KUBOTA Corporation is ···

Since its inception in 1890, KUBOTA Corporation has grown to rank as one of the major firms in Japan.

To achieve this status, the company has through the years diversified the range of its products and services to a remarkable extent, until today, 30 plants and 35,000 employees produce over 1,000 different items, large and small.

All these products and all the services which accompany them, however, are unified by one central commitment. KUBOTA makes products which, taken on a national scale, are basic necessities. Products which are indispensable, products intended to help individuals and nations fulfill the potential inherent in their environment. For KUBOTA is the Basic Necessities Giant.

This potential includes water supply, food from the soil and from the sea, industrial development, architecture, construction and transportation.

Thousands of people depend on KUBOTA's know-how, technology, experience and customer service. You too can depend on KUBOTA.

KUBOTA Corporation es ···

Desde su creación en 1890, KUBOTA Corporation ha crecido hasta convertirse en una de las empresas más importantes de Japón.

Para conseguir esta posición, la empresa a lo largo de los años, ha diversificado la gama de sus productos y servicios de forma notable, hasta llegar hoy en día, con 30 fábricas y 35,000 empleados a fabricar por encima de 1,000 elementos distintos grandes y pequeños.

Todos estos productos y todos los servicios que los acompañan, sin embargo están unificados por un compromiso central. KUBOTA fabrica productos que, tomados a escala nacional, cubren necesidades básicas. Productos que son indispensables, productos destinados a ayudar a las personas y a las naciones y a desarrollar el potencial inherente de su entorno. Por eso KUBOTA es el gigante de las necesidades básicas.

Estas aptitudes potenciales incluyen el abastecimiento de aguas, la producción de alimentos en la tierra y en el mar, el desarrollo industrial, la arquitectura, la construcción y el transporte.

Mil de personas confían en el saber hacer de KUBOTA y su tecnología, experiencia y servicio al cliente. Usted también puede confiar en KUBOTA.
OPERATOR'S MANUAL

KUBOTA
ZERO TURN MOWER

MODELS
Z411
Z421
Z421T

READ AND SAVE THIS MANUAL
ABBREVIATION LIST

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>fpm</td>
<td>Feet Per Minute</td>
</tr>
<tr>
<td>HST</td>
<td>Hydrostatic Transmission</td>
</tr>
<tr>
<td>m/s</td>
<td>Meters Per Second</td>
</tr>
<tr>
<td>PTO</td>
<td>Power Take Off</td>
</tr>
<tr>
<td>RH/LH</td>
<td>Right-hand and left-hand sides are determined by facing in the direction of forward travel</td>
</tr>
<tr>
<td>ROPS</td>
<td>Roll-Over Protective Structures</td>
</tr>
<tr>
<td>rpm</td>
<td>Revolutions Per Minute</td>
</tr>
<tr>
<td>r/s</td>
<td>Revolutions Per Second</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
</tbody>
</table>

UNIVERSAL SYMBOLS

As a guide to the operation of your machine, various universal symbols have been utilized on the instruments and controls. The symbols are shown below with an indication of their meaning.

- **Safety Alert Symbol**
- **Read Operator’s Manual**
- **Gasoline Fuel**
- **Fuel-Level**
- **Parking Brake-Engaged position**
- **Parking Brake-Disengaged position**
- **Engine-Stop**
- **Engine-Run**
- **Starter Control**
- **Power Take-Off Switch Control-Off Position (Disengaged)**
- **Power Take-Off Switch Control-On Position (Engaged)**
- **Hours**
- **Cutting Height**
- **Fast**
- **Slow**
- **Engine Speed Control**
- **Choke**

California Proposition 65

**WARNING**

Engine exhaust, some of its constituents, certain vehicle components and fluids, contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

IMPORTANT

The engine in this machine is not equipped by the manufacturer with a standard spark arrester. It is a violation of California Public Resource Code Section 4442 to use or operate this engine on or near any forest-covered, brush-covered land, or grass-covered land unless the exhaust system is equipped with a working spark arrester meeting state laws. Other states or federal areas may have similar laws.

Canadian Electromagnetic Compatibility (EMC):

This machine complies with Industry Canada ICES-002.
FOREWORD

You are now the proud owner of a KUBOTA ZERO TURN MOWER. This machine is a product of KUBOTA's quality engineering and manufacturing. It is made of excellent materials and under a rigid quality control system. It will give you long, satisfactory service. To obtain the best use of your machine, please read this manual carefully. It will help you become familiar with the operation of the machine and contains many helpful hints about machine maintenance. It is KUBOTA's policy to utilize, as quickly as possible, every advance in our research. The immediate use of new techniques in the manufacturing of products may cause some small parts of this manual to become outdated. KUBOTA distributors and dealers will have the most up-to-date information. Please do not hesitate to consult them.

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 assemble 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, could result in minor or moderate injury.

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

**NOTE** : Gives helpful information.
MAINTENANCE .........................................................................................................................46

TIRES AND WHEELS ................................................................................................................44

PERIODIC SERVICE .................................................................................................................50

EVERY 200 HOURS........................................................................................................................................... 63

EVERY 100 HOURS........................................................................................................................................... 58

EVERY 50 HOURS............................................................................................................................................. 55

DAILY CHECK .................................................................................................................................................... 50

LUBRICANTS AND FUEL ................................................................................................................................... 49

OPERATING THE MOWER...................................................................................................................................... 43

ADJUSTING THE CUTTING HEIGHT................................................................................................................ 41

MOWING TIPS.............................................................................................................................................. 41

OPERATING THE MOWER.................................................................................................................................. 41

1. PTO switch ........................................................................................................................................ 43

2. Starting the machine ......................................................................................................................... 43

TIES AND WHEELS......................................................................................................................................... 44

TIRES............................................................................................................................................................. 44

1. Inflation pressure ............................................................................................................................... 44

WHEELS.......................................................................................................................................................... 44

1. Removing the front caster wheels ...................................................................................................... 44

2. Installing the front caster wheels ........................................................................................................ 45

MAINTENANCE ............................................................................................................................................... 46

SERVICE INTERVALS................................................................................................................................. 46

PERIODIC SERVICE CHART LABEL........................................................................................................... 48

Z400

LUBRICANTS AND FUEL................................................................................................................................... 49

PERIODIC SERVICE ......................................................................................................................................... 50

OPENING THE STEP ...................................................................................................................................... 50

RAISING AND LOWERING THE OPERATOR'S SEAT .................................................................................... 50

1. Step ................................................................................................................................................... 50

DAILY CHECK ................................................................................................................................................ 50

1. Checking the engine oil level ............................................................................................................... 51

2. Checking the amount of fuel and refueling ....................................................................................... 51

3. Checking and cleaning the air intake screen ..................................................................................... 52

4. Checking the transaxle fluid level ....................................................................................................... 53

5. Checking the tire pressure .................................................................................................................. 53

5.1 Inflation pressure ............................................................................................................................. 53

6. Checking the dial cam rotation strength ............................................................................................ 54

7. Checking movable parts ...................................................................................................................... 54

EVERY 25 HOURS............................................................................................................................................ 54

1. Cleaning the cylinder and cylinder head fins .................................................................................... 54

2. Cleaning the foam element ............................................................................................................... 55

EVERY 50 HOURS......................................................................................................................................... 55

1. Checking the engine start system ........................................................................................................ 55

2. Checking the OPC system .................................................................................................................. 56

3. Checking the carbon canister air filter ............................................................................................... 57

4. Greasing ............................................................................................................................................ 57

5. Checking the muffler and spark arrester (if equipped) ..................................................................... 57

EVERY 100 HOURS....................................................................................................................................... 58

1. Changing the engine oil ...................................................................................................................... 58

2. Cleaning the air cleaner paper element ............................................................................................. 58

3. Checking the spark plug .................................................................................................................... 59

4. Checking the fuel filter and fuel lines ............................................................................................... 59

5. Checking the battery condition ......................................................................................................... 60

5.1 Charging the battery ......................................................................................................................... 61

5.2 Storing the battery ............................................................................................................................ 62

6. Adjusting the throttle cable ............................................................................................................... 62

7. Adjusting the choke cable .................................................................................................................. 62

8. Greasing mower link bushings ......................................................................................................... 63

EVERY 200 HOURS OR EVERY 1 YEAR .......................................................................................................... 63

1. Replacing the air cleaner paper element .......................................................................................... 63

EVERY 200 HOURS....................................................................................................................................... 63
SAFE OPERATION

Careful operation is your best insurance against an accident.
Read and understand this manual carefully before operating the machine. All operators, no matter how much experience they may have had, must read this and other related manuals before operating the machine or any implement attached to it. It is the owner's obligation to instruct all operators in safe operation.
If the operator(s) or mechanic(s) cannot understand the contents, it is the owner's responsibility to explain this material to them. This mowing machine is capable of amputating hands, feet and throwing objects. Failure to observe the following safety instructions could result in serious injury or death.

BEFORE OPERATING THE MACHINE

Know your equipment and its limitations. Read all instructions in this manual before attempting to start and operate the machine.

1. General

• The zero turn mowing machine has different steering characteristics than other machines with a steering wheel and does not have a service brake pedal. Normal slowing down and stopping is done with the motion control levers. Read and understand the operator's manual before operating the machine. Practice operating the machine at low engine speed in an unobstructed area without engaging the mower.
• Pay special attention to the safety labels on the machine itself.
• Do not allow any bystanders around or near the machine during operation.
• Do not allow passengers, children or non-qualified operators on the machine at any time. The operator must remain in the machine seat throughout operation.
• Do not operate the machine or any attachments while under the influence of alcohol, medication, controlled substances or when fatigued.
• Do not wear loose, torn, or bulky clothing around the machine. The clothing may catch on moving parts or controls, leading to the risk of an accident. Wear and use any additional safety items such as a hard hat, safety boots or shoes, eye and hearing protection, gloves and so on, as appropriate or required.
• Do not wear radio or music headphones while operating the machine. Do not operate the machine or any attachments while using or texting with a cellphone or any other electronic device. Safe operation requires your full attention.
• Carefully check the vicinity before operating machine or any implement attached to it. Clear the work area of objects (such as wires and rocks,) that might be picked up and thrown. Check for overhead clearance which may interfere with the grass catcher or ROPS.
• Check brakes and other mechanical parts for correct adjustment and wear. Replace worn or damaged parts promptly. Check the tightness of all nuts and bolts regularly. (See MAINTENANCE on page 46 and ADJUSTMENT on page 70.)
• Keep all shields and guards in place. Replace any that are damaged or missing. Do not operate unless they are functioning properly.
• Before allowing other people to use your machine, explain how to operate and have them read this manual before operation.
• In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern and prudence of personnel involved in the operation, transport and maintenance of the equipment.
• Keep the machine and attachments in good operating condition and keep safety devices in place and in proper working condition. Do not operate unless they are functioning properly.
• Do not modify the machine. Unauthorized modification may affect the function of the machine, which may result in personal injury.
• Use only implements approved by KUBOTA. Use proper ballast on the front or rear of the machine to reduce the risk of upsets. Follow the safe operating procedures specified in the manuals of the equipment.
• Keep your machine clean. Accumulations of dirt, grease, and trash can contribute to fires and lead to personal injury.
• The exhaust gas from the muffler is very hot. To prevent fire, do not expose dry grass, mowed grass, oil and any other combustible materials to the exhaust gas. Use a spark arrester where required. Keep the engine and muffler clean all the times.
2. ROPS

- The ROPS is an integral and effective safety device.
- KUBOTA recommends the use of a roll-over protective structure (ROPS) and seat belt in almost all applications. This combination will reduce the risk of serious injury or death, should the machine be upset.
- The machine is equipped with a foldable ROPS, which may be temporarily folded down only when absolutely necessary for areas with height constraints. There is no operator protection provided by the ROPS in the folded position. For operator safety the ROPS must be placed in the upright and locked position and the seat belt fastened for all other operations.
- Do not remove the ROPS.
- If the ROPS is loosened or removed for any reason, make sure that all parts are reinstalled correctly before operating the machine.
- Never modify or repair a ROPS because welding, bending, drilling, grinding, or cutting may weaken the structure.
- If any structural member of the ROPS is damaged, replace the entire structure at your local KUBOTA Dealer. Any alterations to a ROPS must be approved by the manufacturer.
- Check the area to be mowed and never fold down a folding ROPS in areas where there are slopes, drop-offs or water.
- Check carefully for overhead clearances (such as branches, doorways and electrical wires) before driving under any objects and do not contact them.
- Keep the ROPS in safe operating condition by periodically and thoroughly inspecting for damage and keeping all mounting fasteners tight.
- Always use the seat belt if the machine has a ROPS. Check the seat belt regularly and replace if frayed or damaged. Be certain that the seat belt can be released quickly in the event of an emergency.

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1. ROPS
2. Seat belt

1. Starting to operate the machine

- Always sit in the operator's seat when starting the engine or operating levers or controls.
- Before starting the engine make sure that the motion control levers are in neutral lock, the parking brake is applied, and the power take-off (PTO) is disengaged (OFF).
- Do not start the engine by shorting across starter terminals. The machine may start in gear and move if the normal starting circuitry is bypassed.
- Do not operate or idle the engine in a non-ventilated area. Carbon monoxide gas is colorless, odorless, and deadly.
- Do not start the engine when the front or rear tires are not on the ground.
- Check before each use that the operator presence control (OPC) system is functioning correctly. Test the safety systems. (See Checking the engine start system on page 55 and Checking the OPC system on page 56.) Do not operate unless they are functioning correctly.

2. Working the machine

- Do not turn sharply when driving at high speed.
- To avoid tip-over accidents, slow down when turning on uneven terrain or before stopping.
- Do not operate near ditches, holes, embankments, or other terrain, which may collapse under the machine's weight. The risk of machine tip-overs increases when the ground is loose or wet.
- Park the machine on a firm and level surface.
- Watch where you are going at all times. Watch for and avoid obstacles. Be alert at curbs, near trees, and other obstructions and hidden hazards.
- Know what is behind you before backing up. Look to the rear before and when backing. Do not mow while in reverse. Operate in reverse with the blades engaged only when absolutely necessary and make sure the area immediately behind you is clear of obstructions or holes, and small children. Use extra caution when the machine is equipped with a grass catcher as your view to the rear is restricted.
- When working in groups, always let others know what you are doing ahead of time.
- Do not drive the machine on streets or highways. Watch for traffic when you cross roads or operate near roads.
- Be aware of the mower discharge direction and do not point it at anyone. Never operate with the discharge deflector raised, removed or altered, unless using a grass catcher.
- When using any attachments, never direct discharge material toward bystanders. Do not allow
people or pets near the attachments while in operation.
Do not mow when bystanders are present in the mowing area.
• To reduce fire hazards, keep the engine exhaust area free of grass or leaves.
• Be sure that the rotating blades and the engine are stopped and the key is removed before placing hands or feet near blades and cleaning blockages or unclogging the chute. Keep hands and feet away from the cutting units.
• Shut the engine off and wait for all movement to stop before removing the grass catcher or unclogging the chute.
• Maintain all screens to avoid overheating conditions.
• Always inspect the mower for damage after striking a foreign object. Repair or replace any damaged parts before restarting.
• Operate during daylight or in bright artificial light.
• If the machine starts to vibrate abnormally, disengage the drive to the attachments, stop the engine and remove the key. Then check the machine immediately.
• Do not operate the machine when there is a possibility of lightning. Even if the machine is equipped with a cabin, the operator is not protected from lightning.
• Never raise the deck with the blades running. Disengage the PTO and stop the blades from rotating if not mowing.

3. Safety for children
Tragic accidents can occur if the operator is not alert of the presence of children. Children are attracted to the machine and mowing activity.
• Never assume that children will remain where you last saw them.
• Keep children out of the mowing area and under the watchful care of another responsible adult.
• Be alert and turn the machine off if children enter the area.
• Before and when backing, look behind and down for small children.
• Never carry children. There is no safe place for them to ride. They may fall off and be seriously injured or interfere with safe machine operation.
• Never allow children to operate the machine, even under adult supervision.
• Use extra care when approaching blind corners, shrubs, trees, or other obstructions that might hide children from sight.
• Do not mow in reverse. Operate in reverse with the blades engaged only when it is absolutely necessary and make sure that the area to the rear is clear of children before doing so.

4. Operators, age 60 years and older
Data indicates that operators, age 60 years and older, are involved in a large percentage of machine-related injuries. These operators should evaluate their ability to operate the machine safely enough to protect themselves and others from serious injury.

5. Pulling loads
Use extra care when pulling loads to reduce the risk of serious personal injury or death due to a machine tip-over.
• Pull only from the hitch. Never attach loads to the axle housing or any other point above the hitch.
• Limit loads to those you can safely control.
• Do not turn sharply.
• Use care when backing.
• Use front ballast or wheel weights when suggested in this operator's manual.
  – Stopping distance increases with speed and weight of towed load. Travel slowly and allow extra time and distance to stop.
  – Never allow children or others in, or on, towed equipment.
  – Use additional caution when turning or operating under adverse surface conditions.

6. Operating on slopes
Slopes are a major factor related to loss-of-control and tip-over accidents, which can result in severe injury or death. All slopes require extra caution. If you cannot back up the slope or if you feel uneasy on it, do not mow it.
If the engine stops when operating on a slope, apply the parking brake immediately to prevent machine runaway.

Do
• To avoid tip-over accidents, operate across slopes, not up and down. Stay off hills and slopes too steep for safe operation.
• Remove obstacles such as rocks and tree limbs.
• Stay alert for holes in the terrain and other hidden hazards. Keep away from drop-offs. Uneven terrain could overturn the machine. Tall grass can hide obstacles.
• Follow the manufacturer's recommendations for wheel weight or counterweights to improve stability.
• Keep all movement on slopes slow and gradual. Do not make sudden changes in speed or direction.
• If tires lose traction, disengage the PTO and proceed slowly straight down the slope.
• Reduce the speed and exercise extreme caution on slopes and in sharp turns to prevent tip-over accidents or loss of control.
SAFE OPERATION

- Use special caution when changing direction on slopes. Slow down, and use extra caution when changing direction on a slope.

Do not
- Do not turn on slopes unless necessary. If necessary, turn uphill slowly and gradually.
- Do not mow near drop-offs, ditches, or embankments. The mower could suddenly turn over if a wheel is over the edge of cliff or ditch, or if an edge caves in.
- Do not mow on wet grass. Reduced traction could cause sliding and loss of control.
- Do not try to stabilize the machine by putting your foot on the ground.
- Do not use the grass catcher on steep slopes.
- Do not start or stop suddenly on slopes. If tires lose traction, disengage the PTO and proceed slowly straight down the slope.
- Never “freewheel”. Do not let the machine travel downhill with motion control levers at the neutral lock position or in neutral.
- Do not operate the machine without the mower deck installed.

