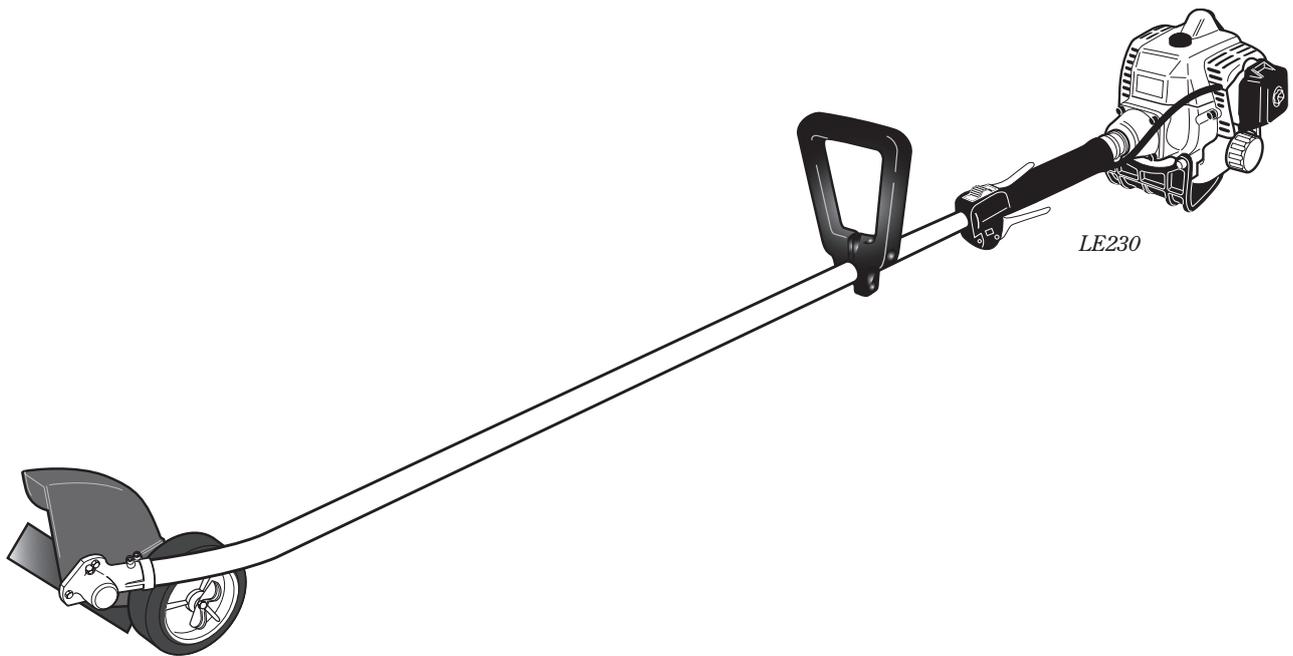


SHINDAIWA OWNER'S/OPERATOR'S MANUAL

LE230 EDGER



WARNING!

Minimize the risk of injury to yourself and others!
Read this manual and familiarize yourself with the
contents. Always wear eye and hearing protection
when operating this unit.

shindaiwa®

Part Number 62714-94311 Rev. 1/06

Introduction

Shindaiwa 230-series hand held power equipment has been designed and built to deliver superior performance and reliability without compromise to quality, comfort, safety or durability.

Shindaiwa's high-performance engines represent the leading edge of 2-cycle engine technology, delivering exceptionally high power with remarkably low displacement and weight. As an owner/operator, you'll soon discover for yourself why Shindaiwa is simply in a class by itself!

IMPORTANT!

The information contained in this owner's/operator's manual describes units available at the time of publication.

Shindaiwa Inc. reserves the right to make changes to products without prior notice, and without obligation to make alterations to units previously manufactured.



WARNING!

The engine exhaust from this unit contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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Attention Statements

Throughout this manual are special "Attention Statements."



WARNING!

A statement preceded by the triangular attention symbol and the word "WARNING" contains information that should be acted upon to prevent serious bodily injury.

CAUTION!

A statement preceded by the word "CAUTION" contains information that should be acted upon to prevent mechanical damage.

IMPORTANT!

A statement preceded by the word "IMPORTANT" is one that possesses special significance.

NOTE:

A statement preceded by the word "NOTE" contains information that is handy to know and may make your job easier.



Read and follow this operators manual. Failure to do so could result in serious injury.



Wear eye and hearing protection at all times during the operation of this unit.



Keep bystanders at least 50 feet (15m) away during operation.



Beware of thrown or ricocheted objects.



Keep feet away from blade. Rotating blade may cause injury.

IMPORTANT!

The operational procedures described in this manual are intended to help you get the most from unit as well as to protect you and others from harm. These procedures are guidelines for safe operation under most conditions, and are not intended to replace any safety rules and/or laws that may be in force in your area. If you have questions regarding your Shindaiwa power tool, or if you do not understand something in this manual, your Shindaiwa dealer will be glad to assist you. You may also contact Shindaiwa, Inc. at the address printed on the back of this manual.

General Safety Instructions

Work Safely

Lawn Edgers operate at very high speeds and can do serious damage or injury if they are misused or abused. *Never allow a person without training or instruction to operate this unit!*



WARNING!

Never make unauthorized attachment installations.



WARNING!

Use Good Judgment

NEVER run the engine when transporting the unit.

NEVER run the engine indoors! Make sure there is always good ventilation. Fumes from engine exhaust can cause serious injury or death.

ALWAYS stop the unit immediately if it suddenly begins to vibrate or shake. Inspect for broken, missing or improperly installed parts or attachments.

ALWAYS keep the unit as clean as practical. Keep it free of loose vegetation, mud, etc.

ALWAYS hold the unit firmly with both hands when cutting or trimming, and maintain control at all times.

ALWAYS keep the handles clean.

ALWAYS disconnect the spark plug wire before performing any maintenance work.



WARNING!

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

General Safety Instructions The Properly Equipped Operator

Stay Alert

You must be physically and mentally fit to operate this unit safely.



WARNING!



Never operate power equipment of any kind if you are tired or if you are under the influence of alcohol, drugs, medication or any other substance that could affect your ability or judgement.



WARNING!

Minimize the Risk of Fire!

NEVER smoke or light fires near the unit.

ALWAYS stop the engine and allow it to cool before refueling. Avoid overfilling and wipe off any fuel that may have spilled.

ALWAYS inspect the unit for fuel leaks before each use. During each refill, check that no fuel leaks from around the fuel cap and/or fuel tank. If fuel leaks are evident, stop using the unit immediately. Fuel leaks must be repaired before using the unit.

ALWAYS move the unit to a place well away from a fuel storage area or other readily flammable materials before starting the engine.

NEVER place flammable material close to the engine muffler.

NEVER run the engine without the spark arrester screen in place.



Figure 1

Be Aware of the Working Environment

Avoid long-term operation in very hot or very cold weather.

Be extremely careful of slippery terrain, especially during rainy weather.

If contact is made with a hard object, stop the engine and inspect the cutting attachment for damage.

Be constantly alert for objects and debris that could be thrown either from the rotating cutting attachment or bounced from a hard surface.



Make sure bystanders or observers outside the 50-foot "danger zone" wear eye protection.

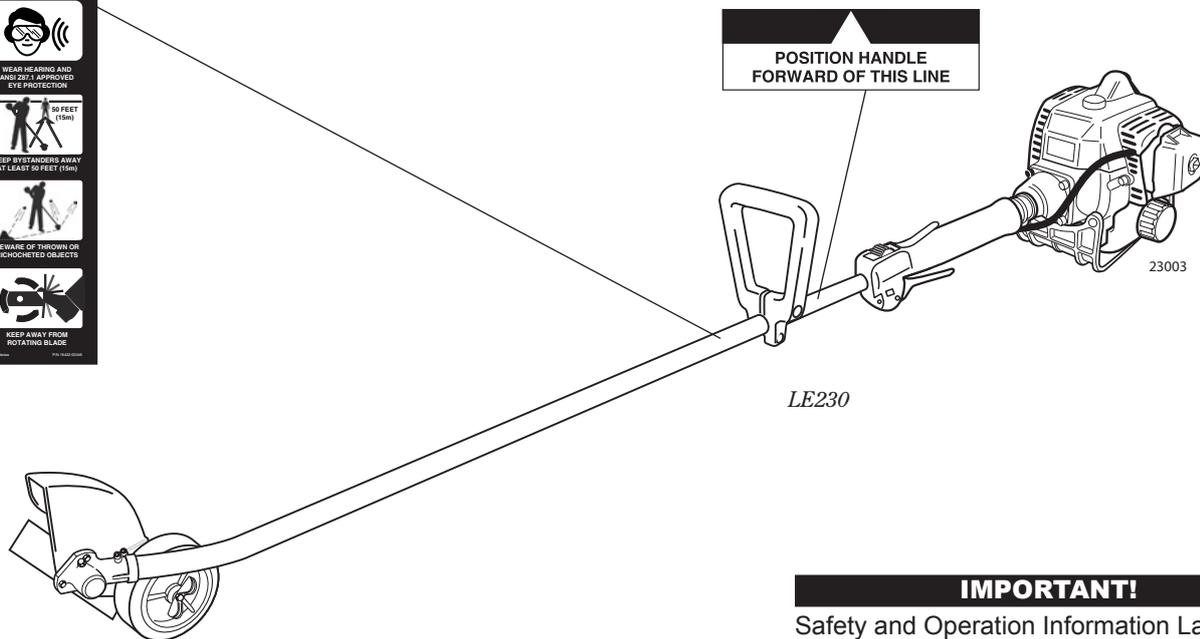
Reduce the risk of bystanders being struck by flying debris. Make sure no one is within 50 feet (15 meters)—that's about 16 paces—of an operating attachment.

