

Product: Kubota ZD221 Zero Turn Mower Service Manual

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WSM

WORKSHOP MANUAL

ZD221

Kubota

KiSC issued 04, 2015 A

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TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of ZD221. It is divided into three parts, "General", "Mechanism" and "Servicing".

■ General

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

■ Mechanism

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

Refer to Diesel Engine / Tractor Mechanism Workshop Manual (Code No. 9Y021-01876 / 9Y021-18201) for the one which has not been described to this workshop manual.

■ Servicing

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

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

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

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

February 2009

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Record of Revisions

For pdf, use search function {Search word} to find all the revised locations.

Last digit of the Code No.	Issue month	Main Revised Point and Corrective Measures {Search word}	Reference Page
1	2013.10	Engine model D782-E4-ZD-2 and trochoid pump are added in table. Error characters are corrected. Table and picture are replaced in "Bushing Replacing tool", "Flywheel Stopper" and "Crankshaft Bearing 1 Replacing Tool". "6.86 to 11.3" is corrected to "9.81 to 11.2". The number in the table is corrected. Tables are added in "Cam Height", "Piston Ring Gap".	10 G-7 G-53, G-54 1-S11 1-S17 1-S47, 1-S50



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 try to repair or use this unit.



DANGER

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



WARNING

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



CAUTION

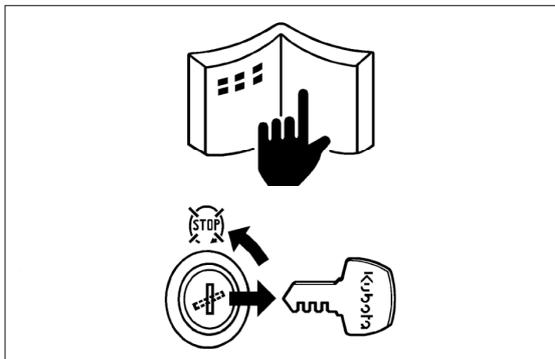
: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

■ IMPORTANT

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

■ NOTE

: Gives helpful information.



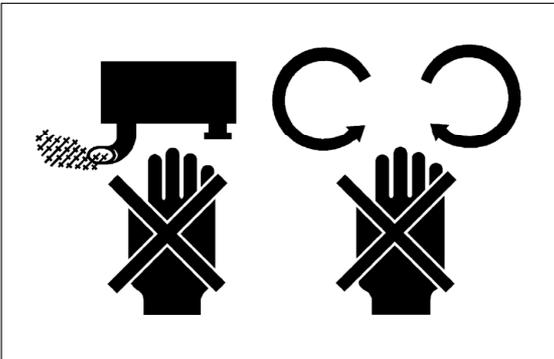
BEFORE SERVICING AND REPAIRING

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



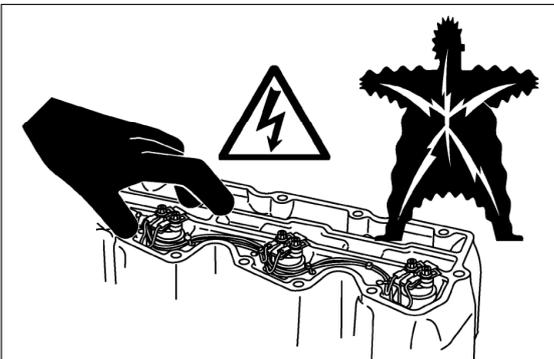
SAFETY STARTING

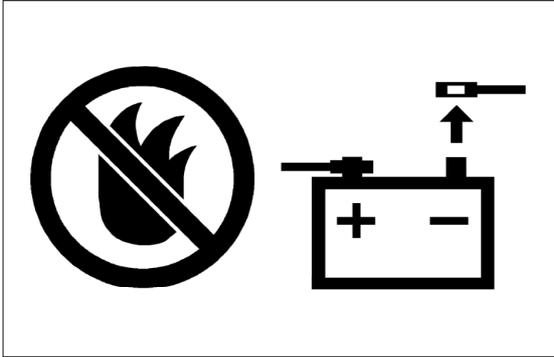
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



SAFETY WORKING

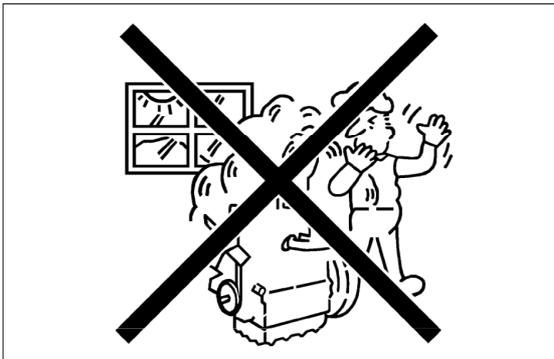
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing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





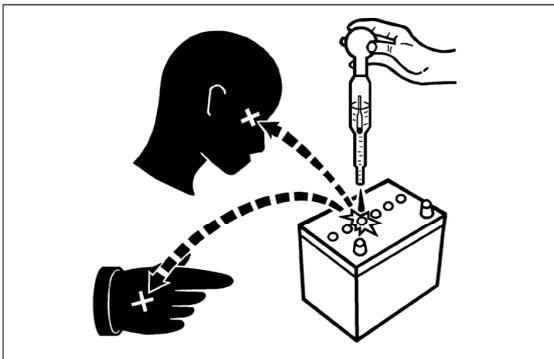
AVOID FIRES

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



VENTILATE WORK AREA

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



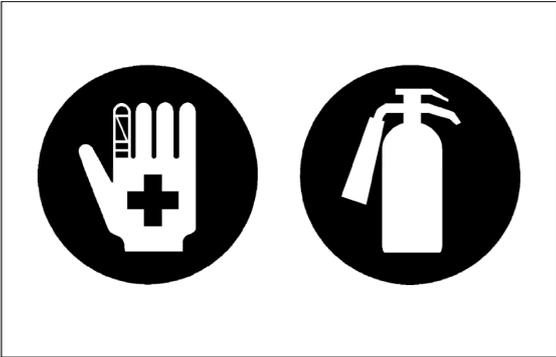
PREVENT ACID BURNS

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



DISPOSE OF FLUIDS PROPERLY

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



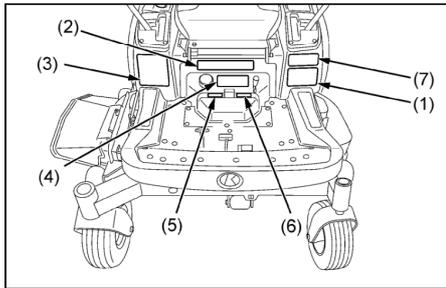
PREPARE FOR EMERGENCIES

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

SAFETY DECALS

The following safety decals 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. K3181-6585-0

