CONTENTS

1. INFORMATION

SAFETY FIRST 1-1
1. Before you start service 1-1
2. Start safely 1-1
3. Operate safely 1-2
4. Prevent a fire 1-2
5. Keep a good airflow in the work area 1-3
6. Discard fluids correctly 1-3
7. Prevent acid burns 1-3
8. Preparing for emergencies 1-3
SAFETY DECALS 1-5
1. Safety decals 1-5
2. Care of danger, warning and caution labels 1-12
SPECIFICATIONS 1-13
1. Specifications for model 1-13
2. Specifications for mower 1-16
DIMENSIONS 1-17

2. GENERAL

IDENTIFICATION 2-1
1. Serial number 2-1
2. Product identification number 2-1
GENERAL PRECAUTIONS 2-3
HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING 2-5
1. Handling of wiring 2-5
2. Battery 2-6
3. Handling of fuse 2-7
4. Connector 2-7
5. Handling of circuit tester 2-8
6. Wiring colors 2-8
LUBRICANTS AND FUEL 2-9
TIGHTENING TORQUES 2-11
1. General use screws, bolts, and nuts 2-11
2. Stud bolts 2-11
3. Hydraulic fittings 2-12
3.1 Hydraulic hose fittings 2-12
3.2 Hydraulic pipe cap nuts 2-12
3.3 Adapters, elbows, and others 2-13
4. Metric screws, bolts and nuts 2-14
5. American standard screws, bolts and nuts with UNC or UNF threads 2-14
6. Plugs 2-14
SERVICE INTERVALS 2-15
PERIODIC SERVICE CHART LABEL 2-17
CHECK AND MAINTENANCE 2-19
1. Daily check 2-19
1.1 Checking engine oil level 2-19
1.2 Checking amount of fuel and refueling 2-20
1.3 Checking and cleaning air intake screen 2-21
1.4 Checking transaxle fluid level 2-21
1.5 Checking tire pressure 2-22
1.6 Checking dial cam rotation force 2-22
1.7 Checking movable parts 2-23
2. Check points of every 25 hours 2-23
2.1 Cleaning cylinder head and cylinder head fins 2-23

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INDEX

Symbols

12 V outlet
checking harness....7-24
checking terminal continuity....7-24

A

air cleaner paper element
cleaning....2-27
replacing....2-31
air intake screen
checking....2-21
cleaning....2-21
anti-scalp roller
removing....8-19
anti-scalp rollers
adjusting....8-9
axle shaft
removing....4-25

B

battery
charging....2-29
checking condition....2-29
checking specific gravity....7-14
checking terminal connection....7-14
checking voltage....7-14
removing....3-10,4-26,4-27,4-29
storing....2-30
blade
checking....2-38
removing....8-16
replacing....2-38
blade shaft
removing....8-17
bolts....2-11
brake arm
function....4-3
brake arm assembly
removing....4-18
brake assembly
removing....4-25
brake rod
disconnecting....4-14
bull gear
removing....4-20
bypass arm
function....4-3
removing....4-22
bypass rod
disconnecting....4-14

C

cam
removing....6-7
center section
function....4-3
removing....4-23
center section kit
replacing....4-23
charge pump
function....4-3
removing....4-20
charging system
electrical circuit....7-7
choke cable
adjusting....2-30
disconnecting....3-14
circuit tester
handling....2-8
combustion chambers
cleaning....2-32
compression tester....2-41
control arm
function....4-3
control arm assembly
removing....4-17
control rod
disconnecting....4-14
cooling system....3-3
crank shaft
lubricating....2-34
cylinder block
removing....4-24
cylinder head
cleaning....2-23
cylinder head fin
cleaning....2-23

D

daily check....2-19
dial cam
checking rotation force....2-22
dimensions....1-17

E

electric clutch
adjusting....2-35
removing....3-10
electric PTO clutch
checking (coil resistance)....7-21
checking (electromagnetic action)....7-21
checking clearance....7-21
disassembling....7-25

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SAFETY FIRST

SAFETY FIRST
- **This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.**
- **It is essential that you read the instructions and safety regulations before you try to repair or use this unit.**

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

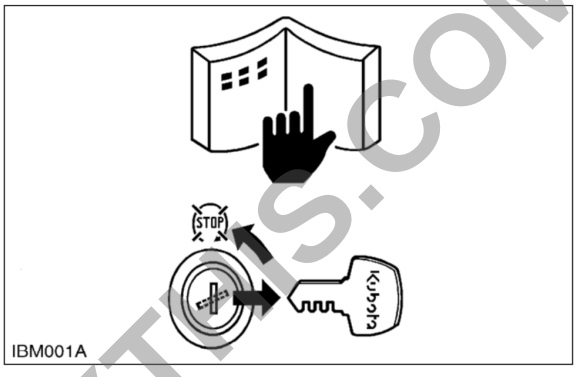
WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

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

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

NOTE
- **Gives helpful information.**

1. Before you start service



IBM001A

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

2. Start safely


IBM002A

- Do not do the procedures below when you start the engine.
  1. Short across starter terminals.
  2. Bypass the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before you start the engine, make sure that all shift levers are in neutral positions or in disengaged positions.

