



WORKSHOP MANUAL

TRACTOR

MX5000

Kubota

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of KUBOTA Tractor MX5000. It is divided into two parts, "Mechanism" and "Servicing" for each section except "Engine Mechanism" section.

■ Mechanism

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

■ Servicing

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

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

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

December 2001

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SAFETY FIRST

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

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



DANGER

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



WARNING

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



CAUTION

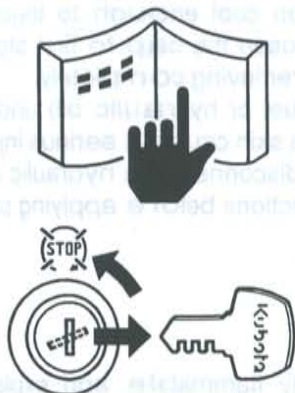
: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

■ IMPORTANT

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

■ NOTE

: Gives helpful information.



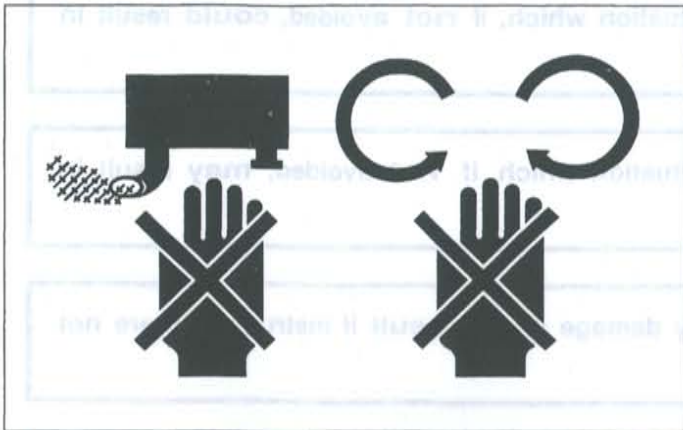
BEFORE SERVICING AND REPAIRING

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



SAFETY STARTING

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



SAFETY WORKING

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



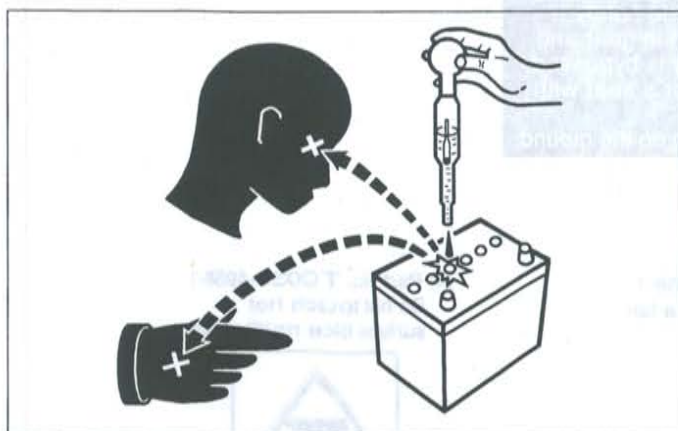
AVOID FIRES

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



VENTILATE WORK AREA

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



PREVENT ACID BURNS

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



DISPOSE OF FLUIDS PROPERLY

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



PREPARE FOR EMERGENCIES

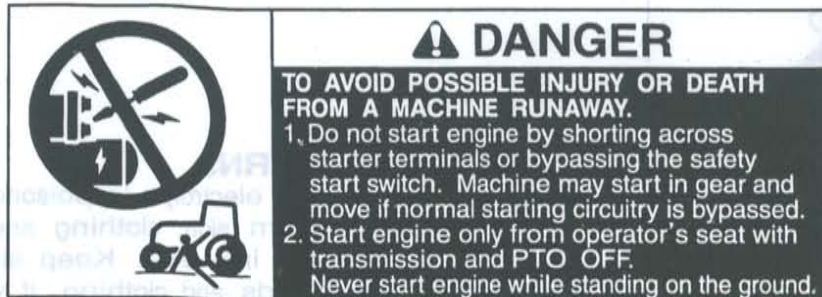
- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

SAFETY DECALS

The following safety decals are installed on the machine.

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

(1) Part No. TA040-4965-2



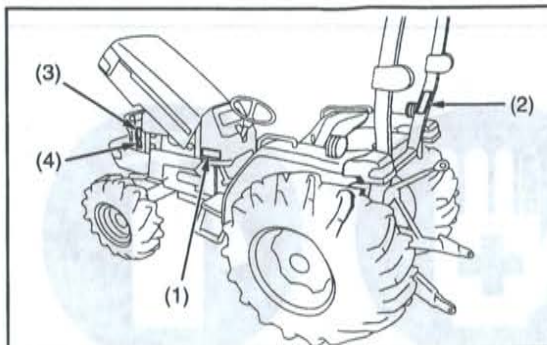
(2) Part No. 3A111-9554-1



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



(4) Part No. TC030-4958-1
Do not touch hot surface like muffler, etc.



(1) Part No. 35260-3491-3

CAUTION**TO AVOID PERSONAL INJURY:**

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

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



(2) Part No. TA240-9848-1

**WARNING****TO AVOID INJURY OR DEATH FROM ROLL-OVER :**

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

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

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

(5) Part No. TA040-4956-1
Diesel fuel only No fire



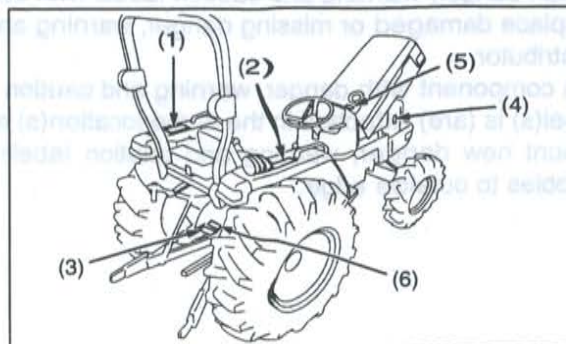
(3) Part No. TA040-4959-3

**WARNING****TO AVOID PERSONAL INJURY:**











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

WARNING**TO AVOID PERSONAL INJURY:**

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



(1) Part No. TC030-3012-1

 RECYCLE AMP. HR (20HR) 55 RESERVE CAPACITY (MIN) 133 COLD CRANKING AMPS (-18°C) 582	 FLAMMABLES  SHIELD EYES  KEEP OUT OF THE REACH OF CHILDREN  CAUTIONS OF SULFURIC ACID  READ INSTRUCTION MANUAL CAREFULLY  EXPLOSIVE	HYDROMETER  OK  CHARGE BATTERY  REPLACE BATTERY DK80959
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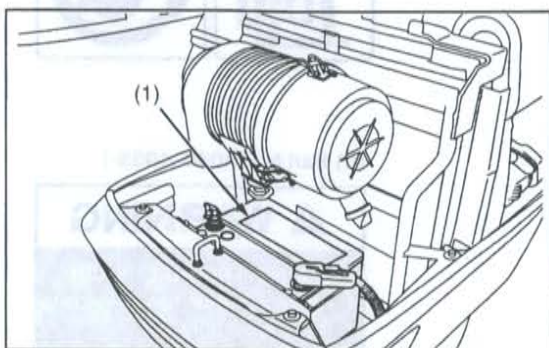
• DUE TO HYDROGEN GAS GENERATED FROM BATTERY, HANDLING WITHOUT CARE CAN CAUSE FIRE AND EXPLOSION.
 • THIS 12V BATTERY ONLY FOR STARTING ENGINE. DO NOT APPLY THIS PRODUCT FOR OTHER USES.
 • CHANGE THIS BATTERY ONLY AT WELL VENTILATED PLACES, AND AVOID SHORTS OR SPARKS.
 • REFER TO THE INSTRUCTION MANUAL OF VEHICLE OR BATTERY BEFORE USING BOOSTER CABLE.
 • SULFURIC ACID MAY CAUSE BLINDNESS OR SEVERE BURN. IN CASE EYES, SKIN, CLOTHES OR ANY ARTICLES ARE STAINED WITH ACID, FLUSH OBJECTS IMMEDIATELY WITH WATER. IF ACID BEING SWALLOWED, DRINK PLENTY OF WATER PROMPTLY. IN CASE OF ACCIDENTAL CONTACT, CONSULT A DOCTOR IMMEDIATELY.
 • BATTERY FILLED WITH ACID (DO NOT TILT OR SPILL) • FLAMMABLE DO NOT CHARGE NEAR FIRE OR SPARKS
 • DO NOT CHARGE RAPIDLY • DO NOT DISASSEMBLE THE BATTERY (SEALED TYPE)

NX110-5LMF**80D26L**
 FITTING DATE 0 1 2 3 4 5 6 7 8 9 YEAR
 1 2 3 4 5 6 7 8 9 10 11 12 MONTH
DANGER EXPLOSIVE GASES

Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and training.

POISON CAUSES SEVERE BURNS

Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.

KEEP OUT OF REACH OF CHILDREN**CARE OF DANGER, WARNING AND CAUTION LABELS**

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

SPECIFICATIONS

Model			MX5000	
			2WD	4WD
Engine	Model		V2403-M-EA	
	Type		E-TVCS Indirect injection, liquid cooled diesel	
	No. of cylinders		4	
	Total displacement		2.434 L (148.5 cu.in.)	
	Bore and stroke		87 × 102.4 mm (3.4 × 4.0 in.)	
	Net power		37.3 kW (50 HP)*	
	PTO power (factory observed)		32.8 kW (44 HP)* / 2700 min ⁻¹ (rpm)	
	Maximum torque		162.7 N·m (120.0 ft-lbs)	
	Battery capacity		12 V, 55 Ah, CCA : 582 A	
	Fuel		Diesel fuel No. 1 [below –10 °C (14 °F)] Diesel fuel No. 2 [above –10 °C (14 °F)]	
Capacities	Fuel tank		50 L (13.2 U.S.gals.)	
	Engine crankcase (with filter)		7.6 L (8.0 U.S.qts.)	
	Engine coolant		7.5 L (7.9 U.S.qts.)	
	Transmission case		44.0 L (11.6 U.S.gals.)	
Dimensions	Overall length (without 3P)		3155 mm (124.2 in.)	3095 mm (121.9 in.)
	Overall width (min. tread)		1770 mm (69.7 in.)	
	Overall height (with ROPS)		2365 mm (93.1 in.)	
	Wheel base		1875 mm (73.8 in.)	1895 mm (74.6 in.)
	Min. ground clearance		405 mm (15.9 in.)	385 mm (15.2 in.)
	Tread	Front	1230 mm (48.4 in.), 1330 mm (52.4 in.) 1430 mm (56.3 in.), 1530 mm (60.2 in.)	1325 mm (52.2 in.)
		Rear	1375 mm (54.1 in.), 1490 mm (58.7 in.)	
Weight (with ROPS)			1490 kg (3285 lbs)	1614 kg (3560 lbs)
Travelling system	Standard tire size	Front	7.5L-15	9.5-16
		Rear	14.9-26	
	Clutch		Dry type single stage	
	Steering		Hydrostatic power steering	
	Transmission		Gear shift, 8 forward and 4 reverse	
	Braking system		Wet disk type	
	Min. turning radius (with brake)		2.6 m (8.5 feet)	2.7 m (8.9 feet)
Hydraulic unit	Hydraulic control system		Position control (standard), Draft (Option)	
	Pump capacity		34.9 L (9.2 U.S.gals.)	
	Three point hitch		SAE Category I & II	
	Max. lift force	At lift points	1300 kg (2870 lbs)	
		24 in. behind lift points	1050 kg (2310 lbs)	
	System pressure		17.1 MPa (175 kgf/cm ²)	
PTO	Rear PTO		SAE 1-3/8, 6 splines	
	PTO / Engine speed		540 / 2700 min ⁻¹ (rpm)	

NOTE: *Manufacturer's estimate

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

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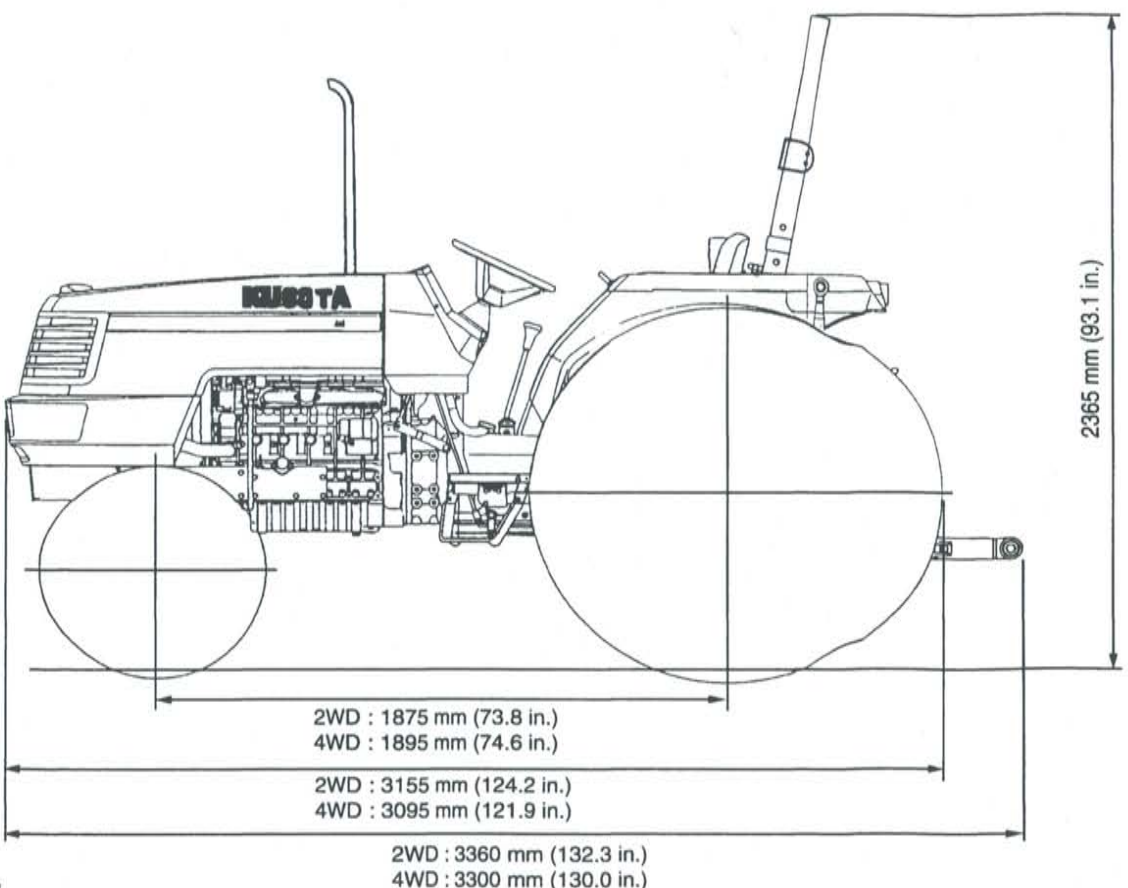
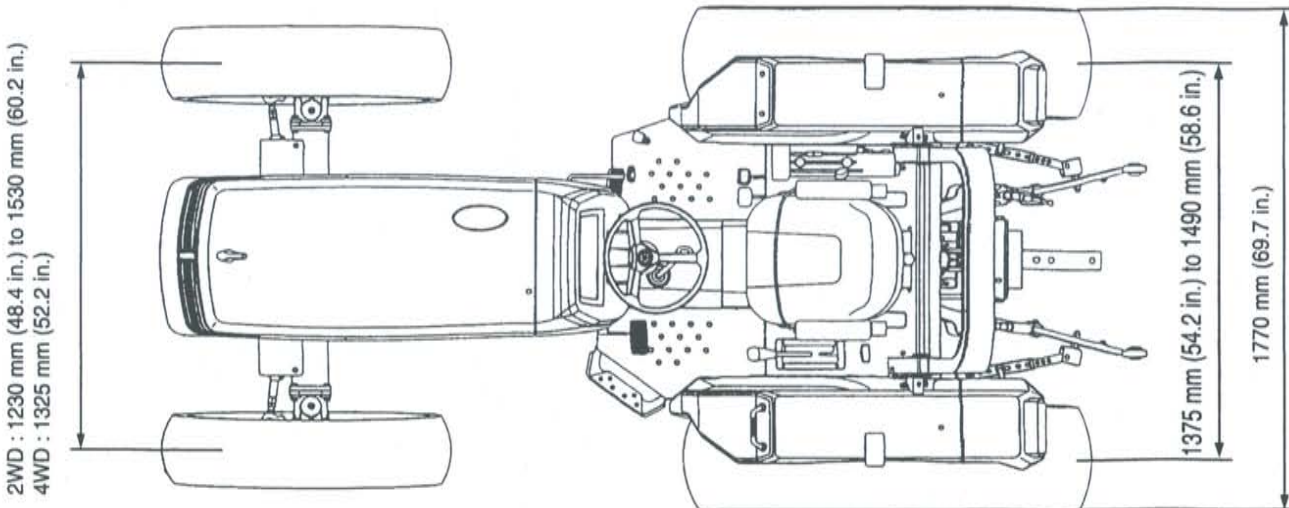
TRAVELLING SPEEDS

Model		MX5000	
Tire size (Rear)		14.9-26 / 13.6-28	
	Range gear shift lever	Main gear shift lever	km/h (mph)
Forward	L	1	2.0 (1.2)
		2	2.9 (1.8)
		3	4.7 (2.9)
		4	6.9 (4.3)
	H	1	7.8 (4.8)
		2	11.0 (6.8)
		3	17.9 (11.1)
		4	26.4 (16.4)
Reverse	R	1	2.8 (1.7)
		2	3.9 (2.4)
		3	6.3 (3.9)
		4	9.3 (5.8)

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

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DIMENSIONS



T12920ZZ00701

G GENERAL

GENERAL

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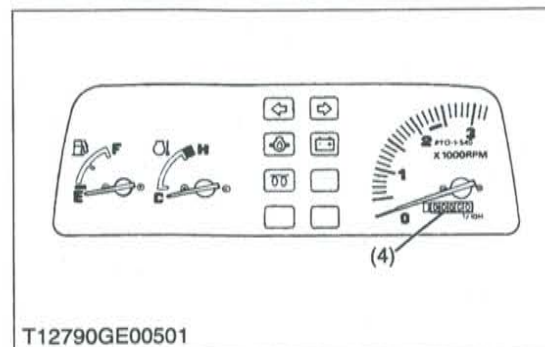
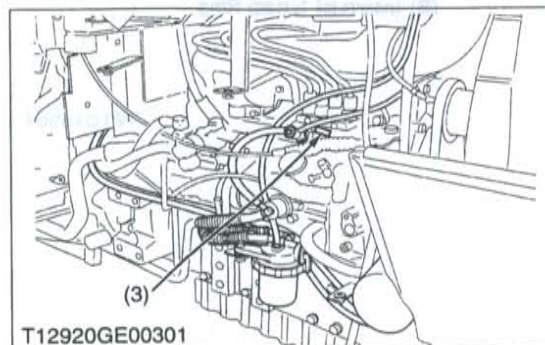
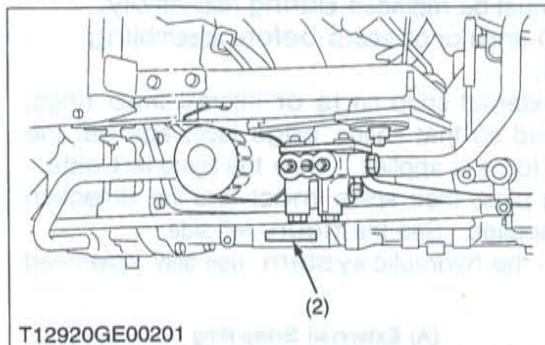
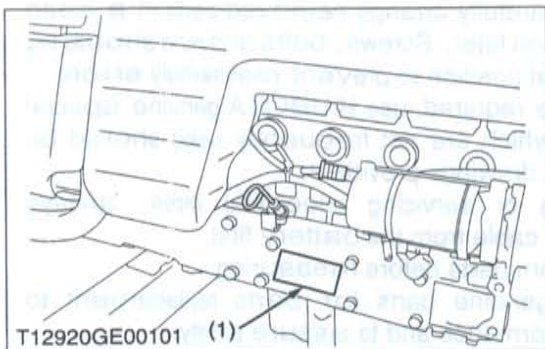
1. TRACTOR IDENTIFICATION

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

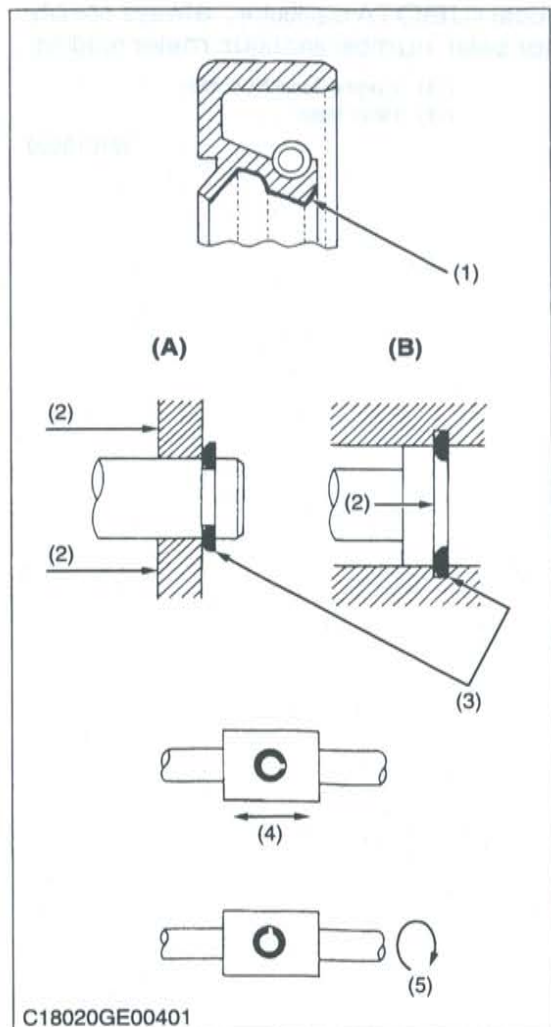
- (1) Tractor Identification Plate
- (2) Tractor Serial Number

- (3) Engine Serial Number
- (4) Hour Meter

W1010600



2. GENERAL PRECAUTIONS



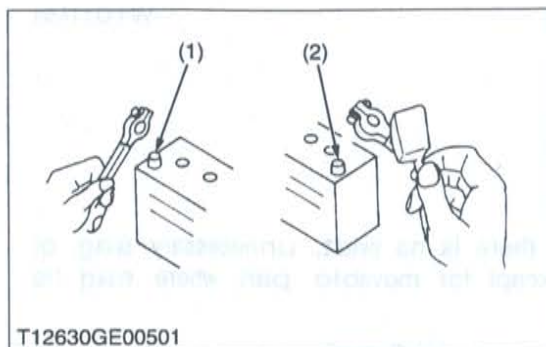
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

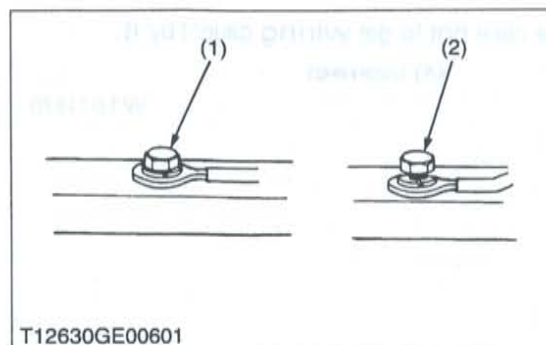
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

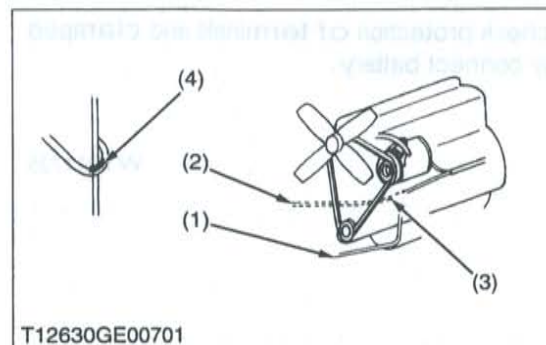


- Securely tighten wiring terminals.

(1) Correct
(Securely Tighten)

(2) Incorrect
(Loosening Leads to Faulty Contact)

W1011216

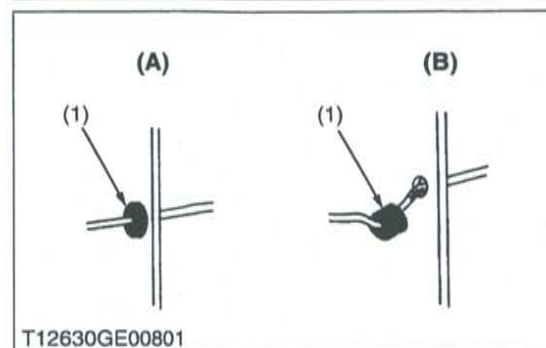


- Do not let wiring contact dangerous part.

(1) Wiring (Correct)
(2) Wiring (Incorrect)

(3) Dangerous Part
(4) Dangerous Part

W1011313

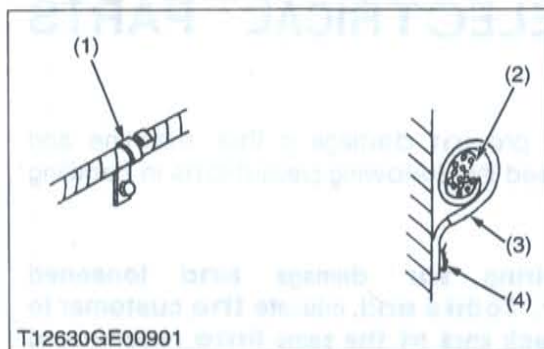


- Securely insert grommet.

(1) Grommet

(A) Correct
(B) Incorrect

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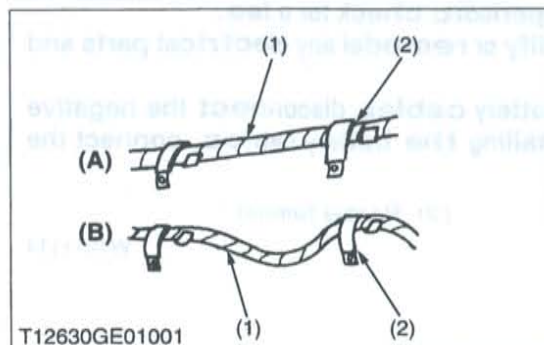


- Securely clamp, being careful not to damage wiring.

- (1) Clamp
 - Wind Clamp Spirally
- (2) Wire Harness

- (3) Clamp
- (4) Welding Dent

W1011458

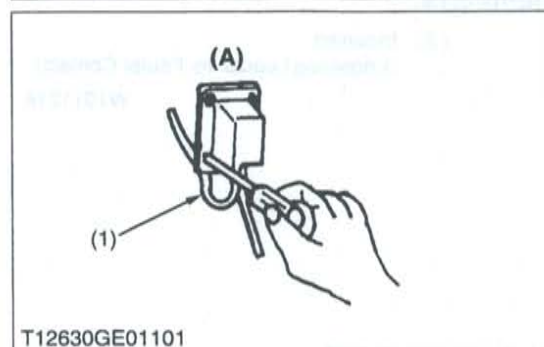


- Clamp wiring so that there is no twist, unnecessary sag, or excessive tension, except for movable part, where sag be required.

- (1) Wiring
- (2) Clamp

- (A) Correct
- (B) Incorrect

W1011587

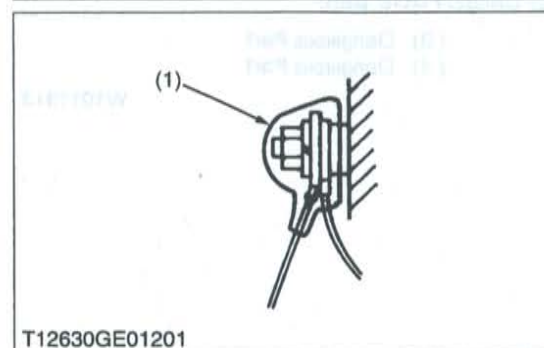


- In installing a part, take care not to get wiring caught by it.

- (1) Wiring

- (A) Incorrect

W1011670

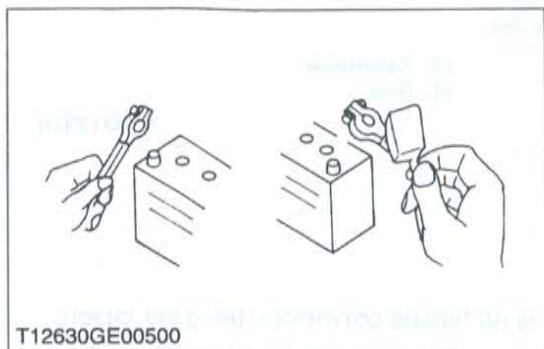


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
 - Securely Install Cover

W1011735

[2] BATTERY



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

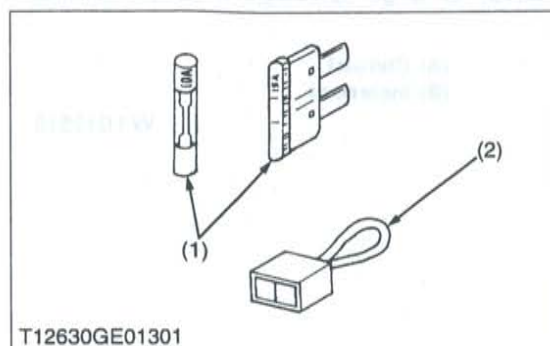


CAUTION

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

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[3] FUSE



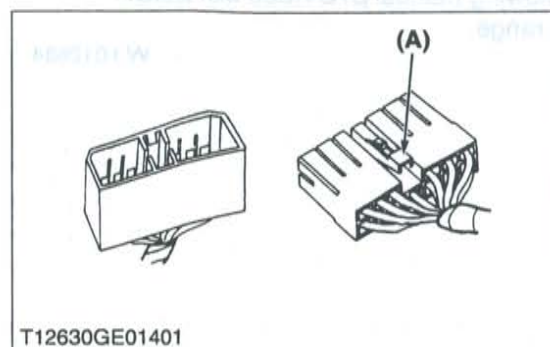
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Slow Blow Fuse

W1012092

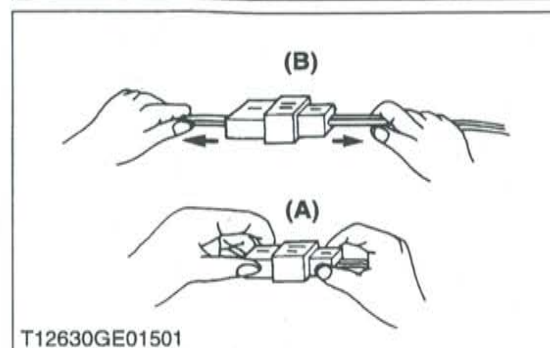
[4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

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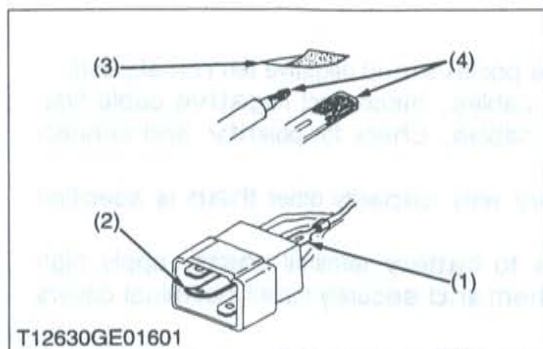


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

W1012272

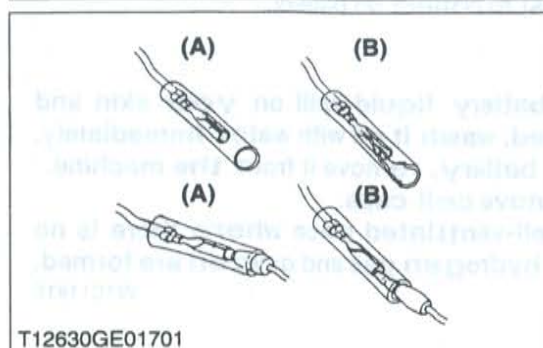


- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make certain there is no terminal being exposed or displaced.

(1) Exposed Terminal
(2) Deformed Terminal

(3) Sandpaper
(4) Rust

W1012346

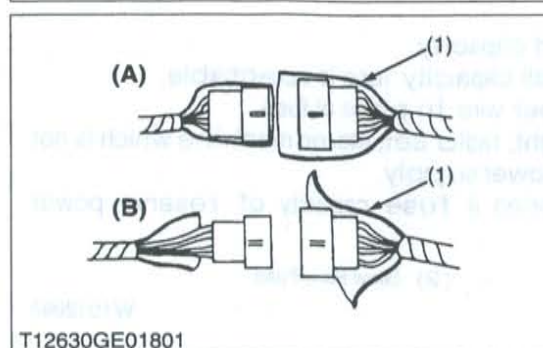


- Make certain that there is no female connector being too open.

(A) Correct

(B) Incorrect

W1012430



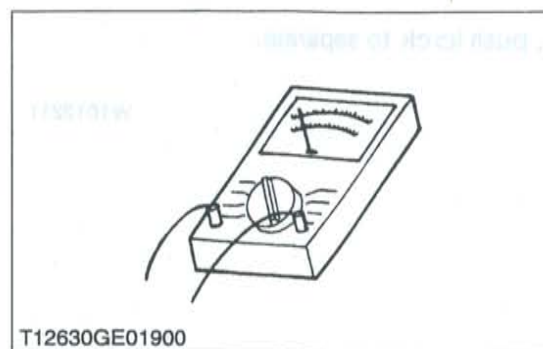
- Make certain plastic cover is large enough to cover whole connector.

(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	
		MX5000		
1	Fuel tank	50 L 13.2 U.S.gals. 11.0 Imp.gals.	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below -10 °C (14 °F)	
2	Cooling system with recovery tank	7.5 L 7.9 U.S.qts. 6.6 Imp.qts.	Fresh clean water with anti-freeze	
3	Engine crankcase	7.6 L 8.0 U.S.qts. 6.7 Imp.qts.	Engine oil : API service CC or CD class Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40	
4	Transmission case	44 L 11.6 U.S.gals. 9.7 Imp.gals.	KUBOTA SUPER UDT fluid*	
5	Front axle case (4WD)	7.5 L 7.9 U.S.qts. 6.6 Imp.qts.	KUBOTA SUPER UDT fluid* or SAE80, 90 gear oil	
Greasing				
	Place	No. of greasing point	Capacity	Type of grease
6	Front wheel hub (2WD)	2	Until grease overflows	Multipurpose type grease
	Knuckle shaft (2WD)	2		
	Front axle support (4WD)	2		
	Top link	1		
	Top link bracket (if equipped)	2 (with draft control)		
	Power steering cylinder	2		
	Battery terminal	2	Moderate amount	

* KUBOTA original transmission hydraulic fluid.

5. TIGHTENING TORQUES

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

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Indication on top of bolt	④ No-grade or 4T						⑦ 7T						⑨ 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
Diameter															
M6 (6 mm, 0.24 in.)	7.85 to 9.31	0.80 to 0.95	5.79 to 6.87	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8 (8 mm, 0.31 in.)	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	16.7 to 19.6	1.7 to 2.0	12.3 to 14.4	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
M10 (10 mm, 0.39 in.)	39.3 to 45.1	4.0 to 4.6	29.0 to 33.2	31.4 to 34.3	3.2 to 3.5	23.2 to 25.3	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5	60.9 to 70.6	6.2 to 7.2	44.9 to 52.0
M12 (12 mm, 0.47 in.)	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	—	—	—	77.5 to 90.2	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 86.7
M14 (14 mm, 0.55 in.)	108 to 125	11.0 to 12.8	79.6 to 92.5	—	—	—	124 to 147	12.6 to 15.0	91.2 to 108	—	—	—	167 to 196	17.0 to 20.0	123 to 144
M16 (16 mm, 0.63 in.)	167 to 191	17.0 to 19.5	123 to 141	—	—	—	197 to 225	20.0 to 23.0	145 to 166	—	—	—	260 to 304	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	246 to 284	25.0 to 29.0	181 to 209	—	—	—	275 to 318	28.0 to 32.5	203 to 235	—	—	—	344 to 402	35.0 to 41.0	254 to 296
M20 (20 mm, 0.79 in.)	334 to 392	34.0 to 40.0	246 to 289	—	—	—	368 to 431	37.5 to 44.0	272 to 318	—	—	—	491 to 568	50.0 to 58.0	362 to 419

W1034542

6. MAINTENANCE

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

■ IMPORTANT

- The jobs indicated by ★ must be done after the first 50 hours of operation.
- * : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- ** : Every year or every 6 times of cleaning.
- *** : Replace only if necessary.
- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

Please see the Warranty Statement in detail.

Service as required

W1035769

7. CHECK AND MAINTENANCE



CAUTION

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

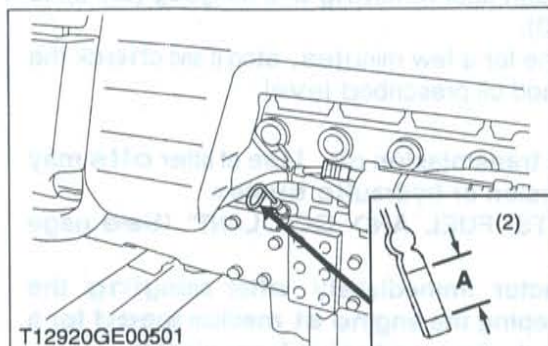
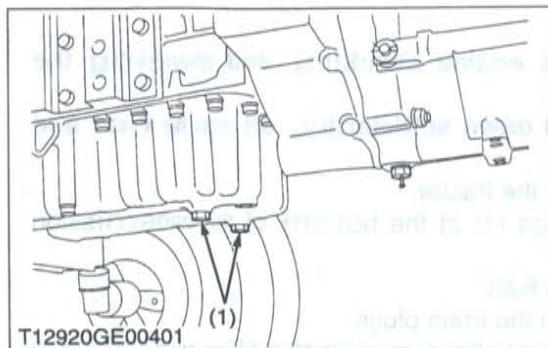
[1] DAILY CHECK

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

Checking

- Check areas where previous trouble was experienced.
 - Walk around the tractor.
1. Check the tire pressure, and check for wear and damage.
 2. Check for oil and water leak.
 3. Check the engine oil level.
 4. Check the transmission fluid level.
 5. Check the coolant level.
 6. Check the condition of seat belt and ROPS attaching hardware.
 7. Check and clean the radiator screen and grill.
 8. Check the nuts of tires are tight.
 9. Check the number plate.
 10. Care of danger, warning and caution labels.
 11. Clean around the exhaust manifold and the muffler of the engine.
- While sitting in the operator's seat.
1. Check the brake pedals and clutch pedal.
 2. Check the parking brake.
 3. Check the steering wheel.
- Turning the key switch.
1. Check the performance of the easy checker lights.
 2. Check the 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. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To drain the used oil, remove the both drain plugs (1) at the bottom of the engine and drain the oil completely.
4. Screw in the both drain plugs (1).
5. Fill new oil up to upper line on the dipstick (2).

■ IMPORTANT

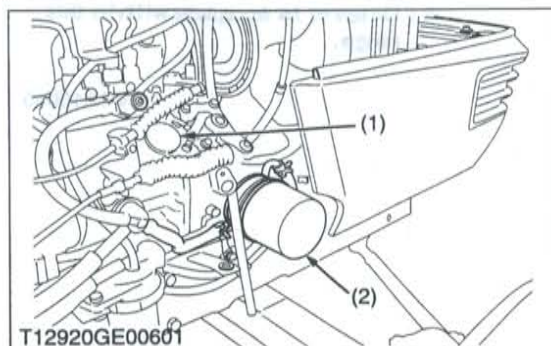
- When using an oil of different manufacture or viscosity from the previous one, remove all of the old oil.
- Never mix two different types of oil.
- Use the proper SAE Engine Oil according to ambient temperatures.
- Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)

Engine oil capacity	7.6 L 8.0 U.S.qts. 6.7 Imp.qts.
---------------------	---------------------------------------

- (1) Drain Plug
(2) Dipstick

A : Oil level is acceptable within this range.

W1014533



Replacing Engine Oil Filter Cartridge

⚠ CAUTION

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

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

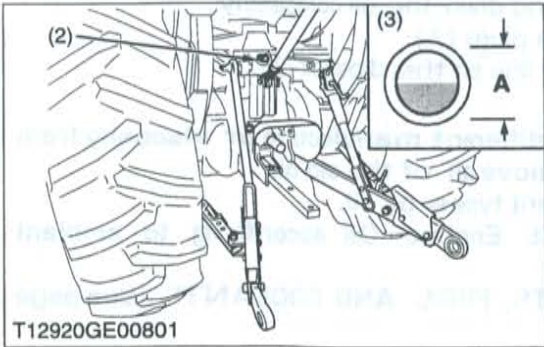
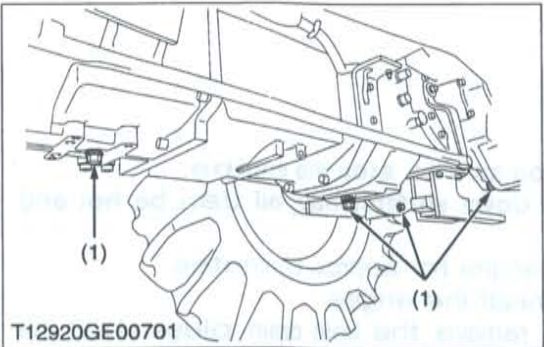
■ IMPORTANT

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

- (1) Oil Inlet

- (2) Engine Oil Filter Cartridge

W1014892



Changing Transmission Fluid

CAUTION

- Be sure to stop the engine checking and changing the transmission fluid.
 - Allow engine to cool down sufficiently, oil can be hot and can burn.
1. Place an oil pan under the tractor.
 2. Remove the drain plugs (1) at the bottom of the transmission case.
 3. Drain the transmission fluid.
 4. After draining, screw in the drain plugs.
 5. Fill new oil from filling port after removing the filling plug (2) up to the line of the gauge (3).
 6. After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

IMPORTANT

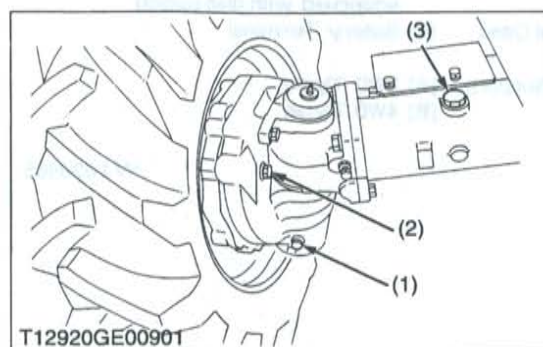
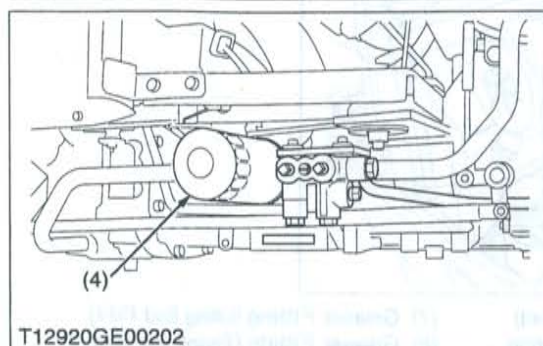
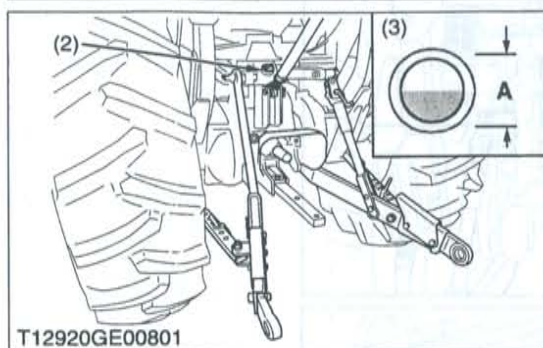
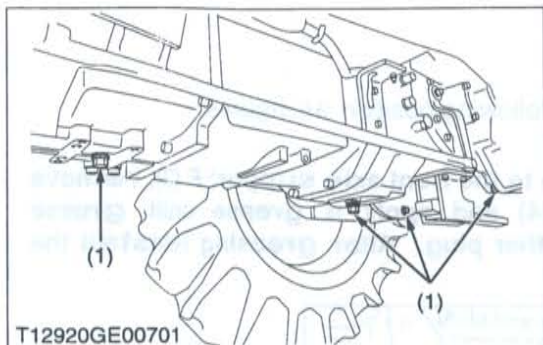
- Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevents damage to the transmission.
- Do not mix different brands oil together.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
-----------------------------	---

- (1) Drain Plug
- (2) Filling Plug
- (3) Gauge

A : Oil level is acceptable within this range.

W1015055



Replacing Hydraulic Oil Filter Cartridge

⚠ CAUTION

- Be sure to stop the engine before changing the oil filters.
 - Allow engine to cool down sufficiently, oil can be hot and can burn.
1. Place an oil pan under the tractor.
 2. Remove the drain plugs (1) at the bottom of the transmission case.
 3. Drain the transmission fluid.
 4. After draining, screw in the drain plugs.
 5. Remove the oil filter cartridge (4) by using a filter wrench.
 6. Make sure the mounting surface is clean.
Put a film of clean transmission fluid on the rubber seal of the new filter.
 7. Install the new filter cartridge.
 8. Quickly tighten the filter until it contacts the mounting surface, then tighten it by hand an additional 1/2 turn only.
 9. After the new filter have been replace, fill with oil up to the upper line of the gauge (3).
 10. After running the engine for a few minutes, stop it and recheck the oil level, add oil to the prescribed level.
 11. Make sure that the transmission fluid doesn't leak through the seal of the filter.

■ IMPORTANT

- To prevent serious damage to the hydraulic system. Use only a genuine KUBOTA filter or its equivalents.

- | | |
|------------------|--------------------------|
| (1) Drain Plug | (3) Gauge |
| (2) Filling Plug | (4) Hydraulic Oil Filter |

W1015586

Changing Front Axle Case Oil [4WD Type]

1. Place the oil pans underneath the front axle case.
2. Remove the drain plug (1) both sides and filling port plug (3) to drain the oil.
3. After draining, reinstall the drain plug.
4. Remove the oil level check plug (2).
5. Fill with the new oil up to the check plug (2) port.
6. After filling, reinstall the check plug (2) and filling port plug.

■ IMPORTANT

- Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil.
Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)

Front axle case oil capacity

7.5 L
7.9 U.S.qts.
6.6 Imp.qts.

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

W1030064

Adjusting Brake Pedal Free Travel

1. Refer to page G-18.

W1029335

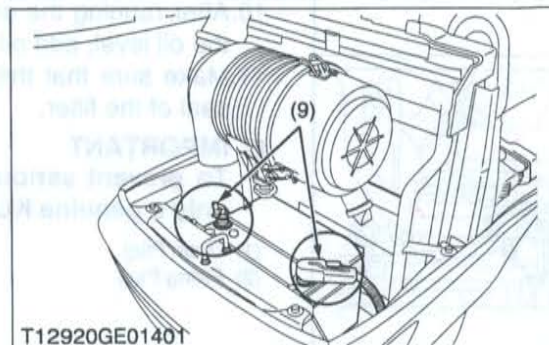
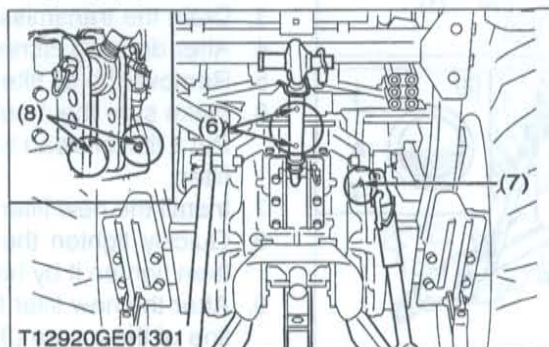
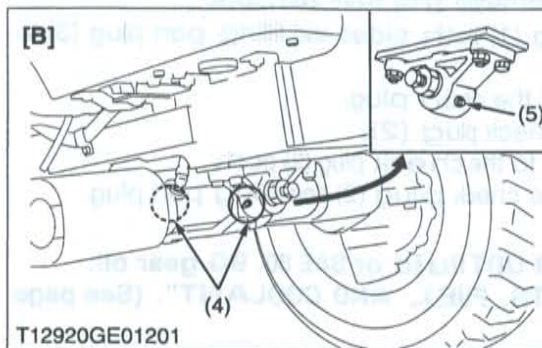
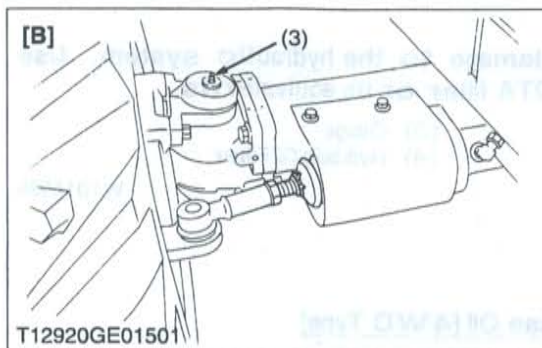
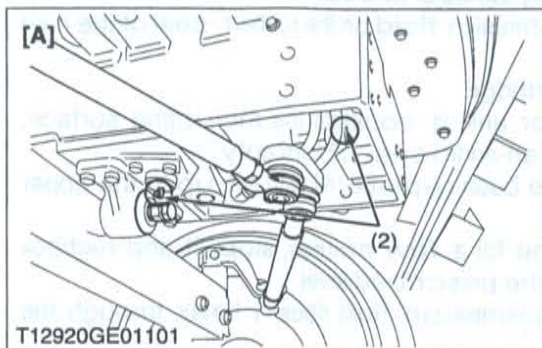
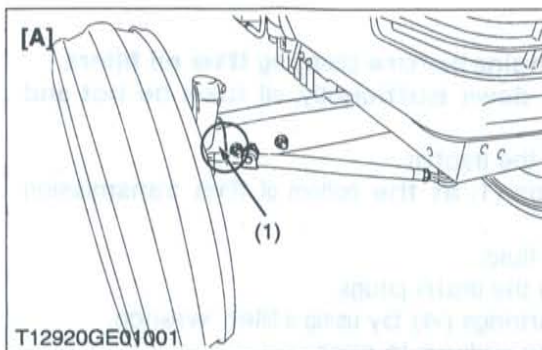
[3] CHECK POINTS OF EVERY 50 HOURS

Greasing

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

■ NOTE

- When apply a grease to the front axle support F (3), remove the breather plug (4) and apply a grease until grease overflows from breather plug. After greasing reinstall the plug (4).

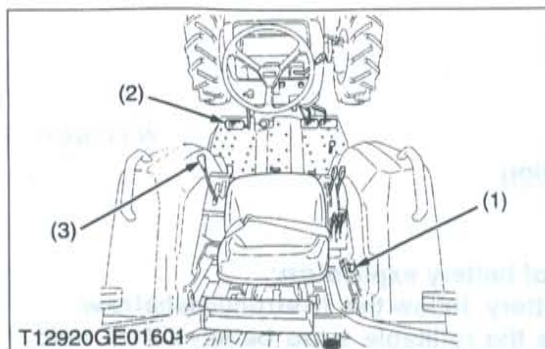


- | | |
|--|--|
| (1) Grease Fitting (Knuckle Shaft) | (7) Grease Fitting (Lifting Rod RH) |
| (2) Grease Fitting (Power Steering Cylinder) | (8) Grease Fitting (Toplink bracket, if equipped with draft control) |
| (3) Grease Fitting (Front Wheel Case Support RH, LH) | (9) Battery Terminal |
| (4) Grease Fitting (Front Axle Support) | |
| (5) Breather Plug | |
| (6) Grease Fitting (Top Link) | |

[A] 2WD Type

[B] 4WD Type

W1030865



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 PTO clutch control lever.

1. Sit on operator's seat.
2. Engage the PTO clutch control lever.
3. Depress the clutch pedal fully.
4. Shift the range gear shift lever to the neutral position.
5. Turn the key to "START" position.
6. The engine must not crank.

■ Test 2 : Switch for the shuttle shift lever.

1. Sit on operator's seat.
2. Disengage the PTO clutch control lever.
3. Depress the clutch pedal fully.
4. Shift the range gear shift lever to the desired position.
5. Turn the key to "START" position.
6. The engine must not crank.

■ If crank any test of the above, adjust or replace the required safety switch.

• Test 1

1. Disengage the PTO clutch control lever.
2. Turn the key to "START" position.
3. The engine should crank.

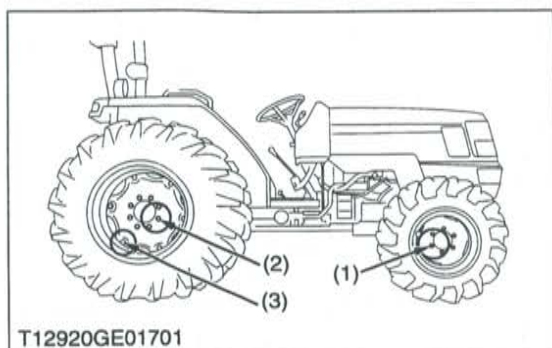
• Test 2

1. Shift the range gear shift lever to the neutral position.
2. Turn the key to "START" position.
3. The engine should crank.

■ If it does not crank during step 3 of Test 1 or Test 2, adjust or replace the required safety switch.

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

W1031201



Checking Wheel Mounting Screws and Nuts Tightening Torque

⚠ CAUTION

- Never operate tractor with a loose rim, wheel, or axle.
1. Check the tightening torque of wheel mounting screws and nuts all.

Tightening torque	Front wheel mounting nuts (2WD)	137 N·m 14 kgf·m 100 ft-lbs
	Front wheel mounting nuts (4WD)	172 N·m 17 kgf·m 123 ft-lbs
	Rear wheel mounting screws and nuts	215 N·m 22 kgf·m 160 ft-lbs

- (1) Front Wheel Mounting Nuts (3) Rear Wheel Rim Mounting Bolts and Nuts
(2) Rear Wheel Mounting Screws and Nuts

W1030999

[4] CHECK POINTS OF EVERY 100 HOURS

Changing Engine Oil

1. See page G-11.

W1 O32035

Checking Battery Condition



DANGER

To avoid the possibility of battery explosion:

For the refillable type battery, follow the instructions below.

- Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark.

Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.



CAUTION

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

1. Mishandling the battery shortens the service life and adds to maintenance costs.
2. The original battery is maintenance free type battery, but need some servicing.

If the battery is weak, the engine is difficult to start and the lights be dim. It is important check the battery periodically.

3. Check the battery condition by reading the indicator.

State of indicator display.

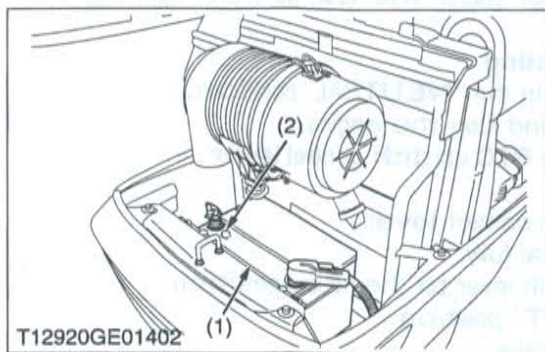
Green: Specify gravity of electrolyte and guarantity of electroly are both in good condition.

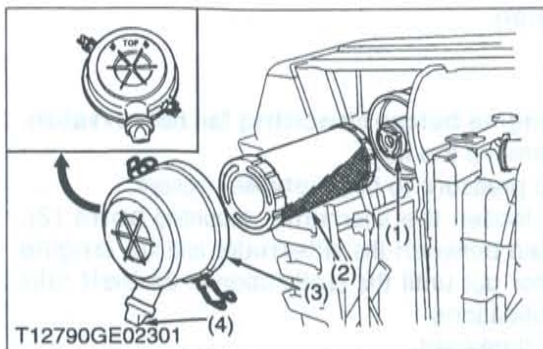
Black: Need charging battery.

White: Need charging battery.

(1) Battery

(2) Indicator





Cleaning Air Cleaner Element

1. Remove the air cleaner cover (3) and primary element (2).
2. When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 490 kPa (5 kgf/cm², 71 psi).
3. 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.

■ NOTE

- Every year or every 6 times of cleaning, replace the air cleaner primary element (2).

■ 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 cover the arrow ↑ (on the rear of cover) upright. If the cover 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.
- (See "Replacing Air Cleaner Secondary Element" in Every 1 year maintenance.)

■ Evacuator Valve

Open the 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.

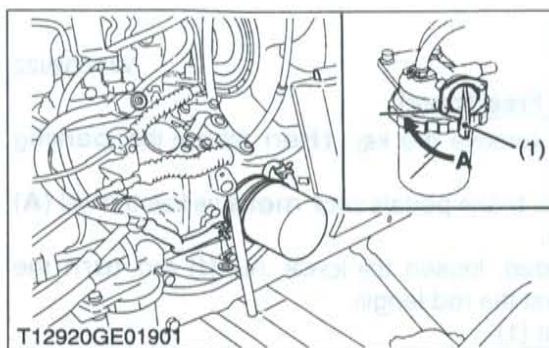
(1) Secondary Element

(2) Primary Element

(3) Cover

(4) Evacuator Valve

W1032216



Cleaning Fuel Filter Element and Filter Bowl

1. Close the fuel filter cock (1).
2. Unscrew the retainer ring (3) and remove the filter bowl (2), and rinse the inside with kerosene.
3. Take out the element (4) and dip it in the kerosene to rinse.
4. After cleaning, reassemble the fuel filter, keeping out dust and dirt.
5. Bleed the fuel system. (See page G-27.)

■ IMPORTANT

- This job should not be done in the field, but in a clean place.
 - If dust and dirt enter the fuel, the fuel pump and injection nozzles are subject to quick wear.
- To prevent this, be sure to clean the fuel filter bowl periodically.

(1) Fuel Filter Cock

(2) Filter Bowl

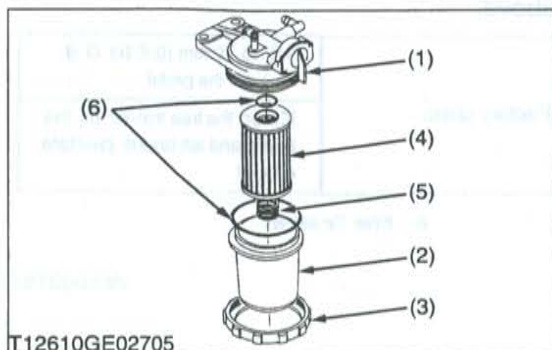
(3) Retainer Ring

(4) Filter Element

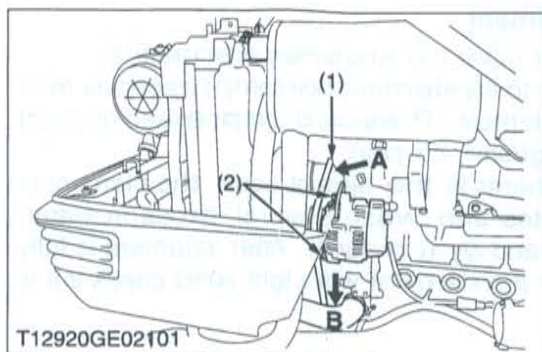
(5) Spring

(6) O-ring

A : Close



W1017467



Adjusting Fan Belt Tension

CAUTION

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

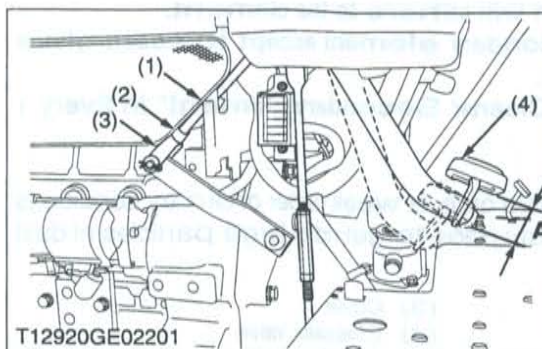
1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts (2), and using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within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

Fan belt tension	Factory spec.	A deflection of between 7 to 9 mm (0.28 to 0.34 in.) when the belt is pressed in the middle of the span.
------------------	---------------	--

- (1) Check Part of Belt Tension
- (2) Alternator Mounting Bolt

A : To Tighten the Fan Belt

W1032627



Adjusting Clutch Pedal Free Travel

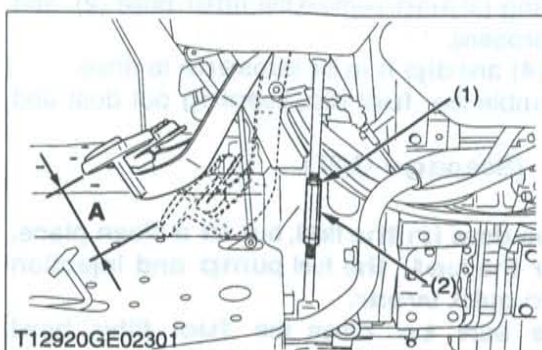
1. Stop the engine and remove the key.
2. Slightly depress the clutch pedal (4) and measure free travel (A) at top of pedal stroke.
3. If adjustment is needed, loosen the lock nut (2), remove the clevis pin (3) and adjust the clutch rod (1) length.
4. Retighten the lock nut (2) and split the cotter pin.

Clutch pedal free travel	Factory spec.	20 to 30 mm (0.8 to 1.2 in.) on the pedal
--------------------------	---------------	---

- (1) Clutch Rod
- (2) Lock Nut
- (3) Clevis Pin
- (4) Clutch Pedal

A : Free Travel

W1032922



Adjusting Brake Pedal Free Travel

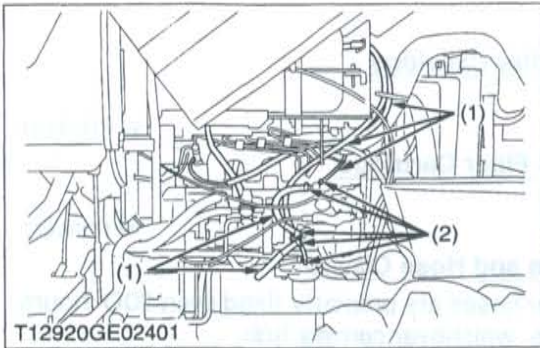
1. Stop the engine and remove the key, then release the parking brake.
2. Slightly depressed the brake pedals and measure free travel (A) at top of pedal stroke.
3. If adjustment is needed, loosen the lock nut (1) and turn the turnbuckle (2) to adjust the rod length.
4. Retighten the lock nut (1).
5. Other side same as above.

Brake pedal free travel	Factory spec.	15 to 20 mm (0.6 to 0.8 in.) on the pedal
		Keep the free travel in the right and left brake pedals equal

- (1) Lock Nut
- (2) Turnbuckle

A : Free Travel

W1033181



Checking Fuel Line

⚠ CAUTION

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

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

■ IMPORTANT

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

(1) Fuel Hose

(2) Clamp

W1034257

[5] CHECK POINTS OF EVERY 200 HOURS

Replacing Engine Oil Filter Cartridge

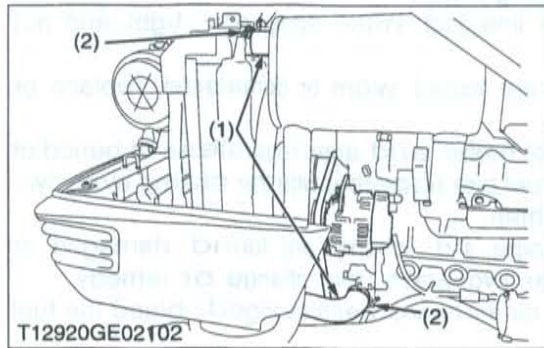
1. See page G-11.

W1034421

Replacing Hydraulic Oil Filter Cartridge

1. See page G-13.

W1034472



Checking Radiator Hose and Hose Clamp

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

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

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

■ Precaution at Overheating

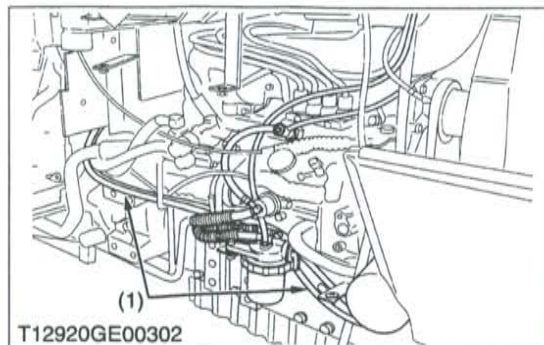
Take the following actions in the event the coolant temperature be nearly or more than the boiling point, what is called "Overheating".

1. Stop the machine operation in a safe place and keep the engine unloaded idling.
2. Don't stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see "Troubleshooting" section, and then, start again the engine.

(1) Radiator Hose

(2) Clamp

W1034737

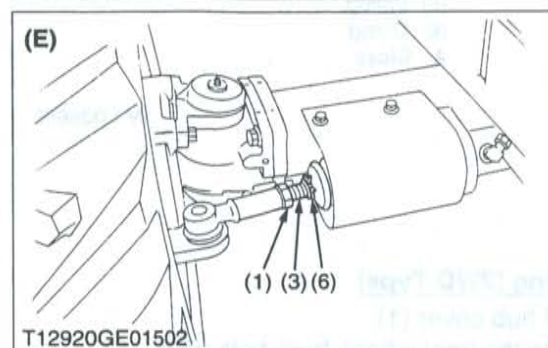
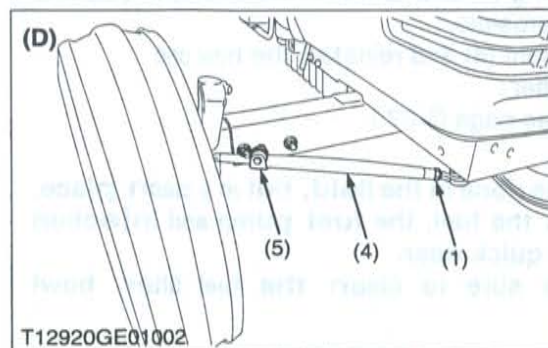
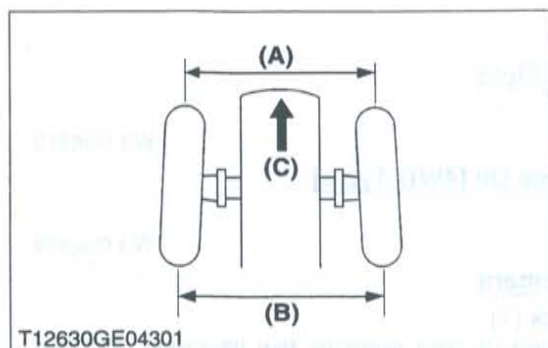


Checking Power Steering Oil Line

1. Check the power steering hydraulic hoses (1).
2. If oil leaks, retighten or replace them.

(1) Power Steering Hydraulic Hoses

W1034635



Toe-in

1. Park the tractor on the flat place.
2. Inflate the tires to the specified pressure.
3. Turn steering wheel so front wheels are in the straight ahead position.
4. Lower the implement, lock the parking brake and stop the engine.
5. Measure distance between tire beads at front of tire, hub height.
6. Measure distance between tire beads at rear of tire, hub height.
7. Front distance should be 2 to 8 mm (0.08 to 0.32 in.) less than rear distance.
8. If the measurement is not within the factory specifications, adjust by changing the tie-rod length.

Toe-in (B - A)	Factory spec.	2 to 8 mm 0.08 to 0.32 in.
----------------	---------------	-------------------------------

■ Adjusting

2WD

1. Loosen the tie-rod lock nut (1) and tie-rod mounting screw (5).
2. Turn the outer tube (4) to adjust the tie-rod length until the proper toe-in measurement is obtained.
3. Retighten the tie-rod lock nut (1) and rod mounting screw (5).

4WD

1. Detach the snap ring (6).
2. Loosen the tie-rod nut (1).
3. Turn the tie-rod joint to adjust the rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod nut (1).
5. Attach the snap ring of the tie-rod joint (3).

Tightening torque	Tie-rod lock nut	117 to 137 N·m 12 to 14 kgf·m 86.1 to 101.3 ft-lbs
-------------------	------------------	--

■ IMPORTANT

- A right and left tie-rod joint is adjusted to the same length.

- (1) Tie-rod Lock Nut
- (2) Turnbuckle
- (3) Tie-rod Joint
- (4) Outer Tube
- (5) Tie-rod Mounting Screw
- (6) Snap Ring

- (A) Wheel to Wheel Distance at front
- (B) Wheel to Wheel Distance at rear
- (C) Front
- (D) 2WD
- (E) 4WD

W1035017

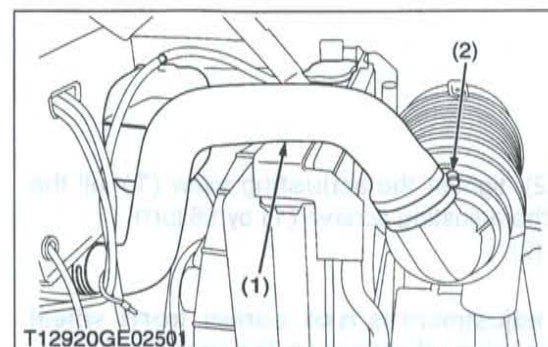
Checking Intake Air Line

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

- (1) Hose

- (2) Hose Clamp

W1034566



[6] CHECK POINTS OF EVERY 400 HOURS

Changing Transmission Fluid

1. See page G-12.

W1 036512

Changing Front Axle Case Oil [4WD Type]

1. See page G-13.

W1 036559

Replacing Fuel Filter Element

1. Close the fuel filter cock (1).
2. Unscrew the retainer ring (3) and remove the filter bowl (2) and clean the inside with kerosene.
3. Take out the filter element (4) and reinstall the new one. Reassemble the fuel filter.
4. Bleed the fuel line. (See page G-27.)

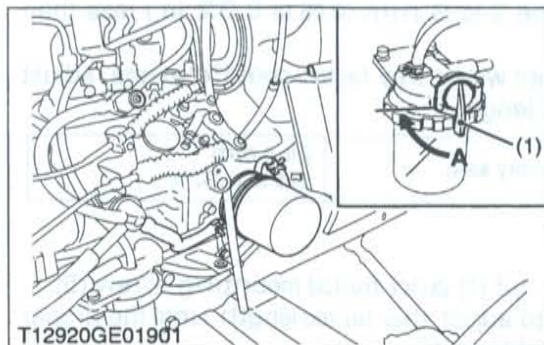
■ IMPORTANT

- This job should not be done in the field, but in a clean place.
- If dust and dirt enter the fuel, the fuel pump and injection nozzle are subject to quick wear.

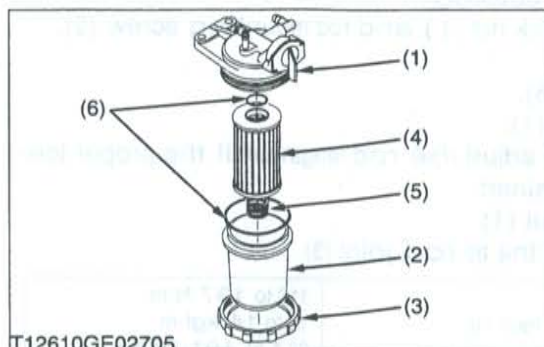
To prevent this, be sure to clean the fuel filter bowl periodically.

- | | |
|----------------------|------------|
| (1) Fuel Filter Cock | (5) Spring |
| (2) Filter Bowl | (6) O-ring |
| (3) Retainer Ring | A : Close |
| (4) Filter Element | |

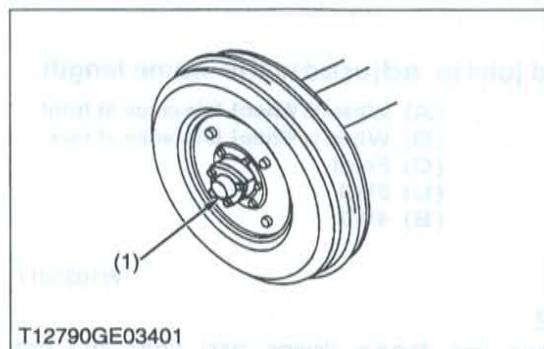
W1 036668



T12920GE01901



T12610GE02705



T12790GE03401

Front Wheel Hub Greasing [2WD Type]

1. Detach the front wheel hub cover (1).
2. Apply bearing grease to the front wheel hub both sides.

- (1) Front Wheel Hub Cover

W1 035808

[7] CHECK POINTS OF EVERY 600 HOURS

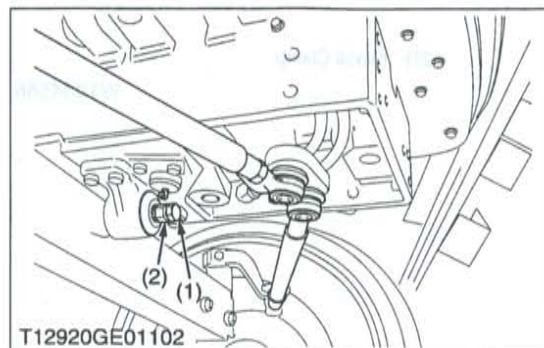
Adjust Front Axle Pivot

1. Loosen the lock nut (2), tighten the adjusting screw (1) all the way, and then loosen the adjusting screw (1) by 1/6 turn.
2. Retighten the lock nut (2).

■ NOTE

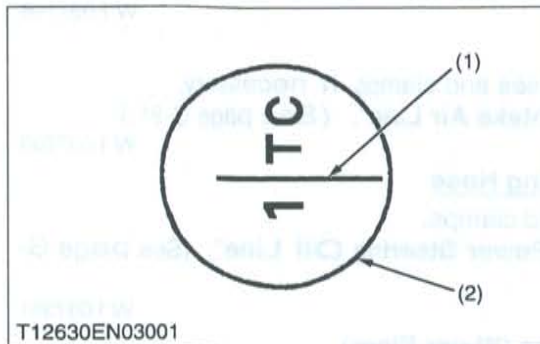
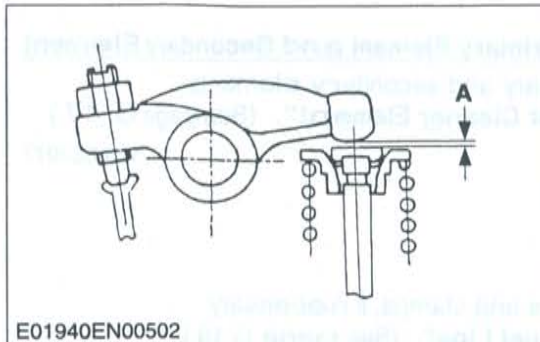
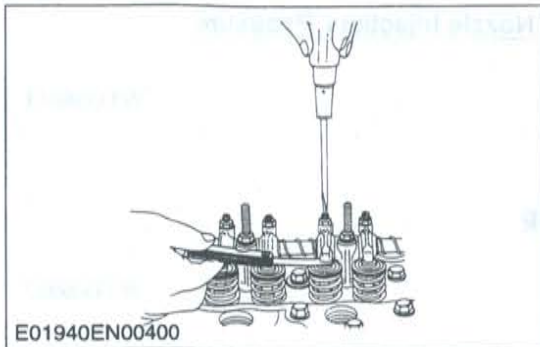
- If the axle pivot pin adjustment is not correct, front wheel vibration can occur causing vibration in the steering wheel.

- (1) Adjusting Screw
- (2) Lock Nut



T12920GE01102

[8] CHECK POINTS OF EVERY 800 HOURS



Checking Valve Clearance

■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.
- Remove the head cover, the glow plugs and the timing window cover on the clutch housing.
 - Align the "1TC" mark line on the flywheel and center of timing window so that the No. 1 piston comes to the compression or overlap top dead center.
 - Check the following valve clearance marked with "☆" using a feeler gauge.
 - If the clearance is not within the factory specifications, adjust with the adjusting screw.

Valve clearance	Factory spec.	0.18 to 0.22 mm 0.0071 to 0.0087 in.
-----------------	---------------	---

■ NOTE

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

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

- (1) TC Mark Line
(2) Timing Window

A : Valve Clearance

W1018974

[9] CHECK POINTS OF EVERY 1500 HOURS**Checking Fuel Injection Nozzle Injection Pressure**

1. See page 1-S52.

W1036874

[10] CHECK POINTS OF EVERY 3000 HOURS**Checking Injection Pump**

1. See page 1-S50.

W1036957

[11] CHECK POINTS OF EVERY 1 YEAR**Replacing Air Cleaner Primary Element and Secondary Element**

1. Replace the both primary and secondary elements.
Refer to "**Cleaning Air Cleaner Element**". (See page G-17.)

W1037077

[12] CHECK POINTS OF EVERY 2 YEARS**Replacing Fuel Hose**

1. Replace the fuel hoses and clamps, if necessary.
Refer to "**Checking Fuel Line**". (See page G-19.)

W1037148

Replacing Intake Line

1. Replace the intake hoses and clamps, if necessary.
Refer to "**Checking Intake Air Line**". (See page G-21.)

W1037203

Replacing Power Steering Hose

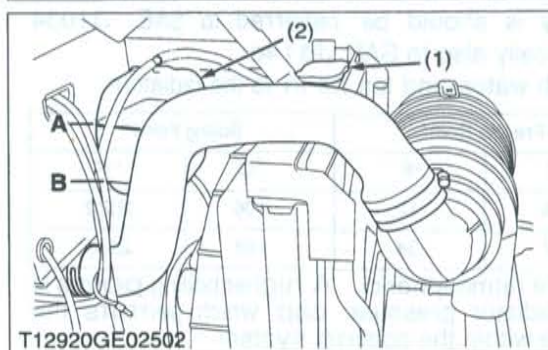
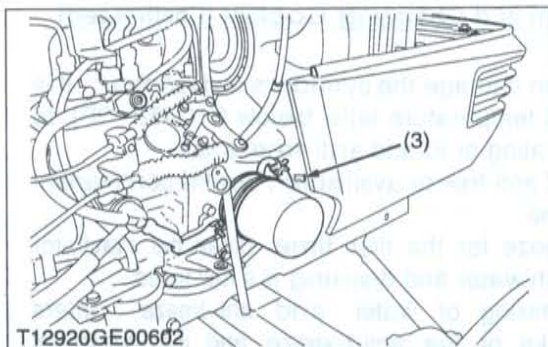
1. Replace the hoses and clamps.
Refer to "**Checking Power Steering Oil Line**". (See page G-20.)

W1037361

Replacing Radiator Hose (Water Pipes)

1. Replace the hoses and clamps.
Refer to "**Checking Radiator Hose and Hose Clamp**". (See page G-20.)

W1037429



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

IMPORTANT

- Do not start engine without coolant.
- Use clean, fresh water and anti-freeze to fill the radiator and recovery tank.
- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.
- Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.
- Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)

Coolant capacity (with recovery tank)

7.5 L
7.9 U.S.qts.
6.6 Imp.qts.

- (1) Radiator Cap
(2) Recovery Tank
(3) Drain Plug

A : FULL
B : LOW

W1037510

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

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

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

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

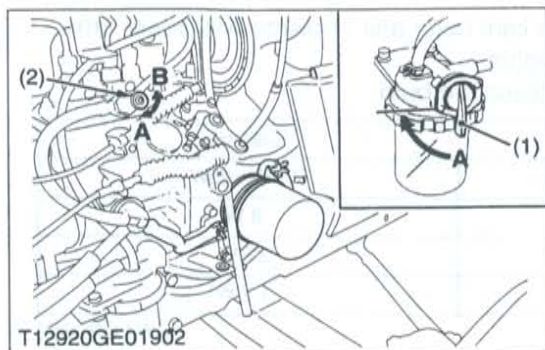
*At 760 mmHg pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

■ NOTE

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

W1038591

[13] OTHERS



Bleeding Fuel System

Air must be removed :

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

1. Fill the fuel tank with fuel, and open the fuel cock (1).
2. Open the air vent cock (2) on the fuel injection pump.
3. Start the engine and run for about 30 seconds, and then stop the engine.
4. Close the air vent cock.

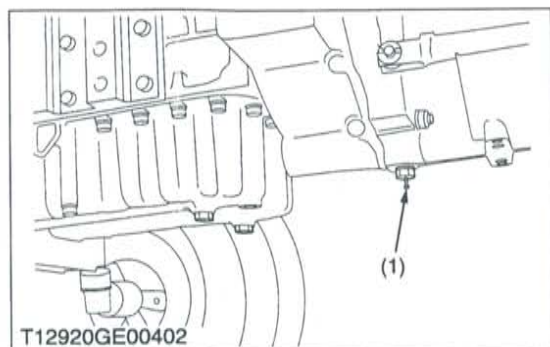
■ IMPORTANT

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

- (1) Fuel Cock
(2) Air Vent Cock

A : Close
B : Open

W1039026



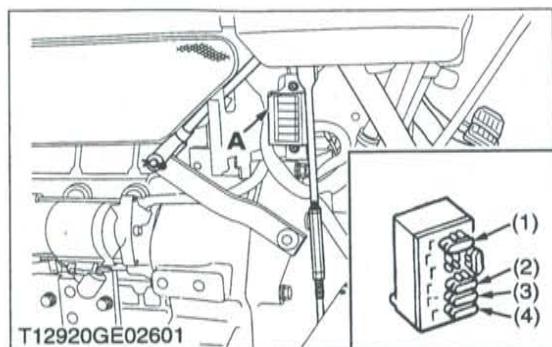
Draining Clutch Housing Water

■ NOTE

- The tractor is equipped with split pin plug (1) under the clutch housing.
 - After operating in rain, snow or tractor has been washed, water may get into the clutch housing.
1. Check it by pushing in the split pin (1).
 2. If water enters into the clutch housing, remove the plug (1) and drain the water, then reinstall the plug.

- (1) Split Pin (Plug)

W1039199



Replacing Fuse

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

■ IMPORTANT

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

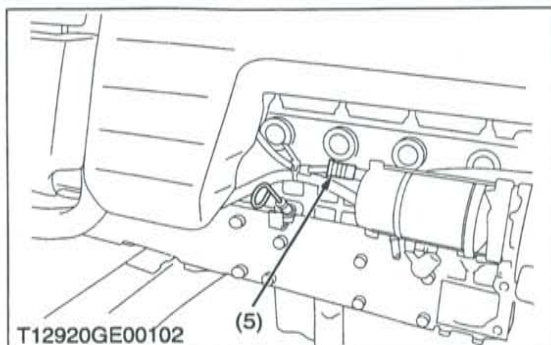
If any of them should blow, replace with a new one of the same capacity.

■ Protected Circuit

Fuse No.	Capacity (A)	Protected circuit
1	10	Turn Signal / Hazard Light
2	10	Working Light
3	10	Regulator, Meter
4	15	Head Light, Tail Light
5	Slow blow fuse 40 A	Check circuit against wrong battery connection.

(A) Fuse Box

W1039315



Replacing Light Bulb

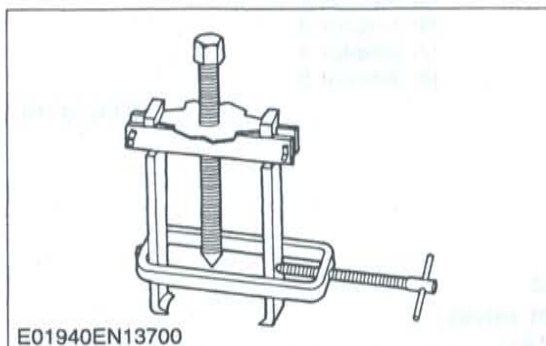
1. Rear combination lights :
Take the bulb out of the light body and replace with a new one.
2. Head lights and Other lights :
Detach the lens and replace the bulb.

Light	Capacity
Head light	25 W / 25W
Tail light	8 W
Turn signal / Hazard light	27 W
Instrument panel light	1.7 W

W1039659

8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE

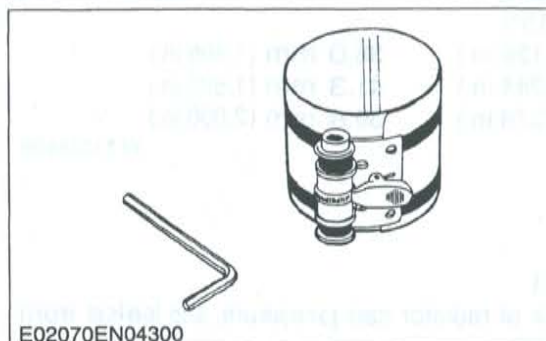


Special Use Puller Set

Code No: 07916-09032

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

W1024050

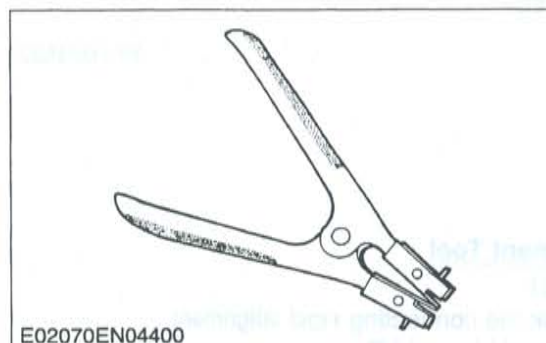


Piston Ring Compressor

Code No: 07909-32111

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

W1024100

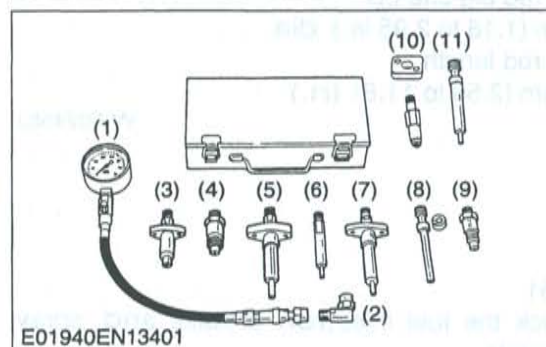


Piston Ring Tool

Code No: 07909-32121

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

W1024150



Diesel Engine Compression Tester

Code No: 07909-30208 (Assembly) 07909-31251 (G)

07909-30934 (A to F) 07909-31271 (I)

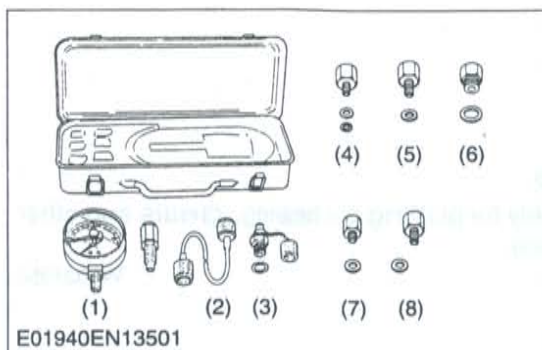
07909-31211 (E and F) 07909-31281 (J)

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 | |

W1024200

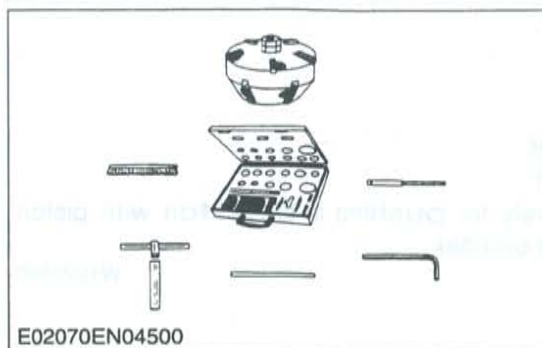
**Oil Pressure Tester**

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 |

W1 O24318

**Valve Seat Cutter**

Code No: 07909-33102

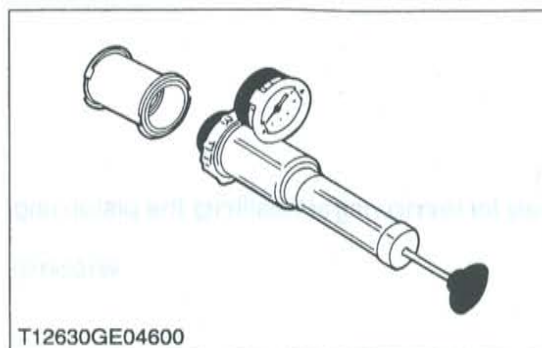
Application: Use to reseal valves.

Angle: 0.785 rad. (45°)

0.262 rad. (15°)

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

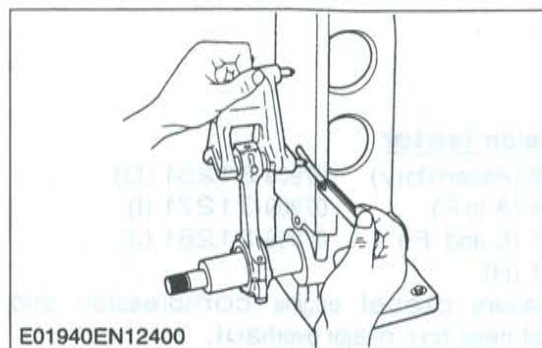
W1 O24458

**Radiator Tester**

Code No: 07909-31551

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

W1 O24532

**Connecting Rod Alignment Tool**

Code No: 07909-31661

Application: Use to check the connecting rod alignment.

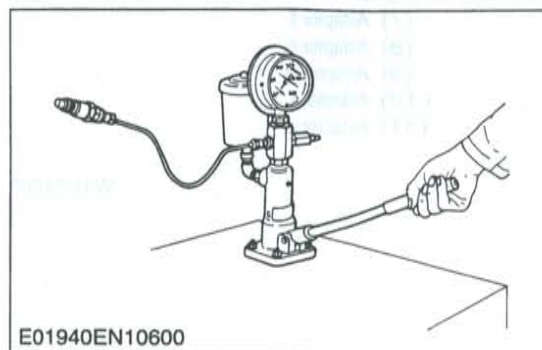
Applicable: Connecting rod big end I.D.

range 30 to 75 mm (1.18 to 2.95 in.) dia.

Connecting rod length

65 to 300 mm (2.56 to 11.81 in.)

W1 O24583

**Nozzle Tester**

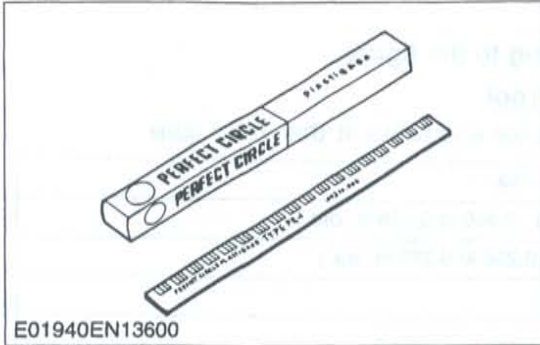
Code No: 07909-31361

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

Measuring: 0 to 50 MPa

range (0 to 500 kgf/cm², 0 to 7000 psi)

W1 O24653

**Plastigage**

Code No: 07909-30241

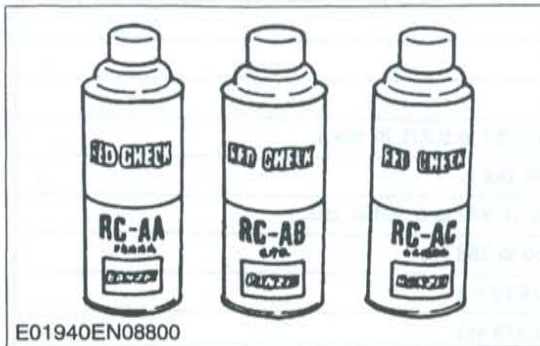
Application: Use to check the oil clearance between crankshaft and bearing, etc.

Measuring: Green 0.025 to 0.076 mm (0.001 to 0.003 in.)

range Red 0.051 to 0.152 mm (0.002 to 0.006 in.)

Blue 0.102 to 0.229 mm (0.004 to 0.009 in.)

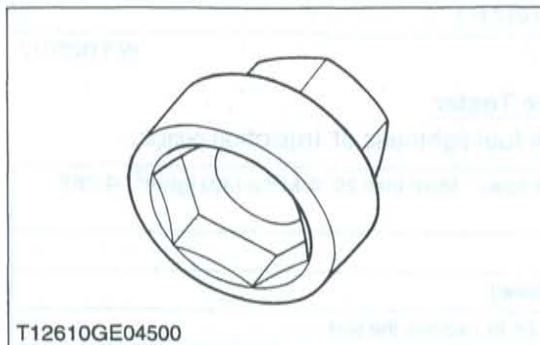
W1024719

**Red Check**

Code No: 07909-31371

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

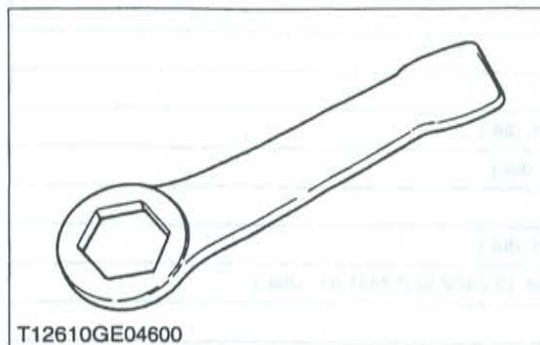
W1024909

**Crankshaft Nut Socket 46**

Code No: 07916-30821

Application: Use exclusively for removing or installing the crankshaft nut.

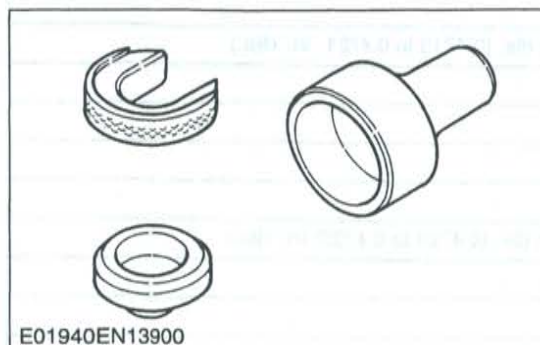
W1044361

**Socket Wrench 46**

Code No: 07916-30901

Application: Use exclusively for removing or installing the crankshaft nut.

W1044460

**Auxiliary Socket For Fixing Crankshaft Sleeve**

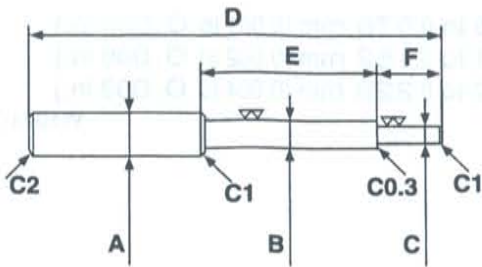
Code No: 07916-32091

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

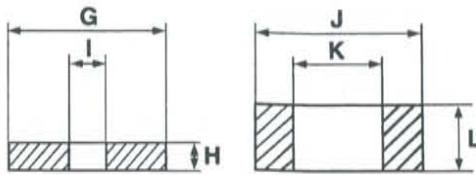
W1077114

■ NOTE

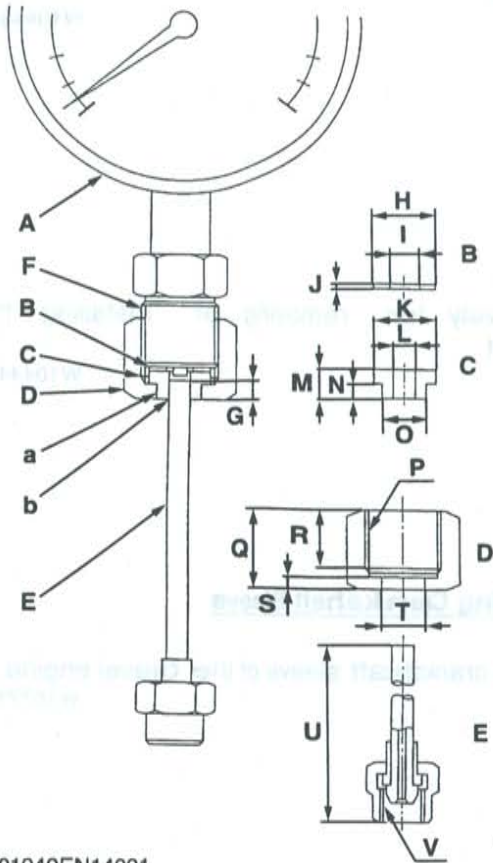
- The following special tools are not provided, so make them referring to the figure.



E01940EN14101



E01940EN14201



E01940EN14001

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 (0.98 in.)
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 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.)

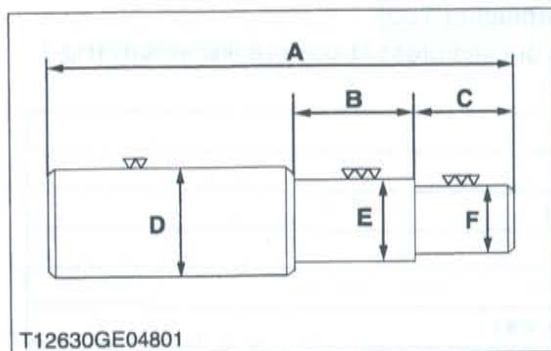
W 1 025017

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	Copper gasket
C	Flange (Material : Steel)
D	Hex. nut 27 mm (1.06 in.) across the plat
E	Injection pipe
F	PF 1/2
G	5 mm (0.20 in.)
H	17 mm dia. (0.67 in. dia.)
I	8 mm dia. (0.31 in. dia.)
J	1.0 mm (0.039 in.)
K	17 mm dia. (0.67 in. dia.)
L	6.10 to 6.20 mm dia. (0.2402 to 0.2441 in. dia.)
M	8 mm (0.31 in.)
N	4 mm (0.16 in.)
O	11.97 to 11.99 mm dia. (0.4713 to 0.4721 in. dia.)
P	PF 1/2
Q	23 mm (0.91 in.)
R	17 mm (0.67 in.)
S	4 mm (0.16 in.)
T	12.00 to 12.02 mm dia. (0.4724 to 0.4732 in. dia.)
U	100 mm (3.94 in.)
V	M12 × P1.5
a	Adhesive application
b	Fillet welding on the enter circumference

W1025240



Bushing Replacing Tools

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

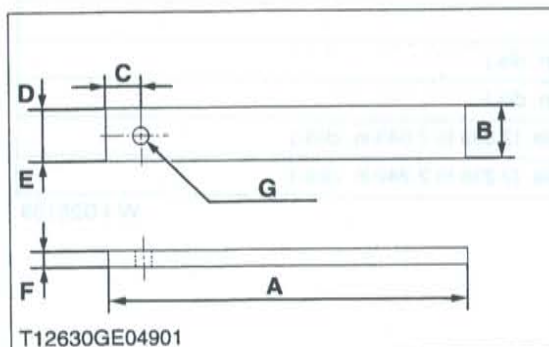
(1) For small end bushing

A	162 mm (6.38 in.)
B	35 mm (1.38 in.)
C	27 mm (1.06 in.)
D	35 mm dia. (1.38 in. dia.)
E	27.90 to 27.95 mm dia. (1.098 to 1.100 in. dia.)
F	25.00 to 25.01 mm dia. (0.984 to 0.985 in. dia.)

(2) For idle gear bushing

A	175 mm (6.89 in.)
B	40 mm (1.57 in.)
C	38 mm (1.49 in.)
D	45 mm dia. (1.77 in. dia.)
E	41.90 to 41.95 mm dia. (1.650 to 1.652 in. dia.)
F	37.95 to 37.97 mm dia. (1.494 to 1.495 in. dia.)

W1025500

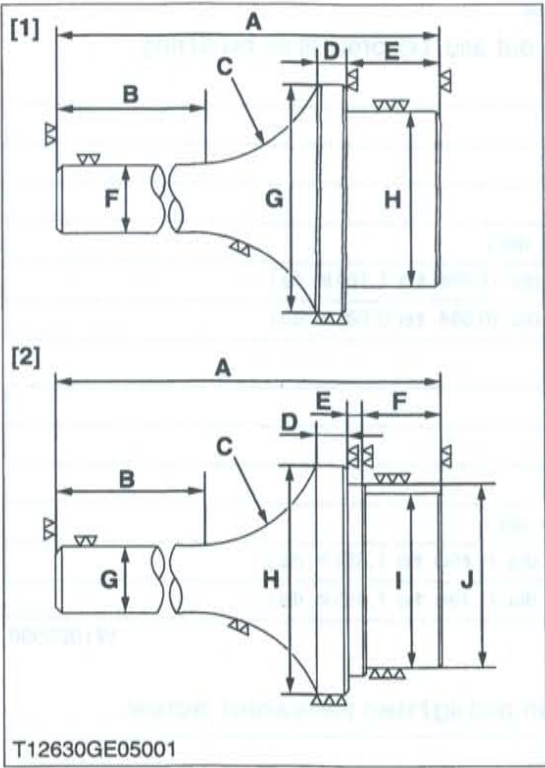


Flywheel Stopper

Application: Use to loosen and tighten the flywheel screw.

A	200 mm (7.87 in.)
B	30 mm (1.18 in.)
C	20 mm (0.79 in.)
D	15 mm (0.59 in.)
E	15 mm (0.59 in.)
F	8 mm (0.31 in.)
G	10 mm dia. (0.39 in. dia.)

W1025948



Crankshaft Bearing 1 Replacing Tool

Application: Use to press out and press fit the crankshaft bearing 1.
1. Extracting tool

A	135 mm (5.31 in.)
B	72 mm (2.83 in.)
C	R40 mm (R1.57 in.)
D	10 mm (0.39 in.)
E	20 mm (0.79 in.)
F	20 mm dia. (0.79 in. dia.)
G	56.8 to 56.9 mm dia. (2.236 to 2.240 in. dia.)
H	51.8 to 51.9 mm dia. (2.039 to 2.043 in. dia.)

