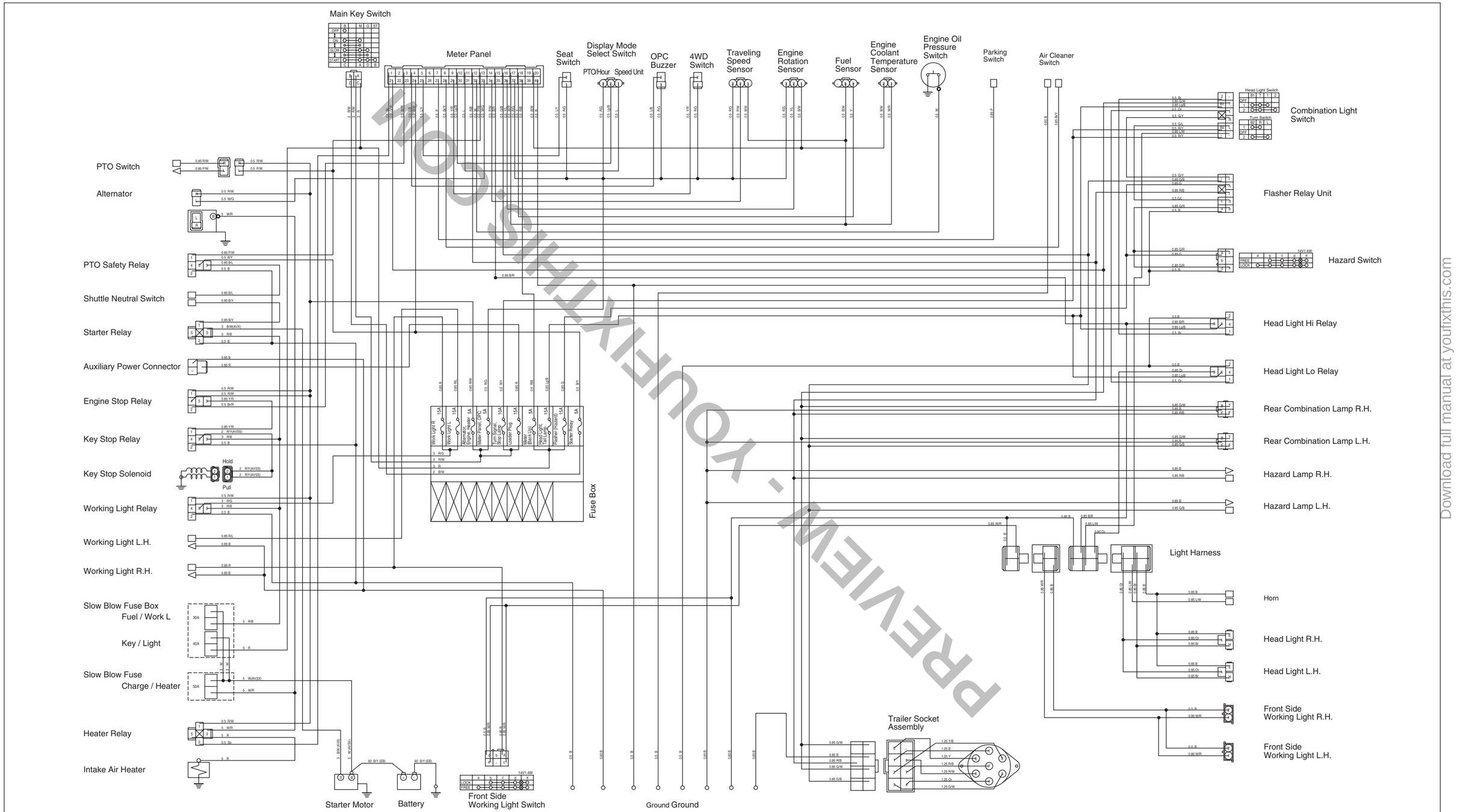
1. WIRING DIAGRAM

[1] MAIN HARNESS (ROPS MODEL)



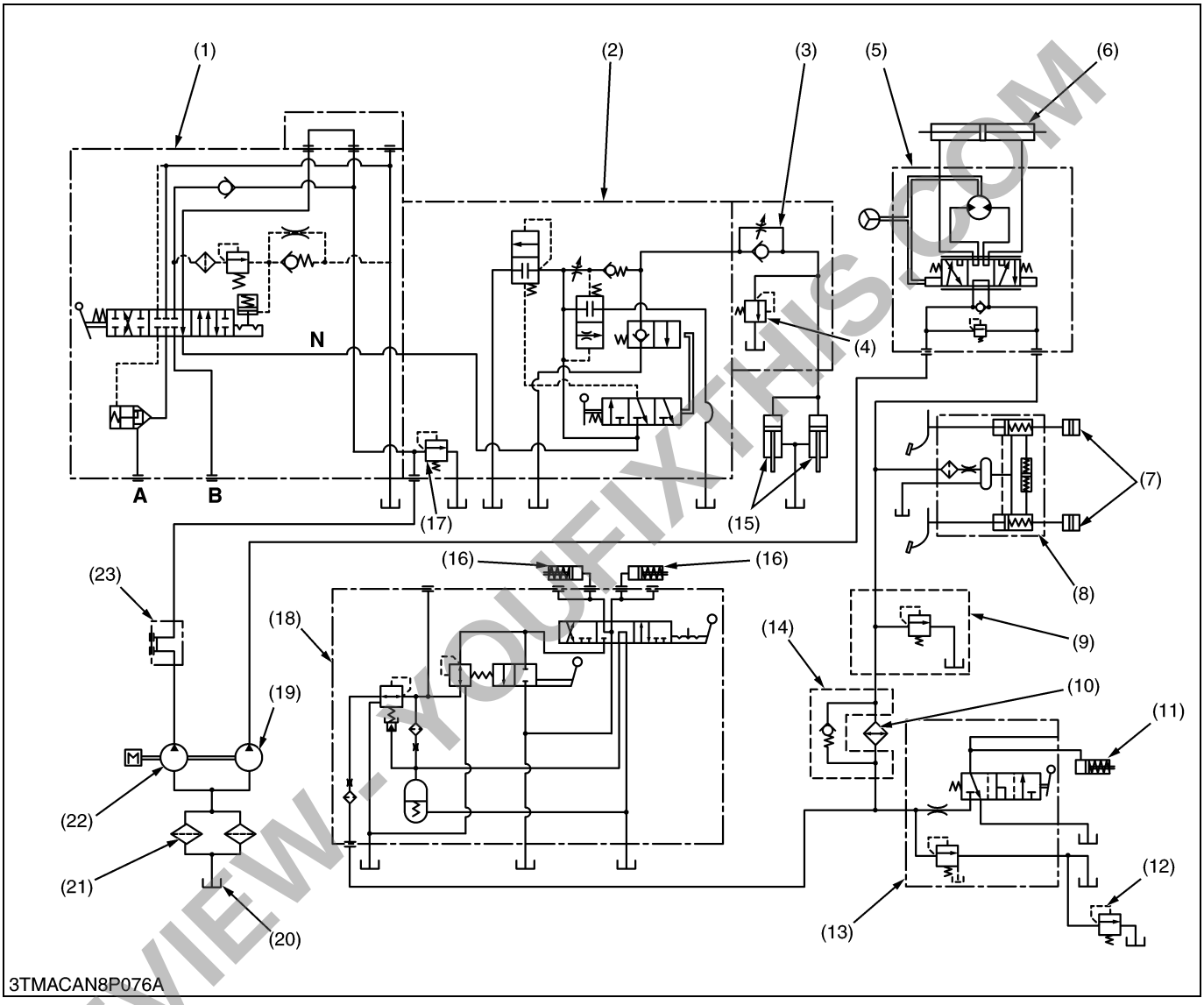
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2. HYDRAULIC CIRCUIT

[1] TOTAL HYDRAULIC CIRCUIT

(1) Hydraulic Shuttle Model



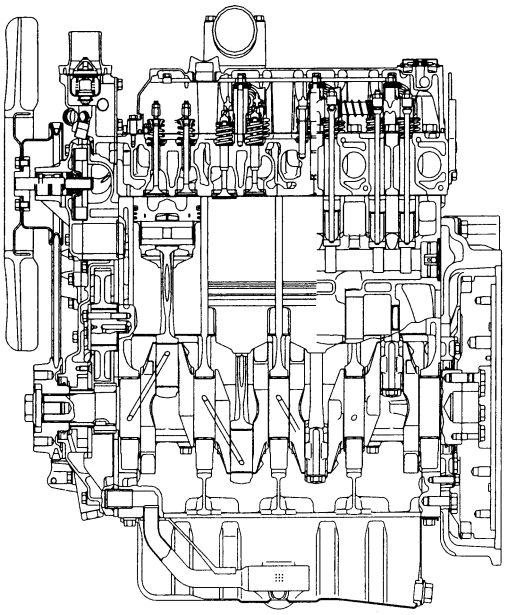
(1) Auxiliary Control Valve
(2) Control Valve (for 3-point Hitch)
(3) Lowering Speed Adjusting Valve
(4) Cylinder Safety Valve
(5) Power Steering Controller
(6) Steering Cylinder
(7) Brake Piston
(8) Brake Master Cylinder
(9) Oil Cooler Relief Valve (for ROPS Model)
(10) Oil Cooler
(11) PTO Clutch Pack
(12) Relief Valve (for Lubricating Line)
(13) PTO Valve
(14) Oil Cooler Check Valve (for CABIN Model)
(15) Exterior Hydraulic Cylinder
(16) Shuttle Clutch Pack
(17) Relief Valve for 3-point Hitch
(18) Shuttle Valve
(19) Hydraulic Pump (Power Steering, Brake, PTO Clutch and Shuttle Clutch)
(20) Oil Tank (Transmission Case)
(21) Hydraulic Oil Filter Cartridge
(22) Hydraulic Pump (for 3-point Hitch)
(23) Hydraulic Outlet

