

Product: Kubota WSM ZD221 Lawn Mowers Service Repair Workshop Manual  
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# WSM

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**WORKSHOP MANUAL**

**ZD221**

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**Kubota**

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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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## SAFETY FIRST

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

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



### DANGER

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



### WARNING

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



### CAUTION

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



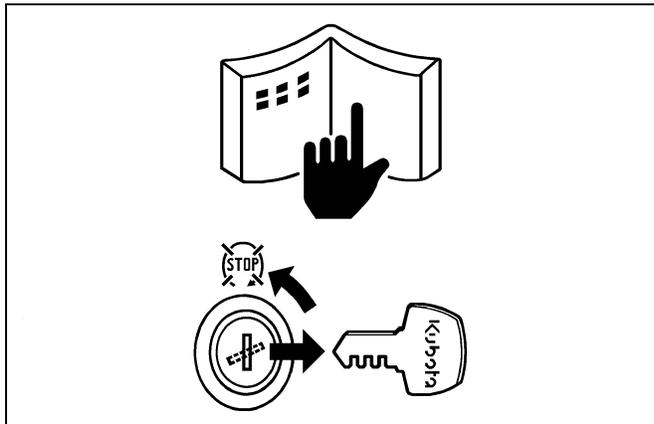
### IMPORTANT

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



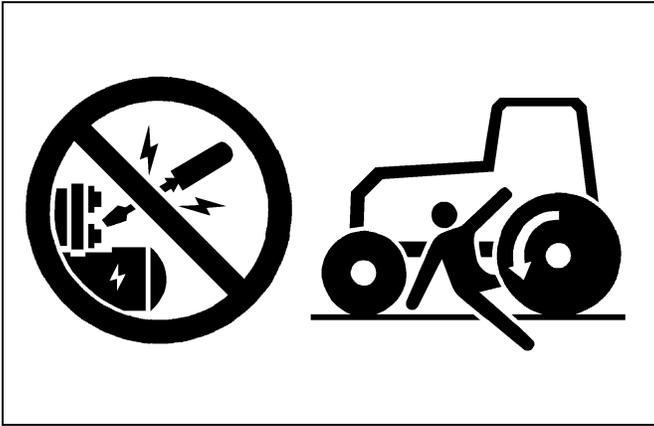
### NOTE

: Gives helpful information.



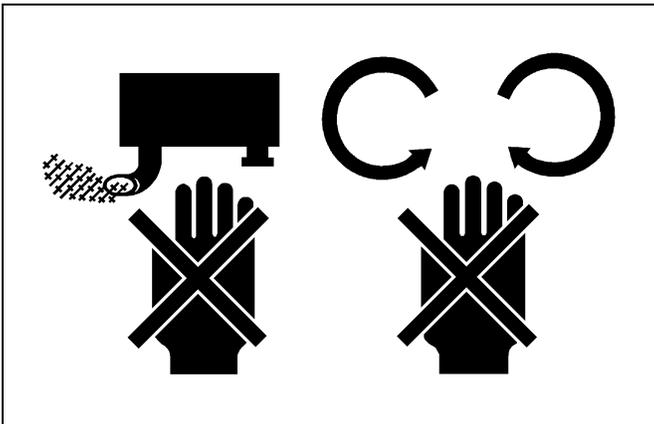
### BEFORE SERVICING AND REPAIRING

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



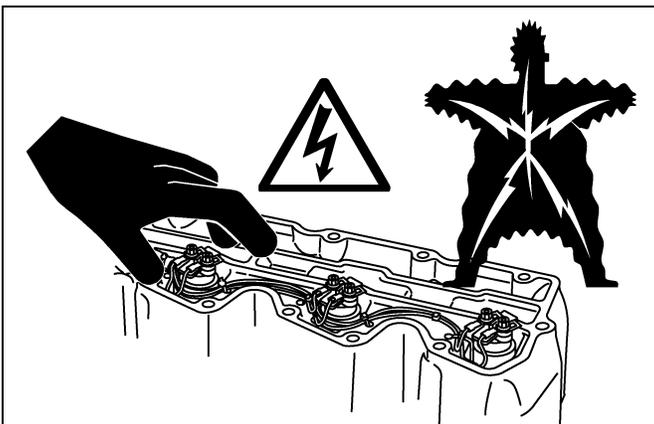
### SAFETY STARTING

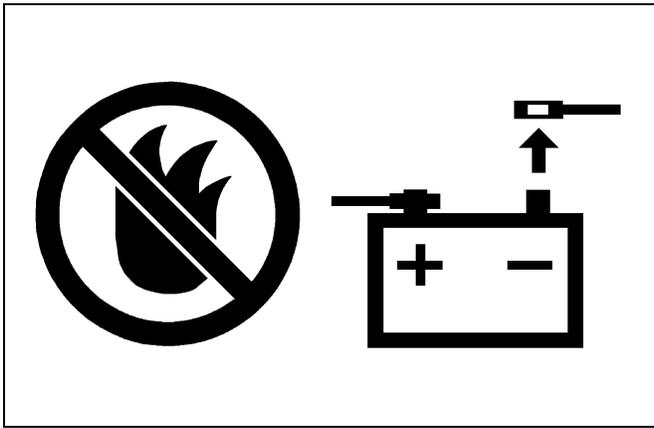
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