Beware of a coasting blade when edging. A coasting blade can injure while it continues to spin after the throttle trigger is released or after the engine is stopped.

ALWAYS clear your work area of trash or hidden debris that could be thrown back at you or toward a bystander. When operating in rocky terrain or near electric wires or fences, use extreme caution to avoid contacting such items with the cutting attachment.

Figure 2

Safety Labels



LE230

IMPORTANT!

Safety and Operation Information Labels: Make sure all information labels are undamaged and readable. Immediately replace damaged or missing information labels. New labels are available from your local authorized Shindaiwa dealer.

Figure 3

Unit Description

Using the accompanying illustrations as a guide, familiarize yourself with this unit and its various components. Understanding the product helps ensure top performance, long service life, and safer operation. See Figure 4.

 **WARNING!**

Do not make unauthorized modifications or alterations to any of these units or their components.

Prior to Assembly

Before assembling, make sure you have all the components required for a complete unit:

- Engine assembly.
- Outer tube assembly.
- Cutting attachment shield.
- Operators handle.
- Kit containing cutting attachment shield mounting bracket and hardware,

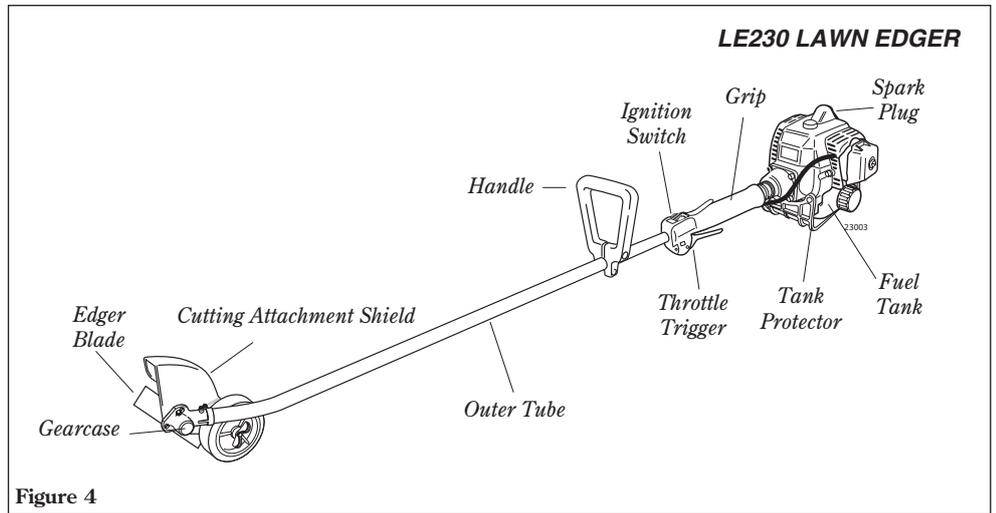


Figure 4

operator's handle mounting bracket and hardware, gearcase tool holder, this manual and tool kit for routine maintenance. Tool kits vary by model and may include a hex wrench, spanner and a combination spark plug wrench/screwdriver.

Carefully inspect all components for damage.

IMPORTANT!

The terms "left", "left-hand", and "LH"; "right", "right-hand", and "RH"; "front" and "rear" refer to directions as viewed by the operator during normal operation.

Specifications

LE230 Dry Weight (less attachments)	5.7 kg/12.5 lb.
Engine Model	Shindaiwa S230
Engine Type	2-cycle, vertical-cylinder, air-cooled
Bore x Stroke	32 x 28 mm/1.26 x 1.10 in.
Displacement	22.5 cc/1.4 cu. in.
Maximum Power Output.....	1.1 HP (0.8 kW) @ 7,500 RPM (min ⁻¹)
Fuel/Oil Ratio	50:1 with Shindaiwa Premium 2-cycle mixing oil
Fuel Tank Capacity	554 ml/18.7 oz.
Carburetor Type	Walbro WYL, diaphragm-type
Ignition	One-piece electronic, transistor-controlled
Spark Plug	Champion CJ8 (for EMC compliance use NGK BMR6A)

Air Cleaner Type	Non-reversible flocked filter element
Starting Method	Recoil
Stopping Method	Slide switch
Transmission Type	Automatic, centrifugal clutch w/bevel gear
EPA Emission Compliance Period*	Category A

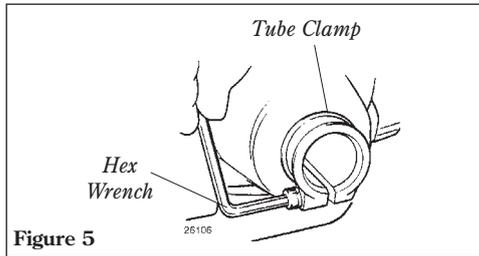
*The EPA emission compliance period referred to on the emission compliance label located on the engine, indicates the number of operating hours for which the engine has been shown to meet Federal emission requirements. Category C = 50 hours (Moderate), B = 125 hours (Intermediate) and A = 300 hours (Extended).

*Specifications are subject to change without notice.

Assembly Driveshaft/Powerhead

Connect the Outer Tube to the Powerhead.

1. Place the powerhead on a clean, flat surface, spark plug facing up. See Figure 6.
2. Use the 4 mm hex wrench to loosen the tube clamp screw.



3. Add some moly-type EP grease to the splines on the end of the mainshaft.
4. Slide the outer tube into the tube clamp until the tube bottoms. If installation is difficult, rotate the outer tube or mainshaft slightly until you feel the mainshaft engage with the powerhead.
5. Position the outer tube so that the ignition switch is facing up and the throttle trigger is down.

LE230

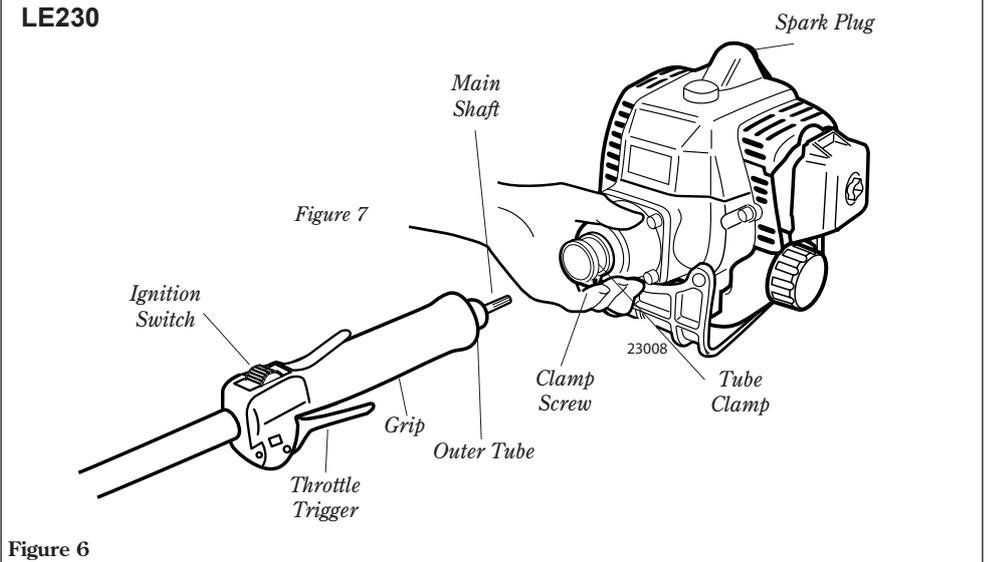


Figure 6

Slide the outer tube into the powerhead until the throttle grip just contacts the tube clamp.

6. Tighten the clamp screw firmly.

CAUTION!

Do not force the shaft tube into the powerhead! Excessive force can damage the shaft tube and mainshaft.