7. Stopping the machine
- Park the machine on level ground.
- Make sure that the machine and all attachments have come to a complete stop before you get off.
- Before you get off, apply the parking brake, place the motion control levers in their neutral lock positions, disengage the PTO, lower all attachments to the ground, turn off the engine, and remove the key.
- Do not park the machine on dry grass or leaves.

TRANSPORTING THE MACHINE
- Disengage power to attachment(s) when transporting or not in use.
- Do not tow this machine. Use a suitable truck or trailer when transporting on public roads.
- Use extra care when loading or unloading the machine into a trailer or truck. Use full width ramps for loading machine into a trailer or truck.
- This machine is not allowed to be used on public roads.
- Shut off fuel while storing or transporting.
- Tie the machine down securely using straps, chains, cables, or ropes.
- Both front and rear straps should be directed down and outward from the machine.

SERVICING AND STORAGE

1. Servicing the machine
- Before servicing, park the machine on a firm, level surface and apply the parking brake. Remove the key to prevent an accidental start-up.
- Allow the machine time to cool before touching the engine, muffler and so on.
- Always stop the engine before refueling. Avoid spills and overfilling. Wipe up spilled fuel immediately.
- Use extra care when handling gasoline fuels. They are flammable.
  1. Use only an approved container.
  2. Do not remove the fuel cap or refuel with the engine running. Allow the engine to cool before refueling. Do not smoke while refueling or when standing near fuel.
  3. Do not refuel the machine indoors and always clean up spilled fuel or oil.
  4. Do not store the machine or fuel container inside where there is an open flame, such as in a water heater.
- Do not smoke when working around battery or when refueling. Extinguish all cigarettes, cigars, pipes, and other sources of ignition. Keep all sparks and flames away from battery and fuel tank.
- Never fill containers inside a vehicle or on a truck or trailer bed with a plastic liner. Always place containers on the ground away from your vehicle before filling.
- Remove equipment from the truck or trailer and refuel it on the ground. If this is not possible, then refuel such equipment with a portable container, rather than from a fuel dispenser nozzle. Keep the nozzle in contact with the rim of the fuel tank or container opening at all times until fueling is complete. Do not use a nozzle lock open device.
- If fuel is spilled on clothing, change the clothing immediately. Replace the fuel cap and tighten securely.
• Charge batteries in an open, well-ventilated area, away from spark and flames. A battery, especially when charging, will give off hydrogen and oxygen gases, which can explode and cause serious personal injury.
• Unplug the charger before connecting or disconnecting from battery.
• Before “jump starting” a dead battery, read and observe all of the instructions:
  • Disconnect the battery or remove the spark plug wire before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect the positive first and negative last. Wear protective clothing and use insulated tools.
  • Do not use or charge the refillable type battery if the fluid level is below the [LOWER] (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery’s service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the [UPPER] and [LOWER] levels.
• Keep a first aid kit and fire extinguisher handy at all times.
• Never allow untrained personnel to service the machine. Do not attempt to mount a tire on a rim unless qualified to do so and all proper safety precautions are followed.
• Always maintain the correct tire inflation pressure. Do not inflate tires above the recommended pressure shown in the operator’s manual.
• Mower blades are sharp and can cut your hands. Wrap the blade(s) or wear gloves, and use extra caution when servicing them. Never straighten or weld blades.
• Keep nuts and bolts, especially blade attachment bolts, tight and keep equipment in good condition.
• Never tamper with safety devices. Check their operation for proper function regularly.
• Waste products such as used oil, fuel, coolant, brake fluid, and batteries can harm the environment, people, pets and wildlife. Please dispose of the waste products properly.
• Do not use beverage containers for waste fluids or other products. Someone, particularly children, may drink them by mistake.
• Securely support the machine or any machine elements with stands or suitable blocking before working underneath. For your safety, do not rely on hydraulically supported devices as they may leak down, suddenly drop or be accidently lowered.
• Consult your local recycling center or KUBOTA Dealer to learn how to recycle or get rid of waste products.
  – A material safety data sheet (MSDS) provides specific details on chemical products physical and health hazards, safety procedures, and emergency response techniques. The seller of the chemical products used with your machine is responsible for providing the MSDS for that product upon request.

2. Storage
• Keep the machine and supply of fuel in locked storage and remove the ignition key to prevent children or others from playing or tampering with them.
• To avoid sparks from an accidental short circuit, always disconnect the battery’s ground cable (-) first and reconnect it last.
SAFE OPERATION

- To avoid the danger of exhaust fume poisoning, do not operate the engine indoors without adequate ventilation.
- To reduce fire hazards, clean the machine thoroughly before storage. Dry grass and leaves around the engine and muffler may ignite.
- Let the engine cool before storing and do not store near flames.
- Shut off fuel while storing or transporting.
SAFETY LABELS

WARNING

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.

SAFE OPERATION

1. Use the machine in the line of the mower.
2. If necessary to park on an incline, stop the machine, apply the brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.
3. If the engine stops suddenly during operation, apply the parking brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.

ADVERTENCIA

1. Use the machine in the line of the mower.
2. If necessary to park on an incline, stop the machine, apply the brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.
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3. If the engine stops suddenly during operation, apply the parking brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.

California Proposition 65

WARNING

Engine exhaust, some of its constituents, certain vehicle components and fluids, certain or all chemical hazards to the State of California to cause cancer and birth defects or other reproductive harm.

1. Use the machine in the line of the mower.
2. If necessary to park on an incline, stop the machine, apply the brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.
3. If the engine stops suddenly during operation, apply the parking brake and remove the key. If the engine stops suddenly during operation, do not start the machine again.
SAFE OPERATION

(1) Part No. K3851-6566-1

ADVERTENCIA

1. Nunca modifique ni repare una estructura de protección contra volcaduras (ROPS), por sus siglas en inglés), porque esto, enmascar, perforar o cortar cualquier parte puede debilitar la estructura.

2. PARA EVITAR LESIONES PERSONALES, AL ELEVAR O PLEGAR LA ESTRUCTURA DE PROTECCIÓN CONTRA VOLCADURAS:
   1. Fije el mazo 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 limpio 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.

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(2) Part No. K3811-6563-1

WARNING

1. Keep Roll-Over Protective Structure (ROPS), as soon as vertical clearance allows.
2. Read ROPS model instructions and warnings.
3. Install the ROPS to the tractor.
4. Do not use tractor without ROPS installed.

TO AVOID PERSONAL INJURY OR DEATH FROM ROLL-OVER:
1. Keep Roll-Over Protective Structure (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 use tractor without ROPS installed.
3. Fasten SEAT BELT if ROPS is folded.
4. Read ROPS model instructions and warnings.

1BDABEAAP009A
1SFRT00034A01
SAFE OPERATION

**WARNING**

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

**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.

**ADVERTENCIA**

Para evitar lesiones personales o la muerte debidos a la maquinaria subida delantera de la máquina.

1. No arranque la máquina con los terminales del arranque del motor al tiempo el interruptor de arranque de seguridad.
2. No arranque el motor si está en el asiento del operador con las palancas de control de movimiento en posición de bloqueo no se ha desenganche.

**DANGER**

To avoid possible injury or death from a machine runaway:

1. Do not start engine by shifting across start terminal or by 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 subido de la máquina.

1. No arranque la máquina con los terminales del arranque del motor al tiempo el interruptor de arranque de seguridad.
2. No arranque el motor si está en el asiento del operador con las palancas de control de movimiento en posición de bloqueo no se ha desenganche.

**NOTICE**

Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. This operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.
SAFE OPERATION

DANGER EXPLOSIVE GASES
- Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. DO NOT CHARGE OR USE BOOSTER CABLES OR ADJUST POST CONNECTIONS WITHOUT PROPER INSTRUCTION AND TRAINING.
- POISON CAUSES SEVERE BURNS
- CONTAINS SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. IN EVENT OF ACCIDENTALcontact, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY.
- KEEP OUT OF REACH OF CHILDREN

California Proposition 65 WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

FITTING DATE
1 2 3 4 5 6 7 8 9 10 11 12 MONTH

(1) Part No. K3011-6118-4

(2) Part No. K3071-6542-2

(3) Part No. K3071-6543-2

TO AVOID INJURY FROM BATTERY GASES AND ACIDES
- Keep away cigarettes, flames or sparks.
- Always shield eyes and face from battery.
- Keep out of reach of children.
- Poison causes severe burns.
- Contains sulfuric acid.
- Read and understand operator's manual.
- Danger explosive gases.

VENEZIO - CAUSA GRAVES QUEMADURAS - LA BATERIA CONTIENEN ACIDO SULFURICO, EVITE EL CONTACTO DEL MISMO CON LA PIEL, LOS OJOS Y LAS ROPAS.
- EN EL CASO DE PRODUCIRSE UN ACCIDENTE LAVE LA ZONA AfectADA CON ABUNDANTE AGUA Y ACUDA INMEDIATAMENTE A UN MEDICO.
- PROPUESTA ES DE CALIFORNIA ADVERTENCIA. ESTE producto puede expone al quimico conocido como causante de cancer y defectos de nacimiento u otros daños reproductivos. Para obtener mas información, visite el sitio web: www.P65Warnings.ca.gov

SAFE OPERATION

1SFRT00090A01

1SFRT00091A01

1SFRT00109A01

1SFRT00109B01

1SFRT0095A01enUS

SMF U1-300
PART No. K3011-61144
NOMINAL VOLTAGE 12V
COLD CRANKING AMPS 300
CRANKING AMPS 410
RESERVE CAPACITY (MINUTES) 45
AMP HOURS (@20 hr Rate) 29

MADE IN KOREA
SAFE OPERATION

(1) Part No. K5591-7312-1

DANGER
DO NOT PUT HANDS OR FEET INTO MOWER WHEN ENGINE IS RUNNING.

PELIGRO
NO COLOQUE LAS MANOS O LOS PIE EN LA CORTADORA MIENTRAS EL MOTOR ESTÉ EN FUNCIONAMIENTO.

1BDACAEAP015B

(2) Part No. K5591-7310-1

DANGER
STAY CLEAR OF DISCHARGE OPENING AT ALL TIMES.
DO NOT PUT HANDS OR FEET INTO MOWER WHEN ENGINE IS RUNNING.
DO NOT OPERATE MOWER WITHOUT DISCHARGE DEFLECTOR.

PELIGRO
MANTÉNGASE ALEJADO DE LA ABERTURA DE LA DESCARGA EN TODO MOMENTO.
NO COLOQUE LAS MANOS O LOS PIE EN LA CORTADORA MIENTRAS EL MOTOR ESTÉ EN FUNCIONAMIENTO.
NO HACER FUNCIONAR LA CORTADORA SIN EL DEFLECTOR DE DESCARGA.

1BDA8FDAP091A
CARE OF SAFETY LABELS

- Keep safety labels clean and free from obstructing material.
- Clean safety labels with soap and water, and dry with a soft cloth.
- Replace damaged or missing safety labels with new labels from your local KUBOTA Dealer.
- If a component with safety label(s) attached is replaced with a new part, make sure new label(s) is (are) attached in the same location(s) as the replaced component.
- Attach new safety labels by applying on a clean dry surface and pressing any bubbles to the outside edge.
SERVICING OF MACHINE

After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself. Your dealer has knowledge of your new machine and has the desire to help you get the best performance and the most value from it. When in need of parts or major service, be sure to consult your local KUBOTA Dealer. When in need of parts, be prepared to give your dealer the machine, ROPS, engine and mower serial numbers. Locate the serial numbers now and record them in the space provided.

<table>
<thead>
<tr>
<th>Type</th>
<th>Serial no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine</td>
<td></td>
</tr>
<tr>
<td>ROPS</td>
<td></td>
</tr>
<tr>
<td>Engine</td>
<td></td>
</tr>
<tr>
<td>Mower</td>
<td></td>
</tr>
<tr>
<td>Date of purchase</td>
<td></td>
</tr>
<tr>
<td>Name of dealer</td>
<td></td>
</tr>
</tbody>
</table>

(To be filled in by purchaser)

(1) Machine identification plate
(2) Machine serial no.

1SFRT00036A02
(1) ROPS serial no.

1SFRT00040A01
(1) Engine serial no.

RCK48P, RCK54P

1SFRT00034A04
(1) Mower identification plate
(2) Mower serial no.
WARRANTY

This machine is warranted under the **KUBOTA Limited Express Warranty**, a copy of which may be obtained from your selling dealer. No warranty shall, however, apply if the machine has not been handled according to the instructions given in the operator's manual, even if it is within the warranty period.

The engine is warranted under the Kawasaki Limited Warranty, a copy of which has been provided with your machine purchase.

Refer to the Kawasaki Limited Warranty for details regarding warranty coverage, owner obligations, warranty limitations, and liabilities.

SCRAPPING THE MACHINE AND ITS PROCEDURE

To put the machine out of service, correctly follow the local rules and regulations of the country or territory where you scrap it. If you have questions, consult your local KUBOTA Dealer.
## SPECIFICATIONS

### SPECIFICATION TABLE

<table>
<thead>
<tr>
<th></th>
<th>Z411KW</th>
<th>Z421KW</th>
<th>Z421KWT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>GH7302V</td>
<td>GH7301V</td>
<td>GH7301V</td>
</tr>
<tr>
<td><strong>Engine</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>Z411KW</td>
<td>Z421KW</td>
<td>Z421KWT</td>
</tr>
<tr>
<td>Max. engine power (gross)</td>
<td>kW (HP)</td>
<td>16.4 (22.0) <em>1</em>2</td>
<td>17.9 (24.0) <em>1</em>2</td>
</tr>
<tr>
<td>Type</td>
<td>Air-cooled gasoline engine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cylinders</td>
<td>2 (V-Twin)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bore and stroke</td>
<td>mm (in.)</td>
<td>78 x 76 (3.07 x 2.99)</td>
<td></td>
</tr>
<tr>
<td>Total displacement</td>
<td>cm³ (cu. in.)</td>
<td>726 (44.3)</td>
<td></td>
</tr>
<tr>
<td>Rated revolution</td>
<td>rpm</td>
<td>3600</td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>Unleaded gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starter</td>
<td>Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Full pressure lubrication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>Air-cooled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>U1 (12 V, RC: 45 min, CCA: 300, CA: 410)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capacities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel tank</td>
<td>L (U.S.gals.)</td>
<td>25.7 (6.8)</td>
<td></td>
</tr>
<tr>
<td>Engine crankcase (with filter)</td>
<td>L (U.S.qts.)</td>
<td>2.1 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Transmission case including rear axle gear case</td>
<td>L (U.S.qts.)</td>
<td>4.8 (5.1) *3</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall length</td>
<td>mm (in.)</td>
<td>2055 (80.9)</td>
<td></td>
</tr>
<tr>
<td>Overall width without mower deck</td>
<td>mm (in.)</td>
<td>1236 (48.7)</td>
<td>1376 (54.2)</td>
</tr>
<tr>
<td>Overall height (with ROPS)</td>
<td>mm (in.)</td>
<td>1772 (69.8)</td>
<td></td>
</tr>
<tr>
<td>Wheelbase</td>
<td>mm (in.)</td>
<td>1255 (49.4)</td>
<td></td>
</tr>
<tr>
<td>Min. ground clearance</td>
<td>mm (in.)</td>
<td>124 (4.9)</td>
<td></td>
</tr>
<tr>
<td>Tread</td>
<td>Front mm (in.)</td>
<td>944 (37.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rear mm (in.)</td>
<td>1000 (39.4)</td>
<td>1070 (42.1)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>kg (lbs.)</td>
<td>388 (856) with 48&quot;</td>
<td>395 (870) with 54&quot;</td>
</tr>
<tr>
<td><strong>Traveling system</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tires</td>
<td>Front</td>
<td>13 x 5.0 - 6 (pneumatic tire) smooth</td>
<td>13 x 6.5 - 6 (pneumatic tire) smooth</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>24 x 9.5 - 14 (4PR) low profile turf</td>
<td>24 x 12 - 14 (4PR) low profile turf</td>
</tr>
<tr>
<td>Traveling speeds</td>
<td>Forward mph (km/h)</td>
<td>0 to 10.0 (0 to 16.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reverse mph (km/h)</td>
<td>0 to 5.0 (0 to 8.0)</td>
<td></td>
</tr>
<tr>
<td>Steering</td>
<td>2 - hand levers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>2 - HST with gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking brake</td>
<td>Foot applied, released</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. turning radius</td>
<td>mm (in.)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td><strong>PTO</strong></td>
<td>Drive system</td>
<td>Belt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clutch type</td>
<td>Electric</td>
<td></td>
</tr>
</tbody>
</table>

Specifications and design subject to change without notice.

*1 Manufacturer's estimate

*2 These Kawasaki engines have been tested in accordance with SAE J1995, verified by TÜV Rheinland Group, and certified by SAE International. The gross power ratings of these engines were determined by using measurements according to SAE J1995 which were witnessed by SAE-approved witnesses from TÜV Rheinland Group. Torque ratings of these engines were not certified by SAE. Actual power and torque
output will vary depending on numerous factors, including, but not limited to, the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

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

<table>
<thead>
<tr>
<th>Model</th>
<th>RCK48-400Z</th>
<th>RCK54-400Z</th>
<th>RCK60-400Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable machine</td>
<td>Z411KW</td>
<td>Z421KW</td>
<td>Z421KWT</td>
</tr>
<tr>
<td>Mounting method</td>
<td>Parallel linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment of cutting height</td>
<td>Dial gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting width</td>
<td>mm (in.)</td>
<td>1219 (48)</td>
<td>1372 (54)</td>
</tr>
<tr>
<td>Cutting height</td>
<td>mm (in.)</td>
<td>38 to 127 (1.5 to 5.0)</td>
<td></td>
</tr>
<tr>
<td>Weight (approximation)</td>
<td>kg (lbs.)</td>
<td>69 (152)</td>
<td>75 (165)</td>
</tr>
<tr>
<td>Blade spindle speed</td>
<td>r/s (rpm)</td>
<td>72 (4320) *1</td>
<td>63.7 (3820) *1</td>
</tr>
<tr>
<td>Blade tip velocity</td>
<td>m/s (fpm)</td>
<td>95.5 (18800) *1</td>
<td>95 (18700) *1</td>
</tr>
<tr>
<td>Blade length</td>
<td>mm (in.)</td>
<td>423 (16.7)</td>
<td>474 (18.7)</td>
</tr>
<tr>
<td>Number of blades</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total length</td>
<td>mm (in.)</td>
<td>867 (34.1)</td>
<td>885 (34.8)</td>
</tr>
<tr>
<td>Total width</td>
<td>mm (in.)</td>
<td>1552 (61.1)</td>
<td>1710 (67.3)</td>
</tr>
<tr>
<td>Total height</td>
<td>mm (in.)</td>
<td>340 (13.3)</td>
<td></td>
</tr>
</tbody>
</table>

*1 Engine maximum rpm
IMPLEMENT LIMITATIONS

The KUBOTA Machine has been thoroughly tested for proper performance with implements sold or approved by KUBOTA.