### SAFETY WORKING

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





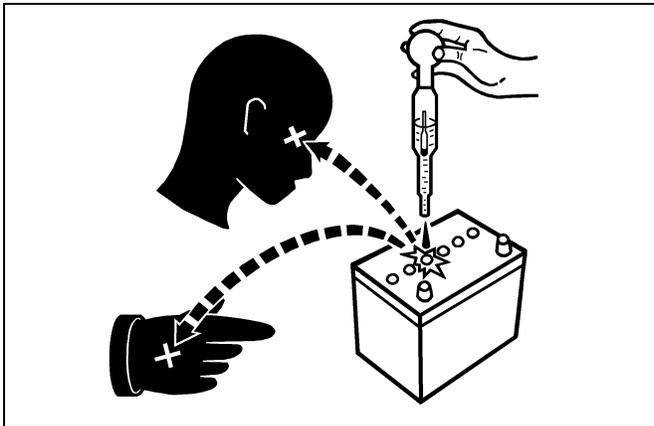
### AVOID FIRES

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



### VENTILATE WORK AREA

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



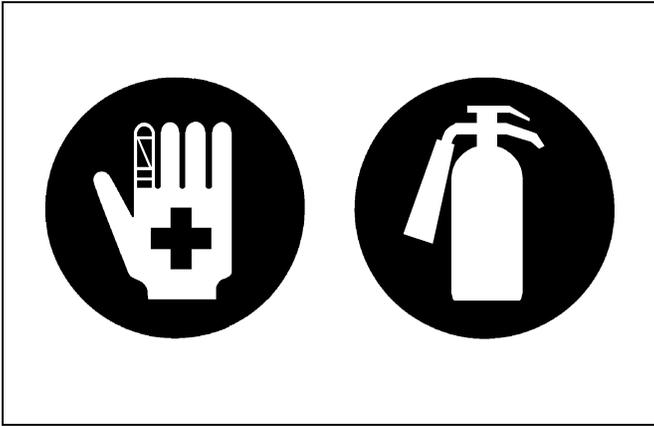
### PREVENT ACID BURNS

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



### DISPOSE OF FLUIDS PROPERLY

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

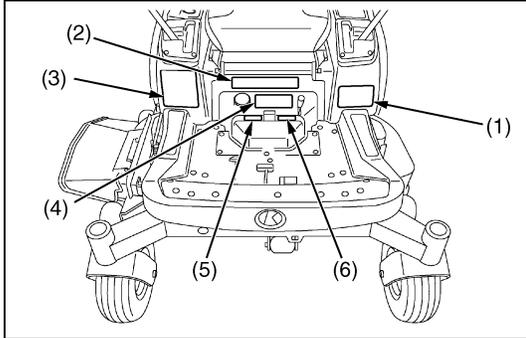
**PREPARE FOR EMERGENCIES**

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

# SAFETY DECALS

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

(2) Part No. K3271-6585-1

<p><b>⚠ CAUTION TO AVOID PERSONAL INJURY</b></p>	
<ol style="list-style-type: none"> <li>1. Read and understand the operator's manual before operation.</li> <li>2. Do not operate this machine unless you are trained.</li> <li>3. Before allowing other people to use the machine, have them read the operator's manual.</li> <li>4. Check the tightness of all nuts and bolts regularly.</li> <li>5. Before starting the engine, make certain that everyone is at a safe distance from the machine, PTO is disengaged and motion control levers are in neutral lock.</li> <li>6. Remove objects that could be thrown by the blade.</li> <li>7. Do not operate the machine when children and/or others are around.</li> </ol>	<ol style="list-style-type: none"> <li>8. Do not carry children or others on the machine at any time.</li> <li>9. Before disengaging, disengage PTO clutch, lower the implement, place motion control levers in neutral lock position, set the parking brake, stop the engine and remove the key.</li> <li>10. Keep safety devices (guards, shields, and switches) in place, and working.</li> <li>11. To reduce the fire hazard, keep the exhaust clear of any grass, dry leaves or other combustible materials.</li> <li>12. This machine is not for street or highway use.</li> <li>13. Securely support the machine and implement before working underneath.</li> </ol>

1BDABDEAP038A

(3) Part No. K3271-6581-0

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

1BDABCYAP064A

(4) Part No. K3271-6587-0

<p><b>⚠ PRECAUCIÓN</b></p> <p><b>PARA EVITAR LESIONES PERSONALES</b></p> <ol style="list-style-type: none"> <li>1. Lea y entienda el manual del operador antes de efectuar la operación.</li> <li>2. No ponga en funcionamiento la máquina a menos que esté capacitado para hacerlo.</li> <li>3. Antes de permitir que otras personas usen la máquina, indíqueles que lean el manual del operador.</li> <li>4. Verifique con regularidad el apriete de todas las tuercas y pernos.</li> <li>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.</li> <li>6. Retire los objetos que pueden ser lanzados por la cuchilla.</li> <li>7. No opere la máquina cuando hayan niños u otras personas alrededor.</li> <li>8. No lleve a niños ni a otras personas en la máquina en ningún momento.</li> <li>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.</li> <li>10. Mantenga los dispositivos de protección(guardas, barreras de protección e interruptores) en su lugar y en buen estado de funcionamiento.</li> <li>11. Para reducir los riesgos de incendio, mantenga el escape exento de hierba seca, hojas secas u otros materiales combustibles.</li> <li>12. Esta máquina no está diseñada para uso en calles ni carreteras.</li> <li>13. Use un soporte seguro para la máquina y el implemento antes de trabajar debajo de los mismos.</li> </ol>	
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1BDABCYAP065A

(5) Part No. K3131-6568-1

<p><b>⚠ CAUTION</b></p> <p>When Engine is running, do not open this cover.</p>
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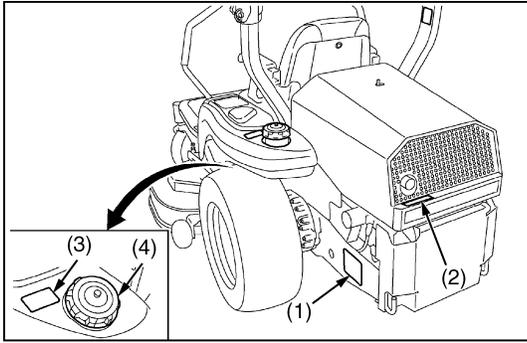
1BDABDEAP024A