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SPECIFICATIONS

1. Specifications for model

Z411KW, Z421KW

Model				Z411KW	Z421KW
Engine	Model			GH7302V	GH7301V
	Max. engine power (Gross)	kW (HP)		16.4 (22.0)*1*2	17.9 (24.0)*1*2
	Type			Air-cooled gasoline engine	
	Number of cylinders			2 (V-Twin)	
	Bore and stroke	mm (in.)		78 × 76 (3.07 × 2.99)	
	Total displacement	cm^3 (cu. in.)		726 (44.3)	
	Rated revolution	rpm		3600	
	Fuel			Unleaded gasoline	
	Starter			Electric	
	Lubrication			Full pressure lubrication	
	Cooling			Air cooled	
	Battery			U1 (12 V, RC: 45 min, CCA: 300, CA: 410)	
Capacities	Fuel tank			25.7 L (6.79 U.S.gals, 5.65 Imp.gals)	
	Engine crankcase (with filter)			2.1 L (2.2 U.S.qts, 1.8 Imp.qts)	
	Transmission case including rear axle gear case			4.8 L(5.1 U.S.qts, 4.2 Imp.qts)*3	
Dimensions	Overall length	mm (in.)		2055 (80.91)	
	Overall width w/o mower deck	mm (in.)		1236 (48.66)	
	Overall height (with ROPS)	mm (in.)		1772 (69.76)	
	Wheelbase	mm (in.)		1255 (49.41)	
	Min. ground clearance	mm (in.)		124 (4.88)	
	Tread	Front	mm (in.)	944 mm (37.2 in.)	
		Rear	mm (in.)	1000 mm (39.4 in.)	
Weight (w/mower deck)		kg (lbs.)		396 (874) with 48"	401 (884) with 54"
Seat				With 1.5 inch stroke suspension	
Traveling system	Tires	Front		13 × 5.0 - 6 (Pneumatic Tire) Smooth	
		Rear		24 × 9.5 - 14 (4PR) Low Profile Turf	
	Traveling speeds	Forward	mph (km/h.)	0 to 10.0 mph (0 to 16.0 km/h)	
		Reverse	mph (km/h.)	0 to 5.0 mph (0 to 8.0 km/h)	
	Steering			2 - Hand levers	
	Transmission			2 - HST w / Gear	
	Parking brake			Foot applied, released	
	Min. turning radius	mm (in.)		0 (0)	
PTO	Drive system			Belt	
	Clutch type			Electric	