Use with implements below may result in malfunctions or failures of the machine, damage to other property and injury to the operator or others.

- Implements which are not sold or approved by KUBOTA
- Implements which exceed the maximum specifications listed below, or
- Implements which are otherwise unfit for use with the KUBOTA Machine

Any malfunctions or failures of the machine resulting from use with improper implements are not covered by the warranty.

### Table: Implement Limitations

<table>
<thead>
<tr>
<th>Unit</th>
<th>Maximum loading weight</th>
<th>Implement weight ( W_1 )</th>
<th>Maximum total weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front axle ( W_f )</td>
<td>Rear axle ( W_r )</td>
<td></td>
</tr>
<tr>
<td>Z411KW, Z421KW</td>
<td>108 kg (238 lbs.)</td>
<td>545 kg (1202 lbs.)</td>
<td>166 kg (366 lbs.)</td>
</tr>
<tr>
<td>Z421KWT</td>
<td>113 kg (249 lbs.)</td>
<td>555 kg (1225 lbs.)</td>
<td>166 kg (366 lbs.)</td>
</tr>
</tbody>
</table>

**IMPORTANT:**
- Do not operate with trailer on an incline greater than 10°.
- Total towed weight must not exceed the combined weight of the pulling machine, ballast and operator.
- Follow the manufacturer's recommendations for weight limits for towed equipment.
Illustrated contents

(1) Parking brake pedal … 27, 38
(2) Parking brake lock pedal … 27, 38
(3) Motion control lever … 27, 36
(4) Seat belt … 35
(5) Cup holder … -
(6) Operator's seat … 35
(7) Foldable ROPS … 33
(8) Mower lift pedal … 41
(9) Cutting height control dial … 41
(10) Key switch … 29
(11) Choke knob … 28
(12) Hour meter … 29
(13) PTO switch … 43
(14) Throttle lever … 35
MOWER

RCK48P, RCK54P

(1) Anti-scalp roller (front, bolt shift type)...41
(2) Discharge deflector

RCK60P

(1) Anti-scalp roller (front, bolt shift type)...41
(2) Discharge deflector
**WARNING**

To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key.

1. Before mounting the mower deck, raise the lift links to the full up position. (See ADJUSTING THE CUTTING HEIGHT on page 41.)
2. Adjust the cutting height control dial to the 38.1 mm (1.5 in.) position.
3. Change the direction of the front tires as shown in the following illustration.
4. Place the mower deck at the right side of the machine.
5. Slide the mower deck under the machine, then lower the mower lift links.
6. Put a Φ9.5 mm (0.37 in.) x 100 mm (4 in.) shaft in the hole of the front right side lift link.
7. Attach the lift links to the mower deck with attaching hardware.
8. Raise the mower deck to 76 mm (3.0 in.) or higher. Attach the PTO belt to the PTO clutch pulley.

9. Remove the step. (See OPENING THE STEP on page 50.)

10. Turn the tension arm clockwise with a square wrench.

11. Attach the mower belt to the mower pulleys.

12. After mounting the mower, check the mower level. If necessary, adjust the mower level and anti-scalp rollers.

---

**ADJUSTING THE MOWER**

(See OPERATING THE MOWER on page 41 and ADJUSTMENT on page 70.)

**DISMOUNTING THE MOWER DECK**

**WARNING**

To avoid serious injury or death:
- Push the mower deck lift pedal with enough strength. If the strength is not enough, the mower link will jump up when the Φ9.5 mm (0.37 in.) shaft is removed from the right side of the machine due to the power of the spring.
- Keep all hands and feet clear of the mower links during this time.

1. Raise or lower (as needed) the mower deck to a cutting height of 76 mm (3.0 in.) or higher.
2. Remove the mower belt.
3. Adjust the cutting height control dial to the 38.1 mm (1.5 in.) position. (See ADJUSTING THE CUTTING HEIGHT on page 41.)
4. Adjust the anti-scalp rollers to the 38.1 mm (1.5 in.) position. (See ADJUSTING THE CUTTING HEIGHT on page 41.)
5. Put a Φ9.5 mm (0.37 in.) x 100 mm (4 in.) shaft in the hole of the front right side lift link.

6. Remove the 4 clevis pins mounting the mower deck.

7. Push the mower lift pedal toward the seat and remove the Φ9.5 mm (0.37 in.) shaft from the hole in the rear right side lift link.

8. Slowly push the mower lift pedal to the full up position.

9. Slide the mower deck from under the machine to the right side of it.
OPERATING THE ENGINE

WARNING
To avoid serious injury or death:
• Read and understand the safe operation section.
• Read and understand the safety labels located on the machine.
• To avoid the danger of exhaust fume poisoning, do not operate the engine indoors without proper ventilation.
• Never start the engine while standing on the ground. Start the engine only from the operator's seat.

Details regarding safe operation can be found in a different section.
(See SAFE OPERATION on page 5.)

GETTING ON AND OFF THE MACHINE SAFELY

Do not step on either side of the mower deck when you get on and get off the machine. When you get on the machine from either side, step over the mower deck.

STARTING THE ENGINE

1. Sit on the operator's seat. Put on the seat belt.
2. Apply the parking brake.

To apply the parking brake:
   a. Depress the parking brake pedal firmly with the left side of your right foot.
   b. While keeping the parking brake pedal depressed, use the right side of your right foot to depress the parking brake lock pedal.
   c. Release the parking brake pedal while holding down the parking brake lock pedal.

   d. Release the parking brake lock pedal.

   To release the parking brake:
   Depress the parking brake pedal and release it slowly with your right foot without pressing the parking brake lock pedal.
3. Make sure that the PTO switch is in the “DISENGAGED” (OFF) position.

4. Place the motion control levers in the “NEUTRAL LOCK” position.

5. Set the throttle lever as follows.
   Place the throttle lever midway between the “SLOW” and the “FAST” positions.

6. Set the choke knob to the “ON” position.

7. Insert the key into the key switch. Turn the key switch to the “START” position and release the key to the “ON” position when the engine starts.

   IMPORTANT:
   • Because of the start interlocks, the engine can not be started except when the PTO switch is disengaged (OFF), the parking brake is applied, motion control levers are in “NEUTRAL LOCK” position and the operator is sitting on the seat.

8. Warm up the engine by running at medium speed.

1. Choke knob

Pull the choke knob to engage the choke.
Push in the choke knob to disengage the choke.

When the engine is cold
Always engage the choke to start the engine in cold conditions.
The engine and equipment may be operated during the warmup period, but it may be necessary to leave the choke partially on until the engine warms up.
When the engine is warm
Always place the throttle lever to the usual position after the engine starts.

2. Throttle lever
Pulling the throttle lever backward decreases the engine speed and pushing it forward increases the engine speed.

3. Key switch

- **OFF**
  The position where the key can be inserted into or removed from the key switch. When the key is turned to this position, the engine shuts off.

- **ON**
  The engine keeps running.

- **START**
  Apply the parking brake and turn the key switch to this position to start the engine.

### IMPORTANT:
- Do not use starting fluid or ether.
- To protect the battery and the starter, make sure that the starter is not continuously turned for more than 10 seconds at a time.
  If the engine does not start, allow a 60 seconds cool down period between starting attempts.
- If the starter does not turn the engine over, shut off the starter immediately. Do not make further attempts to start the engine until the condition is corrected. Do not jump start using another battery.
  Consult your local KUBOTA Dealer.
- Do not turn the key switch to the “START” position while the engine is running.
- When the temperature is below 0 °C (32 ℉), run the engine at medium speed to warm up the lubricant of the engine and the transmission for at least 10 minutes. If the machine is operated before the lubricant is warm enough, the machine operating life will be shortened.
- Do not operate the machine under full load until it is sufficiently warmed up 2 or 3 minutes for temperature above 0 °C (32 ℉).
- When the ambient temperature is less than -15 °C (5 ℉), remove the battery from the machine and store it somewhere warm until the next operation.

### CHECK DURING OPERATING

### IMPORTANT:
Immediately stop the engine if:
- The engine suddenly slows down or accelerates.
- Unusual noises suddenly occur.
- Exhaust fumes suddenly become discolored.

While operating, make the following checks to see that all the parts are functioning normally:
- Fuel gauge on page 29
- Hour meter on page 29

1. Fuel gauge
The fuel gauge indicates the fuel level.

### IMPORTANT:
- Do not refuel over [F]. Fill the tank only to the bottom of the filler neck in the fuel tank.
- Refuel on a level ground.

2. Hour meter
This meter indicates the number of hours the engine has run.
COLD WEATHER STARTING

If the ambient temperature is below 0 °C (32 °F) and the engine is very cold, start it in the following manner:

1. Pull the choke knob out (“CHOKE ON” position).
2. Place the throttle lever midway between the “SLOW” and the “FAST” positions.
3. Turn the key switch to the “START” position.
   a. Operate the starter 5 seconds.
   b. If the engine does not start, wait 10 seconds.
   c. Repeat this procedure until the engine starts.
4. When the engine starts, release the key to the “ON” position.
5. Push in the choke knob (“CHOKE OFF” position).

WARMING UP THE ENGINE

WARNING
To avoid serious injury or death:
• Be sure to apply the parking brake during warm-up.

For 5 minutes after the engine start-up, allow the engine to warm up without applying any load. This is to allow oil to reach every part of the engine. If load is applied to the engine without this warm-up period, problems such as seizure, breakage or premature wear may appear.

1. Warm-up and transmission oil in the low temperature range

Hydraulic oil serves as transmission oil. In cold weather conditions, the oil may be cold with increased viscosity. This can cause delayed oil circulation or abnormally low hydraulic pressure for some time after engine start-up. This, in turn, can create problems with the hydraulic system.

To prevent this from happening warm up the engine at about 50% of rated rpm according to the following table.

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Warm-up time requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher than 0 °C (32 T)</td>
<td>Approximately 5 minutes</td>
</tr>
<tr>
<td>-10 to 0 °C (14 to 32 T)</td>
<td>5 to 10 minutes</td>
</tr>
<tr>
<td>-20 to -10 °C (-4 to 14 T)</td>
<td>10 to 15 minutes</td>
</tr>
<tr>
<td>Below -20 °C (-4 T)</td>
<td>More than 15 minutes</td>
</tr>
</tbody>
</table>

IMPORTANT:
• Do not operate unless the engine is well warmed up. If operation is attempted while the engine is still cold, the hydraulic mechanism will not function properly and its service life will be shortened.
• If noises are heard after you operate the motion control levers, the hydraulic mechanism is not adjusted properly. Unless corrected, the unit will be damaged. Contact your local KUBOTA Dealer for adjustment.

JUMP STARTING

WARNING
To avoid serious injury or death:
• Keep cigarettes, sparks, and flames away from the battery.
• If the machine battery is frozen, do not jump start the engine.
• Do not connect the other end of the negative jumper cable to the negative terminal of the machine battery.

When jump starting the engine, observe the following instructions to start the engine safely:
1. Bring a helper vehicle with a battery of the same voltage as the disabled machine within easy cable reach.

   IMPORTANT:
   • The vehicles must not touch.

2. Apply the parking brakes of both vehicles and put the shift levers in the neutral position. Shut the engine off.
3. Put on safety goggles and rubber gloves.
4. Ensure that vent caps are securely in place (if equipped).
5. Attach the red clamp to the positive (red, (+) or pos.) terminal of the dead battery and clamp the other end of the same cable to the positive (red, (+) or pos.) terminal of the helper battery.
6. Clamp the other cable to the negative (black, (-) or neg.) terminal of the helper battery.
7. Clamp the other end to the engine block or the frame of the disabled machine as far from the dead battery as possible.
8. Start the helper vehicle and let its engine run for a few moments. Start the disabled machine.
9. Disconnect the jumper cables in the exact reverse order of attachment (steps 7, 6 and 5).
   Connect cables in numerical order.
   Disconnect in reverse order after use.

**IMPORTANT:**
- This machine has a 12 volt negative (-) ground starting system.
- Use only same voltage for jump starting.
- Use of a higher voltage source on the machine could result in severe damage to the machine electrical system.
  Use only a matching voltage source when "jump starting" a low or dead battery.

**STOPPING THE ENGINE**
1. After slowing the engine to half speed, turn the key switch to the "OFF" position.
2. Remove the key.
3. Do not leave the key switch at "ON" (key in the "ON" position), as the battery will discharge when the engine is not running.
4. Apply the parking brake.
5. If stopping the machine for a long time. Turn the fuel valve to the "STOP" (OFF) position.
OPERATING THE MACHINE

OPERATING A NEW MACHINE

How a new machine is operated and maintained will determine the operating life of the machine.

A new machine just off the factory production line has been tested, but the various parts are not accustomed to each other, so care should be taken to operate the machine for the first 50 hours at a slower speed and avoid excessive work or operation until the various parts become “broken-in”. The manner in which the machine is handled during the “breaking-in” period greatly affects the life of your machine. Therefore, to obtain the maximum performance and the longest operating life of the machine, it is very important to properly break-in your machine. In handling a new machine, the following precautions should be observed.

1. Changing lubricating oil for new machine

The lubricating oil is especially important in the case of a new machine. The various parts are not “broken-in” and are not accustomed to each other. Small metal grit may develop during the operation of the machine and this may wear out or damage the parts. Therefore, care should be taken to change the lubricating oil a little earlier than it would ordinarily be required.

Details regarding normal service intervals can be found in a different section.

(See SERVICE INTERVALS on page 46.)

2. Engine break-in

After the first 8 hours of operation, change the engine oil.

(See SERVICE INTERVALS on page 46 and EVERY 100 HOURS on page 58.)

3. Machine break-in

After the first 100 hours of operation, change the transaxle fluid and the oil filter cartridge.

(See EVERY 100 HOURS on page 58.)

DANGER

To avoid serious injury or death:

• Do not operate the mower without the discharge deflector in the down position.

WARNING

To avoid serious injury or death:

• The machine relies upon the engine driven transmission for speed, direction, and motion control. If the engine is not running, the machine cannot be driven or controlled.

If the engine stops when operating on a slope, apply the parking brake immediately to prevent a machine runaway.

• Do not allow anyone other than the driver to ride on the machine.

• Do not drive the machine close to the edges of ditches or banks which may collapse under the weight of the machine, especially when the ground is loose or wet.

• When making a turn, be sure to reduce the travel speed and operate the motion control levers carefully.

• To avoid tip-over accidents, operate across slopes, not up and down. Avoid sudden starts and stops on slopes. Slow down and use extra caution when changing direction on a slope.

• Park the machine on a firm and level surface.

• Watch where you are going at all times. Watch for and avoid obstacles. Be alert at curbs, near trees, and other obstructions and hidden hazards.

• Do not mow near drop-offs, ditches or embankments. The mower could turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.

• Do not drive the machine on streets or highways. Watch for traffic when you cross roads or operate near roads.

• Look to the rear before and when backing. Make sure the area immediately behind you is clear of obstructions or holes, and small children. Use extra caution when the machine is equipped with a grass catcher.

• Keep bystanders, especially children, and animals away from the mowing area.

• Clear the work area of objects which might be picked up and thrown by the blades.

• Do not direct the opening of the mower at bystanders or animals. Ejected objects may cause injury. Plan your mowing carefully before starting operation.

• Be sure to disengage the PTO and sit on the operator’s seat before starting the engine.
OPERATING THE FOLDABLE ROPS

WARNING
To avoid serious injury or death:
• When raising or folding the ROPS, apply the parking brake, stop the engine and remove the key.
Always fold the ROPS from a stable position at the rear of the machine.
• Fold the ROPS down only when absolutely necessary and fold it up and lock it again as soon as possible.
• Before proceeding to fold the ROPS, check for any possible interference with installed implements and attachments.
If an interference occurs, contact your KUBOTA Dealer.

1. Folding the ROPS
1. Loosen the knob bolts 1 to 2 turns.
2. Remove both lock pins.
3. Fold the ROPS.

CAUTION
To avoid personal injury:
• Hold the ROPS tightly with both hands and fold the ROPS slowly and carefully.

4. Align the lock pin holes and insert both lock pins and secure them with the snap pins.

CAUTION
To avoid personal injury:
• Make sure that both lock pins are properly installed and secured with the snap pins.
2. Raising the ROPS to the upright position

1. Remove both snap pins and lock pins.

2. Raise the ROPS to the upright position.

**CAUTION**

To avoid personal injury:
- Hold the ROPS tightly with both hands and raise the ROPS slowly and carefully.

3. Align the lock pin holes, insert both lock pins and secure them with the snap pins.

4. Tighten the knob bolts slightly.

**CAUTION**

To avoid personal injury:
- Make sure that both lock pins are properly installed as soon as the ROPS is in the upright position and secured with the snap pins.

3. Adjusting the foldable ROPS

1. Adjust the free fall of the ROPS upper frame regularly.

2. If you feel less friction when folding the ROPS, tighten the nut (1) until you feel the right friction when moving it. Then replace the snap pin.

**WARNING**

To avoid serious injury or death:
- Read and understand the safe operation section.
- Read and understand the safety labels located on the machine.
- To avoid the danger of exhaust fume poisoning, do not operate the engine indoors without proper ventilation.
- Never start the engine while standing on the ground. Start the engine only from the operator's seat.

1. Adjust the operator's position and apply the seat belt.
   - Operator's seat on page 35
   - Seat belt on page 35

2. Start the engine.
   See OPERATING THE ENGINE on page 27.

3. Raise the implement.
   - Mower lift pedal on page 35

4. Accelerate the engine.
   - Throttle lever on page 35

5. Unlock the parking brake.
   - Parking brake pedal on page 36

6. Operate the machine.
   - Motion control lever on page 36
   - Stop position of the motion control lever on page 36
   - Operating position of the motion control lever on page 37
1. Operator's seat

**WARNING**
To avoid serious injury or death:
- Make adjustments to the seat only while the machine is stopped.
- Make sure that the seat is completely secured after each adjustment.
- Do not allow anyone other than the driver to ride on the machine.

Fore-aft adjustment
Pull the seat adjusting lever and slide the seat.

Armrest
The armrest may be set at the upright position if desired.