(6) Part No. K3131-6569-1

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

3GZAAAKCP001A



(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

(3) Part No. K3181-6587-2

Gasoline      No fire  
fuel only

LOW SULFUR FUEL  
OR ULTRA LOW  
SULFUR FUEL ONLY

COMBUSTIBLE CON  
BAJO CONTENIDO  
DE AZUFRE O  
COMBUSTIBLE CON  
CONTENIDO ULTRABAJO  
DE AZUFRE SOLAMENTE

1BDAIATAP001A

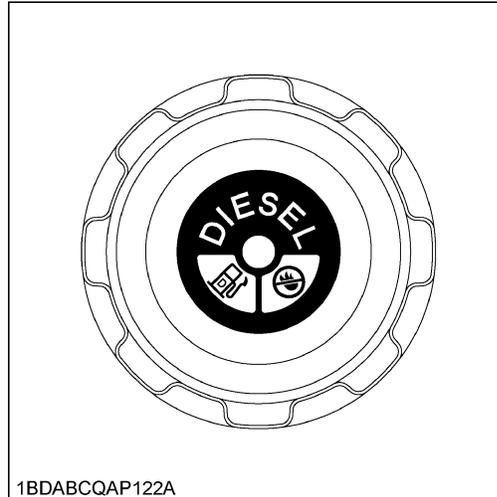
(2) Part No. K3271-6532-0

**⚠ CAUTION**  
**HOT EXHAUST**

**⚠ PRECAUCIÓN**  
**ESCAPE CALIENTE**

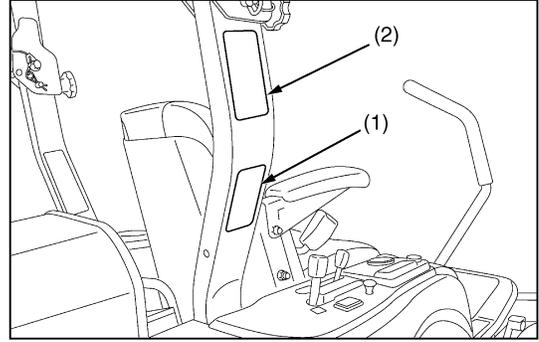
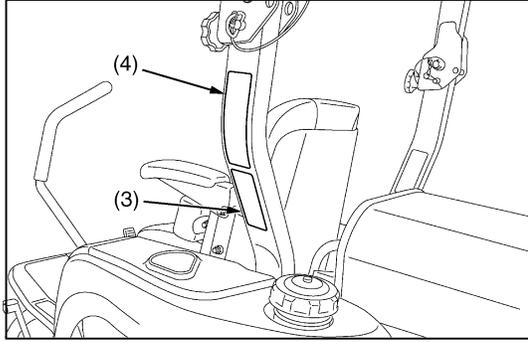
1BDABCYAP067A

(4) Part No. K3181-2481-1



1BDABCQAP122A

3GZAAAKCP002A



(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:  
1. Keep Roll-Over Protective Structures (ROPS) in the upright and locked position.  
2. 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 siglas en inglés) porque soldar, esmerilar, 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

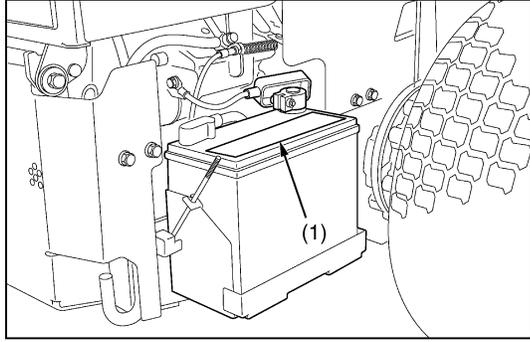
**⚠ ADVERTENCIA**

PARA EVITAR LESIONES PERSONALES O LA MUERTE PRODUCIDAS POR VOLCADURAS:  
1. Mantenga las estructuras de protección contra volcaduras (ROPS por sus siglas 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. Eleve y bloquee la estructura de protección contra volcaduras tan pronto como le permita el espacio libre vertical.  
4. Lea las instrucciones y advertencias relacionadas a la estructura de protección contra volcaduras.

1BDABCQAP134A

3GZAAAKCP003A



(1) Part No. K3181-6115-1

**MAINTENANCE-FREE BATTERY**

**⚠ DANGER/POISON**

**SHIELD EYES.** EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY.

**NO SPARKS.** FLAMES OR SMOKING CAN CAUSE BLINDNESS OR SEVERE BURNS.

**SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS.**

**FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.**

**KEEP OUT OF REACH OF CHILDREN. DO NOT TIP. DO NOT OPEN BATTERY.**

**Pb**

**RECYCLE**

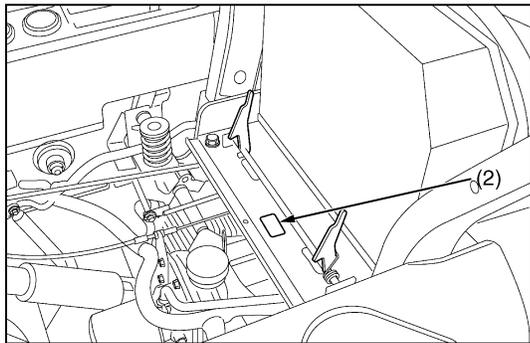
**CALIFORNIA PROPOSITION 65 WARNING:** Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.

