

1. Move the stop lever (8) 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 lbf·ft
	Injection pump mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Injection pump mounting nut	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(8) Stop Lever

(9) Sliding Point between Governor Fork Lever and Governor Connecting Rod

W1069772

Fan Drive Pulley

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

(When reassembling)

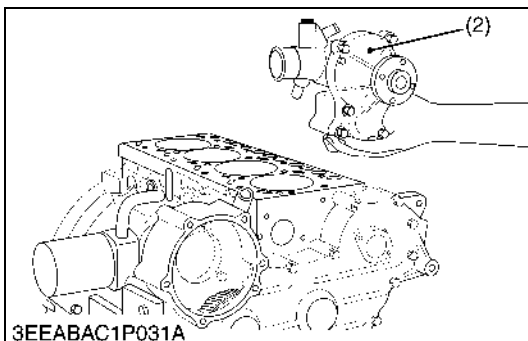
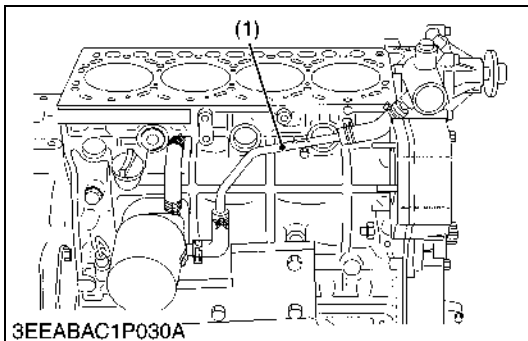
Tightening torque	Crankshaft screw	255 to 274 N·m 26.0 to 28.0 kgf·m 188 to 202 lbf·ft

(1) Crankshaft Screw

(2) Fan Drive Pulley

W1185033

(4) Water Pump and Oil Cooler



Water Pump

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

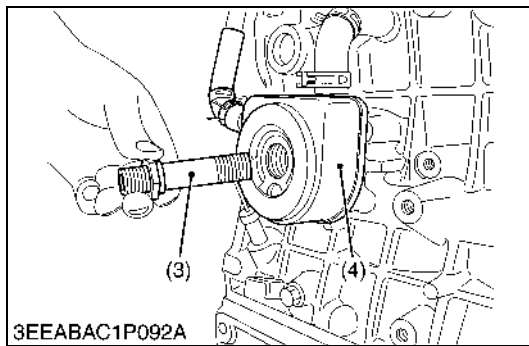
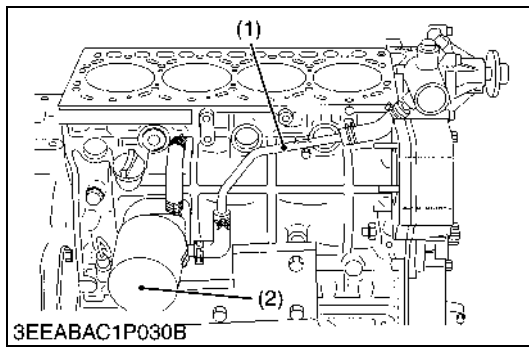
(When reassembling)

- 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

W1064806



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	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Water Pump

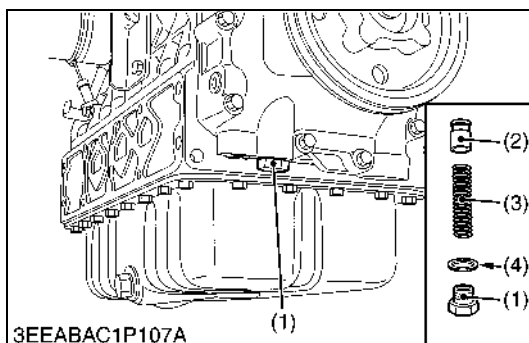
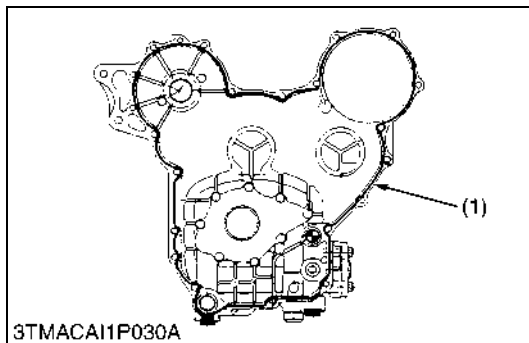
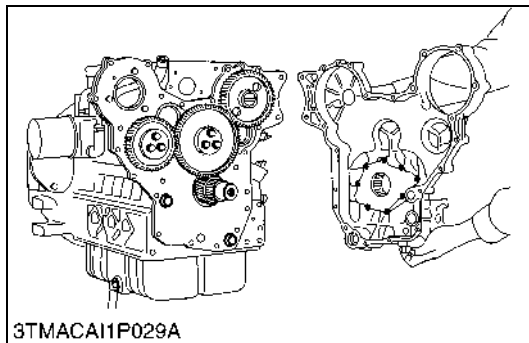
(2) Oil Filter Cartridge

(3) Oil Cooler Joint Screw

(4) Oil Cooler

W1032266

(5) Gear Case



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 or equivalent) to the gear case cover.

Tightening torque	Gear case cover mounting screw (7T)	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Gear case cover mounting screw (10T)	33 to 36 N·m 3.3 to 3.7 kgf·m 24 to 26 lbf·ft

(1) Liquid Gasket

W1189218

Relief Valve

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

Tightening torque	Relief valve retaining screw	69 to 78 N·m 7.0 to 8.0 kgf·m 51 to 57 lbf·ft

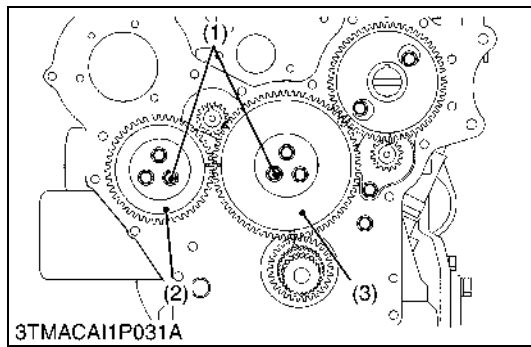
(1) Relief Valve Retaining Screw

(2) Relief Valve

(3) Spring

(4) Packing

W1081251



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.

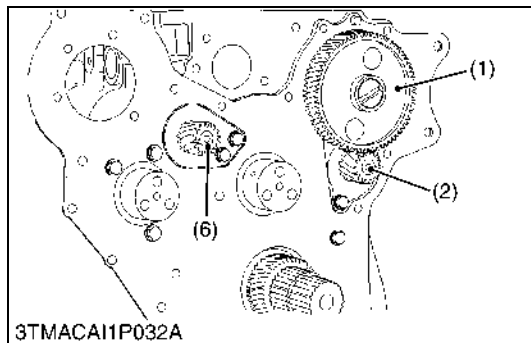
Tightening torque	Idle gear mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Idle Gear Mounting Screw

(3) Idle Gear 1

(2) Idle Gear 2

W1032991



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 cylinders 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	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Balancer shaft set screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Camshaft

(4) Crank Gear

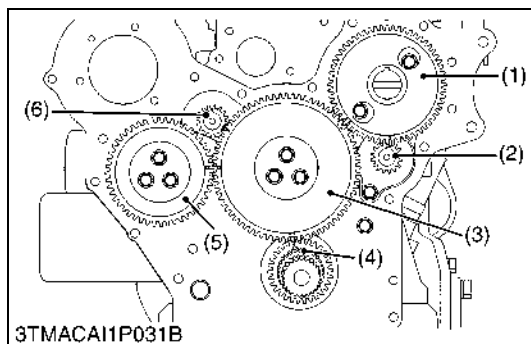
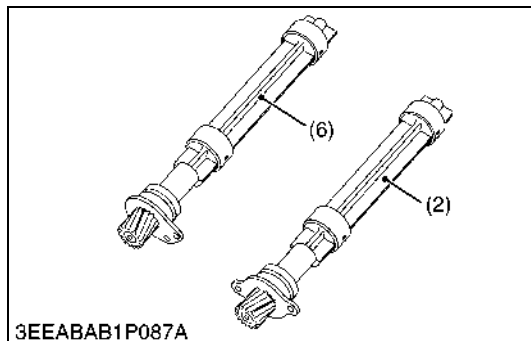
(2) Balancer Shaft 1

(5) Idle Gear 2

(3) Idle Gear 1

(6) Balancer Shaft 2

W1191037



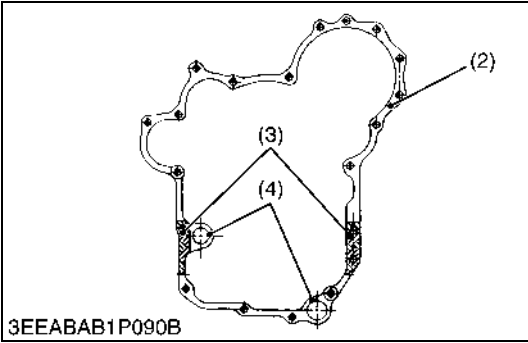
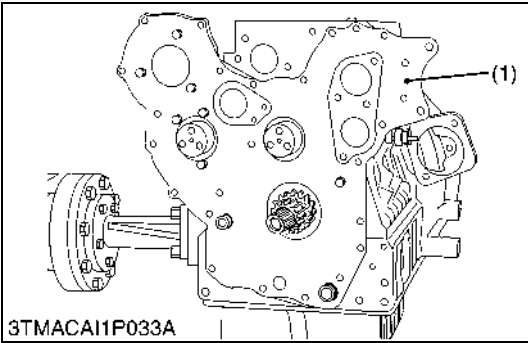


Plate (Gear Case)

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	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Plate

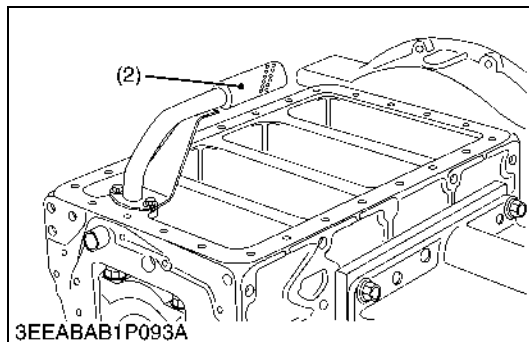
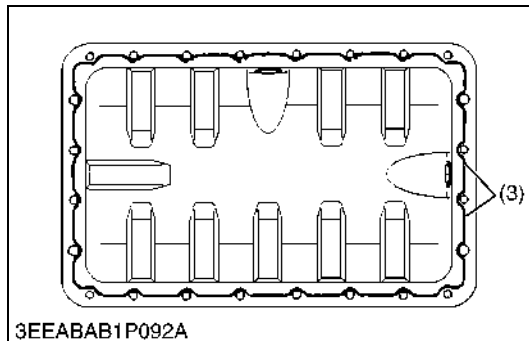
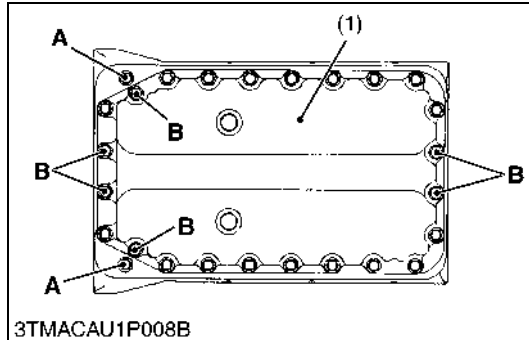
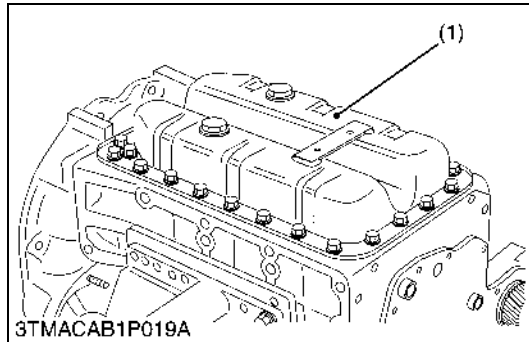
(3) Liquid Gasket

(2) Gasket

(4) O-ring

W1057656

(6) Piston and Connecting Rod



Oil Pan and Oil Strainer

1. Unscrew the oil pan mounting screws and remove the oil pan (1).
2. Unscrew the oil strainer mounting 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 or equivalent) 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.

Tightening torque	Oil pan mounting screw (A) L : 165 mm (6.5 in.)	74 to 78 N·m 7.5 to 8.0 kgf·m 55 to 57 lbf·ft
	Oil pan mounting screw (B) L : 25 mm (1.0 in.)	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

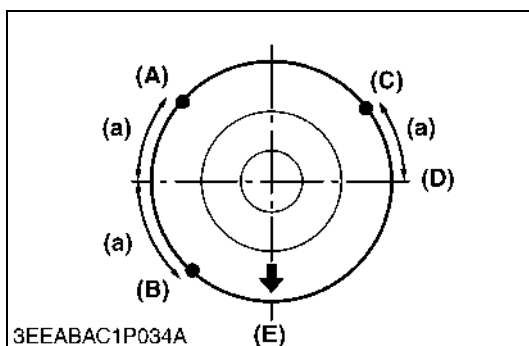
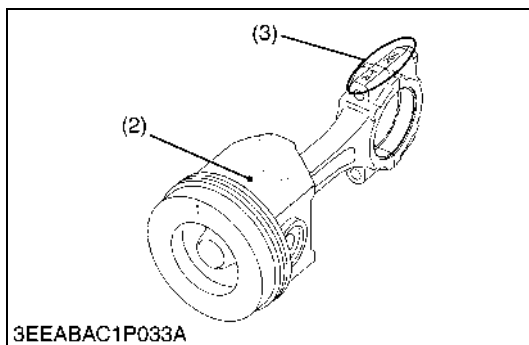
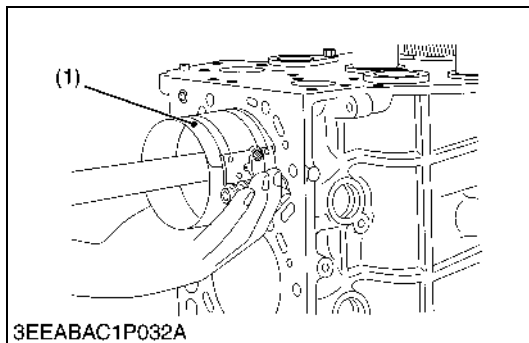
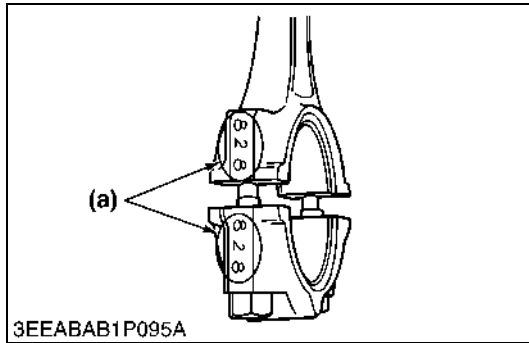
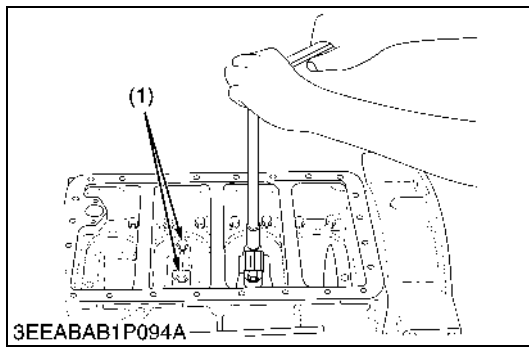
■ NOTE

- 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
(2) Oil Strainer
(3) Liquid Gasket

- (A) Oil Pan Mounting Screw :
165 mm (6.5 in.)
(B) Oil Pan Mounting Screw :
25 mm (1.0 in.)

W1054035



Connecting Rod Cap

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

(When reassembling)

- Align the marks (a) with each other. (Face the marks toward the injection pump.)
- Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque.
If the connecting rod screw won't be screwed in smoothly, clean the threads.
If the connecting rod screw is still hard to screw in, replace it.
- When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.
- Fit the crank pin metal in place : its centrally groove side toward the connecting rod, and the non-grooved side toward the cap.

Tightening torque	Connecting rod screw	79 to 83 N·m 8.0 to 8.5 kgf·m 58 to 61 lbf·ft

(1) Connecting Rod Screw

(a) Mark

W1058252

Piston

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

(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.
- When inserting the piston into the cylinder, face the mark (3) on the connecting rod to the injection pump.

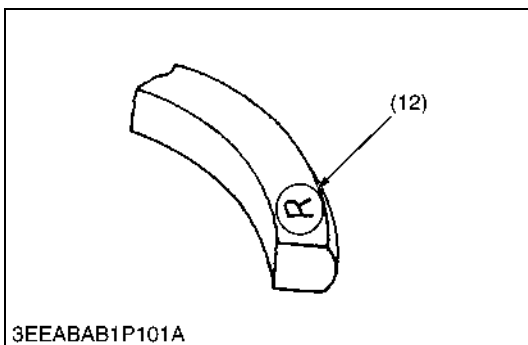
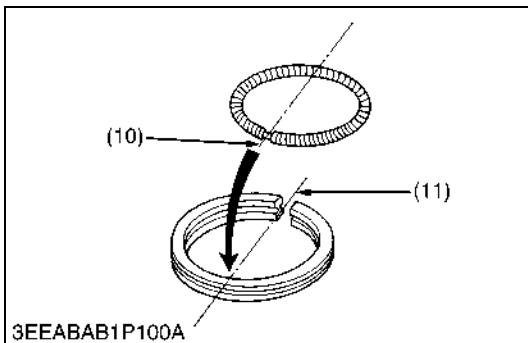
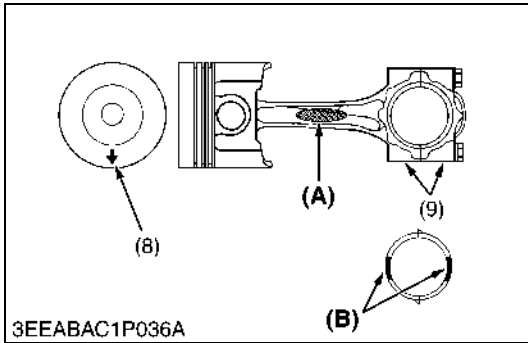
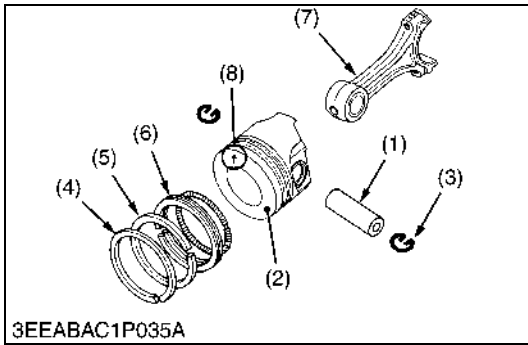
■ IMPORTANT

- Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.
- When inserting the piston into the cylinder, place the gap of each piston ring like the figure.
- Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.
- When inserting the piston in place, be careful not to get the molybdenum disulfide coating torn off its skirt. This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.

- (1) Piston Ring Compressor
(2) Molybdenum Disulfide Coating in piston skirt
(3) Mark
(a) 0.79 rad (45°)

- (A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(E) Injection Pump Side

W1058433



Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (1), and separate the connecting rod (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 ↑ mark (8) and the connecting rod numbering mark (9) facing same side.
- The end faces of the oil ring are plated with hard chrome. In putting the piston into the cylinder, be careful not to get the oil ring scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring. If the ring's planting is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

■ IMPORTANT

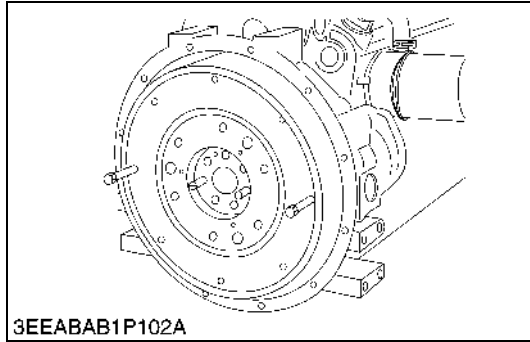
- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

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

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

W1059589

(7) Flywheel and Crankshaft



Flywheel

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

■ NOTE

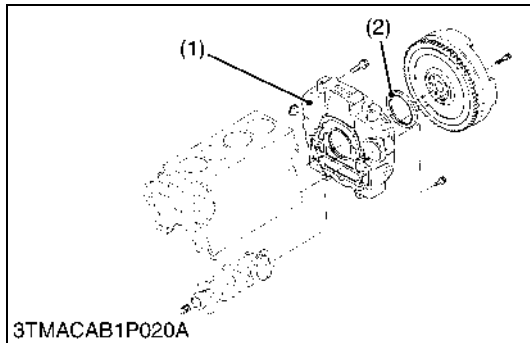
- **Do not use an impact wrench. Serious damage will occur.**
2. Detach the flywheel screws.
 3. Remove the flywheel.

(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 N·m 10.0 to 11.0 kgf·m 72.4 to 79.5 lbf·ft

W1060354



Flywheel Housing

1. Remove the flywheel housing.

(When reassembling)

- Apply liquid gasket (Three Bond 1217D or equipment) to flywheel housing.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Be careful not to get a damage to the oil seal when installing the flywheel housing to the crankshaft.
- Be careful not to place the oil seal tilted.
- Tighten the flywheel housing mounting screws with even force on the diagonal line.

■ NOTE

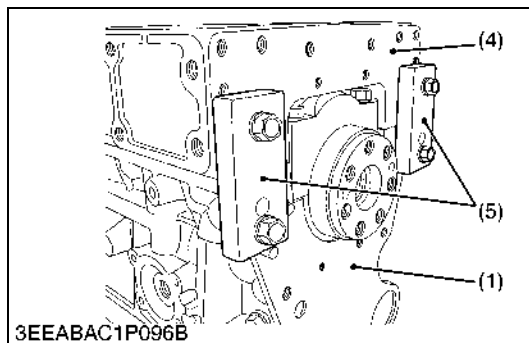
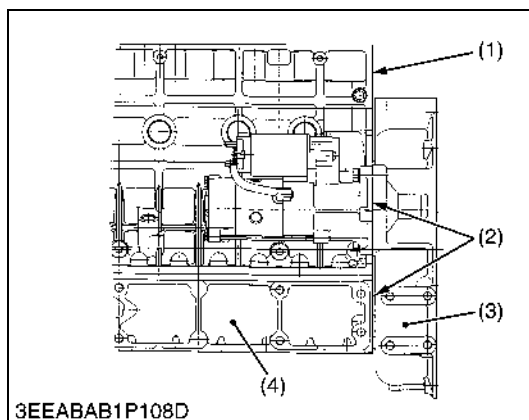
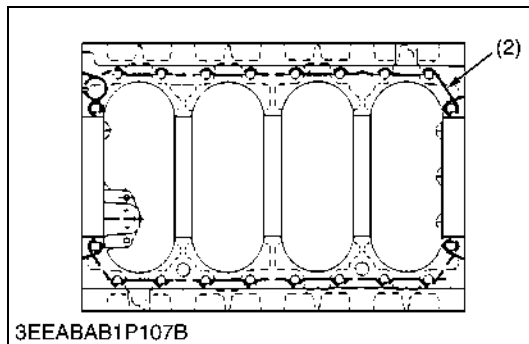
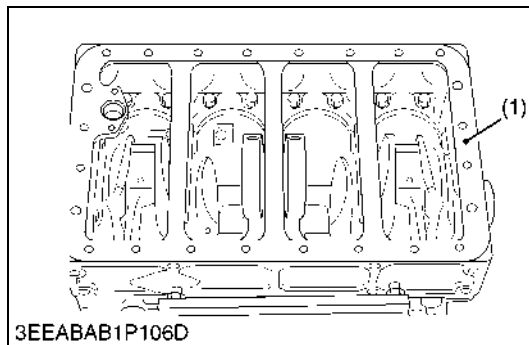
- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts with in ten minutes.**

Tightening torque	Flywheel housing mounting screw (M14, USB)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Flywheel housing mounting screw (M12, 9T)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 lbf·ft

(1) Flywheel Housing

(2) Oil Seal

W1048326



Crankcase 2

1. Remove the crankcase 2 (1).

(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 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

(1) Crankcase 2

(2) Liquid Gasket

W1060825

Crankcase 1 and Crankcase 2

(When reassembling)

- Match the crankcase 1 and 2, referring to the flywheel housing's contoured face.
- Tighten the crankcase 2 mounting screws loosely.
- Tighten up the jig to the specified torque same as the flywheel housing screw. This helps to minimize the level difference between the crankcase 1 and the crankcase 2 (at the flywheel side). Possible gap must be 0.05 mm (0.002 in.) or smaller.

Tightening torque	Crankcase 2 mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	Flywheel housing mounting screw (M14, USB)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Flywheel housing mounting screw (M12, 9T)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 lbf·ft

(1) Crankcase 1

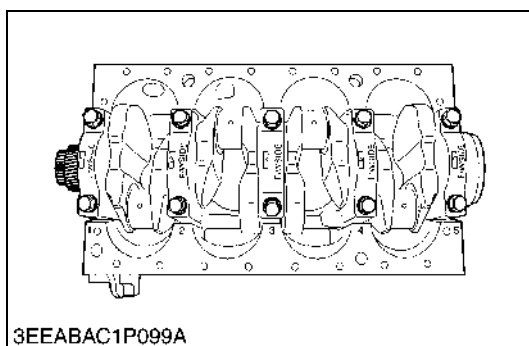
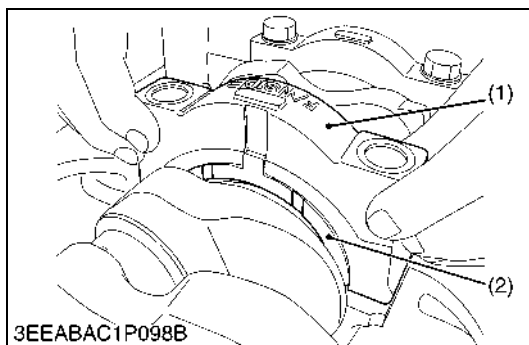
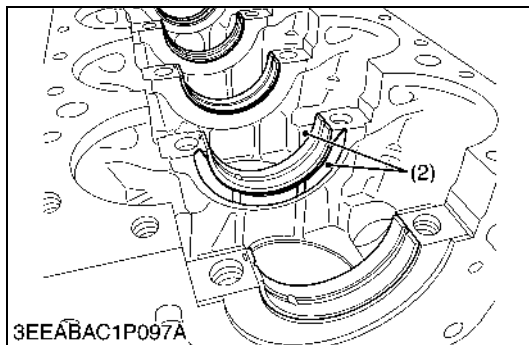
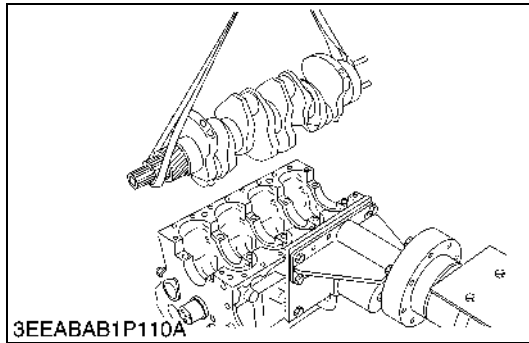
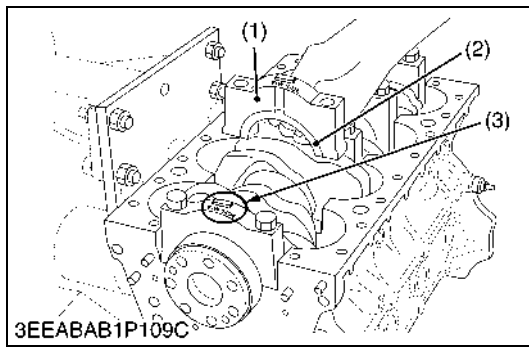
(4) Crankcase 2

(2) Gap to be smaller than 0.05 mm (0.002 in.)

(5) Jig

(3) Flywheel Housing

W1111351



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 (4).
- Apply oil to the main bearing case screws and tighten them to the specified torque.

Tightening torque	Main bearing case screw	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft

(1) 4th Main Bearing Case

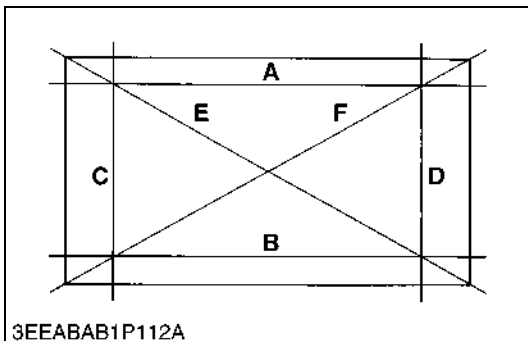
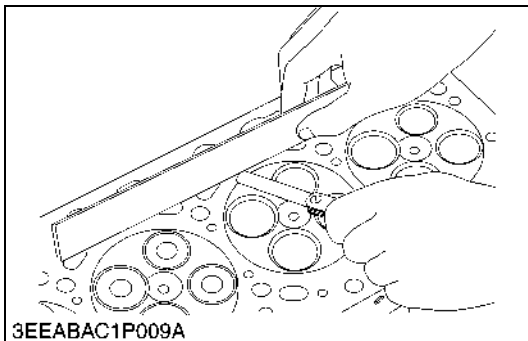
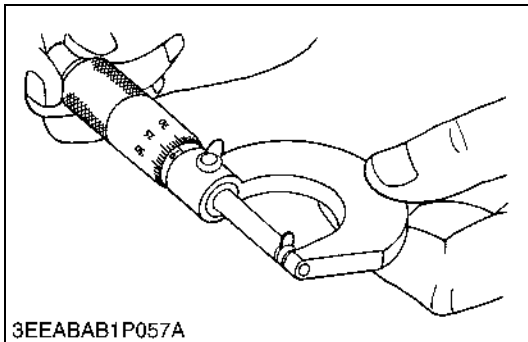
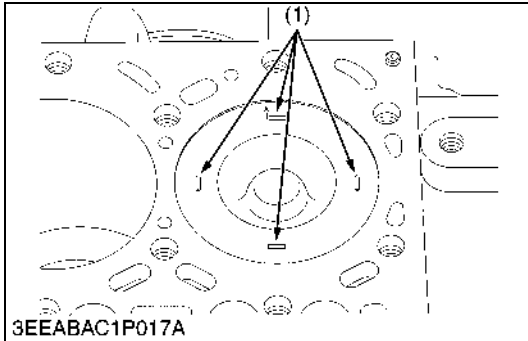
(3) F/W SIDE Mark

(2) Thrust Bearing

W1049051

[7] SERVICING

(1) Cylinder Head



Top Clearance

1. Remove the cylinder head (remove the cylinder head gasket completely).
2. Set the piston to its top dead center, set 1.5 mm (0.059 in.) dia. 5.0 to 7.0 mm (0.20 to 0.27 in.) long fuse wires to 3 or 4 spots on the piston top with grease so as to avoid the intake and exhaust valves.
3. Set the piston to its middle position, install the cylinder head, and tighten the cylinder head screws to specification. (Head gasket must be changed to new one).
4. Turn the crankshaft 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.	V3800DI-T-E3	0.701 to 0.930 mm 0.0276 to 0.0366 in.
Tightening torque	Cylinder head mounting screw		98.1 to 107 N·m 10.0 to 11.0 kgf·m 72.4 to 79.5 lbf·ft

(1) Fuse

W1049122

Cylinder Head Surface Flatness

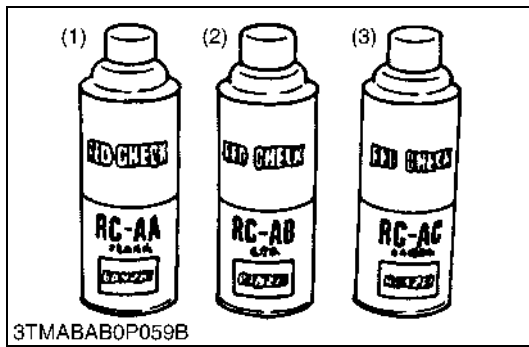
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides (A), (B), (C) and (D) and two diagonal (E) and (F) as shown in the figure. Measure the clearance with a feeler gauge.
3. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ IMPORTANT

- Be sure to check the valve recessing after correcting.

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.

W1061323



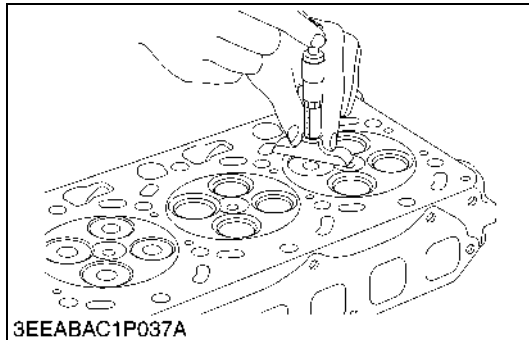
Cylinder Head Flaw

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

(1) Red Permeative Liquid
(2) Detergent

(3) White Developer

W1076542



Valve Recessing

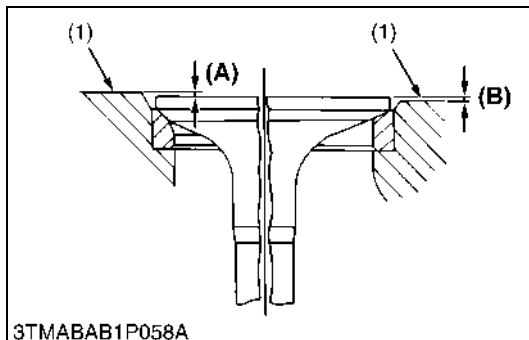
1. Clean the cylinder head, the valve face and seat.
 2. Insert the valve into the valve guide.
 3. Measure the valve recessing with a depth gauge.
 4. If the measurement exceeds the allowable limit, replace the valve.
- If it still exceeds the allowable limit after replacing the valve, replace the cylinder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

Valve recessing	Factory spec.	Intake valve	(recessing) 0.6 to 0.8 mm 0.024 to 0.031 in.
		Exhaust valve	(recessing) 0.850 to 1.05 mm 0.0335 to 0.0413 in.
	Allowable limit	(recessing) 1.2 mm 0.047 in.	

(1) Cylinder Head Surface

(A) Recessing
(B) Protrusion

W1061543



Valve Lapping

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

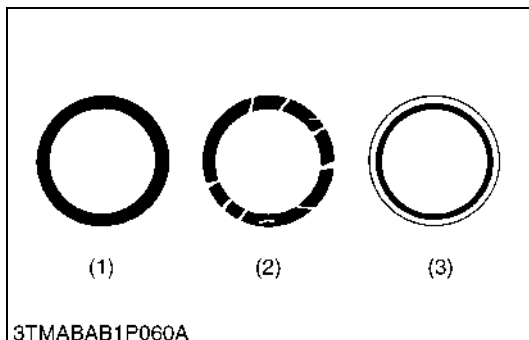
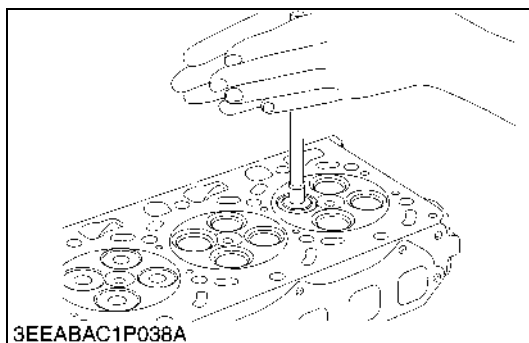
■ IMPORTANT

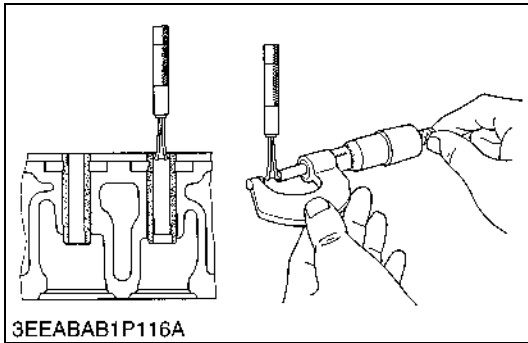
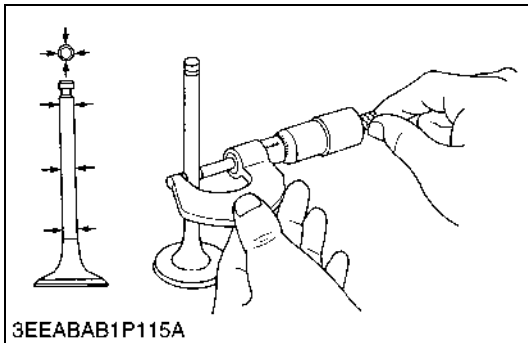
- When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.

(1) Correct
(2) Incorrect

(3) Incorrect

W1061709





Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. of the cylinder head at the most wear part as shown in the figure below with a small hole gauge. And calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

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

Valve stem O.D.	Factory spec.	Intake valve	6.960 to 6.975 mm 0.2741 to 0.2746 in.
		Exhaust valve	6.960 to 6.975 mm 0.2741 to 0.2746 in.

Valve guide I.D.	Factory spec.	Intake valve	7.030 to 7.045 mm 0.2768 to 0.2773 in.
		Exhaust valve	7.030 to 7.045 mm 0.2768 to 0.2773 in.

W1061883

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.

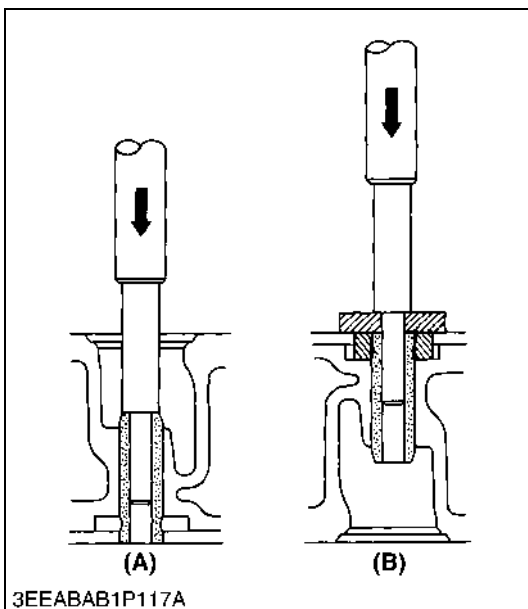
■ IMPORTANT

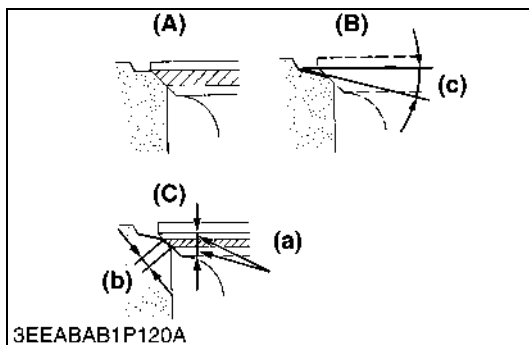
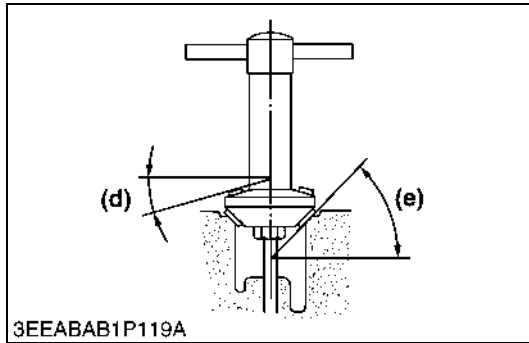
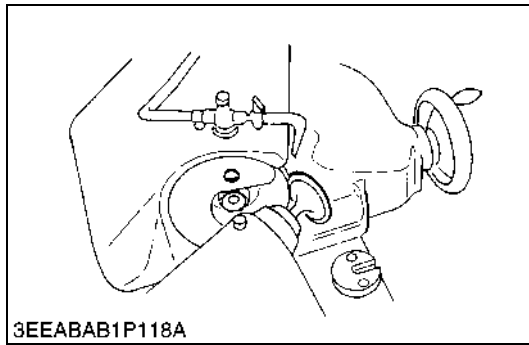
- Do not hit the valve guide with a hammer, etc. during replacement.

(A) When Removing

(B) When Installing

W1062212





Correcting Valve and Valve Seat

NOTE

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

1) Correcting Valve

1. Correct the valve with a valve refacer.

Valve face angle	Factory spec.	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

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) valve seat cutter.
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.

Valve seat width	Factory spec.	IN.	1.6 to 2.0 mm 0.063 to 0.078 in.
		EX.	2.3 to 2.6 mm 0.091 to 0.10 in.

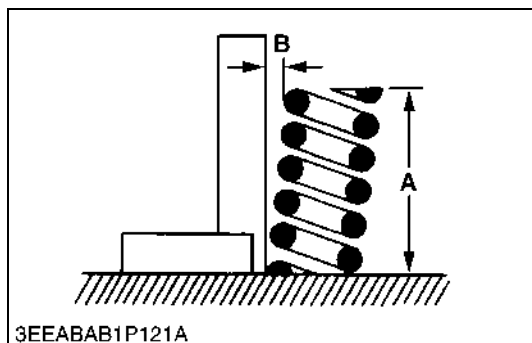
3. After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.
4. Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

Valve seat angle	Factory spec.	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

- (A) Check Contact
(B) Correct Seat Width
(C) Check Contact

- (a) Identical Dimensions
(b) Valve Seat Width
(c) 0.523 rad (30 °) or 0.262 rad (15 °)
(d) 0.262 rad (15 °) or 0.523 rad (30 °)
(e) 0.785 rad (45 °) or 1.047 rad (60 °)

W10283500



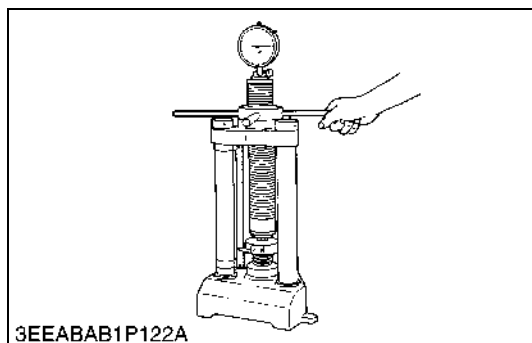
Free Length and Tilt of Valve Spring

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 1.39 to 1.4016 in.
		Exhaust valve	35.1 to 35.6 mm 1.39 to 1.4016 in.
	Allowable limit	Intake valve	34.6 mm 1.36 in.
		Exhaust valve	34.6 mm 1.36 in.

Tilt (B)	Allowable limit	1.0 mm 0.039 in.

W1063303

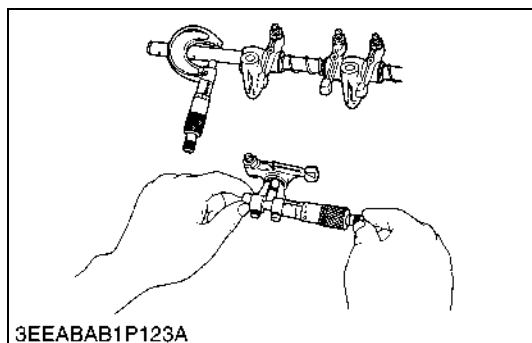


Valve Spring Setting Load

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	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.
		Exhaust valve	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.
	Allowable limit	Intake valve	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.24 in.
		Exhaust valve	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.24 in.

W1063470



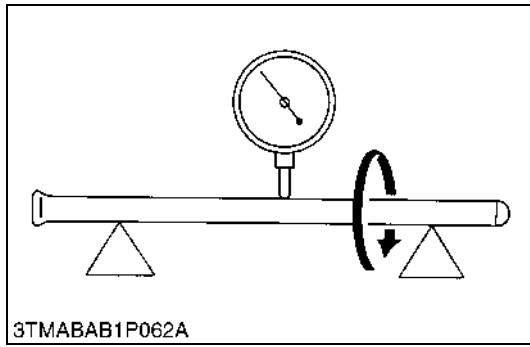
Oil Clearance between Rocker Arm Shaft and Bearing

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 0.00063 to 0.0017 in.
	Allowable limit	0.15 mm 0.0059 in.

Rocker arm shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.62886 to 0.62929 in.
Rocker arm I.D. for shaft	Factory spec.	16.000 to 16.018 mm 0.62993 to 0.63062 in.

W1063697

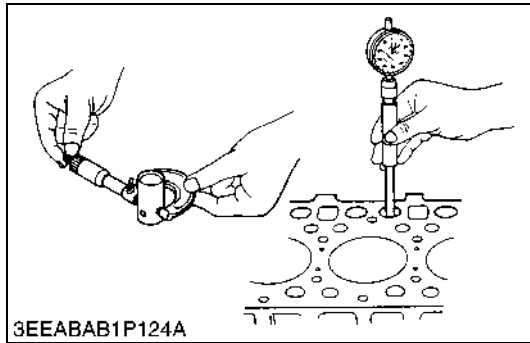


Push Rod Alignment

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.

W10292900



Oil Clearance between Tappet and Tappet Guide Bore

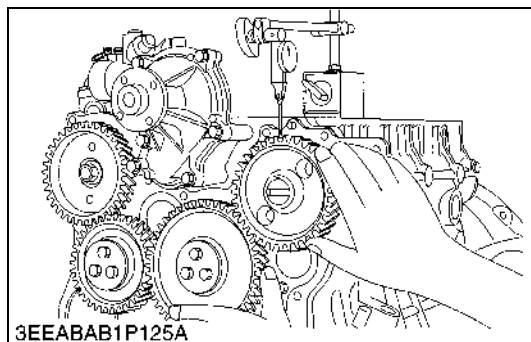
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil clearance between tappet and guide bore	Factory spec.	0.020 to 0.062 mm 0.00079 to 0.0024 in.
	Allowable limit	0.07 mm 0.003 in.

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94409 in.
Tappet guide bore I.D.	Factory spec.	24.000 to 24.021 mm 0.94489 to 0.94570 in.

W1063847

(2) Idle Gear and Camshaft



Timing Gear Backlash

1. Set a dial indicator (lever type) with its tip on the gear tooth.
2. Move the gear to measure the backlash, holding its mating gear.
3. If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.
4. If the oil clearance is proper, replace the gear.

Backlash between crank gear and idle gear 1	Factory spec.	0.0490 to 0.193 mm 0.00193 to 0.00759 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between idle gear 1 and cam gear	Factory spec.	0.0490 to 0.189 mm 0.00193 to 0.00744 in.
	Allowable limit	0.22 mm 0.0087 in.

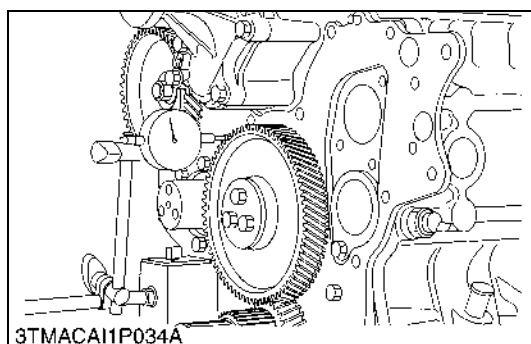
Backlash between idle gear 1 and idle gear 2	Factory spec.	0.0440 to 0.185 mm 0.00174 to 0.00728 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between idle gear 2 and injection pump gear	Factory spec.	0.0440 to 0.177 mm 0.00174 to 0.00696 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between cam gear and balancer gear 1	Factory spec.	0.0470 to 0.182 mm 0.00188 to 0.00716 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between idle gear 1 and balancer gear 2	Factory spec.	0.0440 to 0.183 mm 0.00174 to 0.00720 in.
	Allowable limit	0.22 mm 0.0087 in.

W1064048

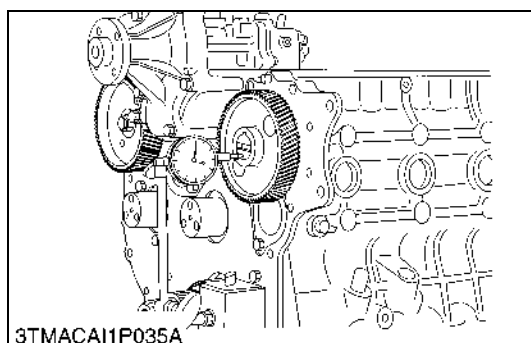


Idle Gear Side Clearance

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.

Idle gear side clearance	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.011 in.
	Allowable limit	0.9 mm 0.04 in.

W1064208

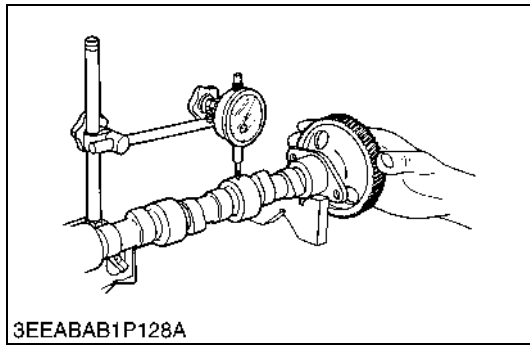


Camshaft Side Clearance

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.

Side clearance	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0086 in.
	Allowable limit	0.30 mm 0.012 in.

W1064307

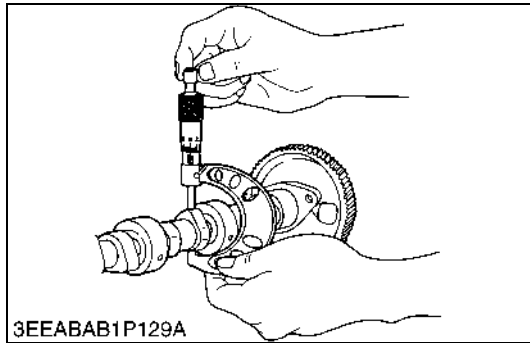


Camshaft Alignment

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 0.0004 in.

W1064422

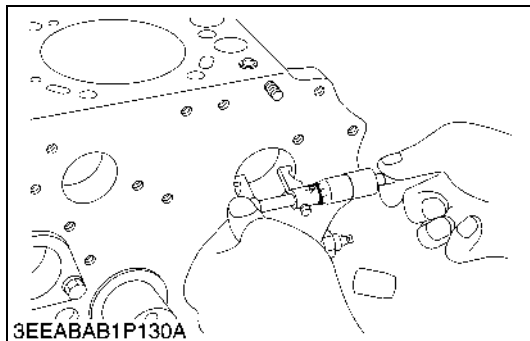


Cam Height

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

Intake and exhaust cam height	Factory spec.	Intake valve	37.63 mm 1.481 in.
		Exhaust valve	38.96 mm 1.534 in.
	Allowable limit	Intake valve	37.13 mm 1.462 in.
		Exhaust valve	38.46 mm 1.514 in.

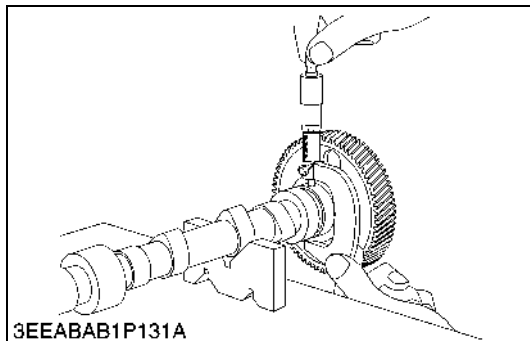
W1064551



Oil Clearance of Camshaft Journal

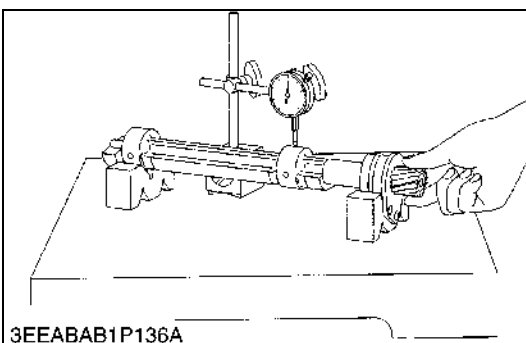
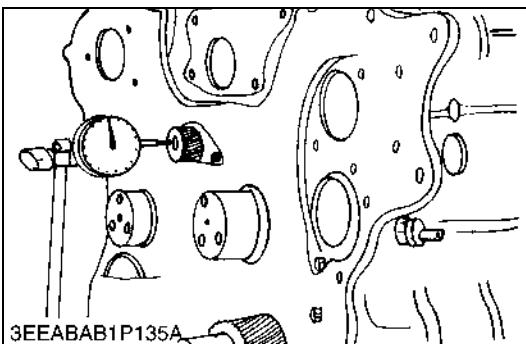
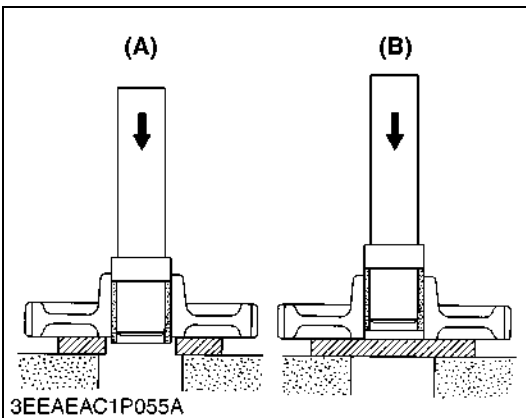
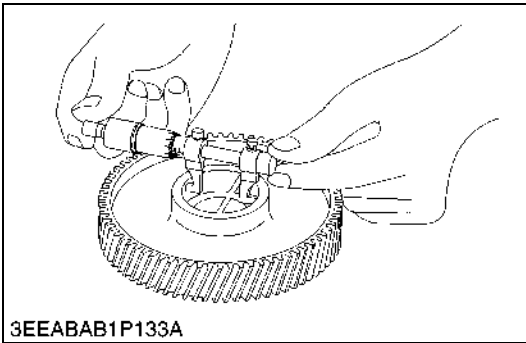
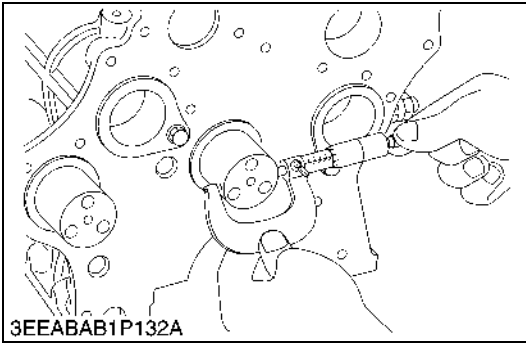
1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.



Camshaft journal O.D.	Factory spec.	45.934 to 45.950 mm 1.8085 to 1.8090 in.
Camshaft bearing I.D.	Factory spec.	46.000 to 46.025 mm 1.8111 to 1.8120 in.

W1064798



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 bushings I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing.

Oil clearance between idle gear 1, 2 shaft and idle gear 1, 2 bushing	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear 1, 2 bushing I.D.	Factory spec.	45.025 to 45.050 mm 1.7727 to 1.7736 in.
Idle gear 1, 2 shaft O.D.	Factory spec.	44.959 to 44.975 mm 1.7701 to 1.7706 in.

W1064968

Replacing Idle Gear Bushing

(When removing)

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

(When installing)

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

(A) When Removing

(B) When Installing

W10302410

Balancer Shaft Side Clearance

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

Side clearance	Factory spec.	0.070 to 0.22 mm 0.00276 to 0.0087 in.
	Allowable limit	0.3 mm 0.011 in.

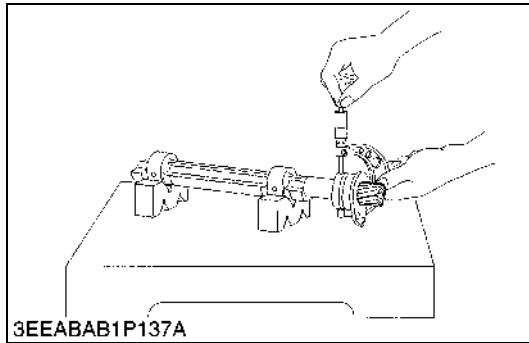
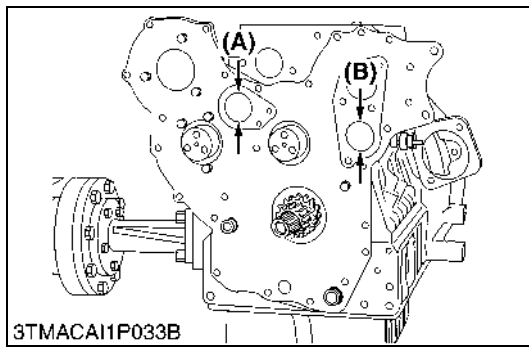
W1065273

Balance Shaft Alignment

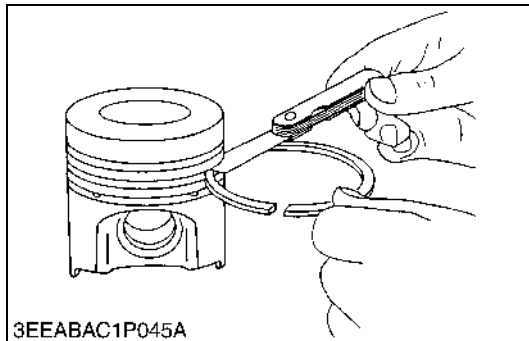
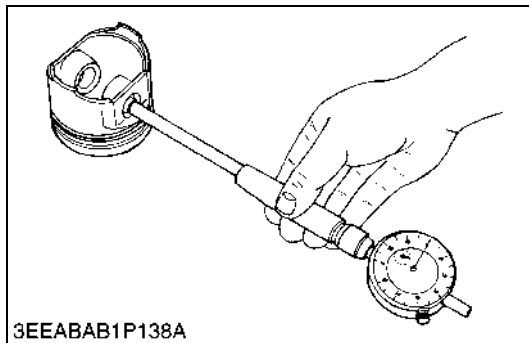
1. Support the balancer shaft with V blocks on the surface plate and set a dial indicator with its tip on the intermediate journal at high angle.
2. Rotate the balancer shaft on the V block and get the misalignment (half of the measurement).
3. If the misalignment exceeds the allowable limit, replace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

Balancer shaft alignment	Allowable limit	0.02 mm 0.0008 in.

W1065448



(3) Piston and Connecting Rod



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 0.00276 to 0.00625 in.
	Allowable limit	0.2 mm 0.008 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. (A), (B)	Factory spec.	51.01 to 51.08 mm 2.008 to 2.011 in.

(A) Balancer-shaft Bearing I.D.

(B) Balancer-shaft Bearing I.D.

W1065581

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 1.183 in.

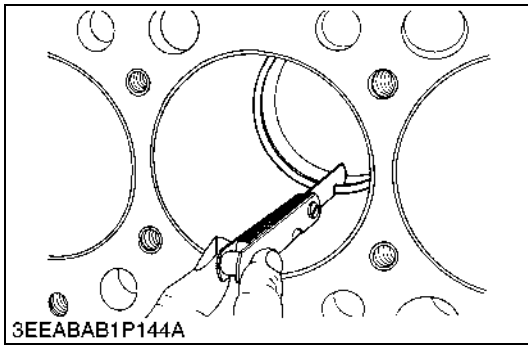
W1065759

Clearance between Piston Ring and Groove

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

Factory spec.	Top ring	0.05 to 0.09 mm 0.002 to 0.003 in.
	Second ring	0.0930 to 0.120 mm 0.00367 to 0.00472 in.
	Oil ring	0.020 to 0.060 mm 0.00079 to 0.0023 in.
Allowable limit	Top ring	0.15 mm 0.0059 in.
	Second ring	0.20 mm 0.0079 in.
	Oil ring	0.15 mm 0.0059 in.

W1066183



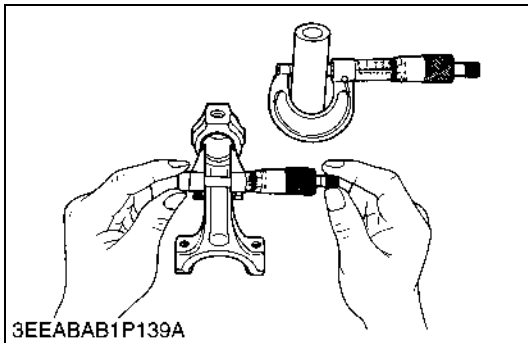
Piston Ring Gap

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.

Top ring and second ring	Factory spec.	0.30 to 0.45 mm 0.012 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil ring	Factory spec.	0.25 to 0.45 mm 0.0099 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

W1066430



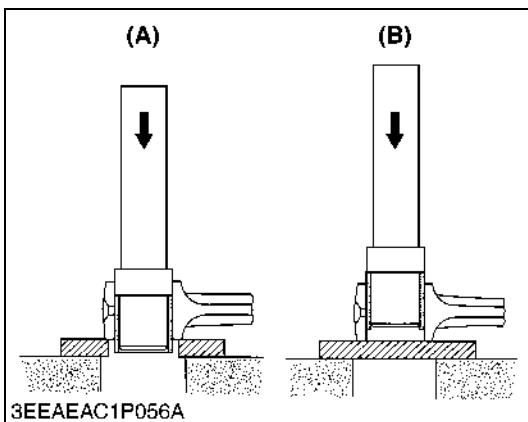
Oil Clearance between Piston Pin and Small End Bushing

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 0.00079 to 0.0015 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	30.006 to 30.011 mm 1.1814 to 1.1815 in.
Small end bushing I.D.	Factory spec.	30.031 to 30.046 mm 1.1824 to 1.1829 in.

W1065897



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.

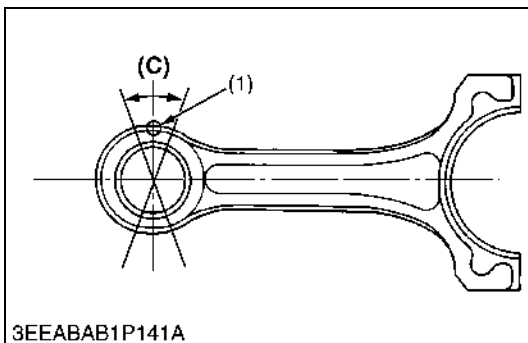
(1) Seam

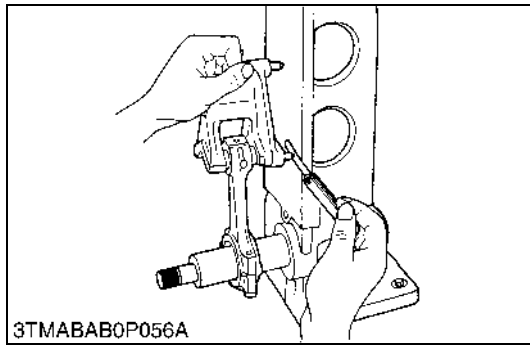
(A) When Removing

(B) When Installing

(C) 0.26 rad (15 °)

W1066057





Connecting Rod Alignment

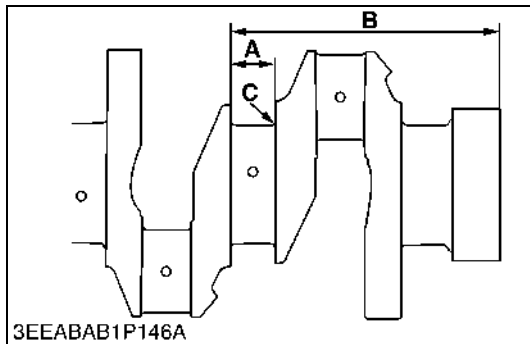
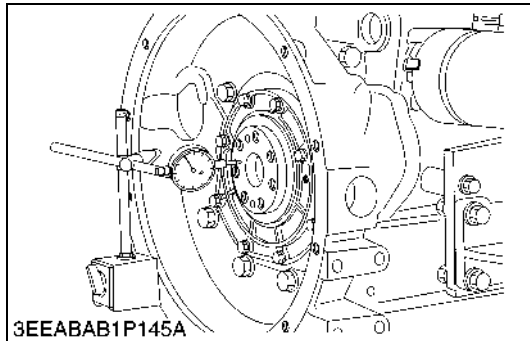
NOTE

- Since the I.D. of the connecting rod small end bushing is the basis of this check, check the bushing for wear beforehand.
- Remove the piston pin in the connecting rod.
 - Install the piston pin in the connecting rod.
 - Install the connecting rod on the connecting rod alignment tool.
 - Put a gauge over the piston pin, and move it against the face plate.
 - If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.
 - If the measurement exceeds the allowable limit, replace the connecting rod.

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.

W1066581

(4) Crankshaft



Crankshaft Side Clearance

- Set a dial indicator with its tip on the end of the crankshaft.
- Measure the side clearance by moving the crankshaft to the front and rear.
- If the measurement exceeds the allowable limit, replace the thrust bearings.
- 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.

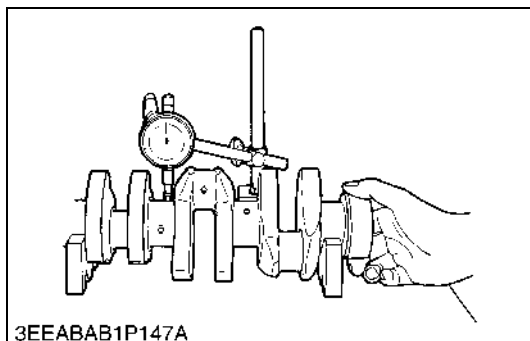
Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.012 in.
	Allowable limit	0.50 mm 0.020 in.

(Reference)

- 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

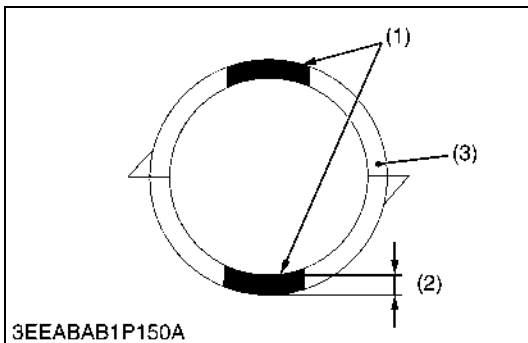
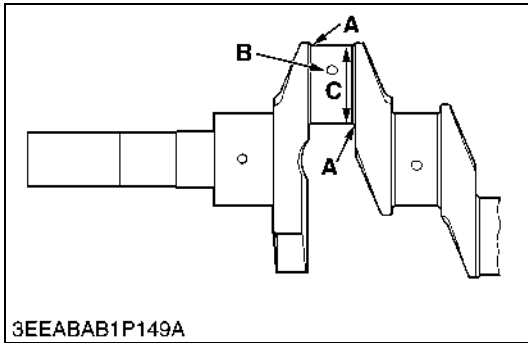
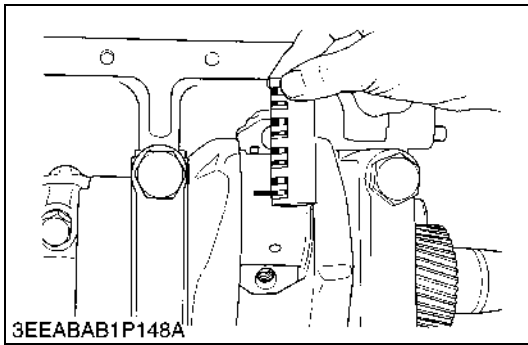


Crankshaft Alignment

- 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.
- Rotate the crankshaft on the V block and get the misalignment (half of the measurement).
- If the misalignment exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.

W1067285



Oil Clearance between Crankpin and Crankpin Bearing

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

NOTE

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

Crankpin O.D.	Factory spec.	52.977 to 52.990 mm 2.0857 to 2.0862 in.

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.018 to 0.051 mm 0.00071 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

IMPORTANT

- **STD size crankpin bearing.**

To replace it with a specific STD service part, make sure the crankpin bearing has the same ID color as the connecting rod.

ID Color	Connecting rod	Crankpin bearing		
	Large-end in. dia.	Class	Part code	Center wall thick
Blue	56.01 to 56.02 mm 2.2051 to 2.2055 in.	L	1C020-22311	1.496 to 1.501 mm 0.05890 to 0.05909 in.
Without color	56.00 to 56.01 mm 2.2047 to 2.2051 in.	S	1C020-22331	1.491 to 1.496 mm 0.05870 to 0.05889 in.

(Reference)

- Undersize dimensions of crankpin

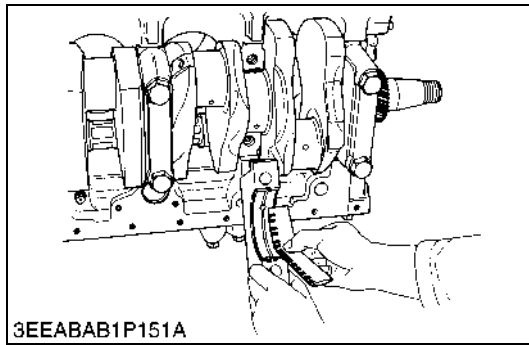
Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension C	52.777 to 52.790 mm dia. 2.0779 to 2.0783 in. dia.	52.577 to 52.590 mm dia. 2.0700 to 2.0704 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ∇∇∇∇. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

(1) ID Color

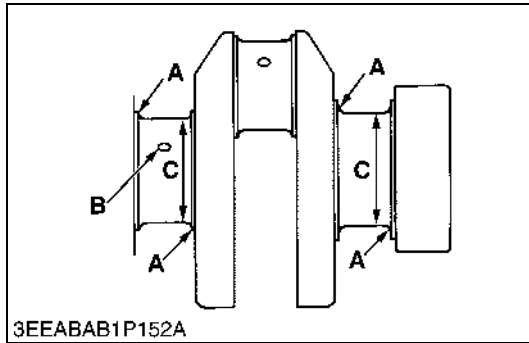
(3) Crankpin Bearing

(2) Center Wall Thick

W1067389



3EEABAB1P151A



3EEABAB1P152A

Oil Clearance between Crankshaft Journal and Crankshaft Bearing

1. Clean the crankshaft journal and crankshaft bearing.
2. Put a strip of press gauge on the center of the journal.

■ IMPORTANT

- **Never insert the press gauge into the oil hole of the journal.**
3. Install the 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.

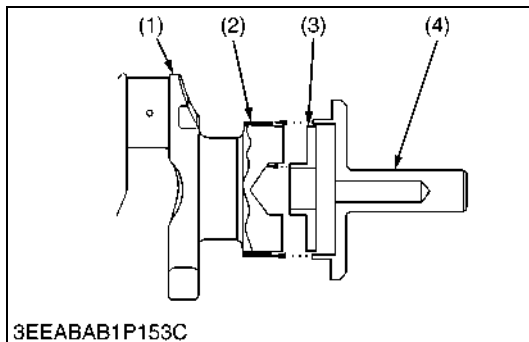
Crankshaft journal O.D.	Factory spec.	74.977 to 74.990 mm 2.9519 to 2.9523 in.
Oil clearance between crankshaft journal and crankshaft bearing	Factory spec.	0.018 to 0.062 mm 0.00071 to 0.0024 in.
	Allowable limit	0.20 mm 0.0079 in.

(Reference)

- Undersize dimensions of crankshaft journal.

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension C	74.777 to 74.790 mm dia. 2.9440 to 2.9444 in. dia.	74.577 to 74.590 mm dia. 2.9361 to 2.9366 in. dia.
(0.8-S) The crankshaft journal must be fine-finished to higher than ∇∇∇∇. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

W1069159



3EEABAB1P153C

Replacing Crankshaft Sleeve

1. Remove the used crankshaft sleeve (2).
2. Set the sleeve guide (3) to the crankshaft (1).
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 (4).

■ NOTE

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

(1) Crankshaft

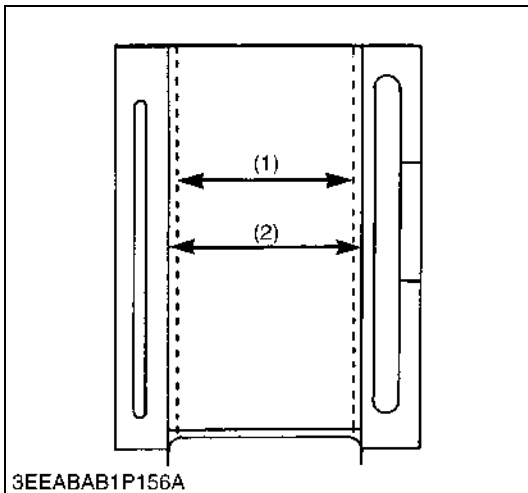
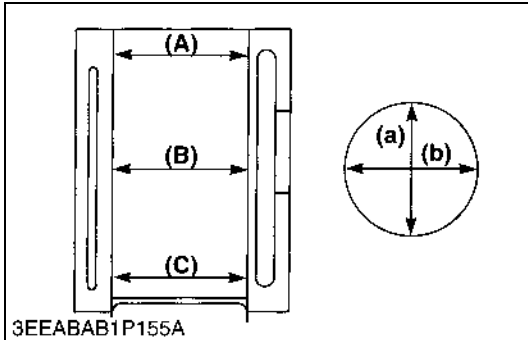
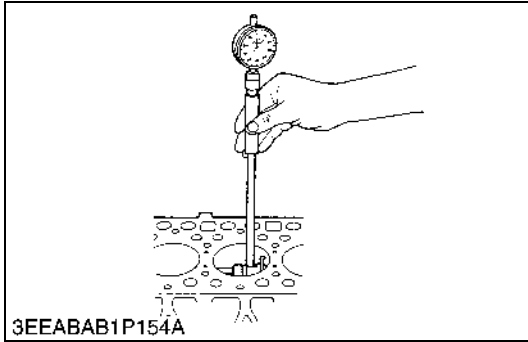
(2) Crankshaft Sleeve

(3) Sleeve Guide

(4) Auxiliary Socket for Pushing

W1069911

(5) Cylinder



Cylinder Wear

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

Cylinder Bore I.D.	Factory spec.	100.000 to 100.022 mm 3.9370 to 3.9379 in.
	Allowable limit	100.150 mm 3.9429 in.

(A) Top

(B) Middle

(C) Bottom (Skirt)

(a) Right-angled to piston pin

(b) Piston pin direction

W1070089

Correcting Cylinder (Oversize)

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

Cylinder I.D. (2)	Factory spec.	100.500 to 100.522 mm 3.95670 to 3.95755 in.
Maximum wear	Allowable limit	100.650 mm 3.96260 in.
Finishing	Hone to 0.2 to 0.8 μm Rz ▽▽▽▽ (8 to 30 $\mu\text{in.}$ Rz)	

2. Replace the piston and piston rings with oversize 0.5 mm (0.02 in.) ones.

■ NOTE

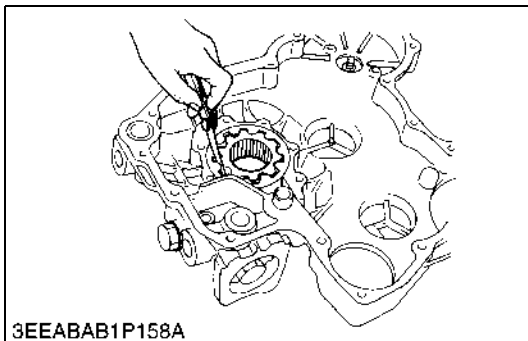
- When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.

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

(2) Oversize Cylinder I.D.

W10344480

(6) Oil Pump

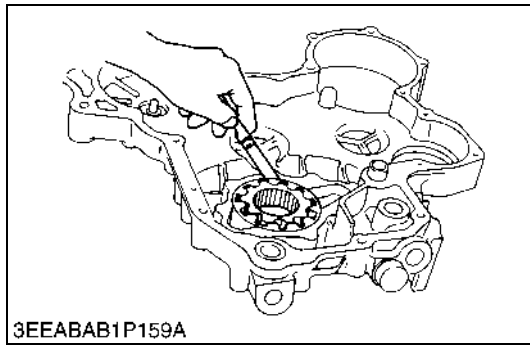


Rotor Lobe Clearance

1. Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor	Factory spec.	0.04 to 0.16 mm 0.0016 to 0.0062 in.
	Allowable limit	0.3 mm 0.01 in.

W1071254

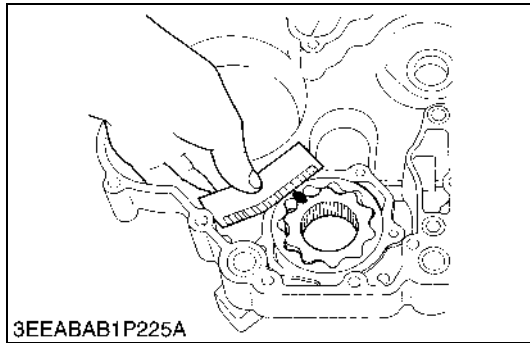


Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.100 to 0.184 mm 0.00394 to 0.00724 in.
	Allowable limit	0.3 mm 0.01 in.

W1071334



Clearance between Rotor and Cover

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

Clearance between rotor and cover	Factory spec.	0.025 to 0.075 mm 0.00099 to 0.0029 in.
	Allowable limit	0.225 mm 0.00866 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 lbf·ft

W1148218

2 CLUTCH

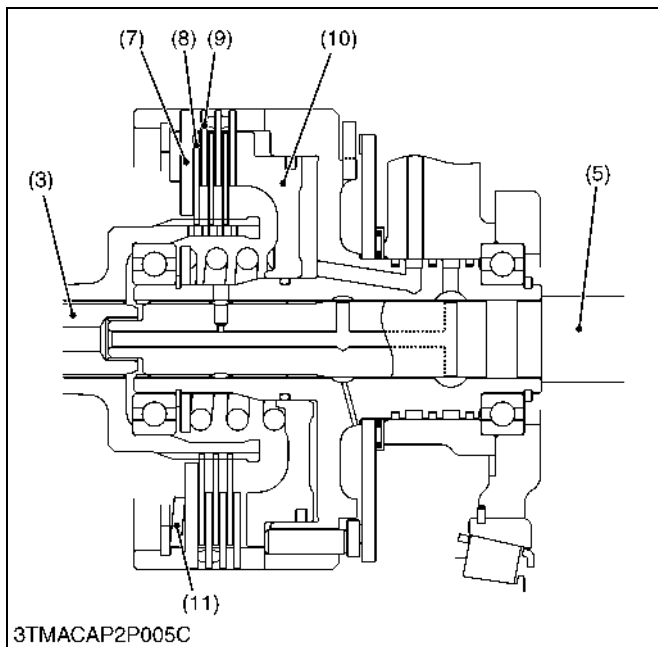
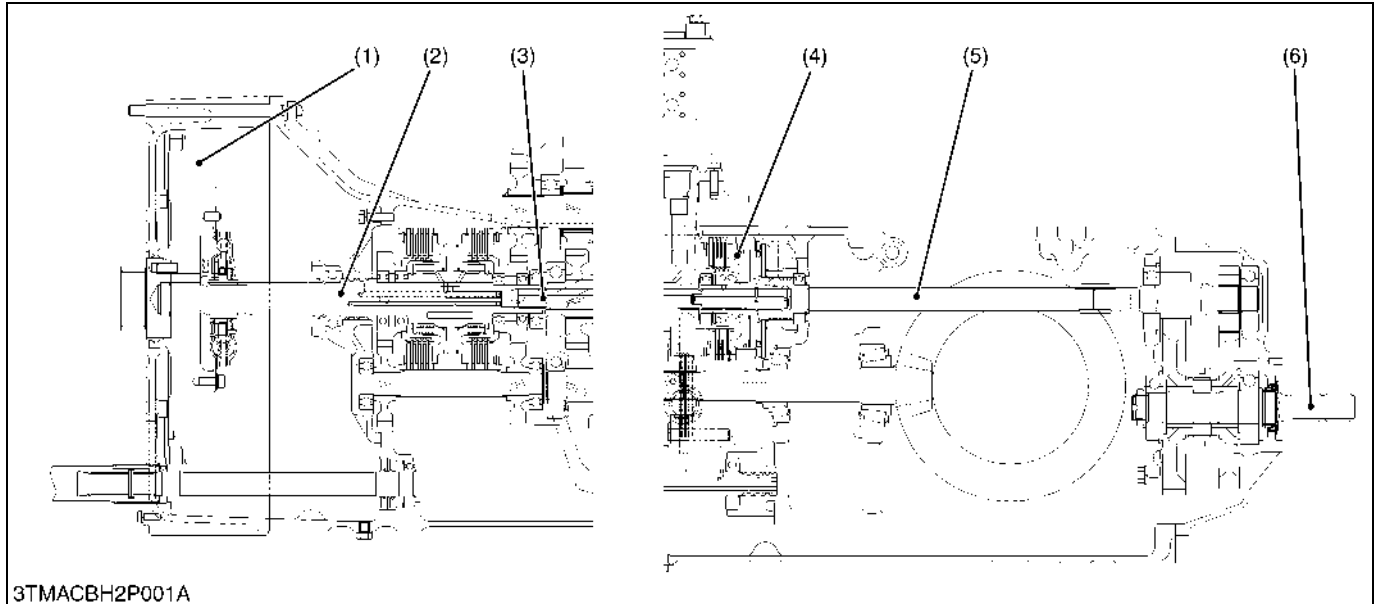
MECHANISM

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[2] PTO SOLENOID VALVE, RELIEF VALVE AND OIL FLOW.....	2-M2

1. PTO CLUTCH

[1] STRUCTURE



As shown in the figure above, the PTO propeller shaft 1 (3) is splined to the input shaft (2) and is always rotating while the engine is running.

The PTO clutch pack (4) has three clutch discs (8), three drive plates (9), a belleville washer (cupped spring washer) (11) and one pressure plate (7). The clutch piston (10) actuated b hydraulic from PTO clutch valve, tightly presses the clutch discs (8) and drive plates (9) toward the pressure plate (7).

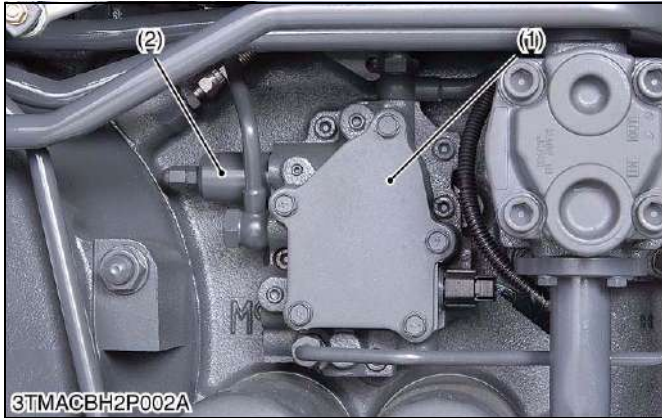
As a result, the rotation of the PTO propeller shaft 1 (3) is transmitted to the PTO propeller shaft 2 (5) through the PTO clutch pack (4).

The belleville washer (cupped spring washer) (11) reduce the engaging shock. Thereby, the PTO clutch is engaged very smoothly.

(1) Flywheel	(7) Pressure Plate
(2) Input Shaft	(8) Clutch Disc
(3) PTO Propeller Shaft 1	(9) Drive Plate
(4) PTO Clutch Pack	(10) Clutch Piston
(5) PTO Propeller Shaft 2	(11) Belleville Washer
(6) PTO Shaft	(Cupped Spring Washer)

W1012717

[2] PTO SOLENOID VALVE, RELIEF VALVE AND OIL FLOW



When the PTO switch is at the **OFF** position, the oil flows is stopped by the PTO solenoid valve (3).

When the PTO switch is at **ON** position, the solenoid valve (3) is operated and the oil flows through the PTO solenoid valve (3) to the PTO clutch pack (5) to engage it.

The relief valve (2) maintains the hydraulic system pressure and supply the oil to lubricate the shuttle section, synchro-mesh gears, PTO clutch pack and PTO brake section.

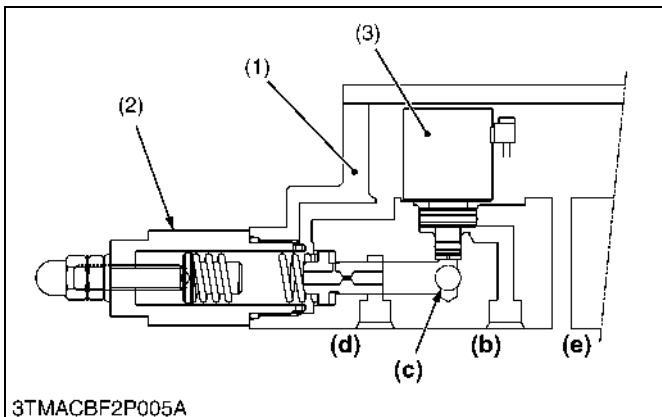
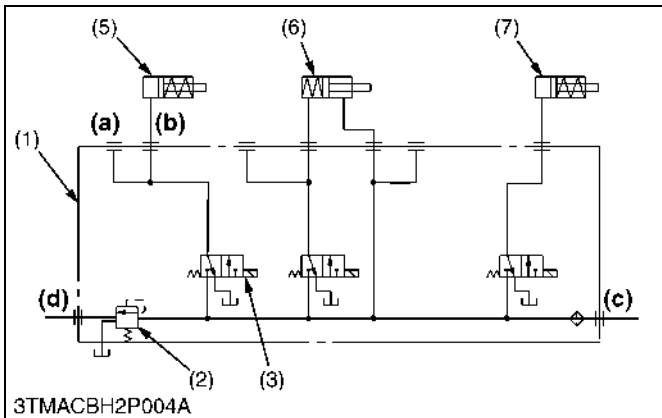
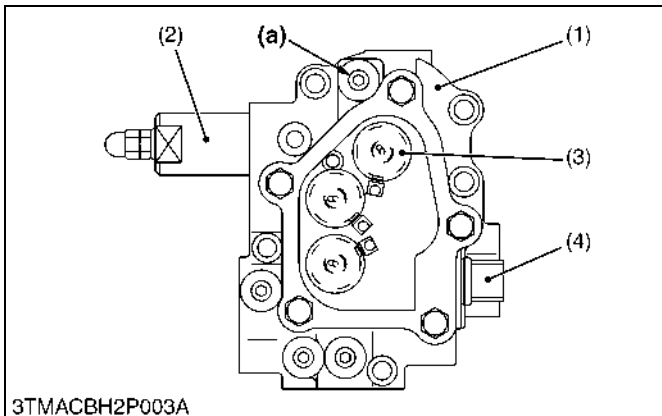
■ NOTE

- Hydraulic system pressure is a operating pressure for the PTO clutch pack and 2WD-4WD clutch pack.

(2.16 MPa, 22.0 kgf/cm², 313 psi)

(1) Solenoid Valve Assembly	(a) Check Port for PTO Pressure
(2) Relief Valve	(b) PTO Port
(3) PTO Solenoid Valve	(c) P Port
(4) Connector	(d) Lubricating Port
(5) PTO Clutch Pack	(e) T Port
(6) 2WD-4WD Clutch Pack	
(7) Differential Lock Piston	

W1012967



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1. TROUBLESHOOTING

PTO CLUTCH

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	Operating pressure is low	Adjust	2-S5
	PTO solenoid valve malfunctioning	Replace	9-S43
	Clutch disc or drive plate excessively worn	Replace	2-S8, 10
	Deformation of piston or return plate	Replace	2-S8
PTO Shaft Does Not Rotate	PTO clutch malfunctioning	Repair or replace	2-S6
	PTO propeller shaft coupling disengaged	Engage	–
	PTO solenoid valve malfunctioning	Replace	9-S43
	PTO switch malfunctioning	Replace	9-S27
PTO Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	G-9
	Relief valve malfunctioning	Adjust or replace	2-S5
PTO Clutch Drags	Brake plate excessively worn	Replace	2-S8
	Return spring weaken or broken	Replace	2-S8
	Deformation of plate or steel plate	Replace	2-S8, 10

W1011019

2. SERVICING SPECIFICATIONS

TRAVELING CLUTCH (HYDRAULIC SHUTTLE MODEL)

Item		Factory Specification	Allowable Limit
Clutch Pedal (ROPS Model)	Free Travel	15 to 20 mm 0.59 to 0.79 in.	—
	Total Stroke	145 to 155 mm 5.71 to 6.10 in.	—
Clutch Pedal (CABIN Model)	Free Travel	15 to 25 mm 0.59 to 0.98 in.	—
	Total Stroke	155 to 165 mm 6.11 to 6.49 in.	—

W1013874

PTO CLUTCH

PTO Clutch Valve Condition • Engine Speed Maximum • Oil temperature 45 to 55 °C (113 to 131 °F)	PTO Clutch Operating	2.16 to 2.26 MPa 22 to 23 kgf/cm ² 312.91 to 327.14 psi	—
PTO Clutch Disc	Thickness	2.5 to 2.7 mm 0.098 to 0.106 in.	2.1 mm 0.083 in.
PTO Steel Plate	Thickness	1.93 to 2.07 mm 0.076 to 0.081 in.	1.80 mm 0.071 in.
PTO Piston	Flatness	—	0.15 mm 0.006 in.
PTO Steel Plate	Flatness	—	0.30 mm 0.012 in.
PTO Return Spring	Free Length	46.0 mm 1.811 in.	37.5 mm 1.48 in.
Seal Ring	Thickness	2.45 to 2.50 mm 0.096 to 0.098 in.	2.0 mm 0.079 in.

W1013874

3. TIGHTENING TORQUES

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

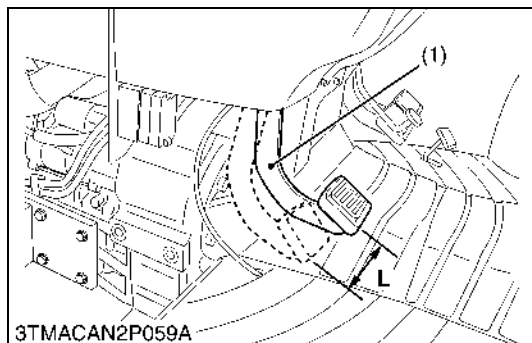
Item	N·m	kgf·m	lbf·ft
PTO clutch holder mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3

W1012736

4. CHECKING AND ADJUSTING

[1] CLUTCH PEDAL FREE TRAVEL

(1) ROPS Model



Clutch Pedal Free Travel (Hydraulic Shuttle Model)

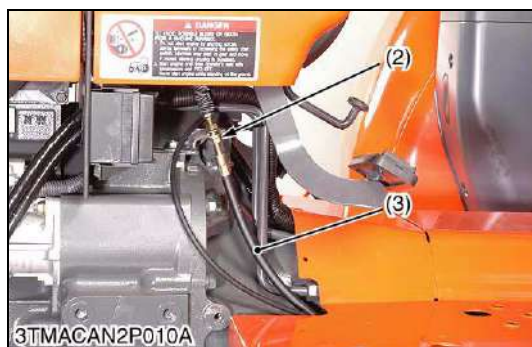
1. Measure the clutch pedal free travel (L).
2. If adjustment is needed, change with clutch wire cable (3) retaining nut (2) so that the free travel becomes 15.0 to 20.0 mm (0.59 to 0.79 in.).
3. After adjustment is completed secure the nut.

Clutch pedal free travel (L)	Factory spec.	15 to 20 mm 0.59 to 0.79 in.

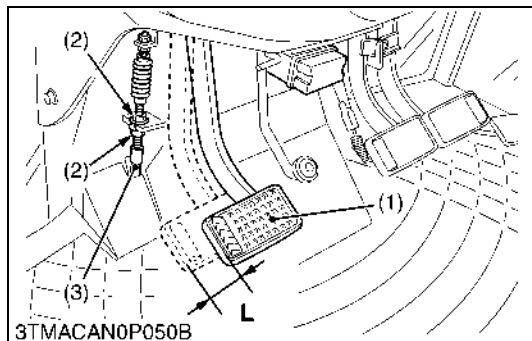
- (1) Clutch Pedal
- (2) Nut
- (3) Clutch Wire Cable

L : Free Travel

W1028233



(2) CABIN Model



Clutch Pedal Free Travel (Hydraulic Shuttle Model)

1. Measure the clutch pedal free travel (L).
2. If adjustment is needed, change with clutch wire cable (3) retaining nut (2) so that the free travel becomes 15.0 to 25.0 mm (0.59 to 0.98 in.).
3. After adjustment is completed secure the nut.

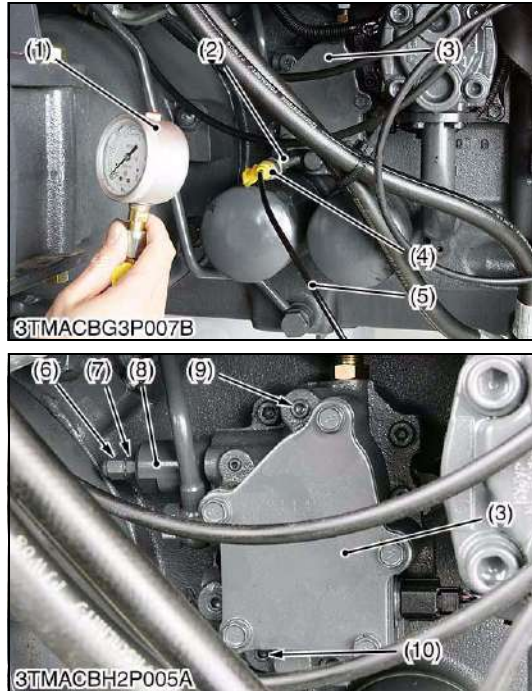
Clutch pedal free travel (L)	Factory spec.	15 to 25 mm 0.59 to 0.98 in.

- (1) Clutch Pedal
- (2) Nut
- (3) Clutch Wire Cable

L : Free Travel

W1109064

[2] PTO CLUTCH



PTO Clutch Operating Pressure

■ IMPORTANT

- Do not connect the universal joint of the implement to the tractor PTO shaft while testing.
 - Set the main shift lever and shuttle lever in Neutral position.
 - Set the parking brake lever in parking position.
1. Place the disassembling stand under the transmission case.
 2. Remove the right rear wheel and left fender.
 3. Place the disassembling stand under the left rear axle case.
 4. Remove the plug (R1/8) (13) on the solenoid valve assembly (3).
 5. Assemble the adaptor (R1/8) (2), threaded joint (4), cable (5) and pressure gauge (1).
 6. Start the engine and set the engine speed to maximum.
 7. Turn on the PTO switch and measure the oil pressure.
 8. If only the pressure in the PTO clutch engaged position is low, check the hydraulic PTO clutch system.
 9. If the measurement is not within the factory specifications, measure the system pressure, and adjust the system pressure with relief valve (8) if necessary.

PTO pressure (when PTO switch is "ON" position)	Factory spec.	2.16 to 2.26 MPa 22 to 23 kgf/cm ² 312.91 to 327.14 psi
PTO pressure (when PTO switch is "OFF" position)	Factory spec.	No pressure

Condition

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Oil temperature : 45 to 55 °C
113 to 131 °F

(Reference)

- Turn the adjusting screw after removed lock nuts (6) and (7).
- Turn the adjusting screw clockwise direction → Pressure increase
- Turn the adjusting screw counterclockwise direction → Pressure decrease.

■ NOTE

- Plug thread size : R1/8

(1) Pressure Gauge	(6) Lock Nut
(2) Adaptor	(7) Lock Nut
(3) Solenoid Valve Assembly	(8) Return Hose
(4) Threaded Joint	(9) Plug (PTO Clutch Check Port)
(5) Cable	(10) Plug (System Pressure Check Port)

W1075337

5. DISASSEMBLING AND ASSEMBLING

[1] REMOVING PTO CLUTCH PACK AND HOLDER

(1) Separating Transmission Case and Clutch Housing Case

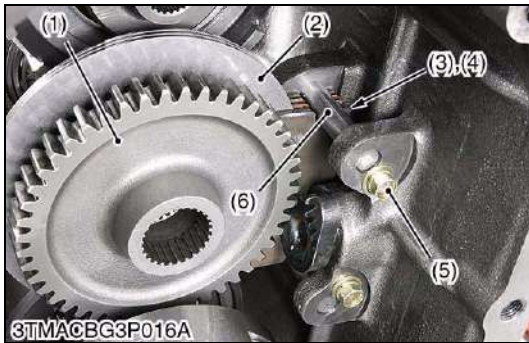


Separating Transmission Case

1. Refer to "5. DISASSEMBLING AND ASSEMBLING" at "3. TRANSMISSION" section.
2. Refer to "6.-[2] DISASSEMBLING AND ASSEMBLING" at "10. CABIN" section for separating cabin from tractor.

W1013737

(2) PTO Clutch Pack and Holder



Hand Brake Disc and Steel Plate

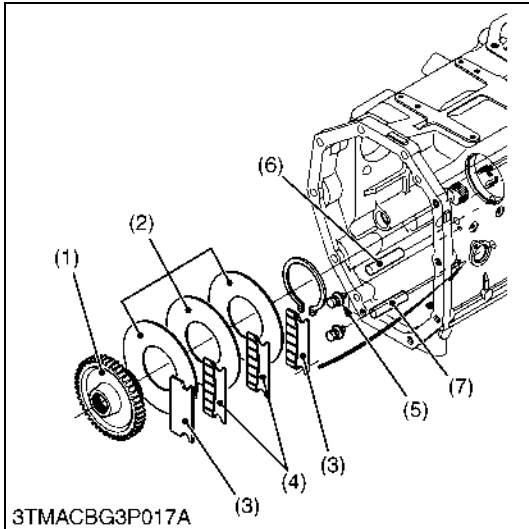
1. Remove the stopper screw (5) and upper pin (6).
2. Remove the disc (3) and (4).
3. Remove the 47T gear (1) with steel plates (2).

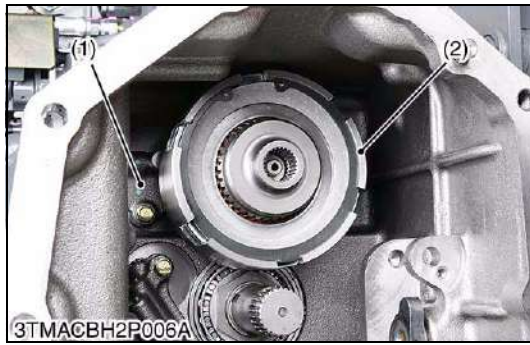
(When reassembling)

- Be sure to assemble the disc (3) and (4) to the original position as shown fig.

(1) 47T Gear	(5) Stopper Screw
(2) Steel Plate	(6) Upper Pin
(3) Disc (5.1 mm, 0.20 in.)	(7) Lower Pin
(4) Disc (2.8 mm, 0.11 in.)	

W1014172





Removing PTO Clutch Pack and Holder

1. Remove the pipes (3).
2. Remove the PTO clutch holder mounting screws.
3. Remove the PTO clutch (5) with holder (1).

(When reassembling)

- Apply transmission fluid to the O-rings (4).
- Replace the O-rings (4) with new one, if they are damaged.

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 lbf·ft

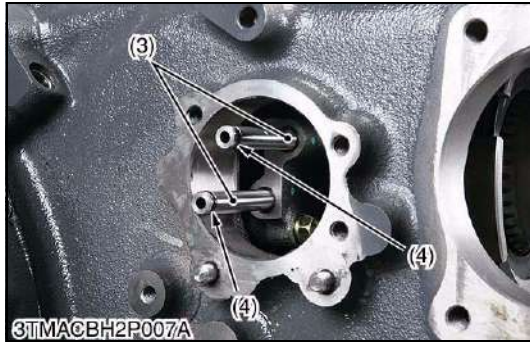
■ IMPORTANT

- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-pressure.**

- (1) Holder
(2) PTO Clutch

- (3) Pipe
(4) O-ring

W1023169



[2] SOLENOID VALVE (PTO)

(1) Removing Solenoid Valve Assembly



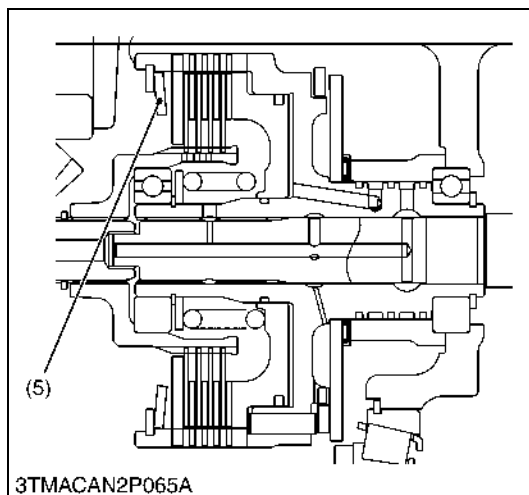
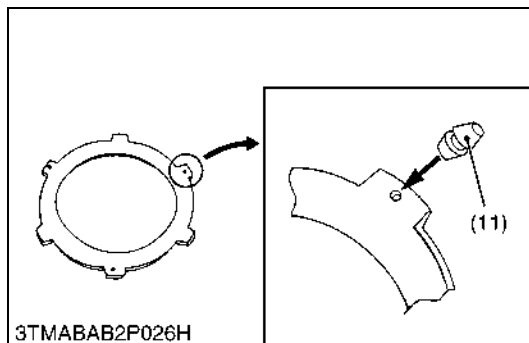
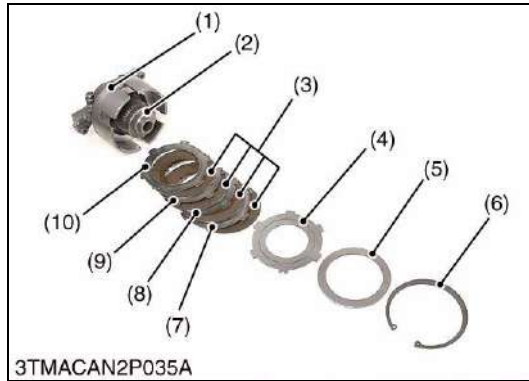
Solenoid Valve Assembly

1. Refer to the "5. DISASSEMBLING AND ASSEMBLING" at "3. TRANSMISSION" section.

- (1) Solenoid Valve Assembly

W1014144

(2) PTO Clutch Pack

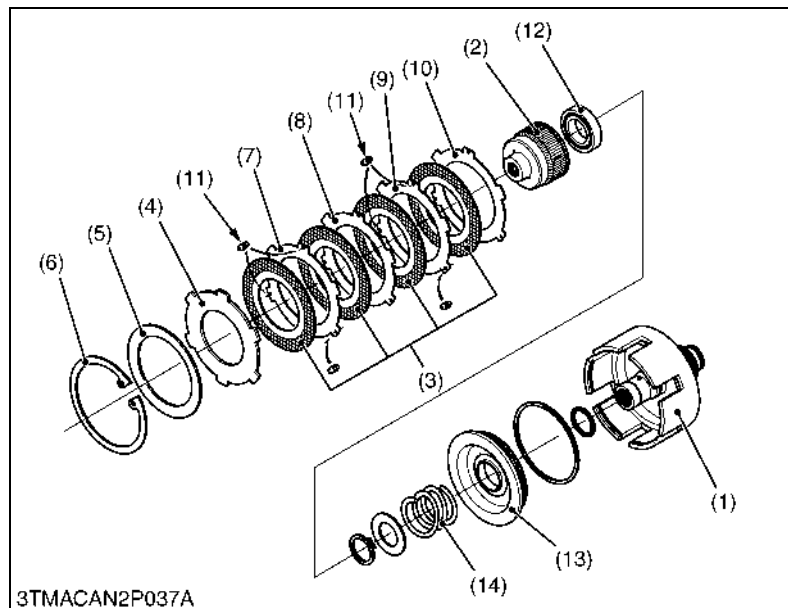


Clutch Hub and Clutch Discs

1. Remove the internal circlip (6), and then take out the clutch discs (3), belleville washer (cupped spring washer) (5), back plate (4), steel plates (7), (8), (9), (10), and the hub (2).

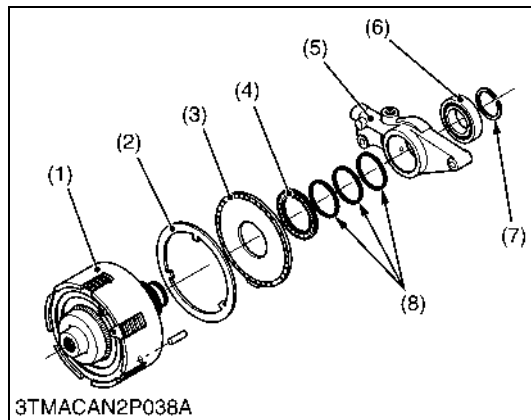
(When reassembling)

- Install the clutch discs (3) and steel plates (7), (8), (9), (10) alternately. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (11) are (7) and (9), and without plug rubbers (11) are (8) and (10).
- Do not confuse the back plate (4) and steel plates. The back plate (4) is thicker than the steel plates.
- Assemble the plug rubbers portion of the two steel plates (7) and (9) are same positions while assembling them. (Refer to figure below.)
- Apply enough transmission fluid to the discs (3).
- Confirm the moving of the piston (13) smoothly when pressure air at 0.29 to 0.39 MPa (3 to 4 kgf/cm², 42 to 57 psi) is sent to clutch pack. (Refer to the photo.)
- Assemble the steel plates with rubber (7) and (9) and steel plates without rubber (8) and (10) alternately, and steel plates are built in so that the part of rubber is not corresponding to the part of the hole.
- Be sure to assemble the belleville washer (cupped spring washer) (5) as shown in the figure.



(1) Clutch Case	(8) Steel Plate (Without Plug Rubbers)
(2) Hub	(9) Steel Plate (With Plug Rubbers)
(3) Clutch Discs	(10) Steel Plate (Without Plug Rubbers)
(4) Back Plate	(11) Plug Rubber
(5) Belleville Washer (Cupped Spring Washer)	(12) Bearing
(6) Internal Circlip	(13) Piston
(7) Steel Plate (With Plug Rubbers)	(14) Spring

W1023397

**Clutch Case**

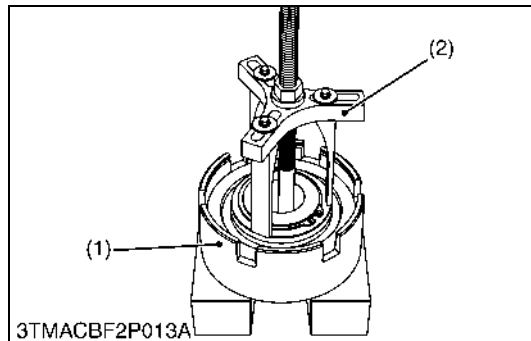
1. Remove the external circlip (7).
2. Remove the clutch case (5), brake disc (3) and brake plate (2).

(When reassembling)

- Direct the contact part of the brake disc (3) to the brake plate (2).
- Apply small amount of grease to the seal rings (8).

(1) Clutch Case	(5) Clutch Holder
(2) Brake Plate	(6) Bearing
(3) Brake Disc	(7) External Circlip
(4) Needle Bearing	(8) Seal Ring

W1024435

**Piston**

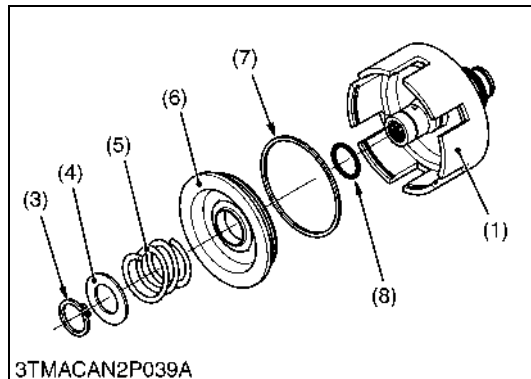
1. Press the washer (4) using the hydraulic clutch spring compressor. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. Remove the external circlip (3).
3. Remove the piston (6).

(When reassembling)

- Apply enough transmission fluid to seal ring (7) and (8).

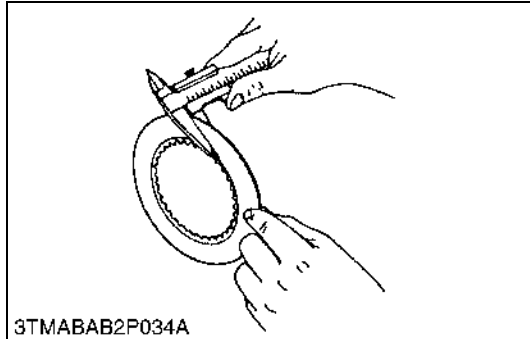
(1) Clutch Case	(5) Spring
(2) Hydraulic Clutch Spring Compressor	(6) Piston
(3) External Circlip	(7) Seal Ring
(4) Washer	(8) Seal Ring

W1024734



6. SERVICING

[1] PTO CLUTCH PACK

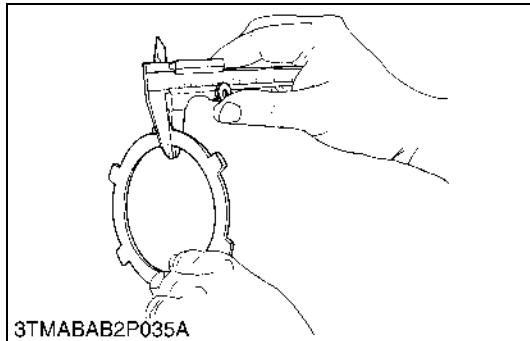


PTO Clutch Disc Wear

1. Measure the thickness of PTO clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of PTO clutch disc	Factory spec.	2.5 to 2.7 mm 0.098 to 0.106 in.
	Allowable limit	2.1 mm 0.083 in.

W1024926



PTO Steel Plate Wear

1. Measure the thickness of PTO steel plate with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of PTO steel plate	Factory spec.	1.93 to 2.07 mm 0.076 to 0.081 in.
	Allowable limit	1.80 mm 0.071 in.

W1025021



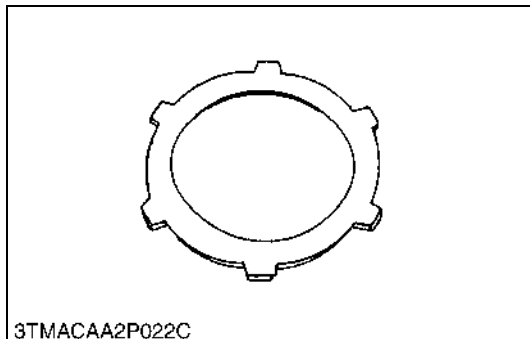
Flatness of PTO Piston and PTO Steel Plate

1. Place the part on a surface plate.
2. Try to insert a feeler gauge (allowable limit size) underneath it at least four points.
3. If the gauge can be inserted, replace it.

Flatness of PTO piston	Allowable limit	0.15 mm 0.006 in.

Flatness of PTO steel plate	Allowable limit	0.30 mm 0.012 in.

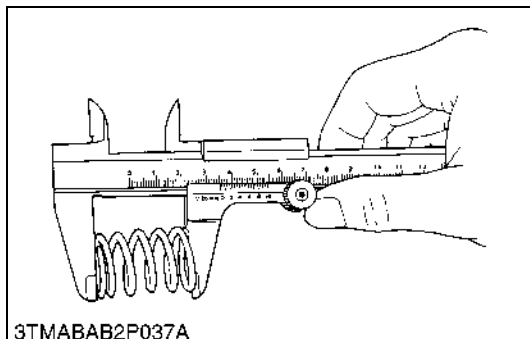
W1025149



Plate

1. Check the contact surface to belleville washer (cupped spring washer).
2. If the back plate has deformed or is scratched and/or scared, replace it.

W1026255

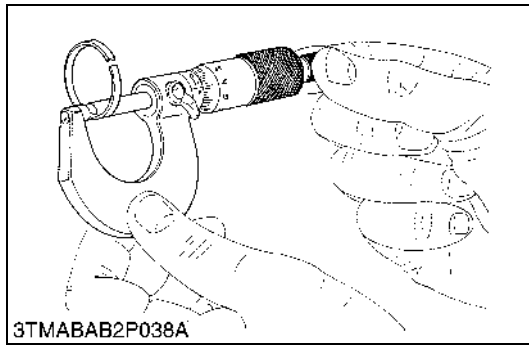


Piston Return Spring Free Length

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

PTO return spring free length	Factory spec.	46.0 mm 1.811 in.
	Allowable limit	37.5 mm 1.48 in.

W1025269



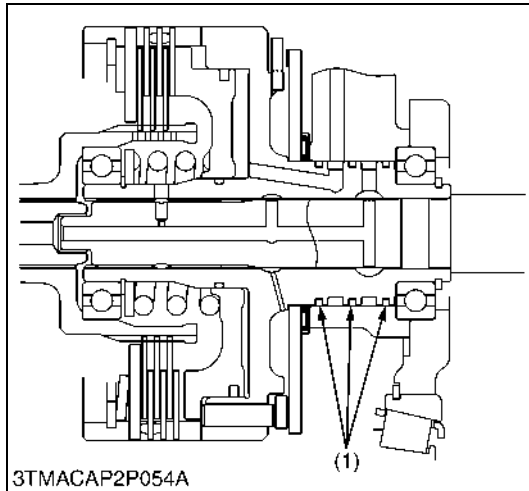
Thickness of Seal Ring

1. Measure the thickness of seal rings (1) with an outside micrometer.
2. If the measurement is less than the allowable limit, replace it.

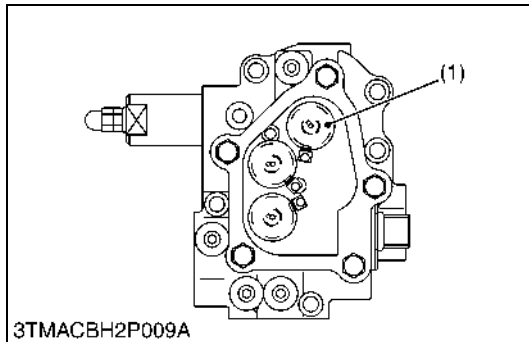
Thickness of seal ring	Factory spec.	2.45 to 2.50 mm 0.096 to 0.098 in.
	Allowable limit	2.0 mm 0.079 in.

(1) Seal Ring

W1025453



[2] SOLENOID VALVE (PTO)



Solenoid Valve (PTO)

1. Refer to the "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM".

(1) PTO Solenoid Valve

W1015800

3 TRANSMISSION

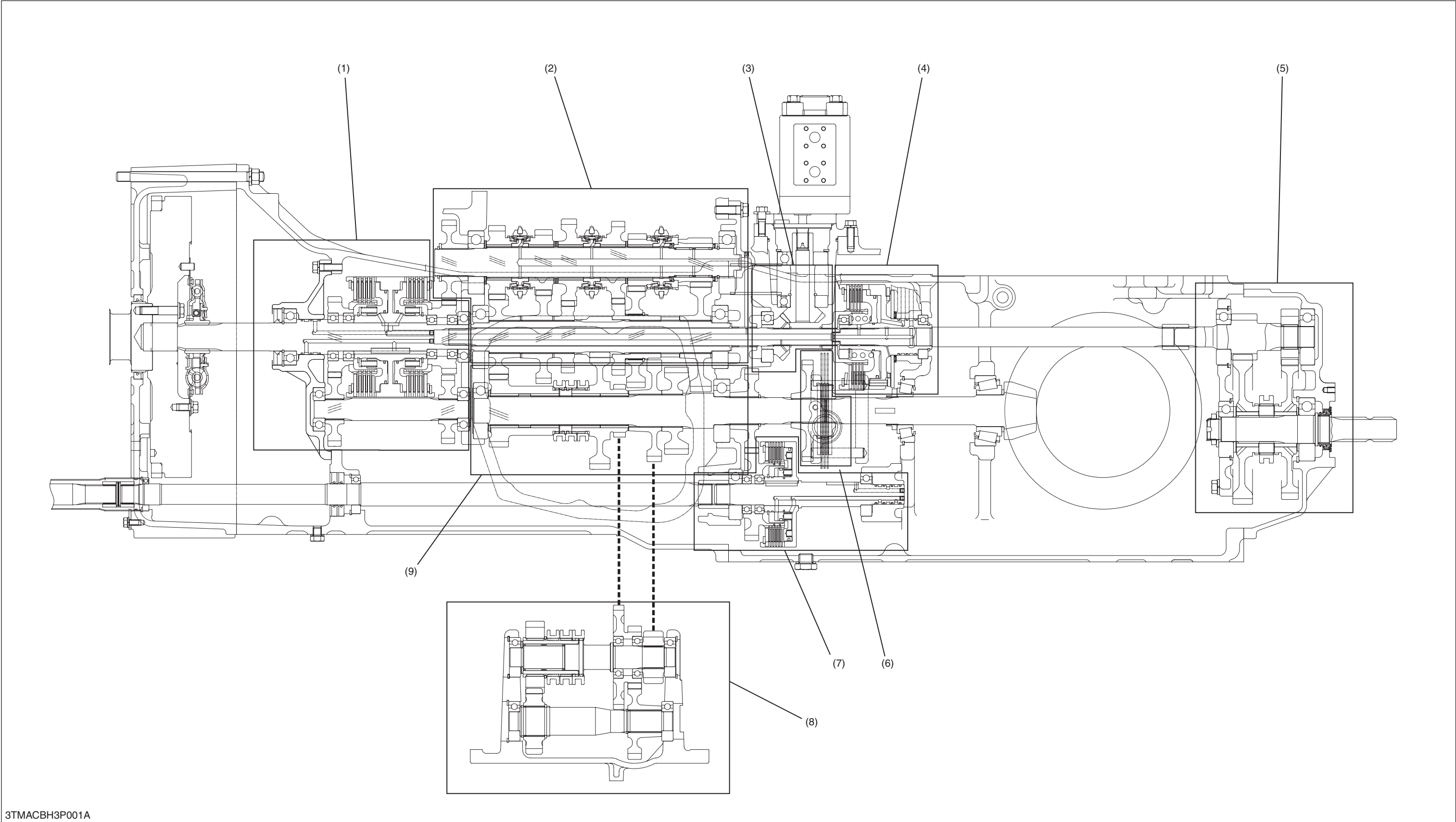
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[2] OIL FLOW	3-M22

1. STRUCTURE

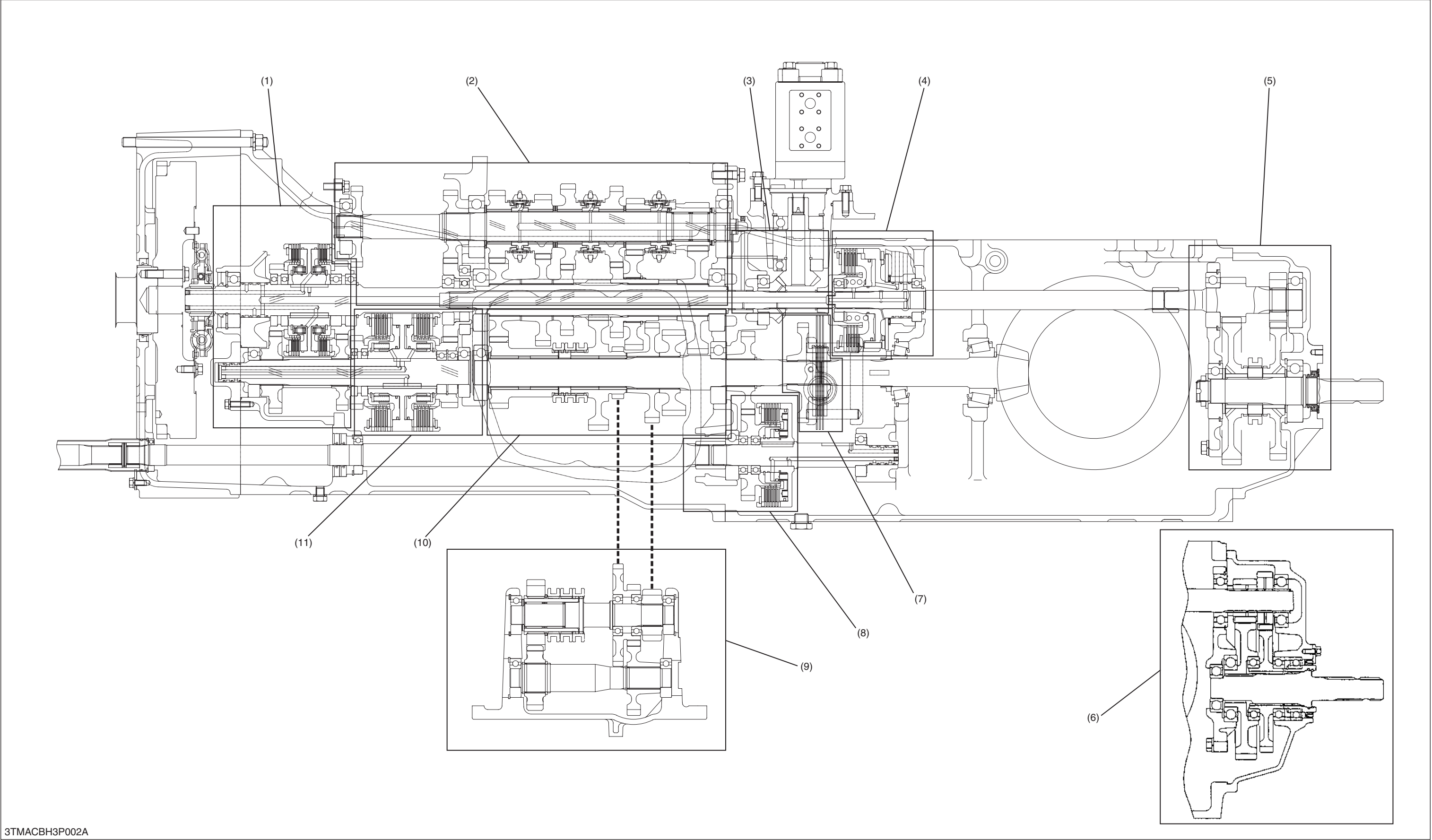
[1] F18/R18 SPEED TRANSMISSION MODEL



3TMACBH3P001A

- (1) Hydraulic Shuttle Section
- (2) Main Gear Shift Section
- (3) Hydraulic Pump Drive Section
- (4) PTO Clutch Section
- (5) PTO Gear Section
(540/540E min⁻¹ (rpm))
- (6) Parking Brake Section
- (7) Four Wheel Drive Clutch Section
- (8) Creep Gear Section
(Cassette Type)
- (9) Auxiliary Gear Shift Section

[2] F36/R36 SPEED TRANSMISSION MODEL



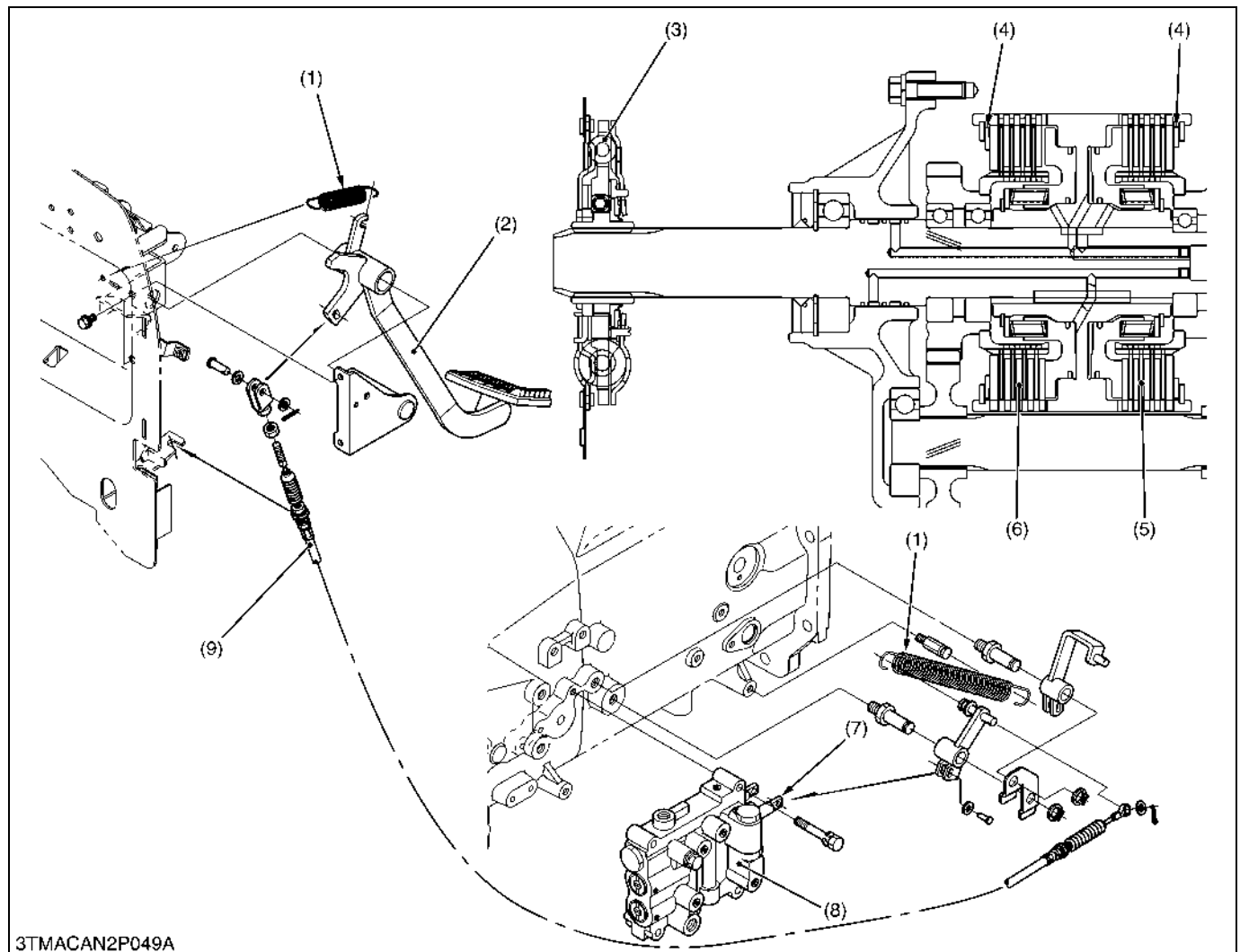
3TMACBH3P002A

- (1) HI-LO Dual Speed Section
- (2) Main Gear Shift Section
- (3) Hydraulic Pump Drive Section
- (4) PTO Clutch Section
- (5) PTO Gear Section
(540/540 min⁻¹ (rpm))
- (6) Interchange Type PTO Gear
Section (540/1000 min⁻¹ (rpm))
- (7) Parking Brake Section
- (8) Four Wheel Drive Clutch Section
- (9) Creep Gear Section
(Cassette Type)
- (10) Auxiliary Gear Shift Section
- (11) Hydraulic Shuttle Section

2. POWER TRAIN FOR TRAVELING GEAR

[1] SHUTTLE SHIFT SECTION

(1) Structure



(1) Return Spring	(4) Belleville Washer (Cupped Spring Washer)	(6) Reverse Side Clutch	(8) Hydraulic Shuttle Valve
(2) Clutch Pedal	(5) Forward Side Clutch	(7) Clutch Spool	(9) Clutch Cable
(3) Damper Disc			

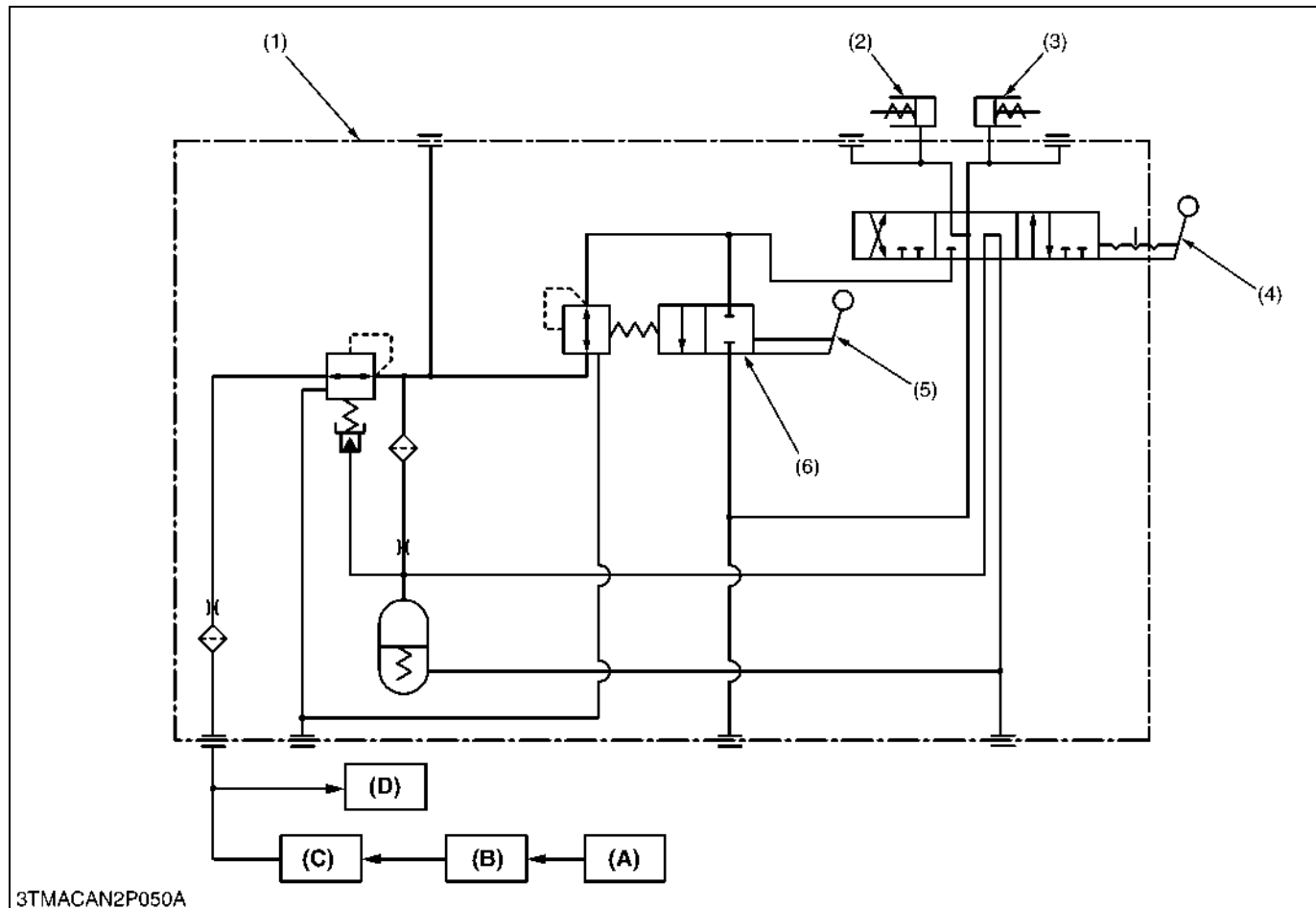
The damper disc (3) helps ease the shock load when engaging the shuttle clutch.

The belleville washer (cupped spring washer) (4) helps ease the engaging shock together with modulating valve effect.

The hydraulic shuttle clutch, which switches forward and reverse running, function as the traveling clutch. When the clutch pedal (2) is depressed, the clutch spool of shuttle valve (8) moves via the clutch cable (9).

As for the oil, it does not flow to both the forward side (5) and reverse side (6) of the clutch pack, the clutch pack enters the state of "Disengaged" and power is not transmitted.

(2) Oil Flow



(1) Shuttle Valve
(2) Reverse Clutch

(3) Forward Clutch
(4) Shuttle Lever

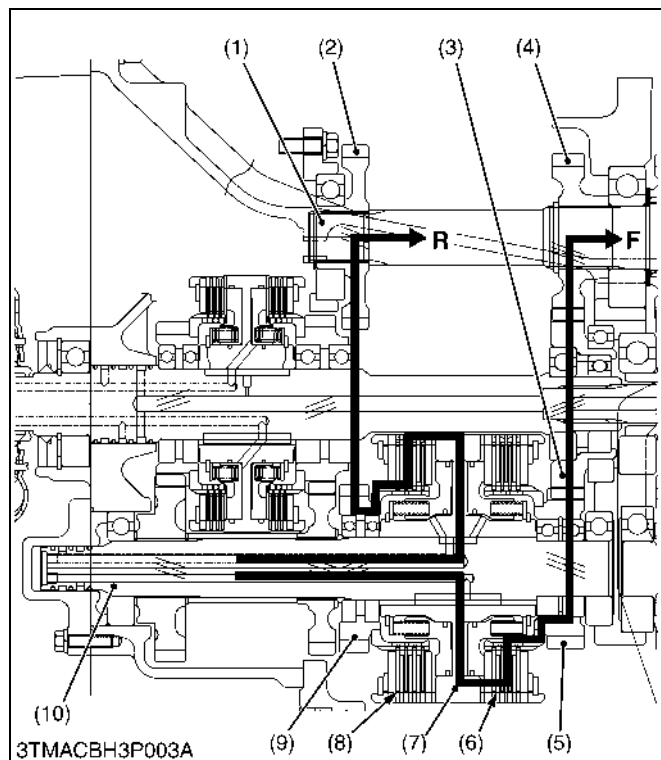
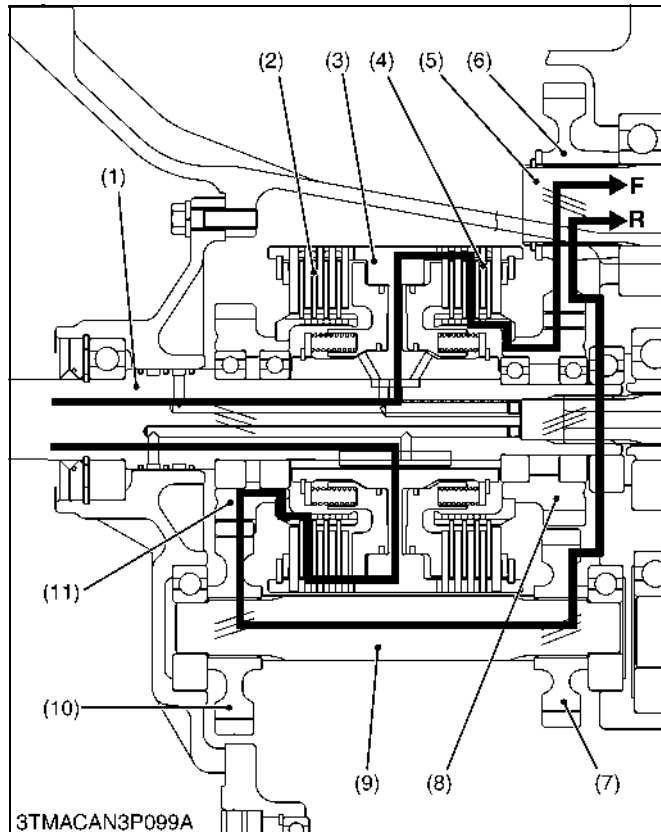
(5) Clutch Pedal
(6) Spool

(A) Pump
(B) Power Steering Controller
(C) Oil Cooler
(D) PTO Clutch and Other Clutches

When the shuttle lever (4) shifts to the forward or reverse, the oil flows to the forward or reverse clutch (2), (3) respectively.

When clutch pedal (5) is depressed, feeding oil returns to the tank through the spool (6), and the clutch is in a **“Disengage”** position.

(3) Hydraulic Clutch Pack



■ Shuttle Shift Section

The shuttle shift section allows the operators to change forward and reverse with a shuttle lever. It is using hydraulic clutch shifting.

When the shuttle lever is move to the **F** or **R** position, clutch is engaged to the front or rear by the hydraulic.

F18/R18 Speed Transmission Model

(Forward)

Input Shaft (1) → Shuttle Clutch Body (3) → Clutch Disc and Plate (4) → 26T Gear (8) → 30T Gear (6) → 1st Shaft (5)

(Reverse)

Input Shaft (1) → Shuttle Clutch Body (3) → Clutch Disc and Plate (2) → 28T Gear (11) → 26T Gear (10) → Shaft 1 (9) → 24T Gear (7) → 30T Gear (6) → 1st Shaft (5)

(1) Input Shaft	(8) 26T Gear
(2) Clutch Disc and Plate	(9) Shaft 1
(3) Shuttle Clutch Body	(10) 26T Gear
(4) Clutch Disc and Plate	(11) 28T Gear
(5) 1st Shaft	
(6) 30T Gear	F : Forward
(7) 24T Gear	R : Reverse

W1013292

F36/R36 Speed Transmission Model

(Forward)

Shaft 1 (10) → Shuttle Clutch Body (7) → Clutch Disc and Plate (6) → 24T Gear (5) → 31T Gear (3) → 27T Gear (4) → 1st Shaft (1)

(Reverse)

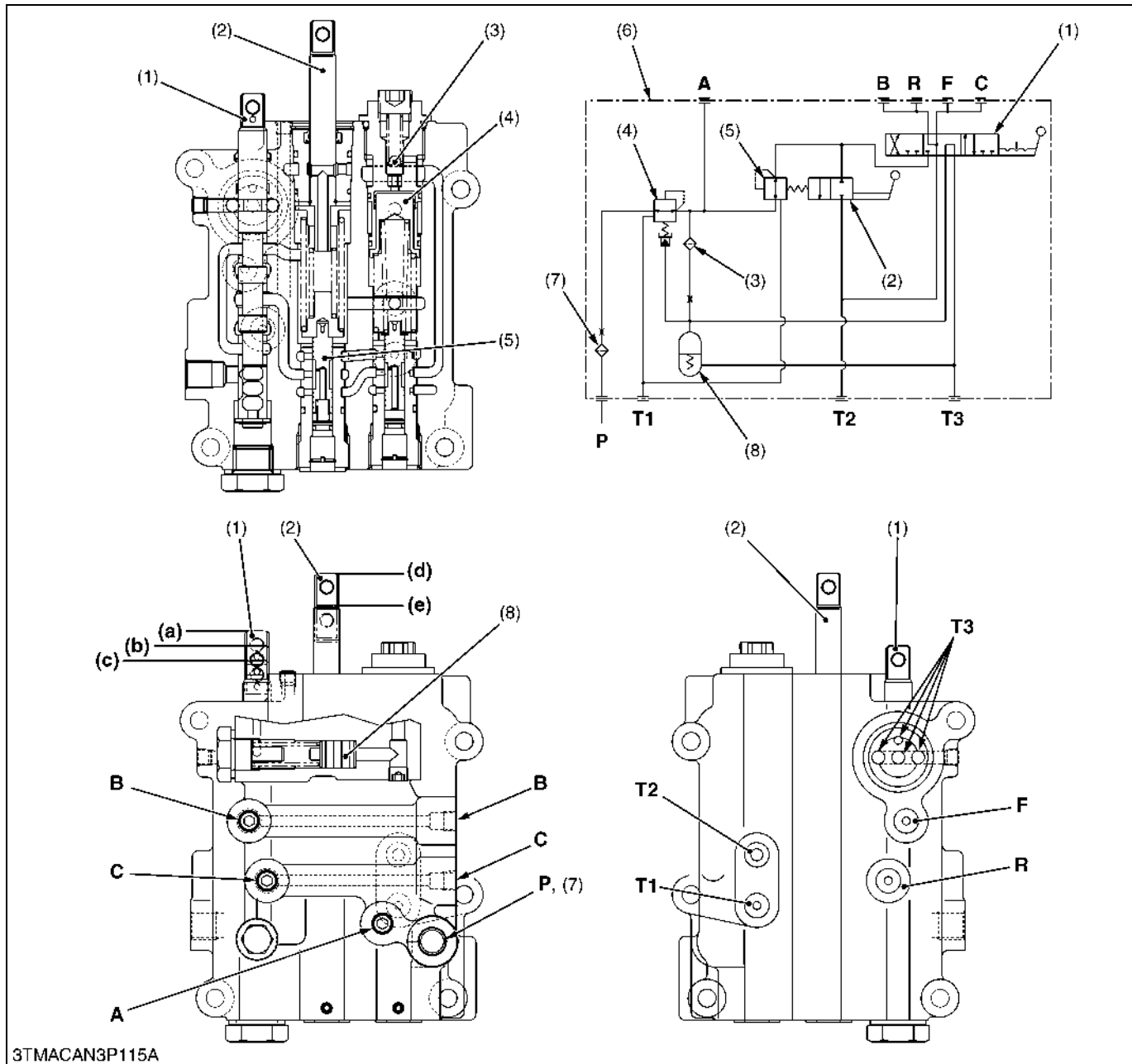
Shaft 1 (10) → Shuttle Clutch Body (7) → Clutch Disc and Plate (8) → 27T Gear (9) → 30T Gear (2) → 1st Shaft (1)

- (1) 1st Shaft (8) Clutch Disc and Plate
(2) 30T Gear (9) 27T Gear
(3) 31T Gear (10) Shaft 1
(4) 27T Gear
(5) 24T Gear **F : Forward**
(6) Clutch Disc and Plate **R : Reverse**
(7) Shuttle Clutch Body

W1013709

[2] HYDRAULIC SHUTTLE VALVE

(1) Structure



(1) Shuttle Shift Spool
(Forward, Reverse)

(2) Inching Valve Spool

(3) Line Filter

(4) Modulating Valve

(5) Proportionally Reducing Valve

(6) Shuttle Valve

(7) Line Filter

(8) Accumulate Valve

(a) Shuttle Forward Position

(b) Shuttle Neutral Position

(c) Shuttle Reverse Position

(d) Clutch Pedal Depressed
Position

(e) Clutch Pedal Released
Position

A : Pressure Check Port
(Modulation)

B : Pressure Check Port
(Reverse)

C : Pressure Check Port
(Forward)

F : To Clutch Body (Forward)

P : P Port (Pump)

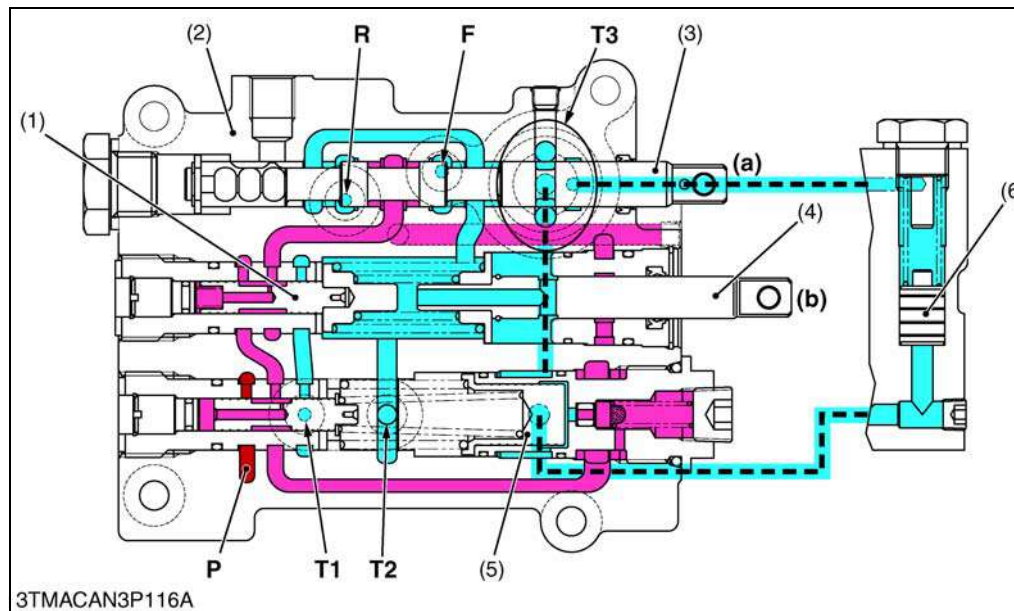
R : To Clutch Body (Reverse)

T1 to T3 : Tank Port

Hydraulic shuttle valve is composed of modulating valve (4), proportionally reducing valve (5), shuttle shift spool (1), accumulate valve (8) and other component parts.

