

WSM

WORKSHOP MANUAL
TRACTOR

B7300

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 B7300. It is divided into two parts, "Mechanism" and "Servicing" for each section.

■ Mechanism

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

■ Servicing

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

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

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

February '97

© KUBOTA Corporation 1997

SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and decals 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.

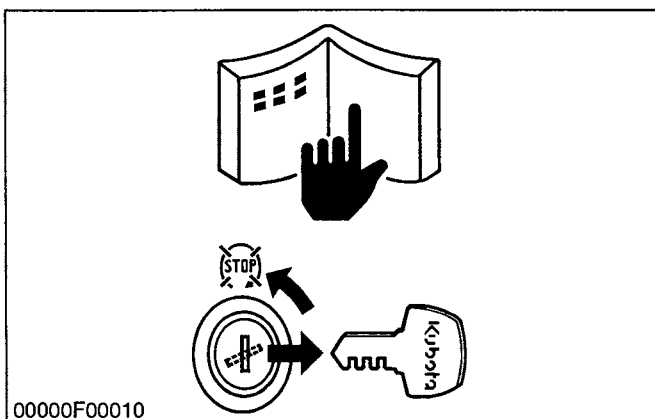


IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.



NOTE : Gives helpful information.

00000Z00010



BEFORE SERVICING AND REPAIRING

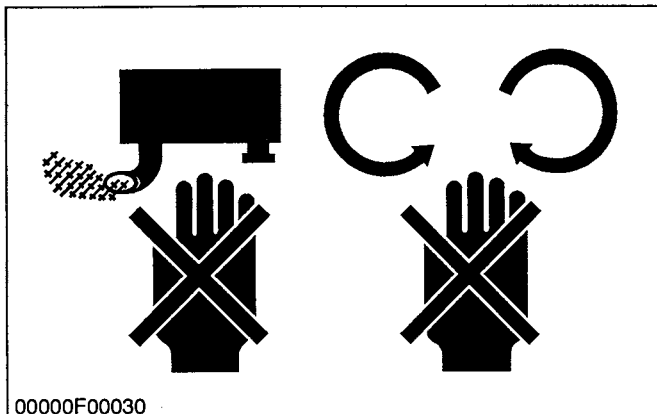
- (1) Read all instructions and safety instructions in this manual and on your machine safety decals.
- (2) Clean the work area and machine.
- (3) Park the machine on a firm and level ground, and set the parking brake.
- (4) Lower the implement to the ground.
- (5) Stop the engine, and remove the key.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

00000Z00020

**SAFETY STARTING**

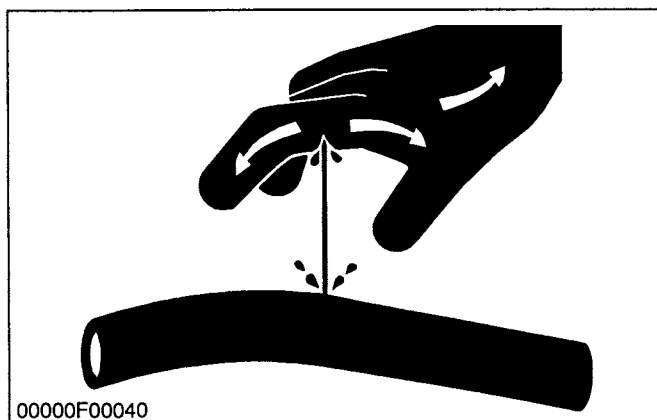
- (1) Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- (2) Do not alter or remove any part of machine safety system.
- (3) Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- (4) Never start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

00000Z00030

**SAFETY WORKING**

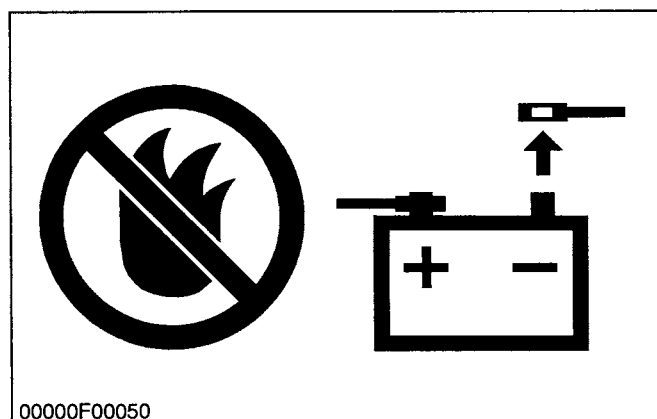
- (1) Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- (2) Wear close fitting clothing and safety equipment appropriate to the job.
- (3) Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- (4) When servicing is performed together by two or more persons, take care to perform all work safely.
- (5) Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- (6) Do not touch the rotating or hot parts while the engine is running.
- (7) 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.
- (8) 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.

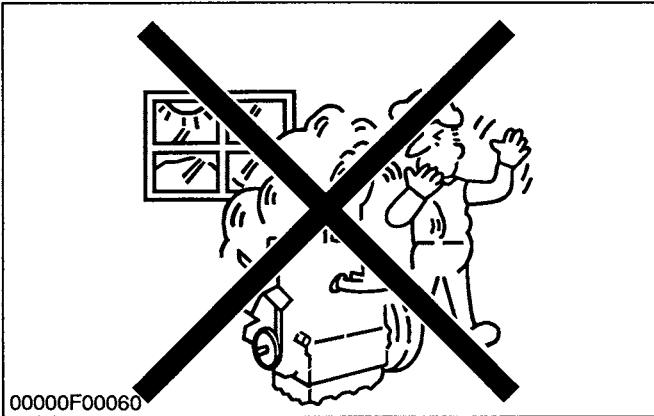
00000Z00040

**AVOID FIRES**

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

00000Z00050

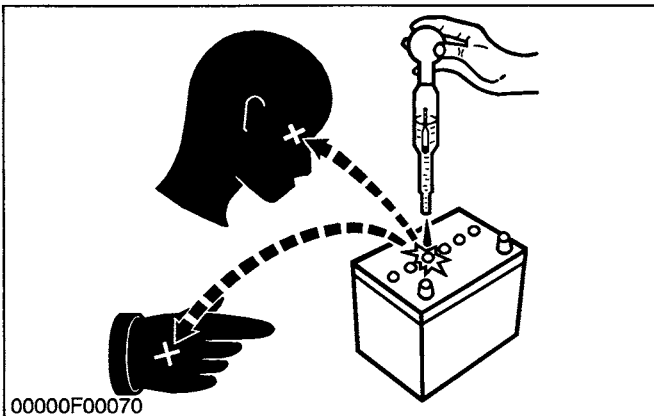




VENTILATE WORK AREA

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

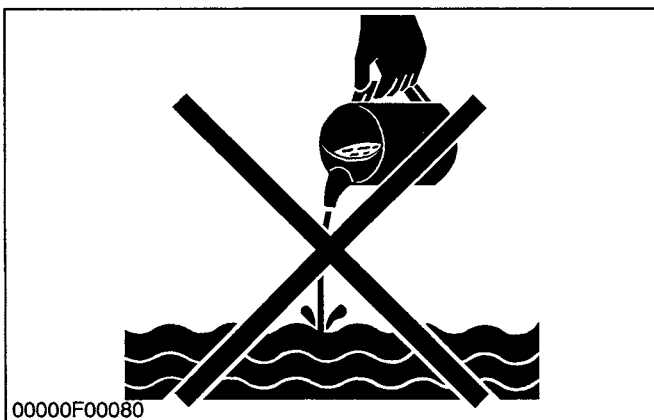
00000Z00060



PREVENT ACID BURNS

- (1) 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.

00000Z00070



DISPOSE OF FLUIDS PROPERLY

- (1) 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.

00000Z00080



PREPARE FOR EMERGENCIES

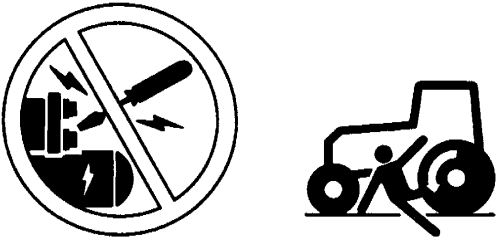
- (1) Keep a first aid kit and fire extinguisher handy at all times.
- (2) Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

00000Z00090

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. 6C090-4965-1



⚠ DANGER

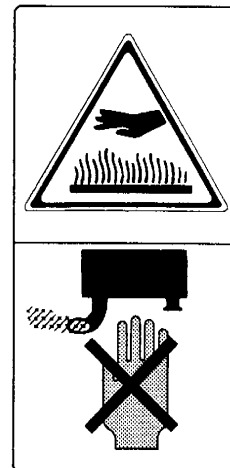
TO AVOID POSSIBLE INJURY OR DEATH FROM A MACHINE RUNAWAY.

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


③ Part No. 6C090-4958-1
Stay clear of engine fan and fanbelt.



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



② Part No. TA040-4959-3



⚠ WARNING

TO AVOID PERSONAL INJURY.

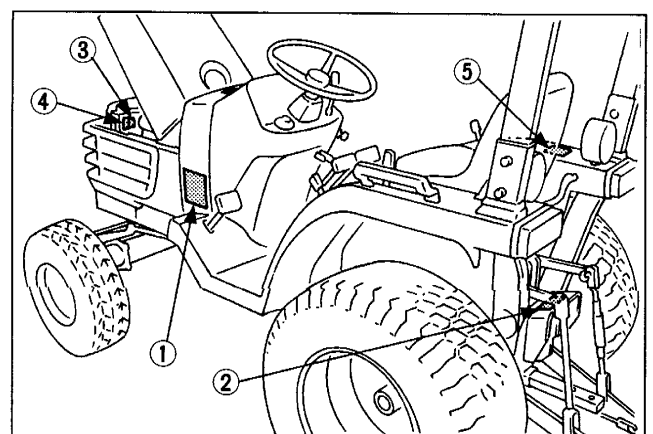
1. Keep PTO shield in place at all times.
2. Do not operate the PTO at speeds faster than the speed recommended by the implement manufacturer.
3. For trailing PTO-driven implements set drawbar at towing position (see operator's manual)

⑤ Part No. TA040-4935-1

⚠ WARNING

TO AVOID PERSONAL INJURY:

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



⑥ Part No. TA040-4932-2

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

1. Kubota recommends the use of a Roll-Over Protective Structures (ROPS) and seat belt in almost all applications
2. Remove the ROPS only when it substantially interferes with operation or itself presents a safety risk (Examples include work in orchards and vineyards); ALWAYS REINSTALL IT BEFORE USING THE TRACTOR IN OTHER APPLICATIONS
3. Never use just the seat belt or just the ROPS. They must be used together. For further details, consult your Operator's Manual or your local dealer.



③ Part No. 6C090-4958-1
Stay clear of engine fan and fanbelt.



⑦ Part No. 6C040-4742-1

⚠ 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.

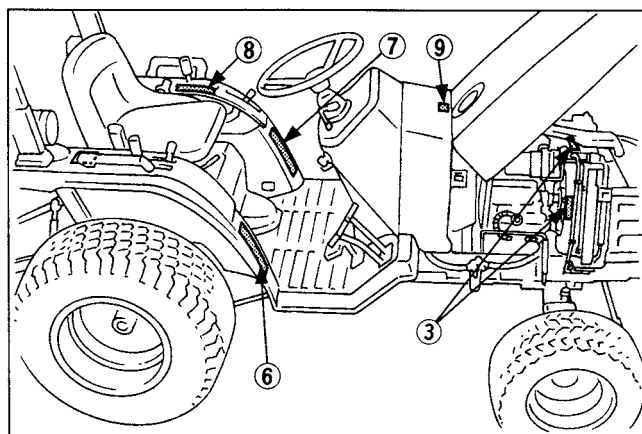
⑨ Part No. 6C040-4741-2
No fire



⑧ Part No. 6C090-4938-1

⚠ WARNING **TO AVOID PERSONAL INJURY:**

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



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 dealer.
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.

B203F002

SPECIFICATIONS

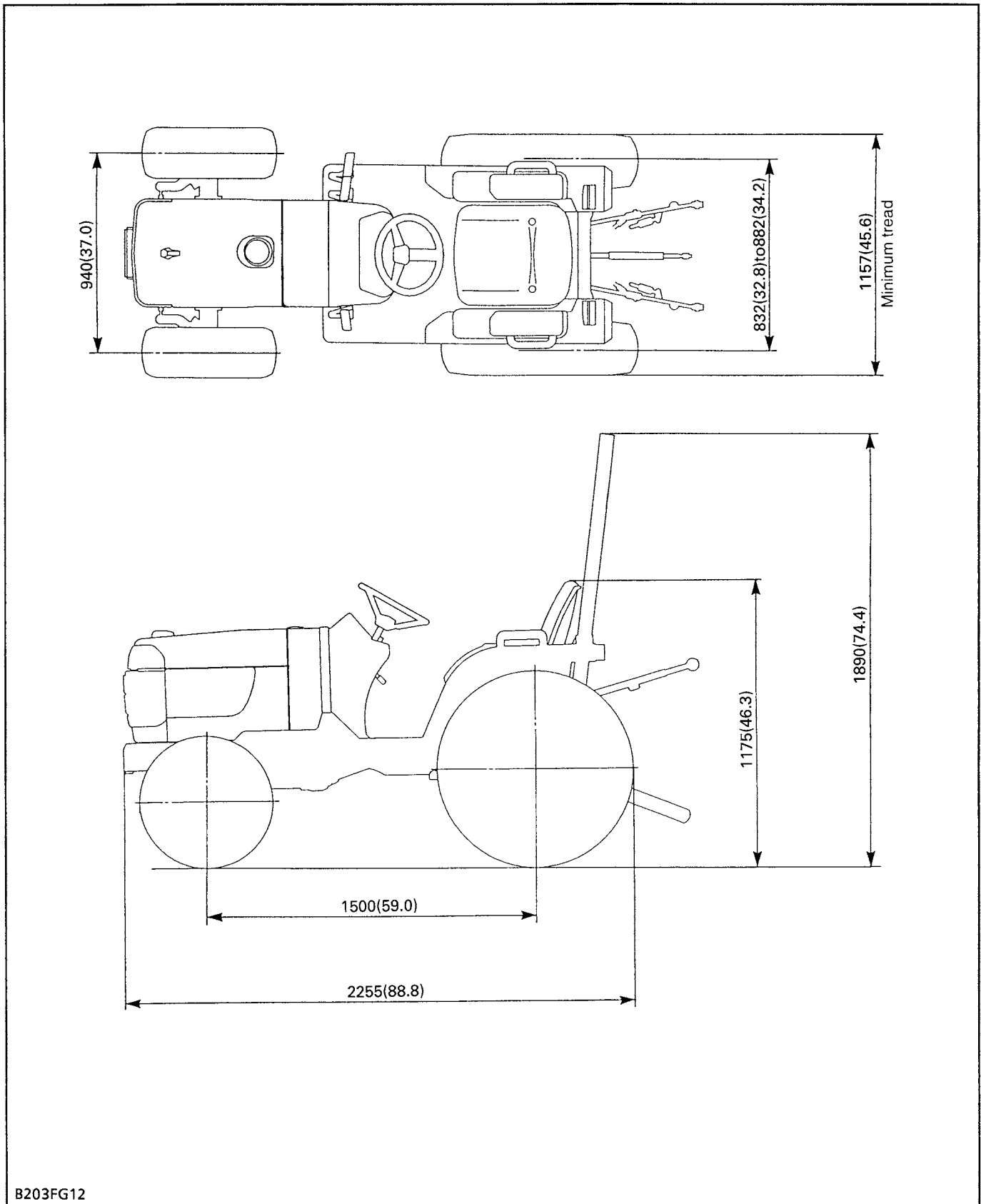
Model		B7300 HSD	
PTO power		9.3 kW (12.5 HP)*	
Engine	Maker	KUBOTA	
	Model	D722-D10SP	
	Type	Indirect Injection. Vertical, water-cooled, 4-cycle diesel	
	Number of cylinders	3	
	Bore and stroke	67.0 x 68.0 mm (2.64 x 2.68 in.)	
	Total displacement	719 cm ³ (43.89 cu.in.)	
	Engine gross power	11.9 kW (16.0 HP)	
	Rated revolution	48.3 r/s (2900 rpm)	
	Maximum torque	45 N·m (33 ft-lbs)	
	Battery	12V, RC : 71 min, CCA : 390 A (12V, RC : 79 min, CCA : 433A)	
	Starting system	Electric starting with cell starter 12V, 0.7 kW	
	Lubricating system	Forced lubrication by trochoidal pump	
	Cooling system	Pressurized radiator, forced circulation with water pump	
	Fuel	Diesel fuel No.2-D [above-10°C (14°F)], Diesel fuel No. 1 [below-10°C (14°F)]	
Capacities	Fuel tank	13 ℓ (3.4 U.S.gals, 2.9 Imp.gal)	
	Engine crankcase (with filter cartridge)	2.4 ℓ (2.5 U.S.qts, 2.1 Imp.qts)	
	Engine coolant (with recovery tank)	2.7 ℓ (2.9 U.S.qts, 2.4 Imp.qts)	
	Transmission case	12.0 ℓ (3.17 U.S.gals, 12.4 Imp.gals)	
	Front axle case	3.7 ℓ (3.9 U.S.qts, 3.3 Imp.qts)	
Dimensions	Overall length (without 3P)	2255 mm (88.8 in.)	
	Overall width (min. tread)	1157 mm (45.6 in.)	
	Overall height (with ROPS)	1890 mm (74.4 in.)	
	Overall height (top of seat)	1175 mm (46.3 in.)	
	Wheelbase	1500 mm (59.0 in.)	
	Min. ground clearance	270 mm (10.6 in.)	
	Treads	Front	940 mm (37.0 in.)
	Rear	832 mm (32.8 in.), 882 mm (34.7 in.)	
Weight (with ROPS)		595 kg (1312 lbs)	
Clutch		Dry single plate	
Traveling system	Tires	Front	21 x 8.00 - 10
		Rear	29 x 12.50 - 15
	Steering	Manual steering	
	Transmission	Main-hydrostatic transmission, High-Low gear shift (2 forward, 2 reverse)	
	Brake	Wet disk type	
Min. turning radius (with brake)		2.1 m (6.9 feet)	
Hydraulic system	Hydraulic control system	Up, Down (without position control)	
	Pump capacity	14.6 ℓ/min (3.9 gals/min)	
	Three point hitch	SAE Category I	
	Max. lift force	At lift points	500 kg (1103 lbs)
	24 in, behind lift points	390 kg (860 lbs)	
PTO shaft	Rear-PTO	SAE 1-3/8, 6 splines	
		Revolution	2 speeds (540 min ⁻¹ (rpm) at 2970 engine min ⁻¹ (rpm), 950 min ⁻¹ (rpm) at 2900 engine min ⁻¹ (rpm))
	Mid-PTO	USA No. 5 (KUBOTA 10-tooth) involute spline	
	Revolution	1 speed (2460 min ⁻¹ (rpm) at 2900 engine min ⁻¹ (rpm))	

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

DIMENSION

Maximum dimension is shown against turf tire variation.

Unit: mm (in.)



B203FG12

G GENERAL

G GENERAL

CONTENTS

[1] FEATURES	G-1
[2] IDENTIFICATION	G-2
[3] GENERAL PRECAUTIONS	G-2
[4] HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING	G-3
[5] LUBRICANTS, FUEL AND COOLING WATER	G-8
[6] TIGHTENING TORQUES	G-9
[7] MAINTENANCE CHECK LIST	G-10
[8] CHECK AND MAINTENANCE	G-11
(1) Daily Check	G-11
(2) Check Points of Initial 50 Hours	G-12
(3) Check Points of Every 50 Hours	G-14
(4) Check Points of Every 100 Hours	G-17
(5) Check Points of Every 200 Hours	G-21
(6) Check Point of Every 300 Hours	G-22
(7) Check Point of Every 400 Hours	G-23
(8) Check Point of Every 800 Hours	G-24
(9) Check Point of Every 1 Year	G-25
(10) Check Point of Every 2 Years	G-26
(11) Others	G-28
[9] SPECIAL TOOLS	G-30
(1) Special Tools for Engine	G-30
(2) Special Tools for Tractor	G-35
[10] TIRES	G-38
(1) Tread Adjustment	G-38
(1)-1 Front Wheel	G-38
(1)-2 Rear Wheels	G-38
(2) Wheel Hub	G-39
(3) Tire Pressure	G-40
[11] SPECIFICATIONS OF IMPLEMENT LIMITATIONS	G-41

[1] FEATURES

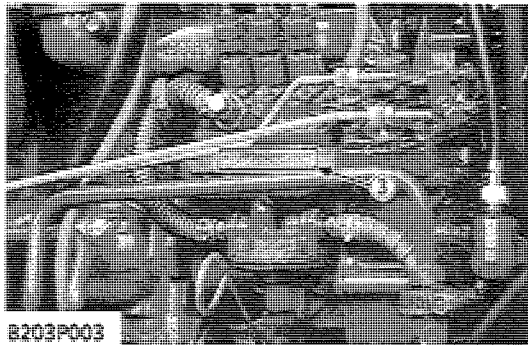
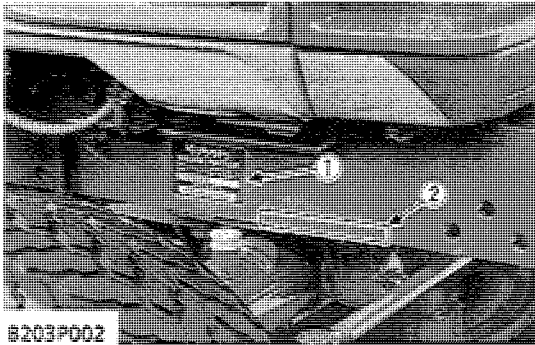


B203P001

- | | |
|---|--|
| <p>(1) Standard Mid PTO</p> <p>(2) Simultaneous Mounting of Both the Mid Mount Mower and Front End Loader
(Loader is fully-compatible with the mower)</p> <p>(3) E-TVCS Diesel Engine</p> <p>(4) Combination Panel of Easy Checker
(Indicators for charging system, engine oil pressure, glow plug, hazard light, and fuel gauge)</p> | <p>(5) New Design</p> <p>(6) HST (Hydrostatic Transmission)</p> <p>(7) Wet Disc Brake</p> <p>(8) Hydraulic Block Type Outlet</p> |
|---|--|

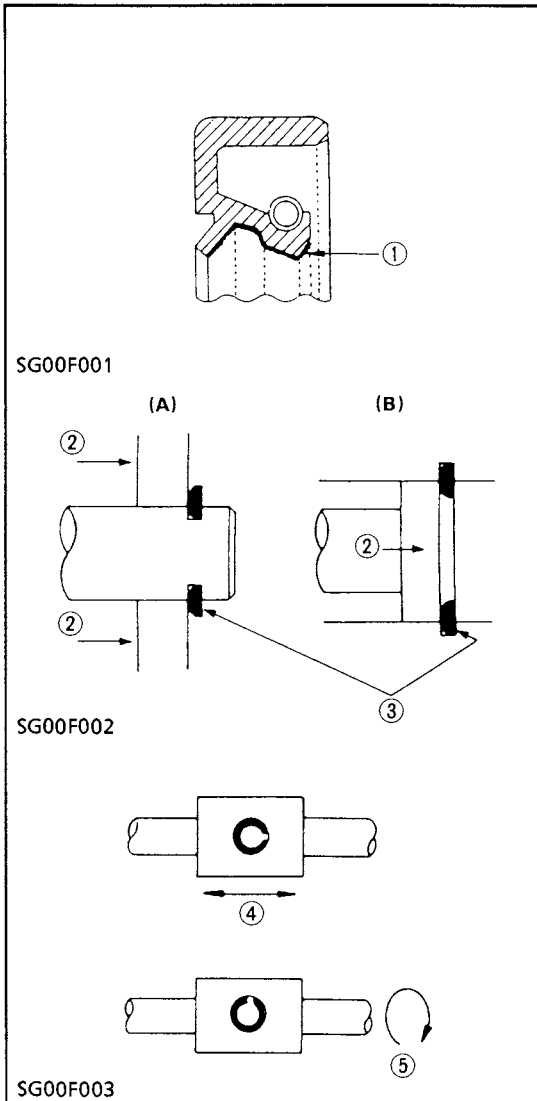
[2] TRACTOR IDENTIFICATION

When contacting your local KUBOTA distributor, always specify engine serial number and frame serial number.



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

[3] GENERAL PRECAUTIONS

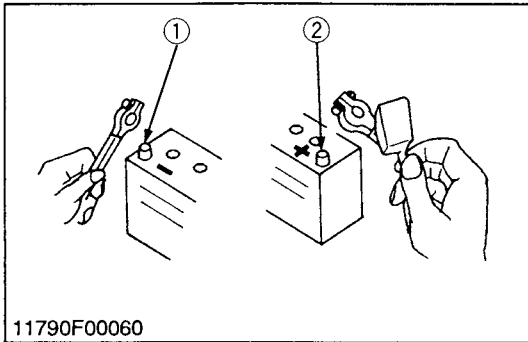


- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used should be made according to the drawings provided.
- Before disassembling or servicing electrical wires, always disconnect the negative 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

[4] 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

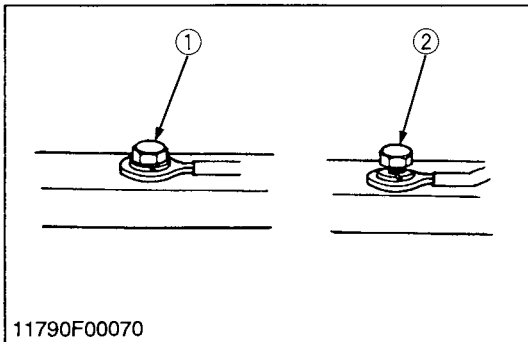
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

(1) Negative Terminal

(2) Positive Terminal

11790G00041

(1) Wiring

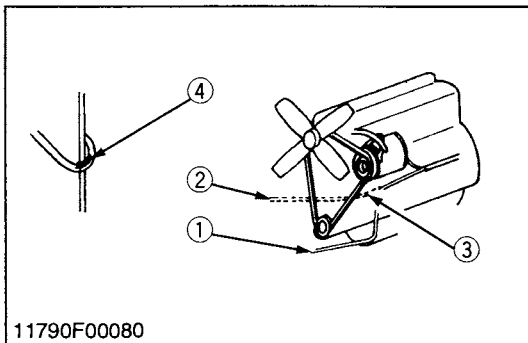


- Securely tighten wiring terminals.

(1) Correct
(Securely Tighten)

(2) Incorrect
(Loosening Leads to Faulty Contact)

11790G00050

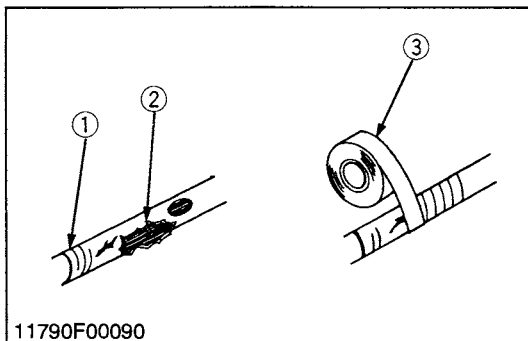


- Do not let wiring contact dangerous part.

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

(3) Dangerous Part
(4) Dangerous Part

11790G00060

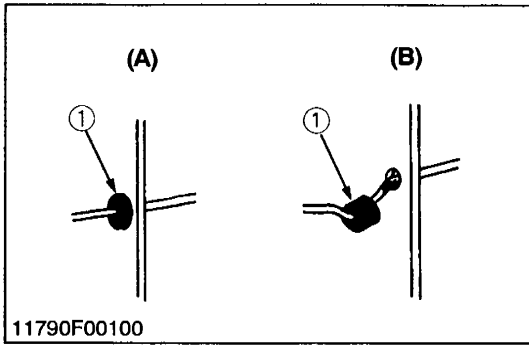


- Repair or change torn or aged wiring immediately.

(1) Aged
(2) Torn

(3) Insulating Vinyl Tape

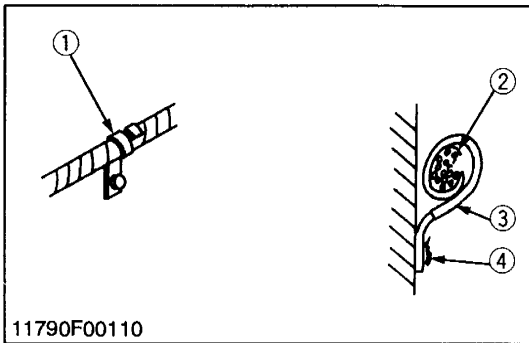
11790G00070



● Securely insert grommet.

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

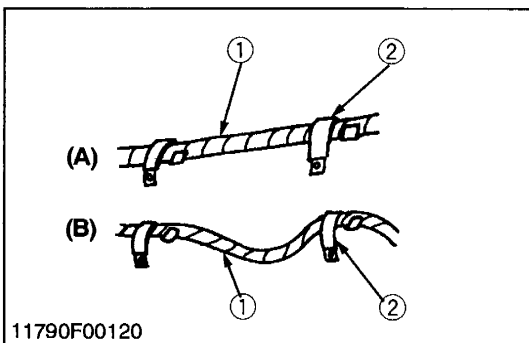
11790G00080



● Securely clamp, being careful not to damage wiring.

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

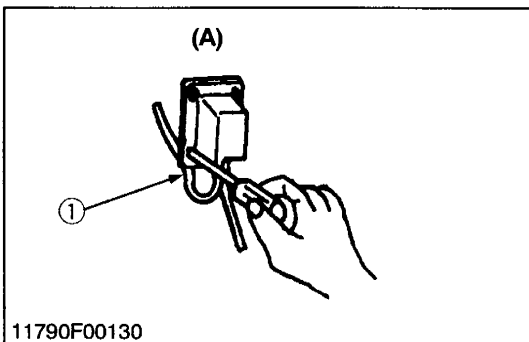
11790G00090



● 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

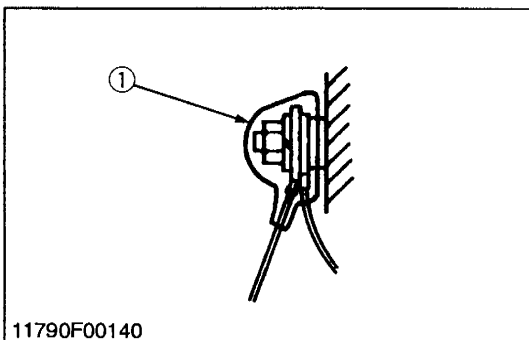
11790G00100



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

- (1) Wiring
- (A) Incorrect

11790G00110

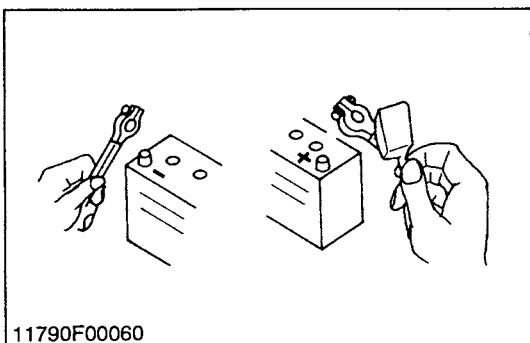


● After installing wiring, check protection of terminals and clamped condition of wiring, only then connect battery.

- (1) Cover
- Securely Install Cover

11790G00120

(2) Battery



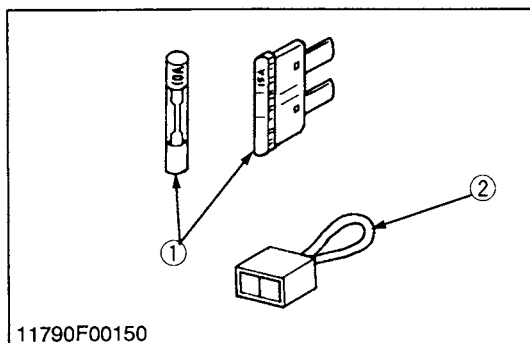
- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting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

11790G00131

(3) Fuse



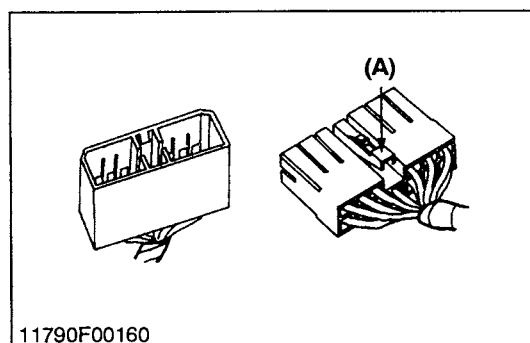
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Fusible Link

11790G00140

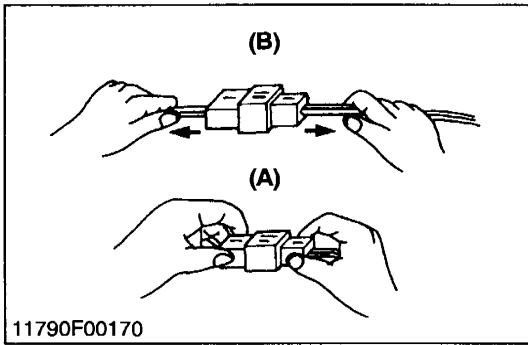
(4) Connector



- For connector with lock, push lock to separate.

(A) Push

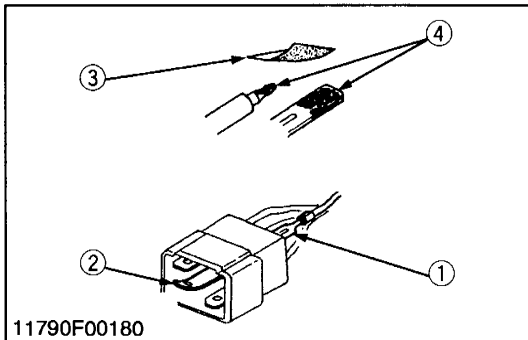
11790G00150



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

(A) Correct (B) Incorrect

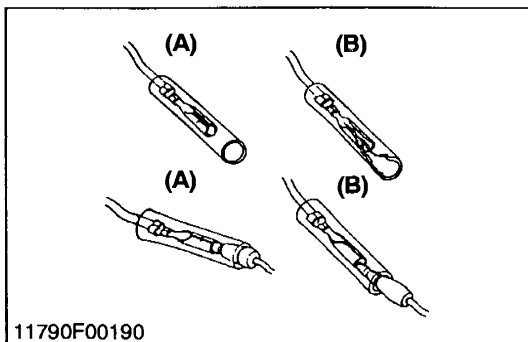
11790G00160



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

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

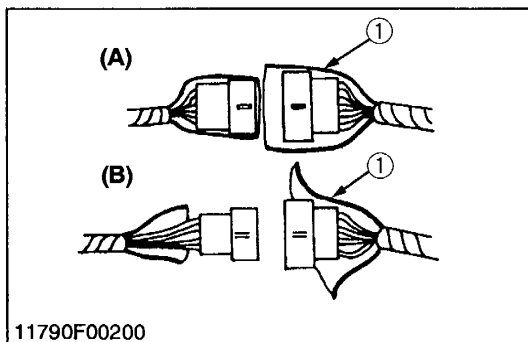
11790G00170



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

(A) Correct (B) Incorrect

11790G00180

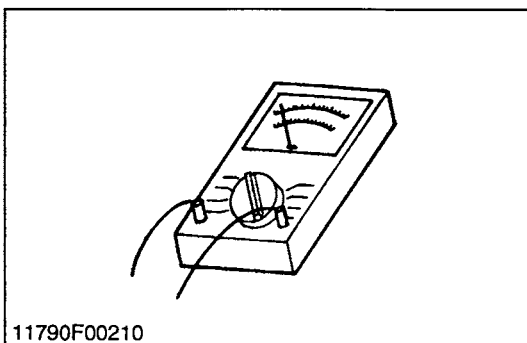


- Make certain plastic cover is large enough to cover whole connector.

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

11790G00190

(5) Handling of Circuit Tester



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

11790G00200

[5] LUBRICANTS, FUEL AND COOLING WATER




	Place	Capacity	Lubricants, fuel and cooling water	
		B7300HSD		
1	Fuel	13 ℓ 3.4 U.S.gals. 2.9 Imp. gals.	No.2-D diesel fuel No.1-D diesel fuel if temperature is below - 10 °C (14 °F)	
2	Coolant with recovery tank	2.7 ℓ 2.9 U.S.qts. 2.4 Imp.qts.	Fresh clean water with anti-freeze	
3	Engine crankcase with filter cartridge	2.4 ℓ 2.5 U.S.qts. 2.1 Imp.qts.	Engine oil : API Service Classification CC or CD 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	12.0 ℓ 3.17 U.S.gals 12.4 Imp.gals	KUBOTA SUPER UDT fluid *	
5	Front axle case [4WD]	3.7 ℓ 3.9 U.S.qts. 3.3 Imp.qts.	KUBOTA SUPER UDT fluid * or SAE 80, 90 gear oil	
6	Steering gear box	0.2 ℓ 0.21 U.S.qts. 0.18 Imp.qts.		
Greasing				
	Place	No. of greasing point	Capacity	Type of grease
7	HST pedal	1	Until grease overflows	SAE multi-purpose type grease

* : KUBOTA original transmission hydraulic fluid.

[6] TIGHTENING TORQUES

(1) General Use Screws, Bolts and Nuts

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

Indication on top of bolt	 No-grade or 4T						 7T						 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit Diameter	N·m	kgf·m	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
M 6 (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
M 8 (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 (16mm, 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 (20mm, 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

(2) Stud Bolts

Material of opponent part	Ordinariness			Aluminum		
Unit Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1

[7] MAINTENANCE CHECK LIST

No.	Check point	Indication on hour meter (Change or check every interval shown below)																After purchase		Reference page						
		50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1 year	2 years							
1	Engine oil changing	⊙	○		○		○		○		○		○		○		○									G-8, 12
2	Engine oil filter cartridge replacement	⊙			○				○																	G-12
3	Transmission fluid changing	⊙					○																			G-8, 13
4	Hydraulic oil filter cartridge replacement	⊙					○																			G-14
5	Transmission oil strainer changing	⊙					○																			G-14
6	Greasing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	G-14
7	Engine starting system checking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	G-15
8	Wheel bolt torque checking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	G-16
9	Battery condition checking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	G-16, 17
10	Air cleaner element cleaning ★		○		○		○		○		○		○		○		○		○		○		○		○	G-18
11	Air cleaner element replacement																						○			G-25
12	Fuel filter element cleaning		○		○		○		○		○		○		○		○		○		○		○		○	G-18
13	Fuel filter element replacement									○														○		G-23
14	Fan belt adjustment		○		○		○		○		○		○		○		○		○		○		○		○	G-19
15	Clutch adjustment		○		○		○		○		○		○		○		○		○		○		○		○	G-19
16	HST pedal spring checking		○		○		○		○		○		○		○		○		○		○		○		○	G-20
17	Brake adjustment		○		○		○		○		○		○		○		○		○		○		○		○	G-20
18	Radiator hose and clamp checking				○				○						○									○		G-21
19	Radiator hose and clamp replacement																							○		G-27
20	Fuel line checking				○				○						○									○		G-21
21	Fuel line replacement																							○		G-28
22	Toe-in checking				○				○						○									○		G-22
23	Front axle case oil changing						○								○											G-8, 22
24	Front axle pivot adjustment								○															○	○	G-23
25	Engine valve clearance adjustment ★★																							○		G-24
26	Cooling system cleaning																							○		G-26, 27
27	Coolant changing																							○		G-8, 26, 27

Note : The jobs indicated by ⊙ must be done by all means 50 hours after the break-in respectively.
 The jobs indicated by ☆ service as required.
 ★ Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
 ★★ Consult your local KUBOTA dealer for this service.

[7] MAINTENANCE CHECK LIST (Continued)

No.	Check point	Indication on hour meter (Change or check every interval shown below)																After purchase		Reference page		
		50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1 year	2 years			
28	Fuel system bleeding ☆																					G-28
29	Clutch housing water draining ☆																					—
30	Fuse replacement ☆																					G-29
31	Light bulb replacement ☆																					G-29

- Note :** The jobs indicated by ⊙ must be done by all means 50 hours after the break-in respectively.
 The jobs indicated by ☆ service as required.
 ★ Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
 ★★ Consult your local KUBOTA dealer for this service.

[8] CHECK AND MAINTENANCE

 CAUTION

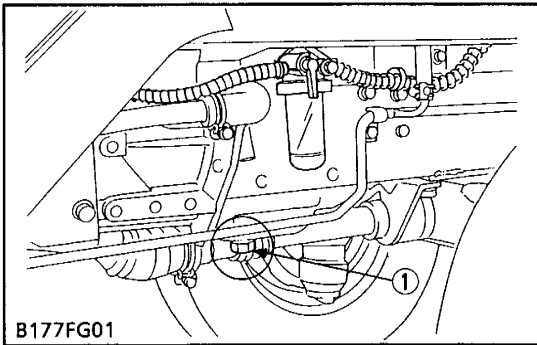
- Be sure to check and service the tractor on a flat place with engine shut off, the parking brake on and choke the wheels.

(1) Daily Check

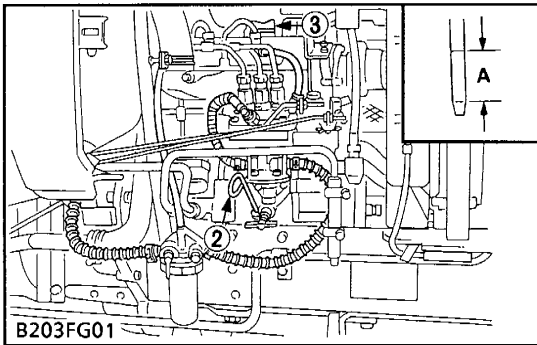
To prevent trouble from occurring, it is important to know the condition of the tractor. Check the following items before starting.

Checking

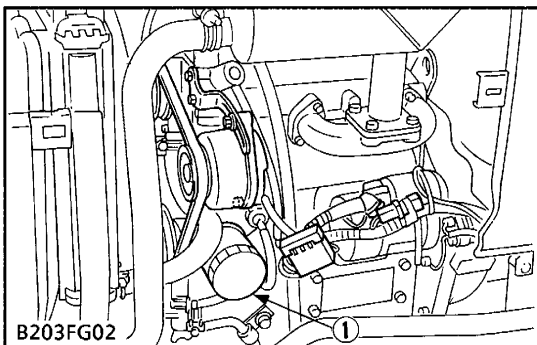
- Check areas where previous trouble was experienced.
- Walk around the tractor.
 - 1) Check the tire pressure, and check for wear and damage.
 - 2) Check for oil and water leaks.
 - 3) Check the engine oil level.
 - 4) Check the transmission fluid level.
 - 5) Check the coolant level.
 - 6) Check the condition of ROPS attaching hardware.
 - 7) Check and clean the radiator screen and drill.
 - 8) Check the bolts and nuts of the tires are tight.
 - 9) Check the number plate or SMV emblem for damage and cleaner replace as necessary if equipped.
 - 10) Care of danger, warning and caution labels.
 - 11) Clean around the exhaust manifold and the muffler of the engine.
- While sitting in the operator's seat.
 - 1) Check the throttle pedal, brake pedals and clutch pedal.
 - 2) Check the parking brake.
 - 3) Check the steering wheel.
- Turning the key switch.
 - 1) Check the performance of the easy checker lights.
 - 2) Check head lights, tail lights and hazard lights. Clean if necessary.
 - 3) Check the performance of the meters and gauges.
- Starting the engine.
 - 1) Check to see that the lights on the Easy Checker go off.
 - 2) Check the color of the exhaust.
 - 3) Check the brakes for proper operation.

(2) Check Points of Initial 50 Hours

B177FG01



B203FG01



B203FG02

Changing Engine Oil**⚠ CAUTION**

- Before changing oil, be sure to stop the engine.
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 drain plug (1) at the bottom of the engine and drain the oil completely.
 4. Screw in the drain plug.
 5. Fill new oil up to upper line on the dipstick (2).

■ IMPORTANT

- When using and 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 COOLING WATER". (See page G-8.)

Engine oil capacity	2.4 ℓ 2.5 U.S.qts 2.1 Imp.qts
---------------------	-------------------------------------

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

[A] Oil level acceptable within this range.

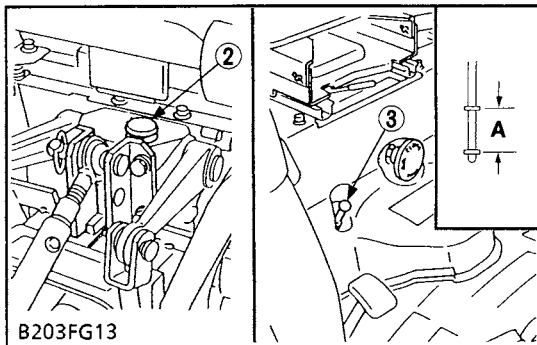
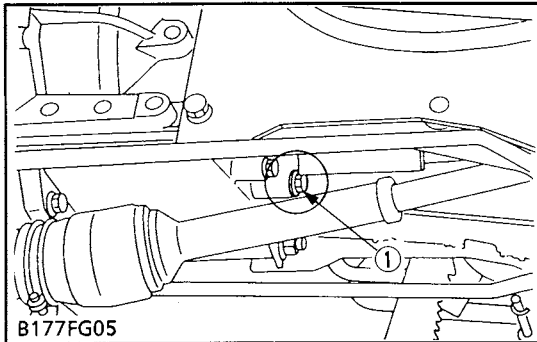
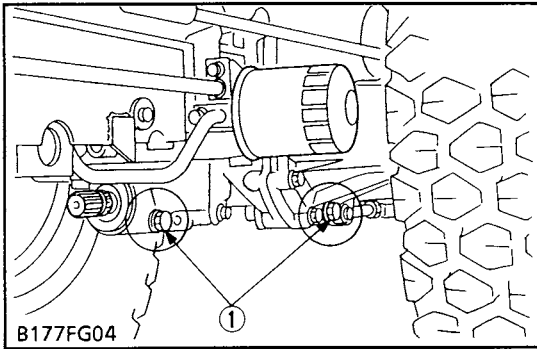
Replacing Engine Oil Filter Cartridge**⚠ CAUTION**

- Be sure to stop the engine before changing oil filter cartridge.
1. Remove the engine oil filter cartridge (1) with the filter wrench.
 2. Apply a slight coat of oil onto the rubber 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 filter cartridge must be highly efficient. Use only a KUBOTA genuine filter.

- (1) Engine Oil Filter Cartridge



Changing Transmission Fluid

⚠ CAUTION

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

1. Place an oil pan underneath the transmission case.
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 upper notch on the dipstick (3).
6. After running the engine for a few minutes, stop it and check the fluid level again. If low, add fluid prescribed level (A).

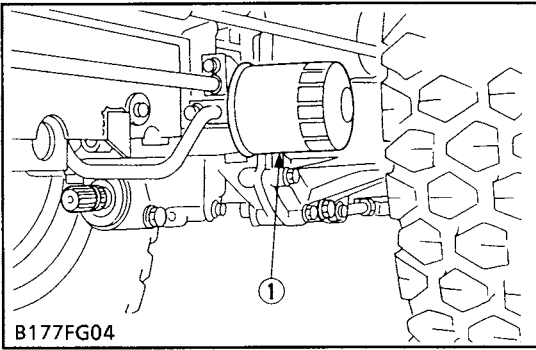
■ IMPORTANT

- Use only multi-grade transmission fluid. Use of other fluids may damage the transmission oil hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)
- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.
 1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
 2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system. This is important to prevent the hydraulic pump and the HST unit from getting seized.
 3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.
- Do not mix different brands oil together.

Transmission fluid capacity	12 ℓ 3.17 U.S.qts 2.6 Imp.qts
-----------------------------	-------------------------------------

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

(A) Oil level is acceptable within this range.



Replacing Transmission Oil Filter Cartridge

⚠ CAUTION

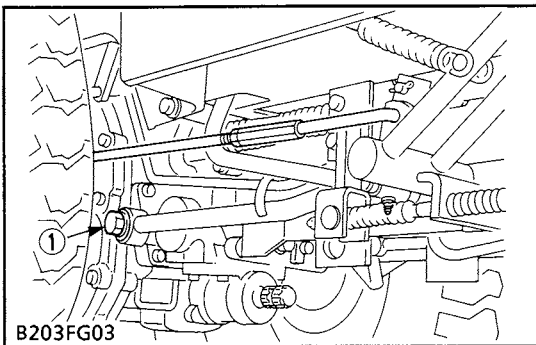
- Be sure to stop the engine before changing the oil filter cartridge.

1. Remove the transmission oil filter cartridge (1) with the filter wrench.
2. When installing, apply the clean transmission oil slightly onto the rubber gasket.
3. Tighten the transmission oil filter cartridge quickly until it contacts the mounting surface. Tighten the transmission oil filter cartridge by hand. Over tightening may cause deformation of rubber gasket.
4. After the new cartridge has been replaced, the transmission fluid level normally decreases a little. Add KUBOTA SUPER UDT fluid to proper level. Check for oil leaks around filter gasket.

■ IMPORTANT

- To prevent serious damage to the hydraulic system, replacement oil filter cartridge must be highly efficient. Use only a genuine KUBOTA filter.

(1) Transmission Oil Filter Cartridge



Cleaning Transmission Oil Strainer

1. Place an oil pan underneath the transmission oil strainer.
2. When changing the transmission oil, be sure to clean the transmission oil strainer (1) with kerosene.
3. If the oil strainer is deformed or broken, replace it.

■ IMPORTANT

- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.

1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system.

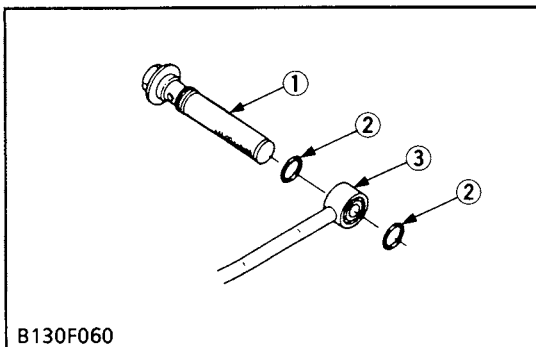
This is important to prevent the hydraulic pump and the HST unit from getting seized.

3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.

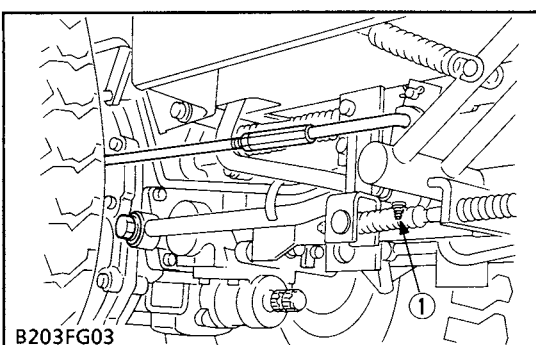
(1) Transmission Oil Strainer

(3) Front Suction Pipe

(2) O-ring



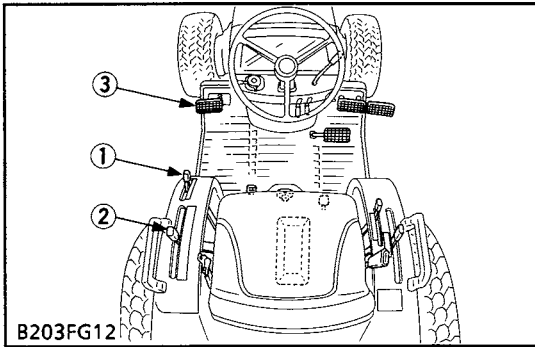
(3) Check Points of Every 50 Hours



Greasing

1. Apply grease to the HST pedal until grease overflows.

(1) Grease Fitting



- (1) Hi-Lo Gear Shift Lever
 (2) PTO Gear Shift Lever
 (3) Clutch Pedal

Checking Engine Start System

⚠ CAUTION

To avoid personal injury :

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

■ Preparation before testing

1. Sit on operator's seat.
2. Set the parking brake and stop the engine.
3. Shift the Hi-Lo gear shift lever (1) in "NEUTRAL" position.
4. Shift the PTO gear shift lever (2) to "OFF" position.
5. Fully depress the clutch pedal (3).

■ Test 1 : for safety switch on the clutch linkage

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

■ Test 2 : for safety switch on the traveling gear shift linkage

1. Fully depress the clutch pedal.
2. Shift the Hi-Lo gear shift lever to "Desired" position.
3. Turn the key to "START" position.
4. The engine must not crank.

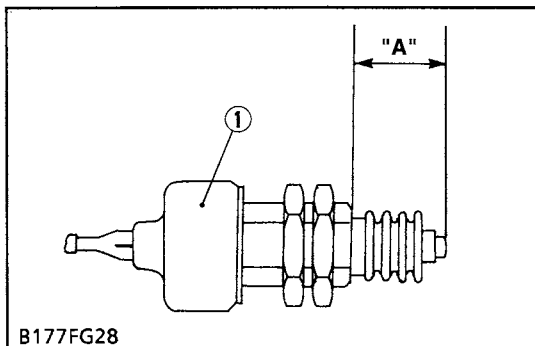
■ Test 3 : for safety switch on the rear PTO gear shift linkage

1. Shift the Hi-Lo gear shift lever to "NEUTRAL" position.
2. Shift the PTO gear shift lever to "ON" position.
3. Turn the key to "START" position.
4. The engine must not crank.

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

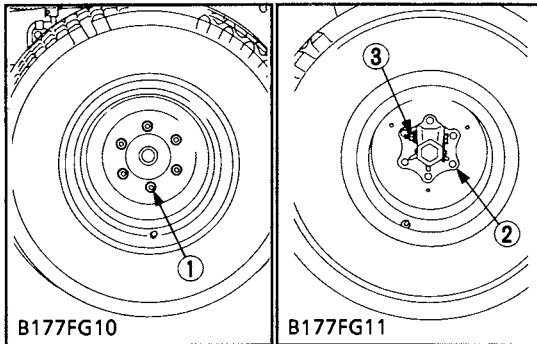
When adjusting the safety switches keep the each linkage at condition indicated below.

1. Clutch pedal linkage → Fully depress the clutch pedal.
2. Traveling gear shift linkage → Shift the Hi-Lo gear shift lever to "NEUTRAL" position.
3. PTO gear shift linkage → Shift the PTO gear shift lever to "OFF" position.



- (1) Safety Switch

Safety switch distance : "A"	Factory spec.	17 to 21 mm 0.67 to 0.83 in.
---------------------------------	---------------	---------------------------------



Checking Wheel Mounting Nuts Tightening Torque

CAUTION

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

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

Tightening torque	Front wheel mounting nut	77 to 90 N·m 7.9 to 9.2 kgf·m 57 to 67 ft-lbs
	Rear wheel hub mounting nut	108 to 125 N·m 11.0 to 12.8 kgf·m 80 to 93 ft-lbs
	Cotter setting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 ft-lbs

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

- (3) Cotter Setting Bolt and Nut

Checking Battery Condition

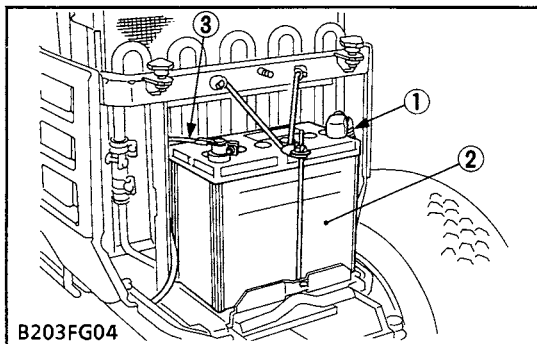
CAUTION

- Never remove the vent plugs while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately and get medical attention.
- 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 become dim. It is important check the battery periodically.

- (1) Positive Cable
(2) Battery

- (3) Negative Cable



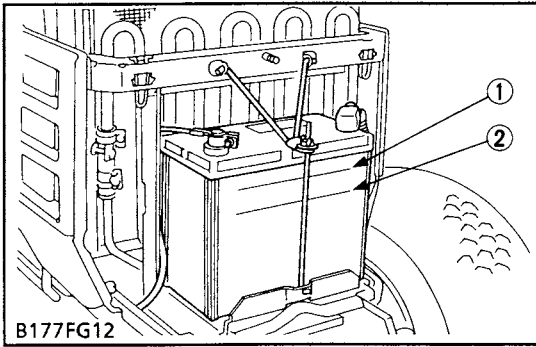


Table 1

Model	Battery type	Volts (V)	Capacity at 5 H.R (A.H)
B7300	50B24L(S)-MF	12	36

Table 2

Model	Reserve Capacity (min)	Cold Cranking Amps	Normal Charging Rate (A)
B7300	71	390	4.5

Battery Charging

CAUTION

- When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.
- When charging battery, remove battery vent plugs.
- When disconnecting the cable from the battery, start with the negative terminal first.
- When connecting the cable to the battery, start with the positive terminal first.
- never check battery charge by placing a metal object across the posts.
- Use a voltmeter or hydrometer.
- Connection with reverse polarities will cause spark and troubles to the battery and electrical machine. Reversing the steps may causes short-circuiting, should a metallic tool touch the terminals.

1. Make sure each electrolyte level is to the bottom of vent wells, if necessary add distilled water in a well-ventilated area.
2. The water in the electrolyte evaporates during recharging. Liquid shortage damages the battery. Excessive liquid spills over and damages the tractor body.
3. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
4. A boost charge is only for emergencies. It will partially charges the battery at a high rate and in a short time. When using a boost-charged battery, it is necessary to recharge the battery as early as possible. Failure to do this will shorten the battery's service life.
5. When the specific gravity of electrolyte become between 1.27 and 1.29 charge has completed.
6. When exchanging an old battery into new one, use battery of equal specification shown in table 1 and 2.

Direction for Storage

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

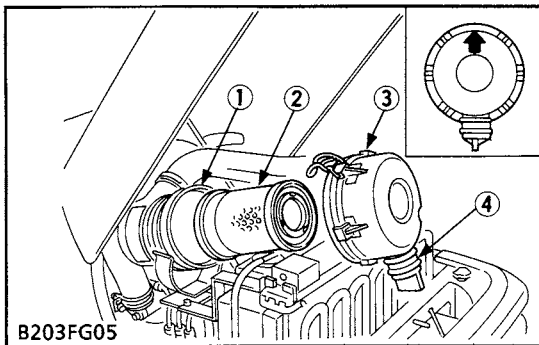
(1) Highest Level

(2) Lowest Level

(4) Check Points of Every 100 Hours

Changing Engine Oil

1. See page G-12.



Cleaning Air Cleaner Element

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

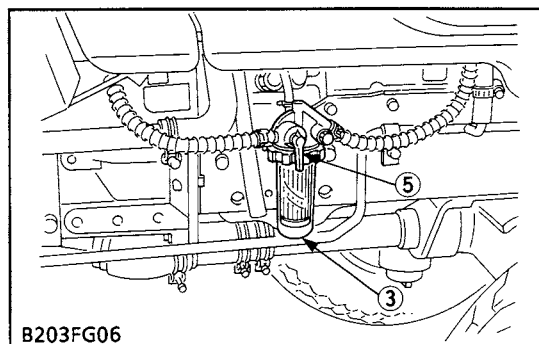
■ IMPORTANT

- Be sure to clean the inside of air cleaner and cover.
- The air cleaner uses a dry element, never apply oil.
- Do not run the engine with filter element removed.
- Be sure to refit the air cleaner cover (3) with the arrow ↑ (on the rear of cover) upright. If the air cleaner cover is improperly fitted, evacuator valve (4) will not function and dust will adhere to the element.
- If it is loose, dust and dirt may be sucked in, wearing down the cylinder and piston rings earlier and thereby resulting in poor power output.

■ 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) Air Cleaner Body | (3) Air Cleaner Cover |
| (2) Air Cleaner Element | (4) Evacuator Valve |



Cleaning Fuel Filter

When operation period reaches approx. 100 hours, clean the fuel filter.

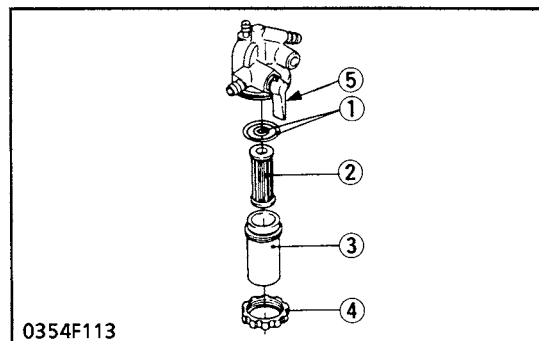
This job should not be done in the field, but in a clean place so as to prevent dust from entering fuel system.

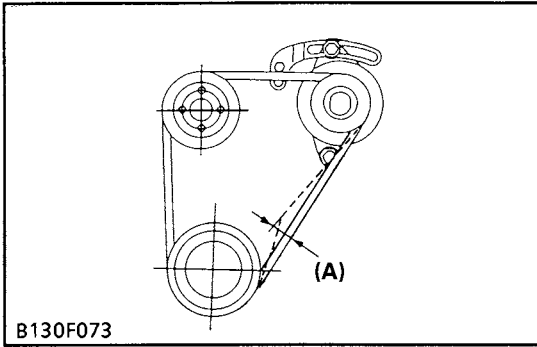
1. Close the fuel filter cock.
2. Unscrew and remove the screw ring, and remove the filter bowl (3), and rinse the inside with kerosene.
3. Take out the element (2) and dip it in the kerosene to rinse.
4. After cleaning reassembling the fuel filter, keeping out dust and dirt.
5. Bleed the fuel system. (Refer to G-28)

■ IMPORTANT

- If dust and dirt enter the fuel, the fuel pump and injection nozzle are subject to wear. To prevent this, be sure to clean the fuel filter bowl periodically.

- | | |
|-----------------|----------------------|
| (1) O-ring | (4) Screw Ring |
| (2) Element | (5) Fuel Filter Cock |
| (3) Filter Bowl | |





Adjusting Fan Belt Tension

CAUTION

- Apply the parking brake and stop the engine and remove the key.
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 to 9 mm 0.28 to 0.35 in.
----------------	---------------	-------------------------------

(A) Deflection

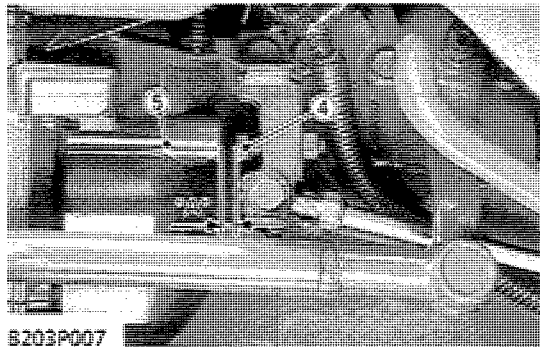
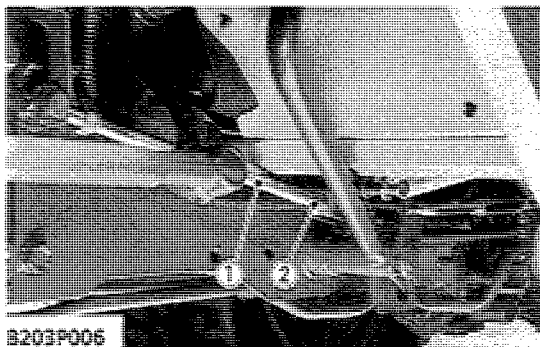
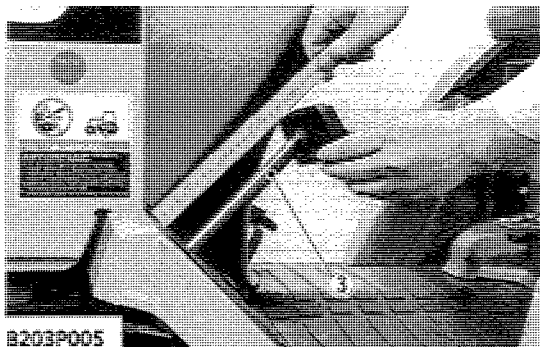
Checking Clutch Pedal Free Travel

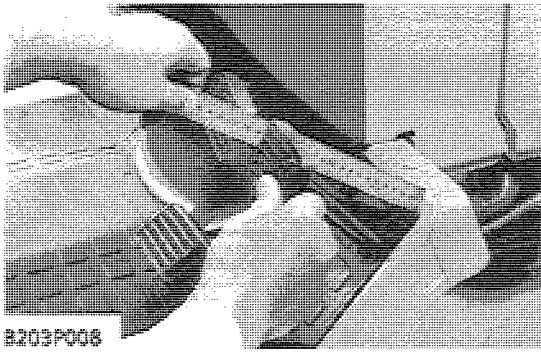
CAUTION

- When checking, park the tractor on flat ground, apply the parking brake, stop the engine and remove the key.
1. Slightly depress the clutch pedal (3) and measure free travel at top of pedal stroke.
 2. If the measurement is not within the factory specifications, loosen the lock nut (2) and adjust the clutch rod (1) length.
 3. After adjusting it, be sure to keep the following distance for clutch pedal stopper bolt (4).
 4. After adjusting them, try to start engine. If no start, check the safety switch setting position.

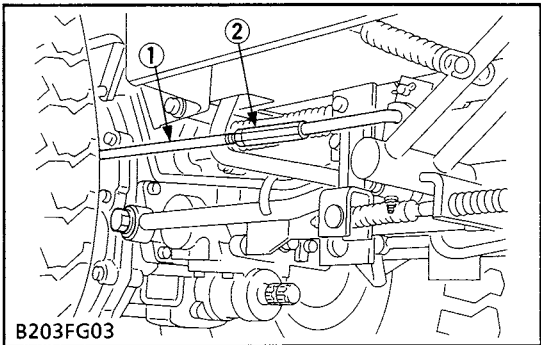
Clutch pedal free travel	Factory spec.	20 to 30 mm 0.8 to 1.2 in.
Stopper bolt distance : "A"	Factory spec.	8.5 mm 0.3 in.

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





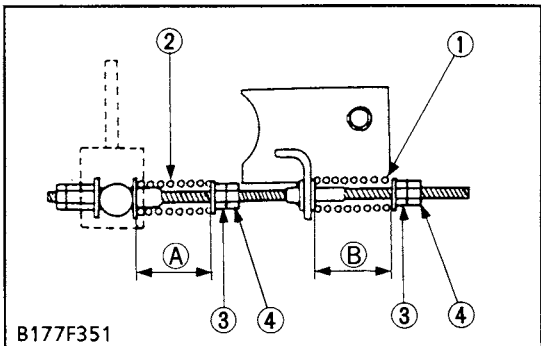
B203F008



B203FG03

(1) Brake Rod

(2) Turnbuckle



B177F351

- (1) Return Spring (for Forward Adjustment)
- (2) Return Spring (for Reverse Adjustment)
- (3) Adjustment Nut
- (4) Lock Nut

Checking Brake Pedal Free Travel

CAUTION

To avoid personal injury :

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

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

Brake pedal free travel	Factory spec.	30 to 40 mm 1.18 to 1.57 in.
-------------------------	---------------	---------------------------------

Checking HST Pedal Performance

CAUTION

To avoid personal injury :

- Do not operate if tractor moves on level ground with foot off HST pedal.

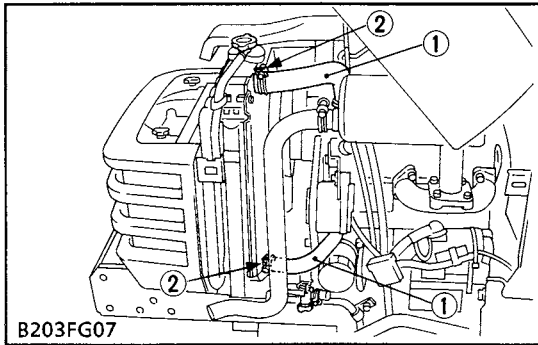
1. Set the engine speed to 1500 rpm.
2. Shift the range gear shift lever to the high position.
3. Move the HST pedal from the forward to the neutral position to make sure that the tractor comes to a complete stop, and check the same for the movement from the rearward to the neutral position.
4. If HST pedal is too slow in returning to neutral position, adjust the HST pedal spring compression.

	Length (A)	Length (B)
Normal compression	65 mm (2.6 in.)	65 mm (2.6 in.)
Max. compression	42 mm (1.7 in.)	42 mm (1.7 in.)

IMPORTANT

- Do not compress the return spring shorter than Max. compression length 42 mm (1.7 in.).

(5) Check Points of Every 200 Hours



B203FG07

Replacing Engine Oil Filter Cartridge

1. See page G-12.

Checking Radiator Hose and Hose Clamp

■ NOTE

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

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

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

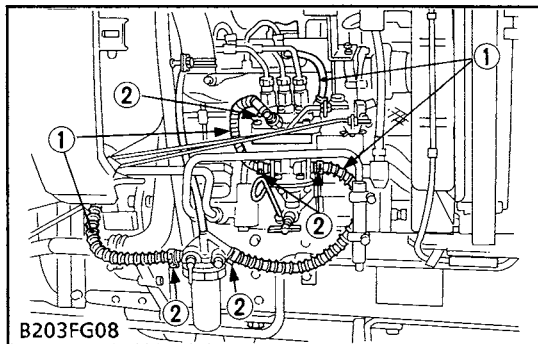
■ Precaution at Overheating

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 and then start again the engine.

(1) Radiator Hose

(2) Hose Clamp



B203FG08

(1) Fuel Hose

(2) Hose Clamp

Checking Fuel Line

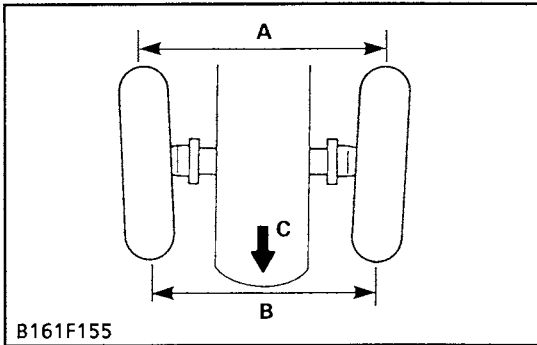
▲ CAUTION

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

1. Check to see that all line and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.
3. The fuel line is made of rubber and ages regardless of period of service. Replace the fuel hose together with the clamp every two years and securely tighten.
4. However if the fuel hose 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.

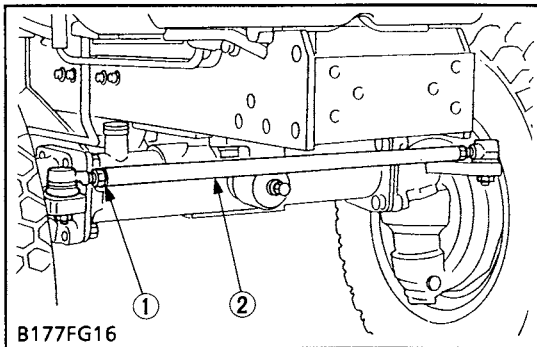


(C) Front

Choking 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 park brake and stop the engine.
5. Measure the toe-in (A-B).
6. If the measurement is not within the factory specifications, adjust the tie rod length.

Toe-in (A-B)	Factory spec.	1 to 10 mm 0.04 to 0.4 in.
--------------	---------------	-------------------------------



(1) Lock Nut (2) Tie Rod

■ Toe-in Adjustment

1. Loosen the lock nuts (1) and turn the tie rod (2) to adjust the rod length until the proper toe-in measurement is obtained.
2. Retighten the lock nuts.

(6) Check Point of Every 300 Hours

Changing Transmission Fluid

See page G-13.

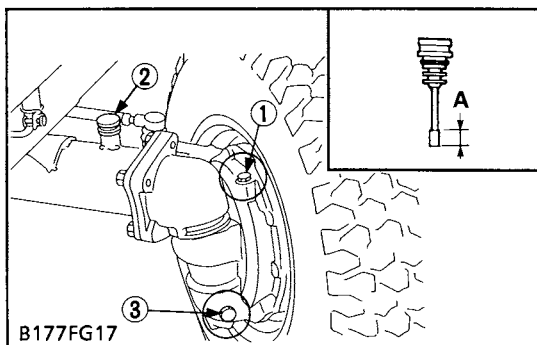
Cleaning Transmission Oil Strainer

See page G-14.

Replacing Transmission Oil Filter Cartridge

See page G-13.

Changing Front Axle Case Oil



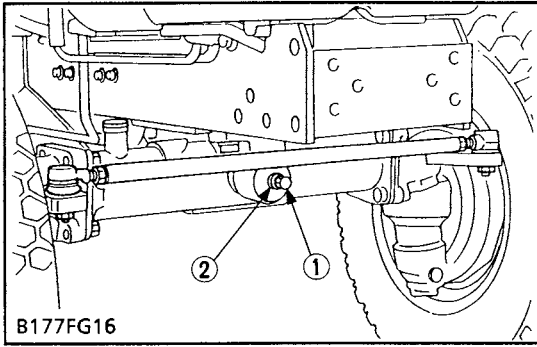
(1) Breather Plug
 (2) Filling Plug with Dipstick
 (3) Drain Plug
 (A) Oil level is acceptable within this range.

1. Place the oil pans underneath the front axle case.
2. Remove the both right and left hand side drain plugs (3) and filling plug (2) to drain the oil.
3. Remove the right and left breather plugs.
4. After draining, reinstall the drain plugs.
5. Fill with new oil up to the upper notch on the dipstick.
6. After filling, reinstall the filling plug and breather plugs.

■ IMPORTANT

- After ten minutes, check the oil level again, add oil to prescribed level.
- Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)

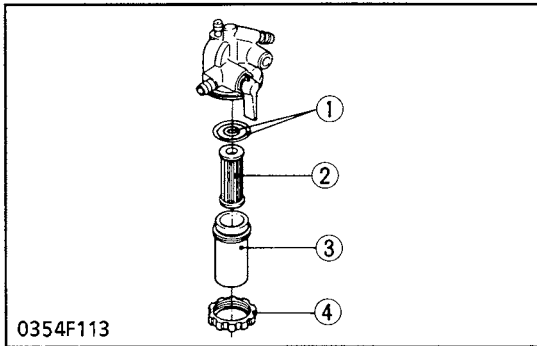
Front axle case oil capacity	3.7 ℓ 3.9 U.S. qts 3.3 Imp. qts
------------------------------	---------------------------------------

(7) Check Point of Every 400 Hours**Adjusting Front Axle Pivot**

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

(1) Adjusting Screw

(2) Lock Nut

**Replacing Fuel Filter Element**

1. The fuel filter element (2) should be replaced every 400 hours.

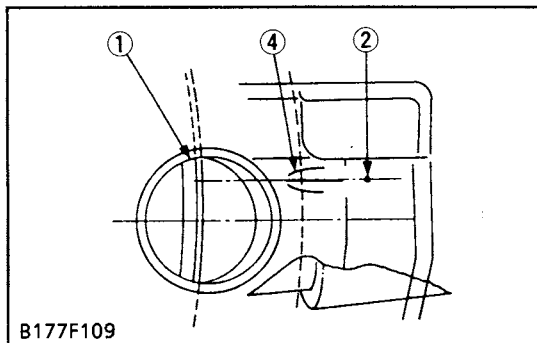
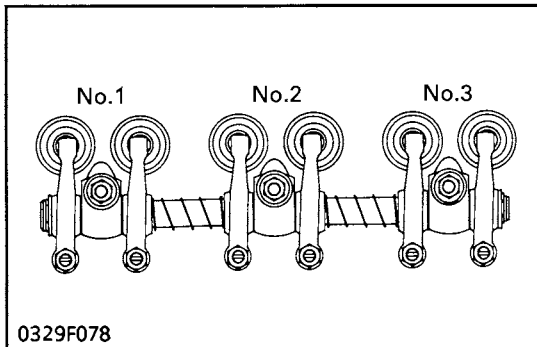
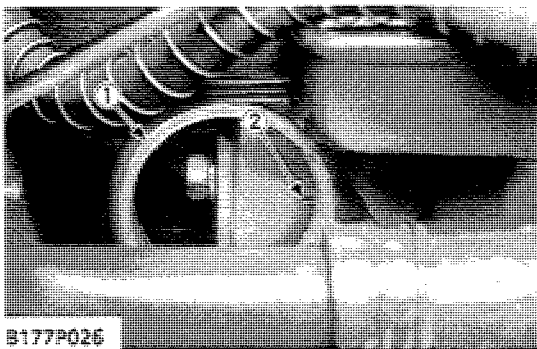
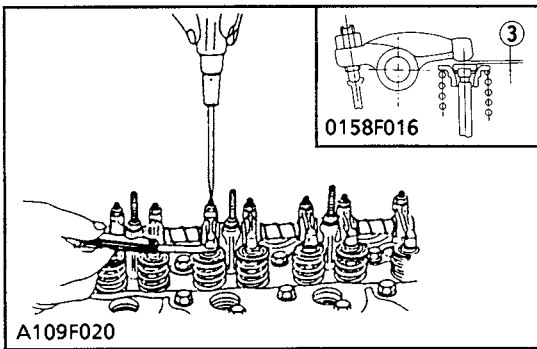
(1) O-ring

(3) Filter Bowl

(2) Element

(4) Screw Ring

(8) Check Point of Every 800 Hours



(1) Timing Window (2) TC Mark Line (3) Valve Clearance (4) Rib

Checking Valve Clearance

IMPORTANT

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

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

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

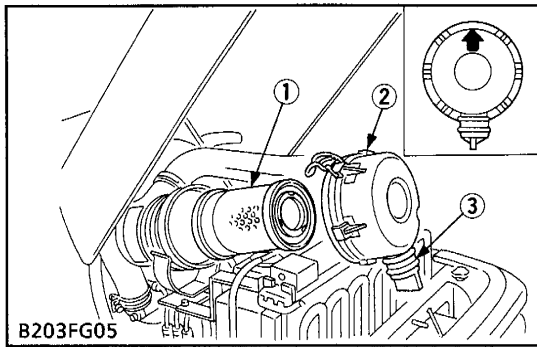
NOTE

- The "TC" marking line on the flywheel is just for No. 1 cylinder. There is no "TC" marking for the other cylinders.
- No. 1 piston comes to the T.D.C. position when the "TC" marking 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.

(Reference)

- The above mark (2) comes aligned with the center of the clutch housing rib (4), which is 13 mm (0.51 in.) above the center of timing window (1).

Adjustable cylinder location of piston	Engine model	D722	
		IN.	EX.
When No. 1 piston is compression top dead center	1st	○	○
	2nd		○
	3rd	○	
When No. 1 piston is overlap position	1st		
	2nd	○	
	3rd		○

(9) Check Point of Every 1 Year**Replacing Air Cleaner Element**

1. Replace the air cleaner element (1).

■ 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 air cleaner cover (2) with the arrow ↑ (on the rear of cover) upright. If the air cleaner cover is improperly fitted, evacuator valve (3) will not function and dust will adhere to the element.

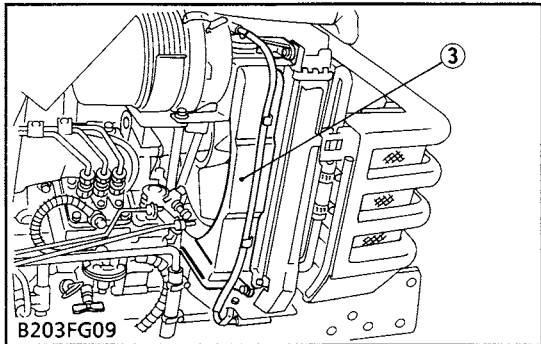
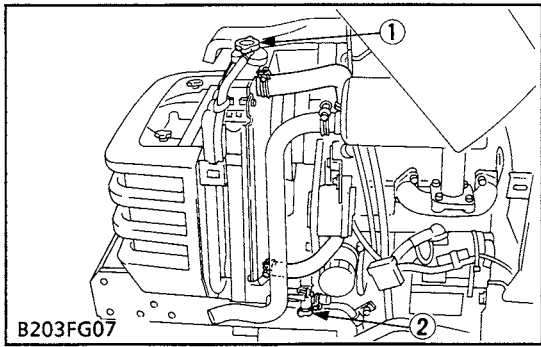
■ Evacuator Valve

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) Air Cleaner Element
 (2) Air Cleaner Cover

- (3) Evacuator Valve

(10) Check Point of Every 2 Years



Flush Cooling System and Changing Coolant

CAUTION

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

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

IMPORTANT

- Do not start engine without coolant.
- Use clean, fresh water and anti-freeze to fill the radiator and recovery tank.
Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)
- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.
- Securely tighten the radiator cap (1). If the cap is loose or improperly fitted, water may lead out and the engine could overheat.

Coolant capacity with recovery tank	2.7 ℓ 2.9 U.S. qts 2.4 Imp. qts
-------------------------------------	---------------------------------------

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

(3) Recovery Tank

Flush Cooling System and Changing Coolant (Continued)

■ Anti-Freeze

If it freezes, cooling water can damage the cylinders and radiator. It is necessary, if the ambient temperature falls below 0 °C (32 °F) to remove cooling water 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, more specifically also to SAE J814c.
4. Mix the anti-freeze with water, and then fill in to the radiator.

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

* At 101 kPa (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

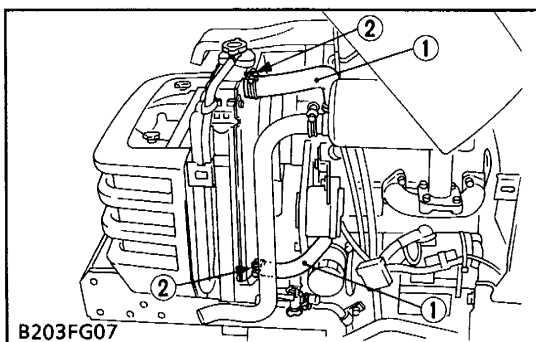
- The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.
- When the cooling water level drops due to evaporation, add water only. In case of leakage, add anti-freeze and water in the specified mixing ratio.
- Anti-freeze absorbs moisture.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

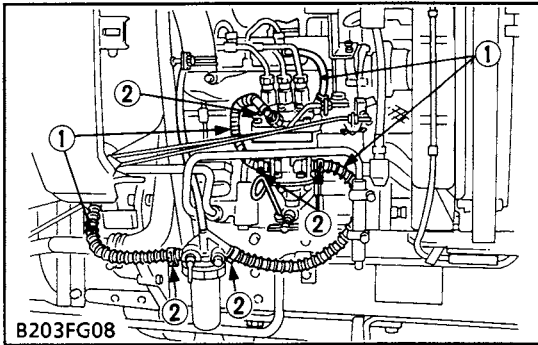
Replacing Radiator Hose and Hose Clamp

1. Replace the radiator hoses (1) and hose clamp (2). Refer to "Checking Radiator Hose and Hose Clamp". (See page G-21.)

(1) Radiator Hose

(2) Hose Clamp





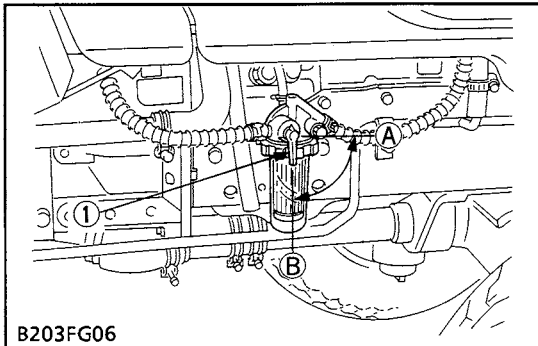
Replacing Fuel Line

1. Replace the fuel hoses (1) and hose clamps (2). Refer to "Checking Fuel Line". (See page G-21.)

(1) Fuel Hose

(2) Hose Clamp

(11) Others



(1) Fuel Cock

[A] Fuel Cock is "Close"

[B] Fuel Cock is "Open"

Bleeding Fuel System

⚠ CAUTION

To avoid personal injury :

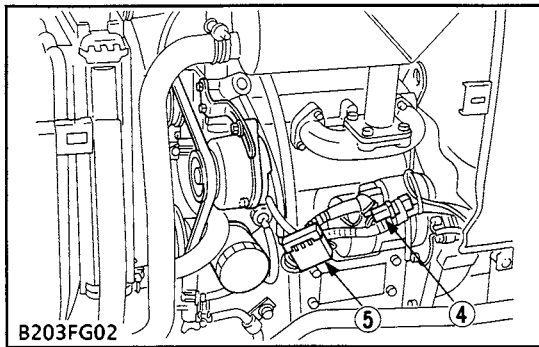
- Do not bleed the fuel system when the engine is hot.

Air must be removed :

1. When the fuel filter or lines are removed.
2. When tank is completely empty.
3. After the machine 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. Start the engine and run for about 30 seconds, and then stop the engine.



		Empty	} (5)
HEAD LIGHT INSTRUMENT CLUSTER	10A	← (1)	
WORK LIGHT	15A	← (2)	
HAZARD	10A	← (3)	

B203FG10

Replacing Fuse

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

IMPORTANT

- Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to the troubleshooting section of this manual or your local KUBOTA dealer for specific information dealing with electrical problems.
If any of them should blow, replace with a new one of the same capacity.

FUSE No.	CAPACITY (A)	Protected circuit
(1)	10	Head lights, Instrument cluster
(2)	15	Work light
(3)	10	Hazard lights
(4)	Slow blow fuse 30	Check circuit against wrong battery connection

(5) Fuse Box

Replacing Light Bulb

(Head lights)

1. Take the bulb out of the light body and replace with new one.

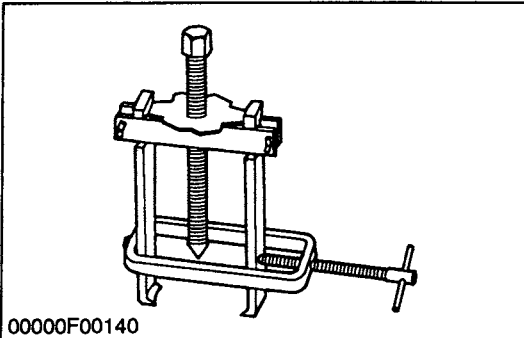
(Other lights)

1. Detach the lens and replace the bulb.

Lights	Capacity
Head lights	15 W
Tail light	8 W
Hazard light	27 W

[9] SPECIAL TOOLS

(1) Special Tools for Engine

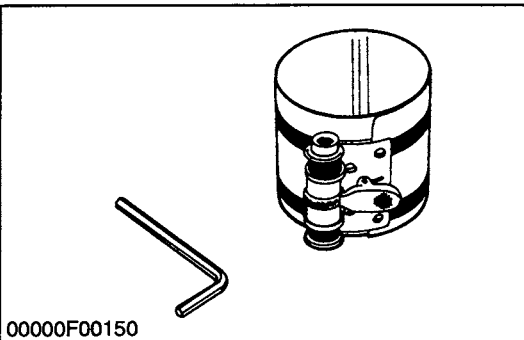


Special Use Puller Set

Code No : 07916-09032

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

00000G00010

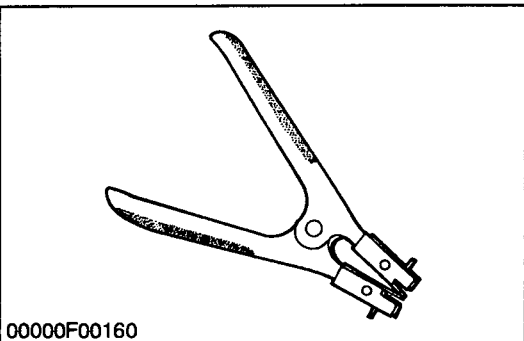


Piston Ring Compressor

Code No : 07909-32111

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

00000G00020

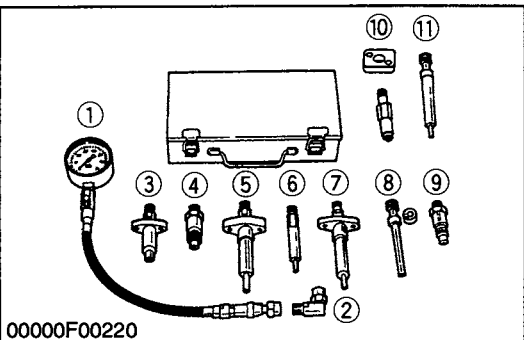


Piston Ring Tool

Code No : 07909-32121

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

00000G00030



Diesel Engine Compression Tester

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

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

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

07909-31231 (H)

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

(1) Gauge

(2) L Joint

(3) Adaptor A

(4) Adaptor B

(5) Adaptor C

(6) Adaptor E

(7) Adaptor F

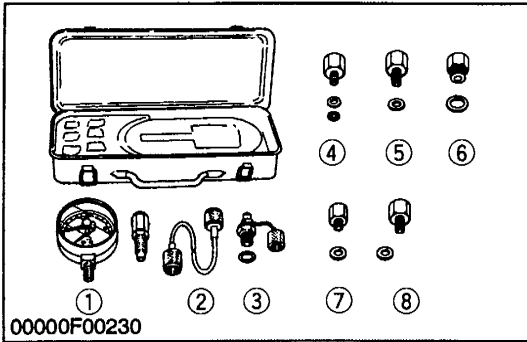
(8) Adaptor G

(9) Adaptor H

(10) Adaptor I

(11) Adaptor J

00000G00070



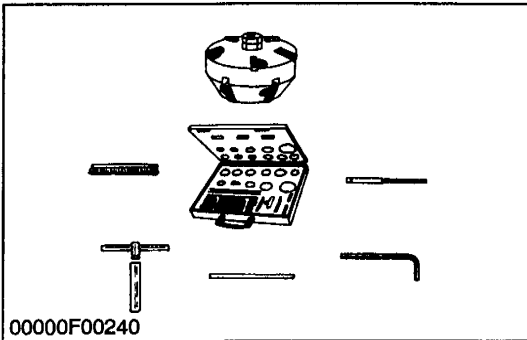
Oil Pressure Tester

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 |

00000G00080



Valve Seat Cutter

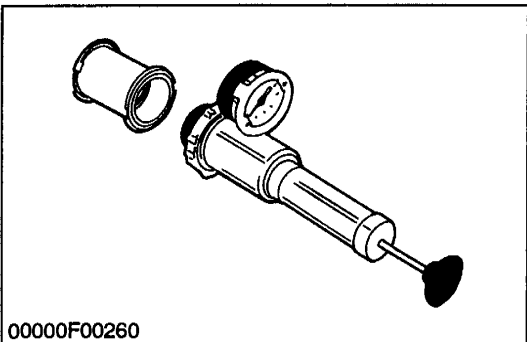
Code No : 07909-33102

Application : Use to reseal valves.

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

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

00000G00090

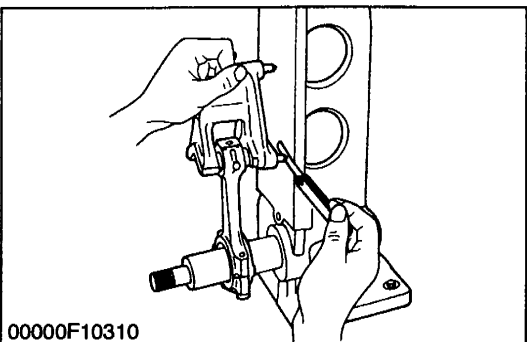


Radiator Tester

Code No : 07909-31551

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

00000G00130



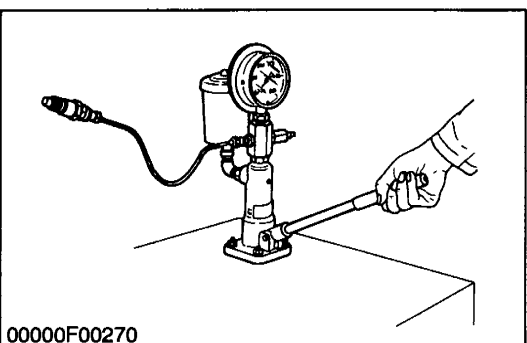
Connecting Rod Alignment Tool

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.)

00000G00110



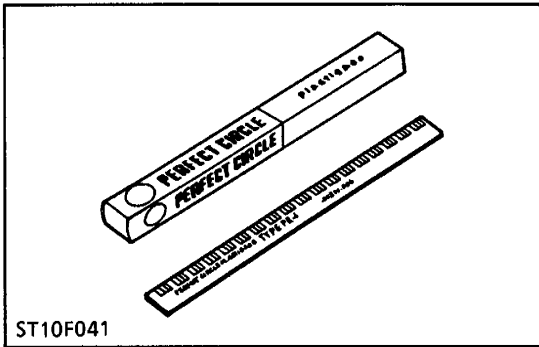
Nozzle Tester

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)

00000G00140



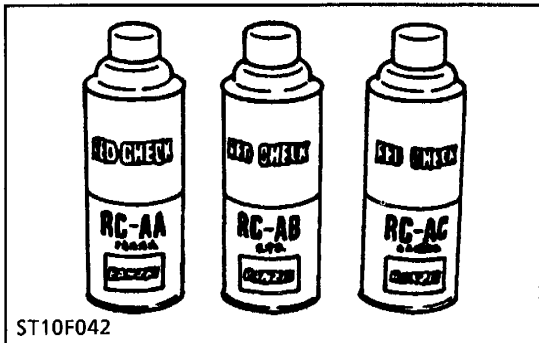
ST10F041

Plastigage

Code No. : 07909-30241

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

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

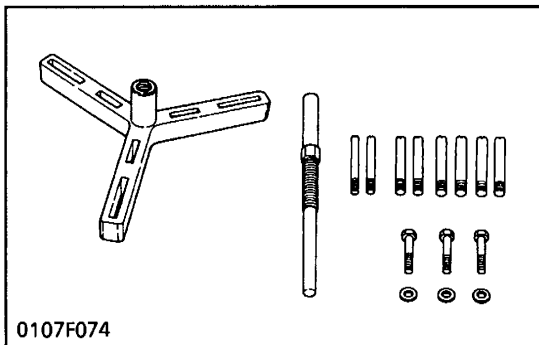


ST10F042

Red Check

Code No. : 07909-31371

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

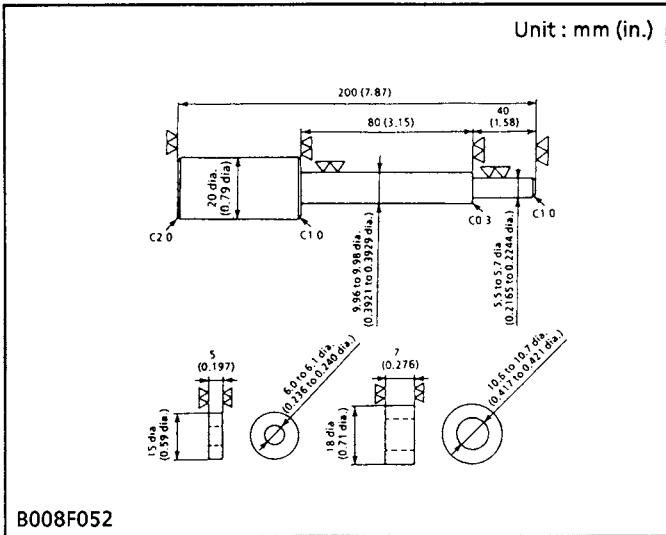


0107F074

Flywheel Puller

Code No. : 07916-32011

Application : Use exclusively for removing the with ease.

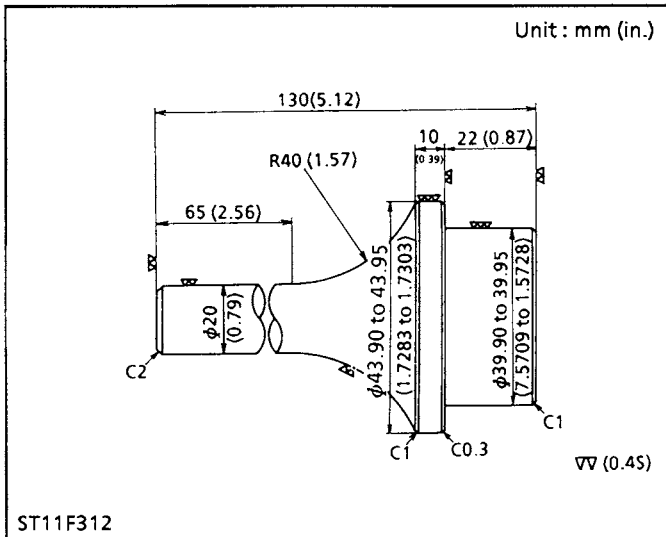


Valve Guide Replacing Tool

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

■ **NOTE**

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

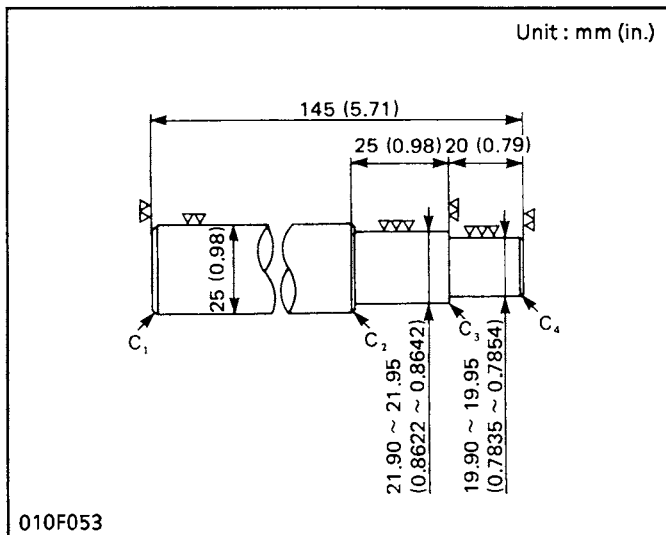


Crankshaft Bearing 1 Replacing Tool

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

■ **NOTE**

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

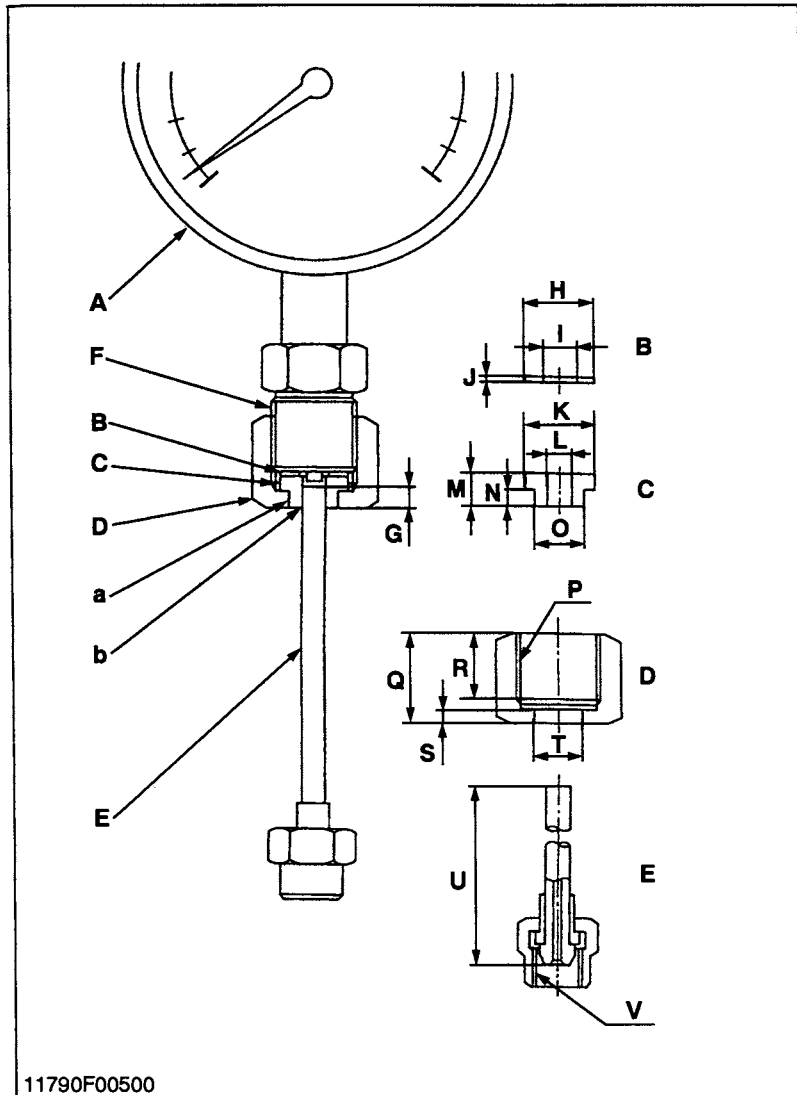


Bushing Replacing Tool

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

■ **NOTE**

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



Injection Pump Pressure Tester

Application: Use to check fuel tightness of injection pumps.

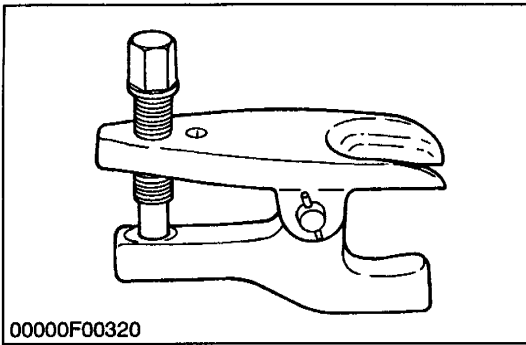
■ **NOTE**

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

A	Pressure gauge full scale more than 29.4 MPa (300 kgf/cm ² , 4267 psi)
B	Gasket (Copper)
C	Flange (Steel)
D	Hex. nut with across the flat 27 mm (1.06 in.)
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

11790G00810

(2) Special Tools for Tractor



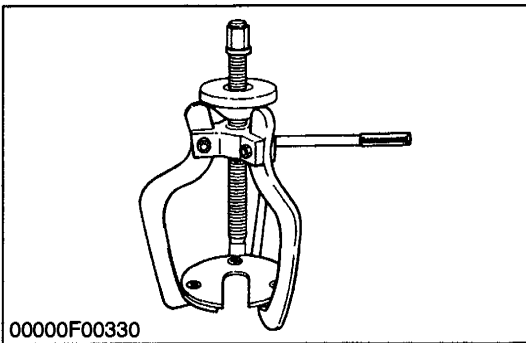
00000F00320

Tie-rod End Lifter

Code No : 07909-39051

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

00000G00190



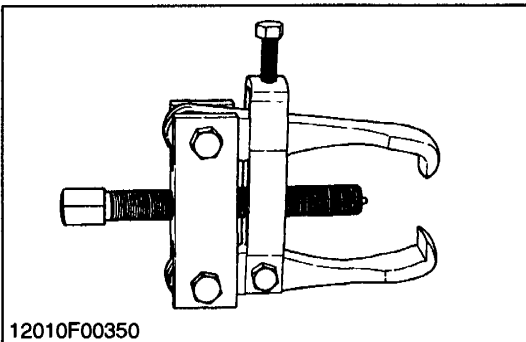
00000F00330

Steering Wheel Puller

Code No : 07916-51090

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

00000G00200



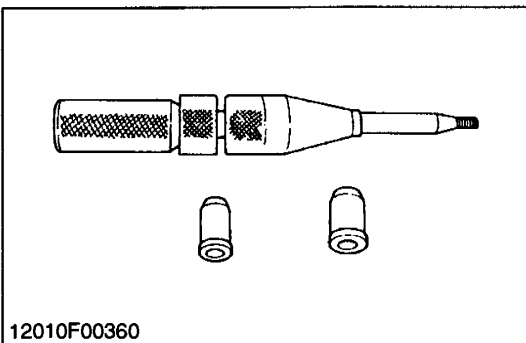
12010F00350

Pitman Arm Puller

Code No : 07909-39011

Application : Use for pulling out pitman arm from tractor.

12010G00440

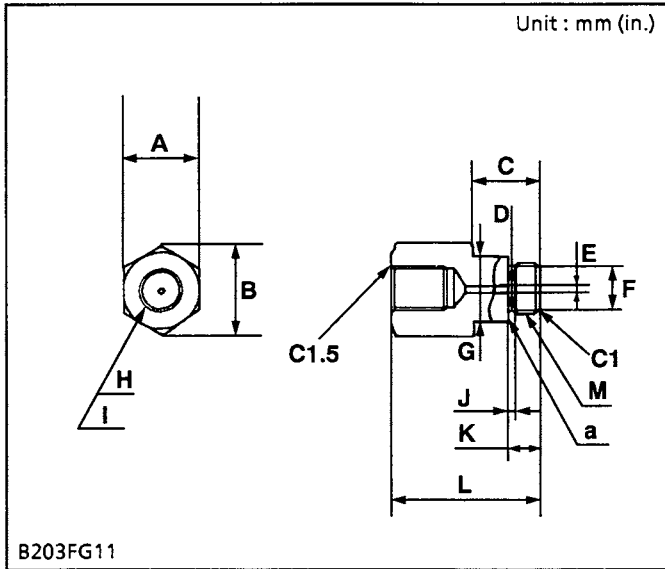


12010F00360

Clutch Center Tool (For B and L Series Tractors)

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

12010G00450



HST Adaptor (A)

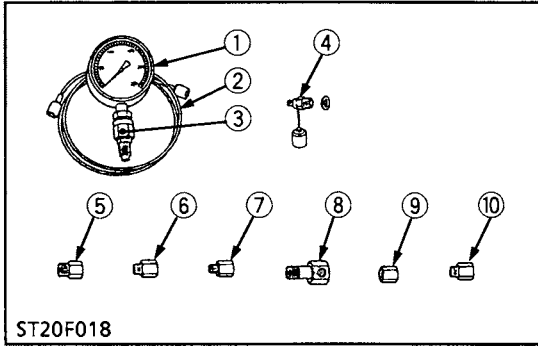
Application : Use for checking the check and high pressure relief valve setting pressure.

A	22 mm (0.8666 in.)
B	25.4 mm (1.00 in.)
C	22 mm (0.8666 in.)
D	16.76 mm dia. (0.6598 in. dia.)
E	2 mm dia. (0.0787 in. dia.)
F	16.76 mm dia. (0.6598 in. dia.)
G	22.23 mm dia. (0.8752 in. dia.)
H	PS 1/4 Thread depth 15 mm (0.590 in.)
I	Hole depth 18 mm (0.709 in.)
J	2.39 mm (0.0941 in.)
K	11.11 mm (0.4374 in.)
L	45 mm (1.77 in.)
M	3/4-16 UNF-2A
a	6.0 μm (0.000236 in.)

HST Adaptor (B)

Application : Use for checking the charge relief valve setting pressure.

A	22 mm (0.8666 in.)
B	25.4 mm (1.00 in.)
C	19 mm (0.7480 in.)
D	12.24 mm dia. (0.4819 in. dia.)
E	2 mm dia. (0.0787 in. dia.)
F	12.24 mm dia. (0.4819 in. dia.)
G	17.46 mm dia. (0.6874 in. dia.)
H	PS 1/4 Thread depth 15 mm (0.590 in.)
I	Hole depth 18 mm (0.709 in.)
J	2.11 mm (0.0831 in.)
K	9.92 mm (0.3906 in.)
L	42 mm (1.65 in.)
M	9/16-18 UNF-2A
a	6.0 μm (0.000236 in.)

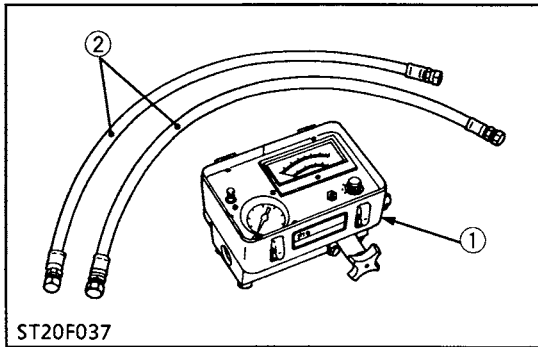


Relief Valve Pressure Tester

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) |

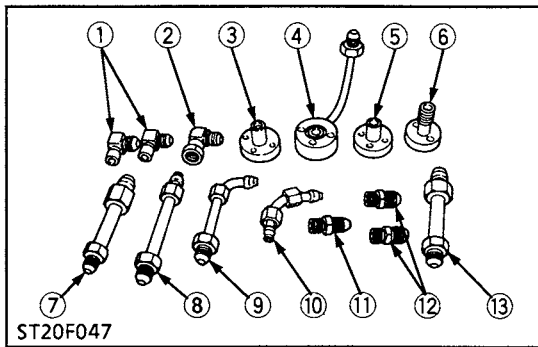


Flowmeter

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 |
|----------------|-------------------------|



Adaptor Set for Flow Meter

Code No. : 07916-54031

Application : Use for testing the hydraulic system.

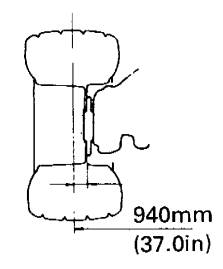
- | | |
|----------------|--------------------------|
| (1) Adaptor 52 | (8) Adaptor 65 |
| (2) Adaptor 53 | (9) Adaptor 66 |
| (3) Adaptor 54 | (10) Adaptor 67 |
| (4) Adaptor 61 | (11) Adaptor 68 |
| (5) Adaptor 62 | (12) Adaptor 69 |
| (6) Adaptor 63 | (13) Hydraulic Adaptor 1 |
| (7) Adaptor 64 |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

[10] TIRES

(1) Tread Adjustment

(1)-1 Front Wheel

Front tread cannot be adjusted.

Models	B7300
Tires	21 x 8.00-10 Turf
Tread	940 mm 37.0 in.
	 <p>940mm (37.0in)</p>
B177FG23	

■ IMPORTANT

- Do not turn front discs to obtain wider tread.

(1)-2 Rear Wheels

Rear tread can be adjusted in 2 steps depending on the model.

To change the tread

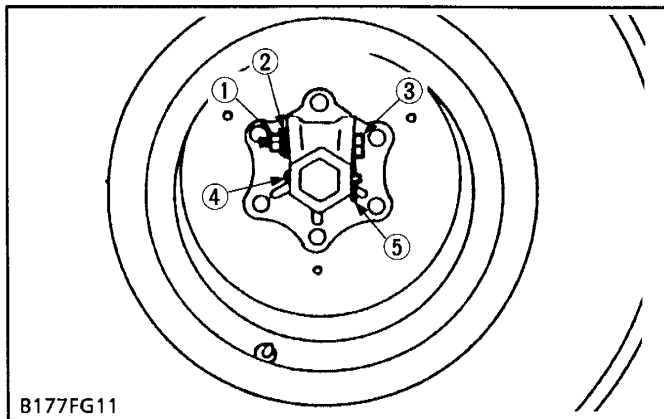
1. Loosen the nut of cotter pin bolt.
2. Remove the snap pin and wheel hub pin.
3. Change the tread to the desired position.
4. Re-set the wheel hub pin, snap pin and cotter pin bolt.

⚠ CAUTION

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

■ IMPORTANT

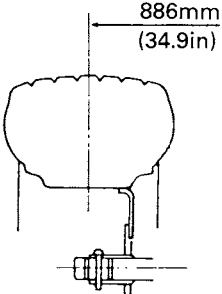
- Always attach tires as shown in the drawings below.
- If not attached as illustrated, transmission parts may be damaged.
- Do not use tires larger than specified.
- When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards)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



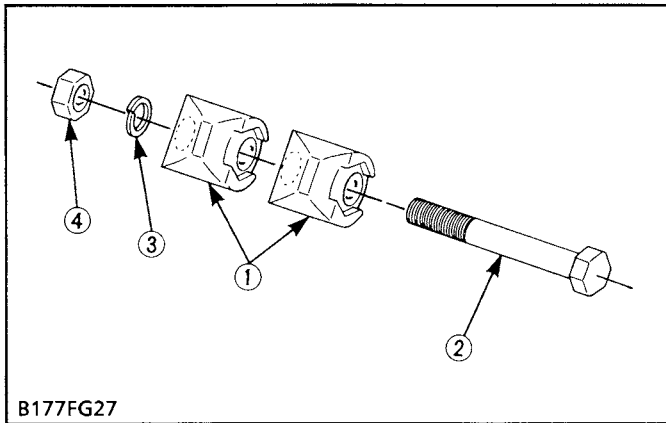
(When adjusting tread)

Tightening torque	Cotter setting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 ft-lbs
	Wheel hub mounting nut	108 to 125 N·m 11.0 to 12.8 kgf·m 80 to 93 ft-lbs

- | | |
|------------------------|-------------------|
| (1) Nut | (4) Wheel Hub Pin |
| (2) Spring Lock Washer | (5) Snap Pin |
| (3) Bolt | |

Models	B7300
Tires	29 x 12.50-15 Turf
Tread	832 mm 882mm (32.8 in.) (34.7 in.)
	 <p>886mm (34.9in.)</p>

0354F105

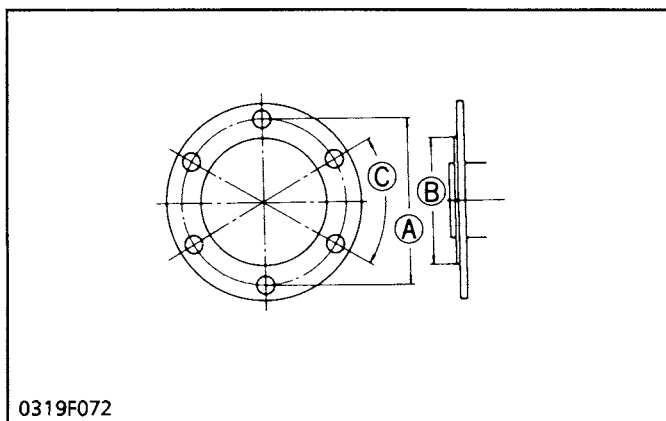


■ NOTE

- Insert the bolt (2) from the indented side of both cotters and tighten the nut (4) with flat side of cotter as shown in figure.

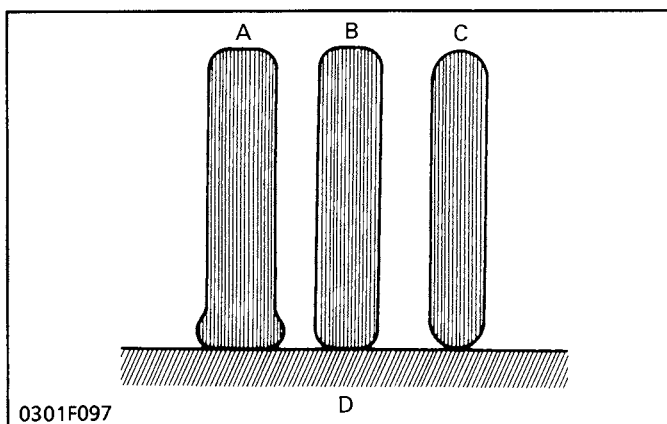
- (1) Cotter
- (2) Bolt
- (3) Spring Lock Washer
- (4) Nut

(2) Wheel Hub



	Front Wheel Hub	Rear Wheel Hub
Type	4WD	4WD
Screw circle diameter (A)	120 mm 4.72 in.	152 mm 6.0 in.
Number of screws	6	6
Screw sizes	M12 x Pitch 1.25	M14 x Pitch 1.5
Pilot bore diameter (B)	69.5 mm 2.74 in.	114 mm 4.49 in.
Hole spacing (C)	Equal 1.05 rad (60 deg.)	Equal 1.05 rad (60 deg.)

(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.

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

- **Recommended inflation pressure**
Maintain the pressure shown below.

	Tire sizes	Inflation Pressure
Rear	29 x 12.50-15, 4PR	140 kPa (1.4 kgf/cm ² , 20 psi)
Front	21 x 8.00-10, 4PR	160 kPa (1.6 kgf/cm ² , 23 psi)

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

⚠ CAUTION

To avoid personal injury:

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

■ **IMPORTANT**

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

[11] SPECIFICATIONS OF IMPLEMENT LIMITATIONS

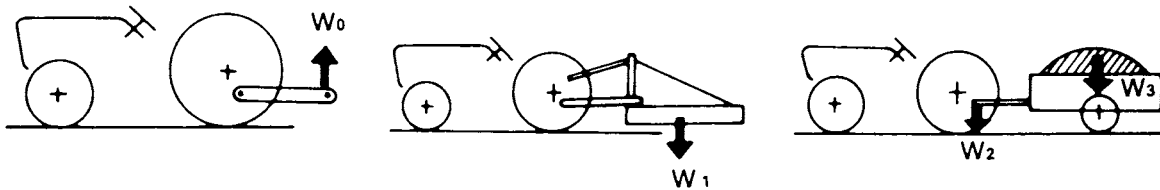
The Kubota tractor has been thoroughly tested for proper performance with implements sold or approved by Kubota. Use with implements which exceed the maximum specifications listed below, or which are otherwise unfit for use with the Kubota tractor may result in malfunctions or failures of the

tractor, damage to other property and injury to the operator or others.

(Any malfunctions or failure of the tractor resulting from use with improper implements are not covered by the warranty.)

	Tread (max. width) with farm tires		Lower link end max. loading weight W₀
	Front	Rear	
B7300	835 mm (32.9 in.)	948 mm (37.3 in.)	300 kg (660 lbs)
	Actual figures		
	Implement weight W₁ and / or size	Max. Drawbar Load W₂	Trailer loading weight W₃ Max. capacity
B7300	As in the following list (shown on the next page)	300 kg (660 lbs.)	1000 kg (2200 lbs.)

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



0350F051

Implement		Remarks		B7300
Mower	Mid Mount	Max. Cutting Width Max. Weight	cm (in.) kg (lbs)	152 (60) 140 (300)
	Rotary-cutter (1 Blade)	Max. Cutting Width Max. Weight	cm (in.) kg (lbs)	107 (42) 140 (300)
	Rear-mount (2 or 3 Blade)	Max. Cutting Width Max. Weight	cm (in.) kg (lbs)	152 (60) 140 (300)
	Flail-mower	Max. Cutting Width	cm (in.)	107 (42)
	Sickle bar	Max. Cutting Width	cm (in.)	122 (48)
Rotary tiller		Max. Tilling Width Max. Weight	cm (in.) kg (lbs)	107 (42) 170 (375)
Bottom plow		Max. Size	cm (in.)	30 (12) x 1
Disc plow		Max. Size	cm (in.)	56 (22) x 1
Cultivator		Max. Size	cm (in.)	122 (48) 1 Row
Disc harrow		Max. Harrowing Width Max. Weight	cm (in.) kg (lbs)	122 (48) 120 (265)
Sprayer		Max. Tank Capacity	ℓ (U.S.gals.)	150 (40)
Front blade		Max. Cutting Width Sub Frame	cm (in.)	122 (48) Necessary
Rear blade		Max. Cutting Width Max. Weight	cm (in.) kg (lbs)	152 (60) 160 (350)
Front loader		Max. Lifting Capacity Max. Width Sub Frame	kg (lbs) cm (in.)	270 (595) 122 (48) Necessary
Box blade		Max. Cutting Width Max. Weight	cm (in.) kg (lbs)	107 (42) 170 (375)
Back hoe		Max. Digging Depth Max. Weight Sub Frame	cm (in.) kg (lbs)	183 (72) 270 (600) Necessary
Snow blower		Max. Working Width Max. Weight Sub Frame	cm (in.) kg (lbs)	107 (42) 160 (350) Necessary
Trailer		Max. load capacity	kg (lbs)	1000 (2200)

■ **NOTE**

- Implement size may vary depending on soil operating conditions.

1 ENGINE

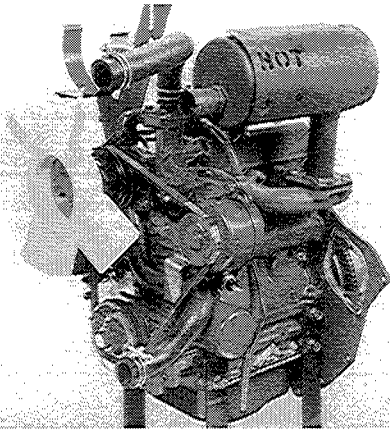
1 ENGINE

MECHANISM

CONTENTS

[1] FEATURES	1-M1
[2] ENGINE BODY	1-M1
(1) Cylinder Block	1-M1
(2) Cylinder Head	1-M2
(3) Crankshaft	1-M2
(4) Piston and Piston Rings	1-M3
(5) Connecting Rod	1-M3
(6) Camshaft	1-M4
(7) Fuel Camshaft	1-M4
(8) Rocker Arm	1-M4
(9) Inlet and Exhaust Valves	1-M5
(10) Valve Timing	1-M5
(11) Flywheel	1-M5
[3] LUBRICATING SYSTEM	1-M6
(1) Oil Pump	1-M7
(2) Relief Valve	1-M7
(3) Oil Filter Cartridge	1-M7
(4) Oil Pressure Switch	1-M8
[4] COOLING SYSTEM	1-M9
(1) Water Pump	1-M9
(2) Thermostat	1-M10
(3) Radiator	1-M10
(4) Radiator Cap	1-M11
[5] FUEL SYSTEM	1-M11
(1) Fuel Line	1-M11
(2) Fuel Filter	1-M12
(3) Fuel Feed Pump	1-M12
(4) Injection Pump	1-M13
(5) Injection Nozzle	1-M15
(6) Governor	1-M15

[1] FEATURES



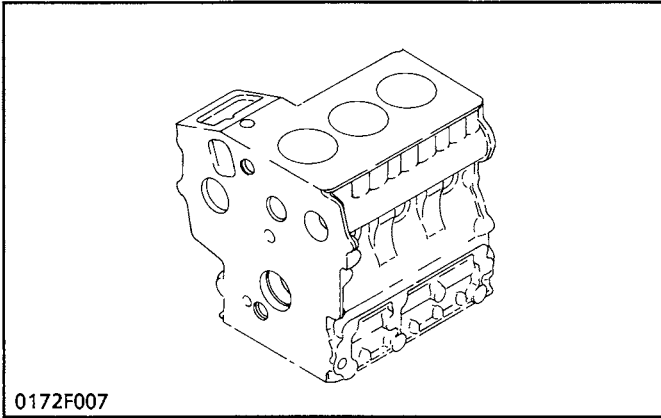
B203P024

The D722-D10SP is vertical, water-cooled, 4 cycle diesel engine.