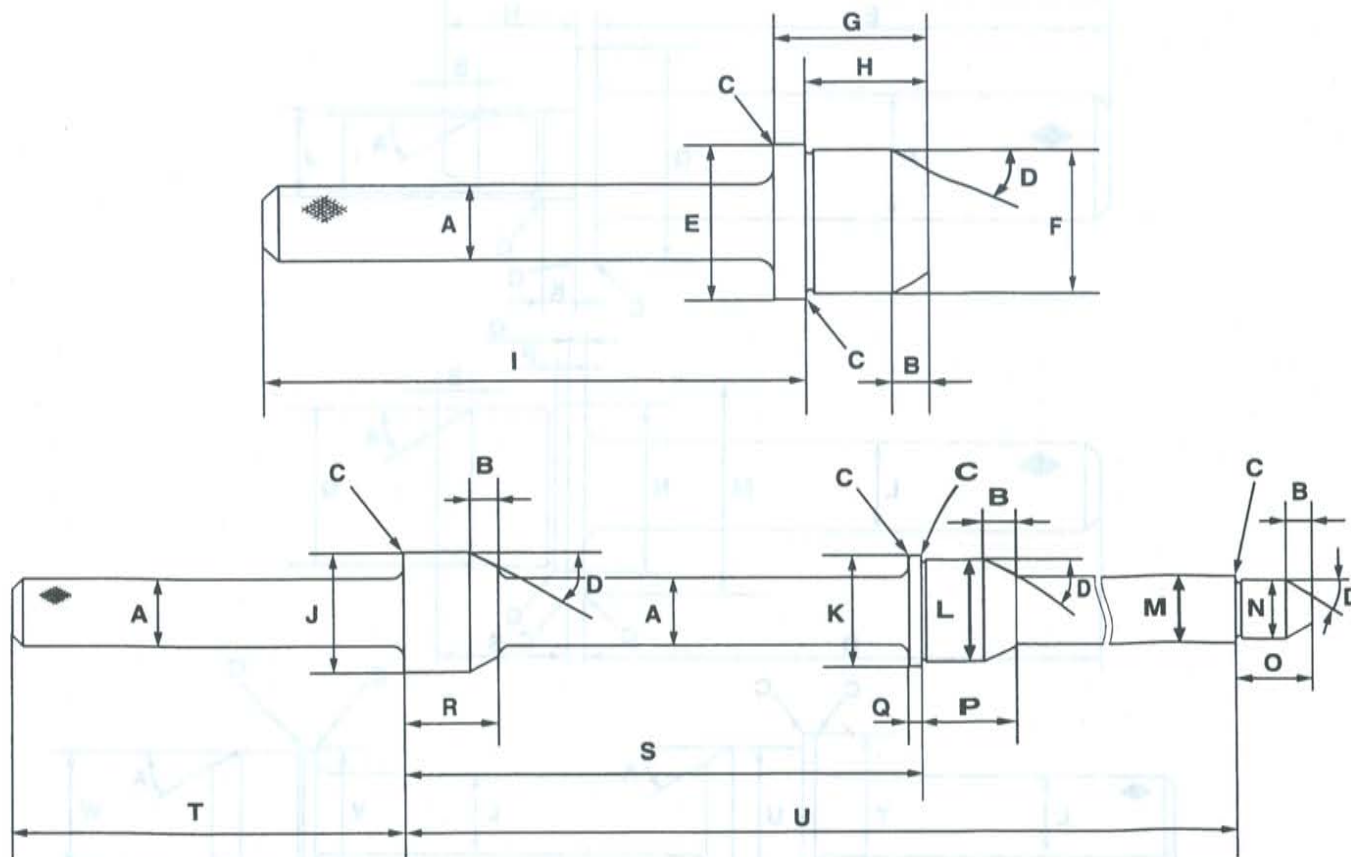
2. Inserting tool

A	130 mm (5.12 in.)
B	72 mm (2.83 in.)
C	R40 mm (R1.57 in.)
D	9 mm (0.35 in.)
E	4 mm (0.16 in.)
F	20 mm (0.79 in.)
G	20 mm dia. (0.79 in. dia.)
H	68 mm dia. (2.68 in. dia.)
I	51.8 to 51.9 mm dia. (2.039 to 2.043 in. dia.)
J	56.8 to 56.9 mm dia. (2.236 to 2.240 in. dia.)

W1026139

Balancer Metal Replacing Tool (for Removing)

Application: Use to remove the metal bearing.

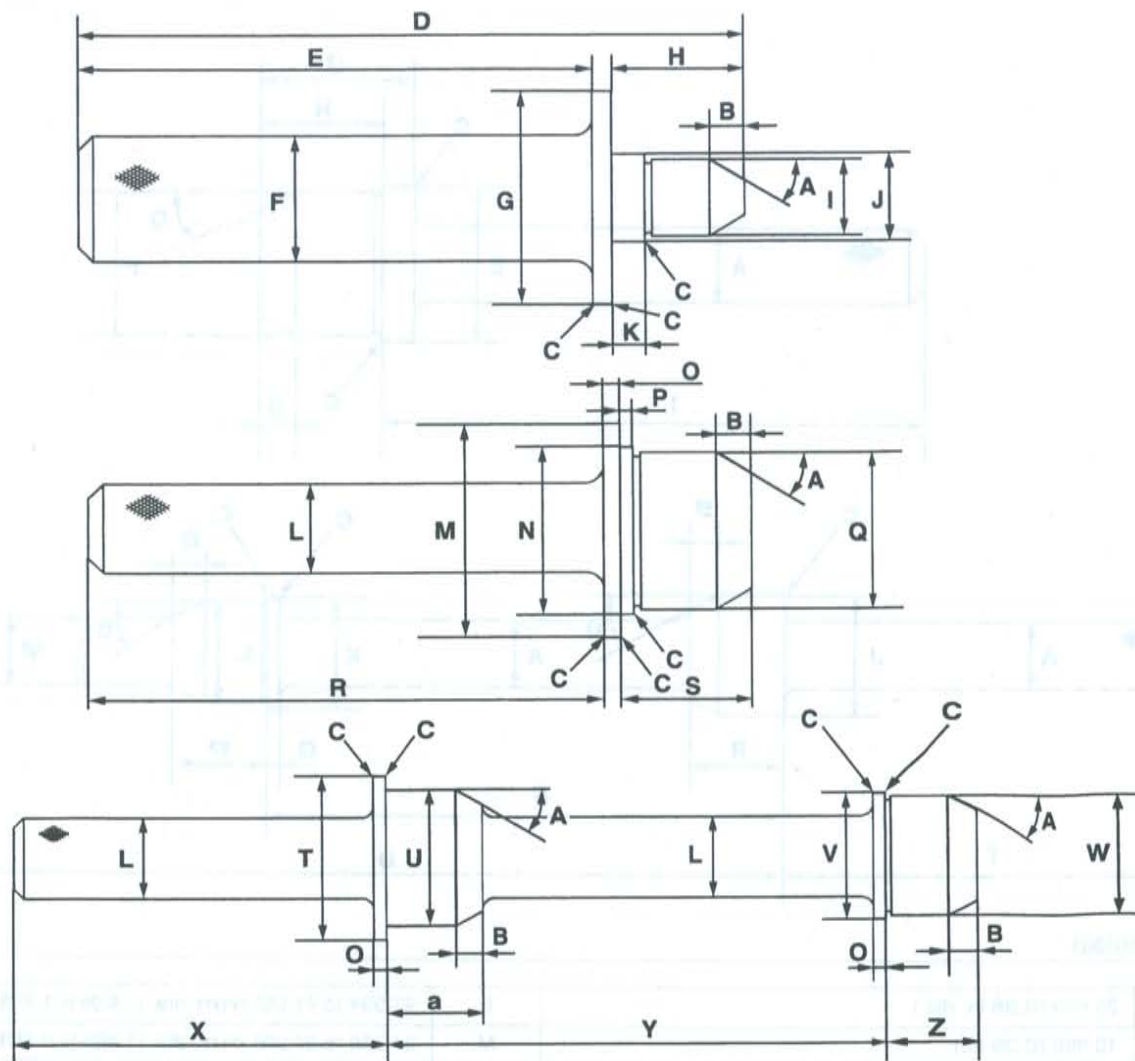


T12610GE04001

A	25 mm (0.98 in. dia.)	L	41.934 to 41.950 mm dia. (1.6509 to 1.6516 in. dia.)
B	10 mm (0.39 in.)	M	24.959 to 24.980 mm dia. (0.9826 to 0.9835 in. dia.)
C	Chamfer 0.3 mm (0.01 in.)	N	21.947 to 21.960 mm dia. (0.8641 to 0.8646 in. dia.)
D	0.52 rad. (30 °)	O	28 mm (1.10 in.)
E	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)	P	29 mm (1.14 in.)
F	43.934 to 43.950 mm dia. (1.7297 to 1.7303 in. dia.)	Q	5 mm (0.20 in.)
G	41 mm (1.61 in.)	R	36 mm (1.42 in.)
H	32.5 mm (1.28 in.)	S	195.25 to 195.75 mm (7.687 to 7.707 in.)
I	148.5 mm (5.85 in.)	T	145 mm (5.71 in.)
J	46.50 to 46.75 mm dia. (1.831 to 1.841 in. dia.)	U	384.75 to 385.25 mm (15.148 to 15.167 in.)
K	44.950 to 44.975 mm dia. (1.7697 to 1.7707 in. dia.)		

Batacer Metal Replacing Tool (for Fitting)

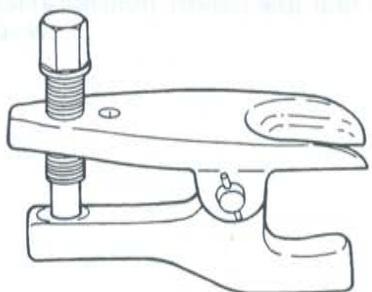
Application: Use to press fit the metal bearing.



T12610GE04101

A	0.52 rad. (30 °)	O	5 mm (0.20 in.)
B	10 mm (0.39 in.)	P	3.3 to 3.7 mm (0.130 to 0.146 in.)
C	Chamfer 0.3 mm (0.01 in.)	Q	43.934 to 43.950 mm dia. (1.7297 to 1.7303 in. dia.)
D	182 mm (7.16 in.)	R	140 mm (5.51 in.)
E	140 mm (5.51 in.)	S	36 mm (1.42 in.)
F	35 mm dia. (1.38 in. dia.)	T	60 mm dia. (2.36 in. dia.)
G	60 mm dia. (2.36 in. dia.)	U	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)
H	37 mm (1.46 in.)	V	44.950 to 44.975 mm dia. (1.7697 to 1.7707 in. dia.)
I	21.947 to 21.960 mm dia. (0.8641 to 0.8646 in. dia.)	W	41.934 to 41.950 mm dia. (1.6509 to 1.6516 in. dia.)
J	24.959 to 24.980 mm dia. (0.9826 to 0.9835 in. dia.)	X	145 mm (5.71 in.)
K	8.8 to 9.2 mm (0.346 to 0.362 in.)	Y	195.25 to 195.75 mm (7.687 to 7.707 in.)
L	25 mm dia. (0.98 in. dia.)	Z	29 mm (1.14 in.)
M	60 mm dia. (2.36 in. dia.)	a	36 mm (1.42 in.)
N	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)		

[2] SPECIAL TOOLS FOR TRACTOR



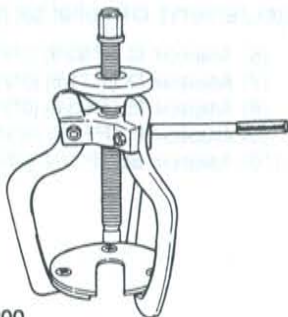
T12630GE05100

Tie-rod End Lifter

Code No: 07909-39051

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

W1026472



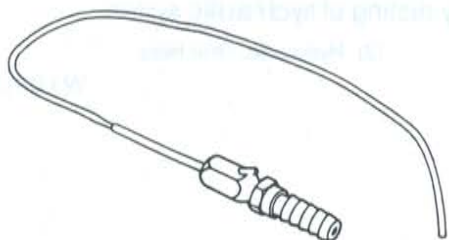
T12630GE05200

Steering Wheel Puller

Code No: 07916-51090

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

W1026533



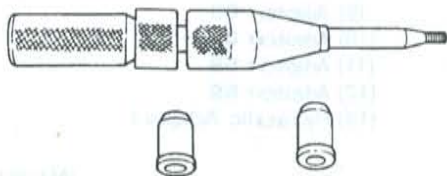
T12610GE04200

Injector CH3

Code No: 07916-52501

Application: Use for injecting calcium chloride solution into, and removing it from, rear and 4WD type front wheel tires.

W1026585

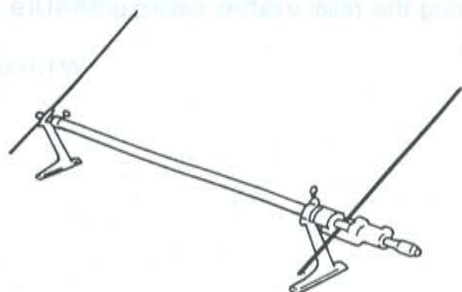


T12630GE05400

Clutch Center Tool (For B and L Series Tractors)

Application: The clutch center tool can be used for all B and L series tractors with a diaphragm clutch by changing tip guides. Center piece diameter is 20 mm (0.79 in.).

W1026637



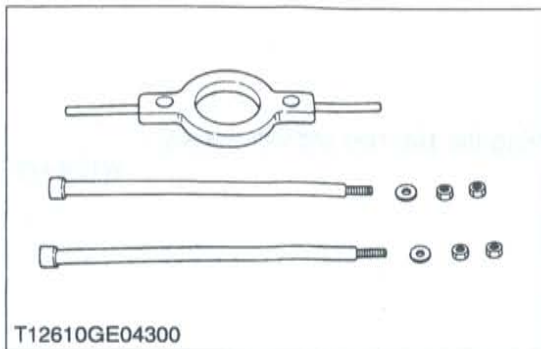
T12630GE05500

Toe-in Gauge

Code No: 07909-31681

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

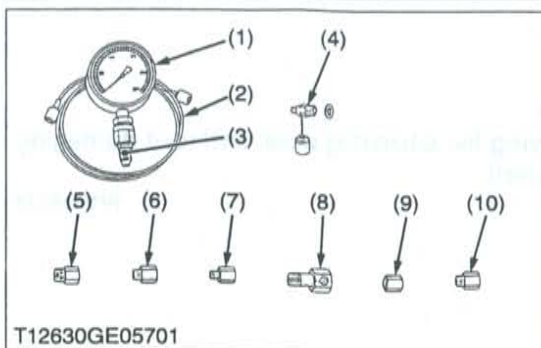
W1026689

**Rear Axle Cover Puller**

Code No: 07916-51041

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

W1O73259

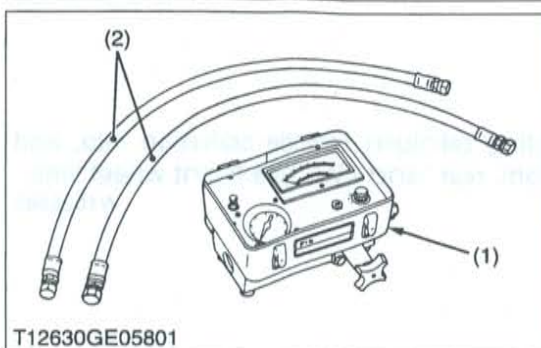
**Relief Valve Pressure Tester**

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 x P1.5) (07916-50361) | (10) Adaptor 58 (PT1/4) (07916-52391) |

W1O26741

**Flow Meter**

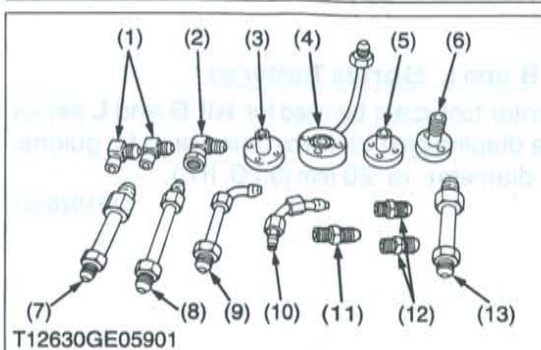
Code No: 07916-52791 (Flow Meter)

07916-52651 (Hydraulic Test Hose)

Application: This allows easy testing of hydraulic system.

- | | |
|----------------|-------------------------|
| (1) Flow Meter | (2) Hydraulic Test Hose |
|----------------|-------------------------|

W1O31318

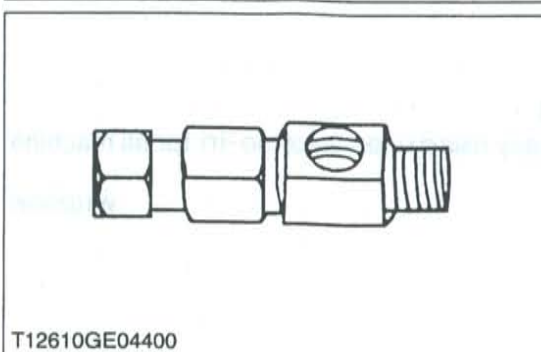
**Adaptor Set for Flow Meter**

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 | |

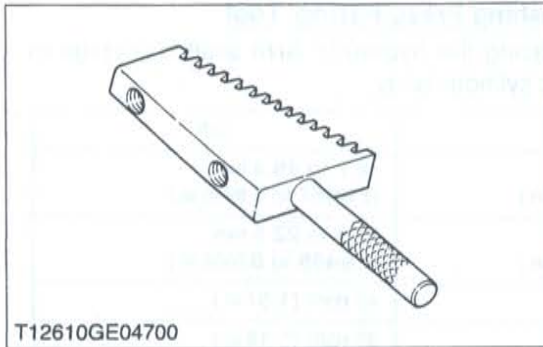
W1O31396

**Power Steering Adapter**

Code No: 07916-54021

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

W1O44287



Pinion Locking Tool

Code No: 07916-52311

Application: Use for preventing the shaft from turning when removing or tighten a bevel pinion shaft staking nut.

W1044552

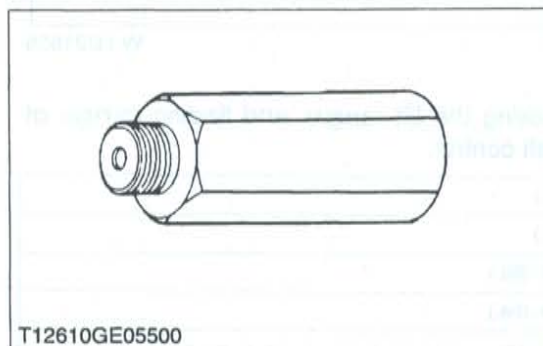


Rear Axle Nut Wrench 71

Code No: 07916-52531

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

W1044646



Relief Valve Setting Pressure Adaptor G

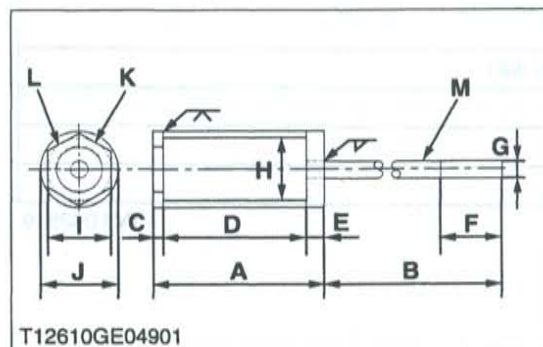
Code No: 07916-52751

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

W1062396

■ NOTE

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

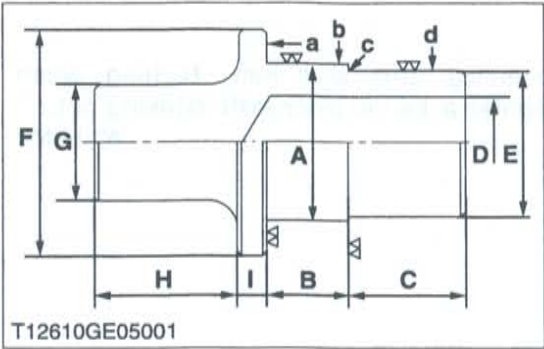


Pinion Shaft Remover

Application: Use for removing a pinion shaft.

A	106 mm (4.17 in.)
B	350 mm (13.78 in.)
C	6 mm (0.24 in.)
D	90 mm (3.54 in.)
E	10 mm (0.39 in.)
F	40 mm (1.57 in.)
G	10 mm (0.39 in.)
H	35.6 mm (1.40 in.)
I	36 mm (1.42 in.)
J	41.6 mm (1.64 in.)
K	Part code No. 3A201-4130 nut
L	M27 × P1.5
M	M10 × P1.25

W1031593

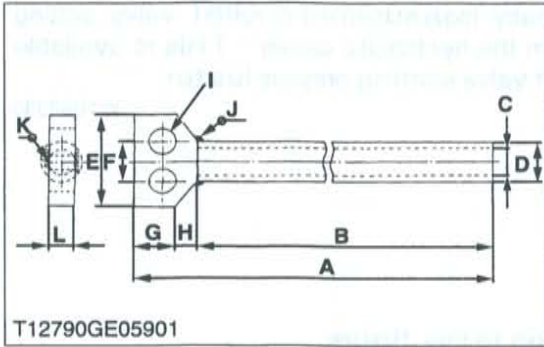


Hydraulic Arm Shaft Bushing Press-Fitting Tool

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

	Right	Left
A	54.7 to 54.9 mm (2.1535 to 2.1614 in.)	49.7 to 49.9 mm (1.9567 to 1.9646 in.)
B	24.5 to 25.5 mm (0.9646 to 1.0039 in.)	21.5 to 22.5 mm (0.8465 to 0.8858 in.)
C	40 mm (1.57 in.)	40 mm (1.57 in.)
D	32 mm (1.26 in.)	30 mm (1.18 in.)
E	49.7 to 49.9 mm (1.9567 to 1.9646 in.)	44.7 to 44.9 mm (1.7598 to 1.7677 in.)
F	70 mm dia. (2.76 in. dia.)	
G	40 mm dia. (1.57 in. dia.)	
H	50 mm (1.97 in.)	
I	10 mm (0.39 in.)	
a	6.3 µm (250 µin.)	
b	6.3 µm (250 µin.)	
c	6.3 µm (250 µin.)	
d	6.3 µm (250 µin.)	

W1031655



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	90 mm (3.54 in.)
F	30 mm (1.18 in.)
G	30 mm (1.18 in.)
H	15 mm (0.59 in.)
I	20 mm dia. (0.79 in. dia.)
J	Weld all around
K	Weld all around
L	20 mm (0.79 in.)

W1062519

9. TIRES

[1] TYPES OF TIRE

The following tires can be mounted.

			
T12790GE04200	T12790GE01200	T12790GE04300	T12790GE05700
Farm tire (Front Tire of 2WD only)	Farm Tire	Turf Tire	Industrial Tire

W1052210


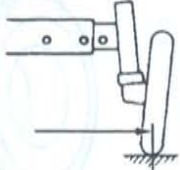
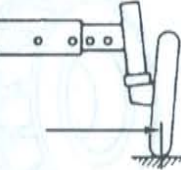
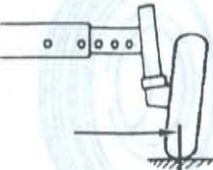
	Type of tire	Front	Rear
2WD	Farm Tire	7.5L - 15	13.6 - 28 or 14.9 - 26
	Turf Tire	29 x 12.50 - 15	44 x 18 - 20 NHS
4WD	Farm Tire	9.5 - 16 Std	13.6 - 28 or 14.9 - 26
	Industrial Tire	12 - 16.5	17.5L - 24

[2] TREADS ADJUSTMENT

(1) Front Wheels

(A) 2WD Type

With 2WD models, the front tread can be adjusted in 4 steps.

Models				
	T12790GE04401	T12790GE04501	T12790GE04601	T12790GE04701
7.5 L-15 Farm	1230 mm (48.4 in.)	1330 mm (52.4 in.)	1430 mm (56.3 in.)	1530 mm (60.2 in.)
29 × 12.50-15 Turf	1330 mm (52.4 in.)	1430 mm (56.3 in.)	1530 mm (60.2 in.)	1630 mm (64.2 in.)

W1052282

CAUTION

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

To change the tread

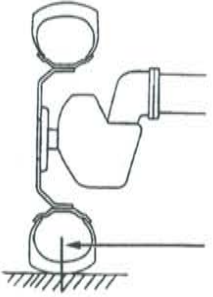
- Lift the front of the tractor with a jack.
- Remove the front axle mounting screws and the tie rod mounting screws.
- Move the front axle (right and left) to the desired position, and tighten them with the screws.

IMPORTANT

- After tread adjustment, adjust toe-in.
Toe-in: All models 2 to 8 mm (0.08 to 0.31 in.)
- The front width for the front loader application on 2WD models should not be greater than 1215 mm (47.8 in.).

(B) 4WD Type

Front axle is not adjustable

	Tire	9.5-16 Farm	12-16.5 IND
	Tread	1325 mm (52.2 in.)	1340 mm (52.7 in.)

T12790GE04801

W1052707

(2) Rear Wheels

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

To change the tread

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



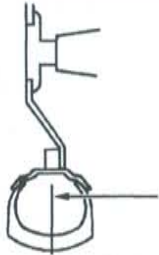
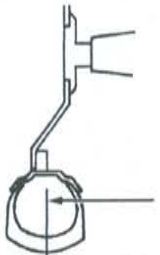
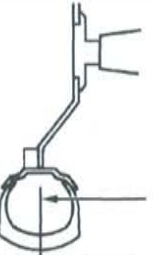
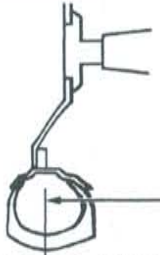
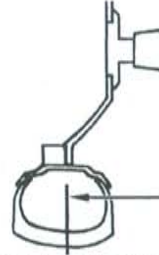
CAUTION

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




IMPORTANT

- Always attach tires as shown in the drawings below.
- If not attached as illustrated, transmission parts may be damaged.
- Do not use tires large than specified.

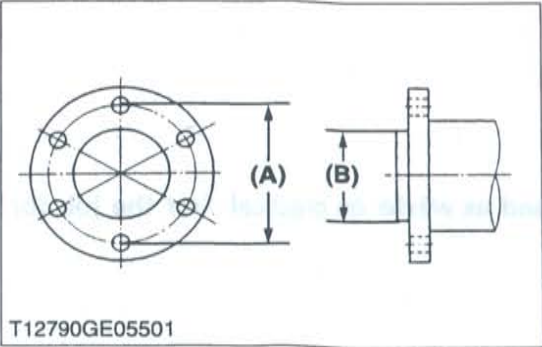
Models	 T12790GE04901	 T12790GE05001	 T12790GE05101	 T12790GE05201	 T12790GE05301
13.6-28 Farm	1185 mm (46.7 in.)	1275 mm (50.2 in.)	1385 mm (54.4 in.)	1480 mm (58.2 in.)	1585 mm (62.4 in.)
14.9-26 Farm	—	—	—	1375 mm (54.2 in.)	1490 mm (58.6 in.)
17.5 L-24 Industrial	—	1245 mm (49.0 in.)	1395 mm (55.0 in.)	1435 mm (56.4 in.)	1545 mm (60.8 in.)

W1052909

Models	 T12790GE05401
44 × 18-20 NHS Turf	1365 mm (53.7 in.)

W1053137

(3) Wheel Hub



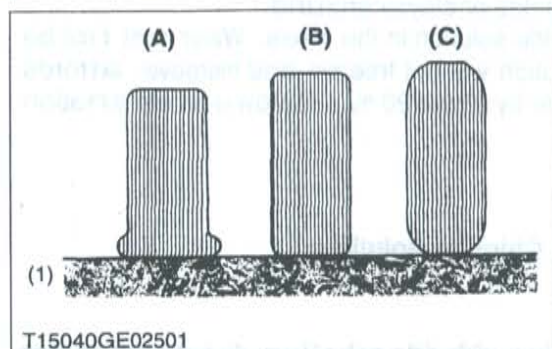
	Front wheel hub	Rear wheel hub
Screw circle diameter (A)	152.4 mm (6 in.)	170 mm (6.7 in.)
Number of screws	6	6
Screws	M14 × 1.5	M16 × 1.5
Hub pilot diameter (B)	117.4 mm (4.625 in.)	135 mm (5.315 in.)

W1O43392

					Models
mm 152.4 (in. 6.0)	mm 152.4 (in. 6.0)	mm 152.4 (in. 6.0)	mm 152.4 (in. 6.0)	mm 152.4 (in. 6.0)	13.5-58 Front
mm 117.4 (in. 4.625)	mm 117.4 (in. 4.625)	mm 117.4 (in. 4.625)	mm 117.4 (in. 4.625)	mm 117.4 (in. 4.625)	14.5-58 Front
mm 135 (in. 5.315)	mm 135 (in. 5.315)	mm 135 (in. 5.315)	mm 135 (in. 5.315)	mm 135 (in. 5.315)	15.5-58 Front

	Models
mm 152.4 (in. 6.0)	14.5-58 Front

[3] TIRE PRESSURE



Though the tire pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, **check** it everyday and inflate as necessary. To inflate the wheel tires, use an air compressor or hand pump.

- **Recommended inflation pressure**

Maintain the pressure shown below.

	Tire sizes	Inflation Pressure
Rear	13.6 – 28, 4 PR	150 kPa (1.5 kgf/cm ² , 22 psi)
	14.9 – 24, 4 PR	140 kPa (1.4 kgf/cm ² , 20 psi)
	17.5L – 24, 6 PR	140 kPa (1.4 kgf/cm ² , 20 psi)
	44 × 18 – 20 NHS, 4 PR	170 kPa (1.7 kgf/cm ² , 24 psi)
Front	9.5 – 16, 4 PR	205 kPa (2.1 kgf/cm ² , 30 psi)
	12 – 16.5, 6 PR	140 kPa (1.4 kgf/cm ² , 20 psi)
	7.5L – 15, 6 PR	220 kPa (2.2 kgf/cm ² , 32 psi)
	29 × 12.50 – 15, 4 PR	140 kPa (1.4 kgf/cm ² , 20 psi)

! CAUTION

- Do not attempt to mount a tire. This should be done by a qualified person with the proper equipment. Qualified person with the proper tire mounting equipment should recognize the following warning.

! WARNING

- Never exceed 241 kPa (2.5 kgf/cm², 35 psi) when attempting to seat a bead. If beads have not been seated by the time the pressure reached 241 kPa (2.5 kgf/cm², 35 psi), deflate the assembly, reposition the tire on the rim, relubricate and reinflate. After seating the bead, adjust inflation pressure as recommended in the inflation pressure chart.

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

(1) Ground

W1044005

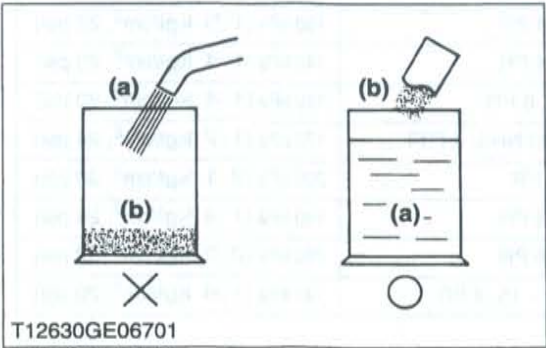
[4] TIRE LIQUID INJECTION

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)
-30 °C (-22 °F)	44 kg (97.0 lbs)
-35 °C (-31 °F)	49 kg (108 lbs)
-40 °C (-40 °F)	52 kg (114.6 lbs)
-45 °C (-49 °F)	56 kg (123.5 lbs)
-50 °C (-58 °F)	61 kg (134.5 lbs)

(a) Water

(b) 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

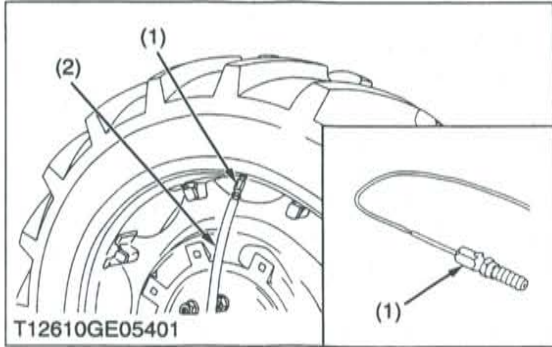
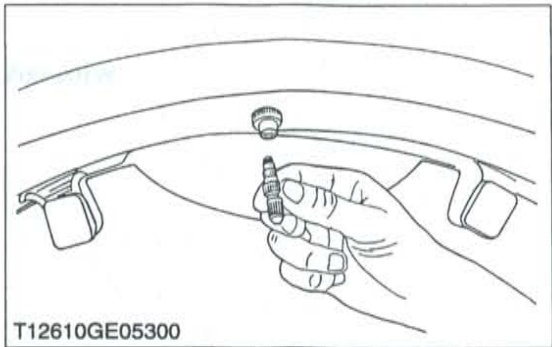


Fig. 1

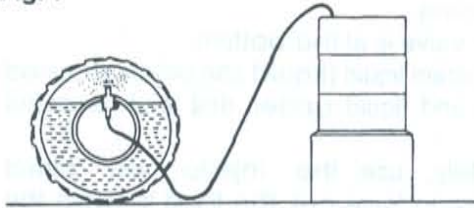


Fig. 2

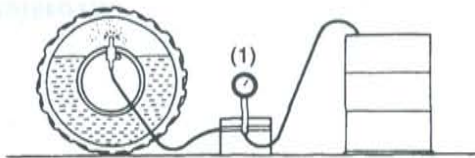
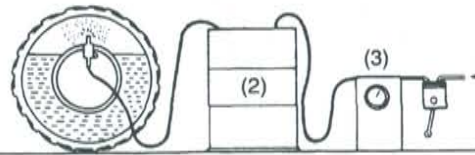
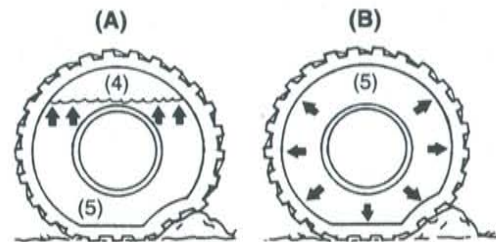


Fig. 3



T12630GE06901



T12630GE07001

Injection

⚠ CAUTION

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

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

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

■ NOTE

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

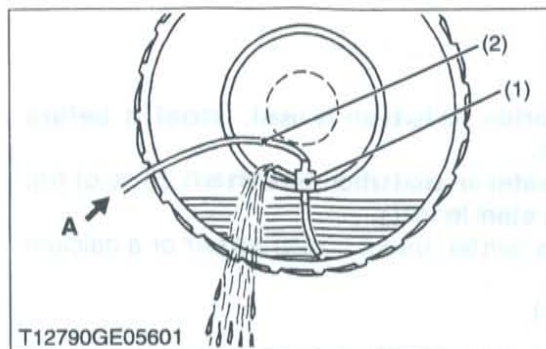
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

Tire sizes	14.9 — 26	13.6 — 28	17.5L — 24
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]	215 kg (470 lbs)	185 kg (410 lbs)	235 kg (515 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]	225 kg (495 lbs)	200 kg (440 lbs)	250 kg (550 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]	235 kg (520 lbs)	215 kg (470 lbs)	265 kg (585 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



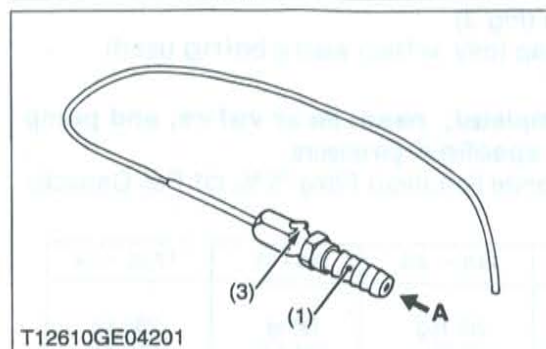
Draining Water or Solution

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, and direct compressed air into the tire to force out the liquid through the injector's vent.

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

A: Compressed Air

W1045167



[5] 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)			Lower link end max. loading weight W_0
Front		Rear	
2WD	4WD		
1530 mm (60.2 in.)	1325 mm (52.2 in.)	1490 mm (58.7 in.)	1300 kg (2870 lbs.)

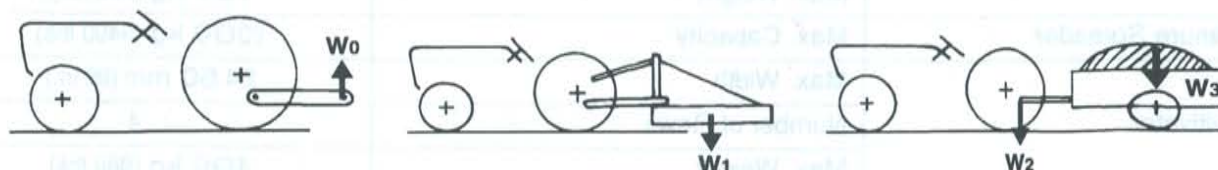
Actual figures		
Implement weight W_1 and / or size	Max. Drawbar Load W_2	Trailer loading weight W_3 Max. capacity
As in the following list (Shown on the next page)	750 kg (1650 lbs)	3500 kg (7700 lbs)

Lower link end max. hydraulic lift capacity W_0

Implement weight.....The implement's weight which can be put on the link : W_1

Max. drawbar load W_2

Trailer loading weightThe max. loading weight for trailer (without trailer's weight) : W_3



T12630GE07101

■ NOTE

- Implement size may vary depending on soil operating conditions.

No.	Implement		Remarks		MX5000
1	Trailer		Max.Load Capacity		3500 kg (7700 lbs)
			Max. Drawbar Load		750 kg (1650 lbs)
2	Mower	Rotary-Cutter	Max. Cutting Width		2130 mm (84 in.)
			Max.Weight		450 kg (1000 lbs)
		Flail Mower	Max. Cutting Width		1830 mm (72 in.)
			Max.Weight		500 kg (1100 lbs)
		Sickle Bar	Max. Cutting Width		2130 mm (84 in.)
			Max.Weight		500 kg (1100 lbs)
3	Sprayer		Max. Tank Capacity	Rear mounted	500 L (130 U.S.gals.)
				Pull type	2000 L (529 U.S.gals.)
4	Rotary Tiller		Max. Tilling Width		1830 mm (72 in.)
5	Bottom Plow		Max. size		16 in. x 2
6	Disc-harrow (Pull type)		Max. Harrowing Width		2130 mm (84 in.)
			Max. Weight		400 kg (880 lbs)
7	Chisel Plow		Max. Cutting Width		1830 mm (72 in.)
			Max. Weight		350 kg (770 lbs)
8	Broad Caster		Max. Tank Capacity		300 L (80 U.S.gals.)
			Max. Weight		100 kg (220 lbs)
9	Manure Spreader		Max. Capacity		2000 kg (4400 lbs)
10	Cultivator		Max. Width		2450 mm (96 in.)
			Number of Rows		4
			Max. Weight		400 kg (880 lbs)
11	Front Blade		Max. cutting width		1830 mm (72 in.)
			Max. oil pressure		175 kgf/cm ² (2490 psi)
			Sub frame		Necessary
12	Rear Blade		Max. Cutting Width		1830 mm (72 in.)
			Max. Oil Pressure		175 kgf/cm ² (2490 psi)
13	Front-end Loader		Max. Lifting Capacity		850 kg (1870 lbs)
			Max. Oil Pressure		175 kgf/cm ² (2490 psi)
			Sub frame		Necessary
14	Box Blade		Max. Cutting Width		1830 mm (72 in.)
			Max. Weight		450 kg (1000 lbs)
15	Back Hoe		Max. digging depth		2290 mm (90 in.)
			Max. weight		450 kg (990 lbs.)
			Sub frame		Necessary
16	Snow Blade		Max. width		1830 mm (72 in.)
			Max. Weight		400 kg (880 lbs)

■ **NOTE**

- Implement size may vary depending on soil operating conditions.

W1012736

1 ENGINE

NOTICE

Regarding engine mechanism information, please refer to DIESEL
ENGINE MECHANISM Workshop manual (Code No. 97897-01872).

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	<ul style="list-style-type: none"> No fuel Air in the fuel system Water in the fuel system 	Replenish fuel Bleed Change fuel and repair or replace fuel system Clean	G-7 G-27 –
	<ul style="list-style-type: none"> Fuel pipe clogged Fuel filter clogged Excessively high viscosity of fuel or engine oil at low temperature Fuel with low cetane number Fuel leak due to loose injection pipe retaining nut 	Clean Change Use the specified fuel or engine oil Use the specified fuel Tighten nut	– G-22 G-7 G-7 1-S21
	<ul style="list-style-type: none"> Incorrect injection timing Fuel camshaft worn Injection nozzle clogged Injection pump malfunctioning Seizure of crankshaft, camshaft, piston, cylinder or bearing Compression leak from cylinder 	Adjust Replace Clean Repair or replace Repair or replace	1-S50 – 1-S52 – –
		Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S21, S22
	<ul style="list-style-type: none"> Improper valve timing 	Correct or replace timing gear	1-S25
	<ul style="list-style-type: none"> Piston and cylinder worn Excessive valve clearance 	Replace Adjust	1-S27 1-S19
Starter Does Not Run	<ul style="list-style-type: none"> Battery discharged Starter malfunctioning Main switch malfunctioning Safety switches improperly adjusted or defective Starter relay defective Wiring disconnected 	Charge Repair or replace Repair or replace Repair or replace Replace Connect	G-16 9-S8, S13 9-S8 9-S12 9-S9 –
Engine Revolution Is Not Smooth	<ul style="list-style-type: none"> Fuel filter clogged or dirty Air cleaner clogged Fuel leak due to loose injection pipe retaining nut Injection pump malfunctioning Incorrect nozzle injection pressure Injection nozzle stuck or clogged Governor malfunctioning 	Change Clean or change Tighten nut Repair or replace Adjust Repair or replace Repair	G-22 G-17 1-S21 1-S23, S50 1-S52 1-S53 –
Either White or Blue Exhaust Gas Is Observe	<ul style="list-style-type: none"> Excessive engine oil Piston ring and cylinder worn or stuck Incorrect injection timing Deficient compression 	Reduce to the specified level Repair or replace Adjust Adjust top clearance	G-11 1-S27, S28 1-S50 1-S20

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Symptom	Probable Cause	Solution	Reference Page
Either Black or Dark Gray Exhaust Gas Is Observe	<ul style="list-style-type: none"> • Overload • Low grade fuel used • Fuel filter clogged • Air cleaner clogged • Deficient nozzle injection 	Lessen the load Use the specified fuel Change Clean or change Repair or replace the nozzle	— G-7 G-22 G-17 1-S21, S52
Deficient Output	<ul style="list-style-type: none"> • Incorrect injection timing • Engine's moving parts seem to be seizing • Uneven fuel injection • Deficient nozzle injection • Compression leak 	Adjust Repair or replace Repair or replace the injection pump Repair or replace the nozzle Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder	1-S50 — 1-S23, S50 1-S52 1-S21, S222
Excessive Lubricant Oil Consumption	<ul style="list-style-type: none"> • Piston ring's gap facing the same direction • Oil ring worn or stuck • Piston ring groove worn • Valve stem and guide worn • Oil leaking due to defective seals or packing 	Shift ring gap direction Replace Replace the piston Replace Replace	1-S28 1-S28 1-S27 1-S23 —
Fuel Mixed Into Lubricant Oil	<ul style="list-style-type: none"> • Injection pump's plunger worn • Deficient nozzle injection • Injection pump broken 	Replace pump element or pump Repair or replace the nozzle Replace	— 1-S21, S52 1-S23, S50
Water Mixed Into Lubricant Oil	<ul style="list-style-type: none"> • Head gasket defective • Cylinder block or cylinder head flawed 	Replace Replace	1-S22 —
Low Oil Pressure	<ul style="list-style-type: none"> • Engine oil insufficient • Oil straight clogged • Relief valve stuck with dirt • Relief valve spring weaken or broken • Excessive oil clearance of crankshaft bearing • Excessive oil clearance of crankpin bearing • Excessive oil clearance of rocker arm • Oil passage clogged • Different type of oil • Oil Pump defective 	Replenish Clean Clean Replace Replace Replace Replace Clean Use the specified type of oil Repair or replace	G-7 1-S26 — — 1-S43 1-S42 1-S22 — G-7 1-S26
High Oil Pressure	<ul style="list-style-type: none"> • Difference type oil • Relief valve defective 	Use the specified type of oil Replace	G-7 —

W1014322

Symptom	Probable Cause	Solution	Reference Page
Engine Overheated	• Engine oil insufficient	Replenish	G-11
	• Fan belt broken or elongated	Change or adjust	1-S48
	• Coolant insufficient	Replenish	G-25
	• Radiator net and radiator fin clogged with dust	Clean	—
	• Inside of radiator corroded	Clean or replace	—
	• Coolant flow route corroded	Clean or replace	—
	• Radiator cap defective	Replace	1-S49
	• Overload running	Loosen the load	—
	• Head gasket defective	Replace	1-S22
	• Incorrect injection timing	Adjust	1-S50
	• Unsuitable fuel used	Use the specified fuel	G-7

W1014322

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Cylinder Head Surface	Flatness	—	0.05 mm / 500 mm 0.0020 in. / 19.69 in.
Compression Pressure (When Cranking with Starting Motor)		3.53 to 4.02 MPa / 290 rpm 36 to 41 kgf/cm ² / 290 rpm 512 to 583 psi / 290 rpm	2.55 MPa / 290 rpm 26 kgf/cm ² / 290 rpm 370 psi / 290 rpm
Difference among Cylinders		—	10 % or less
Top Clearance		0.55 to 0.70 mm 0.0217 to 0.0276 in.	—
Valve Clearance (When Cold)		0.18 to 0.22 mm 0.0071 to 0.0087 in.	—
Valve Seat	Width (Intake)	2.12 mm 0.0835 in.	—
	Width (Exhaust)	2.12 mm 0.0835 in.	—
Valve Seat	Angle (Intake)	1.047 rad. 60 °	—
	Angle (Exhaust)	0.785 rad. 45 °	—
Valve Face	Angle (Intake)	1.047 rad. 60 °	—
	Angle (Exhaust)	0.785 rad. 45 °	—
Valve Stem to Valve Guide	Clearance	0.040 to 0.070 mm 0.00157 to 0.00276 in.	0.1 mm 0.0039 in.
Valve Stem	O.D.	7.960 to 7.975 mm 0.31339 to 0.31398 in.	—
Valve Guide	I.D.	8.015 to 8.030 mm 0.31555 to 0.31614 in.	—
Valve Recessing	Protrusion	0.05 mm 0.0020 in.	—
	Recessing	0.15 mm 0.0059 in.	0.4 mm 0.0157 in.

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Valve Timing (Intake Valve)	Open	0.21 rad. (12 °) before T.D.C.	—
	Close	0.63 rad. (36 °) after B.D.C.	—
Valve Timing (Exhaust Valve)	Open	1.00 rad. (57 °) before B.D.C.	—
	Close	0.21 rad. (12 °) after T.D.C.	—
Valve Spring	Free Length	41.7 to 42.2 mm 1.6417 to 1.6614 in.	41.2 mm 1.6220 in.
	Setting Load	117.6 N 12.0 kgf 26.4 lbs	100.0 N 10.2 kgf 22.5 lbs
	Setting Length	35.0 mm 1.3780 in.	—
	Squareness	—	1.0 mm 0.039 in.
Rocker Arm Shaft to Rocker Arm	Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.1 mm 0.0039 in.
Rocker Arm Shaft	O.D.	13.973 to 13.984 mm 0.55012 to 0.55055 in.	—
Rocker Arm	I.D.	14.000 to 14.018 mm 0.55118 to 0.55189 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Clearance	0.020 to 0.062 mm 0.00079 to 0.00244 in.	0.07 mm 0.0028 in.
Tappet	O.D.	23.959 to 23.980 mm 0.94327 to 0.94410 in.	—
Tappet Guide	I.D.	24.000 to 24.021 mm 0.94488 to 0.94571 in.	—

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Timing Gear Crank Gear to Idle Gear	Backlash	0.0415 to 0.1122 mm 0.00163 to 0.00442 in.	0.15 mm 0.0059 in.
Idle Gear to Cam Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Idle Gear to Injection Pump Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Crank Gear to Oil Pump Gear	Backlash	0.0415 to 0.1090 mm 0.00163 to 0.00429 in.	0.15 mm 0.0059 in.
Idle Gear to Balancer Gear	Backlash (Intake side)	0.0350 to 0.1160 mm 0.00138 to 0.00457 in.	0.15 mm 0.0059 in.
	Backlash (Exhaust side)	0.0350 to 0.1160 mm 0.00138 to 0.00457 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.12 to 0.48 mm 0.0047 to 0.0189 in.	0.9 mm 0.0354 in.
Idle Gear Shaft to Idle Gear Bushing	Clearance	0.025 to 0.066 mm 0.00098 to 0.00260 in.	0.1 mm 0.0039 in.
Idle Gear Shaft	O.D.	37.959 to 37.975 mm 1.49445 to 1.49508 in.	—
Idle Gear Bushing	I.D.	38.000 to 38.025 mm 1.49606 to 1.49704 in.	—
Camshaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Camshaft	Alignment	—	0.01 mm 0.0004 in.
Cam	Height (Intake / Exhaust)	33.90 mm 1.3346 in.	33.85 mm 1.3327 in.
Camshaft Journal to Cylinder Block Bore	Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
Camshaft Journal	O.D.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
Cylinder Block Bore	I.D.	40.000 to 40.025 mm 1.57480 to 1.57579 in.	—
Balancer Shaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Balancer Shaft Journal 1 to Balancer Shaft Bearing 1	Clearance	0.030 to 0.111 mm 0.00118 to 0.00437 in.	0.2 mm 0.0079 in.
Balancer Shaft Journal 1	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Balancer Shaft Bearing 1	I.D.	43.980 to 44.045 mm 1.73149 to 1.73405 in.	—

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Balancer Shaft Journal 2 to Balancer Shaft Bearing 2	Clearance	0.030 to 0.111 mm 0.00118 to 0.00437 in.	0.2 mm 0.0079 in.
Balancer Shaft Journal 2	O.D.	41.934 to 41.950 mm 1.65094 to 1.65157 in.	—
Balancer Shaft Bearing 2	I.D.	41.980 to 42.045 mm 1.65275 to 1.65531 in.	—
Balancer Shaft Journal 3 to Balancer Shaft Bearing 3	Clearance	0.020 to 0.094 mm 0.00079 to 0.00370 in.	0.2 mm 0.0079 in.
Balancer Shaft Journal 3	O.D.	21.947 to 21.960 mm 0.86405 to 0.86456 in.	—
Balancer Shaft Bearing 3	I.D.	21.980 to 22.041 mm 0.86535 to 0.86775 in.	—
Piston Pin Bore	I.D.	25.000 to 25.013 mm 0.98425 to 0.98476 in.	25.05 mm 0.9862 in.
Second Ring to Ring Groove	Clearance	0.093 to 0.128 mm 0.00366 to 0.00504 in.	0.2 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.060 mm 0.00079 to 0.00205 in.	0.15 mm 0.0059 in.
Top Ring	Ring Gap	0.25 to 0.40 mm 0.0098 to 0.0157 in.	1.25 mm 0.0492 in.
Second Ring	Ring Gap	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Oil Ring	Ring Gap	0.25 to 0.45 mm 0.0098 to 0.0177 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Piston Pin to Small End Bushing	Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.15 mm 0.0059 in.
Piston Pin	O.D.	25.002 to 25.011 mm 0.98433 to 0.98468 in.	—
Small End Bushing	I.D.	25.025 to 25.040 mm 0.98523 to 0.98582 in.	—
Crankshaft	Alignment	—	0.02 mm 0.00079 in.
Crankshaft Journal to Crankshaft Bearing 1	Oil Clearance	0.040 to 0.118 mm 0.00157 to 0.00465 in.	0.2 mm 0.0079 in.
Crankshaft Journal	O.D.	59.921 to 59.940 mm 2.35909 to 2.35984 in.	—
Crankshaft Bearing 1	I.D.	59.980 to 60.039 mm 2.36142 to 2.36374 in.	—

W1013874

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 2	Oil Clearance	0.040 to 0.104 mm 0.00157 to 0.00409 in.	0.2 mm 0.0079 in.
	Crankshaft Journal O.D.	59.921 to 59.940 mm 2.35909 to 2.35984 in.	—
	Crankshaft Bearing 2 I.D.	59.980 to 60.025 mm 2.36142 to 2.36318 in.	—
Crankpin to Crankpin Bearing	Oil Clearance	0.025 to 0.087 mm 0.00098 to 0.00343 in.	0.2 mm 0.0079 in.
	Crankpin O.D.	46.959 to 46.975 mm 1.84878 to 1.84941 in.	—
	Crankpin Bearing I.D.	47.000 to 47.046 mm 1.85039 to 1.85220 in.	—
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.5 mm 0.0197 in.
Crankshaft Sleeve	Wear	—	0.1 mm 0.0039 in.
Cylinder Bore [Standard] [Oversize]	I.D.	87.000 to 87.022 mm 3.42519 to 3.42606 in.	+ 0.15 mm + 0.0059 in.
	I.D.	87.250 to 87.272 mm 3.43503 to 3.43590 in.	+ 0.15 mm + 0.0059 in.

W1013874

LUBRICATING SYSTEM

Engine Oil Pressure	At Idle Speed	98 kPa or more 1.0 kgf/cm ² or more 14 psi or more	49 kPa 0.5 kgf/cm ² 7 psi
	At Rated Speed	294 to 441 kPa 3.0 to 4.5 kgf/cm ² 43 to 64 psi	245 kPa 2.5 kgf/cm ² 36 psi
Engine Oil Pressure Switch	Working Pressure	49 kPa 0.5 kgf/cm ² 7 psi	—
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.14 mm 0.0012 to 0.0055 in.	0.2 mm 0.0079 in.
Outer Rotor to Pump Body	Clearance	0.11 to 0.19 mm 0.0043 to 0.0075 in.	0.25 mm 0.0098 in.
Inner Rotor to Cover	End Clearance	0.105 to 0.150 mm 0.00413 to 0.00591 in.	0.2 mm 0.0079 in.

W1013973

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm (0.28 to 0.35 in.) deflection at 98 N (10 kgf, 22 lbs) of force	—
Thermostat	Valve Opening Temperature (At Beginning)	69.5 to 72.5 °C 157.1 to 162.5 °F	—
	Valve Opening Temperature (Opened Completely)	85 °C 185 °F	—
Radiator	Water Tightness	No leaks at 137 kPa 1.4 kgf/cm ² 20 psi	—
Radiator Cap	Pressure Falling Time	10 seconds or more for pressure falling from 88 to 59 kPa from 0.9 to 0.6 kgf/cm ² from 13 to 9 psi	—

W1013874

FUEL SYSTEM

Injection Pump	Injection Timing	0.30 to 0.33 rad. (17 to 19 °) before T.D.C.	—
Pump Element	Fuel Tightness	—	14.7 MPa 150 kgf/cm ² 2133 psi
Delivery Valve	Fuel Tightness	10 seconds or more for pressure falling from 14.7 to 13.7 MPa from 150 to 140 kgf/cm ² from 2133 to 1990 psi	5 seconds for pressure falling from 14.7 to 13.7 MPa from 150 to 140 kgf/cm ² from 2133 to 1990 psi
Injection Nozzle	Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2133 psi	—
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm ² , 1849 psi), the valve seat must be fuel tightness.	—

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 : See page G-8.)

Item	N·m	kgf·m	ft-lbs
Power steering main delivery hose retaining nut	46.6 to 50.9	4.8 to 5.2	34.4 to 37.6
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Starter's terminal B mounting nut	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7
Engine and clutch housing mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
3P delivery pipe joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Engine and clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.5 to 20.3
Fuel tank mounting screw	15.0 to 20.0	1.5 to 2.0	10.8 to 14.5
Front axle frame mounting screw (M10)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Front axle frame mounting screw (M12)	102.9 to 117.6	10.5 to 12.5	76.0 to 86.8
Alternator mounting screw (M10)	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Tension adjusting screw (M8)	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2

W1012736

Item	Size x Pitch	N·m	kgf·m	ft-lbs
Cylinder head cover screw	M6 × 1.0	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
* Cylinder head screws	M11 × 1.25	93.1 to 98.0	9.5 to 10.0	68.7 to 72.3
* Main bearing case screws 1	M9 × 1.25	46.1 to 50.9	4.7 to 5.2	34.0 to 37.6
* Main bearing case screws 2	M10 × 1.25	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
* Flywheel screws	M12 × 1.25	98.0 to 107.8	10.0 to 11.0	72.3 to 79.5
* Connecting rod screws	M8 × 1.0	44.1 to 49.0	4.5 to 5.0	32.5 to 36.2
* Rocker arm bracket screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Fan drive pulley mounting nut	—	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
* Bearing case cover screws	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Glow plugs	M10 × 1.25	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 × 2.0	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Nozzle holder	—	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Oil Switch taper screw	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nuts	M12 × 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe assembly retaining nuts	—	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Camshaft set screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Balancer shaft set screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Hi-idling body	—	44.1 to 49.0	4.5 to 5.0	32.6 to 36.3

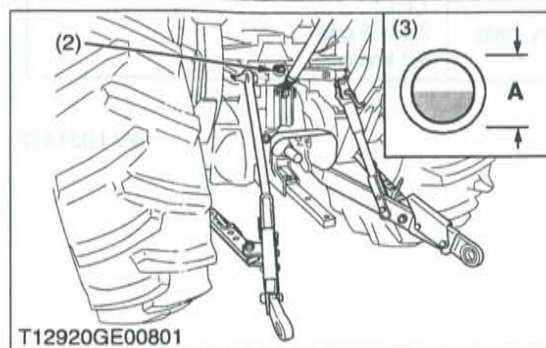
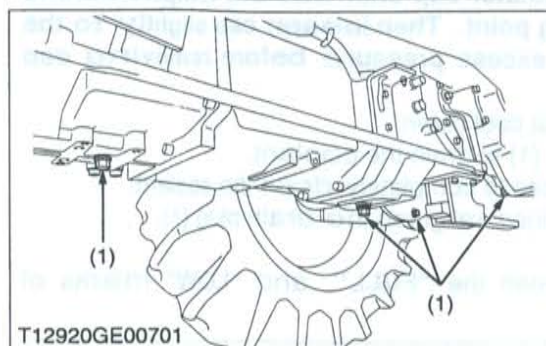
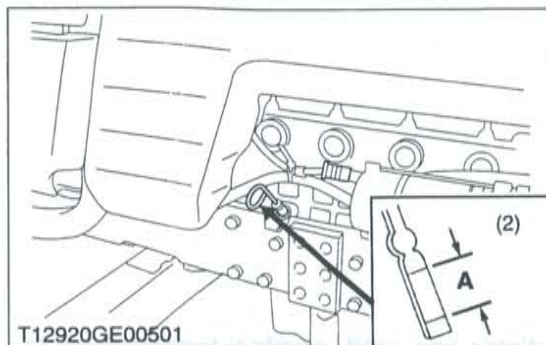
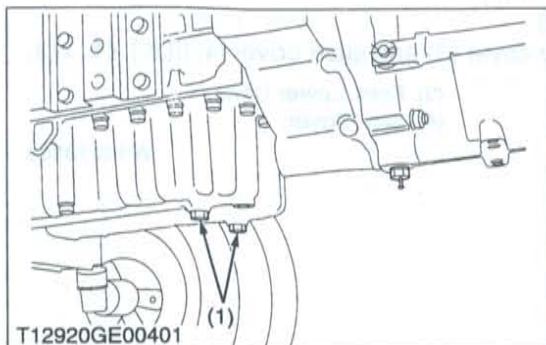
■ NOTE

- For * marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter "M" in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.

W1013236

4. CHECKING, DISASSEMBLING AND SERVICING

[1] SEPARATING ENGINE FROM TRACTOR



Draining Engine Oil

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

(When refilling)

- Fill the engine oil up to the upper line on the dipstick (2).

■ IMPORTANT

- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**

Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)

Engine oil capacity	7.6 L 8.0 U.S.qts. 6.7 Imp.qts.
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- (1) Drain Plug
- (2) Dipstick
- (3) Oil Inlet Plug

A : Oil level is acceptable within this range.

W1015199

Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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■ IMPORTANT

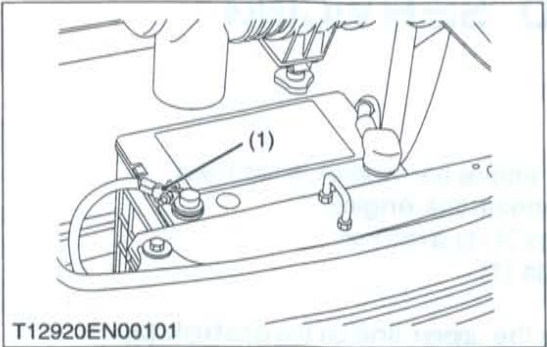
- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)**

- **Do not mix different brands of fluid together.**

- (1) Drain Plugs
- (2) Filling Plug
- (3) Level Gauge

A : Oil level is acceptable within this range.

W1012748

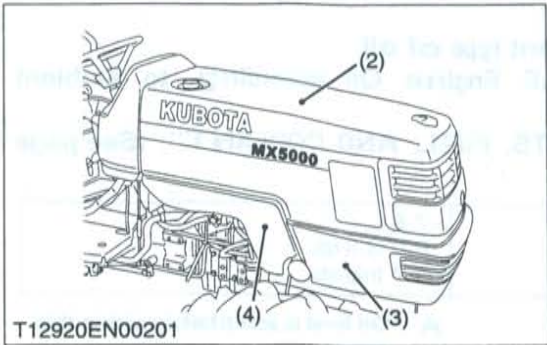


Bonnet, Front Lower Cover

- 1. Disconnect the battery negative cable (1).
- 2. Disconnect the head light 4P connector and remove the wire harness from the bonnet (2).
- 3. Remove the bonnet (2).
- 4. Remove the front lower cover (3) and side cover (4) (R.H.) (L.H.).

- (1) Battery Negative Cable
- (2) Bonnet
- (3) Front Lower Cover
- (4) Side Cover

W1O13560



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. Loosen the drain plug (1) to drain the coolant.
- 3. Remove the radiator cap to completely drain the coolant.
- 4. After all coolant is drained, retighten the drain plug (1).

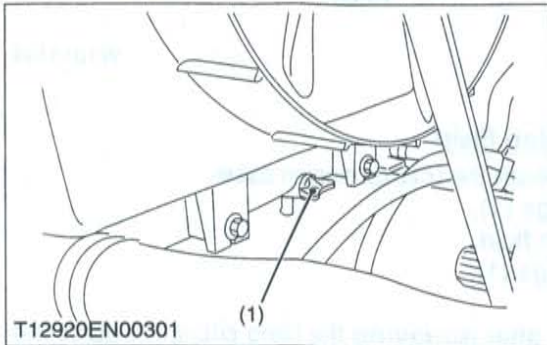
(When refilling)

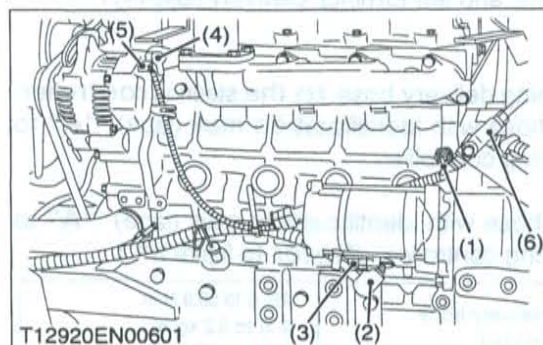
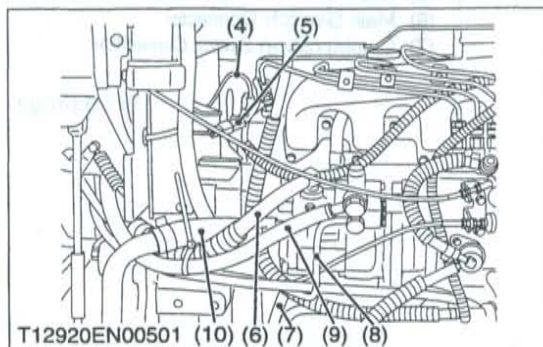
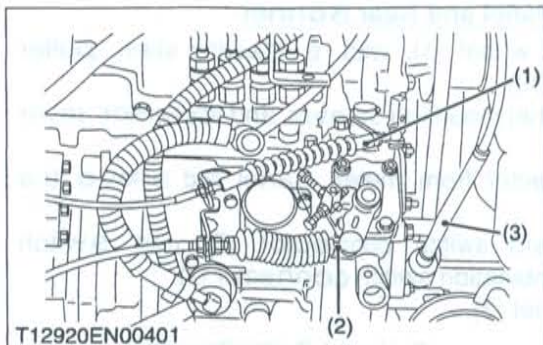
- Fill the coolant between the "FULL" and "LOW" marks of recovery tank.

Coolant capacity (with recovery tank)	7.0 L 7.4 U.S.qts. 6.2 Imp.qts.
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- (1) Drain Plug

W1031412





Wiring, Pipes and Hoses

1. Remove the accelerator wire (1), engine stop wire (2) and hour meter cable (3).
2. Disconnect the 1P connector for water temperature sensor (4) and glow plug 1P connector (5).
3. Disconnect the return hose (6).
4. Remove the power steering delivery hose (9).
5. Remove the PTO delivery pipe (8) and 3P delivery pipe 1 (7).
6. Remove the suction hose (10).

(When reassembling)

Tightening torque	3P delivery pipe 1 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	Power steering hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

- | | |
|------------------------------|----------------------------------|
| (1) Accelerator Wire | (6) Return Hose |
| (2) Engine Stop Wire | (7) 3P Delivery Pipe 1 |
| (3) Hour Meter Cable | (8) PTO Delivery Pipe |
| (4) Water Temperature Sensor | (9) Power Steering Delivery Hose |
| (5) Glow Plug 1P Connector | (10) Suction Hose |

W1014015

Wirings

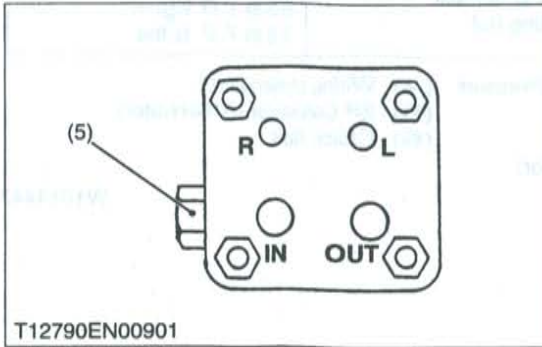
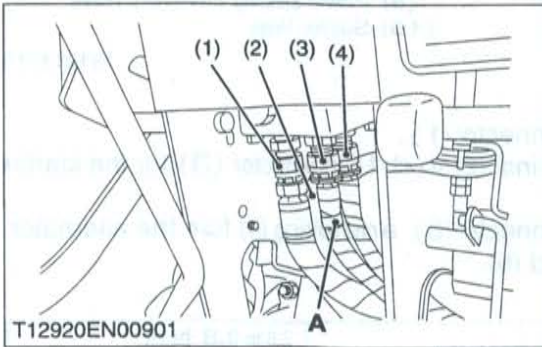
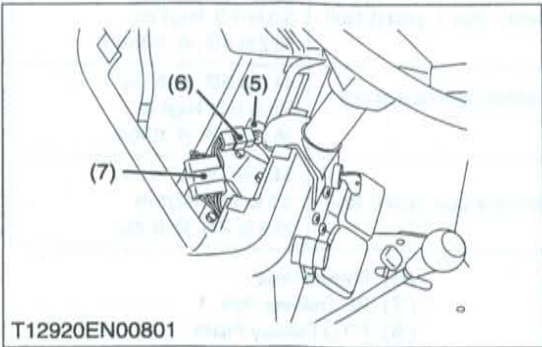
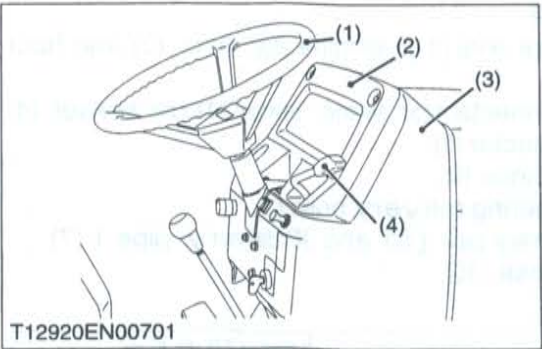
1. Disconnect the 1P connector (1).
2. Disconnect the B terminal (2) and 1P connector (3) for the starter motor.
3. Disconnect the 2P connector (5) and wiring (4) for the alternator.
4. Remove the clutch rod (6).

(When reassembling)

Tightening torque	Starter B terminal mounting nut	7.8 to 9.8 N·m 0.8 to 1.0 kgf·m 5.8 to 7.2 ft-lbs
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- | | |
|---|-------------------------------|
| (1) 1P Connector (Engine Oil Pressure Switch) | (4) Wiring (Alternator) |
| (2) B Terminal (Starter Motor) | (5) 2P Connector (Alternator) |
| (3) 1P Connector (Starter Motor) | (6) Clutch Rod |

W1014443



Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1), with a steering wheel puller (Code No. 07916-51090).
2. Remove the meter panel mounting screws and accelerator lever grip (4).
3. Disconnect the connector from meter panel and remove the meter panel (2).
4. Disconnect the hazard switch connector (5), main switch connector (6) and combination switch connector (7).
5. Remove the rear bonnet (3).

- (1) Steering Wheel
- (2) Meter Panel
- (3) Rear Bonnet
- (4) Accelerator Lever Grip
- (5) Hazard Switch Connector
- (6) Main Switch Connector
- (7) Combination Switch Connector

W1014693

Steering Hoses

1. Disconnect the main delivery hose (1), return hose (2), right turning delivery hose (3) and left turning delivery hose (4).

(When reassembling)

(4WD)

- In assembling the turning delivery hose to the steering controller, connect the delivery hose with identification mark (tape) "A" to the R port of the steering controller.

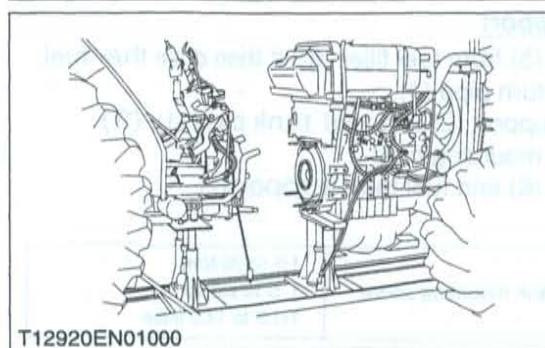
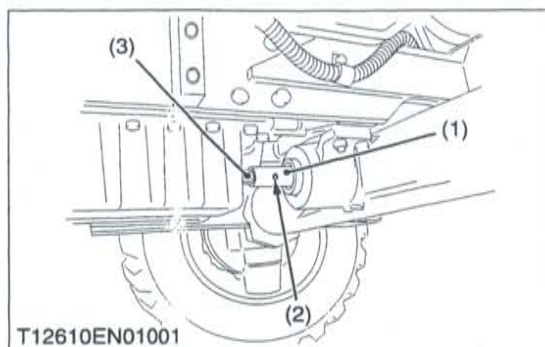
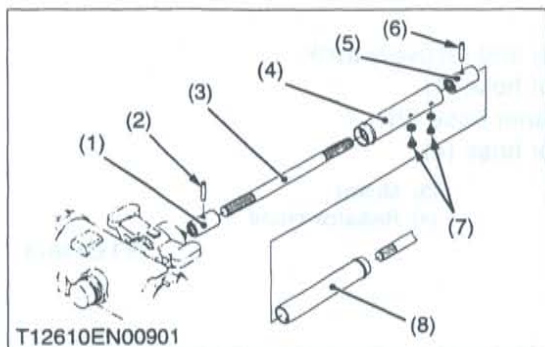
(2WD)

- Connect the delivery hose with identification mark (tape) "A" to the L port of the steering controller. (Refer to figure left.)

Tightening torque	Main delivery hose retaining nut	46.6 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft·lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft·lbs

- (1) Main Delivery Hose
- (2) Return Hose
- (3) Right Turning Delivery Hose
- (4) Left Turning Delivery Hose
- (5) Relief Valve Plug
- (A) Identification Mark (Tape)

W1037929



Propeller Shaft (4WD only)

1. Slide the propeller shaft cover (4) and (8) after removing the screws (7).
2. Tap out the spring pins (2), (6) and slide the couplings (1), (5) and then remove the propeller shaft with covers (4), (8).

(When reassembling)

- Apply grease to the splines of propeller shaft 1 (3).

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

W1030553

Separating Engine and Clutch Housing

1. Place the disassembling stand under the engine and clutch housing case.
2. Remove the fuel tank support mounting bolts.
3. Remove the engine and clutch housing mounting screws and nuts.

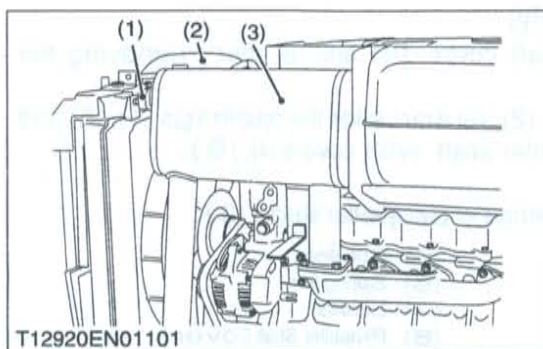
4. Separate the engine and clutch housing.

(When reassembling)

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1015621

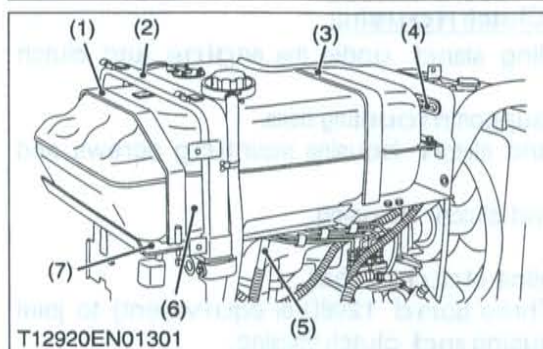
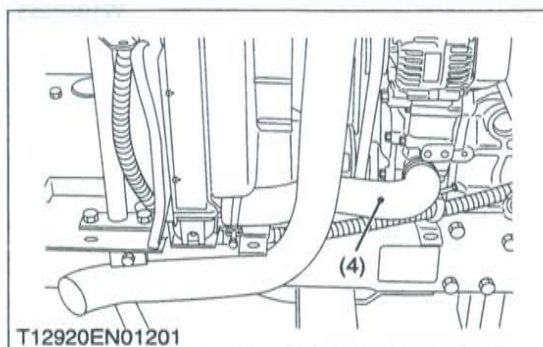


Muffler and Hoses

1. Remove the muffler (3) and recovery tank.
2. Disconnect the radiator hose (1).
3. Disconnect the air cleaner hose (2).
4. Disconnect the radiator hose (4).

- (1) Radiator Hose (3) Muffler
(2) Air Cleaner Hose (4) Radiator Hose

W1015874



Fuel Tank and Tank Support

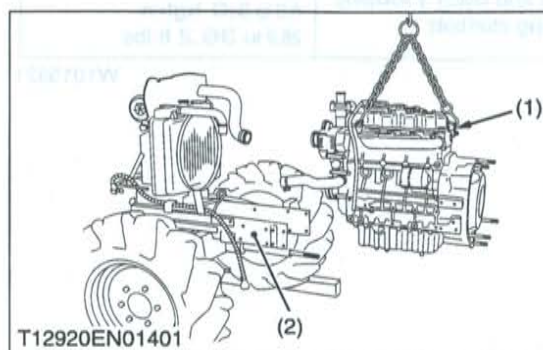
1. Remove the fuel pipe (5) from fuel filter and then drain the fuel.
2. Disconnect the fuel return pipe (4).
3. Remove the bonnet support (2) and fuel tank band (1), (3).
4. Remove the fuel tank mounting bolt.
5. Remove the fuel tank (6) and fuel tank support (7).

(When reassembling)

Tightening torque	Fuel tank mounting screw	15 to 20 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 ft-lbs
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- (1) Fuel Tank Band (5) Fuel Pipe
(2) Bonnet Support (6) Fuel Tank
(3) Fuel Tank Band (7) Fuel Tank Support
(4) Fuel Return Pipe

W1016101



Separating Engine from Front Axle Frame

1. Hoist the engine by the chain at the engine hook (1).
2. Remove the front axle frame mounting screw.
3. Separate the engine from the front axle frame (2).

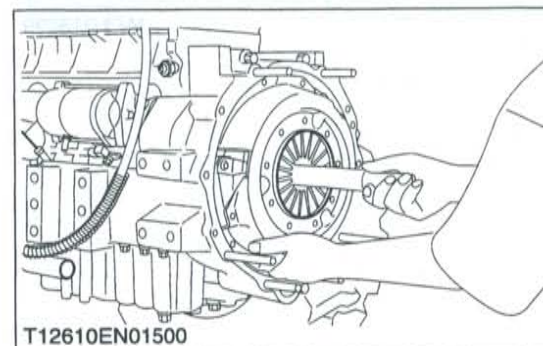
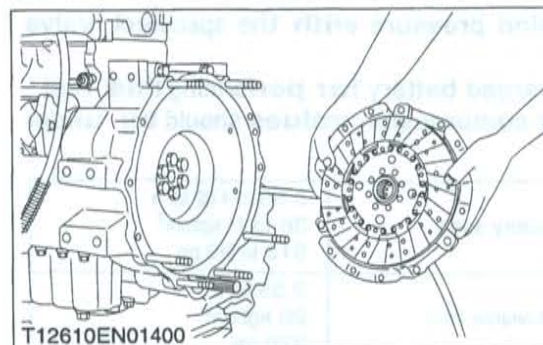
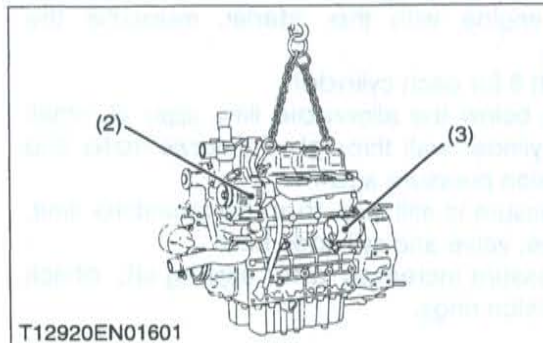
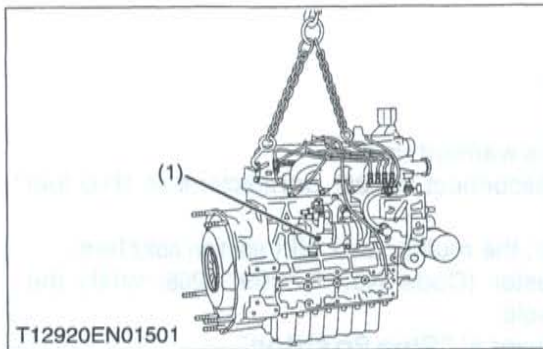
(When reassembling)

- Lift the front of the axle frame by the gap in the bolt hole, and tighten the front axle mounting screws.

Tightening torque	Front axle frame mounting screw (M10)	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
	Front axle frame mounting screw (M12)	102.9 to 117.6 N·m 10.5 to 12.5 kgf·m 76.0 to 86.8 ft-lbs

- (1) Engine Hook (2) Front Axle Frame

W1041831



Outer Parts of Engine

1. Remove the hydraulic pump (1) with pump holder.
2. Remove the alternator (2).
3. Remove the starter motor (3).

(When reassembling)

- Be sure to adjust the fan belt tension. (Refer to G-18.)

Tightening torque	Alternator mounting screw (M10)	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
	Tension adjusting screw (M8)	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs

- (1) Hydraulic Pump
(2) Alternator

- (3) Starter Motor

W1016907

Clutch Assembly

1. Remove the clutch from the flywheel.

(When reassembling)

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

■ IMPORTANT

- Align the center of disc and flywheel by inserting the clutch center tool. (See page G-37.)

■ NOTE

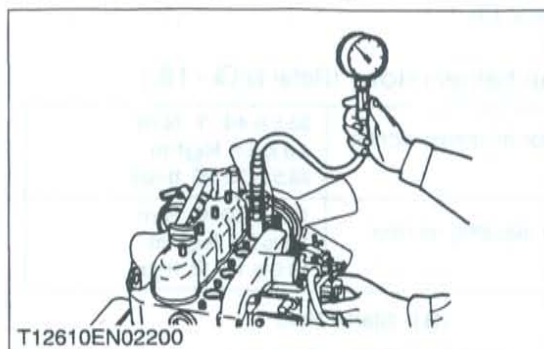
- Do not allow grease and oil on the clutch disc facing.

Tightening torque	Clutch mounting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.5 to 20.3 ft-lbs

W1017185

[2] ENGINE BODY

(1) Checking and Adjusting



Compression Pressure

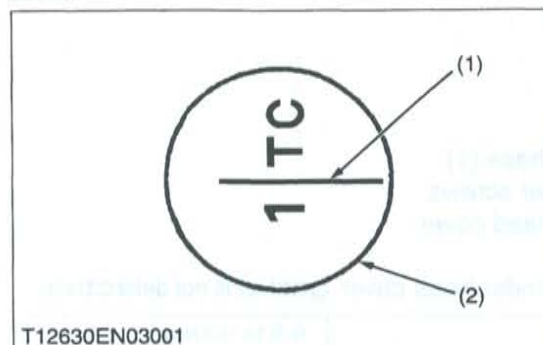
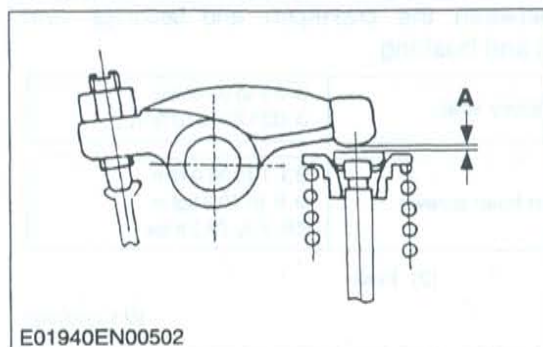
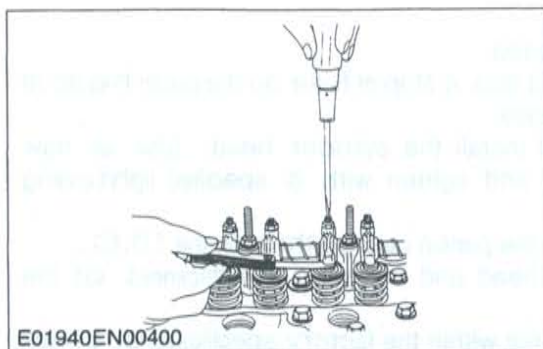
1. Run the engine until it is warmed up.
2. Stop the engine and disconnect the **2P** connector from the fuel pump.
3. Remove the air cleaner, the muffler and all injection nozzles.
4. Set a compression tester (Code No. 07909-30208) with the adaptor to the nozzle hole.
5. Keep the engine stop lever at "**Stop Position**".
6. While cranking the engine with the starter, measure the compression pressure.
7. Repeat steps 4 through 6 for each cylinder.
8. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.
9. If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.
10. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ NOTE

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

Compression pressure	Factory spec.	3.53 to 4.02 MPa 36 to 41 kgf/cm ² 512 to 583 psi
	Allowable limit	2.55 MPa 26 kgf/cm ² 370 psi

W1018639



Valve Clearance

■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.
- Remove the head cover, the glow plugs and the timing window cover on the clutch housing.
 - Align the "1TC" mark line on the flywheel and center of timing window so that the No. 1 piston comes to the compression or overlap top dead center.
 - Check the following valve clearance marked with "☆" using a feeler gauge.
 - If the clearance is not within the factory specifications, adjust with the adjusting screw.

Valve clearance	Factory spec.	0.18 to 0.22 mm 0.0071 to 0.0087 in.
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■ NOTE

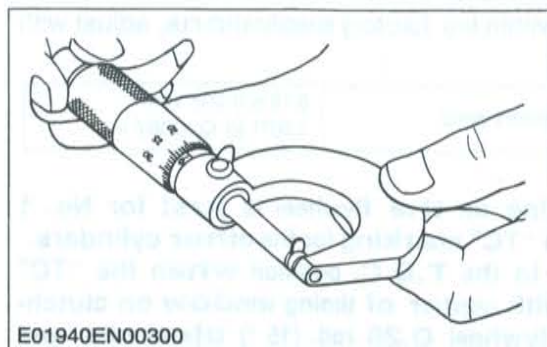
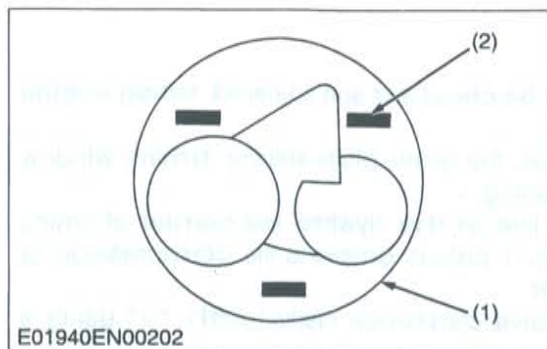
- The "TC" marking line on the flywheel is just for No. 1 cylinder. There is no "TC" marking for the other cylinders.
- No. 1 piston comes to the T.D.C. position when the "TC" marking is aligned with center of timing window on clutch-housing. Turn the flywheel 0.26 rad. (15 °) clockwise and counterclockwise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

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

- (1) TC Mark Line
(2) Timing Window

A : Valve Clearance

W1018974



Top Clearance

1. Remove the cylinder head.
2. Move the piston up and stick a strip of fuse on the piston head at three position with grease.
3. Lower the piston and install the cylinder head. (Use a new cylinder head gasket and tighten with a specified tightening torque.)
4. Turn the flywheel until the piston passes through the T.D.C..
5. Remove the cylinder head and measure the thickness of the fuses.
6. If the measurement is not within the factory specifications, check the oil clearances between the crankpin and bearing and between the piston pin and bushing.

Top clearance	Factory spec.	0.55 to 0.70 mm 0.0217 to 0.0276 in.
Tightening torque	Cylinder head screws	93.1 to 98.0 N·m 9.5 to 10.0 kgf·m 68.7 to 72.3 ft·lbs

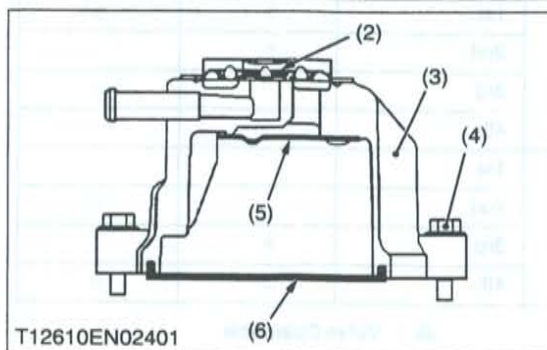
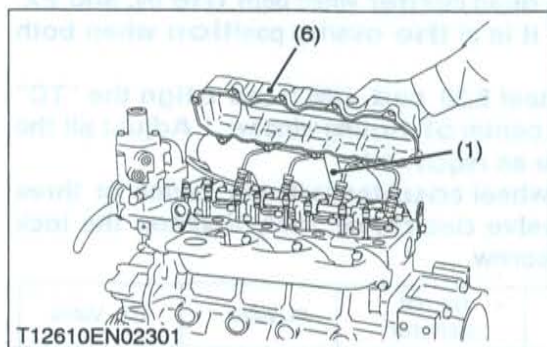
(1) Piston

(2) Fuse

W1020190

(2) Disassembling and Assembling

(A) Cylinder Head and Valves



Cylinder Head Cover

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

(When reassembling)

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

Tightening torque	Cylinder head cover screw	6.9 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.32 ft·lbs
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(1) Breather Hose

(4) Head Cover Screw

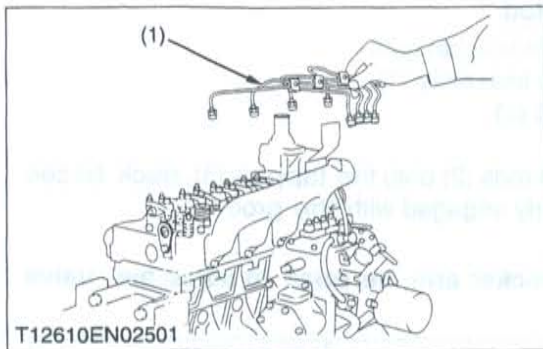
(2) Breather Valve

(5) Plate

(3) Cylinder Head Cover

(6) Cylinder Head Cover Gasket

W1020618



Injection Pipes

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

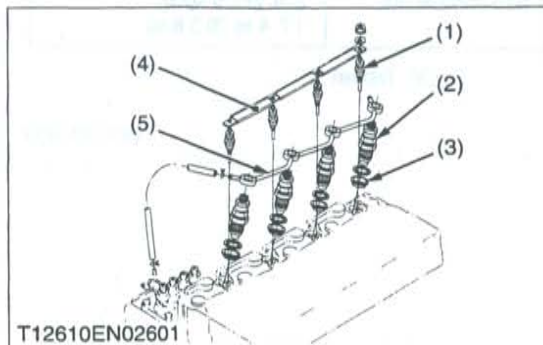
(When reassembling)

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

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

(1) Injection Pipe

W1020811



Nozzle Holder Assembly and Glow Plug

1. Remove the overflow pipe assembly (5).
2. Remove the nozzle holder assemblies (2) using a 21 mm deep socket wrench.
3. Remove the copper gasket and heat seal (3).
4. Remove the glow plugs (1).

(When reassembling)

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

Tightening torque	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Overflow pipe assembly retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Glow plug	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs

(1) Glow Plug

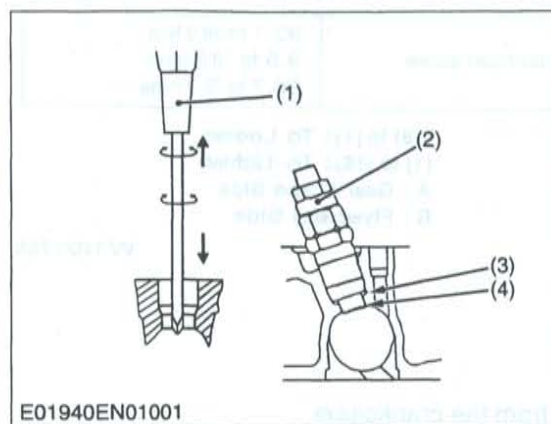
(2) Nozzle Holder Assembly

(3) Heat Seal

(4) Lead

(5) Overflow Pipe Assembly

W1020917



Nozzle Heat Seal Service Removal Procedure

■ IMPORTANT

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

1. Drive screw driver (1) lightly into the heat seal hole.
2. Turn screw driver three or four times each way.
3. While turning the screw driver, slowly pull the heat seal (4) out together with the copper gasket (3).
4. If the heat seal drops, repeat the above procedure.

(When reassembling)

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

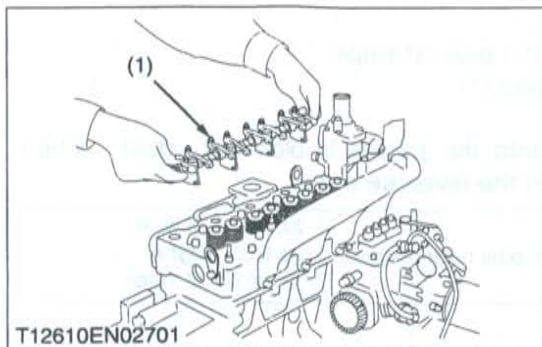
(1) Plus Screw Driver

(2) Nozzle Holder

(3) Copper Gasket

(4) Heat Seal

W1021255



Rocker Arm and Push Rod

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

(When reassembling)

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

■ IMPORTANT

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

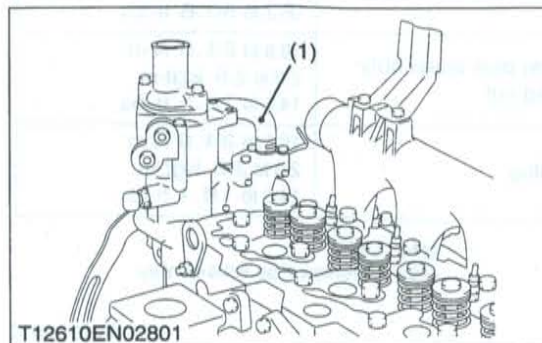
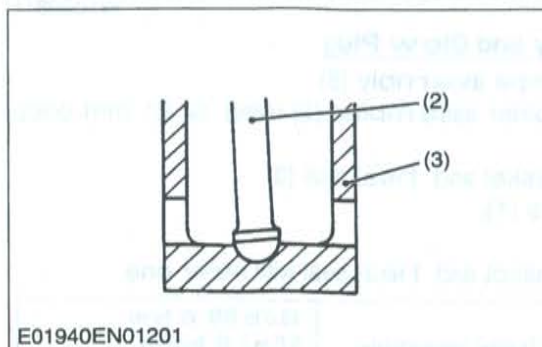
Tightening torque	Rocker arm bracket nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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(1) Rocker Arm Assembly

(2) Push Rod

(3) Tappet

W1021437



Cylinder Head

1. Loosen the pipe clamp, and remove the water return pipe.
2. Remove the cylinder head screw in the order of (18) to (1).
3. Lift up the cylinder head to detach.
4. Remove the cylinder head gasket.

(When reassembling)

- Replace the cylinder head gasket with a new one.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws in diagonal sequence starting from the center.
- Tighten them uniformly, or the head may deform in the long run.

Tightening torque	Cylinder head screw	93.1 to 98.0 N·m 9.5 to 10.0 kgf·m 68.7 to 72.3 ft-lbs
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(1) Return Pipe

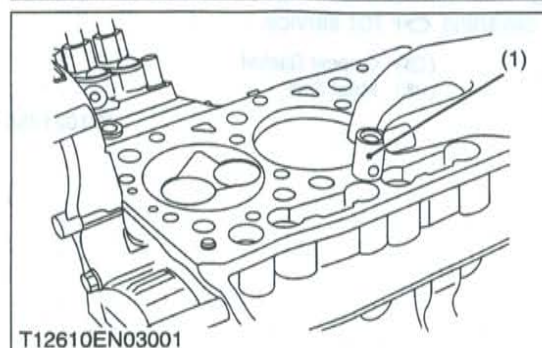
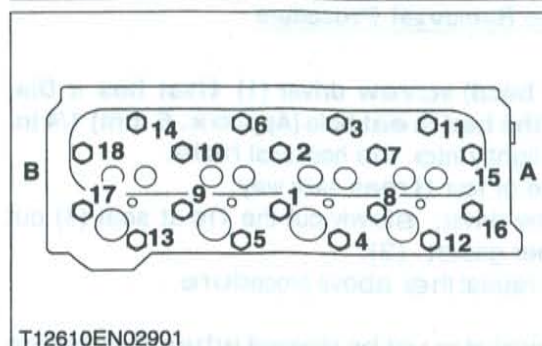
(18) to (1): To Loosen

(1) to (18): To Tighten

A : Gear Case Side

B : Flywheel Side

W1021755



Tappets

1. Remove the tappets from the crankcase.

(When reassembling)

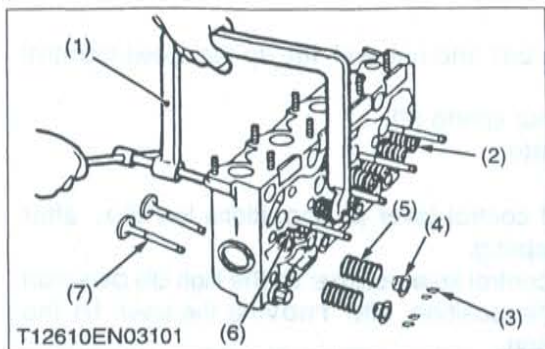
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

■ IMPORTANT

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

(1) Tappet

W1022001



Valves

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

(When reassembling)

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

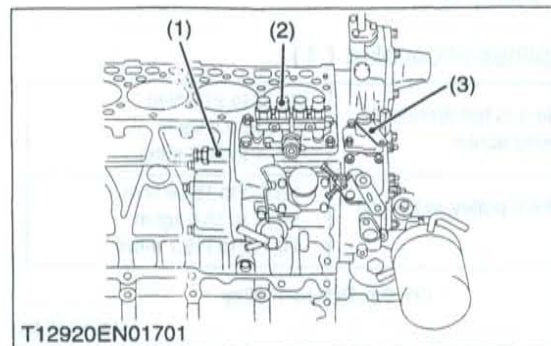
■ IMPORTANT

- **Don't change the combination of valve and valve guide.**

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

W1022102

(B) Timing Gears, Camshaft and Fuel Camshaft



Injection Pump

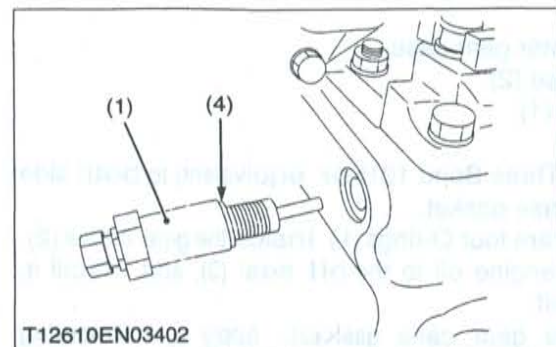
1. Remove the hi-idling body (1).
2. Remove the engine stop lever (3).
3. Remove the fuel injection pump assembly (2).

■ IMPORTANT

- **Before removing the injection pump assembly, be sure to remove the hi-idling body, engine stop lever.**

(When reassembling)

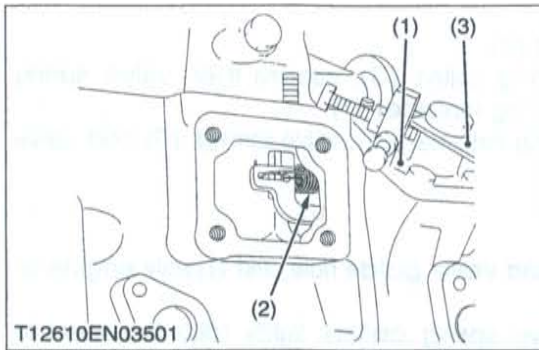
- Before attaching the hi-idling body, install the injection pump first into position.
- Replace the hi-idling body gasket (4) with a new one.



Tightening torque	Hi-idling body	44.1 to 49.0 N·m 4.5 to 5.0 kgf·m 32.6 to 36.3 ft-lbs
-------------------	----------------	---

- | | |
|-----------------------------|----------------|
| (1) Hi-Idling Body | (3) Stop Lever |
| (2) Injection Pump Assembly | (4) Gasket |

W1019534



Speed Control Plate

1. Remove the mounting bolt and nut, and lift up the speed control plate (1).
2. Disconnect the governor spring (2).
3. Take off the control plate.

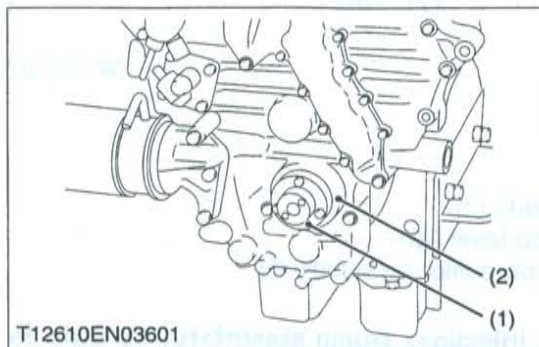
(When reassembling)

- Check that the speed control lever (3) positions low idle, after assembling governor spring.
- Check that the speed control lever returns to the high idle position rather than the low idle position, after moving the lever to the maximum speed position.
- After assembling the engine, check the idling speed referring to Adjusting Idling Speed. (950 to 1000 rpm)

- (1) Speed Control Plate
(2) Governor Spring

- (3) Speed Control Lever

W1024090



Fan Drive Pulley

1. Lock the flywheel not to turn using the flywheel stopper.
2. Remove the coupling (1) for pump drive shaft.
3. Remove the fan drive pulley mounting nut.
4. Remove the fan drive pulley (2).

(When reassembling)

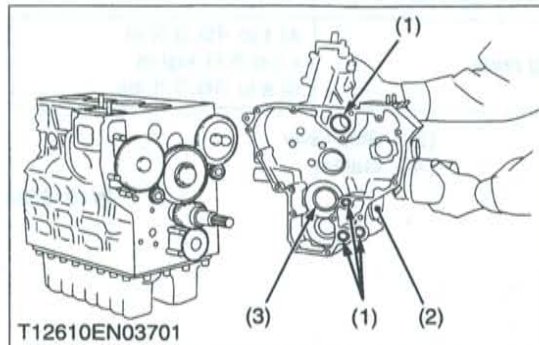
- Apply grease to the splines of coupling (1).

Tightening torque	Coupling to fan drive pulley mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs
	Fan drive pulley mounting nut	137.3 to 156.9 N·m 14.0 to 16.0 kgf·m 101.3 to 115.7 ft·lbs

- (1) Coupling

- (2) Fan Drive Pulley

W1024348



Gear Case

1. Remove the hour meter gear case.
2. Remove the gear case (2).
3. Remove the O-rings (1).

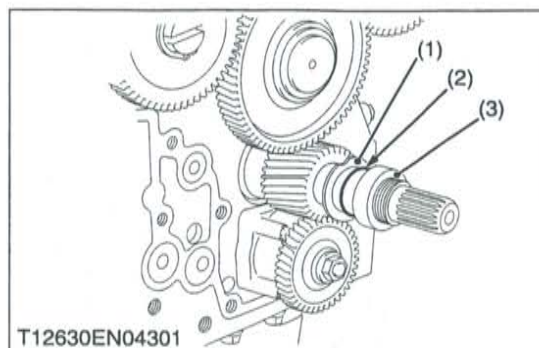
(When reassembling)

- Apply liquid gasket (Three Bond 1215 or equivalent) to both side of hour meter gear case gasket.
- Check to see if there are four O-rings (1) inside the gear case (2).
- Apply a thin film of engine oil to the oil seal (3), and install it, noting the lip come off.
- Before installing the gear case gasket, apply a non-drying adhesive.

- (1) O-ring
(2) Gear Case

- (3) Oil Seal

W1024531



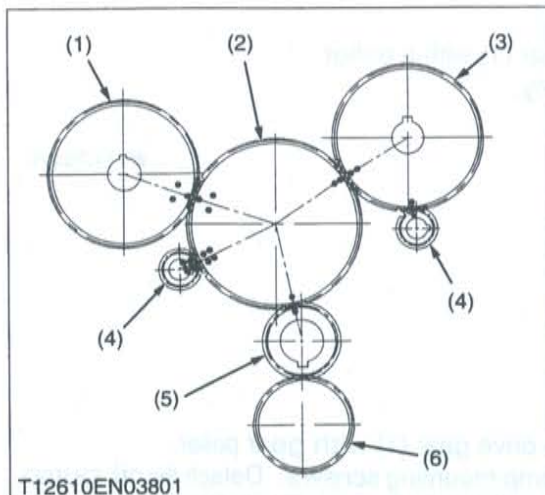
Crankshaft Oil Slinger

1. Remove the feather key.
2. Remove the crankshaft collar (3).
3. Remove the O-ring (2).
4. Detach the crankshaft oil slinger (1).

