



SHINDAIWA SERVICE MANUAL

SERVICE MANUAL

Shindaiwa
Chain Saws

shindaiwa

Service Manual

Shindaiwa Chain Saws

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Attention Statements

Throughout this manual are statements surrounded by boxes and preceded by special symbols:



WARNING!

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



ATTENTION!

A statement preceded by the word "ATTENTION" contains information that should be acted upon to avoid damaging the saw.

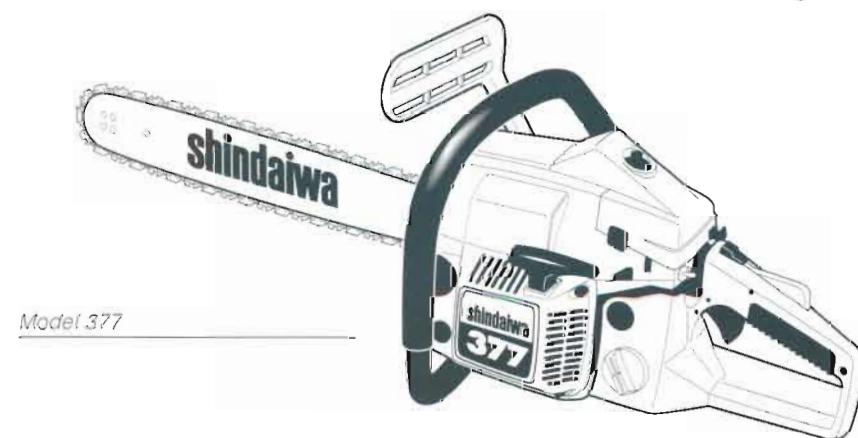
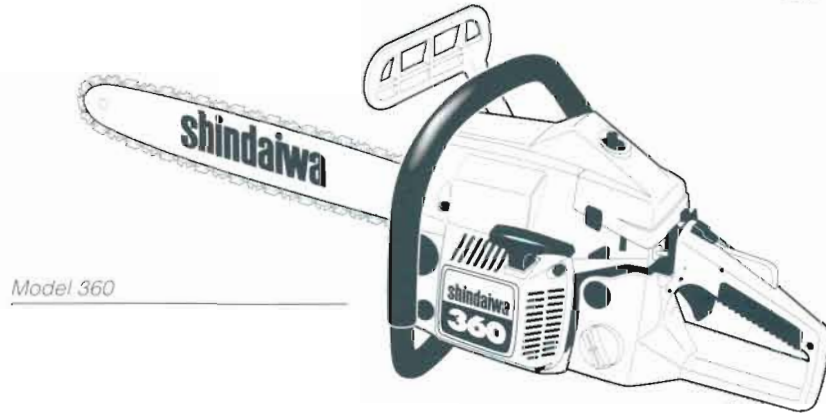
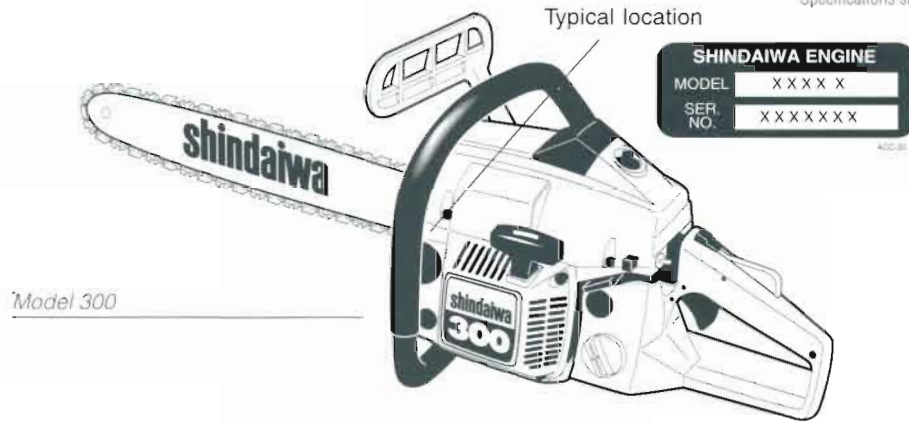
Additional statements that are not preceded by symbols are:

IMPORTANT!