PART NO. \_\_\_\_\_

1BDABCQAP124A

**DANGER / POISON**

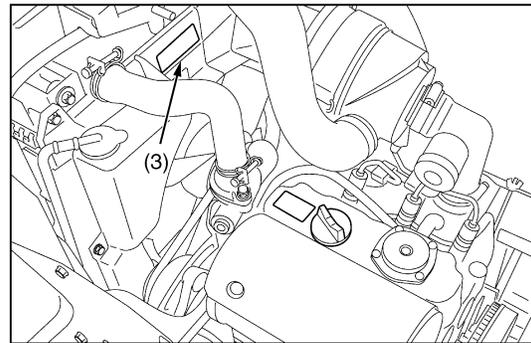
- SHIELD EYES
- EXPLOSIVE GASES can cause blindness or injury.
- NO SPARKS / FLAMES / SMOKING
- SULFURIC ACID can cause blindness or severe burns.
- Flush eyes immediately with water.
- Get medical help fast.



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



1BDABCQAP107A

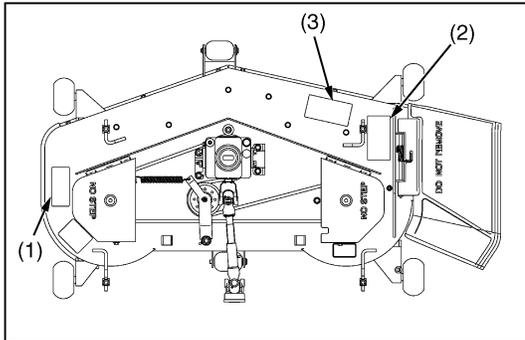


(3) Part No. K3181-6586-1  
Do not get your hands close to engine fan and fan belt.



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.

3GZAAAKCP005A

# SPECIFICATIONS

Model		ZD221-48	ZD221-54	
Engine	Model	D782-E3-ZD-1		
	Maximum engine power (Gross)	15.7 kW (21 HP)* <sup>1</sup>		
	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 <sup>3</sup> (47.5 cu.in.)		
	Rated revolution	3200 min <sup>-1</sup> (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 gear 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)	3.5 L (3.70 U.S.qts, 3.08 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)* <sup>3</sup>		
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<sup>-1</sup> (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) <sup>*2</sup>	
		Reverse	0 to 8.0 km/h (0 to 5.0 mph) <sup>*2</sup>	
	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<sup>-1</sup> (rpm)

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

W1030228

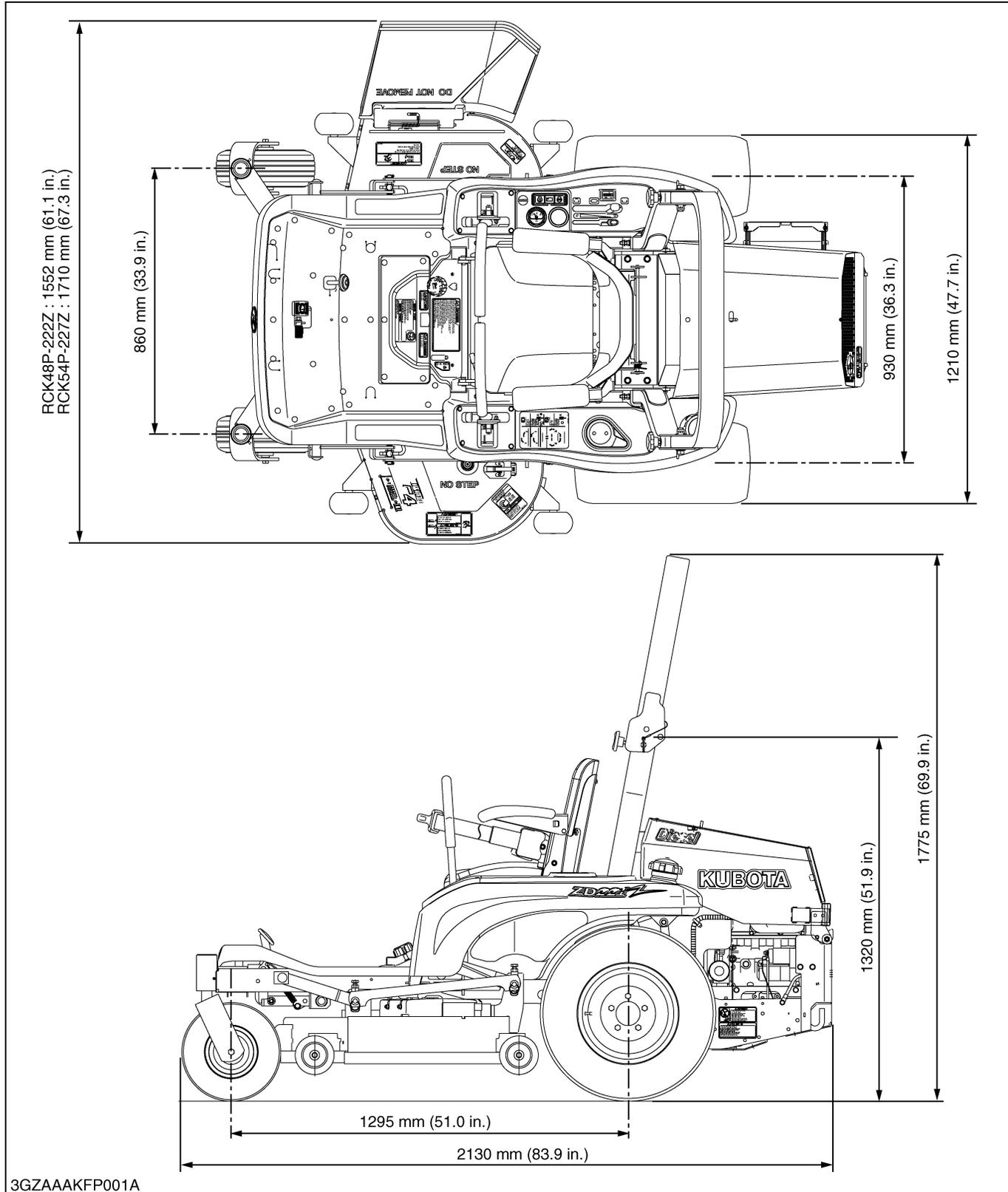
Model			RCK48P-222Z	RCK54P-227Z
PRO commercial deck (fabricated deck)	Suitable machine		ZD221	
	Mounting method		Quick joint, parallel linkage	
	Adjustment of cutting height		Dial gauge	
	Cutting width		1225 mm (48 in.)	1375 mm (54 in.)
	Cutting height		25 to 127 mm (1.0 to 5.0 in.)	
	Weight (approx.)		106 kg (234 lbs)	119 kg (262 lbs)
	Blade spindle speed		64.8 r/s (3890 min <sup>-1</sup> (rpm)) <sup>*1</sup>	58.0 r/s (3480 min <sup>-1</sup> (rpm)) <sup>*1</sup>
	Blade tip velocity		86.4 m/s (17000 fpm) <sup>*1</sup>	86.6 m/s (17000 fpm) <sup>*1</sup>
	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