- (1) Crankshaft Oil Slinger
(2) O-ring

- (3) Crankshaft Collar

W1024731



Idle Gear

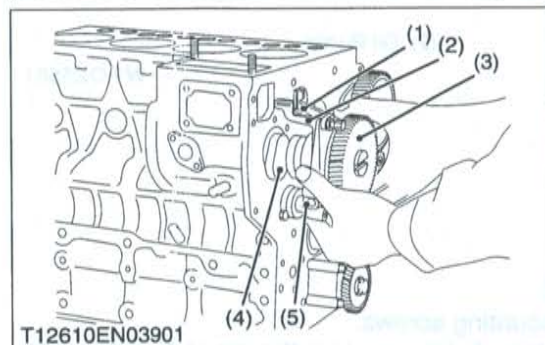
1. Remove the external snap ring.
2. Detach the idle gear collar.
3. Detach the idle gear.

(When reassembling)

- Check to see each gear is aligned with its aligning mark:
 - 1 Mark : Idle gear and crank gear, cam gear and balancer gear
 - 2 Marks : Cam gear and idle gear
 - 3 Marks : Idle gear and injection pump gear
 - 4 Marks : Idle gear and balancer gear

- | | |
|-------------------------|-------------------------|
| (1) Injection Pump Gear | (4) Balancer Gear |
| (2) Idle Gear | (5) Crank Gear |
| (3) Cam Gear | (6) Oil Pump Drive Gear |

W1024941



Fuel Camshaft and Fork Lever Assembly

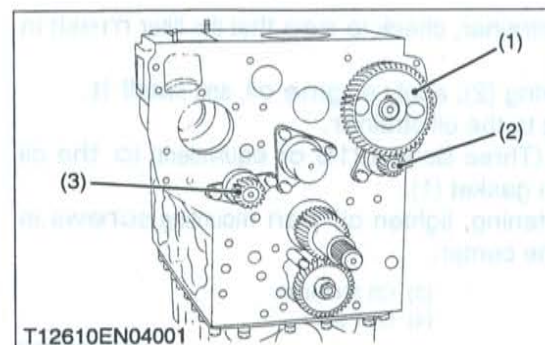
1. Remove the pump drive gear from fuel camshaft.
2. Detach the fuel camshaft stopper.
3. Remove the three fork lever holder mounting screws.
4. Draw out the fuel camshaft assembly (3), (4) and fork lever assembly (1), (2), (5) at the same time.

(When reassembling)

- After installation, check to see that the fork lever 1 (1) and 2 (2) are fixed to the fork lever shaft, and that they can turn smoothly in the holder (5).

- | | |
|-------------------------|-----------------------|
| (1) Fork Lever 1 | (4) Fuel Camshaft |
| (2) Fork Lever 2 | (5) Fork Lever Holder |
| (3) Injection Pump Gear | |

W1025309

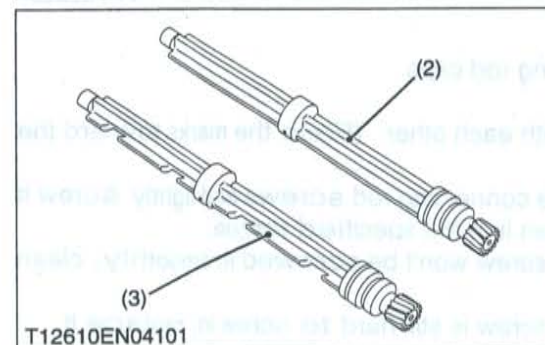


Camshaft and Balancer Shaft

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

(When reassembling)

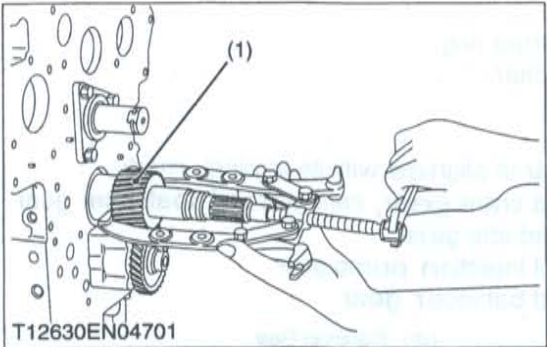
- When install the balancer shaft 1 and 2, be sure to place the 4th cylinders piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.



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

- | | |
|----------------------|----------------------|
| (1) Camshaft | (3) Balancer Shaft 2 |
| (2) Balancer Shaft 1 | |

W1025098

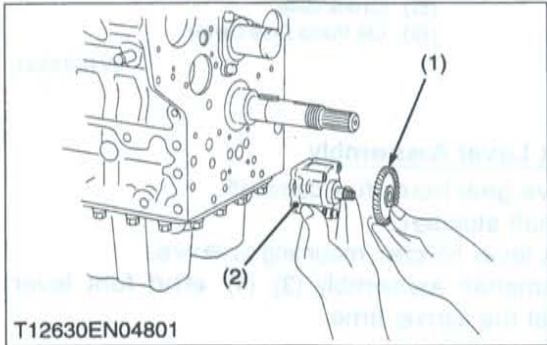


Crank Gear

1. Draw out the crank gear (1) with a puller.
2. Remove the feather key.

(1) Crank Gear

W1O25476



Oil Pump

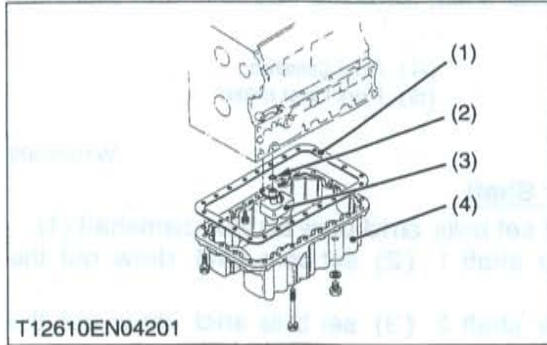
1. Remove the nut.
2. Draw out the oil pump drive gear (1) with gear puller.
3. Remove the four oil pump mounting screws. Detach the oil pump (2).

(1) Oil Pump Drive Gear

(2) Oil Pump

W1O25581

(C) Piston and Connecting Rod



Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws.
2. Remove the oil pan (4) by lightly tapping the rim of the pan with a wooden hammer.
3. Remove the oil strainer (3).

(When reassembling)

- After cleaning the oil strainer, check to see that the filter mesh is clean, and install it.
- Visually check the O-ring (2), apply engine oil, and install it.
- Securely fit the O-ring to the oil strainer.
- Apply a liquid gasket (Three Bond 1215 or equivalent) to the oil pan side of the oil pan gasket (1).
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.

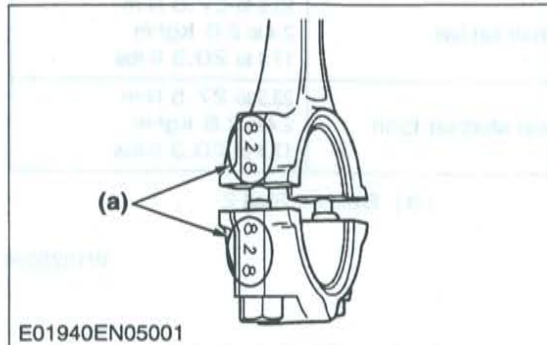
(1) Oil Pan Gasket

(3) Oil Strainer

(2) O-ring

(4) Oil Pan

W1O25687



Connecting Rod Cap

1. Remove the connecting rod caps.

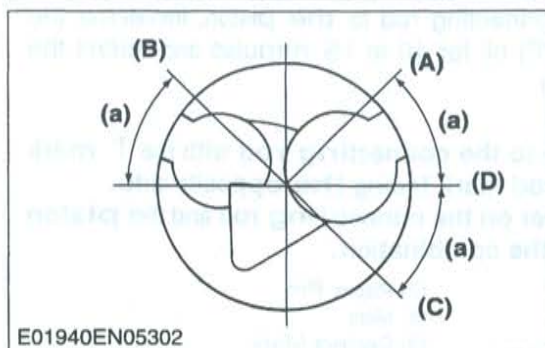
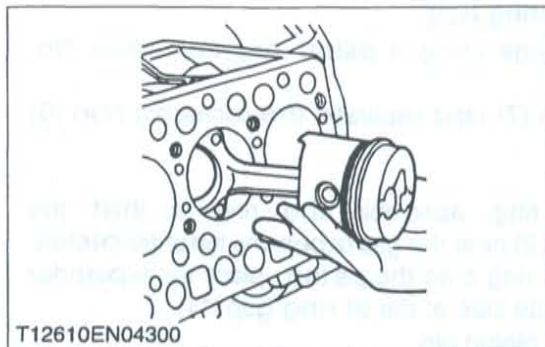
(When reassembling)

- 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.

Tightening torque	Connecting rod screw	44.1 to 49.0 N·m 4.5 to 5.0 kgf·m 32.5 to 36.2 ft·lbs
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(a) Mark

W1O25878



Pistons

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

(When reassembling)

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

■ IMPORTANT

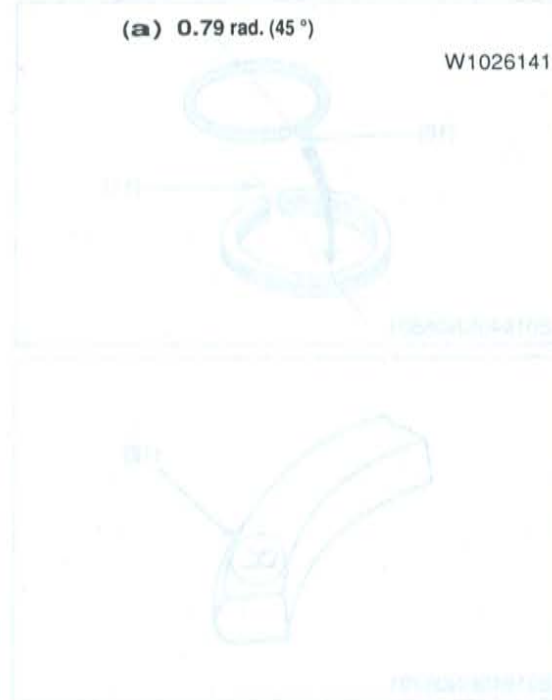
- Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 piston.
- Place the piston rings with their gaps at 0.79 rad. (45 °) from the piston pin's direction as shown in the figure.
- Carefully insert the pistons using a piston ring compressor.
- 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.

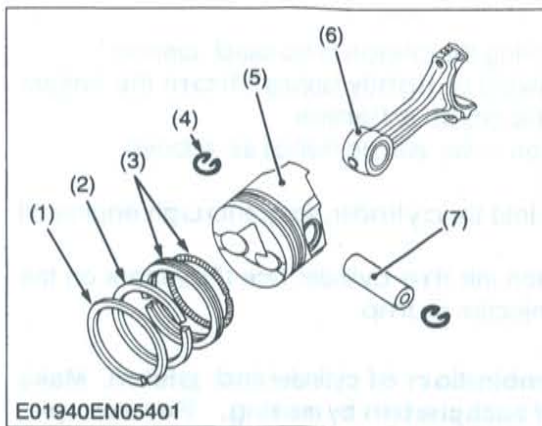
- (A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap

(D) Piston Pin Hole

(a) 0.79 rad. (45 °)

W1026141





Piston Ring and Connecting Rod

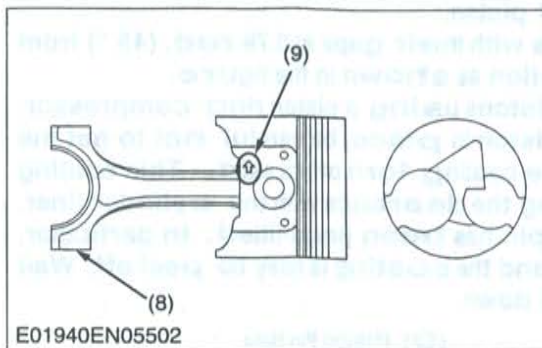
1. Remove the piston rings using a piston ring tool (Code No. 07909-32121).
2. Remove the piston pin (7), and separate the connecting rod (6) from the piston (5).

(When reassembling)

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

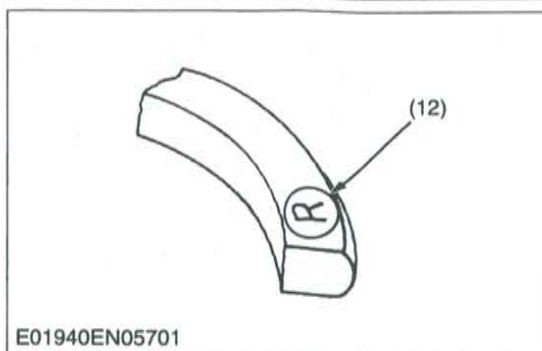
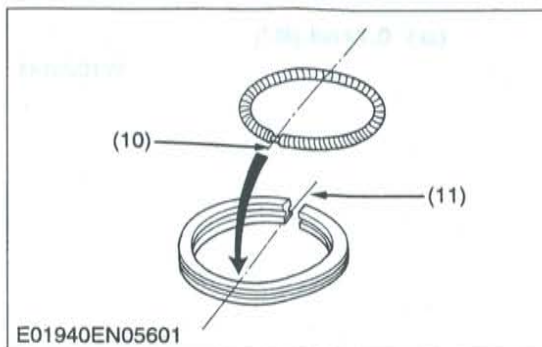
■ NOTE

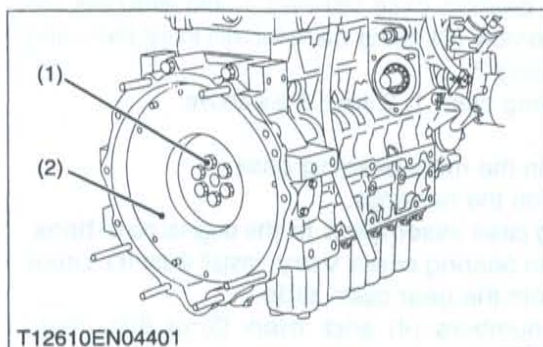
- Assemble the piston to the connecting rod with the ↑ mark and the connecting rod mark facing the opposite side.
- Mark the same number on the connecting rod and the piston so as not to change the combination.



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

W1026376



(D) Crankshaft**Flywheel**

1. Lock the flywheel not to turn using the flywheel stopper.
2. Remove the flywheel screws (1) and remove the flywheel (2).

(When reassembling)

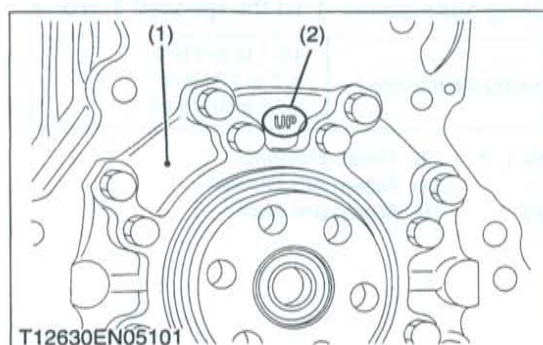
- Apply engine oil to the flywheel screws.
- Check to see that there are no metal particles left on the flywheel mounting surfaces.
- To ease alignment of the crankshaft and the flywheel, bring the crank of No. 1 cylinder to TC (top dead center). Make sure of the flywheel 1TC, align it in the window on flywheel housing.

Tightening torque	Flywheel screws	98.0 to 107.8 N·m 10.0 to 11.0 kgf·m 72.3 to 79.5 ft-lbs
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(1) Flywheel Screw

(2) Flywheel

W1026863

**Bearing Case Cover**

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

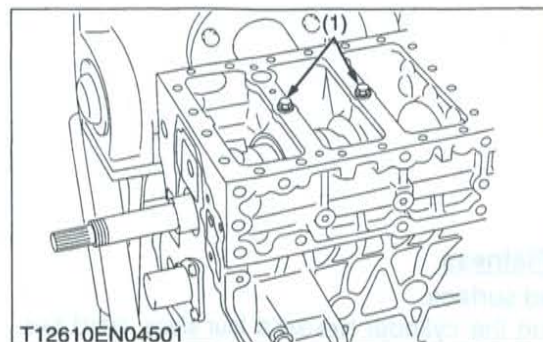
(When reassembling)

- Apply grease the oil seal lip, be careful not to peel the lip off.
- Install the bearing case cover (1) to position the casting mark "UP" (2) on it upward.
- Tighten the bearing case cover mounting screws with even force on the diagonal line.

(1) Bearing Case Cover

(2) Casting Mark

W1027062

**Crankshaft**

1. Remove the main bearing case screws 2 (1).
2. Pull out the crankshaft assembly (2), taking care not to damage the crankshaft bearing 1.

(When reassembling)

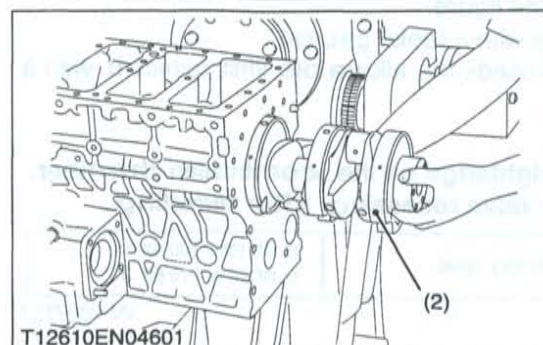
- Apply oil to the main bearing case screws 2.
- Clean the oil passage of the crankshaft with compressed air.
- Install the crankshaft assembly (2), aligning the screw hole of main bearing case with the screw hole of crankcase.

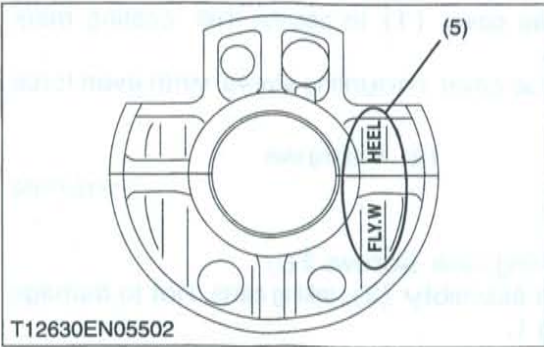
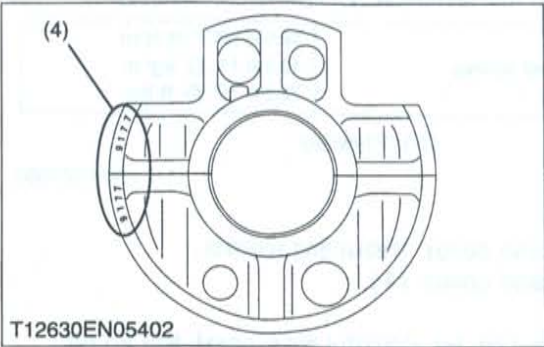
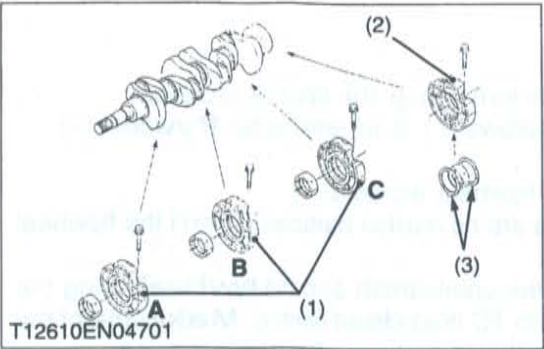
Tightening torque	Main bearing case screws 2	68.6 to 73.5 N·m 7.0 to 7.5 kgf·m 50.6 to 54.2 ft-lbs
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(1) Main Bearing Case Screw 2

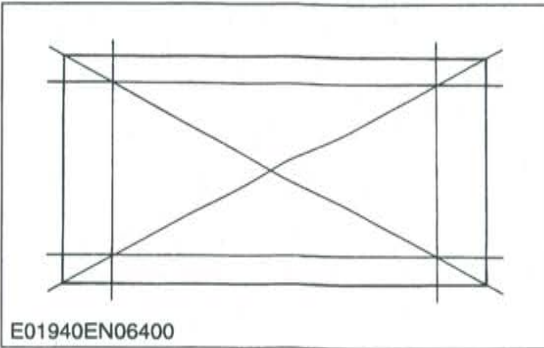
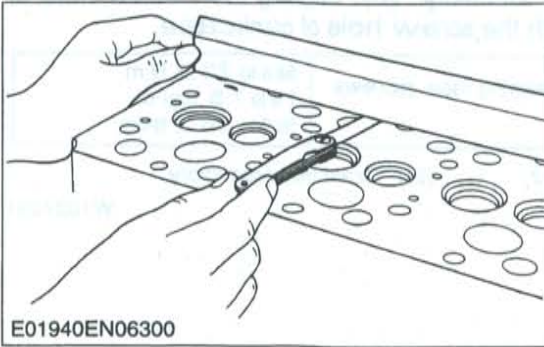
(2) Crankshaft Assembly

W1027231





(3) Servicing
(A) Cylinder Head and Valves



Main Bearing Case Assembly

1. Remove the two main bearing case screws 1, and remove the main bearing case assembly (2) being careful with thrust bearing (3) and crankshaft bearing 2.
2. Remove the main bearing case 1, 2 and 3 as above.

(When reassembling)

- Clean the oil passage in the main bearing case.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of makings (A, B, C) from the gear case side.
- Match the alignment numbers (4) and mark (5) on the main bearing case.
- When installing the main bearing case 1, 2 and 3, face the mark "FLYWHEEL" to the flywheel.
- Install the thrust bearing with its oil groove facing outward.
- Confirm that the main bearing case moves smoothly after tightening the main bearing case screw 1 to the specified torque.

Tightening torque	Main bearing case screw 1	46.1 to 50.9 N·m 4.7 to 5.2 kgf·m 34.0 to 37.6 ft·lbs
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- (1) Main Bearing Case Assembly 1, 2 and 3
(2) Main Bearing Case Assembly
(3) Thrust Bearing
(4) Alignment Number
(5) Alignment Mark

Cylinder Head Surface Flatness

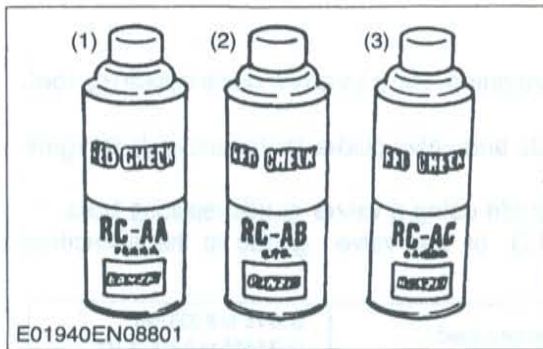
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal as shown in the figure.
3. Measure the clearance with a feeler gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ IMPORTANT

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

Cylinder head surface flatness	Factory spec.	0.05 mm / 500 mm 0.0020 in. / 19.69 in.
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W1027737



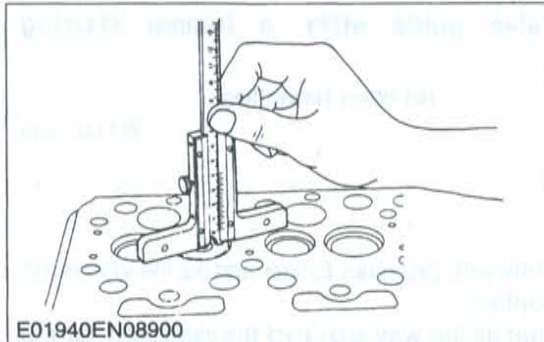
Cylinder Head Flaw

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with detergent (2).
3. Spray the cylinder head surface with the read permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the read 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

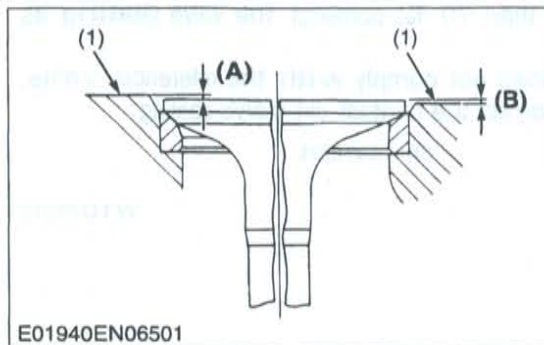
(3) White Developer

W1076542



Valve Recessing

1. Clean the cylinder head surface, valve face and valve seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
5. If it still exceeds the allowable limit after replacing the valve, correct the valve seat face of the cylinder head with a valve seat cutter (Code No. 07909-33102) or valve seat grinder.
6. Then, correct the cylinder head surface with a surface grinder, or replace the cylinder head.

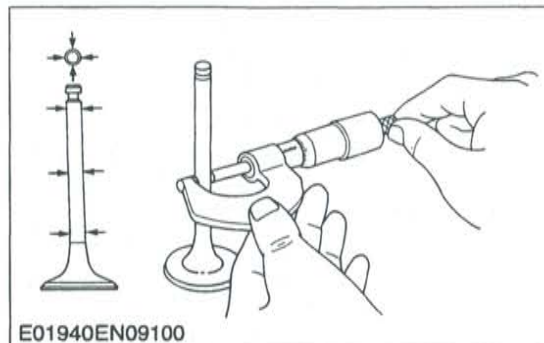


Valve recessing	Factory spec.	0.05 (protrusion) to 0.15 (recessing) mm 0.0020 (protrusion) to 0.0059 (recessing) in.
	Allowable limit	0.40 (recessing) mm 0.0157 (recessing) in.

(1) Cylinder Head Surface

(A) Recessing
(B) Protrusion

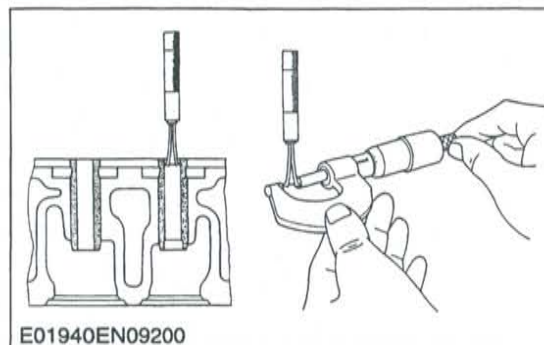
W1076880



Clearance between Valve Stem and Valve Guide

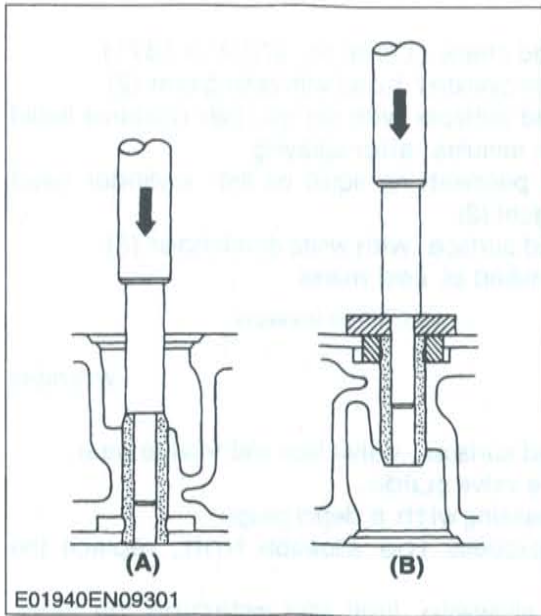
1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. with a small hole gauge, and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit,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

Clearance between valve stem and guide	Factory spec.	0.040 to 0.070 mm 0.00157 to 0.00276 in.
	Allowable limit	0.1 mm 0.0039 in.



Valve stem O.D.	Factory spec.	7.960 to 7.975 mm 0.31339 to 0.31398 in.
Valve guide I.D.	Factory spec.	8.015 to 8.030 mm 0.31555 to 0.31614 in.

W1077495



Replacing Valve Guide

(When removing)

1. Press out the used valve guide using a valve guide replacing tool.

(When installing)

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

Valve guide I.D. (Intake and exhaust)	Factory spec.	8.015 to 8.030 mm 0.31555 to 0.31614 in.
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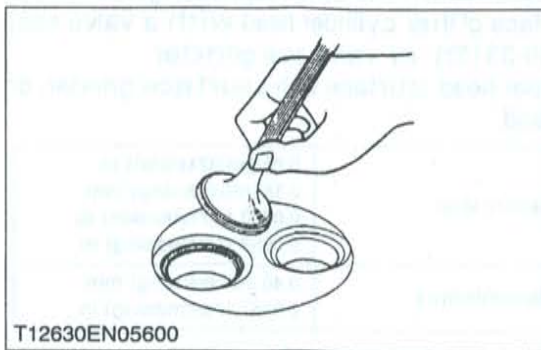
■ IMPORTANT

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

(A) When Removing

(B) When Installing

W1027889



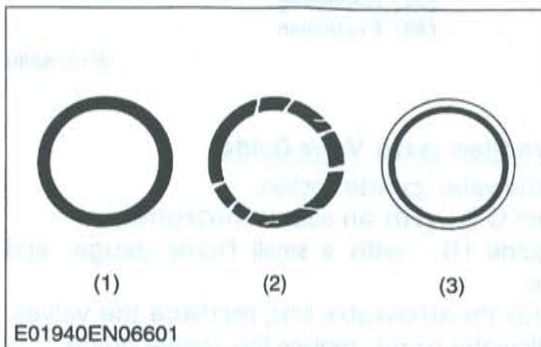
Valve Seating

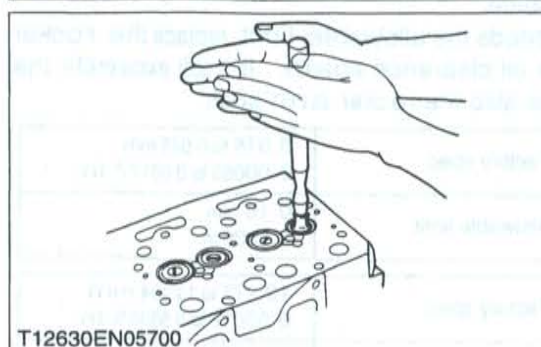
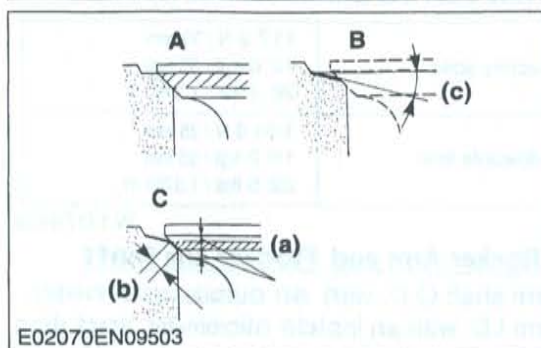
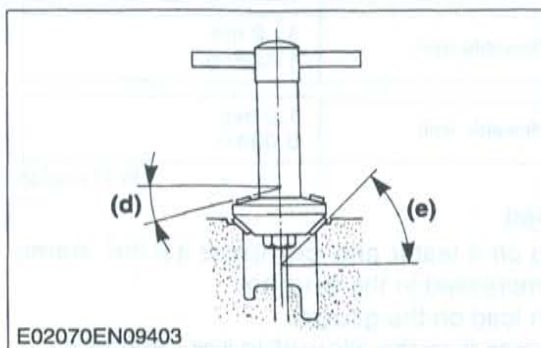
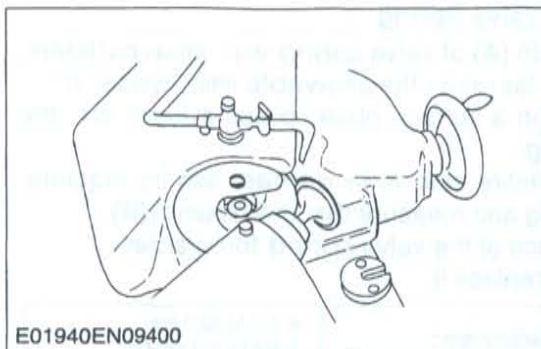
1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
3. If the valve contact does not comply with the reference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

- (1) Correct
(2) Incorrect

(3) Incorrect

W1028219





Correcting Valve and Valve Seat

■ NOTE

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

1) Correcting Valve

1. Correct the valve with a valve refacer.

2) Correcting Valve Seat

1. Slightly correct the seat surface with a 1.047 rad. (60 °) (intake valve) or 0.785 rad. (45 °) (exhaust valve) seat cutter (Code No. 07909-33102).
2. Resurface the seat surface with a 0.523 rad. (30 °) valve seat cutter to intake valve seat and with a 0.262 rad. (15 °) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width (2.12 mm, 0.0835 in.)
3. After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.
4. Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

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

W1028350

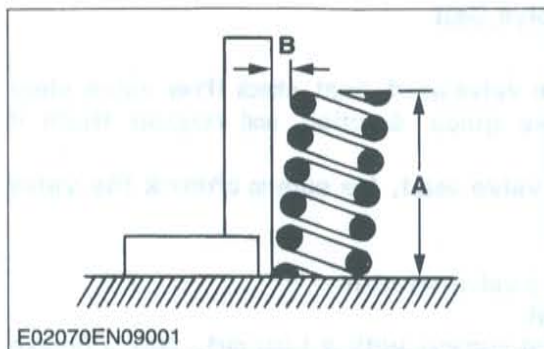
Valve Lapping

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.

W1028814

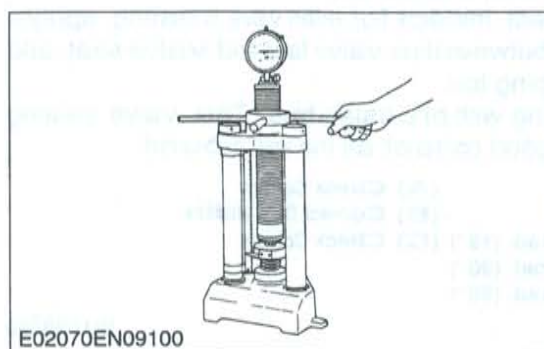


Free Length and Tilt of Valve Spring

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

Free length (A)	Factory spec.	41.7 to 42.2 mm 1.6417 to 1.6614 in.
	Allowable limit	41.2 mm 1.6220 in.
Tilt (B)	Allowable limit	1.0 mm 0.039 in.

W1028935

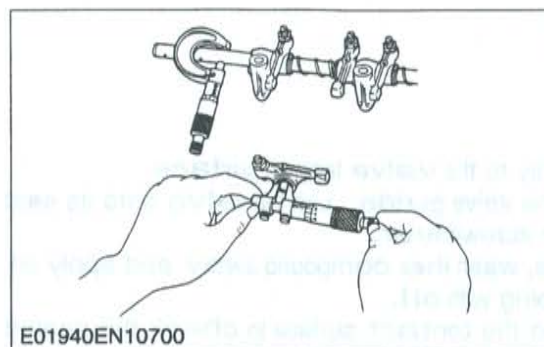


Valve Spring Setting Load

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

Setting load / Setting length	Factory spec.	117.6 N / 35 mm 12.0 kgf / 35 mm 26.4 lbs / 1.3780 in.
	Allowable limit	100.0 N / 35 mm 10.2 kgf / 35 mm 22.5 lbs / 1.3780 in.

W1078436

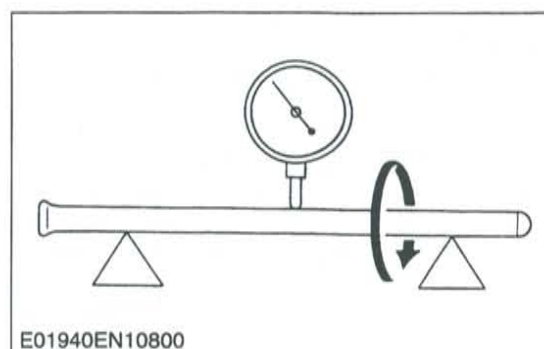


Oil Clearance between Rocker Arm and Rocker Arm Shaft

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

Oil clearance between rocker arm and rocker arm shaft	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.00177 in.
	Allowable limit	0.10 mm 0.0039 in.
Rocker arm shaft O.D.	Factory spec.	13.973 to 13.984 mm 0.55012 to 0.55055 in.
Rocker arm I.D.	Factory spec.	14.000 to 14.018 mm 0.55118 to 0.55189 in.

W1029150

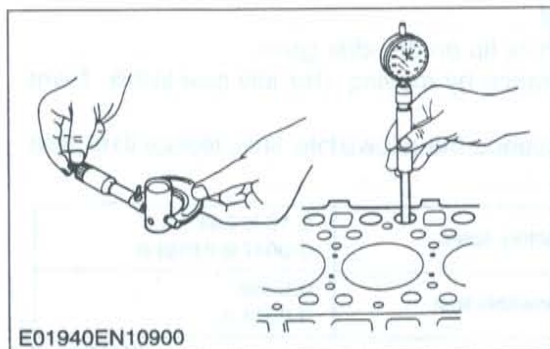


Push Rod Alignment

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.
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W1029290



Oil Clearance between Tappet and Tappet Guide Bore

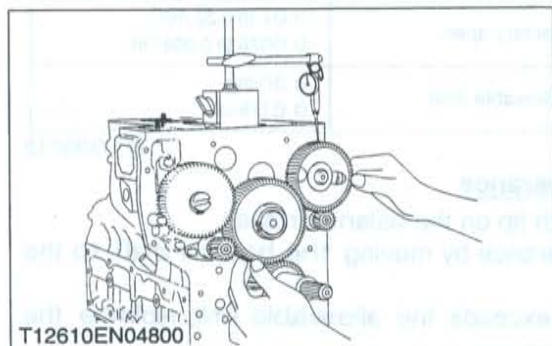
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil Clearance between tappet and tappet guide bore	Factory spec.	0.020 to 0.062 mm 0.00079 to 0.00244 in.
	Allowable limit	0.07 mm 0.0028 in.

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94410 in.
Tappet guide bore I.D.	Factory spec.	24.000 to 24.021 mm 0.94488 to 0.94571 in.

W1023775

(B) Timing Gears, Camshaft and Fuel 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 idle gear and crank gear	Factory spec.	0.0415 to 0.1122 mm 0.00163 to 0.00442 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and cam gear	Factory spec.	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.
	Allowable limit	0.15 mm 0.0059 in.

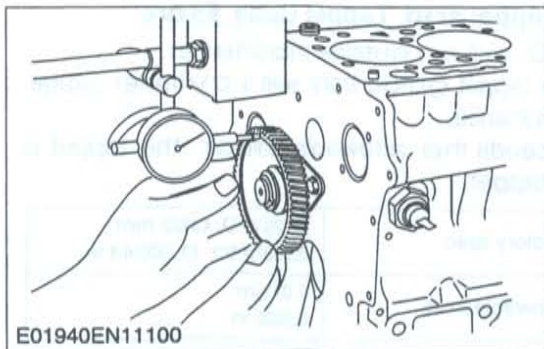
Backlash between idle gear and injection pump gear	Factory spec.	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between crank gear and oil pump gear	Factory spec.	0.0415 to 0.1090 mm 0.00163 to 0.00429 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and balancer gear (IN. side)	Factory spec.	0.0350 to 0.1160 mm 0.00138 to 0.00457 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between cam gear and balancer gear (EX. gear)	Factory spec.	0.0350 to 0.1160 mm 0.00138 to 0.00457 in.
	Allowable limit	0.15 mm 0.0059 in.

W1029564

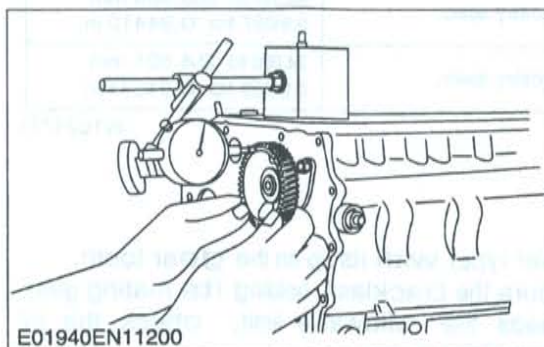


Idle Gear Side Clearance

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.	0.12 to 0.48 mm 0.0047 to 0.0189 in.
	Allowable limit	0.9 mm 0.0354 in.

W1O29843

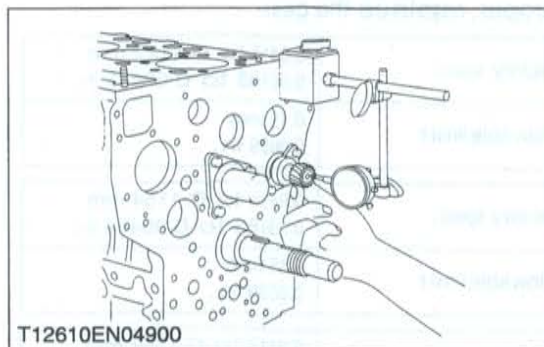


Camshaft Side Clearance

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

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

W1O30012

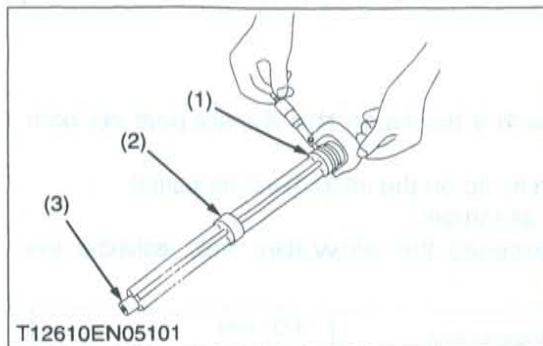
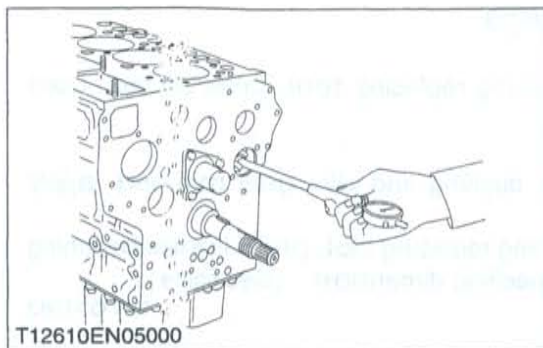


Balancer Shaft Side Clearance

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

Side clearance of balancer shaft	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0087 in.
	Allowable limit	0.3 mm 0.0118 in.

W1O30111



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. for balancer shaft with an inside micrometer or cylinder gauge.
3. If the clearance exceeds the allowable limit, replace the balancer shaft.

Oil clearance of balancer shaft journal 1	Factory spec.	0.030 to 0.111 mm 0.00118 to 0.00437 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer shaft journal 1 O.D.	Factory spec.	43.934 to 43.950 mm 1.72968 to 1.73031 in.
Balancer shaft bearing 1 I.D.	Factory spec.	43.980 to 44.045 mm 1.73149 to 1.73405 in.

Oil clearance of balancer shaft journal 2	Factory spec.	0.030 to 0.111 mm 0.00118 to 0.00437 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer shaft journal 2 O.D.	Factory spec.	41.934 to 41.950 mm 1.65094 to 1.65157 in.
Balancer shaft bearing 2 I.D.	Factory spec.	41.980 to 42.045 mm 1.65275 to 1.65531 in.

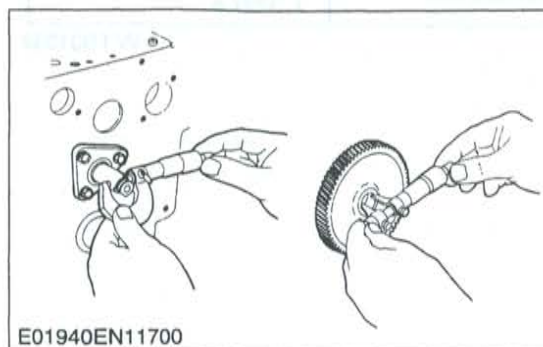
Oil clearance of balancer shaft journal 3	Factory spec.	0.020 to 0.094 mm 0.00079 to 0.00370 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer shaft journal 3 O.D.	Factory spec.	21.947 to 21.960 mm 0.86405 to 0.86456 in.
Balancer shaft bearing 3 I.D.	Factory spec.	21.980 to 22.041 mm 0.86535 to 0.86775 in.

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

(3) Balancer Shaft Journal 3

W1030206



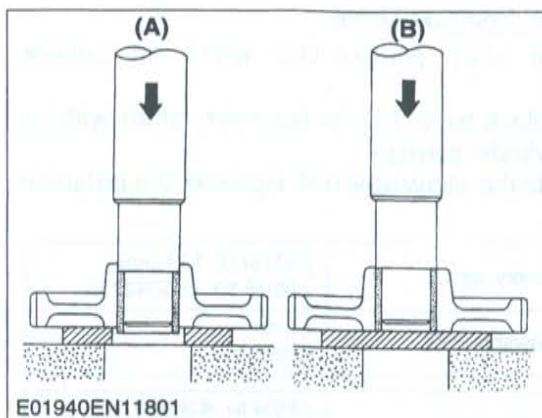
Oil Clearance between Idle Gear Shaft and Idle Gear Bushing

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

Clearance between idle gear shaft and idle gear bushing	Factory spec.	0.025 to 0.066 mm 0.00098 to 0.00260 in.
	Allowable limit	0.1 mm 0.0039 in.

Idle gear shaft O.D.	Factory spec.	37.959 to 37.975 mm 1.49445 to 1.49508 in.
Idle gear bushing I.D.	Factory spec.	38.000 to 38.025 mm 1.49606 to 1.49704 in.

W1030933



Replacing Idle Gear Bushing

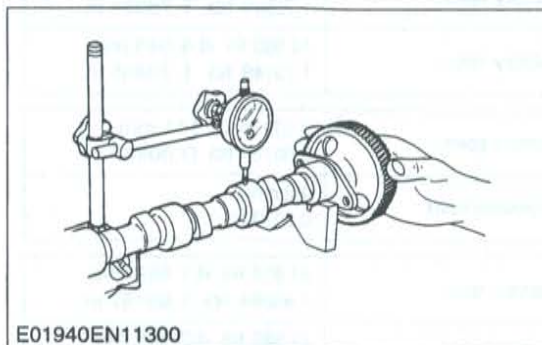
(A) (When removing)

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

(B) (When installing)

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

W1031083

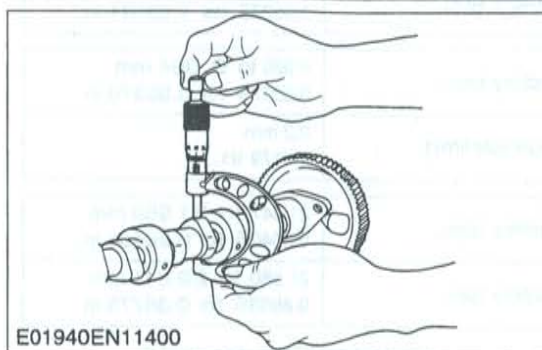


Camshaft Alignment

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

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.
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W1031413



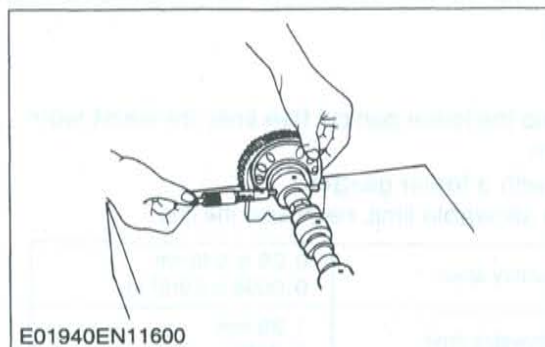
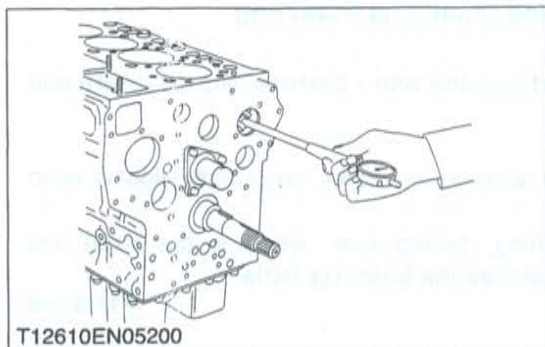
Cam Height

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

Cam height of intake	Factory spec.	33.90 mm 1.3346 in.
	Allowable limit	33.85 mm 1.3327 in.

Cam height of exhaust	Factory spec.	33.90 mm 1.3346 in.
	Allowable limit	33.85 mm 1.3327 in.

W1031532



Oil Clearance of Camshaft Journal

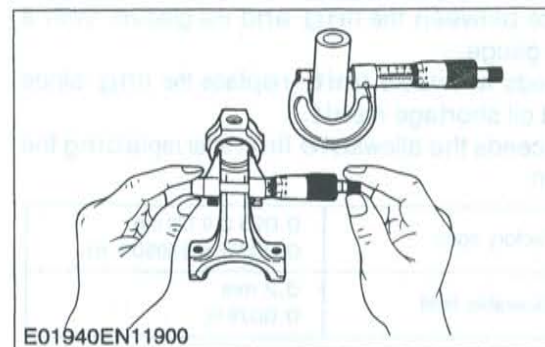
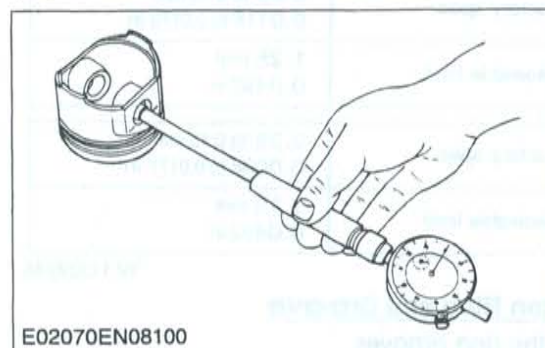
1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the camshaft.

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

Camshaft journal O.D.	Factory spec.	39.934 to 39.950 mm 1.57221 to 1.57284 in.
Cylinder block bore I.D.	Factory spec.	40.000 to 40.025 mm 1.57480 to 1.57579 in.

W1031662

(C) Piston and Connecting Rod



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.	25.000 to 25.013 mm 0.98425 to 0.98476 in.
	Allowable limit	25.05 mm 0.9862 in.

W1031817

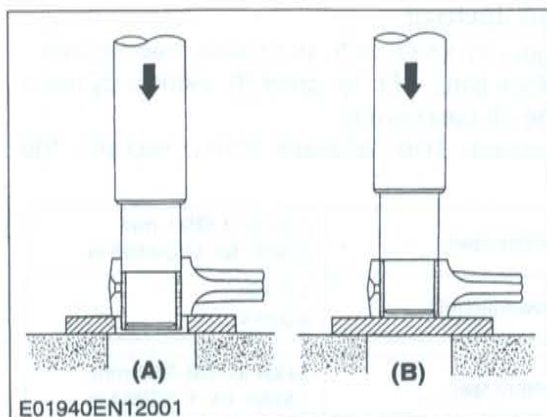
Oil Clearance between Piston Pin and Small End Bushing

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

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

Piston pin O.D.	Factory spec.	25.002 to 25.011 mm 0.98433 to 0.98468 in.
Small end bushing I.D.	Factory spec.	25.025 to 25.040 mm 0.98523 to 0.98582 in.

W1031982



Replacing Connecting Rod Small End Bushing

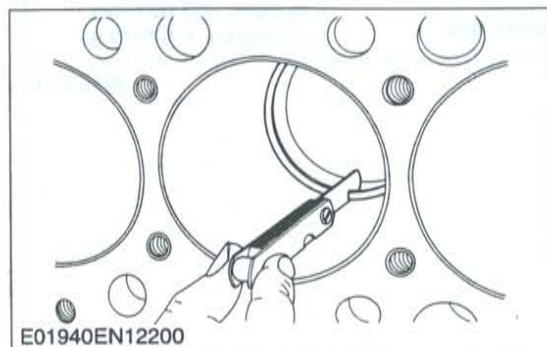
(When removing)

1. Press out the small end bushing with a connecting rod small end bushing replacing tool.

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Press fit a new bushing, taking due care to see that the connecting rod hole matches the bushing hole.

W1032140



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 ring.

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

Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0179 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil ring	Factory spec.	0.25 to 0.45 mm 0.0098 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

W1032246

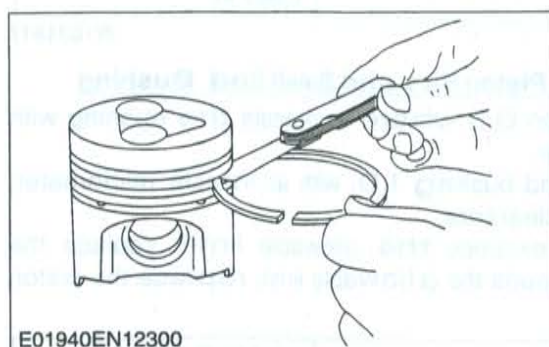
Clearance between Piston Ring and Groove

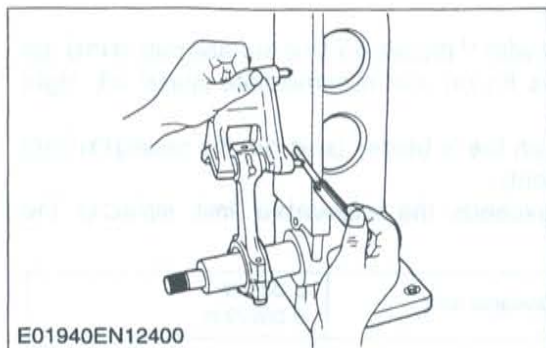
1. Remove carbon from the ring grooves.
2. Measure the clearance between the ring and the groove with a feeler gauge or depth gauge.
3. If the clearance exceeds allowable limit, replace the ring since compression leak and oil shortage result.
4. if the clearance still exceeds the allowable limit after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

Second ring	Factory spec.	0.093 to 0.128 mm 0.00366 to 0.00504 in.
	Allowable limit	0.2 mm 0.0079 in.

Oil ring	Factory spec.	0.020 to 0.060 mm 0.00079 to 0.00205 in.
	Allowable limit	0.15 mm 0.0059 in.

W1032489





Connecting Rod Alignment

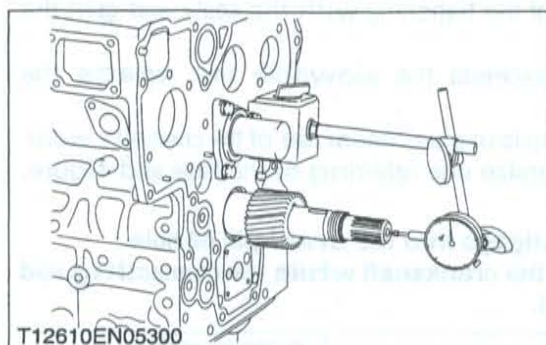
NOTE

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

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.
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W1032720

(D) Crankshaft



Side Clearance of Crankshaft

1. Move the crankshaft to the flywheel side.
2. Set a dial indicator to the crankshaft.
3. Measure the end play by pulling the crankshaft toward the crank gear.
4. If the measurement exceeds the allowable limit, replace the thrust bearing 1 and 2.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.5 mm 0.0197 in.

(Reference)

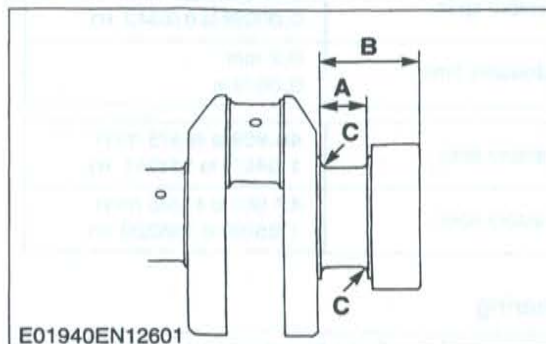
- Oversize thrust bearing

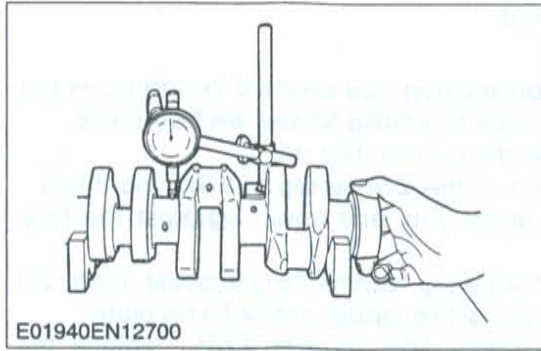
Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	1 A091-23951	020 OS
	Thrust bearing 2 02	1 A091-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	1 A091-23961	040 OS
	Thrust bearing 2 04	1 A091-23981	040 OS

- Oversize dimensions of crankshaft journal

Dimension	Oversize	
	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	26.20 to 26.25 mm 1.0315 to 1.0335 in.	26.40 to 26.45 mm 1.0394 to 1.0413 in.
B	54.5 to 54.7 mm 2.1456 to 2.1535 in.	54.6 to 54.8 mm 2.1496 to 2.1574 in.
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 ∇∇∇∇		

W1032880



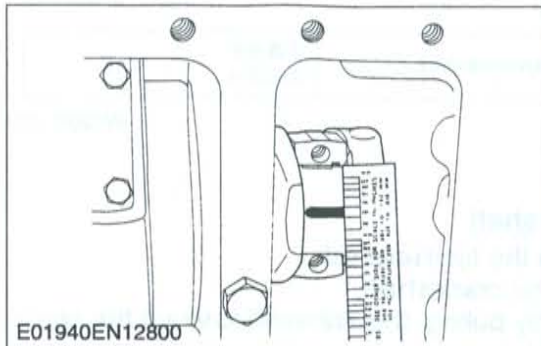


Crankshaft Alignment

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

Crankshaft alignment	Allowable limit	0.02 mm 0.00079 in.
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W1O33001



Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage (Code No.: 07909-30241) on the center of the crankpin in each direction as shown in the figure.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.
4. Measure the amount of the flattening with the scale, and get the oil clearance.
5. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.
6. If the same size bearing is useless because of the crankpin wear, replace it with an undersize one referring to the table and figure.

NOTE

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

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.025 to 0.087 mm 0.00098 to 0.00343 in.
	Allowable limit	0.2 mm 0.0079 in.

Crankpin O.D.	Factory spec.	46.959 to 46.975 mm 1.84878 to 1.84941 in.
Crankpin bearing I.D.	Factory spec.	47.000 to 47.046 mm 1.85039 to 1.85220 in.

(Reference)

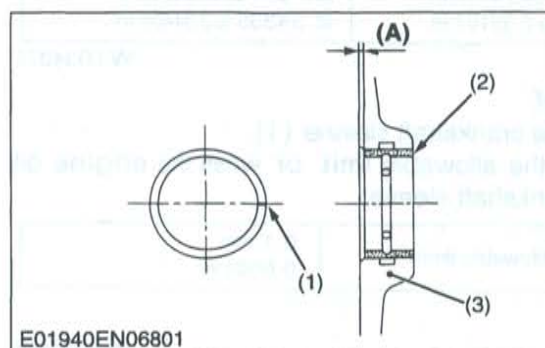
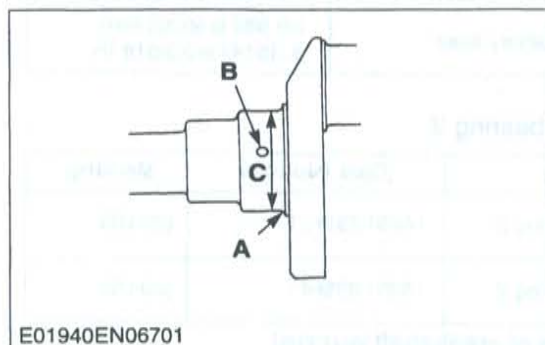
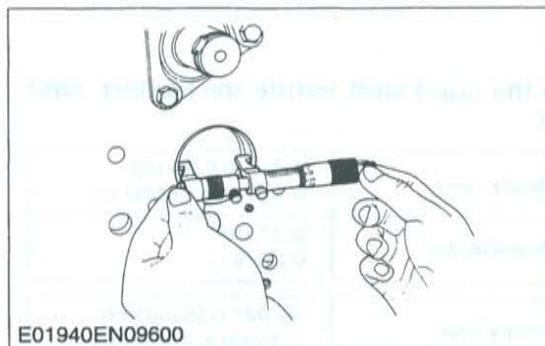
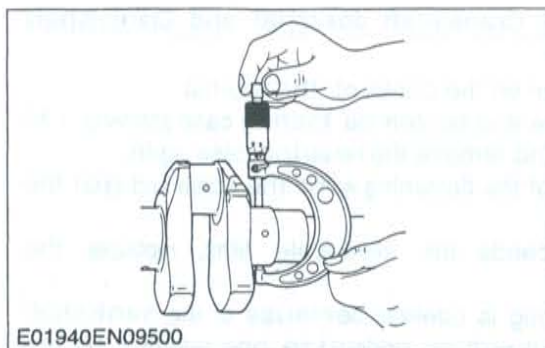
- Undersize crankpin bearing

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankpin bearing 02	17331-22970	020 US
0.4 mm 0.016 in.	Crankpin bearing 04	17331-22980	040 US

- Undersize dimensions of crankpin

Undersize Dimension	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	3.3 to 3.7 mm radius 0.1299 to 0.1457 in. radius	3.3 to 3.7 mm radius 0.1299 to 0.1457 in. radius
B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
C	46.759 to 46.775 mm 1.84091 to 1.84154 in.	46.559 to 46.575 mm 1.83303 to 1.83366 in.
(0.8-S) The crankpin must be fine-finished to higher than ▽▽▽▽		

W1O33106



Oil Clearance between Crankshaft Journal and Crankshaft Bearing 1

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

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory spec.	0.040 to 0.118 mm 0.00157 to 0.00465 in.
	Allowable limit	0.2 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	59.921 to 59.940 mm 2.35909 to 2.35984 in.
Crankshaft bearing 1 I.D.	Factory spec.	59.980 to 60.039 mm 2.36142 to 2.36374 in.

(Reference)

- Undersize crankshaft bearing 1

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 1 02	1A091-23911	020 US
0.4 mm 0.016 in.	Crankshaft bearing 1 04	1A091-23921	040 US

- Undersize dimensions of crankshaft journal

Undersize Dimension	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
C	59.721 to 59.740 mm 2.35122 to 2.35197 in.	59.521 to 59.540 mm 2.34335 to 2.34409 in.
(0.8-S) The crankshaft journal must be fine-finished to higher than ▽▽▽▽		

W1033717

Replacing Crankshaft Bearing 1

(When removing)

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool.

(When installing)

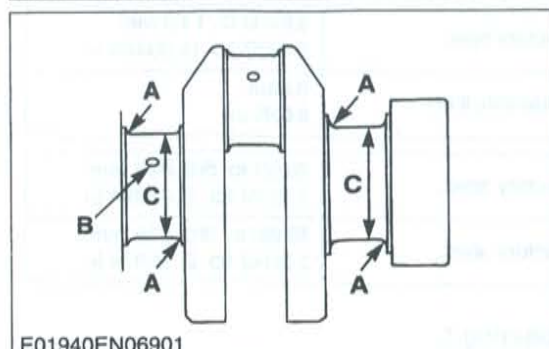
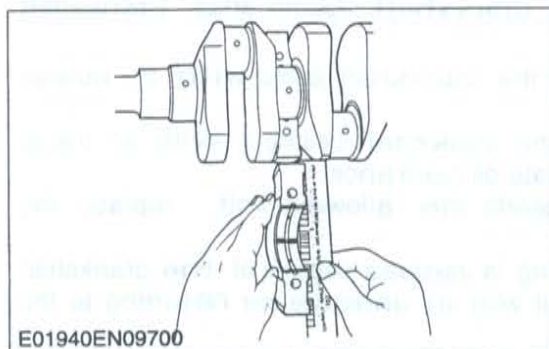
1. Clean a new crankshaft bearing 1 and crankshaft journal bore, and apply engine oil to them.
2. Using a crankshaft bearing 1 replacing tool, press in a new bearing 1 (2) so that its seam (1) directs toward the exhaust manifold side.

Dimension (A)	Factory spec.	4.2 to 4.5 mm 0.1654 to 0.1772 in.
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- (1) Seam
(2) Crankshaft Bearing 1

(3) Cylinder Block

W1033946



Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2

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

NOTE

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

Oil clearance between crankshaft and crankshaft bearing 2	Factory spec.	0.040 to 0.104 mm 0.00157 to 0.00409 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft O.D.	Factory spec.	59.921 to 59.940 mm 2.35909 to 2.35984 in.
Crankshaft bearing 2 I.D.	Factory spec.	59.980 to 60.025 mm 2.36142 to 2.36318 in.

(Reference)

- Undersize crankshaft bearing 2

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 2	1A091-23931	020 US
0.4 mm 0.016 in.	Crankshaft bearing 2	1A091-23941	040 US

- Undersize dimensions of crankshaft journal

Undersize Dimension	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
C, D	59.721 to 59.740 mm 2.35122 to 2.35197 in.	59.521 to 59.540 mm 2.34335 to 2.34409 in.

W1034075

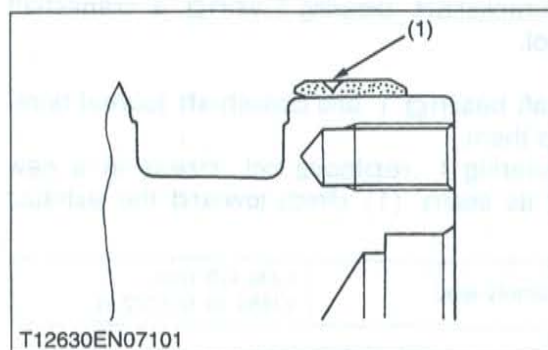
Crankshaft Sleeve Wear

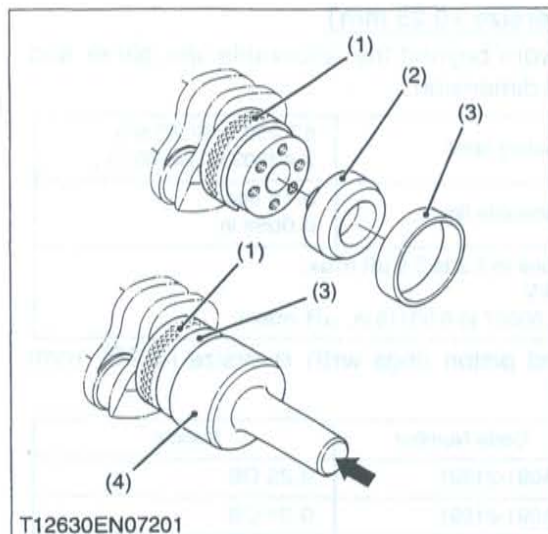
1. Check the wear on the crankshaft sleeve (1).
2. If the wear exceeds the allowable limit or when the engine oil leaks, replace the crankshaft sleeve.

Wear of sleeve	Allowable limit	0.1 mm 0.0004 in.
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- (1) Crankshaft Sleeve

W1033354





Replacing Crankshaft Sleeve

1. Remove the used crankshaft sleeve using a special-use puller set (Code No.: 07916-32091).
2. Set the sleeve guide (2) to the crankshaft.
3. Set the stopper (1) to the crankshaft as shown in figure.
4. Heat a new sleeve to a temperature between 150 and 200 °C (302 to 392 °F), and fix the sleeve to the crankshaft as shown in figure.
5. Press fit the sleeve using the auxiliary socket for pushing (4).

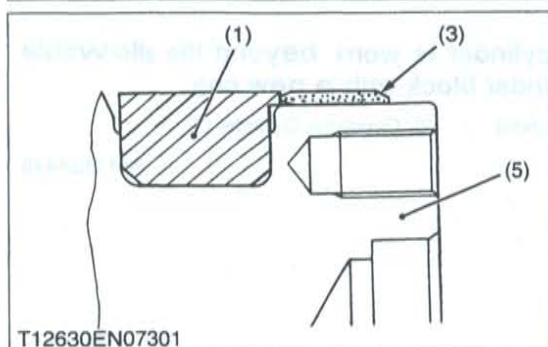
NOTE

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

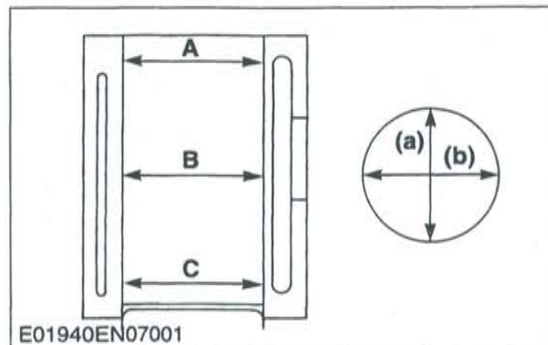
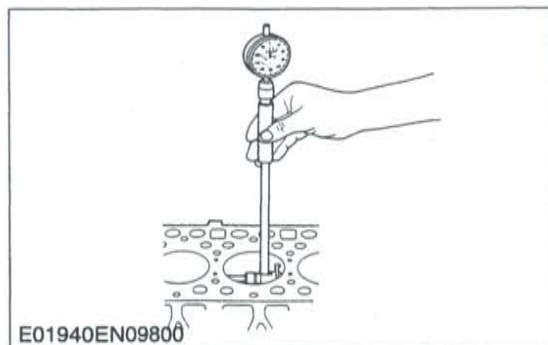
- (1) Stopper
(2) Sleeve Guide
(3) Crankshaft Sleeve

- (4) Auxiliary Socket for Pushing
(5) Crankshaft

W1033503



(E) Cylinder



Cylinder Wear

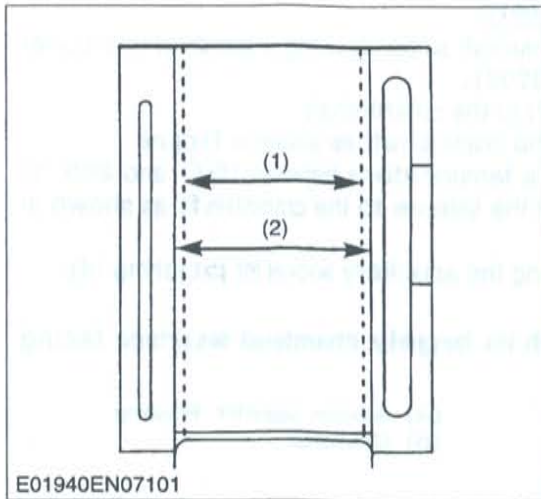
1. Measure the I.D. of the cylinder at the six positions (see figure) with a cylinder gauge to find the maximum and minimum I.D.'s.
2. Get the difference (Maximum wear) between the maximum and the minimum I.D.'s.
3. If the wear exceeds the allowable limit, bore and hone to the oversize dimension. (Refer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

Cylinder I.D.	Factory spec.	87.000 to 87.022 mm 3.42519 to 3.42606 in.
Maximum wear	Allowable limit	0.15 mm 0.0059 in.

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

- (a) Right-angled to Piston Pin
(b) Piston Pin Direction

W1034389



Correcting Cylinder (Oversize +0.25 mm)

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

Oversize cylinder I.D.	Factory spec.	87.250 to 87.272 mm 3.43503 to 3.43590 in.
Maximum wear	Allowable limit	0.15 mm 0.0059 in.
Finishing	Hone to 2.2 to 3.0 μ R max. ▽▽▽ (0.00087 to 0.00118 in. μ R max.)	

2. Replace the piston and piston rings with oversize (+0.25 mm) ones.

Parts Name	Code Number	Marking
Piston	1A091-21901	0.25 OS
Piston ring assembly	1A091-21091	0.25 OS

NOTE

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

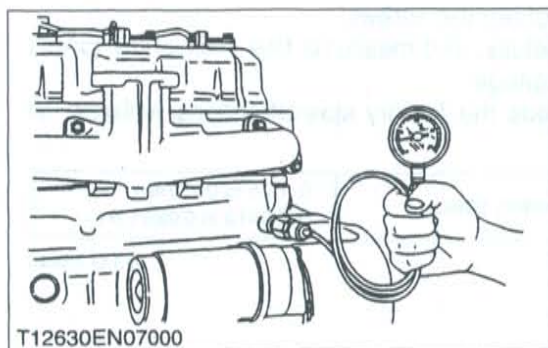
(1) Cylinder I.D. (Before Correction)

(2) Oversize Cylinder I.D.

W1 O34448

[3] LUBRICATING SYSTEM

(1) Checking



T12630EN07000

Engine Oil Pressure

1. Remove the engine oil pressure switch, and set a oil pressure tester (Code No.: 07916-32032).
2. Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.
3. If the oil pressure is less than the allowable limit, check the following.
 - Engine oil insufficient.
 - Oil pump defective
 - Oil strainer clogged
 - Oil filter cartridge clogged
 - Oil gallery clogged
 - Excessive oil clearance
 - Foreign matter in the relief valve

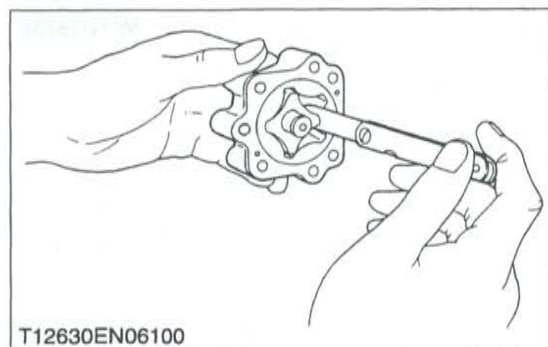
Engine oil pressure	At idle speed	Factory spec.	More than 98 kPa 1.0 kgf/cm ² 14 psi
	At rated speed	Factory spec.	294.2 to 441 kPa 3.0 to 4.5 kgf/cm ² 42.7 to 64 psi
		Allowable limit	245 kPa 2.5 kgf/cm ² 36 psi

(When reassembling)

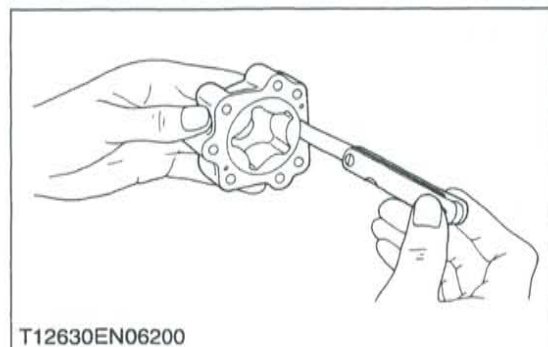
- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

W1034952

(2) Servicing



T12630EN06100



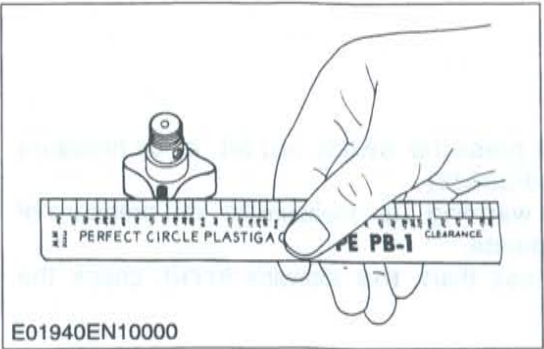
T12630EN06200

Rotor Lobe Clearance

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

Clearance between inner rotor and outer rotor	Factory spec.	0.03 to 0.14 mm 0.0012 to 0.0055 in.
Clearance between outer rotor and pump body	Factory spec.	0.11 to 0.19 mm 0.0043 to 0.0075 in.

W1035296



Clearance between Rotor and Cover

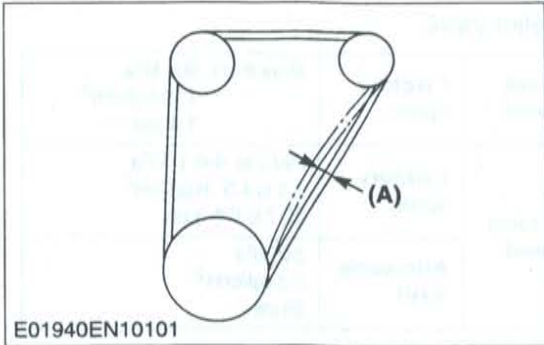
1. Put a strip of plastigage (Code No.: 07909-30241) onto the rotor face with grease.
2. Install the cover and tighten the screws.
3. Remove the cover carefully, and measure the width of the press gauge with a sheet of gauge.
4. If the clearance exceeds the factory specifications, replace oil pump rotor assembly.

End clearance between inner rotor and cover	Factory spec.	0.105 to 0.150 mm 0.00413 to 0.00591 in.
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W1035444

[4] COOLING SYSTEM

(1) Checking and Adjusting

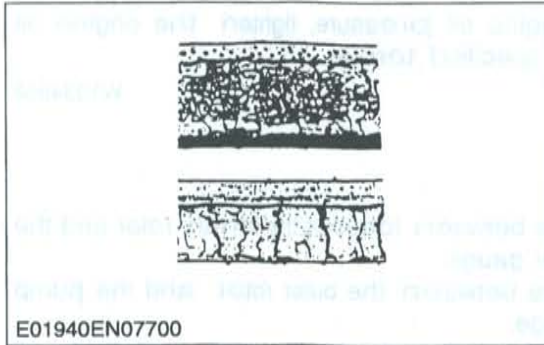


Fan Belt Tension

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 lbs).
2. If the measurement is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

Deflection (A)	Factory spec.	7.0 to 9.0 mm 0.28 to 0.35 in.
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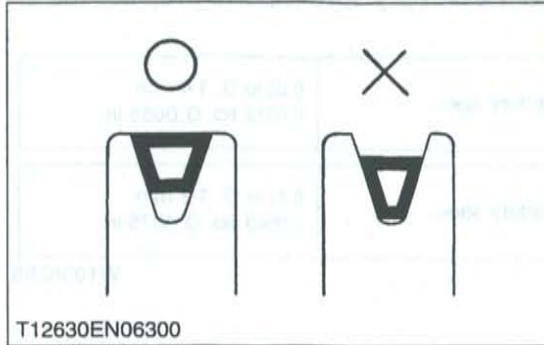
W1035667

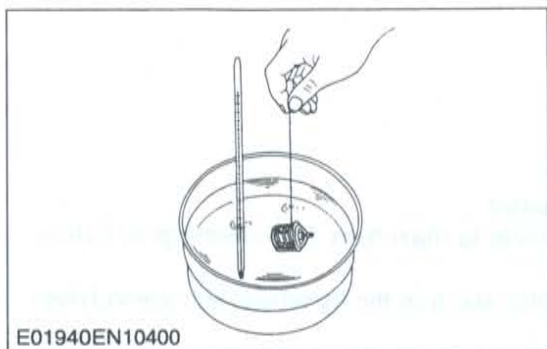


Fan Belt Damage and Wear

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.

W1035758



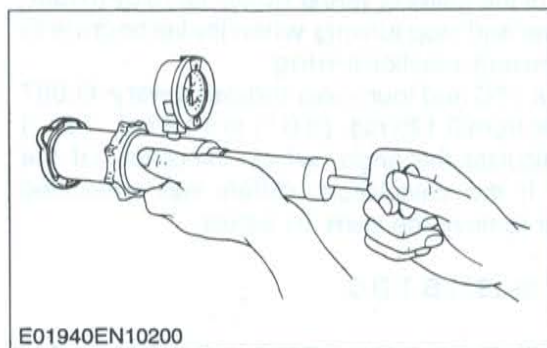


Thermostat Valve Opening Temperature

1. Suspend the thermostat in the water by a string with its end inserted between the valve and seat.
2. Heating the water gradually, read the temperature when the valve opens and leaves the string.
3. Continue heating and read the temperature when the valve opens approx. 6 mm (0.236 in.).
4. If the measurement is not within the factory specifications, replace the thermostat.

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

W1035849



Radiator Cap Air Leakage

! 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.

1. Set a radiator tester (Code No.: 07909-31551) on the radiator cap.
2. Apply the specified pressure (88 kPa, 0.9 kgf/cm², 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm², 9 psi).
3. If the measurement is less than the factory specification, replace the radiator cap.

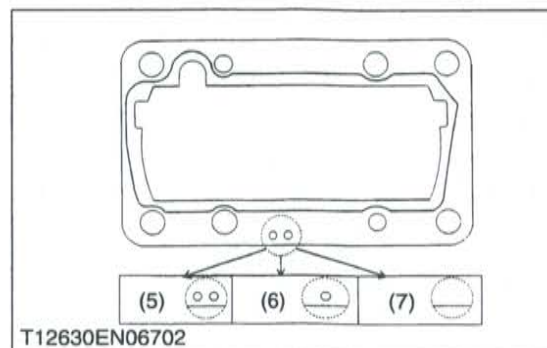
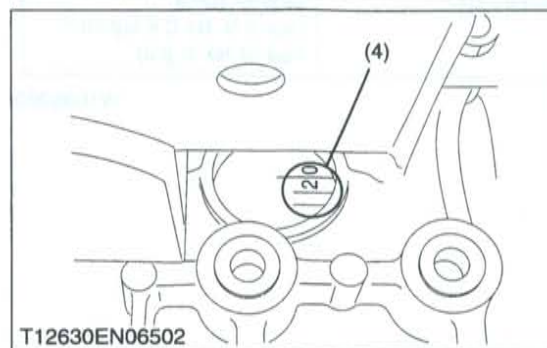
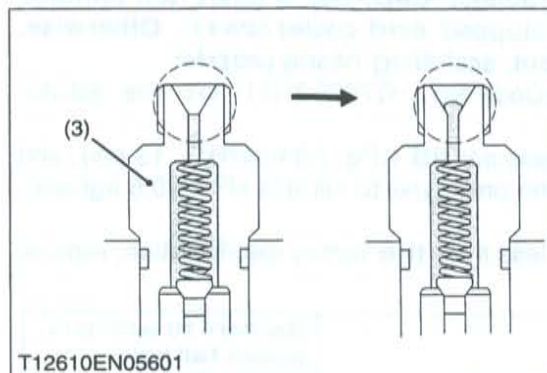
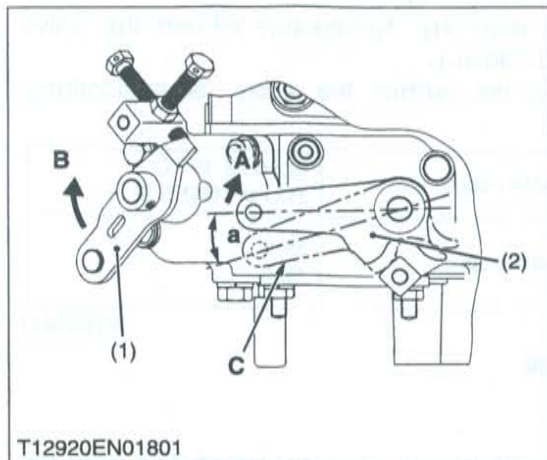
Pressure falling time	Factory spec.	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm ² , from 13 to 9 psi)
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W1036090

[5] FUEL SYSTEM

(1) Checking and Adjusting

(A) Injection Pump



Injection Timing

1. Remove the injection pipes.
2. Set the speed control lever to maximum fuel discharge position.

(Reference)

- Remove the starter motor and turn the flywheel with screwdriver.

■ NOTE

- The pumps have a displacement angle. In adjusting the injection timing, pull the stop lever from its free position by 0.267 ± 0.035 rad. ($15.3 \pm 2^\circ$) toward the stop position.
- 3. Turn the flywheel counterclockwise (facing the flywheel) until the fuel fills up to the hole of the delivery valve holder for 1st cylinder.
- 4. Turn the flywheel further and stop turning when the fuel begins to flow over, to get the present injection timing.
- 5. (The flywheel has mark 1TC and four lines indicating every 0.087 rad. (5°) of crank angle from 0.175 rad. (10°) to 0.436 rad. (25°) before mark 1TC) Calculate the angle which the center of the window points out. If the calculation differs from specified injection timing, add or remove the shim to adjust.

(Injection Timing)

0.30 to 0.33 rad. (17° to 19°) B.T.D.C.

■ NOTE

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

(1) Speed Control Lever

(2) Stop Lever

(3) Delivery Valve Holder

(4) Timing Mark

(5) 2-Holes: 0.20 mm (Shim)

(6) 1-hole: 0.25 mm (Shim)

(7) Without hole: 0.30 mm (Shim)

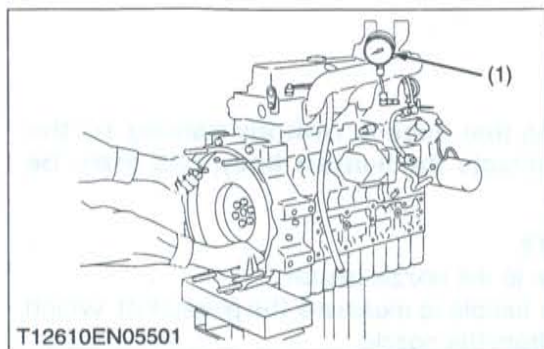
(A) To STOP Position

(B) To Max. Speed Position

(C) Stop Lever in Free Position

(a) 0.267 ± 0.035 rad. ($15.3 \pm 2^\circ$)

W1036402



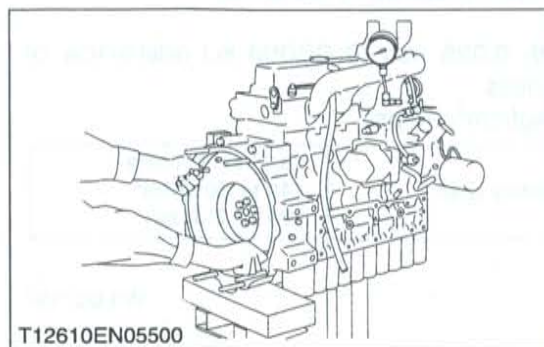
Fuel Tightness of Pump Element

1. Remove the injection pipes and glow plugs.
2. Install the injection pump pressure tester (1) to the injection pump.
3. Set the speed control lever to the maximum speed position.
4. Turn the flywheel ten times or more to increase the pressure.
5. If the pressure can not reach the allowable limit, replace the pump element or injection pump assembly.

Fuel tightness of pump element	Allowable limit	14.7 MPa 150 kgf/cm ² 2133 psi
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(1) Injection Pump Pressure Tester

W1036694



Fuel Tightness of Delivery Valve

1. Remove the injection pipes and glow plugs.
2. Set a pressure tester to the fuel injection pump.
3. Turn the flywheel and raise the pressure to approx. 14.7 MPa (150 kgf/cm², 2133 psi).
4. 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 14.7 to 13.7 MPa (from 150 to 140 kgf/cm², from 2133 to 1990 psi).
5. Measure the time needed to decrease the pressure from 14.7 to 13.7 MPa (from 150 to 140 kgf/cm², from 2133 to 1990 psi).
6. If the measurement is less than allowable limit, replace the delivery valve.

Fuel tightness of delivery valve	Factory spec.	5 seconds 14.7 → 13.7 MPa 150 → 140 kgf/cm ² 2133 → 1990 psi
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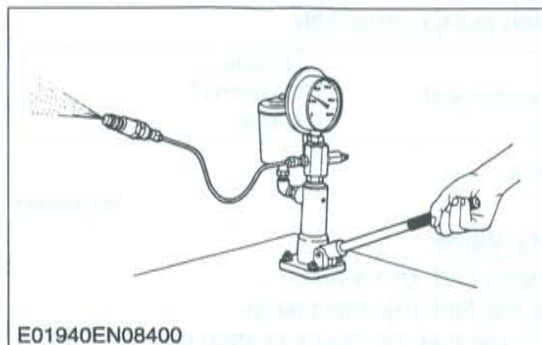
W1036852

(B) Injection Nozzle

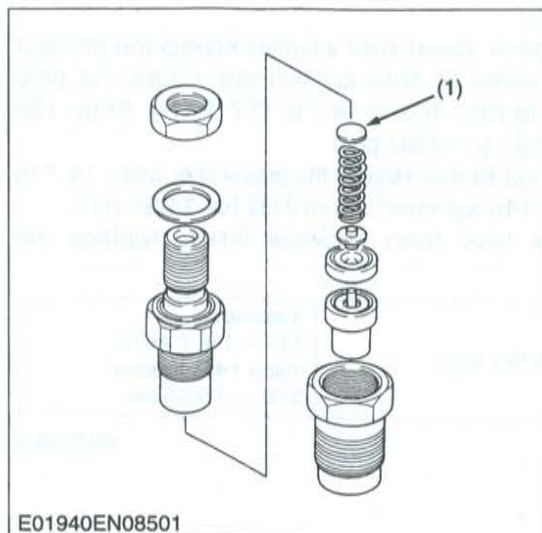


CAUTION

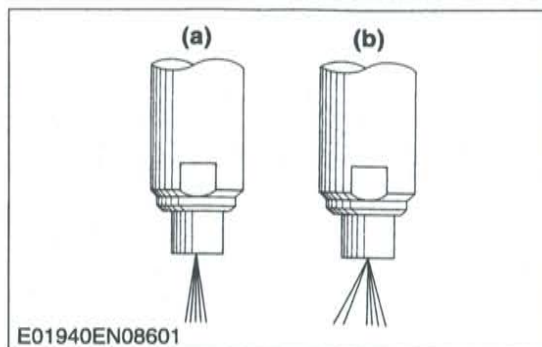
- Check the nozzle injection pressure and condition after confirming that there is **nobody** standing in the direction the fume goes. If the fume from the nozzle directly contacts the human body, cells may be destroyed and blood poisoning may be caused.



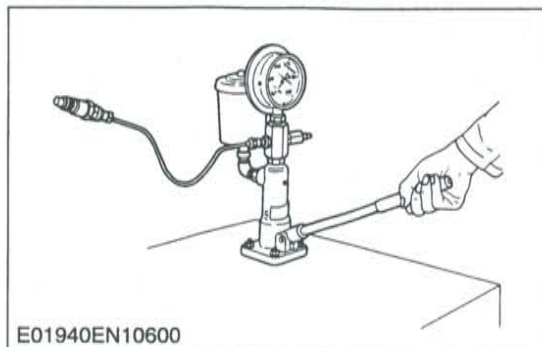
E01940EN08400



E01940EN08501



E01940EN08601



E01940EN10600

Nozzle Injection Pressure

- Set the injection nozzle to the nozzle tester.
- Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
- If the measurement is not within the factory specifications, disassemble the injection nozzle, and change adjusting washer (1) until the proper injection pressure is obtained.

(Reference)

- Pressure variation with 0.025 mm (0.00098 in.) difference of adjusting washer thickness.
Approx. 235 kPa (3.0 kgf/cm², 43 psi)

Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2133 psi
-------------------------	---------------	--

(1) Adjusting Washer

W1037197

Nozzle Spraying Condition

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

(a) Good

(b) Bad

W1037394

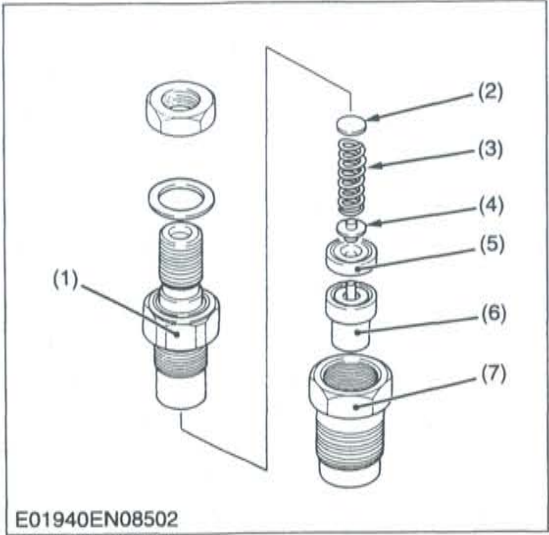
Valve Seat Tightness

- Set the injection nozzle to a nozzle tester (Code No. 07909-31361).
- Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm², 1849 psi) for 10 seconds.
- If any fuel leak is found, replace the nozzle piece.

Valve seat tightness	Factory spec.	No fuel leak at 12.75 MPa 130 kgf/cm ² 1849 psi
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W1088949

(2) Disassembling and Assembling
(A) Injection Nozzle



Nozzle Holder

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

(When reassembling)

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

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

- (1) Nozzle Holder
(2) Adjusting Washer
(3) Nozzle Spring
(4) Push Rod

- (5) Distance Piece
(6) Nozzle Piece
(7) Nozzle Retaining Nut

W1089102

2 CLUTCH

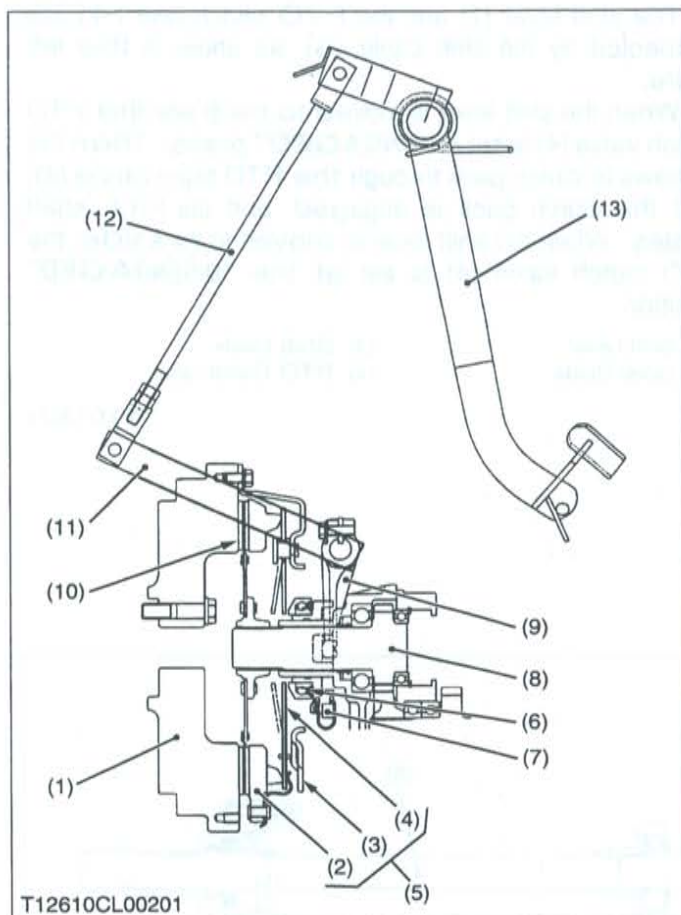
MECHANISM

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1. TRAVELLING CLUTCH	2-M1
[1] LINKAGE MECHANISM.....	2-M1
2. PTO CLUTCH	2-M2
[1] SHIFT LINKAGE	2-M2
[2] STRUCTURE	2-M2
[3] OIL FLOW	2-M3

1. TRAVELLING CLUTCH

[1] LINKAGE MECHANISM



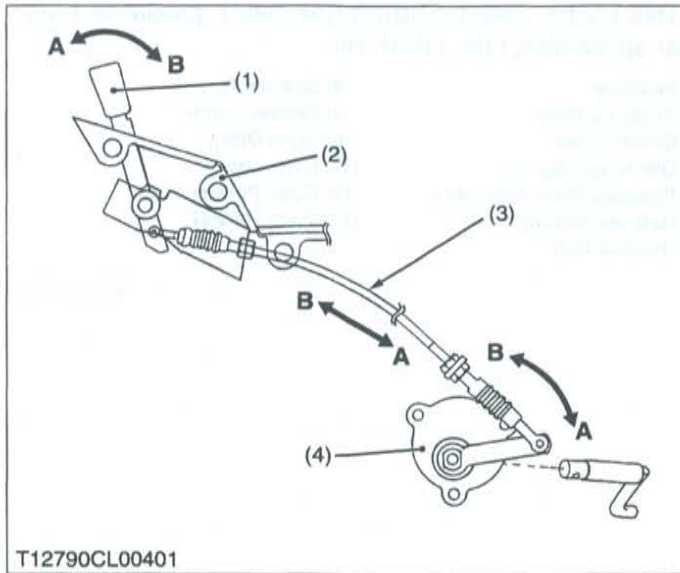
This tractor uses hanging type clutch pedal to have wider space about the platform.

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

W1012681

2. PTO CLUTCH

[1] SHIFT LINKAGE



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

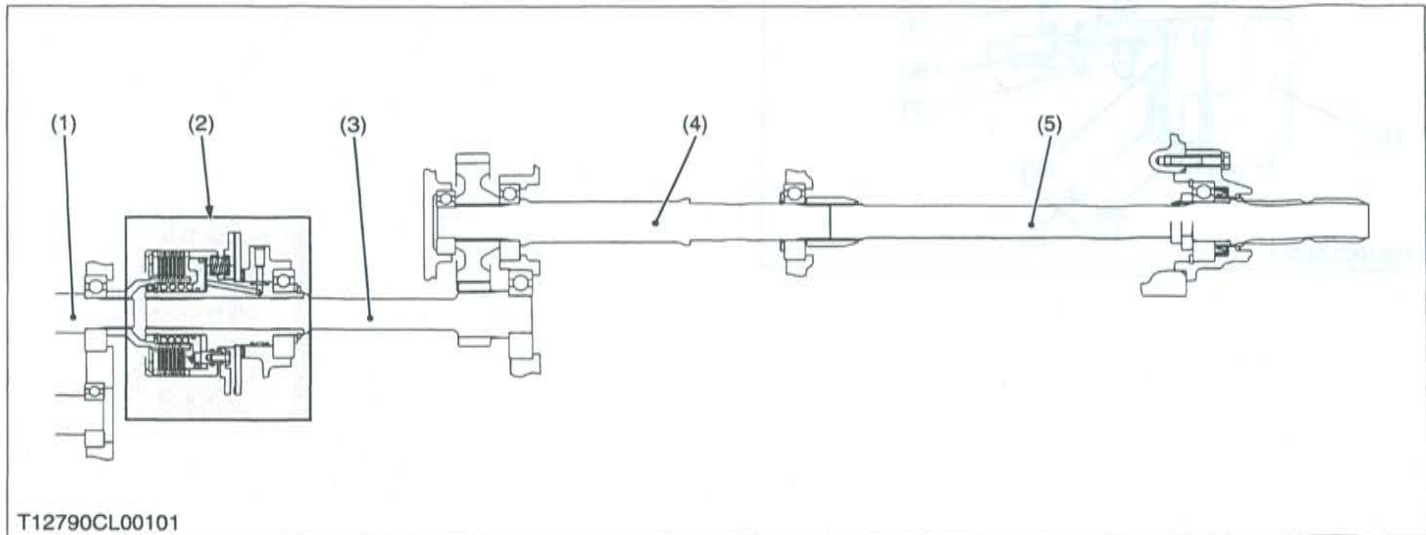
When the shift lever is moved to the **B** side, the PTO clutch valve (4) is set at "**ENGAGED**" position. Then the oil flows to clutch pack through the PTO clutch valve (4), and the clutch pack is engaged and the PTO shaft rotates. When the shift lever is moved to the **A** side, the PTO clutch valve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

- (1) Shift Lever
- (2) Lever Guide

- (3) Shift Cable
- (4) PTO Clutch Valve

W1013671

[2] STRUCTURE



- (1) PTO Counter Shaft
- (2) PTO Clutch Pack

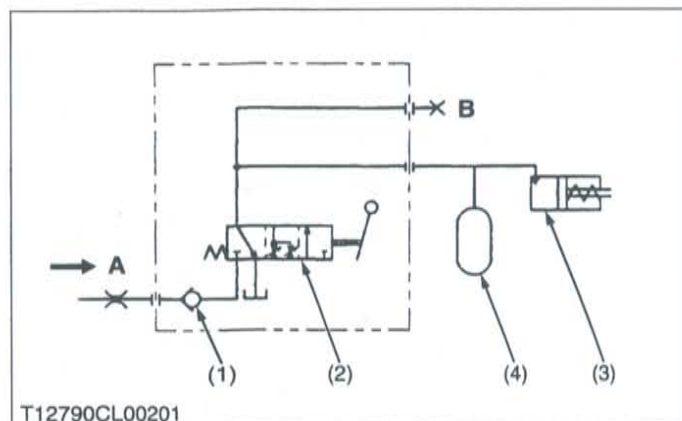
- (3) Gear Shaft

- (4) PTO Drive Shaft

- (5) PTO Shaft

The hydraulic multiple disk clutch is used for tractor with independent PTO. This PTO is controlled by the clutch and is independent of the driving system. PTO is "**ENGAGED**" or "**DISENGAGED**" by operating the shift lever of the PTO clutch valve.

[3] OIL FLOW

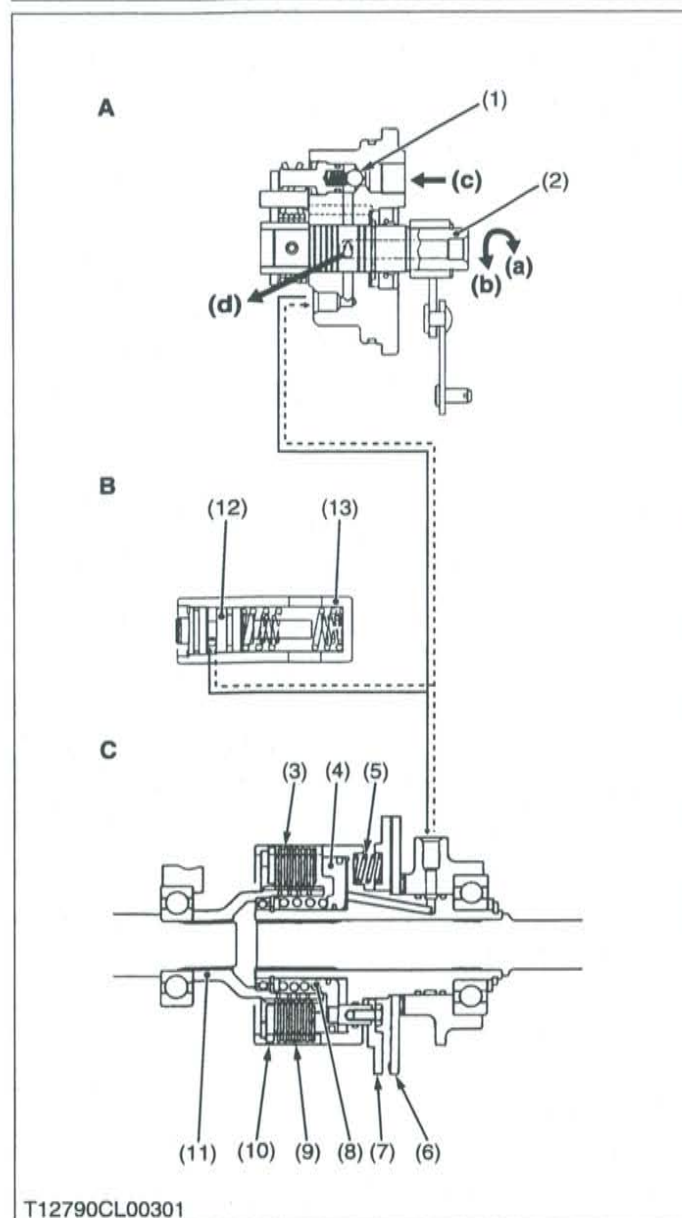


The oil adjusted the pressure by the regulator valve flows into the PTO clutch valve (2). When the PTO lever is at the "DISENGAGED" position, the oil does not flow through the PTO clutch valve (2) to the clutch pack. When the PTO lever is at the "ENGAGED" position, the oil flows through the PTO clutch valve (2) to the accumulator (4) and the PTO clutch pack (3) to engage it.