A : To Implement Cylinder
B : To Implement Cylinder
N : N Port

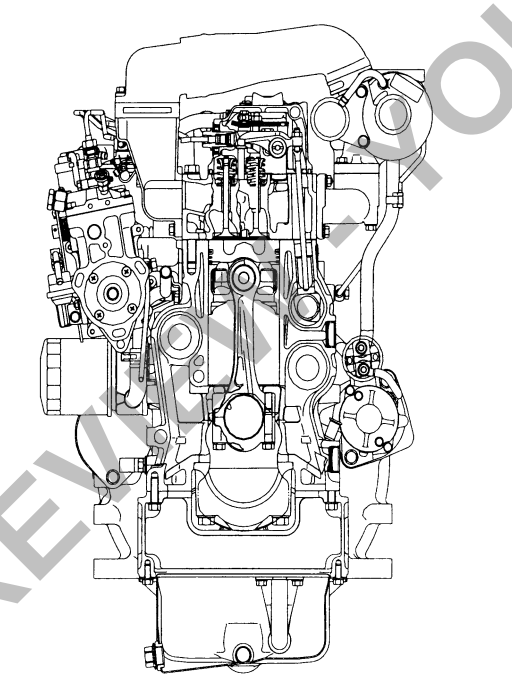
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1. FEATURE



3EEABAC1P001D



3EEABAC1P002D

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

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

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

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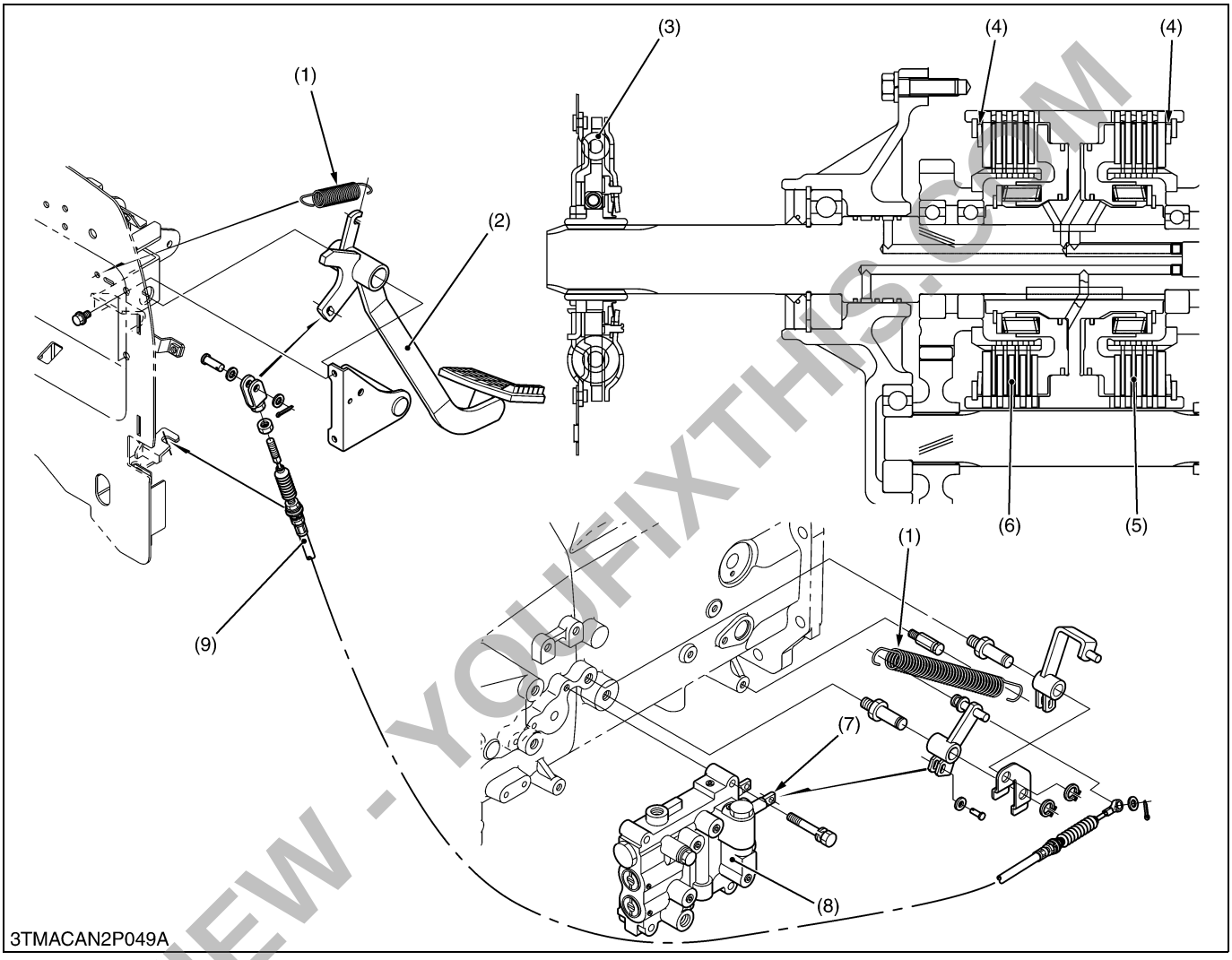
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1. TRAVELING CLUTCH

[1] HYDRAULIC SHUTTLE MODEL

(1) Structure



(1) Return Spring
(2) Clutch Pedal
(3) Damper Disc
(4) Belleville Washer (Cupped Spring Washer)
(5) Forward Side Clutch
(6) Reverse Side Clutch
(7) Clutch Spool
(8) Hydraulic Shuttle Valve
(9) Clutch Cable

The damper disc (3) helps ease the shock load when engaging the shuttle clutch.

The belleville washer (cupped spring washer) (4) helps ease the engaging shock together with modulating valve effect.

The hydraulic shuttle clutch, which switches forward and reverse running, function as the traveling clutch. When the clutch pedal (2) is depressed, the clutch spool of shuttle valve (8) moves via the clutch cable (9).

As for the oil, it does not flow to both the forward side (5) and reverse side (6) of the clutch pack, the clutch pack enters the state of “Disengaged” and power is not transmitted.

■ **NOTE**

- **Refer to “3. TRANSMISSION” section.**

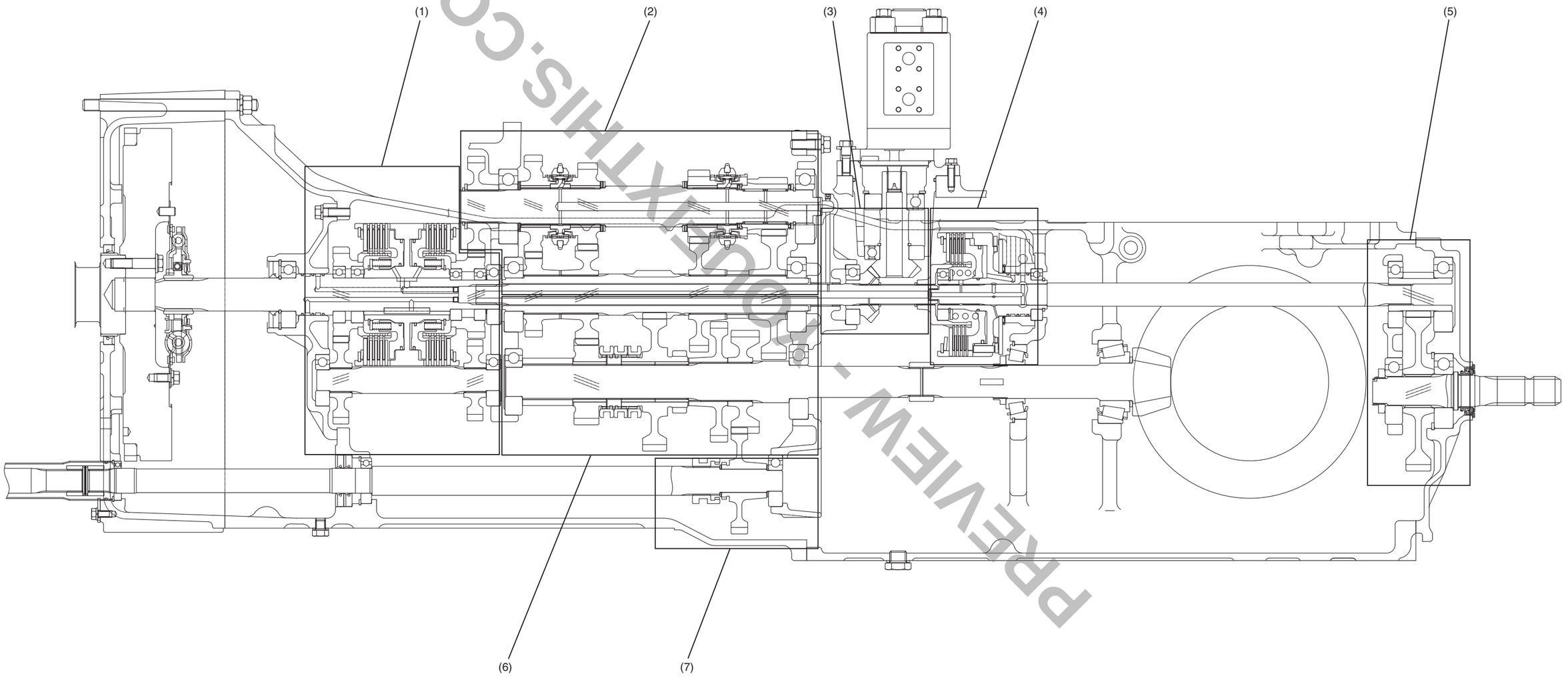
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1. STRUCTURE