<p>⚠ WARNING TO AVOID SERIOUS INJURY OR DEATH</p> <ol style="list-style-type: none"> 1 Park the machine on level ground. 2 If necessary to park on an incline: <ol style="list-style-type: none"> ① Stop the machine. ② Apply the parking brake. ③ Stop the engine. <p>If you stop the engine on an incline without applying the parking brake, the machine could move and runaway.</p> <ol style="list-style-type: none"> 3 If the engine stops suddenly during operation, apply the parking brake immediately to prevent machine runaway. 	<p>⚠ ADVERTENCIA PARA EVITAR LESIONES PERSONALES GRAVES O LA MUERTE</p> <ol style="list-style-type: none"> 1. Estacione la máquina en la tierra del nivel. 2. Si es necesario estacionar en una cuesta: <ol style="list-style-type: none"> ① Apague la máquina. ② Aplique el freno de estacionamiento. ③ Luego apague el motor. <p>Si apaga el motor en una cuesta sin aplicar el freno de estacionamiento, la máquina puede moverse sin control.</p> <ol style="list-style-type: none"> 3. Si la máquina se detiene repentinamente durante la operación, enganche el freno de estacionamiento inmediatamente para evitar la pérdida de control.
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1BDABCQAP093A

(2) Part No. K3271-6585-1

<p>⚠ CAUTION TO AVOID PERSONAL INJURY</p> <ol style="list-style-type: none"> 1 Read and understand the operator's manual before operation. 2 Do not allow other people to use the machine. Have them read the operator's manual. 3 Check the batteries of all fully charged equipment. 4 Before starting the engine, make certain that everyone is at a safe distance from the machine. PTO's, discharge and fuel tank covers are in reverse lock. 5 Remove objects that could be thrown by the blade. 6 Do not operate the machine when children or other persons are around. 	<ol style="list-style-type: none"> 8 Do not carry children or others on the machine at any time. 9 Before dismounting, always PTO clutch lever the implement, place motion control levers in neutral lock position, set the parking brake, stop the engine and remove the key. 10 Wear safety glasses (goggles, shields and earplugs) to ears and hearing. 11 To reduce the fire hazard, keep the exhaust clear of dry grass, dry leaves or other combustible materials. 12 This machine is not for street or highway use. 13 Securely support the machine and equipment before working underneath.
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1BDABDEAP038A

(3) Part No. K3271-6581-0

<p>⚠ WARNING TO AVOID SERIOUS INJURY OR DEATH</p> <ol style="list-style-type: none"> 1. Mow across slopes-Not up and down. 2. Use extreme caution when operating on slopes. 3. Loss of traction may occur when operating on slopes. 4. Drive slowly on slopes. 5. Do not operate on wet slopes. 6. Avoid sudden starts. 7. Execute turns slowly. 	
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<p>⚠ ADVERTENCIA PARA EVITAR LESIONES PERSONALES GRAVES O LA MUERTE</p> <ol style="list-style-type: none"> 1. Corte el césped de manera transversal en las colinas - No de arriba hacia abajo. 2. Tenga mucho cuidado durante la operación en colinas. 3. Se puede perder tracción durante la operación en colinas. 4. Conduzca lentamente en las colinas. 5. No use la máquina en colinas húmedas. 6. Evite arranques súbitos. 7. Realice las vueltas lentamente.
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1BDABCYAP064A

(4) Part No. K3271-6587-0

<p>⚠ PRECAUCIÓN PARA EVITAR LESIONES PERSONALES</p> <ol style="list-style-type: none"> 1. Lea y entienda el manual del operador antes de operar la máquina. 2. No ponga en funcionamiento la máquina a menos que esté capacitado para hacerlo. 3. Antes de permitir que otras personas usen la máquina, asegúrese que lean el manual del operador. 4. Verifique con regularidad el apriete de todas las tuercas y pernos. 5. Antes de arrancar el motor, asegúrese de que todos estén a una distancia segura de la máquina. La toma de fuerza debe estar desactivada y las palancas de control de movimiento bloqueadas en neutro. 6. Retire los objetos que pueden ser lanzados por la cuchilla. 7. No opere la máquina cuando hayan niños u otras personas alrededor. 8. No lleve a niños ni a otras personas en la máquina en ningún momento. 9. Antes de desmontar, desenganche el embrague de la toma de fuerza, baje el implemento, cambie a neutro, aplique el freno de estacionamiento, apague el motor y retire la llave. 10. Mantenga los dispositivos de protección guardados, barreras de protección e interruptores en su lugar y en buen estado de funcionamiento. 11. Para reducir los riesgos de incendio, mantenga el escape exento de hierba seca, hojas secas u otros materiales combustibles. 12. Esta máquina no está diseñada para uso en calles ni carreteras. 13. Use un soporte seguro para la máquina y el implemento antes de trabajar debajo de los mismos.

1BDABCYAP065A

3GZAAAKCP001A

(5) Part No. K3131-6568-1

<p>⚠ CAUTION When Engine is running, do not open this cover.</p>

1BDABDEAP024A

(6) Part No. K3131-6569-1

<p>⚠ PRECAUCIÓN Nunca abra el capó mientras el motor está en funcionamiento.</p>
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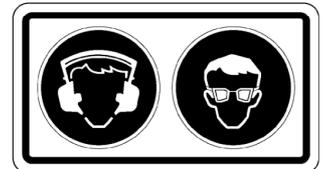
1BDABDEAP025A

(7) Part No. K3271-6571-1 [ZD221]

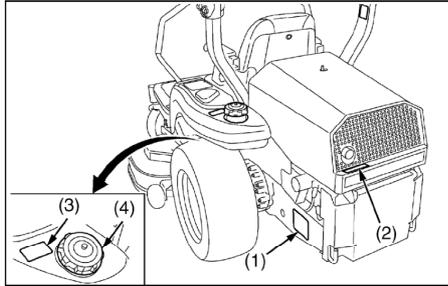
<p>⚠ WARNING Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.</p>
<p>⚠ ADVERTENCIA La operación de este equipo puede generar chispas que puedan iniciar incendios en áreas de vegetación seca. Podría requerirse un pararrayes. El operador debería contactar a las agencias de bomberos locales para informarse sobre leyes o normas relacionadas con los requisitos de prevención de incendios.</p>

1BDABCQAP1570

(7) Part No. K3284-6569-1 [ZD221-AU]



1BDABDMAP011A



(1) Part No. K3271-6583-0

⚠ 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 motion control levers in neutral lock position and PTO OFF. Never start engine while standing on the ground.

⚠ PELIGRO

PARA EVITAR POSIBLES LESIONES PERSONALES O LA MUERTE DEBIDO A ARRANQUE SÚBITO DE LA MÁQUINA.

1. No arranque la máquina cortocircuitando los terminales del arrancador ni omita el interruptor de arranque de seguridad. La máquina puede arrancar en un cambio de velocidad y moverse si se omite el circuito de arranque normal.
2. Arranque el motor solo desde el asiento del operador con las palancas de control de movimiento en la posición de bloqueo neutro y la palanca de toma de fuerza (PTO) en desactivado. Nunca arranque el motor mientras está en el suelo.