- (1) Check Valve
- (2) PTO Clutch Valve
- (3) PTO Clutch Pack
- (4) Accumulator

A : From Regulator Valve
B : Pressure Check Port

W1013206



The oil from the regulator valve flows into the clutch valve and opens the check valve (1). When the shift lever is set at the "ENGAGED" position, the spool (2) is turned to A position, then the oil flows through the spool (2) into the accumulator and the clutch pack. Oil entering the clutch pack pushes the piston (4) to engage the clutch pack. The accumulator absorbs the engaging shock of the clutch pack.

When the shift lever is set at the "DISENGAGED" position, the spool (2) is turned to B position, then the oil from the regulator valve is stopped by the spool (2) and the oil in the PTO clutch pack and accumulator is drained into the transmission case. Thus the piston (4) is pushed back, the brake plate (7) is also moved to contact the brake disc (6) so as to stop the rotation and the drag of the PTO shaft.

- (1) Check Valve
- (2) Spool
- (3) Plate
- (4) Piston
- (5) Brake Spring
- (6) Brake Disc
- (7) Brake Plate
- (8) Return Spring
- (9) Clutch Disc
- (10) Back Plate
- (11) Clutch Hub
- (12) Accumulator Piston
- (13) Bearing Case

(a) ENGAGED Position
(b) DISENGAGED Position
(c) From Regulator Valve
(d) Drain (To the Transmission Case)
A : PTO Clutch Valve
B : Accumulator
C : PTO Clutch Pack

W1013312

SERVICING

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[2] HYDRAULIC PTO CLUTCH	2-S11
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(1) Disassembling and Assembling	2-S18

1. TROUBLESHOOTING

TRAVELLING CLUTCH

Symptom	Probable Cause	Solution	Reference Page
Clutch Drags	• Clutch pedal free play excessive	Adjust	2-S4
	• Dust on clutch disc generated from clutch disc facing	Remove rust	2-S9
	• Release fork broken	Replace	2-S8
	• Clutch disc or pressure plate warped	Replace	2-S9
Clutch Slips	• Clutch pedal free play too small	Adjust	2-S4
	• Clutch disc excessively worn	Replace	2-S9
	• Grease or oil on clutch disc facing	Replace	2-S9
	• Clutch disc or pressure plate warped	Replace	2-S9
	• Diaphragm spring weaken or broken	Replace	2-S9
Chattering	• Grease or oil on clutch disc facing	Replace	2-S9
	• Clutch disc or pressure plate warped	Replace	2-S9
	• Clutch disc boss spline worn or rusted	Replace or remove rust	2-S9
	• Clutch shaft bent	Replace	—
	• Pressure plate or flywheel face cracked or scored	Replace	2-S9
	• Clutch disc boss spline and gear shaft spline worn	Replace	2-S9
	• Diaphragm spring strength uneven or diaphragm spring broken	Replace	2-S9
Rattle During Running	• Clutch disc boss spline worn	Replace	2-S9
	• Thrust ball bearing worn or sticking	Replace	2-S9
Clutch Squeaks	• Thrust ball bearing sticking or dry	Replace or lubricate	2-S9
	• Clutch disc excessively worn	Replace	2-S9
Vibration	• Gear shaft bent	Replace	—
	• Clutch disc rivet worn or broken	Replace	2-S9
	• Clutch parts broken	Replace	2-S9

W1014322

PTO CLUTCH

PTO Clutch Slip	• Operating pressure is low	Adjust	2-S11
	• PTO clutch valve malfunctioning	Repair or replace	2-S14
	• Clutch disc or drive plate excessively worn	Replace	2-S17
	• Deformation of piston or return plate	Replace	2-S17
PTO Shaft Does Not Rotate	• PTO clutch malfunctioning	Repair or replace	2-S14
	• PTO propeller shaft coupling disengaged	Engage	3-S
PTO Clutch Operating Pressure is Low	• Transmission oil improper or insufficient	Replenish or change	G-12
	• Relief valve malfunctioning	Adjust or replace	2-S11
PTO Clutch Drags	• Brake plate excessively worn	Replace	2-S16
	• Return spring weaken or broken	Replace	2-S16
	• Accumulator valve malfunctioning	Repair or replace	2-S15
	• Deformation or return plate or steal plate	Replace	2-S117

W1013718

2. SERVICING SPECIFICATIONS

TRAVELLING CLUTCH

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free play	20 to 30 mm 0.8 to 1.2 in.	—
Clutch Stopper Bolt	Height	18 to 22 mm 0.70 to 0.87 in.	—
Clutch Disc	Disc Surface to Rivet Top (Depth)	—	0.3 mm 0.012 in.
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	—	2.0 mm 0.079 in.
Pressure Plate	Flatness	—	0.2 mm 0.008 in.
Diaphragm Spring	Mutual Difference	—	0.5 mm 0.020 in.

W1013874

PTO CLUTCH

PTO Clutch Valve Condition • Engine Speed : Idling • Oil Temperature : 40 to 60 °C 104 to 140 °F	Relief Valve Setting Pressure	2.35 to 2.55 MPa 24 to 26 kgf/cm ² 341 to 370 psi	—
PTO Clutch Disc	Thickness	1.70 to 1.90 mm 0.067 to 0.075 in.	1.55 mm 0.061 in.
PTO Steel Plate	Thickness	1.15 to 1.25 mm 0.045 to 0.049 in.	1.10 mm 0.043 in.
PTO Piston	Flatness	—	0.15 mm 0.006 in.
PTO Steel Plate	Flatness	—	0.30 mm 0.012 in.
PTO Return Spring	Free Length	40.5 mm 1.59 in.	37.5 mm 1.48 in.
PTO Brake Spring	Free Length	20.3 mm 0.80 in.	18.0 mm 0.71 in.
Seal Ring	Thickness	2.45 to 2.50 mm 0.096 to 0.098 in.	2.0 mm 0.079 in.

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 : See page G-8.)

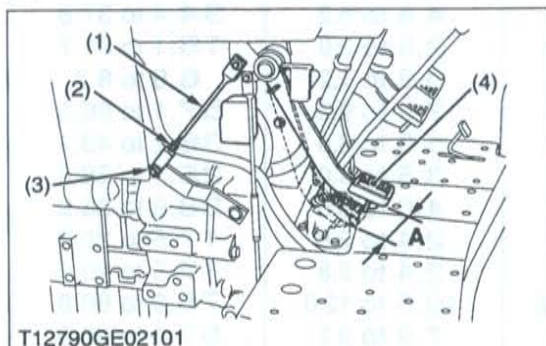
Item	N·m	kgf·m	ft-lbs
Power steering main delivery hose retaining nut	46.6 to 50.9	4.8 to 5.2	34.4 to 37.6
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Starter's terminal B mounting nut	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7
Engine and clutch housing mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
3P delivery pipe joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Engine and clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.5 to 20.3
Release fork setting screw	23.5 to 27.5	2.4 to 2.8	17.5 to 20.3
Clutch housing and mid case mounting nut	102.9 to 117.6	10.5 to 12.0	75.9 to 86.8
Clutch housing and mid case mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
PTO clutch valve mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
PTO clutch holder mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Brake plate mounting screw	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] TRAVELLING CLUTCH

(1) Checking and Adjusting



T12790GE02101

Checking Clutch Pedal Free Travel

⚠ CAUTION

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

- Slightly depress the clutch pedal (4) and measure free travel "A" at top of clutch pedal.
- If the measurement is not within the factory specifications, loosen the lock nut (2), remove the clevis pin (3) adjust the length of rod (1) within acceptable limits.
- Retighten the lock nut (2) and split the cotter pin.

Clutch pedal free travel on top of clutch pedal "L"	Factory spec.	20 to 30 mm 0.78 to 1.18 in.
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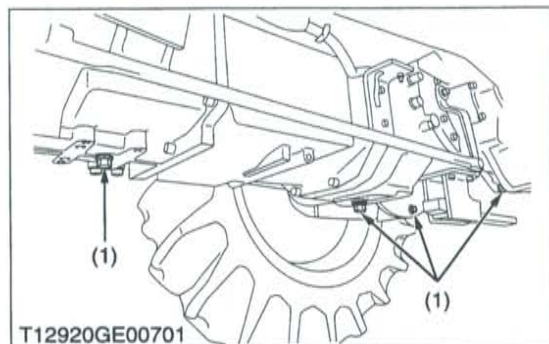
- Clutch Rod
- Lock Nut
- Clevis Pin
- Clutch Pedal

A : Free Travel

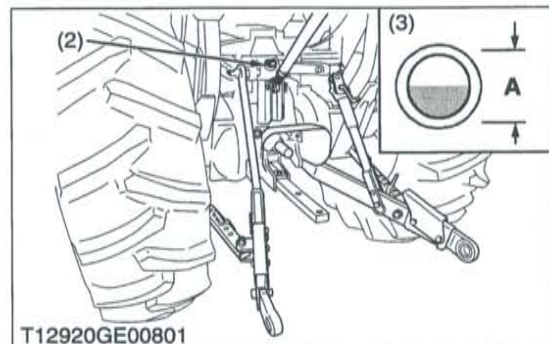
W1012323

(2) Disassembling and Assembling

(A) Separating Clutch Housing and Engine



T12920GE00701



T12920GE00801

Draining the Transmission Fluid

- Place oil pans underneath the transmission case.
- Remove the drain plugs (1).
- Drain the transmission fluid.
- Reinstall the drain plugs (1).

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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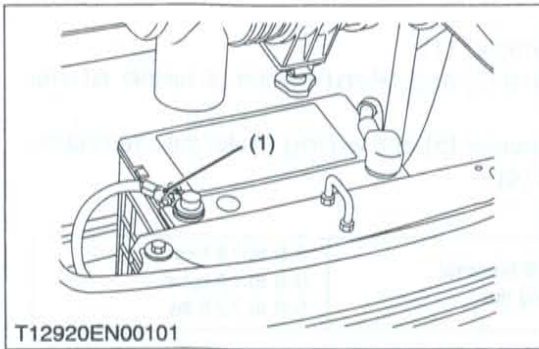
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- Drain Plugs
- Filling Plug
- Level Gauge

A : Oil level is acceptable within this range.

W1012748



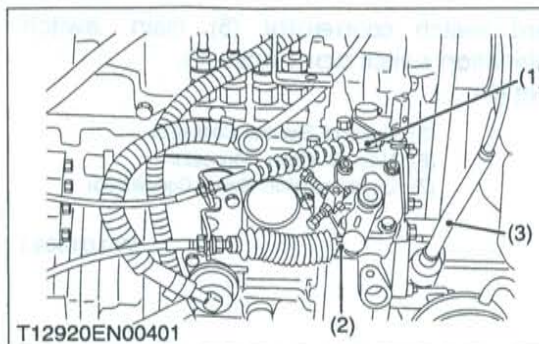
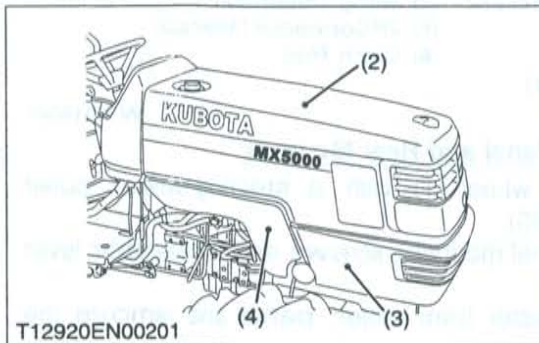
Bonnet, Front Lower Cover

1. Disconnect the battery negative cable (1).
2. Disconnect the head light **4P** connector and remove the wire harness from the bonnet (2).
3. Remove the bonnet (2).
4. Remove the front lower cover (3) and side cover (4) (R.H.) (L.H.).

(1) Battery Negative Cable
(2) Bonnet

(3) Front Lower Cover
(4) Side Cover

W1018713

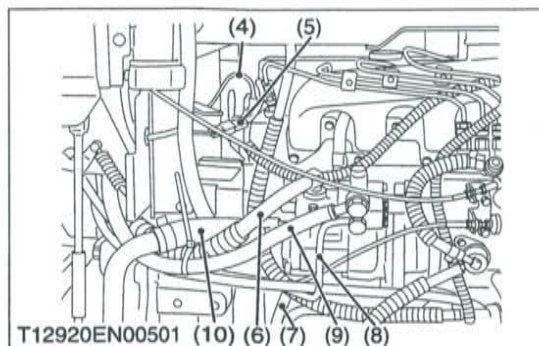


Wiring, Pipes and Hoses

1. Remove the accelerator wire (1), engine stop wire (2) and hour meter cable (3).
2. Disconnect the **1P** connector for water temperature sensor (4) and glow plug **1P** connector (5).
3. Disconnect the return hose (6).
4. Remove the power steering delivery hose (9).
5. Remove the PTO delivery pipe (8) and 3P delivery pipe 1 (7).
6. Remove the suction hose (10).

(When reassembling)

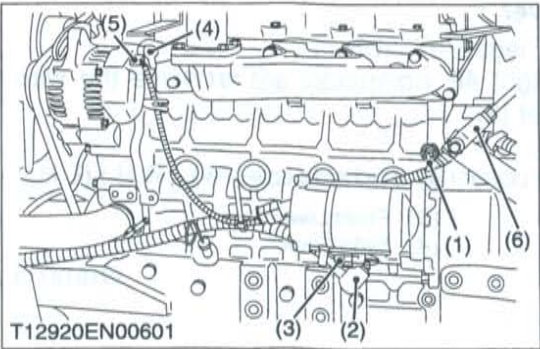
Tightening torque	3P delivery pipe 1 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	Power steering hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs



(1) Accelerator Wire
(2) Engine Stop Wire
(3) Hour Meter Cable
(4) Water Temperature Sensor
(5) Glow Plug **1P** Connector

(6) Return Hose
(7) 3P Delivery Pipe 1
(8) PTO Delivery Pipe
(9) Power Steering Delivery Hose
(10) Suction Hose

W1014015



Wirings

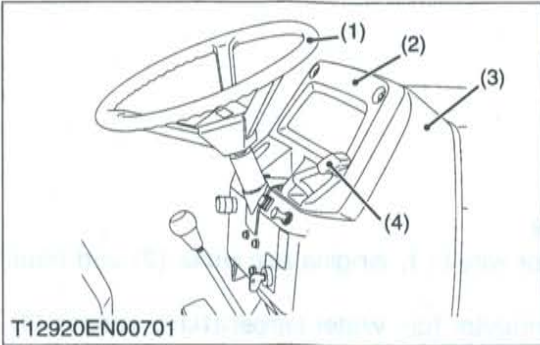
1. Disconnect the **1P** connector (1).
2. Disconnect the **B** terminal (2) and **1P** connector (3) for the starter motor.
3. Disconnect the **2P** connector (5) and wiring (4) for the alternator.
4. Remove the clutch rod (6).

(When reassembling)

Tightening torque	Starter B terminal mounting nut	7.8 to 9.8 N·m 0.8 to 1.0 kgf·m 5.8 to 7.2 ft·lbs
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- | | |
|--|--------------------------------------|
| (1) 1P Connector (Engine Oil Pressure Switch) | (4) Wiring (Alternator) |
| (2) B Terminal (Starter Motor) | (5) 2P Connector (Alternator) |
| (3) 1P Connector (Starter Motor) | (6) Clutch Rod |

W1019047

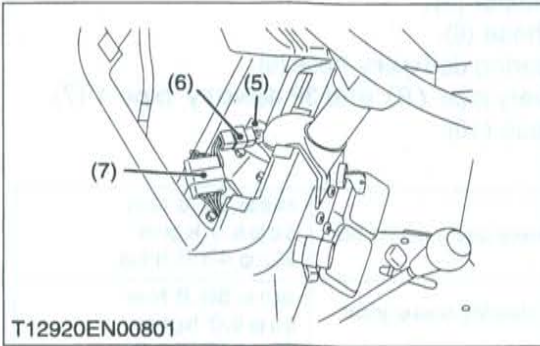


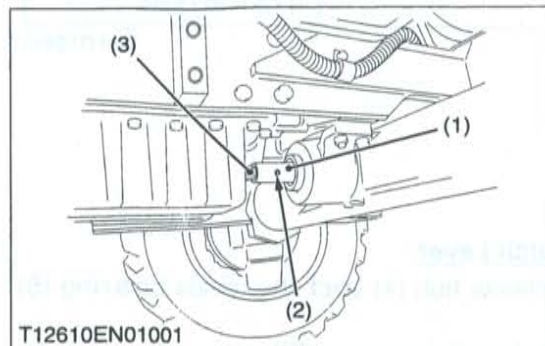
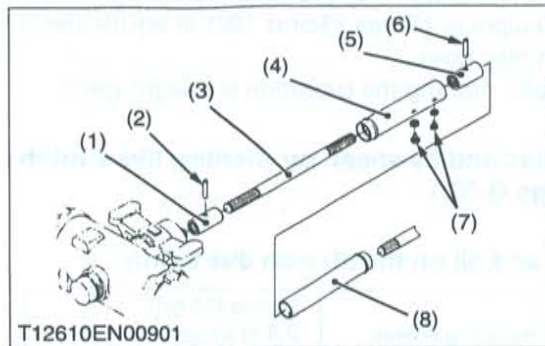
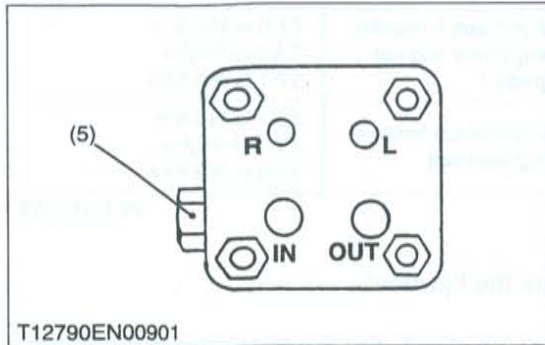
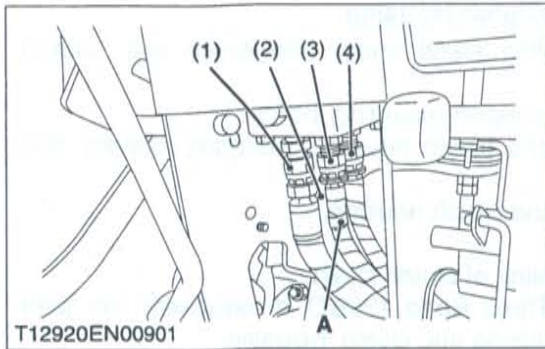
Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1), with a steering wheel puller (Code No. 07916-51090).
2. Remove the meter panel mounting screws and accelerator lever grip (4).
3. Disconnect the connector from meter panel and remove the meter panel (2).
4. Disconnect the hazard switch connector (5), main switch connector (6) and combination switch connector (7).
5. Remove the rear bonnet (3).

- | | |
|----------------------------|----------------------------------|
| (1) Steering Wheel | (5) Hazard Switch Connector |
| (2) Meter Panel | (6) Main Switch Connector |
| (3) Rear Bonnet | (7) Combination Switch Connector |
| (4) Accelerator Lever Grip | |

W1014693





Steering Hoses

1. Disconnect the main delivery hose (1), return hose (2), right turning delivery hose (3) and left turning delivery hose (4).

(When reassembling)

(4WD)

- In assembling the turning delivery hose to the steering controller, connect the delivery hose with identification mark (tape) "A" to the R port of the steering controller.

(2WD)

- Connect the delivery hose with identification mark (tape) "A" to the L port of the steering controller. (Refer to figure left.)

Tightening torque	Main delivery hose retaining nut	46.6 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose
(2) Return Hose
(3) Right Turning Delivery Hose

- (4) Left Turning Delivery Hose
(5) Relief Valve Plug
(A) Identification Mark (Tape)

W1019414

Propeller Shaft (4WD only)

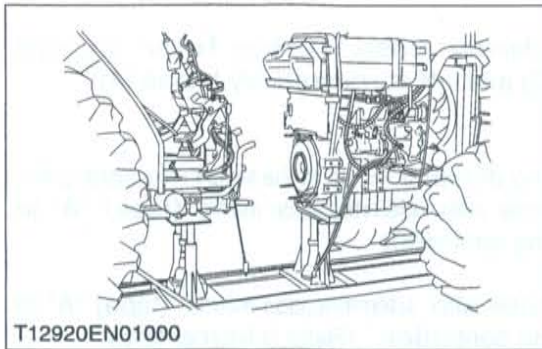
1. Slide the propeller shaft cover (4) and (8) after removing the screws (7).
2. Tap out the spring pins (2), (6) and slide the couplings (1), (5) and then remove the propeller shaft with covers (4), (8).

(When reassembling)

- Apply grease to the splines of propeller shaft 1 (3).

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

W1031685



Separating Engine and Clutch Housing

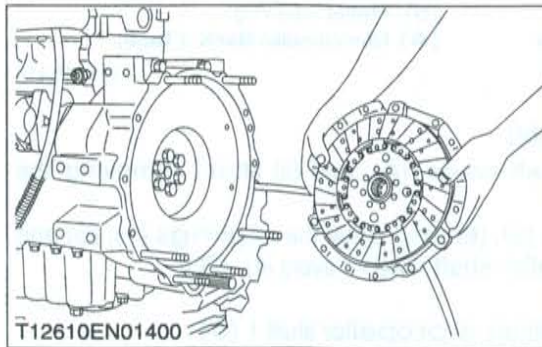
1. Place the disassembling stand under the engine and clutch housing case.
2. Remove the fuel tank support mounting bolts.
3. Remove the engine and clutch housing mounting screws and nuts.
4. Separate the engine and clutch housing.

(When reassembling)

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1019752



Clutch Assembly

1. Remove the clutch from the flywheel.

(When reassembling)

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

■ IMPORTANT

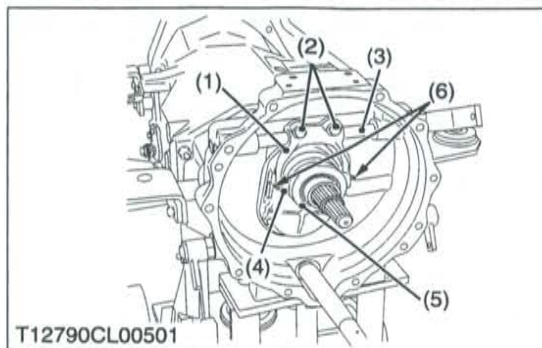
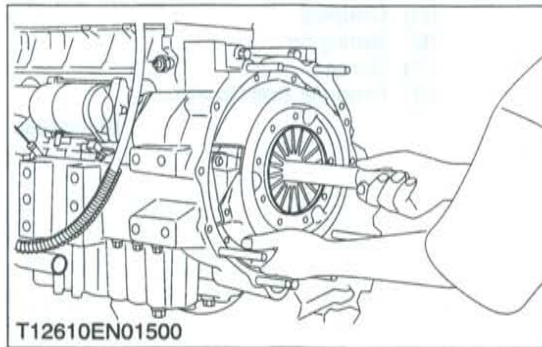
- **Align the center of disc and flywheel by inserting the clutch center tool. (See page G-37.)**

■ NOTE

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

Tightening torque	Clutch mounting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.5 to 20.3 ft-lbs
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W1019957



Release Holder and Clutch Lever

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

(When reassembling)

- Make sure the direction of the release fork (1) is correct.
- Inject grease to the release hub (4).
- Be sure to set the snap pins (6).

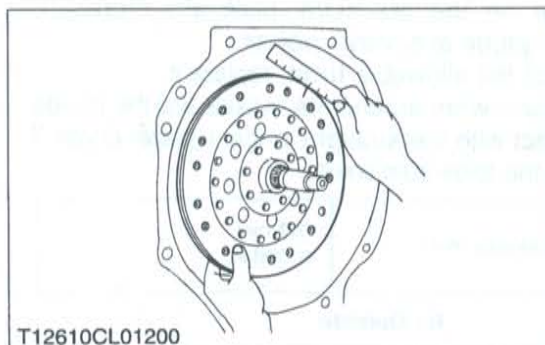
Tightening torque	Release fork setting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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- (1) Release Fork
(2) Setting Screw
(3) Clutch Lever

- (4) Release Hub
(5) Release Bearing
(6) Snap Pin

W1015118

(3) Servicing

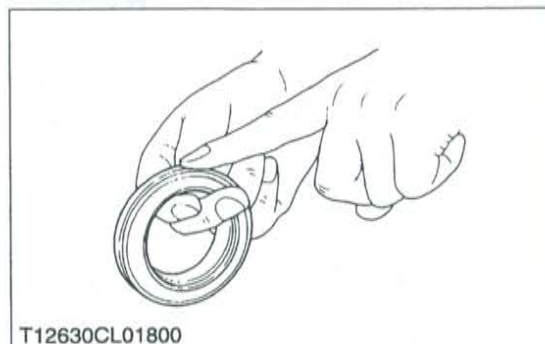


Backlash between Clutch Disc Boss and Gear Shaft

1. Mount the clutch disc to the gear shaft.
2. Hold the gear shaft so that it may not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace the disc.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.
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W1029917



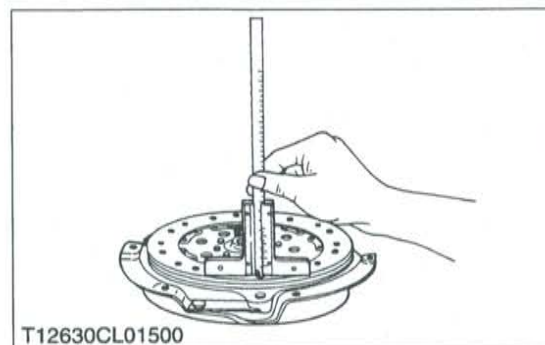
Thrust Ball Bearing

1. Remove the thrust ball bearing from release hub with a puller.
2. Check for abnormal wear on contact surface.
3. Hold bearing inner race and rotate outer race, while applying pressure to it.
4. If the bearing rotation is rough or noisy, replace the bearing.

■ NOTE

- Do not depress outer race, while installing thrust ball bearing

W1030306



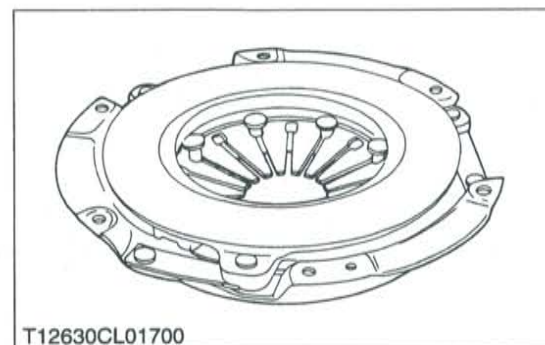
Clutch Disc Wear

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

In this case, inspect transmission gear shaft oil seal, engine rear oil seal and other points for oil leakage.

Disc surface to rivet top (Depth)	Allowable limit	0.3 mm 0.012 in.
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W1030925

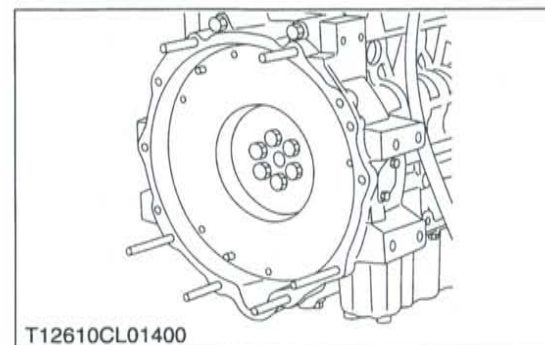


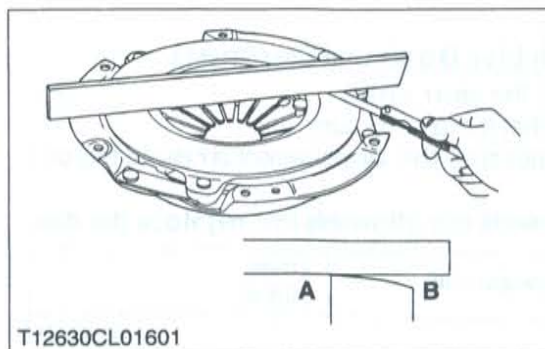
Checking Pressure Plate Assembly and Flywheel

1. Wash the disassembling parts except clutch disc with a suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.
2. Check friction surface of pressure plate and flywheel for scoring or roughness.
 - Slight roughness may be smoothed by using fine emery cloth.
 - If these parts have deep scores or grooves on their surface, they should be replaced.
3. Check the surface of the diaphragm spring for wear. If excessive wear is found, replace clutch cover assembly.
4. Inspect thrust rings (wire ring) for wear or damage. As these parts are invisible from outside, shake pressure plate assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replace as a complete assembly.

Diaphragm spring mutual difference	Allowable limit	0.5 mm 0.020 in.
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W1031283





Pressure Plate Flatness

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

Clearance between pressure plate and straight edge	Allowable limit	0.2 mm 0.008 in.
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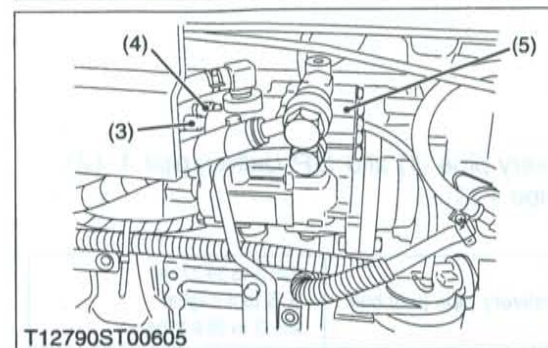
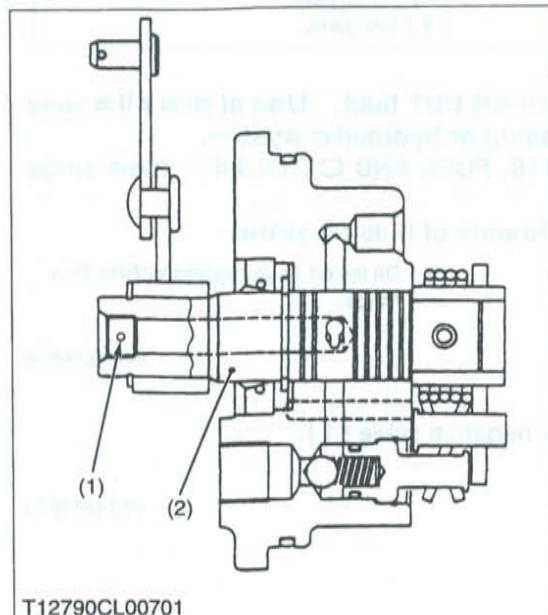
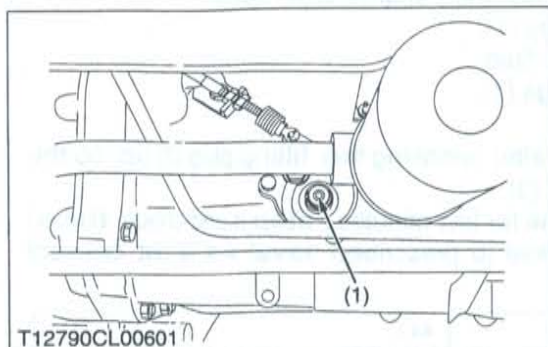
A : Inside

B : Outside

W1017610

[2] HYDRAULIC PTO CLUTCH

(1) Checking and Adjusting



Relief Valve Setting Pressure

1. Start the engine and warm up the transmission fluid, and then stop the engine.
2. Remove the plug (1) (PT 1/8) on the PTO valve spool (2).
3. Set the pressure gauge.
4. Start the engine and measure the pressure.
5. For adjustment, use the reducing valve adjuster (3) of the regulator valve (5).

■ IMPORTANT

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

Independent PTO pressure	When PTO shift lever is "ENGAGED" position	2.35 to 2.55 MPa 24.0 to 26.0 kgf/cm ² 341 to 370 psi
	When PTO shift lever is "DISENGAGED" position	No pressure

Condition

- Engine speed Idling speed
- Oil temperature 40 to 60 °C
104 to 140 °F

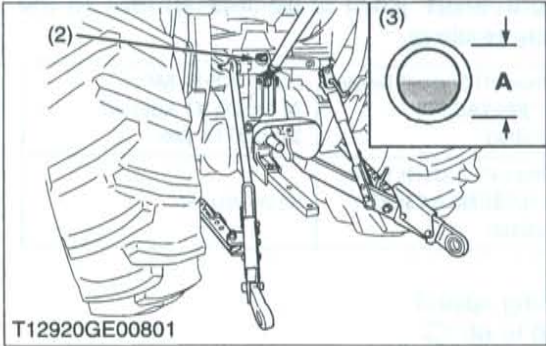
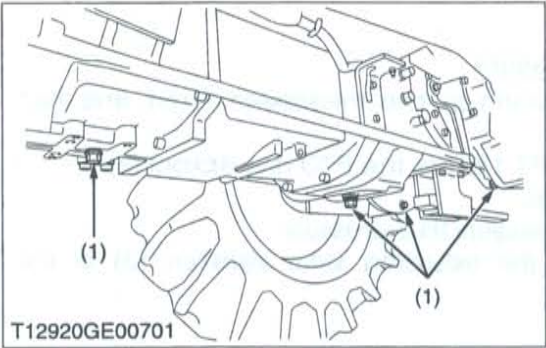
(Reference)

- Turn to clockwise direction → Pressure is increased
- Turn to counterclockwise direction → Pressure is decreased

- | | |
|-----------------------------|---------------------------|
| (1) Plug (PT 1/8) | (4) Relief Valve Adjustor |
| (2) Spool | (5) Regulator Valve |
| (3) Reducing Valve Adjustor | |

W1014391

(2) Disassembling and Assembling



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L
	11.6 U.S.gals.
	9.7 Imp.gals.

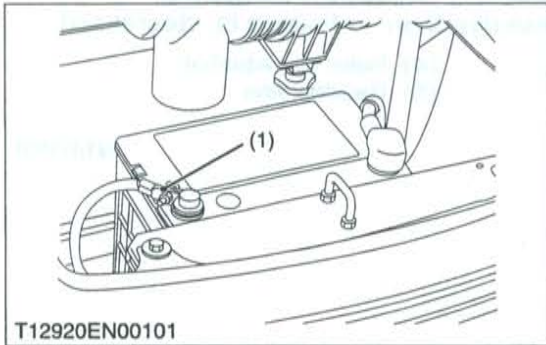
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- (1) Drain Plugs
- (2) Filling Plug
- (3) Level Gauge

A : Oil level is acceptable within this range.

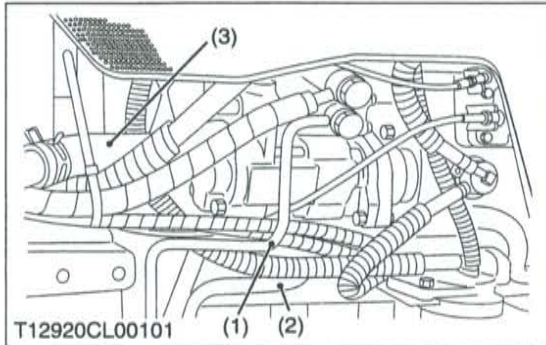
W1021608



Battery Negative Cable

- 1. Disconnect the battery negative cable (1).
- (1) Battery Negative Cable

W1020879



Hydraulic Pipes

- 1. Remove the PTO delivery pipe (1) and 3P delivery pipe 1 (2).
- 2. Remove the suction pipe 1 (3).

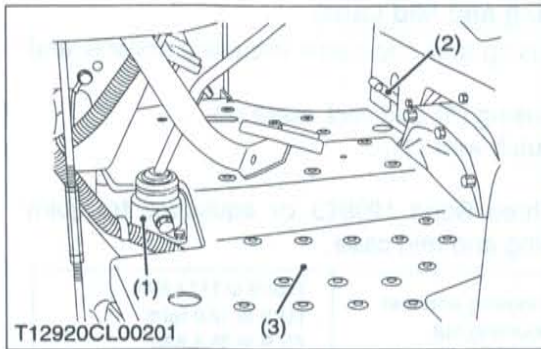
(When reassembling)

Tightening torque	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft·lbs
	3P delivery pipe 1 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft·lbs

- (1) PTO Delivery Pipe
- (2) 3P Delivery Pipe 1

(3) Suction Pipe 1

W1022086

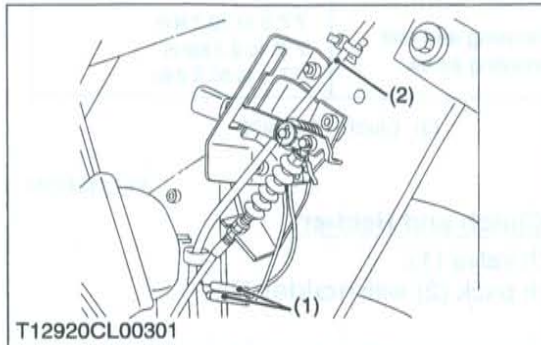
**Step**

1. Remove the main gear shift lever (1).
2. Disconnect the foot accelerator rod.
3. Disconnect the differential lock pedal (2).
4. Remove the foot step (L.H.).
5. Remove the step mounting screws and nuts.
6. Remove the step (3).

(1) Main Gear Shift Lever
(2) Differential Lock Pedal

(3) Step

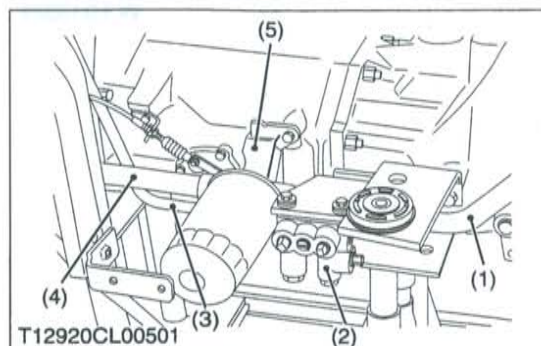
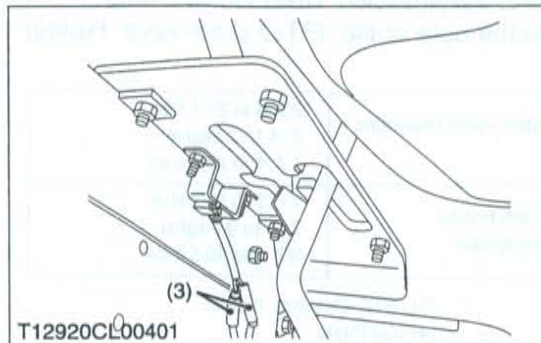
W1023294

**Wirings**

1. Disconnect the 1P connector (1) for PTO safety switch.
2. Disconnect the 1P connector for hazard light (R.H.), (L.H.) and remove the wiring (2) (R.H.), (L.H.).
3. Disconnect the 1P connector (3) for shuttle safety switch.
4. Remove the ground cable.

(1) 1P Connector for PTO Safety Switch (3) 1P Connector for Shuttle Safety Switch
(2) Wiring for Hazard Light

W1024373

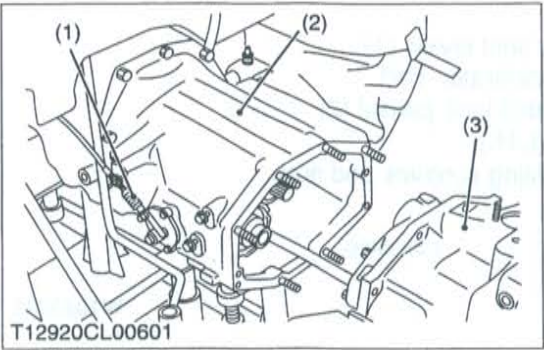
**Hydraulic Block and Pipes**

1. Remove the suction pipe (1).
2. Disconnect the 3P delivery pipe 2 (3).
3. Remove the hydraulic block (2).
4. Remove the hydraulic filter bracket (5) with hydraulic filter.

(1) Suction Pipe
(2) Hydraulic Block
(3) 3P Delivery Pipe 2

(4) Suction Pipe
(5) Hydraulic Filter Bracket

W1025868



Separating Clutch Housing and Mid Case

1. Remove the clutch housing and mid case mounting screws and nuts.
2. Separate the clutch housing (3) and mid case (2).
3. Disconnect the PTO clutch wire (1).

(When reassembling)

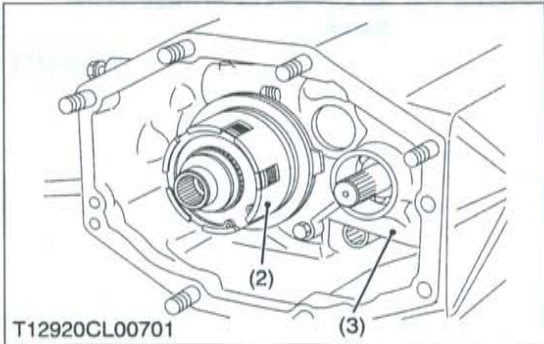
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the clutch housing and mid case.

Tightening torque	Clutch housing and mid case mounting nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Clutch housing and mid case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

- (1) PTO Clutch Wire
(2) Mid Case

(3) Clutch Housing

W1026894



PTO Clutch Valve, PTO Clutch and Holder

1. Remove the PTO clutch valve (1).
2. Remove the PTO clutch pack (2) with holder (3).

(When reassembling)

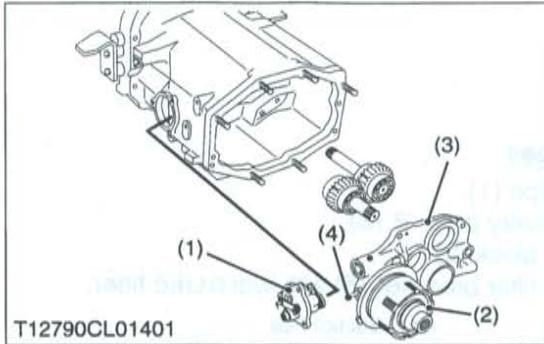
- Apply the small amount of transmission fluid for the O-ring.
- Install the oil pipe (4) to the hole of the PTO clutch valve holder (3) firmly.

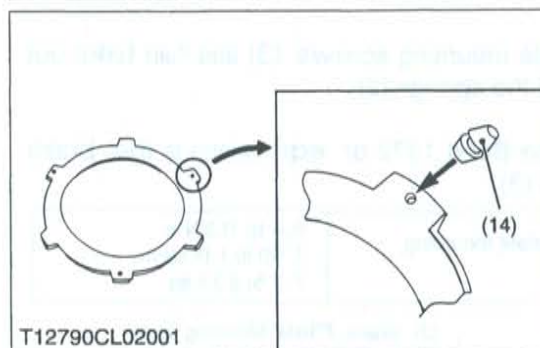
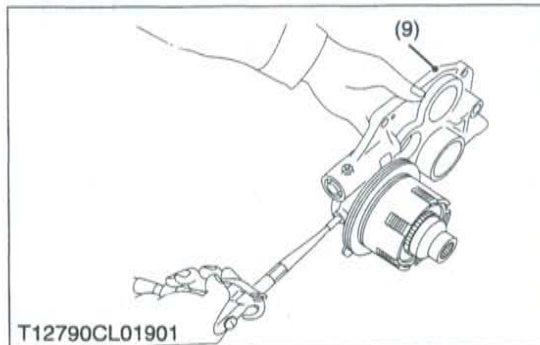
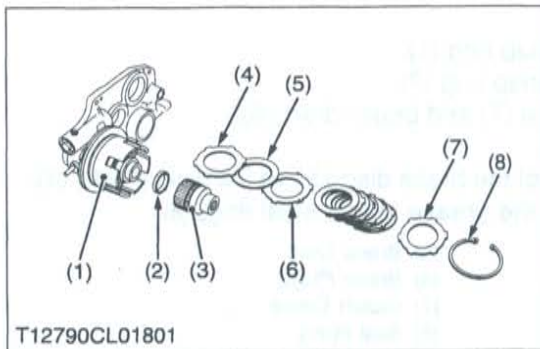
Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8kgf·m 17.4 to 20.2 ft-lbs
	PTO clutch holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

- (1) PTO Clutch Valve
(2) PTO Clutch Pack

(3) PTO Clutch Holder
(4) Oil Pipe

W1015329



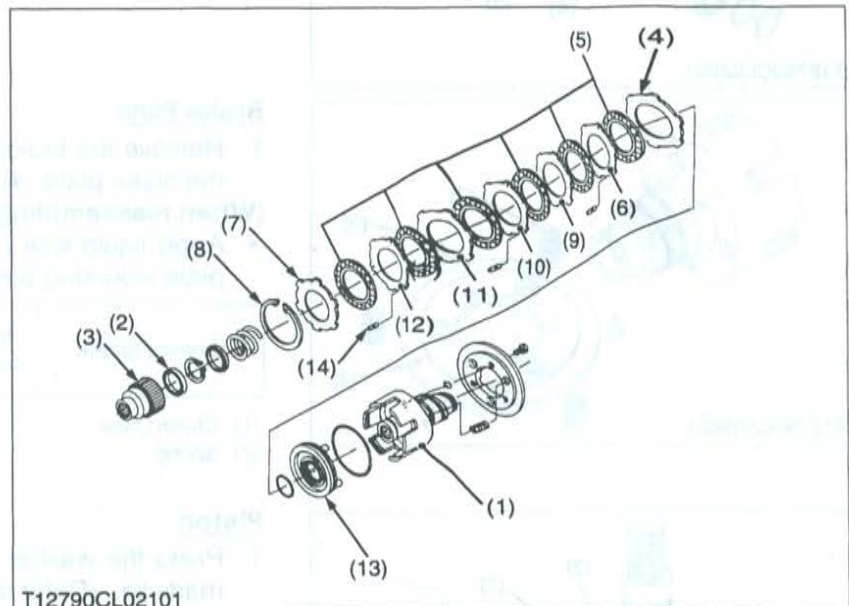


Clutch Hub and Clutch Discs

1. Remove the internal snap ring (8), and then take out the clutch discs (5), the back plate (7), the steel plates (6), (9), (10), (11) and (12), the hub (3) and the bearings (2).

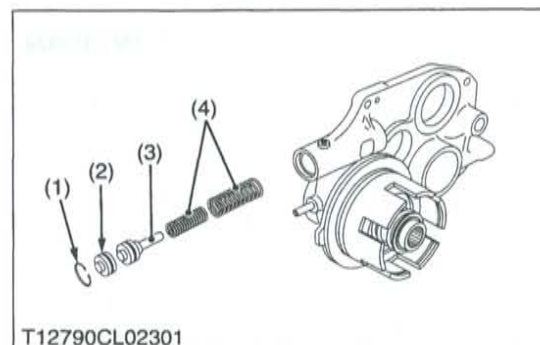
(When reassembling)

- Install the clutch discs (5) and steel plates (12), (11), (10), (9) and (6) mutually. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (14) are (6), (10), (12) and without plug rubbers (14) are (9) and (11).
- Do not confuse the back plate (7) and steel plates. The back plate (7) is thicker than the steel plates.
- Assemble the plug rubbers portion of the three steel plates (6), (10) and (12) are same positions while assembling them. (Refer to figure below.)
- Apply enough transmission fluid to the discs (5).
- 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 figure left.)



- | | |
|---------------------------------------|--|
| (1) Clutch Case | (8) Internal Snap Ring |
| (2) Bearing | (9) Steel Plate (without Plug Rubber) |
| (3) Hub | (10) Steel Plate (with Plug Rubber) |
| (4) Steel Plate (without Plug Rubber) | (11) Steel Plate (without Plug Rubber) |
| (5) Clutch Disc | (12) Steel Plate (with Plug Rubber) |
| (6) Steel Plate (with Plug Rubber) | (13) Piston |
| (7) Back Plate | (14) Plug Rubber |

W1015925

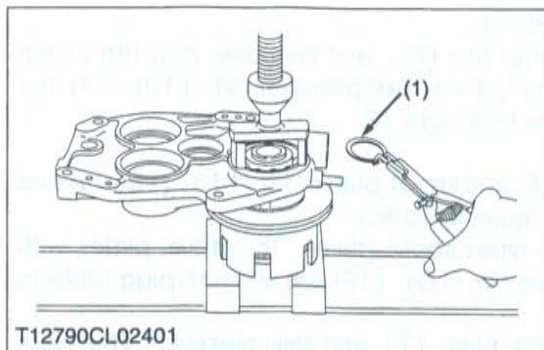


Modulating Valve

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

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

W1016330



Clutch Case

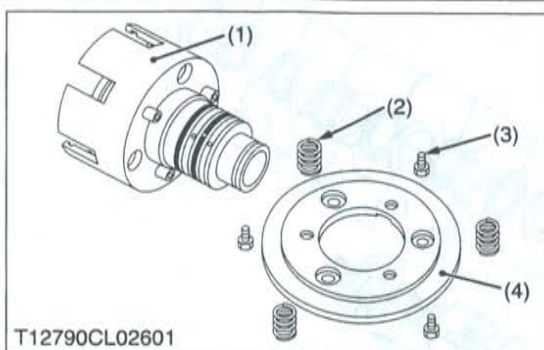
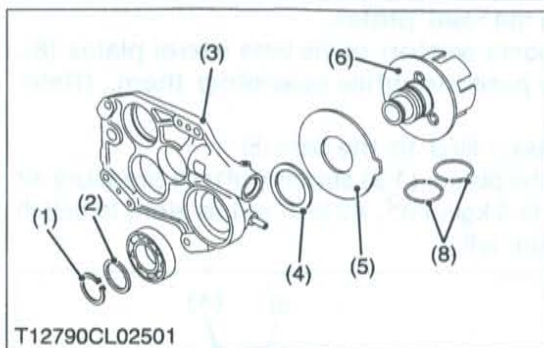
1. Remove the internal snap ring (1).
2. Remove the external snap ring (2).
3. Remove the clutch case (7) and brake disc (5).

(When reassembling)

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

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

W1016451



Brake Plate

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

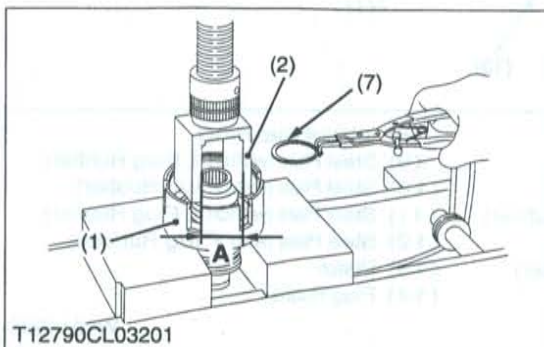
(When reassembling)

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

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

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

W1016788



Piston

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

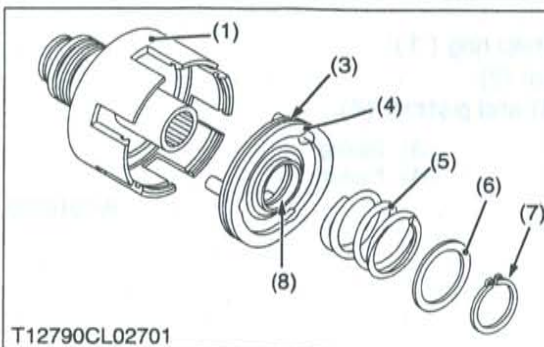
(When reassembling)

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

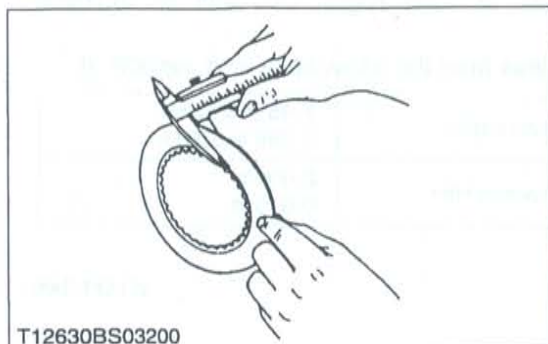
- | | |
|-----------------|------------------------|
| (1) Clutch Case | (7) External Snap Ring |
| (2) Jig | (8) Seal Ring |
| (3) Seal Ring | (9) O-ring |
| (4) Piston | |
| (5) Spring | |
| (6) Washer | |

A : 41 mm (1.6 in.)

W1016924



(3) Servicing

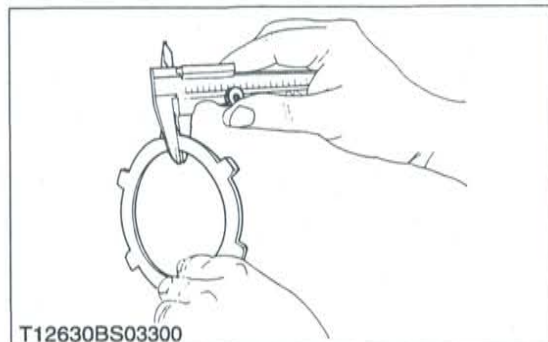


Clutch Disc Wear

1. Measure the thickness of PTO clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Clutch disc wear	Factory spec.	1.70 to 1.90 mm 0.067 to 0.075 in.
	Allowable limit	1.55 mm 0.061 in.

W1024320

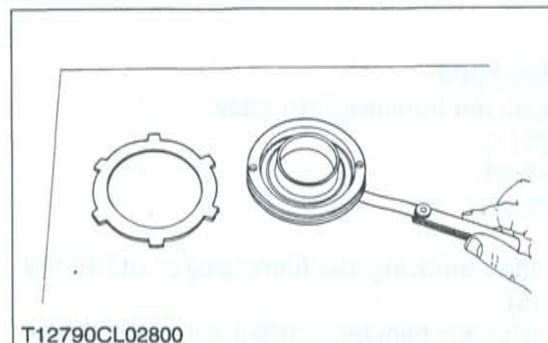


PTO Steel Plate Wear

1. Measure the thickness of PTO steel plate with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Clutch disc wear	Factory spec.	1.15 to 1.25 mm 0.045 to 0.049 in.
	Allowable limit	1.10 mm 0.043 in.

W1017226

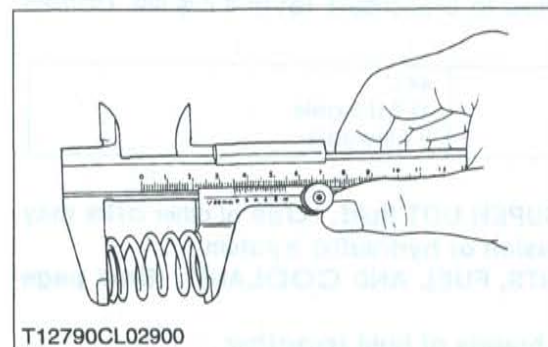


Flatness of PTO Piston and PTO Steel Plate

1. Place the part on a surface plate.
2. Check it unable to insert a feeler gauge (allowable limit size) underneath it at least four points.
3. If the gauge can be inserted, replace it.

Flatness of PTO piston	Allowable limit	0.15 mm 0.006 in.
Flatness of PTO steel plate	Allowable limit	0.30 mm 0.012 in.

W1017358

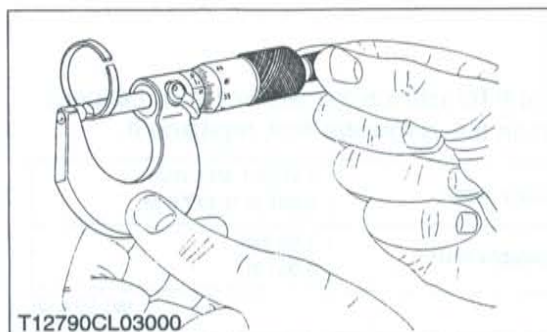


Piston Return Spring Free Length

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

PTO return spring free length	Factory spec.	40.5 mm 1.59 in.
	Allowable limit	37.5 mm 1.48 in.
PTO brake spring free length	Factory spec.	20.3 mm 0.80 in.
	Allowable limit	18.0 mm 0.71 in.

W1017533



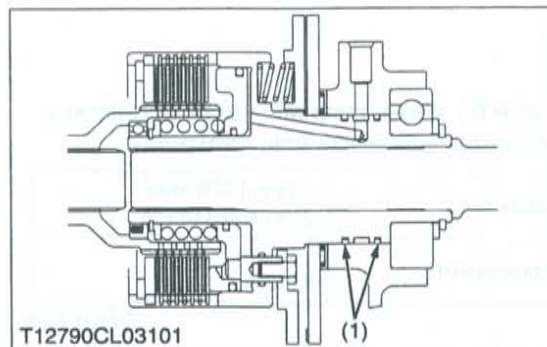
Thickness of Seal Ring

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.

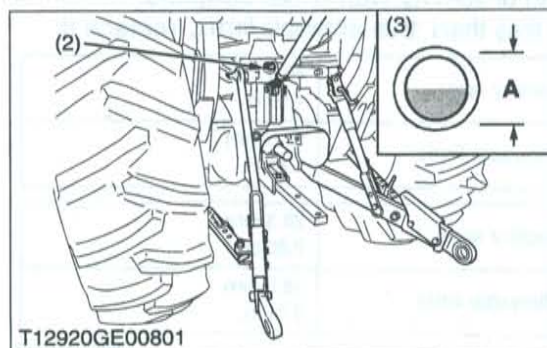
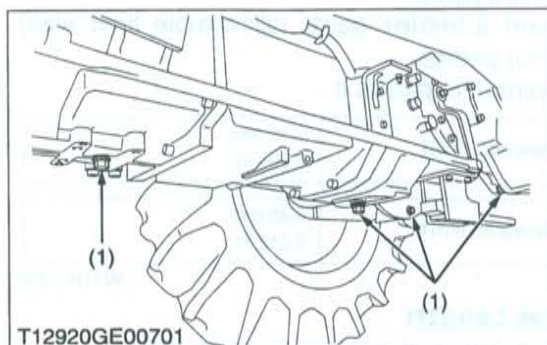
(1) Seal Ring

W1017690



[3] PTO CLUTCH VALVE

(1) Disassembling and Assembling



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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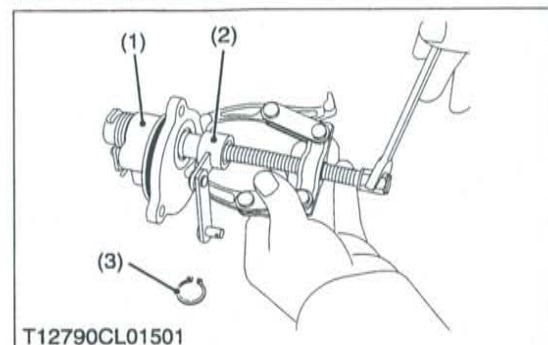
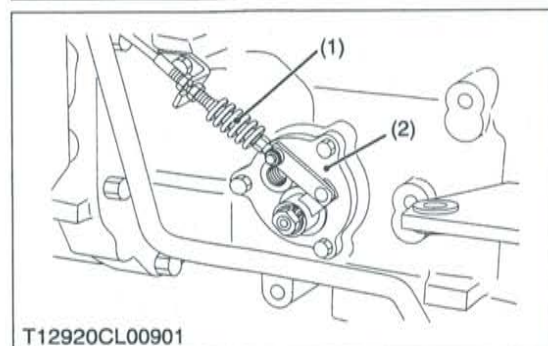
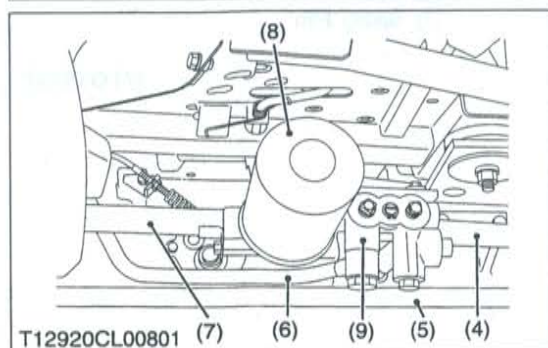
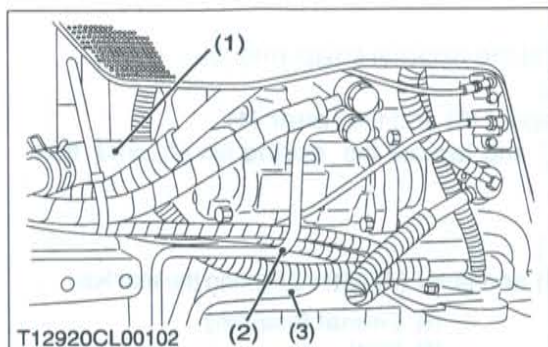
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- (1) Drain Plugs
(2) Filling Plug
(3) Level Gauge

A : Oil level is acceptable within this range.

W1028784



Hose and Pipes

1. Remove the suction hose (1).
2. Remove the PTO delivery pipe (2) and 3P delivery pipe 1 (3).
3. Remove the suction pipe 1 (4).
4. Remove the brake rod (5).
5. Remove the 3P delivery pipe 2 (6).
6. Remove the hydraulic block (9).
7. Remove the hydraulic filter (8) with hydraulic bracket and suction pipe 2 (7).

(When reassembling)

Tightening torque	3P delivery pipe 1, 2 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

- | | |
|------------------------|--------------------------|
| (1) Suction Pipe | (6) 3P Delivery Pipe 2 |
| (2) PTO Delivery Pipe | (7) Suction Pipe 2 |
| (3) 3P Delivery Pipe 1 | (8) Hydraulic Oil Filter |
| (4) Suction Pipe 1 | (9) Hydraulic Block |
| (5) Brake Rod (R.H.) | |

W1028981

PTO Clutch Valve

1. Disconnect the PTO clutch wire (1).
2. Remove the PTO clutch valve (2).

(When reassembling)

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
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(1) PTO Clutch Wire

(2) PTO Clutch Valve

W1029244

Clutch Valve Assembly

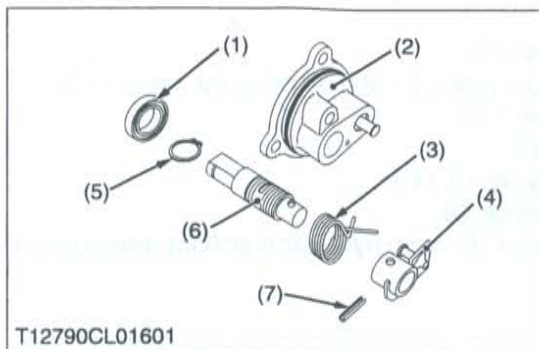
1. Make a marks on the spool and the lever arm (2).
2. Draw out the lever arm (2) by the bearing puller after removing the external snap ring (3).

(When reassembling)

- Assemble them with aligning the marks.

- | | |
|------------------|------------------------|
| (1) Clutch Valve | (3) External Snap Ring |
| (2) Lever Arm | |

W1015517



Clutch Valve Spool

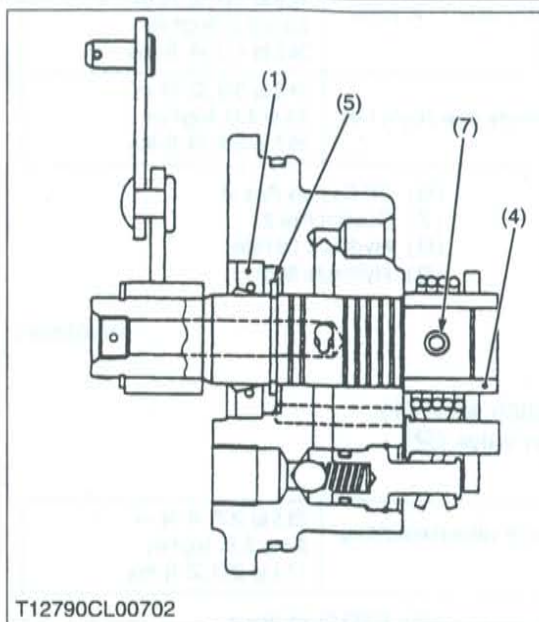
1. Remove the oil seal and the external snap ring (5).
2. Draw out the spool (6).
3. Make a marks on the spool (6) and the lever (4).
4. Remove the spring (3) and tap out the spring pin (7), and then remove the lever (4).

(When reassembling)

- Replace the oil seal (1).
- Assemble the spool (6) and lever (4) with aligning the marks.

- (1) Oil Seal
 (2) Clutch Valve Case
 (3) Spring
 (4) Lever

- (5) External Snap Ring
 (6) Spool
 (7) Spring Pin



W1015630

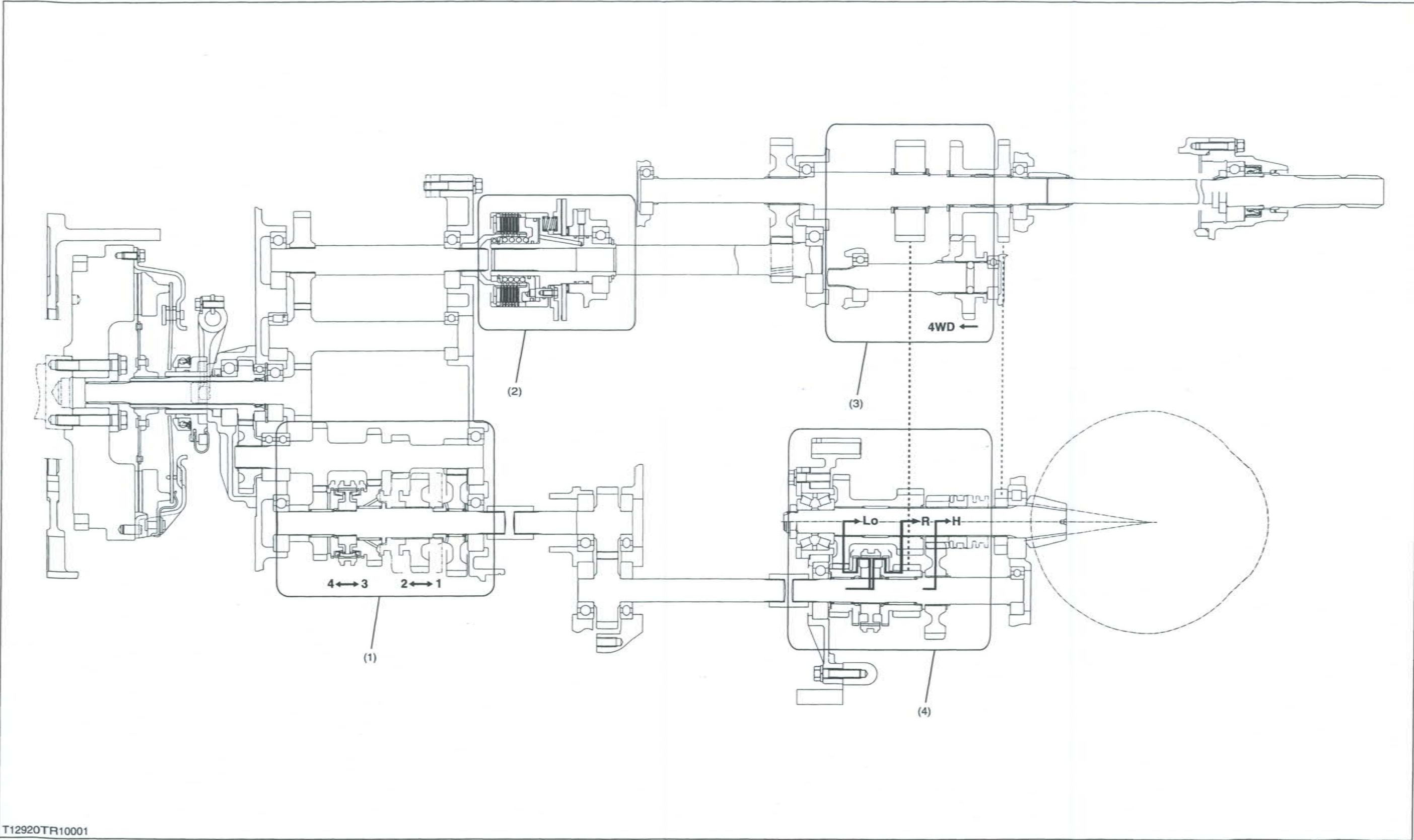
3 TRANSMISSION

MECHANISM

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1. STRUCTURE	3-M1
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1. STRUCTURE



T12920TR10001

(1) Main Gear Shift Section (2) PTO Clutch Pack (3) Front Wheel Drive Shift Section (4) Lo-Reverse, Hi Shift Section

SERVICING

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1. TROUBLESHOOTING	3-S1
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(2) Servicing	3-S21

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Transmission Noise	<ul style="list-style-type: none"> Transmission fluid insufficient Gear worn or backlash improper Bearing worn or broken Shift fork worn Spline worn Snap rings on the shaft come off Spiral bevel pinion lock nut improperly tightened Improper backlash between spiral bevel pinion and spiral bevel gear Improper backlash between differential pinion and differential side gear 	Replenish Replace Replace Replace Replace Repair or replace Tighten Adjust Adjust	G-7, 12 – 3-S12, 21 3-S12 3-S12 – 3-S18 3-S23 3-S24
Gear Slip Out of Mesh	<ul style="list-style-type: none"> Shift linkages rusted Shifter or shift fork or damaged Gears worn or broken 	Repair Replace Replace	– 3-S12 3-S11, 18, 19
Hard Shifting	<ul style="list-style-type: none"> Shifter or shift fork worn or damaged Shift fork bent Shift linkage rusted Shaft part of shift arms rusted 	Replace Replace Repair Repair	3-S12 – – 3-S11
Gears Clash When Shifting	<ul style="list-style-type: none"> Clutch does not release Gears worn or damaged 	Adjust or repair Replace	G-18, 2-S8 –
Differential Lock Can Not Be Set	<ul style="list-style-type: none"> Differential lock shift fork damaged Differential lock shift fork mounting clevis pin damaged Differential lock shifter pin bent or damaged Differential lock fork shaft bent or damaged 	Replace Replace Replace Replace	3-S19 3-S19 3-S20 3-S19
Differential Lock Pedal Does Not Return	<ul style="list-style-type: none"> Differential lock pedal return spring weaken or damaged Differential lock shifter pin bent or damaged Differential lock fork shaft bent 	Replace Replace Replace	– 3-S20 3-S19
Excessive or Unusual at All Time	<ul style="list-style-type: none"> Improper backlash between spiral bevel pinion and spiral bevel gear Improper backlash between differential pinion and differential side gear Bearings worn Insufficient or improper type of transmission fluid used 	Adjust Adjust Replace Replenish or replace	3-S23 3-S24 3-S21 G-7, 12
Noise While Turning	<ul style="list-style-type: none"> Differential pinion or differential side gears worn or damaged Differential lock binding (does not disengage) Bearing worn 	Replace Replace Replace	3-S20, 21 – 3-S12, 21

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Gear to Spline, Hub to Spline	Clearance	0.030 to 0.078 mm 0.00118 to 0.00307 in.	0.2 mm 0.008 in.
Shift Fork and Shift Gear Groove	Clearance	0.15 to 0.40 mm 0.006 to 0.016 in.	0.6 mm 0.024 in.
Spiral Bevel Pinion and Differential Assembly	Combined Turning Torque	3.92 to 6.37 N·m 0.40 to 0.65 kgf·m 2.89 to 4.70 ft-lbs	—
Spiral Bevel Pinion to Spiral Bevel Gear	Backlash	0.15 to 0.30 mm 0.006 to 0.012 in.	—
	Tooth Contact	—	More than 35 %
	Center to Tooth Contact	—	1/3 to 1/2 of the entire width from the small end
Differential Case Bore (Differential Case Cover Bore) to Differential Side Gear Boss	Clearance	0.050 to 0.151 mm 0.00197 to 0.00594 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	—
Differential Case Cover Bore	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	—
Differential Side Gear Boss	O.D.	40.338 to 40.450 mm 1.59008 to 1.59252 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.060 to 0.102 mm 0.00236 to 0.00402 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	O.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	—
Differential Pinion	I.D.	20.040 to 20.061 mm 0.78898 to 0.78980 in.	—
Differential Pinion to Differential Side Gear	Backlash	0.15 to 0.30 mm 0.006 to 0.012 in.	0.40 mm 0.016 in.
Differential Side Gear Washer 1	Thickness	1.5 mm 0.059 in.	—
Differential Side Gear Washer 2	Thickness	1.6 mm 0.063 in.	—
Differential Side Gear Washer 3	Thickness	1.7 mm 0.067 in.	—

W1013874

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-8.)

Item	N·m	kgf·m	ft-lbs
3P delivery pipe 1, 2 joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
Power steering main delivery hose joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Starter B terminal mounting nut	7.8 to 9.8	0.8 to 1.0	5.8 to 7.2
Power steering main delivery hose retaining nut	46.6 to 50.9	4.8 to 5.2	34.4 to 37.6
Power steering turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Engine and clutch housing mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine and clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Main gear shift lever mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Clutch housing and mid case mounting nut	102.9 to 117.6	10.5 to 12.0	75.9 to 86.8
Clutch housing and mid case mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Clutch housing and mid case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Release fork mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Clutch housing bearing holder mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
PTO clutch valve mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
PTO clutch holder mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear wheel mounting screw and nut	197 to 226	20 to 23	145 to 166
Rear wheel mounting stud bolt	98.1 to 112.7	10.0 to 11.5	72.3 to 83.1
ROPS mounting screw	166.7 to 196.1	17 to 20	123 to 144
Hydraulic cylinder assembly mounting stud bolt	34.3 to 49.0	3.5 to 5.0	25.3 to 36.2
Hydraulic cylinder assembly mounting screw	77.4 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting nut	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting screw M10	48 to 55.9	4.9 to 5.7	35.4 to 41.2
Rear axle case mounting screw M12	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Brake case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Brake case mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Mid case and transmission case mounting screw and nut	102.9 to 117.6	10.5 to 12.0	75.9 to 86.8
Mid case and transmission case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Transmission bearing holder mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Staking nut	147 to 196	15 to 20	108 to 145
Pinion bearing case mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
PTO shaft lock nut	147 to 196	15 to 20	108 to 145
PTO bearing case mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Differential support mounting screw	48.1 to 55.9	4.9 to 5.7	31.5 to 41.2
Differential case cover mounting screw	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Spiral bevel gear UBS screw	68.6 to 88.3	7.0 to 9.0	50.6 to 65.1

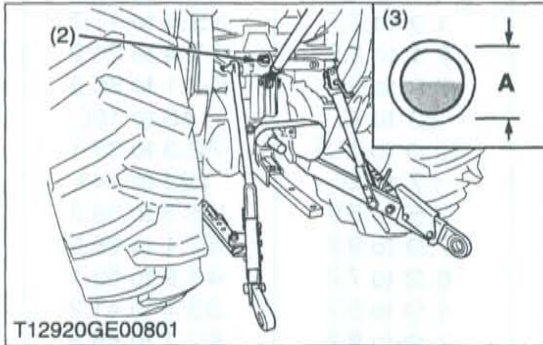
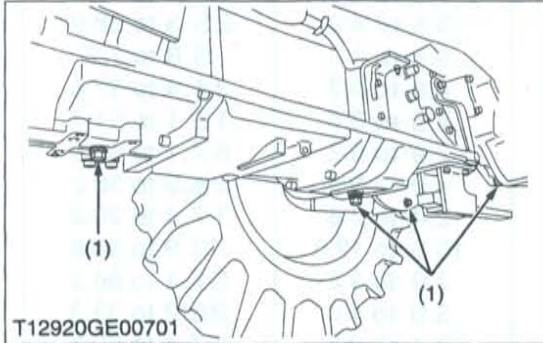
W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CLUTCH HOUSING CASE AND MID CASE

(1) Disassembling and Assembling

(A) Clutch Housing



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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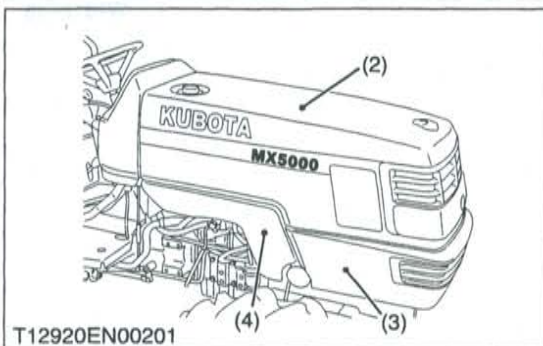
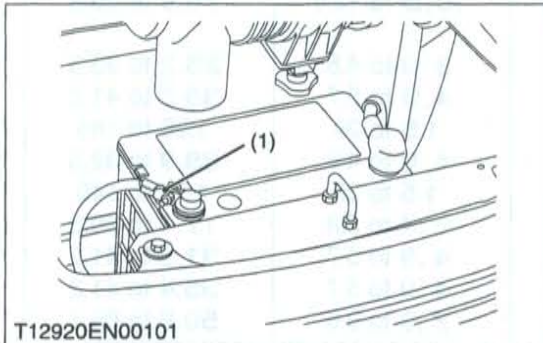
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- (1) Drain Plugs
- (2) Filling Plug
- (3) Level Gauge

A : Oil level is acceptable within this range.

W1011553



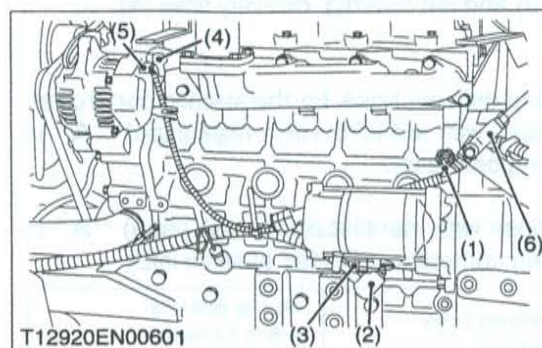
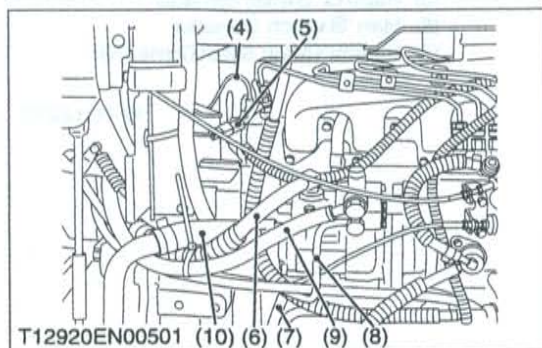
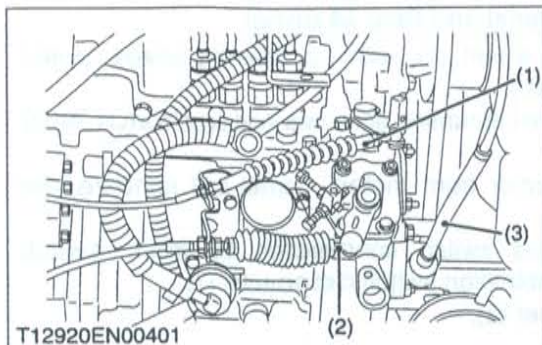
Bonnet, Front Lower Cover

1. Disconnect the battery negative cable (1).
2. Disconnect the head light 4P connector and remove the wire harness from the bonnet (2).
3. Remove the bonnet (2).
4. Remove the front lower cover (3) and side cover (4) (R.H.) (L.H.).

- (1) Battery Negative Cable
- (2) Bonnet

- (3) Front Lower Cover
- (4) Side Cover

W1011742



Wiring, Pipes and Hoses

1. Remove the accelerator wire (1), engine stop wire (2) and hour meter cable (3).
2. Disconnect the **1P** connector for water temperature sensor (4) and glow plug **1P** connector (5).
3. Disconnect the return hose (6).
4. Remove the power steering delivery hose (9).
5. Remove the PTO delivery pipe (8) and 3P delivery pipe 1 (7).
6. Remove the suction hose (10).

(When reassembling)

Tightening torque	3P delivery pipe 1 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	Power steering hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

- | | |
|-----------------------------------|----------------------------------|
| (1) Accelerator Wire | (6) Return Hose |
| (2) Engine Stop Wire | (7) 3P Delivery Pipe 1 |
| (3) Hour Meter Cable | (8) PTO Delivery Pipe |
| (4) Water Temperature Sensor | (9) Power Steering Delivery Hose |
| (5) Glow Plug 1P Connector | (10) Suction Hose |

W1011857

Wirings

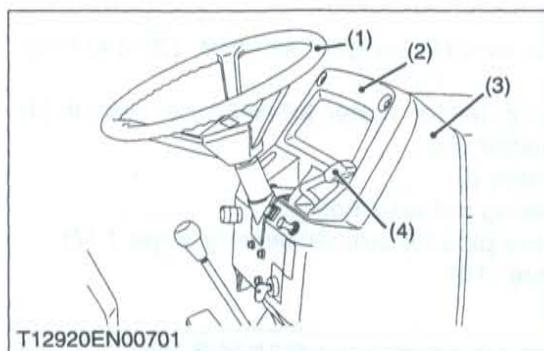
1. Disconnect the **1P** connector (1).
2. Disconnect the **B** terminal (2) and **1P** connector (3) for the starter motor.
3. Disconnect the **2P** connector (5) and wiring (4) for the alternator.
4. Remove the clutch rod (6).

(When reassembling)

Tightening torque	Starter B terminal mounting nut	7.8 to 9.8 N·m 0.8 to 1.0 kgf·m 5.8 to 7.2 ft-lbs
-------------------	--	---

- | | |
|--|--------------------------------------|
| (1) 1P Connector (Engine Oil Pressure Switch) | (4) Wiring (Alternator) |
| (2) B Terminal (Starter Motor) | (5) 2P Connector (Alternator) |
| (3) 1P Connector (Starter Motor) | (6) Clutch Rod |

W1012078



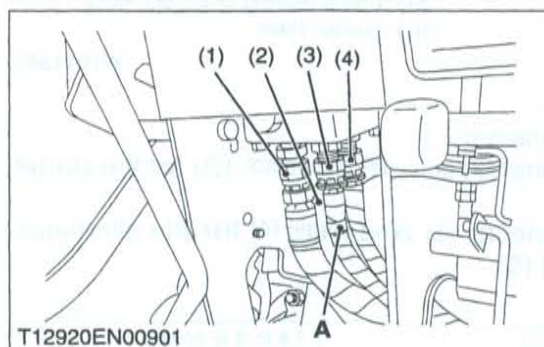
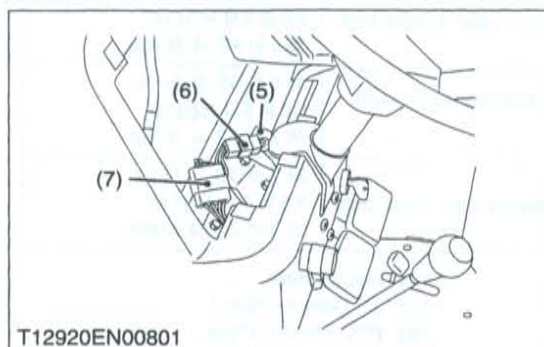
Steering Wheel, Meter Panel and Rear Bonnet

1. Remove the steering wheel (1), with a steering wheel puller (Code No. 07916-51090).
2. Remove the meter panel mounting screws and accelerator lever grip (4).
3. Disconnect the connector from meter panel and remove the meter panel (2).
4. Disconnect the hazard switch connector (5), main switch connector (6) and combination switch connector (7).
5. Remove the rear bonnet (3).

- (1) Steering Wheel
(2) Meter Panel
(3) Rear Bonnet
(4) Accelerator Lever Grip

- (5) Hazard Switch Connector
(6) Main Switch Connector
(7) Combination Switch Connector

W1012252



Steering Hoses

1. Disconnect the main delivery hose (1), return hose (2), right turning delivery hose (3) and left turning delivery hose (4).

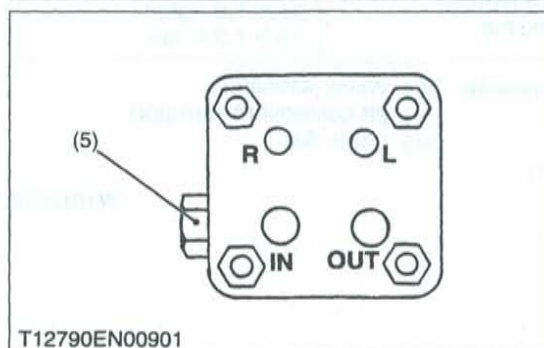
(When reassembling)

(4WD)

- In assembling the turning delivery hose to the steering controller, connect the delivery hose with identification mark (tape) "A" to the R port of the steering controller.

(2WD)

- Connect the delivery hose with identification mark (tape) "A" to the L port of the steering controller. (Refer to figure left.)

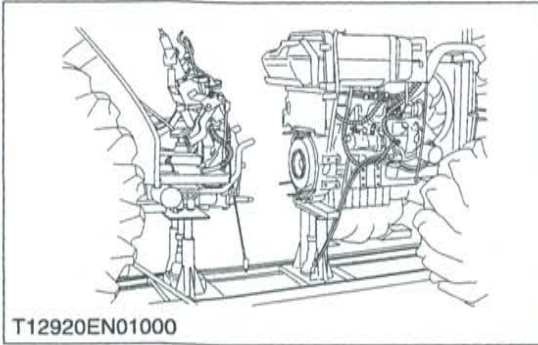
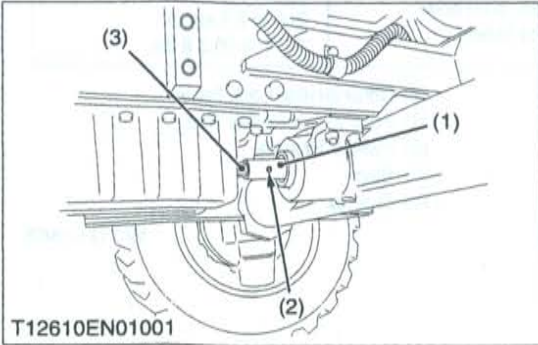
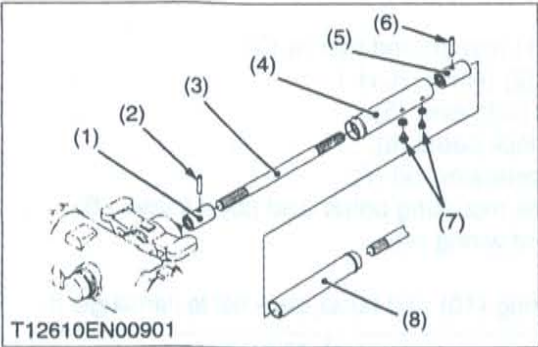


Tightening torque	Main delivery hose retaining nut	46.6 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft·lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft·lbs

- (1) Main Delivery Hose
(2) Return Hose
(3) Right Turning Delivery Hose

- (4) Left Turning Delivery Hose
(5) Relief Valve Plug
(A) Identification Mark (Tape)

W1012392



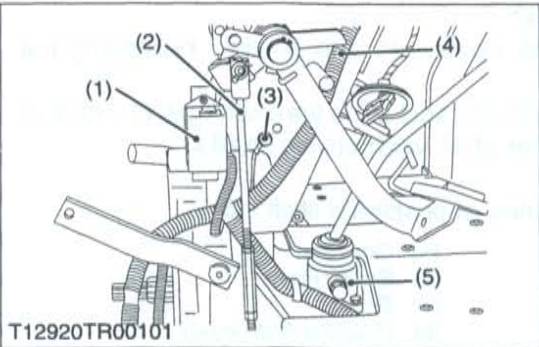
- Propeller Shaft (4WD only)**
- Slide the propeller shaft cover (4) and (8) after removing the screws (7).
 - Tap out the spring pins (2), (6) and slide the couplings (1), (5) and then remove the propeller shaft with covers (4), (8).
- (When reassembling)**
- Apply grease to the splines of propeller shaft 1 (3).
- | | |
|---------------------------|---------------------------|
| (1) Coupling | (5) Coupling |
| (2) Spring Pin | (6) Spring Pin |
| (3) Propeller Shaft 1 | (7) Screws |
| (4) Propeller Shaft Cover | (8) Propeller Shaft Cover |

W1012592

- Separating Engine and Clutch Housing**
- Place the disassembling stand under the engine and clutch housing case.
 - Remove the fuel tank support mounting bolts.
 - Remove the engine and clutch housing mounting screws and nuts.
 - Separate the engine and clutch housing.
- (When reassembling)**
- Apply grease to the spline of clutch shaft.
 - Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1012731



Pedal Frame and Step

- 1. Remove the fuse box (1) and ground cable (3).
- 2. Remove the brake rod (2) (R.H.), (L.H.).
- 3. Remove the main gear shift lever (5).
- 4. Disconnect differential lock pedal (6).
- 5. Disconnect the foot accelerator rod (7).
- 6. Remove the pedal frame mounting bolts and pedal frame (8).
- 7. Remove the step (9) and wiring (4).

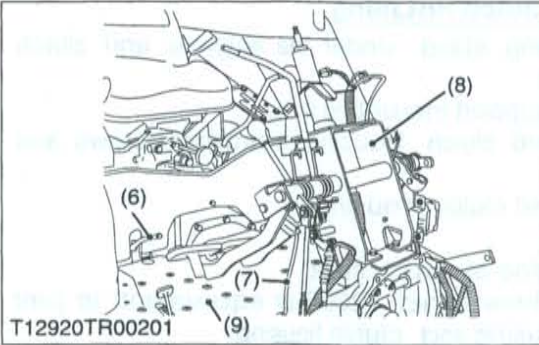
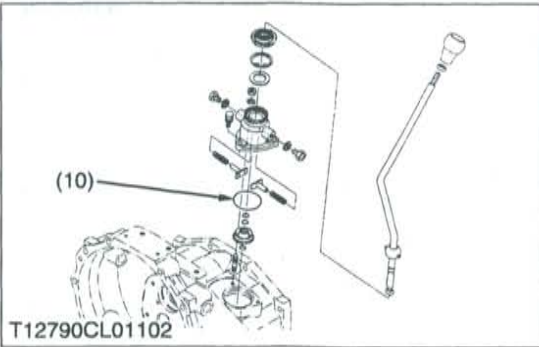
(When reassembling)

- Apply grease to the O-ring (10) and take care not to damage it.

Tightening torque	Main gear shift lever mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	--------------------------------------	---

- | | |
|---------------------------|-----------------------------|
| (1) Fuse Box | (6) Differential Lock Pedal |
| (2) Brake Rod | (7) Foot Accelerator Rod |
| (3) Ground Cable | (8) Pedal Frame |
| (4) Wiring | (9) Step |
| (5) Main Gear Shift Lever | (10) O-ring |

W1012865



Suction Pipe and Hydraulic Block

- 1. Remove the suction pipe 1 (1).
- 2. Disconnect the 3P delivery pipe 2 (3) from hydraulic block (2).
- 3. Remove the hydraulic block (2).
- 4. Remove the pipe (4).

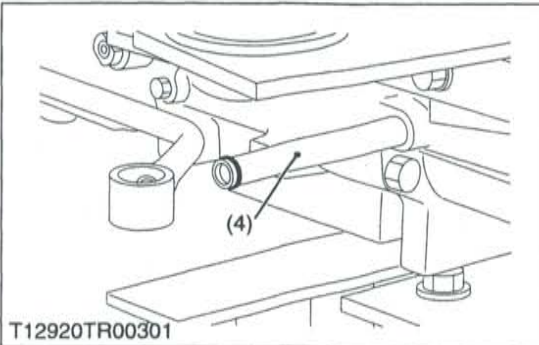
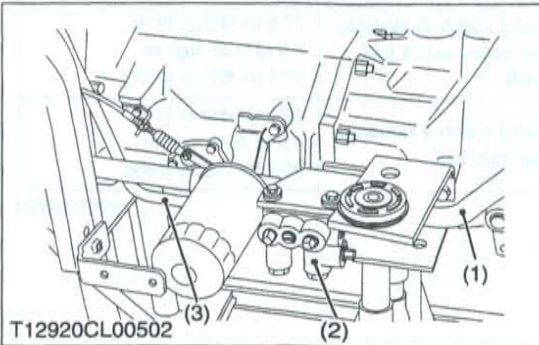
(When reassembling)

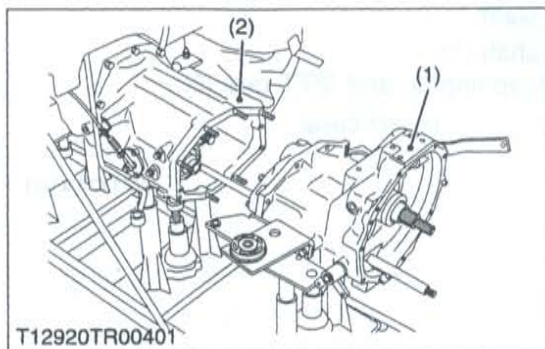
- Apply grease to the O-ring of the pipe (4).

Tightening torque	3P delivery pipe 2 joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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- | | |
|---------------------|------------------------|
| (1) Suction Pipe 1 | (3) 3P Delivery Pipe 2 |
| (2) Hydraulic Block | (4) Pipe |

W1013296





Separating Clutch Housing and Mid Case

1. Remove the clutch housing and mid case mounting screws and nuts.
2. Separate the clutch housing (1) and mid case (2).

(When reassembling)

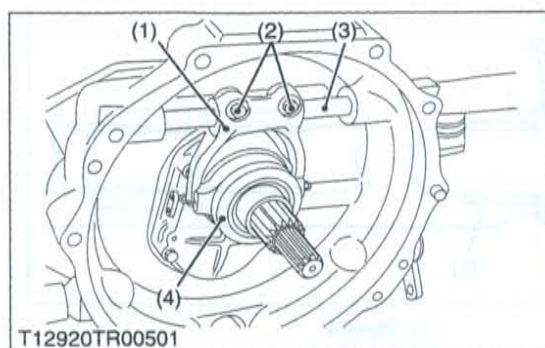
- Replace the gasket with a new one.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the clutch housing and mid case.

Tightening torque	Clutch housing and mid case mounting nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Clutch housing and mid case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Clutch housing and mid case mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs

(1) Clutch Housing

(2) Mid Case

W1013485



Clutch Lever, Release Fork and Release Bearing

1. Remove the release fork mounting screws (2).
2. Draw out the clutch lever (3) to remove the release fork (1).
3. Remove the release bearing and release hub (4) together.

(When reassembling)

- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the clutch lever.

Tightening torque	Release fork mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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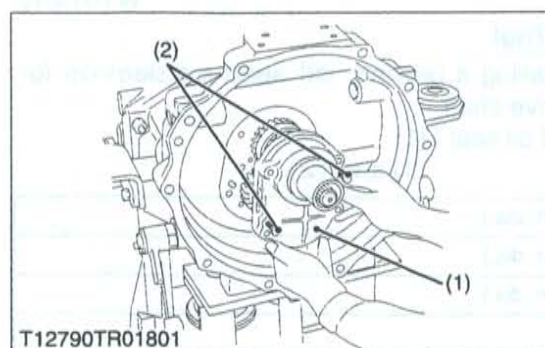
(1) Release Fork

(3) Clutch Lever

(2) Release Fork Mounting Screw

(4) Release Hub

W1012656



Shaft Case

1. Remove the shaft case mounting screws.
2. Screw down the two M6 x 35 mm screws (2) into the shaft case (1) and pull it out.
3. Take out the shaft case (1).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint surface of the shaft case and clutch housing case after eliminating the water, oil and stuck liquid gasket.

(When replacing oil seal in shaft case)

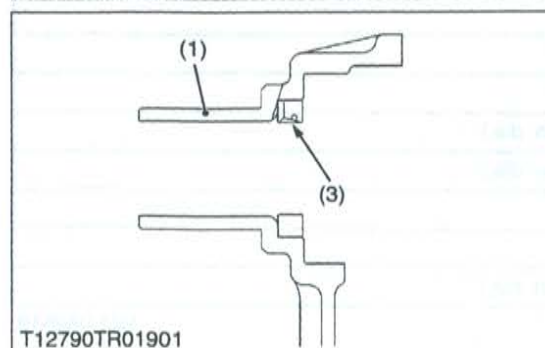
- Install the oil seal (3) as shown in the figure, noting its direction.
- Apply grease to the oil seal (3).

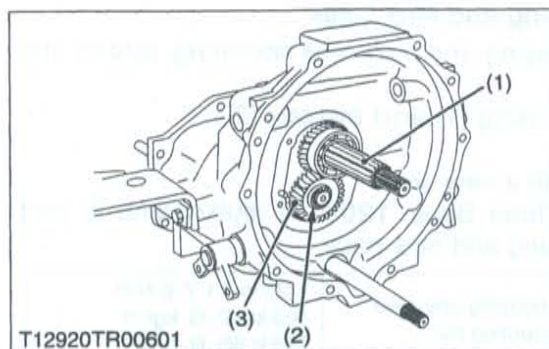
(1) Shaft Case

(3) Oil Seal

(2) Screw M6 x 35 mm

W1012839





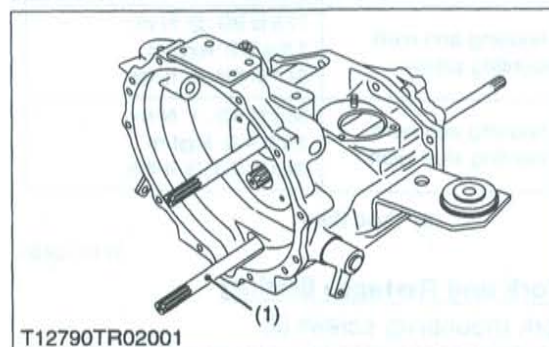
24T Gear Shaft and 27T Gear

1. Remove the 24T gear shaft (1).
2. Remove the external snap ring (2) and 27T gear (3).

(1) 24T Gear Shaft
(2) External Snap Ring

(3) 27T Gear

W1014101

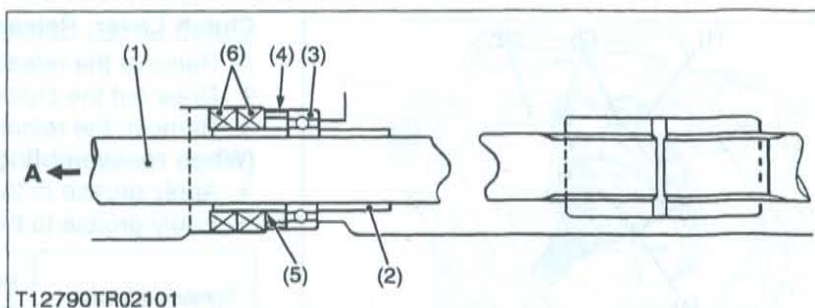


Front Axle Drive Shaft (4WD Only)

1. Pull out the front axle drive shaft (1) to the rear side.

(When reassembling)

- Install the front axle drive shaft (1) from front side after assembling the clutch housing case and mid case. Then install the sleeve (2), bearing (3), collar (4), sleeve (5) and oil seals (6) in order (refer to the figure), by using front axle drive shaft tool. (See page 3-S10.)

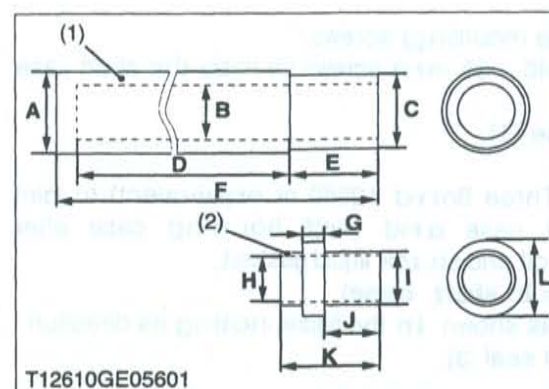


(1) Front Axle Drive Shaft
(2) Sleeve
(3) Bearing
(4) Collar

(5) Sleeve
(6) Oil Seal

A : To Front Axle

W1013010



Front Axle Drive Shaft Tool

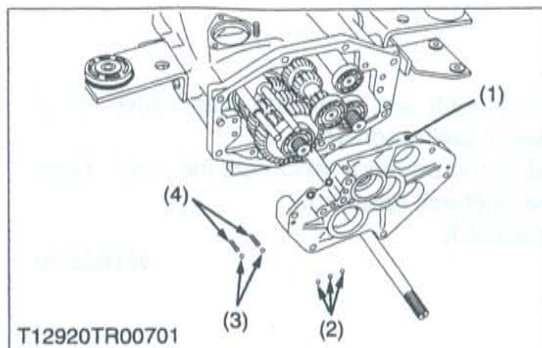
Application: Use for installing a bearing, oil seals and sleeves for front axle drive shaft.

Bearing and oil seal : (1)

Sleeves : (1) and (2)

A	40 mm dia. (1.57 in. dia.)
B	26 mm dia. (1.02 in. dia.)
C	36 mm dia. (1.42 in. dia.)
D	200 mm (7.87 in.)
E	40 mm (1.57 in.)
F	250 mm (9.84 in.)
G	10 mm (0.39 in.)
H	22 mm dia. (0.87 in. dia.)
I	25 mm dia. (0.98 in. dia.)
J	25 mm (0.98 in.)
K	45 mm (1.77 in.)
L	36 mm dia. (1.42 in. dia.)

W1062519



Clutch Housing Bearing Holder

1. Remove the three interlock balls (2) after removing the stopper screw.
2. Pull out the clutch housing bearing holder (1).

■ NOTE

- Take care not to fly out the balls (2) and springs (4) when pull out the bearing holder (1).

(When reassembling)

- Install the three interlock balls (2) with a small amount of grease to the clutch housing bearing holder (1) after setting the shift forks and shift rods to the neutral position.