Assembly Throttle Linkage and Ignition Leads

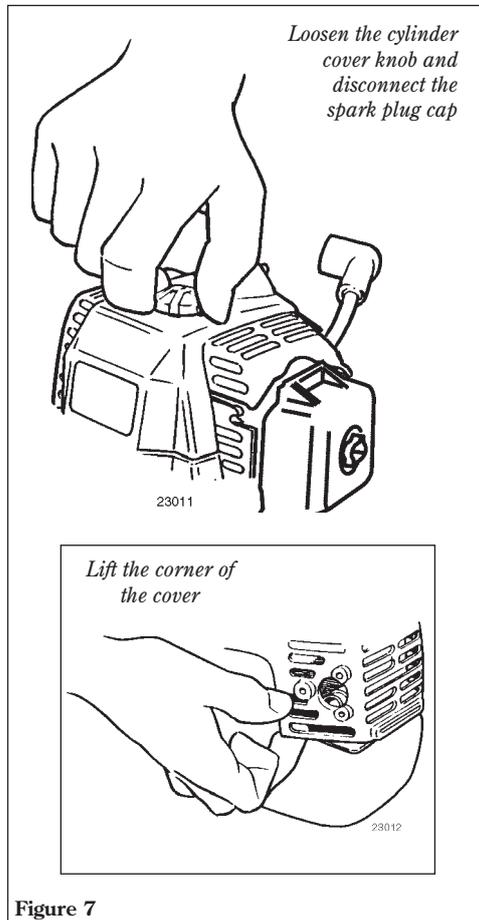


Figure 7

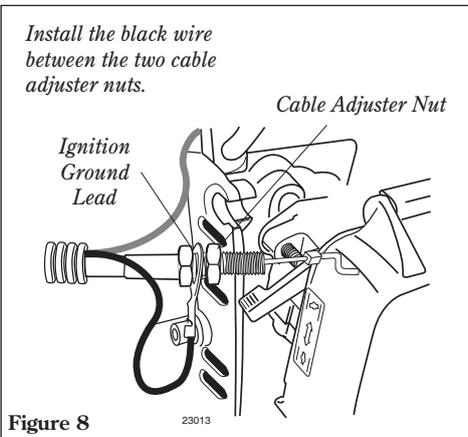


Figure 8

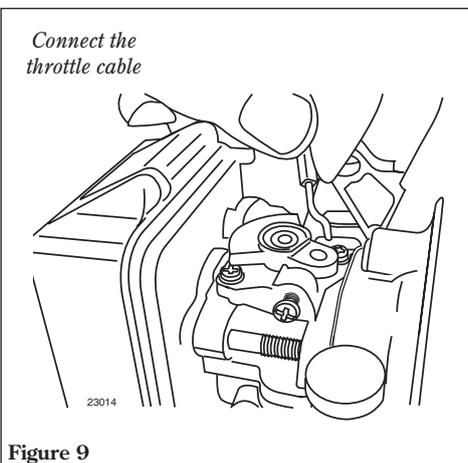


Figure 9

Remove the Cylinder Cover.

1. Remove the cap from the spark plug.
2. Loosen the black cylinder cover knob (about a dozen full turns are required), and then lift off the cylinder cover.

NOTE:

If the cover binds on the muffler outlet tube, pull gently on the corner of the cover as shown (see inset).

Connect the Throttle Cable.

1. Route the ribbed cable over the tube clamp to the top left side of the engine.
2. Install the black wire between the two cable adjuster nuts as shown. See Figure 8.
3. Connect the S-shaped end of the throttle cable to the throttle lever on top of the carburetor. See Figure 8.

Assembly Throttle Linkage and Ignition Leads (continued)

Assemble and Adjust the Throttle Cable.

1. Insert the throttle-cable housing into the notch on the fan cover, and clamp the ground wire terminal between the fan cover and the outer cable adjuster nut. See Figure 10.
2. Tighten the two throttle cable adjuster nuts.

IMPORTANT!

Adjust and tighten the cable nuts to allow approximately 1/4-inch free play at the throttle trigger.

3. Using finger pressure only, connect the black ignition wire from the cable tube to the red ignition wire on the powerhead. Wire routing must be as shown in the illustration with the black wire located away from the throttle cable and carburetor linkage.
4. Reinstall the engine cover and tighten the captive engine cover screw.
5. Reinstall the spark plug boot.

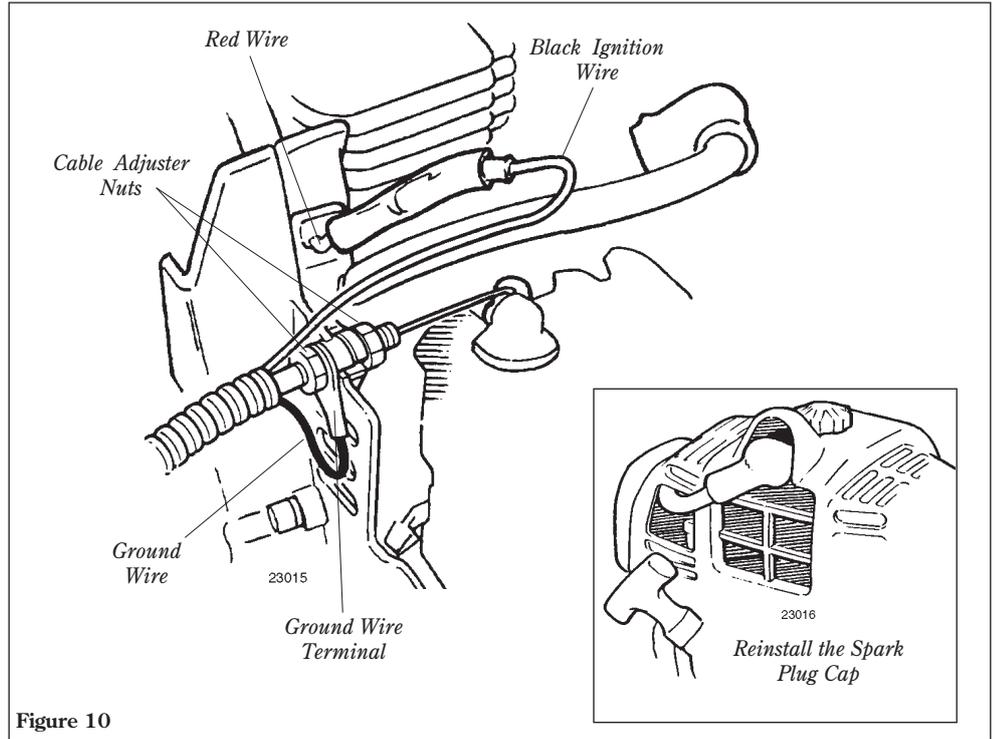


Figure 10

CAUTION!

Routing of wiring must not interfere with throttle operation.

Assembly Handle

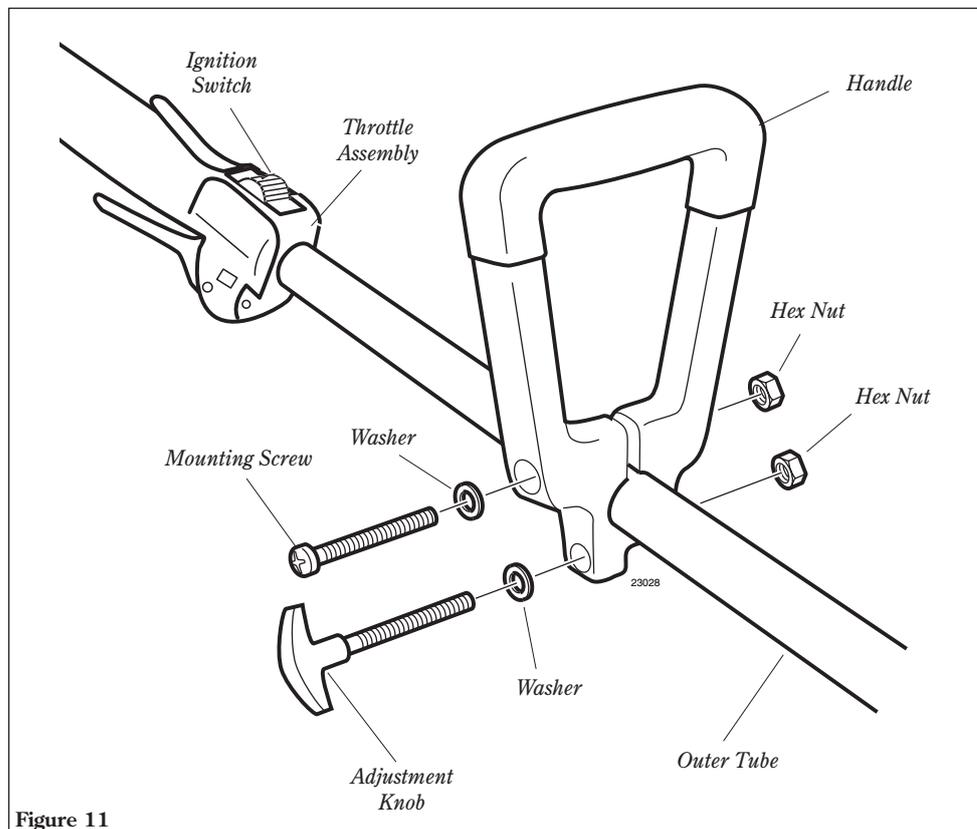


Figure 11

Connect the Handle to the Outer Tube.