1BDABCYAP066A

(2) Part No. K3271-6532-0

CAUTION
HOT EXHAUST

PRECAUCIÓN
ESCAPE CALIENTE

1BDABCYAP067A

(3) [For North American market]
Part No. K3181-6587-2

Gasoline fuel only No fire

ULTRA LOW SULFUR
DIESEL FUEL ONLY

SOLAMENTE COMBUSTIBLE
DIESEL CON NIVELES DE
AZUFRE ULTRA BAJOS

1BDABDEAP087A

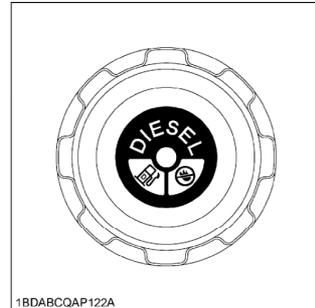
[For other than North American market]
Part No. K3181-6587-2

ULTRA LOW SULFUR
DIESEL FUEL ONLY

If it's used out of north
American market, higher
sulfur fuel may also be
allowed to use as specified
in the Operator's manual.

1BDABDEAP088A

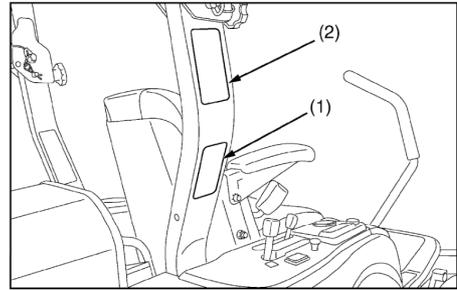
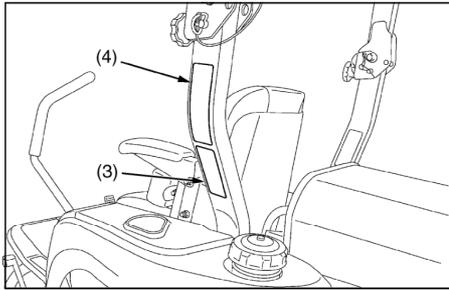
(4) Part No. K3181-2481-1



1BDABCQAP122A

← K3131-6587-1

← K7584-6566-1



(1) Part No. K3181-6564-0

(2) Part No. K3181-6563-0

(3) Part No. K3181-6566-0

(4) Part No. K3181-6565-0

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

⚠ CAUTION
TO AVOID PERSONAL INJURY WHEN RAISING OR FOLDING ROPS:

1. Set parking brake and stop engine.
2. Remove any obstruction that may prevent raising or folding of the ROPS.
3. Do not allow any bystanders.
4. Always perform function from a stable position at the rear of the tractor.
5. Hold the top of the ROPS securely when raising or folding.
6. Make sure all pins are installed and locked.

1BDABCQAP100A

⚠ WARNING

TO AVOID PERSONAL INJURY OR DEATH FROM ROLL-OVER:

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

THERE IS NO OPERATOR PROTECTION WHEN THE ROPS IS IN THE FOLDED POSITION:

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

1BDABCQAP101A

⚠ ADVERTENCIA
Nunca modifique ni repare una estructura de protección contra volcaduras (ROPS) por sus riesgos en inglés) porque soldar, grindar, perforar o cortar cualquier parte puede debilitar la estructura.

⚠ PRECAUCIÓN
PARA EVITAR LESIONES PERSONALES AL ELEVAR O PLEGAR LA ESTRUCTURA DE PROTECCIÓN CONTRA VOLCADURAS:

1. Ponga el freno de estacionamiento para detener el motor.
2. Retire cualquier obstrucción que pueda impedir la elevación o plegado de la estructura de protección contra volcaduras.
3. No permita la presencia de otras personas.
4. Siempre realice la función desde una posición estable en la parte posterior del tractor.
5. Mantenga fija de manera segura la parte superior de la estructura de protección contra volcaduras durante la elevación o plegado.
6. Asegúrese de que todos los pines estén instalados y bloqueados.

1BDABCQAP135A

⚠ ADVERTENCIA

PARA EVITAR LESIONES PERSONALES O LA MUERTE PRODUCIDAS POR VOLCADURAS:

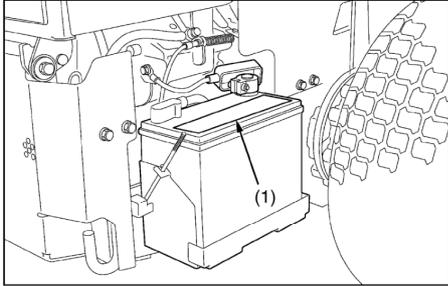
1. Mantenga las estructuras de protección contra volcaduras (ROPS) por sus riesgos en inglés) en posición vertical y bloqueada.
2. Póngase el CINTURÓN DE SEGURIDAD antes de la operación.

EL OPERADOR NO TIENE PROTECCIÓN CUANDO LA ESTRUCTURA DE PROTECCIÓN CONTRA VOLCADURAS ESTÁ EN LA POSICIÓN PLEGADA:

1. Revise el área de operación y plegue la estructura de protección contra volcaduras solo cuando sea absolutamente necesario.
2. No use el CINTURÓN DE SEGURIDAD si la estructura de protección contra volcaduras está plegada.
3. Evite y bloquee la estructura de protección contra volcaduras tan pronto como la permita el espacio libre vertical.
4. Use los procedimientos y advertencias relacionados a la estructura de protección contra volcaduras.

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3GZAAKCP003A



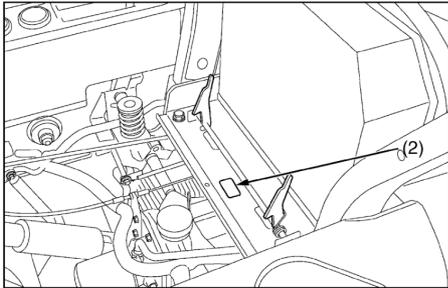
(1) Part No. K3181-6115-1



1BDABCQAP124A

DANGER / POISON

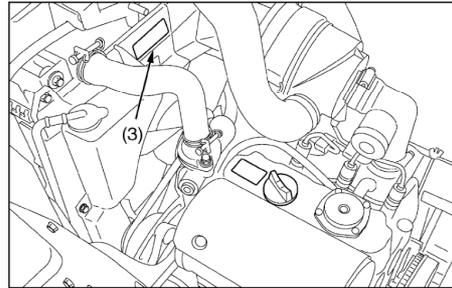
- SHIELD EYES
- EXPLOSIVE GASES can cause blindness or injury.
- NO SPARKS / FLAMES / SMOKING
- SULFURIC ACID can cause blindness or severe burns.
- Flush eyes immediately with water.
- Get medical help fast.



(2) Part No. K3111-6591-1
Do not get your hands close to fan belt.