Tightening torque	Clutch housing bearing holder mounting screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
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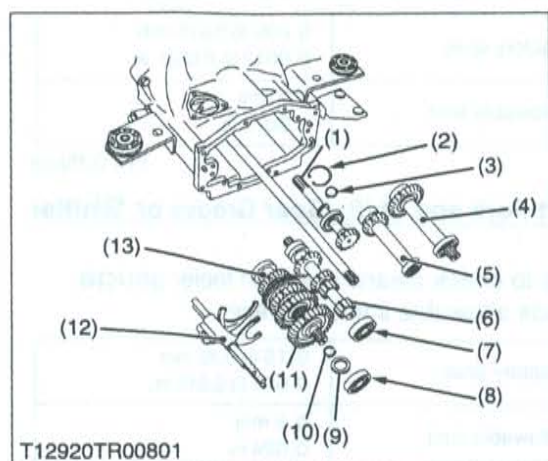
(1) Bearing Holder

(2) Interlock Ball

(3) Shift Lock Ball

(4) Spring

W1013434



Shaft Assemblies

1. Remove the bearings (7), (8) with bearing puller.
2. Remove the external snap ring (10) and thrust collar (9).
3. Draw out the 37T gear (11) then shaft assemblies (4), (5), (6), (13) and shift rod with forks (12).
4. Remove the internal snap ring (2) and draw out the 18T gear shaft (1).

(1) 18T Gear Shaft

(2) Internal Snap Ring

(3) External Snap Ring

(4) PTO Counter Shaft

(5) 21T Gear Shaft

(6) Main Gear Shaft

(7) Bearing

(8) Bearing

(9) Thrust Collar

(10) External Snap Ring

(11) 37T Gear

(12) Shift Fork Assembly

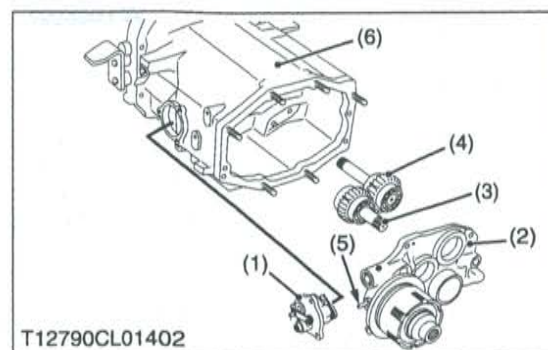
(13) Counter Shaft

W1014870

(B) Mid Case

■ NOTE

- Part of mid case and PTO hydraulic clutch, refer to section 2 CLUTCH (See page 2-S11).



Mid Case, 19T Gear Shaft and 21T Gear Shaft

1. Remove the PTO clutch valve (1).
2. Remove the PTO clutch holder (2) with PTO clutch pack.
3. Tap out the 19T gear shaft (3).
4. Tap out the 21T gear shaft (4).

(When reassembling)

- Apply the small amount of transmission fluid for the O-ring.
- Install the oil pipe (5) to the hole of the PTO clutch valve holder (4) firmly.

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
	PTO clutch holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) PTO Clutch Valve

(2) PTO Clutch Holder

(3) 19T Gear Shaft

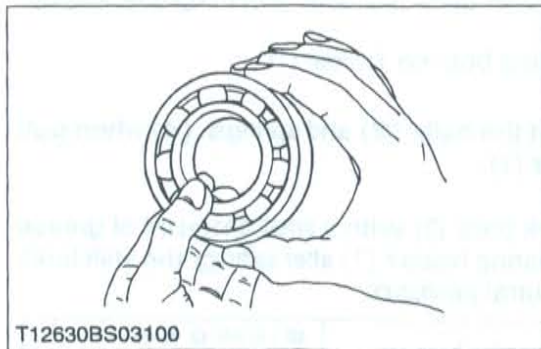
(4) 21T Gear Shaft

(5) Oil Pipe

(6) Mid Case

W1018226

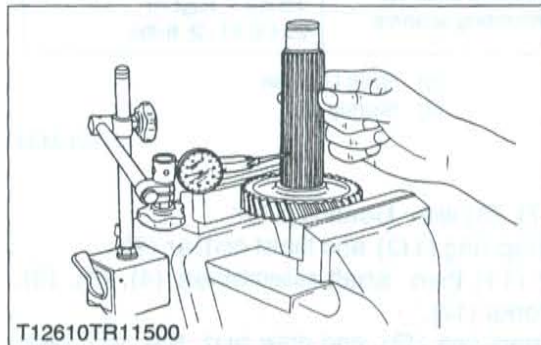
(2) Servicing



Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then turn the outer race to check rotation.
3. If there is any defect, replace it.

W1025781

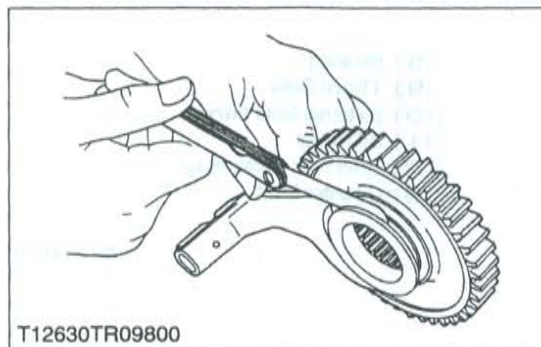


Clearance between Gear and Spline

1. Secure the gear with a vise.
2. Set a dial indicator (lever type) with its finger on the spline.
3. Move the shaft to measure the clearance.
4. If the clearance exceeds the allowable limit, replace them.

Clearance between gear and spline	Factory spec.	0.030 to 0.078 mm 0.0012 to 0.0031 in.
	Allowable limit	0.2 mm 0.0079 in.

W1025848



Clearance between Shift Fork and Shift Gear Groove or Shifter Groove

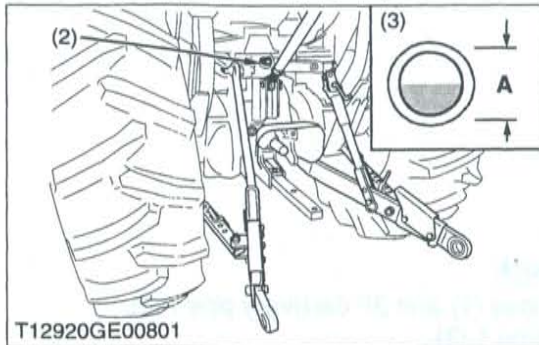
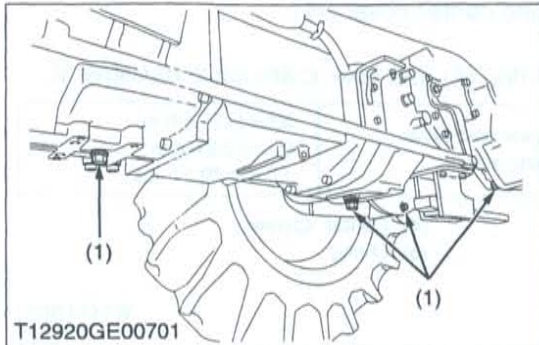
1. Place for in the groove to check clearance with feeler gauge.
2. If the clearance exceeds allowable limit, replace.

Clearance between shift fork and shift gear groove	Factory spec.	0.15 to 0.40 mm 0.006 to 0.016 in.
	Allowable limit	0.6 mm 0.024 in.
Clearance between shift fork and shifter groove	Factory spec.	0.15 to 0.40 mm 0.006 to 0.016 in.
	Allowable limit	0.6 mm 0.024 in.

W1026997

[2] TRANSMISSION CASE

(1) Disassembling and Assembling



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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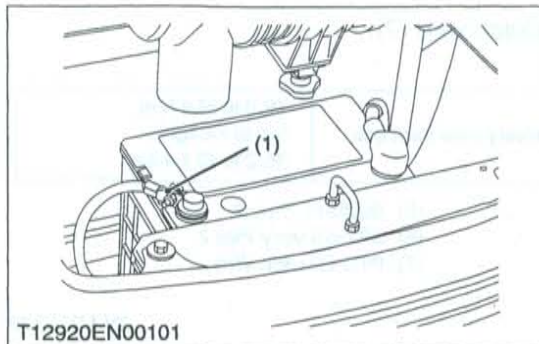
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- (1) Drain Plugs
- (2) Filling Plug
- (3) Level Gauge

A : Oil level is acceptable within this range.

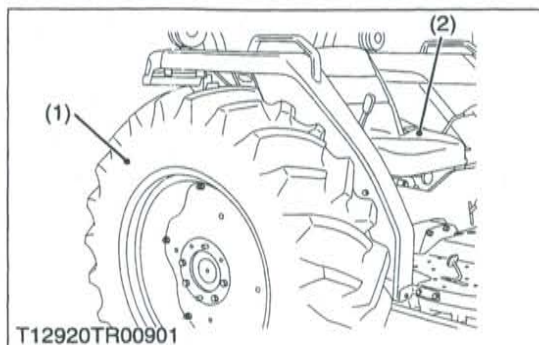
W1015605



Battery Negative Cable

1. Disconnect the battery negative cable (1).
- (1) Battery Negative Cable

W1015802



Rear Wheels and Seat

1. Place the disassembling stand under the clutch housing and transmission case.
2. Loosen and remove the rear wheel mounting screws and nuts.
3. Remove the rear wheels (1).
4. Follow the same procedure as above for the other side.
5. Remove the seat (2).

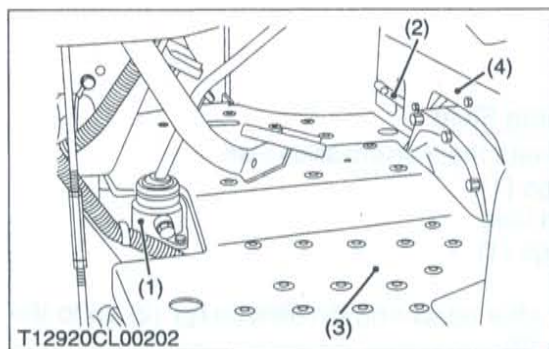
(When reassembling)

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
	Rear wheel mounting stud bolt	98.1 to 112.7 N·m 10.0 to 11.5 kgf·m 72.3 to 83.1 ft-lbs

(1) Rear Wheel

(2) Seat

W1015866



Step and Center Cover

1. Remove the main gear shift lever (1).
2. Disconnect the differential lock pedal (2).
3. Remove the step (3) and center cover (4).

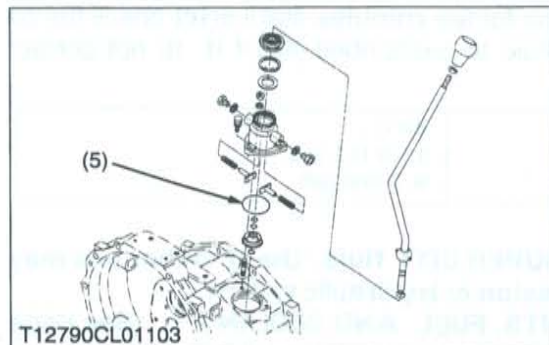
(When reassembling)

- Apply grease to the O-ring (5) and take care not to damage it.

Tightening torque	Main gear shift lever mounting screw	23.6 to 27.4 N·m
		2.4 to 2.8 kgf·m
		17.4 to 20.2 ft-lbs

- | | |
|-----------------------------|------------------|
| (1) Main Gear Shift Lever | (4) Center Cover |
| (2) Differential Lock Pedal | (5) O-ring |
| (3) Step | |

W1016051



Pipes and Hydraulic Block

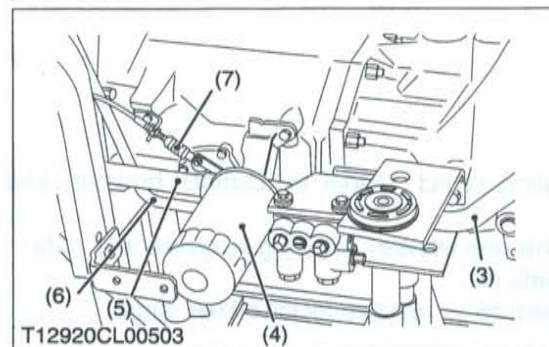
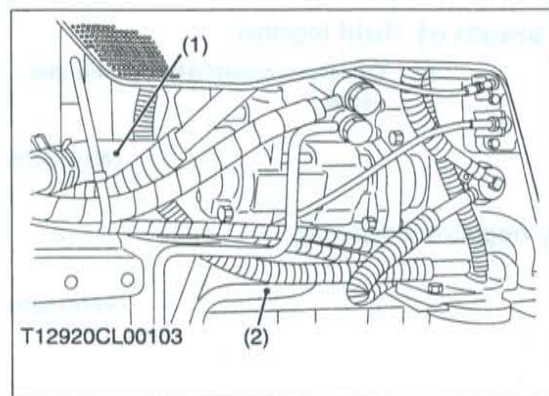
1. Remove the suction hose (1) and 3P delivery pipe 1 (2).
2. Remove the suction pipe 1 (3).
3. Remove the 3P delivery pipe 2 (6).
4. Remove the hydraulic oil filter (4) with filter bracket and suction pipe 2 (5).
5. Disconnect the PTO clutch wire (7).

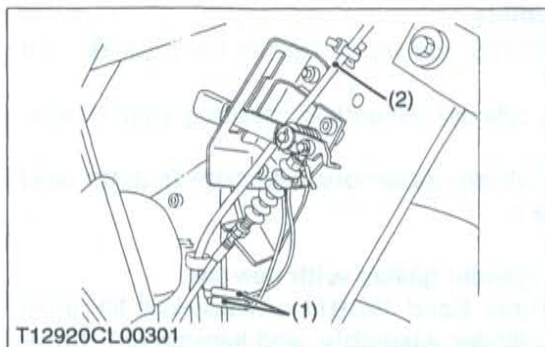
(When reassembling)

Tightening torque	3P delivery pipe joint bolt	49.0 to 58.8 N·m
		5.0 to 6.0 kgf·m
		36.2 to 43.4 ft-lbs

- | | |
|--------------------------|------------------------|
| (1) Suction Hose | (5) Suction Pipe 2 |
| (2) 3P Delivery Pipe 1 | (6) 3P Delivery Pipe 2 |
| (3) Suction Pipe 1 | (7) PTO Clutch Wire |
| (4) Hydraulic Oil Filter | |

W1016339



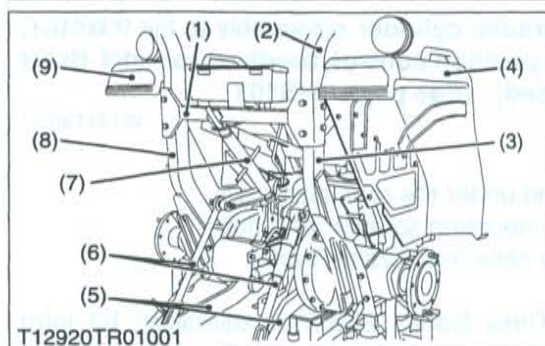
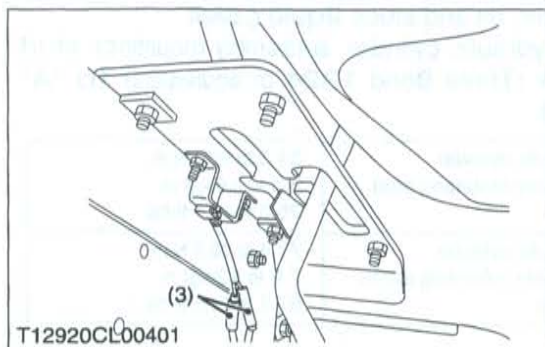


Wirings

1. Disconnect the **1P** connector (1) for PTO safety switch.
2. Disconnect the **1P** connector for hazard light (R.H.), (L.H.) and remove the wiring (2) (R.H.), (L.H.).
3. Disconnect the **1P** connector (3) for shuttle safety switch.
4. Remove the ground cable.

(1) **1P** Connector for PTO Safety Switch (3) **1P** Connector for Shuttle Safety Switch
 (2) Wiring for Hazard Light

W1016574



ROPS and Fender R.H., L.H.

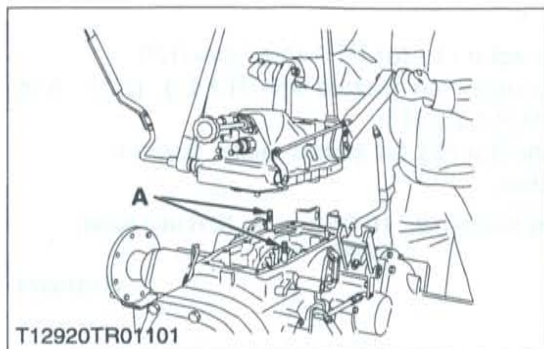
1. Remove the top link (7), lower link (5) and lift rod (6).
2. Remove the ROPS center (1) and draw out the ROPS upper (2).
3. Remove the ROPS mounting screw and ROPS lower (3), (8).
4. Remove the fender (R.H.) (4) and (L.H.) (9).

(When reassembling)

Tightening torque	ROPS mounting screw	166.7 to 196.1 N·m 17 to 20 kgf·m 123 to 144 ft·lbs
-------------------	---------------------	---

- | | |
|---------------------|---------------------|
| (1) ROPS Center | (6) Lift Rod |
| (2) ROPS Upper | (7) Top Link |
| (3) ROPS Lower R.H. | (8) ROPS Lower L.H. |
| (4) Fender R.H. | (9) Fender L.H. |
| (5) Lower Link | |

W1016703



Hydraulic Cylinder Assembly

1. Disconnect the draft control rod from the top link bracket. (If equipped.)
2. Remove the hydraulic cylinder assembly mounting screws and nuts.
3. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then remove it.

(When reassembling)

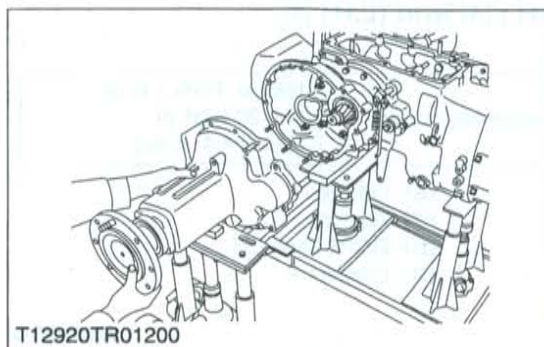
- Replace the hydraulic cylinder gasket with new one.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.
- When replacing the hydraulic cylinder assembly mounting stud bolts, apply liquid lock (Three Bond 1324 or equivalent) to "A" portion of the stud bolt.

Tightening torque	Hydraulic cylinder assembly mounting stud bolt	34.3 to 49.0 N·m 3.5 to 5.0 kgf·m 25.3 to 36.2 ft-lbs
	Hydraulic cylinder assembly mounting screw and nut	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

■ NOTE

- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod (if equipped). (See page 8-S10.)

W1019027



Rear Axle

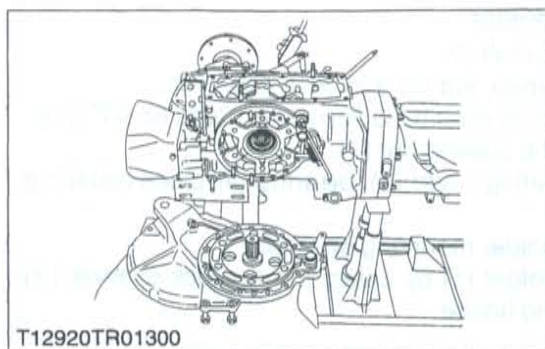
1. Place the support stand under the rear axle case.
2. Remove the rear axle mounting screws and nuts.
3. Separate the rear axle case from brake case.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear wheel mounting screw and nut		196 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
	Rear axle case mounting screw and nut	M10 nut	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
		M10 screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
		Stud bolt	24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft-lbs
		M12 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1019242



Brake Case

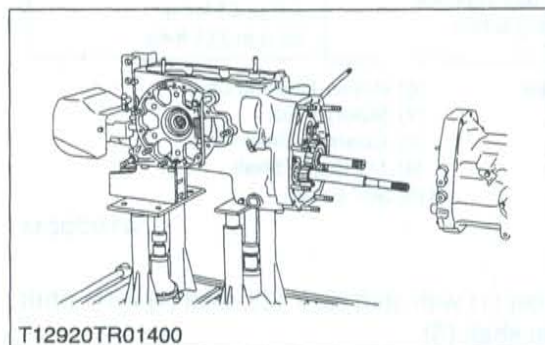
1. Remove the brake case mounting screws and nuts.
2. Separate the brake case, tapping the brake case lever lightly.

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the brake case and transmission case, after eliminate the water, oil and stuck liquid gasket.
- Before installing the brake case to the transmission case, install the cam plate to the transmission case.

Tightening torque	Brake case mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Brake case mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Brake case lever mounting screw	62.8 to 72.5 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs

W1019453



Separating Mid Case and Transmission Case

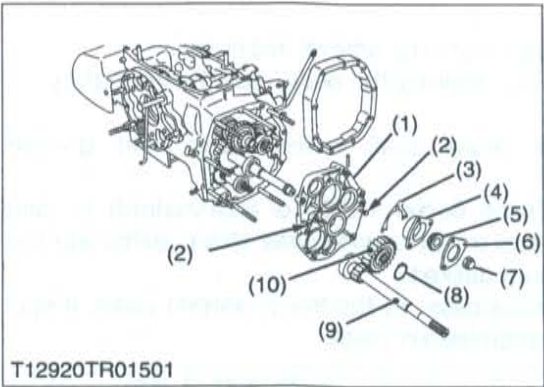
1. Remove the mid case and transmission case mounting screws and nuts.
2. Separate the mid case and transmission case.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of mid case and transmission case after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Mid case and transmission case mounting screw and nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Mid case and transmission case mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs

W1019729



Transmission Bearing Holder

- 1. Remove the 11T gear shaft (9).
- 2. Remove the external snap ring (8) and 30T gear (10).
- 3. Fix the 22T gear on pinion shaft by locking tool (Code No. 07916-52311) and remove the staking nut (7).
- 4. Remove the pinion bearing cover (6), bearing (5), pinion bearing case (4) and shim (3).
- 5. Remove the bearing holder mounting screws.
- 6. Jack up the bearing holder (1) by using the two jack screws (2) and remove the bearing holder

(When reassembling)

- Tap in the transmission bearing holder with soft hammer until contact to transmission case, and then tighten the screws to specified torque.

Tightening torque	Transmission bearing holder mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft·lbs
	Staking nut	147 to 196 N·m 15 to 20 kgf·m 108 to 145 ft·lbs
	Pinion bearing case mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft·lbs

- (1) Transmission Bearing Holder

(2) Jack Screw

(3) Shim

(4) Pinion Bearing Case

(5) Bearing
- (6) Pinion Bearing Cover

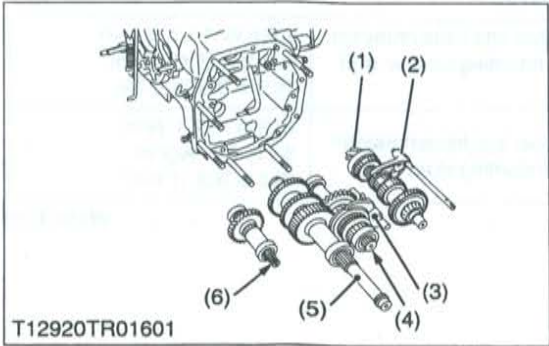
(7) Staking Nut

(8) External Snap Ring

(9) 11T Gear Shaft

(10) 30T Gear

W1O20244



Shaft Assemblies

- 1. Take out the pinion shaft (1) with shift fork (2), shaft (4) with shift fork (3), and PTO drive shaft (5).
- 2. Take out the front wheel drive shaft (6).

- (1) Pinion Shaft

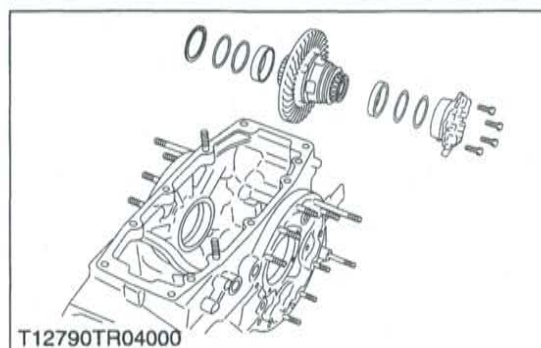
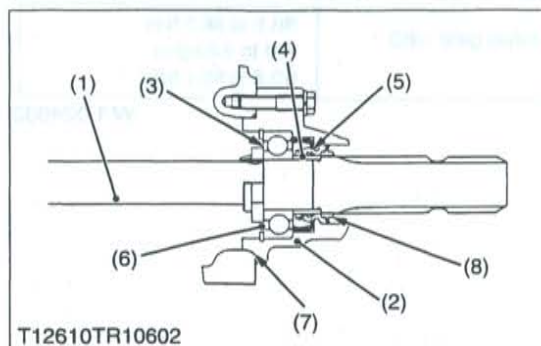
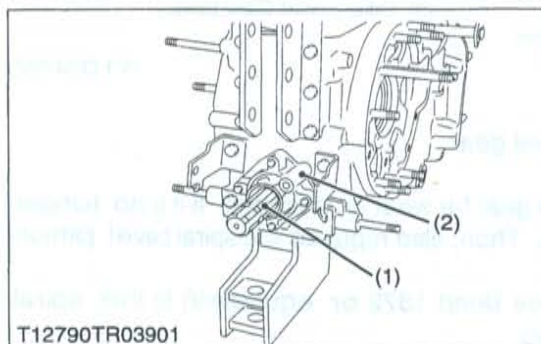
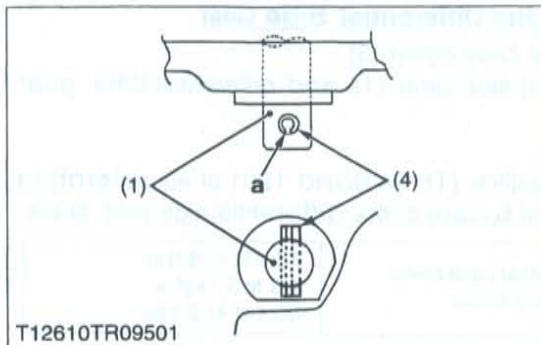
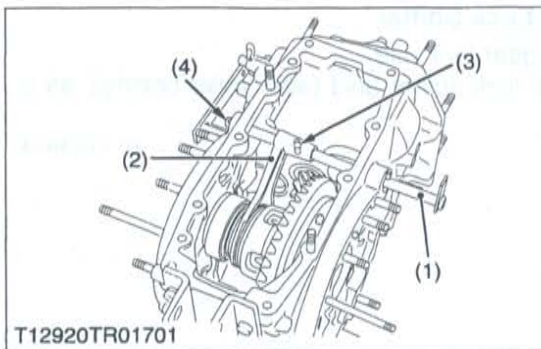
(2) Hi Shift Fork

(3) Lo-Reverse Shift Fork
- (4) Shaft

(5) PTO Drive Shaft

(6) Front Wheel Drive Shaft

W1O18209



Differential Lock Shift Fork

1. Tap out the left side spring pin (4).
2. Remove the cotter pin and take out the clevis pin (3).
3. Draw out the differential lock fork shaft (1) and take out the differential lock shift fork (2).

(When reassembling)

- Apply grease to the left and right oil seals on the transmission case.
- Insert the clevis pin (3) from the top and install the washer and cotter pin.
- Tap in the spring pin (4) so that its split portion **a** may face outward as shown in the figure.

- (1) Differential Lock Fork Shaft
(2) Differential Lock Shift Fork
(3) Clevis Pin
(4) Spring Pin

a : Split Portion

W1022586

PTO Shaft

1. Remove the PTO shaft cover.
2. Remove the bearing case mounting screws, and draw out the PTO shaft (1) with bearing case (2).
3. Remove the internal snap ring (3).
4. Tap out the PTO shaft (1) to the front.

(When reassembling)

- If the lock nut (6) was removed, replace it with a new one. After replacing, be sure to stake it firmly.
- Install the slinger (8) firmly.
- Apply grease to the oil seal (4) and install it, noting its direction.

Tightening torque	Lock nut	147 to 196 N·m 15 to 20 kgf·m 108 to 145 ft·lbs
	Bearing case mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs

- (1) PTO Shaft
(2) Bearing Case
(3) Internal Snap Ring
(4) Oil Seal

- (5) Oil Seal Collar
(6) Lock Nut
(7) O-ring
(8) Slinger

W1024203

Differential Gear Assembly

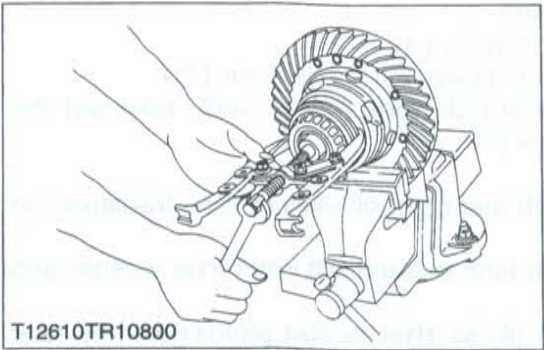
1. Remove the differential support, noting the number of left shims.
2. Take out the differential gear assembly, noting the number of right shims.

(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.
- Use same number of shims as before disassembling.

Tightening torque	Differential support mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft·lbs
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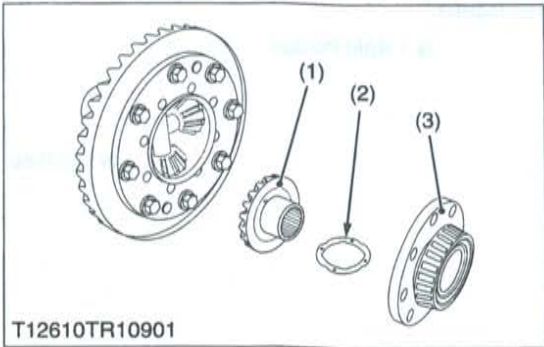
W1024537



Bearing and Differential Lock Shifter

- 1. Secure the differential gear in a vise.
- 2. Remove the differential lock shifter and taper roller bearing as a unit with a puller.

W1 O24664



Differential Case Cover and Differential Side Gear

- 1. Remove the differential case cover (3).
- 2. Remove the differential side gear (1) and differential side gear washer (2).

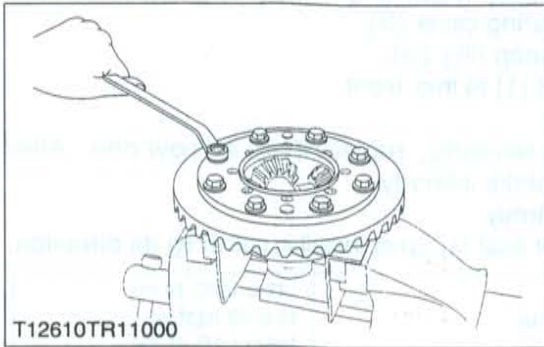
(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gear boss.

Tightening torque	Differential case cover mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
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- (1) Differential Side Gear
- (2) Differential Side Gear Washer
- (3) Differential Case Cover

W1 O24722



Spiral Bevel Gear

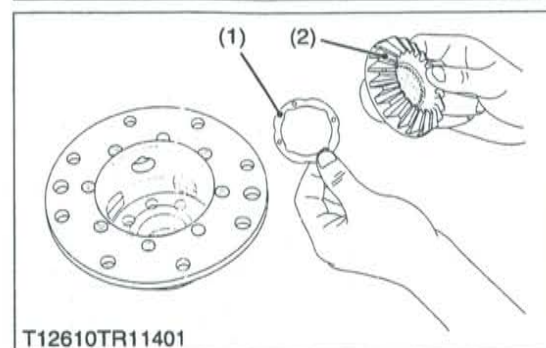
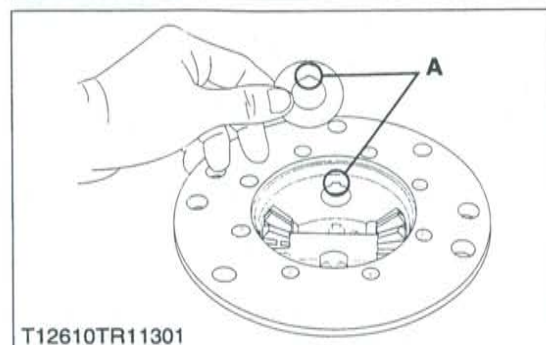
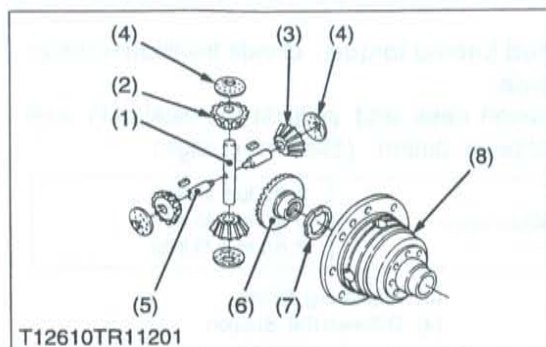
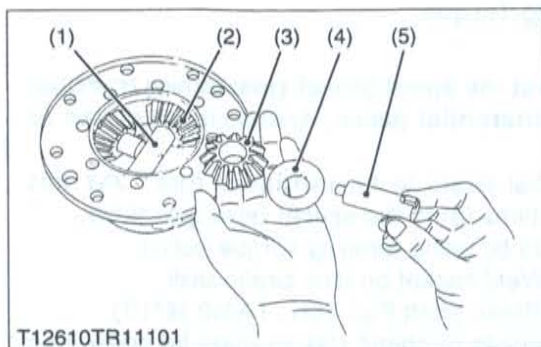
- 1. Remove the spiral bevel gear.

(When reassembling)

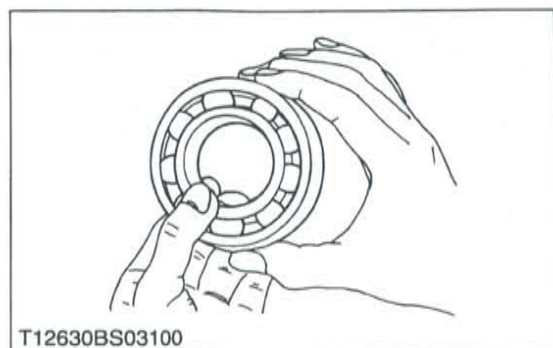
- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion shaft.
- Apply liquid lock (Three Bond 1372 or equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	68.6 to 88.3 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 ft·lbs
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W1 O24933



(2) Servicing



Differential Pinion Shaft and Differential Pinion

1. Draw out the differential pinion shaft 2 (5), and take out the differential pinion (3) and differential pinion washer (4).
2. Draw out the differential pinion shaft (1), and take out the differential pinion (2) and differential pinion washer.

NOTE

- Arrange the parts to know their original position.

(When reassembling)

- Check the differential pinions (2) and (3), and pinion shaft (1) and (5) for excessive wear. If these parts are damaged or excessively worn, replace their parts they are in mesh with, or they sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions.
- Install the parts to their original position.
- Install the differential pinion washer (4), noting its groove position.

- (1) Differential Pinion Shaft
(2) Differential Pinion
(3) Differential Pinion
(4) Differential Pinion Washer
(5) Differential Pinion Shaft 2

- (6) Differential Side Gear
(7) Differential Side Gear Washer
(8) Differential Case

A : Fit Groove

W1025042

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.

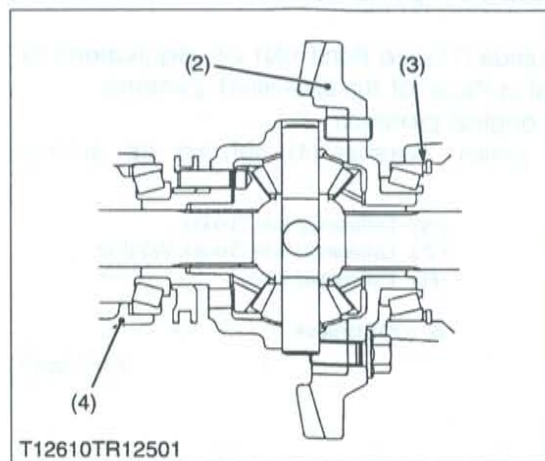
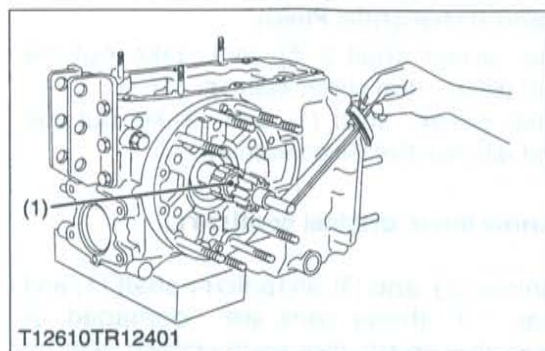
- (1) Differential Side Gear Washer (2) Differential Side Gear

W1025258

Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then turn the outer race to check rotation.
3. If there is any defect, replace it.

W1022294



Spiral Bevel Gear Turning Torque

■ NOTE

- It is necessary to adjust the spiral bevel gear turning torque, when replacing the differential gears, transmission case or other relative parts.

1. Assemble the differential gears to transmission case. At this time, install the some shims (3) to the spiral bevel gear side.

2. Check the turning torque by using turning torque tool (1).

Turning Torque Tool : Weld socket on the brake shaft

(Brake shaft Part No. TA040-26710)

3. Add or reduce the thickness of shims (3) to make the specified turning torque.

4. After getting the specified turning torque, divide the thickness of shims to left and right side.

5. Assemble the transmission case and adjust the backlash and tooth contact with spiral bevel pinion. (See next page.)

Turning torque of 37T spiral bevel gear	Factory spec.	3.92 to 6.37 N·m 0.40 to 0.65 kgf·m 2.89 to 4.70 ft·lbs
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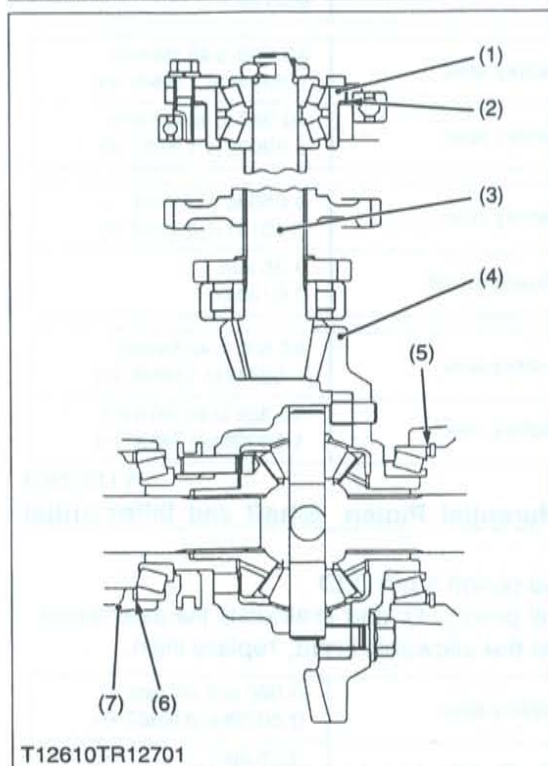
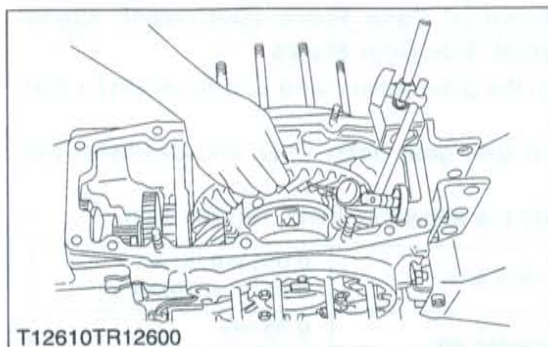
(1) Turning Torque Tool

(3) Adjusting Shim

(2) 37T Spiral Bevel Gear

(4) Differential Support

W1027752



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 (3) and moving the spiral bevel gear (4) by hand.
3. When the backlash is too large, decrease the number of shims (5) in the side of the spiral bevel gear, and insert the shims (6) of the same thickness as the removed ones to the opposite side. When the backlash is too small, do the opposite way of exceed backlash.
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.	0.15 to 0.30 mm 0.006 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of shims (2) :
0.1 mm (0.004 in.) 0.2 mm (0.008 in.) 0.5 mm (0.020 in.)
- Thickness of shims (5) :
0.4 mm (0.016 in.) 0.7 mm (0.028 in.) 1.0 mm (0.039 in.)
0.5 mm (0.020 in.) 0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
0.6 mm (0.024 in.) 0.9 mm (0.035 in.) 1.4 mm (0.055 in.)
- Thickness of shims (6)
0.4 mm (0.016 in.) 0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
0.6 mm (0.024 in.) 1.0 mm (0.039 in.) 1.6 mm (0.063 in.)

- | | |
|-------------------------|--------------------------|
| (1) Pinion Bearing Case | (5) Shim |
| (2) Shim | (6) Shim |
| (3) Spiral Bevel Pinion | (7) Differential Support |
| (4) Spiral Bevel Gear | |

W1027926

More than 35 % red lead contact area on the gear tooth surface.
The center of tooth contact at 1/3 of the entire width from the small end.

(A) Proper Contact

W1018747

Replace the adjusting shim (2) with thicker one to move the spiral bevel pinion shaft backward.

For move the spiral bevel gear rightward, reduce right side shim (5) and add shim (6) of the same thickness as the right side to left side.

(B) Shallow Contact

(C) Heel Contact

W1018900

Replace the shim (5) with a thinner one to move the spiral bevel pinion shaft forward.

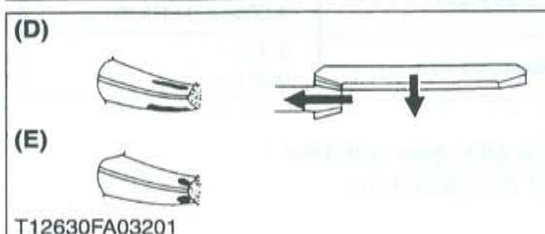
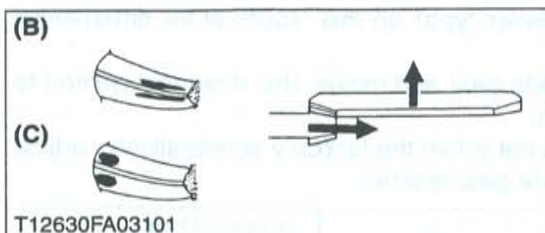
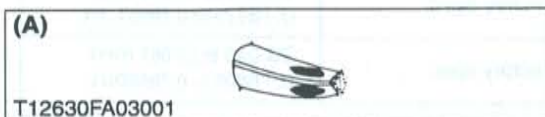
For move the spiral bevel gear leftward, reduce left side shim (6) and add shim (5) of the same thickness as the left side to right side.

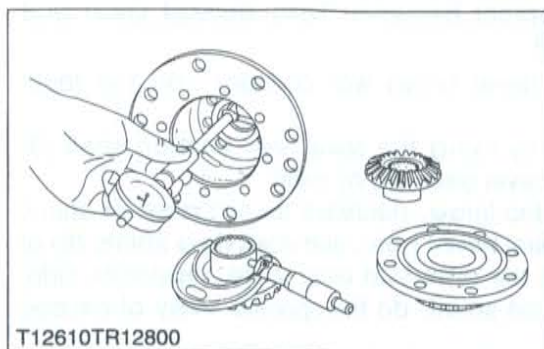
Repeat above until the proper tooth contact and backlash are achieved.

(D) Deep Contact

(E) Toe Contact

W1018973





Clearance between Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and differential case cover.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

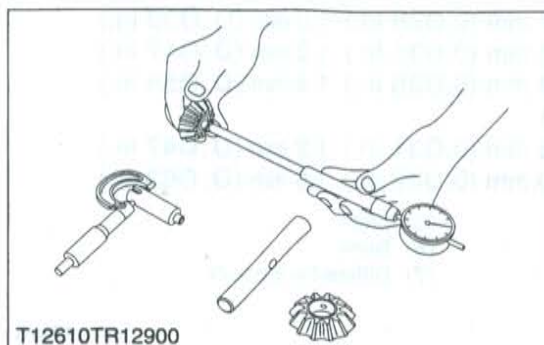
Clearance between differential case bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

Clearance between differential case cover bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case cover bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.59008 to 1.59252 in.

W1028403



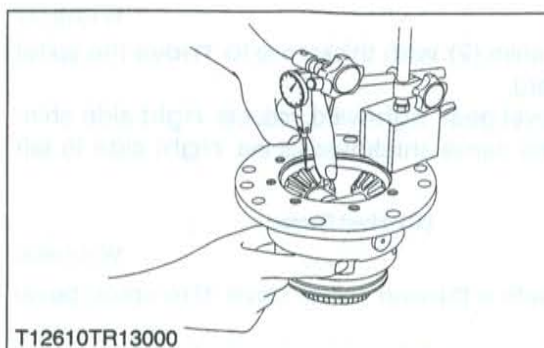
Clearance between Differential Pinion Shaft and Differential Pinion

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.	0.060 to 0.102 mm 0.00236 to 0.00402 in.
	Allowable limit	0.25 mm 0.0098 in.

Differential pinion shaft O.D.	Factory spec.	19.959 to 19.980 mm 0.78579 to 0.78661 in.
Differential pinion I.D.	Factory spec.	20.040 to 20.061 mm 0.78898 to 0.78980 in.

W1028760



Backlash between Differential Pinion and Differential Side Gear

1. Set a dial indicator (lever type) on the tooth of the differential pinion.
2. Hold the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement is not within the factory specifications, adjust with the differential side gear washer.

Backlash between differential pinion and differential side gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of differential side gear washer :
1.5 mm (0.059 in.) 1.7 mm (0.067 in.)
1.6 mm (0.063 in.)

W1028920

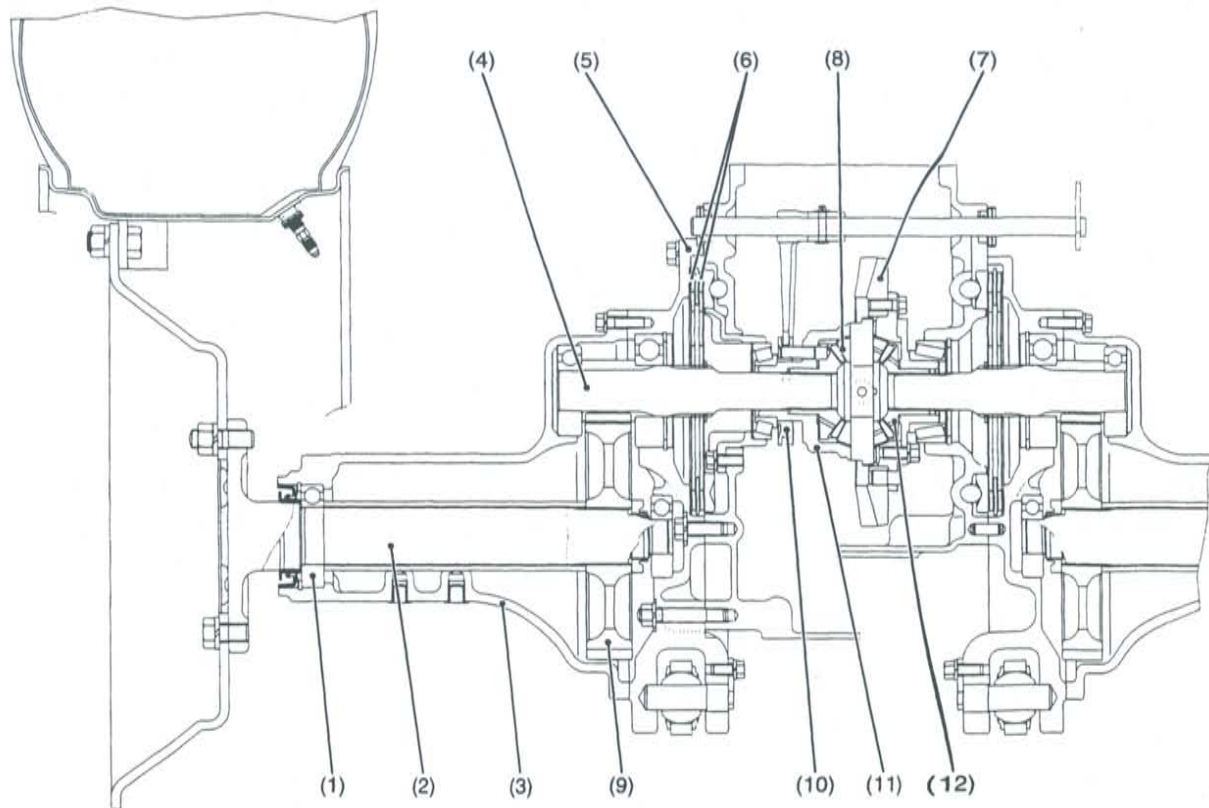
4 REAR AXLE

MECHANISM

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1. STRUCTURE	4-M1
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1. STRUCTURE



T12790RA00101

- | | | | |
|--------------------|-----------------------------|-------------------------|--------------------------------|
| (1) Ball Bearing | (4) Differential Gear Shaft | (7) Ring Gear | (10) Differential Lock Shifter |
| (2) Rear Axle | (5) Brake Case | (8) Differential Pinion | (11) Differential Case |
| (3) Rear Axle Case | (6) Brake Disc | (9) Final Gear | (12) Differential Side Gear |

The final gear (9) are final reduction mechanism which further reduces the speed of rotation. The direction of power transmitted is changed by the differential gear.

The rear axles (2) are the final transmission mechanism which transmit the power from the transmission to the rear wheels. The rotation speed is reduced by the final gears (5).

The rear axles are the semi-floating type with the ball bearing (1) between the rear axle (2) and rear axle case (3), which support the rear wheel load besides transmitting power to the rear wheel. The rear axles also support the weight of the tractor.

SERVICING

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1. TROUBLESHOOTING	4-S1
2. TIGHTENING TORQUES	4-S2
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[1] DISASSEMBLING AND ASSEMBLING.....	4-S3
(1) Separating Rear Axle Case from Brake Case	4-S3
(2) Disassembling Rear Axle	4-S5

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	• Improper backlash between 11T gear and 67T gear	Replace	4-S4
	• Bearing worn	Replace	4-S4
	• Insufficient or improper type of transmission fluid used	Replenish or change	G-7
Noise while Turning	• 11T gear and 67T gear worn or damaged	Replace	4-S4

W1012214

2. TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts : See page G-8.)

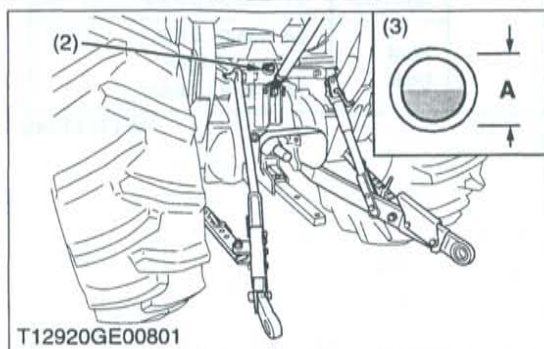
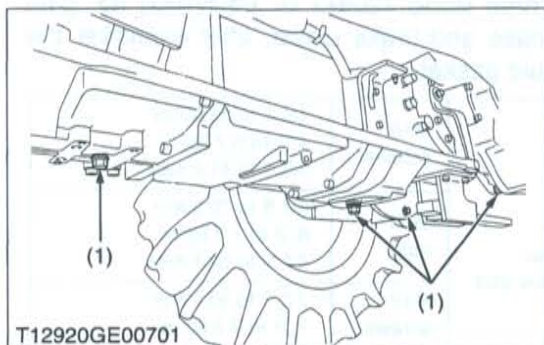
Item	N·m	kgf·m	ft-lbs
Rear wheel mounting screw and nut	197 to 226	20 to 23	145 to 166
ROPS mounting screw	166.7 to 196.1	17 to 20	123 to 144
Rear axle case mounting screw (M10)	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Rear axle case mounting nut (M10)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting screw (M12)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting stud bolt	24.5 to 31.4	2.5 to 3.2	18.1 to 23.1
Rear axle lock nut	196 to 245	20 to 25	14.5 to 18.1

W1O12736

3. CHECKING, DISASSEMBLING AND SERVICING

[1] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case from Brake Case



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L
	11.6 U.S.gals.
	9.7 Imp.gals.

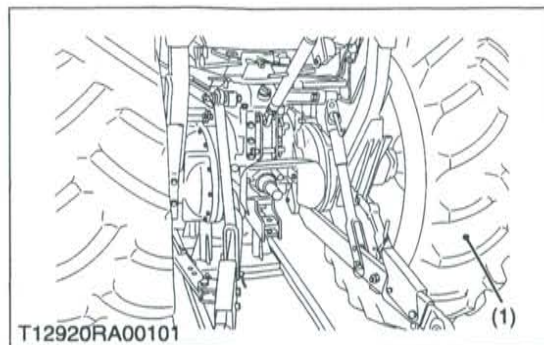
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands of fluid together.

- (1) Drain Plugs
(2) Filling Plug
(3) Level Gauge

A : Oil level is acceptable within this range.

W1010854



Rear Wheel

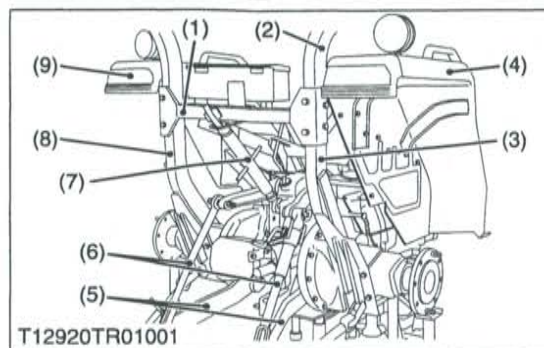
1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel mounting screws and nuts.
3. Remove the rear wheel (1).

(When reassembling)

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
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- (1) Rear Wheel

W1011043



ROPS

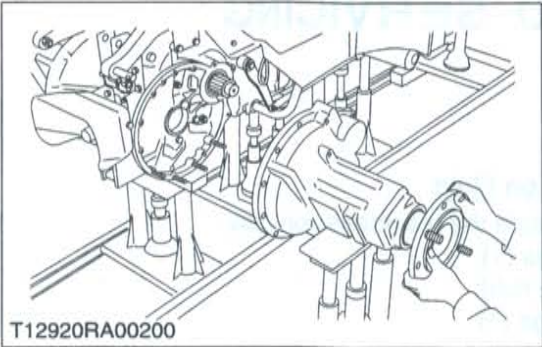
1. Remove the top link (7), lower link (5) and lift rod (6).
2. Remove the ROPS center (1) and draw out the ROPS upper (2).
3. Remove the ROPS mounting screw and ROPS lower (3), (8).

(When reassembling)

Tightening torque	ROPS mounting screw	166.7 to 196.1 N·m 17 to 20 kgf·m 123 to 144 ft-lbs
-------------------	---------------------	---

- (1) ROPS Center (6) Lift Rod
(2) ROPS Upper (7) Top Link
(3) ROPS Lower R.H. (8) ROPS Lower L.H.
(4) Fender R.H. (9) Fender L.H.
(5) Lower Link

W1011189



Rear Axle Case

- 1. Place the disassembling stand under the rear axle case.
- 2. Remove the rear axle mounting screws and nuts.
- 3. Separate the rear axle case from brake case.

(When reassembling)

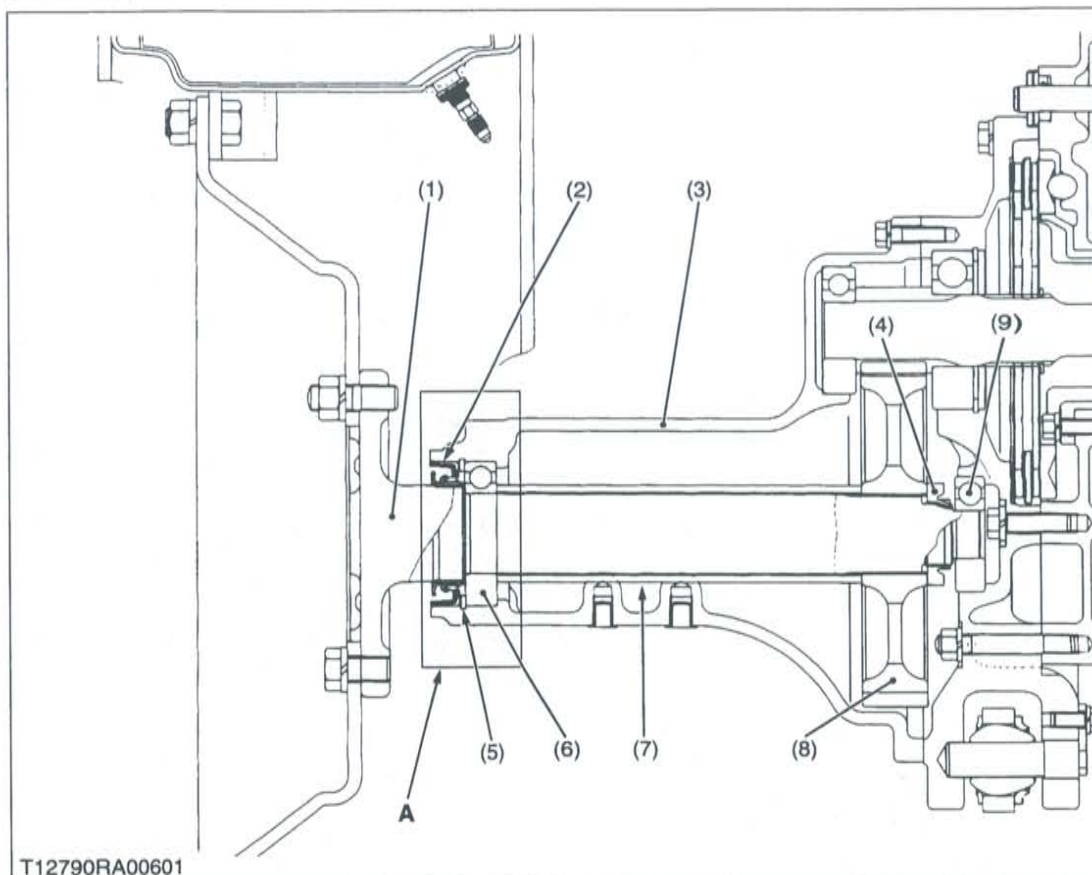
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	M10 screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
		M10 nuts	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft·lbs
		M12 screws and nuts	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs
		Stud bolts	24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft·lbs

W1O11349

(2) Disassembling Rear Axle

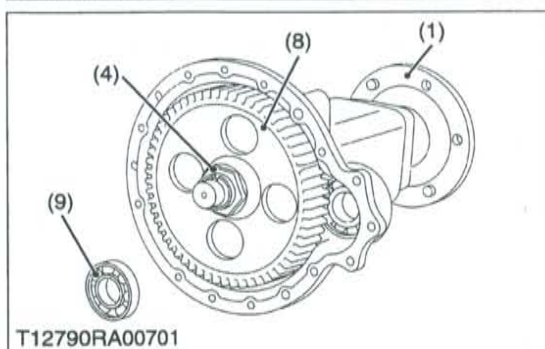
Rear Axle



- (1) Rear Axle
- (2) Oil Seal
- (3) Rear Axle Case
- (4) Lock Nut
- (5) Internal Snap Ring
- (6) Ball Bearing
- (7) Spacer
- (8) Gear
- (9) Ball Bearing

W1011594

T12790RA00601



T12790RA00701

1. Remove the ball bearing (9) with a puller.
2. Remove the stake of lock nut (4).
3. Secure the rear axle (1) in a vise and remove the lock nut.
4. Take out the gear (8) and spacer (7).
5. Tap out the rear axle (1).

(When reassembling)

- Apply grease to the oil seal (2) and install it.
- Replace the lock nut with new one, and after tightening it to specified torque, stake it firmly.
- Assemble the oil seal (2) with correct direction. (See figure above (A) portion.)

Tightening torque	Lock nut	196 to 245 N·m 20 to 25 kgf·m 145 to 181 ft-lbs
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W1011681

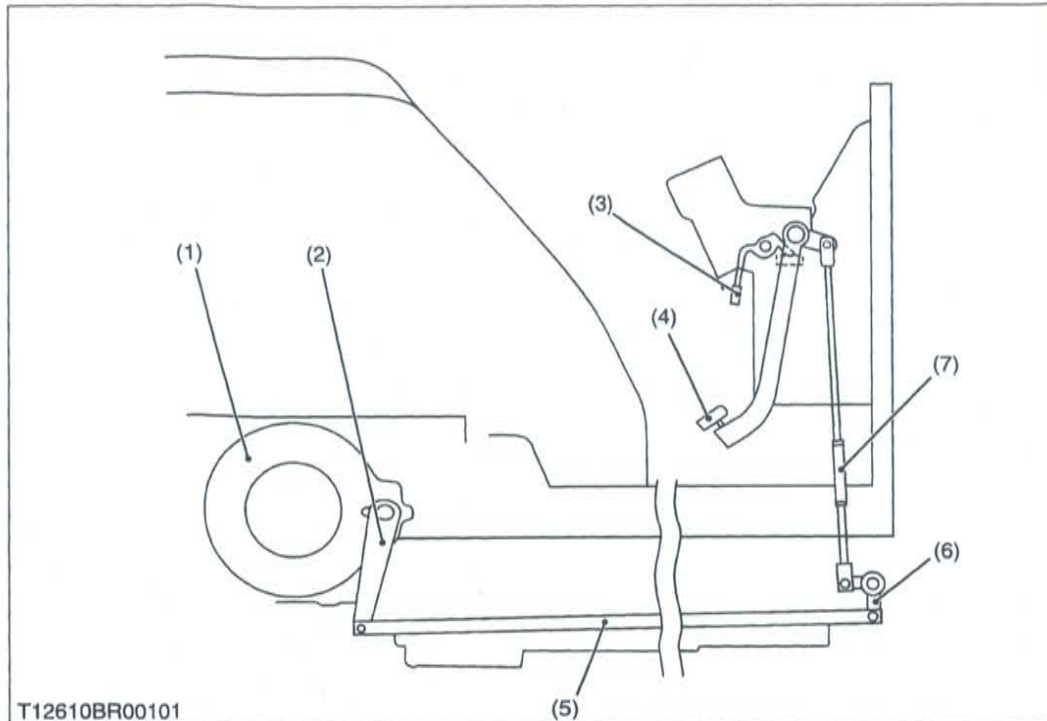
5 BRAKES

MECHANISM

CONTENTS

1. STRUCTURE	5-M1
--------------------	------

1. STRUCTURE



- (1) Brake Case
- (2) Brake Cam Lever
- (3) Parking Brake Lever
- (4) Brake Pedal
- (5) Brake Rod
- (6) Brake Lever Link
- (7) Turnbuckle

W1012543

T12610BR00101

This is used hanging type brake pedals to have wider space of the platform.

Independent mechanical wet disc brakes are used for the right and left travelling brakes. They are operated by the brake pedals through the mechanical linkages.

The parking brake is a mechanical type which is designed to actuate the travelling brakes. Pulling the parking brake lever (3) results in the same state as that obtained when the brake pedals are pressed.

SERVICING

CONTENTS

1. TROUBLESHOOTING	5-S1
2. SERVICING SPECIFICATIONS	5-S2
3. TIGHTENING TORQUES	5-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	5-S4
[1] BRAKE PEDAL	5-S4
(1) Checking and Adjusting	5-S4
(2) Servicing	5-S5
[2] BRAKE CASE	5-S5
(1) Disassembling and Assembling	5-S5
(2) Servicing	5-S8

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Uneven Braking Force	<ul style="list-style-type: none"> • Brake pedal play unevenly adjusted • Brake disc worn • Cam plate warped 	Adjust Replace Replace	5-S4 5-S8 5-S8
Brake Drags	<ul style="list-style-type: none"> • Brake pedal play too small • Ball holes of cam plate for uneven wear • Brake pedal return spring weaken or broken • Brake cam rusted 	Adjust Replace Replace Repair	5-S4 5-S8 5-S4 5-S8
Poor Braking Force	<ul style="list-style-type: none"> • Brake pedal play excessive • Brake disc worn • Cam plate warped • Brake cam or lever damaged • Transmission fluid improper 	Adjust Replace Replace Replace Change	5-S4 5-S8 5-S8 5-S8 5-S5

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	15 to 20 mm 0.6 to 0.8 in.	—
Brake Lever Link Shaft to Bushing	Clearance	0.125 to 0.195 mm 0.00492 to 0.00768 in.	1.0 mm 0.039 in.
Brake Lever Link Shaft	O.D.	19.955 to 19.975 mm 0.78563 to 0.78642 in.	—
Brake Lever Link Bushing	I.D.	20.100 to 20.150 mm 0.79134 to 0.79331 in.	—
Cam Plate	Flatness	—	0.3 mm 0.012 in.
Cam Plate and Ball	Height	20.9 to 21.1 mm 0.823 to 0.831 in.	20.5 mm 0.8071 in.
Brake Disc	Thickness	4.6 to 4.8 mm 0.181 to 0.189 in.	4.2 mm 0.165 in.
Plate	Thickness	2.54 to 2.66 mm 0.1000 to 0.1047 in.	2.1 mm 0.0827 in.

W1013874

3. TIGHTENING TORQUES

Tightening torques of screws and nuts in the table below are especially specified.
(For general use screws and nuts: See page G-8.)

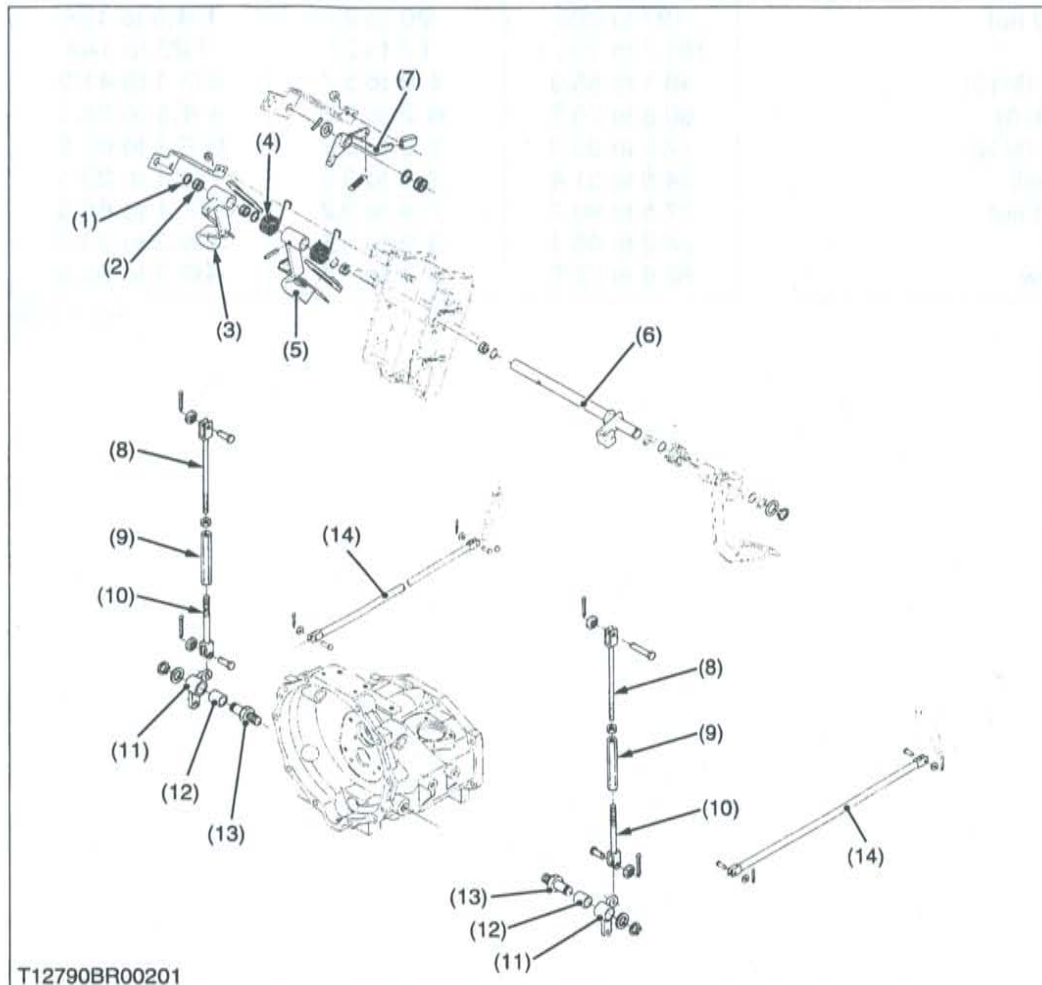
Item	N·m	kgf·m	ft-lbs
Rear wheel mounting screw and nut	197 to 226	20 to 23	14.5 to 166
ROPS mounting screw	166.7 to 196.1	17 to 20	123 to 144
Rear axle case mounting screw (M10)	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Rear axle case mounting nut (M10)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting screw (M12)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting stud bolt	24.5 to 31.4	2.5 to 3.2	18.1 to 23.1
Brake case mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Brake case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Brake case lever mounting screw	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

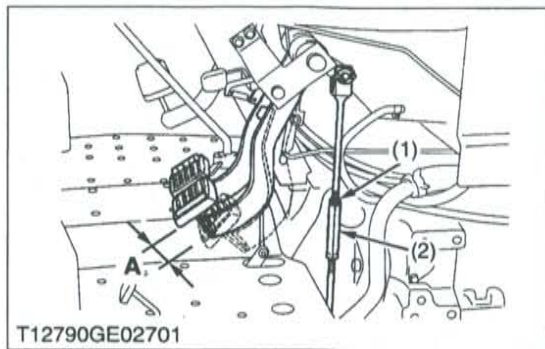
[1] BRAKE PEDAL

(1) Checking and Adjusting



- (1) Oil Seal
- (2) Needle Bearing
- (3) Brake Pedal
- (4) Return Spring
- (5) Brake Pedal LH
- (6) Brake Pedal Shaft
- (7) Parking Brake Lock
- (8) Brake Rod 1
- (9) Turnbuckle
- (10) Brake Rod 2
- (11) Brake Lever
- (12) Bushing
- (13) Brake Lever Link Shaft
- (14) Brake Rod 3

W1O11493



Checking Brake Pedal Free Travel



CAUTION

- Stop the engine and remove the key, then chock the wheels before checking brake pedal.

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut (1) and adjust with the turnbuckle (2).
4. Retighten the lock nut (1).

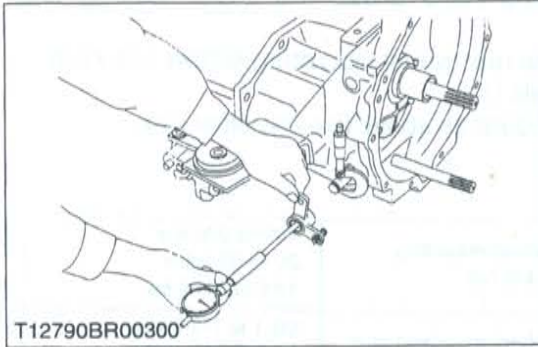
Brake pedal free travel	Factory spec.	15 to 20 mm (0.6 to 0.8 in.) on the pedal.
	Factory spec.	Keep the free travel in the right and left brake pedals equal

- (1) Lock Nut
- (2) Turnbuckle

A : Free Travel

W1011645

(2) Servicing



Clearance between Brake Lever Link Shaft and Bushing

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

Clearance between brake lever link shaft and brake lever link bushing	Factory spec.	0.125 to 0.195 mm 0.00492 to 0.00768 in.
	Allowable limit	1.0 mm 0.039 in.

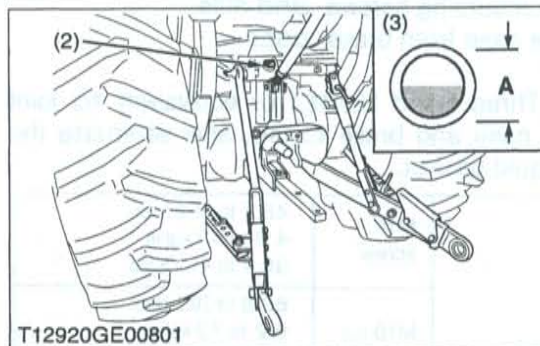
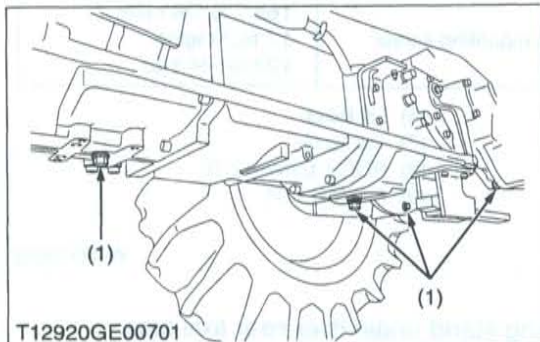
Brake lever link shaft O.D.	Factory spec.	19.955 to 19.975 mm 0.78563 to 0.78642 in.
Brake lever link bushing I.D.	Factory spec.	20.100 to 20.150 mm 0.79134 to 0.79331 in.

W1011853

[2] BRAKE CASE

(1) Disassembling and Assembling

(A) Separating Brake Case from Transmission Case



Draining the Transmission Fluid

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

(When refilling)

- Fill up from filling port after removing the filling plug (2) until reaching the gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	44 L 11.6 U.S.gals. 9.7 Imp.gals.
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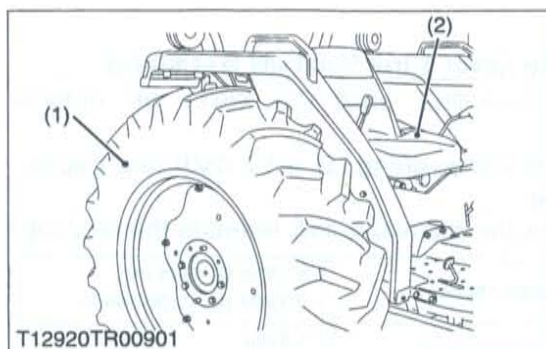
■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)
- Do not mix different brands fluid together.

- (1) Drain Plug
(2) Filling Plug
(3) Gauge

A : Oil level is acceptable with in this range.

W1012195



Rear Wheels and Seat

1. Place the disassembling stand under the clutch housing and transmission case.
2. Loosen and remove the rear wheel mounting screws and nuts.
3. Remove the rear wheels (1).
4. Follow the same procedure as above for the other side.
5. Remove the seat (2).

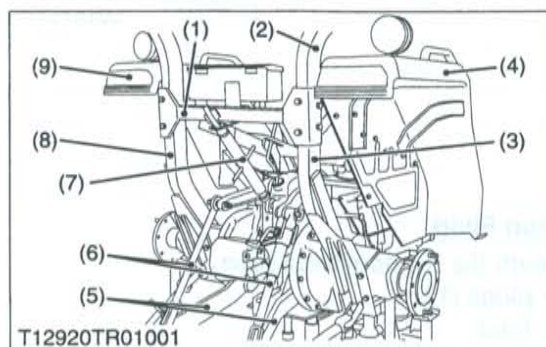
(When reassembling)

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft·lbs
	Rear wheel mounting stud bolt	98.1 to 112.7 N·m 10.0 to 11.5 kgf·m 72.3 to 83.1 ft·lbs

(1) Rear Wheel

(2) Seat

W1013424



ROPS and Fender R.H., L.H.

1. Remove the top link (7), lower link (5) and lift rod (6).
2. Remove the ROPS center (1) and draw out the ROPS upper (2).
3. Remove the ROPS mounting screw and ROPS lower (3), (8).
4. Remove the fender (R.H.) (4) and (L.H.) (9).

(When reassembling)

Tightening torque	ROPS mounting screw	166.7 to 196.1 N·m 17 to 20 kgf·m 123 to 144 ft·lbs
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(1) ROPS Center

(6) Lift Rod

(2) ROPS Upper

(7) Top Link

(3) ROPS Lower R.H.

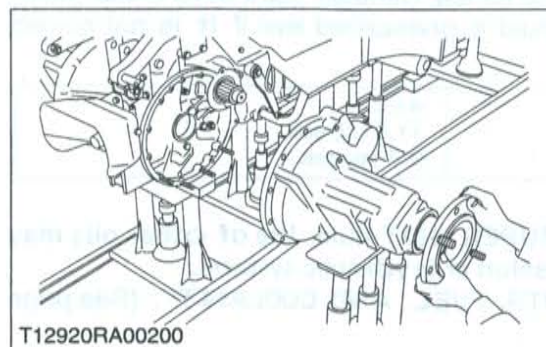
(8) ROPS Lower L.H.

(4) Fender R.H.

(9) Fender L.H.

(5) Lower Link

W1013662



Rear Axle Case

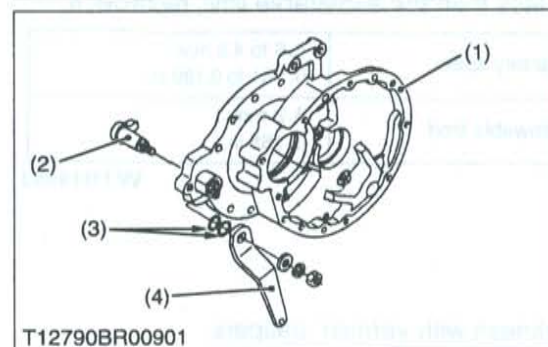
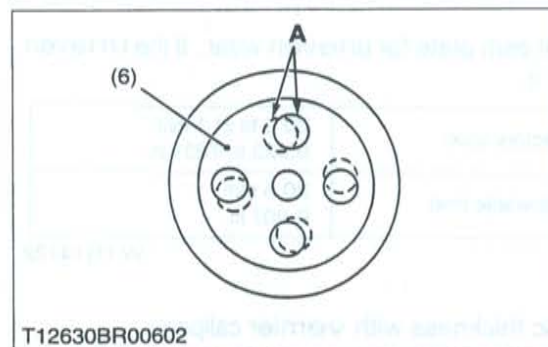
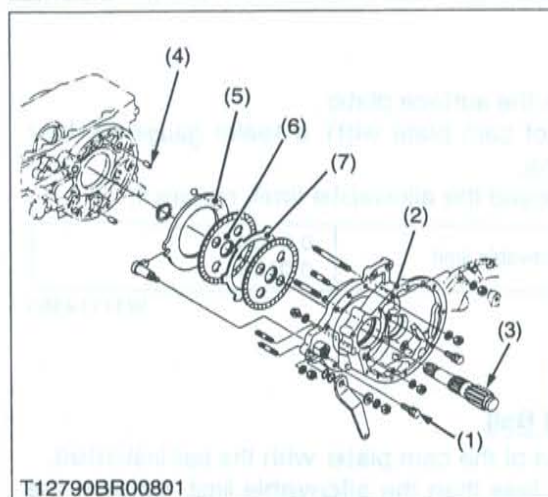
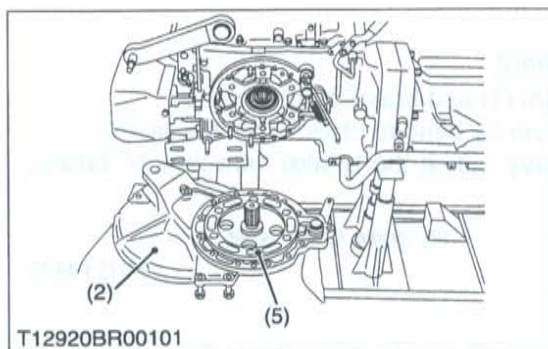
1. Place the disassembling stand under the rear axle case.
2. Remove the rear axle mounting screws and nuts.
3. Separate the rear axle case from brake case.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	M10 screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
		M10 nut	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft·lbs
		M12 screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs
		Stud bolt	24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft·lbs

W1013910



Brake Case

1. Remove the brake case mounting screws and nuts.
2. Separate the brake case, tapping the brake case lever lightly.

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the brake case and transmission case, after eliminate the water, oil and stuck liquid gasket.
- Before installing the brake case to the transmission case, install the cam plate to the transmission case.
- Place the brake discs (6) so that the hole "A" of brake discs should be overlapped 50 % or more.

Tightening torque	Brake case mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Brake case mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Brake case lever mounting screw	62.8 to 72.5 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs

- (1) Brake Case Mounting Screw
(2) Brake Case
(3) Brake Shaft
(4) Steel Ball

- (5) Brake Cam plate
(6) Brake Disc
(7) Plate

W1013995

Brake Cam and Brake Cam Lever

1. Remove the brake cam mounting nut and remove the brake cam (2) and brake cam lever (4).

(When reassembling)

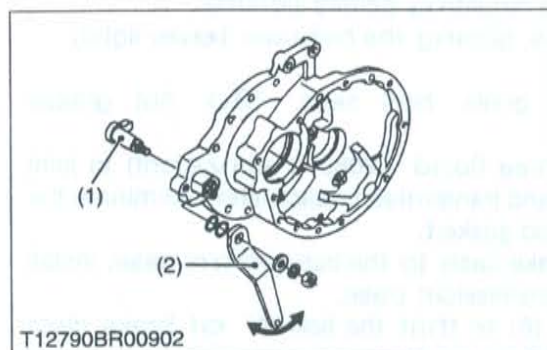
- Apply grease to the O-ring (3) and take care not damage the O-ring.

- (1) Brake Case
(2) Brake Cam

- (3) O-ring
(4) Brake Cam Lever

W1014346

(2) Servicing



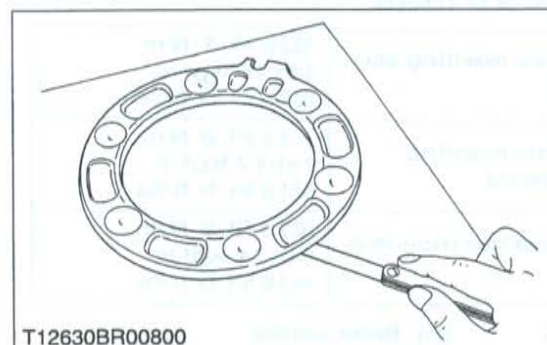
Brake Cam Lever Movement

1. Assemble the brake cam (1) and brake cam lever (2).
2. Move the brake cam lever by hand to check the movement.
3. If the movement is heavy, refine the brake cam lever or brake case with sandpaper.

(1) Brake Cam

(2) Brake Cam Lever

W1014475

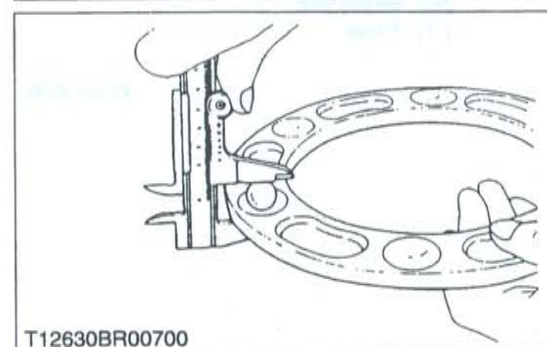


Cam Plate Flatness

1. Place the cam plate on the surface plate.
2. Measure the flatness of cam plate with a feeler gauge at four points on a diagonal line.
3. If the measurement exceed the allowable limit, replace it.

Cam Plate Flatness	Allowable limit	0.3 mm
		0.012 in.

W1014565

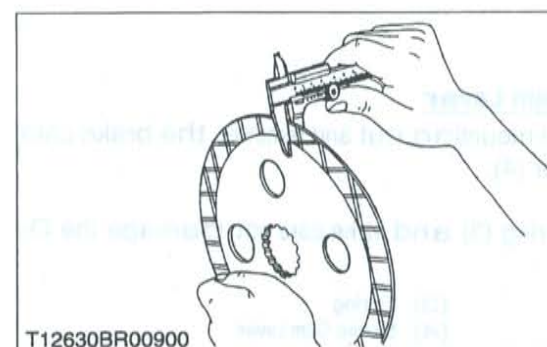


Height of Cam Plate and Ball

1. Measure the dimension of the cam plate with the ball installed.
2. If the measurement is less than the allowable limit, replace the cam plate and balls.
3. Inspect the ball holes of cam plate for uneven wear. If the uneven wear is found, replace it.

Height of cam plate and ball	Factory spec.	20.9 to 21.1 mm 0.823 to 0.831 in.
	Allowable limit	20.5 mm 0.807 in.

W1014722



Brake Disc Wear

1. Measure the brake disc thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake disc thickness	Factory spec.	4.6 to 4.8 mm 0.181 to 0.189 in.
	Allowable limit	4.2 mm 0.165 in.

W1014853

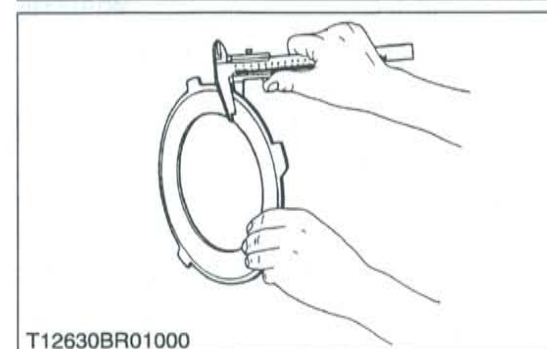


Plate Wear

1. Measure the plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Plate thickness	Factory spec.	2.54 to 2.66 mm 0.1000 to 0.1047 in.
	Allowable limit	2.1 mm 0.083 in.

W1014969

6 FRONT AXLE

MECHANISM

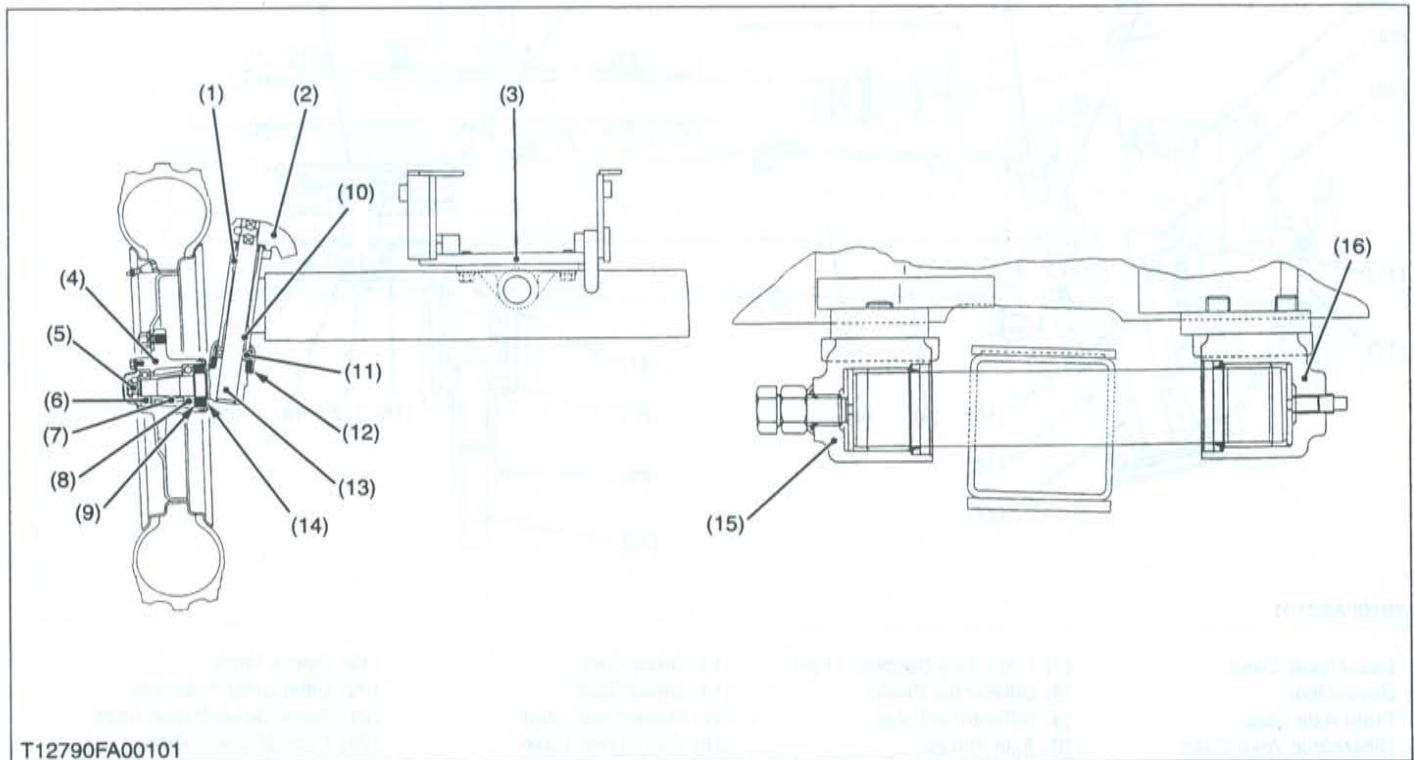
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1. STRUCTURE	6-M1
[1] 2WD TYPE	6-M1
[2] 4WD TYPE	6-M2
2. FRONT WHEEL ALIGNMENT	6-M3

1. STRUCTURE

The front axle supports the front of tractor and facilitates steering. There are two kinds of front axles. The two-wheel drive axle has free-running front wheels and the four-wheel drive axle has powered front wheels.

[1] 2WD TYPE

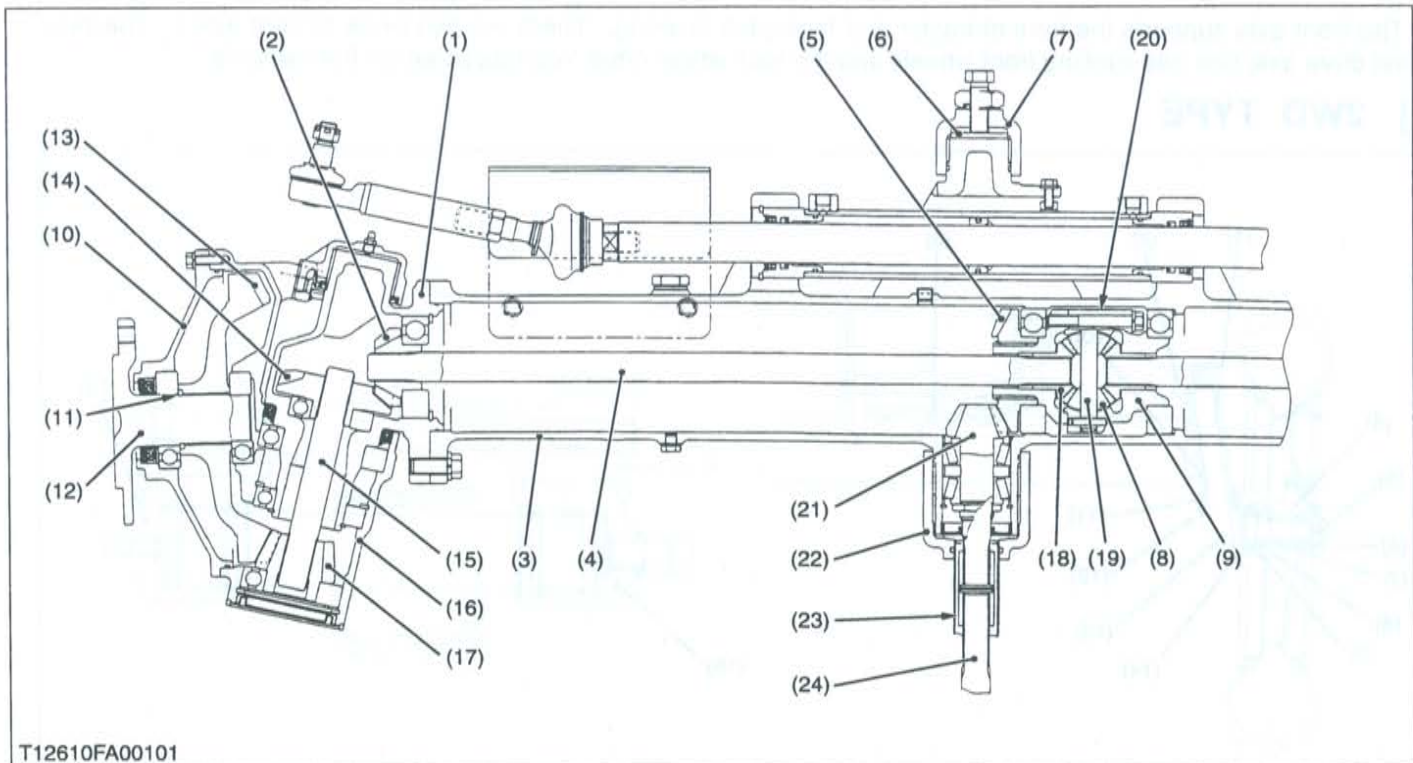


T12790FA00101

- | | | | |
|----------------------|------------------|--------------------------|--------------------------------|
| (1) Bushing | (5) Slotted Nut | (9) Oil Seal | (13) Knuckle Shaft |
| (2) Knuckle Arm | (6) Ball Bearing | (10) Bushing | (14) Dust Cover |
| (3) Front Axle Frame | (7) Spacer | (11) Thrust Ball Bearing | (15) Front Axle Bracket, Front |
| (4) Front Wheel Hub | (8) Ball Bearing | (12) Oil Seal | (16) Front Axle Bracket, Rear |

The front axle of the 2WD type is constructed as shown above. The shape of the front axle is relatively simple, and the front axle is supported at its center with the front axle brackets (15), (16) on the front axle frame (3), so that steering operation is stable even on an uneven grounds in a farm field.

[2] 4WD TYPE



- | | | | |
|-----------------------------|-------------------------------|-----------------------------|--------------------------------|
| (1) Bevel Gear Case | (7) Front Axle Bracket, Front | (13) Bevel Gear | (19) Pinion Shaft |
| (2) Bevel Gear | (8) Differential Pinion | (14) Bevel Gear | (20) Differential Assembly |
| (3) Front Axle Case | (9) Differential Case | (15) Bevel Gear Shaft | (21) Spiral Bevel Pinion Shaft |
| (4) Differential Yoke Shaft | (10) Axle Flange | (16) Front Gear Case | (22) Front Bracket, Rear |
| (5) Spiral Bevel Gear | (11) Collar | (17) Bevel Gear | (23) Coupling |
| (6) Collar | (12) Axle | (18) Differential Side Gear | (24) Propeller Shaft |

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft (24) and to the bevel pinion shaft (21), then to the spiral bevel gear (5) after that to the differential gear.

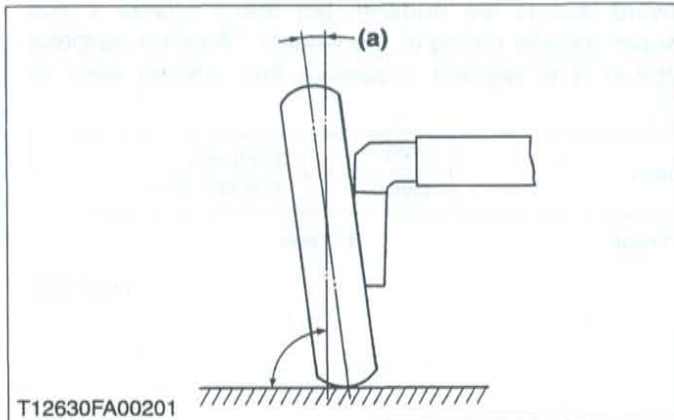
The power through the differential is transmitted to the differential yoke shaft (4), and to the bevel gear shaft (15) in the bevel gear case (1).

The revolution is greatly reduced by the bevel gears (17), (13), then the power is transmitted to the axle (12).

The differential system allows each wheel to rotate at a different speed to make turning easier.

2. FRONT WHEEL ALIGNMENT

To assure smooth mobility or maneuverability and enhance stable and straight running, the front wheels are mounted at an angle to the right, left and forward directions. This arrangement is referred to as the Front Wheel Alignment.



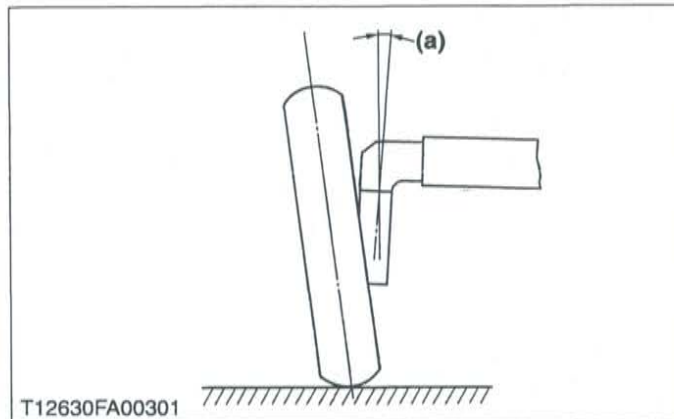
■ Camber

The front wheels are tilted from the vertical as viewed from the front, upper wheels are spreader than lower ones.

This inclination is called camber (a). Camber reduces bending or twisting of the front axle caused by vertical load or running resistance, and also maintains the stability in running.

Camber	2WD	0.035 rad. 2 °
	4WD	0.070 rad. 4 °

W1012811



■ Kingpin Angle

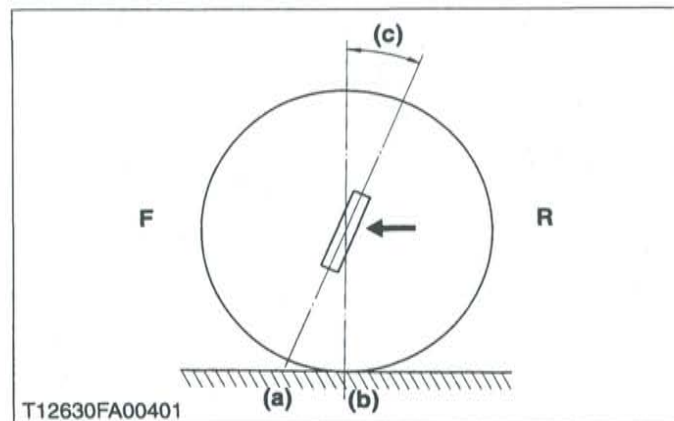
The Kingpin is tilted from the vertical as viewed from the front.

This angle is called kingpin angle (a). As with the camber, kingpin angle reduces rolling resistance of the wheels, and prevents any shimmy motion of the steering wheel.

It also reduces steering effort.

Kingpin angle	2WD	0.131 to 0.146 rad. 7.5 to 8.5 °
	4WD	0.218 rad. 12.5 °

W1013073



■ Caster

The kingpin is tilted forward as viewed from the side. The point (b) of the wheel center line is behind the point (a) of the kingpin shaft center line.

This inclination is called caster (c). Caster helps provide steering stability.

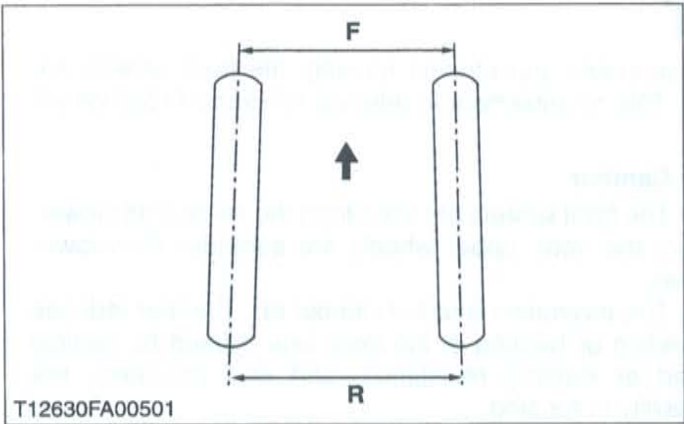
As with the kingpin inclination, caster reduces steering effort.

Camber	2WD	0.026 rad.
	4WD	1.5 °

F : Front

R : Rear

W1013142



■ Toe-in

Viewing the front wheels from above reveals that the distance between the toes of the front wheels is smaller than that between the heels.

It is called toe-in. The front wheels tend to roll outward due to the camber, but toe-in offsets it and ensures parallel rolling of the wheels. Another purpose of toe-in is to prevent excessive and uneven wear of tires.

Toe-in	2WD	2 to 8 mm
	4WD	0.08 to 0.32 in.

F : Front

R : Rear

W1013242

SERVICING

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(1) 2WD Type	6-S16
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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	• Tire pressure uneven	Adjust	G-45
	• Improper toe-in adjustment (improper alignment)	Adjust	6-S6
	• Clearance between front axle middle boss and front axle shaft bracket bushing excessive [2WD Type]	Replace	6-S16
	• Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive [4WD Type]	Replace	6-S20
	• Knuckle shaft bushings worn [2WD Type]	Replace	6-S16
	• Front axle rocking force too small	Adjust	6-S7
	• Front wheel sway excessive	Replace	6-S6
	• Tie-rod end loose	Tighten	6-S9
	• Air sucked in power steering circuit	Bleed	7-S10
Front Wheels Can Not Be Driven [4WD Type]	• Propeller shaft broken	Replace	6-S8
	• Front wheel drive gears in transmission broken	Replace	3-S10
	• Front differential gear broken	Replace	6-S14
	• Shift fork broken	Replace	—
	• Coupling displaced	Reassemble	6-S8
Noise [4WD Type]	• Gear backlash excessive	Adjust or replace	6-S11 to 15
	• Oil insufficient	Replenish	G-7
	• Bearings damaged or broken	Replace	—
	• Gears damaged or broken	Replace	—
	• Spiral bevel pinion shaft turn force improper	Adjust	6-S18

W1014322

2. SERVICING SPECIFICATIONS

2WD TYPE

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2 to 8 mm 0.08 to 0.32 in.	—
Front Wheel	Axial Sway	Less than 5 mm 0.20 in.	—
Front Axle	Rocking Force	49.0 to 117.7 N 5.0 to 12.0 kgf 11.0 to 26.5 lbs	—
Knuckle Shaft to Bushing	Clearance	0.000 to 0.285 mm 0.00000 to 0.01122 in.	0.4 mm 0.016 in.
Knuckle Shaft	O.D.	27.880 to 27.900 mm 1.09764 to 1.09842 in.	—
Bushing	I.D.	27.900 to 28.165 mm 1.09842 to 1.10886 in.	—
Front Axle Middle Boss to Front Axle Shaft Bracket Bushing	Clearance	0.000 to 0.177 mm 0.00000 to 0.00697 in.	0.3 mm 0.012 in.
Front Axle Middle Boss	O.D.	39.938 to 40.000 mm 1.57236 to 1.57480 in.	—
Bushing	I.D.	40.000 to 40.115 mm 1.57480 to 1.57933 in.	—

W1013874

4WD TYPE

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2 to 8 mm 0.08 to 0.32 in.	—
Front Wheel	Steering Angle	0.925 to 0.960 rad. 53 to 55 °	—
	Axial Sway	5.0 mm 0.196 in.	—
	Radial Sway	5.0 mm 0.197 in.	—
Differential Case, Differential Case Cover to Differential Side Gear	Clearance	0.04 to 0.123 mm 0.00157 to 0.00484 in.	0.20 mm 0.0079 in.
Differential Case	I.D.	32.000 to 32.062 mm 1.25984 to 1.26228 in.	—
Differential Case Cover	I.D.	32.000 to 32.062 mm 1.25984 to 1.26228 in.	—
Differential Side Gear	O.D.	31.939 to 31.960 mm 1.25744 to 1.25827 in.	—
Pinion Shaft to Differential Pinion	Clearance	0.064 to 0.100 mm 0.00252 to 0.00394 in.	0.25 mm 0.0096 in.
Pinion Shaft	O.D.	13.950 to 13.968 mm 0.54921 to 0.54992 in.	—
Differential Pinion	I.D.	14.032 to 14.050 mm 0.55244 to 0.55315 in.	—
Differential Pinion to Differential Side Gear	Backlash	0.2 to 0.3 mm 0.008 to 0.012 in.	0.4 mm 0.016 in.
Spiral Bevel Pinion Shaft	Turning Torque	0.98 to 1.18 N·m 0.10 to 0.12 kgf·m 0.72 to 0.87 ft-lbs	—
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.2 to 0.3 mm 0.008 to 0.012 in.	0.4 mm 0.016 in.
10T Bevel Gear to 14T Bevel Gear	Backlash	0.2 to 0.3 mm 0.008 to 0.012 in.	0.6 mm 0.024 in.
9T Bevel Gear to 43T Bevel Gear	Backlash	0.2 to 0.3 mm 0.008 to 0.012 in.	0.6 mm 0.024 in.