[1] HYDRAULIC SHUTTLE MODEL

(1) F8/R8 Speed Transmission Model

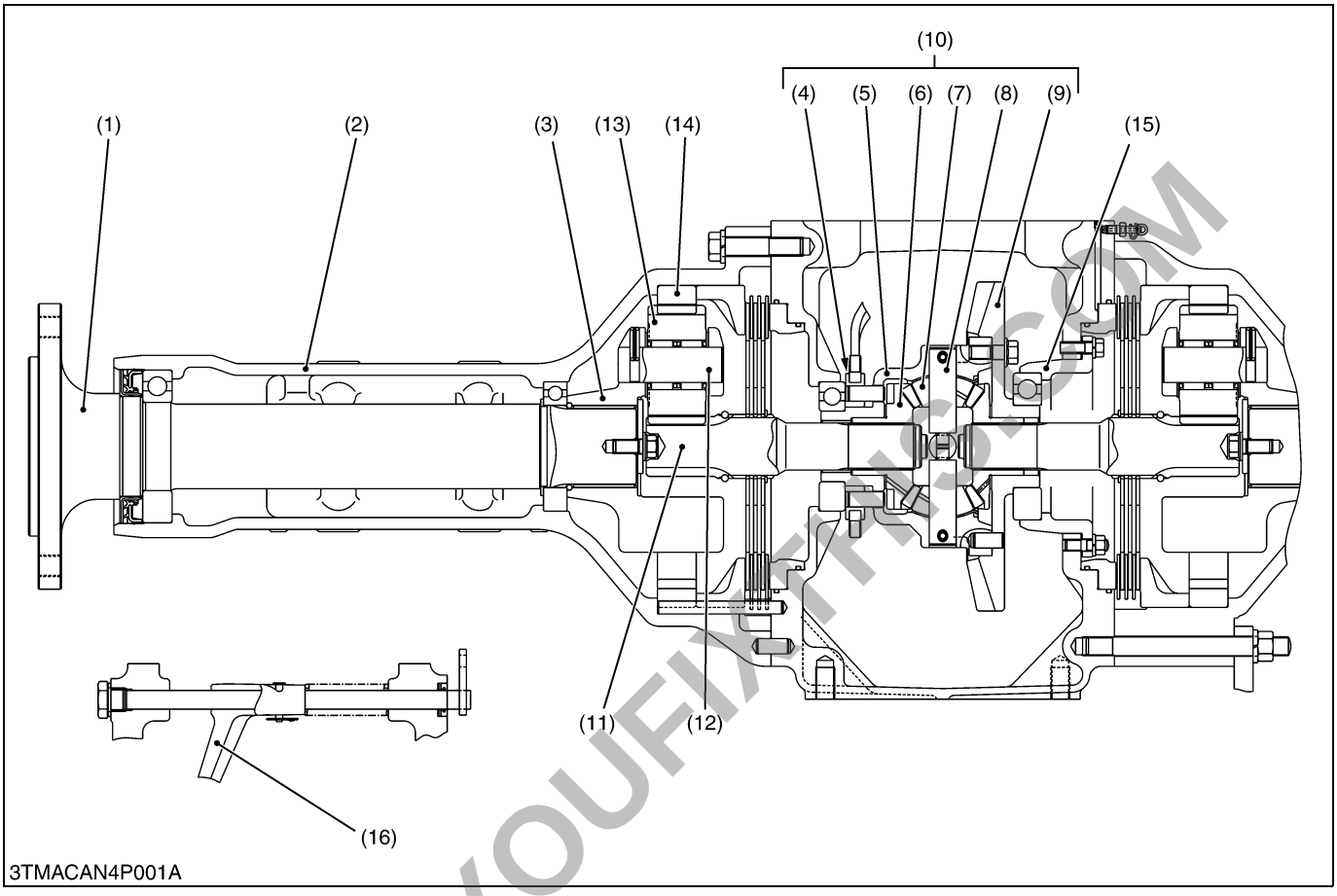


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(1) Hydraulic Shuttle Section (2) Main Gear Shift Section (3) Hydraulic Pump Drive Section (4) PTO Clutch Section (5) PTO Gear Section (6) Auxiliary Gear Shift Section (7) Four Wheel Drive Section

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1. FEATURES



(1) Rear Axle
(2) Rear Axle Case
(3) Planetary Gear Support
(4) Differential Lock Shifter
(5) Differential Case
(6) Differential Side Gear
(7) Differential Pinion Gear
(8) Differential Pinion Shaft
(9) 35T Bevel Gear
(10) Differential Gear
(11) Brake Shaft (12T Gear)
(12) Planetary Gear Pin
(13) 27T Planetary Gear
(14) 66T Internal Gear
(15) Differential Bearing Support
(16) Differential Lock Shift Fork

The rear axles are the final mechanism which transmit power from the transmission to the rear wheels. Direction of power transmitted is changed at a right angle by the differential gear (10) and, at the same time, speed is reduced. It is further reduced by the planetary gear to drive the rear axles.

The rear axles (1) are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

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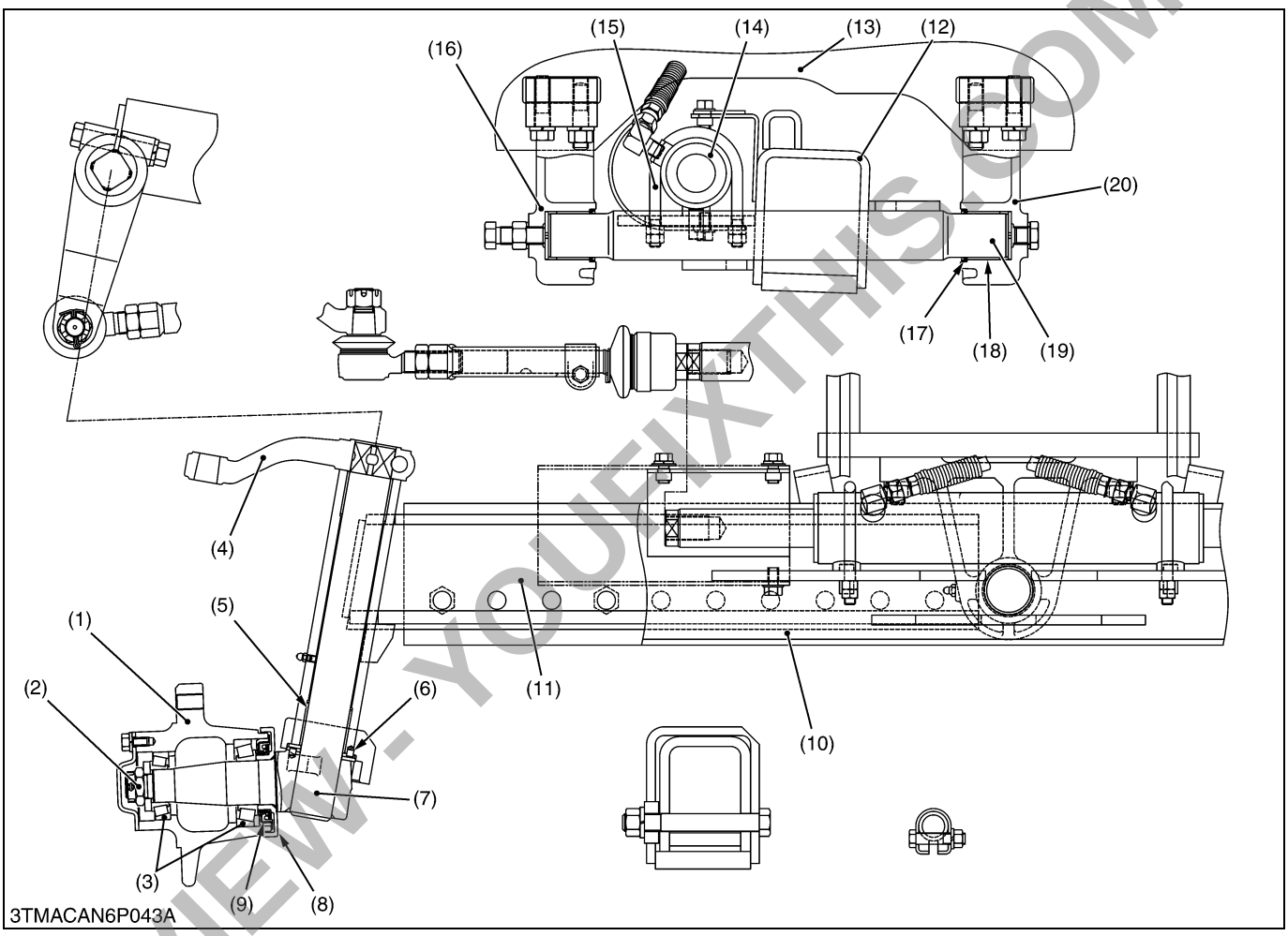
1. STRUCTURE

The front axle supports the front of tractor and facilitates steering.
There are two kinds of front axles.
The two-wheel drive axle has free-running front wheels and four-wheel drive axle has powered front wheels.

■ **NOTE**

- **Refer to "6. FRONT AXLE" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

[1] 2 WHEEL DRIVE



(1) Front Wheel Hub
(2) Slotted Nut
(3) Taper Roller Bearing
(4) Knuckle Arm
(5) Knuckle Shaft Bushing
(6) Knuckle Shaft Dowel Pin
(7) Knuckle Shaft
(8) Knuckle Dust Proof Cover
(9) Knuckle Stub Gasket
(10) Front Axle Middle
(11) Front Axle
(12) Front Axle Support
(13) Front Axle Bracket
(14) Power Steering Cylinder
(15) Power Steering Cylinder Bracket
(16) Bracket (Front)
(17) Oil Seal
(18) Bushing
(19) Center Pin
(20) Bracket (Rear)