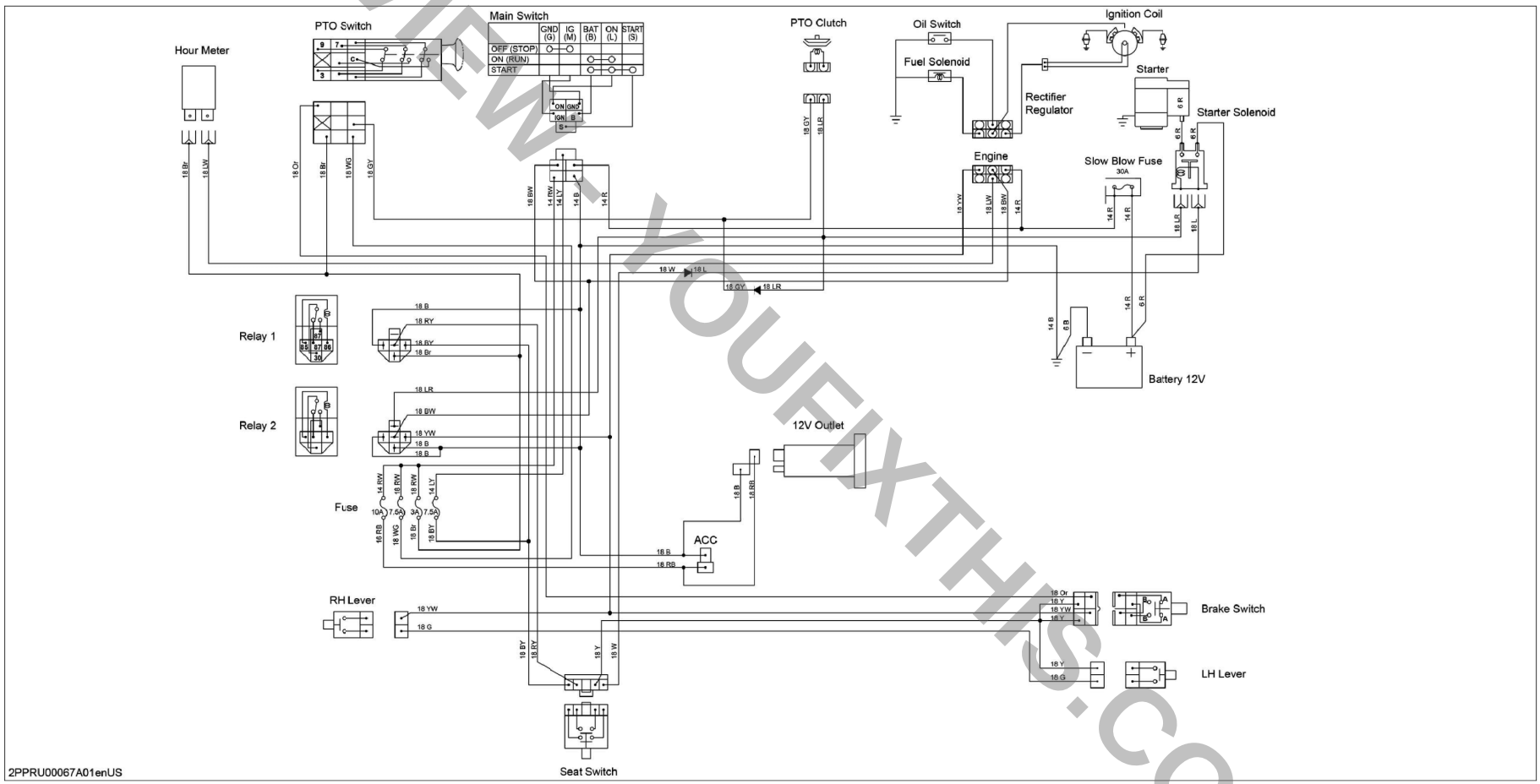
(Specifications and design subject to change without notice)

*1 Manufacturer's estimate

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MECHANISM

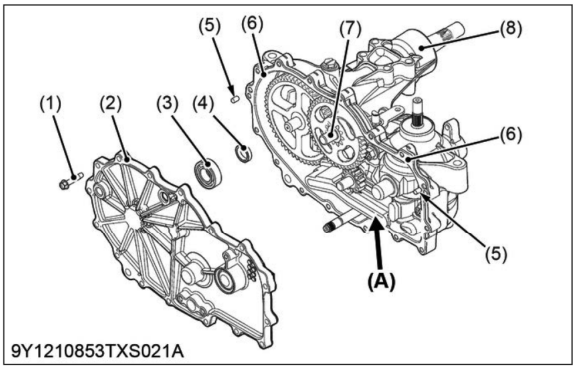
1. Wiring diagram



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5.2.6 Removing side cover

1. Remove the side cover screws (1).



(1) Side cover screw
(2) Side cover
(3) Bearing
(4) Spacer
(5) Locating pin
(6) Pry point
(7) Axle
(8) Main housing
(A) Center section oil filter passage

2. Separate side cover (2) from main housing (8), using the pry points (6) as required.
3. Remove the bearing (3) from side cover (2).
4. Remove the spacer (4) from axle (7).
5. Clean off all the old sealant from the side cover (2) and the main housing (8). Be careful not to damage the sealing surfaces. A wire brush and solvent is effective.

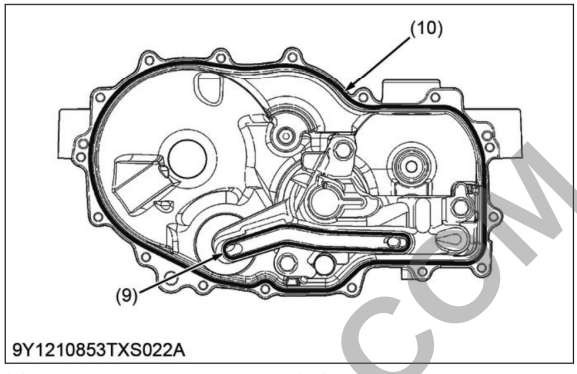
■ IMPORTANT

- **Before scraping the old sealant from the main housing, place a protective cover over the internal parts of the transaxle; avoiding any debris from entering the housing.**
- **Insert a clean rag into the center section oil filter passage (A) before scraping the sealant off the center section.**
  This is to prevent any sealant from getting into the oil passage.