It is incorporated KUBOTA's foremost technologies. With KUBOTA's E-TVCS (Three Vortex Combustion System), well-known Bosch MD type injection pump and the well-balanced designs, the engine features greater power, low fuel consumption, little vibration and quiet operation.

[2] ENGINE BODY

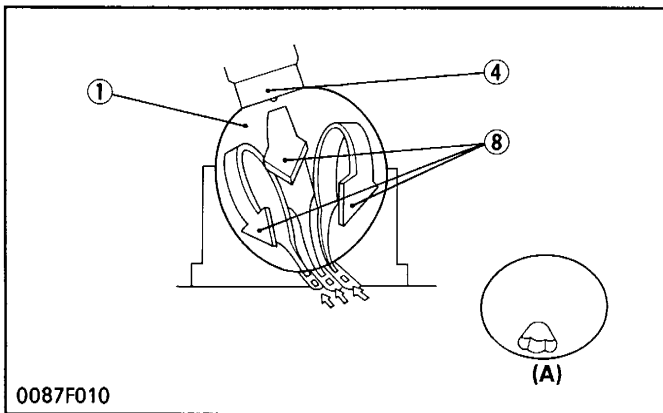
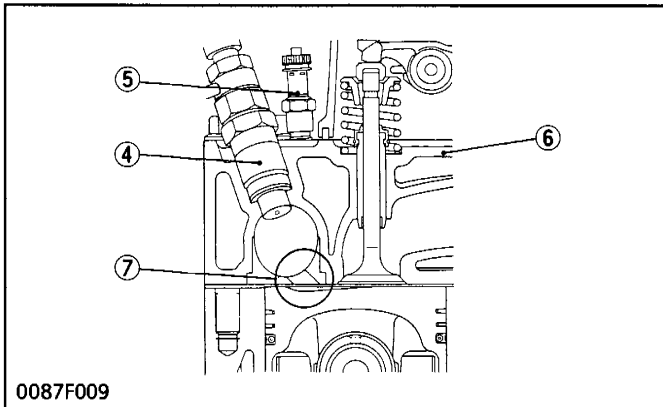
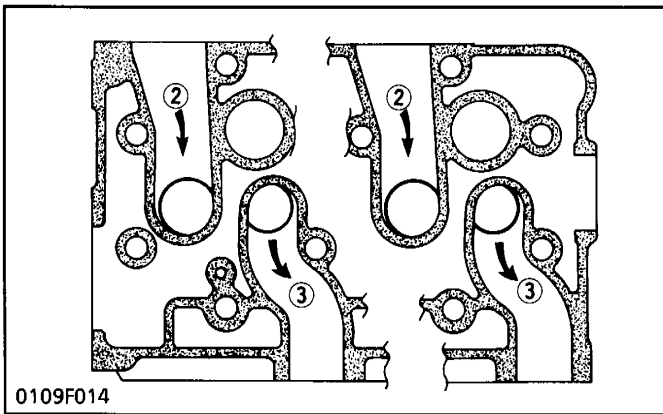
(1) Cylinder Block



0172F007

The engine has a high durability tunnel-type cylinder block in which the crank bearing component is a constructed body. Furthermore, liner less type, allow effective cooling, less distortion, and greater wear-resistance. The noise level is reduced to a minimum because each cylinder has its own chamber.

(2) Cylinder Head



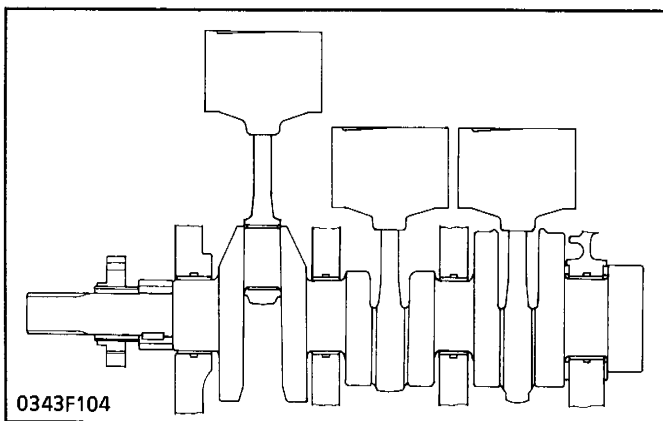
The cross-flow type intake/exhaust ports in this engine have their openings at both sides of the cylinder head. Because overlaps of intake/exhaust ports are smaller than in ports of other types which have openings on one side, the suction air can be protected from being heated and expanded by heated exhaust air. The cool, high density suction air has high volume efficiency and raises the power of the engine. Furthermore, distortion of the cylinder head by heated exhaust gas is reduced because intake ports are arranged alternately. The combustion chamber is of KUBOTA's exclusive E-TVCS combustion chamber type. Suction air is whirled to be mixed effectively with fuel, prompting combustion and reducing fuel consumption.

In the combustion chamber are installed throttle type injection nozzle and rapid heating sheathed type glow plug. This glow plug assures easier than ever engine starts even at -15°C (5°F).

- (1) Combustion Chamber
- (2) Intake Port
- (3) Exhaust Port
- (4) Nozzle Assembly
- (5) Glow Plug
- (6) Cylinder Head
- (7) Depression
- (8) Compressed Air

[A] Connect to Combustion Chamber

(3) Crankshaft



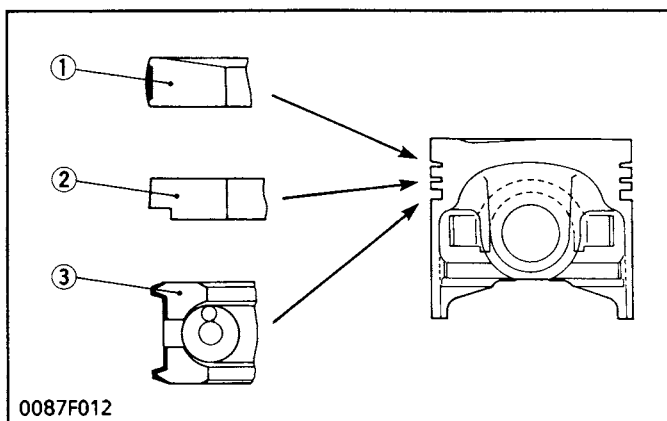
The crankshaft with the connecting rod converts the reciprocating motion of the piston into the rotating motion.

The crankshaft is made of tough special alloy steel, and the journals, pins and oil seal sliding portions are induction hardened to increase the hardness for higher wear resistance.

The front journal is supported by a solid type bearing, the intermediate journal by a split type, and the rear journal by a split type with thrust bearings.

The crankshaft is provided with an oil gallery, through which engine oil is fed to the crankpin portion, and lubricate it.

(4) Piston and Piston Rings



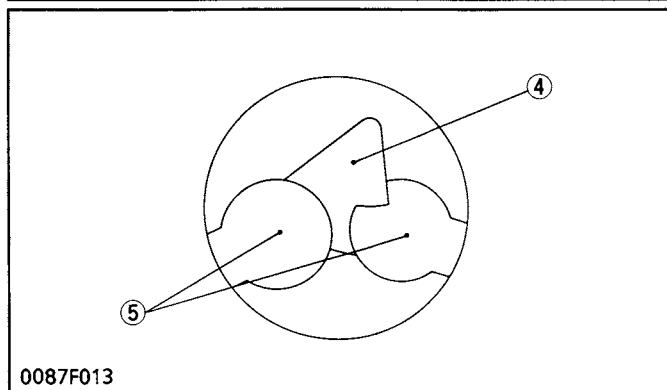
The piston has a slightly oval shape when cold (in consideration of thermal expansion) and a concave head.

Three rings are installed in grooves in the piston. The top ring (1) is a keystone type, which can stand against heavy loads, and the barrel face on the ring fits well to the cylinder wall.

The second ring (2) is an undercut type, which effectively prevents the oil from being carried up.

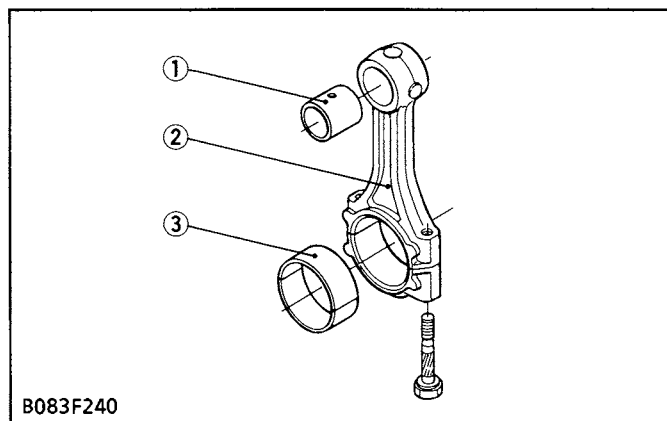
The oil ring (3) has chamfered contact faces and an expander ring, which increase the pressure of the oil ring against the cylinder wall.

Several grooves are cut on the top land to help heat dissipate and to prevent scuffing.



- (1) Top Ring
- (2) Second Ring
- (3) Oil Ring
- (4) Depression
- (5) Valve Recess

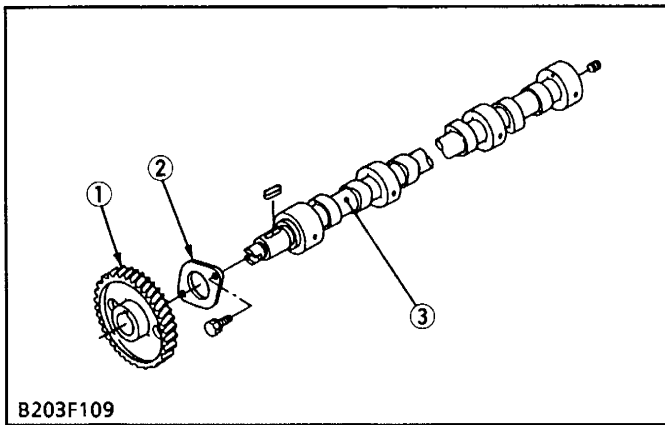
(5) Connecting Rod



Connecting rod (2) is used to connect the piston with the crankshaft. The big end of the connecting rod has a crank pin bearing (3) (split type) and the small end has a small end bushing (1) (solid type).

- (1) Small End Bushing
- (2) Connecting Rod
- (3) Crank pin Bearing

(6) Camshaft

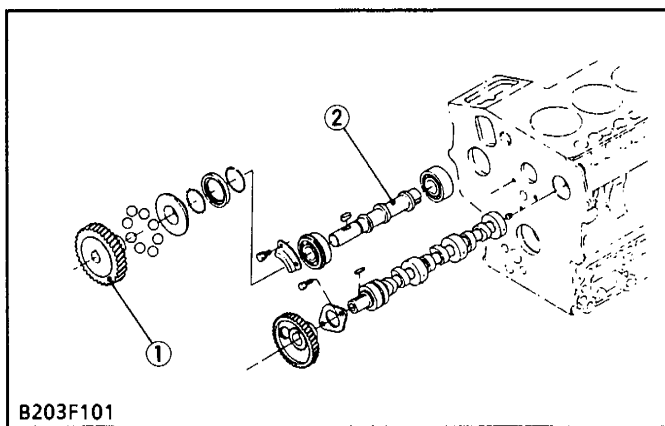


The camshaft (3) is made of special cast iron, and the journal and cam sections are chilled to resist wear.

The journal sections are force-lubricated.

- (1) Cam Gear
- (2) Camshaft Stopper
- (3) Camshaft

(7) Fuel Camshaft

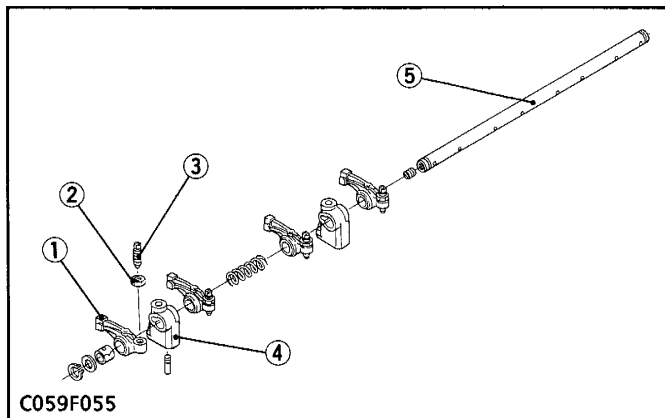


The fuel camshaft (2) controls the reciprocating movement of the injection pump.

The fuel camshaft is made of carbon steel and the cam sections are quenched and tempered to provide greater wear resistance.

- (1) Injection Pump Gear
- (2) Fuel Camshaft

(8) Rocker Arm

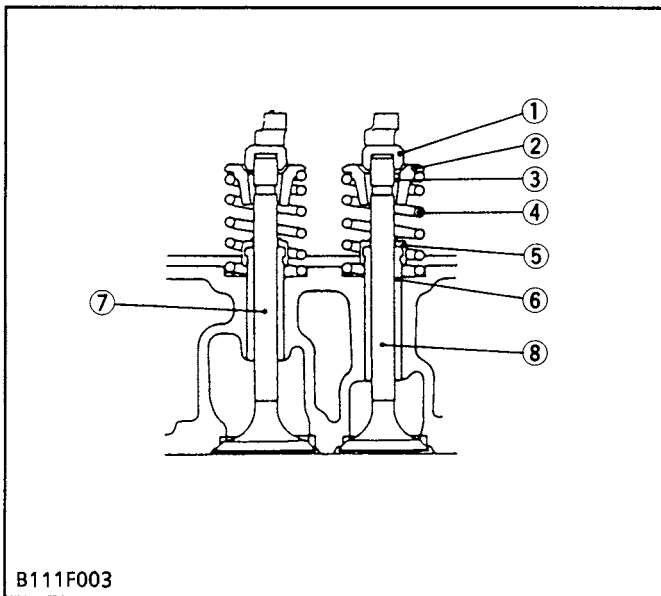


The rocker arm assembly includes the rocker arms (1), rocker arm brackets (4) and rocker arm shaft (5) and converts the reciprocating movement of the push rods to an open/close movement of the inlet and exhaust valves.

Lubricating oil is pressurized through the bracket to the rocker arm shaft, which serves as a fulcrum so that the rocker arm and the entire system are lubricated sufficiently.

- (1) Rocker Arm
- (2) Lock Nut
- (3) Adjusting Screw
- (4) Rocker Arm Bracket
- (5) Rocker Arm Shaft

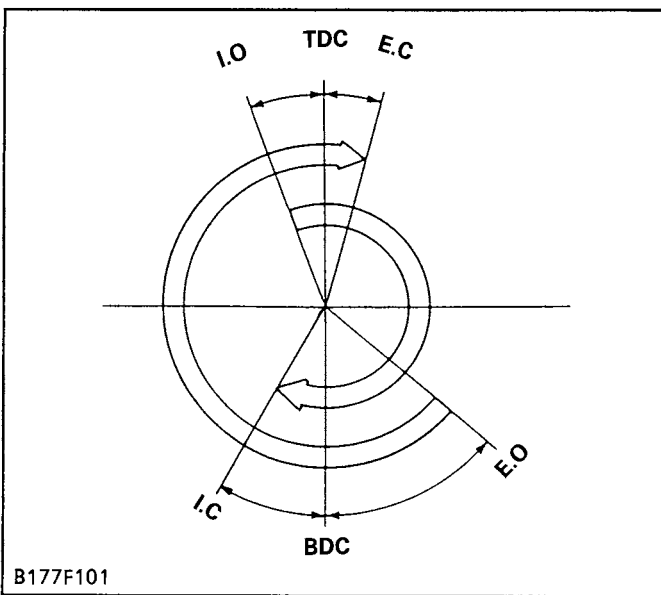
(9) Inlet and Exhaust Valves



The inlet and exhaust valves (7), (8) and their guides (6) are different from each other. Other parts, such as valve springs (4), valve spring retainers (2), valve spring collets (3), valve stem seals (5), and valve caps (1) are the same for both the inlet and exhaust valves. All contact or sliding parts are quenched and tempered to resist wear.

- (1) Valve Cap
- (2) Valve Spring Retainer
- (3) Valve Spring Collet
- (4) Valve Spring
- (5) Valve Stem Seal
- (6) Valve Guide
- (7) Inlet Valve
- (8) Exhaust Valve

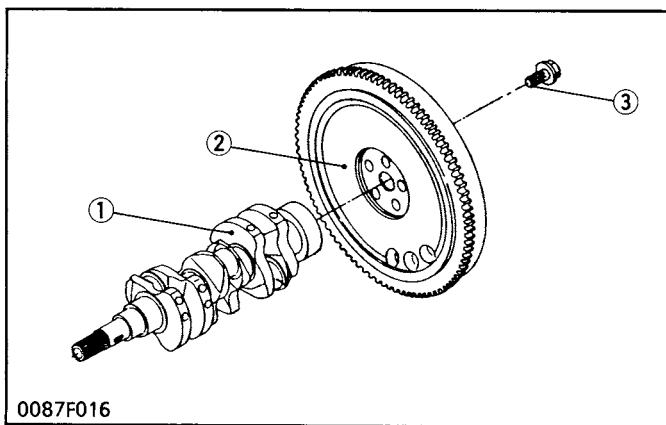
(10) Valve Timing



The valve opening and closing timing is extremely important for effectively intaking air into the cylinder and sufficiently exhaust gas. An appropriate timing can be obtained by aligning the alignment marks on the crank gear and cam gear.

Inlet valve open (I.O)	0.35 rad. (20°) before T.D.C
Inlet valve close (I.C)	0.79 rad. (45°) after B.D.C.
Exhaust valve open (E.O)	0.89 rad. (50°) before B.D.C.
Exhaust valve close (E.C)	0.26 rad. (15°) after T.D.C.

(11) Flywheel

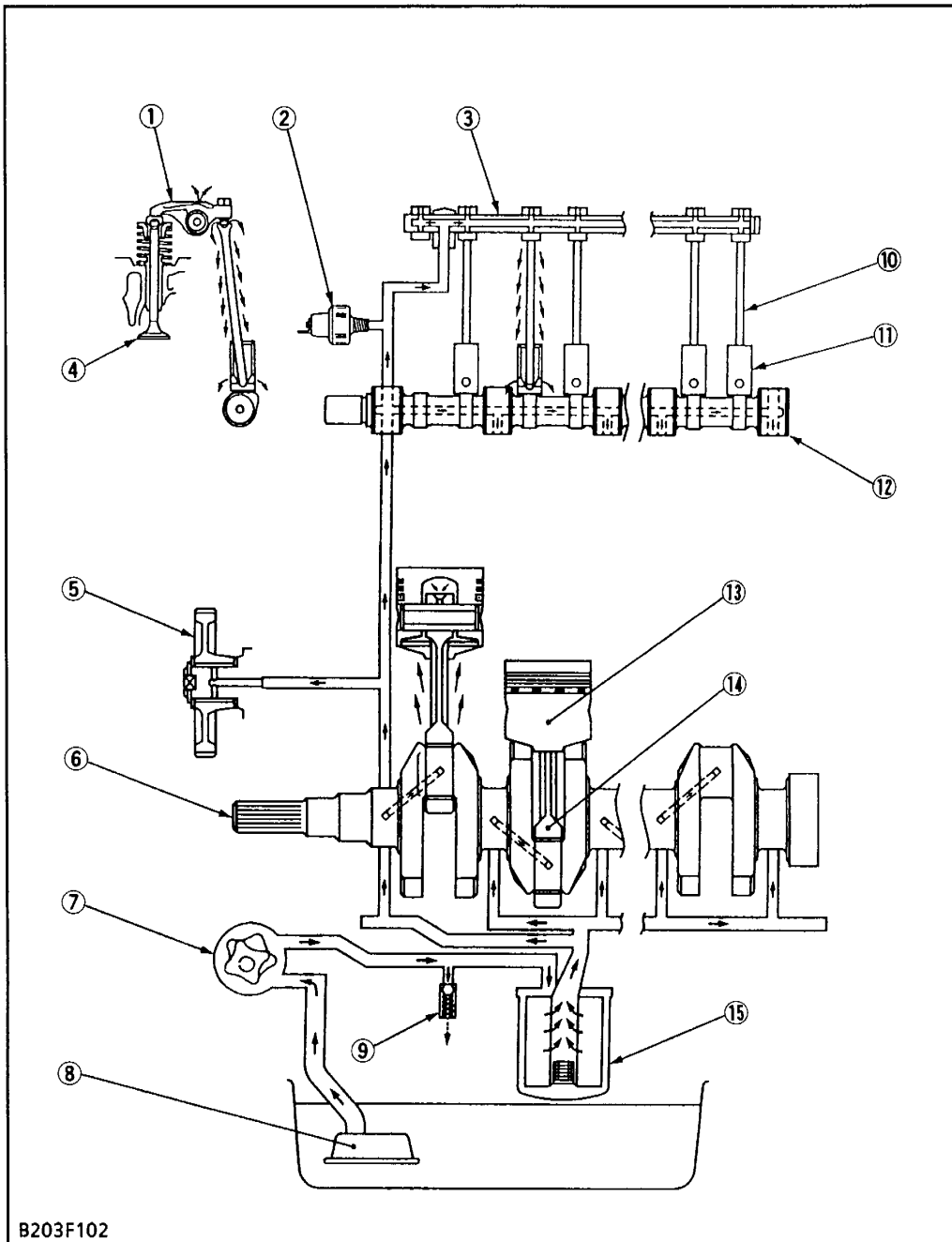


The flywheel is installed on the rear end of the crankshaft. Its inertia keeps the flywheel turning at a constant speed, while the crankshaft tends to speed up during the power stroke and to slow down during other strokes.

The flywheel has a ring gear, which mesh with the drive pinion of the starter.

The flywheel has also marks TC and fuel injection timing lines on its outer rim. The lines of fuel injection timing shows the fuel injection timing and the mark TC shows the piston's top dead center, when they are aligned with the alignment mark on the rear end plate.

- (1) Crankshaft
- (2) Flywheel
- (3) Flywheel Screw

[3] LUBRICATING SYSTEM

- (1) Rocker Arm
- (2) Oil Pressure Switch
- (3) Rocker Arm Shaft
- (4) Valve
- (5) Idle Gear
- (6) Crankshaft
- (7) Oil Pump
- (8) Oil Strainer
- (9) Relief Valve
- (10) Push Rod
- (11) Tappet
- (12) Camshaft
- (13) Piston
- (14) Connecting Rod
- (15) Oil Filter Cartridge

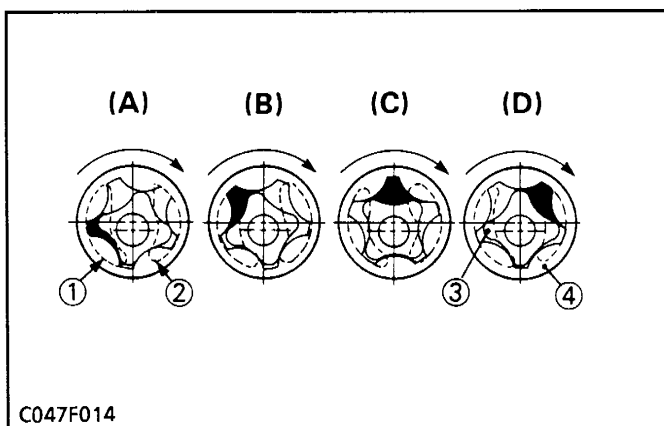
This engine's lubricating system consists of oil strainer (8), oil pump (7), relief valve (9), oil filter cartridge (15) and oil pressure switch (2).

The oil pump sucks lubricating oil from the oil pan through the oil strainer and the oil flows down to the filter cartridge, where it is further filtered. Then the oil is forced to crankshaft (6), connecting rods (14),

idle gear (5), camshaft (12) and rocker arm shaft (3) to lubricate each part.

Some part of oil, splashed by the crankshaft or leaking and dropping from gaps of each part, lubricates these parts : pistons (13), cylinders, small ends of connecting rods, tappets (11), push rods (10), inlet and exhaust valves (4) and timing gears.

(1) Oil Pump



The oil pump is a trochoid pump, whose rotors have trochoid lobes. The inner rotor (3) has 4 lobes and the outer rotor (4) has 5 lobes, and they are eccentrically engaged with each other. The inner rotor, which is driven by the crankshaft through the gears, rotates the outer rotor in the same direction, varying the space between the lobes.

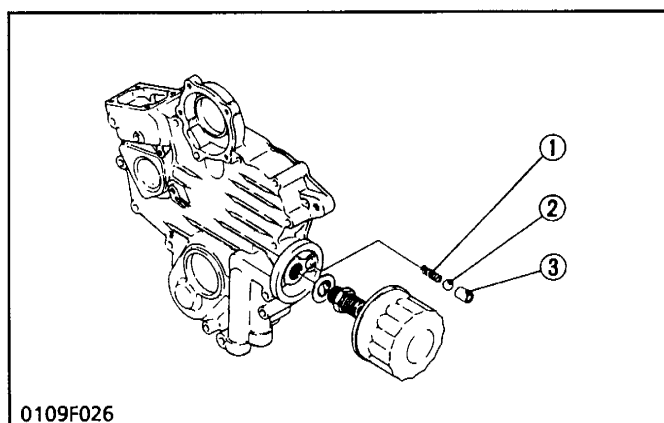
While the rotors rotate from (A) to (B), the space leading to the inlet port increases, which causes the vacuum to suck in the oil from the inlet port.

When the rotors rotate to (C), the space between both rotors switches from the inlet port to the outlet port.

At (D), the space decreases and the sucked oil is discharged from the outlet port.

- (1) Inlet Port
- (2) Outlet Port
- (3) Inner Rotor
- (4) Outer Rotor

(2) Relief Valve



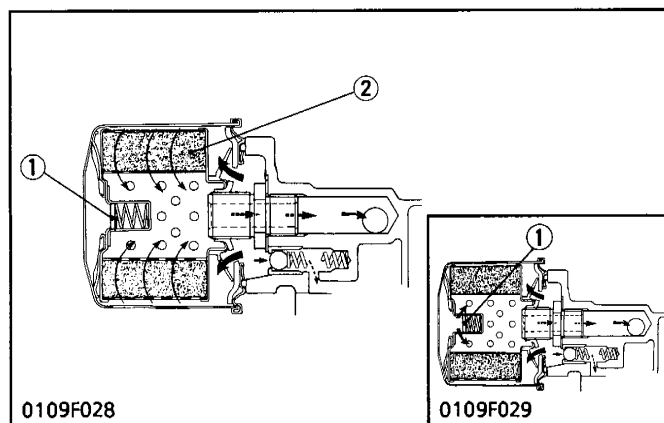
The relief valve prevents the damage to the lubricating system due to the high pressure of the oil.

The relief valve is ball direct acting type, and is best suited for low pressures.

When the pressure of the oil, forced by the pump, exceeds the specified value, the oil pushes back the ball (2) and escapes to the oil pan.

- (1) Spring
- (2) Ball
- (3) Valve Seat

(3) Oil Filter Cartridge

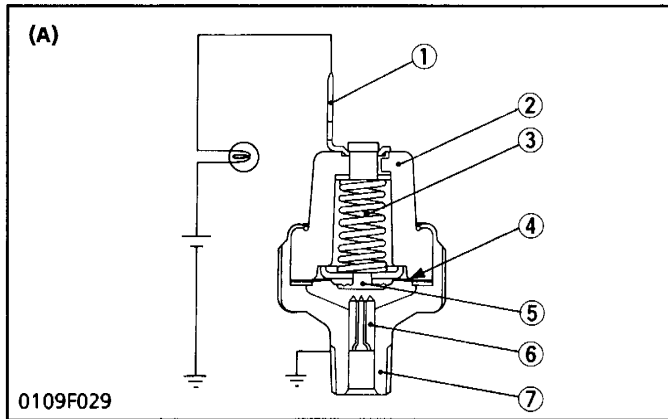


After lubricating, the lubricating oil brings back various particles of grit and dirt to the oil pan. Those particles and the impurities in the lubricating oil can cause wear or seizure of the engine parts. It may also impair the physical and chemical properties of the oil itself.

The lubricating oil which is force-fed by the pump, is filtered by the filter cartridge with the filter element (2). When the filter element accumulates on excessive amount of dirt and the oil pressure in the inlet line builds up by 98 kPa (1.0 kgf/cm², 14 psi) more than the outlet line, the bypass valve (1) opens to allow the oil to flow from the inlet into the outlet line, bypassing the filter element.

- (1) Bypass Valve
- (2) Filter Element

(4) Oil Pressure Switch



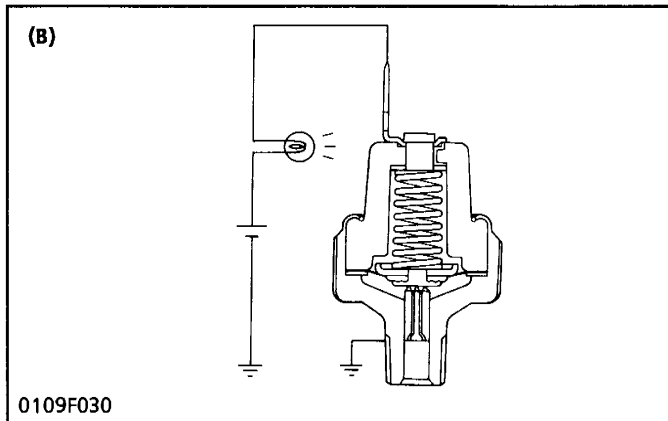
The oil pressure switch is mounted on the cylinder-block, to warn the operator that the lubricating oil pressure is poor.

If the oil pressure falls below 49kPa (0.5 kgf/cm², 7 psi), the oil warning lamp will light up, warning the operator. In this case, stop the engine immediately and check the cause of pressure drop.

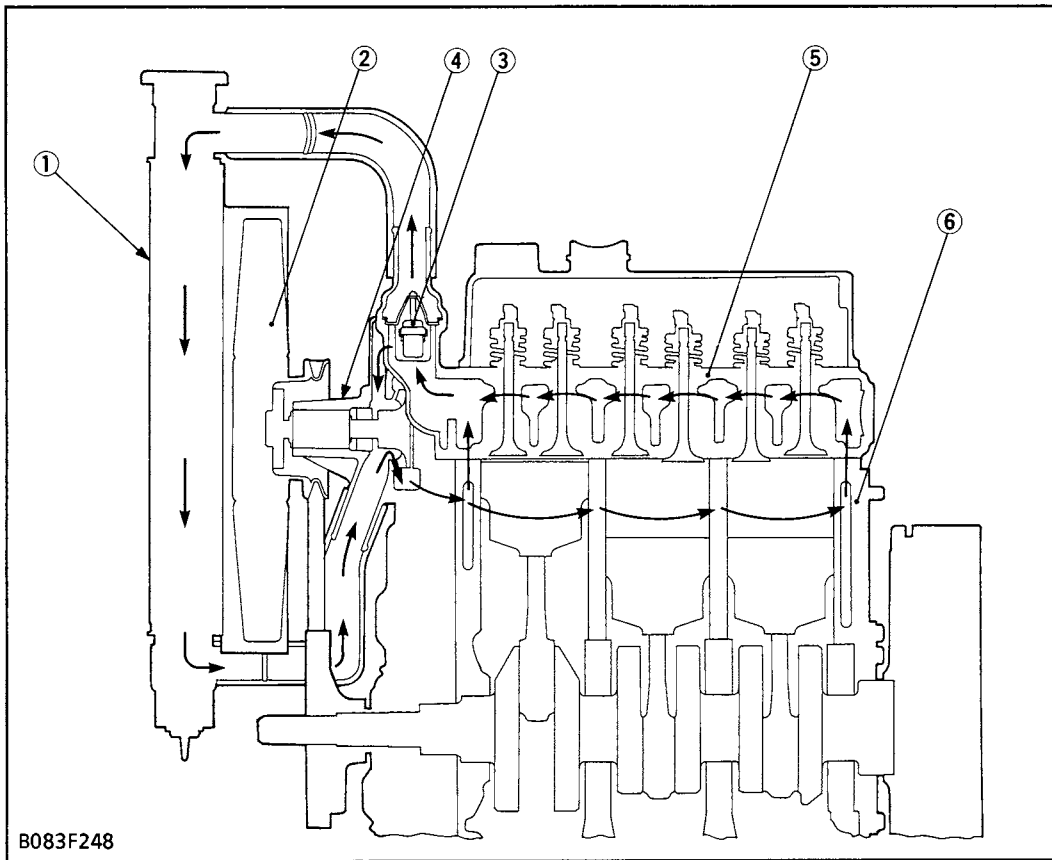
(A) At Proper Oil Pressure

(B) At Oil Pressures of 49 kPa (0.5 kgf/cm², 7 psi) or Less

- | | |
|---------------|---------------------|
| (1) Terminal | (5) Contact Rivet |
| (2) Insulator | (6) Contact |
| (3) Spring | (7) Oil Switch Body |
| (4) Diaphragm | |



[4] COOLING SYSTEM



- (1) Radiator
- (2) Suction Fan
- (3) Thermostat
- (4) Water Pump
- (5) Cylinder Head
- (6) Cylinder Block

B083F248

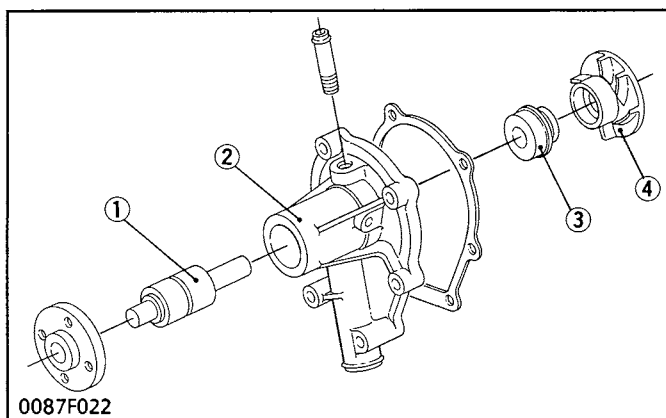
The cooling system consists of a radiator (1), centrifugal water pump (4), suction fan (2) and thermostat (3).

The water is cooled through the radiator core, and the fan set behind the radiator pulls cooling air through the core to improve cooling.

The water pump sucks the cooled water, forces it into the cylinder block and draws out the hot water.

Then the cooling is repeated. Furthermore, to control temperature of water, a thermostat is provided in the system. When the thermostat opens, the water moves directly to radiator, but when it closes, the water moves toward the water pump through the bypass between thermostat and water pump. The opening temperature of thermostat is approx. 82 °C (180 °F).

(1) Water Pump

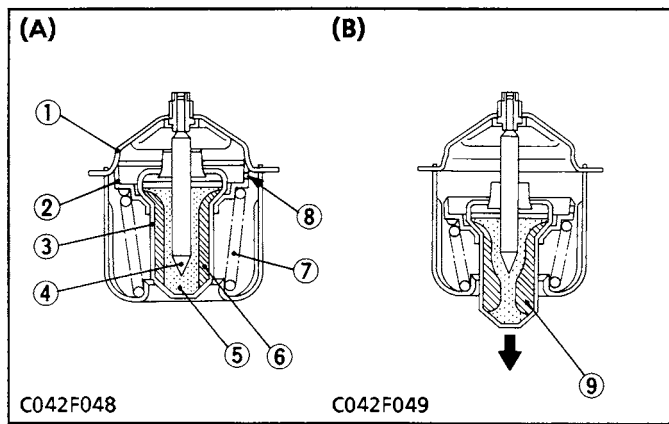


0087F022

The water pump is driven by the crankshaft via a V-belt. Water cooled in the radiator is sucked into the water pump from its lower portion and is sent from the center of the water pump impeller (4) radially outward into the water jacket in the crankcase.

- (1) Bearing Unit
- (2) Water Pump Body
- (3) Mechanical Seal
- (4) Water Pump Impeller

(2) Thermostat



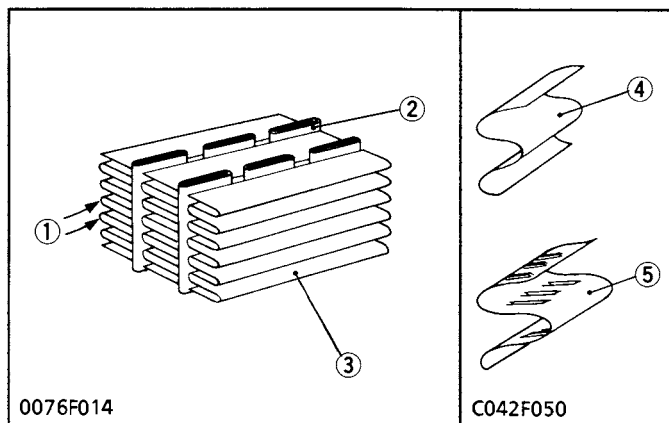
The thermostat maintains the cooling water at correct temperature. KUBOTA's engine uses a wax pellet type thermostat. Wax is enclosed in the pellet. The wax is solid at low temperatures, but turns liquid at high temperatures, expands and opens the valve.

(A) At low temperatures (lower than 82 °C (180 °F)). As the thermostat is closed, cooling water circulates in the engine through the water return pipe without running to the radiator. Air in the water jacket escapes to the radiator side through leak hole (8) of the thermostat.

(B) At high temperatures (higher than 82 °C (180 °F)). When the temperature of cooling water exceeds 71 °C (160 °F), wax in the pellet turns liquid and expands. Because the spindle (4) is fixed, the pellet (3) is lowered, the valve (2) is separated from the seat (1), and then cooling water is sent to the radiator.

- (1) Seat
- (2) Valve
- (3) Pellet
- (4) Spindle
- (5) Synthetic Rubber
- (6) Wax (solid)
- (7) Spring
- (8) Leak Hole
- (9) Wax (liquid)

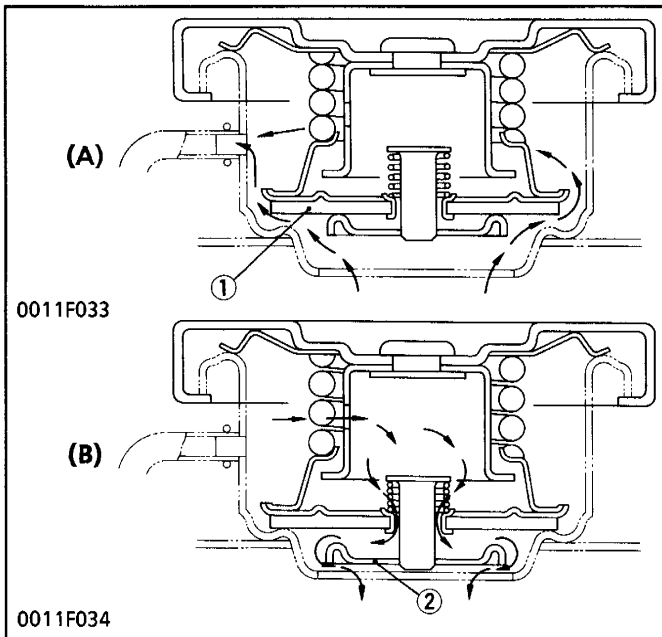
(3) Radiator



The radiator core consists of water carrying tubes and fins (3) at a right angle to the tubes (2). Heat of hot water in the tubes is radiated from the tube walls and fins. KUBOTA's engine uses corrugated fin type core which has a light weight and high heat transfer rate. Clogging is minimized by the louverless corrugated fins.

- (1) Cooling Air
- (2) Tube
- (3) Fin
- (4) Louverless Corrugated Fin
- (5) Louvered Corrugated Fin

(4) Radiator Cap



The radiator cap is for sustaining the internal pressure of the cooling system at the specified level 88 kPa (0.9 kgf/cm², 13 psi) when the engine is in operation. The cap consists of a pressure valve (1) a vacuum valve (2), valve springs, gasket, etc.

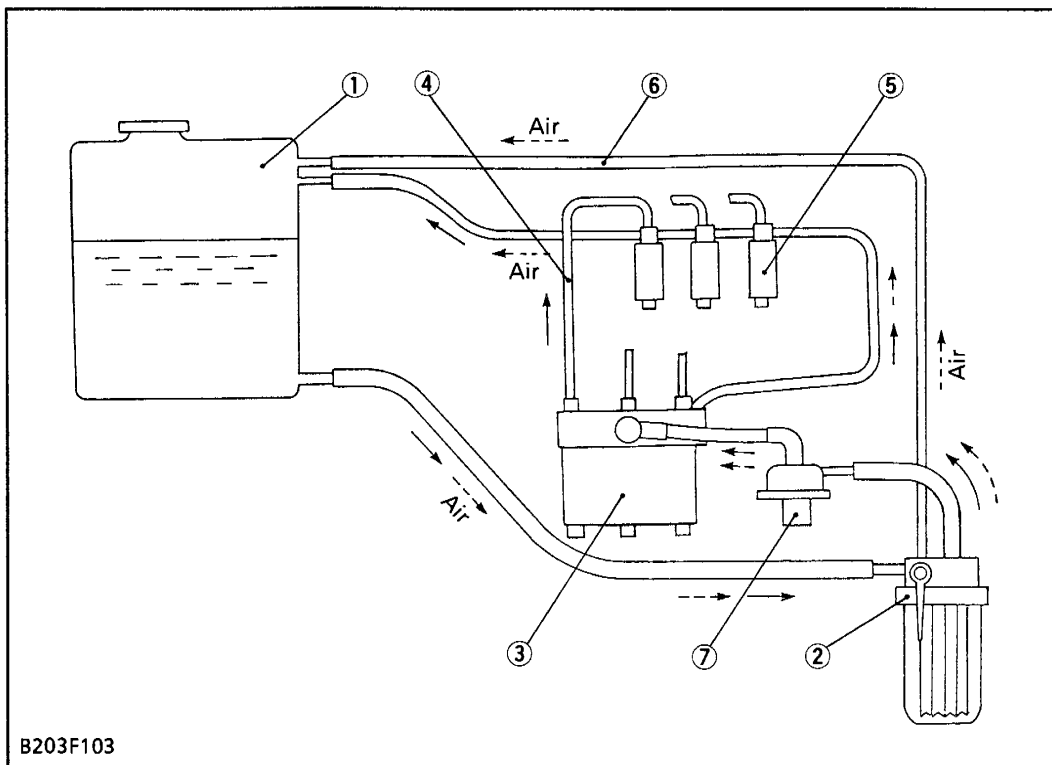
Cooling water is pressurized by thermal expansion of steam, and as its boiling temperature rises, generation of air bubbles will be suppressed. (Air bubbles in cooling water lowers the cooling effect.)

- (A) When radiator internal pressure is high
- (B) When radiator internal pressure is negative

- (1) Pressure Valve
- (2) Vacuum Valve

[5] FUEL SYSTEM

(1) Fuel Line



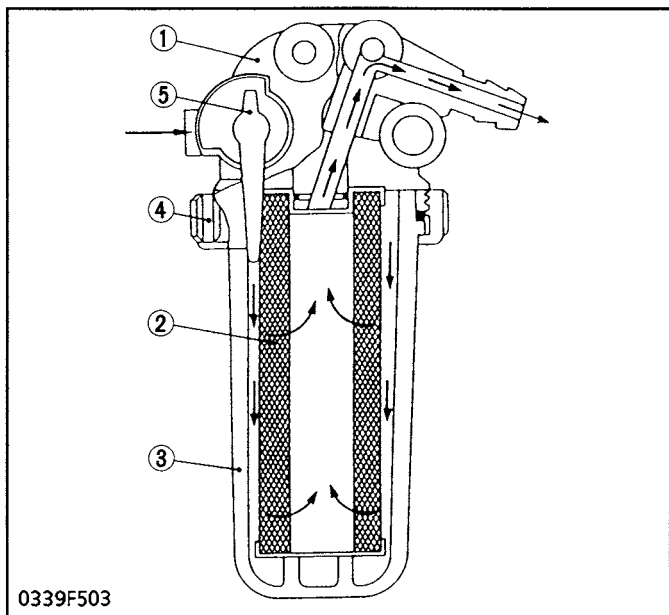
- (1) Fuel Tank
- (2) Fuel Filter
- (3) Injection Pump
- (4) Injection Pipe
- (5) Injection Nozzle
- (6) Fuel Overflow Pipe
- (7) Fuel Feed Pump

Fuel from the fuel tank (1) passes through the fuel filter (2), and then enters the injection pump (3) after impurities such as dirt, water, etc. are removed.

The fuel pressurized by the injection pump to the opening pressure (13.73 to 14.71 MPa, 140 to 150 kgf/cm², 1991 to 2062 psi), of the injection nozzle (5) is injected into the combustion chamber.

Part of the fuel fed to the injection nozzle (5) lubricates the moving parts of the plunger inside the nozzle, then returns to the fuel tank through the fuel overflow pipe (6) from the upper part of the nozzle holder.

(2) Fuel Filter



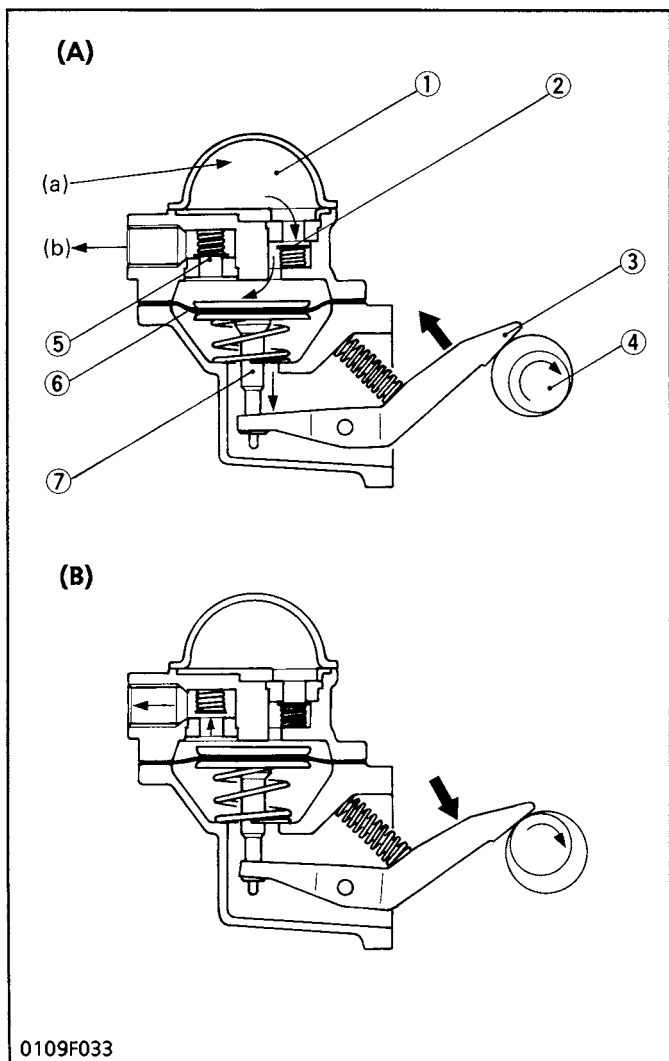
The fuel filter is installed between the fuel tank and fuel lift pump, and serves to remove dirt and impurities from the fuel.

Fuel from the fuel tank enters the outside of the filter element (2) and passes through the filter element under its own pressure. As it passes through, the dirt and impurities in the fuel are filtered out, allowing only clean fuel to enter the interior of the filter element. The fuel exits from the outlet of the cock body (1) and is sent to the fuel lift pump.

Type of filter element	Accodion-pleated paper type
Material of filter element	Cotton fiber
Filter mesh	10 to 20 μm 0.00039 to 0.00079 in.

- (1) Cock Body
- (2) Filter Element
- (3) Filter Cup
- (4) Retaining Ring
- (5) Fuel Cock

(3) Fuel Feed Pump



The filtered fuel is fed to the injection pump by the fuel feed pump.

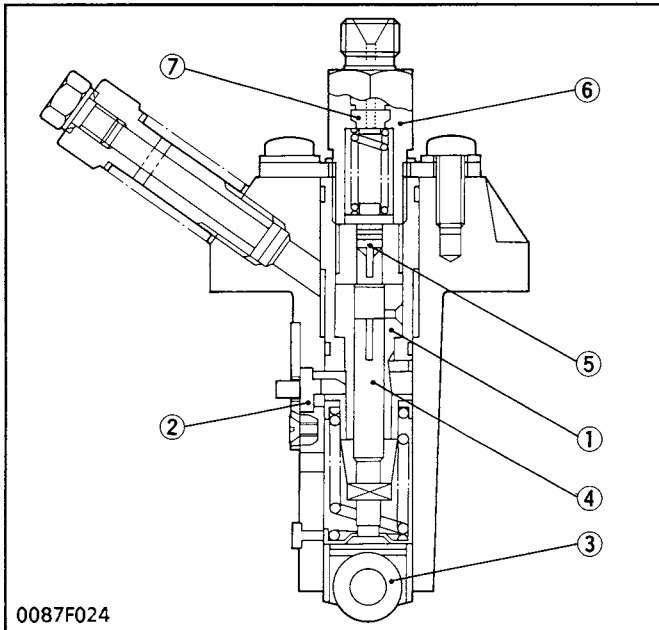
The chamber (1) is enclosed with the inlet valve (2), the outlet valve (5) and the diaphragm (6), which is linked to the rocker arm with the pull rod (7), The rocker arm is swung by the eccentric cam on the fuel camshaft (4).

When the diaphragm is pulled down, vacuum in the chamber (1) causes the outlet valve (5) to close and the atmospheric pressure in the fuel tank to force the fuel into the chamber, opening the inlet valve (2).

When the diaphragm is pushed up by the cam, the pressure in the chamber causes the inlet valve to close and forces out the fuel, opening the outlet valve.

- (A) Inlet Stroke
- (B) Discharge Stroke
- (a) from fuel filter
- (b) to injection pump
- (1) Chamber
- (2) Inlet Valve
- (3) Rocker Arm
- (4) Fuel Camshaft
- (5) Outlet Valve
- (6) Diaphragm
- (7) Pull Rod

(4) Injection Pump

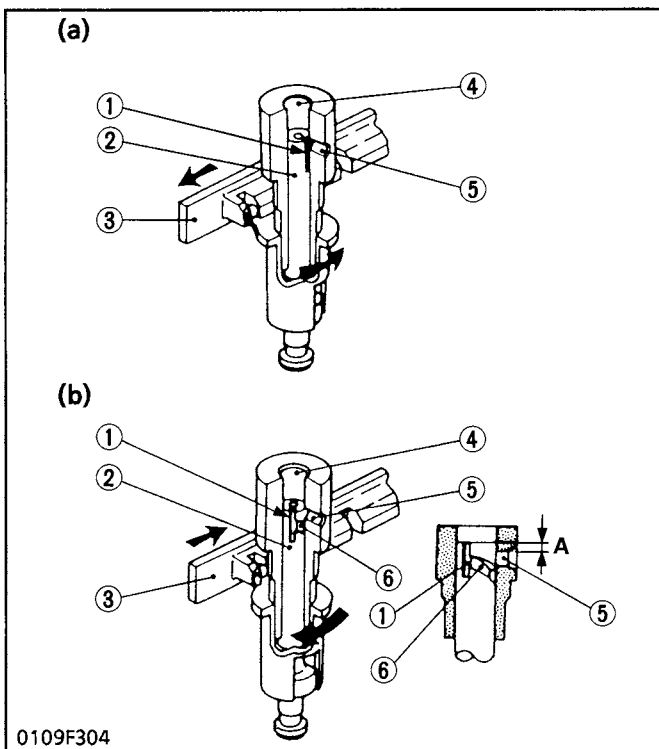


0087F024

A Bosch MD type mini pump is used for the injection pump. It is small, lightweight and easy to handle.

The plunger (4) with a left-hand lead reciprocates via the tappet roller (3) by means of the camshaft fuel cam, causing the fuel to be delivered into the injection nozzle.

- | | |
|-------------------|---------------------------|
| (1) Cylinder | (5) Delivery Valve |
| (2) Control Rack | (6) Delivery Valve Holder |
| (3) Tappet Roller | (7) Dumping Valve |
| (4) Plunger | |



0109F304

Injection Control

(a) No fuel delivery (Engine stop)

At the engine stop position of the control rack (3), the lengthwise slot (1) on the plunger (2) aligns with the feed hole (5). And the delivery chamber (4) is led to the feed hole during the entire stroke of the plunger.

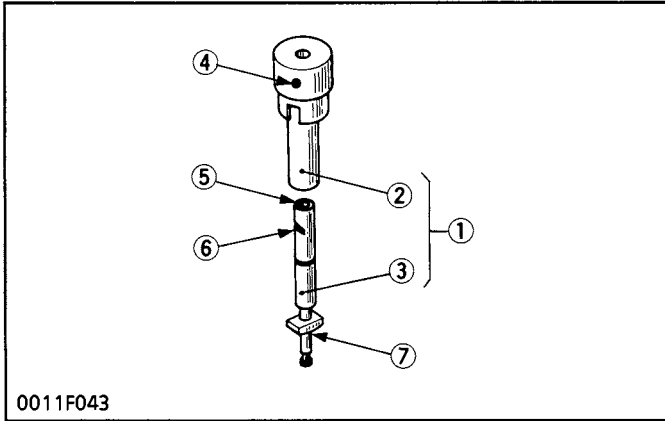
The pressure in the delivery chamber does not build up and no fuel can be forced to the injection nozzle.

(b) Fuel delivery

The plunger (2) is rotated (See figure) by the control rack (3). When the plunger is pushed up, the hole (5) is closed. The pressure in the delivery chamber (4) builds up and forcefeeds the fuel to the injection nozzle until the control groove (6) meets the feed hole (5).

The amount of the fuel corresponds to the distance "A".

- | | |
|------------------|----------------------|
| (1) Slot | (4) Delivery Chamber |
| (2) Plunger | (5) Feed Hole |
| (3) Control Rack | (6) Control Groove |



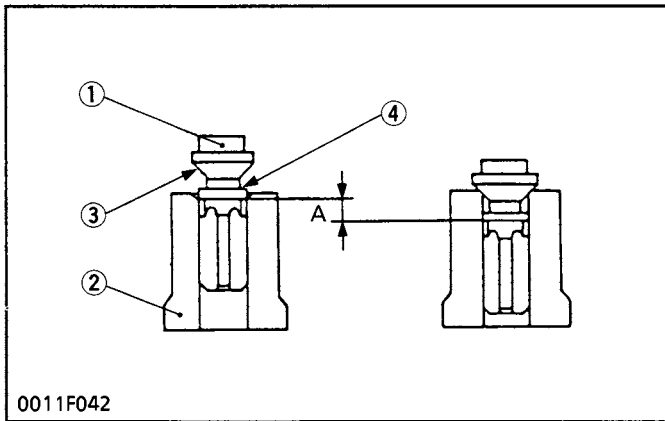
■ Pump Element

The pump element (1) is consist of the plunger (3) and cylinder (2).

The sliding surfaces are super-precision machined to maintain injection pressure at engine low speeds. Since the driving face (7) fits in the control sleeve, the plunger (3) is rotated by the movement of the control rack to increase or decrease of fuel delivery.

As described above, the plunger (3) is machined to have the slot (5) and the control groove (6).

- | | |
|------------------|--------------------|
| (1) Pump Element | (5) Slot |
| (2) Cylinder | (6) Control Groove |
| (3) Plunger | (7) Driving Face |
| (4) Feed Hole | |



■ Delivery Valve

The delivery valve consists of the delivery valve (1) and delivery valve seat (2).

The delivery valve performs the following functions.

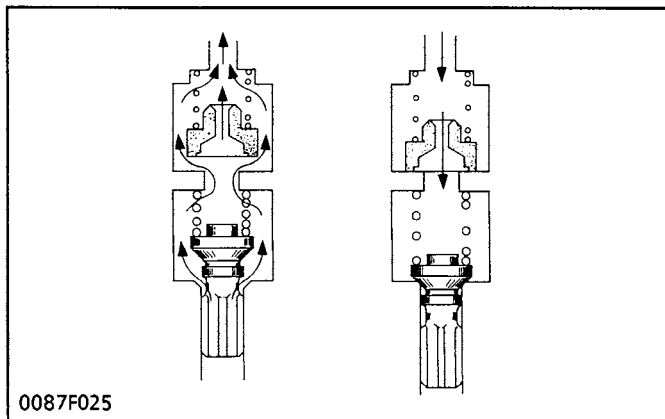
1. Reverse flow preventing function

If the fuel flow reverse from the injection nozzle side when the plunger lowers, the time lag between the next delivery start and the nozzle injection start increases. To avoid this, the delivery chamber to injection pipe interruption by delivery valve (1) prevents this reverse flow, thus keeping fuel always filled in the nozzle and pipe.

2. Suck-back function

After completing the fuel delivery, the delivery valve lowers, and the relief plunger (4) end contacts the delivery valve seat (2). The valve further lowers until its seat surface (3) seats firmly the delivery valve seat. During this time, the amount of fuel corresponding to (A) is sucked back from inside the injection pipe, the pressure inside the pipe is reduced, thus leading to an improved injection shut off and preventing after leakage dribbling.

- | | |
|-------------------------|--------------------|
| (1) Delivery Valve | (3) Seat Surface |
| (2) Delivery Valve Seat | (4) Relief Plunger |



■ Dumping Valve

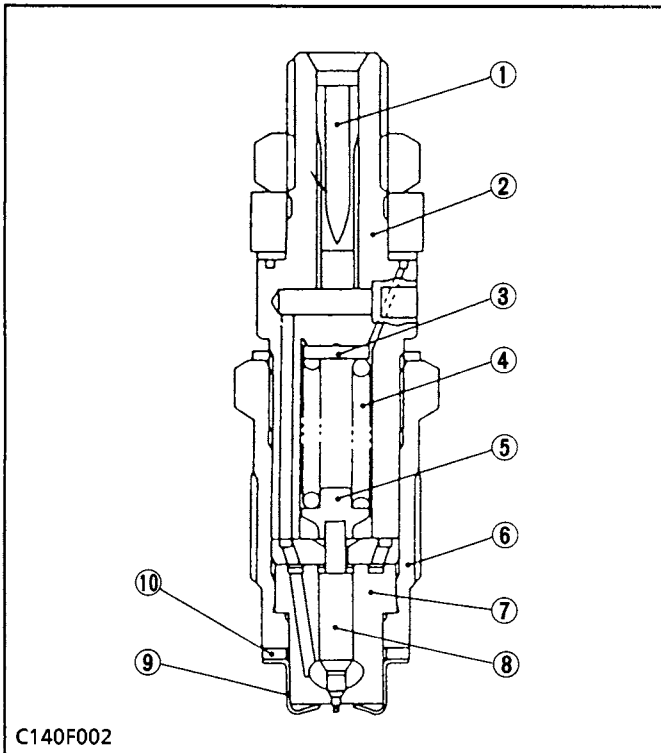
1. At fuel injection

Since dumping valve is pushed up to press the spring, fuel is pressure-fed to injection nozzle the same as without dumping valve.

2. At suck-back

At suck-back by delivery valve after fuel injection fuel returns through dumping valve orifice. Generally second injection is apt to occur by reflex pressure due to reaction of sudden pressure drop when changing into suck-back by delivery valve from high injection pressure. As a result of preventing this second injection perfectly by dumping valve and dissolving nozzle clogging, durability of injection nozzle is improved.

(5) Injection Nozzle



This nozzle is of flat-cut-provided double throttle type. This type of nozzle is designed to control the injection quantity when the lift rate is low at start of the injection, and to cut down on the knocking sound caused by excessive fuel injection by giving the needle valve section more taper than before to prevent the rapid increase in the injection quantity when the initial injection turns into the full-force injection.

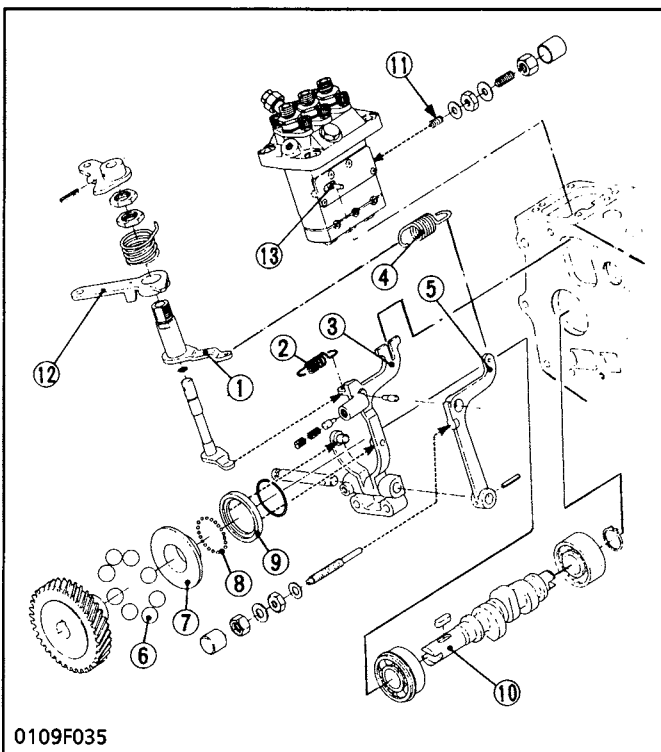
Also, employed to prevent the injection quantity loss in the throttle section caused by carbon, the flat cut provided at the needle valve section helps the throttle withstand long use and reduce as much knocking sound as when it was new.

The heat seal is employed to improve the durability and reliability of the nozzle.

The injection pressure is 13.73 to 14.71 MPa (140 to 150 kgf/cm², 1991 to 2133 psi), and is adjusted with adjusting washers (3).

- | | |
|------------------------|-------------------|
| (1) Bar Filter | (6) Retaining Nut |
| (2) Nozzle Holder Body | (7) Nozzle Body |
| (3) Adjusting Washer | (8) Needle Valve |
| (4) Nozzle Spring | (9) Heat Seal |
| (5) Push Rod | (10) Gasket |

(6) Governor



The governor controls the amount of the fuel to be fed in the entire speed range to prevent the engine from changing its speed according to the load.

The fork lever 1 (3) is held where two forces on it are balanced. One is the force that fork lever 2 pushes, which is caused by the tension of the governor spring (4) between the governor lever (1) and fork lever 2 (5). Another is the component of the centrifugal force produced by the steel balls (6) which are rotated by the fuel camshaft (10).

■ **At start**

The steel ball (6) has no centrifugal force.

Fork lever 1 (3) is pulled by the start spring (2) and the control rod (13) moves to the maximum injection position for easy starting.

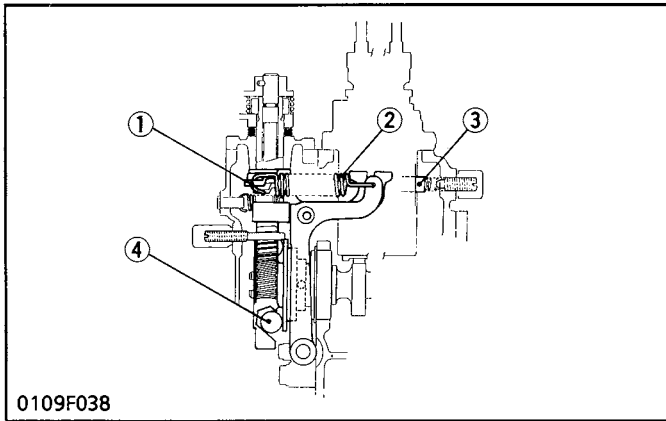
■ **At idling**

When the speed control lever (12) is set at the idling position, the governor spring (4) is pulled slightly.

As the camshaft rotates, the steel ball (6) increase their centrifugal force and push the governor sleeve (7). Fork lever 1 (3) pushed by the governor sleeve, pushes the control rod (13) and the control rod compresses the idling adjust spring (11).

The control rod is kept at a position where the centrifugal force is balanced with the spring tensions on the control rod, providing stable idling.

- | | |
|---------------------|---------------------------|
| (1) Governor Lever | (8) Steel Ball |
| (2) Start Spring | (9) Governor Ball Case |
| (3) Fork Lever 1 | (10) Fuel Camshaft |
| (4) Governor Spring | (11) Idling Adjust Spring |
| (5) Fork Lever 2 | (12) Speed Control Lever |
| (6) Steel Ball | (13) Control Rod |
| (7) Governor Sleeve | |



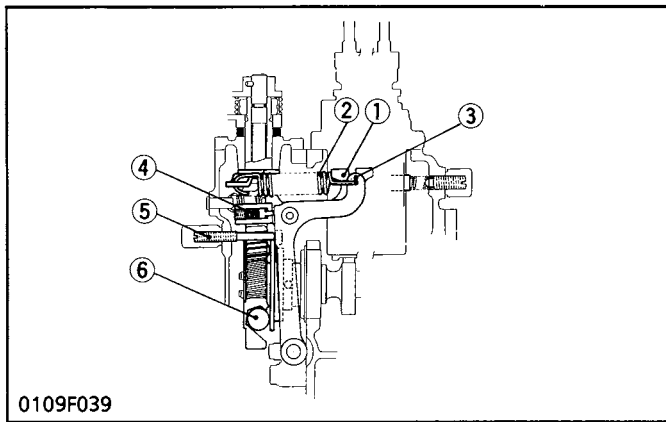
■ **At medium or high speed running**

When the speed control lever (1) is turned further, the governor spring (2) increases the tension and the control rod (3) is pulled to increase the engine speed.

The steel ball (4) increase their centrifugal force and the control rod is pushed, decreasing the engine speed, until the centrifugal force and the spring tension are balanced.

When the engine speed is dropped with the increase of the load, the centrifugal force of the steel ball decreases and the control rod is pulled. The amount of the fuel to the injection nozzle is increased to produce a higher engine torque required for the load.

- | | |
|-------------------------|-----------------|
| (1) Speed Control Lever | (3) Control rod |
| (2) Governor Spring | (4) Steel Ball |



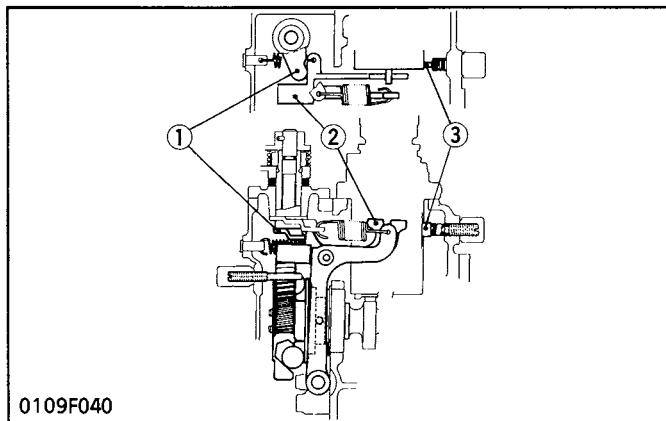
■ **At maximum speed running with an overload**

When the engine is overloaded at the high speeds and the engine speed drops, the centrifugal force of the steel ball (6) decreases and the governor spring (2) pulls fork lever 1 (1) and 2 (3).

When fork lever 2 contacts the adjusting screw (5), the spring (4) which is built in fork lever 1 begins to push the fork lever 1 to pull the control rod.

The fuel to the injection nozzle is increased to run the engine at high speed and torque.

- | | |
|---------------------|---------------------|
| (1) Fork Lever 1 | (4) Spring |
| (2) Governor Spring | (5) Adjusting Screw |
| (3) Fork Lever 2 | (6) Steel Ball |



■ **To stop the engine**

When the stop lever (1) is moved to the stop position, fork lever 1 (2) is pushed and the control rod (3) is moved to stop the fuel injection.

- | | |
|------------------|-----------------|
| (1) Stop Lever | (3) Control Rod |
| (2) Fork Lever 1 | |

SERVICING

CONTENTS

TROUBLESHOOTING	1-S1
SERVICING SPECIFICATIONS	1-S4
TIGHTENING TORQUES	1-S9
CHECKING, DISASSEMBLING AND SERVICING	1-S10
[1] SEPARATING THE ENGINE	1-S10
[2] ENGINE BODY	1-S16
CHECKING AND ADJUSTING	1-S16
DISASSEMBLING AND ASSEMBLING	1-S18
(1) Cylinder Head and Valve	1-S18
(2) Timing Gears and Camshaft	1-S22
(3) Connecting Rod and Piston	1-S26
(4) Crankshaft	1-S29
SERVICING	1-S31
(1) Cylinder Head and Valves	1-S31
(2) Timing Gears and Camshaft	1-S36
(3) Piston and Connecting Rod	1-S38
(4) Crankshaft	1-S40
(5) Cylinder	1-S44
[3] LUBRICATING SYSTEM	1-S45
CHECKING	1-S45
SERVICING	1-S45
(1) Oil Pump	1-S45
[4] COOLING SYSTEM	1-S46
CHECKING AND ADJUSTING	1-S46
(1) Fan Belt	1-S46
(2) Radiator	1-S47
(3) Thermostat	1-S47
DISASSEMBLING AND ASSEMBLING	1-S48
[5] FUEL SYSTEM	1-S49
CHECKING AND ADJUSTING	1-S49
(1) Injection Pump	1-S49
(2) Injection Nozzle	1-S50
DISASSEMBLING AND ASSEMBLING	1-S52
(1) Injection Pump	1-S52
(2) Injection Nozzle	1-S52

Symptom	Probable Cause	Solution	Reference Page
Either Black or Dark Gray Exhaust Gas Is Observed	<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 Clean or replace Clean or replace Repair or replace nozzle	– – G-18, G-23 G-18 1-S19, 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 injection pump Repair or replace nozzle Check compression pressure	1-S49 – 1-S22, S52 1-S19, S52 1-S16
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 piston Replace Replace	1-S28 1-S28, S39 1-S39 1-S21, S33 –
Fuel Mixed into Lubricant Oil	<ul style="list-style-type: none"> ● Injection pump's plunger worn ● Injection pump broken ● Deficient nozzle injection 	Replace pump element or pump Replace Repair or replace nozzle	1-S22, S52 1-S22 1-S19, S52
Water Mixed into Lubricant Oil	<ul style="list-style-type: none"> ● Head gasket defective ● Cylinder block or cylinder head flawed 	Replace Replace or repair	1-S20 1-S20, S31, S44
Low Oil Pressure	<ul style="list-style-type: none"> ● Engine oil insufficient ● Oil strainer clogged ● Oil filter cartridge clogged ● Relief valve stuck with dirt ● Relief valve spring weaken or broken ● Excessive oil clearance of crankshaft bearing ● Excessive oil clearance of crank pin bearing ● Excessive oil clearance of rocker arm ● Oil passage clogged ● Different type of oil ● Oil pump defective 	Replenish Clean Replace Clean Replace Replace Replace Replace Clean Use the specified type of oil Repair or replace	1-S10 1-S26 G-12 1-M7 1-M7 1-S41 1-S41 1-S30 – – 1-S25
High Oil Pressure	<ul style="list-style-type: none"> ● Different type of oil ● Relief valve defective 	Use the specified type of oil Replace	– 1-M7

Symptom	Probable Cause	Solution	Reference Page
Engine Overheated	<ul style="list-style-type: none"> ● Engine oil insufficient ● Fan belt broken or tensioned improperly ● Cooling water insufficient ● Radiator net and radiator fin clogged with dust ● Inside of radiator corroded ● Cooling water flow route corroded ● Radiator cap defective ● Radiator hose damaged ● Overload running ● Head gasket defective ● Incorrect injection timing ● Unsuitable fuel used 	Replenish Replace or adjust Replenish Clean Clean or replace Clean or replace Replace Replace Loosen the load Replace Adjust Use the specified fuel	1-S10 G-19, 1-S46 - - G-26 G-26 1-S47 G-21, 1-S13 - 1-S20 1-S49 -

SERVICING SPECIFICATIONS

[1] ENGINE BODY

Cylinder Head

Item	Factory Specification	Allowable Limit
Cylinder head surface flatness	–	0.05 mm 0.0020 in.
Top clearance	0.50 to 0.70 mm 0.0197 to 0.0276 in.	–
Compression pressure	2.84 to 3.23 MPa 29 to 33 kgf/cm ² 412 to 469 psi	2.26 MPa 23 kgf/cm ² 327 psi
Difference among cylinders		10% or less

Valves

Valve clearance (Cold)		0.145 to 0.185 mm 0.0057 to 0.0072 in.	–
Valve seat width	IN.	2.12 mm 0.0835 in.	–
	EX.	2.12 mm 0.0835 in.	–
Valve seat angle	IN.	0.785 rad. 45°	–
	EX.	0.785 rad. 45°	–
Valve face angle	IN.	0.785 rad. 45°	–
	EX.	0.785 rad. 45°	–
Valve recessing		– 0.10 to 0.10 mm – 0.0039 to 0.0039 in.	0.3 mm 0.0118 in.
Clearance between valve stem and valve guide		0.030 to 0.057 mm 0.00118 to 0.00224 in.	0.1 mm 0.0039 in.
Valve stem O.D.		5.968 to 5.980 mm 0.23496 to 0.23543 in.	–
Valve guide I.D.		6.010 to 6.025 mm 0.23661 to 0.23720 in.	–

Valve Timing

Intake valve	Open	0.35 rad. (20°) before T.D.C.	–
	Close	0.79 rad. (45°) after B.D.C.	–
Exhaust valve	Open	0.87 rad. (50°) before B.D.C.	–
	Close	0.26 rad. (15°) after T.D.C.	–

Valve Spring

Item	Factory Specification	Allowable Limit
Free length	31.3 to 31.8 mm 1.232 to 1.252 in.	28.4 mm 1.118 in.
Setting load / setting length	64.7 N / 27.0 mm 6.6 kgf / 27.0 mm 14.6 lbs / 1.063 in.	54.9 N / 27.0 mm 5.6 kgf / 27.0 mm 12.3 lbs / 1.063 in.
Tilt	–	1.2 mm 0.047 in.

Rocker Arm

Clearance between rocker arm shaft and rocker arm	0.016 to 0.045 mm 0.0006 to 0.0018 in.	0.15 mm 0.0059 in.
Rocker arm shaft O.D.	10.473 to 10.484 mm 0.41232 to 0.41276 in.	–
Rocker arm I.D.	10.500 to 10.518 mm 0.41339 to 0.41410 in.	–

Tappet

Clearance between tappet and guide	0.016 to 0.052 mm 0.00063 to 0.00177 in.	0.15 mm 0.0059 in.
Tappet O.D.	17.966 to 17.984 mm 0.70732 to 0.70803 in.	–
Tappet guide I.D.	18.000 to 18.018 mm 0.70866 to 0.70937 in.	–

Camshaft

Camshaft side clearance		0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.5 mm 0.020 in.
Camshaft alignment		–	0.02 mm 0.0008 in.
Cam height	IN.	26.88 mm 1.0583 in.	26.83 mm 1.0563 in.
	EX.	26.88 mm 1.0583 in.	26.83 mm 1.0563 in.
Oil clearance of camshaft		0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.15 mm 0.0059 in.
Camshaft journal O.D.		32.934 to 32.950 mm 1.2966 to 1.2972 in.	–
Camshaft bearing I.D.		33.000 to 33.025 mm 1.2992 to 1.3002 in.	–

Timing Gear

Item	Factory Specification	Allowable Limit
Timing gear backlash		
Crank gear – Oil pump drive gear	0.041 to 0.123 mm 0.00161 to 0.00484 in.	0.15 mm 0.0059 in.
Idle gear – Cam gear	0.047 to 0.123 mm 0.00185 to 0.00484 in.	0.15 mm 0.0059 in.
Idle gear – Injection pump gear	0.046 to 0.124 mm 0.00181 to 0.00488 in.	0.15 mm 0.0059 in.
Idle gear – Crank gear	0.043 to 0.124 mm 0.00169 to 0.00488 in.	0.15 mm 0.0059 in.

Piston / Piston Ring

Piston pin hole I.D.		20.000 to 20.013 mm 0.78740 to 0.78791 in.	20.05 mm 0.7894 in.
Piston ring clearance	Second ring	0.085 to 0.115 mm 0.0033 to 0.0045 in.	0.15 mm 0.0059 in.
	Oil ring	0.04 to 0.08 mm 0.0016 to 0.0031 in.	0.15 mm 0.0059 in.
Ring gap	Top ring Oil ring	0.15 to 0.30 mm 0.0059 to 0.0118 in.	1.2 mm 0.0472 in.
	Second ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.2 mm 0.0472 in.
Oversize of piston rings		+ 0.25 mm + 0.0098 in.	–

Connecting Rod

Connecting rod alignment		–	0.05 mm 0.0020 in.
Clearance between piston pin and small end bushing		0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.10 mm 0.0039 in.
Piston pin O.D.		20.002 to 20.011 mm 0.78748 to 0.78783 in.	–
Small end bushing I.D.		20.025 to 20.040 mm 0.78839 to 0.78897 in.	–

Crankshaft

Crankshaft alignment		–	0.04 mm 0.0016 in.
Oil clearance between crankshaft and crankshaft bearing 1		0.100 to 0.181 mm 0.00394 to 0.00713 in.	0.20 mm 0.0079 in.
Crankshaft O.D.		39.934 to 39.950 mm 1.57221 to 1.57284 in.	–
Crankshaft bearing 1 I.D.		40.050 to 40.115 mm 1.57677 to 1.57933 in.	–
Oil clearance between crankshaft and crankshaft bearing 2		0.028 to 0.059 mm 0.0014 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft O.D.		43.934 to 43.950 mm 1.72969 to 1.73032 in.	–
Crankshaft bearing 2 I.D.		43.978 to 43.993 mm 1.73142 to 1.73201 in.	–

Crankshaft (Continued)

Item	Factory Specification	Allowable Limit
Oil clearance between crankshaft and crank shaft bearing 3	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft O.D.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	–
Crank bearing 3 I.D.	39.978 to 39.993 mm 1.57394 to 1.57453 in.	–
Oil clearance between crank pin and crank pin bearing	0.020 to 0.051 mm 0.00079 to 0.00201 in.	0.15 mm 0.0059 in.
Crankshaft O.D.	33.959 to 33.975 mm 1.33697 to 1.33759 in.	–
Crank pin bearing I.D.	33.994 to 34.040 mm 1.33835 to 1.34016 in.	–
Crankshaft side clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.5 mm 0.0197 in.

Cylinder Liner

Cylinder liner I.D.	67.000 to 67.019 mm 2.63779 to 2.63854 in.	+ 0.15 mm 0.0059 in.
Oversized cylinder liner I.D.	67.250 to 67.269 mm 2.64764 to 2.64839 in.	+ 0.15 mm 0.0059 in.

[2] LUBRICATING SYSTEM**Oil Pump**

Engine oil pressure	At idle speed	98 kPa 1.0 kgf/cm ² , 14 psi	–
	At rated speed	196 to 441 kPa 2.0 to 4.5 kgf/cm ² 36 to 64 psi	98 kPa 1.0 kgf/cm ² 14 psi
Clearance between inner rotor and outer rotor	0.03 to 0.14 mm 0.0012 to 0.0055 in.	–	
Clearance between outer rotor and pump body	0.07 to 0.15 mm 0.0028 to 0.0059 in.	–	
End clearance between rotor and cover	0.075 to 0.135 mm 0.0029 to 0.0053 in.	–	

[3] COOLING SYSTEM**Thermostat**

Thermostat's valve opening temperature	80.5 to 83.5 °C 176.9 to 182.3 °F	–
Temperature at which thermostat completely opens	95 °C 203 °F	–

Radiator

Item	Factory Specification	Allowable Limit
Radiator water leakage	Water tightness at specified pressure 157 kPa 1.6 kgf/cm ² , 23 psi	–
Radiator cap air leakage	10 seconds or more 0.9 → 0.6 kgf/cm ² 88 → 59 kPa, 13 → 9 psi	–
Fan belt tension	7 to 9 mm/10 kgf 0.28 to 0.35 in./ 10 kgf (22.1 lbs.)	–

[4] FUEL SYSTEM**Injection Pump**

Injection timing	0.31 to 0.34 rad. (17.5° to 19.5°) before T.D.C.	–
Fuel tightness of pump element	–	14.7 MPa 150 kgf/cm ² , 2133 psi
Fuel tightness of delivery valve	–	5 seconds 14.7 → 13.7 MPa 150 → 140 kgf/cm ² 2133 → 1990 psi

Injection Nozzle

Fuel injection pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2133 psi	–
Valve seat tightness	When the pressure is 12.75 MPa (130 kgf/cm ² , 1849 psi), the valve seat must be fuel tightness.	–

TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench. Several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and at the proper torque.

(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft-lbs
Drag link slotted nut	17.7 to 34.5	1.8 to 3.5	13.0 to 25.3
Front axle frame mounting screw	39.2 to 64.7	4.0 to 6.6	28.9 to 47.7
Steering wheel mounting nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Delivery pipe cap screw	34.0 to 39.0	3.5 to 4.0	25.0 to 28.8
Joint bolt of 3-point hitch delivery pipe	34.3 to 44.1	3.5 to 4.5	25.3 to 32.5
Fuel filter bracket mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Clutch housing and engine mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Clutch cover mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Flow priority valve mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Hydraulic pump mounting screw	39.2 to 64.7	4.0 to 6.6	28.9 to 47.7

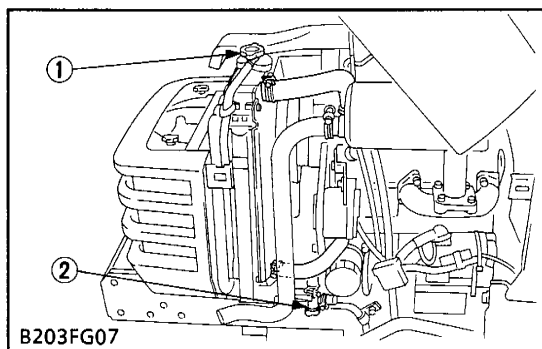
Item	Size x Pitch	N·m	kgf·m	ft-lbs
* Cylinder head cover cap nut	M6 x 1.0	3.9 to 5.9	0.4 to 0.6	2.9 to 4.3
Cylinder head bolt	M8 x 1.25	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
* Bearing case bolt 1	M6 x 1.0	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
* Bearing case bolt 2	M7 x 1.0	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
* Flywheel bolt	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
* Connecting rod bolt	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
* Rocker arm bracket nuts	M6 x 1.0	9.81 to 11.28	1.00 to 1.15	7.23 to 8.32
* Idle gear shaft mounting bolt	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
* Idle gear retaining nut	M20 x 1.0	78.4 to 88.2	8.0 to 9.0	57.6 to 64.8
* Fan drive pulley retaining bolt	M12 x 1.5	117.7 to 127.5	12.0 to 13.0	86.80 to 94.03
Glow plug	M8 x 1.0	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Overflow pipe assembly retaining nut (nozzle)	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Oil switch	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3

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.

CHECKING, DISASSEMBLING AND SERVICING

[1] SEPARATING THE ENGINE



Draining Cooling Water

⚠ CAUTION

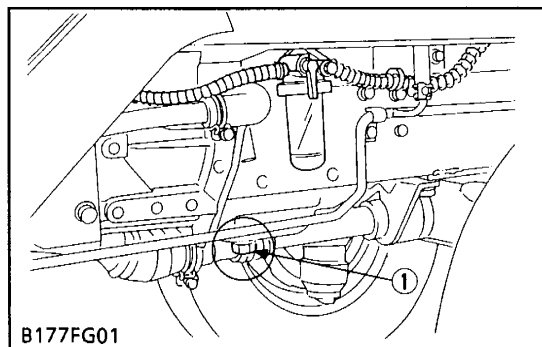
- Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.

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

Coolant Capacity	Cooling system with recovery tank	2.7 ℓ 2.9 U.S. qts. 2.1 Imp. qts.
------------------	-----------------------------------	---

(1) Radiator Cap

(2) Drain Cock



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 plug (1) to drain oil.
4. Screw in the drain plug.

(When refilling)

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

■ IMPORTANT

- Never mix two different type of oil.
- Use the proper SAE Engine Oil according to ambient temperature. Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)

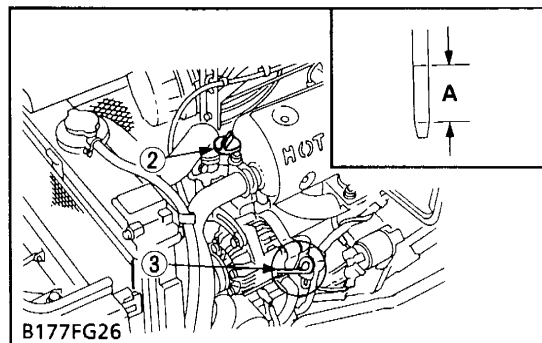
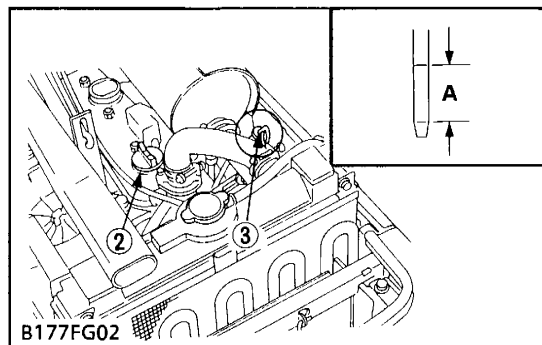
Engine oil capacity	2.4 ℓ 2.5 U.S. qts. 2.1 Imp. qts.
---------------------	---

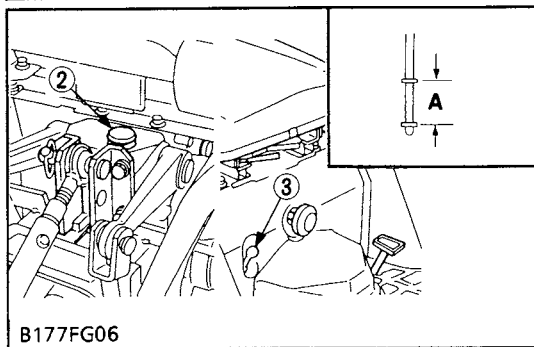
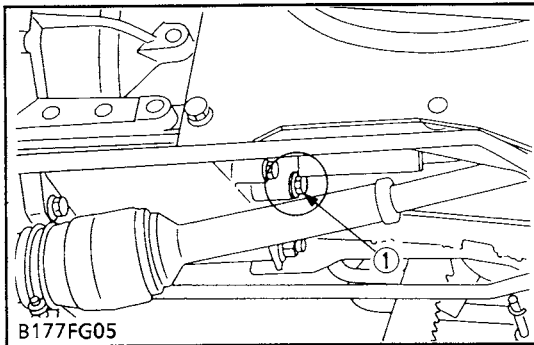
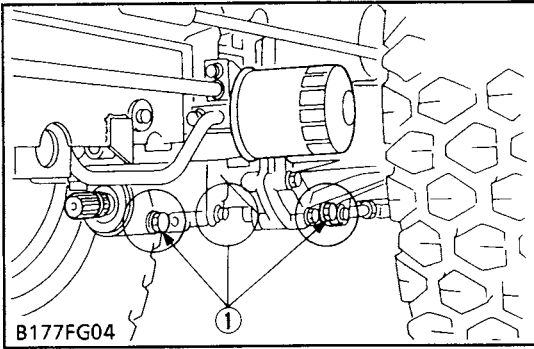
[A] Oil level is acceptable within this range.

(1) Drain Plug

(3) Dipstick

(2) Oil Inlet Plug





Drain the Transmission Oil

1. Place oil pans underneath the transmission case.
2. Remove the four drain plugs (1) at the bottom of the transmission case.
3. Drain the transmission oil.
4. After draining, screw in the four drain plugs (1).

(When refilling)

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

IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)
- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.
 1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
 2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system.

This is important to prevent the hydraulic pump and the HST unit from getting seized.

 3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.
- Do not mix different brands oil together.

Transmission oil capacity	12.0 ℓ 3.17 U.S.gals. 2.4 Imp.gals
---------------------------	--

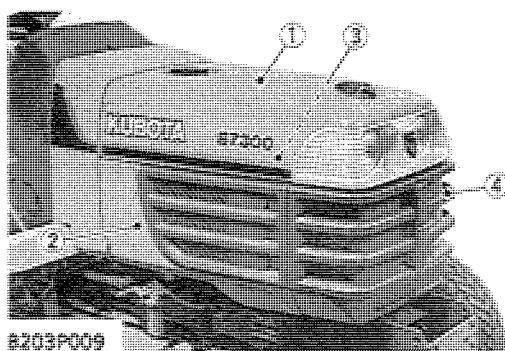
[A] Oil level is acceptable within this range.

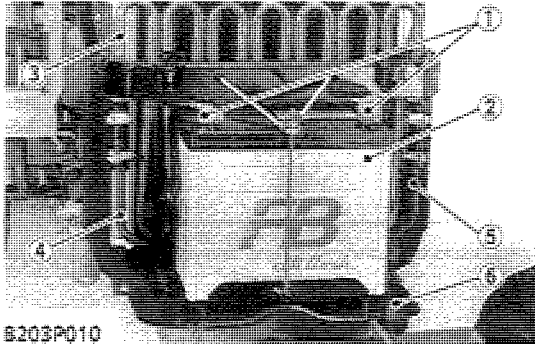
- (1) Drain Plugs (3) Dipstick
 (2) Filling Plug

Hood, Side Cover and Front Grille

1. Open the hood from front and remove the spring lock pin and remove the food with hood rod for keeping it open.
2. Remove the front grille (4).
3. Remove the right and left side cover (2), (3).

- (1) Hood (3) Left Side Cover
 (2) Right Side Cover (4) Front Grille





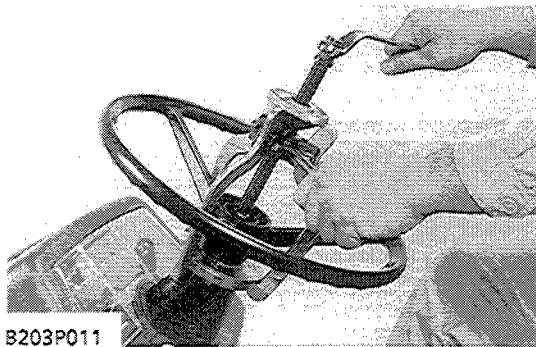
Battery, Oil Cooler and Hydraulic Pipes

1. Disconnect the battery cords (1) and remove the battery (2).
2. Loosen the clamps of hydraulic hoses and remove the battery base (6) with oil cooler then remove the delivery pipe (4) and return pipe (5).

■ **NOTE**

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

- | | |
|------------------|-------------------|
| (1) Battery Cord | (4) Delivery Pipe |
| (2) Battery | (5) Return Pipe |
| (3) Oil Cooler | (6) Battery Base |

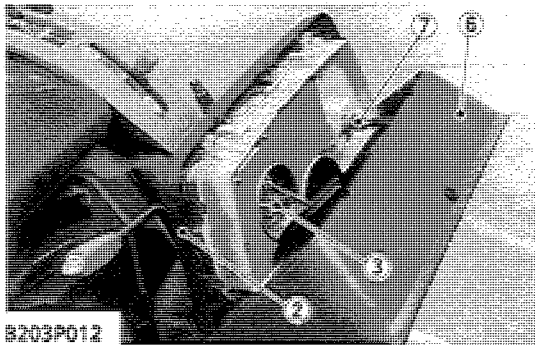


Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel with a steering wheel puller (Code No. 07916-51090).

(When reassembling)

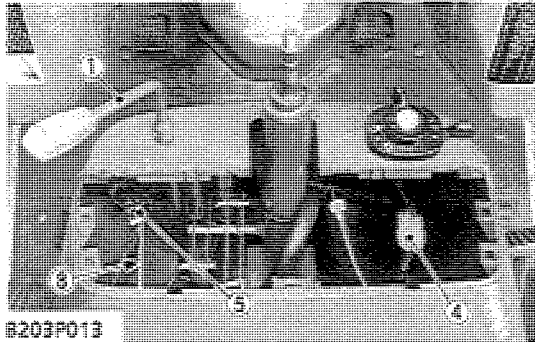
Tightening torque	Steering wheel mounting nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft-lbs
-------------------	-----------------------------	---

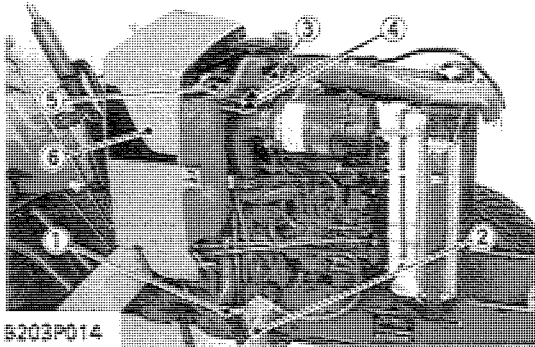


Meter Panel and Panel Under Cover

1. Remove the meter panel (2) and disconnect the meter panel connector (3) and hour-meter cable (9) from the meter panel. Then remove the meter panel.
2. Tap out the spring pin and remove the hand accelerator lever (1).
3. Disconnect the combination switch connector (4) and main switch connector (5).
4. Remove the knob of engine stop rod (8).
5. Remove the panel under cover mounting screw, and take off the panel under cover (6).

- | | |
|----------------------------------|---------------------------|
| (1) Hand Accelerator Lever | (5) Main Switch Connector |
| (2) Meter Panel | (6) Panel Under Cover |
| (3) Meter Panel Connector | (7) Hour-meter Cable |
| (4) Combination Switch Connector | (8) Engine Stop Rod |

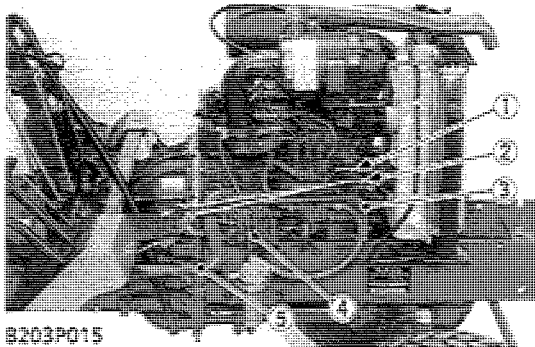




Center Pillar with Fuel Tank and Others

1. Close the fuel filter cock.
2. Disconnect the fuel hose (1) between fuel filter (2) and fuel tank at the fuel filter side, then drain fuel completely.
3. Remove the fuel hose from fuel pump side and remove the fuel filter from the bracket.
4. Remove the pillar stay (3).
5. Disconnect the flasher unit, relay box and relay comp. connectors and remove the lead wire for fuel gauge.
6. Disconnect the overflow hoses (4) of fuel line.
7. Remove the center pillar with fuel tank (5).

- | | |
|-----------------|-------------------|
| (1) Fuel Hose | (4) Overflow Hose |
| (2) Fuel Filter | (5) Fuel Tank |
| (3) Pillar Stay | (6) Center Pillar |



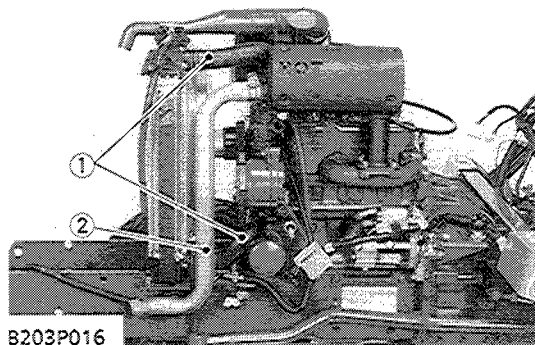
Suction Pipe, Delivery Pipe and Others

1. Remove the accelerator rod (1) and engine stop rod (2).
2. Remove the delivery pipe (3).
3. Loosen the clamp for delivery pipes, then disconnect the delivery pipe (4) for 3-point hitch from flow priority valve.
4. Loosen the clamp of suction hose (5).

(When reassembling)

Tightening torque	Delivery pipe cap screw	34.0 to 39.0 N·m 3.5 to 4.0 kgf·m 25.1 to 28.8 ft·lbs
-------------------	-------------------------	---

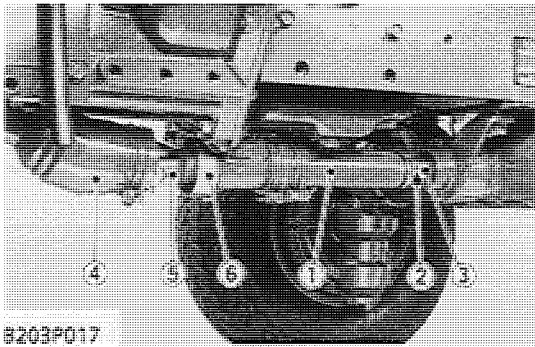
- | | |
|---------------------|-------------------------------------|
| (1) Accelerator Rod | (4) Delivery Pipe for 3-Point Hitch |
| (2) Engine Stop Rod | (5) Suction Pipe |
| (3) Delivery Pipe | |



Radiator Hoses and Muffler Pipe

1. Loosen the clamps and disconnect radiator hoses (1).
2. Remove the muffler pipe (2).
3. Disconnect the radiator stay and then dismantle the radiator.

- | | |
|-------------------|------------------|
| (1) Radiator Hose | (2) Muffler Pipe |
|-------------------|------------------|



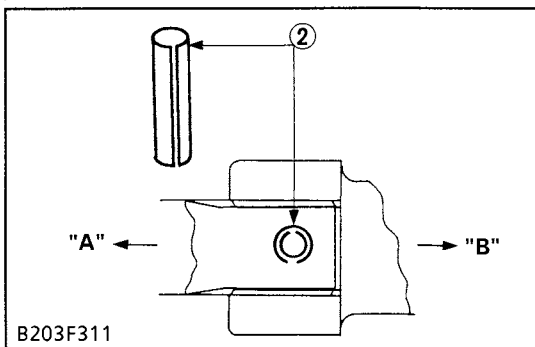
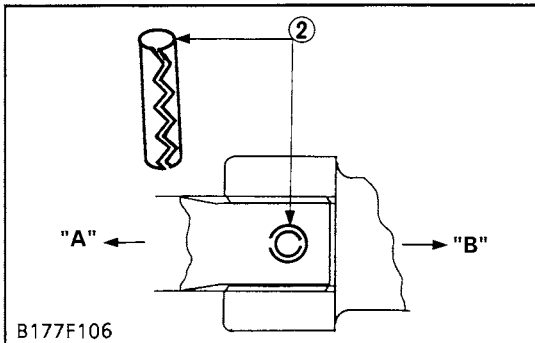
Propeller Shaft and Bearing Holder

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.
3. Loosen the clamp and slide the universal joint cover (4) to the rear.
4. Tap out the spring pin and slide the universal joint (5) to the rear.
5. Remove the bearing holder (6) and propeller shaft cover as a unit.

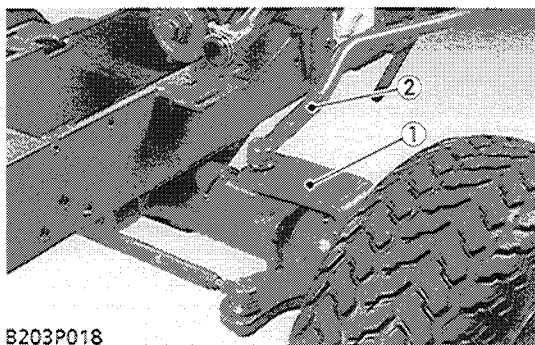
(When reassembling)

- Apply grease to the splines of the propeller shaft and coupling.
- Apply grease to the splines of the propeller shaft and universal joint.
- When inserting the spring pins (2), face their splits in the direction parallel to the universal joint as shown in the figure.

- | | |
|---------------------------|---------------------------|
| (1) Propeller Shaft Cover | (4) Universal Joint Cover |
| (2) Spring Pin | (5) Universal Joint |
| (3) Coupling | (6) Bearing Holder |



[A] Front [B] Rear



Drag Link

1. Remove the slotted nut and disconnect the drag link (2) from the knuckle arm (1).

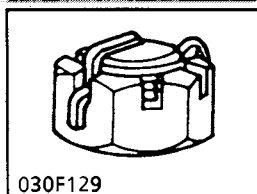
(When reassembling)

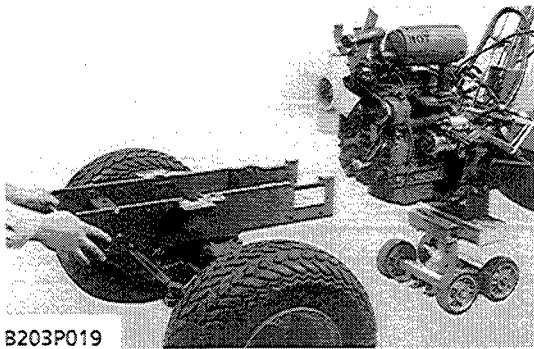
■ IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure.

Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13 to 25.3 ft·lbs
-------------------	-------------	---

- | | |
|-----------------|---------------|
| (1) Knuckle Arm | (2) Drag Link |
|-----------------|---------------|





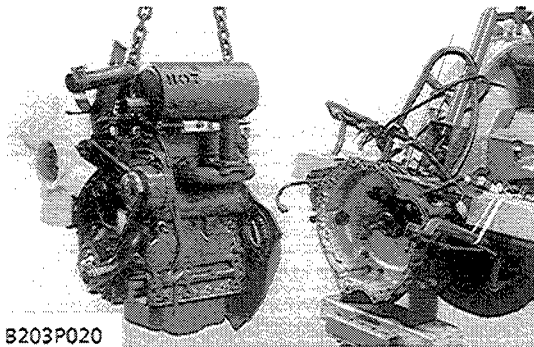
B203P019

Separating Front Axle Assembly

1. Remove the front axle frame mounting screws and separate the front axle assembly from the engine.

(When reassembling)

Tightening torque	Front axle frame mounting screw	39.2 to 64.7 N·m 4.0 to 6.6 kgf·m 28.9 to 47.7 ft-lbs
-------------------	---------------------------------	---



B203P020

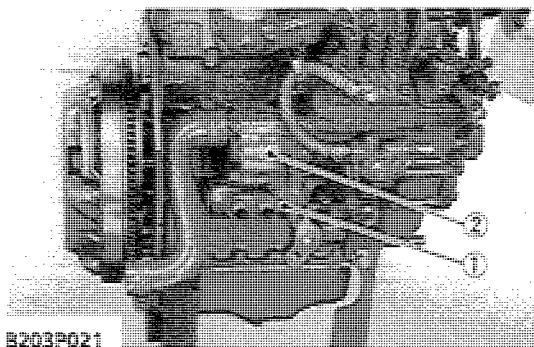
Separating the Engine from Clutch Housing

1. Remove the wiring harness.
2. Place the jack under the front mission case.
3. Hoist the engine by the chain at the engine hook.
4. Remove the engine mounting screws and separate the engine from the clutch housing.

(When reassembling)

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

Tightening torque	Engine mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	-----------------------	---



B203P021

Outer Parts

1. Remove the flow priority valve (1) and hydraulic pump (2).
2. Remove the clutch assembly (3).

(When reassembling)

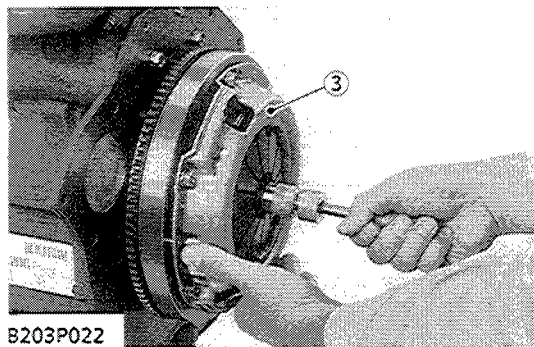
- Direct the shorter end of the clutch disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Insert the pressure plate, noting the position of straight pins.
- Apply a thin coat of liquid gasket (Three Bond 1215 or equivalent) to both surface of the solenoid's cover packing.

■ IMPORTANT

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

■ NOTE

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



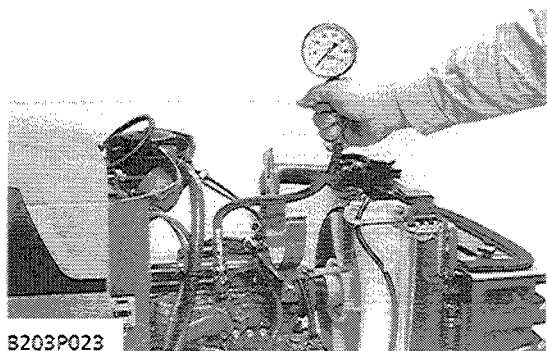
B203P022

- (1) Flow Priority Valve (3) Clutch Assembly
(2) Hydraulic Pump

Tightening torque	Clutch cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Flow priority valve mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump mounting screw	39.2 to 64.7 N·m 4.0 to 6.6 kgf·m 28.9 to 47.7 ft-lbs

[2] ENGINE BODY

CHECKING AND ADJUSTING



B203P023

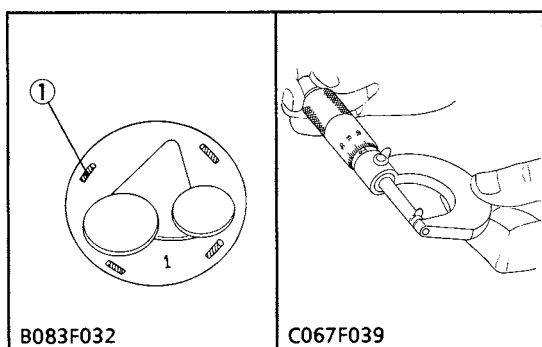
Compression Pressure

1. Run the engine until it is warmed up.
2. Stop the engine, and then remove the air cleaner and muffler.
3. Remove the injection nozzles from all cylinders, and set a compression tester (Code No. 07909-30208) with the adaptor (Adaptor H, Code No. 07909-31231) to the nozzle hole.
4. Keep the engine stop lever at "Stop Position".
5. While cranking the engine with cell starter, measure the compression pressure.
6. Repeat steps 3 through 5 for each cylinder.
7. If the measurement does not reach the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.
8. If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.
9. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ NOTE

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

Compression pressure	Factory spec.	2.84 to 3.24 MPa 29 to 33 kgf/cm ² 412 to 469 psi
	Allowable limit	2.26 MPa 23 kgf/cm ² 327 psi



(1) Fuse

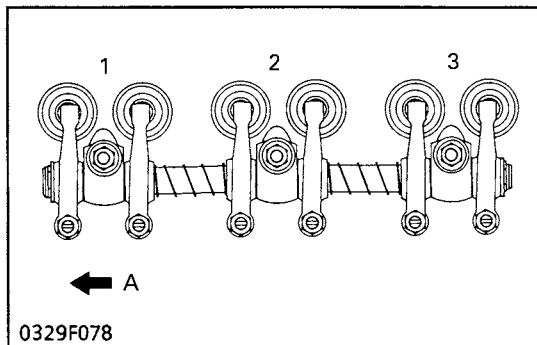
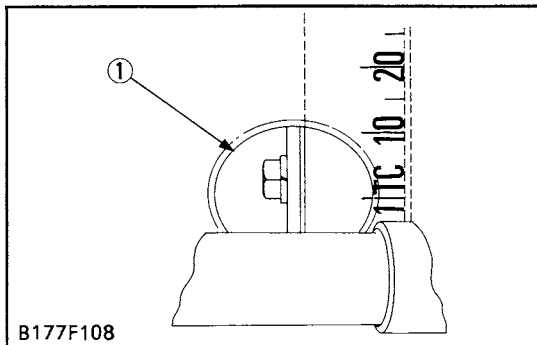
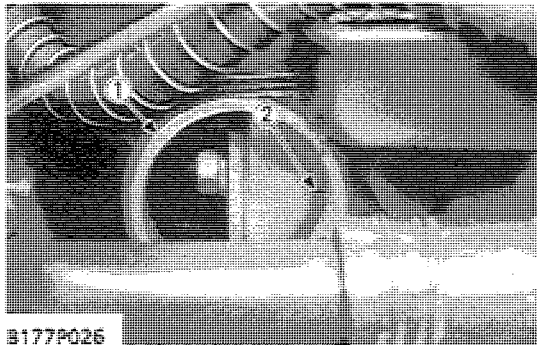
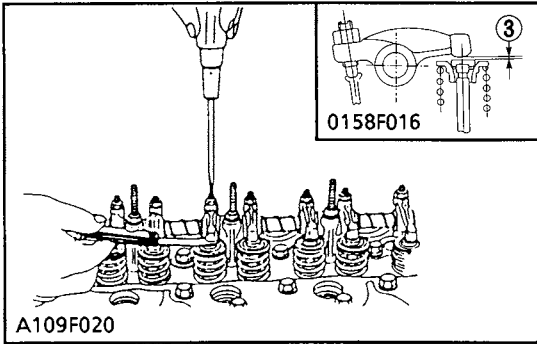
Top Clearance

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

■ NOTE

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

Top clearance	Factory spec.	0.50 to 0.70 mm 0.0197 to 0.0276 in.
Tightening torque	Cylinder head bolt	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs



Valve Clearance

IMPORTANT

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

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

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

NOTE

- The "TC" marking line on the flywheel is just for No. 1 cylinder. There is no "TC" marking for the other cylinders.
- No. 1 piston comes to the T.D.C. position when the "TC" marking 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.

Adjustable cylinder location of piston	Engine model	D722	
		IN.	EX.
When No. 1 piston is compression top dead center	1st	○	○
	2nd		○
	3rd	○	
When No. 1 piston is overlap position	1st		
	2nd	○	
	3rd		○

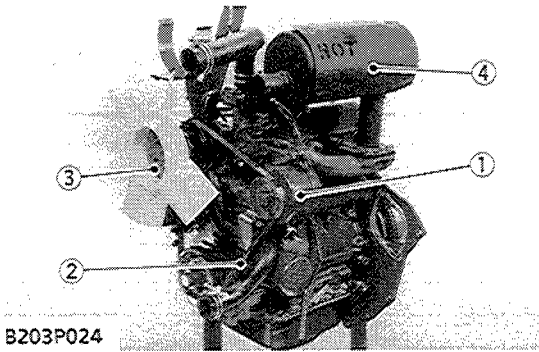
(1) Timing Window
(2) TC Mark Line

(3) Valve Clearance

[A] Gear Case Side

DISASSEMBLING AND ASSEMBLING

(1) Cylinder Head and Valve



B203P024

External Components

1. Remove the dynamo (1) and fan belt (2).
2. Remove the cooling fan (3) and muffler (4).

(When reassembling)

- Check to see that there are no cracks on the belt surface.

■ IMPORTANT

- After reassembling the fan belt, be sure to adjust the fan belt tension.

Tightening torque	Flow priority valve mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	------------------------------------	---

- | | |
|--------------|-----------------|
| (1) Dynamo | (3) Cooling Fan |
| (2) Fan Belt | (4) Muffler |

Head Cover

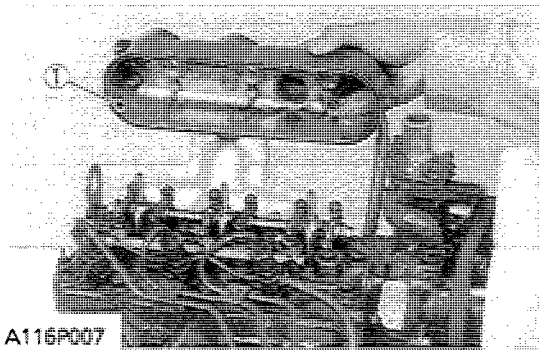
1. Remove the head cover (1).

(When reassembling)

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

Tightening torque	Cylinder head cover cap nut	3.9 to 5.9 N·m 0.4 to 0.6 kgf·m 2.9 to 4.3 ft-lbs
-------------------	-----------------------------	---

- (1) Head Cover



A116P007

Injection Pipes

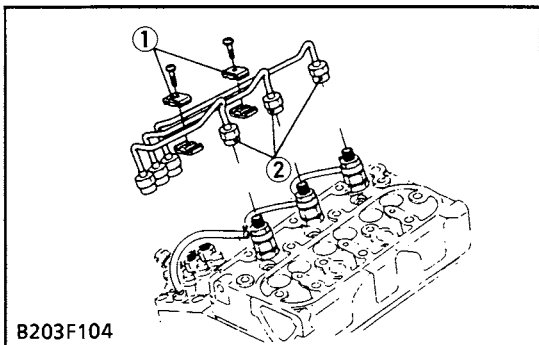
1. Loosen the screws on the pipe clamps.
2. Detach the injection pipes (1).

(When reassembling)

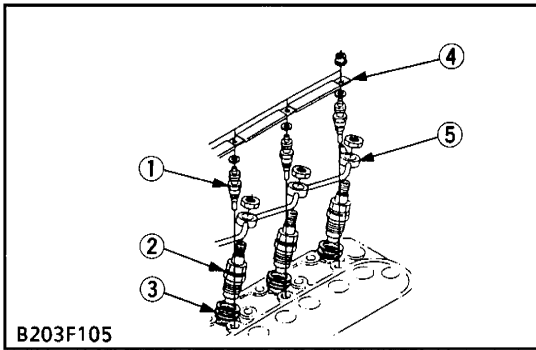
- Send compressed air into the pipes to blow out dust. Then, reassemble the pipes in the reverse order.

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

- | | |
|-----------------|---------------------|
| (1) Pipe Clamps | (2) Injection Pipes |
|-----------------|---------------------|



B203F104



Nozzle Holder Assembly and Glow Plug

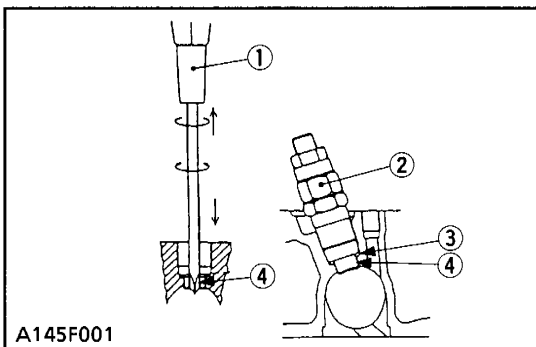
1. Remove the overflow pipe assembly (5).
2. Remove the nozzle holder assemblies (2) using a 21 mm deep socket wrench.
3. Remove the copper gasket and heat seal (3).
4. Remove the lead (4) from the glow plugs.
5. Remove the glow plugs (1).

(When reassembling)

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

Tightening torque	Nozzle holder assembly	49.0 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	7.8 to 14.7 N·m 0.8 to 1.5 kgf·m 5.8 to 10.8 ft-lbs

- | | |
|----------------------------|----------------------------|
| (1) Glow Plug | (4) Lead |
| (2) Nozzle Holder Assembly | (5) Overflow Pipe Assembly |
| (3) Heat Seal | |



Nozzle Heat Seal Service Removal Procedure

■ IMPORTANT

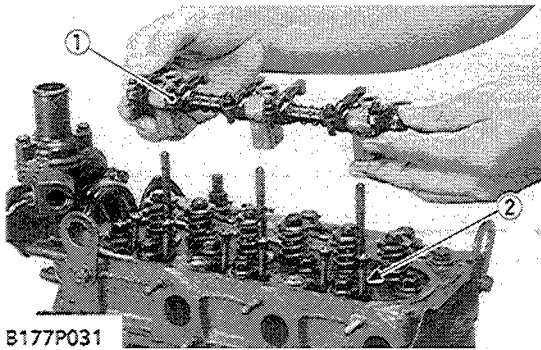
- Use a plus (Phillips head) screw driver that has a Dia. which is bigger than the heat seal hole. (Approx. 6 mm) 1/4 in.

1. Drive screw driver (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 injection nozzle gasket (3).
4. If the heat seal drops, repeat the above procedure.

(When reassembling)

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

- | | |
|-----------------------|------------------------------|
| (1) Plus Screw Driver | (3) Injection Nozzle Packing |
| (2) Injection Nozzle | (4) Heat Seal |



B177P031

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.

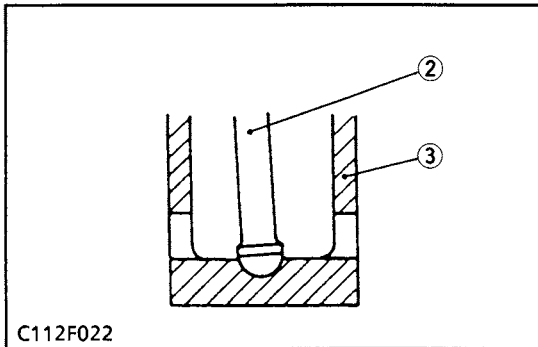
■ IMPORTANT

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

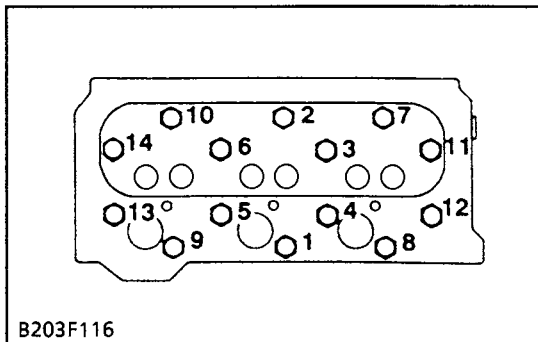
Tightening torque	Rocker arm bracket nut	9.8 to 11.3 N·m 1.01 to 1.15 kgf·m 7.2 to 8.3 ft-lbs
-------------------	------------------------	--

- (1) Rocker Arm Assembly
(2) Push Rod

(3) Tappet



C112F022



B203F116

Cylinder Head

1. Loosen the pipe clamp, and remove the water return pipe.
2. Remove the cylinder head screw in the order of (14) to (1).
3. Lift up the cylinder head to detach.
4. Remove the cylinder head gasket and O-ring.

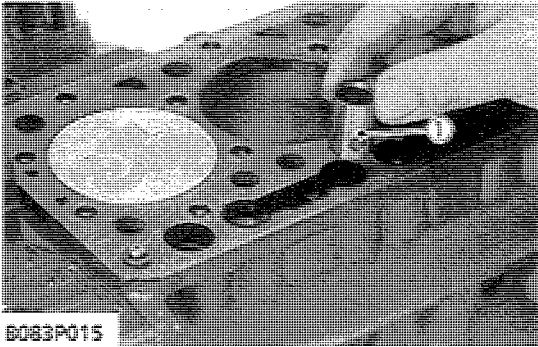
(When reassembling)

- Replace the cylinder head gasket with a new one.
- Securely fit the O-ring to the pipe pin.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws in diagonal sequence starting from the center. (Refer to figure left.)
- Tighten them uniformly, or the head may deform in the long run.
- Retighten the cylinder head screws after running the engine for 30 minutes.