**IMPORTANT :**
- After adjusting the operator's seat, be sure to check and see that the seat is securely locked.

2. Seat belt

**WARNING**
To avoid serious injury or death:
- Always use the seat belt when the ROPS is installed.
- Do not use the seat belt if a foldable ROPS is down or if there is no ROPS.

Adjust the seat belt for proper fit and connect to the buckle. The seat belt is an auto-locking retractable type.

3. Mower lift pedal

1. The mower lift pedal is used to raise and lower the mower deck.
   - To raise and lock the mower deck at the carry position, push the pedal to the end of the pedal stroke.
   - To lower the mower deck, push the pedal all the way then release the pedal to the desired mower deck cutting height.

4. Throttle lever

- Move the throttle lever backward to decrease the engine speed.
- Move it forward to increase the engine speed.
5. Parking brake pedal

To apply the parking brake:
1. Depress the parking brake pedal firmly with the left side of your right foot.
2. While keeping the parking brake pedal depressed, use the right side of your right foot to depress the parking brake lock pedal.
3. Release the parking brake pedal while holding down the parking brake lock pedal.
4. Release the parking brake lock pedal.

To release the parking brake:
Depress the parking brake pedal and release it slowly with your right foot, without pressing the parking brake lock pedal.

6. Motion control lever

**WARNING**
To avoid serious injury or death:
- Understand how to use the motion control levers and practice in an unrestricted area at slightly more than idle speed without the mower engaged until becoming proficient in the operation of the machine.
- Do not move motion control levers from the forward to rearward or from the rearward to forward position rapidly. Sudden direction changes could cause the loss of control or damage to the machine or property.
- Do not make sharp turns at high speed. Fast and sharp turns could cause the loss of control.
- Motion control levers must be in the “NEUTRAL LOCK” position to safely enter and exit the operator’s seat or to carry out maintenance and safety checks.
- This machine can make sharp turns. Always make sure your intended path is clear of obstructions or people.

6.1 Stop position of the motion control lever

Neutral lock position
Forward and rearward movements of the motion control levers are locked when these levers are in the “NEUTRAL LOCK” position (the engine can only be started with levers in this position).
6.2 Operating position of the motion control lever

Machine speed and steering is controlled by the motion control levers, when the engine is running and the parking brake is released.

**WARNING**

To avoid serious injury or death:
- No control is provided by the motion control levers when the engine is off.

Neutral position
Grasp the motion control levers and move them inward from the “NEUTRAL LOCK” position so that the machine is in “NEUTRAL” (the engine cannot be restarted).

Forward and rearward motion:
1. Move the throttle lever to the “FAST” position.
2. Release the parking brake.
3. Move both motion control levers from the “NEUTRAL LOCK” position inward to the “NEUTRAL” position.
4. To move your machine, see the following figures.

To stop:
Move and hold both motion control levers to the “NEUTRAL” position until the machine comes to a stop.

Forward:
For forward travel in a straight line, push both motion control levers forward equally and slowly.

Rearward:
For rearward travel in a straight line, pull both motion control levers past center rearward equally and slowly.

General left turn:
For forward travel to the left, push the right motion control lever further forward than the left motion control lever.

General right turn:
For forward travel to the right, push the left motion control lever further forward than the right motion control lever.
Sharp (zero) left turn:
Push the right motion control lever forward and pull the left motion control lever rearward at the same time.

Sharp (zero) right turn:
Push the left motion control lever forward and pull the right motion control lever rearward at the same time.

Adjustment

NOTE:
- The motion control levers are adjustable.
  (If adjustment is required, see ADJUSTMENT on page 70.)
  We recommend you to contact your local KUBOTA Dealer.

STOPPING THE MACHINE

WARNING
To avoid serious injury or death:
- Park the machine on level ground.
  If necessary to park on an incline, stop the machine, apply the parking brake, and then stop the engine.
- If you stop the engine on an incline without applying the parking brake, the machine could move and run away.

IMPORTANT:
- The parking brake is for parking use only. If the parking brake is applied when the motion control levers are not in the “NEUTRAL LOCK” position, the engine will stop. This feature is to prevent brake and transmission damage during operation.

1. Move both motion control levers to the “NEUTRAL” position to stop the machine.
2. Move both motion control levers to the “NEUTRAL LOCK” position.
3. Apply the parking brake.
4. Move the throttle lever to the half speed position and push the PTO switch to the “DISENGAGE” (OFF) position.
5. Lower all implements to the ground.
6. Turn off the engine and remove the key.

IMPORTANT:
- Do not stop the engine when the machine is on an incline for a long time. The engine oil may go into the carburetor and the muffler through the valve system.
- Before stopping the engine, place the throttle control lever in the half speed position to help prevent the engine from backfiring.

PARKING THE MACHINE

WARNING
To avoid serious injury or death:
Before leaving the operator’s position:
• Apply the parking brake.
• Lower all implements to the ground.
• Shut off the engine.
• Remove the key.
• Place the motion control levers in the “NEUTRAL LOCK” position.

To lock:
1. Depress the parking brake pedal firmly with the left side of your right foot.
2. While keeping the parking brake pedal depressed, use the right side of your right foot to depress the parking brake lock pedal.
3. Release the parking brake pedal while holding the parking brake lock pedal down.
4. Release the parking brake lock pedal.

To unlock:
Depress the parking brake pedal and release it slowly with your right foot without pressing the parking brake lock pedal.

If necessary to park on an incline, be sure to chock the wheels on the downhill side to prevent accidental rolling of the machine.

ACCESSORIES

1. Electric outlet (12 volt), plug, smartphone holder, cup holder and utility box

• A 12 volt outlet is on the left-hand fender. An electrical charger or other device may be connected to this outlet.
• A 12 volt plug is behind the seat in the blue tape. An auxiliary light or other device may be connected to this plug.
• The outlet and plug are only powered when the key switch is at the “ON” or “START” position.
• Do not connect lights or other devices that draw more than a total of 84 watts to these power points, or the battery may discharge very rapidly, or the outlet or plug may fail.

IMPORTANT:
• Do not use the outlet as a cigarette lighter.
• Do not use the outlet or the plug when it is wet.
• Make sure that the outlet cap is closed when the outlet is not used.

TRANSPORTING THE MACHINE

• To transport the machine on a trailer:
  – Turn the fuel valve to the “OFF” position.
  – Fasten the machine to the trailer.
• Do not attempt to tow this machine, or damage to the transmission may result.
• When trailering the machine over a long distance:
  – Make sure to lower the mower to the 38.1 mm (1.5 in.) cutting height by using the mower lift pedal.
• When transporting the machine under its own power:
  – Make sure to lift the mower to the “TRANSPORT” position by using the mower lift pedal.

1. Hydrostatic transaxle bypass rods

DANGER
To avoid serious injury or death:
• Do not use bypass levers on or around slopes. The machine can run away and cause injury or death easily.

WARNING
To avoid serious injury or death:
• Do not touch the muffler or exhaust pipes while they are hot. Severe burns could result.
IMPORTANT:

- Do not push the machine without pulling the bypass rods, or transmission damage may occur.
- Never pull the rods with the engine running.

1. Face the machine from the rear. Lift and pull the left side HST bypass rod from the "OPERATING POSITION" and push it down to the "BYPASS POSITION".

2. Pull the right side HST bypass rod from the "OPERATING POSITION" to the "BYPASS POSITION". Continue to hold the right side HST bypass rod in the "BYPASS POSITION" in order to move the machine.

3. After moving, place both the right side and left side HST bypass rod back into the "OPERATING POSITION".
OPERATING THE MOWER

MOWING TIPS

**WARNING**
To avoid serious injury or death:
• Clear the work area of objects which might be picked up and thrown by the blades.
• Keep bystanders and animals away from the mowing area.

1. When using the mower for the first time, choose a smooth level area and cut in straight and slightly overlapping strips.

2. The size and type of the area to be mowed will determine the proper mowing pattern. Take into account obstructions, such as trees, fences and buildings.
   To keep grass clippings off fences, sidewalks and so on, it is advisable to go over the outside of the area to be mowed several times in a clockwise direction.
   To mow the area remaining, work in a counterclockwise direction so that the clippings are dispersed onto the previously cut area.

3. Always keep the left side of the mower toward trees, posts or other obstacles on the first trip around the obstacle.

4. Most lawns must be mowed to keep the grass approximately 50 to 80 mm (2 to 3 in.) high. Best results are obtained by cutting often and not too short.
   For a healthy lawn, only 1/3 of the grass plant should be removed in one mowing. For example, tall grass with the height of 75 mm (3 in.) can be cut to a minimum of 50 mm (2 in.).
   For extremely tall grass, set the cutting height at maximum cutting height for the first mowing, then reset to the desired height and mow again. Allow the grass to grow to 80 mm (3 in.), then cut off only the top 25 mm (1 in.).

5. Clippings may be left on the lawn unless they form clumps or rows.

6. For best appearance, grass must be cut in the afternoon or evening when it is free of moisture.

ADJUSTING THE CUTTING HEIGHT

**DANGER**
To avoid serious injury or death:
• Do not engage the mower in the transport position.

1. Before adjusting the cutting height, check that all tire pressures are correct. If necessary, adjust to the correct tire pressure.
2. To set the cutting height, push the mower lift pedal to raise the mower deck to the top position. Then adjust the cutting height control dial to the desired height.

3. Use higher settings for mowing in a rough area or when mowing tall grass. Lower settings should be used only for smooth lawns where short grass is desired.

4. Lower the mower deck by pushing the mower lift pedal again. This lowers the mower deck from the “TRANSPORT” position to the “OPERATING” position.

5. Adjust the anti-scalp rollers’ height as follows for normal operating condition.

**IMPORTANT:**
- Never allow the rollers to contact the ground continuously as premature roller wear may develop if set incorrectly.
- Anti-scalp rollers must maintain a minimum clearance of 6 mm (0.25 in.) to the ground.
OPERATING THE MOWER

1. PTO switch

1. To engage the PTO, pull the PTO switch to the “ENGAGED” (ON) position.
2. To disengage the PTO, push the PTO switch “DISENGAGED” (OFF) position.

NOTE:
- These interlock features are built-in.
- If you get off the seat while the PTO is running, the engine will stop automatically (operator presence control).
- Before starting the engine, push the PTO switch to the “DISENGAGED” (OFF) position. If it is at the “ENGAGED” (ON) position, the engine will not start.

2. Starting the machine

WARNING
To avoid serious injury or death:
- Engine components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running, or immediately after it is turned off.
- Never operate the engine without heat shields or guards.

1. Sit on the operator's seat. Put on the seat belt. Make sure that the parking brake is engaged.
2. Start the engine.
3. Engage the PTO switch.
4. Disengage the parking brake.
5. Speed up the engine by moving the throttle lever forward.
6. Push or pull the motion control levers to move forward or rearward.

IMPORTANT:
- Never attempt to move the machine with the parking brake “ON”.

NOTE:
- Keep the engine running at full throttle for best results. Control the travel speed with the motion control levers.
- During heavy duty use, operate the machine at a slower ground speed or go over the area twice.
- Keep the mower deck in the raised position when the mower is disengaged.
- The mower will not cut cleanly if the ground speed is too high or if the blade speed drops due to an overload.
- If debris builds up on the grass screen or other cooling air intake areas, stop the engine and clean them. Operating the engine with blocked or dirty air intake and cooling areas causes damage due to overheating.
TIRES AND WHEELS

TIRES

WARNING
To avoid serious injury or death:
- Do not attempt to mount a tire. This should be done by a qualified person with the proper equipment.
- Always maintain the correct tire pressure. Do not inflate tires above the recommended pressure shown in the operator’s manual.
- The inflation pressure in the front tires rises quickly when using compressed air.
- Never operate the machine with a loose rim, wheel, or axle.
- Whenever bolts are loosened, retighten to the specified torque.
- Check all the bolts frequently and keep them tightened.

1. Inflation pressure

Even though the inflation pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Therefore, check it everyday and inflate as necessary.

Z411KW, Z421KW

<table>
<thead>
<tr>
<th>Tire sizes</th>
<th>Recommended inflation pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front 13 x 5 - 6, 4PR smooth</td>
<td>170 kPa 1.7 kgf/cm² 25 psi</td>
</tr>
<tr>
<td>Rear 24 x 9.5 - 14, 4PR turf</td>
<td>83 kPa 0.84 kgf/cm² 12 psi</td>
</tr>
</tbody>
</table>

Z421KWT

<table>
<thead>
<tr>
<th>Tire sizes</th>
<th>Recommended inflation pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front 13 x 6.5 - 6, 4PR smooth</td>
<td>170 kPa 1.7 kgf/cm² 25 psi</td>
</tr>
<tr>
<td>Rear 24 x 12 - 14, 4PR turf</td>
<td>83 kPa 0.84 kgf/cm² 12 psi</td>
</tr>
</tbody>
</table>

WHEELS

IMPORTANT:
- When refitting a wheel, tighten the wheel bolt to the following torques then recheck after traveling 200 m (200 yards), changing directions several times.

Rear

When using wheels with beveled or tapered holes, use tapered wheel nuts.

1. Removing the front caster wheels

WARNING
To avoid serious injury or death:
- Do not place your body under the machine or the mower deck while lifting the machine.
• Park the machine on a firm and level surface.
• Apply the parking brake.
• Stop the engine and remove the key before removing the front caster wheels.

1. Lift the front of the machine with a safe lifting device.
2. Remove the lock nut with nylon sleeve and the wheel bolt.
3. Remove the wheel and dust covers from the yoke assembly.

2. Installing the front caster wheels

**WARNING**
To avoid serious injury or death:
• Do not place your body under the machine or the mower deck while lifting the machine.
• Park the machine on a firm and level surface.
• Apply the parking brake.
• Stop the engine and remove the key before removing the front caster wheels.

1. Install the replacement wheel and dust covers.
2. Install the wheel bolt and the lock nut with nylon sleeve.
3. Tighten the nut.
4. After installing, add grease to the grease fittings.

**IMPORTANT:**
• Insert the wheel bolt from the outside of the yoke.
• Tighten the nut gradually until the wheel bearing play is eliminated and the wheel turns freely by hand.

<table>
<thead>
<tr>
<th>Tightening torque</th>
<th>20 to 25 N m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.8 to 18.4 lbf ft</td>
</tr>
<tr>
<td></td>
<td>2 to 2.5 kgf m</td>
</tr>
</tbody>
</table>

5. Lower the machine.
## MAINTENANCE

### SERVICE INTERVALS

The following servicing tasks should be carried out on the machine at the stated running-time intervals.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Indication hour meter (hr)</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>1</td>
<td>Engine oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cylinder and cylinder head</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>fins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Air cleaner</td>
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</tr>
<tr>
<td></td>
<td>Foam element</td>
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<td></td>
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<tr>
<td></td>
<td>Paper element</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>Engine start system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>OPC system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Front wheel, seat adjuster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Carbon canister air filter</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Check</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>Muffler and spark arrester</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(if equipped)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fuel filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Battery condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Throttle cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Choke cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Mower link bushings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Spark plug</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Engine oil filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Engine valve clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Combustion chamber, valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>seating surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Transaxle oil filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Transaxle fluid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Crankshaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Electric clutch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Fuel line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Hydraulic hose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
### Maintenance Schedule

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Indication hour meter (hr)</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Fuse</td>
<td>Replace</td>
<td>Service as required</td>
</tr>
<tr>
<td>25</td>
<td>Blade</td>
<td>Replace</td>
<td>Service as required</td>
</tr>
<tr>
<td>26</td>
<td>Mower belt</td>
<td>Replace</td>
<td>Service as required</td>
</tr>
</tbody>
</table>

*1 The initial 8 hour oil change is not the scheduled maintenance cycle.

*2 This maintenance should be done daily or more often in dusty conditions than in normal conditions.

*K Consult your local KUBOTA Dealer for this service.

*3 The initial 100 hour oil change and oil filter replacement are not the scheduled maintenance cycle.

*4 Every 500 hours or every 1 year, whichever comes first.

*5 Replace if any deterioration or damage occurred (crack, hardening, scar or deformation).

**IMPORTANT:**
- The jobs indicated by ☑ must be done initially.
- Maintenance instructions related to gasoline engine emissions:
  - Non-warranty maintenance, repairs, or replacement of the emission control devices and systems should be performed by a qualified repair establishment or an individual who has the experience and equipment to perform such work. See the Emissions Warranty Statement.
  - To ensure the best quality and reliability, use new KUBOTA genuine parts or their equivalents for repairs and replacement, whenever you have maintenance done.
## LUBRICANTS AND FUEL

### Capacities

<table>
<thead>
<tr>
<th>Locations</th>
<th>Capacities</th>
<th>Lubricants</th>
</tr>
</thead>
</table>
| Fuel tank | 25.7 L (6.8 U.S. gals.) | • Automobile unleaded or regular gasoline  
• Unleaded gasoline 87 octane or higher |
| Engine crankcase | 2.1 L (2.2 U.S.qts.)*1 | • Engine oil: API service  
Classification SF, SG, SH, SJ or SL  
Above 20 °C (68 ℉)...SAE40  
Between 0 °C (32 ℉) to 35 °C (86 ℉)...SAE30  
Between -20 °C (-4 ℉) to 35 °C (86 ℉)...SAE10W-30 or SAE10W-40  
Below 0 °C (32 ℉)...SAE5W-20 |
| Transmission case with filter, hose and tank (RH & LH) | 4.8 L (5.1 U.S.qts.) | • 20W50 oil with API service classification SL |

### Greasing

<table>
<thead>
<tr>
<th>Greasing</th>
<th>No. of greasing points</th>
<th>Capacity</th>
<th>Type of grease</th>
</tr>
</thead>
</table>
| Front wheel | 2 | Until grease overflows | • Multipurpose EP2 Grease  
(NLGI Grade no.2) |
| Mower link bushing | 4 | Moderate amount | |
| Cutting height cam | 1 | | |
| Seat adjuster | 2 | Moderate amount | • Copper-based anti-seize |
| Crankshaft | 1 | Moderate amount | |

*1 Oil amount when the oil level is at the upper level of the oil level gauge.

**IMPORTANT:**
- To prevent serious damage to the hydraulic systems, use only the fluid recommended in the previous table.

**Fuel:**
- Clean, fresh, unleaded gasoline.
- A minimum of 87 octane/87AKI (90 RON).
- Gasoline with up to 10% ethanol (ethyl or grain alcohol) or up to 15% methyl tertiary butyl ether (MTBE) by volume is acceptable.
- Do not use unapproved gasoline, such as E85. Do not mix oil in gasoline or modify the engine to run on alternate fuels. This will damage the engine components and void the engine warranty.
- High altitude:  
This engine may require a high altitude carburetor kit to ensure correct engine operation at altitudes above 3300 ft. (1006 meters). Operation without this kit will cause decreased performance, increased fuel consumption, and increased emissions.  
This engine should be operated in its original configuration below 3300 ft. (1006 meters) as damage may occur if a high altitude carburetor kit is installed and operated below 3300 ft. (1006 meters).
- The indicated capacity of fuel is the manufacturer's estimate.