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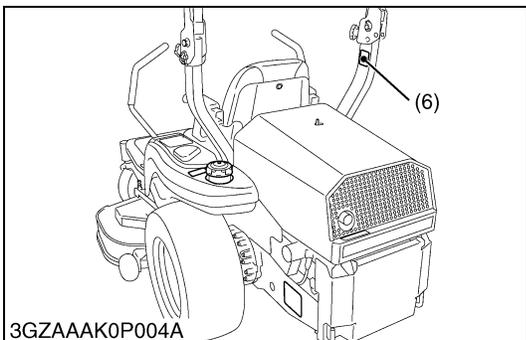
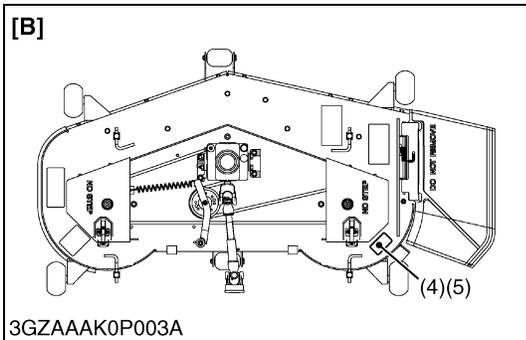
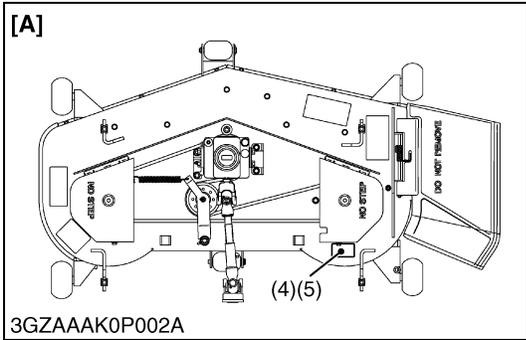
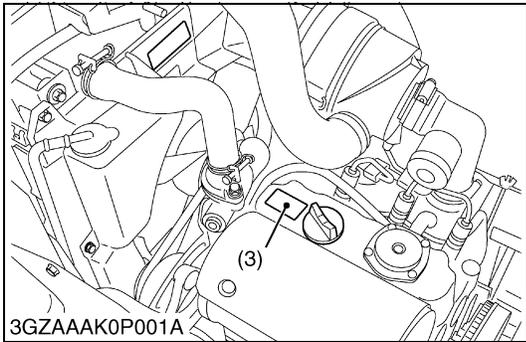
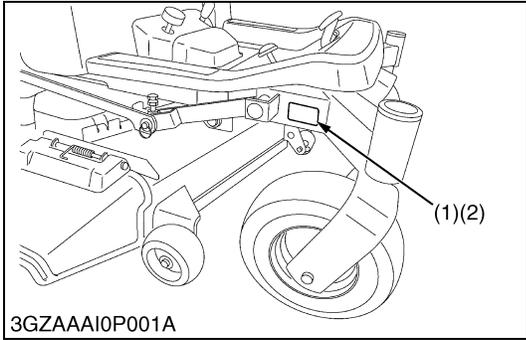
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# 1. IDENTIFICATION

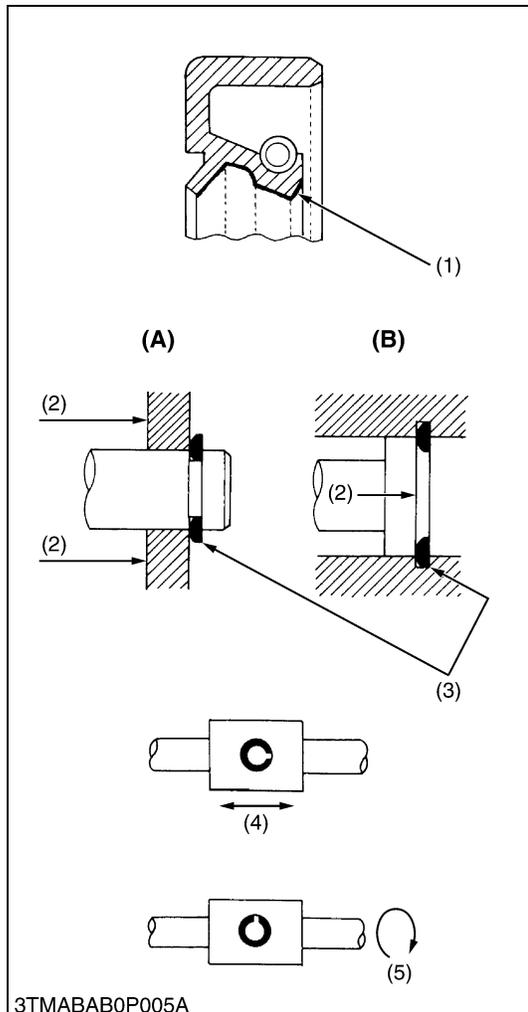
When contacting your local KUBOTA distributor, always specify engine serial number (3), machine serial number (2), mower serial number (4) and hour meter reading.