1. Remove both screws from the handle.
2. While spreading the handle at the mounting hole, position the handle on the outer tube as shown.
3. Reinstall the two mounting screws in the handle, but do not tighten them at this time.

NOTE:

The handle is recessed to receive the hex nuts.

4. Locate the handle at the best position for operator comfort (usually about 10 inches ahead of the throttle assembly).
5. Secure the handle by tightening the mounting screw and the adjustment knob screw.

Assembly Attachment Shield and Edger Blade

Mount the Cutting Attachment Shield on the Gearcase

1. Remove the output shaft bolt, bolt guard, holder A and holder B from the gearcase.
2. Align the cutting attachment shield assembly with the gearcase, and then fit the shield onto the matching flange on the gearcase. See figure 12.

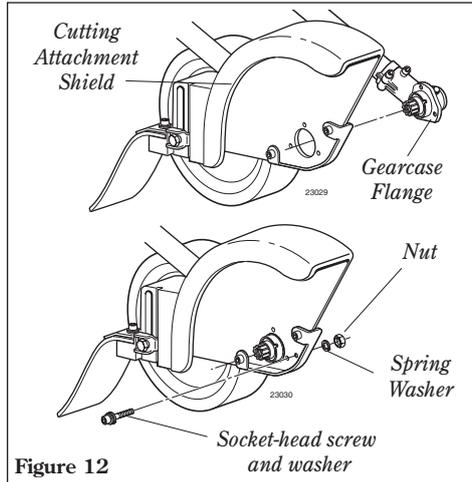


Figure 12

Mount the Edger Blade

3. Install the socket-head screws with washers, then use the hex wrench to firmly tighten all three screws.
 4. Install a washer and nut on each of the three screws assembled in Step 3, then firmly tighten each nut.
1. Install holder A onto the output shaft. See Figure 13.
 2. Mount the edger blade and holder B onto the output shaft, and then install the bolt guard and shaft bolt (turn bolt counterclockwise to install).
 3. Align the hole in holder A with the matching hole in the gearcase, and then use the hex wrench to temporarily lock the output shaft as shown. See Figure 13.
 4. Use the combination spark plug wrench/screwdriver to firmly tighten the shaft bolt. Remove the hex wrench.

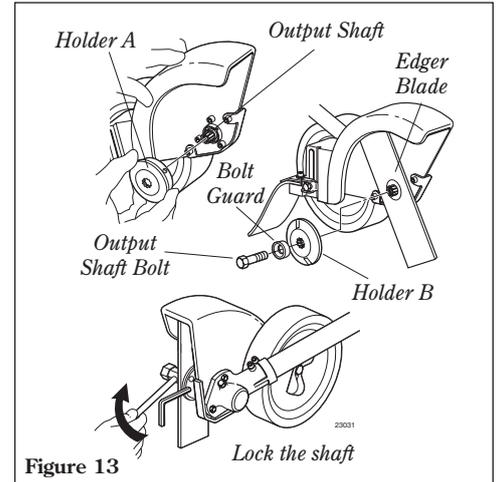


Figure 13



WARNING!

The LE230 is intended for right-handed operation only! When correctly assembled, the cutting attachment shield and shaft **must** be oriented as shown.



WARNING!

- The LE230 is designed for use with a edger blade only!
- Never operate the LE230 without the cutting attachment shield installed and tightly secured!

IMPORTANT!

The three hex-head screws must be firmly tightened before installing and tightening the nuts.

The LE230 Edger should now be completely assembled.

Mixing Fuel

CAUTION!

- Some types of gasoline contain alcohol as an oxygenate. Oxygenated gasoline may cause increased operating temperatures. Under certain conditions, alcohol-based gasoline may also reduce the lubricating qualities of some 2-cycle mixing oils.

- Never use any type of gasoline containing more than 10% alcohol by volume! Generic oils and some outboard oils may not be intended for use in high-performance 2-cycle type engines, and should never be used in your Shindaiwa engine.

- Use only fresh, clean unleaded gasoline with a pump octane of 87 or higher.
- Mix with 50:1 Shindaiwa Premium 2-cycle mixing oil or with an equivalent high quality 2-cycle mixing oil.

Examples of 50:1 mixing quantities

- 1 gallon of gasoline to 2.6 oz. mixing oil.
- 5 liters of gasoline to 100 ml. mixing oil.

IMPORTANT!

Mix only enough fuel for your immediate needs! If fuel must be stored longer than 30 days and **Shindaiwa ONE** oil with fuel stabilizer is not used, it should first be treated with a fuel stabilizer such as STA-BIL™.

CAUTION!

This engine is designed to operate on a 50:1 mixture consisting of unleaded gasoline and 2-cycle mixing oil only. Use of non-approved mixing oils can lead to excessive carbon deposits.

Filling the Fuel Tank



WARNING!

Minimize the Risk of Fire!

- **STOP** engine before refueling.
- **ALWAYS** allow the engine to cool before refueling!
- Wipe all spilled fuel and move the engine at least 10 feet (3 meters) from the fueling point and source before restarting!
- **NEVER** start or operate this unit if there is a fuel leak.

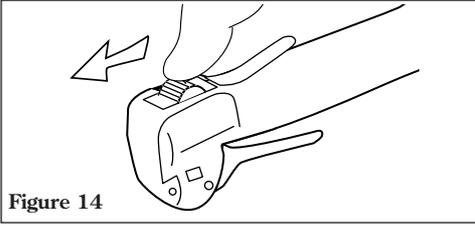
- **NEVER** start or operate this unit if the carburetor, fuel lines, fuel tank and/or fuel tank cap are damaged.
- **NEVER** smoke or light any fires near the engine or fuel source!
- **NEVER** place any flammable material near the engine muffler!
- **NEVER** operate the engine without the muffler and spark arrester in good working condition.

1. Place the unit on a flat, level surface.
2. Clear any dirt or other debris from around the fuel filler cap.
3. Remove the fuel cap, and fill the tank with clean, fresh fuel.
4. Reinstall the fuel filler cap and tighten firmly.

Starting the Engine

IMPORTANT!

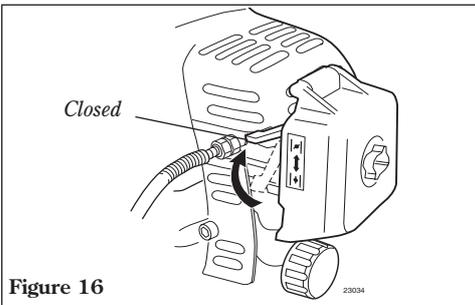
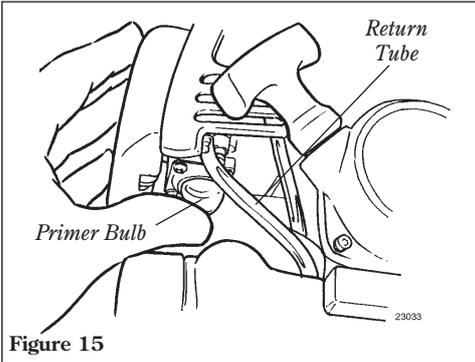
Engine ignition is controlled by a two position switch mounted on the throttle housing labeled, "I" for ON or START and "O" for OFF or STOP.



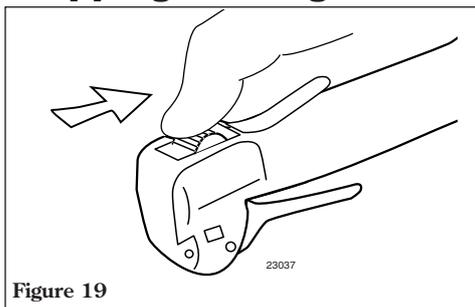
1. Slide the ignition switch to the "I" position (engine ON).
2. Press the primer bulb until fuel can be seen flowing in the transparent return tube.

IMPORTANT!

The primer system only pushes fuel through the carburetor. Repeatedly pressing the primer bulb will not flood the engine with fuel.



Stopping the Engine



3. (Cold Engine Only) Set the choke lever to the CLOSED position.



4. While holding the outer tube firmly with one hand, slowly pull the recoil starter handle until resistance is felt, then pull quickly to start the engine.

CAUTION!

Do not pull the recoil starter to the end of the rope travel. Pulling the recoil starter to the end of the rope travel can damage the starter.



WARNING!

The cutting attachment may rotate when the engine is started!

5. When the engine starts, slowly move the choke lever to the "OPEN" position. See Figure 18. (If the engine stops after the initial start, close the choke and restart.)



WARNING!

Never start the engine from the operating position.