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

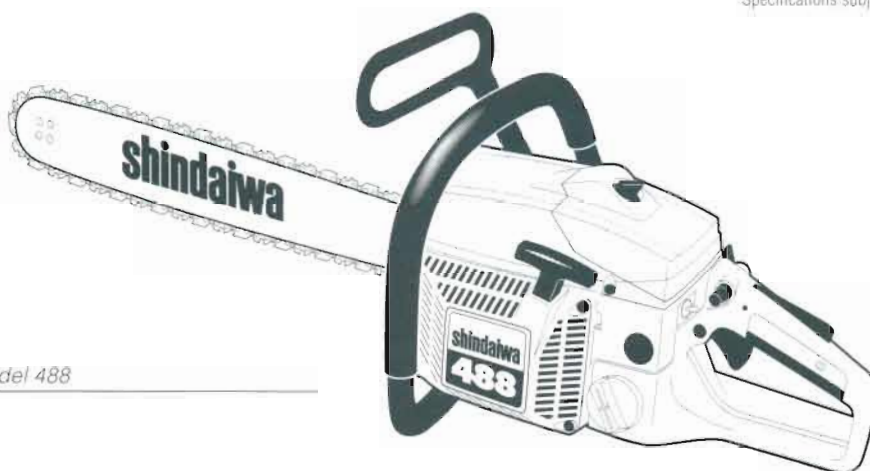
Specifications subject to change without notice.

Chain Saws



Chain Saws

Specifications subject to change without notice.



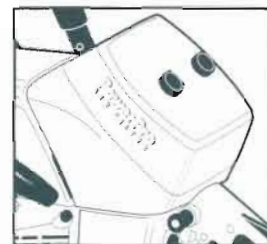
Model 488



Model 575 (680 and 695 similar)



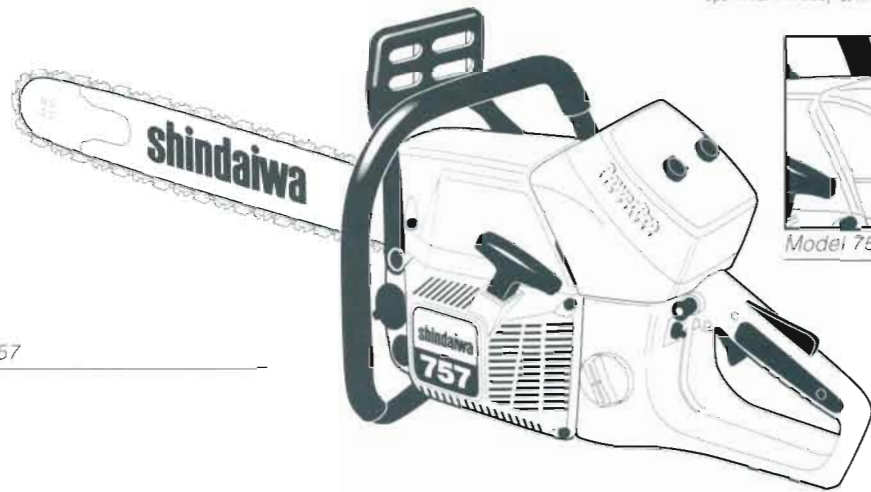
Model 577



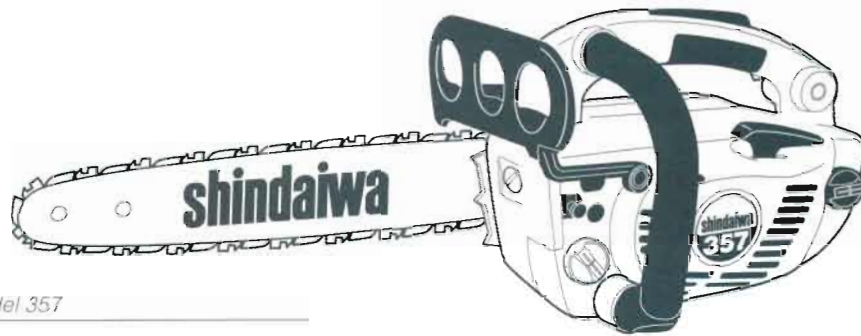
Model 577P

Specifications subject to change without notice.

Chain Saws



Model 757



Model 357

Theory of Operation

Figures 2.1 and 2.2

A two-stroke cycle or "two-cycle" engine produces one power stroke for every revolution of its crankshaft. Intake and compression occur during the piston's "up" stroke; power and exhaust occur during the "down" stroke.