W1010989

4WD TYPE (Continued)

Item		Factory Specification	Allowable Limit
Front Axle Case Boss (Front) to Bracket Bushing	Clearance	0.025 to 0.160 mm 0.00098 to 0.00630 in.	0.35 mm 0.0138 in.
Front Axle Case Boss (Front)	O.D.	49.950 to 49.975 mm 1.96653 to 1.96752 in.	—
Bushing	I.D.	50.000 to 50.110 mm 1.96850 to 1.97283 in.	—
Front Axle Case Boss (Rear) to Bracket Bushing	Clearance	0.025 to 0.190 mm 0.00098 to 0.00748 in.	0.35 mm 0.0138 in.
Front Axle Case Boss (Rear)	O.D.	70.000 to 70.035 mm 2.75590 to 2.75728 in.	—
Bushing	I.D.	70.060 to 70.190 mm 2.75826 to 2.76338 in.	—
Bevel Gear Case Boss to Front Axle Support Bushing	Clearance	0.060 to 0.220 mm 0.00236 to 0.00866 in.	0.50 mm 0.0197 in.
Bevel Gear Case Boss	O.D.	54.970 to 55.000 mm 2.16417 to 2.16535 in.	—
Front Axle Support Bushing	I.D.	55.060 to 55.190 mm 2.16772 to 2.17283 in.	—

W1013874

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-8.)

2WD TYPE

Item	N·m	kgf·m	ft-lbs
Tie-rod clamp screw and nut	39.2 to 49.0	4.0 to 5.0	28.9 to 36.1
Slotted nut of tie-rod end	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Front axle shaft brackets mounting screw	77.4 to 90.2	7.9 to 9.2	57.2 to 66.5
Front wheel mounting stud bolt	63.7 to 73.5	6.5 to 7.5	47.0 to 54.0
Front wheel mounting lug nut	137.3	14.0	101.3
Front wheel hub slotted nut	78.5 to 117.7	8.0 to 12.0	57.9 to 86.8
Knuckle arm mounting bolt and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5

W1012736

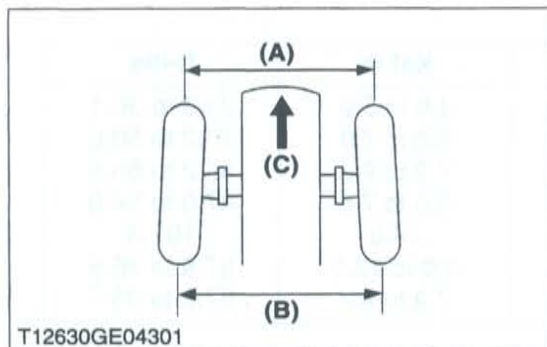
4WD TYPE

Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Cylinder cover	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Tie-rod joint and steering cylinder mounting screw	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Front wheel mounting nut	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Front bracket and rear bracket mounting screw	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Front bracket and rear bracket mounting nut	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Tie-rod end 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	122.9 to 144.6
Bevel gear case mounting screw	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Front axle rocking force adjusting screw	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.3 to 108.5
Front wheel case support mounting screw (M12 UBS)	127 to 142	13.0 to 14.5	94.6 to 104.9
Axle flange mounting screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Differential case cover mounting screw	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1

W1011757

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Toe-in

1. Park the tractor on the flat place.
2. Inflate the tires to the specified pressure.
3. Turn steering wheel so front wheels are in the straight ahead position.
4. Lower the implement, lock the parking brake and stop the engine.
5. Measure distance between tire beads at front of tire, hub height.
6. Measure distance between tire beads at rear of tire, hub height.
7. Front distance should be 2 to 8 mm (0.08 to 0.32 in.) less than rear distance.
8. If the measurement is not within the factory specifications, adjust by changing the tie-rod length.

Toe-in (B - A)	Factory spec.	2 to 8 mm 0.08 to 0.32 in.
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■ Adjusting

2WD

1. Loosen the tie-rod lock nut (1) and tie-rod mounting screw (3).
2. Turn the outer tube (2) to adjust the tie-rod length until the proper toe-in measurement is obtained.
3. Retighten the tie-rod lock nut (1) and rod mounting screw.

4WD

1. Detach the snap ring (4).
2. Loosen the tie-rod lock nut (5).
3. Turn the tie-rod joint (6) to adjust the rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod lock nut (5).
5. Attach the snap ring (4) of the tie-rod joint (6).

Tightening torque	Tie-rod clamp screw and nut (2WD)	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.1 ft-lbs
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■ IMPORTANT

- A right and left tie-rod joint is adjusted to the same length.

- | | |
|----------------------------|--------------------------------------|
| (1) Tie-rod Lock Nut | (A) Wheel to Wheel Distance at front |
| (2) Outer Tube | (B) Wheel to Wheel Distance at rear |
| (3) Tie-rod Mounting Screw | (C) Front |
| (4) Snap Ring | |
| (5) Tie-rod Nut | |
| (6) Tie-rod Joint | |

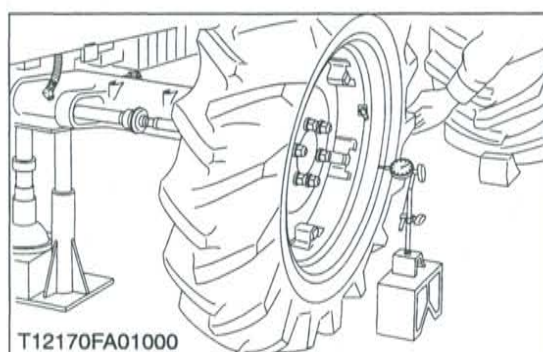
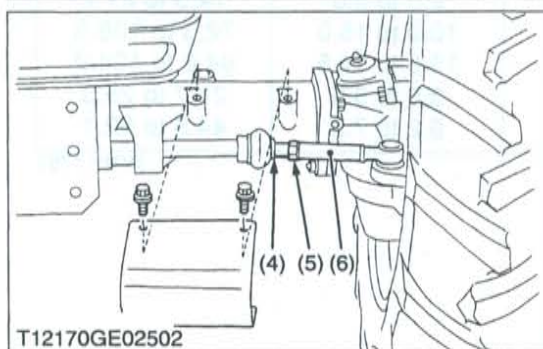
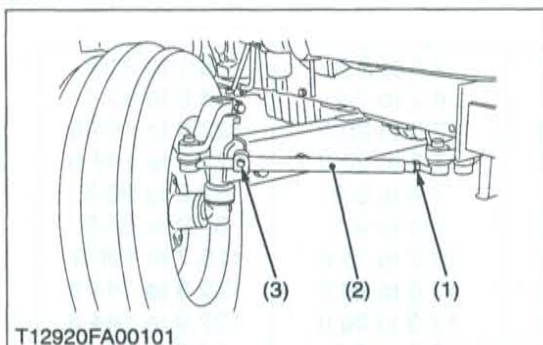
W1021328

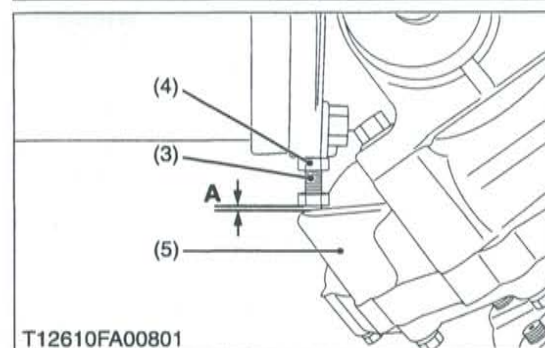
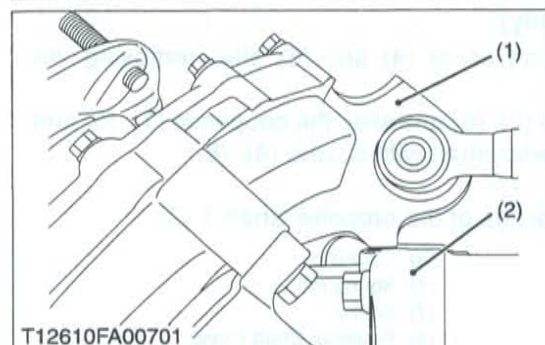
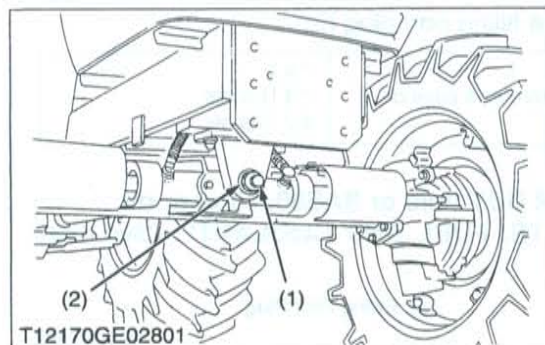
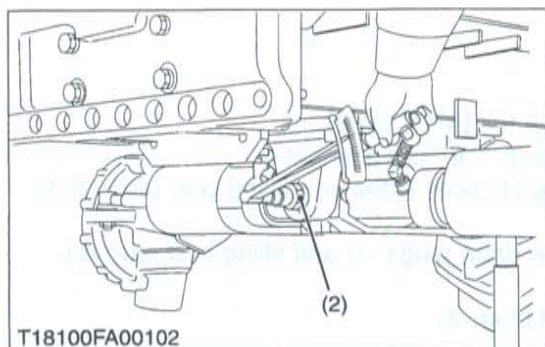
Axial Sway of Front Wheel

1. Jack up the front side of tractor.
2. Set a dial gauge on the outside of rim.
3. Turn the wheel slowly and rear the runout of rim.
4. If the measurement exceeds the factory specifications, check the bearing, rim and front wheel hub.

Axial sway of front wheel	Factory spec.	Less than 5.0 mm 0.197 in.
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W1012092





Adjusting Front Axle Pivot

1. Jack up the tractor body, then loosen the lock nut (2).
2. Measure the adjusting screw tightening torque.
3. If tightening torque is not within the factory specifications, adjust the adjusting screw (1).
4. After adjustment, tighten the lock nut firmly.

(When reassembling)

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

(1) Adjusting Screw

(2) Lock Nut

W1012203

Front Wheel Steering Angle (4WD Only)

1. Inflate the tires to the specified pressure.
2. Steer the wheels to the extreme right until the front gear case (1) contacts with the bevel gear case (2) at right hand side of the front axle.
3. If the front gear case (1) can not be contacted with the bevel gear case (2), shorten the length of stopper (3).
4. Keeping the front gear case (1) contact with the bevel gear case (2), make a specified clearance (A) as shown in the lower 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 (A) between bevel gear case and stopper	Factory spec.	1.0 to 3.0 mm 0.04 to 0.12 in.
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- (1) Front Gear Case
- (2) Bevel Gear Case
- (3) Stopper
- (4) Lock Nut

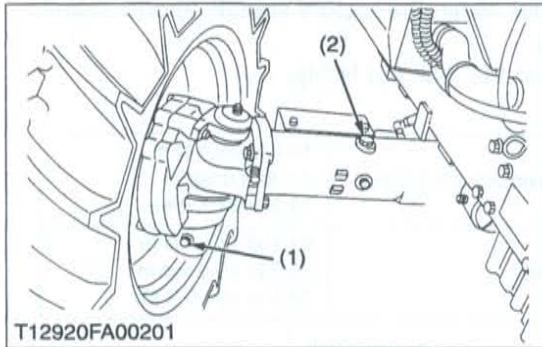
(5) Front Gear Case

A : Clearance

W1012644

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle



Draining Front Axle Case Oil (4WD Only)

1. Place oil pans underneath the front axle case.
2. Remove the drain plug (1) both sides and filling port plug (2) to drain the oil.
3. After filling, reinstall the drain plugs (1) and filling port plug (2).

(When reassembling)

- Remove the filling port plug (2).
- Fill with the new oil.
- After filling, reinstall the filling port plug (2).

Capacity	Front axle case oil	7.0 L 7.4 U.S.qts. 6.2 Imp.qts.
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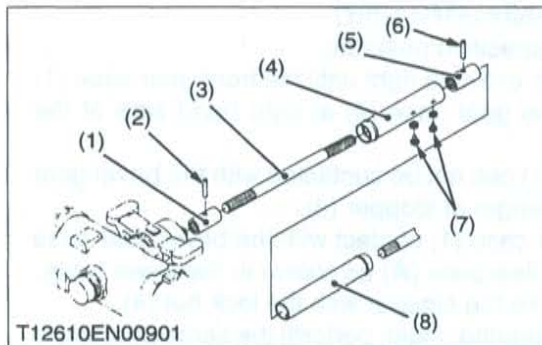
■ IMPORTANT

- Use KUBOTA SUPER UDT fluid or SAE80, 90 gear oil. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)

(1) Drain Plug

(2) Filling Port Plug

W1012889



Propeller Shaft (4WD Only)

1. Slide the propeller shaft cover (4) and (8) after removing the screws (7).
2. Tap out the spring pins (2), (6) and slide the couplings (1), (5) and then remove the propeller shaft with covers (4), (8).

(When reassembling)

- Apply grease to the splines of the propeller shaft 1 (3).

(1) Coupling

(5) Coupling

(2) Spring Pin

(6) Spring Pin

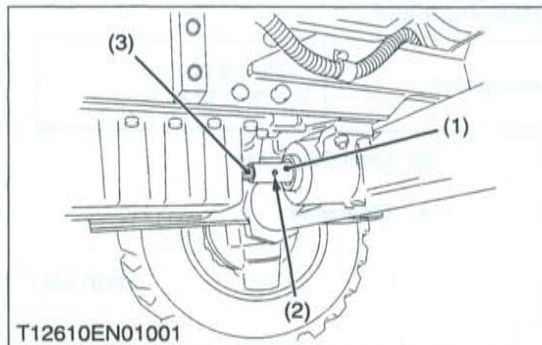
(3) Propeller Shaft 1

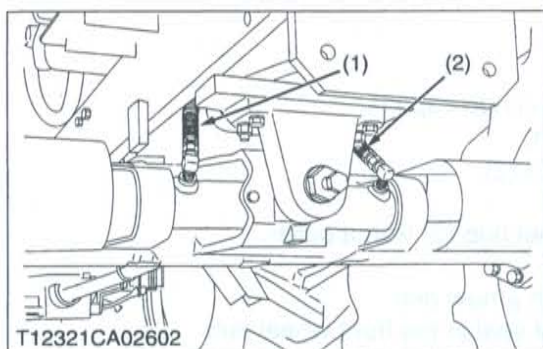
(7) Screw

(4) Propeller Shaft Cover

(8) Propeller Shaft Cover

W1013271





Power Steering Hoses

1. Disconnect the power steering hoses (1), (2) from steering cylinder.
2. Remove the cylinder cover.

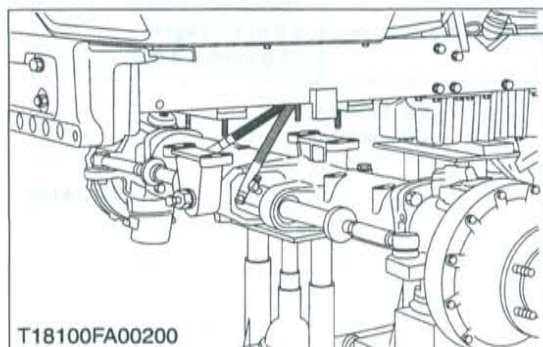
(When reassembling)

- Connect the power steering hose 1 with green tape to the RH.

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Cylinder cover	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs

- (1) Power Steering Hose 1 with Green Tape (2) Power Steering Hose 2

W1022569



Front Wheel and Front Axle

1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Loosen the front wheel mounting nuts.
3. Lift the front axle and remove the front wheels.
4. Remove the bracket (front) mounting screws and nuts.
5. Remove the bracket (rear) mounting screws and nuts.
6. Separate the front axle from front axle bracket.

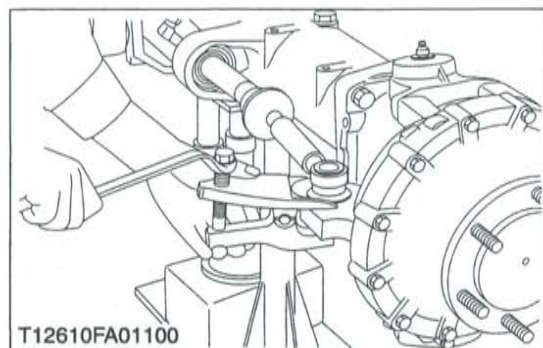
(When reassembling)

Tightening torque	Front wheel mounting nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft-lbs
	Bracket mounting screw and nut	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs

■ IMPORTANT

- Be sure to adjust the front axle rocking force.
(See page 6-S7.)

W1013692



Tie-rods

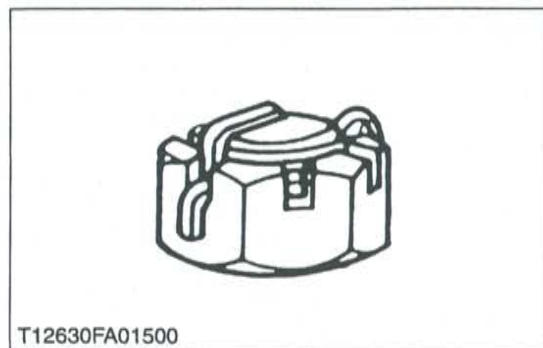
1. Pull out the cotter pin and remove the tie-rod end slotted nuts.
2. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(When reassembling)

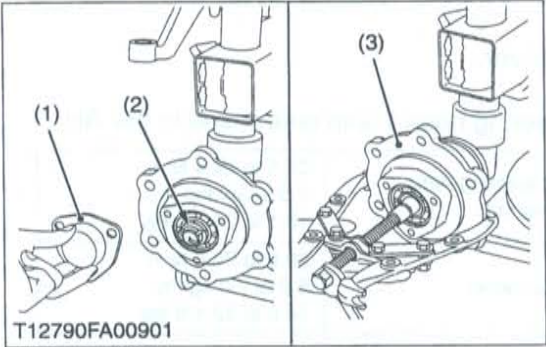
- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure left.

Tightening torque	Tie-rod end nut	2WD	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
		4WD	156.9 to 176.5 N·m 16.0 to 18.0 kgf·m 115.7 to 130.2 ft-lbs

W1014520



(2) Disassembling 2WD Type Front Axle



Front Wheel Hub

- 1. Remove the front wheel hub cap (1).
- 2. Draw out the cotter pin.
- 3. Remove the slotted nut (2).
- 4. Remove the collar.
- 5. Remove the front wheel hub (3) with a puller.

(When reassembling)

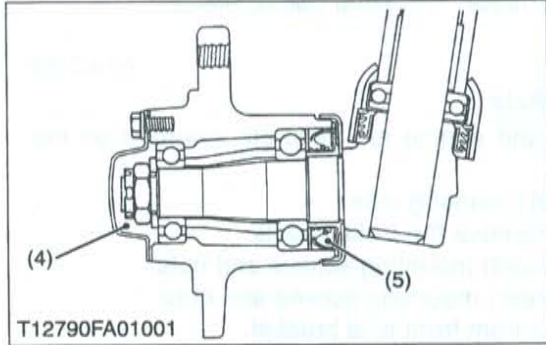
- Replace cotter pin with a new one.
- Apply grease to the oil seal in the front wheel hub.

■ IMPORTANT

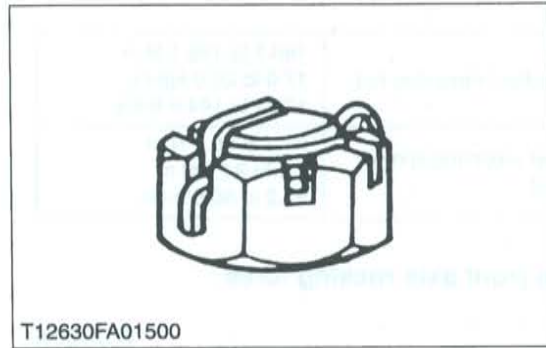
- After tightening the slotted nut to the specified torque, insert a cotter pin and bend it as shown in the figure.
- Pack in the grease to the bearing in the front wheel hub.

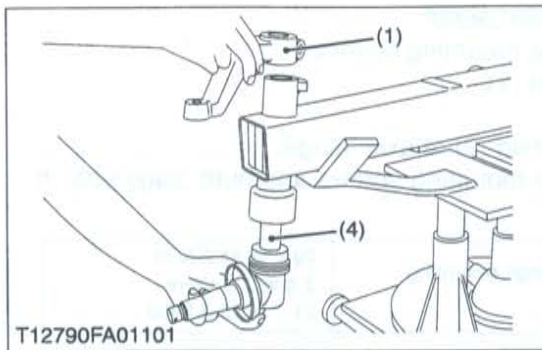
Tightening torque	Front wheel hub slotted nut	78.5 to 117.7 N·m 8.0 to 12.0 kgf·m 57.9 to 86.8 ft·lbs
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- (1) Front Wheel Hub Cap
- (2) Slotted Nut
- (3) Front Wheel Hub
- (4) Grease
- (5) Oil Seal



W1014125



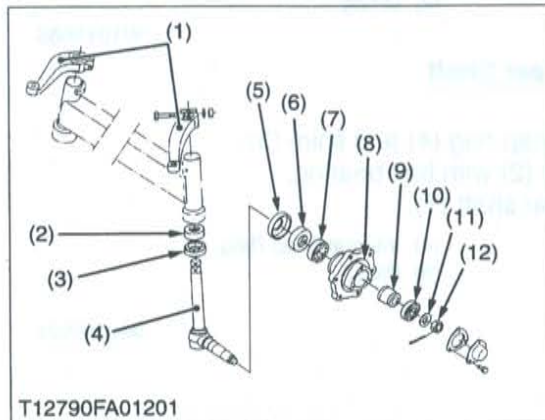


Knuckle Shaft

1. Remove the knuckle arm (1) and draw out the knuckle shaft (4) from the front axle.

(When reassembling)

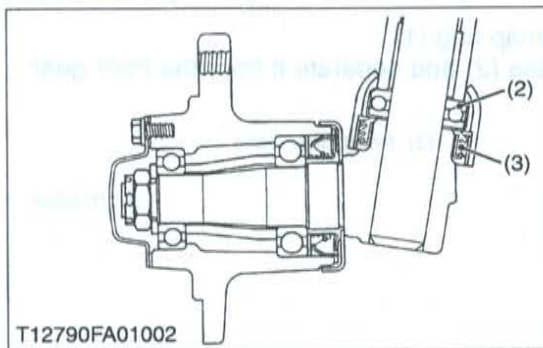
- Insert the thrust ball bearing (2) and oil seal (3), noting its direction.
- Apply grease to the oil seals (3), (6).
- Do not interchange right and left knuckle arms.
- When lift the knuckle shaft, the knuckle arms must be mounted so that the clearance between the knuckle arms and front axle is 0.3 to 1.0 mm (0.012 to 0.039 in.).



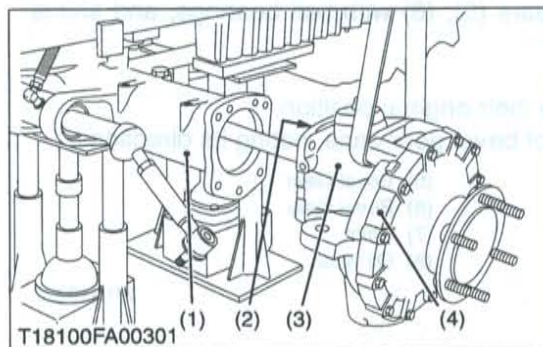
Tightening torque	Knuckle arm mounting bolt and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
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- | | |
|-------------------------|---------------------|
| (1) Knuckle Arm | (7) Ball Bearing |
| (2) Thrust Ball Bearing | (8) Front Wheel Hub |
| (3) Oil Seal | (9) Spacer |
| (4) Knuckle Shaft | (10) Ball Bearing |
| (5) Dust Cover | (11) Washer |
| (6) Oil Seal | (12) Slotted Nut |

W1014597



(3) Disassembling 4WD Type Front Axle



Bevel Gear Case and Front Gear Case

1. Remove the bevel gear case mounting screws.
2. Remove the bevel gear case (3) and front gear case (4) as a unit from the front axle case (1).

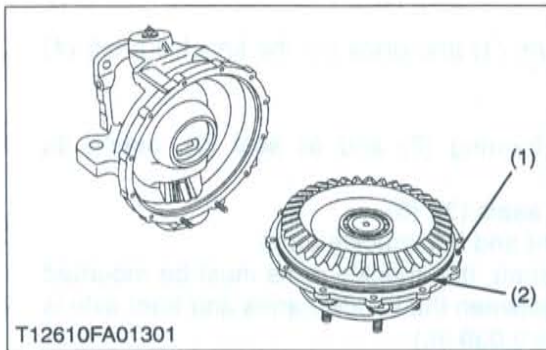
(When reassembling)

- Apply grease to the O-ring (2) and take care not to damage it.
- Do not interchange right and left bevel gear case assemblies.

Tightening torque	Bevel gear case mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft-lbs
-------------------	--------------------------------	---

- | | |
|---------------------|---------------------|
| (1) Front Axle Case | (3) Bevel Gear Case |
| (2) O-ring | (4) Front Gear Case |

W1015512



Axle Flange and Front Gear Case

1. Remove the axle flange mounting screws.
2. Remove the axle flange (1).

(When reassembling)

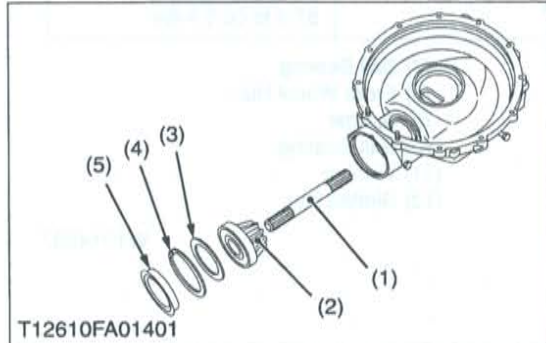
- Apply grease to the O-ring (2) of axle flange.
- Tighten the axle flange mounting screws and nuts diagonally in several steps.

Tightening torque	Axle flange mounting screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
-------------------	----------------------------	---

(1) Axle Flange

(2) O-ring

W1015666



Bevel Gear and Bevel Gear Shaft

1. Remove the plug (5).
2. Remove the internal snap ring (4) and shim (3).
3. Tap out the bevel gear (2) with ball bearing.
4. Draw out the bevel gear shaft (1).

(1) Bevel Gear Shaft

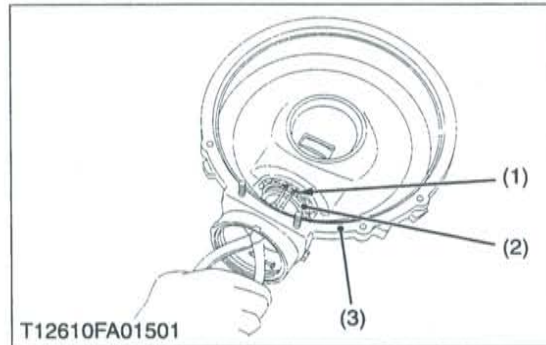
(4) Internal Snap Ring

(2) Bevel Gear

(5) Plug

(3) Shim

W1015924



Bevel Gear Case

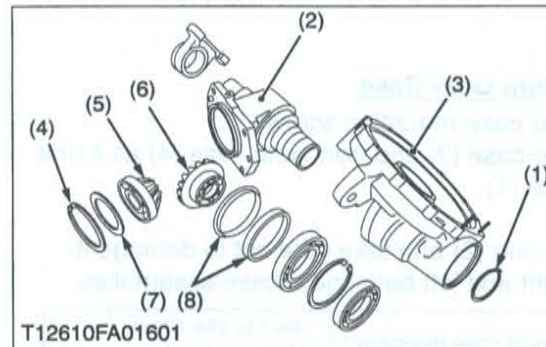
1. Remove the external snap ring (1).
2. Tap the bevel gear case (2) and separate it from the front gear case (3).

(1) External Snap Ring

(3) Front Gear Case

(2) Bevel Gear Case

W1016054



Bevel Gear Case Gears

1. Remove the internal snap ring (4).
2. Take out the bevel gears (5), (6) with ball bearings, and shims (7).

(When reassembling)

- Install the shims (7) to their original position.
- Install the oil seal (8) of bevel gear case, noting its direction.

(1) External Snap Ring

(5) Bevel Gear

(2) Bevel Gear Case

(6) Bevel Gear

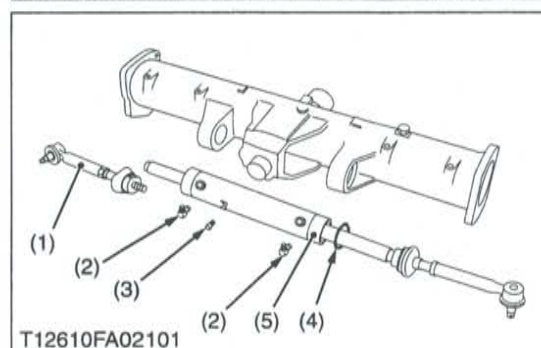
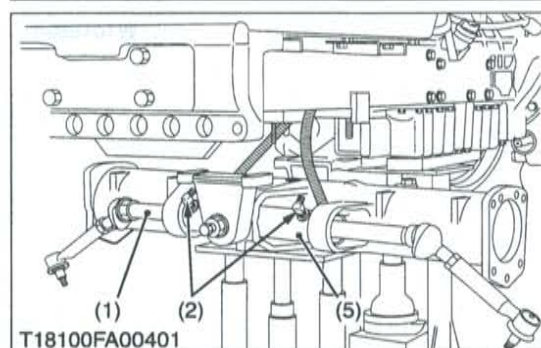
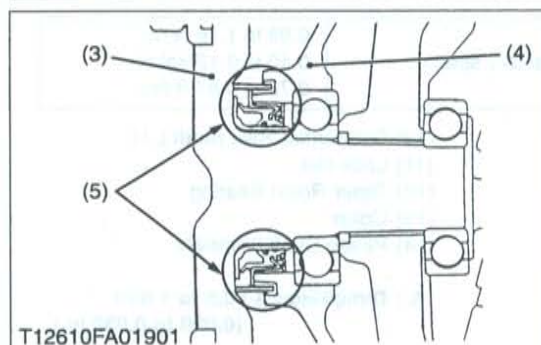
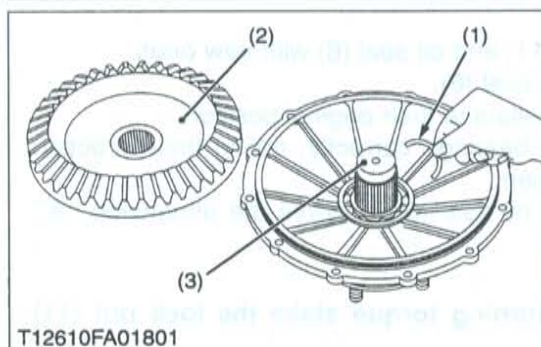
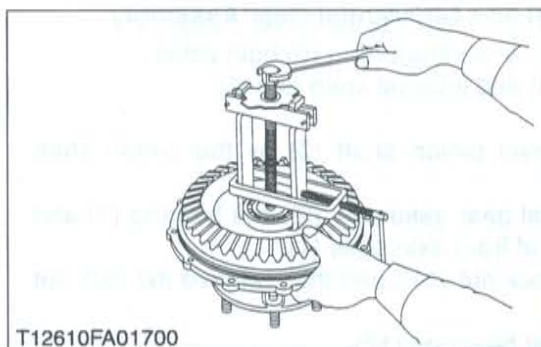
(3) Front Gear Case

(7) Shim

(4) Internal Snap Ring

(8) Oil Seal

W1016227



Axle

1. Remove the bearing with a special use puller set (Code No. 07916-09032).
2. Take out the bevel gear (2).
3. Take out the collar (1).
4. Tap out the axle (3).

(When reassembling)

- Install the oil seal (5) of axle flange (4), noting its direction as shown in the figure below.

- (1) Collar
(2) Bevel Gear
(3) Axle

- (4) Axle Flange
(5) Oil Seal

W1016391

Steering Cylinder

1. Remove the tie-rod joint (1) (right side).
2. Remove the cylinder set screw (3).
3. Remove the nipples (2) from steering cylinder.
4. Remove the internal snap ring (4).
5. Draw out the steering cylinder (5).

(When reassembling)

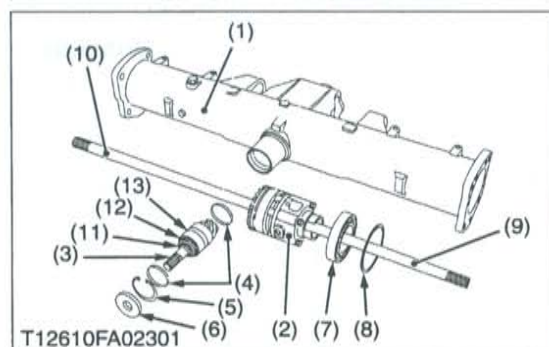
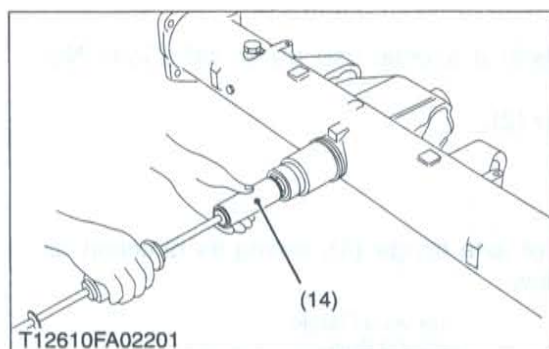
- Apply liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.

Tightening torque	Tie-rod joint and steering cylinder mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft·lbs
-------------------	--	---

- (1) Tie-rod Joint
(2) Nipple
(3) Cylinder Set Screw

- (4) Internal Snap Ring
(5) Steering Cylinder

W1016560



Spiral Bevel Pinion Shaft and Differential Gear Assembly

1. Take out the differential yoke shaft (9), (10) both sides.
2. Remove the oil seal (6) and internal snap ring (5).
3. Remove the collar (4).
4. Remove the spiral bevel pinion shaft (3) by the pinion shaft remover (14).
5. Take out the differential gear assembly (2), ball bearing (7) and shim (8) from left side of front axle case (1).
6. Remove the stake of lock nut (11), and then remove the lock nut (11).
7. Remove the taper roller bearings (12).

(When reassembling)

- Replace the lock nut (11) and oil seal (6) with new ones.
- Apply grease to the oil seal (6).
- Install the shims and collars to their original position.
- Install the taper roller bearings correctly, noting their direction and apply gear oil to them.
- When press-fitting an oil seal (6), observe the dimension "A" described in the figure.

■ IMPORTANT

- After adjusting the turning torque stake the lock nut (11) firmly.

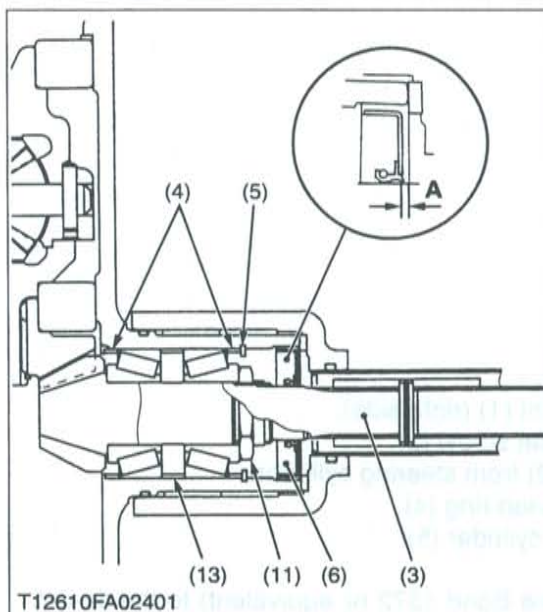
Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.18 N·m 0.10 to 0.12 kgf·m 0.72 to 0.87 ft-lbs
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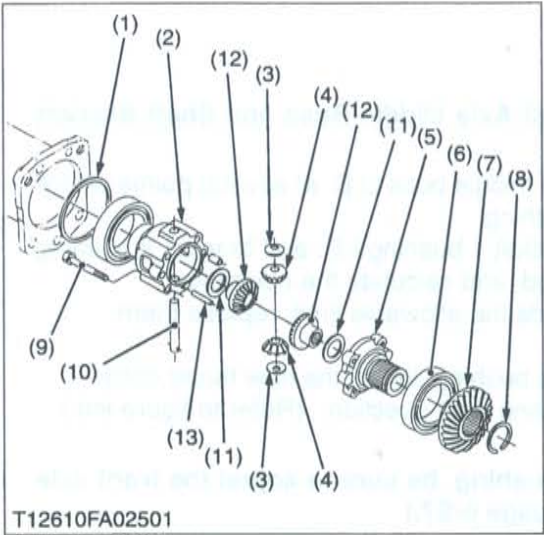
- (1) Front Axle Case
- (2) Differential Gear Assembly
- (3) Spiral Bevel Pinion Shaft
- (4) Adjusting Collar
- (5) Internal Snap Ring
- (6) Oil Seal
- (7) Ball Bearing
- (8) Shim
- (9) Differential Yoke Shaft R.H.

- (10) Differential Yoke Shaft L.H.
- (11) Lock Nut
- (12) Taper Roller Bearing
- (13) Collar
- (14) Pinion Shaft Remover

A : Dimension A : 0.5 to 1 mm
(0.020 to 0.039 in.)

W1016865





Differential Gear

- 1. Remove the differential case cover mounting screws (9) and then take out the differential case cover (5), ball bearing (6) and spiral bevel gear (7) as a unit.
- 2. Remove the external snap ring (8), and then remove the ball bearing (6) and spiral bevel gear (7) as a unit with a puller.
- 3. Remove the straight pin (13).
- 4. Pull out the pinion shaft (10) and take out the differential pinions (4) and differential side gears (12).

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gears (12) and differential pinions (4).

Tightening torque	Differential case cover mounting screw	60.8 to 70.6 N·m
		6.2 to 7.2 kgf·m
		44.8 to 52.1 ft-lbs

- (1) Shim

(2) Differential Case

(3) Thrust Collar

(4) Differential Pinion

(5) Differential Case Cover

(6) Ball Bearing

(7) Spiral Bevel Gear
- (8) External Snap Ring

(9) Differential Case Cover Mounting Screw

(10) Pinion Shaft

(11) Shim

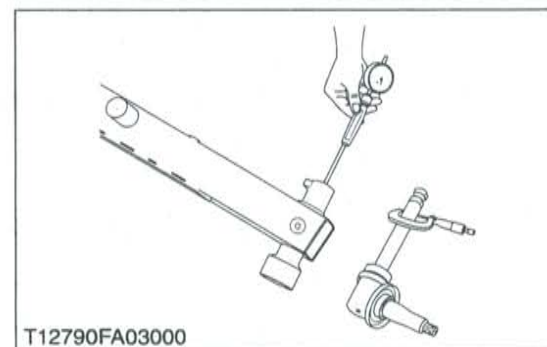
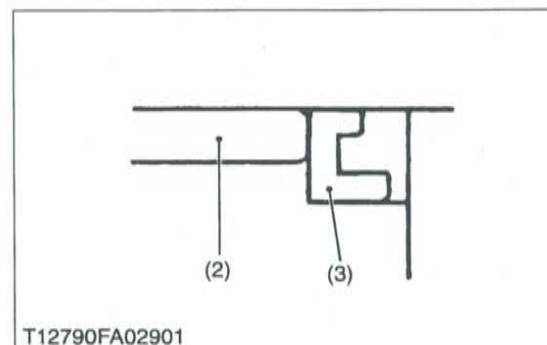
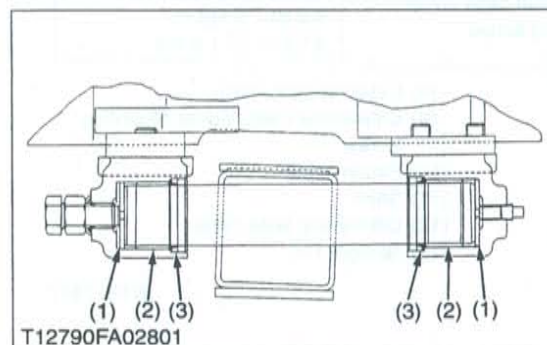
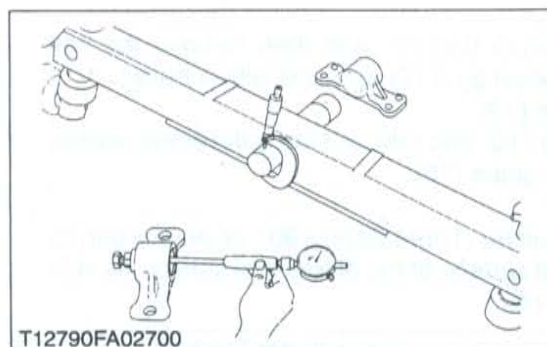
(12) Differential Side Gear

(13) Straight Pin

W1017467

[3] SERVICING

(1) 2WD Type



Clearance between Front Axle Middle Boss and Shaft Bracket Bushing

1. Measure the front axle middle boss O.D. at several points where it contacts with the bushing.
2. Measure the shaft bracket 1 bushing I.D. and bracket 2 bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

(When reassembling)

- Before press-fitting the bushing, install the new thrust collar.
- Install the oil seals, noting their direction. (Refer to figure left.)

■ IMPORTANT

- **After replacing the bushing, be sure to adjust the front axle rocking force. (See page 6-S7.)**

Clearance between front axle middle boss and bushing	Factory spec.	0.000 to 0.177 mm 0.00000 to 0.00697 in.
	Allowable limit	0.3 mm 0.012 in.
Front axle middle boss O.D.	Factory spec.	39.938 to 40.000 mm 1.57236 to 1.57480 in.
Bushing I.D.	Factory spec.	40.000 to 40.115 mm 1.57480 to 1.57933 in.

- (1) Thrust Collar
(2) Bushing

- (3) Oil Seal

W1017740

Clearance between Knuckle Shaft (Kingpin) and Bushing

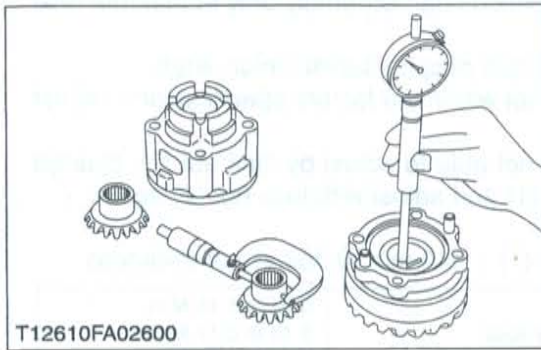
1. Measure the shaft O.D. at several points where it contacts with the bushings.
2. Measure the bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

(When reassembling)

- Remove the bushing with a bushing puller.

Clearance between knuckle shaft (kingpin) and bushing	Factory spec.	0.000 to 0.285 mm 0.00000 to 0.01122 in.
	Allowable limit	0.4 mm 0.016 in.
Knuckle shaft O.D.	Factory spec.	27.880 to 27.900 mm 1.09764 to 1.09842 in.
Bushing I.D.	Factory spec.	27.900 to 28.165 mm 1.09842 to 1.10886 in.

W1017976

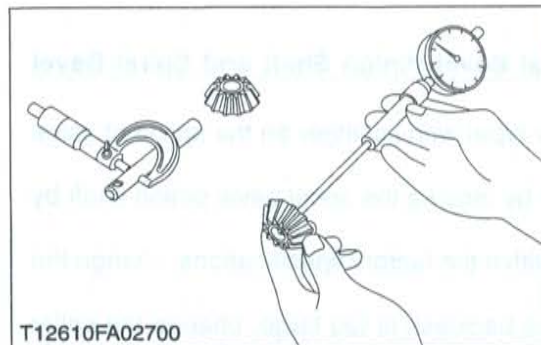
(2) 4WD Type**Clearance between Differential Case (Differential Case Cover) and Differential Side Gear**

1. Measure the differential side gear O.D..
2. Measure the differential case bore I.D. and calculate the clearance.
3. Measure the differential case cover bore I.D. and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (differential case cover) and differential side gear	Factory spec.	0.040 to 0.123 mm 0.00157 to 0.00484 in.
	Allowable limit	0.20 mm 0.0079 in.

Differential case bore I.D.	Factory spec.	32.000 to 32.062 mm 1.25984 to 1.26228 in.
Differential case cover bore I.D.	Factory spec.	32.000 to 32.062 mm 1.25984 to 1.26228 in.
Differential side gear O.D.	Factory spec.	31.939 to 31.960 mm 1.25744 to 1.25827 in.

W1018204

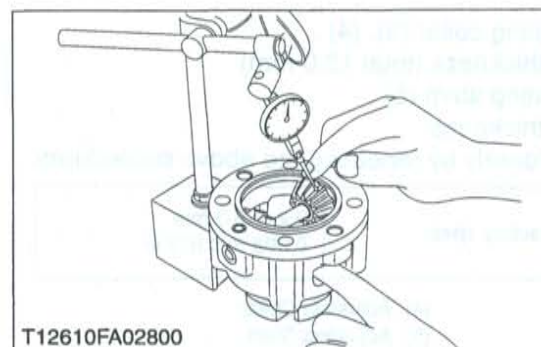
**Clearance between Pinion Shaft and Differential Pinion**

1. Measure the pinion shaft O.D.
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between pinion shaft and differential pinion	Factory spec.	0.064 to 0.100 mm 0.00252 to 0.00394 in.
	Allowable limit	0.25 mm 0.0096 in.

Pinion shaft O.D.	Factory spec.	13.950 to 13.968 mm 0.54921 to 0.54992 in.
Differential pinion I.D.	Factory spec.	14.032 to 14.050 mm 0.55244 to 0.55315 in.

W1018369

**Backlash between Differential Pinion and Differential Side Gear**

1. Set a dial gauge (lever type) on a tooth of the differential pinion.
2. Fix the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

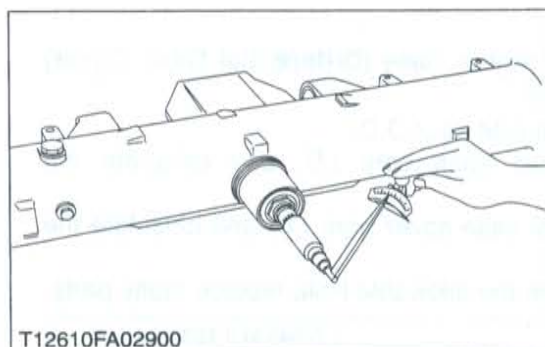
Backlash between differential pinion and differential side gear	Factory spec.	0.2 to 0.3 mm 0.008 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shims

0.4 mm (0.016 in.)	1.0 mm (0.039 in.)
0.6 mm (0.024 in.)	1.2 mm (0.047 in.)
0.8 mm (0.031 in.)	
- Tooth contact : More than 35 %

W1018511



Turning Torque of Spiral Bevel Pinion Shaft (Pinion Shaft Only)

1. Install the spiral bevel pinion shaft assembly only to the front axle case.
2. Measure the turning torque of spiral bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut.
If the turning torque is not able to adjust by lock nut (2), change the thickness of collar (1) and adjust with lock nut (2) again.

(Reference)

- Standard size of collar (1) : 10.0 mm (0.394 in.) of thickness

Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.18 N·m 0.10 to 0.12 kgf·m 0.72 to 0.87 ft-lbs
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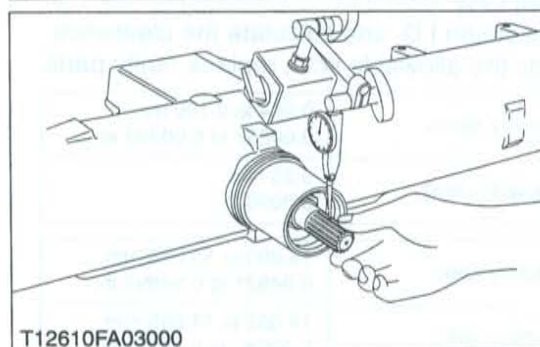
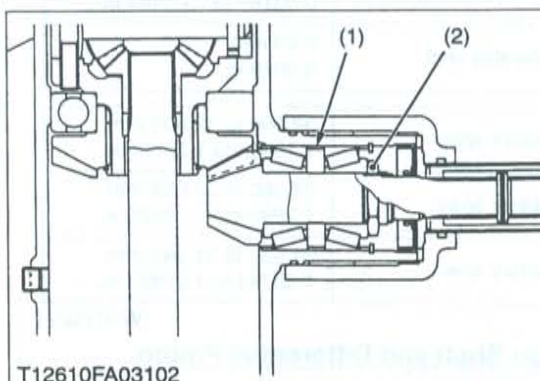
■ NOTE

- After turning torque adjustment, be sure to stake the lock nut.

(1) Collar

(2) Lock Nut

W1018454



Backlash between Spiral Bevel Pinion Shaft and Spiral Bevel Gear

1. Set a dial gauge (lever type) with its finger on the spline of spiral bevel pinion shaft.
2. Measure the backlash by moving the spiral bevel pinion shaft by hand lightly.
3. If the backlash is not within the factory specifications, change the adjusting collar (3), (4).
For example, when the backlash is too large, change the collar (3) to thinner one and change the collar (4) to thicker one. At this time, if the collar (3) is thinned by 1 mm, the collar (4) must be thickened by 1 mm.

(Reference)

- Standard size of adjusting collar (3), (4) :
6.0 mm (0.236 in.) of thickness (total 12.0 mm)
- Standard size of adjusting shim (5) :
2.0 mm (0.079 in.) of thickness
- 4. Adjust the backlash properly by repeating the above procedures.

Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory spec.	0.2 to 0.3 mm 0.008 to 0.012 in.
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(1) Spiral Bevel Gear

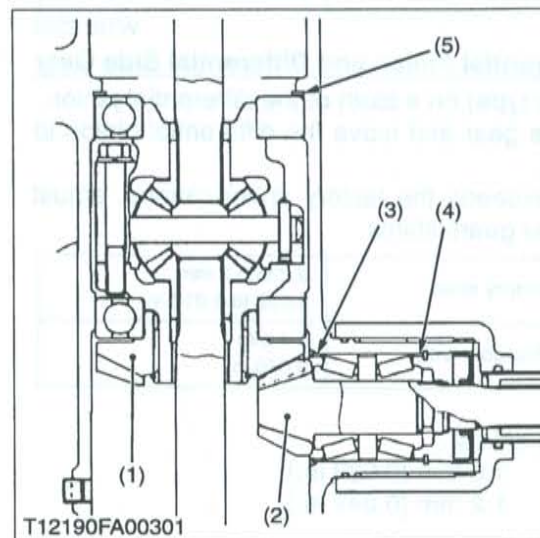
(4) Adjusting Collar

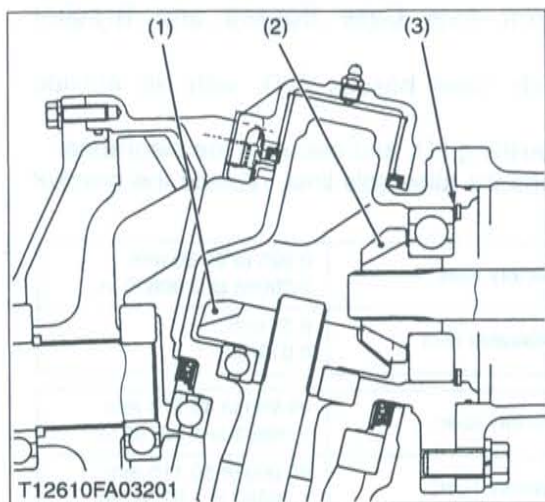
(2) Spiral Bevel Pinion Shaft

(5) Adjusting Shim

(3) Adjusting Collar

W1018690





Backlash between 10T Bevel Gear and 14T Bevel Gear

1. Stick a strip of fuse spots on the 17T bevel gear (1) with grease.
2. Fix the front axle case, bevel gear case and front gear case.
3. Turn the axle.
4. Remove the bevel gear case from front axle case and measure the thickness of the fuses with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between 10T bevel gear and 17T bevel gear	Factory spec.	0.2 to 0.3 mm 0.008 to 0.012 in.
	Allowable limit	0.6 mm 0.024 in.

(Reference)

- Thickness of adjusting shims

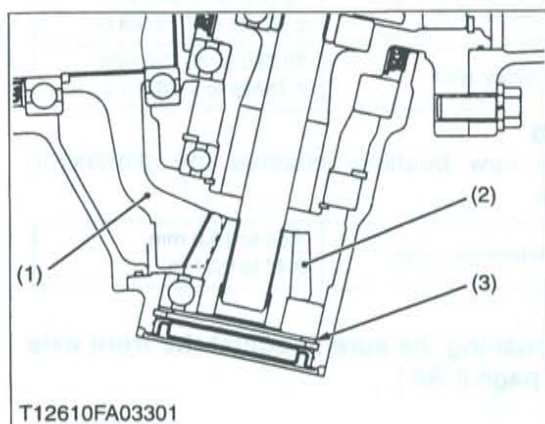
0.4 mm (0.016 in.)	1.0 mm (0.039 in.)
0.6 mm (0.024 in.)	1.2 mm (0.047 in.)
0.8 mm (0.031 in.)	
- Tooth contact : More than 35 %

(1) 17T Bevel Gear

(3) Shim

(2) 10T Bevel Gear

W1019095



Backlash between 9T Bevel Gear and 43T Bevel Gear

1. Stick a strip of fuse to three spots on the 43T bevel gear (1) with grease.
2. Fix the axle flange and front gear case.
3. Turn the axle.
4. Remove the axle flange from front gear case and measure the thickness of the fuse with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between 9T bevel gear and 43T bevel gear	Factory spec.	0.2 to 0.3 mm 0.008 to 0.012 in.
	Allowable limit	0.6 mm 0.024 in.

(Reference)

- Thickness of adjusting shims

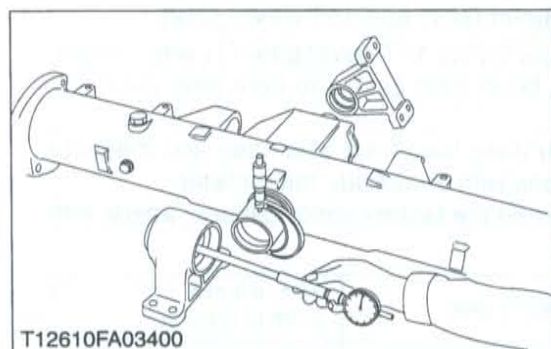
0.4 mm (0.016 in.)	2.0 mm (0.079 in.)
0.5 mm (0.020 in.)	
- Tooth contact : More than 35 %

(1) 43T Bevel Gear

(3) Shim

(2) 9T Bevel Gear

W1019649



Clearance between Front Axle Case Bosses and Bracket Bushings

1. Measure the front axle case bosses O.D. with an outside micrometer.
2. Measure the bracket bushing I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bracket bushing.

Clearance between front axle case boss (front) and bracket bushing (front)	Factory spec.	0.025 to 0.160 mm 0.00098 to 0.00630 in.
	Allowable limit	0.35 mm 0.0138 in.

Front axle case boss (front) O.D.	Factory spec.	49.950 to 49.975 mm 1.96653 to 1.96752 in.
Bracket bushing (front) I.D.	Factory spec.	50.000 to 50.110 mm 1.96850 to 1.97283 in.

Clearance between front axle case boss (rear) and bracket bushing (rear)	Factory spec.	0.025 to 0.190 mm 0.00098 to 0.00748 in.
	Allowable limit	0.35 mm 0.0138 in.

Front axle case boss (rear) O.D.	Factory spec.	70.000 to 70.035 mm 2.75590 to 2.75728 in.
Bracket bushing (rear) I.D.	Factory spec.	70.060 to 70.190 mm 2.75826 to 2.76338 in.

■ Press-fitting Bushing

- When press-fitting a new bushing, observe the dimension described in the figure.

Press-fit depth of bushing (A)	Reference value	12.0 to 13.0 mm 0.47 to 0.51 in.
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■ NOTE

- After replacing the bushing, be sure to adjust the front axle rocking force. (See page 6-S#.)

(1) Bushing

W1019429

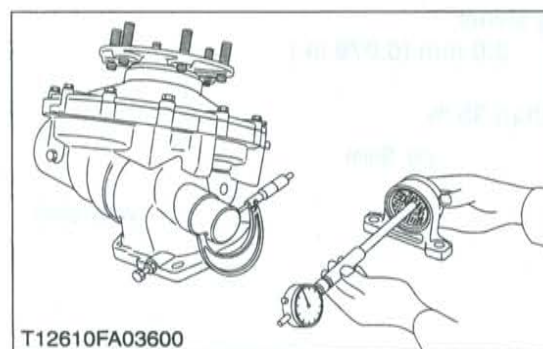
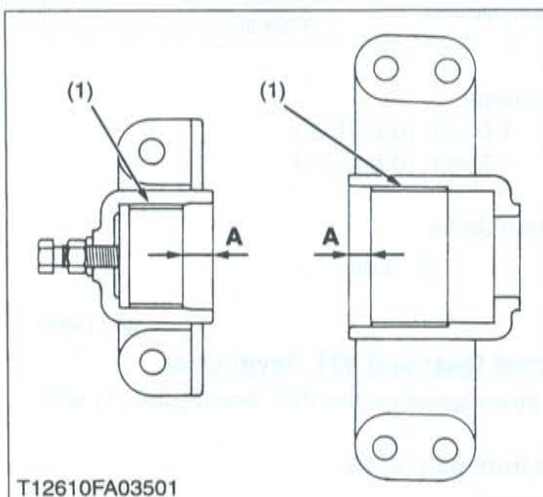
Clearance between Bevel Gear Case Boss and Front Axle Support Bushing

1. Measure the bevel gear case boss O.D. with an outside micrometer.
2. Measure the support bushing I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between bevel gear case boss and front axle support bushing	Factory spec.	0.060 to 0.220 mm 0.00236 to 0.00860 in.
	Allowable limit	0.50 mm 0.0197 in.

Bevel gear case boss O.D.	Factory spec.	54.970 to 55.000 mm 2.16417 to 2.16535 in.
Front axle support bushing I.D.	Factory spec.	55.060 to 55.190 mm 2.16772 to 2.17283 in.

W1019806



7 STEERING

MECHANISM

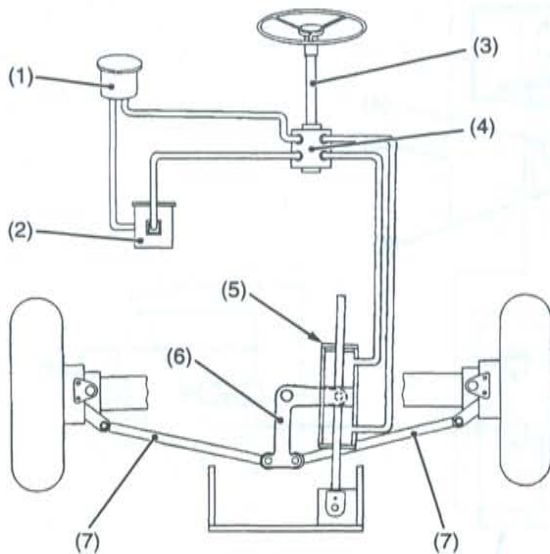
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1. STRUCTURE	7-M1
[1] STEERING LINKAGE	7-M1
[2] OIL FLOW	7-M2
[3] STEERING CYLINDER.....	7-M3
(1) 2WD Type	7-M3
(2) 4WD Type	7-M4

1. STRUCTURE

[1] STEERING LINKAGE

[A]



T12790ST00102

These tractors are provided with a hydraulic power steering. The steering controller is connected to the steering cylinder with the hydraulic pipes only.

This steering is actuated by oil pressure. Accordingly, it does not have mechanical transmitting parts such as steering gear, drag link, etc.

Therefore, it is simple in construction. In these models, the non-road reaction type is used. With this type, the wheels maintain their position when the operator releases his hands from the steering wheel. Vibration at the wheel is not transmitted to the steering wheel.

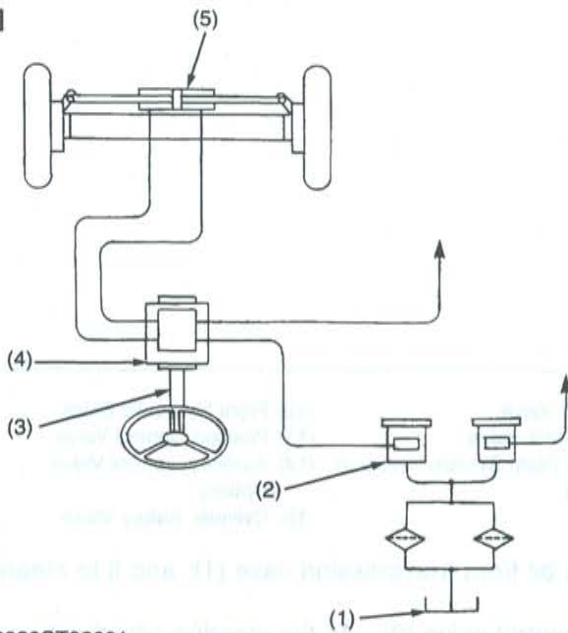
- (1) Transmission Case
- (2) Hydraulic Pump
- (3) Steering Joint
- (4) Steering Controller
- (5) Steering Cylinder

- (6) Pitman Arm
- (7) Tie-rod

[A] 2WD
[B] 4WD

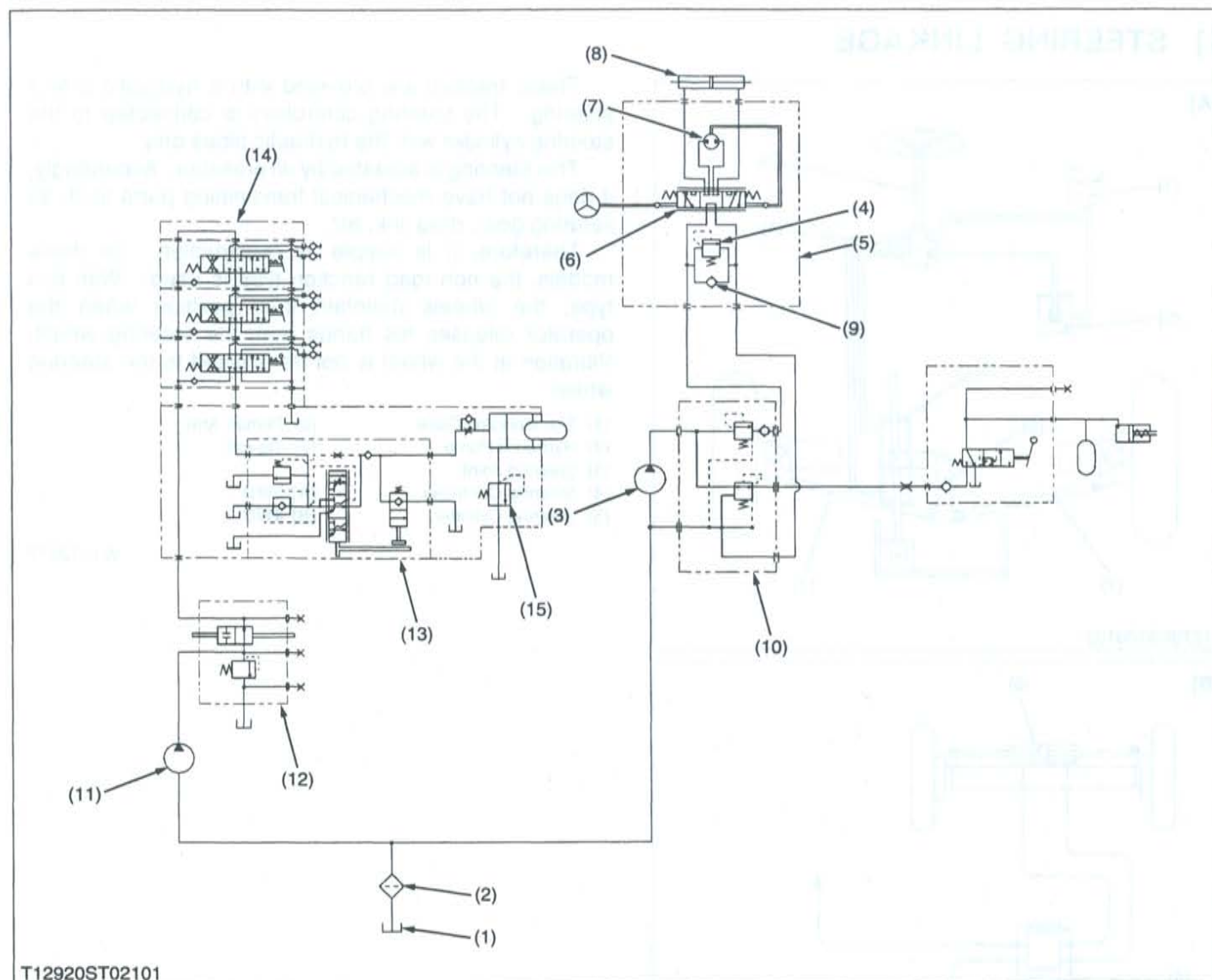
W1012677

[B]



T12920ST02001

[2] OIL FLOW

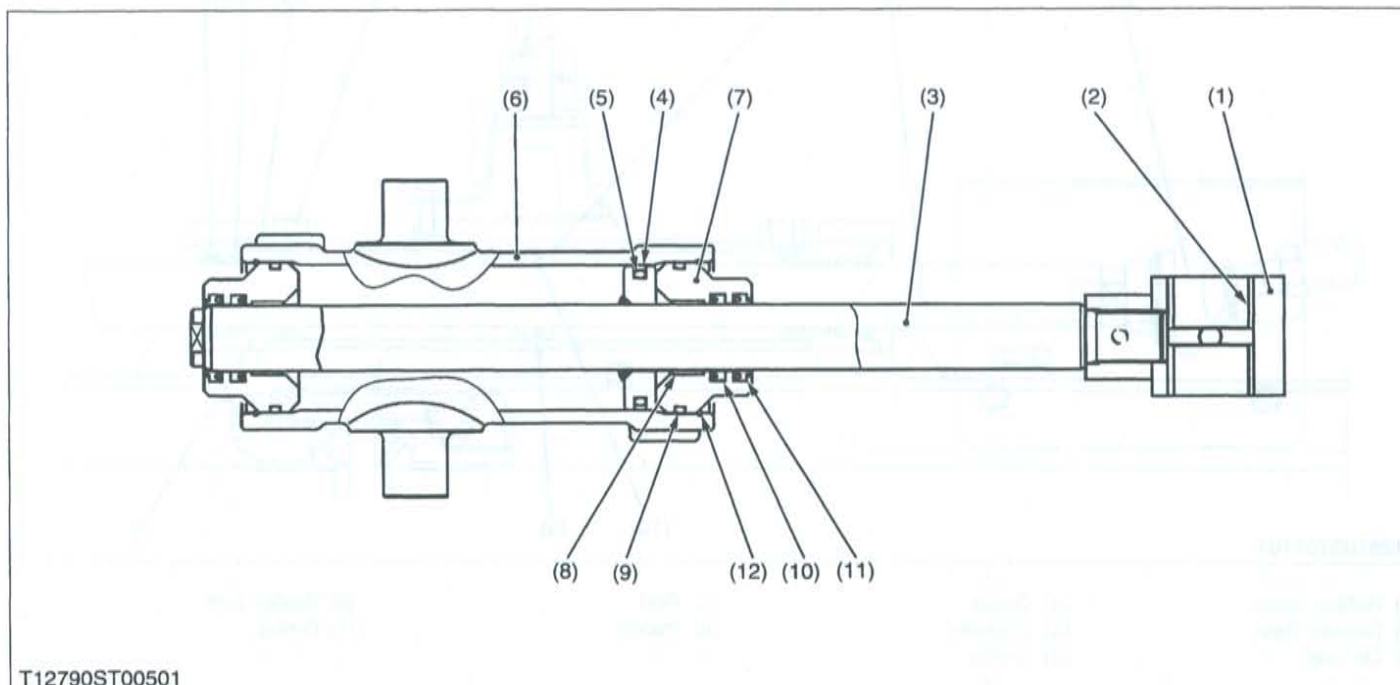


- | | | | |
|-----------------------------------|-------------------------|--|---------------------------------------|
| (1) Transmission Case | (5) Steering Controller | (9) Check Valve | (12) Front Hydraulic Block |
| (2) Oil Filter | (6) Control Valve | (10) Regulator Valve | (13) Position Control Valve |
| (3) Power Steering Hydraulic Pump | (7) Gerotor | (11) Three Point System Hydraulic Pump | (14) Auxiliary Control Valve (Option) |
| (4) Relief Valve | (8) Steering Cylinder | | (15) Cylinder Safety Valve |

1. Power steering hydraulic pump (3), driven by the engine, sucks oil from transmission case (1), and it to steering controller (5) through the regulator valve (10).
2. The oil which has entered steering controller (5) is directed to control valve (6). As the steering wheel is turned, control valve (6) operates, and into steering cylinder (8). The cylinder rod then moves to control the directional movement of the front wheels.
3. Return oil from steering cylinder (8) passes through control valve (6) and back into transmission case (1).
4. When the engine is not operating, and the steering wheel is turned, gerotor (7) rotates to supply oil in the pipe to steering cylinder (8). Thus the machine can be steered manually. Under this condition, check valve (9) opens, and oil returning from the steering cylinder, which would otherwise return to transmission case (1), flows to the pipe leading to the hydraulic pump.

[3] STEERING CYLINDER

(1) 2WD Type

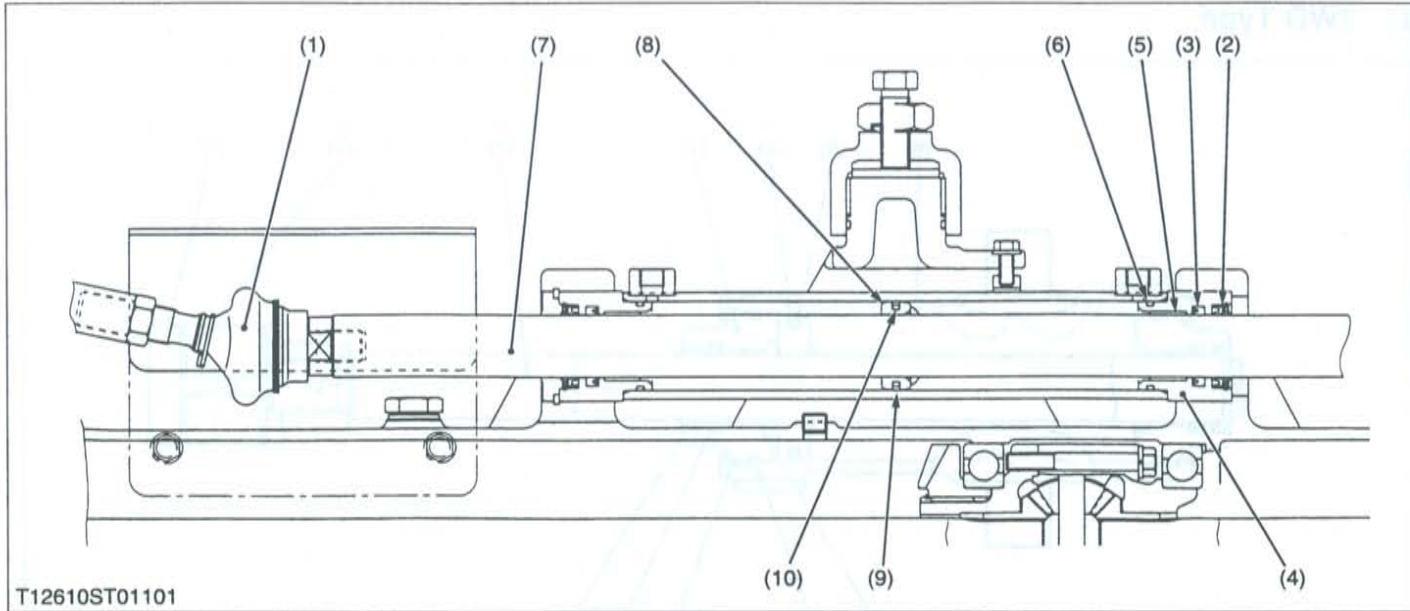


- | | | | |
|------------------|-------------------|-------------|-------------------------|
| (1) Rod End | (4) Packing | (7) Cover | (10) Packing |
| (2) Bushing | (5) O-ring | (8) Bushing | (11) Dust Seal |
| (3) Rod Assembly | (6) Cylinder Tube | (9) O-ring | (12) Internal Snap Ring |

The steering cylinder is single piston both rod double-acting type.

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.

(2) 4WD Type

(1) Rubber Boots

(2) Scraper Seal

(3) Oil Seal

(4) Guide

(5) Bushing

(6) O-ring

(7) Rod

(8) Piston

(9) Slipper Seal

(10) O-ring

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provide force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Tractor Can Not Be Steered	<ul style="list-style-type: none"> Steering controller broken Steering linkage broken Pipe broken 	Replace Replace Replace	7-S10 to S19 7-S19 to S22 —
Front Wheels Vibrate	<ul style="list-style-type: none"> Pitman arm bushing worn Rod end bushing worn Centering spring weaken or broken Improper toe-in adjustment Air in the hydraulic system Improperly mounted wheels Tie-rod end loose worn Front wheel hub bearing worn Clearance between front axle center pivots and bracket bushing excessive 	Replace Replace Replace Adjust Bleed Retighten Retighten or replace Replace Replace	7-S26 7-S26 7-S16 6-S6 — G-15 7-S21 6-S10 6-S16
Hard Steering	<ul style="list-style-type: none"> Steering linkage bushings sticking Hydraulic pump malfunctioning Overload Transmission fluid improper or insufficient Oil leak from pipe joint Insufficient tire pressure Steering controller malfunctioning Relief valve malfunctioning 	Replace Replace — Change Retighten Inflate Replace Replace	7-S21, S22 7-S7, S8 — G-12 7-S7, S11, S21 G-45 7-S10, S11 7-S9
Steering Force Fluctuates	<ul style="list-style-type: none"> Air sucked in pump due to leaking or missing of oil Air sucked in pump from suction circuit 	Replenish Repair	— —
Excessive Steering Wheel Play	<ul style="list-style-type: none"> Steering linkage worn 	Replace	7-S19 to S22
Front Wheels Wander to Right or Left	<ul style="list-style-type: none"> Centering spring weaken or broken Air sucked in pump due to leak of oil Air sucked in pump from suction circuit Tire pressure uneven Insufficient bleeding Improper toe-in adjustment Clearance between front axle center pivots and brackets bushings excessive Tie-rod end loose or worn Steering linkage worn 	Replace Replenish Repair Inflate Bleed Adjust Replace Retighten or replace Replace	7-S16 — — G-45 7-S10 G-21 6-S16 7-S21 7-S19 to S22
Wheels Are Turned to a Direction Opposite to Steering Direction	<ul style="list-style-type: none"> Piping connected in reversed 	Repair	7-S11, S21
Noise	<ul style="list-style-type: none"> Air sucked in pump due to lack of oil Air sucked in pump from suction circuit Pipe deformed 	Replenish Repair Replace	— — —

W1014322

2. SERVICING SPECIFICATIONS

[1] POWER STEERING

POWER STEERING HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition • Engine Speed : 2700 rpm • Rated Pressure : [2WD Type].....8.3 to 9.3 MPa 85 to 95 kgf/cm ² 1209 to 1351 psi [4WD Type].....12.7 to 13.7 MPa 130 to 140 kgf/cm ² 1849 to 1991 psi • Oil Temperature : 40 to 60 °C 104 to 140 °F	Delivery at No Pressure	Above 18.1 L/min. 4.78 U.S.gals./min. 3.98 Imp.gals./min.	—
	Delivery at Rated Pressure	17.7 L/min. 4.68 U.S.gals./min. 3.89 Imp.gals./min.	15.8 L/min. 4.17 U.S.gals./min. 3.48 Imp.gals./min.
Housing	Depth of Scratch	—	0.09 mm 0.0035 in.
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.0984 in.	2.40 mm 0.0945 in.

W1013874

STEERING CONTROLLER

Relief Valve Condition • Engine Speed : Maximum • Oil Temperature : 40 to 60 °C 104 to 140 °F	Setting Pressure [2WD Type]	8.3 to 9.3 MPa 85 to 95 kgf/cm ² 1209 to 1351 psi	—
	[4WD Type]	12.7 to 13.7 MPa 130 to 140 kgf/cm ² 1849 to 1991 psi	—
Rotor Set	Clearance	—	0.08 mm 0.0031 in.

W1013874

STEERING CYLINDER [2WD TYPE]

Cylinder Tube	I.D.	55.000 to 55.074 mm 2.16535 to 2.16826 in.	55.100 mm 2.16929 in.
Rod to Cylinder Cover Bushing	Clearance	0.020 to 0.134 mm 0.00079 to 0.00528 in.	0.145 mm 0.00571 in.
Rod	O.D.	24.947 to 24.980 mm 0.98216 to 0.98346 in.	—
Cylinder Cover Bushing	I.D.	25.000 to 25.081 mm 0.98425 to 0.98744 in.	—

W1015120

STEERING CYLINDER [4WD TYPE]

Steering Cylinder	I.D.	50.000 to 50.062 mm 1.96850 to 1.97094 in.	50.100 mm 1.97244 in.
Rod to Bushing	Clearance	0.009 to 0.127 mm 0.00035 to 0.00500 in.	0.135 mm 0.00531 in.

W1013973

STEERING LINKAGE [2WD]

Item		Factory Specification	Allowable Limit
Rod End Shaft to Rod End Bushing	Clearance	0.025 to 0.135 mm 0.00098 to 0.00531 in.	0.35 mm 0.0138 in.
Rod End Shaft	O.D.	27.950 to 27.975 mm 1.10039 to 1.10138 in.	—
Rod End Bushing	I.D.	28.000 to 28.085 mm 1.10236 to 1.10571 in.	—
Cylinder Tube Pin to Pitman Arm Bushing	Clearance	0.020 to 0.122 mm 0.00079 to 0.00480 in.	0.35 mm 0.0138 in.
Cylinder Tube Pin	O.D.	23.959 to 23.980 mm 0.94327 to 0.94409 in.	—
Pitman Arm Bushing	I.D.	24.000 to 24.081 mm 0.94488 to 0.94807 in.	—
Pitman Arm Shaft to Pitman Arm Bushing	Clearance	0.025 to 0.135 mm 0.00098 to 0.00531 in.	0.35 mm 0.0138 in.
Pitman Arm Shaft	O.D.	39.950 to 39.975 mm 1.57283 to 1.57382 in.	—
Pitman Arm Bushing	I.D.	40.000 to 40.085 mm 1.57480 to 1.57815 in.	—

W1015120

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-8.)

Item	N·m	kgf·m	ft-lbs
Power steering main delivery hose joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
3P delivery pipe joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
Regulator valve mounting screw	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
Hydraulic pump assembling mounting screw and nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Power steering turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Steering controller mounting nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Steering controller retaining nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Hex. socket head cap screw	1.24 to 1.47	0.13 to 0.15	0.94 to 1.08
Rod end shaft stopper mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Pitman arm cap mounting reamer screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Tie-rod end nut (2WD)	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Tie-rod end nut (4WD)	156.9 to 146.5	16.0 to 18.0	115.7 to 130.2
Pitman arm shaft stopper mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Rod end	196 to 294	20 to 30	145 to 217
Rod end stopper screw	12.3 to 14.2	1.25 to 1.45	9.0 to 10.5
Cylinder cover	60.8 to 70.6	6.2 to 7.2	44.9 to 52.1
Tie-rod joint and steering cylinder	166.6 to 196.0	17.0 to 20.0	122.9 to 144.6

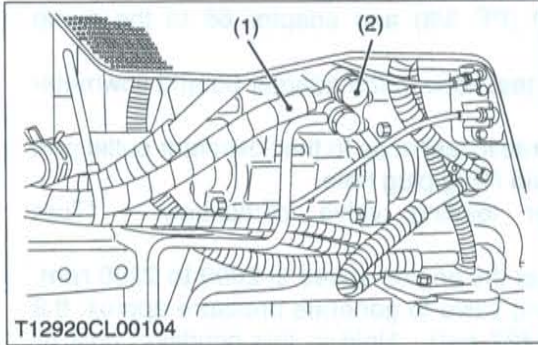
W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] POWER STEERING HYDRAULIC PUMP

(1) Checking

(A) Pump Test Using Flow-meter



Preparation

1. Remove the power steering main delivery hose (1).

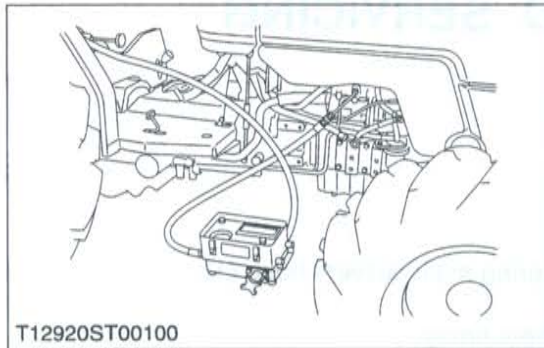
(When reassembling)

- Install the copper washers firmly.

Tightening torque	Delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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(1) Power Steering Main Delivery Hose (2) Joint Bolt

W1012732



Hydraulic Flow Test

■ IMPORTANT

- When using a flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with that flowmeter.
 - Do not close the flowmeter loading valve completely, before testing, because it has not relief valve.
1. Install the adaptor 69 (PF 3/8) and adaptor 66 to the pump discharge port.
 2. Connect the hydraulic test hose to the adaptor 66 and flowmeter inlet port.
 3. Connect the other hydraulic test hose to the flowmeter outlet port and to transmission fluid filling plug hole.
 4. Open the flowmeter loading valve completely. (Turn counterclockwise.)
 5. Start the engine and set the engine speed at **2000 to 2200 rpm**.
 6. Slowly close the loading valve to generate pressure approx. **9.8 MPa (100 kgf/cm², 1422 psi)**. Hold in this condition until oil temperature reaches approx. 40 °C (104 °F).
 7. Open the loading valve completely.
 8. Set the engine speed. (Refer to **Condition**.)
 9. Read and note the pump delivery at no pressure.
 10. Slowly close the loading valve to increased, engine speed drops, therefore, reset the engine speed.
 11. Read and note the pump delivery at rated pressure.
 12. Open the loading valve completely and stop the engine.
 13. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition

- Engine Speed.....Approx. 2700 rpm
- Rated pressure
 - [2WD Type].....8.3 to 9.3 MPa
85 to 95 kgf/cm²
1209 to 1351 psi
 - [4WD Type].....12.7 to 13.7 MPa
130 to 140 kgf/cm²
1849 to 1991 psi

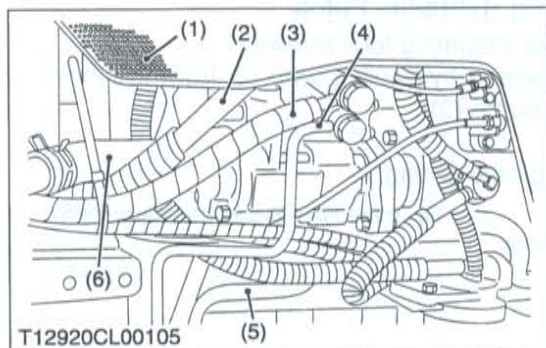
Hydraulic pump delivery at no pressure	Factory spec.	Above 18.1 L/min. 4.78 U.S.gals./min. 3.98 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	Above 17.7 L/min. 4.68 U.S.gals./min. 3.89 Imp.gals./min.
	Allowable limit	15.8 L/min. 4.17 U.S.gals./min. 3.48 Imp.gals./min.

W1012877

(2) Disassembling and Assembling

■ IMPORTANT

- The hydraulic pump is precision machined and assembled : if disassemble once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assemble except when emergency repair is unavoidable.
- When repair is required, follow the disassembly and servicing procedures shown below with utmost care.
- Be sure to test the hydraulic pump with a flowmeter before disassembling.
- After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.

(A) Removing Hydraulic Pump Assembly**Preparation**

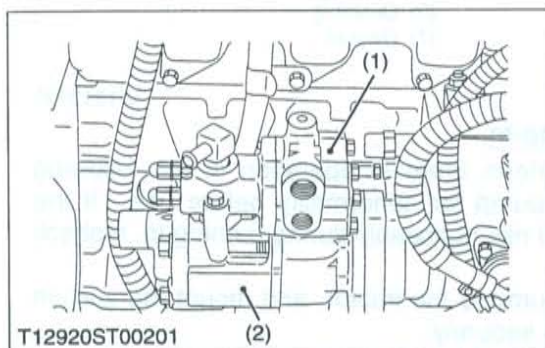
1. Remove the side cover (1).
2. Disconnect the power steering main delivery hose (3) and return hose (2).
3. Remove the PTO delivery pipe (4) and 3P delivery pipe (5).
4. Disconnect the suction hose (6).

(When reassembling)

Tightening torque	Power steering main delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	3P delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

- (1) Side Cover (4) PTO Delivery Pipe
 (2) Return Hose (5) 3P Delivery Pipe
 (3) Power Steering Main Delivery Hose (6) Suction Hose

W1012802

**Regulator Valve and Hydraulic Pump Assembly**

1. Remove the regulator valve (1).
2. Remove the hydraulic pump mounting screw and nut.
3. Take out the hydraulic pump assembly (2).

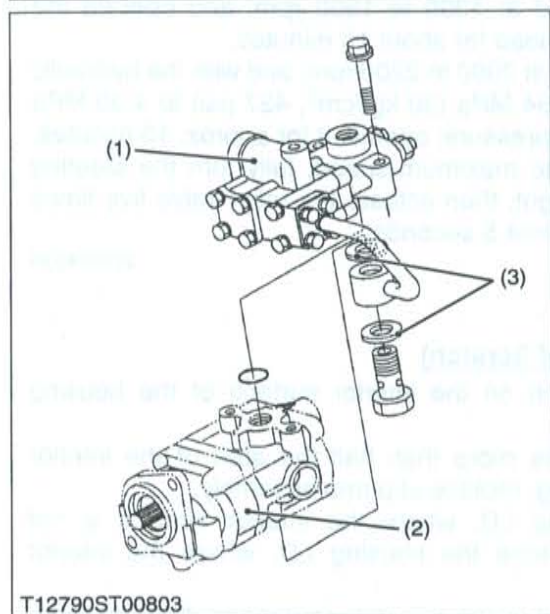
(When reassembling)

- Apply grease to the O-ring and take care not to damage it.

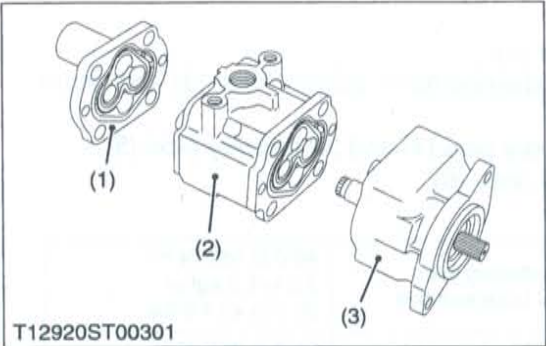
Tightening torque	Regulator valve mounting screw	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs

- (1) Regulator Valve (3) Copper Washer
 (2) Hydraulic Pump

W1013150



(B) Disassembling Power Steering Hydraulic Pump



Separating Power Steering Hydraulic Pump

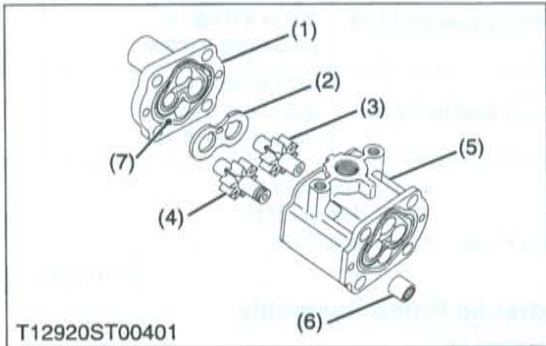
- 1. Remove the pump cover mounting four screws.
- 2. Separate the power steering hydraulic pump (2) from the three point system hydraulic pump (3).

(When reassembling)

- Take care not to damage the O-ring.

- (1) Pump Cover (3) Three Point System Hydraulic Pump
- (2) Power Steering Hydraulic Pump

W1014217



Disassembling Power Steering Hydraulic Pump

- 1. Remove the side plate (2), drive gear (4) and driven gear (3).
- 2. Take out the coupling (6).

(When reassembling)

- Take care not to damage the gasket (7).
- Align the hole of the cover (1) and casing (5).
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

- (1) Cover (5) Casing
- (2) Plate (6) Coupling
- (3) Driven Gear (7) Gasket
- (4) Drive Gear

W1013559

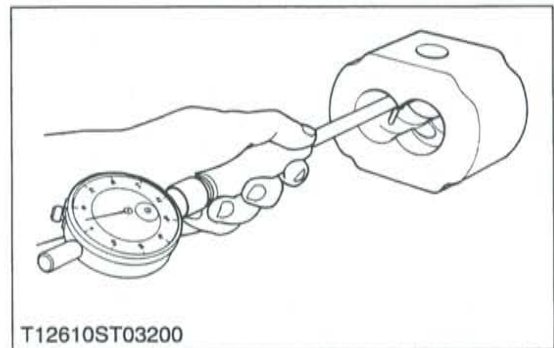
Hydraulic Pump Running-In

After reassembly, perform break-in operation in the following manner, and check the pump for abnormality before use. If the pump temperature should rise noticeably during running-in, recheck should be performed.

- 1. Install the hydraulic pump to the tractor, and mount the suction pipe and delivery pipe securely.
- 2. Set the engine speed at 1300 to 1500 rpm, and operate the hydraulic pump at no load for about 10 minutes.
- 3. Set the engine speed at 2000 to 2200 rpm, and with the hydraulic pump applied with 2.94 MPa (30 kgf/cm², 427 psi) to 4.90 MPa (50 kgf/cm², 711 psi) pressure, operate it for approx. 15 minutes.
- 4. With the engine set to maximum speed, fully turn the steering wheel to the left or right, then actuate the relief valve five times for 25 seconds (one time 5 seconds).

W1014536

(3) Servicing



Housing Bore (Depth of Scratch)

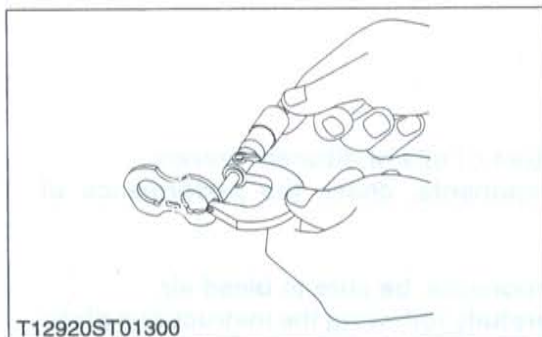
- 1. Check for the scratch on the interior surface of the housing caused by the gear.
- 2. If the scratch reaches more than half the area of the interior surface of the housing, replace at pump assembly.
- 3. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
- 4. If the valves obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.
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(Reference)

- Use a cylinder gauge to measure the housing I.D.

W1014649



Side Plate Thickness

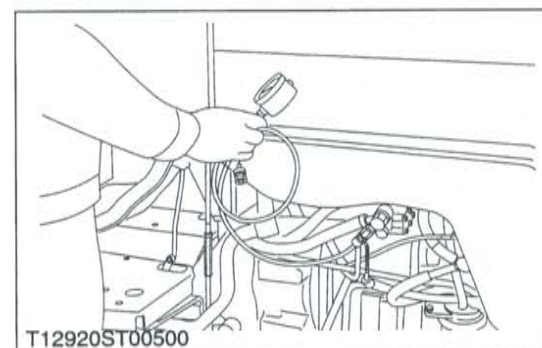
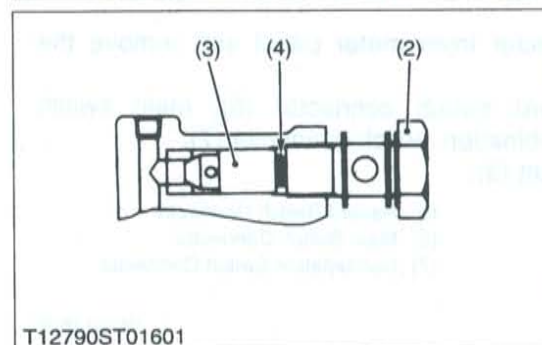
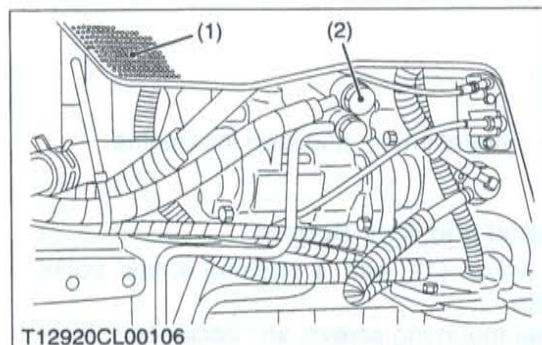
1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0976 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

W10134960

[2] RELIEF VALVE

(1) Checking



Relief Valve Setting Pressure Test

1. Remove the delivery hose joint bolt (2) which connects delivery hose and regulator valve.
2. Take out the spring (4) and check valve (3).
3. Install the adaptor **E** and adaptor **58** of relief valve setting pressure tester to the regulator valve, and then set a thread joint, cable and pressure gauge.
4. Start the engine and set the engine speed at max. speed.
5. Fully turn the steering wheel to the left or right and read the pressure when the relief valve functions.
6. Stop the engine.
7. If the pressure is not within the factory specifications, check the pump delivery line, replace the relief valve assembly or repair the power steering.

Power steering relief valve setting pressure	Factory spec.	2WD	8.3 to 9.3 MPa 85 to 95 kgf/cm ² 1209 to 1351 psi
		4WD	12.7 to 13.7 MPa 130 to 140 kgf/cm ² 1849 to 1991 psi

(Reference)

- Install the spring (4) and check valve (3) firmly.
- Install the copper washers firmly.

Tightening torque	Power steering main delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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Condition

- Engine speed.....Maximum
- Oil temperature.....40 to 60 °C
104 to 140 °F

- | | |
|------------------------------|-----------------|
| (1) Side Cover RH | (3) Check Valve |
| (2) Delivery Hose Joint Bolt | (4) Spring |

W1015089

[3] STEERING CONTROLLER

(1) Disassembling and Assembling

■ IMPORTANT

- Use only the transmission fluid (See page G-7), in no case use mixture of oils of different brands.
- Before disassembling the power steering system hydraulic components, check the performance of hydraulic pump and power steering using a flowmeter.
Do not disassemble the power steering needlessly.
- After removing or disassembling the power steering hydraulic components, be sure to bleed air.
- If disassembly of power steering is needed, perform disassembly carefully following the instructions given below.

1. Since the sliding surfaces of those parts have been precisely finished, do not brush or grind with sandpaper. Use transmission fluid for cleaning and compressed air for blowing off.

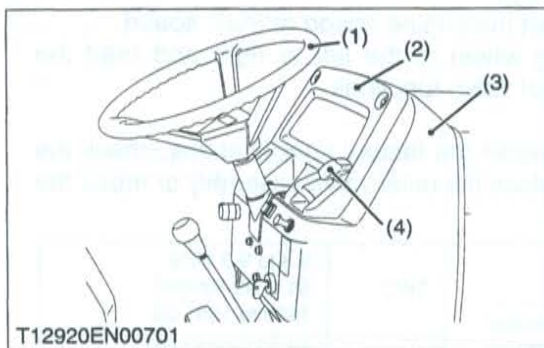
2. When reassembling, inspect each part for wear and damage. If seriously damaged, replace parts as sub-assembly or assembly.

It is desirable to replace O-rings and seals with new ones.

[Bleeding]

1. Start the engine.
2. Turn the steering wheels slowly in both directions all the way alternately several times, and stop the engine.

(A) Removing Steering Controller

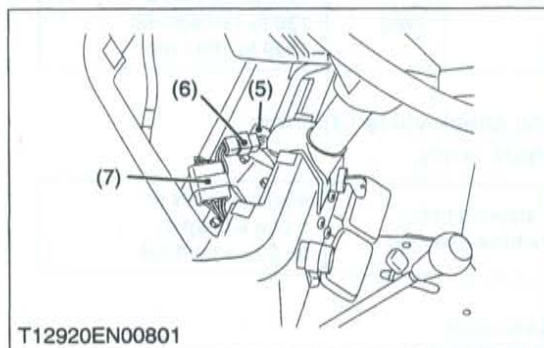


Steering Wheel, Meter Panel and Rear Bonnet

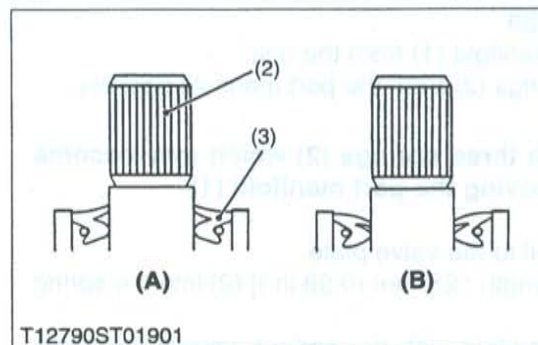
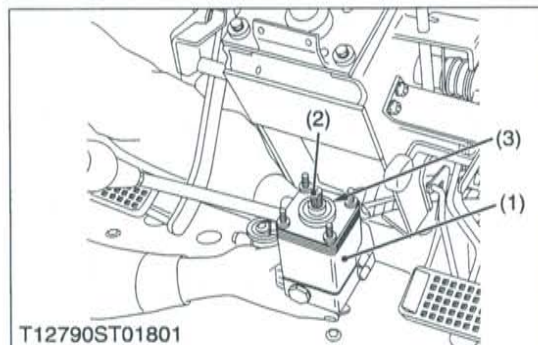
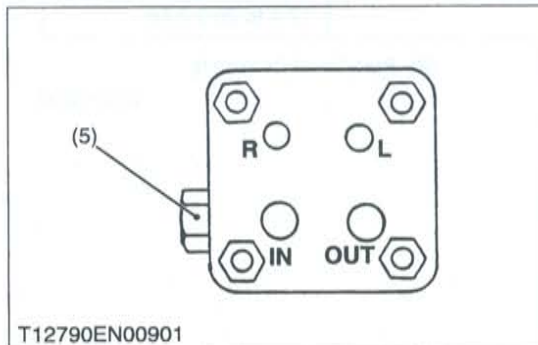
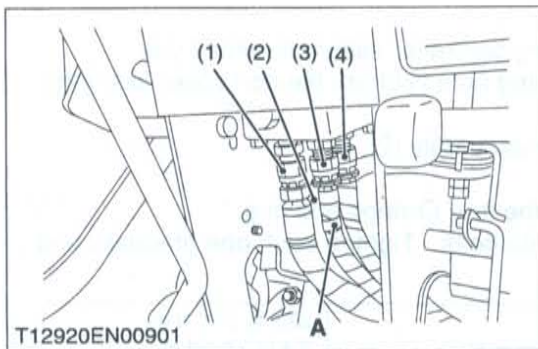
1. Remove the steering wheel (1), with a steering wheel puller (Code No. 07916-51090).
2. Remove the meter panel mounting screws and accelerator lever grip (4).
3. Disconnect the connector from meter panel and remove the meter panel (2).
4. Disconnect the hazard switch connector (5), main switch connector (6) and combination switch connector (7).
5. Remove the rear bonnet (3).

- (1) Steering Wheel
- (2) Meter Panel
- (3) Rear Bonnet
- (4) Accelerator Lever Grip

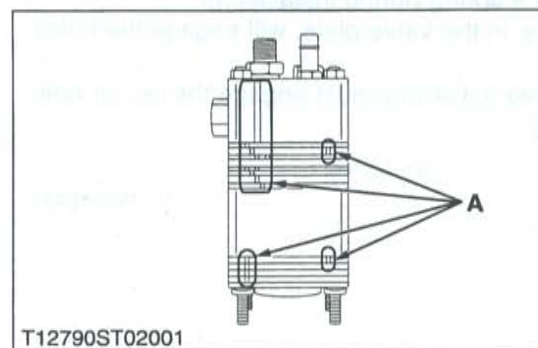
- (5) Hazard Switch Connector
- (6) Main Switch Connector
- (7) Combination Switch Connector



W1014622



(B) Disassembling Steering Controller



Steering Hoses

1. Disconnect the main delivery hose (1), return hose (2), right turning delivery hose (3) and left turning delivery hose (4).