(2) Operation

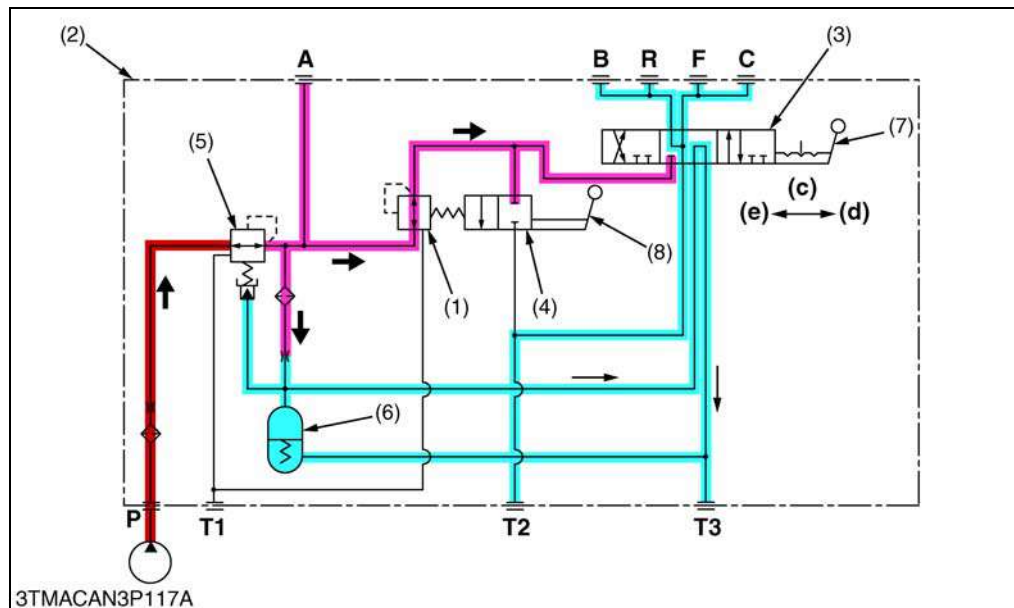
■ Shuttle Lever at Neutral Position



- (1) Proportionally Reducing Valve
- (2) Shuttle Valve
- (3) Shuttle Shift Spool (Forward, Reverse)
- (4) Inching Valve
- (5) Modulating Valve
- (6) Accumulate Valve
- (7) Shuttle Lever
- (8) Clutch Pedal

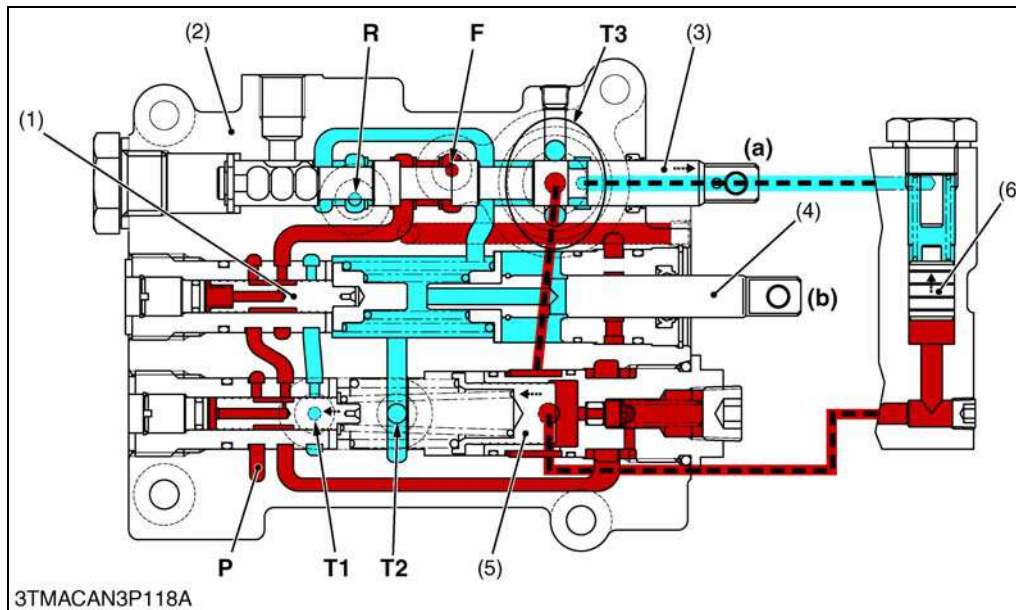
- A : Check Port (Modulation)
- B : Check Port (Reverse)
- C : Check Port (Forward)
- P : P Port (Pump)
- T1 to T3 : To Transmission Case
- (a) Connect to Shuttle Lever
- (b) Connect to Clutch Pedal
- (c) Neutral
- (d) Forward
- (e) Reverse

W1014324



When the shuttle lever at “**Neutral**” position, as the oil passage between **P** port to **F** or **R** port is closed by shuttle shift spool (3), pressure-fed oil from **P** port flows to the **T3** port. Thus the shuttle clutch is not engaged.

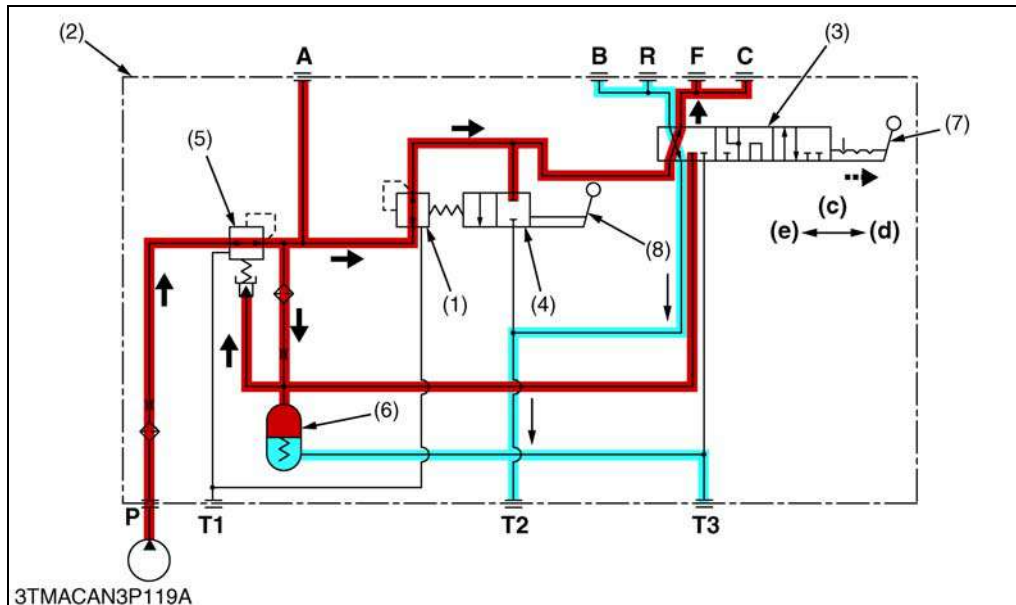
■ When Shuttle Lever is Shifting Neutral to Reverse or Forward Position (Clutch Pedal is Released)



- (1) Proportionally Reducing Valve
- (2) Shuttle Valve
- (3) Shuttle Shift Spool (Forward, Reverse)
- (4) Inching Valve
- (5) Modulating Valve
- (6) Accumulate Valve
- (7) Shuttle Lever
- (8) Clutch Pedal

A : Check Port (Modulation)
 B : Check Port (Reverse)
 C : Check Port (Forward)
 P : P Port (Pump)
 T1 to T3 : To Transmission Case
 (a) Connect to Shuttle Lever
 (b) Connect to Clutch Pedal
 (c) Neutral
 (d) Forward
 (e) Reverse

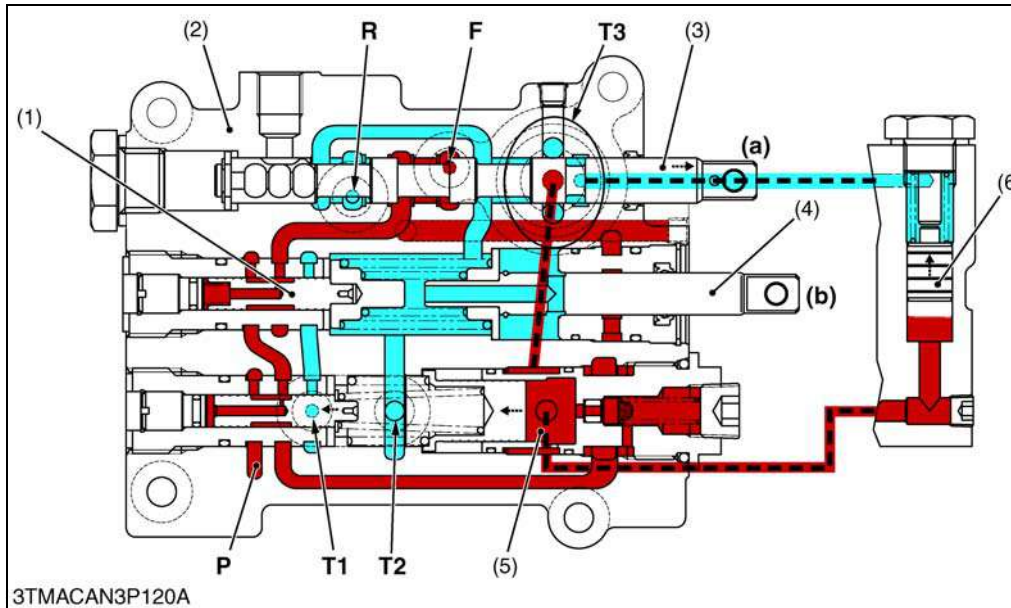
W1014545



When the shuttle lever is moved to “**REVERSE**” or “**FORWARD**”, pressure-fed oil from **P** port flows into shuttle clutch via **R** or **F** port. At this time, the pressure of **R** or **F** port is increased gradually by modulating valve (5).

When the shuttle clutch is engaging, the accumulate valve (6) assists the operation of modulating valve (5) to reduce a shock.

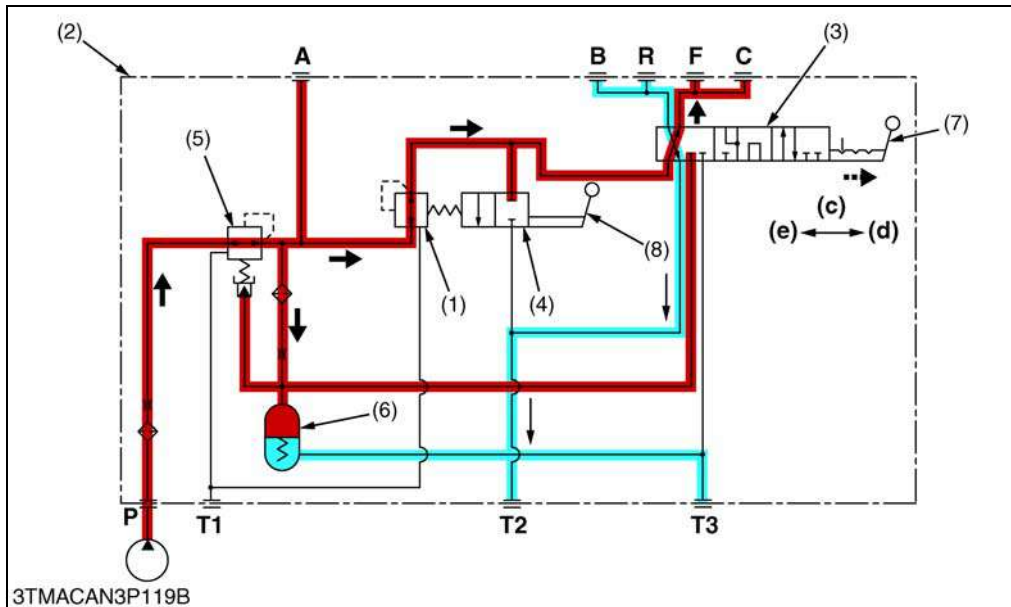
■ When Lever at Forward Position (Clutch Pedal is Released)



- (1) Proportionally Reducing Valve
- (2) Shuttle Valve
- (3) Shuttle Shift Spool (Forward, Reverse)
- (4) Inching Valve
- (5) Modulating Valve
- (6) Accumulate Valve
- (7) Shuttle Lever
- (8) Clutch Pedal

A : Check Port (Modulation)
 B : Check Port (Reverse)
 C : Check Port (Forward)
 P : P Port (Pump)
 T1 to T3 : To Transmission Case
 (a) Connect to Shuttle Lever
 (b) Connect to Clutch Pedal
 (c) Neutral
 (d) Forward
 (e) Reverse

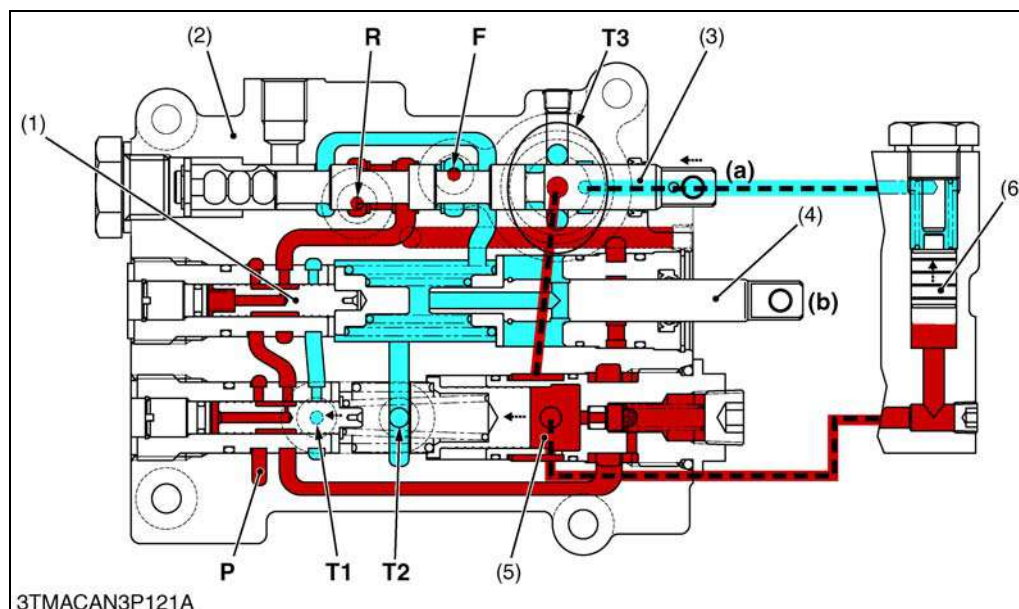
W1014859



When the shuttle lever has been setting on the **F** side, the oil pressure on **F** port is constantly controlled by proportionally reducing valve (1).

On the other hand, the oil in the **R** side of shuttle clutch returns to **T2** port through **R** port and shuttle shift spool (3).

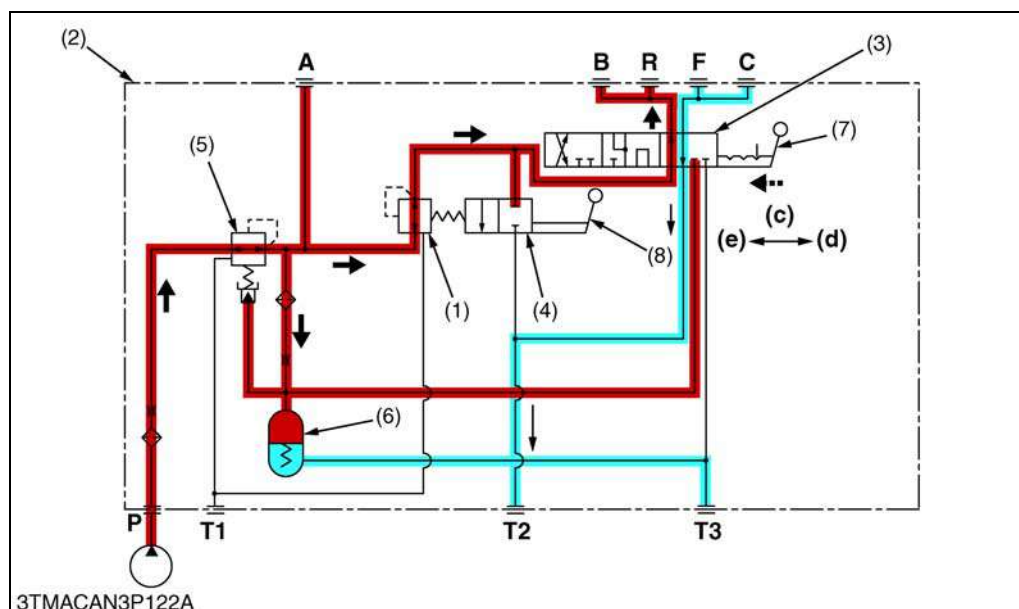
■ When Lever at Reverse Position (Clutch Pedal is Released)



- (1) Proportionally Reducing Valve
- (2) Shuttle Valve
- (3) Shuttle Shift Spool (Forward, Reverse)
- (4) Inching Valve
- (5) Modulating Valve
- (6) Accumulate Valve
- (7) Shuttle Lever
- (8) Clutch Pedal

- A : Check Port (Modulation)**
- B : Check Port (Reverse)**
- C : Check Port (Forward)**
- P : P Port (Pump)**
- T1 to T3 : To Transmission Case**
- (a) Connect to Shuttle Lever**
- (b) Connect to Clutch Pedal**
- (c) Neutral**
- (d) Forward**
- (e) Reverse**

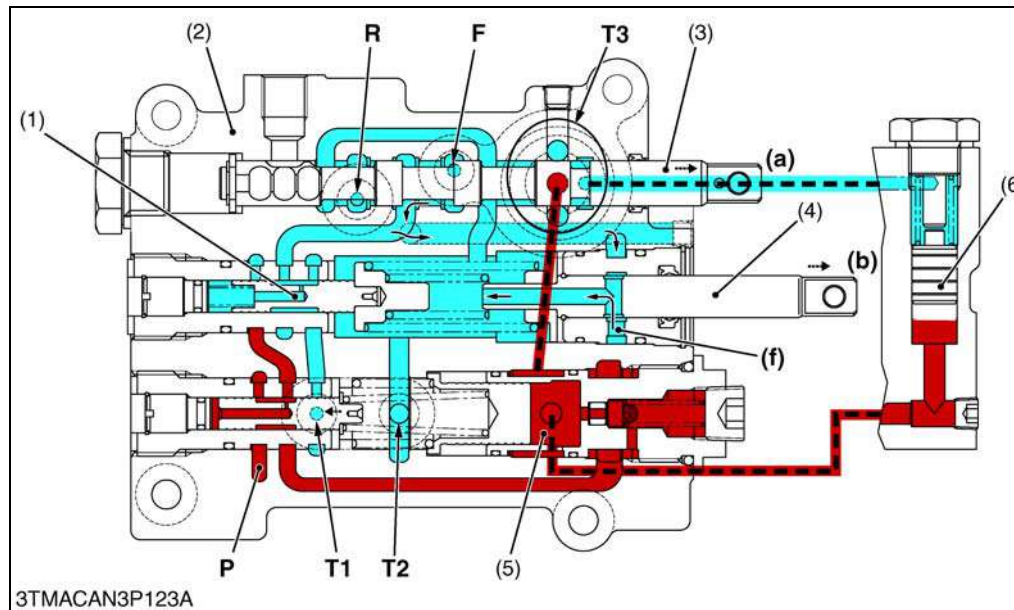
W1015344



When the shuttle lever has been setting on the **R** side, the oil pressure on **R** port is constantly controlled by proportionally reducing valve (1).

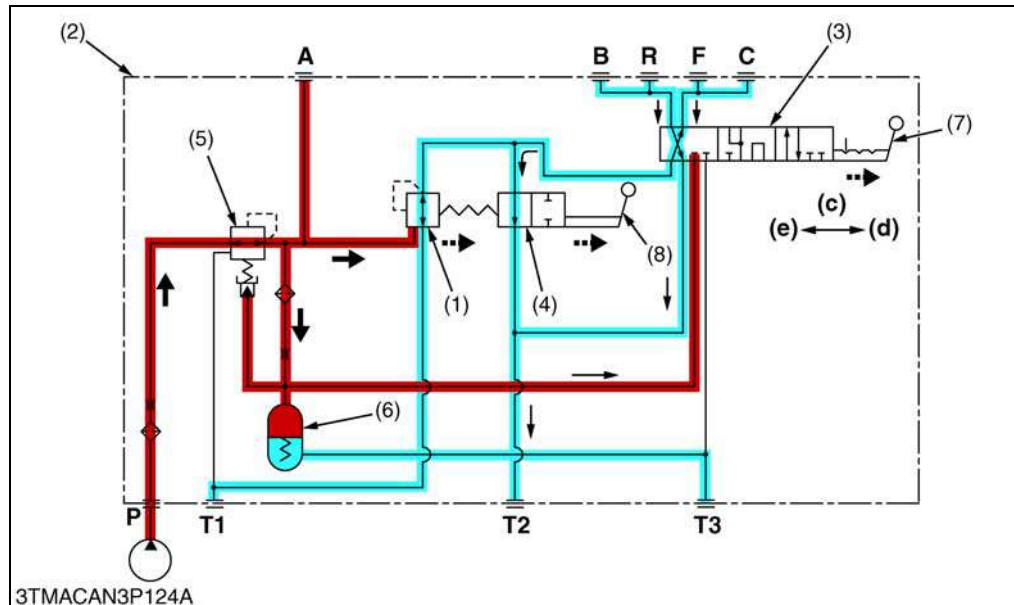
On the other hand, the oil in the **F** side of shuttle clutch returns to **T2** through **F** port and shuttle shift spool (3).

■ When Clutch Pedal is Depressed (with Shuttle Lever at Reverse or Forward Position)



- (1) Proportionally Reducing Valve
- (2) Shuttle Valve
- (3) Shuttle Shift Spool (Forward, Reverse)
- (4) Inching Valve
- (5) Modulating Valve
- (6) Accumulate Valve
- (7) Shuttle Lever
- (8) Clutch Pedal

- A : Check Port (Modulation)
- B : Check Port (Reverse)
- C : Check Port (Forward)
- P : P Port (Pump)
- T1 to T3 : To Transmission Case
- (a) Connect to Shuttle Lever
- (b) Connect to Clutch Pedal
- (c) Neutral
- (d) Forward
- (e) Reverse
- (f) Passage f



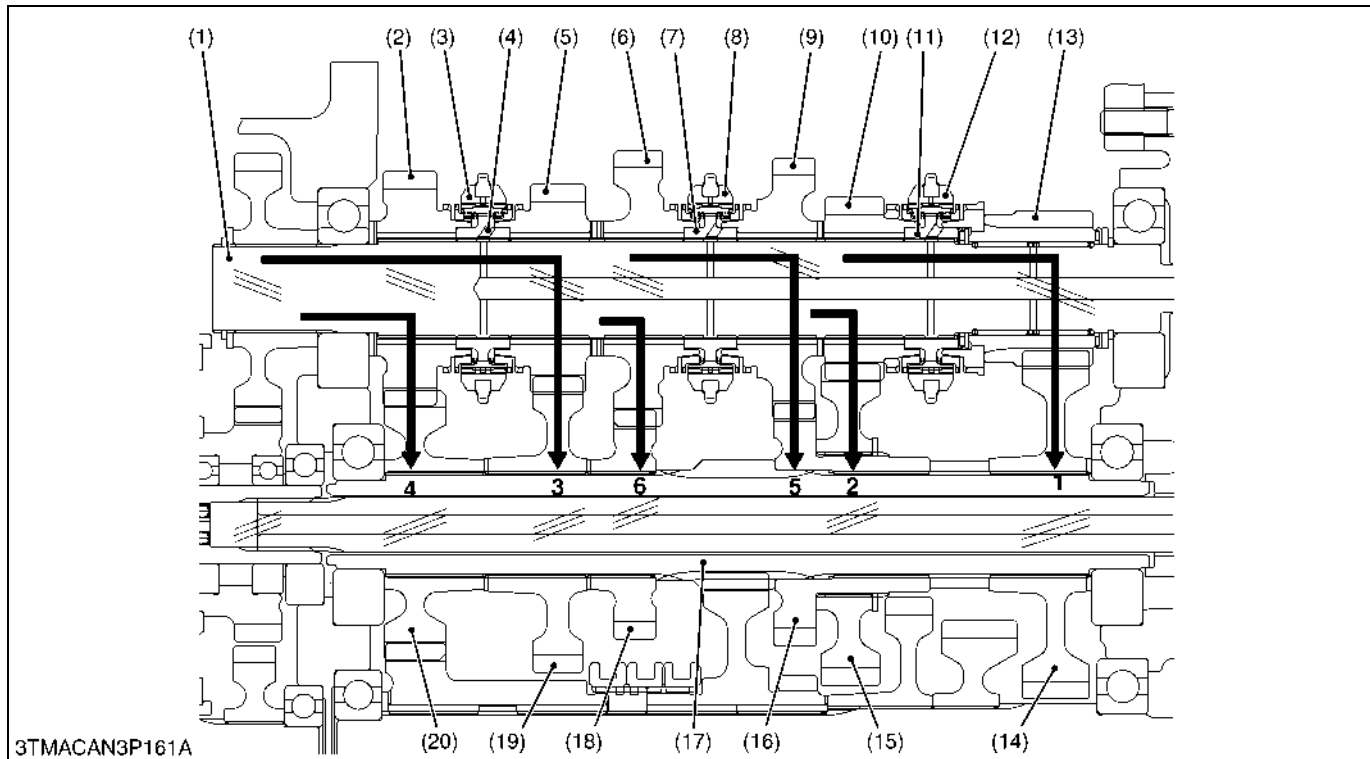
With the shuttle lever at **R** or **F** position, when the clutch pedal is depressed, the inching valve (4) is moved to the right. And connect the passage 1 (f) to **T2** port. As the proportionally reducing valve (1) is moved to the right by pressure difference, **R** port (or **F** port) and **T2** port are connected.

The oil in the shuttle clutch returns into the transmission case via **R** port (or **F** port) through the proportionally reducing valve (1) and **T2** port. This cause the shuttle clutch to be set off.

As a result, even when the proportionally reducing valve (1) does not move, the oil passage from **R** port (or **F** side) to **T2** port is secured.

W1015685

[3] MAIN GEAR SHIFT SECTION



(1) 1st Shaft	(6) 32T Gear	(11) Coupling	(16) 27T Gear
(2) 26T Gear	(7) Coupling	(12) Shifter	(17) 14T Gear Shaft
(3) Shifter	(8) Shifter	(13) 16T Gear	(18) 24T Gear
(4) Coupling	(9) 29T Gear	(14) 40T Gear	(19) 34T Gear
(5) 23T Gear	(10) 19T Gear	(15) 37T Gear	(20) 30T Gear

■ 1st Speed

1st Shaft (1) → Coupling (11) → Shifter (12) → 16T Gear (13) → 40T Gear (14) → 14T Gear Shaft (17).

■ 2nd Speed

1st Shaft (1) → Coupling (11) → Shifter (12) → 19T Gear (10) → 37T Gear (15) → 14T Gear Shaft (17).

■ 3rd Speed

1st Shaft (1) → Coupling (4) → Shifter (3) → 23T Gear (5) → 34T Gear (18) → 14T Gear Shaft (17).

■ 4th Speed

1st Shaft (1) → Coupling (4) → Shifter (3) → 26T Gear (2) → 30T Gear (20) → 14T Gear Shaft (17).

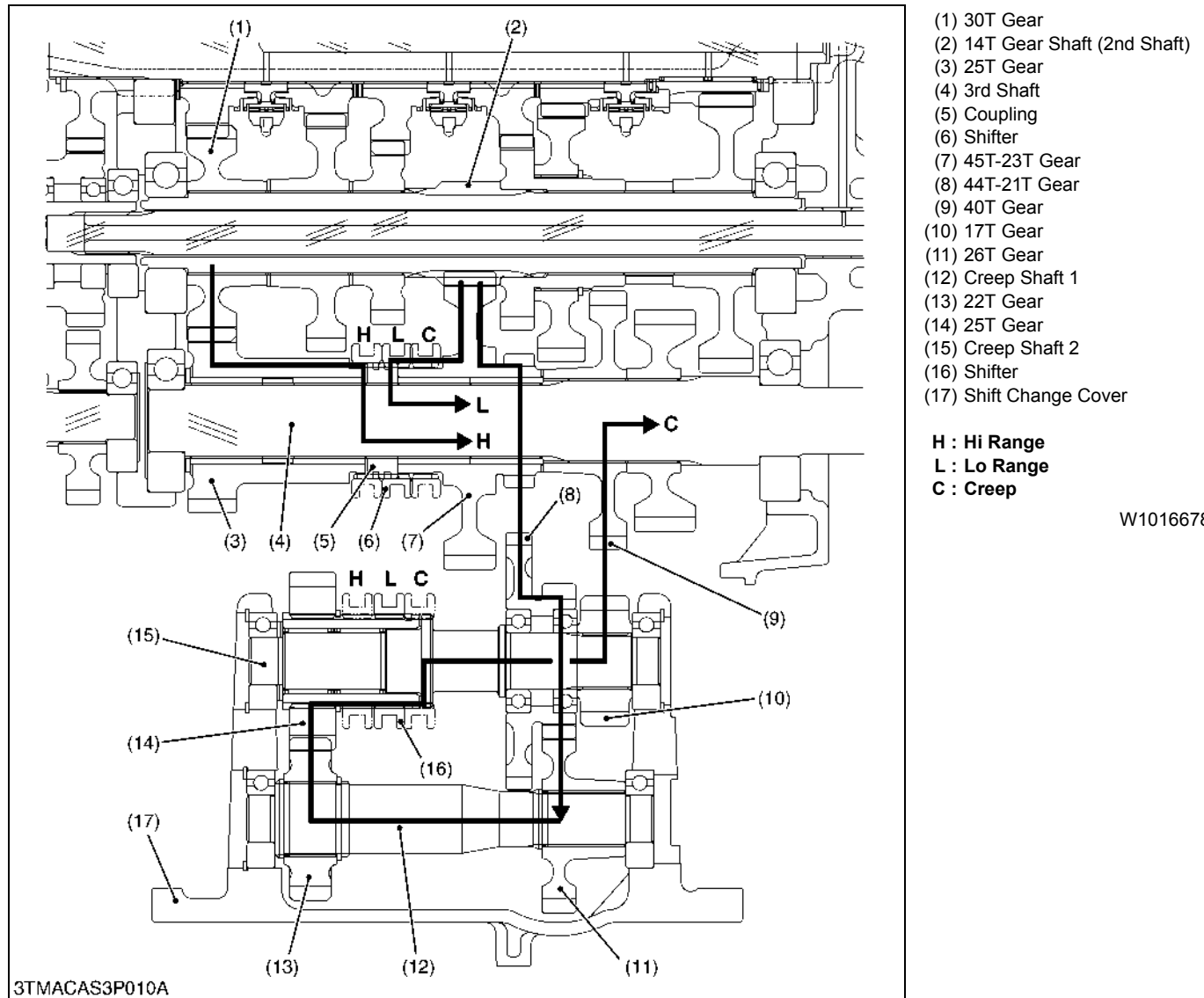
■ 5th Speed

1st Shaft (1) → Coupling (7) → Shifter (8) → 29T Gear (9) → 27T Gear (16) → 14T Gear Shaft (17).

■ 6th Speed

1st Shaft (1) → Coupling (7) → Shifter (8) → 32T Gear (6) → 24T Gear (18) → 14T Gear Shaft (17).

[4] HI-LO/CREEP SHIFT SECTION



The Hi-Lo-Creep shift section allows the operator to change an auxiliary speed change lever is move to the Hi-Lo-Creep position. The shifter (6) slides to the front or rear by mechanical linkage to be engaged with the 25T gear (3) or 45T-23T gear (7) for H and L position. The shifter (16) slide to H, L or C position by mechanical linkage to be engaged with the 25T gear (14) and creep shaft 2 (15) for L or C position.

Then, power is transmitted as follows.

The shifter (6) for H-L range locates on the 3rd shaft (4) and shifter (16) for creep locates on the creep shaft 2 (15).

They operated by one piece type shift fork same time.

(Hi-Range)

14T Gear Shaft (2) → 30T Gear (1) → 25T Gear (3) → Shifter (6) → Coupling (5) → 3rd Shaft (4).

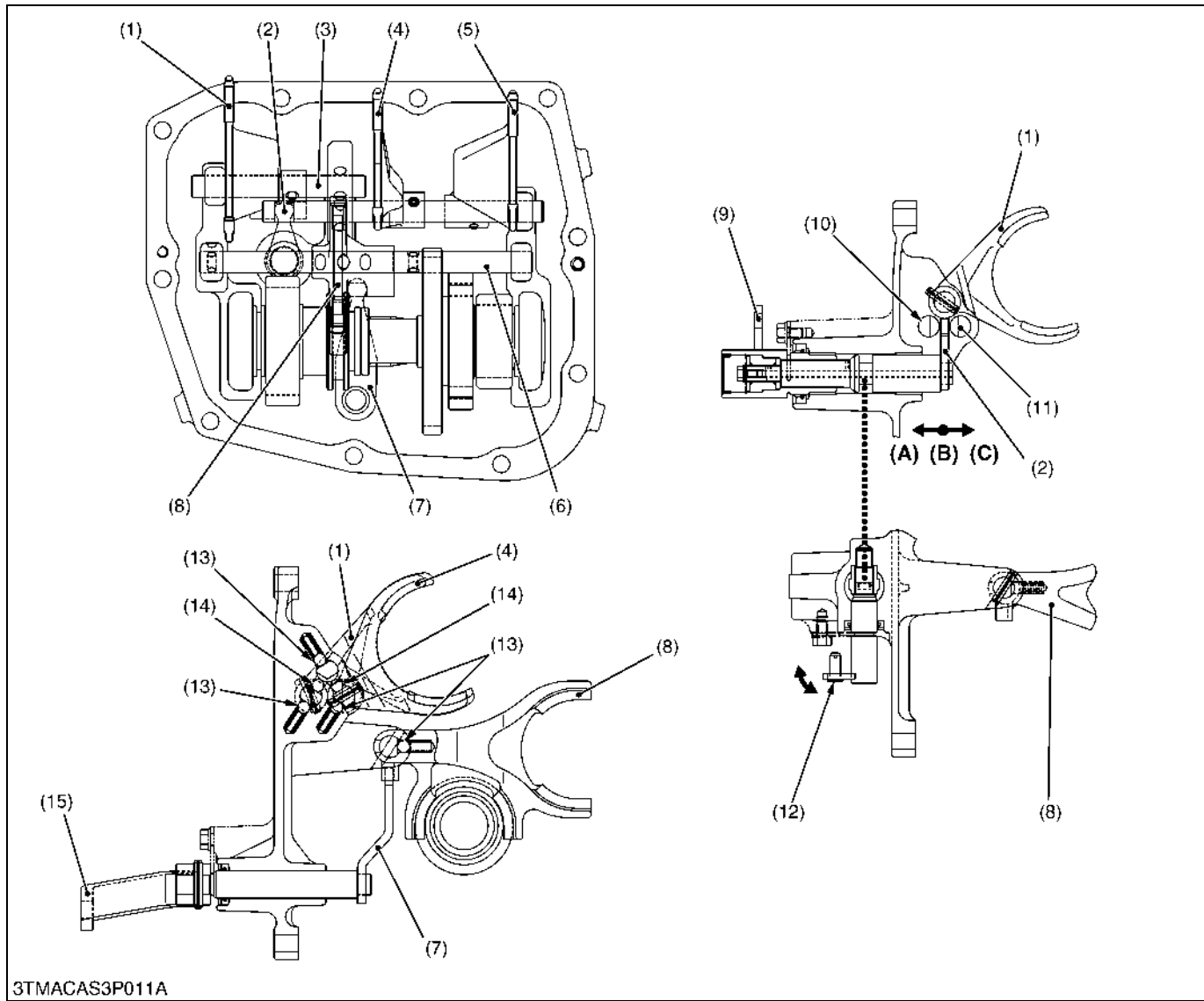
(Lo-Range)

14T Gear Shaft (2) → 45T-23T Gear (7) → Shifter (6) → Coupling (5) → 3rd Shaft (4).

(Creep Range)

14T Gear Shaft (2) → 45T-23T Gear (7) → 44T-21T Gear (8) → 26T Gear (11) → Creep Shaft 1 (12) → 22T Gear (13) → 25T Gear (14) → Creep Shaft 2 (15) → 17T Gear (10) → 40T Gear (9) → 3rd Shaft (4).

[5] SHIFT FORK ROD AND FORK

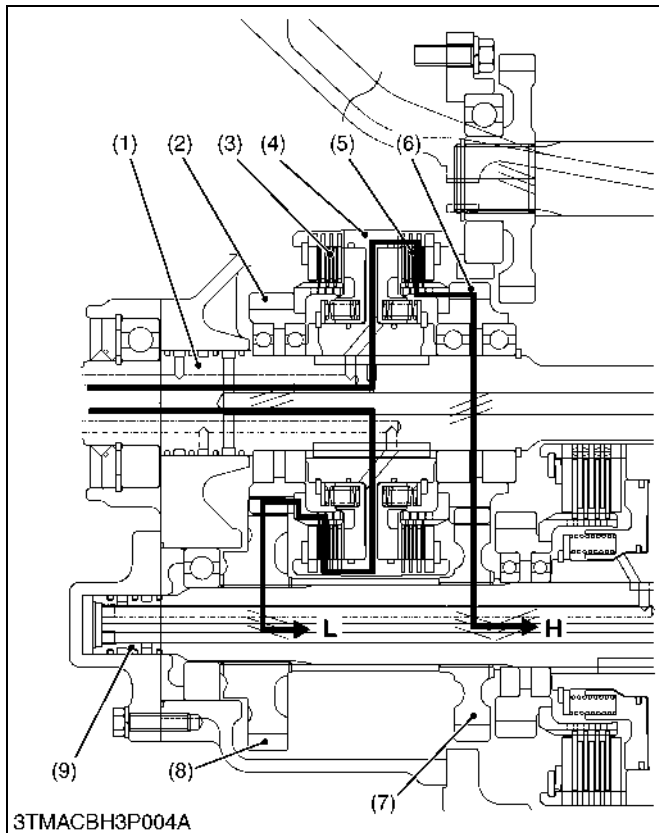


(1) 3rd-4th Shift Fork	(6) H-L-C Rod	(11) 5th-6th Shift Fork Rod	(A) Engage to 1st-2nd Shift Fork Rod (B) Engage to 3rd-4th Shift Fork (C) Engage to 5th-6th Shift Fork Rod
(2) Select Arm	(7) H-L-C Arm	(12) Select Lever	
(3) 3rd-4th Shift Fork Rod	(8) H-L-C Fork	(13) Detent Ball	
(4) 5th-6th Shift Fork	(9) Main Shift Lever	(14) Interlock Ball	
(5) 1st-2nd Shift Fork	(10) 1st-2nd Shift Fork Rod	(15) H-L-C Lever	

- Interlock ball (14) restrain the movement of the 1st-2nd shift fork rod (10), 3rd-4th shift fork rod (3) and 5th-6th shift fork rod (4) at the same time. As a result, double engagement of the gear is prevented.
- Detent balls (13) prevent the self disengagement of the gears.
- When operate the main shift lever (9) with select motion, select the select arm (2) by rotating the select lever (12). There for select arm (2) engage to **(A)** (1st-2nd shift fork rod (10)) or **(B)** (3rd-4th shift fork (1)) or **(C)** (5th-6th shift lock rod (11)).
- When operate the H-L-C lever (15), operate the H-L-C fork engage to Hi, Lo or Creep speed position.

[6] HI-LO DUAL SPEED SHIFT SECTION (F36/R36 TRANSMISSION MODEL)

(1) Hydraulic Clutch Pack



■ Hi-Lo Dual Speed Section

The hi-Lo dual speed section is operated hydraulic clutch, solenoid valve and dual speed switch. When operate the lo to hi position, travelling speed increase approx. 18 %.

When the Hi-Lo solenoid valve is operated to the Hi or Lo position, hydraulic clutch is engaged to the Hi or Low by the hydraulic. Then the power is transmitted as follows.

(Hi)

Input Shaft (1) → Dual Speed Clutch Body (4) → Clutch Disc and Plate (5) → 29T Gear (6) → 28T Gear (7) → 1st Shaft (9).

(Lo)

Input Shaft (1) → Dual Speed Clutch Body (4) → Clutch Disc and Plate (3) → 27T Gear (2) → 31T Gear (8) → 1st Shaft (9).

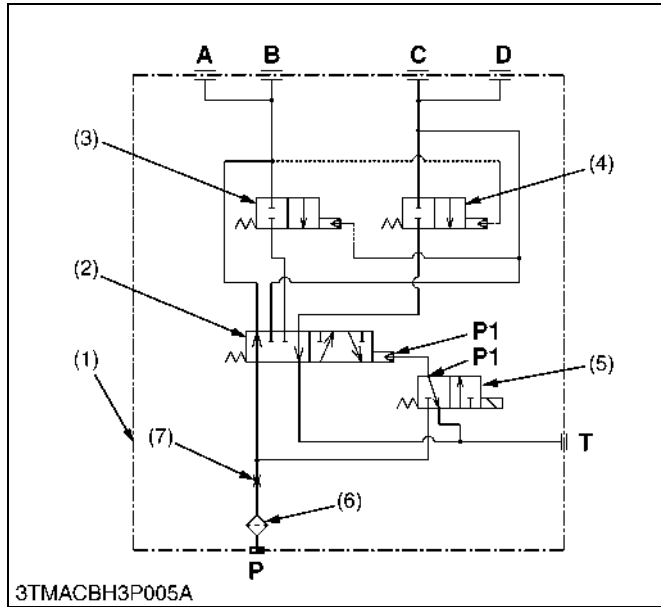
- (1) Input Shaft
- (2) 27T Gear
- (3) Clutch Disc and Plate
- (4) Dual Speed Clutch Body
- (5) Clutch Disc and Plate
- (6) 29T Gear

- (7) 28T Gear
- (8) 31T Gear
- (9) 1st Shaft

L : Low Speed
H : Hi Speed

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(2) Dual Speed Valve



This valve change the oil flow to the dual speed **HI** clutch or **LO** clutch.

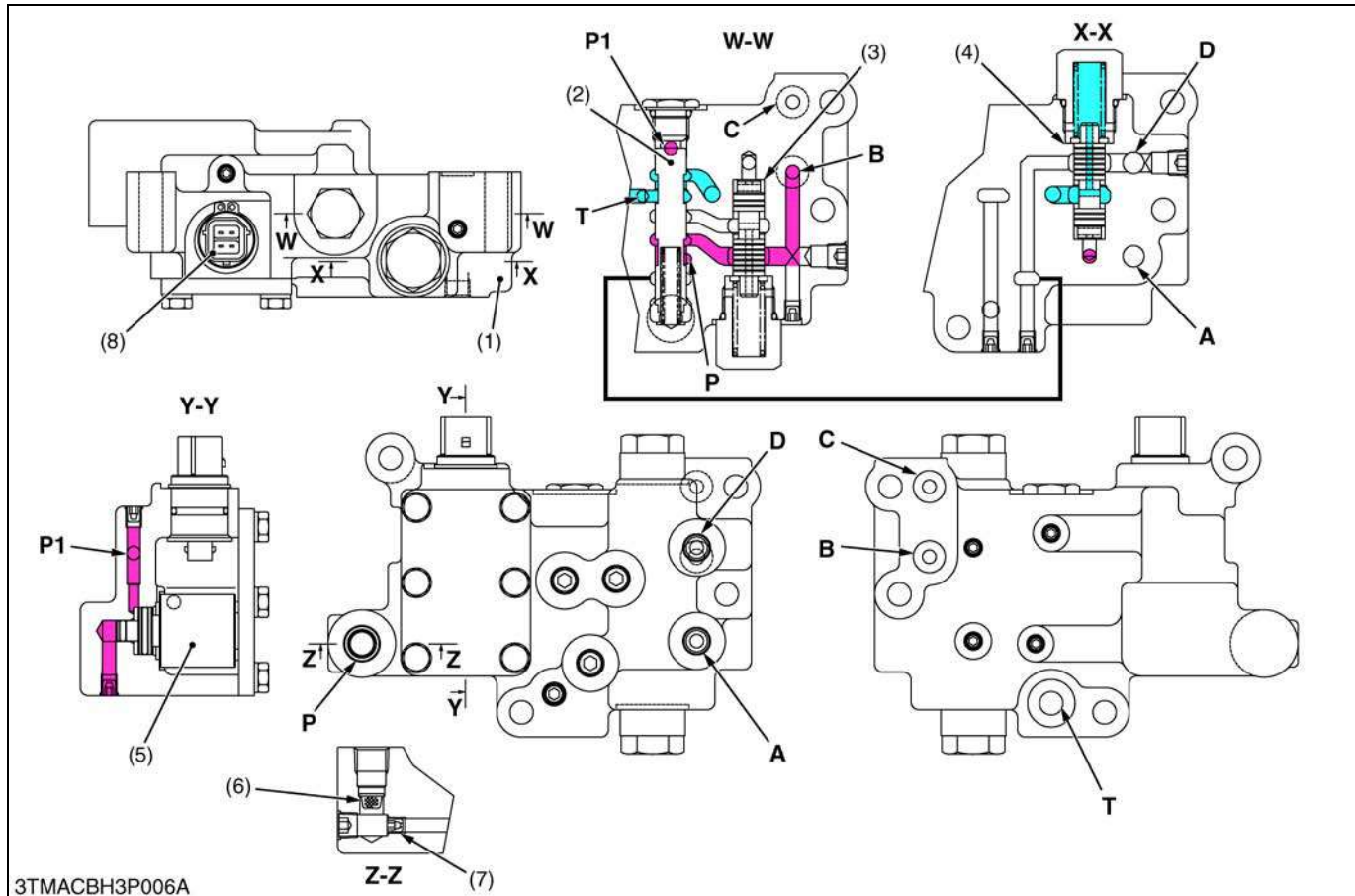
As the pilot valve DS (solenoid valve) (5) operates by energizing the solenoid, the flow of oil is switched to the **HI** side (**B**) or **LO** (**C**) side of dual speed clutch with DS spool (2).

When one of clutches are engaged, pilot valve **HI** (3) and pilot valve **LO** (4) are object in free which makes it do as for the other clutch.

- (1) Valve Body
- (2) DS Spool
- (3) Pilot Valve **HI**
- (4) Pilot Valve **LO**
- (5) Pilot Valve DS (Solenoid Valve)
- (6) Line Filter
- (7) Orifice

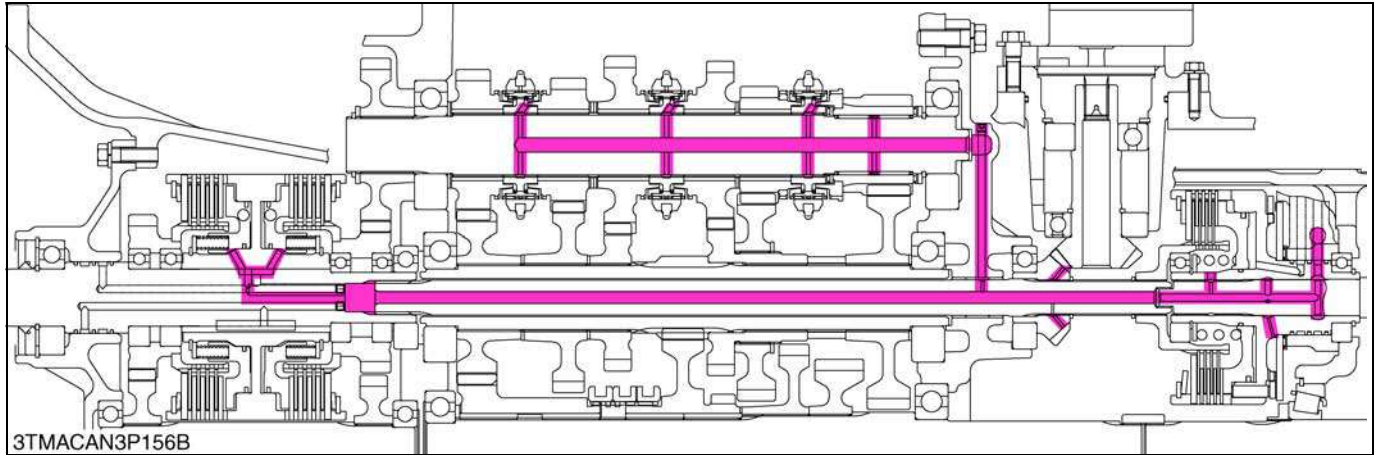
- A** : Check Port **HI**
- B** : To Clutch Pack **HI**
- C** : To Clutch Pack **LO**
- D** : Check Port **LO**
- P** : P Port
- T** : Tank Port
- W-W** : View **W**
- X-X** : View **X**
- Y-Y** : View **Y**
- Z-Z** : View **Z**

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3. LUBRICATION FOR TRANSMISSION

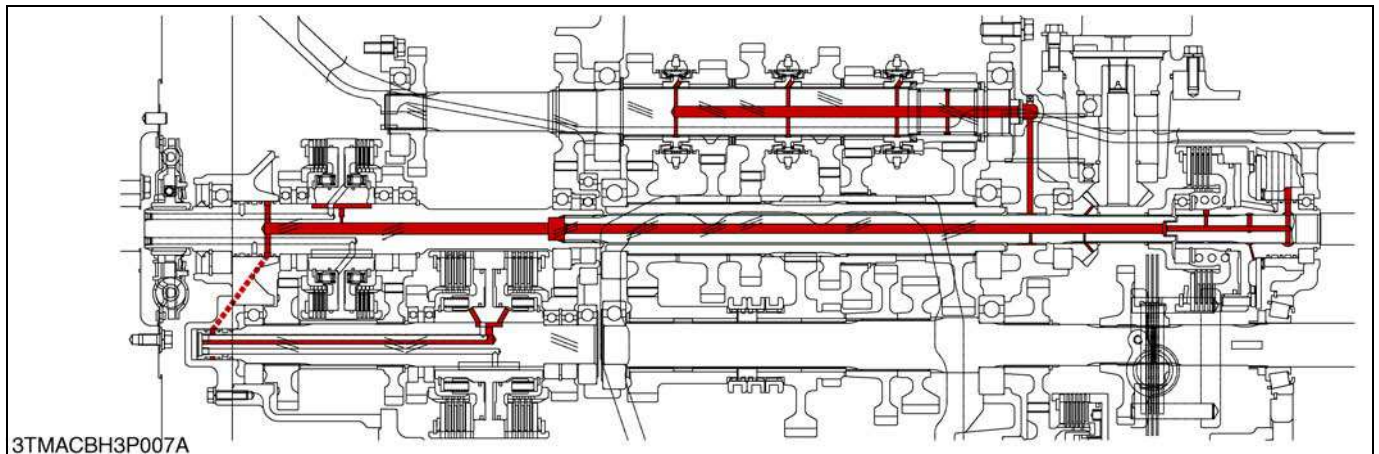
[1] F18/R18 SPEED TRANSMISSION



Hydraulic shuttle section, main shift change synchromesh gears, hydraulic pump drive / driven gear, PTO hydraulic pack and PTO brake are forcibly lubricated.

The lubrication oil from the PTO valve lubricates to PTO clutch holder and the each sections through PTO propeller shaft and 1st shaft.

[2] F36/R36 SPEED TRANSMISSION MODEL

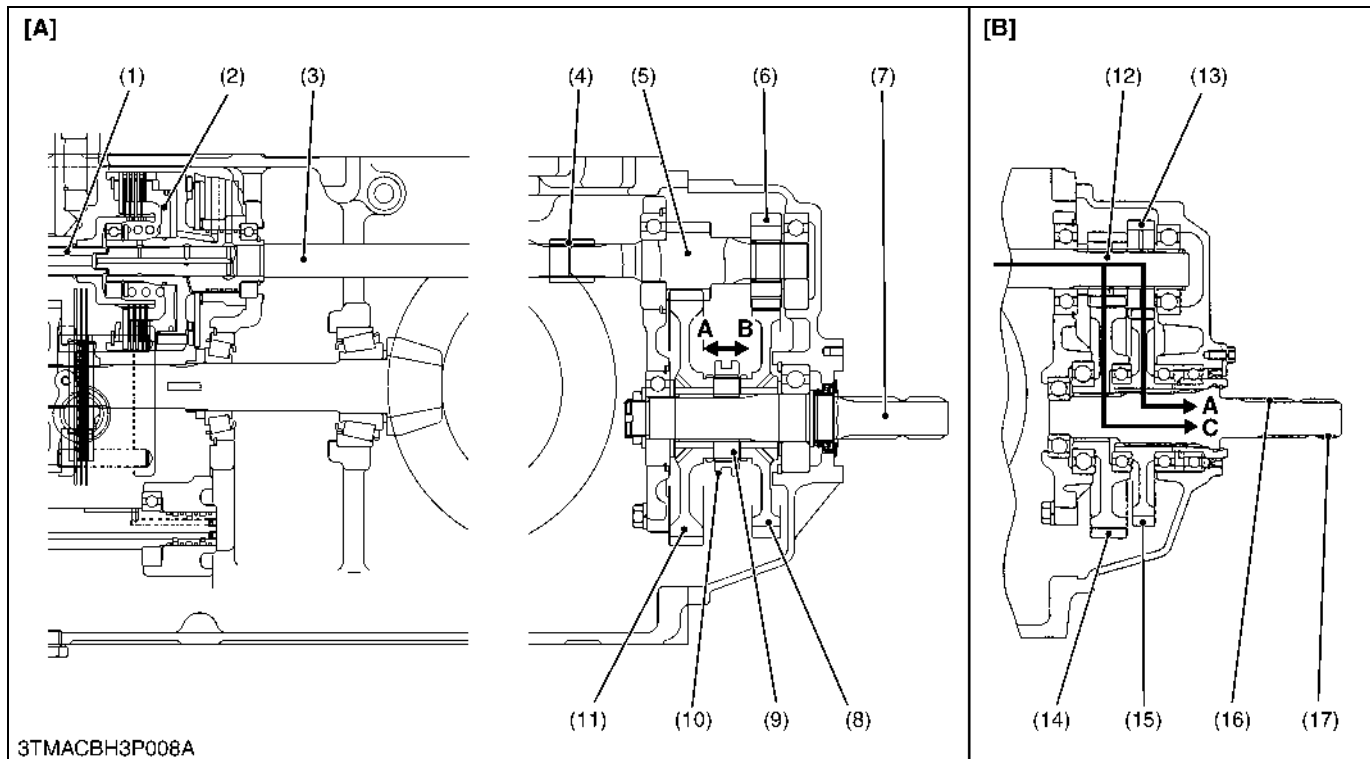


Hydraulic shuttle section, Hi-Lo dual speed section, main shift change synchromesh gears, hydraulic pump drive / driven gear, PTO hydraulic pack and PTO brake are forcibly lubricated.

The lubrication oil from the PTO valve lubricates to PTO clutch holder and the each sections through PTO propeller shaft and 1st shaft.

4. POWER TRAIN FOR PTO SYSTEM

[1] PTO GEAR SECTION



(1) PTO Propeller Shaft 1	(8) 45T Gear	(14) 49T Gear
(2) PTO Clutch	(9) Hub	(15) 43T Gear
(3) PTO Propeller Shaft 2	(10) Shifter	(16) 6-spline 540 min ⁻¹ (rpm) PTO Shaft (Interchangeable)
(4) Coupling	(11) 49T Gear	(17) 21-spline 1000 min ⁻¹ (rpm) PTO Shaft (Interchangeable)
(5) 13T Gear Shaft	(12) 13T Gear Shaft	
(6) 16T Gear	(13) 18T Gear	
(7) PTO Shaft		

- [A] 540-540E Shift Type**
[B] 540-1000 Interchange Type
A : 540 PTO
B : 540E PTO
C : 1000 PTO

(540-540E/Shift Type)

Two different PTO speeds are available by operating the shift lever, to shift position of the shifter (10). Power is transmitted as follows.

■ Position A : 540 [540 min⁻¹ (rpm) at 2035 min⁻¹ (rpm) engine speed]

PTO Propeller Shaft 1 (1) → PTO Clutch (2) → PTO Propeller Shaft 2 (3) → 13T Gear Shaft (5) → 49T Gear (11) → Shifter (10) → Hub (9) → PTO Shaft (7).

■ Position B : 540E [540 min⁻¹ (rpm) at 1519 min⁻¹ (rpm) engine speed]

PTO Propeller Shaft 1 (1) → PTO Clutch (2) → PTO Propeller Shaft 2 (3) → 13T Gear Shaft (5) → 16T Gear (6) → 45T Gear (8) → Shifter (10) → Hub (9) → PTO Shaft (7).

■ NOTE

- This PTO gear section does not have neutral position.

(540-1000/Interchange Type)

By interchanging the PTO shafts (16), (17), two different PTO shaft speeds are available. Power is transmitted as follows.

■ With 6-spline PTO shaft (540 min⁻¹ (rpm) PTO speed)

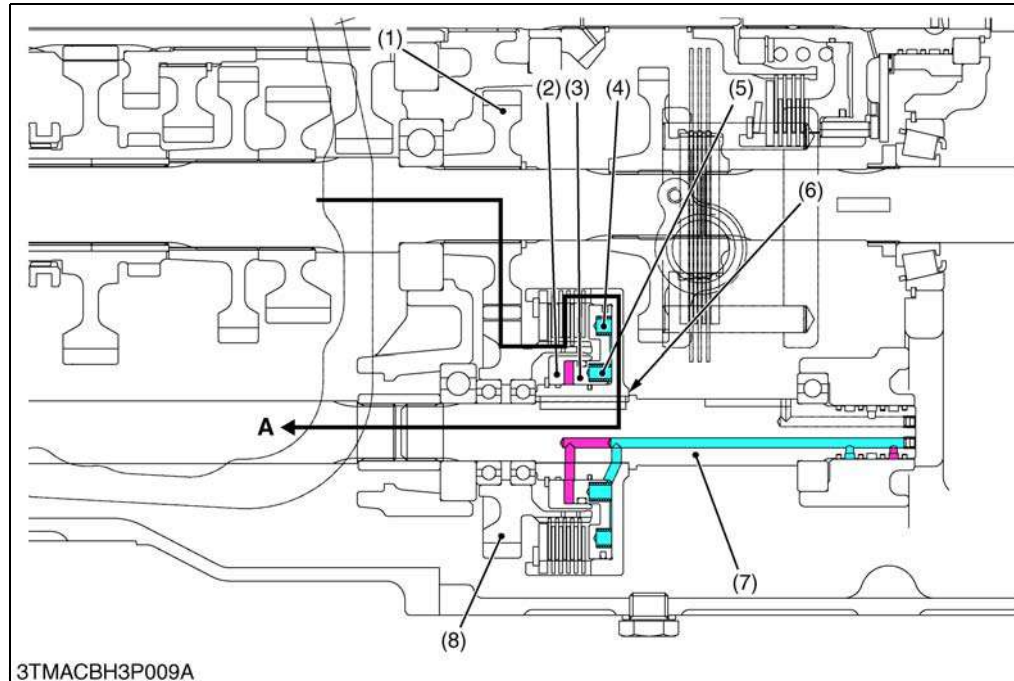
PTO Transmitting Shaft → 13T Gear (12) → 49T Gear (14) → PTO Shaft (16).

■ With 21-spline PTO shaft (1000 min⁻¹ (rpm) PTO speed)

PTO Transmitting Shaft → 18T Gear (13) → 43T Gear (15) → PTO Shaft (17).

5. POWER TRAIN FOR 4WD

[1] 4WD HYDRAULIC CLUTCH SECTION



- (1) DT Propeller Shaft
- (2) 33T Gear
- (3) Neutral Cover
- (4) 4WD Piston
- (5) Spring
- (6) Clutch Body
- (7) 4WD Shaft
- (8) 35T Gear

A : 4WD

W1019299

The 4WD clutch is controlled by the solenoid valve and the hydraulic flow.

When the 4WD switch turn on, the front wheel drive (4WD) is engaged. When it is pushed once more, the 2-wheel drive is engaged. The power train are available as follows.

2-wheel drive (4WD switch is turned to “OFF”)

- The hydraulic system pressure is fed to between the neutral cover (3) and 4WD piston (4) at 4WD switch is turned to **“OFF”** and hydraulic pressure does not come from 4WD solenoid valve to actuate the 4WD piston (4). So, the hydraulic system pressure actuate the 4WD piston (4) to the neutral position and power is not transmitted from 33T gear (2) to DT propeller shaft (1).
- When both brake pedals are depressed together while driving in 2WD mode, 2-brake switches operate the 4WD solenoid valve and activate to the 4WD mode. 4WD mode activate the 4WD braking system and the 4WD indicator lights up.

4-wheel drive (4WD switch is turned to “ON”)

- The 4WD solenoid valve switches and supply the hydraulic pressure to actuate the 4WD piston (4) to engage the clutch pack together with the spring (4) tension force.

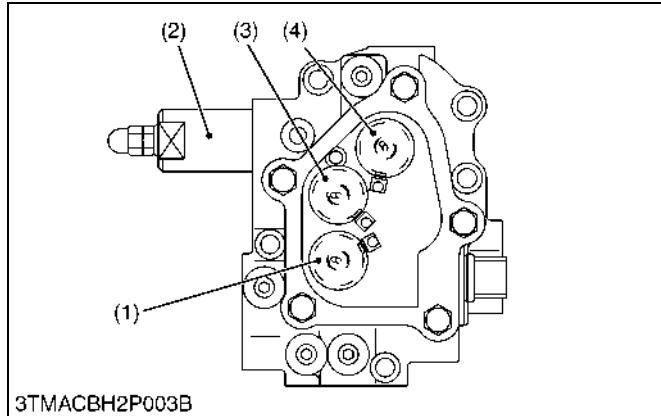
The power is transmitted as follow.

33T Gear (2) → 35T Gear (8) → Clutch Body (6) → 4WD Shaft (7) → DT Propeller Shaft (1).

Engine stop

- The 4WD piston (4) engage to 4WD mode by springs (5) tension force.

[2] 4WD OIL FLOW

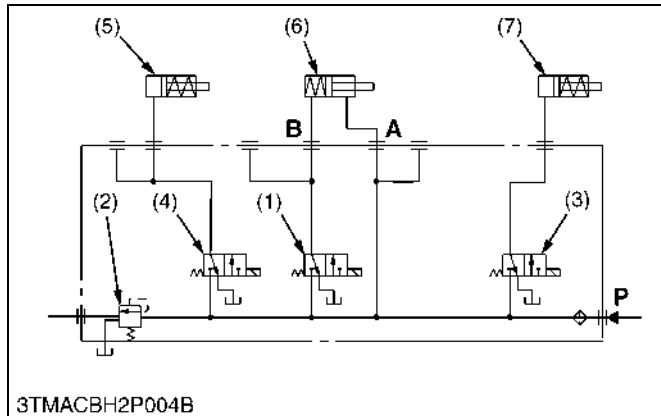


Oil pressure-fed from the power steering hydraulic pump is flowed to the 4WD solenoid valve (1) through the steering controller and oil cooler. The system hydraulic pressure-fed to disengaged position for 4WD clutch (6) when 4WD switch at 2WD position. As the 4WD solenoid valve does not electrified, the oil flows to 2WD mode. When the 4WD switch turned on, the 4WD solenoid valve is electrified, the oil flow is switched and engage the 4WD clutch (6).

The maximum pressure against the clutch piston is regulated under approx. 2.16 MPa (22.0 kgf/cm², 313 psi) by the relief valve (2) of system pressure.

On the other hand, the return oil is flowed to the transmission case through the valve case.

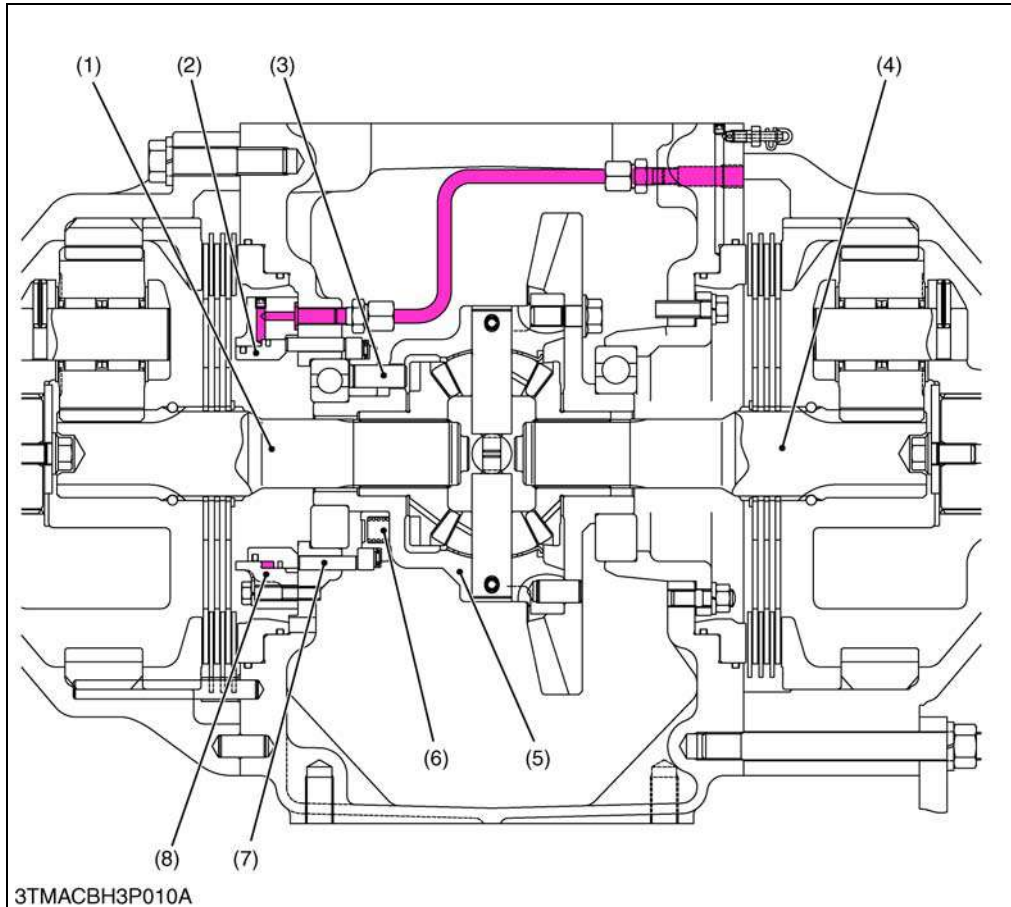
(1) 4WD Solenoid Valve	A : 2WD Port
(2) Relief Valve	B : 4WD Port
(3) Differential Lock Solenoid Valve	P : From Power Steering Pump
(4) PTO Solenoid Valve	
(5) PTO Clutch Pack	
(6) 4WD Clutch Pack	
(7) Differential Lock Piston	



W1019793

6. DIFFERENTIAL LOCK

[1] HYDRAULIC ACTUATED TYPE



- (1) Shaft L.H.
- (2) Piston
- (3) Differential Lock Pin
- (4) Shaft R.H.
- (5) Differential Case
- (6) Spring
- (7) Pin
- (8) Piston Support

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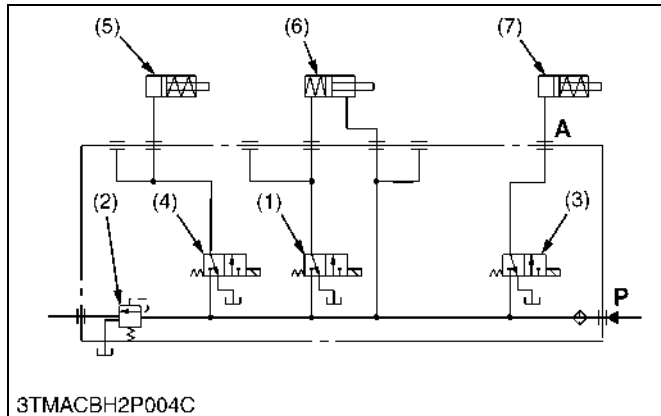
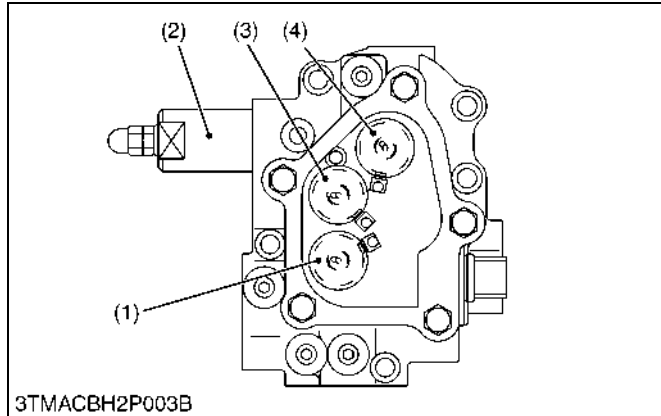
The differential lock can be operated easily with an electric switch.

When the switch is turned **ON**, the solenoid valve operates and oil flows to the piston (2). The differential lock pin (3) engages, and as a result, right and left shaft (1) and (4) rotates as a unit through differential case (3).

On the other hand, oil is not supplied when the switch is **OFF**, and differential lock pin (3) is maintained at the disengaged position by force of spring (6).

W1021065

[2] OIL FLOW



Oil pressure-fed from the power steering hydraulic pump is flowed to the differential lock solenoid valve (3) through the steering controller and oil cooler. When the differential lock switch turned on, the differential lock solenoid valve is electrified, the oil flow is switched and engage the differential lock pin to lock position.

The maximum pressure against the clutch piston is regulated under approx. 2.16 MPa (22.0 kgf/cm², 313 psi) by the relief valve (2) of system pressure.

On the other hand, the return oil is flowed to the transmission case through the valve case.

- (1) 4WD Solenoid Valve
- (2) Relief Valve
- (3) Differential Lock Solenoid Valve
- (4) PTO Solenoid Valve
- (5) PTO Clutch Pack
- (6) 4WD Clutch Pack
- (7) Differential Lock Piston

A : Differential Lock Port
P : From Power Steering Pump

W1020339

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Shuttle Clutch Slip	Operating pressure is low	Adjust	3-S12
	Shuttle clutch valve malfunctioning	Replace	3-S17
	Clutch disc or steel plate excessively worn	Replace	3-S33, 67
	Deformation of piston or steel plate	Replace	–
Shuttle Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	G-9
	Relief valve malfunctioning	Adjust or replace	2-S5, 3-S12
Shuttle Clutch Drags	Return spring weak or broken	Replace	–
	Modulating valve malfunctioning	Replace	3-S17
	Deformation of piston or steel plate	Replace	–
Tractor Does Not Keep in Neutral	Shuttle linkage defective or deformed	Adjust or replace	3-S6
Excessive Transmission Noise	Transmission fluid insufficient	Replenish	G-9
	Improper backlash between bevel pinion shaft and bevel gear	Adjust	3-S72
	Improper backlash between differential pinion and side gear	Adjust	3-S77
	Collars or shims have not been installed	Repair	–
	Bearing worn	Replace	3-S66
Gears Slip Out of Mesh	Shifter or shift fork worn or damaged	Replace	3-S66
	Shift fork spring weaken or damaged	Replace	–
	Interlock ball fallen	Reassemble	–
	Synchronizer unit damaged	Repair or replace	3-S67
Hard Shifting	Shifter or shift fork worn or damaged	Replace	3-S66
	Shift fork rod bent	Replace	–
	Synchronizer unit damaged	Repair or replace	3-S67
Gears Clash When Shifting	Synchronizer unit damaged	Repair or replace	3-S67
Differential Lock Can Not Be Set	Solenoid valve defective	Replace	3-S17, 9-S43
	Piston seal defective	Replace	3-S63
Differential Lock Pedal Does Not Return	Differential pin damaged	Repair or replace	3-S60

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4WD

Symptom	Probable Cause	Solution	Reference Page
4WD Clutch Slip	Operating pressure is low	Adjust	2-S5
	4WD solenoid valve malfunctioning	Repair or replace	3-S17, 9-S43
	Clutch disc or drive plate excessively worn	Replace	3-S58, 70
	Deformation of piston, steel plate or pressure plate	Replace	3-S58, 71
Front Wheel Does Not Rotate	4WD clutch malfunctioning	Repair or replace	3-S58, 70
	4WD propeller shaft coupling disengaged	Engage	–
4WD Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	G-9
	Relief valve malfunctioning	Adjust or replace	2-S5

W1011019

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
[ROPS Model] Main Shift Rod 1	Length	364 mm 14.33 in.	—
	Length	178 mm 7.008 in.	—
	Length	447 mm 17.6 in.	—
	Length	211 mm 8.31 in.	—
[CABIN Model] Range Gear Shift Rod 1	Length	368 mm 14.49 in.	—
	Length	279 mm 10.98 in.	—
Internal Circlip to Presser Plate of Hi-Lo Dual Speed Hydraulic Pack [F36/R36 Speed Transmission Model]		1.3 to 1.7 mm 0.052 to 0.066 in.	2.5 mm 0.098 in.
Gear on 1st Shaft		Side Clearance Less than 0.2 mm 0.0078 in.	—
Internal Circlip to Belleville Washer (Cupped Spring Washer) of Shuttle Hydraulic Pack		1.8 to 2.0 mm 0.071 to 0.079 in.	3.6 mm 0.142 in.
Damper Disc Boss to Gear Shaft		Backlash (Displacement Around Disc Edge)	2.0 mm 0.079 in.
Valve Lever Pin to Lever Bushing		Clearance 0.049 to 0.156 mm 0.0019 to 0.0061 in.	0.5 mm 0.0197 in.
Lever Pin		O.D. 13.957 to 13.984 mm 0.5495 to 0.5506 in.	—
Lever Bushing		I.D. 14.033 to 14.113 mm 0.5525 to 0.5556 in.	—
Clutch Pedal Shaft to Clutch Pedal Bushing		Clearance 0.03 to 0.25 mm 0.0012 to 0.0098 in.	0.4 mm 0.0157 in.
Clutch Pedal Shaft		O.D. 24.9 to 25.0 mm 0.9803 to 0.9843 in.	—
Clutch Pedal Bushing		I.D. 25.03 to 25.15 mm 0.9854 to 0.9902 in.	—
Shift Fork to Shift Groove (for Main Change Section and Range Section)		Clearance 0.15 to 0.40 mm 0.0059 to 0.0157 in.	0.80 mm 0.031 in.
18T Bevel Gear to 19T Bevel Gear		Backlash 0.15 to 0.30 mm 0.0059 to 0.0118 in.	—

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Item		Factory Specification	Allowable Limit
Spiral Bevel Pinion Shaft Only	Turning Torque	3.138 to 3.628 N·m 0.32 to 0.37 kgf·m 2.314 to 2.676 lbf·ft	–
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.2 to 0.3 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case Bore to Differential Side Gear Boss	Clearance	0.070 to 0.189 mm 0.00276 to 0.00744 in.	0.35 mm 0.014 in.
Differential Case Bore	I.D.	49.07 to 49.15 mm 1.93189 to 1.92913 in.	–
Differential Side Gear Boss	O.D.	48.961 to 49.066 mm 1.92760 to 1.92913 in.	–
35T Bevel Gear Bore to Differential Side Gear Boss	Clearance	0.070 to 0.189 mm 0.00276 to 0.00744 in.	0.35 mm 0.014 in.
35T Bevel Gear Bore	I.D.	49.07 to 49.15 mm 1.93189 to 1.92913 in.	–
Differential Side Gear Boss	O.D.	48.961 to 49.066 mm 1.92760 to 1.92913 in.	–
Differential Pinion Shaft to Differential Pinion	Clearance	0.06 to 0.102 mm 0.00236 to 0.00402 in.	0.25 mm 0.010 in.
Differential Pinion Shaft	O.D.	22.959 to 22.980 mm 0.90390 to 0.90472 in.	–
Differential Pinion	I.D.	23.040 to 23.061 mm 0.90709 to 0.90791 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.
Hydraulic System Pressure for Shuttle, PTO, Differential Lock and 2WD-4WD	Pressure	2.06 to 2.15 MPa 21.0 to 22.0 kgf/cm ² 299 to 312 psi	–
4WD Clutch Disc	Thickness	2.1 to 2.3 mm 0.083 to 0.090 in.	1.9 mm 0.075 in.
4WD Steel Plate	Thickness	1.56 to 1.64 mm 0.0614 to 0.0646 in.	1.3 mm 0.051 in.
4WD Pressure Plate	Thickness	3.92 to 4.08 mm 0.155 to 0.160 in.	3.7 mm 0.15 in.
4WD Piston	Flatness	–	0.15 mm 0.006 in.
4WS Steel Plate	Flatness	–	0.40 mm 0.016 in.
4WD Pressure Plate	Flatness	–	0.30 mm 0.012 in.
Seal Ring	Thickness	2.39 to 2.44 mm 0.0941 to 0.0960 in.	2.0 mm 0.079 in.

W1013874

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	343.2 to 393.3	35.0 to 40.1	253.2 to 290.0
Shuttle valve pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Shuttle valve mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.2
Joint screw for hydraulic pipe	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Return pipe retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Power steering hose nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Oil cooler pipe nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Intake air heater terminal mounting nut	3.4 to 5.4	0.35 to 0.55	2.53 to 3.98
Starter's B terminal mounting nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7
Compressor bracket mounting screw (M8) to aluminum parts	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Compressor bracket mounting screw (M8) to ordinariness parts	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Compressor bracket mounting screw (M10) to ordinariness parts	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Master cylinder hose nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Steering joint shaft mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Brake pipe retaining nut	15.7 to 23.5	1.6 to 2.4	11.6 to 17.4
PTO pipe eye joint screw	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Oil cooler pipe (return)	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
3-point hitch delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Brake return pipe retaining eye screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Transmission case mounting screw and nut	124 to 147	12.6 to 15.0	91.2 to 108
Cylinder hose retaining nut	34.3 to 48.1	3.5 to 4.9	25.3 to 35.4
Top cover mounting screw and nut	124 to 147	12.6 to 15.0	91.2 to 108
PTO gear case assembly mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting screw and nut	196.1 to 225.6	20.0 to 23.0	145 to 166
Damper disc mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Shuttle case shuttle holder mounting screw and nut	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Speed change cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
PTO shaft staking nut	226 to 264	23.0 to 27.0	167 to 195
PTO clutch holder mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Differential bearing support mounting screw	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Spiral bevel gear mounting UBS screw	142.2 to 161.8	14.5 to 16.5	104.9 to 119.3
Spiral bevel pinion shaft staking nut	93.2 to 103.0	9.5 to 10.5	68.7 to 75.9

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4. CHECKING AND ADJUSTING

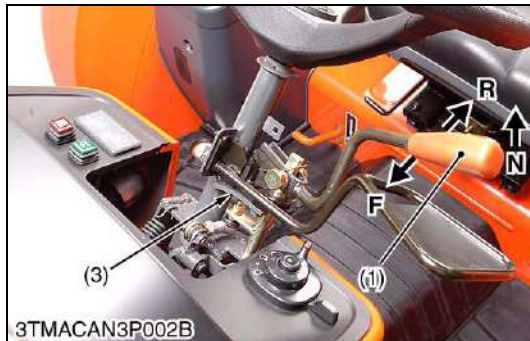
[1] SHUTTLE LEVER

(1) Hydraulic Shuttle Model



CAUTION

- Park the machine on a firm, flat and level surface, set the parking brake and place the gear shift in neutral.
- Stop the engine and remove the key before checking and adjusting.



Adjusting Shuttle Valve Neutral Position and Lever Guide Neutral Position

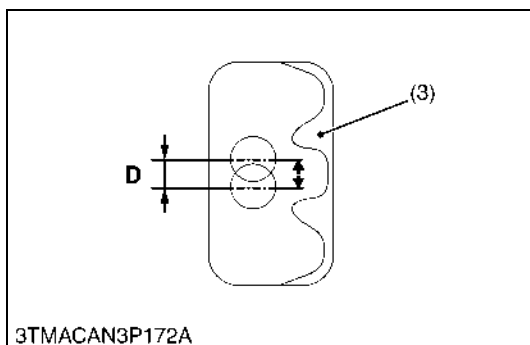
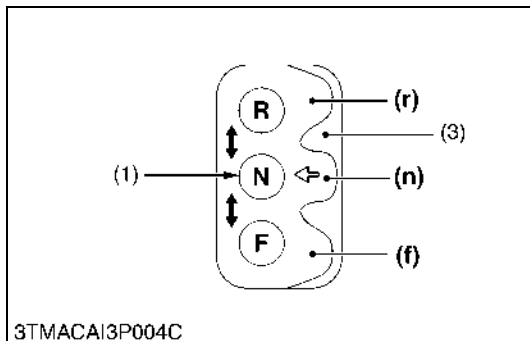
1. Remove the steering post cover (2).
2. The shuttle valve spool is provided with **F**, **N** and **R** ball detents. (Lift the shuttle lever (1) and slowly move it to the **F** and **R** directions until you feel the lever clicking at the ball detents.)
3. The shuttle lever guide (3) also has the **f**, **n** and **r** grooves for the shuttle lever.
4. In this adjustment procedure, make alignment between the shuttle valve neutral detent position and shuttle lever guide groove **N**.
5. Place the shuttle lever to the neutral position.
6. Lift the shuttle lever (1) then move it reverse and forward, and confirm the free play "**D**" of the shuttle lever (1) at neutral position.

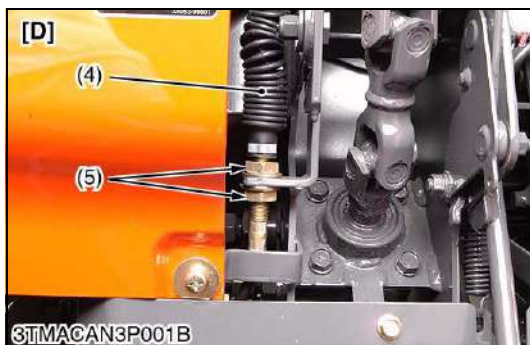
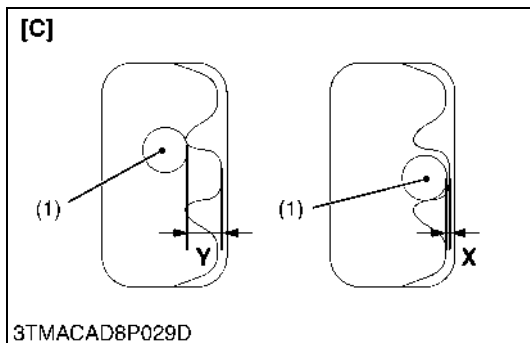
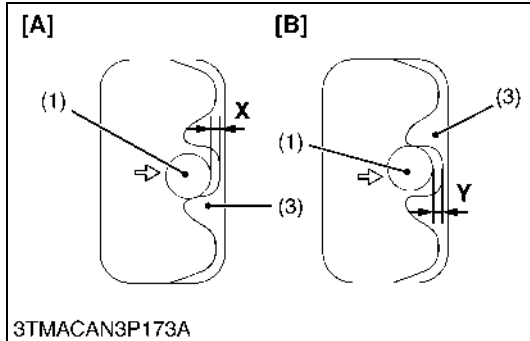
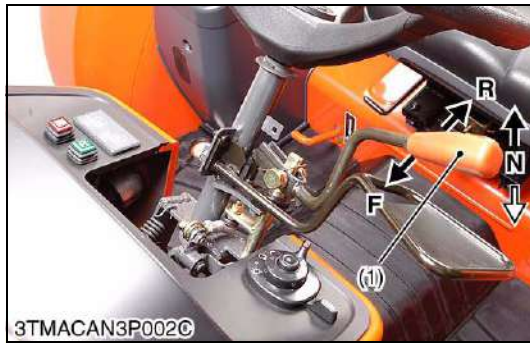
- (1) Shuttle Lever
(2) Steering Post Cover
(3) Shuttle Lever Guide

- (f) Groove F
(n) Groove N
(r) Groove R

F : Forward
R : Reverse
N : Neutral
D : Free Play

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Adjusting Shuttle Valve Neutral Position and Lever Guide Neutral Position (Continued)

7. Shift the free play "D" toward the forward direction and slowly lower the shuttle lever as shown in the figure. And visually inspect the clearance "X".
8. Shift the free play "D" toward the rear direction and slowly lower the shuttle lever (1) as shown in the figure. And visually inspect the clearance "Y".
9. Make sure the two clearance "X" and "Y" are just the same, with shuttle cable retaining nut (5).

NOTE

- The figure [C] is an example when the length of the shuttle cable (4) is misadjusted.

- (1) Shuttle Lever
 (2) Steering Post Cover
 (3) Shuttle Lever Guide
 (4) Shuttle Cable
 (5) Retaining Nut

[A] When the shuttle lever shift to forward.

[B] When the shuttle lever shift to reverse.

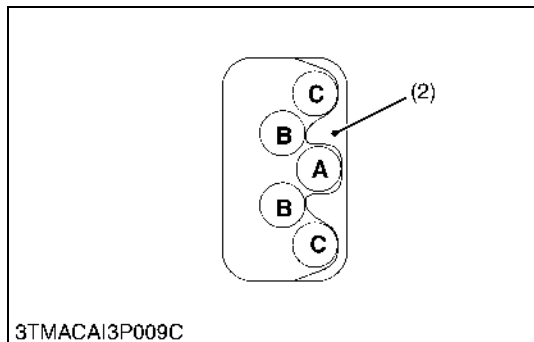
[C] The cable is misadjusted

[D] ROPS Model

[E] CABIN Model

W1113888

(2) Engine Start Condition



Engine Start Condition

■ IMPORTANT

- Before starting the engine, make sure the gear shift lever at the neutral position.
- Place the PTO lever to the OFF position.
- Apply the parking brake.

1. Check the engine start condition as follows :

■ NOTE

- Do not touch the shuttle lever (1) when the shuttle lever (1) is at specified position as shown in figure.

(Reference)

- Position **A** : Engine start
 - Position **B** : Engine does not start
 - Position **C** : Engine does not start
2. If the engine started at position **B** and/or **C**, adjust the shuttle cable with retaining nut (refer with this section).

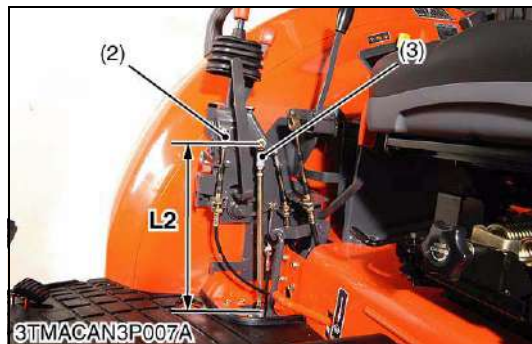
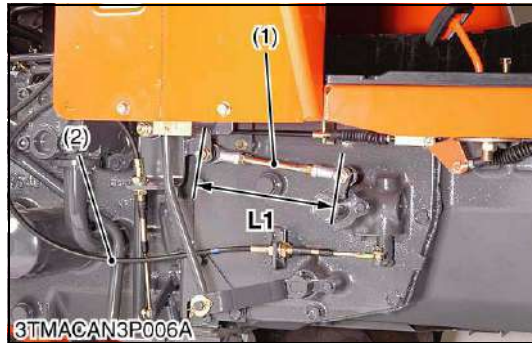
(1) Shuttle Lever

(2) Shuttle Lever Guide

W1011278

[2] GEAR SHIFTING LINKAGE

(1) Main Gear Shift



Checking Function of Main Gear Shift (ROPS Model)

- Check the function of the main gear shift.
 - Neutral position to 1st gear position.
 - Neutral position to 2nd gear position.
 - Neutral position to 3rd gear position.
 - Neutral position to 4th gear position.
 - Neutral position to 5th gear position.
 - Neutral position to 6th gear position.
- If shifting is not smooth, check the length of main shift rod 1 (1) and main shift rod 2 (3). Adjust the select cable (2) so that the lever end (4) has contact with stopper (5) when main gear shift lever operates to 1st-2nd direction.

NOTE

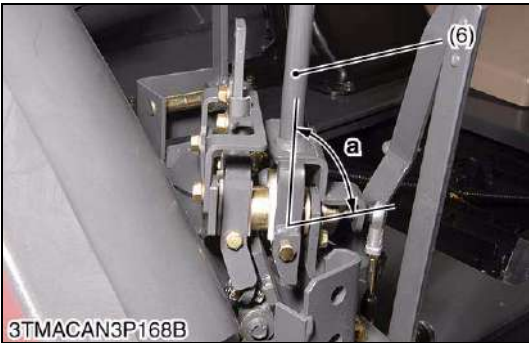
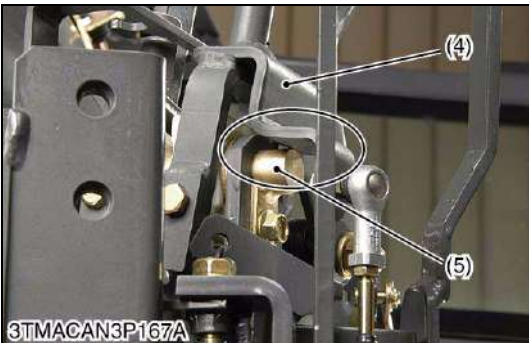
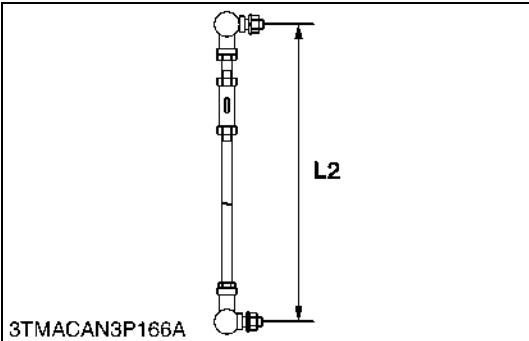
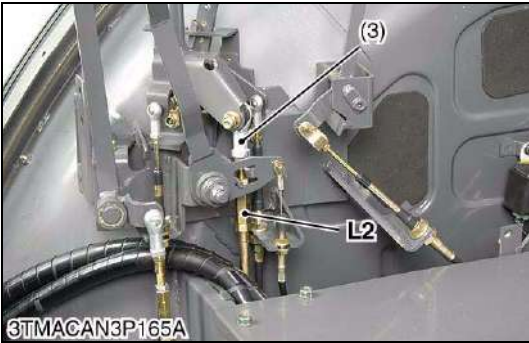
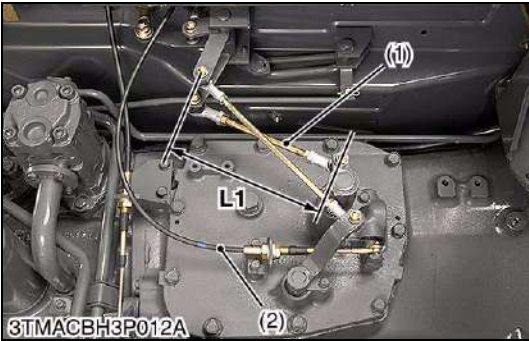
- The main gear shift lever (6) is not positioned in vertically at "neutral" position.

Length of main shift rod 2 (L1)	Initial adjustment	178 mm 7.01 in.
Length of main shift rod 1 (L2)	Factory spec.	364 mm 14.33 in.

- Main Shift Rod 2
- Select Cable
- Main Shift Rod 1
- Lever End
- Stopper
- Main Gear Shift Lever

L1 :Main Shift Rod 2 Length
L2 :Main Shift Rod 1 Length
a : Shift Lever Position at Neutral is
1.5 rad (87 °)

W1011767



Checking Function of Main Gear Shift (CABIN Model)

1. Check the function of the main gear shift.
 - Neutral position to 1st gear position.
 - Neutral position to 2nd gear position.
 - Neutral position to 3rd gear position.
 - Neutral position to 4th gear position.
 - Neutral position to 5th gear position.
 - Neutral position to 6th gear position.
2. If shifting is not smooth, check the length of main shift rod 2 (1) and main shift rod 1 (3). Adjust the select cable (2) so that the lever end (4) has contact with stopper (5) when main gear shift lever operates to 1st-2nd direction.

NOTE

- The main gear shift lever (6) is not positioned in vertically at “neutral” position.

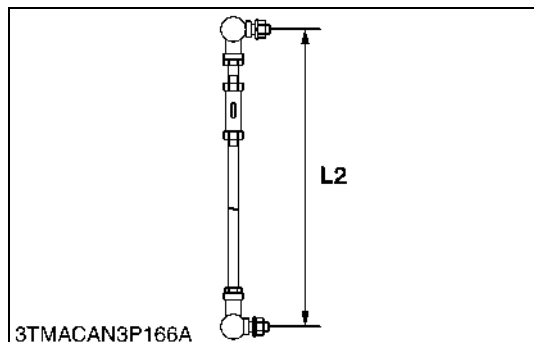
Length of main shift rod 2 (L1)	Initial adjustment	211 mm 8.31 in.
Length of main shift rod 1 (L2)	Factory spec.	447 mm 17.6 in.

- (1) Main Shift Rod 2
- (2) Select Cable
- (3) Main Shift Rod 1
- (4) Lever End
- (5) Stopper
- (6) Main Gear Shift Lever

L1 :Main Shift Rod 2 Length
L2 :Main Shift Rod 1 Length
a : Shift Lever Position at Neutral is 1.3 rad (76 °)

W1101501

(2) Range Gear Shift



Checking Function of Range Shift (CABIN Model Only)

1. Check the function of the range gear shift.
- **Hi** and **Lo** position.
2. If feeling abnormal shifting, check the length of range gear shift rod 1 (3) and 2 (1).

Length of range gear shift rod 2 (L1)	Factory spec.	279 mm 10.98 in.
Length of range gear shift rod 1 (L2)	Initial adjustment	368 mm 14.49 in.

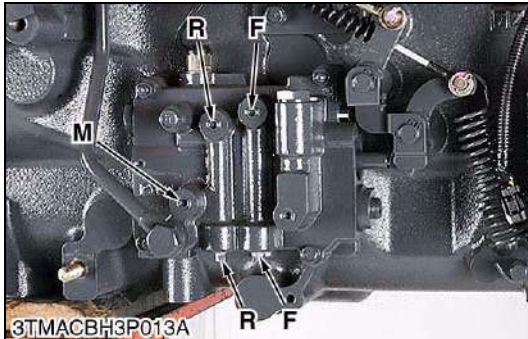
- (1) Range Gear Shift Rod 2
- (2) Range Gear Shift Lever
- (3) Range Gear Shift Rod 1

L1 :Range Gear Shift 1 Length

L2 :Range Gear Shift 2 Length

W1102254

[3] SHUTTLE VALVE



Checking of Shuttle Valve System Pressure

1. Prepare a can (3) for fuel and put in the fuel hose (1) and fuel return hose (2).
2. Remove the each plugs of **F**, **R**, **M** and install the adaptor (4) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section), threaded joint, cable, and pressure gauge (Code No. : 07916-52961).
3. Start the engine and measure the pressure of each port and each shuttle lever position as the pressure table.

Condition

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Oil temperature : 45 to 55 °C (113 to 131 °F)

Shuttle Lever	Clutch Pedal	F port pressure	R port pressure	M port pressure
Forward	Fully pressed	0	0	2.16 to 2.26 MPa 22 to 23 kgf/cm ² 312.9 to 327.1 psi
	Free	2.06 to 2.26 MPa 21 to 23 kgf/cm ² 298.7 to 327.1 psi	0	
Reverse	Fully pressed	0	0	2.06 to 2.26 MPa 21 to 23 kgf/cm ² 298.7 to 327.1 psi
	Free	0	2.06 to 2.26 MPa 21 to 23 kgf/cm ² 298.7 to 327.1 psi	
Neutral	—	0	0	0.26 to 0.28 MPa 2.7 to 2.9 kgf/cm ² 38 to 41 psi



WARNING

- Be sure to place the main gear shift lever in neutral and set the parking brake lever to parking position.

NOTE

- Pressure gauge is 5 MPa (50 kgf/cm², 700 psi) full scale.
- Apply Three Bond 1324N or equivalent to the plugs **F**, **R** and **M**, when install them.
- Plug (**F**, **R**, **M**) thread size is R1/8.

- (1) Fuel Hose
- (2) Fuel Return Hose
- (3) Can
- (4) Adaptor
- (5) Shuttle Valve

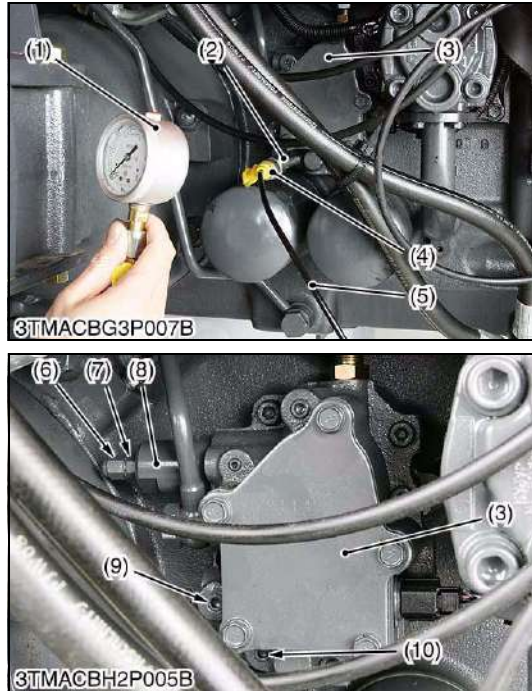
Plug **F** : Operation Oil Pressure
(For Forward)

Plug **R** : Operation Oil Pressure
(For Reverse)

Plug **M** : Operation Oil Pressure
(For Modulation Valve)

W1012050

[4] 2WD-4WD CLUTCH



Clutch Operating Pressure

■ IMPORTANT

- Do not connect the universal joint of the implement to the tractor PTO shaft while testing.
 - Set the main shift lever and shuttle lever in Neutral position.
 - Set the parking brake lever in parking position.
1. Place the disassembling stand under the transmission case.
 2. Remove the right rear wheel and left fender.
 3. Place the disassembling stand under the left rear axle case.
 4. Remove the plug (R1/8) (13) on the solenoid valve assembly (3).
 5. Assemble the adaptor (R1/8) (2), threaded joint (4), cable (5) and pressure gauge (1).
 6. Start the engine and set the engine speed to maximum.
 7. Set the 4WD switch to 4WD position and measure the oil pressure.
 8. If only the pressure in the 4WD clutch engaged position is low, check the hydraulic 4WD clutch system.
 9. If the measurement is not within the factory specifications, measure the system pressure, and adjust the system pressure with relief valve (8) if necessary.

4WD pressure (when 4WD switch at "4WD" position)	Factory spec.	2.16 to 2.26 MPa 22 to 23 kgf/cm ² 312.91 to 327.14 psi
4WD pressure (when 4WD switch at "2WD" position)	Factory spec.	No pressure

Condition

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Oil temperature : 45 to 55 °C
113 to 131 °F

(Reference)

- Turn the adjusting screw after removed lock nuts (6) and (7).
- Turn the adjusting screw clockwise direction → Pressure increase
- Turn the adjusting screw counterclockwise direction → Pressure decrease.

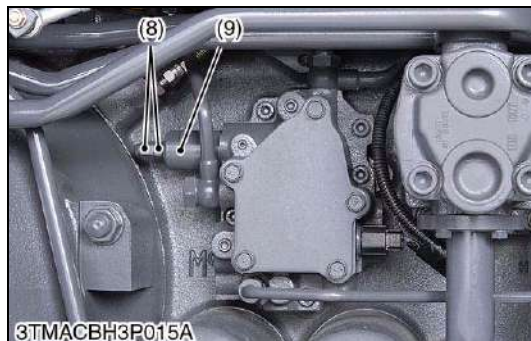
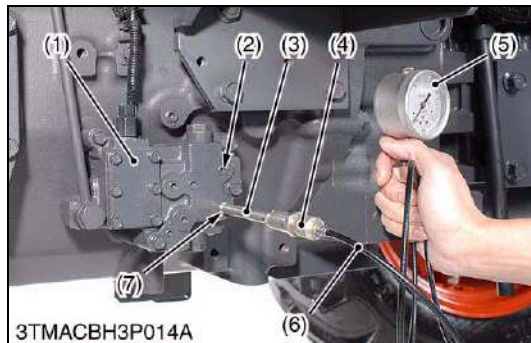
■ NOTE

- Plug thread size : R1/8

(1) Pressure Gauge	(6) Lock Nut
(2) Adaptor	(7) Lock Nut
(3) Solenoid Valve Assembly	(8) Relief Valve (System Pressure)
(4) Threaded Joint	(9) Plug (4WD Clutch Check Port)
(5) Cable	(10) Plug (System Pressure Check Port)

W1075337

[5] HI-LOW DUAL SPEED CLUTCH (F36/R36 SPEED TRANSMISSION MODEL)



Dual Speed Clutch Operating Pressure

■ IMPORTANT

- Do not connect the universal joint of the implement to the tractor PTO shaft while testing.
- Set the main shift lever and shuttle lever in Neutral position.
- Set the parking brake lever in parking position.
- Be sure to set the disassembling stand, under the transmission case when remove the rear wheel to adjust the relief valve pressure.
- Be sure to set the disassembling stand, under the rear axle after removed rear wheel.

1. Remove the plug (R1/8) (2) and/or (7) on the solenoid valve assembly (1).
2. Assemble the adaptor (R1/8) (3), threaded joint (4), cable (6) and pressure gauge (5).
3. Start the engine and set the engine speed to maximum.
4. Set the hi-low dual speed switch Hi or Lo position and measure the oil pressure.
5. If only the pressure in the clutch engaged position is low, check the dual speed clutch system.
6. If the measurement is not within the factory specifications, measure the system pressure, and adjust the system pressure with relief valve (9) if necessary.

Dual speed pressure (at Hi and Lo check port)	Factory spec.	2.16 to 2.26 MPa 22 to 23 kgf/cm ² 312.91 to 327.14 psi

Condition

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Oil temperature : 45 to 55 °C
113 to 131 °F

(Reference)

- Turn the adjusting screw after removed lock nuts (8).
- Turn the adjusting screw clockwise direction → Pressure increase
- Turn the adjusting screw counterclockwise direction → Pressure decrease.

■ NOTE

- Plug thread size : R1/8

(1) Dual Speed Solenoid Valve	(6) Cable
(2) Check Port for Low Speed	(7) Check Port for Hi Speed
(3) Adaptor	(8) Lock Nut
(4) Threaded Joint	(9) Relief Valve (System Pressure)
(5) Pressure Gauge	

W1016859

5. DISASSEMBLING AND ASSEMBLING

[1] HYDRAULIC SHUTTLE VALVE AND SOLENOID VALVE ASSEMBLY

(1) Removing Fuel Tank (ROPS Model)

Draining Transmission Fluid and Fuel

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

W1012355



Rear Wheel (L.H.) and Fender (L.H.)

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (2).
3. Place the disassembling stand under the rear axle case.
4. Remove the fender (1).

(When reassembling)

Tightening torque	Rear wheel mounting nut	343.2 to 393.3 N·m 35.0 to 40.1 kgf·m 253.2 to 290.0 lbf·ft

(1) Fender

(2) Rear Wheel

W1016895



Fuel Tank

1. Remove the auxiliary step (3).
2. Disconnect the wire harness from fuel level sensor (1).
3. Remove the fuel filling port screw.
4. Remove the fuel hose and overflow hose.
5. Remove the fuel tank (2).

(1) Fuel Level Sensor

(3) Auxiliary Step

(2) Fuel Tank

W1017026

(2) Removing Fuel Tank (CABIN Model)

Draining Transmission Fluid and Fuel

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

W1015022



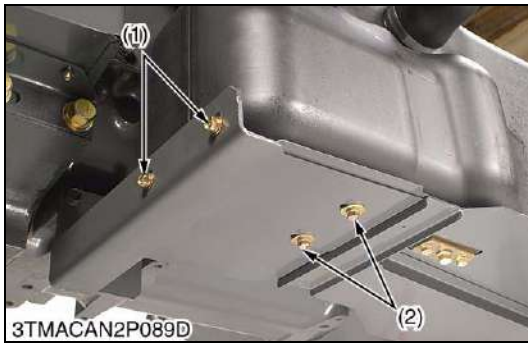
Fuel Filling Port and Auxiliary Step

1. Remove the fuel filling port mounting screw (1).
2. Remove the auxiliary step (2).

(1) Fuel Filling Port Mounting Screw

(2) Auxiliary Step

W1015076



Fuel Tank Under Cover

1. Remove the fuel tank mounting screws (1) and under cover mounting screws (2).

(1) Fuel Tank Mounting Screw

(2) Under Cover Mounting Screw

W1015206



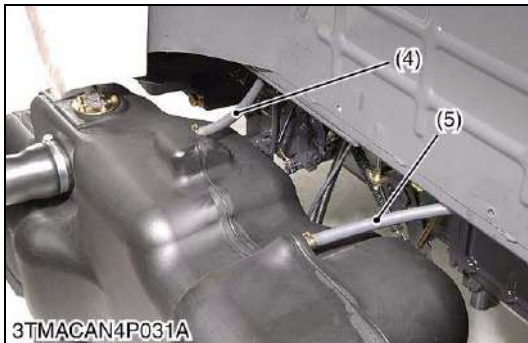
Rear Wheel and Fuel Tank

1. Place the disassembling stand under the transmission case.
2. Remove the left rear wheel.
3. Place the disassembling stand under the rear axle case.
4. Remove the fuel sensor **2P** connector (1).
5. Remove the fuel hose cover (2).
6. Remove the both fuel tank band (3).
7. Draw out the fuel tank and disconnect the breather hose (4) and (5).
8. Disconnect the fuel hose (6) and return hose (7).

(When reassembling)

- Be sure to connect the fuel sensor connector.
- Be sure to fix the fuel hoses and breather hose.

Tightening torque	Rear wheel mounting nut	343.2 to 393.2 N·m 35.0 to 40.1 kgf·m 253.2 to 290.0 lbf·ft



(1) Fuel Sensor **2P** Connector

(5) Breather Hose (Rear)

(2) Fuel Hose Cover

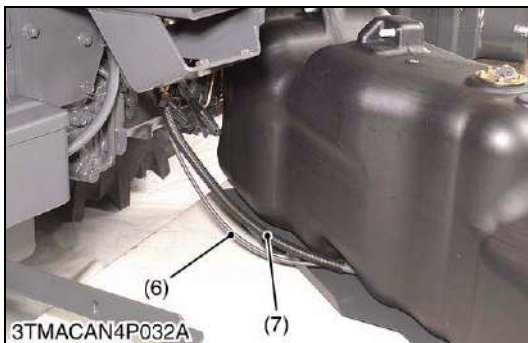
(6) Fuel Hose

(3) Fuel Tank Band

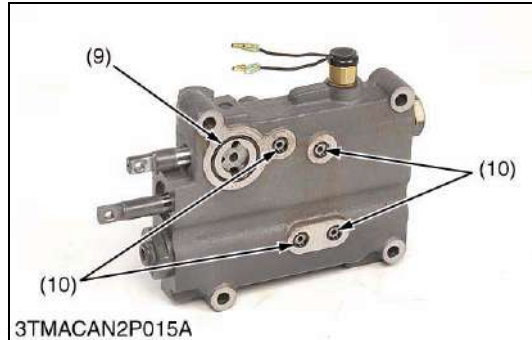
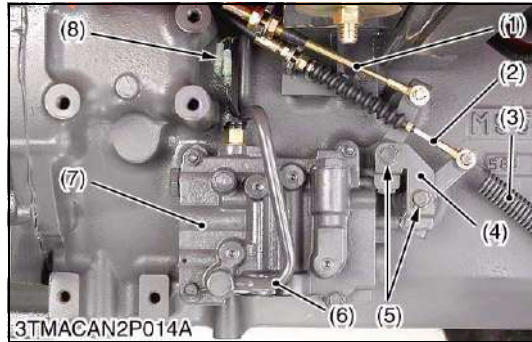
(7) Fuel Return Hose

(4) Breather Hose (Front)

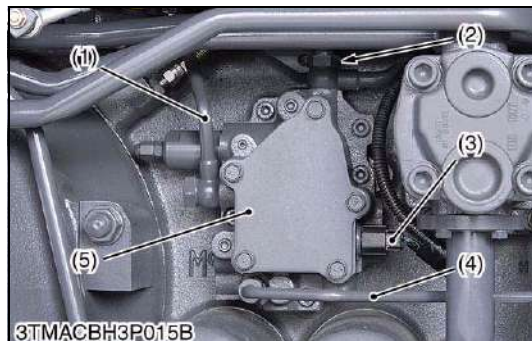
W1015400



(3) Hydraulic Shuttle Valve



(4) Solenoid Valve Assembly



Shuttle Valve Assembly

1. Disconnect the shuttle cable (1).
2. Disconnect the clutch cable (2) and spring (3).
3. Remove the shuttle valve pipe (6).
4. Remove the external circlip (5) and plate (4).
5. Disconnect the neutral switch **1P** connectors (8).
6. Remove the shuttle valve assembly (7).

(When reassembling)

- Be sure to fix the O-ring (10) and (9) in position as shown photo and apply transmission fluid.
- Adjust the clutch pedal free travel (refer to "CHECKING AND ADJUSTING" in this section).
- Turn the mark (11) to outward.

Tightening torque	Shuttle valve pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	Shuttle valve mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(1) Shuttle Cable	(7) Shuttle Valve Assembly
(2) Clutch Cable	(8) 1P Connector for Neutral Switch
(3) Spring	(9) O-ring
(4) Plate	(10) O-ring
(5) External Circlip	(11) Mark
(6) Shuttle Valve Pipe	(12) Shuttle Spool

W1015835

Solenoid Valve Assembly

1. Remove the I-joint screw (delivery pipe) (2) and differential lock (1).
2. Remove the return pipe (4) for F36/R36 speed transmission model.
3. Disconnect the connector (3).
4. Remove the solenoid valve assembly (5).

(When reassembling)

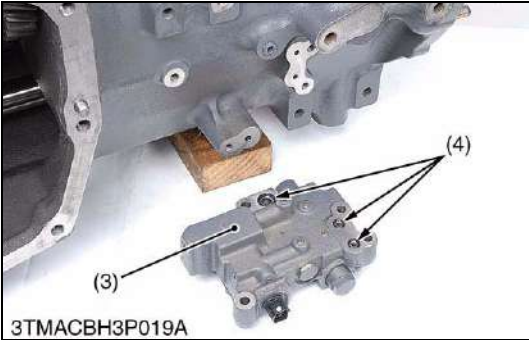
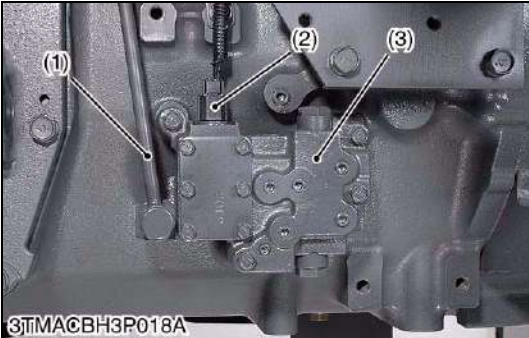
- Apply transmission fluid to the O-rings (6).
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of transmission case and solenoid valve assembly.

Tightening torque	Joint screw for hydraulic pipe	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Return pipe retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft

(1) Pipe (Differential Lock)	(4) Return Pipe
(2) Pipe (Delivery)	(5) Solenoid Valve Assembly
(3) Connector	(6) O-ring

W1016680

(5) Dual Speed Solenoid Valve (F36/R36 Speed Transmission Model)



Dial Speed Valve Solenoid Assembly

- 1. Disconnect the harness coupler (2).
- 2. Remove the dual speed valve delivery pipe (1).
- 3. Remove the dual speed solenoid valve (3).

(When reassembling)

- Be sure to fix the O-rings (4) in position as shown photo and apply transmission fluid to the O-rings (4).

Tightening torque	Joint screw for hydraulic pipe	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

- (1) Dual Speed Solenoid Valve Delivery Pipe
- (2) Coupler
- (3) Dual Speed Solenoid Valve
- (4) O-ring

W1019547

[2] PREPARATION FOR SEPARATING EACH BLOCK

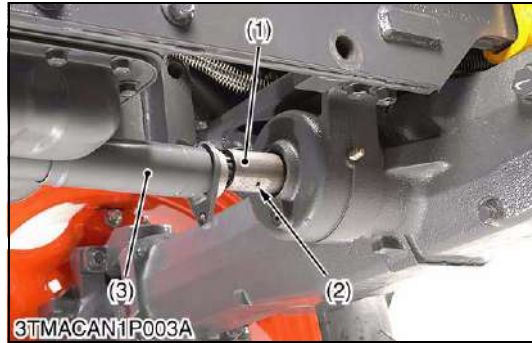
(1) Lubricant and Coolant

Draining Transmission Fluid and Fuel

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

W1016839

(2) 4WD Propeller Shaft and Power Steering Hose



Propeller Shaft

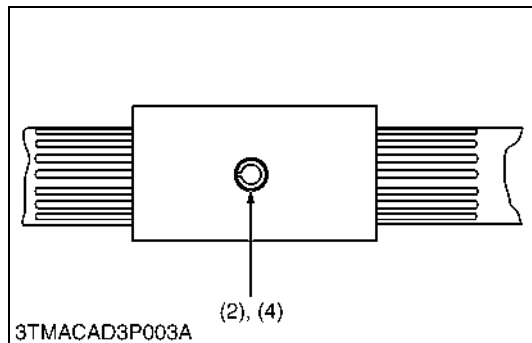
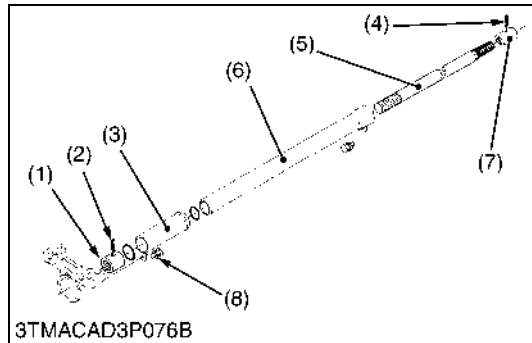
1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

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

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

W1054851



Power Steering Hose

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

(When reassembling)

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

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

(1) Power Steering Cylinder

(2) Power Steering Hose

W1055187

(3) Front Axle Rocking Restrictor



Front Axle Rocking Restrictor

1. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOL" at "G. GENERAL" section) to the front axle bracket on both side.

(1) Front Axle Rocking Restrictor

W1063409

(4) Bonnet (ROPS Model)



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connector (2) for head lights.
3. Disconnect the damper (4).
4. Remove the bonnet (1) and side cover (2) for both side.

■ IMPORTANT

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

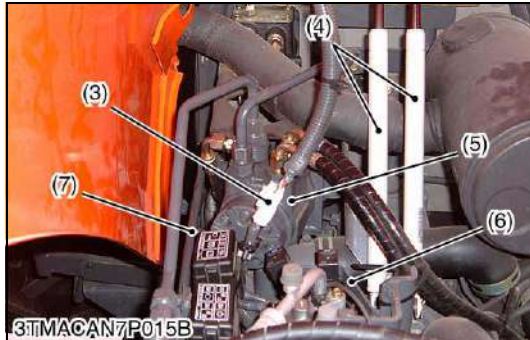
(1) Bonnet
(2) Connector

(3) Side Cover
(4) Damper

W1017565



(5) Bonnet (CABIN Model)



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connector (3) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1).
5. Remove the both side covers (2).
6. Remove the muffler pipe (8).

(When reassembling)

- The connector (3) should be placed within the space of controller pipe (7), power steering controller (5) and stay (6).

■ **IMPORTANT**

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

(1) Bonnet	(5) Power Steering Controller
(2) Side Cover	(6) Stay
(3) Connector	(7) Controller Pipe
(4) Damper	(8) Muffler Pipe

W1095434

(6) Air Cleaner Harness Connector



Air Cleaner Harness

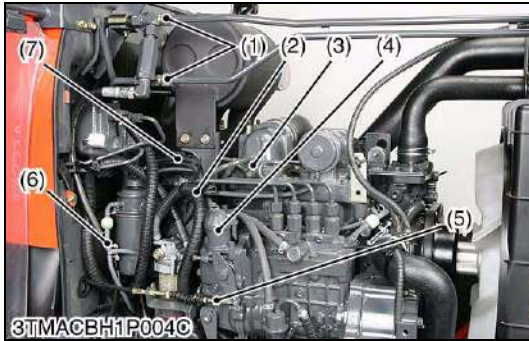
1. Disconnect the **1P** connectors from the air cleaner switch (1).
2. Remove the air cleaner harness clamp.

- (1) Air Cleaner Switch

W1017939

[3] SEPARATING ENGINE AND CLUTCH HOUSING CASE

(1) ROPS Model



Cover, Oil Cooler Pipe, Fuel Hoses, Accelerator Wire and Wire Harness for R.H. Side

1. Disconnect the fuel hose (2) from separator and fuel overflow hose (6).
2. Disconnect the oil cooler pipe nut (1).
3. Disconnect the wire harness from air heater (3), engine stop solenoid (4) and engine speed sensor (8).
4. Remove the accelerator wire (5).

(When reassembling)

Tightening torque	Oil cooler pipe nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	Intake air heater terminal mounting nut	3.4 to 5.4 N·m 0.35 to 0.55 kgf·m 2.53 to 3.98 lbf·ft

- (1) Oil Cooler Pipe Nut
(2) Fuel Hose
(3) Air Heater
(4) Engine Stop Solenoid

- (5) Accelerator Wire
(6) Overflow Hose
(7) Wire Harness
(8) Engine Speed Sensor

W1040899

Power Steering Hose and Wire Harness for L.H. Side

1. Remove the side cover (1).
2. Remove the power steering hose bands (2).
3. Disconnect the wire harness (6) from starter (5), alternator (4), water temperature switch (3) and engine oil pressure switch (7).

(When reassembling)

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

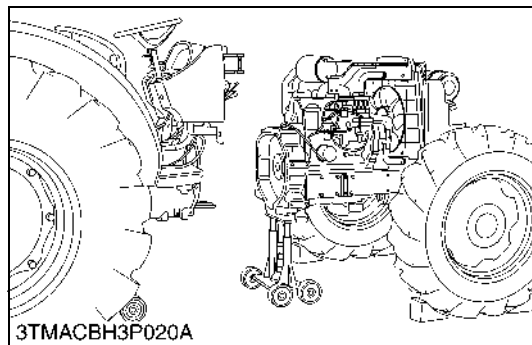
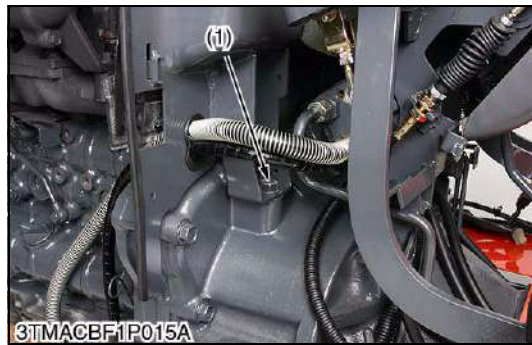
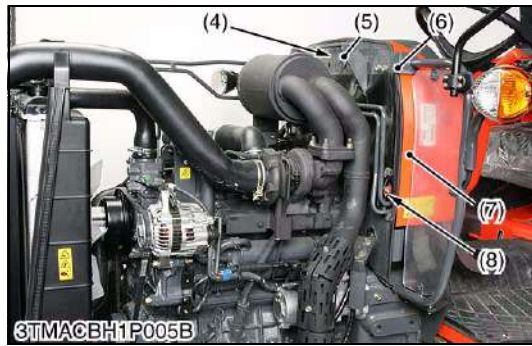
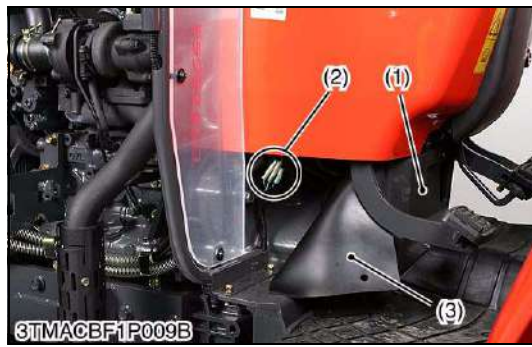
■ NOTE

- There are three bands for power steering hose. Hose band under the radiator is not in photo.

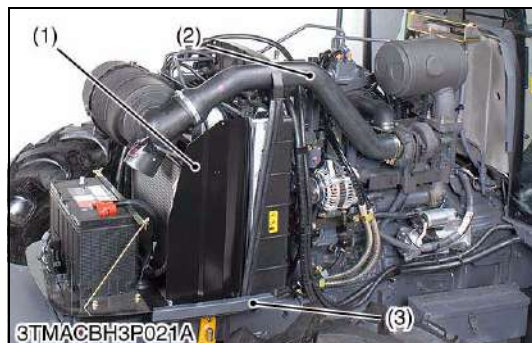
- (1) Side Cover
(2) Power Steering Hose Band
(3) Water Temperature Switch
(4) Alternator

- (5) Starter Motor
(6) Wire Harness
(7) Engine Oil Pressure Switch

W1040730



(2) CABIN Model



Steering Support Under Cover and Rear Bonnet

1. Remove the steering support under cover (1).
2. Remove the rubber sheet (3) and disconnect the 3-1P connectors (2).
3. Remove the shield assembly (6).
4. Loosen the rear bonnet mounting screws (8).
5. Remove the seal (4) and panel guide mounting screw (5).
6. Disconnect the wire harness and remove the rear bonnet (7).

(1) Steering Support Under Cover	(5) Screw
(2) 1P Connectors	(6) Shield
(3) Rubber Sheet	(7) Rear Bonnet
(4) Seal	(8) Screw

W1018688

Separating Engine from Clutch Housing

1. Make sure the engine and clutch housing case are securely mounted on the disassembling stands.
2. Remove the steering support mounting screw (1) for front side.
3. Remove the engine mounting screws and nut, and separate the engine from the clutch housing.

(When reassembling)

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

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Engine and clutch housing mounting stud bolt	61.8 to 73.6 N·m 6.3 to 7.5 kgf·m 45.6 to 54.2 lbf·ft

- (1) Steering Support Mounting Screw

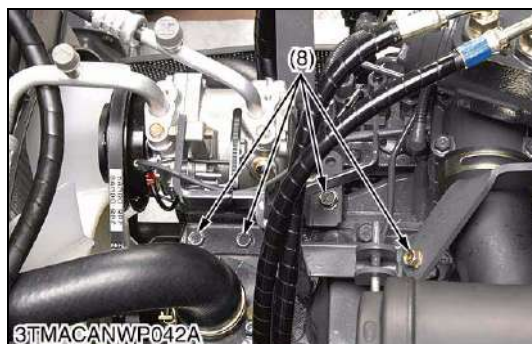
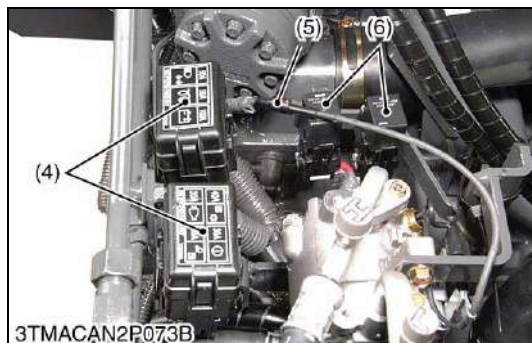
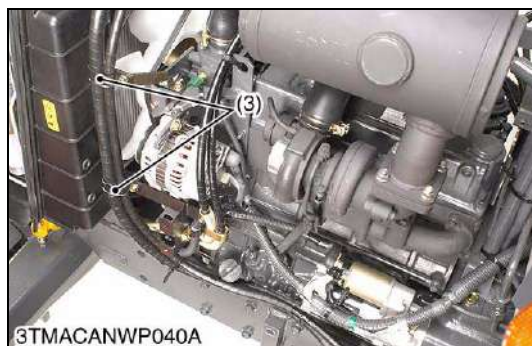
W1013389

Side Panel

1. Remove the both side cover guides (3).
2. Remove the both side panels (1).
3. Remove the air cleaner hose (2).

(1) Side Panel	(3) Side Cover Guide
(2) Air Cleaner Hose	

W1022025



Condenser and Compressor

■ Without discharging the refrigerant from system

1. Detach the air conditioner hoses from the hose retainer (1) and slide out the condenser (2).
2. Remove the hose clamps (3).
3. Remove the slow blow fuse boxes (4) and relays (6).
4. Disconnect 1P connector (5) of magnetic clutch.
5. Remove the compressor bracket (7) mounting screw (8) from engine.

(1) Hose Retainer	(5) 1P Connector (Magnetic Clutch)
(2) Condenser	(6) Relay
(3) Hose Clamp	(7) Compressor Bracket
(4) Slow Blow Fuse Box	(8) Screw

W1026138



Preparation 3 (Continued)

1. Remove the compressor (1) with hoses and compressor bracket.

(When reassembling)

- Take care not damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the air conditioner belt tension.

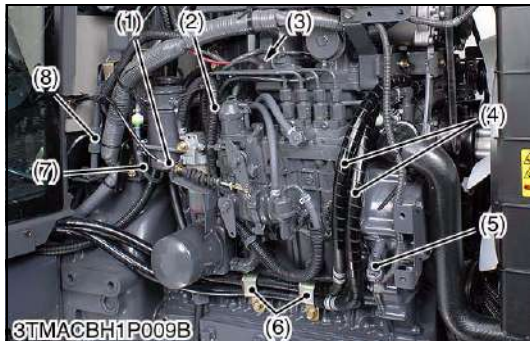
(Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)

Tightening torque	Compressor bracket mounting screw (M8) to aluminum parts	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft
	Compressor bracket mounting screw (M8) to ordinariness parts	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Compressor bracket mounting screw (M10) to ordinariness parts	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

(1) Compressor

(2) Condenser

W1052713



Accelerator Wire, Fuel Hose, Heater Hose and Wire Harness

1. Remove the hose clamps (6).
2. Disconnect the heater hoses (4).
3. Disconnect the accelerator wire (1).
4. Disconnect the master cylinder hose (12).
5. Remove the bonnet support (11).
6. Remove the fuel hose (2) and (7).
7. Remove the retaining nut for hydraulic pipe (8).
8. Remove the connectors for air heater (3), engine speed sensor (5) and engine stop solenoid (9).

(When reassembling)

- Be sure to fix the heater hose to the original position. Note the inlet hose and outlet hoses.

Tightening torque	Master cylinder hose nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft

(1) Accelerator Wire

(2) Fuel Hose

(3) Air Heater

(4) Heater Hose

(5) Engine Speed Sensor

(6) Hose Clamp

(7) Fuel Hose (Overflow)

(8) Hydraulic Pipe

(9) Engine Stop Solenoid

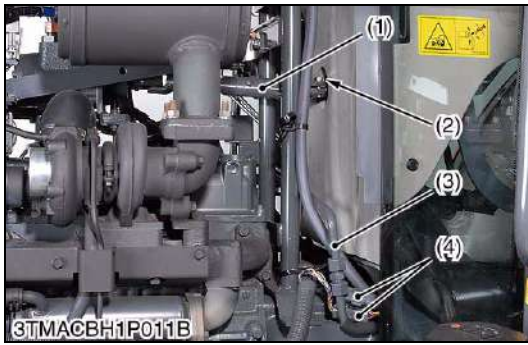
(10) Master Cylinder Return Hose

(11) Bonnet Support

(12) Master Cylinder Hose



W1022765



Steering Joint and Wire Harness

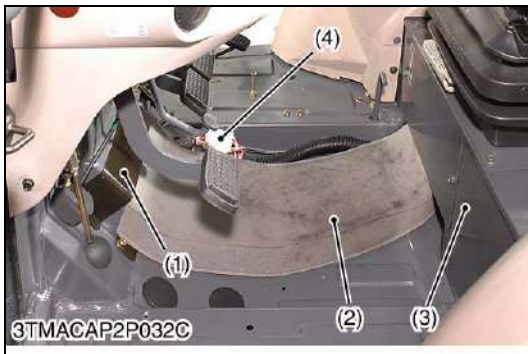
1. Remove the steering joint shaft mounting screw (2) then remove the steering joint shaft (1).
2. Remove the retaining nut for hydraulic hose (3).
3. Remove the connectors (4).
4. Remove the harness connectors for the engine oil pressure switch (7), alternator (5) and starter (6).

(When reassembling)

Tightening torque	Steering joint shaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(1) Steering Joint Shaft	(5) Alternator
(2) Steering Joint Shaft Mounting Screw	(6) Starter
(3) Hydraulic Pipe	(7) Engine Oil Pressure Switch
(4) Connector	

W1023199



Separating Engine from Clutch Housing

1. Check the engine and clutch housing case are securely mounted on the disassembling stands.
2. Remove the floor cover and duct retainer (1).
3. Disconnect the connectors (4) and pull out the connectors from cabin.
4. Remove the seat under cover (3) and duct (2).
5. Remove the engine mounting screws and nuts.
6. Separate the engine from the clutch housing.

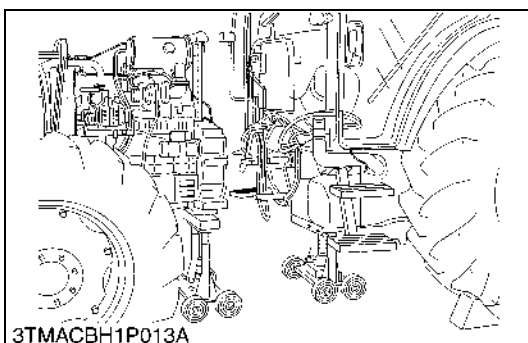
(When reassembling)

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

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

(1) Duct Retainer	(3) Seat Under Cover
(2) Duct	(4) Connector

W1014655



[4] SEPARATING CLUTCH HOUSING CASE FROM TRANSMISSION CASE

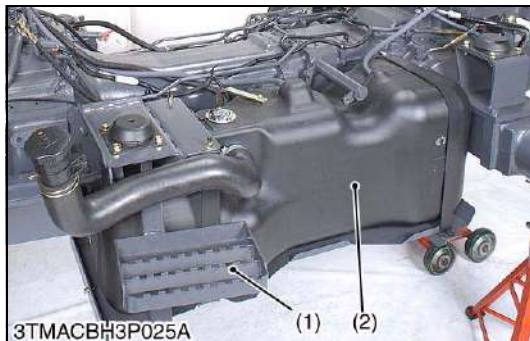
(1) Preparation for CABIN Model



Removing Cabin from Body

1. Refer to "10. CABIN" section.

W1020843



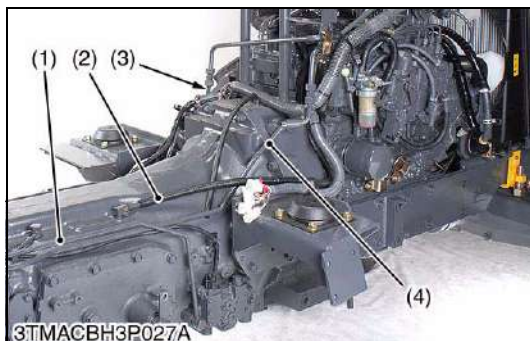
Fuel Tank

1. Remove the auxiliary step (1) both side.
2. Remove the fuel tank (2).

(1) Auxiliary Step

(2) Fuel Tank

W1023971



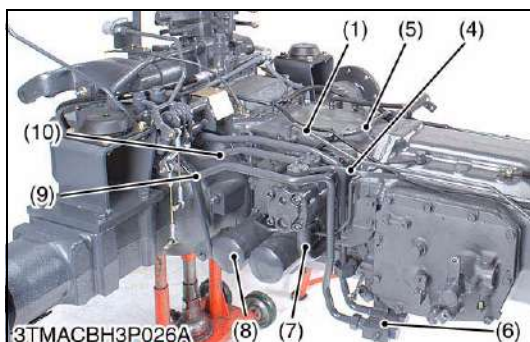
Hydraulic Pipes

1. Remove the shuttle valve delivery pipe (3).
2. Remove the power steering delivery pipe (4).
3. Remove the brake master cylinder return hose (2).
4. Remove the dual speed pipe (1).
5. Remove the 3 point delivery pipe (9).
6. Remove the trailer brake pipe (10).
7. Remove the solenoid valve assembly pipe (5).
8. Remove the suction pipe (7).*
9. Remove the oil filter cartridge (8).*
10. Remove the return pipe (11).*
11. Remove the outlet block (6) with pipe.
12. Remove the trailer brake return pipe (12).

NOTE

- Procedure 8, 9 and 10 with * marks relate for F36/R36 speed transmission model.

(When reassembling)

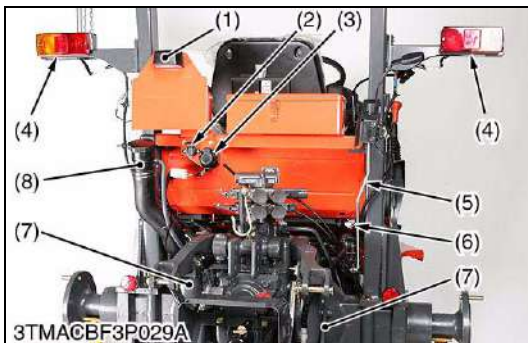
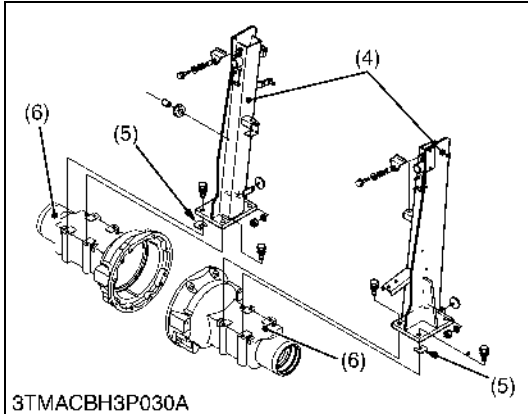


Tightening torque	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 lbf·ft
	Power steering pipe and hydraulic pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	Hydraulic pipe joint screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

(1) Dual Speed Pipe	(7) Suction Pipe
(2) Brake Master Cylinder Return Hose	(8) Oil Filter Cartridge
(3) Shuttle Valve Delivery Pipe	(9) 3P-Delivery Pipe
(4) Power Steering Delivery Pipe	(10) Trailer Brake Pipe
(5) Solenoid Valve Assembling Pipe	(11) Return Pipe
(6) Outlet Block	(12) Trailer Brake Return Pipe

W1024101

(2) Preparation for ROPS Model



ROPS Upper

1. Hook the ROPS upper frame (2) and remove the damper (1).
2. Remove the set bolt (3).
3. Remove the ROPS upper frame (2).

(When reassembling)

- Confirm the ROPS upper frame (2) slide smoothly.
- If the ROPS upper frame (2) does not slide smoothly, adjust the sliding condition using an adjusting shim (5) between ROPS under frame (4) and rear axle (6).

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

(1) Damper	(4) ROPS Under Frame
(2) ROPS Upper Frame	(5) Adjusting Shim (0.5)
(3) Set Bolt	(6) Rear Axle

W1024631

Lift Rod, Lower Link and Fender (R.H., L.H.)

1. Place the disassembling stand under the transmission case.
2. Remove the lift rod (3) and lower link (4).
3. Remove the both rear wheel (2).
4. Place the stand under the both rear axle after remove the rear wheel (2).
5. Remove the both rear fender (1) (R.H., L.H.).

(When reassembling)

Tightening torque	Rear wheel mounting nut	343.2 to 393.3 N·m 35.0 to 40.1 kgf·m 253.2 to 290.0 lbf·ft

(1) Fender	(4) Lower Link
(2) Rear Wheel	(5) PTO Clutch Cable
(3) Lift Rod	

W1015170

Connectors and Rod

1. Remove the fuel filling port (8) mounting screw.
2. Disconnect the connectors for trailer coupler (3), electric outlet (2) and number plate licence light (1).
3. Disconnect the connectors for both rear combination lamp (4) and connector (6) for PTO switch.
4. Remove the rod (5).
5. Remove the hydraulic cylinders (7).

(1) Number Plate Licence Light	(5) Rod (Outer Position Control)
(2) Electric Outlet	(6) Connector
(3) Trailer Coupler	(7) Hydraulic Cylinder
(4) Rear Combination Lamp	(8) Fuel Filling Port

W1021955



Remote Control Valve Cable and Lowering Speed Rod

1. Remove the cables (1) for remote control valves.
2. Remove the lowering speed rod (2).

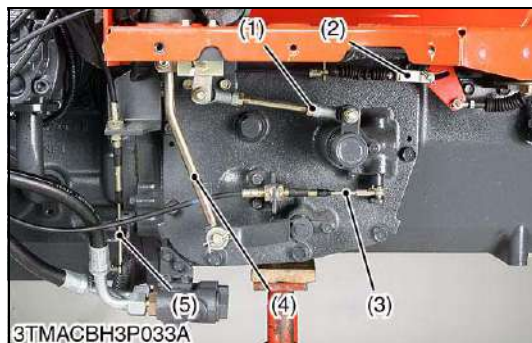
(When reassembling)

- Adjust the remote control valve cable position. (Refer to “8. HYDRAULIC SYSTEM” section.)

(1) Cable (Remote Control Valve)

(2) Lowering Speed Rod

W1022365



Hydraulic Control Rod, Shift Change Rod and Wire

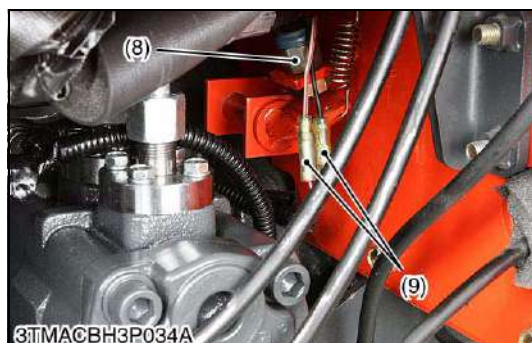
1. Disconnect the position control rod (7) and draft control rod (6).
2. Disconnect the main shift change rod (1) and range shift rod (4).
3. Disconnect the select wire (3).
4. Disconnect the accelerator wire (2).
5. Disconnect the parking gear lock brake wire (5).
6. Disconnect the 2-1P connector (9) for differential lock switch.

■ NOTE

- After assembling check the speed change lever movement and adjust them if necessary.
- After assembling check the hydraulic control rod and auxiliary control system. (Refer to “4. CHECKING AND ADJUSTING” at “8. HYDRAULIC SYSTEM” section.)

(When reassembling)

Main shift rod (1) length	Reference value	Approx. 211 mm 8.31 in.
Draft control rod (5) length	Reference value	Approx. 144 mm 5.67 in.
Position control rod (6) length	Reference value	Approx. 155 mm 6.10 in.



(1) Main Shift Change Rod

(2) Accelerator Wire

(3) Select Wire

(4) Range Shift Rod

(5) Parking Gear Lock Brake Wire

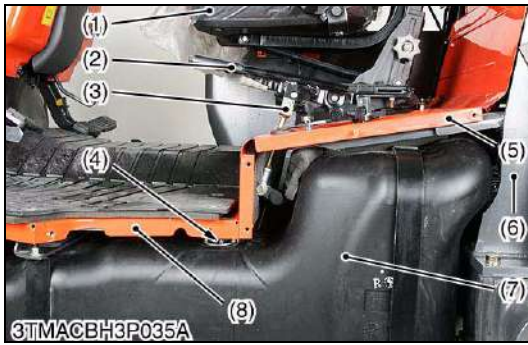
(6) Draft Control Rod

(7) Position Control Rod

(8) Differential Lock Switch

(9) 1P Connector

W1015486



Seat, Parking Brake Lever, Fuel Tank and Center Frame

1. Remove the seat (1).
2. Remove the seat stay.
3. Remove the parking brake rod 1 (3).
4. Remove the parking brake lever (2).
5. Disconnect the connector (4) from the fuel tank.
6. Remove the auxiliary step.
7. Remove the fuel tank band and fuel tank (7).
8. Remove the center frame (5).
9. Remove the ROPS under frame.
10. Remove the step (8).

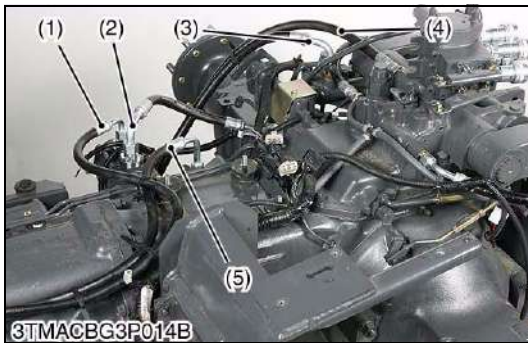
(When reassembling)

Parking brake rod 1 (3) length	Reference value	175 mm 6.89 in.

Tightening torque	ROPS under mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

(1) Seat	(5) Center Frame
(2) Parking Brake Lever	(6) ROPS Under Frame
(3) Parking Brake Rod 1	(7) Fuel Tank
(4) Connector	(8) Step

W1026027



Hydraulic Pipe

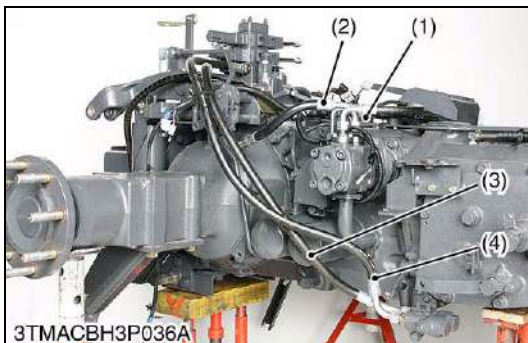
1. Remove the hydraulic hoses, power steering hose (1), trailer brake delivery hose (2), 3P-delivery hose 1, 2 (3) (4) and solenoid valve delivery hose (5).
2. Remove the brake pipes (6).
3. Remove the master cylinder return hose.

(When reassembling)

Tightening torque	Brake pipe retaining nut	15.7 to 23.5 N·m 1.6 to 2.4 kgf·m 11.6 to 17.4 lbf·ft

(1) Power Steering Hose	(4) 3P Delivery Hose 2
(2) Trailer Brake Delivery Hose	(5) Solenoid Valve Delivery Hose
(3) 3P Delivery Hose 1	(6) Brake Pipe

W1026554





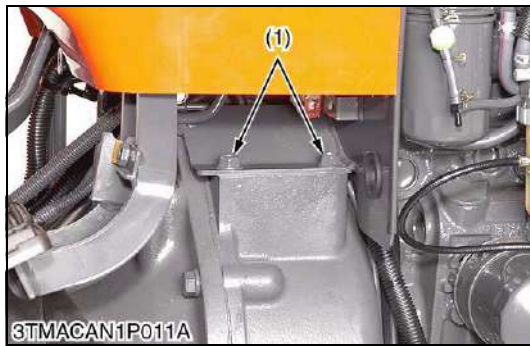
Shuttle Wire Cable

1. Remove the shuttle wire cable (1).
2. Remove the clutch wire cable (2).

(1) Shuttle Wire Cable

(2) Clutch Wire Cable

W1026838



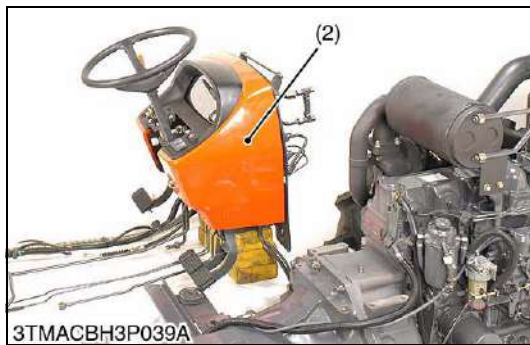
Steering Support Unit

1. Unscrew the steering support screws (1).
2. Remove the steering support unit (2) as shown photo.

(1) Steering Support Screw

(2) Steering Support Unit

W1027056



(3) Separating Transmission Case



Separating Clutch Housing Case from Engine

1. Remove the clutch housing mounting screws and nuts.
2. Separate the clutch housing case.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to spline of input shaft.
- Apply liquid gasket (Three Bond 1211, 1141 or equivalent) to the seam of engine and clutch housing.

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

W1012254



Separating Clutch Housing Case from Transmission Case

1. Remove the transmission case mounting screws and nuts.
2. Separate the clutch housing case from transmission case.

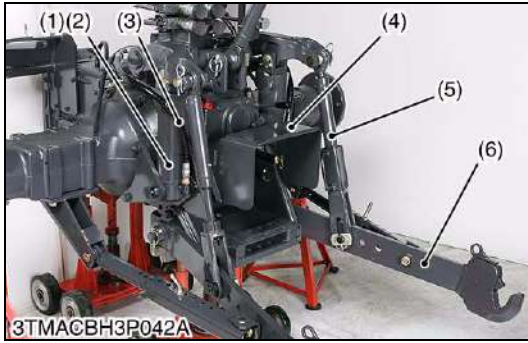
(When reassembling)

- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face.

Tightening torque	Transmission case mounting screw and nut	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft

W1012424

[5] SEPARATING TRANSMISSION CASE



3-Point Linkage and Hydraulic Cylinder

1. Remove the lower link (6) and lift rod (5).
2. Remove the cylinder cover (1).
3. Disconnect the cylinder hose (3) and return hose.
4. Remove the hydraulic cylinder (2).
5. Remove the PTO cover (4).

(When reassembling)

Tightening torque	Cylinder hose retaining nut	34.3 to 48.1 N·m 3.5 to 4.9 kgf·m 25.3 to 35.4 lbf·ft

(1) Cylinder Cover	(4) PTO Cover
(2) Hydraulic Cylinder	(5) Lift Rod
(3) Cylinder Hose	(6) Lower Link

W1012537



Top Cover Assembly

1. Remove the top cover mounting screws and nuts.
2. Disconnect the position feedback rod (2).
3. Remove the top cover assembly (1).

(When reassembling)

- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face.

Tightening torque	Top cover mounting screw and nut	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft

(1) Top Cover Assembly	(2) Position Feedback Rod

W1012746



PTO Gear Case Assembly

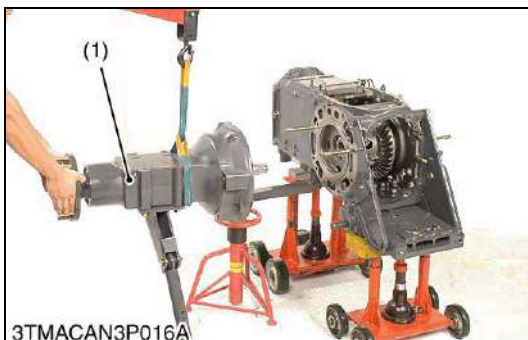
1. Remove the PTO gear case and PTO drive shaft as a unit.

(When reassembling)

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face.

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 lbf·ft

W1012984



Rear Axle Case Assembly

1. Remove the rear axle case mounting screws and nuts.
2. Remove the rear axle case assembly (1).

(When reassembling)

- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face.

Tightening torque	Rear axle case mounting screw and nut	196.1 to 225.6 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft

- | |
|-----------------------------|
| (1) Rear Axle Case Assembly |
|-----------------------------|

W1013184

[6] DAMPER DISC



Damper Disc

1. Remove the damper disc (1).

(When reassembling)

- Direct the shorter end of the damper disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the spline.