Six distinct processes occur during every revolution of the crankshaft, and a loss or weakness of even one of these processes will affect the other five.

Piston Ported Induction

1. Intake

As the piston moves up toward the cylinder head, a low pressure (vacuum) is created in the crankcase. As the moving piston uncovers the intake port, atmospheric pressure pushes a fresh charge of fuel-air mixture into the crankcase.

The mixture accomplishes two functions before it is moved to the combustion chamber:

- Oil suspended in the mixture coats all internal engine parts including cylinder walls, crankshaft, and bearings.
- The atomized fuel mixture absorbs heat as it enters the crankcase, lowering the engine's operating temperature.

2. Compression

As the piston continues to move upward and cover the cylinder ports, the combustion chamber is sealed and compression begins. The air-fuel mixture introduced during the previous revolution's transfer cycle is now trapped and becomes compressed between the piston and cylinder head.

3. Ignition

As the piston approaches the top of the cylinder, the spark plug fires and ignites the fuel-air mixture. To compensate for increases in engine rpm, spark timing is advanced electronically.

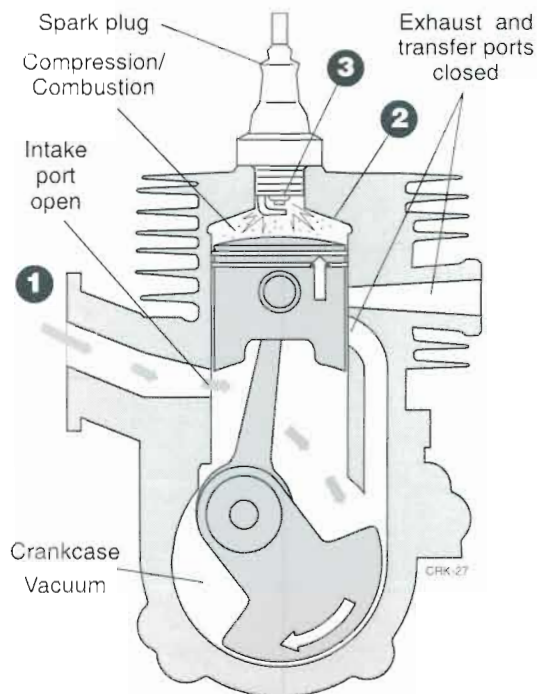


Figure 2.1 Crankcase vacuum is created during the compression stroke. When the spark plug fires, the compressed mixture above the piston ignites and begins to expand.

4. Power (combustion)

The fuel-air mixture expands rapidly as it burns, forcing the piston down the cylinder. Piston movement is transferred to the crankshaft through the connecting rod, rotating the crankshaft.

5. Exhaust

Expanding gasses continue to force the piston downward, exposing the exhaust port. Most of the spent combustion gasses are expelled through the exhaust port.

6. Transfer

The piston's downward movement covers the intake port and uncovers the transfer port, while simultaneously compressing the fresh fuel-air mixture drawn into the crankcase during Step 1. As the transfer port is uncovered, the fresh mixture swirls rapidly into the cylinder.

As the fresh fuel-air mixture enters the cylinder, it also helps to push or *scavenge* any remaining exhaust gasses out through the exhaust port.

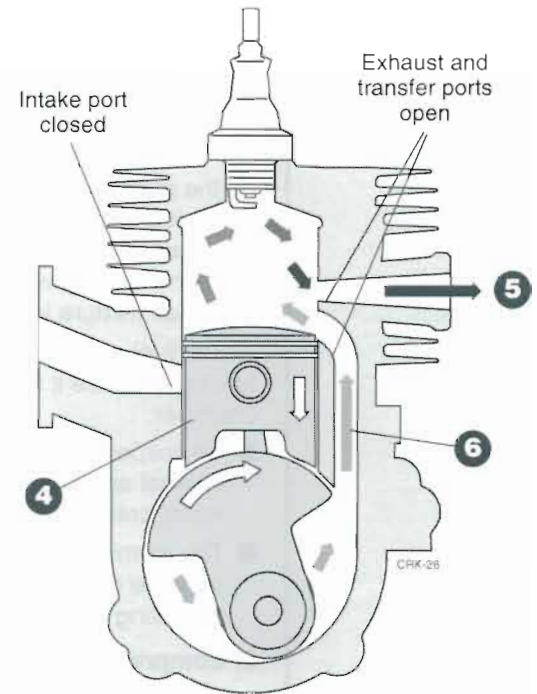


Figure 2.2 The burning mixture expands, forcing the piston down and compressing the fresh mixture in the crankcase. As the piston exposes the transfer port, crankcase pressure forces fresh mixture into the combustion chamber and helps push the remaining exhaust gasses through the exhaust port.