6. Inspect the bearing and bushing areas in the side cover for excessive wear or damage. Replace if necessary.

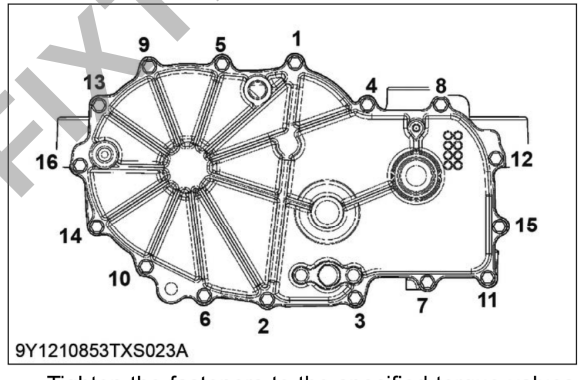
(When reassembling)

1. Reassemble all parts in the reverse order of disassembly.
   - Apply sealant (9), (10) to the main housing and center section prior to installing the side cover (2).



(9) Sealant path for center section
(10) Sealant path for main housing

- Install the locating pins, if not already installed.
- Install the side cover (2). Use care not to smear the sealant bead.
- Install the side cover screws (1). Refer to the screw tightening pattern.



- Tighten the fasteners to the specified torque values in the required order.
- As a general rule, use the low end of the torque spec. on fasteners when reassembling.

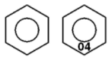
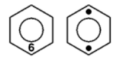
Tightening torque	Screw (Side cover)	12 to 17 N·m 1.2 to 1.8 kgf·m 8.8 to 12 lbf·ft

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TIGHTENING TORQUES

1. General use screws, bolts, and nuts

Tighten screws, bolts, and nuts whose tightening torques are not specified in the Workshop Manual according to the table below.

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

2. Stud bolts

Material of opponent part	Ordinariness			Aluminum		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	12 to 15	1.2 to 1.6	8.7 to 11	8.9 to 11	0.90 to 1.2	6.5 to 8.6
M10	25 to 31	2.5 to 3.2	18 to 23	20 to 25	2.0 to 2.6	15 to 18
M12	30 to 49	3.0 to 5.0	22 to 36	31	3.2	23
M14	62 to 73	6.3 to 7.5	46 to 54	—	—	—
M16	98.1 to 112	10.0 to 11.5	72.4 to 83.1	—	—	—
M18	172 to 201	17.5 to 20.5	127 to 148	—	—	—

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SERVICING

1. Troubleshooting for engine

Refer to the FS651V, FS730V Kawasaki Engine Service Manual.

Symptom	Probable cause	Solution	Reference page
Engine is difficult to start or will not start	1. No operator on seat	Sit on operator's seat	2-24
	2. Parking brake lever not in the proper position	Apply the parking brake	2-24
	3. PTO switch not in the proper position	Make sure PTO switch is in disengaged (OFF) position	2-24
	4. Motion control levers not in the proper position	Make sure motion control levers are in neutral lock position	2-24
	5. Main switch is not in the proper position	Make sure main switch is in ON position	2-24
	6. No fuel	Fill fuel	2-9 2-20
	7. Fuse is blown	Replace fuse	2-38
	8. Air cleaner is clogged	Clean or replace air cleaner	2-27
	9. Over choking or choke is adjusted incorrectly	Check and adjust	2-30
	10. Battery becomes weak	1. Clean battery cables and terminals	2-29
		2. Charge the battery	2-29
		3. In cold weather, always remove the battery from the engine, charge and store it indoors Install it on the machine only when you use the machine	2-29
	11. Spark plug damaged	1. Check the spark plug wire connection	2-27
		2. Adjust the spark plug gap or replace the spark plug	2-27
	12. Fuel hose or fuel filter clogged or damaged	Clean or replace fuel hose	2-28
	13. Engine oil viscosity is wrong	Use oils of different viscosities, depending on ambient temperature	2-9
	14. Improper or stale fuel (fuel quality is poor)	Replace fuel and the fuel filter	2-20 2-28

(Continued)