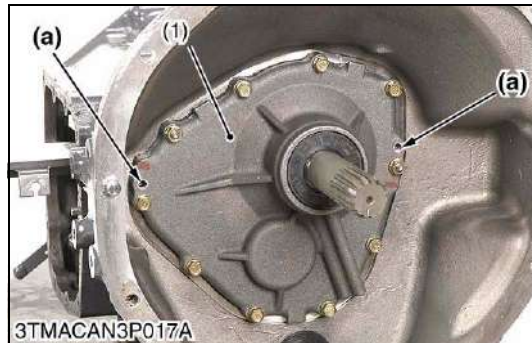
Tightening torque	Damper disc mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Damper Disc

W1048484

[7] SHUTTLE / HI-LO DUAL SPEED

(1) Removing Hydraulic Shuttle Clutch (F18/R18 Speed Transmission Model)



Shuttle Case Assembly



CAUTION

- The shuttle case assembly is heavy, so that take care it when handling.

1. Remove the shuttle case mounting screws and nuts.
2. Remove the shuttle case assembly (1) by using M10 x Pitch 1.25 mm screws into holes (a).

(When reassembling)

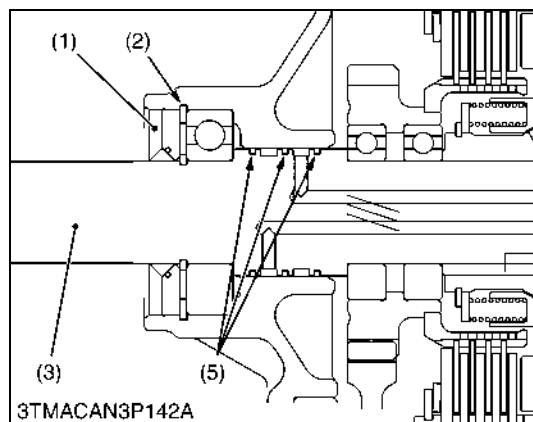
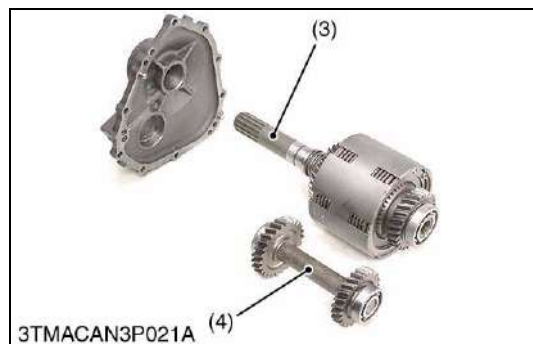
- Be sure to fit the O-rings (2) and apply transmission fluid.
- The oil passage hole of oil (b) is free from liquid gaskets.
- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face of the shuttle case and clutch housing case.

Tightening torque	Shuttle case mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Shuttle Case Assembly
(2) O-ring

(a) Threaded Hole
(b) Oil Passage Hole

W1013327



Disassembling Shuttle Case Assembly

1. Remove the oil seal (1).
2. Remove the external circlip (2).
3. Tap out the input shaft (3) with shuttle clutch and 26T, 24T gear with shuttle shaft (4) together.

(When reassembling)

- Replace the seal rings (5), oil seal (1) and external circlip (2) with new ones.
- Apply transmission fluid to seal rings (5) and bearings.
- Apply grease to oil seal.

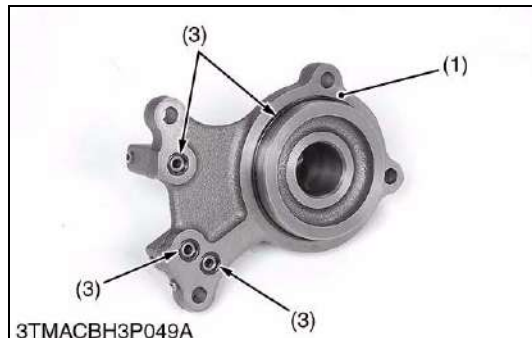
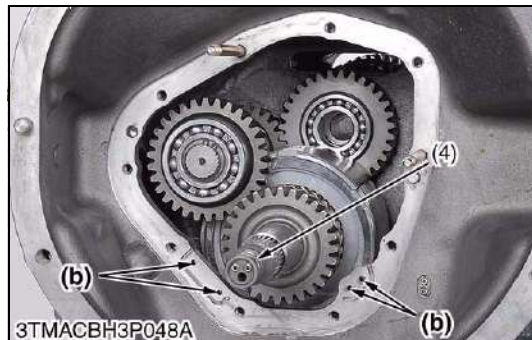
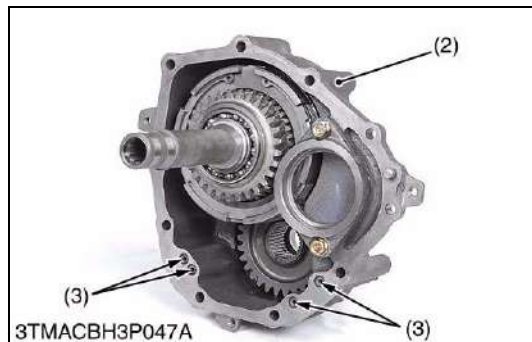
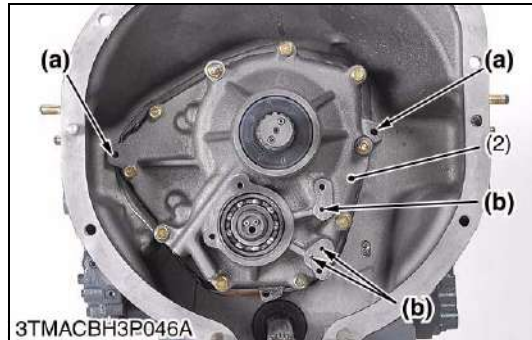
■ NOTE

- **Do not get in the seal rings (5) between input shaft (3) and shuttle case.**

(1) Oil Seal	(4) Shuttle Shaft
(2) External Circlip	(5) Seal Ring
(3) Input Shaft	

W1013781

(2) Removing Hydraulic Shuttle / Dual Speed Clutch (F36/R36 Speed Transmission Model)



Shuttle / Dual Case



CAUTION

- The shuttle case assembly is heavy, so that take care it when handling.

- Remove the shuttle holder (1).
- Remove the shuttle case mounting screws and nuts.
- Remove the shuttle case assembly (2) by using M10 x Pitch 1.25 mm screws into holes (a).

(When reassembling)

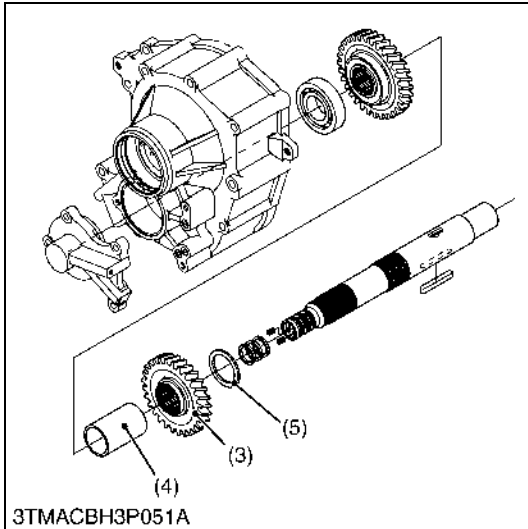
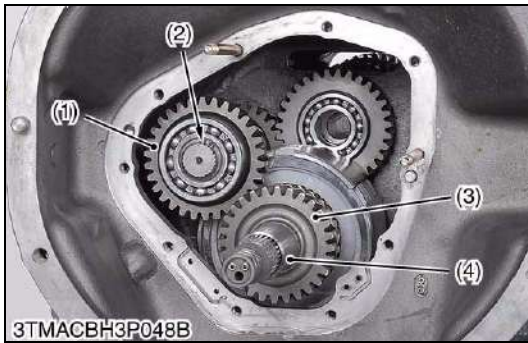
- Be sure to fit the O-rings (3).
- The oil passage hole (b) is free from liquid gaskets.
- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face of the shuttle case and clutch housing case.
- Apply grease to seal rings (4).

Tightening torque	Shuttle case and shuttle holder mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

- Shuttle Holder
- Shuttle Case Assembly
- O-ring
- Seal Ring

- (a) Threaded Hole
(b) Oil Passage Hole

W1028441



Removing Shuttle Clutch Pack

1. Remove the external circlip (2) and 30T gear (1).
2. Remove the spacer (4), collar (5) and 28T gear (3).
3. Pull the shuttle clutch pack (7) and lower the shuttle clutch pack (7) in the housing case.
4. Pull out the 31T gear (6) with bearing (8).
5. Remove the shuttle clutch pack (7).

NOTE

- Remove the 31T gear (6), then remove the shuttle pack.

(When reassembling)

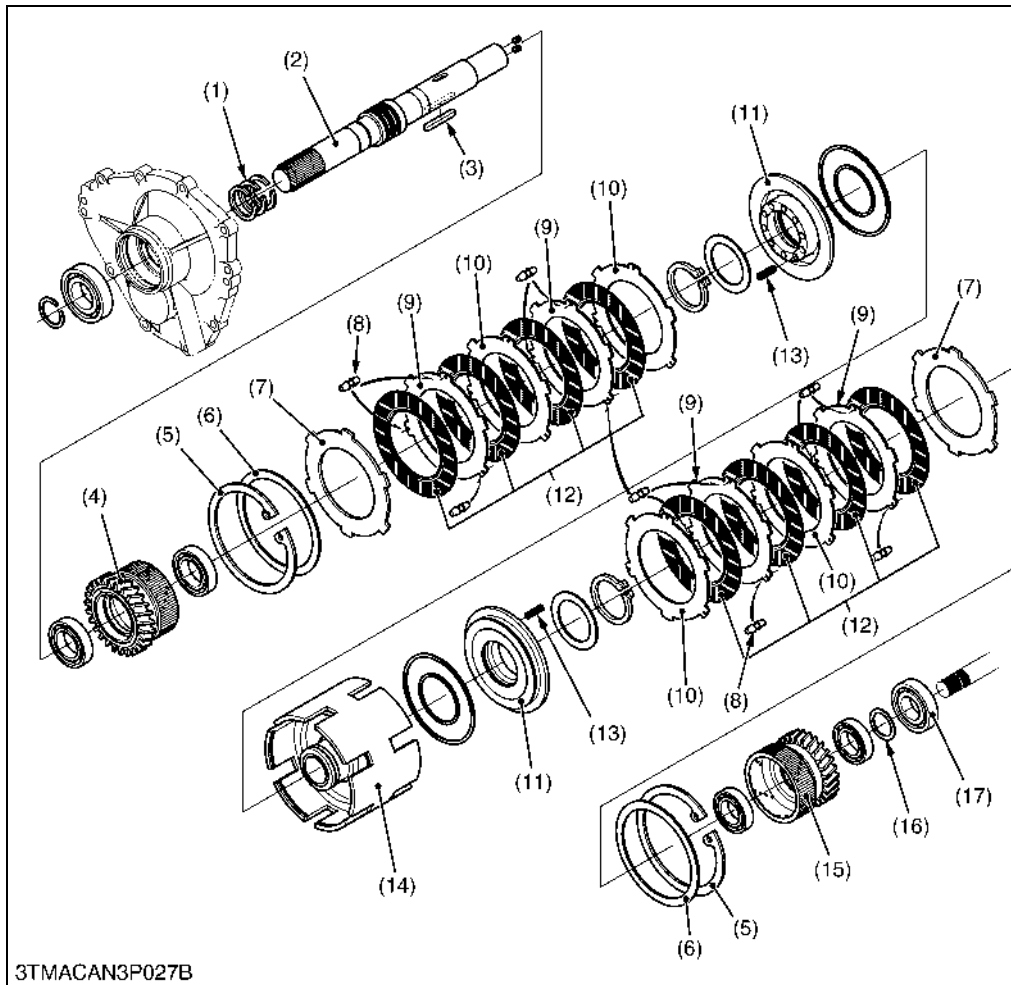
- Put in the shuttle clutch pack (7) to the housing case first, then be sure to assemble the 31T gear (6) with bearing (8).

(1) 30T Gear	(5) Collar
(2) External Circlip	(6) 31T Gear
(3) 28T Gear	(7) Shuttle Clutch Pack
(4) Spacer	(8) Bearing

W1029313

(3) Shuttle Clutch Assembly

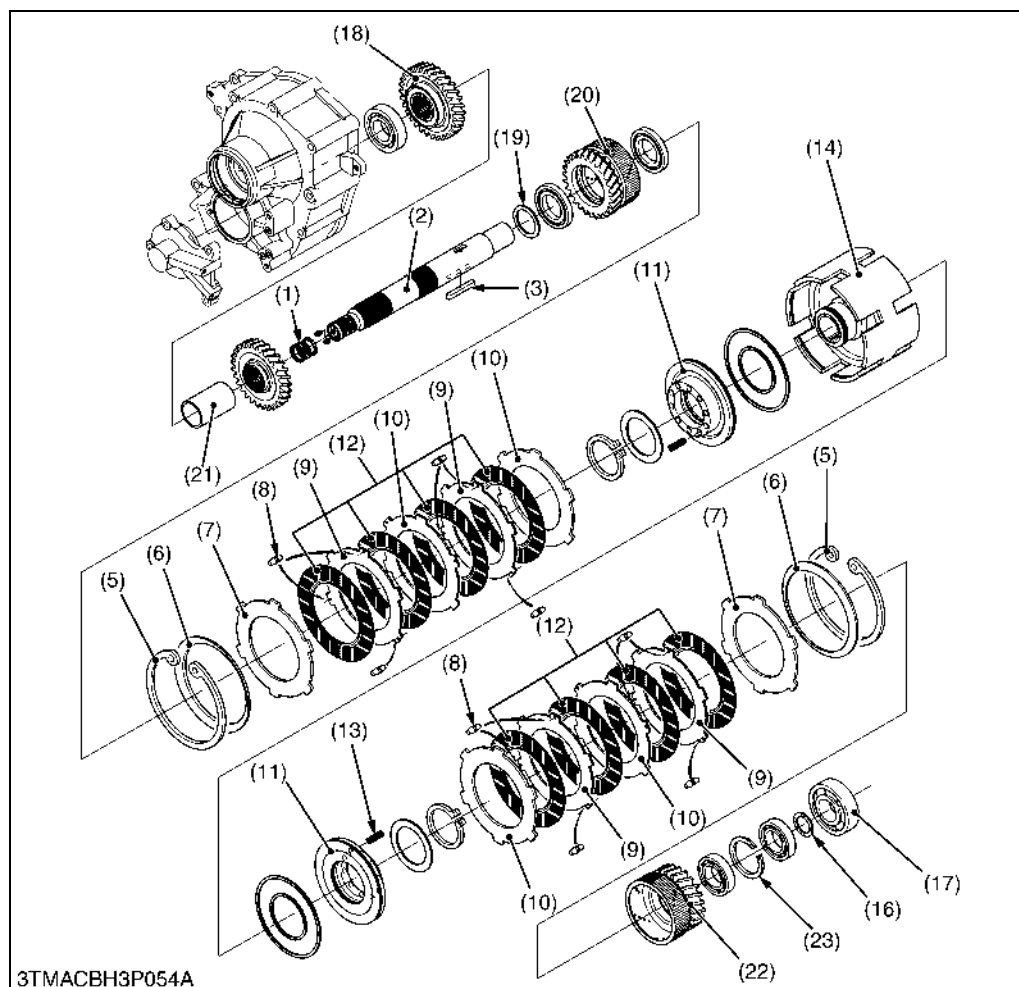
Shuttle Clutch Assembly (F18/R18 Speed Transmission Model)



- (1) Seal Ring
- (2) Shuttle Shaft
- (3) Key
- (4) 28T Gear
- (5) Internal Circlip
- (6) Belleville Washer (Cupped Spring Washer)
- (7) Pressure Plate
- (8) Rubber
- (9) Steel Plate with Rubber
- (10) Steel Plate without Rubber
- (11) Piston
- (12) Disc
- (13) Spring
- (14) Clutch Body
- (15) 26T Gear
- (16) Washer
- (17) Bearing

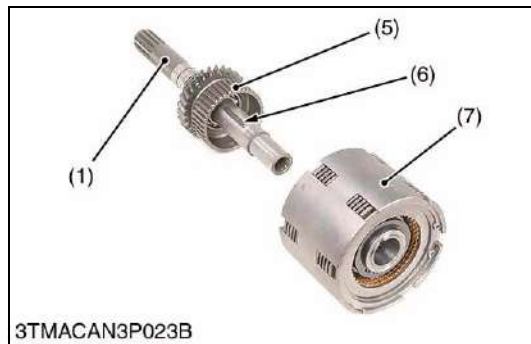
W1029782

3TMACAN3P027B

Shuttle / Hi-Lo Dual Speed Clutch Assembly (F36/R36 Speed Transmission Model)

- (1) Seal Ring
- (2) Shuttle Shaft
- (3) Key
- (4) 28T Gear
- (5) Internal Circlip
- (6) Belleville Washer (Cupped Spring Washer)
- (7) Pressure Plate
- (8) Rubber
- (9) Steel Plate with Rubber
- (10) Steel Plate without Rubber
- (11) Piston
- (12) Disc
- (13) Spring
- (14) Clutch Body
- (15) 26T Gear
- (16) Washer
- (17) Bearing
- (18) 31T Gear
- (19) Collar
- (20) 27T Gear
- (21) Spacer
- (22) 24T Gear
- (23) Internal Circlip

W1030671



Shuttle Shaft

1. Remove the bearing (4) and washer (3).
2. Remove the gear (2).
3. Tap out the shuttle shaft (1) with gear (5) to the forward.

■ NOTE

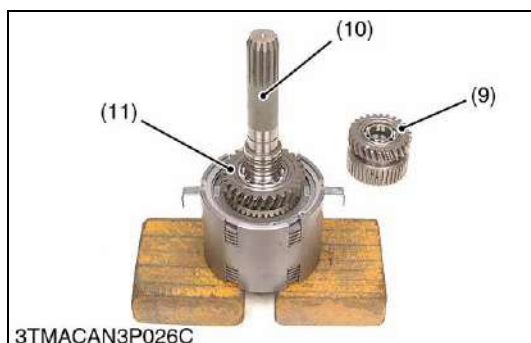
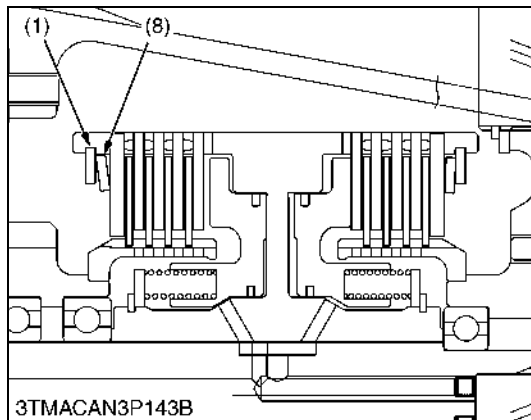
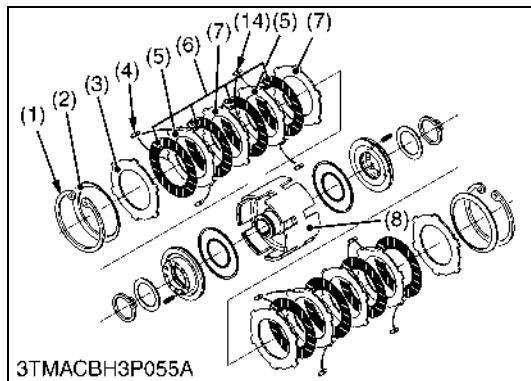
	F18/R18 speed transmission model	F36/R36 speed transmission model
Gear (2)	26T gear	24T gear
Gear (5)	28T gear	27T gear

(When reassembling)

- Align the key (6) and groove.

(1) Shuttle Shaft	(5) Gear
(2) Gear	(6) Key
(3) Washer	(7) Shuttle Pack
(4) Bearing	

W1030900



Shuttle Clutch Pack

1. Remove the internal circlip (1).
2. Remove the belleville washer (2), pressure plate (3), steel plate (5), (7) and clutch discs (6).

(When reassembling)

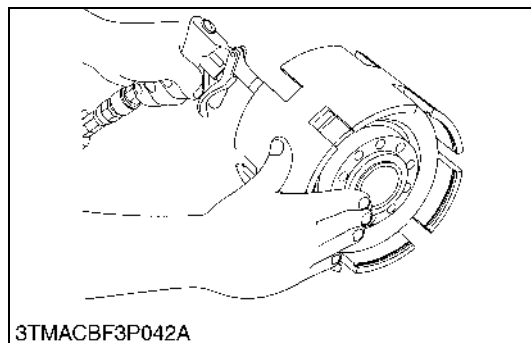
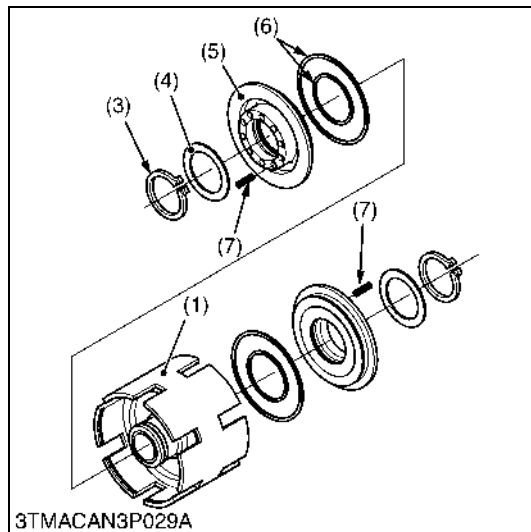
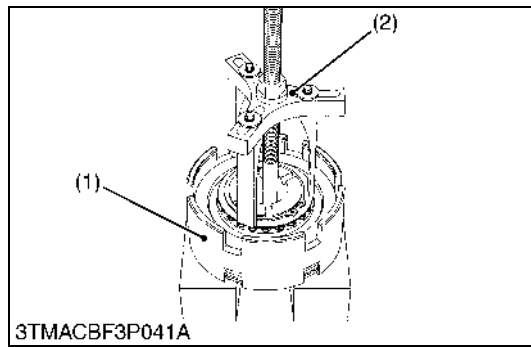
- Install the clutch discs (6) and steel plate (5), (7) mutually.
- Apply enough transmission fluid to the discs (6).
- Do not confuse the two types of steel plates.
The steel plate with rubbers (5) and without rubbers (7).
- Two steel plate match the position of rubber (4) from the piston side, and one remaining steel plate (7) is not matched.
- Do not confuse the pressure plates (3) and steel plate (7). The pressure plate (3) is thicker than the steel plate (7).
- Be sure to assemble the belleville washer (cupped spring washer) (2) direction as shown in figure.
- When installing the internal circlip (1) to the clutch body (8), align its split portion to the notched portion of clutch body as shown in photo.
- When assemble the shuttle shaft (10) with gear (11) for reverse side, temporary align the spline and clutch disc's teeth using the gear (9).
 - Insert the steel piece (a) between belleville washer (cupped spring washer) (2) and pressure plate (3) to prevent turn the clutch discs (6) during assemble.
 - Draw out the gear (9) after inserted the steel piece (a). Then tap in the shuttle shaft (10) with gear (11).
 - Same procedure for forward side.
- Confirm the moving of the piston smoothly when pressure air at 0.5 to 1.0 MPa (5 to 10 kgf/cm², 71 to 142 psi) is sent to clutch pack.

NOTE

	F18/R18 speed transmission model	F36/R36 speed transmission model
Gear (9)	26T gear	24T gear
Gear (11)	28T gear	27T gear

(1) Internal Circlip	(7) Steel Plate without Rubber
(2) Belleville Washer (Cupped Spring Washer)	(8) Clutch Body
(3) Pressure Plate	(9) Gear
(4) Rubber	(10) Shuttle Shaft
(5) Steel Plate with Rubber	(11) Gear
(6) Clutch Disc	(a) Steel Piece

W1031301



Piston

1. Press the washer (4) lightly by the hand made jig (refer to the "SPECIAL TOOLS" at GERERAL section), and remove the external circlip (3).
2. Remove the springs (7).
3. Draw out the piston (5) using a air pressure.

NOTE

- Ten springs for one side.
- The passage holes for the piston are beside the feather key groove.

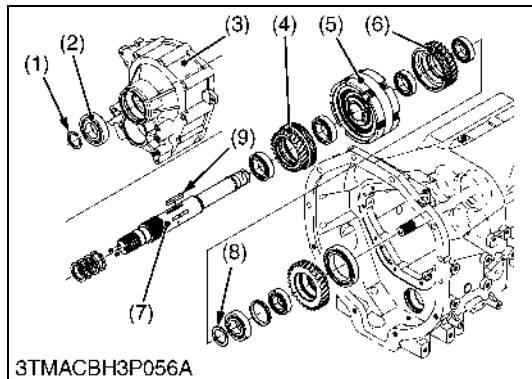
(When reassembling)

- Apply enough transmission fluid to seal rings (6).

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

W1014825

(4) Removing Dual Speed Clutch (F36/R36 Speed Transmission Model)



Dual Speed Clutch Assembly

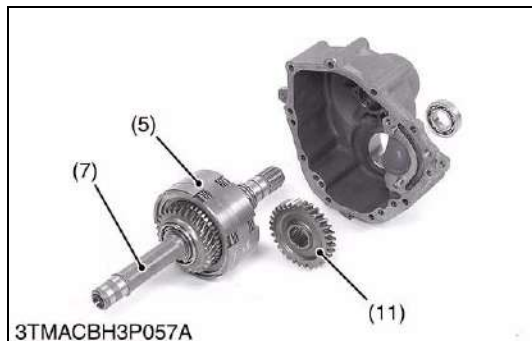
1. Remove the holder (10).
2. Remove the oil seal (12) and external circlip (1).
3. Tap out the dual speed shaft (7) with clutch pack (5).
4. Remove the external circlip (8) and 29T gear (6).
5. Tap out the dual speed shaft (7) with 27T gear (4) to forward.

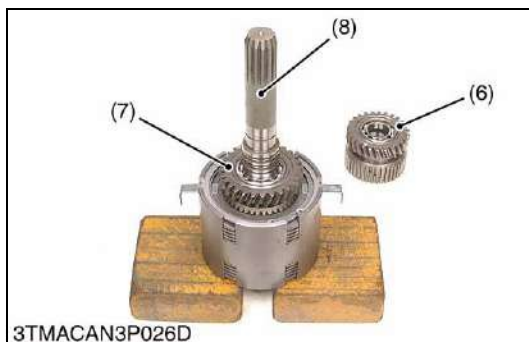
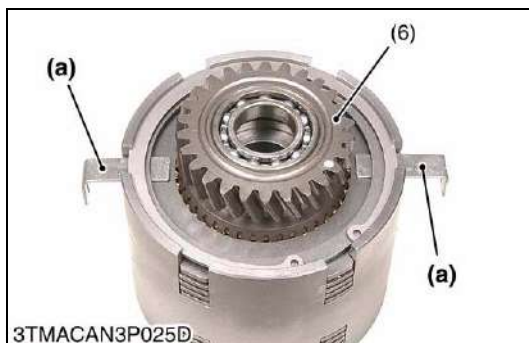
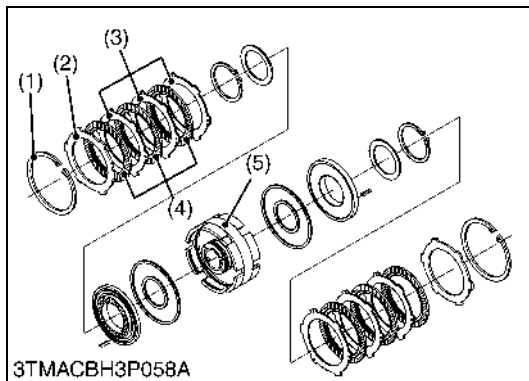
(When reassembling)

- Align the key (9) and groove of clutch pack (5).
- Replace the oil seal (12) with new one.

(1) External Circlip	(7) Dual Speed Shaft
(2) Bearing	(8) External Circlip
(3) Shuttle Gear Case	(9) Key
(4) 27T Gear	(10) Holder
(5) Clutch Pack	(11) 31T Gear
(6) 29T Gear	(12) Oil Seal

W1032436





Dual Speed Clutch Pack

1. Remove the internal circlip (1).
2. Take out the pressure plate (2), clutch discs (4) and steel plates (3).

(When reassembling)

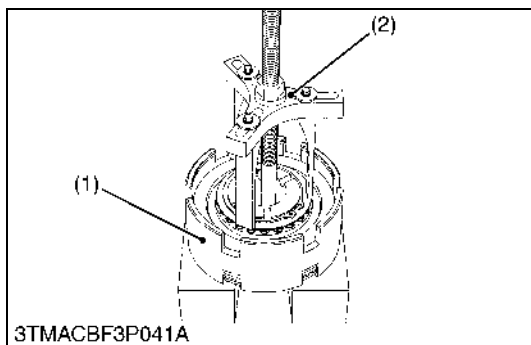
- Install the clutch discs (4) and steel plate (3) mutually.
- Apply enough transmission fluid to the discs (12).
- Do not confuse the pressure plate (2) and steel plate (3). The pressure plate (2) is thicker than the steel plate (3).
- When installing the internal circlip (1) to the clutch body (5) align its split portion to the notched portion of clutch body as shown in photo.
- When assembling the input shaft (8) with 27T gear (7) for low speed side, temporary align the spline and clutch disc's teeth using the 29T gear (6).
 - Insert the steel piece (a) between the internal circlip (1) and pressure plate (2) to prevent turn the clutch discs (4) during assemble.
 - Draw out the 29T gear (6) after inserted the steel piece (a). Then tap in the input shaft (8) with 27T gear (7).
 - Same procedure for forward side.
- Confirm the moving of the piston (18) smoothly when pressure air at 0.5 to 1.0 MPa (5 to 10 kgf/cm², 71 to 142 psi) is sent to clutch pack.

- (1) Internal Circlip
(2) Pressure Plate
(3) Steel Plate
(4) Clutch Disc
(5) Clutch Body

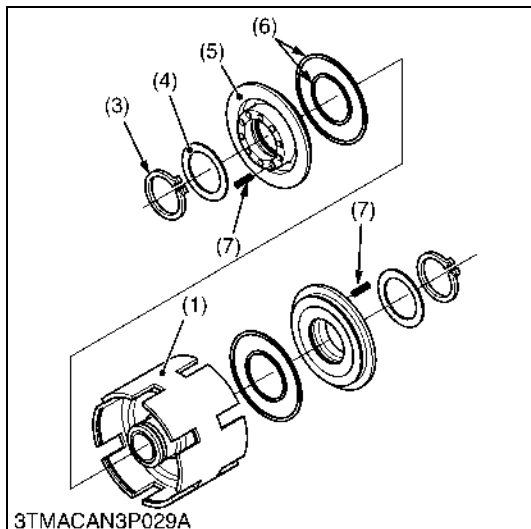
- (6) 29T Gear
(7) 27T Gear
(8) Dual Speed Shaft

(a) Steel Piece

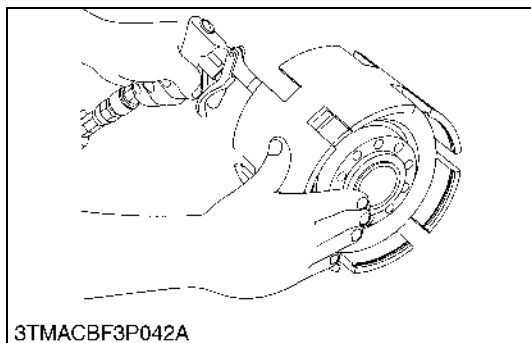
W1033172



3TMACBF3P041A



3TMACAN3P029A



3TMACBF3P042A

Piston

1. Press the washer (4) lightly by the hand made jig (refer to the "SPECIAL TOOLS" at GERERAL section), and remove the external circlip (3).
2. Remove the springs (7).
3. Draw out the piston (5) using a air pressure.

NOTE

- **21 springs for one side.**
- **The passage holes for the piston are beside the feather key groove.**

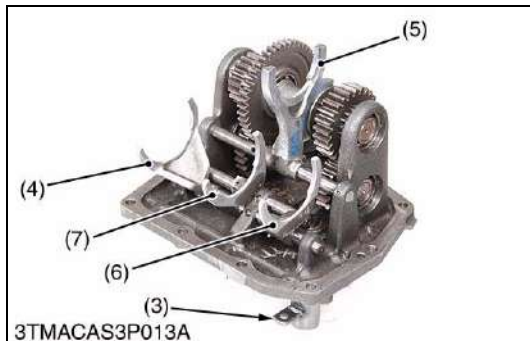
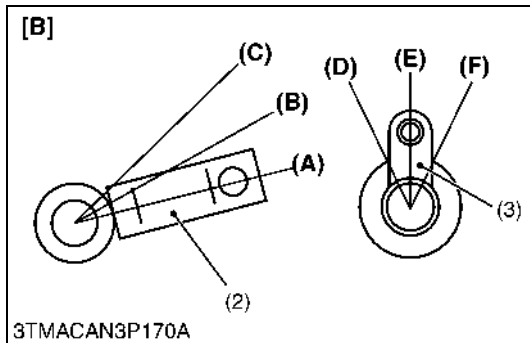
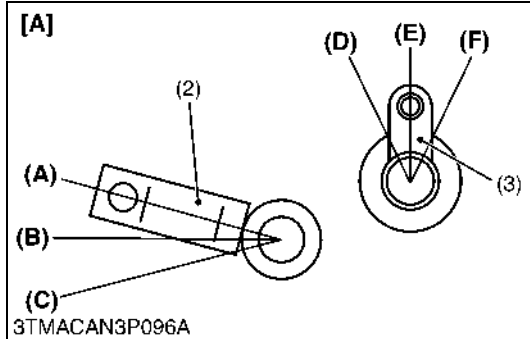
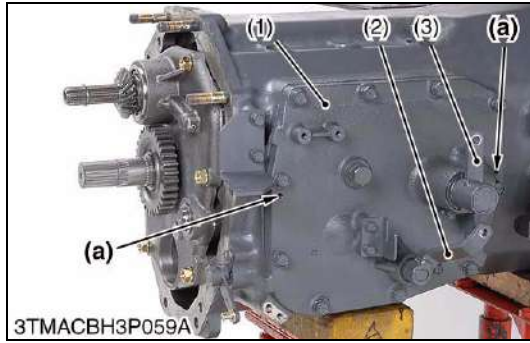
(When reassembling)

- Apply enough transmission fluid to seal rings (6).

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

W1034102

[8] SHIFT COVER



Speed Change Lever

1. Set the main change shift lever (3) to the neutral position.
2. Set the range shift lever (2) to the **H** position **(A)**.
3. Remove the shift cover (1) mounting screws.
4. Screw in the M8 x 1.25 mm screw (or M14 x Pitch 1.5 mm screw) to threaded hole **(a)** for jack up the shift cover (1).
5. Remove the shift cover (1) gently.

(When reassembling)

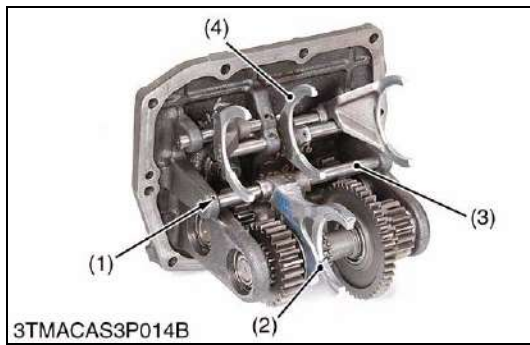
- Set the all main change shift fork (4), (6) and (7) to “**neutral**” position and shifters in the transmission on neutral position, and range shift fork (5) and shifter in the transmission on **H** side (forward).
- Apply liquid gaskets (Three Bond 1206C or equivalent) to joint face.

Tightening torque	Speed change cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

- (1) Shift Cover
 (2) Range Shift Lever
 (3) Main Change Shift Lever
 (4) 1st-2nd Shift Fork
 (5) Range Shift Fork
 (6) 3rd-4th Shift Fork
 (7) 5th-6th Shift Fork

- [A] ROPS Model**
[B] CABIN Model
(a) Threaded Hole for Jack Up
(A) H Position
(B) L Position
(C) Creep Position
(D) 1st, 3rd or 5th Position
(E) Neutral Position
(F) 2nd, 4th or 6th Position

W1017076



Range Gear Shift Fork

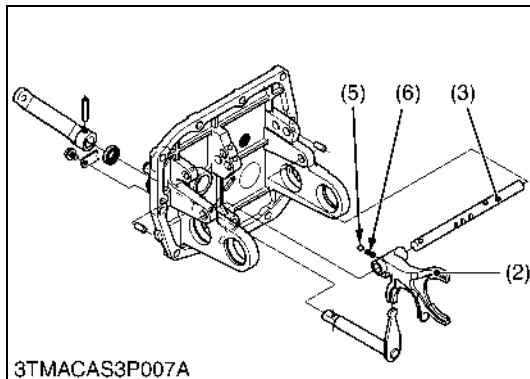
1. Shift the 5-6th fork (4) to rearward (5th speed).
2. Remove the roll pin (1), fork rod (3) and range shift fork (2).
3. Remove the ball (detent) (5) and spring (6).

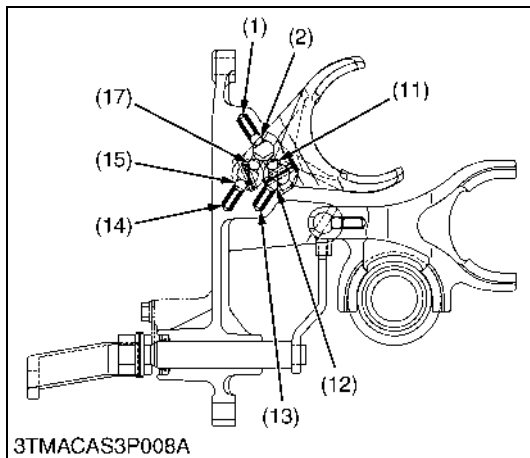
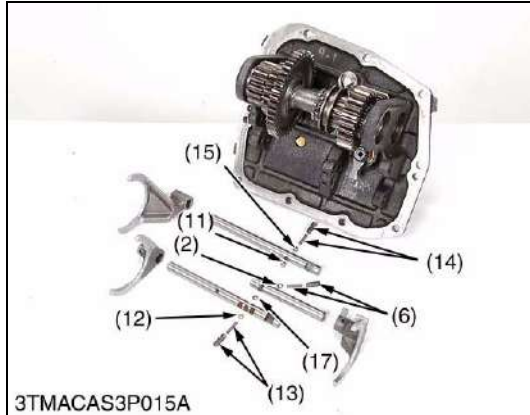
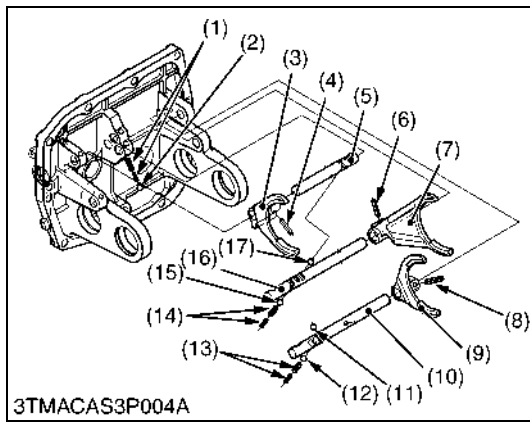
■ NOTE

- Take care not to lose the detent ball (5) and spring (6).

(1) Roll Pin	(4) 5-6th Fork
(2) Range Shift Fork	(5) Ball (Detent)
(3) Fork Rod	(6) Spring

W1017369





Main Shift Fork

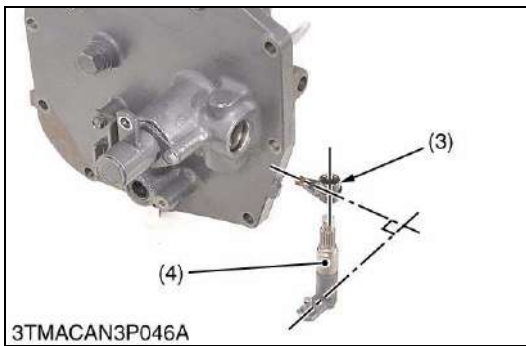
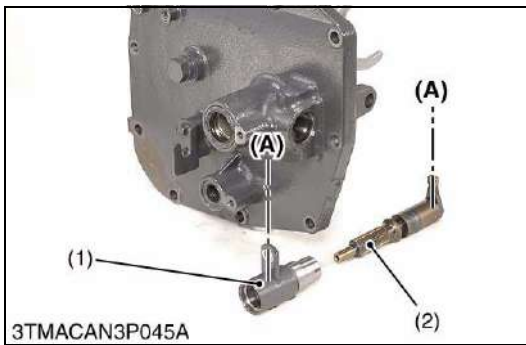
1. Remove the roll pin (4), fork rod (5) and 3rd-4th fork (3).
2. Remove the roll pin (8), fork rod (10) and 5th-6th fork (9).
3. Remove the roll pin (6), fork rod (16) and 1st-2nd fork (7).

NOTE

- Take care not to lose the balls and springs.
 - The springs (1), (13) and (14) are paired, large and small one.
- (When reassembling)
- Be sure to assemble the detent balls (2), (12), (15) with springs (1), (13), (14) and inter lock ball (11), (17).

(1) Spring	(10) Fork Rod
(2) Ball (Detent)	(11) Ball (Inter Lock)
(3) 3rd-4th Fork	(12) Ball (Detent)
(4) Roll Pin	(13) Spring
(5) Fork Rod	(14) Spring
(6) Roll Pin	(15) Ball (Detent)
(7) 1st-2nd Fork	(16) Fork Rod
(8) Roll Pin	(17) Ball (Inter Lock)
(9) 5th-6th Fork	

W1018064

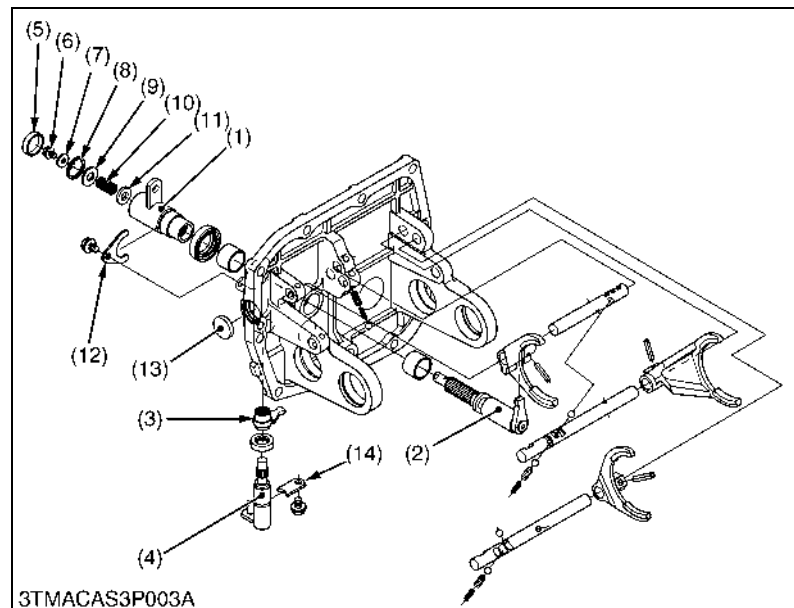


Main Shift Arm

1. Remove the stopper plate (14) and seal cap (13).
2. Remove the select lever (4) then remove the select arm (3).
3. Remove the seal cap (5).
4. Remove the internal circlip (8).
5. Remove the screw (6) and remove the washer (9), spring (10) and washer (11).
6. Remove the main shift arm (2).
7. Remove the stopper plate (12) and main shift lever (1).

(When reassembling)

- Replace the seal caps with new one.
- Assemble the main shift arm (2) and main shift lever (1) with spline, align the both levers are the same direction as shown in the photo.
- Apply transmission fluid to the spline.
- Assemble the select arm (3) and select lever (4) with spline, difference them at 1.57 rad (90 °) as shown in the photo.

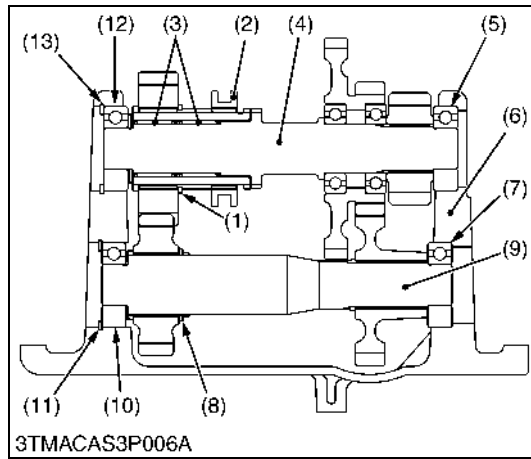
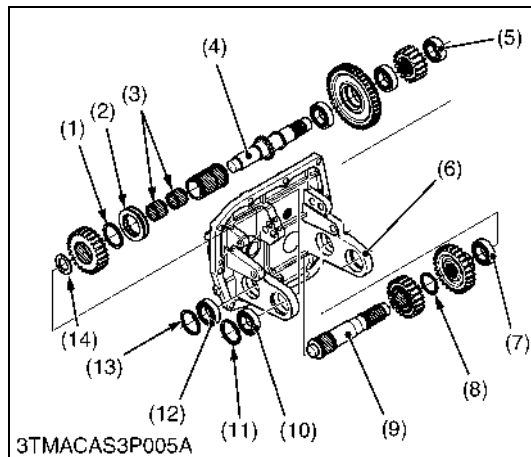


- (1) Main Shift Lever
- (2) Main Shift Arm
- (3) Select Arm
- (4) Select Lever
- (5) Seal Cap
- (6) Screw
- (7) Washer
- (8) Internal Circlip

- (9) Washer
- (10) Spring
- (11) Washer
- (12) Stopper Plate
- (13) Seal Cap
- (14) Stopper Plate

(A) Align the Same Direction

W1017681



Creep Gear

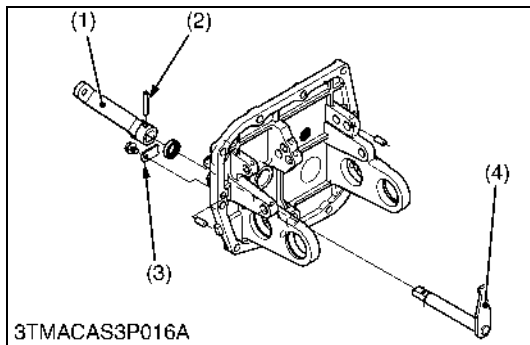
1. Slide the shifter (2) and remove the external circlip (1).
2. Remove the internal circlip (9) and tap out the creep shaft 2 (4) with gears.
3. Remove the bearing (12) and (5).
4. Remove the gears.
5. Remove the external circlip (6) and internal circlip (8).
6. Tap out the creep shaft 1 (7) with gears.
7. Remove the bearing (7).
8. Remove the gears.

(When reassembling)

- Apply oil to needle bearings (3) and thrust collar (14).
- Replace the external circlip (1) and (6) with new one.

(1) External Circlip	(8) External Circlip
(2) Shifter (Creep)	(9) Creep Shaft 1
(3) Needle Bearing	(10) Bearing
(4) Creep Shaft 2	(11) Internal Circlip
(5) Bearing	(12) Bearing
(6) Speed Change Cover	(13) Internal Circlip
(7) Bearing	(14) Thrust Collar

W1037018

**Range Shift Arm**

1. Remove the roll pin (2) and stopper plate (3).
2. Draw out the range shift arm (4).

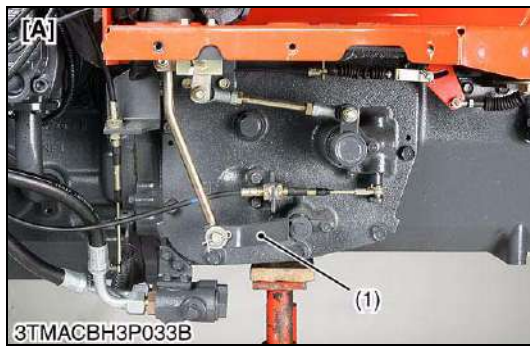
(When reassembling)

- Be sure to assemble the range shift lever (1) as an original direction as shown in photo.

- (1) Range Shift Lever
- (2) Roll Pin
- (3) Stopper Plate
- (4) Range Shift Arm

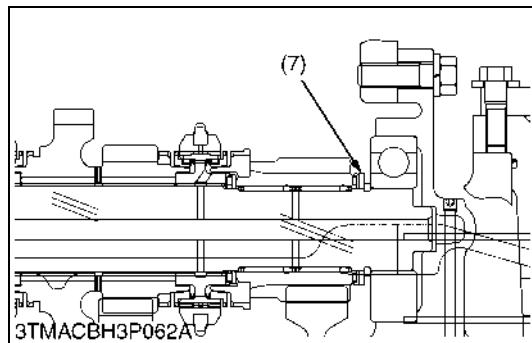
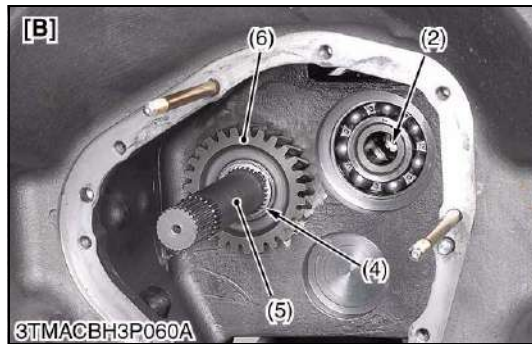
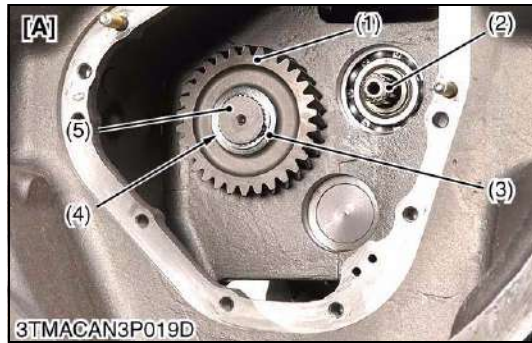
[A] ROPS Model**[B] CABIN Model**

W1040290



[9] DISASSEMBLING CLUTCH HOUSING CASE

(1) Removing 1st Shaft, 2nd Shaft and 3rd Shaft



PTO Propeller Shaft and 30T Gear (27T Gear)

1. Tap out the PTO propeller shaft (2) rearward.
2. Remove the external circlip (4).
3. Remove the 30T gear (1) or 27T gear (6) and collar (3).

(When reassembling)

- Adjust the side clearance of 3rd-4th gears on the 1st shaft by adjusting collar (7).

(Reference)

- Thickness of adjusting collar (7) :
 - 2.8 mm (0.110 in.) [Code No. 3C081-28490]
 - 3.0 mm (0.118 in.) [Code No. 3C081-28410]
 - 3.2 mm (0.126 in.) [Code No. 3C081-28420]
 - 3.4 mm (0.133 in.) [Code No. 3C081-28430]
 - 3.6 mm (0.141 in.) [Code No. 3C081-28440]

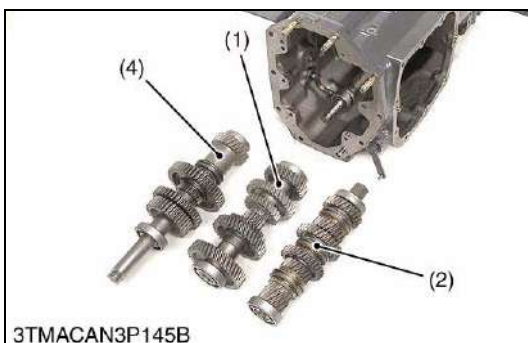
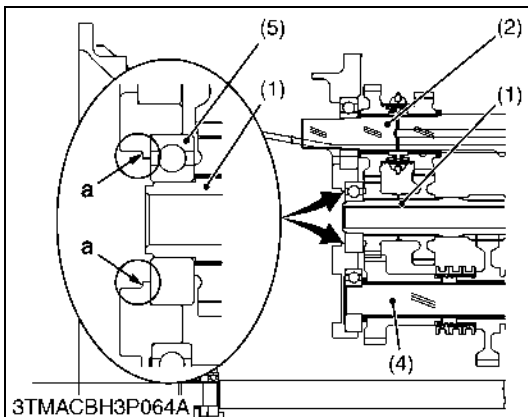
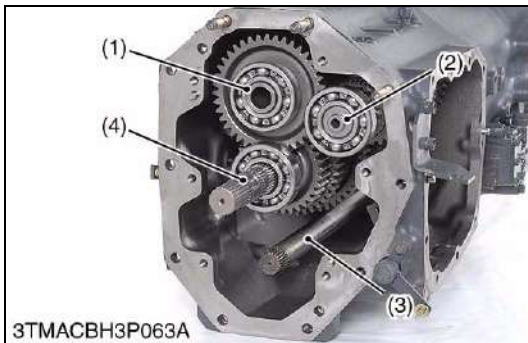
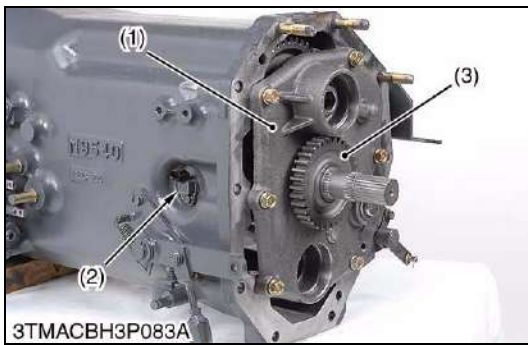
Side clearance gears on 1st shaft	Factory spec.	Less than 0.2 mm 0.0078 in.

- (1) 30T Gear (F18/R18 Speed Transmission Model)
- (2) PTO Propeller Shaft
- (3) Collar
- (4) External Circlip
- (5) 1st Shaft
- (6) 27T Gear (F36/R36 Speed Transmission Model)
- (7) Adjusting Collar

[A] F18/R18 Speed Transmission Model

[B] F36/R36 Speed Transmission Model

W1018554



Bearing Holder and Speed Sensor

1. Remove the speed sensor (2).
2. Remove the external circlip and 33T DT gear (3).
3. Remove the bearing holder mounting screws, and take out the bearing holder (1).

If the shaft comes out with bearing holder, tap in the shaft during take out the bearing holder (1).

(When reassembling)

- Apply transmission fluid to the O-ring of speed sensor (2).
- Be sure to fix the parking brake arm (5) and parking cam lever (4).

(1) Bearing Holder	(4) Parking Cam Lever
(2) Speed Sensor	(5) Parking Brake Arm
(3) 33T DT Gear	

W1019129

1st Shaft, 2nd Shaft and 3rd Shaft

1. Slowly draw out the three shafts with gears together by step by step.
2. Take out the three shafts from clutch housing case.

■ IMPORTANT

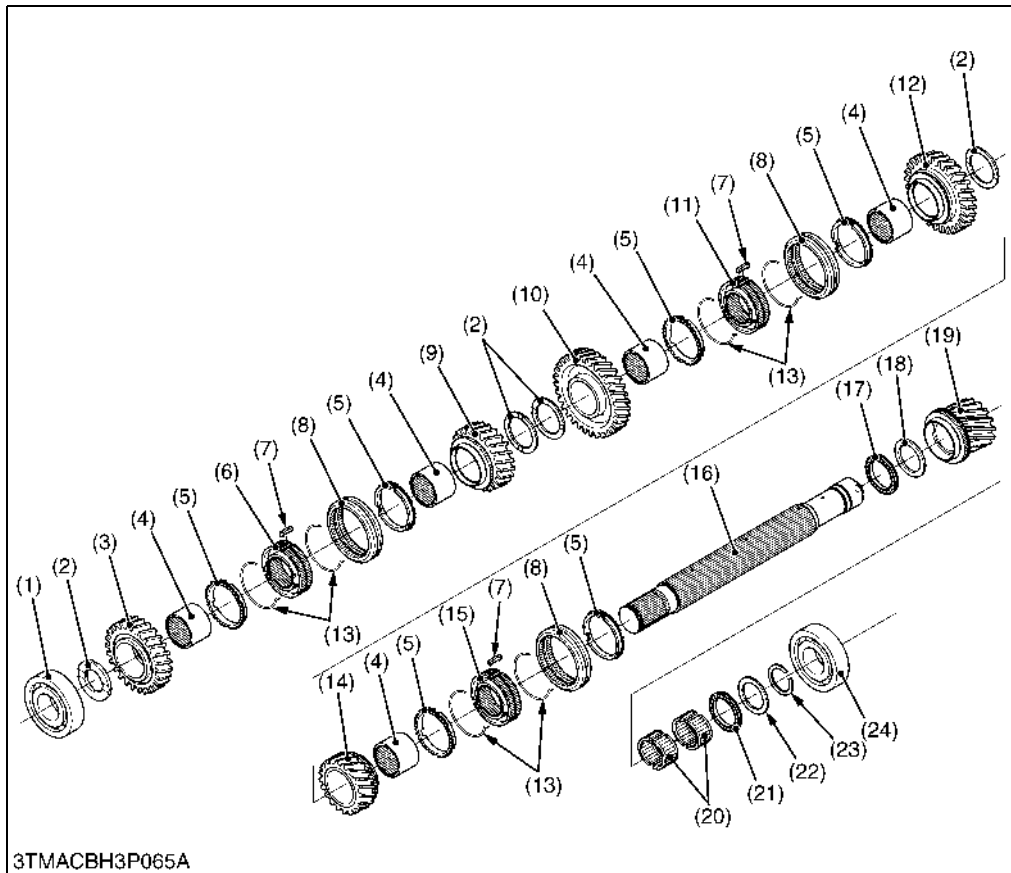
- Do not fall down the shaft when removing the shafts with gears.
- Do not tap the bearing stop part (a) of clutch housing case, it cause break a part of clutch housing case. Be sure to tap at the inner race of bearing (5) or 2nd shaft when remove the 2nd shaft assembly (1).

(When reassembling)

- For easily assemble, stand the clutch housing case and assemble the 1st shaft assembly (2), 2nd shaft assembly (1) and 3rd shaft assembly (4) at same time.

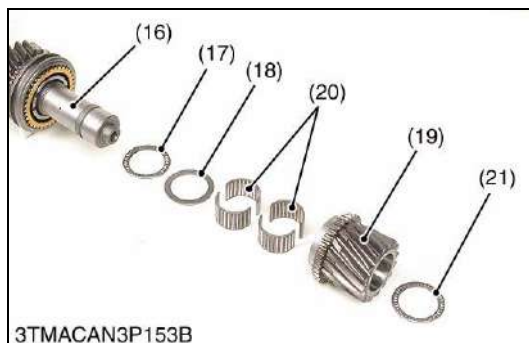
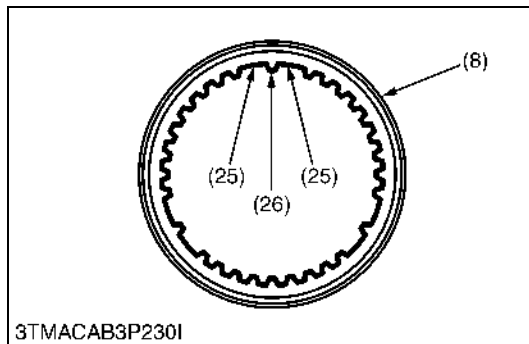
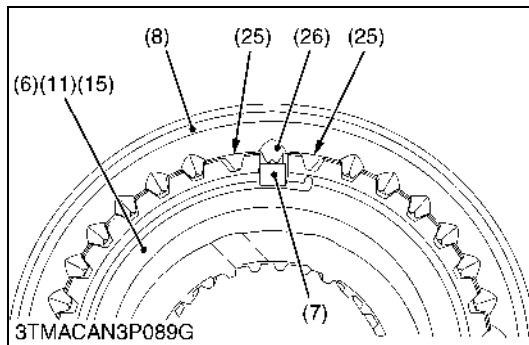
(1) 2nd Shaft Assembly	a : Bearing Stop Part
(2) 1st Shaft Assembly	
(3) DT Propeller Shaft	
(4) 3rd Shaft Assembly	
(5) Bearing	

W1019414

(2) 1st Shaft Assembly**1st Shaft**

- (1) Bearing
- (2) Thrust Collar
- (3) 26T Gear
- (4) Inner Race
- (5) Synchronizer Ring
- (6) Coupling (3-4 Speed)
- (7) Synchronizer Key
- (8) Shifter
- (9) 23T Gear
- (10) 32T Gear
- (11) Coupling (5-6 Speed)
- (12) 29T Gear
- (13) Synchronizer Spring
- (14) 19T Gear
- (15) Coupling (1-2 Speed)
- (16) 1st Shaft
- (17) Thrust Needle Bearing
- (18) Bearing Washer
- (19) 16T Gear
- (20) Needle Bearing (Split Type)
- (21) Thrust Needle Bearing
- (22) Adjusting Collar
- (23) External Circlip
- (24) Bearing

W1036797



1st Shaft (Continued)

1. Remove the bearing (22) and external circlip (23).
2. Draw out the all synchronizer units and gears.

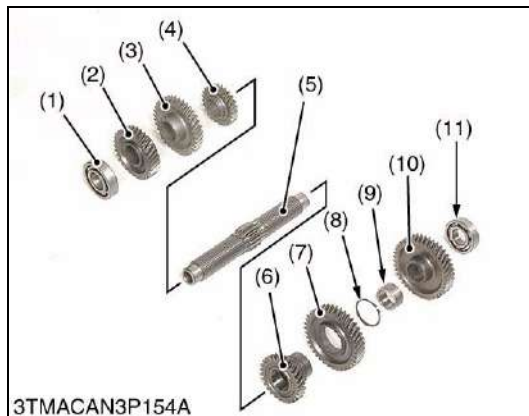
(When reassembling)

- Be sure to assemble the synchronizer unit, set the teeth (25) on the shifter (8) to the key (7) as shown in the figure.
- Apply transmission fluid to synchronizer unit.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner races (4).
- The thrust collar between 23T gear and 31T (30T) gear have two collars.
- Set the thrust needle bearing (17) and bearing washer (18). Toward the needle side to the 16T gear (19).
- Set the split type needle bearing (20) on the 1st shaft, then install the 16T gear (19).
- Install the thrust needle bearing (21) toward the needle side to 16T gear (19).
- Replace the external circlip (23) with new one.

(1) Thrust Collar	(14) Thrust Collar
(2) Inner Race	(15) 31T Gear
(3) 19T Gear	(16) 28T Gear
(4) Synchro Unit	(17) Bearing
(5) Thrust Needle Bearing	(18) Thrust Collar
(6) Bearing Washer	(19) 1st Shaft
(7) 16T Gear	(20) Coupling
(8) Split Type Needle Bearing	(21) Shifter
(9) Thrust Needle Bearing	(22) Adjusting Collar
(10) External Circlip	(23) External Circlip
(11) Bearing	(24) Bearing
(12) 26T Gear	(25) Without Teeth
(13) 23T Gear	(26) Teeth

W1091413

(3) 2nd Shaft

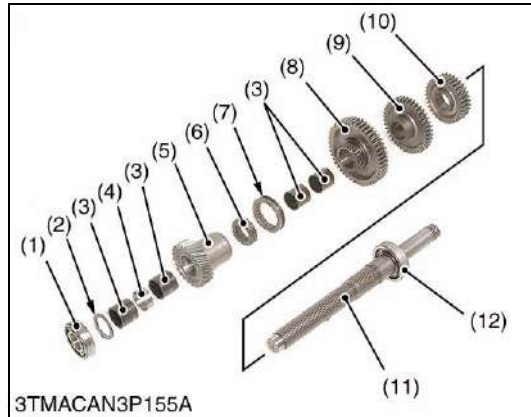


2nd Shaft

1. Remove the bearing (1), (11).
2. Remove the gears.

(1) Bearing	(7) 37T Gear
(2) 30T Gear	(8) External Circlip
(3) 34T Gear	(9) Collar
(4) 24T Gear	(10) 40T Gear
(5) 2nd Shaft	(11) Bearing
(6) 27T Gear	

W1093274

(4) 3rd Shaft**3rd Shaft**

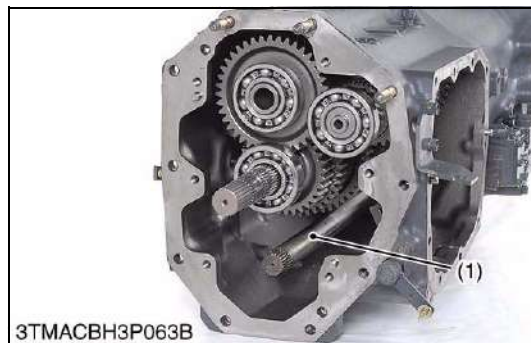
1. Remove the bearing (1).
2. Remove the gears.

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner races (3).

(1) Bearing	(7) Shifter
(2) Thrust Collar	(8) 46T Gear
(3) Inner Race	(9) 40T Gear
(4) Collar	(10) 33T Gear
(5) 25T Gear	(11) 3rd Shaft
(6) Hub	(12) Bearing

W1093419

(5) DT Propeller Shaft**DT Propeller Shaft**

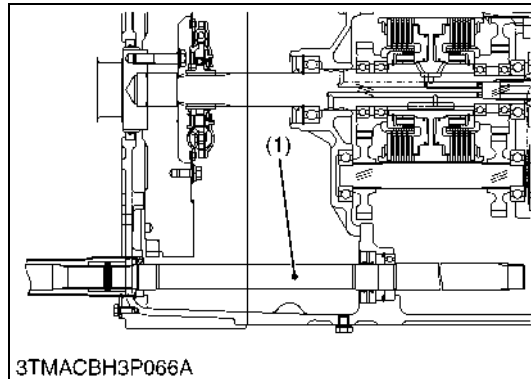
1. Tap out the DT propeller shaft (1) to rearward.

(When reassembling)

- Apply grease to the oil seal.

- (1) DT Propeller Shaft

W1020906

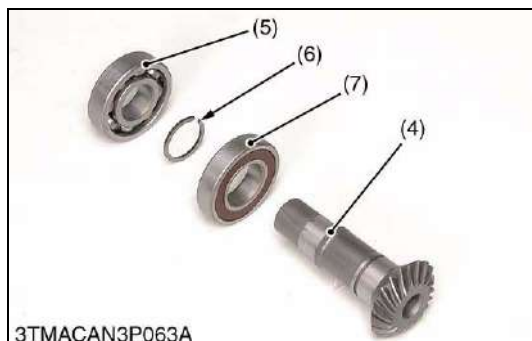
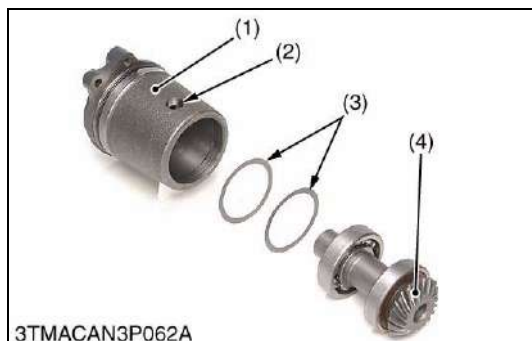
**(6) Creep Gear****Creep Gear and Shaft**

1. Refer to "[7] SHIFT COVER" in this section.

W1040976

[10] DISASSEMBLING TRANSMISSION CASE

(1) Hydraulic Pump Holder



Hydraulic Pump Holder

1. Tap out the 18T spiral bevel gear (4) with bearings.
2. Remove the shim (3) from pump holder (1).
3. Remove the bearing (5) using a puller.
4. Remove the external circlip (6) and bearing (7).

(When reassembling)

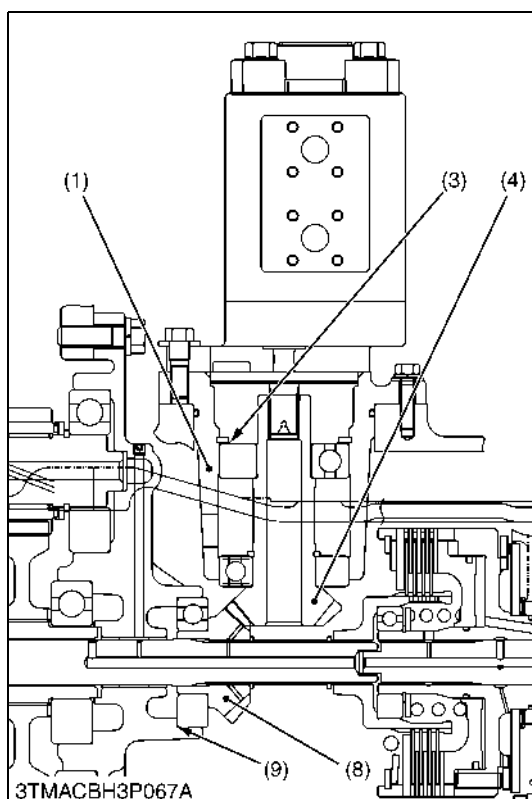
- Fill the transmission fluid to the hydraulic pump holder from the window (2) before install the hydraulic pump holder assembly to the transmission case.

NOTE

- Check the backlash between 18T bevel gear (4) and 19T bevel gear (refer to "6. SERVICING" in this section).

(1) Pump Holder	(6) External Circlip
(2) Window	(7) Bearing
(3) Shim	(8) 19T Spiral Bevel Gear
(4) 18T Spiral Bevel Gear	(9) Shim
(5) Bearing	

W1021097



(2) Parking Brake



Parking Brake Disc and Steel Plate

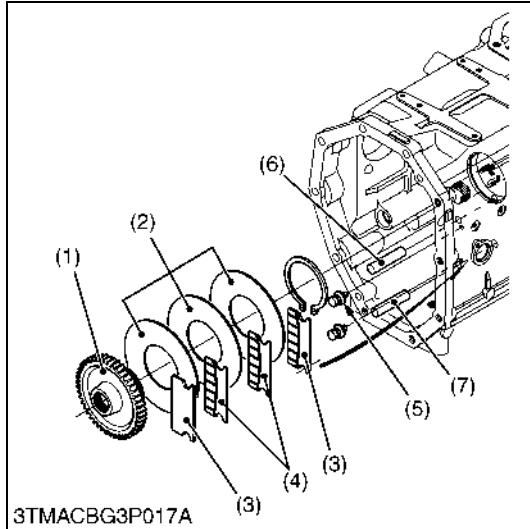
1. Remove the stopper screw (5) and upper pin (6).
2. Remove the disc (3) and (4).
3. Remove the 47T gear (1) with steel plates (2).

(When reassembling)

- Be sure to assemble the disc (3) and (4) to the original position as shown fig.

(1) 47T Gear	(5) Stopper Screw
(2) Steel Plate	(6) Upper Pin
(3) Disc (5.1 mm, 0.20 in.)	(7) Lower Pin
(4) Disc (2.8 mm, 0.11 in.)	

W1014172



(3) PTO Clutch Pack



Removing PTO Clutch Pack and Holder

1. Remove the PTO clutch holder mounting screws.
2. Remove the PTO clutch (4) with holder (5).

(When reassembling)

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 lbf·ft

(1) PTO Clutch

(2) Holder

W1025105

(4) Removing 4WD Clutch



4WD Clutch

1. Remove the 4WD clutch (1).

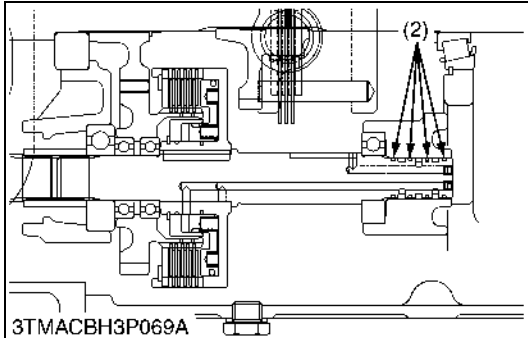
(When reassembling)

- Replace the seal rings (2) with new one.
- Apply grease to the seal rings (2) when assembling.

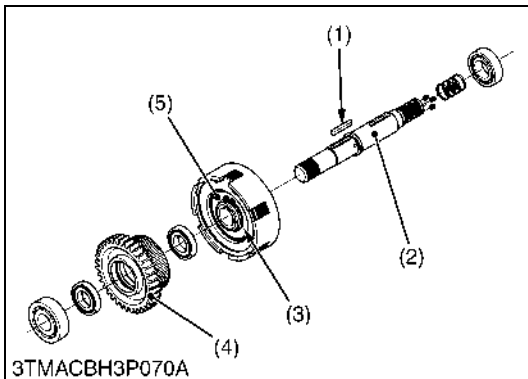
(1) 4WD Clutch

(2) Seal Ring

W1031993



(5) Disassembling 4WD Hydraulic Pack



4WD Hydraulic Pack

1. Tap and remove the 4WD shaft (2) to rearward.
2. Remove the 35T gear (3) from the clutch pack.
3. Remove the external circlip (3) and neutral cover (5).

(When reassembling)

- Align the key (1) and groove.
- Apply transmission fluid to the O-ring (6).

(1) Key

(4) 35T Gear

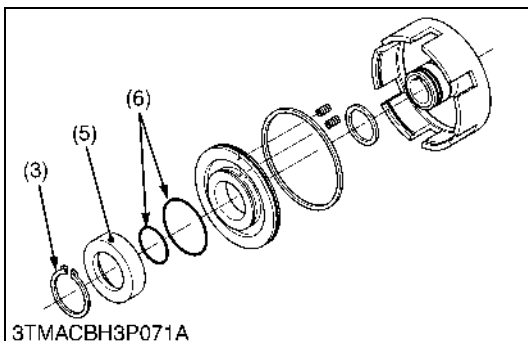
(2) 4WD Shaft

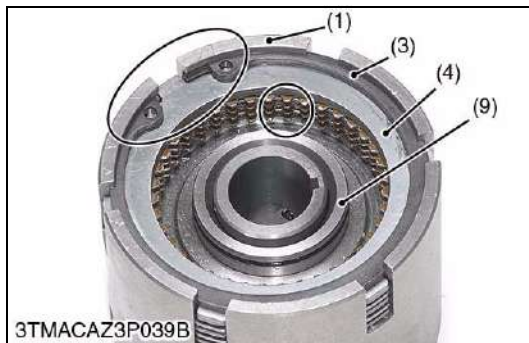
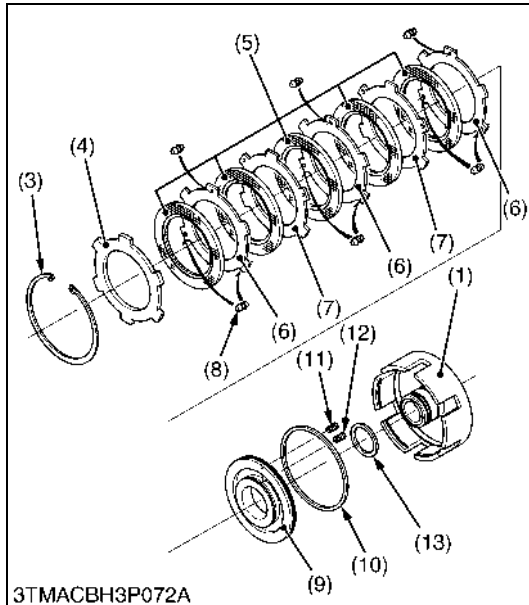
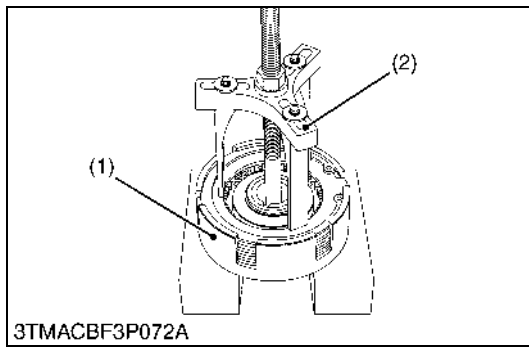
(5) Neutral Cover

(3) External Circlip

(6) O-ring

W1039065





4WD Piston

1. Press the pressure plate (4) to press down the 4WD piston (11), using jig (refer to "4. SPECIAL TOOLS" at "NG. GENERAL" section), and remove the internal circlip (3).
2. Remove the discs (5), steel plates (6), (7) and pressure plates (4).

NOTE

- 24 springs (outer) for 4WD piston.
- 15 springs (inner) for 4WD piston.
- 5 discs and 5 steel plates for 4WD clutch side.

(When reassembling)

- Apply transmission fluid to D-ring (12) and (13), then install the 4WD piston (9) with springs (11) and (12).
- Install the clutch discs (5) and steel plate (6), (7) mutually.
- Apply enough transmission fluid to the discs (5).
- Do not confuse the two types of steel plates. The steel plate with plug rubbers (6) and without rubbers (7).
- Two steel plates match the position of rubber (8) from the piston side, and one remaining steel plate is not matched.
- Do not confuse the pressure plates (4) and steel plate (7). The pressure plate (4) is thicker than the steel plate.
- When installing the internal circlip (3) to the clutch case (1), press the pressure plate (4) using a jig and align its split portion to the notched portion of clutch case (1) as shown in photo.
- When installing the internal circlip (3), temporary align the spline and teeth of clutch discs using the 35T gear.

(1) Clutch Case	(8) Rubber
(2) Jig	(9) 4WD Piston
(3) Internal Circlip	(10) D-ring (Outer)
(4) Pressure Plate	(11) Spring (Outer)
(5) Disc	(12) Spring (Inner)
(6) Steel Plate with Rubber	(13) D-ring (Inner)
(7) Steel Plate without Rubber	

W1033448

(6) Removing Differential Gear and Bevel Pinion Shaft



Differential Lock Device

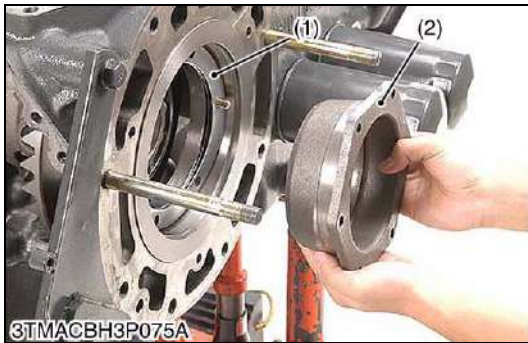
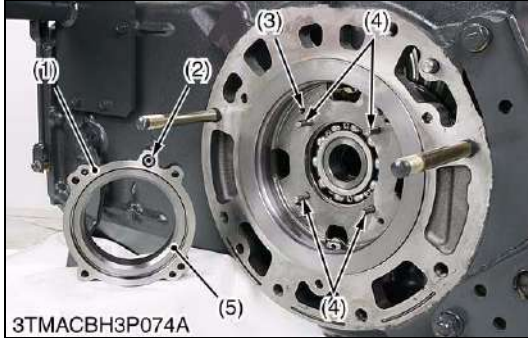
1. Remove the differential lock support (1) with piston (5).
2. Remove the pins (4).

(When reassembling)

- Apply transmission fluid to the O-ring (2).
- Align the oil passage.

(1) Differential Lock Holder	(4) Pin
(2) O-ring	(5) Piston
(3) Oil Passage	

W1039804



Differential Gear Assembly

1. Remove the differential support (2), noting the number of shims (1).
2. Take out the differential gear assembly (3) from transmission case.
3. Remove the differential lock collar (5) and thrust bearing (4).

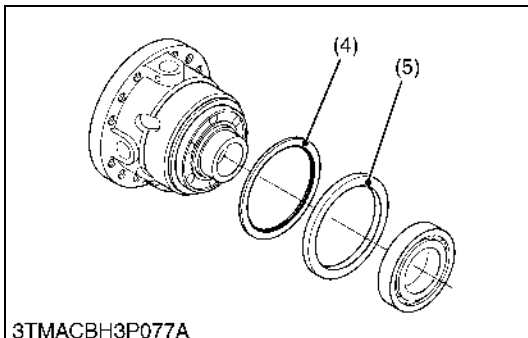
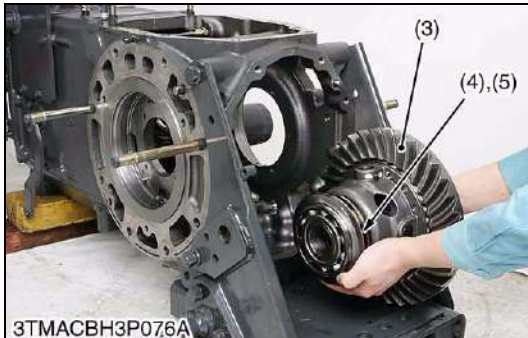
(When reassembling)

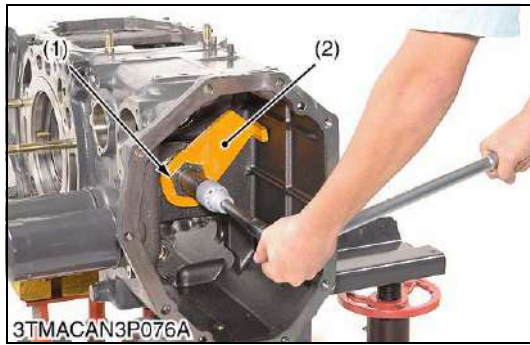
- Be sure to adjust the turning torque of spiral bevel pinion shaft (refer to "6. SERVICING" in this section).
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft (refer to "6. SERVICING" in this section).

Tightening torque	Differential bearing support mounting screw	48.1 to 55.8 N·m
		4.9 to 5.7 kgf·m
		35.4 to 41.2 lbf·ft

(1) Shim	(4) Thrust Bearing
(2) Differential Support	(5) Differential Lock Collar
(3) Differential Gear Assembly	

W1022138





Spiral Bevel Pinion Shaft

1. Remove the stake of staking nut (1).
2. Set the staking nut locking wrench (2).
3. Set the spiral bevel pinion shaft turning wrench.
4. Turn the spiral bevel pinion shaft turning wrench to the counterclockwise, then remove it.
5. Tap out the shaft to the rear.

(When reassembling)

- Replace the staking nut with a new one, and be sure to adjust the turning torque of spiral bevel pinion shaft itself (refer to "6. SERVICING" in this section).
- Stake the staking nut after installing the differential gear assembly.

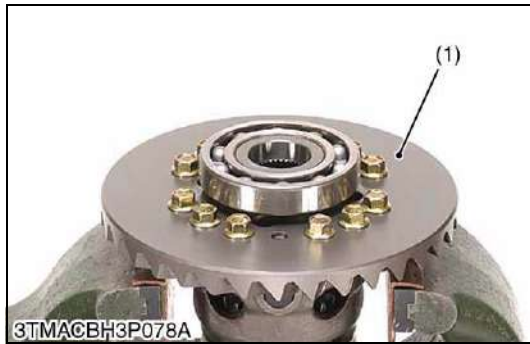
Tightening torque	Spiral bevel pinion shaft staking nut	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 lbf·ft

(1) Staking Nut

(2) Locking Wrench

W1023487

(7) Differential Gear



Spiral Bevel Gear

1. Remove the spiral bevel gear (1).

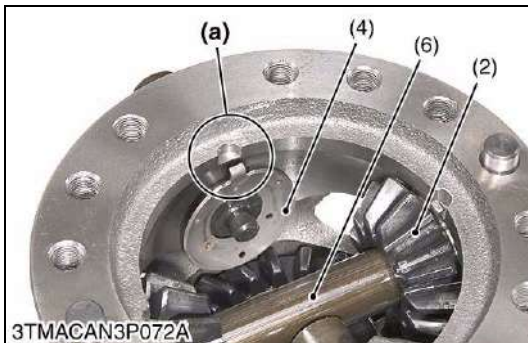
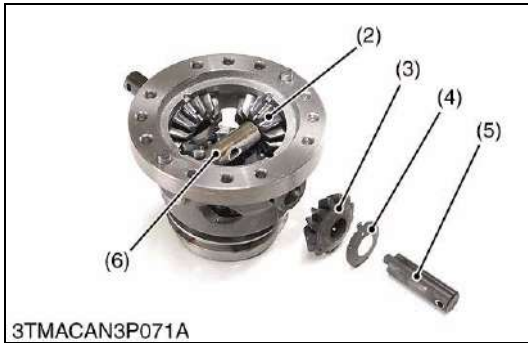
(When reassembling)

- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion shaft.
- Apply liquid lock (Three Bond 1324N or equivalent) to the spiral bevel gear mounting UBS screws.

Tightening torque	Spiral bevel gear mounting UBS screw	142.2 to 161.8 N·m 14.5 to 16.5 kgf·m 104.9 to 119.3 lbf·ft

(1) Spiral Bevel Gear

W1022465



Differential Pinion Shaft and Differential Pinion Gear

1. Tap out the roll pin (1).
2. Draw out the differential pinion shaft 2 (5), and take out the differential pinion gear (3) and differential pinion washer (4).
3. Draw out the differential pinion shaft 1 (6), and take out the differential pinion gear (2) differential pinion washer (4).

NOTE

- **Arrange the parts to know their original position.**

(When reassembling)

- Check the differential pinion gear (2), (3), and pinion shaft (6), (5) for excessive wear. If these parts are damaged or excessively worn, replace their parts they are in mesh with, or they sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions.
- Install the parts to their original position.
- Install the differential pinion washer (4), noting its groove position (a).

(1) Roll Pin

(2) Differential Pinion Gear

(3) Differential Pinion Gear

(4) Differential Pinion Washer

(5) Differential Pinion Shaft 2

(6) Differential Pinion Shaft 1

(a) Fitting Groove

W1022609

Differential Side Gear

1. Take out the differential side gear (2) and differential side gear washer (1).

(When reassembling)

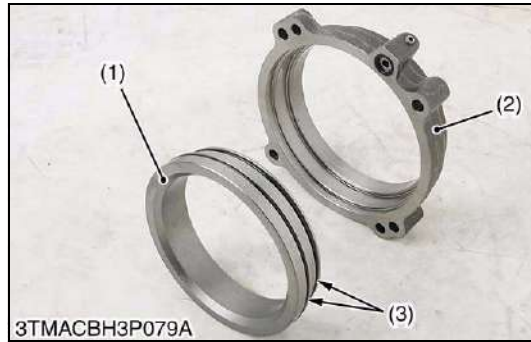
- Check the thrust and bearing surface of both differential side gears (2). If they are worn or damaged, bores in the differential case may also be damaged. Be sure to replace their parts.

(1) Differential Side Gear Washer

(2) Differential Side Gear

W1023050

(8) Differential Lock Piston



Piston

1. Remove the piston (1) from the differential lock support (2).

(When reassembling)

- Apply transmission fluid to the O-rings (3).

(1) Piston

(3) O-ring

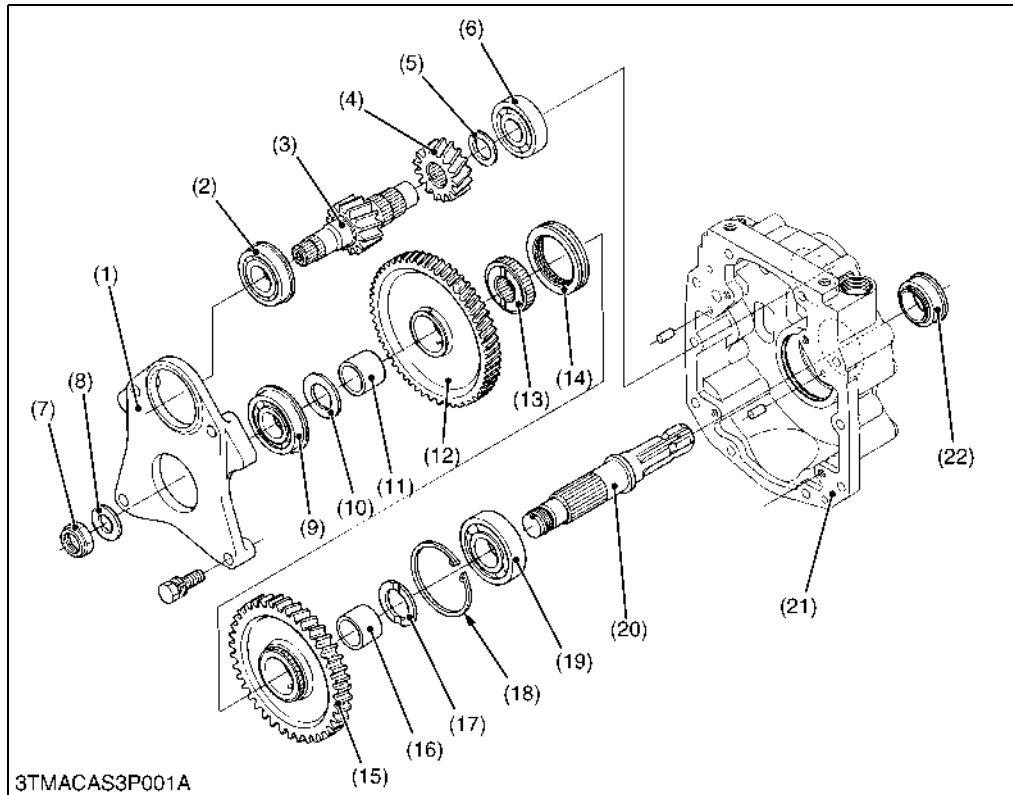
(2) Differential Lock Support

W1041076

[11] PTO GEAR CASE

(1) 540/540E Shift Type

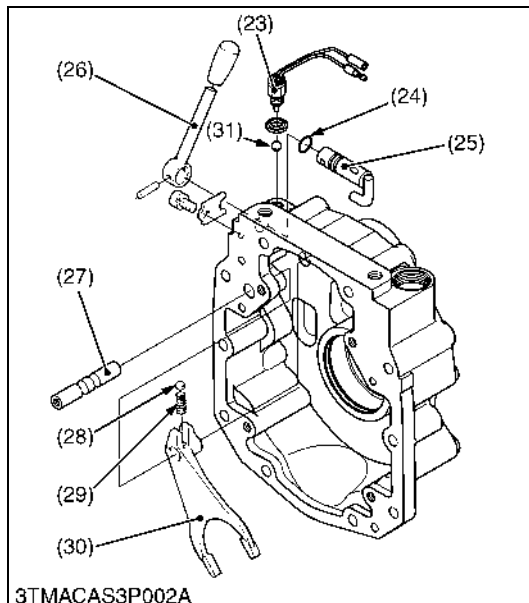
PTO Gear Case



3TMACAS3P001A

- (1) PTO Gear Case Cover
- (2) Ball Bearing
- (3) PTO Drive Gear Shaft
- (4) Gear
- (5) Collar
- (6) Ball Bearing
- (7) Stake Nut
- (8) Washer
- (9) Ball Bearing
- (10) Thrust Collar
- (11) Inner Ring
- (12) Gear
- (13) Hub
- (14) Shifter
- (15) Gear
- (16) Inner Ring
- (17) Thrust Collar
- (18) Internal Circlip
- (19) Ball Bearing
- (20) PTO Shaft
- (21) PTO Gear Case
- (22) Oil Seal
- (23) PTO Change Switch
- (24) O-ring
- (25) PTO Shift Arm
- (26) PTO Shift Lever
- (27) Shift Rod
- (28) Ball (Detent)
- (29) Spring
- (30) PTO Shift Fork
- (31) Ball

W1021401



3TMACAS3P002A

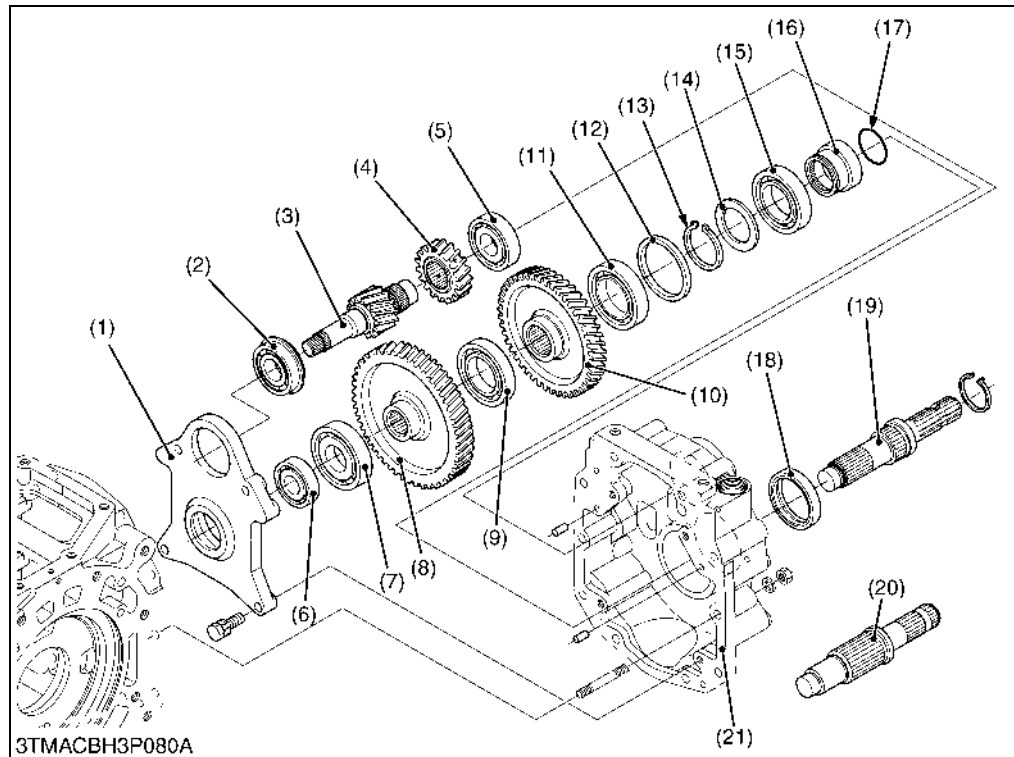
1. Remove the PTO change switch (23) and ball (31).
2. Remove the PTO case cover mounting screws and then remove the PTO gear case cover (1).
3. Remove the stake of the staking nut (7), and then remove it.
4. Remove the bearing (9) by using the bearing puller.
5. Tap out the PTO shaft (20) to the rear side.
6. Remove the gears (12), (15), thrust collars (10), (17), inner rings (11), (16), hub (13) and shifter (14).
7. Pull out the PTO drive gear shaft (3) as a unit.
8. Remove the PTO shift fork parts and PTO shift lever parts.

(When reassembling)

- Direct the grooves of thrust collars (10), (17) to the inner rings (11), (16) sides.
- Replace the PTO shaft staking nut (7) with new one, and stake it firmly after tightening.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner rings (11) and (16).
- Apply grease to the oil seal (22) and O-ring (24).
- Do not loose the ball (28) and (31).

Tightening torque	PTO shaft staking nut	226 to 264 N·m 23.0 to 27.0 kgf·m 167 to 195 lbf·ft
	PTO gear case mounting screws	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

W1033566

(2) 540/1000 Interchangeable Type

- (1) PTO Gear Case Cover
- (2) Ball Bearing
- (3) PTO Drive Gear Shaft
- (4) 18T Gear
- (5) Ball Bearing
- (6) Ball Bearing
- (7) Bearing
- (8) 49T Gear
- (9) Bearing
- (10) 43T Gear
- (11) Bearing
- (12) Spacer
- (13) External Circlip
- (14) Washer
- (15) Bearing
- (16) Holder
- (17) O-ring
- (18) Oil Seal
- (19) PTO Shaft (6 Spline)
- (20) PTO Shaft (21 Spline)
- (21) PTO Gear Case

W1041886

1. Remove the PTO shaft (19) or (20).
2. Remove the PTO case cover mounting screws and then remove the PTO gear case cover (1).
3. Remove the gears (8) and (10) as a unit.
4. Pull out the PTO drive gear shaft (3) as a unit.

(When reassembling)

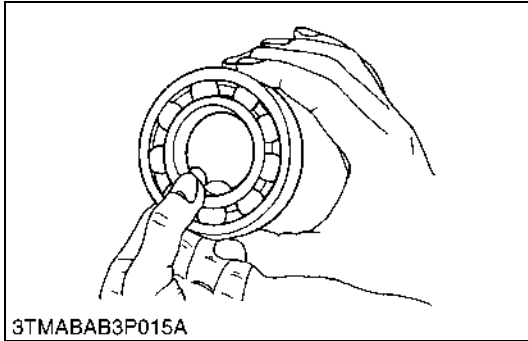
- Apply grease to the oil seal (18) and O-ring (17).

Tightening torque	PTO gear case mounting screws	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

W1042266

6. SERVICING

[1] BEARING, SHIFT FORK AND SYNCHRONIZER



Ball Bearing

1. Hold the inner race, push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

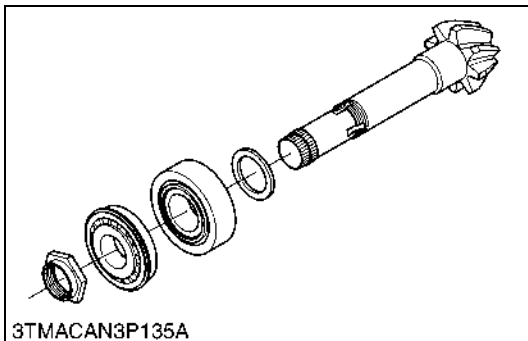
W1024200



Needle Bearing and Thrust Needle Bearing

1. Check the needle bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a needle bearing, replace it.

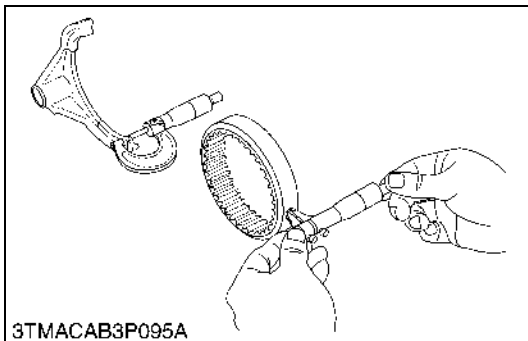
W1070684



Taper Roller Bearing

1. Check the bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a taper roller bearing, replace it.

W1070816

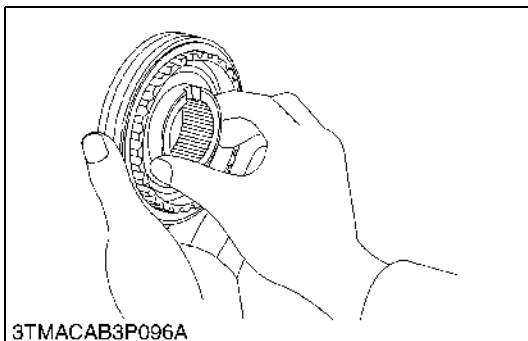


Clearance between Shift Fork and Shifter Groove

1. Measure the width of shift fork.
2. Measure the shifter groove width, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between shift fork and shift groove for main change section and range section	Factory spec.	0.15 to 0.40 mm 0.0059 to 0.0157 in.
	Allowable limit	0.80 mm 0.031 in.

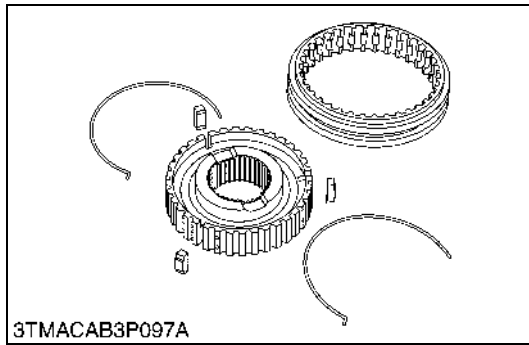
W1025154



Checking Contact between Coupling and Shifter

1. Check to see if there is flaw or wear on the spline of the coupling and shifter, and the key groove on the coupling.
2. Engage the shifter with the coupling, and check that they slide smoothly.
3. Similarly, check that there is any flaw or wear on the gear splines.
4. If there is any defect, replace them.

W1025396



Flaw on Synchronizer Key and Spring

1. Check the projection in the center of the synchronizer key for wear.
2. Check the spring for fatigue or wear on the area where the spring contacts with the keys.
3. If there is any defect, replace them.

W1025323

[2] TRAVELING CLUTCH



Backlash between Damper Disc Boss and Shaft

1. Mount the damper disc to the input shaft.
2. Hold the shaft so that it does not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace the damper disc.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

W1024206



Shuttle Lever and Inching Lever Bushing

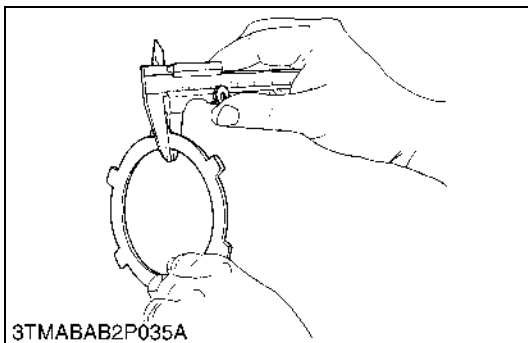
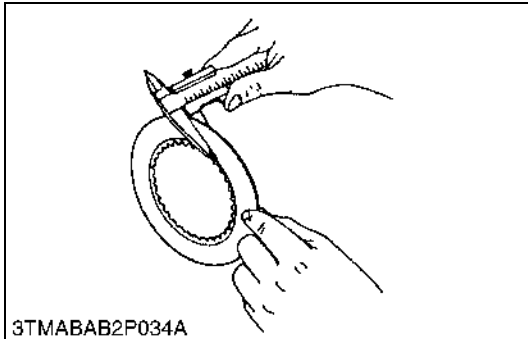
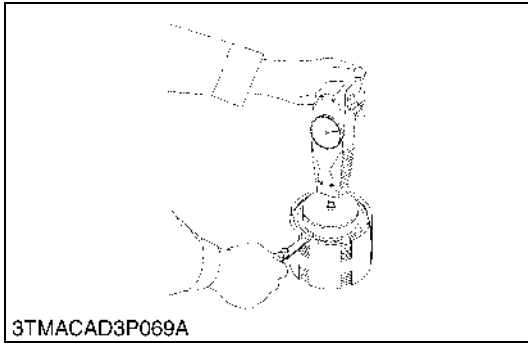
1. Measure the lever pin O.D. with an outside micrometer.
2. Measure the lever bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between lever pin and lever bushing	Factory spec.	0.049 to 0.156 mm 0.0019 to 0.0061 in.
	Allowable limit	0.5 mm 0.0197 in.

Lever pin O.D.	Factory spec.	13.957 to 13.984 mm 0.5495 to 0.5506 in.
Lever Bushing I.D.	Factory spec.	14.033 to 14.113 mm 0.5525 to 0.5556 in.

W1026979

[3] SHUTTLE CLUTCH PACK



Clearance between Internal Circlip and Belleville Washer (Cupped Spring Washer)

1. Measure the clearance between internal circlip and belleville washer (cupped spring washer) with a feeler gauge while applying specified force.
Specified force : 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbf)
2. 3-points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

■ NOTE

- Clearance between internal circlip and belleville washer (cupped spring washer) is adjusted by two kinds of clutch discs with different thickness. Therefore, use the one of the same thickness when you change clutch disc.

Clearance between internal circlip and belleville washer (cupped spring washer)	Factory spec.	1.8 to 2.0 mm 0.071 to 0.079 in.
	Allowable limit	3.6 mm 0.142 in.

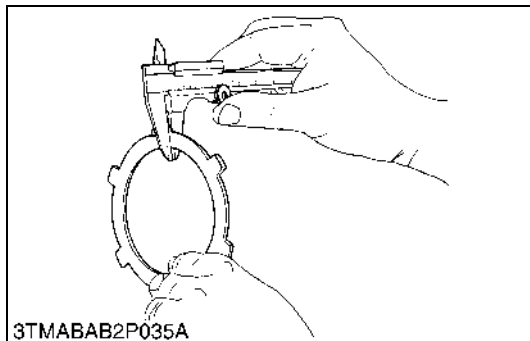
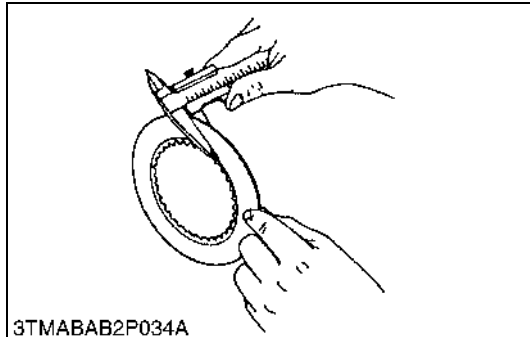
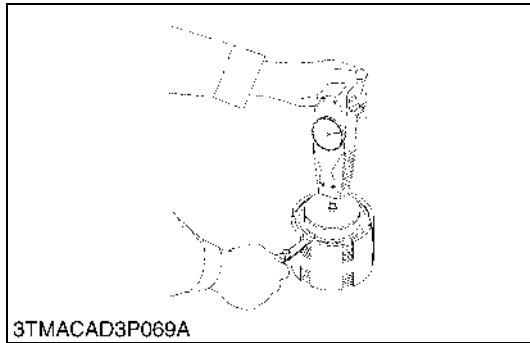
(Reference)

- There are two kinds of thickness of clutch discs.
- Thickness of plate and disc.

Steel plate	Factory spec.	3.1 to 3.3 mm 0.122 to 0.130 in.
Pressure plate	Factory spec.	4.42 to 4.58 mm 0.174 to 0.180 in.
Clutch disc (3C291-23130)	Factory spec.	2.85 to 2.95 mm 0.112 to 0.116 in.
Clutch disc (3C291-23030)	Factory spec.	3.0 to 3.1 mm 0.118 to 0.122 in.

W1023707

[4] DUAL SPEED CLUTCH PACK (F36/R36 SPEED TRANSMISSION MODEL)



Clearance between Internal Circlip and Pressure Plate

1. Measure the clearance between internal circlip and pressure plate with a feeler gauge while applying specified force.
Specified force : 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbf)
2. 3-points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

Clearance between internal circlip and pressure plate	Factory spec.	1.3 to 1.7 mm 0.052 to 0.066 in.
	Allowable limit	2.0 mm 0.079 in.

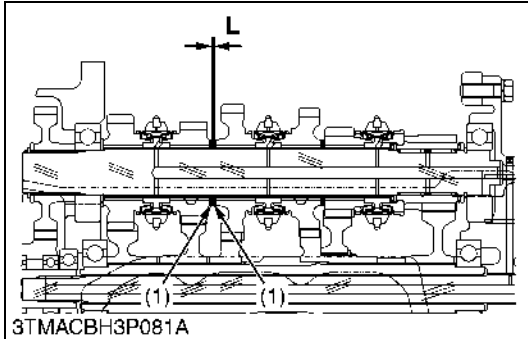
(Reference)

- There are two kinds of thickness of clutch discs.
- Thickness of plate, disc and piston.

Steel plate	Factory spec.	1.55 to 1.65 mm 0.0611 to 0.0649 in.
Pressure plate	Factory spec.	3.92 to 4.08 mm 0.155 to 0.160 in.
Clutch disc	Factory spec.	2.12 to 2.28 mm 0.0835 to 0.0897 in.

W1043835

[5] SHAFT AND GEAR



Side Clearance of 1st Shaft

1. Measure the side clearance (**L**) between the two thrust collars (1).
2. If clearance (**L**) exceeds the factory specification, adjust the clearance using adjusting collar (2).

(Reference)

- Thickness of adjusting collar (2)
 - 2.8 mm (0.110 in.) [Code No.: 3C081-28490]
 - 3.00 mm (0.118 in.) [Code No.: 3C001-28410]
 - 3.2 mm (0.126 in.) [Code No.: 3C001-28420]
 - 3.4 mm (0.134 in.) [Code No.: 3C001-28430]
 - 3.6 mm (0.142 in.) [Code No.: 3C001-28441]

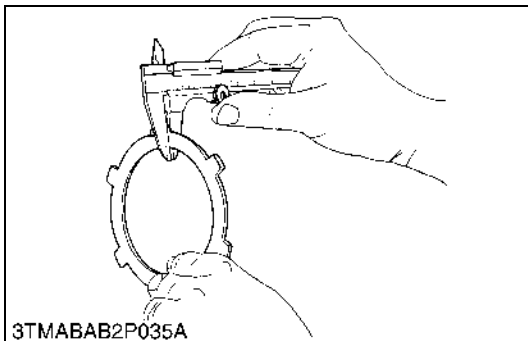
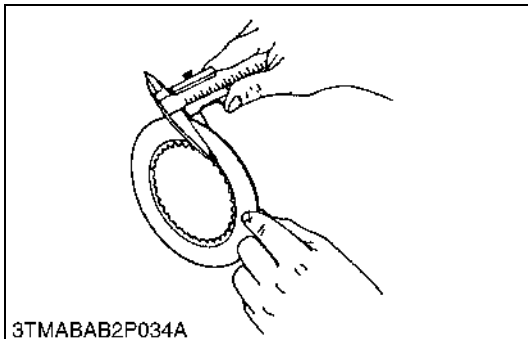
Clearance (L) between external circlip and collar	Factory spec.	Less than 0.2 mm 0.0078 in.

- (1) External Circlip
- (2) Adjusting Collar

L : Clearance

W1029017

[6] 4WD CLUTCH PACK



Clutch Disc Wear

1. Measure the thickness of clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of clutch disc	Factory spec.	2.1 to 2.3 mm 0.083 to 0.090 in.
	Allowable limit	1.9 mm 0.075 in.

W1016467

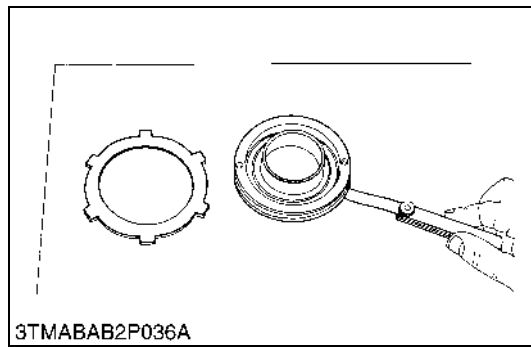
Steel Plate and Pressure Plate Wear

1. Measure the thickness of steel plate and pressure plate with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of steel plate	Factory spec.	1.67 to 1.83 mm 0.0658 to 0.0720 in.
	Allowable limit	1.3 mm 0.051 in.

Thickness of pressure plate	Factory spec.	4.42 to 4.58 mm 0.174 to 0.180 in.
	Allowable limit	3.7 mm 0.15 in.

W1016583

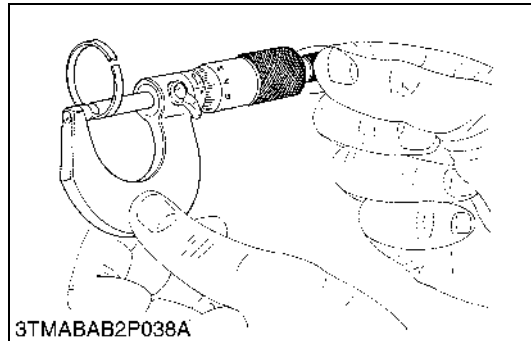


Flatness of Piston, Steel Plate and Pressure Plate

1. Place the part on a surface plate and check it unable to insert a feeler gauge (allowable limit size) underneath it (at least four points).
2. If the gauge can be inserted, replace it.

Flatness of piston	Allowable limit	0.15 mm 0.006 in.
Flatness of steel plate	Allowable limit	0.40 mm 0.016 in.
Flatness of pressure plate	Allowable limit	0.30 mm 0.012 in.

W1016731



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.	2.39 to 2.44 mm 0.0941 to 0.0960 in.
	Allowable limit	2.0 mm 0.079 in.

(1) Seal Ring

W1016857

[7] HYDRAULIC PUMP DRIVE GEAR



Backlash between 18T Bevel Gear and 19T Bevel Gear

1. Hold the fuse (1) in place with grease.
2. Assemble the hydraulic pump holder to the transmission case.
3. Turn the input shaft using a damper disc or clutch disc.
4. Disassemble the hydraulic pump holder and measure the thickness of pressed fuse.
5. If the measurement is not within the factory specification, adjust with shim.

Backlash between 18T bevel gear and 19T bevel gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.

■ IMPORTANT

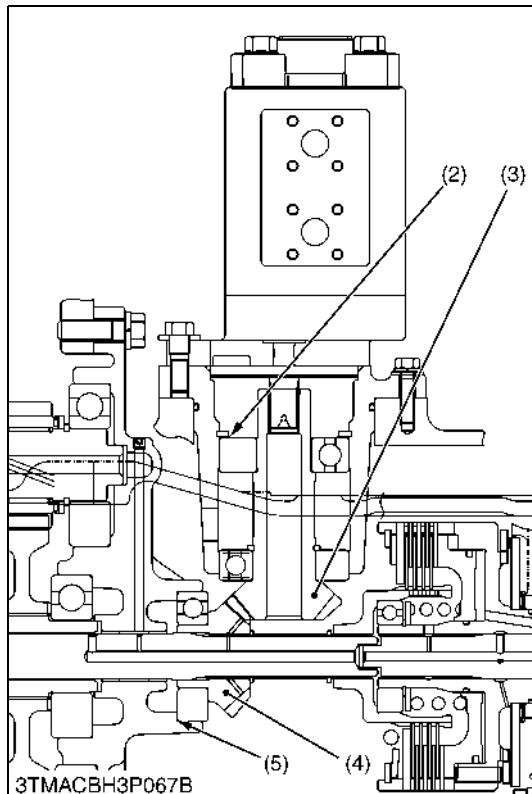
- Do not drop the fuse in the transmission case.

(Reference)

- Thickness of 18T bevel gear shim :
0.1 mm (0.004 in.) [Code No. 35533-42350]
0.2 mm (0.008 in.) [Code No. 35533-42360]
0.4 mm (0.016 in.) [Code No. 35533-42370]
- Thickness of 19T bevel gear shim :
0.1 mm (0.004 in.) [Code No. 35533-42350]
0.2 mm (0.008 in.) [Code No. 35533-42360]

(1) Fuse	(4) 19T Spiral Bevel Gear
(2) Shim for 18T Bevel Gear Shaft	(5) Shim for 19T Bevel Gear
(3) 18T Spiral Bevel Gear	

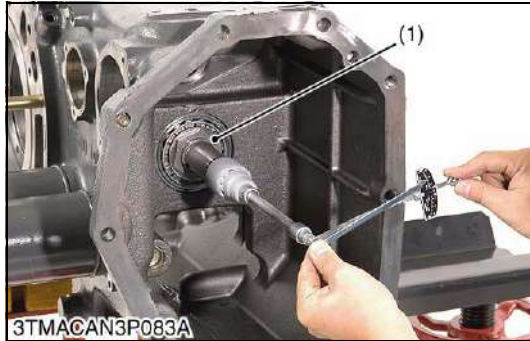
W1025903



[8] DIFFERENTIAL GEAR

■ IMPORTANT

- When reassembling spiral bevel pinion shaft and differential assembly, be sure to adjust the following.
- Turning torque of spiral bevel pinion shaft only.
- Backlash and tooth contact between spiral bevel pinion shaft and spiral bevel gear.



Turning Torque of Spiral Bevel Pinion Shaft Only

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut (1) with locking wrench and turning wrench.
2. After tapping the bevel pinion shaft to the front and rear, retighten the staking nut (1) to specified torque.
3. Measure the turning torque of spiral bevel pinion shaft.
4. If the measurement is not within the factory specifications, adjust the tightening torque of staking nut (1).

Turning torque of spiral bevel pinion shaft only	Factory spec.	3.138 to 3.628 N·m 0.32 to 0.37 kgf·m 2.314 to 2.676 lbf·ft

(Reference)

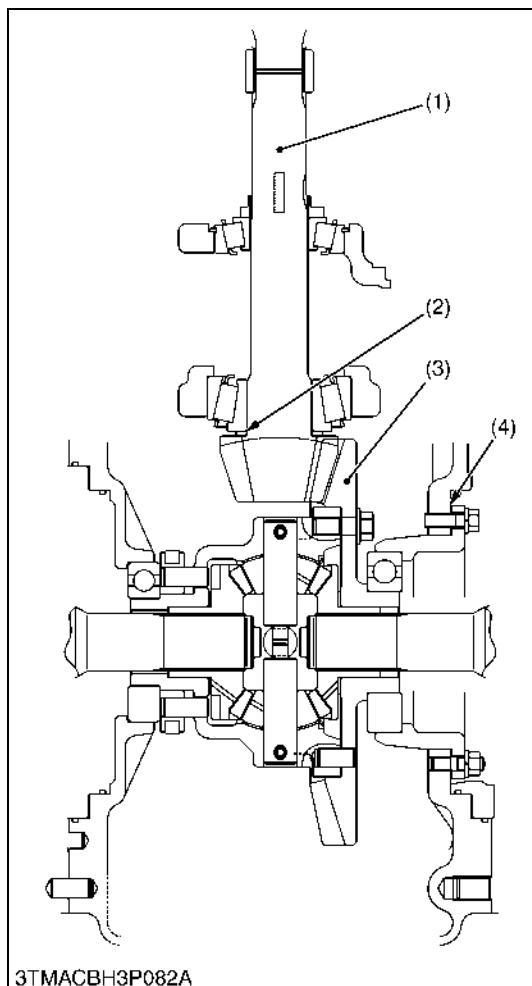
Tightening torque	Staking nut	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.71 to 75.95 lbf·ft

■ NOTE

- Stake the staking nut after performing adjustment described in the following pages.

(1) Staking Nut

W1025551



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 (3) by hand.
3. When the backlash is too large, decrease the number of shims (4).
When the backlash is too small, increase the number of shims (4).
4. Adjust the backlash properly by repeating the above procedure.
5. Apply red lead lightly over several teeth at three positions equally spaced on the spiral bevel gear.
6. Turn the spiral bevel pinion shaft, while pressing a wooden piece against the periphery on the spiral bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions next page.

Backlash between spiral bevel gear and spiral bevel pinion shaft	Factory spec.	0.2 to 0.3 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

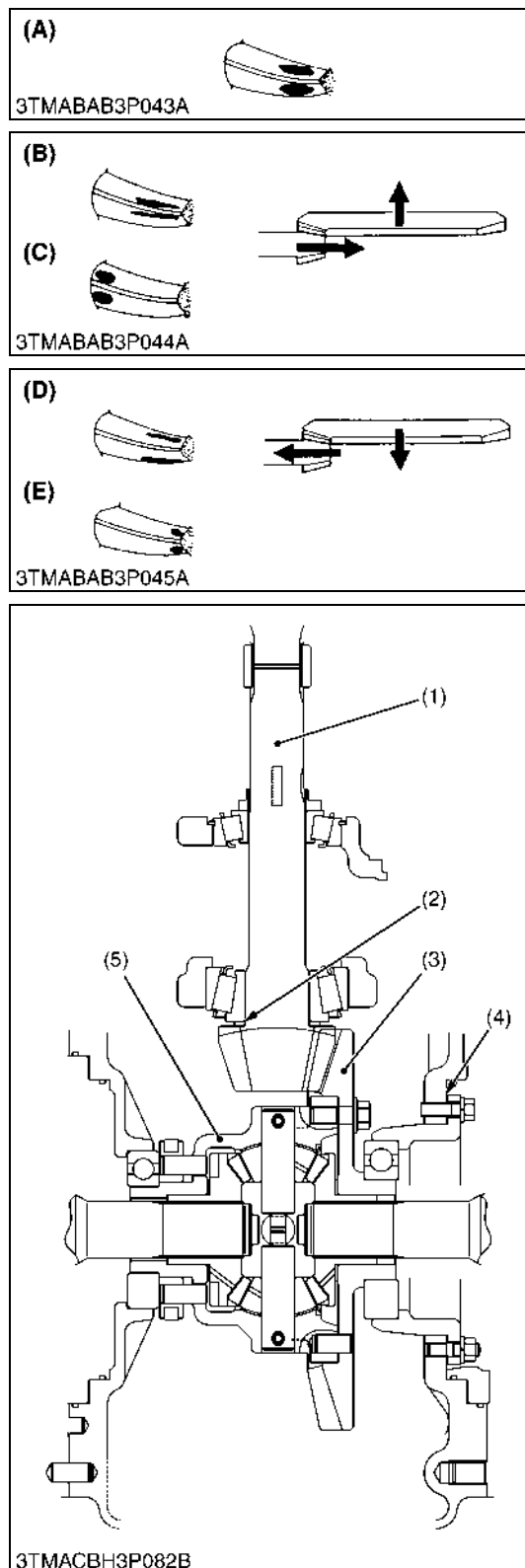
(Reference)

- Thickness of adjusting shim (4)
0.1 mm (0.004 in.) [Code No. 3C081-32130]
0.3 mm (0.012 in.) [Code No. 3C081-32140]
0.5 mm (0.020 in.) [Code No. 3C081-32150]
- Thickness of adjusting collar (2)
0.8 mm (0.031 in.) [Code No. 36200-32610]
1.0 mm (0.039 in.) [Code No. 36200-32630]
1.2 mm (0.047 in.) [Code No. 36200-32650]
1.4 mm (0.055 in.) [Code No. 36200-32670]
1.6 mm (0.063 in.) [Code No. 36200-32690]

(1) Spiral Bevel Pinion Shaft
(2) Adjusting Collar

(3) Spiral Bevel Gear
(4) Shim

W1072839



Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft (Continued)

- **Proper Contact**

More than 35 % red lead contact area on the gear tooth surface.

The center of tooth contact at 1/3 of the entire width from the small end.

- **Shallow or Heel Contact**

Replace the adjusting collar (2) with thicker one to move the spiral bevel pinion shaft backward.

And reduce the shim (4) to move the spiral bevel gear rightward.

Repeat above until the proper tooth contact and backlash are achieved.

- **Deep or Toe Contact**

Replace the adjusting collar (2) with a thinner one to move the spiral bevel pinion shaft forward.

And increase the shim (4) to move the spiral bevel gear leftward.

Repeat above until the proper tooth contact and backlash are achieved.

- (1) Spiral Bevel Pinion Shaft
- (2) Adjusting Collar
- (3) Spiral Bevel Gear
- (4) Shim
- (5) Differential Case

- (A) Proper Contact
- (B) Shallow Contact
- (C) Heel Contact
- (D) Deep Contact
- (E) Toe Contact

W1076897



Clearance between Differential Case Bore (35T Bevel Gear Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and 35T bevel gear.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

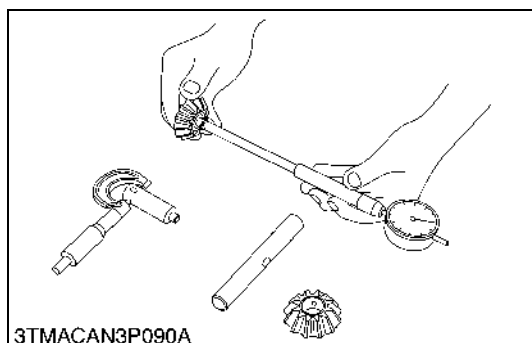
Clearance between differential case bore and differential side gear boss	Factory spec.	0.070 to 0.189 mm 0.00276 to 0.00744 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case bore I.D.	Factory spec.	49.07 to 49.15 mm 1.93189 to 1.93504 in.
Differential side gear boss O.D.	Factory spec.	48.961 to 49.066 mm 1.92760 to 1.92913 in.

Clearance between 35T bevel gear bore and differential side gear boss	Factory spec.	0.070 to 0.189 mm 0.00276 to 0.00744 in.
	Allowable limit	0.35 mm 0.014 in.

35T bevel gear bore I.D.	Factory spec.	49.07 to 49.15 mm 1.93189 to 1.93504 in.
Differential side gear boss O.D.	Factory spec.	48.961 to 49.066 mm 1.92760 to 1.92913 in.

W1029389



Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D.
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceed the allowable limit, replace them.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.06 to 0.102 mm 0.00236 to 0.00402 in.
	Allowable limit	0.25 mm 0.010 in.

Differential pinion shaft O.D.	Factory spec.	22.959 to 22.980 mm 0.90390 to 0.90472 in.
Differential pinion I.D.	Factory spec.	23.040 to 23.061 mm 0.90709 to 0.90791 in.

W1029788



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.) [Code No. 33740-32760]
 1.6 mm (0.063 in.) [Code No. 33740-32780]
 1.7 mm (0.067 in.) [Code No. 33740-32790]

(1) Side Gear Washer

W1030074

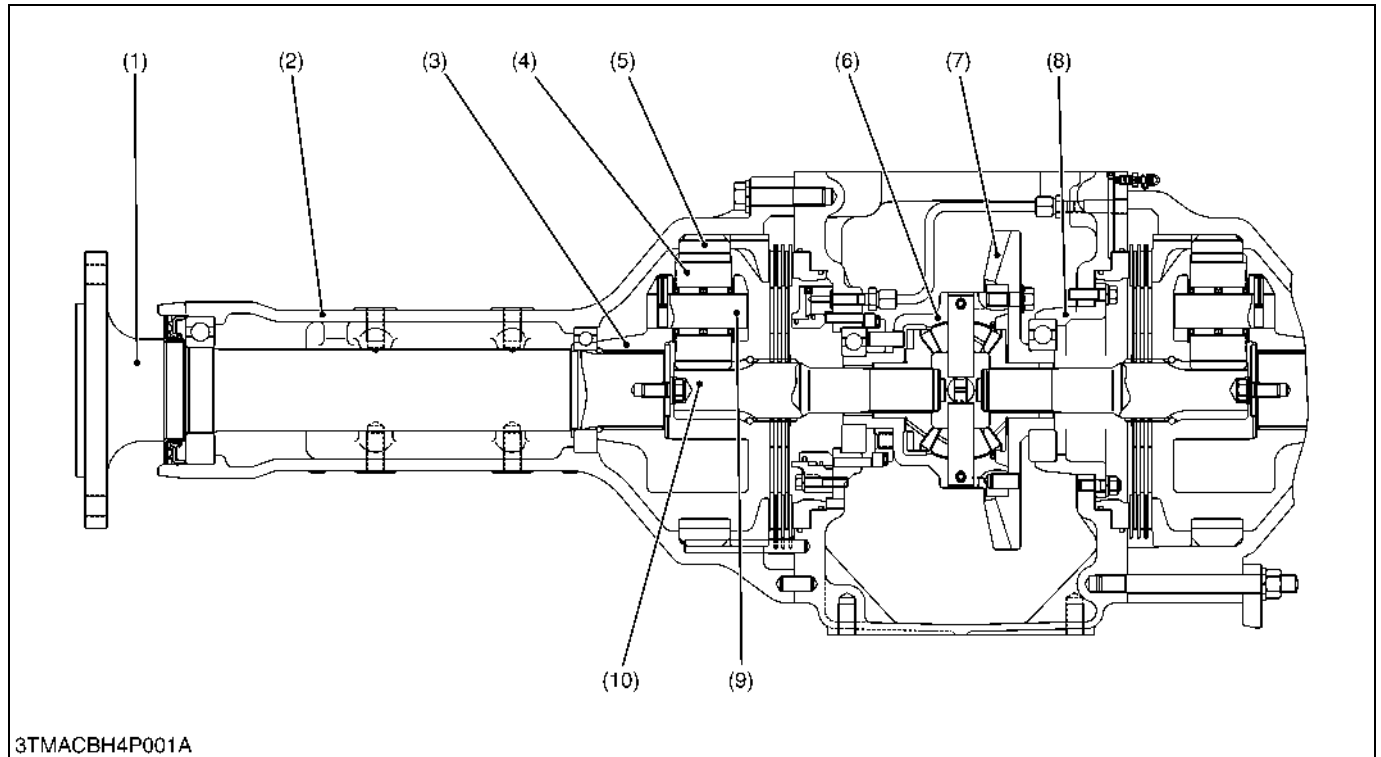
4 REAR AXLE

MECHANISM

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1. FEATURES



(1) Rear Axle	(4) 27T Planetary Gear	(7) 35T Bevel Gear	(9) Planetary Gear Pin
(2) Rear Axle Case	(5) 66T Internal Gear	(8) Differential Bearing Support	(10) Brake Shaft (12T Gear)
(3) Planetary Gear Support	(6) Differential Gear		

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 (6) and, at the same time, speed is reduced. It is further reduced by the planetary gear to drive the rear axles.

The rear axles (1) are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	Improper backlash between planetary gear and internal gear	Replace	4-S9
	Bearing worn	Replace	4-S9
	Insufficient or improper type of transmission fluid used	Replace	G-9

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.2 to 0.4 mm 0.0078 to 0.0157 in.	0.5 mm 0.020 in.
Thrust Collar	Thickness	1.55 to 1.65 mm 0.0610 to 0.0650 in.	1.2 mm 0.047 in.
Planetary Gear to Planetary Gear Shaft	Clearance	0.009 to 0.048 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.	—

W1013874

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Rear axle case mounting screw and nut	197 to 225	20.0 to 23.0	145 to 166
Cabin mounting bolt and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Retainer mounting screw	89.2 to 104.0	9.1 to 10.6	65.8 to 76.7

W1012736

4. DISASSEMBLING AND ASSEMBLING

[1] SEPARATING REAR AXLE

(1) Removing Rear Axle (ROPS Model)



Removing Rear Axle Assembly

1. Refer to the “5. DISASSEMBLING AND ASSEMBLING” at “3. TRANSMISSION” section.
2. Remove the cylinder support (1).
3. Remove the rear axle case mounting screws and nuts.
4. Support the rear axle case with nylon lift strap and hoist.
5. Separate the rear axle case from transmission case.

(When reassembling)

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

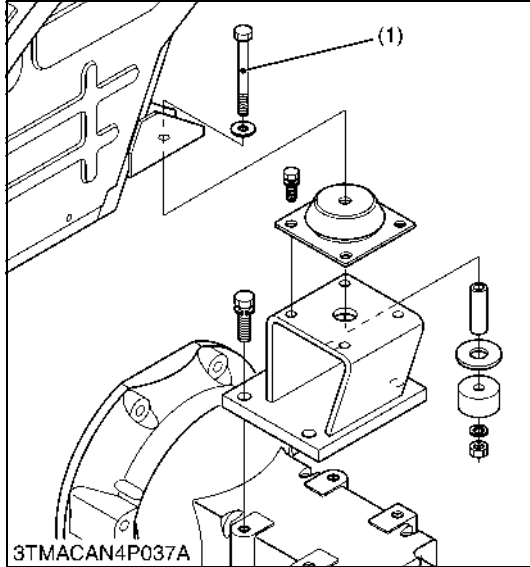
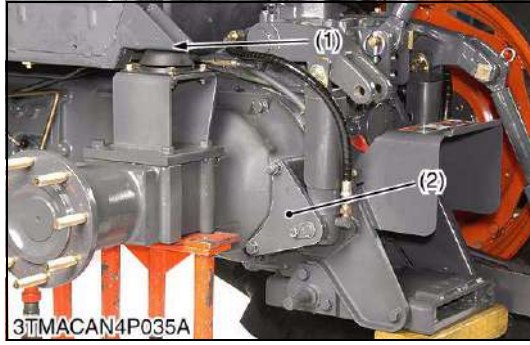
Tightening torque	Rear axle case mounting screw and nut	197 to 225 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft

(1) Cylinder Support

W1012123



(2) Removing Rear Axle (CABIN Model)



Removing Rear Axle Assembly

1. Remove the cylinder support (2).
2. Support the cabin and remove the cabin mounting bolt (1).
3. Remove the rear axle case mounting screws and nuts.
4. Support the rear axle case with nylon lift strap and hoist.
5. Separate the rear axle case from transmission case.

■ IMPORTANT

- Be sure to support the rear axle and make sure the balance for support position.
- Hoist up and support the rear axle under neath as shown photo.

(When reassembling)

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.
- Be sure to assemble the cabin mount as shown figure.

Tightening torque	Cabin mounting bolt and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Rear axle case mounting screw and nut	197 to 225 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft

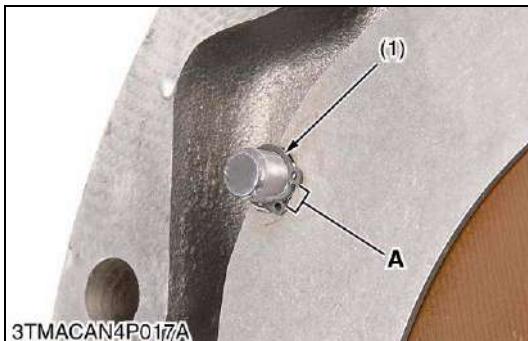
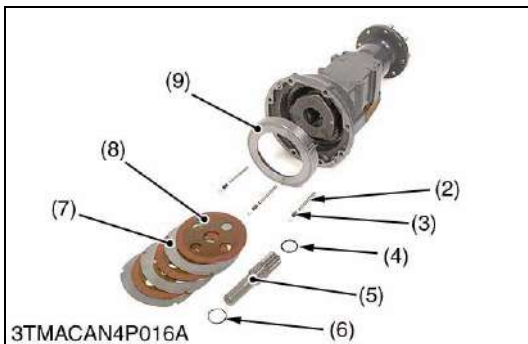
(1) Cabin Mounting Bolt

(2) Cylinder Support

W1026233

[2] DISASSEMBLING REAR AXLE

(1) Brake Section



Brake Shaft, Brake Disc, Steel Plate and Brake Plate

1. Remove the external circlip (1).
2. Draw out the brake shaft (5) with brake disc (8) and steel plates (7).
3. Remove the external circlip (6).
4. Remove the brake plate (9), collar (3) and pin (2).

(When reassembling)

- Place the brake discs (8) so that the holes aligned to next holes.
- The pin (2) does not have groove for external circlip (1).
- Face the external circlip (1) gap to brake shaft.

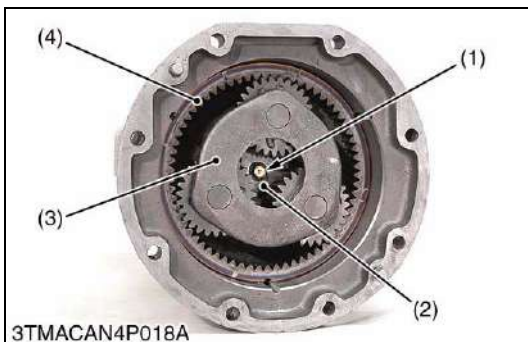
- (1) External Circlip
(2) Pin
(3) Collar
(4) O-ring
(5) Brake Shaft
(6) External Circlip

- (7) Steel Plate
(8) Brake Disc
(9) Brake Plate

A : Gap

W1012450

(2) Rear Axle Case



Planetary Gear Support

1. Remove the retainer mounting screw (1).
2. Carefully remove the planetary gear support (3).
3. Remove the internal gear (4).

(When reassembling)

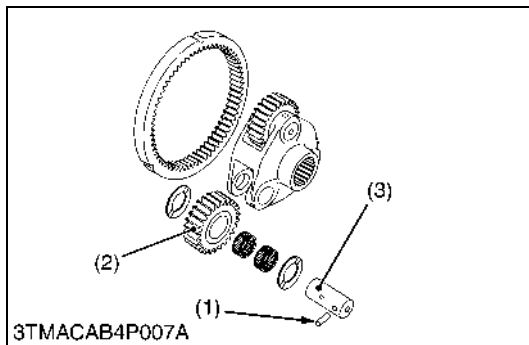
- Be sure to insert the retainer plate (2).

Tightening torque	Retainer mounting screw	89.2 to 104.0 N·m 9.1 to 10.6 kgf·m 65.8 to 76.7 lbf·ft

- (1) Retainer Mounting Screw
(2) Retainer Plate

- (3) Planetary Gear Support
(4) Internal Gear

W1012740



Planetary Gear

1. Tap the roll pin (1) into the planetary gear shaft (3).
2. Draw out the planetary gear shaft (3), and remove the planetary gear (2).
3. Tap out the roll pin from the planetary gear shaft.

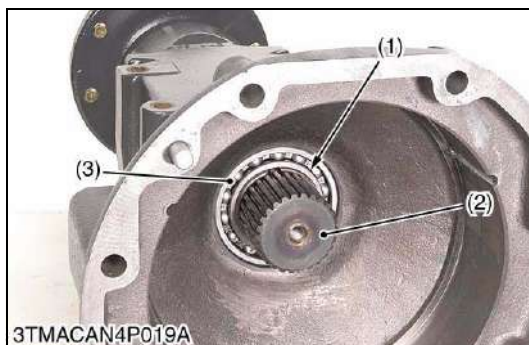
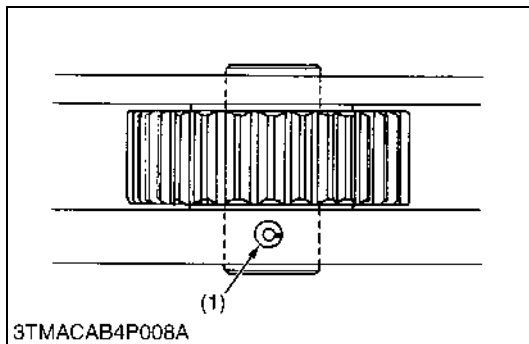
(When reassembling)

- Apply transmission fluid to the inner surface of planetary gear (2).
- Tap in the roll pin (1) as shown in the figure.

(1) Roll Pin
(2) Planetary Gear

(3) Planetary Gear Shaft

W1012932



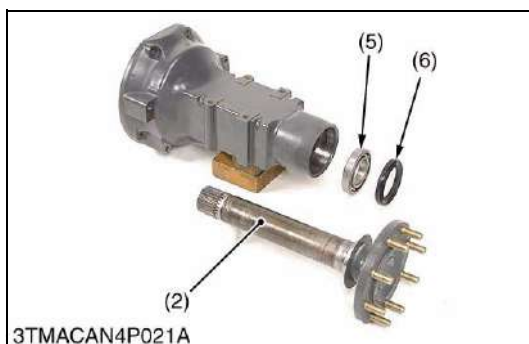
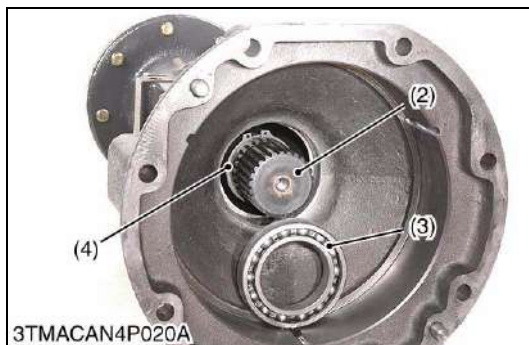
Rear Axle

1. Remove the external circlip (1).
2. Tap out the rear axle (2) half way.
3. Remove the ball bearing (3) and external circlip (4) from rear axle.
4. Tap out the rear axle (2).
5. Tap out the ball bearing (5) and oil seal (6) together.

(1) External Circlip
(2) Rear Axle
(3) Ball Bearing

(4) External Circlip
(5) Ball Bearing
(6) Oil Seal

W1013143



**Assembling Procedure for Rear Axle**

1. Assemble the ball bearing (2) to the rear axle case.
2. Assemble the oil seal 1 (1), face the seal lip to outside.
3. Assemble the oil seal 2 (3) to the rear axle.
4. Assemble the rear axle to rear axle case.
5. Assemble the external circlip (5) then tap in the ball bearing (4) to the rear axle shaft.

(When reassembling)

- Apply transmission fluid to the oil seal when insert the rear axle to rear axle case.

- (1) Oil Seal 1
(2) Ball Bearing
(3) Oil Seal 2

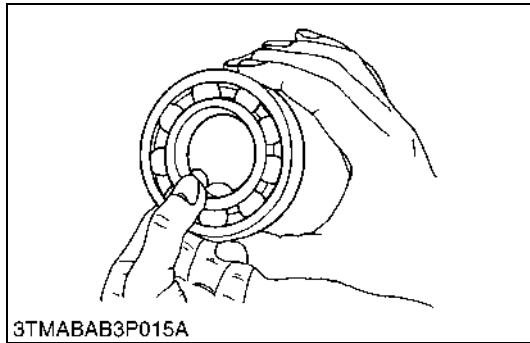
- (4) Ball Bearing
(5) External Circlip

W1013414



5. SERVICING

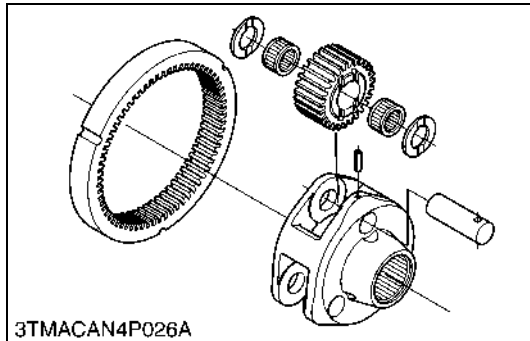
[1] BEARING



Ball Bearing

1. Hold the inner race, push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1024200



Needle Bearing

1. Check the needle bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a needle bearing, replace it.

W1018975

[2] PLANETARY GEAR

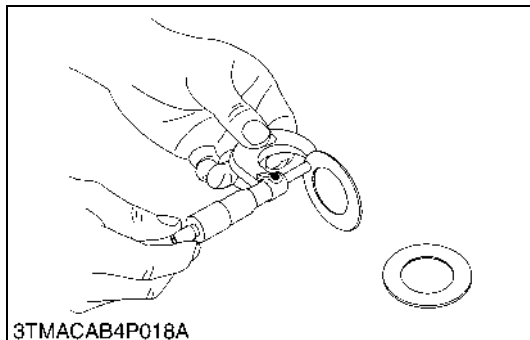


Backlash between Internal Gear and Planetary Gear

1. Set a dial indicator (lever type) on the tooth of the planetary gear.
2. Hold the planetary gear support and move only the planetary gear to measure the backlash.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gear and planetary gear	Factory spec.	0.2 to 0.4 mm 0.0078 to 0.0157 in.
	Allowable limit	0.5 mm 0.020 in.

W1013592

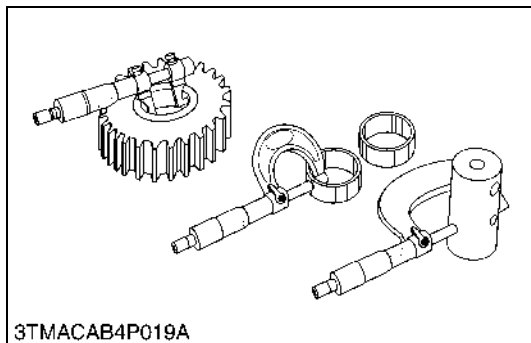


Thrust Collar Thickness

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



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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.	29.991 to 30.000 mm 1.18075 to 1.18110 in.
Planetary gear I.D.	Factory spec.	42.009 to 42.025 mm 1.65390 to 1.65453 in.
Needle O.D.	Factory spec.	5.994 to 6.000 mm 0.23559 to 0.23622 in.