- (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



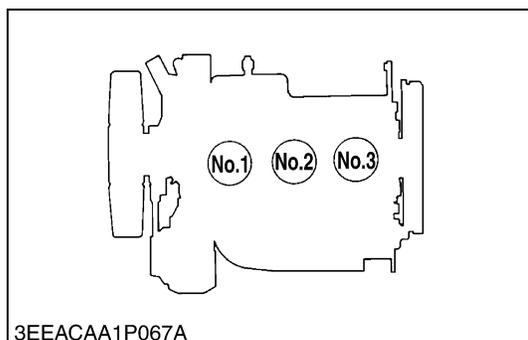
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

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

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

W1010904

## 3. CYLINDER NUMBER

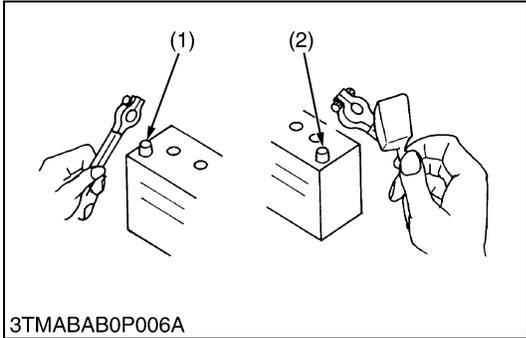


The cylinder numbers of KUBOTA diesel engine are designated as shown in the figure.

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.

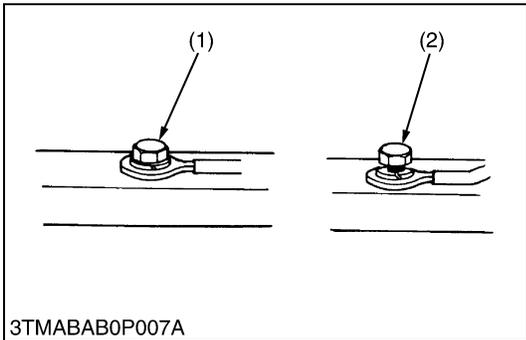
**■ IMPORTANT**

- 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 attempt to modify or remodel any electrical parts and wiring.
- When removing the battery cables, disconnect the negative cable first. When installing the battery cables, connect the positive cable first.

- (1) Negative Terminal (2) Positive Terminal

W1011114

## [1] WIRING

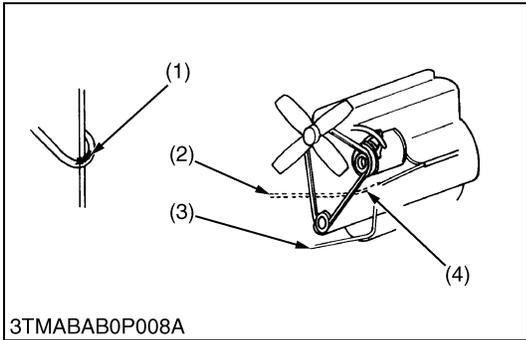


3TMABAB0P007A

- Securely tighten wiring terminals.

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

W1011216

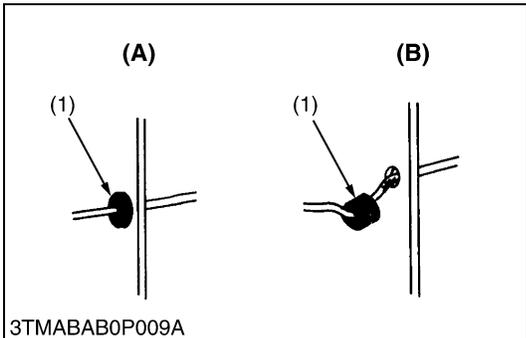


3TMABAB0P008A

- Do not let wiring contact dangerous part.

- (1) Wiring (Correct) (2) Wiring (Incorrect) (3) Dangerous Part (4) Dangerous Part

W1011313

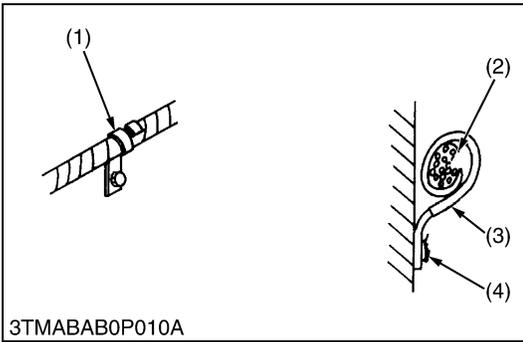


3TMABAB0P009A

- Securely insert grommet.

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

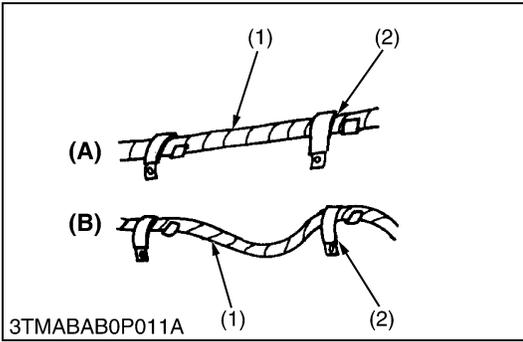
W1011388



- Securely clamp, being careful not to damage wiring.