(When reassembling)

(4WD)

- In assembling the turning delivery hose to the steering controller, connect the delivery hose with identification mark (tape) "A" to the **R** port of the steering controller.

(2WD)

- Connect the delivery hose with identification mark (tape) "A" to the **L** port of the steering controller. (Refer to figure left.)

Tightening torque	Main delivery hose retaining nut	46.6 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose
(2) Return Hose
(3) Right Turning Delivery Hose

- (4) Left Turning Delivery Hose
(5) Relief Valve Plug
(A) Identification Mark (Tape)

W1014755

Removing Steering Controller

1. Loosen and remove the steering controller mounting nuts.
2. Take out the steering controller (1) and joint shaft (2) as a unit.
3. Pull out the joint shaft (2) from the steering controller (1).

(When reassembling)

- Apply grease to the joint shaft (2).
- After install the joint shaft (2) to the steering controller (1), check the dust seal (3). (Refer to figure left)

Tightening torque	Steering controller mounting nuts	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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- (1) Steering Controller
(2) Joint Shaft
(3) Dust Seal

- (A) Correct
(B) Incorrect

W1015751

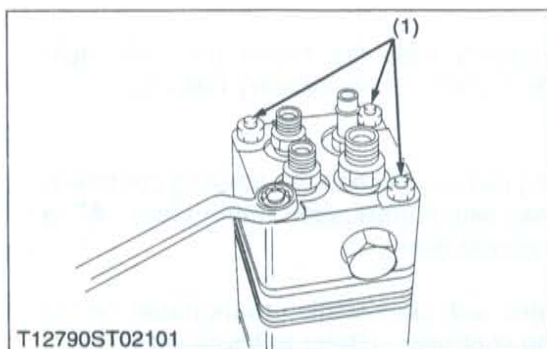
Steering Controller

■ IMPORTANT

- Components of the steering controller with alignment grooves must be assembled so that their alignment grooves are positioned as figured for the unit to function.

A : Alignment Grooves

W1016113



Port Cover Assembly

1. Slightly hold the steering controller assembly with a vise.
2. Remove the four retaining nuts (1) from the port cover assembly (2).
3. Remove the port cover assembly (2).

(When reassembling)

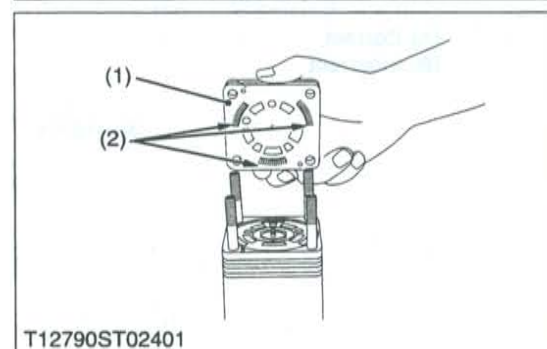
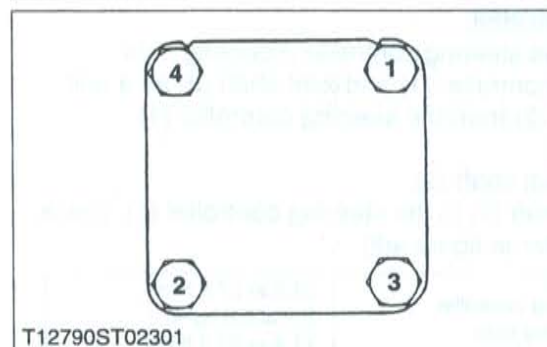
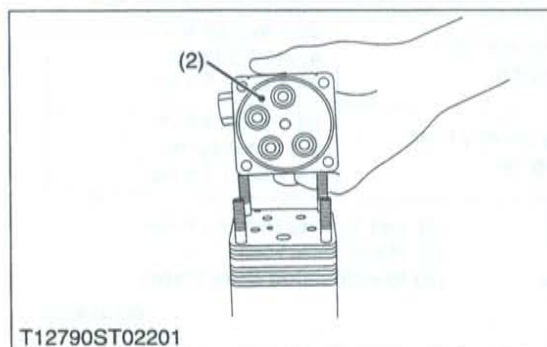
- Apply clean grease to the four O-rings and ring.
- Install retaining nuts onto bolts. Tighten each one gradually until resistance is felt.

Tightening torque	Retaining nuts	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	----------------	---

(1) Retaining Nut

(2) Port Cover Assembly

W1016232



Port Manifold and Springs

1. Carefully lift the port manifold (1) from the unit.
2. Remove the three springs (2) from the port manifold pockets.

■ NOTE

- **Be prepared to catch three springs (2) which may become disengage when removing the port manifold (1).**

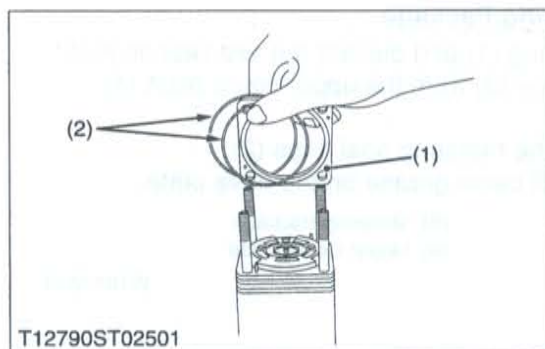
(When reassembling)

- Apply a few drops of oil to the valve plate.
- Install three springs [length : 25 mm (0.98 in.)] (2) into the spring pockets.
- Assemble the port manifold with the springs toward the valve plate.
- Be careful not to pinch a spring during installation.
- The two alignment pins, in the valve plate, will engage the holes in the port manifold.
- The pin on the hex. drive assembly must engage the center hole in the port manifold (1).

(1) Port Manifold

(2) Spring

W1016491



Valve Ring

1. Remove the valve ring (1) with the two seal rings (2).

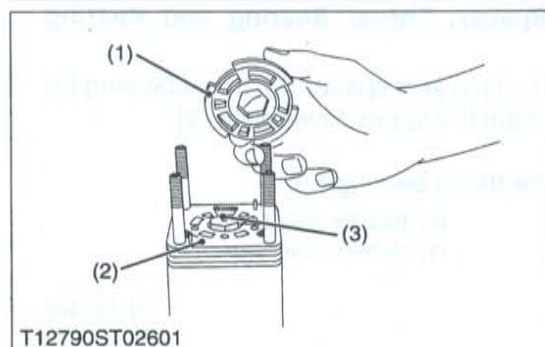
(When reassembling)

- Apply clean grease to the seal rings (2).
- Install the valve ring (1) over the bolts and alignment pins with seal ring facing the isolation manifold.

(1) Valve Ring

(2) Seal Rings

W1016642



Valve Ring

1. Remove the valve plate (1) by lifting it from the isolation manifold (2).

2. Pull out the hex. drive assembly (3) from the drive link.

(When reassembling)

- Aligning the three springs slots of the valve plate (1) centrally over the three springs placed in the isolation manifold (2).
- Place hex. drive assembly (3), pin side up, through the hole in the isolation manifold (2).

■ IMPORTANT

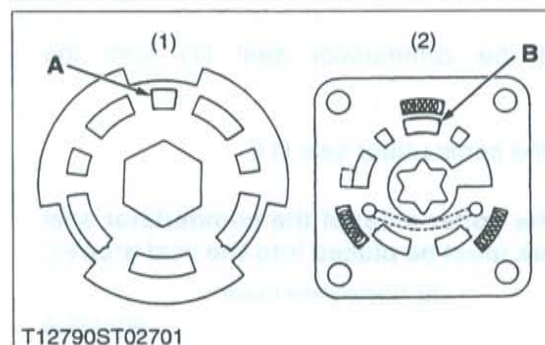
- Place the valve plate (1) with the surface that reads "shaft side" down over the hex. drive assembly (3).
- Aligning the "A" part of the valve plate (1) and the "B" part of the isolation manifold (2).

(1) Valve Plate

(3) Hex. Drive Assembly

(2) Isolation Manifold

W1016813



Springs and Isolation Manifold

1. Remove the three springs (1) from the isolation manifold pockets.
2. Remove the two alignment pins (2).
3. Remove the isolation manifold (3).

(When reassembling)

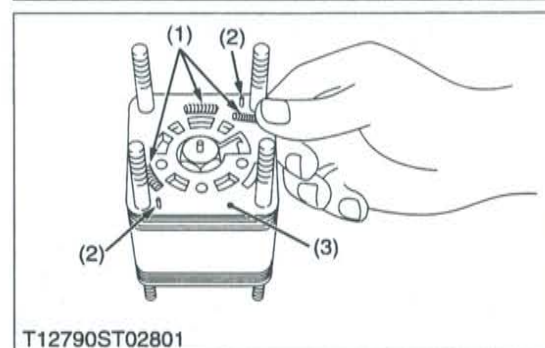
- Install three springs [length :15 mm (0.59 in.)] (1) into the spring pockets.

(1) Springs

(3) Isolation Manifold

(2) Alignment Pins

W1016986



Alignment Pins and Drive Link

1. Remove the two alignment pins (1) from the metering ring (2).
2. Remove the drive link (3) from the metering package.

(When reassembling)

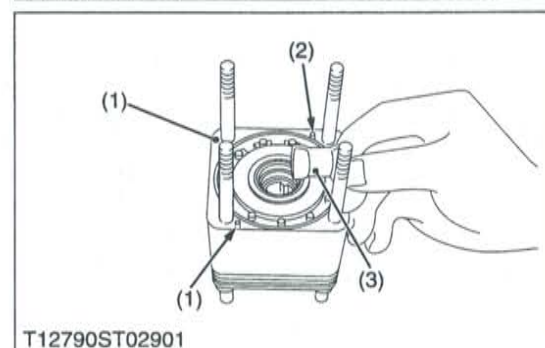
- Insert large tang of the drive link (3) into the slot in the rotor.

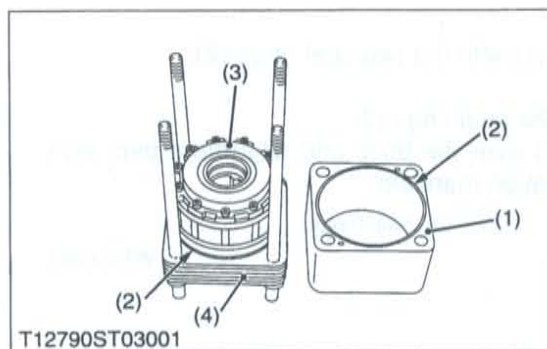
(1) Alignment Pins

(3) Drive Link

(2) Metering Ring

W1017103





Metering Ring and Metering Package

1. Remove the metering ring (1) and discard the two seal rings (2).
2. Lift the metering package (3) from the upper cover plate (4).

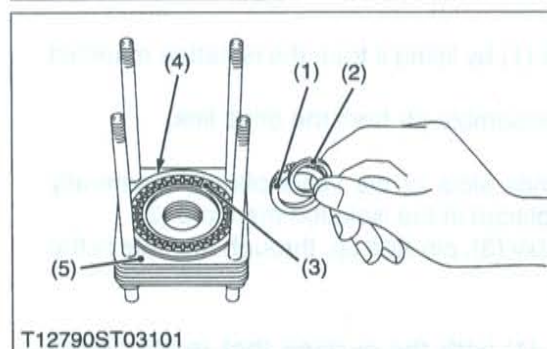
(When reassembling)

- Apply clean grease to the metering seal rings (2).
- Apply a small amount of clean grease on the drive plate.

- (1) Metering Ring
(2) Seal Ring

- (3) Metering Package
(4) Upper Cover Plate

W1017243



Face Seal, Face Seal Spacer, Thrust Bearing and Bearing Spacer

1. Remove the face seal (1), face seal spacer (2), thrust bearing (3) and bearing spacer (4) from the upper cover plate (5).

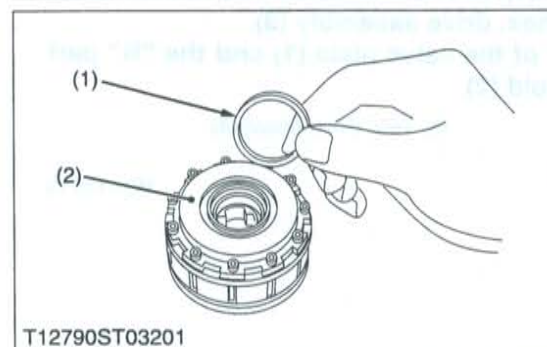
(When reassembling)

- Apply clean grease to the thrust bearing (3).

- (1) Face Seal
(2) Face Seal Spacer
(3) Thrust Bearing

- (4) Bearing Spacer
(5) Upper Cover Plate

W1017460



Commutator Seal

1. Remove and discard the commutator seal (1) from the commutator cover (2).

(When reassembling)

- Apply clean grease to the commutator seal (1).

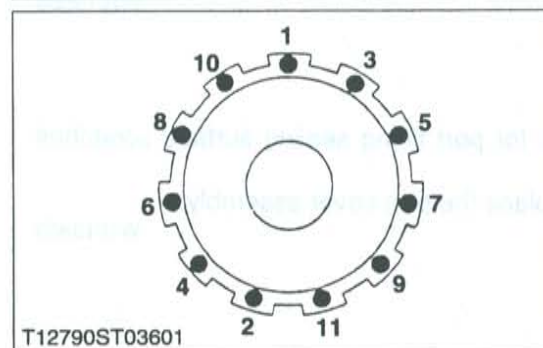
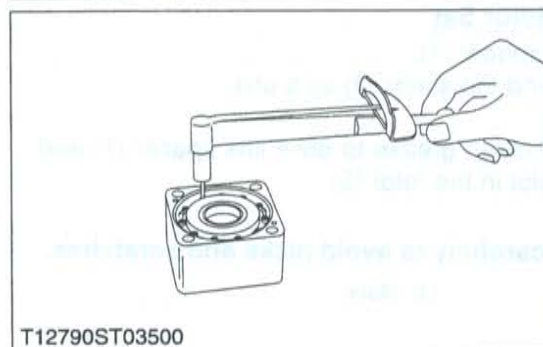
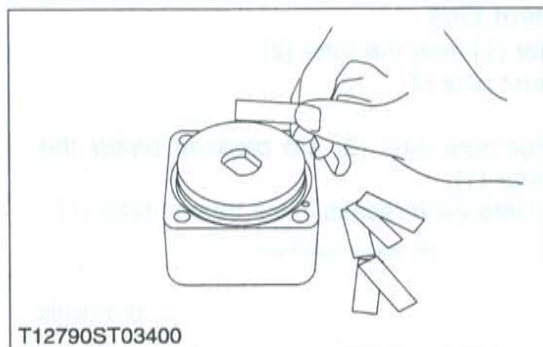
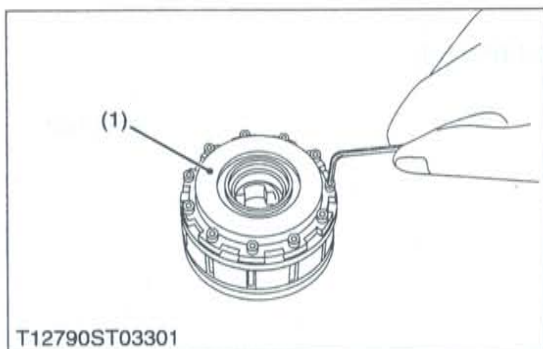
■ IMPORTANT

- The rubber portion (the softer side) of the commutator seal (1) with the yellow mark must be placed into the seal groove.

- (1) Commutator Seal

- (2) Commutator Cover

W1017619



Commutator Cover

1. Remove the eleven hex. socket head cap screws.
2. Lift the commutator cover (1) from the metering package.

(When reassembling)

- Align screw holes in commutator cover (1) with screw holes in drive plate, and then screw the eleven hex. socket head cap screws loosely into the metering package.

■ IMPORTANT

- The commutator ring must be concentric with drive plate within 0.127 mm (0.005 in.) total indicator reading after tightening the eleven hex. socket head cap screws.

- The next procedures are a method of achieving the concentricity.

1. Place the metering ring on a hard flat surface.
2. Place the assembled metering package into the metering ring with the commutator cover down, such that the drive plate is partially out of the metering ring. (A suitable wood block under the metering package.)
3. Place one piece of 0.18 mm (0.007 in.) shim stock approximately 13 mm (0.5 in.) wide x 38 mm (1.5 in.) long between the metering ring and drive plate in three places of the drive plate.
4. Place another piece of the 0.18 mm (0.17 in.) shim stock between the drive plate and each of the three pieces of shim stock already in place.
5. Lift the metering ring and metering package and remove the wood block.
6. Push the metering package shims into the metering ring until the drive plate and shims are at least flush with the metering ring.
7. Reverse the metering ring and metering package as a unit on the flat surface.
8. Push down on the metering package until the drive plate is on the flat surface.
9. Be sure the cap screws are loose enough to allow the commutator ring and drive plate to align themselves concentrically in the metering ring bore.
10. Gradually tighten the eleven cap screws, following the sequence shown in figure.
11. Remove the metering package and shims from the metering ring.

Tightening torque	Hex. socket head cap screw	1.24 to 1.47 N·m 0.13 to 0.15 kgf·m 0.94 to 1.08 ft-lbs
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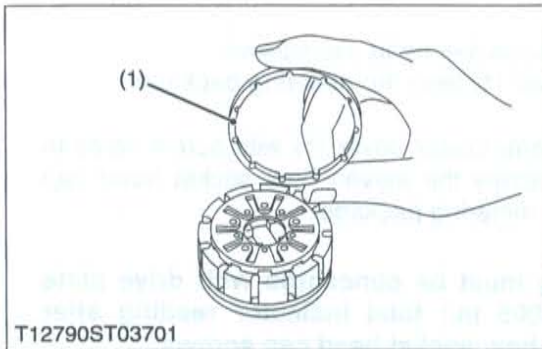


CAUTION

- Use care and eye protection while adding and removing shims from metering ring as the shims will be under spring tension and could fly into the air causing injury.

(1) Commutator Cover

W1017736

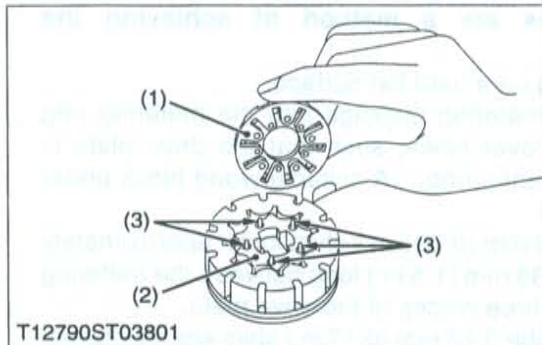


Commutator Ring

1. Remove the commutator ring (1).

(1) Commutator Ring

W1018531



Commutator and Alignment Pins

1. Remove the commutator (1) from the rotor (2).
2. Pull out the five alignment pins (3).

(When reassembling)

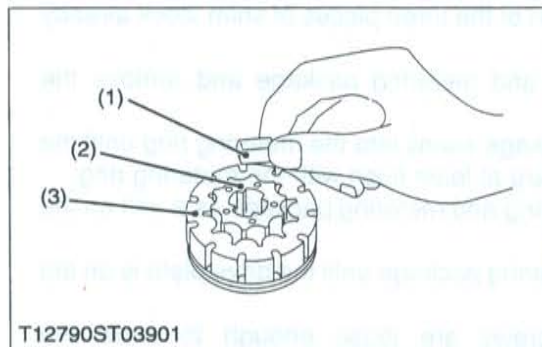
- Make sure the five alignment pins (3) are pressed below the surface of the commutator (1).
- Place a few drops of oil into each recess in the commutator (1).

(1) Commutator

(3) Alignment Pins

(2) Rotor

W1018668



Drive Link Spacer and Rotor Set

1. Remove the drive link spacer (1).
2. Remove the rotor (2) and the stator (3) as a unit.

(When reassembling)

- Apply small amount of clean grease to drive link spacer (1) and insert it into the drive slot in the rotor (2).

■ IMPORTANT

- **Handle the rotor set carefully to avoid nicks and scratches.**

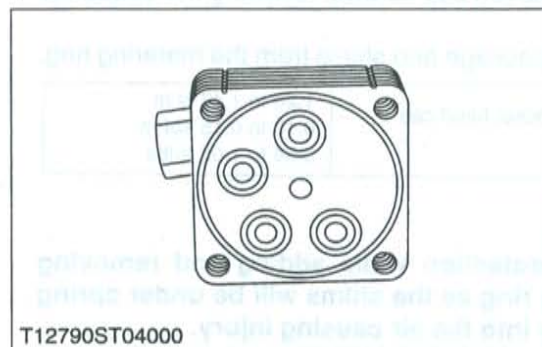
(1) DriveLink Spacer

(3) Stator

(2) Rotor

W1019005

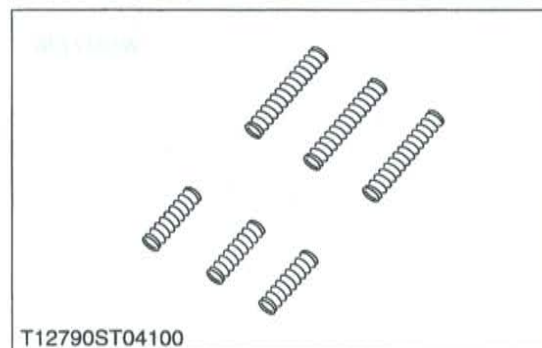
(2) Servicing



Port Cover

1. Inspect the port cover for port fitting sealing surface scratches and thread damage.
2. If these conditions, replace the port cover assembly.

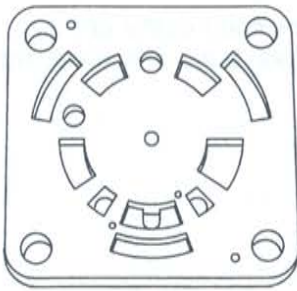
W1018803



Spring

1. Inspect the spring for bent or distorted coils.
2. If a spring is broken or deformed, all six springs in the unit should be replaced.

W1018861



T12790ST04200

Port Manifold

1. Inspect the ground surface of the port manifold.
2. If the port manifold shows nick or scoring or the edge are not sharp, replace the steering controller assembly.

W1018933



T12790ST04300

Valve Plate

1. Inspect the slot edges and ground surface.
2. If the valve plate shows nicks or scoring or the edges are not sharp, replace the steering controller assembly.

W1019221

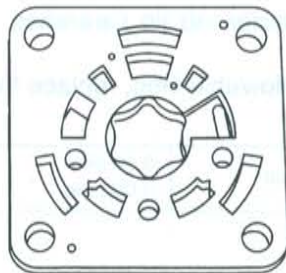


T12790ST04400

Hex. Drive Assembly

1. The pin in the hex. drive assembly should not shown wear and must be firmly pressed in place.
2. The sides of the hex. and the slot should not have grooves or scoring.
3. If the hex. drive assembly shows signs of this type of wear, replace the steering controller assembly.

W1019297

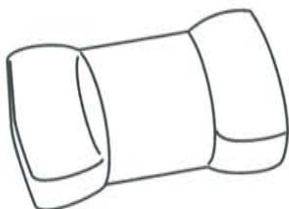


T12790ST04500

Isolation Manifold

1. Inspect the ground surface of the isolation manifold.
2. If the isolation manifold shows nicks or scoring or the edges are not sharp, replace the steering controller assembly.

W1019378

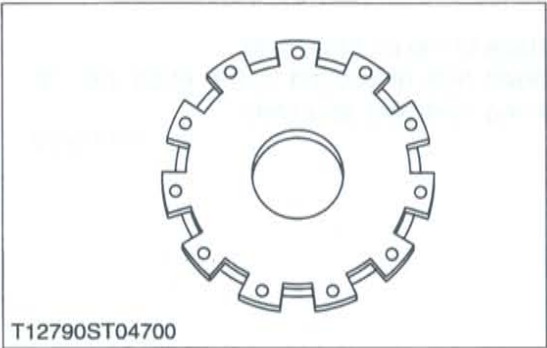


T12790ST04600

Drive Link

1. Inspect each end of the drive link.
2. If the drive link shows wear or scoring, replace the steering controller assembly.

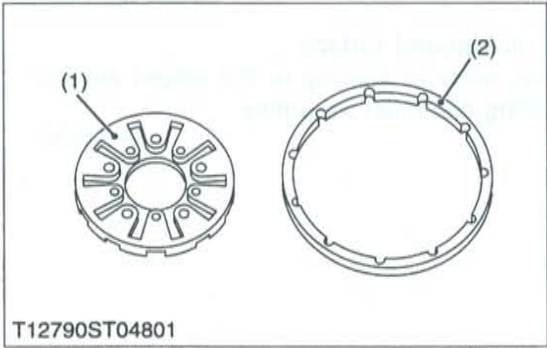
W1019450



Commutator Cover

- 1. Inspect the ground surface of the commutator cover.
- 2. If the commutator cover has nicks, burrs or scoring, replace the steering controller assembly.

W1019522



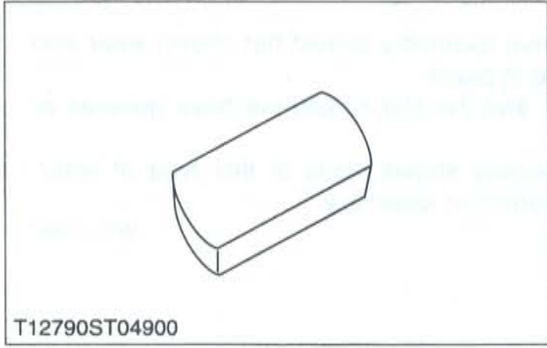
Commutator Ring and Commutator

- 1. Inspect the ground surface of the commutator (1) and inside surface of the commutator ring (2).
- 2. If either is worn or damaged, replace the steering controller assembly.

(1) Commutator

(2) Commutator Ring

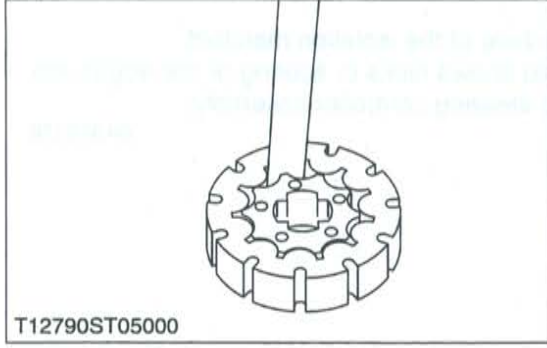
W1019649



Drive Link Spacer

- 1. Inspect the drive link spacer.
- 2. If the drive link spacer is grooved or worn, replace the steering controller assembly.

W1019752

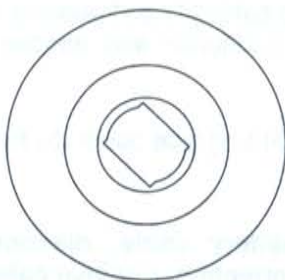


Rotor Set

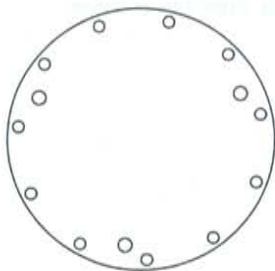
- 1. Measure the rotor lobe tip to stator lobe tip clearance, using the appropriate feeler gauge.
- 2. If the clearance exceeds the allowable limit, replace the steering controller assembly.

Clearance between rotor lobe tip and stator lobe tip	Allowable limit	0.08 mm 0.0031 in.
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W1019824

[A]

T12790ST05101

[B]

T12790ST05201



T12790ST05300

Drive Plate

1. The rotor side of the drive plate should show the **"normal"** spiral pattern due to rotor movement.
2. Inspect the thrust bearing side of the plate for brinelling (dents) or spalling (flaking).
3. The flat sides of the input shaft engagement hole should not be grooved worn.
4. If any of these conditions are present, replace the steering controller assembly.

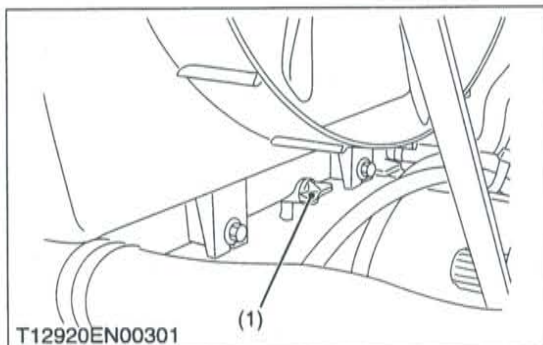
[A] Input Shaft Side**[B] Rotor Side**

W1019967

Bearing and Spacers

1. Inspect the thrust bearing for brinelling (dents) or spalling (flaking).
2. If either exists, or if one or more of the rolls are lost or broken, replace the steering controller assembly.
3. If the seal spacer or bearing spacer are worn or broken, replace the steering controller assembly.

W1020189

[4] STEERING CYLINDER**(1) Disassembling and Assembling****(A) Removing Steering Cylinder and Pitman Arm [2WD]**

T12920EN00301

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. Loosen the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, retighten the drain plug (1).

(When refilling)

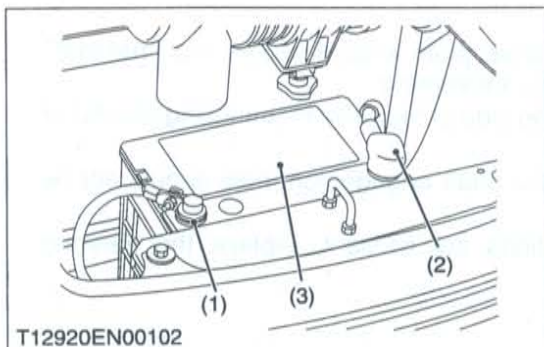
- Fill the coolant between the **"FULL"** and **"LOW"** marks of recovery tank.

Coolant capacity (with recovery tank)

7.0 L
7.4 U.S.qts.
6.2 Imp.qts.

(1) Drain Plug

W1017682



Battery, Bonnet and Lower Cover

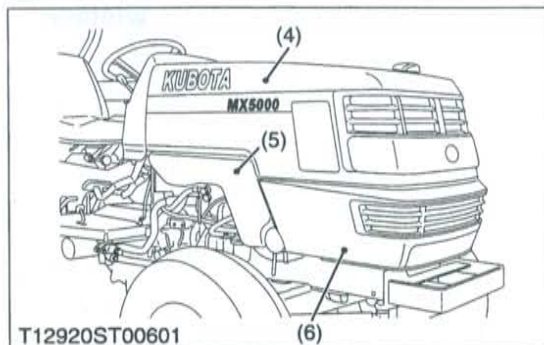
1. Disconnect the battery negative cable (1) and positive cable (2).
2. Disconnect the head light **4P** connector and remove the wire harness from bonnet (4).
3. Remove the bonnet (4).
4. Remove the front lower cover (6) and side cover (5) R.H., L.H..
5. Remove the battery (3).

NOTE

- When disconnecting the battery cable, disconnect the negative cable first, when connecting, positive cable first.

- | | |
|----------------------------|-----------------------|
| (1) Battery Negative Cable | (4) Bonnet |
| (2) Battery Positive Cable | (5) Side Cover |
| (3) Battery | (6) Front Lower Cover |

W1017842

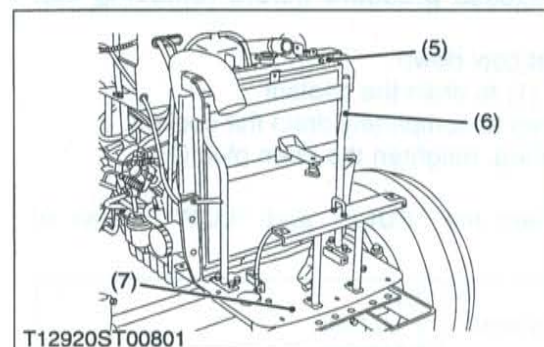
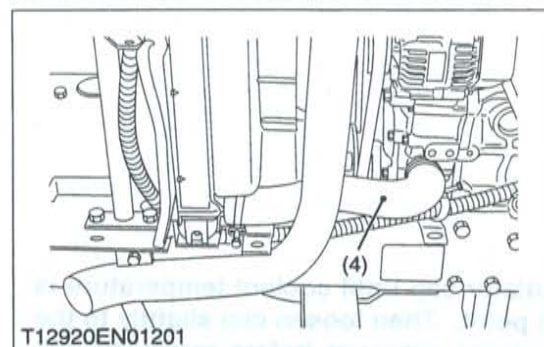
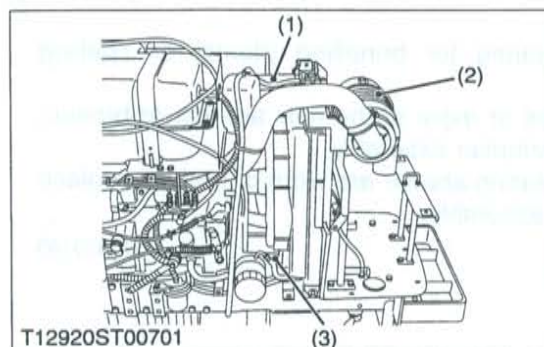


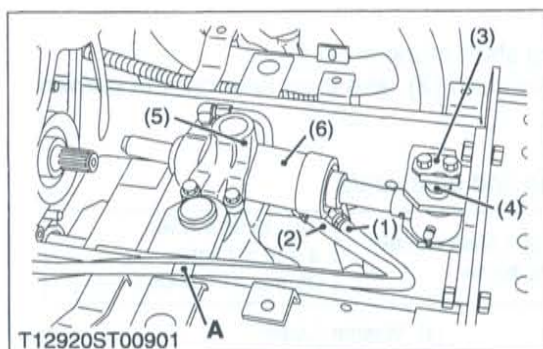
Radiator and Battery Support

1. Disconnect the radiator hose (1) and radiator hose (3).
2. Remove the air cleaner (2).
3. Disconnect the radiator hose (4).
4. Remove the radiator support mounting screws and take out the radiator (5) with radiator support (6).
5. Remove the battery support (7).

- | | |
|-------------------|----------------------|
| (1) Radiator Hose | (5) Radiator |
| (2) Air Cleaner | (6) Radiator Support |
| (3) Radiator Hose | (7) Battery Support |
| (4) Radiator Hose | |

W1018184





Removing Steering Cylinder

1. Disconnect the turning delivery hoses (1) and (2).
2. Remove the rod end shaft stopper (3), and then push out the rod end shaft (4).
3. Remove the pitman arm cap (5).
4. Take out the steering cylinder (6).

(When reassembling)

- Apply grease to bushing.
- In assembling the turning delivery hoses (1) and (2) to the steering cylinder (6), connect the delivery hose with the identification mark "A" (tape) to the port (port of 1) in front of the steering cylinder (6).

Tightening torque	Rod end shaft stopper mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
	Pitman arm cap mounting reamer screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

(1) Right Turning Delivery Hose

(2) Left Turning Delivery Hose

(3) Rod End Shaft Stopper

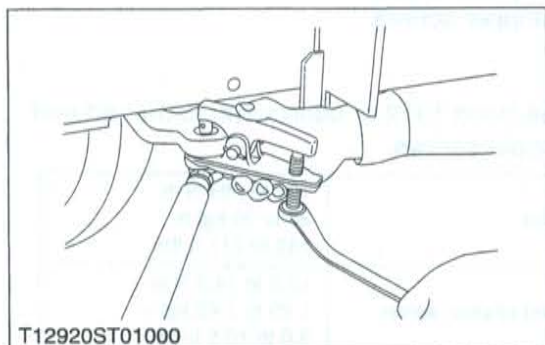
(4) Rod End Shaft

(5) Pitman Arm Cap

(6) Steering Cylinder

A : Identification Mark (Tape)

W1020788



Tie-rods

1. Remove the tie-rods with the tie-rod end lifter.
In this case, take special care not to damage the tie-rod end nut (slotted nut). (It is preferable to replace it with an unrequired nut.)

(When reassembling)

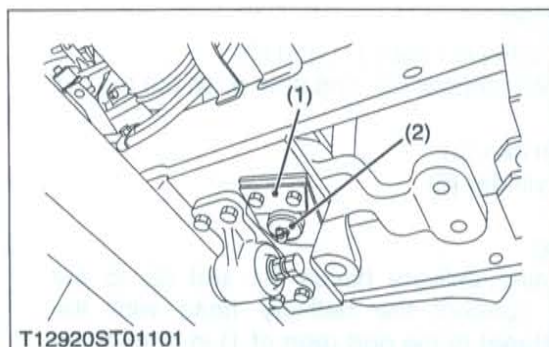
Tightening torque	Tie-rod end nut	2WD	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
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■ IMPORTANT

- After tightening the tie-rod end nut to the specified torque, install a cotter pin as shown in the figure left.

W1021227





Removing Pitman Arm

1. Remove the pitman arm shaft stopper (1).
2. Push out the pitman arm shaft (2), and then take out the pitman arm (3).

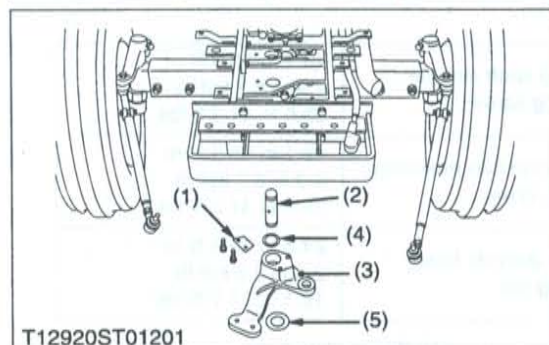
(When reassembling)

- Apply grease to bushing and dust seals.

Tightening torque	Pitman arm shaft stopper mounting screw	48.1 to 55.9 N·m
		4.9 to 5.7 kgf·m
		35.5 to 41.2 ft-lbs

- | | |
|------------------------------|--------------------|
| (1) Pitman Arm Shaft Stopper | (4) Washer (Upper) |
| (2) Pitman Arm Shaft | (5) Washer (Lower) |
| (3) Pitman Arm | |

W1021376



(B) Disassembling Steering Cylinder [2WD Type]

Rod End

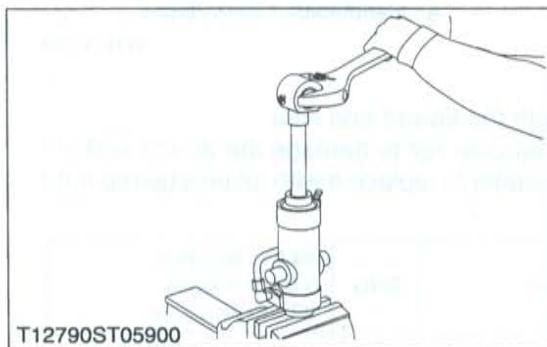
1. Secure the rod assembly with a vise.
2. Remove the rod end stopper screws.
3. Remove the rod end.

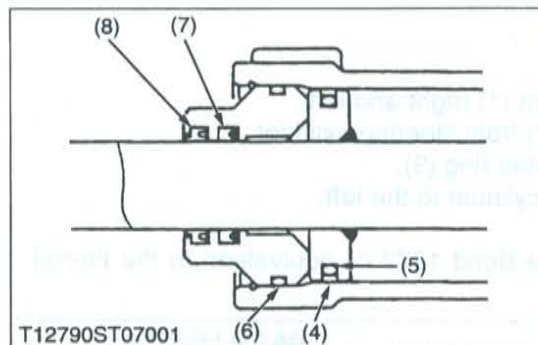
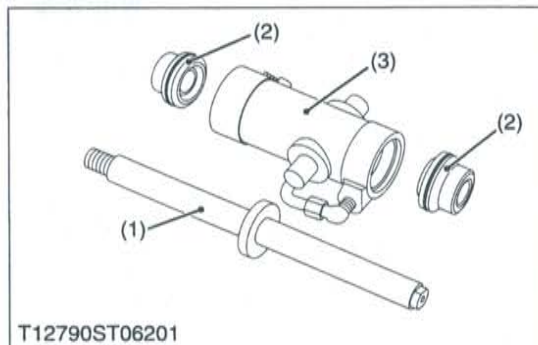
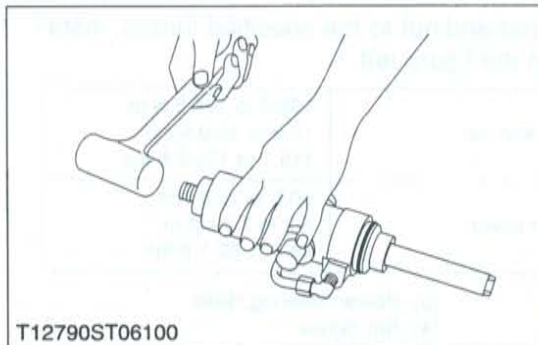
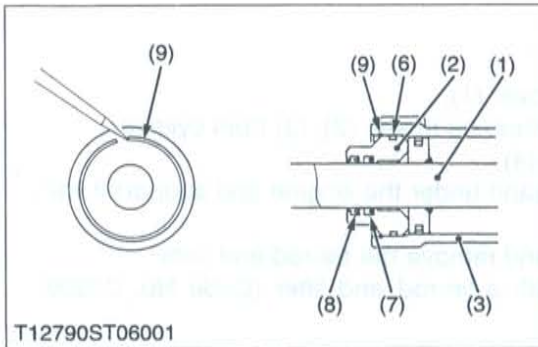
(When reassembling)

- Apply liquid lock (Three Bond 1372 or equivalent) to the rod end screw and rod end stopper screws.

Tightening torque	Rod end	196 to 294 N·m 20 to 30 kgf·m 145 to 217 ft-lbs
	Rod end stopper screw	12.3 to 14.2 N·m 1.25 to 1.45 kgf·m 9.0 to 10.5 ft-lbs

W1021667





Cylinder Cover Assembly and Rod Assembly

1. Tap in the cylinder cover assembly (2) lightly to inside of cylinder.
2. Use a pointed tool and remove the internal snap ring (9) by raising it out of the groove of the cylinder tube (3).
3. Tap the rod assembly (1) lightly to remove the cylinder cover assembly (2) from the cylinder tube (3).
4. Pull out the cylinder cover assembly (2) from the rod assembly (1).

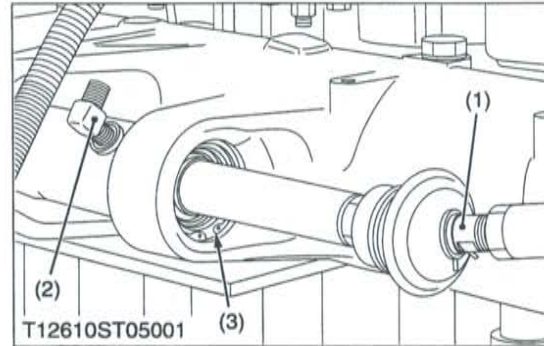
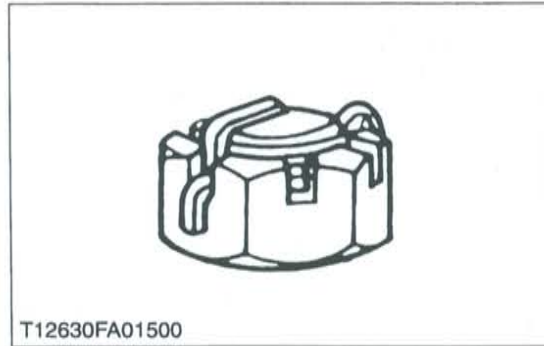
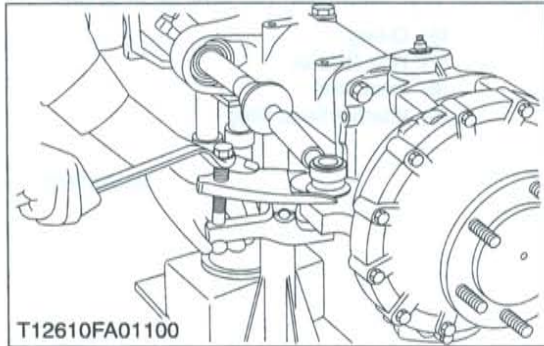
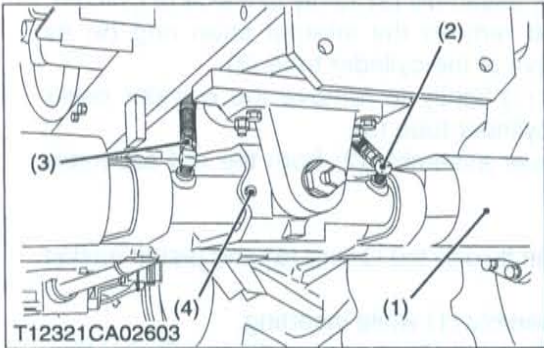
(When reassembling)

- Apply clean transmission fluid to the O-ring (5) and piston gasket (4).
- Do not spin the rod assembly (1) while inserting.
- Apply grease to the rod gasket (7), dust seal (8) and O-ring (6).

- | | |
|-----------------------------|------------------------|
| (1) Rod Assembly | (6) O-ring |
| (2) Cylinder Cover Assembly | (7) Rod Gasket |
| (3) Cylinder Tube | (8) Dust Seal |
| (4) Piston Gasket | (9) Internal Snap Ring |
| (5) O-ring | |

W1021882

(C) Removing the Steering Cylinder [4WD Type]



Tie-rod

- 1. Remove the cylinder cover (1).
- 2. Disconnect the power steering hoses (2), (3) from cylinder.
- 3. Remove the set screw (4).
- 4. Place a disassembly stand under the engine and support it with a jack.
- 5. Pull out the cotter pin and remove the tie-rod end nuts.
- 6. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(When reassembling)

- After tightening the tie-rod end nut to the specified torque, install a cotter pin as shown in the figure left.

Tightening torque	Tie-rod end nut	156.9 to 176.5 N·m 16.0 to 18.0 kgf·m 115.7 to 130.2 ft-lbs
	Cylinder cover	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs

- (1) Cylinder Cover
- (2) Power Steering Hose
- (3) Power Steering Hose
- (4) Set Screw

W1017530

Steering Cylinder

- 1. Remove the tie-rod joint (1) (right and left).
- 2. Remove the nipples (2) from steering cylinder.
- 3. Remove the internal snap ring (3).
- 4. Draw out the steering cylinder to the left.

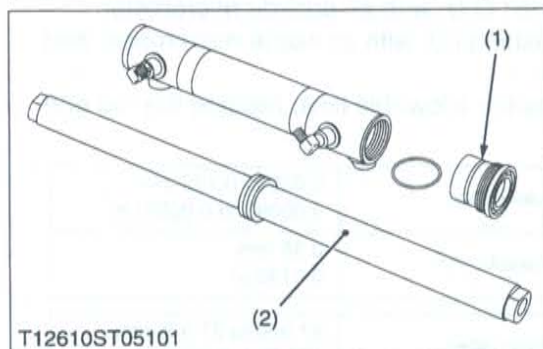
(When reassembling)

- After liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.

Tightening torque	Tie-rod and steering cylinder	166.6 to 196.0 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft-lbs
-------------------	-------------------------------	---

- (1) Tie-rod Joint
- (2) Nipple
- (3) Internal Snap Ring

W1017733

(D) Disassembling Steering Cylinder [4WD Type]**Piston Rod**

1. Remove the guide assembly (1) and draw out the piston rod (2).

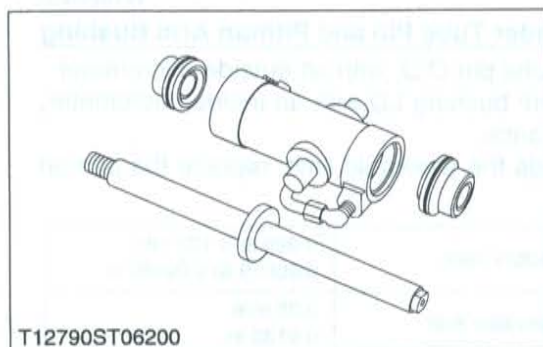
(When reassembling)

- Apply transmission fluid to the oil seal and O-ring.

(1) Guide Assembly

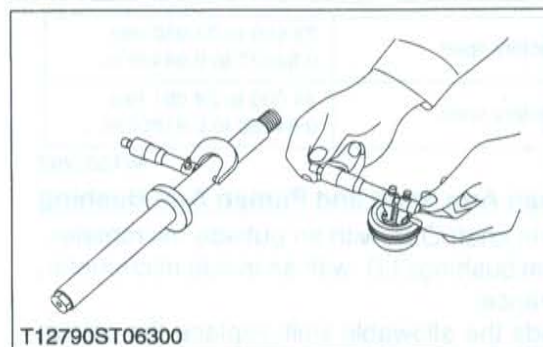
(2) Piston Rod

W1017961

(2) Servicing**(A) Steering Cylinder [2WD Type]****Cylinder Tube, Rod Assembly and Cylinder Covers**

1. Inspect the sliding surface of the cylinder tube, rod assembly and cylinder covers.
2. If the shows nicks or scoring, they must be replaced.

W1022225

**Clearance between Rod and Cylinder Cover Bushing**

1. Measure the rod O.D. with an outside micrometer.
2. Measure the cylinder cover bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the cylinder cover bushing.

Clearance between rod and cylinder cover bushing	Factory spec.	0.020 to 0.134 mm 0.00079 to 0.00528 in.
	Allowable limit	0.145 mm 0.00571 in.

Rod O.D.	Factory spec.	24.947 to 24.980 mm 0.98216 to 0.98346 in.
Cylinder cover bushing I.D.	Factory spec.	25.000 to 25.081 mm 0.98425 to 0.9874 in.

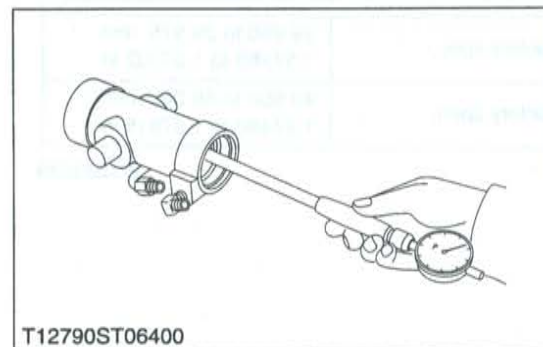
W1022323

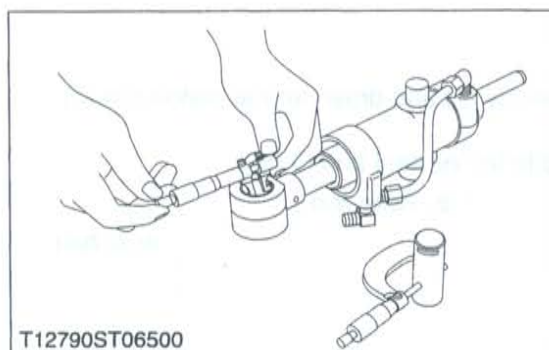
Cylinder Tube Wear

1. Measure the cylinder tube I.D. with a cylinder gauge.
2. If the measurement exceeds the allowable limit, replace the cylinder.

Cylinder tube I.D.	Factory spec.	55.000 to 55.074 mm 2.16535 to 2.16826 in.
	Allowable limit	55.100 mm 2.16929 in.

W1022526





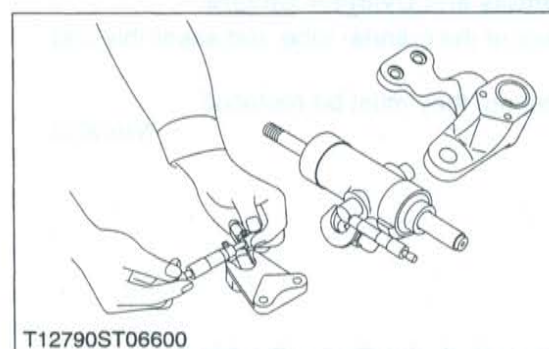
Clearance between Rod End Shaft and Rod End Bushing

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

Clearance between rod end shaft and rod end bushing	Factory spec.	0.025 to 0.135 mm 0.00098 to 0.00531 in.
	Allowable limit	0.35 mm 0.0138 in.

Rod end shaft O.D.	Factory spec.	27.950 to 27.975 mm 1.10039 to 1.10138 in.
Rod end bushing I.D.	Factory spec.	28.000 to 28.085 mm 1.10236 to 1.10571 in.

W1022635



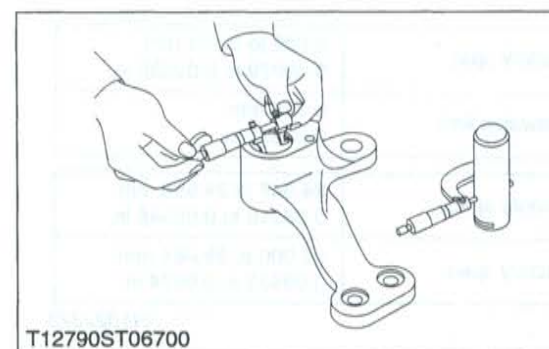
Clearance between Cylinder Tube Pin and Pitman Arm Bushing

1. Measure the cylinder tube pin O.D. with an outside micrometer.
2. Measure the pitman arm bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the pitman arm bushing.

Clearance between cylinder tube pin and pitman arm bushing	Factory spec.	0.020 to 0.122 mm 0.00079 to 0.00480 in.
	Allowable limit	0.35 mm 0.0138 in.

Cylinder tube pin O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94409 in.
Pitman arm bushing I.D.	Factory spec.	24.000 to 24.081 mm 0.94488 to 0.91807 in.

W1022792



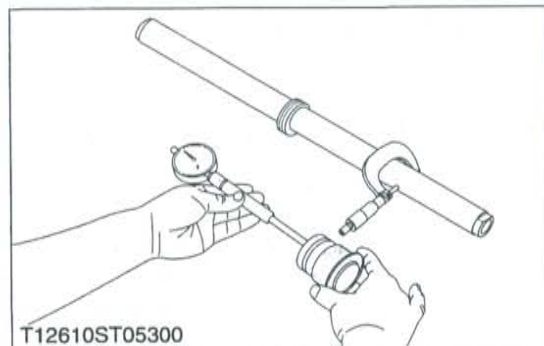
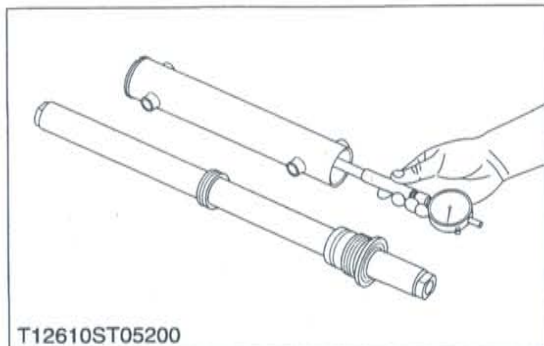
Clearance between Pitman Arm Shaft and Pitman Arm Bushing

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

Clearance between pitman arm shaft and pitman arm bushings	Factory spec.	0.025 to 0.135 mm 0.00098 to 0.00531 in.
	Allowable limit	0.35 mm 0.0138 in.

Pitman arm shaft O.D.	Factory spec.	39.950 to 39.975 mm 1.57283 to 1.57382 in.
Pitman arm bushing I.D.	Factory spec.	40.000 to 40.085 mm 1.57480 to 1.57815 in.

W1023049

(B) Steering Cylinder [4WD Type]**Steering Cylinder I.D.**

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceed the allowable limit, replace the cylinder barrel.

Steering cylinder I.D.	Factory spec.	50.000 to 50.062 mm 1.96850 to 1.97094 in.
	Allowable limit	50.100 mm 1.97244 in.

W1018172

Clearance between Rod and Bushing

1. Measure the bushing I.D. with a cylinder gauge.
2. Measure the rod O.D. with a 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.	0.009 to 0.127 mm 0.00035 to 0.00500 in.
	Allowable limit	0.135 mm 0.00531 in.

W1018266

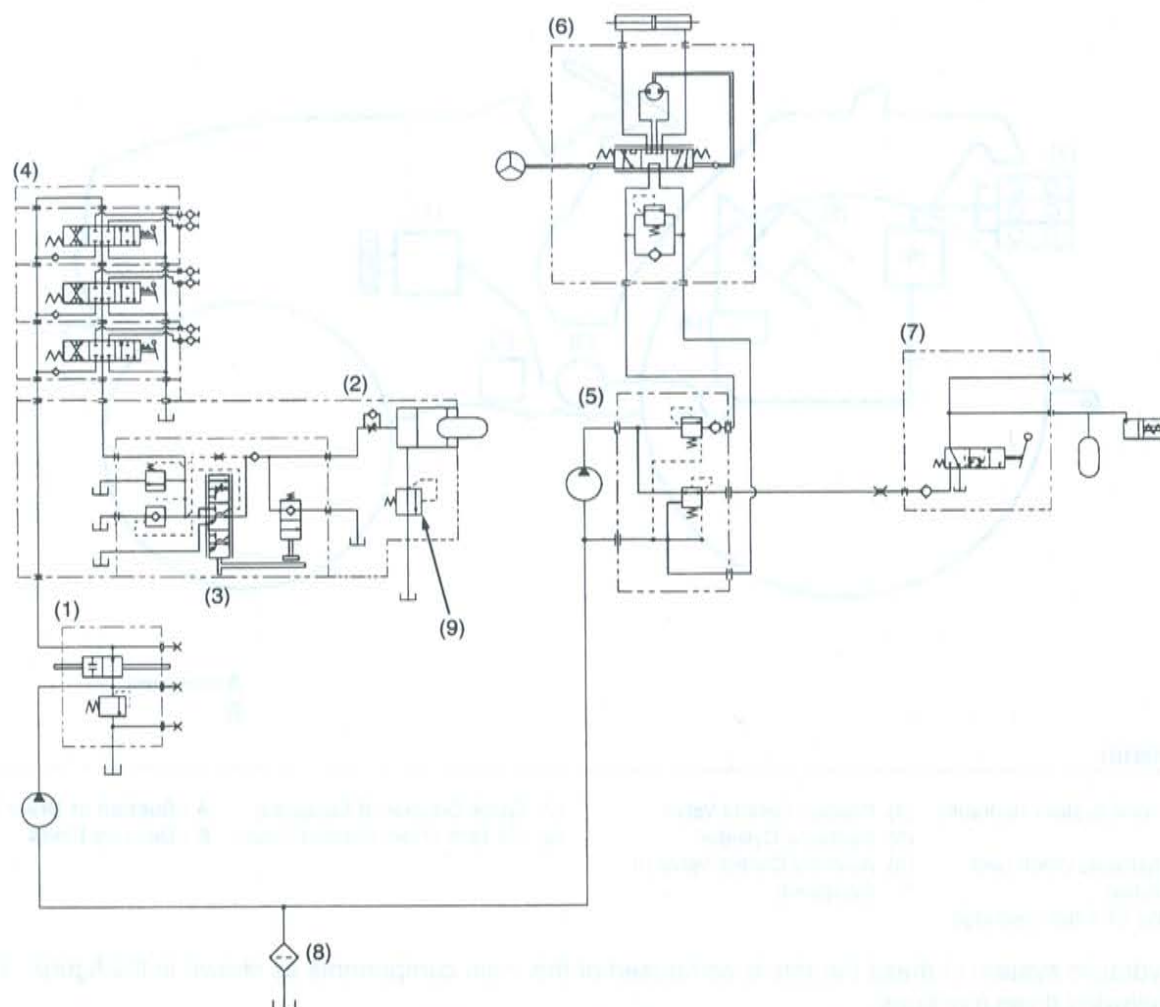
8 HYDRAULIC SYSTEM

MECHANISM

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1. HYDRAULIC CIRCUIT8-M1
2. STRUCTURE8-M2
3. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM.....8-M3

1. HYDRAULIC CIRCUIT



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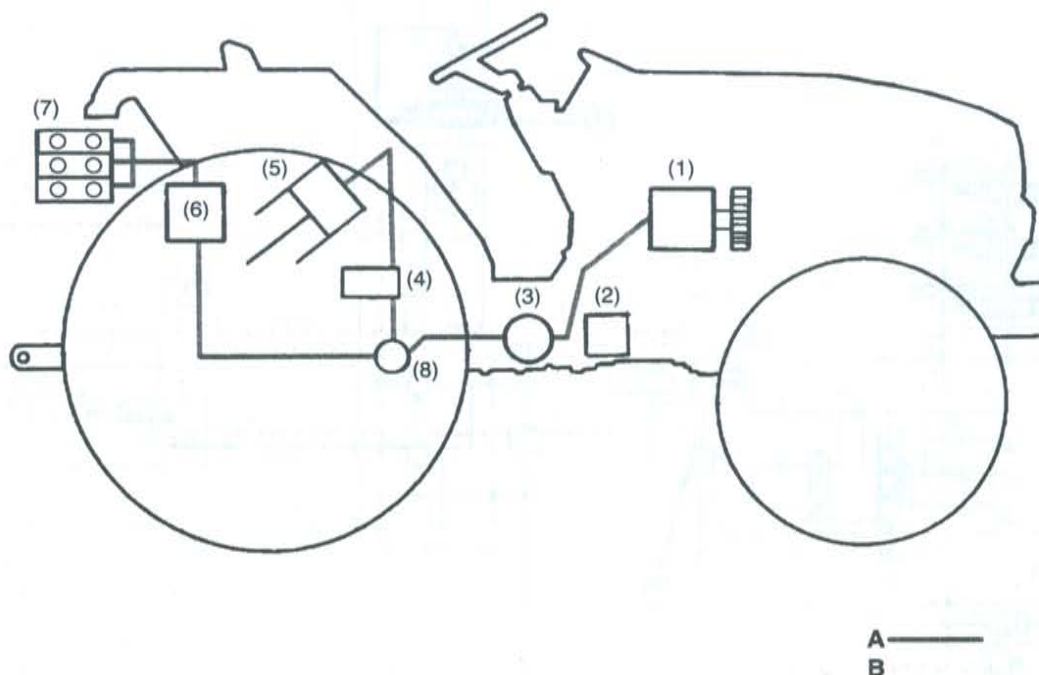
(1) Front Hydraulic Block
(2) Hydraulic Cylinder Block

(3) Position Control Valve
(4) Auxiliary Control Valve
(Option)

(5) Regulator Valve (Refer to 2
CLUTCH)
(6) Power Steering Controller

(7) PTO Clutch Valve
(8) Strainer
(9) Cylinder Safety Valve

2. STRUCTURE



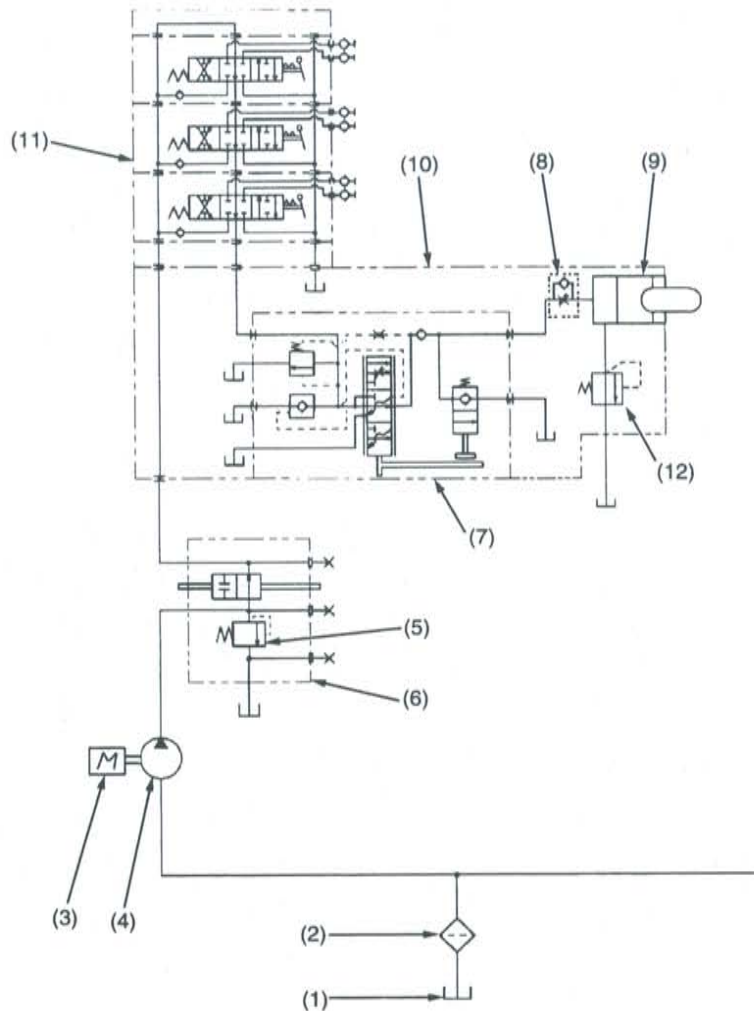
T12920HY00101

- | | | | |
|---|---|----------------------------------|-----------------------------------|
| (1) Three Point System Hydraulic Pump | (4) Position Control Valve | (7) Quick Coupler (If Equipped) | A : Suction or Drain Lines |
| (2) Front Hydraulic Block (with Relief Valve) | (5) Hydraulic Cylinder | (8) Oil Tank (Transmission Case) | B : Delivery Lines |
| (3) Hydraulic Oil Filter Cartridge | (6) Auxiliary Control Valve (If Equipped) | | |

The hydraulic system of these tractors is composed of the main components as shown in the figure. This system has the following three functions.

- To raise and lower the implement connected to the three point hitch.
For this motion, the position control valve (4) and the linkage installed on the hydraulic cylinder body provide three difference applications' position control, draft control (if equipped), and mixed control.
- Takes out hydraulic power from the front hydraulic block assembly (2) to operate an implement's hydraulic actuator.
- Takes out hydraulic power from the quick couplers (7) induced in the auxiliary control valves assembly (6) (if equipped) for the implements with actuators. In this case, the implement's cylinders can be actuated by operating the auxiliary control valves.

3. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM



- (1) Oil Tank (Transmission Case)
- (2) Hydraulic Oil Filter Cartridge
- (3) Engine
- (4) Three Point System Hydraulic Pump
- (5) Relief Valve
- (6) Front Hydraulic Block
- (7) Position Control Valve
- (8) Lowering Speed Adjusting Valve
- (9) Hydraulic Cylinder
- (10) Hydraulic Cylinder Block
- (11) Auxiliary Control Valve
- (12) Cylinder Safety Valve

W1012949

T12920HY00201

■ Hydraulic Oil Flow

1. When the engine (3) is started, the hydraulic pump (4) is rotated to draw oil from the transmission case (1) through the suction pipe. Supplied oil is filtered by the hydraulic oil filter cartridge (2).
2. Filtered oil is forced out by the hydraulic pump to the front hydraulic block (6). When a front end loaders is equipped with the tractor, oil pressure is taken from the front hydraulic block (6), and the return oil from the front end loader flows back to this front hydraulic block (6), to be returned into the oil hydraulic circuit.
3. After that oil into the position control valve (7) through the delivery pipe.
4. The position control valve (7) switches the oil flow, and oil is channeled to the hydraulic cylinder (9) for the three-point hydraulic system or return to the oil tank (transmission case) (1).
 - The hydraulic system has a relief valve (5) which restricts the maximum pressure in the circuit.
 - When hydraulic power is taken out to use a hydraulically-operated implement, implement's cylinders can be actuated by operating the double-acting auxiliary control valve (11).

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rise (Not Noise)	<ul style="list-style-type: none"> Control linkage improperly adjusted Control linkage improperly assembled or damaged Position control valve malfunctioning Relief valve spring weaken or broken Hydraulic piston O-ring, cylinder damaged 	Adjust Repair or replace Repair or replace Replace Replace	8-S9 8-S12, S19 8-S19 8-S13 8-S17
	(Noise) <ul style="list-style-type: none"> Transmission fluid improper or insufficient Oil filter clogged Suction pipe loosen or broken Relief valve setting pressure too low Relief valve spring weaken or damaged Hydraulic pump malfunctioning 	Change or replenish Replace Repair or replace Adjust Replace Repair pr replace	G-7 G-13 – 8-S13 8-S13 8-S5 to S9
Implement Does Not Reach Maximum Height	<ul style="list-style-type: none"> Position control feedback rod improperly adjusted 	Adjust	8-S10
	<ul style="list-style-type: none"> Top link length improperly adjusted 	Adjust	–
	<ul style="list-style-type: none"> Position control valve spool joint 1 improperly adjusted 	Adjust	8-S19
	<ul style="list-style-type: none"> Hydraulic arm shaft, hydraulic arm, lift arm improperly assembled 3 point link improperly set 	Adjust Adjust	8-S17 –
Implement Does Not Lower	<ul style="list-style-type: none"> Position control valve malfunctioning <ul style="list-style-type: none"> Spool damaged Poppet 2, push rod improperly adjusted Draft control rod improperly adjusted (if equipped) 	Replace Adjust Adjust	8-S19 8-S19 8-S11
Implement Drops by Weight	<ul style="list-style-type: none"> Hydraulic cylinder worn or damaged 	Replace	8-S20
	<ul style="list-style-type: none"> Safety valve damaged 	Replace	8-S14
	<ul style="list-style-type: none"> Hydraulic piston and O-ring worn or damaged 	Replace	8-S17
	<ul style="list-style-type: none"> Lowering speed adjusting valve damaged 	Replace	8-S20
	<ul style="list-style-type: none"> Position control valve malfunctioning <ul style="list-style-type: none"> Poppet 1 seat surface damaged Poppet 1 seat plug O-ring damaged Poppet 2 seat surface damaged Poppet 2 seat plug O-ring damaged 	Replace Replace Replace Replace	8-S19 8-S19 8-S19 8-S19
	<ul style="list-style-type: none"> Position control valve malfunctioning <ul style="list-style-type: none"> Poppet 1 seat surface damaged Poppet 1 seat plug O-ring damaged Poppet 2 seat surface damaged Poppet 2 seat plug O-ring damaged 	Replace Replace Replace Replace	8-S19 8-S19 8-S19 8-S19
	<ul style="list-style-type: none"> Poppet 2, push rod improperly adjusted 	Adjust	8-S19
Draft Control Malfunction	<ul style="list-style-type: none"> Draft control linkage improperly adjusted (if equipped) 	Adjust	8-S11
	<ul style="list-style-type: none"> Torsion bar weaken or broken 	Replace	–
Oil Temperature Increases Rapidly	<ul style="list-style-type: none"> Relief valve operating 	Adjust	8-S13
	<ul style="list-style-type: none"> Hydraulic pump leak or damaged 	Repair or replace	8-S6, S7
	<ul style="list-style-type: none"> Oil leaks from valves 	Repair or replace	–
	<ul style="list-style-type: none"> Gear or bearing damaged in the transmission case 	Replace	–

2. SERVICING SPECIFICATIONS

THREE POINT SYSTEM HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition <ul style="list-style-type: none"> Engine speed : Approx. 2700 rpm Rated Pressure : 16.7 to 17.7 MPa 170 to 180 kgf/cm² 2418 to 2560 psi Oil Temperature : 40 to 60 °C 104 to 140 °F 	Delivery at No Pressure	Above 34.9 L/min. 9.22 U.S.gals./min. 7.68 Imp.gals./min.	—
	Delivery at Rated Pressure	Above 34.2 L/min. 9.04 U.S.gals./min. 7.52 Imp.gals./min.	30.6 L/min. 8.08 U.S.gals./min. 6.73 Imp.gals./min.
Housing Bore	Depth of Scratch	—	0.09 mm 0.0035 in.
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.0984 in.	2.40 mm 0.0945 in.

W1013874

RELIEF VALVE

Relief Valve Condition <ul style="list-style-type: none"> Engine Speed : Maximum Oil Temperature : 40 to 60 °C 104 to 140 °F 	Setting Pressure	16.7 to 17.7 MPa 170 to 180 kgf/cm ² 2418 to 2560 psi	—
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W1013874

CYLINDER SAFETY VALVE

Cylinder Safety Valve	Operating Pressure	19.6 to 22.6 MPa 200 to 230 kgf/cm ² 2845 to 3277 psi	—
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W1011552

CONTROL LINKAGE

Lift Arm	Free Play (at Maximum Raising Position)	10 to 15 mm 0.39 to 0.58 in.	—
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W1013874

HYDRAULIC CYLINDER

Item		Factory Specification	Allowable Limit
Cylinder Bore	I.D.	90.000 to 90.050 mm 3.54330 to 3.54527 in.	90.150 mm 3.54921 in.
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.125 to 0.230 mm 0.00492 to 0.00906 in.	0.50 mm 0.0197 in.
	Clearance (Left)	0.125 to 0.220 mm 0.00492 to 0.00866 in.	0.50 mm 0.0197 in.
	Hydraulic Arm Shaft O.D. (Right)	44.920 to 44.950 mm 1.76850 to 1.76968 in.	—
	O.D. (Left)	39.920 to 39.950 mm 1.57165 to 1.57283 in.	—
	Bushing I.D. (Right)	45.075 to 45.150 mm 1.77460 to 1.77756 in.	—
	I.D. (Right)	40.075 to 40.140 mm 1.57775 to 1.58031 in.	—

W1011871

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-8.)

Item	N·m	kgf·m	ft-lbs
3P delivery pipe joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
Power steering main delivery hose joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Regulator valve mounting screw	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
Hydraulic pump assembling mounting screw and nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Rear wheel mounting screw and nut	197 to 226	20 to 23	145 to 166
Rear wheel mounting stud bolt	98.1 to 112.7	10.0 to 11.5	72.3 to 83.1
Control linkage assembly mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Hydraulic cylinder assembly mounting stud bolt	34.3 to 49.0	3.5 to 5.0	25.3 to 36.2
Hydraulic cylinder assembly mounting screw and nut	77.4 to 90.2	7.9 to 9.2	57.1 to 66.5
Position control valve mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Cylinder safety valve body	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Cylinder safety valve lock nut	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9

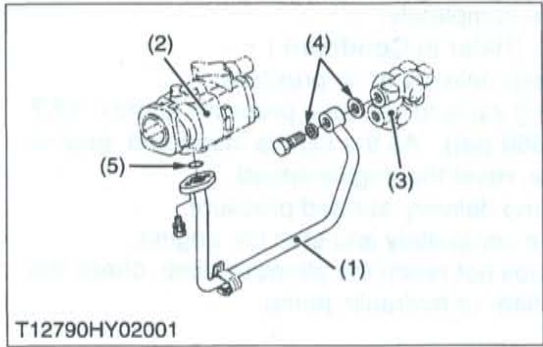
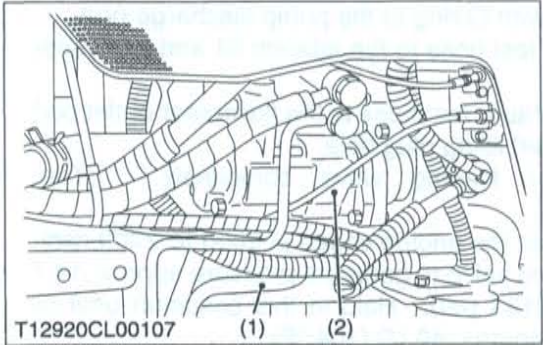
W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] HYDRAULIC PUMP

(1) Checking

(A) Pump Test Using Flow-meter



Preparation

1. Remove the 3P delivery pipe (1) between the hydraulic pump (2) and hydraulic block (3).

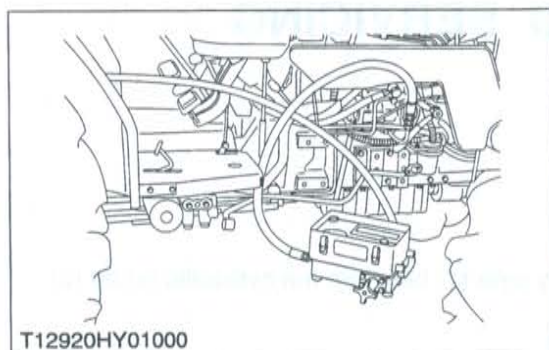
(When reassembling)

- Apply grease to the O-rings (5) and take care not to damage them.
- Install the copper washers (4) firmly.

Tightening torque	3P delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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- (1) 3P Delivery Pipe (2) Three Point System Hydraulic Pump (3) Hydraulic Block (4) Copper Washers (5) O-ring

W1018615



Hydraulic Flow Test

■ IMPORTANT

- When using a flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with that flowmeter.
 - Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.
1. Install the adaptor **61** with O-ring to the pump discharge port.
 2. Connect the hydraulic test hose to the adaptor **61** and flowmeter inlet port.
 3. Connect the other hydraulic test hose to the flowmeter outlet port and to transmission fluid filling plug hole.
 4. Open the flowmeter loading valve completely. (Turn counterclockwise.)
 5. Start the engine and set the engine speed at **2000 to 2200 rpm**.
 6. Slowly close the loading valve to generate pressure approx. **14.7 MPa (150 kgf/cm², 2133 psi)**. Hold in this condition until oil temperature reached approx. **40 °C (104 °F)**
 7. Open the loading valve completely.
 8. Set the engine speed. (Refer to **Condition**.)
 9. Read and note the pump delivery at no pressure.
 10. Slowly close the loading valve to increase pressure approx. **17.7 MPa (180 kgf/cm², 2560 psi)**. As the load is increased, engine speed drops, therefore, reset the engine speed.
 11. Read and note the pump delivery at rated pressure.
 12. Open the loading valve completely and stop the engine.
 13. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition

- Engine speed.....Approx. 2700 rpm
- Rated pressure....16.7 to 17.7 MPa
170 to 180 kgf/cm²
2418 to 2560 psi
- Oil temperature.....40 to 60 °C
104 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 34.9 L/min. 9.22 U.S.gals./min. 7.68 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	Above 34.2 L/min. 9.04 U.S.gals./min. 7.52 Imp.gals./min.
	Allowable limit	30.6 L/min. 8.08 U.S.gals./min. 6.73 Imp.gals./min.

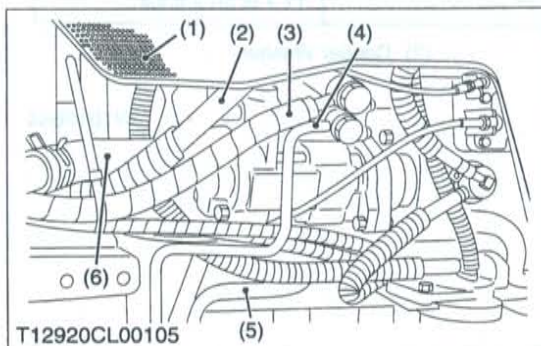
W1018791

(2) Disassembling and Assembling

■ IMPORTANT

- The hydraulic pump is precision machined and assembled : if disassemble once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assemble except when emergency repair is unavoidable.
- When repair is required, follow the disassembly and servicing procedures shown below with utmost care.
- Be sure to test the hydraulic pump with a flowmeter before disassembling.
- After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.

(A) Removing Hydraulic Pump Assembly



Preparation

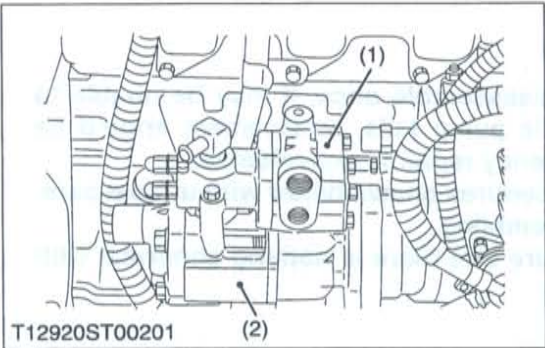
1. Remove the side cover (1).
2. Disconnect the power steering main delivery hose (3) and return hose (2).
3. Remove the PTO delivery pipe (4) and 3P delivery pipe (5).
4. Disconnect the suction hose (6).

(When reassembling)

Tightening torque	Power steering main delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	3P delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

- | | |
|---------------------------------------|-----------------------|
| (1) Side Cover | (4) PTO Delivery Pipe |
| (2) Return Hose | (5) 3P Delivery Pipe |
| (3) Power Steering Main Delivery Hose | (6) Suction Hose |

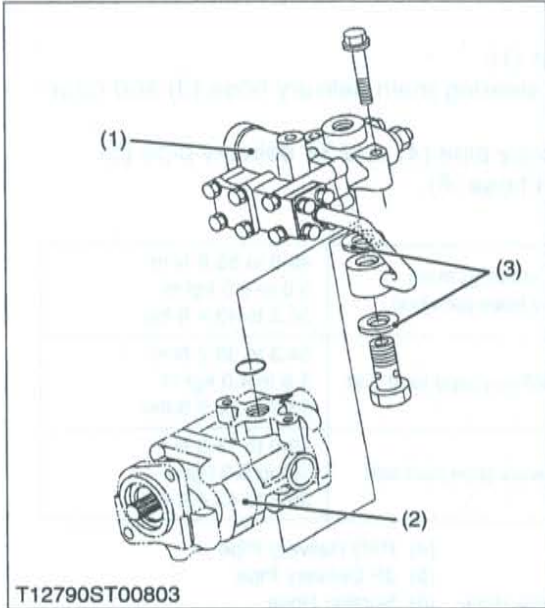
W1012802



Regulator Valve and Hydraulic Pump Assembly

- 1. Remove the regulator valve (1).
 - 2. Remove the hydraulic pump mounting screw and nut.
 - 3. Take out the hydraulic pump assembly (2).
- (When reassembling)**
- Apply grease to the O-ring and take care not to damage it.

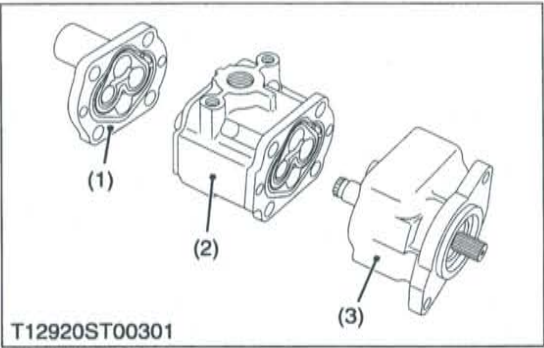
Tightening torque	Regulator valve mounting screw	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft·lbs
	Hydraulic pump assembly mounting screw and nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs



- (1) Regulator Valve
- (2) Hydraulic Pump
- (3) Copper Washer

W1012664

(B) Disassembling Three System Hydraulic Pump

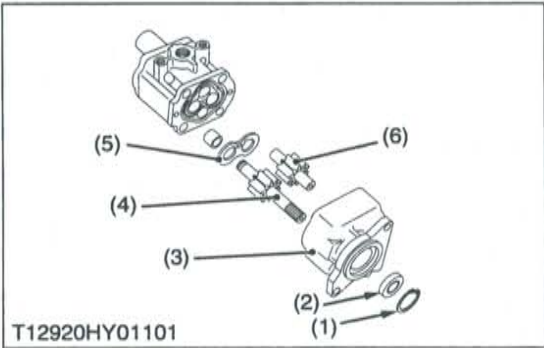


Separating Power Steering Hydraulic Pump

- 1. Remove the pump cover mounting four screws.
 - 2. Separate the power steering hydraulic pump (2) from the three point system hydraulic pump (3).
- (When reassembling)**
- Take care not to damage the O-ring.

- (1) Pump Cover
- (2) Power Steering Hydraulic Pump
- (3) Three Point System Hydraulic Pump

W1012857



Disassembling Three Point System Hydraulic Pump

- 1. Remove the side plate (5), driven gear (4) and drive gear (6).
 - 2. Remove the internal snap ring (1) and oil seal (2).
- (When reassembling)**
- If oil seal is defective, worn or scratched, replace it.
 - Install the side plate, noting its location and direction.
 - Install the gears, noting its direction.

- (1) Internal Snap Ring
- (2) Oil Seal
- (3) Casing
- (4) Driven Gear
- (5) Side Plate
- (6) Drive Gear

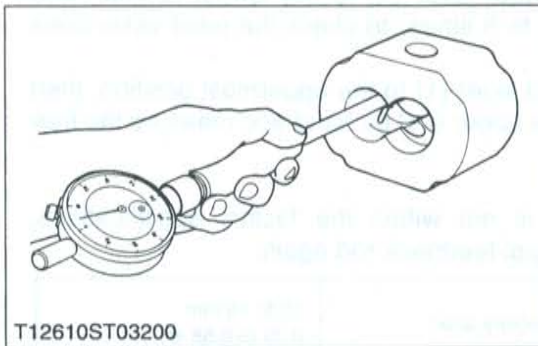
W1012960

Hydraulic Pump Running-In

After reassembly, perform break-in operation in the following manner, and check the pump for abnormality before use. If the pump temperature should rise noticeably during running-in, recheck should be performed.

1. Install the hydraulic pump to the tractor, and mount the suction pipe and delivery pipe securely.
2. Set the engine speed at 1300 to 1500 rpm, and operate the hydraulic pump at no load for about 10 minutes.
3. Set the engine speed at 2000 to 2200 rpm, and with the hydraulic pump applied with 2.94 MPa (30 kgf/cm², 427 psi) to 4.90 MPa (50 kgf/cm², 711 psi) pressure, operate it for approx. 15 minutes.
4. With the engine set to maximum speed, fully turn the steering wheel to the left or right, then actuate the relief valve five times for 25 seconds (one time 5 seconds).

W1013117

(3) Servicing

T12610ST03200

Housing Bore (Depth of Scratch)

1. Check for the scratch on the interior surface of the housing caused by the gear.
2. If the scratch reaches more than half the area of the interior surface of the housing, replace at pump assembly.
3. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
4. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.
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(Reference)

- Use a cylinder gauge to measure the housing I.D.

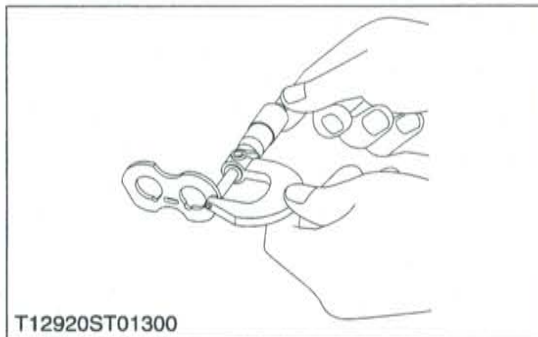
W1014649

Side Plate Thickness

1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0976 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

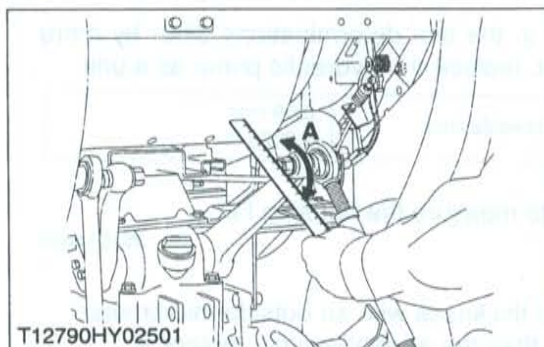
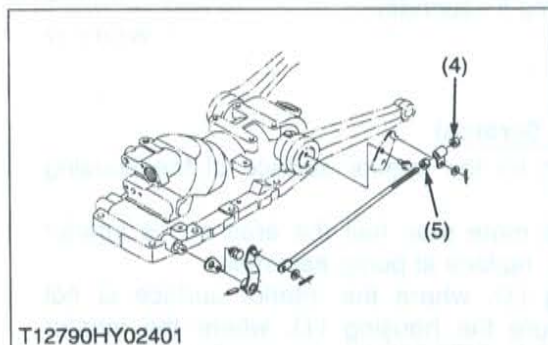
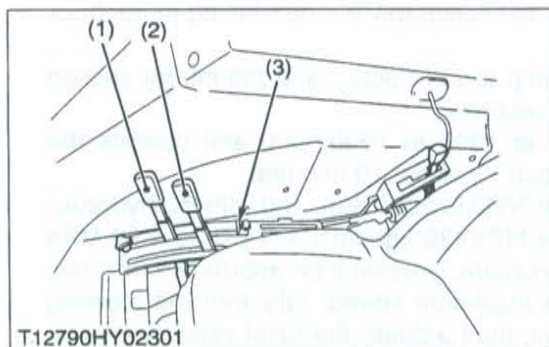
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T12920ST01300

[2] POSITION CONTROL AND DRAFT CONTROL LINKAGE

(1) Checking and Adjusting



Adjusting Position Control Feedback Rod

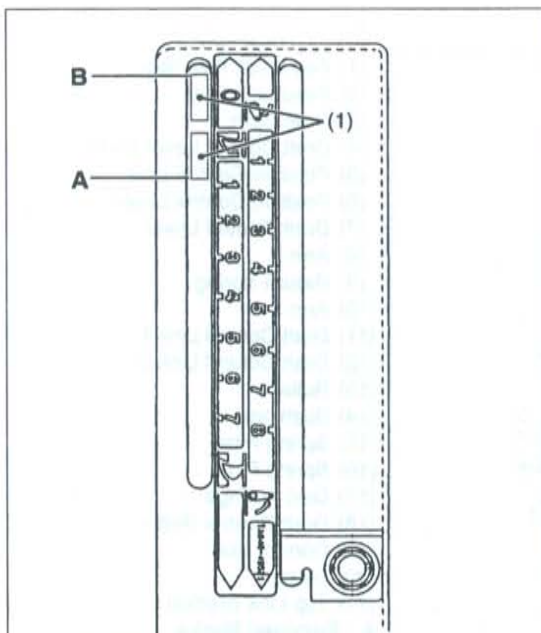
1. Set the position control lever (1) to the lowest position.
2. Set the draft control lever (2) to the lowest position. (If equipped.)
3. Start the engine, and after warming-up, set the engine speed at the idling.
4. Move the position control lever (1) to the uppermost position. [Contact to the position control lever stopper (3).]
5. Turn the adjusting nut (4) and lock nut (5) together to counterclockwise until the relief valve begins to be operated.
6. From the relief valve operating position of nuts (4) and (5), turn back the adjusting nut (4) and lock nut (5) together to clockwise by 2 turn.
7. Tighten the lock nut (5).
8. Set the engine speed at the maximum.
9. Move the position control lever (1) to the lowest position and uppermost position (3 to 5 times) to check the relief valve does not operate.
10. Set the position control lever (1) to the uppermost position, then move the lift arm to the upper end by hand and measure the free play.
11. Stop the engine.
12. If the measurement is not within the factory specifications, adjusting position control feedback rod again.

Lift arm free play at maximum raising position	Factory spec.	10 to 15 mm 0.39 to 0.58 in.
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- (1) Position Control Lever
(2) Draft Control Lever (If Equipped)
(3) Position Control Lever Stopper

- (4) Adjusting Nut
(5) Lock Nut
A : Lift Arm Free Play

W1020369



T12790HY02601

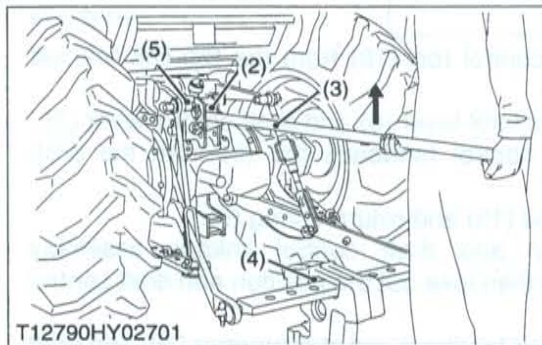
Adjusting Draft Control Rod (If Equipped)

1. Set the draft control lever (1) to the lowest position.
2. Adjust the position control feedback rod. (Refer to "Adjusting Position Control Feedback Rod". See page 8-S10.)
3. Start the engine.
4. Move the position control lever (7) and adjust so that the lower link is level.
5. Set the rear side (A) of the draft control lever (1) to the scale 1 of the lever guide. (Refer to the figure left.)
6. Set the engine speed at the maximum.
7. Attach the test bar (3) (see page G-#) to the top link bracket (2).
8. Pull the test bar (3) upward and adjust the draft control rod (6) so that the lower link is raised when the top link bracket (2) and the top link bracket holder (5) come in contact. (Confirm that the lower link is lowered when the test bar (3) is pushed downward.)
9. Confirm that the draft control will not operate (float) when the draft control lever (1) is set to lowest position (B).
10. After adjustment, tighten the lock nut firmly.

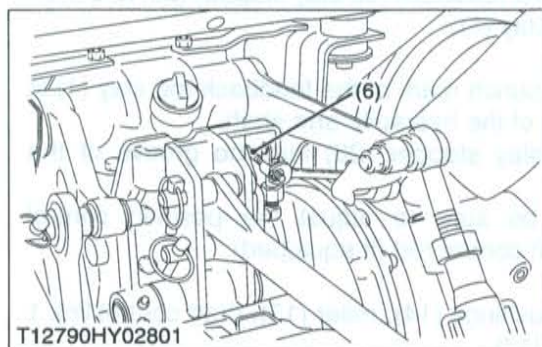
- (1) Draft Control lever
(2) Top Link Bracket
(3) Test Bar

- (4) Weight
(5) Top Link Bracket Holder
(6) Draft Control Rod

W1020770

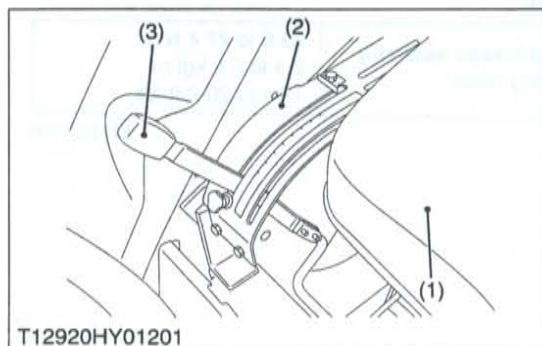


T12790HY02701



T12790HY02801

(2) Disassembling and Assembling



T12920HY01201

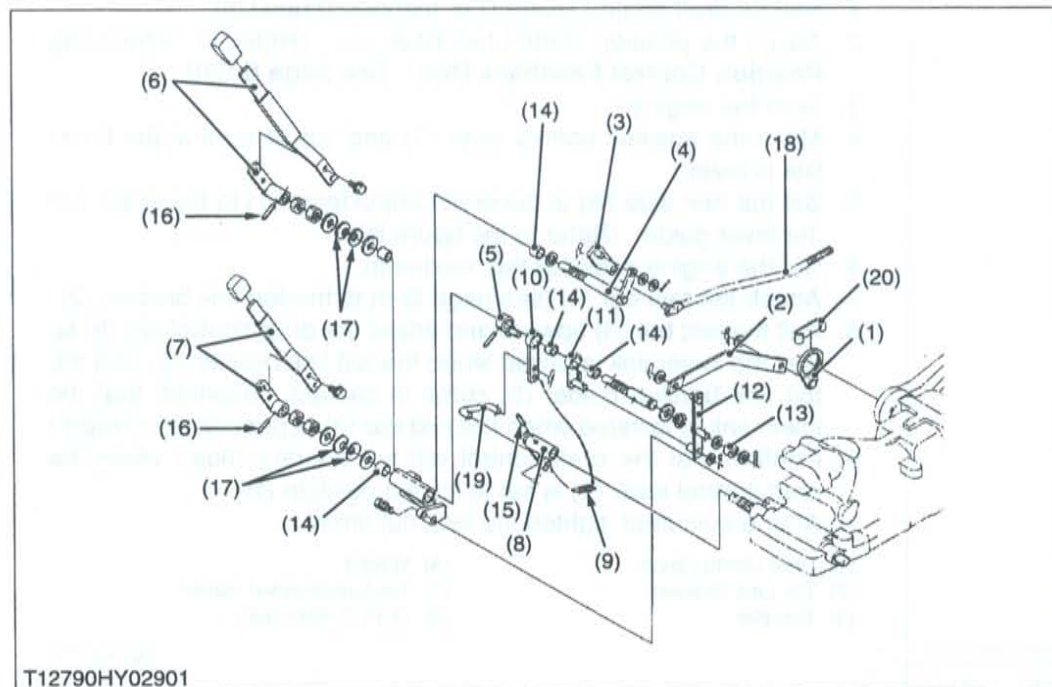
Seat and Lever Guide

1. Remove the seat (1).
2. Remove the position control lever grip (3) and draft control lever grip (if equipped).
3. Remove the lever guide (2).

- (1) Seat
(2) Lever Guide

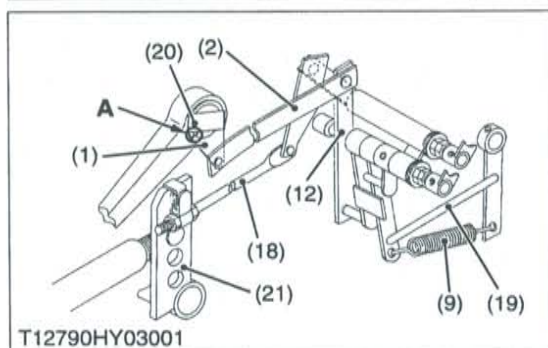
- (3) Position Control Lever Grip

W1013866

Position Control and Draft Control Linkage (if equipped)

- (1) Feedback Rod Stay
 - (2) Feedback Rod
 - (3) Draft Cam
 - (4) Draft Control Lever Shaft
 - (5) Position Control Link
 - (6) Position Control Lever
 - (7) Draft Control Lever
 - (8) Arm 2
 - (9) Return Spring
 - (10) Arm 1
 - (11) Draft Control Link 1
 - (12) Draft Control Link 2
 - (13) Roller
 - (14) Bushings
 - (15) Spring Pins
 - (16) Spring Pins
 - (17) Disc Springs
 - (18) Draft Control Rod
 - (19) Control Rod
 - (20) Stopper
 - (21) Top Link Bracket
- A : Punched Marks**
B : Hydraulic Cylinder Block Side

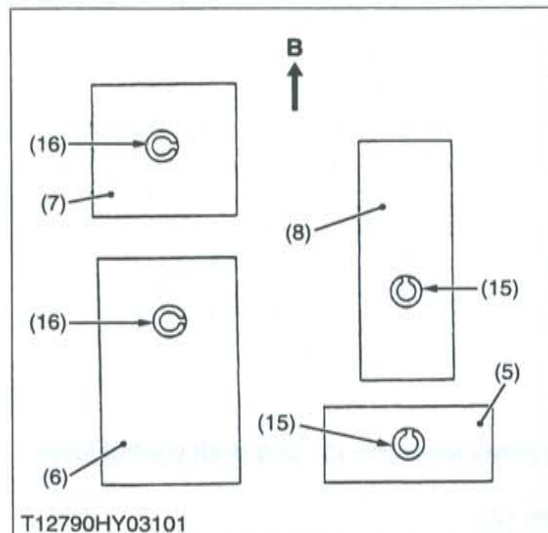
W1021774



1. Disconnect the draft control rod (18) from the top link bracket (21).
2. Remove the position control lever (6) and draft control lever (7).
3. Disconnect the draft control feedback rod (2) from the draft control link 2 (12).
4. Remove the control rod (19) and return spring (9).
5. Remove the position and draft control linkage assembly mounting screws, and then take out the position and draft control linkage assembly.
6. Remove the draft control feedback rod stay stopper (20) and draft control feedback rod stay (1).

(When reassembling)

- Assemble so that the punch mark of the feedback rod stay (1) is set to the punch mark of the hydraulic arm shaft.
- Securely fit the rod stay stopper (20) into the groove of the hydraulic arm shaft.
- After reassembling, be sure to adjust the position control feedback rod and draft control rod (if equipped). (See page 8-S10, 11)
- Apply grease to the bushings (14), roller (13), draft control link 1 (11) and disc springs (17).
- Tap in the spring pins (15), (16) so that their split portion as shown in the figure left.

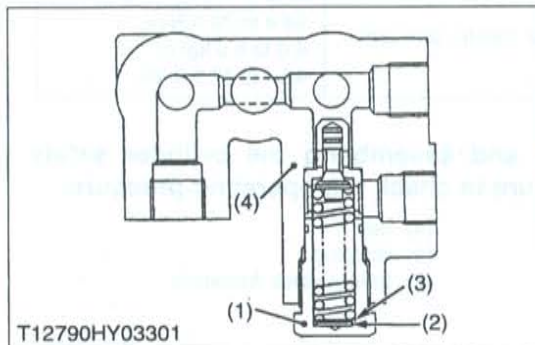
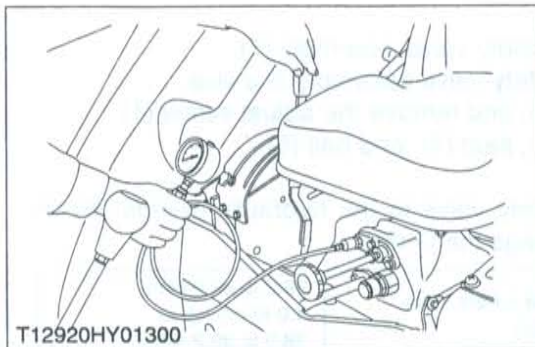


Tightening torque	Control linkage assembly mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
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W1022295

[3] RELIEF VALVE

(1) Checking and Adjusting



Relief Valve Setting pressure Test Using Pressure Tester

1. Remove the plug (screw head size : 17 mm) from front of hydraulic cylinder block.
2. Install the adaptor 58 (screw size : PT 1/4). Then connect the cable and pressure gauge to adaptor 58.
3. Remove the position control lever stopper.
4. Start the engine and set at maximum speed.
5. Move the position control lever all way up to operate the relief valve and read the gauge.
6. If the pressure is not within the factory specifications, remove the plug (1) of front hydraulic block (4) and adjust with the adjusting shims (3).
7. After the relief valve setting pressure test, reset the position control lever stopper firmly.

Relief valve setting pressure	Factory spec.	16.7 to 17.7 MPa 170 to 180 kgf/cm ² 2418 to 2560 psi
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Condition

- Engine speed.....Maximum
- Oil temperature.....40 to 60 °C
104 to 140 °F

(Reference)

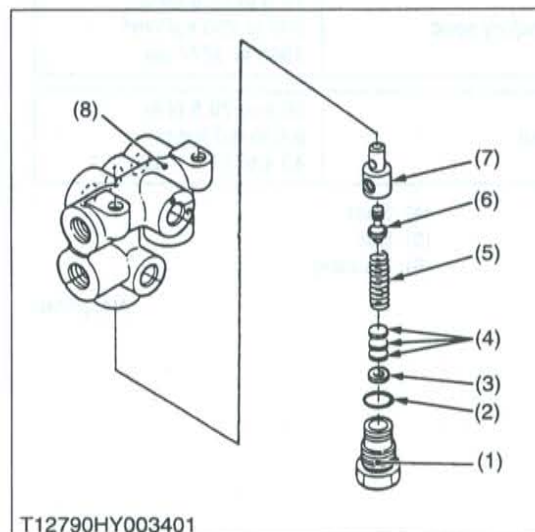
- Thickness of shims (3) : 0.1 mm (0.0039 in.)
0.2 mm (0.0078 in.)
0.4 mm (0.0157 in.)
- Pressure change per
0.1 mm (0.0039 in.) shim : Approx. 264.8 kPa
2.7 kgf/cm²
38.4 psi

- (1) Plug
(2) Washer

- (3) Adjusting Shim
(4) Front Hydraulic Block

W1022630

(2) Disassembling and Assembling



Relief Valve

1. Remove the plug (1), and draw out the spring (5) and the poppet (6).
2. Take out the valve seat (7).

(When reassembling)

- Take care not to damage the O-ring.