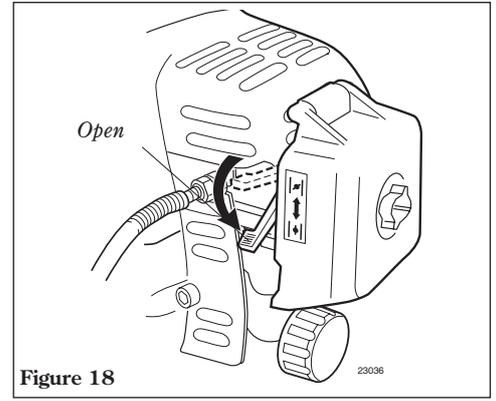


Figure 18

IMPORTANT!

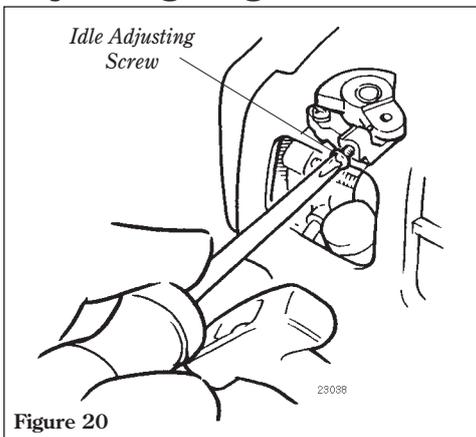
If the engine fails to start after several attempts with the choke in the closed position, the engine may be flooded with fuel. If flooding is suspected, move the choke lever to the open position and repeatedly pull the recoil starter to remove excess fuel and start the engine. If the engine still fails to start, refer to the troubleshooting section of this manual.

When the Engine Starts...

- After the engine starts, allow the engine to warm up at idle 2 or 3 minutes before operating the unit.
- Advancing the throttle makes the cutting attachment turn faster; releasing the throttle permits the attachment to stop turning. If the cutting attachment continues to rotate when the engine returns to idle, carburetor idle speed should be adjusted (see page 10).

Idle the engine briefly before stopping (about 2 minutes), then slide the ignition switch to the "O" (Engine OFF) position.

Adjusting Engine Idle



The engine must return to idle speed whenever the throttle lever is released. Idle speed is adjustable, and must be set low enough to permit the engine clutch to disengage the cutting attachment.

Idle Speed Adjustment



The cutting attachment must NEVER rotate at engine idle! If the idle speed cannot be adjusted by the procedure described here, return the unit to your Shindaiwa dealer for inspection.

1. Place the unit on the ground, then start the engine, and then allow it to idle 2-3 minutes until warm.
2. If the attachment rotates when the engine is at idle, reduce the idle speed by turning the idle adjustment screw counter-clockwise. See Figure 20.
3. If a tachometer is available, the engine idle speed should be final adjusted to 2,750 (± 250) rpm (min^{-1}).
4. Carburetor fuel mixture adjustments are preset at factory on units with emission control systems and cannot be serviced in the field.

Checking Unit Condition

NEVER operate the unit with the cutting attachment shield or other protective devices (ignition switch, etc.) removed!



A cutting attachment shield or other protective device is no guarantee of protection against ricochet. **YOU MUST ALWAYS GUARD AGAINST FLYING DEBRIS!**

Use only authorized Shindaiwa parts and accessories with your Shindaiwa trimmer, edger or brushcutter. Do not make modifications to this unit without the written approval of Shindaiwa Inc.

ALWAYS make sure the cutting attachment is properly installed and firmly tightened before operation.

NEVER use a cracked or warped cutting attachment: replace it with a serviceable one.

ALWAYS make sure the cutting attachment fits properly into the appropriate

cutter holder. If a properly installed attachment vibrates, replace the attachment with a new one and re-check.

ALWAYS stop the engine immediately and check for damage if you strike a foreign object or if the unit becomes tangled. Do not operate with broken or damaged equipment, or attachments.

NEVER allow the engine to run at high rpm without a load. Doing so could damage the engine.

NEVER operate the unit with worn or damaged fasteners or attachment holders.

Using a Hand-Held Edger

Guidelines for Operating the Edger.

- Before edging, make sure the area is soft enough so the blade does not bog down. If necessary, water the area before edging.
- Remove debris and other obstacles that could be thrown by the rotating blade.
- Plan your work so the edger blade is always on your right-hand side.

Begin each pass by positioning the unit over the work, and with the engine running at about half-throttle. Slowly lower the blade to the ground while applying full throttle.

CAUTION!

Low-speed edging can lead to premature clutch failure.

- Do not move the edger into the work so fast that the engine or blade bogs down.

NOTE:

Regular and frequent use of the edger will make a neater lawn, and a frequently trimmed edge will be easier to maintain.



- Wear eye protection, long pants, and boots when operating this unit!
- Whenever you strike a hard object with the blade, always stop the edger and carefully inspect the blade for damage. **NEVER OPERATE THE EDGER WITH A DAMAGED BLADE!**

Figure 21

Using a Hand-Held Edger (Continued)

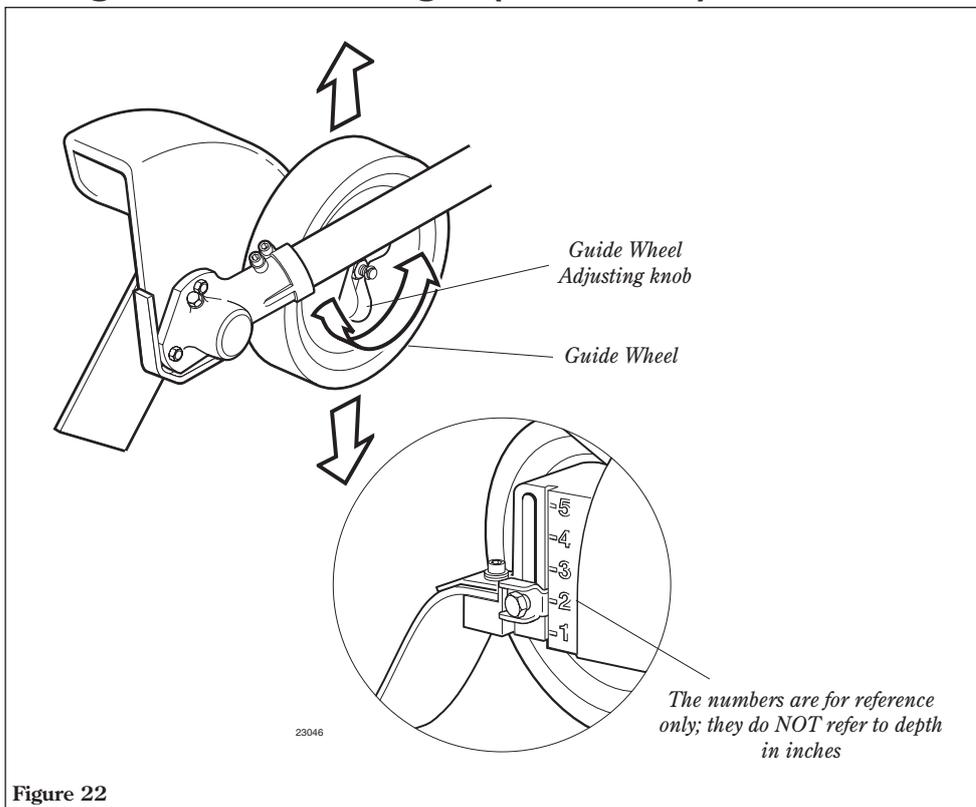


Figure 22

Adjusting the Blade Cutting Depth.

The edger's depth of cut is controlled by a combination of operator height, blade wear, and the positioning of the edger's guide wheel.

To Adjust Blade Height:

1. Loosen the guide wheel adjusting knob.
2. Raise or lower the guide wheel to the desired setting (see the inset).
3. Tighten the guide wheel adjusting knob firmly.



WARNING!

Never adjust the guide wheel while the engine is running.

NOTE:

Guide wheel adjustment is also required to compensate for blade wear.



WARNING!

Use only Shindaiwa replacement blades.

General Maintenance

IMPORTANT!

MAINTENANCE, REPLACEMENT OR REPAIR OF EMISSION CONTROL DEVICES AND SYSTEMS MAY BE PERFORMED BY ANY REPAIR ESTABLISHMENT OR INDIVIDUAL; HOWEVER, WARRANTY REPAIRS MUST BE PERFORMED BY A DEALER OR SERVICE CENTER AUTHORIZED BY SHINDAIWA KOGYO CO., LTD. THE USE OF PARTS THAT ARE NOT EQUIVALENT IN PERFORMANCE AND DURABILITY TO AUTHORIZED PARTS MAY IMPAIR THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM AND MAY HAVE A BEARING ON THE OUTCOME OF A WARRANTY CLAIM.



WARNING!