Tightening torque	Cylinder head screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
-------------------	---------------------	---

■ NOTE

- To Loosen : 14 to 1
To Tighten : 1 to 14



Tappets

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

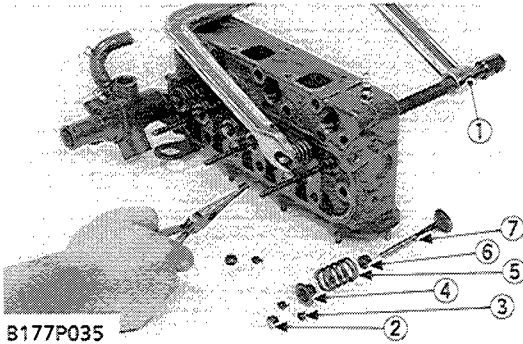
(When reassembling)

- Visually check the contact between tappets and cams for proper rotation. If a 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



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

(2) Valve Cap

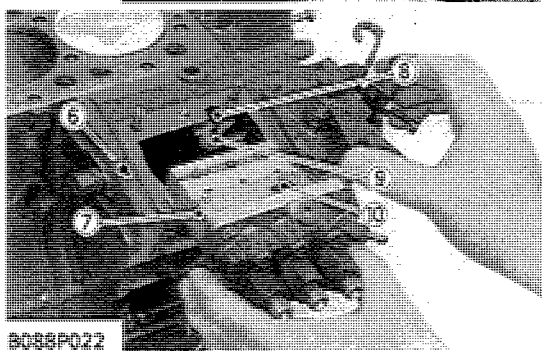
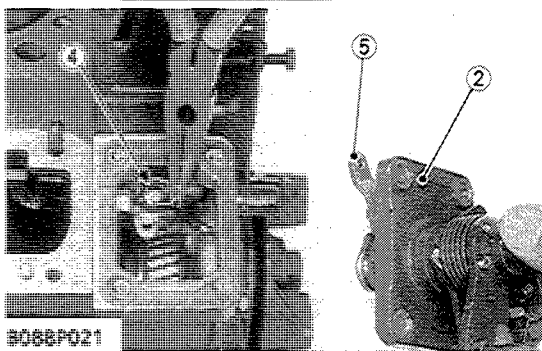
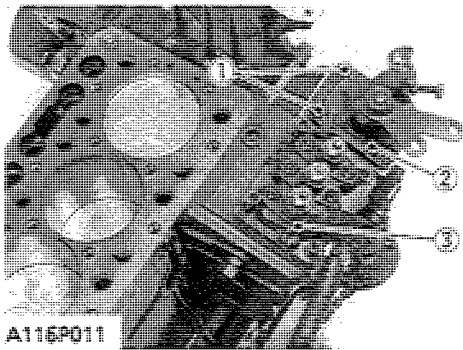
(3) Valve Spring Collet

(4) Valve Spring Retainer

(5) Valve Spring

(6) Valve Stem Seal

(7) Valve

(2) Timing Gears and Camshaft**Injection Pump and Speed Control Plate**

1. Remove the socket head screws and nuts, and remove the injection pump (3).
2. Remove the screws (1) and separate the speed control plate (2), taking care not to damage the spring (4).
3. Disconnect the spring (4) and remove the speed control plate (2).

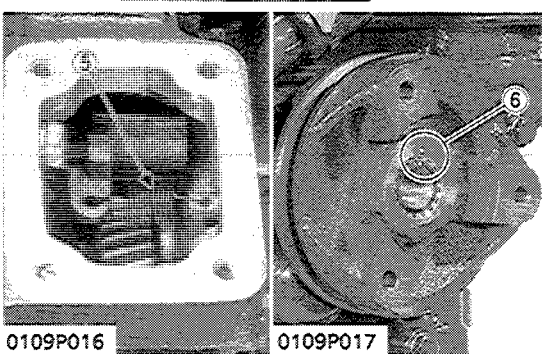
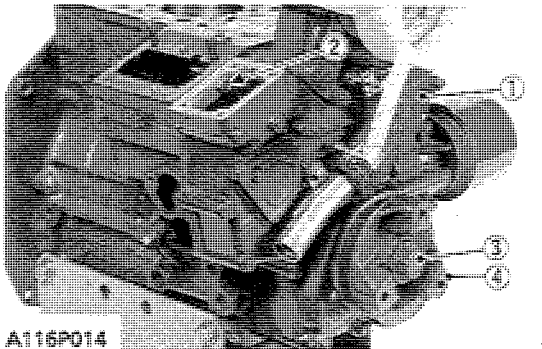
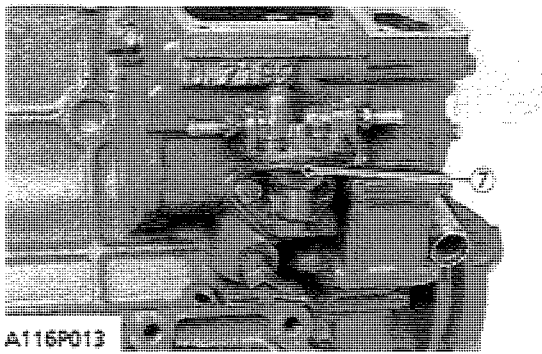
(When reassembling)

- Hook the spring (4) to the lever (5) first and install the speed control plate (2).
- Be sure to place the copper washers underneath two screws (1) (See photo).
- Position the slot (9) on the fork lever just under the slot (8) on the crankcase.
- Insert the injection pump (3) so that the control rod (7) should be pushed by the spring (6) at its end and the pin (10) on the rod engages with the slot (9) on the fork lever (See photo).

NOTE

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

- | | |
|-------------------------------|----------------------------|
| (1) Screws and Copper Washers | (6) Spring |
| (2) Speed Control Plate | (7) Control Rod |
| (3) Injection Pump | (8) Slot (Crankcase Side) |
| (4) Spring | (9) Slot (Fork Lever Side) |
| (5) Lever | (10) Pin |



Pulley and Gear Case

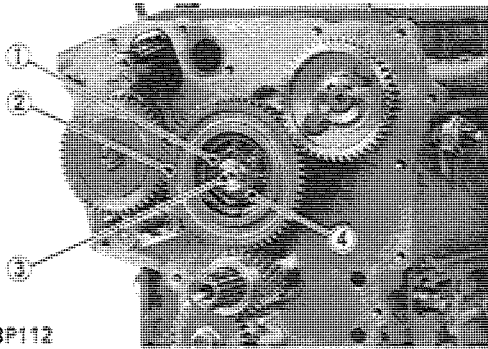
1. Remove the fuel feed pump (7).
2. Unscrew the fan drive pulley mounting screw (3) and remove the fan drive pulley (4).
3. Unscrew the screw (2) and disconnect the start spring (5) in the speed control plate mounting hole.
4. Unscrew the retaining screws and remove the gear case (1).

(When reassembling)

- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of the gear case packing.
- Be sure to set three O-rings inside the gear case.
- Install the pulley to the crankshaft, aligning the marks (6) on them. (See photo)

Tightening torque	Fan drive pulley retaining screw	117.7 to 127.5 N·m 12.0 to 13.0 kgf·m 86.80 to 94.03 ft-lbs
-------------------	----------------------------------	---

- | | |
|--------------------------------------|--------------------|
| (1) Gear Case | (5) Start Spring |
| (2) Screw | (6) Aligning Mark |
| (3) Fan Drive Pulley Retaining Screw | (7) Fuel Feed Pump |
| (4) Fan Drive Pulley | |



B203F112

Idle Gear

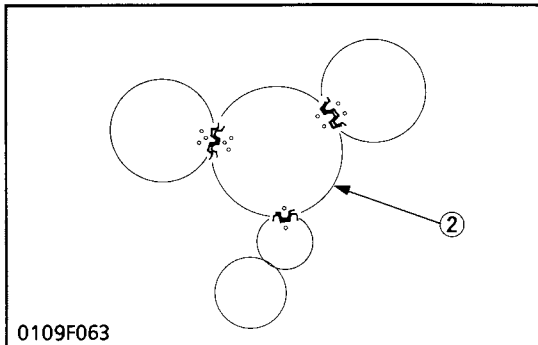
1. Remove the nut (1) and the idle gear (2).
2. Remove the screws and the idle gear shaft (3).

(When reassembling)

- Install the idle gear, aligning the marks on the gears referring to the figure.

NOTE

- When installing the idle gear shaft (3), noting the lubricating hole position of shaft shown in the figure.

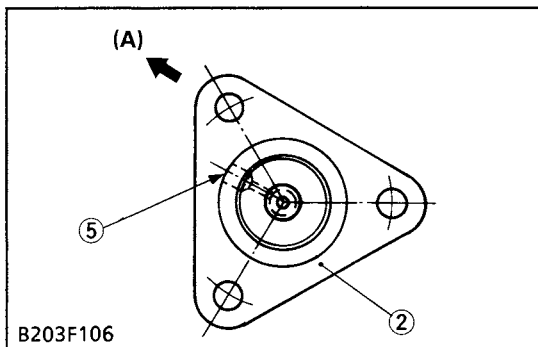


0109F063

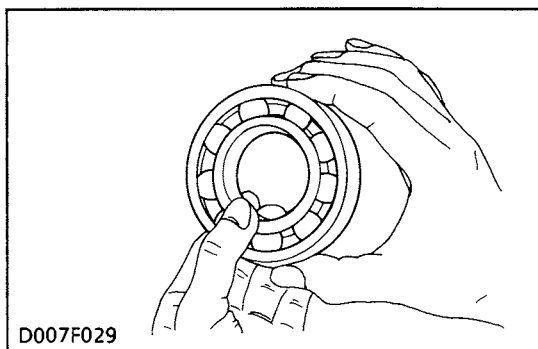
Tightening torque	Idle gear shaft mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft-lbs
	Idle gear retaining nut	78.4 to 88.2 N·m 8.0 to 9.0 kgf·m 57.6 to 64.8 ft-lbs

(A) Fuel Camshaft

- | | |
|-----------------------------|-----------------------|
| (1) Idle Gear Retaining Nut | (4) Idle Gear Bearing |
| (2) Idle Gear | (5) Lubricating Hole |
| (3) Idle Gear Shaft | |



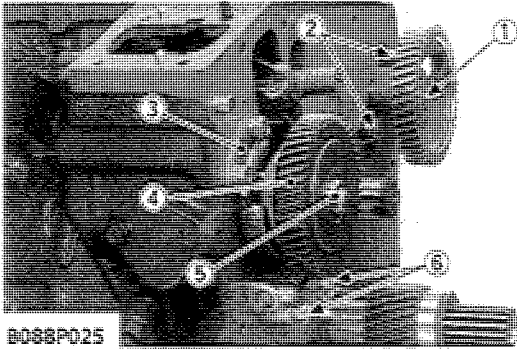
B203F106



D007F029

Idle Gear Bearing Check

1. While holding the inner race, push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission oil to the bearing and hold the inner race.
3. For needle bearing, lay the needle rollers to check for any damage and wear.
4. Replace it if defects are found.



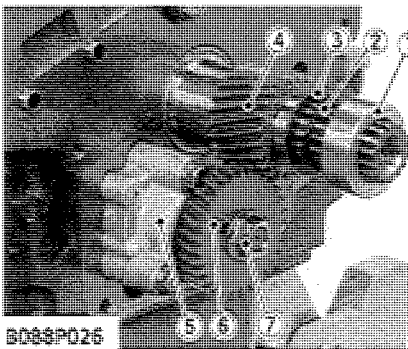
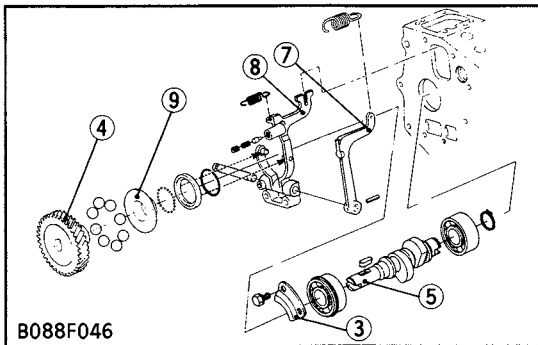
Fuel Camshaft

1. Remove the screws (2) and draw out the camshaft (1) with the gear on it.
2. Remove the retaining plate (3).
3. Remove the screws (6), then draw out the injection pump gear (4) and fuel camshaft (5) with the governor fork assembly.

(When reassembling)

- Hook the spring to the fork lever 2 (7) as shown in the figure before installing the fork lever assembly to the crankcase.

- | | |
|-------------------------|---------------------|
| (1) Camshaft | (6) Screw |
| (2) Screw | (7) Fork Lever 2 |
| (3) Retaining Plate | (8) Fork Lever 1 |
| (4) Injection Pump Gear | (9) Governor Sleeve |
| (5) Fuel Camshaft | |



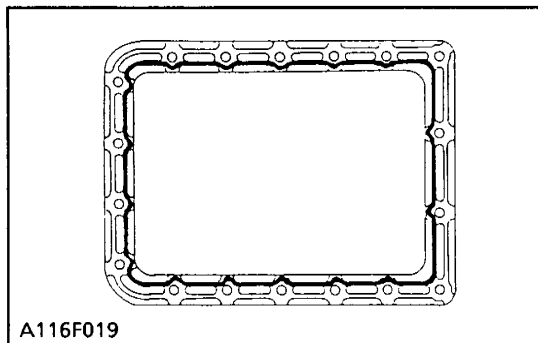
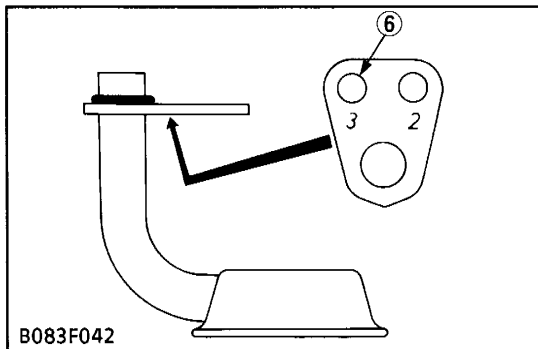
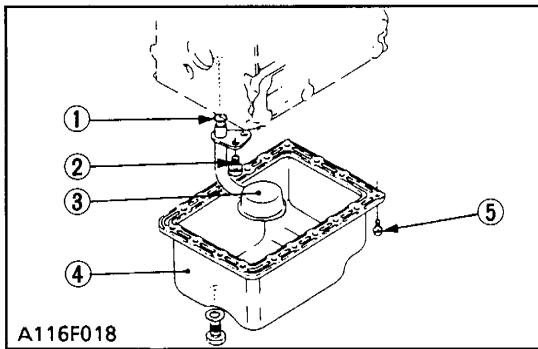
Oil Pump and Crankshaft Gear

1. Unscrew the flange nut (7) and remove the oil pump gear (6).
2. Unscrew the retaining screws and remove the oil pump (5).
3. Remove the collar (1), O-ring (2) and oil slinger (3).
4. Remove the crankshaft gear (4) with a puller.

(When reassembling)

- Install the collar after aligning the marks on the gears. (See the figure at "Idle Gear")

- | | |
|----------------------------|-------------------|
| (1) Crankshaft Collar | (5) Oil Pump |
| (2) O-ring | (6) Oil Pump Gear |
| (3) Crankshaft Oil Slinger | (7) Flange Nut |
| (4) Crankshaft Gear | |

(3) Connecting Rod and Piston**Oil Pan and Oil Strainer**

1. Unscrew the oil pan mounting screws (5), and remove the oil pan (4).
2. Unscrew the oil strainer mounting screw (2), and remove the oil strainer (3).

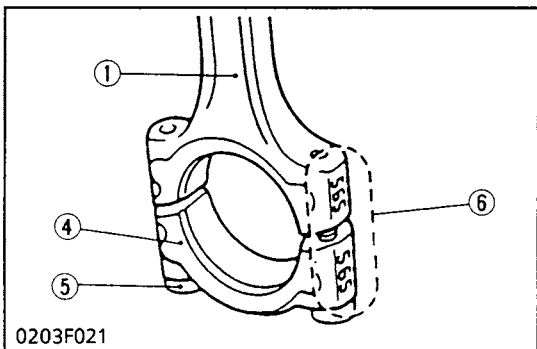
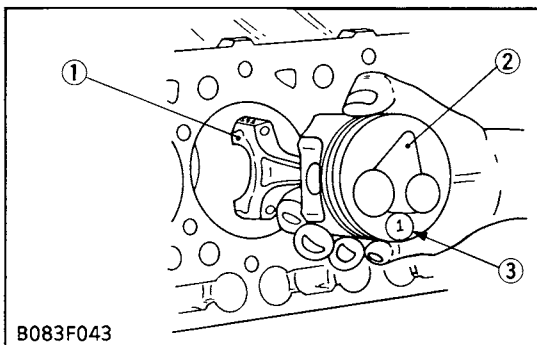
(When reassembling)

- Install the oil strainer, using care not to damage the O-ring (1).
- Using the hole (6) numbered "3", install the oil strainer by mounting screw.
- Apply liquid gasket (Three Bond 1270D or 1270C) to the oil pan as shown in the figure.

■ IMPORTANT

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

- | | |
|------------------|-----------------------------|
| (1) O-ring | (4) Oil Pan |
| (2) Screw | (5) Oil Pan Mounting Screws |
| (3) Oil Strainer | (6) Hole |



Piston and Connecting Rod

1. Unscrew the connecting rod screws (5), and remove the connecting rod cap (4).
2. Turn the crankshaft to bring the piston to top dead center.
3. Push the connecting rod from the bottom of the cylinder block with a hammer grip, and pull out the piston (2) and connecting rod (1).

IMPORTANT

- Do not change the combination of cylinder and piston.

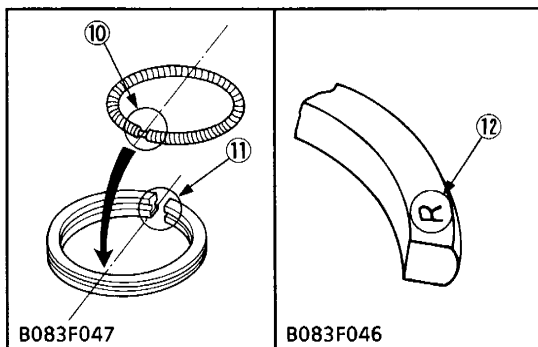
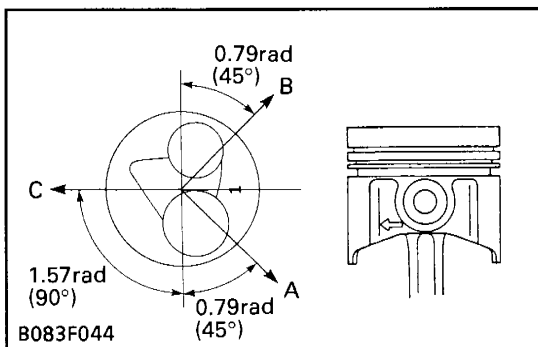
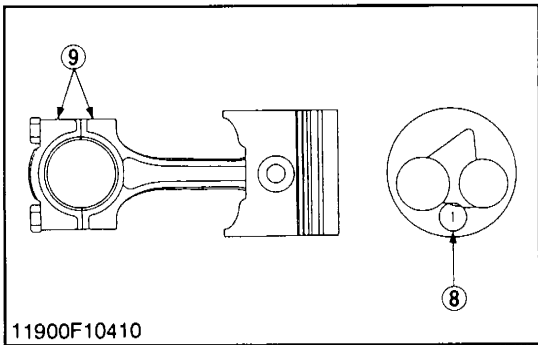
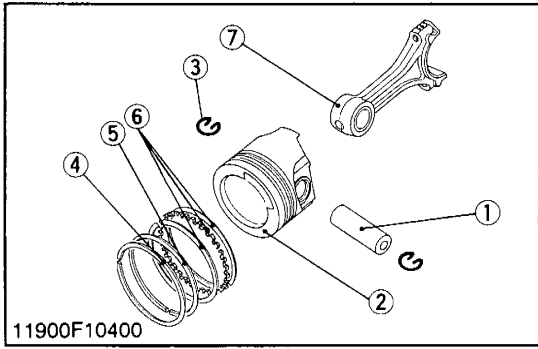
(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the inside surface of the cylinder.
- Apply engine oil to the crank pin bearings and connecting rod screws.
- Be sure to install the piston and connecting rod into the cylinder so that the number (3) on the piston head opposite side of the injection pump.
- Align the alignment marks (6) on the connecting rod (1) and connecting rod cap (4).
- When inserting the piston into the cylinder, face the mark on the connecting rod to the injection pump.

Tightening torque	Connecting rod screw	26.5 to 30.4 N·m 2.7 to 3.1 kgf·m 19.5 to 22.4 ft-lbs
-------------------	----------------------	---

- (1) Connecting Rod
- (2) Piston
- (3) Number

- (4) Connecting Rod Cap
- (5) Connecting Rod Screw
- (6) Alignment Mark



Piston Ring and Connecting Rod

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

(When reassembling)

- 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 and small end bushing.
- When installing the piston pin, immerse the piston in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin to the piston.
- When installing the connecting rod to the piston, align the mark (9) on the connecting rod to the casting mark (8).

■ IMPORTANT

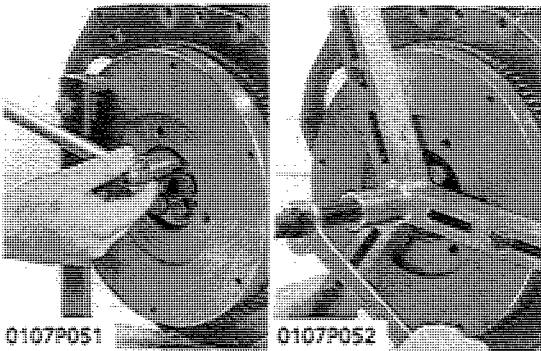
- Mark the same number on the connecting rod and the piston so as not to change the combination.
- When inserting the piston into the cylinder, place the gap of the compression ring 1 on the opposite side of the combustion chamber and stagger the gaps of the compression ring 2 and oil ring making a right angle from the gap of the compression ring 1.
- Carefully insert the pistons using a piston ring compressor. Otherwise, their chrome-plated section may be scratched, causing trouble inside the liner.

[A] Top Compression Ring Gap
[B] Second Compression Ring Gap

[C] Oil Ring Gap

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

(4) Crankshaft



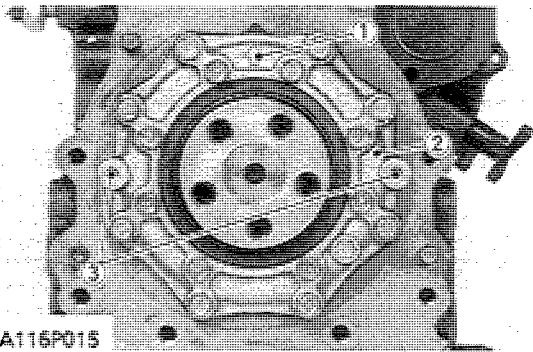
Flywheel

1. Lock the flywheel not to turn using the flywheel stopper.
2. Remove the flywheel bolts, except for two which must be loosened and left as they are.
3. Set a flywheel puller (Code No: 07916-32011), and remove the flywheel.

(When reassembling)

- Apply engine oil to the flywheel bolts.

Tightening torque	Flywheel bolt	53.9 to 58.8 N·m 5.5 to 6.0 kgf·m 39.8 to 43.4 ft-lbs
-------------------	---------------	---



Bearing Case Cover

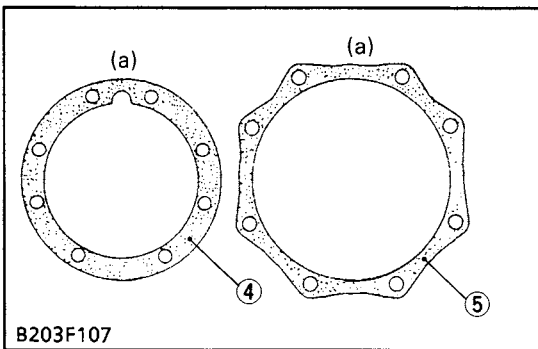
1. Unscrew the bearing case cover mounting screws.
2. Screw two removed bolts into the bolt hole (3) of the bearing case cover (2) to remove it.

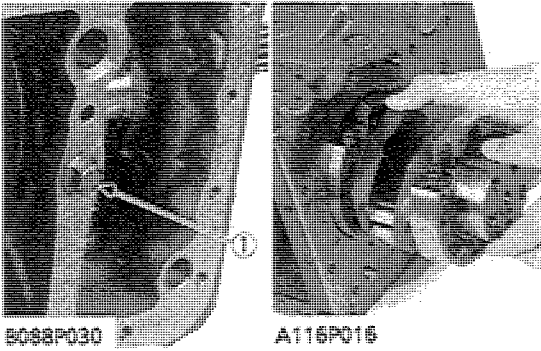
(When reassembling)

- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of a new bearing case cover gasket.
- Install the bearing case cover to position the casting mark "↑" (1) on it upward.
- Tighten the bearing case cover mounting screws with even force on the diagonal line.

- (1) Mark
- (2) Main Bearing Case Cover
- (3) To lift the cover, screw in two screws
- (4) Bearing Case Gasket
- (5) Bearing Case Cover Gasket

[a] Upside





Crankshaft

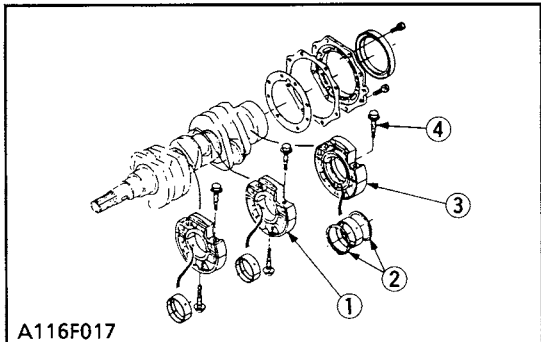
1. Unscrew the bearing case screws 2 (1), and draw out the crankshaft.

(When reassembling)

- Install the crankshaft sub assembly, aligning the screw hole of main bearing case 2 with the screw hole of cylinder block.
- Apply engine oil to the seat and thread of bearing case screw 2. After tightening it.

Tightening torque	Bearing case screw 2	26.5 to 30.4 N·m 2.7 to 3.1 kgf·m 19.5 to 22.4 ft-lbs
-------------------	----------------------	---

(1) Bearing Case Screw 2

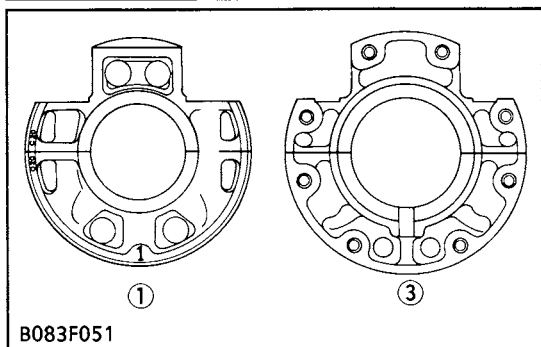


Main Bearing Case Assembly

1. Remove the two bearing case screws 1 (4), and remove the main bearing case assembly 1 (3), being careful with the thrust bearing (2) and crankshaft bearing 2.
2. Remove the main bearing case assemblies 2, 3.

(When reassembling)

- Clean the oil passage in the main bearing case.
- Apply clean engine oil on the crankshaft bearing 2 and thrust bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of makings (1, 2) from the gear case side.
- When installing the main bearing case assemblies 2, 3, face the mark "FLYWHEEL" to the flywheel.
- Be sure to install the thrust bearing with its oil groove facing outward.



Tightening torque	Bearing case screw 1	12.7 to 15.7 N·m 1.3 to 1.6 kgf·m 9.4 to 11.5 ft-lbs
-------------------	----------------------	--

(1) Main Bearing Case Assembly 2

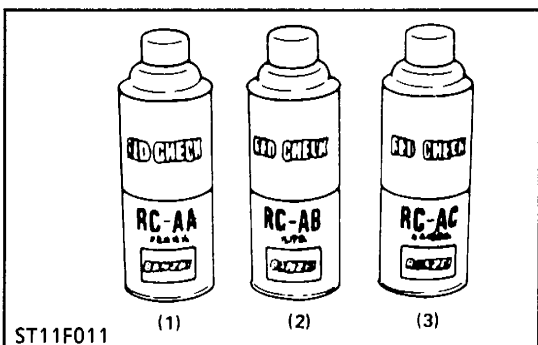
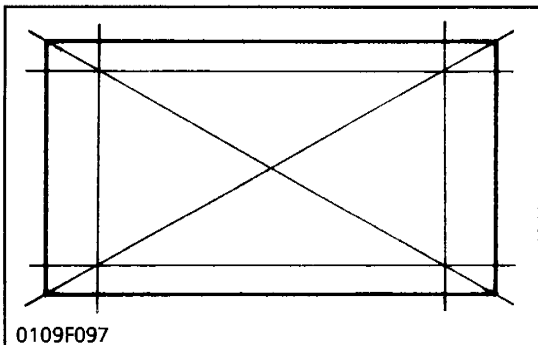
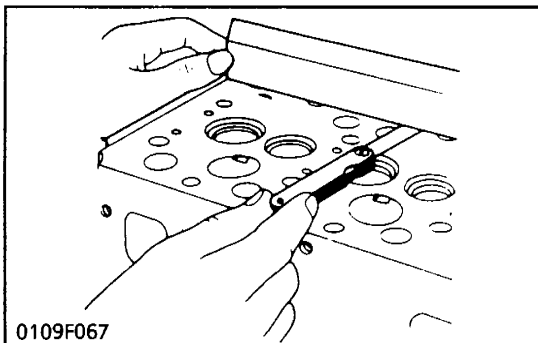
(3) Main Bearing Case Assembly 1

(2) Thrust Bearing

(4) Bearing Case Screw 1

SERVICING

(1) Cylinder Head and Valves



Cylinder Head Surface Flatness

1. Thoroughly 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.

■ **NOTE**

- Do not place the straightedge on the combustion chamber.

■ **IMPORTANT**

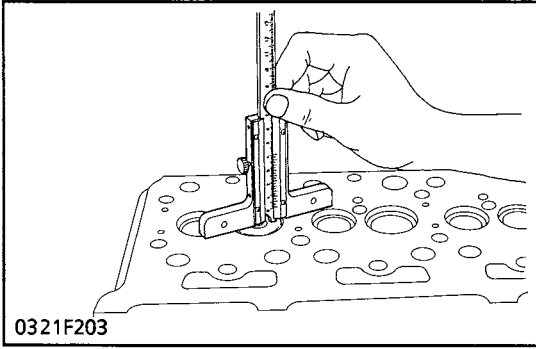
- Be sure to check the valve recessing after correcting.

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.
Finishing	8 μ R max $\nabla\nabla$	∇ 8 (320) unit: μ m (μ in.)

Cylinder Head Flaw

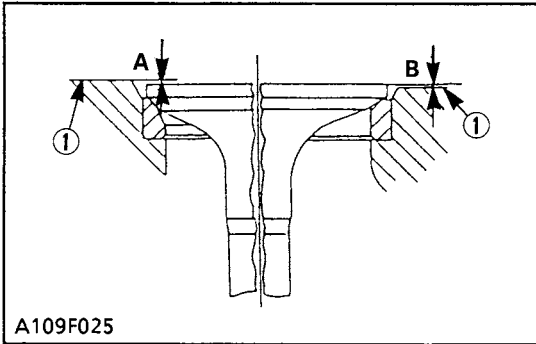
1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with detergent (1).
3. Spray the cylinder head surface with the red permeative liquid (2).
Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface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

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



Valve Recessing

1. Clean the cylinder head, the valve face and seat.
2. Insert the valve into 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.

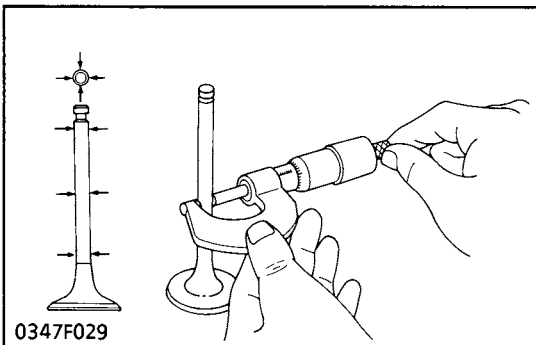


Valve recessing (Intake and Exhaust)	Factory spec.	(Protrusion) 0.10 mm (0.0039 in.) to (Recessing) 0.10 mm (0.0039 in.)
	Allowable limit	(Recessing) 0.30 mm (0.0118 in.)

(1) Cylinder Head Surface

(A) Recessing

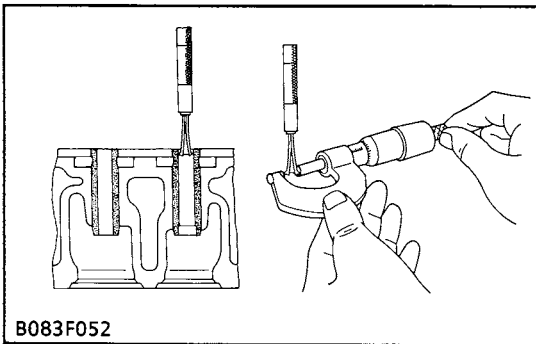
(B) Protrusion



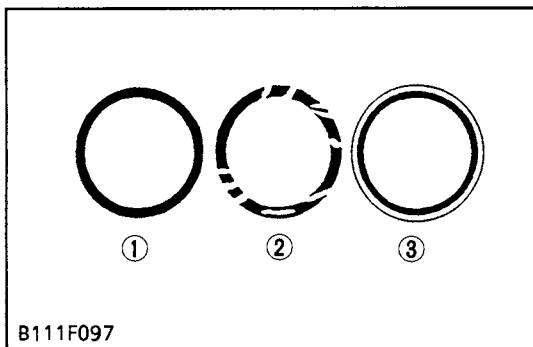
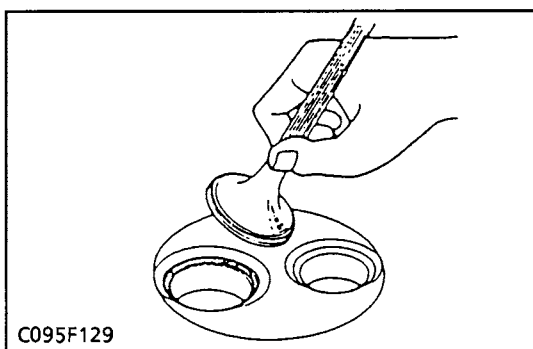
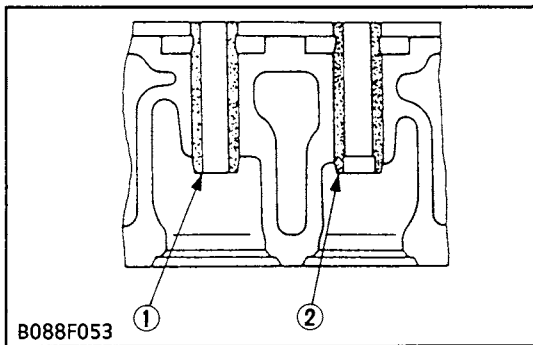
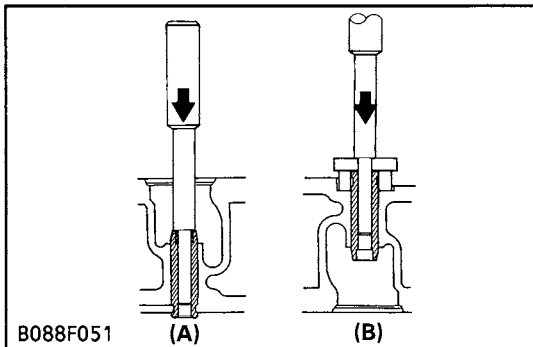
Clearance between Valve Stem and Valve Guide

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 valve guide or valve.

Clearance between valve stem and valve guide	Factory spec.	0.030 to 0.057 mm 0.00118 to 0.00224 in.
	Allowable limit	0.10 mm 0.0039 in.



Valve stem O.D.	Factory spec.	5.968 to 5.980 mm 0.23496 to 0.23543 in.
Valve guide I.D.	Factory spec.	6.010 to 6.025 mm 0.23661 to 0.23720 in.



Replacing Valve Guide

(When removing)

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

(When installing)

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

Valve guide I.D. (intake and exhaust)	Factory spec.	6.010 to 6.025 mm 0.23661 to 0.23721 in.
--	---------------	---

■ IMPORTANT

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

(1) Intake Valve Guide

(2) Exhaust Valve Guide

(A) When Removing

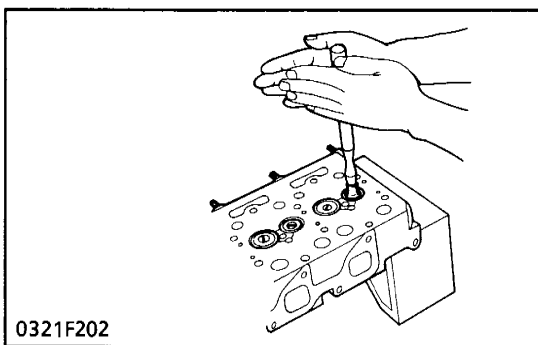
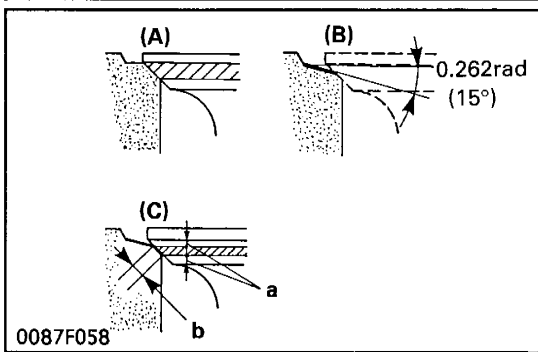
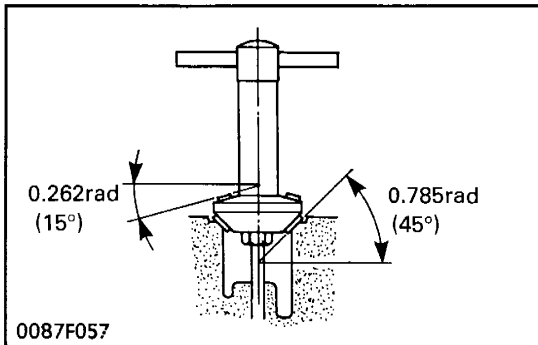
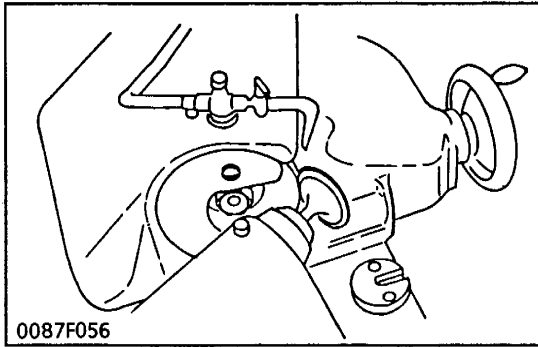
(B) When Installing

Valve Seating

- Coat the valve face lightly with red lead and put the valve on its seat to check the contact.
- 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.
- 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



Correcting Valve and Valve Seat

■ **NOTE**

- Before correcting the valve and seat, check the valve stem and the I.D. of the 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 0.785 rad. (45°) seat cutter (Code No: 07909-33102).
2. Resurface the seat surface with a 0.262 rad. (15°) valve seat cutter to 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 the valve seat, and fit them with valve lapping tool.
4. Check valve sealing with prussian blue, the valve seating surface should show good contact all the way around.

Valve seat width	Factory spec.	2.12 mm 0.0835 in.
------------------	---------------	-----------------------

(A) Check Contact

(C) Check Contact

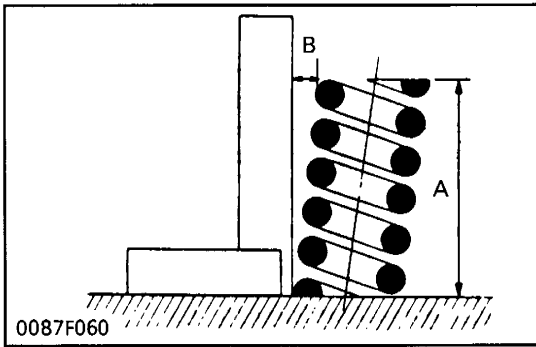
(B) Correct Seat Width

(a) Identical Dimensions

(b) Valve Seat Width

Valve Lapping

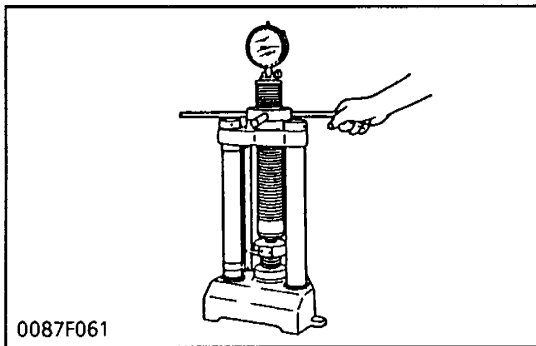
1. Apply compound on the valve face evenly.
2. Put the valve on its seat hold it with the valve lapper.
3. Turn and flap the valve back and forth on the valve seat to lap.
4. Remove the compound and clean the valve and the seat.
5. Apply oil on the valve face and finish to complete fitting.
6. Repeat lapping until the valve seats correctly, checking the seating.



Free Length and Tilt of Valve Spring

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

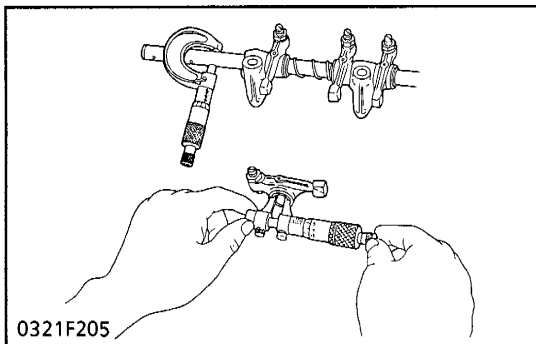
Valve spring free length	Factory spec.	31.3 to 31.8 mm 1.232 to 1.252 in.
	Allowable limit	28.4 mm 1.118 in.
Valve spring tilt	Allowable limit	1.2 mm 0.047 in.



Valve Spring Setting Load

1. Place the 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 exceeds the allowable limit, replace it.

Valve Setting load	Factory spec.	64.7 kgf / 27.0 mm 6.6 N·m / 27.0 mm 14.6 lbs./ 1.063 in.
	Allowable limit	54.9 kgf / 27.0 mm 5.6 N·m / 27.0 mm 12.3 lbs./ 1.063 in.

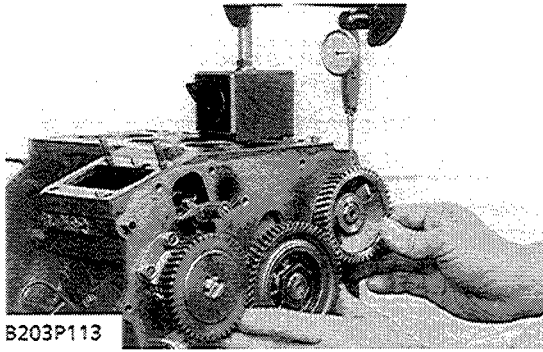


Oil Clearance of Rocker Arm Shaft and Bearing

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

Clearance between rocker arm shaft and rocker arm	Factory spec.	0.016 to 0.068 mm 0.0007 to 0.0026 in.
	Allowable limit	0.15 mm 0.0059 in.
Rocker arm shaft O.D.	Factory spec.	10.473 to 10.484 mm 0.41233 to 0.41276 in.
Rocker arm I.D.	Factory spec.	10.500 to 10.518 mm 0.41339 to 0.41410 in.

(2) Timing Gears and Camshaft

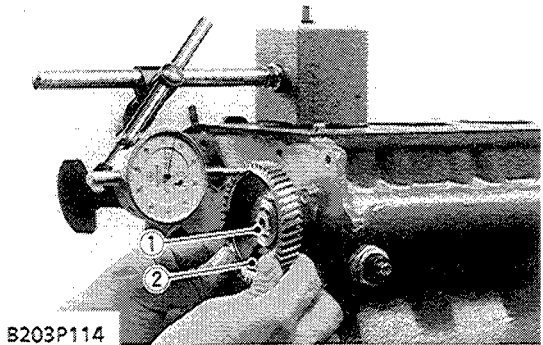


B203P113

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 gear.
4. If the oil clearance is proper, replace the gear.

Crank gear / Idle gear	Factory spec.	0.043 to 0.124 mm 0.00169 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.
Idle gear / Cam gear	Factory spec.	0.047 to 0.123 mm 0.00185 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.
Idle gear / Injection pump gear	Factory spec.	0.046 to 0.124 mm 0.00181 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.
Oil pump gear / Crank gear	Factory spec.	0.041 to 0.123 mm 0.00161 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.



B203P114

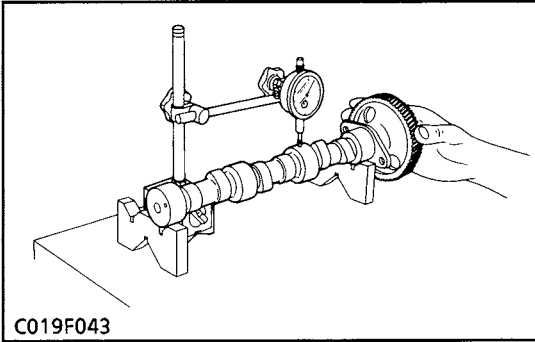
Camshaft Side Clearance

1. Pull the cam gear (2) with the camshaft (1) to its end.
2. Measure the clearance between the cam gear (2) and the camshaft stopper.
3. If the clearance exceeds the allowable limit, replace the camshaft stopper.

Side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.5 mm 0.020 in.

(1) Camshaft

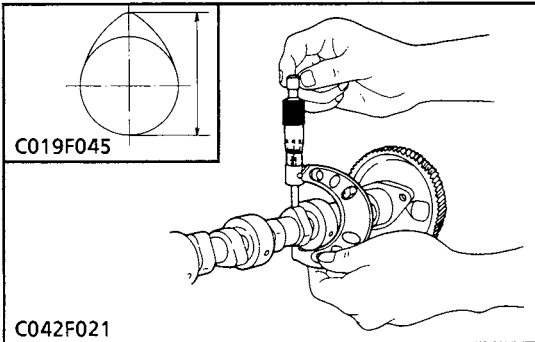
(2) Cam Gear



Camshaft Alignment

1. Support the camshaft 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 camshaft on the V-blocks and get the misalignment.
3. If the misalignment exceeds the allowable limit, replace the camshaft.

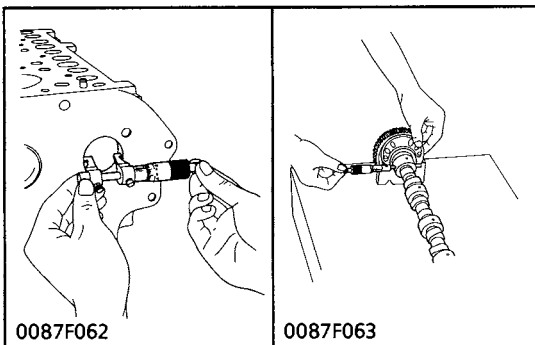
Camshaft alignment	Allowable limit	0.02 mm 0.0008 in.
--------------------	-----------------	-----------------------



Intake and Exhaust 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 it.

Cam height of intake and exhaust	Factory spec.	26.88 mm 1.0583 in.
	Allowable limit	26.83 mm 1.0563 in.



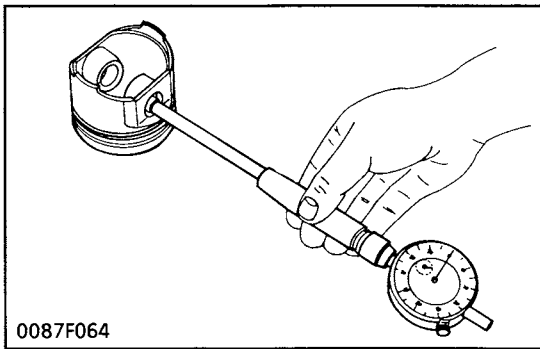
Oil Clearance of Camshaft Journal

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

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

Camshaft bearing journal O.D.	Factory spec.	32.934 to 32.950 mm 1.29662 to 1.29725 in.
Camshaft bearing I.D.	Factory spec.	33.000 to 33.025 mm 1.29921 to 1.30020 in.

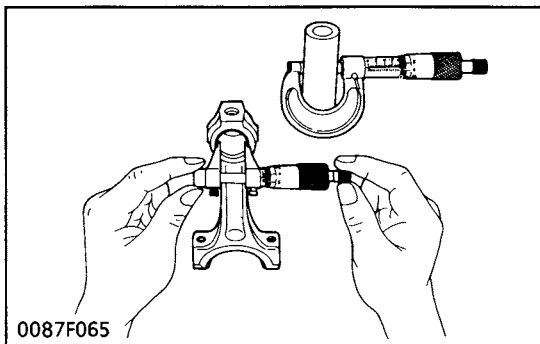
(3) Piston and Connecting Rod



Piston Pin-Bore I.D.

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

Inside diameter of piston pin bosses	Factory spec.	20.000 to 20.013 mm 0.78740 to 0.78791 in.
	Allowable limit	20.05 mm 0.78940 in.

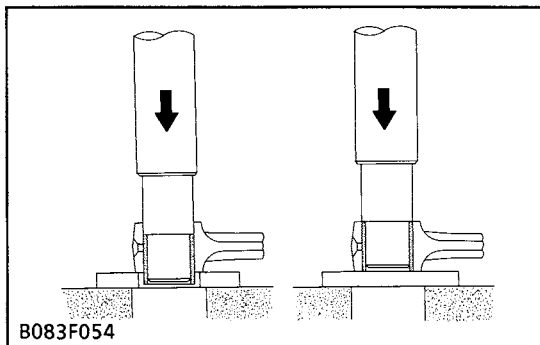


Oil Clearance between Piston Pin and Small End Bushing

1. Measure the O.D. of the piston pin where it contacts the bushing with an outside micrometer.
2. Measure the I.D. of the piston pin bushing at the connecting rod small end with a cylinder gauge. Calculate the oil clearance.
3. If the clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

Clearance between piston pin and small end bushing	Factory spec.	0.014 to 0.038 mm 0.00055 to 0.00150 in.
	Allowable limit	0.10 mm 0.0039 in.

Piston pin O.D.	Factory spec.	20.002 to 20.011 mm 0.78748 to 0.78783 in.
Small end bushing I.D.	Factory spec.	20.025 to 20.040 mm 0.78839 to 0.78897 in.



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)

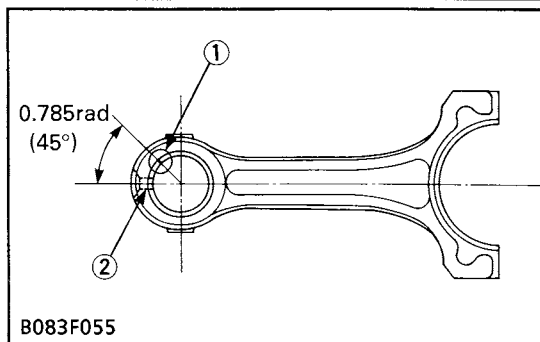
1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Insert a new bushing onto the tool and press-fit it with a press so that the seam (1) of bushing positions as shown in the figure, until it is flush with the connecting rod.
3. Drill a hole to the bushing with aligning the oil hole (2) of connecting rod using 4.0 mm dia. (0.157 in. dia.) drill.

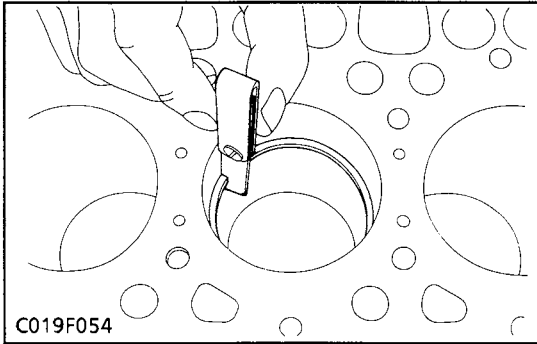
NOTE

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

(1) Seam

(2) Oil Hole





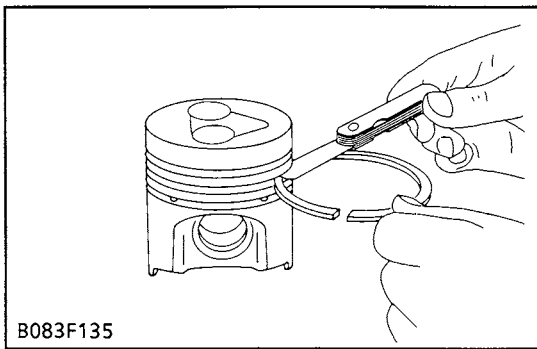
Piston Ring Gap

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 it.

IMPORTANT

- Measure the piston ring gap at the point of the minimum inside diameter of the cylinder.

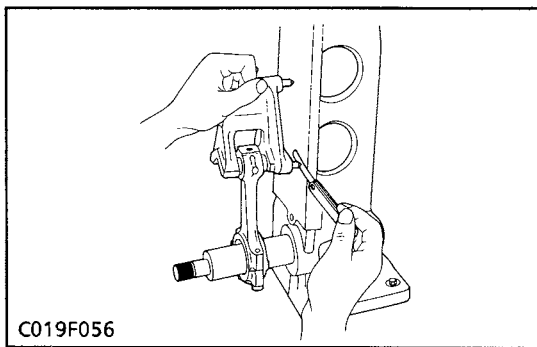
Piston ring gap	Top ring Oil ring	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
		Allowable limit	1.2 mm 0.0472 in.
	Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
		Allowable limit	1.2 mm 0.0472 in.



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 exceed the allowable limit, replace the piston rings.
4. If the clearance still exceeds the allowable limit after replacing the ring, replace the piston.

Piston ring clearance	Second ring	Factory spec.	0.085 to 0.115 mm 0.00335 to 0.0045 in.
		Allowable limit	0.15 mm 0.0059 in.
	Oil ring	Factory spec.	0.04 to 0.08 mm 0.0016 to 0.0031 in.
		Allowable limit	0.15 mm 0.0059 in.



Connecting Rod Alignment

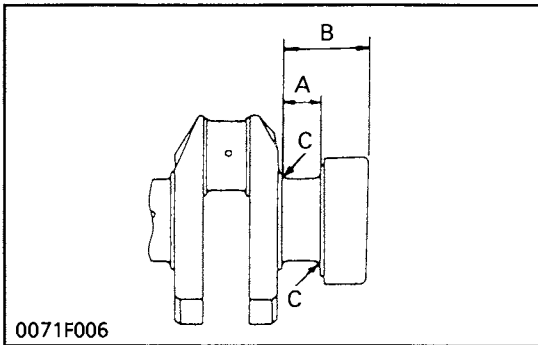
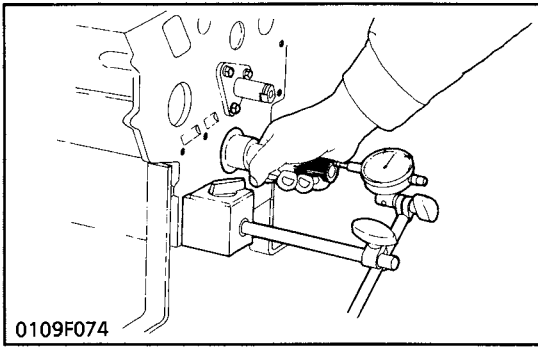
NOTE

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

1. Install the piston pin into the connecting rod.
2. Install the connecting rod on the connecting rod alignment tool (Code No: 07909-31661).
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.
--------------------------	-----------------	-----------------------

(4) Crankshaft



Crankshaft Side Clearance

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

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

(Reference)

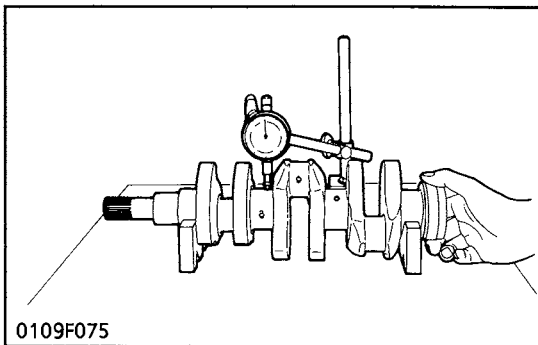
● **Oversize thrust bearing**

Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	15261-23951	020 OS
	Thrust bearing 2 02	15261-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	15261-23961	040 OS
	Thrust bearing 2 04	15261-23981	040 OS

● **Oversize dimensions of crankshaft journal**

Dimension	Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
	A		23.40 to 23.45 mm 0.9134 to 0.9154 in.
B		46.1 to 46.3 mm 1.815 to 1.823 in.	46.3 to 46.5 mm 1.823 to 1.831 in.
C		1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius

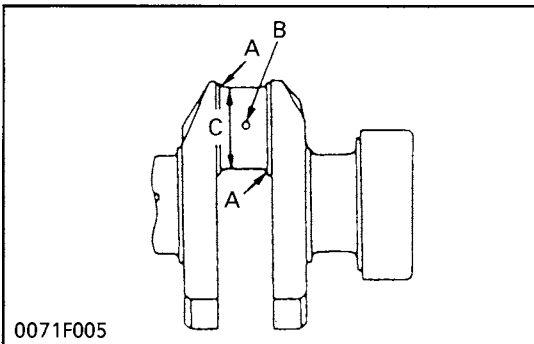
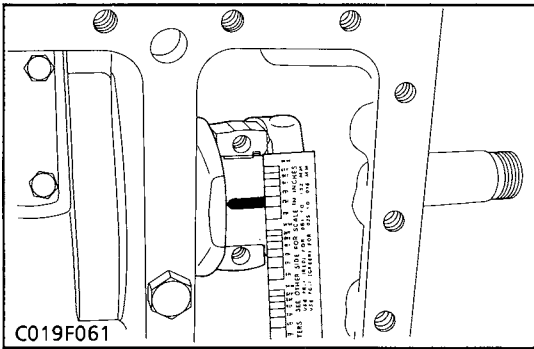
The crankshaft journal must be fine-finished to higher than $\nabla\nabla\nabla\nabla$ (0.4S).



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

Misalignment	Allowable limit	0.04 mm 0.0016 in.
--------------	-----------------	-----------------------



Oil Clearance between Crank Pin and Crank Pin Bearing

1. Clean the crank pin and crank pin bearing.
2. Put a strip of plastigage (Code No. 07909-30241) on the center of the crank pin.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque (26.5 to 30.4 N·m, 2.7 to 3.1 kgf·m, 19.5 to 22.4 ft-lbs), 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 crank pin bearing.
6. If the same size bearing is useless because of the crank pin wear, replace it with an undersize one referring to the table and figure.

NOTE

- Never insert the press gauge into the crank pin oil hole.
- Be sure not to move the crankshaft while the connecting rod screws are tightened.

Oil clearance between crank pin and crank pin bearing	Factory spec.	0.020 to 0.051 mm 0.00079 to 0.00201 in.
	Allowable limit	0.15 mm 0.0059 in.
Crank pin O.D.	Factory spec.	33.959 to 33.975 mm 1.33697 to 1.33760 in.
Crank pin bearing I.D.	Factory spec.	33.994 to 34.010 mm 1.33835 to 1.33898 in.

(Reference)

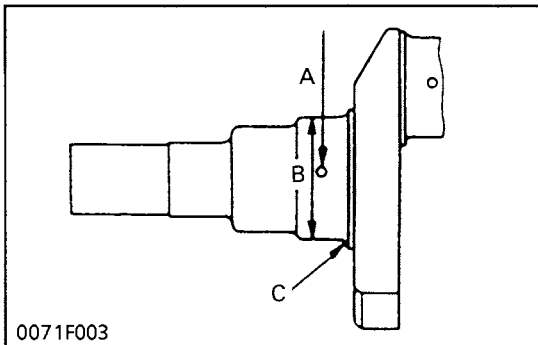
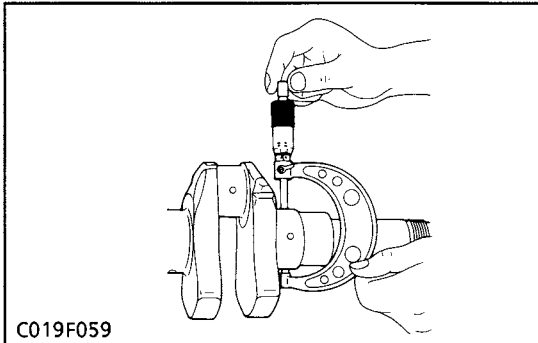
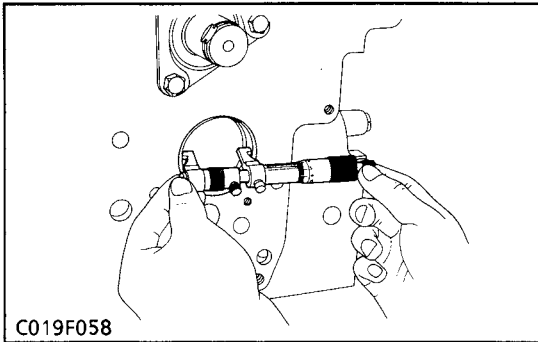
- Undersize crank pin bearing

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crank pin bearing 02	15861-22971	020 US
0.4 mm 0.016 in.	Crank pin bearing 04	15861-22981	040 US

- Undersize dimensions of crank pin

Dimension	Undersize	
	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius
B	4 mm dia. 0.16 in. dia.	4 mm dia. 0.16 in. dia.
C	33.759 to 33.775 mm 1.32910 to 1.32973 in.	33.559 to 33.575 mm 1.32122 to 1.32185 in.

The crank pin must be fine-finished to higher than ▽▽▽▽ (0.4S).



Oil Clearance between Crankshaft Journal and Crankshaft

Bearing 1

1. Measure the I.D. of the crankshaft bearing 1 with an inside micrometer.
2. Measure the O.D. of the crankshaft front journal with an outside micrometer, and calculate the oil clearance.
3. If the oil 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.

Oil clearance between crank shaft journal and crankshaft bearing 1	Factory spec.	0.100 to 0.181 mm 0.00394 to 0.00713 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	33.934 to 39.950 mm 1.57221 to 1.57284 in.
Crankshaft bearing 1 I.D.	Factory spec.	40.050 to 40.115 mm 1.57077 to 1.57933 in.

(Reference)

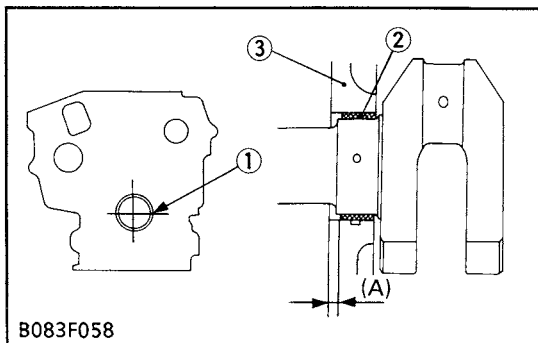
● Undersize crank shaft bearing 1

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 1 02	15861-23911	020 US
0.4 mm 0.016 in.	Crankshaft bearing 1 04	15861-23921	040 US

● Undersize dimensions of crank shaft journal

Dimension	Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
	A	5 mm dia. 0.20 in. dia.	5 mm dia. 0.20 in. dia.
B	39.734 to 39.750 mm 1.56433 to 1.56496 in.	39.534 to 39.550 mm 1.55646 to 1.55709 in.	39.534 to 39.550 mm 1.55646 to 1.55709 in.
C	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius

● The crankshaft journal must be fine-finished to higher than ∇∇∇∇ (0.4S).
 ● Chamfer the oil hole with an oilstone.



Replacing Crankshaft Bearing 1

(When removing)

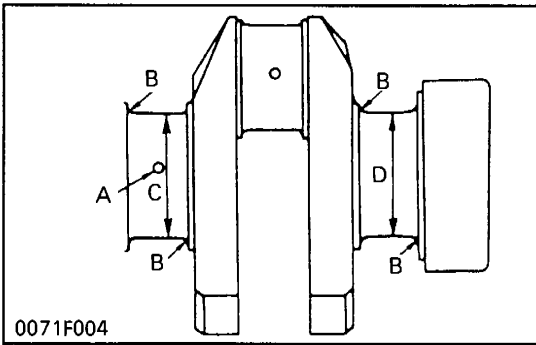
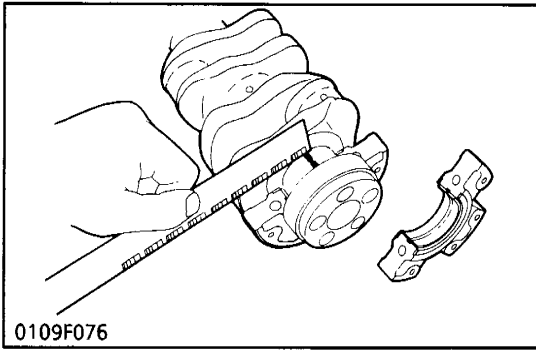
1. Using a crankshaft bearing 1 replacing tool, press out the used crankshaft bearing.

(When installing)

1. Clean a new crankshaft bearing 1 and crankshaft journal, 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 side in the cylinder block. (See figure)

Dimension (A)	Factory spec.	0 to 0.3 mm 0 to 0.0118 in.
---------------	---------------	--------------------------------

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



Oil Clearance between Crankshaft Journal and Crankshaft

Bearing 2 and 3

1. Put a strip of plastigage (Code No. 07909-30241) on the center of the journal.
2. Install the bearing case and tighten the bearing case screws 1 to the specified torque (12.7 to 15.7 N·m, 1.3 to 1.6 kgf·m, 9.4 to 11.6 ft·lbs), and remove the bearing case again.

NOTE

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

3. Measure the amount of the flattening with the scale, and get the oil clearance.
4. If the oil clearance exceeds the allowable limit, replace the crankshaft bearing 2 or 3.
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.

Oil clearance between crankshaft journal and crankshaft bearing 2 and 3	Factory spec.	0.034 to 0.092 mm 0.00134 to 0.00362 in.
	Allowable limit	0.20 mm 0.0079 in.
Crankshaft journal O.D. (Flywheel side)	Factory spec.	43.934 to 43.950 mm 1.72969 to 1.73032 in.
Crankshaft bearing 2 I.D.	Factory spec.	43.978 to 43.993 mm 1.73142 to 1.73201 in.
Crankshaft journal O.D. (Intermediate)	Factory spec.	39.934 to 39.950 mm 1.57221 to 1.57284 in.
Crankshaft bearing 3 I.D.	Factory spec.	39.978 to 39.993 mm 1.57394 to 1.57453 in.

(Reference)

- Undersize crankshaft bearing 2 and 3

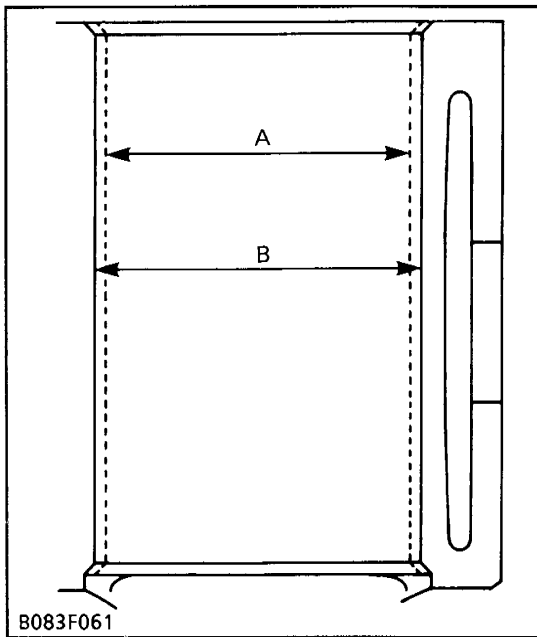
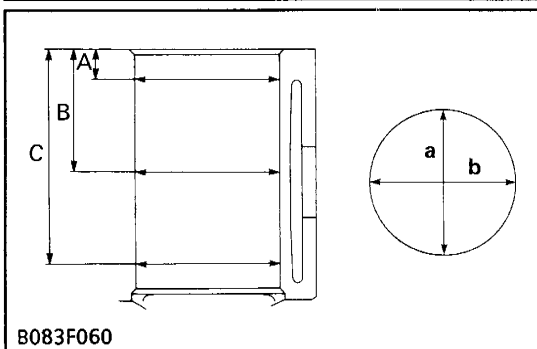
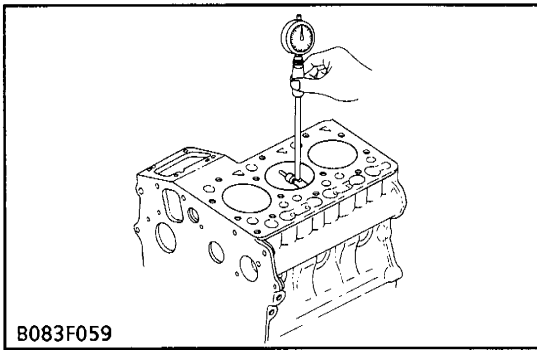
Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 2 02	15694-23931	020 US
	Crankshaft bearing 3 02	15861-23861	020 US
0.4 mm 0.016 in.	Crankshaft bearing 2 04	15694-23941	040 US
	Crankshaft bearing 3 04	15861-23871	040 US

- Undersize dimensions of crankshaft journal

Dimension	Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
	A	3 mm dia. 0.12 in. dia.	3 mm dia. 0.12 in. dia.
B	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
C	39.734 to 39.750 mm 1.56433 to 1.56496 in.	39.734 to 39.750 mm 1.56433 to 1.56496 in.	39.534 to 39.550 mm 1.55646 to 1.55709 in.
D	43.734 to 43.750 mm 1.72181 to 1.72244 in.	43.734 to 43.750 mm 1.72181 to 1.72244 in.	43.534 to 43.550 mm 1.71394 to 1.71457 in.

The crank pin journal must be fine-finished to higher than ∇∇∇∇ (0.4S).

(5) Cylinder



Cylinder Wear

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

Cylinder I.D.	Factory spec.	67.000 to 67.019 mm 2.63779 to 2.63854 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

Correcting Cylinder

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

Oversize cylinder I.D.	Factory spec.	67.250 to 67.269 mm 2.64764 to 2.64839 in.
Maximum wear	Allowable limit	0.15 mm 0.0059 in.

2. Replace the piston and piston rings with oversize ones.

Oversize	Part Name	Code Number	Marking
0.25 mm 0.0098 in.	Piston	16851-21900	0.25 OS
	Piston ring assembly	16851-21090	0.25 OS

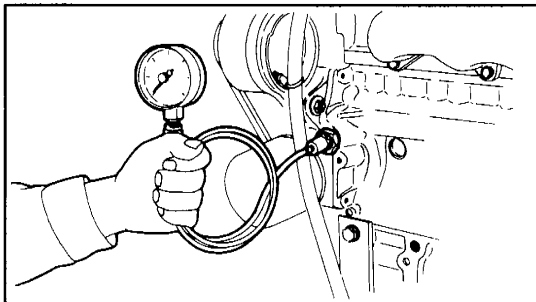
NOTE

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

(A) Cylinder I.D. (Before Correction) (B) Oversize Cylinder I.D.

[3] LUBRICATING SYSTEM

CHECKING



0109F079

Engine Oil Pressure

1. Remove the oil pressure switch, and install the engine oil pressure tester (Code No. 07916-32032, Adaptor 4). (Adaptor screw size: PT1/8).
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.	98 kPa 1.0 kgf/cm ² 14 psi
	At rated speed	Factory spec.	196 to 441 kPa 2.0 to 4.5 kgf/cm ² 28 to 64 psi
		Allowable limit	98 kPa 1.0 kgf/cm ² 14 psi

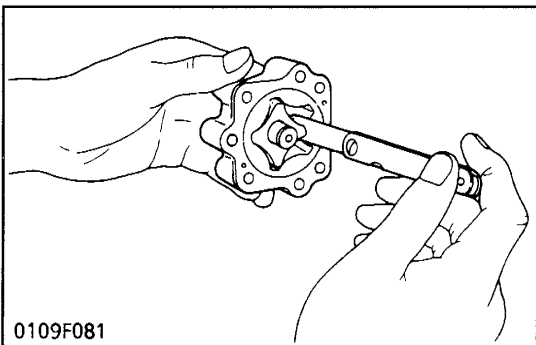
(When reassembling)

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

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

SERVICING

(1) Oil Pump

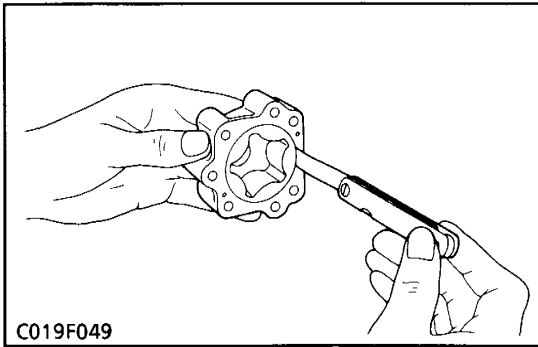


0109F081

Rotor Lobe Clearance

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

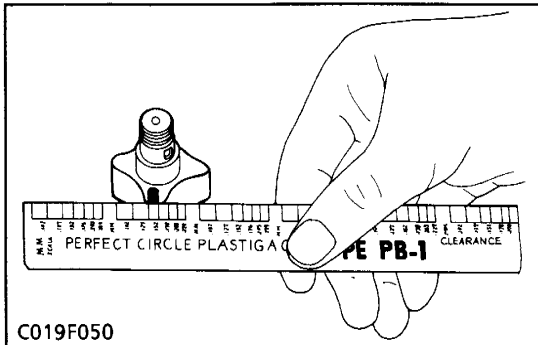
Rotor lobe clearance	Factory spec.	0.03 to 0.14 mm 0.012 to 0.0055 in.
----------------------	---------------	--



Clearance between Outer Rotor and Pump Body

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

Clearance between outer rotor and pump body	Factory spec.	0.07 to 0.15 mm 0.0028 to 0.0059 in.
---	---------------	---



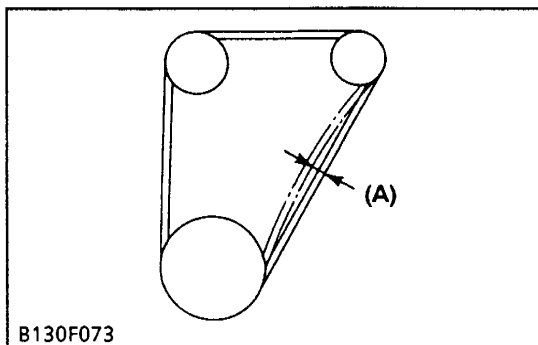
Clearance between Rotor and Cover

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 amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the factory specification, replace oil pump rotor assembly.

Clearance between rotor and cover	Factory spec.	0.075 to 0.135 mm 0.0029 to 0.0053 in.
-----------------------------------	---------------	---

**[4] COOLING SYSTEM
CHECKING AND ADJUSTING**

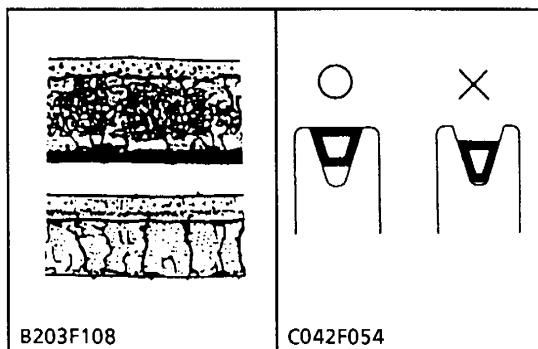
(1) Fan Belt



Fan Belt Tension

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

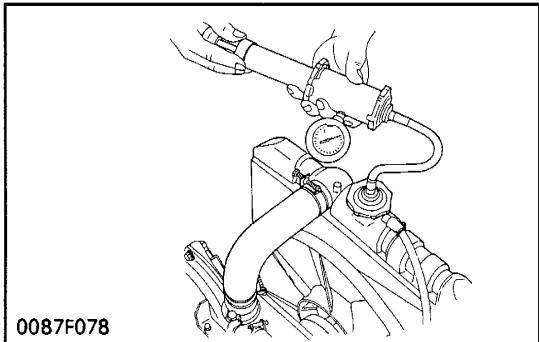
Deflection (A)	Factory spec.	7 to 9 mm 0.28 to 0.35 in.
----------------	---------------	-------------------------------



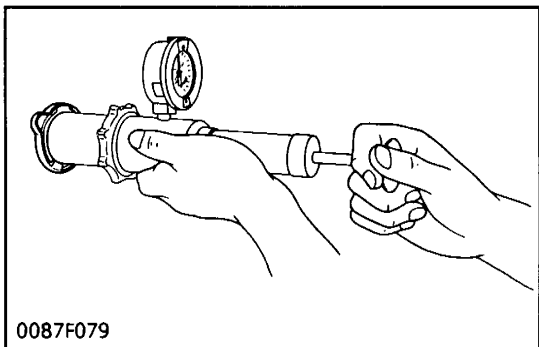
Fan Belt Damage and Wear

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.

(2) Radiator



0087F078



0087F079

⚠ CAUTION

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

Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Set a radiator tester (Code No: 07909-31551). Increase water pressure to the specified pressure.
3. Check each section for water leakage.
4. When water leakage is excessive, replace the radiator. If water leakage is caused by a small pinhole, correct the radiator with radiator cement.

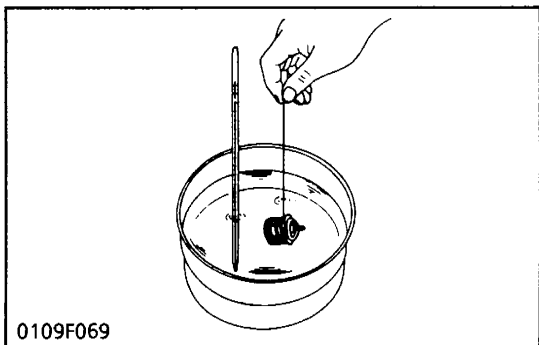
Water tightness	Factory spec.	No leak at 157 kPa 1.6 kgf/cm ² 23 psi
-----------------	---------------	---

Radiator Cap Air Leakage

1. Set a radiator tester (Code No: 07909-31551) to the radiator cap.
2. Apply the specified pressure of 88.0 kPa (0.9 kgf/cm², 12.8 psi).
3. Check if the pressure drop to less than 59 kPa (0.6 kgf/cm², 9 psi) in 10 seconds.
4. If the pressure is less than the factory specification, replace it.

Radiator cap tightness	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)
------------------------	---------------	---

(3) Thermostat



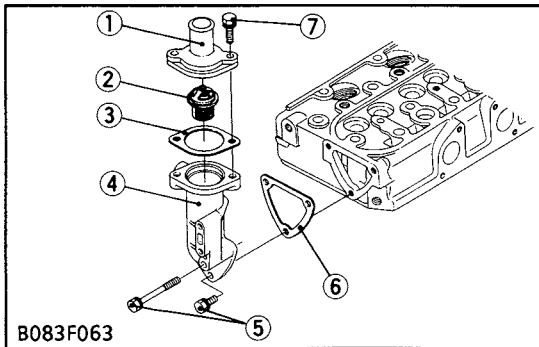
0109F069

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

DISASSEMBLING AND ASSEMBLING



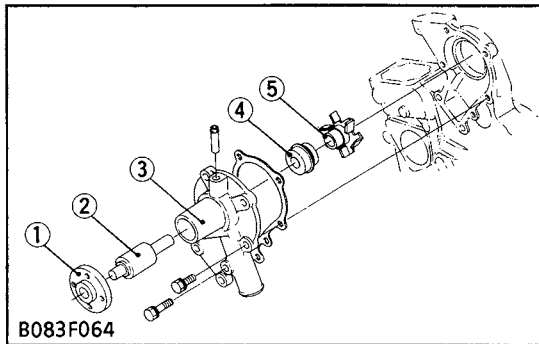
Thermostat and Water Flange

1. Unscrew the thermostat cover mounting screws (7), and remove the thermostat cover (1).
2. Remove the thermostat (2).
3. Unscrew the water flange mounting screws (5), and remove the water flange (4).

(When reassembling)

- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of a new thermostat cover gasket (3).
- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of a new water flange gasket (6).

- | | |
|-----------------------------|-------------------------------------|
| (1) Thermostat Cover | (5) Water Flange Mounting Screw |
| (2) Thermostat | (6) Water Flange Gasket |
| (3) Thermostat Cover Gasket | (7) Thermostat Cover Mounting Screw |
| (4) Water Flange | |



Water Pump

1. Unscrew the water pump mounting screws, and remove the water pump from the gear case cover.
2. Remove the water pump flange (1).
3. Press out the water pump shaft (2) with the impeller (5) on it.
4. Remove the impeller (5) from the water pump shaft (2).
5. Remove the mechanical seal (4).

(When reassembling)

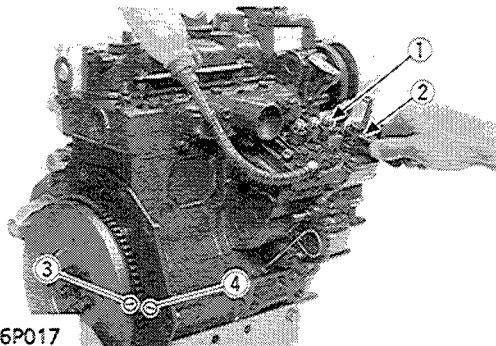
- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of a new water pump gasket.
- Replace the mechanical seal (4) with a new one.

- | | |
|-----------------------|---------------------|
| (1) Water Pump Flange | (4) Mechanical Seal |
| (2) Water Pump Shaft | (5) Impeller |
| (3) Water Pump Body | |

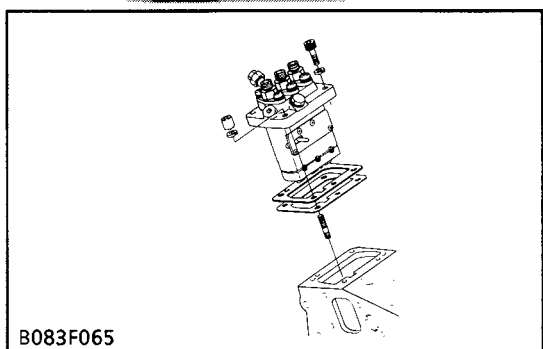
[5] FUEL SYSTEM

CHECKING AND ADJUSTING

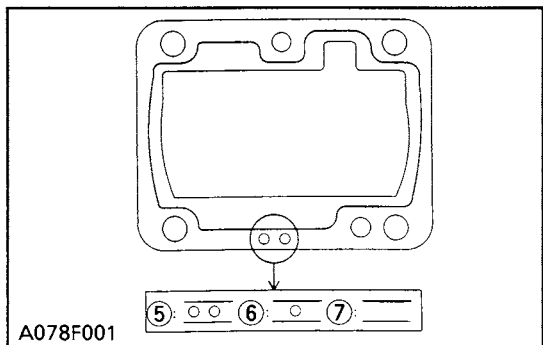
(1) Injection Pump



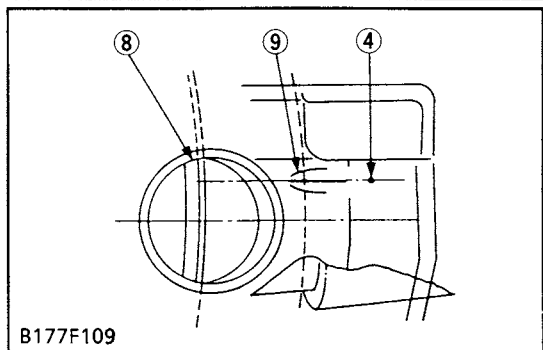
A116P017



B083F065



A078F001



B177F109

Injection Timing

1. Remove the injection pipes.
2. Set the speed control lever (2) to the maximum fuel discharge position.
3. Turn the flywheel until the fuel fills up to hole of the delivery valve holder (1).
4. Turn the flywheel further to check the injection timing, and stop turning when the fuel begins to flow over again.
5. Check to see if the timing lines (3) on the flywheel is aligned with the alignment mark (4).
6. If the timing is out of adjustment, readjust the timing with shims.

Injection timing	Factory spec.	0.31 to 0.34 rad. (17.5° to 19.5°) before T.D.C.
------------------	---------------	--

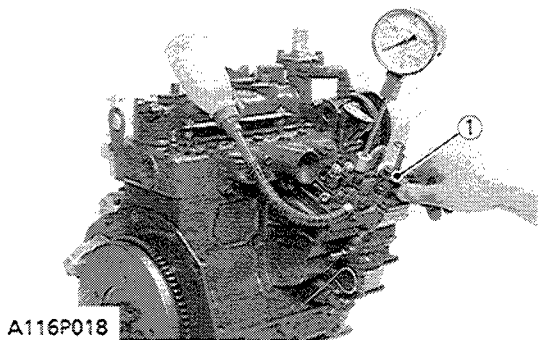
NOTE

- 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.
- Refer to figure below to check the thickness of the shims.

(Reference)

- The alignment mark (4) of the injection timing line (3) is not in alignment with the center of the timing window (8).
- The above mark (4) comes aligned with the center of the clutch housing rib (9), which is 13 mm (0.51 in.) above the center of timing window (8).

- | | |
|---------------------------|----------------------------|
| (1) Delivery Valve Holder | (5) 2-hole : 0.20 mm |
| (2) Speed Control Lever | (6) 1-hole : 0.25 mm |
| (3) Timing Line | (7) Without hole : 0.30 mm |
| (4) Alignment Mark | (8) Timing Window |
| | (9) Rib |



Fuel Tightness of Pump Element

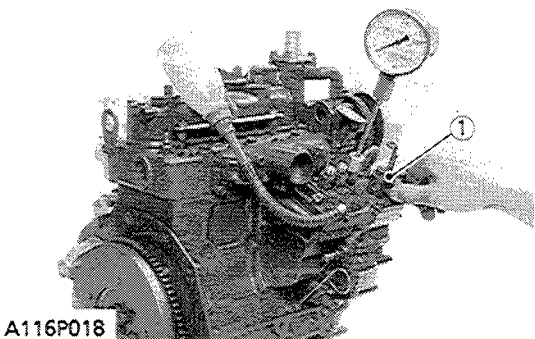
1. Remove the injection pipes and injection nozzles.
2. Install the pressure tester to the injection pump.
3. Set the speed control lever (1) to the maximum fuel discharge position.
4. Turn the flywheel counterclockwise to raise the fuel pressure.
5. If the fuel pressure can not reach the allowable limit, replace the pump element or injection pump assembly.

■ IMPORTANT

- After replacing only pump element, the amount of injection should be adjusted on a specified test bench .

Fuel tightness of pump element (Fuel pressure)	Allowable limit	14.71 MPa 150 kgf/cm ² 2133 psi
--	-----------------	--

(1) Speed Control Lever



Fuel Tightness of Delivery Valve

1. Remove the injection pipes and injection nozzles.
2. Install the pressure tester to the injection pump.
3. Set the speed control lever (1) to the maximum fuel discharge position.
4. Turn the flywheel counterclockwise to raise the fuel pressure to 14.71 MPa (150 kgf/cm², 2133 psi).
5. Set the plunger of the injection pump at the bottom dead center to reduce the delivery chamber pressure to zero.
6. Measure the falling time of the fuel pressure from 14.71 to 13.73 MPa (from 150 to 140 kgf/cm², from 2133 to 1991 psi).
7. If the measurement is less than the allowable limit, replace the delivery valve or injection pump assembly.

Fuel tightness of delivery valve	Allowable limit	5 seconds
----------------------------------	-----------------	-----------

(1) Speed Control Lever

(2) Injection Nozzle

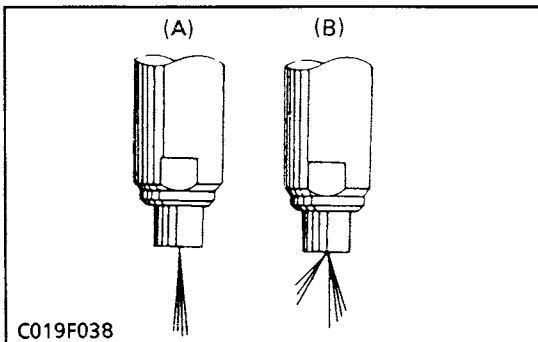
⚠ CAUTION

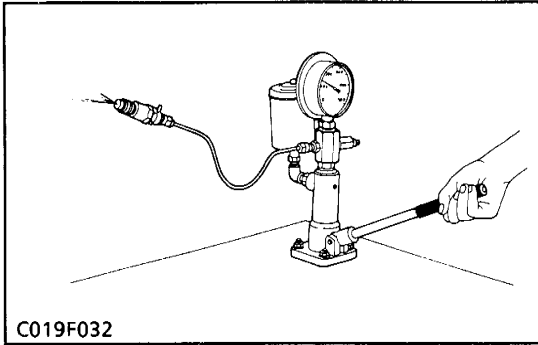
- Check the nozzle injection pressure and condition after confirming that there is nobody standing in the direction the fume goes.
If the fume from the nozzle directly contacts the human body, cells may be destroyed and blood poisoning may be caused.

Nozzle Spraying Condition

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

- (A) Good
- (B) Bad

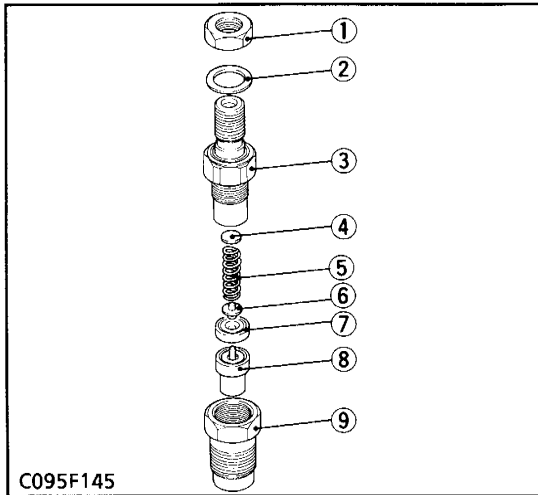




Fuel Injection Pressure

1. Set the injection nozzle to a nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the adjusting washer (4) in the nozzle holder to adjust it.

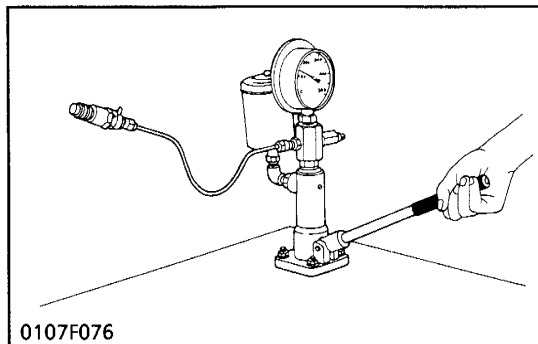
Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2133 psi
-------------------------	---------------	--



(Reference)

- Adjusting washer is provided every 0.025 mm (0.00098 in.) of thickness from 0.900 mm (0.03543 in.) to 1.950 mm (0.07677 in.). [Adjusting washer assembly : Code No. 15841-98101]

- | | |
|----------------------------|--------------------------|
| (1) Fuel Overflow Pipe Nut | (6) Push Rod |
| (2) Plain Washer | (7) Distance Piece |
| (3) Nozzle Holder | (8) Nozzle Piece |
| (4) Adjusting Washer | (9) Nozzle Retaining Nut |
| (5) Nozzle Spring | |



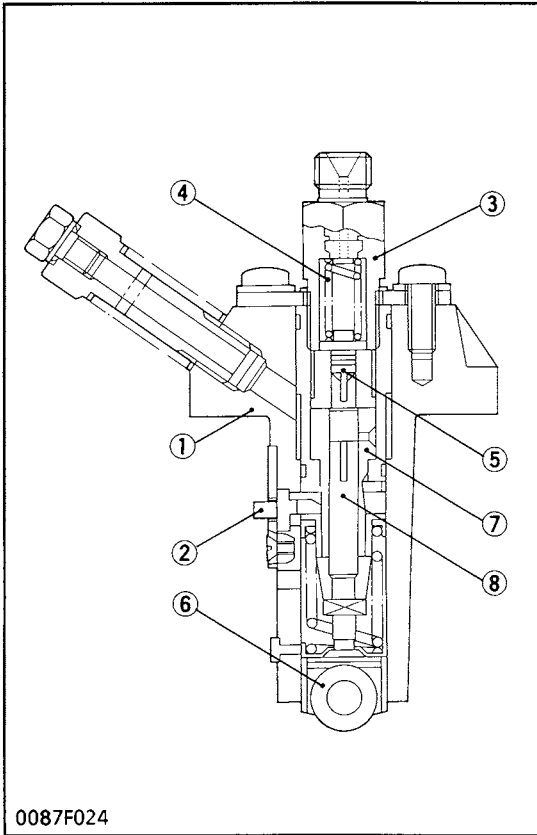
Valve Seat Tightness

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

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

DISASSEMBLING AND ASSEMBLING

(1) Injection Pump

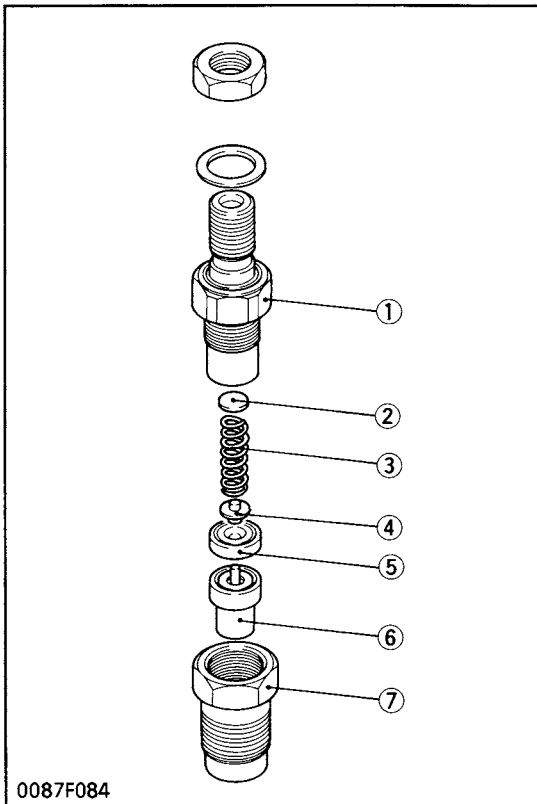


■ IMPORTANT

- If replacing the pump element, the amount of fuel injection should be adjusted on a specified bench.

- | | |
|---------------------------|--------------------|
| (1) Pump Body | (5) Delivery Valve |
| (2) Control Rack | (6) Tappet Roller |
| (3) Delivery Valve Holder | (7) Cylinder |
| (4) Delivery Valve Spring | (8) Plunger |

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

2 CLUTCH

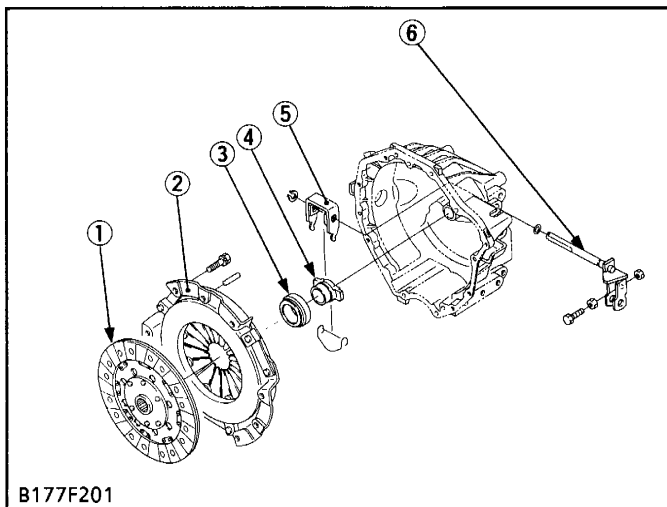
2 CLUTCH

MECHANISM

CONTENTS

[1] FEATURES	2-M1
[2] LINKAGE MECHANISM	2-M1
[3] OPERATION	2-M2

[1] FEATURES



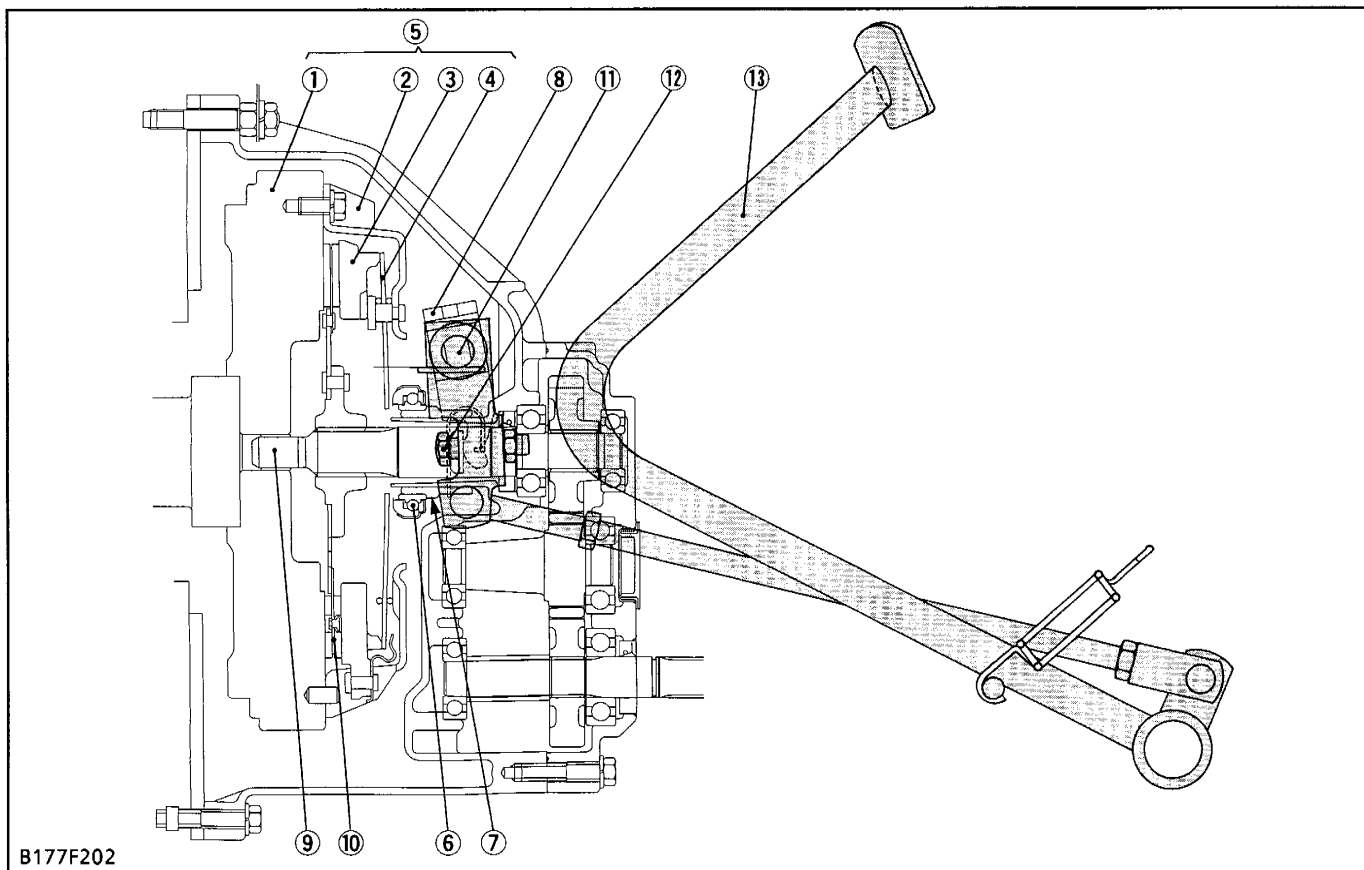
This tractor is used dry single plate type clutch. The clutch is located between the engine and transmission and is operated by stepping on the clutch pedal.

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

- | | |
|-----------------------------|------------------|
| (1) Clutch Disc | (4) Release Hub |
| (2) Pressure Plate Assembly | (5) Release Fork |
| (3) Release Bearing | (6) Clutch Rod |

B177F201

[2] LINKAGE MECHANISM



B177F202

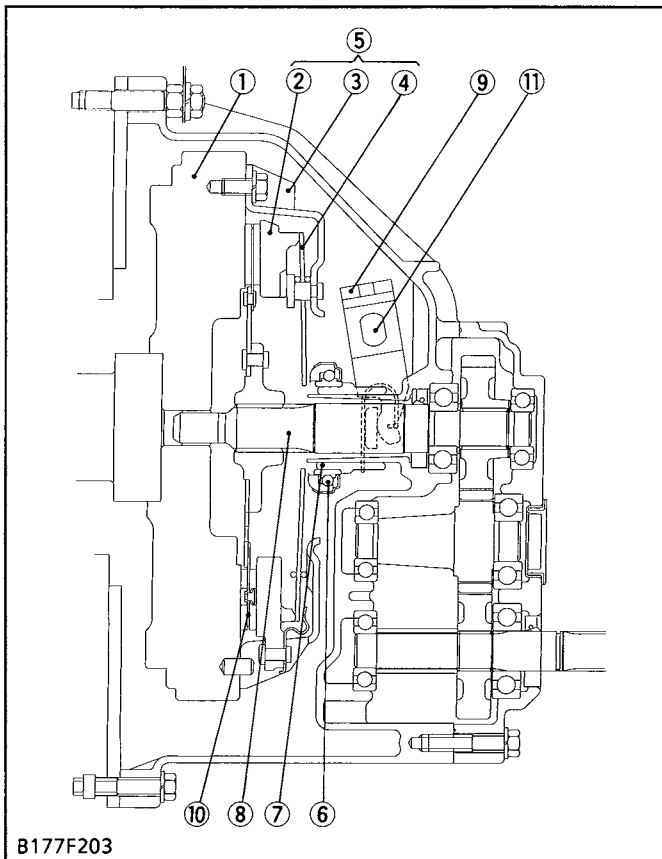
- | | | | |
|----------------------|-----------------------------|-------------------------|----------------------------|
| (1) Engine Flywheel | (5) Pressure Plate Assembly | (8) Clutch Release Fork | (11) Clutch Rod |
| (2) Clutch Cover | (6) Clutch Release Bearing | (9) Clutch Shaft | (12) Clutch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

Engine torque is transmitted to the pressure plate assembly (5) via the flywheel (1) which is connected to the engine crankshaft. Therefore, the clutch cover constantly runs with engine. The clutch disc (10) is located between the flywheel (1) and the pressure plate (3) of pressure plate assembly. Torque is transmitted to the clutch disc (10) by the pressure created by diaphragm spring (4) installed in pressure

plate assembly. Then, the torque is transmitted to the transmission via the clutch shaft (9).

When the pedal (13) is depressed, the clutch release hub (7) and the clutch release bearing (6) move towards the flywheel and push the fingers of the diaphragm spring (4). In other words, this movement pulls the pressure plate (3) up and disengages the clutch.

[3] OPERATION



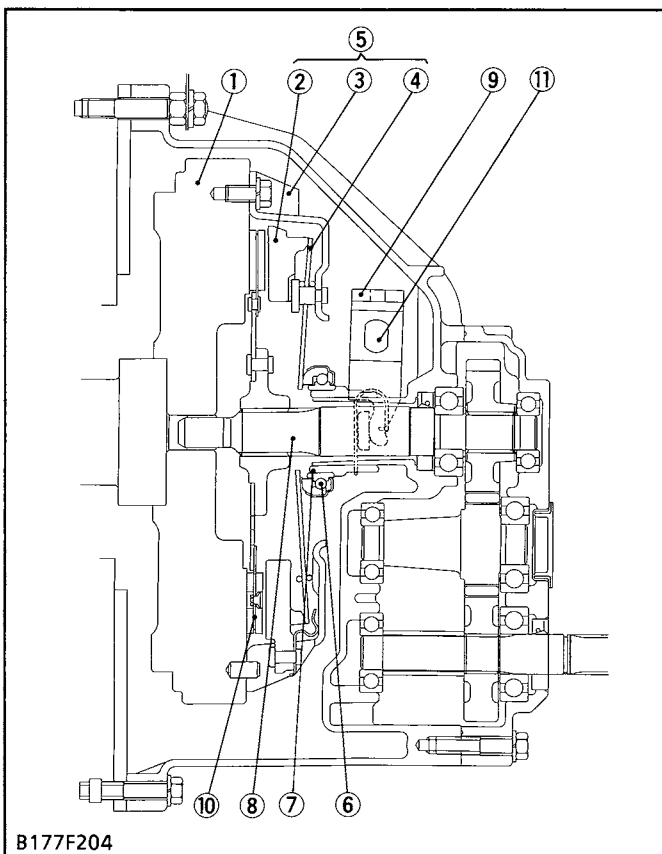
B177F203

■ Clutch "Engaged"

When the clutch pedal is not depressed, the clutch release bearing (6) and the fingers of diaphragm spring (4) are not connected to each other.

Accordingly, the pressure plate (2) is tightly pressed against the flywheel (1) by the diaphragm spring (4). As a result, rotation of the flywheel (1) is transmitted to the transmission through the clutch shaft (8) due to the frictional force among the flywheel (1), clutch disc (10) and pressure plate (2).

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



B177F204

■ Clutch "Disengaged"

When the clutch pedal is depressed, the clutch rod is pulled to move the clutch lever (11). Then, the release fork (9) pushes the release hub (7) and release bearing (6) toward the flywheel. Simultaneously, the release bearing (6) pushes the diaphragm spring (4).

As the pressure plate (2) is pulled by the diaphragm spring (4), the frictional force among the flywheel (1), clutch disc (10) and pressure plate (2) disappears.

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

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

SERVICING

CONTENTS

TROUBLESHOOTING	2-S1
SERVICING SPECIFICATIONS	2-S2
TIGHTENING TORQUES	2-S2
CHECKING, DISASSEMBLING AND SERVICING	2-S3
CHECKING AND ADJUSTING	2-S3
DISASSEMBLING AND ASSEMBLING	2-S4
[1] SEPARATING ENGINE FROM CLUTCH HOUSING	2-S4
[2] SEPARATING CLUTCH ASSEMBLY	2-S7
SERVICING	2-S8

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Clutch Drags	<ul style="list-style-type: none"> ● Clutch pedal free travel excessive ● Dust on clutch disc generated from clutch disc facing ● Release fork broken ● Clutch disc or pressure plate warped ● Wire ring of the pressure plate worn or broken 	Adjust Remove rust Replace Replace Replace (Pressure plate assembly)	2-S3 - 2-S8 2-S8 2-S9
Clutch Slips	<ul style="list-style-type: none"> ● Clutch pedal free travel too small ● Clutch disc excessively worn ● Grease or oil on clutch disc facing ● Clutch disc or pressure plate warped ● Diaphragm spring weaken or broken ● Wire ring of the pressure plate worn or broken 	Adjust Replace Replace Replace Replace Replace (Pressure plate assembly)	2-S3 2-S8 2-S7 2-S8 2-S9 2-S9
Chattering	<ul style="list-style-type: none"> ● Grease or oil on clutch disc facing ● Clutch disc or pressure plate warped ● Clutch disc boss spline worn or rusted ● Clutch shaft bent ● Pressure plate or flywheel face cracked or scored ● Clutch disc boss spline and clutch shaft spline worn ● Diaphragm spring strength uneven or diaphragm spring broken 	Replace Replace Replace or remove rust Replace Replace Replace Replace	2-S7 2-S8 2-S8 3-S15 1-S14, 2-S7, S9 2-S8 3-S15 2-S9
Rattle During Running	<ul style="list-style-type: none"> ● Clutch disc boss spline worn ● Replace bearing worn or sticking 	Replace Replace	2-S8 2-S9
Clutch Squeaks	<ul style="list-style-type: none"> ● Replace bearing sticking or dry ● Clutch disc excessively worn 	Replace Replace	2-S9 2-S8
Vibration	<ul style="list-style-type: none"> ● Clutch shaft bent ● Clutch disc rivet worn or broken ● Clutch parts broken 	Replace Replace Replace	3-S15 2-S8 2-S7, S8

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free play	20 to 30 mm 0.8 to 1.2 in.	–
Clutch Pedal Stopper Bolt	Clearance "A" between stopper bolt and clutch housing	8.5 mm 0.33 in.	–
Safety Switch Setting Position	Distance "A" of Safety Switch when Clutch Pedal Fully Depressed	17 to 21 mm 0.67 to 0.83 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.

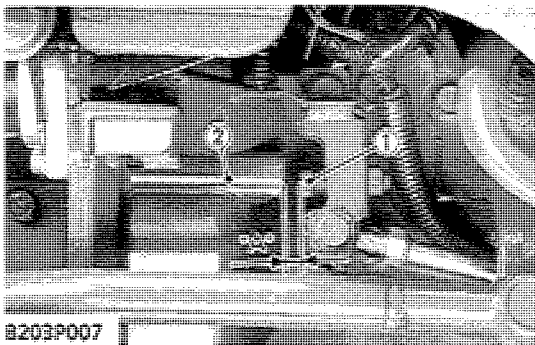
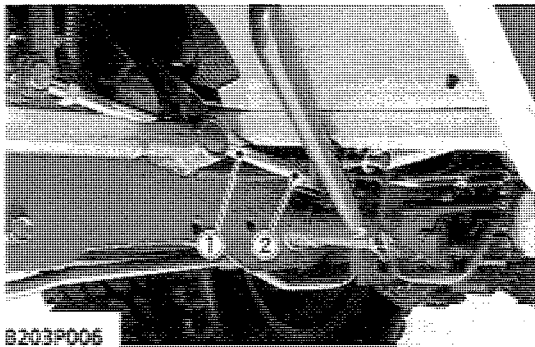
TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Engine and clutch housing mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Steering wheel mounting nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Delivery pipe cap screw	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Joint bolt for delivery pipe of three point	34.3 to 44.1	3.5 to 4.5	25.3 to 32.5
Drag link slotted nut	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3

CHECKING, DISASSEMBLING AND SERVICING

CHECKING AND ADJUSTING



Clutch Pedal Free Travel

⚠ CAUTION

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

1. Slightly depress the clutch pedal and measure free travel at top of pedal stroke.
2. If the measurement is not within the factory specifications, loosen the lock nut (2) and adjust the clutch rod (1) length.
3. After adjusting it, be sure to keep the clearance "A" of stopper bolt.
4. After adjusting them, try to start engine. If no start, check the safety switch setting position.

Clutch pedal free travel	Factory spec.	20 to 30 mm 0.79 to 1.18 in.
--------------------------	---------------	---------------------------------

(1) Clutch Rod

(2) Lock Nut

Clutch Pedal Stopper Bolt

1. Measure the clearance "A" between stopper bolt (1) and clutch housing (2).
2. If the measurement is not within the factory specifications, adjust it with the clutch pedal stopper bolt (1).

■ NOTE

- After adjustment, secure the stopper bolt with the lock nut.

Clearance : "A"	Factory spec.	8.5 mm 0.33 in.
-----------------	---------------	--------------------

(1) Clutch Pedal Stopper Bolt

(2) Clutch Housing

Safety Switch Setting Position

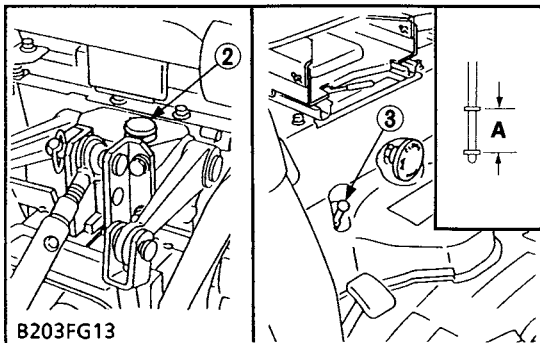
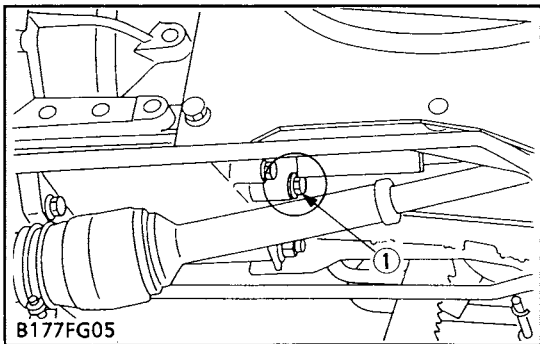
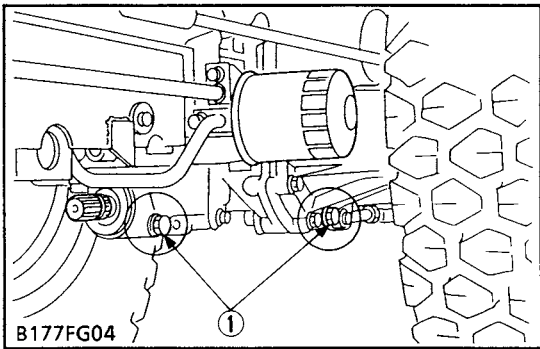
1. Measure the distance "A" of safety switch when clutch pedal is fully depressed.
2. If the distance "A" is not within the factory specifications, adjust the mounting position of safety switch.

Safety switch distance : "A"	Factory spec.	17 to 21 mm 0.67 to 0.83 in.
------------------------------	---------------	---------------------------------

(1) Safety Switch

DISASSEMBLING AND ASSEMBLING

[1] SEPARATING ENGINE FROM CLUTCH HOUSING



Drain Transmission Oil

⚠ CAUTION

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

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1) at the bottom of the transmission case to drain transmission oil.
3. Drain the transmission oil.
4. After draining, screw in the four drain plugs.

(When reassembling)

- Fill new oil from filling port after removing the filling plug (2).
- 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 AND FLUID" (See page G-8).

- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.

1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system.

This is important to prevent the hydraulic pump and the HST unit from getting seized.

3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.

- Do not mix different brands oil together.

Transmission oil capacity	12.0 ℓ 3.17 U.S.gals. 2.6 Imp.gals
---------------------------	--

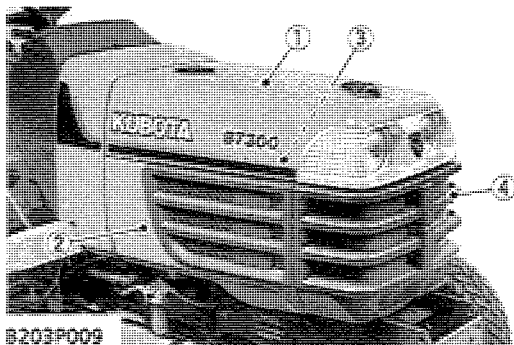
[A] Oil level acceptable within this range.

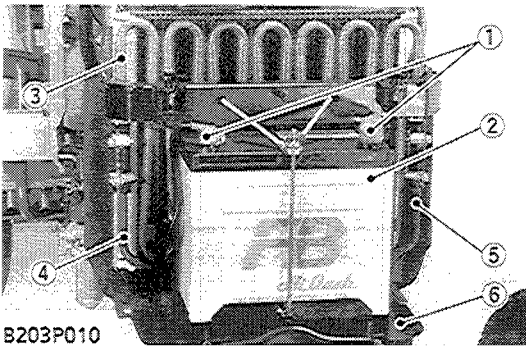
- (1) Drain Plug (3) Dipstick
(2) Filling Plug

Hood, Side Cover and Front Grille

1. Open the hood (1) from the front and remove the spring lock pin and remove hood with hood rod for keeping it open.
2. Remove the front grille (4).
3. Remove the right and left side cover (2), (3).

- (1) Hood (3) Side Cover (LH)
(2) Side Cover (RH) (4) Front Grille





B203P010

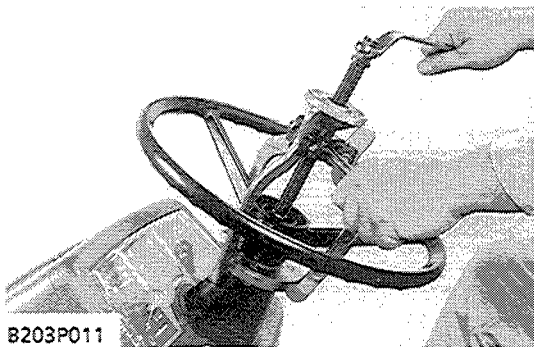
Battery, Oil Cooler and Hydraulic Pipes

1. Disconnect the battery cords (1) and remove the battery (2).
2. Loosen the clamps of hydraulic hoses and remove the battery base (6) with oil cooler (3) then remove the delivery pipe (4) and return pipe (5).

NOTE

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

- | | |
|------------------|-------------------|
| (1) Battery Cord | (4) Delivery Pipe |
| (2) Battery | (5) Return Pipe |
| (3) Oil Cooler | (6) Battery Base |



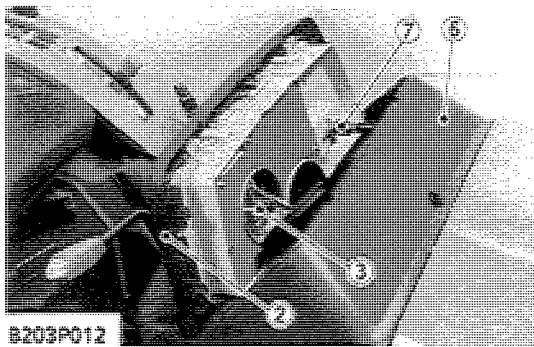
B203P011

Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel with a steering wheel puller. (Code No : 07916-51090)

(When reassembling)

Tightening torque	Steering wheel mounting nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft-lbs
-------------------	-----------------------------	---

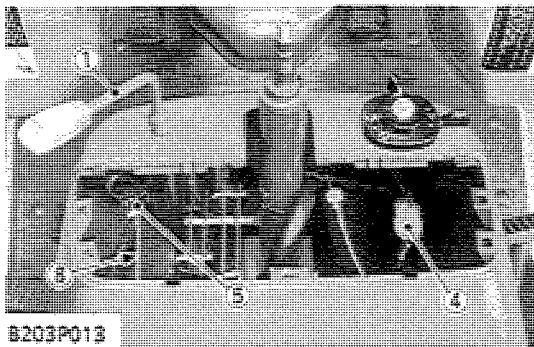


B203P012

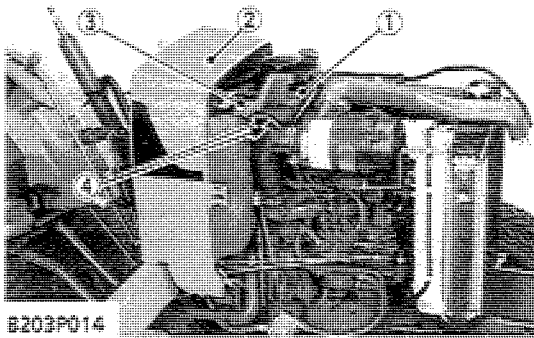
Meter Panel and Panel Under Cover

1. Remove the meter panel (2) and disconnect the meter panel connector (3) and hour-meter cable (7) from the meter panel. Then remove the meter panel.
2. Tap out the spring pin and remove the hand accelerator lever (1).
3. Disconnect the combination switch connector (4) and main switch connector (5).
4. Remove the knob of engine stop rod (8).
5. Remove the panel under cover mounting screw and remove the panel under cover (6).

- | | |
|----------------------------------|---------------------------|
| (1) Hand Accelerator Lever | (5) Main Switch Connector |
| (2) Meter Panel | (6) Panel Under Cover |
| (3) Meter Panel Connector | (7) Hour-meter Cable |
| (4) Combination Switch Connector | (8) Engine Stop Rod |



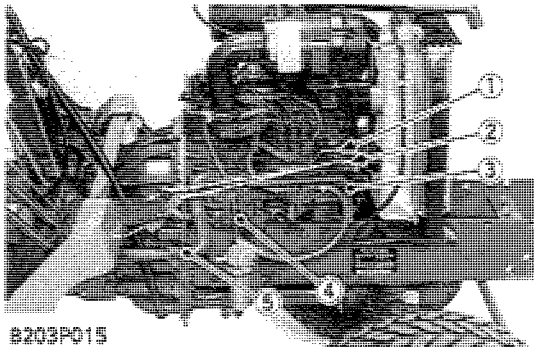
B203P013



Center Pillar with Fuel Tank and Others

1. Disconnect the fuel hose between fuel filter and fuel tank at the fuel filter side, then drain fuel completely.
2. Remove the pillar stay (1).
3. Disconnect the regulator and hazard unit connectors, and remove the lead wire for fuel gauge.
4. Disconnect the overflow hoses (4) of fuel line.
5. Remove the center pillar (2) with fuel tank (3).

- (1) Pillar Stay
- (2) Center Pillar
- (3) Fuel Tank
- (4) Overflow Hose



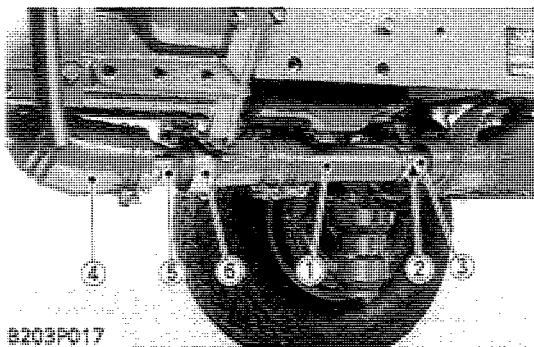
Suction Pipe, Delivery Pipe and Others

1. Remove the accelerator rod (1) and engine stop rod (2).
2. Remove the delivery pipe (3).
3. Loosen the clamp for delivery pipes, then disconnect the delivery pipe (4) for 3-point hitch from flow priority valve.
4. Loosen the clamp of suction hose (5).