1BDABCQAP107A

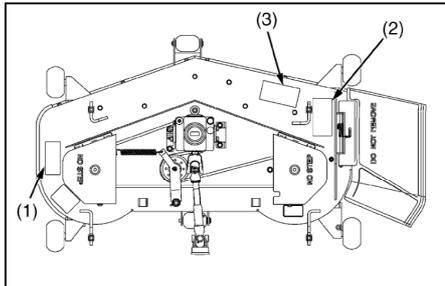


(3) Part No. K3181-6586-1
Do not get your hands close to engine fan and fan belt.



1BDABCQAP108A

3GZAAAKCP004A



(1) Part No. K5681-7312-0



1BDACAEAP015B

(2) Part No. K5681-7311-0



1BDACAEAP016B

(3) Part No. K5681-7310-0



1BDACAEAP017B

CARE OF DANGER, WARNING AND CAUTION LABELS

1. Keep danger, warning and caution labels clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels.
4. If a component with danger, warning and caution 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.

3GZAAKCP005A

SPECIFICATIONS

Model		ZD221-48	ZD221-54	
Engine	Model	D782-E3-ZD-1 / D782-E4-ZD-2		
	Maximum engine power (Gross)	15.7 kW (21 HP) ^{*1}		
	Type	Liquid-cooled		
	Number of cylinders	3		
	Bore and stroke	67 x 73.6 mm (2.64 x 2.90 in.)		
	Total displacement	778 cm ³ (47.5 cu.in.)		
	Rated revolution	3200 min ⁻¹ (rpm)		
	Low idling revolution	1250 to 1350 min ⁻¹ (rpm)		
	Fuel	Diesel fuel No. 1 [below – 10 °C (14 °F)] Diesel fuel No. 2 [above – 10 °C (14 °F)]		
	Starter	Electric starter with battery, glow plug, 12 V, 1.0 kW		
	Lubrication	Forced lubrication by trochoid pump		
	Cooling	Liquid with pressurized radiator		
	Battery	51 R (12 V, RC : 70 min, CCA : 450 A)		
Capacities	Fuel tank	23 L (6.1 U.S.gals, 5.1 Imp.gals)		
	Engine crankcase (with filter)	E3: 3.5 L (3.7 U.S.qts, 3.1 Imp.qts) E4: 3.6 L (3.8 U.S.qts, 3.2 Imp.qts)		
	Engine coolant	1.2 L (1.27 U.S.qts, 1.06 Imp.qts)		
	Recovery tank	0.25 L (0.26 U.S.qts, 0.22 Imp.qts)		
	Transmission including rear axle gear case	7.5 L (7.9 U.S.qts, 6.60 Imp.qts) ^{*3}		
Dimensions	Overall length	2130 mm (83.9 in.)		
	Overall width Without mower deck	1210 mm (47.7 in.)		
	Overall height	With ROPS upright	1775 mm (69.9 in.)	
		With ROPS folded	1320 mm (51.9 in.)	
	Wheel base	1295 mm (51.0 in.)		
	Minimum ground clearance	130 mm (5.12 in.) with 54 in., with 48 in.		
	Tread	Front	860 mm (33.9 in.)	
Rear		930 mm (36.3 in.)		

NOTE: Specifications and design subject to change without notice.

*1 : Manufacturer's estimate

*2 : At 3200 min⁻¹ (rpm)

*3 : Oil amount when the oil level is at the upper level.

Model			ZD221-48	ZD221-54
Weight (with Mower Deck)			545 kg (1202 lbs) with 48 in.	555 kg (1224 lbs) with 54 in.
Travelling system	Tires	Front	13 x 5.0-6 (4PR) Rib	
		Rear	23 x 10.5-12 (4PR) Turf	
	Travelling speeds	Forward	0 to 14.5 km/h (0 to 9.0 mph) ^{*2}	
		Reverse	0 to 8.0 km/h (0 to 5.0 mph) ^{*2}	
	Steering		2-Hand levers	
	Transmission		2-Hydrostatic transmission with gear	
	Parking brake		Wet multi discs / foot applied, released	
	Min. turning radius		0 mm (0 in.)	
PTO	Revolution		1 speed (2530 rpm at 3200 engine rpm)	
	Drive system		Shaft drive, KUBOTA 10 tooth in involute spline	
	Clutch type		Wet multi discs	
	PTO brake		Wet single disc	

NOTE: Specifications and design subject to change without notice.

*1 : Manufacturer's estimate

*2 : At 3200 min⁻¹ (rpm)

*3 : Oil amount when the oil level is at the upper level.