Theory of
Operation

Reed Valve Induction

as used on Model 357

Figures 2.3 and 2.4

1. Intake

As the piston moves up toward the cylinder head, low pressure (vacuum) created in the crankcase allows atmospheric pressure to open the reed valve and push a fresh charge of fuel-air mixture into the crankcase.

The fuel-air mixture accomplishes two functions before it is moved to the combustion chamber:

- Oil suspended in the mixture coats all internal engine parts including cylinder walls, crankshaft, and bearings.
- The atomized fuel mixture absorbs heat from the crankcase, lowering the engine's operating temperature.

2. Compression

As the piston continues to move upward and cover the cylinder ports, the combustion chamber is sealed and compression begins. The air-fuel mixture introduced during the *previous* revolution's transfer cycle is now trapped and becomes compressed between the piston and cylinder head.

3. Ignition

As the piston approaches the cylinder head, the spark plug fires and ignites the fuel-air mixture. To compensate for increases in engine rpm, spark timing is advanced electronically.

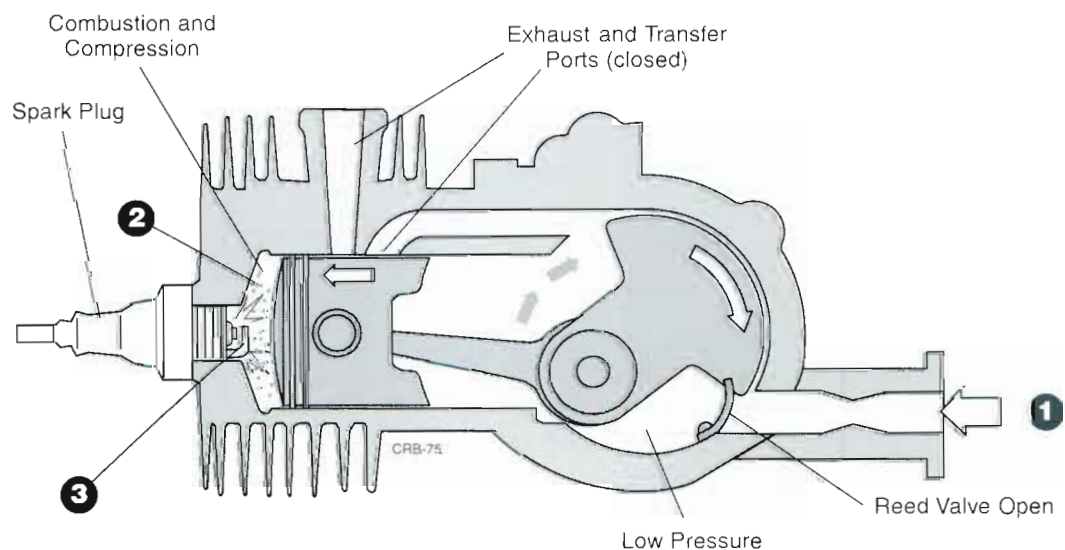


Figure 2.3 Reed Valve Induction System (reed valve open)

4. Power (combustion)

The fuel-air mixture expands rapidly as it burns, forcing the piston down the cylinder. Piston movement is transferred to the crankshaft through the connecting rod, rotating the crankshaft.

5. Exhaust

Expanding gasses continue to force the piston downward, exposing the exhaust port. Most of the spent combustion gasses are expelled through the exhaust port.

6. Transfer

The piston's downward movement compresses the fuel-air mixture drawn into the crankcase during Step 1, causing the reed valve to close. As the moving piston uncovers the transfer port, the fresh mixture swirls rapidly into the cylinder.

As the fresh fuel-air mixture enters the cylinder, it also helps to push or *scavenge* any remaining exhaust gasses out through the exhaust port.