(When reassembling)

Tightening torque	Delivery pipe cap screw	34.3 to 44.1 N·m 3.5 to 4.5 kgf·m 25.3 to 32.5 ft·lbs
-------------------	-------------------------	---

- (1) Accelerator Rod
- (2) Engine Stop Rod
- (3) Delivery Pipe
- (4) Delivery Pipe for 3-Point Hitch
- (5) Suction Hose



Propeller Shaft and Bearing Holder

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.
3. Loosen the clamp and slide the universal joint cover (4) to the rear.
4. Tap out the spring pin and then slide the universal joint (5) to the rear.
5. Remove the bearing holder (6) and propeller shaft cover as a unit.

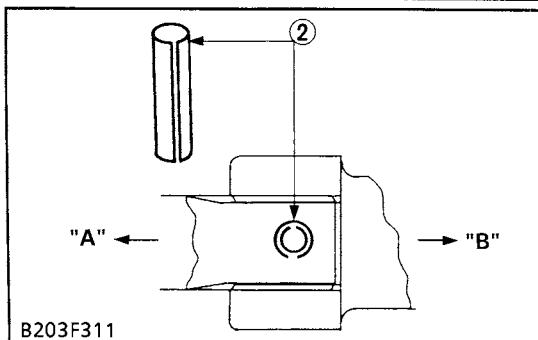
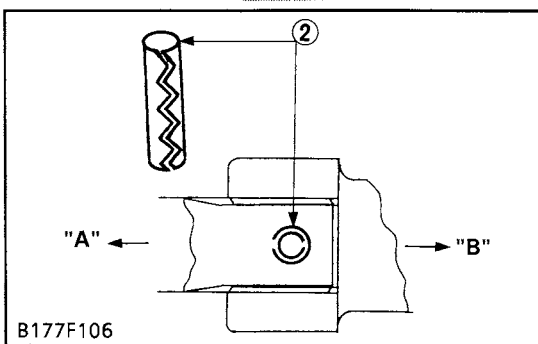
(When reassembling)

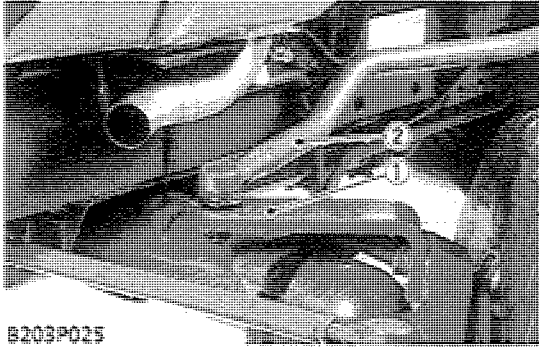
- Apply grease to the spline of the propeller shaft and coupling.
- Apply grease to the spline of the propeller shaft and universal joint.
- When inserting the spring pins (2), face their splits in the direction parallel to the universal joint as shown in the figure.

- (1) Propeller Shaft Cover
- (2) Spring Pin
- (3) Coupling
- (4) Universal Joint Cover
- (5) Universal Joint
- (6) Bearing Holder

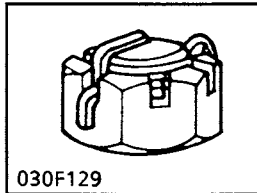
[A] Front

[B] Rear





B203P025



030F129

Drag Link

1. Remove the slotted nut and disconnect the drag link (2) from the knuckle arm (1).

(When reassembling)

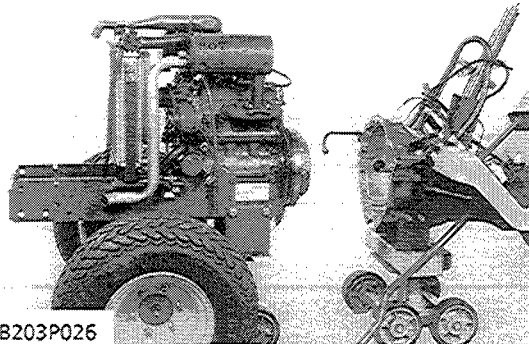
IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure.

Tightening torque	Slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
-------------------	-------------	---

(1) Knuckle Arm

(2) Drag Link



B203P026

Separating the Engine from Clutch Housing

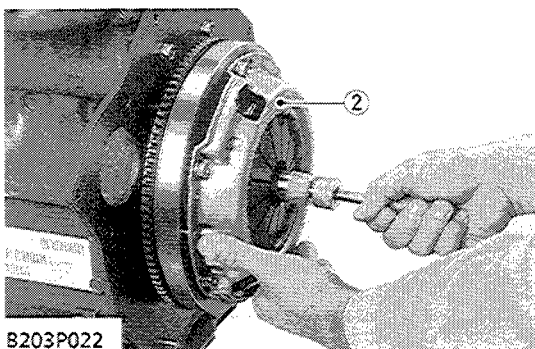
1. Disconnect the glow plug lead wire and then disconnect the connectors for dynamo and starter motor lead wire.
2. Place the jack under the front mission case.
3. Place the jack under the front axle frame.
4. Remove the engine mounting screws and separate the engine from the clutch housing.

(When reassembling)

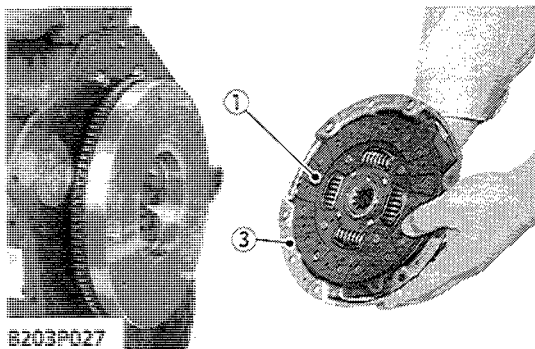
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	-----------------------	---

[2] SEPARATING CLUTCH ASSEMBLY



B203P022



B203P027

Separating the Clutch Assembly

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

(When reassembling)

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

IMPORTANT

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

NOTE

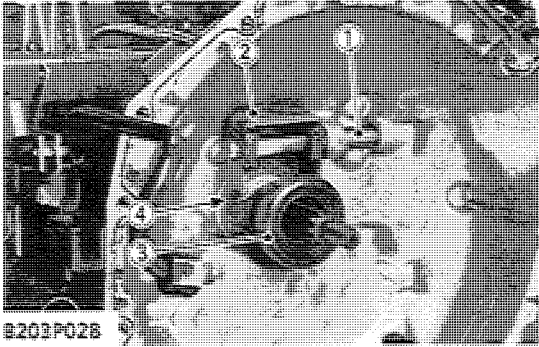
- Do not allow grease and oil on the clutch disc facing.

Tightening torque	Clutch mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	-----------------------	---

(1) Clutch Disc

(3) Clutch Cover

(2) Clutch Assembly



Clutch Rod and Clutch Release Fork

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

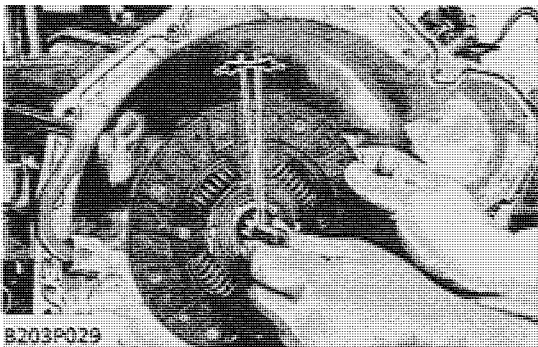
(When reassembling)

■ **NOTE**

- Set the clutch release fork and release hub with set spring (4) in the correct direction.

- | | |
|-------------------------|---------------------|
| (1) Clutch Rod | (3) Release Bearing |
| (2) Clutch Release Fork | (4) Set Spring |

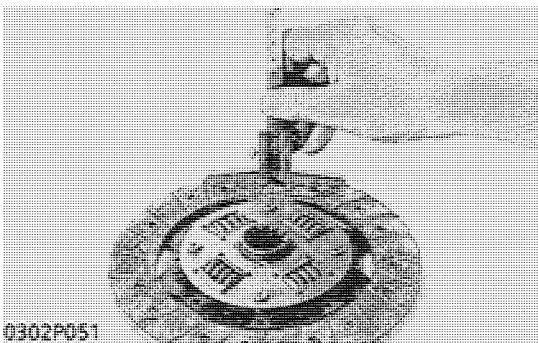
SERVICING



Backlash between Clutch Disc and Clutch Shaft

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

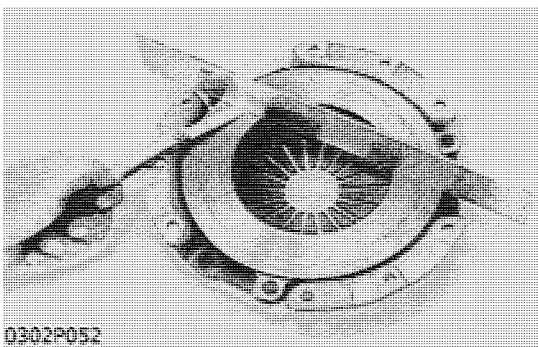
Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.
-------------------------------	-----------------	---------------------



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.
3. If oil is sticking to the clutch disc, or disc surface is carbonized, replace clutch disc.

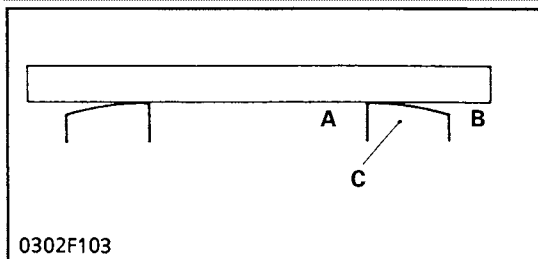
Depth to rivet top	Allowable limit	0.3 mm 0.012 in.
--------------------	-----------------	---------------------



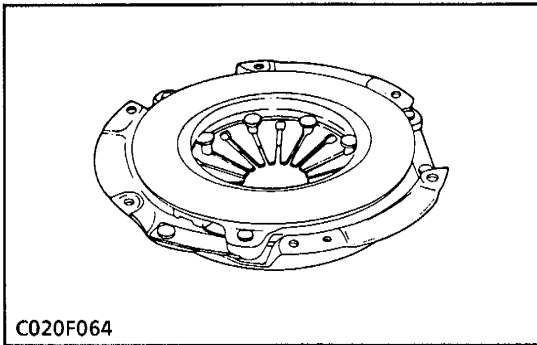
Pressure Plate Flatness

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

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

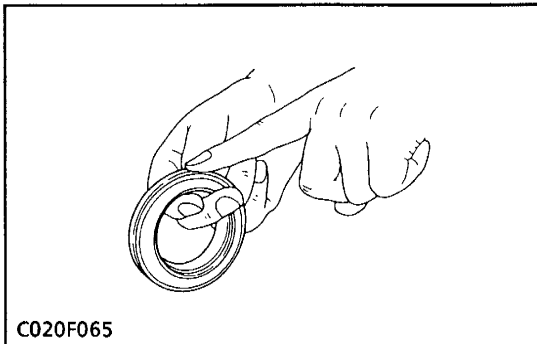


- [A] Inside
- [B] Outside
- [C] Pressure plate should be replaced.



Checking Pressure Plate and Diaphragm

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



Checking Clutch Release Bearing

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

3 TRANSMISSION

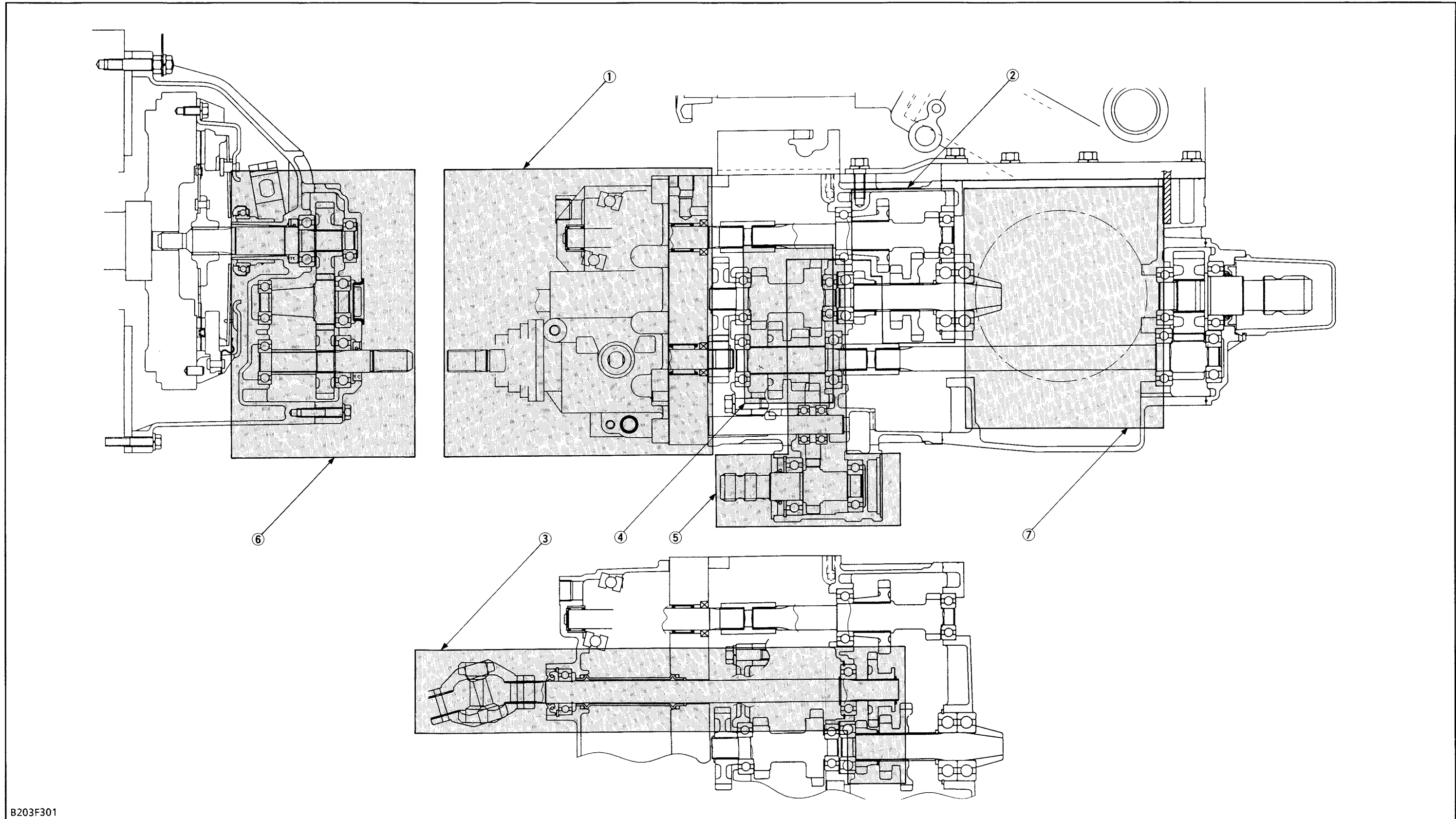
3 TRANSMISSION

MECHANISM

CONTENTS

[1] STRUCTURE	3-M1
[2] POWER TRAIN	3-M2
(1) Hydrostatic Transmission	3-M2
(1)-1. Structure	3-M2
(1)-2. Pump and Motor	3-M4
(1)-3. Oil Flow and Valves	3-M4
(1)-4. Operation	3-M6
(1)-5. Control Linkage	3-M9
(2) Hi-Lo Gear Shift Section	3-M10
(3) Front Wheel Drive Section	3-M10
[3] PTO SYSTEM	3-M11
(1) Rear-PTO Shift Section	3-M11
(2) Mid-PTO Section	3-M11
[4] DIFFERENTIAL GEAR	3-M12
(1) Differential Function	3-M12
(2) Differential Lock	3-M13

[1] STRUCTURE



B203F301

(1) Hydrostatic Transmission Section

(2) Hi-Lo Shift Gear Section

(3) Front Wheel Drive Section

(4) Rear-PTO Shift Section

(5) Mid-PTO Shift Section

(6) Clutch Housing Section

(7) Differential Gear Section

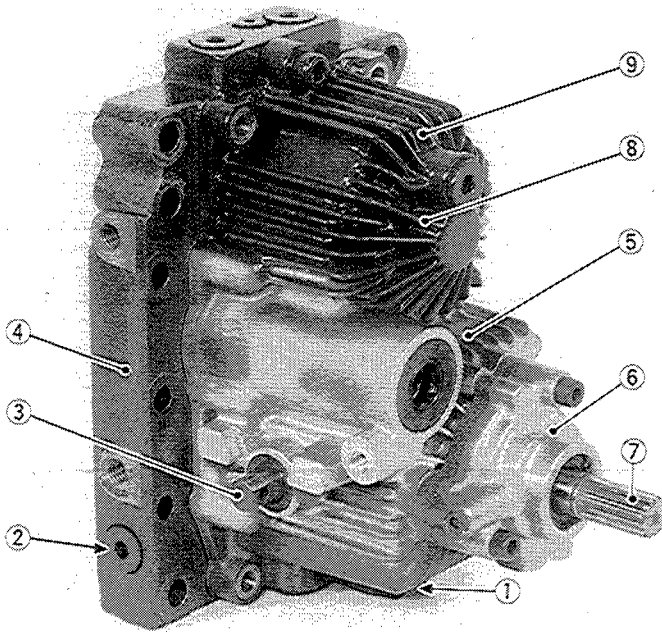
[2] POWER TRAIN

The transmission consists of a series of gears shown previously. It offers the most suitable speed for travelling and operation by combination of these gears.

It transmits power to the front or rear axles and the PTO shaft, which are classified respectively as the travelling system and PTO system.

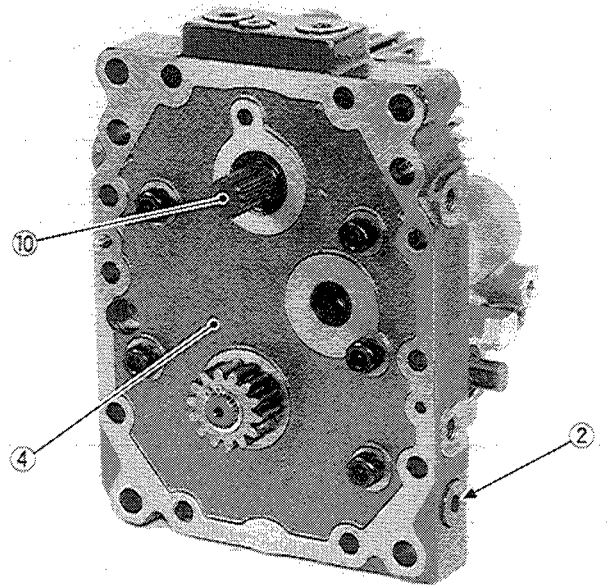
(1) Hydrostatic Transmission

(1)-1. Structure



B177P274

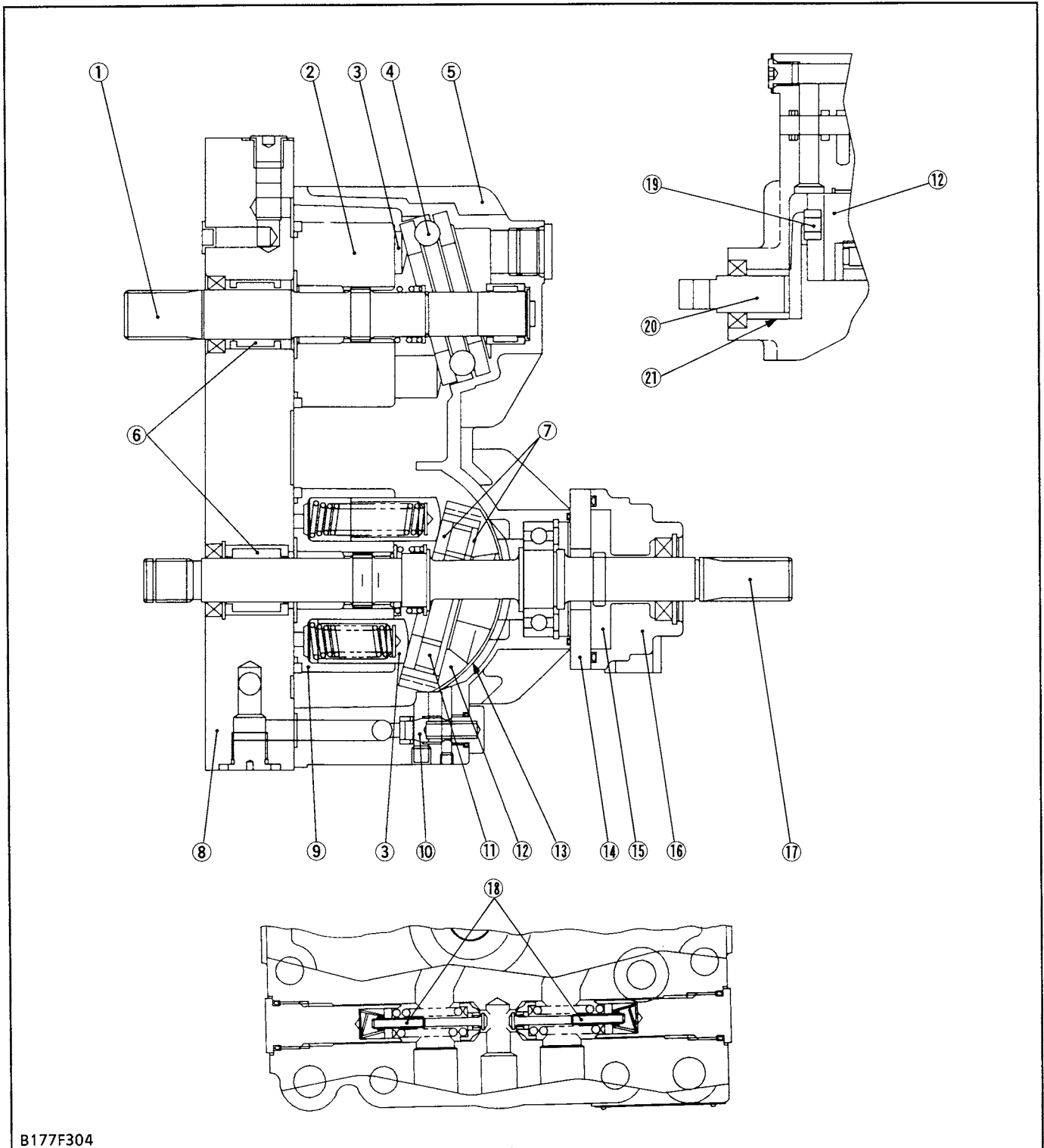
- | | |
|--|---------------------------------------|
| (1) Charge Relief Valve | (4) Center Section |
| (2) Check and High Pressure Relief Valve | (5) Variable Displacement Piston Pump |
| (3) Trunnion Shaft | |



B177P097

- | | |
|------------------------------|-------------------------------------|
| (6) Charge Pump | (9) Fixed Displacement Piston Motor |
| (7) Input Shaft (Pump Shaft) | (10) Output Shaft |
| (8) Housing | |

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



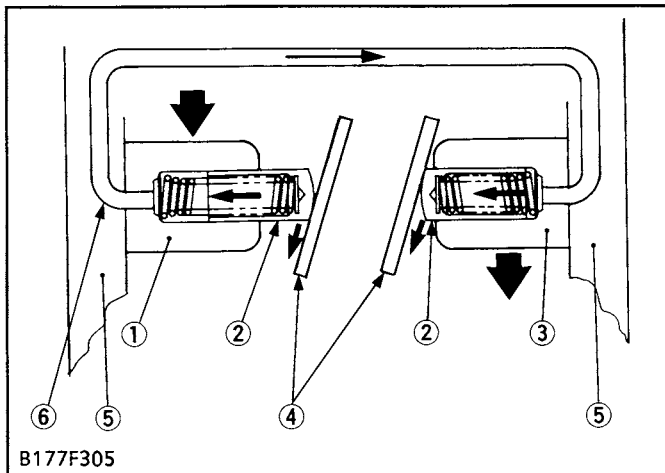
B177F304

- | | | | |
|----------------------------|----------------------------|--------------------------|---|
| (1) Motor Shaft | (7) Thrust Plate | (13) Cradle Bearing | (18) Check and High Pressure Relief Valve |
| (2) Cylinder Block (Motor) | (8) Center Section | (14) Charge Pump Spacer | (19) Slot Guide |
| (3) Piston Assembly | (9) Cylinder Block (Pump) | (15) Gerotor Assembly | (20) Trunnion Arm |
| (4) Thrust Ball Bearing | (10) Charge Relief Valve | (16) Charge Pump Housing | (21) Journal Bearing |
| (5) Housing | (11) Thrust Roller Bearing | (17) Pump Shaft | |
| (6) Needle Bearing | (12) Swashplate | | |

The hydrostatic transmission consists of a variable displacement piston pump and a fixed displacement piston motor.

Convenient single lever control permits simple operation of the vehicle, starting, stopping, increasing or decreasing speeds, changing direction of travel, and even going up or down hills.

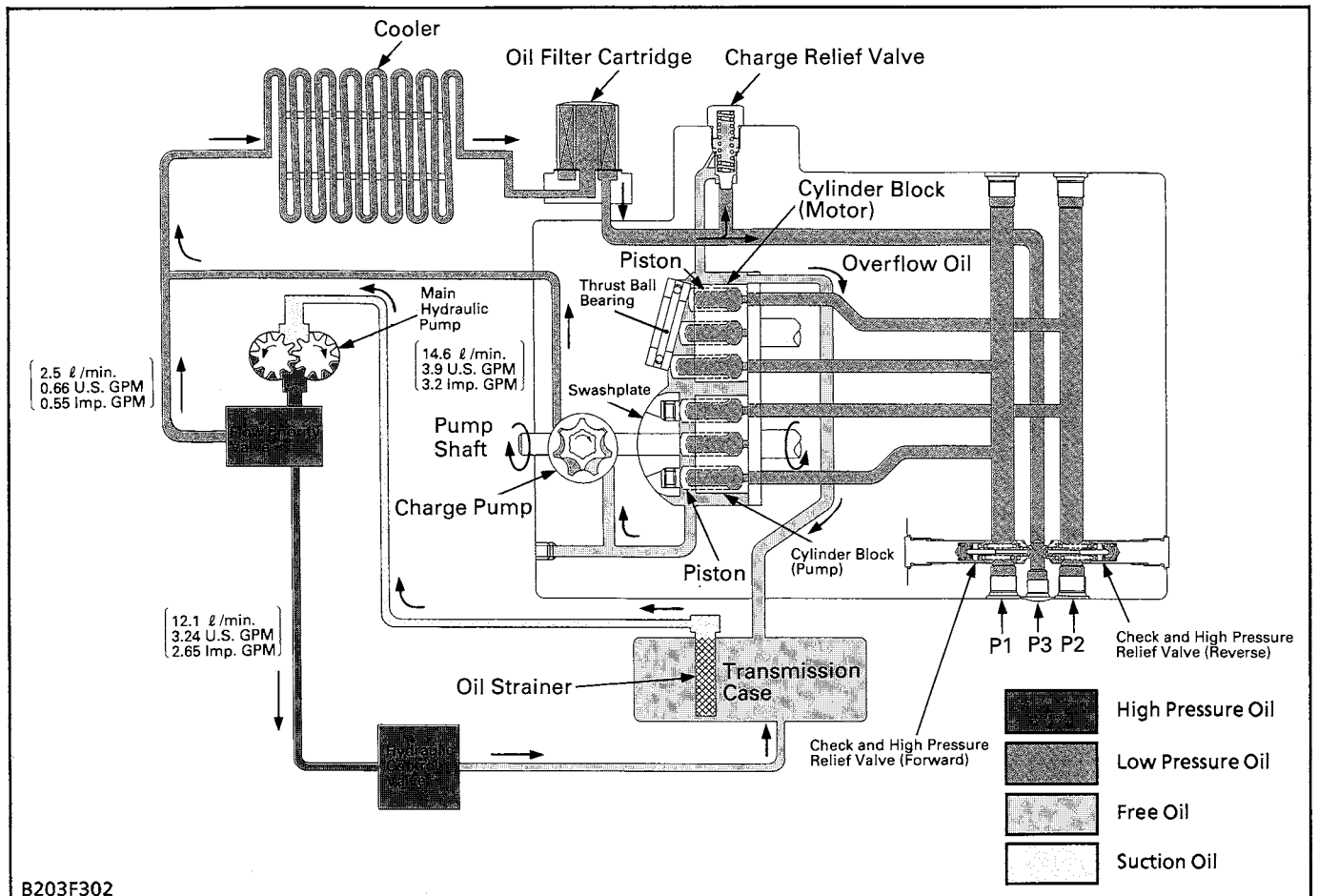
(1)-2. Pump and Motor



Pump and motor cylinder, each containing pistons, are connected by lines. Cylinders and lines are filled with oil. Pistons ride against swashplates located in pump and motor. In the pump, as the cylinder rotates, pistons move across the sloping face of swashplate and slide in or out of their cylinder bores. The oil, forced out by the pump pistons, causes the motor pistons to slide out of their cylinder bores. In the motor, sliding out of the cylinder and moving across the sloping face of swashplate, the pistons rotate the cylinder.

- (1) Cylinder Block (Pump)
- (2) Piston
- (3) Cylinder Block (Motor)
- (4) Swashplate
- (5) Center Section
- (6) Connecting

(1)-3. Oil Flow and Valves



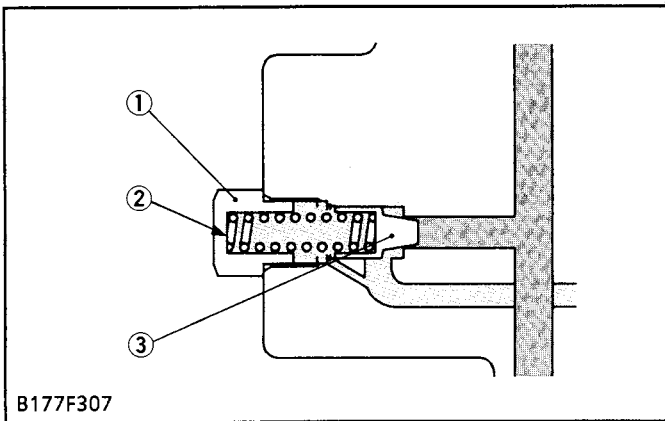
P1: Port for checking high pressure (forward) P2: Port for checking high pressure (reverse) P3: Port for checking charge pressure

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

The combined oil flow from the flow priority valve and HST charge pump are flows into the HST for charging.

The charge oil aids smooth operation of piston pump and motor. The charge oil passes through the oil cooler and transmission oil filter to charge relief valve port. The rest of oil passes through the charge relief valve into the HST housing. Oil from the hydraulic cylinder and overflow oil from HST housing return to the transmission case.

■ Charge Relief Valve



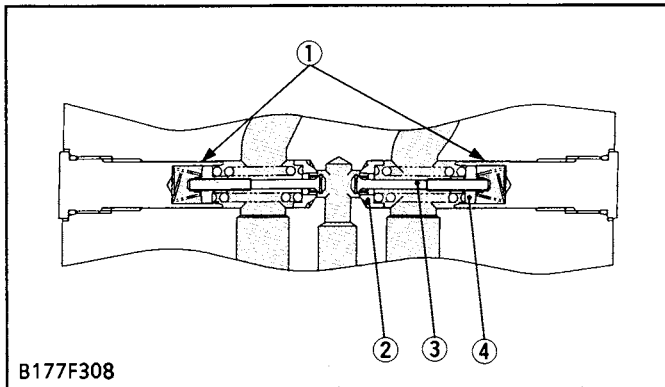
While pumped and filtered oil flows into the main oil circuit through the check valves, excessive oil passes to the case through the charge relief valve.

Oil temperature	Valve operating pressure
50 °C (122 °F)	294 to 491 kPa 3.0 to 5.0 kgf /cm ² 42.7 to 71.1 psi

- (1) Plug
- (2) Spring
- (3) Charge Relief Cone

■ Check and High Pressure Relief Valve

(In Neutral)



The check and high pressure relief valves (1) monitor the oil pressure in each line of the main oil circuit.

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

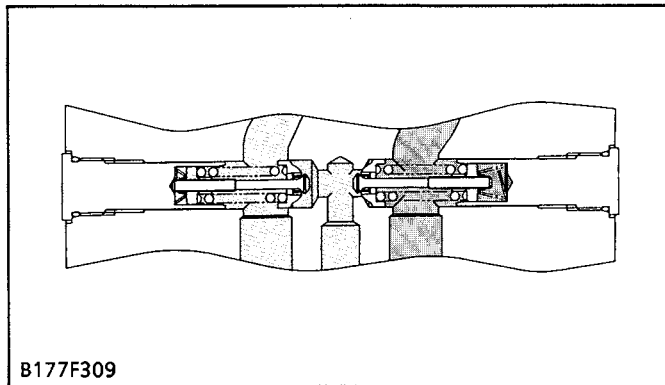
At normal operation, the check valve in the high pressure side is closed and it pushes and opens the another one.

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

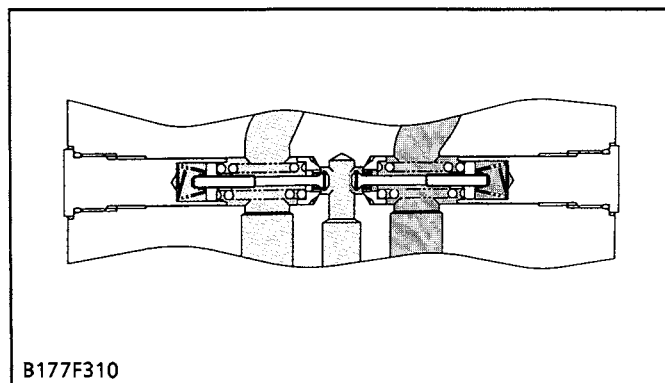
Oil temperature	Valve operating pressure
50 °C (122 °F)	21.6 MPa 220 kgf /cm ² 3131 psi

- (1) Check and High Pressure Relief Valve
- (2) Seat Washer
- (3) Pressure Poppet
- (4) Spring Guide

(At normal operation)

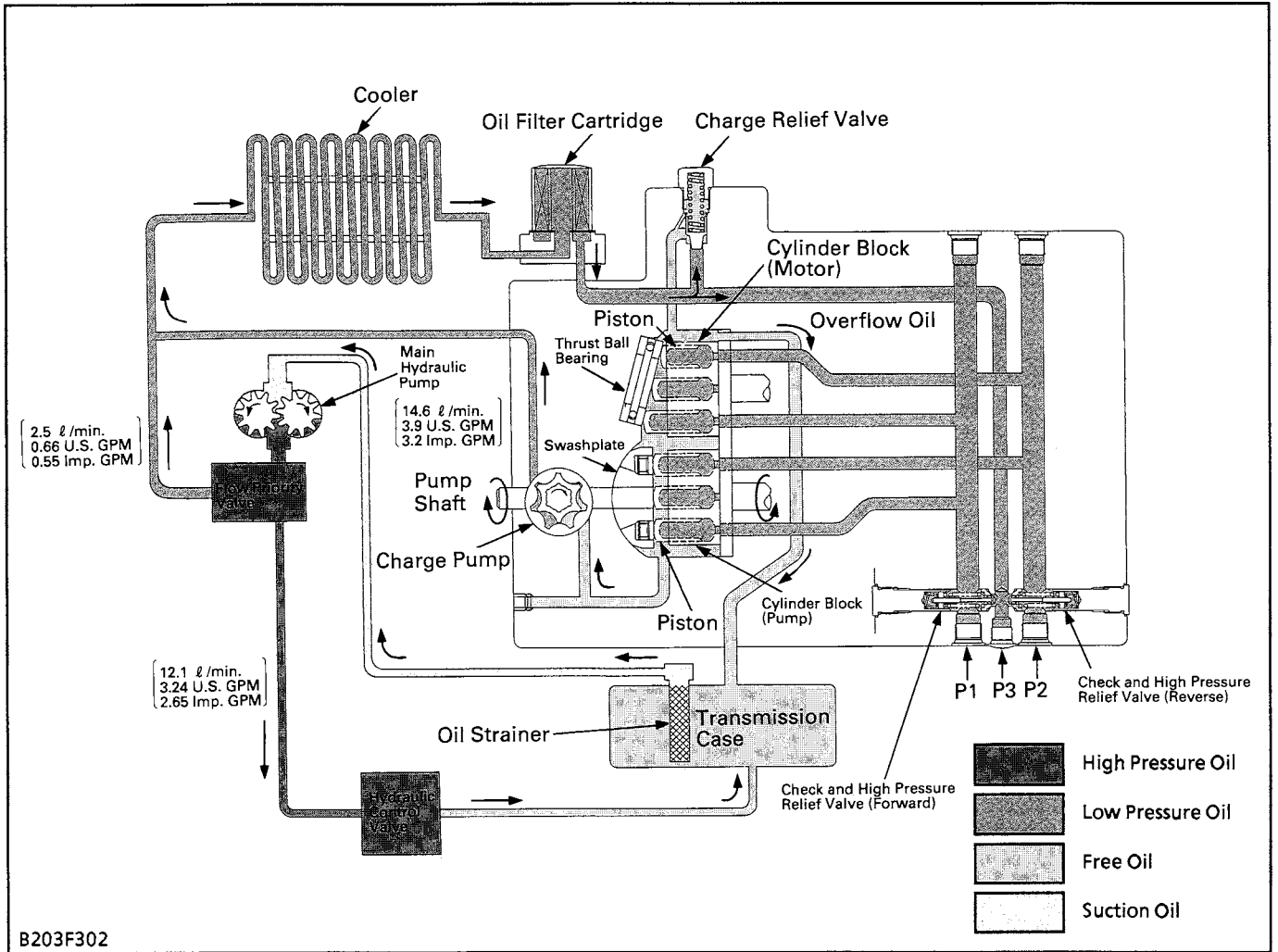


(When high pressure valve activating)



(1)-4. Operation

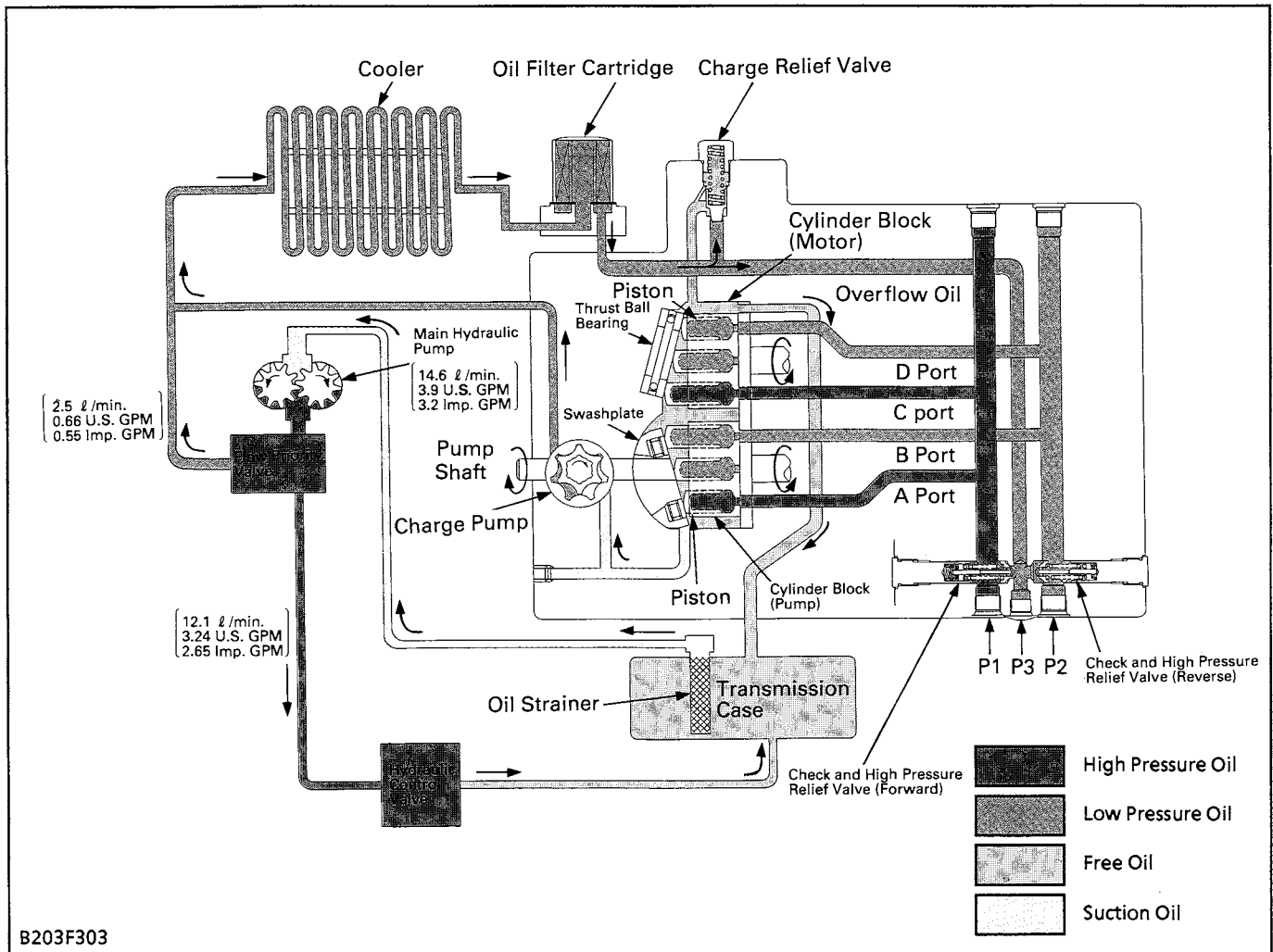
■ Neutral



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

pumped to the motor, the cylinder block in the motor is stationary and the output shaft does not move.

■ Forward



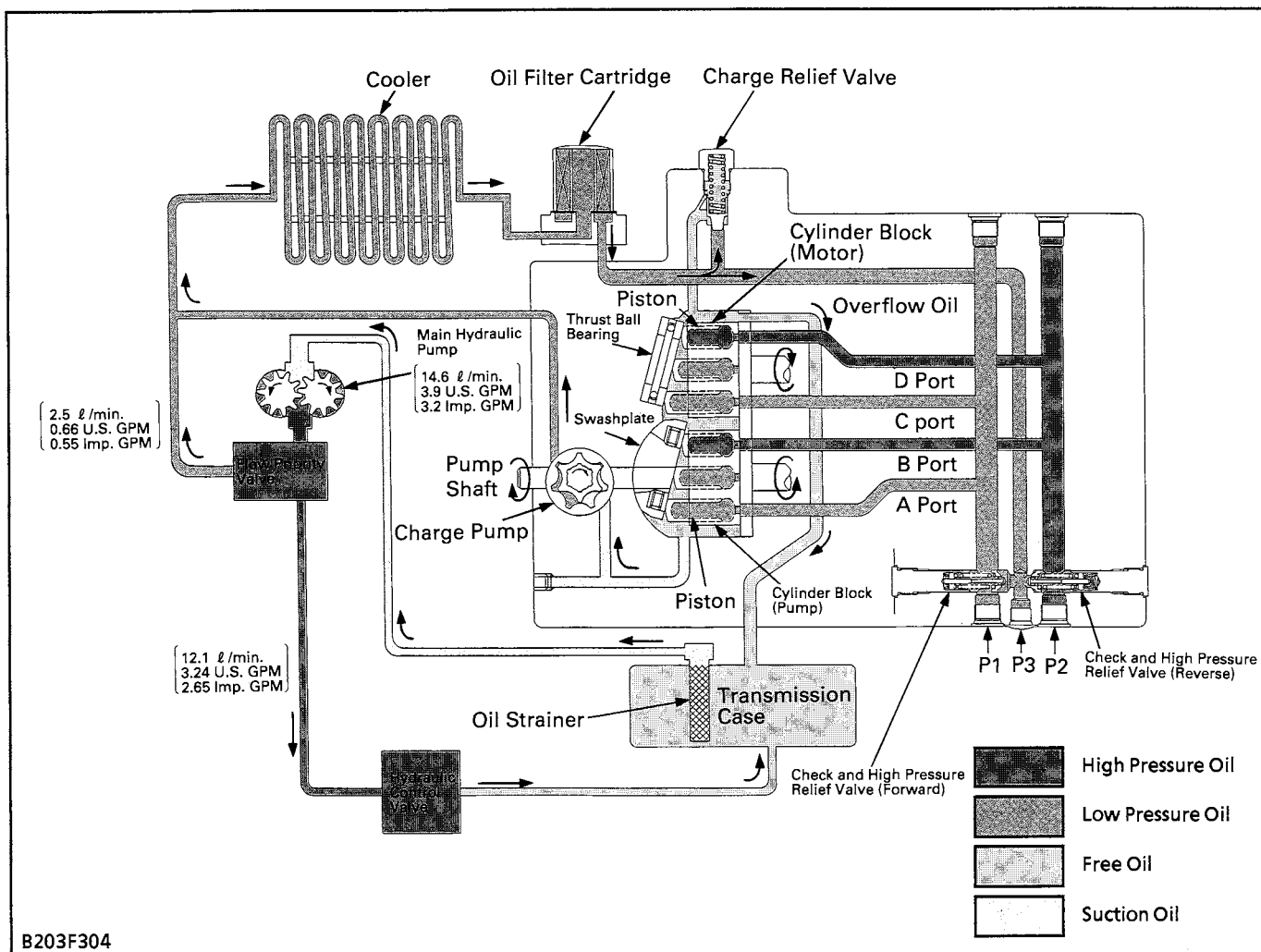
When the speed control pedal is stepped on and in forward, the variable swashplate is tilted as shown in figure above.

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

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

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

Reverse



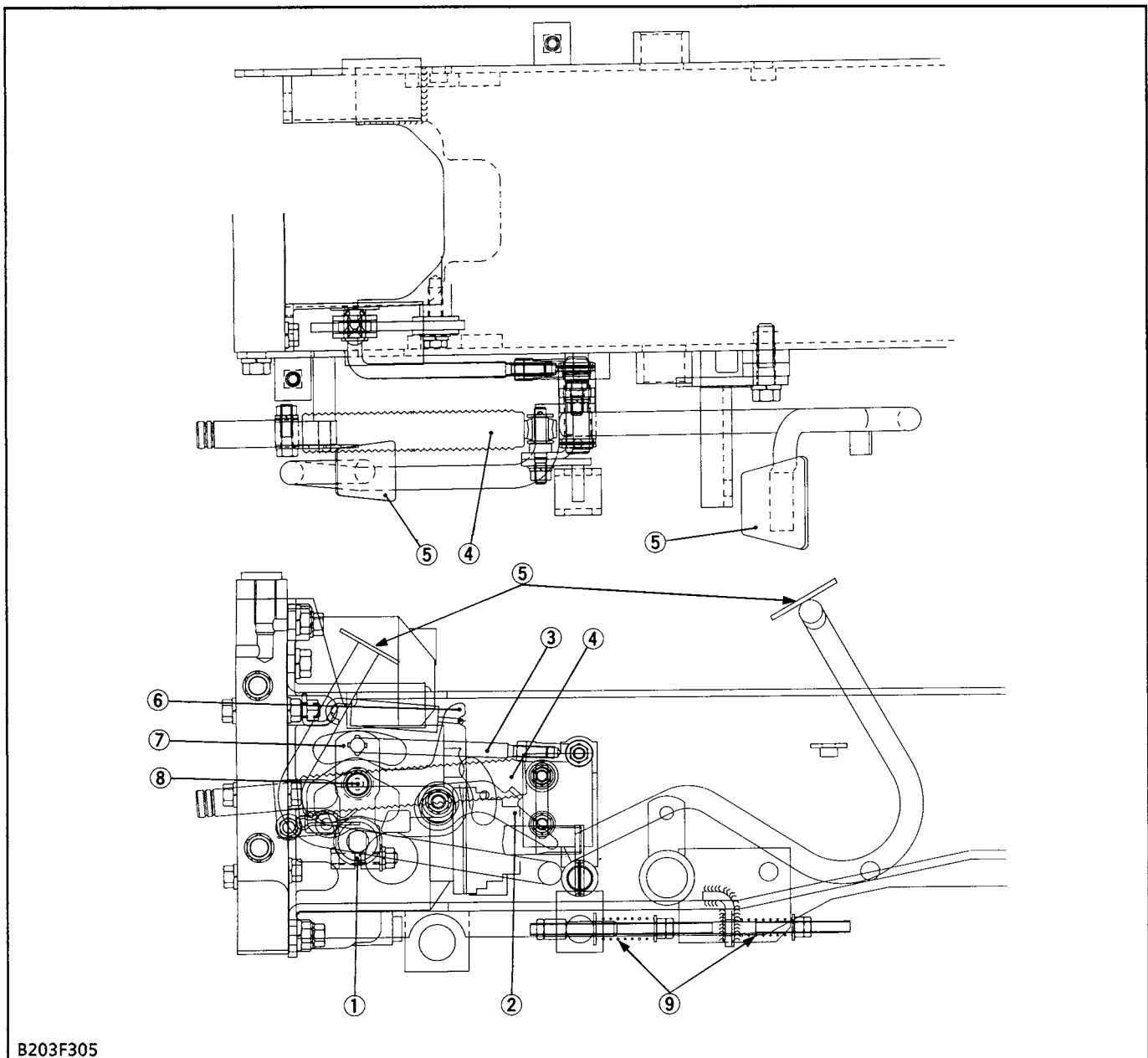
When the speed control pedal is stepped on and in reverse, the variable swashplate is tilted as shown in figure above.

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

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

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

(1)-5. Control Linkage



B203F305

- | | | | |
|-------------------------------------|-----------------------|-------------------------------------|-------------------------------|
| (1) Trunnion Control Lever Assembly | (3) Speed Control Rod | (5) Speed Control Pedal (HST Pedal) | (7) Trunnion Lever |
| (2) Neutral Adjuster | (4) Damper | (6) Trunnion Arm | (8) Roller |
| | | | (9) HST Pedal Spring Assembly |

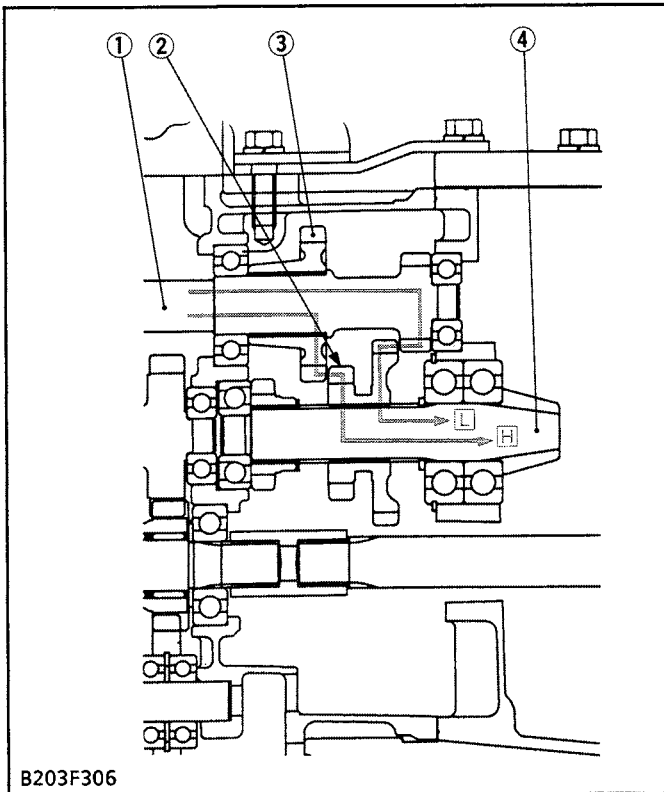
The speed control pedal (5) and the trunnion shaft of variable swashplate are linked with the speed control rod (3) and the trunnion control lever assembly (1). As the front footrest of the pedal is depressed, the swashplate rotates and forward travelling speed increases. Depressing the rear footrest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

The roller (8) on the trunnion lever (7) held with spring seats the detent of the trunnion arm (6) so that the trunnion lever returns to neutral. Then, the

swashplate is returned to neutral with the trunnion control lever assembly, by means of HST pedal spring assembly (9), when the pedal is released. The damper (4) connected to the speed control pedal restricts the movement of the linkage to prevent abrupt operation or reversing.

The speed set lever linked to the speed control pedal enables the linkage not to return to neutral and to keep a certain forward speed while the speed control pedal is released.

(2) Hi-Lo Gear Shift Section



Two kinds of power flow (from 4th shaft to spiral bevel pinion shaft) are available by operating the high-low gear shift lever to shift the gear (2) on the spiral bevel pinion shaft (4).

■ Low Position

4th Gear Shaft (1) → Shifter Gear (2) → Spiral Bevel Pinion Shaft (4)

■ High Position

4th Shaft (1) → Gear(3) → Shifter Gear (2) → Bevel Pinion Shaft (4)

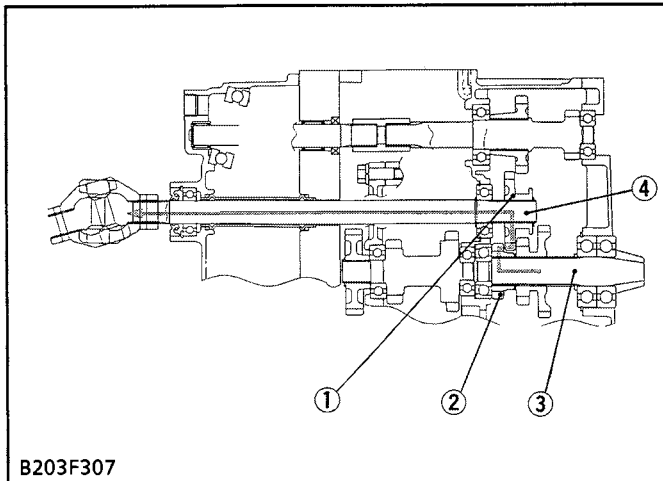
(1) 4th Gear Shaft with 14T Gear

(3) 18T Gear

(2) 15T-29T Shifter Gear

(4) Spiral Bevel Pinion Shaft

(3) Front Wheel Drive Section



2-wheel drive or 4-wheel drive is selected by changing the position of 20T shift gear (1) with the front wheel drive lever. When the front wheel drive lever is set to "Disengaged," the 20T shift gear (1) is neutral and power is not transmitted to the front wheel drive shaft (4).

When the front wheel drive lever is set to "Engaged," the 20T shift gear (1) slides to the right to engage with 13T gear (2) on the spiral bevel pinion shaft (3). Therefore, the front drive shaft is actuated to drive the front wheels.

(1) 20T Shift Gear

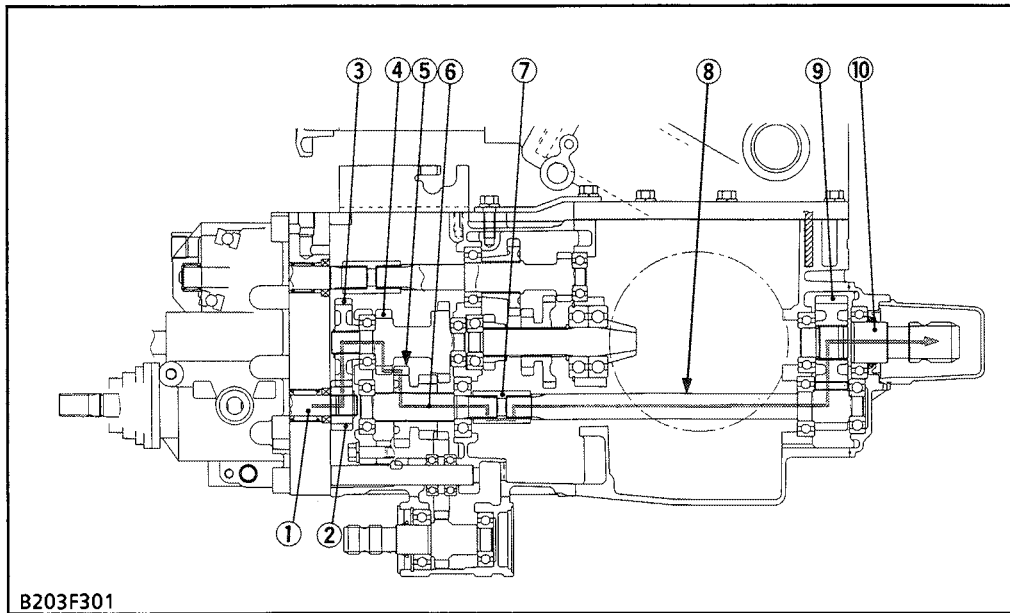
(3) Spiral Bevel Pinion Shaft

(2) 13T Gear

(4) Front Wheel Drive Shaft

[3] PTO SYSTEM

(1) Rear-PTO Shift Section



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

■ Rear-PTO Shift Lever ON Position

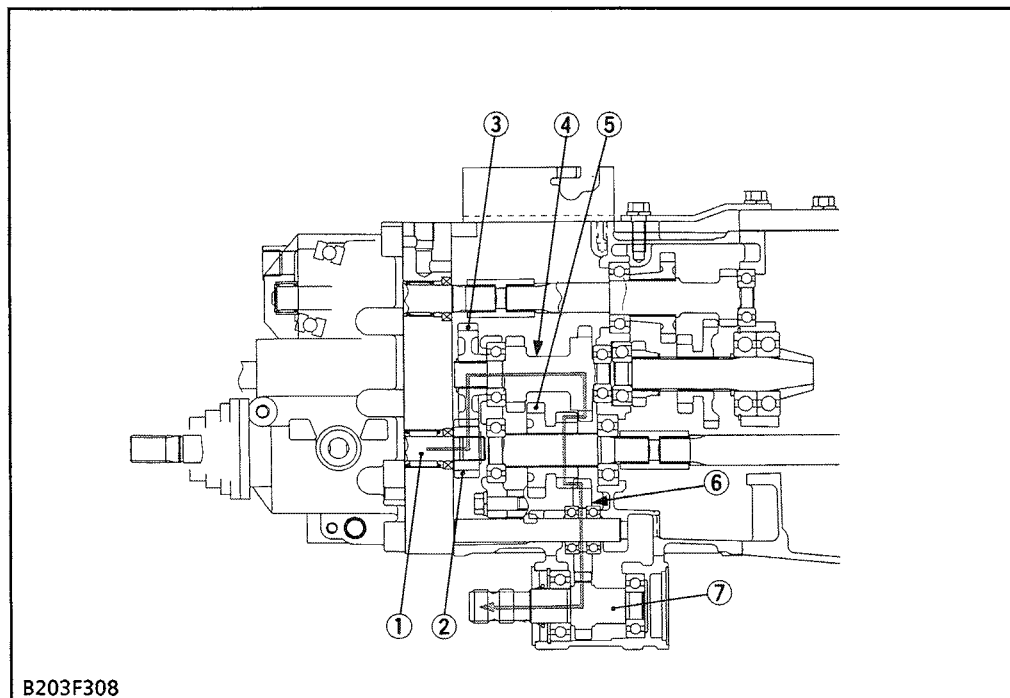
HST Pump Shaft (1) → 14T Gear (2) → 27T Gear (3) → 2nd Gear Shaft with 13T Gear (4) → 13T-17T Shifter Gear (5) → 3rd Shaft (6) → Coupling (7) → 5th

Shaft with 11T Gear (8) → 24T Gear (9) → Rear-PTO Shaft (10)

(2) Mid-PTO Section

Besides neutral, one kind of power flow is available by operating the PTO shift lever to shift

position of 13T-17T shift gear for mid-PTO.



- (1) HST Pump Shaft
- (2) 14T Gear
- (3) 27T Gear
- (4) 2nd Gear Shaft with 13T and 18T Gear
- (5) 13T-17T Shift Gear
- (6) 19T Gear
- (7) Mid-PTO Shaft

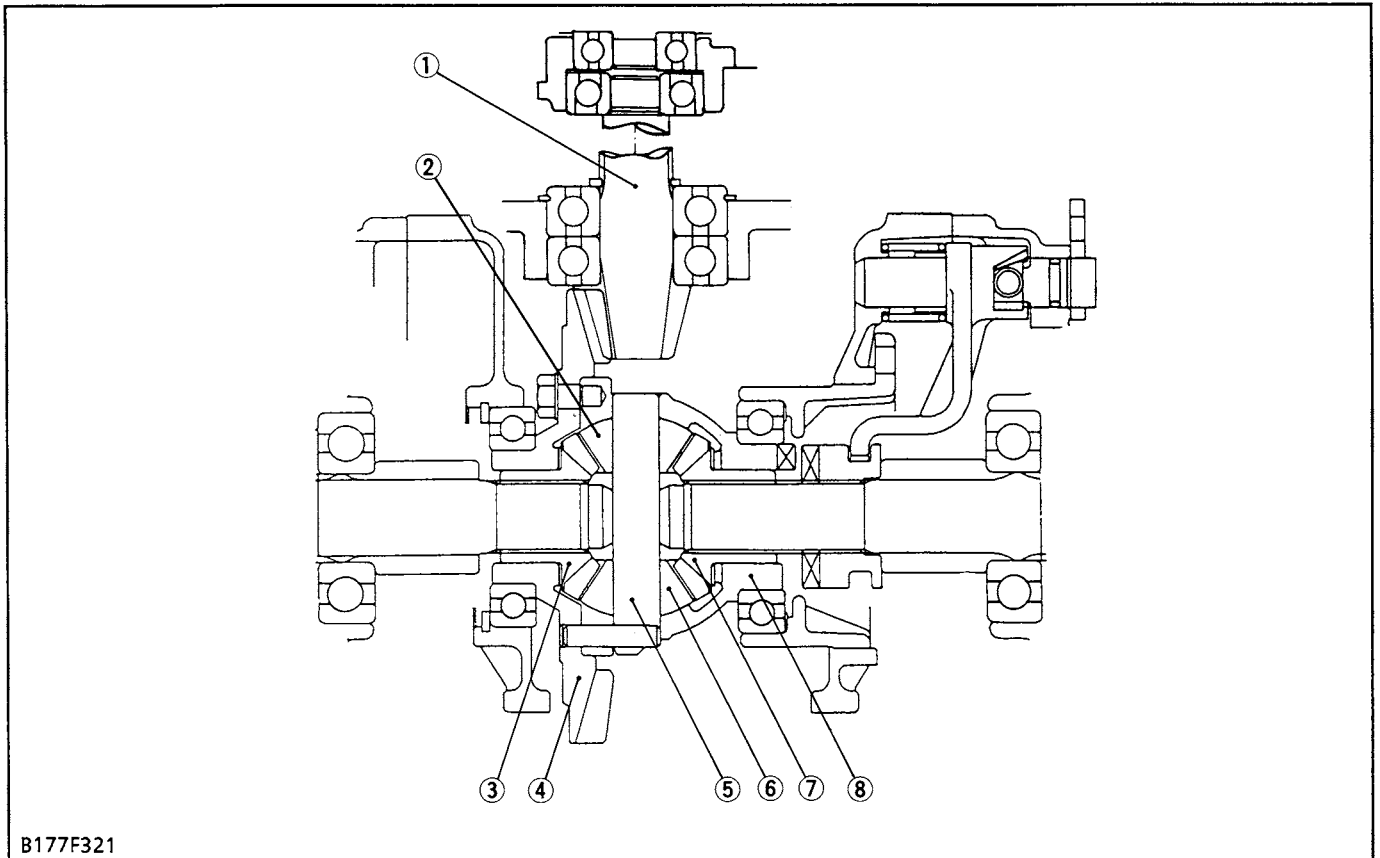
■ Mid-PTO Shift Lever ON Position

HST Pump Shaft (1) → 14T Gear (2) → 27T Gear (3) → 2nd Gear Shaft with 18T Gear (4) → 13T-17T Shift

Gear (5) → 19T Gear (6) → Mid-PTO Shaft (7)

[4] DIFFERENTIAL GEAR

(1) Differential Function



B177F321

(1) Spiral Bevel Pinion
(2) Differential Pinion

(3) Differential Side Gear
(4) Spiral Bevel Gear

(5) Differential Pinion Shaft
(6) Differential Pinion

(7) Differential Side Gear
(8) Differential Case

1. During Straight Running

Rotation of the spiral bevel pinion (1) is transmitted to the spiral bevel gear (4) and differential case (8).

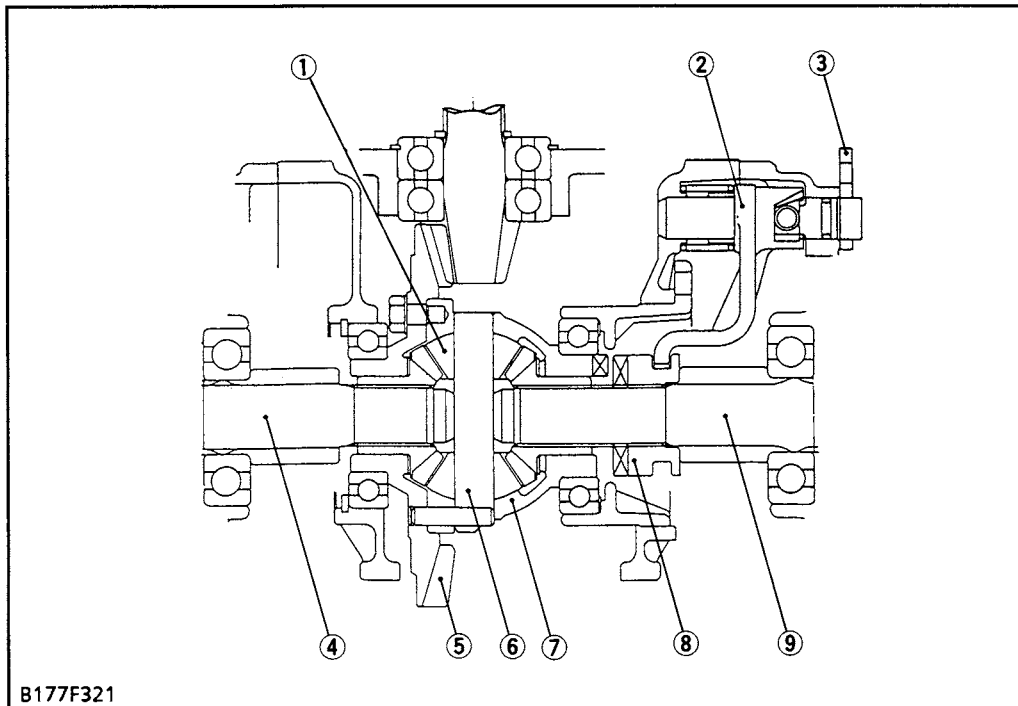
When road resistance to the right and left wheels are equal, differential pinions (2), (6) and differential side gears (3), (7) are all rotate as a unit. Both rear axles received equal input, and both wheels turn at the same speed, allowing the tractor to go straight ahead.

At this time, differential pinions (2), (6) do not rotate around the differential pinion shaft (5).

2. During Turning

When the tractor turns, the road resistance to the inside tire increases (as if braking is applied to that side only). In other words, if one of tires slows down, revolution difference is generated in the differential side gears (3), (7). When rotation of one differential side gear becomes lower than the other, differential pinions (2), (6) begin rotating around differential pinion shaft (5). The other differential side gear is increased in speed by the speed increment of differential pinion rotating around differential axle. This means that rotation of one rear axle is slowed down and that of the other rear axle is increased. Thus, the tractor turn smoothly without power loss.

The combined number of revolutions of the right and left differential side gears is always twice that of the spiral bevel gear (4). When spiral bevel gear revolution is 100 rpm, and if one of the differential side gears stops moving, the revolution of the other differential side gear becomes 200 rpm and if one rotates at 50 rpm, the other rotates at 150 rpm.

(2) Differential Lock

- (1) Differential Pinions
- (2) Shift Fork
- (3) Differential Lock Lever
- (4) Differential Gear Shaft
- (5) Spiral Bevel Gear
- (6) Differential Pinion Shaft
- (7) Differential Case
- (8) Differential Lock Clutch
- (9) Differential Gear Shaft

B177F321

When resistance to the right and left tires are greatly different due to ground conditions or type of work, the tire with less resistance slips and prevents the tractor from moving ahead. To compensate for this drawback, the differential lock restricts the differential action and causes both rear axles to rotate as a unit.

When the differential lock pedal is stepped on, it causes the differential lock lever (3) to rotate, which will move the shift fork (2) and the differential lock

clutch (8) toward the spiral bevel gear (5). The differential lock clutch (8) engaged with the teeth of the differential case (7) to cause the differential case (7) and the differential lock clutch (8) to rotate as a unit.

Therefore, differential pinions (1) are unable to rotate around differential pinion shaft (6) and identical revolutions are transmitted to the right and left differential gear shafts (4), (9).

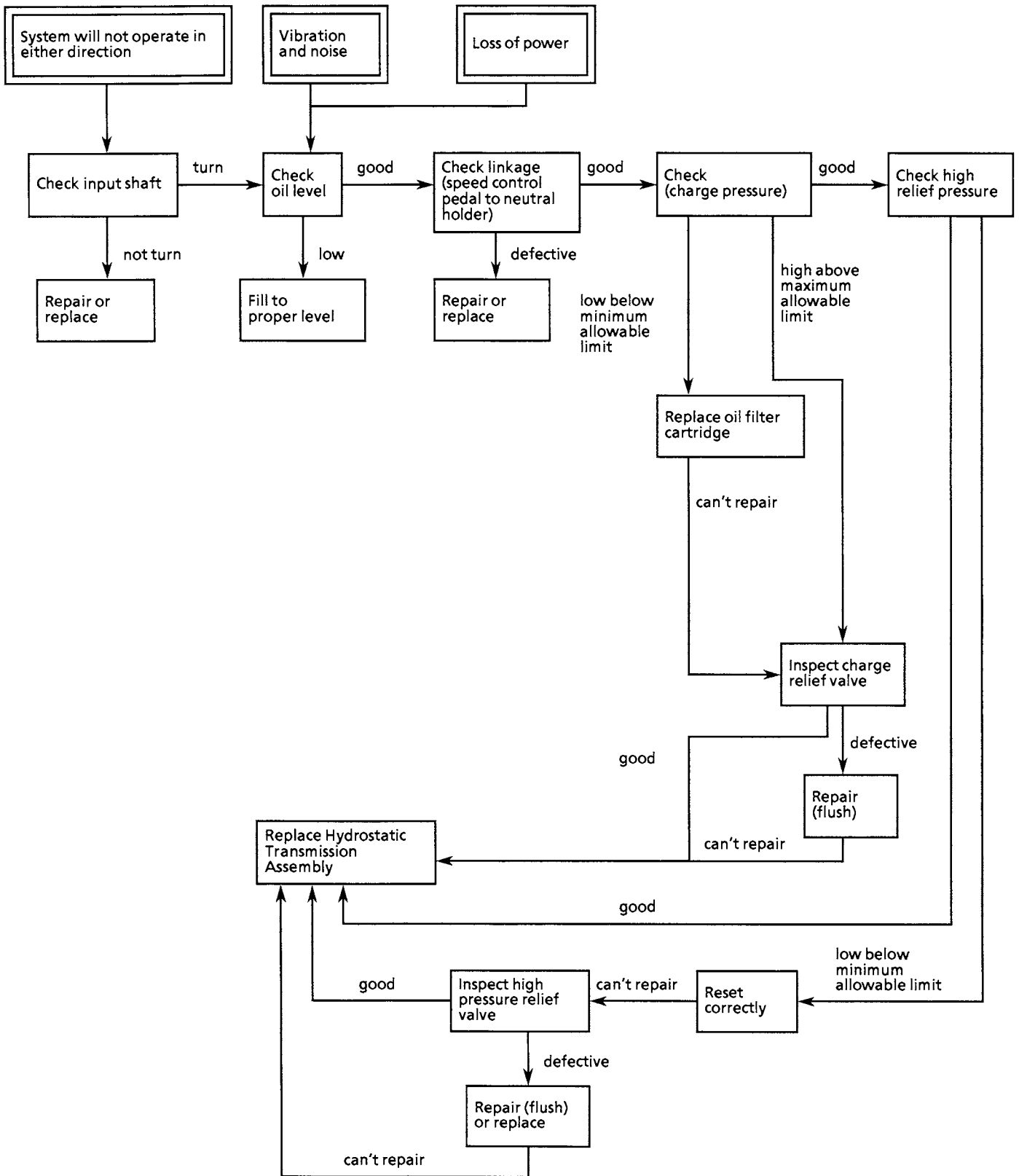
SERVICING

CONTENTS

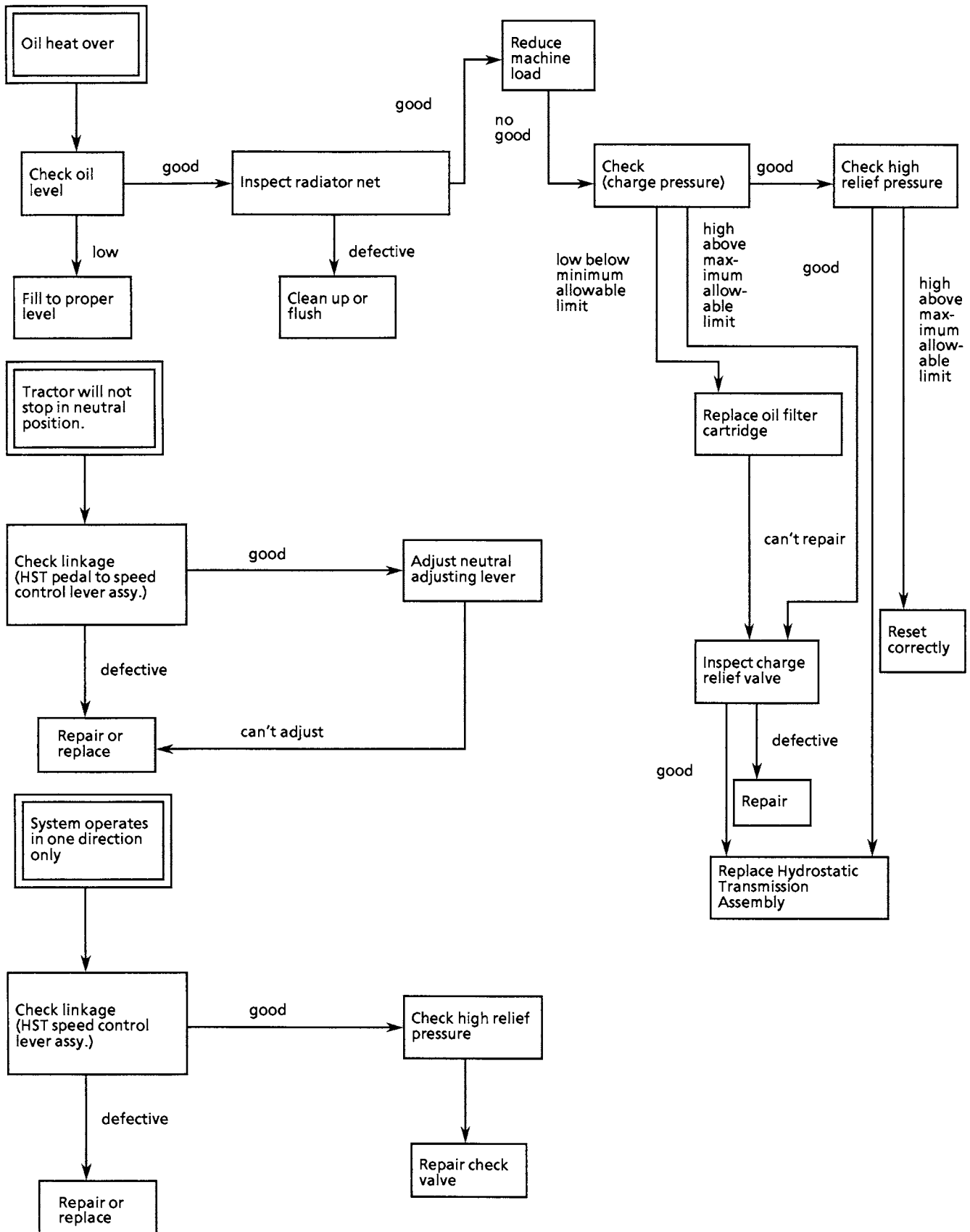
TROUBLESHOOTING	3-S1
SERVICING SPECIFICATIONS	3-S4
TIGHTENING TORQUES	3-S5
CHECKING AND ADJUSTING	3-S6
DISASSEMBLING AND ASSEMBLING	3-S11
[1] SEPARATING ENGINE FROM CLUTCH HOUSING	3-S11
[2] CLUTCH HOUSING	3-S15
[3] SEPARATING CENTER FRAME AND TRANSMISSION ASSEMBLY	3-S16
[4] TRANSMISSION CASE	3-S22
[5] DIFFERENTIAL GEAR CASE	3-S28
SERVICING	3-S29
[1] CLUTCH HOUSING	3-S29
[2] TRANSMISSION CASE	3-S29
[3] DIFFERENTIAL CASE	3-S33

TROUBLESHOOTING

■ HYDROSTATIC TRANSMISSION



TROUBLESHOOTING (Continued)



TROUBLESHOOTING

■ CLUTCH HOUSING

Symptom	Probable Cause	Solution	Reference Page
Noise from Clutch Housing	<ul style="list-style-type: none"> ● Transmission oil insufficient ● Gear worn or broken ● Bearing worn 	Refill Replace Replace	3-S11 3-S15 3-S15

■ TRANSMISSION CASE SECTION

Symptom	Probable Cause	Solution	Reference Page
Noise from Transmission	<ul style="list-style-type: none"> ● Transmission oil insufficient ● Gear worn or broken ● Improper backlash between 6T spiral bevel pinion and bevel gear ● Improper backlash between differential pinion and differential side gear ● Bearings worn 	Refill Replace Adjust Adjust Replace	3-S11 – 3-S34 3-S33 –
Gear Slip out of Mesh	<ul style="list-style-type: none"> ● Shift fork spring tension insufficient ● Shift fork or shifter worn ● Shift fork bent 	Replace Replace Replace	– – –

■ DIFFERENTIAL CASE SECTION

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise At All Time	<ul style="list-style-type: none"> ● Improper backlash between 6T spiral bevel pinion and bevel gear ● Improper backlash between differential pinion and differential side gear ● Bearing worn ● Insufficient or improper type of transmission fluid used 	Adjust Adjust Replace Replenish or Replace	3-S34 3-S33 – G-8, 3-S11
Noise while Turning	<ul style="list-style-type: none"> ● Differential pinions or differential side gears worn or damaged ● Differential lock binding (does not disengage) ● Bearings worn 	Replace Replace Replace	3-S28, S29 3-S25 –
Differential Lock Can Not Be Set	<ul style="list-style-type: none"> ● Differential lock shift fork damaged ● Differential lock shifter mounting pin damaged ● Differential lock clutch damaged 	Replace Replace Replace	4-S2 4-S2 4-S2
Differential Lock Pedal Does Not Return	<ul style="list-style-type: none"> ● Differential lock pedal return spring weaken or damaged ● Differential lock fork shaft rusted 	Replace Repair	– 3-S25, 4-S2

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Check and High Pressure Relief Valve	Setting Pressure [Relief Valve]	21.6 MPa 220 kgf/cm ² 3129 psi	—
Charge Relief valve	Setting Pressure	294 to 490 kPa 3.0 to 5.0 kgf/cm ² 43 to 71 psi	—
Gears	Backlash	0.10 to 0.20 mm 0.004 to 0.008 in.	0.4 mm 0.016 in.
Gear to Spline	Clearance	0.03 to 0.08 mm 0.0012 to 0.0031 in.	0.20 mm 0.0079 in.
Shift Fork to Shift Gear Groove	Clearance	0.10 to 0.35 mm 0.004 to 0.014 in.	0.50 mm 0.020 in.
16T-20T Gear to Front wheel Drive Shaft	Clearance	0.027 to 0.067 mm 0.0011 to 0.0025 in.	0.1 mm 0.0039 in.
Front Wheel Drive Shaft	O.D.	21.967 to 21.980 mm 0.8648 to 0.8654 in.	—
16T-20T Gear	I.D.	28.007 to 28.021 mm 1.1024 to 1.1032 in.	—
Needle	O.D.	2.996 to 3.000 mm 0.1179 to 0.1181 in.	—
Spiral Bevel Gear to Spiral Bevel Pinion	Backlash	0.10 to 0.20 mm 0.0039 to 0.0080 in.	0.4 mm 0.016 in.
Adjusting Shim	Thickness	0.2 mm, 0.008 in. 0.3 mm, 0.012 in. 0.5 mm, 0.020 in.	— — —
Differential Pinion to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	0.4 mm 0.016 in.
Adjust Shim	Thickness	0.8 mm (0.0315 in.) 1.0 mm (0.0394 in.) 1.2 mm (0.0472 in.)	— — —
Differential Case to Differential Side Gear	Clearance	0.025 to 0.066 mm 0.0016 to 0.0029 in.	0.30 mm 0.0118 in.
Differential Case	I.D.	32.000 to 32.025 mm 1.2598 to 1.2608 in.	—
Spiral Bevel Gear	I.D.	32.000 to 32.025 mm 1.2598 to 1.2608 in.	—
Differential Side Gear	O.D.	31.959 to 31.975 mm 1.2582 to 1.2589 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.016 to 0.045 mm 0.0006 to 0.0018 in.	0.30 mm 0.0118 in.
Differential Pinion Shaft	O.D.	15.973 to 15.984 mm 0.6299 to 0.6293 in.	—
Differential Pinion	I.D.	16.000 to 16.018 mm 0.6299 to 0.6306 in.	—

TIGHTENING TORQUES

Item	N·m	kgf·m	ft-lbs
Steering wheel mounting nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Pitman arm mounting nut	118 to 147	12.0 to 15.0	79.7 to 108.4
Steering gear box assembly mounting screw	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Clutch housing mounting screw to engine	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Clutch housing rear cover mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.0
Center frame mounting screw and nut to transmission case	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5
HST mounting screw and nut	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Charge pump mounting hex. socket head screw	15.7 to 20.6	1.6 to 2.1	11.6 to 15.2
HST center section mounting hex. socket head screw	40.2 to 44.1	4.0 to 4.5	29.7 to 32.5
Check and high pressure relief valve setting hex. socket head plug	40.70 to 94.93	4.15 to 9.68	30.02 to 70.02
Charge pressure relief valve setting hex. socket head plug	14.22 to 23.54	1.45 to 2.40	10.49 to 17.36
Check port plug (High pressure relief pressure)	40.70 to 94.93	4.15 to 9.68	30.02 to 70.02
Check port plug (Charge relief pressure)	21.17 to 47.47	2.77 to 4.84	20.04 to 35.01
Trunnion control lever mounting bolt and nut	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Transmission case to differential case mounting screw and nut	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Top link bracket mounting screw	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Hydraulic cylinder to differential case mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Mid-PTO case to transmission case mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Rear-PTO cover mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Rear axle case mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
3rd shaft, 2nd gear shaft bearing holder mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Differential bearing holder mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Spiral bevel gear mounting screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
3-Point hitch shaft setting screw	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
3-Point hitch shaft setting screw lock nut	43.2 to 47.1	4.4 to 4.8	31.8 to 34.7
Drawbar frame mounting screw	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5
ROPS frame and frame top connecting bolt and nut	149.1 to 179.5	15.2 to 18.3	109.9 to 132.4
ROPS connecting plate mounting screw	47.1 to 56.9	4.8 to 5.8	34.7 to 42.0
ROPS frame mounting screw	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Cotter setting bolt and nut	123 to 147	12.6 to 15.0	91 to 108
Joint bolt for delivery pipe of three point hitch	34.3 to 44.1	3.5 to 4.5	25.3 to 32.5
Delivery pipe cap screw	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9

CHECKING AND ADJUSTING

Neutral

1. Disengage the front wheel drive lever. (Drive only rear wheels.)
2. Lift the rear of the tractor so that the rear wheels are off the ground and run the engine at low idling and drive only rear wheels.
3. Depress the one end of speed control pedal and release, and do the same at the other end.
4. If the rear wheels do not stop turning, adjust as following procedure.

Adjusting Neutral

1. Disconnect the brake rod RH (1).
2. Loosen the lock nut (8) (9) and adjusting nut (6) (7) until springs (4) (5) are freely.
3. Loosen the lock nut (10) and neutral position adjusting nut (11) until washer welded on the rod (12) comes off from stay (13).
4. Remove the HST pedal damper (2).
5. Loosen the neutral adjuster (3) setting screw.

(When rear wheels tend to turn forward)

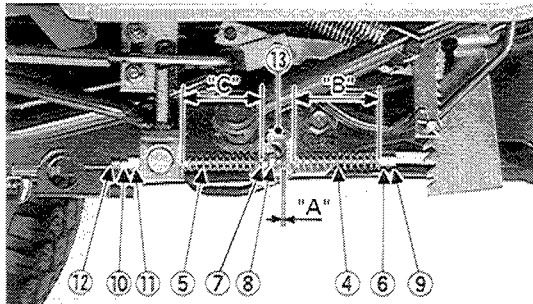
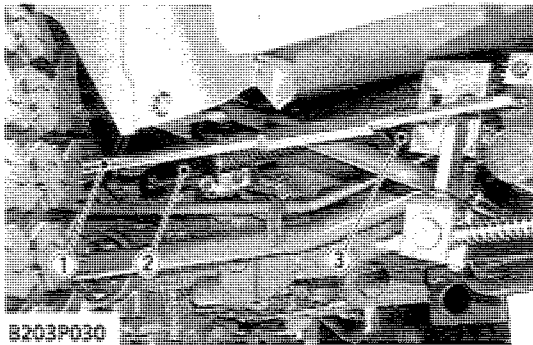
1. Rotate the neutral adjusting lever clockwise so that the rear wheels turn reverse.
2. Then rotate it counterclockwise until wheels stop completely.

(When rear wheels tend to turn reverse)

1. Rotate the neutral adjusting lever counterclockwise so that the rear wheels turn forward.
2. Then rotate it clockwise until wheels stop completely.

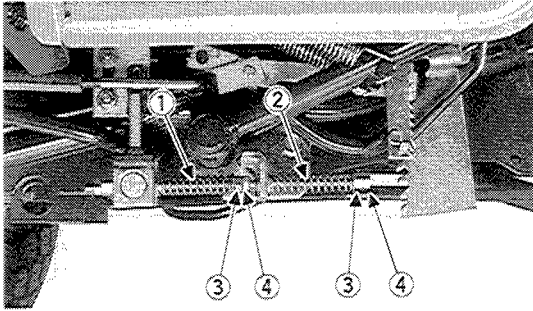
(After adjusting neutral)

1. Make sure the HST control pedal (d) is at the neutral position. (Let the pedal go from the forward to the neutral position, as well as from the rearward to the neutral position. Make sure the pedal returns to just the same neutral position.)
2. Turn the neutral position adjusting nut (11) to move the rod (12) until there is a clearance "A" 0 mm (0 in.) between the welded washer and the stay (13). (Set in position with a slight contact.) Now turn this nut counterclockwise by half a turn. Now lock the nut (10). (Be careful not overtighten the nut (11). Otherwise the HST pedal may get stuck.)
3. Finally lock the double nut (8), (9) so that the spring (4), (5), should be 64 to 66 mm (2.5 to 2.6 in.) forward and 64 to 66 mm (2.53 to 2.6 in.) rearward in length B and C.



- B203P032
- | | |
|--|-------------------------------------|
| (1) Brake Rod (RH) | (7) Adjusting Nut |
| (2) HST Pedal Damper | (8) Lock Nut |
| (3) Neutral Adjuster | (9) Lock Nut |
| (4) Return Spring (for forward adjustment) | (10) Lock Nut |
| (5) Return Spring (for reverse adjustment) | (11) Neutral Position Adjusting Nut |
| (6) Adjusting Nut | (12) Rod |
| | (13) Stay |

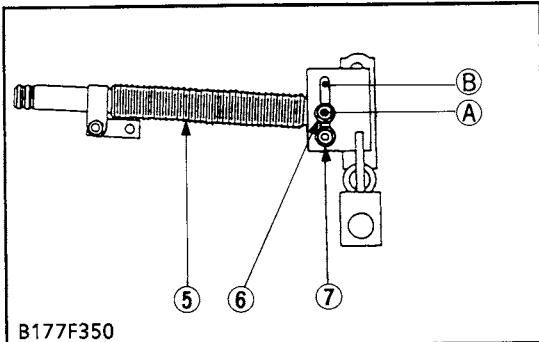
	Length (B)	Length (C)
Normal compression	65 mm (2.6 in.)	65 mm (2.6 in.)
Max. compression	42 mm (1.7 in.)	42 mm (1.7 in.)
Tightening torque	Neutral adjuster setting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft·lbs



B203P032

HST Pedal Performance

1. Set the engine speed to 1500 rpm.
2. Shift the range gear shift lever to Hi position.
3. Move the HST pedal from the forward to the neutral position to make sure that the tractor comes to a complete stop. Check the same for the movement from the rearward to the neutral position.
4. If the tractor fails to stop, take the following steps to readjust the HST pedal spring (1), (2).
To make the HST pedal return back more slowly, readjust the damper in the procedure below.



B177F350

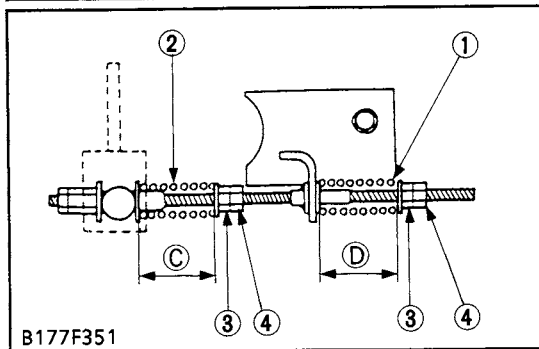
(When adjusting speed HST pedal damper)

- The damper controls HST pedal returning speed. Move the damper (5) from (A) towards (B) if slower stopping is needed.

1. Loosen the nut (6).
2. Move the damper (5) from (A) towards (B).
3. Tighten the nut (6).

IMPORTANT

- Do not loosen the nut (7) when moving damper position.
- If the pedal returns to neutral too fast when the operator removes his foot, turf damage and / or premature tire wear may occur.



B177F351

(When adjusting HST pedal returning spring)

WARNING

To avoid personal injury :

- Do not operate if tractor moves on level ground with foot off Speed Control Pedal.
- The return spring can adjust returning force of HST pedal.

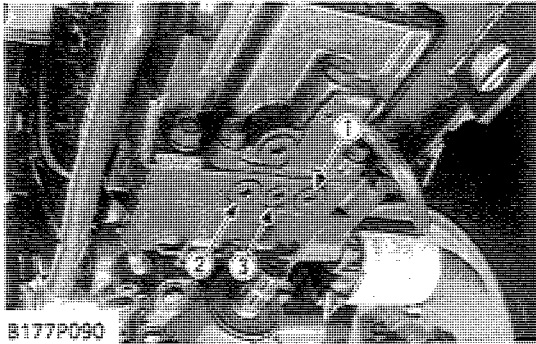
1. If HST pedal is too slow in returning to neutral position when removing the foot from HST pedal.

- | | |
|--|-----------------------------|
| (1) Return Spring (for forward adjustment) | (A) Normal Setting Position |
| (2) Return Spring (for reverse adjustment) | (B) Slower Setting Position |
| (3) Adjusting Nut | (C) Spring Length |
| (4) Lock Nut | (D) Spring Length |
| (5) Damper | |
| (6) Nut for Fixing the damper | |
| (7) Nut | |

	Length (C)	Length (D)
Normal compression	65 mm (2.6 in.)	65 mm (2.6 in.)
Max. compression	42 mm (1.7 in.)	42 mm (1.7 in.)

IMPORTANT

- Do not compress the Return Spring shorter than Max. compression length 42 mm (1.7 in.).

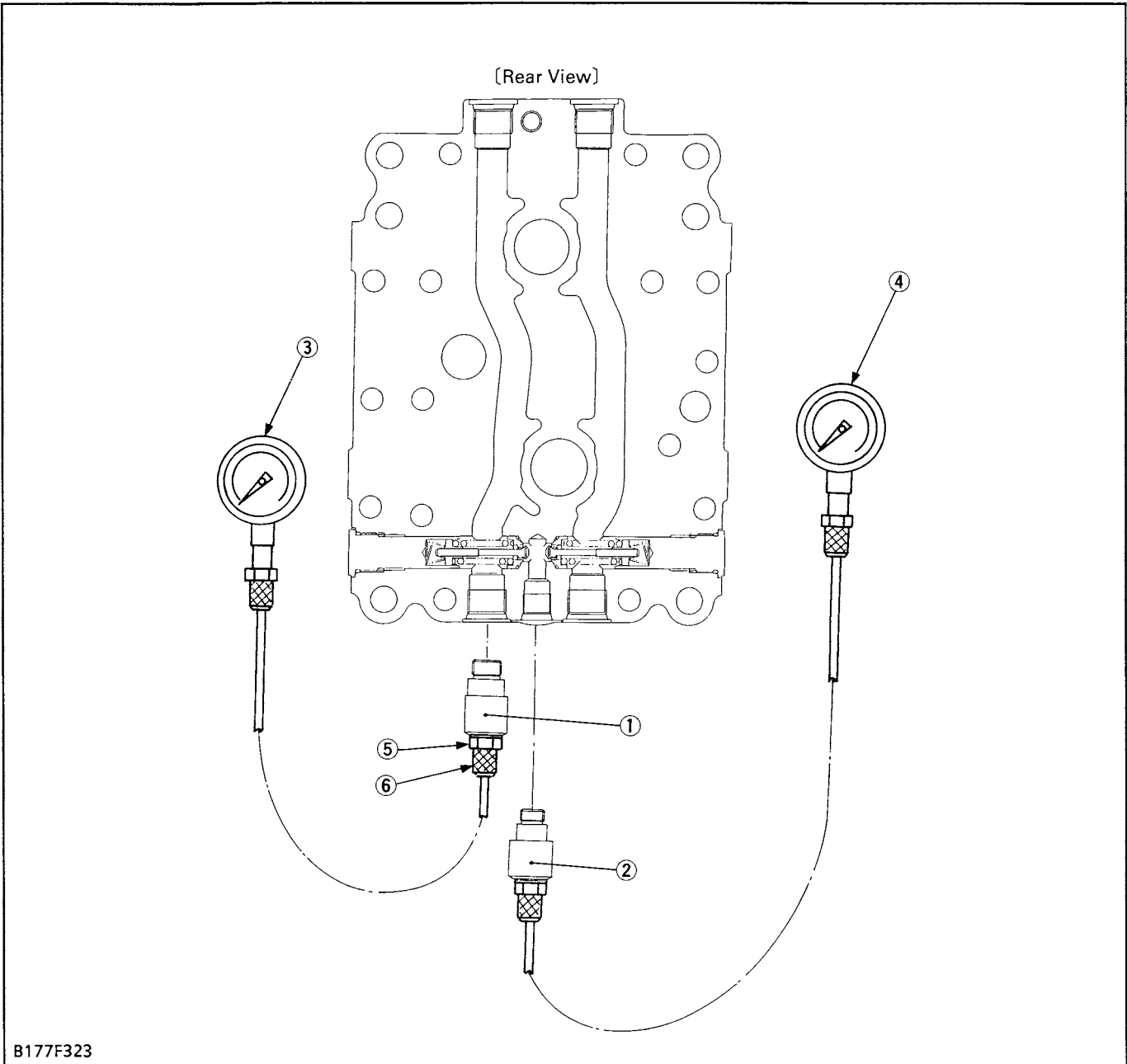


B177P090

Oil Pressure in Hydrostatic Transmission

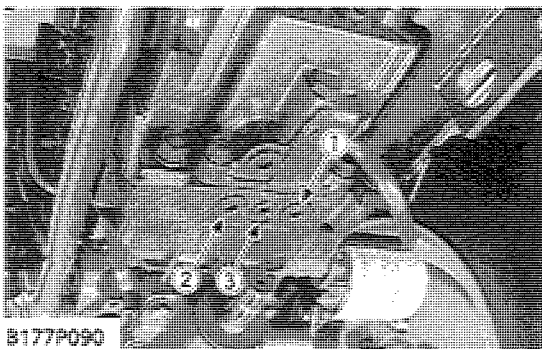
1. Clean and clear the work area, and fully engage the parking brake.
2. Measure the following oil pressures using and HST adaptor A and B (refer to G-36) as instructed.

- (1) P1 Port (High Relief Pressure for Forward)
- (2) P2 Port (High Relief Pressure for Reverse)
- (3) P3 Port (Charge Relief Pressure)



B177F323

- (1) HST Adaptor A
- (2) HST Adaptor B
- (3) Pressure Gauge (High Pressure)
- (4) Pressure Gauge (Low Pressure)
- (5) Threaded Joint
- (6) Cable



Check and High Relief Pressure

CAUTION

- When checking, park the tractor on flat ground, apply the parking brake.
1. Remove the 8 mm (0.31 in.) hex socket head plug from P1 (1) or P2 (2) port (P1 is for forward and P2 is for reverse).
 2. Assemble the HST adaptor A and threaded joint with the gasket between them.
 3. Install the assembled HST adaptor A and threaded joint to P1 (forward) (1) or P2 (reverse) (2) port.
 4. Install the cable threaded joint in relief valve set pressure tester and high pressure gauge to threaded joint in order.
 5. Run the engine at 2600 rpm.
 6. Place the high-low shift lever in high.
 7. Depress the speed control pedal approx. 10 mm (0.39 in.) which rotates the trunnion shaft 0.087 rad (5.0°).

Check and High relief pressure (Oil temperature at 50 °C, 122 °F)	Factory spec.	21.6 MPa 220 kgf/cm ² 3129 psi
---	---------------	---

IMPORTANT

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

NOTE

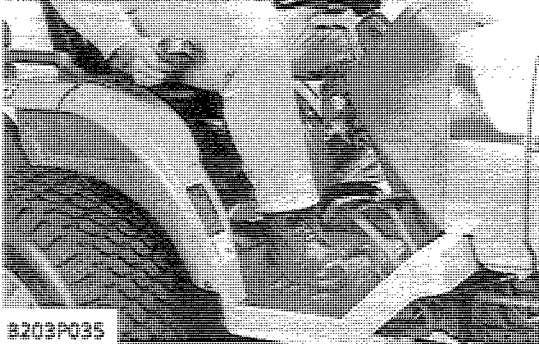
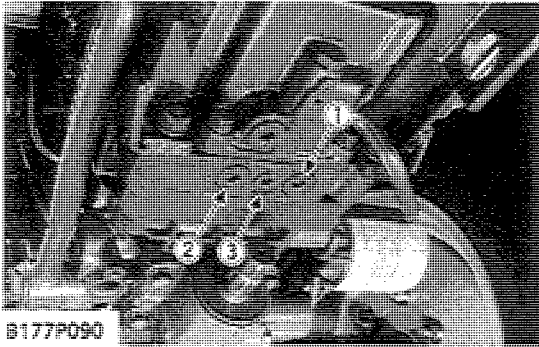
- High pressure gauge is 30 MPa (300 kgf/cm², 4260 psi) full scale.

(When reassembling)

- Install the 8 mm (0.31 in.) hex. socket head plug to the port with O-ring.

Tightening torque	Plug (P1, P2 port)	40.70 to 94.93 N·m 4.15 to 9.68 kgf·m 30.02 to 70.02 ft-lbs
-------------------	--------------------	---

- (1) P1 Port (Forward)
- (2) P2 Port (Reverse)
- (3) P3 Port (Charge)



(1) P1 Port (Forward) (3) P3 Port (Charge)
 (2) P2 Port (Reverse)

Charge Pressure

CAUTION

- When checking, park the tractor on flat ground, apply the parking brake.
1. Remove the 6 mm hex. socket head plug from P3 port (3).
 2. Assemble the HST adaptor B and thread joint with the gasket between them.
 3. Install the assembled HST adaptor B and thread joint to P3 port.
 4. Install the cable, thread joint in relief valve set pressure tester and low pressure gauge to threaded joint in order.
 5. Run the engine at 2600 rpm.
 6. Place the high-low shift lever in neutral.
 7. Release the speed control pedal to set in neutral.

Charge pressure (Oil temperature at 50 °C, 122 °F)	Factory spec.	294 to 490 kPa 3.0 to 5.0 kgf/cm ² 43 to 71 psi
--	---------------	--

NOTE

- Low pressure gauge is 2 MPa (20 kgf/cm², 284 psi) full scale.

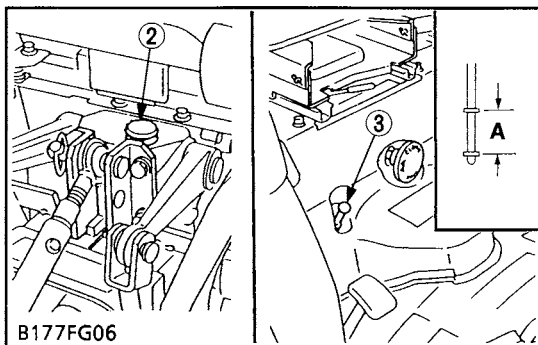
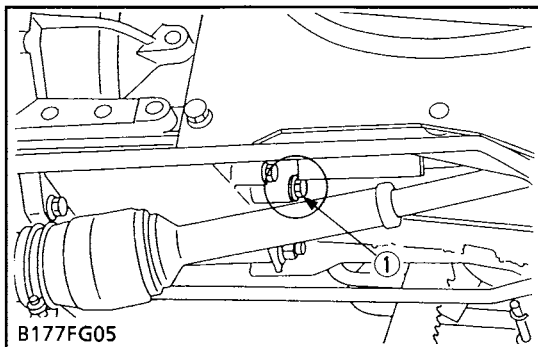
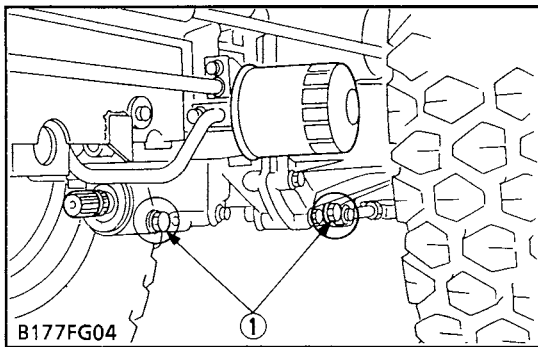
(When reassembling)

- Install the 6 mm hex. socket head plug to the P3 port with O-ring.

Tightening torque	Plug (P3 port)	21.17 to 47.47 N·m 2.77 to 4.84 kgf·m 20.04 to 35.01 ft-lbs
-------------------	----------------	---

DISASSEMBLING AND ASSEMBLING

[1] SEPARATING ENGINE FROM CLUTCH HOUSING



Drain Transmission Oil

⚠ CAUTION

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

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1) at the bottom of the transmission case to drain transmission oil.
3. Drain the transmission oil.
4. After draining, screw in the four drain plugs.

(When reassembling)

- Fill new oil from filling port after removing the filling plug (2).
- 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 AND FLUID" (See page G-8).
- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer.

Follow these air bleeding procedures.

1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system.

This is important to prevent the hydraulic pump and the HST unit from getting seized.

3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.
- Do not mix different brands oil together.

Transmission oil capacity	12.0 ℓ 3.17 U.S.gals. 2.6 Imp.gals
---------------------------	--

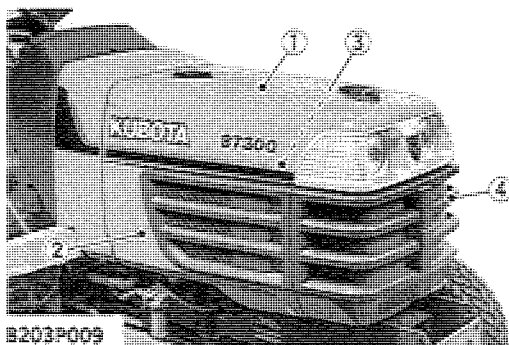
[A] Oil level acceptable within this range.

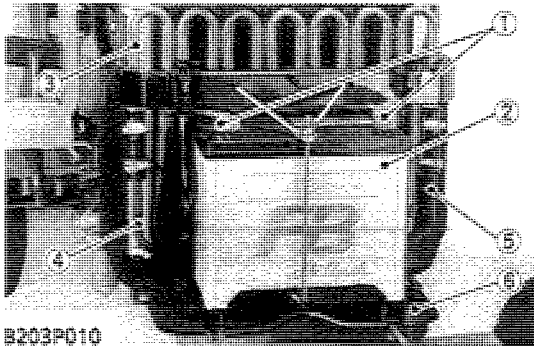
- (1) Drain Plug (3) Dipstick
(2) Filling Plug

Hood, Side Cover and Front Grille

1. Open the hood (1) from the front and remove the spring lock pin and remove hood with hood rod for keeping it open.
2. Remove the front grille (4).
3. Remove the right and left side cover (2), (3).

- (1) Hood (3) Side Cover LH
(2) Side Cover RH (4) Front Grille





B203P010

Battery, Oil Cooler and Hydraulic Pipes

1. Disconnect the battery cords (1) and remove the battery (2).
2. Loosen the clamps of hydraulic hoses and remove the battery base (6) with oil cooler (3) then remove the delivery pipe (4) and return pipe (5).

NOTE

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

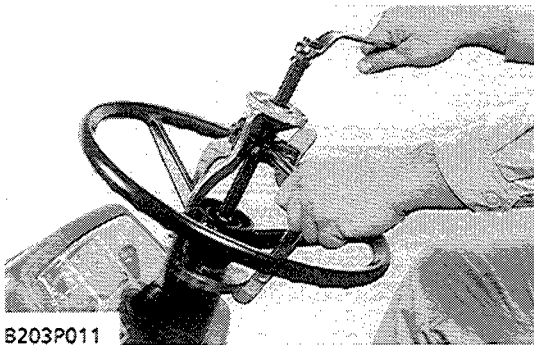
- | | |
|------------------|-------------------|
| (1) Battery Cord | (4) Delivery Pipe |
| (2) Battery | (5) Return Pipe |
| (3) Oil Cooler | (6) Battery Base |

Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel with a steering wheel puller. (Code No : 07916-51090)

(When reassembling)

Tightening torque	Steering wheel mounting nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft·lbs
-------------------	-----------------------------	---

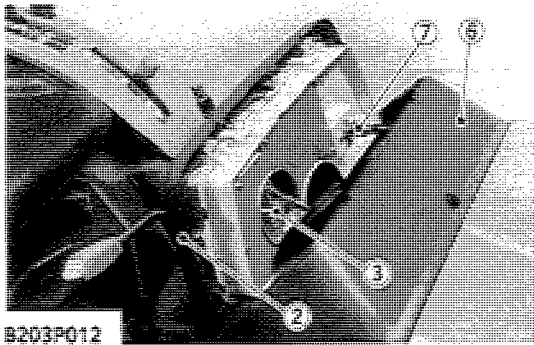


B203P011

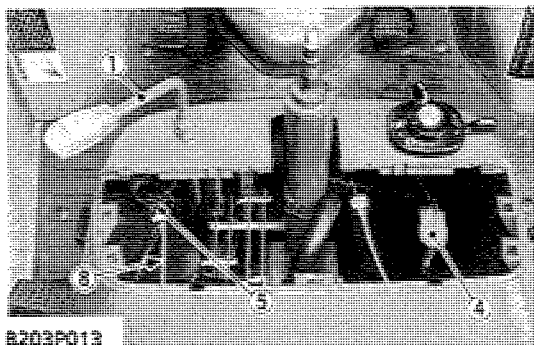
Meter Panel and Panel Under Cover

1. Remove the meter panel (2) and disconnect the meter panel connector (3) and hour-meter cable (7) from the meter panel. Then remove the meter panel.
2. Tap out the spring pin and remove the hand accelerator lever (1).
3. Disconnect the combination switch connector (4) and main switch connector (5).
4. Remove the knob of engine stop rod (8).
5. Remove the panel under cover mounting screw and remove the panel under cover (6).

- | | |
|----------------------------------|---------------------------|
| (1) Hand Accelerator Lever | (5) Main Switch Connector |
| (2) Meter Panel | (6) Panel Under Cover |
| (3) Meter Panel Connector | (7) Hour-meter Cable |
| (4) Combination Switch Connector | (8) Engine Stop Rod |



B203P012

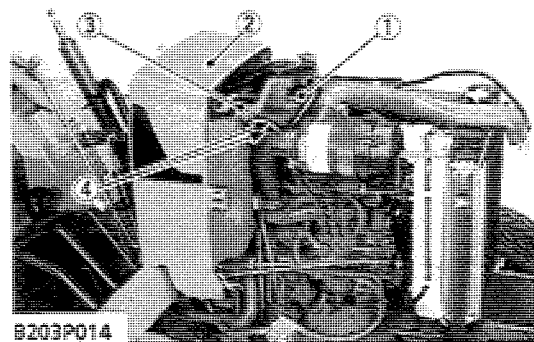


B203P013

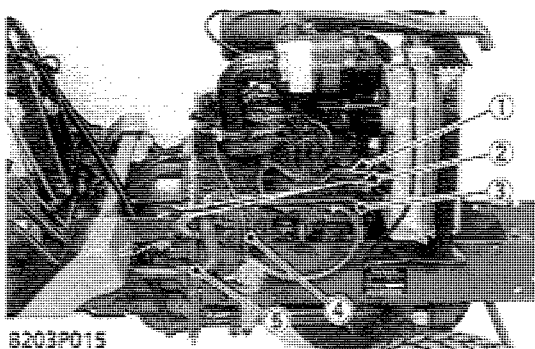
Center Pillar with Fuel Tank

1. Disconnect the fuel hose between fuel filter and fuel tank at the fuel filter side, then drain fuel completely.
2. Remove the fuel tank stay (1).
3. Disconnect the regulator and hazard unit connectors, and remove the lead wire for fuel gauge.
4. Disconnect the overflow hoses (5) of fuel line.
5. Remove the center pillar (2) with fuel tank (3).

- | | |
|--------------------|-------------------|
| (1) Fuel Tank Stay | (3) Fuel Tank |
| (2) Center Pillar | (4) Overflow Hose |



B203P014



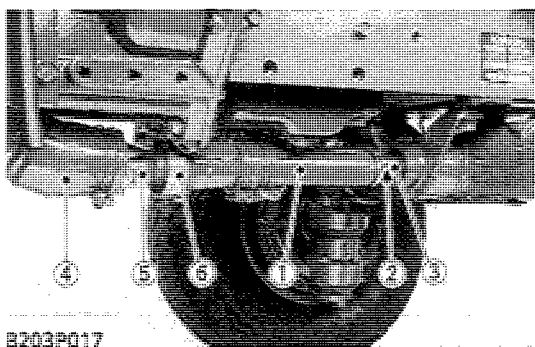
Suction Pipe, Delivery Pipes and Others

1. Remove the accelerator rod (1) and engine stop rod (2).
2. Remove the delivery pipe (2).
3. Loosen the clamp for delivery pipes, then disconnect the delivery pipe (4) for 3-point hitch from flow priority valve.
4. Loosen the clamps of suction hose (5).

(When reassembling)

Tightening torque	Delivery pipe cap screw	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft·lbs
-------------------	-------------------------	---

- | | |
|---------------------|-------------------------------------|
| (1) Accelerator Rod | (4) Delivery Pipe for 3-Point Hitch |
| (2) Engine Stop Rod | (5) Suction Hose |
| (3) Delivery Pipe | |



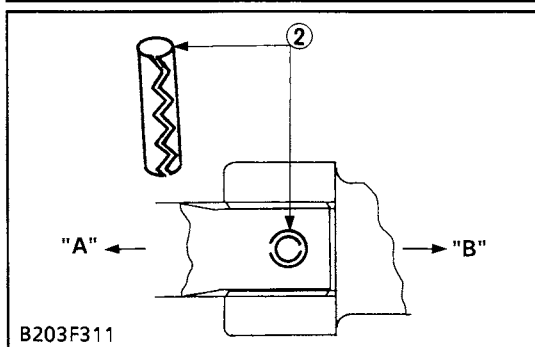
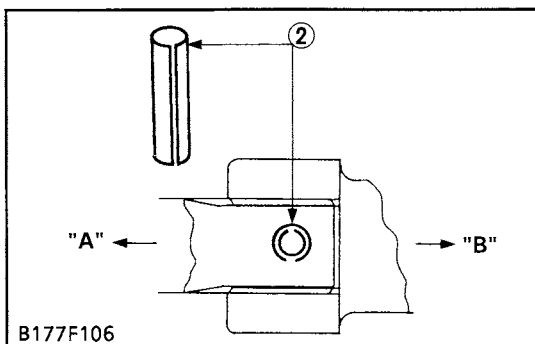
Propeller Shaft and Bearing Holder

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.
3. Loosen the clamp and slide the universal joint cover (4) to the rear.
4. Tap out the spring pin and then slide the universal joint (5) to the rear.
5. Remove the bearing holder (6) and propeller shaft cover as a unit.

(When reassembling)

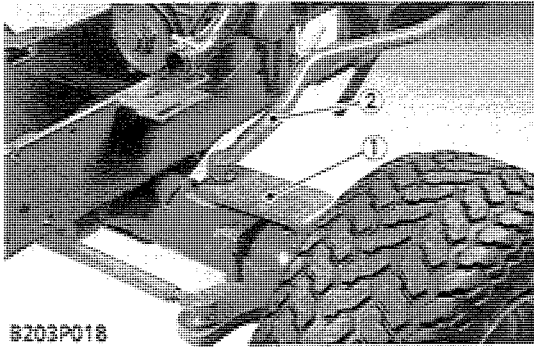
- Apply grease to the spline of the propeller shaft and coupling.
- Apply grease to the spline of the propeller shaft and universal joint.
- When inserting the spring pins (2), face their splits in the direction parallel to the universal joint as shown in the figure.

- | | |
|---------------------------|---------------------------|
| (1) Propeller Shaft Cover | (4) Universal Joint Cover |
| (2) Spring Pin | (5) Universal Joint |
| (3) Coupling | (6) Bearing Holder |



[A] Front

[B] Rear



Drag Link

1. Remove the slotted nut and disconnect the drag link (2) from the pitman arm (1).

(When reassembling)

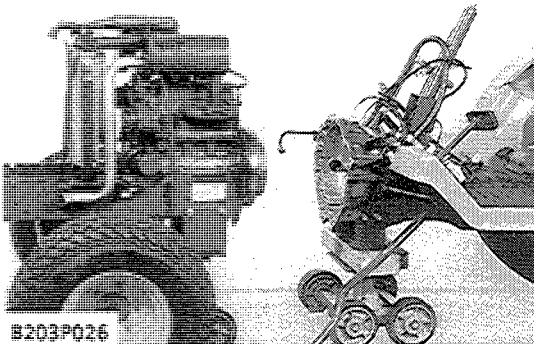
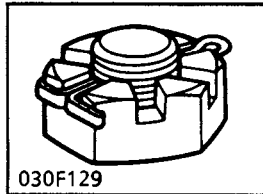
■ IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure.

Tightening torque	Slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
-------------------	-------------	---

(1) Pitman Arm

(2) Drag Link



Separating the Engine from Clutch Housing

1. Disconnect the glow plug lead wire and thermo sensor lead wire. And then disconnect the connectors for dynamo or 2P for alternator connector and starter motor lead wire.
2. Place the jack under the center frame.
3. Hoist the engine by the chain at the engine hook.
4. Remove the engine mounting screws and separate the engine from the clutch housing.

(When reassembling)

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

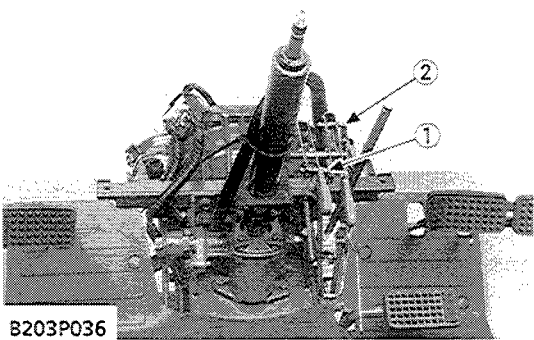
Tightening torque	Engine mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	-----------------------	---

Steering Gear Box

1. Remove the speed set rod (1) and parking brake rod (2).
2. Remove the steering gear box from center frame.

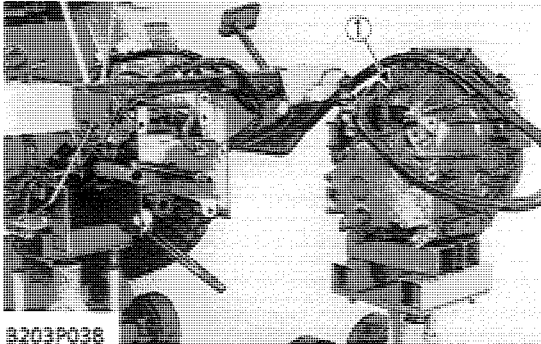
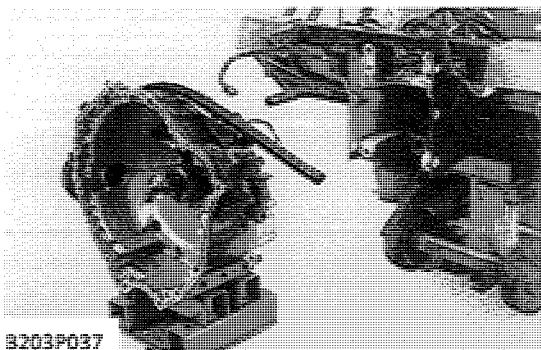
(When reassembling)

Tightening torque	Steering gear box mounting screw	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
-------------------	----------------------------------	---



(1) Speed Set Rod

(2) Parking Brake Rod



Separating Clutch Housing

1. Disconnect the clutch rod.
2. Disconnect the rubber hose (1) of hydraulic pipe.
3. Separate the clutch housing from center frame.

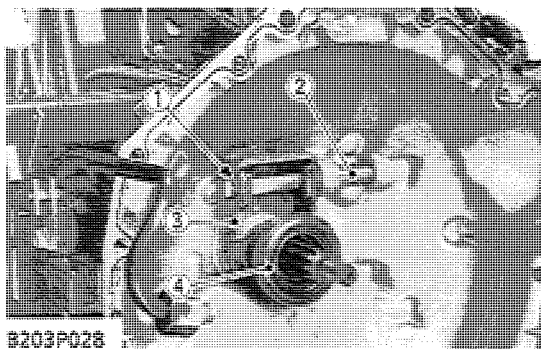
(When reassembling)

- Apply grease to the splines of propeller shaft and ball joint.
- Reinstall the connecting pipe and O-rings securely.

Tightening torque	Clutch housing mounting screw and nut	62.8 to 72.6 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs
-------------------	---------------------------------------	---

(1) Rubber Hose

[2] CLUTCH HOUSING



Clutch Rod and Release Fork

1. Remove the external snap ring (1).
2. Draw out the clutch rod (2) and remove the clutch release fork (3).
3. Take out the release hub with release bearing (4).

- (1) External Snap Ring
- (2) Clutch Rod
- (3) Clutch Release Fork
- (4) Release Bearing

Clutch Housing Rear Cover

1. Remove the clutch housing rear cover (1).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of clutch housing and rear cover (1).

Tightening torque	Clutch housing rear cover mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	--	---

(1) Clutch Housing Rear Cover

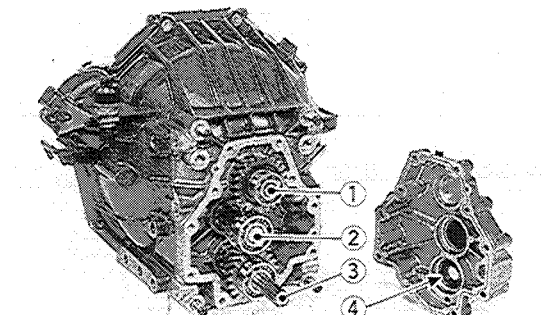
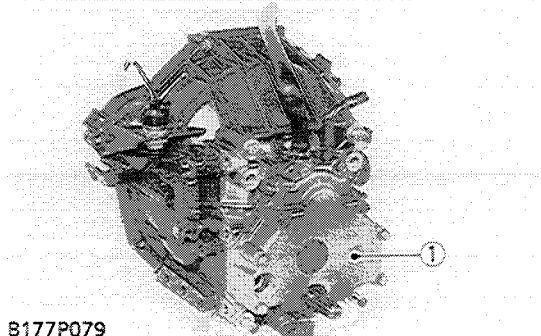
Clutch Shaft and Others

1. Pull out the clutch shaft assembly (1).
2. Pull out the 2nd gear shaft, front assembly (2).
3. Pull out the 3rd shaft, front assembly (3).