Before performing any maintenance, repair or cleaning work on the unit, make sure the engine and cutting attachment are completely stopped. Disconnect the spark plug wire before performing service or maintenance work.



WARNING!

Non-standard parts may not operate properly with your unit and may cause damage and lead to personal injury.

NOTE:

Using non-standard replacement parts could invalidate your Shindaiwa warranty.

Muffler

This unit must never be operated with a faulty or missing spark arrester or muffler. Make sure the muffler is well secured and in good condition. A worn or damaged muffler is a fire hazard and may also cause hearing loss.

Spark Plug

Keep the spark plug and wire connections tight and clean.

Fasteners

Make sure nuts, bolts, and screws (except carburetor adjusting screws) are tight.

Blades

Check blade condition frequently. If a blade's performance changes suddenly, stop the engine and check the blade for cracks or other damage. Replace a damaged blade IMMEDIATELY!



WARNING!

- Never repair a damaged blade by welding, straightening, or by modifying its shape. An altered blade may break during operation, resulting in serious personal injury.
- The LE230 Edger is designed for use with a single, bar-type blade only.
- Blades are **not** interchangeable between Shindaiwa edgers and trimmer/brushcutter models. Operating any unit with a blade or attachment not approved for that unit can be hazardous and may cause serious injury.

Daily Maintenance

Prior to each work day, perform the following:

- Remove all dirt and debris from the engine, check the cooling fins and air cleaner for clogging, and clean as necessary.
- Carefully remove any accumulations of dirt or debris from the muffler and fuel tank. Dirt build-up in these areas can lead to engine overheating, fire, or premature wear.

- Check for loose or missing screws or components. Make sure the cutting attachment is securely fastened.
- Check the entire unit for leaking fuel or grease.

10-Hour Maintenance

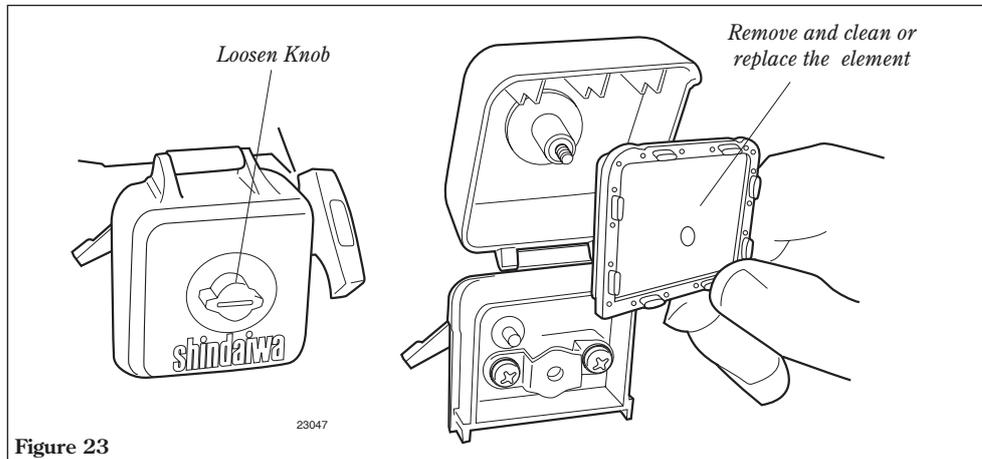


Figure 23

Every 10 hours of operation (more frequently in dusty or dirty conditions):

- Remove the air cleaner element from the carburetor and clean it thoroughly with soap and water or compressed air, let dry before reinstalling the element.

CAUTION!

Do not operate the machine if the air cleaner or element is damaged, or if the element is wet.

10/15-Hour Maintenance

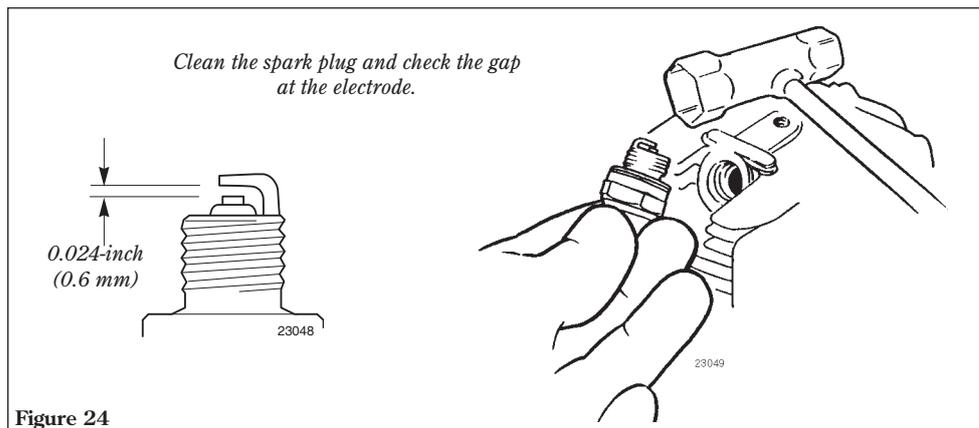


Figure 24

Every 10 to 15 hours of operation: Remove and clean the spark plug.

- Adjust the spark plug electrode gap to 0.024-inch (0.6 mm). If the plug must be replaced, use only a Champion CJ8 or equivalent spark plug of the correct heat range. For electromagnetic compliance (EMC), use NGK BMR6A.

CAUTION!

Before removing the spark plug, clean the area around the plug to prevent dirt and debris from getting into the engine's internal parts.

50-Hour Maintenance

Every 50 hours of operation

(more frequently in dusty or dirty conditions):

- Remove and clean the cylinder cover and clean grass and dirt from the cylinder fins.
- Remove the cutting attachment, holder and the gear shaft collar. Remove the filler plug from the side of the gearcase and press new grease into the gearcase until the old grease has been pushed out. Use only lithium-base grease such as Shindaiwa Gearcase Lubricant or equivalent. See Figure 25.
- Use a hooked wire to extract the fuel filter from inside the fuel tank. Remove and replace the filter element. Before reinstalling the filter, inspect the condition of the fuel line. If damage or deterioration are noted, the unit should be removed from service until it can be inspected by a Shindaiwa-trained service technician. See Figure 26.

CAUTION!

Make sure you do not pierce the fuel line with the end of the hooked wire, the line is delicate and can be damaged easily.

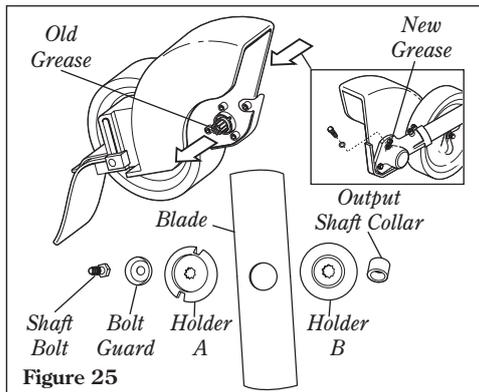


Figure 25

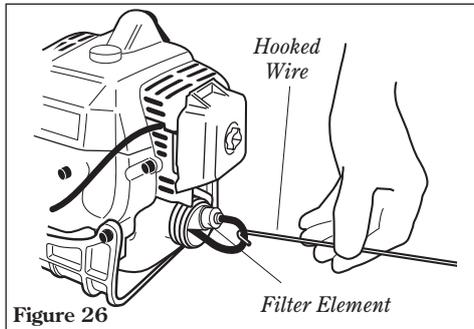


Figure 26

Lubricate the Flexible Shaft.

Lack of lubrication will cause rapid wear to the flexible shaft and also to the shaft tube liner, resulting in increased vibration and greatly decreased service life. Remove and lubricate the flexible shaft as follows: See Figure 27.

1. Loosen the gearcase clamp screw.

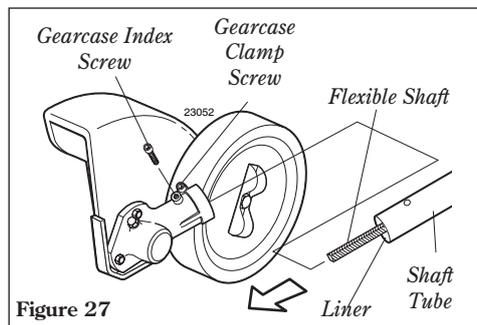


Figure 27

2. Remove the gearcase index screw.
3. Slide the gearcase and shield assembly from the shaft tube.
4. Pull the flexible shaft from the shaft tube assembly and clean the shaft thoroughly in solvent and dry with a clean shop towel.
5. Inspect the flexible shaft carefully and replace if worn or damaged.

NOTE:

Always replace the liner if the flexible shaft is being replaced.

6. Coat the entire length of the shaft with Shindaiwa Premium Gearcase Lube (or equivalent), and reinstall the shaft in the shaft tube assembly.

NOTE:

For extended shaft life, the flexible cable should be reversed end-for-end during the reinstallation process.