**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 in the previous table.
- The indicated capacity of oil is the manufacturer's estimate.

**Transmission oil:**
- The indicated capacity of oil is the manufacturer's estimate.
PERIODIC SERVICE

OPENING THE STEP

**WARNING**
To avoid serious injury or death from contact with moving parts:

- Never open the step while the engine is running.

### 1. Step

1. To open the step, use the grip to rotate the step in direction (A), then remove the step in direction (B).

![Diagram of step opening](image)

(1) Step  
(2) Grip  
(A) “ROTATE”  
(B) “REMOVE”

### RAISING AND LOWERING THE OPERATOR’S SEAT

#### Raising

**WARNING**
To avoid serious injury or death:

- Fully raise the operator’s seat to the resting position.
- Do not keep the seat halfway.

1. Pull the latch lever on the seat panel rearward.

![Diagram of raising seat](image)

(1) Operator’s seat  
(A) “PULL”

#### Lowering

**WARNING**
To avoid serious injury or death:

- Do not drop the seat when lowering it.
- Watch your hands. Do not place your hands under the seat when lowering it.

1. Lower the seat slowly to lock.

### DAILY CHECK

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

**WARNING**
To avoid serious injury or death:

- Be sure to check and service the machine on a level surface with the engine shut off, the key...
removed and the parking brake securely set or
the rear wheels chocked.

<table>
<thead>
<tr>
<th>No.</th>
<th>Check item</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Damage to machine body, tightness of all bolts, nuts, pins, and so on.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Fuel and oil leak</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Tire pressure, wear and damage</td>
<td>44, 53</td>
</tr>
<tr>
<td>4</td>
<td>Engine oil level</td>
<td>51</td>
</tr>
<tr>
<td>5</td>
<td>Fuel level</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>Air intake screen</td>
<td>52</td>
</tr>
<tr>
<td>7</td>
<td>Transaxle fluid level</td>
<td>53</td>
</tr>
<tr>
<td>8</td>
<td>Air cleaner (foam element)</td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>Machine body cleaning</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Clean area around the muffler and engine controls.</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Check item</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check all hardware.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Make sure all pins are in place.</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Mower deck cleaning</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Make sure blade bolts are tight.</td>
<td>68</td>
</tr>
<tr>
<td>5</td>
<td>Blades and belt wear or damage</td>
<td>68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Check item</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motion control lever</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Parking brake</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Other movable parts</td>
<td>54</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Check item</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check for abnormal noise and vibration.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Engine start system/OPC system. If either of these do not operate properly, contact your local KUBOTA Dealer immediately.</td>
<td>55, 56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Check item</th>
<th>Ref. page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check the areas where previous trouble was experienced.</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Check the engine oil before starting and 5 minutes or more after the engine has stopped.
2. Wipe the dipstick area clean.
3. To check the oil level, remove the dipstick and wipe it clean. Reinsert the dipstick into the tube, rest the cap on the tube and do not thread the cap onto the tube. Remove the dipstick again. Check to see that the oil level is between the 2 notches.
4. Add new oil to the prescribed level at the oil port if necessary.

**2. Checking the amount of fuel and refueling**

**WARNING**

To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Handle the fuel carefully. If the engine is running, do not fill the fuel tank. If the engine is hot, let the engine cool down several minutes before adding fuel.
- Do not smoke while filling the fuel tank or servicing the fuel system. Fill the fuel tank only to the bottom of the filler neck. Do not fill until completely full. The empty space in the tank allows gasoline to expand when it heats up.
- Never remove the fuel tank cap or add fuel when the fuel tank is hot.
Check the fuel level. Take care that the fuel tank does not become empty.

| Fuel tank capacity | 25.7 L (6.8 U.S. gals.) |

**IMPORTANT:**
- Do not mix oil with gasoline.
- Tighten the fuel cap until it clicks.
- Do not use a fuel cap other than one approved by KUBOTA.
- Do not permit dirt, trash or water to get into the fuel system.
- Be careful not to spill fuel while refueling. If a spill should occur, wipe it off at once, or it may cause a fire.

Use only unleaded gasoline with an octane rating index of 87 or higher.

**NOTE:**
- Use fuel within approximately 30 days after purchase to avoid deterioration in fuel quality, or add fuel stabilizer to keep fuel fresh and stabilized.
- Fuel blend differs from season to season for the best seasonal engine performance. To prevent engine performance troubles such as vapor lock or hard starting, use fuel within the season in which the fuel is purchased.
- Infrequent use of the engine during a season can make fuel stale in the fuel tank of the machine. Stale fuel condition can cause engine performance troubles due to varnished and plugged carburetor components.
- Seal the fuel storage container tightly and store it out of sunlight and heat to prevent fuel degradation.
- Condensation in the fuel tank may occur because of various operating or environmental conditions. To reduce condensation and to avoid affecting the machine operation, fill the fuel tank at the end of daily operations.

**IMPORTANT:**
- Do not use old fuel.

**Use of alcohol mixed gasoline**

Only use gasoline containing ethanol when the ethanol is 10% or less of the fuel. When using gasoline containing MTBE, the MTBE must be 15% or less of the fuel mixture. The use of methanol additive is not recommended. For best results, use unleaded fuel with a minimum of 87 octane.

**3. Checking and cleaning the air intake screen**

**WARNING**
To avoid serious injury or death:
- Be sure to stop the engine and remove the key before cleaning.
- Make sure that the engine is cool to the touch before cleaning.

**IMPORTANT:**
- The air intake screen and air intake area must be clear of debris to prevent the engine from overheating.

Daily or after every 5 hours of operation, make sure the air intake screen and the air intake area are clean.
Dirt or chaff around the air intake screen, air intake area, or the engine cooling area decrease cooling performance.

1. Check that the air intake screen is clear of grass clippings and debris.
2. If the screen is dirty, clean it with a brush or cloth.
3. Remove the dust and all foreign material from the engine plate.

4. Checking the transaxle fluid level

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before checking the transaxle fluid level.

1. Check to see that the oil level lies at the “FULL COLD” line while the machine is at ambient temperature. If the level is too low, add new oil into the tank up to the prescribed level.
(See LUBRICANTS AND FUEL on page 49.)

5. Checking the tire pressure

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before checking the tire pressure.
- Do not attempt to mount a tire on a rim. This should be done by a qualified person with the proper equipment.
- Always maintain the correct tire pressure. The inflation pressure in the front tires rises quickly when using compressed air.
- Do not inflate the tires above the recommended pressure shown in the operator’s manual.

**IMPORTANT:**
- Do not use tires larger than specified.

5.1 Inflation pressure

Even though the inflation pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Therefore, check it everyday and inflate as necessary.

**Z411KW, Z421KW**

<table>
<thead>
<tr>
<th>Tire sizes</th>
<th>Recommended inflation pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front 13 x 5 - 6, 4PR smooth</td>
<td>170 kPa 0.84 kgf/cm²</td>
</tr>
<tr>
<td>Rear 24 x 9.5 - 14, 4PR turf</td>
<td>83 kPa 0.84 kgf/cm²</td>
</tr>
</tbody>
</table>

**Z421KWT**

<table>
<thead>
<tr>
<th>Tire sizes</th>
<th>Recommended inflation pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front 13 x 6.5 - 6, 4PR smooth</td>
<td>170 kPa 0.84 kgf/cm²</td>
</tr>
<tr>
<td>Rear 24 x 12 - 14, 4PR turf</td>
<td>83 kPa 0.84 kgf/cm²</td>
</tr>
</tbody>
</table>

**IMPORTANT:**
- If the oil level is low, do not run the engine.
6. Checking the dial cam rotation strength

**WARNING**

To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Disengage the PTO (OFF).
- Stop the engine and remove the key before checking the dial cam rotation strength.

1. Raise the implement to the “TRANSPORT” position. (See ADJUSTING THE CUTTING HEIGHT on page 41.)
2. Rotate the cutting height control dial and check for smoothness.
3. If the rotation strength is too high, clean the dial cam area and apply grease under the dial cam between the dial cam and the frame.

7. Checking movable parts

If any of the movable parts, such as levers and pedals, cannot be smoothly moved because of rust or anything sticky, do not attempt to force it into motion. In this case, remove the rust or the sticky object, and apply oil or grease on the relevant spot. Otherwise, the machine may get damaged.

**EVERY 25 HOURS**

1. Cleaning the cylinder and cylinder head fins

**WARNING**

To avoid serious injury or death:
- Make sure the engine is cool to the touch before removing shrouds.
- Always shield eyes and face from air deposits and objects.

1. Turn the fasteners counterclockwise.
2. Remove the air cleaner cover.
3. Use the clean out ports to check if the engine’s cooling fins are blocked with dust or debris. Clean them with compressed air if required.
2. Cleaning the foam element

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before cleaning the foam element.

1. Turn the fasteners counterclockwise.
2. Remove the air cleaner cover.

3. Loosen the clamp.
4. Remove the element assembly from the intake hose.

5. Disassemble the element assembly by removing the foam element from the paper element.

6. Clean the foam element in a bath of detergent and water, and let the element air-dry thoroughly.
7. Clean the paper element by tapping it gently on a flat surface to remove dust. If the element is very dirty, replace it with a new one.

**IMPORTANT:**
- Do not wash paper elements. Do not oil paper elements or foam elements. Do not use pressurized air to clean paper elements or foam elements.

**NOTE:**
- Operating the engine with loose or damaged air filter components could allow unfiltered air into the engine causing premature wear and failure.
- Operating in dusty conditions may require more frequent maintenance than above.

---

### EVERY 50 HOURS

1. Checking the engine start system

The engine start system in your machine is designed to protect you while operating. Check the engine start system periodically (daily is best) to test the function of the engine start system before operation.

**WARNING**
To avoid serious injury or death:
- Do not allow anyone near the machine while testing.
- If the machine does not pass one of the following tests, do not operate the machine. See your local KUBOTA Dealer.
- Sit on the operator’s seat for all tests except for test 1.

**IMPORTANT:**
- Test the following before operating the machine:
Test 1 (operator not on the seat)
1. Securely set the parking brake.
2. Set the PTO switch to the “DISENGAGE” (OFF) position.
3. Set the motion control levers to the “NEUTRAL LOCK” position.
4. Turn the key switch to the “START” position.
5. The engine must not crank.

Test 2 (operator on the seat)
1. Do not set the parking brake (release it from test 1).
2. Set the PTO switch to the “DISENGAGE” (OFF) position.
3. Set the motion control levers to the “NEUTRAL LOCK” position.
4. Turn the key switch to the “START” position.
5. The engine must not crank.

Test 3 (operator on the seat)
1. Securely set the parking brake.
2. Set the PTO switch to the “DISENGAGE” (OFF) position.
3. Grasp the motion control levers and move them inward from the “NEUTRAL LOCK” position to the “NEUTRAL” position and then release the levers.
4. Turn the key switch to the “START” position.
5. The engine must not crank.

Test 4 (operator on the seat)
1. Securely set the parking brake.
2. Set the PTO switch to the “ENGAGE” (ON) position.
3. Set the motion control levers to the “NEUTRAL LOCK” position.
4. Turn the key switch to the “START” position.
5. The engine must not crank.

NOTE:
• If the engine cranks in tests 1 through 4, consult your local KUBOTA Dealer to have the unit checked before operation.

Test 5 (operator on the seat)
1. Start the engine.
2. Keep the parking brake securely set.
3. Set the PTO switch to the “DISENGAGE” (OFF) position.
4. Grasp the motion control levers and move them inward from the “NEUTRAL LOCK” position to the “NEUTRAL” position and then release the levers.
5. The engine must shut off.

NOTE:
• If the engine keeps running in test 5, consult your local KUBOTA Dealer to have the unit checked before operation.

2. Checking the OPC system
The operator presence control (OPC) system in your machine is designed to protect you while operating. Check the OPC system periodically (daily is best) to test function of the OPC system before operation.

WARNING
To avoid serious injury or death:
• Do not allow anyone near the machine while testing.
• If the machine does not pass one of the following tests, do not operate the machine. See your local KUBOTA Dealer.

NOTE:
• If the engine cranks in tests 1 through 4, consult your local KUBOTA Dealer to have the unit checked before operation.

Test 1 (operator on the seat)
1. Start the engine.
2. Do not set the parking brake.
3. Set the PTO switch to the “DISENGAGE” (OFF) position.
4. Stand up. Do not get off the machine.
5. The engine must shut off.

Test 2 (operator on the seat)
1. Start the engine.
2. Do not set the parking brake.
3. Set the PTO switch to the “ENGAGE” (ON) position.
4. Stand up. Do not get off the machine.
5. The engine must shut off.

NOTE:
- If the engine keeps running in tests 1 through 2, consult your local KUBOTA Dealer to have the unit checked before operation.

### 3. Checking the carbon canister air filter

Check the carbon canister air filter every 50 hours of operation (more often under extremely dusty or dirty conditions).

**WARNING**
**To avoid serious injury or death:**
- Always stop the engine, set the parking brake, remove the key, and disengage the PTO.

1. Remove the carbon canister air filter.

![carbon canister air filter](image)

(1) Canister air filter  
(2) Carbon canister  
(A) Air port

2. Check to see if the carbon canister air filter is worn out, damaged or dirty.
3. If the air filter is dirty, wash the air filter in warm water with detergent. Then rinse the air filter thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow the air filter to air-dry. Do not use high pressure air to clean the filter.
4. If the air filter is worn out, damaged or too dirty to wash clean, replace it with a new one.
5. Reinstall the carbon canister air filter.

**NOTE:**
- Operating in dusty condition may require more frequent maintenance than in normal conditions.

### 4. Greasing

**WARNING**
**To avoid serious injury or death:**
- Be sure to stop the engine and remove the key before greasing.

1. Apply a small amount of multipurpose grease to the following points every 50 hours. If you operated the machine in extremely wet and muddy conditions, lubricate the grease fittings more often.

![greasing](image)

(1) Front wheel (LH, RH)

1SFRT00098A01

(1) Seat adjuster

1SFRT00099A01

### 5. Checking the muffler and spark arrester (if equipped)

**WARNING**
Running engines produce heat. Engine parts, especially the muffler, become extremely hot. Severe thermal burns can occur on contact. Combustible debris, such as leaves, grass, brush, and so on can catch fire.

**To avoid serious injury or death:**
- Allow the muffler, engine cylinder and fins to cool before touching.
• Remove accumulated debris from the muffler area and cylinder area.
• It is a violation of California Public Resource Code, Section 4442, to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order. Other states or federal jurisdictions may have similar laws. Contact the original equipment manufacturer, retailer, or dealer to obtain a spark arrester designed for the exhaust system installed on this engine.
• Replacement parts must be of the same design and installed in the same position as the original parts. Other parts may not perform as well, may damage the unit, and may result in injury.

1. Remove accumulated debris from the muffler and cylinder area.
2. Inspect the muffler for cracks, corrosion, or other damage.
3. Remove the spark arrester, if equipped, and inspect for damage or carbon blockage.
4. If damage is found, install replacement parts before operating.

EVERY 100 HOURS
1. Changing the engine oil

**WARNING**
To avoid serious injury or death:
• Be sure to stop the engine and remove the key before changing the oil.
• Allow the engine to cool down sufficiently, as oil can be hot and may cause burns.

1. To change the used oil, use the oil drain valve connected to the engine block. To drain the oil, loosen the hex plug until oil begins to drain. Then, remove the oil level dipstick to allow the engine to vent.

**NOTE:**
• The used oil can be drained out more easily if the engine is warm.

2. Cleaning the air cleaner paper element
(See Cleaning the foam element on page 55.)
3. Checking the spark plug

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before checking the spark plug.

Check the spark plug condition and gap every 100 hours of operation. Replace the spark plug annually.

1. Remove the spark plug wire from the spark plug.
2. Use a spark plug wrench to remove the plug.

**NOTE:**
- This engine is equipped with a resistor-type spark plug.

3. Inspect the spark plug for cracked porcelain, pitted electrodes, or other wear and damage. Replace the spark plug if necessary.

4. Check the spark plug gap with a gap gauge.

| Recommended spark plug | NGK BPR4ES |

5. Reinstall the spark plug into the cylinder head.

---

4. Checking the fuel filter and fuel lines

**WARNING**
To avoid serious injury or death:
- Be sure to stop the engine and remove the key when attempting to make the following checks and changes.
- Never fail to check the fuel lines periodically. The fuel lines are subject to wear and aging. Fuel may leak out onto the running engine, causing a fire.

1. The fuel line is made of rubber and ages regardless of service period.
2. If the fuel line, clamps and fuel filter are found damaged or deteriorated, replace them.

**IMPORTANT:**
- When the fuel line is disconnected for maintenance or repairs, close both ends of the fuel line with a piece of clean cloth or paper to prevent dust and dirt from entering.
- Particular care must be taken not to allow dust and dirt to enter into the fuel pump. Entrance of dust and dirt causes malfunction of the fuel pump.

5. Checking the battery condition

**DANGER**
To avoid the possibility of battery explosion:
For the refillable type battery, follow these instructions:
• Do not use or charge the refillable type battery if the fluid level is below the [LOWER] (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion.
• Check the fluid level regularly and add distilled water as required so that the fluid level is between the [UPPER] and [LOWER] levels.
• When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.

**WARNING**

To avoid serious injury or death:

• Batteries, battery posts, terminals and related accessories contain lead, 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.
• Never remove the battery cap while the engine is running.
• Keep electrolyte away from eyes, hands and clothes. If you are spattered with electrolyte, wash it away completely with water immediately and get medical attention.
• Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.
• Wear eye protection and rubber gloves when working around the battery.

**NOTE:**

• The factory-installed battery is a non-refillable type.
  If the battery is weak, charge the battery or replace it with a new one.

**IMPORTANT:**

• Mishandling the battery shortens the service life and adds to maintenance costs.
  The original battery is maintenance free, but needs some servicing.
  If the battery is weak, the engine will be difficult to start and the lights will be dim. It is important to check the battery periodically.
• When exchanging an old battery with a new one, use a battery of equal specifications (as described in the following table).