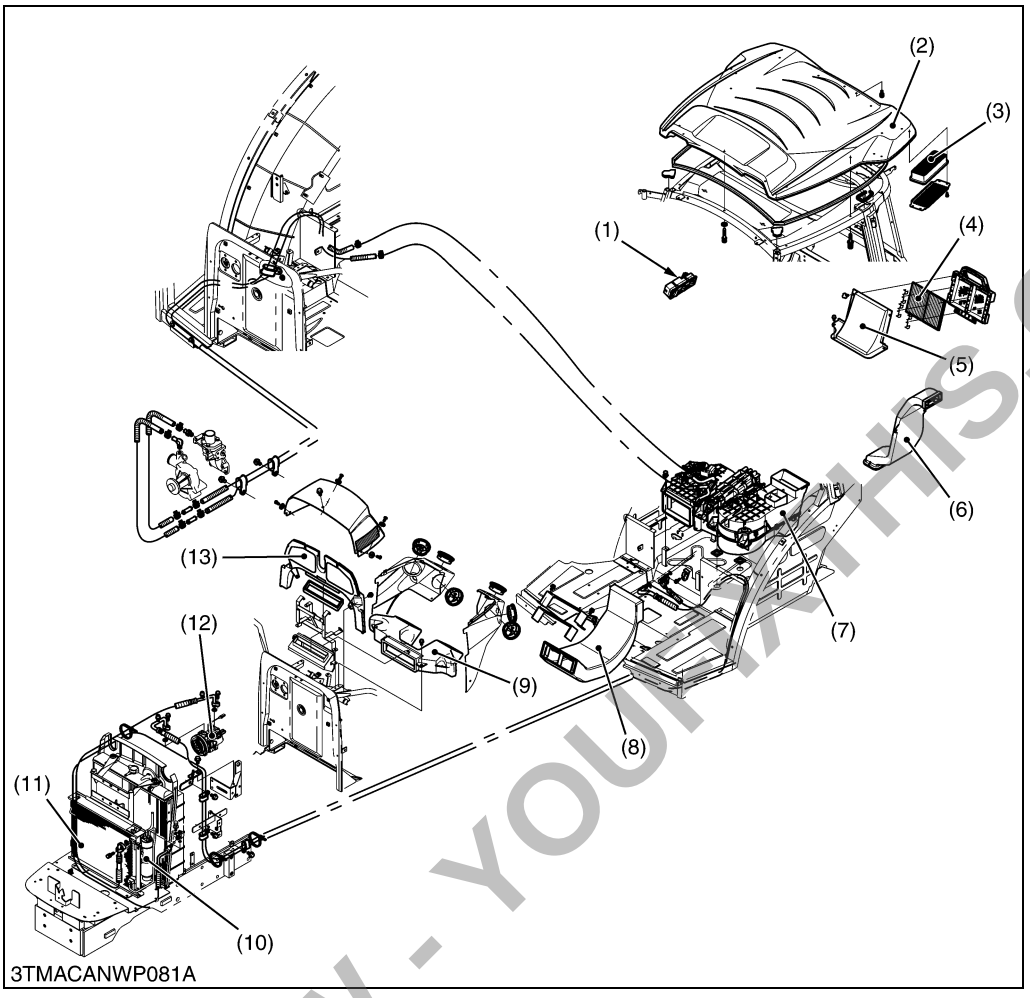
The front axle of the 2WD model is constructed as shown above.
The knuckle shaft (7) is installed to the front axle (11) by the **"RUMOAN"** method.
With this method, the shape of the front axle is relatively simple, and front axle is supported at its center with the front axle support (12) on the front axle bracket (13), so that steering operation is stable even on an uneven ground encountered in a farm field.

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1. AIR CONDITIONING SYSTEM

[1] STRUCTURE



(1) Control Panel
(2) Outer Roof
(3) Fresh Air Filter
(4) Inner Air Filter
(5) Inner Air Duct
(6) Fresh Air Duct
(7) Air Conditioner Unit
(8) Front Duct
(9) Dashboard Blow Port
(10) Receiver
(11) Condenser
(12) Compressor
(13) Defroster Blow Port

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This cabin is equipped with the inner air circulation/outside air inhalation type large capacity thin air conditioner.

The inner air inhaled from the inner air filter (4) provided behind the seats goes through the inner air duct (5) and goes into the air conditioner unit (7). The fresh air inhaled from the fresh air filter (3) goes through the center pillar on the left and goes into the air conditioner unit (7) via the fresh air duct (6).

The inner air and fresh air inhaled into the air conditioner unit (7) is cooled and dehumidified in the cooling section of the air conditioner unit (7). The comfortable air, warmed moderately with the heater, comes from the air duct with low humidity.

The six dashboard air outlets allow opening and closing, and adjusting direction of winds. The defroster air outlet is opened and closed by moving the mode dial on the control panel (1).

Capacity (Cooling)	Factory spec.	3.95 kW
Capacity (Warming)	Factory spec.	4.30 kW
Kinds of refrigerant (Charge amount)	Factory spec.	R134a 0.85 to 0.95 kg 1.87 to 2.09 lbs
Pressure sensor (Low)	Factory spec.	0.196 MPa 2.0 kgf/cm^2 28.4 psi
Pressure sensor (High)	Factory spec.	3.14 MPa 32.0 kgf/cm^2 455 psi

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5. TIGHTENING TORQUES

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

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Indication on top of bolt	⬡ 4 No-grade or 4T			⬡ 7 7T						⬡ 9 9T		
Material of bolt	SS400, S20C			S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit / Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6 (6 mm, 0.24 in.)	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8 (8 mm, 0.31 in.)	18 to 20	1.8 to 2.1	13 to 15	17 to 19	1.7 to 2.0	13 to 14	24 to 27	2.4 to 2.8	18 to 20	18 to 20	1.8 to 2.1	13 to 15	30 to 34	3.0 to 3.5	22 to 25
M10 (10 mm, 0.39 in.)	40 to 45	4.0 to 4.6	29 to 33	32 to 34	3.2 to 3.5	24 to 25	48 to 55	4.9 to 5.7	36 to 41	40 to 44	4.0 to 4.5	29 to 32	61 to 70	6.2 to 7.2	45 to 52
M12 (12 mm, 0.47 in.)	63 to 72	6.4 to 7.4	47 to 53	–	–	–	78 to 90	7.9 to 9.2	58 to 66	63 to 72	6.4 to 7.4	47 to 53	103 to 117	10.5 to 12.0	76.0 to 86.7
M14 (14 mm, 0.55 in.)	108 to 125	11.0 to 12.8	79.6 to 92.5	–	–	–	124 to 147	12.6 to 15.0	91.2 to 108	–	–	–	167 to 196	17.0 to 20.0	123 to 144
M16 (16 mm, 0.63 in.)	167 to 191	17.0 to 19.5	123 to 141	–	–	–	197 to 225	20.0 to 23.0	145 to 166	–	–	–	260 to 304	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	246 to 284	25.0 to 29.0	181 to 209	–	–	–	275 to 318	28.0 to 32.5	203 to 235	–	–	–	344 to 402	35.0 to 41.0	254 to 296
M20 (20 mm, 0.79 in.)	334 to 392	34.0 to 40.0	246 to 289	–	–	–	368 to 431	37.5 to 44.0	272 to 318	–	–	–	491 to 568	50.0 to 58.0	362 to 419

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[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit / Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8 (8 mm, 0.31 in.)	12 to 15	1.2 to 1.6	8.7 to 11	8.9 to 11	0.90 to 1.2	6.5 to 8.6
M10 (10 mm, 0.39 in.)	25 to 31	2.5 to 3.2	18 to 23	20 to 25	2.0 to 2.6	15 to 18
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1
M14 (14 mm, 0.55 in.)	62 to 73	6.3 to 7.5	46 to 54	–	–	–
M16 (16 mm, 0.63 in.)	98.1 to 112	10.0 to 11.5	72.4 to 83.1	–	–	–
M18 (18 mm, 0.71 in.)	172 to 201	17.5 to 20.5	127 to 148	–	–	–

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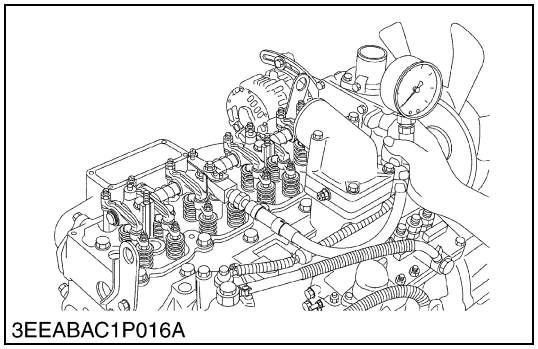
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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body


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Compression Pressure

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

■ **NOTE**

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

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

Tightening torque	Nozzle holder clamp nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 lbf·ft
	Overflow pipe assembly retaining screw	9.8 to 11.3 N·m 1.0 to 1.15 kgf·m 7.23 to 8.32 lbf·ft
	Cylinder head cover screw	6.9 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.32 lbf·ft
	Injection pipe retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 lbf·ft

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	G-9
	Air in the fuel system	Vent air	G-38
	Water in the fuel system	Change fuel and repair or replace fuel system	G-9, 29
	Fuel hose clogged	Clean or replace	G-25
	Fuel filter clogged	Replace	G-31
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-9, 11
	Fuel with low cetane number	Use specified fuel	G-9, 11
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S42
	Incorrect injection timing	Adjust	1-S19
	Injection nozzle clogged	Repair or replace	1-S21, 42
	Injection pump malfunctioning	Repair or replace	1-S19, 57
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw and nozzle holder	1-S42, 43, 44, 45
	Improper valve timing	Correct or replace timing gear	1-S61
	Piston ring and cylinder worn	Replace	1-S78, 79, 83
	Excessive valve clearance	Adjust	1-S15
	Stop solenoid malfunctioning	Replace	9-S16
Starter Does Not Run	Battery discharged	Charge	9-S8
	Starter malfunctioning	Repair or replace	9-S15
	Key switch malfunctioning	Replace	9-S12
	Wiring disconnected	Connect	–