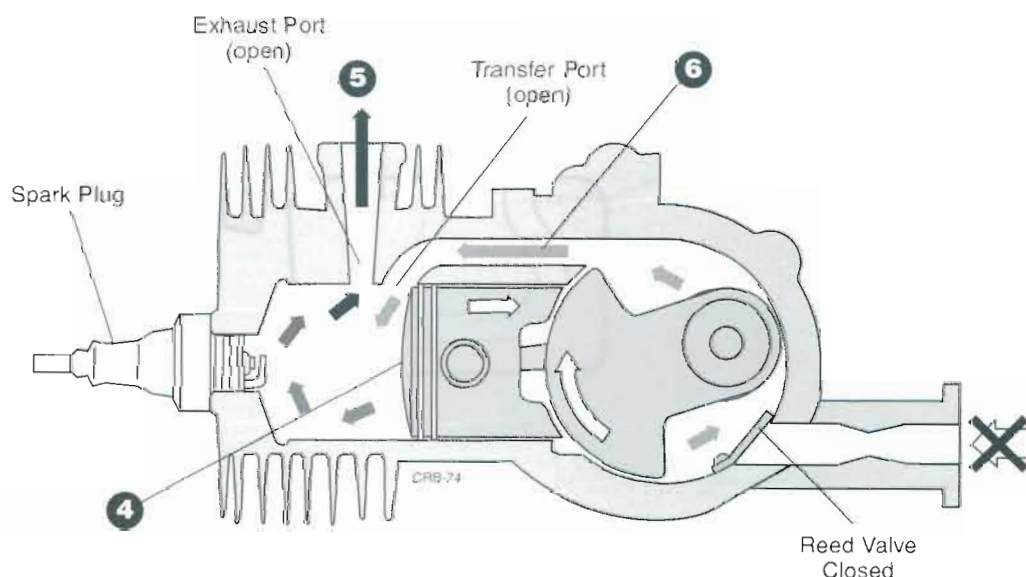


Figure 2.4 Reed Valve Induction System (reed valve closed)

General Troubleshooting Procedures

Mechanical failure of any carburetor is far less common than problems arising from contaminated fuel, improper adjustment, or operator abuse. Figure 2.5 is provided as a troubleshooting checklist.

IMPORTANT!

Carburetor operation is directly affected by the quality of air and fuel entering the carburetor! Before troubleshooting or adjusting any carburetor, inspect fuel and air filters for cleanliness, operation, and proper installation!

1. Is the fuel tank filled with clean, fresh fuel of the proper grade and mixture?
2. Check for spark!
3. Compression at least 100 psi or above?
4. Is the air filter clean and properly installed?
5. Are the spark arrestor and muffler clean and properly installed?
6. Inspect fuel filter, and check fuel lines for leaks/deterioration. Pressure-test fuel system for leaks.
7. Inspect the impulse tube or passage for condition and operation. Pressure-test crankcase as required.
8. Inspect the tank vent. Clean or replace as required.
9. Reset carburetor mixture adjustments (Section 3).
10. Pressure test the carburetor for pop-off and reseal values.