W1013795

5 BRAKES

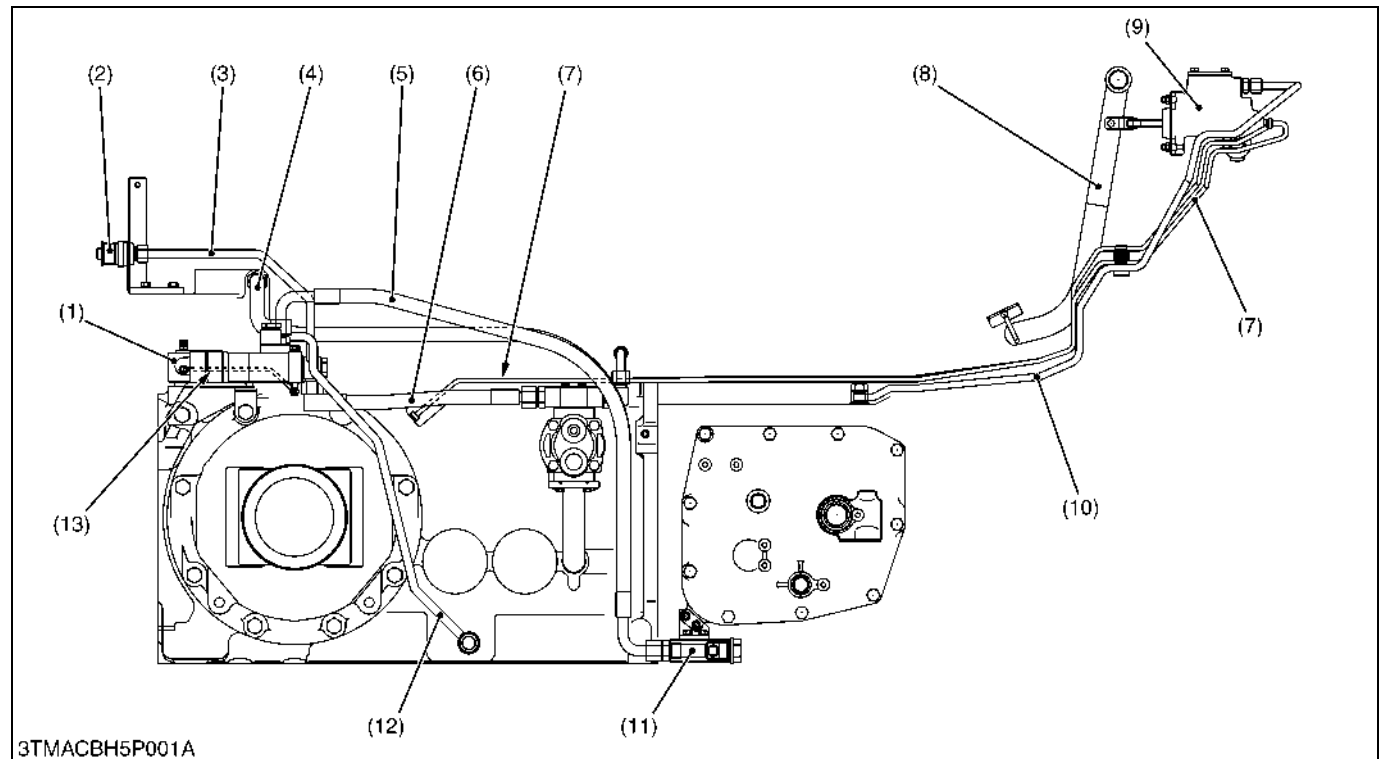
MECHANISM

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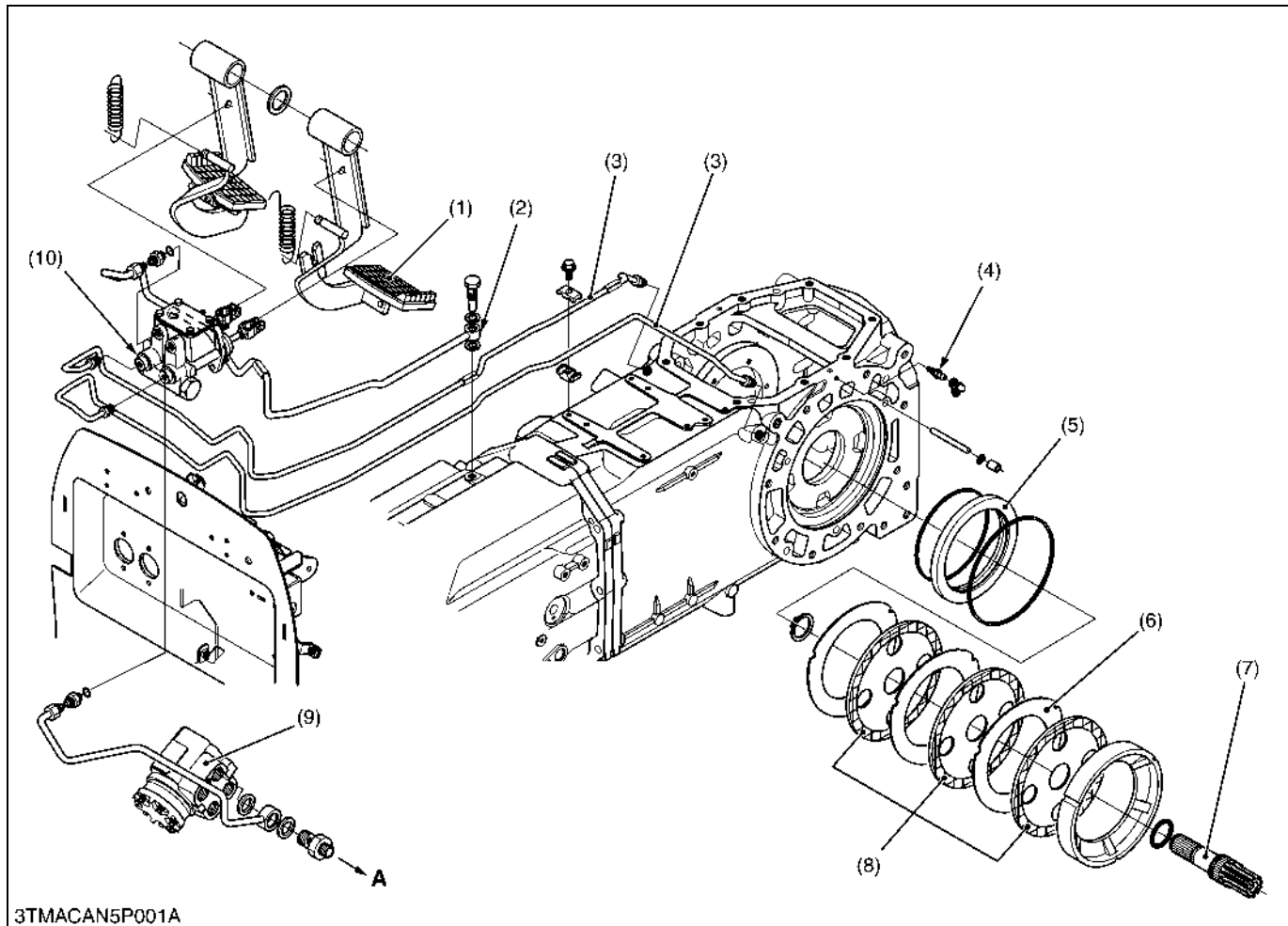
1. TRAVELLING BRAKE AND TRAILER BRAKE

[1] STRUCRURE



(1) Trailer Brake Valve	(5) Delivery Pipe (To Outlet Block)	(8) Brake Pedal	(12) Return Pipe (Trailer Brake Valve)
(2) Trailer Brake Coupler	(6) Delivery Pipe (Hose) (From Hydraulic Pump)	(9) Master Cylinder	
(3) Trailer Brake Pipe	(7) Brake Pipe	(10) Return Pipe (Master Cylinder)	(13) Pilot Pipe
(4) Delivery Pipe (Hose) (To 3P Hydraulic System)		(11) Outlet Block	

[2] STRUCTURE FOR TRAVELING BRAKE



(1) Brake Pedal	(4) Bleeder	(7) Brake Shaft	(10) Master Cylinder
(2) Return Pipe	(5) Brake Piston	(8) Brake Disc	
(3) Brake Pipe	(6) Brake Plate	(9) Power Steering Controller	A : To Oil Cooler

The traveling brake is a hydraulic wet disc type, which consists of the master cylinder (10), brake pipe (3), brake piston (5) and others. This type provides high and stable braking effect and requires almost no adjustment.

The master cylinder (10) is one piece type which including equalizer and oil reservoir.

While the machine operates 2WD travelling mode, the hydraulic 4WD clutch is kept 2WD mode. When the both brake pedal depressed at same time, 2-brake pedal switches energize the 4WD solenoid valve to switch the 4WD travelling mode. Therefore, all 4-wheels are put on brakes to provide for greater braking effect.

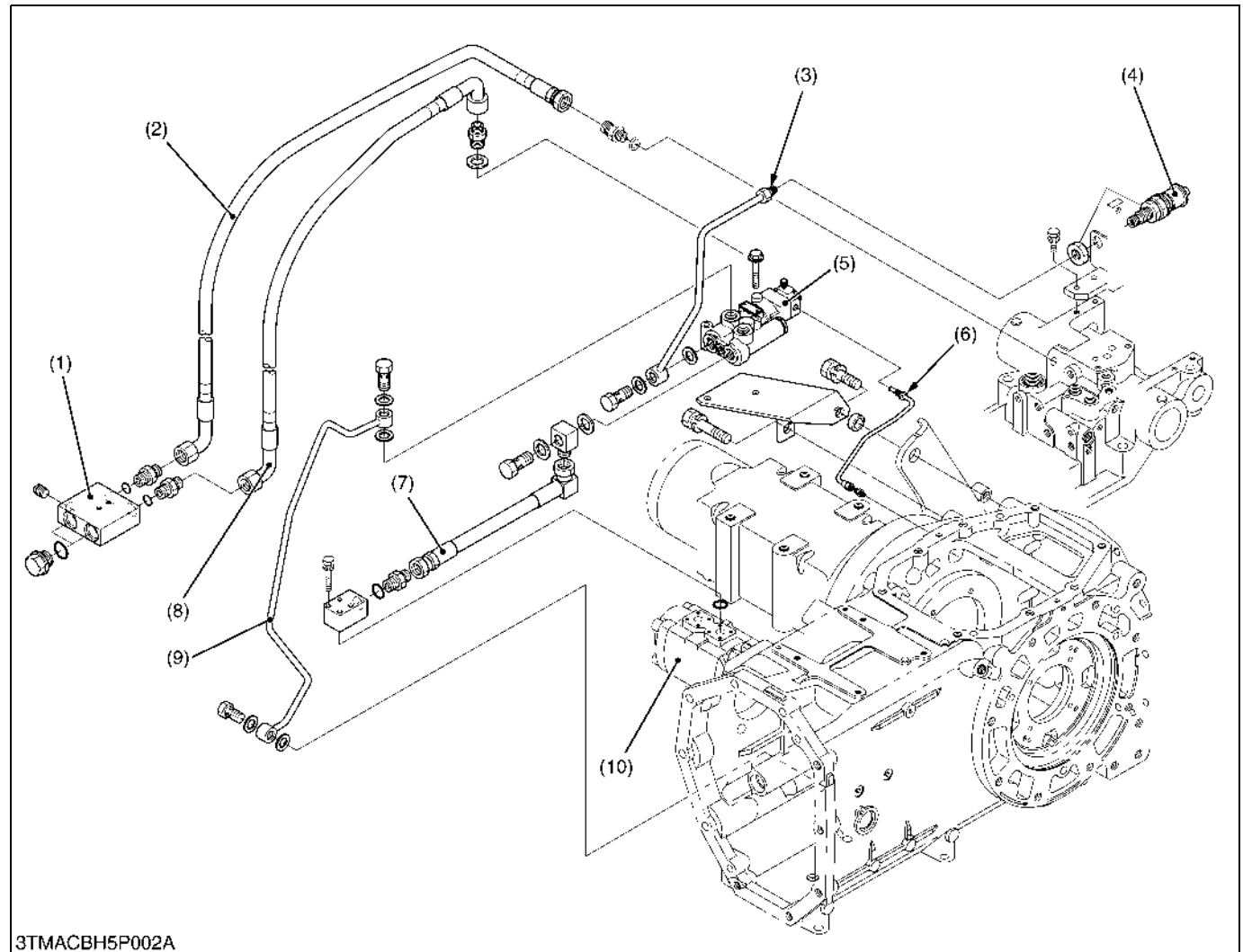
■ NOTE

- Refer to "5. BRAKES" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

The brake oil provided forcibly, the oil after through the power steering controller (9), oil line separate for oil cooler and master cylinder (10). The master cylinder (10) saves oil and surplus oil return to the clutch housing case through the return pipe (2).

This system makes free maintenance for brake oil level check.

[3] STRUCTURE FOR TRAILER BRAKE



3TMACBH5P002A

(1) Outlet Block	(4) Trailer Brake Coupler	(7) Delivery Hose (from Hydraulic Pump)	(9) Return Pipe
(2) Delivery Pipe (Hose) (for 3P Hydraulic System)	(5) Trailer Brake Valve	(8) Delivery Pipe (Hose) (for Outlet Block)	(10) Hydraulic Pump
(3) Trailer Brake Pipe (Hose)	(6) Pilot Pipe		

The hydraulic trailer brake valve (5) is provided in this tractor, which brings a steady braking power at work to use the heavy trailer. The oil pressure rise in the brake case (6) is perceived to the trailer brake valve (5) through the pilot pipe (6). Then the trailer brake valve (5) feeds pressurized oil to the trailer through the coupler (2) corresponding to the brake oil pressure.

[4] MASTER CYLINDER ASSEMBLY

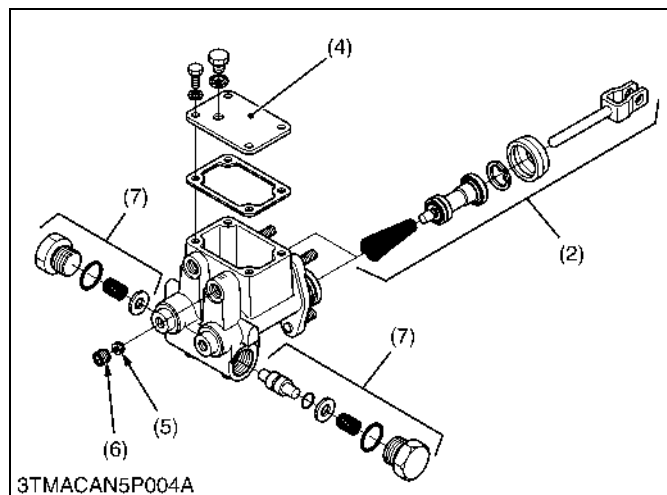
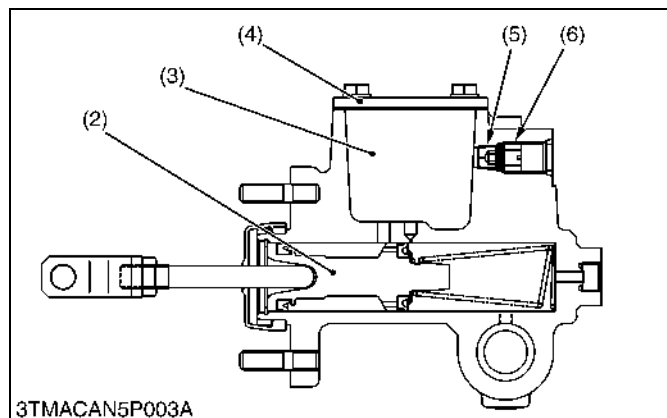


The master cylinder is one piece type which including oil tank (3), master cylinder (2) and equalizer (6).

(The function for each parts, refer to "5. BRAKES" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).)

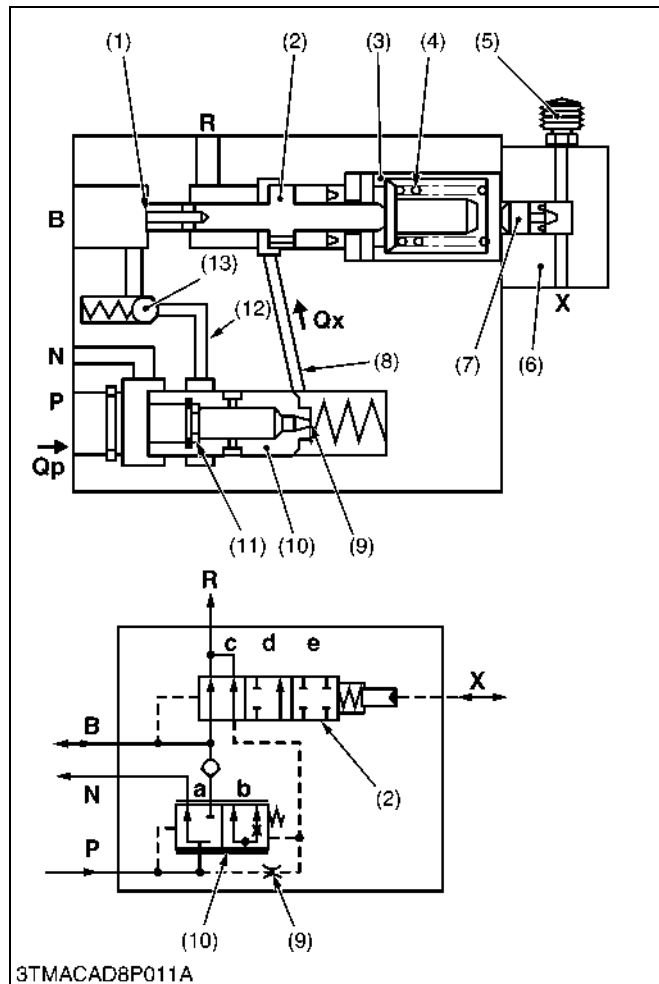
(1) Master Cylinder Assembly	(5) Orifice
(2) Master Cylinder	(6) Filter
(3) Tank	(7) Equalizer
(4) Tank Cover	

W1012749



[5] HYDRAULIC TRAILER BRAKE VALVE

(1) Structure



■ Main Elements

- Flow control valve (10) with throttle (9) and restrictor (11) : for controlling the delivery flow Q_p and for regulating the fluid flow for the trailer brake.
- Control spool (2) with piston surface (1) : for controlling the flow control valve (10) and regulating the trailer braking pressure.
- Check valve (13) : prevents oil from flowing back from the brake line **B** to port **N**.
- Pressure relief element (3) with pre-loaded spring (4) : for limiting the trailer braking pressure.
- Control head (6) with piston (7) and bleed valve (5) : for operating the trailer brake valve through the tractor brake line.

(1) Piston Surface

(2) Control Spool

(3) Pressure Relief Element

(4) Spring

(5) Bleed Valve

(6) Control Head

(7) Piston

(8) Bore

(9) Throttle

(10) Flow Control Valve

(11) Restrictor

(12) Bore

(13) Check Valve

P : Port for 3P Hydraulic Pump

N : Port for 3P Control Valve

B : Port for Trailer Brake
(Connected to Coupler)

R : Port for Reservoir
(Transmission Case)

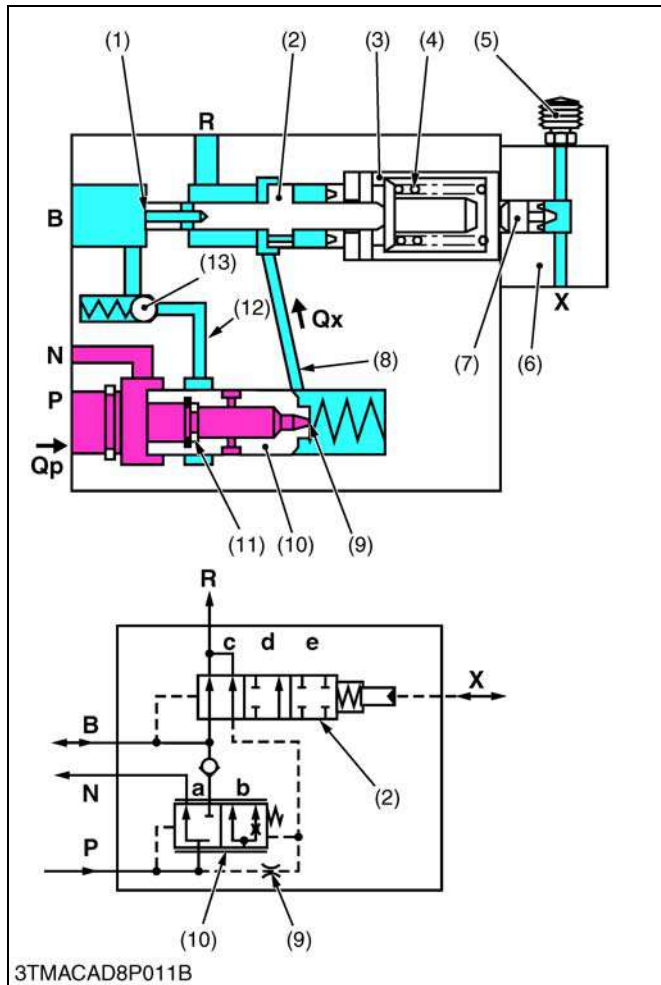
X : Port for Tractor Service
Brake (Connected to Pilot
Pipe)

Q_p : Delivery Flow

Q_x : Control Flow

W1016170

(2) Operation



■ Tractor Brake Released

The tractor service brake line **X** is pressureless. The brake line **B** is relieved to the reservoir through the control spool (2) and port **R**.

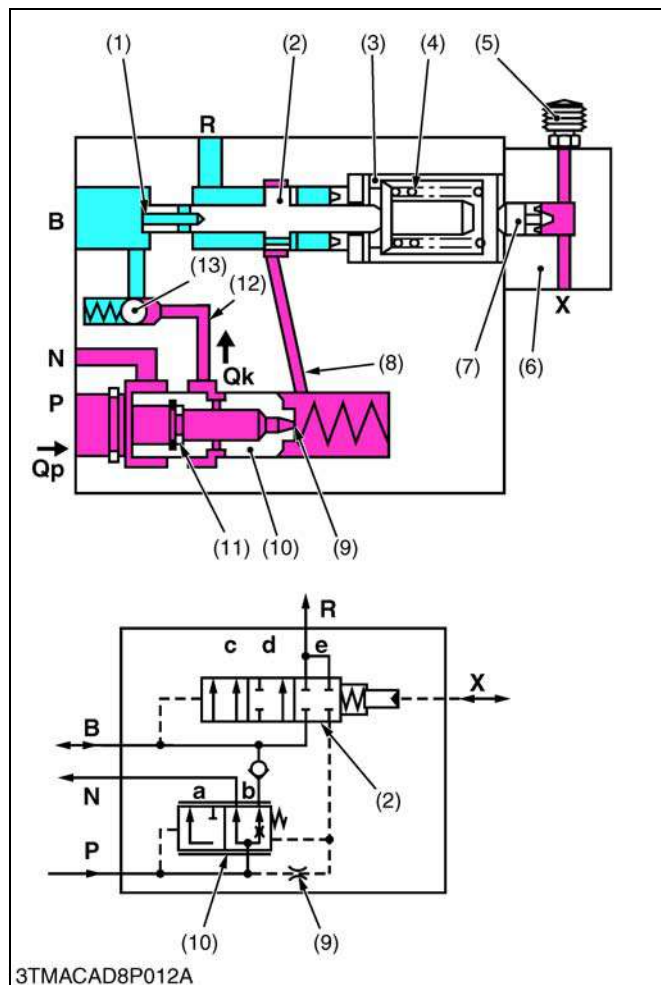
The delivery flow **Q_p** of the pump flows from port **P** past flow control valve (10), the flow **Q_p - Q_x** continues through port **N** to the tractor hydraulics.

A small control oil flow **Q_x** of approx. 0.6 L/min. passes from port **P** to the reservoir through restrictor (11), throttle (9), bore (8), control spool (2), and port **R**. Thus the pressure drop at throttle (9) holds the flow control valve (10) in the open flow position **a**. The flow control valve (10) has no regulating function.

- (1) Piston Surface
- (2) Control Spool
- (3) Pressure Relief Element
- (4) Spring
- (5) Bleed Valve
- (6) Control Head
- (7) Piston
- (8) Bore
- (9) Throttle
- (10) Flow Control Valve
- (11) Restrictor
- (12) Bore
- (13) Check Valve

- P** : Port for 3P Hydraulic Pump
- N** : Port for 3P Control Valve
- B** : Port for Trailer Brake
- R** : Port for Reservoir
(Transmission Case)
- X** : Port for Tractor Service
Brake
- Q_p** : Delivery Flow
- Q_x** : Control Flow

W1016523



■ Partial Braking of Trailer Brake - Initiation

Piston (7) of control head (6) is pressurized through control line **X** from the tractor service brake. Control spool (2) is thus shifted to the left and separates from the reservoir first brake line **B** and then bore (8). The control spool (2) is shifted from position **c** to position **e**. The control oil flow is blocked and hence flow control valve (10) is switched into the regulating function in position **b**. A constant flow **Q_k** (approx. 30 L/min.) passes from port **P** to the trailer brake through restrictor (11), bore (12), check valve (13) and port **B**.

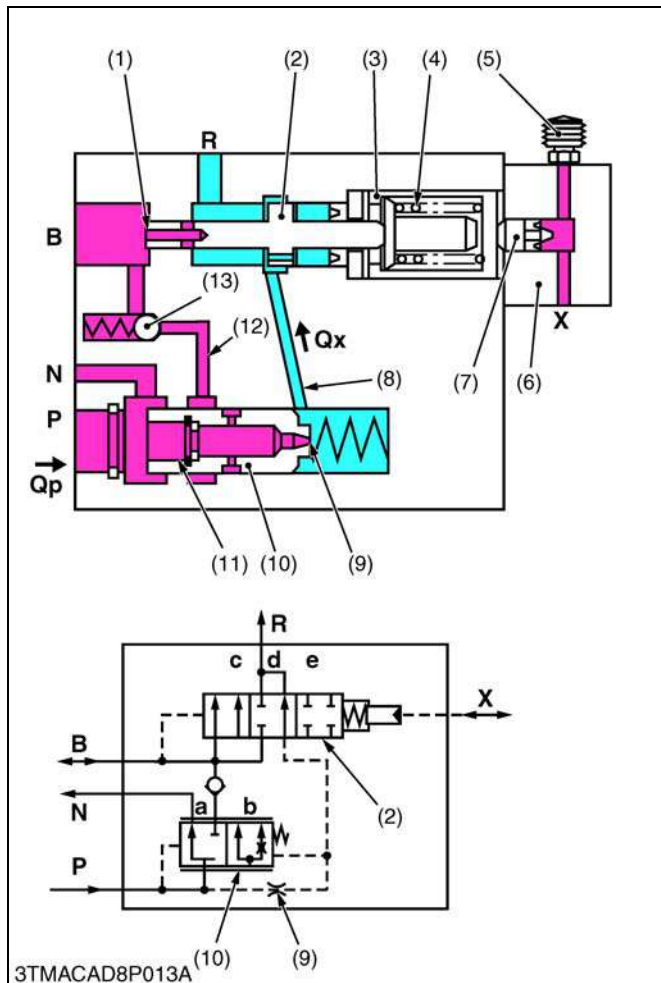
The restrictor (11) is designed for the constant flow **Q_k**. A residual flow **Q_p-Q_k** bypasses the flow control valve (10), and then passes to the tractor hydraulic through port **N**.

The pressure in the trailer brake line **B** is built up and it acts on surface (1) of control spool (2) in opposition to the pressure on piston (7).

- (1) Piston Surface
- (2) Control Spool
- (3) Pressure Relief Element
- (4) Spring
- (5) Bleed Valve
- (6) Control Head
- (7) Piston
- (8) Bore
- (9) Throttle
- (10) Flow Control Valve
- (11) Restrictor
- (12) Bore
- (13) Check Valve

- P** : Port for 3P Hydraulic Pump
- N** : Port for 3P Control Valve
- B** : Port for Trailer Brake
- R** : Port for Reservoir (Transmission Case)
- X** : Port for Tractor Service Brake
- Q_k** : Brake Oil Flow
- Q_p** : Delivery Flow

W1016704



■ Partial Braking of Trailer Brake

The trailer braking pressure P_b (acting on surface (1) of control spool (2)) is in equilibrium with the tractor braking pressure P_x (acting on piston (7)).

The brake line **B** remains separated from the reservoir and the oil in the trailer brake is thus enclosed.

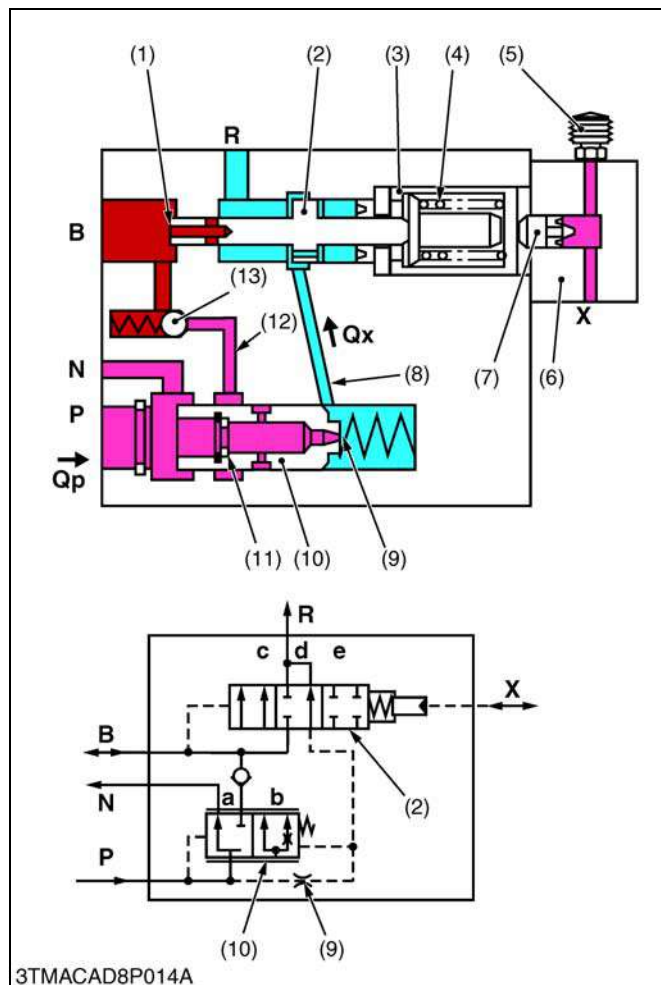
Control spool (2) is shifted to the right after the pressures have equalized and opens bore (8) to the reservoir through port **R**. Control spool (2) is in position **d**. Flow control valve (10) is thus switched into position **a** and has no regulating function.

As in the case of the released trailer brake, the delivery flow Q_p from the pump passes through port **N** and flows as $Q_p - Q_x$ to the tractor hydraulic system. A control flow Q_x passes to the reservoir through control spool (2).

- (1) Piston Surface
- (2) Control Spool
- (3) Pressure Relief Element
- (4) Spring
- (5) Bleed Valve
- (6) Control Head
- (7) Piston
- (8) Bore
- (9) Throttle
- (10) Flow Control Valve
- (11) Restrictor
- (12) Bore
- (13) Check Valve

- P** : Port for 3P Hydraulic Pump
- N** : Port for 3P Control Valve
- B** : Port for Trailer Brake
- R** : Port for Reservoir (Transmission Case)
- X** : Port for Tractor Service Brake
- Q_p : Delivery Flow
- Q_x : Control Flow

W1016925



■ Maximum Braking of Trailer Brake - Braking Pressure Limited

Flow control valve (10) and control spool (2) have the same spool positions (**a** and **d**) as in the case of partial braking.

The fluid flows **Q_p** and **Q_x** pass as with partial braking.

The maximum permissible trailer braking pressure **P_b** (e.g. 150 bar) has been reached. An even further increase of the trailer braking pressure is prevented, even if the tractor braking pressure rises further. The pressure relief element (3) is now shifted to the left. The springs (4), which are pre-loaded to the maximum permissible trailer braking pressure **P_b** , are compressed.

If the trailer braking pressure **P_b** also rises, e.g. owing to external factor, control spool (2) momentarily opens brake line **B** to the reservoir and avoids further increasing of the braking pressure.

In all control positions of the trailer brake valve, the tractor hydraulics can be used and pressurized as desired through port **N**. This does not have any important effect on the trailer brake. The trailer brake has precedence over the tractor hydraulics. The maximum pressure of the tractor hydraulics may be higher than the maximum trailer braking pressure.

- (1) Piston Surface
- (2) Control Spool
- (3) Pressure Relief Element
- (4) Spring
- (5) Bleed Valve
- (6) Control Head
- (7) Piston
- (8) Bore
- (9) Throttle
- (10) Flow Control Valve
- (11) Restrictor
- (12) Bore
- (13) Check Valve

- P** : Port for 3P Hydraulic Pump
- N** : Port for 3P Control Valve
- B** : Port for Trailer Brake
- R** : Port for Reservoir
(Transmission Case)
- X** : Port for Tractor Service
Brake
- Q_p** : Delivery Flow
- Q_x** : Control Flow

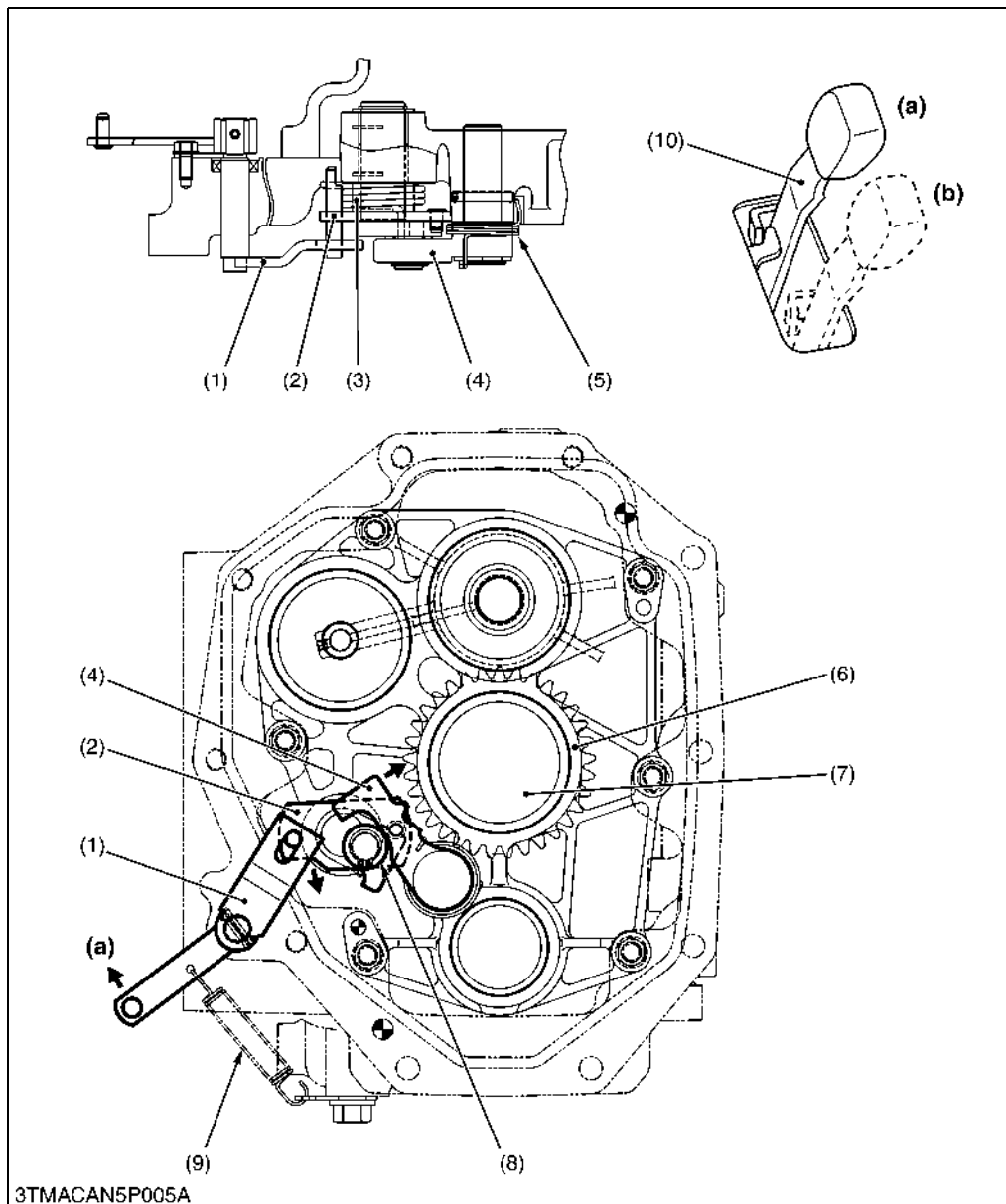
W1017159

2. PARKING BRAKE

- There are two systems for parking brake, one is the gear lock brake system and the other one is parking brake system. They are independent of the travelling brake system each other.
- While the machine is parked with the engine off, the hydraulic 4WD clutch is kept disengaged. But the clutch disc is held pressed by the spring, which means that the 4WD mechanism is still on. When the parking brake is applied, therefore, all the four wheels are put on brakes to provide for greater braking effect. (Refer to the "5. POWER TRAIN FOR 4WD" at "3. TRANSMISSION" section.)

[1] GEAR LOCK BRAKE

(1) Structure



- (1) Parking Lever
- (2) Parking Lever Cam
- (3) Spring
- (4) Parking Brake Gear Lever
- (5) Spring
- (6) Parking Brake Gear
- (7) Counter Shaft
- (8) Parking Collar
- (9) Spring
- (10) Parking Brake lever

(a) ON Position
(b) OFF Position

W1013735

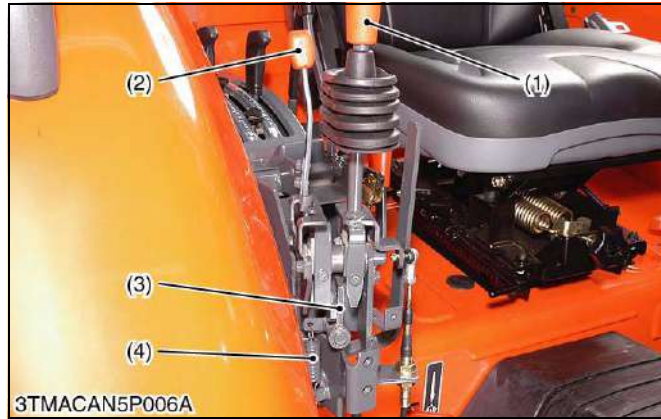
The parking brake is gear lock type.

Parking brake lever (10) and parking lever (1) are connected with cable. When the parking brake lever (10) is in "ON" position (a), the parking lever (1) pushes down the parking lever cam (2).

The parking collar pushes the parking brake gear lever (4) to engage and lock the parking brake gear (6) on the counter shaft (7).

When the parking brake lever (10) is in "OFF" position (b), parking brake gear lever (4), parking lever cam (2) and parking lever (1) are returned by return springs (3), (5) and (9).

(2) Restriction Device (Gear Lock Brake Lever and Main Gear Shift Lever)



When the gear lock brake is on, the main shift lever (1) cannot shift any speed range.

When the main shift lever (1) is shifted, the operator cannot operate the gear lock brake lever (2).

(a) At Gear Lock Brake "OFF"

The restriction lever (3) does not interfere for main shift lever (1). The main shift lever (1) can operate for selecting direction (d) and shifting direction (c).

(b) At Gear Lock Brake "ON"

The restriction lever (3) moves into the main shift lever (1) by gear lock brake lever (2) motion.

So that the main shift lever (1) can move the selecting direction (d), but it can not move to shifting direction (c).



- (1) Main Shift Lever
- (2) Gear Lock Brake Lever
- (3) Restriction Lever
- (4) Return Spring

(a) At Gear Lock Brake "OFF"

(b) At Gear Lock Brake "ON"

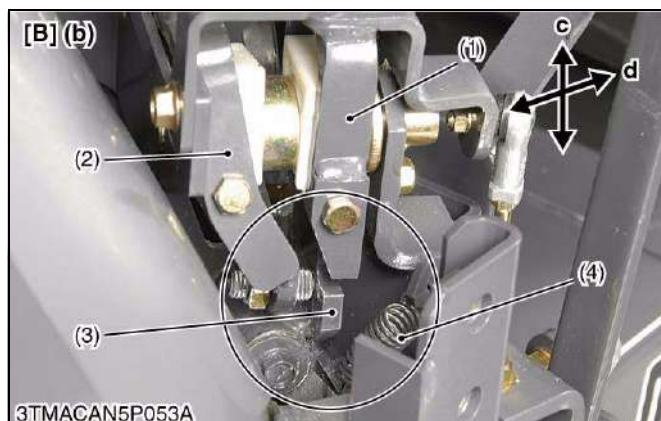
c : Shifting Direction

d : Selecting Direction

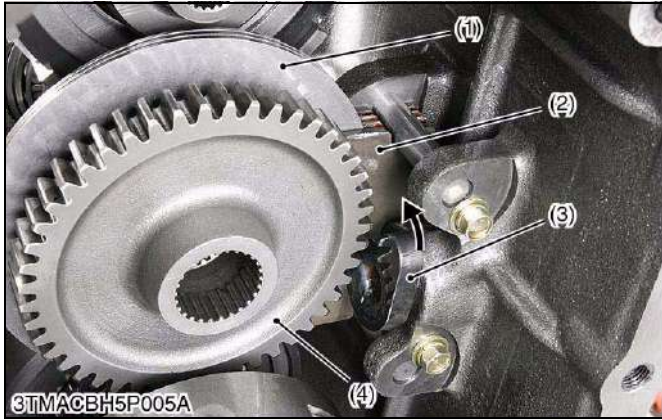
[A] ROPS Model

[B] CABIN Model

W1013011



[2] PARKING BRAKE

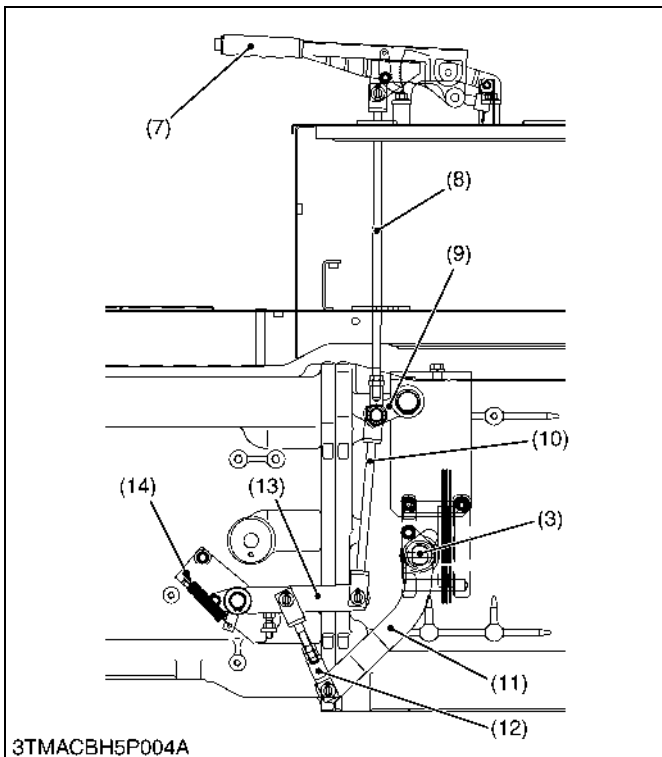
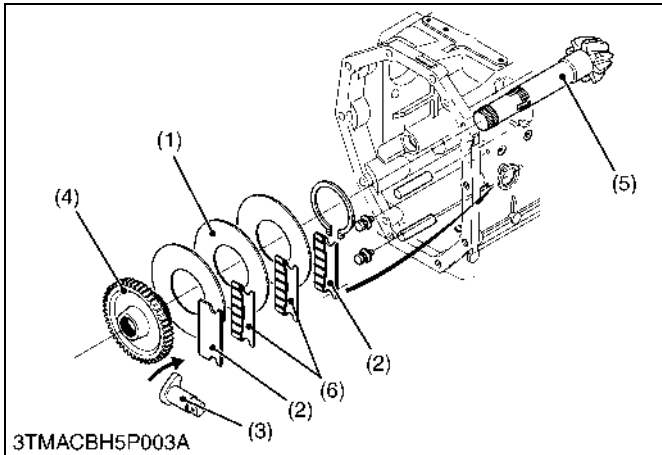


Parking brakes are a wet disc brake, which is independent of the travelling brakes and provided on the bevel gear shaft (5). When the parking brake lever is pulled, the parking brake cam (3) is moved in the direction of arrow through the parking brake linkage.

As the parking brake cam (3) moves, the steel plate (1) are pressed by the brake pads (2) and (6), causing frictional force. This frictional force provides braking effect.

(1) Steel Plate	(8) Upper Parking Brake Rod
(2) Brake Pad 1	(9) Upper Lever
(3) Parking Brake Cam	(10) Lower Parking Brake Rod
(4) 47T Gear	(11) Parking Brake Cam Lever
(5) 8T Bevel Gear	(12) Brake Cam Rod
(6) Brake Pad 2	(13) Lower Lever
(7) Parking Brake Lever	(14) Return Spring

W1013031



SERVICING

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(1) Brake Pedal	5-S22
(2) Travelling Brake	5-S22
(3) Parking Brake	5-S23

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Poor Braking Force	Brake pedal free travel excessive	Adjust	5-S4
	Brake disc worn	Replace	5-S18, 22
	Brake piston warped	Replace	5-S17, 22
	Brake oil leakage from brake pipes, bleeder, master cylinder or equalizer	Repair or replace	–
	Master cylinder or equalizer malfunctioning	Repair or replace	5-S16
Uneven Braking Force	Brake pedal free travel improper adjusted	Adjust	5-S4
	Brake disc worn	Replace	5-S18, 22
	Brake piston warped	Replace	5-S17, 22
	Brake oil leakage from brake pipes, bleeder, master cylinder or equalizer	Repair or replace	–
	Master cylinder or equalizer malfunctioning	Repair or replace	5-S16
Brake Drags	Brake pedal free travel too small	Adjust	5-S4
	Master cylinder return spring weaken or broken	Replace	5-S16
	Master cylinder malfunctioning	Repair or replace	5-S16
	Brake seal failure	Replace	5-S17
	Brake lines clogged	Clean	–
	Brake pedal return spring weaken or broken	Replace	5-S16
Spongy Brake Pedal	Air in brake system	Bleed air	5-S6
Brake Oil Consumed Excessively	Brake seal failure	Replace	5-S17
	Brake oil leakage in brake lines	Repair or replace	–
Poor Parking Brake Force	Parking brake lever free play excessive	Adjust	5-S11
Parking Brake Drags	Parking brake lever free play too small	Adjust	5-S11

W1014322

2. SERVICING SPECIFICATIONS

TRAVELING BRAKE

Item		Factory Specification	Allowable Limit
Brake Pedal R.H.	Free Travel	5.0 to 10 mm 0.20 to 0.39 in.	—
Brake Pedal L.H.	Free Travel	Free travel of brake pedal R.H. plus 5.0 to 10 mm 0.20 to 0.39 in.	—
Brake Pedal (Both)	Stroke	100 mm 3.9 in.	—
Equalizer Working Level	Level Difference between Both Pedals	Over 5 mm 0.2 in.	—
Parking Brake Lever to Guide Plate	Clearance	0.5 to 1.0 mm 0.020 to 0.039 in.	—
Brake Pedal Bushing to Pedal Shaft	Clearance	0.03 to 0.246 mm 0.012 to 0.0097 in.	0.5 mm 0.0197 in.
Brake Pedal Bushing	I.D.	25.030 to 25.146 mm 0.9854 to 0.9900 in.	—
Pedal Shaft	O.D.	24.9 to 25.0 mm 0.9803 to 0.9843 in.	—
Brake Piston	Flatness	—	0.3 mm 0.012 in.
Brake Disc	Thickness	4.15 to 4.35 mm 0.1634 to 0.1713 in.	3.3 mm 0.130 in.
Brake Plate	Thickness	2.1 to 2.5 mm 0.0827 to 0.0984 in.	1.5 mm 0.059 in.

W1013874

GEAR LOCK BRAKE

Gear Lock Brake Lever to Guide Plate	Clearance	0.5 to 1.0 mm 0.020 to 0.039 in.	—
Gear Lock Brake Lever	Free Play	Approx. 17.0 mm 0.669 in.	—
Restriction Lever to Gear Lock Brake Lever (CABIN Model)	Length	21.0 mm 0.83 in.	—

W1011887

PARKING BRAKE

Brake Rod 1	Thickness	5.00 to 5.20 mm 0.197 to 0.204 in.	4.7 mm 0.18 in.
Brake Rod 2	Thickness	2.70 to 2.90 mm 0.107 to 0.114 in.	2.4 mm 0.094 in.
Steel Plate	Thickness	1.55 to 1.65 mm 0.0611 to 0.0649 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 "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

Item	N·m	kgf·m	lbf·ft
Brake pipe retaining nut	16.0 to 24.0	1.6 to 2.5	11.8 to 17.7
Master cylinder pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Master cylinder hose and return hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Plug	98.1 to 118	10.0 to 12.0	72.3 to 86.8

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

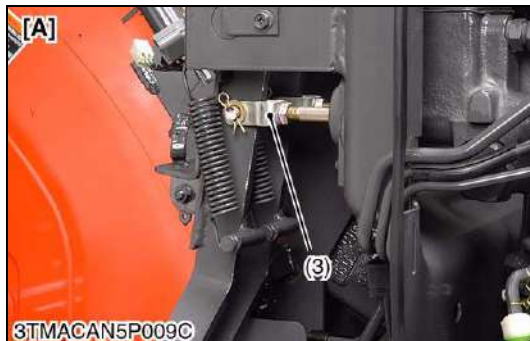
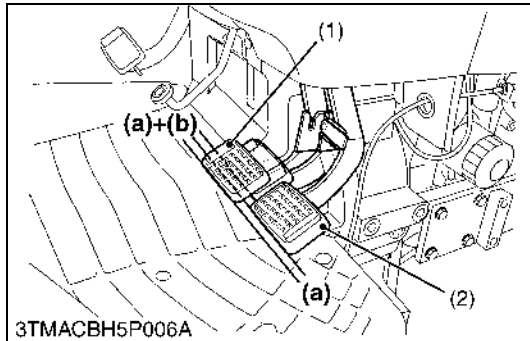
[1] CHECKING AND ADJUSTING



CAUTION

- When checking, park the tractor on flat ground, and stop the engine.

(1) Traveling Brake



Adjusting Brake Pedal

1) Brake Pedal Free Travel

- Set the parking brake.
- Slightly depress the brake pedals and measure free travel at the top of pedal stroke.
- If the measurement is not within the factory specifications, adjust the free travel by the push rod (2).
- After adjustment, tighten the lock nut firmly.

■ IMPORTANT

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

Right brake pedal (a)	Factory spec.	5.0 to 10 mm 0.20 to 0.39 in.
Left brake pedal (a) + (b)	Factory spec.	Right brake pedal free travel (a) + 5.0 to 10 mm (0.20 to 0.39 in.)

■ NOTE

- Step on the right brake, and the trailer hydraulic brake allows some pilot oil to flow. This means that the free travel is different between the left and right brakes.

- (1) Brake Pedal (L.H.)
(1) Brake Pedal (R.H.)
(3) Push Rod

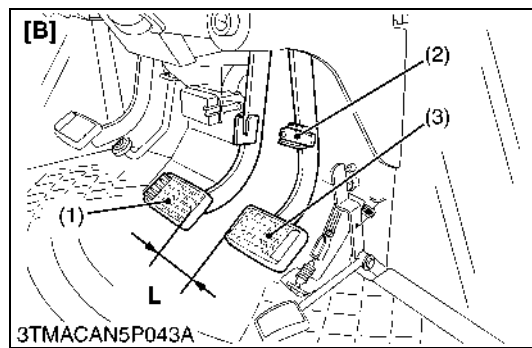
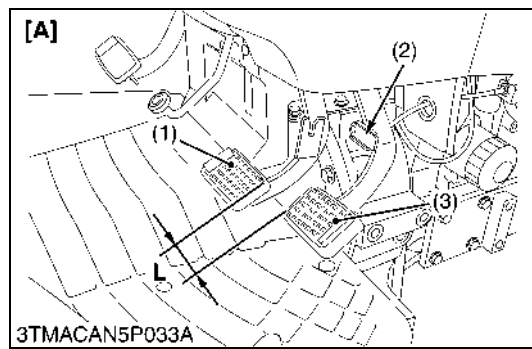
[A] ROPS Model

[B] CABIN Model

(a) Free Travel for Brake Pedal
R.H.

(a)+(b) Free Travel for Brake Pedal
L.H.

W1010629



2) Brake Pedal Stroke

1. Disengage the brake pedal lock (2).
2. Depress the brake pedal several time.
3. Step on either side brake pedal and measure the level difference (pedal stroke) between right and left pedals.
4. Do the same for the other side.
5. If the pedal stroke (**L**) exceeds the factory specification, check the air bleeding, master cylinder, equalizer or brake case.

Brake pedal stroke (L) (each pedal)	Factory spec.	100 mm 3.9 in.

- (1) Brake Pedal L.H.
(2) Brake Pedal Lock
(3) Brake Pedal R.H.

L : Pedal Stroke
[A] ROPS Model
[B] CABIN Model

W1010823

3) Equalizer Working Level (Anti-imbalance device)

1. Gently step on both the right and left pedals at once.
2. Further step on the right pedal (the left pedal slightly rises itself) and measure the level difference between the pedals.
3. Do the same for left pedal.
4. If the measurement is not within the factory specification, check the equalizer (2).

Level difference between both pedals	Factory spec.	Over 5 mm 0.2 in.

(1) Master Cylinder

(2) Equalizer

W1011041

Brake Test

1. Remove the bleeder (1) from brake case and set the hydraulic brake adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section), joint (Code No. 07916-50401), cable (Code No. 07916-50331) and pressure gauge (Code No. 07916-52961).
2. Set the pedal fixing plate between the pedal and pedal stopper after depressing the brake pedal to reach the pressure between 2.94 to 3.24 MPa (30 to 33 kgf/cm², 426.7 to 469.4 psi).
3. Read the pressure **P** after one minute.
4. After reading the pressure **P**, wait another five minutes to read the pressure **P'** and check the pressure drop. The pressure drop should be within **P** x 0.1 MPa (**P** x 0.1 kgf/cm², **P** x 0.1 psi).
5. If the pressure drop is too big, attach the pressure gauge to equalizer (brake pipe rear end) and master cylinder (brake pipe front end) to find out the problem area.



CAUTION

- If the air is in the master cylinder, brake pipe and case bleed the air completely.

(1) Bleeder

W1011229



Bleeding Brake System

■ IMPORTANT

- The shuttle lever and main change lever are shift in "NEUTRAL" position.
- Set the parking brake lever to "ON" position.
- Fill the transmission fluid to the equalizer and master cylinder when overhaul the master cylinder assembly.



CAUTION

- Take care to hot part such a muffler and rotating part of engine during air bleeding procedure.

■ NOTE

- While bleeding, run the engine at low speed to keep enough oil in the master cylinder assembly.
- Connect the vinyl pipe (2) of R.H. side to the air bleeder (4) at trailer brake valve (3).

1. Disconnect the brake pipes (1) from the master cylinder.
2. Move the brake pedal up and down by hand. At this time, when raising the pedal, close the master cylinder outlet by a finger, and when lowering, release the finger.
Repeat this operation several times. (Prepare the oil can.)
3. After bleeding the master cylinder, install the front brake pipes.
4. After installing the vinyl pipe (2) to the bleeder loosen the bleeder two turns.
5. Move the brake pedal up and down.
Repeat this motion until air bubble in brake oil disappears.
After bleeding, tighten the bleeders firmly.

Tightening torque	Brake pipe retaining nut	16.0 to 24.0 N·m 1.6 to 2.5 kgf·m 11.8 to 17.7 lbf·ft

(Reference : Importance of Bleeding)

- If the air mixes in the brake hydraulic circuit, poor or no braking force is obtained due to compress the air even when the brake pedal is pressed.

Accordingly whenever the hydraulic brake system is disassembled, be sure to bleed after reassembling.

- (1) Brake Pipe
(2) Vinyl Pipe

- (3) Trailer Brake Valve
(4) Air Bleeder

W1011456

(2) Trailer Brake Valve



Checking Brake Pressure

1. Remove the trailer brake coupler, and set the trailer brake adaptor (3), joint (Code No. 07616-50401), cable (Code No. 07916-50331) and pressure gauge (1) (Code No. 07916-50321).
2. Interlock the left and right pedals.
3. Start the engine and fully depress the brake pedal to measure the braking pressure.
4. If the measurement is not within the factory specifications, check the pilot pipe (4) and braking system.

(Reference)

Braking pressure	Reference value	9.8 to 12.7 MPa 100 to 130 kgf/cm ² 1422 to 1849 psi

Condition

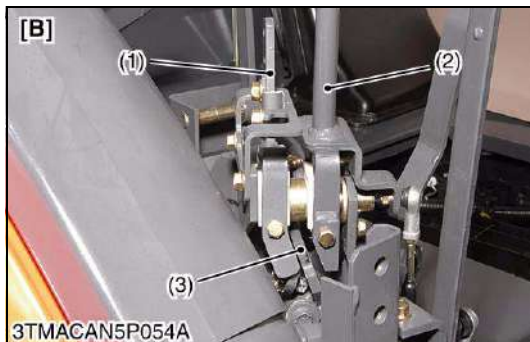
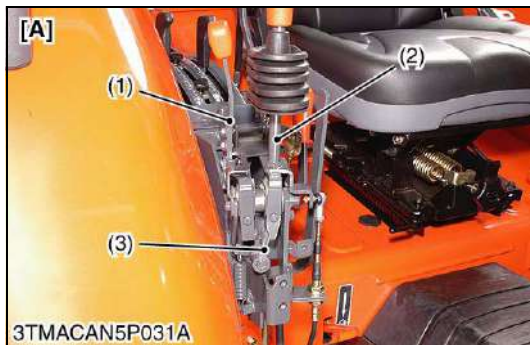
- Oil temperature 45 to 55 °C
113 to 131 °F

- (1) Pressure Gauge
(2) Cable

- (3) Trailer Brake Adaptor
(4) Pilot Pipe

W1018536

(3) Gear Lock Brake



Checking Gear Lock Brake Restriction System

1. When the gear lock brake lever (1) at “PARKING” position, main change lever (2) does not shift to 1st-2nd and 3rd-4th direction.
2. Check the gear lock brake lever (1) does not shift to “PARKING” position when main shift lever (2) has shifted at any speed position.
3. If the restriction system does not work, adjust the gear lock brake lever following “Adjusting Gear Lock Brake Lever” and “Adjusting Restriction Lever” section.

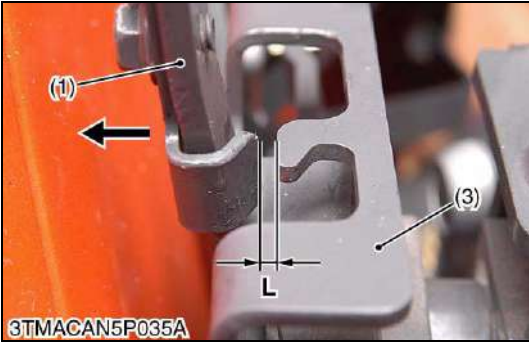
NOTE

- When parking brake lever at “PARKING” position, main change lever can move to selecting direction.

- (1) Gear Lock Brake Lever
(2) Main Change Lever
(3) Restriction Lever

- [A] ROPS Model
[B] CABIN Model

W1012602



Adjusting Gear Lock Brake Lever (ROPS Model)

- 1. Check the clearance (L) between gear lock brake lever (1) and guide plate (3) when gear lock brake lever (1) pushed to outside.
- 2. If the clearance (L) is not within the factory specification, adjust with adjusting screw (2).

(When reassembling)

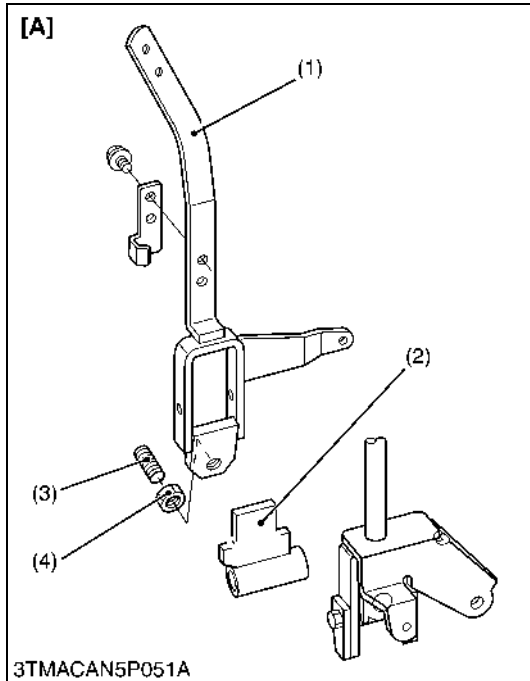
- Be sure to tighten the lock nut.

Clearance between gear lock brake lever and guide plate (L)	Factory spec.	0.5 to 1.0 mm 0.020 to 0.039 in.

- (1) Gear Lock Brake Lever
- (2) Adjusting Screw
- (3) Guide Plate

L : Clearance

W1016030



Adjusting Restriction Lever

1. Check the restriction lever (2) when gear lock brake lever (1) at "OFF" position as follows.

[ROPS Model]

- The restriction lever (2) is positioned in vertically when gear lock brake lever (1) at "OFF" position.

[CABIN Model]

- Check the length (L) between the restriction lever (2) and gear lock brake lever (1) when gear lock brake lever (1) push to outside.
2. If the length (L) is not with factory specification, adjust with set screw (3).

(When reassembling)

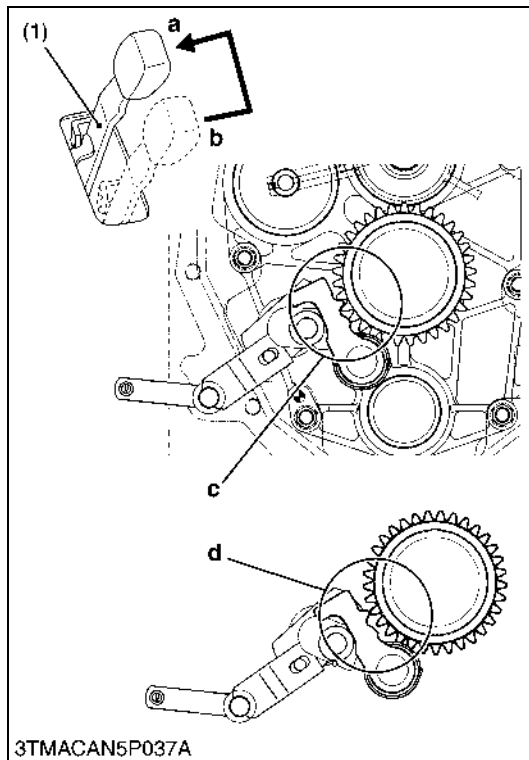
- Be sure to tighten the lock nut (4).

Restriction lever position (ROPS model)	Factory spec.	Positioned in vertical
Length between restriction lever and gear lock brake lever (L) (CABIN model)	Factory spec.	21.0 mm 0.83 in.

- (1) Gear Lock Brake Lever
(2) Restriction Lever
(3) Set Screw
(4) Lock Nut

[A] ROPS Model
[B] CABIN Model
L : Length

W1028509



Parking Position

1. Unhook the spring (4).
2. Set the gear lock brake lever (1) to “**PARKING**” position (a).
3. Shake the tractor for forward and reverse to confirm the gear lock brake gears mesh with each other completely as shown in the figure (c).
4. Return the parking brake lever (1) to “**TRAVELING**” position (b).
5. Slowly operate the gear lock brake lever (1) to “**PARKING**” position (a) and check the point for end of the free play.

NOTE

- If the gear lock brake gears not mesh with each other (d), the free play to be smaller than factory specification.
- 6. If the point for end of free play is not inline, adjust the gear lock brake cable (2) retaining position with retaining nuts (3) so that the alignment point (g) on the guide plate (5) to be inline as shown photo.

(When reassembling)

- Be sure to tighten the retaining nuts (3).
- Hook the spring (4) to original position.

IMPORTANT

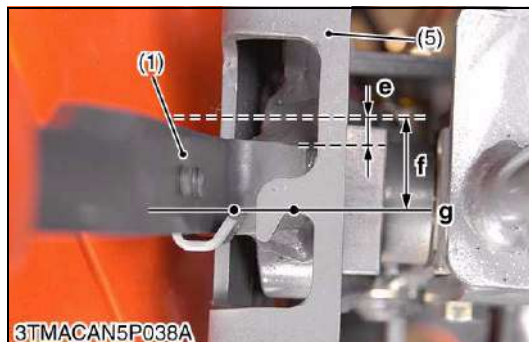
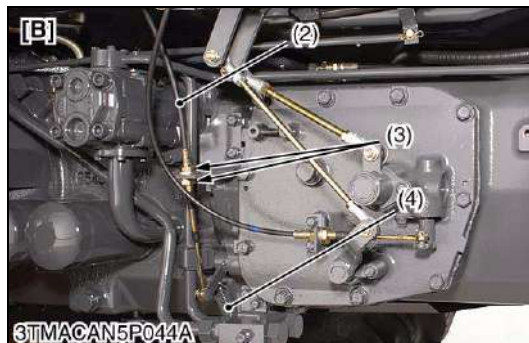
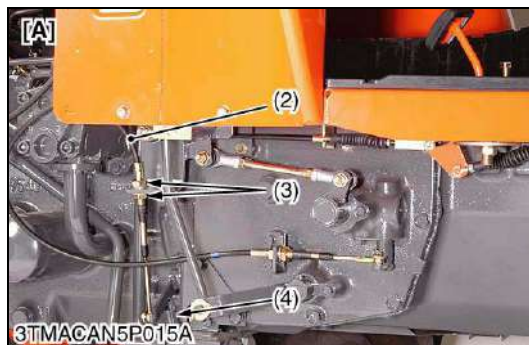
- Check the gear lock brake lever motion and gear lock brake performance securely.

Free play (f)	Factory spec.	Approx. 17.0 mm 0.669 in.
Free play (e)	Reference value	Approx. 2.0 mm 0.078 in.

- (1) Gear Lock Brake Lever
(2) Gear Lock Brake Cable
(3) Retaining Nut
(4) Spring
(5) Guide Plate

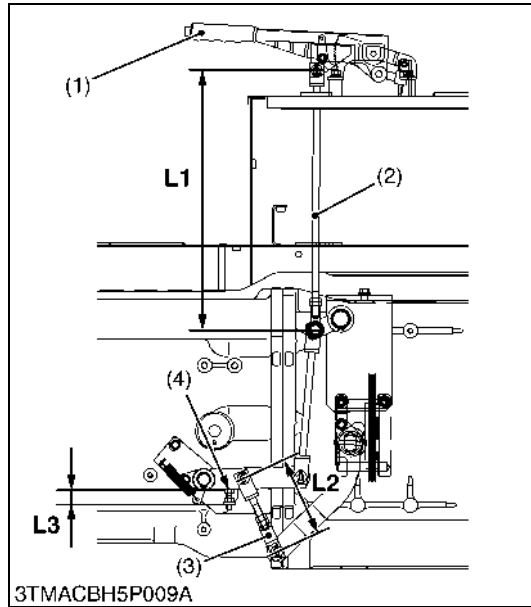
- a : “**PARKING**” Position
b : “**TRAVELING**” Position
c : Gears Mesh with Each Other
d : Gears Not Mesh with Each Other
e : Free Play (Gears Not Meshed)
f : Free Play (Gears Meshed)
g : Alignment Point

- [A] ROPS Model
[B] CABIN Model



W1012673

(4) Parking Brake



Adjusting Parking Brake

1. Check the length (L1) of upper parking brake rod (2).
2. Check the length (L2) of brake cam rod (3).
3. Check the height (L3) of stopper screw (4).
4. If the measurement is not within the factory specifications adjust them.
5. Check the parking brake lever (1) free stroke, if the measurement is not within the factory specification, adjust the length of brake cam rod (3).

Parking brake lever free stroke	Factory spec.	2 notches
Length of upper parking brake rod (L1)	Factory spec.	175 mm 6.89 in.
Length of brake cam rod (3)	Factory spec.	120 mm 4.72 in.
Height of stopper screw (L3)	Factory spec.	18 mm 0.71 in.

NOTE

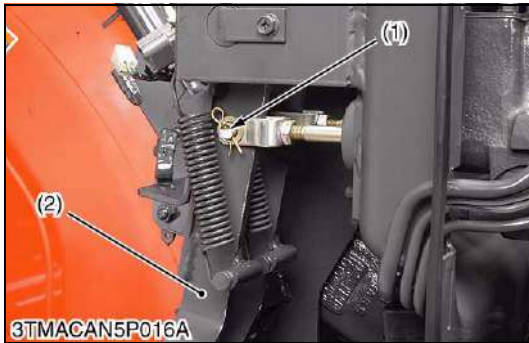
- The ROPS mode and cabin mode are same measurement.

(1) Parking Brake Lever	(3) Brake Cam Rod
(2) Upper Parking Brake Rod	(4) Stopper Screw

W1014103

[2] DISASSEMBLING AND ASSEMBLING

(1) Removing Master Cylinder (ROPS Model)



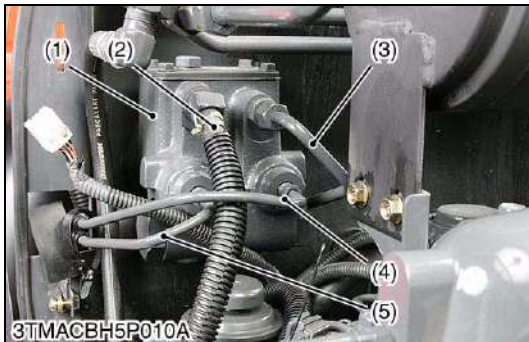
Master Cylinder Rod

1. Remove the panel cover refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section.
2. Remove the master cylinder rod pin (1) from brake pedal (2).

(1) Pin

(2) Brake Pedal

W1012928



Brake Pipes and Master Cylinder Pipes

1. Remove the master cylinder pipe (3) and master cylinder return pipe (2) from the master cylinder assembly (1).
2. Remove the brake pipe L.H. (5) and R.H. (4).

Tightening torque	Brake pipe retaining nut	16.0 to 24.0 N·m 1.6 to 2.5 kgf·m 11.8 to 17.7 lbf·ft
	Master cylinder pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

(1) Master Cylinder Assembly

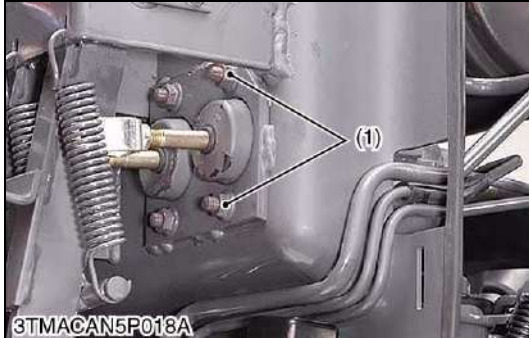
(4) Brake Pipe R.H.

(2) Master Cylinder Return Hose

(5) Brake Pipe L.H.

(3) Master Cylinder Pipe

W1013011



Master Cylinder

1. Remove the master cylinder mounting nuts (1).
2. Remove the master cylinder assembly.

(When reassembling)

- After mounting the master cylinder assembly, be sure to bleed air. (Refer to "(1) Traveling Brake" in this section.)

(1) Cylinder Mounting Nut

W1013165

(2) Removing Master Cylinder (CABIN Model)



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connector (2) for head lights.
3. Disconnect the dampers (3).
4. Remove the bonnet (1).

(When reassembling)

- The connector (2) should be placed within the space of controller pipe (6), power steering controller (4) and stay (5).

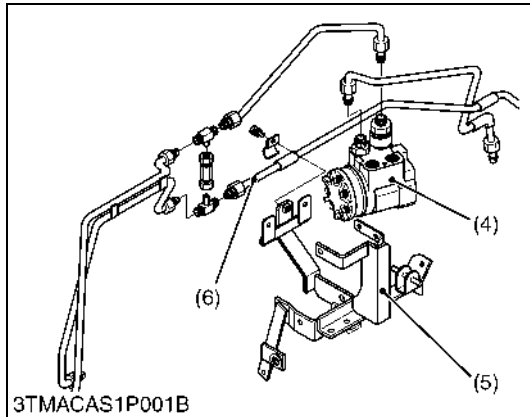
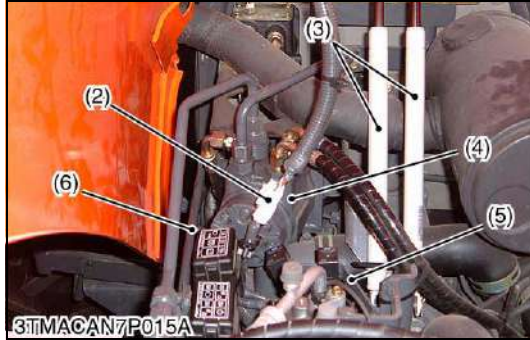
■ **IMPORTANT**

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

- (1) Bonnet
(2) Connector
(3) Damper

- (4) Power Steering Controller
(5) Stay
(6) Controller Pipe

W1022962



Muffler Pipe

1. Remove the muffler pipe (1).

- (1) Muffler Pipe

W1023136



Panel Cover and Panel Under Cover

1. Remove the panel cover (1) and disconnect the connectors from hazard switch (2) and display mode switch (3).
2. Remove the air outlet (4) then remove the panel under cover R.H. (5).
3. Disconnect the connector from main key switch (6).

(1) Panel Cover	(4) Air Outlet
(2) Hazard Switch	(5) Panel Under Cover R.H.
(3) Display Mode Switch	(6) Main Key Switch

W1025033





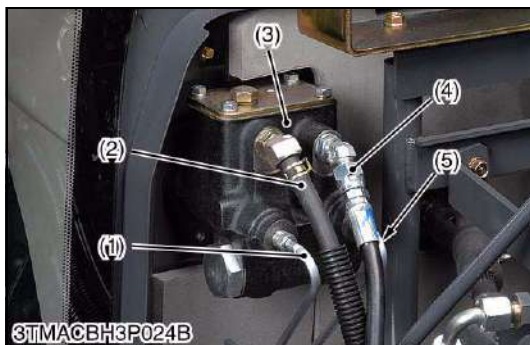
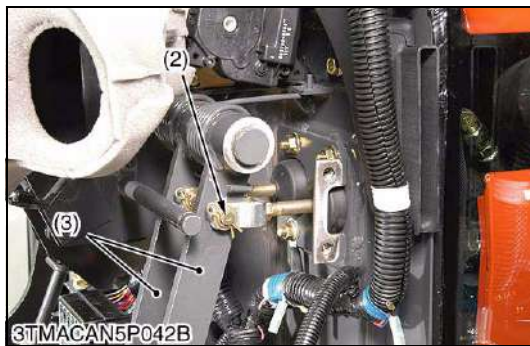
Master Cylinder Rod

1. Remove the pedal shaft support (1)
2. Remove the master cylinder rod pins (2) from brake pedals (3).

(1) Pedal Shaft Support
(2) Pin

(3) Brake Pedal

W1023783



Brake Pipes and Master Cylinder Hoses

1. Remove the master cylinder hose (4) and cylinder return hose (2) from the master cylinder assembly (3).
2. Remove the brake pipe R.H. (1) and L.H. (5).

Tightening torque	Brake pipe retaining nut	16.0 to 24.0 N·m 1.6 to 2.5 kgf·m 11.8 to 17.7 lbf·ft
	Master cylinder hose and return hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft

(1) Brake Pipe R.H.

(4) Master Cylinder Hose

(2) Master Cylinder Return Hose

(5) Brake Pipe L.H.

(3) Master Cylinder Assembly

W1023917



Master Cylinder

1. Remove the master cylinder mounting nuts (1).
2. Remove the master cylinder assembly.

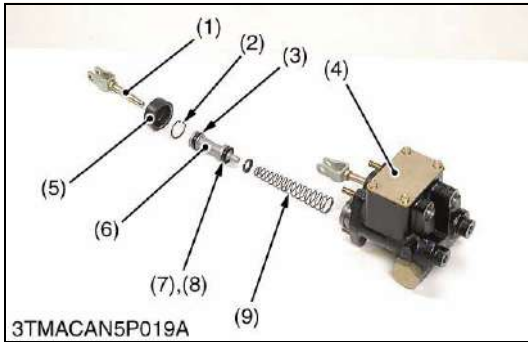
(When reassembling)

- After mounting the master cylinder assembly, be sure to bleed air. (Refer to "(1) Traveling Brake" in this section.)

(1) Cylinder Mounting Nut

W1023223

(3) Master Cylinder



Master Cylinder

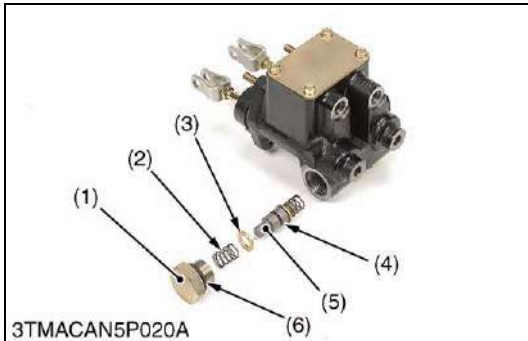
1. Drain the brake oil from the master cylinder assembly (4).
2. Remove the push rod (1) and boot (5) from the master cylinder.
3. Remove the internal circlip (2), and pull out the piston (6) and return spring (9).

(When reassembling)

- Install the outlet valve, noting its direction.
- Install the piston, taking care not to damage the cylinder cup lip.

(1) Push Rod	(6) Piston
(2) Internal Circlip	(7) Secondary Cylinder Cup
(3) Primary Cylinder Cup	(8) Spacer (Shim)
(4) Master Cylinder Assembly	(9) Return Spring
(5) Boot	

W1013276



Equalizer

1. Drain the brake oil from the equalizer.
2. Secure the equalizer in a vise, remove the both plug (1) to pull out the piston (5).

(When reassembling)

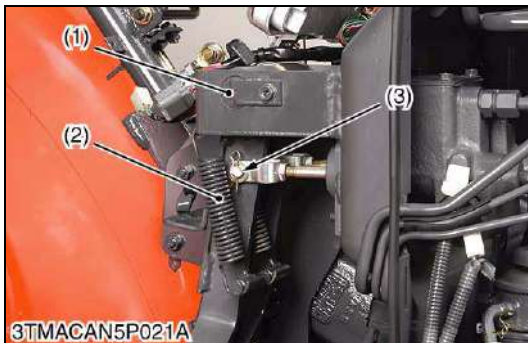
- Install the piston and plug, noting the O-ring.

Tightening torque	Plug	98.1 to 118 N·m 10.0 to 12.0 kgf·m 72.3 to 86.8 lbf·ft

(1) Plug	(4) O-ring
(2) Spring	(5) Piston
(3) Washer	(6) O-ring

W1013503

(4) Brake Pedal



Brake Pedal (ROPS Model)

1. Remove the panel cover refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section
2. Remove the springs (2) and master cylinder rod pin (3).
3. Remove the pedal shaft (1) mounting screw.
4. Draw out the pedal shaft (1) and brake pedal.

(When reassembling)

- Apply grease to the pedal shaft.

■ IMPORTANT

- After reassembling the brake pedal, be sure to adjust the brake pedal free travel.

(1) Pedal Shaft	(3) Rod Pin
(2) Spring	

W1013878



Brake Pedal (CABIN Model)

1. Remove the pedal shaft support (1).
2. Remove the master cylinder rod pins (3).
3. Unhook the springs (2).
4. Draw out the brake pedals (4).

(When reassembling)

- Apply grease to the pedal shaft.

■ IMPORTANT

- **After reassembling the brake pedal, be sure to adjust the brake pedal free travel.**

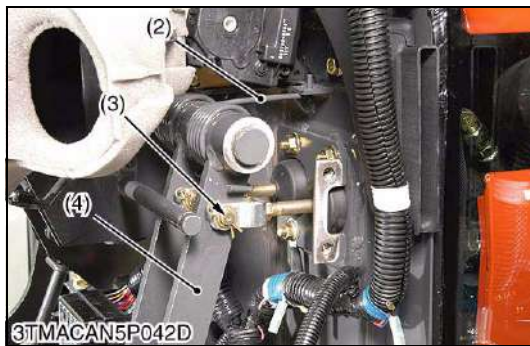
(1) Pedal Shaft Support

(3) Rod Pin

(2) Spring

(4) Brake Pedal

W1027387



(5) Brake Piston

- Separating rear axle case from transmission case, refer to "4. DISASSEMBLING AND ASSEMBLING" at "4. REAR AXLE" Section.



Brake Piston

1. Remove the bleeder.
2. Remove the brake piston with compressed air. (Slowly inject an air from bleeder hole (1).)

(When reassembling)

- Replace the brake seal 1 and 2 with new one.
- Install the brake seal so as not to twist.
- Take care not to enter the foreign matter into the seal groove of inside brake case.
- When installing the brake piston, apply silicon grease to the brake seals, and tap it in evenly and lightly using a soft hammer.

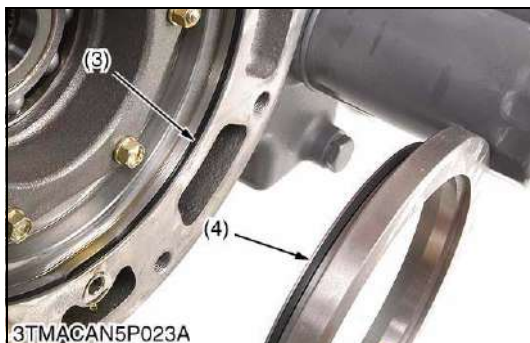
(1) Bleeder Hole

(3) Brake Seal 1

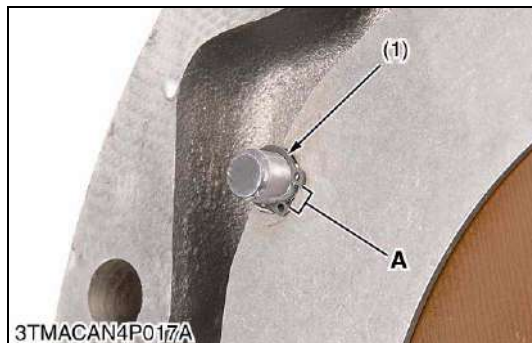
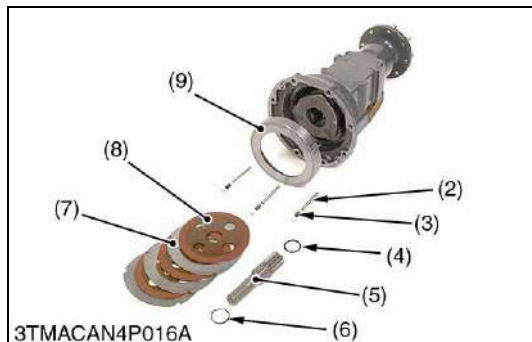
(2) Brake Piston

(4) Brake Seal 2

W1014050



(6) Brake Disc and Plate

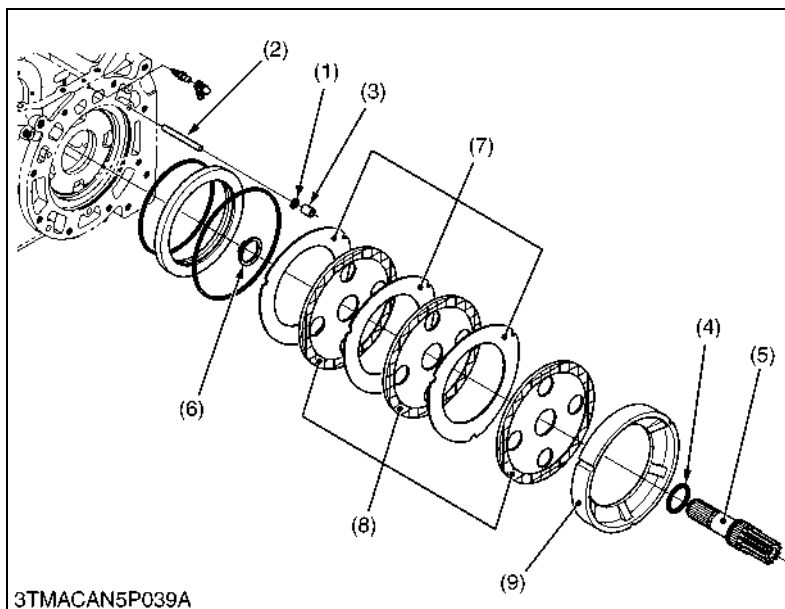


Brake Shaft, Brake Disc, Steel Plate and Brake Plate

1. Remove the external circlip (1).
2. Draw out the brake shaft (5) with brake disc (8) and steel plates (7).
3. Remove the external circlip (6).
4. Remove the brake plate (9), collar (3) and pin (2).

(When reassembling)

- Place the brake discs (8) so that the holes aligned to next holes.
- The pin (2) does not have groove for external circlip (1).
- Face the external circlip (1) gap to brake shaft.



- (1) External Circlip
- (2) Pin
- (3) Collar
- (4) O-ring
- (5) Brake Shaft
- (6) External Circlip

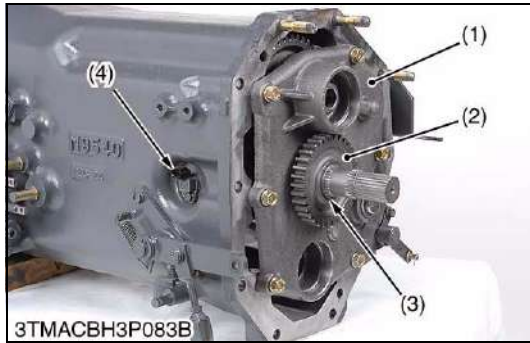
- (7) Steel Plate
- (8) Brake Disc
- (9) Brake Plate

A : Gap

W1018899

(7) Gear Lock Brake Gear

- Separating transmission case and clutch housing case, refer to “5. DISASSEMBLING AND ASSEMBLING” at “3. TRANSMISSION” section.



Bearing Holder and Speed Sensor

1. Remove the speed sensor (4).
2. Remove the external circlip (3) and 33T gear (2).
3. Remove the bearing holder mounting screws, and take out the bearing holder (1).
If the shaft comes out with bearing holder, tap in the shaft during take out the bearing holder (1).

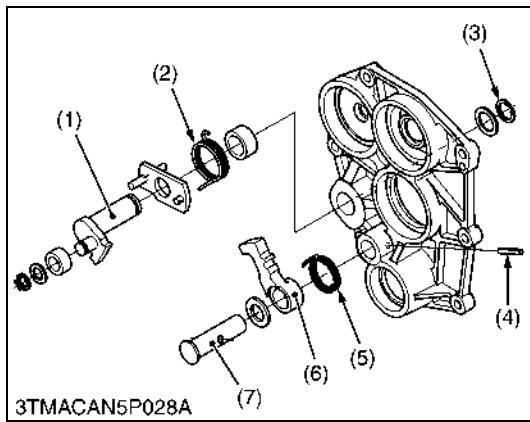
(When reassembling)

- Apply transmission fluid to the O-ring of speed sensor (4).
- Be sure to fix the gear lock brake arm (6) and gear lock cam lever (5).

- (1) Bearing Holder
(2) 33T Gear
(3) External Circlip

- (4) Speed Sensor
(5) Gear Lock Cam Lever
(6) Gear Lock Brake Arm

W1019332

**Gear Lock Gear**

1. Remove the external circlip (3) and draw out the gear lock cam shaft (1).
2. Remove the roll pin (4) and remove the gear lock gear pin (7) and gear lock gear (6).

(When reassembling)

- Be sure to hook the springs (2), (5) as shown photo.
- | | |
|--------------------------|---------------------------|
| (1) Gear Lock Cam Shaft | (5) Gear Lock Gear Spring |
| (2) Gear Lock Cam Spring | (6) Gear Lock Gear |
| (3) External Circlip | (7) Gear Lock Gear Pin |
| (4) Roll Pin | |

W1014851



(8) Parking Brake



Parking Brake Disc and Steel Plate

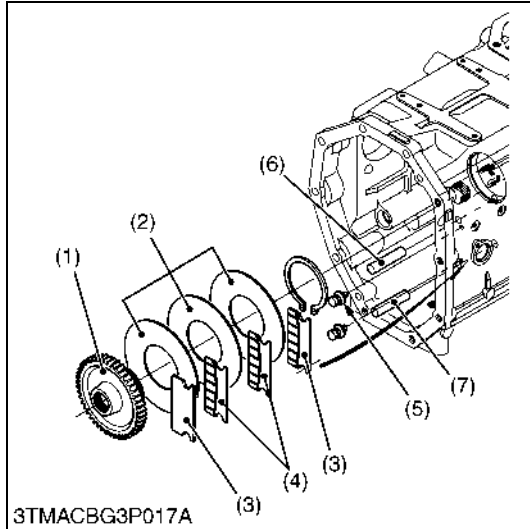
1. Remove the stopper screw (5) and upper pin (6).
2. Remove the disc (3) and (4).
3. Remove the 47T gear (1) with steel plates (2).

(When reassembling)

- Be sure to assemble the disc (3) and (4) to the original position as shown fig.

(1) 47T Gear	(5) Stopper Screw
(2) Steel Plate	(6) Upper Pin
(3) Disc (5.1 mm, 0.20 in.)	(7) Lower Pin
(4) Disc (2.8 mm, 0.11 in.)	

W1014172



[3] SERVICING

(1) Brake Pedal



Brake Pedal Bushing

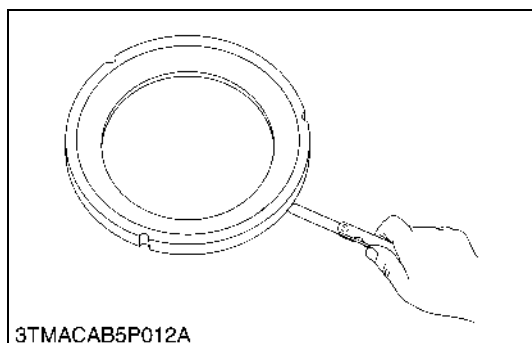
1. Measure the brake pedal bushing I.D. with inside micrometer.
2. Measure the pedal shaft O.D. with outside micrometer and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between brake pedal bushing and pedal shaft	Factory spec.	0.03 to 0.246 mm 0.0012 to 0.0097 in.
	Allowable limit	0.5 mm 0.0197 in.

Brake pedal bushing I.D.	Factory spec.	25.030 to 25.146 mm 0.9854 to 0.9900 in.
Pedal shaft O.D.	Factory spec.	24.9 to 25.0 mm 0.9803 to 0.9843 in.

W1014297

(2) Travelling Brake

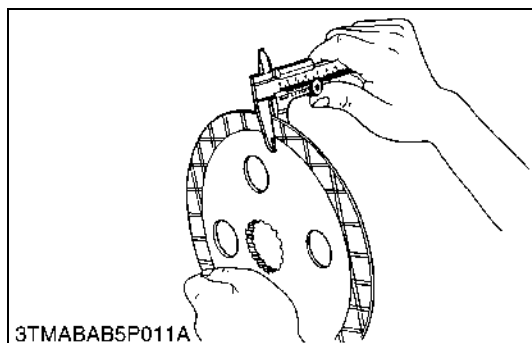


Brake Plate and Brake Piston Flatness

1. Place the brake plate / brake piston on the surface plate.
2. Measure the flatness of brake plate / brake piston 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.

W1018247



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 wear	Factory spec.	4.15 to 4.35 mm 0.1634 to 0.1713 in.
	Allowable limit	3.3 mm 0.130 in.

W1014578



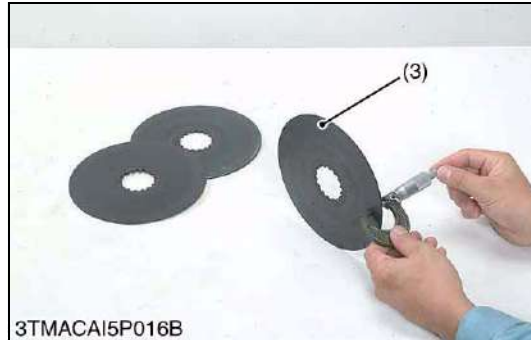
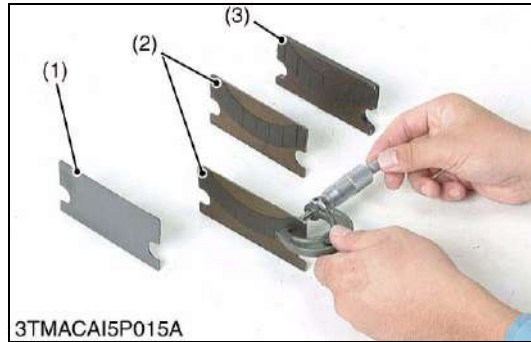
Brake Plate Wear

1. Measure the brake plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake plate wear	Factory spec.	2.1 to 2.5 mm 0.0827 to 0.0984 in.
	Allowable limit	1.5 mm 0.059 in.

W1014676

(3) Parking Brake



Parking Brake Pad and Steel Plate Wear

1. Measure the brake pad thickness with a vernier caliper.
2. Measure the steel plate thickness with a vernier caliper.
3. If the thickness is less than the allowable limit, replace it.

Brake pad thickness	Factory spec.	Pad 1	5.0 to 5.2 mm 0.197 to 0.204 in.
		Pad 2	4.7 mm 0.18 in.
	Allowable limit	Pad 1	2.70 to 2.90 mm 0.107 to 0.114 in.
		Pad 2	2.4 mm 0.094 in.

Friction plate thickness	Factory spec.	1.55 to 1.65 mm 0.0611 to 0.0649 in.

- (1) Brake Pad 1
(2) Brake Pad 2

- (3) Steel Plate

W1021315

6 FRONT AXLE

MECHANISM

CONTENTS

1. STRUCTURE	6-M1
[1] FRONT AXLE.....	6-M1
[2] LIMITED SLIP DIFFERENTIAL (LSD)	6-M2

1. STRUCTURE

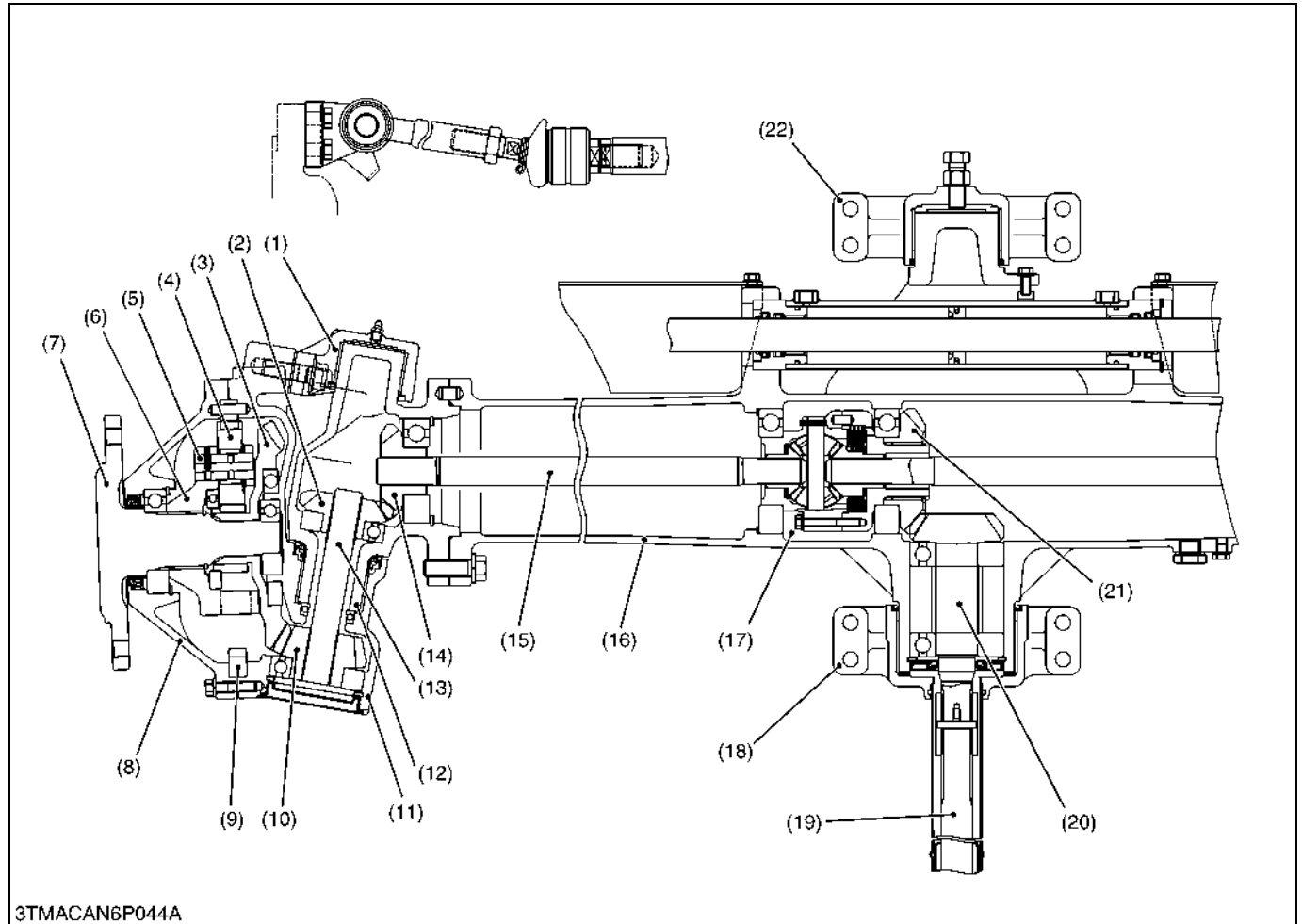
The front axle supports the front of tractor and facilitates steering.

The four-wheel drive axle has powered front wheels.

■ NOTE

- Refer to “6. FRONT AXLE” section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

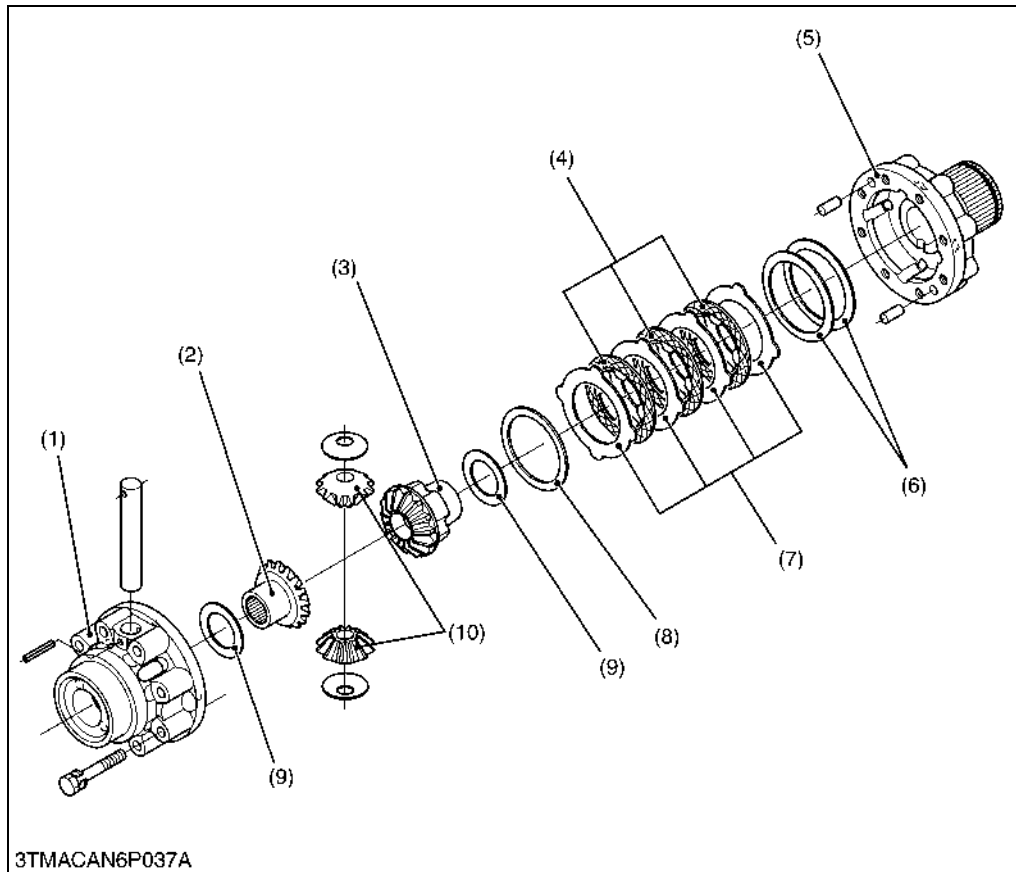
[1] FRONT AXLE



3TMACAN6P044A

(1) Front Axle Case Support	(7) Front Axle	(13) Bevel Gear Shaft	(18) Bracket (Rear)
(2) 18T Bevel Gear	(8) Front Axle Case Cover	(14) 17T Bevel Gear	(19) Propeller Shaft
(3) 41T Bevel Gear	(9) 62T Internal Gear	(15) Differential Yoke Shaft	(20) 17T Bevel Pinion Shaft
(4) 23T Planetary Gear	(10) 15T Bevel Gear	(16) Front Differential Case	(21) 23T Bevel Gear
(5) Planetary Gear Pin	(11) Front Axle Case	(17) Differential Gear Assembly (LSD)	(22) Bracket (Front)
(6) Planetary Gear Support	(12) Bevel Gear Case		

[2] LIMITED SLIP DIFFERENTIAL (LSD)



- (1) Differential Case
- (2) Side Gear
- (3) Side Gear (LSD)
- (4) Friction Disc
- (5) Case Cover
- (6) Belleville Washer (Cupped Spring Washer)
- (7) Steel Plate
- (8) Adjustment Shim (LSD)
- (9) Adjustment Shim (Side Gear)
- (10) Pinion Gear

W1013358

3TMACAN6P037A

In addition to conventional components, this differential gear system has friction discs (4) on one side of a side gear (LSD) (3), steel plates (7) on the differential gear case cover (5), belleville washer (cupped spring washer) (6), and an adjustment shim (LSD) (8).

The steel plates (7) and the friction discs (4) are coupled and pressed against each other with the belleville washer (cupped spring washer) (6), which assembles the side gear (LSD) (3) and the differential case (1) into one.

Therefore, this differential gear system is always differential lock condition under normal conditions.

When a tractor is driving straight ahead, the differential gear is in differential lock condition and the right and left wheels rotate at the same speed, allowing stable running in a straight line.

When the tractor takes a turn, the right and left wheels are forced to rotate in different speeds, and the difference in rotation makes the right and left side gears rotate in different speeds.

At this point, if a torque higher than a specified load level is applied the belleville washer (cupped spring washer) (6), the spring operates and the steel plate is released from the friction disc.

As a result, the right and left side gears rotate differently just as usual differential gear, allowing smooth cornering. A load specified on the spring is adjusted by changing thickness of the adjustment shim (LSD) (8).

SERVICING

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1. TROUBLESHOOTING	6-S1
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3. TIGHTENING TORQUES	6-S4
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(1) Separating Front Axle	6-S7
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[3] SERVICING	6-S14
(1) 4WD Model	6-S14

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Tire pressure uneven	Adjust	G-72
	Improper toe-in adjustment (improper alignment)	Adjust	6-S5
	Front axle bracket (front, rear) bushing excessive wear	Replace	6-S11, 19
	Front axle rocking force too small	Adjust	6-S6
	Front wheel sway excessive	Replace	6-S5
	Tie-rod end loose	Tighten	6-S8
	Aeration of the hydraulic fluid in power steering circuit	Bleed	–
Front Wheels Can Not Be Driven	Propeller shaft broken	Replace	6-S7
	Front wheel drive gears in transmission broken	Replace	–
	Front differential gear broken	Replace	6-S12
	Coupling displaced	Reassemble	6-S7
Noise	Gear backlash excessive	Adjust or replace	–
	Oil insufficient	Replenish	G-9
	Bearings damaged or broken	Replace	6-S14
	Gears damaged or broken	Replace	–

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Toe-in		2.0 to 8.0 mm 0.078 to 0.315 in.	—
Front Wheel	Steering Angle	0.925 to 0.960 rad 53 to 55 °	—
	Axial Sway (Face Runout of Wheel at Bead)	Less than 5.0 mm 0.197 in.	—
Bevel Gear Case to Stopper	Clearance	Below 0.5 mm 0.02 in.	—
Front Axle	Swing Angle	0.157 to 0.227 rad 9 to 13 °	—
Bevel Gear to Bevel Pinion Shaft	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case to Differential Side Gear	Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	32.025 to 32.050 mm 1.26083 to 1.26181 in.	—
Differential Side Gear Boss	O.D.	31.959 to 31.975 mm 1.25823 to 1.25886 in.	—
Differential Pinion Shaft to Pinion Gear	Clearance	0.016 to 0.052 mm 0.00063 to 0.00205 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	O.D.	15.966 to 15.984 mm 0.62858 to 0.62929 in.	—
Differential Pinion Gear	I.D.	16.000 to 16.018 mm 0.62992 to 0.63063 in.	—
Pinion Gear to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.0039 to 0.0118 in.	0.4 mm 0.016 in.
Pinion Gear to LSD Side Gear	Backlash	0.1 to 0.3 mm 0.0039 to 0.0118 in.	0.4 mm 0.016 in.
LSD Disc	Slip Torque	54 to 68 N·m 5.5 to 6.9 kgf·m 39.8 to 49.9 lbf·ft	—
Front Bracket to Rear Bracket Bushing	Alloy Thickness	0.57 mm 0.0224 in.	—
Rear Differential Case Boss	O.D.	109.965 to 110.000 mm 4.32933 to 4.33071 in.	—
Front Differential Case Boss	O.D.	79.965 to 80.000 mm 3.14823 to 3.14961 in.	—

W1029325

Item		Factory Specification	Allowable Limit
Front Wheel Case Support Bushing	Alloy Thickness	0.57 mm 0.0224 in.	—
Bearing Retainer	O.D.	59.97 to 60.00 mm 2.36102 to 2.36220 in.	—
Front Wheel Case Bushing	Alloy Thickness	0.57 mm 0.0224 in.	—
Bevel Gear Case	O.D.	59.97 to 60.00 mm 2.36102 to 2.36220 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.
Internal Gear to Planetary Gear	Backlash	0.10 to 0.30 mm 0.0039 to 0.0118 in.	0.5 mm 0.020 in.
Planetary Gear to Shaft	Clearance	0.009 to 0.046 mm 0.00035 to 0.00181 in.	0.3 mm 0.012 in.
Planetary Gear	I.D.	33.009 to 33.025 mm 1.29957 to 1.30020 in.	—
Shaft	O.D.	24.991 to 25.000 mm 0.98390 to 0.98425 in.	—
Needle Bearing	O.D.	3.994 to 4.000 mm 0.15724 to 0.15748 in.	—
Thrust Collar	Thickness	0.75 to 0.85 mm 0.02953 to 0.03346 in.	0.5 mm 0.0197 in.

W1013874

3. TIGHTENING TORQUES

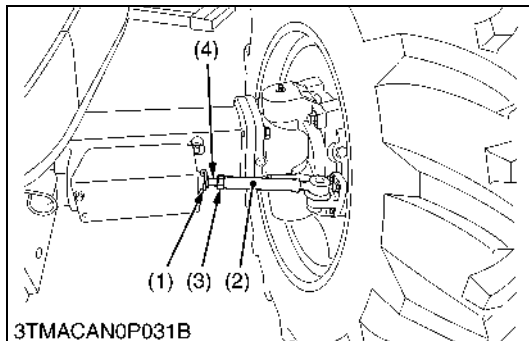
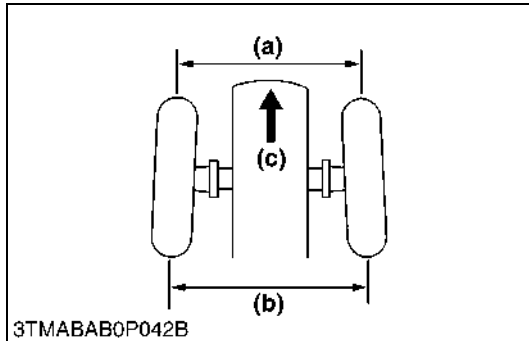
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to “5. TIGHTENING TORQUES” at “G. GENERAL” section.)

Item	N·m	kgf·m	lbf·ft
Tie-rod end lock nut	167.7 to 196.1	17.1 to 20.0	123.7 to 144.7
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.3 to 108.5
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Bracket mounting nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Bracket mounting screw	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Front wheel mounting nut (M16)	259 to 304	26.5 to 31.0	191.7 to 224.2
Tie-rod end slotted nut	156.9 to 176.5	16.0 to 18.0	115.7 to 130.2
Tie-rod joint lock nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Knuckle arm mounting screw (M12)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Bevel gear case mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Front wheel case support mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Front wheel case cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Front wheel mounting stud bolt (M16)	130.4 to 152.0	13.3 to 15.5	96.2 to 112.1
Differential case cover mounting screw (M8, USB)	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



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) (4WD)	Factory spec.	2.0 to 8.0 mm 0.08 to 0.31 in.

■ Toe-in Adjustment

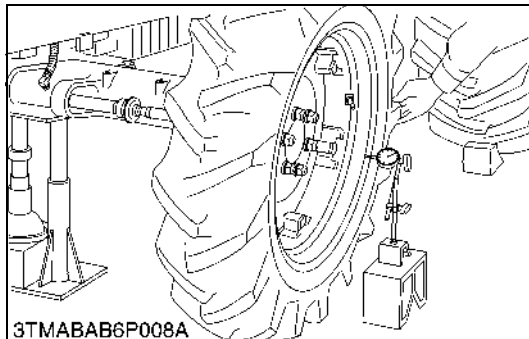
1. Remove the cylinder covers.
2. Detach the snap ring (1).
3. Loosen the tie-rod end lock nut (3).
4. Turn the rod end (4) to adjust until the proper toe-in measurement is obtained. (4WD model)
5. Retighten the tie-rod nut (3).
6. Attach the snap ring (1) of the tie-rod joint.

Tightening torque	Tie-rod end lock nut	167.7 to 196.1 N·m 17.1 to 20.0 kgf·m 123.7 to 144.7 lbf·ft

- (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"

W1022542

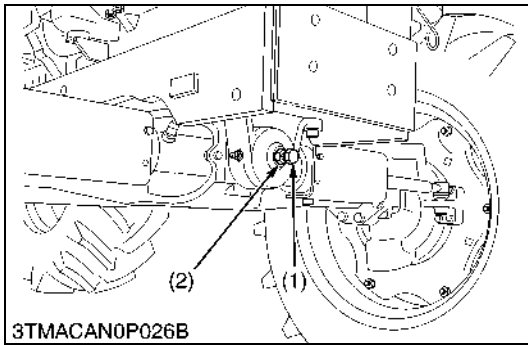


Axial Sway of Front Wheel

1. Jack up the front side of tractor.
2. Set a dial gauge on the outside of rim.
3. Turn the wheel slowly and rear the runout of rim.
4. If the measurement exceeds the factory specifications, check the bearing, rim and front wheel hub.

Axial sway of front wheel (Face runout of wheel at bead)	Factory spec.	Less than 5.0 mm 0.197 in.

W1012092



Adjusting Front Axle Pivot

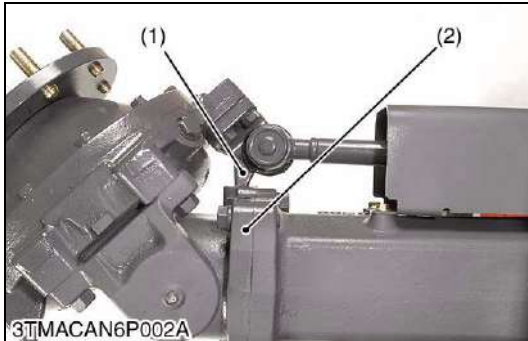
1. Jack up the tractor body, then loosen the front axle rocking force adjusting lock nut (2).
2. Screw in the adjusting screw (1) until seated, then tighten the adjusting screw (1) with an additional 1/6 turn.
3. Retighten the lock nut (2).

Tightening torque	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 lbf·ft

(1) Adjusting Screw

(2) Lock Nut

W1012203



Adjusting between Bevel Gear Case and Stopper [4WD Model]

1. Inflate the tires to the specified pressure.
2. Steer the wheels to the extreme right until the knuckle arm (1) contacts with the bevel gear case (2).
3. If the knuckle arm (1) can not be contacted with the bevel gear case (2), shorten the length of stopper (3).
4. Keeping the knuckle arm (1) contact with the bevel gear case (2), make a specified length as shown in the table.
5. After adjustment, secure the stopper with the lock nut (4).
6. For adjusting the left steering angle, perform the same procedure as mentioned in right steering angle.

Clearance between bevel gear case and stopper (L)	Factory spec.	Below 0.5 mm 0.02 in.

(1) Knuckle Arm

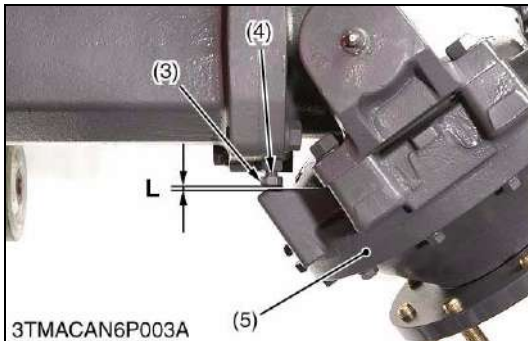
(5) Front Gear Case

(2) Bevel Gear Case

L : Clearance

(3) Stopper

(4) Lock Nut



W1012461

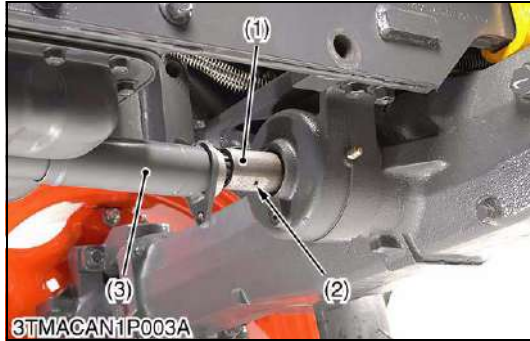
[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle

Draining Front Axle Gear Case (Right and Left) and Front Differential Case Oil

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

W1013103



Propeller Shaft

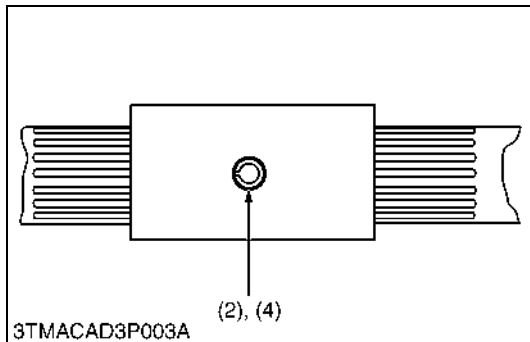
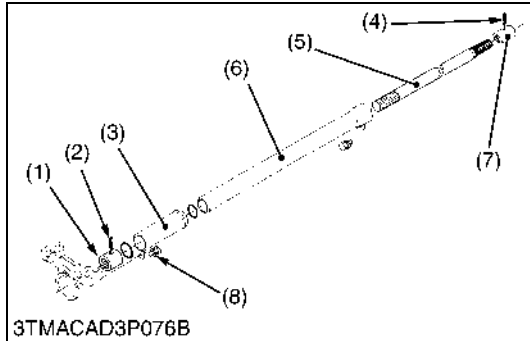
1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

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

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

W1012954



Front Wheel and Power Steering Hoses

1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Remove the front wheel.
3. Lift the front axle and remove the front wheels.
4. Disconnect the power steering hoses (1), (2).

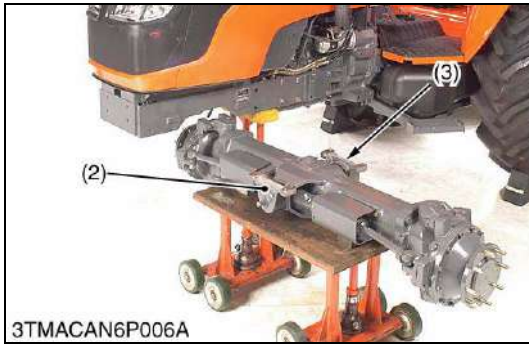
(When reassembling)

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Front wheel mounting nut (M16)	259 to 304 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

(1) Power Steering Hose 1

(2) Power Steering Hose 2

W1013645



Front Axle

1. Place a disassembling stand under the front axle case and support it with a jack.
2. Disconnect the breather hose (1).
3. Remove the bracket (front) (3) mounting screws and nuts.
4. Remove the bracket (rear) (2) mounting screws and nuts.
5. Separate the front axle from front axle bracket.

(When reassembling)

Tightening torque	Bracket mounting nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft
	Bracket mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 lbf·ft

■ IMPORTANT

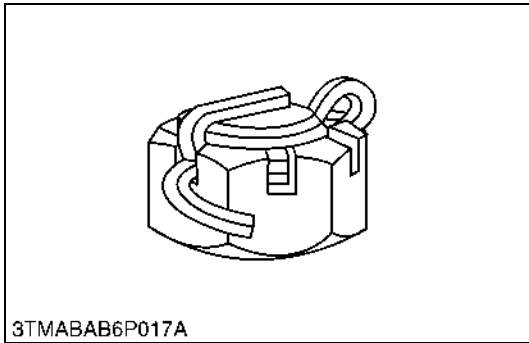
- Be sure to adjust the front axle pivot.

- (1) Breather Hose
(2) Rear Bracket

- (3) Front Bracket

W1013843

(2) Disassembling Front Axle



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 lbf·ft
	Tie-rod joint lock nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 lbf·ft
	Knuckle arm mounting screw (M12)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

W1015246

Separating of Front Differential Case from Bevel Gear Case

1. Remove the bevel gear case (2) and the front wheel case (3) as a unit from the front differential case (1).

(When reassembling)

- Apply grease to the O-ring.
- Install the bevel gear case to the front differential case, noting the O-ring.

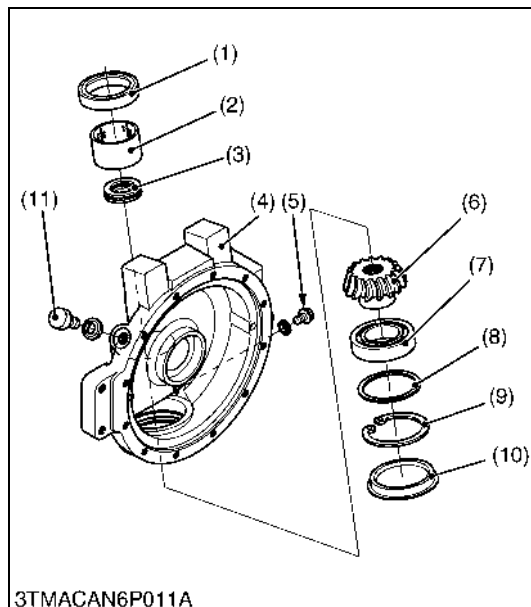
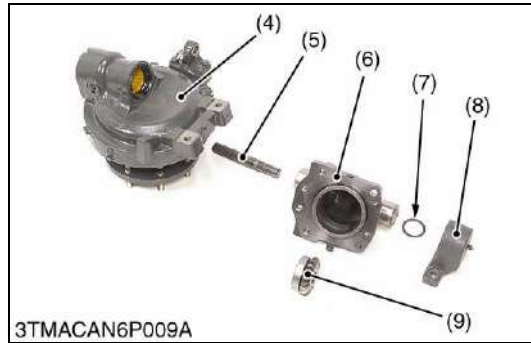
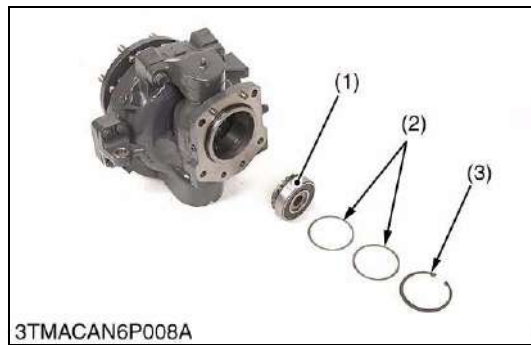
Tightening torque	Bevel gear case mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

- (1) Front Differential Case
(2) Bevel Gear Case

- (3) Front Wheel Case

W1015400

KiSC issued 09, 2008 A



Bevel Gear Case

1. Remove the internal circlip (3) and shim (2) then draw out the 17T bevel gear (1) with bearing.
2. Remove the front wheel case support (8).
3. Draw out the 18T bevel gear (9) and bevel gear shaft (5).

(When reassembling)

- Apply grease to the front wheel case support DX bushing and front wheel case DX bushing.
- Install the oil seal to the front wheel case support so that its lip faces the outward.
- Apply gear oil to the bearing.

Tightening torque	Front wheel case support mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft

(1) 17T Bevel Gear	(6) Bevel Gear Case
(2) Shim	(7) Collar
(3) Internal Circlip	(8) Front Wheel Case Support
(4) Front Wheel Case	(9) 18T Bevel Gear
(5) Bevel Gear Shaft	

W1015548

Front Wheel Case Cover

1. Remove the front wheel case cover from the front wheel case.

(When reassembling)

- Apply transmission fluid to the O-ring.

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 lbf·ft

W1016102

Front Wheel Case

1. Remove the cap (10) which is installed in the bottom of front wheel case.
2. Remove the internal circlip (9) and take out the adjusting shims (8).
3. Tap the bevel gear to downward, and take out the 15T bevel gear (6) with bearing.

(When reassembling)

- Apply grease to the front wheel case DX bushing (2).
- Apply grease to the oil seal.
- Replace the cap (10) with new one.
- Apply transmission fluid to the cap.

(1) Oil Seal	(7) Ball Bearing
(2) DX Bushing	(8) Shim
(3) Thrust Ball Bearing	(9) Internal Circlip
(4) Front Wheel Case	(10) Cap
(5) Plug	(11) Plug
(6) 15T Bevel Gear	

W1016239

**Bevel Gear**

1. Remove the bevel gear and bearing with a puller.

W1016676

**Planetary Gear**

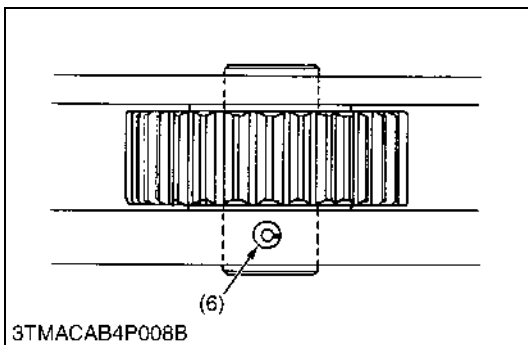
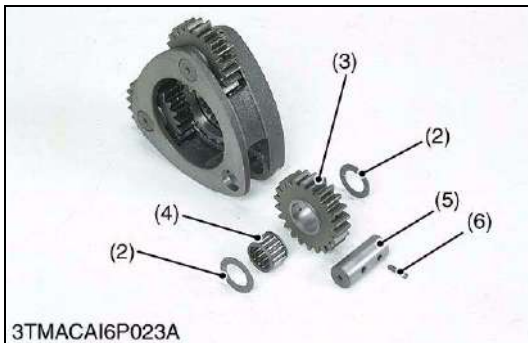
1. Remove the external circlip (1).
2. Remove the planetary gear support assembly.
3. Tap the roll pin (6) into the planetary gear shaft (5).
4. Draw out the planetary gear shaft (5), and remove the planetary gear (3).
5. Tap out the roll pin (6) from the planetary gear shaft (5).

(When reassembling)

- Apply transmission fluid to the needle bearing (4).
- Tap in the roll pin (6) as shown in the figure left.
- Replace the external circlip (1) with new one.

(1) External Circlip	(4) Needle Bearing
(2) Thrust Collar	(5) Planetary Gear Shaft
(3) Planetary Gear	(6) Roll Pin

W1016767

**Front Axle**

1. Tap out the front axle (2) from front wheel case cover (1).

(When reassembling)

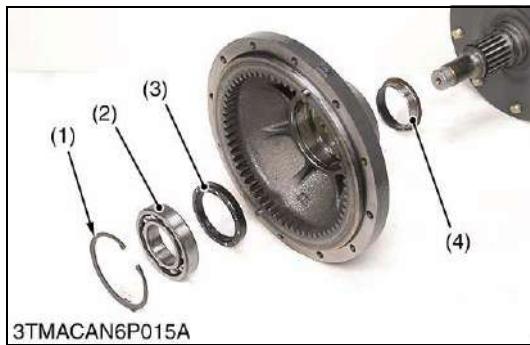
- Apply grease to the front axle oil seal.

Tightening torque	Front wheel mounting stud bolt (M16)	130.4 to 152.0 N·m 13.3 to 15.5 kgf·m 96.2 to 112.1 lbf·ft

(1) Front Wheel Case Cover

(2) Front Axle

W1017050



Front Axle Oil Seal

1. Remove the internal circlip (1) and tap out the bearing (2).
2. Draw out the oil seal (3), (4).

(When reassembling)

- Install the oil seal outward to the front wheel case cover so that its lip faces the outward.

- (1) Internal Circlip
(2) Bearing

- (3) Oil Seal
(4) Oil Seal

W1017742

(3) Removing Differential Gear and Bevel Pinion Shaft



Bevel Pinion Shaft

1. Draw out the front bracket (2) and rear bracket (1).
2. Remove the oil seal (3), internal circlip (4) and shim (5).
3. Pull out the bevel pinion shaft (6) using a slide hammer (8).

(When reassembling)

- Replace oil seal (3) with new one.
- Install the oil seal (3) to the front axle case so that its lip faces the inward.
- Apply grease to the DX bushing for bracket (1), (2).

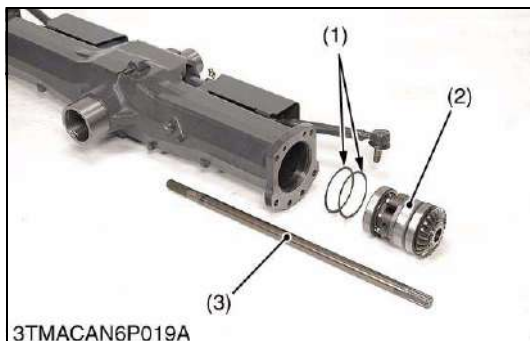
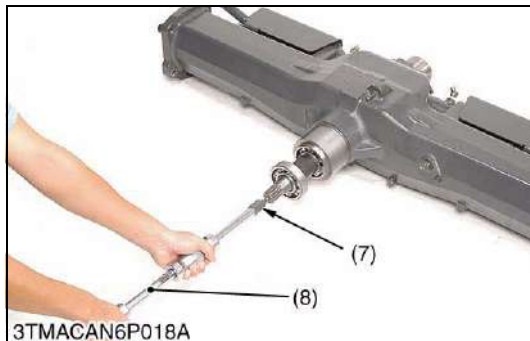
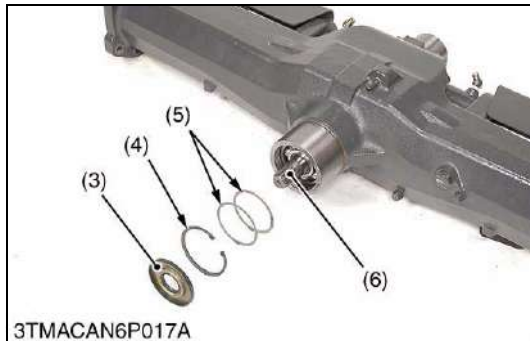
(Reference)

- Adaptor for slide hammer : M6 pitch 1.0 mm.
(Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

- (1) Rear Bracket
(2) Front Bracket
(3) Oil Seal
(4) Internal Circlip

- (5) Shim
(6) Bevel Pinion Shaft
(7) Adaptor for Slide Hammer
(8) Slide Hammer

W1018133



Differential Gear (LSD) Assembly

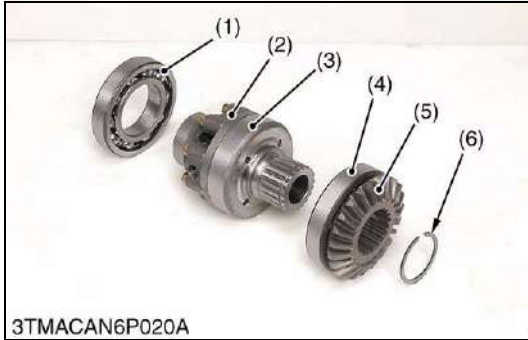
1. Draw out the both yoke shaft.
2. Tap out the differential gear (LSD) assembly (2) and shim (1) to R.H. side.

- (1) Shim
(2) Differential Gear (LSD) Assembly

- (3) Yoke Shaft (R.H.)

W1018549

(4) Disassembling Differential Gear (LSD)



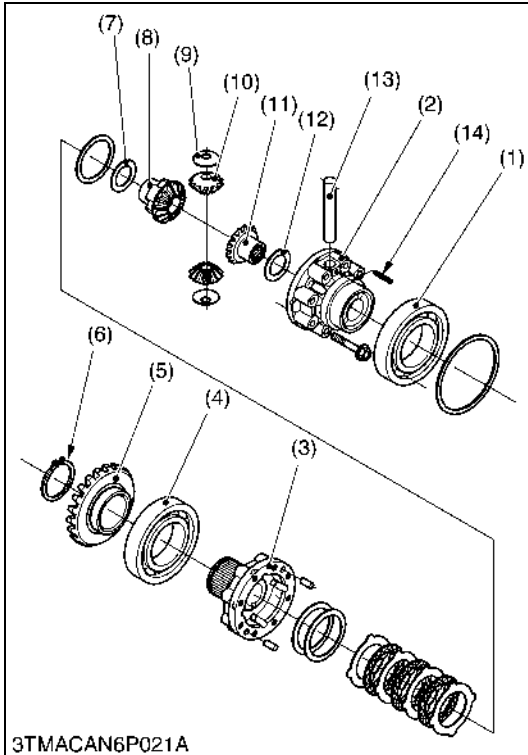
Spiral Bevel Gear

1. Remove the external circlip (6) and the 23T spiral bevel gear (5) with bearing (4).
2. Remove the bearing (1).
3. Remove the differential case cover mounting screws and remove the differential case cover.
4. Tap out the roll pin (14) and draw out the differential pinion shaft (13) and pinion gears (10), differential side gear (11) and shim.

(When reassembling)

- Replace the external circlip (6) with new one.
- Check the differential pinion gears (10), pinion shaft (13) for excessive wear. If these parts are damaged or excessively worn, replace there parts thy are in mesh with, or they sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner circumferential surface of differential pinions, side gear and shim.
- Install the parts to there original position.
- Face the roll pin (14) as shown in the photo.

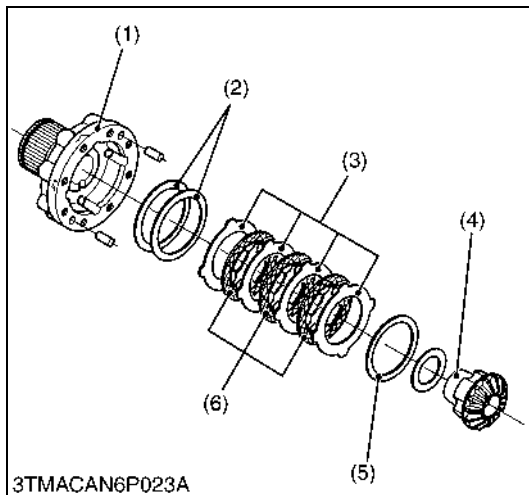
Tightening torque	Differential case cover mounting screw (M8, USB)	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft



(1) Bearing	(8) LSD Side Gear
(2) Differential Case	(9) Pinion Washer
(3) Differential Case Cover	(10) Differential Pinion Gear
(4) Bearing	(11) Differential Side Gear
(5) 23T Spiral Bevel Gear	(12) Shim
(6) External Circlip	(13) Differential Pinion Shaft
(7) Shim	(14) Roll Pin

W1019054





LSD Disc and Steel Plate

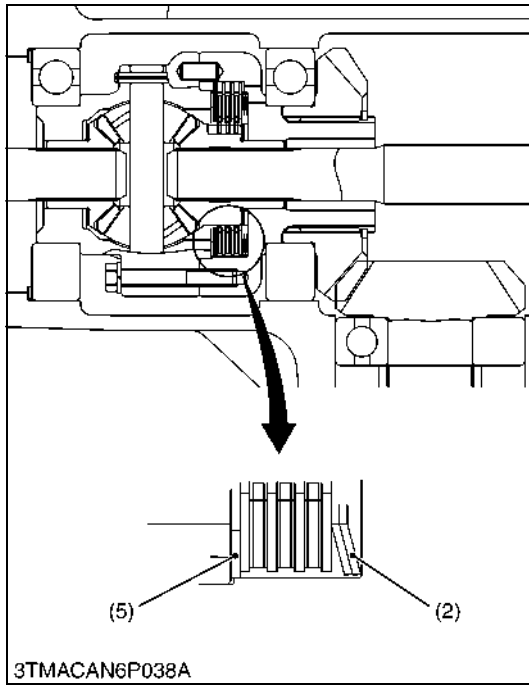
1. Draw out the LSD side gear (4), LSD shim (5), steel plates (3), LSD discs (6) and belleville washers (cupped spring washer) (2).

(When reassembling)

- Apply transmission fluid to the LSD discs.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to side gear and shim.
- Assemble the belleville washers (cupped spring washer) as shown in the figure.
- Check the slip torque of LSD after assembly, the differential refer to "[3] SERVICING" at this section.

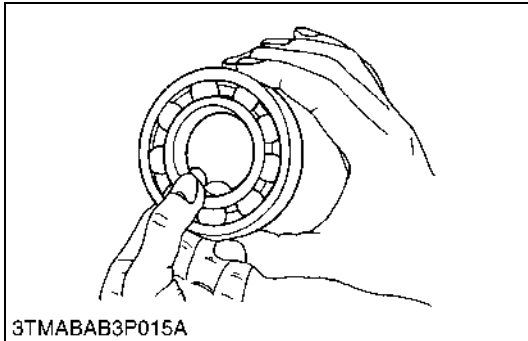
(1) Differential Case Cover	(4) LSD Side Gear
(2) Belleville Washer (Cupped Spring Washer)	(5) LSD Shim
(3) Steel Plate	(6) LSD Disc

W1019850



[3] SERVICING

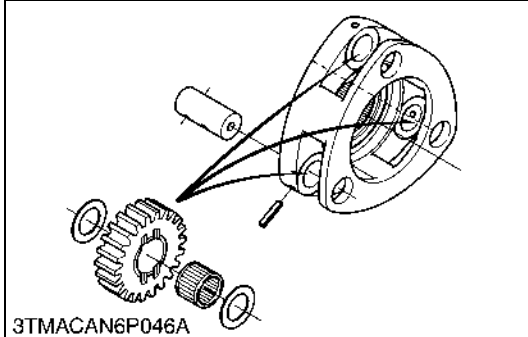
(1) 4WD Model



Ball Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

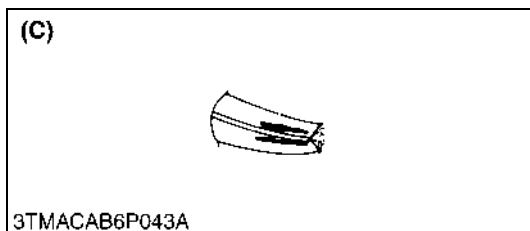
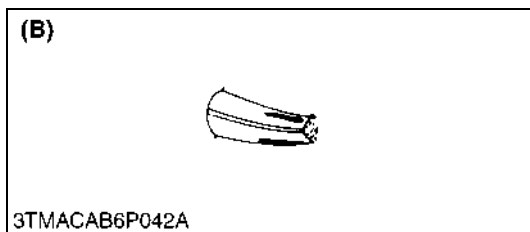
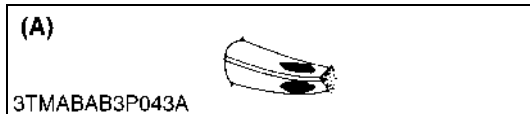
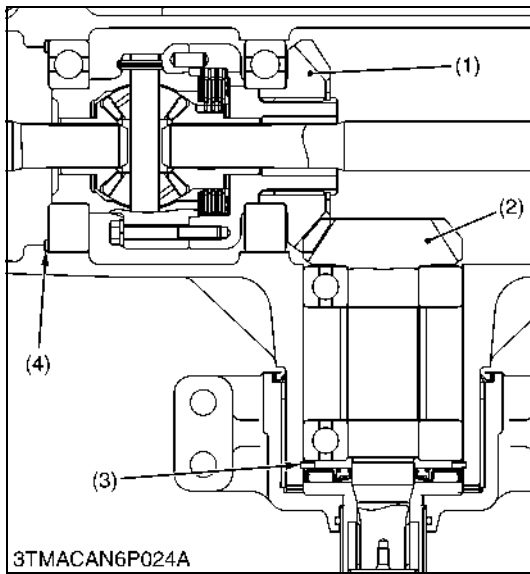
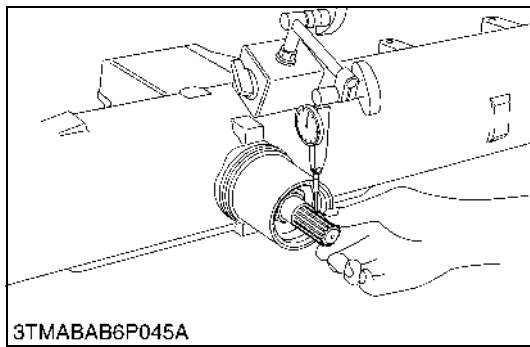
W1035672



Needle Bearing

1. Check the needle bearing for abrasion, color, change or other damage.
2. If there is any doubt as to the condition of a needle bearing, replace it.

W1035776



Backlash and Tooth Contact between Bevel Pinion Shaft and Bevel Gear

1. Set a dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the bevel pinion shaft (2) and moving the bevel gear (1) by hand.
3. If the backlash exceeds the allowable limit, adjust with the shim (4).
4. Adjust the backlash properly by repeating the above procedures.

Backlash between bevel gear and bevel pinion shaft	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

5. Apply red lead lightly over several teeth at three positions equally spaced on the bevel gear (1).
6. Turn the bevel pinion shaft (2), against the periphery of the bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions shown in the figure.

(Reference)

- Thickness of adjusting shims (3) :
 - 0.1 mm (0.004 in.) [Code No.: 35533-44080]
 - 0.2 mm (0.008 in.) [Code No.: 35533-44090]
 - 0.4 mm (0.016 in.) [Code No.: 35533-44100]
 - 0.8 mm (0.032 in.) [Code No.: 35533-44110]
 - 1.0 mm (0.039 in.) [Code No.: 35533-44120]
 - 1.2 mm (0.047 in.) [Code No.: 35533-44130]
- Thickness of adjusting shims (4) :
 - 0.7 mm (0.028 in.) [Code No.: 3A151-32180]
 - 0.8 mm (0.032 in.) [Code No.: 3A151-32130]
 - 1.0 mm (0.039 in.) [Code No.: 3A151-32140]
 - 1.2 mm (0.047 in.) [Code No.: 3A151-32150]
 - 1.4 mm (0.055 in.) [Code No.: 3A151-32160]
 - 2.3 mm (0.091 in.) [Code No.: 3A151-32170]
- Standard size of shim (3) : 0.5 mm (0.020 in.)
shim (4) : 1.2 mm (0.047 in.)
- Backlash changes per 0.1 mm (0.004 in.) shim : Approx. 0.05 mm (0.002 in.)

■ IMPORTANT

- **Adjust the tooth contact with shims (3) and (4) so that the spiral bevel pinion shaft may not contact with the differential case.**

- (1) Bevel Gear
(2) Bevel Pinion Shaft
(3) Shim
(4) Shim

- (A) Proper Contact :
More than 35 % red lead contact area on the gear tooth surface.
The center of tooth contact at 1/3 of the entire width from the small end.
- (B) Deep Contact :
Decrease the shims.
- (C) Shallow Contact :
Increase the shims.

W1018771



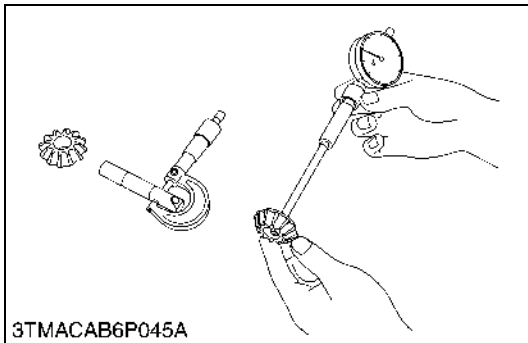
Clearance between Differential Case and Differential Side Gear

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



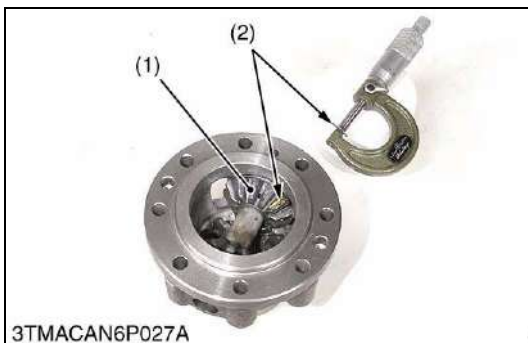
Clearance between Differential Pinion Shaft and Pinion Gear

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



Backlash between Differential Pinion and Differential Side Gear

1. Hold the fuse (2) on the pinion gear (1) with grease.
2. Turn the pinion gear (1) to mesh the fuse.
3. Measure the thickness of fuse.
4. If the backlash exceeds the allowable limit, adjust with shim (3).
5. Adjust the backlash properly by repeated above procedure.

Backlash between pinion gear and differential side gear	Factory spec.	0.1 to 0.3 mm 0.0039 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

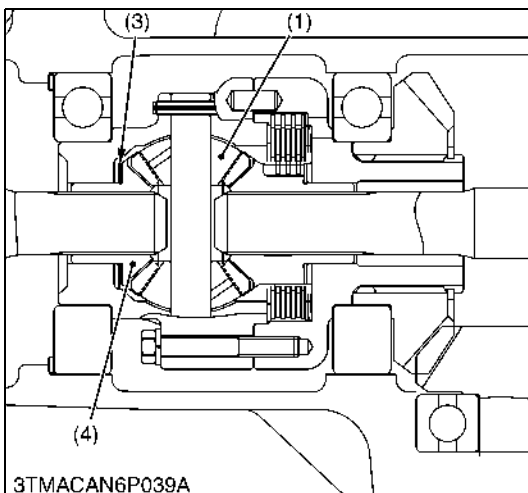
(Reference)

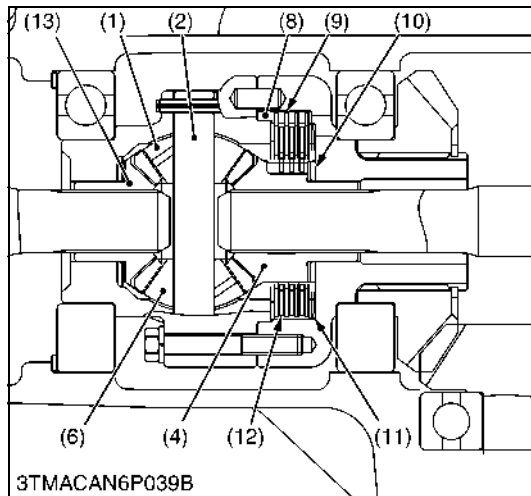
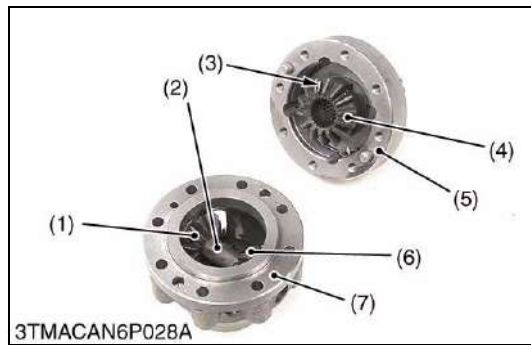
- Thickness of adjusting shim :
0.8 mm (0.032 in.) [Code No. 67211-15170]
1.0 mm (0.039 in.) [Code No. 67211-15160]
1.2 mm (0.047 in.) [Code No. 67211-15180]
- Standard size of shim : 1.0 mm (0.039 in.)

- (1) Pinion Gear
(2) Fuse

- (3) Shim
(4) Side Gear

W1021715





Backlash between Differential Pinion and LSD Side Gear

1. Assemble the pinion gear (1), (6) and pinion shaft (2) without differential side gear (13).
2. Assemble the LSD side gear (4) without belleville washers (cupped spring washer) (11), steel plates (9), LSD discs (12) and LSD shim (8).
3. Put the fuse (3) on the LSD side gear (4).
4. Assemble the differential case (7) and differential case cover (5).
5. Turn the LSD side gear using the yoke shaft to clash the fuse.
6. Disassemble the differential case cover and measure the thickness of fuse.
7. If the backlash exceeds the allowable limit, adjust with shim (10).
8. Adjust the backlash properly by repeated above procedure.

Backlash between pinion gear and LSD side gear	Factory spec.	0.1 to 0.3 mm 0.0039 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

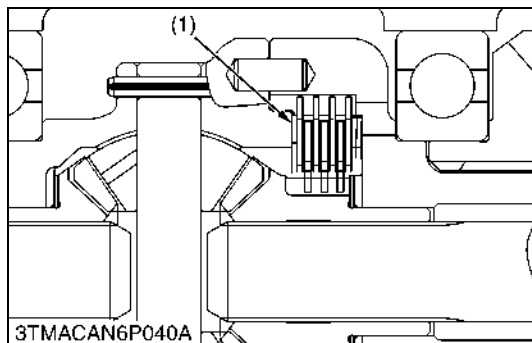
(Reference)

- Thickness of adjusting shim :
0.8 mm (0.032 in.) [Code No. 67211-15170]
1.0 mm (0.039 in.) [Code No. 67211-15160]
1.2 mm (0.047 in.) [Code No. 67211-15180]

- Standard size of shim : 1.0 mm (0.039 in.)

(1) Pinion Gear	(8) Shim (LSD)
(2) Pinion Shaft	(9) Steel Plate
(3) Fuse	(10) Shim (LSD Side Gear)
(4) Side Gear (LSD)	(11) Belleville Washer (Cupped Spring Washer)
(5) Differential Case Cover	(12) LSD Disc
(6) Pinion Gear	(13) Side Gear
(7) Differential Case	

W1021916



Slip Torque of LSD Disc

1. Set the differential assembly on the vice securely.
2. Check the LSD slip torque using a jig as shown in the photo.
3. If the LSD slip torque is not within the factory specification, adjust with LSD shim (1).

■ IMPORTANT

- When measuring the slip torque for LSD, apply ample lubricant to the LSD disc.
- Turn the LSD side gear using a jig clockwise and counterclockwise each direction several times to mesh the LSD disc and steel plate.

LSD slip torque	Factory spec.	54 to 68 N·m 5.5 to 6.9 kgf·m 39.8 to 49.9 lbf·ft

(Reference)

- Jig in the photo is : Spline from yoke shaft and welded with box wrench. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
- Thickness of LSD shim :
 - 0.1 mm (0.004 in.) [Code No.: 35533-43010]
 - 0.2 mm (0.008 in.) [Code No.: 35533-43020]
 - 0.4 mm (0.016 in.) [Code No.: 35533-43030]
 - 0.8 mm (0.032 in.) [Code No.: 35533-43040]
 - 1.0 mm (0.039 in.) [Code No.: 35533-43050]
 - 1.2 mm (0.047 in.) [Code No.: 35533-43060]

Thickness of steel plate	Factory spec.	1.32 to 1.48 mm 0.05197 to 0.05827 in.
Thickness of LSD disc	Factory spec.	2.55 to 2.65 mm 0.10039 to 0.10433 in.