<table>
<thead>
<tr>
<th>Battery type</th>
<th>Volts (V)</th>
<th>Reserve capacity (min)</th>
<th>Cold cranking amps</th>
<th>Normal charging rate (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1-300</td>
<td>12</td>
<td>45</td>
<td>300</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Regarding non-accessible maintenance-free type batteries:

Maintenance-free, non-accessible batteries are designed to eliminate the need to add water. Yet the volume of electrolyte above the plates may eventually become depleted due to abnormal conditions such as high heat or improper regulator settings. Use a voltmeter to check the state of charge.

(See the following reference chart to determine if charging is necessary.)

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>Reference state of charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.6</td>
<td>100% (full charge)</td>
</tr>
<tr>
<td>12.4</td>
<td>75%</td>
</tr>
<tr>
<td>12.2</td>
<td>50%</td>
</tr>
<tr>
<td>12.0</td>
<td>25%</td>
</tr>
<tr>
<td>11.8</td>
<td>0%</td>
</tr>
</tbody>
</table>

5.1 Charging the battery

**DANGER**

To avoid serious injury or death:

• When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.

**WARNING**

To avoid serious injury or death:

• When disconnecting the cable from the battery, start with the negative terminal first. When connecting the cable to the battery, start with the positive terminal first.
• Never check the battery charge by placing a metal object across the posts.
  Use a voltmeter or hydrometer.
1. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative. Then, charge for at least 1 hour at 6.5 amperes.

2. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time. When using a boost-charged battery, it is necessary to recharge the battery as early as possible. Failure to do this will shorten the battery’s service life.

3. When the specific gravity of electrolyte is between 1.27 and 1.29, the charging is completed.

5.2 Storing the battery

1. When storing the machine for a long period, remove the battery from the machine, adjust the electrolyte to the proper level and store in a dry place out of direct sunlight.

2. The battery self-discharges while it is stored. Recharge it once every 3 months in the hot season and once every 6 months in the cold season.

3. Nut size for the battery terminals: +10 mm, -10 mm

6. Adjusting the throttle cable

**WARNING**

To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before adjusting the throttle cable.

1. Move the throttle lever to the “FAST” position.

2. Make sure the speed control lever (2) contacts the high idle adjustment bolt (B).

3. Link the throttle cable (1) to the speed control lever (2) and loosely clamp the throttle cable sheath (3) with the cable clamp bolt (A).

4. Pull up the sheath (3) of the throttle cable until the inner wire of the throttle cable has almost no slack, and tighten the cable clamp bolt (A).

5. Move the throttle lever to the “SLOW” position. Make sure that the carburetor throttle valve is moved smoothly.

7. Adjusting the choke cable

**WARNING**

To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before adjusting the choke cable.
1. Move the choke knob to the “OFF” position.

2. Link the choke cable (1) to the choke control lever (2), and loosely clamp the choke cable sheath (3) with the cable clamp bolt (A). Make sure that the carburetor choke valve is fully opened.

3. Pull up the sheath (3) of the choke cable until the inner wire of the choke cable has almost no slack, and tighten the cable clamp bolt (A).

4. Move the choke knob to the “ON” position. Make sure that the carburetor choke valve is completely closed.

5. Make sure that the choke valve turns from fully closed position to fully opened position when actuating the choke knob.

1. Apply a small amount of multipurpose grease to the following points every 100 hours.
   If you operated the machine in extremely wet and muddy conditions, lubricate the bushings more often.

8. Greasing mower link bushings

**WARNING**

To avoid serious injury or death:
- Be sure to stop the engine and remove the key before greasing.

**EVERY 200 HOURS OR EVERY 1 YEAR**

Replace every 200 hours or every 1 year, whichever comes first.

1. Replacing the air cleaner paper element

(See Cleaning the foam element on page 55.)

**NOTE:**
- Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

**EVERY 200 HOURS**

1. Replacing the fuel filter

(See Checking the fuel filter and fuel lines on page 59.)

2. Replacing the engine oil filter

**WARNING**

To avoid serious injury or death:
- Engine oil is a toxic substance. Dispose of used oil properly. Contact your local authorities for approved disposal methods or possible recycling.
- Be sure to stop the engine and remove the key before changing the oil and the oil filter cartridge.
PERIODIC SERVICE

EVERY 300 HOURS

1. Adjusting the engine valve clearance
Consult your local KUBOTA Dealer for this service.

2. Cleaning the combustion chamber, lapping the valve seating surface
Consult your local KUBOTA Dealer for this service.

EVERY 400 HOURS

1. Replacing the transaxle oil filter cartridge

WARNING
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow the transmission case to cool down sufficiently, as oil can be hot and may cause burns.

1. Apply the bypass valve.
   (See Hydrostatic transaxle bypass rods on page 39.)
2. Remove the hex head bolts (4), and filter guard (3).
   Clean any loose debris from around the perimeter of the oil filter (2).
3. Place an oil drain pan (12 in. diameter or larger and 8 qt. capacity is optimal) beneath the oil filter.
   Remove the oil filter (2) and discard it.
NOTE:
• Always replace the filter when performing any internal maintenance to the transaxle.

4. After the oil has drained, inspect all parts for excessive wear or damage. Replace if necessary.
5. Wipe off the filter base surface and apply a film of new oil to the gasket of the new replacement filter.
6. Install the new filter by hand and turn 3/4 to 1 full turn after the filter gasket contacts the filter base surface.

7. Reinstall the filter guard (3) with 3 hex head bolts (4). Torque bolts (4) to 7.35 N·m (5.42 lbf·ft) securely.
8. Repeat steps 2-7 on the opposite side transaxle drive.
9. Drain the old oil filters of all free flowing oil prior to disposal. Place the used oil in appropriate containers and deliver to an approved recycling collection facility.
10. Remove the breather port plug (5) from the left side and right side transaxles prior to filling with oil. This will allow the transaxles to vent during oil fill.
11. Remove the cap from the transaxle fluid tank located on the machine frame.

12. Fill with 20W-50 motor oil until oil appears just at the bottom of the breather port. Install the breather port plug (5) into the transaxle. Torque the plug (5) to 20.34 N·m (15.0 lbf·ft).
13. Continue to fill the transaxles through the transaxle fluid tank until the “FULL COLD” line is reached on the transaxle fluid tank.
14. Reinstall the transaxle fluid tank cap by hand. Be careful not to overtighten.
15. Proceed to the purge procedure.

Purging procedures
Due to the effects air has on efficiency in hydrostatic drive applications, it is critical to purge it from the system.
Air creates inefficiency because its compression and expansion rate is higher than the one of the oil approved for use in hydrostatic drive systems.
These purge procedures should be performed anytime a hydrostatic system has been opened to facilitate maintenance or the oil has been changed.
The resulting symptoms in hydrostatic systems may be:
1. Noisy operation.
2. Lack of power or drive after short-term operation.
3. High operation temperature and excessive expansion of oil.
Before starting, make sure the transaxle oil is at the proper oil level. If it is not, fill to the specifications outlined in this manual.
The following procedures are best performed with the machine drive wheels off the ground. Then, repeat under normal operating conditions. If this is not possible, then the procedure should be performed in an open area free of any objects or bystanders.
1. Disengage the brake if activated.
2. With the bypass valve open and the engine running, slowly move the motion control levers in both forward and rearward directions (5 or 6 times).
3. With the bypass valve closed and the engine running, slowly move the motion control levers in both forward and rearward directions (5 to 6 times). Check the oil level, and add oil as required after stopping the engine.
4. It may be necessary to repeat steps 2 and 3 until all the air is completely purged from the system. When the transaxle operates at normal noise levels and moves smoothly forward and rearward at normal speed, then the transaxle is considered purged.

2. Changing the transaxle fluid
(See Replacing the transaxle oil filter cartridge on page 64.)

EVERY 500 HOURS
1. Replacing the spark plug
(See Checking the spark plug on page 59.)
2. Lubricating the crank shaft

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before lubricating the crankshaft.

The engine crank shaft should be lubricated every 500 hours to ensure that critical components such as the electric clutch, transaxle drive pulley and the engine can be removed if needed.

1. Remove the mower belt.
2. Remove the transaxle belt.
3. Remove the electric clutch and transaxle drive pulley.
4. Apply a light coating of copper-based anti-seize lubricant to the engine crank shaft.
5. Reinstall the transaxle drive pulley, electric clutch, and clutch mounting bolt.
6. Torque the clutch mounting bolt to 67-75 N·m (50-55 lbf·ft).
7. Reinstall the transaxle belt.
8. Reinstall the mower belt.

---

**EVERY 500 HOURS OR EVERY 1 YEAR**

1. Adjusting the electric clutch

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key before adjusting the electric clutch.

The electric clutch serves 2 functions in the operation of the mower:
- Starting and stopping the power flow to the cutter blades.
- The clutch also acts as a brake to assist in stopping blade rotation when the PTO is switched off or the operator presence control is interrupted.

When the clutch is disengaged, the air gap between the armature and rotor must be adjusted to 0.4 mm (0.015 in.) for proper operation. The air gap adjustment is made with 3 bolts on the clutch. There are 3 inspection windows, one next to each adjusting bolt.
EVERY 1 YEAR

1. Checking fuel lines
(See Checking the fuel filter and fuel lines on page 59.)

2. Checking the muffler and spark arrester (if equipped)
(See Checking the muffler and spark arrester (if equipped) on page 57.)

EVERY 2 YEARS

1. Replacing the carbon canister air filter
(See Checking the carbon canister air filter on page 57.)

EVERY 4 YEARS

1. Replacing hydraulic hoses
Consult your local KUBOTA Dealer for this service.

2. Replacing fuel lines
Consult your local KUBOTA Dealer for this service.

SERVICE AS REQUIRED

1. Replacing fuses

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.

3. Checking hydraulic hoses

**WARNING**
To avoid serious injury or death:
- Be sure to stop the engine, remove the key, and relieve the pressure before checking and replacing the hydraulic hoses.
- Allow the transmission case to cool down sufficiently as oil can be hot and may cause burns.

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

This adjustment should be done every 500 hours of operation or annually, whichever comes first. In case the machine is heavily used, air gap settings should be checked more often. If the air gap is too narrow, the clutch armature may drag when disengaged, resulting in premature failure.

1. Place a 0.4 mm (0.015 in.) feeler gauge in the slot between the rotor and the armature.

3. Tighten or loosen the adjusting nut as needed to achieve the 0.4 mm (0.015 in.) air gap. Perform this operation at all 3 inspection windows.

EVERY 1 YEAR

1. Checking fuel lines
(See Checking the fuel filter and fuel lines on page 59.)

2. Checking the muffler and spark arrester (if equipped)
(See Checking the muffler and spark arrester (if equipped) on page 57.)
• Apply the parking brake.
• Stop the engine and remove the key before replacing fuses.

1. Raise the operator's seat.
2. Remove the blown fuse.
3. Place a new fuse of the same capacity in position.

---

**IMPORTANT:**
• If the new fuse happens to blow out within a short time, contact your dealer for inspection and repair. Never “jump” the fuse with wire or foil, or install a larger capacity fuse than recommended.

---

### Fuse location

Fuse no. | Capacity (A) | Protected circuit
---|---|---
(1) | 7.5 | Start
| 3 | Operator control
| 7.5 | PTO clutch
| 10 | Accessories
| - | -
| - | -
(2) Slow blow fuse 30 Check circuit against wrong battery connection

---

### 2. Checking and replacing blades

**WARNING**
To avoid serious injury or death:
• Be sure to stop the engine and remove the key.
• Blades may be sharp. When you handle blades, wear heavy gloves or wrap the end of the blades with a rag.

**NOTE:**
• Before checking or replacing the blades, wipe grass and mud off the top and inside of the mower.
  Especially, clean inside the belt cover, otherwise the belt life will be reduced.

**Checking**
The blade cutting edges should be kept sharp at all times. Sharpen the cutting edges if they look like blade (B). Replace the blades if they appear similar to blade (C).

**Replacing**
1. Dismount the mower deck from the machine. (See DISMOUNTING THE MOWER DECK on page 25.)
Then turn it over to expose the blades.

2. Wedge a block of wood between the blade and the mower housing or use a box wrench over the pulley nut to prevent the spindle from rotating while removing the blade bolts. Then, loosen the blade bolt as illustrated.

**IMPORTANT:**
- Use the proper metric size box or socket wrench to tighten or loosen the blade mounting bolt.

3. To sharpen the blades yourself, clamp the blade securely in a vise. Use a large mill file and file along the original bevel until sharp.

4. To check the blade for balance, place a small rod through the center hole. If the blade is not balanced, file the heavy side of the blade until balance is achieved.

5. To attach blades, be sure to install the cup washer between the blade and bolt head. Then tighten the bolt securely.

**IMPORTANT:**
- The blade bolts have right hand threads. Turn them counterclockwise to loosen.
- To prolong the service life of the blades, reposition them as shown in the following figure periodically.

3. **Replacing the mower belt**

1. Remove the mower deck from the machine. (See DISMOUNTING THE MOWER DECK on page 25.)
2. Remove the left and right hand shield from the mower deck.
3. Remove the tension pulley, and remove the belt.
4. To install a new belt, reverse the previous procedure.

**NOTE:**
- Tighten the tension pulley bolt securely from 77.6 to 90.2 N·m (8.0 to 9.2 kgf·m, 57.1 to 66.5 lbf·ft).

---

**Z400 69**
**WARNING**

To avoid serious injury or death:

- Park the machine on a firm and level surface.
- If it is necessary to run the engine indoors, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or by blocking the rear of the machine. Do not run the machine while adjusting.
- Remove the rear wheels.
- Do not make only one of the following adjustments (except "MOTION CONTROL LEVER ALIGNMENT"). They are interlinked.
- If you feel you are unable to make the following adjustments correctly and safely, contact your local KUBOTA Dealer.

Details regarding motion control lever alignment can be found in a different section. (See Motion control lever alignment on page 71.)

**IMPORTANT:**

- Right and left motion control levers can be adjusted independently.

---

1. **Adjusting the motion control lever operating strength**

The strength required to move the motion control levers can be adjusted to 3 levels depending on operator preference.

**NOTE:**

- Adjust the dampers after adjusting HST neutral.
- Adjusting the motion control lever strength will affect the maneuverability.

1. Change the upper side of the damper to the desired hole location.
   - Tighten the upper side damper nut.

2. Loosen the nut on the bottom side of the damper.
3. Move the motion control lever to the rearmost position and release the motion control lever.
4. After the motion control lever and damper have stopped moving, place the motion control lever in the “NEUTRAL LOCK” position.
5. Tighten the bottom side damper nut.

---

2. **HST neutral**

1. Lift up and secure with jack stands or by blocking the rear of the machine frame.
2. Remove both rear wheels.
3. Start the engine and run at maximum speed.
4. Place the motion control lever in the “NEUTRAL LOCK” position.
5. If either rear axle is turning, observe the following steps to adjust the neutral position.
6. Loosen the 3 bolts of the guide plate corresponding to the rotating axle (LH or RH).
   - Adjust the guide position until the rear axle rotation stops.
7. Tighten the rear guide plate bolt and check that the rear axle does not rotate.
   - If the axle does not stop rotating, adjust the “HST NEUTRAL” again.

| Tightening torque | 23.6 to 27.4 N m (2.4 to 2.8 kgf m, 17.4 to 20.2 lbf ft) |

8. Adjust the opposite side axle “HST NEUTRAL” if required.
9. After adjustment, make sure to stop the engine immediately.

**Right hand side**

(1) Guide plate  
(2) Speed adjust plate  
(3) Bolt (front)  
(A) Motion control lever

10. Slide the speed adjustment plate all the way forward. Push the motion control lever forward until it reaches the end of its range of motion. Slide the speed adjustment plate back until it touches the motion control lever. Then move the speed adjustment plate an additional 3 to 4 mm rearward and tighten the 2 front bolts. Repeat this step for the other side.

11. If at full speed the machine pulls one direction or the other, it is an indication that one wheel is turning faster than the other. To adjust the condition, proceed as follows:
   a. Park the machine on a firm and level surface.
   b. Stop the engine.
   c. Loosen the 2 front bolts of the faster side.
   d. Move the speed adjust plate slightly rearward.

**Left hand side**

(1) Guide plate  
(2) Speed adjust plate  
(3) Bolt (front)  
(A) Motion control lever

**3. Maximum speed (forward)**
Consult your local KUBOTA Dealer for this service.

**4. Motion control lever alignment**

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Stop the engine, remove the key and apply the parking brake.

**4.1 Checking the alignment**
1. Check the gap and space between the levers at the maximum forward position.

**Recommended gap:**
- 0 to 2 mm
- 0 to 0.08 in.

If the positions of the motion control levers are unequal, adjustment is necessary.

**4.2 Aligning the motion control levers**
1. Stop the engine and apply the parking brake.

**Lever position (high or low)**
1. Remove the bolts and select the motion control lever position, high or low.
2. Tighten the bolts.
1. Loosen the bolts.
2. Slide both levers forward or rearward to the desired position within tab slots until the levers are aligned.
3. Tighten the bolts.

5. Adjusting the mower lift pedal

1. Stop the engine and apply the parking brake.
2. Loosen the nut and adjust the pedal position.
3. Tighten the nuts.

MOWER DECK LEVEL

1. Anti-scalp rollers

**WARNING**

To avoid serious injury or death:

- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key.
- Wait for all moving parts to stop.

**NOTE:**

- The flattest cut can be achieved by having the anti-scalp rollers adjusted off the ground. Check the anti-scalp roller adjustments each time the mower deck cutting height is changed. It is recommended that all the anti-scalp rollers be kept off the ground to minimize scuffing.

1. Check the machine tire pressure.
   Inflate tires to the correct pressure.
   (See TIRES AND WHEELS on page 44.)
2. Start the engine.
3. Raise up the mower deck to the transport position (the top end of the lift).
4. Turn the cutting height control dial to adjust the height.
5. Lower the mower deck.
6. Adjust the height of the front side anti-scalp roller to 1 of the 4 positions, to approximately 19 mm (0.75 in.) between the rollers and the ground. Adjust the other 3 rollers to the same height.

7. Install the roller with the attaching hardware.

2. Leveling the mower deck (side-to-side)

**WARNING**

To avoid serious injury or death:

- Park the machine on a firm and level surface.
- Apply the parking brake.
- Disengage the PTO (OFF).
- Stop the engine and remove the key while checking or adjusting the level of the mower deck.

**IMPORTANT:**

- Check the machine tire pressure.
  Inflate the tires to the correct pressure.
  (See TIRES AND WHEELS on page 44.)
Checking the level (side-to-side)

NOTE:
- The mower deck anti-scalp rollers should not contact the ground.

1. Raise the mower deck to the transport position (the top end).
2. Turn the cutting height set dial to the 3 in. cutting height position.
3. Lower the mower deck.
4. Position the right mower blade in the side-to-side position.
5. Measure from outside the blade tip to the level surface with a short ruler or leveling gauge.