W1030228

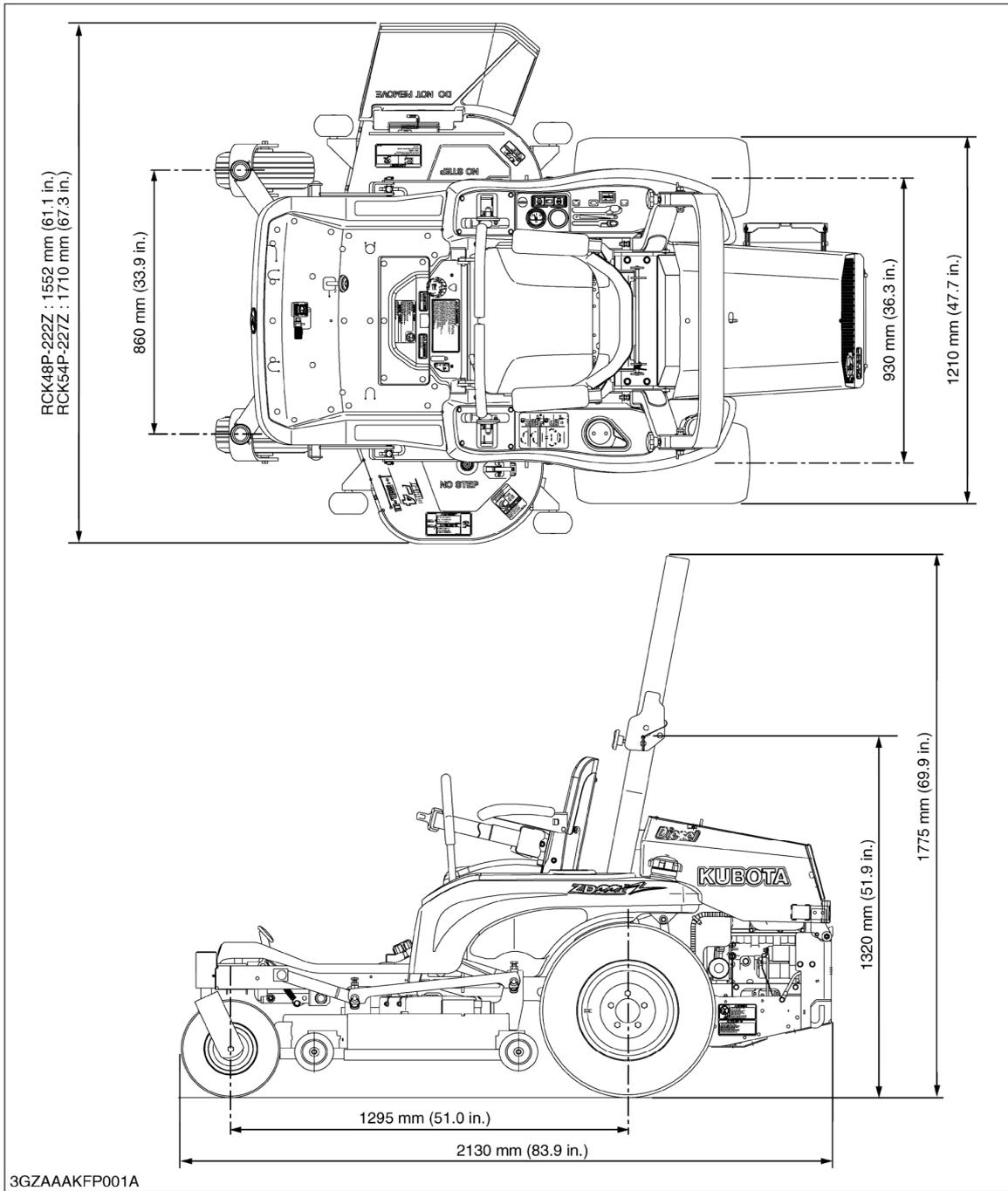
Model			RCK48P-222Z	RCK54P-227Z
PRO commercial deck (fabricated deck)	Suitable machine		ZD221	
	Mounting method		Quick joint, parallel linkage	
	Adjustment of cutting height		Dial gauge	
	Cutting width		1225 mm (48 in.)	1375 mm (54 in.)
	Cutting height		25 to 127 mm (1.0 to 5.0 in.)	
	Weight (approx.)		106 kg (234 lbs)	119 kg (262 lbs)
	Blade spindle speed		64.8 r/s (3890 min ⁻¹ (rpm)) ^{*1}	58.0 r/s (3480 min ⁻¹ (rpm)) ^{*1}
	Blade tip velocity		86.4 m/s (17000 fpm) ^{*1}	86.6 m/s (17000 fpm) ^{*1}
	Blade length		424 mm (16.7 in.)	475 mm (18.7 in.)
	Number of blades		3	
	Dimensions	Total length	880 mm (34.6 in.)	925 mm (36.4 in.)
		Total width	1552 mm (61.1 in.)	1710 mm (67.3 in.)
Total height		340 mm (13.3 in.)	340 mm (13.3 in.)	

NOTE: Specifications and design subject to change without notice.

*1 : Engine max. revolution.

W1036076

DIMENSIONS



G GENERAL

GENERAL

CONTENTS

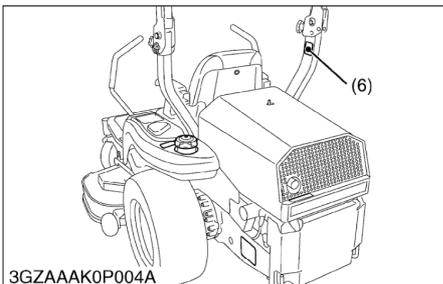
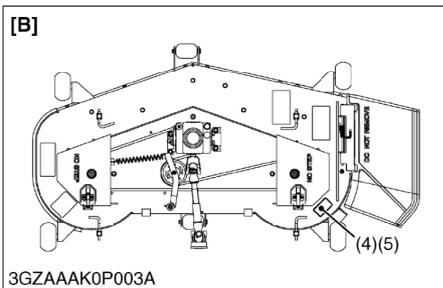
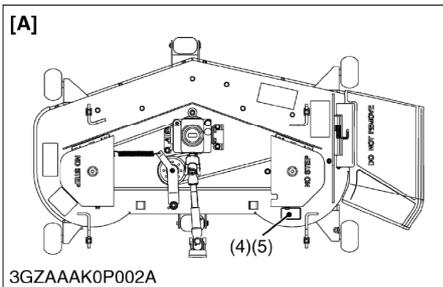
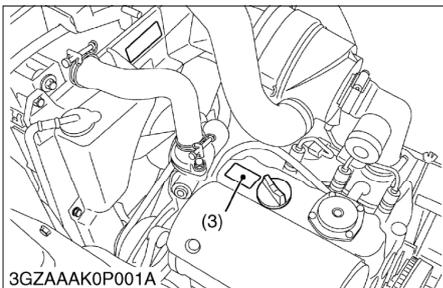
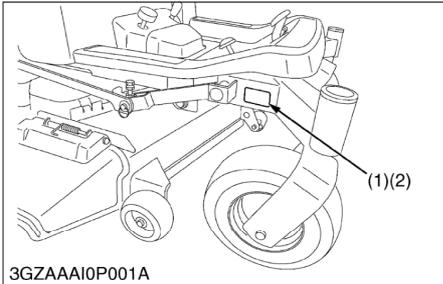
1. IDENTIFICATION.....	G-1
2. GENERAL PRECAUTIONS.....	G-2
3. CYLINDER NUMBER.....	G-2
4. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING..	G-3
[1] WIRING.....	G-3
[2] BATTERY.....	G-5
[3] FUSE.....	G-5
[4] CONNECTOR.....	G-5
[5] HANDLING OF CIRCUIT TESTER.....	G-6
5. LUBRICANTS, FUEL AND COOLANT.....	G-7
6. TIGHTENING TORQUES.....	G-10
[1] GENERAL USE SCREWS, BOLTS AND NUTS.....	G-10
[2] STUD BOLTS.....	G-10
[3] METRIC SCREWS, BOLTS AND NUTS.....	G-11
[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS.....	G-11
[5] PLUGS.....	G-11
7. MAINTENANCE CHECK LIST.....	G-12
8. CHECK AND MAINTENANCE.....	G-14
[1] DAILY CHECK.....	G-14
[2] CHECK POINTS OF INITIAL 50 HOURS.....	G-18
[3] CHECK POINT OF INITIAL 400 HOURS.....	G-20
[4] CHECK POINTS OF EVERY 50 HOURS.....	G-23
[5] CHECK POINTS OF EVERY 100 HOURS.....	G-29
[6] CHECK POINTS OF EVERY 150 HOURS.....	G-34
[7] CHECK POINTS OF EVERY 200 HOURS.....	G-34
[8] CHECK POINT OF EVERY 400 HOURS.....	G-38
[9] CHECK POINT OF EVERY 1500 HOURS.....	G-39
[10]CHECK POINT OF EVERY 3000 HOURS.....	G-40
[11]CHECK POINTS OF EVERY 1 YEAR.....	G-41
[12]CHECK POINTS OF EVERY 2 YEARS.....	G-44
[13]OTHERS.....	G-46
9. SPECIAL TOOLS.....	G-49
[1] SPECIAL TOOLS FOR ENGINE.....	G-49
[2] SPECIAL TOOLS FOR MACHINE.....	G-55
10. IMPLEMENT LIMITATIONS.....	G-56