- Slip torque changes per 0.1 mm (0.004 in.) shim :
Approx. 5 to 7 N·m (0.5 to 0.7 kgf·m, 3.6 to 5.1 lbf·ft)

(1) Shim

W1022263

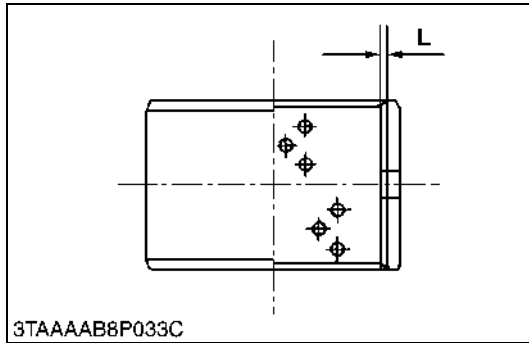


Front Bracket and Rear Bracket Bushing

1. Visually inspect the DX bushings for signs of wear or damage.
(The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (L), replace it.

Front bracket and rear bracket bushing	Alloy thickness (L)	0.57 mm 0.0224 in.
Rear differential case boss O.D.	Factory spec.	109.965 to 110.000 mm 4.32933 to 4.33071 in.
Front differential case boss O.D.	Factory spec.	79.965 to 80.000 mm 3.14823 to 3.14961 in.

W1020171

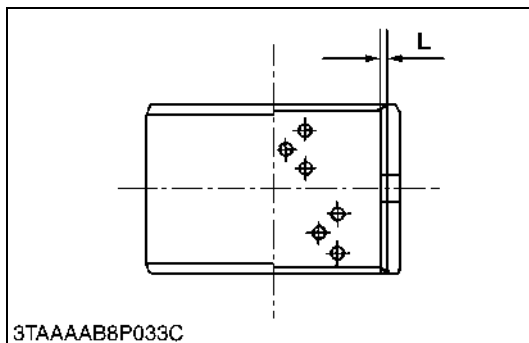


Bearing Retainer and Front Wheel Case Support Bushing

1. Visually inspect the DX bushings for signs of wear or damage.
(The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (L), replace it.

Front wheel case support bushing	Alloy thickness (L)	0.57 mm 0.0224 in.
Bearing retainer O.D.	Factory spec.	59.97 to 60.00 mm 2.36102 to 2.36220 in.

W1020339





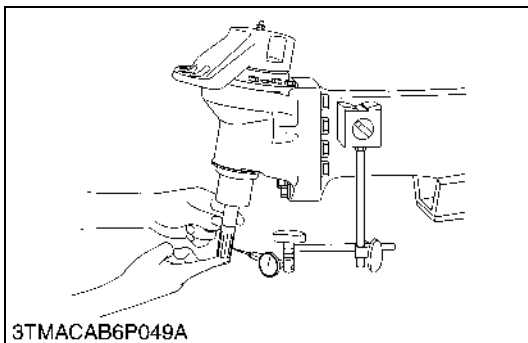
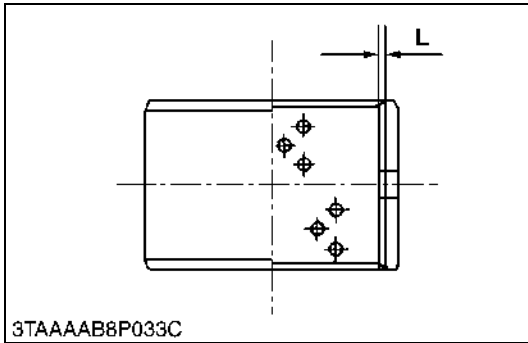
Bevel Gear Case and Front Wheel Case Bushing

1. Visually inspect the DX bushings for signs of wear or damage.
(The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (L), replace it.

Front wheel case bushing	Alloy thickness (L)	0.57 mm 0.0224 in.

Bevel gear case O.D.	Factory spec.	59.97 to 60.00 mm 2.36102 to 2.36220 in.

W1020555



Backlash of Bevel Gear in Bevel Gear Case

1. Set a dial indicator (lever type) on the shaft (Kingpin).
2. Move the shaft (Kingpin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter. (Backlash = Play x 2)
4. If the backlash exceeds the allowable limit, adjust with the shims (1).

Backlash of bevel gear in bevel gear case	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

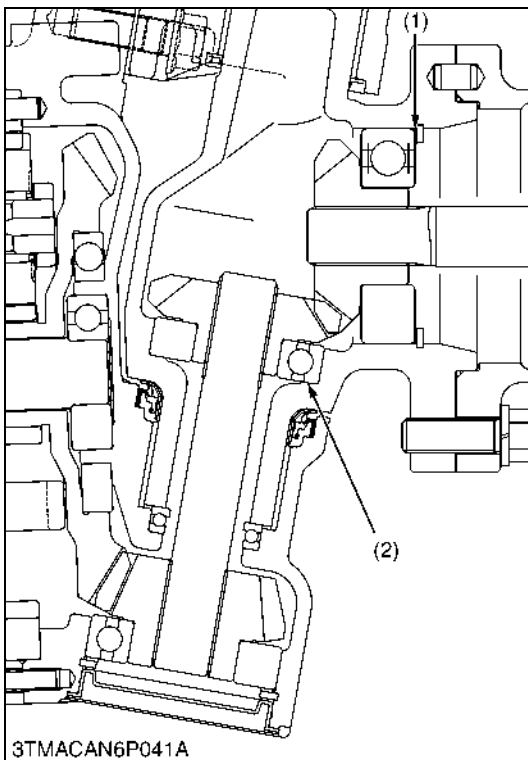
(Reference)

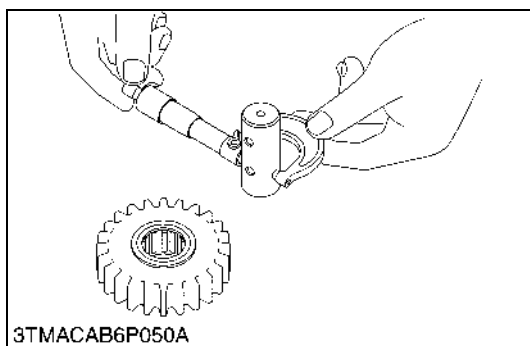
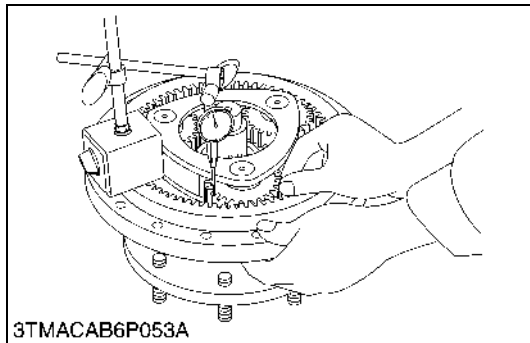
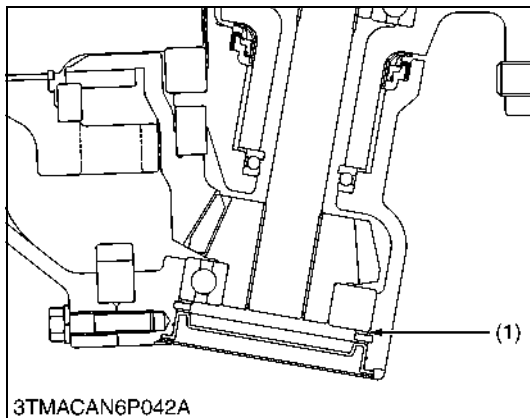
- Thickness of adjusting shims (1) :
0.1 mm (0.004 in.) [Code No.: 35533-44020]
0.2 mm (0.008 in.) [Code No.: 35533-44030]
0.4 mm (0.016 in.) [Code No.: 35533-44040]
0.8 mm (0.032 in.) [Code No.: 35533-44050]
1.0 mm (0.039 in.) [Code No.: 35533-44060]
1.2 mm (0.047 in.) [Code No.: 35533-44070]
- Thickness of adjusting shims (2) :
0.1 mm (0.004 in.) [Code No.: 35533-44080]
0.2 mm (0.008 in.) [Code No.: 35533-44090]
- Standard size of shim (1) : 1.0 mm (0.039 in.)
shim (2) : None.
- Backlash changes per 0.1 mm (0.004 in.) shim :
Approx. 0.04 mm (0.015 in.)

(1) Shim

(2) Shim

W1020677





Backlash of Bevel Gear in Front Wheel Case

1. Set a dial indicator (lever type) on the shaft (Kingpin).
2. Move the shaft (Kingpin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter. (Backlash = Play x 2)
4. If the backlash exceeds the allowable limit, adjust with the shims (1).

Backlash of bevel gear in front wheel case	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shims (1) :
 0.1 mm (0.004 in.) [Code No.: 35533-44080]
 0.2 mm (0.008 in.) [Code No.: 35533-44090]
 0.4 mm (0.016 in.) [Code No.: 35533-44100]
 0.8 mm (0.032 in.) [Code No.: 35533-44110]
 1.0 mm (0.039 in.) [Code No.: 35533-44120]
 1.2 mm (0.047 in.) [Code No.: 35533-44130]
- Standard size of shim (1) : 2.0 mm (0.079 in.)

(1) Shim

W1021810

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.
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

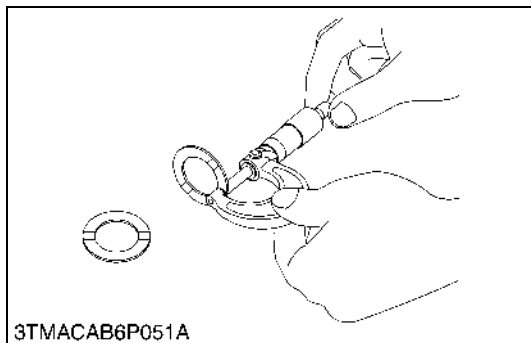
Clearance between Planetary Gear and Shaft

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 bearing 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.	0.75 to 0.85 mm 0.02953 to 0.03346 in.
	Allowable limit	0.5 mm 0.0197 in.

W1021223

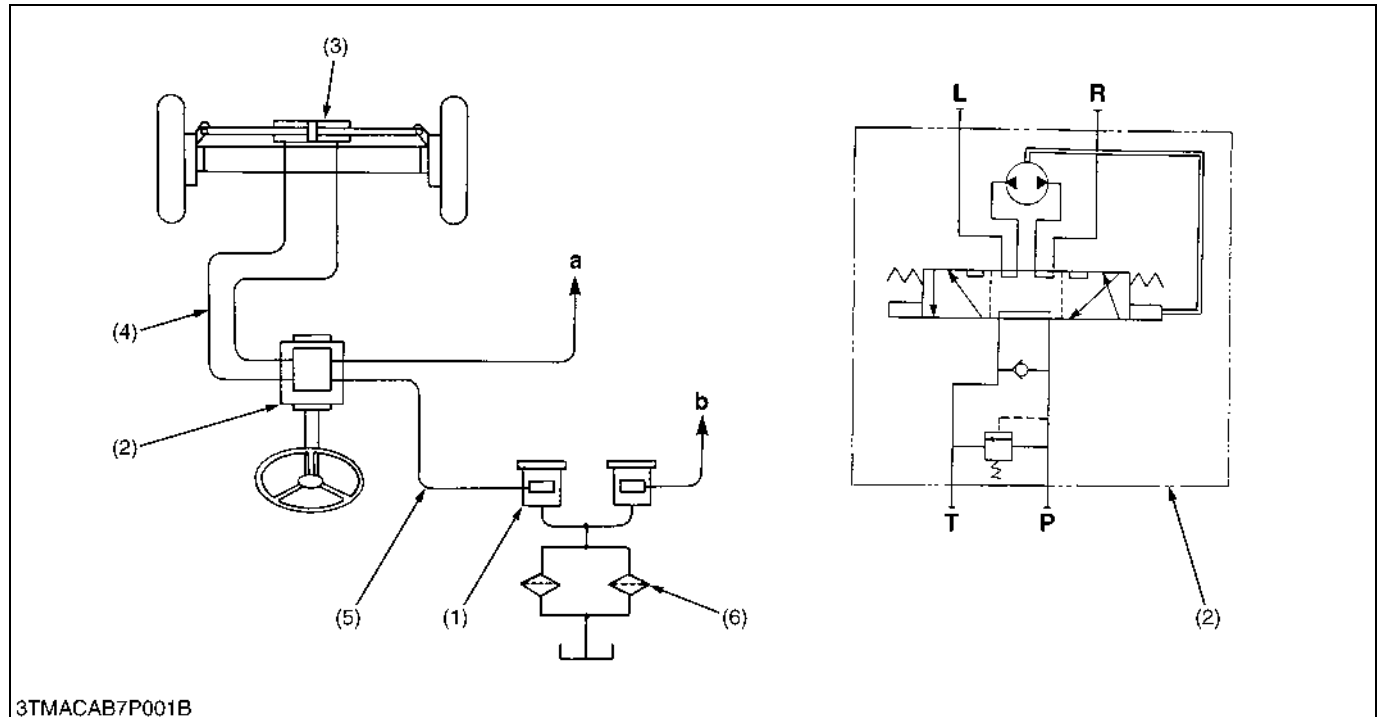
7 STEERING

MECHANISM

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1. STEERING MECHANISM.....	7-M1
2. STEERING CYLINDER.....	7-M2

1. STEERING MECHANISM



(1) Hydraulic Pump
(2) Steering Controller

(3) Steering Cylinder
(4) Power Steering Hose

(5) Power Steering Pipe
(6) Magnet Filter

a : To Oil Cooler and Brake Master Cylinder
b : To 3-point Hydraulic System

All models are provided with a full hydrostatic power steering. Generally power steerings are divided into 4 types : booster type, integral type, semi-integral type and full hydrostatic type.

In the full hydrostatic power steering, the steering controller is connected to the steering cylinder with only the hydraulic piping. This steering is actuated by oil pressure. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc.. Therefore, it is simple in construction.

This steering system consists of the hydraulic pump (1), steering controller (2), steering cylinder (3), magnet filter (6), etc..

The full hydrostatic power steering systems are divided into two types : non-load reaction type and load reaction type.

They are distinguished by whether the cylinder port is blocked or not with the controller in neutral. In these models, load reaction type is used.

With the load reaction type power steering, the steering wheel returns almost to the straight forward position as with an automobile when the operator releases his hands from the steering wheel.

(Reference)

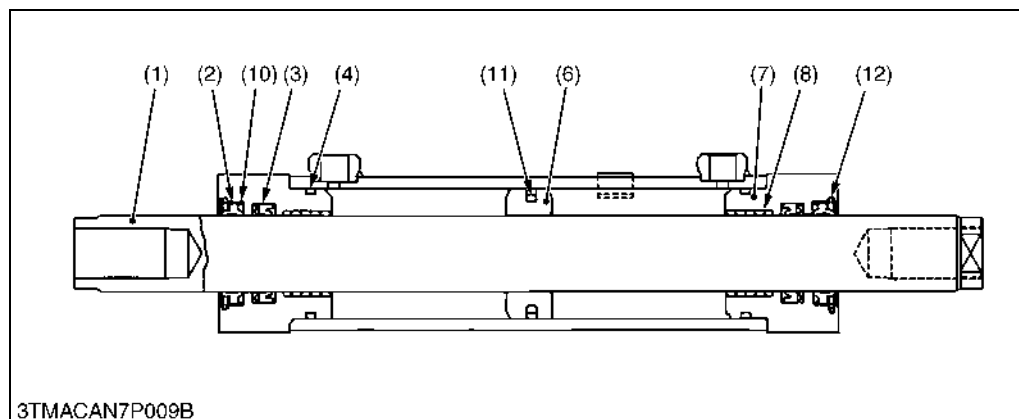
With the non-load reaction type power steering, the steering wheel maintain their position when the operator releases his hands from the steering wheel.

Vibration at the wheels is not transmitted to the steering wheel.

■ NOTE

- Refer to "7. STEERING" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

2. STEERING CYLINDER



- (1) Rod
- (2) Scraper Seal
- (3) Oil Seal
- (4) O-ring
- (5) Slipper Seal
- (6) Piston
- (7) Guide
- (8) Bushing
- (9) O-ring
- (10) Backup Ring
- (11) Piston Seal
- (12) Circlip

W1012783

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provide force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.

SERVICING

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[5] SERVICING	7-S14

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Tractor Cannot Be Steered	Drive shaft in the power steering controller improper assembled	Reassemble	7-S7, 9
	Pipe broken	Replace	–
Hard Steering	Oil improper	Change with specified oil	G-9
	Hydraulic pump malfunctioning	Replace	8-S20
	Relief valve malfunctioning	Replace	7-S4
	Controller (spool and sleeve) malfunctioning	Repair or replace	7-S7, 9
	Oil leak due to seal damaged	Replace	–
Steering Force Fluctuates	Controller malfunctioning	Replace	7-S7, 9
	Air sucked in pump due to leaking or missing of oil	Replenish	G-9, 20
	Air sucked in pump from suction circuit	Repair	–
Heavy Steering Especially in the Beginning of Steering	Controller malfunctioning	Repair or replace	7-S7, 9
Steering Wheel Turns Spontaneously When Released	Controller malfunctioning	Repair or replace	7-S7, 9
Front Wheels Wander to Right and Left	Controller malfunctioning	Repair or replace	7-S7, 9
	Air sucked in pump due to lack of oil	Replenish	G-9, 20
	Air sucked in pump from suction circuit	Repair	–
	Insufficient bleeding	Bleed	–
	Cylinder malfunctioning	Repair or replace	7-S10
Wheels Are Turned to a Direction Opposite to Steering Direction	Cylinder piping connected in reverse	Repair	–
Steering Wheel Turns Idle in Manual Steering	Insufficient bleeding	Bleed	–
	Air sucked in pump due to lack of oil	Replenish	G-9, 20
Noise	Air sucked in pump due to lack of oil	Replenish	G-9, 20
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–
Oil Temperature Increases Rapidly	Relief valve malfunctioning	Replace	7-S4
Front Wheels Vibrate	Mechanical connections or wheel bearings worn	Replace defective parts	–

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Relief Valve Setting Pressure	At Idling Engine Speed	Above 12.3 MPa 125 kgf/cm ² 1777.9 psi	—
	At Maximum Engine Speed	Below 18.1 MPa 185 kgf/cm ² 2631.3 psi	—
Steering Cylinder	I.D.	55.000 to 55.074 mm 2.16535 to 2.16827 in.	55.100 mm 2.16929 in.
Rod to Bushing	Clearance	0.010 to 0.140 mm 0.00039 to 0.00551 in.	0.250 mm 0.00984 in.

W1013874

3. TIGHTENING TORQUES

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

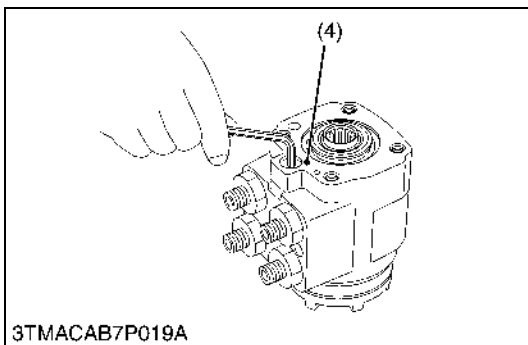
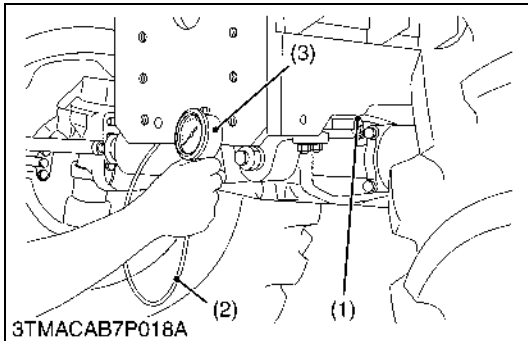
Item	N·m	kgf·m	lbf·ft
Power steering delivery hose 1 and 2	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Controller pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Master cylinder delivery pipe joint screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Oil cooler pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Master cylinder pipe retaining nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Brake pipe R.H. and L.H. retaining nut	16.0 to 24.0	1.63 to 2.45	11.8 to 17.7
Master cylinder hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Power steering delivery hose	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Tie-rod end slotted nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Tie-rod joint	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Hose joint	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Gerotor assembly mounting screw (5/16')	25.5 to 28.4	2.6 to 2.9	18.8 to 21.0

W1018157

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Steering Controller



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/cm², 427 psi).

Relief valve setting pressure	Factory spec.	At idling engine speed	Above 12.3 MPa 125 kgf/cm ² 1777.9 psi
		At maximum engine speed	Below 18.1 MPa 185 kgf/cm ² 2631.3 psi

Condition

- Oil temperature 50 to 60 °C
122 to 140 °F

- (1) Power Steering Adaptor
(2) Cable

- (3) Pressure Gauge
(4) Adjust Plug for Relief Valve

W1014224

(2) Hydraulic Pump

Hydraulic Flow Test

1. Refer to "[1] CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.

W1020116

[2] REMOVING STEERING CONTROLLER

(1) ROPS Model



Bonnet

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

■ IMPORTANT

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

- (1) Bonnet
(2) Connector

- (3) Damper

W1013836

Panel Cover

1. Remove the steering port cover (6).
2. Detach the panel cover (1).
3. Disconnect the connectors for main key switch (5), FS switch (2), hazard switch (3), panel change switch (4) and combination switch (7).
4. Remove the panel cover (1).

- (1) Panel Cover
(2) FS Switch
(3) Hazard Switch
(4) Panel Change Switch

- (5) Main Key Switch
(6) Steering Port Cover
(7) Combination Switch

W1014438

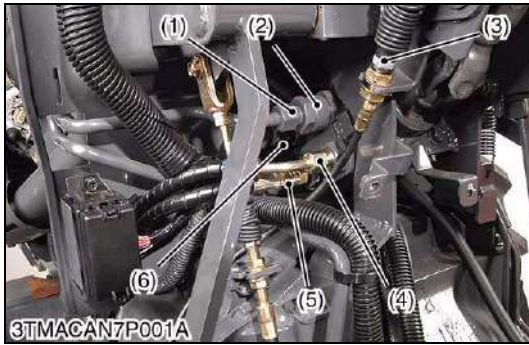


Steering Support Under Cover

1. Remove the steering support under cover (1).

(1) Steering Support Under Cover

W1014598



Shuttle Cable and Oil Pipes

1. Disconnect the shuttle cable (3).
2. Disconnect the power steering delivery hose 1 (4) and 2 (5) from power steering controller.
3. Disconnect the controller pipe (6) and oil cooler pipe retaining nut (1).
4. Remove the master cylinder delivery pipe joint screw (2).

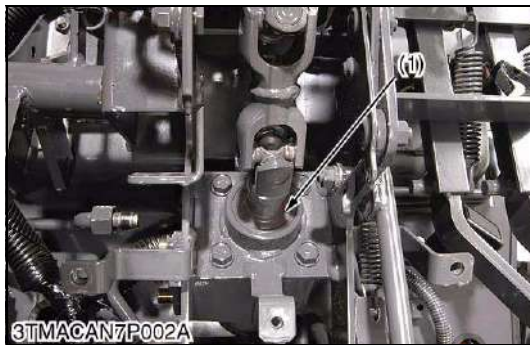
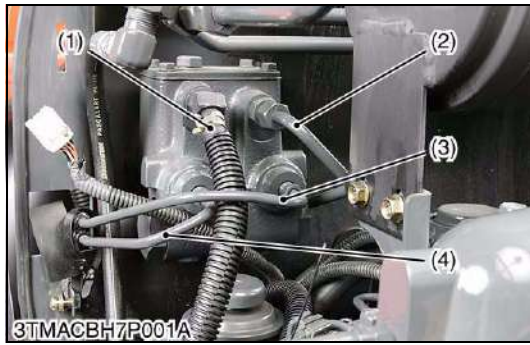
(When reassembling)

- Be sure to assemble the power steering delivery hose to original position.
- After assembling the power steering controller, be sure to adjust the shuttle lever “**Neutral**” position, refer to “4. CHECKING AND ADJUSTING” at “3. TRANSMISSION” section.

Tightening torque	Power steering delivery hose 1 and 2	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Controller pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	Master cylinder delivery pipe joint screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

- (1) Oil Cooler Pipe Retaining Nut (4) Power Steering Delivery Hose 1
 (2) Master Cylinder Delivery Pipe Joint Screw (5) Power Steering Delivery Hose 2
 (3) Shuttle Cable (6) Controller Pipe

W1010629



Pipes for Master Cylinder

1. Disconnect the master cylinder delivery pipe (2) and master cylinder return pipe (1).
2. Disconnect the brake pipe L.H. (4) and R.H. (3) from master cylinder.
3. Remove the brake pipe clamp (5).

IMPORTANT

- After assembling the master cylinder pipes, be sure to bleed the air from brake system. (Refer to "[1] CHECKING AND ADJUSTING" in the "5. BRAKES" section.)

Tightening torque	Master cylinder pipe retaining nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Brake pipe R.H. and L.H. retaining nut	16.0 to 24.0 N·m 1.63 to 2.45 kgf·m 11.8 to 17.7 lbf·ft

- (1) Master Cylinder Return Hose (4) Brake Pipe L.H.
(2) Master Cylinder Delivery Pipe (5) Pipe Clamp
(3) Brake Pipe R.H.

W1010873

Controller

1. Remove the controller mounting screw.
2. Remove the controller (1) to right side.

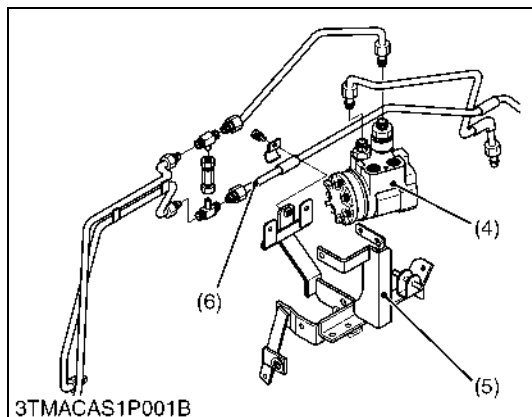
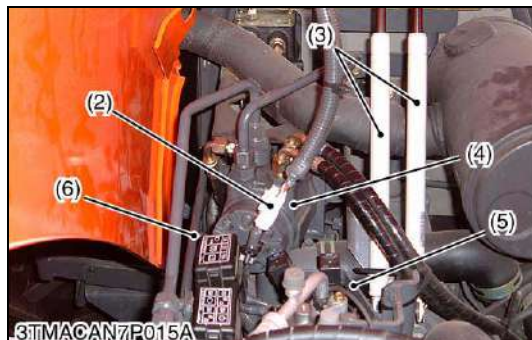
(When reassembling)

- Be sure to fit the controller to the controller support.

- (1) Controller

W1011056

(2) CABIN Model



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connector (2) for head lights.
3. Disconnect the dampers (3).
4. Remove the bonnet (1).

(When reassembling)

- The connector (2) should be placed within the space of controller pipe (6), power steering controller (4) and stay (5).

■ IMPORTANT

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

(1) Bonnet	(4) Power Steering Controller
(2) Connector	(5) Stay
(3) Damper	(6) Controller Pipe

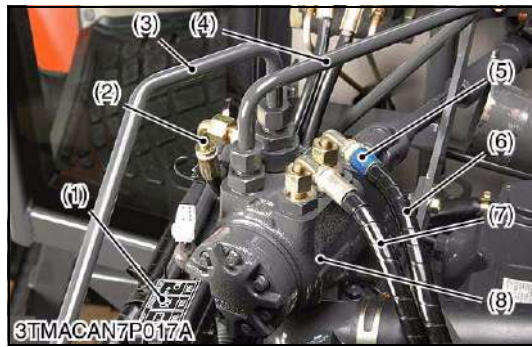
W1015131

Muffler Pipe

1. Remove the muffler pipe (1).

- (1) Muffler Pipe

W1021995



Oil Pipes and Hoses

1. Remove the fuse box (slow blow) (1).
2. Disconnect the power steering delivery hose 1 (6) and 2 (7) from power steering controller (8).
3. Disconnect the controller pipe (4) and oil cooler pipe (3).
4. Remove the master cylinder hose (2).

(When reassembling)

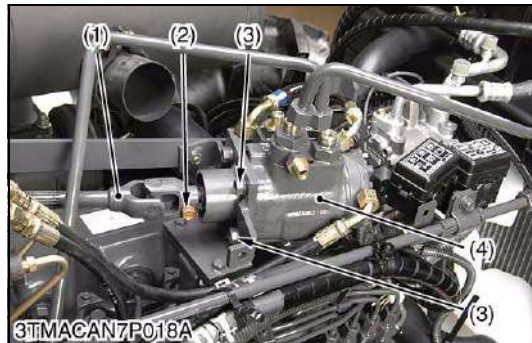
- Be sure to assemble the power steering delivery hose to original position. (The power steering hose with blue tape (6) fix to rear joint.)

Tightening torque	Power steering delivery hose 1 and 2 retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Controller pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	Master cylinder hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

- (1) Fuse Box (Slow Blow)
(2) Master Cylinder Hose
(3) Oil Cooler Pipe
(4) Controller Pipe

- (5) Blue Tape
(6) Power Steering Delivery Hose 1
(7) Power Steering Delivery Hose 2
(8) Controller

W1022208



Controller

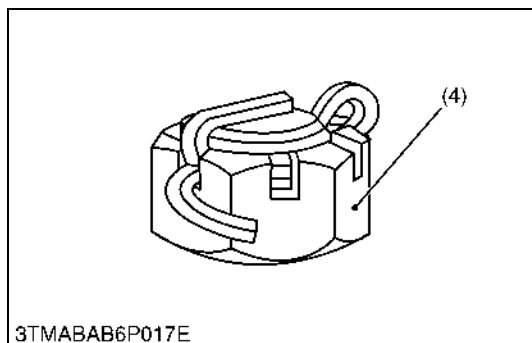
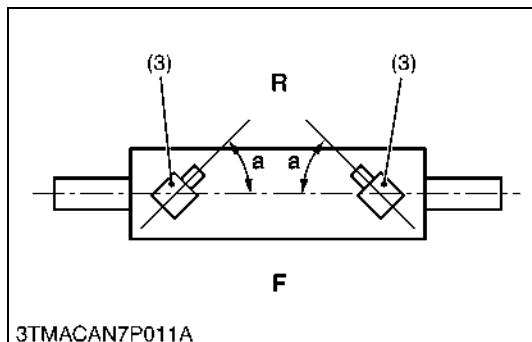
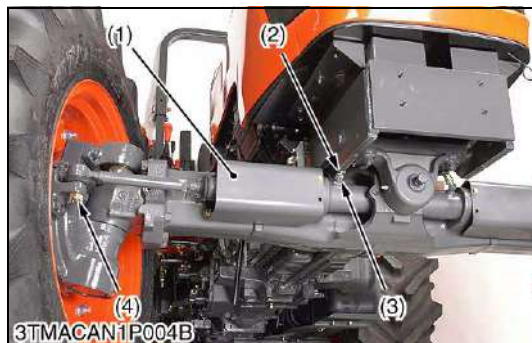
1. Remove the U-joint screw (2) and draw out the U-joint (1) from controller (4).
2. Remove the controller mounting screws (3) and remove the controller (4).

- (1) U-joint
(2) U-joint Screw

- (3) Controller Mounting Screw
(4) Controller

W1022567

[3] REMOVING STEERING CYLINDER



Tie-rod

1. Remove the both cylinder cover (1).
2. Disconnect the both power steering delivery hoses (2) from cylinder.
3. Remove the both hose joints (3) from steering cylinder.
4. Pull out the cotter pin and remove the tie-rod end slotted nuts (4).
5. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(When reassembling)

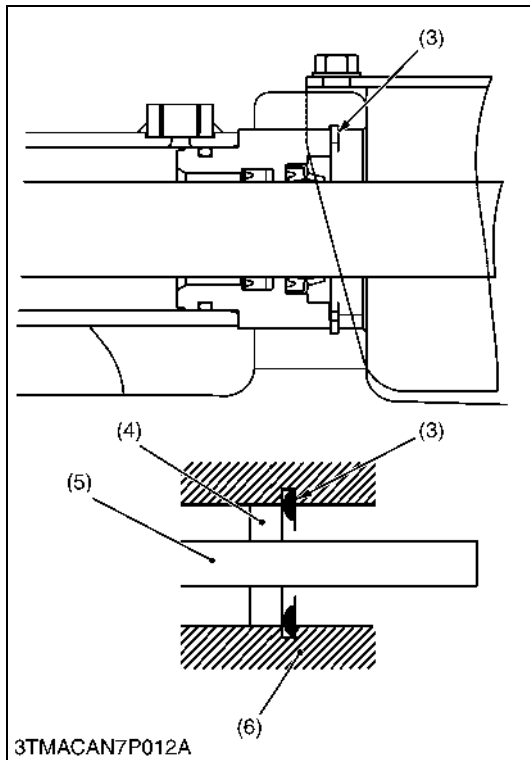
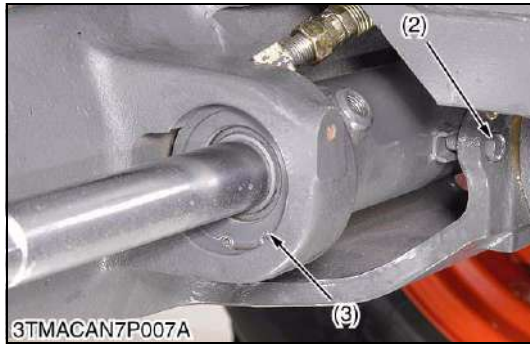
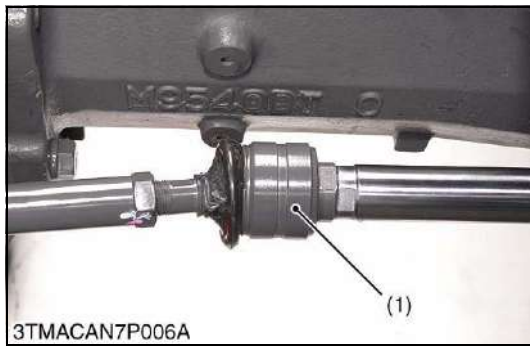
- Apply teflon tape to joint and set the joint as shown in figure.
- Connect the power steering delivery hose with blue tape to the R.H..
- Replace cotter pin with a new one.
- After tightening the tie-rod end nut to the specified torque, install a cotter pin as shown in the figure left.
- After assembling the power steering cylinder and tie-rod, check the toe-in and adjust it if necessary.

Tightening torque	Power steering delivery hose	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Tie-rod end slotted nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft
	Hose joint	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
Toe-in	Factory spec.	2.0 to 8.0 mm 0.078 to 0.315 in.

- (1) Cylinder Cover
- (2) Power Steering Delivery Hose
- (3) Hose Joint
- (4) Slotted Nut

F : Front
R : Rear
a : 0.79 rad (45 °)

W1011235



Steering Cylinder

1. Remove the both tie-rod joint (1).
2. Remove the internal circlip (3) and set screw (2).
3. Draw out the steering cylinder to the right.

(When reassembling)

- Apply liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.
- When reassembling internal circlip (3), should be positioned so that sharp edge face to outward as shown in the figure.

Tightening torque	Tie-rod joint	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 lbf·ft

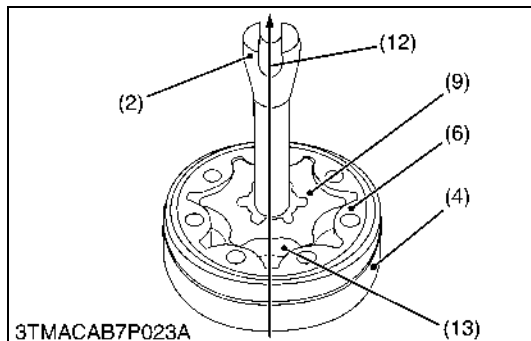
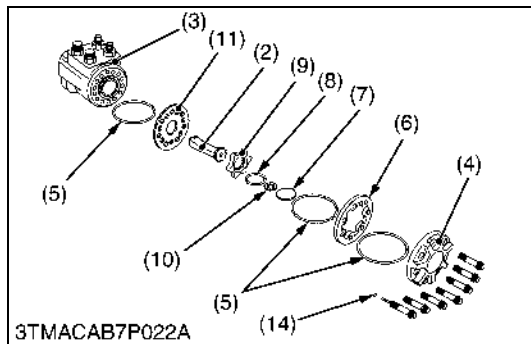
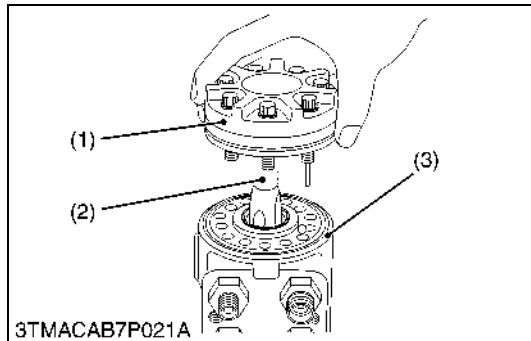
- (1) Tie-rod Joint
(2) Set Screw
(3) Internal Circlip

- (4) Cylinder
(5) Cylinder Rod
(6) Front Axle Case

W1011578

[4] DISASSEMBLING AND ASSEMBLING

(1) Steering Controller



Removing Gerotor

1. Secure the housing (3) in a vise and remove seven gerotor mounting screws and gerotor assembly (1).
2. Remove the distributor plate (11) and driven shaft (2).
3. Remove the rotor (9), O-ring (5) between the distributor plate and stator (6).
4. Take out the spacer ring (10) and spacer (7).
5. Remove the O-ring (8) from the rotor (9).

(When reassembling)

1. Fit an O-ring into the groove of the end cap (4), and insert 2 or 3 bolts.
2. Fit an O-ring into the groove of the stator (6), and put it on the end cap, with the O-ring upward.
3. Apply clean transmission fluid (specified fluid) to the rotor (9), fit an O-ring (8) into the groove of the rotor and put the spacer on it. Keeping the spacer on the rotor, fit it into the stator (6) with the spline bevelled side upward.
4. After putting the spacer into the rotor (9), insert the splines of driven shaft (2) into the rotor (9), aligning the direction of drive shaft pin groove (12) with the rotor tooth bottom (13).
5. Fit an O-ring into the groove of the housing (3).
Fit the pin groove of the driven shaft (2) to the dowel pin inside the housing.

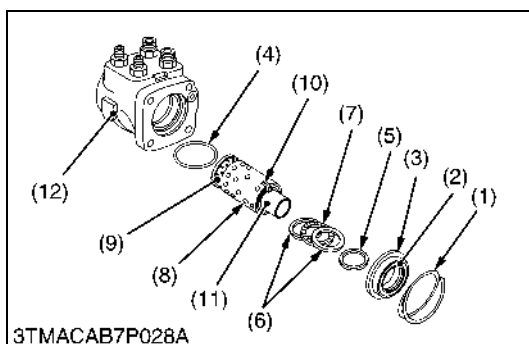
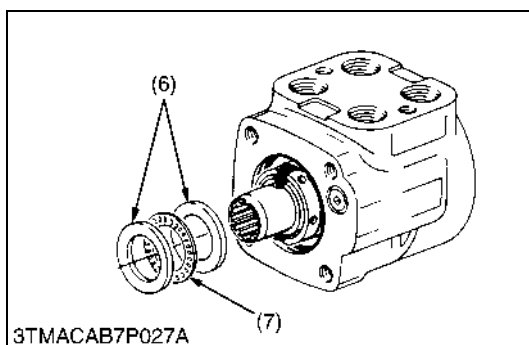
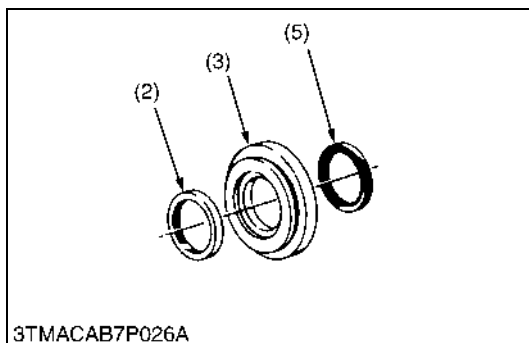
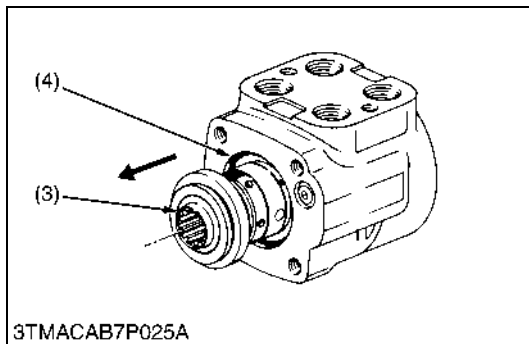
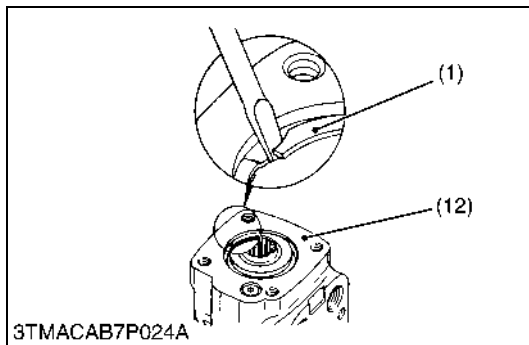
■ IMPORTANT

- Be sure to align the direction of the drive shaft pin groove (12) with the rotor tooth bottom (13).

Tightening torque	Gerotor assembly mounting screw (5/16")	25.5 to 28.4 N·m 2.6 to 2.9 kgf·m 18.8 to 21.0 lbf·ft

(1) Gerotor Assembly	(8) O-ring
(2) Driven Shaft	(9) Rotor
(3) Housing	(10) Spacer Ring
(4) End Cap	(11) Distributor Plate
(5) O-ring	(12) Direction Pin Groove
(6) Stator	(13) Rotor Tooth Bottom
(7) Spacer	(14) Ball

W1015327



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.**

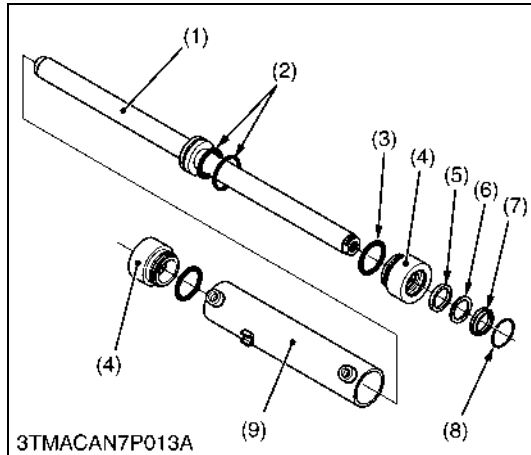
(When reassembling)

- 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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(2) Disassembling Steering Cylinder



Steering Cylinder (4WD Model)

1. Draw out the cylinder head (4).
2. Draw out the cylinder rod (1).

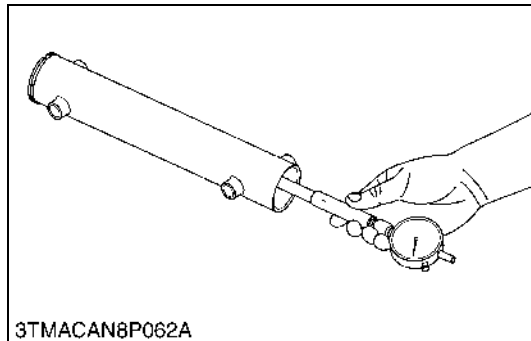
(When reassembling)

- Apply transmission fluid to the O-ring (3), rod seal (5) and inside of cylinder tube (9).

(1) Cylinder Rod	(6) Backup Ring
(2) Piston Seal	(7) Dust Seal
(3) O-ring	(8) Internal Circlip
(4) Cylinder Head	(9) Cylinder Tube
(5) Rod Seal	

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[5] SERVICING

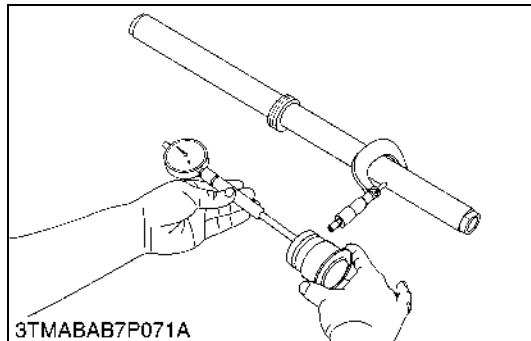


Steering Cylinder I.D.

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceeds the allowable limit, replace the cylinder barrel.

Steering cylinder I.D.	Factory spec.	55.000 to 55.074 mm 2.16535 to 2.16827 in.
	Allowable limit	55.100 mm 2.16929 in.

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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.	0.010 to 0.140 mm 0.00039 to 0.00551 in.
	Allowable limit	0.250 mm 0.00984 in.

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8 HYDRAULIC SYSTEM

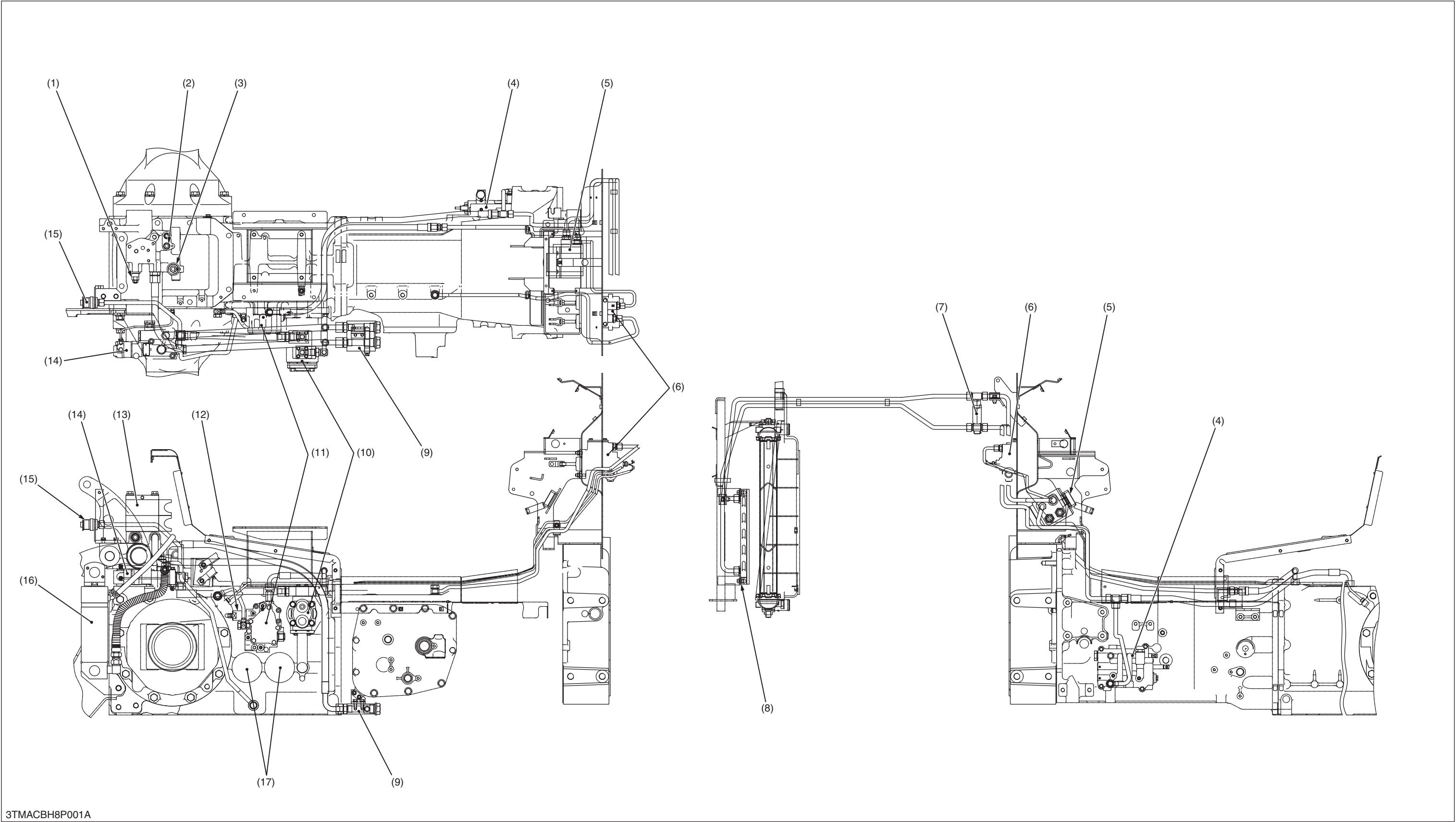
MECHANISM

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1. STRUCTURE

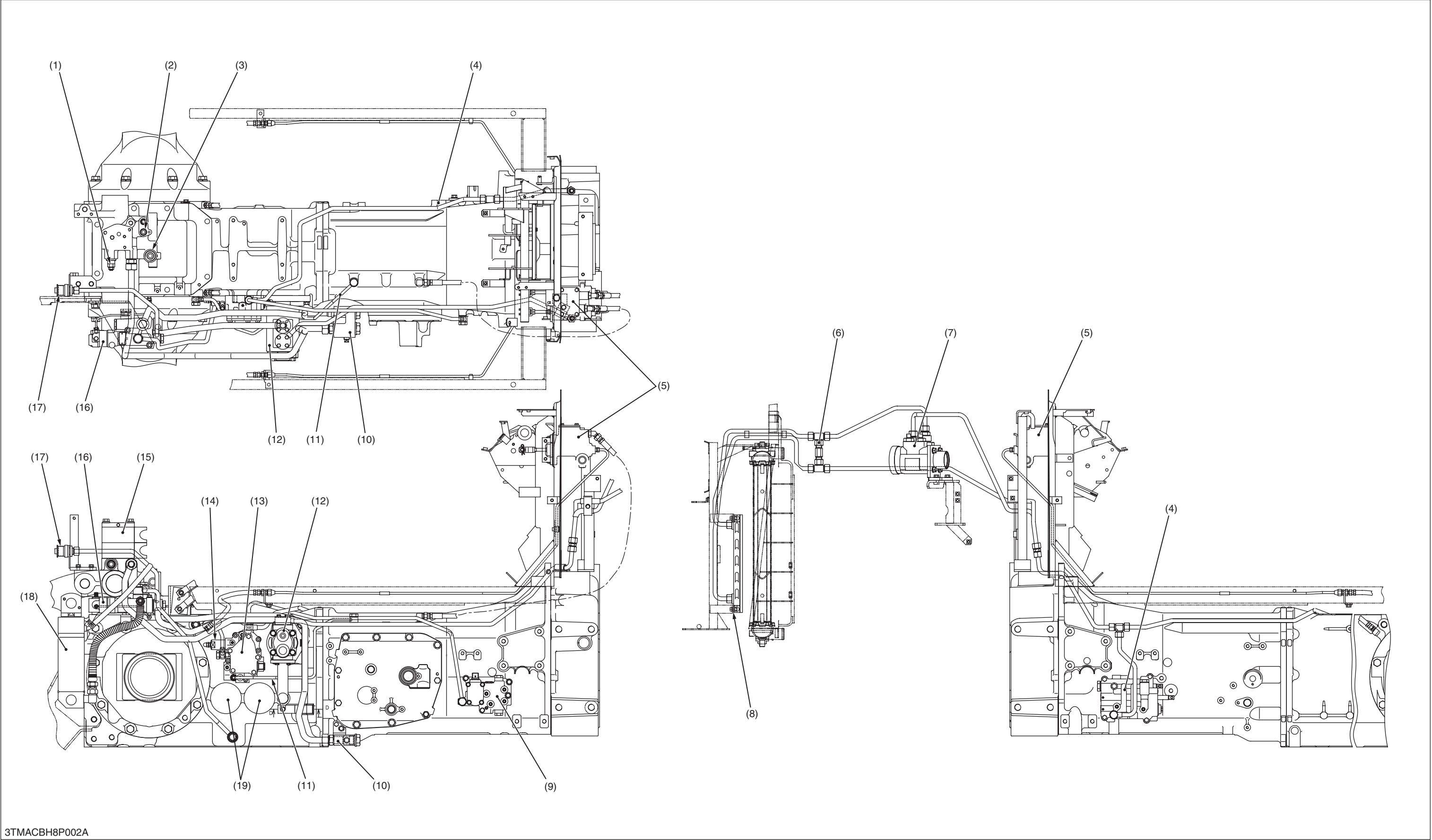
[1] ROPS MODEL



3TMACBH8P001A

(1) Relief Valve (3-Point Lifting Linkage)	(3) Cylinder Safety Valve	(6) Brake Master Cylinder	(8) Oil Cooler	(11) Solenoid Valve Assembly (PTO, 4WD, Differential Lock)	(13) Auxiliary Control Valves	(15) Trailer Brake Outlet Coupler	(17) Oil Filter
(2) Lowering Speed Adjusting Valve	(4) Shuttle Valve	(7) Oil Cooler Relief Valve	(9) Hydraulic Outlet	(12) Relief Valve (System Pressure)	(14) Trailer Brake Valve	(16) Hydraulic Cylinder	

[2] CABIN MODEL



(1) Relief Valve (3-Point Lifting Linkage)	(3) Cylinder Safety Valve	(6) Oil Cooler Check Valve	(9) Hi-Lo Dual Speed Valve	(11) Return Pipe (F36/R36 Speed Transmission Model)	(13) Solenoid Valve Assembly (PTO, 4WD, Differential Lock)	(15) Auxiliary Control Valve	(17) Trailer Brake Outlet Coupler
(2) Lowering Speed Adjusting Valve	(4) Shuttle Valve	(7) Power Steering Controller	(10) Hydraulic Outlet	(12) Hydraulic Pump	(14) Relief Valve (System Pressure)	(16) Trailer Brake Valve	(18) Hydraulic Cylinder
	(5) Brake Master Cylinder	(8) Oil Cooler					(19) Oil Filter

The hydraulic system of the M8540 and M9540 tractor is composed of a 3-point hitch, remote hydraulic control for implements, power steering, PTO clutch, shuttle clutch, 4WD, rear differential lock, Hi-Lo dual speed (F36/R36 speed transmission model) and hydraulic brakes shown above.

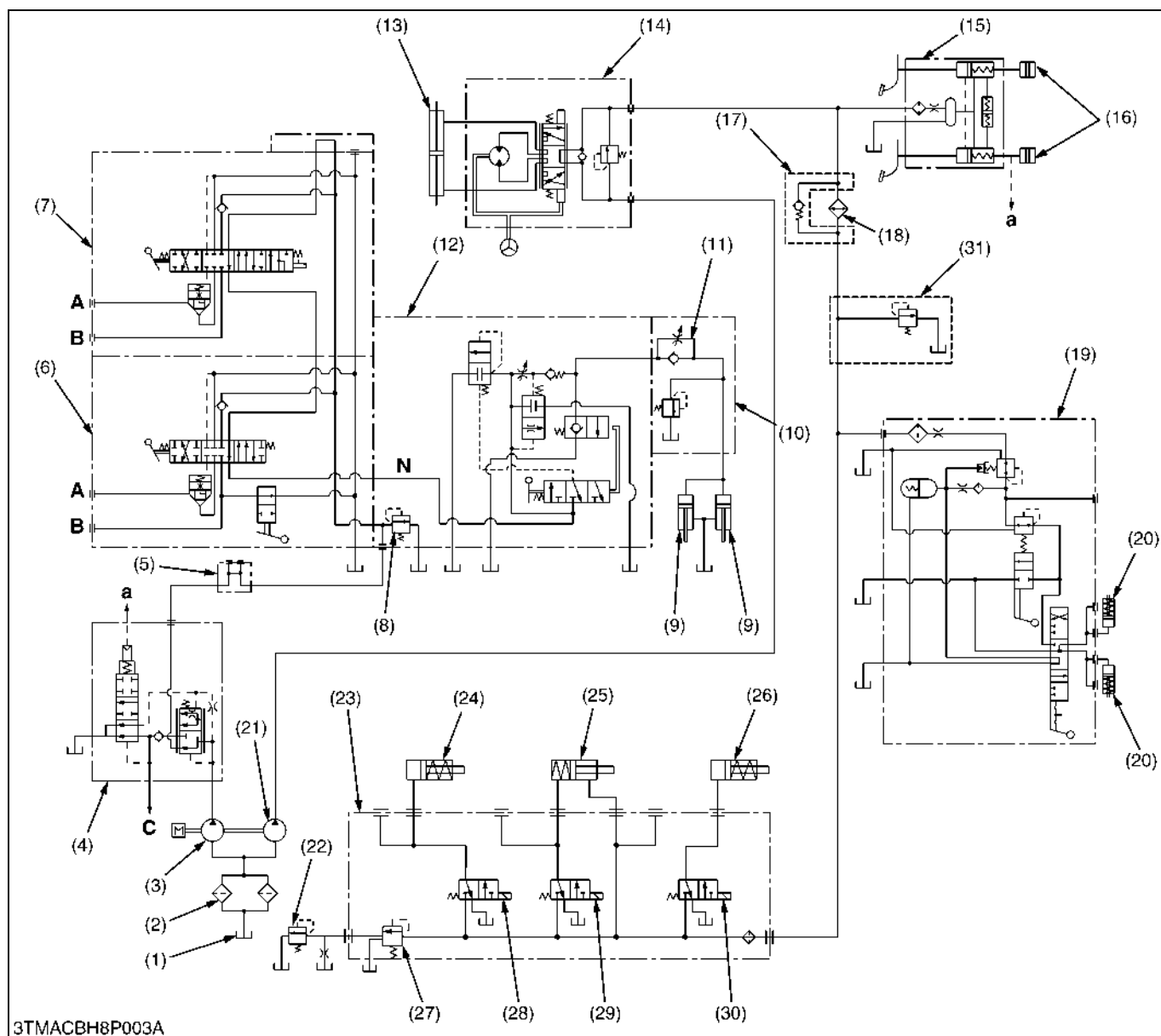
This system has the following functions.

1. Raise and lower implements connected to the 3-point hitch with external hydraulic cylinders. The hydraulic lift is subject to position control and draft control (mixed) control.
2. Draw hydraulic power from auxiliary control valve to operate implement hydraulic cylinders.
 - Implements with double acting cylinders can easily receive, hydraulic power drawn from the quick coupler.
 - Auxiliary control permits simultaneous operation of implements powered by hydraulic pressure along with operation of 3-point hitch.
 - Oil flow from 3-point hitch pump can be connected with oil flow from auxiliary control valve.
 - Hydraulic oil flow is 64.3 L/min (17.0 U.S.gal/min, 14.1 Imp.gal/min).
 - Operating pressure is 19.6 MPa (200 kgf/cm², 2847 psi).
 - Maximum of three remote valves or 2 valves with a flow control valve.
3. Hydraulic oil flow for power steering, shuttle, PTO, 4WD, rear differential lock and Hi-Lo dual speed (F36/R36 speed transmission model) is 21.3 L (5.63 U.S.gal/min, 4.69 Imp.gal/min.).
4. Operation of power steering through the steering controller, refer to "7. STEERING" section in this workshop manual.
5. Operation of hydraulic PTO clutch, refer to "2. CLUTCH" section in this workshop manual.
6. Operation of hydraulic shuttle, refer to "3. TRANSMISSION" section in this workshop manual.
7. Operation of trailer brake, refer to "5. BRAKES" section in this workshop manual.
8. Operation of auxiliary control valve, refer to "8. HYDRAULIC SYSTEM" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

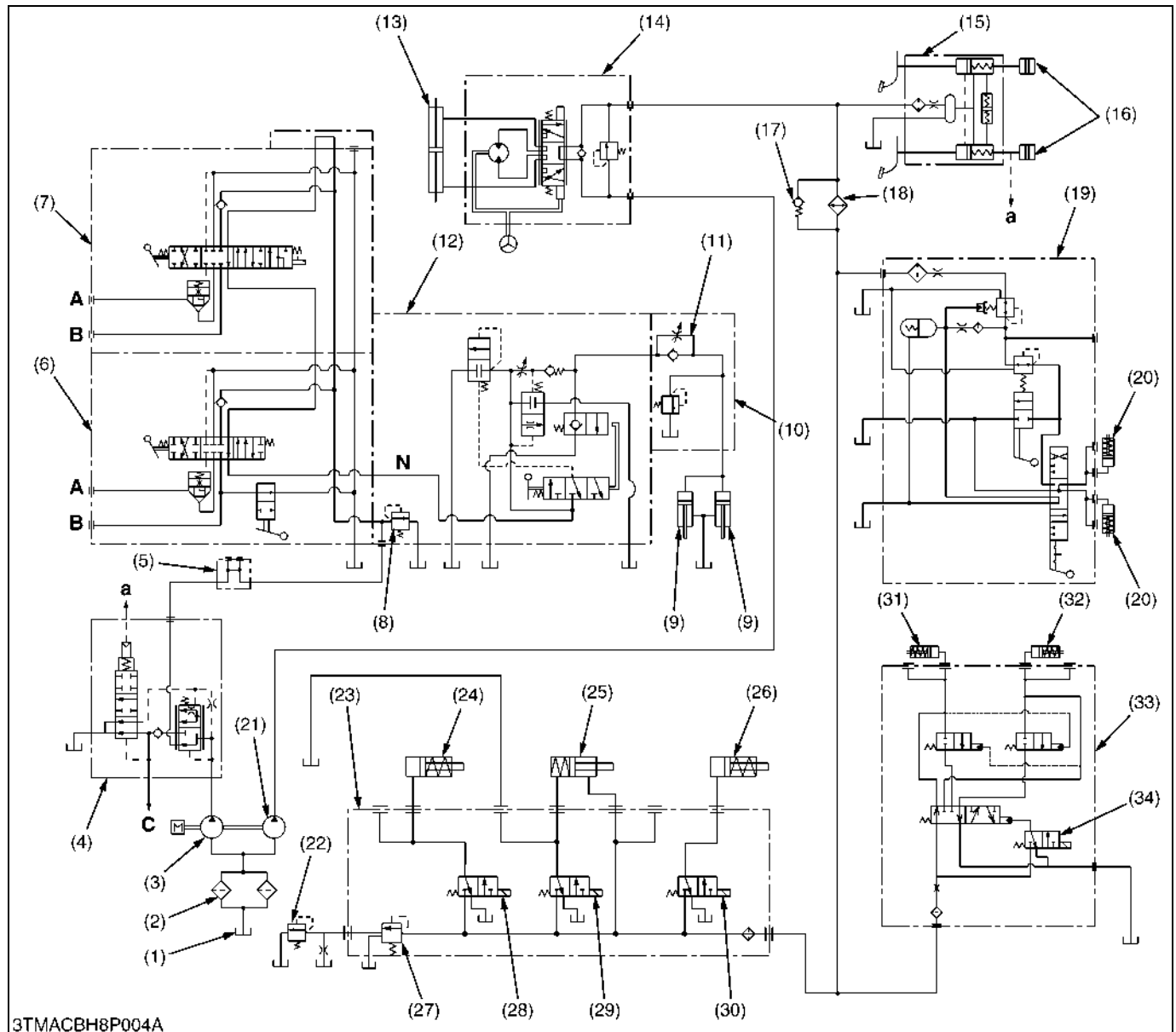
2. HYDRAULIC CIRCUIT

[1] TOTAL HYDRAULIC CIRCUIT

(1) F18/R18 Speed Transmission Model

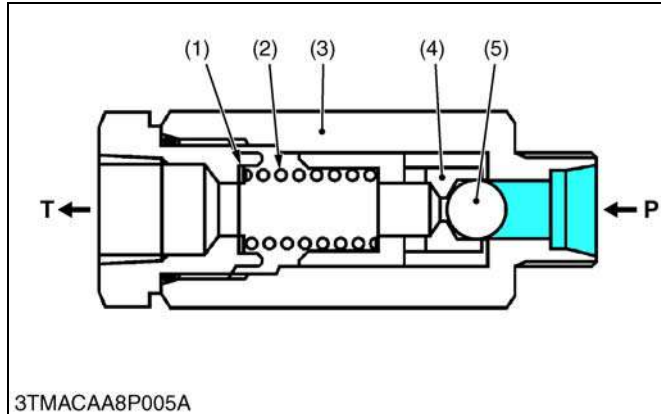


(1) Oil Tank (Transmission Case)	(12) Control Valve (for 3-point)	(22) Relief Valve (for Lubricating Line)	(31) Oil Cooler Relief Valve (ROPS Model)
(2) Hydraulic Oil Filter Cartridge	(13) Steering Cylinder	(23) Solenoid Valve Assembly	a : Pilot Line
(3) Hydraulic Pump (for 3-point)	(14) Power Steering Controller	(24) PTO Clutch Pack	A : To Implement Cylinder
(4) Trailer Brake	(15) Brake Master Cylinder	(25) 4WD Clutch Pack	B : To Implement Cylinder
(5) Hydraulic Outlet	(16) Brake Piston	(26) Rear Differential Lock Piston	C : To Trailer Coupler
(6) Auxiliary Control Valve (S/D)	(17) Oil Cooler Check Valve (Cabin Model)	(27) Relief Valve (for System)	N : N Port
(7) Auxiliary Control Valve (SCD)	(18) Oil Cooler	(28) Solenoid Valve (PTO)	
(8) Relief Valve for 3-point	(19) Shuttle Valve	(29) Solenoid Valve (4WD)	
(9) Exterior Hydraulic Cylinder	(20) Shuttle Clutch Pack	(30) Solenoid Valve (Rear Differential Lock)	
(10) Cylinder Safety Valve	(21) Hydraulic Pump (Power Steering and System Line)		
(11) Lowering Speed Adjusting Valve			

(2) F36/R36 Speed Transmission Model

(1) Oil Tank (Transmission Case)	(12) Control Valve (for 3-point)	(22) Relief Valve (for Lubricating Line)	(31) Clutch Pack (Hi)
(2) Hydraulic Oil Filter Cartridge	(13) Steering Cylinder	(23) Solenoid Valve Assembly	(32) Clutch Pack (Lo)
(3) Hydraulic Pump (for 3-point)	(14) Power Steering Controller	(24) PTO Clutch Pack	(33) Hi-Lo Dual Speed Valve
(4) Trailer Brake	(15) Brake Master Cylinder	(25) 4WD Clutch Pack	(34) Solenoid Valve (Dual Speed)
(5) Hydraulic Outlet	(16) Brake Piston	(26) Rear Differential Lock Piston	
(6) Auxiliary Control Valve (S/D)	(17) Oil Cooler Check Valve (Cabin Model)	(27) Relief Valve (for System)	
(7) Auxiliary Control Valve (SCD)	(18) Oil Cooler	(28) Solenoid Valve (PTO)	
(8) Relief Valve for 3-point	(19) Shuttle Valve	(29) Solenoid Valve (4WD)	
(9) Exterior Hydraulic Cylinder	(20) Shuttle Clutch Pack	(30) Solenoid Valve (Rear Differential Lock)	
(10) Cylinder Safety Valve	(21) Hydraulic Pump (Power Steering and System Line)		
- a : Pilot Line**
A : To Implement Cylinder
B : To Implement Cylinder
C : To Trailer Coupler
N : N Port

[2] OIL COOLER RELIEF VALVE (ROPS MODEL)



The oil cooler relief valve is located on the right hand side of the engine.

This valve uses 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 engine starting.

If pressure in the oil cooler line becomes too great, oil pressure forces the ball (5) off the seat of valve body (3), compressing the coil spring (2) and allows oil to flow to the transmission case through the T port.

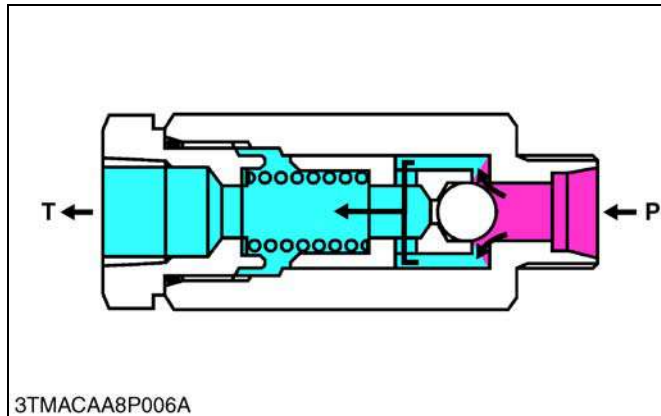
(Reference)

- Oil cooler relief valve setting pressure.
4.4 to 4.9 MPa
45 to 50 kgf/cm²
640 to 711 psi

- (1) Shim
- (2) Spring
- (3) Valve Body
- (4) Poppet
- (5) Ball

P : P Port (From Power Steering Controller)

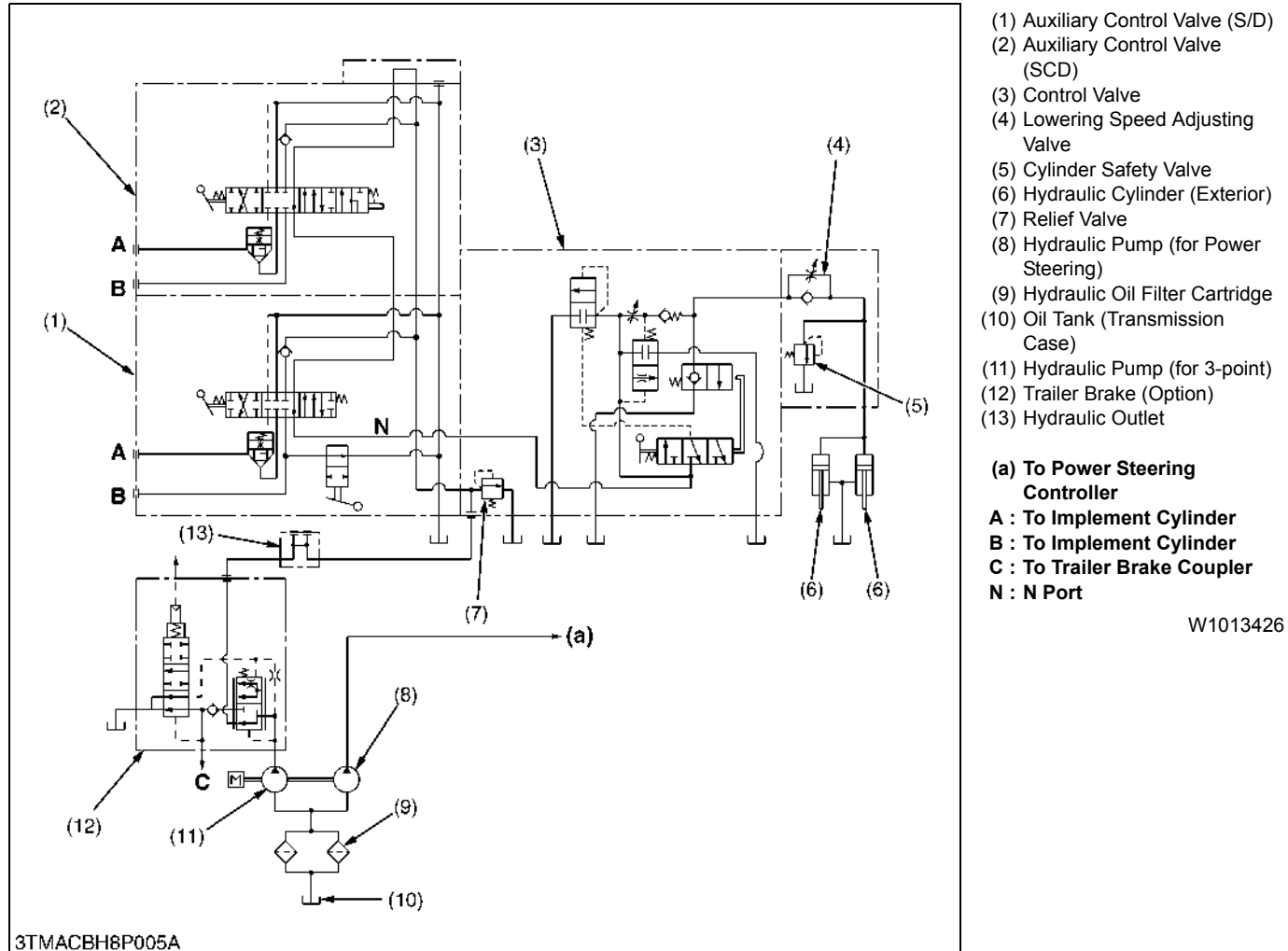
T : Tank Port (To Transmission Case)



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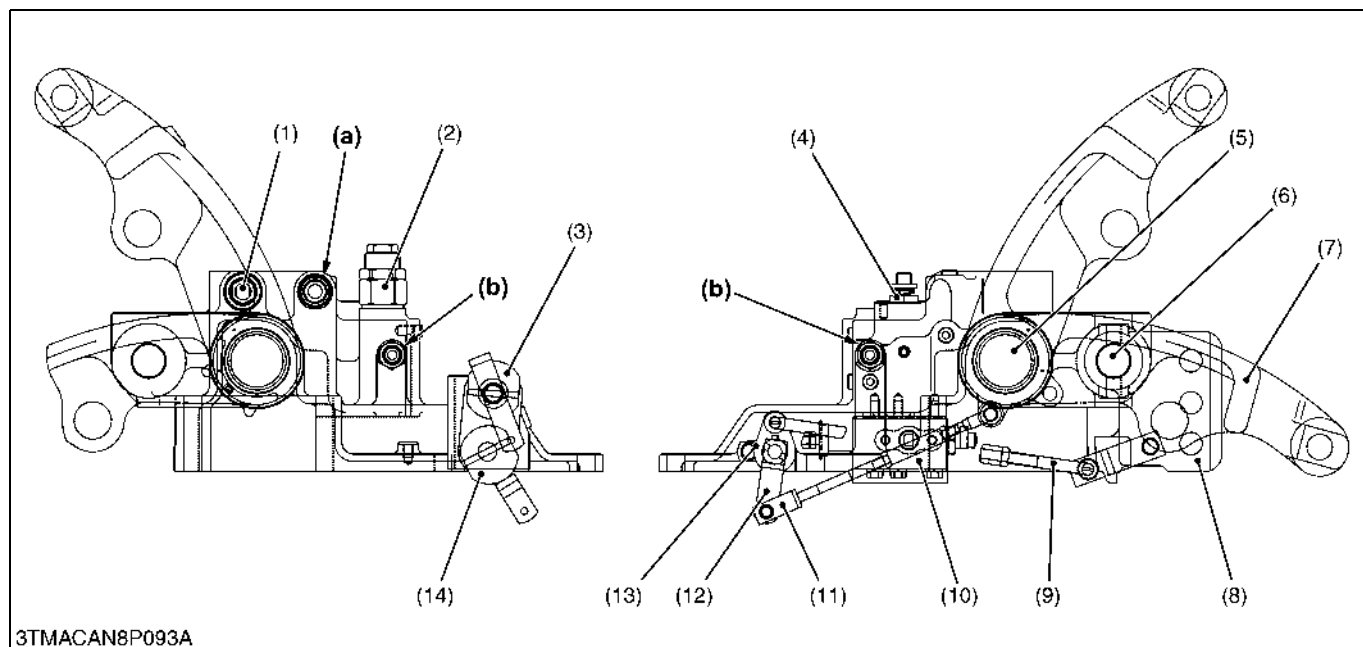
3. THREE POINT HITCH HYDRAULIC SYSTEM

[1] HYDRAULIC CIRCUIT



- When the engine is started, the hydraulic pump (11) is rotated to draw oil from transmission case (10) through the suction pipe.
Supplied oil is filtered by the hydraulic oil filter cartridge (9).
- Filtered oil is forced out by the hydraulic pump to the auxiliary control valve (1) through the hydraulic outlet (13).
- With the auxiliary control valve (1) and (2) in neutral position, oil is channeled from “N” port to the control valve (3).
- The hydraulic system has a relief valve (7) which restricts the maximum pressure in the circuit.
The hydraulic cylinders (6) have a cylinder safety valve (5) to relieve shock pressure due to heavy implement bounce.
- The control valve (3) is actuated by the mechanical linkage for “**Position control**” or “**Draft control**” or both “**Mix control**” (combining position control with draft control).

[2] HYDRAULIC BLOCK



(1) Relief Valve	(5) Hydraulic Arm Shaft	(10) Control Valve	(a) From Hydraulic Pump
(2) Cylinder Safety Valve	(6) Torsion Bar	(11) Position Feedback Rod	(b) To or From Hydraulic Cylinder
(3) Draft Control Linkage	(7) Lift Arm	(12) Position Feedback Link	
(4) Lowering Speed Adjusting Valve	(8) Top Link Bracket	(13) Draft Feedback Link	
	(9) Draft Feedback Rod	(14) Position Control Linkage	

The hydraulic block is equipped with cylinder safety valve (2), relief valve (1), lowering speed adjusting valve (4), check valve, control valve (10), lift arm (7), lift arm shaft (5), torsion bar (6), position feedback rod (11) and draft feedback rod (9) etc.

The hydraulic outlet port (b) is located in the hydraulic block to take power from the tractor to operate the hydraulic cylinders of the 3-point linkage.

1. To operate the control valve, refer to "8. HYDRAULIC SYSTEM / (7) Position Control Valve - Type 7" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).
2. To operate the relief valve operation, refer to "8. HYDRAULIC SYSTEM / 4. RELIEF VALVE / [2] PILOT OPERATED TYPE" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).
3. To operate the cylinder safety valve (surge relief valve) operation, refer to "8. HYDRAULIC SYSTEM / 7. CYLINDER SAFETY VALVE (SURGE RELIEF VALVE)" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

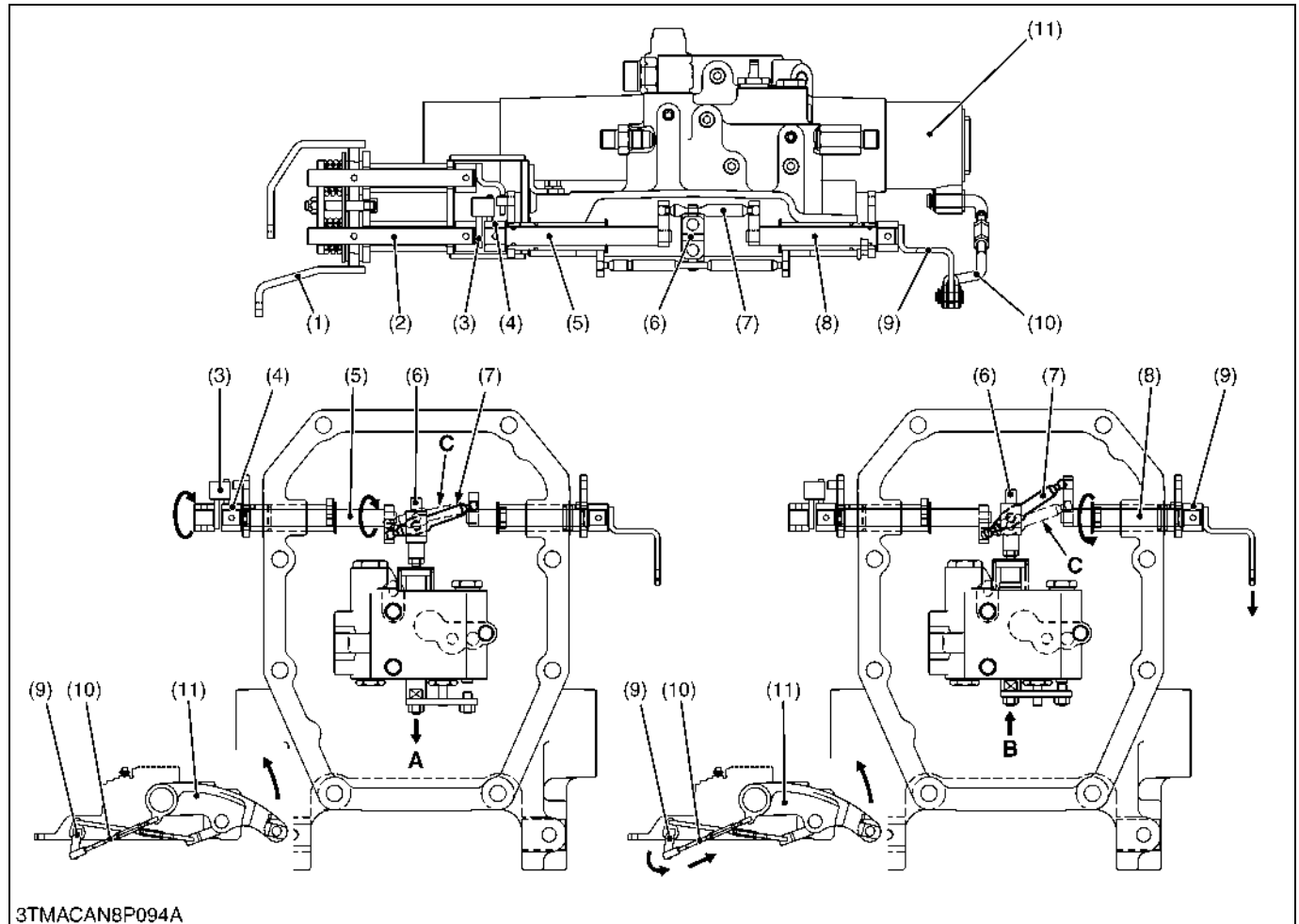
[3] LINKAGE MECHANISM

(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



- (1) Position Control Lever
- (2) Position Lever Shaft 1
- (3) Position Link 1
- (4) Position Link 2

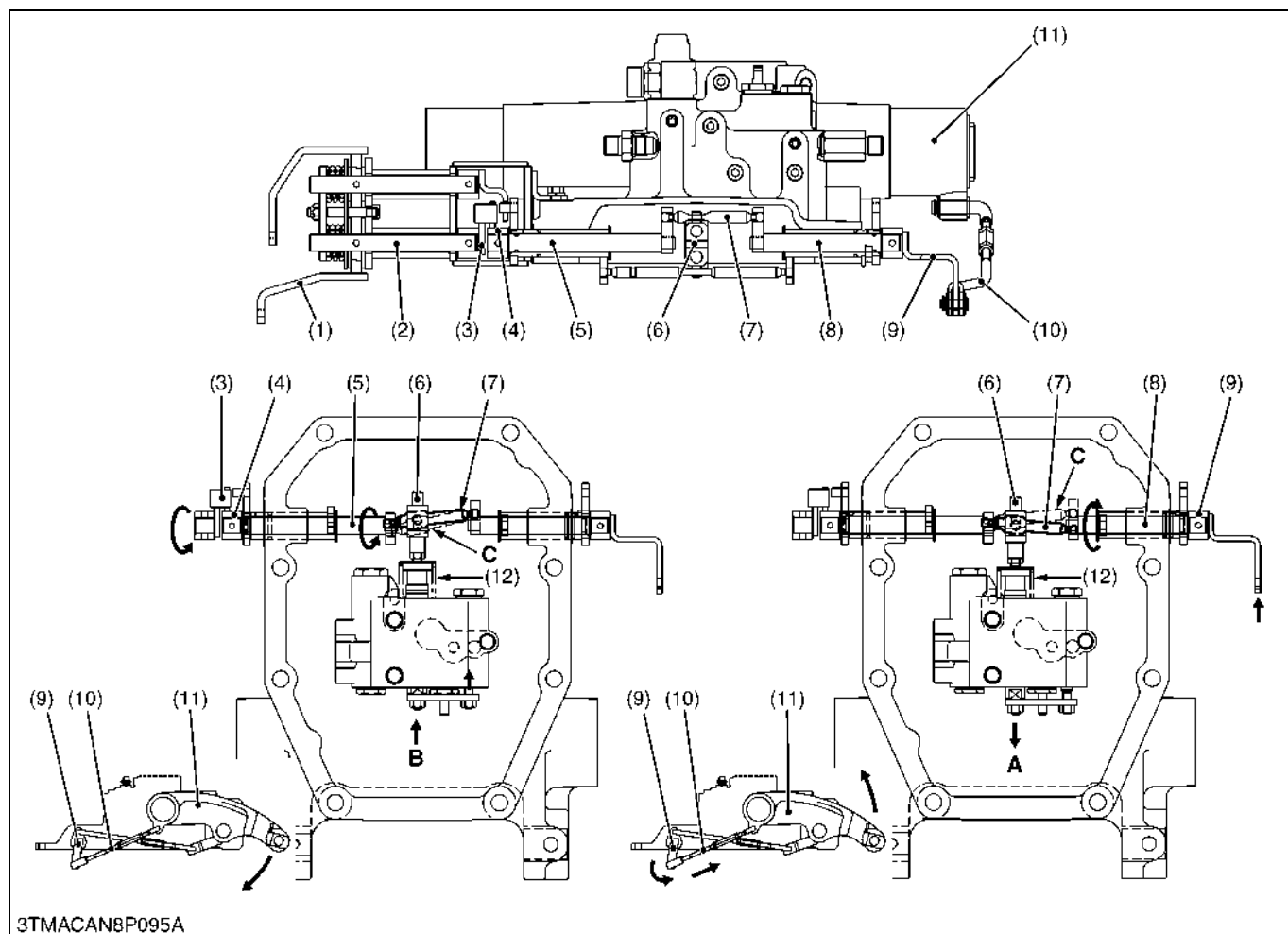
- (5) Position Lever Shaft 2
- (6) Spool
- (7) Spool Drive Lever (Position)
- (8) Position Feedback Shaft

- (9) Position Feedback Lever
- (10) Position Feedback Rod
- (11) Lift Arm

- A : LIFT**
- B : DOWN**
- C : Neutral Position**

1. When the position control lever (1) is moved to the “LIFT” position, the position lever shaft 1 (2) and position link 1 (3) rotates and press down the position link 2 (4).
The position lever shaft 2 (5) rotates and pushes the spool (6) by the spool drive lever (7), opening the “LIFT” circuit.
2. When the lift arm (11) moves upward, position feedback shaft (8) rotates via position feedback rod (10) and pulls the spool (6) by the spool drive lever (7).
The lift arm stops when the spool (6) returns to the neutral position (C).

■ Down



(1) Position Control Lever
 (2) Position Lever Shaft 1
 (3) Position Link 1
 (4) Position Link 2

(5) Position Lever Shaft 2
 (6) Spool
 (7) Spool Drive Lever (Position)
 (8) Position Feedback Shaft

(9) Position Feedback Lever
 (10) Position Feedback Rod
 (11) Lift Arm
 (12) Spring

A : LIFT
B : DOWN
C : Neutral Position

1. When the position control lever (1) is moved to the **“DOWN”** position, the position link 2 (4) is free.
 The spool (6) of control valve moves by spool spring (12) to opening the **“DOWN”** circuit.
2. When the lift arm (11) moves downward, feedback shaft (8) rotates via position feedback rod (10) and push the spool (6) by the spool drive lever (7).
 The lift arm stops when the spool returns to the neutral position (C).

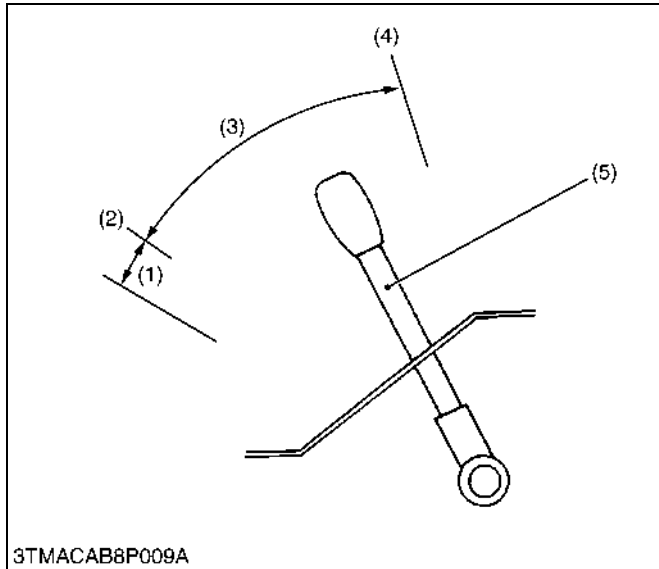
(2) Draft Control

Draft control is a system which maintains 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.



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 (1), the implement lowers to the ground.
2. When the draft control lever is positioned in the draft control range (3), 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)

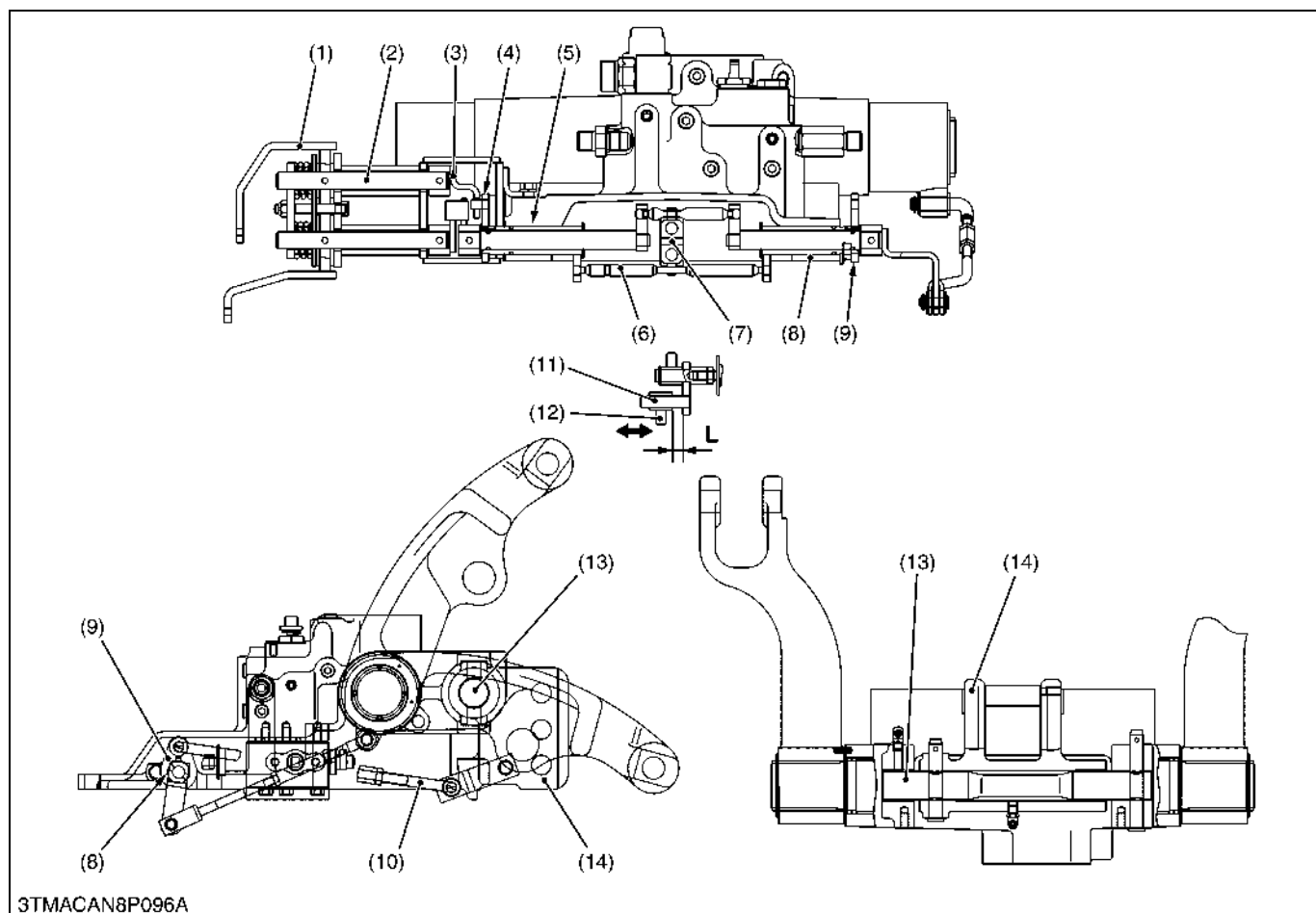
- When the draft control is used, the position control lever should be set at “**FLOATING**” range.
- If the position control lever is set at working range, both control systems operate performing mix control system. (Refer to “**(3) Mixed Control**”.)

- (1) Floating Range
- (2) Deep
- (3) Draft Control Range

- (4) Shallow
- (5) Draft Control Lever

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■ Draft Control Operation



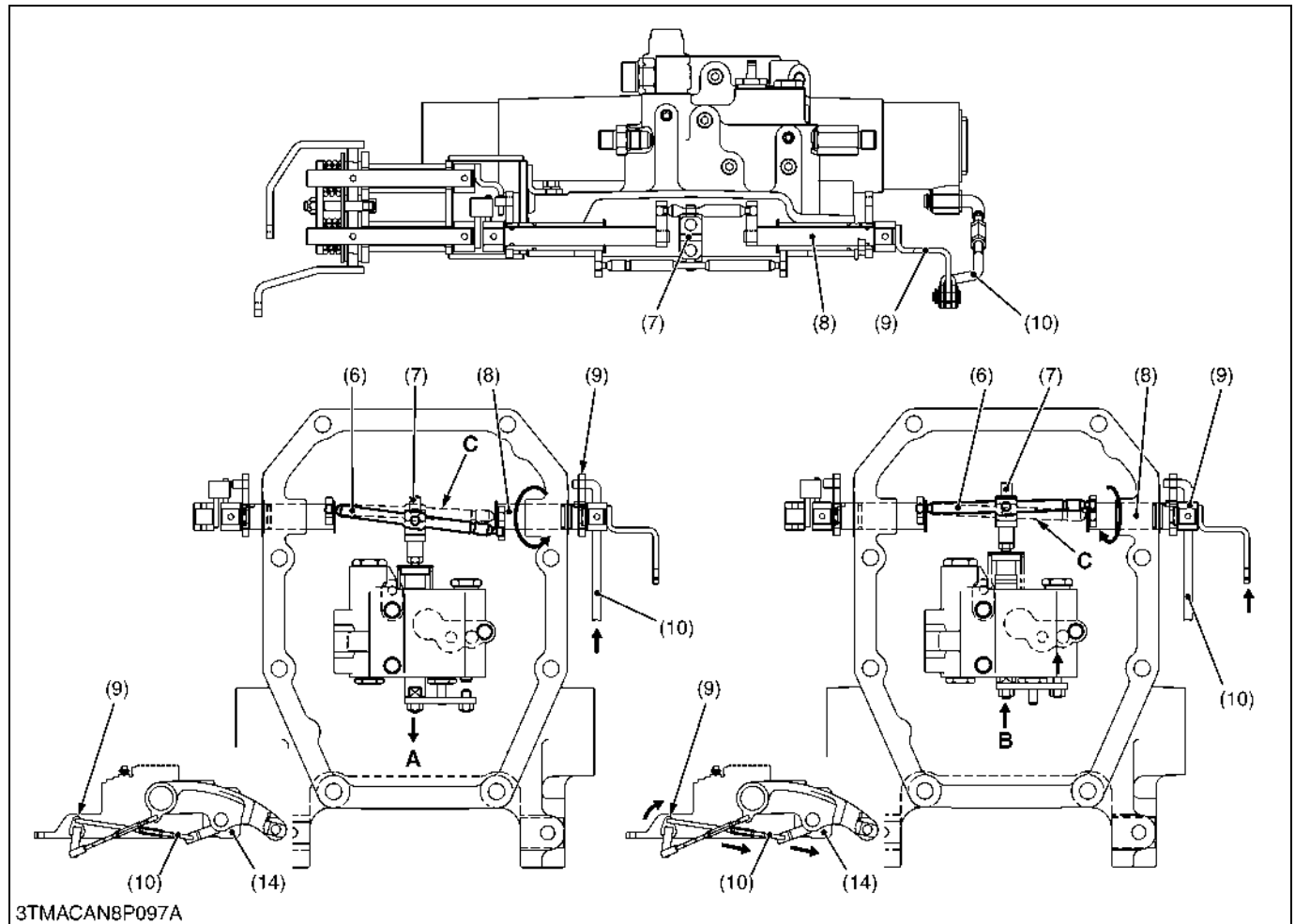
(1) Draft Control Lever	(5) Draft Link Shaft	(9) Draft Feedback Lever	(13) Torsion Bar
(2) Draft Lever Shaft	(6) Spool Drive Lever (Draft)	(10) Draft Feedback Rod	(14) Top Link Holder
(3) Draft Lever	(7) Spool	(11) Spool Shaft	
(4) Draft Link	(8) Draft Feedback Link Shaft	(12) Spool Link	
- L : Clearance**

1. The traction load applied to the tractor from the implement act as a torsional force to the torsion bar (13) via the top link and top link holder (14). When the torsion bar (13) is twisted, its displacement is transmitted to the draft feedback link shaft (8) to rotate via the draft feedback rod (10) and draft feedback lever (9). The draft feedback link shaft (8) rotates. The end of the spool drive lever (6) is connected to the draft feedback link shaft (8) and the other end is fixed with the draft link shaft (5), pulling out or pushing in the spool (7) by the rotation of the draft link shaft (5).

The angle of the draft link shaft (5) is controlled by the draft control lever (1).

The angle of the draft link shaft (5) slides the spool link (12) on the spool shaft (11). This sliding motion changes clearance (L) and draft sensibility.

■ Draft Control Operation (Continued)



(6) Spool Drive Lever (Draft)
(7) Spool

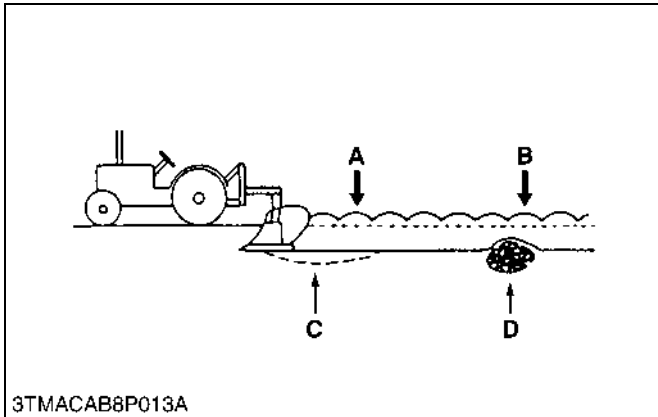
(8) Draft Feedback Link Shaft
(9) Draft Feedback Lever

(10) Draft Feedback Rod
(14) Top Link Holder

A : LIFT
B : DOWN
C : Neutral Position

- When the traction load increases, the torsion bar is twisted, and its displacement is transmitted to the draft feedback link shaft (8) via the draft feedback rod (10) and draft feedback lever (9). The draft feedback link shaft (8) rotates.
The draft feedback link shaft (8) pushes the spool (7) in via the spool drive lever (6) and the **“LIFT”** circuit is activated.
As the implement is raised and the traction load decreases, the torsion bar is restored to return the spool (7) to neutral point (C).
- When the traction load decreases, the torsion bar is restored and its displacement is transmitted to the draft feedback link shaft (8) via the draft feedback rod (10) and draft feedback lever (9). As the draft feedback link shaft (8) rotates, the spool drive lever (6) pulls the spool (7) to form the **“DOWN”** circuit.
As the implement lowers and the traction load increases, the torsion bar is twisted to return the spool (7) to neutral position (C).

(3) Mixed Control



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.

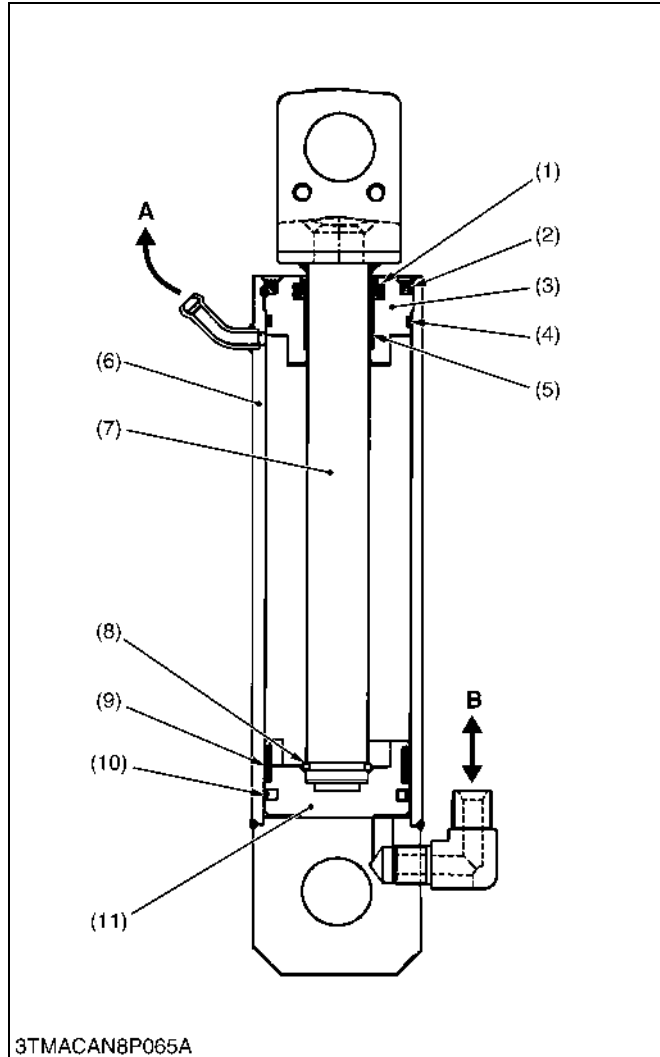
The mixed control serves to eliminate such disadvantages.

A : Position Controlled
B : Draft Controlled
C : Not Deep Even in Soft Soil

D : Shallow where Resistance Occurs

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[4] HYDRAULIC CYLINDER



The external type hydraulic cylinders are used for 3-point linkage system. This hydraulic cylinder is single acting type, and it is installed directly between hydraulic lift arms.

The main components of the hydraulic cylinder are shown in the figure.

(1) Dust Seal	(9) Wear Ring
(2) Circlip	(10) Seal
(3) Head	(11) Piston
(4) O-ring	
(5) Bushing	
(6) Cylinder Tube	
(7) Rod	
(8) Circlip	

A : To Transmission Case
B : To or From Position
Control Valve

W1015282

SERVICING

CONTENTS

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Raise (Not Noise)	Control linkage improperly assembled or damaged	Repair or replace	8-S24
	Control valve malfunctioning (unload valve, spool, check valve, poppet valve)	Repair or replace	8-S28
	Control valve broken	Replace	8-S28
	Control valve improperly adjusted	Adjust	8-S28
	Relief valve spring damaged	Replace	8-S31
	Cylinder damaged	Replace	8-S30
	Safety valve damaged	Replace	8-S32
Implement Does Not Raise (Noise)	Transmission fluid improper or insufficient	Change or replenish	G-9
	Oil filter clogged	Replace	G-19
	Relief valve setting pressure too low	Adjust	8-S8
	Relief valve spring weak or damaged	Replace	8-S31
	Hydraulic pump malfunctioning	Repair or replace	8-S20
Implement Does Not Reach Maximum Height	Position rod and feedback rod improperly adjusted	Adjust	8-S9
	Draft rod and feedback rod improperly adjusted	Adjust	8-S9
Implement Does Not Lower	Control valve malfunctioning	Repair or replace	8-S28
	Spool damaged	Replace	8-S28
	Lowering speed adjusting valve closed	Open	8-S33
Implement Drops by Weight	Hydraulic cylinder worn or damaged	Replace	8-S30
	Safety valve damaged	Replace	8-S32
	Lowering speed adjusting valve damaged	Replace	8-S33
	Control valve malfunctioning (check valve seat surface, check valve O-ring, poppet valve seat surface and poppet valve O-ring damaged)	Replace	8-S28
Implement Hunts (Moves Up and Down)	Poppet valve, poppet seat surface damaged	Replace	8-S28
	Check valve, check valve seat surface damaged	Replace	8-S28
	Control valve O-ring worn or damaged	Replace	8-S28
Draft Control Malfunctioning	Draft control linkage improperly adjusted	Adjust	8-S9, 13
	Torsion bar weak or broken	Replace	8-S32

W1014322

2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump for Power Steering Condition	Delivery	Above 21.3 L/min. 5.63 U.S.gals/min. 4.69 Imp.gals/min.	18.0 L/min. 4.76 U.S.gals/min. 3.96 Imp.gals/min.
- Engine speed : Approx. 2600 min⁻¹ (rpm) - Rated pressure : 18.1 MPa 185 kgf/cm² 2631 psi - Oil temperature : 50 to 60 °C 122 to 140 °F			
Hydraulic Pump for 3-point Linkage Condition	Delivery	Above 64.3 L/min. 17.0 U.S.gals/min. 14.1 Imp.gals/min.	53.9 L/min. 14.2 U.S.gals/min. 11.9 Imp.gals/min.
- Engine speed : Approx. 2600 min⁻¹ (rpm) - Rated pressure : 19.1 MPa 195 kgf/cm² 2770 psi - Oil temperature : 50 to 60 °C 122 to 140 °F			

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RELIEF AND SAFETY VALVE

Oil Cooler Relief Valve (ROPS Model)	Setting Pressure	4.4 to 4.9 MPa 45 to 50 kgf/cm ² 640 to 711 psi	—
Relief Valve	Setting Pressure	18.9 to 19.8 MPa 192 to 202 kgf/cm ² 2730 to 2870 psi	—
Safety Valve	Opening Pressure	23.1 to 24.5 MPa 235 to 250 kgf/cm ² 3342 to 3556 psi	—
Position Feedback Rod	Length	Approx. 210 mm 8.268 in.	—
Draft Feedback Rod	Length	Approx. 272 mm 10.709 in.	—

W1013874

POSITION AND DRAFT CONTROL LINKAGE

Item		Factory Specification	Allowable Limit
Position Control Rod (ROPS)	Length	Approx. 155 mm 6.10 in.	—
Draft Control Rod (ROPS)	Length	Approx. 144 mm 5.67 in.	—
Position Control Rod (CABIN)	Length	Approx. 183 mm 7.20 in.	—
Draft Control Rod (CABIN)	Length	Approx. 178 mm 7.01 in.	—
Position Feedback Rod (ROPS and CABIN)	Length	Approx. 210 mm 8.3 in.	—
Draft Feedback Rod (ROPS and CABIN)	Length	Approx. 272 mm 10.7 in.	—
Position Control	Length	10 to 30 mm 0.39 to 1.18 in.	—
Uppermost Position of Lift Arm	Length	5 to 8 mm 0.197 to 0.315 in.	—
Draft Lever Free Range	Floating Range	Less than 25.0 mm 0.984 in.	—
Draft Floating Range Check	Floating Range	More than 15.0 mm 0.59 in.	—
Position and Draft Control Lever	Operating Force	20 to 40 N 2.0 to 4.1 kgf 4.5 to 9.0 lbf	—

W1013874

OIL COOLER RELIEF VALVE (ROPS MODEL)

Item		Factory Specification	Allowable Limit
Oil cooler relief valve	Operating Pressure	4.4 to 4.9 MPa 45.0 to 50.0 kgf/cm ² 640 to 711 psi	—

W1013874

OIL COOLER CHECK VALVE (CABIN MODEL)

Oil cooler check valve	Operating Pressure	Approx. 343.2 kPa 3.5 kgf/cm ² 49.8 psi	—

W1094253

CONTROL VALVE

Spool Joint	Length	22.5 to 23.0 mm 0.8858 to 0.9055 in.	—

W1013874

LIFT ARM AND TOP LINK BRACKET

Bushing	Press-fit Location	11.0 mm 0.433 in.	—

W1013874

3. TIGHTENING TORQUES

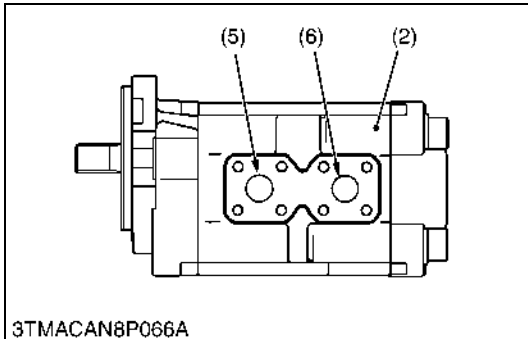
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	343 to 401	35.0 to 41.0	254 to 297
Relief valve assembly	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Safety valve assembly	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Safety valve lock nut	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
Oil cooler relief valve retaining nut	49.0 to 68.0	5.0 to 7.0	36.2 to 50.6
Oil cooler check valve retaining nut	49.0 to 68.0	5.0 to 7.0	36.2 to 50.6
Housing cover mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
3-point hitch delivery pipe nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Cylinder hose retaining nut	45.1 to 53.0	4.6 to 5.4	33.3 to 39.1
Cabin mounting bolt and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Top cover mounting screw (M14, 9T)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Top cover mounting nut (M14, 7T)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Control valve mounting screw	19.6 to 23.5	2.0 to 2.4	14.5 to 17.4
Seat plug 1	39.2 to 58.8	4.0 to 6.0	28.9 to 43.4
Seat plug 2	39.2 to 58.8	4.0 to 6.0	28.9 to 43.4
Seat plug	39.2 to 58.8	4.0 to 6.0	28.9 to 43.4
Lock nut	15.7 to 19.6	1.6 to 2.0	11.6 to 14.5
Seat plug	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Lowering speed adjusting valve assembly	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9

W1012736

4. CHECKING AND ADJUSTING

[1] HYDRAULIC PUMP



Hydraulic Flow Test

■ IMPORTANT

- When using flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with the flowmeter.
 - Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.
 - Set the main change lever and shuttle lever in Neutral position.
 - Set parking brake lever in parking position.
1. Place the disassembling stand under the transmission case.
 2. Remove the right rear wheel.
 3. Place the disassembling stand under the right rear axle case.
 4. Disconnect the differential lock rod from pedal.
 5. Disconnect the delivery pipe for power steering or delivery pipe for 3 point hydraulic from hydraulic pump (2).
 6. Install the adaptor **53** and **54** (refer to "SPECIAL TOOLS" at "G. GENERAL" section) to the pump discharge port.
 7. Connect the hydraulic test hose (3) to the adaptor at hydraulic pump (2) and flowmeter (4) inlet port.
 8. Connect the other hydraulic test hose (1) to the flowmeter outlet, insert the hydraulic test hose other end to transmission oil filling port at PTO case.
 9. Open the flowmeter loading valve completely. (Turn counterclockwise.)
 10. Start the engine and set the engine speed at 2000 to 2200 min⁻¹ (rpm).
 11. Slowly close the loading valve to generator pressure approx. 9.8 MPa (100 kgf/cm², 1422 psi). Hold in this condition until oil temperature reaches approx. 55 °C (131 °F).
 12. Open the loading valve completely.
 13. Set the engine speed. (Refer to "**Condition**".)
 14. Read and note the pump delivery at rated pressure.
 15. Open the loading valve completely and stop the engine.
 16. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.
 17. Check the hydraulic flow test for power steering and three point pump are same procedure.

(When reassembling)

Tightening torque	Rear wheel mounting nut	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft

- (1) Hydraulic Test Hose
- (2) Hydraulic Pump
- (3) Hydraulic Test Hose
- (4) Flowmeter
- (5) Port for 3-Point Hydraulic
- (6) Port for Power Steering

[A] ROPS Model
[B] CABIN Model

W1010684

Hydraulic Flow Test (Continued)**[Power Steering Pump Delivery]****Condition**

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Rated pressure : 18.1 MPa
185 kgf/cm²
2631 psi
- Oil temperature : 50 to 60 °C
122 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 21.8 L/min. 5.76 U.S.gals./min. 4.80 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	21.3 L/min. 5.63 U.S.gals./min. 4.69 Imp.gals./min.
	Allowable limit	18.0 L/min. 4.76 U.S.gals./min. 3.96 Imp.gals./min.

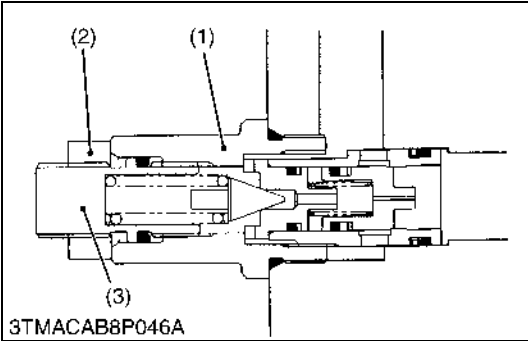
[Three Point Pump Delivery]**Condition**

- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Rated pressure : 19.1 MPa
195 kgf/cm²
2770 psi
- Oil temperature : 50 to 60 °C
122 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 64.9 L/min. 17.1 U.S.gals./min. 14.3 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	64.3 L/min. 17.0 U.S.gals./min. 14.1 Imp.gals./min.
	Allowable limit	53.9 L/min. 14.2 U.S.gals./min. 11.9 Imp.gals./min.

W1011083

[2] RELIEF AND SAFETY VALVE



Relief Valve Setting Pressure Test Using Pressure Tester (Coupler)

- 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. 07916-50322).
- 2. Start the engine, set at maximum speed.
- 3. Set the auxiliary control valve operation lever to the **UP** position and read the pressure gauge when the relief valve is actuated.
- 4. If the pressure is not within the factory specification, adjust the relief valve adjuster (3).

Condition

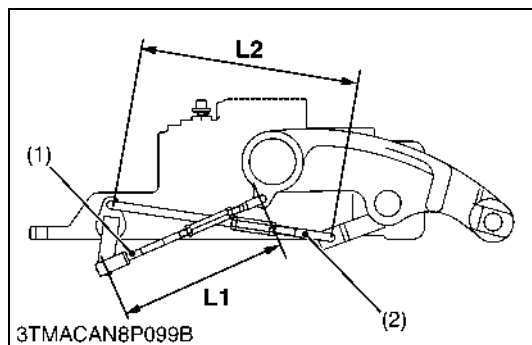
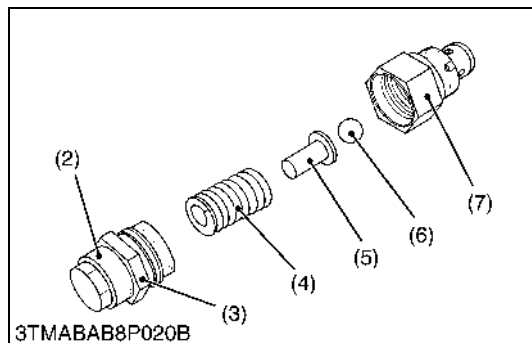
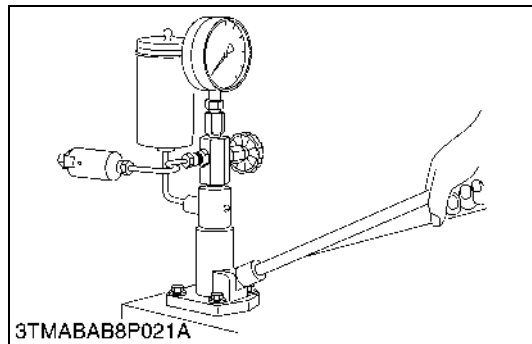
- Engine speed : Approx. 2600 min⁻¹ (rpm)
- Oil temperature : 45 to 55 °C
113 to 131 °F

Tightening torque	Relief valve assembly	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 lbf·ft
Relief valve setting pressure	Factory spec.	18.9 to 19.8 MPa 192 to 202 kgf/cm ² 2730 to 2870 psi

- (1) Relief Valve

(2) Lock Nut
- (3) Adjuster

W1020510



Safety Valve Setting Pressure Test Using Injection Nozzle Tester

1. Remove the safety valve assembly (1).
2. Attach the safety valve to an injection nozzle tester with a safety valve setting adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
3. Measure the operating pressure of the safety valve.
4. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (2).
5. After adjustment, tighten the lock nut (3) firmly.

(When reassembling)

- Install the safety valve to the hydraulic cylinder block, taking care not to damage the O-ring and apply transmission fluid.

Tightening torque	Safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft
	Safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 lbf·ft

Safety valve operating pressure	Factory spec.	23.1 to 24.5 MPa 235 to 250 kgf/cm ² 3342 to 3556 psi

NOTE

- Use specified transmission fluid (refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section) to test the operating pressure of the cylinder safety valve.

(1) Safety Valve Assembly	(5) Seat
(2) Adjusting Screw	(6) Ball
(3) Lock Nut	(7) Housing
(4) Spring	

W1012986

Adjusting Position Feedback Rod and Draft Feedback Rod

1. Be sure to adjust the position feedback rod (1) length (L1) and draft feedback rod (2) length (L2).

Position feedback rod length (L1)	Factory spec.	Approx. 210 mm 8.3 in.
Draft feedback rod length (L2)	Factory spec.	Approx. 272 mm 10.7 in.

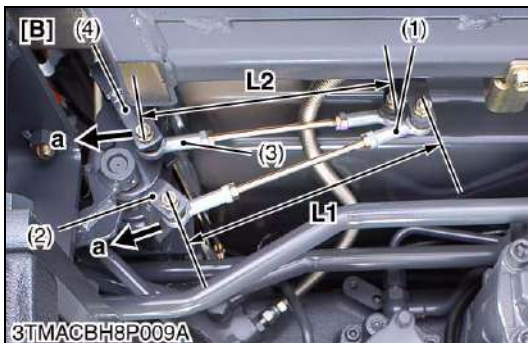
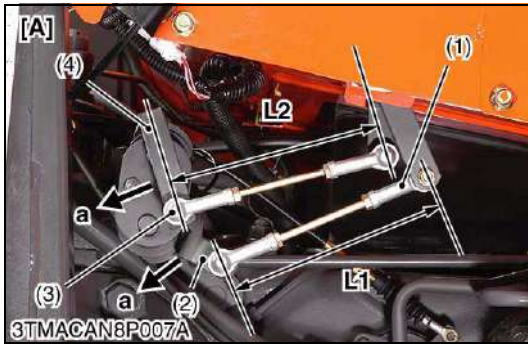
- (1) Position Feedback Rod
- (2) Draft Feedback Rod

L1 :Length of Position Feedback Rod
L2 :Length of Draft Feedback Rod

W1013440

[3] POSITION AND DRAFT CONTROL LINKAGE

(1) Control Rod



Adjusting Position Control Rod and Draft Control Rod

1. Be sure to adjust the position control rod (1) length (L1) and draft control rod (3) length (L2).

■ IMPORTANT

- Each draft control lever and position control lever should contact with lever guide lowest position when operate the position lever 1 (2) and draft lever 1 (4) to end of direction (a). If not, adjust the position control rod (1) length (L1) and/or draft control rod (3) length (L2).

[ROPS Model]

Position control rod length (L1)	Factory spec.	Approx. 155 mm 6.10 in.
Draft control rod length (L2)	Factory spec.	Approx. 144 mm 5.67 in.

[CABIN Model]

Position control rod length (L1)	Factory spec.	Approx. 183 mm 7.20 in.
Draft control rod length (L2)	Factory spec.	Approx. 178 mm 7.01 in.

- (1) Position Control Rod
- (2) Position Lever 1
- (3) Draft Control Rod
- (4) Draft Lever 1
- (5) Position Control Lever
- (6) Draft Control Lever

[A] ROPS Model

[B] CABIN Model

L1 :Length of Position Control Rod

L2 :Length of Draft Control Rod

a : Direction for Lower

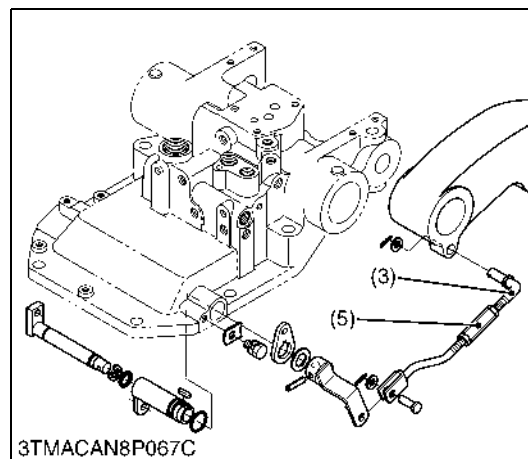
W1013598

(2) Position Control



Adjusting Position Control

1. Attach a weight of approx. 490 N (50 kgf, 110 lbf) to the end of the lower links.
2. Set the position control lever (2) and draft control lever (1) to the lowest position.
3. Start the engine, and after warming-up, set the engine speed at 1000 min⁻¹ (rpm).
4. Move the position control lever (2) to the uppermost position. (Contact to the position control lever guide.)
5. Lengthen the position feedback rod (3) until the relief valve begins to be operated.
6. From the relief valve operating position, turn back the adjusting nut (4) clockwise by 3 turns or turn the turnbuckle (5) 1.5 turns to shorten the position feedback rod (3).
7. Tighten the nut (4).
8. Move the position control lever (2) to the lowest position to check the cylinder goes to lowest position.
9. Set the position control lever (2) to the lowest position, then slowly shift the lift arm to the upper until the lift arm begins to be operated. Check the floating range length (L) guide end and position control lever.
10. If floating range (L) is not within the factory specification, readjust with above procedure.

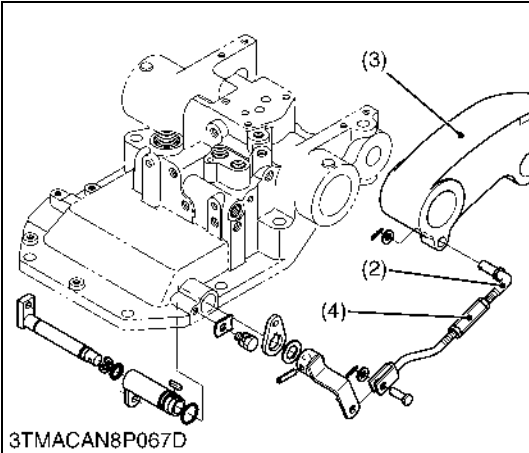
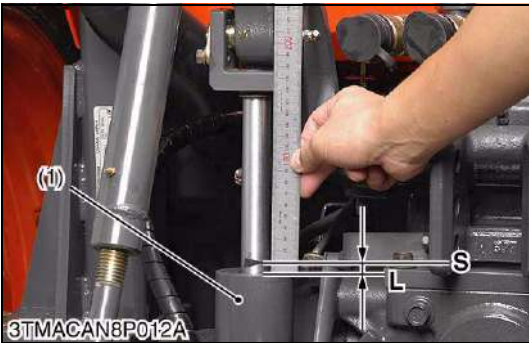


Floating range (L)	Factory spec.	10 to 30 mm 0.39 to 1.18 in.

- (1) Draft Control Lever
- (2) Position Control Lever
- (3) Position Feedback Rod
- (4) Adjusting Nut
- (5) Turnbuckle

[A] ROPS Model
[B] CABIN Model
L : Floating Range

W1014181



Adjusting Uppermost Position of Lift Arm

- 1. Move the position and draft control levers all the way down.
- 2. Start the engine and set the speed at maximum speed.
- 3. Operate the position control lever to the uppermost position.
- 4. Raise the lift arm (3) to the top dead center by hand, and mark hydraulic cylinder (1) with **S** respectively.
- 5. Measure the cylinder free play (**L**) from **S** to cylinder body end.
- 6. If the cylinder free play is not within the factory specifications, adjust the position feedback rod (2).

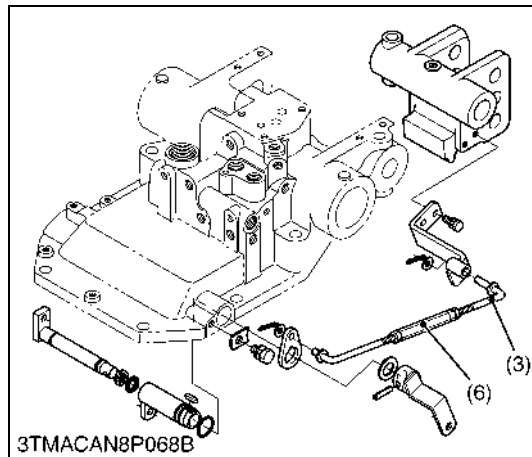
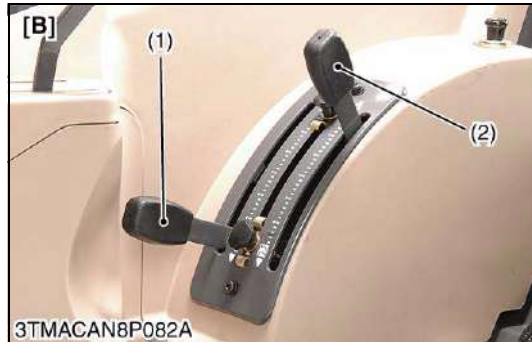
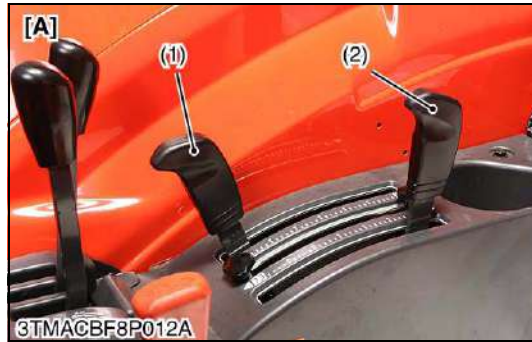
Cylinder free play (L)	Factory spec.	5 to 8 mm 0.197 to 0.315 in.

- (1) Hydraulic Cylinder
 - (2) Position Feedback Rod
 - (3) Lift Arm
 - (4) Turnbuckle

L : Cylinder Free Play
S : Mark

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(3) Draft Control



Adjusting Draft Control

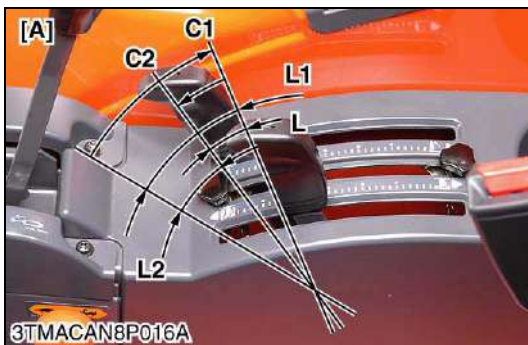
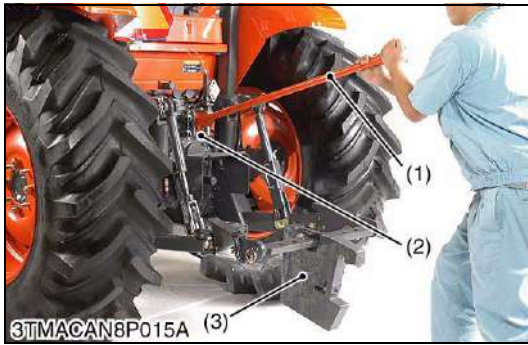
1. Attach a weight of approx. 490 N (50 kgf, 110 lbf) to the end of the lower links.
2. Start the engine and set the speed at 1000 min⁻¹ (rpm).
3. Move the position control lever (1) and draft control lever (2) all the way down.
4. Move the draft control lever (2) to uppermost position then lengthen the draft feedback rod (3) and check the point where the lift arms begin to rise.
5. When the lift arms (4) begin to rise, turn back the adjusting nut (5) 2 turns or turn the turnbuckle (6) 1 turn to shorten the draft feedback rod (3).
6. Move the position control lever (1) and draft control lever (2) to uppermost position to make sure the relief does not operate.
7. If the relief valve operate, adjust the draft feedback rod (3).
8. Tighten the lock nuts securely.

- (1) Position Control lever
- (2) Draft Control Lever
- (3) Draft Feedback Rod
- (4) Lift Arm
- (5) Adjusting Nut
- (6) Turnbuckle

[A] ROPS Model

[B] CABIN Model

W1015078



Draft Lever Free Range

1. Attach the weight (3) of approx. 490 N (50 kgf, 110 lbf) to the end of the lower links.
2. Attach the test bar (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the top link bracket (2).
3. Start the engine and set the engine speed at maximum speed.
4. Move the draft and position control lever (5), (4) all the way down.
5. Press the test bar (1) downward until the top link bracket (2) comes in contact with the body.
6. Slowly shift the draft control lever (5) upward until the lift arms begin to rise (C1). Then slowly shift the draft control lever (5) downward until the lift arms begin to down (C2). Calculate the free range (L) of the draft control lever (5) on the lever guide.

Free range L1 – L2	Factory spec.	Less than 25.0 mm 0.984 in.

- (1) Test Bar
- (2) Top Link Bracket
- (3) Weight
- (4) Position Control Lever
- (5) Draft Control Lever

C1 : Begin to rise the lift arm

C2 : Begin to down the lift arm

L : Free Range

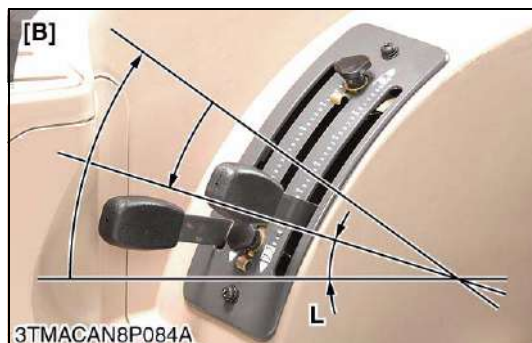
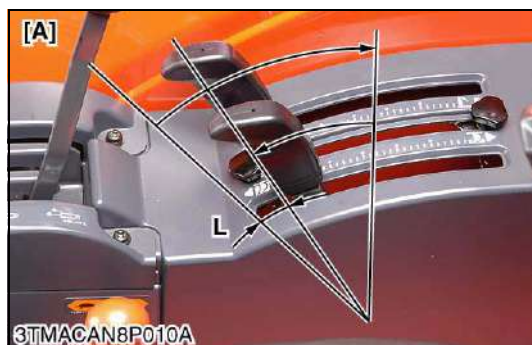
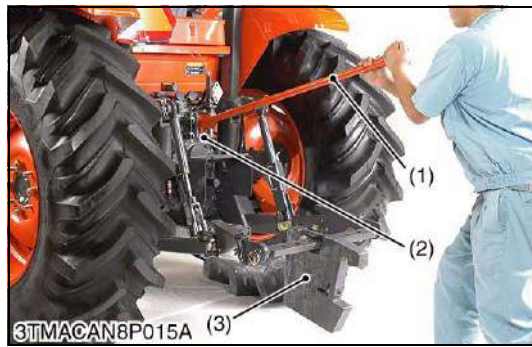
L1 : Distance for begin to rise the lift arm

L2 : Distance for begin to down the lift arm

[A] ROPS Model

[B] CABIN Model

W1015369



Draft Floating Range Check

1. Attach the weight (3) of approx. 490 N (50 kgf, 110 lbf) to the end of the lower links.
2. Attach the test bar (1) to the top link bracket (2).
3. Start the engine and set the speed at maximum speed.
4. Move the draft and position control lever (5), (4) all the way down.
5. Press the test bar (1) downward until the top link bracket (2) comes in contact with the body.
6. Slowly shift the draft control lever (5) upward to mid way of the lift arm guide. At this time, the lift arm should rise. Then slowly shift the draft control lever (5) downward until the lift arms begin to down, measure the floating range (L) of the draft control lever (5) from the end of the lever guide (4).
7. If floating range (L) is not within the factory specification, adjust the draft control rod.

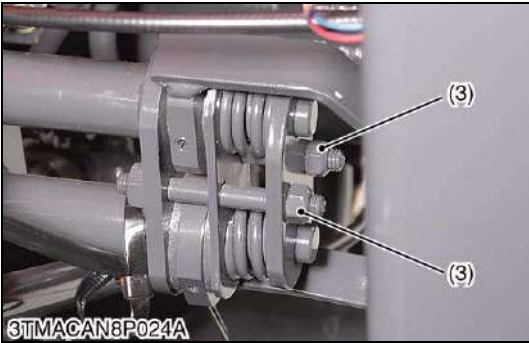
Floating range (L)	Factory spec.	More than 15.0 mm 0.59 in.

- (1) Test Bar
- (2) Top Link Bracket
- (3) Weight
- (4) Position Control Lever
- (5) Draft Control Lever

L : Floating Range
[A] ROPS Model
[B] CABIN Model

W1015844

(4) Control Lever Operating Force



Position and Draft Control Lever Operating Force

- 1. Check the position and draft control lever operating force.
- 2. If measurement is not within the factory specification, adjust the with tightening nuts (3).

Operating force for position and draft control lever	Factory spec.	20 to 40 N 2.0 to 4.1 kgf 4.5 to 9.0 lbf

- (1) Position Control Lever
- (2) Draft Control Lever
- (3) Nut

[A] ROPS Model
[B] CABIN Model

W1017524

[4] AUXILIARY CONTROL VALVE LINKAGE

(1) ROPS Model



Preparation

1. Remove the hand accelerator lever grip (1).
2. Remove the shift lever cover 2 (3) and 1 (2).

(1) Hand Accelerator Lever Grip

(3) Shift Lever Cover 2

(2) Shift Lever Cover 1

W1018681



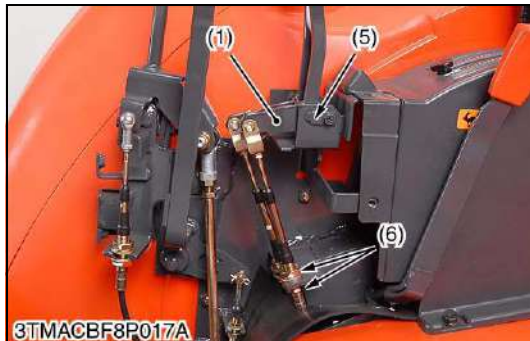
Adjusting Wire of Auxiliary Control Valve

(Lever Side)

1. Screw in the wire (3) to the rod end (4) fully.
2. Shift the control lever (1) forward and fix the wire with lock nuts (2) to contact the control lever (1) and stopper (5).
3. Fix the wire (3) with retaining nut (6) center of thread.

(Valve Side)

1. Pull the auxiliary valve lever (8) to a full engage position.
2. Pull out the wire (3) fully, and fix the wire with retaining nuts (7) to be a length (L) between wire end (10) and valve lever pin (9) as shown photo.



(1) Control Lever

(2) Lock Nut

(3) Wire

(4) Rod End

(5) Stopper

(6) Retaining Nut (Lever Side)

(7) Retaining Nut (Valve Side)

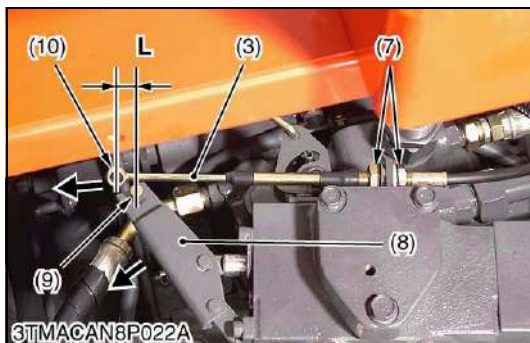
(8) Auxiliary Valve Lever

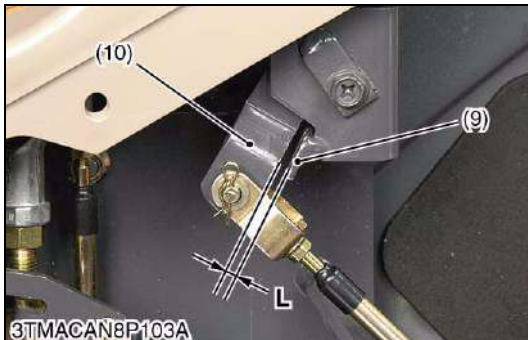
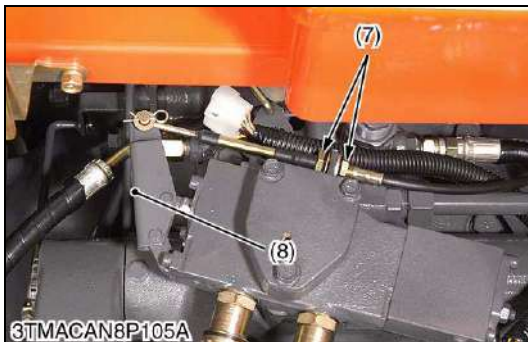
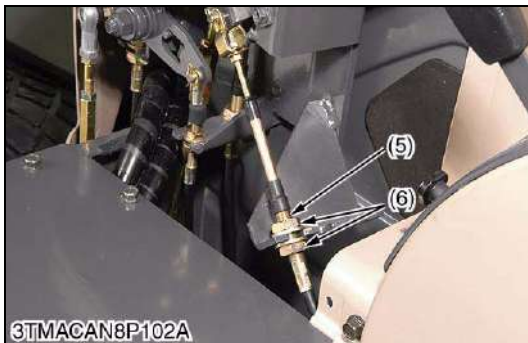
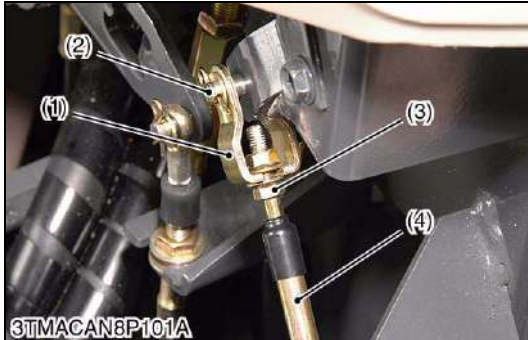
(9) Lever Pin

(10) Wire End

L : 0 to 3.0 mm (0 to 0.118 in.)

W1018862



(2) CABIN Model**Preparation**

1. Remove the inner cover R.H. 2 (1).

(1) Inner Cover R.H. 2

W1019238

Adjusting Wire of Auxiliary Control Valve**(Lever Side)**

1. Screw in the wire (4) to the rod end (1) fully.
2. Temporarily fix the wire (4) with retaining nuts (6) center of thread (5).

(Valve Side)

1. Fix the wire end to the auxiliary valve lever (8).
2. Assemble the cable with retaining nut (7) to the left end side of thread.
3. Adjust the retaining nut (6), so that the clearance (L) between control lever (10) and to stopper plate (9) to be factory specification when operate the control lever (10).

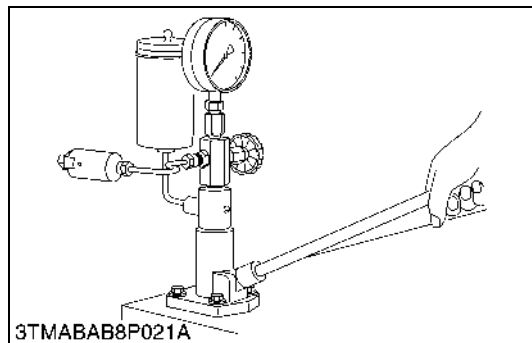
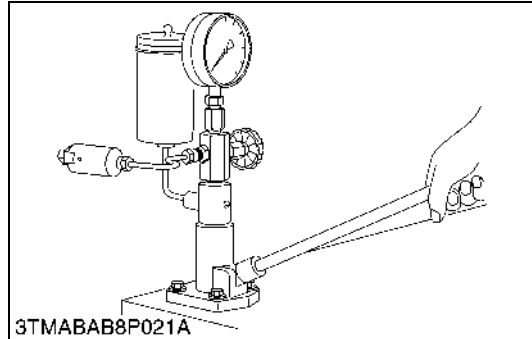
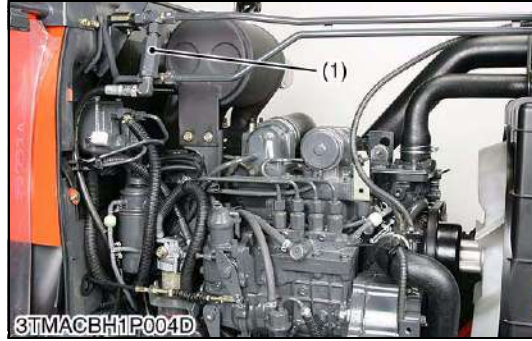
(When reassembling)

- Insert the pin (2) from the fender side.

(1) Rod End	(7) Retaining Nut (Valve Side)
(2) Pin	(8) Auxiliary Valve Lever
(3) Lock Nut	(9) Stopper Plate
(4) Wire	(10) Control Lever
(5) Thread	
(6) Retaining Nut (Lever Side)	L : 1.0 mm (0.039 in.)

W1019369

[5] OIL COOLER RELIEF VALVE



Operating Pressure of Oil Cooler Relief Valve (ROPS Model)

1. Attach the oil cooler relief valve to a injection nozzle tester with a relief valve adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
2. Measure the operating pressure of the oil cooler relief valve (1).
3. If the pressure is not within the factory specifications, replace relief valve with the new one.

Oil cooler relief valve operating pressure	Factory spec.	4.4 to 4.9 MPa 45.0 to 50.0 kgf/cm ² 640 to 711 psi

Tightening torque	Oil cooler relief valve retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

■ NOTE

- Use specified transmission fluid (refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section) to test the operating pressure of the oil cooler relief valve (1).

(1) Oil Cooler Relief Valve

W1031580

Operating Pressure of Oil Cooler Check Valve (CABIN Model)

1. Attach the oil cooler check valve to a injection nozzle tester with a relief valve adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
2. Measure the operating pressure of the oil cooler check valve (1).
3. If the pressure is not within the factory specifications, replace relief valve with the new one.

Oil cooler check valve operating pressure	Factory spec.	Approx. 343.2 kPa 3.5 kgf/cm ² 49.8 psi

Tightening torque	Oil cooler check valve retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

■ NOTE

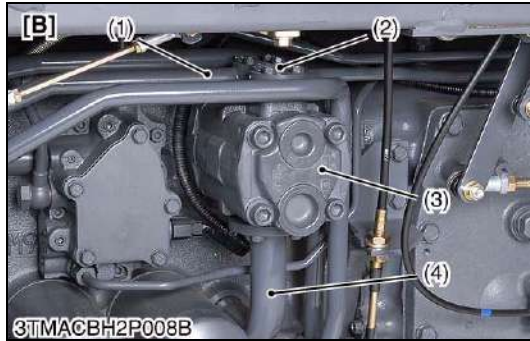
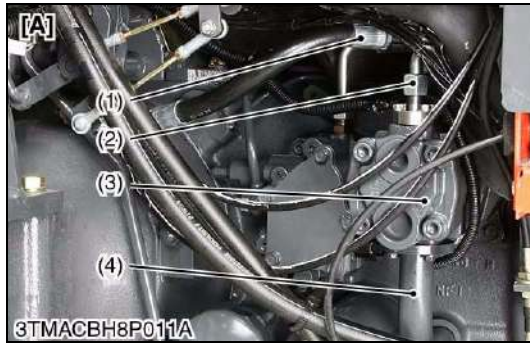
- Use specified transmission fluid (refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section) to test the operating pressure of the oil cooler relief valve (1).

(1) Oil Cooler Check Valve

W1075337

5. DISASSEMBLING AND ASSEMBLING

[1] HYDRAULIC PUMP



Removing Hydraulic Pump Assembly

1. Place the disassembling stand under the transmission case and right rear axle.
2. Remove the right rear wheel.
3. Unscrew the delivery pipes for power steering (2) and delivery pipe for three point linkage (1) retaining screws from hydraulic pump (3).
4. Unscrew the suction pipe (4) retaining screws from hydraulic pump (3).
5. Remove the hydraulic pump (3).

NOTE

- Do not remove and detach the suction pipe from transmission case and keep the vertically position to prevent the oil flow out.
- The ROPS model tractor is using a rubber type hydraulic hoses for hydraulic system and cabin model tractor is using a steel type pipes.

(When reassembling)

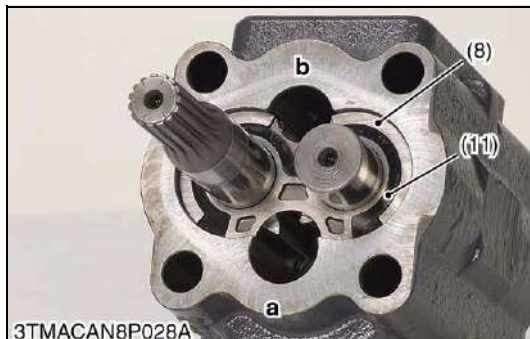
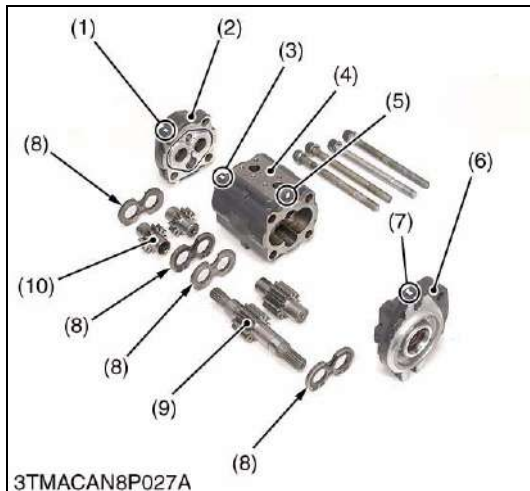
- Be sure to fix the O-ring with transmission fluid.

Tightening torque	Rear wheel mounting nut	343 to 402 N·m 35.0 to 41.0 kgf·m 253.2 to 296.5 lbf·ft

- (1) Delivery Pipe for Three Point Linkage
(2) Delivery Pipe for Power Steering
(3) Hydraulic Pump
(4) Suction Pipe

[A] ROPS Model
[B] CABIN Model

W1024905



Hydraulic Pump

1. Put the parting marks (1), (3), (5), (7) on the flange (6), housing (4), housing (8) and housing cover (2).
2. Unscrew the housing cover mounting screw and separate the flange (6) and housing cover (2) from the housing (4).
3. Remove the backup plate (8).
4. Take out the gears (9), (10).