Reference

| Height of the blade at the flat surface | 76 mm (3 in.) |

NOTE:
- There is a difference of blade height between flat surface and ground measurements.

6. Check that the left side blade has the same height. The difference between both measurements is less than 3 mm (0.13 in.).
7. If the side-to-side adjustment is not within the given tolerance, adjustment is necessary.

Side-to-side adjustment

| Less than 3 mm (0.13 in.) |

Adjusting the level (side-to-side)

1. Raise up the mower deck to the transport position (the top end).
2. Turn the cutting height set dial to the 3 in. cutting height position.
3. Place 51 mm (2 in.) heigh wood blocks under each side of the mower deck.
   Anti-scalp rollers must not rest on the wood block.
4. Lower the mower deck.
5. Position the mower blade in the side-to-side position.
6. Loosen the jam nuts of the right side of the machine.
7. Adjust the cutting height fine tuning bolts to set 76 mm (3 in.) blade height.
   Front and rear side bolts must be adjusted.
8. Jam the nuts.
9. Adjust the left side equally.
10. Check the side-to-side level. If it is not level, adjustment is necessary.

3. Leveling the mower deck (front-to-rear)

**WARNING**
To avoid serious injury or death:
- Park the machine on a firm and level surface.
- Engage the parking brake.
- Disengage the PTO.
- Stop the engine and remove the key while checking or adjusting the level of the mower deck.

**IMPORTANT:**
- Check the machine tire pressure.
  Inflate the tires to the correct pressure.
  (See TIRES AND WHEELS on page 44.)

Checking level (front-to-rear)

NOTE:
- The mower deck anti-scalp rollers should not contact the ground.

1. Raise the mower deck to the transport position (the top end).
2. Turn the cutting height set dial to the 3 in. cutting height position.
3. Lower the mower deck.
4. Position the right mower blade in the front-to-rear position.
5. Measure from the right front blade tip to the level surface with a short ruler or leveling gauge.
6. Turn the blade 180° and measure from the right rear blade tip to the level surface.
7. Check that the left side blade has the same dimensions. The difference between both measurements should be less than 6 mm (0.25 in.). The front side must be lower than the rear side.
8. If the front-to-rear adjustment is not within the given tolerance, adjustment is necessary.

<table>
<thead>
<tr>
<th>(A) Front</th>
<th>(H) Height of blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>(B) Rear</td>
<td></td>
</tr>
</tbody>
</table>

### Adjusting the level (front-to-rear)

1. Raise up the mower deck to the transport position (the top end).
2. Turn the cutting height set dial to the 3 in. cutting height position.
3. Place 51 mm (2 in.) height wood blocks under each side of the mower deck. Anti-scalp rollers must not rest on the wood block.
4. Lower the mower deck.
5. Loosen the jam nuts of the front side of the machine.
6. Adjust the cutting height fine tuning bolts to set 76 mm (3 in.) blade height. Both front side bolts must be adjusted.
7. Jam the nuts.
8. Adjust the other side equally.

**IMPORTANT:**
- The difference between both measurements should be less than 6 mm (0.25 in.). The front side must be lower than the rear side.

9. Check the front-to-rear level. If it is not level, adjustment is necessary.
### GENERAL TORQUE SPECIFICATION

<table>
<thead>
<tr>
<th>SAE grade no.</th>
<th>American standard cap screws with UNC or UNF threads</th>
<th>Metric cap screws</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GR.5 (lbf ft)</td>
<td>GR.8 (lbf ft)</td>
</tr>
<tr>
<td></td>
<td>(N m)</td>
<td>(N m)</td>
</tr>
<tr>
<td></td>
<td>(kgf m)</td>
<td>(kgf m)</td>
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<tr>
<td></td>
<td>Property class</td>
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<td>Class 8.8</td>
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<td>2.35-2.84</td>
<td>3.31-4.01</td>
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<tr>
<td>3/8</td>
<td>35-42</td>
<td>45-54</td>
</tr>
<tr>
<td></td>
<td>47.5-57.0</td>
<td>61.0-73.2</td>
</tr>
<tr>
<td></td>
<td>4.84-5.82</td>
<td>6.22-7.47</td>
</tr>
<tr>
<td>1/2</td>
<td>80-96</td>
<td>110-132</td>
</tr>
<tr>
<td></td>
<td>108.5-130.2</td>
<td>149.2-179.0</td>
</tr>
<tr>
<td></td>
<td>110.7-13.29</td>
<td>15.22-18.27</td>
</tr>
<tr>
<td>9/16</td>
<td>110-132</td>
<td>160-192</td>
</tr>
<tr>
<td></td>
<td>149.2-179.0</td>
<td>217.0-260.4</td>
</tr>
<tr>
<td></td>
<td>15.22-18.27</td>
<td>22.14-26.57</td>
</tr>
<tr>
<td>5/8</td>
<td>150-180</td>
<td>220-264</td>
</tr>
<tr>
<td></td>
<td>203.4-244.1</td>
<td>298.3-358.0</td>
</tr>
<tr>
<td></td>
<td>20.75-24.91</td>
<td>30.44-36.53</td>
</tr>
</tbody>
</table>
# TIGHTENING TORQUE CHART

<table>
<thead>
<tr>
<th>Thread size d (mm)</th>
<th>Hex. bolt head size B (mm)</th>
<th>No mark</th>
<th>7T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lbf⋅ft</td>
<td>N⋅m</td>
</tr>
<tr>
<td>M8</td>
<td>12 or 13</td>
<td>13.0-15.2 (14.1 ± 1.1)</td>
<td>17.8-20.6 (19.2 ± 1.4)</td>
</tr>
<tr>
<td>M10</td>
<td>14 or 17</td>
<td>28.9-33.3 (31.1 ± 2.2)</td>
<td>39.3-45.1 (42.2 ± 2.9)</td>
</tr>
<tr>
<td>M12</td>
<td>17 or 19</td>
<td>46.3-53.5 (49.9 ± 3.6)</td>
<td>62.8-72.6 (67.7 ± 4.9)</td>
</tr>
<tr>
<td>M14</td>
<td>19 or 22</td>
<td>79.6-92.6 (86.1 ± 6.5)</td>
<td>107.9-125.5 (116.7 ± 8.8)</td>
</tr>
</tbody>
</table>

**NOTE:**
- Figure [7] on the top of the bolt indicates that the bolt is made of special material.
- Before tightening, check the figure on top of the bolt.

---

**Scale**

![Scale Diagram](1SFRT00002A01)

(1) *Scale*
STORAGE

WARNING
To avoid serious injury or death:
• To reduce fire hazards, allow the engine and the exhaust system to cool before storing the machine indoors or near combustible materials.
• To avoid the danger of exhaust fume poisoning, do not operate the engine indoors without proper ventilation.
• Do not clean the machine with the engine running.
• To avoid fire hazards, do not leave grass and leaves in the mower and the grass catcher.
• When storing, remove the key from the key switch to avoid operation by unauthorized persons.

STORING THE MACHINE
When the machine will not be operated for over 2 months, clean the machine and perform the following operations before storage:
1. Repair parts as necessary.
2. Check bolts and nuts and tighten as necessary.
3. Apply grease or engine oil to parts most likely to rust.
4. Inflate the tires to a little above the standard pressure levels (approximately 110%).
5. Lower the mower to the ground.
6. Remove the battery from the machine, recharge it, adjust the electrolyte to the proper level, and store in a cool dry place.
   The battery discharges over time even while in storage. Recharge it once a month in the hot season and once every 2 months in the cold season.
7. Drain the fuel tank, fuel lines and carburetor or use a fuel stabilizer to prevent deterioration of the gasoline. If you choose to use a fuel stabilizer, follow the manufacturers recommendations and add the correct amount for the capacity of the fuel system. Fill the fuel tank with clean, fresh gasoline. Run the engine for 2 to 3 minutes to get stabilized fuel into the carburetor.
8. Store the machine in a dry place sheltered from rain. Cover the machine with a vinyl tarp.
9. Moisture content in most grasses can damage the mower and grass catcher they are not properly cleaned after use. Make sure the mower and the grass catcher are clean and completely empty before storage.
10. Store the machine only on flat, level ground.

REMOVING THE MACHINE FROM STORAGE
1. Check the tire inflation pressure and adjust as required.
2. Install the battery. Before installing the battery, be sure it is fully charged.
3. Do the daily check. (See DAILY CHECK on page 50.)
4. Check all fluid levels (engine oil, hydrostatic oil).
5. Start the engine. Shut the engine off, walk around the machine and make a visual inspection looking for leakage of oil or other fluids.
6. Run the engine a couple of minutes before you put the engine under load.
# TROUBLESHOOTING

## ENGINE TROUBLESHOOTING

If something is wrong with the engine, refer to the following table for the cause and its corrective measure.

<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The engine is difficult to start or will not start.</td>
<td>• No operator on the seat.</td>
<td>• Sit on the operator’s seat.</td>
</tr>
<tr>
<td></td>
<td>• Parking brake pedal not in the proper position.</td>
<td>• Apply the parking brake.</td>
</tr>
<tr>
<td></td>
<td>• PTO switch not in the proper position.</td>
<td>• Make sure the PTO switch is in the “DISENGAGED” (OFF) position.</td>
</tr>
<tr>
<td></td>
<td>• The motion control levers not in the proper position.</td>
<td>• Make sure motion control levers are in the “NEUTRAL LOCK” position.</td>
</tr>
<tr>
<td></td>
<td>• The key switch not in the proper position.</td>
<td>• Make sure the key switch is in the “ON” position.</td>
</tr>
<tr>
<td></td>
<td>• No fuel.</td>
<td>• Fill with fuel.</td>
</tr>
<tr>
<td></td>
<td>• Improper or stale fuel. (Fuel quality is poor.)</td>
<td>• Replace fuel and the fuel filter.</td>
</tr>
<tr>
<td></td>
<td>• Water or dirt in the fuel system.</td>
<td>• Replace fuel and see your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Fuel hose or fuel filter clogged or damaged.</td>
<td>• Clean or replace fuel lines and see your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Air cleaner clogged.</td>
<td>• Clean or replace the air cleaner.</td>
</tr>
<tr>
<td></td>
<td>• Spark plug damaged.</td>
<td>• Adjust the spark plug gap or replace the spark plug.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the spark plug wire connection.</td>
</tr>
<tr>
<td></td>
<td>• Fuse blown.</td>
<td>• Replace the fuse.</td>
</tr>
<tr>
<td></td>
<td>• The engine oil viscosity is wrong.</td>
<td>• Use oils of different viscosities, depending on the ambient temperature.</td>
</tr>
<tr>
<td></td>
<td>• The battery becomes weak and the engine does not turn over quick enough.</td>
<td>• Clean battery cables and terminals.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Charge the battery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In cold weather, always remove the battery from the engine, charge and store it indoors. Install it on the machine only when the machine is going to be used.</td>
</tr>
<tr>
<td></td>
<td>• Over choking or choke adjusted incorrectly.</td>
<td>• Check and see your Kubota dealer.</td>
</tr>
<tr>
<td>Insufficient engine power.</td>
<td>• Insufficient or dirty fuel.</td>
<td>• Check the fuel system.</td>
</tr>
<tr>
<td></td>
<td>• Fuel filter clogged.</td>
<td>• Replace the fuel filter.</td>
</tr>
<tr>
<td></td>
<td>• Air cleaner clogged.</td>
<td>• Clean or replace the air cleaner.</td>
</tr>
<tr>
<td></td>
<td>• Spark plug damaged.</td>
<td>• Adjust the spark plug gap or replace it.</td>
</tr>
<tr>
<td>The engine stops suddenly.</td>
<td>• Insufficient fuel.</td>
<td>• Refuel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the fuel valve position.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the carburetor fuel valve position.</td>
</tr>
<tr>
<td>Rough engine running.</td>
<td>• Spark plug damaged.</td>
<td>• Adjust the spark plug gap or replace it.</td>
</tr>
<tr>
<td></td>
<td>• Spark plug wire damaged.</td>
<td>• See your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Carburetion problems.</td>
<td>• See your Kubota dealer.</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough engine running.</td>
<td>• Ignition coil damaged.</td>
<td>• See your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Choke adjusted incorrectly.</td>
<td>• See your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Fuel hose or fuel filter clogged or damaged.</td>
<td>• Clean or replace fuel lines and see your Kubota dealer.</td>
</tr>
<tr>
<td></td>
<td>• Improper or stale fuel. (Fuel quality is poor.)</td>
<td>• Replace fuel and the fuel filter.</td>
</tr>
<tr>
<td></td>
<td>• Air cleaner clogged.</td>
<td>• Clean or replace the air cleaner.</td>
</tr>
<tr>
<td>Exhaust fumes are colored (black, dark or gray).</td>
<td>• Overload.</td>
<td>• Reduce load.</td>
</tr>
<tr>
<td></td>
<td>• Low grade fuel used.</td>
<td>• Use specified fuel.</td>
</tr>
<tr>
<td></td>
<td>• Fuel filter clogged.</td>
<td>• Replace the fuel filter.</td>
</tr>
<tr>
<td></td>
<td>• Air cleaner clogged.</td>
<td>• Clean or replace the air cleaner element.</td>
</tr>
<tr>
<td></td>
<td>• Choke not fully opened.</td>
<td>• Check the choke position.</td>
</tr>
<tr>
<td>Exhaust fumes are colored (white or blue).</td>
<td>• Excessive engine oil.</td>
<td>• Reduce to the specified oil level.</td>
</tr>
<tr>
<td></td>
<td>• Piston ring worn or stuck.</td>
<td>• See your Kubota dealer.</td>
</tr>
<tr>
<td>Engine overheats.</td>
<td>• Engine overloaded.</td>
<td>• Lower speed or reduce load.</td>
</tr>
<tr>
<td></td>
<td>• Engine oil insufficient.</td>
<td>• Fill engine oil.</td>
</tr>
<tr>
<td></td>
<td>• The engine air intake screen and cooling fins are dirty.</td>
<td>• Clean the air intake screen and cooling fins.</td>
</tr>
<tr>
<td></td>
<td>• Air cleaner element plugged.</td>
<td>• Clean or replace the air cleaner element.</td>
</tr>
<tr>
<td></td>
<td>• Engine speed too low.</td>
<td>• Operate at “FAST” speed.</td>
</tr>
<tr>
<td></td>
<td>• Operating ground speed too fast.</td>
<td>• Operate the machine at slower ground speed.</td>
</tr>
<tr>
<td>The engine knocks.</td>
<td>• Stale or low octane fuel.</td>
<td>• Use specified fuel.</td>
</tr>
<tr>
<td></td>
<td>• Engine overloaded.</td>
<td>• Lower ground speed or reduce load.</td>
</tr>
<tr>
<td></td>
<td>• Engine speed too low.</td>
<td>• Operate at “FAST” speed.</td>
</tr>
<tr>
<td>The engine will not idle.</td>
<td>• Spark plug damaged.</td>
<td>• Adjust the spark plug gap or replace it.</td>
</tr>
<tr>
<td></td>
<td>• Faulty spark plug.</td>
<td>• Replace the spark plug.</td>
</tr>
<tr>
<td></td>
<td>• Carburetion problem.</td>
<td>• See your Kubota dealer.</td>
</tr>
</tbody>
</table>

If you have any questions, contact your local KUBOTA dealer.
BATTERY TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
<th>Preventive measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The starter does not function.</td>
<td>• Battery overuse, dim lights.</td>
<td>• Charge the battery sufficiently.</td>
<td>• Charge the battery properly.</td>
</tr>
<tr>
<td></td>
<td>• The battery has not been recharged.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Poor terminal connection.</td>
<td>• Clean the terminal and tighten securely.</td>
<td>• Keep the terminal clean and tight. Apply grease and treat with anti-corrosives.</td>
</tr>
<tr>
<td></td>
<td>• The battery life has expired.</td>
<td>• Replace the battery.</td>
<td></td>
</tr>
<tr>
<td>The starter does not function from the beginning, and lights soon become dim.</td>
<td>• Insufficient charging.</td>
<td>• Charge the battery sufficiently.</td>
<td>• The battery must be serviced properly before initial use.</td>
</tr>
<tr>
<td>When viewed from the top, the top of the plates look whitish.</td>
<td>• The battery was used with an insufficient amount of electrolyte.</td>
<td>• Add distilled water and charge the battery.</td>
<td>• Regularly check the electrolyte level.</td>
</tr>
<tr>
<td></td>
<td>• The battery was used too much without recharging.</td>
<td>• Charge the battery sufficiently.</td>
<td>• Charge the battery properly.</td>
</tr>
<tr>
<td>Recharging is impossible.</td>
<td>• The battery life has expired.</td>
<td>• Replace the battery.</td>
<td></td>
</tr>
<tr>
<td>Terminals are severely corroded and heated up.</td>
<td>• Poor terminal connection.</td>
<td>• Clean the terminal and tighten securely.</td>
<td>• Keep the terminal clean and tight. Apply grease and treat with anti-corrosives.</td>
</tr>
<tr>
<td>The battery electrolyte level drops rapidly.</td>
<td>• There is a crack or pin holes in the electrolytic cells.</td>
<td>• Replace the battery.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Charging system trouble.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have any questions, contact your local KUBOTA dealer.