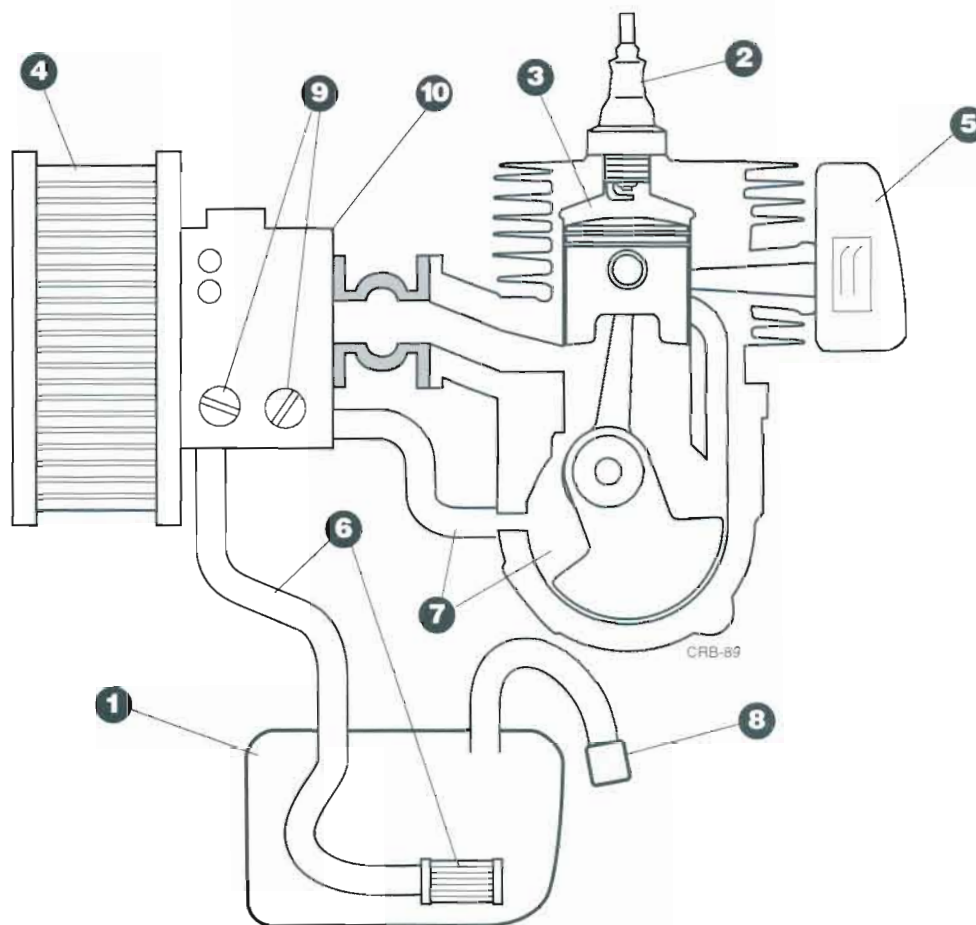


Figure 2.5 Troubleshooting Guide

1. Fuel

Drain all fuel into a clean container, and discard any fuel showing visible contamination such as dirt or water. Be especially suspicious of fuel with an unusual odor, cloudiness, or thickening. If the fuel is severely contaminated or "varnished," the carburetor and fuel system must be completely disassembled for a thorough inspection and cleaning. For specific fuel recommendations and testing procedures, see "Fuel and Oil" in the Appendix.

2. Spark (Figure 2.7)

Connect the spark plug lead to an adjustable-gap spark tester, turn the ignition switch to the "I" (on) position, and crank the engine vigorously to test for spark. A healthy ignition should produce a strong blue spark of nearly 1/4" length at the tester. If no spark is visible or if the spark is weak or yellow in color, refer to "Ignition Troubleshooting," (Section 5).

3. Compression (Figure 2.8)

Install a reliable compression gauge, and then crank the engine vigorously through 2-3 pulls of the recoil starter. Compression at cranking speeds should be at least 100 psi or above. Compression readings consistently below 100 psi can indicate internal engine wear or damage (Sections 7 and 8).

4. Air Filter

Inspect the air filter, and clean or replace filter elements as required (Figure 2.9).

- Paper-type elements should be cleaned with compressed air only.
- All other Shindaiwa filter elements can be washed in clean fuel mixture and then blown dry before reinstallation.



ATTENTION!

Careless use of compressed air can damage air filter elements. Always direct the airstream from the inside (carburetor side) toward the outside face of the element. Any engine that has been run with a damaged or incorrectly installed air filter assembly should be carefully inspected for internal damage from ingested debris.