1. IDENTIFICATION

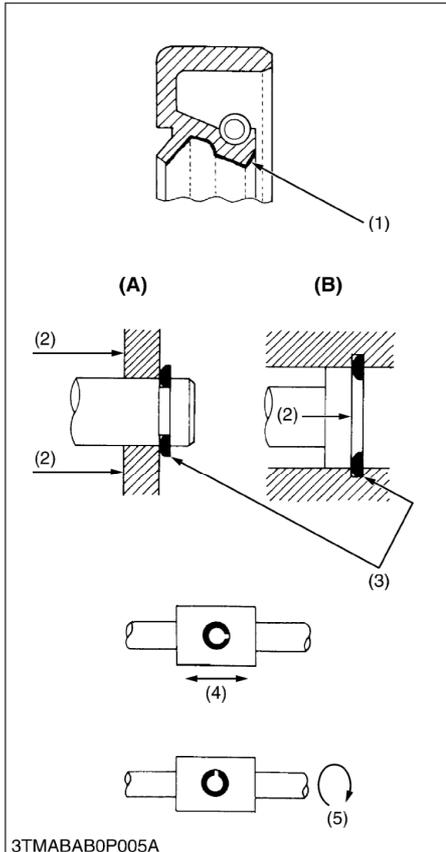
When contacting your local KUBOTA distributor, always specify engine serial number (3), machine serial number (2), mower serial number (4) and hour meter reading.

- (1) Machine Identification Plate **[A] RCK48P**
- (2) Machine Serial Number **[B] RCK54P**
- (3) Engine Serial Number
- (4) Mower Serial Number
- (5) Mower Identification Plate
- (6) ROPS Serial Number

W1010714



2. GENERAL PRECAUTIONS



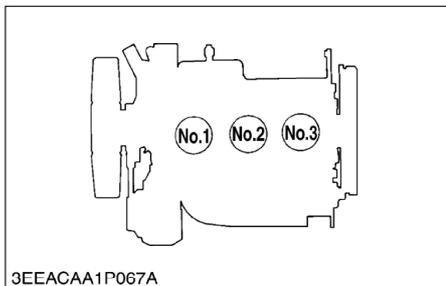
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

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

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

W1010904

3. CYLINDER NUMBER

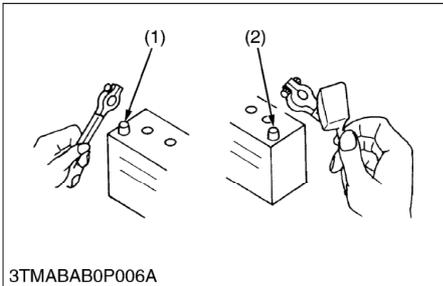


The cylinder numbers of KUBOTA diesel engine are designated as shown in the figure.

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

W1011077

4. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

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

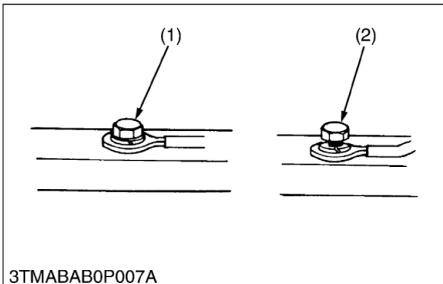
■ IMPORTANT

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

- (1) Negative Terminal (2) Positive Terminal

W1011114

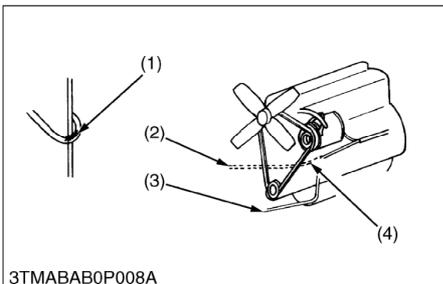
[1] WIRING



3TMABAB0P007A

- Securely tighten wiring terminals.
- (1) Correct (Securely tighten) (2) Incorrect (Loosening leads to faulty contact)

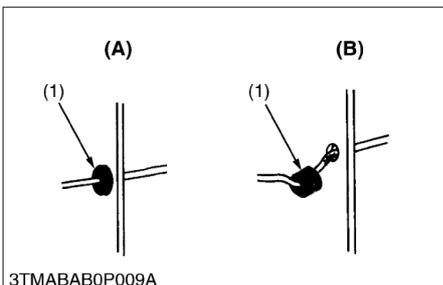
W1011216



3TMABAB0P008A

- Do not let wiring contact dangerous part.
- (1) Wiring (Correct) (2) Wiring (Incorrect) (3) Dangerous Part (4) Dangerous Part

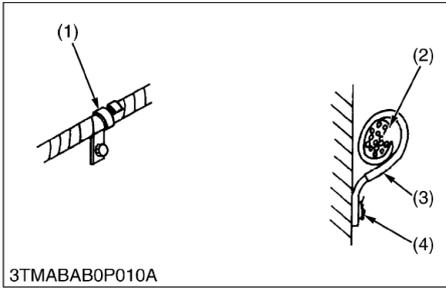
W1011313



3TMABAB0P009A

- Securely insert grommet.
- (1) Grommet (A) Correct (B) Incorrect

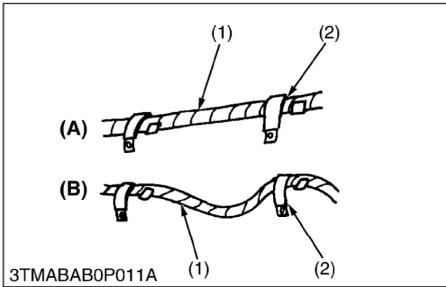
W1011388



- Securely clamp, being careful not to damage wiring.

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

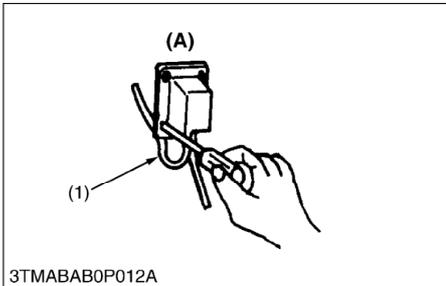
W1011458



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

- (1) Wiring
- (2) Clamp
- (A) Correct
- (B) Incorrect

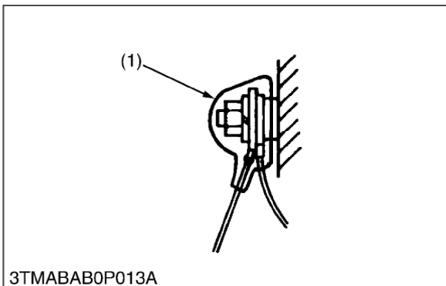
W1011587



- In installing a part, be careful not to get wiring caught by it.