(When reassembling)

- When installing the backup plate (8) with seal element (11), be sure to reassemble them to the each original position. Seal element on the backup plate (8) does not face to the gear side.
- Take care not to damage the seal elements and O-rings.
- After reassembly, check the smooth rotation of the hydraulic pump (for example, mount arm an approx. 100 mm (3.94 in.) long to the drive gear and rotate its arm slowly for smooth rotation).

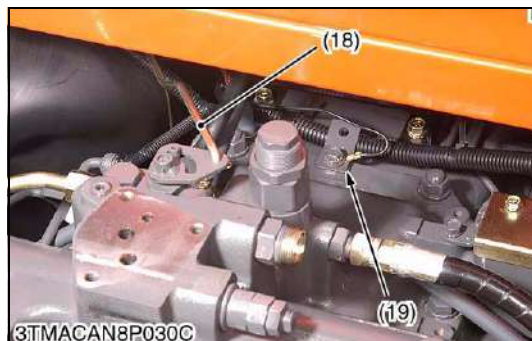
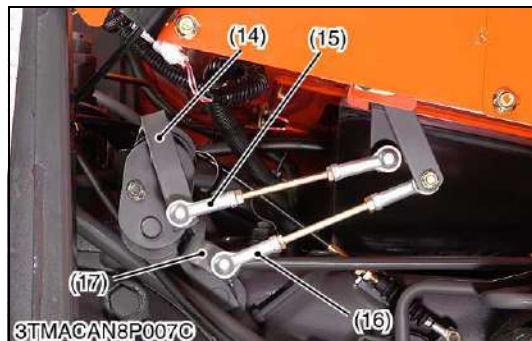
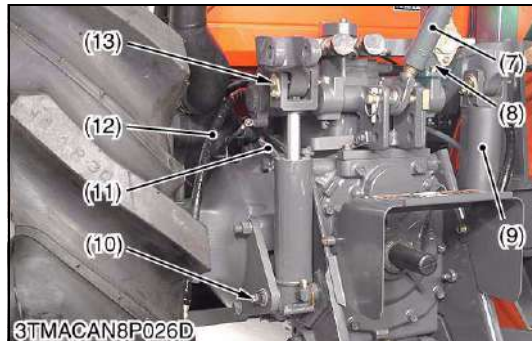
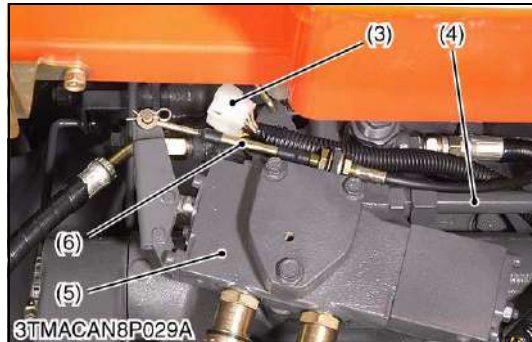
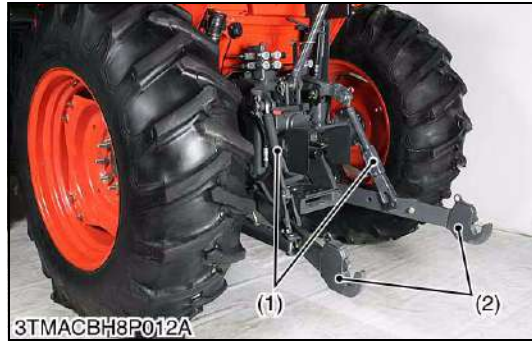
Tightening torque	Housing cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 lbf·ft

- (1) Parting Mark
(2) Housing Cover
(3) Parting Mark
(4) Housing
(5) Parting Mark
(6) Flange
(7) Parting Mark
(8) Backup Plate
(9) Gear (Three Point System)
(10) Gear (Power Steering)
(11) Seal Element
- a : Inlet
b : Outlet

W1018089

[2] 3-POINT HITCH HYDRAULIC BLOCK ASSEMBLY

(1) Removing Top Cover (3-Point Hitch Hydraulic Block) (ROPS Model)



Preparation 1

1. Remove the lower links (2) and lift rods (1).
2. Disconnect the connector (3) for trailer coupler then remove the top link holder (8) with trailer coupler.
3. Disconnect the auxiliary control valve wire (6).
4. Disconnect the cylinder hose (12) from hydraulic cylinder.
5. Remove the hydraulic cylinder cover (9).
6. Disconnect the breather hose (11) from hydraulic cylinder.
7. Remove the cylinder pin (upper) (13).
8. Remove the cylinder pin (lower) (10), then take out the cylinder.
9. Remove the top link (7).
10. Remove the delivery pipe (4).
11. Disconnect the position control rod (16) from the position lever 1 (17) and draft control rod (15) from the draft lever 1 (14).
12. Remove the auxiliary control valve (5).
13. Disconnect the ground harness (19).
14. Disconnect the lowering speed rod (18).

NOTE

- Take care not to damage the grease nipple when remove the hydraulic cylinder pin.

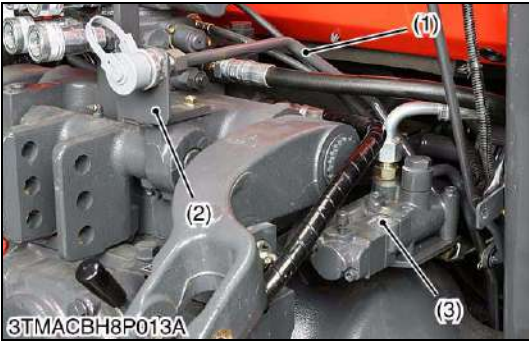
(When reassembling)

- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.
- To assemble the auxiliary control valve wire, refer to "[1] CHECKING AND ADJUSTING" in this section.
- Be sure to fit the O-rings for auxiliary control valve.

Tightening torque	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 lbf·ft
	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft

(1) Lift Rod	(11) Breather Hose
(2) Lower Link	(12) Cylinder Hose
(3) Connector	(13) Cylinder Pin (Upper)
(4) Delivery Pipe	(14) Draft Lever 1
(5) Auxiliary Control Valve	(15) Draft Control Rod
(6) Auxiliary Control Valve Wire	(16) Position Control Rod
(7) Top Link	(17) Position Lever 1
(8) Top Link Holder	(18) Lowering Speed Rod
(9) Hydraulic Cylinder Cover	(19) Ground Harness
(10) Cylinder Pin (Lower)	

W1018551



Preparation 2

1. Remove the trailer brake outlet pipe (1) with a holder (2).

- (1) Trailer Brake Outlet Pipe
- (2) Holder
- (3) Trailer Brake Valve

W1017715

Removing Top Cover (3-Point Hitch Hydraulic Block)

- 1. Remove the top cover mounting screws and nuts.
- 2. Take out the top cover assembly.

(When reassembling)

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of transmission case and top cover.

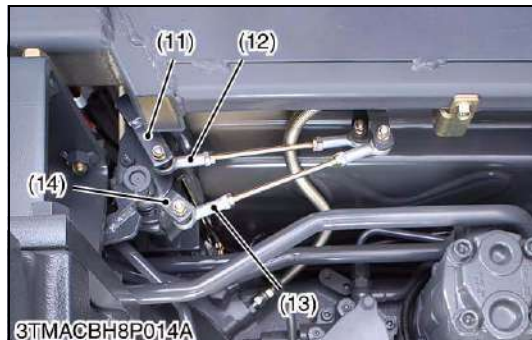
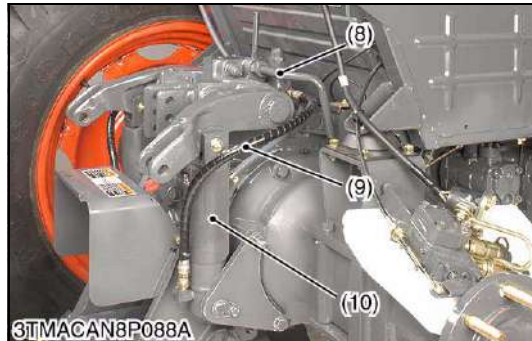
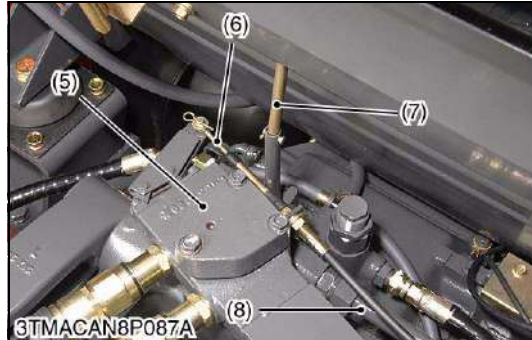
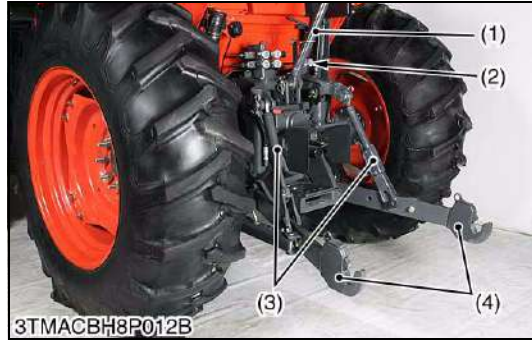
NOTE

- After reassembling the top cover assembly to the tractor, be sure to adjust the position and draft levers and position and draft feedback rods.
- Top cover mounting screw has two different length, be sure to assemble the original position.

Tightening torque	Top cover mounting screw (M14, 9T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 lbf·ft
	Top cover mounting nut (M14, 7T)	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft

W1019417

(2) Removing Top Cover (3-Point Hydraulic Block) (CABIN Model)



Preparation

1. Park the tractor on a flat place.
2. Remove the lower links (4), lift rods (3) and top link (1).
3. Remove the trailer coupler stay (2).
4. Disconnect the lowering speed rod (7).
5. Remove the auxiliary control wire (6) and auxiliary control valve (5).
6. Place the disassembling stand under the transmission case and remove the right rear wheel.
7. Remove the both cylinder hoses (9) and cylinders (10).
8. Remove the both delivery pipe (8) retaining nuts.
9. Disconnect the position control rod (13) from the position lever 1 (14) and draft rod (12) from the draft lever 1 (11).

NOTE

- Take care not to damage the grease nipple when remove the hydraulic cylinder pin.

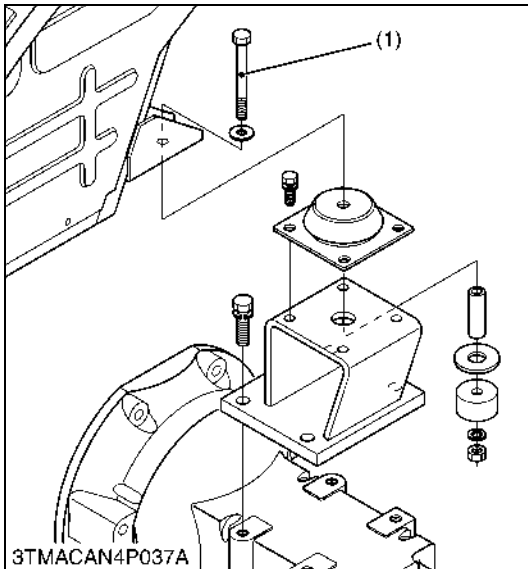
(When reassembling)

- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.
- To assemble the auxiliary control valve wire, refer to "[1] CHECKING AND ADJUSTING" in this section.
- Be sure to fit the O-rings for auxiliary control valve.

Tightening torque	Rear wheel mounting nut	343.2 to 393.3 N·m 35.0 to 40.1 kgf·m 253.2 to 290.0 lbf·ft
	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 lbf·ft
	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft

(1) Top Link	(8) Delivery Pipe
(2) Trailer Coupler Stay	(9) Cylinder Hose
(3) Lift Rod	(10) Cylinder
(4) Lower Link	(11) Draft Lever 1
(5) Auxiliary Control Valve	(12) Draft Rod
(6) Auxiliary Control Wire	(13) Position Control Rod
(7) Lowering Speed Rod	(14) Position Lever 1

W1076845



Removing Top Cover (3-Point Hitch Hydraulic Block)

1. Remove the both cabin mounting bolt (1) and lift up the cabin rear side approx. 38.0 to 50.0 mm (1.5 to 2.0 in.) then support the cabin.
2. Remove the top cover mounting screws and nuts.
3. Take out the top cover assembly.

(When reassembling)

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of transmission case and top cover.

■ NOTE

- After reassembling the top cover assembly to the tractor, be sure to adjust the position and draft levers and position and draft feedback rods.
- Top cover mounting screw has two different length, be sure to assemble the original position.
- Photo shows wooden pieces (2) for supporting the cabin.
- Be sure to assemble the cabin mount as shown figure.

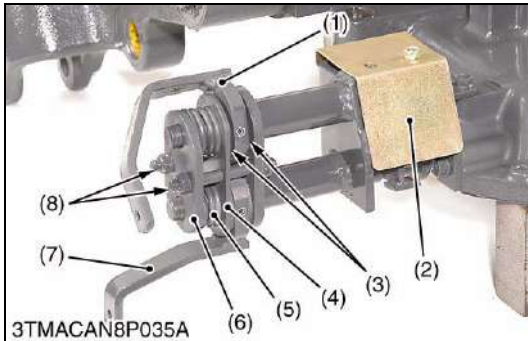
Tightening torque	Cabin mounting bolt and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Top cover mounting screw (M14, 9T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 lbf·ft
	Top cover mounting nut (M14, 7T)	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft

(1) Cabin Mounting Bolt

(2) Wooden Piece

W1077358

[3] HYDRAULIC LINKAGE



Position and Draft Linkage

1. Remove the link cover (2).
2. Unscrew the nuts (8) then draw out the spring plates (6), springs (5) and plate (4).
3. Tap out the roll pin then draw out the friction plates (3), draft lever 1 (1) and position lever 1 (7).

(When reassembling)

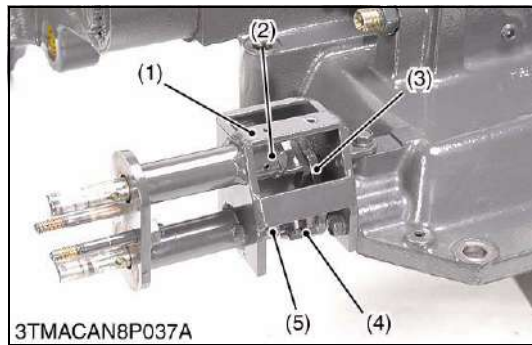
- Be sure to assemble the friction plate to original position and they are free for oil and dust.

■ NOTE

- After assembling the linkage, adjust the position and draft levers operating force and position and draft rods.

(1) Draft Lever 1	(5) Spring
(2) Link Cover	(6) Spring Plate
(3) Friction Plate	(7) Position Lever 1
(4) Plate	(8) Nut

W1020750



Linkage Bracket

1. Remove the bracket (1).

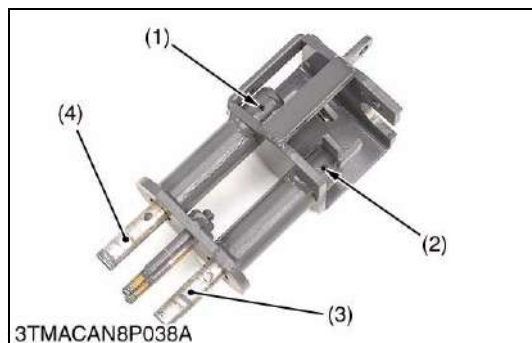
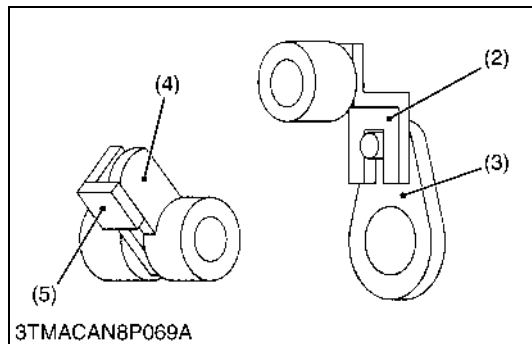
(When reassembling)

- Be sure to assemble the position lever 2 (5) and 3 (4) as shown in figure.
- Be sure to assemble the draft link cam 2 (2) and draft lever 3 (3) as shown in figure.

(1) Bracket
(2) Draft Link Cam 2
(3) Draft Lever 3

(4) Position Lever 3
(5) Position Lever 2

W1021374



Draft Lever Rod and Position Lever Rod

1. Tap out the roll pin (1) and (2).

2. Draw out the rod (3) and (4).

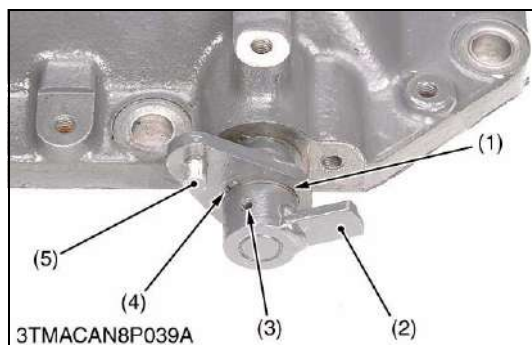
(When reassembling)

- Apply grease to the bushes.

(1) Roll Pin
(2) Roll Pin

(3) Rod
(4) Rod

W1021505



Draft Lever 3 and Position Lever 3

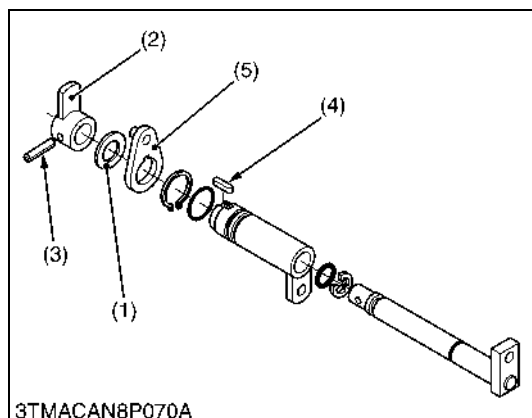
1. Tap out the roll pin (3).

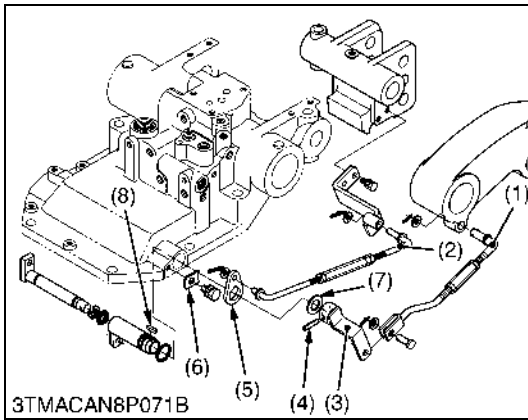
2. Remove the position lever 3 (2), washer (1), draft lever 3 (5) and key (4).

(1) Washer
(2) Position Lever 3
(3) Roll Pin

(4) Key
(5) Draft Lever 3

W1021633





Position Feedback Rod and Draft Feedback Rod

1. Tap out the roll pin (4), remove the position feedback rod (1) with position feedback lever (3) and washer (7).
2. Remove the draft feedback rod (2) with draft feedback lever (5) and key (8).
3. Remove the stopper (6).

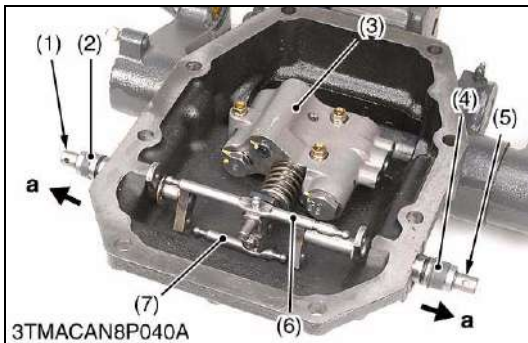
(When reassembling)

- Adjust the position and feedback rod length to the factory specifications.

Position feedback rod length	Factory spec.	210 mm 8.3 in.
Draft feedback rod length	Factory spec.	272 mm 10.7 in.

(1) Position Feedback Rod	(5) Draft Feedback Lever
(2) Draft Feedback Rod	(6) Stopper
(3) Position Feedback Lever	(7) Washer
(4) Roll Pin	(8) Key

W1021825



Draft Spool Lever and Position Spool Lever

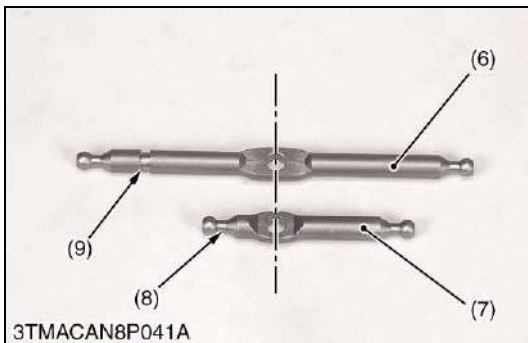
1. Push out the draft feedback shaft (2) and position feedback shaft (1).
2. Push out the draft shaft (4) and position shaft (5).
3. Remove the draft spool lever (6).
4. Remove the control valve (3) then remove the position spool lever (7).

(When reassembling)

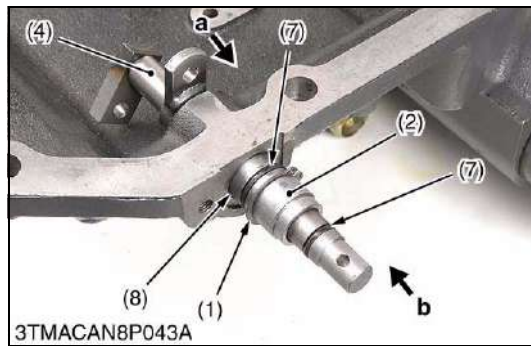
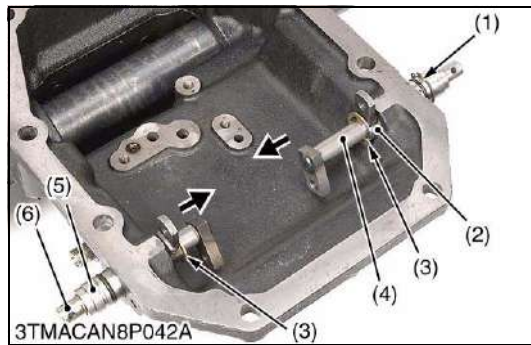
- Fix the with groove side (9) on the draft spool lever (6) and shorter side (8) on the position spool lever (7) face to the hydraulic operating lever side.
- Be sure to fix the O-rings to the control valve and apply grease to them.

(1) Position Feedback Shaft	(7) Position Spool Lever
(2) Draft Feedback Shaft	(8) Shorter Side
(3) Control Valve	(9) Groove
(4) Draft Shaft	
(5) Position Shaft	
(6) Draft Spool Lever	

a : Push Out Direction



W1022053



Position and Draft Control Shaft and Position and Draft Feedback Shaft

1. Remove the position and draft feedback rod (6) and (5).
2. Remove the external circlip (1) then draw out the position and draft control shaft (4) and (2).
3. Remove the E-shaped stopper (3) then remove the position feedback shaft (6) from draft feedback shaft (5) and remove the position control shaft (4) from draft control shaft (2).

(When reassembling)

- Remove the O-ring (7) from position control shaft.
 - Insert the position control shaft and draft control shaft to the body until the both O-ring grooves comes out.
 - Apply grease to the O-ring then assemble the O-ring from outside.
 - Fix the external circlip the draft control shaft then push back the position control shaft with draft control shaft.
 - Fix the E-shaped clip.
- The feedback side same as control side.

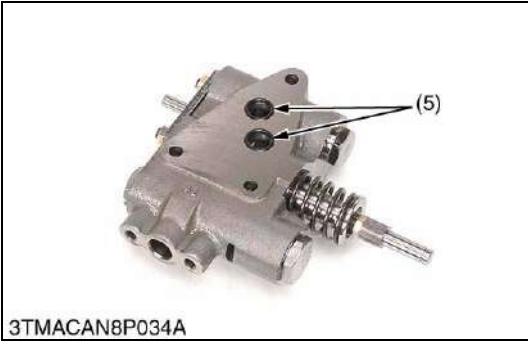
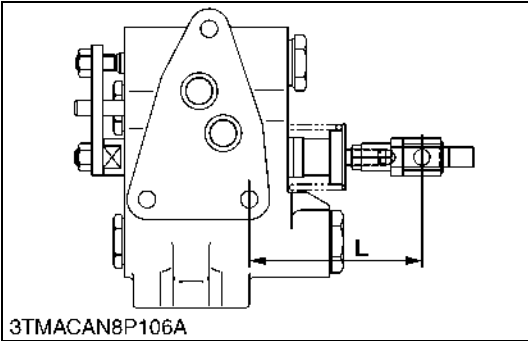
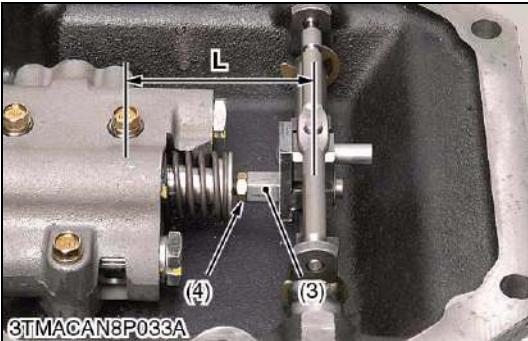
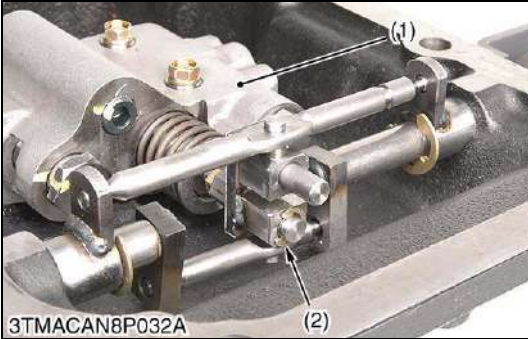
- (1) External Circlip
- (2) Draft Control Shaft
- (3) E-shaped Stopper
- (4) Position Control Shaft
- (5) Draft Feedback Shaft
- (6) Position Feedback Shaft

- (7) O-ring
- (8) Chamfer

a : To Fix O-rings
b : To Assemble Shafts

W1022407

[4] CONTROL VALVE



Removing Control Valve

- 1. Remove the E-shaped stopper (2).
- 2. Remove the control valve mounting screws.
- 3. Remove the control valve (1).

NOTE

- Do not loosen adjusting section at the end of the spool unless necessary.

(When reassembling)

- Be sure to fit the O-rings.

Tightening torque	Control valve mounting screw	19.6 to 23.5 N·m 2.0 to 2.4 kgf·m 14.5 to 17.4 lbf·ft

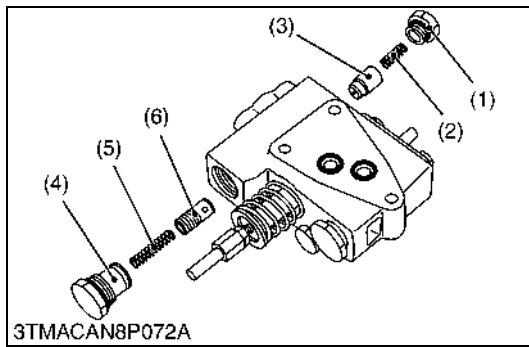
Length (L)	Factory spec.	85.8 to 86.2 mm 3.38 to 3.39 in.

Adjusting Spool Joint

- 1. Measure the length (L).
- 2. If the measurement is not within the factory specifications, loosen the lock nut (4) and adjust by the spool link (3).

- (1) Control Valve
- (2) E-shaped Stopper
- (3) Spool Link
- (4) Lock Nut
- (5) O-ring

W1019759



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 lbf·ft
	Seat plug 2	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 lbf·ft

(1) Seat Plug 1

(2) Spring

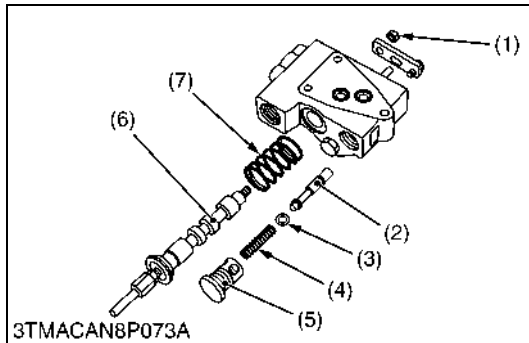
(3) Unload Poppet 1

(4) Seat Plug 2

(5) Spring

(6) Unload Poppet 2

W1020079



Spool and Poppet Valve

1. Remove the lock nut (8) 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).

■ IMPORTANT

- Do not change the adjuster (1) adjustment.

(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 lbf·ft
	Lock nut	15.7 to 19.6 N·m 1.6 to 2.0 kgf·m 11.6 to 14.5 lbf·ft

(1) Adjuster

(2) Poppet Valve

(3) Collar

(4) Spring

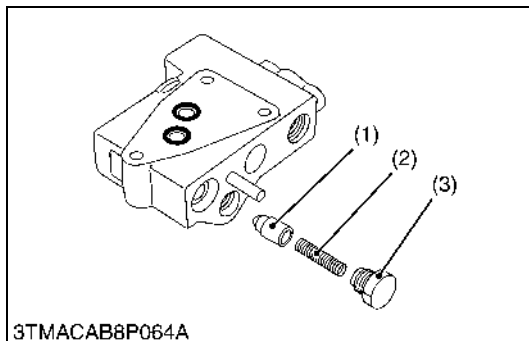
(5) Seat Plug

(6) Spool

(7) Spring

(8) Lock Nut

W1020366



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 lbf·ft

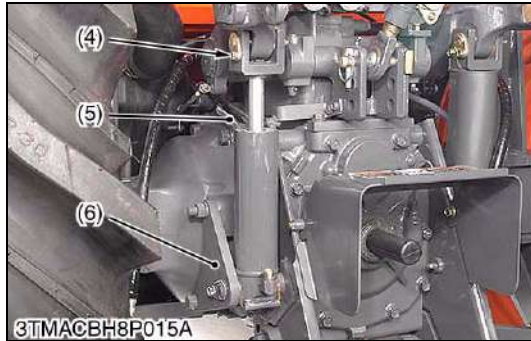
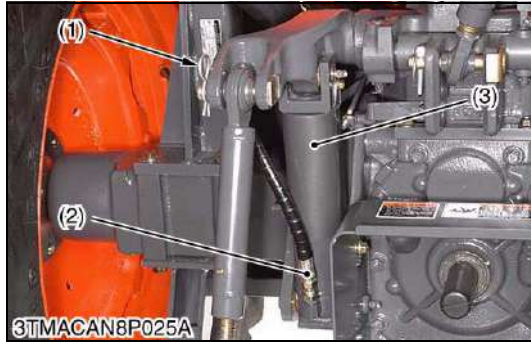
(1) Check Valve

(2) Spring

(3) Seat Plug

W1020605

[5] HYDRAULIC CYLINDER



Removing Hydraulic Cylinder

1. Remove the lift rod pin (1).
2. Disconnect the hydraulic hose (2) from hydraulic cylinder.
3. Remove the hydraulic cylinder cover (3).
4. Remove the cylinder pin (upper) (4).
5. Disconnect the breather hose (5) from hydraulic cylinder.
6. Remove the cylinder pin (lower) (6).
7. Take out the hydraulic cylinder.

NOTE

- Take care not to damage the grease nipples when remove the hydraulic cylinder.

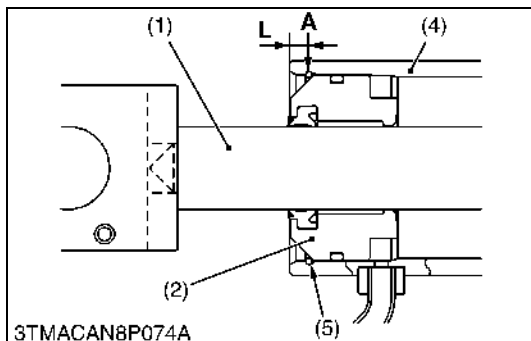
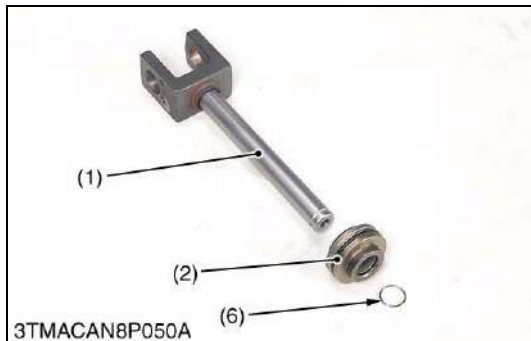
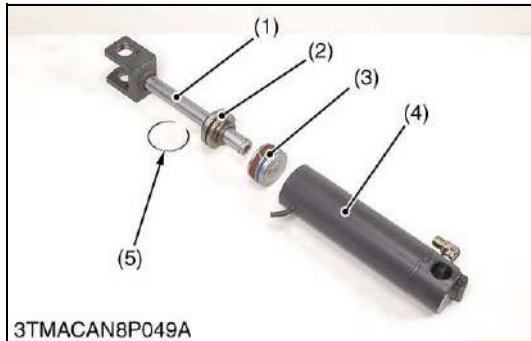
(When reassembling)

- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.

Tightening torque	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft

- (1) Lift Rod Pin (4) Cylinder Pin (Upper)
 (2) Hydraulic Hose (5) Breather Hose
 (3) Hydraulic Cylinder Cover (6) Cylinder Pin (Lower)

W1017814



Disassembling Hydraulic Cylinder

1. Remove the liquid gasket from top of head (2).
2. Slightly tap-in the head (2) to inside, and remove the internal circlip (5) by using the small screwdriver.
3. If the internal circlip (5) cannot be removed by above-mentioned method, remove it by the following procedure.
 - Carefully clamp the cylinder tube (4) in a vise.
 - Drill approx. 2.5 mm (0.1 in.) diameter hole on the cylinder tube (position A) just over the internal circlip (5) as shown in figure.
 - Use a small screwdriver and remove the internal circlip (5). Simultaneously support this action by pushing from the outside of the cylinder tube with another small screwdriver or similar tool.
4. Remove the rod (1) and head (2).
5. Inject the compressed air through the oil inlet port of the cylinder tube (4), and remove the piston (3).
6. Remove the external circlip (6), and remove the head (2).

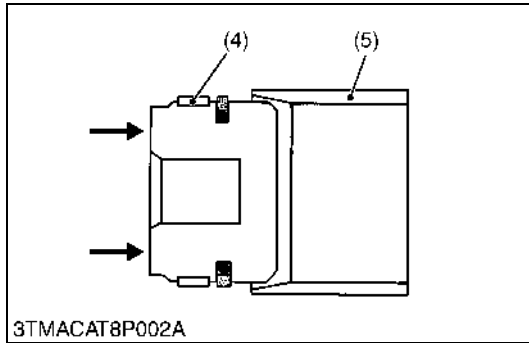
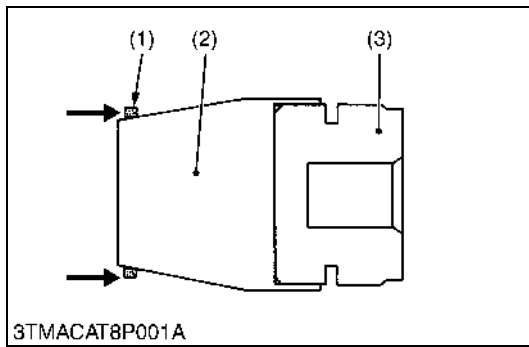
(When reassembling)

- Apply transmission fluid to the piston (3), head (2) and cylinder tube (4).
- Take care not to damage the O-ring, backup ring and seal.
- Apply liquid gasket (Three Bond 1206C or equivalent) to the top of head (2), while pressing the head (2) against internal circlip (5).
- After reassembling the cylinder, be sure to close the drilled hole by liquid gasket.

- (1) Rod (6) External Circlip
 (2) Head
 (3) Piston
 (4) Cylinder Tube
 (5) Internal Circlip

A : Position for drilling
L : 6.0 mm (0.236 in.)

W1018811



Installing Piston Seal

1. Place the slide jig (2) on the piston (3).
2. Install the piston seal (1) to the piston using the slide jig. (Refer to “**SPECIAL TOOLS**” section)
3. Compress the piston seal to the correct size by installing the piston into the correcting jig (5).

■ NOTE

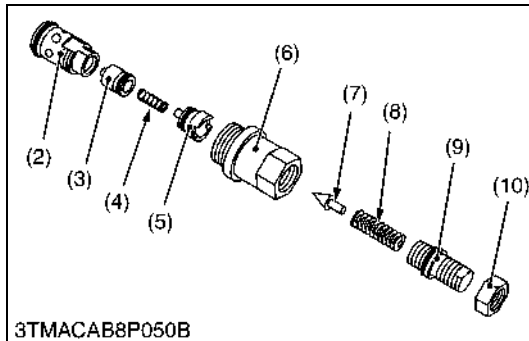
- Do not turn (roll) the piston seal as you install it.

- (1) Piston Seal
(2) Slide Jig
(3) Piston

- (4) Bearing Ring
(5) Correcting Jig

W1052958

[6] RELIEF VALVE



Relief Valve

1. Remove the relief valve assembly (1).
2. Secure the relief valve assembly (1) in a vise.
3. Loosen the lock nut (10).
4. Remove the adjuster (9), and remove the spring (8) and then pilot valve (7).
5. Remove the valve seat (2), and draw out the valve seat (5), the spring (4) and the main valve (3).

(When reassembling)

- Take care not to damage the O-ring.

Tightening torque	Relief valve	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 lbf·ft

■ IMPORTANT

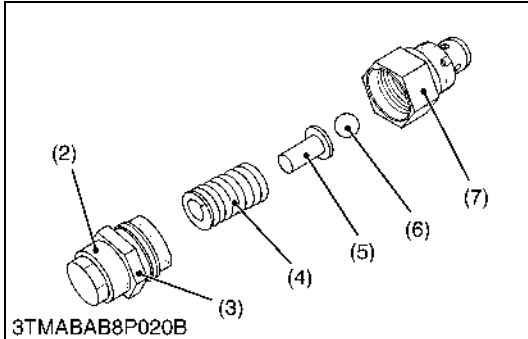
- After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure.

- (1) Relief Valve
(2) Valve Seat
(3) Main Valve
(4) Spring
(5) Valve Seat

- (6) Valve Body
(7) Pilot Valve
(8) Spring
(9) Adjuster
(10) Lock Nut

W1053972

[7] SAFETY VALVE



Safety Valve

1. Remove the safety valve assembly (1).
2. Secure the safety valve assembly in a vise.
3. Loosen the lock nut (3), and remove the adjust screw (2).
4. Draw out the spring (4), seat (5) and ball (6).

(When reassembling)

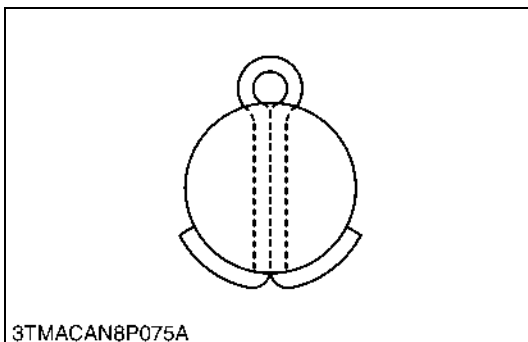
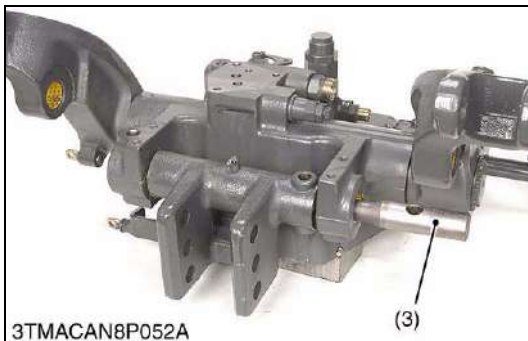
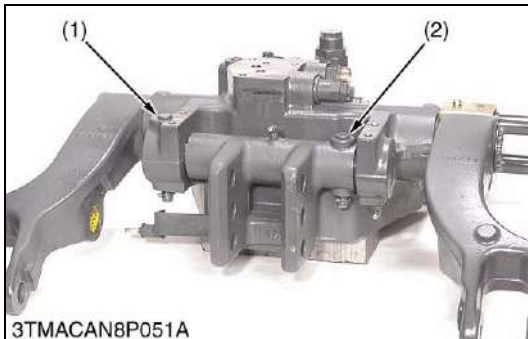
- Install the safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.

Tightening torque	Safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft
	Safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 lbf·ft

(1) Safety Valve Assembly	(5) Seat
(2) Adjust Screw	(6) Ball
(3) Lock Nut	(7) Housing
(4) Spring	

W1054901

[8] TOP LINK BRACKET



Top Link Bracket

1. Remove the position and draft feedback rod.
2. Remove the cotter pin and take out the clevis pins (1) and (2).
3. Draw out the torsion bar (3).

(When reassembling)

- Apply grease to the torsion bar bushing.
- Replace the cotter pin with new one, and assemble as shown figure.

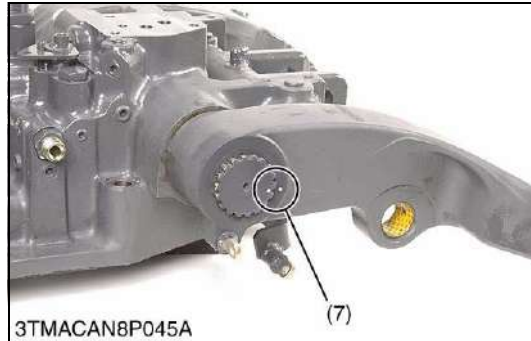
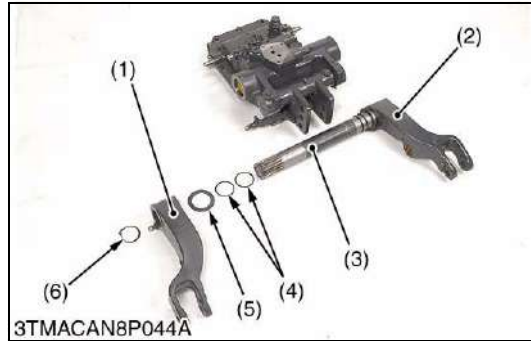
■ NOTE

- After assembling the top link bracket, be sure to adjust the position and draft feedback levers.
- Grease up to the grease nipples.

(1) Clevis Pin	(3) Torsion Bar
(2) Clevis Pin	

W1023774

[9] LIFT ARM AND LIFT ARM SHAFT



Lift Arm and Lift Arm Shaft

1. Remove the external circlip (6).
2. Remove the lift arm R.H. (2).
3. Draw out the lift arm shaft (3) and lift arm L.H. (1) as a unit.
4. Remove the collar (5) and O-rings (4).

(When reassembling)

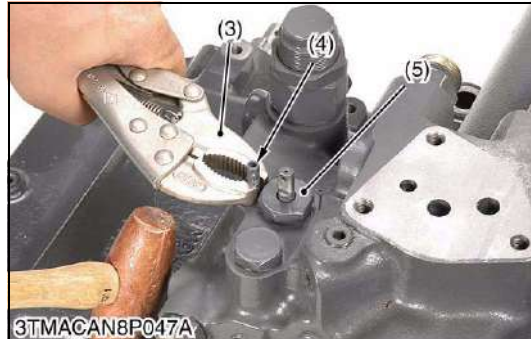
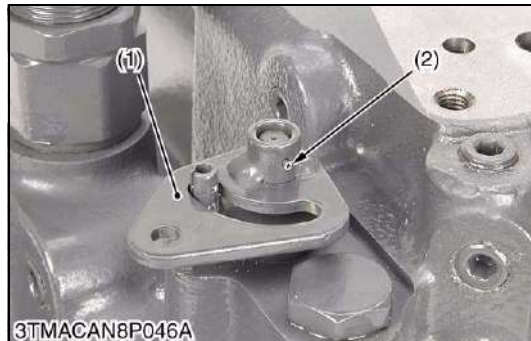
- Align the alignment marks (7) of the lift arm shaft and lift arms.
- Apply grease to the right and left bushings of lift arm support and O-rings.
- Take care not to damage the O-rings.

- (1) Lift Arm L.H.
(2) Lift Arm R.H.
(3) Lift Arm Shaft
(4) O-ring

- (5) Collar
(6) External Circlip
(7) Alignment Mark

W1022677

[10] LOWERING SPEED ADJUSTING VALVE



Lowering Speed Adjusting Valve

1. Tap out the roll pin (2) then remove the plate (1).
2. Remove the roll pin (4) using a vice grip pliers (3).
3. Remove the lowering speed adjusting valve assembly (5).

(When reassembling)

- Check the lowering speed adjusting valve turns smoothly.

Tightening torque	Lowering speed adjusting valve assembly	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 lbf·ft

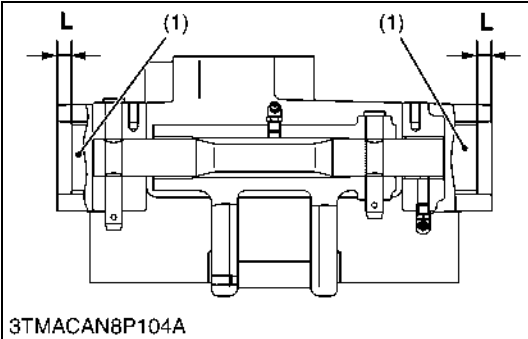
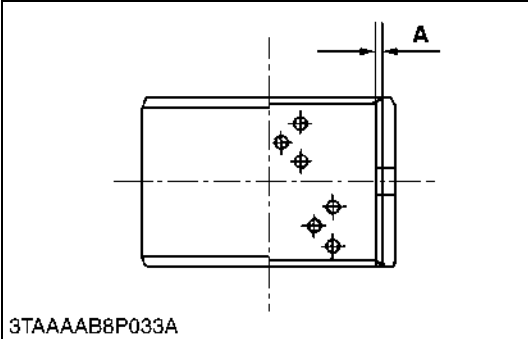
- (1) Plate
(2) Roll Pin
(3) Vice Grip Pliers
(4) Roll Pin

- (5) Lowering Speed Adjusting Valve Assembly
(6) Valve
(7) Pin

W1023001

6. SERVICING

[1] LIFT ARM AND TOP LINK BRACKET



- Lift Arm Support Bushing**
1. Visually inspect the DX bushings for signs of wear or damage.
(The DX bushing tends to show concentrated wear.)
 2. If the DX bushing is worn beyond the alloy portion (A), replace it.
- (When installing)**
- When press-fitting a new bushing with a press-fitting tool (refer to “8. SPECIAL TOOLS” at “G. GENERAL” section).
 - When press-fitting a new bushing, apply transmission fluid to the lift arm support liner boss.
 - When press-fitting a new bushing
 - Lift arm support bushing’s seam face to rear and hole face to front and upper.
 - Lift arm bushing’s seam face to front and lower and hole face to rear.

Press-fit location of bushing (L)	Factory spec.	11.0 mm 0.433 in.

(Reference)

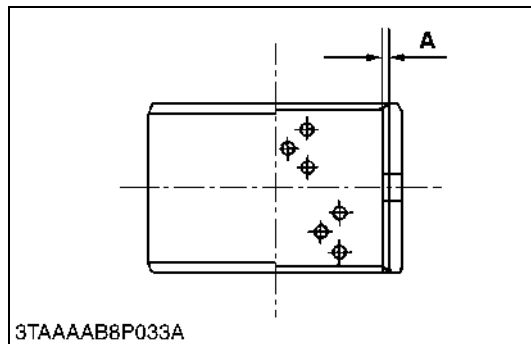
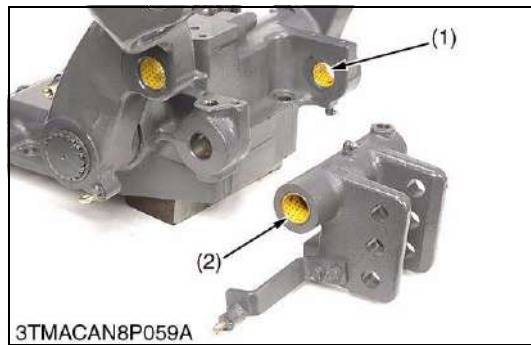
Lift arm support and lift arm bushing	Alloy thickness (A)	0.57 mm 0.0224 in.

- (1) Lift Arm Support Bushing

(2) Lift Arm Bushing
- A : Alloy Thickness

L : Press-fit Location

W1020043



Torsion Bar and Top Link Bracket

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**A**), replace it.

(When installing)

- When press-fitting a new bushing, apply transmission fluid to the bushing press in position.
- When press-fitting a new bushing of top link bracket, the seam of bushing face to rear.
- When press-fitting a new bushing of torsion bar, the hole of bushing face lower to align with grease gallery.

(Reference)

Lift arm bushing	Alloy thickness (A)	0.57 mm 0.0224 in.

- (1) Torsion Bar Bushing
(2) Top Link Bracket Bushing

A : Alloy Thickness

W1026668

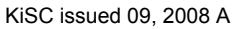
9 ELECTRICAL SYSTEM

MECHANISM

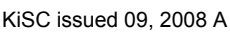
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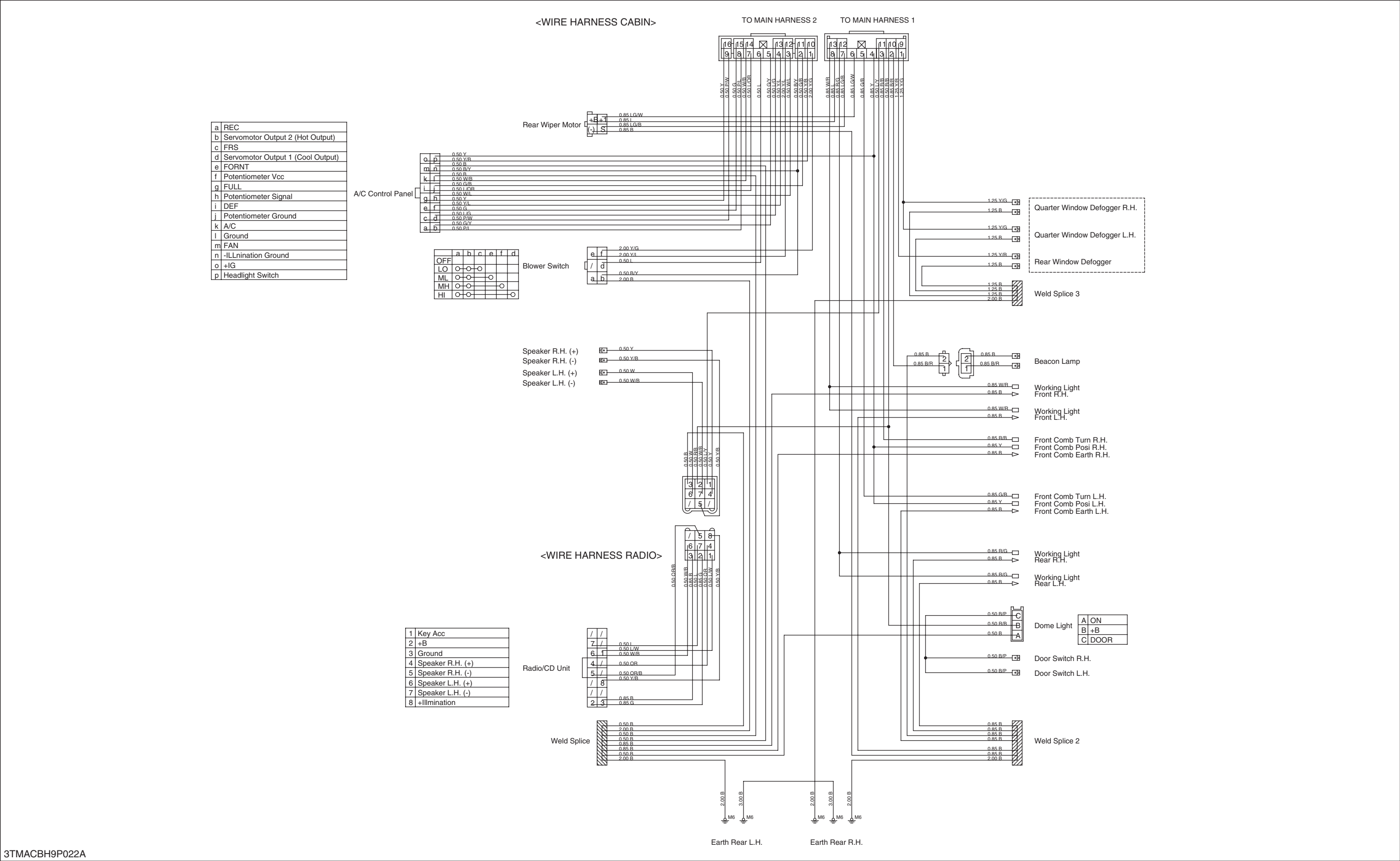
(1) Main Harness



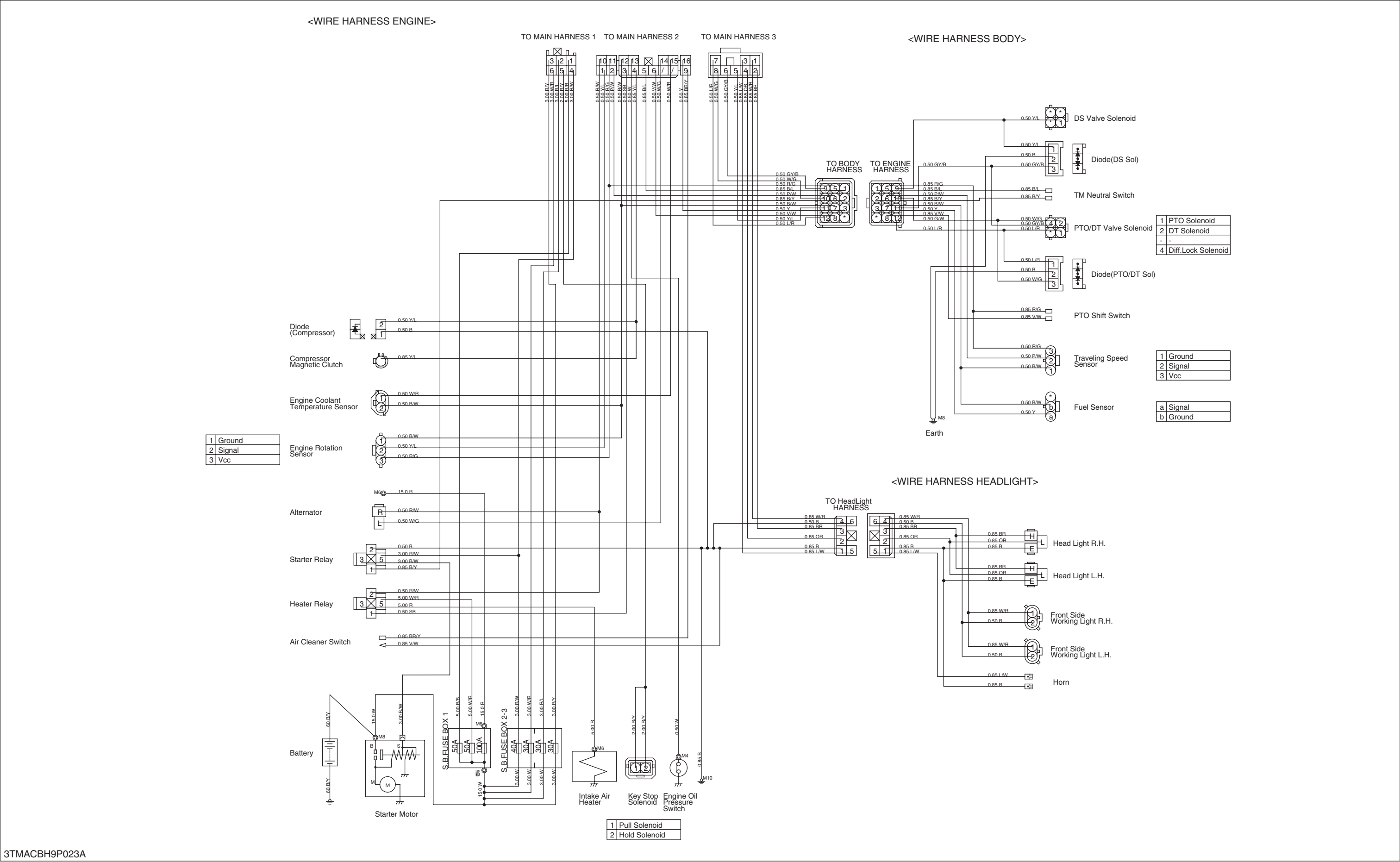
(1) Main Harness



(2) Cabin Harness



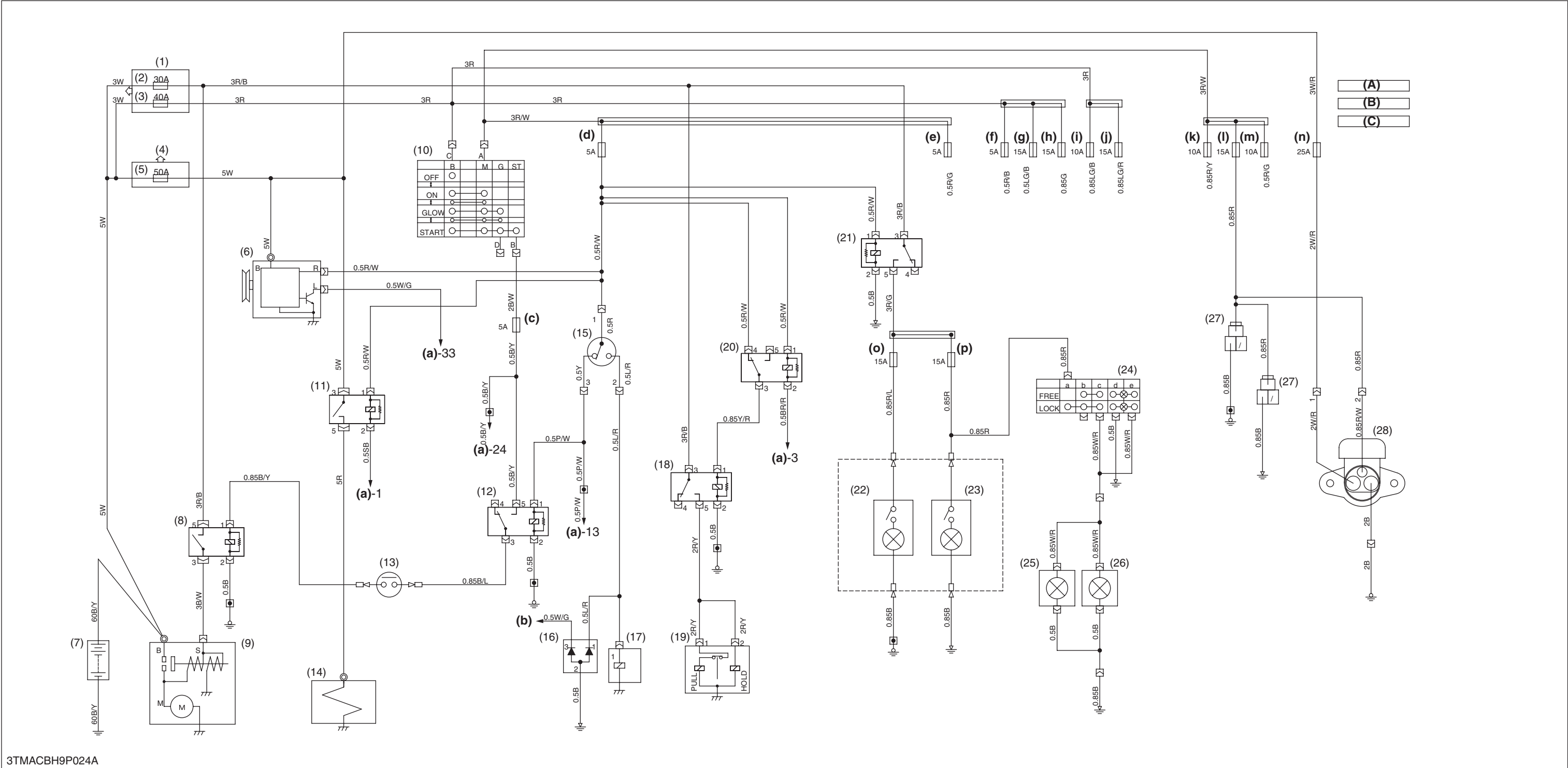
(3) Engine Harness



2. ELECTRICAL CIRCUIT DETAILED CHART

[1] ROPS MODEL

(1) Starting System, Charging System and Power Supply



- (1) Slow Blow Fuse Box

(2) Fuel/Work Light

(3) Key/Light

(4) Slow Blow Fuse

(5) Charge/Heater

(6) Alternator

(7) Battery

(8) Starter Relay
- (9) Starter Motor

(10) Main Key Switch

(11) Glow Relay

(12) PTO Safety Relay

(13) Shuttle Neutral Switch

(14) Air Intake Heater

(15) PTO Switch

(16) Diode (PTO/DT Solenoid)
- (17) PTO Valve (Solenoid)

(18) Key Stop Relay

(19) Key Stop Solenoid

(20) Engine Stop Relay

(21) Working Light Relay

(22) Working Lamp L.H. (12V, 35W) (Option)
- (23) Working Lamp R.H. (12V, 35W) (Option)

(24) Working Lamp Front Side Switch (14V, 1.4W)

(25) Working Lamp Front Side L.H. (12V, 21W)

(26) Working Lamp Front Side R.H. (12V, 21W)
- (27) Auxiliary Power Connector

(28) Auxiliary Power Socket
- (A) Fuel/Work Light

(B) Key/Light

(C) Key/IG
- (a) To Meter Panel

(b) To DT Valve (Solenoid)

(c) Fuse (Starter Relay)

(d) Fuse (Alternator, Engine, PTO, Heater)

(e) Fuse (Meter Panel)
- (f) Fuse (Meter Back Up)

(g) Fuse (Position Lamp, Number Lamp)

(h) Fuse (Flasher (Hazard))

(i) Fuse (Horn)

(j) Fuse (Head Light)
- (k) Fuse (Turn signal, Stop Lamp)

(l) Fuse (Auxiliary Power)

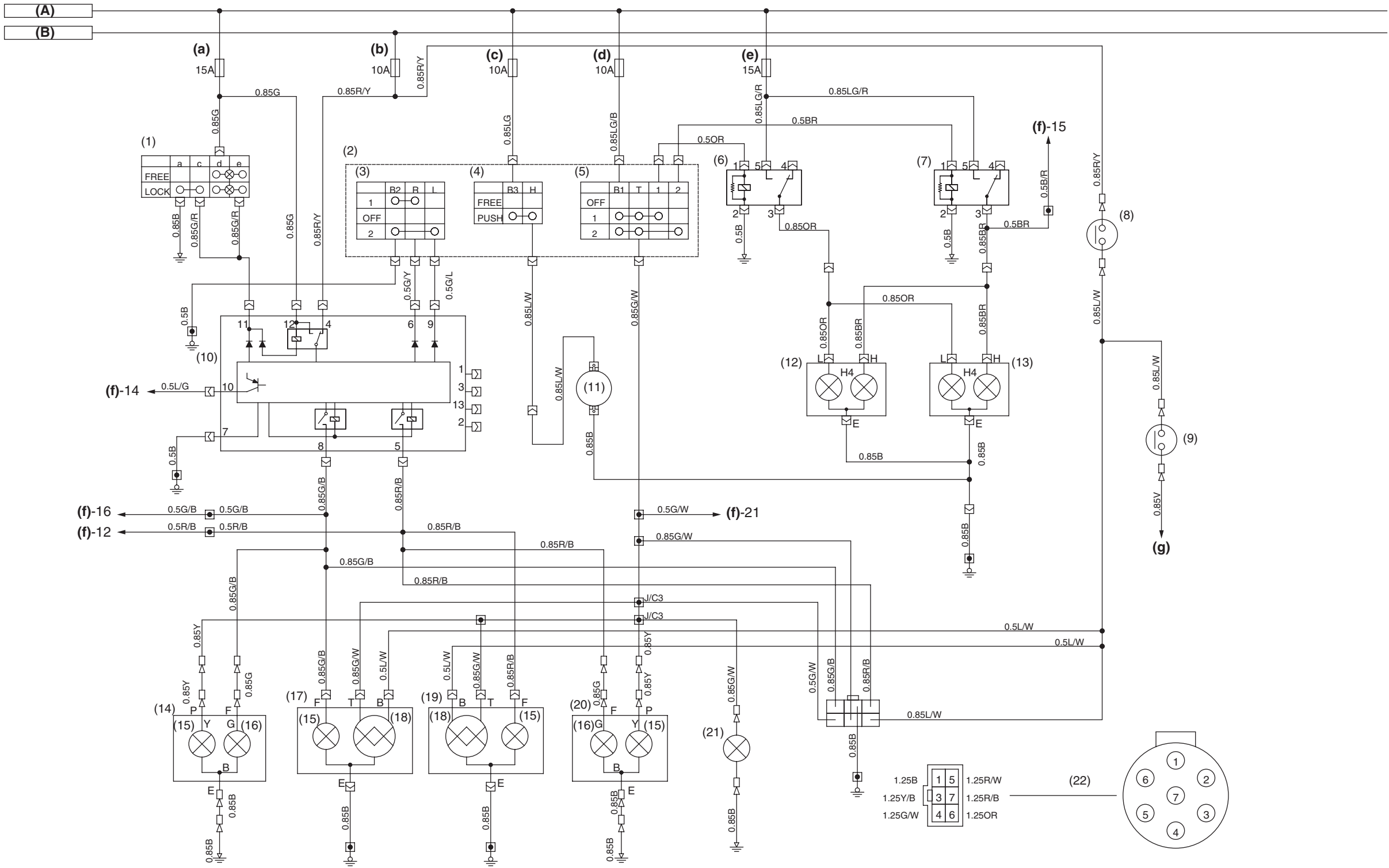
(m) Fuse (T/M Control)

(n) Fuse (AUX. Socket)

(o) Fuse (Work Light L)

(p) Fuse (Work Light R)

(2) Lighting System



3TMACBF9P035A

- (1) Hazard Switch (14V, 1.4W)

(2) Combination Light Switch

(3) Turn Switch

(4) Horn Switch

(5) Head Light Switch
- (6) Head Light LO Relay

(7) Head Light HI Relay

(8) Brake Switch R.H.

(9) Brake Switch L.H.

(10) Flasher Unit
- (11) Horn

(12) Head Light L.H.
(H4 12V, 55/60 W)

(13) Head Light R.H.
(H4 12V, 55/60 W)
- (14) Front Combination Lamp L.H.

(15) Position Lamp (10 W)

(16) Turn Lamp (21 W)

(17) Rear Combination Lamp L.H.

(18) Tail/Stop Lamp (5/21 W)
- (19) Rear Combination Lamp R.H.

(20) Front Combination Lamp R.H.

(21) Licence Lamp (10 W)

(22) Trailer Socket Assembly
- (A) Key/Light

(B) Key/IG
- (a) Fuse (Flasher/Hazard)

(b) Fuse (Turn Signal/Stop Lamp)

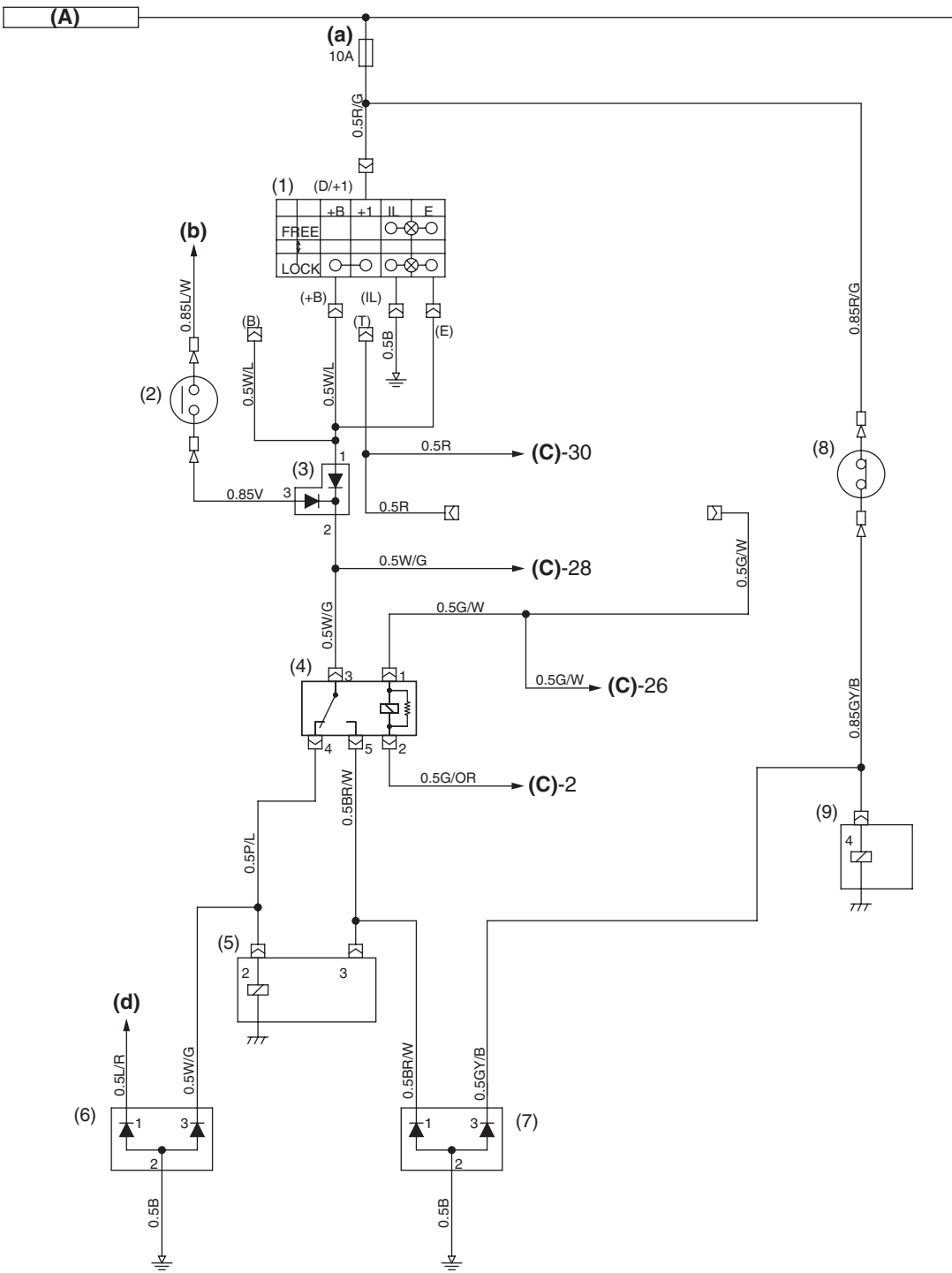
(c) Fuse (Horn)

(d) Fuse (Position Lamp/Number Lamp)
- (e) Fuse (Head Light)

(f) To Meter Panel

(g) To Diode (4WD Brake)

(3) 4WD System



3TMACBH9P026A

(1) 4WD Switch (12 V, 3 W)
(2) Brake Switch L.H.

(3) Diode (4WD Brake)
(4) Relay (Bi-speed)

(5) DT Valve (Solenoid)
(6) Diode (PTO/DT)

(7) Diode (Bi-speed, DIFF, LOCK)
(8) Rear Differerential Lock Switch

(9) DIFF. Lock Valve (Solenoid)

(A) Key/IG

(a) Fuse (T/M Control)
(b) To Brake Switch R.H.

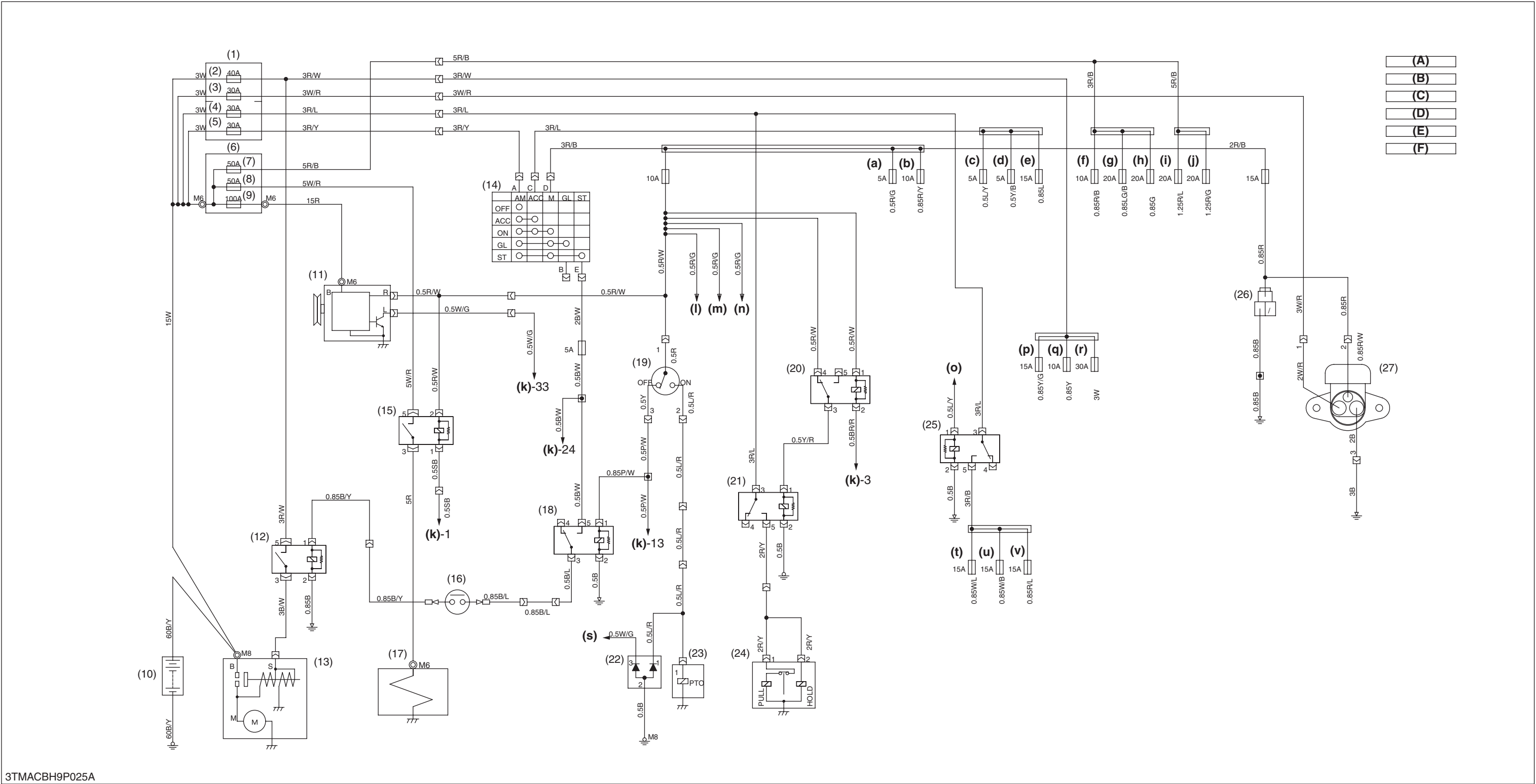
(c) To Meter Panel
(d) To PTO Valve (Solenoid)

3TMACBH9P027A

(1) Display Mode Swlect Switch	(8) Engine Oil Pressure Indicator	(15) Turn Signal (L.H.) Indicator	(22) Meter Panel	(27) Engine Oil Pressure Switch	(A) Light / Defogger	(a) To Main Key (Start)	(g) To Flasher Unit (Output R)
(2) PTO/Hour	(9) Charge Indicator	(16) Turn Signal (R.H.) Indicator	(23) Traveling Speed Sensor	(28) Parking Brake Switch	(B) ACC	(b)To PTO Switch	(h) To Flasher Unit (Trailer)
(3) Speed Unit	(10) PTO Indicator	(17) Trailer Indicator	(24) Engine Rotation Sensor	(29) Air Cleaner Indicator		(c) To Heater Relay	(i) To DT Switch
(4) PTO Change Switch	(11) Heater Indicator	(18) 4WD Indicator	(25) Fuel Sensor	(30) Air Cleaner Switch		(d) To Engine Stop Relay	(j) Rear DIFF. Lock Switch
(5) LCD Display	(12) Fuel Level Indicator	(19) Rear DIFF. Lock Indicator	(26) Engine Coolant Temperature	(31) Meter Panel (Wire Harness Side)		(e) To Light Switch (High Beam)	(k) To Light Switch
(6) Tacho Meter	(13) Parking Brake Indicator	(20) Back Light	Sensor	(32) Meter Panel Side		(f) To Flasher Unit (Output L)	(l) To Alternator
(7) Fuel/Temperature Meter	(14) High Beam Indicator	(21) LCD Back Light					

[2] CABIN MODEL

(1) Starting System and Charging System



- (1) Slow Blow Fuse Box 2, 3
- (2) Blower
- (3) Auxiliary
- (4) ACC
- (5) KEY
- (6) Slow Blow Fuse Box 1
- (7) Light/Defogger

- (8) Heater
- (9) Charge
- (10) Battery
- (11) Alternator
- (12) Starter Relay
- (13) Starter Motor
- (14) Main Key Switch

- (15) Heater Relay
- (16) Shuttle Neutral Switch
- (17) Heater
- (18) PTO Safety Relay
- (19) PTO Switch
- (20) Engine Stop Relay
- (21) Key Stop Relay

- (22) Diode (PTO/DT)
- (23) PTO/DT Valve (Solenoid)
- (24) Key Stop Solenoid
- (25) Working Light Relay
- (26) Auxiliary Power Connector
- (27) Auxiliary Power Socket

- (A) Head Light
- (B) Blower Motor
- (C) Auxiliary Power
- (D) ACC
- (E) Key ACC
- (F) Key IG

- (a) Fuse (Meter Panel)
- (b) Fuse (Turn Signal, Brake)

- (c) Fuse (Radio)
- (d) Fuse (Air Conditioner (Control))
- (e) Fuse (Wiper)
- (f) Fuse (Meter Back Up, Radio)
- (g) Fuse (Head Light, Tail Lamp)
- (h) Fuse (Flasher (Hazard))
- (i) Fuse (Rear Window Defogger)
- (j) Fuse (Quarter Window Defogger)

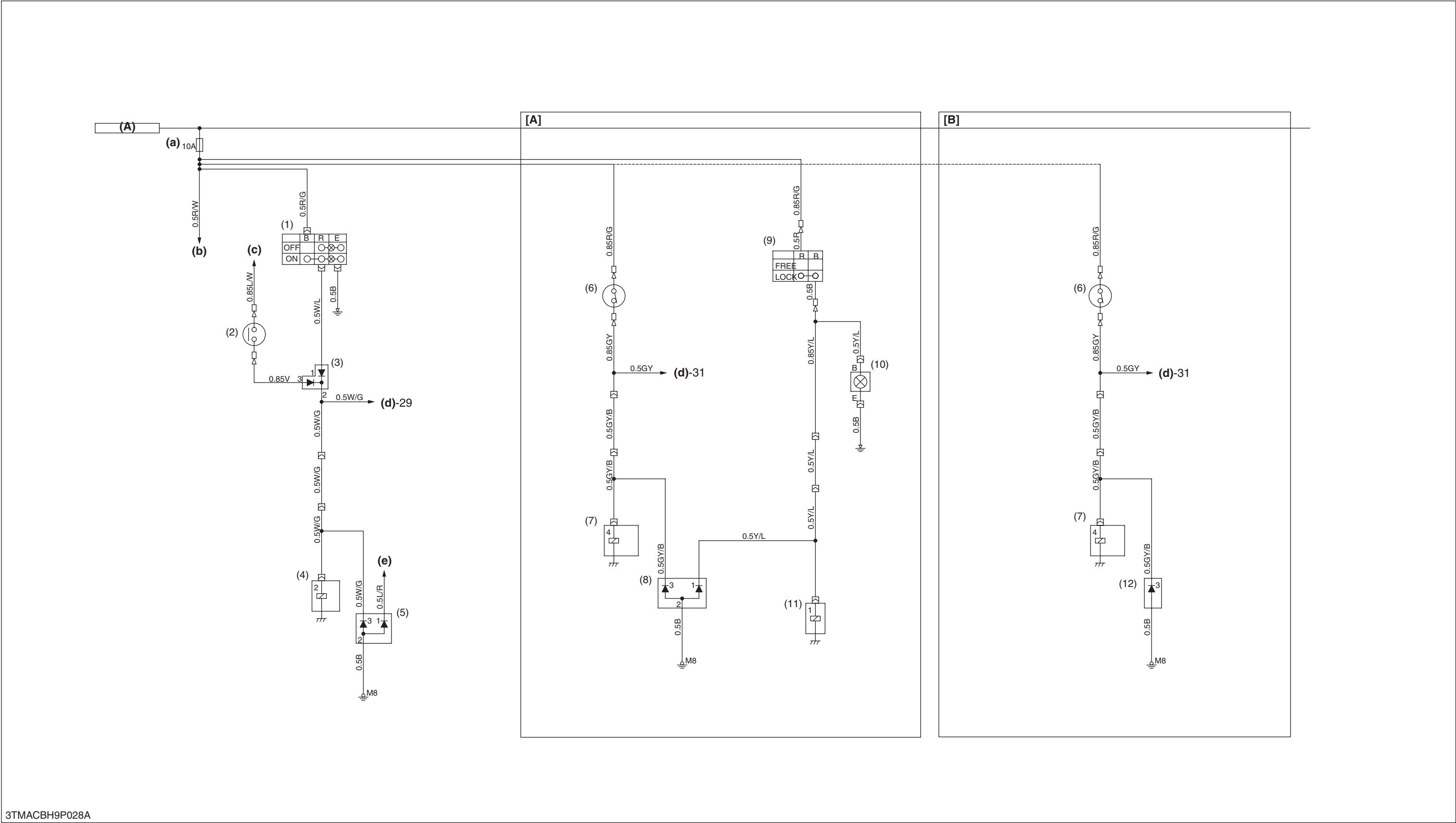
- (k) To Meter Panel
- (l) To 4WD Switch
- (m) To Rear Diff. Lock Switch
- (n) To Dual Speed Switch
- (o) To Radio Fuse 5A
- (p) Fuse (Working Light (Front Side))

- (q) Fuse (Air Conditioner (Compressor))
- (r) Fuse (Air Conditioner (Fan Motor))
- (s) To DT Solenoid Valve
- (t) Fuse (Working Light (Rear))
- (u) Fuse (Working Light (Front))
- (v) Fuse (Cigarette Lighter)

[illegible]

(1) Hazard Switch (14V, 1.4W)	(8) Dome Light (Room) (12V, 5W)	(15) Licence Light (12V/10W)	(21) Rear Flasher Lamp R.H. (Lower) (12V, 21W)	(A) Head Light	(c) Fuse (Head Light, Position Lamp)	(f) To Meter Panel (16: Turn L.H.)	(i) To A/C Control Panel
(2) Flasher Unit	(9) Door Switch L.H.	(16) Front Combination Lamp L.H.		(B) Key IG		(g) To Meter Panel (12: Turn R.H.)	(j) To Meter Panel (15: High Beam)
(3) Combination Light Switch	(10) Door Switch R.H.	(17) Position Lamp (10W)	(22) Rear Combination Lamp R.H. (12V, 5/21W)	(a) Fuse (Flasher, Hazard)	(d) Fuse (Meter (Back Up), Radio, Horn, Dome Light)	(h) To Meter Panel (21: Illumination)	(k) To Meter Panel (38: Back Up)
(4) Turn Switch	(11) Brake Switch R.H.	(18) Turning Lamp (21W)		(b) Fuse (Turn Signal, Stop Light)	(e) To Meter Panel (14: Trailer Indicator)		(l) To Radio (Back Up)
(5) Head Light Switch	(12) Brake Switch L.H.	(19) Rear Combination Lamp L.H. (12V, 5/21W)	(23) Front Combination Lamp L.H. (12V, 5/21W)				
(6) Head Light L.H. (H4 12V, 55/60W)	(13) Horn Switch	(20) Rear Flasher Lamp L.H. (Lower) (12V, 21W)	(24) Trailer Socket Assembly				
(7) Head Light R.H. (H4 12V, 55/60W)	(14) Horn						

(3) 4WD (T/M Control) System



3TMACBH9P028A

- (1) 4WD Switch (14 V, 1.12 W)
(2) Brake Switch L.H.
(3) Diode (4WD Brake)

- (4) DT Valve (Solenoid)
(5) Diode (PTO/DT)
(6) Rear DIFF. Lock Switch

- (7) Diff. Lock Valve (Solenoid)
(8) Diode (DS/DIFF)
(9) Dual Shift Switch

- (10) Dual Shift Pilot Lamp
(12 V, 1.7 W)
(11) Dual Speed Valve (Solenoid)
(12) Diode (DIFF Lock)

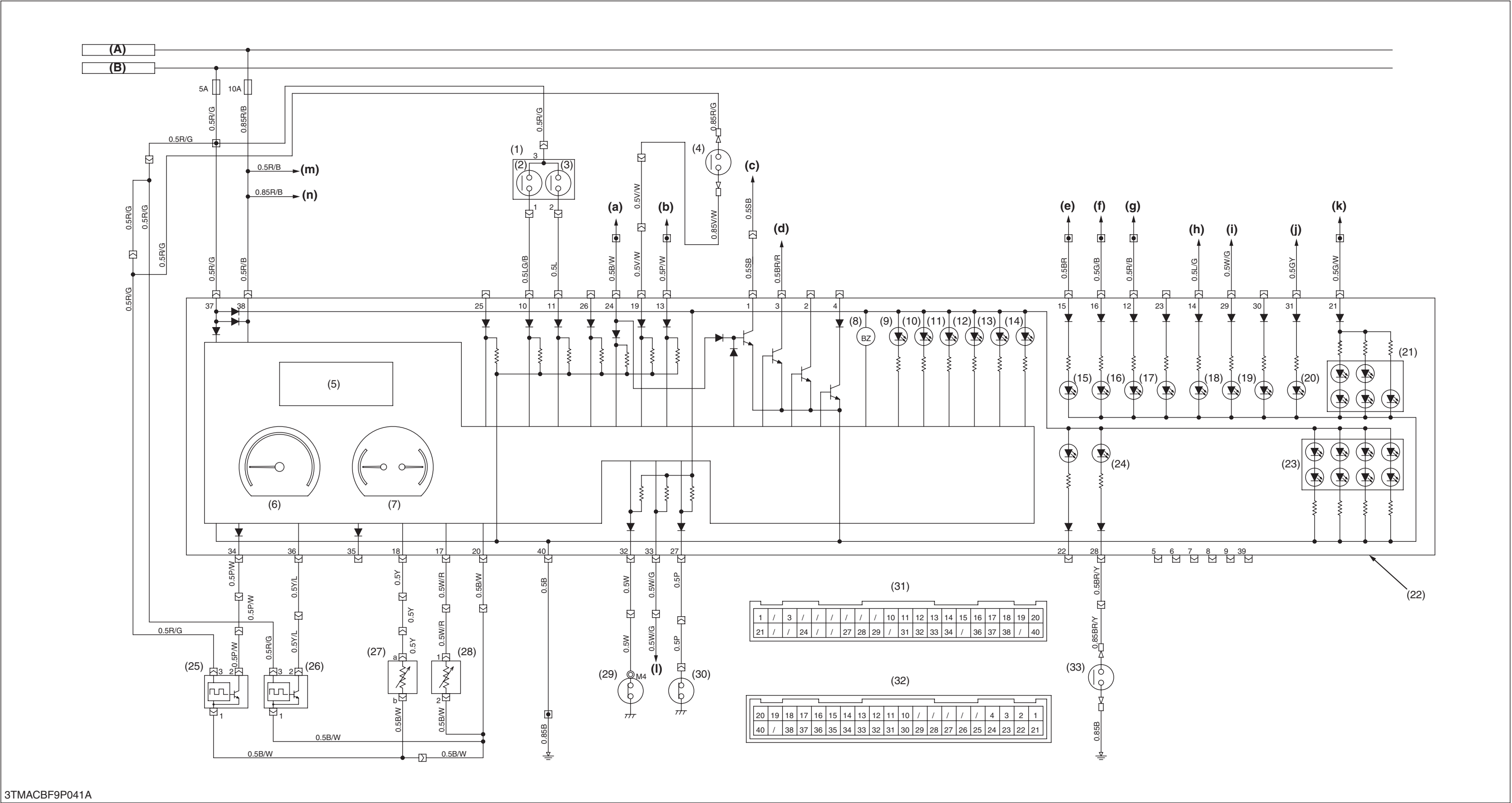
- [A] F36/R36 Speed Transmission
Model
[B] F18/R18 Speed Transmission
Model

(A) Key/IG

- (a) Fuse (T/M Control, Alternator,
PTO, Engine)
(b) To PTO Switch

- (c) To Brake Switch R.H.
(d) To Meter Panel
(e) To PTO Valve (Solenoid)

(4) Instrument Panel Board (Meter Panel)



- (1) Display Mode Select Switch

(2) PTO/Hour

(3) Speed Unit

(4) PTO Change Switch

(5) LCD Display

(6) Tacho Meter

(7) Fuel/Temperature Meter

(8) Buzzer
- (9) Engine Oil Pressure Indicator

(10) Charge Indicator

(11) PTO Indicator

(12) Heater Indicator

(13) Fuel Level Indicator

(14) Parking Indicator

(15) High Beam Indicator

(16) Turn Signal (L.H.) Indicator
- (17) Turn Signal (R.H.) Indicator

(18) Trailer Indicator

(19) 4WD Indicator

(20) Rear Differential Lock Indicator

(21) Back Light

(22) Meter Panel

(23) LCD Back Light
- (24) Air Cleaner Indicator

(25) Traveling Speed Sensor

(26) Engine Rotation Sensor

(27) Fuel Sensor

(28) Engine Coolant Temperature Sensor

(29) Engine Oil Pressure Switch
- (30) Parking Brake Switch

(31) Meter Panel (Wire Harness Side)

(32) Meter Panel Side

(33) Air Cleaner Switch
- (a) To Main Key (Start)

(b) To PTO Switch

(c) To Heater Relay

(d) To Engine Stop Relay

(e) To Light Switch (High Beam)
- (f) To Flasher Unit (Output L)

(g) To Flasher Unit (Output R)

(h) To Flasher Unit (Trailer)

(i) To 4WD Switch

(j) To Diff. Lock Switch
- (k) To Light Switch

(l) To Alternator

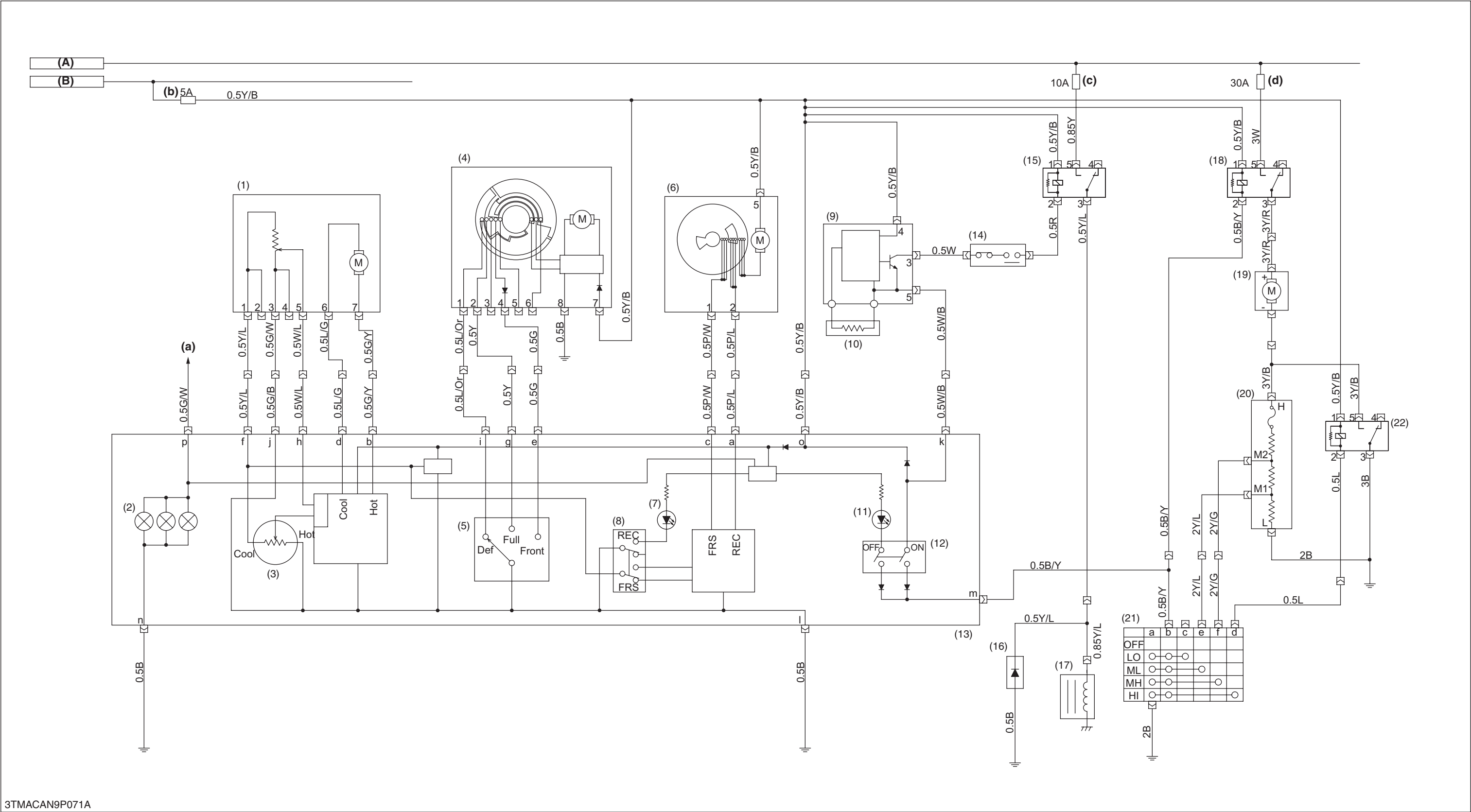
(m) To Dome Light

(n) To Horn Switch

[illegible]

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(6) Air Conditioner



- (1) Servomotor Temperature Control

(2) Illumination Lamp (14V, 1.96W)

(3) Temperature Control Volume

(4) Servomotor Mode
- (5) Mode Select Switch

(6) Servomotor FRS/REC

(7) F/R Indicator

(8) F/R Switch
- (9) Thermo Amplifier

(10) Frost Thermistor

(11) A/C Indicator

(12) A/C Switch
- (13) A/C Control Panel

(14) Dual Pressure Switch

(15) Compressor Relay

(16) Surge Cut Diode
- (17) Magnetic Clutch Compressor

(18) Blower Relay

(19) Blower Motor

(20) Blower Motor Resistor
- (21) Switch Blower Motor (A/C Control Panel)

(22) Blower High Relay
- (A) Blower Motor

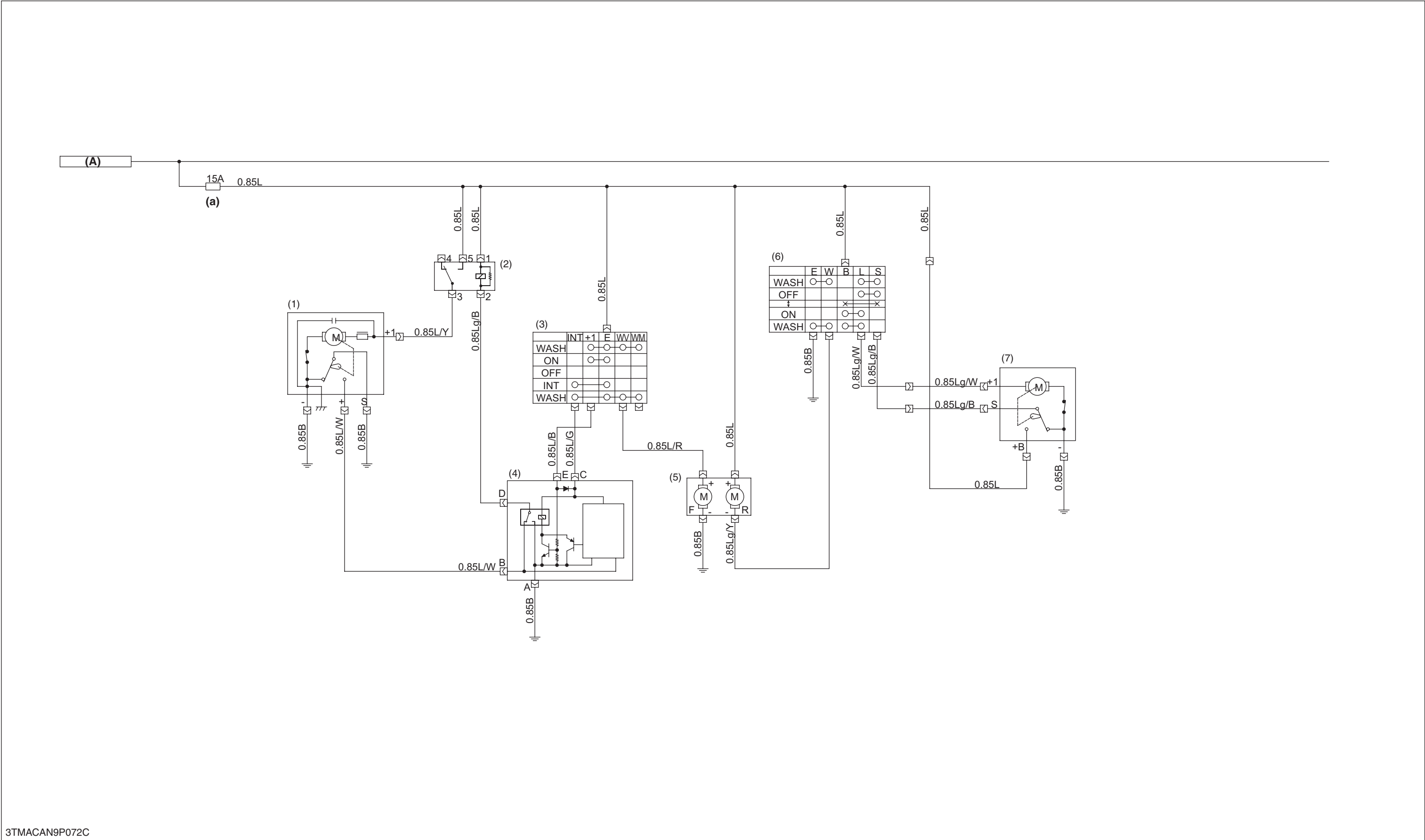
(B) Key ACC
- (a) To Light Switch

(b) Fuse (Air Con: Control)

(c) Fuse (Air Con: Compressor)

(d) Fuse (Air Con: Fan Motor)

(7) Wiper System



3TMACAN9P072C

(1) Front Wiper Motor

(2) Front Wiper Motor Relay

(3) Front Wiper Switch

(4) Front Wiper Relay/Timer

(5) Washer Motor

(6) Rear Wiper Switch

(7) Rear Wiper Motor

(A) Key ACC
(a) Fuse (Wiper)

[3] WIRING COLOR

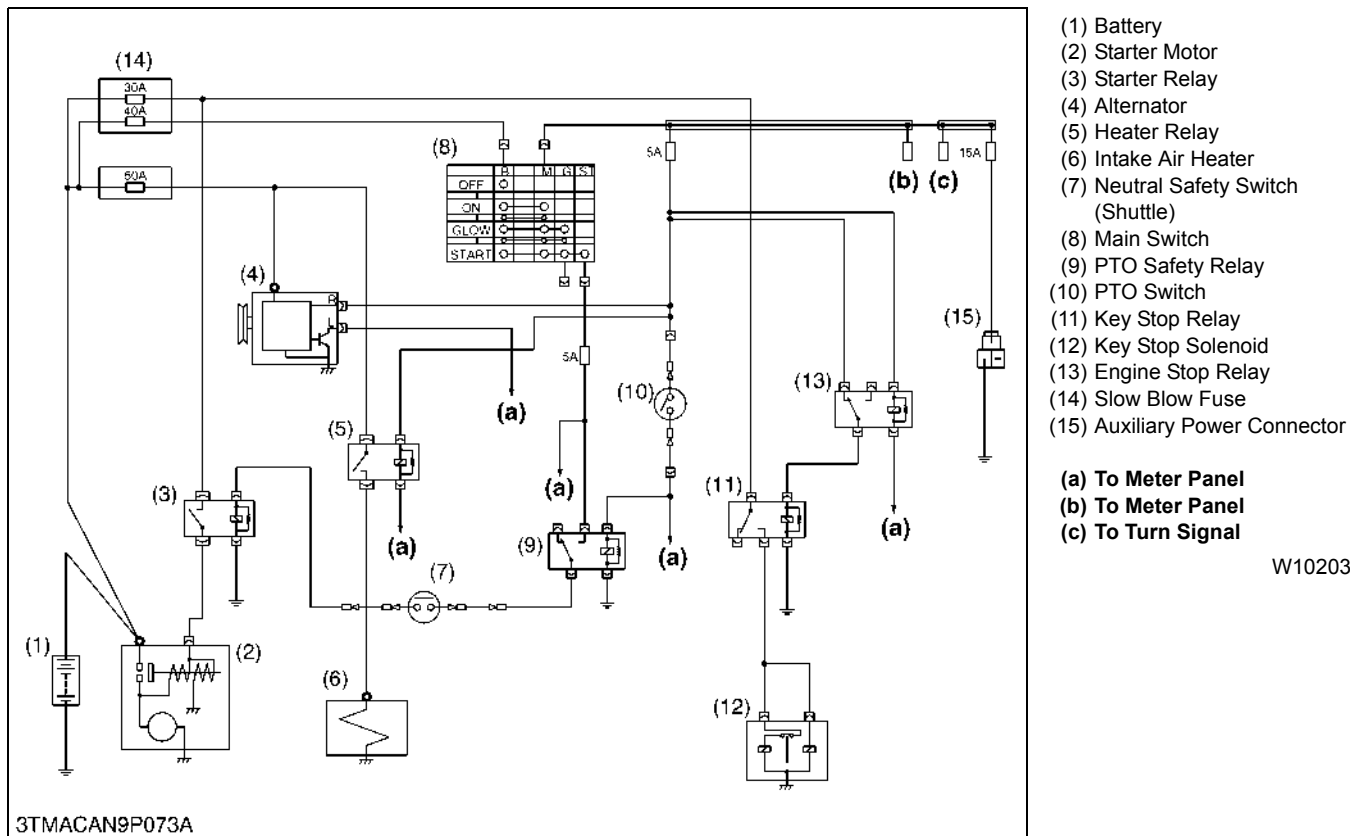
B Black	Br/B Brown / Black	Or/W Orange / White
G Green	Br/Y Brown / Yellow	P/W Pink / White
L Blue	Br/R Brown / Red	P/L Pink / Blue
P Pink	G/B Green / Black	R/B Red / Black
R Red	G/L Green / Blue	R/G Red / Green
W White	G/R Green / Red	R/L Red / Blue
Y Yellow	G/W Green / White	R/W Red / White
Br Brown	G/Y Green / Yellow	R/Y Red / Yellow
GY Gray	L/B Blue / Black	V/W Violet / White
Lg Light Green	L/G Blue / Green	W/B White / Black
Or Orange	L/Or Blue / Orange	W/G White / Green
Sb Sky Blue	L/R Blue / Red	W/L White / Blue
B/G Black / Green	L/W Blue / White	W/R White / Red
B/L Black / Blue	L/Y Blue / Yellow	W/Y White / Yellow
B/P Black / Pink	Lg/B Light Green / Blue	Y/B Yellow / Black
B/Pu Black / Violet	Lg/R Light Green / Red	Y/G Yellow / Green
B/R Black / Red	Lg/W Light Green / White	Y/L Yellow / Blue
B/W Black / White	Lg/Y Light Green / Yellow	Y/R Yellow / Red
B/Y Black / Yellow		

W1019456

3. STARTING SYSTEM

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT

(1) ROPS Model



W1020335

There are three key positions, “OFF”, “ON” and “START” on the main switch as shown above.

When the main switch is set “ON”, terminal **B** of the main switch is connected to terminal **M**.

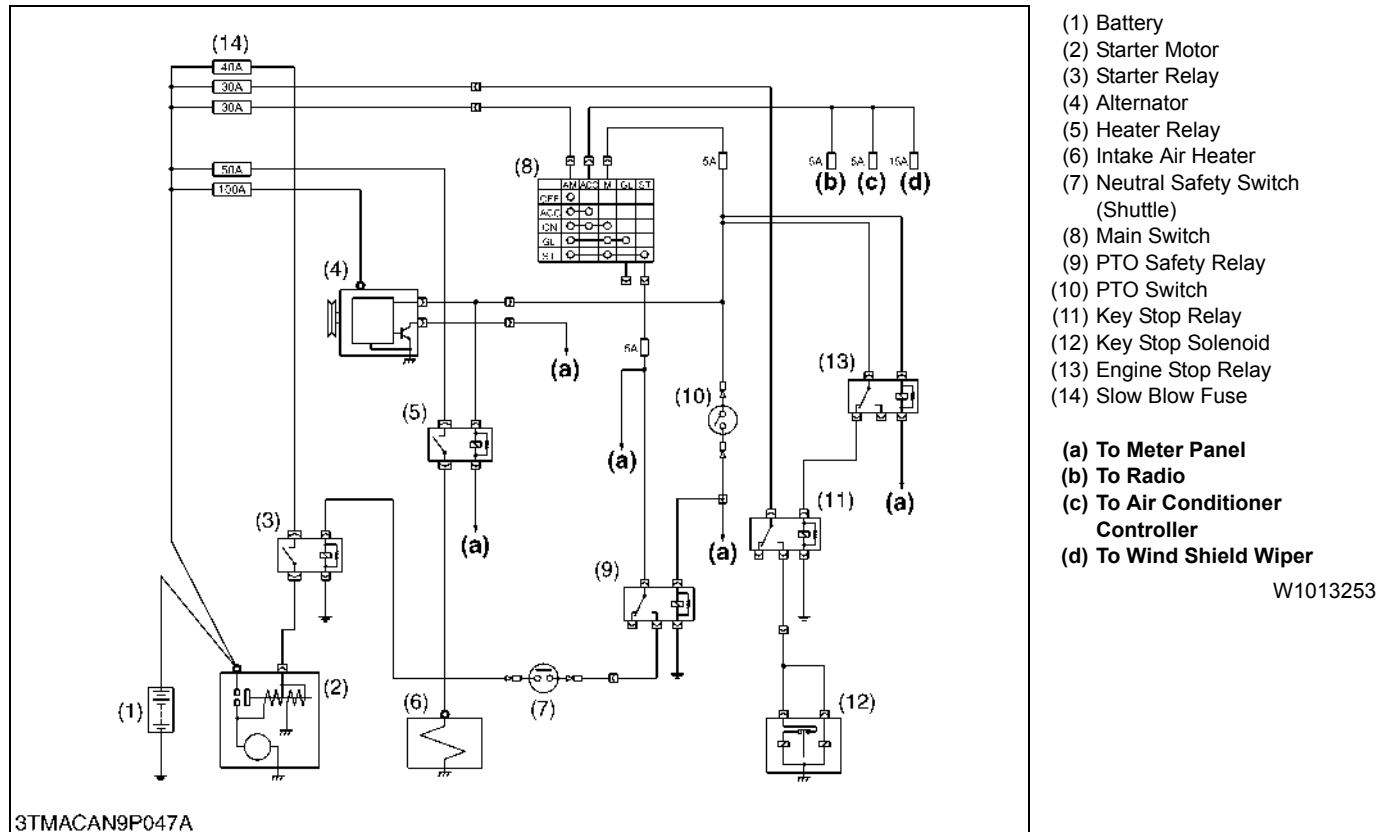
As a result, the battery current flows to the key stop relay (11) and the contact points of relay turned on “ON” position, and the key stop solenoid (12) is actuating for governor linkage, and linkage are connecting to the stop lever of injection pump, and stop lever move into “START” position.

When the main switch is set to “START” under the condition that the shuttle shift lever is neutral position and the safety switch (7) is turned on the PTO lever is in “OFF” position (PTO switch (10) is pushed to “ON”). Terminal **AM** of the main switch is connected to terminal **M** and terminal **ST**. Consequently, battery current flows to safety switches (7), (10), coil of starter relay (3), PTO safety relay (9). (When the PTO switches is set to “OFF”, battery current flows PTO switch (10) and coil of PTO safety relay (9).

This actuates starter (2).

When the main switch is released after starting the engine, the main switch returns to “ON” automatically. This stops the starter. Fuel supply and fuel stop to and from the injection pump are carried out by the key stop relay (11) and engine stop solenoid (12).

(2) CABIN Model



There are four key positions, “OFF”, “ACC”, “ON” and “START” on the main switch as shown above.

When the main switch is set to “ACC” (accessory), the radio, windshields wiper, work lights (front and rear), cigar lighter and blower fan can be used.

When the main switch is set “ON”, terminal **AM** of the main switch is connected to terminal **ACC** and terminal **M**.

As a result, the battery current flows to the key stop relay (11) and the contact points of relay turned on “ON” position, and the key stop solenoid (12) is actuating for governor linkage, and linkage are connecting to the stop lever of injection pump, and stop lever move into “START” position.

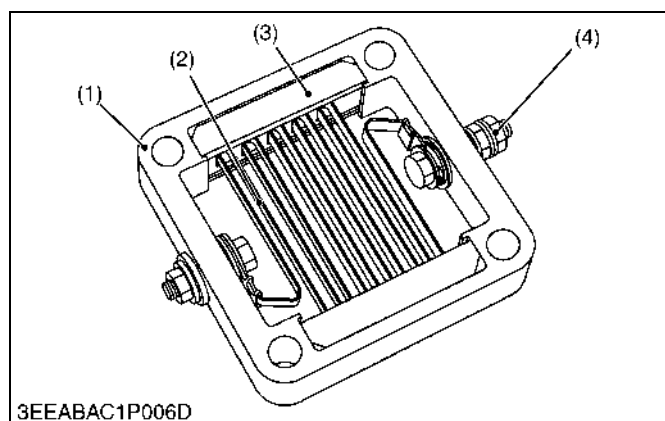
When the main switch is set to “START” under the condition that the shuttle shift lever is neutral position and the safety switch (7) is turned on the PTO lever is in “OFF” position (PTO switch (10) is pushed to “ON”). Terminal **AM** of the main switch is connected to terminal **M** and terminal **ST**. Consequently, battery current flows to safety switches (7), (10), coil of starter relay (3), PTO safety relay (9). (When the PTO switches is set to “OFF”, battery current flows PTO switch (10) and coil of PTO safety relay (9).

This actuates starter (2).

When the main switch is released after starting the engine, the main switch returns to “ON” automatically. This stops the starter. Fuel supply and fuel stop to and from the injection pump are carried out by the key stop relay (11) and engine stop solenoid (12).

[2] COMPONENTS

(1) Air Heater



The PTC intake air heater is introduced in order to further improve the starting performance in cold regions. The intake air heater is mounted on the air inlet manifold, while the conventional glow plug on the cylinder head. This means that a multi-valve design can be implemented and that the starting performance and serviceability are enhanced.

[Structure]

The 12 V battery's positive terminal is connected with the main terminal. When the key switch is set to the "ON" position, the current starts flowing in this routes as indicated with the arrow marks : main terminal → PTC element → ground (body).

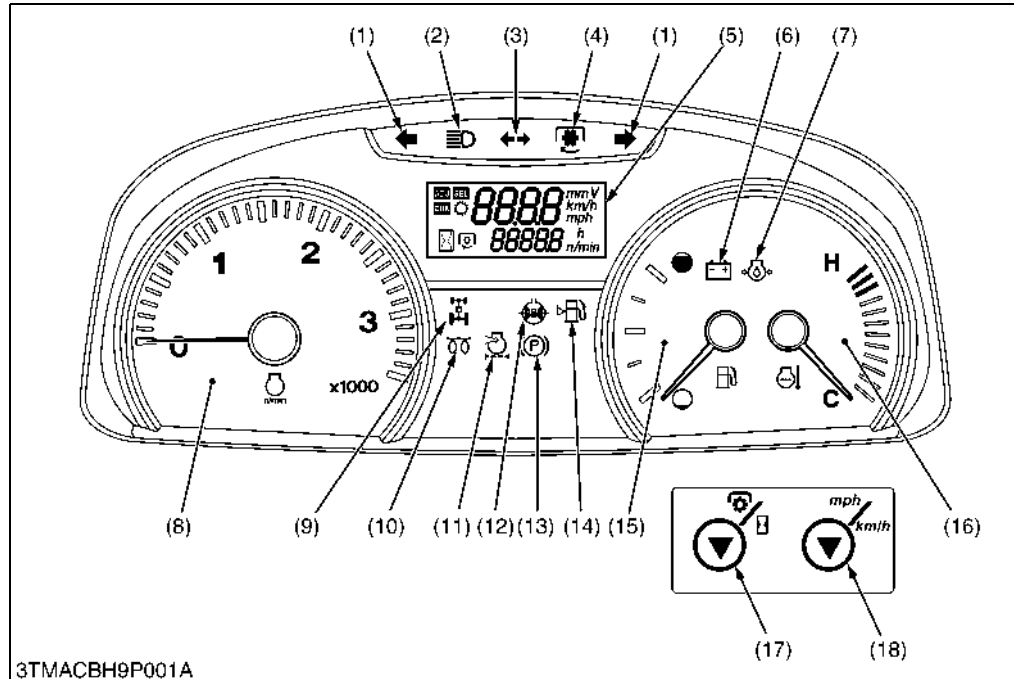
The preheating time and after heating time are controlled by CPU that is in the meter panel.

(1) Body	(3) Insulator
(2) PTC Element	(4) Terminal

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4. INSTRUMENT PANEL

[1] INDICATION ITEMS OF METER PANEL

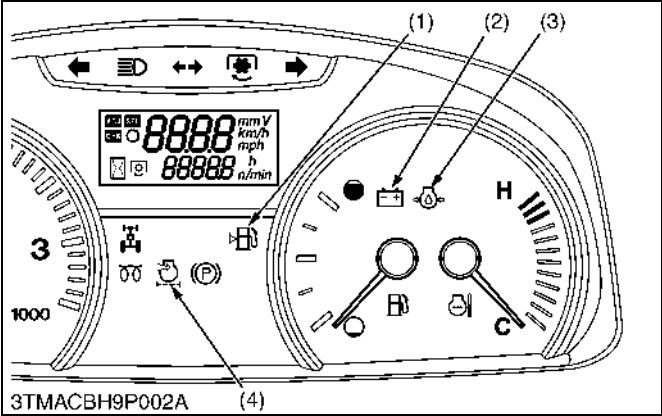


- (1) Hazard / Turn Signal Indicator
- (2) High Beam Indicator
- (3) Trailer Indicator
- (4) PTO Clutch Indicator
- (5) Liquid Crystal Display
- (6) Electrical Charge Indicator
- (7) Engine Oil Pressure Indicator
- (8) Tachometer
- (9) 4WD Indicator
- (10) Heater Indicator
- (11) Air Cleaner Indicator
- (12) Rear Wheel Differential Lock Indicator
- (13) Parking Brake Indicator
- (14) Fuel Level Indicator
- (15) Fuel Gauge
- (16) Coolant Temperature Gauge
- (17) PTO / Hour Meter Select Switch
- (18) Travel Speed Select Switch

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[2] EASY CHECKER (TM)



If the warning lamps in the Easy Checker (TM) come on during operation, immediately stop the engine, and find the cause as shown below.

Never operate the tractor while Easy Checker (TM) lamp is on.

■ Engine Oil Pressure

If the oil pressure in the engine goes below the prescribed level, the warning lamp in the Easy Checker (TM) will come on.

If this should happen during operation, and it does not go off when the engine is accelerated to more than 1000 min⁻¹ (rpm), check level of engine oil.

■ Fuel Level

If the fuel in the tank goes below the prescribed level, the warning lamp in the Easy Checker (TM) will come on.

If this should happen during operation, refuel as soon as possible.

Prescribed level	ROPS model	20 L 5.3 U.S.gals 4.4 Imp.gals
	CABIN model	15 L 4.0 U.S.gals 3.3 Imp.gals

■ Electrical Charge

If the alternator is not charging battery, the Easy Checker will come on.

If this should happen during operation, check the electrical charging system.

■ Air Cleaner

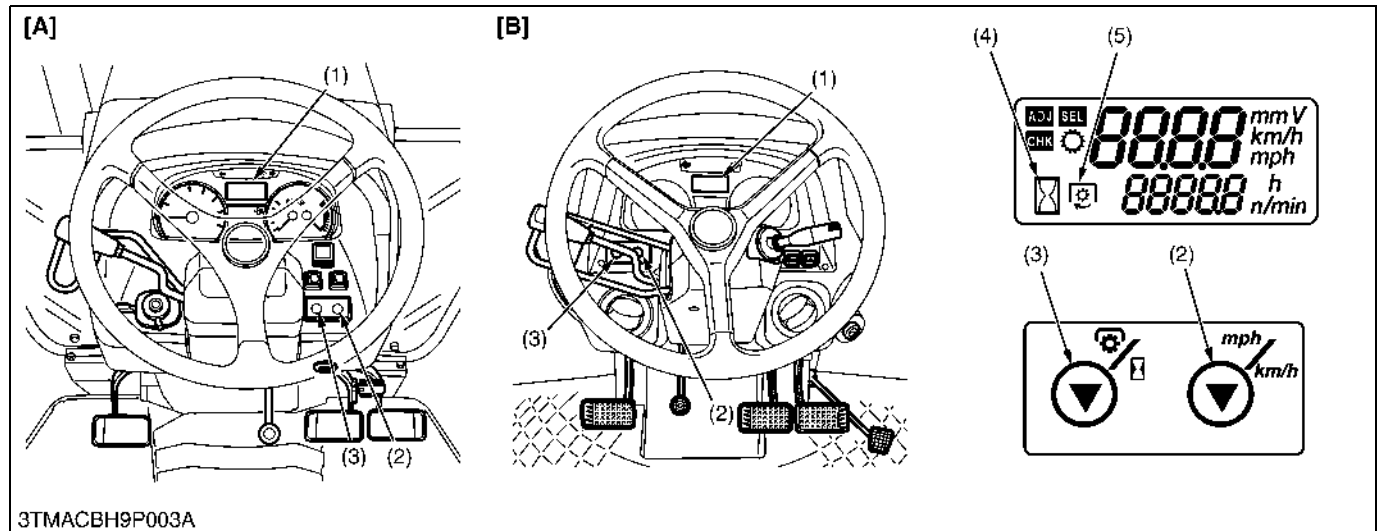
If the air cleaner is clogged, the warning lamp in the Easy Checker (TM) will come on.

If this should happen during operation, clean the air cleaner element.

- (1) Fuel Level Indicator
- (2) Electrical Charge Indicator
- (3) Engine Oil Pressure Indicator
- (4) Air Cleaner Switch

W1020575

[3] LCD MONITOR INDICATION



- (1) LCD Monitor (3) PTO/Hour Meter Select Switch (5) PTO Indication
(2) Traveling Speed Select Switch (4) Hour Meter Indication

[A] ROPS Model
[B] CABIN Model

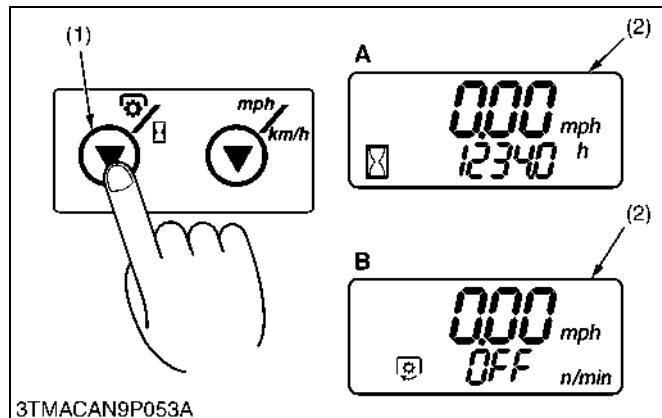
The LCD monitor gives three different modes : “display mode”, “setting mode” and “checking mode”.

■ NOTE

- The travel speed displayed when the wheels slip under traction is different from the actual one.
- In cold weather the LCD monitor response will normally be slower and the visibility be less, than in the warmer weather.

(1) Display Mode

1. The LCD monitor gives two different modes : “traveling speed and hour meter” and “traveling speed and PTO speed”. Each time the PTO/Hour meter select switch is pressed, the mode is switched to the changing display.
2. To switch between “mph” and “km/h” for the traveling speed, use the traveling speed select switch.
3. The PTO clutch control lever works for the following automatic display modes.
 - PTO clutch control lever “ON” : traveling speed and PTO speed are displayed.
 - PTO clutch control lever “OFF” : traveling speed and hour meter are displayed.



■ Switching Hour Meter Mode and PTO Speed Mode

Press the PTO/Hour meter select switch (1) to change the “hour meter mode” and “PTO speed mode”.

(Hour meter mode)

- Traveling speed and total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.

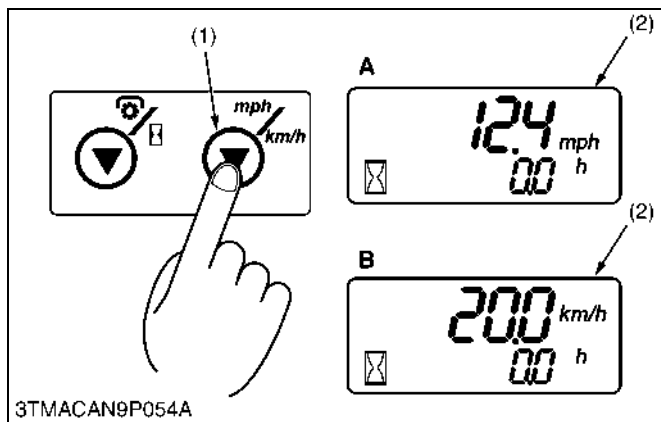
(PTO speed mode)

- Traveling speed and PTO speed are displayed.
- When the PTO clutch control lever is in “OFF” position, “OFF” is displayed.

- (1) PTO/Hour Meter Select Switch
(2) LCD Monitor

A : Hour Meter Mode
B : PTO Speed Mode

W1015241



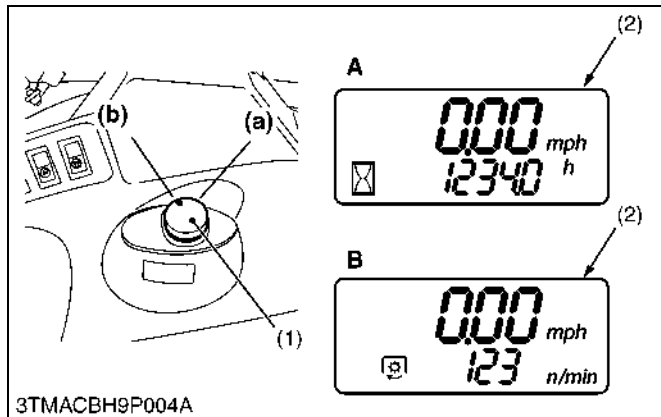
■ Switching “km/h” and “mph” Indication

Press the traveling speed select switch (1) to change the “km/h” and “mph” indication.

- (1) PTO/Hour Meter Select Switch
(2) LCD Monitor

A : mph (Traveling Speed)
B : km/h (Traveling Speed)

W1015520



■ When Operate PTO Clutch Control Switch

(At hour meter mode)

- Traveling speed and total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.
- When the PTO/Hour meter select switch is pressed in this state, “OFF” is displayed.

(At PTO speed mode)

- Traveling speed and PTO speed are displayed.
- When the PTO/Hour meter select switch is pressed in this state, the display mode switches to hour meter mode.

- (1) PTO Clutch Control Lever
(2) LCD Monitor

A : PTO OFF (Hour Meter Mode)
B : PTO ON (PTO Speed Mode)
(a) ON Position
(b) OFF Position

W1015719

(2) Setting Mode

- Input the various data to RAM.
- There are three different setting modes : “PTO speed display mode switching”, “entering the traveling speed coefficient” and “model select mode”.

■ PTO Speed Display Mode Switching

The PTO speed display mode switching is set at factory. When replacing the instrument panel assembly, enter the numerical code.

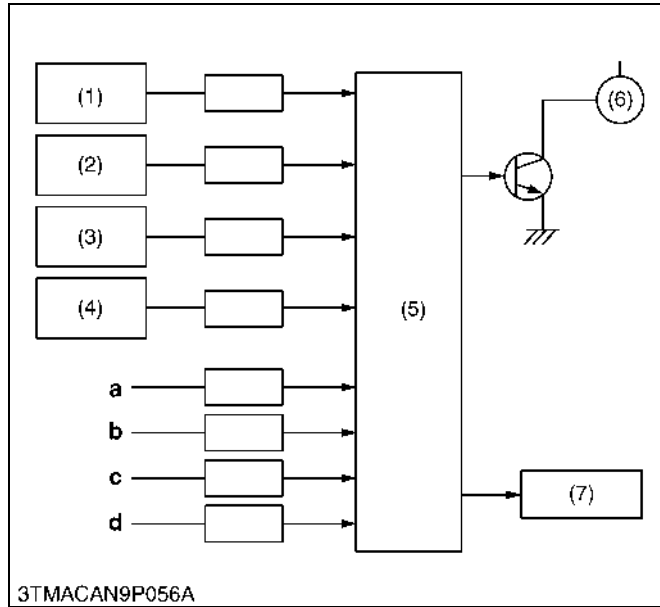
■ Entering the Travel Speed Coefficient

When optional different-diameter tires are fitted on the machine, the travel speed display mode must be changed. Otherwise the travel speed will not get correctly displayed. Such mode switching is also needed when the original tires are back on the machine.

■ Mode Select Mode

The mode select mode is set at factory. When replacing the instrument panel assembly, enter the model code.

(3) Checking Mode



The checking mode checking for sensors, battery voltage and engine revolution.

The CPU (5) process the input dates from sensors resistance, taco pulse and voltage to indicate with the LCD monitor (7).

The check mode shows four items as below.

No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	-30 to 120 °C (-4 to 248 °F)	V
3	Battery voltage	-	V
4	Engine revolution	Idling to max.	n/min

- (1) Engine Speed Sensor
- (2) Fuel Sensor
- (3) Battery Voltage
- (4) Coolant Temperature Sensor
- (5) CPU
- (6) Buzzer
- (7) LCD Monitor

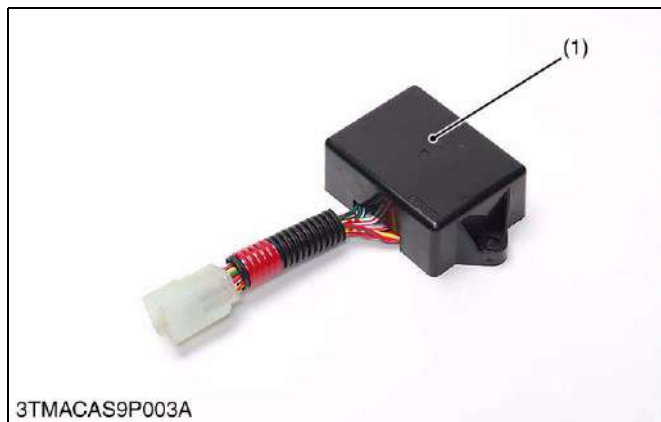
- a : From Alternator Terminal L**
- b : From PTO/Hour Meter Select Switch**
- c : From Traveling Speed Select Switch**
- d : From Main Key Switch**

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5. LIGHTING SYSTEM

[1] COMPONENTS

(1) Flasher Unit



■ Flasher Unit

The function of flasher unit is as follows.

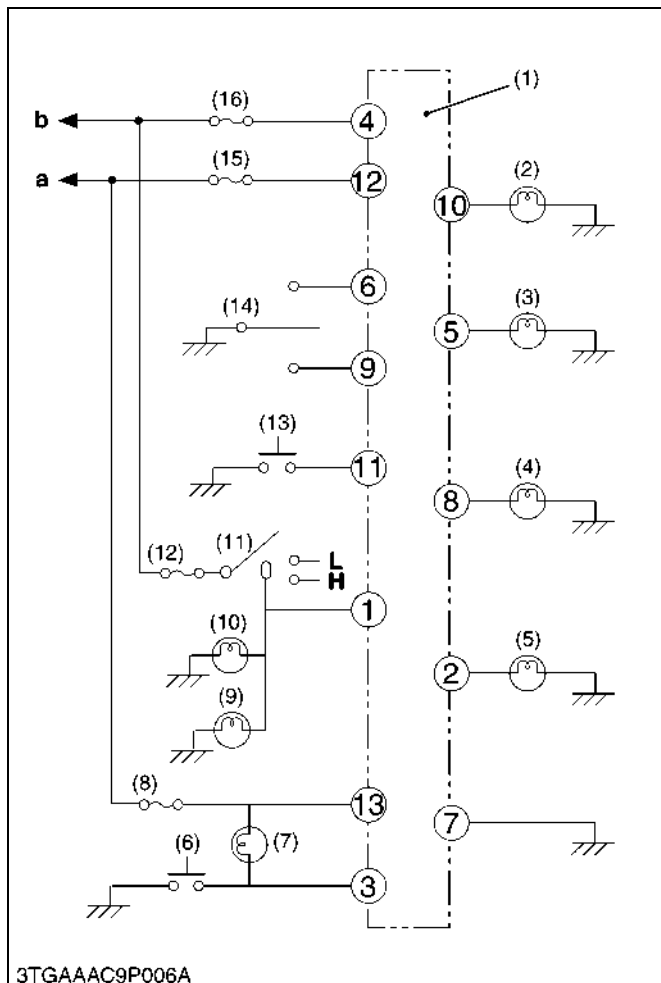
1. The flasher unit blinks the turn signal light (3), (4) and hazard indicator light (2) when the hazard switch (13) is turned on.
2. Then flasher unit blinks the turn signal light (3) or (4), when the turn signal switch (14) is turned clockwise or counterclockwise.
3. The flasher unit lights the position light (5) when the light switch (11) is turned on (Lo or Hi).
4. The flasher unit lights the position light (5) when the position light switch (6) is turned on.
5. The blinking frequency is 60 to 120 times per minutes.

(1) Flasher Unit	(11) Light Switch
(2) Hazard Indicator Light	(12) Fuse (15 A)
(3) Turn Signal Light (Right)	(13) Hazard Switch
(4) Turn Signal Light (Left)	(14) Turn Signal Switch
(5) Position Light	(15) Fuse (15 A)
(6) Position Light Switch	(16) Fuse (10 A)
(7) Position Switch Light	
(8) Fuse (10 A)	
(9) Meter Panel	
(10) Hazard Switch Light	

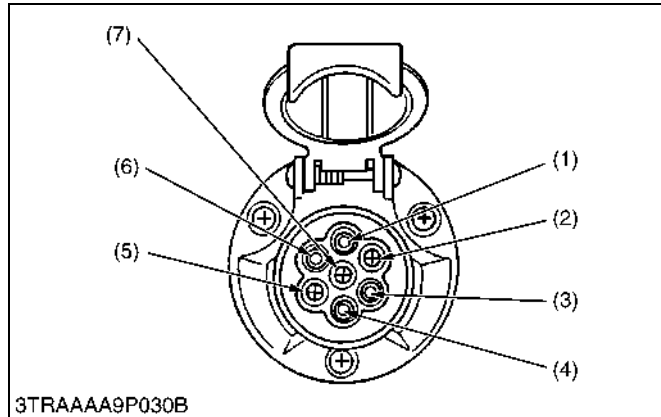
a : To Battery

b : To Key Switch AC Terminal

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6. TRAILER SOCKET



The trailer socket is provided to take out the electrical power from tractor to trailer or implement.

The function of each terminal is shown below.

Terminal	Function	Color of wire harness	
		ROPS Model	CABIN Model
(1)	Turn signal light (L.H.)	Black	Green / Black
(2)	–	–	Green / White
(3)	Ground	Yellow / Black	Green / Blue
(4)	Turn signal light (R.H.)	Green / White	Green / Yellow
(5)	Tail light Sidemarker light Parking light	Red / White	Black
(6)	Brake stop light	Orange	Gray
(7)	Number plate light	Red / Black	Green / Red

- (1) Terminal 1
- (2) Terminal 2
- (3) Terminal 3
- (4) Terminal 4

- (5) Terminal 5
- (6) Terminal 6
- (7) Terminal 7

W1017401

SERVICING

CONTENTS

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	Battery discharged or defective	Recharge or replace	9-S9
	Battery positive cable disconnected or improperly connected	Repair or replace	9-S8
	Battery negative cable disconnected or improperly connected	Repair or replace	9-S8
	Slow blow fuse blown	Replace	9-S10, 11
Fuse Blown Frequently	Short-circuited	Repair or replace	–

W1014322

BATTERY

Battery Discharges Too Quickly	Battery defective	Replace	9-S8
	Alternator defective	Repair or replace	9-S18
	Wiring harness disconnected or improperly connected (between battery positive terminal and alternator B terminal)	Repair or replace	–
	Cooling fan belt slipping	Adjust tension	G-26

W1013580

STARTING SYSTEM

Starter Motor Does Not Operate	Battery discharged or defective	Recharge or replace	9-S9
	Slow blow fuse blown	Replace	9-S10, 11
	Starter relay defective	Replace	9-S40
	PTO switch defective	Repair or replace	9-S27
	Wiring harness disconnected or improperly connected (between main switch M terminal and PTO switch, between main switch ST terminal and PTO relay, shuttle neutral switch, between safety switch and starter relay, between starter relay and ground, between starter relay and starter motor S terminal, between battery positive terminal and starter motor B terminal)	Repair or replace	–
	Starter motor defective	Repair or replace	9-S16
	Main switch defective	Replace	9-S13, 14

W1011018

AIR HEATER

Air Heater Does Not Heat	Slow blow fuse blown	Replace	9-S10, 11
	Air heater relay defective	Replace	9-S40
	Air heater defective	Replace	9-S16

W1010808

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Bulb blown	Replace	G-40
	Wiring harness disconnected or improperly connected	Repair or replace	–
Illumination Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Meter panel defective	Replace	9-S24
	Wiring harness disconnected or improperly connected	Repair or replace	–
Tail Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Wiring harness disconnected or improperly connected	Repair or replace	–
Hazard Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Bulb blown	Replace	G-40
	Flasher unit defective	Replace	9-S37
	Hazard switch defective	Replace	9-S36
	Turn signal switch defective	Replace	9-S34, 35
Hazard and Turn Signal Indicator Lamp Does Not Light	Meter panel defective	Replace	9-S24
	Wiring harness disconnected or improperly connected	Repair or replace	–
Hazard and Turn Signal Light Does Not Go ON and OFF	Flasher unit defective	Replace	9-S37
Work Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Bulb blown	Replace	G-40
	Wiring harness disconnected or improperly connected	Repair or replace	–
Brake Light Does Not Light	Fuse blown	Replace	9-S10, 11
	Bulb blown	Replace	G-40

W1011496

HORN

Horn Does Not Sound when Horn Button Is Pushed	Horn switch defective	Replace	9-S34, 36
	Horn defective	Replace	–
	Wiring harness disconnected or improperly connected (between combination switch terminal H terminal and horn)	Repair or replace	–

W1011277

EASY CHECKER

Symptom	Probable Cause	Solution	Reference Page
Engine Oil Pressure Lamp Lights Up When Engine is Running	Engine oil pressure too low	Repair	1-S16
	Engine oil insufficient	Replenish	G-9
	Engine oil pressure switch defective	Replace	9-S26
	Short circuit between engine oil pressure switch lead and chassis	Repair	9-S26
	Circuit in panel board defective	Replace	–
Engine Oil Pressure Lamp Does Not Light When Main Switch is Turned ON and Engine Is Not Running	Meter panel defective	Replace	9-S24
	Engine oil pressure switch defective	Replace	9-S26
	Wiring harness disconnected or improperly connected (between meter panel and engine oil pressure switch)	Repair or replace	–
	Circuit in meter panel defective	Replace	–
Charge Lamp Does Not Go OFF When Engine Is Running	Alternator defective	Repair or replace	9-S18
	Short circuit between alternator terminal L and chassis	Repair	–
	Circuit in meter panel defective	Replace	–
Charge Lamp Does Not Light When Main Switch Is Turned ON	Wiring harness disconnected or improperly connected (between meter panel and alternator)	Repair or replace	–
	Circuit in meter panel defective	Replace	–
PTO Lamp Lights Up When PTO Switch Is OFF Position	PTO switch is defective	Replace	9-S27
PTO Lamp Does Not Light Up When PTO Switch Is ON Position	PTO switch is defective	Replace	9-S27
	Meter panel defective	Replace	9-S24
Fuel Level Indicator Lamp Lights Up	Fuel insufficient	Replenish	G-9
	Fuel level sensor defective	Replace	9-S30
	Short circuit between fuel unit lead and chassis	Repair	–
	Circuit in meter panel defective	Replace	–
Fuel Level Indicator Lamp Does Not Light When Fuel Tank Is Empty	Fuel level sensor defective	Replace	9-S30
	Wiring harness disconnected or improperly connected (between meter panel and fuel unit)	Repair or replace	–
	Circuit in meter panel defective	Replace	–

W1013580

EASY CHECKER (Continued)

Symptom	Probable Cause	Solution	Reference Page
Coolant Temperature Indicator Does Not Light When Water Temperature Gauge Points to H (Red Zone)	Fuse blown	Replace	—
	Coolant temperature sensor is defective	Replace	9-S26
	Wiring harness disconnected or improperly connected (between panel and coolant temperature sensor)	Repair or replace	—
	Circuit in panel board is defective	Replace	9-S24
4WD Indicator Lamp Lights Up When 4WD Is Not Engaged	4WD switch is defective	Replace	9-S31, 32
4WD Indicator Lamp Does Not Light When 4WD Is Engaged	4WD switch is defective	Replace	9-S31, 32
Air Cleaner Clogged Lamp Lights Up	Air cleaner clogged	Clean or replace	G-25
	Air cleaner sensor defective	Repair or replace	9-S33
	Short circuit between air cleaner sensor lead and chassis	Replace	9-S33
	Circuit panel board defective	Repair or replace	9-S24
Air Cleaner Clogged Lamp Does Not Light When Air Cleaner Clogged	Air Cleaner sensor defective	Replace	9-S33
	Wiring harness disconnected or improperly connected (between panel board and air cleaner sensor, between air cleaner sensor and ground)	Repair or replace	—

W1013580

ENGINE KEY SWITCH SHUT-OFF SYSTEM

Engine Does Not Stop When Main Switch Is Turned OFF	Fuse blown	Replace	9-S10, 11
	Key stop relay defective	Replace	9-S41
	Engine stop relay defective	Replace	9-S41
	Meter panel defective	Replace	9-S24
	Wiring harness disconnected or improperly connected	Repair or replace	—
Engine Does Not Start	Fuse or slow blow fuse blown	Replace	9-S10, 11
	Engine stop solenoid defective	Replace	9-S17
	Engine stop relay defective	Replace	9-S41
	Key stop relay defective	Replace	9-S41
	PTO switch defective	Replace	9-S27
	Shuttle neutral switch defective	Replace	9-S28

W1011890

4WD

Symptom	Probable Cause	Solution	Reference Page
Front Wheel Does Not Drive When 4WD Switch is Turned ON	4WD switch or wiring harness is defective	Replace	9-S31
	4WD relay defective	Replace	9-S41
	4WD solenoid valve defective	Replace	8-S43
Front Wheel Drive Not Be Cancelled	4WD switch or wiring harness is defective	Repair or replace	9-S31
	4WD relay defective	Replace	9-S41
	4WD solenoid valve defective	Replace	8-S43

W1013718

GAUGES

Fuel Gauge Does Not Function	Fuel level sensor defective	Replace	9-S30
	Wiring harness disconnected or improperly connected (between meter panel and fuel unit)	Repair or replace	–
	Circuit in meter panel defective	Replace	–
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge defective	Replace	9-S24
	Coolant temperature sensor defective	Replace	9-S26
	Wiring harness disconnected or improperly connected (between meter panel and coolant temperature sensor)	Repair or replace	–
	Circuit in meter panel defective	Replace	–

W1011980

LCD MONITOR

Nothing is Displayed in LCD	Battery discharged or defective (Battery voltage is below 10 V)	Recharge or replace	9-S9
	Slow blow fuse blown	Replace	9-S10, 11
	Meter panel connector disconnect	Connect	9-S24
	Meter panel defective	Replace	9-S24
Indication on LCD Does Not Change When Pushing the Display Mode Switch	Display mode select switch defective	Replace	9-S26
	Wiring harness disconnected	Repair	–
Traveling Speed is Not Indicating	Wiring harness disconnected	Repair	–
	Traveling speed sensor defective	Replace	9-S31
PTO Speed is Not Indicating	Wiring harness disconnected	Repair	–
	Engine tachometer sensor defective	Replace	9-S31

W1013580

2. SERVICING SPECIFICATIONS

STARTER MOTOR

Item		Factory Specification	Allowable Limit
Commutator	O.D.	32.0 mm 1.26 in.	31.4 mm 1.24 in.
Mica	Undercut	0.50 to 0.80 mm 0.020 to 0.031 in.	0.2 mm 0.0079 in.
Brush	Length	18.0 mm 0.709 in.	11.0 mm 0.433 in.

W1013874

AIR HEATER

Air Heater	Resistance	Approx. 0.3 Ω	—

W1014914

ALTERNATOR

Brush	Length	18.5 mm 0.728 in.	5.0 mm 0.20 in.
Slip Ring	O.D.	22.7 mm 0.894 in.	22.1 mm 0.870 in.

W1013973

FUEL LEVEL SENSOR

Float at Uppermost Position	Resistance	3.0 to 5.0 Ω	—
Float at Lowermost Position	Resistance	107.5 to 112 Ω	—

W1014788

COOLANT TEMPERATURE SENSOR

Coolant Temperature at 120 °C (248 °F)	Resistance	Approx. 117 Ω	—
Coolant Temperature at 100 °C (212 °F)	Resistance	Approx. 189 Ω	—
Coolant Temperature at 80 °C (176 °F)	Resistance	Approx. 290 to 354 Ω	—
Coolant Temperature at 50 °C (122 °F)	Resistance	Approx. 808 Ω	—
Coolant Temperature at 20 °C (68 °F)	Resistance	Approx. 2.21 to 2.69 k Ω	—

W1014851

FLASHER UNIT

Flasher Blinking	Times	60 to 120 times / minutes	—

W1014977

SOLENOID VALVE

PTO Solenoid Valve 4WD Solenoid Valve Rear Differential Lock Solenoid Valve	Resistance	10 to 12 Ω	—

W1013415

DUAL SPEED SOLENOID VALVE (F36/R36 SPEED TRANSMISSION MODEL)

Dual Speed Solenoid Valve	Resistance	10 to 12 Ω	—

W1013455

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Pulley nut (Alternator)	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2
Air heater lead terminal nut	3.5 to 5.3	0.35 to 0.55	2.6 to 3.9
Starter B terminal nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7

W1012736

4. CHECKING AND ADJUSTING



CAUTION

- To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.
- Never remove the battery cap while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.

IMPORTANT

- If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.

[1] BATTERY, FUSE, GROUNDING AND CONNECTOR

(1) Battery

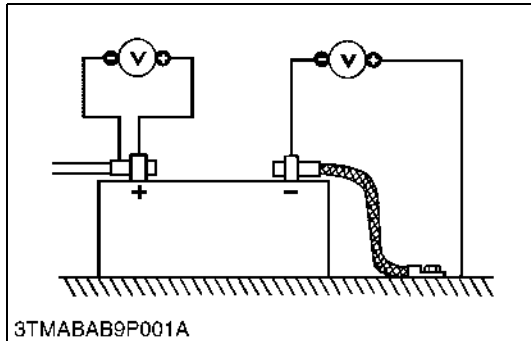


Battery Voltage

1. Stop the engine and turn the main switch off.
2. Connect the COM (–) lead of the voltmeter to the battery's negative terminal post and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Factory spec.	More than 12 V

W1015899

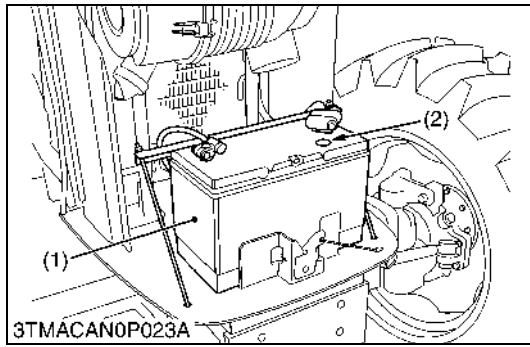


Battery Terminal Connection

1. Turn the main switch on, and turn on the head light.
2. Measure the voltage with a voltmeter across the battery's positive terminal post and the cable terminal, and the voltage across the battery's negative terminal post and the chassis.
3. If the measurement exceeds the factory specification, clean the battery terminal posts and cable clamps, and tighten them firmly.