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

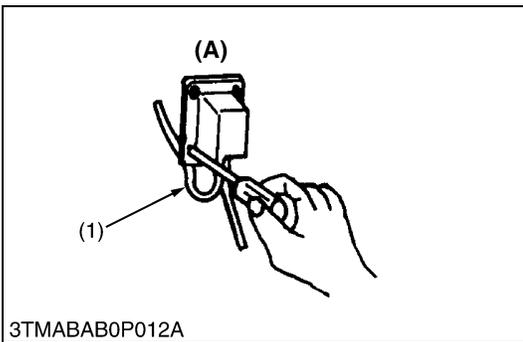
W1011458



- 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

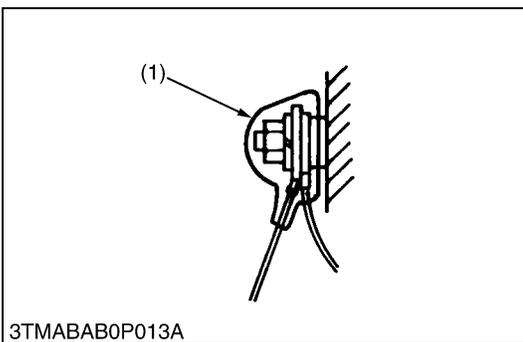
W1011587



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

- (1) Wiring
- (A) Incorrect

W1011670

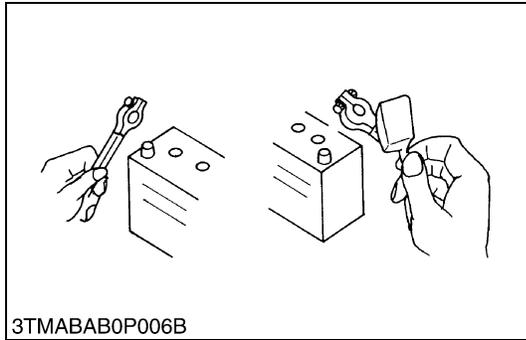


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
  - Securely Install Cover

W1011735

## [2] BATTERY



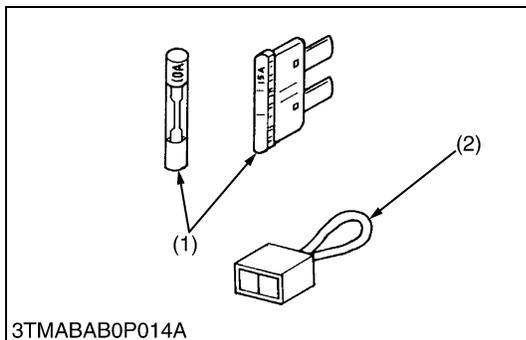
- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting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

### **CAUTION**

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

W1011816

## [3] FUSE



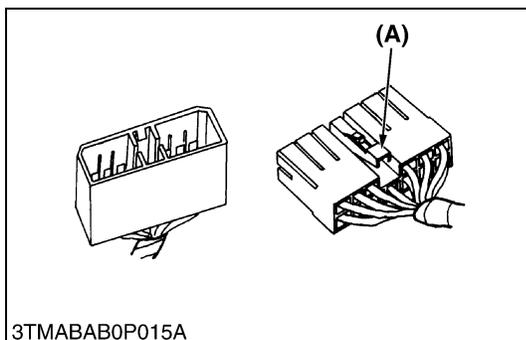
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Slow Blow Fuse

W1012092

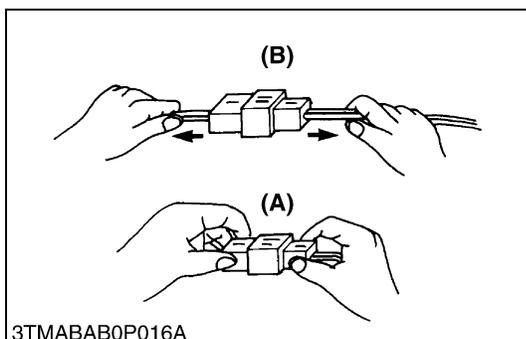
## [4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

W1012211

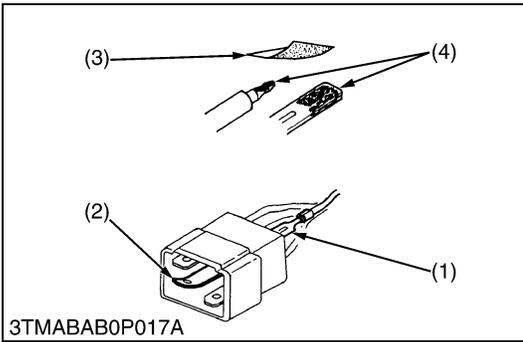


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

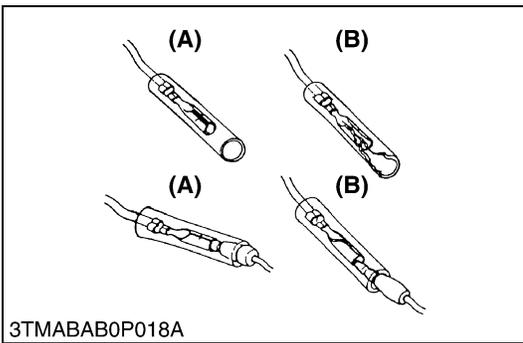
W1012272



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

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

W1012346

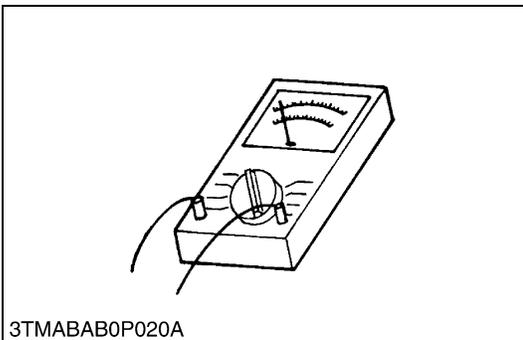


- Make certain that there is no female connector being too open.