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SPECIFICATIONS

Model			M8540		M9540	
			2WD	4WD	2WD	4WD
Engine	Model		V3800DI-TE2 / V3800DI-TE3			
	Type		Vertical, water-cooled, 4-cycle direct injection diesel engine with turbo charger and EGR (TE3)			
	Number of cylinders		4			
	Total displacement		3769 cm^3 (230.0 cu.in.)			
	Bore and stroke		100 × 120 mm (3.9 × 4.7 in.)			
	Rated speed		2600 min^{-1} (rpm)			
	Net power*1	E2 Engine	62.6 kW (84.0 HP)		70.8 kW (95.0 HP)	
	PTO power*1	E2 Engine	56.0 kW (75 HP)		62.7 kW (84 HP)	
	Maximum torque	E2 Engine	283 N·m (28.9 kgf·m, 208.7 lbf·ft) / 1400 to 1600 min^{-1} (rpm)		316 N·m (32.2 kgf·m, 233.1 lbf·ft) / 1400 to 1600 min^{-1} (rpm)	
	Net power*1	E3*2 Engine	63.7 kW (85.5 HP)		70.8 kW (95.0 HP)	
	PTO power*1	E3*2 Engine	56.6 kW (76 HP)		62.7 kW (84 HP)	
	Maximum torque	E3*2 Engine	286 N·m (29.2 kgf·m, 211 lbf·ft) / 1500 to 1700 min^{-1} (rpm)		316 N·m (32.2 kgf·m, 233.1 lbf·ft) / 1500 to 1700 min^{-1} (rpm)	
	Battery capacity		12 V, CCA : 900 A			
	Fuel		Diesel fuel No. 1 [below −10 °C (14 °F], Diesel fuel No. 2-D [above −10 °C (14 °F)]			
	Fuel tank capacity	ROPS Model	90 L (23.8 U.S.gals, 19.8 Imp.gals)			
	Fuel tank capacity	CABIN Model	110 L (29.1 U.S.gals, 24.2 Imp.gals)			
	Engine oil capacity		10.7 L (11.3 U.S.qts, 9.4 Imp.qts)			
	Coolant capacity		9.0 L (9.5 U.S.qts, 7.9 Imp.qts)			
Dimensions	Overall length		3885 mm (153 in.)	3760 mm (148 in.)	3885 mm (153 in.)	3760 mm (148 in.)
	Overall width (min. tread)		1990 mm (78.0 in.)		2010 mm (79.0 in.)	
	Overall height	ROPS Model	2465 mm (97.0 in.)		2490 mm (98.0 in.)	
	Overall height	CABIN Model	2545 mm (100.0 in.)		2750 mm (101.0 in.)	
	Wheel base		2250 mm (88.6 in.)			
	Tread	Front	1440 to 2040 mm (56.7 to 80.3 in.)	1520, 1620 mm (59.8, 63.8 in.)	1440 to 2040 mm (56.7 to 80.3 in.)	1520, 1620 mm (59.8, 63.8 in.)
	Tread	Rear	1520 to 1920 mm (59.8 to 75.6 in.)			
	Minimum ground clearance		425 mm (16.7 in.) (Drawbar bracket)		450 mm (17.7 in.) (Drawbar bracket)	
Weight	ROPS		2270 kg (5004 lbs)	2450 kg (5401 lbs)	2310 kg (5093 lbs)	2500 kg (5512 lbs)
	CABIN		2540 kg (5600 lbs)	2740 kg (6040 lbs)	2580 kg (5690 lbs)	2800 kg (6175 lbs)
Traveling system	Standard tire size	Front	7.5-18	11.2-24	7.5-18	12.4-24
	Standard tire size	Rear	18.4-28		18.4-30	
	Clutch*3		Dry, single plate / Multiple wet discs			
	Shuttle		Wet disc type synchro / Hydraulic			
	Transmission*4		F8/R8 fully synchronized / F12/R12 fully synchronized			
	Steering		Hydraulic power steering			
	Braking system	Traveling	Hydraulic wet discs			
	Braking system	Parking	Mechanical gear lock			
	Differential	Front	LSD (Limited Slip Differential)			
	Differential	Rear	Bevel gears with differential lock			

Note : *1 : Manufacture's estimate
*2 : Refer to G-3.
*3 : Dry, single plate type clutch for wet disc type synchro shuttle model multiple wet discs type clutch for hydraulic shuttle model.
*4 : F12/R12 speed transmission for hydraulic shuttle model.

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6. MAINTENANCE

No.	Item			Indication on hour meter														Interval	Important		Reference page
				50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Engine start system		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-22
2	Wheel bolt torque		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-23
3	Battery condition		Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*4		G-24
4	Greasing		–		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-27
5	Fan belt		Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
6	Brake pedal		Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
7	Clutch pedal [Synchro shuttle model]		Adjust	★	☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-18
8	Air cleaner element [Double type]	Primary element	Clean		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*1	@	G-25
			Replace															every 1 year	*2		G-25
		Secondary element	Replace															every 1 year			G-25
9	Fuel line		Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		@	G-26
			Replace															every 2 years			G-26
10	Parking brake cable		Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		@	G-26
			Replace															every 2 years			G-38
11	Toe-in		Adjust				☆				☆				☆			every 200 Hr			G-30
12	Fuel tank water		Drain				☆				☆				☆			every 200 Hr			G-30
13	Power steering oil line		Check				☆				☆				☆			every 200 Hr			G-29
			Replace															every 2 years			G-29
14	Radiator hose and clamp		Check				☆				☆				☆			every 200 Hr			G-29
			Replace															every 2 years			G-29
15	Intake air line		Check				☆				☆				☆			every 200 Hr		@	G-29
			Replace															every 2 years	*3		G-29
16	Engine oil		Change	★					☆						☆			every 300 Hr			G-18
17	Hydraulic oil filter		Replace	★					☆						☆			every 300 Hr			G-19
18	Greasing (2WD front wheel hub)		–								☆							every 400 Hr			G-32
19	Water separator		Clean								☆							every 400 Hr			G-32
20	Fuel filter		Replace								☆							every 400 Hr		@	G-32
21	Engine oil filter		Replace	★											☆			every 600 Hr			G-19

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SAFETY FIRST

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

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

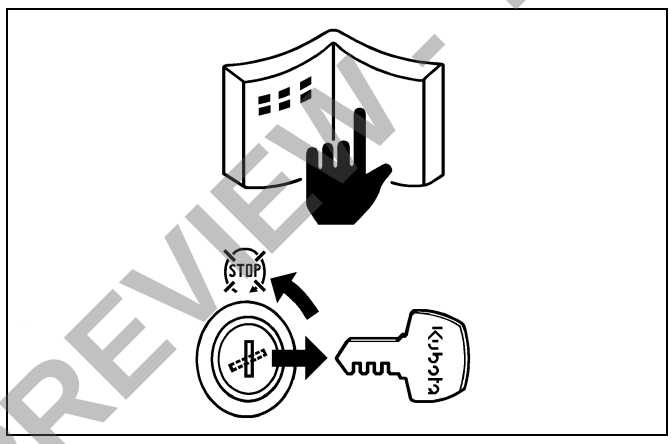
DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

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

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

■ NOTE : Gives helpful information.



BEFORE SERVICING AND REPAIRING

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

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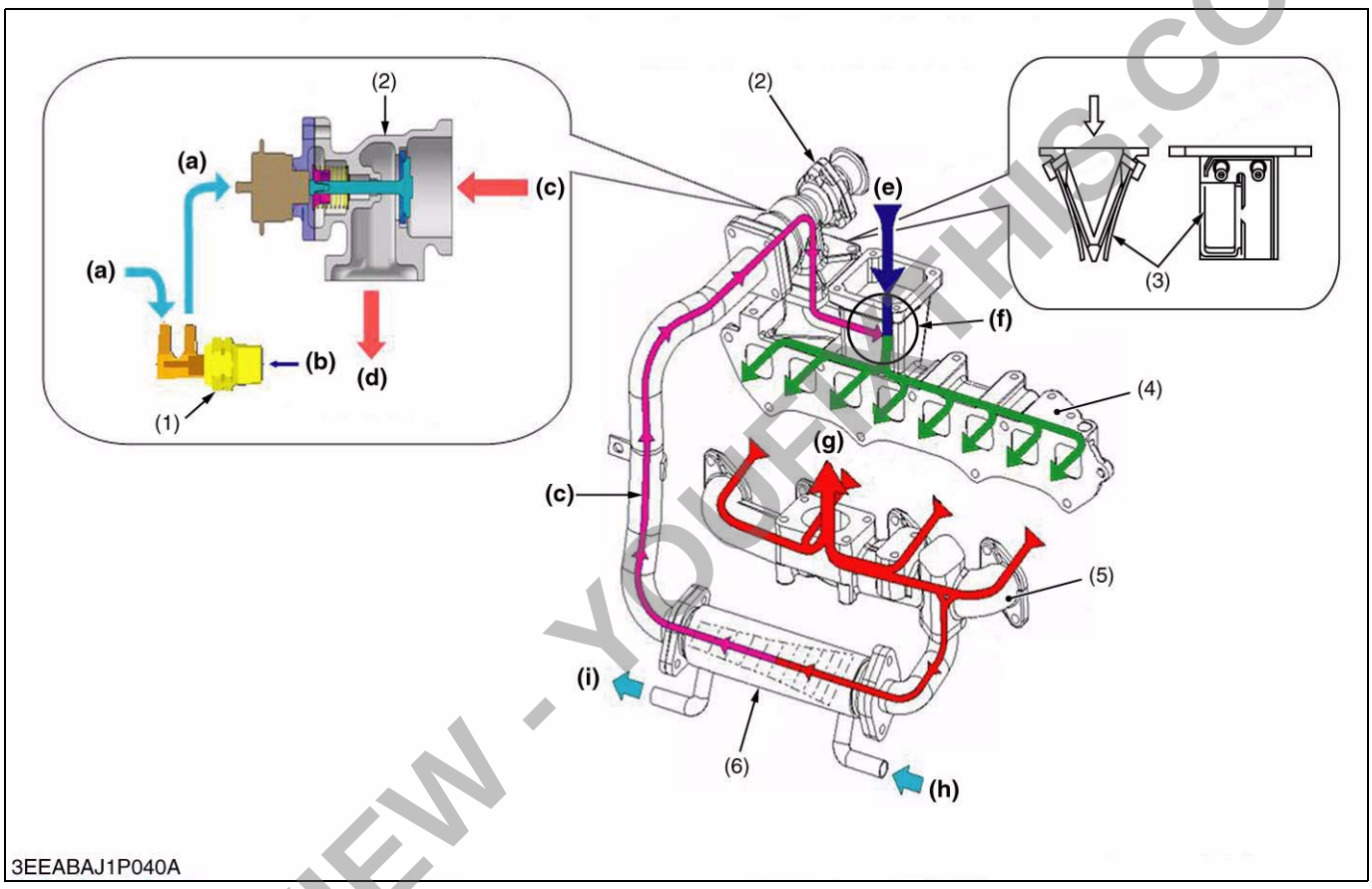
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7. EXHAUST GAS RECIRCULATION (EGR) SYSTEM [FOR E3 ENGINE]

[1] GENERAL

In order to meet the strict emission regulations, Kubota has adopted the EGR on the V3800DI-TE3. The nitrogen oxide (NOx) which is a hazardous component in exhaust gas is generated by oxidation of nitrogen in the air, due to rise of the combustion temperature in cylinders. The EGR is a system in which the exhaust gas with lean oxygen is cooled and returned to cylinders again in order to lower the combustion temperature. As a result, NOx can be decreased.