Potential difference	Factory spec.	Less than 0.1 V

W1016279



Battery Condition Indicator

1. Check the battery condition by reading the indicator (2).

State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery
White	Needs changing battery

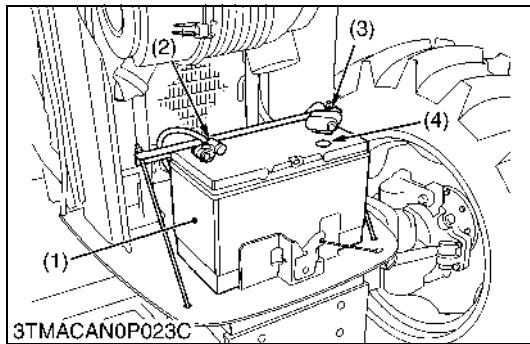
■ IMPORTANT

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

(1) Battery

(2) Indicator

W1016405



Recharging



CAUTION

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

Use a voltmeter or hydrometer.

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

Table

Battery Type	Volts (V)	Capacity at 5H.R. (A.H.)
GP31 (105E41R)	12	85.3
Reserve Capacity (min)	Cold Cranking Amps	Normal Charging Rate (A)
160	900	11

(1) Battery

(3) Positive Terminal

(2) Negative Terminal

(4) Indicator

W1016725

Directions for Storage

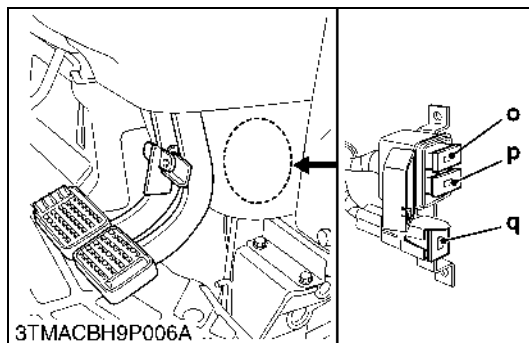
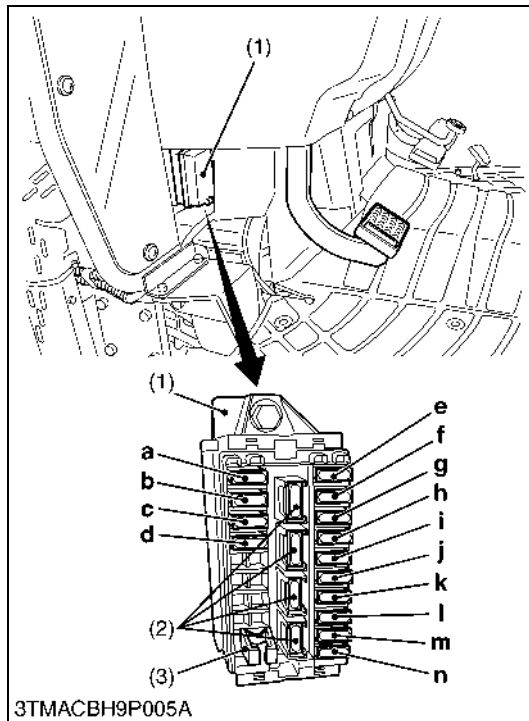
1. When shutting down the tractor for long periods of time, remove the battery from the tractor, store the battery in a well ventilated placed where it is not exposed to direct sunlight.
2. Since the battery self-discharges by approx. 0.5 % per day even in storage, it must be once every two months in cold season.
3. When storing the battery mounted on the tractor, disconnect the ground cable from the battery's negative terminal post.

(Reference)

- Self-discharge Rate

Temperature	Self-discharge rate
30 °C (86 °F)	Approx. 1.0 % per day
20 °C (68 °F)	Approx. 0.5 % per day
10 °C (50 °F)	Approx. 0.25 % per day

W1017453

(2) Checking Fuse**Fuse (ROPS Model)**

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

■ IMPORTANT

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

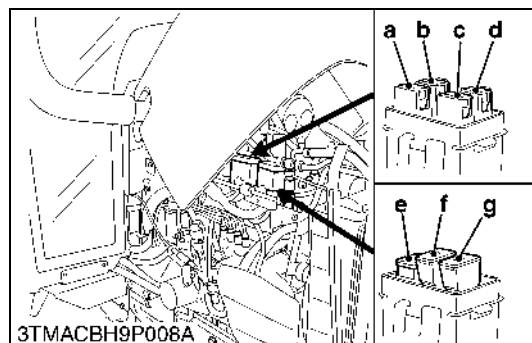
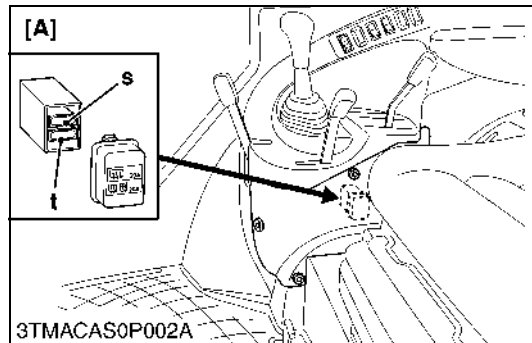
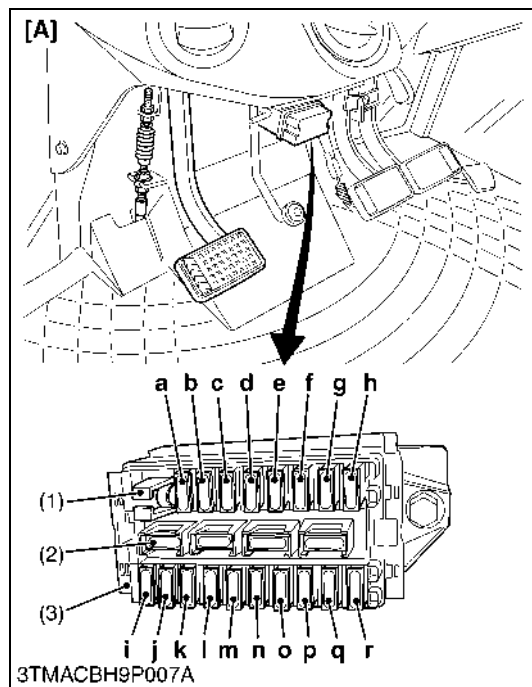
■ Protected Circuit

Fuse I.D.	Capacity (A)	Protected circuit
a	10	Horn
b	15	Head light
c	25	Auxiliary socket
d	5	Starter relay
e	15	Work light R
f	15	Work light L
g	5	Alternator, Engine, PTO, Heater
h	5	Meter panel
i	10	Turn signal, Stop lamp
j	15	Auxiliary power
k	10	Transmission Control
l	5	Meter (Backup)
m	10	Position lamp, Number lamp
n	15	Flasher (Hazard)
o	40 Slow-Blow Fuse	Key switch, Head light, Hazard
p	30 Slow-Blow Fuse	Fuel cut solenoid
q	50 Slow-Blow Fuse	Charge, Air heater

- (1) Fuse Case
(2) Spare Fuse

- (3) Fuse Puller

W1015983



Fuse (CABIN Model)

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

■ IMPORTANT

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

■ Protected Circuit (Fuse)

Fuse I.D.	Capacity (A)	Protected circuit
a	5	Starter relay
b	15	Auxiliary power
c	15	Work light (front, side)
d	10	Air conditioner (compressor)
e	30	Air conditioner (fan motor)
f	15	Cigarette lighter
g	15	Work light (front)
h	15	Work light (rear)
i	20	Spare fuse
j	20	Flasher (hazard)
k	20	Head light, tail lamp
l	10	Meter, Radio (back up)
m	10	Turn signal, Stop lamp
n	5	Meter panel
o	10	Alternator, Engine, PTO, Heater, Transmission control
p	15	Wiper
q	5	Air conditioner (control)
r	5	Radio
s	20	Rear window defogger
t	20	Side window defogger

■ Protected Circuit (Slow Blow Fuse)

Fuse I.D.	Capacity (A)	Protected circuit
a	30	Key switch
b	30	Work light, Fuel cut solenoid
c	40	Air conditioner
d	30	Electrical outlet
e	50	Head light, Hazard
f	50	Glow relay
g	100	Charge

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

[A] Fuse

[B] Slow Blow Fuse

W1016255

(3) Checking Grounding Wires



Grounding Wire

1. Check the whether the grounding wire (1) is connected securely to the tractor chassis.
2. If the grounding wire is broken or disconnected, replace it.

- (1) Grounding Wire
(2) Grounding Connector

- [A] ROPS Model
[B] CABIN Model

W1037688

(4) Connector

Checking Connector

1. When inspect the circuit line, check the related connectors.
2. Disconnect the connectors and check their terminals for contamination and deformation.
3. Check to see that cable does not broken or terminals are not shelled off.
4. If any defective parts are found, repair or replace them.

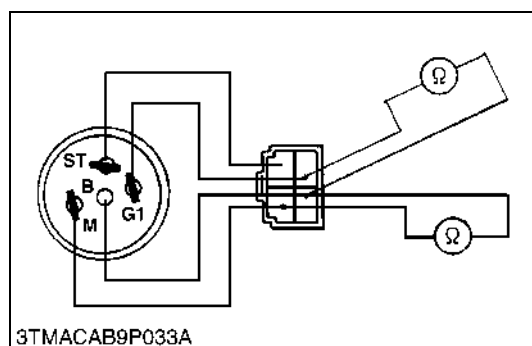
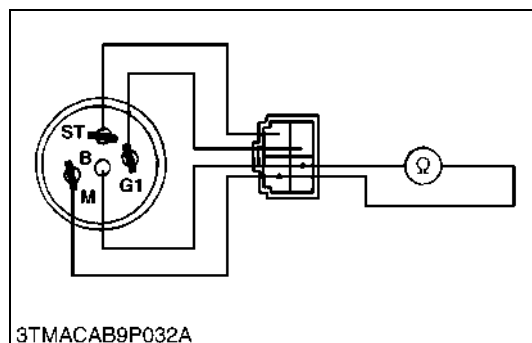
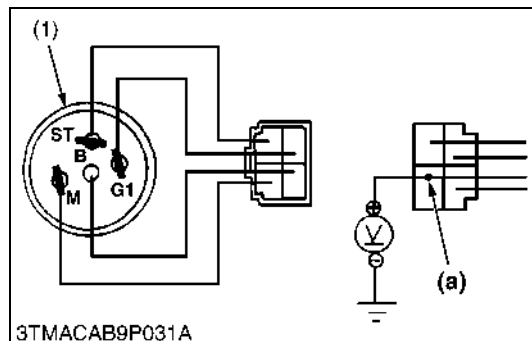
■ IMPORTANT

- Connect connector surely after checked.

W1017143

[2] MAIN SWITCH

(1) Main Switch (ROPS Model)



Main Switch

1. Remove the panel cover (1), refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section.
2. Disconnect the meter panel and the main switch connectors after turning the main switch off.
3. Perform the following checking.

(1) Panel Cover

(2) Main Switch

W1017484

Connector Voltage

1. Measure the voltage with a voltmeter across the connector terminal **B** and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector terminal B – Chassis	Approx. battery voltage

(1) Main Switch

(a) From Battery Positive Terminal

W1014366

Main Switch at ON Position

1. Turn the main switch to **ON** position.
2. Measure the resistance with an ohmmeter across the terminal **B** and the terminal **M**.
3. If 0 ohm is not indicated, the **B** – **M** contacts of the main switch are faulty.

Resistance	Terminal B – Terminal M	0 Ω

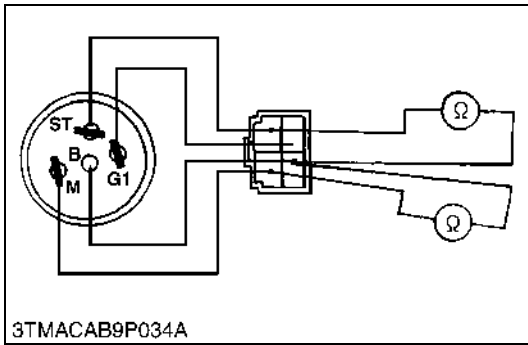
W1014494

Main Switch at PREHEAT Position

1. Turn and hold the main switch at the **PREHEAT** position.
2. Measure the resistances with an ohmmeter across the terminal **B** and the terminal **G1** and across terminal **B** and terminal **M**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal B – Terminal G1	0 Ω
	Terminal B – Terminal M	0 Ω

W1014641



Main Switch at START Position

1. Turn and hold the main switch at the **START** position.
2. Measure the resistances with an ohmmeter across the terminal **B** and the terminal **ST** and across terminal **B** and the terminal **M**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal B – Terminal ST	0 Ω
	Terminal B – Terminal M	0 Ω

W1014907

(2) Main Switch (CABIN Model)

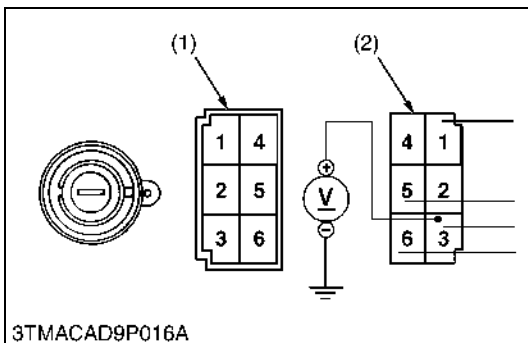
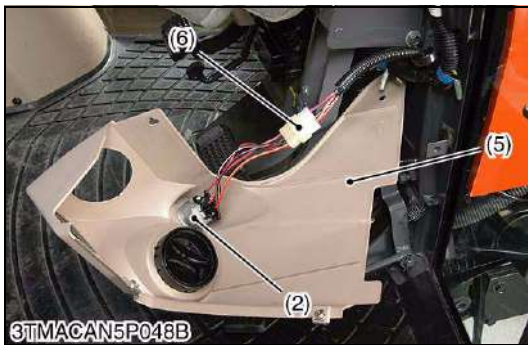


Main Switch

1. Remove the panel cover (1).
2. Remove the air outlet (3) and (4).
3. Remove the panel under cover R.H. (5) and disconnect the connector.
4. Perform the following checking.

(1) Panel Cover	(4) Air Outlet
(2) Main Switch	(5) Panel Under Cover R.H.
(3) Air Outlet	(6) Connector

W1018558



Connector Voltage

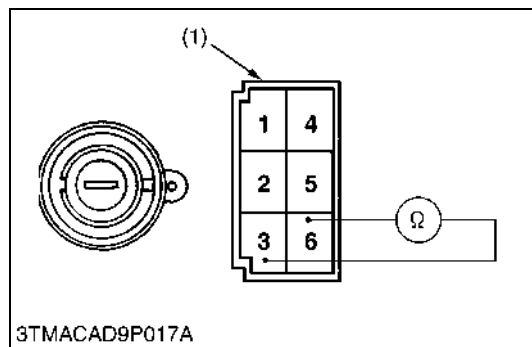
1. Measure the voltage with a voltmeter across the connector terminal **3** and chassis.
2. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	Connector terminal 3 – Chassis	Approx. battery voltage

(1) Main Switch

(2) Main Switch Connector
(Wire Harness Side)

W1018767

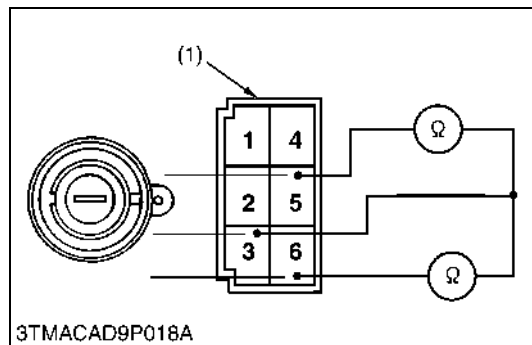
**Main Switch at ON Position**

1. Turn the main switch to **ON** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, the **3 – 6** contacts of the main switch are faulty.

Resistance	Terminal 3 – Terminal 6	0 Ω

(1) Main Switch Connector

W1018982

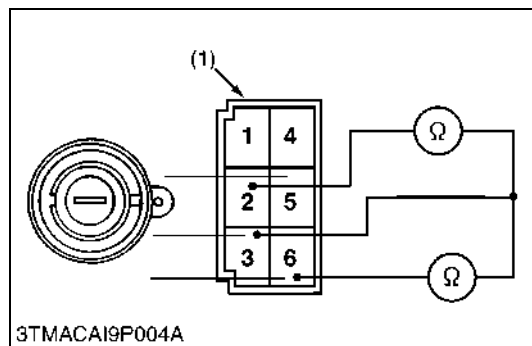
**Main Switch at START Position**

1. Turn and hold the main switch at the **START** position.
2. Measure the resistances with an ohmmeter across the terminal **5** and across terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal 3 – Terminal 5	0 Ω
	Terminal 3 – Terminal 6	0 Ω

(1) Main Switch Connector

W1019166

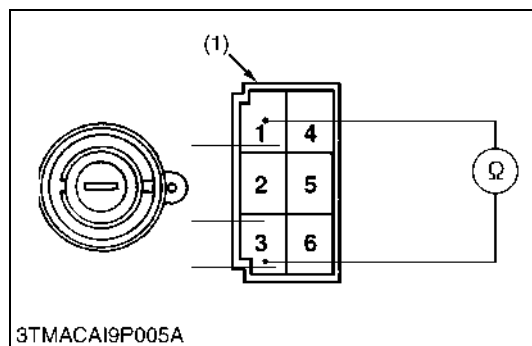
**Main Switch at PREHEAT Position**

1. Turn and hold the main switch key at the **PREHEAT** position.
2. Measure the resistances with an ohmmeter across the terminal **3** and terminal **2**, and the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal 3 – Terminal 2	0 Ω
	Terminal 3 – Terminal 6	0 Ω

(1) Main Switch Connector

W1018647

**Main Switch at ACC Position**

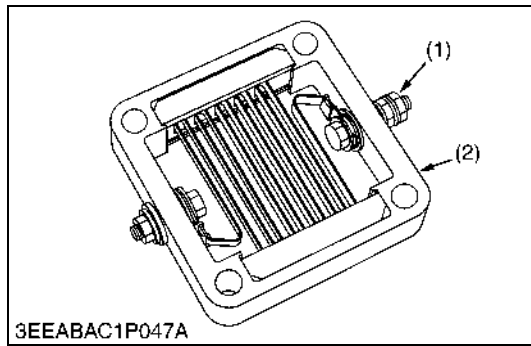
1. Turn the main switch key at the **ACC** position.
2. Measure the resistances with an ohmmeter across the terminal **3** and the terminal **1**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal 3 – Terminal 1	0 Ω

(1) Main Switch Connector

W1018807

[3] AIR HEATER



Intake Air Heater

1. Disconnect the lead.
2. Measure the resistance between + terminal (1) and intake air heater body (2).
3. If the resistance is infinity, the intake air heater is faulty.

Intake air heater resistance	Factory spec.	Approx. 0.3 Ω (At cold occasion)

(When reassembling)

Tightening torque	Lead terminal nut	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 lbf·ft

(1) + Terminal

(2) Intake Air Heater Body

W1073774

[4] STARTER MOTOR



Starter Motor Terminal B Voltage

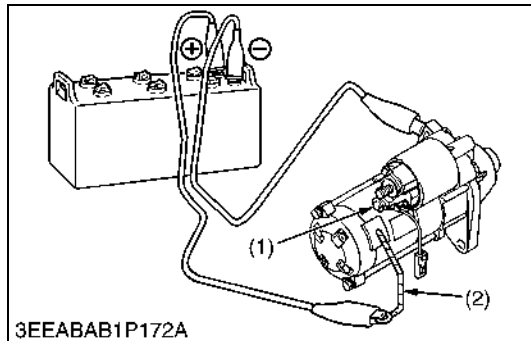
1. Measure the voltage with a voltmeter across the terminal B and chassis.
2. If the voltage differs from the battery voltage, the battery's positive cable or the battery negative cable is faulty.

Voltage	Factory spec.	Approx. battery voltage

(1) Terminal B

(2) Starter Motor

W1022522



Motor Test



CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**
1. Disconnect the battery negative cable from the battery.
 2. Disconnect the battery positive cable and the leads from the starter terminal C (1).
 3. Remove the starter from the engine.
 4. Disconnect the connecting lead (2) from the starter terminal C (1).
 5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
 6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post.
 7. If the motor does not run, check the motor.

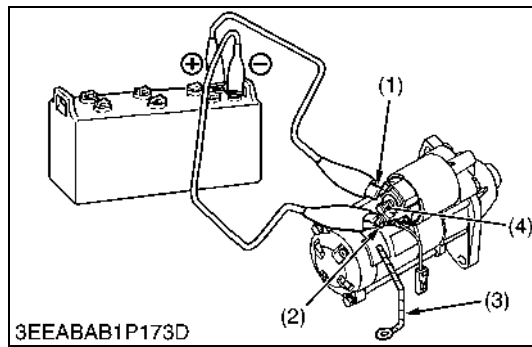
(When reassembling)

Tightening torque	Starter B terminal	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 lbf·ft

(1) Terminal C

(2) Connecting Lead

W1022645



Magnet Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **B** (4).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter terminal **C** (2).
5. Connect a jumper lead from the starter terminal **S** (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter terminal **C** (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

NOTE

- This test should be carried out for a short time, about 3 to 5 seconds.

(When reassembling)

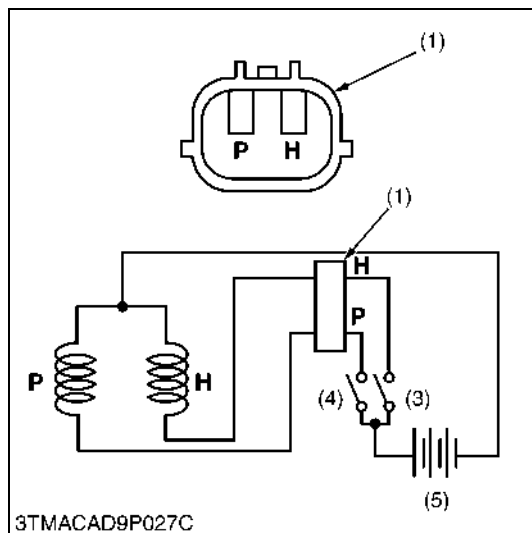
Tightening torque	Starter B terminal	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 lbf·ft

- (1) Terminal **S**
(2) Terminal **C**

- (3) Connecting Lead
(4) Terminal **B**

W1023186

[5] ENGINE STOP SOLENOID



Functional Check

1. Remove the engine stop solenoid (2) from the injection pump.
2. Connect the leads as shown in the figure.
 - Connect the jumper leads from terminal **P** through the switch (4) to the battery positive terminal
 - Connect the jumper leads from terminal **H** through the switch (3) to the battery positive terminal
 - Connect the jumper leads from the negative terminal to the engine stop solenoid body
3. When switch (4) is turn **ON**, the plunger is pulled into the solenoid body and then turn **OFF** the switch (4), the plunger comes out.
4. Turn on the switch (3) then turn **ON** the switch (4), the plunger is pulled into the solenoid body and it is kept in **HOLDING** position after turning **OFF** the switch (4).
5. If the plunger is not attracted, the engine stop solenoid is faulty.

IMPORTANT

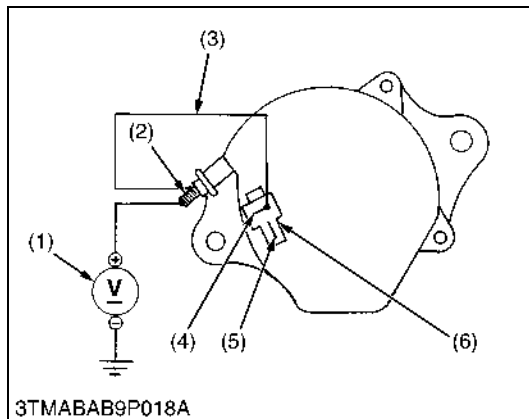
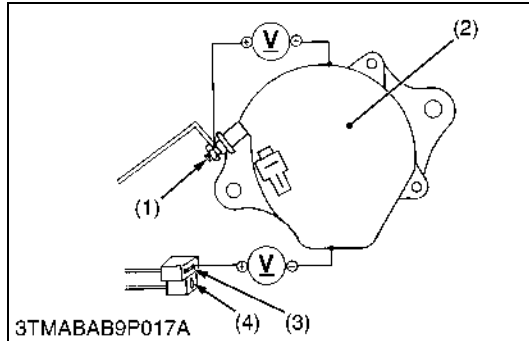
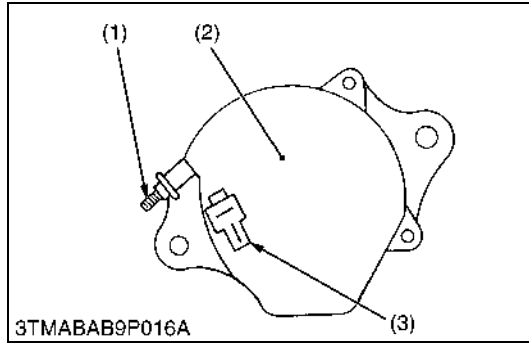
- Never apply the current for pulling coil more than two seconds when inspecting.

- (1) Connector
(2) Engine Stop Solenoid
(3) Switch for Holding Coil
(4) Switch for Pulling Coil
(5) Battery

P : Terminal for Pulling Coil
H : Terminal for Holding Coil

W1024150

[6] ALTERNATOR



Preparation

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

- (1) Terminal **B** (3) **2P** Connector
(2) Alternator

W1030485

Connector Voltage

1. Turn off the main switch. Measure the voltage between the terminal **B** (1) and the chassis.
2. Turn on the main switch. Measure the voltage between the terminal **IG** (3) and the chassis.

Voltage (Main switch at OFF)	Terminal B – Chassis	Approx. battery voltage
Voltage (Main switch at ON)	Terminal IG – Chassis	Approx. battery voltage

- (1) Terminal **B** (3) Terminal **IG**
(2) Alternator (4) Terminal **L**

W1030607

No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning off the main switch.
2. Connect the jumper lead (3) between terminal **IG** (4) and terminal **B** (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the terminal **B** (2) and the chassis.
6. If the measurement is less than the factory specifications, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V

(Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

- (1) Voltmeter (4) Terminal **IG**
(2) Terminal **B** (5) Terminal **L**
(3) Jumper Lead (6) **2P** Connector

W1030850

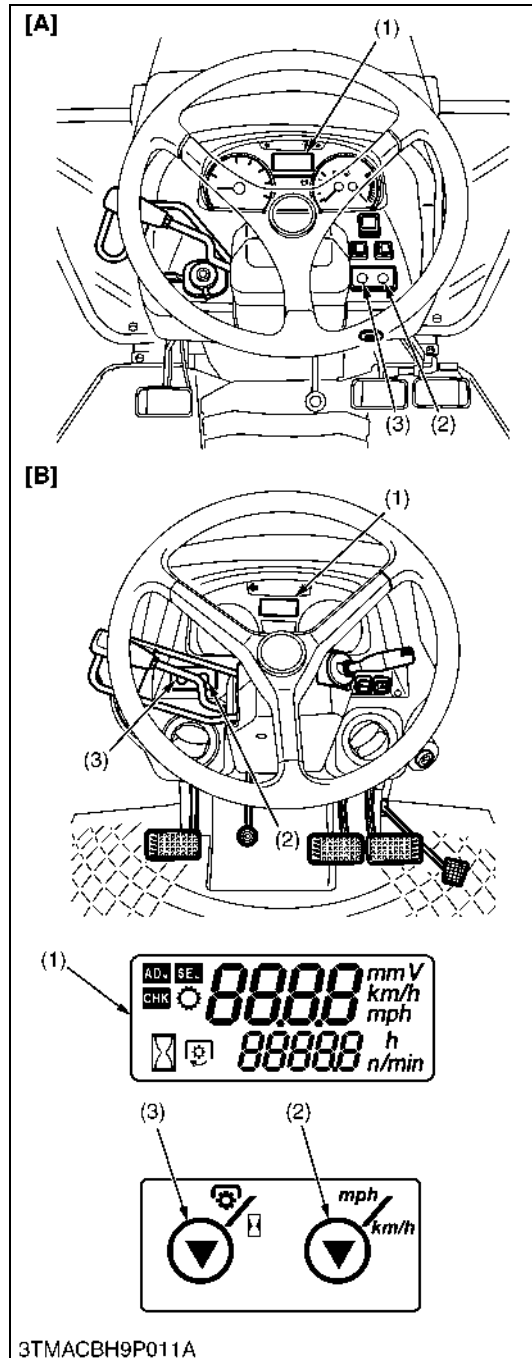
[7] METER PANEL

(1) Setting Mode (Select the PTO Display Mode Switching, Tractor Model Select and Entering Travel Speed Coefficient)



CAUTION

- To perform the meter panel, the operator must be seated on the tractor.



LCD Monitor Indication (Setting Mode)

The following settings and checking can be done by using the LCD monitor (1), PTO/Hour meter select switch (3) and traveling speed select switch (2).

1. Setting Mode :

Input the various dates (PTO speed display mode switching, entering the traveling speed coefficient and model select) to the meter panel.

2. Checking Mode :

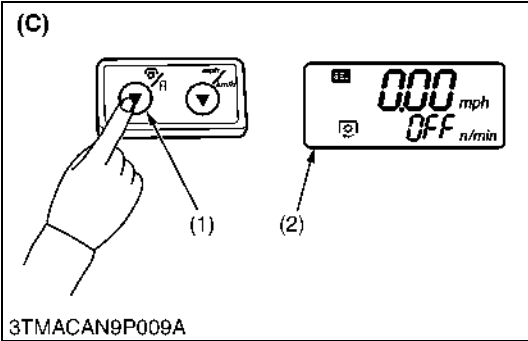
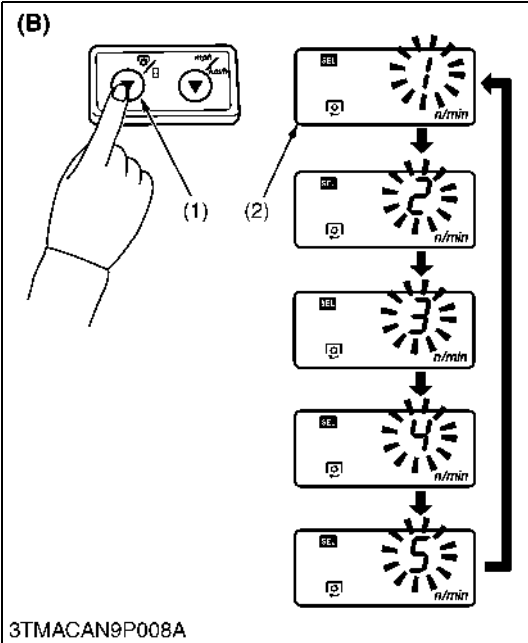
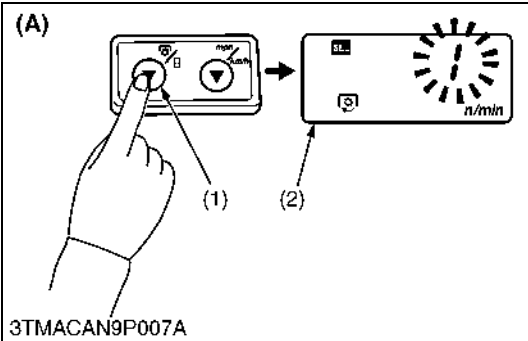
Check a voltage of various sensor (fuel unit sensor, coolant temperature sensor and monitor voltage (battery voltage)) or rotation of engine.

- (1) LCD Monitor
- (2) Traveling Speed Select Switch
- (3) PTO/Hour Meter Select Switch

[A] ROPS Model

[B] CABIN Model

W1021685



PTO Speed Display Mode Switching (Setting Mode)

1. While pressing the PTO/Hour meter select switch (1), turn the key switch to “ON” position.
The current numerical code starts flashing.
2. Each time the PTO/Hour meter select switch (1) is pressed, the code changes in the order of [1] → [2] → [3] → [4] → [5] → [1]. Select the appropriate code according to the table below.
3. Press and hold the PTO/Hour meter select switch (1) longer than 2 seconds. The setting is put in memory, and the LCD monitor (2) goes back to the PTO speed display mode.
4. Turn the key switch to “OFF” position to exit.

■ **NOTE**

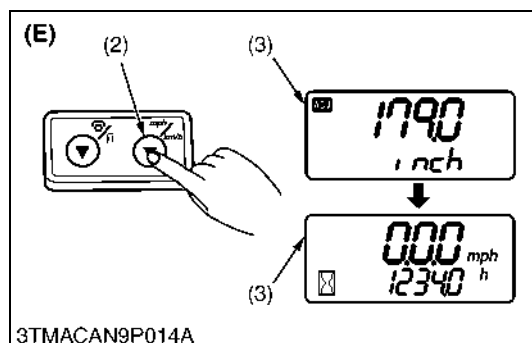
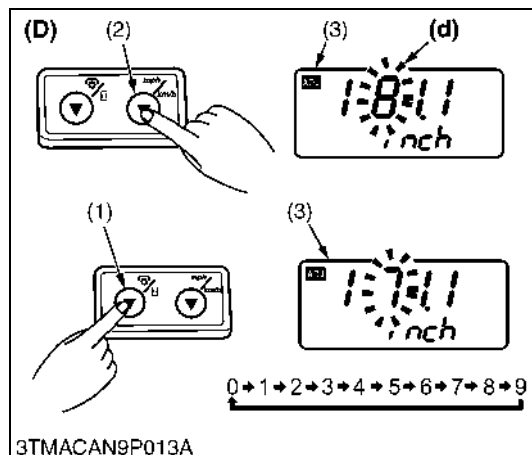
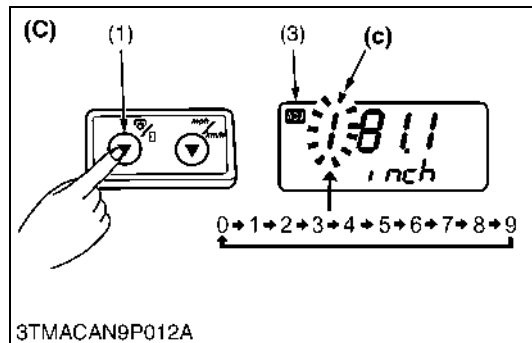
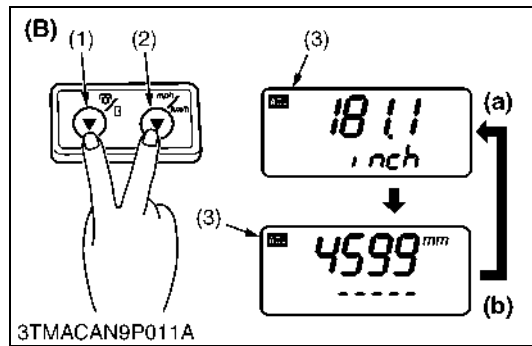
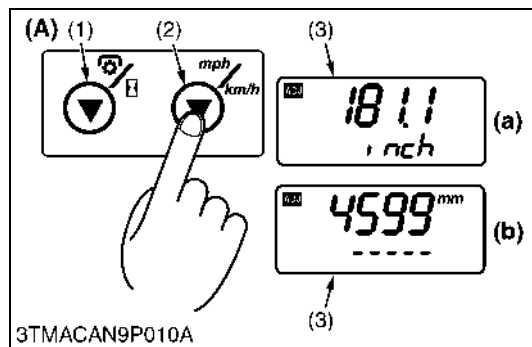
- The setting will be cancelled if the key switch is turned OFF halfway in the procedure.

Numerical code	PTO speed (min ⁻¹ (rpm))
1	540 (Single speed)
2	540 (Dual speed PTO kit, interchangeable type)
3	1000 (Dual speed PTO kit, interchangeable type)
4	540 / 540E (2 Speed PTO, gear shift type)
5	540 / 1000 (2 Speed PTO, gear shift type)

- (1) PTO/Hour Meter Select Switch
(2) LCD Monitor

- (A) Procedure to enter the PTO speed display mode switching
(B) Procedure to select numerical code
(C) Procedure to put in memory

W1021843



Entering Traveling Speed Coefficient

[Example : Entering 179.0 inch]

1. While pressing the traveling speed select switch (2), turn the key switch to "ON" position. The setting of the current tire's circumference is displayed in inches (a) or millimeters (b). The highest-digit numeral starts flashing.
2. Each time both the PTO/Hour meter select switch (1) and traveling speed select switch (2) are pressed at the same time, the unit changes for inches (a) or millimeters (b). Select the inch display mode.
3. Note that the highest-digit numeral (c) is flashing. Press the PTO/Hour meter select switch (1) to select "1". (The numeral changes from 0 to 9 at each push of the switch.)
4. Press the traveling speed select switch (2), and the next highest digit (d) starts flashing. Now press the PTO/Hour meter select switch (1) to select "7".
5. Enter "9" and "0" for the remaining digits in the same procedure.
6. Make sure the entry is "179.0". Press and hold the traveling speed select switch (2) longer than 2 seconds. The setting is put in memory, and the LCD monitor (3) goes back to the hour meter mode.
7. Turn the key switch to "OFF" position to exit.

NOTE

- The setting will be cancelled if the key switch is turned OFF halfway in the procedure.

Tire circumference chart (reference)

Rear tire size	Entry (in.)	Entry (mm)
420/85R30 (16.9R30)	175.4	4455
460/85R30 (18.4R30)	184.1	4678
420/85R34 (16.9R34)	186.8	4745
480/70R34	185.8	4720
23.1 x 26	182.0	4623

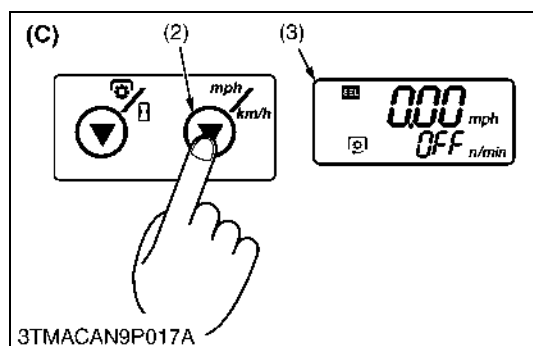
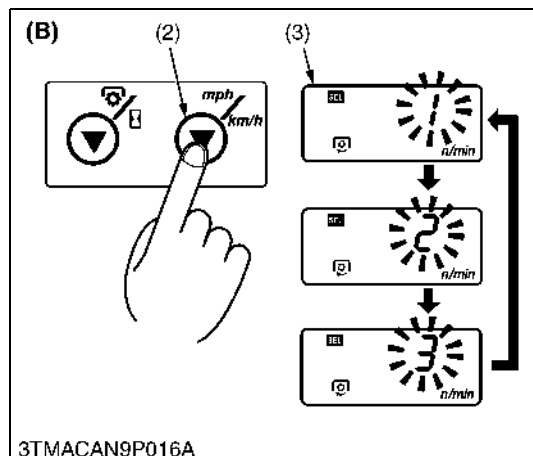
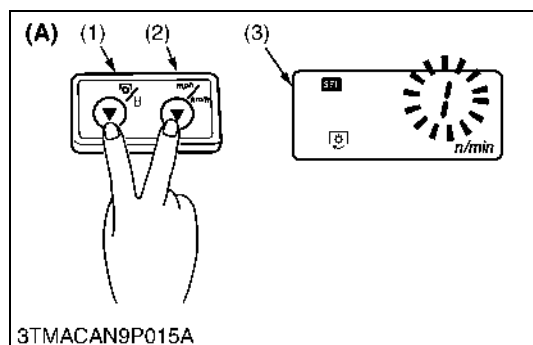
- (1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

- (D) Procedure to change next highest digit and select numerical
(E) Procedure to put in memory

- (A) Procedure to enter the traveling speed coefficient mode
(B) Procedure to select display for inches or millimeters
(C) Procedure to select numerical at highest digit

- (a) Displayed in inches
(b) Displayed in millimeters
(c) Highest-digit numerical
(d) Next Highest-digit numerical

W1022482



Model Select (Setting Mode)

1. While pressing the PTO/Hour meter select switch (1) and traveling speed select switch (2), turn the key switch to "ON" position.
The current numerical code starts flashing.
2. Each time the traveling speed select switch (2) is pressed, the code changes in order of [1] → [2] → [3] → [1]. Select the appropriate code according to the table below.
3. Press and hold the traveling speed select switch (2) longer than 2 seconds. The setting is put in memory, and the LCD monitor (3) goes back to the PTO speed display or hour meter display mode.
4. Turn the key switch to "OFF" position to exit.

NOTE

- The setting will be cancelled if the key switch is turned OFF halfway in the procedure.

Numerical code	Tractor model
1	M8540, M9540(LP)
2	M6040(N), M7040(N), M8540N
3	Void

- (1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

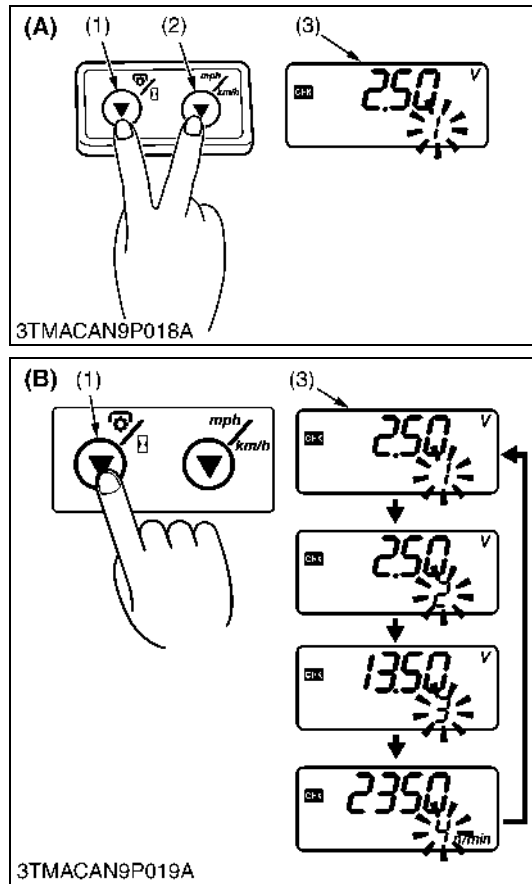
(A) Procedure to enter model select mode

(B) Procedure to select numerical code

(C) Procedure to put in memory
LP : Low Profile Model
N : Narrow Model

W1023923

(2) Checking Mode



Checking Mode

1. Turn the key switch to "ON" position.
2. Press the PTO/Hour meter select switch (1) and traveling speed select switch (2) more than 2 seconds.
3. Each time the PTO/Hour meter select switch (1) is pressed, the code number changes in order of [1] → [2] → [3] → [4] → [1] with flashing. The code number display as a table below.
4. Turn the key switch to "OFF" position to exit.

NOTE

- To check the engine revolution, enter the checking mode under running the engine.
- When enter the checking mode under running the engine, code 3 display the generating voltage of alternator.

No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	-30 to 120 °C (-4 to 248 °F)	V
3	Battery voltage	-	V
4	Engine revolution	Idling to max.	n/min

- (1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

- (A) Procedure to enter checking mode
(B) Procedure to select code number of checking contents

W1024533

(3) Checking Meter Panel, PTO/Hour Meter Select Switch and Traveling Speed Select Switch



CAUTION

- For checking of electric circuit, use the circuit tester.
- As for the checking of sensors and switches, do the following order; check the battery, fuse and grounding line first, check by the test function of meter panel next, and check the connectors of panel or related electronic switch or sensor. If any defect is found there, check individual sensors or switches to see whether the defect exists at the sensor and switch side or at the wire harness side.
- When any defect is not found for sensors, switches and harness, replace meter panel with new one.

IMPORTANT

- When connecting or disconnecting the connector for the purpose of checking, be sure to turn OFF the main switch before hand. Moreover, pay attention not to allow the terminal to come in contact with other terminal or chassis while checking.
- When applying the test pin of the tester to the connector terminals, use care not to damage to the connector terminal.



Checking Connector Voltage, Sensor Resistance and Switch Continuity

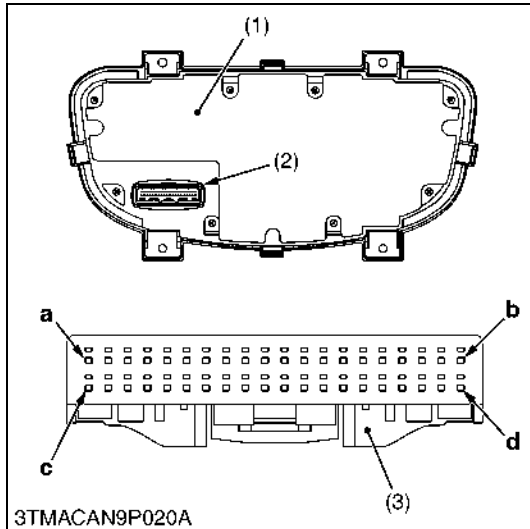
1. Remove the panel cover, refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section (for ROPS model).
2. Remove the meter panel (1).
3. Disconnect the **40P** connector (2) from the meter panel.
4. Check the main voltage (battery voltage) first and check the connector voltage, sensor resistance or switch continuity which related for defective indication of meter panel as table below.

(When reassembling)

- Tighten the meter panel mounting screw evenly.

(1) Meter Panel	a : Terminal 1 (T1)
(2) 40P Connector Meter Panel Side	b : Terminal 20 (T20)
(3) 40P Connector Wire Harness Side	c : Terminal 21 (T21)
	d : Terminal 40 (T40)

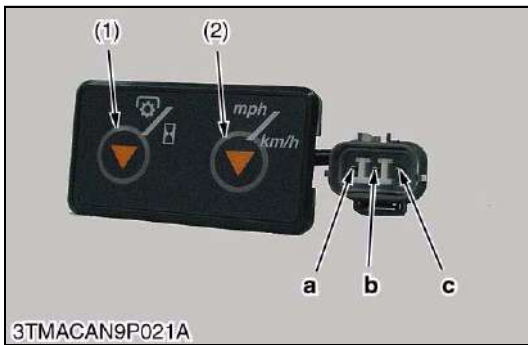
W1025566



Connector (40P) of Wire Harness Side

Terminal No.	Color of wiring	Terminal Name	Measuring across T40 (Ground)	Condition
T1	SB	Heater relay	Battery voltage	Main switch at ON
T2				
T3	Br/R	Engine stop relay	Battery voltage	Main switch at ON
T4				
T5				

Terminal No.	Color of wiring	Terminal Name	Measuring across T40 (Ground)	Condition
T6				
T7				
T8				
T9				
T10	LG/B	PTO/Hour meter select switch	Battery voltage	Main switch at ON and PTO/Hour meter select switch ON
T11	L	Traveling speed select switch	Battery voltage	Main switch at ON and traveling speed select switch ON
T12	R/B	Turn signal switch (R.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (R.H.) ON
T13	P/W	PTO switch	Battery voltage	Main switch at ON and PTO switch OFF
T14	L/G	Trailer indicator	Battery voltage	Main switch at ON and turn the turn signal switch under the trailer coupler has connected
T15	B/R	High beam	Battery voltage	Main switch at ON and head light switch at high beam position
T16	G/B	Turn signal switch (L.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (L.H.) ON
T17	W/R	Coolant temperature switch	Approx. 117 Ω at 120 °C (248 °F) to 5.88 k Ω at 0 °C (32 °F)	Main switch at OFF
T18	Y	Fuel unit sensor	Approx. 3.0 (F) to 112 Ω (E)	Main switch at OFF
T19	V/W	PTO change switch	Battery voltage	Main switch at ON and PTO speed lever shifted at 540E position
T20	B/W	GND (analogue)		
T21	G/W	Illumination light	Battery voltage	Main switch at ON and head light switch ON
T22				
T23	B/Y	Hazard Switch	Battery voltage	Hazard switch at ON
T24	B/W	Main switch (start position)	Battery voltage	Main switch at START
T25				
T26				
T27	P	Parking brake switch	Battery voltage	Main switch at ON and parking brake switch at ON
T28	Br/Y	Air cleaner switch	Battery voltage	Main switch at ON and air cleaner switch at ON
T29	W/G	4WD Switch	Battery voltage	Main switch at ON and 4WD switch at ON
T30				
T31	G/B	Differential lock switch	Battery voltage	Main switch at ON and differential lock switch ON
T32	W	Engine oil pressure switch	0 Ω	At engine not run
			Infinity	At engine run
T33	W/G	Alternator terminal L	Approx. 10 V	At engine run
T34	P/W	Traveling speed sensor	Battery voltage	Main switch at ON
T35				
T36	Y/L	Engine tachometer sensor	Battery voltage	Main switch at ON
T37	R/G	Main switch (ON position)	Battery voltage	Main switch at ON
T38	R/B	Main voltage (battery)	Battery voltage	
T39				
T40	B	GND		



PTO/Hour Meter Select Switch and Traveling Speed Select Switch

1. Check the resistance between terminal **a** and terminal **c** while pushing the PTO/Hour meter select switch (1).
2. It is OK if 0 ohm is indicated.
3. Check the resistance between terminal **b** and terminal **c** while pushing the traveling speed select switch (2).
4. It is OK if 0 ohm is indicated.

(1) PTO/Hour Meter Select Switch (2) Traveling Speed Select Switch

W1028780

(4) Switch and Sensor



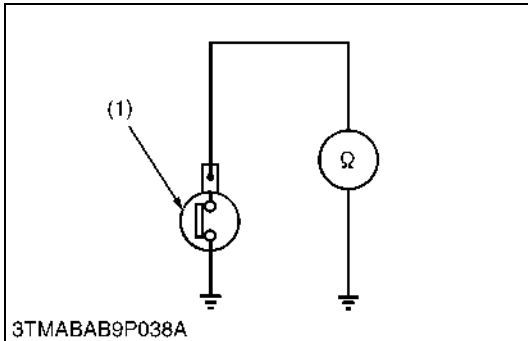
Checking Engine Oil Pressure Switch

1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 4.9 kPa (0.5 kgf/cm², 7 psi), the switch is faulty.

Resistance (Switch terminal – Chassis)	In normal state	0 Ω
	At pressure over approx. 4.9 kPa (0.5 kgf/cm ² , 7 psi)	Infinity

(1) Engine Oil Pressure Switch

W1106807



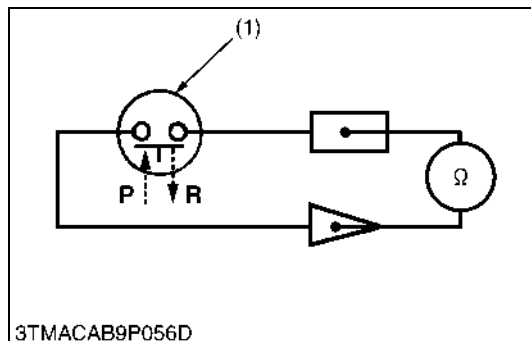
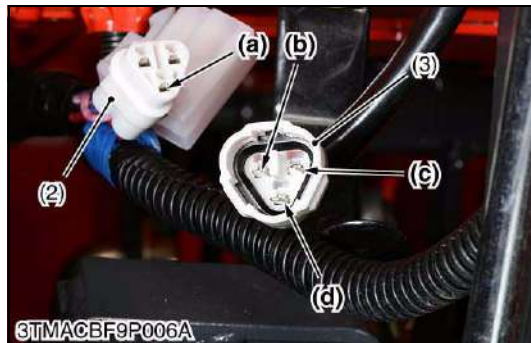
Checking Coolant Temperature Sensor

1. Disconnect the connector from the coolant temperature sensor (1).
2. Measure the resistance with an ohmmeter across the terminal **1** and **2** of coolant temperature sensor (1).
3. If the measurement is not indicated, the sensor is faulty.

Resistance (Sensor terminal 1 – terminal 2)	Reference value	Approx. 117 Ω at 120 °C (248 °F)
		Approx. 189 Ω at 100 °C (212 °F)
		Approx. 290 to 354 Ω at 80 °C (176 °F)
		Approx. 808 Ω at 50 °C (122 °F)
		Approx. 2.21 to 2.69 kΩ at 20 °C (68 °F)

(1) Coolant Temperature Sensor

W1047287



PTO Switch

1) Connector Voltage

1. Remove the PTO switch connector (3).
2. Turn the main switch **ON** position.
3. Measure the voltage across terminal **2 (a)** and chassis.
4. If the voltage differs from battery voltage, the wiring harness, fuse, or main switch is faulty.

Voltage	Terminal 2 – chassis	Approx. battery voltage

2) PTO Switch Continuity

1. Remove the PTO switch connector (1).
2. Check the continuity with an ohmmeter across the terminal **1 (b)** and terminal **2 (d)**, terminal **2 (d)** and terminal **3 (c)**.
3. If connection does not change, PTO switch is faulty.

Position	Terminal 1 – terminal 2	Terminal 2 – terminal 3
OFF	0 Ω	Infinity
ON	Infinity	0 Ω

- (1) PTO Switch
 (2) Harness Connector
 (3) PTO Switch Connector

- (a) Terminal 2 (Harness)
 (b) Terminal 1
 (c) Terminal 3
 (d) Terminal 2 (PTO Switch)
 [A] ROPS Model
 [B] CABIN Model

W1021582

PTO Change Switch

1) PTO Change Switch Continuity

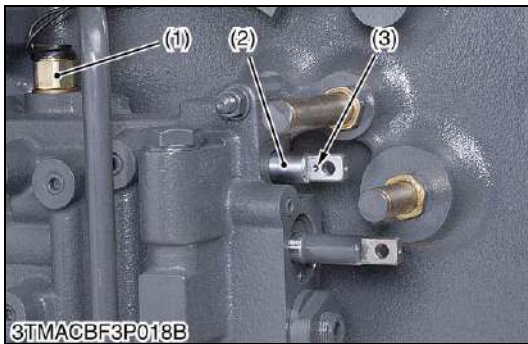
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

- (1) PTO Change Switch

P : Pushed
R : Released

W1025181



Shuttle Neutral Switch

1) Shuttle Neutral Switch Continuity

1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

■ NOTE

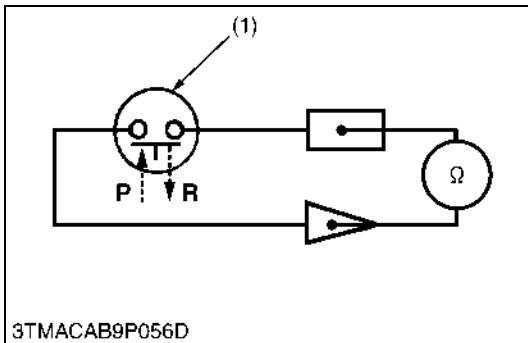
- Be sure to check the position of shuttle spool (2), the mark (3) toward the outside as shown photo.
If the shuttle spool (2) is not correct position, shuttle neutral switch (1) operates improperly.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

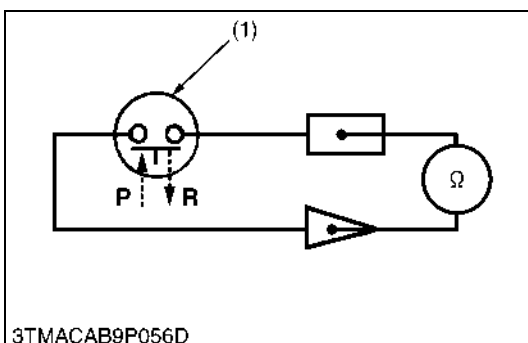
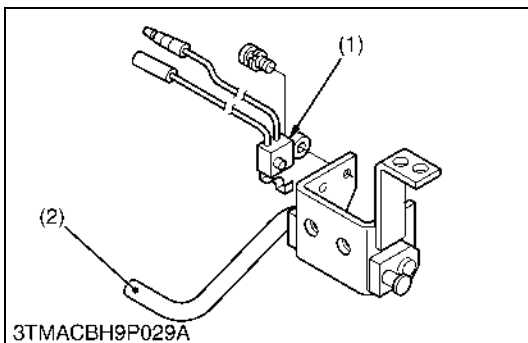
- (1) Shuttle Neutral Switch
(2) Shuttle Spool
(3) Mark

P : Pushed
R : Released

W1029574



3TMACAB9P056D



3TMACAB9P056D

Rear Differential Lock Switch

1) Rear Differential Lock Switch Continuity

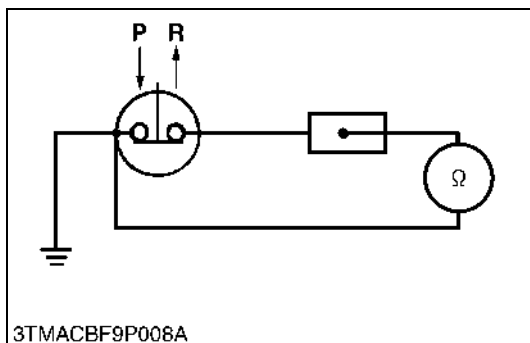
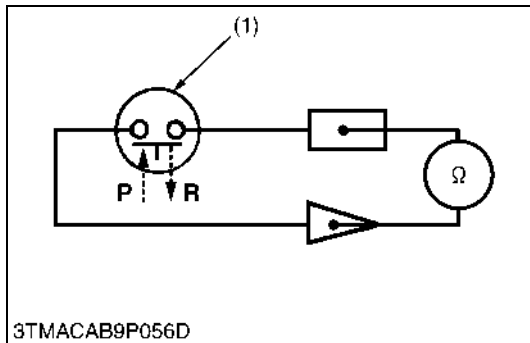
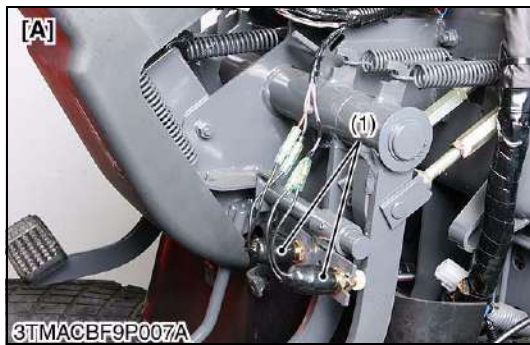
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

- (1) Rear Differential Lock Switch
(2) Rear Differential Lock Pedal

P : Pushed
R : Released

W1049922



Brake Switch

1) Wiring Harness

1. Disconnect the leads from the brake switch (1).
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.

2) Brake Switch Continuity

1. Remove the brake switch (1).
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 released, the switch is faulty.
4. If infinity is not indicated when the switch is pushed, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed	Infinity
		When switch is released	0 Ω

(1) Brake Switch

[A] ROPS Type

[B] CABIN Type

P : Pushed

R : Released

W1041960

Parking Brake Switch

1) Connector Voltage

1. Remove the connector.
2. Turn the main switch ON position.
3. Measure the voltage across the terminal and chassis.
4. If the voltage differs from battery voltage, the wiring harness, fuse, or main switch is faulty.

Voltage	Terminal – chassis	Approx. battery voltage

2) Parking Brake Switch Continuity

1. Remove the parking brake switch (1).
2. Check the continuity with an ohmmeter across the switch terminal and chassis.
3. If it does not conduct or any value is indicated when the switch is released, the switch is faulty.
4. If infinity is not indicated when the switch is pushed, the switch is faulty.

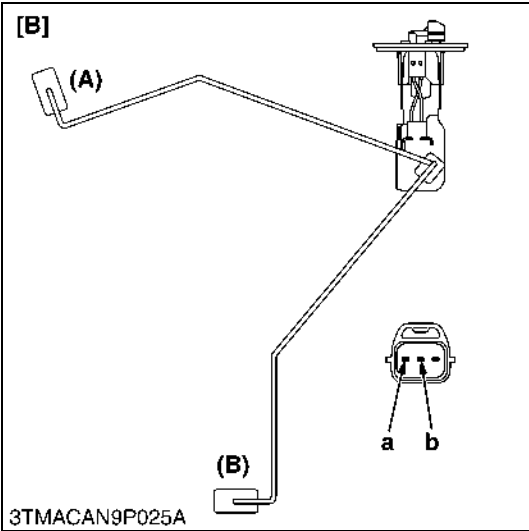
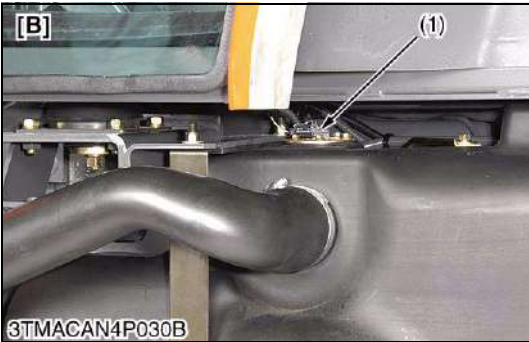
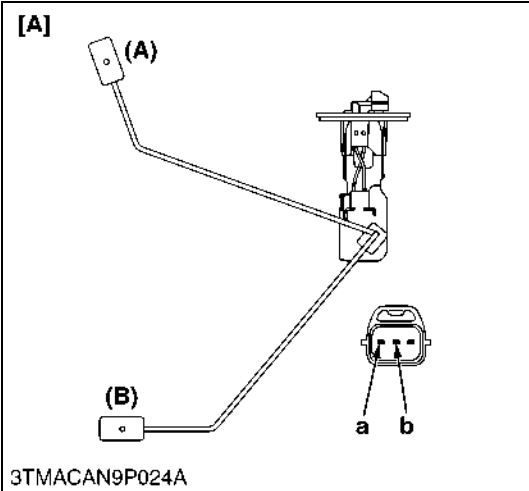
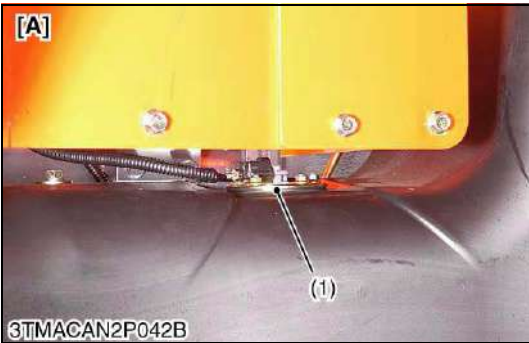
Resistance (Across switch terminal and chassis)	Reference value	When switch is pushed	Infinity
		When switch is released	0 Ω

(1) Parking Brake Switch

P : Pushed

R : Released

W1023179



Checking Fuel Level Sensor

- 1. Remove the fuel level sensor from the fuel tank.
- 2. Measure the resistance with an ohmmeter across the terminal **a** and terminal **b**.
- 3. If the measurement is not indicated, the sensor is faulty.

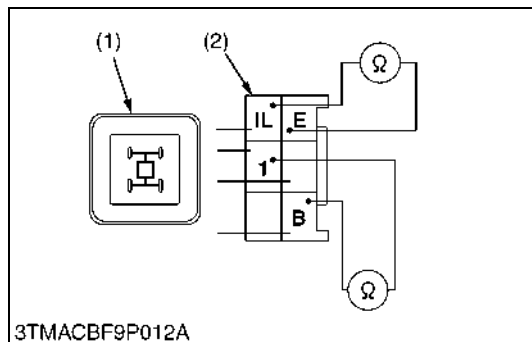
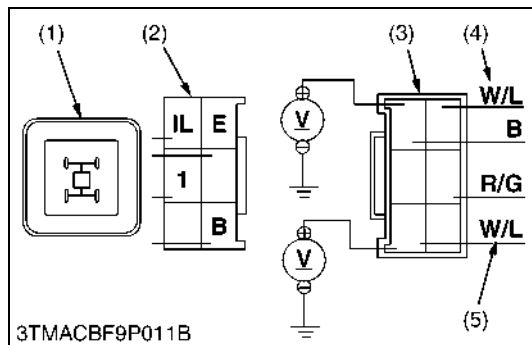
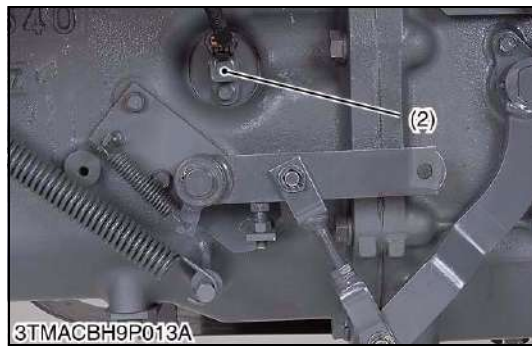
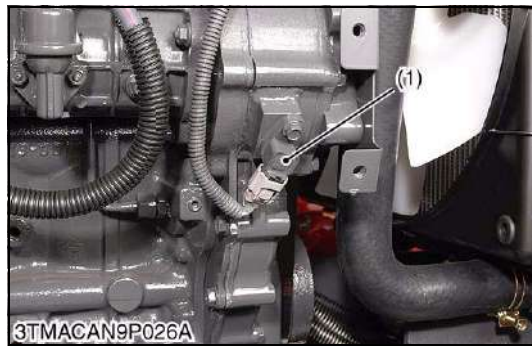
Resistance (Sensor terminal a – terminal b)	Factory spec.	Float at uppermost position	3.0 to 5.0 Ω
		Float at lowermost position	107.5 to 112.5 Ω

(1) Fuel Unit

[A] ROPS Model
[B] CABIN Model

(A) Float at Uppermost Position
(B) Float at Lowermost Position
a : Terminal 1
b : Terminal 2

W1190488



Engine Rotation Sensor and Traveling Speed Sensor

1. Check the engine speed meter and traveling speed display.
2. It is OK if engine speed is displayed in the meter panel.
3. It is OK if traveling speed is displayed in the LCD monitor.

NOTE

- As for engine speed sensor and traveling speed sensor are not checking with circuit tester.

(1) Engine Rotation Sensor

(2) Traveling Speed Sensor

W1051772

4WD Switch (ROPS Model)

1. Remove the 4WD switch (1).

(1) 4WD Switch

W1023926

1) Connector Voltage

1. Turn the main switch to **ON** position.
2. Measure the voltage with a voltmeter across the connector each **W/L** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	W/L terminal – Chassis	Battery voltage (11 to 14 V)

(1) 4WD Switch

(2) 4WD Switch Connector
(Switch Side)

(3) 4WD Switch Connector
(Wiring Harness Side)

(4) Terminal **W/L** for Illumination
(5) Terminal **W/L** for DT

W1024064

2) 4WD Switch

1. Check the continuity through switch with an ohmmeter.
2. If continuity specified below are not indicated, the switch is faulty.

Terminal	B	1	IL	E
Position				
Free			●	●
↑				
DT	●	●	●	●

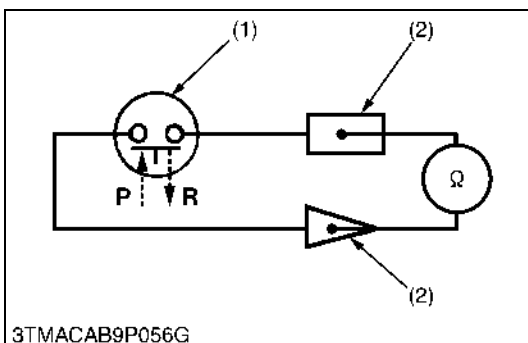
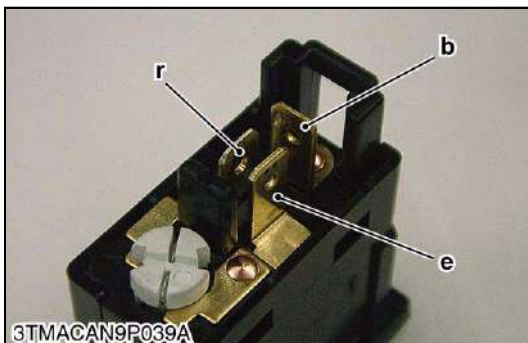
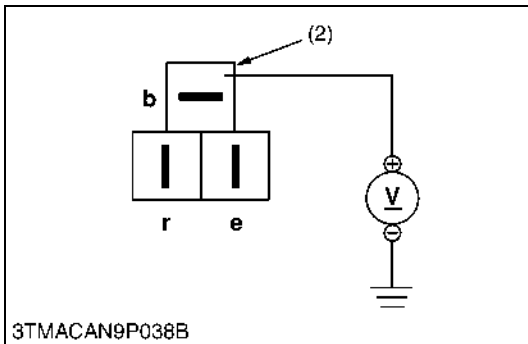
(1) 4WD Switch

(2) 4WD Switch Connector
(Switch Side)

(3) 4WD / Bi-speed Turn Switch
Connector (Wiring Harness Side)

(4) Terminal **W/L** for Illumination
(5) Terminal **W/L** for 4WD

W1011204



4WD Switch (CABIN Model)

1) Connector Voltage

1. Turn the main switch to **ON** position.
2. Measure the voltage with a voltmeter across the terminal **b** and chassis.
3. If the voltage differ from the battery voltage, the wiring harness or fuse is faulty.

■ NOTE

- The terminal **b** of 3P connector for 4WD switch is red/green color wire.

Voltage	Terminal b – Chassis	Approx. battery voltage

(1) 4WD Switch

(2) 3P Connector (Wire Harness Side)

W1036008

2) 4WD Switch

1. Test the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

	b	r	e
OFF		●	●
ON	●	●	●

(1) Work Light Switch

W1036530

Hi-Lo Dual Speed Switch (F36/R36 Speed Transmission Model)

1) Dual Switch Continuity

1. Check the continuity with an ohmmeter across the switch **1P** connectors.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

(1) Hi-Lo Dual Speed Switch

(2) 1P Connector

P : Pushed

R : Released

W1024152



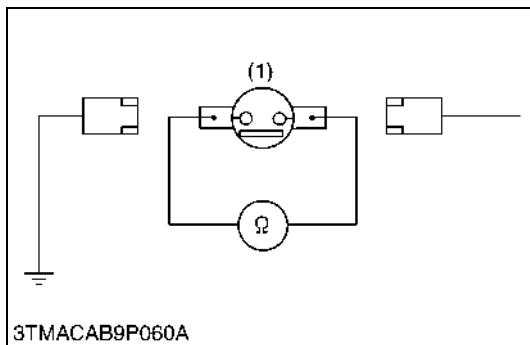
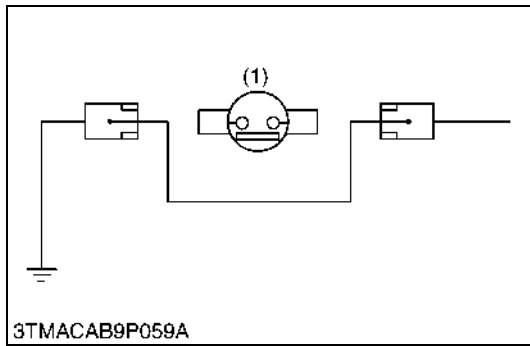
Air Cleaner Sensor

1) Wiring Harness

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



2) Air Cleaner Sensor

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.

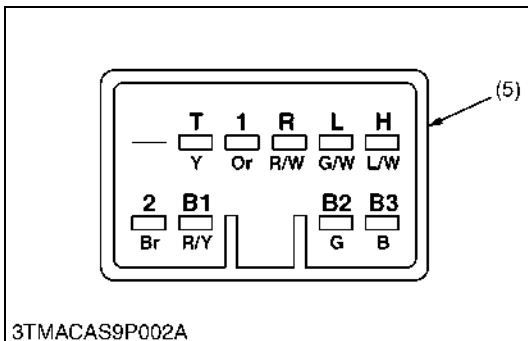
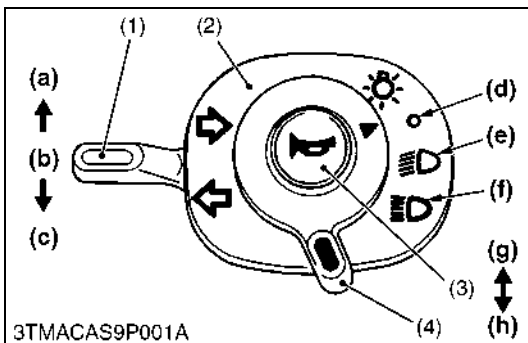
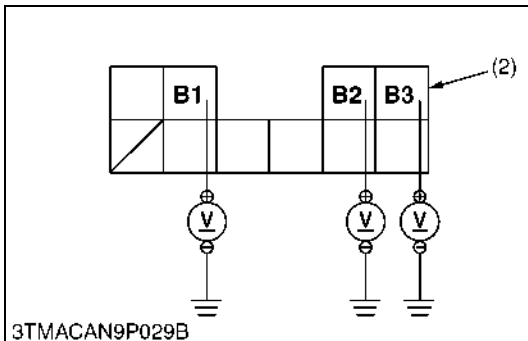
Resistance (Across sensor terminals)	In normal state	Infinity

(1) Air Cleaner Sensor

W1052230

[8] LIGHTING SWITCHES AND FLASHER UNIT

(1) Combination Switch (ROPS Model)



Checking Connector Voltage

1. Disconnect the combination switch connector.
2. Measure the voltage with voltmeter across the connector terminal **B1** and chassis, across the terminal **B2** and chassis, across the terminal **B3** and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuses or main switch faulty.

Voltage	Main switch at "ON"	Terminal B1 – Chassis	Approx. battery voltage
	Main switch at "OFF"	Terminal B2/B3 – Chassis	

(1) Combination Switch

(2) Combination Switch Connector
(Wire Harness Side)

W1030781

Checking Light Switch and Turn Signal Switch

1. Test the continuity through the switch with an ohmmeter.

		Terminal								
Continuity	Position	B1	T	1	2	B2	R	L	B3	H
Turn signal switch	R.H. (a)					●	●			
	OFF (b)									
	L.H. (c)					●		●		
Light switch	OFF (d)									
	Lo (e)	●	●	●						
	Hi (f)	●	●		●					
Horn switch	Free (g)									
	Push (h)								●	●

(1) Turn Signal Switch

(2) Combination Switch

(3) Horn Switch

(4) Light Switch

(5) Combination Switch Connector
(Switch Side)

(a) Right Turn

(b) OFF

(c) Left Turn

(d) OFF

(e) Head Light (Lo)

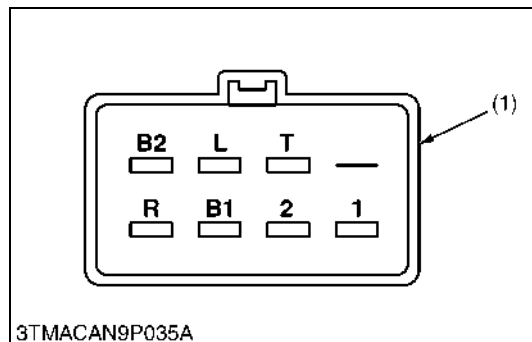
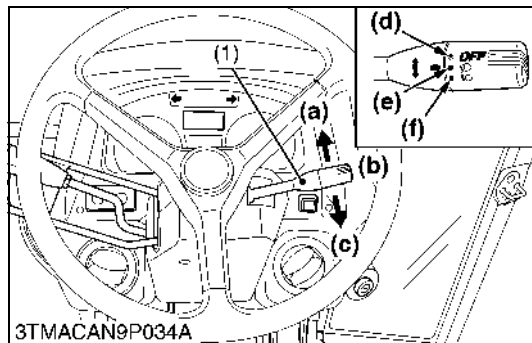
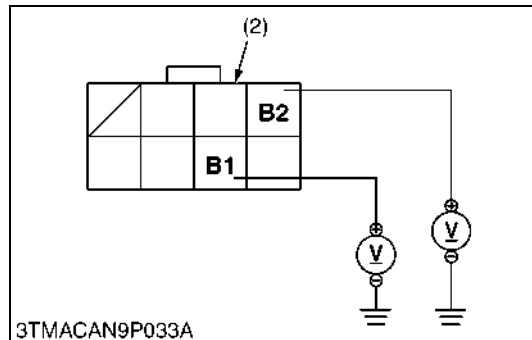
(f) Head Light (Hi)

(g) Free

(h) Push

W1031103

(2) Lever Combination Switch and Horn Switch (CABIN Model)



Checking Connector Voltage

1. Disconnect the lever combination switch connector (1).
2. measure the voltage with voltmeter across the connector terminal **B1** and chassis, across the terminal **B2** and chassis.
3. if the voltage differs from the battery voltage, the wiring harness, fuses or main switch is faulty.

Voltage	Main switch at "OFF"	Terminal B1 – Chassis	Approx. battery voltage
	Main switch at "ON"	Terminal B2 – Chassis	

(1) Lever Combination Switch

(2) Combination Switch Connector
(Wire Harness Side)

W1100674

Checking Light Switch and Turn Signal Switch

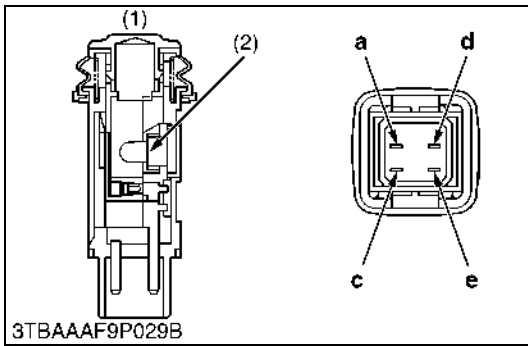
1. Test the continuity through the switch with an ohmmeter.
2. If the continuity specified below is not indicated, the switch is faulty.

		Terminal						
Continuity	Position	B1	T	1	2	B2	R	L
Turn signal switch	R.H. (a)					●	●	
	OFF (b)							
	L.H. (c)					●		●
Light switch	OFF (d)							
	Lo (e)	●	●	●				
	Hi (f)	●	●		●			

(1) Lever Combination Switch
Connector (Switch Side)

- (a) Right Turn
(b) OFF
(c) Left Turn
(d) OFF
(e) Head Light (Lo)
(f) Head Light (Hi)

W1032505



Checking Horn Switch Continuity (CABIN Model)

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.

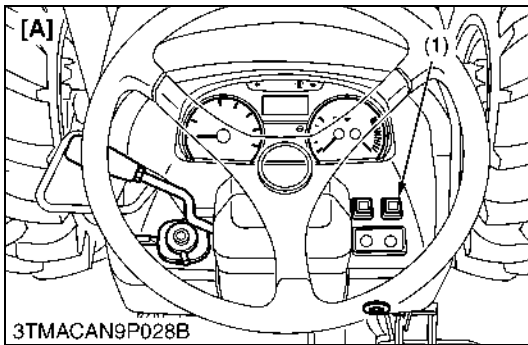
Resistance (Switch at OFF)	Terminal a – Terminal c	Infinity
Resistance (Switch at ON)	Terminal a – Terminal c	0 Ω
Resistance (Bulb)	Terminal d – Terminal e	Approx. 13 Ω

(1) Horn Switch

(2) Bulb

W1027873

(3) Hazard Switch



Checking Connector Voltage

1. Connect the battery negative code, then measure the voltage with a voltmeter across the each terminal **c/e** and chassis.
2. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal c/e – Chassis	Approx. battery voltage

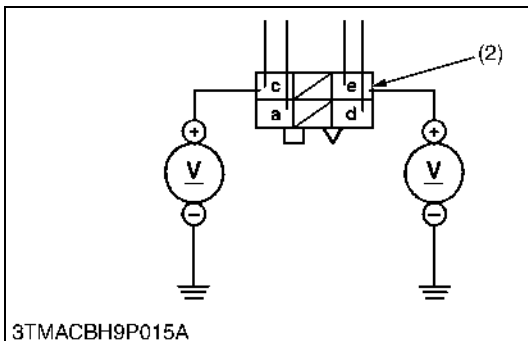
(1) Hazard Switch

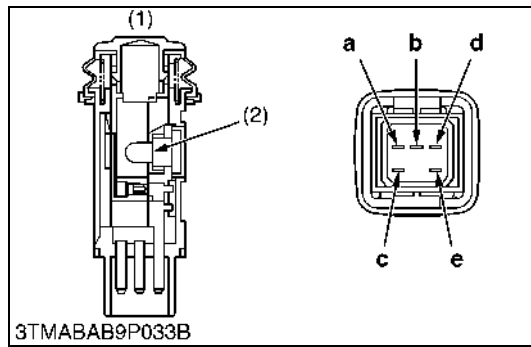
[A] ROPS Model

(2) 6P Connector (Wire Harness Side)

[B] CABIN Model

W1033077





Checking Hazard Switch Continuity

1. Measure the resistance with ohmmeter across the terminal **a** and terminal **c**, and across the terminal **d** and terminal **e**.
2. If the measurement is not following below, the hazard switch or the bulb are faulty.

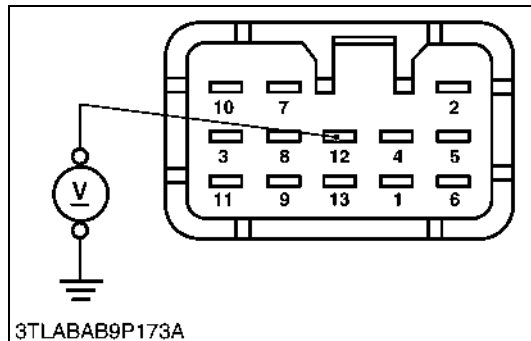
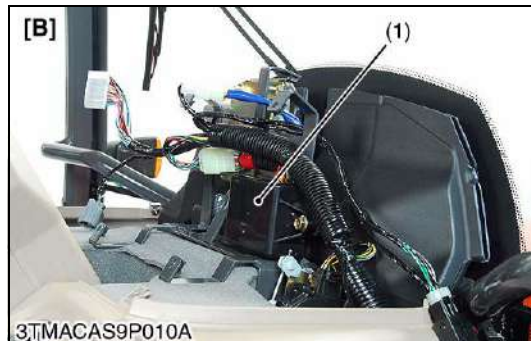
Resistance (Switch at OFF)	Terminal a – Terminal c	Infinity
Resistance (Switch at ON)	Terminal a – Terminal c	0 Ω
Resistance (Bulb)	Terminal d – Terminal e	Approx. 13 Ω

(1) Hazard Switch

(2) Bulb

W1047271

(4) Flasher Unit



Flasher Unit

1. Disconnect the connector from the flasher unit.
2. Turn the main switch at **ON** position.
3. Measure the voltage between the terminal **12**, **13** and chassis.
4. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal 12 – Chassis	Approx. battery voltage
	Terminal 13 – Chassis	Approx. battery voltage

(Reference)

1	0.85Y	Lighting switch
2	0.85Y/R	Position light
3	0.5W/B	Position light switch
4	0.85R/Y	Main switch (AC)
5	0.85R/W	Turn signal light (R)
6	0.5G/R	Turn signal light switch (R)
7	0.5B/W	Ground
8	0.85G/W	Turn signal light (L)
9	0.5W/G	Turn signal light switch (L)
10	0.5G/B	Hazard indicator lamp
11	0.5W/L	Hazard switch
12	1.25R/B	Battery voltage
13	0.85R/L	Battery voltage (lighting)

Flasher Unit Actuation Test

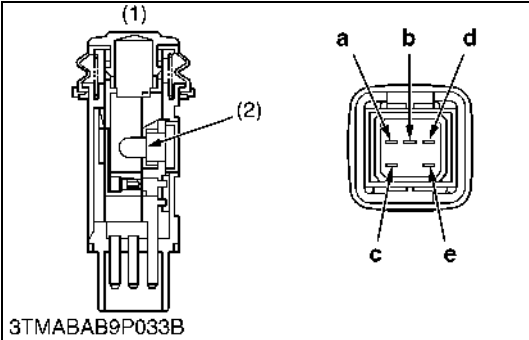
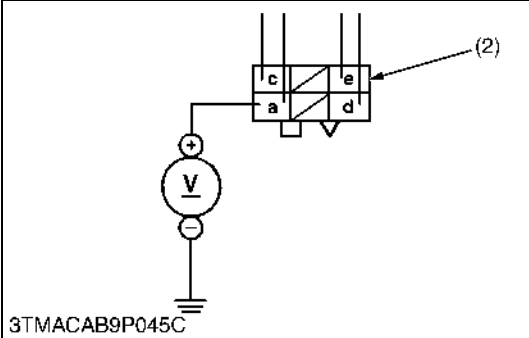
1. Set the hazard switch to the **ON** position, and make sure the hazard light gives 60 to 120 flashers for a minute.
2. Set the main switch to the **ON** position and move the turn signal switch to the left. Make sure the left-hand light gives flashes. Then move the turn signal switch to the right and make sure the right-hand light gives flashes. Make sure the same actions as above result.
3. If both the hazard switch and the turn signal switch and the turn signal switch function but the above actions do not take place, replace the flasher unit with new one.

(1) Flasher Unit

[A] ROPS Model**[B] CABIN Model**

W1029094

(5) Front Work Light Switch (ROPS Model)



Checking Connector Voltage

- 1. Turn the main switch to **ON** position.
- 2. Measure the voltage with a voltmeter across the terminal a and chassis.
- 3. If the voltage differ from the battery voltage, the wiring harness or fuse is faulty.

Voltage	Terminal a – Chassis	Approx. battery voltage

(1) Hazard Switch

(2) 6P Connector (Wire Harness Side)

W1035385

Checking Hazard Switch Continuity

- 1. Measure the resistance with ohmmeter across the terminal a and terminal c, and across the terminal d and terminal e.
- 2. If the measurement is not following below, the switch or the bulb are faulty.

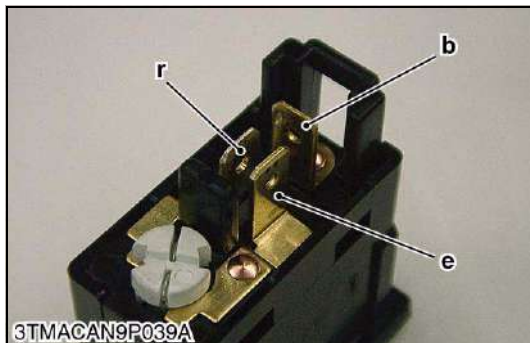
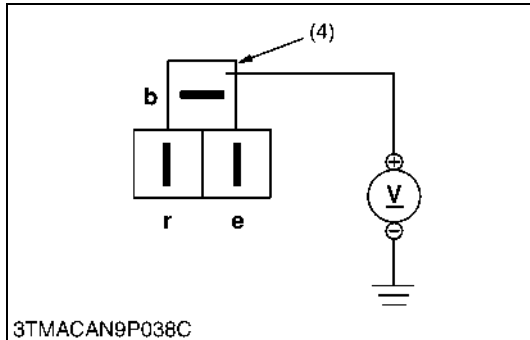
Resistance (Switch at OFF)	Terminal a – Terminal c	Infinity
Resistance (Switch at ON)	Terminal a – Terminal c	0 Ω
Resistance (Bulb)	Terminal d – Terminal e	Approx. 13 Ω

(1) Front Work Light Switch

(2) Bulb

W1035521

(6) Front/Rear Work Light and Beacon Light Switch (CABIN Model)



Checking Connector Voltage

1. Turn the main switch to **ON** position.
2. Measure the voltage with a voltmeter across the terminal **b** and chassis.
3. If the voltage differ from the battery voltage, the wiring harness or fuse is faulty.

NOTE

- The terminal **b** of 3P connector for front work light switch and beacon light switch are white/black color wire, for rear light switch is white/blue color wire.

Voltage	Terminal b – Chassis	Approx. battery voltage

- (1) Work Light Switch (Front)
(2) Work Light Switch (Rear)

- (3) Beacon Light Switch
(4) 3P Connector (Wire Harness Side)

W1028416

Checking Switch Continuity

1. Test the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

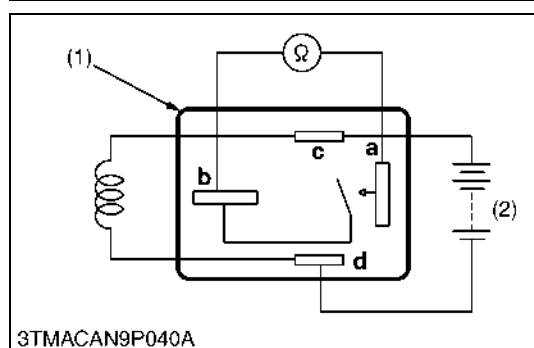
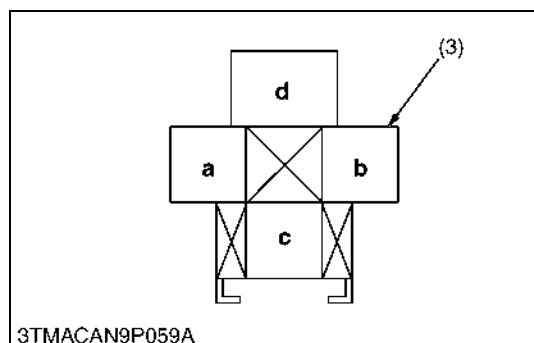
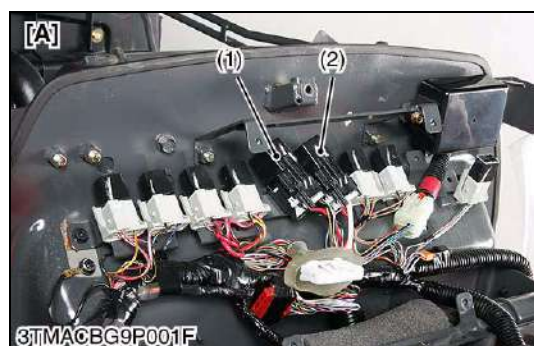
	b	r	e
OFF		●	●
ON	●	●	●

- (1) Work Light Switch

W1029003

[9] RELAYS

(1) Starter Relay and Heater Relay



Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Starter relay	ROPS and CABIN	Terminal d – Chassis	Approx. battery voltage
Heater relay	ROPS	Terminal c – Chassis	Approx. battery voltage
	CABIN	Terminal d – Chassis	Approx. battery voltage

- (1) Starter Relay
- (2) Heater Relay
- (3) Connector (Wire Harness)

[A] ROPS Model

[B] CABIN Model

W1043116

Functional Check

NOTE

- The relays described here are used same ones so that these are interchangeable.

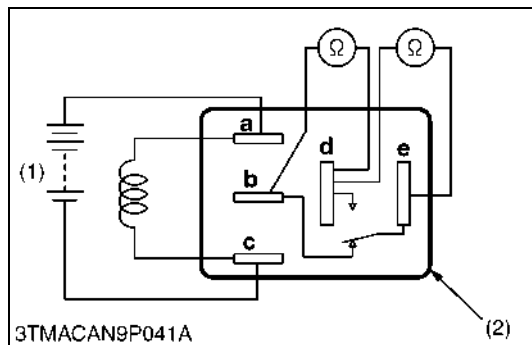
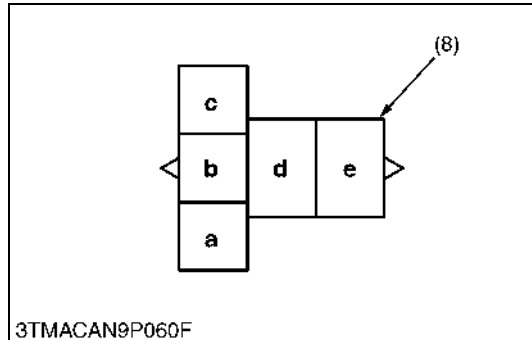
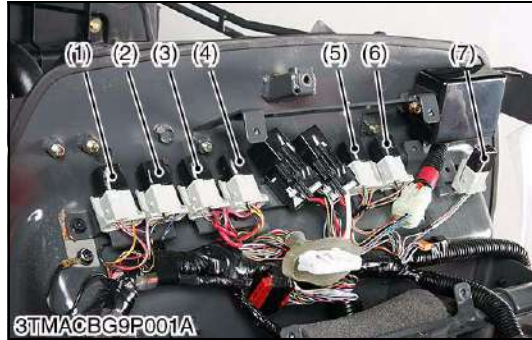
1. Apply battery voltage across the terminals **c** and **d**, and check for continuity across the terminals **a** and **b**.
2. If continuity is not established across the terminals **a** and **b**, replace it.

(1) Connector (Relay)

(2) Battery

W1036849

(2) Relays (ROPS Model)



Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

(1)	Engine stop relay (main switch at ON position)	Terminal c – Chassis	Approx. battery voltage
(2)	PTO safety relay (main switch at ON position and PTO lever OFF position)	Terminal c – Chassis	Approx. battery voltage
(3)	Work light relay (front) (main switch at OFF position)	Terminal e – Chassis	Approx. battery voltage
(4)	Key stop relay (main switch at OFF position)	Terminal e – Chassis	Approx. battery voltage
(5)	Head light relay (low) (main switch at OFF position)	Terminal d – Chassis	Approx. battery voltage
(6)	Head light relay (high) (main switch at OFF position)	Terminal d – Chassis	Approx. battery voltage
(7)	4WD / Bi-speed turn relay (main switch at ON , 4WD / Bi-speed turn switch at bi-speed position and turning angle inspection switch at ON)	Terminal c – Chassis	Approx. battery voltage

- (1) Engine Stop Relay
- (2) PTO Safety Relay
- (3) Work Light Relay (Front)
- (4) Key Stop Relay

- (5) Head Light Relay (Low)
- (6) Head Light Relay (High)
- (7) DT / Bi-Speed Turn Relay
- (8) Connector (Wire Harness)

W1043911

Functional Check

NOTE

- The relays described here are used same ones so that these are interchangeable.

1. Apply battery voltage across the terminals **a** and **c**, and check for continuity across the terminals **d** and **e**.
2. If continuity is not established across terminals **d** and **e**, replace it.

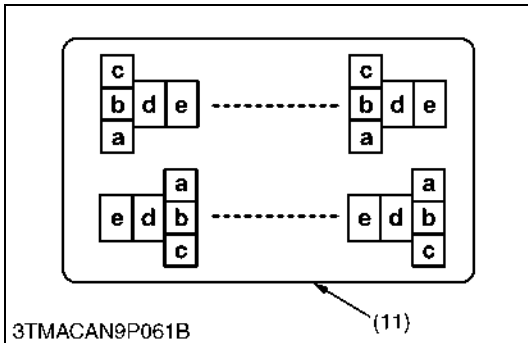
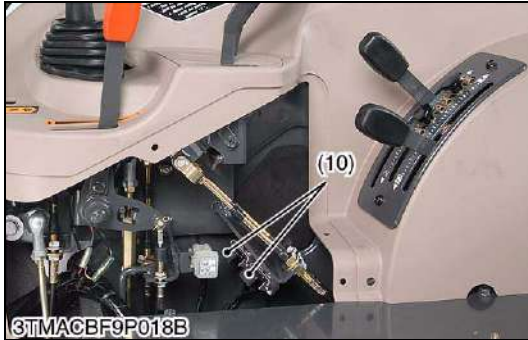
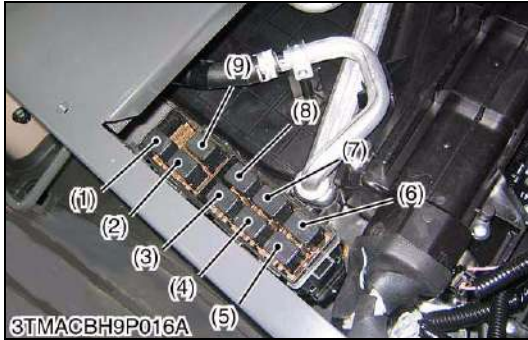
	b	d	e
At 0 voltage between terminal a and c	●		●
At battery voltage between terminal a and c		●	●

(1) Battery

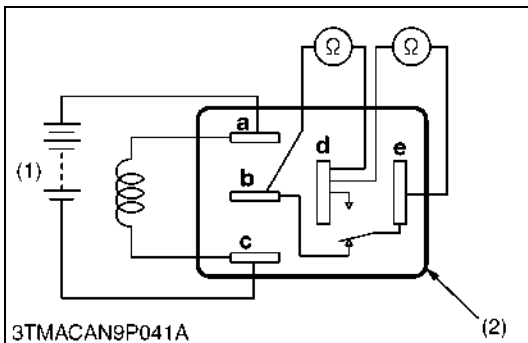
(2) Connector (Relay)

W1037072

(3) Relays (CABIN Model)



3TMACAN9P061B



3TMACAN9P041A

Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

(1)	Wiper relay (front) (main switch at ACC position)	Terminal c – Chassis	Approx. battery voltage
(2)	Engine stop relay (main switch at ON position)	Terminal c – Chassis	Approx. battery voltage
(3)	Work light relay (front) (main switch at OFF position)	Terminal e – Chassis	Approx. battery voltage
(4)	Key stop relay (main switch at OFF position)	Terminal e – Chassis	Approx. battery voltage
(5)	A/C compressor relay (main switch at OFF position)	Terminal d – Chassis	Approx. battery voltage
(6)	Blower relay (main switch at OFF position)	Terminal d – Chassis	Approx. battery voltage
(7)	PTO safety relay (main switch at ON position and PTO lever OFF position)	Terminal c – Chassis	Approx. battery voltage
(8)	Work light relay (ACC relay) (main switch at OFF position)	Terminal e – Chassis	Approx. battery voltage
(9)	Blower high relay (main switch at ACC position)	Terminal c – Chassis	Approx. battery voltage

NOTE

- The defogger rear and side are option.

(1) Wiper Relay (Front)	(7) PTO Safety Relay
(2) Engine Stop Relay	(8) Work Light Relay (ACC Relay)
(3) Work Light Relay (Front)	(9) Blower High Relay
(4) Key Stop Relay	(10) Defogger Relay (Rear/Side) (Option)
(5) A/C Compressor Relay	(11) Connector Box
(6) Blower Relay	

W1030641

Functional Check

NOTE

- The relays described here are used same ones so that these are interchangeable.

1. Apply battery voltage across the terminals **a** and **c**, and check for continuity across the terminals **d** and **e**.
2. If continuity is not established across terminals **d** and **e**, replace it.

	b	d	e
At 0 voltage between terminal a and c	●		●
At battery voltage between terminal a and c		●	●

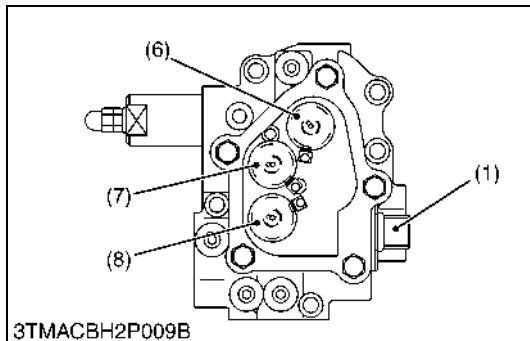
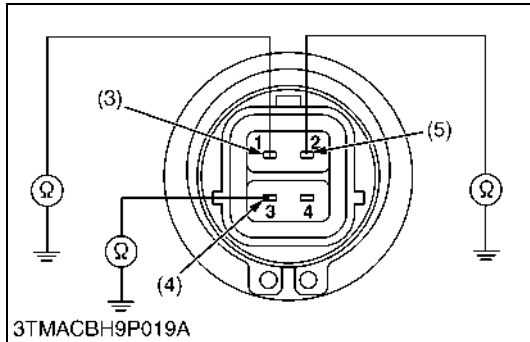
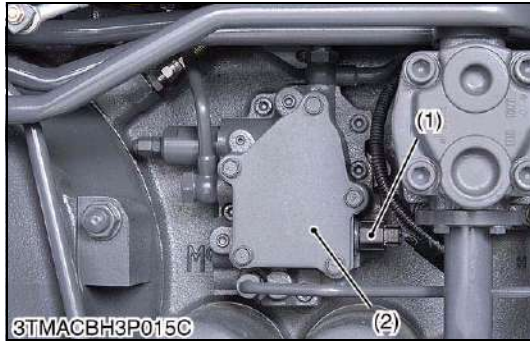
(1) Battery

(2) Connector (Relay)

W1031628

[10] SOLENOID VALVE

(1) PTO, 4WD and Rear Differential Lock



Solenoid Valves

1) Connector Voltage

1. Remove the connector (1).
2. Turn on the main switch, PTO switch, 4WD switch or rear differential lock switch at **ON** position.
3. Measure the voltage across the each terminal and chassis.
4. If the voltage differs from battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Each terminal – Chassis	Approx. battery voltage

2) Solenoid Valve

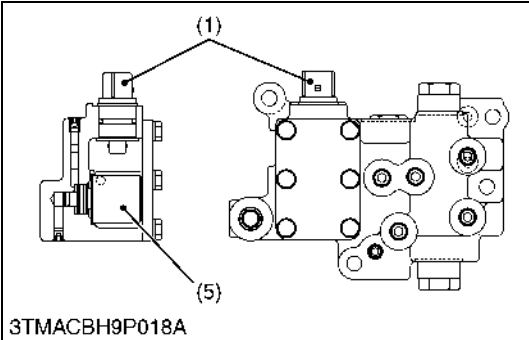
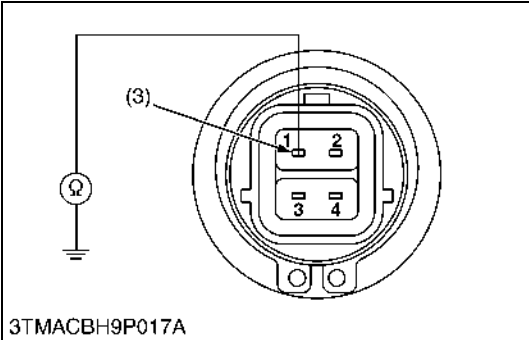
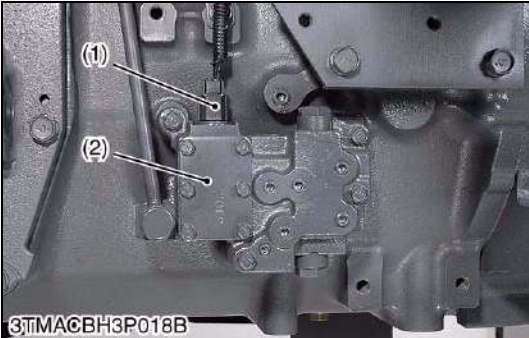
1. Disconnect the wire harness connector (1).
2. Measure the resistance with an ohmmeter across the each terminal **1/2/3** on the connector (1) and chassis.
3. If infinity is indicated, the solenoid valve is faulty.

Resistance	Solenoid valve 1/2/3 terminal to chassis	10 to 12 Ω

(1) Connector	(5) Terminal 2 for Rear Differential Lock Solenoid Valve
(2) Solenoid Valve Assembly	(6) PTO Solenoid Valve
(3) Terminal 1 for 4WD Solenoid Valve	(7) Rear Differential Lock Solenoid Valve
(4) Terminal 3 for PTO Solenoid Valve	

W1030393

(2) Hi-Lo Dual Speed (F36/R36 Speed Transmission Model)



Solenoid Valves

1) Connector Voltage

- 1. Remove the connector (1).
- 2. Turn on the dual speed switch at **Lo** position.
- 3. Measure the voltage across the each terminal and chassis.
- 4. If the voltage differs from battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Each terminal – Chassis	Approx. battery voltage

2) Solenoid Valve

- 1. Disconnect the wire harness connector (1).
- 2. Measure the resistance with an ohmmeter across the each terminal 1 on the connector (1) and chassis.
- 3. If infinity is indicated, the solenoid valve is faulty.

Resistance	Solenoid valve 1 terminal to chassis	10 to 12 Ω

- (1) Connector

(2) Dual Speed Solenoid Valve Assembly

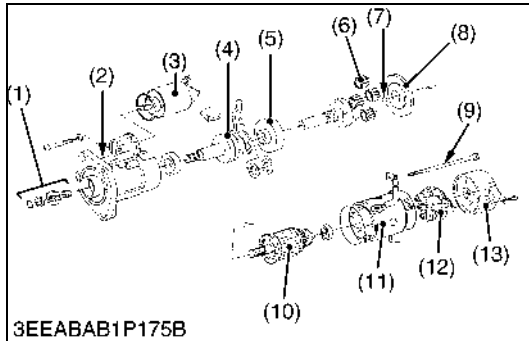
(3) Terminal 1 for Dual Speed Solenoid Valve
- (5) 4WD Solenoid Valve

(6) PTO Solenoid Valve

W1032404

5. DISASSEMBLING AND ASSEMBLING

[1] STARTER MOTOR



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.

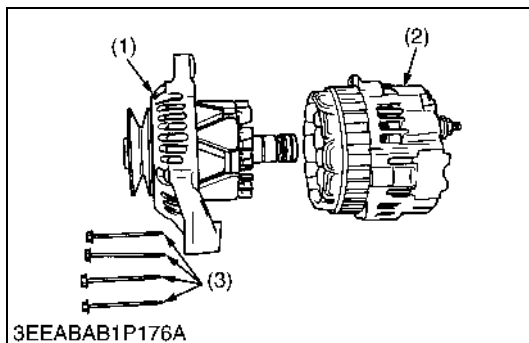
(When reassembling)

- Apply grease (DENSO CO. No. 50 or equivalent) to the parts indicated in the figure.

(1) Gear	(8) Set of Packings
(2) Front Bracket	(9) Through Screw
(3) Solenoid Switch	(10) Armature
(4) Overrunning Clutch	(11) Yoke
(5) Internal Gear	(12) Brush Holder
(6) Planetary Gear	(13) Rear End Frame
(7) Ball	

W1110814

[2] ALTERNATOR



Front Bracket

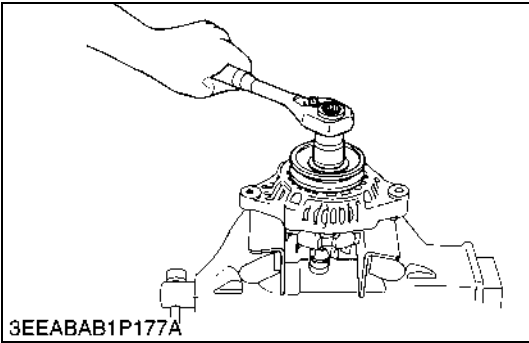
1. Remove the 4 screws.
2. Separate the front bracket (1) and the rear bracket (2) from each other.

■ IMPORTANT

- Put a tally line on the front bracket and the rear bracket for reassembling them later.

(1) Front Bracket	(3) Screw
(2) Rear Bracket	

W1018481

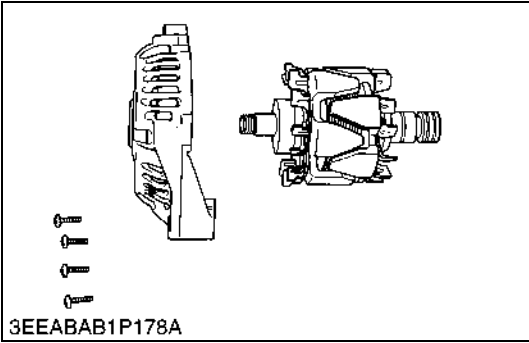


Pulley

- 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 lbf·ft

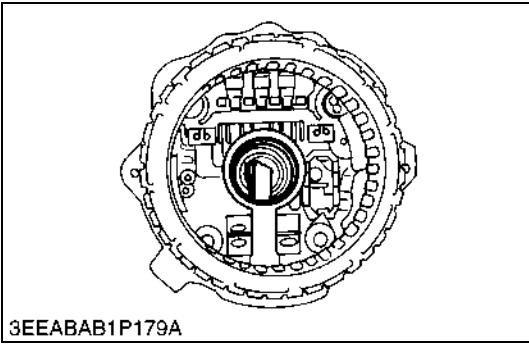
W1018613



Rotor

- 1. Remove the 4 screws and detach the bearing retainer.
- 2. Temporarily install the nut on the pulley screw, and detach the rotor.

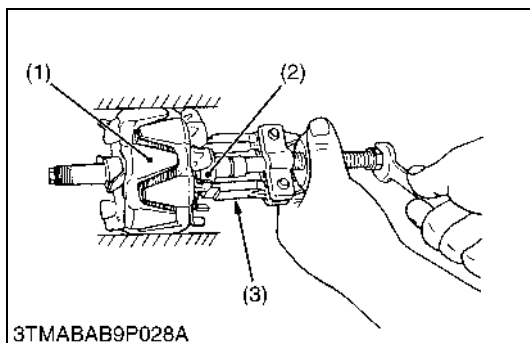
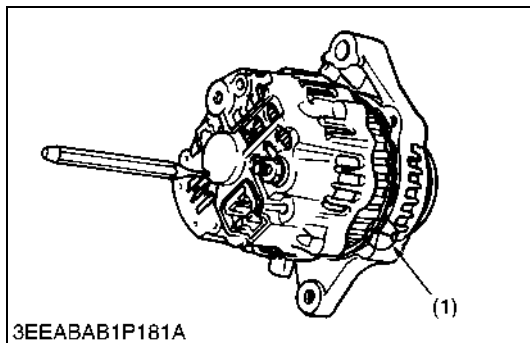
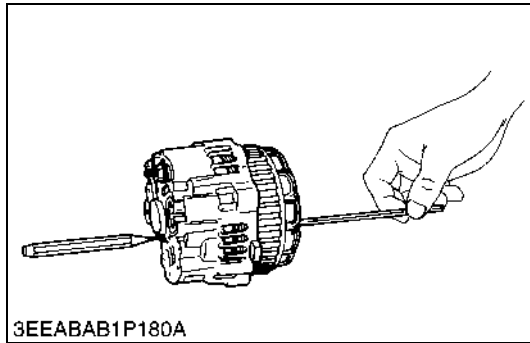
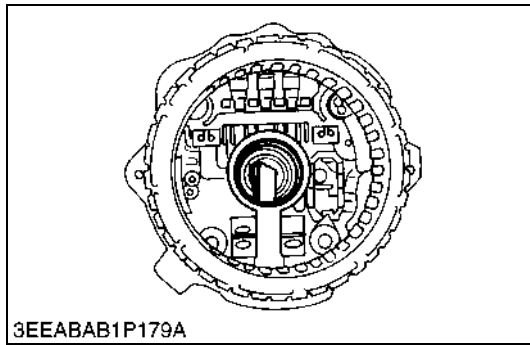
W1018685



Brush

- 1. When the rotor is detached, the 2 brushes are found to stretch out of the shaft hole.

W1018748



Reassembling the Brush

1. Fit the brush with its sliding face in the clockwise direction when viewed from front.

■ IMPORTANT

- Be sure to keep the 2 brushes deep in the brush holder. Otherwise the rotor and the rear section can not be fitted into position.
 - Use a 4 mm hex. wrench to push the brushes into place.
 - Using a pin-pointed (2 mm) punch, keep the brushes from popping out.
2. Match the tally line of the front section with that of the rear section.
 3. Tighten the 4 screws, and draw out the pin-pointed punch out of the brush holder.

(1) Marking

W1018847

Bearing at Slip Ring Side

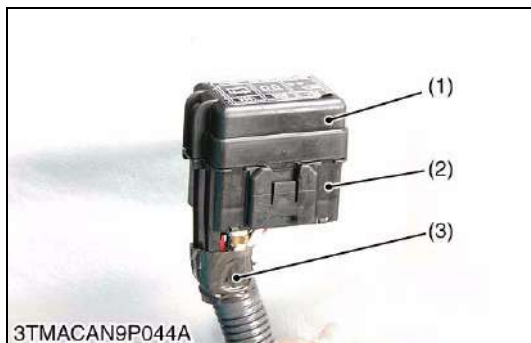
1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

(1) Rotor
(2) Bearing

(3) Puller

W1019701

[3] FUSE (SLOW BLOW 100 A) FOR CABIN MODEL



Fuse

[Replacing procedure for 100 A]

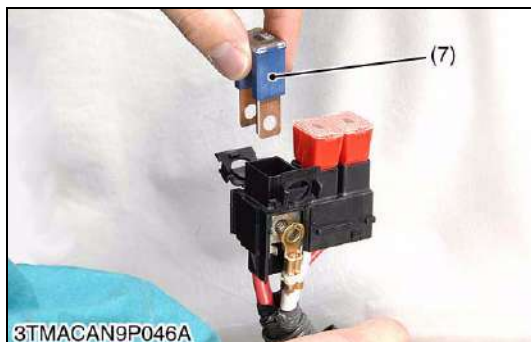
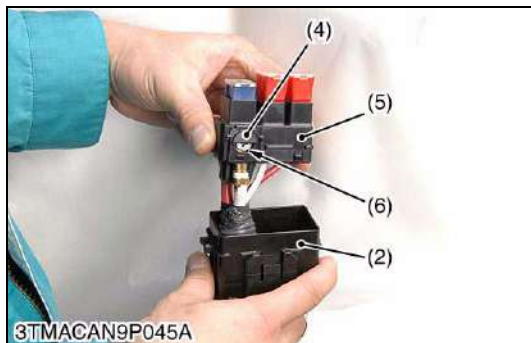
1. Remove the battery negative cable.
2. Remove the top cover (1) and protect tape (3).
3. Draw out the fuse stay (5) from the fuse box (2).
4. Open the cover (4) and remove the screw (6) to draw out the fuse (100 A) (7).

(When reassembling)

- Be sure to apply the nylon tape.

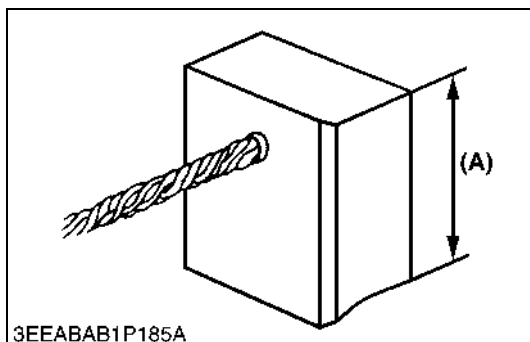
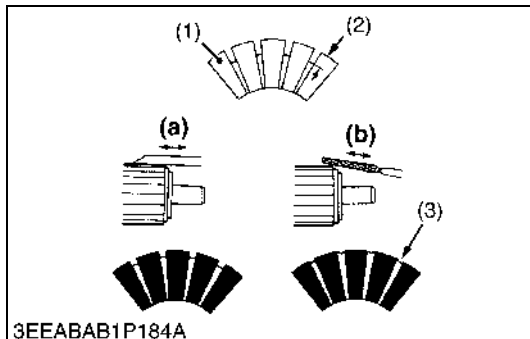
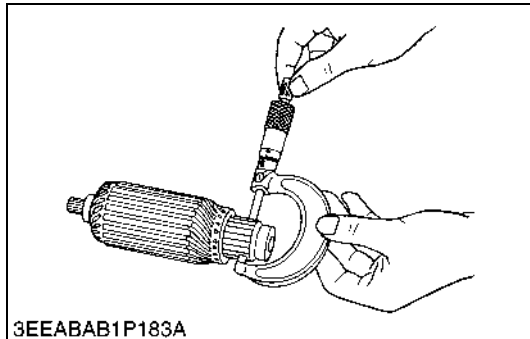
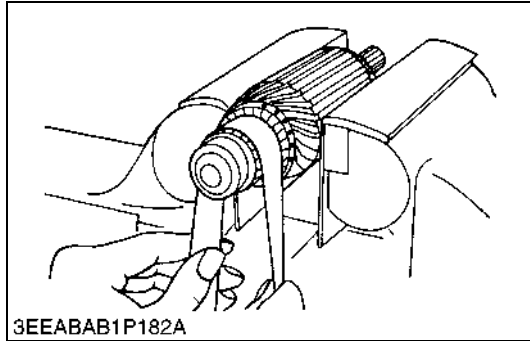
(1) Top Cover	(5) Fuse Stay
(2) Fuse Box	(6) Screw
(3) Tape	(7) Fuse (100 A)
(4) Cover	

W1039550



6. SERVICING

[1] STARTER



Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory spec.	32 mm 1.2598 in.
	Allowable limit	31.4 mm 1.2362 in.

Mica undercut	Factory spec.	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.

- (1) Segment
- (2) Depth of Mica
- (3) Mica

(a) Good
(b) Bad

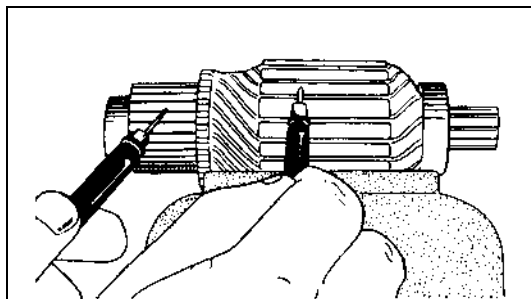
W1017092

Brush Wear

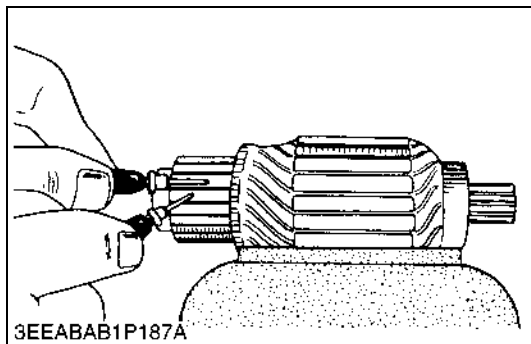
1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length (A) with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length (A)	Factory spec.	18.0 mm 0.7086 in.
	Allowable limit	11.0 mm 0.4331 in.

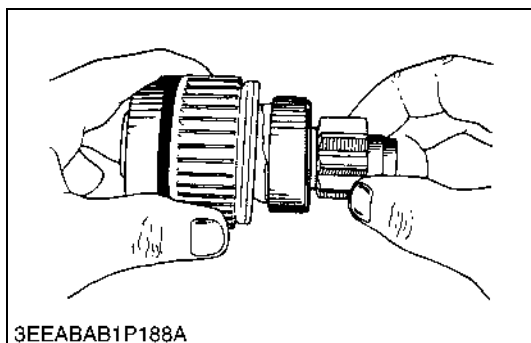
W1017544



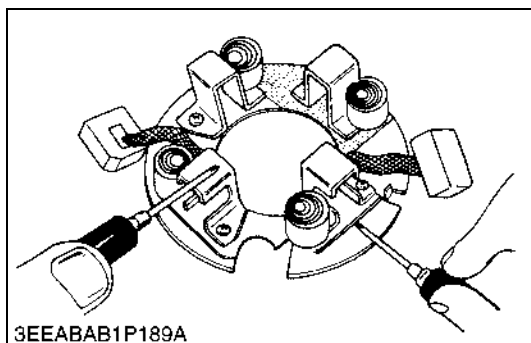
3EEABAB1P186A



3EEABAB1P187A



3EEABAB1P188A



3EEABAB1P189A

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

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.

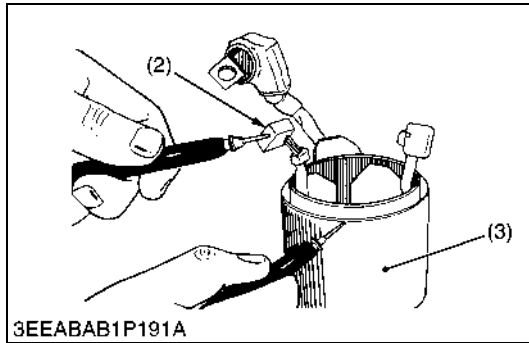
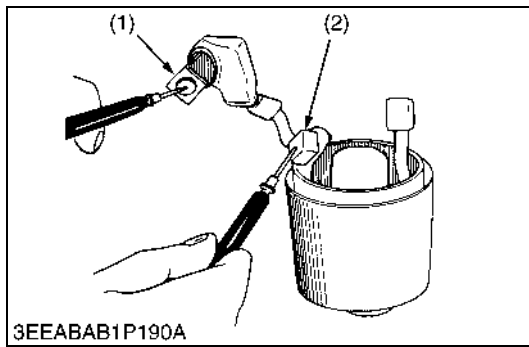
W1016990

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

**Field Coil**

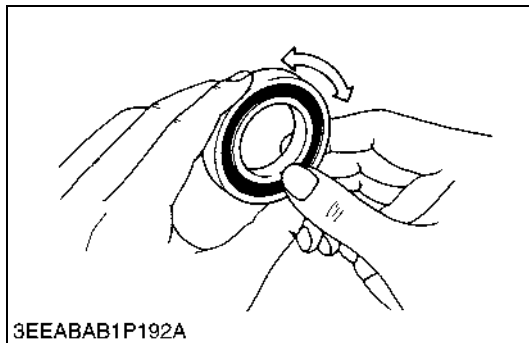
1. Check the continuity across the lead (1) and brush (2) with an ohmmeter.
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter.
4. If it conducts, replace the yoke assembly.

Resistance	Lead (1) – Brush (2)	0 Ω
	Brush (2) – Yoke (3)	Infinity

(1) Lead
(2) Brush

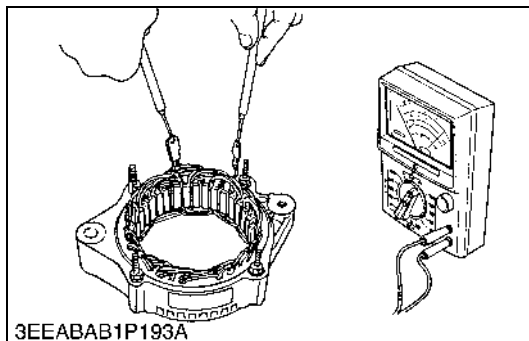
(3) Yoke

W1018015

[2] ALTERNATOR**Bearing**

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

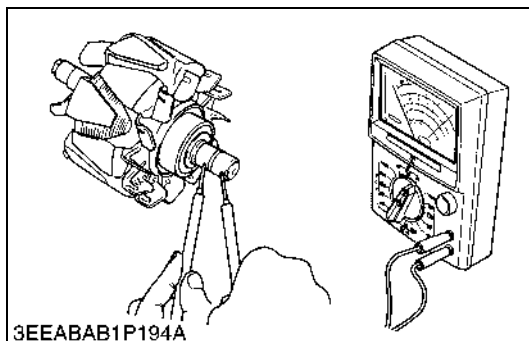
W1019790

**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

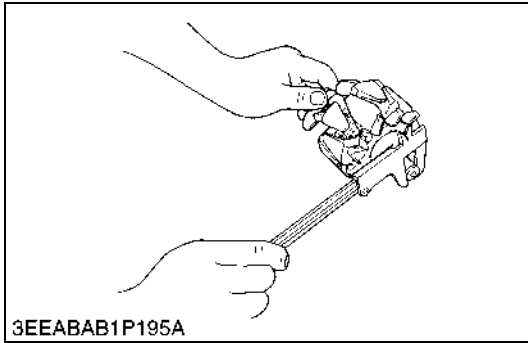
W1019964

**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

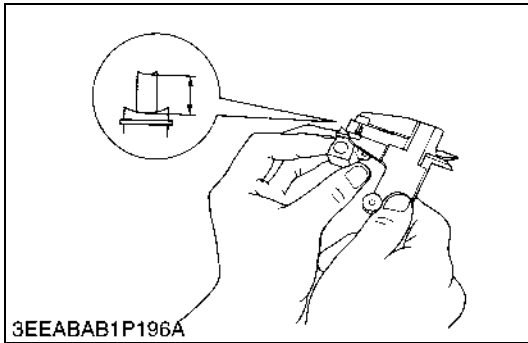
W1020094

**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.

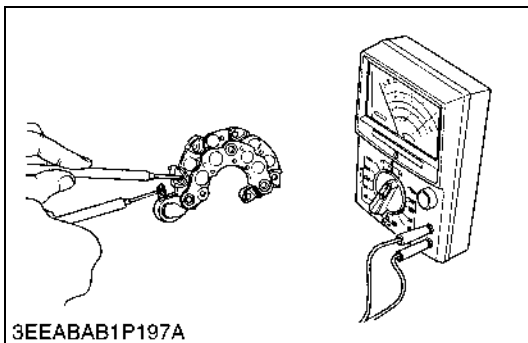
W1020208

**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.

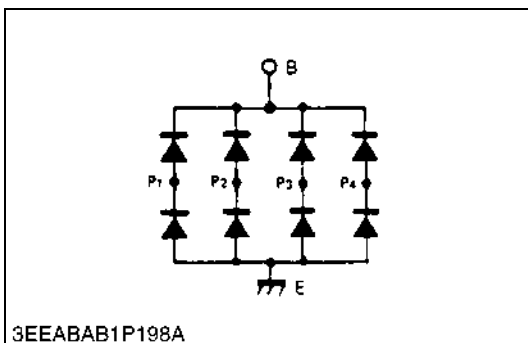
Brush length	Factory spec.	18.5 mm 0.728 in.
	Allowable limit	5.0 mm 0.197 in.

W1020329

**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



10 CABIN

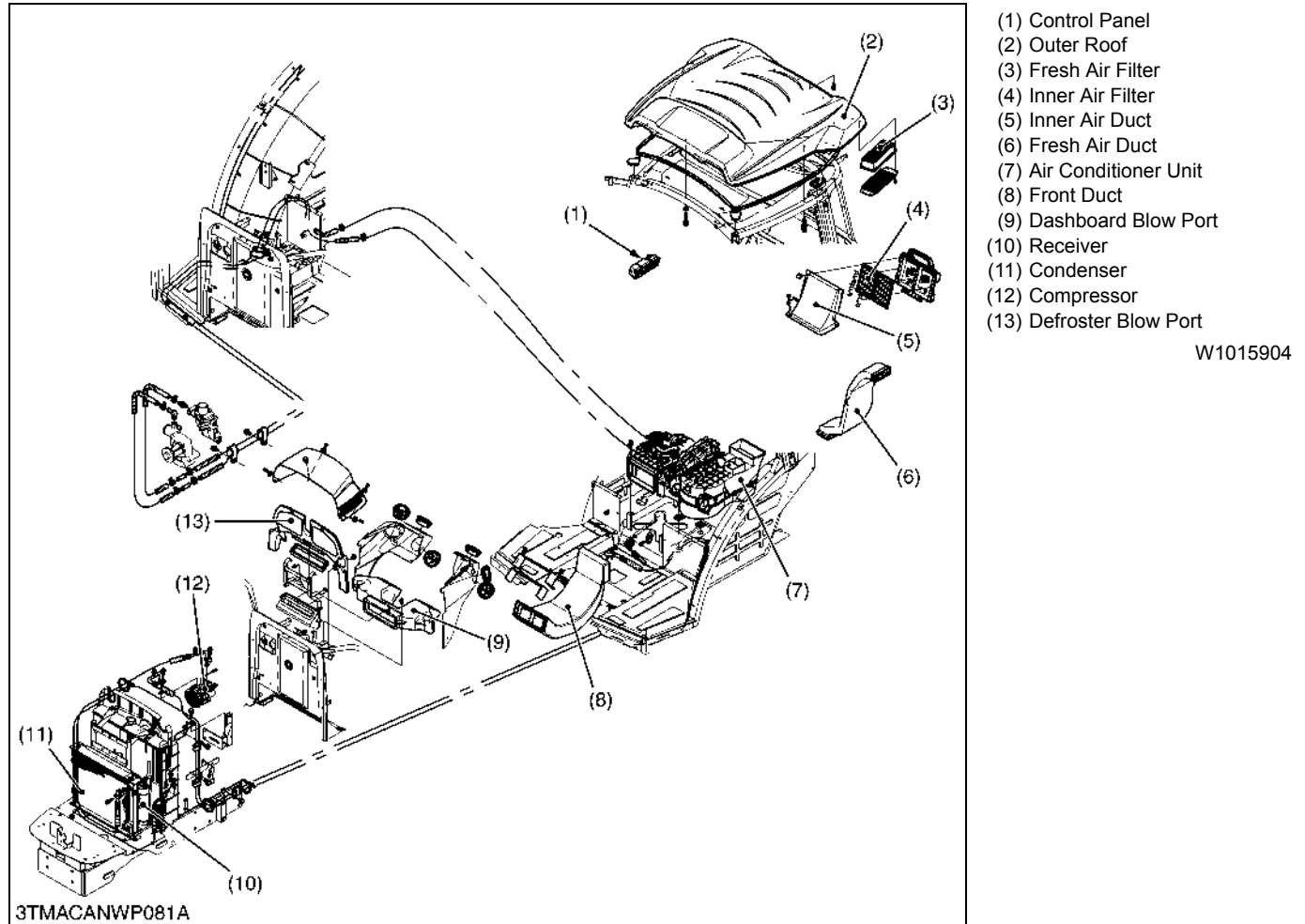
MECHANISM

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1. AIR CONDITIONING SYSTEM

[1] STRUCTURE



This cabin is equipped with the inner air circulation/outside air inhalation type large capacity thin air conditioner.

The inner air inhaled from the inner air filter (4) provided behind the seats goes through the inner air duct (5) and goes into the air conditioner unit (7). The fresh air inhaled from the fresh air filter (3) goes through the center pillar on the left and goes into the air conditioner unit (7) via the fresh air duct (6).

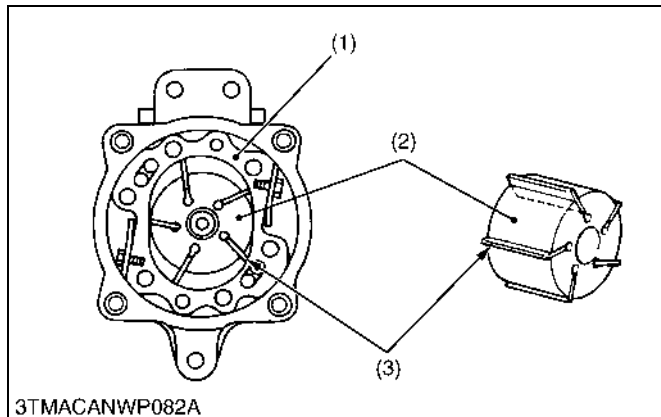
The inner air and fresh air inhaled into the air conditioner unit (7) is cooled and dehumidified in the cooling section of the air conditioner unit (7). The comfortable air, warmed moderately with the heater, comes from the air duct with low humidity.

The six dashboard air outlets allow opening and closing, and adjusting direction of winds. The defroster air outlet is opened and closed by moving the mode dial on the control panel (1).

Capacity (Cooling)	Factory spec.	3.95 kW
Capacity (Warming)	Factory spec.	4.30 kW
Kinds of refrigerant (Charge amount)	Factory spec.	R134a 0.85 to 0.95 kg 1.87 to 2.09 lbs
Pressure sensor (Low)	Factory spec.	0.196 MPa 2.0 kgf/cm ² 28.4 psi
Pressure sensor (High)	Factory spec.	3.14 MPa 32.0 kgf/cm ² 455 psi

W1012759

[2] COMPRESSOR



The vane type compressor installed on this cabin is composed of a cylinder (1) with an oval cross section and a rotor (2) with five vanes (3). The vane type compressor is provided with two suction ports and two discharge ports respectively.

The five vanes (3) mounted on the rotor (2), rotating along the inner wall of the cylinder (1), keeps airtightness using the centrifugal force of the rotor (2) and the back pressure of the vanes (3) that grow in proportion to the rotating speed of the rotor (2).

As a result, the volumes of the five cylinder chambers separated with the cylinder (1) and the five vanes (3) change.

For each rotation of the rotor (2), each of the cylinder chambers performs two cycles of inhalation, compression, and discharge.

(1) Cylinder
(2) Rotor

(3) Vane

W1012943

■ Operation

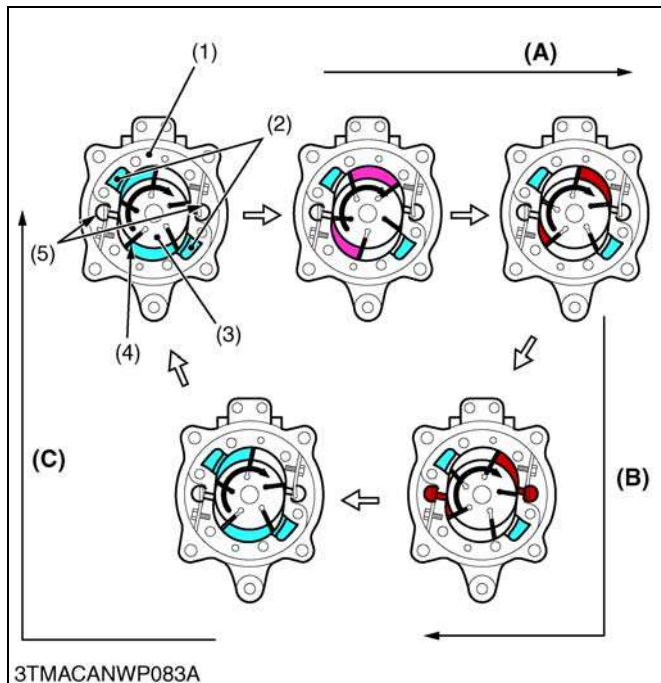
In proportion to the rotation of the rotor (3), a volume of a cylinder chamber separated with the cylinder (1) and the vanes (4) increases. The cylinder chamber inhales refrigerant gas from the suction port (2).

As the rotor (3) rotates further, a volume of the cylinder chamber separated with the cylinder (1) and the vanes (4) decreases, and the refrigerant gas is compressed. As the rotor (3) rotates even further, the refrigerant gas is highly compressed and then presses the discharge valve to open. The refrigerant gas is discharged from the discharge port (5).

(1) Cylinder
(2) Suction Port
(3) Rotor
(4) Vane
(5) Discharge Port

(A) Compression Process
(B) Discharge Process
(C) Suction Process

W1013091



■ Compressor Oil

The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 does not dissolve in R134a, so it does not circulate through the cycle, and the lifespan of the compressor is considerably shortened.

It is still essential to ensure that the correct refrigerant oil is used. R12 systems were lubricated with mineral oil, which is totally unsuitable for R134a systems. The latter require PAG oil, which mixes very well with the refrigerant and provides ideal lubrication throughout the system.

Quantity (Total)	Brand Name
100 to 120 cc 0.106 to 0.127 U.S.qts. 0.088 to 0.106 Imp.qts.	ND-OIL 8 <PAG* oil>

*PAG : Polyalkyleneglycol (Synthetic oil)

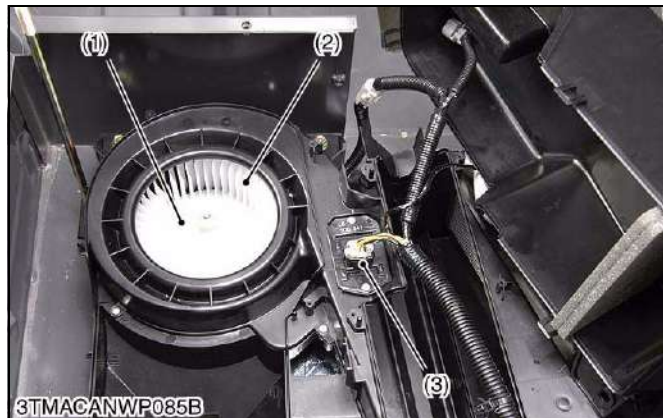
[3] AIR CONDITIONER UNIT



The air conditioner unit (3) consists of evaporator (2), expansion valve (4), heater core (1), blower (5). etc..

(1) Heater Core	(4) Expansion Valve
(2) Evaporator	(5) Blower
(3) Air Conditioner Unit	

W1013727



■ A/C Blower

The blower is incorporated in the left-hand space of the air conditioner unit. It blows cool, warm or fresh air via the dashboard and defroster blow ports into the cabin.

The speed of the blower motor (1) can be adjusted in 4 steps by the resistor (3).

The blower fan (2) is centrifugal type. The air being sucked in parallel with the rotary shaft is blown in the centrifugal direction; in other words, perpendicular to the rotary shaft.

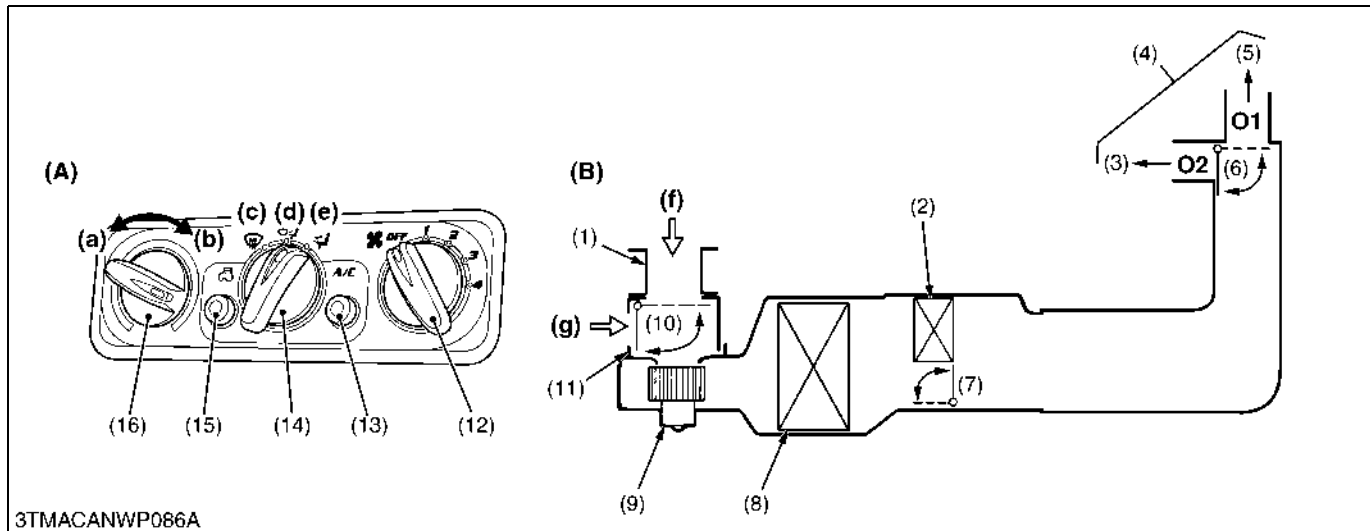
(1) Blower Motor	(3) Resistor
(2) Blower Fan	

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■ NOTE

- As for the mechanism and function of each component part, refer to “10. CABIN” section in the Workshop Manual of tractor mechanism (Code No. 9Y021-18200).

[4] SYSTEM CONTROL



(1) Fresh Air Inlet Port	(9) Blower	(16) Temperature Control Dial	(d) Air is blown the dashboard and defroster air outlets
(2) Heater	(10) D1 : Air Intake Door	(A) Control Panel	(e) Air is blown from only the dashboard air outlets
(3) Dashboard	(11) Recirculated Air Inlet Port	(B) Block Diagram of Air Flow Passage	(f) Fresh Air
(4) Defroster and Dashboard	(12) Blower Switch		(g) Recirculated Air
(5) Defroster	(13) Air Conditioner Switch (with Indicator)	(a) COOL	O1 :Defroster Air Outlet
(6) D3 : Air Outlet Door (Mode Door)	(14) Mode Dial	(b) WARM	O2 :Dashboard Air Outlets
(7) D2 : Temperature Door (Air Mixed Door)	(15) Recirculation/Fresh Air Selection Switch (with Indicator)	(c) Air is blown from only the defroster air outlet	
(8) Evaporator			

■ Recirculation / Fresh Air Selection Switch

● RECIRCULATION (Indicator : ON)

By pushing the recirculation / fresh air selection switch (15) to “**RECIRCULATION**” position (indicator : ON), door D1 (10) shuts the fresh air inlet port (1). Air inside the cabin is recirculated.

● FRESH AIR (Indicator : OFF)

By pushing the recirculation / fresh air selection switch (15) to “**FRESH AIR**” position (indicator : OFF), door D1 (10) opens the fresh air inlet port (1). Outside air comes into cabin.

■ Temperature Control Dial

● COOL

By moving the temperature control dial (16) to “**COOL**” position (a), door D2 (7) moves to close water valve and opens side passage. The air flows toward door D3 (6) through the side passage.

● WARM

By moving the temperature control dial (16) to “**WARM**” position (b), door D2 (7) moves to open water valve and closes side passage. The air flows toward door D3 (6) through the heater (2).

■ Mode Dial

● DEFROSTER

Moving the mode dial (14) to (c) position, the door D3 (6) is moved to set up the air passage to outlet O1. Air comes out from outlet O1.

● DEFROSTER + DASHBOARD

Moving the mode dial (14) to (d) position, the door D3 (6) is moved to establish the air passages to outlets O1 and O2. Air comes out from both outlets.

● DASHBOARD

Moving the mode dial (14) to (e) position, the door D3 (6) is moved to set up the air passage to outlet O2. Air comes out from outlet O2.

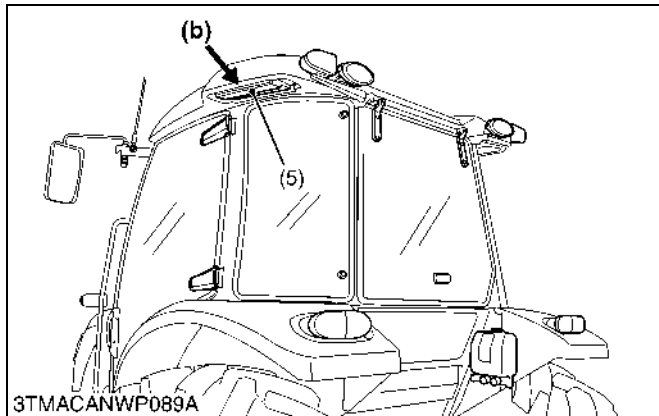
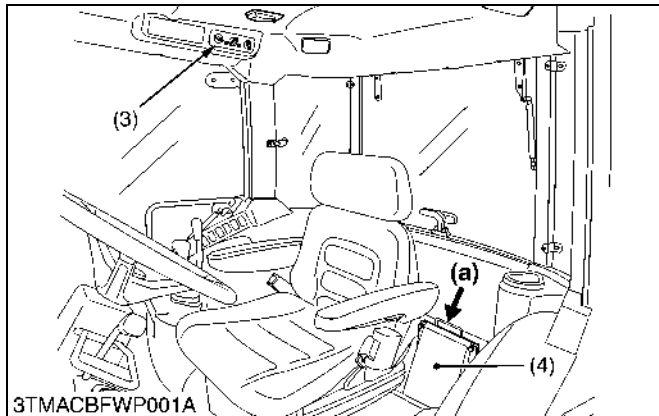
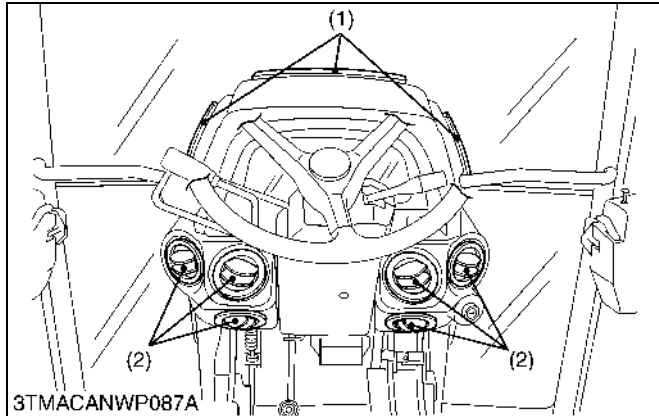
■ Blower Switch

Air volume can be changed in four steps. At the “4” position, the largest air volume is obtained.

■ Air Conditioner Switch

Push this switch to activate the air conditioner. An indicator will light up when the switch is set to “**ON**”. Push switch again to turn air conditioner off, in which case the indicator light will be off.

[5] AIR FLOW



■ Flow

Air in the cabin and fresh air introduced into the cabin flow as shown below. Adjust the 7 air ports to obtain the desired condition.

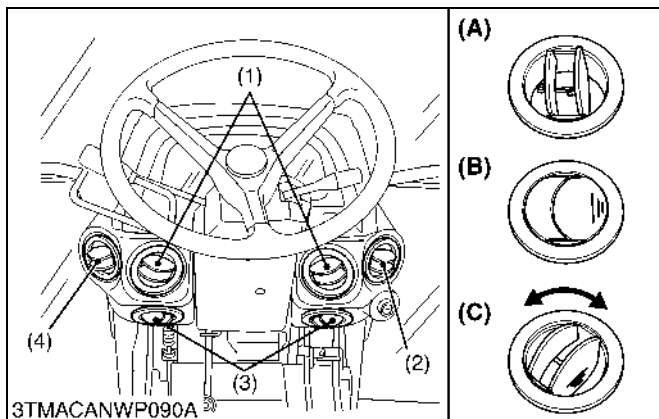
■ IMPORTANT

- Do not pour water directly into the fresh air port while washing the vehicle.

(1) Defroster Air Outlet	(a) Inner Air Recirculation
(2) Dashboard Air Outlet	(b) Fresh Air Inlet
(3) Control Panel	
(4) Inner Air Filter	
(5) Fresh Air Filter	

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[6] AIR CONTROL VENT



■ Dashboard Air Outlet

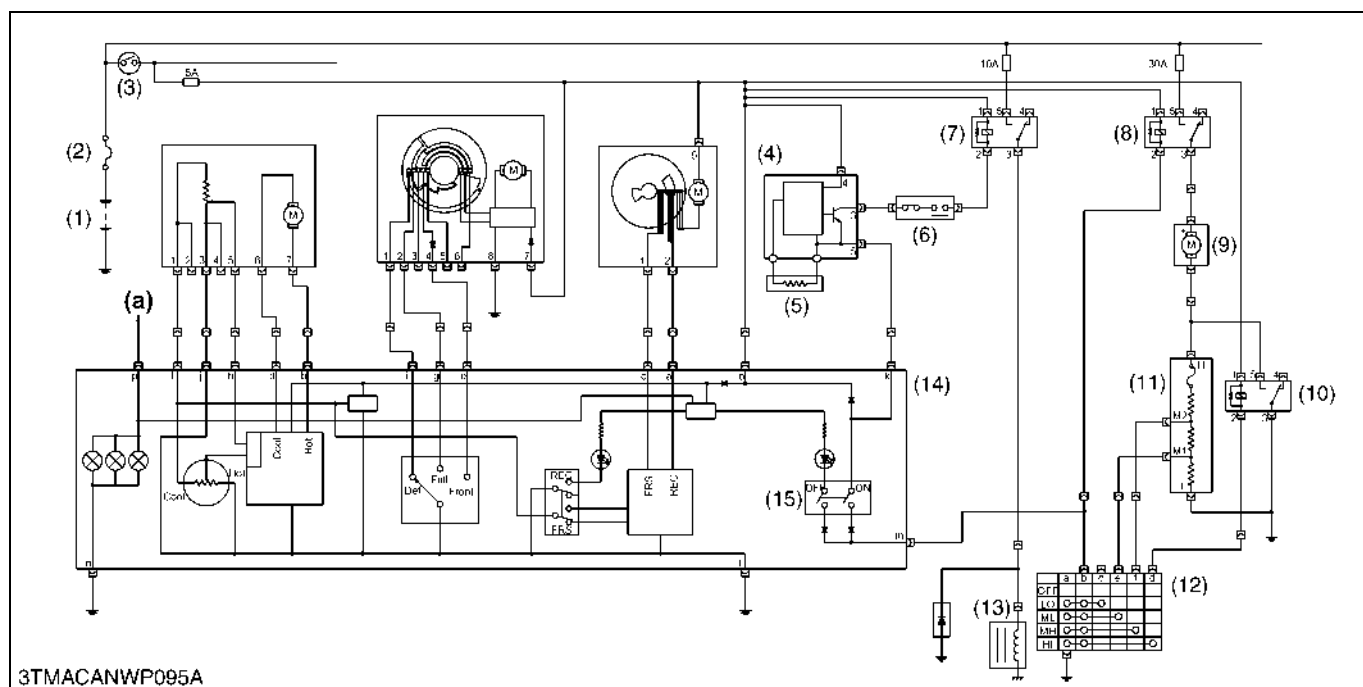
The dashboard air outlet can be independently adjusted as required.