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SERVICE INTERVALS

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

No.	Items			Indication hour meter (Hr)															Reference page	
				8	25	50	100	150	200	250	300	350	400	450	500	550	600	After since		
1	Engine oil		Change	◎			○		○		○		○		○		○	every 100Hr	2-26	*1
2	Cylinder and cylinder head fins		Clean		○	○	○	○	○	○	○	○	○	○	○	○	○	every 25Hr	2-23	
3	Air cleaner	Foam element	Clean		○	○	○	○	○	○	○	○	○	○	○	○	○	every 25Hr	2-27	*2
		Paper element	Clean				○		○		○		○		○		○	every 100Hr	2-27	*2
			Replace						○				○				○	every 200Hr	2-31	*2
4	Engine start system		Check			○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	2-24	
5	OPC system		Check			○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	2-25	
6	Front wheel, seat adjuster		Greasing			○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	2-25	
7	Muffler and spark arrester (if equipped)		Check			○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr or every 1 year	2-26	
8	Fuel filter		Check				○		○		○		○		○		○	every 100Hr	2-28	
			Replace						○				○				○	every 200Hr	2-31	
9	Battery condition		Check				○		○		○		○		○		○	every 100Hr	2-29	
10	Throttle cable		Adjust				○		○		○		○		○		○	every 100Hr	2-30	
11	Choke cable		Adjust				○		○		○		○		○		○	every 100Hr	2-30	
12	Mower link bushings		Greasing				○		○		○		○		○		○	every 100Hr	2-31	
13	Spark plug		Check				○		○		○		○		○		○	every 100Hr	2-27	
			Replace												○			every 500Hr	2-34	
14	Engine oil filter		Replace						○				○				○	every 200Hr	2-31	
15	Engine valve clearance		Check								○						○	every 300Hr	2-32	
16	Combustion chamber, valve seating surface		Clean Lap								○						○	every 300Hr	2-32 2-32	
17	Transaxle oil filter		Replace				◎						○					every 400Hr	2-32	*3
18	Transaxle fluid		Change				◎						○					every 400Hr	2-34	*3

(Continued)

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CHECK AND MAINTENANCE

⚠ 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 chock the rear wheels.**

1. Daily check

	No.	Check item	Reference page
Walking around the machine	1	Damage of machine body Tightness of all bolts, nuts, pins, etc.	–
	2	Fuel and oil leak	–
	3	Tire pressure, wear, and damage	2-22
	4	Engine oil level	2-19
	5	Fuel level	2-20
	6	Air intake screen	2-21
	7	Transaxle fluid level	2-21
	8	Air cleaner (foam element)	2-23
	9	Machine body cleaning	–
	10	Clean area around muffler and engine controls.	–
Mower	1	Check all hardware.	–
	2	Make sure pins are in place.	–
	3	Mower deck cleaning	–
	4	Make sure blade bolts are tight.	2-38
	5	Blades and belt wear or damage	2-39
While sitting in the operator's seat	1	Motion control lever	–
	2	Parking brake	–
	3	Other movable parts	2-23
Starting the engine	1	Color of exhaust fumes	–
	2	Check for abnormal noise and vibration.	–
	3	Engine start system / OPC system. If either do not operate properly, contact your local Kubota dealer immediately.	2-24
Others	1	Check the areas where previous trouble occurred.	–

1.1 Checking engine oil level

⚠ WARNING
To avoid serious injury or death:
- **Always stop the engine and remove the key before checking the oil.**

1. Check engine oil before starting and 5 minutes or more after the engine has stopped.
2. Wipe dipstick area clean.

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Reduction gears function
The function of the reduction gears (1), (2) is to lower the input speed for a required lower output speed.

Motor function
The function of the hydraulic motor (6) is to convert hydraulic fluid power into mechanical force and motion by transfer of flow under pressure.

Pump function
The function of the hydraulic pump (7) is to convert mechanical force and motion into hydraulic fluid power by producing flow.

Swashplate function
The function of the swashplate (9) is to control the displacement of the pump pistons in the fluid power system.

Charge pump function
The function of the charge pump (10) is to supply filling fluid to the fluid power system.

Center section function
The function of the center section (11) is to act as the valve body and manifold of the hydrostatic transaxle.

4. Transaxle specification

Specifications	ZT-3600
Overall transaxle reduction	23.16:1
Input speed	Maximum hi-idle (no load): 3600 rpm Minimum: 1800 rpm
Output torque	Up to 677 N·m (69.0 kgf·m, 499 lbf·ft)
Axle shaft diameter	28.575 mm (1.125 in.)
Axle shaft end options	Tapered 4-bolt flange T5-bolt flange
Parking brake type	Internal
Weight of unit	15.6 kg (35.5 lbs)

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