(When reassembling)

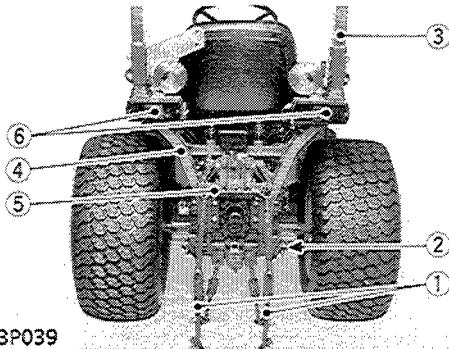
- Apply small amount of the grease to the oil seal (4).

- (1) Clutch Shaft Assembly
- (2) 2nd Gear Shaft, Front Assembly
- (3) 3rd Shaft, Front Assembly
- (4) Oil Seal



B177P080

[3] SEPARATING CENTER FRAME AND TRANSMISSION ASSEMBLY



B203P039

Roll-Over Protective Structures (ROPS) and 3 Point Hitch

1. Remove the lower link (1) and the collar from the 3-point hitch shaft (2).
2. Remove the ROPS frame top (3) mounting bolts and nuts and then remove the ROPS frame top.
3. Remove the both sides tail lamps (6) with lamp frames.
4. Remove the both sides fender mounting screws.
5. Remove the PTO shaft cover (5) and connecting plate.
6. Remove the ROPS mounting screws and then remove the ROPS frames (4) from the 3-point hitch shaft.

(When reassembling)

Tightening torque	Connecting plate mounting screw	47.1 to 56.9 N·m 4.8 to 5.8 kgf·m 34.7 to 42.0 ft-lbs
	ROPS frame and frame top mounting bolt and nut	149.1 to 179.5 N·m 15.2 to 18.3 kgf·m 109.9 to 132.4 ft-lbs
	ROPS frame mounting screw	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	3-Point hitch shaft setting screw	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 ft-lbs
	3-Point hitch shaft setting screw lock nut	43.2 to 47.1 N·m 4.4 to 4.8 kgf·m 31.8 to 34.7 ft-lbs

- | | |
|-------------------------|---------------------|
| (1) Lower Link | (4) ROPS Frame |
| (2) 3-Point Hitch Shaft | (5) PTO Shaft Cover |
| (3) ROPS Frame, Top | (6) Tail Lamp |

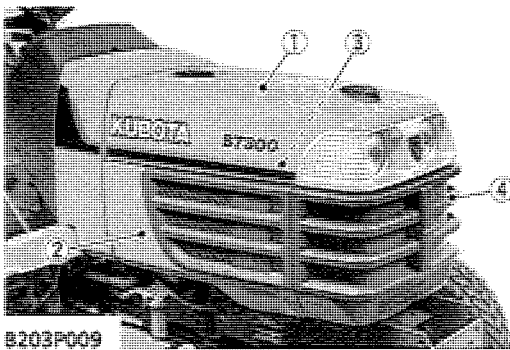
Draining Transmission Oil

Refer to 3-S11.

Hood, Side Cover and Front Grille

1. Open the hood from front and remove the spring lock pin and remove the food with hood rod for keeping it open.
2. Remove the front grille (4).
3. Remove the right and left side cover (2), (3).

- | | |
|---------------------|---------------------|
| (1) Hood | (3) Side Cover (LH) |
| (2) Side Cover (RH) | (4) Front Grille |



B203P009

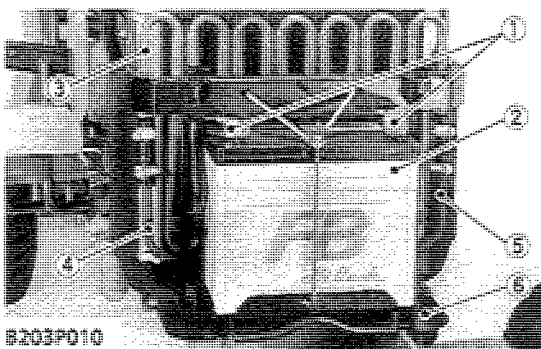
Battery

1. Disconnect the battery cords (1) and remove the battery (2).
2. Loosen the clamps of hydraulic hoses and remove the battery base (6) with oil cooler (3) then remove the delivery pipe (4) and return pipe (5).

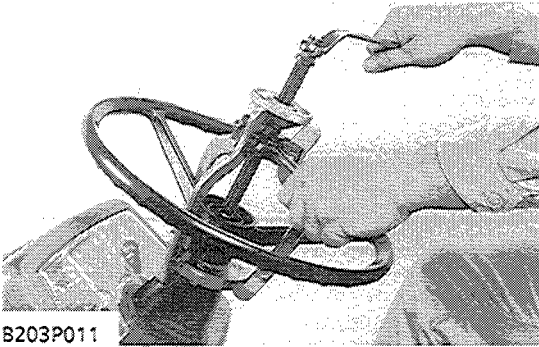
NOTE

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

- | | |
|------------------|-------------------|
| (1) Battery Cord | (4) Delivery Pipe |
| (2) Battery | (5) Return Pipe |
| (3) Oil Cooler | (6) Battery Base |



B203P010



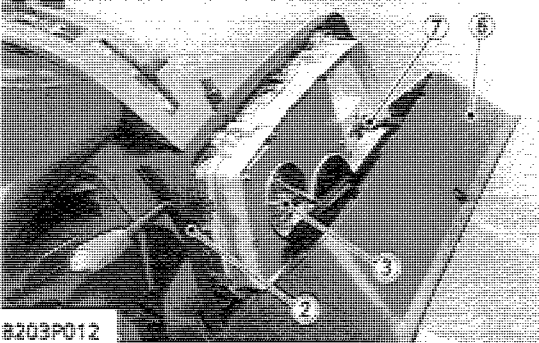
B203P011

Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel with a steering wheel puller. (Code No. 07916-51090)

(When reassembling)

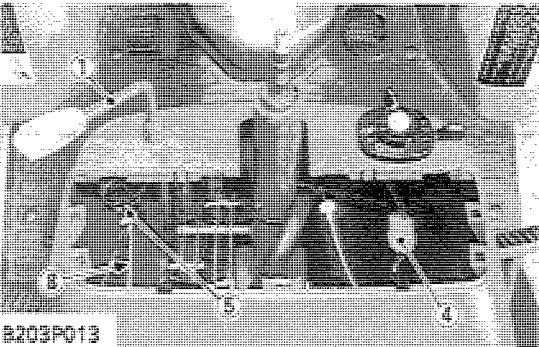
Tightening torque	Steering wheel mounting nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft·lbs
-------------------	-----------------------------	---



B203P012

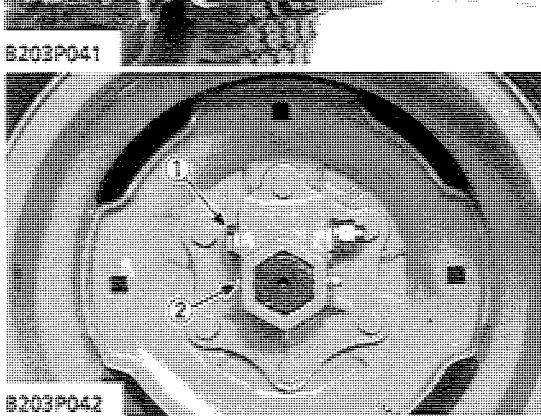
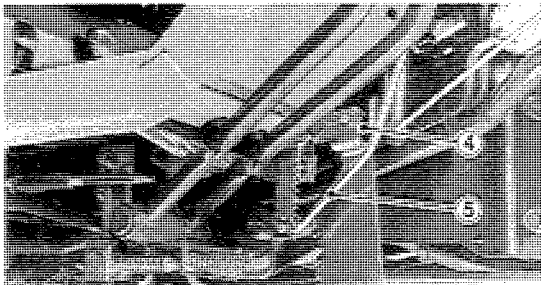
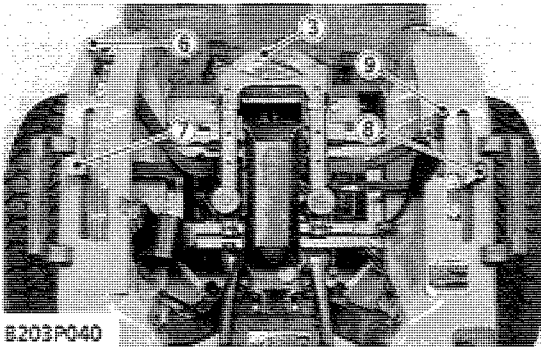
Meter Panel and Panel Under Cover

1. Remove the meter panel (2) and disconnect the meter panel connector (3) and hour-meter cable from the meter panel. Then remove the meter panel.
2. Tap out the spring pin and remove the hand accelerator lever (1).
3. Disconnect the combination switch connector (4) and main switch connector (5).
4. Remove the knob of engine stop rod (8).
5. Remove the panel under cover mounting screw and remove the panel under cover (6).



B203P013

- | | |
|----------------------------------|---------------------------|
| (1) Hand Accelerator Lever | (5) Main Switch Connector |
| (2) Meter Panel | (6) Panel Under Cover |
| (3) Meter Panel Connector | (7) Hour-meter Cable |
| (4) Combination Switch Connector | (8) Engine Stop Rod |



Step, Fender, Tire and Seat

1. Remove the seat, lowering speed adjusting knob and seat under cover (3).
2. Remove the rubber mat.
3. Disconnect the speed set rod (4) and parking brake rod (5).
4. Remove the clutch and brake springs.
5. Remove the left and right hand sides steps.
6. Remove the cotter (1) setting bolt and nut, then place the jack under the transmission case, and set the rigid rack under the rear axles.
7. Take out the wheel hub pin (2) and remove the rear wheels.
8. Remove the seat.
9. Remove the Hi-Lo gear shift lever grip (6), PTO gear shift lever grip (7), and front wheel drive lever grip (8).
10. Disconnect the hydraulic control lever (9) from control lever arm.
11. Disconnect the wire harness and remove the left and right hand side fenders.
12. Remove the tool box and seat stay with seat rail.

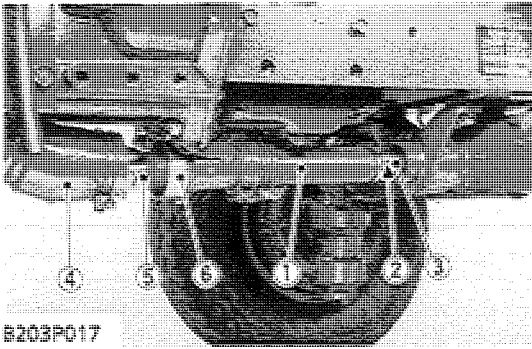
■ IMPORTANT

- When refitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and there after daily check service.

(When reassembling)

Tightening torque	Rear wheel cotter setting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 ft·lbs
-------------------	--	--

- | | |
|---|--|
| <ul style="list-style-type: none"> (1) Cotter (2) Wheel Hub Pin (3) Seat Under Cover (4) Speed Set Rod (5) Parking Brake Rod | <ul style="list-style-type: none"> (6) Hi-Lo Gear Shift Lever Grip (7) PTO Gear Shift Lever Grip (8) Hydraulic Control Lever Grip (9) Front Wheel Drive Lever Grip |
|---|--|



B203P017

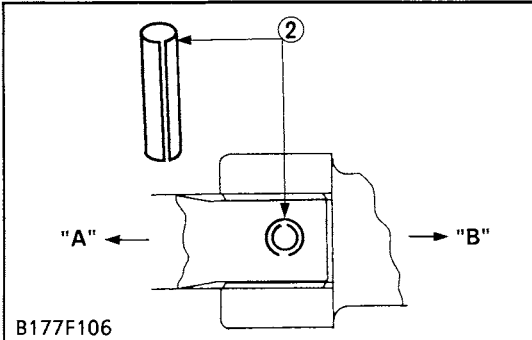
Propeller Shaft and Bearing Holder

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.
3. Loosen the clamp and slide the universal joint cover (4) to the rear.
4. Tap out the spring pin and then slide the universal joint (5) to the rear.
5. Remove the bearing holder (6) and propeller shaft cover as a unit.

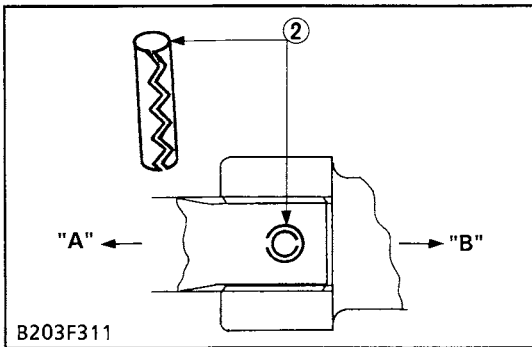
(When reassembling)

- Apply grease to the spline of the propeller shaft and coupling.
- Apply grease to the spline of the propeller shaft and universal joint.
- When inserting the spring pins (2), face their splits in the direction parallel to the universal joint as shown in the figure.

- | | |
|---------------------------|---------------------------|
| (1) Propeller Shaft Cover | (4) Universal Joint Cover |
| (2) Spring Pin | (5) Universal Joint |
| (3) Coupling | (6) Bearing Holder |



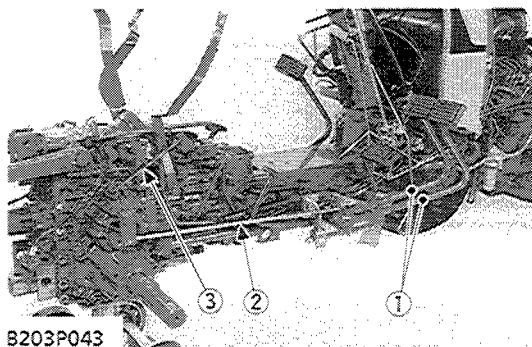
B177F106



B203F311

[A] Front

[B] Rear

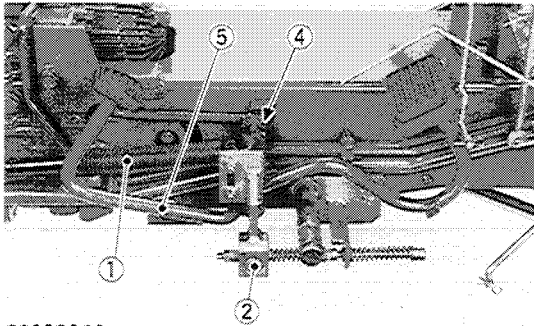


B203P043

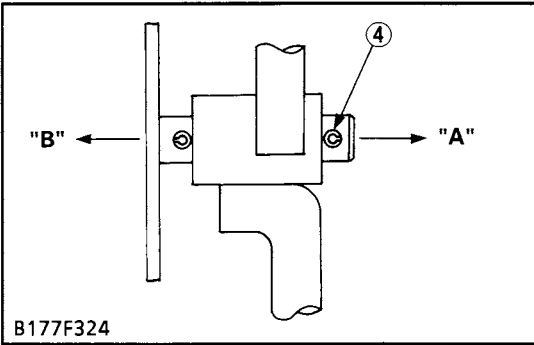
Brake Pedals

1. Remove the brake pedal rods (2).
2. Remove the external circlip and brake pedals (1).
3. Remove the differential lock rod (3).

- | | |
|---------------------|---------------------------|
| (1) Brake Pedal | (3) Differential Lock Rod |
| (2) Brake Pedal Rod | |



B203P044



B177F324

[A] Outside

[B] Inside

- (1) Damper
- (2) HST Pedal Spring assembly

- (3) Spring Pin
- (4) Spring Lock Pin
- (5) HST Pedal

HST Pedal

1. Remove the damper (1).
2. Remove the HST pedal spring assembly (2).
3. Tap out the spring pin (3) and remove the spring lock pin (4), then remove the HST pedal (5).

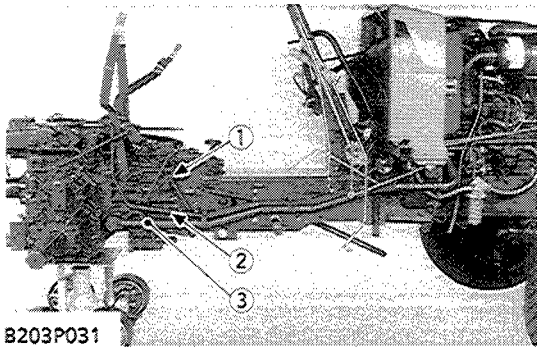
(When reassembling)

- Tap in the spring pin (3) as shown in the figure.

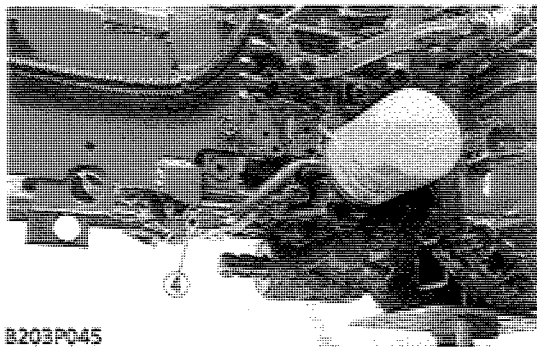
NOTE

- After reassembling the HST pedal spring assembly, must adjust the spring force and check the pedal performance (See page 3-S7).

Tightening torque	Stay mounting screw (M12)	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Arm mounting bolt and nut (M8)	23.5 to 29.8 N·m 2.4 to 2.8 kgf·m 17.3 to 20.5 ft-lbs
	Damper adjusting nut	23.5 to 29.8 N·m 2.4 to 2.8 kgf·m 17.3 to 20.5 ft-lbs



B203P031



B203P045

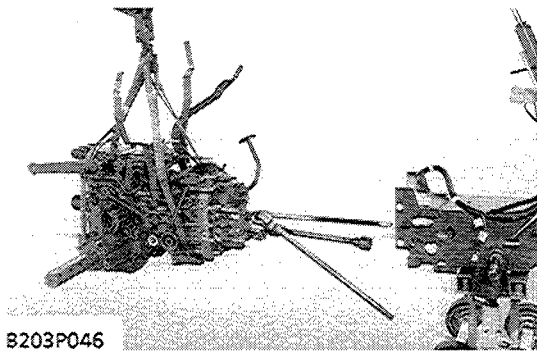
Suction Pipe, Delivery Pipe, Hydraulic Pipes and Rods

1. Loosen the transmission oil filter bracket mounting screw and remove the hydraulic pipe (4) from transmission oil filter bracket to HST housing.
2. Remove the three clamps.
3. Remove the return pipe (1) from clutch housing.
4. Remove the delivery pipe (2) for 3-point hitch.
5. Remove the transmission oil strainer and disconnect the suction pipe (3).

(When reassembling)

Tightening torque	Joint bolt for delivery pipe	34.3 to 44.1 N·m 3.5 to 4.5 kgf·m 25.3 to 32.5 ft-lbs
-------------------	------------------------------	---

- (1) Return Pipe (from Clutch Housing)
- (2) Delivery Pipe
- (3) Suction Pipe
- (4) Hydraulic Pipe



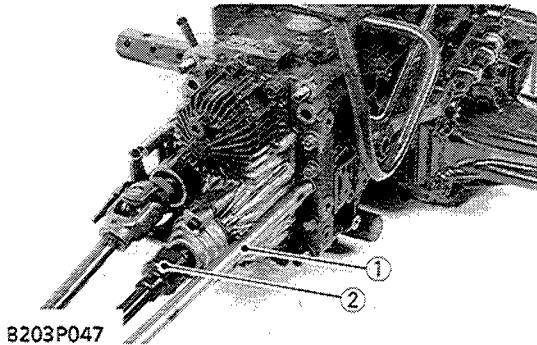
B203P046

Separating Transmission Assembly

1. Place the jacks under the transmission case and center frame.
2. Remove the center frame mounting screws and nuts, and separate the transmission assembly from center frame.

(When reassembling)

- Apply grease to the splines of HST pump shaft, 2nd gear shaft and ball coupling.
- Reinstall the connecting pipe and two O-rings securely.



B203P047

Propeller Shaft and Connecting Pipe

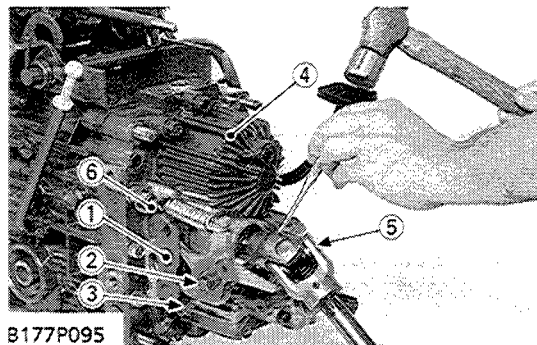
1. Remove the connecting pipe (1) and propeller shaft (2) with ball coupling.

(When reassembling)

- Apply grease to the splines of the front wheel drive shaft, universal joint and ball coupling.

(1) Connecting Pipe

(2) Propeller Shaft



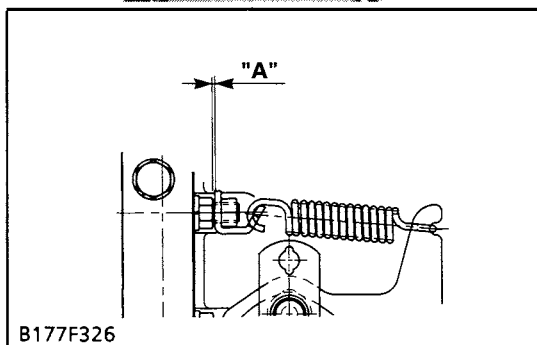
B177P095

Separating Hydrostatic Transmission

1. Tap out the spring pins and remove the universal joint (5) with front wheel propeller shaft.
2. Remove the neutral adjuster setting screw (2) and loosen the trunnion control lever mounting bolt and nut (3). Then remove the trunnion control lever assembly (1).
3. Remove the hydrostatic transmission mounting screws and nuts, and separate the hydrostatic transmission (4) from the transmission case.

(When reassembling)

- When assembling the neutral spring bracket (3), adjust the clearance "A" between nut and bracket shown in the figure.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the HST and transmission case.
- When inserting the spring pins (7), face their splits in the direction parallel to the universal joint as shown in the figure below.

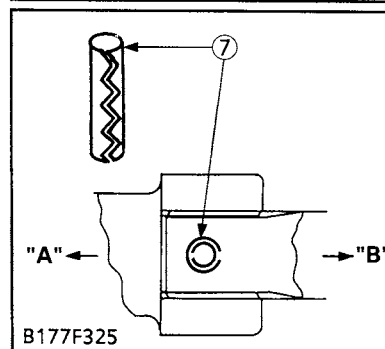


B177F326

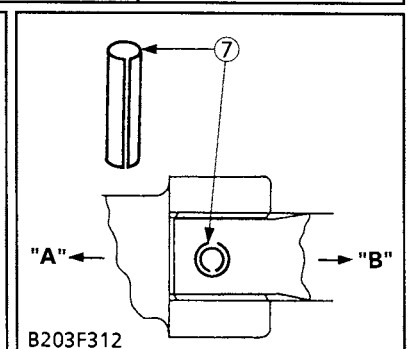
Clearance : "A"	Less than 1 mm 0.039 in.
-----------------	-----------------------------

- | | |
|--|------------------------------|
| (1) Trunnion Control Lever Assembly | (4) Hydrostatic Transmission |
| (2) Setting Screw | (5) Universal Joint |
| (3) Trunnion Control Lever Mounting Bolt | (6) Neutral Spring Bracket |
| | (7) Spring Pin |

Tightening torque	Trunnion control lever mounting bolt and nut	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
	HST mounting screw and nut	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs



B177F325

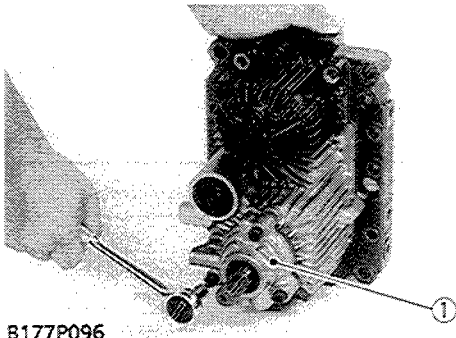


B203F312

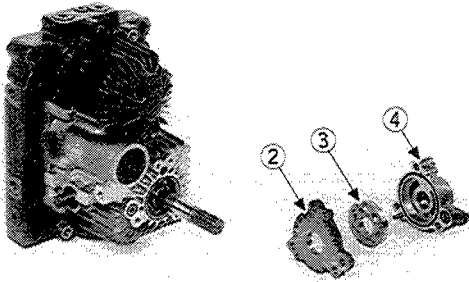
[A] Front

[B] Rear

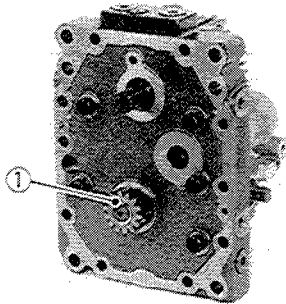
[4] TRANSMISSION CASE



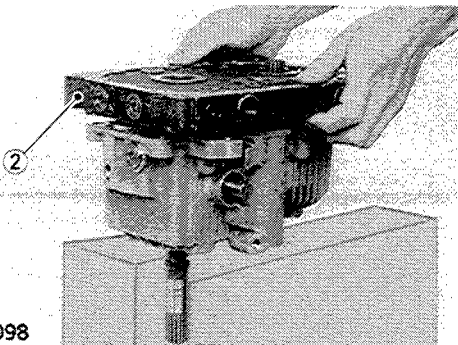
B177P096



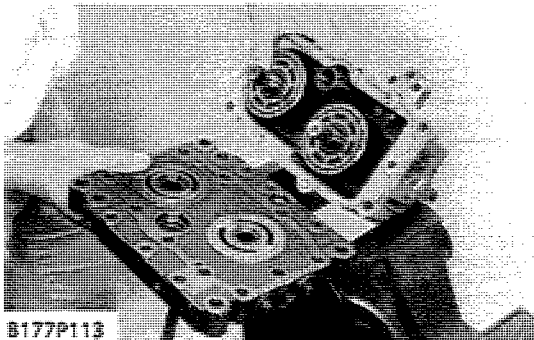
B177P108



B177P097



B177P098



B177P113

Charge Pump Housing and Spacer

1. Remove the charge pump mounting hex. socket head screw, and remove the charge pump assembly (1) from the HST housing.
2. Remove the charge pump spacer (2) from the charge pump assembly.

(When reassembling)

■ **NOTE**

- Take care not to damage the O-rings.

Tightening torque	Charge pump mounting hex. socket head screw	15.7 to 20.6 N·m 1.6 to 2.1 kgf·m 11.6 to 15.2 ft-lbs
-------------------	---	---

- | | |
|--------------------------|-------------------------|
| (1) Charge Pump Assembly | (3) Gerotor Assembly |
| (2) Spacer | (4) Charge Pump Housing |

Center Section

1. Remove the external snap ring and 14T gear (1).
2. Remove the center section mounting hex. socket head screw.
3. Lift and remove the center section (2) from the HST housing.

(When reassembling)

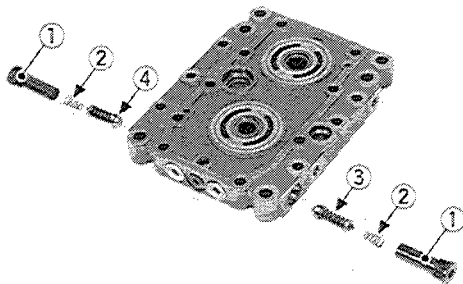
- Place a new gasket on the housing.
- Press the cylinder block (motor side) by hand then softly reinstall the counter section shown in the photo below. Be careful the pistons for come off from the cylinder block.
- Install the snap ring with its rounded edge facing the gear so that its sharp edge in the groove keep itself in place against the face.

■ **NOTE**

- Take care not to damage the surface of cylinder blocks, pistons and surface of center section.

Tightening torque	Center section mounting hex. socket head screw	40.2 to 44.1 N·m 4.0 to 4.5 kgf·m 29.7 to 32.5 ft-lbs
-------------------	--	---

- | | |
|--------------|--------------------|
| (1) 14T Gear | (2) Center Section |
|--------------|--------------------|



B177P099

Check and High Pressure Relief Valve

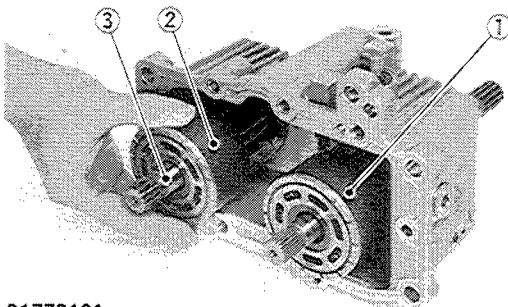
1. Remove the hex. socket head plug (1) and remove the spring (2) and relief valve assembly (3), (4).

(When reassembling)

- Take care not to damage the O-ring on the plug.

Tightening torque	Hex. socket head plug	40.70 to 94.93 N·m 4.15 to 9.68 kgf·m 30.02 to 70.02 ft-lbs
-------------------	-----------------------	---

- | | |
|------------|---|
| (1) Plug | (3) Check and High Pressure Relief Valve Assembly (Forward) |
| (2) Spring | (4) Check and High Pressure Relief Valve Assembly (Reverse) |



B177P101

Cylinder Block Assembly and Thrust Ball Bearing

1. Lay the housing on its side.
2. Remove the cylinder block assembly (pump side) (1).
3. Remove the cylinder block assembly (motor side) (2) with the motor shaft (3).
4. Remove the thrust ball bearing (4).

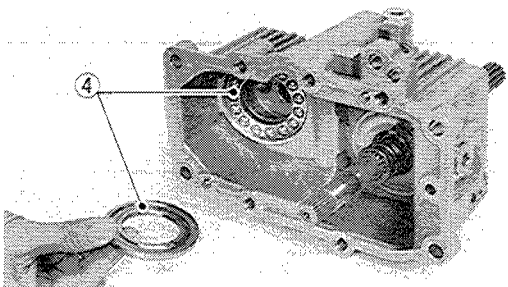
(When reassembling)

- Apply clean hydrostatic transmission oil to thrust ball bearing, cylinder block and piston.

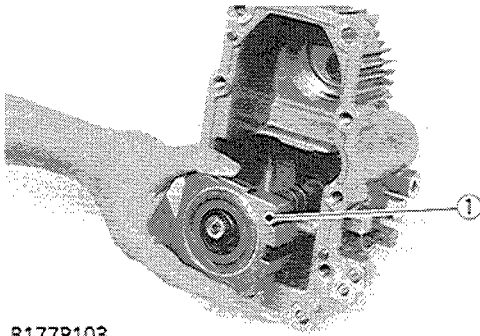
NOTE

- Take care not to damage the surface of cylinder blocks and pistons.

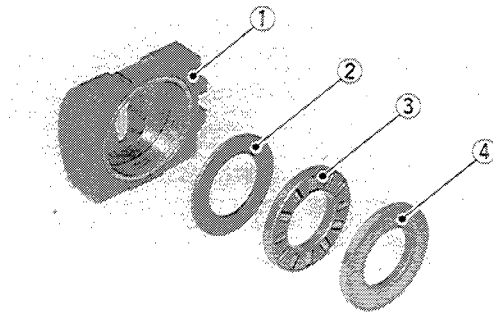
- | | |
|--|-------------------------|
| (1) Cylinder Block Assembly (Pump Side) | (3) Motor Shaft |
| (2) Cylinder Block Assembly (Motor Side) | (4) Thrust Ball Bearing |



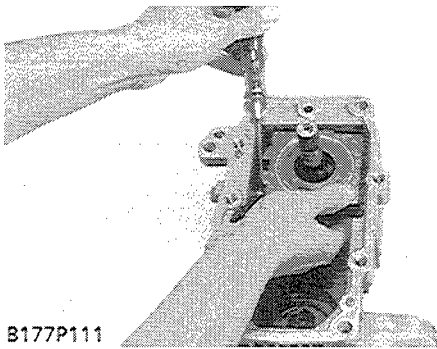
B177P102



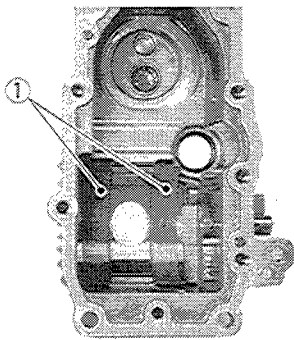
B177P103



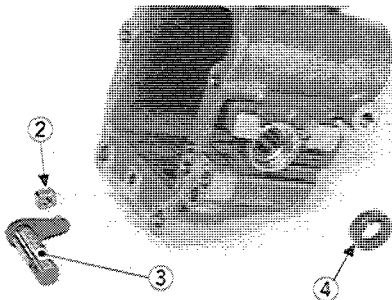
B083P069



B177P111



B177P104



B177P106

Swashplate

1. Remove the swashplate (1) from the housing.
2. Remove the thrust plate (4), thrust roller bearing (3) and thrust washer (2) from the swashplate.

(When reassembling)

- Apply clean hydrostatic transmission oil to the thrust roller bearing.
- Place the swashplate (1) into the housing, align the groove of swashplate and slot guide by keeping the slot guide from moving with a screw driver.

- | | |
|-------------------|---------------------------|
| (1) Swashplate | (3) Thrust Roller Bearing |
| (2) Thrust Washer | (4) Thrust Plate |

Slot Guide, Cradle Bearing and Trunnion Arm

1. Remove the slot guide (2) from the trunnion arm.
2. Remove the cradle bearing (1) from the housing.
3. Remove the trunnion arm (3).
4. Remove the oil seal (4) with a screw driver.

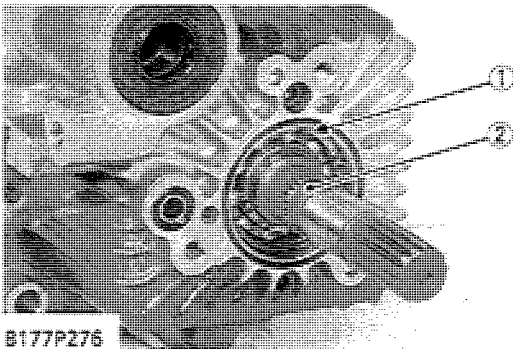
(When reassembling)

- Apply clean hydrostatic transmission oil to journal bearing, trunnion arm and cradle bearing.

■ NOTE

- Take care not to damage the housing.

- | | |
|--------------------|------------------|
| (1) Cradle Bearing | (3) Trunnion Arm |
| (2) Slot Guide | (4) Oil Seal |

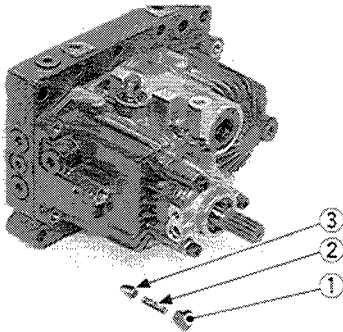


B177P276

Pump Shaft

1. Remove the internal snap ring (1).
2. Tap the pump shaft (2) with a plastic hammer slightly to slide out it from the housing.

- (1) Internal Snap Ring (2) Pump Shaft



B177P109

Charge Relief Valve

1. Remove the charge relief valve plug (1).
2. Remove the spring (2) and charge relief cone (3).

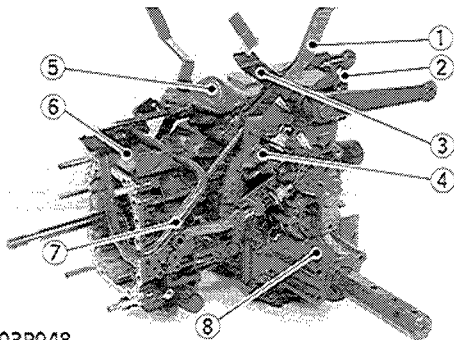
(When reassembling)

NOTE

- If shims are placed at the bottom of the relief valve plug bore, place them as they are.
- Take care not to damage the O-ring on the relief plug.

Tightening torque	Charge relief valve plug	14.22 to 23.54 N·m 1.45 to 2.40 kgf·m 10.49 to 17.36 ft-lbs
-------------------	--------------------------	---

- (1) Plug (2) Spring (3) Charge Relief Cone



B203P048

Separating Hydraulic Cylinder and Rear Axle Case

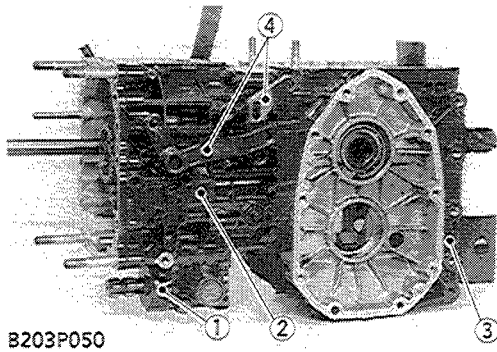
1. Remove the lock plate for fulcrum shaft (4) and then remove the PTO shift lever (1) with rod and auxiliary speed change lever (3) as a unit.
2. Remove the top link bracket (LH) (2).
3. Remove the hydraulic cylinder mounting screws and dismount the hydraulic cylinder assembly (5).
4. Remove the differential lock pedal support (6) with differential lock pedal (7).
5. Remove the rear axle case (8).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the differential lock support and the transmission case, differential case and the hydraulic cylinder, differential case and the rear axle case.

Tightening torque	Top link bracket mounting screw	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Hydraulic cylinder mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
	Differential lock pedal support mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Rear axle 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) PTO Shift Lever (2) Top Link Bracket (LH) (3) Aux. Speed Change Lever (4) Fulcrum Shaft (5) Hydraulic Cylinder Assembly (6) Differential Lock Pedal Support (7) Differential Lock Pedal (8) Rear Axle Case



Separating Mid-PTO Case and Transmission Case

1. Remove the shift lever arms (4).
2. Remove the mid-PTO case mounting screws and separate the mid-PTO case (1) from transmission case.
3. Remove the transmission case mounting screws and nuts and separate the transmission case (2) from the differential case (3).

(When reassembling)

- Apply liquid gasket (three Bond 1208D or equivalent) to joint face of the transmission case, differential case and mid-PTO case.

Tightening torque	Mid-PTO case mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
	Transmission case mounting screw and nut	

- (1) Mid-PTO Case (3) Differential Case
 (2) Transmission Case (4) Shift Lever Arm

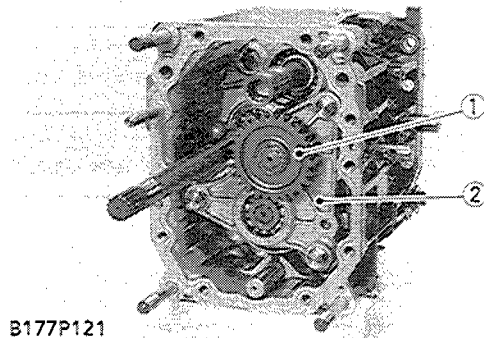
Bearing Holder

1. Remove the external snap ring and remove the 27T gear (1).
2. Remove the bearing holder mounting screws and remove the bearing holder (2).

(When reassembling)

Tightening torque	Bearing support mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
-------------------	--------------------------------	---

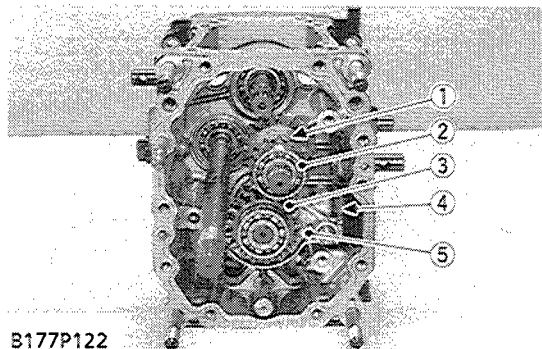
- (1) 27T Gear (2) Bearing Holder



2nd Gear Shaft and 13T-17T Shifter Gear

1. Remove the 2nd gear shaft (1) with bearings.
2. Remove the bearing (2), 13T-17T shifter gear (3) and shift fork (5) with shift rod.
3. Remove the shift lever (4).

- (1) 2nd Gear Shaft (4) Shift Lever
 (2) Bearing (5) Shift Fork
 (3) 13T-17T Shifter Gear



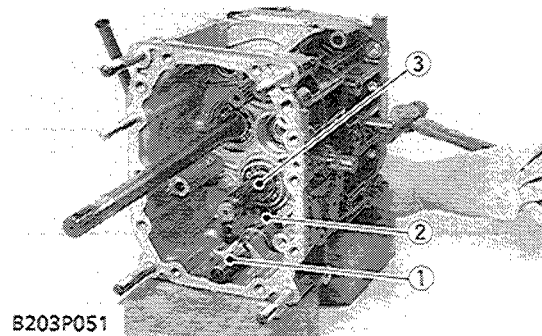
Middle Shaft and 3rd Shaft

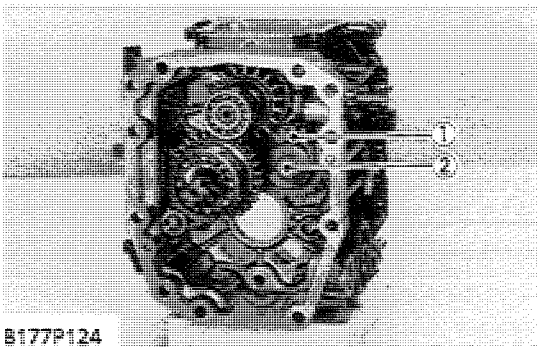
1. Tap out the middle shaft (1) and remove the 19T gear (2) with bearing.
2. Draw out the 3rd shaft (3).

(When reassembling)

- When assembling the 19T gear (2), face the chamber side to the rear.

- (1) Middle Shaft (3) 3rd Shaft
 (2) 19T Gear



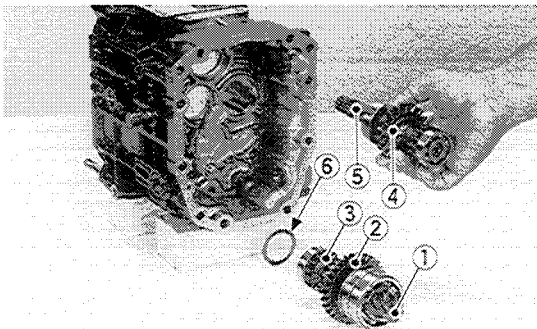


B177P124

Front Wheel Drive Shaft

1. Remove the external snap ring and remove the 20T shifter gear (1).
2. Draw out the front wheel drive shaft (2) to the front.

- | | |
|----------------------|-----------------------------|
| (1) 20T Shifter Gear | (2) Front Wheel Drive Shaft |
|----------------------|-----------------------------|



B177P125

4th Gear Shaft and Spiral Bevel Pinion Shaft

1. Remove the spiral bevel pinion shaft (1) with 15T-29T shifter gear (2) and 13T gear (3).
2. Remove the 4th gear shaft (5) with 18T gear (4).

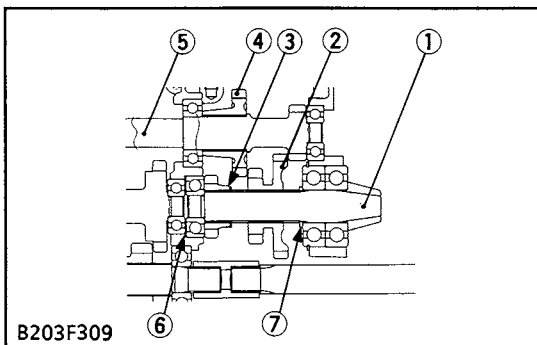
(When reassembling)

- When installing the spiral bevel pinion shaft, be sure to install the shim (6).

NOTE

- If the spiral bevel pinion shaft was disassembled, replace the external snap ring (7) with new one.

- | | |
|-------------------------------|------------------------|
| (1) Spiral Bevel Pinion Shaft | (5) 4th Gear Shaft |
| (2) 15T-29T Shifter Gear | (6) Shim |
| (3) 13T Gear | (7) External Snap Ring |
| (4) 18T Gear | |



B203F309

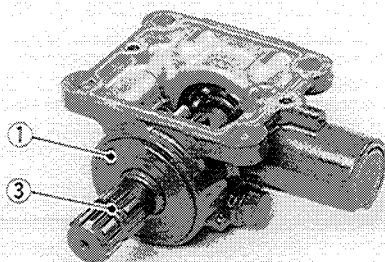
Mid-PTO Shaft

1. Remove the oil seal (1) and internal snap ring (2).
2. Remove the mid-PTO shaft (3) with bearings (4).

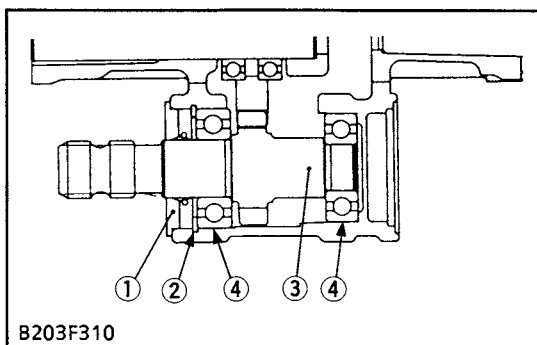
(When reassembling)

- Apply grease to lip and outer of oil seal.

- | | |
|------------------------|-------------------|
| (1) Oil Seal | (3) Mid-PTO Shaft |
| (2) Internal Snap Ring | (4) Bearing |

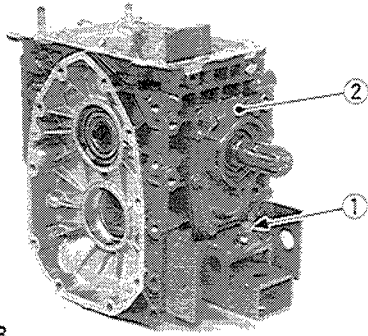


B203P052



B203F310

[5] DIFFERENTIAL GEAR CASE



B203P053

5th Gear Shaft and Rear-PTO Shaft

1. Remove the lower link pin set bolt (1).
2. Remove the rear-PTO cover mounting screw and remove the rear-PTO cover assembly (2).

(When reassembling)

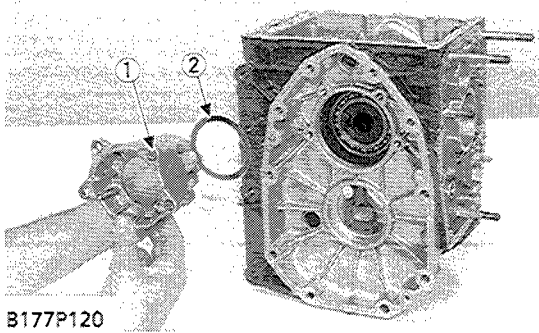
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of differential case and rear-PTO cover.

NOTE

- Do not tighten the rear-PTO cover mounting screws before reassembling the differential case and transmission case.

Tightening torque	Rear-PTO cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
-------------------	-------------------------------	---

(1) Set Bolt (2) Rear-PTO Cover Assembly



B177P120

Removing Differential

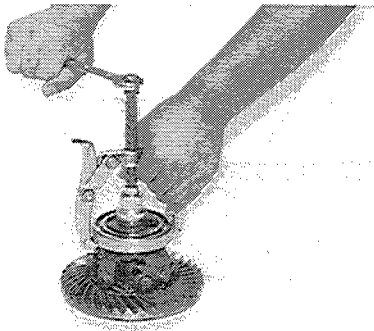
1. Remove the bearing holder mounting screws and remove the differential bearing holder (1).
2. Remove the differential assembly.

(When reassembling)

- Install the differential assembly, noting the number of shims (2) in the differential case left side and differential bearing holder.

Tightening torque	Differential bearing holder mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
-------------------	--	---

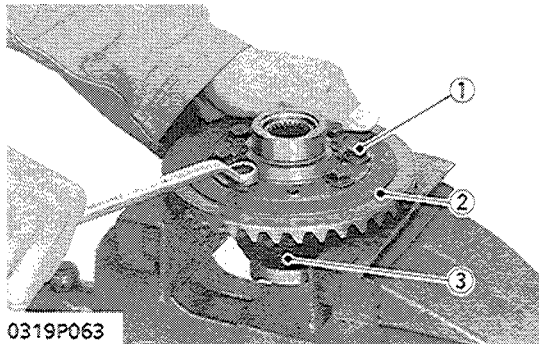
(1) Differential Bearing Holder (2) Shim



0302P073

Bearings

1. Remove the right and left bearings from the differential case.



0319P063

Spiral Bevel Gear

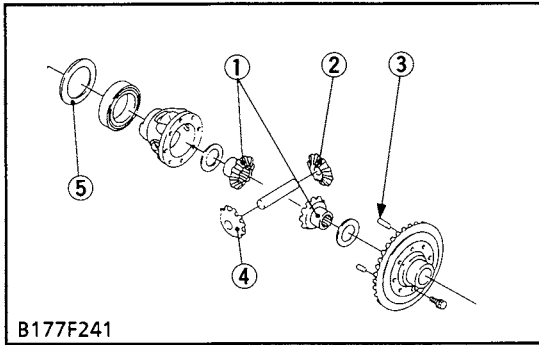
1. Remove the bevel gear UBS screws (1).
2. Remove the spiral bevel gear (2) from differential case (3).

(When reassembling)

- Apply liquid lock (Three Bond 1324B or equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
-------------------	-----------------------------	---

(1) UBS Screw (2) Spiral Bevel Gear (3) Differential Case



Differential Side Gear and Differential Pinion

1. Put parting marks on the differential pinion (2) and the differential side gear (1).
2. Tap out the dowel pin (3).
3. Remove the differential pinion shaft.
4. Remove the differential pinion (4), differential side gear (2) and shim (5).

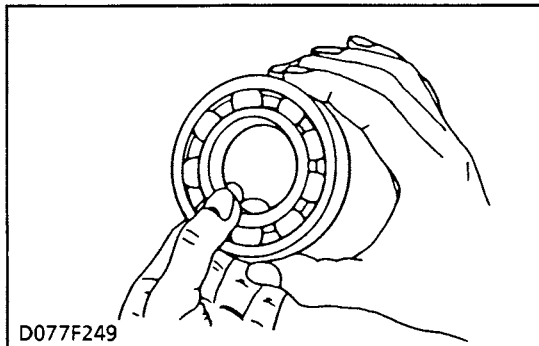
(When reassembling)

- Install the differential pinion and differential side gear, aligning the parting marks.

- | | |
|----------------------------|-------------------------|
| (1) Differential Side Gear | (4) Differential Pinion |
| (2) Differential Pinion | (5) Shim |
| (3) Dowel Pin | |

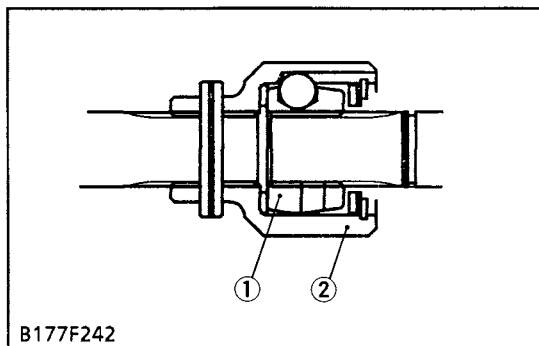
SERVICING

[1] CLUTCH HOUSING



Checking Bearing

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



Checking Propeller Shaft Ball Coupling

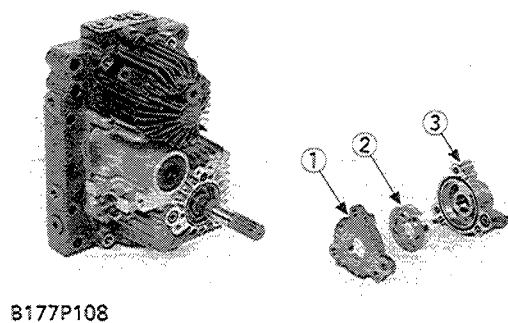
1. Hold the ball coupling outer, and push and pull, and rotate the ball coupling inner in all directions to check for wear and roughness.
2. If there is any defect, replace it.

(When reassembling)

- Apply grease to the inner parts of ball coupling and splines of ball coupling inner.
- When replacing the ball coupling assembly, install the ball coupling inner (1) with balls so that its ball position inside of ball coupling outer (2) as shown in the figure.

- | | |
|---------------------|---------------------|
| (1) Inner, Coupling | (2) Outer, Coupling |
|---------------------|---------------------|

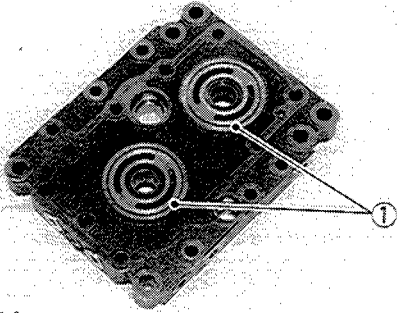
[2] TRANSMISSION CASE



Charge Pump

1. Check the charge pump housing (3), spacer (1) and the gerotor assembly (2) for scratches and wear.
2. If scratch or worn, replace the charge pump complete assembly.

- | | |
|----------------------|-------------------------|
| (1) Spacer | (3) Charge Pump Housing |
| (2) Gerotor Assembly | |

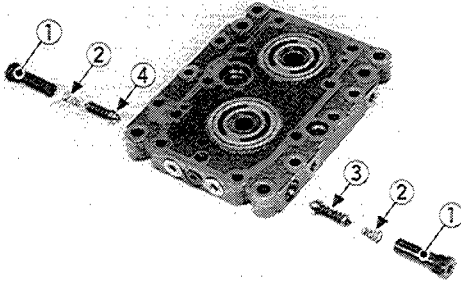


B177P114

Center Section

1. Check the surface (1) of center section for scratches or wear. If deep scratch or excessive wear is found, replace the center section.

(1) Surface of Center Section



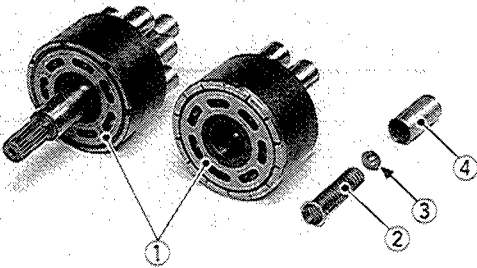
B177P099

Check and High Pressure Relief Valve

1. Check the valve (3), (4) for scratches and damage.
2. Check the valve seat in the center section for damage.
3. Check the spring (2) for breakage and wear.
4. If anything unusual, replace the high pressure relief valve complete assembly.

(1) Plug
(2) Spring

(3) Check and High Pressure Relief Valve Assembly (Forward)
(4) Check and High Pressure Relief Valve Assembly (Reverse)



B083P079

Cylinder Block Assembly

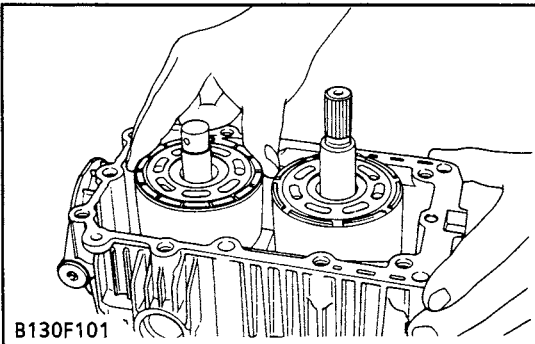
1. Check cylinder blocks (1) and pistons (4) for scratches and wear. If deep scratch or excessive wear is found, replace the cylinder block assembly.
2. Check that the piston (4), spring (2) and spring seat (3) are in each cylinder bore.
3. Check the pistons for their free movement in the cylinder block bores. If the piston or cylinder block bore is scored, replace the cylinder block assembly.

(1) Cylinder Block
(2) Spring

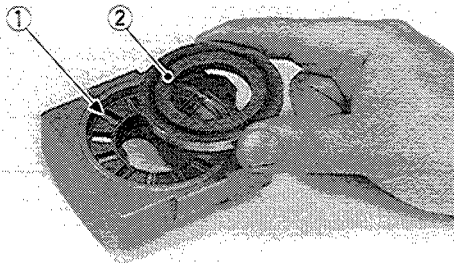
(3) Spring Seat
(4) Piston



B083P080



B130F101

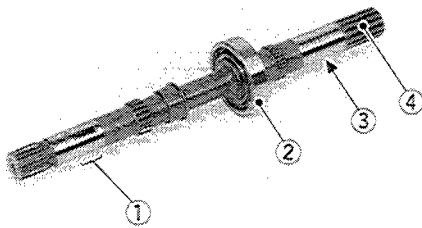


B083P075

Thrust Washer, Thrust Roller Bearing and Thrust Plate

1. Check the thrust roller bearing (1) for scratches and excessive wear.
2. If worn, replace.
3. Check the thrust plate (2) for scratches and excessive wear.
4. If worn or scored, replace.

(1) Thrust Roller Bearing (2) Thrust Plate

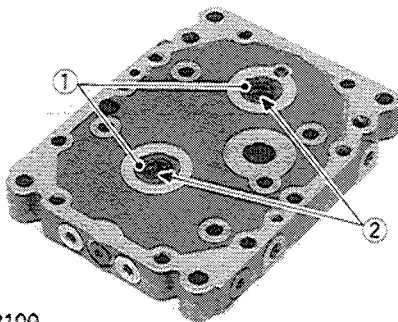


B177P107

Pump Shaft

1. Check the seal surface (3), the bearing surface (1) and the bearing (2).
2. If the shaft (4) is rough or groove, replace.
3. If the bearing is worn, replace.

(1) Bearing Surface (3) Seal Surface
(2) Bearing (4) Pump Shaft

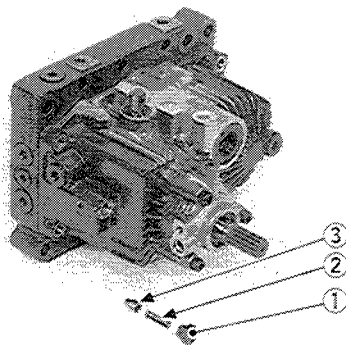


B177P100

Needle Bearing and Oil Seal

1. Check the oil seals (1) for damage.
2. Check the needle bearings (2) for wear.
3. If the oil seals and bearings are worn, replace them.

(1) Oil Seal (2) Needle Bearing

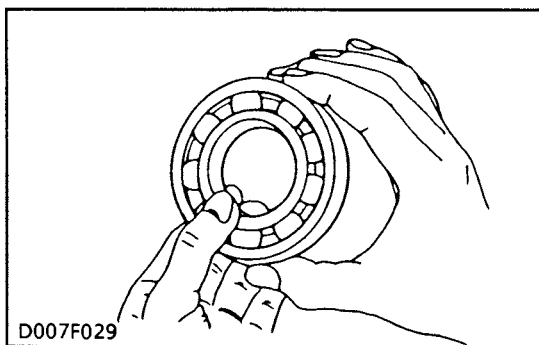


B177P109

Charge Relief Valve

1. Check the charge relief cone (3) and the seat in the housing for damage.
2. If defects are found, replace them.

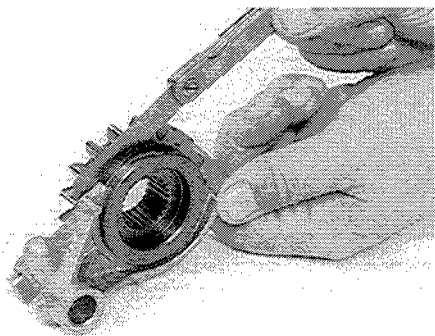
(1) Plug (3) Charge Relief Cone
(2) Spring



D007F029

Bearing Check

1. While holding the inner race, push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission oil to the bearing and hold the inner race.
3. For needle bearing, lay the needle rollers to check for any damage and wear.
4. Replace it if defects are found.

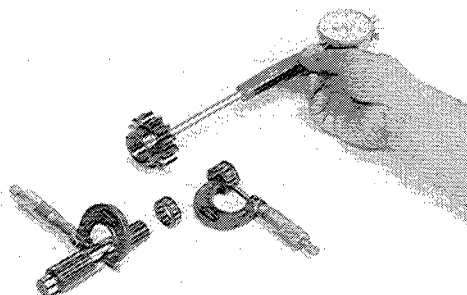


B177P127

Clearance between Shift Fork and Shift Gear Groove

1. Insert the fork into the shift gear groove and measure the clearance with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace it.

Clearance between shift fork and shift gear groove	Factory spec.	0.10 to 0.35 mm 0.004 to 0.014 in.
	Allowable limit	0.5 mm 0.020 in.



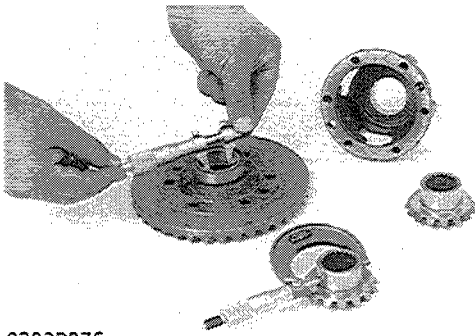
B177P126

Clearance between Gear and Shaft

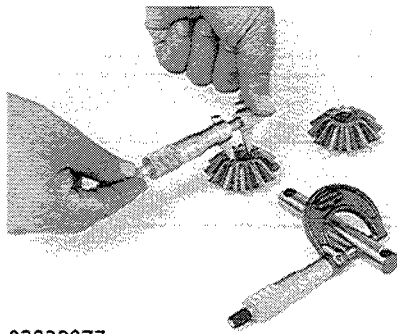
1. Measure the gear I.D. with a cylinder gauge, and then shaft O.D. with an outside micrometer.
2. Measure the O.D. of two needles in the needle bearing with an outside micrometer.
3. Clearance is the difference between the gear I.D. and the sum of shaft O.D. and two needles O.D..
4. If the clearance exceeds the allowable limit, replace it.

Clearance between F.W.D. shaft and 16T-20T gear	Factory spec.	0.027 to 0.067 mm 0.0011 to 0.0025 in.
	Allowable limit	0.10 mm 0.0039 in.
F.W.D. shaft O.D.	Factory spec.	21.967 to 21.980 mm 0.8648 to 0.8654 in.
16T-20T gear I.D.	Factory spec.	28.007 to 28.021 mm 1.1024 to 1.1032 in.
Needle O.D.	Factory spec.	2.996 to 3.000 mm 0.1179 to 0.1181 in.

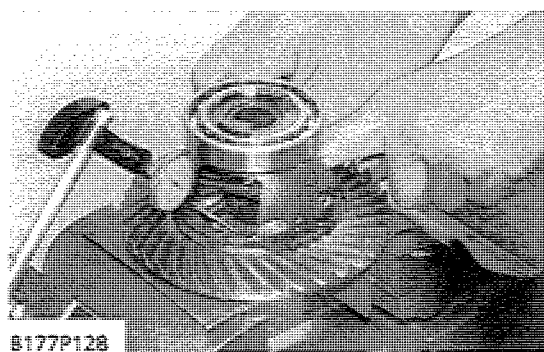
[3] DIFFERENTIAL CASE



0302P076



0302P077



B177P128

Clearance between Differential Case and Differential Side Gear

1. Measure the differential side gear boss O.D. with an outside micrometer.
2. Measure the differential case I.D. and the spiral bevel gear I.D. with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between differential case and differential side gear	Factory spec.	0.025 to 0.066 mm 0.0016 to 0.0029 in.
	Allowable limit	0.30 mm 0.0118 in.

Differential case I.D.	Factory spec.	32.000 to 32.025 mm 1.2598 to 1.2608 in.
Differential side gear O.D.	Factory spec.	31.959 to 31.975 mm 1.2582 to 1.2589 in.
Spiral bevel gear I.D.	Factory spec.	32.000 to 32.025 mm 1.2598 to 1.2608 in.

Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D. with an outside micrometer.
2. Measure the differential pinion I.D. with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.016 to 0.045 mm 0.0006 to 0.0018 in.
	Allowable limit	0.30 mm 0.0118 in.

Differential pinion shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.6289 to 0.6293 in.
Differential pinion I.D.	Factory spec.	16.000 to 16.018 mm 0.6299 to 0.6306 in.

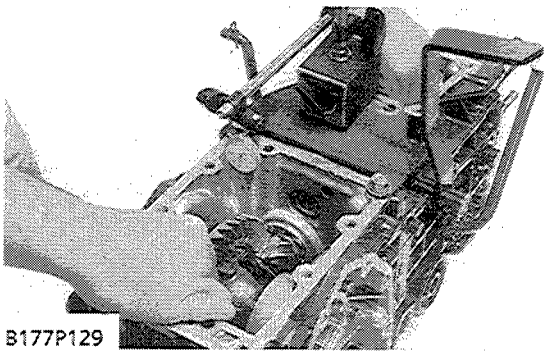
Backlash between Differential Pinion and Differential Side Gear

1. Secure the differential case with a vise.
2. Set the dial indicator (lever type) with its finger on the tooth of the differential side gear.
3. Press differential pinion and side gear against the differential case.
4. Hold the differential pinion and move the differential side gear to measure the backlash.
5. If the backlash exceeds the allowable limit, adjust with differential side gear shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

■ NOTE

- Thickness of shims :
0.8 mm (0.0315 in.), 1.0 mm (0.0394 in.)
1.2 mm (0.0472 in.)



Backlash between Spiral Bevel Pinion and Spiral Bevel Gear

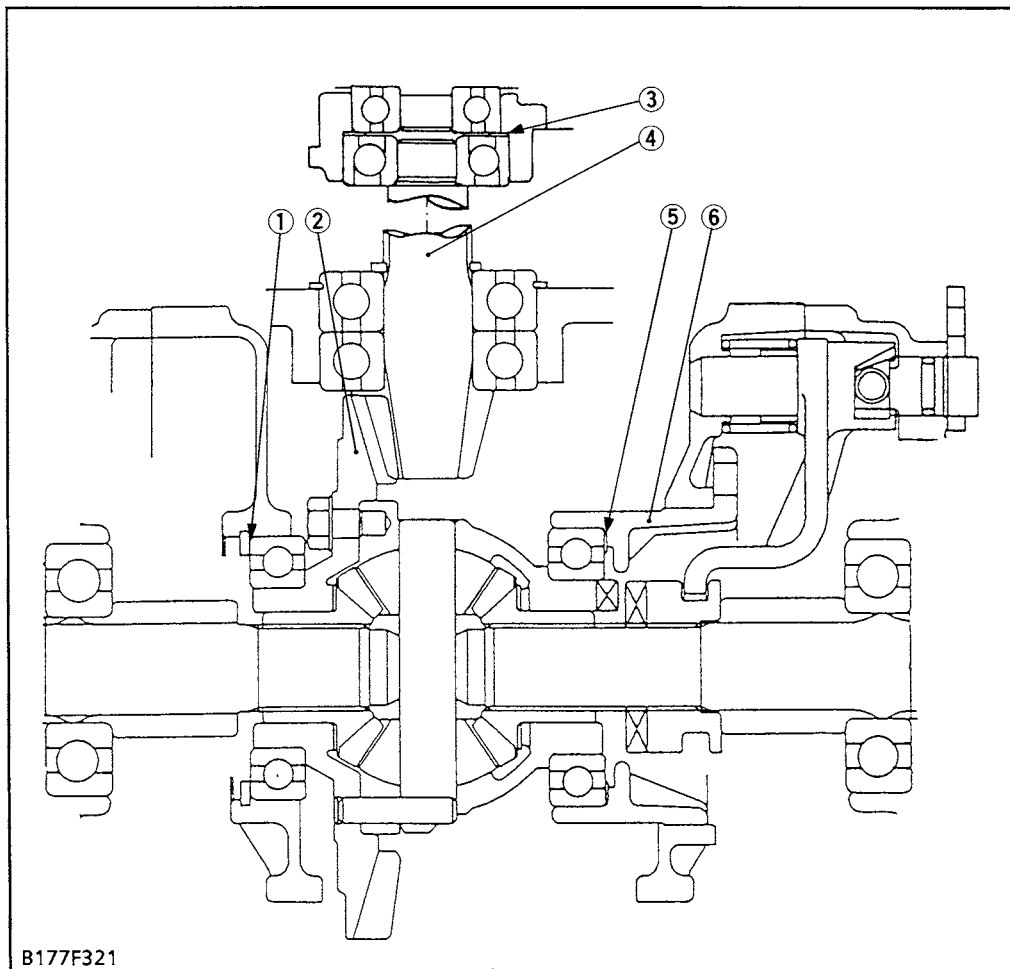
1. Set the dial indicator (lever type) with its finger on the end of spiral bevel pinion (4).
2. Move the spiral bevel pinion back and forth to each end and measure the side clearance.
3. If the side clearance exceeds the factory spec., adjust with the shims (3) at front end of spiral bevel pinion.
4. Set the dial indicator (lever type) with its finger on the tooth surface of bevel gear.
5. Measure the backlash by fixing the spiral bevel pinion (4) and moving bevel gear (2) by hand.
6. If the backlash exceeds the factory spec., adjust with the shims (1), (5) at bearing holder (6) and differential case.
7. Adjust the backlash properly by repeating the above procedures.

(When adjusting)

Side clearance of spiral bevel pinion	Factory spec.	Less than 0.15 mm 0.006 in.
Backlash between spiral bevel pinion and spiral bevel gear	Factory spec.	0.10 to 0.20 mm 0.0039 to 0.0080 in.

(Reference)

- Thickness of shims (1), (5) :
0.2 mm (0.008 in.) 0.5 mm (0.020 in.)
- Thickness of shims (3) :
0.2 mm (0.008 in.) 1.4 mm (0.055 in.)
1.8 mm (0.071 in.)



- (1) Shim
- (2) Bevel Gear
- (3) Shim
- (4) Spiral Bevel Pinion
- (5) Shim
- (6) Bearing Holder

4 REAR AXLE

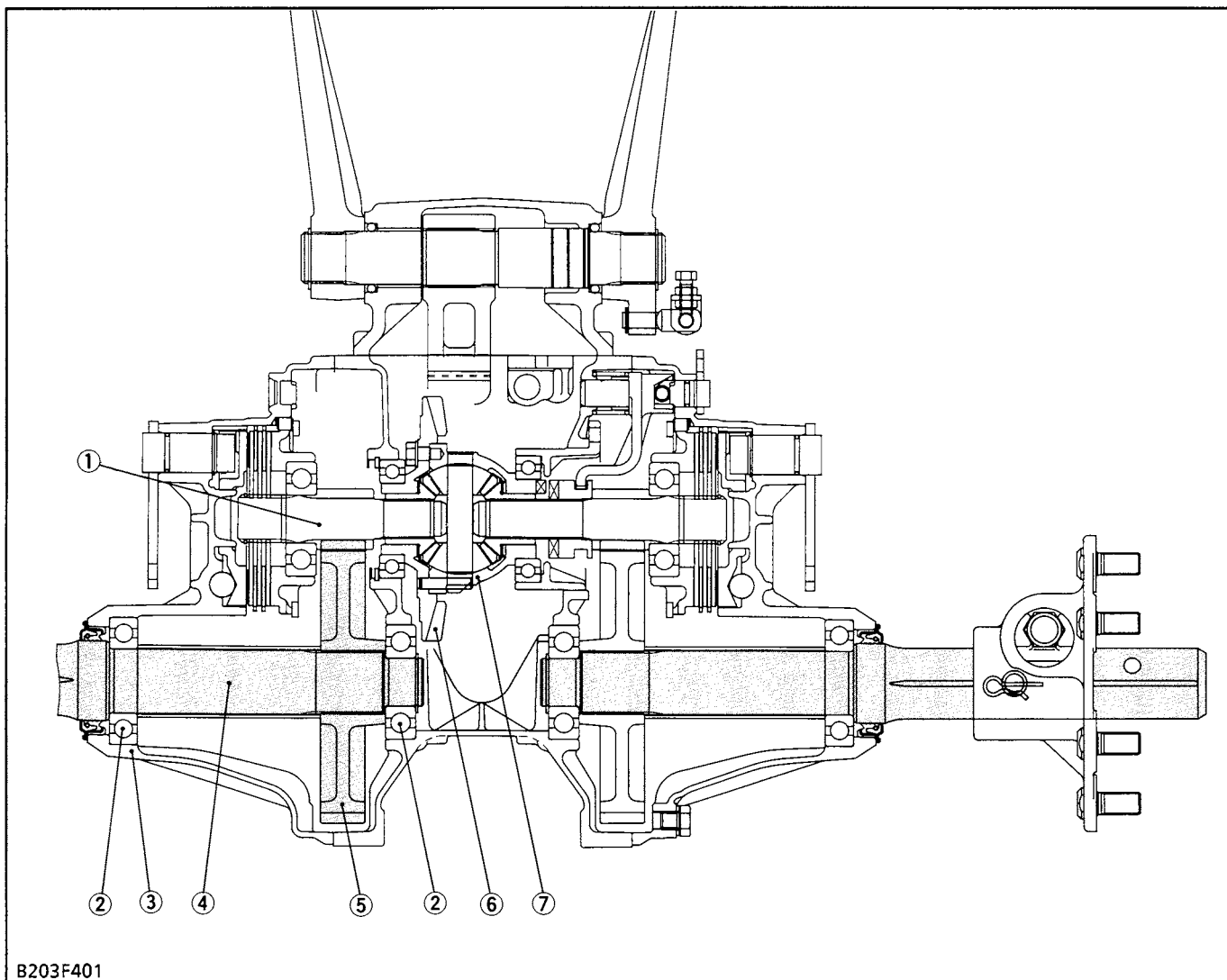
4 REAR AXLE

MECHANISM

CONTENTS

[1] FEATURES	4-M1
--------------------	------

[1] FEATURES



- | | | | |
|-----------------------------|--------------------|-----------------------|---------------------------|
| (1) Differential Gear Shaft | (3) Rear Axle Case | (5) Spur Gear | (7) Differential Assembly |
| (2) Ball Bearing | (4) Rear Axle | (6) Spiral Bevel Gear | |

The rear axles are the semifloating type with ball bearings (2) between the rear axle (4) and the rear axle case (3), which supports the rear wheel load as well as transmitting power to the rear wheels.

The differential assembly (7) automatically controls the revolution of right and left wheels when the rear wheels encounter unequal road resistance during turning.

SERVICING

CONTENTS

TIGHTENING TORQUES	4-S1
CHECKING, DISASSEMBLING AND SERVICING	4-S1
DISASSEMBLING AND ASSEMBLING	4-S1
(1) Separating Rear Axle Case from Brake Case	4-S1
(2) Disassembling Rear Axle	4-S2

TIGHTENING TORQUES

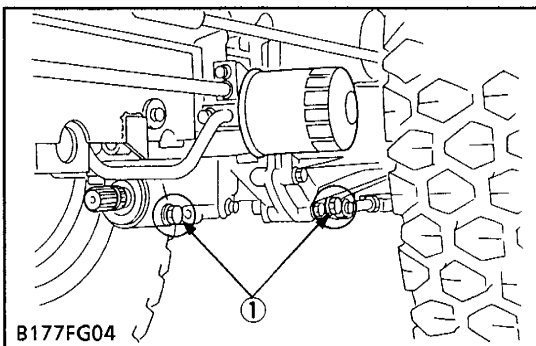
Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft-lbs
Rear wheel cotter setting bolt and nut	123 to 147	12.6 to 15.0	91 to 108
Rear wheel hub mounting nut	108 to 125	11.0 to 12.8	80 to 93
Rear axle case mounting screw	39 to 44	4.0 to 4.5	29 to 33

CHECKING, DISASSEMBLING AND SERVICING

DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case from Differential Gear Case

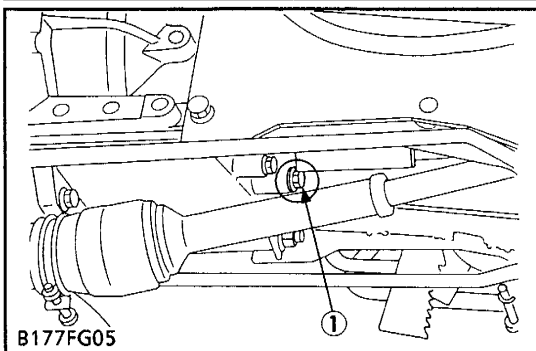


Drain the Transmission Fluid

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

(When refilling)

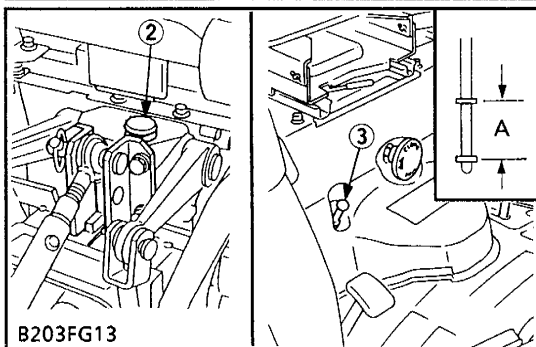
- After removing the plug (2), fill from the filling port with transmission oil up to the upper notch on the dipstick.
- After running the engine for few minutes, stop it and check the oil level again. Add the oil to prescribed level if it is not correct level.



Transmission oil capacity	12 ℓ 3.17 U.S.gals 2.6 Imp.gals
---------------------------	---------------------------------------

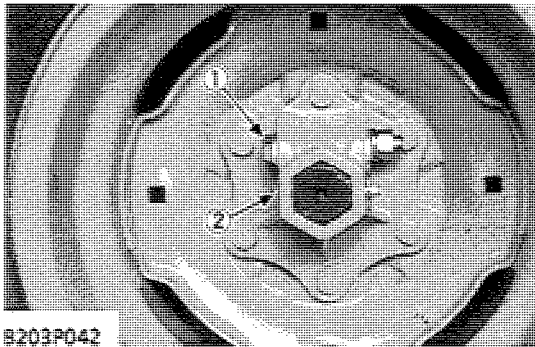
■ IMPORTANT

- Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS AND FLUID" (See page G-8).
- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.
 1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
 2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system. This is important to prevent the hydraulic pump and the HST unit from getting seized.
 3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.
- Do not mix different brands oil together.



(A) Oil level is acceptable within this range.

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



B203P042

(1) Cotter (2) Wheel Hub Pin

Rear Wheel

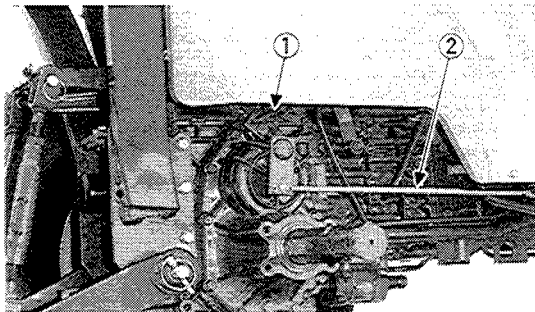
1. Place a jack under the transmission case.
2. Loosen the rear wheel cotter (1) setting bolt and nut.
3. Take out the wheel hub pin (2).
4. Take out the rear wheel.

IMPORTANT

- When re-fitting or adjusting a wheel, tighten the bolts to the following torques and then recheck them after driving the tractor approximately 200 m (or 200 yards).

(When reassembling)

Tightening torque	Rear wheel cotter setting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 ft-lbs
	Rear wheel hub mounting nut	108 to 125 N·m 11.0 to 12.8 kgf·m 80 to 93 ft-lbs



B177P167

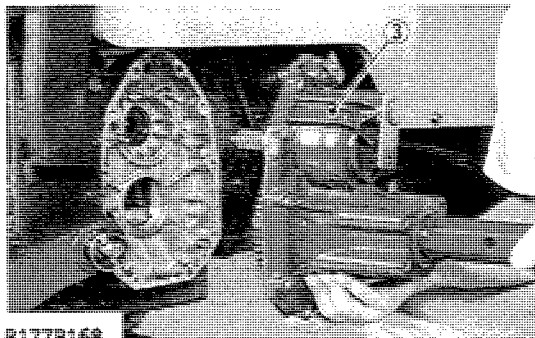
Rear Axle Case

1. Disconnect the differential lock rod (1).
2. Disconnect the brake rod (2).
3. Remove the rear axle case mounting screw.
4. Separate the rear axle case (3) from differential gear case.

(When reassembling)

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

Tightening torque	Rear axle case mounting screws	39 to 44 N·m 4.0 to 4.5 kgf·m 29 to 33 ft-lbs
-------------------	--------------------------------	---



B177P168

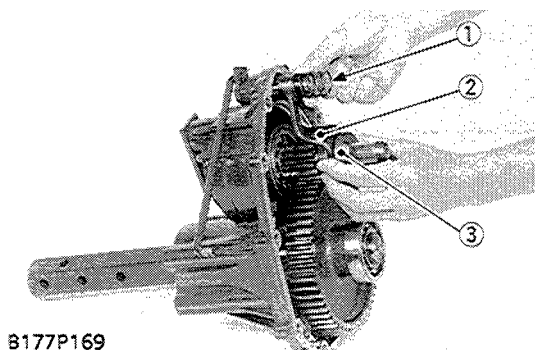
(1) Differential Lock Rod (2) Brake Rod (3) Rear Axle Case

(2) Disassembling Rear Axle

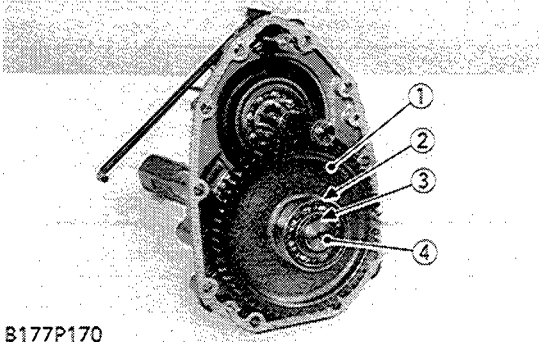
Differential Lock Shift Fork and Differential Lock Clutch

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).

- (1) Spring (2) Differential Lock Shift Fork (3) Differential Lock Clutch



B177P169



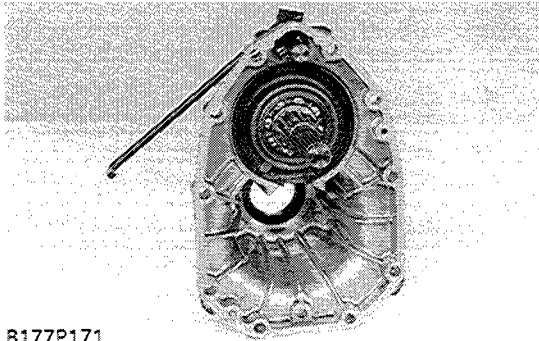
B177P170

57T Gear

1. Remove the external snap ring (3) and remove the bearing (2).
2. Draw out the 57T gear (1) from the rear axle (4).

(1) Gear
(2) Bearing

(3) External Snap Ring
(4) Rear Axle



B177P171

Rear Axle

1. Tap out the rear axle to the outside of the rear axle case.

5 BRAKES

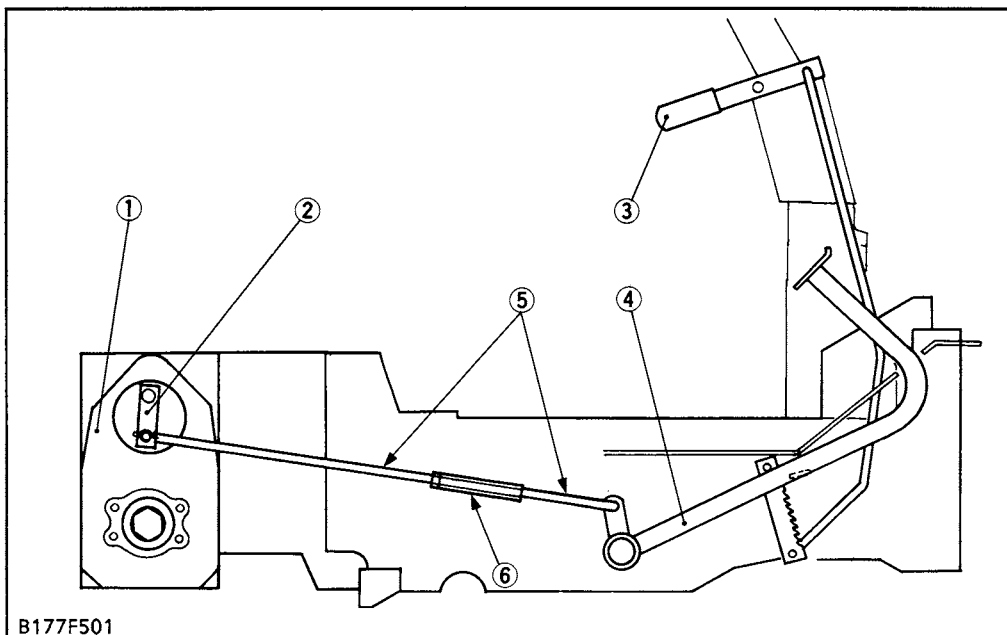
5 BRAKES

MECHANISM

CONTENTS

[1] FEATURES	5-M1
[2] OPERATION	5-M2

[1] FEATURES



- (1) Rear Axle Case
- (2) Brake Cam Lever
- (3) Parking Brake Lever
- (4) Brake Pedal
- (5) Brake Rod
- (6) Turnbuckle

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 and provide stable braking and require little adjustment.

■ Features of Wet Disc Brakes

1. Reduced disc wear

Although wet discs are worn by approx. several tens of microns depending on the accuracy of parts during the initial contact in initial period of 50 hours or so, almost no wear occurs afterwards. This means that very little brake adjustments are required.

2. Stable braking

Since the brake discs are immersed in transmission oil, Fade* is rarely caused even after repeated braking and a stable braking force is obtained.

3. Pedal stroke does not change under influence of heat.

Unlike internal expanding type brakes, the drum-to-shoe clearance of the wet disc brake does not increase due to thermal expansion and the increased pedal stroke does not result. Thus, the wet disc brake provides a constant pedal stroke.

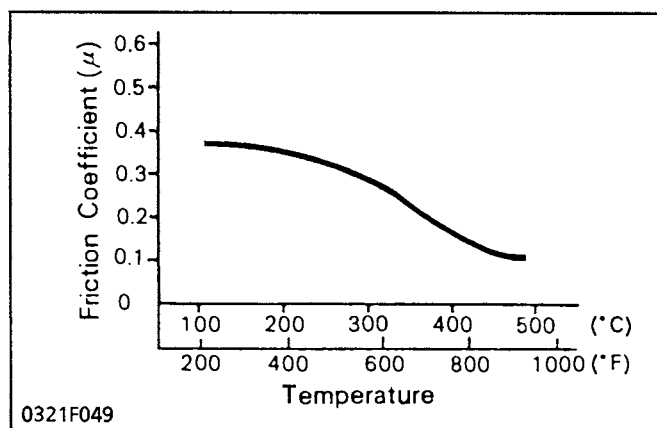
The parking brake is a mechanical type which is designed to actuate the travelling brakes through the linkage. Pulling the parking brake lever (3) results in the same state as the obtained when the brake pedals are pressed.

* Fade

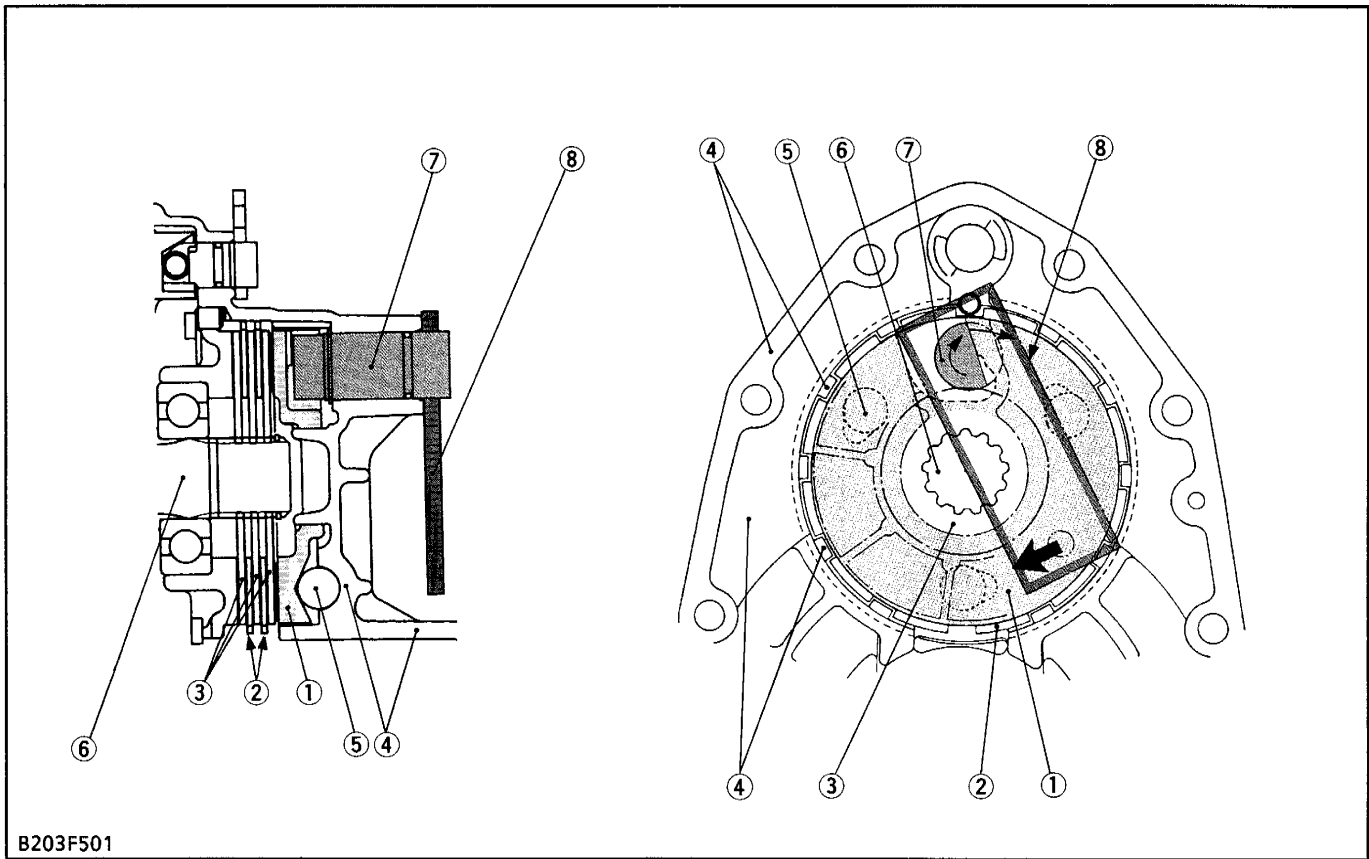
Fade is a phenomenon of braking force loss caused by the heat generated in repeated braking. Generally, the friction coefficient of brake disc tends to lower and the braking force reduces with the rise of the temperature of the brake disc.

(Reference)

- Relationship between temperature and friction coefficient of brake disc is as follows.



0321F049

[2] OPERATION

B203F501

- | | | | |
|--------------------|--------------------|--|---------------------|
| (1) Cam Plate | (4) Rear Axle Case | (6) Brake Shaft
(Differential Gear Shaft) | (7) Brake Cam |
| (2) Friction Plate | (5) Steel Ball | | (8) Brake Cam Lever |
| (3) Brake Disc | | | |

The brake body is incorporated in the rear axle case (4) filled with transmission oil and is designed to brake when the brake disc (3) splined with the differential gear shaft (6) is pressed against the cam plate (1) by means of the cam mechanism incorporating steel balls (5).

For greater braking force, four brake discs are provided at the right and left sides respectively, and the friction plate (2) fixed to the rear axle case is arranged between the brake discs.

■ During Braking

When the brake pedal is pressed, the linkage causes the brake cam lever (8) and brake cam (7) to turn into the direction of arrow shown in the above figure.

Therefore, the cam plate (1) also moves the direction of arrow. At this time, since the cam plate (1) rides on the steel balls (5) set in the grooves of the rear axle case to press the brake disc (3), the differential gear shaft (6) is braked by the frictional force generated by the cam plate (1) and brake disc (3).

SERVICING

CONTENTS

TROUBLESHOOTING	5-S1
SERVICING SPECIFICATIONS	5-S1
TIGHTENING TORQUES	5-S2
CHECKING, DISASSEMBLING AND SERVICING	5-S2
[1] BRAKE PEDAL	5-S2
CHECKING AND ADJUSTING	5-S3
SERVICING	5-S3
[2] BRAKE ASSEMBLY	5-S4
DISASSEMBLING AND ASSEMBLING	5-S4
(1) Separating Rear Axle Case with Brake Assembly	5-S4
(2) Disassembling Brake Assembly	5-S6
SERVICING	5-S7

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-S3 5-S7 5-S7
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-S3 5-S7 5-S2 5-S7
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-S3 5-S7 5-S7 5-S7 5-S4

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	30 to 40 mm 1.18 to 1.57 in.	–
Pedal Shaft to Pedal Shaft Bush	Clearance	0 to 0.165 mm 0 to 0.00649 in.	1.0 mm 0.039 in.
Pedal Shaft	O.D.	24.916 to 25.030 mm 0.98094 to 0.98543 in.	–
Bushing	I.D.	25.030 to 25.081 mm 0.98543 to 0.98744 in.	–
Cam Plate and Bearing Holder	Flatness	–	0.3 mm 0.012 in.
Cam Plate and Ball	Height	22.89 to 22.99 mm 0.9012 to 0.9051 in.	22.40 mm 0.8819 in.
Brake Disc	Thickness	3.3 to 3.5 mm 0.130 to 0.138 in.	3.0 mm 0.118 in.
Friction Plate	Thickness	1.92 to 2.08 mm 0.0756 to 0.0819 in.	1.52 mm 0.0598 in.

TIGHTENING TORQUES

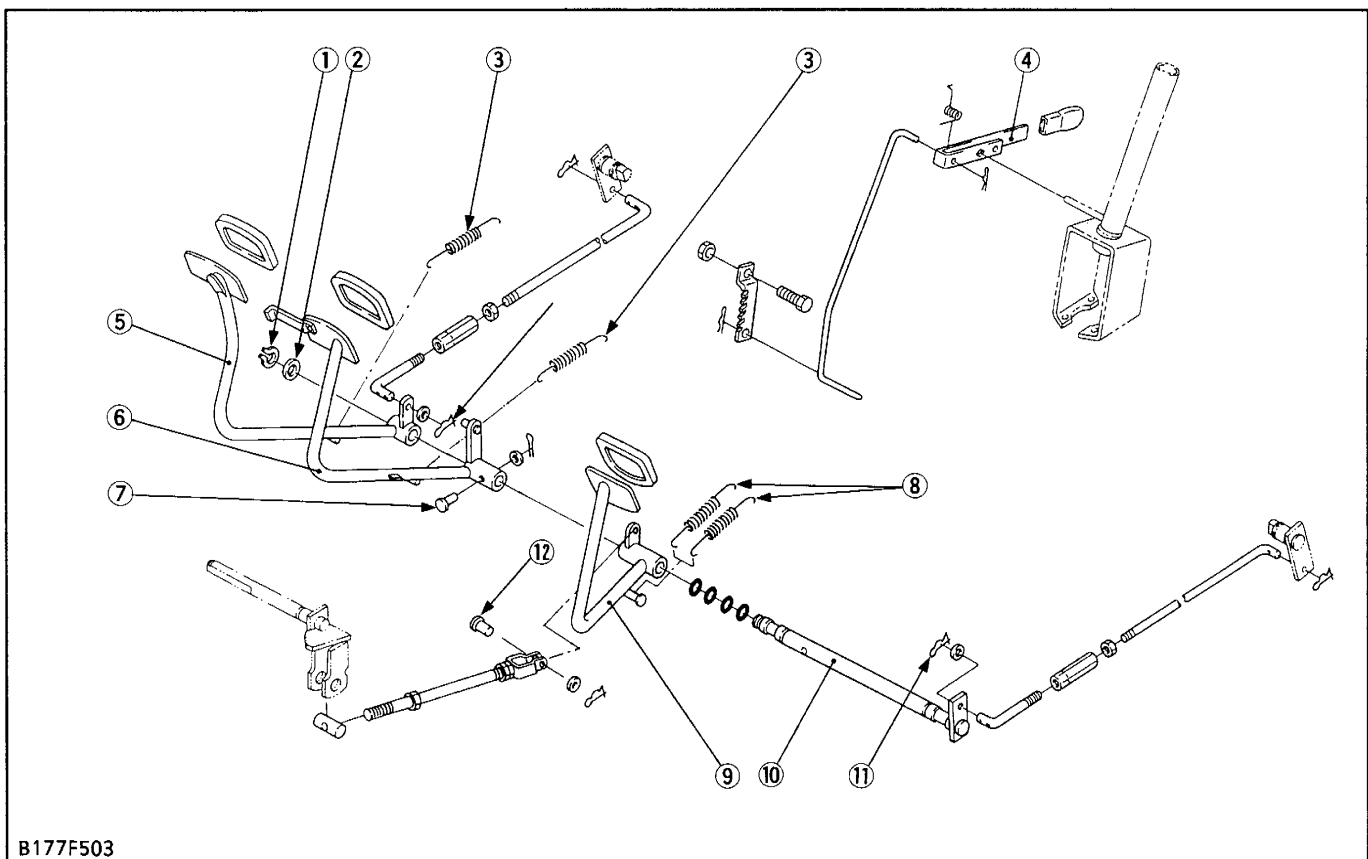
Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft·lbs
Rear wheel cotter setting bolt and nut	123 to 147	12.6 to 15.0	91 to 108
Rear axle case mounting screw	39 to 44	4.0 to 4.5	29 to 33

CHECKING, DISASSEMBLING AND SERVICING

[1] BRAKE PEDAL

Removing Brake Pedal



B177F503

- | | | | |
|------------------------|-------------------------|-------------------|------------------------|
| (1) External Snap Ring | (4) Parking Brake Lever | (7) Clevis Pin | (10) Brake Pedal Shaft |
| (2) Collar | (5) Brake Pedal RH | (8) Return Spring | (11) Spring Lock Pin |
| (3) Return Spring | (6) Brake Pedal LH | (9) Clutch Pedal | (12) Clevis Pin |

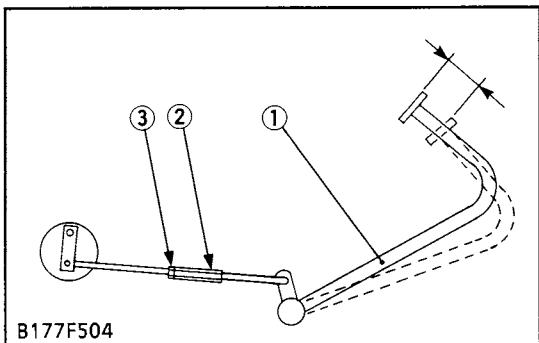
1. Remove the spring lock pin (11) of brake rod at pedal side, and pull out the brake rod.
2. Remove the return springs (3), (8).
3. Remove the external snap ring (1) at the end of the brake pedal shaft (10).
4. Remove the clevis pin (7) of the brake pedal LH (6).
5. Remove the clevis pin (12) of the clutch pedal (9).

6. Pull the right and left brake pedals from the brake pedal shaft (10).
7. Tap out the brake pedal shaft (10) to the left, and remove it with the clutch pedal (9).

(When reassembling)

- Apply grease to the brake pedal shaft.

CHECKING AND ADJUSTING



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

Brake Pedal Free Travel

1. Press each brake pedal five times with a force of 147 to 294 N (15 to 30 kgf, 33 to 66 lbs.).
2. Press the center of the pedal (1) at a force of 39 to 58 N (4 to 6 kgf, 9 to 13 lbs), and measure the movement at the footrest of pedal.
3. If the measurement is not within the factory specifications, turn the turnbuckle (2) to adjust.
4. After adjustment, tighten the lock nut (3) firmly.

Brake pedal free travel	Factory spec.	30 to 40 mm 1.18 to 1.57 in.
-------------------------	---------------	---------------------------------

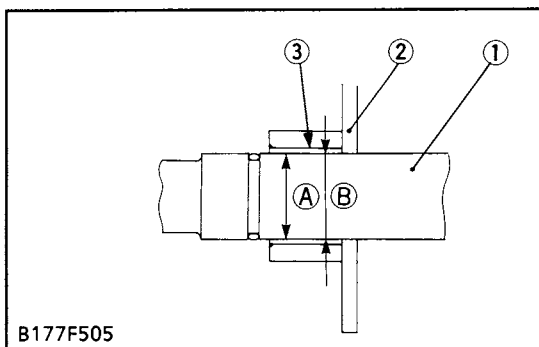
CAUTION

- The difference between the right and left pedal free travels must be less than 4.0 mm (0.16 in.).

NOTE

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

SERVICING



(A) Bush I.D.
(B) Brake Pedal Shaft O.D.

(1) Brake Pedal Shaft
(2) Center Frame
(3) Bushing

Clearance between Brake Pedal Shaft and Center Frame

Bushing

1. Measure the brake pedal shaft O.D. with an outside micrometer.
2. Measure the bush (3) I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace it.

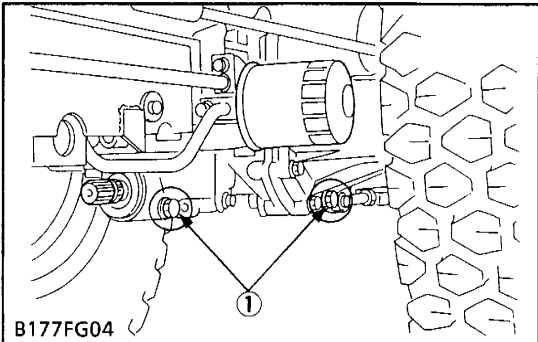
Clearance between brake pedal shaft and center frame bushing	Factory spec.	0 to 0.165 mm 0 to 0.00649 in.
	Allowable limit	1.0 mm 0.039 in.

Brake pedal shaft O.D.	Factory spec.	24.916 to 25.030 mm 0.98094 to 0.98543 in.
Center frame bushing I.D.	Factory spec.	25.030 to 25.081 mm 0.98543 to 0.98744 in.

[2] BRAKE ASSEMBLY

DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case with Brake Assembly

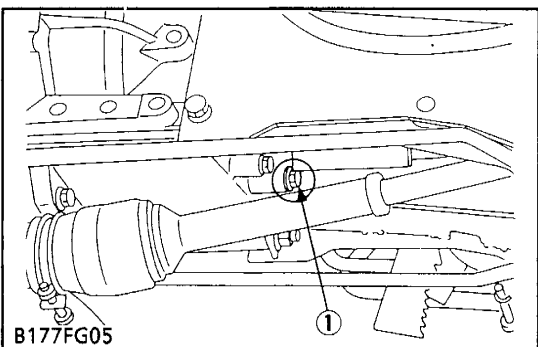


Drain the Transmission Fluid

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

(When refilling)

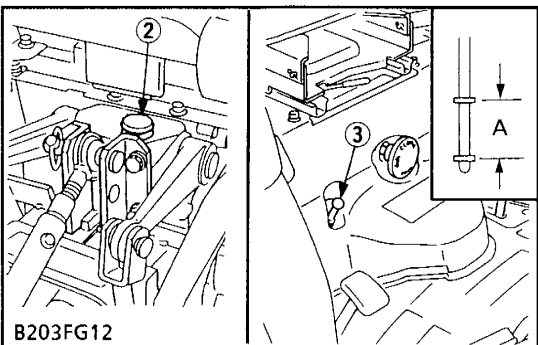
- After removing the plug (2), fill from the filling port with transmission oil up to the upper notch on the dipstick.
- After running the engine for few minutes, stop it and check the oil level again. Add the oil to prescribed level if it is not correct level.



Transmission oil capacity	12 ℓ 3.17 U.S.gals 2.6 Imp.gals
---------------------------	---------------------------------------

■ IMPORTANT

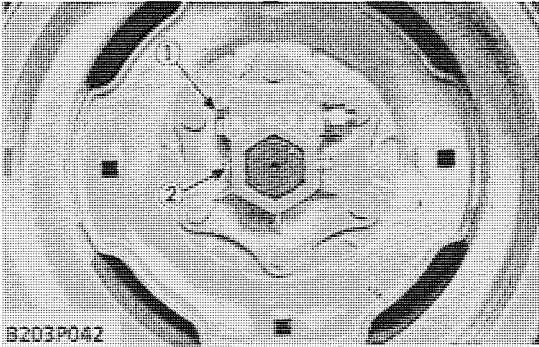
- Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS AND FLUID" (See page G-8).
- Do not operate the tractor immediately after changing the transmission fluid or cleaning transmission oil strainer. Follow these air bleeding procedures.
 1. Set the hydraulic control lever to the down position, fully depress and hold the clutch pedal, start the engine.
 2. Operate the engine at low idle speed and continue to depress the clutch pedal for at least 30 seconds to bleed air from the hydraulic system. This is important to prevent the hydraulic pump and the HST unit from getting seized.
 3. Run the engine at medium speed for a few minutes to prevent damage to the transmission.
- Do not mix different brands oil together.



(A) Oil level acceptable within this range.

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

- (3) Dipstick



B203P042

(1) Cotter (2) Wheel Hub Pin

Rear Wheel

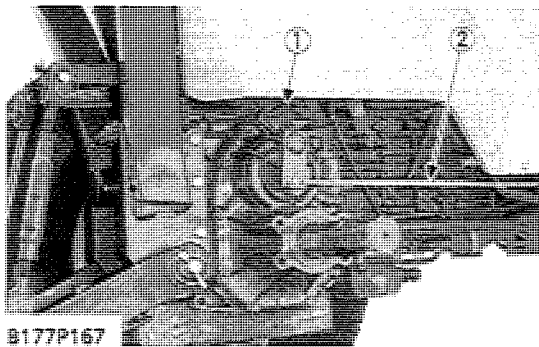
1. Place a jack under the transmission case.
2. Loosen the rear wheel cotter (1) setting bolt and nut.
3. Take out the wheel hub pin (2).
4. Take out the rear wheel.

IMPORTANT

- When re-fitting or adjusting a wheel, tighten the bolts to the following torques and then recheck them after driving the tractor approximately 200 m (or 200 yards).

(When reassembling)

Tightening torque	Rear wheel cotter setting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 ft·lbs
-------------------	--	--



B177P167

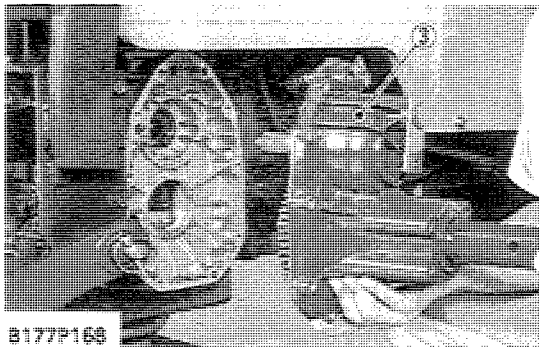
Rear Axle Case with Brake Assembly

1. Disconnect the differential lock rod (1).
2. Disconnect the brake rod (2).
3. Remove the rear axle case mounting screw.
4. Separate the rear axle case (3) from differential gear case.

(When reassembling)

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

Tightening torque	Rear axle case mounting screws	39 to 44 N·m 4.0 to 4.5 kgf·m 29 to 33 ft·lbs
-------------------	--------------------------------	---



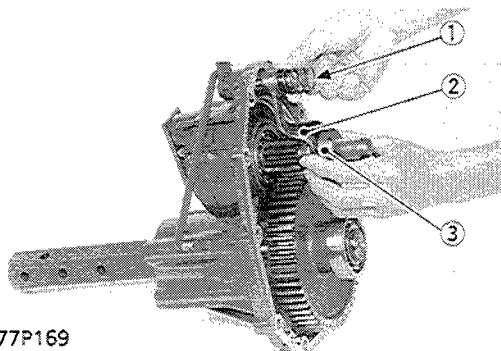
B177P168

(1) Differential Lock Rod (2) Brake Rod (3) Rear Axle Case

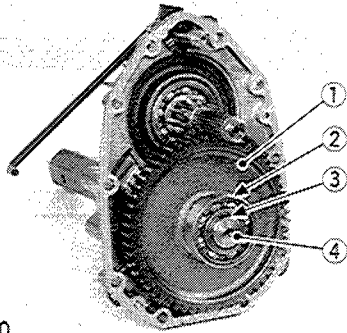
Differential Lock Shift Fork and Differential Lock Clutch

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).

- (1) Spring
- (2) Differential Lock Shift Fork
- (3) Differential Lock Clutch

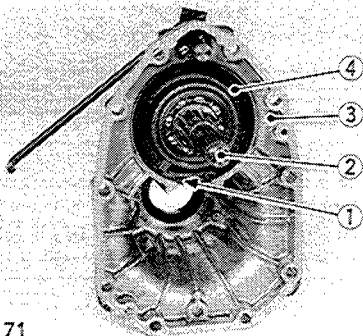


B177P169

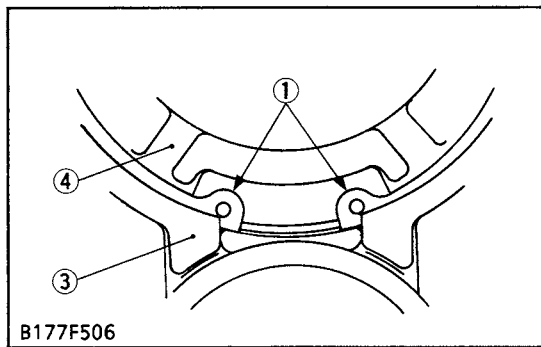


B177P170

(2) Disassembling Brake Assembly



B177P171



B177F506

57T Gear

1. Remove the external snap ring (3) and remove the bearing (2).
2. Draw out the 57T gear (1) from the rear axle (4).

- | | |
|-------------|------------------------|
| (1) Gear | (3) External Snap Ring |
| (2) Bearing | (4) Rear Axle |

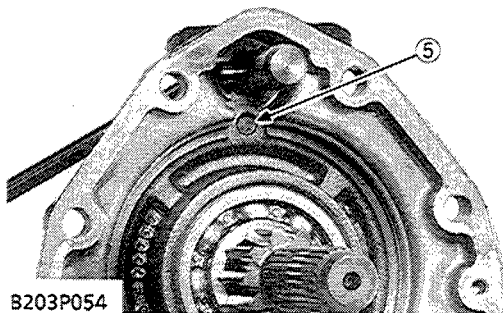
Brake Assembly

1. Remove the internal snap ring (1).
2. Remove the brake shaft (2) with brake discs.

(When reassembling)

- When installing the internal snap ring (1) to rear axle case (3) as shown in the figure left.
- When installing the bearing holder (4) to the rear axle case (3), do not forget to install the straight pin (5). (Refer to the photo. below.)

- | | |
|------------------------|--------------------|
| (1) Internal Snap Ring | (4) Bearing Holder |
| (2) Brake Shaft | (5) Straight Pin |
| (3) Rear Axle Case | |



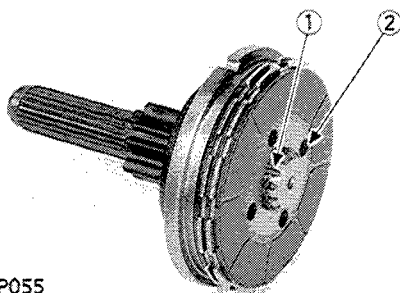
B203P054

Brake Discs and Friction Plate

1. Remove the external snap ring (1) and remove the brake discs and friction plate.
2. Remove the cam plate and balls.
3. Remove the external snap ring and pull out the brake cam lever.

(When reassembling)

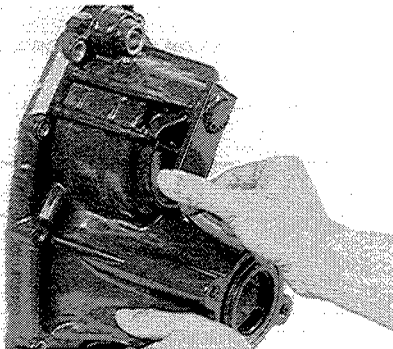
- Install the brake discs with their holes (2) deviation at less than 1/3 of the total hole area.



B203P055

- | | |
|------------------------|----------|
| (1) External Snap Ring | (2) Hole |
|------------------------|----------|

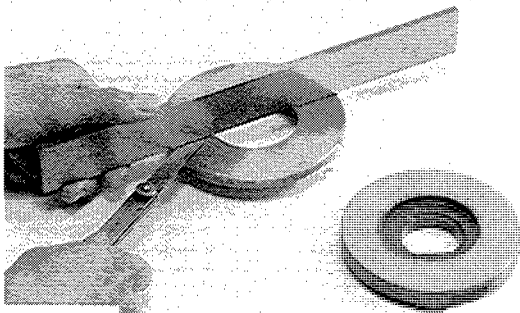
SERVICING



B177P177

Brake Cam Lever Movement

1. Move the brake cam lever by hand to check its movement.
2. If the movement is heavy, refine the brake cam with sandpaper.



B177P175

Cam Plate Flatness and Bearing Holder Wear

1. Place a straightedge of 150 mm (5.91 in.) or more in length on the contacting surface of the cam plate and the bearing holder.
2. Inspect the friction surface of the cam plate and the bearing holder with the straightedge, and determine if a 0.30 mm (0.0118 in.) feeler gauge will fit on the part of wear. If it will fit, resurface.



B177P176

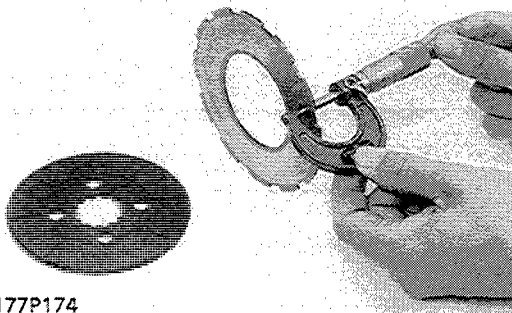
Height of Cam Plate and Ball

1. Measure the dimensions of the cam plate with the ball installed.
2. If the measurement is less than the allowable limit, replace the cam plate and balls.
3. Inspect the ball holes of cam plate for uneven wear. If the uneven wear is found, replace it.

Height of cam plate and ball	Factory spec.	22.89 to 22.99 mm 0.9012 to 0.9051 in.
	Allowable limit	22.40 mm 0.8819 in.

Brake Disc and Friction Plate Wear

1. Measure the brake disc thickness and the friction plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.



B177P174

Brake disc thickness	Factory spec.	3.3 to 3.5 mm 0.130 to 0.138 in.
	Allowable limit	3.0 mm 0.118 in.

Plate thickness	Factory spec.	1.92 to 2.08 mm 0.0756 to 0.0819 in.
	Allowable limit	1.52 mm 0.0598 in.

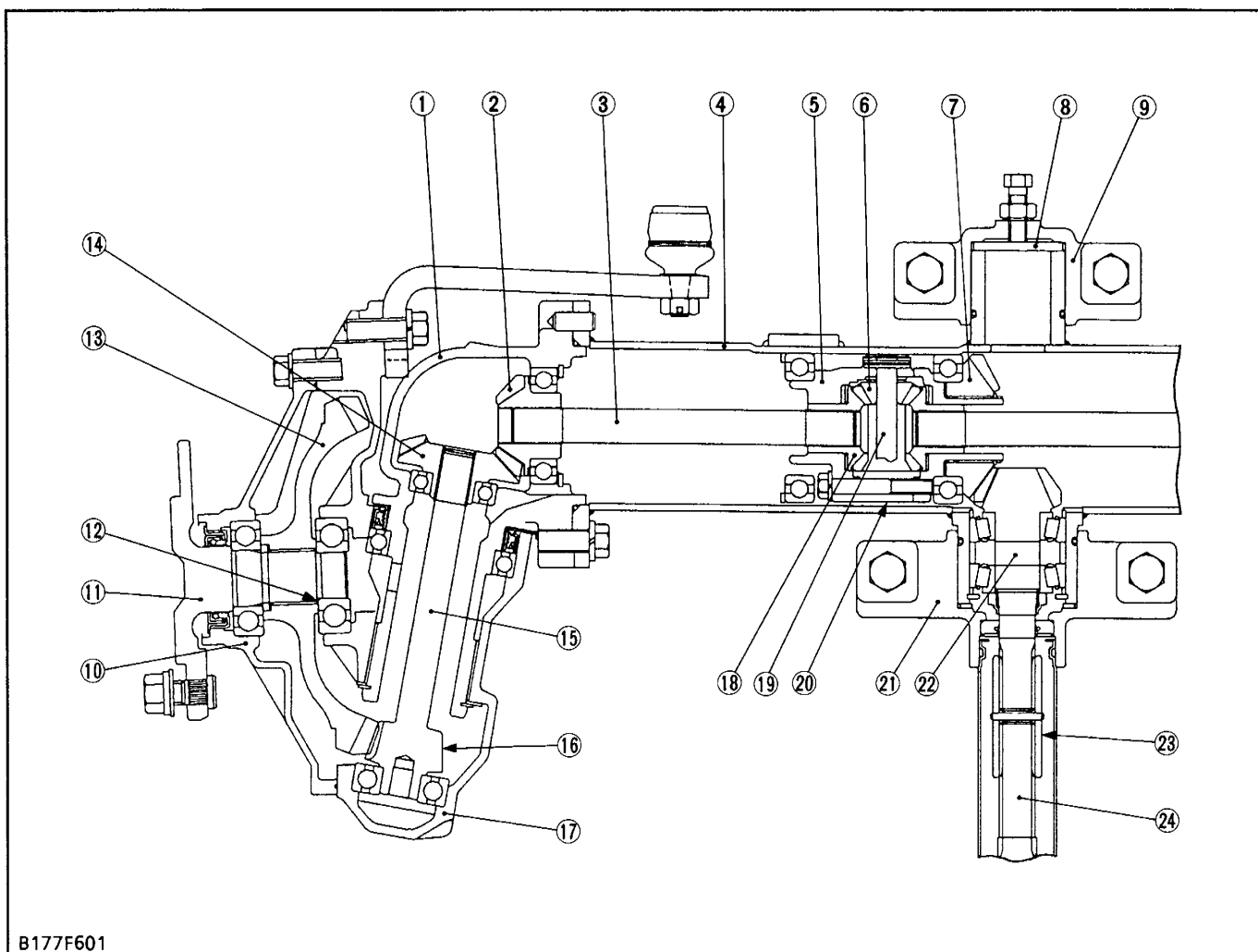
6 FRONT AXLE

6 FRONT AXLE

MECHANISM

CONTENTS

[1] STRUCTURE	6-M1
[2] FRONT WHEEL ALIGNMENT	6-M2

[1] STRUCTURE

B177F601

- | | | | |
|-----------------------------|-------------------------------|-----------------------------|--------------------------------|
| (1) Bevel Gear Case | (7) Spiral Bevel Gear | (13) Bevel Gear | (19) Pinion Shaft |
| (2) Bevel Gear | (8) Collar | (14) Bevel Gear | (20) Differential Assembly |
| (3) Differential Yoke Shaft | (9) Front Axle Bracket, Front | (15) Bevel Gear Shaft | (21) Front Axle Bracket, Rear |
| (4) Front Axle Case | (10) Axle Flange | (16) Bevel Gear | (22) Spiral Bevel Pinion Shaft |
| (5) Differential Case | (11) Axle | (17) Front Gear Case | (23) Coupling |
| (6) Differential Pinion | (12) Collar | (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) to the spiral bevel pinion shaft (22), then to the spiral bevel gear (7) and to the differential gear (18).

The power through the differential side gear is transmitted to the differential yoke shaft (3), and to the bevel gear shaft (15) through the bevel gears (2), (14) in the bevel gear case (1).

The revolution is greatly reduced by the bevel gears (16), (13), then the power is transmitted to the axle (11).

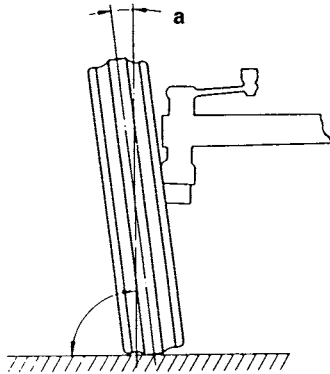
The differential system allows each wheel to rotate at a different speed to make turning easier.

[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]



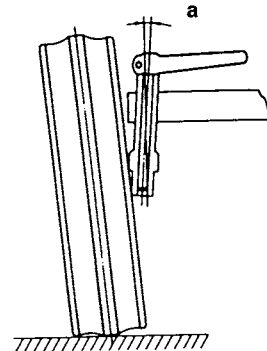
C045F051

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	0.035 rad. 2°
--------	------------------

[Kingpin Angle]



C045F053

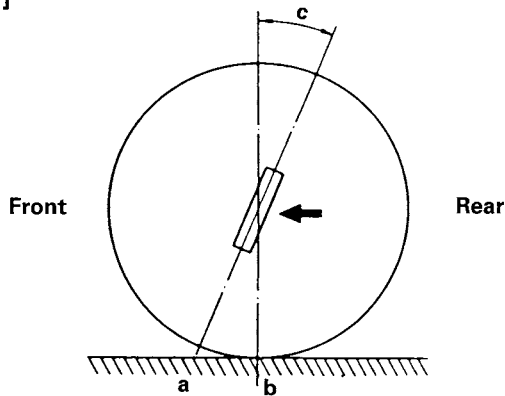
The kingpin is tilted from the vertical as viewed from the front.