7. Insert the flexible shaft into the female end of the gearcase pinion.
8. Install the gearcase on the shaft tube in the reverse order of removal.

CAUTION!

The D-shaped shim washer must be positioned with its flat edge toward the shaft tube.

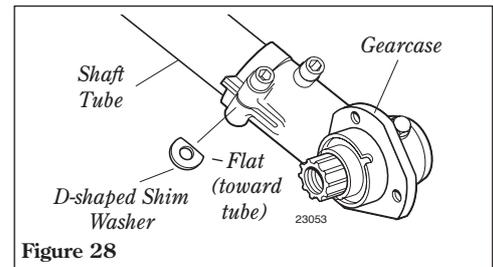


Figure 28

Inspect the Gearcase Protector.

The metal gearcase protector (P/N 72958-16210) is installed to protect the gearcase flange from damage when working close to sidewalks or other abrasive surfaces, and should be routinely inspected for damage or excessive wear. See Figure 29.

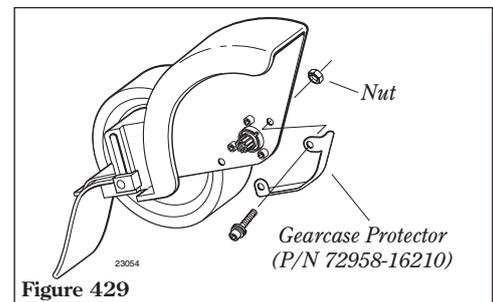


Figure 429

When replacing the protector, inspect to be sure that both of the protector mounting screws are firmly tightened and each screw is locked in place with a nut as shown in Figure 29.

135-Hour Maintenance

After every 135 hours of operation or if engine becomes hard to start and has low power. The spark arrester screen should be inspected and cleaned.



WARNING!

Never operate the unit with a damaged or missing muffler or spark arrester! Operating with missing or damaged exhaust components is a fire hazard and could also damage your hearing.

1. Remove the spark plug boot.
2. Remove the engine cover by loosening the engine cover knob (the knob is captive) and lifting the cover from the engine.
3. Remove the spark arrester screen screw.
4. Remove the spark arrester screen and clean with a stiff bristle brush.

IMPORTANT!

If carbon deposits are severe or if no performance improvement is noted, this unit should be inspected by an authorized Shindaiwa servicing dealer.

5. Reassemble the spark arrester screen and engine cover in reverse order.

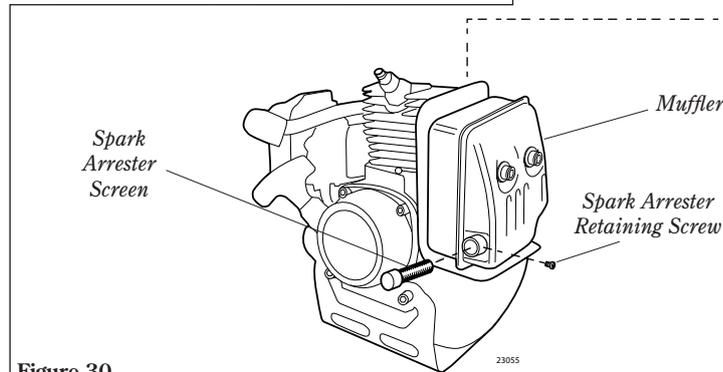
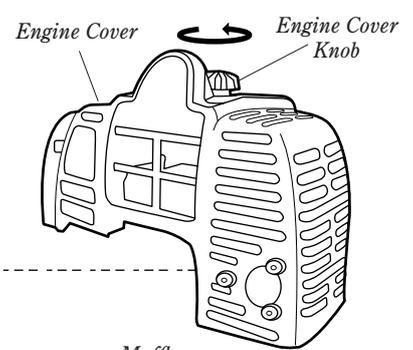


Figure 30

Long Term Storage

Whenever the unit will not be used for 30 days or longer, use the following procedures to prepare it for storage:

- Clean external parts thoroughly.
- Drain all the fuel from the carburetor and the fuel tank.

IMPORTANT!

All stored fuels should be stabilized with a fuel stabilizer such as STA-BIL™.

To remove the remaining fuel from the fuel lines and carburetor and with the fuel drained from the fuel tank.

1. Prime the primer bulb until no more fuel is passing through.
2. Start and run the engine until it stops running.
3. Repeat steps 1 and 2 until the engine will no longer start.

CAUTION!

Gasoline stored in the carburetor for extended periods can cause hard starting, and could also lead to increased service and maintenance costs.

- Remove the spark plug and pour about 1/4 ounce of 2-cycle mixing oil into the cylinder through the spark plug hole. Slowly pull the recoil starter 2 or 3 times so oil will evenly coat the interior of the engine. Reinstall the spark plug.
- Before storing the unit, repair or replace any worn or damaged parts.
- Remove the air cleaner element from the carburetor and clean it thoroughly with soap and water, let dry and reassemble the element.
- Store the machine in a clean, dust-free area.

Troubleshooting Guide

ENGINE DOES NOT START

What To Check	Possible Cause	Remedy
Does the engine crank? ↓ YES	NO Faulty recoil starter. Fluid in the crankcase. Internal damage.	Consult with an authorized servicing dealer.
Good compression? ↓ YES	NO Loose spark plug. Excess wear on cylinder, piston, rings.	Tighten and re-test. Consult with an authorized servicing dealer.
Does the tank contain fresh fuel of the proper grade? ↓ YES	NO Fuel incorrect, stale, or contaminated; mixture incorrect.	Refill with fresh, clean unleaded gasoline with a pump octane of 87 or higher, mixed with Shindaiwa Premium 2-cycle mixing oil at a 50:1 gasoline/oil ratio.
Is fuel visible and moving in the return line when priming? ↓ YES	NO Check for clogged fuel filter and/or vent.	Replace fuel filter or vent as required. Restart.
Is there spark at the spark plug wire terminal? ↓ YES	NO The ignition switch is in "O" (OFF) position. Shorted ignition ground. Faulty ignition unit.	Move switch to "I" (ON) position and re-start. Consult with an authorized servicing dealer.
Check the spark plug.	If the plug is wet, excess fuel may be in the cylinder. The plug is fouled or improperly gapped. The plug is damaged internally or of the wrong size.	Crank the engine with the plug removed, reinstall the plug, and restart. Clean and regap the plug to 0.024" (0.6 mm). Restart. Replace the plug with a Champion CJ8 or equivalent type spark plug of the correct heat range. For EMC compliance, use NGK BMR6A. Restart.

LOW POWER OUTPUT

What To Check	Possible Cause	Remedy
Is the engine overheating?	Operator is overworking the unit. Carburetor mixture is too lean. Improper fuel ratio. Fan, fan cover, cylinder fins dirty or damaged. Carbon deposits on the piston or in the muffler.	Cut at a slower rate. Consult with an authorized servicing dealer. Refill with fresh, clean unleaded gasoline with a pump octane of 87 or higher, mixed with Shindaiwa Premium 2-cycle mixing oil at a 50:1 gasoline/oil ratio Consult with an authorized servicing dealer.
Engine is rough at all speeds. May also have black smoke and/or unburned fuel at the exhaust.	Clogged air filter. Loose or damaged spark plug. Air leakage or clogged fuel line. Water in the fuel. Piston seizure. Faulty carburetor and/or diaphragm.	Clean or replace the air filter. Tighten or replace the plug with a Champion CJ8 or equivalent type spark plug of the correct heat range. For EMC compliance, use NGK BMR6A. Restart. Repair or replace fuel filter and/or fuel line. Refill with fresh fuel/oil mixture. See page 8. Consult with an authorized servicing dealer.
Engine is knocking.	Overheating condition. Improper fuel. Carbon deposits in the combustion chamber.	See above. Check fuel octane rating; check for presence of alcohol in the fuel (page 8). Refuel as necessary. Consult with an authorized servicing dealer.