- (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	1.2 L 1.27 U.S.qts 1.06 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		3.5 L* 3.70 U.S.qts 3.08 Imp.qts	Engine oil : Refer to page G-9. Below 0 °C (32 °F) : SAE30, SAE10W-30 or 15W-40 0 to 25 °C (32 to 77 °F) : SAE20, SAE10W-30 or 15W-40 Above 25 °C (77 °F) : SAE10W, SAE10W-30 or 15W-40
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.

<b>Greasing, oiling (Machine)</b>				
<b>No.</b>	<b>Place</b>	<b>No. of greasing point</b>	<b>Capacity</b>	<b>Type of grease</b>
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		
<b>Greasing (Mower)</b>				
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)	<b>CF</b> (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)	<b>CF, CF-4, CG-4, CH-4 or CI-4</b>

- 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  $-20\text{ }^{\circ}\text{C}$  ( $-4\text{ }^{\circ}\text{F}$ ) 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  $-10\text{ }^{\circ}\text{C}$  ( $14\text{ }^{\circ}\text{F}$ ).

### Transmission Oil :

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

W1034542

### [2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit						
Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
<b>M8</b> (8 mm, 0.31 in.)	12	1.2	8.7	8.9	0.90	6.5
	to 15	to 1.6	to 11	to 11	to 1.2	to 8.6
<b>M10</b> (10 mm, 0.39 in.)	25	2.5	18	20	2.0	15
	to 31	to 3.2	to 23	to 25	to 2.6	to 18
<b>M12</b> (12 mm, 0.47 in.)	29.5	3.0	21.7	31.4	3.2	23.1
	to 49.0	to 5.0	to 36.1			
<b>M14</b> (14 mm, 0.55 in.)	62	6.3	46	–	–	–
	to 73	to 7.5	to 54	–	–	–
<b>M16</b> (16 mm, 0.63 in.)	98.1	10.0	72.4	–	–	–
	to 112	to 11.5	to 83.1	–	–	–
<b>M18</b> (18 mm, 0.71 in.)	172	17.5	127	–	–	–
	to 201	to 20.5	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
<b>M8</b>		24 to 27	2.4 to 2.8	18 to 20	30 to 34	3.0 to 3.5	22 to 25
<b>M10</b>		48 to 55	4.9 to 5.7	36 to 41	61 to 70	6.2 to 7.2	45 to 52
<b>M12</b>		78 to 90	7.9 to 9.2	58 to 66	103 to 117	10.5 to 12.0	76 to 86.7
<b>M14</b>		124 to 147	12.6 to 15.0	91.2 to 108	167 to 196	17.0 to 20.0	123 to 144
<b>M16</b>		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
<b>5/16</b>		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
<b>3/8</b>		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
<b>1/2</b>		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
<b>9/16</b>		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
<b>5/8</b>		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
<b>Tapered screw</b> 	<b>R1/8</b>	13 to 21	1.3 to 2.2	9.4 to 15	13 to 21	1.3 to 2.0	9.4 to 15
	<b>R1/4</b>	25 to 44	2.5 to 4.5	18 to 32	25 to 34	2.5 to 3.5	18 to 25
	<b>R3/8</b>	49 to 88	5.0 to 9.0	37 to 65	49.0 to 58	5.0 to 6.0	37 to 43
	<b>R1/2</b>	59 to 107	6.0 to 11.0	44 to 79.5	59 to 78	6.0 to 8.0	44 to 57
<b>Straight screw</b> 	<b>G1/4</b>	25 to 34	2.5 to 3.5	18 to 25	–	–	–
	<b>G3/8</b>	62 to 82	6.3 to 8.4	46 to 60	–	–	–
	<b>G1/2</b>	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			
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	

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No.	Items	Period	Service interval													After since	Reference 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	Mower gear box oil seal	Replace													every 2 years	G-45	*2		
25	Fuel system	Bleed													Service as required	G-48			
26	Fuse	Replace												G-46					
27	Blade	Replace												G-47					
28	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.

## 8. CHECK AND MAINTENANCE



### CAUTION

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

### [1] DAILY CHECK

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

#### Checking

- Check areas where previous trouble was experienced.
- Walk around the machine.
  1. Tire pressure, wear and damage
  2. Oil and water leak
  3. Engine oil level
  4. Transmission fluid level
  5. Coolant level in the recovery tank
  6. Damage of machine body, tightness of all bolts and nuts
  7. Radiator screen
  8. Brake play
  9. Air cleaner primary element
  10. Fuel level
  11. Oiling
- Mower
  1. Oil leak
  2. Make sure blade cap screws are tight.
  3. Check blades for wear or damage.
  4. Check all hardware.
  5. Make sure all pins are in place.
  6. Mower deck cleaning
  7. Greasing
- While sitting in the operator's seat,
  1. Motion control lever
  2. Parking brake
- Turning the key switch "ON"
  1. Performance of the Easy Checker (TM) light
- Starting the engine,
  1. Color of the exhaust fumes
  2. Safety start switch, seat safety control and another safety control and other safety devices.
  3. Check for abnormal noise and vibration.
- Others
  1. Check the areas where previous trouble was experienced.

Sample of manual. Download All 253 pages at:

<https://www.aresairmanual.com/downloads/kubota-wsm-zd221-lawn-mowers-service-repair-workshop-manual/>