(1) Face Area Air Outlet	(A) Open
(2) Back Area Air Outlet	(B) Shut
(3) Feet Area Air Outlet	(C) Turn
(4) Back Area Air Outlet	

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[7] ELECTRICAL SYSTEM

(1) Electrical Circuit

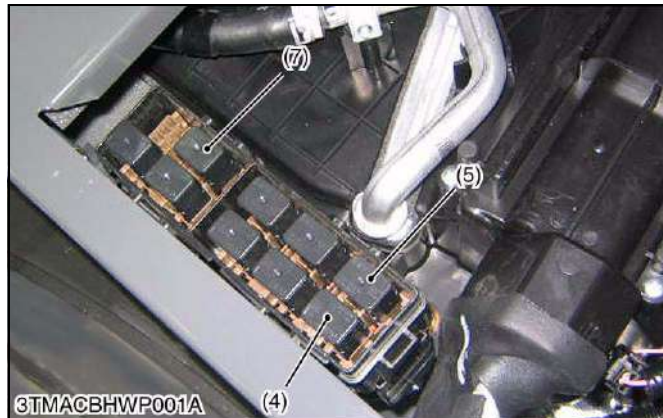
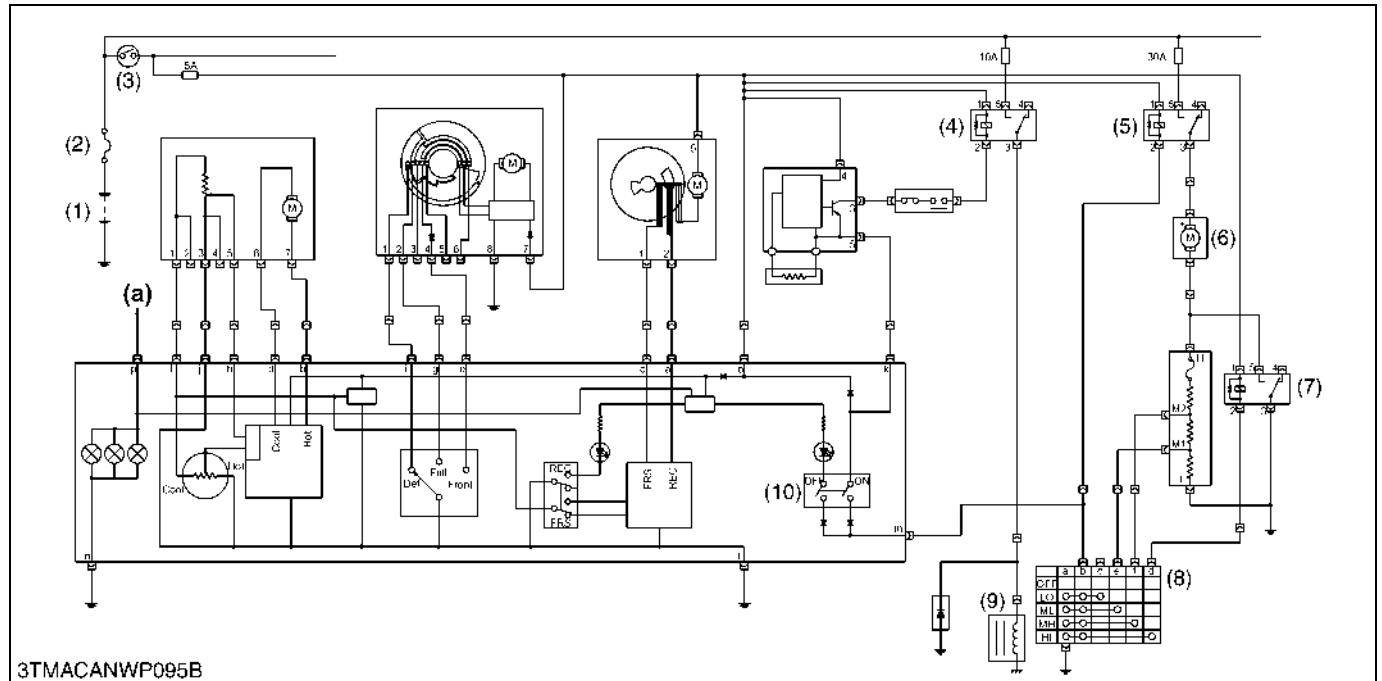


(1) Battery	(6) Pressure Switch	(10) Blower High Relay	(14) A/C Control Panel
(2) Slow Blow Fuse	(7) Compressor Relay	(11) Blower Resistor	(15) A/C Switch
(3) Main Switch	(8) Blower Relay	(12) Blower Switch	
(4) Thermo Amplifier	(9) Blower Motor	(13) Compressor	
(5) Frost Thermistor			(a) To Light Switch

The process of magnetic clutch being engaged is shown below.

Main Switch (3) **ON** → A/C Switch (15) **ON** → Blower Switch (12) **ON** (Low, Medium 1, Medium 2 or High) → Compressor Relay (7) **ON** → Thermo Amplifier (4) **ON** (the thermostat temperature is more than 3 °C (37.4 °F)) → Pressure Switch (6) **ON** (if refrigerant pressure is between 0.21 MPa (2.1 kgf/cm², 30 psi) and 265 MPa (27 kgf/cm², 384 psi) → Magnetic Clutch of Compressor Engaged.

(2) Blower Relay and Compressor Relay



Remove the seat, the seat under cover and the relays on the right side of the air conditioner unit : blower relay (5), blower high relay (7) and compressor relay (4). When the blower fan is adjusted for the air flow rate, the blower relay (5) and blower high relay (7) are activated by a signal from the blower switch (8) on the control panel.

Among the air conditioner components, current flows to the blower motor (6) and magnetic clutch. If all of these current were to be passes through the main switch (3) and supplied, the current would be too large for the main switch (3) so that there will be danger or burning out the main switch contact. If the current were to be passed directly from the battery (1), forgetting to turn off the blower motor (6) could result in a discharged battery (1).

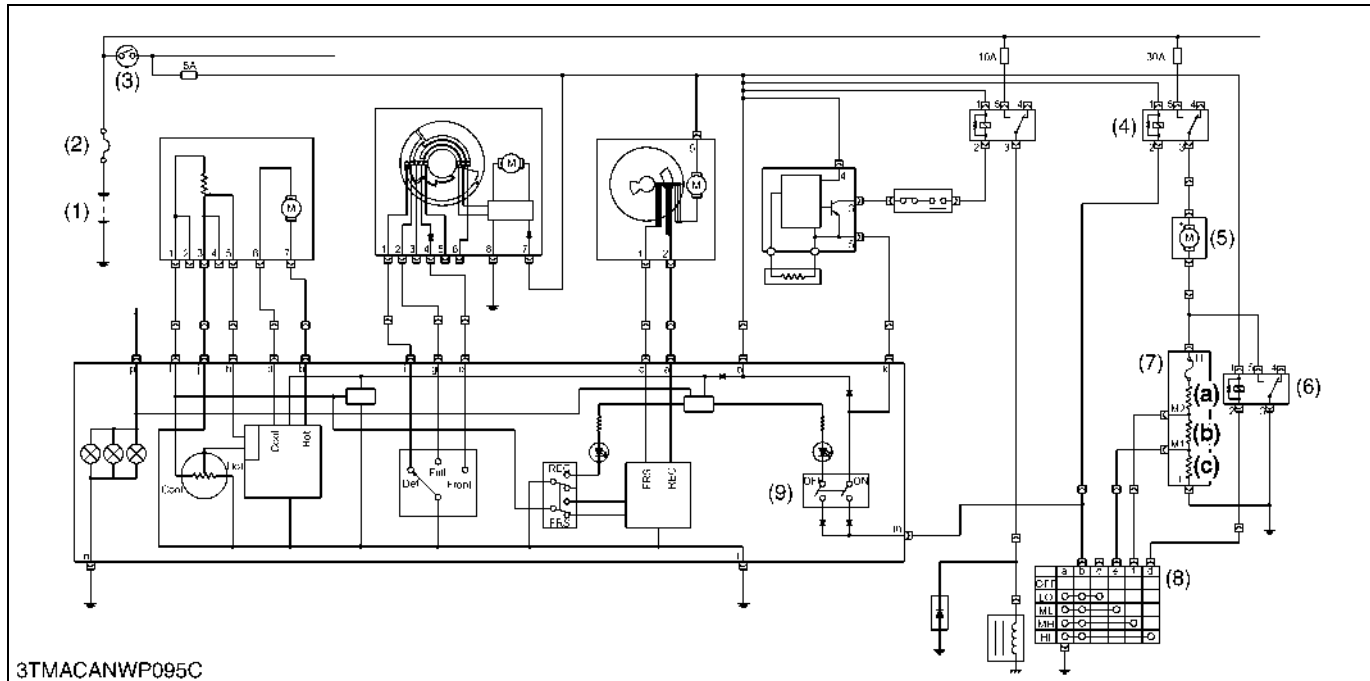
To protect against such trouble, relays have been provided. These relays have been made so that when current flows through its coil, the contact close to supply the power from the battery (1). By employing these relays, the current flowing through the main switch (3) has been decreased as only a small current is required to actuate the relay. Thus there will be no danger of burning out the switch contact, and when the main switch (3) is opened, the relay contact will open at the same time. This action stops the current flow in the air conditioner circuit so that there will also be no chance of the battery discharging.

(1) Battery	(7) Blower High Relay
(2) Slow Blow Fuse	(8) Blower Switch
(3) Main Switch	(9) Compressor
(4) Compressor Relay	(10) A/C Switch
(5) Blower Relay	
(6) Blower Motor	
- (a) To Light Switch

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(3) Blower Switch

■ When Blower Switch is in Low, Medium 1, Medium 2 or High Position



(1) Battery	(4) Blower Relay	(7) Blower Resistor	(a) Resistor M2
(2) Slow Blow Fuse	(5) Blower Motor	(8) Blower Switch	(b) Resistor M1
(3) Main Switch	(6) Blower High Relay	(9) A/C Switch	(c) Resistor L

When the main switch (3) and blower switch (8) is turned **ON**, the current flows from battery (1) to blower relay coil and blower relay (4) is turned **ON**. As the blower relay (4) is turned **ON**, the current from battery (1) flows to the blower switch (8) through the blower motor (5) as follows.

● Low Position

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : (a), (b) and (c) → Blower Switch (8) → Ground.

● Medium 1 Position

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : (a) and (b) → Blower Switch (8) → Ground.

● Medium 2 Position

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : (a) → Blower Switch (8) → Ground.

● High Position

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower High Relay (6) → Blower Switch (8) → Ground.

SERVICING

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[3] SERVICING	10-S54

1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	Bearing of compressor worn or damaged	Replace	10-S43
	Valves in compressor damaged	Replace	10-S43
	Belt slipping	Adjust or replace	G-31
	Compressor bracket mounting screws loosen	Tighten	–
	Piping resonant	Tighten or add clamp	–
Noisy (Compressor OFF)	Blower defective	Repair or replace	10-S27, 45
	Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	10-S22

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AIR CONDITIONING SYSTEM

Does Not Cool (No Air Flow)	Fuse blown	Replace	–
	A/C compressor relay defective	Replace	9-S42
	A/C blower motor defective	Replace	10-S27, 45
	A/C blower switch defective	Replace	10-S24
	Wiring harness disconnected or improperly connected	Repair	–
Does Not Cool (Compressor Does Not Rotate)	Fuse blown	Replace	9-S11
	Magnetic clutch defective	Repair or replace	10-S22
	A/C switch defective	Replace	10-S25
	Pressure switch defective	Replace	10-S30
	Belt slipping	Adjust or replace	G-31
Does Not Cool (Others)	Insufficient refrigerant	Check with manifold gauge	10-S21
	Expansion valve defective	Replace	–
	Compressor defective	Replace	10-S43
Insufficient Cooling (Insufficient Air Flow)	Air filter clogged	Clean or replace	G-30
	Evaporator frosted	Clean or replace thermo switch	–
	A/C blower motor defective	Replace	10-S27, 45
	A/C blower resistor defective	Replace	10-S27, 45
Insufficient Cooling (Many Bubbles in Sight Glass)	Insufficient refrigerant	Check with manifold gauge	10-S21
	Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	10-S13
	Air mixed in	Check with manifold gauge	10-S15
Insufficient Cooling (No Bubbles in Sight Glass)	Too much refrigerant	Check with manifold gauge	10-S21

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AIR CONDITIONING SYSTEM (Continued)

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	Belt slipping	Adjust or replace	G-31
	Magnetic clutch defective	Repair or replace	10-S22
	Compressor defective	Replace	10-S43
Insufficient Cooling (Others)	Thermostat defective	Replace	–
	Water valve defective	Replace	–
	Condenser fin clogged with dust	Clean	G-31
	Expansion valve defective	Replace	–
Insufficient Heating	Water valve defective	Replace	–
	Temperature motor defective	Check and repair	10-S28
	Insufficient coolant	Replenish	G-9
Too Low Air Flow Rate (Blower Motor Does Not Run)	Blower fan switch defective	Check and repair	10-S24
	A/C compressor relay defective	Replace	9-S42
	Brush in poor contact	Replace	–
	Fuse blown out	Replace	9-S11
	Wrong wiring or loose connections	Check and repair	–
Too Low Air Flow Rate (Flow Rate Does Not Change in 4 Steps)	Blower resistor defective	Replace	10-S27, 45
	Relay defective	Replace	9-S42
	Blower fan switch defective	Replace	10-S24
Too Low Air Flow Rate (Others)	Blower is not tightened enough	Check and repair	10-S27, 45
	Blower deformed	Replace	10-S45
	Blower in contact with casing	Check and repair	–
	Obstacle at or near suction port	Check and repair	–
	Evaporator frosted	Clean or replace	–
	Filter clogged	Clean or replace	G-30
	Blow duct clogged or missing	Check and repair	–
Insufficient Cooling (Compressor Magnetic Clutch Does Not Work)	Low battery voltage	Charge	–
	Rotor in contact with stator	Replace	10-S44
	Wrong wiring loose connections	Check and repair	–
	Relay defective	Replace	9-S42
	Coil shortage	Replace	–
	Ground malfunction	Check and Repair	–
	Coil burst out	Replace	–
Insufficient Cooling (Hi-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
	Condenser clogged with dust and dirt	Clean	G-31
	Air mixed	Check with manifold gauge	10-S15

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AIR CONDITIONING SYSTEM (Continued)

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Hi-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21
	Compressor discharge valve damaged	Replace	10-S43
	Compressor gasket damaged	Replace	10-S43
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S43
Insufficient Cooling (Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
	Heat-sensitive tube in poor contact	Check and repair	–
	Expansion valve too open	Replace	–
Insufficient Cooling (Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21
	Gas leak at heat-sensitive tube	Replace	–
	Evaporator frosted	Clean or replace	–
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S43
	Expansion valve clogged	Replace	–
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21
Temperature Cannot be Controlled (Temperature Motor and/or Temperature Control Dial Malfunction)	Temperature motor defective	Replace	10-S28
	Temperature control dial defective	Replace	10-S26
	Wiring harness controller disconnected	Repair or replace	10-S26
Temperature Cannot be Controlled (Water Valve Does Not Open Properly)	Cable wrongly set	Repair	–
	Cable disconnected	Repair	–
Temperature Cannot be Controlled (Mode Motor and/or Mode Switch Malfunction)	Mode motor defective	Replace	10-S28
	Mode Switch defective	Replace	10-S25
	Wiring harness controller disconnected	Repair or replace	10-S25
Temperature Cannot be Controlled (Heater Hoses Laid is Bad)	Heater hose caught	Repair	–
	Heater hose twisted or bent	Repair or replace	–

W1014322

WINDSHIELD WIPER

Symptom	Probable Cause	Solution	Reference Page
Windshield Wiper Does Not Operate	Fuse blown (Short-circuit, burnt component inside motor or other part for operation)	Correct cause and replace	–
	Wiper motor defective (Broken armature, worn motor brush or seized motor shaft)	Replace	10-S53
	Wiper switch defective	Replace	10-S31
	Foreign material interrupts movement of link mechanism	Repair	10-S53
	Wiper arm seized or rusted	Lubricate or replace	10-S53
Windshield Wiper Operating Speed Is Too Low	Wiper motor defective (Short-circuit of motor armature, worn motor brush or seized motor shaft)	Replace	10-S53
	Low battery voltage	Recharge or replace	–
	Humming occurs on motor in arm operating cycle due to seized arm shaft	Lubricate or replace	10-S53
	Wiper switch contact improper	Replace	10-S31, 32
Windshield Wiper Does Not Stop Correctly	Wiper motor defective (Contaminated auto-return contacts or improper contact due to foreign matter)	Replace	10-S53

W1066515

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
A/C Compressor Magnetic Clutch	Air Gap	0.30 to 0.65 mm 0.0118 to 0.0255 in.	—
Magnetic Clutch Stator Coil	Resistance	3.0 to 4.0 Ω	—
Refrigerating Cycle (Refrigerating Cycle is Normal Operating)	Pressure (LO Pressure Side)	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm ² 21 to 28 psi	—
	Pressure (HI Pressure Side)	1.27 to 1.66 MPa 13 to 17 kgf/cm ² 185 to 242 psi	—
Pressure Switch (Dual Type) (When pressure switch is turned OFF)	Setting Pressure (LO Pressure Side)	Less than approx. 0.196 MPa 2.0 kgf/cm ² 28.4 psi	—
	Setting Pressure (HI Pressure Side)	More than approx. 3.14 MPa 32 kgf/cm ² 455 psi	—
Air-gap of A/C Compressor Magnetic Clutch	Air-gap	0.30 to 0.65 mm 0.0118 to 0.0255 in.	—
Air Conditioner Drive Belt	Tension	10 to 12 mm (de 0.39 to 0.48 in.) deflection at 98 N (10 kgf, 22 lbf) of force	—
Front Wiper	Rotating Speed	25 to 43 times/min.	—
Rear Wiper (Option)	Rotating Speed	25 to 43 times/min.	—

W1013874

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Cabin mounting screw and nut	124 to 147	12.6 to 15.0	91.2 to 108
Brake hose retaining nut	16.0 to 24.0	1.6 to 2.4	11.8 to 17.7
A/C unit mounting screw (M8)	9.8 to 15.7	1.0 to 1.6	7.2 to 11.6
Low pressure pipe mounting screw (compressor side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
High pressure pipe 1 mounting screw (compressor side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
Pressure pipe joint mounting screw (cooler unit side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
High pressure pipe 1 mounting screw (condenser side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7	1.2 to 1.5	8.7 to 10.8
Compressor mounting screw	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Compressor bracket mounting screw (M8) to aluminum parts	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Compressor bracket mounting screw (M8) to ordinariness parts	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Compressor bracket mounting screw (M10) to ordinariness parts	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Magnetic clutch mounting screw	15.0 to 21.0	1.5 to 2.1	11.1 to 15.5
Master cylinder hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Power steering joint shaft mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Rear wheel mounting nut	343 to 401	35.0 to 41.0	254 to 297
Wiper arm mounting nut (front wiper)	6.3 to 9.3	0.7 to 1.0	5.0 to 6.9
Wiper arm mounting nut (rear wiper)	7.9 to 9.3	0.8 to 1.0	5.8 to 6.9
Wiper motor mounting screw	7.9 to 9.3	0.8 to 1.0	5.8 to 6.9

W1012736

4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allow to handle the refrigerant.



CAUTION

- Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.
- The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.
- Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.
- If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.
- In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.
- Beware of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.
- Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.

■ IMPORTANT

- If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.
- Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.
- Use only for R134a refrigerant service tool.
- Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.
- Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.
- When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.
- Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..
- Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.
- Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.
- R134a compressor oil absorbs moisture easily, so that be sure to seal after disconnecting the each parts.
- Do not use old-type refrigerant R12a or compressor oil for old-type refrigerant.
- When replacing the condenser, evaporator and receiver, etc., replenish the compressor oil to compressor according to the table below.

(Refrigerant)

Kinds of refrigerant (Charge amount)	Factory spec.	R134a 0.85 to 0.95 kg 1.87 to 2.09 lbs

(Compressor Oil)

Quantity (Total)	Brand Name
100 to 120 cc 0.106 to 0.127 U.S.qts 0.088 to 0.106 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG : Polyalkyleneglycol (Synthetic oil)

(Reference)

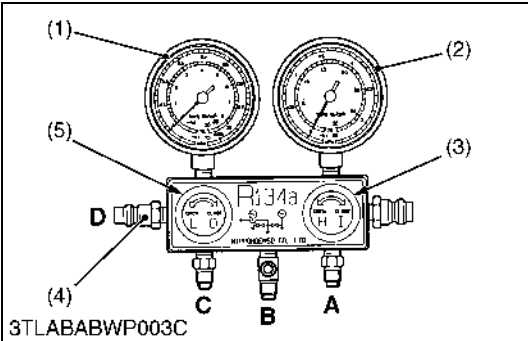
Replacing Parts	Replenish Quantity	Brand Name
Condenser	40 cc 0.042 U.S.qts. 0.035 Imp.qts.	ND-OIL 8 <PAG* oil>
Evaporator	40 cc 0.042 U.S.qts. 0.035 Imp.qts.	
Receiver	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	
Hose	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	

*PAG : Polyalkyleneglycol (Synthetic oil)

W1012709

[1] HANDLING OF SERVICE TOOLS

(1) Manifold Gauge Set



The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (5) and **HI** is for the high pressure side valve (3). By opening or closing the high and low pressure hand valves, the following circuits are established.

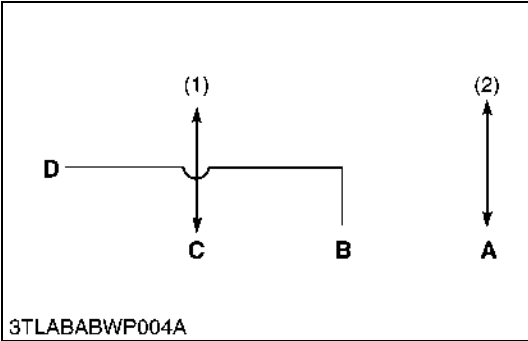
- (1) **LO** Pressure Gauge

(2) **HI** Pressure Gauge

(3) **HI** Pressure Side Valve
- (4) Schrader Valve

(5) **LO** Pressure Side Valve

W1013107



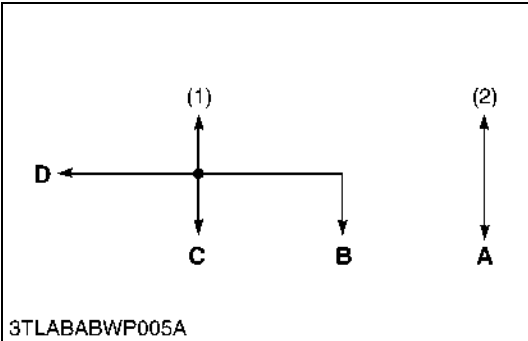
■ When LO Pressure Side Valve and HI Pressure Side Valve are Closed

Two circuits are established.
Port (C) → **LO** pressure gauge (1)
Port (A) → **HI** pressure gauge (2)

■ NOTE

- Schrader valve (D) must be opened.

W1013376



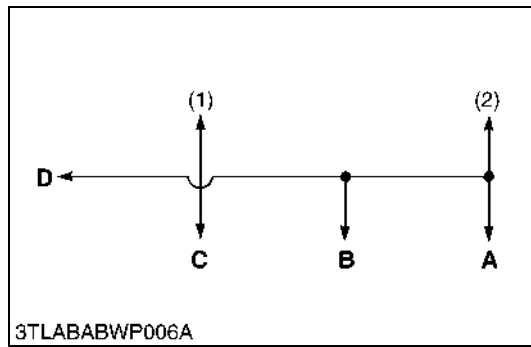
■ When LO Valve is Opened and HI Valve is Closed

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



■ When LO Valve is Closed and HI Valve is Opened

Two circuits are established.

Port (C) → **LO** pressure gauge (1)

→ Port (B)

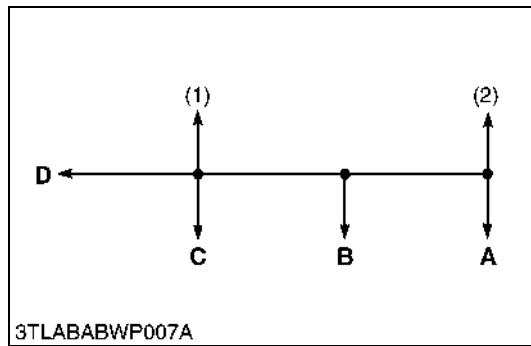
→ Port (D) (Schrader valve must be opened)

Port (A) → **HI** pressure gauge (2)

■ NOTE

- **Schrader valve (D) must be opened.**

W1013304



■ When LO and HI Valve is Opened

Two circuits are established.

Port (A) → **HI** pressure gauge (2)

→ **LO** pressure gauge (1)

→ Port (B)

→ Port (C)

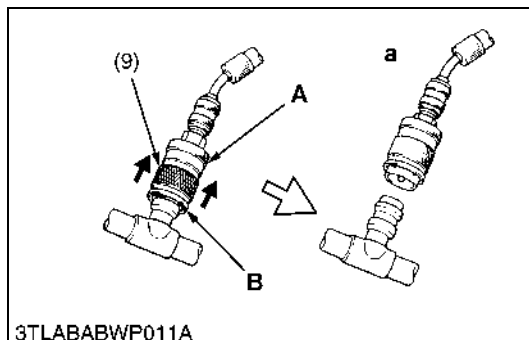
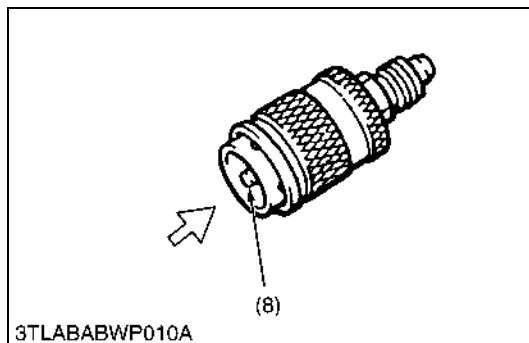
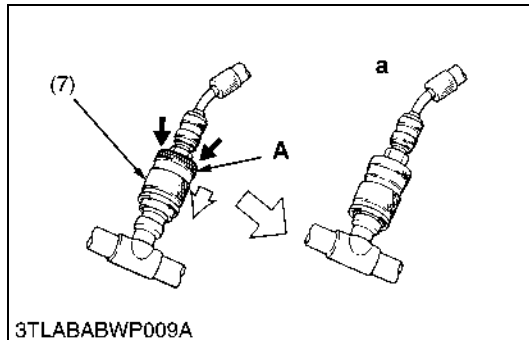
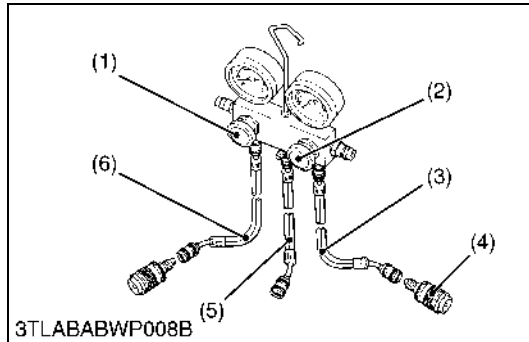
→ Port (D) (Schrader valve must be opened)

■ NOTE

- **Schrader valve (D) must be opened.**

W1013864

(2) Refrigerant Charging Hose



The charging hoses are classified into three colors. Each charging hose must be handled as follows :

- The air conditioner manufacture recommends that the blue hose (6) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (3) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (4) into the charging valve, and push on part **A** until a click is heard.

■ NOTE

- When connecting, push carefully so the pipe does not bend.
- When connecting the quick disconnect connector, should the sleeve (7) move before the quick link connector can be connected to the charging valve, move the quick sleeve to its original position and try again.
- When some refrigerant remains in the charging hose at the time of connections, it may be difficult to connect the quick link connector. In this case, perform the operation after removing any residual pressure in the hose. (Remove the residual pressure by pushing the pusher (8).)

(When reassembling)

- While holding on to part **A** of the quick disconnect adaptor, slide part **B** up.

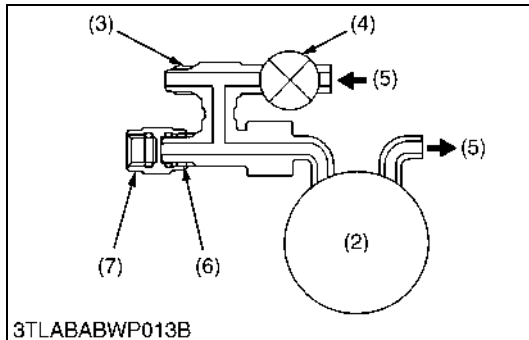
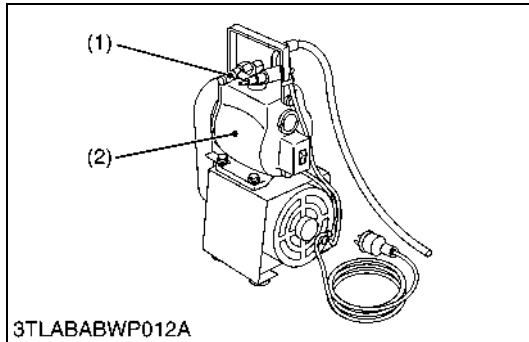
■ NOTE

- After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.

(1) LO Pressure Side Valve	(7) Sleeve
(2) HI Pressure Side Valve	(8) Pusher
(3) Red Hose	(9) Sleeve
(4) Quick Disconnect Adaptor	
(5) Green Hose	
(6) Blue Hose	a : CLICK

W1014039

(3) Vacuum Pump Adaptor



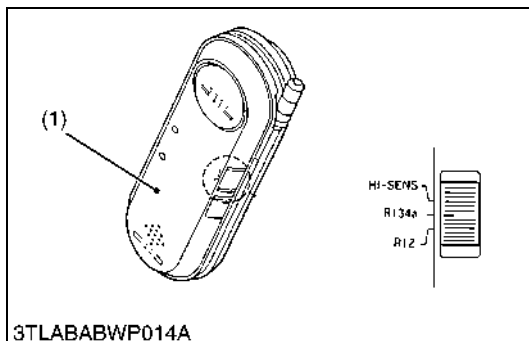
Objective of the Vacuum Pump Adaptor

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	(5) Air
(2) Vacuum Pump	(6) For R12
(3) For R134a	(7) Blind Cap
(4) Magnetic Valve	

W1014539

(4) Electric Gas Leak Tester



The current R12 gas leak tester has poor sensitivity for R134a and cannot be used. Therefore, a new electric gas leak tester with greater sensitivity has been designed and can be used with both R134a and R12.

(Reference)

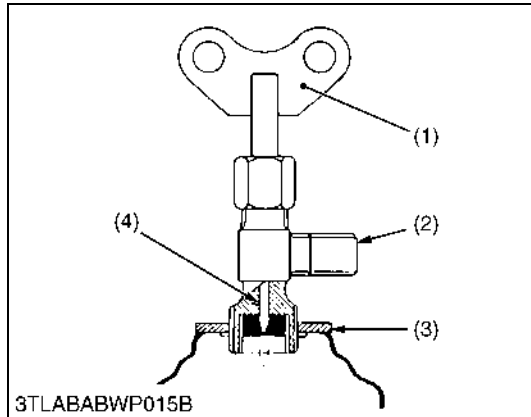
Leak tester with halide torch

- Since the reaction with chlorine within the refrigerant is used to detect gas leaks, R134a, which contains no chlorine, cannot be detected.

- (1) Electric Gas Leak Tester

W1014905

(5) Can Tap Valve



The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows :

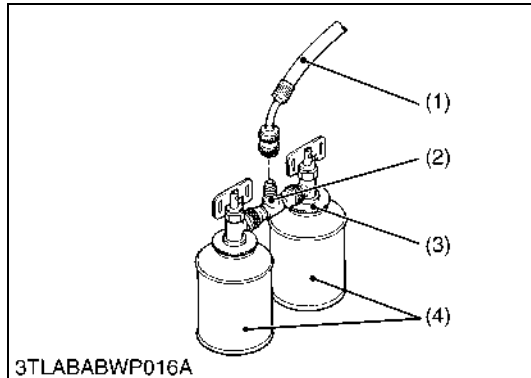
1. Before putting the can tap valve on the refrigerant container, turn the handle (1) counterclockwise till the valve needle is fully retracted.
2. Turn the plate nut (disc) (3) counterclockwise till it reaches its highest position, then screw down the can tap valve into the sealed tap.
3. Turn the place nut clockwise fully, and fix the center charging hose to the valve.
4. Tighten the place nut firmly by hand.
5. Turn the handle (1) clockwise, thus making a hole in the sealed tap.
6. To charge the refrigerant into the system, turn the handle (1) counterclockwise. To stop charging, turn it clockwise.

(1) Butterfly Handle
(2) Connection

(3) Disc
(4) Needle

W1015014

(6) T-joint



T-joint (2) is used to increase efficiency of gas charging using two refrigerant containers (4) at a time.

1. Install two refrigerant container service valves to T-joint (2) sides and connect the charging hose (1) to it.

(1) Charging Hose (Green)
(2) T-joint

(3) Can Tap Valve
(4) Refrigerant Container

W1015169

(7) R134a Refrigerant Recover and Recycling Machine

When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine. (Do not release the refrigerant into the atmosphere.)

■ IMPORTANT

- Use only R134a refrigerant recovery and recycling machine, eliminate mixing R134a equipment, refrigerant and refrigerant oils with R12 systems to prevent compressor damage.

W1015488

5. CHECKING AND CHARGING REFRIGERANT CYCLE

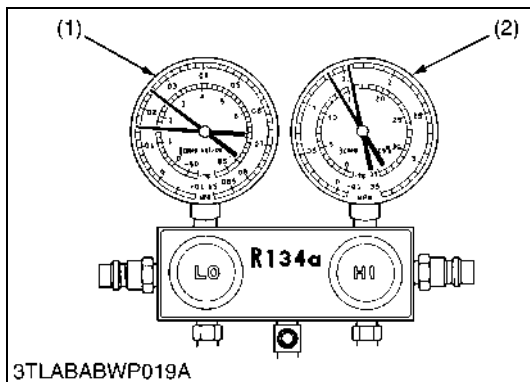
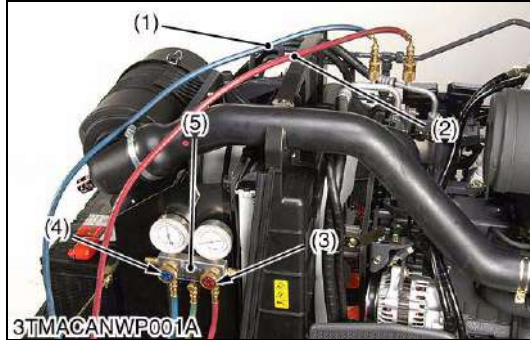
[1] CHECKING WITH MANIFOLD GAUGE

■ IMPORTANT

- The gauge indications described in the following testing are those taken under the same condition, so it should be noted that the gauge readings will differ somewhat with the ambient conditions.

Condition

- Ambient temperature : 30 to 35 °C (86 to 95 °F)
- Engine speed : Approx. 1500 min⁻¹ (rpm)
- Temperature control lever : **Maximum cooling position**
- Blower switch : **HI position**



Manifold Gauge Connecting and Test Preparation

- Close the manifold gauge **HI** and **LO** pressure side valve (3), (4) tightly.
- Connect the charging hose (red) (2) to the **HI** pressure side charging valve (7) and connect the charging hose (blue) (1) to the **LO** pressure side charging valve (6).

■ NOTE

- Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerating cycle.
- Start the engine and set at approx. 1500 min⁻¹ (rpm).
 - Turn on the A/C switch and set the temperature control dial to **maximum cooling position**.
 - Set the blower switch to **HI position**.

- (1) Charging Hose (Blue)
 (2) Charging Hose (Red)
 (3) **HI** Pressure Side Valve
 (4) **LO** Pressure Side Valve

- (5) Manifold Gauge
 (6) **LO** Pressure Side Charging Valve
 (7) **HI** Pressure Side Charging Valve

W1015662

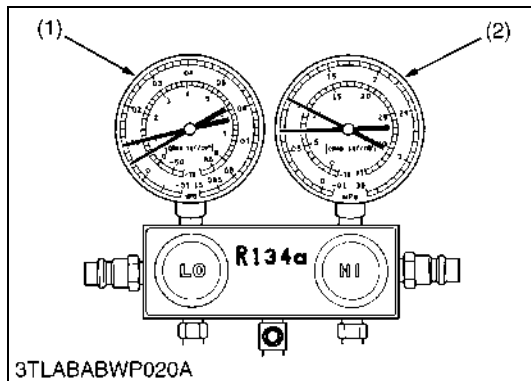
Normal Operating

If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.20 MPa (1.5 to 2.0 kgf/cm², 21 to 28 psi) and that at the **HI** pressure side (2) around 1.27 to 1.66 MPa (13 to 17 kgf/cm², 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

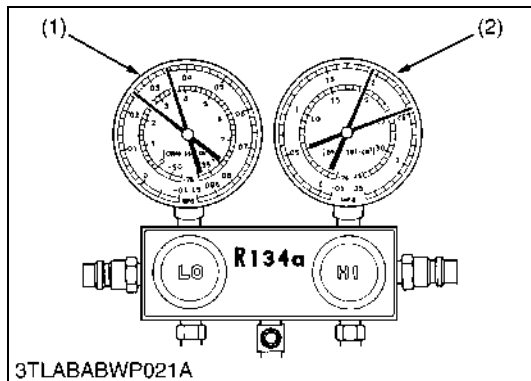


Insufficient Refrigerant

1. Symptoms seen in refrigerating cycle
 - Both **LO** and **HI** pressure side (1), (2) pressures too low.
 - LO** pressure side (1) : 0.05 to 0.10 MPa
(0.5 to 1.0 kgf/cm², 7.1 to 14.2 psi)
 - HI** pressure side (2) : 0.69 to 0.98 MPa
(7 to 10 kgf/cm², 99.6 to 142.2 psi)
 - Bubbles seen in sight glass.
 - Air discharged from air conditioner slightly cold.
2. Probable cause
 - Gas leaking from some place in refrigerant cycle.
3. Solution
 - Check for leakage with electric gas leak tester (refer to "[1] HANDLING OF SERVICE TOOLS" in this section) and repair.
 - Recharge refrigerant to the proper level. (Refer to "(4) Checking Charge Refrigerant Amount" in this section.)

(1) **LO** Pressure Side(2) **HI** Pressure Side

W1016070



Excessive Refrigerant or Insufficient Condenser Cooling

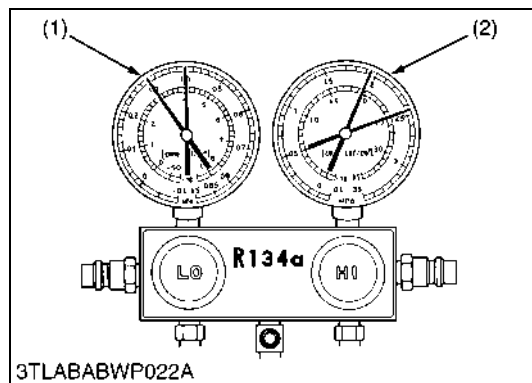
1. Symptoms seen in refrigerating cycle
 - Both **LO** and **HI** pressure side (1), (2) pressures too high.
 - LO** pressure side (1) : 0.20 to 0.35 MPa
(2.0 to 3.5 kgf/cm², 28.4 to 49.8 psi)
 - HI** pressure side (2) : 1.96 to 2.45 MPa
(20 to 25 kgf/cm², 284.5 to 355.6 psi)
2. Probable cause
 - Overcharging refrigerant into cycle.
 - Condenser cooling faulty.
3. Solution
 - Clean condenser. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)
 - Adjust air conditioner belt to proper tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)
 - If the above two items are in normal condition, check refrigerant quantity. (Refer to "(4) Checking Charge Refrigerant Amount" in this section.)

NOTE

- If excessive refrigerant is to be discharged, loosen manifold gauge **LO** pressure side valve and vent out slowly.

(1) **LO** Pressure Side(2) **HI** Pressure Side

W1016402



Air Entered in the Cycle

- Symptoms seen in refrigerating cycle
 - Both **LO** and **HI** pressure side (1), (2) pressures too high.
 - LO** pressure side (1) : 0.20 to 0.35 MPa
(2.0 to 3.5 kgf/cm², 28.4 to 49.8 psi)
 - HI** pressure side (2) : 1.96 to 2.45 MPa
(20 to 25 kgf/cm², 284.5 to 355.6 psi)
 - LO** pressure side (1) piping not cold when touched.
- Probable cause
 - Air entered in refrigerating cycle.
- Solution
 - Replace receiver.
 - Check compressor oil contamination and quantity.
 - Evacuate and recharge new refrigerant. (Refer to “(3) Charging the Refrigerant” in this section.)

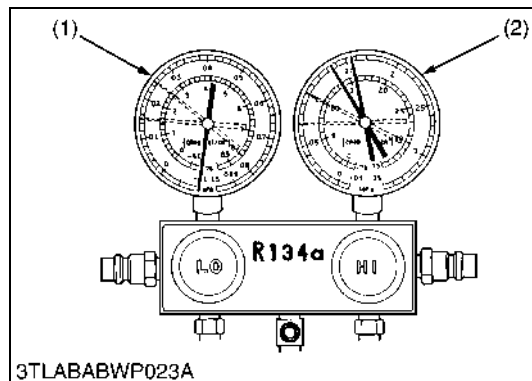
■ NOTE

- The above cycle can be seen when the cycle is charged without evacuation.

(1) **LO** Pressure Side

(2) **HI** Pressure Side

W1016771



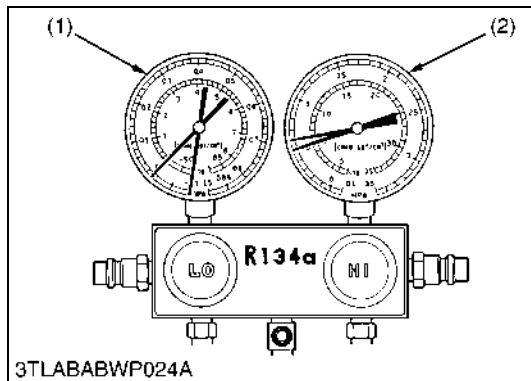
Moisture Entered in the Cycle

- 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/cm², 99.6 to 142.2 psi)
- 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.
- Solution
 - Replace receiver.
 - Remove moisture in cycle by means of repeated evacuation. (Refer to “(2) Evacuating the System” in this section.)
 - Recharge new refrigerant to the proper level. (Refer to “(3) Charging the Refrigerant” in this section.)

(1) **LO** Pressure Side

(2) **HI** Pressure Side

W1017013



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/cm², 71.2 to 85.3 psi)
2. Probable cause
 - Refrigerant flow obstructed by moisture or dirt in the refrigerating cycle freezing or sticking on the expansion valve orifice.
3. Solution

Allow to stand for same time and then resume operation to decide whether the plugging is due to moisture or dirt.

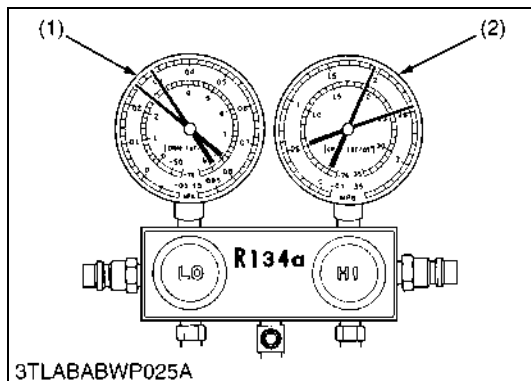
 - If caused by moisture, correct by referring to instructions in previous.
 - If caused by dirt, remove the expansion valve and blow out the dirt with compressed air.
 - If unable to remove the dirt, replace the expansion valve.

Replace the receiver. Evacuate and charge in proper amount of new refrigerant. (Refer to "(3) Charging the Refrigerant" in this section.)

 - If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side(2) **HI** Pressure Side

W1017346

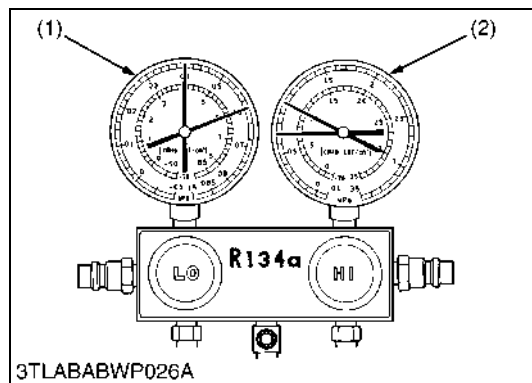


Expansion Valve Opens Too Far or Improper Installation of Heat Sensitizing Tube

1. Symptoms seen in refrigerating cycle
 - Both **LO** and **HI** pressure side (1), (2) pressures too high.
 - LO** pressure side (1) : 0.29 to 0.39 MPa
(3 to 4 kgf/cm², 42.7 to 56.9 psi)
 - HI** pressure side (2) : 1.96 to 2.45 MPa
(20 to 25 kgf/cm², 284.5 to 355.6 psi)
 - Frost or heavy dew on low pressure side piping.
2. Probable cause
 - Expansion valve trouble or heat sensitizing tube improperly installed.
 - Flow adjustment not properly done.
3. Solution
 - Check installed condition of heat sensitizing tube.
 - If installation of heat sensitizing tube is correct, replace the expansion valve.

(1) **LO** Pressure Side(2) **HI** Pressure Side

W1017612



Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
 - LO pressure side (1) : 0.39 to 0.59 MPa
(4 to 6 kgf/cm², 56.9 to 85.3 psi)
 - HI pressure side (2) : 0.69 to 0.98 MPa
(7 to 10 kgf/cm², 99.6 to 142.2 psi)
2. Probable cause
 - Leak in compressor.
3. Solution
 - Replace compressor. (Refer to “(2) Removing Compressor Assembly” in this section.)

■ NOTE

- Manifold gauge indications (left side figure) at faulty compressing by compressor.

(1) LO Pressure Side

(2) HI Pressure Side

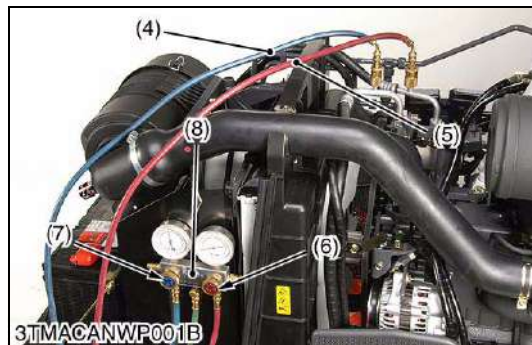
W1017960

[2] DISCHARGING, EVACUATING AND CHARGING

■ IMPORTANT

- When discharging, evacuating or charging the refrigerating system, be sure to observe the “4. PRECAUTION AT REPAIRING REFRIGERANT CYCLE”. (Refer to “4. PRECAUTION AT REPAIRING REFRIGERANT CYCLE” in this section.)

(1) Discharging the Refrigerant



Prepare for the R134a refrigerant recovery and recycling machine (9).

1. Connect low pressure side hose (blue) (4) from the recovery and recycling machine (9) to LO pressure side charging valve (1). Connect high pressure side hose (red) (5) to HI pressure side charging valve (2).
2. Follow the manufacturers instructions and discharge the system.

■ IMPORTANT

- Use only R134a refrigerant recovery and recycling machine (9). Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 system to prevent compressor damage.

⚠ CAUTION

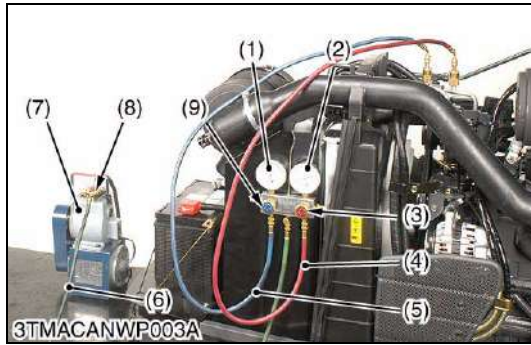
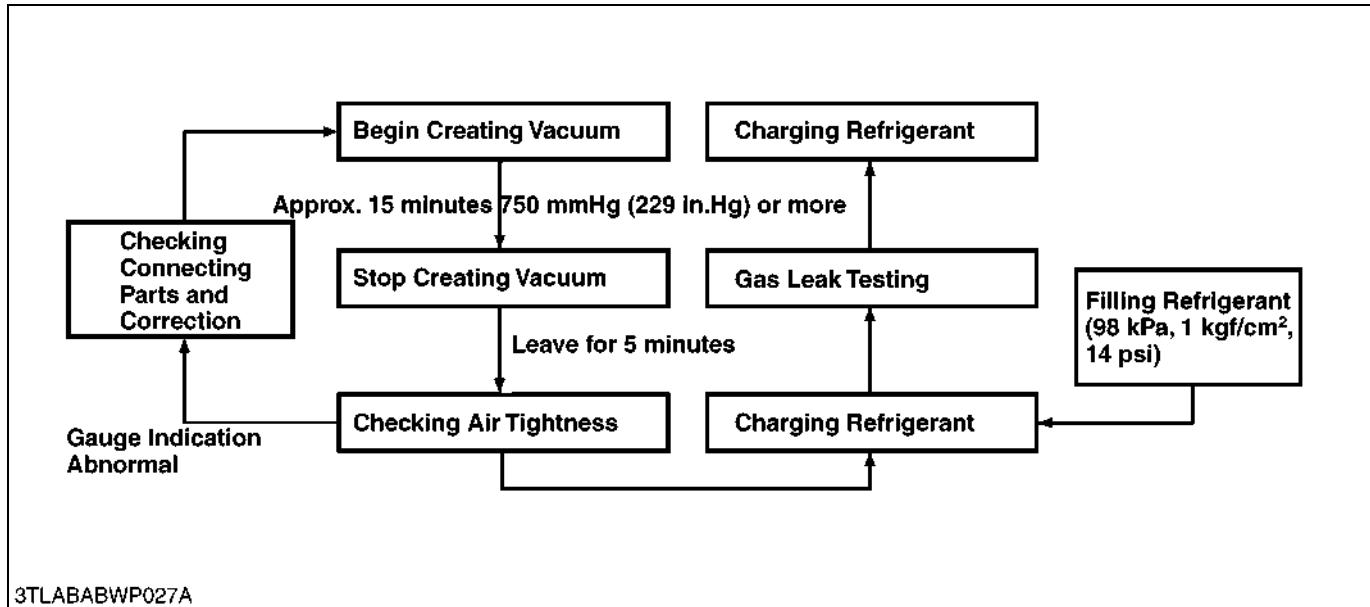
- Protect fingers and eyes with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.

- (1) LO Pressure Side Charging Valve
 (2) HI Pressure Side Charging Valve
 (3) Compressor
 (4) Charging Hose (Blue)
 (5) Charging Hose (Red)

- (6) HI Pressure Side Valve
 (7) LO Pressure Side Valve
 (8) Manifold Gauge
 (9) Refrigerant Recovery and Recycling Machine

W1018328

(2) Evacuating the System



Evacuating the System

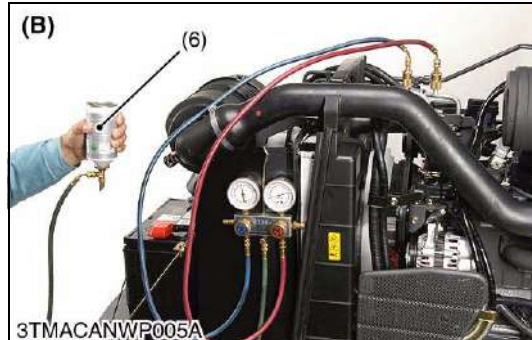
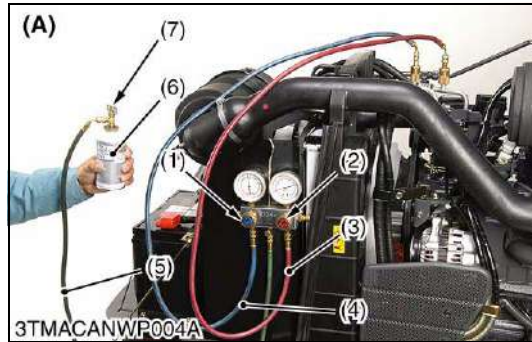
1. Discharge refrigerant from the system by R134a refrigerant recovery and recycling machine. (Refer to “(1) Discharging the Refrigerant” in this section.)
2. Connect the charging hose (red) (4) to the **HI** pressure side charging valve and connect the charging hose (blue) (5) to the **LO** pressure side charging valve.
3. Connect the center charging hose (green) (6) to a vacuum pump inlet.
4. Open both valves (3) and (9) of manifold gauge fully. Then run the vacuum pump (7) to evacuate the refrigerant cycle. (For approx. 15 minutes.)
5. When **LO** pressure gauge (1) reading is more than 750 mmHg (299 in.Hg), stop the vacuum pump (7) and close both valves (3), (9) of manifold gauge fully.
6. Wait for over 5 minutes with the **HI** and **LO** pressure side valves (3) and (9) of gauge manifold closed, and then check that gauge indicator does not return to 0.
7. If the gauge indicator is going to approach to 0, check whether there is a leaking point and repair if it is, and then evacuate it again.

- (1) **LO** Pressure Gauge
- (2) **HI** Pressure Gauge
- (3) **HI** Pressure Side Valve
- (4) Charging Hose (Red)
- (5) Charging Hose (Blue)

- (6) Charging Hose (Green)
- (7) Vacuum Pump
- (8) Vacuum Pump Adaptor
- (9) **LO** Pressure Side Valve

W1018495

(3) Charging the Refrigerant



Charging an Empty System (Liquid)

This procedure is for charging an empty system through the **HI** pressure side with the refrigerant in the liquid state.



CAUTION

- **Never run the engine when charging the system through the HI pressure side.**
- **Do not open the LO pressure valve when refrigerant R134a is being charged in the liquid state (refrigerant container is placed upside-down).**

IMPORTANT

- **After charging the refrigerant in the liquid state with approx. 500 g (1.1 lbs) through the HI pressure side, be sure to recharge the refrigerant in the vapor state to specified amount through the LO pressure side.**
1. Close the **HI** and **LO** pressure side valves (1) and (2) of manifold gauge after the system is evacuated completely.
 2. Connect the center charging hose (green) (5) to the can tap valve (7) fitting, and then loosen the center charging hose (green) (5) at the center fitting of manifold gauge until hiss can be heard. Allow the air to escape for few seconds and tighten the nut.
 3. Open the **HI** pressure side valve (2) fully, and keep the container upside-down to charge the refrigerant in the liquid state from the **HI** pressure side.
 4. Charge the refrigerant in the liquid state with approx. 500 g (1.1 lbs) from the **HI** pressure side.

NOTE

- **If LO pressure gauge does not show a reading, the system is clogged and must be repaired.**
5. Close the **HI** pressure side valve (2) of manifold gauge and can tap valve of refrigerant container.

(1) **LO** Pressure Side Valve

(2) **HI** Pressure Side Valve

(3) Charging Hose (Red)

(4) Charging Hose (Blue)

(5) Charging Hose (Green)

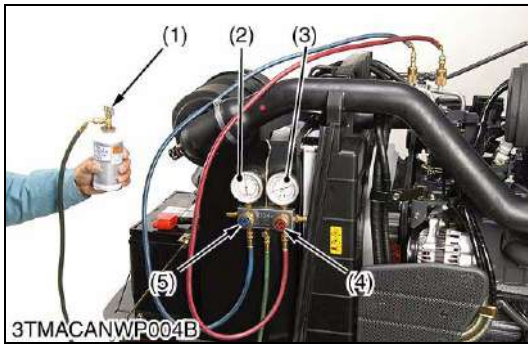
(6) Refrigerant Container (R134a)

(7) Can Tap Valve

(A) Refrigerant Container "Upside"

(B) Refrigerant Container "Down Side"

W1018931



Charging an Empty or Partially Charged System (Vapor)

This procedure is to charge the system through the **LO** pressure side with refrigerant in the vapor state. When the refrigerant container is placed right side up, refrigerant will enter the system as a vapor.



CAUTION

- Never open the **HI** pressure side valve of manifold gauge while the engine is running.

NOTE

- Do not turn the refrigerant container upside-down when charging the system by running the engine.
 - Put refrigerant container into a pan of warm water (maximum temperature 40 °C (104 °F)) to keep the vapor pressure in the container slightly higher than vapor pressure in the system.
1. Check that the **HI** pressure side valve (4) is closed.
 2. Start the engine and set an approx. **1500 min⁻¹ (rpm)**.
 3. Turn on the A/C switch.
Set the temperature control lever to **maximum cooling** position and the blower switch to **HI** position.
 4. Open the **LO** pressure side valve (5) of manifold gauge and the can tap valve (1) on refrigerant container and charge the refrigerant until air bubbles in the sight glass of the receiver vanish.
 5. After charging the specified amount of refrigerant into the system, close the **LO** pressure side valve (5) of manifold gauge and can tap valve (1), then stop the engine.
 6. Check for gas leak with an electric gas leak tester. (Refer to “(4) Electric Gas Leak Tester” in this section.)

(Reference)

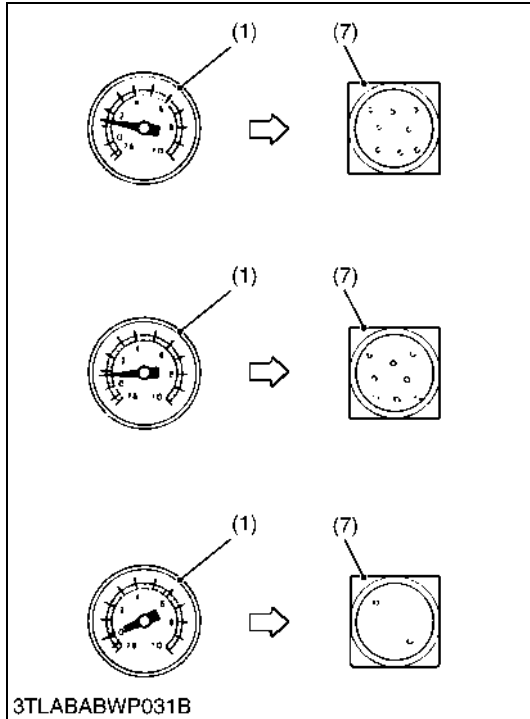
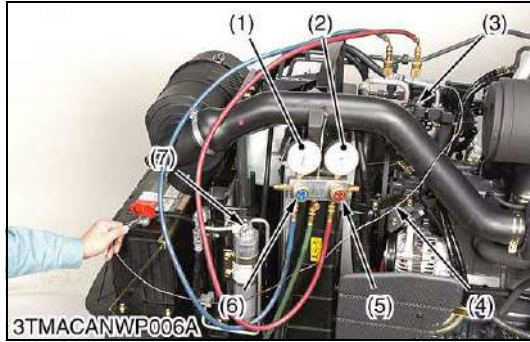
- Specified amount of refrigerant (total) : R134a
0.85 to 0.95 kg
1.87 to 2.09 lbs
- Manifold gauge indication at fully charged system (at ambient temperature: 30 °C (86 °F))
HI pressure side : 1.27 to 1.66 MPa
13 to 17 kgf/cm²
185 to 242 psi
LO pressure side : 0.15 to 0.20 MPa
1.5 to 2.0 kgf/cm²
21 to 28 psi

- (1) Can Tap Valve
(2) **LO** Pressure Gauge
(3) **HI** Pressure Gauge

- (4) **HI** Pressure Side Valve
(5) **LO** Pressure Side Valve

W1019245

(4) Checking Charge Refrigerant Amount



After charging the refrigerant, check for amount of charging refrigerant as follows.

■ NOTE

- The pressure on the following checking is the gauge indications at ambient temperature 30 °C (86 °F), so it should be noted that the pressure will differ some what with the ambient temperature.

1. Disconnect the **1P** connector (3) of magnetic clutch.
2. Start the engine and set a approx. **1500 min⁻¹ (rpm)**.
3. Connect the **1P** connector (3) of magnetic clutch to battery directly, and then set the blower switch to **HI** position.
4. Leave the system for approx. **5 minutes** until the refrigerant cycle becomes stable, keeping pressure on the **HI** pressure side from 1.27 to 1.66 MPa (13 to 17 kgf/cm², 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/cm², 185 to 242 psi), air bubbles which pass through the sight glass (7) becomes as stated below depending on refrigerant charged amount.

■ Insufficient refrigerant charge

Air bubbles pass continuously the sight glass when pressure on the **LO** pressure side is over 99.0 kPa (1.01 kgf/cm², 14.4 psi). In this case, charge the refrigerant from the **LO** pressure side.

■ Properly refrigerant charge

Air bubbles pass through the sight glass continuously when pressure on the **LO** pressure side is within 59 to 98 kPa (0.6 to 1.0 kgf/cm², 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/cm², 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/cm², 9 to 14 psi).

■ Excessive refrigerant charge

Air bubbles pass through the sight glass time to time or no air bubble is observed when pressure on the **LO** pressure side is under 59 kPa (0.6 kgf/cm², 9 psi).

In this case, discharge excessive refrigerant gradually from the **LO** pressure side.

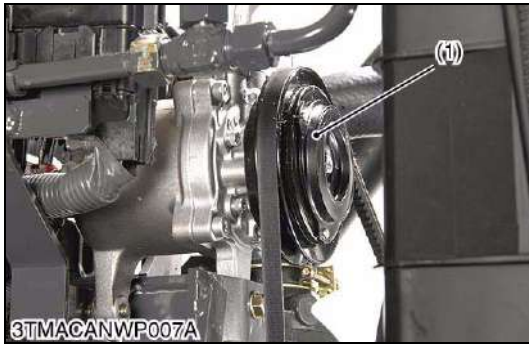
(1) LO Pressure Gauge	(5) HI Pressure Side Valve
(2) HI Pressure Gauge	(6) LO Pressure Side Valve
(3) 1P Connector	(7) Sight Glass
(4) To Battery	

W1019604

6. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Compressor

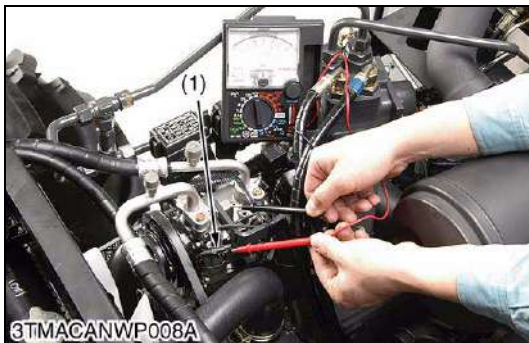


Operation of Magnetic Clutch

1. Turn off the A/C switch after starting the engine.
2. Check whether abrasion or abnormal noise is heard when only the magnetic clutch pulley is running.
3. Check that the magnetic clutch (1) does not slip when the A/C switch and blower switch are turned **ON** (when the air conditioner is in operation).
4. If anything abnormal is found, repair or replace.

(1) Magnetic Clutch

W1014211



Stator Coil

1. Measure the resistance of the stator coil with an ohmmeter across the **1P** connector (1) of magnetic clutch and compressor body.
2. If the measurement is not within the factory specifications, replace the stator coil.

Stator coil resistance	Factory spec.	3.0 to 4.0 Ω

(1) 1P Connector

W1014331



Air Gap

1. Check the air gap with feeler gauge.
2. If the measurement is not within the factory specifications, adjust it. (Refer to "[3] SERVICING" in this section.)

Air gap	Factory spec.	0.30 to 0.65 mm 0.0118 to 0.0255 in.

W1018230

(2) Relay (A/C Compressor, Front Working Light, Front Wiper, Blower, Blower Hi, ACC, Auxiliary Power)

Connector Voltage

1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

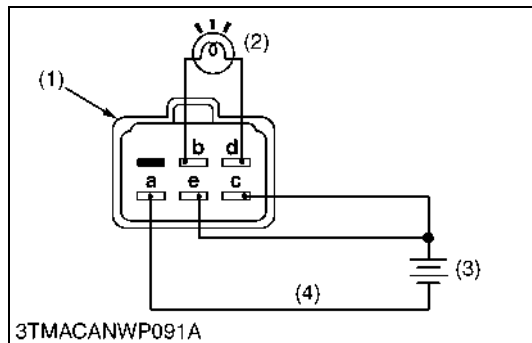
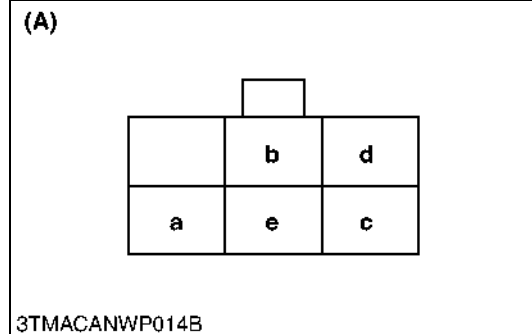
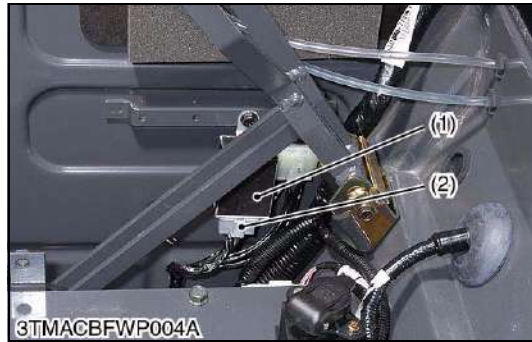
W1044440

Relay Test

1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

W1043756

(3) Wiper Relay



Connector Voltage

1. Disconnect the **6P** connector (2) from wiper relay (1).
2. Turn the main switch to “**ON**” position.
3. Measure the voltage with a voltmeter across the connector terminal **c** and chassis.
4. Measure the voltage with a voltmeter across the connector terminal **e** and chassis.
5. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal c – chassis	Approx. battery voltage
	Terminal e – chassis	Approx. battery voltage

- (1) Wiper Relay
(2) **6P** Connector

(A) **6P** Connector (Wire Harness Side)

W1016209

Wiper Relay Checking

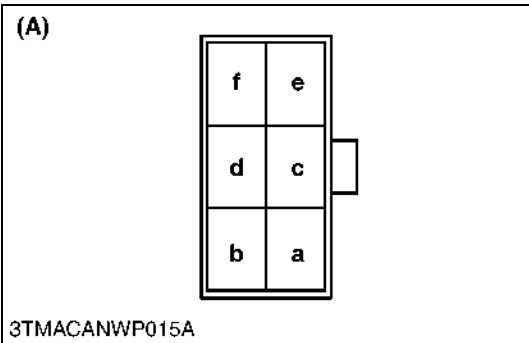
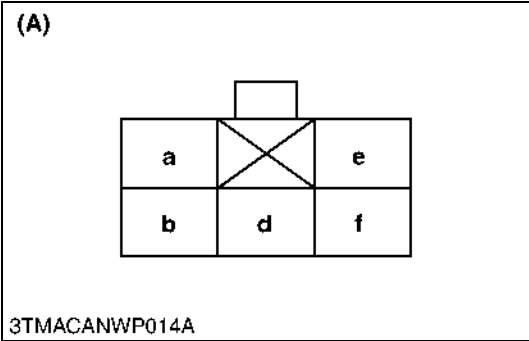
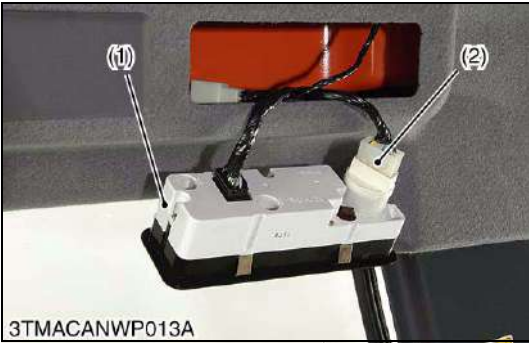
1. Remove the wiper relay.
2. Connect jumper leads across the wiper relay, bulb (2) and 12 V battery (3) as shown in the figure left.
3. When the jumper lead (4) is connected with terminal **a**, the bulb (2) should light up. When it is disconnected, the bulb (2) should light off.
4. If the bulb does not light up or light off correctly, the relay is faulty.

Ampere	Bulb	When jumper lead is connected	Light up
		When jumper lead is disconnected	Light off

- (1) **6P** Connector (Wiper Relay Side) (3) Battery
(2) Bulb (4) Jumper Lead

W1019080

(4) Control Panel (Blower Switch, A/C Switch, Mode Control Dial, Temperature Control Dial and Recirculation/Fresh Air Selection Switch)



Blower Switch Connector Voltage

- 1. Disconnect the 6P connector (2) from blower switch.
- 2. Turn the main switch to “ON” position.
- 3. Measure the voltage with a voltmeter across the connector terminal a and terminal b.
- 4. If the voltage differs from the battery voltage, the wiring harness, A/C relay, fuse or main switch is faulty.

Voltage	Terminal a – Terminal b	Approx. battery voltage

(1) Control Panel
(2) 6P Connector

(A) 6P Connector (Wire Harness Side)

W1019240

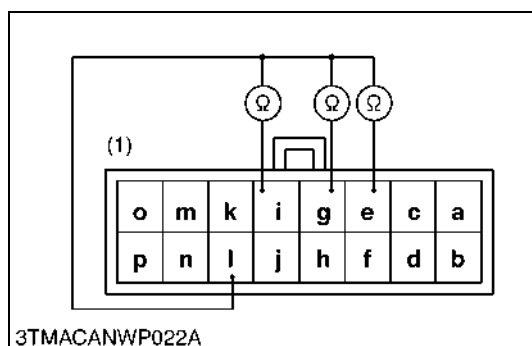
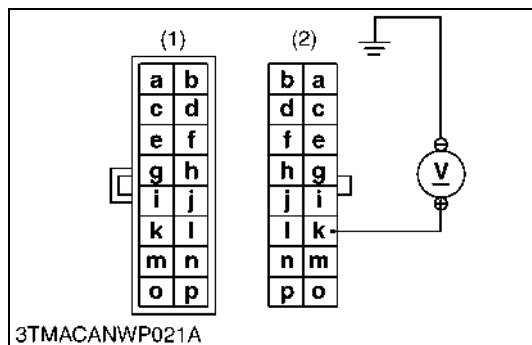
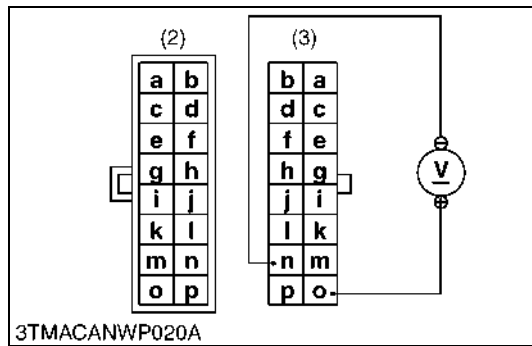
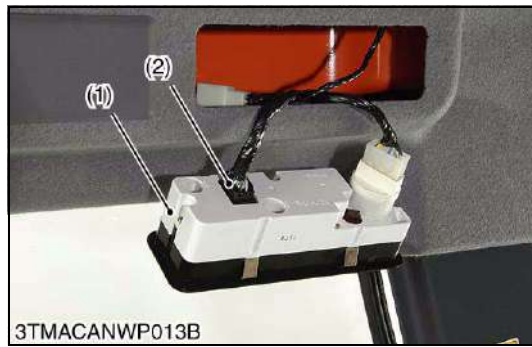
Blower Switch Test

- 1. Check the continuity through the switch with an ohmmeter.
- 2. If the continuity specified below are not indicated, the switch is faulty.

Terminal		a	b	c	d	e	f
Position							
A/C blower switch	OFF						
	● (Low)	●	●	●			
	● (Medium Low)	●	●			●	
	● (Medium High)	●	●				●
	● (High)	●	●		●		

(A) 6P Connector
(Blower Switch Side)

W1019735



Connector Voltage

1. Disconnect the **16P** connector (2) from control panel switch.
2. Turn the main switch to “**ON**” position.
3. Measure the voltage with a voltmeter across the terminal **o** and terminal **n**.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay or fuse is faulty.

Voltage	Terminal n – Terminal o	Approx. battery voltage

(1) Control Panel

(3) **16P** Connector (Wire Harness Side)(2) **16P** Connector (Switch Side)

W1020794

A/C Switch Checking

1. Measure the voltage with a voltmeter across the terminal **k** and chassis.
2. Turn the main switch to “**ON**” position.
3. Turn the blower switch to “**ON**” position.
4. Press the air conditioner switch to set it to “**OFF**” position (indicator : OFF), and then measure a voltage using a circuit tester.
5. Press the air conditioner switch to set it at “**ON**” position (indicator : ON), and then measure a voltage using a circuit tester.
6. If a measured voltage does not comply with the values in the table below, the control panel, wiring harness or fuse is faulty.

Voltage	Terminal k – Chassis	A/C switch at ON	Approx. battery voltage
		A/C switch at OFF	Approx. 1 V

(1) **16P** Connector (Switch Side)(2) **16P** Connector (Wire Harness Side)

W1020998

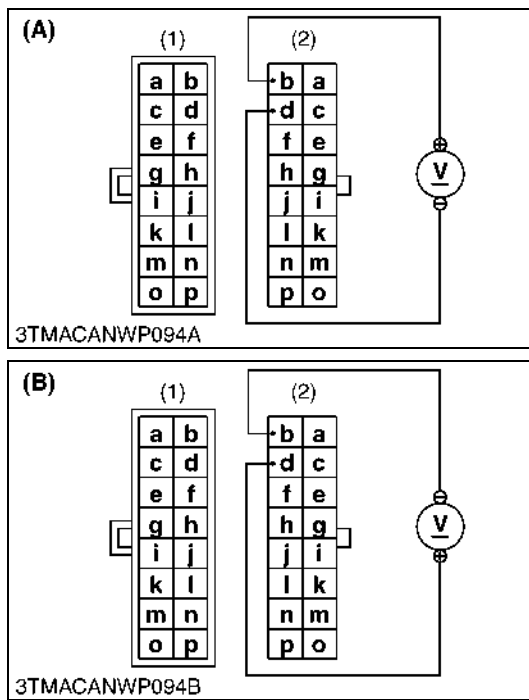
Mode Control Dial Checking

1. Disconnect the **16P** connector from control panel switch.
2. Check the continuity through the switch with an ohmmeter.
3. If the continuity specified below is not indicated, the switch is faulty.

Terminal		e	g	i	l
Mode switch	FRONT	●			●
	FULL		●		●
	DEF			●	●

(1) **16P** Connector (Switch Side)

W1042432



Temperature Control Dial Checking

1. Turn the temperature control dial counterclockwise till it stops (at **“COOL”** position).
2. Measure the voltage with a voltmeter across the terminal **b** and terminal **d**. Make the following measurement with the terminals connected.
3. Turn the main switch to **“ON”** position.
4. Check that an output voltage is approximately 10 V when turning the temperature control dial clockwise till it stops (**“WARM”** position).
5. Turn the main switch back to **“OFF”** position.
6. Turn the temperature control dial clockwise till it stops (**“WARM”** position).
7. Measure the voltage with a voltmeter across the terminal **d** and terminal **b**. Make the following measurement with the terminals connected.
8. Turn the main switch to **“ON”** position.
9. Check that an output voltage is approximately 10 V, when turning the temperature control dial counterclockwise till it stops (**“COOL”** position).
10. If an output voltage differs from approximately 10 V, the control panel, wiring harness of fuse is faulty.

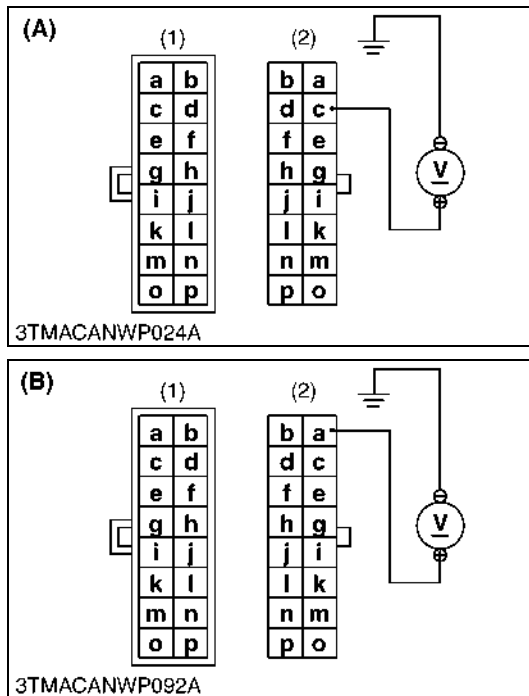
(1) 16P Connector (Switch Side)

(2) 16P Connector (Wire Harness Side)

(A) **“COOL”** position to **“WARM”** position

(B) **“WARM”** position to **“COOL”** position

W1021942



Recirculation / Fresh Air Selection Switch Checking

1. Measure the voltage with a voltmeter across the terminal **c** and chassis. Make the following measurement with the terminals connected.
2. Turn the main switch to **“ON”** position.
3. Press the recirculation/fresh air selection switch to set it at fresh air position (indicator : OFF), and then measure a voltage using a circuit tester.
4. Turn the main switch back to **“OFF”** position.
5. Measure the voltage with a voltmeter across the terminal **a** and chassis. Make the following measurement with the terminals connected.
6. Turn the main switch to **“ON”** position.
7. Press the recirculation/fresh air selection switch to set it at recirculation position (indicator : ON), and then measure a voltage using a circuit tester.
8. If a measured voltage does not comply with the values in the table below, the control panel, wiring harness or fuse is faulty.

Voltage	Terminal c – Chassis	Recirculation / fresh air selection switch at “Fresh Air” (indicator : OFF)	Approx. battery voltage
	Terminal a – Chassis	Recirculation / fresh air selection switch at “Recirculation” (indicator : ON)	Approx. battery voltage

(1) 16P Connector (Switch Side)

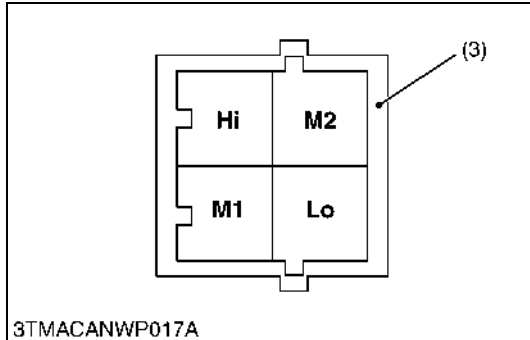
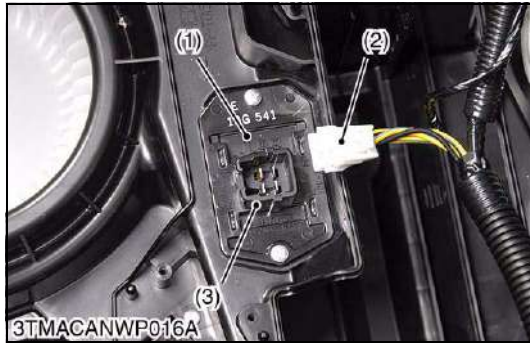
(2) 16P Connector (Wire Harness Side)

(A) **Fresh Air (Indicator : OFF)**

(B) **Recirculation (Indicator : ON)**

W1022089

(5) Blower Resistor



Blower Resistor Check

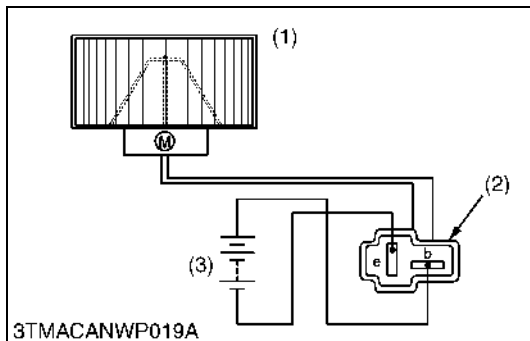
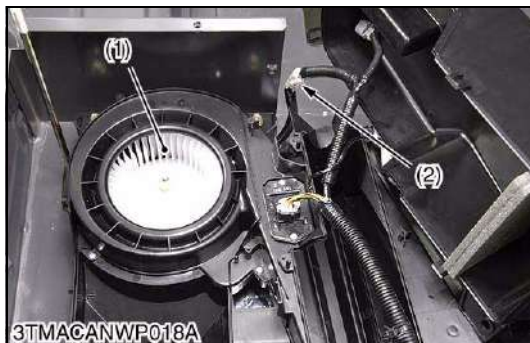
1. Disconnect the **4P** connector (2) from blower resistor (1).
2. Measure each resistance from terminal **Hi**.
3. If the factory specifications are not indicated, replace blower resistor.

Resistance	Factory spec.	Terminal Hi – Terminal M2	Approx. 0.22 Ω
		Terminal Hi – Terminal M1	Approx. 0.69 Ω
		Terminal Hi – Terminal Lo	Approx. 1.69 Ω

- (1) Blower Resistor (3) **4P** Connector (Blower Resistor Side)
 (2) **4P** Connector (Wire Harness Side)

W1020387

(6) Blower Motor



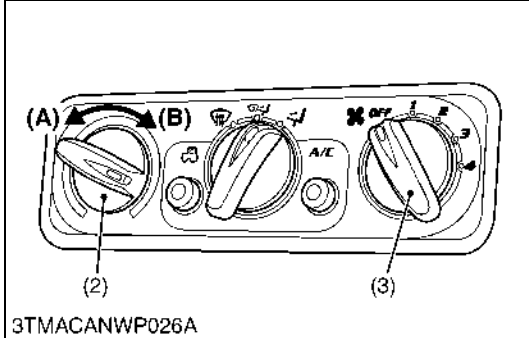
Blower Motor Test

1. Turn the blower motor (1) by hand and check whether it turns smoothly.
2. Disconnect the **2P** connector (2) of blower motor (1).
3. Connect a jumper lead from battery (3) positive terminal to connector terminal **b**.
4. Connect a jumper lead from battery negative terminal to connector terminal **e** momentarily.
5. If the blower motor does not run, check the motor.

- (1) Blower Motor **b** : Terminal **b**
 (2) **2P** Connector (Blower Motor Side) **e** : Terminal **e**
 (3) Battery (12 V)

W1020120

(7) Temperature Motor



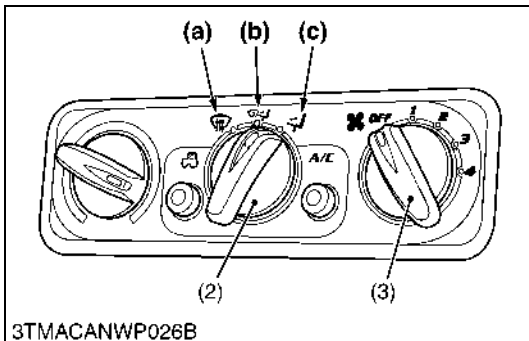
Temperature Motor Checking

1. Confirm whether the temperature control dial (2) is defective. (Refer to “(4) Control Panel” in this section.)
2. Turn the main switch to “ON” position.
3. Turn the blower switch (3) at 1 position.
4. Turn the temperature control dial from “COOL” position (A) to “WARM” position (B). At the time, confirm the motor is operating.
5. If the motor does not operate, replace it.

(1) Temperature Motor	(A) COOL
(2) Temperature Control Dial	(B) WARM
(3) Blower Switch	

W1023638

(8) Mode Motor



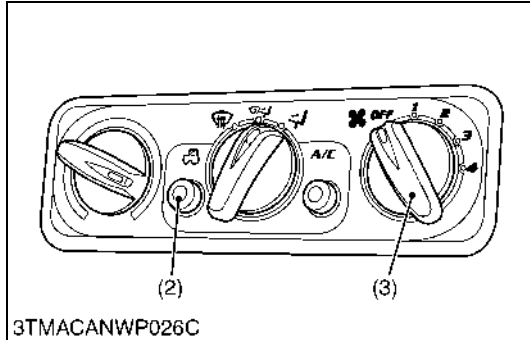
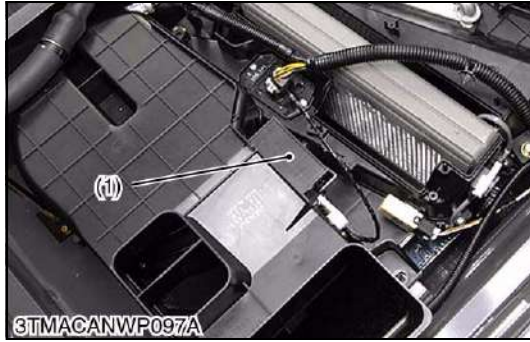
Mode Motor Checking

1. Confirm whether the mode switch (2) is defective. (Refer to “(4) Control Panel” in this section.)
2. Turn the main switch to “ON” position.
3. Turn the blower switch at 1 position.
4. Turn the mode switch each (a), (b) and (c).
5. Confirm whether the position where the mode motor (1) is stopped synchronize with mode switch (2).
6. If the motor does not move, replace it.

(1) Mode Motor	(a) Air is blown from only the defroster air outlet
(2) Mode Switch	(b) Air is blown the dashboard and defroster air outlets
(3) Blower Switch	(c) Air is blown from only the dashboard air outlets

W1044370

(9) Recirculation/Fresh Air Motor



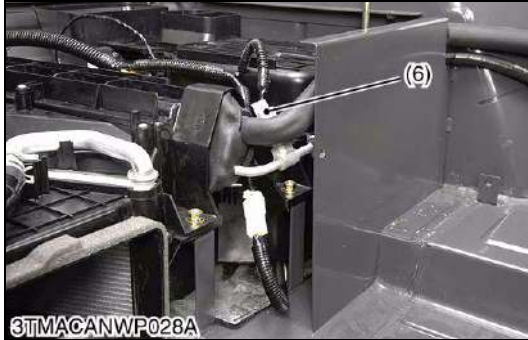
Recirculation/Fresh Air Motor Checking

1. Confirm whether the recirculation/fresh air selection switch (2) is defective. (Refer to “(4) Control Panel” in this section.)
2. Turn the main switch to “**ON**” position.
3. Turn the blower switch at **1** position.
4. Push the recirculation/fresh air selection switch to “**Recirculation**” position.
5. If the motor does not move, replace it.

(1) Recirculation/Fresh Air Motor	(3) Blower Switch
(2) Recirculation/Fresh Air Selection Switch	

W1061334

(10) Pressure Switch



Pressure Switch

1) HI Pressure Side

1. Connect the manifold gauge (3) to compressor as following procedure.

Close the **HI** and **LO** pressure valves (4), (5) of manifold gauge tightly, and connect the charging hoses (2), (1) (red and blue) to the respective compressor service valves. (Refer to "[1] HANDLING OF SERVICE TOOLS" in this section)

■ NOTE

- Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.
2. Start the engine and set at approx. 1500 min⁻¹ (rpm). Turn on the A/C switch, then set the blower switch to **HI** position.
 3. Raise pressure on the **HI** pressure side of the refrigerant cycle by covering the condenser front with a corrugated carboard, and the pressure switch is activated and the compressor magnetic clutch is turned off. At this time, read the **HI** pressure gauge of the manifold gauge. If this pressure reading differs largely with the setting pressure, replace the pressure switch with a new one.

Setting pressure	Factory spec.	Pressure switch OFF	More than approx. 3.14 MPa 32 kgf/cm ² 455 psi

2) LO Pressure Side

1. Disconnect **2P** connector (6) of pressure switch.
2. Measure the resistance with an ohmmeter across the connector terminals.
3. If 0 ohm is not indicated at normal condition, there is no refrigerant in the refrigerating cycle because gas leaks or pressure switch is defective.

(Reference)

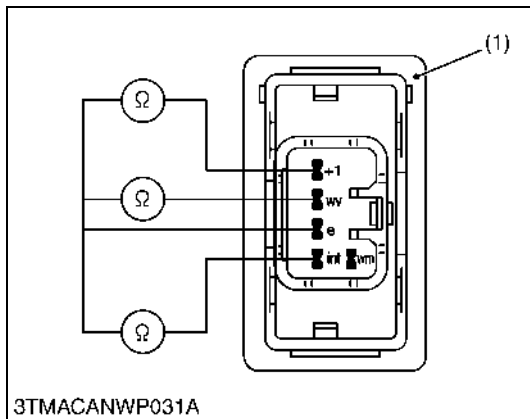
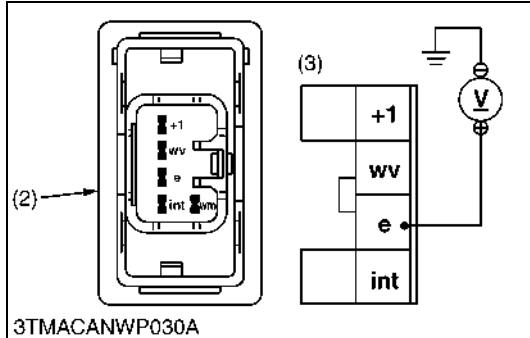
Setting pressure	Factory spec.	Pressure switch OFF	Less than approx. 0.196 MPa 2.0 kgf/cm ² 28.4 psi

- The resistance of pressure switch is 0 ohm in normal condition, but it becomes infinity if the pressure is out of factory spec.. Because the pressure switch starts to work.

(1) Charging Hose (Blue)	(5) LO (Low Pressure Side) Charging Valve
(2) Charging Hose (Red)	
(3) Manifold Gauge	(6) 2P Connector
(4) HI (High Pressure Side) Charging Valve	

W1020509

(11) Front Wiper Switch



Connector Voltage

1. Disconnect the **6P** connector from front wiper switch (1).
2. Turn the main switch to "ON" position.
3. Measure the voltage with a voltmeter across the connector terminal **e** of wiring harness side and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal e – Chassis	Approx. battery voltage

- (1) Front Wiper Switch (3) **6P** Connector (Wire Harness Side)
 (2) **6P** Connector (Switch Side)

W1022044

Front Wiper Switch Checking

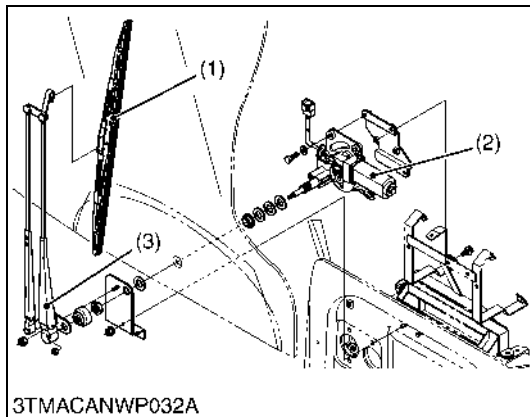
1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

		Terminal				
Position		int	+1	e	wv	wm
Front wiper switch	WASH I		●	●	●	●
	ON		●	●		
	OFF					
	INT	●		●		
	WASH II	●		●	●	●

- (1) **6P** Connector (Switch Side)

W1021874

(12) Front Wiper Motor



Front Wiper Motor

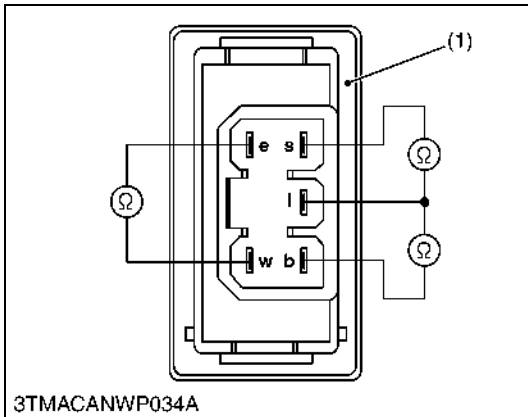
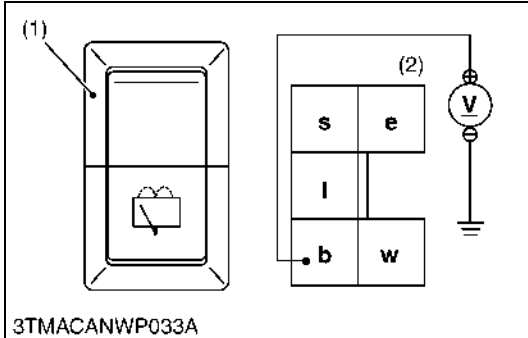
1. Raise up the front wiper arm (3).
2. Turn the main switch to "ON" position.
3. Push the front wiper switch to "ON" position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

No. of wiper arm swing frequency at no load	Factory spec.	25 to 43 times/min.

- (1) Wiper Blade (3) Wiper Arm
 (2) Wiper Motor

W1022632

(13) Rear Wiper Switch



Connector Voltage (If equipped)

1. Disconnect the **5P** connector from rear wiper switch (1).
2. Turn the main switch to "**ON**" position.
3. Measure the voltage with a voltmeter across the connector terminal **b** of the wiring harness side and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal b – Chassis	Approx. battery voltage

(1) Rear Wiper Switch

(2) **5P** Connector (Switch Side)

W1024597

Rear Wiper Switch Checking

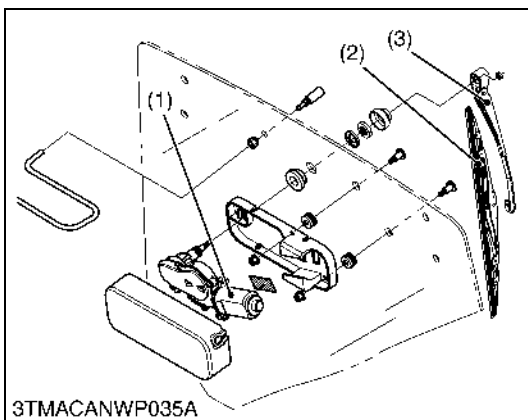
1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

		Terminal				
Position		e	w	b	l	s
Rear wiper switch	WASH I	●	●		●	●
	ON			●	●	
	OFF				●	●
	WASH II	●	●	●	●	

(1) **5P** Connector (Switch Side)

W1023782

(14) Rear Wiper Motor



Rear Wiper Motor

1. Raise up the rear wiper arm (3).
2. Turn the main switch to "**ON**" position.
3. Push the front wiper switch to "**ON**" position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

No. of wiper arm swing frequency at no load	Factory spec.	25 to 43 times/min.

(1) Wiper Motor

(3) Wiper Arm

(2) Wiper Blade

W1024574

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Cabin from Tractor



Draining Coolant



CAUTION

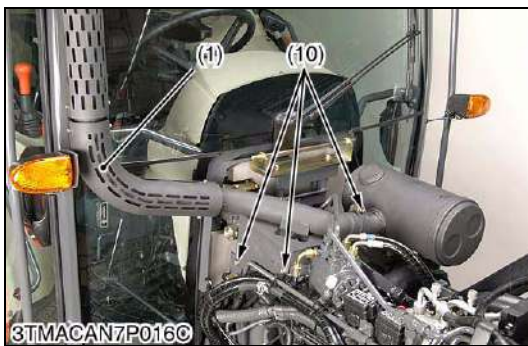
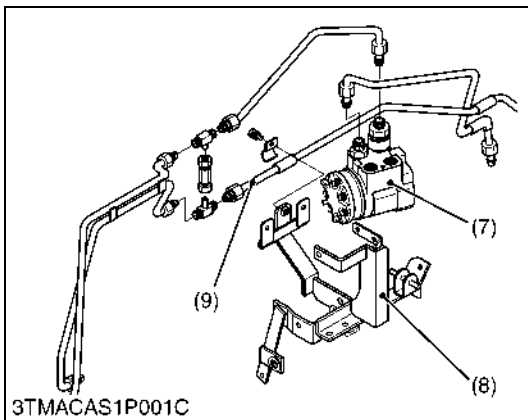
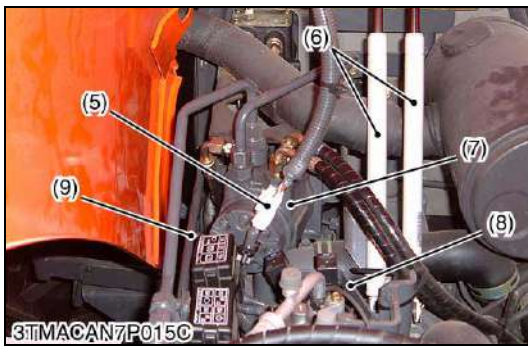
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. To drain the coolant, open the radiator drain plug (1). When opening the drain plug set the hose to drain port.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

Coolant	Capacity	9.0 L
		9.5 U.S.qts
		7.9 Imp.qts

(1) Drain Plug

W1024819



Preparation 1

1. Open the bonnet (2) and disconnect the battery (3) negative terminal and **6P** connector (5) for head light.
2. Remove the bonnet dampers (6) and bonnet (2).
3. Remove the both side covers (4).
4. Remove the muffler pipe (1) mounting screws (10) and remove the muffler pipe (1).
5. Install the front axle rocking restrictor (11) to the front axle bracket.

(When reassembling)

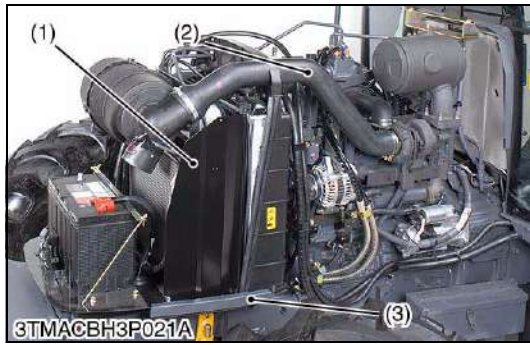
- The **6P** connector (5) should be placed within the space of controller pipe (9), power steering controller (7) and stay (8).

■ IMPORTANT

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

(1) Muffler Pipe	(7) Power Steering Controller
(2) Bonnet	(8) Stay
(3) Battery	(9) Controller Pipe
(4) Side Cover	(10) Screw
(5) 6P Connector (Head Light)	(11) Rocking Restrictor
(6) Damper	

W1025500

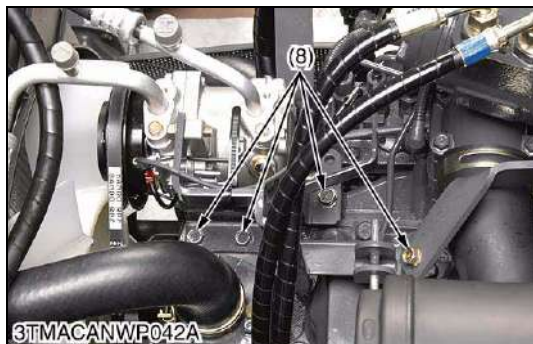
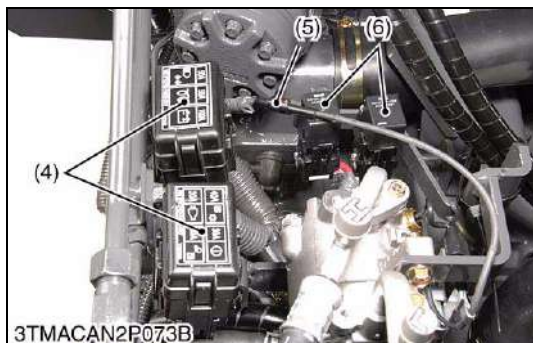
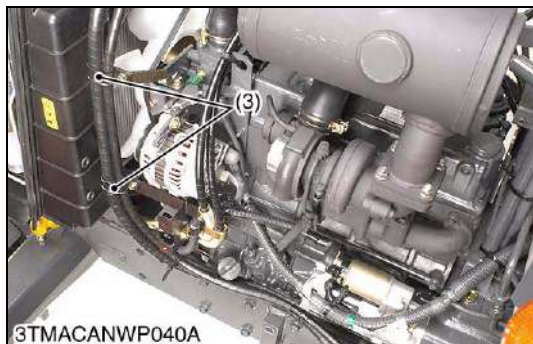
**Preparation 2**

1. Remove the both side cover guides (3).
2. Remove the both side panels (1).
3. Remove the air cleaner hose (2).

(1) Side Panel
(2) Air Cleaner Hose

(3) Side Cover Guide

W1025955



Preparation 3

■ Without discharging the refrigerant from system

1. Detach the air conditioner hoses from the hose retainer (1) and slide out the condenser (2).
2. Remove the hose clamps (3).
3. Remove the slow blow fuse boxes (4) and relays (6).
4. Disconnect 1P connector (5) of magnetic clutch.
5. Remove the compressor bracket (7) mounting screw (8) from engine.

(1) Hose Retainer	(5) 1P Connector (Magnetic Clutch)
(2) Condenser	(6) Relay
(3) Hose Clamp	(7) Compressor Bracket
(4) Slow Blow Fuse Box	(8) Screw

W1026138



Preparation 3 (Continued)

1. Remove the compressor (1) with hoses and compressor bracket.

(When reassembling)

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

Tightening torque	Compressor bracket mounting screw (M8) to aluminum parts	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft
	Compressor bracket mounting screw (M8) to ordinariness parts	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Compressor bracket mounting screw (M10) to ordinariness parts	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

■ With discharge the refrigerant from system

1. Refer to "(1) Discharging the Refrigerant" in this section.
2. Disconnect the low pressure pipe (2) and high pressure pipe 1 (3) from compressor (1).

(When reassembling)

- Charge the refrigerator to the air conditioner system, refer to "(3) Charging the Refrigerant" in this section.
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

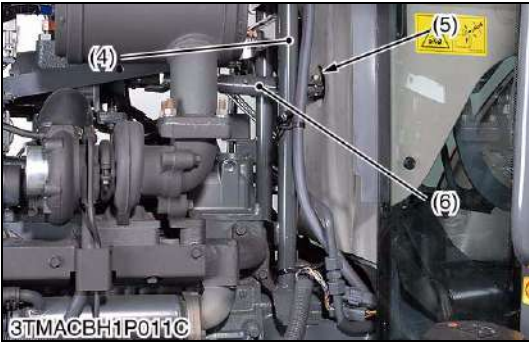
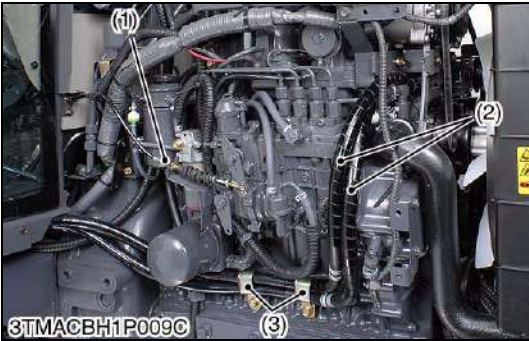
Tightening torque	High pressure pipe 1 mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft
	Low pressure pipe mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft

(1) Compressor

(2) Low Pressure Hose

(3) High Pressure Hose 1

W1052713



Preparation 4

- 1. Remove the hose clamps (3).
- 2. Disconnect the heater hoses (2).
- 3. Disconnect the accelerator wire (1).
- 4. Disconnect the master cylinder hose (7) and master cylinder return hose (8).
- 5. Remove the bonnet support (4).
- 6. Remove the steering joint shaft mounting screw (5) then disconnect the steering joint shaft (6) from steering joint.

(When reassembling)

- Be sure to fix the heater hose to the original position. Note the inlet hose and outlet hoses.

Tightening torque	Master cylinder hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 lbf·ft
	Power steering joint shaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

- (1) Accelerator Wire

(2) Heater Hose

(3) Hose Clamp

(4) Bonnet Support
- (5) Screw

(6) Steering Joint Shaft

(7) Master Cylinder Hose

(8) Master Cylinder Return Hose

W1027330



Preparation 5

1. Remove the fuel filling port (1).
2. Remove the floor mat 1 (3) and mat 2 (4).
3. Remove the floor cover (5).
4. Disconnect the connectors (6) and pull out them from cabin.
5. Disconnect the connector (7) and pull out them from cabin.

(1) Fuel Filling Port	(5) Floor Cover
(2) Fuel Filling Hose	(6) Connector
(3) Floor Mat 1	(7) Connector
(4) Floor Mat 2	

W1027792

**Preparation 6**

1. Disconnect the clutch cable (1).
2. Remove the shuttle select rod mounting nut (2) from shuttle select rod (4) then disconnect the shuttle select rod (4).
3. Disconnect the shuttle cable (3).

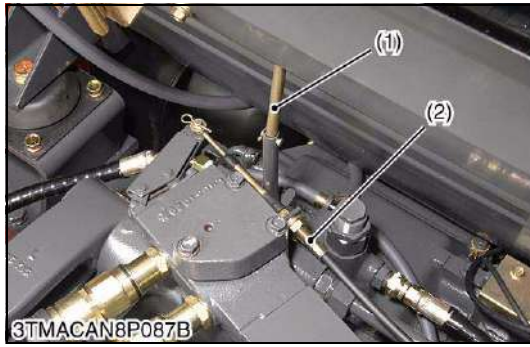
(When reassembling)

- Be sure to adjust the clutch cable for the clutch pedal free travel. (Refer to "4. CHECKING AND ADJUSTING" at "2. CLUTCH" section.)
- Be sure to adjust the shuttle cable for the shuttle lever neutral position. (Refer to "4. CHECKING AND ADJUSTING" at "3. TRANSMISSION" section.)

(1) Clutch Cable
(2) Nut

(3) Shuttle Cable
(4) Shuttle Select Rod

W1028272



Preparation 7

1. Place the disassembling stand under the transmission case and drawbar bracket.
2. Remove the rear wheels (R.H., L.H.).
3. Disconnect the lowering speed rod (1).
4. Disconnect the auxiliary control wires (2).
5. Disconnect the breather hose (3).
6. Disconnect the ground cable (4).
7. Remove the 3P external control rod (5).
8. Remove the parking brake upper rod (6).

(When reassembling)

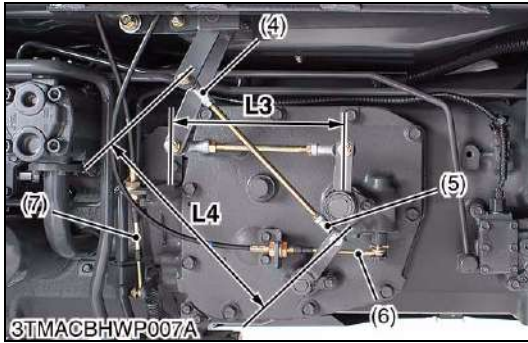
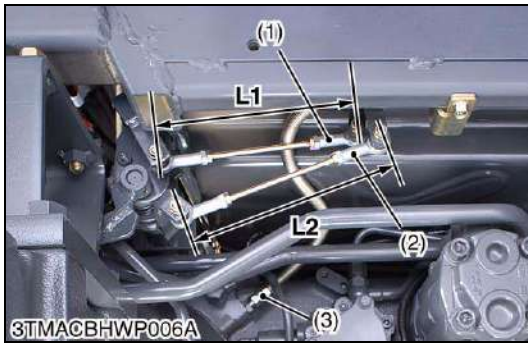
- Be sure to adjust the auxiliary control lever movement by auxiliary control wire (2). (Refer to "[1] CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 lbf·ft

- (1) Lowering Speed Rod
(2) Auxiliary Control Wire
(3) Breather Hose

- (4) Ground Cable
(5) 3P External Control Rod
(6) Parking Brake Upper Rod

W1028721



Preparation 8

1. Disconnect the position control rod (2) and draft control rod (1).
2. Disconnect the select cable (6).
3. Disconnect the range gear shift rod (5).
4. Disconnect the main gear shift rod (4).
5. Remove the gear lock parking brake cable (7).
6. Remove the brake hose (3).

NOTE

- After assembling check the speed change lever movement and adjust them if necessary.
- After assembling check the hydraulic control system. (Refer to "4. CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.)

(When reassembling)

- Be sure to bleed the air from hydraulic brake line.

Length (L1) (Draft control rod)	Factory spec.	Approx. 178 mm 7.01 in.
Length (L2) (Position control rod)	Factory spec.	Approx. 183 mm 7.20 in.
Length (L3) (Main shift rod)	Factory spec.	Approx. 211 mm 8.31 in.
Length (L4) (Range shift rod)	Factory spec.	Approx. 279 mm 11.0 in.

Tightening torque	Brake hose retaining nut	16.0 to 24.0 N·m 1.6 to 2.4 kgf·m 11.8 to 17.7 lbf·ft

(1) Position Control Rod	(5) Range Gear Shift Rod
(2) Draft Control Rod	(6) Select Cable
(3) Brake Hose	(7) Gear Lock Parking Brake Cable
(4) Main Gear Shift Rod	

W1013471



Dismounting Cabin

1. Remove the cabin mounting all screws and nut (1).
2. Set the cabin dismounting tool (2) to the cabin.
3. Dismounting the cabin from tractor body.

(When reassembling)

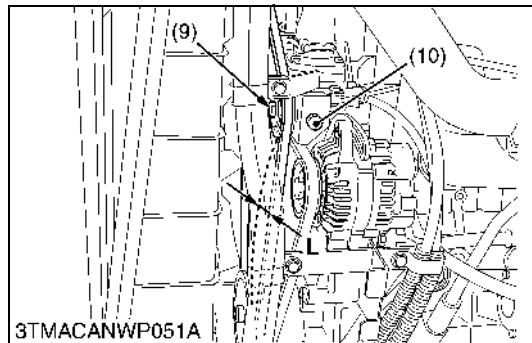
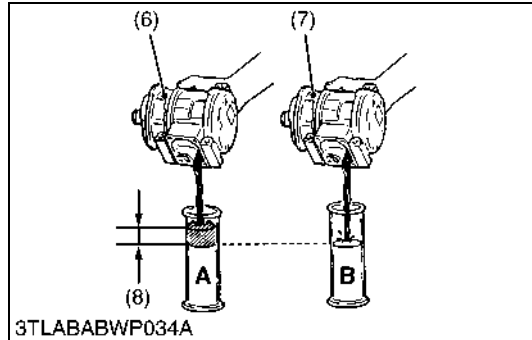
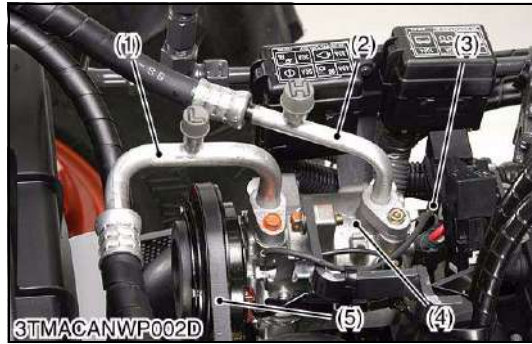
Tightening torque	Cabin mounting screw and nut	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft

(1) Cabin Mounting Nut	(2) Cabin Dismounting Tool

W1029973



(2) Removing Compressor Assembly



Compressor Assembly

1. Discharge the refrigerant from the system. (Refer to "(1) Discharging the Refrigerant" in this section.)
2. Disconnect the low pressure pipe (suction) (1) and high pressure pipe 1 (discharge) (2) from the compressor, then cap the open fitting immediately to keep moisture out of the system.
3. Disconnect the **1P** connector (3) of magnetic clutch.
4. Remove the air conditioner belt (5) and remove the compressor (4) with stay.

(When reassembling)

- After reassembling the compressor, be sure to adjust the air conditioner belt tension and recharge the refrigerant to the system. (Refer to "(3) Charging the Refrigerant" in this section.)
- Apply compressor oil (DENSO CO. ND-OIL8 or equivalent) to the O-rings and take care not to damage them.
- "**S**" letter is marked on the compressor for connecting the low pressure pipe (suction side).
- "**D**" letter is marked on the compressor for connecting the high pressure pipe (discharge side).
- When replacing the compressor with a new one, meet the oil amount with old one.
- Push on the belt between the pulleys with a finger. Deflection (**L**) of 10 to 12 mm (0.4 to 0.48 in.) under a 98 N (10 kgf, 22 lbf) load is appropriate.

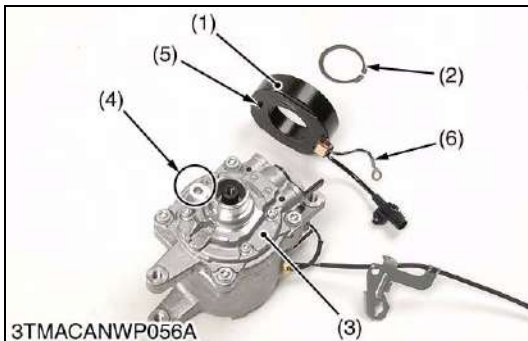
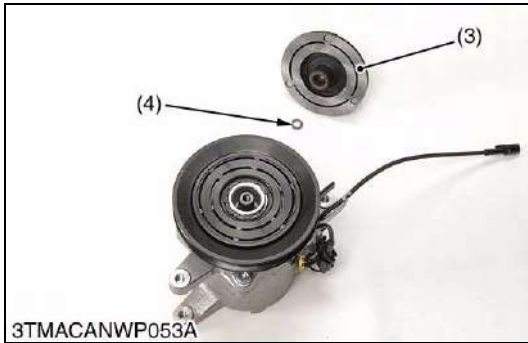
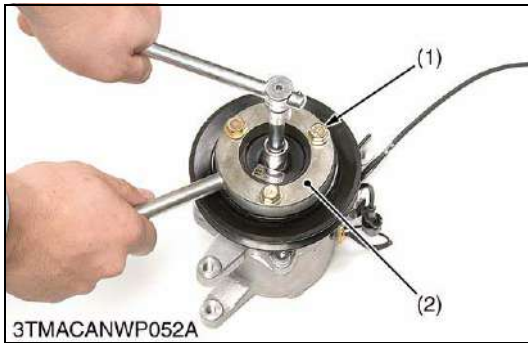
Tightening torque	High pressure pipe 1 and low pressure pipe mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft
	Compressor mounting screws	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 lbf·ft

- (1) Low Pressure Pipe
 (2) High Pressure Pipe 1
 (3) **1P** Connector (Magnetic Clutch)
 (4) Compressor
 (5) Air Conditioner Belt
 (6) New Compressor
 (7) Old Compressor
 (8) Remove the Excess Oil (**A-B**)

- (9) Lock Nut
 (10) Adjusting Bolt

A : Oil Flow New Compressor
B : Oil Flow Replace Compressor
L : Deflection (10 to 12 mm
(0.4 to 0.48 in.))

W1014469



Hub Plate

1. Three stopper bolts (1) are set in stopper magnet clutch (2) at the position corresponding to the shape of compressor. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. The stopper magnet clutch (2) is hung on hub plate (3) and it is fixed that the compressor rotates.
3. Remove the magnetic clutch mounting screw.
4. Remove the hub plate (3) and air gap adjustment shim (4).

(When reassembling)

- Do not apply grease or oil on the hub plate facing.
- Do not use the magnetic clutch mounting screw again.
- It is confirmed to turn rotor by hand after assembling and not contact with stator and hub plate.
- Check and adjust the air gap before tight the magnet clutch mounting screw to the specified torque. (Refer to "[3] SERVICING" in this section.)

Tightening torque	Magnetic clutch mounting screw	15.0 to 21.0 N·m 1.5 to 2.1 kgf·m 11.1 to 15.5 lbf·ft

- (1) Stopper Bolt (3) Hub Plate
(2) Stopper Magnet Clutch (4) Shim

W1059166

Rotor

1. Remove the external circlip (1).
2. Remove the rotor (2).

(When reassembling)

- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of rotor.
- The width of expanding of external circlip is set in boss of shaft as a minimum.

(Reference)

- Code No. for external circlip : T1065-87450

- (1) External Circlip (2) Rotor

W1059753

Stator

1. Remove the lead wire (6) from compressor body.
2. Remove the external circlip (2).
3. Remove the stator (1).

(When reassembling)

- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of front housing.
- The width of expanding of external circlip is set is boss of shaft as a minimum.
- Match and assemble the concave part (4) of the front housing (3) and the pin (5) of stator.

(Reference)

- Code No. for external circlip : T1065-87440

- (1) Stator (4) Concave Part
(2) External Circlip (5) Pin
(3) Front Housing (6) Lead Wire

W1059953

(3) Removing Air Conditioner Unit

Draining Coolant

1. Refer to "[2] DISASSEMBLING AND ASSEMBLING" in this section.

W1031565

Discharging Refrigerant Gas

1. Refer to "(1) Discharging the Refrigerant" in this section.

W1031483

Seat, Floor Mats and Floor Cover

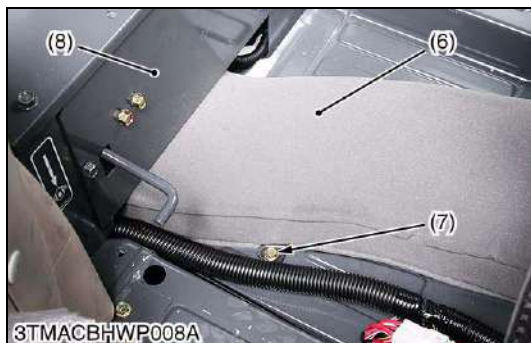
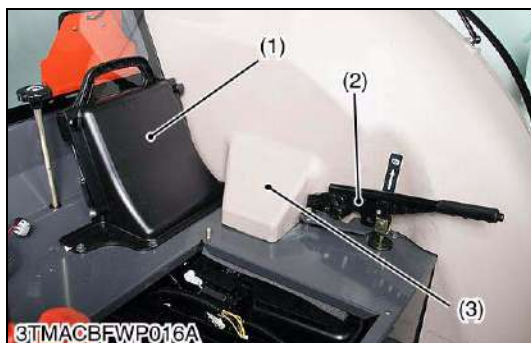
1. Disconnect the battery negative cable from battery.
2. Remove the seat (1).
3. Remove the floor mat 1 (2) and mat 2 (3).
4. Remove the floor cover (4).

- (1) Seat
(2) Floor Mat 1

- (3) Floor Mat 2
(4) Floor Cover

W1031630



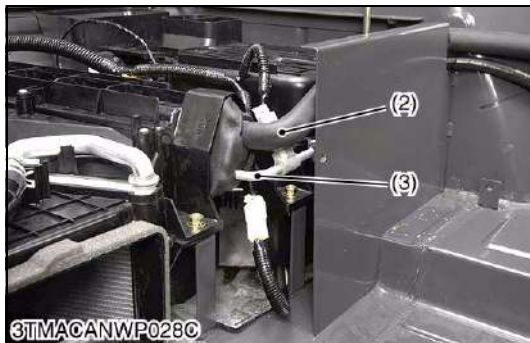
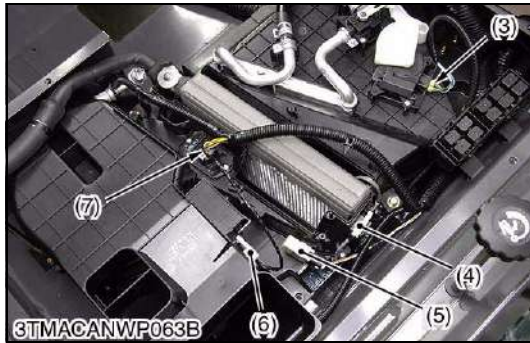
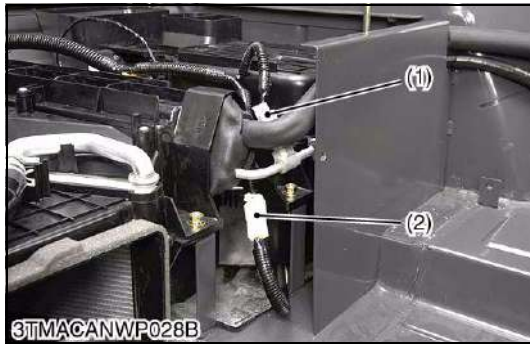


Air Conditioner Ducts and Covers

1. Remove the duct 1 (1).
2. Remove the parking brake lever (2).
3. Remove the inner cover (L.H.) (3).
4. Remove the duct 2 (4).
5. Remove the seat under cover 1 (5).
6. Remove the seat under cover 2 (8).
7. Remove the relay box (9) from seat under cover 2 (8).
8. Remove the duct 3 mounting screw (7) for removing duct 3 (6).

(1) Duct 1	(6) Duct 3
(2) Parking Brake Lever	(7) Screw
(3) Inner Cover (L.H.)	(8) Seat Under Cover 2
(4) Duct 2	(9) Relay Box
(5) Seat Under Cover 1	

W1037175



Wiring Harness

1. Disconnect the **2P** connector (1) for pressure switch.
2. Disconnect the **2P** connector (2) for blower motor.
3. Disconnect the **4P** connector (7) for blower resistor.
4. Disconnect the **5P** connector (6) for recirculation/fresh air selection motor.
5. Disconnect the **7P** connector (3) for air mix control motor.
6. Disconnect the **1P** connector (4) for thermistor.
7. Disconnect the **5P** connector (5) for thermostat.

(1) 2P Connector (Pressure Switch)	(5) 5P Connector (Thermostat)
(2) 2P Connector (Blower Motor)	(6) 5P Connector (Recirculation/Fresh Air Selection Motor)
(3) 7P Connector (Air Mix Control Motor)	(7) 4P Connector (Blower Resistor)
(4) 1P Connector (Thermistor)	

W1032388

Air Conditioning Unit

1. Disconnect the heater hoses (1).
2. Remove the pressure pipes joint mounting screw and pressure pipes joint.
3. Disconnect the high pressure pipe 2 (3) and low pressure pipe (2).
4. Take off the unit.

NOTE

- Open parts are cap and moisture is prevented from going into the system at once.

(When reassembling)

- When reconnecting the cooler pipes with the unit, apply compressor oil (DENSO OIL8 or equivalent) to O-rings.

Tightening torque	A/C unit mounting screw (M8)	9.8 to 15.7 N·m 1.0 to 1.6 kgf·m 7.2 to 11.6 lbf·ft
	Pressure pipe joint mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft

(1) Heater Hose	(3) High Pressure Pipe 2 (Cooler Pipe (Liquid)) (High Pressure)
(2) Low Pressure Pipe	

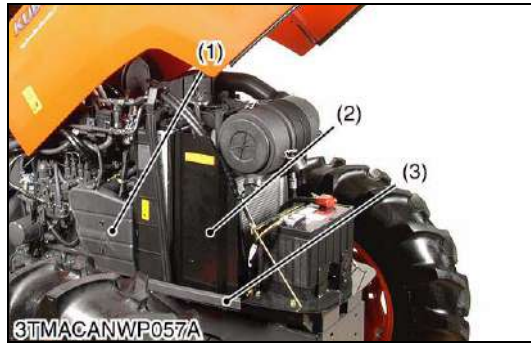
W1025169

(4) Removing Air Conditioner Pipes

Discharging Refrigerant Gas

1. Refer to “(1) Discharging the Refrigerant” in this section.

W1033151



Cover and Guide

1. Remove the both side panel guides (3).
2. Remove the both side panels (2).
3. Remove the both side covers (1).

(1) Side Cover
(2) Side Panel

(3) Side Panel Guide

W1033208



High Pressure Pipe 1, 2 and Low Pressure Pipe

1. Disconnect the low pressure pipe (3) and high pressure pipe 1 (1) from the compressor (2), then cap the open fittings immediately to keep moisture out of the system.
2. Slide the condenser (4).
3. Disconnect the high pressure pipe 1 (1) from the condenser (4) and cap the open fittings immediately to keep moisture out of the system.
4. Disconnect the high pressure pipe 2 (6) from the receiver (5) and cap the open fittings immediately to keep moisture out of the system.

(When reassembling)

- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.



Tightening torque	Low pressure pipe mounting screw (compressor side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft
	High pressure pipe 1 mounting screw (compressor side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft
	High pressure pipe 1 mounting screw (condenser side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft
	High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.7 to 10.8 lbf·ft

(1) High Pressure Pipe 1

(4) Condenser

(2) Compressor

(5) Receiver

(3) Low Pressure Pipe

(6) High Pressure Pipe 2

W1033365

Seat, Mats and Floor Cover

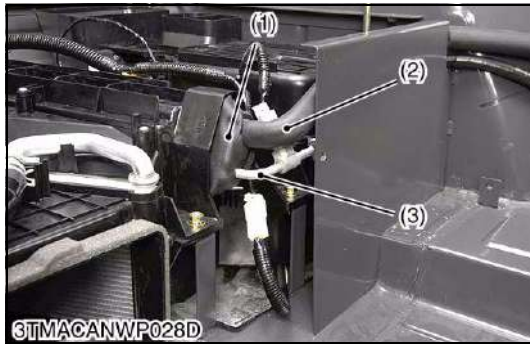
1. Refer to “(3) Removing Air Conditioner Unit” in this section.

W1033832

Air Conditioner Ducts and Covers

1. Refer to “(3) Removing Air Conditioner Unit” in this section.

W1033899



High Pressure Pipe 2 and Low Pressure Pipe

1. Remove the rubber (1) and pressure pipes joint mounting screw.
2. Remove the pressure pipes joint.
3. Disconnect the high pressure pipe 2 (3) and low pressure pipe (2), then cap the open fitting immediately to keep moisture out of the system.
4. Pull out the high pressure pipe 2 (3) and low pressure pipe (2) from the bottom of the cabin and take out the pressure pipes.

(When reassembling)

- Replace the rubber (1) with a new one.
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	Pressure pipe joint mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 lbf·ft

(1) Rubber

(3) High Pressure Pipe 2

(2) Low Pressure Pipe

W1033968

(5) Removing Heater Hoses

Draining Coolant

1. Refer to "[2] DISASSEMBLING AND ASSEMBLING" in this section.

W1034298



Side Cover (R.H.) and Heater Hoses

1. Remove the side cover (R.H.) (1).
2. Disconnect the heater hoses (2) and (3) from the engine.
3. Remove the clamps (4).

(When reassembling)

- Note the inlet hose and outlet hose.

(1) Side Cover (R.H.)

(3) Heater Hose 2

(2) Heater Hose 1

(4) Clamp

W1034358



Seat, Mats and Floor Cover

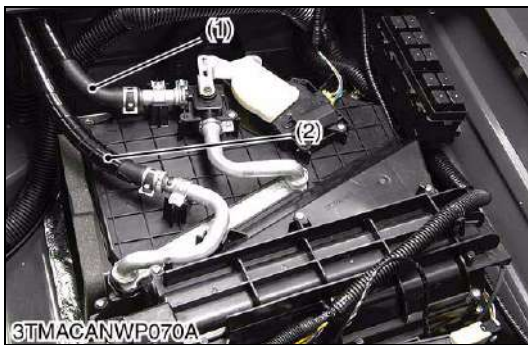
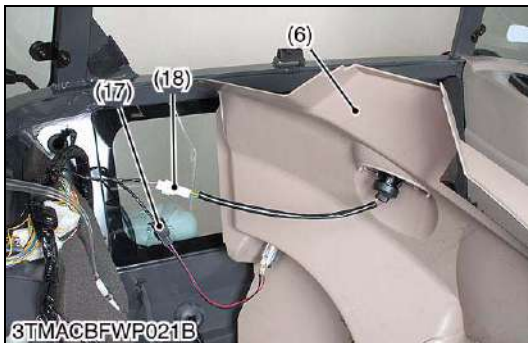
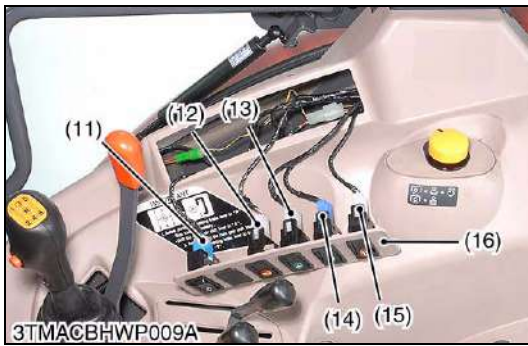
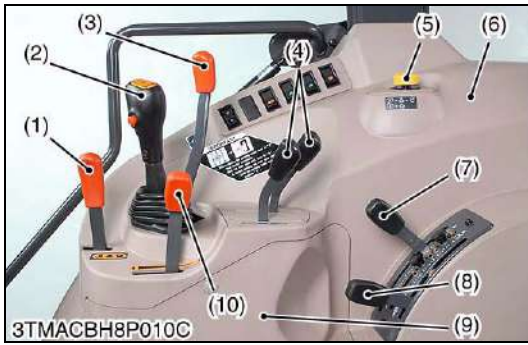
1. Refer to "(3) Removing Air Conditioner Unit" in this section.

W1034679

Air Conditioner Ducts and Covers

1. Refer to "(3) Removing Air Conditioner Unit" in this section.

W1034615



Inner Cover (R.H.)

1. Remove the hand accelerator lever grip (10).
2. Remove the range gear shift lever grip (1).
3. Remove the main shift lever grip (2).
4. Remove the auxiliary control lever grip (4).
5. Remove the PTO control lever grip (5).
6. Remove the position control lever grip (7) and draft control lever grip (8).
7. Pull out the switch board (16).
8. Disconnect the **5P** connector (11) from front wiper switch.
9. Disconnect the **3P** connector (white) (13) from front working light switch and **3P** connector (white) (12) from 4WD switch.
10. Disconnect the **3P** connector (blue) (14) from rear working light switch.
11. Remove the inner cover R.H. (6).
12. Disconnect the **2P** connector (16) from cigar lighter and remove the inner cover 1 (R.H.) (6).

(1) Range Gear Shift Lever Grip	(11) 5P Connector (Front Wiper Switch)
(2) Main Shift Lever Grip	(12) 3P Connector (Rear Wiper Switch)
(3) Parking Brake Lever 1	(13) 3P Connector (Front Working Light Switch)
(4) Auxiliary Control Lever Grip	(14) 3P Connector (Rear Working Light Switch)
(5) PTO Switch	(15) Beacon Light Switch
(6) Inner Cover (R.H.)	(16) Switch Board
(7) Position Control Lever Grip	(17) 2P Connector (Cigar Lighter)
(8) Draft Control Lever Grip	(18) 3P Connector (PTO Switch)
(9) Inner Cover 2	
(10) Hand Accelerator Lever Grip	

W1034733

Removing Heater Hoses

1. Disconnect the heater hoses (1) and (2).
2. Pull out the heater hoses (1) and (2) from the bottom of the cabin.
3. Take out the heater hoses (1) and (2).

(When reassembling)

- When connecting the heater hose with A/C unit, hose should be put into the A/C unit pipe more than 30 mm (1.2 in.).
- Be sure to fix the heater hoses (1) and (2) to the original position. Note the inlet hose and outlet hoses.

(1) Heater Hose 1

(2) Heater Hose 2

W1030250

(6) Cab Windshield

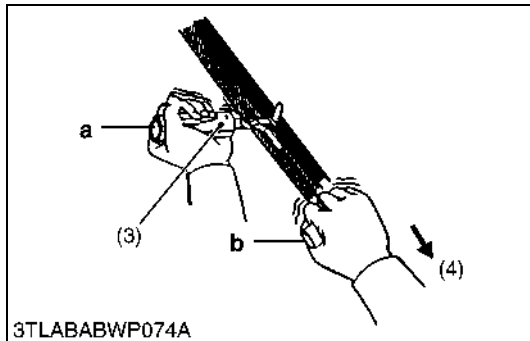
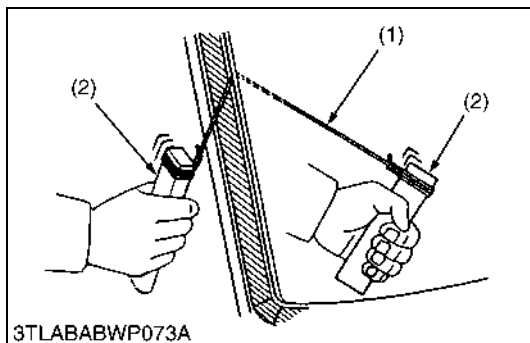
Preparation

1. Prepare the followings.
 - Cutter knife 1 piece
 - Scraper 1 piece
 - Gun for coating 1 piece
 - Sika Tack-Ultrafast or equivalent
 - Sika-cleaner No. 1
 - Gummed tape

■ NOTE

- Sika Tack-Ultrafast and cleaner No. 1 are made by Sika Corporation.
- These materials can not be provided by Kubota Corporation.
- Therefore, please find the local made equivalent materials in your country and use them when you need.

W1053361



Before Replacing Windshields (1)

[In case of using piano wire (When glass is cracked)]

1. Thread the piano wire from the inside of cabin. Tie its both ends to a wooden blocks or the like. (See the left figure.)
2. Pull the piano wire inward/outward alternately to cut the adhered part.

■ NOTE

- Do not let the piano wire make sliding contact with the edge of glass plate forcibly.

[In case of using cutter knife (When glass is totally crushed finely)]

1. Insert the knife (3) into the adhered part.
2. Keep the edge of knife blade square to the glass edge at the part (a). Slide the knife blade along the glass surface and the edge. Pull the part (b) in the direction parallel to the glass edge to cut them off.

■ NOTE

- Find a wider gap between the glass and body.
- Take care of handling the cutter knife not to damage your hand.

- (1) Piano Wire
(2) Wood Peace

- (3) Cutter Knife
(4) Pulling

W1035600

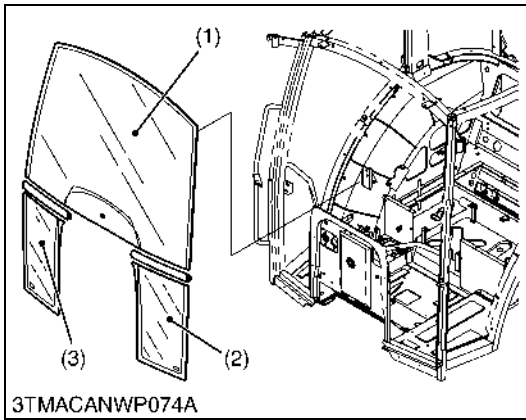
Before Replacing Windshields (2)

1. When the Sika Tack-Ultrafast or equivalent attached to the cabin frame and the glass are reused, remove the bond clearly.
2. Clean the frame surface with Sika-cleaner No. 1.

■ NOTE

- Remove the bond completely.

W1035852



Before Replacing Windshields (3)

1. Check that the glasses are not damaged and cracked.
2. Turn over the glass and clean this surface of the glass by Sika-cleaner No. 1.
3. The cleaning area of the rear surface is indicated "a" in the figure left.

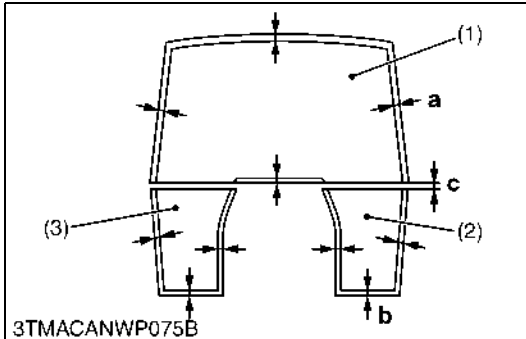
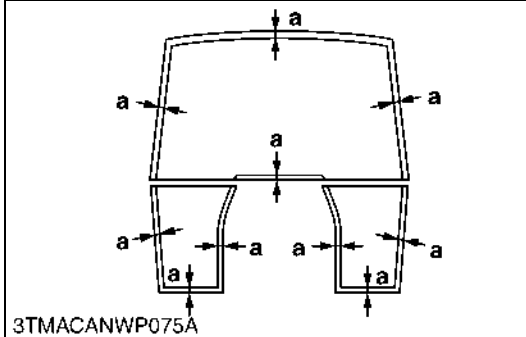
NOTE

- If not cleaning the glass, it may result in adhesive failure.

- (1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)

a : 25 mm (1.0 in.)

W1035931



Applying Sika Tack-Ultrafast

1. Apply a Sika Tack-Ultrafast (or equivalent) on the glasses as shown in figure left.

NOTE

- Apply the Sika Tack-Ultrafast (or equivalent) with the jig having the specified tip shape as shown in the figure left.
- Apply it with a uniform speed to minimize unevenness.
- Follow the instruction manual of Sika Tack-Ultrafast.

- (1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)
(4) Sika Tack-Ultrafast
(5) Jig
(6) Shield

a : 10 mm (0.39 in.)

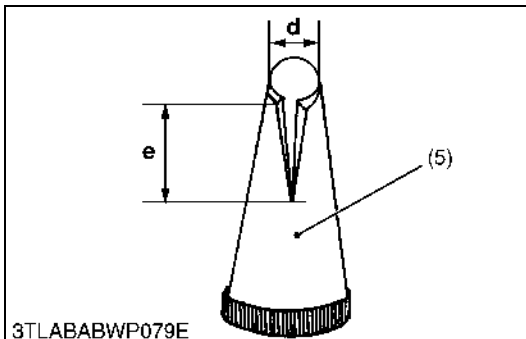
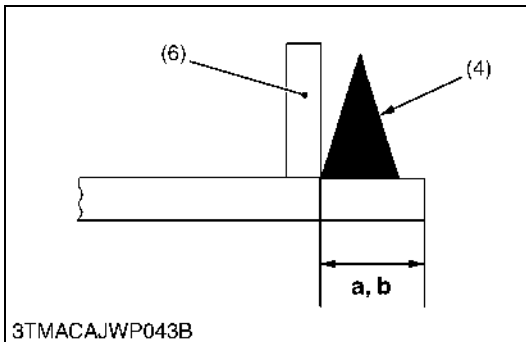
b : 12 mm (0.47 in.)

c : 4 mm (0.16 in.)

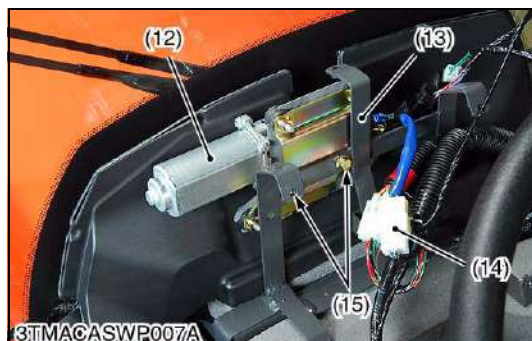
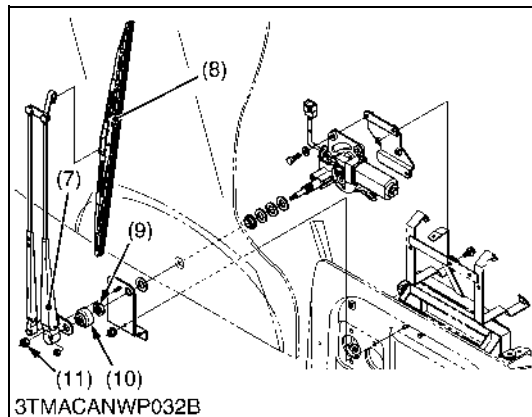
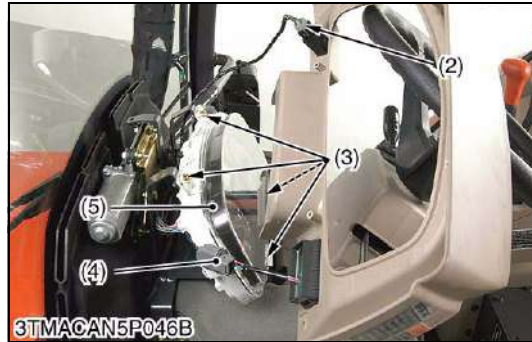
d : 8 mm dia. (0.31 in. dia.)

e : 12 mm (0.47 in.)

W1054050



(7) Wiper Motor



Front Wiper Motor

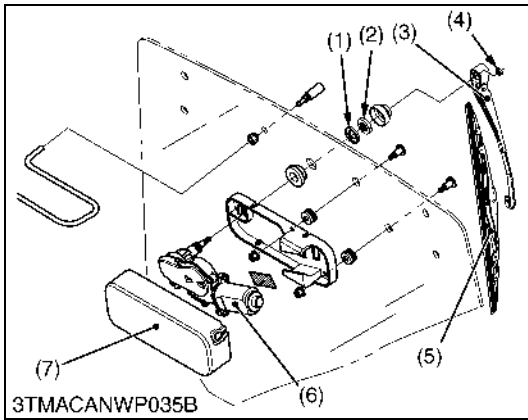
1. Remove the panel cover (1).
2. Disconnect the **5P** connector (2) from hazard switch.
3. Disconnect the **3P** connector (4) from display switch.
4. Remove the meter panel (5) mounting screw (3).
5. Disconnect the **40P** connector (6) from meter panel (5) and remove the meter panel (5).
6. Disconnect the **4P** connector (14) from front wiper motor (12).
7. Remove the wiper arm mounting nut (11) and wiper arm (7).
8. Remove the wiper link cap (10) and nut (9).
9. Disconnect the earth lead setting screw.
10. Remove the front wiper motor bracket (13) mounting screws (15), then take out the front wiper motor (12).

(When reassembling)

Tightening torque	Wiper arm mounting nut	6.3 to 9.3 N·m 0.7 to 1.0 kgf·m 5.0 to 6.9 lbf·ft

(1) Panel Cover	(9) Nut
(2) 5P Connector (Hazard Switch)	(10) Wiper Link Cap
(3) Screw	(11) Nut
(4) 3P Connector (Display Switch)	(12) Wiper Motor
(5) Meter Panel	(13) Wiper Motor Bracket
(6) 40P Connector (Meter Panel)	(14) 4P Connector (Wiper Motor)
(7) Wiper Arm	(15) Screw
(8) Wiper Blade	

W1036304



Rear Wiper Motor (If equipped)

1. Remove the wiper motor cover (7).
2. Disconnect the **4P** connector from rear wiper motor.
3. Remove the wiper arm mounting nut (4) and wiper arm (5).
4. Remove the wiper link cap (1) and nut (2).
5. Remove the rear wiper motor mounting screws, then take out the rear wiper motor (6).

Tightening torque	Wiper arm mounting nut	7.9 to 9.3 N·m 0.8 to 1.0 kgf·m 5.8 to 6.9 lbf·ft
	Wiper motor mounting screw	7.9 to 9.3 N·m 0.8 to 1.0 kgf·m 5.8 to 6.9 lbf·ft

- (1) Wiper Link Cap
(2) Nut
(3) Wiper Arm
(4) Nut

- (5) Wiper Blade
(6) Rear Wiper Motor
(7) Wiper Motor Cover

W1031819

[3] SERVICING



Adjustment of Air Gap

1. Measure the air gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim (3) is added or deleted.

Air gap (L)	Factory spec.	0.30 to 0.65 mm 0.0118 to 0.0255 in.

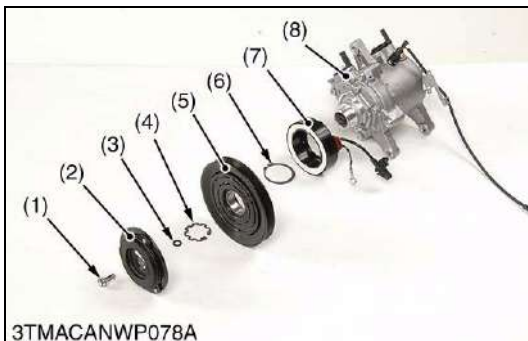
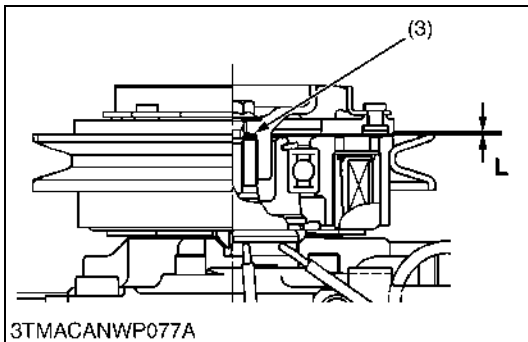
(Reference)

Adjusting Shim Size	Code No.
0.10 mm (0.0039 in.)	T1065-87340
0.15 mm (0.0059 in.)	T1065-87350
0.40 mm (0.016 in.)	T1065-87360
0.60 mm (0.024 in.)	T1065-87370
1.0 mm (0.0394 in.)	T1065-87380

- (1) Magnetic Clutch Mounting Screw
(2) Hub Plate
(3) Shim
(4) External Snap Ring
(5) Rotor

- (6) External Snap Ring
(7) Stator
(8) Compressor Body

L : Air Gap



W1060178

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