- (1) Wiring
- (A) Incorrect

W1011670

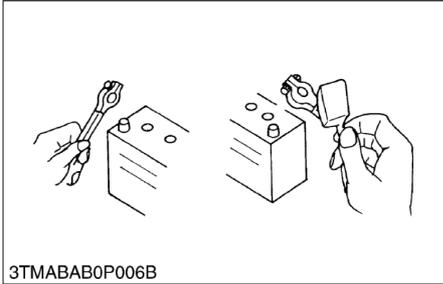


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
 - Securely Install Cover

W1011735

[2] BATTERY



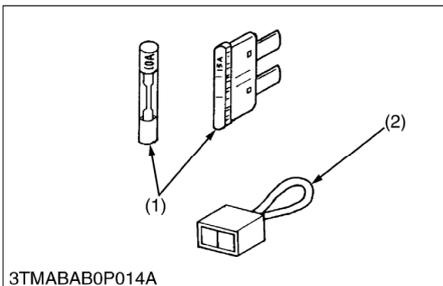
- Be careful not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting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

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

W1011816

[3] FUSE



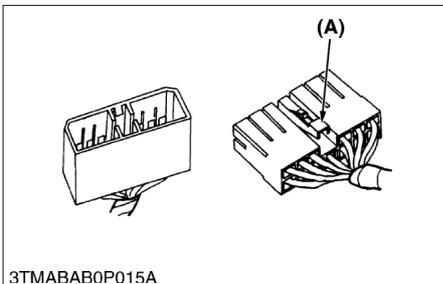
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Slow Blow Fuse

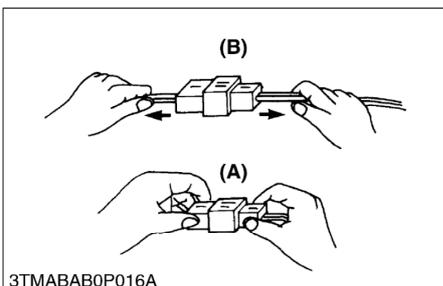
W1012092

[4] CONNECTOR



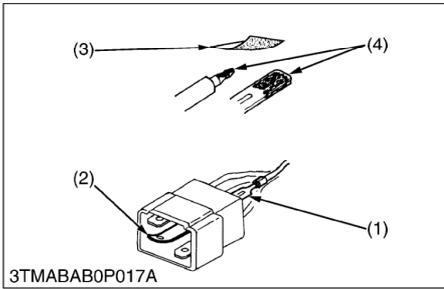
- For connector with lock, push lock to separate.
- (A) Push

W1012211



- In separating connectors, do not pull wire harnesses.
 - Hold connector bodies to separate.
- (A) Correct (B) Incorrect

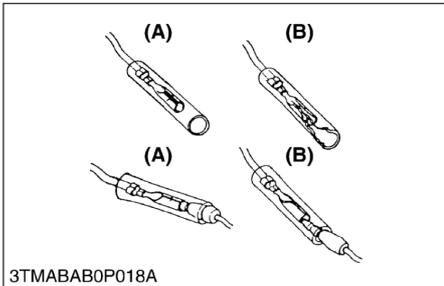
W1012272



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

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

W1012346

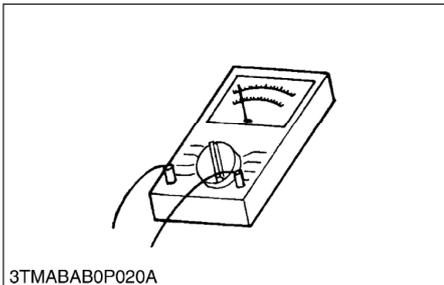


- Make certain that there is no female connector being too open.

(A) Correct (B) Incorrect

W1012430

[5] HANDLING OF CIRCUIT TESTER



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

W1012684

5. LUBRICANTS, FUEL AND COOLANT

No.	Place		Capacity		Lubricants, fuel and coolant
			ZD221		
1	Fuel		23 L 6.1 U.S.gals 5.1 Imp.gals		No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below -10 °C (14 °F)
2	Coolant	Cooling system	2.1 L 2.2 U.S.qts 1.85 Imp.qts		Fresh clean water (soft water) with anti-freeze
		Recovery tank	0.25 L 0.26 U.S.qts 0.22 Imp.qts		
3	Engine crankcase		D782-E3	3.5 L* 3.7 U.S.qts 3.1 Imp.qts	Engine oil: Refer to page G-9. Above 25 °C (77 °F): SAE30, SAE10W-30 or 15W-40 0 to 25 °C (32 to 77 °F): SAE20, SAE10W-30 or 15W-40 Below 0 °C (32 °F): SAE10W, SAE10W-30 or 15W-40
			D782-E4	3.6 L* 3.8 U.S.qts 3.2 Imp.qts	
4	Transmission case with filter, hose and rear axle gear case (RH and LH)		7.5 L 7.9 U.S.qts 6.60 Imp.qts		KUBOTA UDT or SUPER UDT fluid**
5	Mower gear case		0.15 L 0.16 U.S.qts 0.13 Imp.qts		SAE 90 gear oil (API service classification : more than GL-3)

■ NOTE

- * Oil amount when the oil level is the upper of the oil level gauge.
- ** KUBOTA original transmission hydraulic fluid.

■ IMPORTANT

- To prevent serious damage to hydraulic system, use only KUBOTA genuine fluid or its equivalent.

Greasing, oiling (Machine)				
No.	Place	No. of greasing point	Capacity	Type of grease
6	Front axle	2	Until grease overflows.	Multipurpose type grease NLGI-2 or NLGI-1 (GC-LB)
7	Front wheel	2		
8	Parking brake lock pedal	1		
9	Front lift arm	2		
10	Universal joint	3		
11	Seat adjuster	2		
12	Cable (throttle cable, mower lift cable)	3	Moderate amount	Engine oil
13	Motion control lever pivot bushing, and contact position	6		
Greasing (Mower)				
14	Universal joint	3	Until grease overflows.	Multipurpose EP2 grease NLGI Grade No.2
15	Three spindle shafts	3		
16	Belt tension pulley	1		
17	Belt tension pivot	1		
18	Anti scalp roller	1		
19	Front anti-scalp roller pivot boss	2		

■ NOTE

Engine Oil :

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

Fuel used	Engine oil classification (API classification)
High Sulfur Fuel (≥ 500 ppm)	CF (If the "CF-4, CG-4, CH-4, or CI-4" lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals. (approximately half))
Low Sulfur Fuel (< 500 ppm) or Ultra Low Sulfur Fuel (< 15 ppm)	CF, CF-4, CG-4, CH-4 or CI-4

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

Fuel :

- Cetane number of 45 minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20 °C (-4 °F) or elevations above 1500 m (5000 ft).
- If diesel sulfur content greater than 0.5 % sulfur content is used, reduce the service interval for engine oil and filter by 50 %.
- DO NOT use diesel fuel with sulfur content greater than 1.0 %.
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- Since this engine adopts EPA Tier 4 and Interim Tier 4 standards, the use of low sulfur fuel or ultra low sulfur fuel is mandatory in EPA regulated area (North America). Therefore, please use No.2-D S500 or S15 diesel fuel as an alternative to No.2-D, or use No.1-D S500 or S15 diesel fuel as an alternative to No.1-D if outside air temperature is below -10 °C (14 °F).