(1) External / Mechanical EGR



(1) Thermo Valve
(2) Mechanical EGR Valve
(3) Reed Valve
(4) Intake Manifold
(5) Exhaust Manifold
(6) EGR Cooler

(a) Boost Pressure
(b) Coolant Temperature
(c) Cooled EGR Gas
(d) To The Intake Manifold
(e) Fresh Air
(f) Cooled EGR Gas Merges with Fresh Air
(g) Exhaust
(h) Coolant Inlet
(i) Coolant Outlet

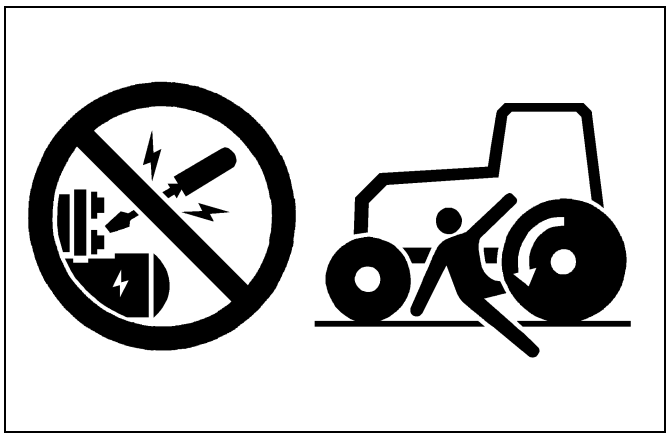
External / Mechanical EGR consists of water cooled EGR cooler (6), mechanical EGR valve (2), reed valve (3) and thermo valve (1).

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

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

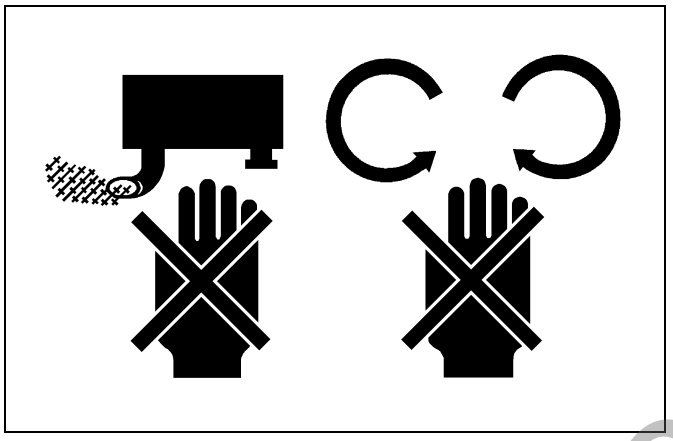
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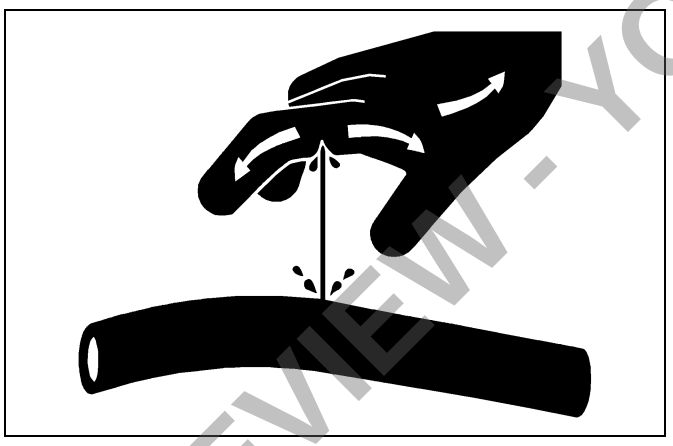
SAFETY STARTING

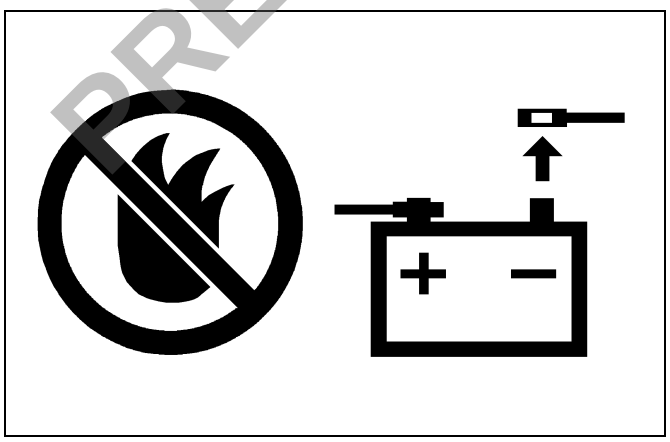
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



SAFETY WORKING

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





AVOID FIRES

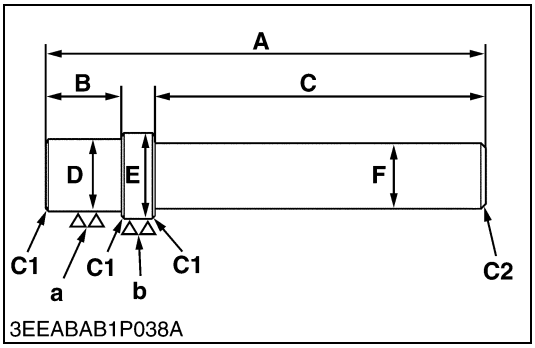
- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open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

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■ **NOTE**

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



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Small End Bushing Replacing Tool

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

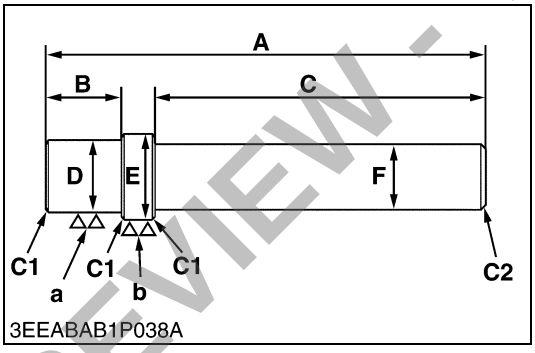
[Press out]

A	157 mm (6.1811 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.0 mm dia. (1.1811 in. dia.)
E	32.95 mm dia. (1.2972 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

[Press fit]

A	157 mm (6.1811 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.0 mm dia. (1.1811 in. dia.)
E	42.000 mm dia. (1.6535 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

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Idle Gear Bushing Replacing Tool

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

A	196 mm (7.7165 in.)
B	37.5 mm (1.476 in.)
C	150 mm (5.9055 in.)
D	44.95 mm dia. (1.7697 in. dia.)
E	48.075 to 48.100 mm dia. (1.8927 to 1.8937 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

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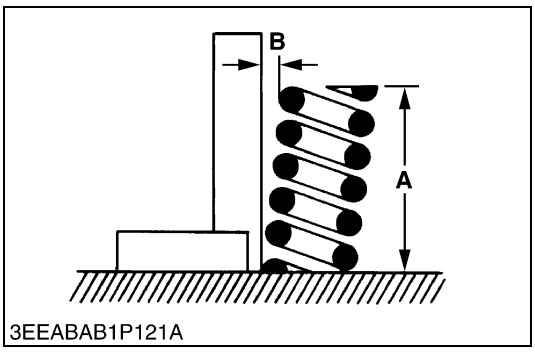
ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Timing Gear			
Idle Gear 1 to Crank Gear	Backlash	0.049 to 0.193 mm 0.0019 to 0.0076 in.	0.22 mm 0.0087 in.
Idle Gear 1 to Cam Gear	Backlash	0.049 to 0.189 mm 0.0019 to 0.0074 in.	0.22 mm 0.0087 in.
Idle Gear 1 to Idle Gear 2	Backlash	0.044 to 0.185 mm 0.0017 to 0.0073 in.	0.22 mm 0.0087 in.
Idle Gear 2 to Injection Pump Gear	Backlash	0.044 to 0.177 mm 0.0017 to 0.0070 in.	0.22 mm 0.0087 in.
Cam Gear to Balancer Gear 1	Backlash	0.047 to 0.182 mm 0.0018 to 0.0072 in.	0.22 mm 0.0087 in.
Idle Gear 1 to Balancer Gear 2	Backlash	0.044 to 0.183 mm 0.0017 to 0.0072 in.	0.22 mm 0.0087 in.
Idle Gear Shaft 1, 2 to Idle Gear 1, 2 Bushing	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.10 mm 0.0039 in.
Idle Gear 1, 2 Bushing	I.D.	45.025 to 45.050 mm 1.7726 to 1.7736 in.	–
Idle Gear 1, 2 Shaft	O.D.	44.959 to 44.975 mm 1.7700 to 1.7707 in.	–
Idle Gear	Side Clearance	0.15 to 0.30 mm 0.0059 to 0.0118 in.	0.9 mm 0.0354 in.
Balancer Shaft	Side Clearance	0.070 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Balancer Shaft	Alignment	–	0.02 mm 0.0008 in.
Balancer Shaft	Oil Clearance	0.070 to 0.159 mm 0.0028 to 0.0063 in.	0.2 mm 0.0079 in.
Balancer Shaft Journal	O.D.	50.92 to 50.94 mm 2.0047 to 2.0055 in.	–
Balancer Bearing	I.D.	51.01 to 51.08 mm 2.0083 to 2.0110 in.	–
Piston Pin Bore	I.D.	30.000 to 30.013 mm 1.1811 to 1.1816 in.	30.05 mm 1.1831 in.
Top Ring to Ring Groove	Clearance	0.05 to 0.09 mm 0.0020 to 0.0047 in.	0.15 mm 0.0059 in.
Second Ring to Ring Groove	Clearance	0.093 to 0.120 mm 0.0037 to 0.0047 in.	0.20 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.060 mm 0.0008 to 0.0023 in.	0.15 mm 0.0059 in.