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 inclination	0.209 rad. 12°
---------------------	-------------------

[Caster]



C045F052

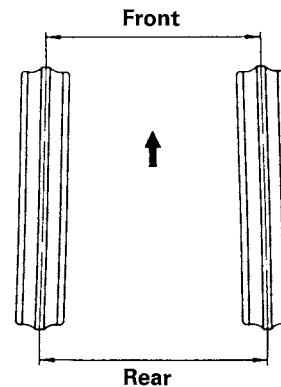
The kingpin is tilted forward as viewed from the side. The point (b) of the wheel center line is behind the point (a) of the kingpin shaft center line.

This inclination is called caster (c). Caster helps provide steering stability.

As with the kingpin inclination, caster reduces steering effort.

Caster	0 rad. 0°
--------	--------------

[Toe-in]



C045F054

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 front wheels. Another purpose of toe-in is to prevent excessive and uneven wear of tires.

Toe-in	1 to 10 mm 0.04 to 0.39 in.
--------	--------------------------------

SERVICING

CONTENTS

TROUBLESHOOTING	6-S1
SERVICING SPECIFICATIONS	6-S2
TIGHTENING TORQUES	6-S3
CHECKING, DISASSEMBLING AND SERVICING	6-S3
CHECKING AND ADJUSTING	6-S3
DISASSEMBLING AND ASSEMBLING	6-S4
(1) Separating Front Axle	6-S4
(2) Disassembling Front Axle	6-S6
SERVICING	6-S10

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	<ul style="list-style-type: none"> ● Tire pressure uneven ● Improper toe-in adjustment (improper alignment) 	Adjust Adjust	G-40 6-S3
	<ul style="list-style-type: none"> ● Clearance between front axle case boss and front axle bracket (front, rear) excessive ● Front axle rocking force too small ● Front wheel sway excessive ● Tie-rod end loose ● Air sucked in power steering circuit 	Replace Adjust Replace Tighten Bleed	6-S12 6-S4 6-S4 6-S3 7-S10
Front Wheels Can Not Be Driven	<ul style="list-style-type: none"> ● Front wheel driving gears in front axle gear case broken ● Universal joint broken 	Replace Replace Replace	6-S7 – –
	<ul style="list-style-type: none"> ● Front wheel drive gears in transmission broken ● Front differential gear broken ● Shift fork broken ● Coupling displaced 	Replace Replace Reassemble	6-S9 – 6-S5
Noise	<ul style="list-style-type: none"> ● Gear backlash excessive ● Oil insufficient ● Bearings damaged or broken ● Gears damaged or broken ● Spiral bevel pinion shaft turning force improper 	Adjust or replace Replenish Replace Replace Adjust	6-S10 to S12 G-22 – – 6-S11

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	1 to 10 mm 0.04 to 0.39 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	–
Differential Case, Differential Case Cover to differential Side Gear	Clearance	0.040 to 0.082 mm 0.00157 to 0.00323 in.	0.17 mm 0.0067 in.
Differential Case	I.D.	26.000 to 26.021 mm 1.02362 to 1.02445 in.	–
Differential Case Cover	I.D.	26.000 to 26.021 mm 1.02362 to 1.02445 in.	–
Differential Side Gear	O.D.	25.939 to 25.960 mm 1.02122 to 1.02205 in.	–
Pinion Shaft to Differential Pinion	Clearance	0.038 to 0.068 mm 0.00150 to 0.00268 in.	0.17 mm 0.0067 in.
Pinion Shaft	O.D.	9.972 to 9.987 mm 0.39260 to 0.39312 in.	–
Differential Pinion	I.D.	10.025 to 10.040 mm 0.39469 to 0.39528 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	–
Shim	Thickness	0.8 mm 0.031 in.	–
		1.0 mm 0.039 in.	–
		1.2 mm 0.047 in.	–
Spiral Bevel Pinion Shaft	Turning Force	127.5 to 166.7 N 13.0 to 17.0 kgf 28.7 to 37.5 lbs	–
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	–
11T Bevel Gear to 16T Bevel Gear	Backlash	0.10 to 0.30 mm 0.0039 to 0.0118 in.	–
Shim	Thickness	0.8 mm 0.031 in.	–
		1.0 mm 0.039 in.	–
		1.2 mm 0.047 in.	–
		1.4 mm 0.055 in.	–

(Continued)

Item		Factory Specification	Allowable Limit
Front Axle Case Boss (Front)	O.D.	49.920 to 49.945 mm 1.96535 to 1.96634 in.	–
Front Axle Bracket (Front)	I.D.	50.150 to 50.200 mm 1.97441 to 1.97638 in.	–
Front Axle Case Boss (Rear)	O.D.	64.910 to 64.940 mm 2.55551 to 2.55669 in.	–
Front Axle Bracket (Rear)	I.D.	65.150 to 65.200 mm 2.56496 to 2.56693 in.	–

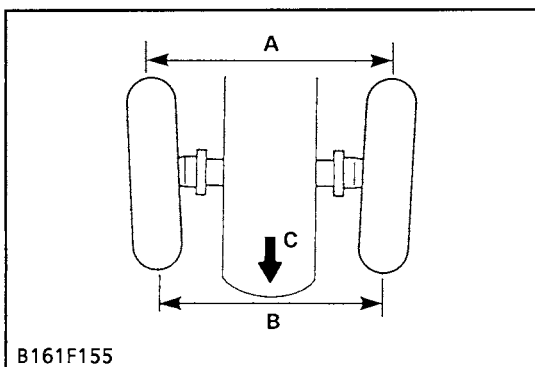
TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft-lbs
Lock nut of rocking force adjusting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Slotted nut of tie-rod end	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
Slotted nut of drag link end	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
Lock nuts of tie-rod	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Front axle shaft bracket mounting screw	124 to 147	12.6 to 15.0	91.1 to 108.5
Front wheel mounting nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Bevel gear case mounting screw	123.5 to 147.0	12.6 to 15.0	91.2 to 108.4
Axle flange mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Spiral bevel pinion shaft lock nut	98.1 to 117.7	10.0 to 12.0	72.3 to 86.8
Differential case cover mounting screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3

CHECKING, DISASSEMBLING AND SERVICING

CHECKING AND ADJUSTING



B161F155

Toe-in

1. Inflate the tires to the specified pressure.
2. Turn the front wheels straight ahead.
3. Measure the toe-in (A-B).
4. If the measurement is not within the factory specifications, adjust the tie-rod length.

Toe-in (A-B)	Factory spec.	1 to 10 mm 0.04 to 0.39 in.
--------------	---------------	--------------------------------

- (A) Wheel to Wheel Distance at rear
(B) Wheel to Wheel Distance at front
(C) Front

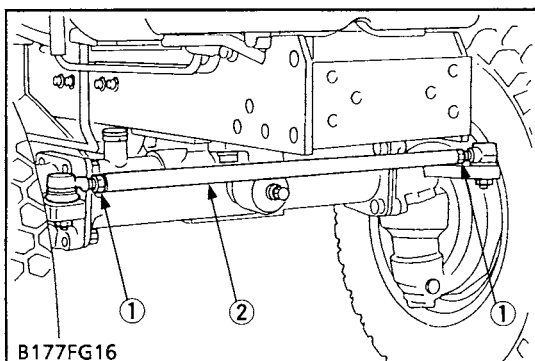
Toe-in Adjustment

1. Loosen the lock nuts (1).
2. Turn the tie-rod (2) until to be factory specification.
3. Tighten the lock nuts (1).

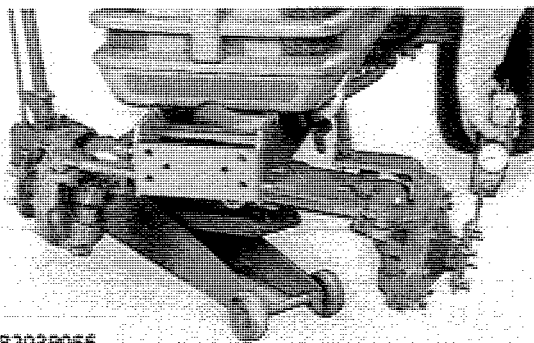
Tightening torque	Lock nuts	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
-------------------	-----------	---

(1) Lock Nut

(2) Tie-rod



B177FG16



Front Axle Rocking Force

1. Jack up the front side of tractor.
2. Set a spring balance to the front axle flange.
3. Measure the front axle rocking force.
4. If the measurement is not within the factory specifications, adjust with the adjusting screw (1).
5. Tighten the lock nut (2) firmly.

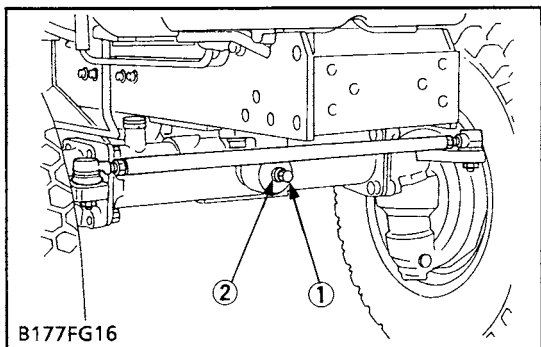
Front axle rocking force	Factory spec.	49.0 to 117.7 N 5.0 to 12.0 kgf 11.0 to 26.5 lbs
--------------------------	---------------	--

Tightening torque	Lock nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	----------	---

(1) Adjusting Screw

(2) Lock Nut

B203P056



B177FG16

DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle

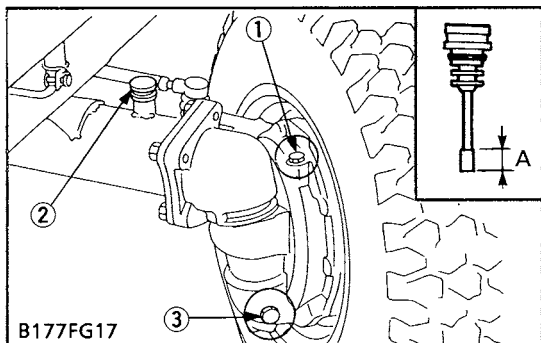
Draining Front Axle Case Oil

1. Place oil pans underneath the front axle case.
2. Remove both right and left drain plugs (3) and filling plug (2) to drain the oil.
3. Remove the right and left breather plugs.
4. After draining, reinstall the drain plugs (3).
5. Fill with new oil up to the upper notch on the dipstick.
6. After filling, reinstall the filling plug and breather plugs.

Front axle case oil capacity	3.7 ℓ 3.9 U.S.qts. 3.3 Imp.qts.
------------------------------	---------------------------------------

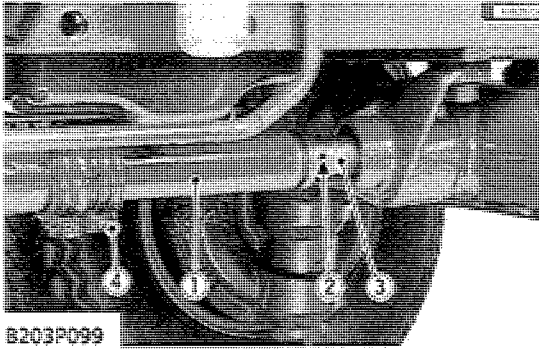
■ IMPORTANT

- After ten minutes, check the oil level again. If low, add oil to prescribed level.
- Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. Refer to "LUBRICANTS, FUEL AND COOLING WATER". (See page G-8.)



B177FG17

- (1) Breather Plug
- (2) Filling Plug with Dipstick
- (3) Drain Plug
- (A) Oil level is acceptable within this range.



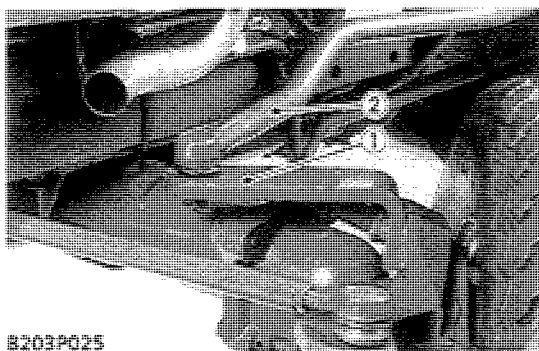
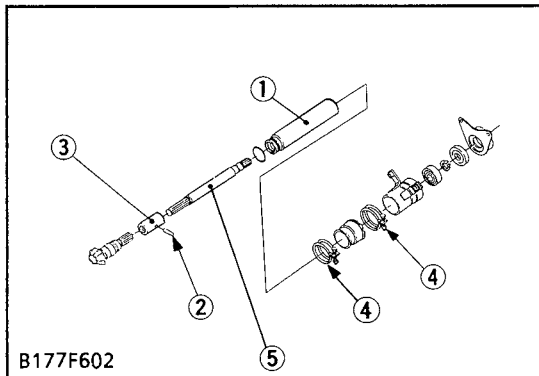
Propeller Shaft

1. Loosen the clamp (4) and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2), and then slide the coupling (3) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft.

- | | |
|---------------------------|---------------------|
| (1) Propeller Shaft Cover | (4) Clamp |
| (2) Spring Pin | (5) Propeller Shaft |
| (3) Coupling | |



Drag Link

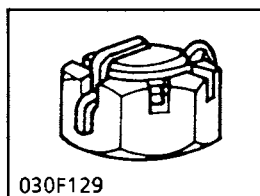
1. Steer the front wheels to the left.
2. Remove the slotted nut and disconnect the drag link (2) from the knuckle arm (1).

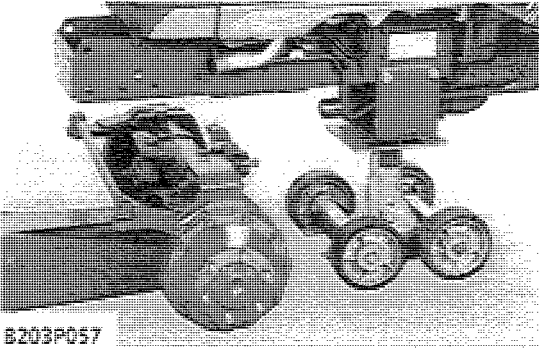
■ IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure left.

Tightening torque	Slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
-------------------	-------------	---

- | | |
|-----------------|---------------|
| (1) Knuckle Arm | (2) Drag Link |
|-----------------|---------------|



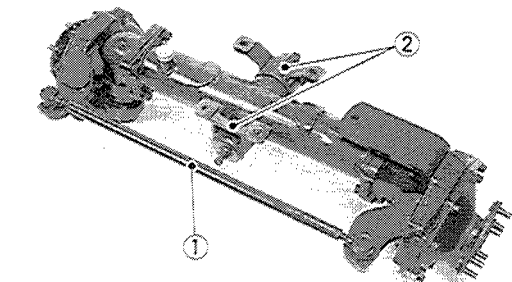


Front Axle

1. Place the jacks under the front axle, and hang up the front axle frame by the hoist to support it.
2. Remove the front wheels.
3. Remove the front axle bracket (Front) mounting screws and front axle bracket (Rear) mounting screws.
4. Separate the front axle from the front axle frame.

(When reassembling)

Tightening torque	Front axle bracket mounting screws	124 to 147 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs
	Front wheel mounting nuts	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs



B207P058

Tie Rod and Front Axle Bracket

1. Remove the tie rod (1).
2. Remove the front axle bracket (2).

(When reassembling)

- Apply grease to the oil seal of front axle bracket (Rear) (2).

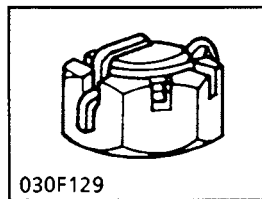
■ IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure left.

Tightening torque	Slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
-------------------	-------------	---

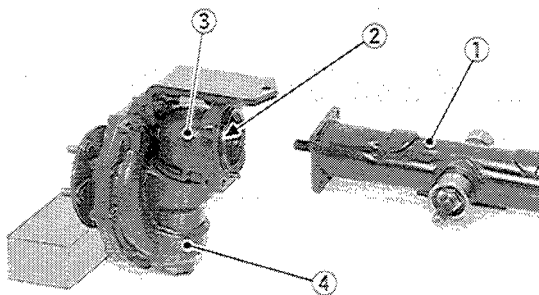
(1) Tie Rod

(2) Front Axle Bracket



030F129

(2) Disassembling Front Axle



B177P181

- (1) Front Axle Case
- (2) O-ring

- (3) Bevel Gear Case
- (4) Front Gear Case

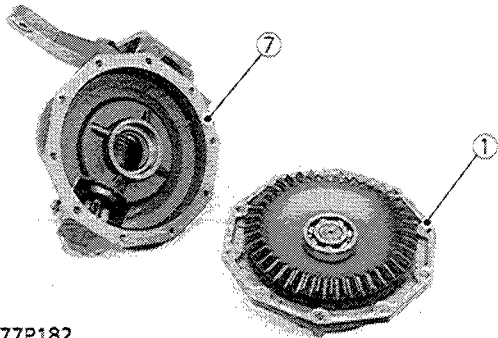
Bevel Gear Case and Front Gear Case

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).

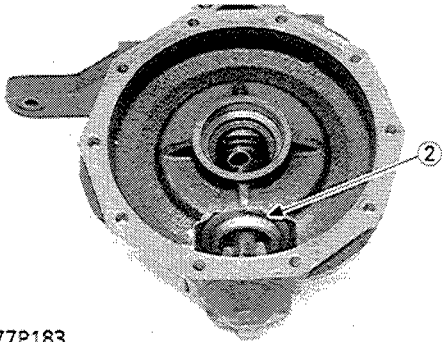
(When reassembling)

- Apply grease to the O-ring (2) and take care not to damage it.
- Do not interchange right and left bevel gear case assemblies and right and left front gear case assemblies.

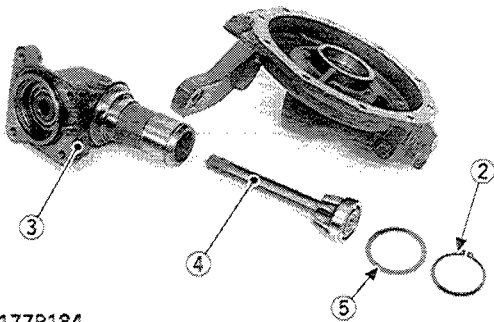
Tightening torque	Bevel gear case mounting screw	123.5 to 147.0 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 ft-lbs
-------------------	--------------------------------	--



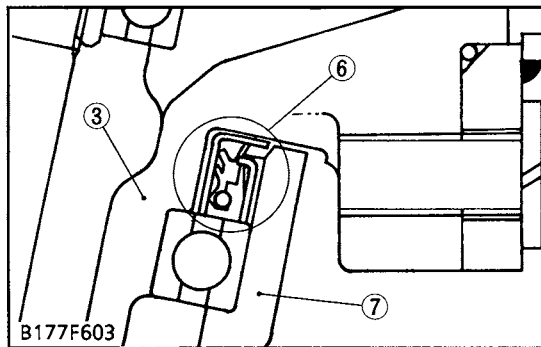
B177P182



B177P183



B177P184



B177F603

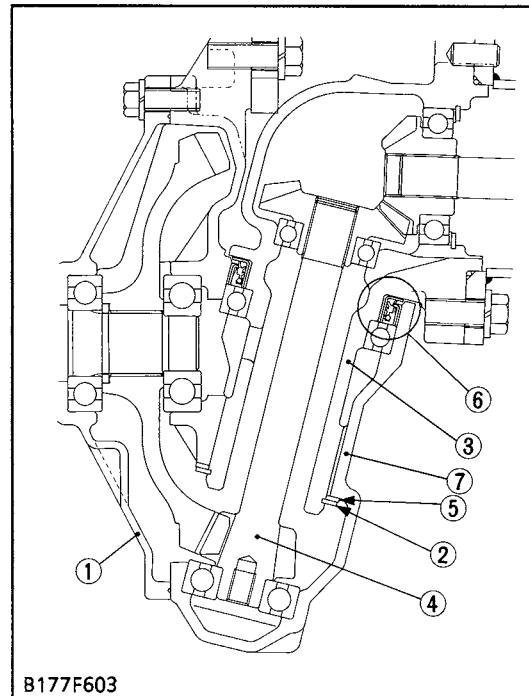
Bevel Gear Case, Axle Flange and Front Gear Case

1. Remove the knuckle arm (Left side).
2. Remove the axle flange (1) mounting screws.
3. Remove the external snap ring (2).
4. Remove the bevel gear case (3) from front gear case (7).
5. Remove the bevel gear shaft (4) and ball bearing.

(When reassembling)

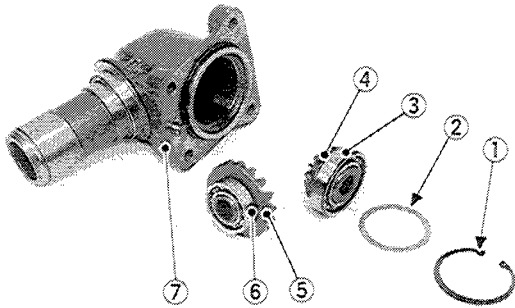
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the axle flange (1) and front gear case (7) after eliminate the water, oil and stuck liquid gasket.
- Tighten the axle flange mounting screws and nuts diagonally in several steps.
- Install the oil seal (6) of bevel gear case, noting its direction as shown in the figure below.

Tightening torque	Axle flange mounting screws	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs
-------------------	-----------------------------	---



B177F603

- (1) Axle Flange
- (2) External Snap Ring
- (3) Bevel Gear Case
- (4) Bevel Gear Shaft
- (5) Thrust Collar
- (6) Oil Seal
- (7) Front Gear Case



B177P185

Bevel Gear Case Gears

1. Remove the internal snap ring (1).
2. Take out the bevel gears (4), (5) with ball bearings (3), (6), and shims (2).

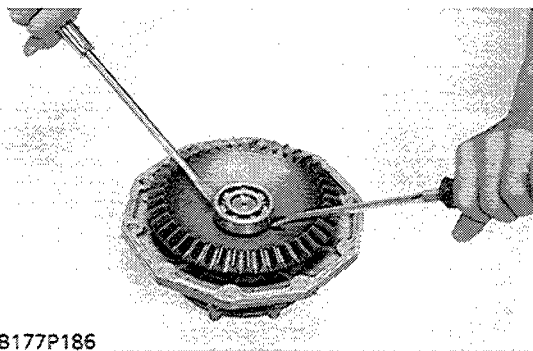
(When reassembling)

- Install the shims (2) to their original position.

(Reference)

- Thickness of adjusting shims :
 0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
 1.0 mm (0.039 in.)

- | | |
|------------------------|---------------------|
| (1) Internal Snap Ring | (5) Bevel Gear |
| (2) Shim | (6) Ball Bearing |
| (3) Ball Bearing | (7) Bevel Gear Case |
| (4) Bevel Gear | |



B177P186

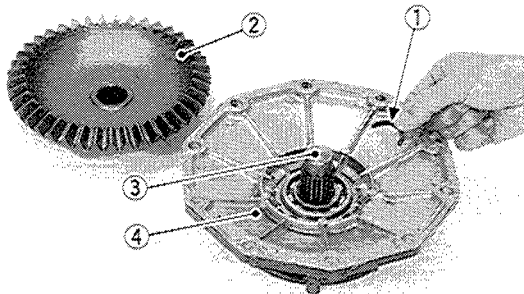
Axle

1. Remove the bearing.
2. Take out the bevel gear (2).
3. Take out the collar (1).
4. Tap out the axle (3).

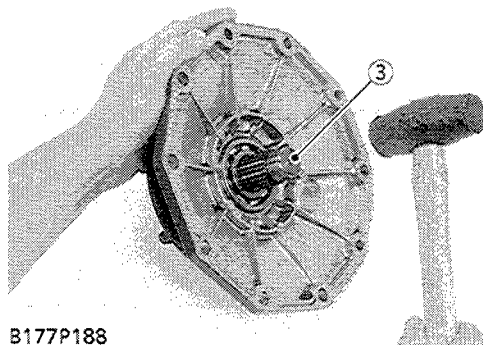
(When reassembling)

- Install the oil seal (5) of axle flange (4), noting its direction as shown in the figure below.

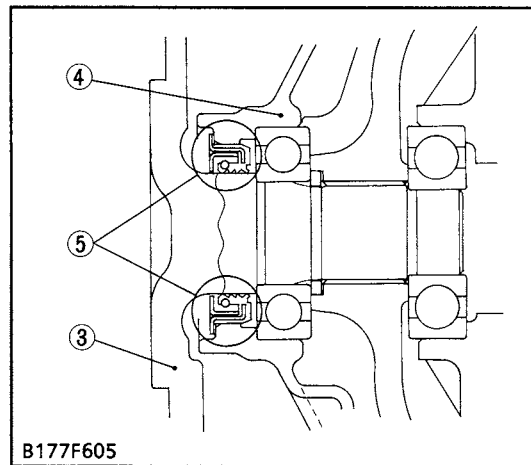
- | | |
|----------------|-----------------|
| (1) Collar | (4) Axle Flange |
| (2) Bevel Gear | (5) Oil Seal |
| (3) Axle | |



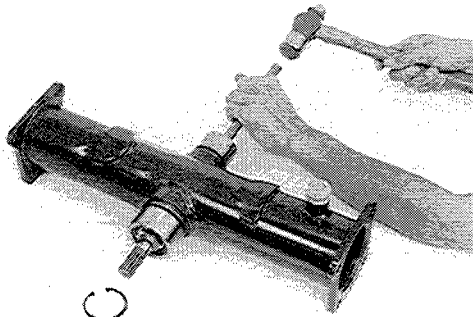
B177P187



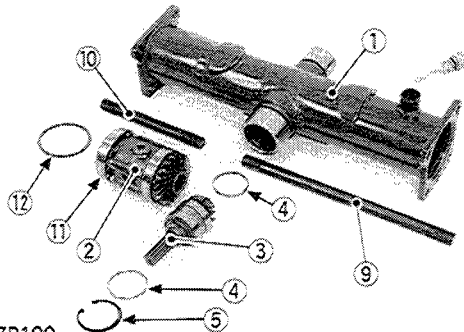
B177P188



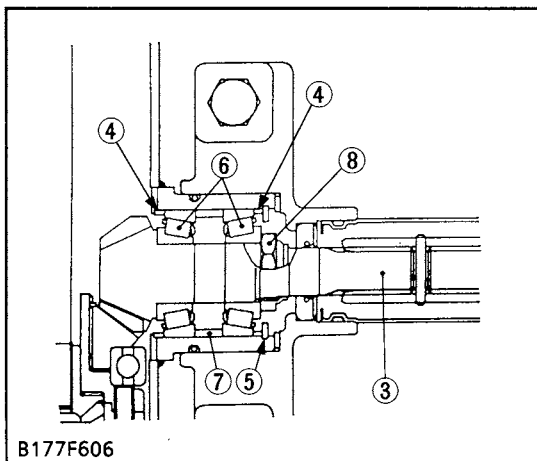
B177F605



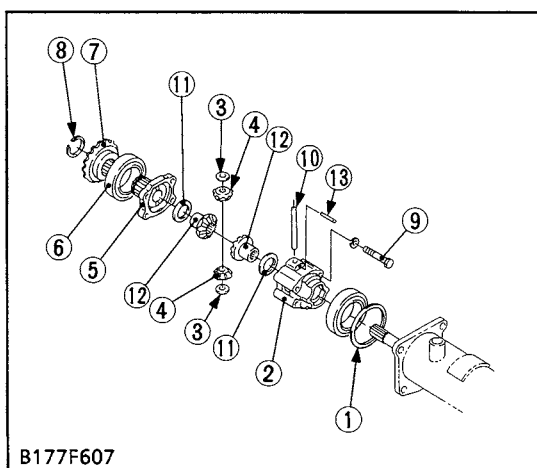
B177P189



B177P190



B177F606



B177F607

- (1) Collar
- (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) Screws
- (10) Pinion Shaft
- (11) Shim
- (12) Differential Side Gear
- (13) Straight Pin

Spiral Bevel Pinion Shaft and Differential Gear Assembly

1. Take out the differential yoke shaft (9), (10).
2. Remove the internal snap ring (5).
3. Tap out the spiral bevel pinion shaft (3) by the brass rod and hammer.
4. Take out the differential gear assembly (2), ball bearing (11) and collar (12) from right side of front axle case (1).
5. Remove the stake of lock nut (8), and then remove the lock nut (8).
6. Remove the taper roller bearings (6).

(When reassembling)

- Replace the lock nut (8) with new ones.
- Apply grease to the O-ring of front axle case bosses.
- Install the shims and collars to their original position.
- Apply gear oil to the taper roller bearings (6) and install them correctly, noting their direction.
- Stake the lock nut (8) firmly.

- (1) Front Axle Case
- (2) Differential Gear Assembly
- (3) Spiral Bevel Pinion Shaft
- (4) Adjusting Collar
- (5) Internal Snap Ring
- (6) Taper Roller Bearings
- (7) Collar
- (8) Lock Nut
- (9) Differential Yoke Shaft RH
- (10) Differential Yoke Shaft LH
- (11) Ball Bearing
- (12) Collar

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).

NOTE

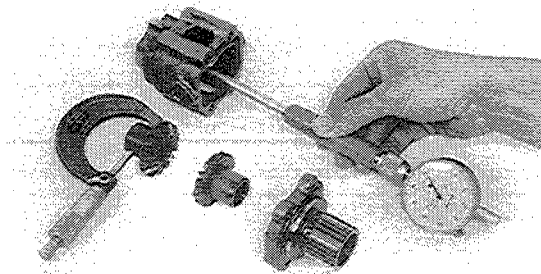
- Arrange the parts to know their original position.

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gears (12) and differential pinions (4).
- Install the pinion shaft (10) so that the hole on it may align with the hole on differential case (2), and install the straight pin (13).

Tightening torque	Differential case cover mounting screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
-------------------	--	---

SERVICING

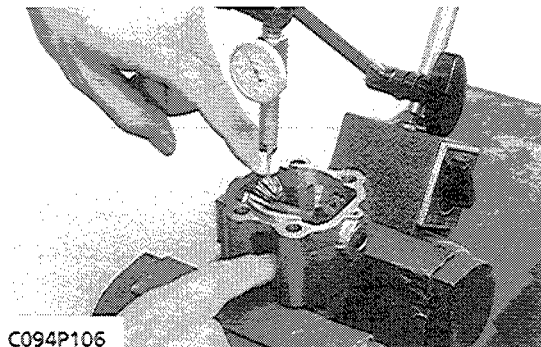


B177P192

Clearance between Differential Case (Differential Case Cover) and Differential Side Gear

1. Measure the differential side gear boss O.D.
2. Measure the differential case bore I.D. and calculate the clearance.
3. Measure the differential case cover bore I.D. and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (Differential case cover) and differential side gear	Factory spec.	0.040 to 0.082 mm 0.00157 to 0.00323 in.
	Allowable limit	0.17 mm 0.0067 in.
Differential case bore I.D.	Factory spec.	26.000 to 26.021 mm 1.02362 to 1.02445 in.
Differential case cover bore I.D.	Factory spec.	26.000 to 26.021 mm 1.02362 to 1.02445 in.
Differential side gear O.D.	Factory spec.	25.939 to 25.960 mm 1.02122 to 1.02205 in.



C094P106

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.

Backlash between Differential Pinion and Differential Side Gear

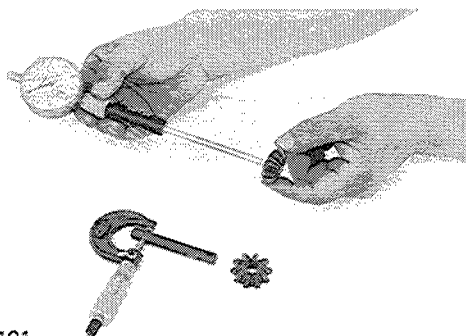
Gear

1. Set a dial gauge (lever type) on a tooth of the differential pinion.
2. Fix the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

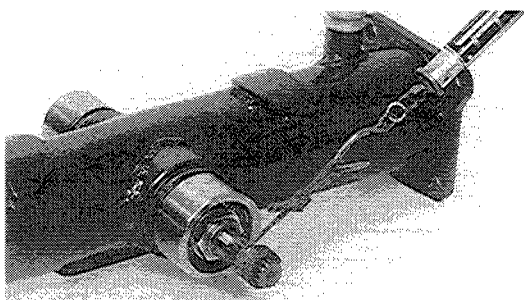
Backlash between differential pinion and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
---	---------------	-------------------------------------

(Reference)

- Thickness of adjusting shims :
0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
1.0 mm (0.039 in.)



B177P191



B177P194

Turning Force of Spiral Bevel Pinion Shaft

1. Install the spiral bevel pinion shaft assembly to the front axle case.
2. Wind a string around the spiral bevel pinion shaft and attach spring balance to the tip of the string.
3. Slowly pull the spring balance in a direction at right angle to the spiral bevel pinion shaft to measure the turning force.
4. If the turning force is not within the factory specifications, adjust with the lock nut.

Turning force	Factory spec.	127.5 to 166.7 N 13 to 17 kgf 28.7 to 37.5 lbs
---------------	---------------	--

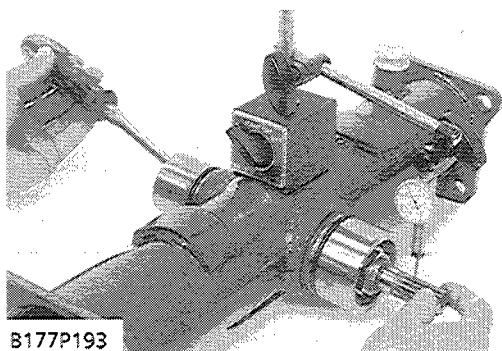
NOTE

- The turning torque is figured by multiplying the radius (distance from the center of the spiral bevel pinion shaft to a point on the circumference from which the string is pulled) by the reading on the spring balance.
- After turning force adjustment, be sure to stake the lock nut.

Backlash between Spiral Bevel Pinion Shaft and Spiral Bevel Gear

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 collars (3), (4). For example change the adjusting collar (4) to 0.1 mm (0.004 in.) smaller size, and change the adjusting collar (3) to 0.1 mm (0.004 in.) larger size.
4. Adjust the backlash properly by repeating the above procedures.



B177P193

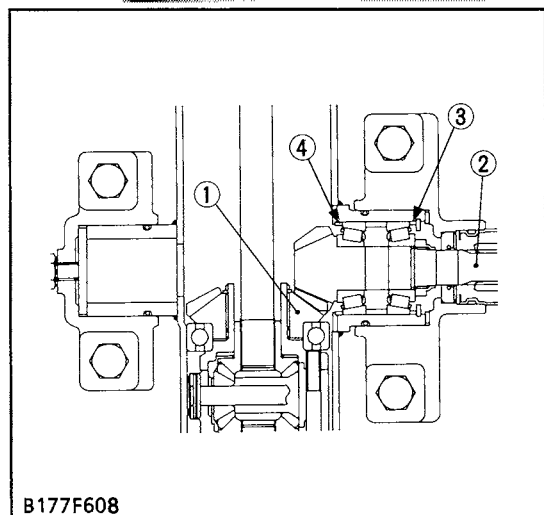
Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
--	---------------	-------------------------------------

- (1) Spiral Bevel Gear
- (2) Spiral Bevel Pinion Shaft
- (3) Adjusting Collar
- (4) Adjusting Collar

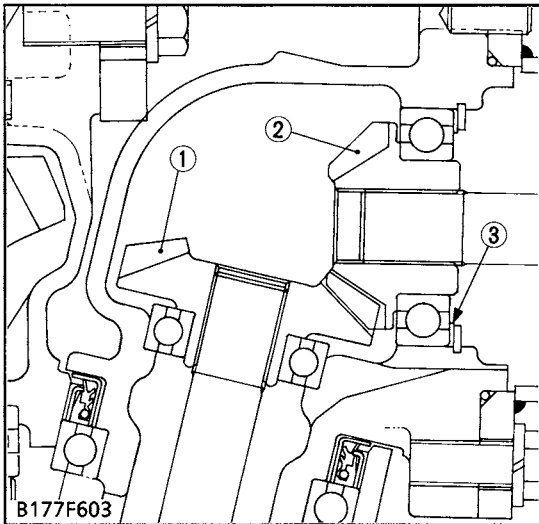
(Reference)

- Above factory specification should be measured on the tooth of spiral bevel pinion. When measuring the backlash on the spline of its shaft, factory specification will be 0.0571 to 0.1714 mm (0.00225 to 0.00675 in.).
- Thickness of adjusting collars (3), (4) :

3.4 mm (0.134 in.)	4.1 mm (0.161 in.)
3.6 mm (0.142 in.)	4.2 mm (0.165 in.)
3.8 mm (0.150 in.)	4.4 mm (0.173 in.)
4.0 mm (0.157 in.)	4.6 mm (0.181 in.)



B177F608



(1) 16T Bevel Gear (2) 11T Bevel Gear (3) Shim

Backlash between 11T Bevel Gear and 16T Bevel Gear

1. Stick a strip of fuse to three spots on the 16T bevel gear (1) with grease.
2. Fix the front axle case, bevel gear case and front gear case.
3. Turn the axle.
4. Remove the bevel gear case from front axle case and measure the thickness of the fuses with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between 11T bevel gear and 16T bevel gear	Factory spec.	0.10 to 0.30 mm 0.0039 to 0.0118 in.
--	---------------	---

(Reference)

- Thickness of adjusting shims (3) :
0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
1.0 mm (0.039 in.) 1.4 mm (0.055 in.)
- Tooth contact : More than 35 %

Outside Diameter of Front Axle Case Bosses and Inside Diameter of Front Axle Bracket

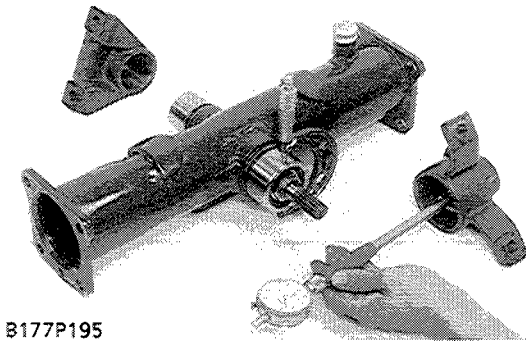
Diameter of Front Axle Bracket

1. Measure the front axle case bosses O.D. with an outside micrometer.
2. Measure the front axle bracket I.D. with a cylinder gauge.

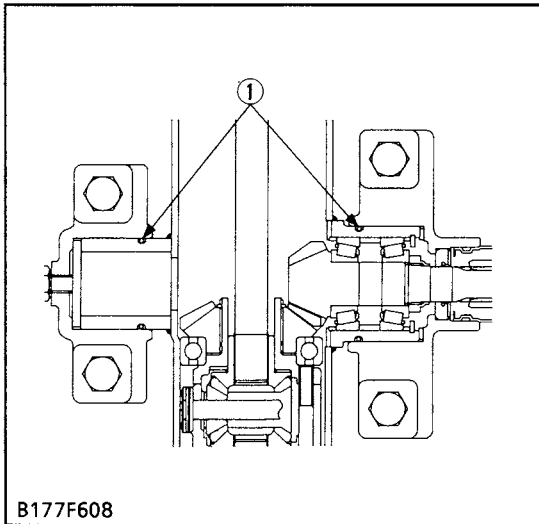
(Reference)

Front axle case boss (front) O.D.	Factory spec.	49.920 to 49.945 mm 1.96535 to 1.96634 in.
Front axle bracket (front) I.D.	Factory spec.	50.150 to 50.200 mm 1.97441 to 1.97638 in.

Front axle case boss (rear) O.D.	Factory spec.	64.910 to 64.940 mm 2.55551 to 2.55669 in.
Front axle bracket (rear) I.D.	Factory spec.	65.150 to 65.200 mm 2.56496 to 2.56693 in.



B177P195



B177F608

(When reassembling)

- Apply grease to the O-ring (1) and take care not to damage it.
- After mounting the front axle assy to the front axle frame, be sure to adjust the front axle rocking force (See page 6-54).

(1) O-ring

7 STEERING

7 STEERING

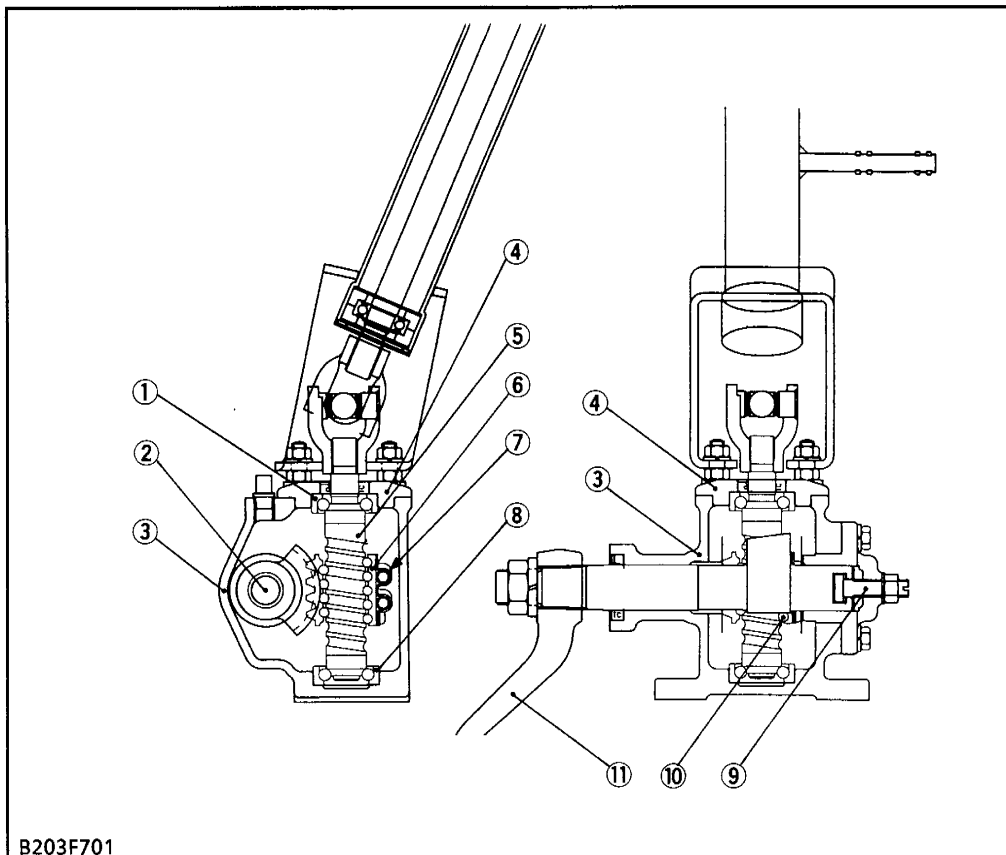
MECHANISM

CONTENTS

[1] STRUCTURE	7-M1
(1) Manual Steering System	7-M1

[1] STRUCTURE

(1) Manual Steering System



- (1) Bearing
- (2) Sector Shaft
- (3) Steering Gear Case
- (4) Top Cover
- (5) Worm Shaft
- (6) Ball Nut
- (7) Ball Guide
- (8) Bearing
- (9) Adjusting Screw
- (10) Ball
- (11) Pitman Arm

The steering is of the recirculating ball bearing, ball nut type. Ball nut (6) is thread over the worm portion of worm shaft (5) and they have grooves corresponding to each other. These grooves are filled with steel balls (10) and ball nut (6) is provided with ball guides (7) to make up circuits of recirculating balls.

Worm shaft (5) is supported by two bearings (1), (8). One is at the bottom of top cover (4) and the other is in the bottom of steering gear case (3). The gear teeth on ball nut (6) mesh with the gear on sector shaft (2).

Turning the steering wheel clockwise, ball nut (6) is moved upward by the steering worm shaft (5). Sector shaft (2), which meshes with ball nut (6), rotates and pitman arm (11) pulls the drag link. Then wheels turn to the right.

Turning the steering wheel counterclockwise, ball nut (6) is moved downward by the worm shaft (5). Sector shaft (2), which meshes with ball nut (6), rotates and pitman arm (11) pushes the drag link. Then wheels turn to the left.

SERVICING

CONTENTS

TROUBLESHOOTING	7-S1
SERVICING SPECIFICATIONS	7-S1
TIGHTENING TORQUES	7-S1
CHECKING, DISASSEMBLING AND SERVICING	7-S2
CHECKING AND ADJUSTING	7-S2
[1] SEPARATING STEERING GEAR BOX	7-S2
[2] STEERING GEAR BOX ASSEMBLY	7-S4
DISASSEMBLING AND ASSEMBLING	7-S4
SERVICING	7-S6

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Steering Wheel Play	● Backlash between sector gear shaft and ball nut too large	Adjust	–
	● Steering linkage worn ● Sector gear shaft worn	Replace Replace	– 7-S6
Tractor Pulls to Right or Left	● Tire pressure uneven	Adjust	G-40
	● Steering wheel play too small ● Improper toe-in adjustment	Adjust Adjust	7-S2 G-22
Front Wheels Vibration	● Steering linkage worn	Replace	–
	● Improper toe-in adjustment	Adjust	G-22

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Steering Wheel	Play	10.0 to 30.0 mm 0.39 to 1.18 in.	–
Worm Shaft and Sector Shaft	Total Turning Torque	0.45 to 1.0 N·m 0.05 to 0.10 kgf·m 0.33 to 0.74 ft-lbs	–

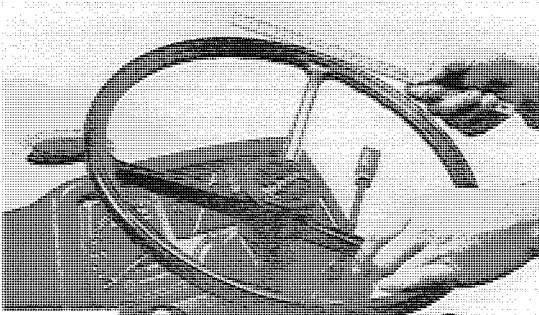
TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft-lbs
Drag link end slotted nut	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
Tie rod lock nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Pitman arm mounting nut	147.1 to 176.5	15.0 to 18.0	108.5 to 130.2
Steering gear box mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Steering wheel mounting nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Top cover mounting nut	24.5 to 28.5	2.5 to 2.9	18.1 to 21.0
Side cover mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3

CHECKING, DISASSEMBLING AND SERVICING

CHECKING AND ADJUSTING

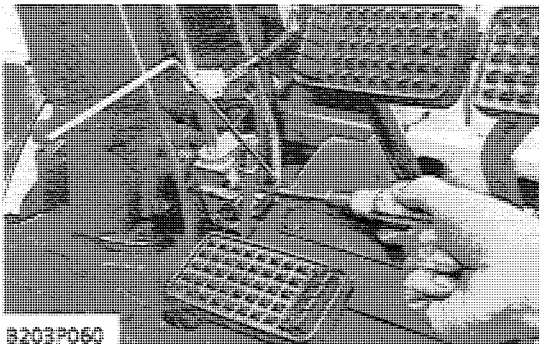


B203P059

Steering Wheel Play

1. Turn the front wheels straight ahead.
2. Move the steering wheel back and forth until slight movement of pitman arm is seen. Measure maximum play of steering wheel at outer rim.
3. If the play is not within the factory specifications, turn the adjusting screw to adjust.

Steering wheel play	Factory spec.	10 to 30 mm 0.39 to 1.18 in.
---------------------	---------------	---------------------------------

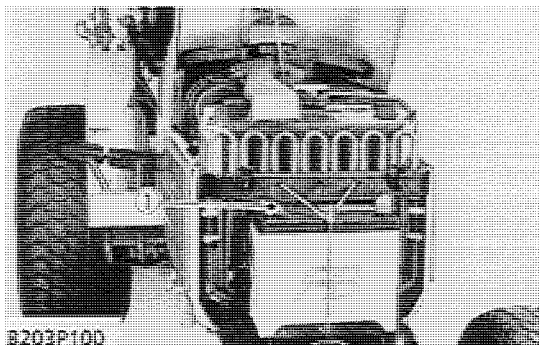


B203P060

(Adjusting)

1. Remove the steering wheel.
2. Remove the meter panel and panel under cover.
3. Install the steering wheel.
4. Loosen the lock nut and turn the adjusting screw with a screwdriver to adjust the play.
When the adjusting screw is turned clockwise, the play decreases.
5. After adjustment, fix it with the lock nut while holding the adjusting screw.

[1] SEPARATING STEERING GEAR BOX

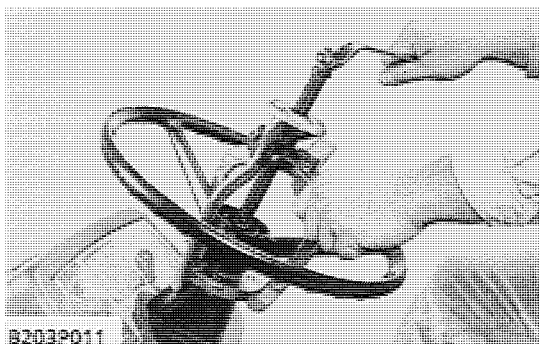


B203P100

Hood and Side Cover

1. Open the hood from the front and remove the front grille.
2. Disconnect the battery negative cable (1).

(1) Battery Negative Cable



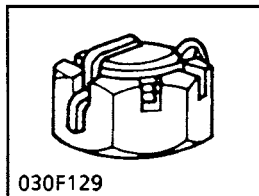
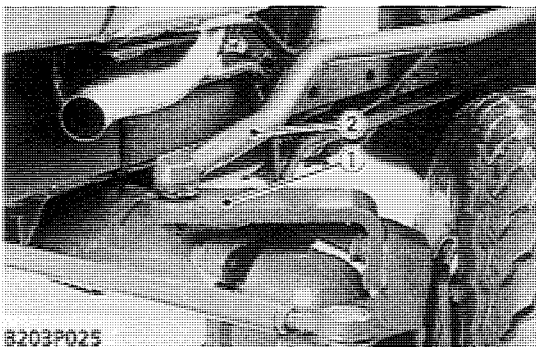
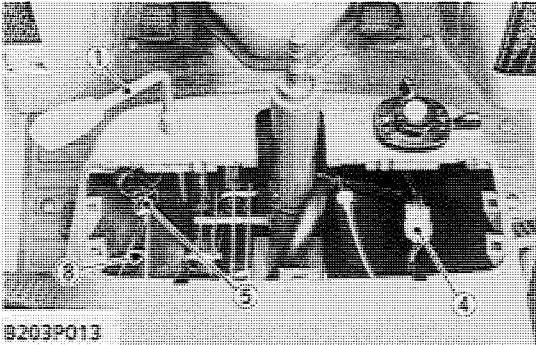
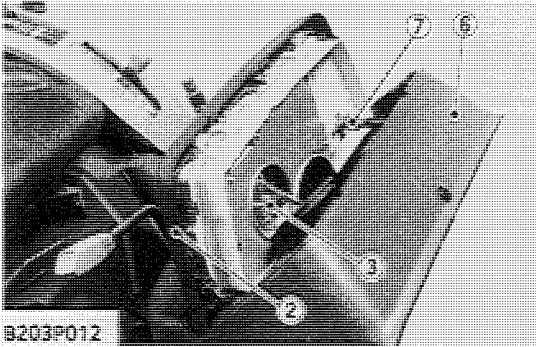
B203P011

Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel with a steering wheel puller. (Code No : 07916-51090)

(When reassembling)

Tightening torque	Steering wheel mounting nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft.-lbs
-------------------	-----------------------------	--



Meter Panel and Panel Under Cover

1. Remove the meter panel (2) and disconnect the meter panel connector (3) and hour-meter cable (7) from the meter panel. Then remove the meter panel.
2. Tap out the spring pin and remove the hand accelerator lever (1).
3. Disconnect the combination switch connector (4) and main switch connector (5).
4. Remove the knob of engine stop rod (8).
5. Remove the panel under cover (6).

- | | |
|----------------------------------|---------------------------|
| (1) Hand Accelerator Lever | (5) Main Switch Connector |
| (2) Meter Panel | (6) Panel Under Cover |
| (3) Meter Panel Connector | (7) Hour-meter Cable |
| (4) Combination Switch Connector | (8) Engine Stop Rod |

Drag Link

1. Steer the front wheels to the left.
2. Remove the slotted nut and disconnect the drag link (2) from the knuckle arm (1).

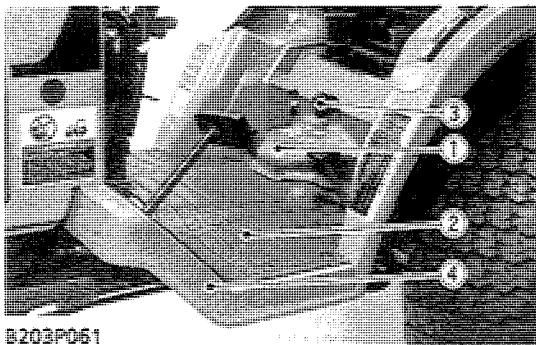
(When reassembling)

IMPORTANT

- After tightening the slotted nut to the specified torque, install the cotter pin as shown in the figure.

Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13 to 25.3 ft-lbs
-------------------	-------------	---

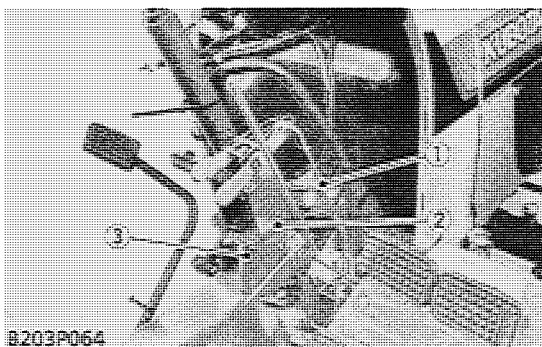
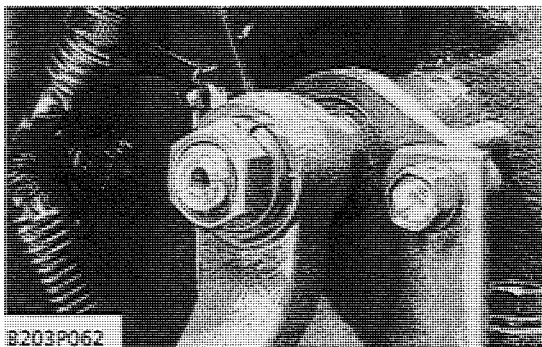
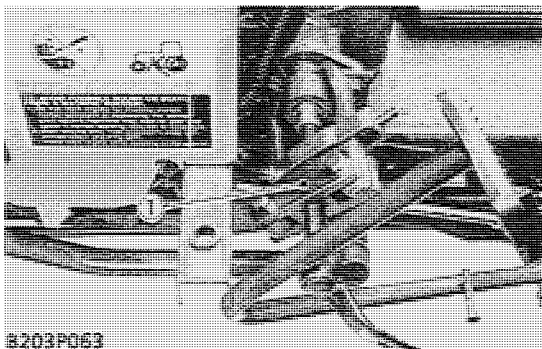
- | | |
|-----------------|---------------|
| (1) Knuckle Arm | (2) Drag Link |
|-----------------|---------------|



Step

1. Remove the lowering speed adjusting knob (3).
2. Remove the seat under cover (1).
3. Remove the rubber mat (2).
4. Remove the clutch spring and left hand step (4).

- | | |
|----------------------|-----------------------------------|
| (1) Seat Under Cover | (3) Lowering Speed Adjusting Knob |
| (2) Rubber Mat | (4) Step (LH) |



Pitman Arm

1. Use a pitman arm puller (1) or similar puller to remove the pitman arm.

IMPORTANT

- When removing pitman arm, do not strike the end of cross shaft or puller. Damage to gear box could occur.
- Install the pitman arm to the sector gear shaft so that their marks align.

Tightening torque	Pitman arm mounting	118.0 to 147 N·m 12.0 to 15.0 kgf·m 87.0 to 108.4 ft-lbs
-------------------	---------------------	--

(1) Pitman Arm Puller

Steering Gear Box Assembly

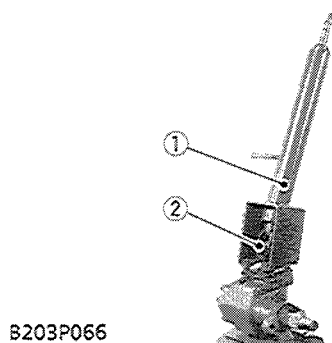
1. Remove the parking brake lever (1) and speed control set lever (2).
2. Remove the steering gear box assembly (3) from the center frame.

Tightening torque	Steering gear box mounting screw	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
-------------------	----------------------------------	---

(1) Parking Brake Lever
(2) Speed Control Set Lever

(3) Steering Gear Box Assembly

**[2] STEERING GEAR BOX ASSEMBLY
DISASSEMBLING AND ASSEMBLING**



B203P066

Steering Column and Top Cover

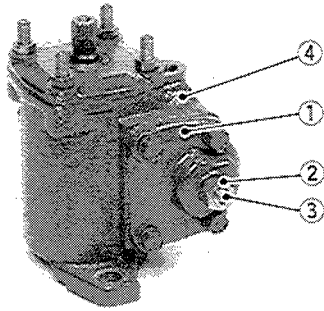
1. Secure the steering assembly in a vise.
2. Loosen the steering column (1) mounting nut, and remove the steering column with steering shaft and universal joint (2).

(When reassembling)

Tightening torque	Steering column mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	------------------------------	---

(1) Steering Column

(2) Universal Joint



B203P067

Side Cover

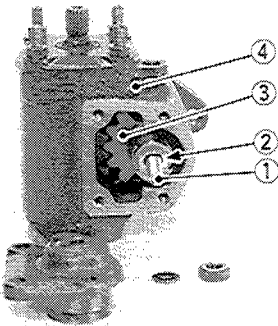
1. Remove the lock nut (2) and seal washer on the adjusting screw.
2. Remove the side cover mounting screws.
3. Adjusting the screw (3) in, to remove the side cover (1).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of side cover (1) and steering gear box (4).
- Apply liquid gasket (Three Bond 1208D or equivalent) to threads of adjusting screw (3) and lock nut (2).
- Be sure to keep adjusting screw loose when tightening.

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

- (1) Side Cover
 (2) Lock Nut
 (3) Adjusting Screw
 (4) Steering Gear Box



B203P068

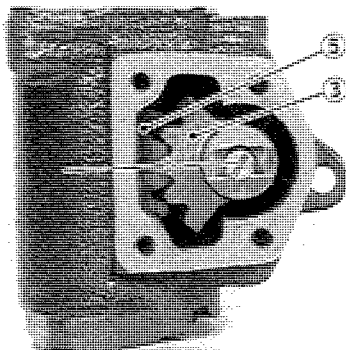
Sector Shaft

1. Remove the adjusting screw (1) with shim (2).
2. Turn the worm shaft so that sector shaft (3) teeth are aligned with wider opening in steering gear box (4).
3. Remove the sector shaft (3).

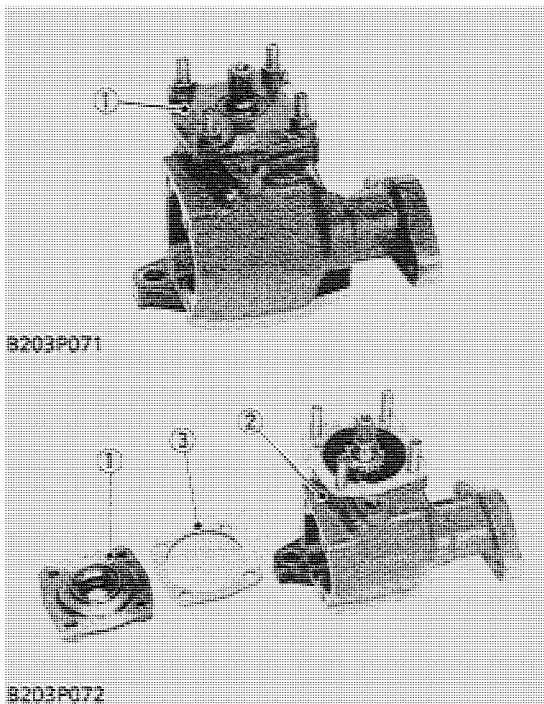
(When reassembling)

- Turn the worm shaft so that the ball nut (5) is centered in its travel. Then, install the sector shaft (3) to center tooth engage the center of the ball nut (5).

- (1) Adjusting Screw
 (2) Shim
 (3) Sector Shaft
 (4) Steering Gear Box
 (5) Ball Nut



B203P069



Top Cover and Ball Nut Assembly

1. Remove the top cover mounting nuts.
2. Pull the worm shaft with ball nut from the steering gear box.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of top cover (1), steering gear box (2), and shims (3).

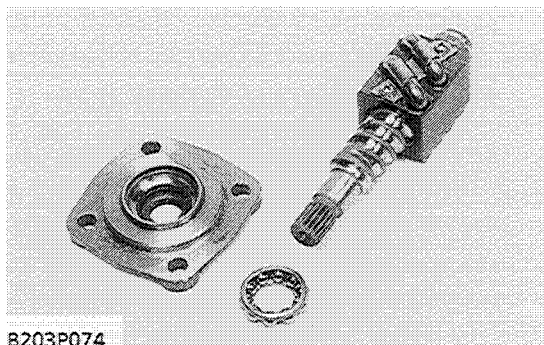
NOTE

- Be sure to check the number of shims used between top cover and steering gear box.

Tightening torque	Top cover mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs
-------------------	------------------------	---

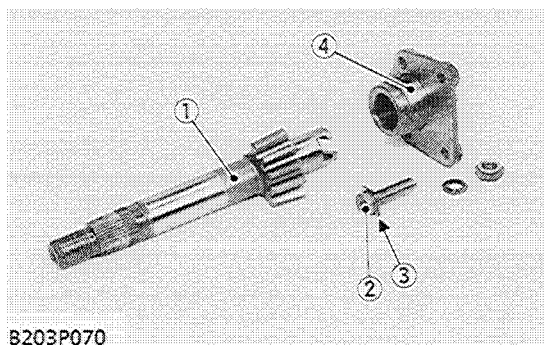
- (1) Top Cover
(2) Steering Gear Box
(3) Shims

SERVICING



Bearing and Bearing to Worm Shaft Contact Area

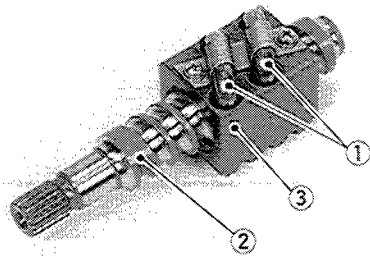
1. Inspect the lower and upper ball bearing and race for roughness or pitting. If damaged, replace bearing and race.
2. Inspect the lower and upper bearing to worm shaft contact area for pitting or roughness. Replace parts as necessary.



Sector Shaft

1. Inspect the sector shaft to steering gear box and side cover contact areas for wear or scoring.
2. Inspect the teeth area and pitman arm spline for cracks, chipping or excessive wear. Replace the sector shaft as necessary.
3. Check the side cover for cracks or damage. Replace the side cover if necessary.

- (1) Sector Shaft
(2) Adjusting Screw
(3) Shim
(4) Side Cover



B203P075

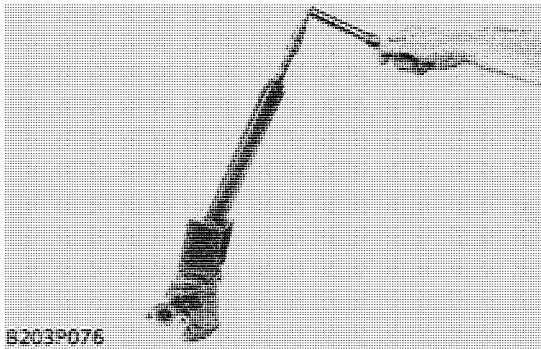
- (1) Return Guide
- (2) Worm Shaft
- (3) Ball Nut

Ball Nut

1. Thoroughly clean the worm shaft (2) and ball nut (3). Turn the ball nut on the shaft, feeling for roughness, binding or sticking. Inspect the worm path for pitting or flaking.
2. Check the return guide (1) for damage.
3. Inspect the ball nut teeth for excessive wear or roughness.

NOTE

- Do not remove the ball nut from the worm shaft. The two parts are replaced as a unit only.

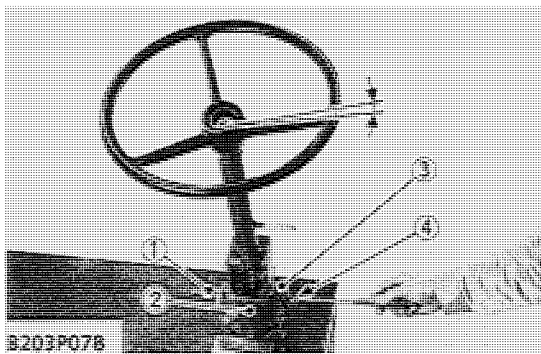


B203P076

Turning Torque of Worm Shaft

1. Install top cover with shims to steering gear box.
2. Assemble the steering column. Then set the steering wheel mounting nut and lock nut on steering shaft.
3. Set the torque wrench on the steering shaft and measure the torque required to initial turning.
4. If the measurement is not within the factory specification, adjust with the shims at top cover and gear box.

Turning torque of worm shaft	Factory spec.	0.25 to 0.5 N·m 0.03 to 0.05 kgf·m 0.18 to 0.37 ft-lbs
------------------------------	---------------	--

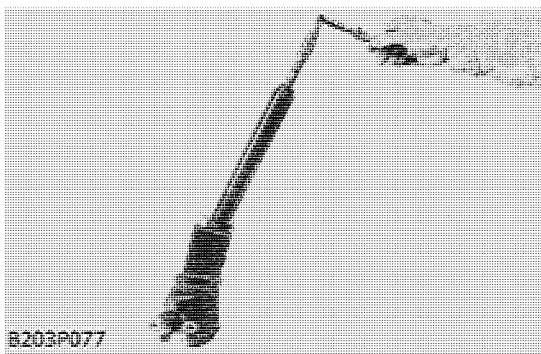


B203P078

Total Turning Torque of Worm Shaft and Sector Shaft

1. Install the sector shaft (1) to steering gear box (2) as shown.
2. Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of side cover and steering gear box.
3. Install the side cover (3) by adjusting screw (4) through cover.
4. Tighten the side cover mounting screw. Be sure to keep adjusting screw loosen when tightening.
5. Install the seal washer and lock nut to adjusting screw and adjust the steering wheel play (backlash between sector shaft teeth and ball nut teeth).
6. Then, measure the total turning torque required to initial turning.

Steering wheel play	Factory spec.	10 to 30 mm 0.39 to 1.18 in.
Total turning torque of worm shaft and sector shaft	Factory spec.	0.45 to 1.0 N·m 0.05 to 0.10 kgf·m 0.33 to 0.74 ft-lbs



B203P077

- (1) Sector Shaft
- (2) Steering Gear Box
- (3) Side Cover
- (4) Adjusting Screw

8 HYDRAULIC SYSTEM

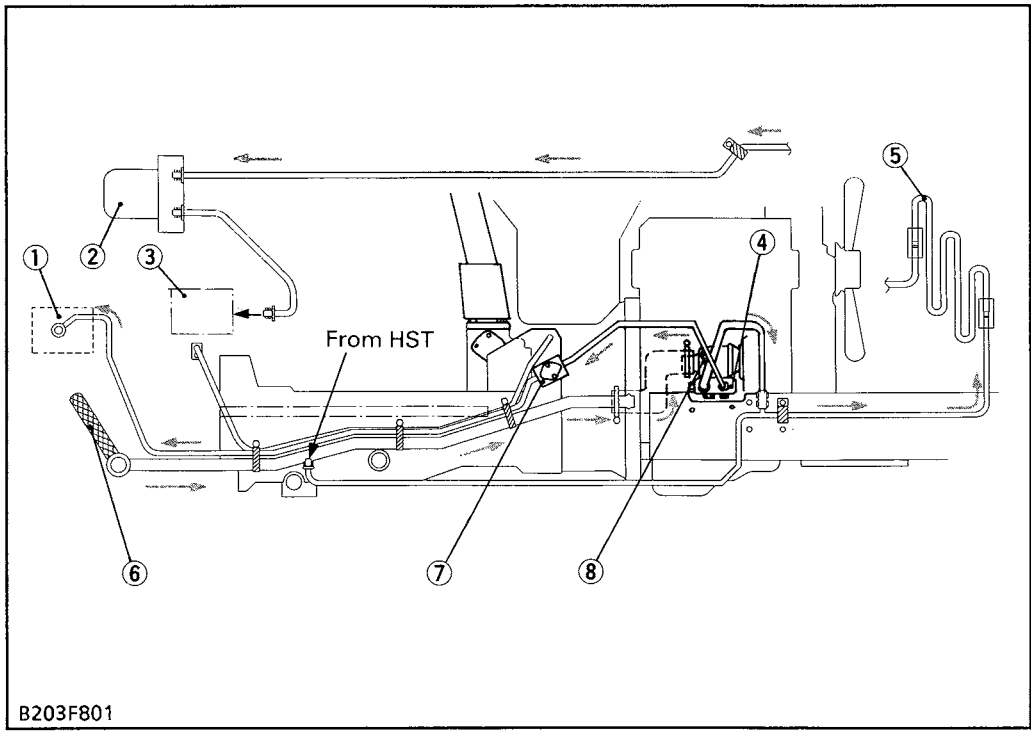
8 HYDRAULIC SYSTEM

MECHANISM

CONTENTS

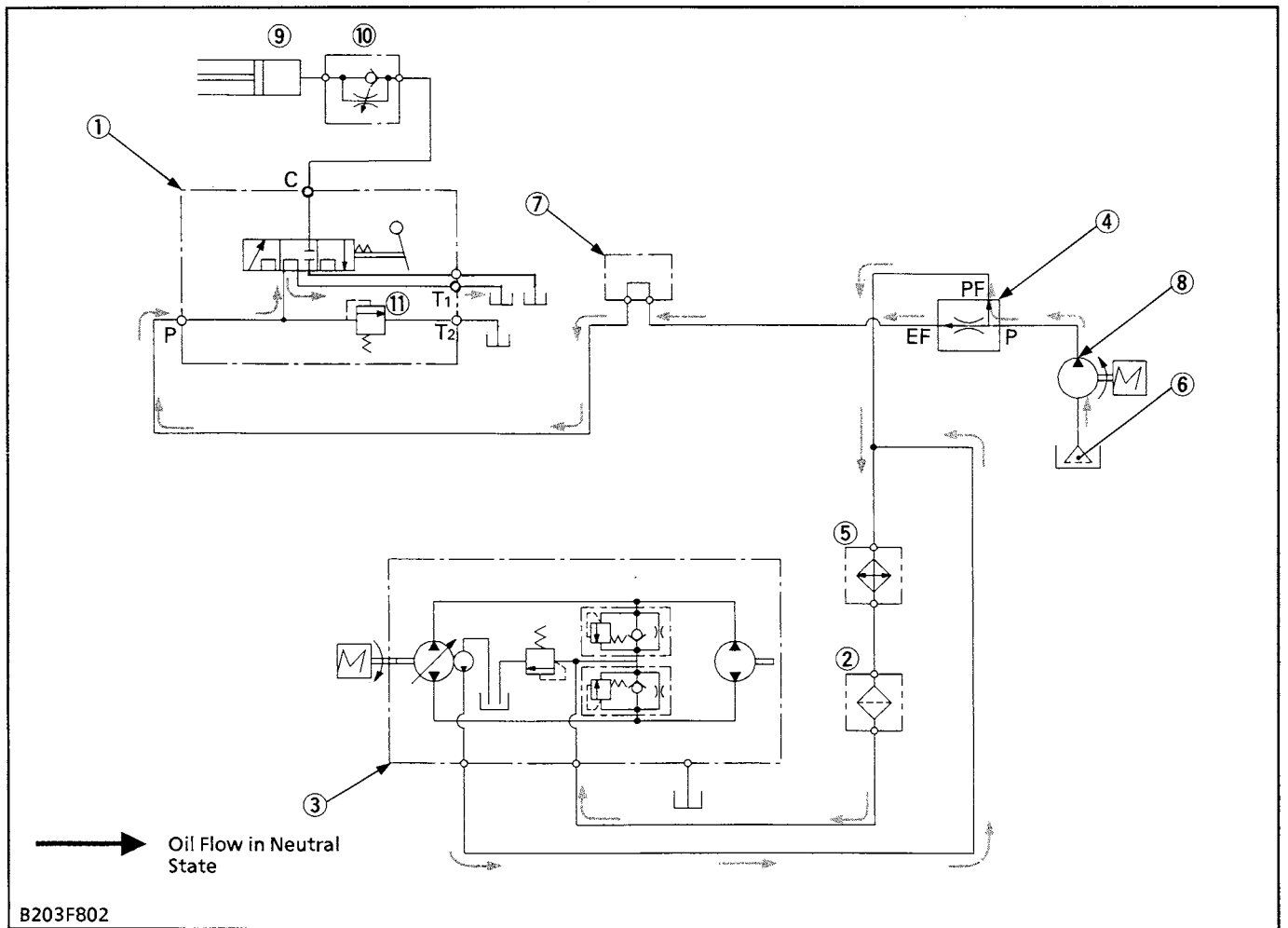
[1] HYDRAULIC CIRCUIT	8-M1
[2] HYDRAULIC PUMP	8-M2
[3] FLOW PRIORITY VALVE	8-M2
[4] CONTROL VALVE	8-M3
[5] FEEDBACK LINKAGE FOR POSITION CONTROL	8-M4
[6] RELIEF VALVE	8-M5
[7] HYDRAULIC CYLINDER	8-M6
[8] HYDRAULIC BLOCK TYPE OUTLET	8-M7

[1] HYDRAULIC CIRCUIT



- (1) Control Valve
- (2) Oil Filter
- (3) Hydrostatic Transmission (HST)
- (4) Flow Priority Valve
- (5) Oil Cooler
- (6) Oil Strainer
- (7) Hydraulic Block Type Outlet
- (8) Hydraulic Pump
- (9) Hydraulic Cylinder
- (10) Lowering Speed Adjusting Valve
- (11) Relief Valve

B203F801



Oil Flow in Neutral State

B203F802

Hydraulic System

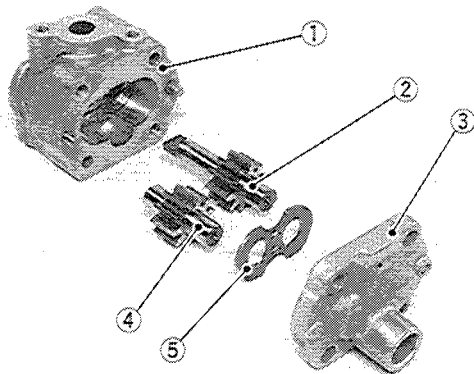
The hydraulic system of this tractor is composed of a hydraulic pump, hydraulic block type outlet, control valve, hydraulic cylinder, hydraulic oil filter and other components.

This system has the following functions.

1. Hydraulic power take off from the hydraulic block type outlet to operate the implements such as a front loader, front blade and etc.

- Oil is supplied by a hydraulic pump connected to the engine. When an engine is started, a hydraulic pump starts running, sucks oil from a transmission case. The hydraulic pump forces out the oil to hydraulic block type outlet, control valve, hydraulic cylinder and hydrostatic transmission.

[2] HYDRAULIC PUMP



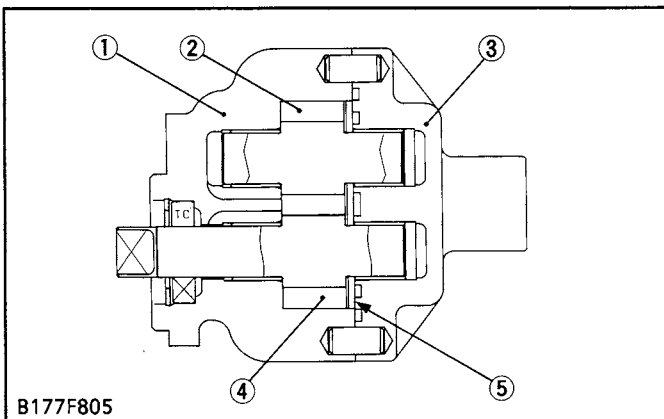
The hydraulic pump is composed of the casing (1), cover (3), side plate (5), and two spur gears (drive gear (4) and driven gear (2)) that are in mesh.

Hydraulic pump is driven by the fuel camshaft. Maximum displacement is as follows.

Displacement	Engine speed	Condition
14.6 l/min. 3.9 U.S. GPM 3.2 Imp. GPM	At 2900 rpm	11.3 to 11.8 MPa 115 to 120 kg/cm ² 1636 to 1707 psi

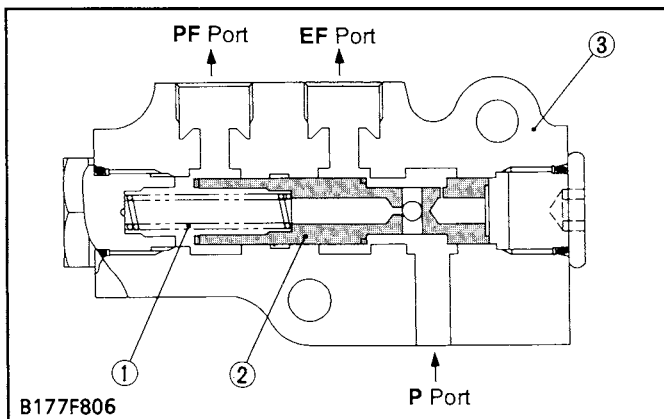
- (1) Casing
- (2) Driven Gear
- (3) Cover
- (4) Drive Gear
- (5) Side Plate

B203P079



B177F805

[3] FLOW PRIORITY VALVE



B177F806

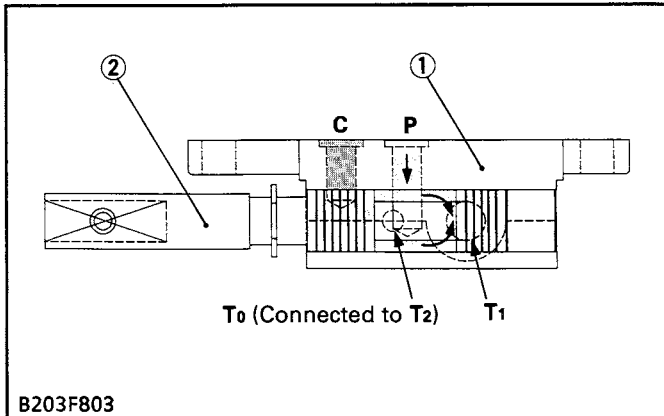
The flow priority valve is a flow divider that divides the flow from single hydraulic source (hydraulic pump) to actuates two circuits (position control circuit and power steering circuit) simultaneously.

This valve feeds fixedly controlled flow (2.5 l/min, 0.66 U.S. GPM, 0.55 Imp. GPM) to the PF port with priority and excessive flow to the EF port.

- (1) Spring
- (2) Spool
- (3) Valve Body

[4] CONTROL VALVE

This implement control valve is located under the hydraulic cylinder block.



■ Neutral

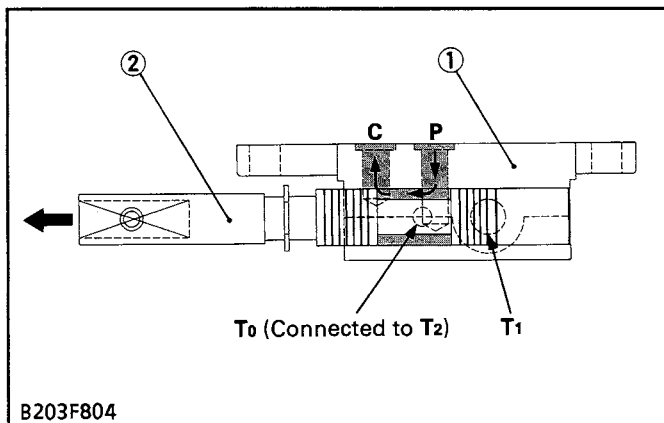
Oil forced into the control valve (1) through P port and returns to the transmission case through T1 port.

Also, C port is closed by spool (2), oil in the hydraulic cylinder does not flow to the transmission case.

Thus, the implement remains at its fixed position.

- (1) Control Valve
- (2) Spool

- P : Pump Port
- C : Cylinder Port
- T0, T1, T2 : Tank Port



■ Lift

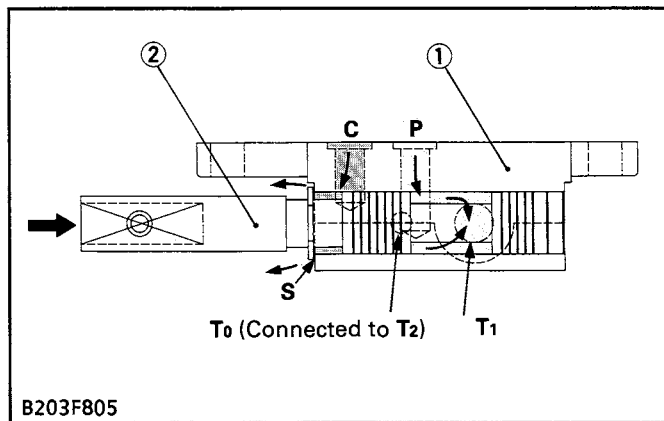
When the control lever is set to the "LIFT" position, the spool (2) is moved to the left.

The oil forced into the control valve (1) through P port flows to C port.

The oil pushes and flows into the hydraulic cylinder through the C port to lift the implement.

- (1) Control Valve
- (2) Spool

- P : Pump Port
- C : Cylinder Port
- T0, T1, T2 : Tank Port



■ Down

When the control lever is moved to "DOWN" position, the spool (2) is moved to the right.

Oil in the hydraulic cylinder is forced out to the transmission case through the spool "S" by the weight of the implement, causing the implement to lower.

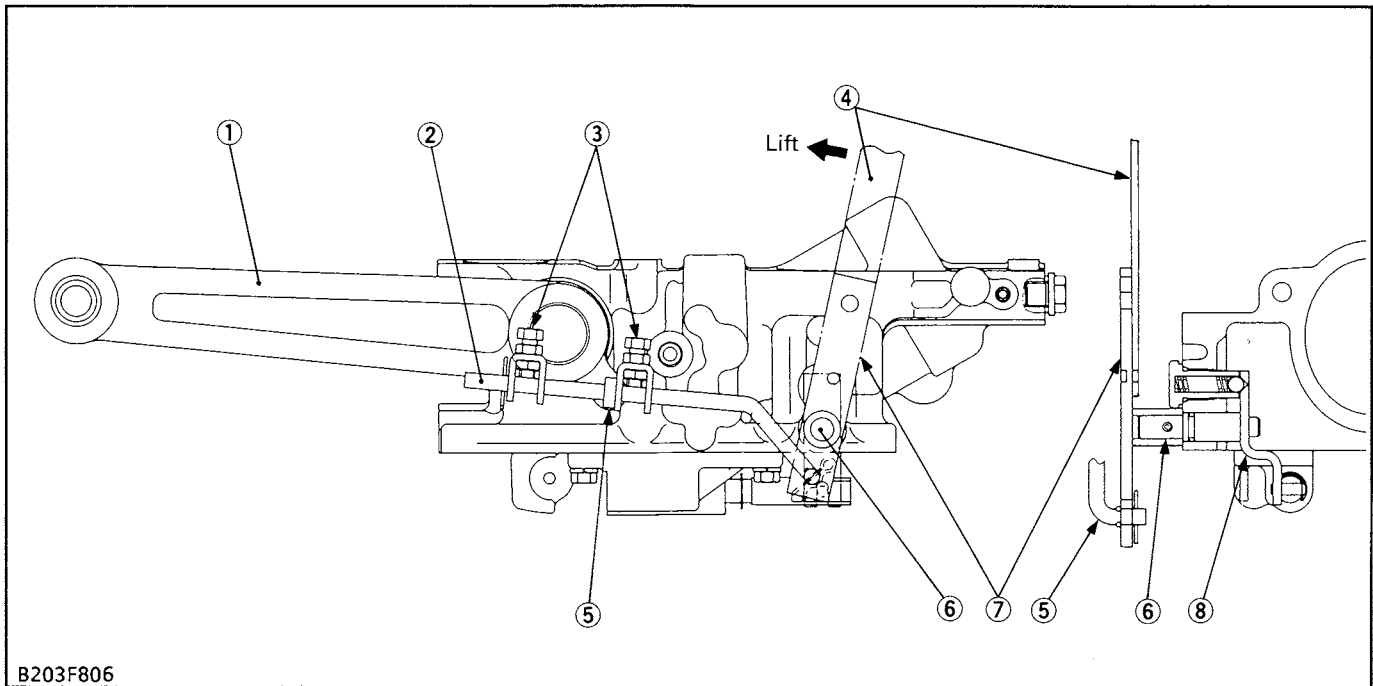
Oil forced into the control valve (1) through the P port and returns to the transmission case through the T1 port.

- (1) Control Valve
- (2) Spool

- P : Pump Port
- C : Cylinder Port
- T1, T2 : Tank Port

■ NOTE

- The T0 port is connected to T2 through the relief valve. When the relief valve opens, pressurized oil is released to the transmission case through T2 ports.

[5] FEEDBACK LINKAGE FOR POSITION CONTROL

(1) Lift Arm RH
(2) Feedback Rod

(3) Interlocker
(4) Hydraulic Control Lever

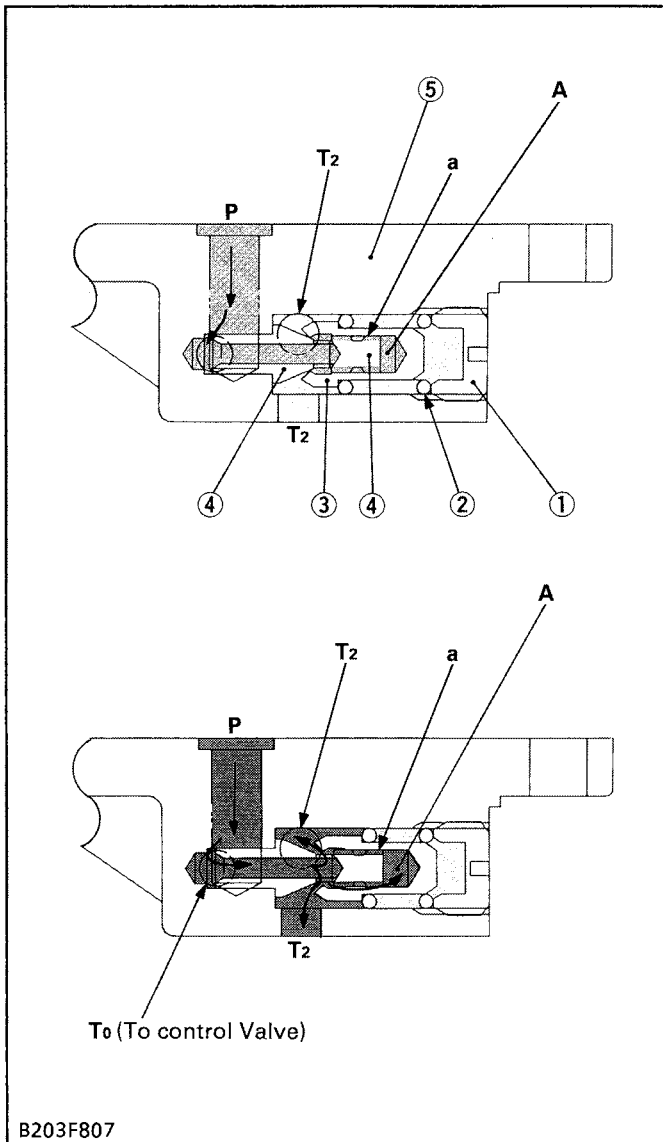
(5) Feedback Pin
(6) Control Lever Shaft

(7) Feedback Arm
(8) Control Lever Arm

When the hydraulic control lever (4) moved to rearward to lift the implement, the spool of the control valve is pulled out to form a raising circuit by the motions of feedback arm (7), control lever shaft (6) and control lever arm (8). And after the lift arm

(1) moves upward, the spool is pushed in and returned to form a neutral circuit by the motions of interlocker (3), feedback rod (2), feedback arm (7), control lever shaft (6) and control lever arm (8).

[6] RELIEF VALVE



The three point hydraulic system circuit has a relief valve to restrict the maximum pressure in the circuit. The relief valve is located in control valve body.

Among direct acting relief valves, this type is suited to higher pressure and has large capacity. Furthermore, this type is free from unstable operation, such as chattering, which occurs often in direct acting relief valves.

When the oil pressure in the circuit is lower than the setting pressure of the relief valve, the relief valve is not operated and the oil fed to the relief valve from the hydraulic pump flows into the position control valve.

When the pressure rises above the relief valve setting pressure, the oil reaches the room A through the clearance "a" of the valve seat (4), then the poppet (3) is pushed against the spring (2) force. This mechanism relieves the shock of this hydraulic system. Finally, oil flows out to the transmission case through T2 ports, preventing any further rise in pressure. The poppet closes again when enough oil is released to drop pressure below the valve setting.

(Reference)

- Relief valve setting pressure : 11.3 to 11.8 MPa
115 to 120 kgf/cm²
1636 to 1707 psi
- Engine speed : Maximum
- Oil temperature : 45 to 55 °C
113 to 131 °F

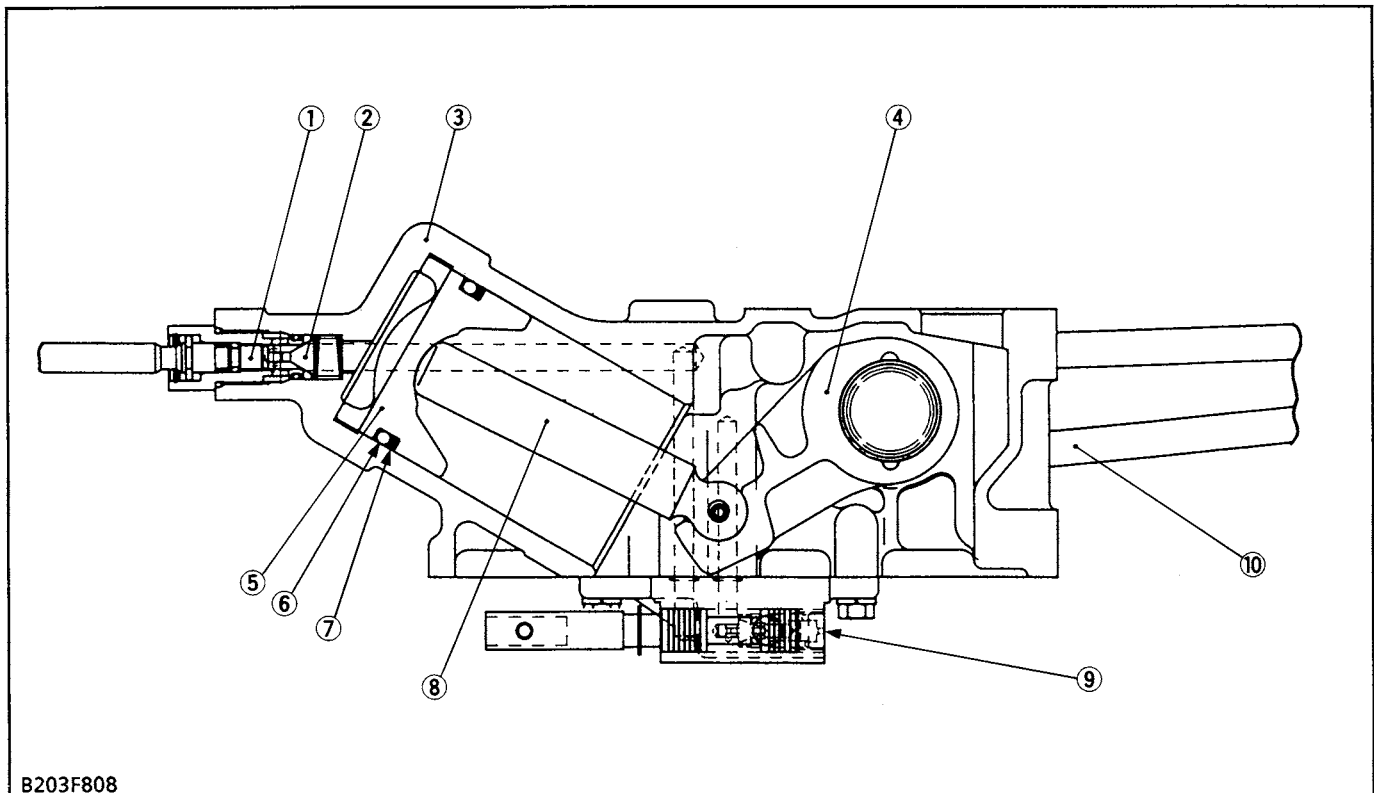
- P : Pump Port
- A : Room
- T2 : Tank Port
- a : Clearance (Oil Path)

- (1) Adjusting Plug
- (2) Spring
- (3) Poppet
- (4) Valve Seat
- (5) Control Valve Body

■ NOTE

- Right side of valve seat (4) is connected with left side of valve seat (4).

B203F807

[7] HYDRAULIC CYLINDER

- | | | | |
|------------------------------------|-------------------|-------------------|----------------------------|
| (1) Lowering Speed Adjusting Shaft | (4) Hydraulic Arm | (7) Back-up Ring | (9) Position Control Valve |
| (2) Lowering Speed Adjusting Valve | (5) Piston | (8) Hydraulic Rod | (10) Lift Arm |
| (3) Hydraulic Cylinder | (6) O-ring | | |

The main components of the hydraulic cylinder are shown in the figure above.

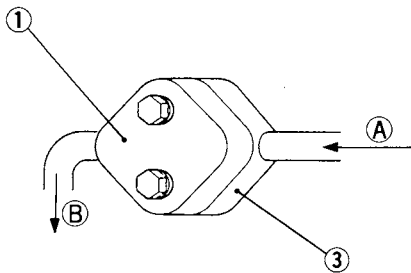
While the lift arm (10) is rising, oil from the hydraulic pump flows into the hydraulic cylinder through the position control valve (9). Then oil pushes out the piston (5).

While the lift arm (10) is lowering, oil in the hydraulic cylinder is discharged to the transmission case through the position control valve (9) by the weight of the implement. At this time, the lowering

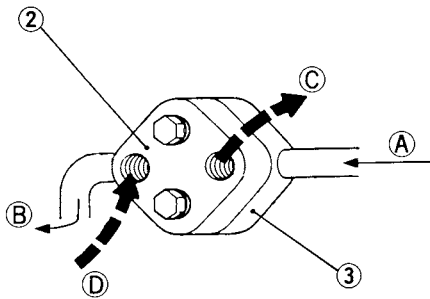
speed of the implement can be controlled by the lowering speed adjusting valve (2) attached to the hydraulic cylinder (3). Turning the lowering speed adjusting knob clockwise decreases the lowering speed, and counterclockwise increases lowering speed. When the lowering speed adjusting valve (2) is completely closed, the lift arm (10) is held at its position since oil in the hydraulic cylinder is sealed between the piston (5) and lowering speed adjusting valve (2).

[8] HYDRAULIC BLOCK TYPE OUTLET

When implement is not attached



When implement is attached



B177F813

The hydraulic block type outlet is located at the right hand side of the engine.

This hydraulic block type outlet is provided to take power out from the tractor to operate the hydraulic cylinders on the implement, such as front end loader, front blade and so on.

- (1) Block Cover
- (2) Block Outlet Cover (Option)
- (3) Hydraulic Block
- (A) From Hydraulic Pump
- (B) To Position Control Valve
- (C) To Implement (Inlet)
Max. flow
12 l/min.
(3.2 U.S. GPM, 2.6 Imp. GPM)
No relief valve in the hydraulic block.
- (D) From Implement (Outlet)

SERVICING

CONTENTS

TROUBLESHOOTING	8-S1
SERVICING SPECIFICATIONS	8-S2
TIGHTENING TORQUES	8-S2
CHECKING, DISASSEMBLING AND SERVICING	8-S3
[1] HYDRAULIC PUMP	8-S3
CHECKING AND ADJUSTING	8-S3
DISASSEMBLING AND ASSEMBLING	8-S4
SERVICING	8-S6
[2] HYDRAULIC CYLINDER ASSEMBLY (HYDRAULIC CYLINDER, CONTROL VALVE AND ETC)	8-S7
CHECKING AND ADJUSTING	8-S7
DISASSEMBLING AND ASSEMBLING	8-S8
(1) Separating Hydraulic Cylinder Assembly	8-S8
(2) Disassembling Hydraulic Cylinder Assembly	8-S9
(3) Disassembling Control Valve	8-S10
SERVICING	8-S11

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rise (No Noise)	<ul style="list-style-type: none"> ● Control valve broken ● Relief valve spring damaged ● Spool sticks ● Piston O-ring or cylinder damaged 	Replace Replace Repair Replace	8-S9 8-S10 8-S10 8-S9
(Noise)	<ul style="list-style-type: none"> ● Oil strainer clogged ● Suction pipe loosen or broken ● Suction pipe connecting hose loosen or broken ● Suction pipe O-ring broken ● Insufficient transmission oil ● Relief valve setting pressure too low ● Hydraulic pump broken 	Clean or Replace Repair or Replace Repair or Replace Replace Refill Adjust or Replace Replace	G-14 – – – G-8 8-S7 8-S5
Implement Does Not Reach Maximum Height	<ul style="list-style-type: none"> ● Feedback rod interlock improperly adjusted 	Adjust	8-S7
Implement Does Not Lower	<ul style="list-style-type: none"> ● Hydraulic linkage malfunctioning 	Repair	8-S7
Implement Drops by Its Weight	<ul style="list-style-type: none"> ● Hydraulic cylinder worn or damaged ● Piston O-ring worn or damaged ● Control valve malfunctioning 	Replace Replace Replace	8-S11 8-S9 8-S9

SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
[Hydraulic Pump] Pump Delivery at Engine 2900 rpm, Oil Temperature 50 °C, 122 °F		at no pressure	14.6 ℓ / min. 3.9 U.S.GPM 3.2 Imp.GPM
		at 11.8 MPa 120 kgf/cm ² 1707 psi	10.5 ℓ / min. 2.8 U.S.GPM 2.3 Imp.GPM
Gear Shaft to Bushing	Clearance	0.020 to 0.091 mm 0.0008 to 0.0036 in.	0.12 mm 0.0047 in.
Gear Shaft	O.D.	14.970 to 14.980 mm 0.5894 to 0.5898 in.	—
Bushing	I.D.	15.000 to 15.061 mm 0.5906 to 0.5930 in.	—
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.0984 in.	2.40 mm 0.0945 in.
Gear to Casing	Clearance	—	0.15 mm 0.0059 in.
Lift Arm	Free Play	5 to 25 mm 0.20 to 0.98 in.	—
Relief Valve	Setting Pressure	11.3 to 11.8 MPa 115 to 120 kgf/cm ² 1636 to 1707 psi	—
Hydraulic Cylinder	I.D.	70.05 to 70.10 mm 2.7579 to 2.7598 in.	70.15 mm 2.7618 in.
Hydraulic Arm Shaft to Bushing	Clearance	0.020 to 0.110 mm 0.0008 to 0.0043 in.	0.30 mm 0.0118 in.
Hydraulic Arm Shaft, Left	O.D.	33.925 to 33.950 mm 1.3356 to 1.3366 in.	—
Bushing, Left	I.D.	33.970 to 34.035 mm 1.3374 to 1.3400 in.	—

TIGHTENING TORQUES

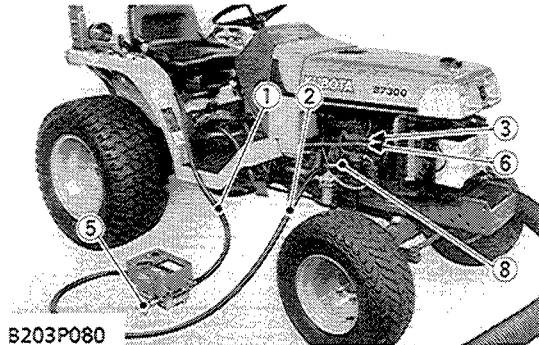
Tightening torques of screws and nuts on the table below is especially specified.
(For general use screws and nuts: See page G-9)

Item	N·m	kgf·m	ft-lbs
Fuel filter bracket mounting screws	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Flow priority valve mounting screws	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Connector of flow priority valve	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Delivery pipe cap screw	34.0 to 39.0	3.5 to 4.0	25.1 to 28.8
Delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Hydraulic pump mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Top link bracket mounting screws	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5
Hydraulic cylinder assembly mounting screws and nuts	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Control valve mounting screws	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2

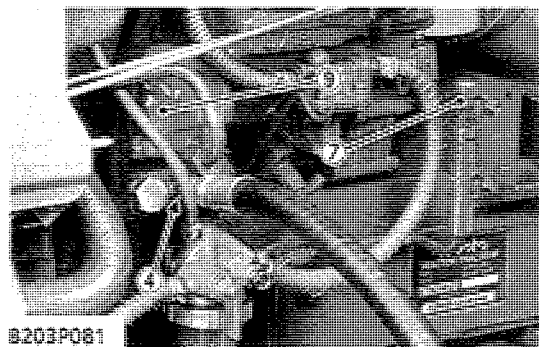
CHECKING, DISASSEMBLING AND SERVICING

[1] HYDRAULIC PUMP

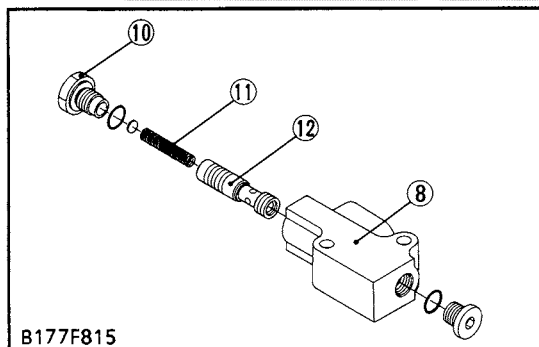
CHECKING AND ADJUSTING



B203P080



B203P081



B177F815

Flowmeter Connecting and Test Preparation

■ IMPORTANT

- When using a flowmeter other than KUBOTA specified flowmeter (Code No.: 07916-52791), be sure to use the instructions with that flowmeter.
- In this hook-up, there is no relief valve. Therefore while testing, do not close the flowmeter loading valve completely.

1. Disconnect the accelerator rod (6) and stop rod (3).
2. Remove the fuel filter bracket with fuel filter.
3. Disconnect the delivery pipes and plug the delivery hose (7).
4. Remove the flow priority valve body (8), plug (10) and pull out the spool (12) and spring (11).
5. Install the plug (M16 x 1.5) to the flow priority valve body (8).
6. Install the flow priority valve body to the hydraulic pump (9).
7. Install the fuel filter bracket with fuel filter.
8. Connect the accelerator rod (6).
9. Install the adaptor 69 (4) and stop rod to the flow priority valve body.
10. Connect the hydraulic test hose (2) (Code No.: 07916-52651) to the flowmeter (Code No.: 07916-52791) inlet port.
11. Connect the another hydraulic test hose (1) to flowmeter outlet port and transmission oil filling port.
12. Open the flowmeter loading valve (5) completely. (Turn counterclockwise)
13. Start the engine and set the engine speed at 2900 rpm.
14. Slowly close the loading valve to generate the pressure approx. 11.8 MPa (120 kgf/cm², 1707 psi). Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).

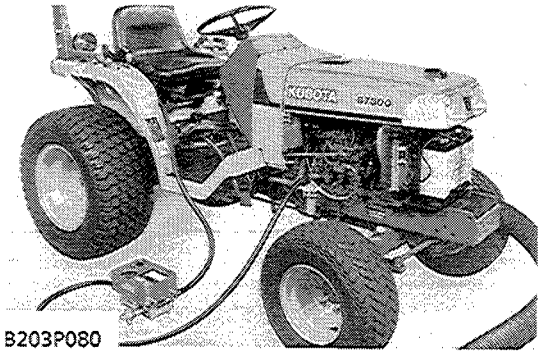
■ NOTE

- After starting the engine, fix the clutch in a disengaged position.

(Reference)

- Adaptor 69 are included in the adaptor set (Code No: 07916-54031).

- | | |
|-------------------------|------------------------------|
| (1) Hydraulic Test Hose | (7) Delivery Hose |
| (2) Hydraulic Test Hose | (8) Flow Priority Valve Body |
| (3) Stop Rod | (9) Hydraulic Pump |
| (4) Adaptor 69 | (10) Plug |
| (5) Loading Valve | (11) Spring |
| (6) Accelerator Rod | (12) Spool |



Pump Test

■ **NOTE**

● Before pump testing, perform the Flowmeter Connecting and Test Preparation. (See page 8-S3).

1. Open the loading valve completely.
2. Start the engine and set at approx. 2600 rpm.
3. Read and note the pump delivery at no pressure.
4. Slowly close the loading valve to increase pressure approx. 11.8 MPa (120 kgf/cm², 1707 psi).
5. Read and note the pump flow at rated pressure.
6. Open the loading valve and stop the engine.
7. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition

- Engine speed approx. 2600 rpm
- Rated pressure 11.8 MPa
120 kgf/cm²
1707 psi
- Oil temperature 50 °C
122 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 14.6 ℓ/min. 3.9 U.S.GPM 3.2 Imp.GPM
Hydraulic pump delivery at rated pressure	Factory spec.	Above 12 ℓ/min. 3.2 U.S.GPM 2.6 Imp.GPM
	Allowable limit	10.5 ℓ/min. 2.8 U.S.GPM 2.3 Imp.GPM

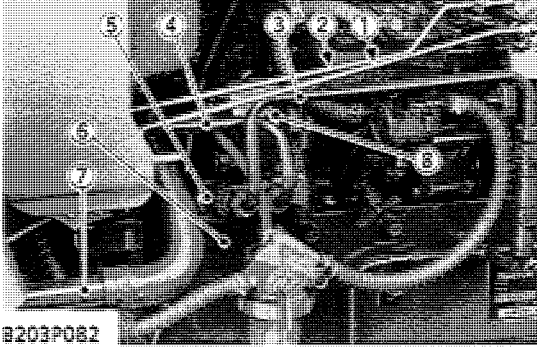
DISASSEMBLING AND ASSEMBLING



Hood, Front Grille and Side Cover

1. Open the hood (1).
2. Remove the front grille (2) and side cover RH (3).

- (1) Hood
- (2) Front Grille
- (3) Side Cover RH



B203P082

- (1) Accelerator Rod
- (2) Stop Rod
- (3) Delivery Pipe
- (4) Delivery Pipe for 3-Point Hitch
- (5) Flow Priority Valve
- (6) Fuel Fitter Bracket
- (7) Suction Pipe
- (8) Hydraulic Pump

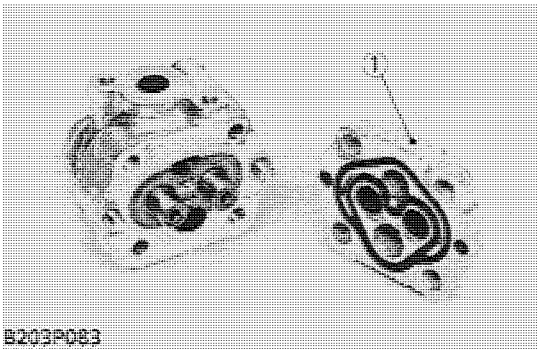
Removing Hydraulic Pump

1. Disconnect the accelerator rod (1) and stop rod (2).
2. Remove the fuel filter bracket (6) with fuel filter.
3. Remove the delivery pipe (3).
4. Loosen the clamp and disconnect the delivery pipe for 3-point hitch (4).
5. Disconnect the suction hose (7) and remove the hydraulic pump (8) with flow priority valve (5).
6. Remove the flow priority valve.

(When reassembling)

- Apply grease to O-ring and take care not to damage it.
- Apply liquid gasket (Three Bond 1208D or equivalent) to the engine stop solenoid gasket.

Tightening torque	Fuel filter bracket mounting screws	39.2 to 64.7 N·m 4.0 to 6.6 kgf·m 28.9 to 47.7 ft-lbs
	Delivery pipe cap screw	34.0 to 39.0 N·m 3.5 to 4.0 kgf·m 25.1 to 28.8 ft-lbs
	Flow priority valve mounting screws	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Connector of flow priority valve	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
	Hydraulic pump mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs



B203P083

Cover

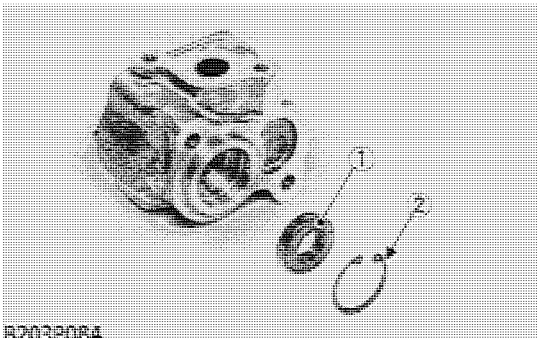
1. Secure the hydraulic pump with a vise, and remove the cover (1).

(When reassembling)

- Use care not to damage the O-ring.
- Align the holes of the cover and casing.

Tightening torque	Cover mounting screw	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
-------------------	----------------------	---

- (1) Cover



B203P084

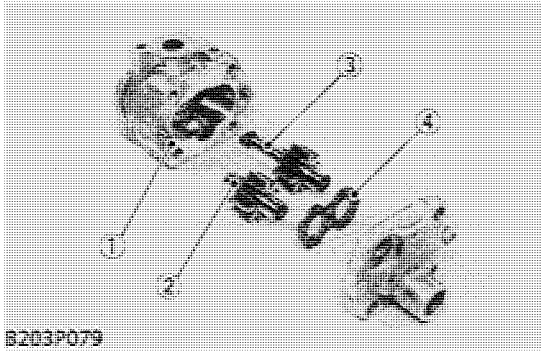
Oil Seal

1. Remove the internal snap ring (2), and remove the oil seal (1).

(When reassembling)

- If the oil seal is defective, worn or scratched, replace it.

- (1) Oil Seal
- (2) Internal Snap Ring



Side Plate and Gear

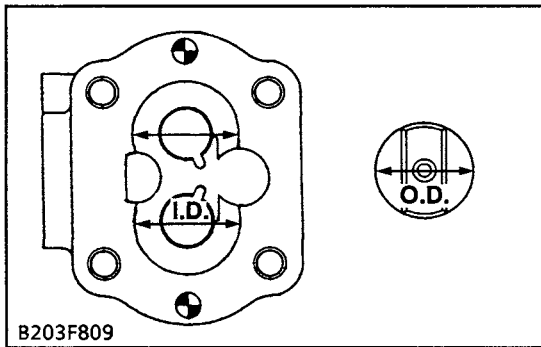
1. Remove the side plate (4).
2. Remove the drive gear (3) and driven gear (2) from the casing (1).

(When reassembling)

- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

- | | |
|-----------------|----------------|
| (1) Casing | (3) Drive Gear |
| (2) Driven Gear | (4) Side Plate |

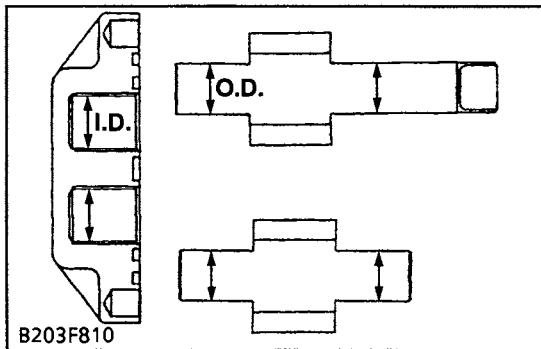
SERVICING



Clearance between Tip of Gear Tooth and Casing

1. Measure the gear O.D. with an outside micrometer.
2. Measure the casing I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace the assembly.

Clearance between tip of gear tooth and casing	Allowable limit	0.15 mm 0.0059 in.
--	-----------------	-----------------------



Clearance between Bushing and Shaft

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

Clearance between bushing and shaft	Factory spec.	0.020 to 0.091 mm 0.0008 to 0.0036 in.
	Allowable limit	0.12 mm 0.0047 in.

Shaft O.D.	Factory spec.	14.970 to 14.980 mm 0.5894 to 0.5898 in.
------------	---------------	---

Bushing I.D.	Factory spec.	15.000 to 15.061 mm 0.5906 to 0.5930 in.
--------------	---------------	---



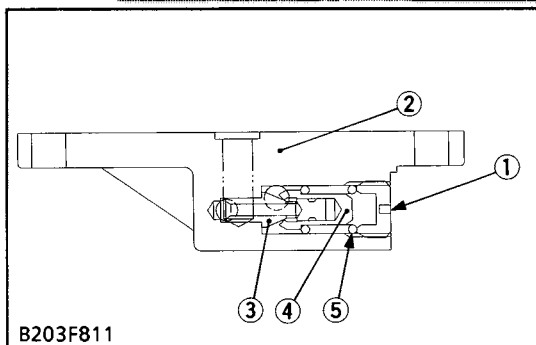
Side Plate Thickness

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.

[2] HYDRAULIC CYLINDER ASSEMBLY (HYDRAULIC CYLINDER, CONTROL VALVE AND ETC)

CHECKING AND ADJUSTING



Relief Valve Setting Pressure

1. Remove the seat under cover.
2. Remove the plug from front of hydraulic cylinder block.
3. Install the adaptor 58. Then connect the cable and pressure gauge to adaptor 58.
4. Remove the feedback rod interlocker and spring.
5. Start the engine and set at maximum speed.
6. Move the position control lever all way up to operate the relief valve and read the gauge.
7. If the pressure is not within the factory specifications, remove the hydraulic cylinder assembly (refer to 8-58) and adjust with the adjusting plug (1).
8. Reinstall the hydraulic cylinder assembly. After checking the pressure, be sure to stake the adjusting plug and control valve body with a punch and reinstall the spring and feedback rod interlocker.

Relief valve setting pressure	Factory spec.	11.3 to 11.8 MPa 115 to 120 kgf/cm ² 1636 to 1707 psi
-------------------------------	---------------	--

Condition

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

(Reference)

- A quarter turn of adjusting plug (1) changes the relief setting pressure by 875.3 kPa (8.925 kgf/cm², 126.9 psi).

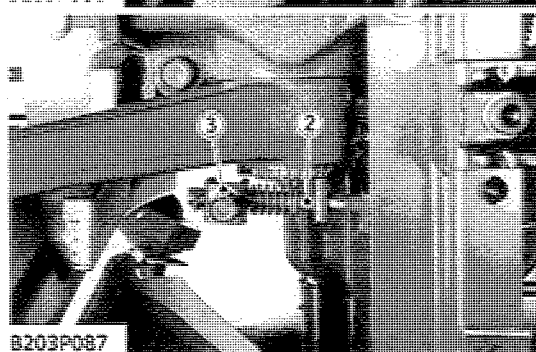
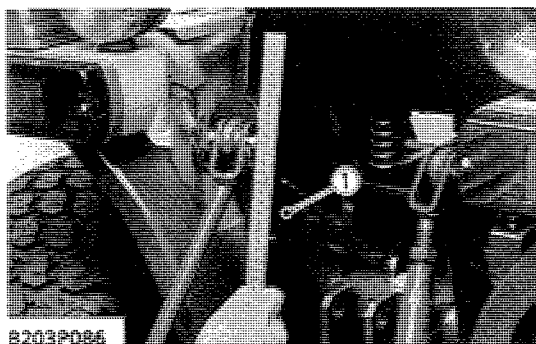
- | | |
|--------------------|------------|
| (1) Adjusting Plug | (4) Poppet |
| (2) Control Valve | (5) Spring |
| (3) Valve Seat | |

Lift Arm Free Play

1. Set the hydraulic control lever to the lowest position.
2. Start the engine, and set at the idling speed.
3. Set the hydraulic control lever to Lift position until the lift arm moves to the uppermost position.
4. Move the lift arm (1) to the upper end by hand and measure the free play.
5. If the measurement is not within the factory specifications, adjust the free play by changing the set position of feedback rod interlocker (3).

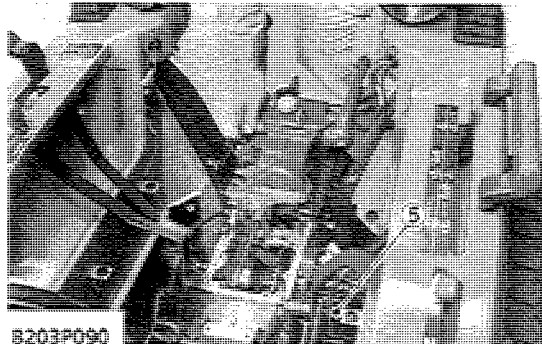
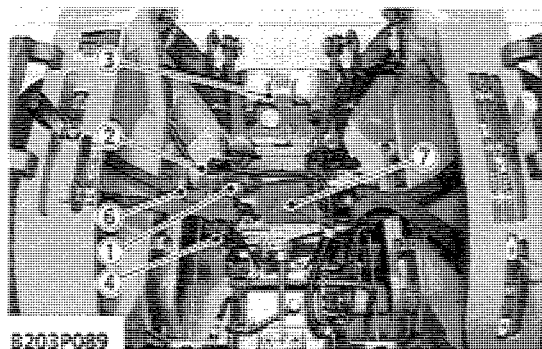
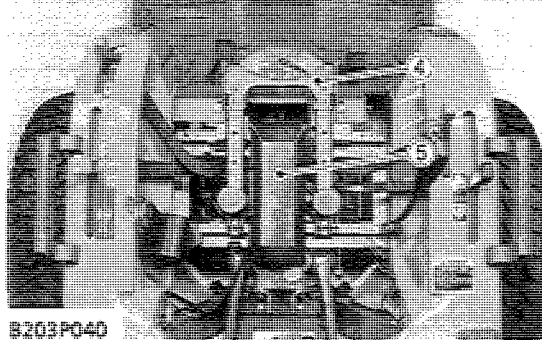
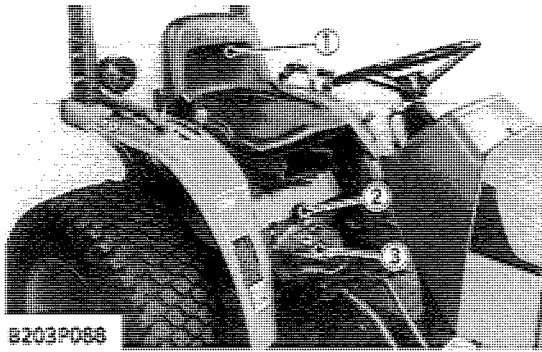
Lift arm free play	Factory spec.	5 to 25 mm 0.20 to 0.98 in.
--------------------	---------------	--------------------------------

- | | |
|------------------|-----------------|
| (1) Lift Arm | (3) Interlocker |
| (2) Feedback Rod | |



DISASSEMBLING AND ASSEMBLING

(1) Separating Hydraulic Cylinder Assembly



Seat, Seat Rail, Seat Stay and Seat Under Cover

1. Remove the seat (1) and lowering speed adjusting knob (2).
2. Remove the tool box (5) and seat under cover (3).
3. Remove the seat stay and seat rail (4) as a unit.

- | | |
|-----------------------------------|---------------|
| (1) Seat | (4) Seat Rail |
| (2) Lowering Speed Adjusting Knob | (5) Tool Box |
| (3) Seat Under Cover | |

Hydraulic Cylinder Assembly

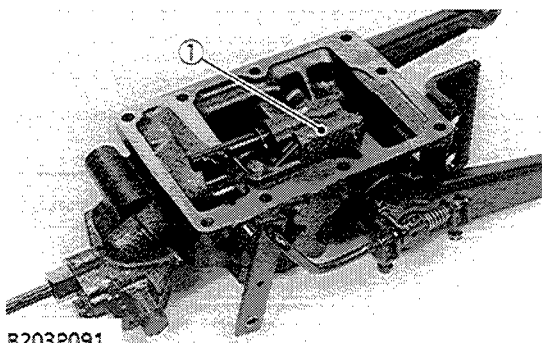
1. Remove the top link and disconnect the lift rods.
2. Disconnect the battery negative cable.
3. Disconnect the wiring harness (2) differential lock rod (4) and delivery pipe (1).
4. Remove the lock plate for fulcrum shaft (5).
5. Move the fulcrum shaft to outside and disconnect the shaft from hydraulic cylinder.
6. Remove the hydraulic control lever (6) and top link bracket (LH).
7. Remove the hydraulic cylinder assembly mounting screws and nuts, and separate the hydraulic cylinder assembly.