Troubleshooting Guide (continued)

ADDITIONAL PROBLEMS

Symptom	Possible Cause	Remedy
Poor acceleration.	<ul style="list-style-type: none"> Clogged air filter. Clogged fuel filter. Lean fuel/air mixture. Idle speed set too low. 	<ul style="list-style-type: none"> Clean or replace the air filter. Replace the fuel filter. Consult with an authorized servicing dealer. Adjust: 2,750 (\pm250) RPM (min^{-1}).
Engine stops abruptly.	<ul style="list-style-type: none"> Switch turned off. Fuel tank empty. Clogged fuel filter. Water in the fuel. Shorted spark plug or loose terminal. Ignition failure. Piston seizure. 	<ul style="list-style-type: none"> Reset the switch and restart. Refuel. See page 8. Replace strainer. Drain; replace with clean fuel. See page 8. Clean or replace spark plug with a Champion CJ8 or equivalent type spark plug of the correct heat range. For EMC compliance, use NGK BMR6A. Tighten the terminal. Replace the ignition unit. Consult with an authorized servicing dealer.
Engine difficult to shut off.	<ul style="list-style-type: none"> Ground (stop) wire is disconnected, or switch is defective. Overheating due to incorrect spark plug. Overheated engine. 	<ul style="list-style-type: none"> Test and replace as required. Replace spark plug with a Champion CJ8 or equivalent type spark plug of the correct heat range. For EMC compliance, use NGK BMR6A. Idle engine until cool.
Cutting attachment rotates at engine idle.	<ul style="list-style-type: none"> Engine idle too high. Broken clutch spring or worn clutch spring boss. Loose attachment holder. 	<ul style="list-style-type: none"> Set idle: 2,750 (\pm250) RPM (min^{-1}). Replace spring/shoes as required, check idle speed. Inspect and re-tighten holders securely.
Excessive vibration.	<ul style="list-style-type: none"> Warped or damaged cutting attachment. Loose gearcase. 	<ul style="list-style-type: none"> Inspect and replace attachment as required. Tighten gearcase securely.
Cutting attachment will not rotate.	<ul style="list-style-type: none"> Shaft not installed in powerhead or gearcase. Broken shaft. Damaged gearcase. 	<ul style="list-style-type: none"> Inspect and reinstall as required. Consult with an authorized servicing dealer.

The following statement only applies to United States and its territories

Shindaiwa Kogyo Co., Ltd. Federal Emission Design And Defect Limited Warranty Utility And Lawn And Garden Engines

Shindaiwa Kogyo Co., Ltd. warrants to the initial purchaser and each subsequent owner, that this utility equipment engine (herein engine) is designed, built and equipped to conform at the time of initial sale, to all applicable regulations of the U.S. Environmental Protection Agency (EPA), and that the engine is free of defects in materials and workmanship that would cause this engine to fail to conform with EPA regulations during its warranty period. This emission warranty is applicable in all States, except the State of California.

For parts listed under PARTS COVERED, the dealer authorized by Shindaiwa Kogyo Co., Ltd. will, at no cost to you, make the necessary diagnosis, repair, or replacement of any defective emission-related component to ensure that the engine complies with applicable U.S. EPA regulations.

MANUFACTURERS WARRANTY COVERAGE

When sold within the U.S., this engine's emission control system is warranted for a period of two (2) years from the date this product is first delivered to the original retail purchaser.

OWNER'S WARRANTY RESPONSIBILITIES

As the engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Shindaiwa Kogyo Co., Ltd. recommends that you retain all receipts covering maintenance on your engine, but Shindaiwa Kogyo Co., Ltd. cannot deny a warranty claim solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

As the engine owner, you should however be aware that Shindaiwa Kogyo Co., Ltd. may deny your warranty coverage if your engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your engine to the nearest dealer authorized by Shindaiwa Kogyo Co., Ltd. when a problem exists.

If your Shindaiwa Dealer is unable to answer questions regarding your warranty rights and responsibilities, you should then contact your Shindaiwa Distributor.

For the name and telephone number of the Shindaiwa Distributor in your area, please call Shindaiwa Inc. at (503) 692-3070 between the hours of 8:00 AM and 5:00 PM Pacific Standard Time.

PARTS COVERED

Listed below are the parts covered by the Federal Emission Design and Defect Warranty. Some parts listed below may require scheduled maintenance and are warranted up to the first scheduled replacement of that part. The warranted parts include:

1. Carburetor Internal Components
 - Valve Assembly-throttle, Jet, Metering Diaphragm
2. Ignition System Components
 - Ignition Coil
 - Flywheel Rotor

The emission control system for your particular Shindaiwa engine may also include certain related hoses and connectors.

LIMITATIONS

The Federal Emission Design and Defect Warranty shall not cover any of the following:

- (a) conditions resulting from tampering, misuse, improper adjustment (unless they were made by the dealer or service center authorized by Shindaiwa Kogyo Co., Ltd. during a warranty repair), alteration, accident, failure to use the recommended fuel and oil, or not performing required maintenance services,
- (b) the replacement parts used for required maintenance services,
- (c) consequential parts used for required maintenance services,
- (d) diagnosis and inspection fees that do not result in eligible warranty service being performed, and
- (e) any non-authorized replacement part, or malfunction of authorized parts due to use of non-authorized parts.

MAINTENANCE AND REPAIR REQUIREMENTS

You are responsible for the proper use and maintenance of the engine. You should keep all receipts and maintenance records covering the performance of regular maintenance in the event questions arise. These receipts and maintenance records should be transferred to each subsequent owner of the engine. Shindaiwa Kogyo Co., Ltd. reserves the right to deny warranty coverage if the owner has not properly maintained the engine. Shindaiwa Kogyo Co., Ltd. will not deny warranty repairs, however, solely because of the lack of repair, maintenance or failure to keep maintenance records.

MAINTENANCE, REPLACEMENT OR REPAIR OF EMISSION CONTROL DEVICES AND SYSTEMS MAY BE PERFORMED BY ANY REPAIR ESTABLISHMENT OR INDIVIDUAL; HOWEVER, WARRANTY REPAIRS MUST BE PERFORMED BY A DEALER OR SERVICE CENTER AUTHORIZED BY SHINDAIWA KOGYO CO., LTD. THE USE OF PARTS THAT ARE NOT EQUIVALENT IN PERFORMANCE AND DURABILITY TO AUTHORIZED PARTS MAY IMPAIR THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM AND MAY HAVE A BEARING ON THE OUTCOME OF A WARRANTY CLAIM.

If other than the parts authorized by Shindaiwa Kogyo Co., Ltd. are used for maintenance replacements or for the repair of components affecting emission control, you should assure yourself that such parts are warranted by their manufacturer to be equivalent to the parts authorized by Shindaiwa Kogyo Co., Ltd. in their performance and durability.

OBTAINING WARRANTY SERVICE

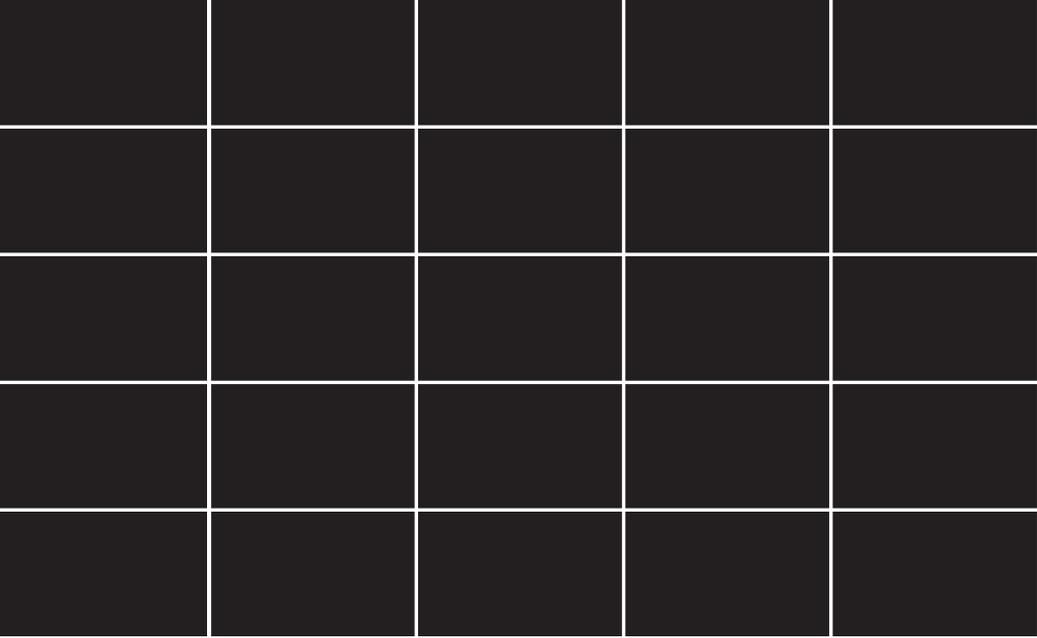
All repairs qualifying under this limited warranty must be performed by a dealer authorized by Shindaiwa Kogyo Co., Ltd.

If any emission-related part is found defective during the warranty period, it is your responsibility to present the product to an authorized Shindaiwa dealer. Bring your sales receipts showing the date of purchase for this engine. The dealer authorized by Shindaiwa Kogyo Co., Ltd. will perform the necessary repairs or adjustments within a reasonable amount of time and furnish you with a copy of the repair order. All parts and accessories replaced under this warranty become the property of Shindaiwa Kogyo Co., Ltd.

To locate an authorized Shindaiwa dealer near you, contact your Shindaiwa Distributor. For the name and telephone number of the Shindaiwa Distributor in your area, please call Shindaiwa Inc. at (503) 692-3070 between the hours of 8:00 AM and 5:00 PM Pacific Standard Time.

THIS WARRANTY IS ADMINISTERED BY

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