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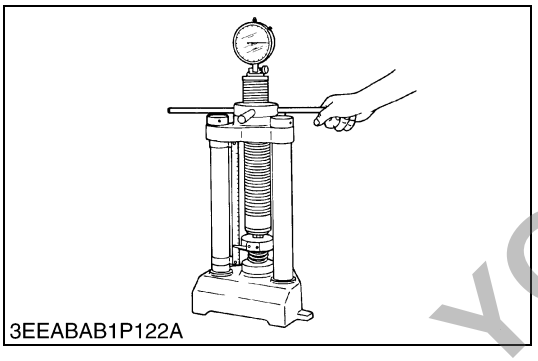
Free Length and Tilt of Valve Spring

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

Free length (**A**)	Factory spec.	Intake valve	35.1 to 35.6 mm 1.38 to 1.40 in.
		Exhaust valve	35.1 to 35.6 mm 1.38 to 1.40 in.
	Allowable limit	Intake valve	34.6 mm 1.36 in.
		Exhaust valve	34.6 mm 1.36 in.

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

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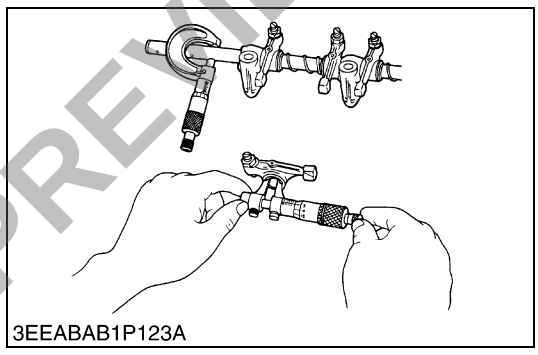

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Valve Spring Setting Load

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

Setting load / setting length	Factory spec.	Intake valve	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.2 lbf / 1.2401 in.
		Exhaust valve	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.2 lbf / 1.2401 in.
	Allowable limit	Intake valve	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbf / 1.2401 in.
		Exhaust valve	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbf / 1.2401 in.

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Oil Clearance between Rocker Arm Shaft and Bearing

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

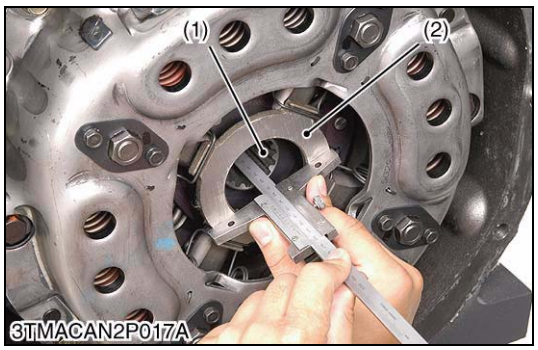
Oil clearance of rocker arm shaft and bearing	Factory spec.	0.016 to 0.045 mm 0.0006 to 0.0018 in.
	Allowable limit	0.15 mm 0.0059 in.

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

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Inspect Release Lever Height

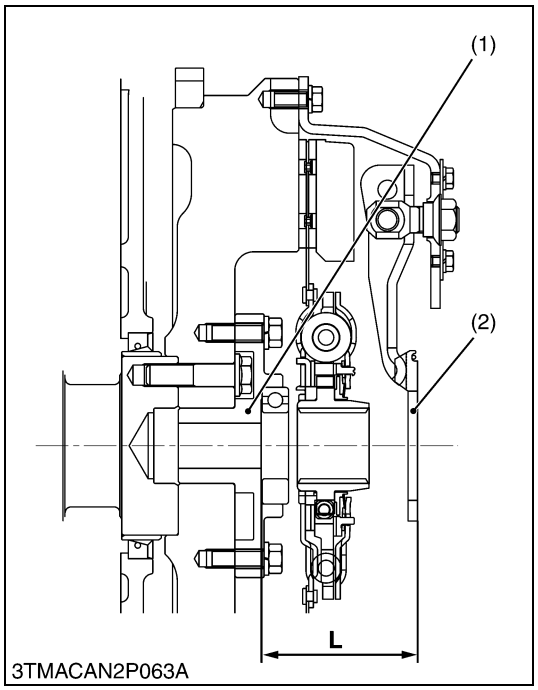
1. Measure the height from spline hub (1) to the lever plate (2) with a scale or vernier calipers.
2. If the height is exceeds the allowable limit, check the clutch disc, pressure plate and other parts.

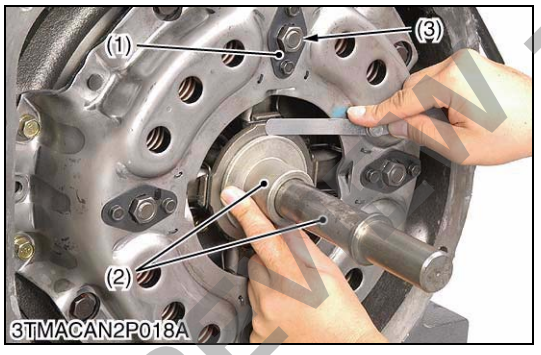
Release lever height (**L**)	Factory spec.	81.7 to 83.3 mm 3.217 to 3.280 in.
	Allowable limit	98.3 mm 3.87 in.

(1) Spline Hub
(2) Lever Plate

L : Release Lever Height

W1031881





Inspect Mutual Difference of Release Levers

1. Insert the clutch center tool (2) (Center bar : Code No. 07916-50203, Gauge ring F : Code No. 07916-52551).
2. Measure the mutual difference of release levers.
3. If the measurement is not within the factory specifications, adjust the height of the highest release lever which contacts with the gauge ring with the nut (3) after removing the lock plate (1) so that their heights become same.

Mutual difference of release levers	Factory spec.	Less than 0.3 mm 0.012 in.

Tightening torque	Lock plate mounting screw	5.9 to 7.8 N·m 0.6 to 0.8 kgf·m 4.3 to 5.8 lbf·ft

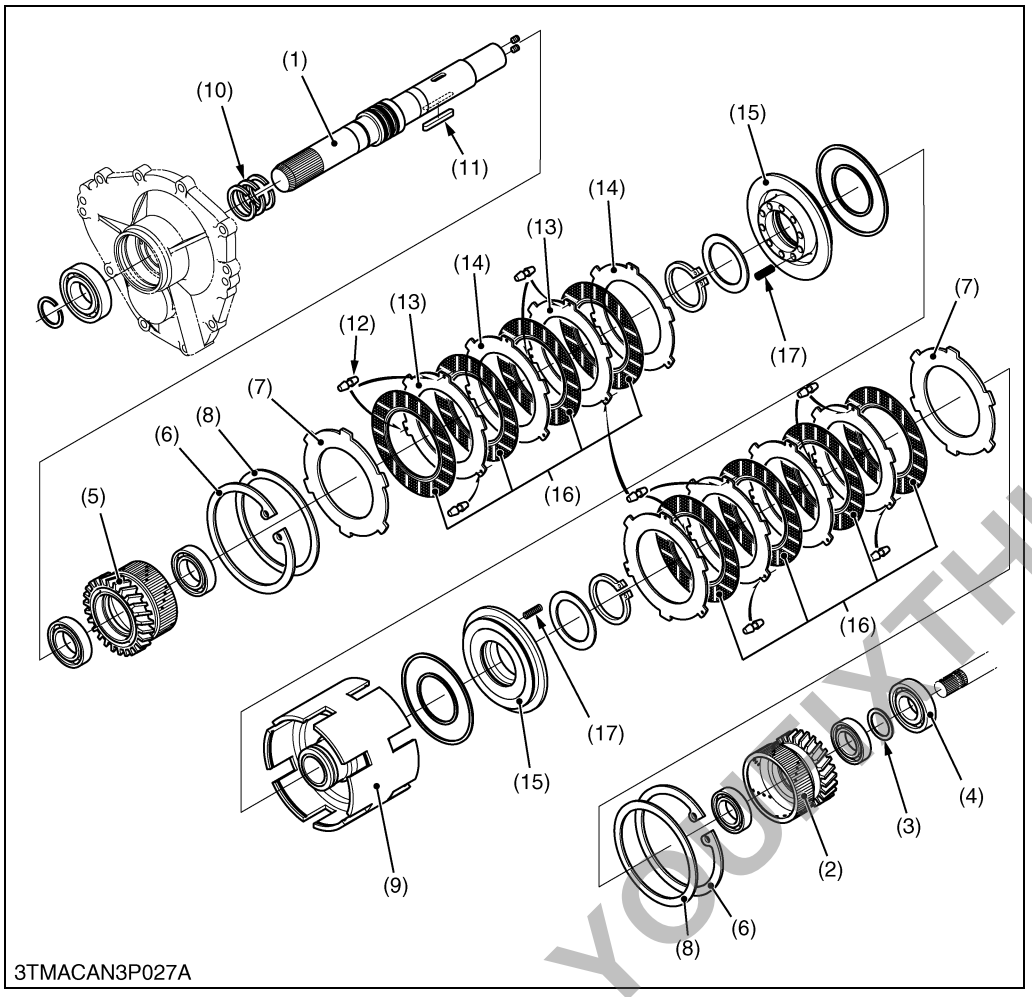
(1) Lock Plate
(2) Clutch Center Tool
(3) Nut

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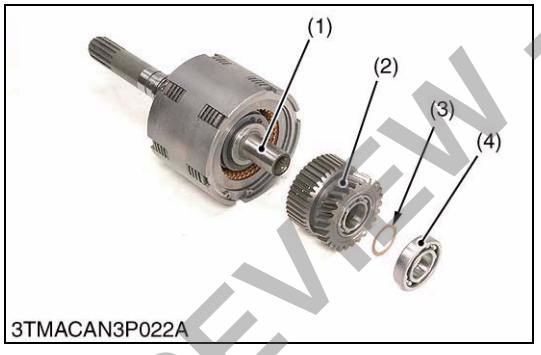
Shuttle Clutch Assembly



3TMACAN3P027A

(1) Input Shaft
(2) 26T Gear
(3) Washer
(4) Bearing
(5) 28T Gear
(6) Internal Circlip
(7) Pressure Plate
(8) Belleville Washer (Cupped Spring Washer)
(9) Clutch Body
(10) Seal Ring
(11) Key
(12) Rubber
(13) Steel Plate with Rubber
(14) Steel Plate without Rubber
(15) Piston
(16) Disc
(17) Spring

W1075928



3TMACAN3P022A



3TMACAN3P023A

1. Remove the bearing (4) and washer (3).
2. Remove the 26T gear (2).
3. Tap out the input shaft (1) with 28T gear (5) to the forward.
4. Remove the internal circlip (1).
5. Remove the pressure plate (2), steel plates (13), (14) and clutch discs (16).