(When reassembling)

Tightening torque	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
	Top link bracket mounting screws	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft·lbs
	Hydraulic cylinder assembly mounting screws and nuts	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft·lbs

- | | |
|---------------------------|---------------------------------|
| (1) Delivery Pipe | (5) Fulcrum Shaft |
| (2) Wiring Harness | (6) Hydraulic Control Lever |
| (3) Top Link Bracket (LH) | (7) Hydraulic Cylinder Assembly |
| (4) Differential Lock Rod | |

(2) Disassembling Hydraulic Cylinder Assembly



B203P091

Control Valve

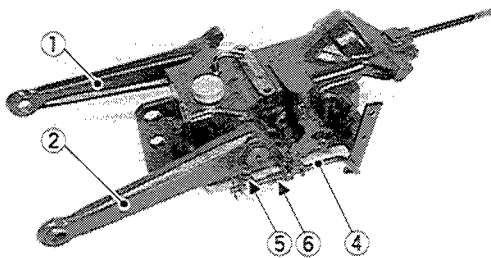
1. Remove the control valve mounting screws, and remove the control valve(1).

(When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Control valve mounting screws	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs
-------------------	-------------------------------	---

- (1) Control Valve



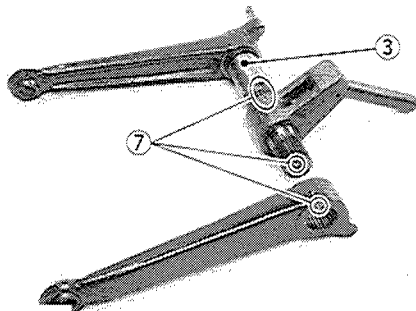
B203P092

Lift Arm, Hydraulic Arm Shaft and Hydraulic Arm

1. Remove the feedback rod interlocker (5) and spring (6).
2. Remove the lift arm LH (1).
3. Remove the hydraulic arm shaft (3) and lift arm RH (2) as a unit.

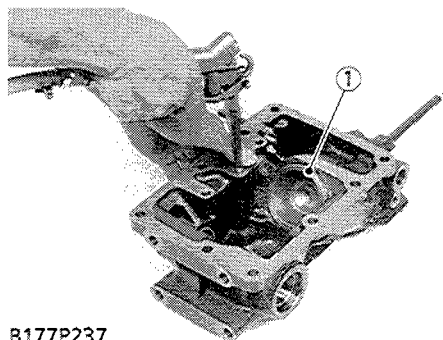
(When reassembling)

- Align the alignment marks (7) of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks (7) of the lift arm LH and hydraulic arm shaft.
- Apply grease to the right and left bushings and O-rings.
- Take care not to damage the O-rings.



B203P093

- (1) Lift Arm LH
 (2) Lift Arm RH
 (3) Hydraulic Arm Shaft
 (4) Feedback Rod
 (5) Interlocker
 (6) Spring
 (7) Alignment Marks



B177P237

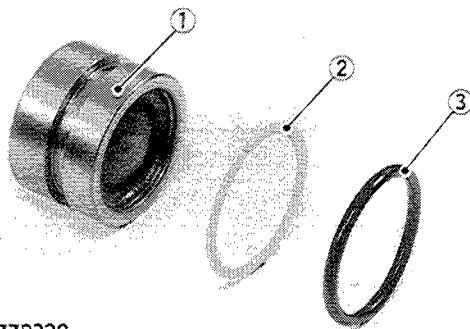
Hydraulic Piston

1. Inject the compressed air into the hydraulic cylinder, and take out the hydraulic piston (1).

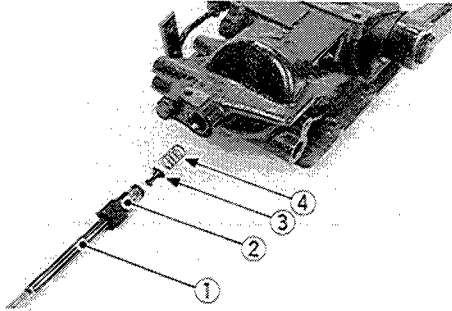
(When reassembling)

- Take care not to damage the O-ring and backup ring.
- Apply transmission fluid to the O-ring.
- Replace the O-ring if it is defective, worn or scratched, which may cause oil leakage.

- (1) Hydraulic Piston
 (2) Backup Ring
 (3) O-ring



B177P238



B203P094

Lowering Speed Adjusting Valve

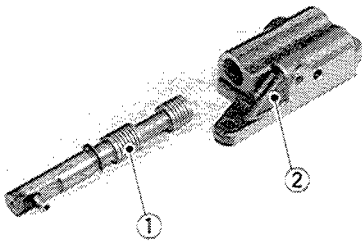
1. Remove the lowering speed adjusting valve body (2) with the lowering speed adjusting shaft (1).
2. Draw out the poppet (3) and spring (4).

(When reassembling)

- Take care not to damage the O-rings.

- | | |
|---|------------|
| (1) Lowering Speed Adjusting Shaft | (3) Poppet |
| (2) Lowering Speed Adjusting Valve Body | (4) Spring |

(3) Disassembling Control Valve

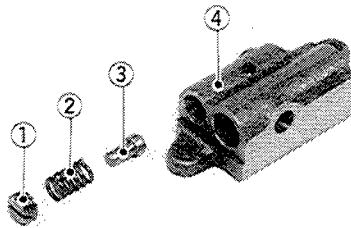


B203P095

Spool

1. Remove the spool (1).

- | | |
|-----------|----------------|
| (1) Spool | (2) Valve Body |
|-----------|----------------|



B177P231

Relief Valve

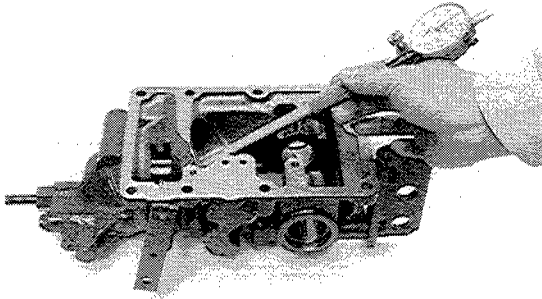
1. Remove the adjusting plug (1), spring (2) and poppet (3).

(When reassembling)

- Recutting the threads of adjusting plug and control valve inner thread.
- After adjusting the pressure, be sure to stake the adjusting plug and control valve body.

- | | |
|--------------------|----------------|
| (1) Adjusting Plug | (3) Poppet |
| (2) Spring | (4) Valve Body |

SERVICING

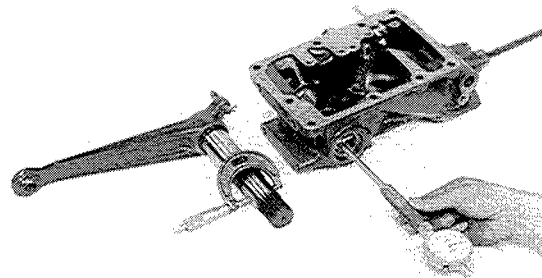


B203P097

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.	70.05 to 70.10 mm 2.7579 to 2.7598 in.
	Allowable limit	70.15 mm 2.7618 in.



B177P244

Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between hydraulic arm shaft and bushing	Left	Factory spec.	0.020 to 0.110 mm 0.0008 to 0.0043 in.
		Allowable limit	0.30 mm 0.0118 in.
Hydraulic arm shaft O.D.	Left	Factory spec.	33.925 to 33.950 mm 1.3356 to 1.3366 in.
Bushing I.D. (after press fitted)	Left	Factory spec.	33.970 to 34.035 mm 1.3374 to 1.3400 in.

9 ELECTRICAL SYSTEM

9 ELECTRICAL SYSTEM

MECHANISM

CONTENTS

[1] WIRING DIAGRAM AND ELECTRICAL CIRCUIT	9-M1
[2] STARTING SYSTEM	9-M3
(1) Starter	9-M4
(2) Glow Plug	9-M5
(3) Safety Switch	9-M5
[3] CHARGING SYSTEM	9-M6
(1) AC Dynamo	9-M7
(2) Regulator	9-M7
[4] LIGHTING SYSTEM	9-M8
(1) Head Light	9-M9
(2) Hazard Light	9-M9
[5] EASY CHECKER	9-M10
(1) Indication Items	9-M10
(2) Low Engine Oil Pressure	9-M10
[6] GAUGE	9-M11
(1) Fuel Quantity	9-M11

[1] WIRING DIAGRAM AND ELECTRICAL CIRCUIT

● Main Switch

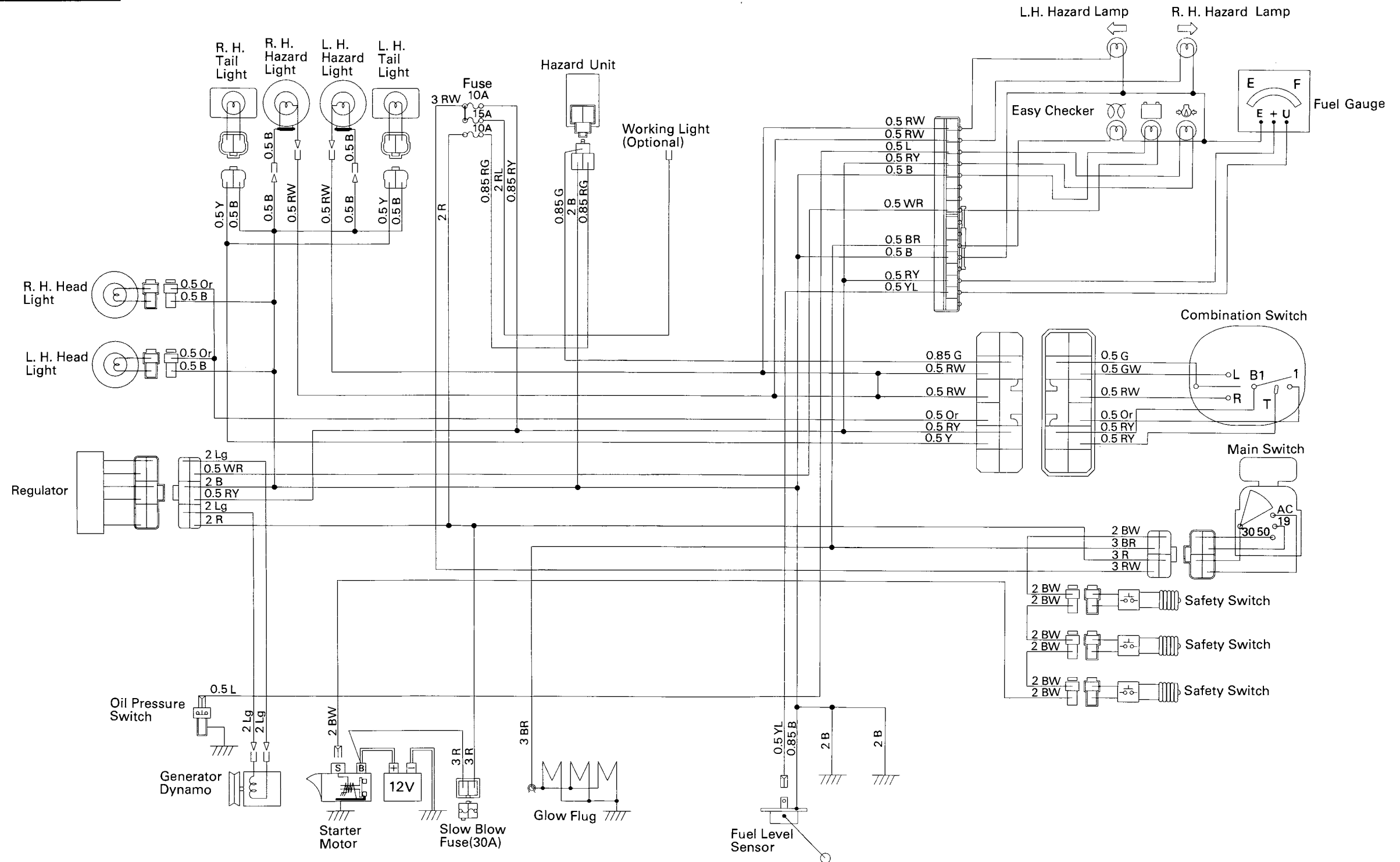
Terminal	30	AC	19	50
Key Position				
OFF	●			
ON	●	●		
PREHEAT	●	●	●	
START	●	●	●	●

● Combination Switch

Key Position	Head Light Switch			Hazard Light Switch		
	B1	T	1	B2	R	L
OFF	●			1	●	●
ON	●	●	●	OFF	●	
				2	●	●

● Color of Wiring

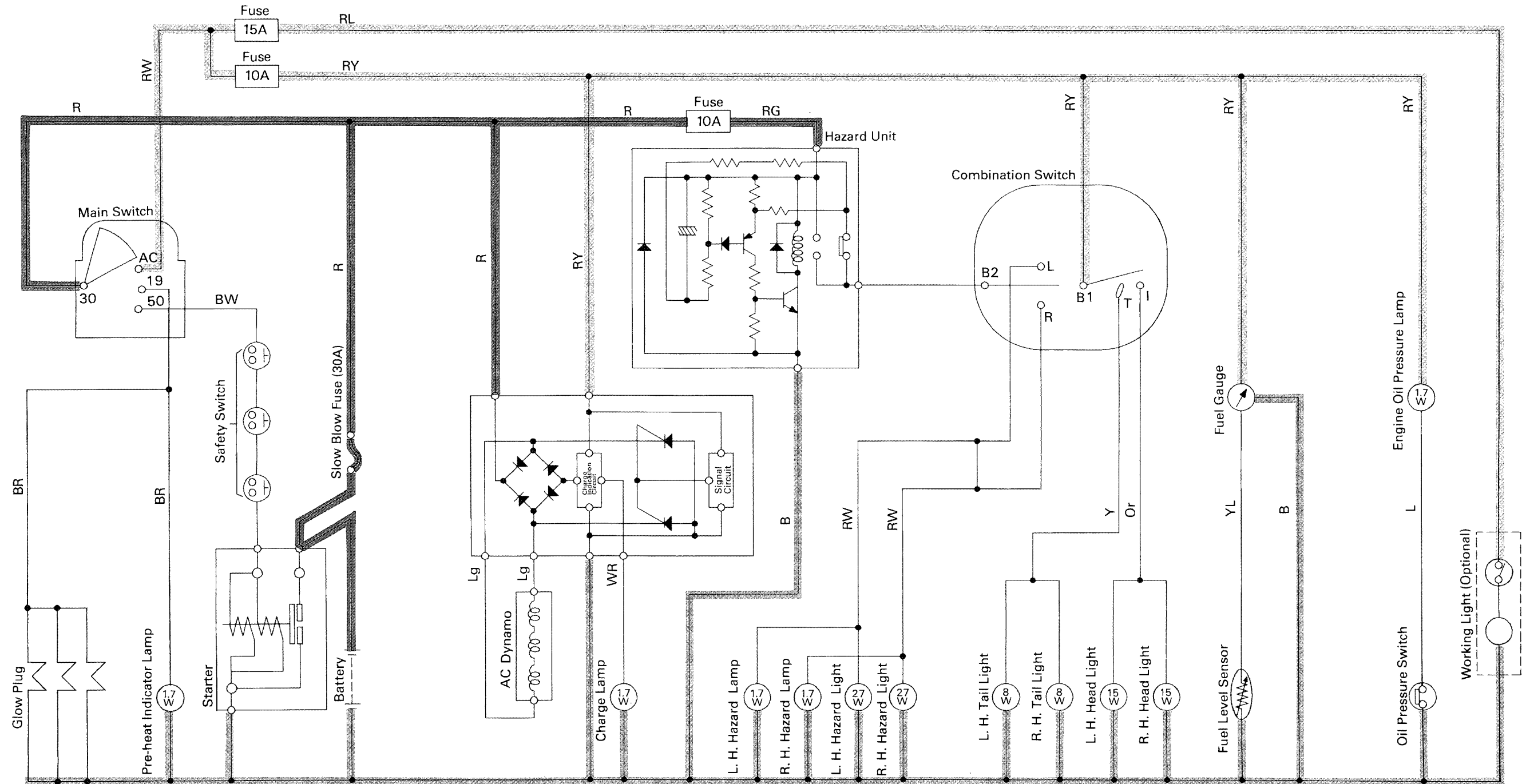
W ----- White	Or ----- Orange	RG ----- Red / Green	GW ----- Green / White
R ----- Red	WR ----- White / Red	RY ----- Red / Yellow	GB ----- Green / Black
L ----- Blue	WY ----- White / Yellow	BW ----- Black / White	Sb ----- Sky Blue
Y ----- Yellow	RB ----- Red / Black	BR ----- Black / Red	YL ----- Yellow / Blue
B ----- Black	RW ----- Red / White	BY ----- Black / Yellow	Lg ----- Light Green
G ----- Green	RL ----- Red / Blue		



B203F901

● Color of Wiring

W ----- White	B ----- Black	WR ----- White / Red	RW ----- Red / White	RY ----- Red / Yellow	BY ----- Black / Yellow	Sb ----- Sky Blue
R ----- Red	G ----- Green	WY ----- White / Yellow	RL ----- Red / Blue	BW ----- Black / White	GW ----- Green / White	YL ----- Yellow / Blue
L ----- Blue	Or ----- Orange	RB ----- Red / Black	RG ----- Red / Green	BR ----- Black / Red	GB ----- Green / Black	Lg ----- Light Green
Y ----- Yellow						



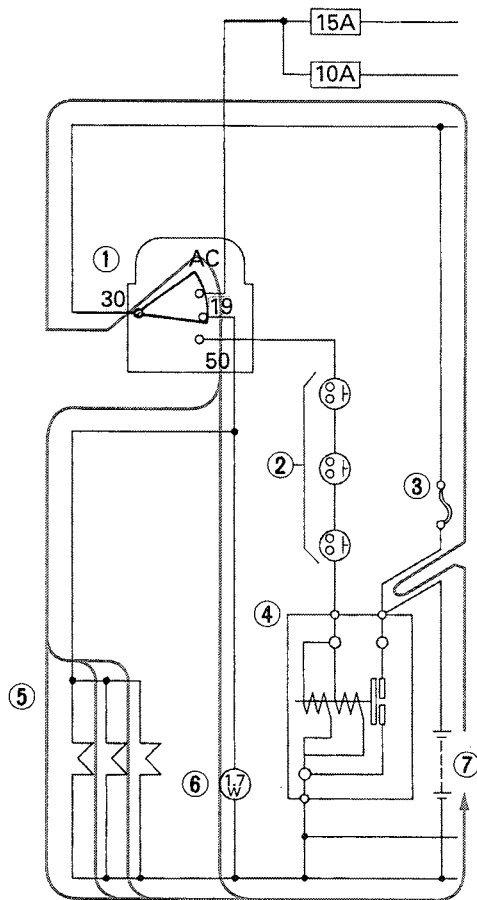
- Denotes battery voltage at any position of main switch.
- Denotes battery voltage when turning on the main switch.
- Denotes ground line.

B203F902

[2] STARTING SYSTEM

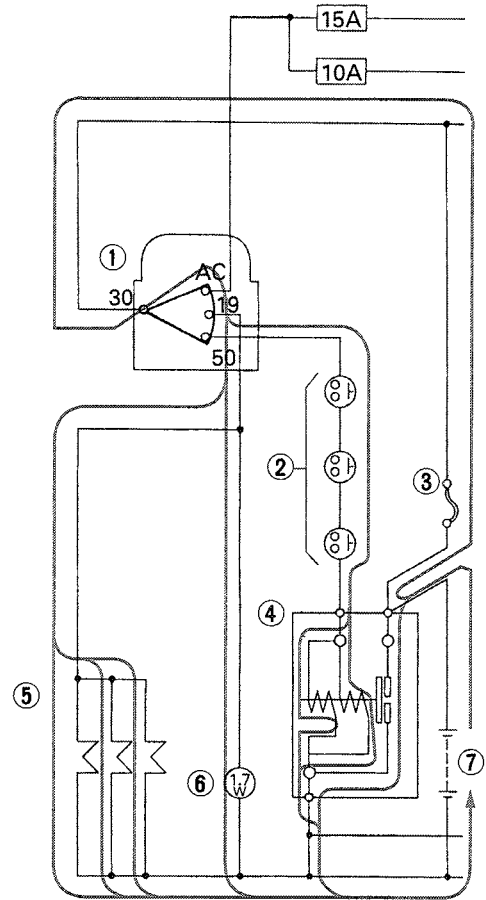
Main Switch Table					
Key Position	Terminal	30	AC	19	50
OFF		●			
ON		●	●		
PREHEAT		●	●	●	
START		●	●	●	●

At the "PREHEAT" Position



B203F903

At the "START" Position



B203F904

- (1) Main Switch
- (2) Safety Switches

- (3) Slow Blow Fuse
- (4) Starter Motor

- (5) Glow Plugs
- (6) Pre-heat Indicator Lamp

- (7) Battery

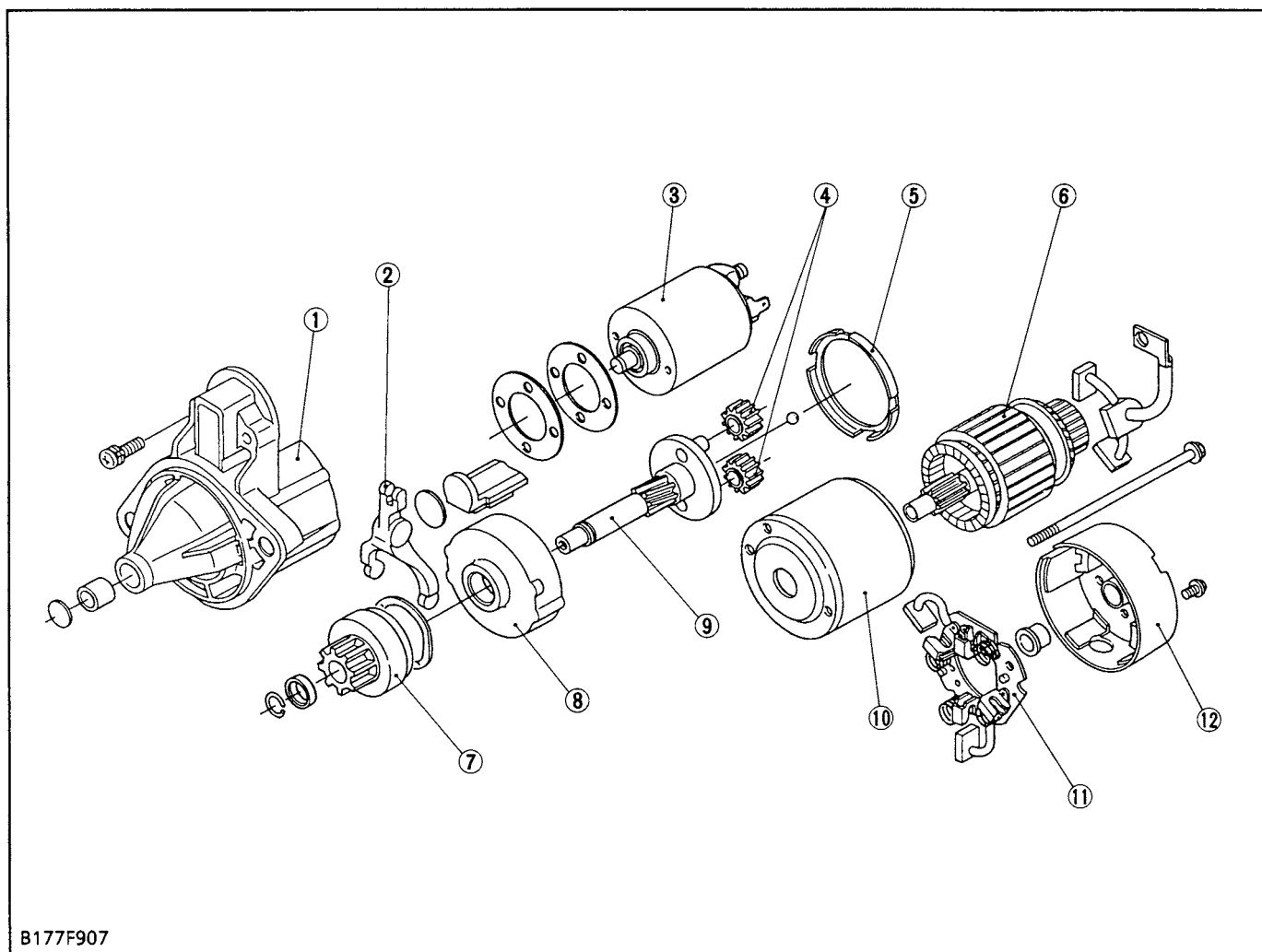
When the main switch (1) is turned to the PREHEAT position, the terminal 30 is connected to the terminals 19 and AC. The glow plugs (5) become red-hot, and at the same time, the pre-heat indicator lamp (6) also lights on.

When the main switch is then turned to the START position with the safety switches (2) on, the

terminal 30 is connected to the terminals 50 and AC so that the starter motor (4) begins running and the glow plugs are kept red-hot.

The main switch automatically returns to the ON position, the terminal 30 is connected only to the terminal AC, thereby causing the starting circuit to be opened, stopping the starter motor.

(1) Starter



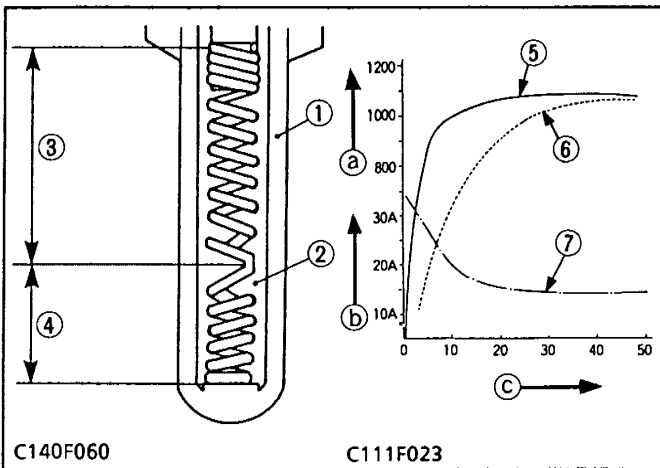
B177F907

- | | | | |
|---------------------|--------------------|------------------------|-------------------|
| (1) Front Bracket | (4) Pinion Gear | (7) Overrunning Clutch | (10) Yoke |
| (2) Lever | (5) Gasket | (8) Internal Gear | (11) Brush Holder |
| (3) Magnetic Switch | (6) Armature Shaft | (9) Gear Shaft | (12) Rear Bracket |

The starter is a reduction type.

The reduction system is used planetary gears, and the speed of gear shaft (9) is reduced to approximately one fifth of the armature shaft (6).

(2) Glow Plug



- (a) Glow Plug Temperature (°C)
- (b) Current (A)
- (c) Time (Sec.)
- (1) Sheath Tube
- (2) Insulation Powder
- (3) Heater also functioning as a Resistor
- (4) Heater
- (5) Super Glow Plug
- (6) Conventional Quick-heating type Glow Plug
- (7) Glow Plug Current

This plug is a two-material type QGS (Quick Glow System) for quick temperature rise, and has self-controlling function as well as excellent durability.

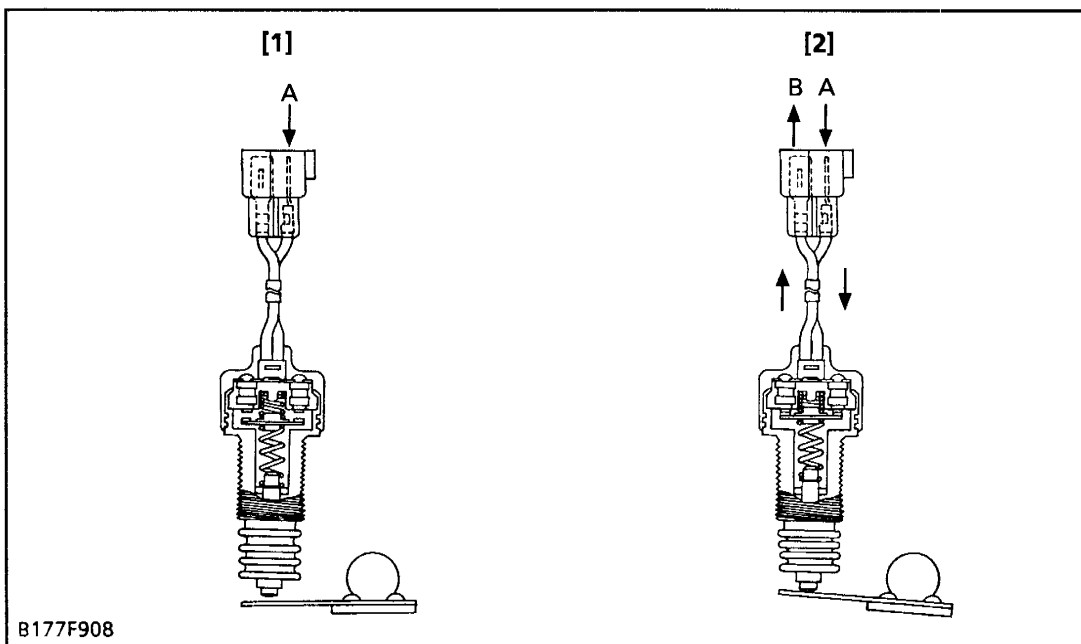
The heater (4) connected in series to the heater (3), which also functions as the resistor, is incorporated in the sheath tube (1) of the super glow plug.

The resistance of this heater (3) cum resistor is small when the temperature is low, while the resistance becomes large when the temperature rises.

Therefore, because sufficient current is flown to the heater (4) during the initial period of energization, the temperature rises quickly and the resistance grows with the rise in the temperature of the resistor, the flowing current is reduced to prevent the heater (4) from being heated.

The ignition point is in the area of 2 to 3 mm (0.079 to 0.118 in.) from the tip of the plug in order to reduce its projection into the combustion chamber.

(3) Safety Switch

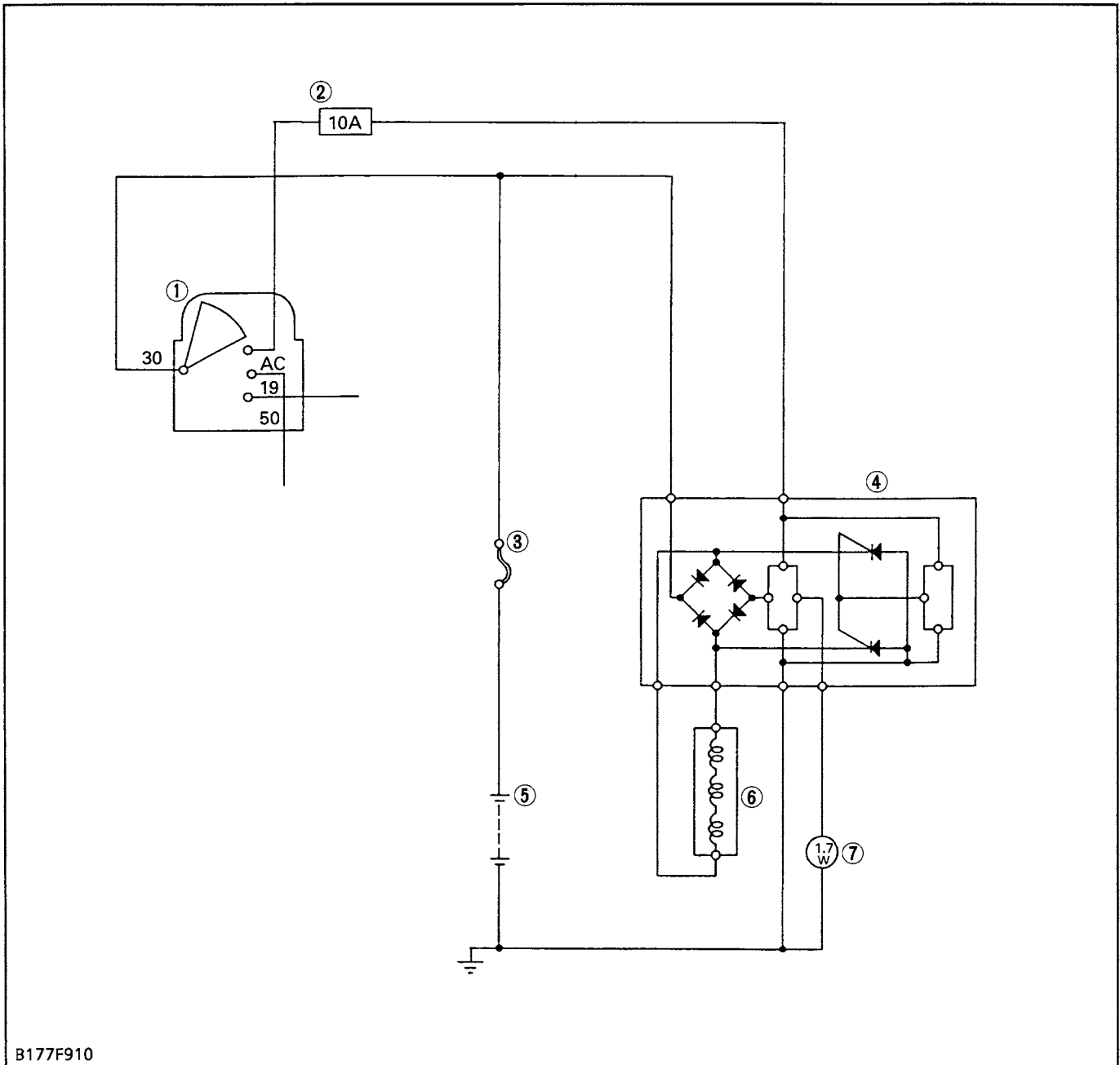


- [1] Released
- [2] Depressed
- A: From Main Switch
- B: To Starter

The safety switch prevents current from flowing to the starter when the safety switches are not depressed. This is to ensure safe starting.

The safety switches are located three (Clutch pedal, PTO gear shift lever and Hi-Lo gear shift lever) different position.

[3] CHARGING SYSTEM



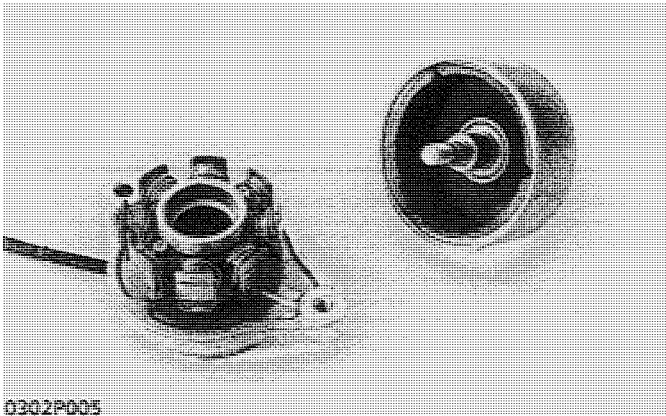
B177F910

- (1) Main Switch
- (2) Fuse
- (3) Slow Blow Fuse
- (4) Regulator
- (5) Battery
- (6) AC Dynamo
- (7) Charge Lamp

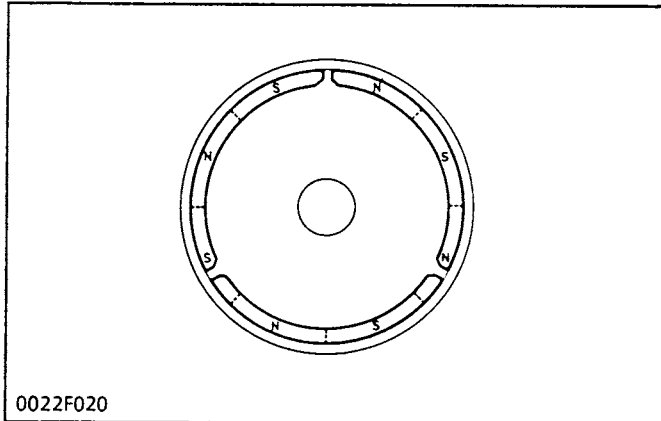
The charging system supplies electric power for various electrical devices and also charges the battery while the engine runs.

It consists of a AC dynamo and a regulator.

(1) AC Dynamo



0302P005

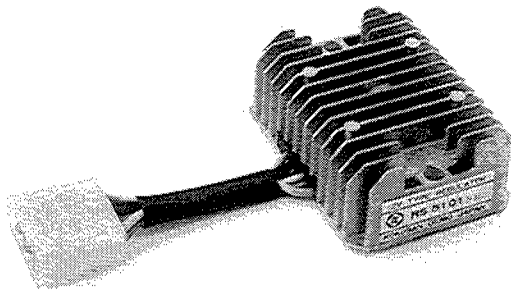


0022F020

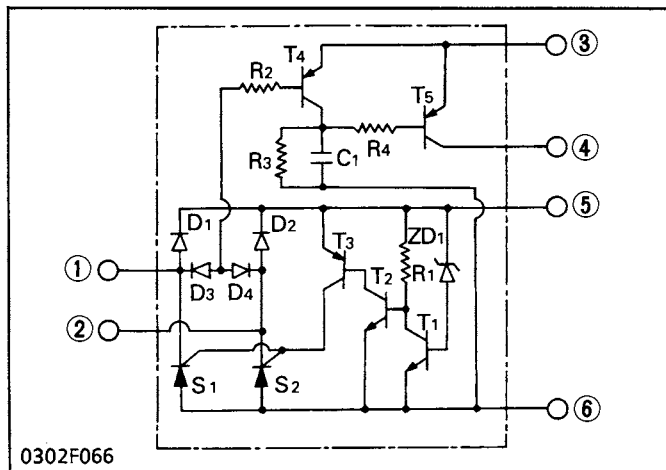
This dynamo is an 8-8 pole rotating magnet type generator. It is simple in construction, consisting of a stator and rotor. The rotor is made up of eight permanent magnet pole pieces assembled on a shaft and rotates on the center of the stator around which eight electromagnetic coils are provided for.

This dynamo produces higher voltage in slow speed rotation, and charges electric current to the battery during engine idling.

(2) Regulator



0302P006



0302F066

A regulator has two functions:

1. When the battery voltage is low, it turns the SCR on to form a charging circuit to the battery.
2. During charging, it turns the charging lamp off.

- (1) Light Green (AC Dynamo)
- (2) Light Green (AC Dynamo)
- (3) Red / Yellow (Main Switch Terminal AC)
- (4) White / Red (Charge Lamp)
- (5) Red (Main Switch Terminal No.30)
- (6) Black (Ground)

C1: Capacitor

D1: Diode

D2: Diode

D3: Diode

D4: Diode

R1: Resistor

R2: Resistor

R3: Resistor

R4: Resistor

S1: SCR (Silicon Controlled Rectifier)

S2: SCR (Silicon Controlled Rectifier)

T1: Transistor

T2: Transistor

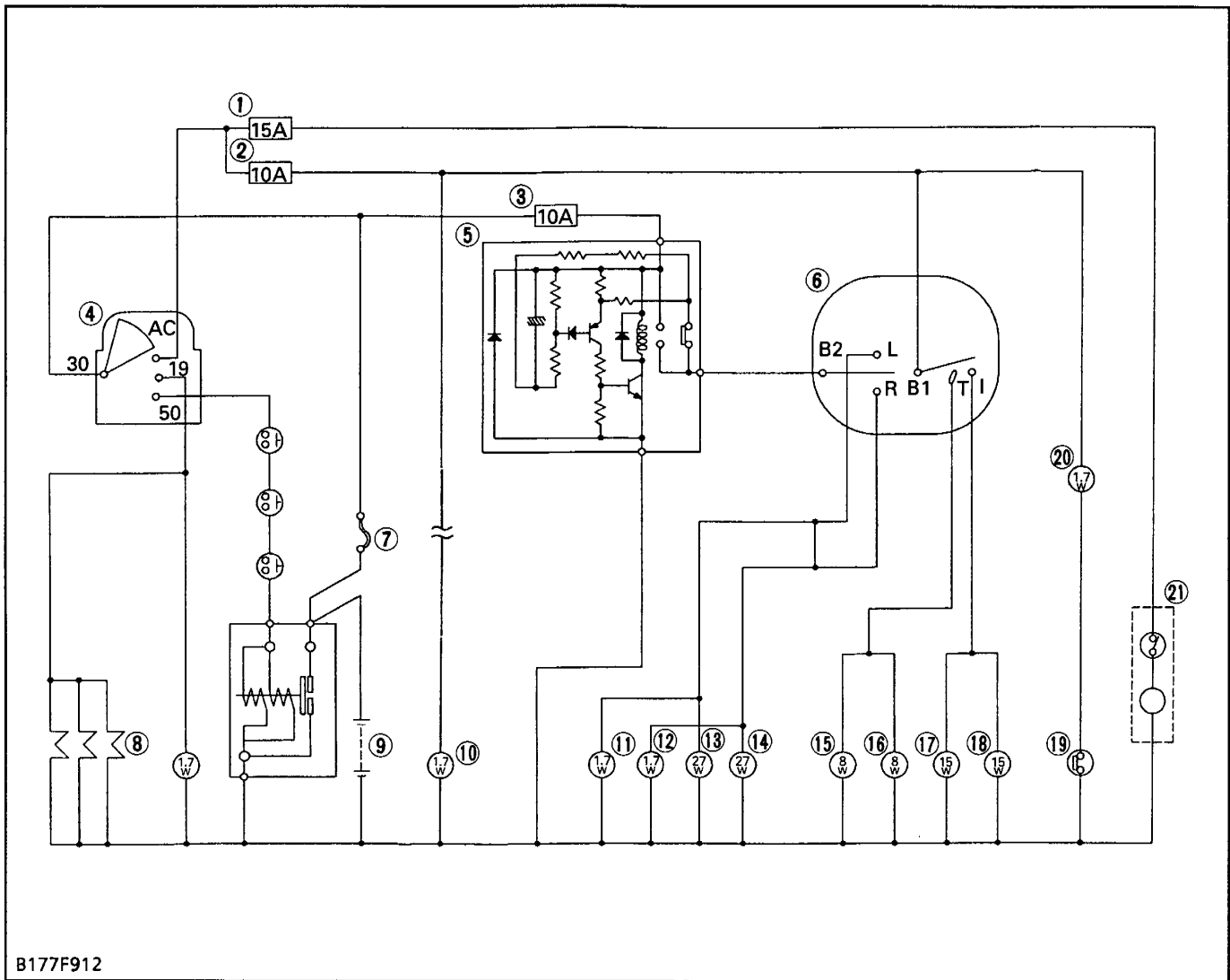
T3: Transistor

T4: Transistor

T5: Transistor

ZD1: Zener Diode

[4] LIGHTING SYSTEM

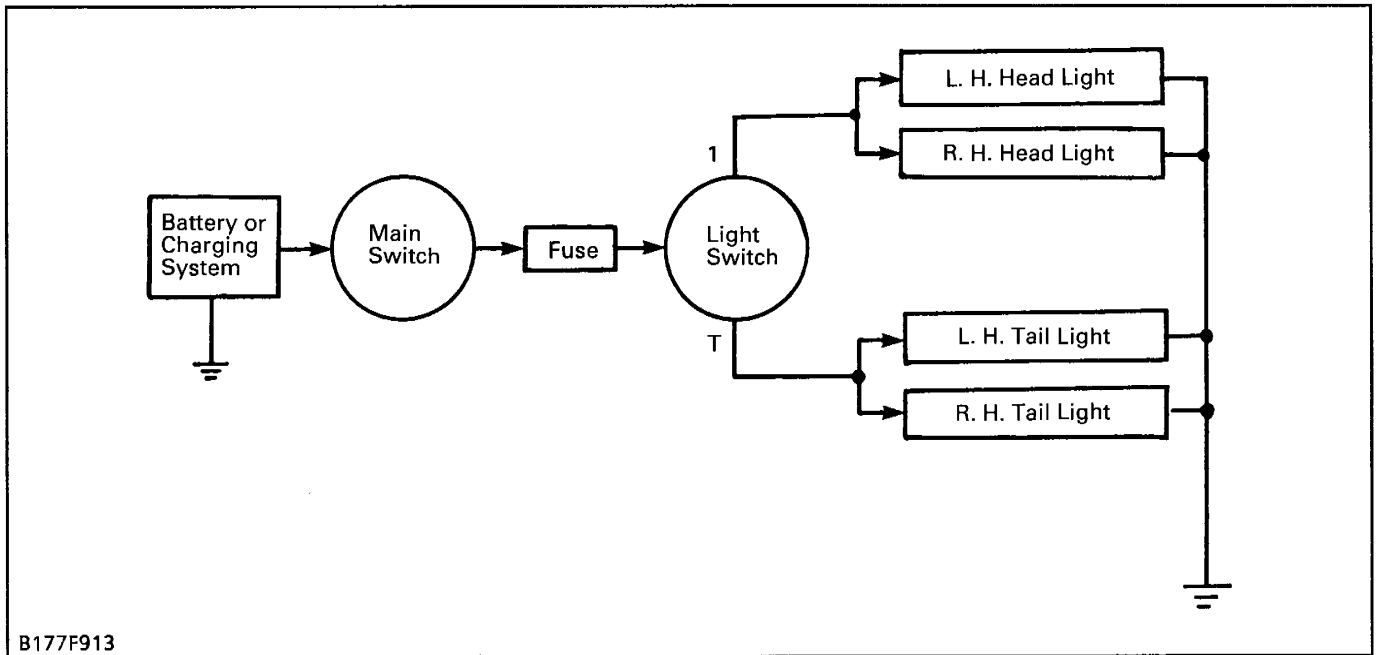


B177F912

- | | | | |
|------------------------|-----------------------------|------------------------|-------------------------------|
| (1) Fuse | (7) Slow Blow Fuse | (12) R.H. Hazard Lamp | (17) L.H. Head Light |
| (2) Fuse | (8) Pre-heat Indicator Lamp | (13) L.H. Hazard Light | (18) R.H. Head Light |
| (3) Fuse | (9) Battery | (14) R.H. Hazard Light | (19) Oil Pressure Switch |
| (4) Main Switch | (10) Charge Lamp | (15) L.H. Tail Light | (20) Engine Oil Pressure Lamp |
| (5) Hazard Unit | (11) L.H. Hazard Lamp | (16) R.H. Tail Light | (21) Working Light (Optional) |
| (6) Combination Switch | | | |

The lighting system consists of combination switch (light switch and hazard switch), head lights, tail lights, hazard unit, hazard lights, pilot lamps, etc.

(1) Head Light

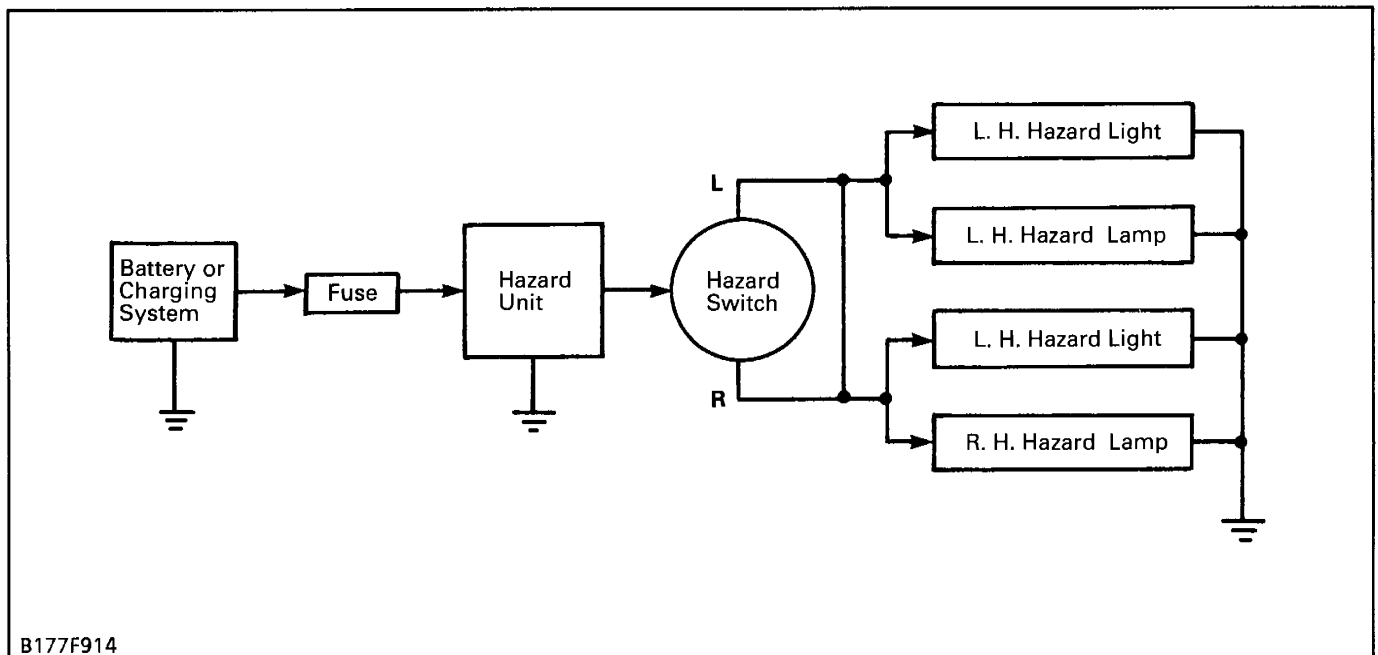


B177F913

The light switch, which forms a combination switch with the hazard switch, has two position; **OFF** and **ON**.

Current passes through the light circuit as shown in the figure above.

(2) Hazard Light



B177F914

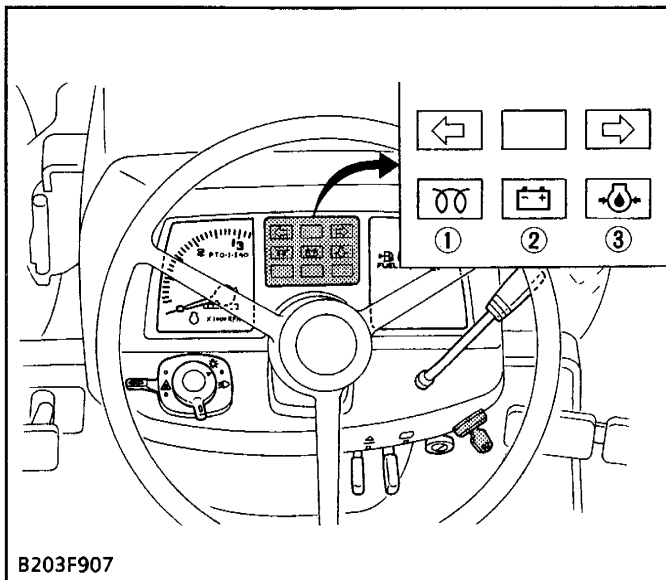
The hazard switch, which forms a combination switch with the light switch, has three positions; **OFF**, **L** and **R**. At either switch lever position of **L** or **R**,




current flows to the same circuit, blinking the hazard lights and indicator lamps as shown in the figure above.

[5] EASY CHECKER

To check the conditions of tractor easily before and during operation, easy checker combination of lamps on the easy checker board is provided.

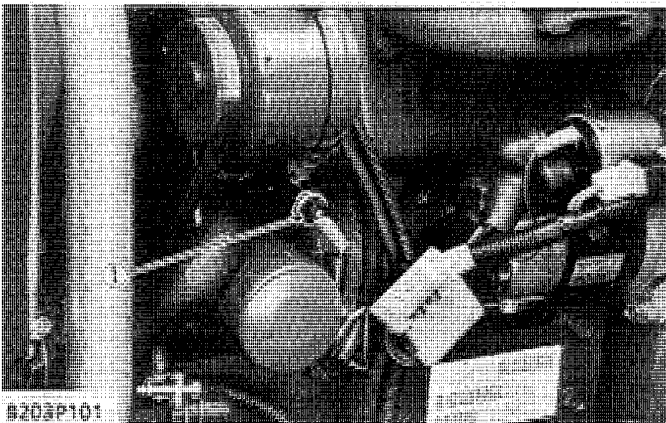
(1) Indication Items



-  **Pre-heat Indicator Lamp**
When the key switch is in the "Preheat" position, the pre-heat indicator lamp illuminates.
-  **Charge Lamp**
When the charging system is not functioning properly, this lamp illuminates.
-  **Oil Pressure Lamp**
When the engine oil pressure is low, this lamp illuminates.

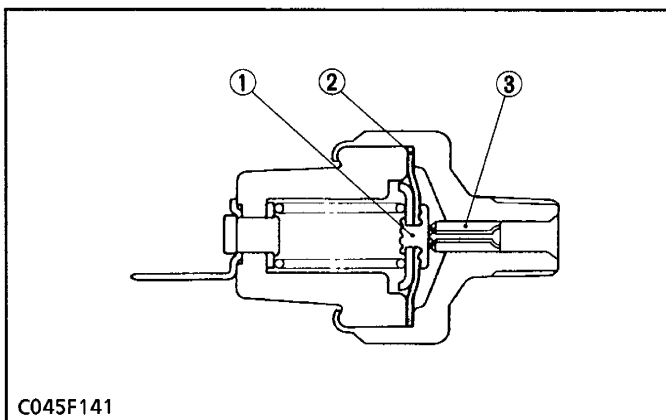
- (1) Pre-heat Indicator Lamp
- (2) Charge Lamp
- (3) Oil Pressure Lamp

(2) Low Engine Oil Pressure



Low engine oil pressure is detected by the oil switch installed in the lubricating system of engine.

- (1) Oil Pressure Switch

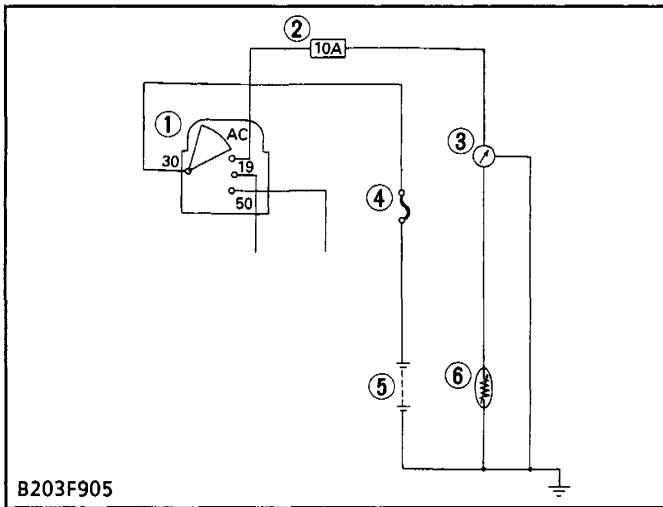


■ Oil Pressure Switch

While oil pressure is high and the force applied to the diaphragm (2) is larger than the spring tension, the terminal contact (1) is open separated from the body contact (3). If the pressure drops below approx. 49 kPa (0.5 kgf/cm², 7.1 psi), the contact closes.

- (1) Terminal Contact
- (2) Diaphragm
- (3) Body Contact

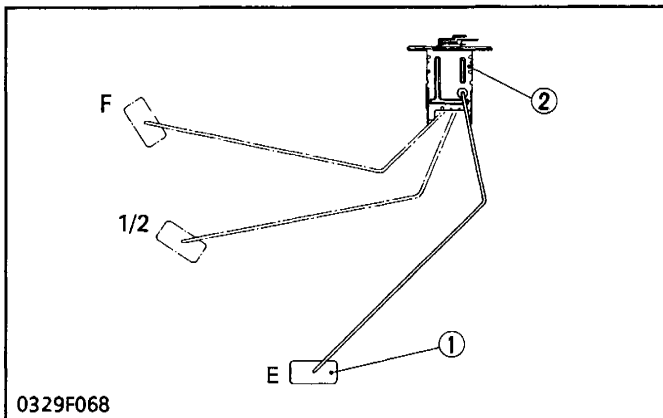
[6] GAUGE



The fuel quantity is indicated by the ammeters. The ammeters indicate the amperate flowing through the fuel level sensor (6) for the fuel quantity detection.

- (1) Main Switch
- (2) Fuse
- (3) Fuel Gauge
- (4) Slow Blow Fuse
- (5) Battery
- (6) Fuel Level Sensor

(1) Fuel Quantity



■ Fuel Level Sensor

The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

As the float (1) lowers, the resistance of the variable resistor (2) varies. The relation between the amount of fuel and the resistance is as follows.

F	1/2	E (Remaining fuel of approx. 3.0 ℓ, 0.79 U.S.gal, 0.66 Imp.gal)
1 to 5 Ω	28.5 to 36.5 Ω	103 to 117 Ω

- (1) Float
- (2) Variable Resistor

SERVICING

CONTENTS

TROUBLESHOOTING	9-51
SERVICING SPECIFICATIONS	9-54
CHECKING, DISASSEMBLING AND SERVICING	9-54
[1] BATTERY	9-54
CHECKING	9-54
SERVICING	9-56
[2] STARTING SYSTEM	9-57
CHECKING	9-57
DISASSEMBLING AND ASSEMBLING	9-510
SERVICING	9-512
[3] CHARGING SYSTEM	9-513
CHECKING	9-513
DISASSEMBLING AND ASSEMBLING	9-514
SERVICING	9-514
[4] LIGHTING SYSTEM	9-515
CHECKING	9-515
[5] EASY CHECKER	9-518
CHECKING	9-518
[6] GAUGE	9-519
CHECKING	9-519

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	● Battery discharged or defective	Recharge or Replace	9-S4
	● Battery positive cable disconnected or improperly connected	Repair or Replace	9-S4
	● Battery negative cable disconnected or improperly connected	Repair or Replace	9-S4
	● Slow blow fuse blown	Replace	–
Fuse Blown Frequently	● Short-circuited	Repair or Replace	–

BATTERY

Battery Discharges Too Quickly	● Battery defective	Recharge or Replace	9-S4
	● Dynamo defective	Repair or Replace	9-S13
	● Regulator defective	Replace	9-S13
	● Wiring harness disconnected or improperly connected (between battery positive terminal and regulator B terminal, and between regulator and dynamo)	Repair or Replace	9-S13
	● Cooling fan belt slipping	Adjust tension	G-19

STARTING SYSTEM

Starter Does Not Run	● Battery discharged or defective	Recharge or Replace	9-S4
	● Slow blow fuse blown	Replace	–
	● Safety switch improperly adjusted or defective	Repair or Replace	G-15
	● Wiring harness disconnected or improperly connected (between main switch 50 terminal and safety switches, between safety switches and starter motor, between battery positive terminal and starter motor)	Repair or Replace	9-S7
	● Starter motor defective	Repair or Replace	9-S10
	● Main switch defective	Replace	9-S7
Pre-heat Indicator Lamp Does Not Light When Main Switch is in Pre-heat Position	● Battery discharged or defective	Recharge or Replace	9-S4
	● Slow blow fuse blown	Replace	–
	● Wiring harness disconnected or improperly connected (between main switch 19 terminal and pre-heat indicator, between pre-heat indicator and glow plugs)	Repair or Replace	9-S7
	● Main switch defective	Replace	9-S7
	● Pre-heat indicator defective	Replace	9-S9

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 (10A) ● Wiring harness disconnected or improperly connected (between main switch AC terminal and panel board, between panel board and regulator, between dynamo and regulator) 	Replace Repair or Replace	– 9-S13
	<ul style="list-style-type: none"> ● Regulator defective ● Dynamo defective 	Replace Repair or Replace	– 9-S14
Charging Lamp Does Not Go Off When Engine is Running	<ul style="list-style-type: none"> ● Wiring harness disconnected or improperly connected (between dynamo and regulator, between main switch 30 terminal and regulator, between panel board and regulator) 	Repair or Replace	9-S13
	<ul style="list-style-type: none"> ● Dynamo defective ● Regulator defective 	Repair or Replace Replace	9-S14 –

LIGHTING SYSTEM

Head Light Does Not Light	<ul style="list-style-type: none"> ● Fuse blown (10A) ● Bulb blown ● Wiring harness disconnected or improperly connected (between main switch AC terminal and combination switch B1 terminal, between combination switch 1 terminal and headlight) 	Replace Replace Repair or Replace	– – 9-S15
Tail Light Does Not Light	<ul style="list-style-type: none"> ● Fuse blown (10A) ● Bulb blown ● Wiring harness disconnected or improperly connected (between main switch AC terminal and combination switch B1 terminal, between combination switch T terminal and tail light) 	Replace Replace Repair or Replace	– – 9-S15
Hazard Light Does Not Light	<ul style="list-style-type: none"> ● Fuse blown (10A) ● Bulb blown ● Wiring harness disconnected or improperly connected (between main switch AC terminal and hazard unit, between hazard unit and combination switch B2 terminal, between combination switch R or L terminal and hazard lights) 	Replace Replace Repair or Replace	– – 9-S15
	<ul style="list-style-type: none"> ● Hazard unit defective ● Combination switch defective 	Replace Replace	9-S17 9-S15
Hazard Indicator Lamp Does Not Light	<ul style="list-style-type: none"> ● Bulb blown ● Wiring harness disconnected or improperly connected (between combination switch R or L terminal and panel board) 	Replace Repair or Replace	– 9-S16
Hazard Light Does Not Flicker	<ul style="list-style-type: none"> ● Hazard unit defective 	Replace	9-S17

EASY CHECKER

Symptom	Probable Cause	Solution	Reference Page
Oil Pressure Lamp Lights Up When Engine is Running	<ul style="list-style-type: none"> ● Engine oil pressure too low ● Engine oil insufficient ● Oil pressure switch defective ● Short circuit between oil pressure switch lead and chassis ● Circuit in panel board defective 	Repair engine Replenish Replace Repair Replace	– G-8 – 9-S18 9-S18
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 ● Oil pressure switch defective ● Wiring harness disconnected or improperly connected (between panel board and oil pressure switch) ● Circuit in panel board defective 	Replace Replace Repair or Replace Replace	– – 9-S18 9-S18

GAUGES

Fuel Gauge Does Not Function	<ul style="list-style-type: none"> ● Fuel gauge defective ● Fuel level sensor defective ● Wiring harness disconnected or improperly connected (between panel board and fuel level sensor) ● Circuit in panel board defective 	Replace Replace Repair or Replace Replace	9-S19 9-S19 9-S20 –
-------------------------------------	--	--	----------------------------------

SERVICING SPECIFICATIONS

STARTER MOTOR

Item		Factory Specification	Allowable Limit
Mica	Undercut	0.5 to 1.0 mm 0.020 to 0.039 in.	0.2 mm 0.0079 in.

CHECKING, DISASSEMBLING AND SERVICING

⚠ CAUTION

- To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the ground cable is attached to the negative terminal.

■ IMPORTANT

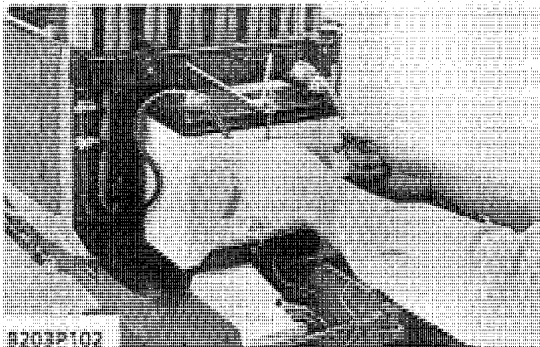
- If the tractor is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to dynamo and regulator may result.

■ NOTE

- In this section, when measuring resistance, voltage and amperage, leads of ohmmeter, voltmeter and ammeter are represented by — marks in figure.

[1] BATTERY

CHECKING

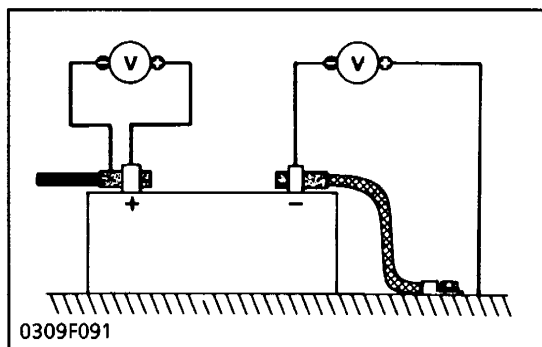


B203P102

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 specifications, check the battery condition. (See the next page.)

Battery voltage	Factory spec.	More than 12 V
-----------------	---------------	----------------

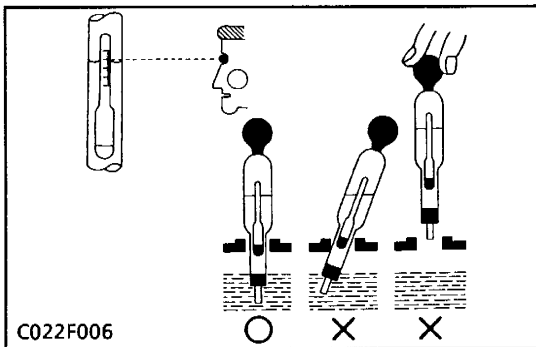
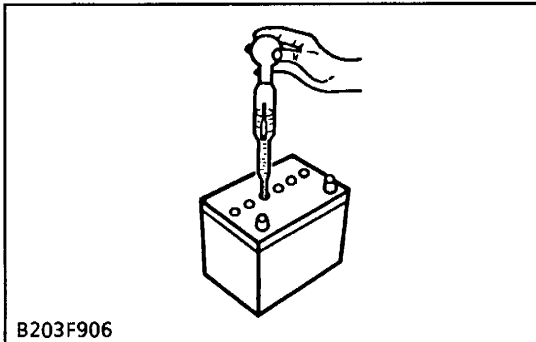


0309F091

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 specifications, clean the battery terminal posts and cable clamps, and tighten them firmly.

Factory spec.	Less than 0.1 V
---------------	-----------------



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)

Battery Specific Gravity

⚠ CAUTION

- Keep electrolyte away from eyes, hands and clothes. If you are splattered with it, wash it away completely with water.
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) below.
 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 decrease of 1 °C (0.0004 with a decrease of 1 °F). Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula :
 - Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature – 20 °C)
 - Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature – 68 °F)

SERVICING

Table 1

Model	Battery Type	Volts (V)	Capacity at 5H.R (A.H)
B7300	50B24L(S)-MF	12	36

Model	Reserve Capacity (min)	Cold Cranking Amps	Normal Charging Rate (A)
B7300	71	390	4.5

Recharging

⚠ CAUTION

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

1) Slow Charging

1. Add distilled water if the electrolyte level is low. When charging, the amount of electrolyte should be slightly lower than the specified level to prevent overflow.
2. Connect the battery to the charging unit, following the manufacturer's instructions.
3. As the electrolyte generates gas while charging, remove all port caps.
4. The electrolyte temperature must not exceed 40 °C (105 °F) during charging.
If it exceed 40 °C (105 °F), decrease the charging amperage or stop charging for a while.
5. When charging several batteries in series, charge at the rate of the smallest battery in the line.

■ **NOTE**

- Slow charger operation differs with the type used. For details, refer to the manufacturer's instructions.

2) Quick Charging

1. Determine the proper charging current and charging time with the tester attached to the quick charger.
2. Determine the proper charging current as 1/1 of the battery capacity. If the battery capacity exceeds 50 Ah, consider 50 A as the maximum.

■ **NOTE**

- Quick charger operation differs with the type used. For details, refer to the manufacturer's instructions.

Directions for Storage

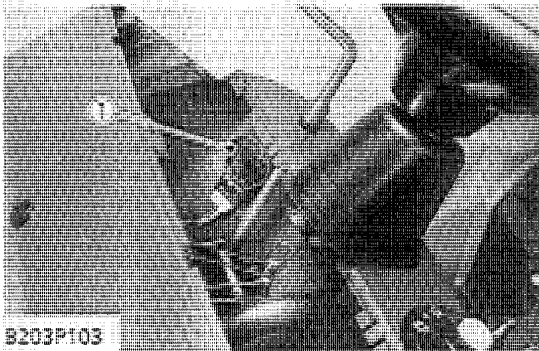
1. When storing the tractor for long periods of time, remove the battery from tractor, adjust the electrolyte to the proper level and store in a dry place out of direct sunlight.
2. The battery self-discharges while it is stored.
Recharge it once every three months in hot seasons and once every six months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

(Reference)

Self-discharge Rate

Temperature	Self-discharge rate
30 °C (86 °F)	Approx. 1.0 % per day
20 °C (68 °F)	Approx. 0.5 % per day
10 °C (50 °F)	Approx. 0.25 % per day

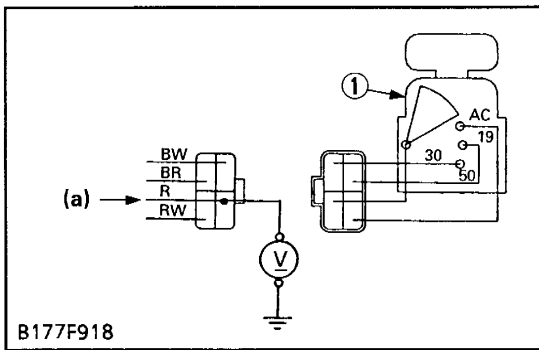
[2] STARTING SYSTEM CHECKING



Main Switch

1. Remove the panel board, and remove the main switch.
2. Perform the following checkings 1) to 5).

(1) Main Switch



B177F918

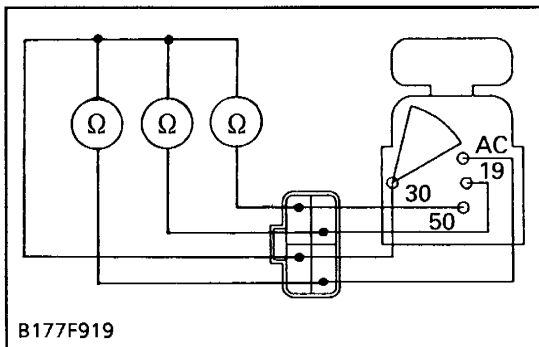
1) Connector Voltage

1. Measure the voltage with a voltmeter across the connector 30 terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector 30 terminal – chassis	Approx. battery voltage
---------	---------------------------------	-------------------------

(1) Main Switch

(a) From Battery Positive Terminal

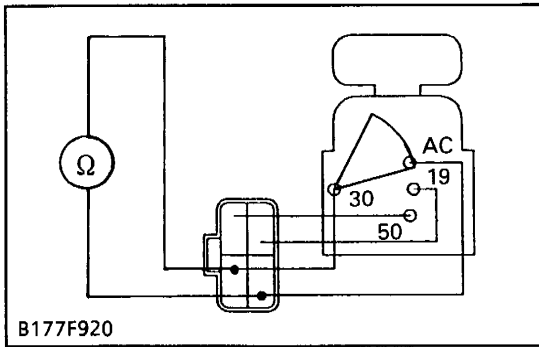


B177F919

2) Main Switch Key at Off Position

1. Turn the main switch off.
2. Measure the resistance with an ohmmeter across the 30 terminal and the AC terminal, 30 terminal and 50 terminal, 30 terminal and 19 terminal.
3. If infinity is not indicated, the contacts of the main switch are faulty.

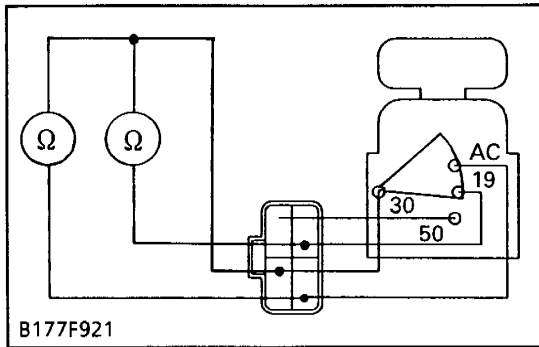
Resistance	30 – AC	Infinity
	30 – 50	Infinity
	30 – 19	Infinity



3) Main Switch Key at ON Position

1. Turn the main switch on.
2. Measure the resistance with an ohmmeter across the 30 terminal and the AC terminal.
3. If 0 ohm is not indicated, the 30 – AC contacts of the main switch are faulty.

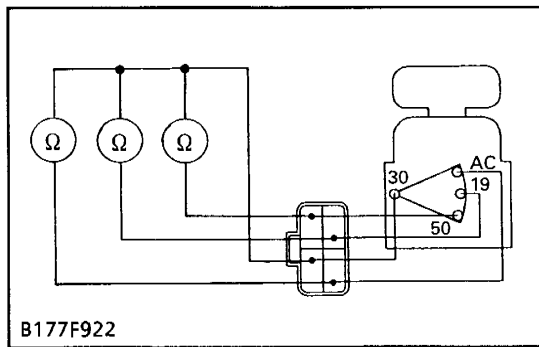
Resistance	30 – AC	0 ohm
------------	---------	-------



4) 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 30 terminal and the 19 terminal, and measure the resistance across the 30 terminal and the AC terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	30 – 19	0 ohm
	30 – AC	

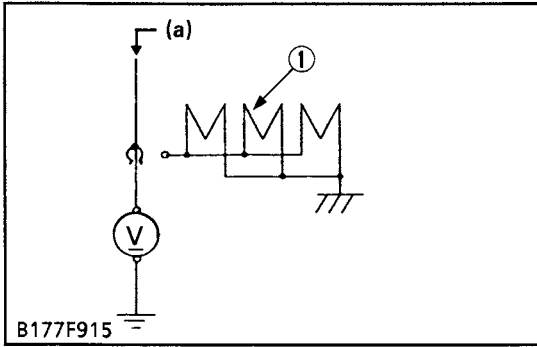


5) Main Switch Key at START Position

1. Turn and hold the main switch key at the START position.
2. Measure the resistance with an ohmmeter across the 30 terminal and the 19 terminal, across the 30 terminal and the 50 terminal, and across the 30 terminal and the AC terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	30 – 19	0 ohm
	30 – 50	
	30 – AC	

Key position	Terminal			
	30	AC	19	50
OFF	●			
ON	●	●		
PREHEAT	●	●	●	
START	●	●	●	●



Pre-heating

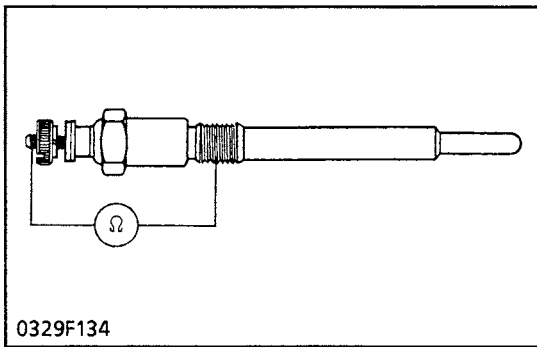
1) Lead Terminal Voltage

1. Disconnect the wiring lead from the glow plug terminal after turning the main switch off.
2. Turn the main switch key to the **PREHEAT** position, and measure the voltage across the lead terminal and the chassis.
3. Turn the main switch key to the **START** position, and measure the voltage with a voltmeter across 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	

(1) Glow Plugs

(a) From Main Switch 19 Terminal and Pre-heat Indicator Lamp



2) Glow Plug

1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter across 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 reference value is not indicated, the glow plug is faulty.

Glow plug resistance	Reference value	Approx. 0.9 ohms
----------------------	-----------------	------------------



Safety Switch

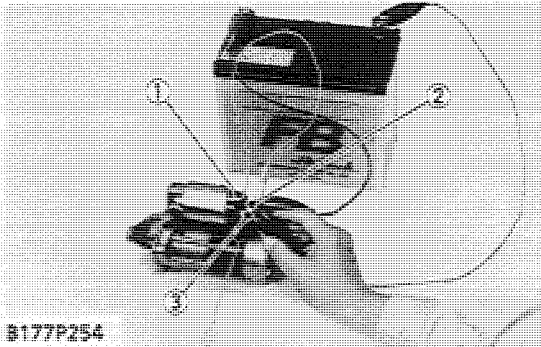
1. Remove the safety switch leads.
2. Connect the circuit tester to the safety switch leads.
3. Measure the resistance between leads.
4. If the safety switch is defective, replace it.

Resistance (Across switch terminal)	When switch push is pushed	0 ohm
	When switch push is released	Infinity



(A) Clutch Pedal

(B) PTO Gear Shift Lever



B177P254

Motor Test

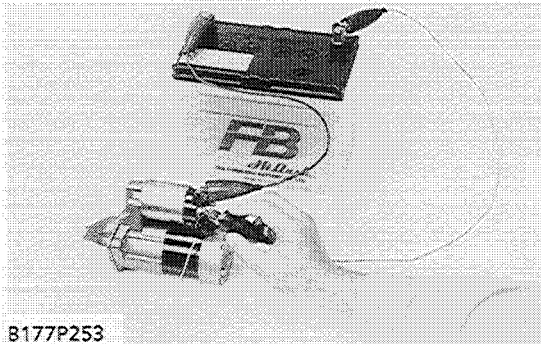
1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter.
3. Remove the starter from the engine.
4. Connect the jumper lead from the battery positive terminal post to the **B** terminal (2), and from the **B** terminal (2) to the **S** terminal (1).
5. Connect a jumper lead momentarily between the battery negative terminal post and the **M** terminal (3).
6. If the motor does not run, check the motor.

⚠ CAUTION

- Secure the starter to prevent it from jumping up and down while testing the motor.

(1) **S** Terminal
(2) **B** Terminal

(3) **M** Terminal



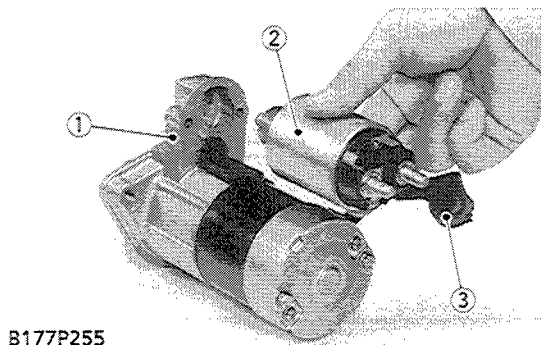
B177P253

Magnetic Switch Test

1. Connect the jumper lead from the battery positive terminal post to the **S** terminal.
2. The pinion gear should pop out, when a jumper lead is connected between the battery negative terminal post and the **M** terminal.
3. If the pinion gear does not pop out, check the magnetic switch.

■ NOTE

- The test should be carried out for a short time, about 3 to 5 seconds.

DISASSEMBLING AND ASSEMBLING

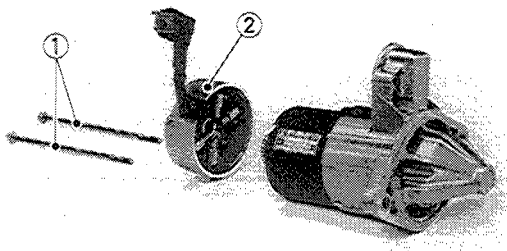
B177P255

Magnetic Switch

1. Disconnect the connecting lead (3).
2. Remove the mounting screws, and separate the magnetic switch (2) from the front bracket (1).

(1) Front Bracket
(2) Magnetic Switch

(3) Connecting Lead

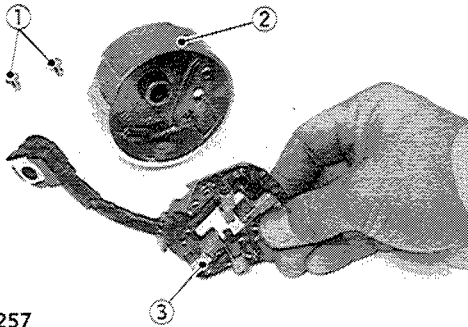


B177P256

Rear Bracket

1. Remove the mounting screws (1).
2. Remove the rear bracket (2).

- | | |
|-----------|------------------|
| (1) Screw | (2) Rear Bracket |
|-----------|------------------|

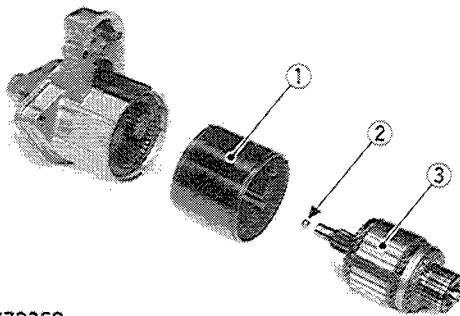


B177P257

Brush Holder

1. Remove the mounting screws (1).
2. Remove the brush holder (3) from the rear bracket (2).

- | | |
|------------------|------------------|
| (1) Screw | (3) Brush Holder |
| (2) Rear Bracket | |



B177P258

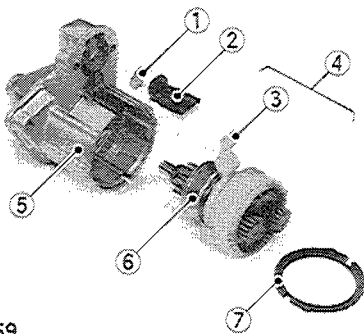
Armature and Yoke

1. Draw out the armature (3), ball (2) and the yoke (1) from the front bracket.

NOTE

- Before disassembling, put the parting marks on the yoke and front bracket.

- | | |
|----------|--------------|
| (1) Yoke | (3) Armature |
| (2) Ball | |



B177P259

Shaft Assembly (with Overrunning Clutch)

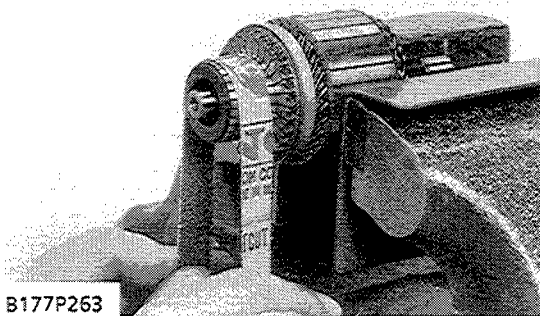
1. Remove the gasket A (7), gasket B (2) and the plate (1).
2. Draw out the shaft assembly (4) from the front bracket (5).

(When reassembling)

- Install the lever (3), noting its direction.

- | | |
|--------------------|------------------------|
| (1) Plate | (5) Front Bracket |
| (2) Gasket B | (6) Overrunning Clutch |
| (3) Lever | (7) Gasket A |
| (4) Shaft Assembly | |

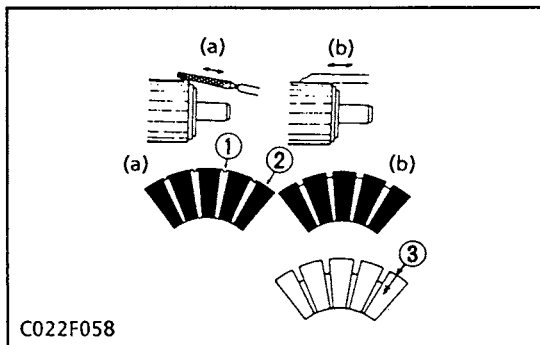
SERVICING



B177P263

Staining or Burning of Commutator

1. Check to see if the commutator surface is stained or burnt.
2. If it is burnt, grind off with a fine-grain sandpaper.



C022F058

Mica Undercut

1. Check to see the mica undercut.
2. If the mica is less than the allowable limit, correct with a saw blade. As the edge of the segment will be rough, chamfer it.

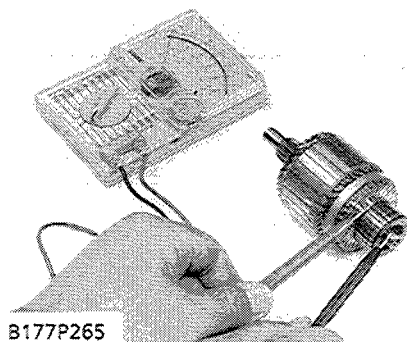
Mica undercut	Factory spec.	0.5 to 1.0 mm 0.020 to 0.039 in.
	Allowable limit	0.2 mm 0.008 in.

- (1) Mica (2) Segment (3) Depth of Mica (a) Bad (b) Good

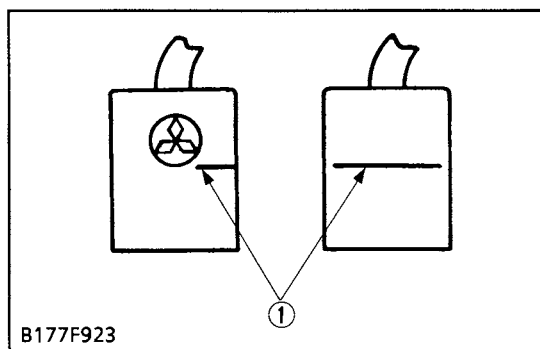
Grounding of Armature Coil

1. Measure the resistance with an ohmmeter across the commutator and the armature shaft.
2. If infinity is not indicate, replace it.

Resistance	Commutator – Armature	Infinity
------------	-----------------------	----------



B177P265



B177F923

Brush Wear

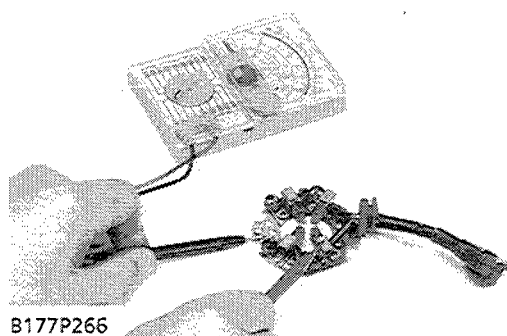
1. If the conduct face of the brush is dirty or dusty, clean it with sandpaper.
2. Visually inspect the brush wear.
3. If the brush is worn more than allowable limit, replace it.

- (1) Allowable Limit Line

Grounding of Brush Holder

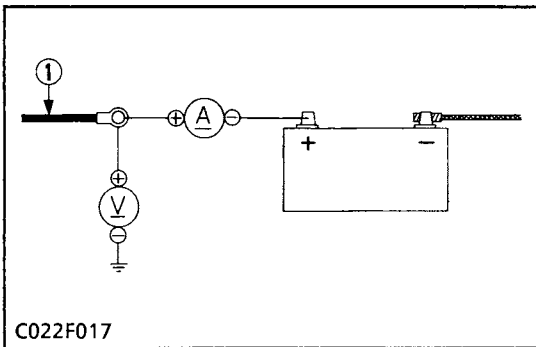
1. Measure the resistance with an ohmmeter across the brush holder and the holder support.
2. If infinity is not indicated, replace it.

Resistance	Brush holder – Holder support	Infinity
------------	-------------------------------	----------



B177P266

[3] CHARGING SYSTEM CHECKING



C022F017

Battery Charging Current

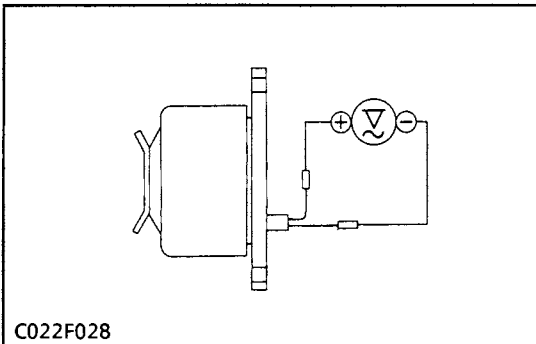
1. After starting the engine, disconnect the battery positive cord (+), and connect an ammeter and voltmeter. Then switch on all electrical loads (such as headlights) and measure the charging current.

■ **NOTE**

- Connect an ammeter only after starting the engine.
- When the electrical loads is considerably low or the battery is fully charged, the specified reading may not be obtained.

Factory spec.	Current	14 to 15 A
	Dynamo speed	5200 r.p.m

(1) Battery Positive Cord

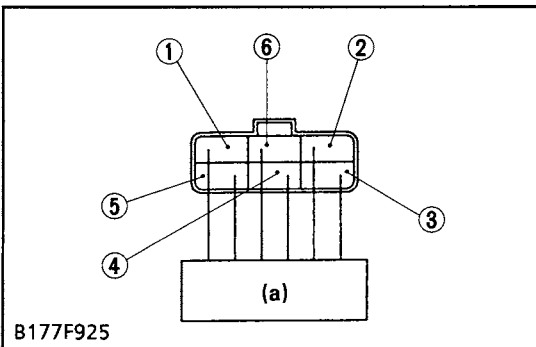


C022F028

Dynamo No-load Voltage

1. Disconnect the lead wires from the dynamo.
2. Start the engine, and check the generating voltage of the dynamo.

Factory spec.	Voltage	14 to 15 V (at engine idling speed)
		36 to 39 V (at engine high speed)



B177F925

- (1) Light Green
- (2) Light Green
- (3) Red
- (4) Red / Yellow
- (5) White / Red
- (6) Black

(a) Regulator

Continuity across Regulator's Terminals

1. Remove the regulator coupler.
2. Check with a tester whether the regulator is in optimum condition or not.

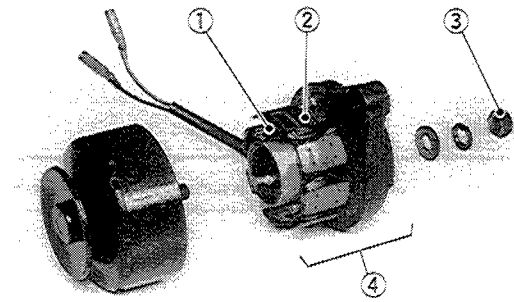
■ **Check Table**

■ **NOTE**

- Type to use a high-resistance tester as far as possible.
- The judgement should be as below table. "ON" if the indicator moves, otherwise "OFF".

Tester + terminal / Tester - terminal		Cord colours					
		Light Green	Light Green	Red	Red / Yellow	White / Red	Black
Cord colours	Light Green	OFF	OFF	ON	OFF	OFF	OFF
	Light Green	OFF	OFF	ON	OFF	OFF	OFF
	Red	OFF	OFF	ON	OFF	OFF	OFF
	Red / Yellow	ON	ON	ON	OFF	OFF	ON
	White / Red	OFF	OFF	OFF	OFF	OFF	OFF
	Black	OFF	OFF	OFF	OFF	OFF	OFF

DISASSEMBLING AND ASSEMBLING



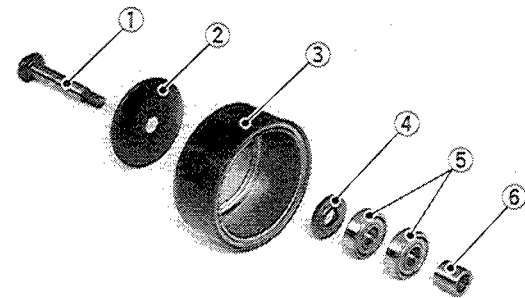
B177P306

Stator

1. Remove the nut (3) and separate the stator comp. (4).
2. Unscrew the screws (1) and remove the stator (2).

(1) Screw
(2) Stator

(3) Nut
(4) Stator Comp.



B177P307

Rotor

1. Tap out the shaft (1) from the rotor (3).

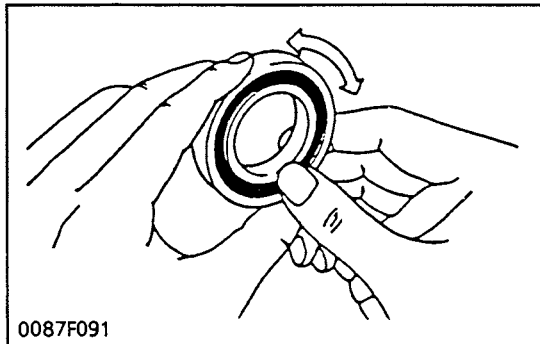
(When reassembling)

- Take care the direction of the collar (4), the flat side should face to the pulley (2) side.

(1) Shaft
(2) Pulley
(3) Rotor

(4) Collar
(5) Bearings
(6) Collar

SERVICING



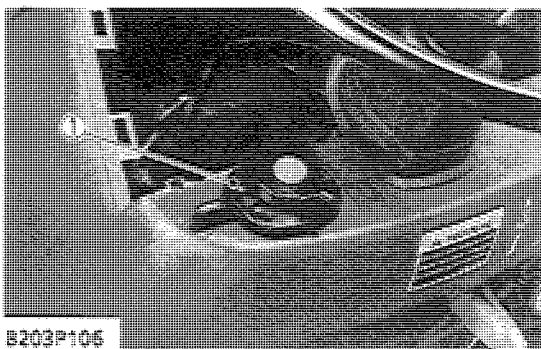
0087F091

Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

[4] LIGHTING SYSTEM

CHECKING

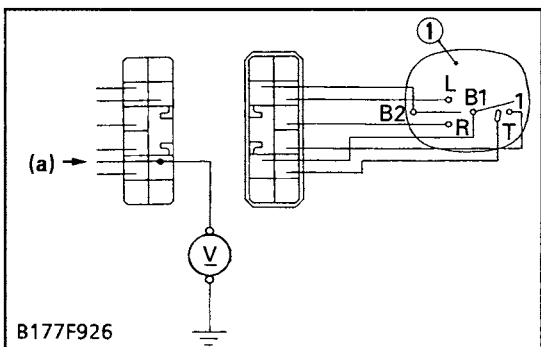


B203F105

Combination Switch

1. Remove the panel board, and disconnect the combination switch connector.
2. Remove the combination switch (1) and perform the following checkings 1) to 6).

(1) Combination Switch



B177F926

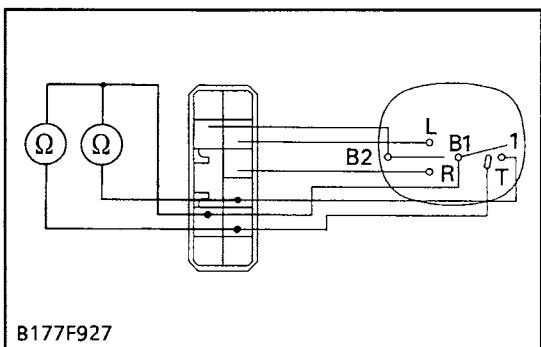
1) Connector Voltage

1. Turn the main switch on, and measure the voltage with a voltmeter across the connector B1 terminal and the chassis.
2. If the voltage differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage	B1 – Chassis	Approx. battery voltage
---------	--------------	-------------------------

(1) Combination Switch

(a) From Main Switch AC Terminal

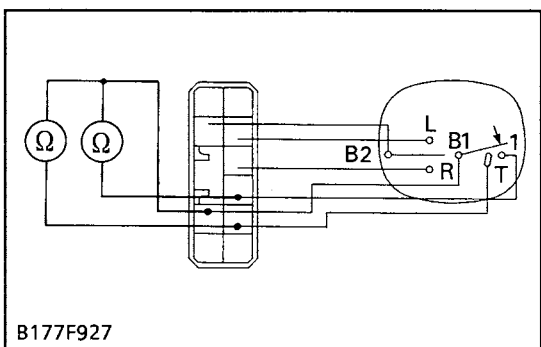


B177F927

2) Headlight Switch Continuity When Setting Switch Knob at OFF Position

1. Set the light switch knob to the OFF position.
2. Measure the resistances with an ohmmeter across the B1 terminal and 1 terminal, and across the B1 terminal and the T terminal.
3. If infinity is not indicated, the combination switch is faulty.

Resistance (Switch knob at OFF position)	B1 – 1	Infinity
	B1 – T	

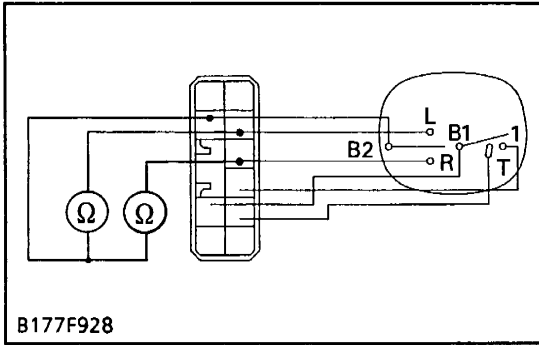


B177F927

3) Headlight Switch Continuity When Setting Switch Knob at ON Position

1. Measure the resistance with an ohmmeter across the B1 terminal and 1 terminal, and across the B1 terminal and T terminal.
2. If 0 ohm is not indicated, the combination switch is faulty.

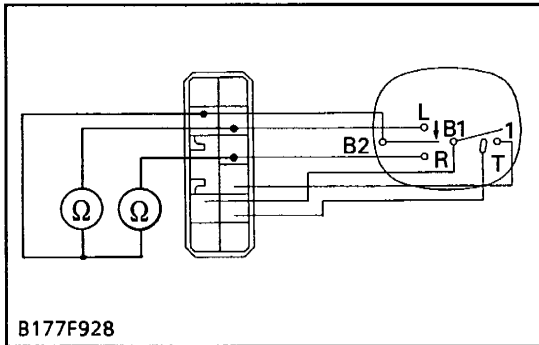
Resistance (Switch knob at ON position)	B1 – 1	0 ohm
	B1 – T	



4) Hazard Switch Continuity When Setting Switch Knob at OFF Position

1. Set the hazard switch knob to the **OFF** position.
2. Measure the resistances with an ohmmeter across the **B2** terminal and **L** terminal, and across **B2** terminal and **R** terminal.
3. If infinity is not indicated, the combination switch is faulty.

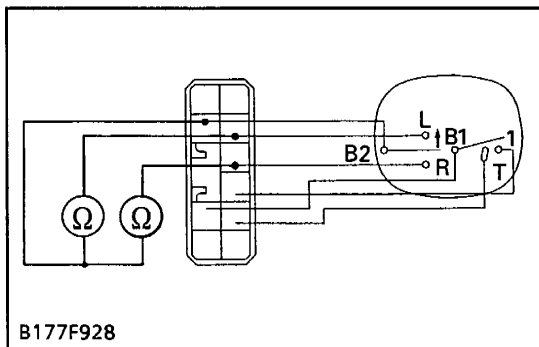
Resistance (Switch knob at OFF position)	B2 – L	Infinity
	B2 – R	



5) Hazard Switch Continuity When Setting Switch Knob at R Position

1. Set the hazard switch knob to the **R** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **R** terminal.
3. If 0 ohm is not indicated, the combination switch is faulty.

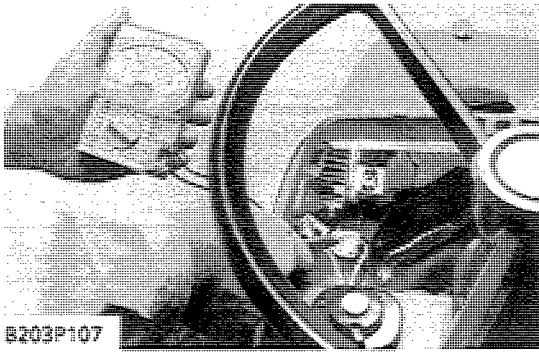
Resistance (Switch knob at 1 position)	B2 – R	0 ohm
	B2 – L	Infinity



6) Hazard Switch Continuity When Setting Switch Knob at L Position

1. Set the hazard switch knob to the **L** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **L** terminal.
3. If 0 ohm is not indicated, the combination switch is faulty.

Resistance (Switch knob at 2 position)	B2 – L	0 ohm
	B2 – R	Infinity



Hazard Unit

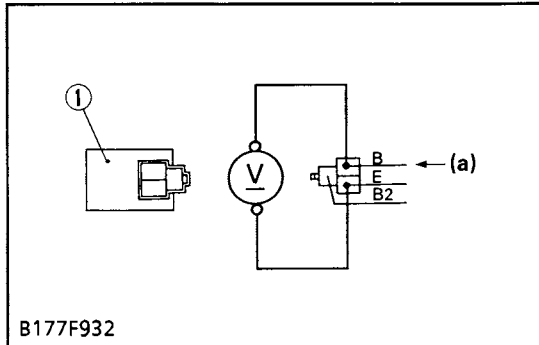
1) Connector Voltage

1. Disconnect the connector from the hazard unit after turning the main switch off.
2. Measure the voltage with a voltmeter across the connector B terminal and E terminal.
3. If the voltage differs from the battery voltage, the main switch, fuse or wiring harness is faulty.

Voltage	B - E	Approx. battery voltage
---------	-------	-------------------------

(1) Hazard Unit

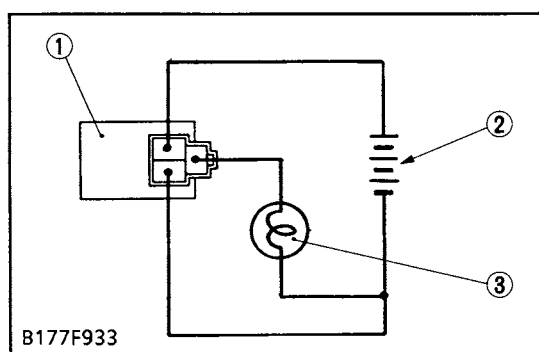
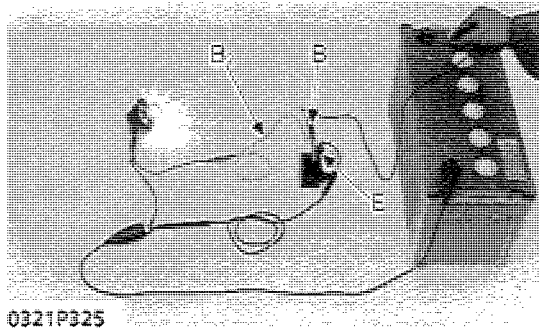
(a) From Main Switch B Terminal



2) Hazard Unit Test

1. Remove the panel board.
2. Disconnect the connector and remove the hazard unit.
3. Connect jumper leads from the B2 terminal to the bulb, and from the bulb to the battery negative terminal.
4. Connect jumper lead from the B terminal to the battery positive terminal.
5. Connect jumper lead from the E terminal to the battery negative terminal.
6. If the bulb does not flicker, the hazard unit is faulty.

- (1) Hazard Unit
- (2) Battery (12V)
- (3) Bulb

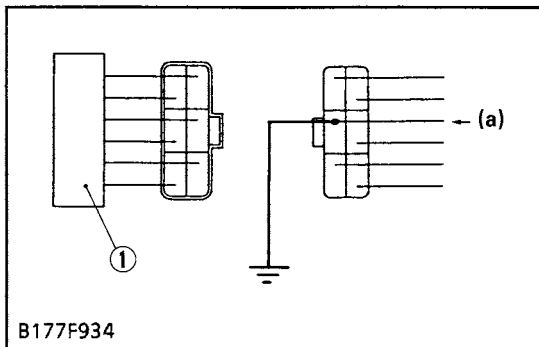


**[5] EASY CHECKER
CHECKING**



Easy Checker

1. Remove the panel board and disconnect the connector from it.
2. Turn the main switch on.
3. Measure the voltage with a voltmeter across the terminal (Red / Yellow) and the earth terminal (Black).
4. If the voltage differs from the battery voltage, the wiring harness, fuses and main switch should be checked.

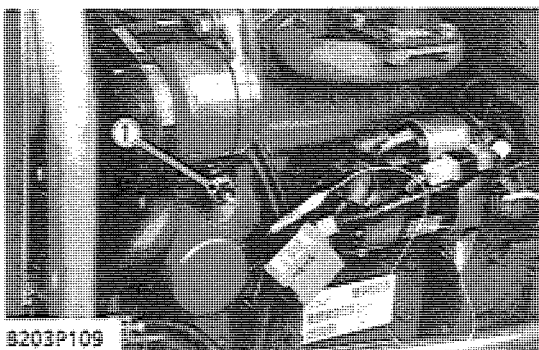


Charging Circuit (Panel Board and Wiring Harness)

1. Remove the panel board from tractor.
2. Disconnect the 6-P connector from the regulator after turning the main switch off.
3. Turn the main switch on and connect a jumper lead from the wiring harness connector terminal (Black) to the chassis.
4. If the charge lamp does not light, the panel board circuit, regulator, wiring harness, or fuse is fault.

(1) Regulator

(a) From Charge Lamp



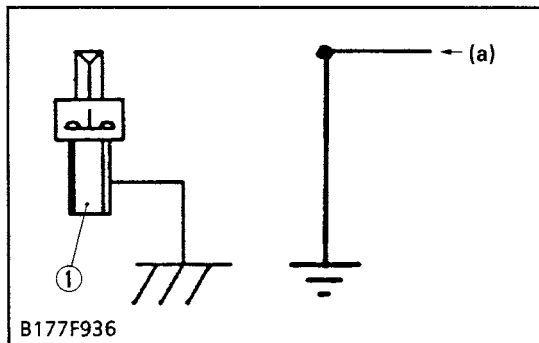
Engine Oil Pressure Switch

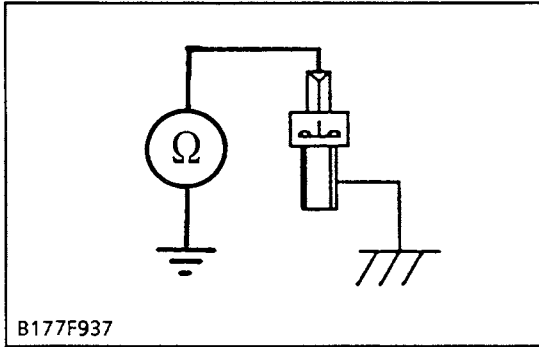
1) Panel Board and Wiring Harness

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 terminal 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

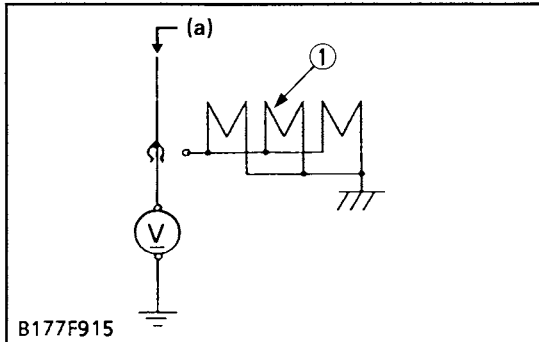




2) Switch Continuity

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 ohm
	At pressure over approx. 4.9 kPa (0.5 kgf/cm ² , 7 psi)	Infinity

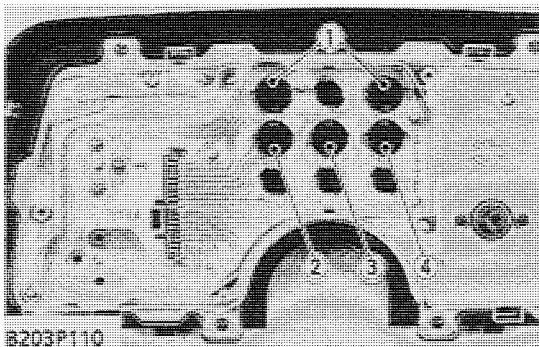


Glow Plug

1. Disconnect the lead from the glow plug.
2. Connect the tester positive cable to the glow plug lead and negative one to the chassis.
3. Measure its voltage with a voltmeter, after turning the main switch to the preheating or starting position.
4. If its voltage is not approximately the battery one, check the main switch or wiring harness.

(1) Glow Plugs

(a) From Main Switch 19 Terminal and Pre-heat Indicator Lamp



Monitor Lamp (for Charge, Engine Oil Pressure, Pre-heat and Hazard)

1. After removing the panel board from tractor, remove the plate behind the panel.
2. Remove the each lamp.
3. Measure the lamp resistance.
4. If it is infinity, replace the lamp with new.

Lamp spec.	12 V, 1.7 W
------------	-------------

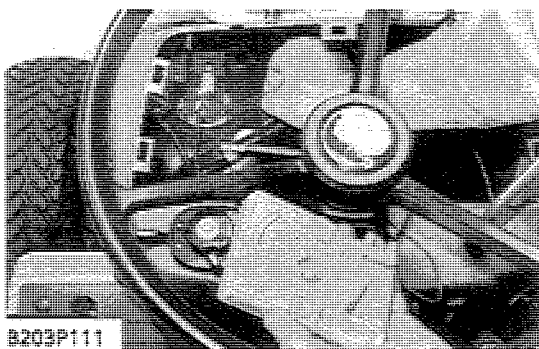
(1) Hazard

(3) Charge

(2) Engine Oil Pressure

(4) Pre-heat

[7] GAUGE CHECKING

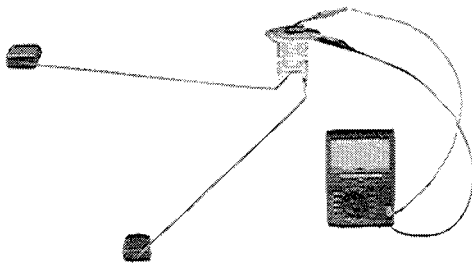


Fuel Level Sensor

1) Lead Terminal Voltage

1. Remove the panel board and disconnect the connector from the fuel gauge unit after turning the main switch off.
2. Turn the main switch on and measure the voltage with a voltmeter across the connector terminal and the chassis.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	Lead terminal - Chassis	Approx. battery voltage
---------	-------------------------	-------------------------

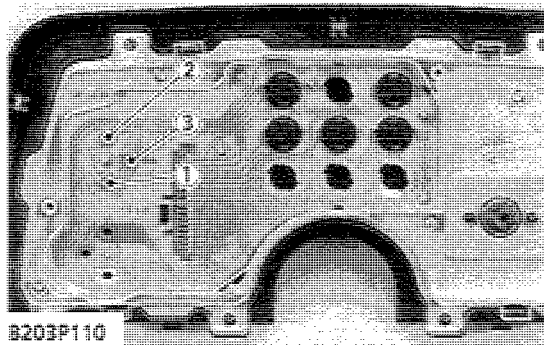


0310P180

2) Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the reference values are not indicated, the sensor is faulty.

Resistance (Sensor terminal - its body)	Reference value	Float at upper-most position	1 to 5 ohms
		Float at lower-most position	103 to 107 ohms



B203P110

Fuel Gauge Continuity

1. Remove the panel board from the tractor.
2. Check the continuity with an ohmmeter across the **U** terminal (1) and **IGN** terminal (2) and across the **U** terminal (1) and **GND** terminal (3).
3. If infinity is indicated, the fuel gauge is faulty.

- (1) **U** Terminal (Fuel)
- (2) **IGN** Terminal (Fuel)
- (3) **GND** Terminal (Fuel)

M MOWER

M MOWER



SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and decals 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.

SAFETY SERVICING AND REPAIRING

- (1) Before working on the machine :
 - Park the machine on a firm and level ground, and set the parking brake.
 - Lower the implement or mower to the ground.
 - Stop the engine, and remove the key.
 - Disconnect the battery's ground cable.
 - Clean the work area and machine.
- (2) Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- (3) Do not wear a necktie, scarf, necklace, loose or bulky clothing when you work near machine tools or moving parts.
- (4) Use tools appropriate to the work. Makeshift tools, parts, and procedures will not make good repairs.
- (5) When servicing is performed together by two or more persons, take care to perform all work safely.
- (6) Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.

- (7) If the engine must be running to do same work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.
- (8) Do not touch the rotating or hot parts while the engine is running.
- (9) Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- (10) To avoid sparks from an accidental short circuit, always disconnect the battery's ground cable first and connect it last.
- (11) 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.
- (12) Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- (13) Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Wait for more than ten minutes to cool the radiator, before removing the cap.
- (14) 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.
- (15) Do not start the engine by shorting across starter terminals.
- (16) Unauthorized modifications to the machine may impair the function and / or safety and affect machine life.
- (17) Do not alter or remove any part of machine safety system.
- (18) Keep a first aid kit and fire extinguisher handy at all times.
- (19) Be sure to chock the wheels to prevent accident during servicing the machine.

SAFETY OPERATION

[BEFORE OPERATION]

- (1) Read the "OPERATOR'S MANUAL" carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
- (2) Do not wear loose, bulky clothing when operating the machine. Do wear safety shoes and eye protection.
- (3) Do not operate the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- (4) Never allow children or inadequately trained persons to operate the machine. Keep everyone, especially children and pets, away from the area of operation.
- (5) Thoroughly inspect the area where the machine is to be used. Remove all sticks, stones, bottles, cans, wires, etc.
- (6) Remove all debris (string, wire or cords) which might wrap around blade shafts.
- (7) Keep all shields and safety devices in place. If a shield, safety device or decal is missing, defective or damaged, repair or replace it before operating.
- (8) Use only implements, attachments and accessories approved by KUBOTA.
- (9) Fuel is very flammable. Handle fuel carefully.
 - Use a properly and approved safety container.
 - Refuel the machine outdoors.
 - Shut off engine and allow it to cool before refueling.
 - Do not refuel the machine while smoking or when near open flame or sparks.
 - Do not overflow fuel while filling fuel tank.
 - Install the fuel tank cap securely, and clean up any spilled fuel before starting the engine.

[OPERATION]

- (1) Operate the machine only in daylight or in good artificial light.
- (2) Do not run the engine in a closed area without adequate ventilation.
- (3) Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- (4) Never start the engine while standing on ground. Start the engine only from operator's seat.
- (5) Be alert when operating. To prevent loss of control :
 - Watch for holes in the terrain or other hidden hazards.
 - Do not drive close to ditches, creeks, or other hazardous areas.
 - Reduce speed when making sharp turns.
 - Avoid sudden stops and starts.
 - Before backing up, look to the rear to make sure no people or obstacles are behind you or the machine.
- (6) Keep side discharge chute, mulching plate or grass catcher (option) in place.
- (7) Do not discharge clippings toward people or objects.
- (8) Do not put hands or feet near or under mower deck.
- (9) Shut the engine off and wait for all movement to stop before removing grass catcher or unclogging discharge chute.
- (10) Adjust cutting height only when engine is stopped and mower blades have stopped turning.
- (11) Mow across the face of slopes — never up and down. Exercise extreme caution when changing direction on slopes. Do not mow excessively steep slopes.
- (12) To reduce fire hazards, keep the engine exhaust area free of grass or leaves.
- (13) Disengage power to the mower blades before crossing gravel drives, walks, or roads.
- (14) If the machine should start to vibrate abnormally, stop the engine and check immediately for the cause. Vibration is generally a warning of trouble.
- (15) After striking a foreign object, stop the engine immediately and thoroughly inspect the machine for any damage. Repair damage before restarting and operating the machine.
- (16) Before leaving the operator's position :
 - All shift levers are in neutral positions or in disengaged positions.
 - Shut off engine, and remove the key.
- (17) Do not operate the rear gauge wheel adjusting lever without support by block.

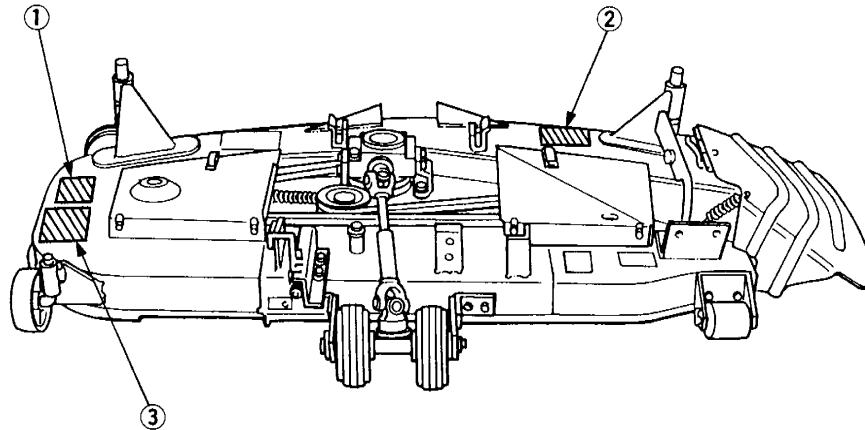
[TRANSPORTING]

- (1) Disengage power to the mower blades, implements and attachments before transporting the machine.
- (2) Do not tow this machine.
- (3) Do not use this machine on public roads. If you must transport it, use a pick-up truck, trailer, or other suitable machine and ramp.
- (4) Tie the machine down securely before transporting on public roads.

SAFETY DECALS

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

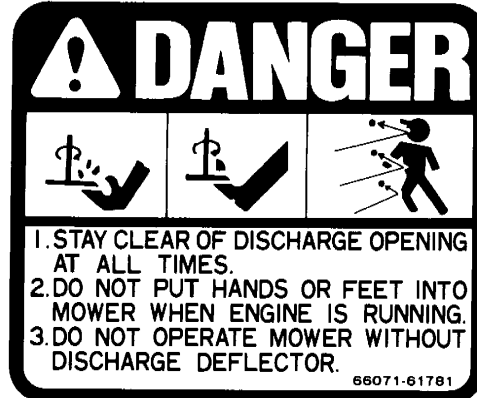
■ RC54-24B



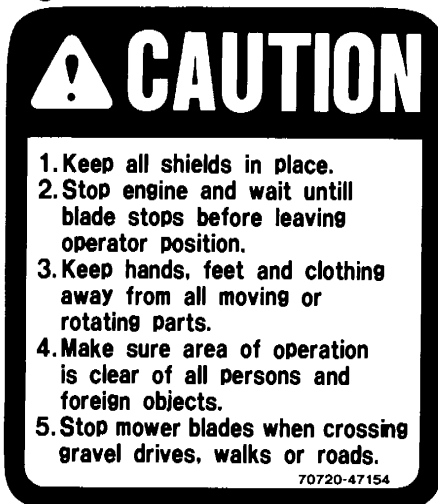
① Part No. 66071-61791



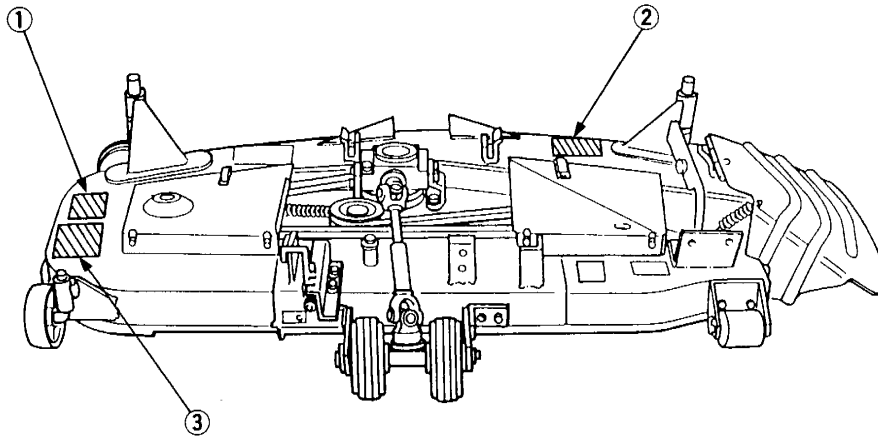
② Part No. 66071-61781



③ Part No. 70720-47154



■ RCK60-24B



① Part No. K5112-73121



② Part No. K5112-73111



③ Part No. K5763-47151

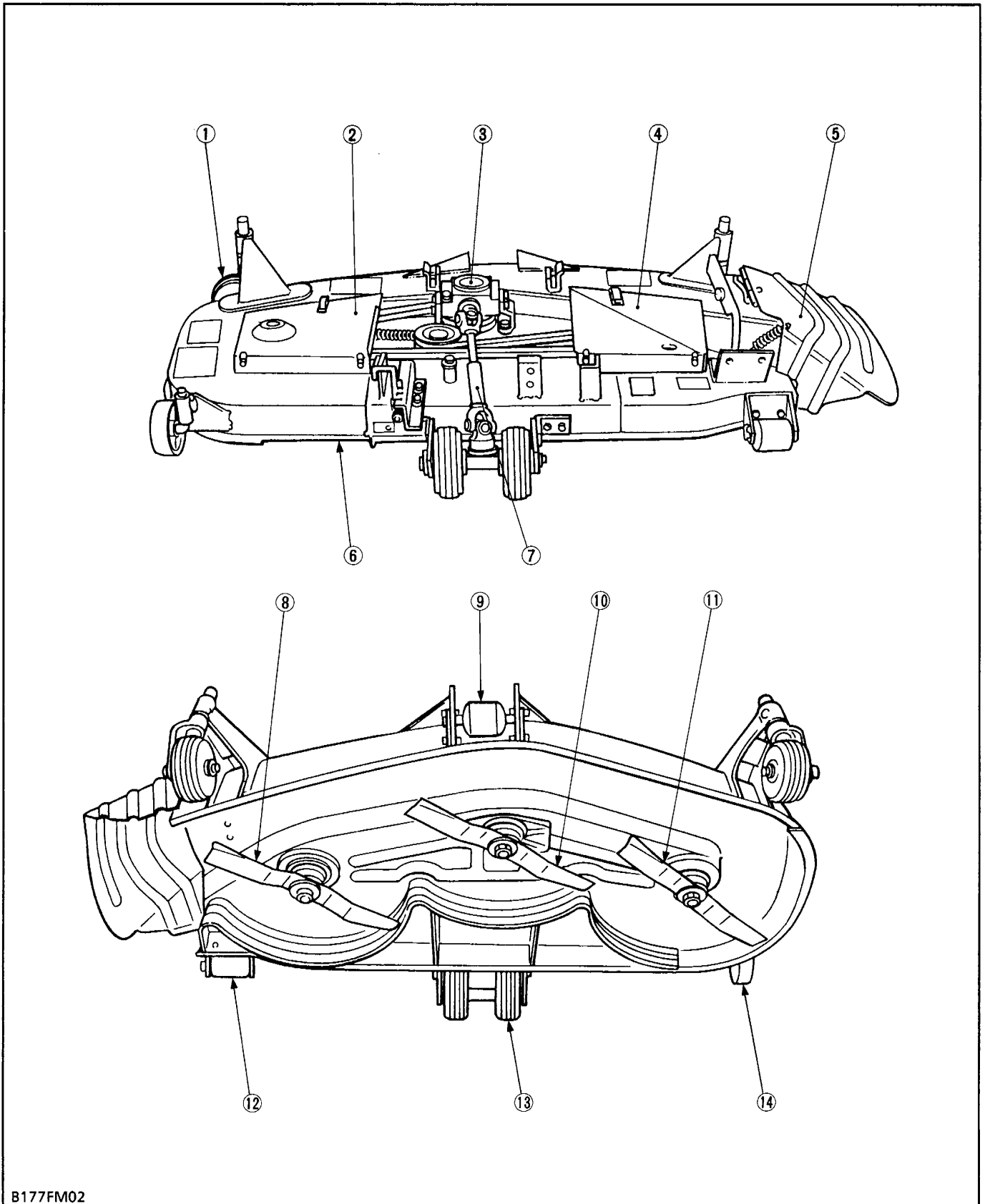


B203FM01

SPECIFICATIONS

Model		RC54-24B	RCK60-24B
Suitable tractor		B7300, B2400, B2100, B1700	
Mounting method		Parallel linkage	
Adjustment of cutting height		Gauge wheel	
Cutting width		1372 mm (54 in.)	1524 mm (60 in.)
Cutting height		38 to 102 mm (1.5 to 4.0 in.)	
Weight (Approx.)		142 kg (314 lbs)	158 kg (348 lbs)
Blade spindle speed		54.7 S ⁻¹ (3280 rpm)	44.7 S ⁻¹ (2680 rpm)
Blade tip velocity		81.5 m/s (16050 rpm)	73.4 m/s (14439 rpm)
Blade length		475 mm (18.7 in.)	523 mm (20.6 in.)
Number of blades		3	
Dimensions	Total length	1008 mm (39.7 in.)	1060 mm (41.7 in.)
	Total width	1758 mm (69.2 in.)	1881 mm (74.1 in.)
	Total height	345 mm (13.6 in.)	345 mm (13.6 in.)