MACHINE TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The machine operation is not smooth.</td>
<td>• The hydrostatic transaxle fluid is insufficient.</td>
<td>• Fill with oil.</td>
</tr>
<tr>
<td></td>
<td>• The filter is clogged.</td>
<td>• Replace the filter.</td>
</tr>
<tr>
<td>The machine does not move while the engine is running.</td>
<td>• The parking brake is on.</td>
<td>• Release the parking brake.</td>
</tr>
<tr>
<td></td>
<td>• The transaxle fluid level is insufficient.</td>
<td>• Fill with oil.</td>
</tr>
<tr>
<td>The machine moves when the motion control levers are in the “NEUTRAL LOCK” position (operating the engine).</td>
<td>• The hydrostatic lever linkage is not correctly adjusted.</td>
<td>• Ask your dealer for hydrostatic lever linkage adjustment.</td>
</tr>
<tr>
<td></td>
<td>• The control linkage pivots are sticking.</td>
<td>• Pull up and lubricate linkage.</td>
</tr>
<tr>
<td>All electrical equipment do not operate.</td>
<td>• Slow blow fuse blown.</td>
<td>• Replace the slow blow fuse.</td>
</tr>
</tbody>
</table>

If you have any questions, contact your local KUBOTA dealer.
# MOWER TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blades do not rotate.</td>
<td>• The PTO system is not normal: PTO system malfunctioning.</td>
<td>• See your KUBOTA dealer.</td>
</tr>
<tr>
<td></td>
<td>• The PTO system is normal: broken mower belt.</td>
<td>• Replace.</td>
</tr>
<tr>
<td>Mower belt slipping.</td>
<td>• Weaken tension spring.</td>
<td>• Replace.</td>
</tr>
<tr>
<td></td>
<td>• Worn mower belt.</td>
<td>• Replace.</td>
</tr>
<tr>
<td></td>
<td>• Mower plugged.</td>
<td>• Unplug and clean the mower deck.</td>
</tr>
<tr>
<td></td>
<td>• Debris in pulleys.</td>
<td>• Clean.</td>
</tr>
<tr>
<td>Discharge chute plugged.</td>
<td>• Grass too wet.</td>
<td>• Wait for grass to dry.</td>
</tr>
<tr>
<td></td>
<td>• Grass too long.</td>
<td>• Raise the cutting height and cut grass twice.</td>
</tr>
<tr>
<td></td>
<td>• Cutting too low.</td>
<td>• Raise the cutting height.</td>
</tr>
<tr>
<td></td>
<td>• Engine rpm too low.</td>
<td>• Mow at full throttle.</td>
</tr>
<tr>
<td></td>
<td>• Ground speed too fast.</td>
<td>• Slow down.</td>
</tr>
<tr>
<td>Streaking of grass uncut.</td>
<td>• Ground speed too fast.</td>
<td>• Slow down.</td>
</tr>
<tr>
<td></td>
<td>• Engine rpm too low.</td>
<td>• Mow at full throttle, check and reset the engine rpm.</td>
</tr>
<tr>
<td></td>
<td>• Grass too long.</td>
<td>• Cut grass twice.</td>
</tr>
<tr>
<td></td>
<td>• Blades dull or damaged.</td>
<td>• Replace blades or have blades sharpened.</td>
</tr>
<tr>
<td></td>
<td>• Debris in mower deck.</td>
<td>• Clean the mower deck.</td>
</tr>
<tr>
<td>Uneven cut.</td>
<td>• Mower deck not level.</td>
<td>• Level the mower deck.</td>
</tr>
<tr>
<td></td>
<td>• Ground speed too fast.</td>
<td>• Slow down.</td>
</tr>
<tr>
<td></td>
<td>• Blades dull.</td>
<td>• Have blades sharpened.</td>
</tr>
<tr>
<td></td>
<td>• Blades worn or damaged.</td>
<td>• Replace the blades.</td>
</tr>
<tr>
<td></td>
<td>• Low tire inflation.</td>
<td>• Add air to correct pressure.</td>
</tr>
<tr>
<td></td>
<td>• Anti-scalp rollers not adjusted correctly.</td>
<td>• Adjust the anti-scalp rollers.</td>
</tr>
<tr>
<td></td>
<td>• Wheels pressure not adjusted correctly.</td>
<td>• Set both tire pressure to the correct pressure.</td>
</tr>
<tr>
<td></td>
<td>(See TIRES on page 44.)</td>
<td></td>
</tr>
<tr>
<td>Blades scalping grass.</td>
<td>• Cutting height too low.</td>
<td>• Raise the cutting height.</td>
</tr>
<tr>
<td></td>
<td>• Turning speed too fast.</td>
<td>• Reduce speed on turns.</td>
</tr>
<tr>
<td></td>
<td>• Ridges in terrain.</td>
<td>• Change the mowing pattern.</td>
</tr>
<tr>
<td></td>
<td>• Rough or uneven terrain.</td>
<td>• Adjust wheels pressure and anti-scalp rollers.</td>
</tr>
<tr>
<td></td>
<td>• Anti-scalp rollers not adjusted correctly.</td>
<td>• Adjust wheels pressure and anti-scalp rollers.</td>
</tr>
<tr>
<td></td>
<td>• Bent blade(s).</td>
<td>• Replace blade(s).</td>
</tr>
<tr>
<td>Excessive vibration.</td>
<td>• Debris on mower deck or in pulleys.</td>
<td>• Clean the mower deck and pulleys.</td>
</tr>
<tr>
<td></td>
<td>• Damaged mower belt.</td>
<td>• Replace the mower belt.</td>
</tr>
<tr>
<td></td>
<td>• Damaged pulleys.</td>
<td>• Replace pulleys.</td>
</tr>
<tr>
<td></td>
<td>• Pulleys out of alignment.</td>
<td>• Check pulleys.</td>
</tr>
<tr>
<td></td>
<td>• Blades out of balance.</td>
<td>• Have blades balanced.</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Symptom (if)</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mower loads down machine.</td>
<td>• Engine rpm too low.</td>
<td>• Mow at full throttle, check and reset the engine rpm.</td>
</tr>
<tr>
<td></td>
<td>• Ground speed too fast.</td>
<td>• Slow down.</td>
</tr>
<tr>
<td></td>
<td>• Debris wrapped around mower spindles.</td>
<td>• Clean the mower.</td>
</tr>
<tr>
<td></td>
<td>• Front of deck too low.</td>
<td>• Adjust the mower deck. (See MOWER DECK LEVEL on page 72.)</td>
</tr>
</tbody>
</table>

If you have any questions, contact your local KUBOTA dealer.
# INDEX

## Symbols

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 volt electric outlet (accessory)</td>
<td>39</td>
</tr>
<tr>
<td>12 volt plug (accessory)</td>
<td>39</td>
</tr>
</tbody>
</table>

## A

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>accessories</td>
<td>39</td>
</tr>
<tr>
<td>air cleaner paper element</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>58</td>
</tr>
<tr>
<td>replacing</td>
<td>63</td>
</tr>
<tr>
<td>air purging procedures</td>
<td>64</td>
</tr>
<tr>
<td>anti-scalp rollers</td>
<td></td>
</tr>
<tr>
<td>adjusting</td>
<td>72</td>
</tr>
</tbody>
</table>

## B

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>battery</td>
<td></td>
</tr>
<tr>
<td>charging</td>
<td>61</td>
</tr>
<tr>
<td>checking condition</td>
<td>60</td>
</tr>
<tr>
<td>jump starting</td>
<td>30</td>
</tr>
<tr>
<td>storing</td>
<td>62</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>80</td>
</tr>
<tr>
<td>blades</td>
<td></td>
</tr>
<tr>
<td>checking</td>
<td>68</td>
</tr>
<tr>
<td>replacing</td>
<td>68</td>
</tr>
</tbody>
</table>

## C

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon canister air filter</td>
<td></td>
</tr>
<tr>
<td>checking</td>
<td>57</td>
</tr>
<tr>
<td>replacing</td>
<td>67</td>
</tr>
<tr>
<td>choke cable</td>
<td></td>
</tr>
<tr>
<td>adjusting</td>
<td>62</td>
</tr>
<tr>
<td>choke knob</td>
<td></td>
</tr>
<tr>
<td>operating</td>
<td>28</td>
</tr>
<tr>
<td>cold weather</td>
<td></td>
</tr>
<tr>
<td>starting engine</td>
<td>30</td>
</tr>
<tr>
<td>combustion chamber</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>64</td>
</tr>
<tr>
<td>crank shaft</td>
<td></td>
</tr>
<tr>
<td>lubricating</td>
<td>66</td>
</tr>
<tr>
<td>cup holder (accessory)</td>
<td>39</td>
</tr>
<tr>
<td>cutting height</td>
<td></td>
</tr>
<tr>
<td>adjusting</td>
<td>41</td>
</tr>
<tr>
<td>cylinder</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>54</td>
</tr>
<tr>
<td>cylinder head fins</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>54</td>
</tr>
</tbody>
</table>

## D

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>daily check</td>
<td></td>
</tr>
<tr>
<td>checking fuel level</td>
<td>51</td>
</tr>
<tr>
<td>checking movable parts</td>
<td>54</td>
</tr>
<tr>
<td>checking the air intake screen</td>
<td>52</td>
</tr>
<tr>
<td>checking the dial cam rotation strength</td>
<td>54</td>
</tr>
<tr>
<td>checking the engine oil level</td>
<td>51</td>
</tr>
<tr>
<td>checking the tire pressure</td>
<td>44,53</td>
</tr>
<tr>
<td>checking the tire pressure (warning information)</td>
<td>53</td>
</tr>
<tr>
<td>checking the transaxle fluid level</td>
<td>53</td>
</tr>
<tr>
<td>cleaning the transaxle fluid level</td>
<td>52</td>
</tr>
<tr>
<td>refueling</td>
<td>51</td>
</tr>
<tr>
<td>daily check list</td>
<td>50</td>
</tr>
</tbody>
</table>

## E

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>electric clutch</td>
<td></td>
</tr>
<tr>
<td>adjusting</td>
<td>66</td>
</tr>
<tr>
<td>engine</td>
<td></td>
</tr>
<tr>
<td>jump starting</td>
<td>30</td>
</tr>
<tr>
<td>operating (warning information)</td>
<td>27</td>
</tr>
<tr>
<td>starting</td>
<td>27</td>
</tr>
<tr>
<td>starting in cold weather</td>
<td>30</td>
</tr>
<tr>
<td>starting information</td>
<td>29</td>
</tr>
<tr>
<td>stopping</td>
<td>31</td>
</tr>
<tr>
<td>stopping immediately</td>
<td>29</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>78</td>
</tr>
<tr>
<td>warming up</td>
<td>30</td>
</tr>
<tr>
<td>engine break-in</td>
<td>32</td>
</tr>
<tr>
<td>engine oil</td>
<td></td>
</tr>
<tr>
<td>changing</td>
<td>58</td>
</tr>
<tr>
<td>engine oil filter</td>
<td></td>
</tr>
<tr>
<td>replacing</td>
<td>63</td>
</tr>
<tr>
<td>engine start system</td>
<td></td>
</tr>
<tr>
<td>checking</td>
<td>55</td>
</tr>
<tr>
<td>engine valve clearance</td>
<td></td>
</tr>
<tr>
<td>adjusting</td>
<td>64</td>
</tr>
</tbody>
</table>

## F

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>foam element</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>55</td>
</tr>
<tr>
<td>front caster wheels</td>
<td></td>
</tr>
<tr>
<td>installing</td>
<td>45</td>
</tr>
<tr>
<td>removing</td>
<td>44</td>
</tr>
<tr>
<td>fuel</td>
<td>49</td>
</tr>
<tr>
<td>fuel filter</td>
<td></td>
</tr>
<tr>
<td>checking</td>
<td>59</td>
</tr>
<tr>
<td>replacing</td>
<td>63</td>
</tr>
<tr>
<td>fuel gauge</td>
<td>29</td>
</tr>
<tr>
<td>fuel lines</td>
<td></td>
</tr>
<tr>
<td>checking</td>
<td>59,67</td>
</tr>
<tr>
<td>replacing</td>
<td>67</td>
</tr>
<tr>
<td>fuses</td>
<td></td>
</tr>
<tr>
<td>replacing</td>
<td>67</td>
</tr>
</tbody>
</table>

## G

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>general torque specification</td>
<td>75</td>
</tr>
<tr>
<td>grease fittings</td>
<td></td>
</tr>
<tr>
<td>lubricating</td>
<td>57</td>
</tr>
<tr>
<td>H</td>
<td>hand controls</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>hour meter</td>
<td>29</td>
</tr>
<tr>
<td>hydraulic hoses</td>
<td>67</td>
</tr>
<tr>
<td>checking</td>
<td>67</td>
</tr>
<tr>
<td>replacing</td>
<td>67</td>
</tr>
<tr>
<td>hydrostatic transaxle bypass rods</td>
<td>39</td>
</tr>
<tr>
<td>I</td>
<td>implement limitations</td>
</tr>
<tr>
<td>instrument panel</td>
<td>22</td>
</tr>
<tr>
<td>K</td>
<td>key switch</td>
</tr>
<tr>
<td>L</td>
<td>labels (safety)</td>
</tr>
<tr>
<td>taking care of the labels</td>
<td>16</td>
</tr>
<tr>
<td>lubricants</td>
<td>49</td>
</tr>
<tr>
<td>M</td>
<td>machine</td>
</tr>
<tr>
<td>before operating</td>
<td>5</td>
</tr>
<tr>
<td>getting off</td>
<td>27</td>
</tr>
<tr>
<td>getting on</td>
<td>27</td>
</tr>
<tr>
<td>operating on slopes</td>
<td>7</td>
</tr>
<tr>
<td>parking</td>
<td>38</td>
</tr>
<tr>
<td>pulling loads</td>
<td>7</td>
</tr>
<tr>
<td>removing from storage</td>
<td>77</td>
</tr>
<tr>
<td>scraping procedure</td>
<td>18</td>
</tr>
<tr>
<td>servicing</td>
<td>8,17</td>
</tr>
<tr>
<td>specification table</td>
<td>19</td>
</tr>
<tr>
<td>starting</td>
<td>34,43</td>
</tr>
<tr>
<td>starting to operate</td>
<td>6</td>
</tr>
<tr>
<td>stopping</td>
<td>8,38</td>
</tr>
<tr>
<td>storing</td>
<td>9,77</td>
</tr>
<tr>
<td>transporting</td>
<td>8,39</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>80</td>
</tr>
<tr>
<td>warranty</td>
<td>18</td>
</tr>
<tr>
<td>working</td>
<td>6</td>
</tr>
<tr>
<td>machine (new)</td>
<td>32</td>
</tr>
<tr>
<td>changing engine oil</td>
<td>32</td>
</tr>
<tr>
<td>changing lubricating oil</td>
<td>32</td>
</tr>
<tr>
<td>changing oil filter cartridge</td>
<td>32</td>
</tr>
<tr>
<td>changing transaxle fluid</td>
<td>32</td>
</tr>
<tr>
<td>operating</td>
<td>32</td>
</tr>
<tr>
<td>operating warning</td>
<td>32</td>
</tr>
<tr>
<td>motion control lever</td>
<td>36</td>
</tr>
<tr>
<td>adjusting (warning information)</td>
<td>70</td>
</tr>
<tr>
<td>adjusting HST neutral</td>
<td>70</td>
</tr>
<tr>
<td>adjusting maximum speed (forward)</td>
<td>71</td>
</tr>
<tr>
<td>adjusting the operating strength</td>
<td>70</td>
</tr>
<tr>
<td>aligning</td>
<td>71</td>
</tr>
<tr>
<td>alignment</td>
<td>71</td>
</tr>
<tr>
<td>checking the alignment</td>
<td>71</td>
</tr>
<tr>
<td>operating position</td>
<td>37</td>
</tr>
<tr>
<td>stop position</td>
<td>36</td>
</tr>
<tr>
<td>mower</td>
<td>25</td>
</tr>
<tr>
<td>adjusting</td>
<td>43</td>
</tr>
<tr>
<td>operating</td>
<td>81</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>23</td>
</tr>
<tr>
<td>mower belt</td>
<td>69</td>
</tr>
<tr>
<td>replacing</td>
<td>69</td>
</tr>
<tr>
<td>mower deck</td>
<td>25</td>
</tr>
<tr>
<td>dismounting</td>
<td>73</td>
</tr>
<tr>
<td>front-to-rear leveling</td>
<td>24</td>
</tr>
<tr>
<td>mounting</td>
<td>72</td>
</tr>
<tr>
<td>side-to-side leveling</td>
<td>35</td>
</tr>
<tr>
<td>mower lift pedal</td>
<td>72</td>
</tr>
<tr>
<td>adjusting</td>
<td>72</td>
</tr>
<tr>
<td>mower link bushings</td>
<td>63</td>
</tr>
<tr>
<td>greasing</td>
<td>41</td>
</tr>
<tr>
<td>mowing tips</td>
<td>41</td>
</tr>
<tr>
<td>muffler</td>
<td>57,67</td>
</tr>
<tr>
<td>checking</td>
<td>57,67</td>
</tr>
<tr>
<td>O</td>
<td>OPC system</td>
</tr>
<tr>
<td>checking</td>
<td>56</td>
</tr>
<tr>
<td>operator's seat</td>
<td>35</td>
</tr>
<tr>
<td>lowering</td>
<td>50</td>
</tr>
<tr>
<td>raising</td>
<td>50</td>
</tr>
<tr>
<td>P</td>
<td>parking brake</td>
</tr>
<tr>
<td>applying</td>
<td>27</td>
</tr>
<tr>
<td>releasing</td>
<td>36</td>
</tr>
<tr>
<td>parking brake pedal</td>
<td>36</td>
</tr>
<tr>
<td>periodic service (chart label)</td>
<td>48</td>
</tr>
<tr>
<td>PTO switch</td>
<td>43</td>
</tr>
<tr>
<td>R</td>
<td>ROPS (foldable type)</td>
</tr>
<tr>
<td>adjusting</td>
<td>34</td>
</tr>
<tr>
<td>folding</td>
<td>33</td>
</tr>
<tr>
<td>operating</td>
<td>33</td>
</tr>
<tr>
<td>raising to the upright position</td>
<td>34</td>
</tr>
<tr>
<td>S</td>
<td>safety</td>
</tr>
<tr>
<td>before operating the machine</td>
<td>5</td>
</tr>
<tr>
<td>general information</td>
<td>5</td>
</tr>
<tr>
<td>operating on slopes</td>
<td>7</td>
</tr>
<tr>
<td>pulling loads</td>
<td>7</td>
</tr>
<tr>
<td>ROPS</td>
<td>6</td>
</tr>
<tr>
<td>servicing the machine</td>
<td>8</td>
</tr>
<tr>
<td>starting to operate the machine</td>
<td>8</td>
</tr>
<tr>
<td>stopping the machine</td>
<td>8</td>
</tr>
<tr>
<td>storing the machine</td>
<td>9</td>
</tr>
</tbody>
</table>
transporting the machine.........................................8
working the machine............................................... 6
safety for children....................................................... 7
safety for operators (age 60 years and older).............. 7
seat belt...................................................................... 35
service intervals..........................................................46
smartphone holder (accessory)...................................39
spark arrester (if equipped)
  checking..................................................................57,67
spark plug
  checking...................................................................... 59
  replacing..................................................................... 65
step
  opening..................................................................... 50
switches...................................................................... 22

T
  throttle cable
    adjusting................................................................... 62
  throttle lever.............................................................. 35
  operating....................................................................... 29
  torque tightening chart............................................... 76
  transaxle fluid
    changing.................................................................... 65
  transaxle oil filter cartridge
    replacing....................................................................... 64
  transmission oil
    warming up in the low temperature range............. 30

U
  utility box (accessory)..................................................39

V
  valve seating surface
    lapping....................................................................... 64

W
  warranty........................................................................ 18
  wheels......................................................................... 44