Tightening torque	Relief valve plug	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft·lbs
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■ IMPORTANT

- After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure.

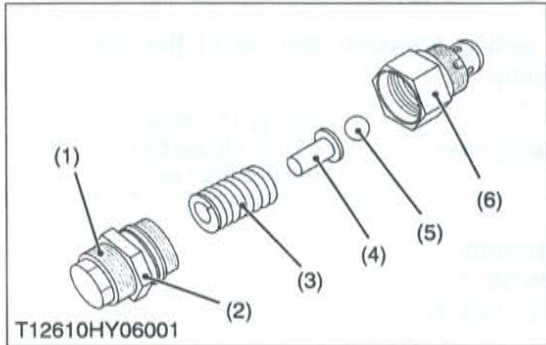
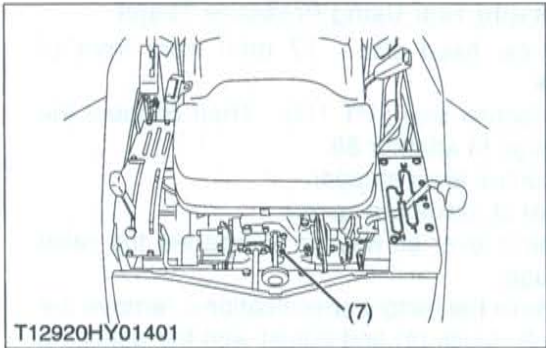
- (1) Plug
(2) O-ring
(3) Washer
(4) Adjusting Shims

- (5) Spring
(6) Poppet
(7) Valve Seat
(8) Front Hydraulic Block

W1023025

[4] CYLINDER SAFETY VALVE

(1) Disassembling and Assembling



Cylinder Safety Valve

- 1. Remove the cylinder safety valve assembly (7).
- 2. Secure the cylinder safety valve assembly in a vise.
- 3. Loosen the lock nut (2), and remove the adjust screw (1).
- 4. Draw out the spring (3), seat (4), and ball (5).

(When reassembling)

- Install the cylinder safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.

Tightening torque	Cylinder safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs
	Cylinder safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft-lbs

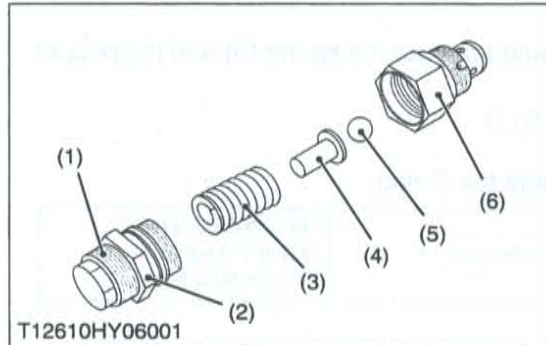
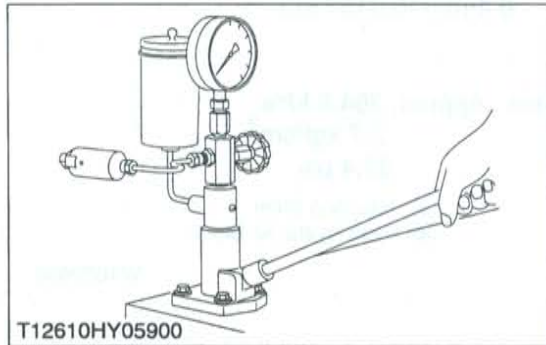
■ IMPORTANT

- After disassembling and assembling the cylinder safety valve assembly, be sure to check the operating pressure.

- | | |
|------------------|---------------------------|
| (1) Adjust Screw | (5) Ball |
| (2) Lock Nut | (6) Housing |
| (3) Spring | (7) Safety Valve Assembly |
| (4) Seat | |

W1024851

(2) Servicing



Operating Pressure of Cylinder Safety Valve

- 1. Attach the cylinder safety valve to a injection nozzle tester with a safety valve setting adaptor.
- 2. Measure the operating pressure of the cylinder safety valve.
- 3. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (1).
- 4. After adjustment, tighten the lock nut (2) firmly.

■ NOTE

- Use specified transmission fluid (see page G-7) to test the operating pressure of the cylinder safety valve.

Cylinder safety valve operating pressure	Factory spec.	19.6 to 22.6 MPa 200 to 230 kgf/cm ² 2845 to 3277 psi
Tightening torque	Lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft-lbs

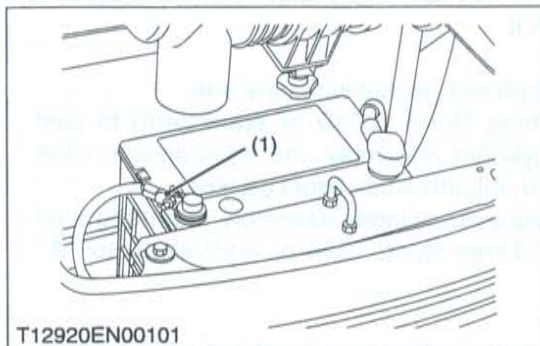
- | | |
|---------------------|-------------|
| (1) Adjusting Screw | (4) Seat |
| (2) Lock Nut | (5) Ball |
| (3) Spring | (6) Housing |

W1020561

[5] HYDRAULIC CYLINDER AND POSITION CONTROL VALVE

(1) Disassembling and Assembling

(A) Removing Hydraulic Cylinder Assembly

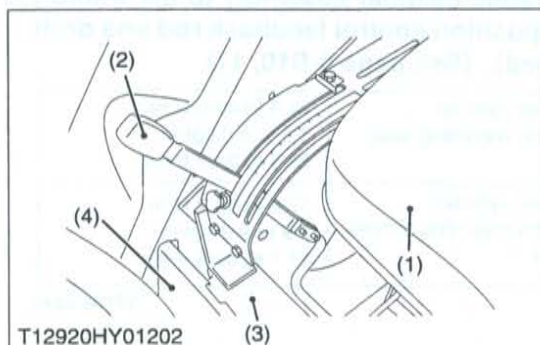


Battery Negative Cable

1. Disconnect the battery negative cable (1).

(1) Battery Negative Cable

W1015244



Seat and Fender Support

1. Remove the seat (1) and position lever grip (2).
2. Remove the front drip lever grip and center cover (4).
3. Remove the fender support (3).

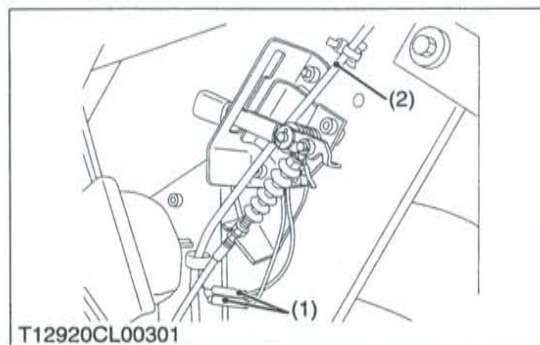
(1) Seat

(2) Grip

(3) Fender Support

(4) Center Cover

W1015313

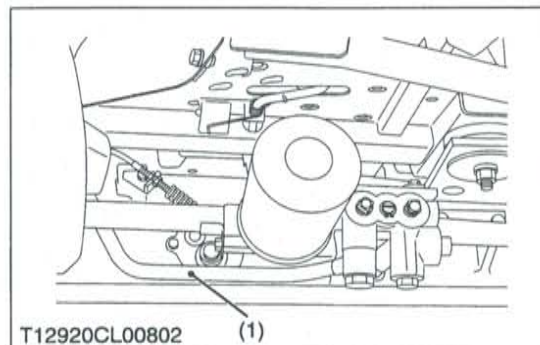


Wiring

1. Disconnect the **1P** connector (1) for PTO safety switch.
2. Disconnect the **1P** connector for hazard light (R.H.) and remove the wiring (2).

(1) **1P** Connector for PTO Safety Switch (2) Wiring for Hazard Light

W1015533



3P Delivery Pipe

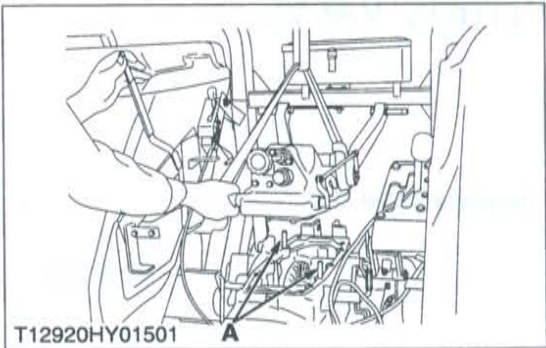
1. Remove the 3P delivery pipe (1) (from hydraulic block to hydraulic cylinder assembly).

(When reassembling)

Tightening torque	3P delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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(1) 3P Delivery Pipe

W1015631



Hydraulic Cylinder Assembly

- 1. Disconnect the lift rods from lift arms.
- 2. Loosen and remove the hydraulic cylinder assembly mounting screws and nuts.
- 3. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then take out it.

(When reassembling)

- Replace the hydraulic cylinder gasket with new one.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.
- When replacing the hydraulic cylinder assembly mounting stud bolts, apply liquid lick (Three Bond 1324 or equivalent) to “A” portion of the stud bolt.

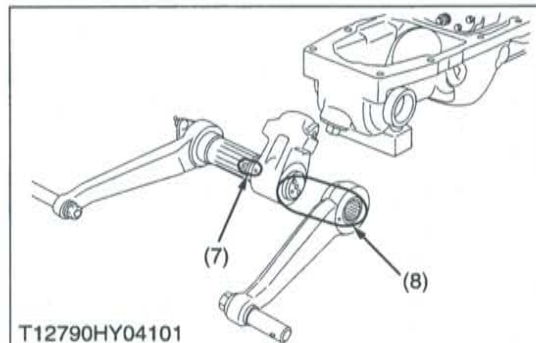
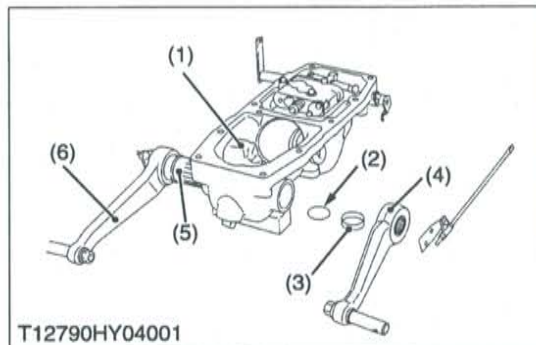
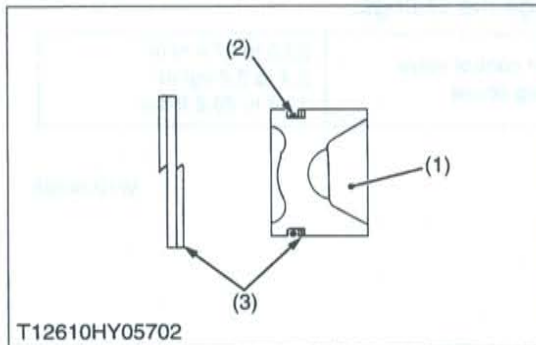
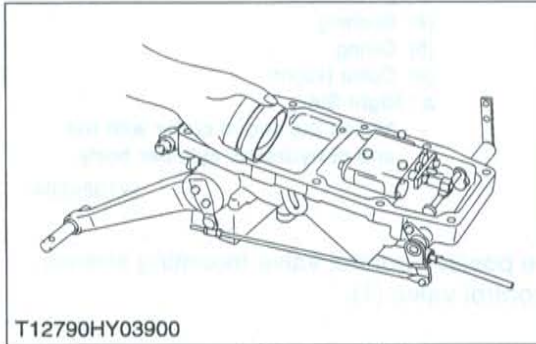
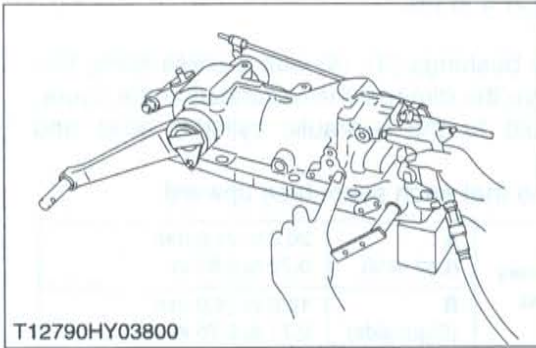
NOTE

- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod (If equipped). (See page 8-S10, 11)

Tightening torque	Hydraulic cylinder assembly mounting stud bolt	34.3 to 49.0 N·m 3.5 to 5.0 kgf·m 25.3 to 36.2 ft-lbs
	Hydraulic cylinder assembly mounting screws and nut	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

W1023395

(B) Disassembling Hydraulic Cylinder Assembly



Hydraulic Rod and Hydraulic Piston

1. Tap out the spring pin.
2. Remove the hydraulic rod.
3. Remove the plug (screw head size : 17 mm) from front of hydraulic cylinder.
4. Inject the compressed air through the plug hole, and take out the hydraulic piston.



CAUTION

- Do not put your hand into the hydraulic cylinder block because the hydraulic piston jumps out with a strong force, which is dangerous.

(When reassembling)

- Install the piston, nothing O-ring (2) and back-up ring (3). (See figure.)
- Apply transmission fluid to the cylinder, and then install the piston.
- Apply grease to the piston bottom contacts with hydraulic rod.

- (1) Piston
(2) O-ring

- (3) Back-up Ring

W1023541

Lift Arm, Hydraulic Arm and Hydraulic Arm Shaft

1. Disconnect the feedback rod from feedback lever.
2. Remove the lift arm setting screws.
3. Remove the lift arm LH (4).
4. Draw out the hydraulic arm shaft (5) and lift arm RH (6) as a unit.
5. Take out the hydraulic arm (1).
6. Remove the collar (3) and O-ring (2).

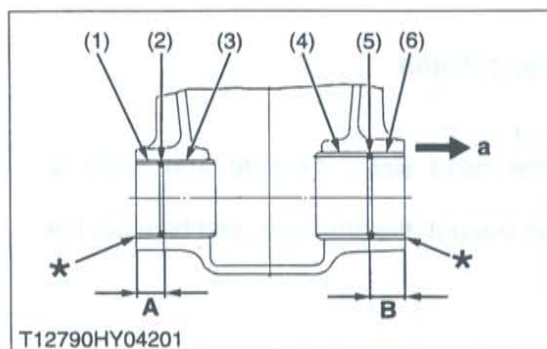
(When reassembling)

- Align the alignment marks (7) of the hydraulic arm (1) and hydraulic arm shaft (5).
- Align the alignment marks (8) of the lift arms (6), (4) and hydraulic arm shaft (5).
- Apply grease to the right and left bushings of hydraulic cylinder block and O-ring (2).
- Take care not to damage the O-ring (2).

- (1) Hydraulic Arm
(2) O-rings
(3) Collars
(4) Lift Arm LH
(5) Hydraulic Arm Shaft
(6) Lift Arm RH

- (7) Alignment Mark
(Hydraulic Arm Shaft and Hydraulic Arm)
(8) Alignment Mark
(Hydraulic Arm Shaft and Lift Arm)

W1024025



Bushings

1. Remove the bushings (3) and (4).

(When reassembling)

- When press-fitting new bushings (3), (4) with a press-fitting tool (see page G-40) observe the dimensions described in the figure.
- Apply transmission fluid to the hydraulic cylinder boss and bushing.
- Press-fit the bushing so that each seam face upward.

Press-fit location of bushing	Factory spec.	A (Left side)	20.0 to 21.0 mm 0.79 to 0.83 in.
		B (Right side)	18.0 to 19.0 mm 0.71 to 0.75 in.

- (1) Collar (Left)
- (2) O-ring
- (3) Bushing (Left)

- (4) Bushing
- (5) O-ring
- (6) Collar (Right)

a : Right Side

*Flush the end of collar with the end of hydraulic cylinder body.

W1024284

Position Control Valve

1. Loosen and remove the position control valve mounting screws.
2. Take out the position control valve (1).

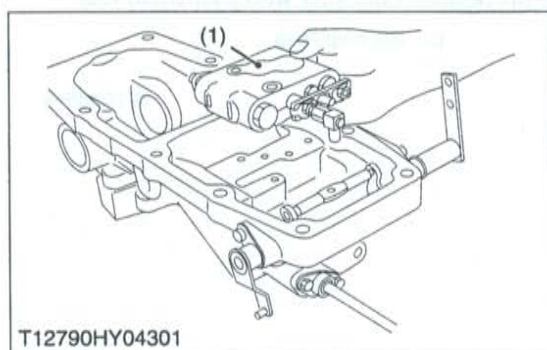
(When reassembling)

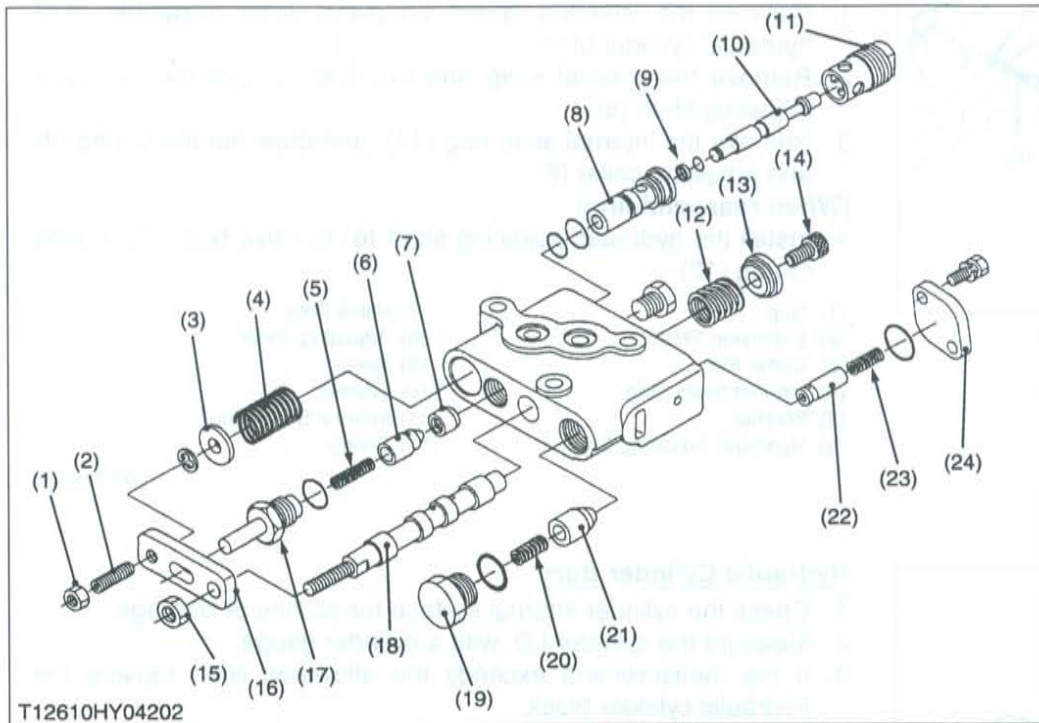
- Take care not to damage the O-rings.

Tightening torque	Position control valve mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
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- (1) Position Control Valve

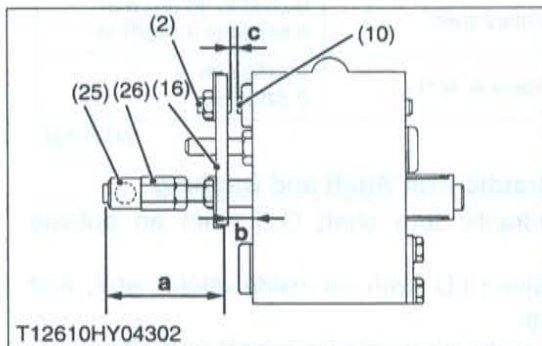
W1024698



Disassembling Position Control Valve

- (1) Nut 1
- (2) Set Screw
- (3) Washer
- (4) Spring
- (5) Spring
- (6) Poppet 1
- (7) Valve Seat
- (8) Sleeve
- (9) Backup Ring
- (10) Poppet 2
- (11) Plug
- (12) Spring
- (13) Spring Holder
- (14) Screw
- (15) Nut 2
- (16) Plate 1
- (17) Fulcrum Pin
- (18) Spool
- (19) Unload Plug
- (20) Spring
- (21) Unload Poppet
- (22) Poppet 3
- (23) Spring
- (24) Plate 2
- (25) Spool Joint 2
- (26) Spool Joint 1

W1016748



■ It is possible to disassemble as shown in the figure above.

■ **IMPORTANT**

- Set screw (2) and spool joint 1 (26) are adjusted to very close accuracy. Do not disassemble them or cause them to be out of order unless necessary.

If disassembled due to unavoidable reasons, be sure to make the following adjustments before assembling.

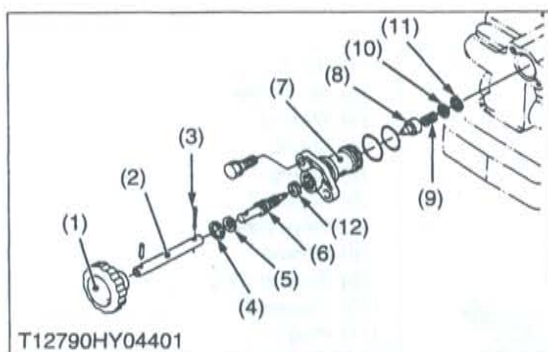
■ **Dimensions for assembling spool joint 1 (26)**

1. Turn and adjust the spool joint 1 (26) so that the dimension (a) between the spool joint 2 (25) and the plate 1 (16) is 47.5 mm (1.87 in.).
2. After the adjustment, be sure to adjust the position control feedback rod.

■ **Dimensions for assembling set screw (2)**

1. Set the dimension (b) between the plate 1 (16) and the valve body to 16.0 mm (0.63 in.).
2. Turn and adjust the set screw (2) so that the clearance (c) between the set screw (2) and the poppet 2 (10) is 0.1 to 0.2 mm (0.0039 to 0.0079 in.).

W1017128



Lowering Speed Adjusting Valve

1. Remove the lowering speed adjusting valve assembly from hydraulic cylinder block.
2. Remove the internal snap ring (4), and remove the hydraulic adjusting shaft (6).
3. Remove the internal snap ring (11), and draw out the spring (9) and adjusting collar (8).

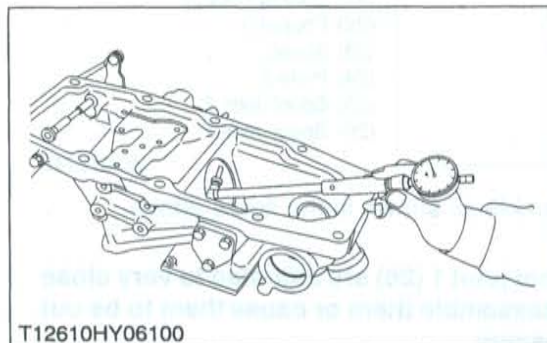
(When reassembling)

- Install the hydraulic adjusting shaft (6) to valve body (7), noting O-ring (12).

- | | |
|-------------------------------|-------------------------|
| (1) Grip | (7) Valve Body |
| (2) Extension Shaft | (8) Adjusting Collar |
| (3) Cotter Pin | (9) Spring |
| (4) Internal Snap Ring | (10) Washer |
| (5) Washer | (11) Internal Snap Ring |
| (6) Hydraulic Adjusting Shaft | (12) O-ring |

W1025732

(2) Servicing

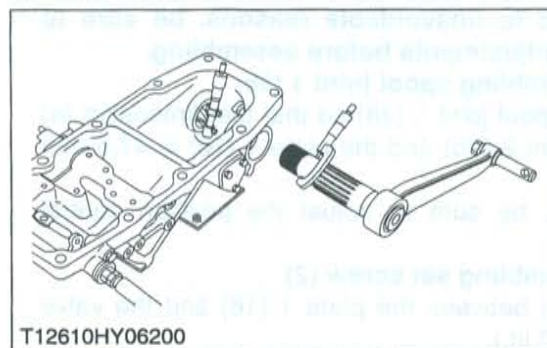


Hydraulic Cylinder Bore

1. Check the cylinder internal surface for scoring or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace the hydraulic cylinder block.

Cylinder I.D.	Factory spec.	90.000 to 90.050 mm 3.54330 to 3.54527 in.
	Allowable limit	90.150 mm 3.54921 in.

W1026023



Clearance between Hydraulic Arm Shaft and Bushing

1. Measurement the hydraulic arm shaft O.D. with an outside micrometer.
2. Measurement the bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit. replace the bushing.

Clearance between hydraulic arm shaft and bushing	Right	Factory spec.	0.125 to 0.230 mm 0.00492 to 0.00906 in.
		Allowable limit	0.50 mm 0.0197 in.
	Left	Factory spec.	0.125 to 0.220 mm 0.00492 to 0.00866 in.
		Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D.	Right	Factory spec.	44.920 to 44.950 mm 1.76850 to 1.76968 in.
	Left	Factory spec.	39.920 to 39.950 mm 1.57165 to 1.57283 in.

Bushing I.D. (after press fitted)	Right	Factory spec.	45.075 to 45.150 mm 1.77460 to 1.77756 in.
	Left	Factory spec.	40.075 to 40.140 mm 1.57775 to 1.58031 in.

W1026122

9 ELECTRICAL SYSTEM

MECHANISM

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[2] WIRING DIAGRAM	9-M2

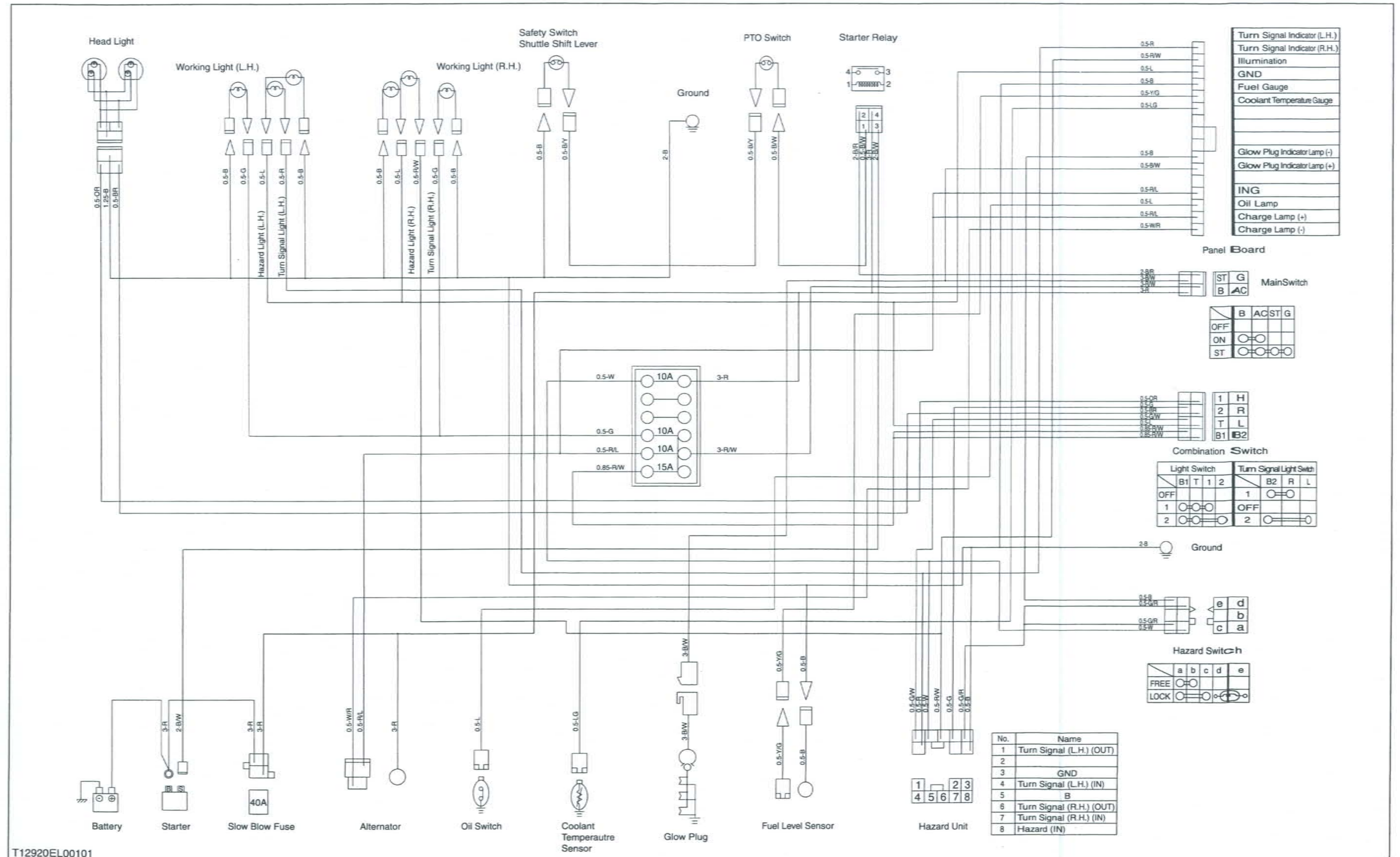
1. WIRING DIAGRAM

[1] COLOR OF WIRING

B Black	RW Red / White
W White	RY Red / Yellow
R Red	RG Red / Green
G Green	RL Red / Blue
Or Orange	GB Green / Black
Y Yellow	GW Green / White
Br Brown	GR Green / Red
L Blue	GY Green / Yellow
Lg Light Green	GL Green / Blue
WB White / Black	YR Yellow / Red
WR White / Red	YB Yellow / Black
BL Black / Blue	LB Blue / Black
BR Black / Red	YL Yellow / Blue
BW Black / White	LW Blue / White
BY Black / Yellow	LR Blue / Red
BPu Black / Purple	LY Blue / Yellow
BP Black / Pink	LgW Light Green / White
BrY Brown / Yellow	LgB Light Green / Black
RB Red / Black	LgY Light Green / Yellow

W1014151

[2] WIRING DIAGRAM



T12920EL00101

SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipment Do Not Operate	• Battery discharged or defective	Recharge or replace	G-16
	• Battery positive cable disconnected or improperly connected	Repair or replace	—
	• Battery negative cable disconnected or improperly connected	Repair or replace	—
	• Slow blow fuse blown	Replace	—
Fuse Blown Frequently	• Short-circuited	Repair or replace	—

W1014322

BATTERY

Battery Discharges Too Quickly	• Battery defective	Replace	—
	• Alternator defective	Repair or replace	9-S16
	• IC Regulator defective	Replace	9-S16
	• Wiring harness disconnected or improperly connected (between battery positive terminal and regulator B terminal)	Repair or replace	—
	• Cooling fan belt slipping	Adjust tension	G-18

W1013718

STARTING SYSTEM

Starter Motor Does Not Operate	• Battery discharged or defective	Recharge or replace	G-16
	• Slow blow fuse blown	Replace	G-27
	• Safety switch improperly adjusted or defective	Repair or replace	9-S11
	• Wiring harness disconnected or improperly connected (between main switch terminal 3 and safety switches, between safety switches and starter motor, between battery positive terminal and starter motor)	Repair or replace	—
	• Starter motor defective	Repair or replace	9-S11
	• Main switch defective	Replace	9-S8
Glow Lamp Does Not Light	• Fuse blown (10 A)	Replace	G-27
	• Water temperature sensor defective	Replace	9-S26
	• Bulb blown	Replace	G-28
	• Main switch defective	Replace	9-S8
	• Circuit in panel board defective	Replace	—
	• Wiring harness disconnected or improperly connected (between main switch terminal 2 and panel board, between panel board and glow controller, between glow controller and ground)	Repair or replace	—

W1013718

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light when Main Switch is Turned ON	<ul style="list-style-type: none"> Fuse blown (10 A) Wiring harness disconnected or improperly connected (between main switch terminal 2 and panel board, between panel board and alternator) 	Replace Repair or replace	G-27 –
	<ul style="list-style-type: none"> Alternator defective 	Repair or replace	9-S15
Charging Lamp Does Not Go Off When Engine is Running	<ul style="list-style-type: none"> Wiring harness disconnected or improperly connected (between main switch terminal 2 and alternator, between panel board and alternator) 	Replace Repair or replace	–
	<ul style="list-style-type: none"> Alternator defective 	Repair or replace	9-S15

W1013580

LIGHTING SYSTEM

Head Light Does Not Light	<ul style="list-style-type: none"> Fuse blown (15 A) Bulb blown 	Replace Replace	G-27 G-28
	<ul style="list-style-type: none"> Wiring harness disconnected or improperly connected (between main switch terminal 2 and combination switch B1 terminal, between combination switch 1 terminal and head light, between combination switch 2 terminal and head light) 	Repair or replace	–
Hazard Light Does Not Light	<ul style="list-style-type: none"> Fuse blown (10 A) Bulb blown 	Replace Replace	G-27 G-28
	<ul style="list-style-type: none"> Wiring harness disconnected or improperly connected Flasher unit defective Hazard switch defective 	Repair or replace Replace Replace	– 9-S24 9-S22

W1013718

EASY CHECKER

Engine Oil Pressure Lamp Lights Up When Engine Is Running	<ul style="list-style-type: none"> Engine oil pressure too low Engine oil insufficient Engine oil pressure switch defective 	Repair engine Replenish Replace	– G-7 9-S25
	<ul style="list-style-type: none"> Short circuit between engine oil pressure switch lead and chassis Circuit in panel board defective 	Repair Replace	– 9-S26
Engine Oil Pressure Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running	<ul style="list-style-type: none"> Bulb blown Engine oil pressure switch defective 	Replace Replace	G-28 9-S25
	<ul style="list-style-type: none"> Wiring harness disconnected or improperly connected (between panel board and engine oil pressure switch) Circuit in panel board defective 	Repair or replace Replace	– 9-S26

W1013718

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	<ul style="list-style-type: none"> Fuel gauge defective Fuel lever sensor (tank unit) defective Wiring harness disconnected or improperly connected (between panel board and fuel level sensor) 	Replace Replace Repair or replace	9-S26 9-S26 —
	<ul style="list-style-type: none"> Circuit in panel board defective 	Replace	9-S26
Coolant Temperature Gauge Does Not Function	<ul style="list-style-type: none"> Coolant temperature gauge defective Coolant temperature sensor defective Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor) 	Replace Replace Repair or replace	9-S26 9-S26 —
	<ul style="list-style-type: none"> Circuit in panel board defective 	Replace	9-S26

W1013718

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Starter	Commutator	O.D. 30.0 mm 1.181 in.	29.0 mm 1.142 in.
	Mica	Under Cut 0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.20 mm 0.0079 in.
	Brush	Length 15.0 mm 0.591 in.	11.0 mm 0.433 in.
	Brush Holder and Holder Support	Resistance Infinity	—
Glow Plug		Resistance Approx. 0.9 Ω	—
Fuel Level Sensor			
Float at Upper-most Position		Resistance 1.0 to 5.0 Ω	—
Float at Lower-most Position		Resistance 103 to 117 Ω	—
Coolant Temperature Sensor			
at 130 °C (266 °F)		Resistance Approx. 12.2 Ω	—
at 105 °C (221 °F)		Resistance Approx. 23.6 Ω	—
at 80 °C (176 °F)		Resistance Approx. 51.9 Ω	—
at 50 °C (122 °F)		Resistance Approx. 153.9 Ω	—
Alternator		No-load voltage More than 14 V	—
Stator		Resistance Less than 1.0 Ω	—
Rotor		Resistance 2.9 Ω	—
Slip Ring		O.D. 14.4 mm 0.567 in.	12.8 mm 0.504 in.
Brush		Length 10.5 mm 0.413 in.	8.4 mm 0.331 in.

W1013874

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-8.)

Item	N·m	kgf·m	ft-lbs
Alternator pulley nut	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2
Starter terminal nut	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7

W1012736



4. CHECKING, DISASSEMBLING AND SERVICING

CAUTION

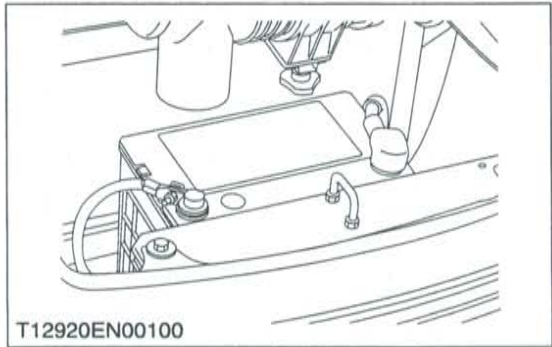
- To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.
- Never remove the battery cap while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are spattered with 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

(1) Checking

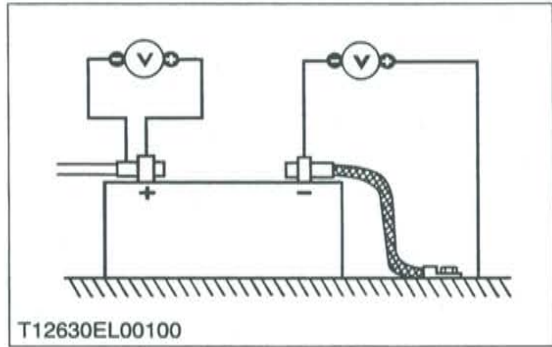


Battery Voltage

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	Reference value	More than 12 V
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W1012562

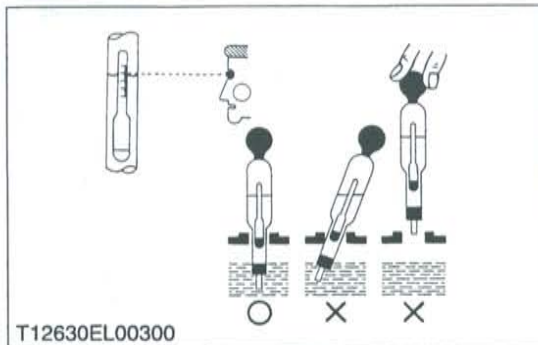
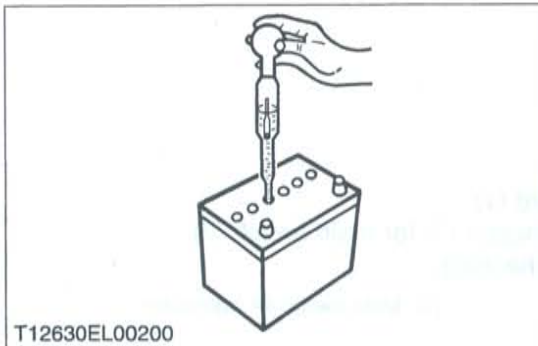


Battery Terminal Connection

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	Reference value	Less than 0.1 V
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W1012663



Battery Specific Gravity

1. Check the specific gravity of the electrolyte in each cell with a hydrometer.
2. When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned in (Reference).
3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity differs between any two cells by more than 0.05, replace the battery.

NOTE

- Hold the hydrometer tube vertical without removing it from the electrolyte.
- Do not suck too much electrolyte into the tube.
- Allow the float to move freely and hold the hydrometer at eye level.
- The hydrometer reading must be taken at the highest electrolyte level.

(Reference)

- Specific gravity slightly varies with temperature. To be exact, the specific gravity decreases by 0.0007 with an increase of 1 °C (0.0004 with an increase of 1 °F) in temperature, and increases by 0.0007 with a decreases of 1 °C (0.0004 with a decrease of 1 °F).

Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula :

- Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature : 20 °C)
- Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature : 68 °C)

Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

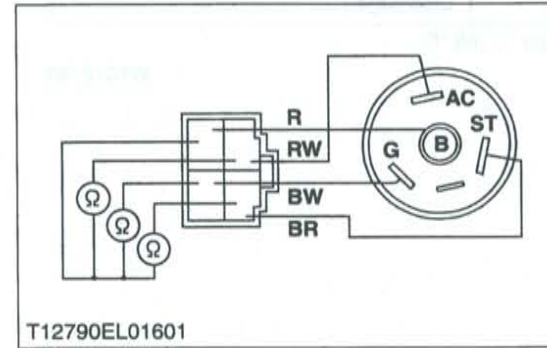
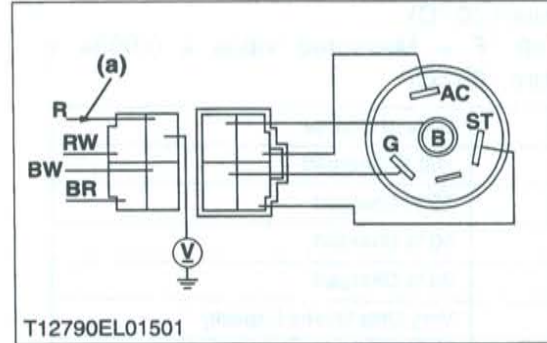
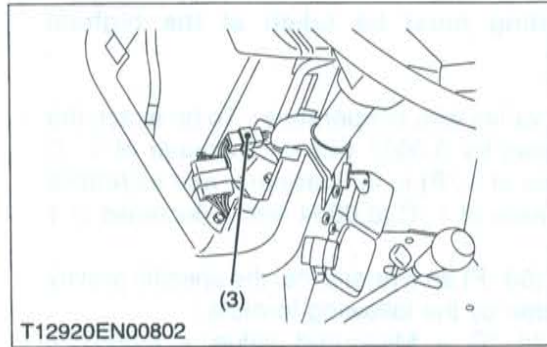
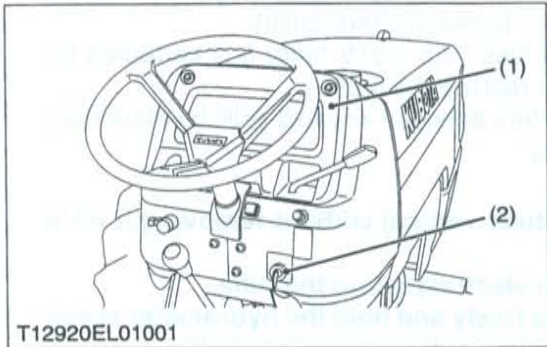
At an electrolyte temperature of 20 °C (68 °F)

W1012763

[2] STARTING SYSTEM

(1) Checking

(A) Main Switch



Main Switch

1. Remove the panel board (1).
2. Disconnect the 4P connector (3) for main switch (2).
3. Perform the following checking.

- (1) Panel Board
- (2) Main Switch
- (3) Main Switch 4P Connector

W1021298

Connector Voltage

1. Measure the voltage with a voltmeter across the connector B terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector B terminal – Chassis	Approx. battery voltage
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(a) From Battery Positive Terminal

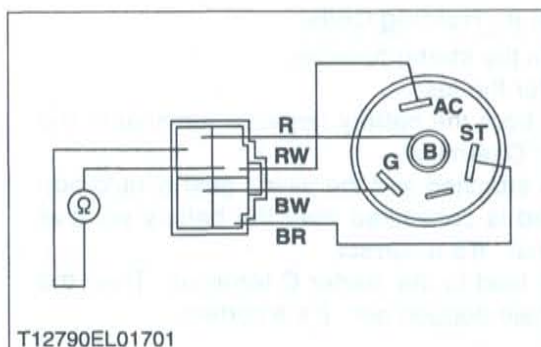
W1022319

Main Switch Key at OFF Position

1. Turn the main switch off.
2. Measure the resistance with an ohmmeter across the B terminal and the AC terminal, B terminal and ST terminal, and B terminal and G terminal.
3. If infinity is not indicated, the contact of the main switch are faulty.

Resistance	B terminal – AC terminal	Infinity
	B terminal – ST terminal	Infinity
	B terminal – G terminal	Infinity

W1023217

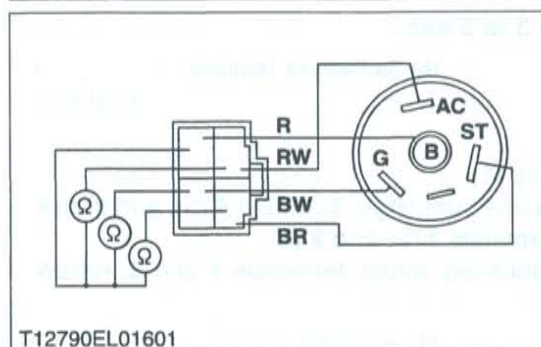


Main Switch Key at ON Position

1. Turn the main switch on.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **AC** terminal.
3. If 0 ohm is not indicated, the **B-AC** contacts of the main switch are faulty.

Resistance	B terminal – AC terminal	0 Ω
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W1024636

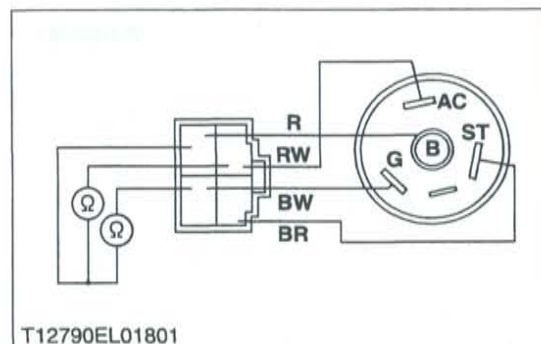


Main Switch Key at START Position

1. Turn and hold the main switch key at the **START** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **G** terminal, and across the **B** terminal and the **AC** terminal, and across the **B** terminal and the **ST** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	B terminal – G terminal	0 Ω
	B terminal – ST terminal	0 Ω
	B terminal – AC terminal	0 Ω

W1025150



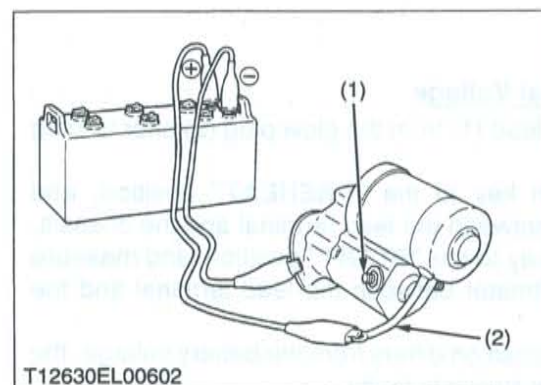
Main Switch Key at PREHEAT Position

1. Turn and hold the main switch key at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **G** terminal, and across the **B** terminal and the **AC** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	B terminal – G terminal	0 Ω
	B terminal – AC terminal	0 Ω

W1029974

(B) Starter



Motor Test

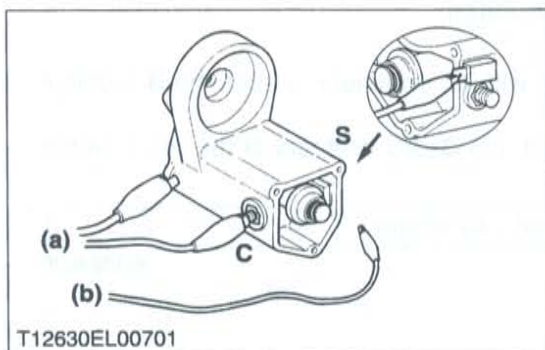
⚠ CAUTION

- **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.
 3. Remove the starter from the engine.
 4. Disconnect the connecting lead (2) from the starter **C** terminal (1).
 5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
 6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post.
 7. If the motor does not run, check the motor.

(1) C Terminal

(2) Connecting Lead

W1014267



Magnet Switch Test (Pull-in, Holding Coils)

1. Remove the motor from the starter housing.
2. Prepare a 6 V battery for the test.
3. Connect jumper leads from the battery negative terminal to the housing and the starter **C** terminal.
4. The plunger should be attached and the pinion gear should pop out when a jumper lead is connected from the battery positive terminal to the **S** terminal. It's a correct.
5. Disconnect the jumper lead to the starter **C** terminal. Then the pinion gear should remain popped out. It's a correct.

■ IMPORTANT

- Testing time must be 3 to 5 sec..

(a) To Negative Terminal

(b) To Positive Terminal

W1014690

Checking Starter Relay

1. Remove the starter relay (1).
2. Apply battery voltage across terminals 3 (4) and 4 (5), and check for continuity across terminals 1 (2) and 2 (3).
3. If continuity is not established across terminals 1 and 3, renew the starter relay.

(1) Starter Relay

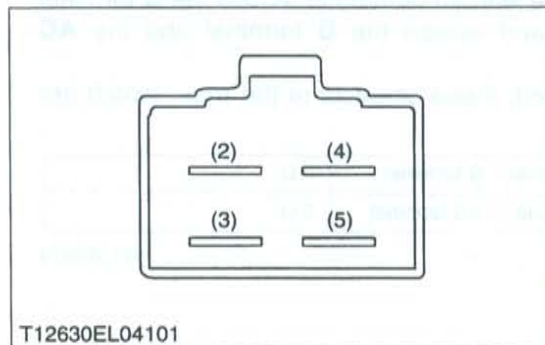
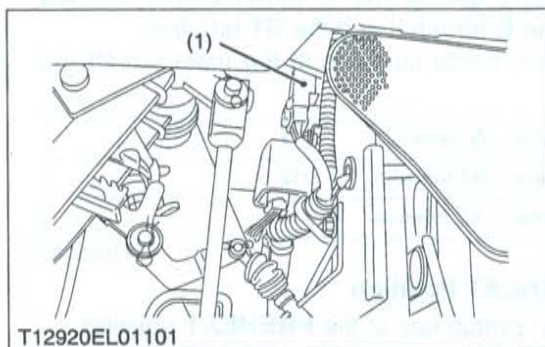
(4) Terminal 3

(2) Terminal 1

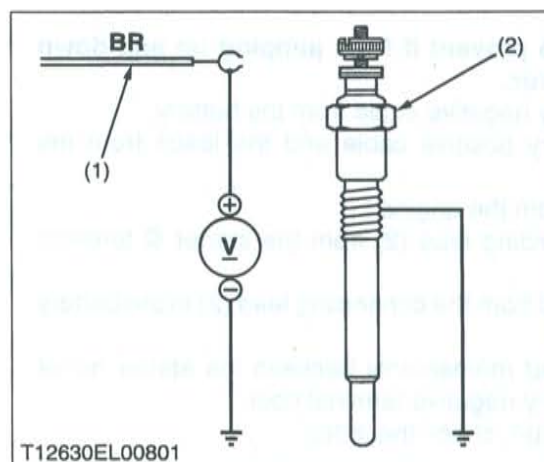
(5) Terminal 4

(3) Terminal 2

W1026991



(C) Glow Control System



Glow Plug Lead Terminal Voltage

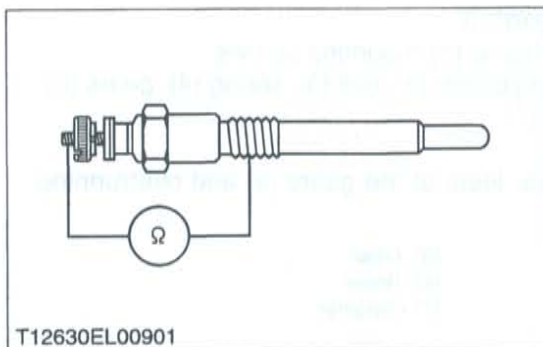
1. Disconnect the wiring lead (1) from the glow plug (2) after turning the main switch off.
2. Turn the main switch key to the "PREHEAT" position, and measure the voltage between the lead terminal and the chassis.
3. Turn the main switch key to the "START" position, and measure the voltage with a voltmeter between the lead terminal and the chassis.
4. If the voltage at either position differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage (Lead terminal – Chassis)	Main switch key at "PREHEAT"	Approx. battery voltage
	Main switch key at "START"	Approx. battery voltage

(1) Wiring Lead (Positive)

(2) Glow Plug

W1014913



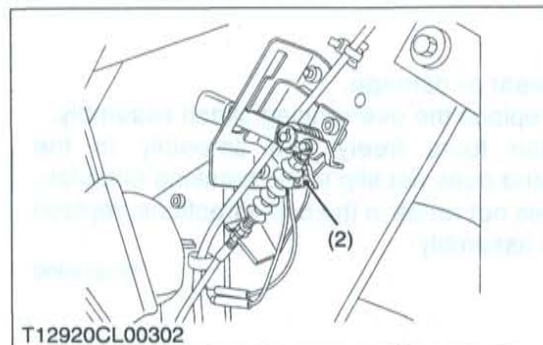
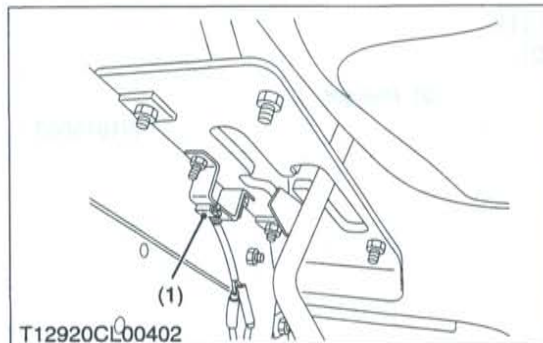
Glow Plug Continuity

1. Disconnect the lead from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and the chassis.
3. If 0 ohm is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, the glow plug is faulty.

Glow plug resistance	Factory spec.	Approx. 0.9 Ω
----------------------	---------------	---------------

W1015115

(D) Safety Switch



Safety Switch Continuity

1. Disconnect the leads from safety switches (1) and (2).
2. Connect the ohmmeter to the safety switch leads.
3. Measure the resistance between leads as follows.
4. If the safety switch is defective, replace it.

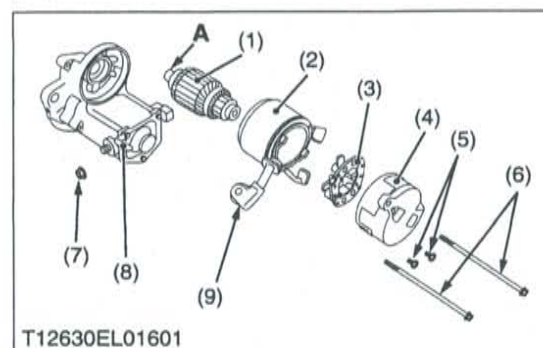
Resistance (Across switch terminal) safety switch for shuttle shift lever	When switch arm is turned	Infinity
	When switch arm is released	0 Ω
Resistance (Across switch terminal) safety switch for PTO clutch change lever	When switch spring is pushed	Infinity
	When switch spring is released	0 Ω

(1) Safety Switch for Shuttle Shift Lever (2) Safety Switch for PTO Clutch Lever

W1014757

(2) Disassembling and Assembling

(A) Starter



Disassembling Motor

1. Disconnect the connecting lead (9) from the magnet switch (8).
2. Remove the screws (6), and then separate the end frame (4), yoke (2) and armature (1).
3. Remove the two screws (5), and then take out the brush holder (3) from the end frame (4).

(When reassembling)

- Apply grease to the spline teeth (A) of the armature (1).

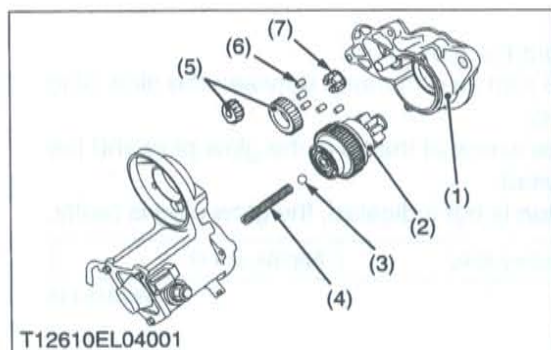
Tightening torque	Nut (7)	5.9 to 11.8 N·m 0.6 to 1.2 kgf·m 4.3 to 8.7 ft-lbs
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- (1) Armature
(2) Yoke
(3) Brush Holder
(4) End Frame
(5) Screw
(6) Screw

- (7) Nut
(8) Magnet Switch
(9) Connecting Lead

A : Spline Teeth

W1016288



Disassembling Magnet Switch

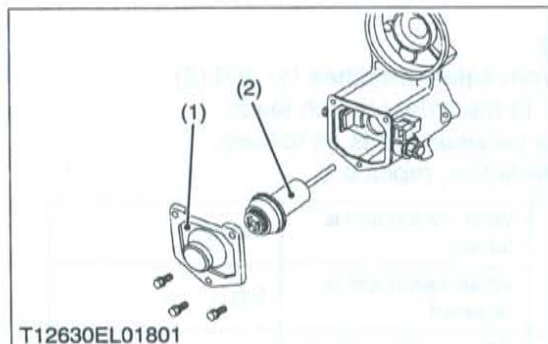
1. Remove the drive end frame (1) mounting screws.
2. Take out the overrunning clutch (2), ball (3), spring (4), gears (5), rollers (6) and retainer (7).

(When reassembling)

- Apply grease to the gear teeth of the gears (5) and overrunning clutch (2), and ball (3).

- | | |
|------------------------|--------------|
| (1) Drive End Frame | (5) Gear |
| (2) Overrunning Clutch | (6) Roller |
| (3) Ball | (7) Retainer |
| (4) Spring | |

W1016728



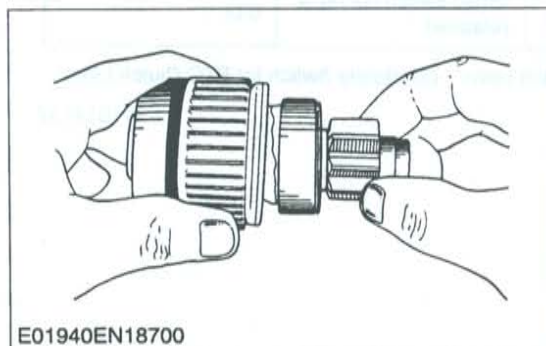
Plunger

1. Remove the end cover (1).
2. Take out the plunger (2).

- | | |
|---------------|-------------|
| (1) End Cover | (2) Plunger |
|---------------|-------------|

W1016883

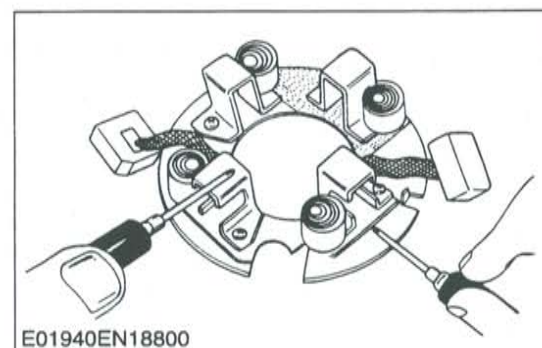
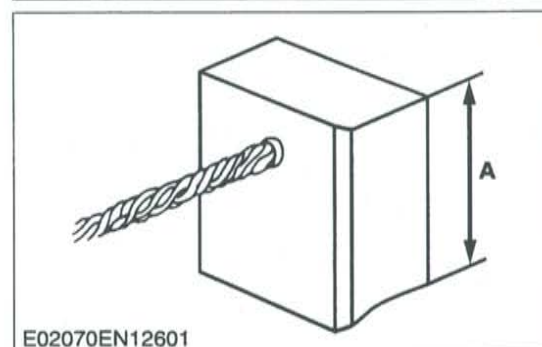
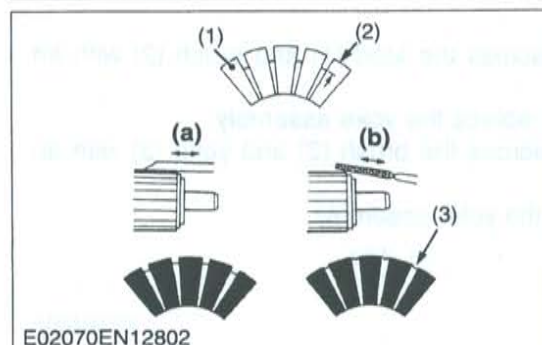
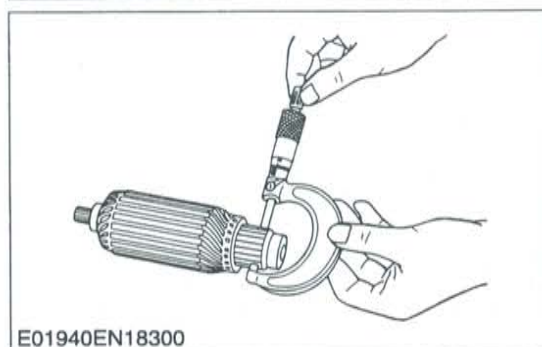
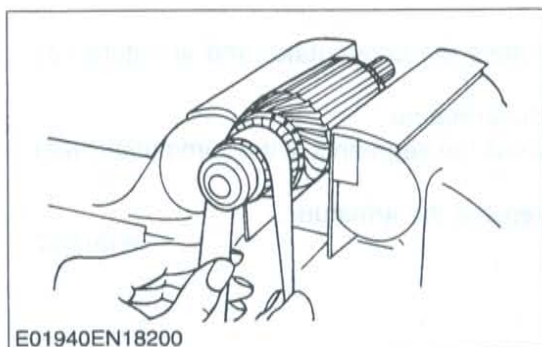
(3) Servicing



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



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.	30.0 mm 1.181 in.
	Allowable limit	29.0 mm 1.142 in.

Difference of O.D.'s	Factory spec.	Less than 0.02 mm 0.0008 in.
	Allowable limit	0.05 mm 0.0020 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) Undercut
(3) Mica

- (a) Correct
(b) Incorrect

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.	15.0 mm 0.591 in.
	Allowable limit	11.0 mm 0.433 in.

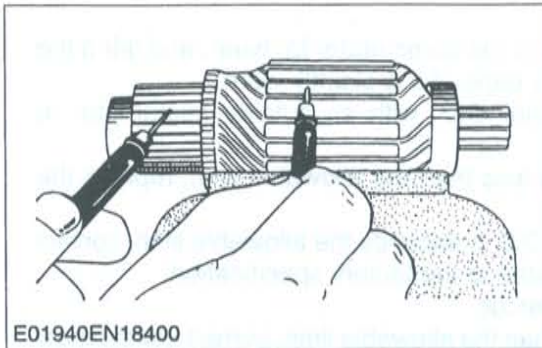
W1017544

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
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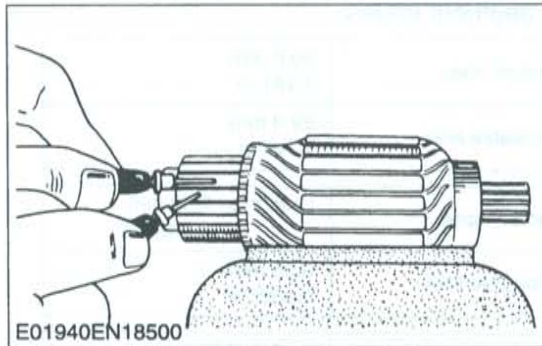
W1017672



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.

W1017767

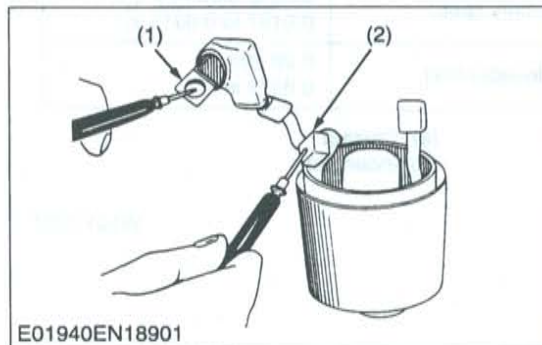


Field Coil

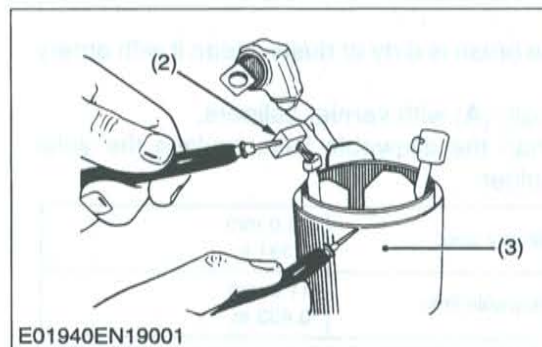
1. Check the continuity across the lead (1) and brush (2) with an ohmmeter.
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter.
4. If it conducts, replace the yoke assembly.

(1) Lead
(2) Brush

(3) Yoke

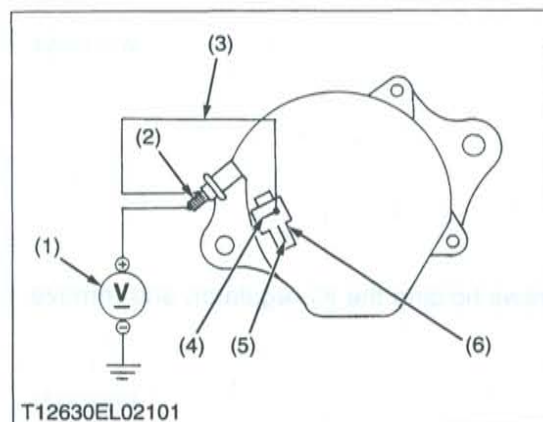
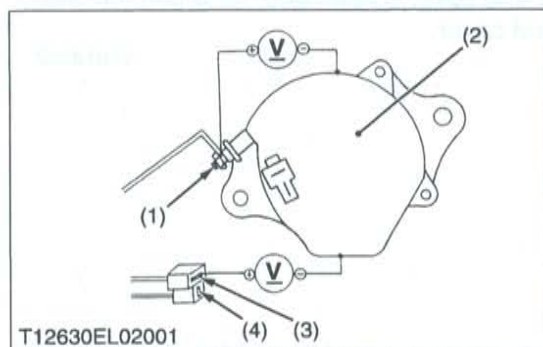
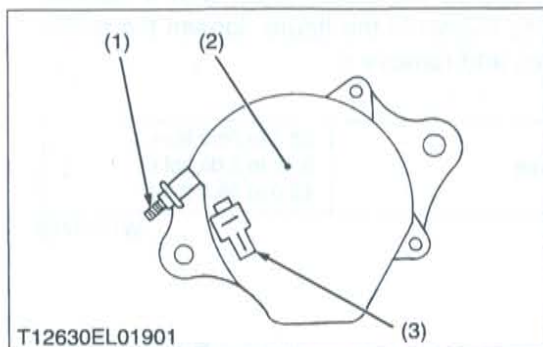


W1018015



[3] CHARGING SYSTEM

(1) Checking



Alternator

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

- (1) B Terminal (3) 2P Connector
(2) Alternator

W1018175

Connector Voltage

1. Turn the main switch **OFF**. Measure the voltage between the **B** terminal (1) and the chassis.
2. Turn the main switch **ON**. Measure the voltage between the **IG** terminal (3) and the chassis.

Voltage (Main switch at OFF)	B terminal – Chassis	Approx. battery voltage
Voltage (Main switch at ON)	IG terminal – Chassis	Approx. battery voltage

- (1) B Terminal (3) IG Terminal
(2) Alternator (4) L Terminal

W1018279

No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (3) between **IG** terminal (4) and **B** terminal (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the **B** terminal (2) and the chassis.
6. If the measurement is less than the factory specification, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V
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(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) IG Terminal
(2) B Terminal (5) L Terminal
(3) Jumper Lead (6) 2P Terminal

W1018478

(2) Disassembling and Assembling

Pulley

1. Secure the hexagonal end of the pulley shaft with a double-ended ratchet wrench as shown in the figure, loosen the pulley nut with a socket wrench and remove it.

(When reassembling)

Tightening torque	Pulley nut	58.3 to 78.9 N·m 5.95 to 8.05 kgf·m 43.0 to 58.2 ft-lbs
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W1018728

Rear End Cover

1. Unscrew the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

W1018982

Brush Holder

1. Unscrew the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

W1019054

IC Regulator

1. Unscrew the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

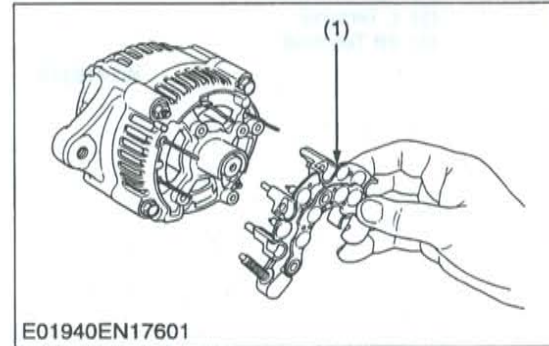
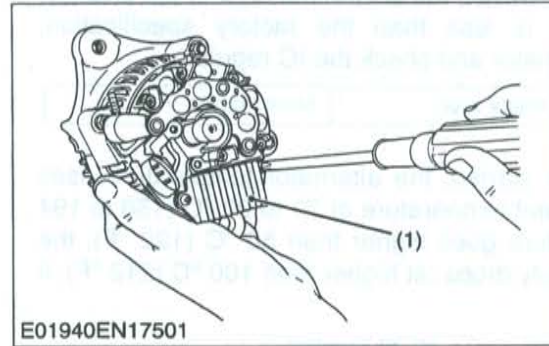
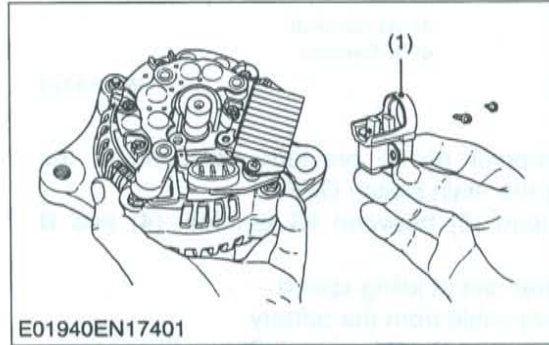
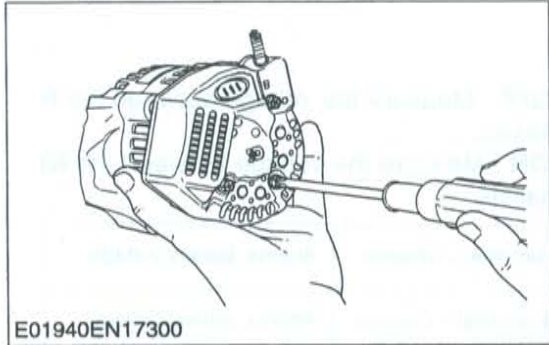
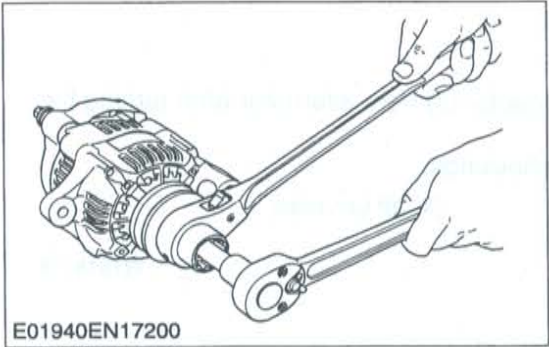
W1019123

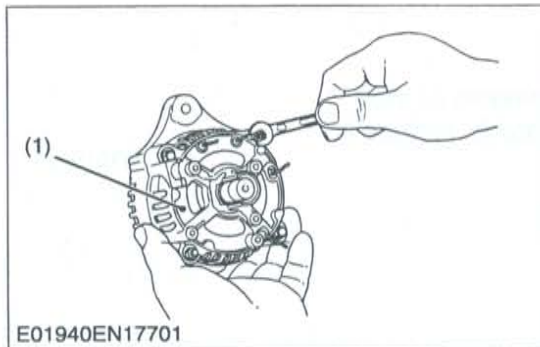
Rectifier

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

W1019192



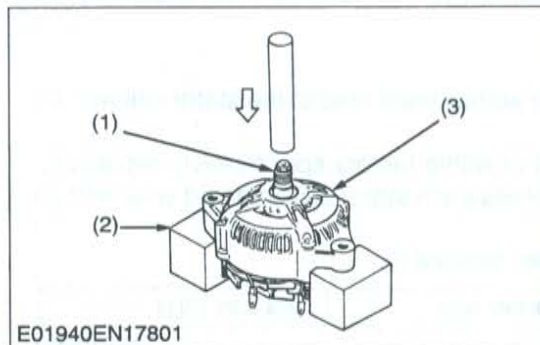


Rear End Frame

1. Unscrew the two nuts and two screws holding the drive end frame and the rear end frame.
2. Remove the rear end frame (1).

(1) Rear End Frame

W1019274



Rotor

1. Press out the rotor (1) from drive end frame (3).

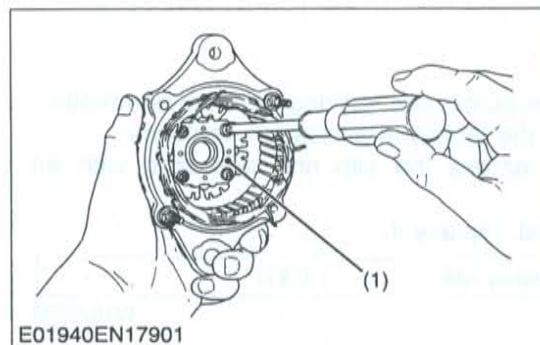
■ IMPORTANT

- Take special care not to drop the rotor and damage the slip ring or fan, etc..

(1) Rotor
(2) Block

(3) Drive End Frame

W1019438

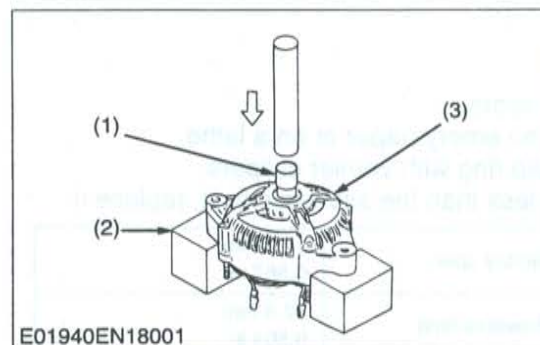


Retainer Plate

1. Unscrew the four screws holding the retainer plate, and remove the retainer plate (1).

(1) Retainer Plate

W1019542



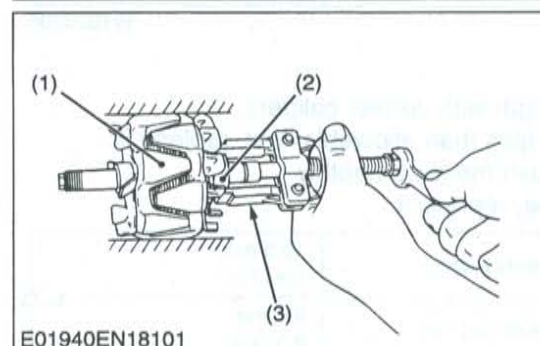
Bearing on Drive End Side

1. Press out the bearing from drive end frame (3) with a press and jig (1).

(1) Jig
(2) Block

(3) Drive End Frame

W1019611



Bearing at Slip Ring Side

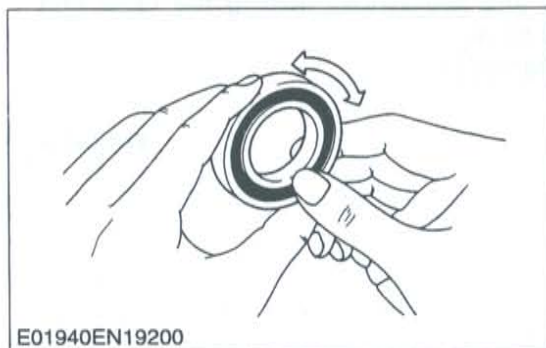
1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

(1) Rotor
(2) Bearing

(3) Puller

W1019701

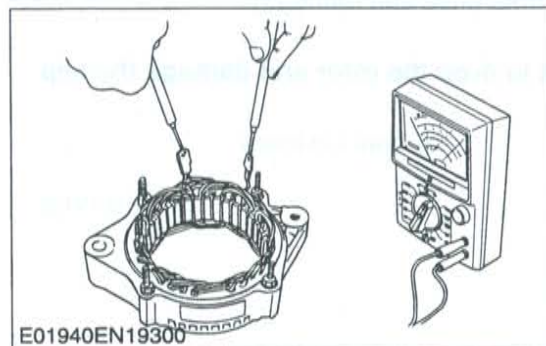
(3) Servicing



Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

W1019790

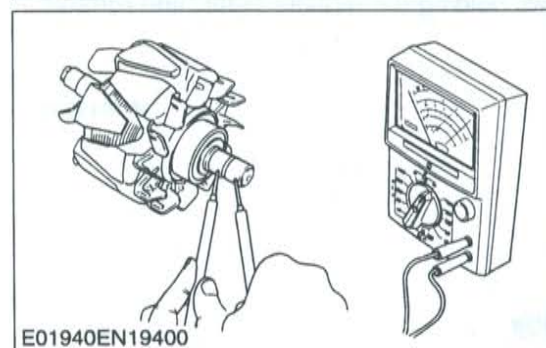


Stator

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
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W1019964

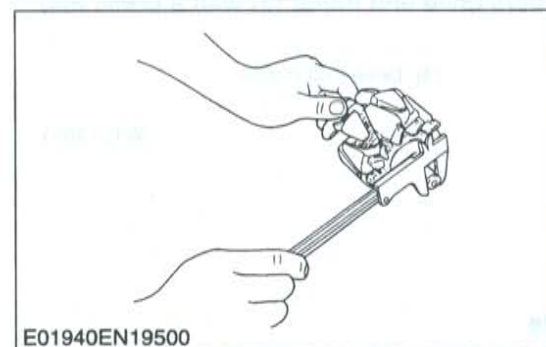


Rotor

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.	2.9 Ω
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W1020094

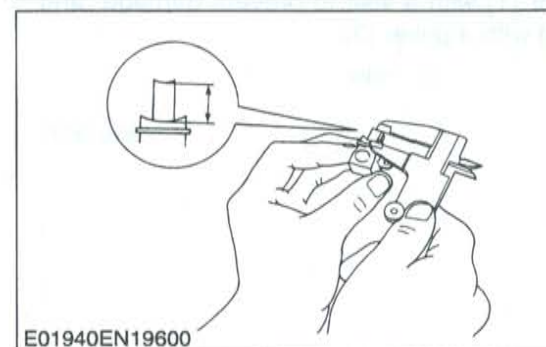


Slip Ring

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.	14.4 mm 0.567 in.
	Allowable limit	12.8 mm 0.504 in.

W1020208

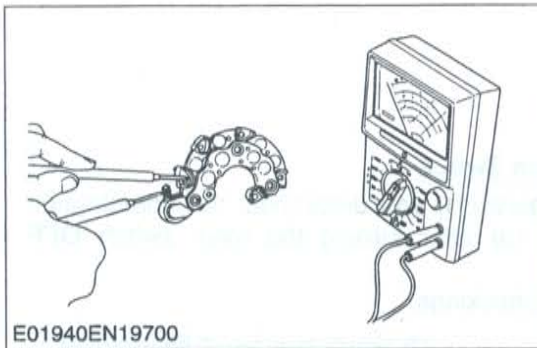


Brush Wear

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.	10.5 mm 0.413 in.
	Allowable limit	8.4 mm 0.331 in.

W1020329



Rectifier

1. Check the continuity across each diode of rectifier with an analog ohmmeter. Conduct the test in the ($R \times 1$) setting.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

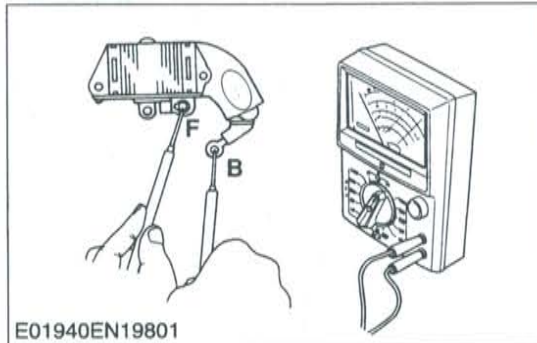
■ IMPORTANT

- Do not use a 500 V megger for measuring because it will destroy the rectifier.

■ NOTE

- Do not use an auto digital multimeter. Because it's very hard to check the continuity of rectifier by using it.

W1020452



IC Regulator

1. Check the continuity across the **B** terminal and the **F** terminal of IC regulator with an analog ohmmeter. Conduct the test in the ($R \times 1$) setting.
2. The IC regulator is normal if the IC regulator conducts in one direction and does not conduct in the reverse direction.

■ IMPORTANT

- Do not use a 500 V megger for measuring because it will destroy the IC regulator.

■ NOTE

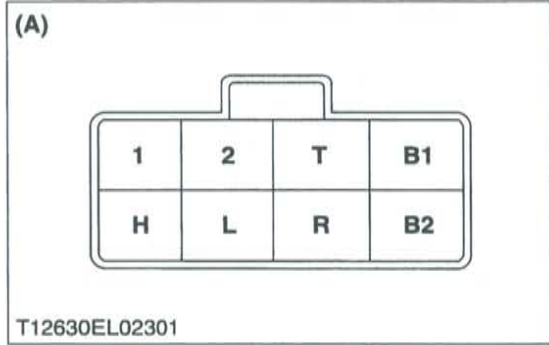
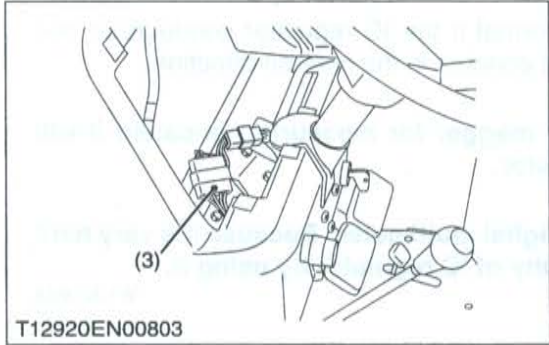
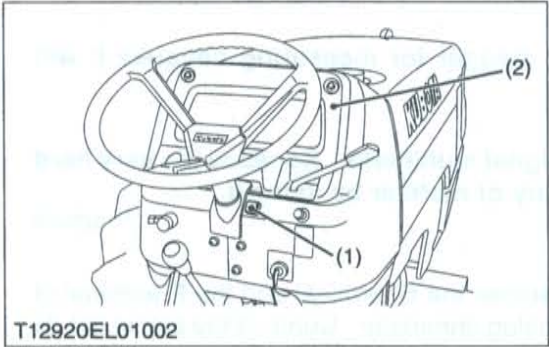
- Do not use an auto digital multimeter. Because it's very hard to check the continuity of IC regulator by using it.

W1020645

[4] LIGHTING SYSTEM

(1) Checking

(A) Combination Switch



Remove the Combination Switch

1. Remove the panel board (1), and disconnect the combination switch connector **8A** (3) after turning the main switch **OFF** position.
2. Perform the following checkings.
 - (1) Combination Switch
 - (2) Panel Board
 - (3) Combination Switch **8A** Connector

W1020799

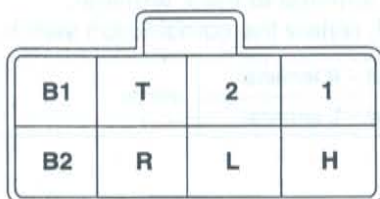
Connector Voltage

1. Disconnect the connector **8A** from the combination switch.
2. Measure the voltage with a voltmeter across the connector **B1** terminal and chassis when the main switch is **OFF** position.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.
4. Measure the voltage with a voltmeter across the connector **B2** terminal and chassis when the main switch is **ON** position.
5. If the voltage differs from the battery voltage, check the wiring harness and main switch.

Voltage	Main switch at OFF position	B1 terminal – Chassis	Battery voltage
	Main switch at ON position	B2 terminal – Chassis	

(A) Wire Harness Side Connector 8A

W1020896

(B) Lighting Switch**(A)**

T12630EL02302

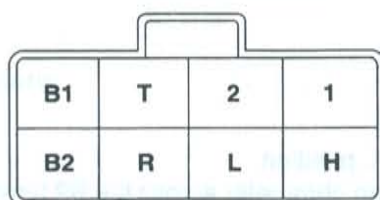
Head Light Switch Continuity when Setting Switch at OFF Position

1. Disconnect the connector **8A** from the combination switch.
2. Set the light switch to the **OFF** position.
3. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal, the **B1** terminal to the **1** terminal and the **B1** terminal to the **2** terminal.
4. If infinity is not indicated, renew the switch.

Resistance (Switch at OFF position)	B1 terminal – T terminal	Infinity
	B1 terminal – 1 terminal	
	B1 terminal – 2 terminal	

**(A) Combination Switch Side
Connector 8A**

W1021136

(A)

T12630EL02302

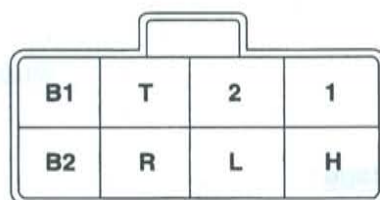
Head Light Switch Continuity when Setting Switch at ON1 Position

1. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the **1** terminal.
2. If 0 ohm is not indicated, renew the head light switch.

Resistance (Switch at HI-BEAM position)	B1 terminal – T terminal	0 Ω
	B1 terminal – 1 terminal	

**(A) Combination Switch Side
Connector 8A**

W1021514

(A)

T12630EL02302

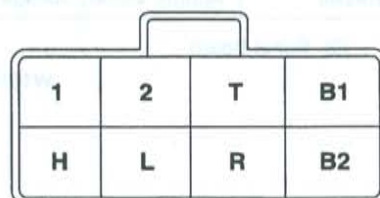
Head Light Switch Continuity when Setting Switch at ON2 Position

1. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the **2** terminal.
2. If 0 ohm is not indicated, renew the head light switch.

Resistance (Switch at LO-BEAM position)	B1 terminal – T terminal	0 Ω
	B1 terminal – 2 terminal	

**(A) Combination Switch Side
Connector 8A**

W1021917

(C) Turn Signal Switch**(A)**

T12630EL02301

Connector Voltage

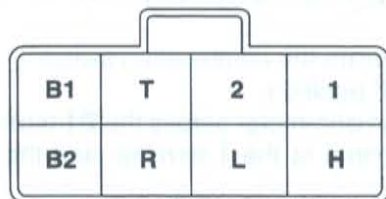
1. Disconnect the connector **8A** from the combination switch.
2. Measure the voltage with a voltmeter across the connector **B2** terminal and chassis when the main switch is **ON** position.
3. If the voltage differs from the battery voltage, check the wiring harness.

Voltage	Main switch at ON position	B2 terminal – Chassis	Battery voltage
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(A) Wire Harness Side Connector 8A

W1022090

(A)



T12630EL02302

Turn Signal Switch OFF Position

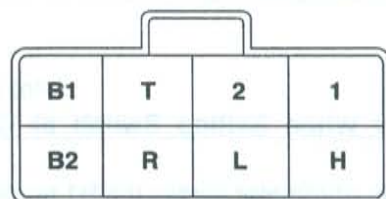
1. Set the hazard switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal to the **R** terminal and the **B2** terminal to the **L** terminal.
3. If infinity ohm is not indicated, renew the combination switch.

Resistance (Switch at OFF position)	B2 terminal – R terminal	Infinity
	B2 terminal – L terminal	

(A) Combination Switch Side
Connector 8A

W1022305

(A)



T12630EL02302

Turn Signal Switch R Position

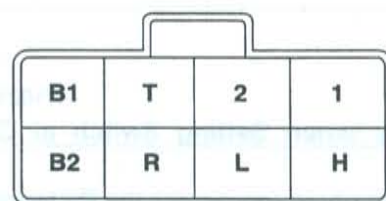
1. Set the hazard switch to the **R** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal to the **R** terminal.
3. If 0 ohm is not indicated, renew the combination switch.

Resistance (Switch at R position)	B2 terminal – R terminal	0 Ω
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(A) Combination Switch Side
Connector 8A

W1022505

(A)



T12630EL02302

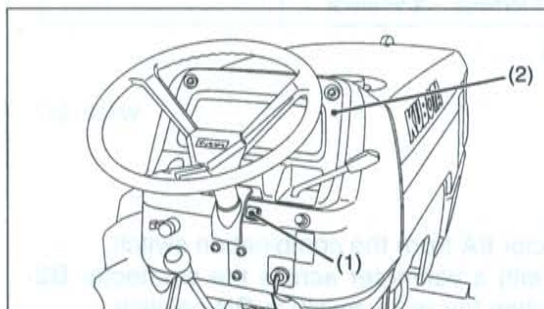
Turn Signal Switch L Position

1. Set the hazard switch to the **L** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal to the **L** terminal.
3. If 0 ohm is not indicated, renew the combination switch.

Resistance (Switch at L position)	B2 terminal – L terminal	0 Ω
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(A) Combination Switch Side
Connector 8A

W1022710

(D) Hazard Switch

T12920EL01002

Hazard Switch Connector Voltage

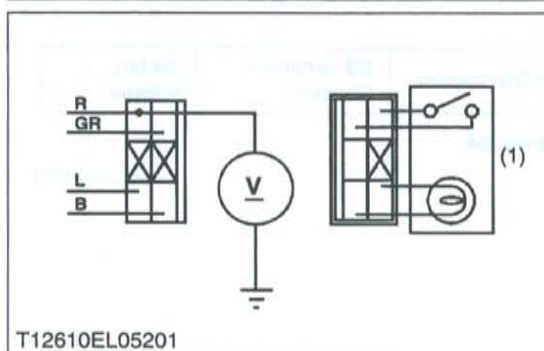
1. Remove the panel board (2) and disconnect the connector from hazard switch (1).
2. Measure the voltage with a voltmeter across the **R** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	R terminal – Chassis	Approx. battery voltage
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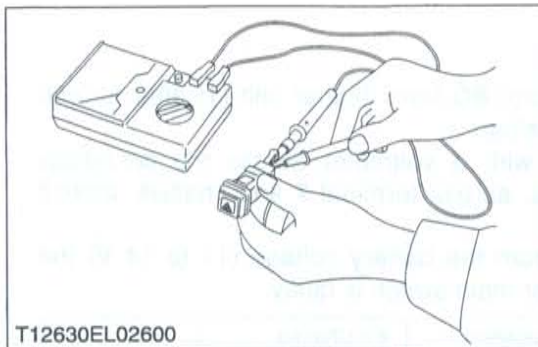
(1) Hazard Light Switch

(2) Panel Board

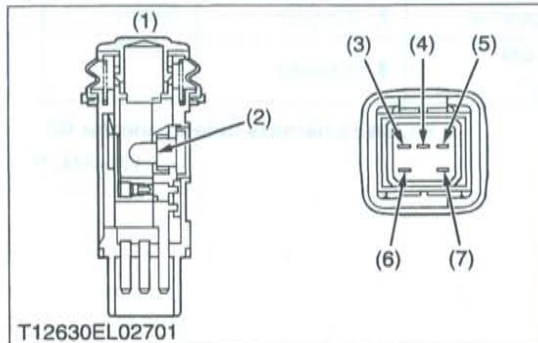
W1022891



T12610EL05201



T12630EL02600



T12630EL02701

Hazard Switch Continuity

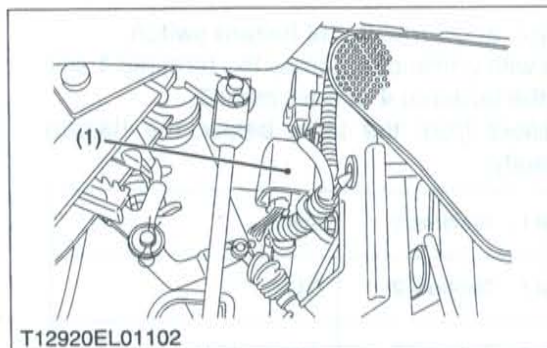
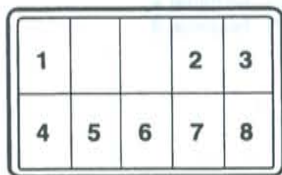
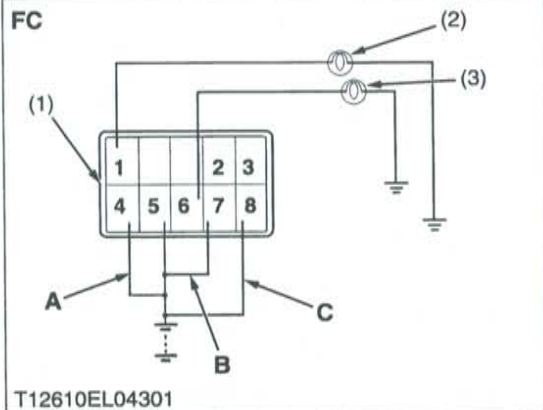
1. Remove the panel.
2. Disconnect the connector, and remove the hazard switch.
3. Measure the resistance with ohmmeter across the terminal 1 and terminal 2, and across the terminal 4 and terminal 3.
4. If the measurement differs from the table below, the hazard switch or the bulb are faulty.

Resistance (Switch at OFF)	Terminal 1 – Terminal 2	Infinity
Resistance (Switch at ON)	Terminal 1 – Terminal 2	0 Ω
Resistance (Bulb)	Terminal 4 – Terminal 3	Approx. 13 Ω

- (1) Hazard Switch
(2) Bulb
(3) Terminal 1
(4) Terminal 5

- (5) Terminal 4
(6) Terminal 2
(7) Terminal 3

W1023023

(E) Flasher Unit**WC****FC****Connector Voltage**

1. Disconnect the connector **8C** from flasher unit (1) after turning the main switch **ON** position.
2. Measure the voltage with a voltmeter across the connector terminal **4** and chassis, across terminal **7** and chassis, across terminal **8** and chassis.
3. If the voltage differs from the battery voltage (11 to 14 V) the wiring harness, fuses or main switch is faulty.

Voltage	Turn switch R position	4 – Chassis	Battery voltage
	Turn switch L position	7 – Chassis	
	Hazard switch ON position	8 – Chassis	

(1) Flasher Unit

WC :Wire Harness Side Connector 8C

W1024479

Flasher Unit Test

1. Remove the flasher unit (1).
2. Connect jumper leads across the flasher unit, bulbs (2), (3) and 12 V battery as shown in the following figure.
3. When the jumper lead **A**, **B** or **C** are connected, the bulb, should flicker by each switch position. When it is disconnected, the bulb, should not flicker.
4. If the bulbs does not flicker or off correctly, renew the unit.

Ampere	Bulb	When jumper lead A is connected	Bulb (3) is flicker
		When jumper lead B is connected	Bulb (2) is flicker
		When jumper lead C is connected	Bulb (2), (3) are flicker

(1) Flasher Unit

FC :Flasher Unit Side Connector 8C

(2) Bulb

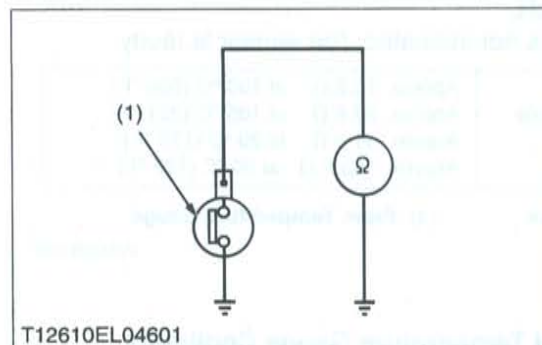
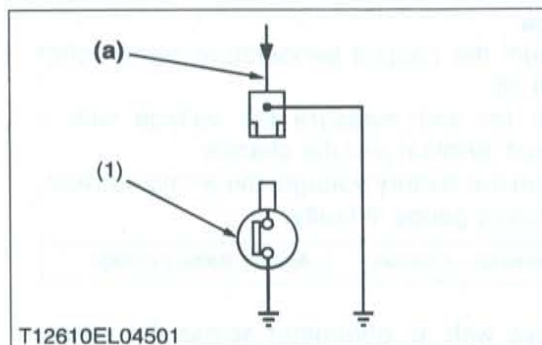
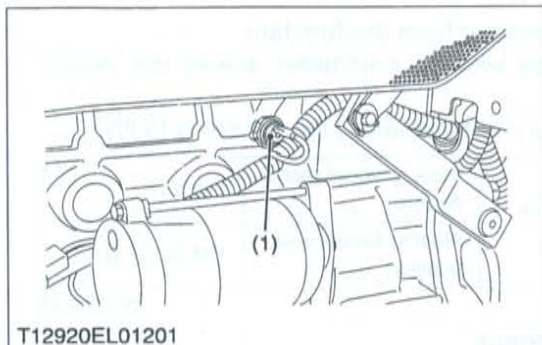
(3) Bulb

W1025669

[5] WARNING LAMPS

(1) Checking

(A) Engine Oil Pressure



Engine Oil Pressure Switch Panel Board and Wiring Harness

1. Disconnect the lead from the engine oil pressure switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the lead to the chassis.
3. If the engine oil pressure indicator lamp does not light, the panel board circuit or the wiring harness is faulty.

(1) Engine Oil Pressure Switch

(a) From Oil Pressure Lamp

W1025954

Engine Oil Pressure Switch Continuity

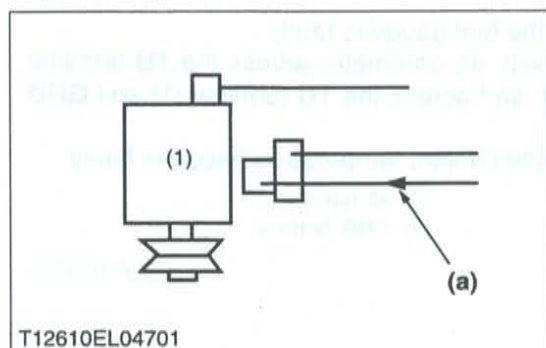
1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 4.9 kPa (0.5 kgf/cm², 7 psi), the switch is faulty.

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

W1026084

(B) Charging Circuit



Charging Circuit (Panel Board and wiring Harness)

1. Disconnect the 2P connector from the alternator after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the wiring harness connector terminal (WR) to the chassis.
3. If the charge lamp does not light, the panel board circuit, alternator, wiring harness, or fuse is fault.

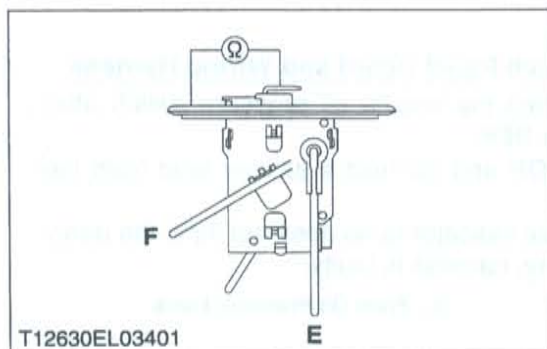
(1) Alternator

(a) From Charge Lamp

W1026253

[6] GAUGES

(1) Checking



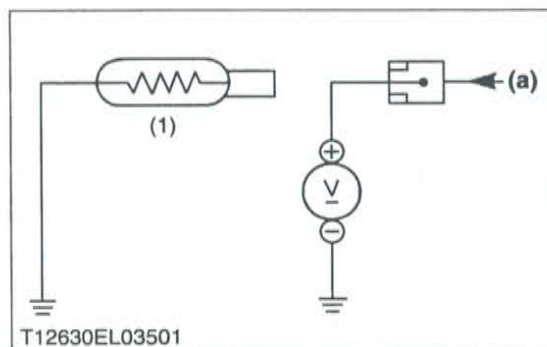
Fuel Level Sensor

1) Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the reference value are not indicated, the sensor is faulty.

Resistance (Sensor terminal – its body)	Reference value	Float at upper-most position	1 to 5 Ω
		Float at lower-most position	103 to 117 Ω

W1024865



Coolant Temperature Sensor

1) Lead Terminal Voltage

1. Disconnect the lead from the coolant temperature sensor after turning the main switch off.
2. Turn the main switch on and measure the voltage with a voltmeter across the lead terminal and the chassis.
If the voltage differs from the battery voltage, the wiring harness, fuse or coolant temperature gauge is faulty.

Voltage	Lead terminal – Chassis	Approx. battery voltage
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2) Sensor Continuity

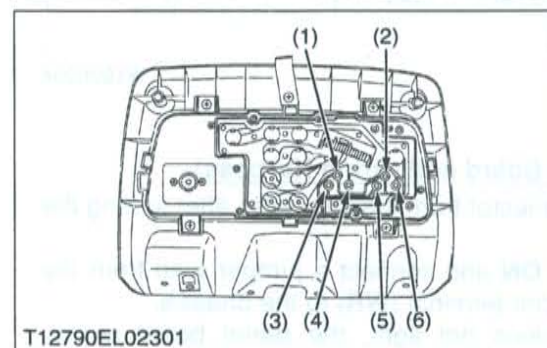
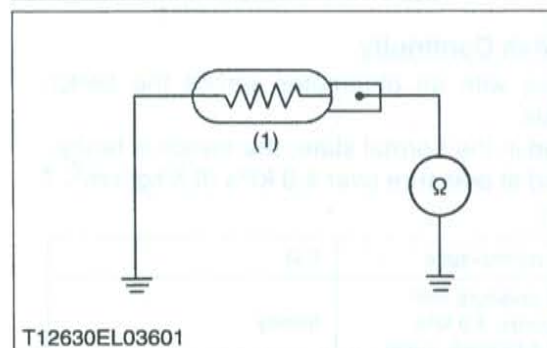
1. Measure the resistances with an ohmmeter across the sensor terminal and the chassis.
2. If the reference value is not indicated, the sensor is faulty.

Resistance (Sensor terminal – Chassis)	Reference value	Approx. 12.2 Ω at 130 °C (266 °F)
		Approx. 23.6 Ω at 105 °C (221 °F)
		Approx. 51.9 Ω at 80 °C (176 °F)
		Approx. 153.9 Ω at 50 °C (122 °F)

(1) Coolant Temperature Sensor

(a) From Temperature Gauge

W1025104



Fuel Gauge and Coolant Temperature Gauge Continuity

1. Remove the panel board from the tractor.
2. Check the continuity with an ohmmeter across the **FU** terminal (2) and **IG** terminal (3) and across the **FU** terminal (2) and **GND** terminal (4).
3. If infinity is indicated, the fuel gauge is faulty.
4. Check the continuity with an ohmmeter across the **TU** terminal (1) and **IG** terminal (3) and across the **TU** terminal (1) and **GND** terminal (4).
5. If infinity is indicated, the coolant temperature gauge is faulty.

(1) **TU** Terminal
(2) **FU** Terminal

(3) **IG** Terminal
(4) **GND** Terminal

W1027205



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