EXTERIOR VIEW AND APPELLATION



B177FM02

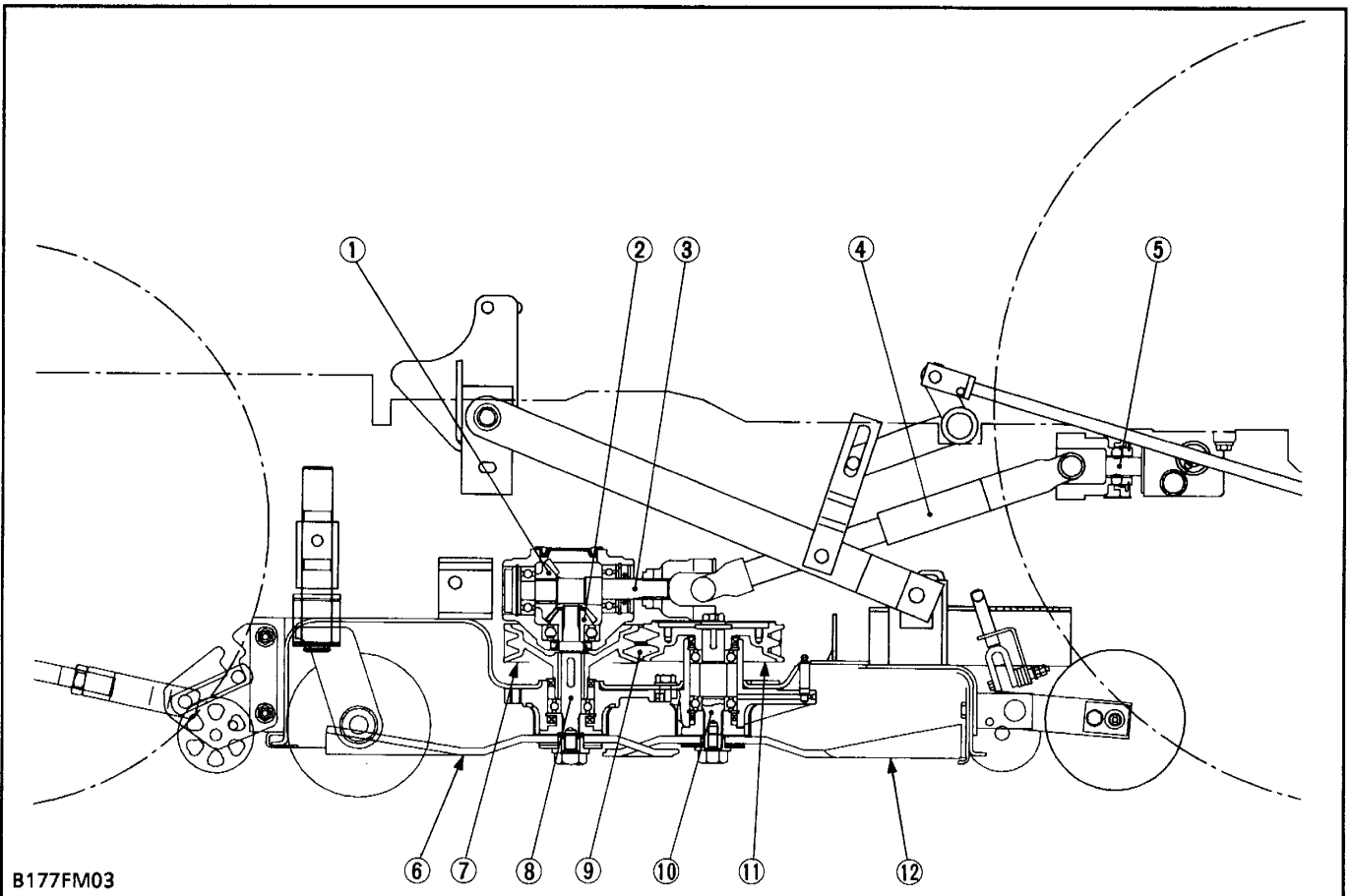
- | | | | |
|------------------------|-------------------------|-----------------------------|-----------------------------|
| (1) Front Gauge Wheel | (5) Discharge Deflector | (9) Front Anti-scalp Roller | (12) Rear Anti-scalp Roller |
| (2) Belt Cover (Left) | (6) Deck | (10) Center Blade | (13) Rear Gauge Wheel |
| (3) Gear Box | (7) Universal Joint | (11) Outer Blade | (14) Anti-scalp Wheel |
| (4) Belt Cover (Right) | (8) Outer Blade | | |

MECHANISM

CONTENTS

[1] POWER TRANSMISSION	M-M1
[2] LIFTING MECHANISM	M-M2

[1] POWER TRANSMISSION



- | | | | |
|---|---------------------|----------------------|-------------------|
| (1) 21T Bevel Gear (RC54-24B)
18T Bevel Gear (RCK60-24B) | (3) Pinion Shaft | (7) Center Pulley | (10) Blade Shaft |
| (2) 16T Bevel Gear (RC54-24B)
17T Bevel Gear (RCK60-24B) | (4) Universal Joint | (8) Bevel Gear Shaft | (11) Outer Pulley |
| | (5) Mid PTO Shaft | (9) Mower Belt | (12) Outer Blade |
| | (6) Center Blade | | |

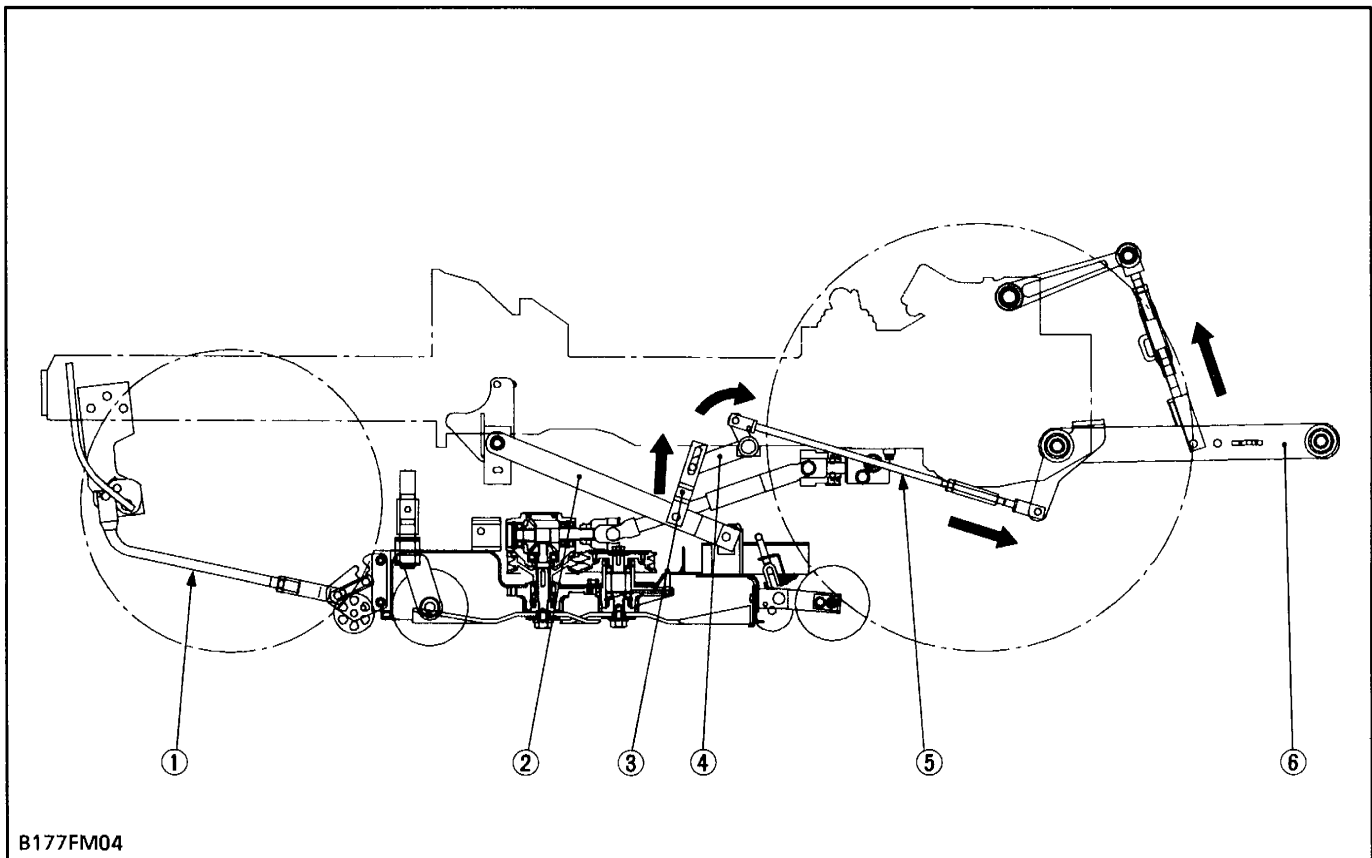
The power is transmitted from mid PTO to blades as follows:

■ Center Blade

Mid PTO Shaft (5) → Universal Joint (4) → Pinion Shaft (3) → 21T Bevel Gear (or 18T Bevel Gear) (1) → 16T Bevel Gear (or 17T Bevel Gear) (2) → Bevel Gear Shaft (8) → Center Blade (6)

■ Outer Blade

Mid PTO Shaft (5) → Universal Joint (4) → Pinion Shaft (3) → 21T Bevel Gear (or 18T Bevel Gear) (1) → 16T Bevel Gear (or 17T Bevel Gear) (2) → Bevel Gear Shaft (8) → Center Pulley (7) → Mower Belt (9) → Outer Pulley (11) → Blade Shaft (10) → Outer Blade (12)

[2] LIFTING MECHANISM

B177FM04

(1) Front Link
(2) Rear Link

(3) Lift Link
(4) Lift Arm

(5) Connecting Rod

(6) Lower Link

The lifting of mower is performed by the hydraulic system installed on the tractor.

For avoiding danger, the mower should be kept lifting when traveling. When the position control lever is moved to "LIFT" position, the lower links (6) are risen by the oil pressure of hydraulic system, and the connecting rods (5) are pulled rearward.

Therefore, lift arms (4) round and the mower is lifted by the lift links (3) and rear links.

As this link system is a pantographic linkage, the mower can be kept parallel at every position.

⚠ CAUTION

- Never operate mower in transport position.

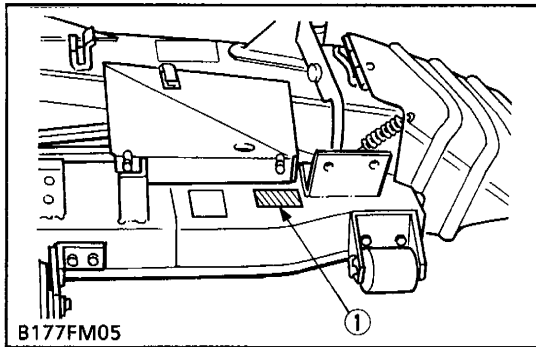
SERVICING

CONTENTS

GENERAL	M-S1
[1] MOWER IDENTIFICATION	M-S1
[2] GENERAL PRECAUTION	M-S1
[3] LUBRICANTS	M-S2
[4] TIGHTENING TORQUES (GENERAL USE SCREWS, BOLTS AND NUTS)	M-S2
[5] MAINTENANCE CHECK LIST	M-S3
[6] CHECK AND MAINTENANCE	M-S3
(1) Check Points of Daily or Each Use	M-S3
(2) Check Point of Initial 50 Hours	M-S5
(3) Check Points of Every 50 Hours	M-S6
(4) Check Point of Every 150 Hours	M-S6
(5) Check Point of Every 2 Years	M-S6
[7] SPECIAL TOOLS	M-S7
[8] SETTING UP MOWER	M-S9
TROUBLESHOOTING	M-S17
SERVICING SPECIFICATIONS	M-S17
TIGHTENING TORQUES	M-S18
CHECKING, DISASSEMBLING AND SERVICING	M-S19
CHECKING AND ADJUSTING	M-S19
DISASSEMBLING AND ASSEMBLING	M-S21
(1) Dismounting Mower	M-S21
(2) Disassembling Mower	M-S22
SERVICING	M-S27

GENERAL

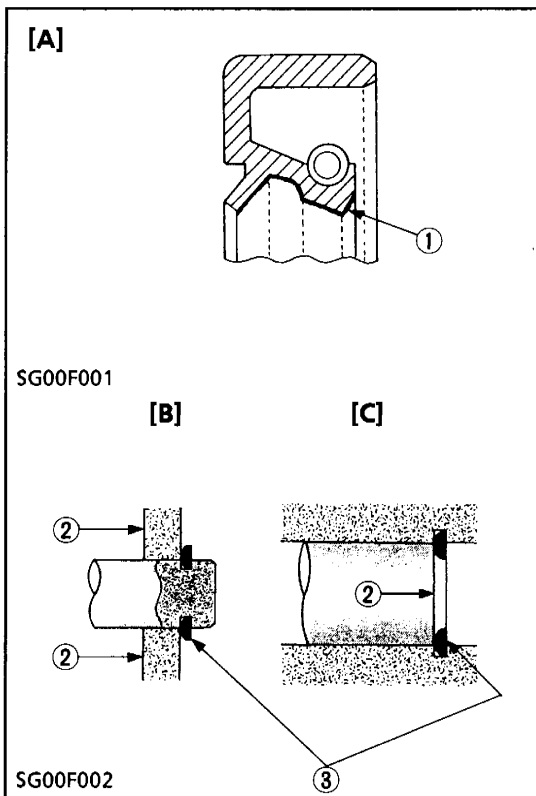
[1] MOWER IDENTIFICATION



When contacting your local KUBOTA distributor, always specify mower serial number.

(1) Mower Serial Number

[2] GENERAL PRECAUTION



- 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.
- Use KUBOTA genuine parts or KUBOTA - recommended parts and lubricants or their equivalents.
- Gaskets and O-rings must be replaced during reassembly.
- Apply grease to new O-rings or oil seals before assembling. See the figure.
- 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.
- Use only metric tools when servicing this mower. Metric screws, bolts and nuts are not interchangeable with nonmetric fasteners.
- Remove oil and dirt from parts before measuring.

(1) Grease
 (2) Force
 (3) Sharp Edge




[A] Oil Seal
 [B] External Snap Ring
 [C] Internal Snap Ring

[3] LUBRICANTS

Place	Capacity	Lubricants
Gear box	0.36 ℓ 0.38 U.S.qts. 0.32 Imp.qts.	SAE 90 gear oil (API Service GL-5 gear oil)
Greasing		
Universal joint	Until grease overflows	SAE multi-purpose type grease
Spindle shafts (Bevel gear shaft and blade shafts)	Until grease overflows	
Belt tension pulley	Until grease overflows	
Belt tension pivot	Until grease overflows	
Lift arms	Until grease overflows	
Front gauge wheels	Until grease overflows	
Rear gauge wheels	Until grease overflows	

[4] TIGHTENING TORQUES (GENERAL USE SCREWS, BOLTS AND NUTS)

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

Grade Unit Nominal Diameter	No-grade or 4T * ( or )			7T * ()		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M 6	7.85 to 9.32	0.80 to 0.95	5.79 to 6.87	9.81 to 11.28	1.00 to 1.15	7.24 to 8.32
M 8	17.65 to 20.59	1.80 to 2.10	13.0 to 15.2	23.54 to 27.46	2.40 to 2.80	17.4 to 20.2
M10	39.23 to 45.11	4.00 to 4.60	29.0 to 33.2	48.05 to 55.90	4.90 to 5.70	35.5 to 41.2
M12	62.76 to 72.57	6.40 to 7.40	46.3 to 53.5	77.47 to 90.22	7.90 to 9.20	57.2 to 66.5
M14	107.9 to 125.5	11.0 to 12.8	79.6 to 92.5	123.6 to 147.1	12.6 to 15.0	91.2 to 108
M16	166.7 to 191.2	17.0 to 19.5	123 to 141	196.1 to 225.6	20.0 to 23.0	145 to 166
M18	245.2 to 284.4	25.0 to 29.0	181 to 210	274.6 to 318.7	28.0 to 32.5	203 to 235
M20	333.4 to 392.3	34.0 to 40.0	246 to 289	367.7 to 431.5	37.5 to 44.0	272 to 318

* The figures on the table above are indicated the top of screw or bolt.

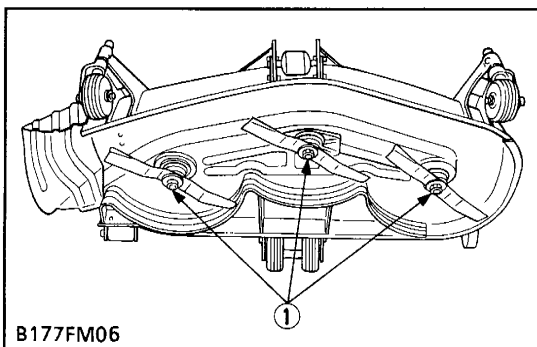
[5] MAINTENANCE CHECK LIST

To keep the mower working in good condition as well as to avoid any accident and trouble, carry out periodic inspection and maintenance. Check the following points before use.

Service Interval	Check Points	Reference Page
Daily (Each use)	<ul style="list-style-type: none"> ● Anything unusual in previous day's operation ● Make sure mower blade screws are tighten ● Check mower blades for wear or damage ● Check gear box oil level ● Check oil leaks ● Check all hardware ● Make sure all pins are in place ● Clean mower deck ● Apply grease to universal joint ● Apply grease to spindle shafts (Bevel gear shaft and blade shafts) ● Apply grease to belt tension pulley ● Apply grease to belt tension pivot ● Apply grease to lift arms 	- M-S3 M-S19 M-S4 - - - - M-S4 M-S4 M-S5 M-S5 M-S5
Initial 50 hours	<ul style="list-style-type: none"> ● Change gear box oil 	M-S5
Every 50 hours	<ul style="list-style-type: none"> ● Apply grease to front gauge wheels ● Apply grease to rear gauge wheels ● Check mower belt 	M-S6 M-S6 M-S19
Every 150 hours	<ul style="list-style-type: none"> ● Change gear box oil 	M-S5
Every 2 years (After purchase)	<ul style="list-style-type: none"> ● Replace gear box oil seal 	M-S6

[6] CHECK AND MAINTENANCE

(1) Check Points of Daily or Each Use



Retightening Mower Blade Screw

CAUTION

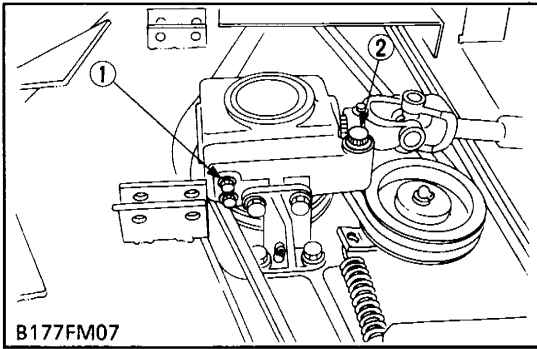
- To avoid injury, always handle the mower blade with care.
1. Dismount the mower and turn it over to expose the mower blades.
 2. Wedge a block of wood securely between the mower blade and mower deck.
 3. Retighten the mower blade screw to the specified torque.
 4. If the mower blade screw is worn or broken, replace it.

Tightening torque	Mower blade screw	98.1 to 117.7 N·m 10.0 to 12.0 kgf·m 72.3 to 86.8 ft·lbs
-------------------	-------------------	--

(1) Mower Blade Screw

Checking Mower Blade

1. See page M-S19.



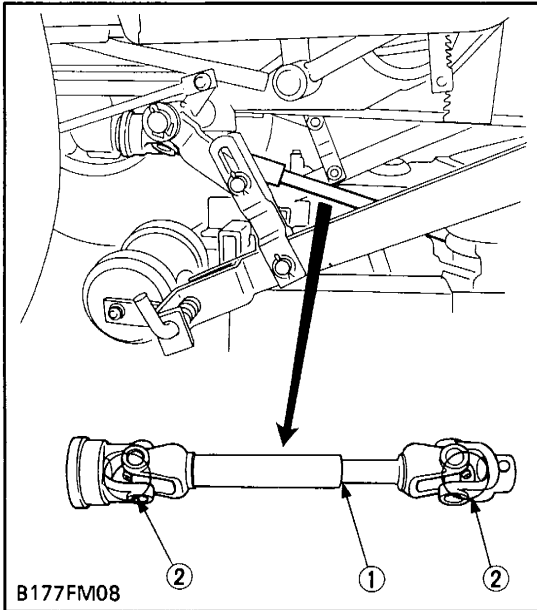
Checking Gear Box Oil Level

1. Place the mower on level ground.
2. Loosen the check plug (1), and check to see if oil seep from the opening.
3. If the oil level is low, remove the oil filler plug (2) and add new gear oil.

IMPORTANT

- Use the specified gear oil.
Refer to "LUBRICANTS". (See page M-S2.)

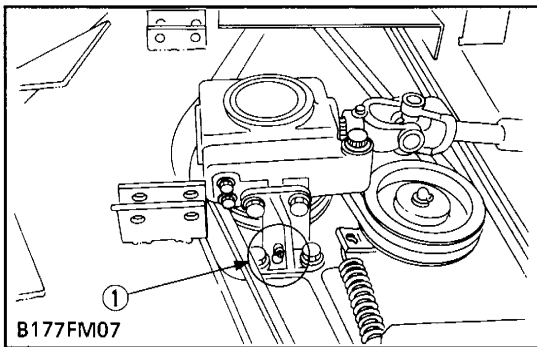
- (1) Check Plug (2) Oil Filler Plug



Greasing Universal Joint

1. Grease the internal splines (1) and grease nipples (2) of the universal joint if the amount of grease is insufficient.

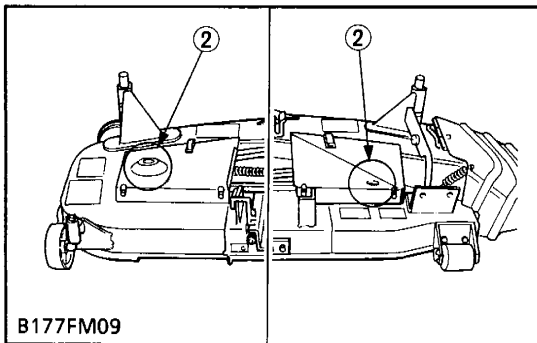
- (1) Spline (2) Grease Nipple

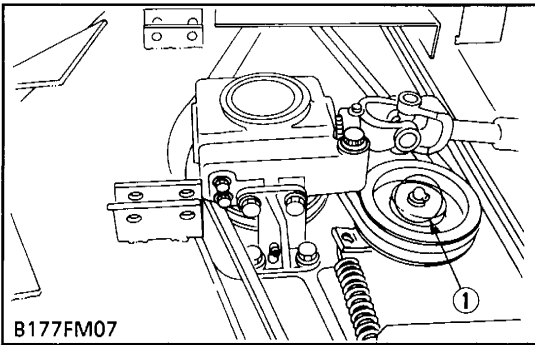


Greasing Spindle Shafts

1. Grease the grease nipples (1), (2) of the spindle shafts if the amount of grease is insufficient.

- (1) Grease Nipple (Bevel Gear Shaft) (2) Grease Nipple (Blade Shaft)

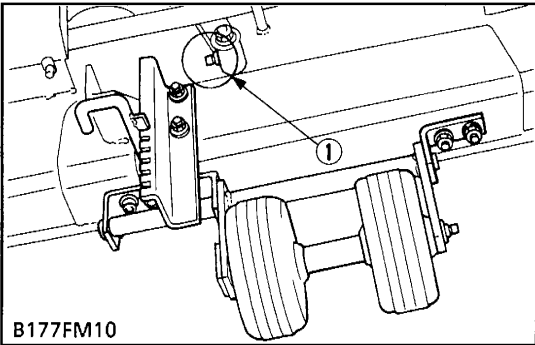




Greasing Belt Tension Pulley

1. Grease the grease nipple (1) of the belt tension pulley if the amount of grease is insufficient.

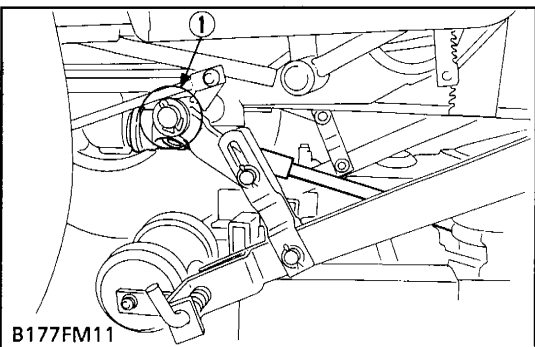
(1) Grease Nipple



Greasing Belt Tension Pivot

1. Grease the grease nipple (1) of the belt tension pivot if the amount of grease is insufficient.

(1) Grease Nipple

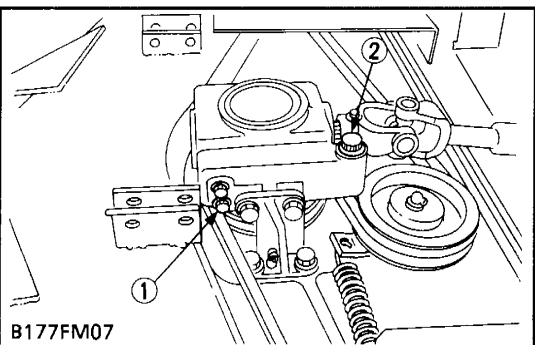


Greasing Lift Arms

1. Grease the grease nipples (1) of the lift arms if the amount of grease is insufficient.

(1) Grease Nipple

(2) Check Point of Initial 50 Hours



Changing Gear Box Oil

1. Dismount the mower from the tractor, and place the mower on level ground.
2. Remove the oil filler plug (2).
3. Remove the drain plug (1), and drain the used oil completely.
4. After draining the used oil, reinstall the drain plug.
5. Fill with new oil up to the specified level.

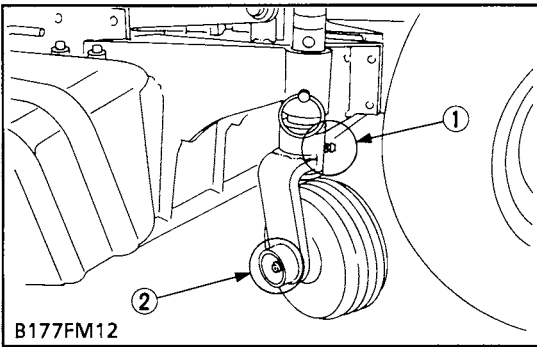
■ IMPORTANT

- Use the specified gear oil.
Refer to "LUBRICANTS". (See page M-S2.)

(1) Drain Plug

(2) Oil Filler Plug

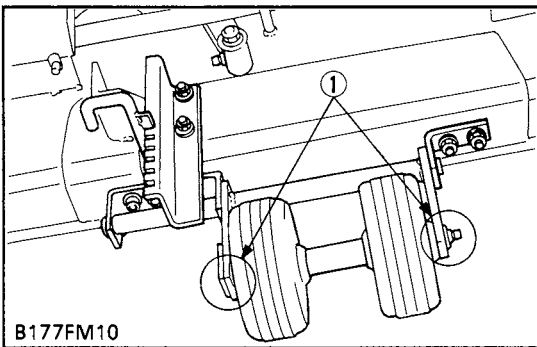
(3) Check Points of Every 50 Hours



Greasing Front Gauge Wheels

1. Grease the grease nipples (1), (2) of the front gauge wheels if the amount of grease is insufficient.

- | | |
|--|--|
| (1) Grease Nipple
(Front Gauge Wheel Bracket) | (2) Grease Nipple
(Front Gauge Wheel) |
|--|--|



Greasing Rear Gauge Wheels

1. Grease the grease nipples (1) of the rear gauge wheels if the amount of grease is insufficient.

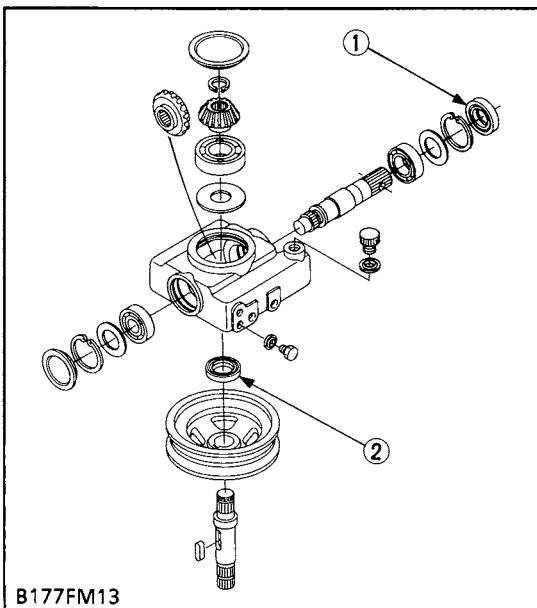
- | |
|-------------------|
| (1) Grease Nipple |
|-------------------|

(4) Check Point of Every 150 Hours

Checking Mower Belt

1. See page M-519.

(5) Check Point of Every 2 Years



Changing Gear Box Oil

1. See page M-55.

Replacing Gear Box Oil Seal

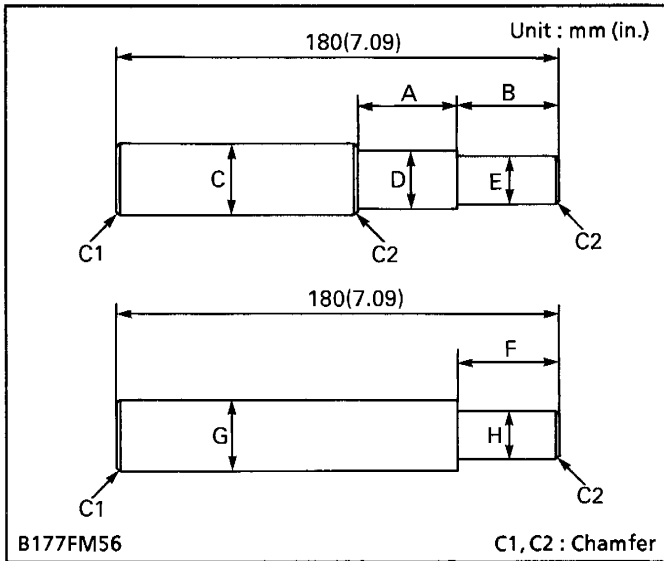
1. Replace the gear box oil seals (1), (2) with new ones. (See page M-524.)

- | | |
|--------------|--------------|
| (1) Oil Seal | (2) Oil Seal |
|--------------|--------------|

[7] SPECIAL TOOLS

■ NOTE

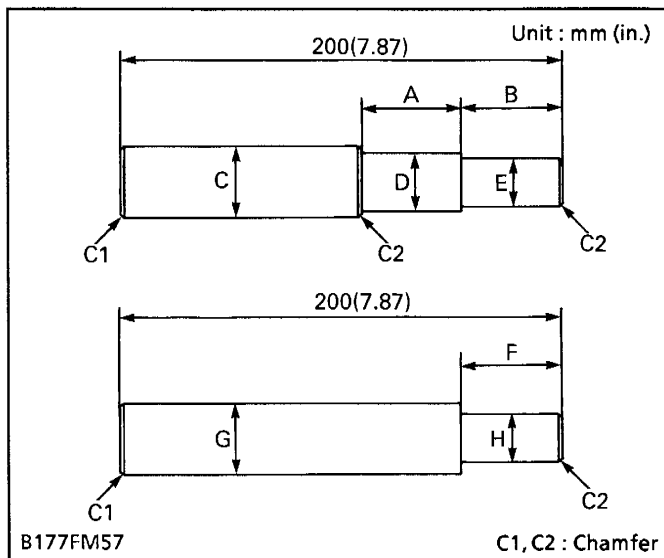
- The following special tools are not provided, so make them referring to the figures.



Tension Arm Bushing Replacing Tool

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

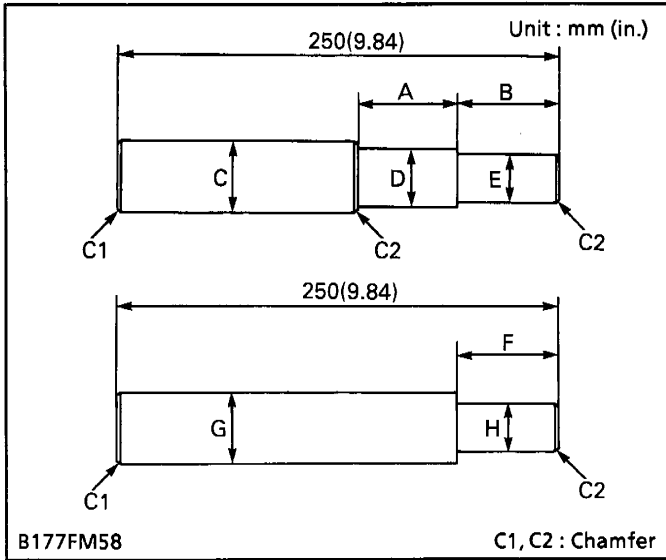
Model	RC54-24B	RCK60-24B
A	43 mm 1.69 in.	43 mm 1.69 in.
B	42 mm 1.65 in.	42 mm 1.65 in.
C	28 mm Dia. 1.10 in. Dia.	28 mm Dia. 1.10 in. Dia.
D	22.90 to 22.95 mm Dia. 0.9016 to 0.9035 in. Dia.	22.10 to 22.15 mm Dia. 0.8701 to 0.8720 in. Dia.
E	19.90 to 19.95 mm Dia. 0.7835 to 0.7854 in. Dia.	18.90 to 18.95 mm Dia. 0.7441 to 0.7461 in. Dia.
F	42 mm 1.65 in.	42 mm 1.65 in.
G	28 mm Dia. 1.10 in. Dia.	28 mm Dia. 1.10 in. Dia.
H	19.90 to 19.95 mm Dia. 0.7835 to 0.7854 in. Dia.	18.90 to 18.95 mm Dia. 0.7441 to 0.7461 in. Dia.
C1	2.0 mm 0.079 in.	2.0 mm 0.079 in.
C2	1.0 mm 0.039 in.	1.0 mm 0.039 in.



Front Gauge Wheel Bushing Replacing Tool

Application : Use to press out and to press fit the front gauge wheel bushing.

Model	RC54-24B	RCK60-24B
A	46 mm 1.81 in.	46 mm 1.81 in.
B	45 mm 1.77 in.	45 mm 1.77 in.
C	40 mm Dia. 1.57 in. Dia.	40 mm Dia. 1.57 in. Dia.
D	33.90 to 33.95 mm Dia. 1.3346 to 1.3366 in. Dia.	33.90 to 33.95 mm Dia. 1.3346 to 1.3366 in. Dia.
E	29.90 to 29.95 mm Dia. 1.1772 to 1.1791 in. Dia.	29.85 to 29.90 mm Dia. 1.1752 to 1.1772 in. Dia.
F	45 mm 1.77 in.	45 mm 1.77 in.
G	40 mm Dia. 1.57 in. Dia.	40 mm Dia. 1.57 in. Dia.
H	29.90 to 29.95 mm Dia. 1.1772 to 1.1791 in. Dia.	29.85 to 29.90 mm Dia. 1.1752 to 1.1772 in. Dia.
C1	2.0 mm 0.079 in.	2.0 mm 0.079 in.
C2	1.0 mm 0.039 in.	1.0 mm 0.039 in.



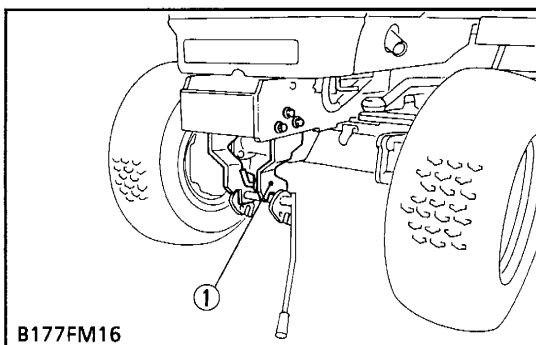
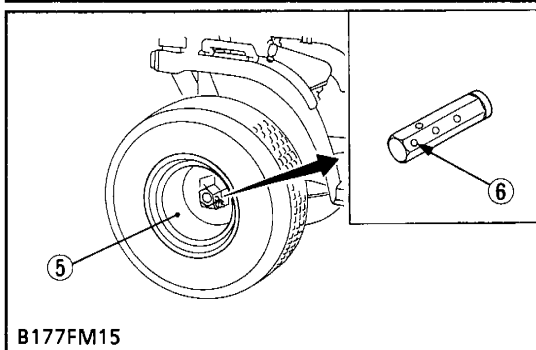
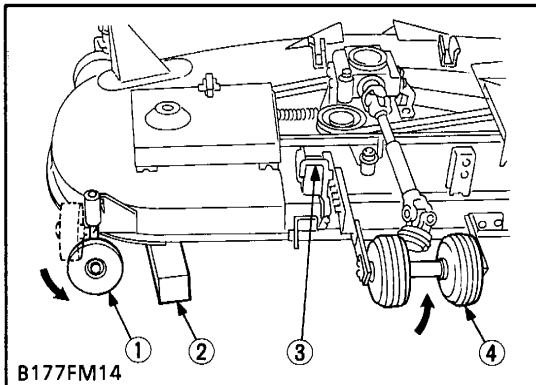
Rear Link Bushing Replacing Tool

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

Model	RC54-24B	RCK60-24B
A	92 mm 3.62 in.	92 mm 3.62 in.
B	90 mm 3.54 in.	90 mm 3.54 in.
C	28 mm Dia. 1.10 in. Dia.	28 mm Dia. 1.10 in. Dia.
D	22.90 to 22.95 mm Dia. 0.9016 to 0.9035 in. Dia.	22.10 to 22.15 mm Dia. 0.8701 to 0.8720 in. Dia.
E	19.90 to 19.95 mm Dia. 0.7835 to 0.7854 in. Dia.	18.90 to 18.95 mm Dia. 0.7441 to 0.7461 in. Dia.
F	90 mm 3.54 in.	90 mm 3.54 in.
G	28 mm Dia. 1.10 in. Dia.	28 mm Dia. 1.10 in. Dia.
H	19.90 to 19.95 mm Dia. 0.7835 to 0.7854 in. Dia.	18.90 to 18.95 mm Dia. 0.7441 to 0.7461 in. Dia.
C1	2.0 mm 0.079 in.	2.0 mm 0.079 in.
C2	1.0 mm 0.039 in.	1.0 mm 0.039 in.

[8] SETTING UP MOWER

■ RC54-24B



Assembling Mower

⚠ CAUTION

- Do not operate the rear gauge wheel adjusting lever (3) without support by block (2).

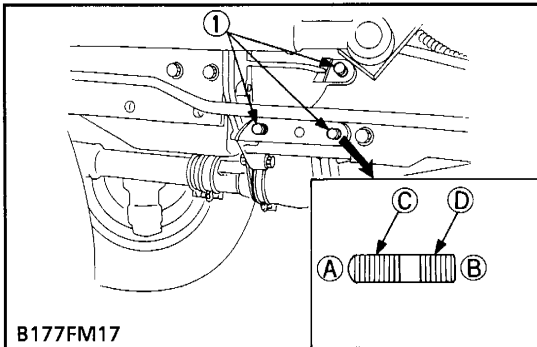
1. Take out all mower components from the case, and assemble the mower.
2. Support the mower deck with a block (2) as shown in the figure.
3. Turn the anti-scalp wheel (1) sideways position, and set the rear gauge wheel (4) on the lowest cutting height.
4. Remove the a block.
5. Park the tractor on level ground, and set the rear wheels (5) of the tractor at the outer position (6) as shown in the figure.

- | | |
|--------------------------------------|----------------------|
| (1) Anti-scalp Wheel | (4) Rear Gauge Wheel |
| (2) Block | (5) Rear Wheel |
| (3) Rear Gauge Wheel Adjusting Lever | (6) Outer Position |

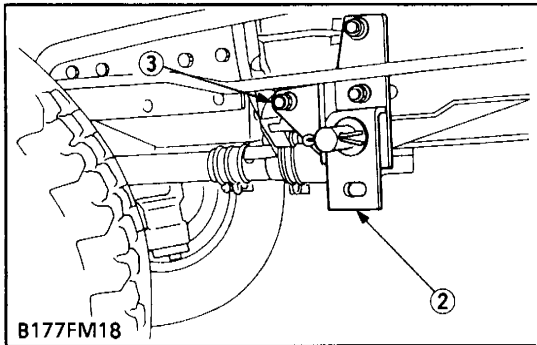
Front Hanger Bracket

1. Attach the front hanger bracket (1) to the frame with M14 bolts.

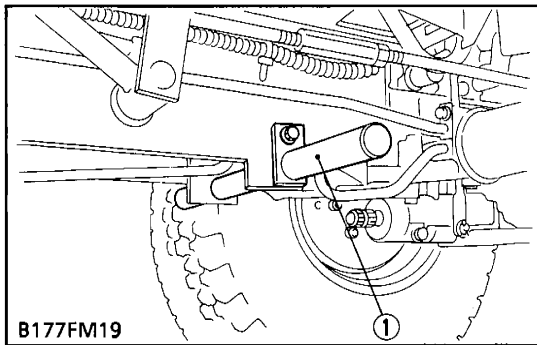
- (1) Front Hanger Bracket



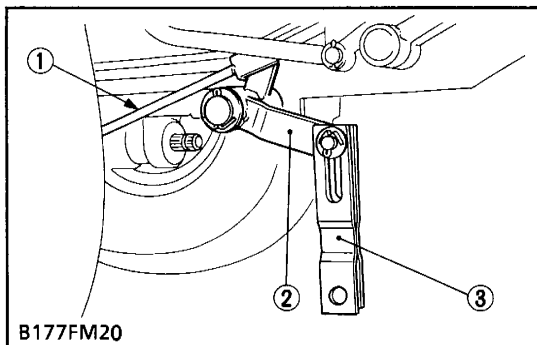
B177FM17



B177FM18



B177FM19



B177FM20

Mid Hanger Bracket

1. Screw M12 stud bolts (1) in the clutch housing.
2. Attach the mid hanger bracket (2) to the clutch housing with spring washers and nuts (3).

Tightening torque	Stud bolt	31.4 N·m 3.2 kgf·m 23.1 ft·lbs
	Nut	68.6 N·m 7.0 kgf·m 50.6 ft·lbs

- | | |
|-----------------------------|------------------------------------|
| (1) Stud Bolt | (A) Outside |
| (2) Mid Hanger Bracket | (B) Inside |
| (3) Spring Washers and Nuts | (C) Thread Size : M12 x Pitch 1.25 |
| | (D) Thread Size : M12 x Pitch 1.75 |

Rear Hanger Bracket

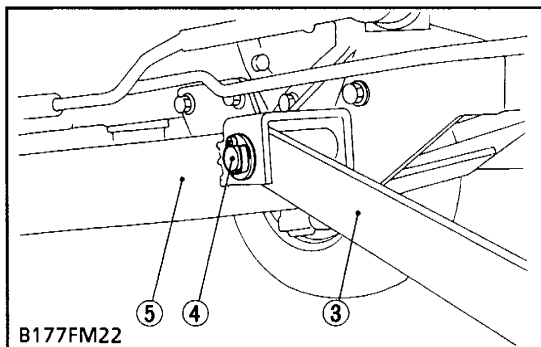
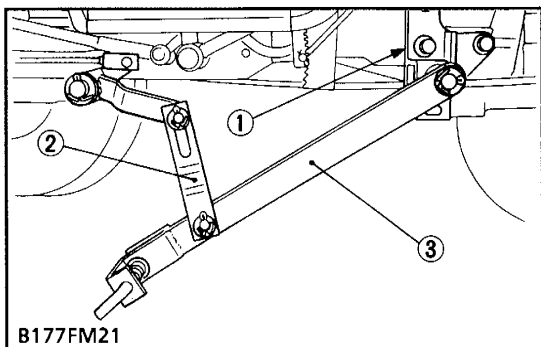
1. Insert the rear hanger bracket (1) from left side of the frame holes, and set it with M8 bolt.

- (1) Rear Hanger Bracket

Lift Arm, Lift Link and Connecting Rod

1. Install the lift arms (2), lift links (3) and connecting rods (1) to the rear hanger bracket with plain washers and cotter pins.

- | | |
|--------------------|---------------|
| (1) Connecting Rod | (3) Lift Link |
| (2) Lift Arm | |



Rear Link

(When mounting the mower only)

1. Install the rear links (3) to the mid hanger brackets (1) with plain washers and cotter pins.
2. Attach the lift links (2) to the rear links (3) with clevis pins, plain washers and cotter pins.

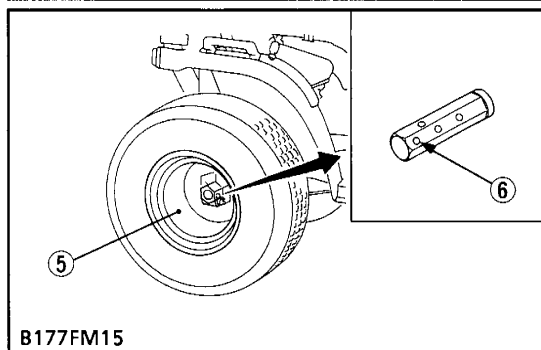
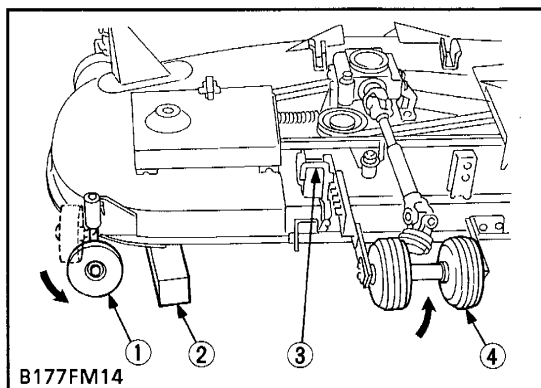
(When mounting the mower with front loader)

1. Install the rear links (3) to the front loader frame (5) with pins (4), plain washers and cotter pins.
2. Attach the lift links (2) to the rear links (3) with clevis pins, plain washers and cotter pins.

- | | |
|------------------------|------------------------|
| (1) Mid Hanger Bracket | (4) Pin |
| (2) Lift Link | (5) Front Loader Frame |
| (3) Rear Link | |

Go to the next step (Lift Bracket, see page M-514).

■ RCK60-24B



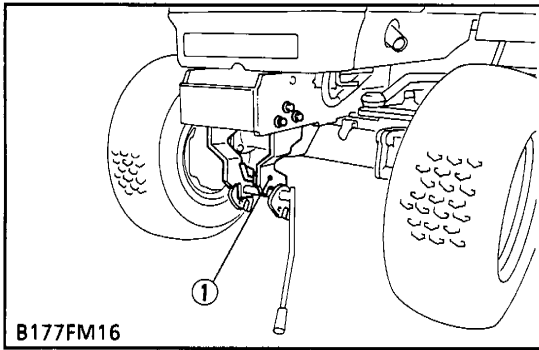
Assembling Mower

⚠ CAUTION

- Do not operate the rear gauge wheel adjusting lever (3) without support by block (2).

1. Take out all mower components from the case, and assemble the mower.
2. Support the mower deck with a block (2) as shown in the figure.
3. Turn the anti-scalp wheel (1) sideways position, and set the rear gauge wheel (4) on the lowest cutting height.
4. Remove the a block.
5. Park the tractor on level ground, and set the rear wheels (5) of the tractor at the outer position (6) as shown in the figure.

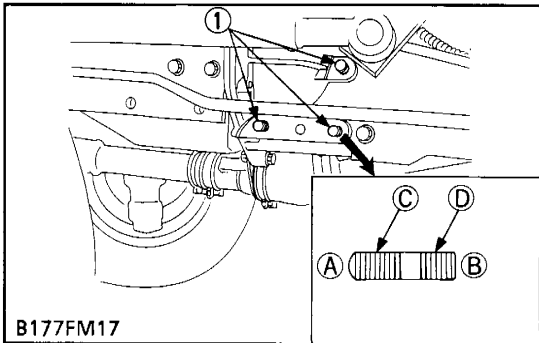
- | | |
|--------------------------------------|----------------------|
| (1) Anti-scalp Wheel | (4) Rear Gauge Wheel |
| (2) Block | (5) Rear Wheel |
| (3) Rear Gauge Wheel Adjusting Lever | (6) Outer Position |



Front Hanger Bracket

1. Attach the front hanger bracket (1) to the frame with M14 bolts.

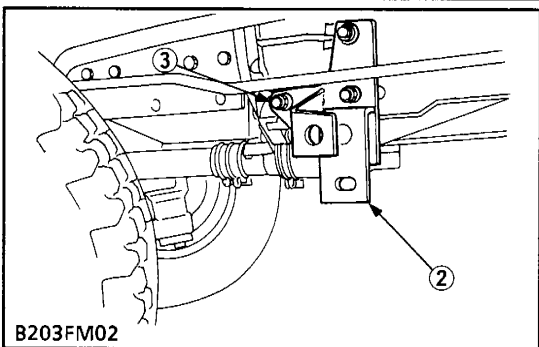
(1) Front Hanger Bracket



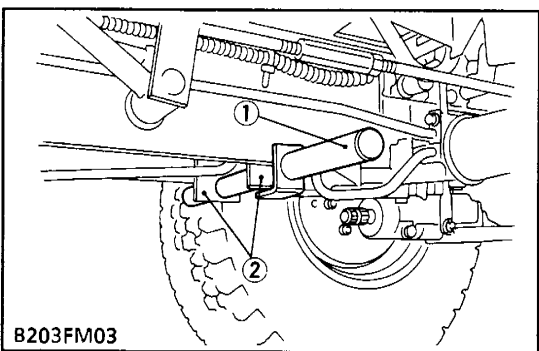
Mid Hanger Bracket

1. Screw M12 stud bolts (1) in the clutch housing.
2. Attach the mid hanger bracket (2) to the clutch housing with plain washers, spring washers and nuts (3).

Tightening torque	Stud bolt	31.4 N·m 3.2 kgf·m 23.1 ft·lbs
	Nut	68.6 N·m 7.0 kgf·m 50.6 ft·lbs



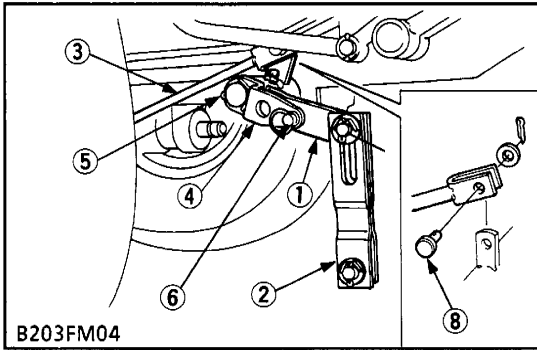
- | | |
|--|------------------------------------|
| (1) Stud Bolt | (A) Outside |
| (2) Mid Hanger Bracket | (B) Inside |
| (3) Plain Washers, Spring Washers and Nuts | (C) Thread Size : M12 x Pitch 1.25 |
| | (D) Thread Size : M12 x Pitch 1.75 |



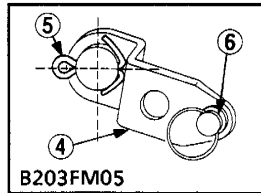
Rear Hanger Bracket

1. Insert the rear hanger bracket (1) from left side of the tractor stay holes.

(1) Rear Hanger Bracket (2) Tractor Stay



B203FM04



B203FM05

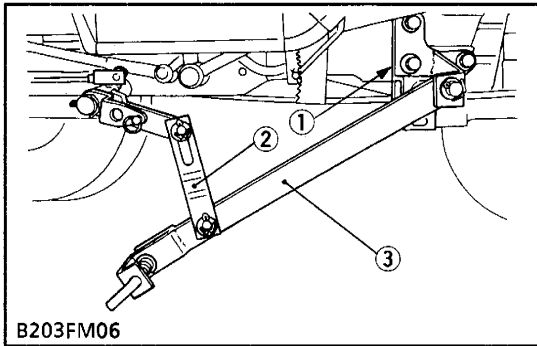
Lift Arm, Lift Link and Connecting Rod

1. Install the lift arms (1) to the rear hanger bracket with link stoppers (4) and cotter pins (5).
2. Install the lift arms (1), lift links (2) and connecting rods (3) with clevis pins, plain washers and cotter pins as shown.

NOTE

- Completely bend the cotter pin (5) to prevent contact with link stopper as shown.
- When assembling the connecting rod, insert the clevis pin from the outside as shown, and be sure to properly bend the cotter pin.

- | | |
|--------------------|------------------------------|
| (1) Lift Arm | (5) Cotter Pin (ø 5.6 x 44) |
| (2) Lift Link | (6) Clevis Pin (ø 8 x 25) |
| (3) Connecting Rod | (7) Clevis Pin (ø 12.7 x 38) |
| (4) Link Stopper | (8) Clevis Pin (ø 12.7 x 32) |



B203FM06

Rear Link

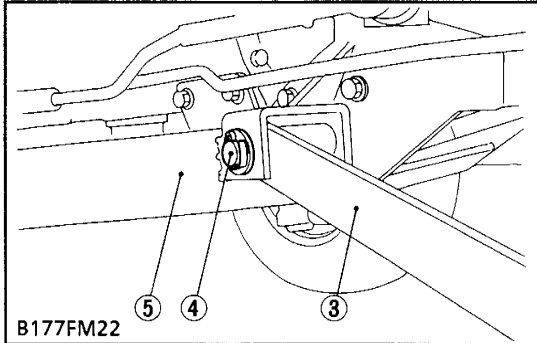
(When mounting the mower only)

1. Install the rear links (3) to the mid hanger brackets (1) with plain washers and cotter pins.
2. Attach the lift links (2) to the rear links (3) with clevis pins, plain washers and cotter pins.

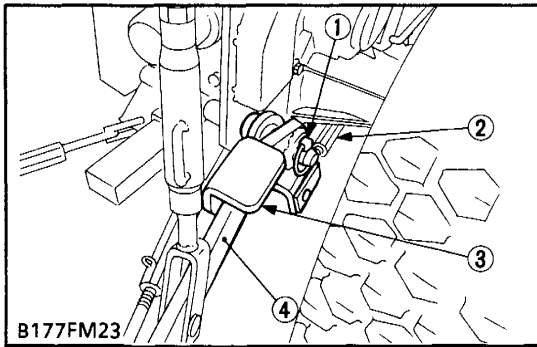
(When mounting the mower with front loader)

1. Install the rear links (3) to the front loader frame (5) with pins (4), plain washers and cotter pins.
2. Attach the lift links (2) to the rear links (3) with clevis pins, plain washers and cotter pins.

- | | |
|------------------------|------------------------|
| (1) Mid Hanger Bracket | (4) Pin |
| (2) Lift Link | (5) Front Loader Frame |
| (3) Rear Link | |



B177FM22



Lift Bracket

1. Remove the spacer and lower links from the shaft of lower link.
2. Attach both lift brackets (3) inside the lower links (4) with the lower link pins (1) as shown in the figure.
3. Connect the connecting rods (2) to the lift brackets (3) with clevis pins, plain washers and cotter pins.

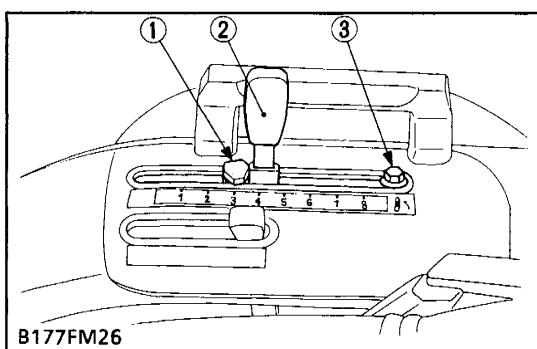
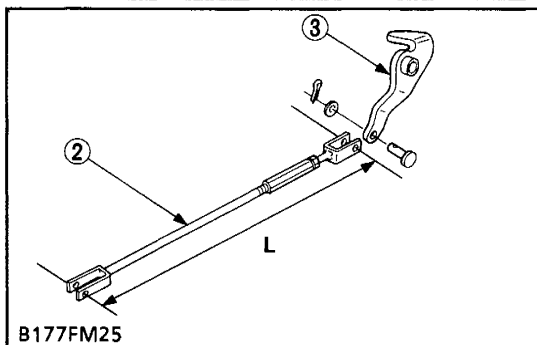
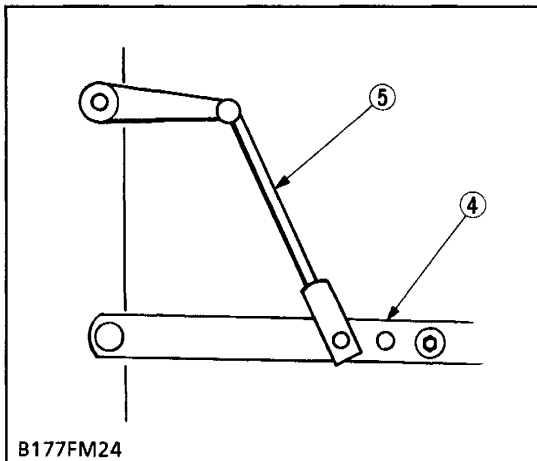
IMPORTANT

- Connect the lift rods (5) of the tractor as shown in the figure, and adjust the length of both lift rods equally with the turnbuckle of the right lift rod.

(Reference)

- Make sure the length (L) of the connecting rod (2) is as follows.
 RC54-24B : 625 mm (24.6 in.)
 RCK60-24B : 620 mm (24.4 in.)

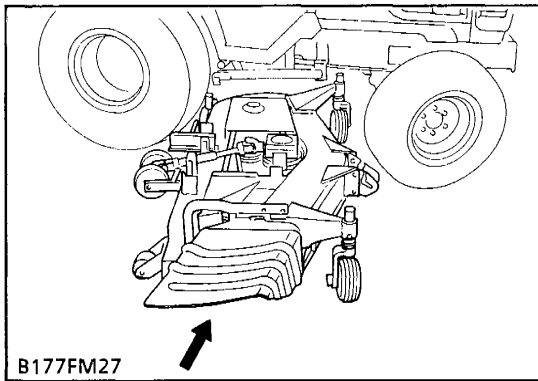
- | | |
|--------------------|----------------|
| (1) Lower Link Pin | (4) Lower Link |
| (2) Connecting Rod | (5) Lift Rod |
| (3) Lift Bracket | |



Setting Position Control Lever

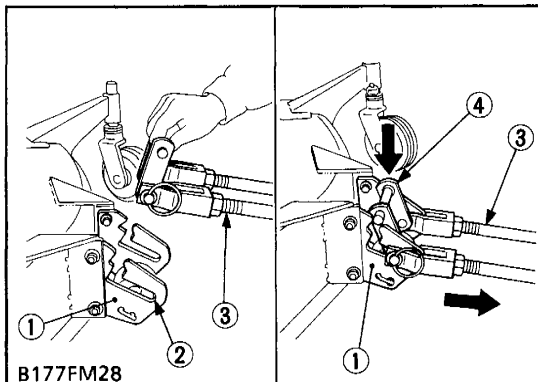
1. Set the stop screw (3) at the top of the range to pull the position control lever (2) back fully.
2. Set the stop knob screw (1) at the "3" range as shown in the figure.

- | | |
|----------------------------|----------------|
| (1) Stop Knob Screw | (3) Stop Screw |
| (2) Position Control Lever | |



Setting Mower

1. Turn the steering wheel fully left.
2. Install the mower from right side of the tractor.
3. Roll the mower under the tractor, and then return the steering wheel.



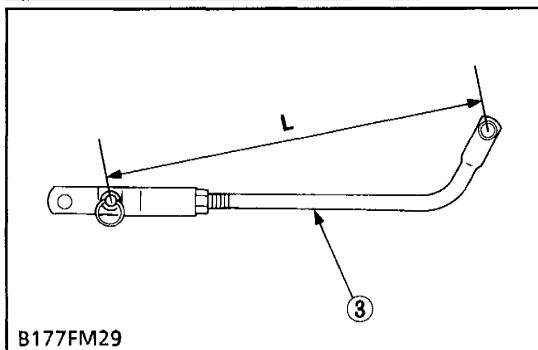
Front Link

1. Hook the front link (3) with the clevis pin section to front end of the groove (2), and then turn the stopper (4) as shown in the figure.

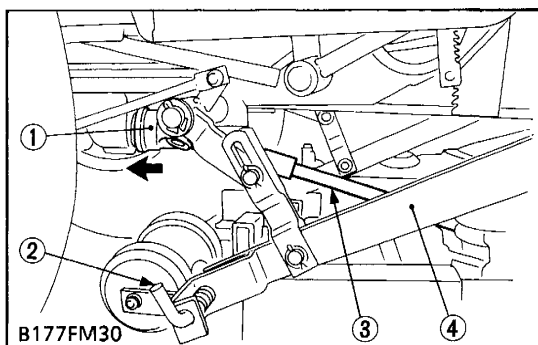
(Reference)

- Make sure the length (L) of the front link (3) is as follows.
 RC54-24B : 505 mm (19.9 in.)
 RCK60-24B : 505 mm (19.9 in.)

- | | |
|------------|----------------|
| (1) Stay | (3) Front Link |
| (2) Groove | (4) Stopper |

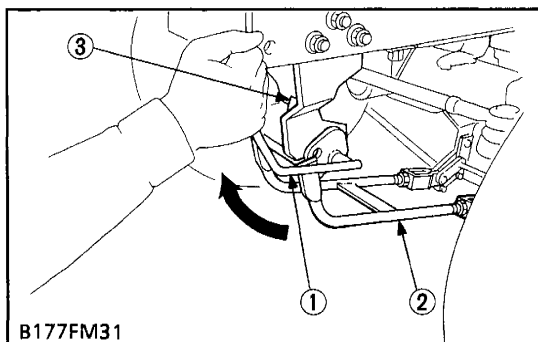


Mounting Universal Joint and Rear Link



1. Pull back the coupler (1) of the universal joint.
2. Push the universal joint (3) onto the mid PTO shaft, and release the coupler (1).
3. Slide the universal joint back and forward to make sure the universal joint is locked securely.
4. Lower the rear links.
5. Attach the rear links (4) to the mower deck, pulling the L-pins (2).

- | | |
|-------------|---------------------|
| (1) Coupler | (3) Universal Joint |
| (2) L-pin | (4) Rear Link |



Mounting Front Link

1. Push down the link fixing lever, pulling the L-pin.
2. Hook the front link (2) to the lever fulcrum, and turn the link fixing lever (1).
3. Return the L-pin (3).

NOTE

- Make sure the link fixing lever (1) is fixed with L-pin (3) securely.

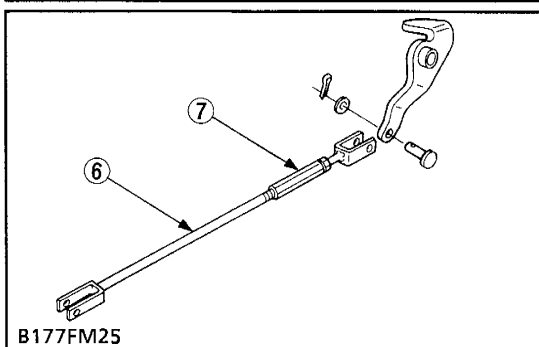
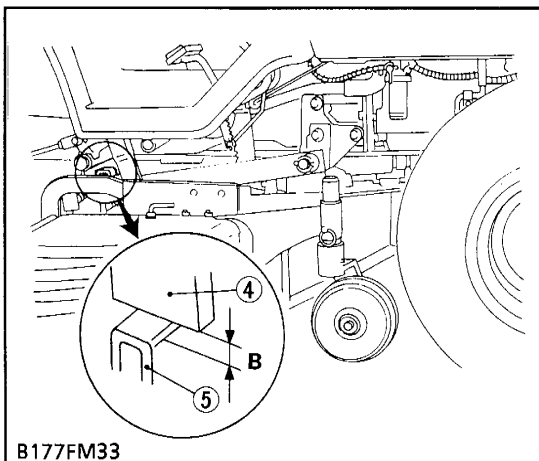
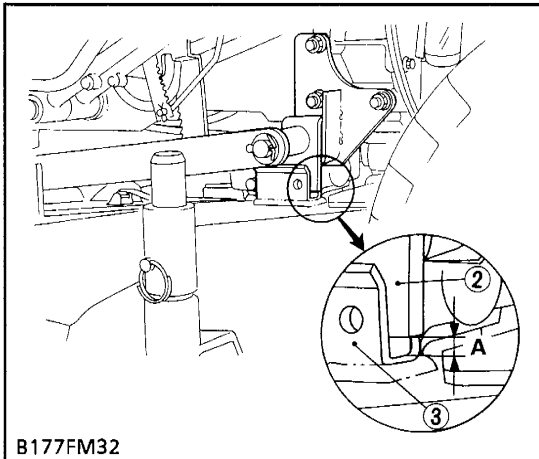
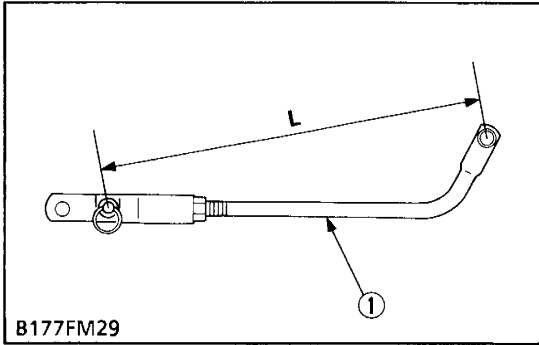
- | | |
|-----------------------|-----------|
| (1) Link Fixing Lever | (3) L-pin |
| (2) Front Link | |

Adjusting Front Link and Connecting Rod

CAUTION

- Before starting the engine, change the mid PTO and gear shift lever into neutral.
- Shut off the engine and allow the mower blades to stop before making adjustments.

1. Park the tractor on level ground with the mower touching the ground.
2. Set the height of the four mower gauge wheels the same.
3. If the front gauge wheels are not on the ground, remove the front link from the mower. And adjust the length (L) of the front link (1) until the front gauge wheels come into contact with the ground.
4. Attach the front link to the mower.
5. Start the engine.
6. Lift the mower to the maximum lifting position and shut off the engine.
7. Adjust the turnbuckles (7) of the left and right connecting rods (6) so that the clearances are within the factory specifications.



Clearance (A) between front stopper and mid hanger bracket	Factory spec.	RC54-24B	2 to 5 mm 0.08 to 0.20 in.
		RCK60-24B	2 to 4 mm 0.08 to 0.15 in.
Clearance (B) between rear stopper and tractor frame	Factory spec.	RC54-24B	5 to 10 mm 0.20 to 0.39 in.
		RCK60-24B	LH : just contact RH : 5 to 8 mm 0.20 to 0.30 in.

IMPORTANT

- Proper adjustment for the connecting rod length is very important to avoid damage to the mower lifting system.

- | | |
|------------------------|--------------------|
| (1) Front Link | (5) Rear Stopper |
| (2) Mid Hanger Bracket | (6) Connecting Rod |
| (3) Front Stopper | (7) Turnbuckle |
| (4) Tractor Frame | |

TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Blade Does Not Turn	<ul style="list-style-type: none"> ● Mid PTO system malfunctioning ● Broken mower belt 	Check transmission Replace mower belt	– M-S19
Blade Speed Is Slow	<ul style="list-style-type: none"> ● Loosen mower belt ● Clogged grass ● Flattened out or worn cup washer 	Replace mower belt or tension spring Remove grass Replace cup washer	M-S19, S23 – M-S22
Cutting Is Poor	<ul style="list-style-type: none"> ● Worn or broken mower blade ● Loosen mower blade screw ● Cutting height improper 	Sharpen or replace mower blade Retighten mower blade screw Adjust cutting height	M-S19 M-S3 M-S20
Mower Is Not Lifted	<ul style="list-style-type: none"> ● Broken linkage system ● Trouble of hydraulic system 	Replace linkage system Check hydraulic system	– –

SERVICING SPECIFICATIONS

■ RC54-24B

Item		Factory Specification	Allowable Limit
Pinion Shaft	Turning Force	Less than 117.7 N 12.0 kgf 26.5 lbs	–
	Turning Torque	Less than 1.47 N·m 0.15 kgf·m 1.08 ft-lbs	–
Bevel Gears in Gear Box	Backlash	0.10 to 0.20 mm 0.0039 to 0.0079 in.	0.4 mm 0.0157 in.
Tension collar to Tension Arm Bushing	Clearance	0.025 to 0.127 mm 0.00098 to 0.00500 in.	0.30 mm 0.0118 in.
Tension Coller	O.D.	19.954 to 19.975 mm 0.78559 to 0.78642 in.	–
Tension Arm Bushing	I.D.	20.000 to 20.081 mm 0.78740 to 0.79059 in.	–
Front Gauge Wheel Shaft Bushing	I.D.	30.000 to 30.085 mm 1.18110 to 1.18445 in.	31.000 mm 1.22047 in.
Rear Link Bushing	I.D.	20.000 to 20.081 mm 0.78740 to 0.79059 in.	21.000 mm 0.82677 in.
Gauge Wheel Bushing	I.D.	20.030 to 20.100 mm 0.78858 to 0.79134 in.	21.000 mm 0.82677 in.

■ RCK60-24B

Item		Factory Specification	Allowable Limit
Pinion Shaft	Turning Force	Less than 56.5 N 5.7 kgf 12.7 lbs	–
	Turning Torque	Less than 0.7 N·m 0.07 kgf·m 0.5 ft-lbs	–
Bevel Gears in Gear Box	Backlash	0.13 to 0.25 mm 0.0051 to 0.0098 in.	0.4 mm 0.0157 in.
Tension collar to Tension Arm Bushing	Clearance	0.023 to 0.127 mm 0.00091 to 0.00500 in.	0.30 mm 0.0118 in.
Tension Coller	O.D.	18.997 to 19.027 mm 0.74791 to 0.74909 in.	–
Tension Arm Bushing	I.D.	19.050 to 19.124 mm 0.75000 to 0.75291 in.	–
Front Gauge Wheel Shaft Bushing	I.D.	30.010 to 30.135 mm 1.18150 to 1.18641 in.	31.051 mm 1.22248 in.
Rear Link Bushing	I.D.	19.060 to 19.185 mm 0.75039 to 0.75531 in.	20.063 mm 0.78988 in.
Gauge Wheel Bushing	I.D.	19.202 to 19.253 mm 0.75598 to 0.75799 in.	20.300 mm 0.79921 in.

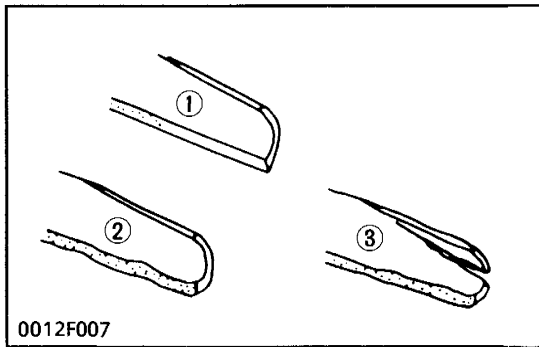
TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts : See page M-S2)

Item	N·m	kgf·m	ft-lbs
Gear box bracket mounting screw	78.5 to 88.2	8.0 to 9.0	57.9 to 65.1
Mower blade screw	98.1 to 117.7	10.0 to 12.0	72.3 to 86.8
Gear box mounting screw	78.5 to 88.2	8.0 to 9.0	57.9 to 65.1
Outer pulley mounting nut	166.7 to 186.3	17.0 to 19.0	123.0 to 137.4

CHECKING, DISASSEMBLING AND SERVICING

CHECKING AND ADJUSTING



Checking Mower Blade

1. Check the cutting edge of mower blade.
2. Sharpen the cutting edges, if the mower blades are as shown in figure (2).
3. Replace the mower blades, if they are as shown in figure (3).

■ IMPORTANT

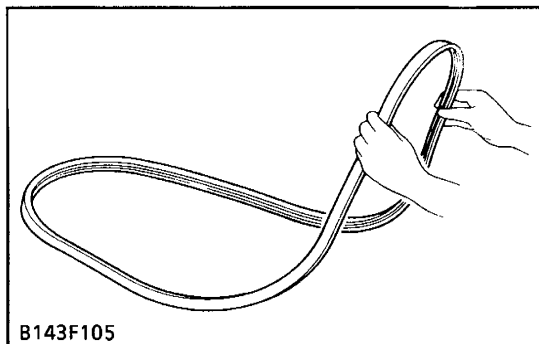
- Never forget to set the two cup washers between mower blade and spline boss, when reassembling the mower blades.

■ NOTE

- To sharpen the mower blades by yourself, clamp the mower blade securely in a vise and use a large mill file along the original bevel.
- To balance the mower blade, place a small rod through the center hole and check to see if the blade balances evenly. File heavy side of the blade until it balances out even.

- (1) New Blade
(2) Worn Blade

- (3) Cracked Blade

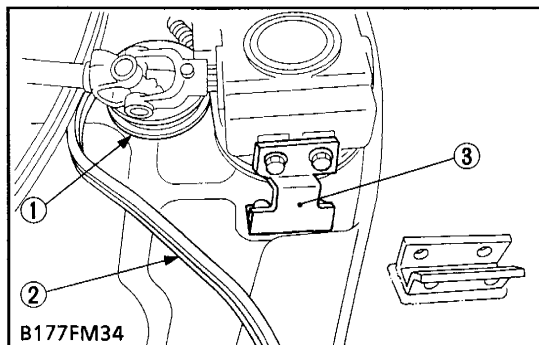


Checking Mower Belt

1. Check to see the mower belt.
2. Replace the mower belt with a new one, if there is found surface split at more than 3 positions.

(When replacing mower belt)

1. Dismount the mower from the tractor.
2. Remove the left and right hand belt cover from the mower deck.
3. Clean around the gear box.
4. Remove the right hand bracket (3) which mounts the gear box to the mower deck.
5. Remove the mower belt (2) from the tension pulley (1). Slip the mower belt over the top of the gear box.
6. To install a new belt, reverse the above procedure.



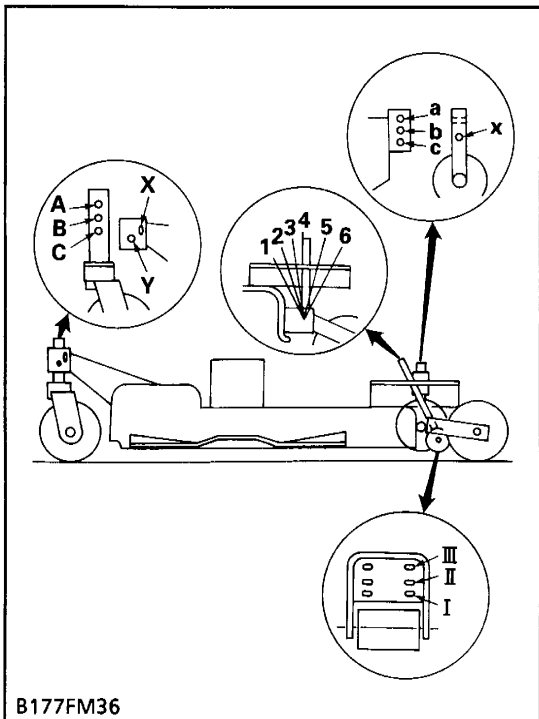
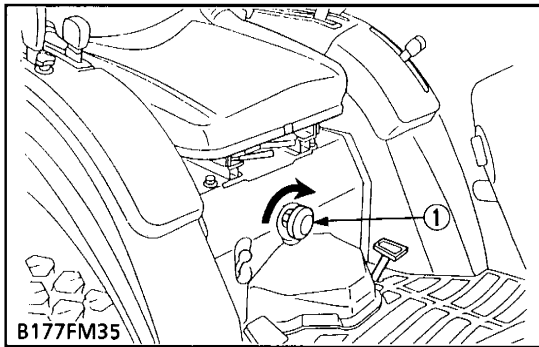
Tightening torque	Gear box bracket mounting screw	78.5 to 88.2 N·m 8.0 to 9.0 kgf·m 57.9 to 65.1 ft·lbs
-------------------	---------------------------------	---

■ IMPORTANT

- After setting the gear box bracket mounting screws on the deck without tightening, then mount the other screws on the gear box. And finally tighten them.

- (1) Tension Pulley
(2) Mower Belt

- (3) Gear Box Bracket (Right)



Adjusting Cutting Height

1. The cutting height can be adjusted from 38 mm to 102 mm (from 1.5 in. to 4.0 in.).
2. To adjust the cutting height, lift the mower slightly and close the 3-point lowering speed knob (1).
3. Adjust the cutting height with the front gauge wheels, rear gauge wheel, anti-scalp wheel and anti-scalp rollers as shown in the table below.
4. The recommended cutting height is approx. 50 mm (2.0 in.).

Cutting height	Front gauge wheel	Rear gauge wheel	Anti-scalp wheel	Anti-scalp roller
38 mm (1.5 in.)	C - X	1	a - x	I
51 mm (2.0 in.)	C - Y	2		
64 mm (2.5 in.)	B - X	3	b - x	II
76 mm (3.0 in.)	B - Y	4		
89 mm (3.5 in.)	A - X	5	c - x	III
102 mm (4.0 in.)	A - Y	6		

IMPORTANT

- After adjusting the cutting height, open the 3-point lowering speed knob (1) and adjust the lowering speed of the mower.

(1) 3-point Lowering Speed Knob

Adjusting Front Link and Connecting Rod

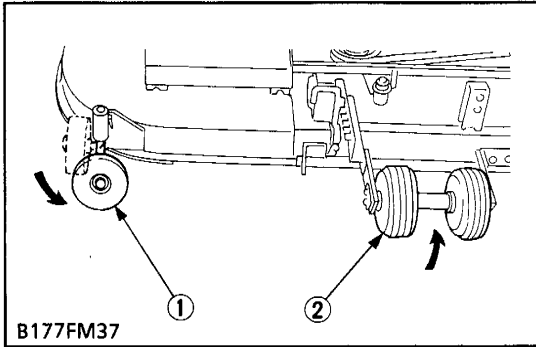
1. See page M-S16.

DISASSEMBLING AND ASSEMBLING

(1) Dismounting Mower

⚠ CAUTION

- When dismantling or mounting the mower, park the tractor on flat ground, apply the parking brake, and stop the engine.



Anti-scalp Wheel

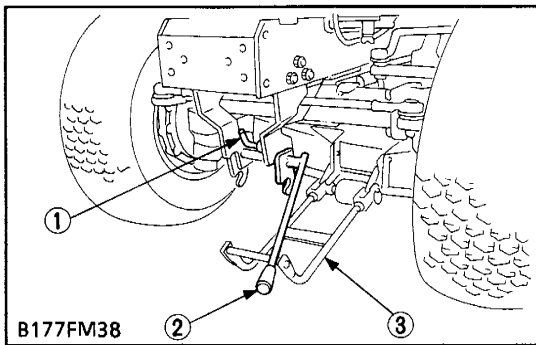
- Start the engine, and lift the mower.
- Turn the anti-scalp wheel (1) sideways position and set the rear gauge wheel (2) on the lowest cutting height.
- Lower the mower, and stop the engine.

(When reassembling)

- After mounting the mower, turn the anti-scalp wheel straight position.

(1) Anti-scalp Wheel

(2) Rear Gauge Wheel



Front Link

- Push down the link fixing lever (2) to disconnect the front link (3), pulling the L-pin (1).
- Remove the front link (3) from the stay (4).

(When reassembling)

- Hook the front link (3) with the clevis pin section to front end of the groove (5), and then turn the stopper (6) as shown in the figure.
- Make sure the link fixing lever (2) is fixed with L-pin (1) securely.

(1) L-pin

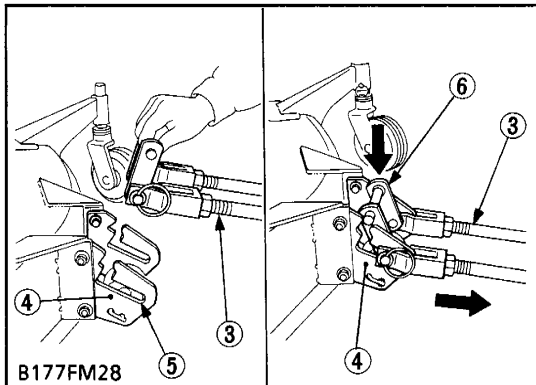
(4) Stay

(2) Link Fixing Lever

(5) Groove

(3) Front Link

(6) Stopper



Rear Link and Universal Joint

- Disconnect the rear links (4), pulling the L-pin (2).
- Pull back the coupler (1) to unlock, and remove the universal joint (3) from the mid PTO shaft.
- Start the engine, and shift the position control lever to "LIFT" position.

(When reassembling)

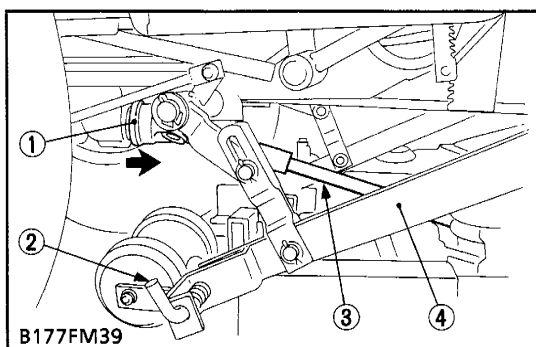
- Apply grease to the splines and grease nipples of the universal joint.
- Slide the universal joint back and forward to make sure the universal joint is locked securely.

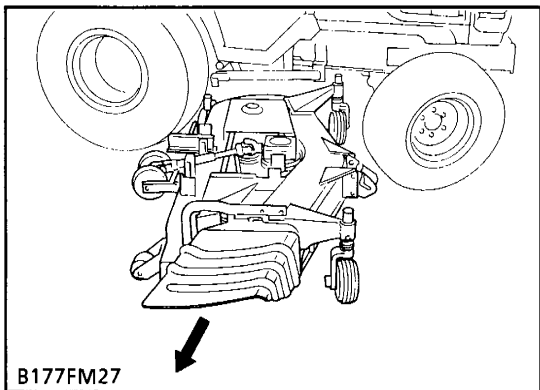
(1) Coupler

(3) Universal Joint

(2) L-pin

(4) Rear Link

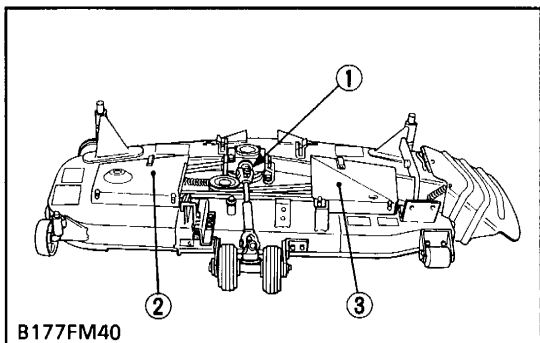




Taking Out Mower

1. Turn the steering wheel fully left.
2. Take out the mower to the right side of the tractor.

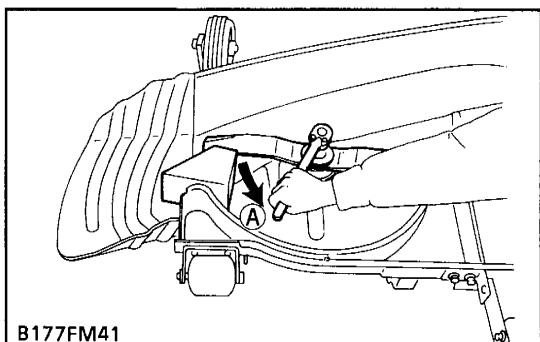
(2) Disassembling Mower



Universal Joint and Belt Cover

1. Remove the universal joint (1).
2. Remove the left and right belt covers (2), (3).

- (1) Universal Joint
- (2) Belt Cover (Left)
- (3) Belt Cover (Right)



Mower Blades (Center Blade and Outer Blades)

1. Turn over the mower.
2. Unscrew the mower blade screw (5), and remove the spline boss (4), two cup washers (3), mower blade (2) and dust cover (1).

NOTE

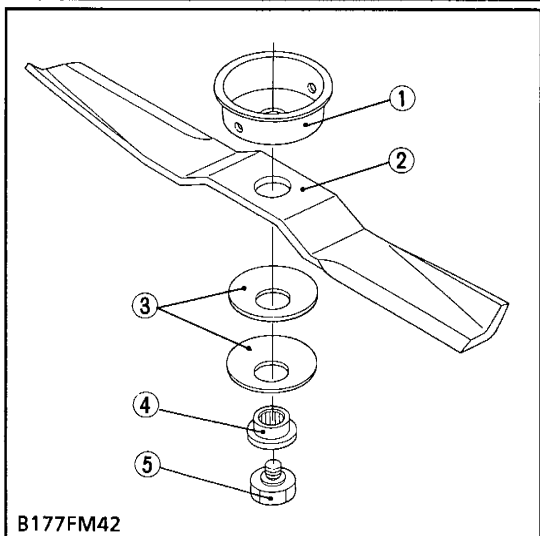
- To remove the blade securely, wedge a block of wood between one blade and the mower deck in such position that it will hold the blade safely while loosening or tightening the blade screw.

(When reassembling)

- Be sure to assemble the two cup washers between the mower blade and spline boss.

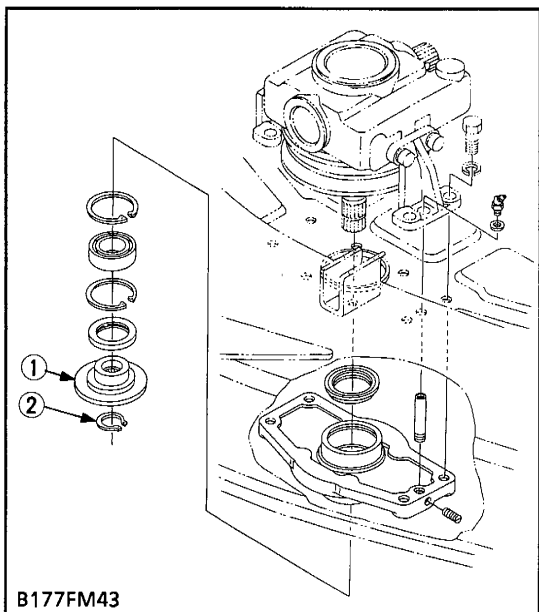
IMPORTANT

- Make sure the cup washer is not flattened out or worn, causing blade to slip easily. Replace two cup washers if either is damaged.



Tightening torque	Mower blade screw	98.1 to 117.7 N·m 10.0 to 12.0 kgf·m 72.3 to 86.8 ft-lbs
-------------------	-------------------	--

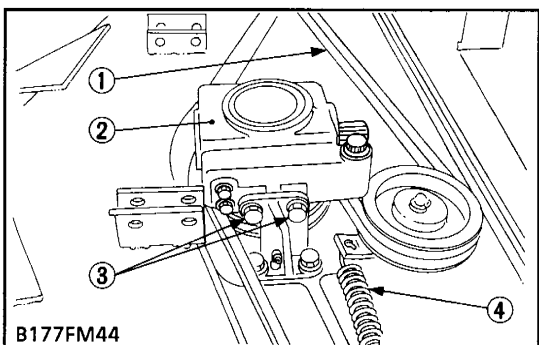
- (1) Dust Cover
 - (2) Mower Blade
 - (3) Cup Washer
 - (4) Spline Boss
 - (5) Mower Blade Screw
- (A) Loosen



Blade Boss

1. Remove the external snap ring (2).
2. Remove the blade boss (1).

(1) Blade Boss (2) External Snap Ring

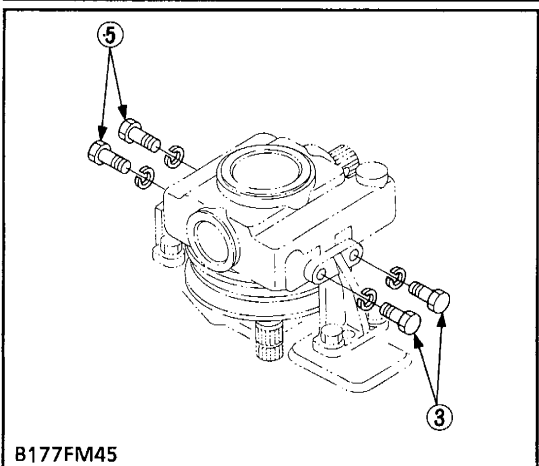


Gear Box and Mower Belt

1. Turn over the mower.
2. Remove the tension spring (4).
3. Clean around the gear box (2).
4. Unscrew the left and right gear box mounting screws (3), (5) and remove the gear box (2) from the mower deck.
5. Remove the mower belt (1).

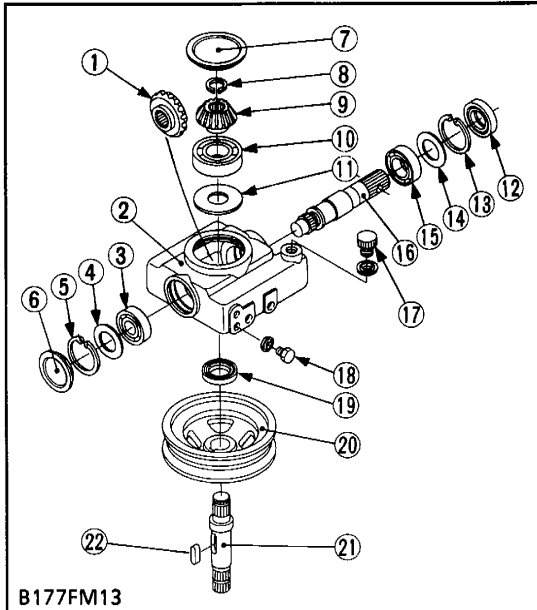
(When reassembling)

- Install the reamer screws (3) at their original positions as shown in the figure.



Tightening torque	Gear box mounting screw	78.5 to 88.2 N·m 8.0 to 9.0 kgf·m 57.9 to 65.1 ft-lbs
-------------------	-------------------------	---

- (1) Mower Belt (2) Gear Box (3) Gear Box Mounting Screw (Reamer Screw) (4) Tension Spring (5) Gear Box Mounting Screw



Disassembling Gear Box

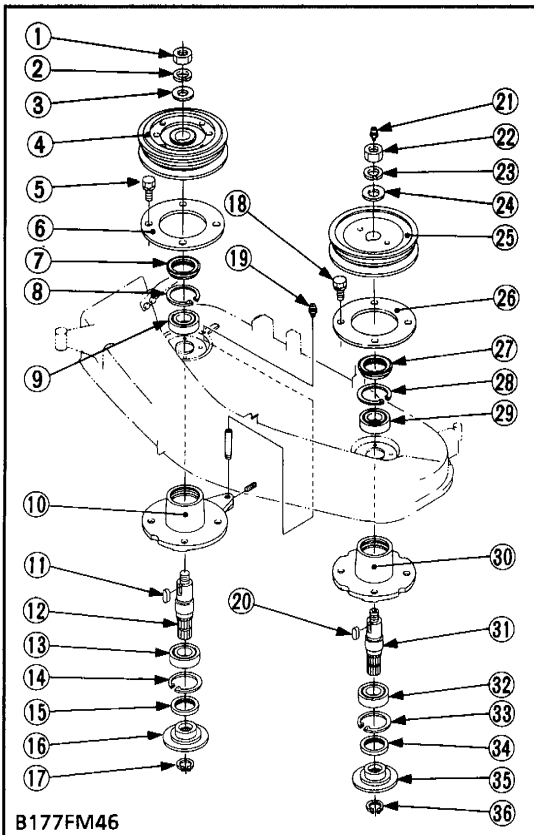
1. Unscrew the drain plug (18), and drain gear box oil.
2. Remove the center pulley (20) with a puller, and remove the feather key (22) on the bevel gear shaft.
3. Remove the gear box caps (6), (7).
4. Remove the oil seal (12), internal snap ring (13) and shim (14).
5. Tap out the pinion shaft (16) with the ball bearing (15), and remove the 21T bevel gear (or 18T bevel gear) (1).
6. Remove the internal snap ring (5), shim (4) and ball bearing (3).
7. Remove the external snap ring (8), and draw out the bevel gear shaft (21).
8. Remove the 16T bevel gear (or 17T bevel gear) (9), ball bearing (10), shim (11) and oil seal (19).

(When reassembling)

- Replace the oil seals (12), (19) and gear box caps (6), (7) with new ones.
- Check the backlash and turning torque.
If not proper, adjust with the shims (4), (11), (14).
(See page M-S27, 28.)

- | | |
|-------------------------------|-------------------------|
| (1) 21T Bevel Gear (RC54-24B) | (11) Shim |
| 18T Bevel Gear (RCK60-24B) | (12) Oil Seal |
| (2) Gear Box | (13) Internal Snap Ring |
| (3) Ball Bearing | (14) Shim |
| (4) Shim | (15) Ball Bearing |
| (5) Internal Snap Ring | (16) Pinion Shaft |
| (6) Gear Box Cap | (17) Oil Filler Plug |
| (7) Gear Box Cap | (18) Drain Plug |
| (8) External Snap Ring | (19) Oil Seal |
| (9) 16T Bevel Gear (RC54-24B) | (20) Center Pulley |
| 17T Bevel Gear (RCK60-24B) | (21) Bevel Gear Shaft |
| (10) Ball Bearing | (22) Feather Key |

■ RC54-24B



Outer Pulley and Blade Shaft

1. Unscrew the outer pulley mounting nut (22), and remove the outer pulley (25) and feather key (20).

■ NOTE

- The outer pulley mounting nut has left-hand threads. Turn it clockwise to loosen.

2. Unscrew the pulley holder mounting screws (18), and separate the left pulley holder (30) and plate (26) from the mower deck.
3. Remove the external snap ring (36) on the left blade shaft (31).
4. Remove the spline boss (35) and oil seal (34).
5. Remove the internal snap ring (33) and tap out the left blade shaft (31) with the ball bearings (29), (32), taking care not to damage the grease nipple (21).
6. Remove the oil seal (27) and internal snap ring (28).
7. Remove the ball bearings (29), (32) from the blade shaft (31).
8. Remove the right pulley holder (10) and blade shaft (12) as above.

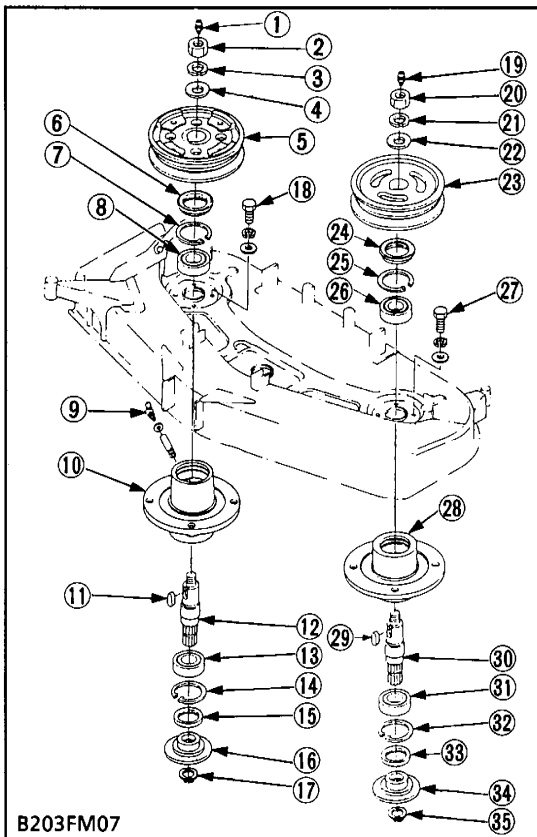
(When reassembling)

- Replace the oil seals (34), (27), (15) and (7) with new ones.

Tightening torque	Outer pulley mounting nut	166.7 to 186.3 N·m 17.0 to 19.0 kgf·m 123.0 to 137.4 ft·lbs
-------------------	---------------------------	---

- | | |
|-----------------------------------|--------------------------------|
| (1) Outer Pulley Mounting Nut | (19) Grease Nipple |
| (2) Spring Washer | (20) Feather Key |
| (3) Plain Washer | (21) Grease Nipple |
| (4) Outer Pulley (Right) | (22) Outer Pulley Mounting Nut |
| (5) Pulley Holder Mounting Screw | (23) Spring Washer |
| (6) Plate | (24) Plain Washer |
| (7) Oil Seal | (25) Outer Pulley (Left) |
| (8) Internal Snap Ring | (26) Plate |
| (9) Ball Bearing | (27) Oil Seal |
| (10) Pulley Holder (Right) | (28) Internal Snap Ring |
| (11) Feather Key | (29) Ball Bearing |
| (12) Blade Shaft (Right) | (30) Pulley Holder (Left) |
| (13) Ball Bearing | (31) Blade Shaft (Left) |
| (14) Internal Snap Ring | (32) Ball Bearing |
| (15) Oil Seal | (33) Internal Snap Ring |
| (16) Spline Boss | (34) Oil Seal |
| (17) External Snap Ring | (35) Spline Boss |
| (18) Pulley Holder Mounting Screw | (36) External Snap Ring |

■ RCK60-24B



B203FM07

1. Unscrew the outer pulley mounting nut (20), and remove the outer pulley (23) and feather key (29).

■ NOTE

- The outer pulley mounting nut has left-hand threads. Turn it clockwise to loosen.

2. Unscrew the pulley holder mounting screws (27), and separate the left pulley holder (28) from the mower deck.
3. Remove the external snap ring (35) on the left blade shaft (30).
4. Remove the spline boss (34) and oil seal (33).
5. Remove the internal snap ring (32) and tap out the left blade shaft (30) with the ball bearings (26), (31), taking care not to damage the grease nipple (19).
6. Remove the oil seal (24) and internal snap ring (25).
7. Remove the ball bearings (26), (31) from the blade shaft (30).
8. Remove the right pulley holder (10) and blade shaft (12) as above.

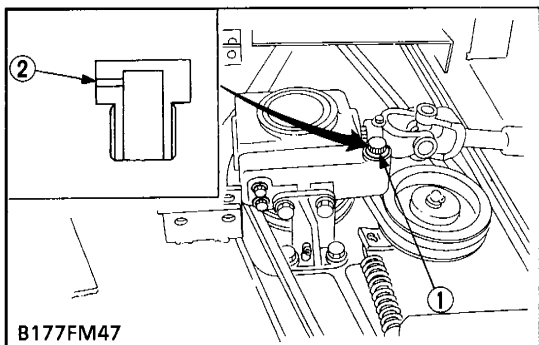
(When reassembling)

- Replace the oil seals (33), (24), (15) and (7) with new ones.

Tightening torque	Outer pulley mounting nut	166.7 to 186.3 N·m 17.0 to 19.0 kgf·m 123.0 to 137.4 ft·lbs
-------------------	---------------------------	---

- | | |
|-----------------------------------|-----------------------------------|
| (1) Grease Nipple | (19) Grease Nipple |
| (2) Outer Pulley Mounting Nut | (20) Outer Pulley Mounting Nut |
| (3) Spring Washer | (21) Spring Washer |
| (4) Plain Washer | (22) Plain Washer |
| (5) Outer Pulley (Right) | (23) Outer Pulley (Left) |
| (6) Oil Seal | (24) Oil Seal |
| (7) Internal Snap Ring | (25) Internal Snap Ring |
| (8) Ball Bearing | (26) Ball Bearing |
| (9) Grease Nipple | (27) Pulley Holder Mounting Screw |
| (10) Pulley Holder (Right) | (28) Pulley Holder (Left) |
| (11) Feather Key | (29) Feather Key |
| (12) Blade Shaft (Right) | (30) Blade Shaft (Left) |
| (13) Ball Bearing | (31) Ball Bearing |
| (14) Internal Snap Ring | (32) Internal Snap Ring |
| (15) Oil Seal | (33) Oil Seal |
| (16) Spline Boss | (34) Spline Boss |
| (17) External Snap Ring | (35) External Snap Ring |
| (18) Pulley Holder Mounting Screw | |

SERVICING

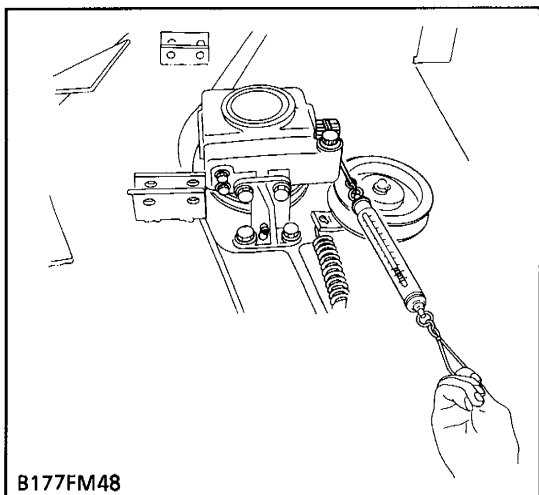


Oil Filler Plug

1. Remove the oil filler plug (1) from the gear box.
2. Check the hole of breather does not clogging.
3. If the breather hole (2) has clogged, clean it.

(1) Oil Filler Plug

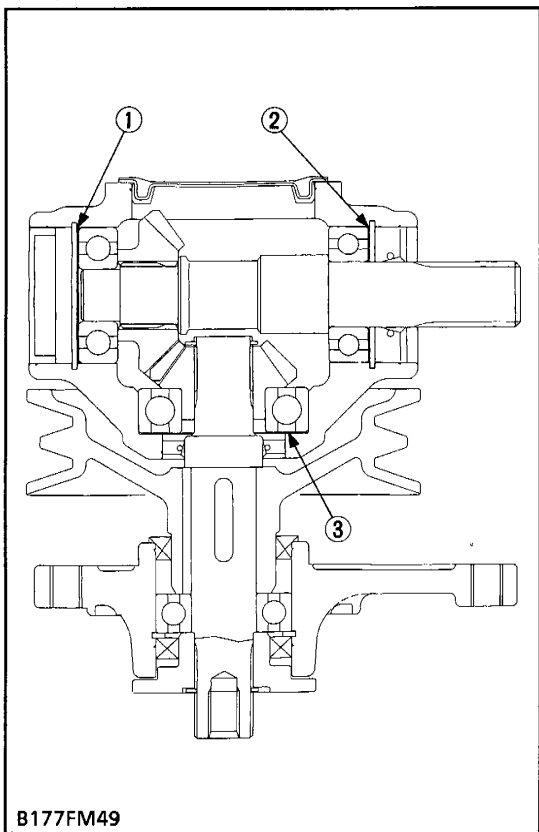
(2) Breather Hole



Turning Torque of Pinion Shaft

1. Remove the mower belt, and reassemble the gear box to the mower deck.
2. Wind a string around the pinion shaft and set a spring balance (or push-pull gauge) to the tip of the string, and then slowly pull the spring balance horizontally to measure the turning force.
3. If the measurement exceeds the factory specification, check the bearing and gears and adjust the adjusting shims (1), (2), (3).

Turning force	Factory spec.	RC54-24B	Less than 117.7 N 12.0 kgf 26.5 lbs
		RCK60-24B	Less than 56.5 N 5.7 kgf 12.7 lbs
Turning torque	Factory spec.	RC54-24B	Less than 1.47 N-m 0.15 kgf-m 1.08 ft-lbs
		RCK60-24B	Less than 0.7 N-m 0.07 kgf-m 0.5 ft-lbs

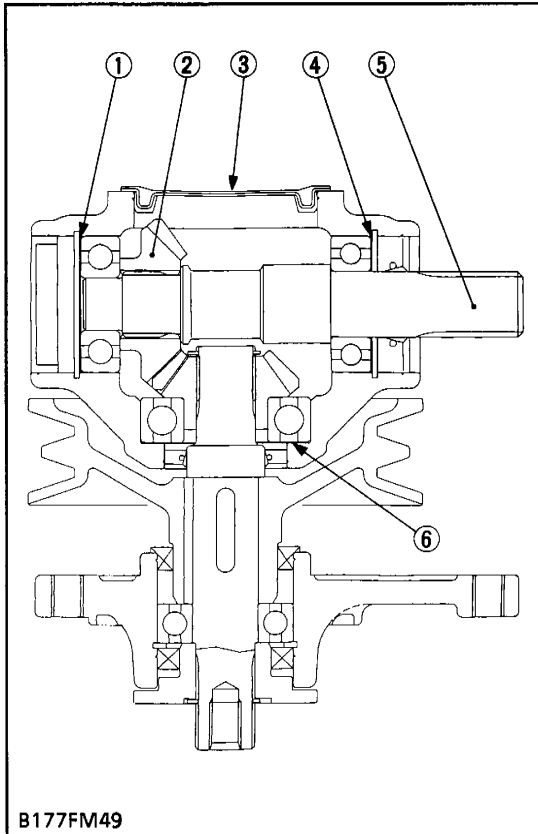


(Reference)

- Thickness of adjusting shims (1), (2), (3) : 0.2 mm (0.0079 in.)
0.3 mm (0.0118 in.)

(1) Adjusting Shim
(2) Adjusting Shim

(3) Adjusting Shim



Backlash between Bevel Gears

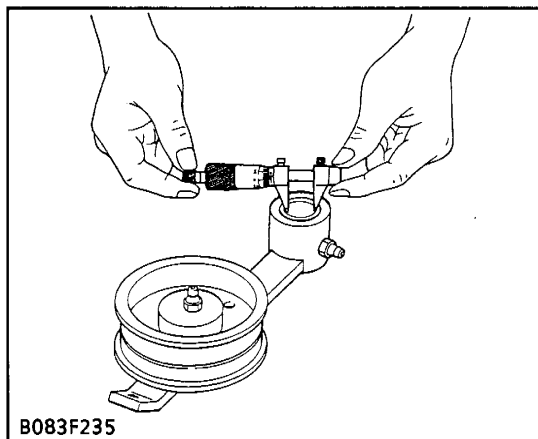
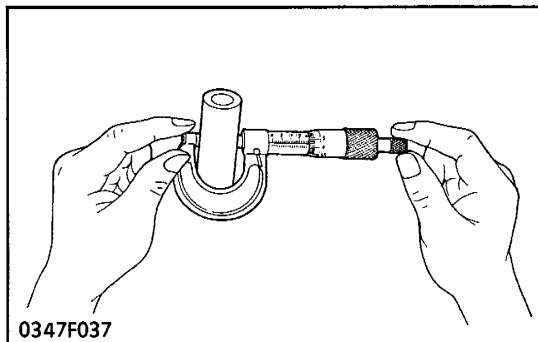
1. Remove the gear box cap (3).
2. Place fuses the 21T bevel gear (or 18T bevel gear) (2) on the pinion shaft (5).
3. Turn the pinion shaft.
4. Take out the fuses, and measure the thickness of fuses with an outside micrometer. (Backlash equal thickness of fuse)
5. If the backlash exceeds the allowable limit, adjust with shims (1), (4), (6).

Backlash between bevel gears	Factory spec.	RC54-24B	0.10 to 0.20 mm 0.0039 to 0.0079 in.
		RCK60-24B	0.13 to 0.25 mm 0.0051 to 0.0098 in.
	Allowable limit	RC54-24B	0.4 mm 0.0157 in.
		RCK60-24B	

(Reference)

- Thickness of adjusting shims (1), (4), (6) : 0.2 mm (0.0079 in.)
0.3 mm (0.0118 in.)

- | | |
|---|------------------|
| (1) Shim | (4) Shim |
| (2) 21T Bevel Gear (RC54-24B)
18T Bevel Gear (RCK60-24B) | (5) Pinion Shaft |
| (3) Gear Box Cap | (6) Shim |

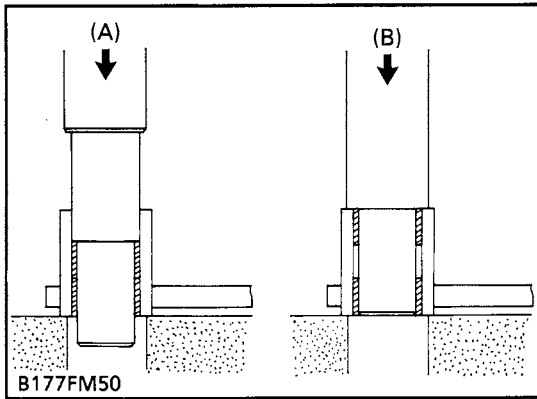


Clearance between Tension Collar and Tension Arm Bushing

1. Measure the tension collar O.D. with an outside micrometer.
2. Measure the tension arm bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between tension collar and tension arm bushing	Factory spec.	RC54-24B	0.025 to 0.127 mm 0.00098 to 0.00500 in.
		RCK60-24B	0.023 to 0.127 mm 0.00098 to 0.00500 in.
	Allowable limit	RC54-24B	0.30 mm 0.0118 in.
		RCK60-24B	

Tension collar O.D.	Factory spec.	RC54-24B	19.954 to 19.975 mm 0.78559 to 0.78642 in.
		RCK60-24B	18.997 to 19.027 mm 0.74791 to 0.74909 in.
Tension arm bushing I.D.	Factory spec.	RC54-24B	20.000 to 20.081 mm 0.78740 to 0.79059 in.
		RCK60-24B	19.050 to 19.124 mm 0.75000 to 0.75291 in.



Replacing Tension Arm Bushing

(When removing)

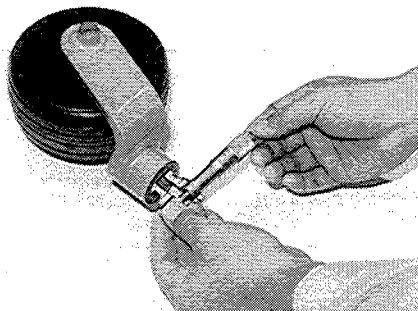
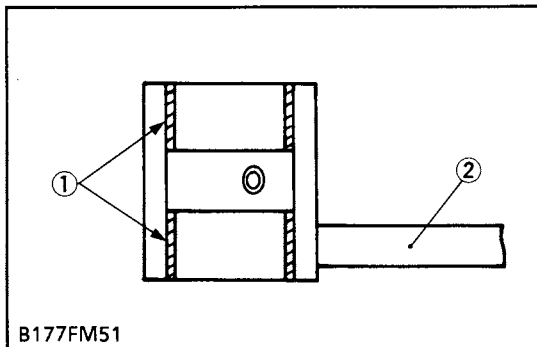
1. Remove the grease nipple from the tension arm.
2. Using a tension arm bushing replacing tool (see page M-S7), press out the used bushings.

(When installing)

1. Clean new bushings and apply gear oil to them.
2. Using a tension arm bushing replacing tool, press in new bushings (1) until they are flush with tension arm (2) as shown in the figure.

- (1) Tension Arm Bushing
 (2) Tension Arm

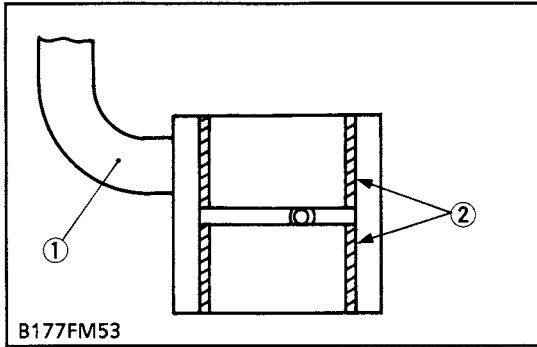
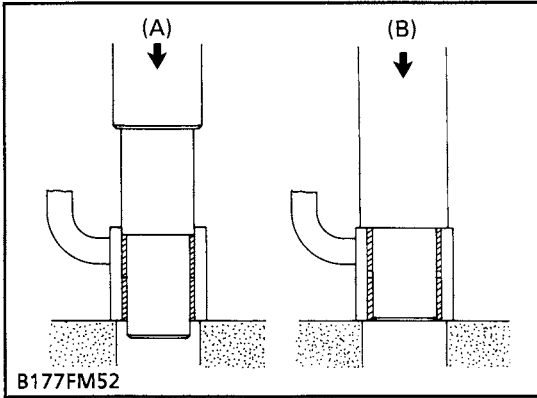
- (A) When Removing
 (B) When Installing



Front Gauge Wheel Bushing Wear

1. Measure the front gauge wheel bushing I.D. with an inside micrometer.
2. If the measurement exceeds the allowable limit, replace the bushings.

Front gauge wheel bushing I.D.	Factory spec.	RC54-24B	30.000 to 30.085 mm 1.18110 to 1.18445 in.
		RCK60-24B	30.010 to 30.135 mm 1.18150 to 1.18640 in.
	Allowable limit	RC54-24B	31.000 mm 1.22047 in.
		RCK60-24B	31.051 mm 1.22250 in.



Replacing Front Gauge Wheel Bushing

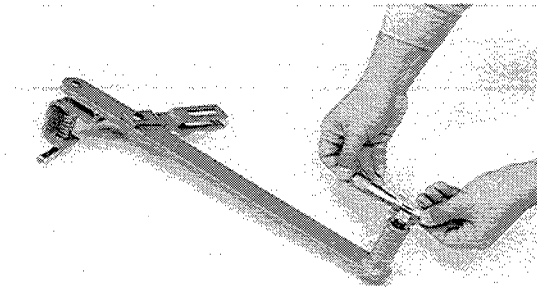
(When removing)

1. Using a front gauge wheel bushing replacing tool (see page M-S7), press out the used bushings.

(When installing)

1. Clean new bushing and apply gear oil to them.
2. Using a front gauge wheel bushing replacing tool, press in new bushings (2) until they are flush with front gauge wheel stay (1) as shown in the figure.

- (1) Front Gauge Wheel Stay
- (2) Front Gauge Wheel Bushing
- (A) When Removing
- (B) When Installing

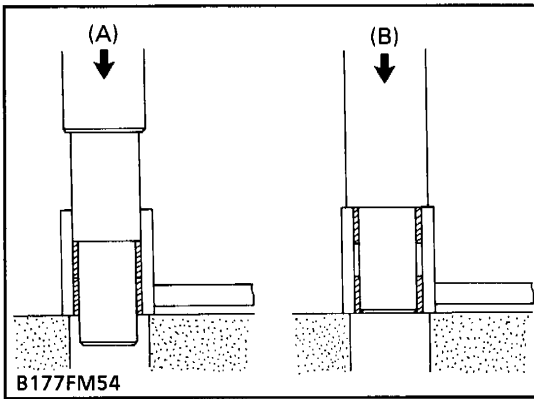


B177PM02

Rear Link Bushing Wear

1. Measure the rear link bushing I.D. with an inside micrometer.
2. If the measurement exceeds the allowable limit, replace the bushings.

Rear link bushing I.D.	Factory spec.	RC54-24B	20.000 to 20.081 mm 0.78740 to 0.79059 in.
		RCK60-24B	19.060 to 19.185 mm 0.75039 to 0.75531 in.
	Allowable limit	RC54-24B	21.000 mm 0.82677 in.
		RCK60-24B	20.063 mm 0.78988 in.



Replacing Rear Link Bushing

(When removing)

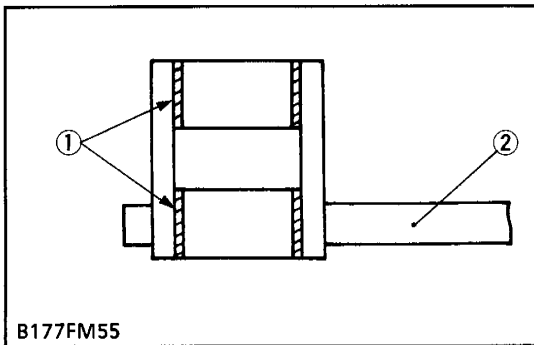
1. Using a rear link bushing replacing tool (see page M-S8), press out the used bushings.

(When installing)

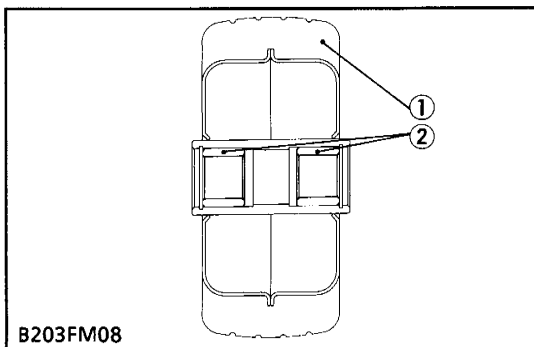
1. Clean new bushings and apply gear oil to them.
2. Using a rear link bushing replacing tool, press in new bushings (1) until they are flush with rear link (2) as shown in the figure.

- (1) Rear Link Bushing
(2) Rear Link

- (A) When Removing
(B) When Installing



■ **RC54-24B**

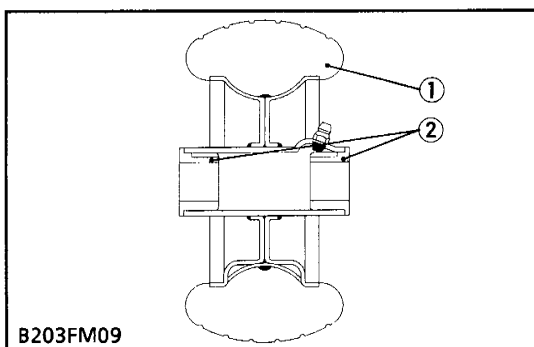


Gauge Wheel Bushing Wear

1. Measure the gauge wheel bushing I.D. with an inside micrometer.
2. If the measurement exceeds the allowable limit, replace the bushings.

Gauge wheel bushing I.D.	Factory spec.	RC54-24B	20.030 to 20.100 mm 0.7886 to 0.7913 in.
		RCK60-24B	19.202 to 19.253 mm 0.75598 to 0.75799 in.
	Allowable limit	RC54-24B	21.000 mm 0.82677 in.
		RCK60-24B	20.300 mm 0.79921 in.

■ **RCK60-24B**



(When installing)

1. Clean new bushing and apply gear oil to them.

- (1) Gauge Wheel

- (2) Gauge Wheel Bushing

EDITOR:

KUBOTA FARM & INDUSTRIAL MACHINERY SERVICE, LTD.

64, ISHIZU-KITAMACHI, SAKAI-KU, SAKAI-CITY, OSAKA, 590-0823, JAPAN

PHONE : (81)72-241-1129

FAX : (81)72-245-2484

E-mail : ks_g.ksos-pub@kubota.com