(To be continued)

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SERVICING

CONTENTS

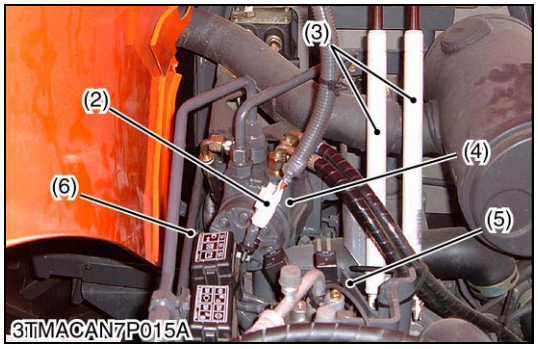
1. TROUBLESHOOTING 5-S1
2. SERVICING SPECIFICATIONS 5-S2
3. TIGHTENING TORQUES 5-S3
4. CHECKING, DISASSEMBLING AND SERVICING 5-S4
   - [1] CHECKING AND ADJUSTING 5-S4
     - (1) Traveling Brake 5-S4
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     - (1) Removing Master Cylinder (ROPS Model) 5-S10
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     - (7) Parking Brake Gear 5-S17
   - [3] SERVICING 5-S19

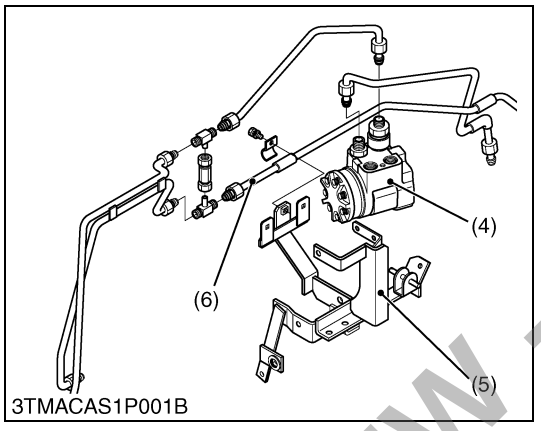
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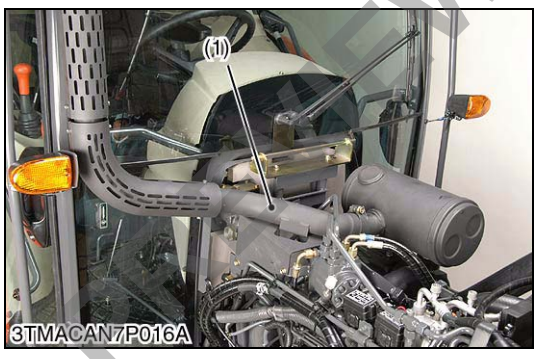
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(2) Removing Steering Controller (CABIN Model)









Bonnet

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

(When reassembling)

- The connector (2) should be placed within the space of controller pipe (6), power steering controller (4) and stay (5).

■ **IMPORTANT**

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

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

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Muffler Pipe

1. Remove the muffler pipe (1).

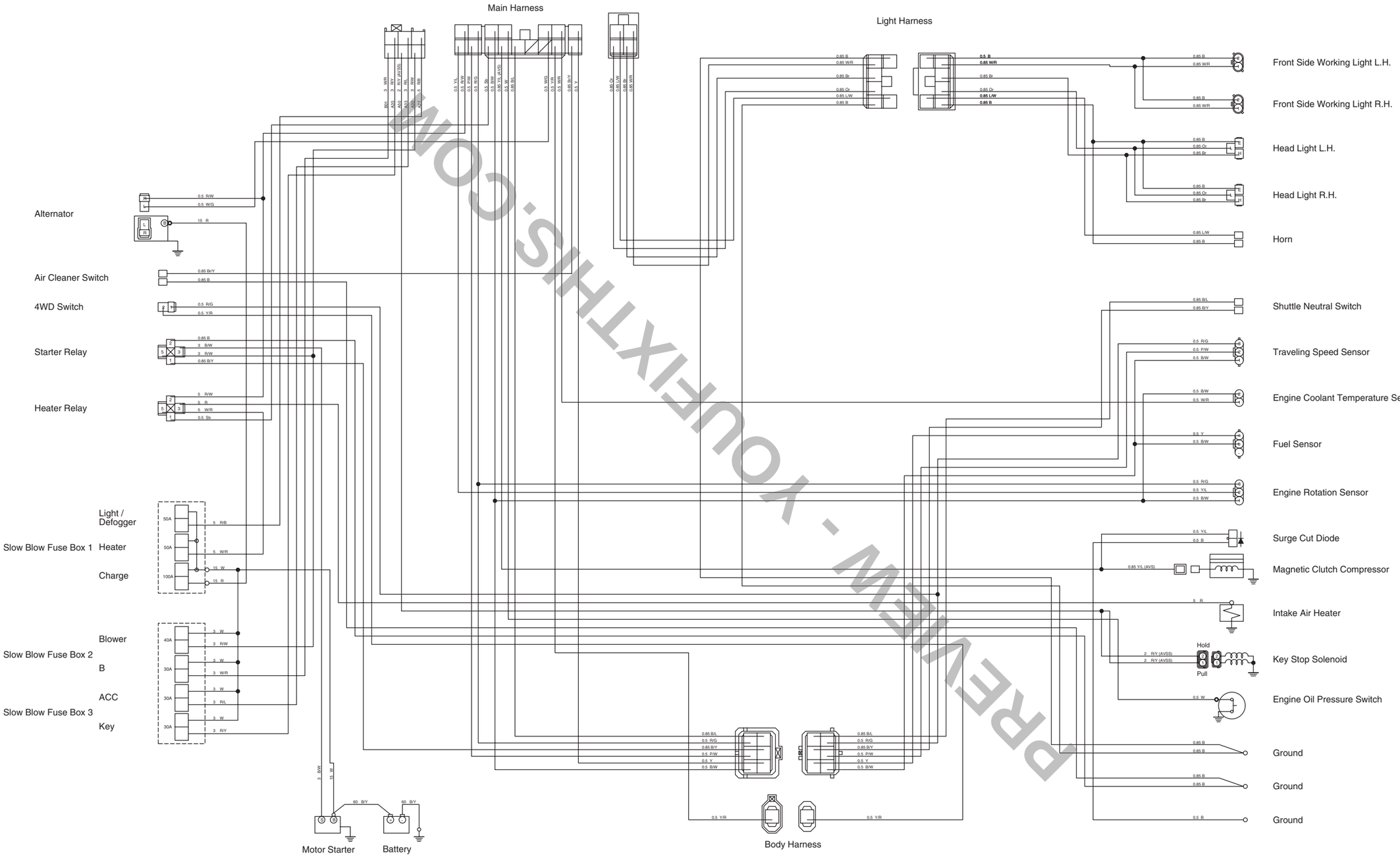
(1) Muffler Pipe

W1021995

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[4] ENGINE HARNESS (CABIN MODEL)



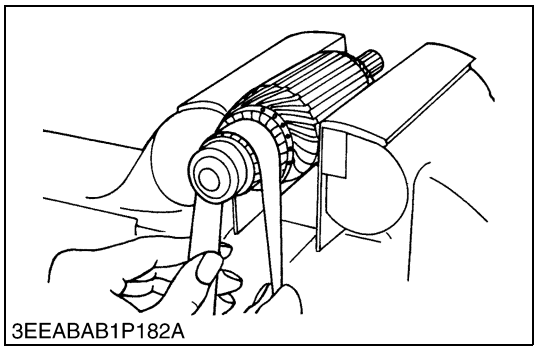
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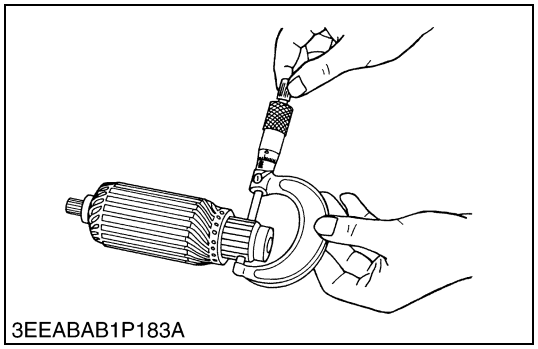
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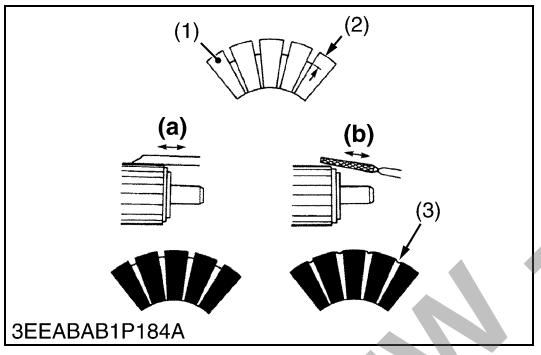
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6. SERVICING

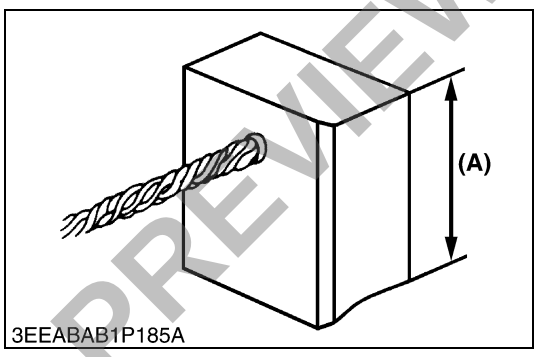
[1] STARTER


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3EEABAB1P183A



3EEABAB1P184A



3EEABAB1P185A

Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory spec.	32 mm 1.2598 in.
	Allowable limit	31.4 mm 1.2362 in.

Mica undercut	Factory spec.	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.

(1) Segment
(2) Depth of Mica
(3) Mica

(a) Good
(b) Bad

W1017092

Brush Wear

1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length (**A**) with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length (**A**)	Factory spec.	18.0 mm 0.7086 in.
	Allowable limit	11.0 mm 0.4331 in.

W1017544

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