Transmission Oil :

The oil used to lubricate the transmission is also used as hydraulic fluid. To ensure proper operation of the hydraulic system and to complete lubrication of the transmission, it is important that a multi-grade transmission fluid is used in this system. We recommend the use of KUBOTA UDT or SUPER UDT fluid for optimum protection and performance. (Consult your local KUBOTA Dealer for further detail.)

Do not mix different brands together.

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

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	4 No-grade or 4T						7 7T						9 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit	N·m	kgf·m	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
Diameter															
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

W1034542

[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
Diameter						
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	-	-	-

W1048139

[3] METRIC SCREWS, BOLTS AND NUTS

Grade	Property class 8.8 			Property class 10.9 			
	Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8		24 to 27	2.4 to 2.8	18 to 20	30 to 34	3.0 to 3.5	22 to 25
M10		48 to 55	4.9 to 5.7	36 to 41	61 to 70	6.2 to 7.2	45 to 52
M12		78 to 90	7.9 to 9.2	58 to 66	103 to 117	10.5 to 12.0	76 to 86.7
M14		124 to 147	12.6 to 15.0	91.2 to 108	167 to 196	17.0 to 20.0	123 to 144
M16		197 to 225	20.0 to 23.0	145 to 166	260 to 304	26.5 to 31.0	192 to 224

W1016172

[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS

Grade	SAE GR.5 			SAE GR.8 			
	Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
5/16		23.1 to 27.7	2.35 to 2.83	17.0 to 20.5	32.6 to 39.3	3.32 to 4.00	24.0 to 29.0
3/8		48 to 56	4.9 to 5.8	35.0 to 42.0	61.1 to 73.2	6.23 to 7.46	45.0 to 54.0
1/2		109 to 130	11.1 to 13.2	80.0 to 96.0	149.2 to 178.9	15.21 to 18.24	110.0 to 132.0
9/16		149.2 to 178.9	15.21 to 18.24	110.0 to 132.0	217.0 to 260.3	22.12 to 26.54	160.0 to 192.0
5/8		203.4 to 244	20.74 to 24.88	150.0 to 180.0	298.3 to 357.9	30.42 to 36.49	220.0 to 264.0

W1022485

[5] PLUGS

Shape	Size	Material of opponent part					
		Ordinariness			Aluminum		
		N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
 Tapered screw	R1/8	13 to 21	1.3 to 2.2	9.4 to 15	13 to 21	1.3 to 2.0	9.4 to 15
	R1/4	25 to 44	2.5 to 4.5	18 to 32	25 to 34	2.5 to 3.5	18 to 25
	R3/8	49 to 88	5.0 to 9.0	37 to 65	49.0 to 58	5.0 to 6.0	37 to 43
	R1/2	59 to 107	6.0 to 11.0	44 to 79.5	59 to 78	6.0 to 8.0	44 to 57
 Straight screw	G1/4	25 to 34	2.5 to 3.5	18 to 25	–	–	–
	G3/8	62 to 82	6.3 to 8.4	46 to 60	–	–	–
	G1/2	49 to 88	5.0 to 9.0	37 to 65	–	–	–

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7. MAINTENANCE CHECK LIST

No.	Items	Period	Service interval													Reference page			
			50	100	150	200	250	300	350	400	450	500	550	600	After since				
1	Engine oil	Change	★			☆						☆			☆	every 200 Hr	G-18		
2	Engine oil filter	Replace	★			☆						☆			☆	every 200 Hr	G-18		
3	Transmission fluid and rear axle gear case (RH and LH) fluid	Change										★				every 400 Hr	G-21		
4	Transmission oil filter	Replace	★			☆						☆			☆	every 200 Hr	G-19		
5	Transmission strainer	Clean										★				every 400 Hr	G-22		
6	Motion control lever pivot	Adjust				☆						☆			☆	every 200 Hr	G-36		
7	Safety device	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-23		
8	Mower gear box oil	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-28		
		Change			☆			☆			☆				☆	every 150 Hr	G-34		
9	Greasing (without mower)	-	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-25		
10	Oiling	Oil	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-27		
11	Air cleaner primary element	Clean		☆		☆			☆			☆			☆	every 100 Hr	G-29	*1	@
		Replace														every 1 year	G-41		
	Secondary element	Replace														every 1 year	G-41		
12	Fuel filter element	Check		☆		☆			☆			☆			☆	every 100 Hr	G-29		@
		Replace										☆				every 400 Hr	G-38	*2	
13	Fuel line	Check		☆		☆			☆			☆			☆	every 100 Hr	G-29		@
		Replace														every 2 years	G-44	*2	
14	Fan belt	Adjust		☆		☆			☆			☆			☆	every 100 Hr	G-30		
15	Parking brake	Adjust		☆		☆			☆			☆			☆	every 100 Hr	G-31	*2	
16	Battery condition	Check		☆		☆			☆			☆			☆	every 100 Hr	G-32		
17	Radiator hose and clamp	Check				☆						☆			☆	every 200 Hr	G-36		
		Replace														every 2 years	G-44	*2	
18	Hydraulic hose	Check				☆						☆			☆	every 200 Hr	G-37		
		Replace														every 2 years	G-44	*2	

W1037757

No.	Items	Period	Service interval												After since	Refer- ence page			
			50	100	150	200	250	300	350	400	450	500	550	600					
19	Intake air line	Check				☆									☆	every 200 Hr	G-37		@
		Replace														every 2 years	G-44	*3	
20	Fuel injection nozzle injection pressure	Check													every 1500 Hr	G-39		@	
21	Injection pump	Check													every 3000 Hr	G-40		@	
22	Radiator	Clean													every 1 year	G-42			
23	Coolant	Change													every 1 year	G-42			
24	Engine breather hose	Replace													every 2 years	G-44	*2		
25	Mower gear box oil seal	Replace													every 2 years	G-45	*2		
26	Fuel system	Bleed													Service as required	G-48			
27	Fuse	Replace												G-46					
28	Blade	Replace												G-47					
29	Mower belt	Replace												G-48					

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■ **IMPORTANT**

- The jobs indicated by ★ must be done initially.
 *1 This maintenance should be done daily more often in dusty condition than in normal conditions.
 Suggested cleaning interval is every 100 hours in normal conditions.
 *2 These items should be serviced by an authorized KUBOTA Dealer, unless the owner has the proper tools and is mechanically proficient.
- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA non-road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.
 Please see the Warranty Statement in detail.