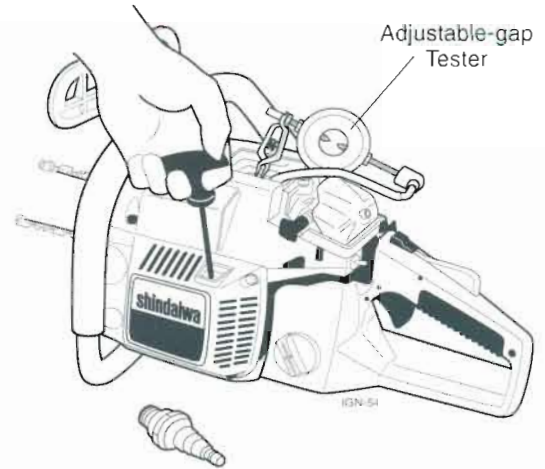


Figure 2.7 Checking Spark

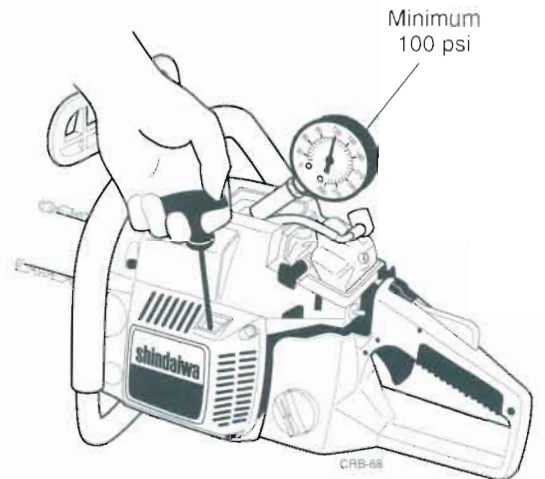


Figure 2.8 Checking Compression

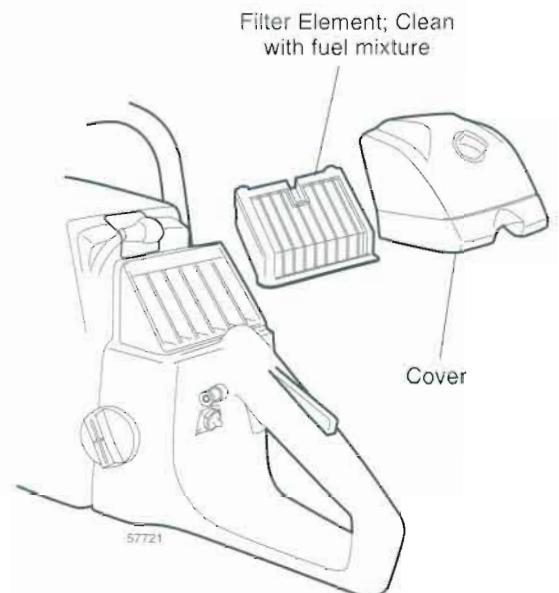


Figure 2.9 577 Air Filter Installation

General Troubleshooting Procedures (continued)

5. Spark Arrestor Screen and Exhaust Port (Figures 2.10 and 2.11)

Remove and inspect the spark arrestor screen, and clean as required. If further decarbonizing is necessary, refer to Section 9 (Mufflers) and Section 7 (Pistons).

IMPORTANT!

A clogged arrestor screen or muffler can cause an engine to lose power, and may prevent the engine from starting altogether!

6. Fuel Filter and Lines

Remove and inspect the fuel filter elements and screens. Be especially alert for any signs of dirt, water, or other contamination (Figure 2.12).

IMPORTANT!

Dirt or other debris on the inner filter screen may indicate additional debris is trapped within the carburetor body! Trapped debris can restrict fuel flow, possibly leading to engine seizure!

Tug gently on the fuel line, and replace any line showing unusual stretch or loss of elasticity. Be especially alert for softened sections of line that might collapse under suction and "starve" the saw.

Disconnect the fuel line from the carburetor. Plug or clamp the filter end of the line and use Shindaiwa p/n 99909-93 to pressure test the line for leaks (Figure 2.13).

IMPORTANT!

When servicing fuel filters, always use the factory-recommended filter or components for the specific model carburetor and application! Modification, substitution, or use of aftermarket fuel filters or components can unbalance fuel flow within the entire system, causing engine performance problems!

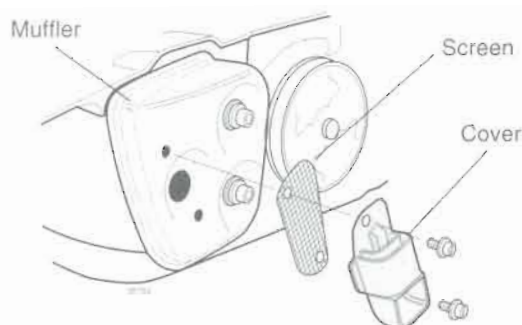


Figure 2.10 Inspect Arrestor Screen (357 shown)

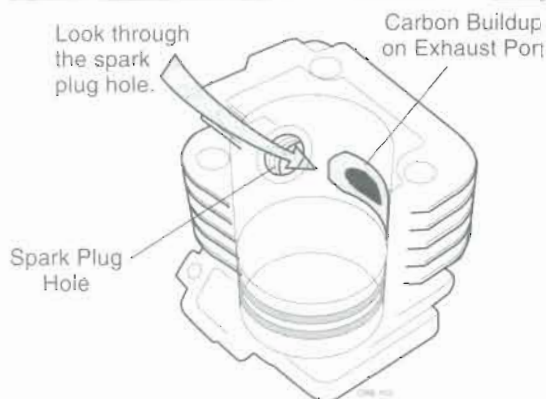
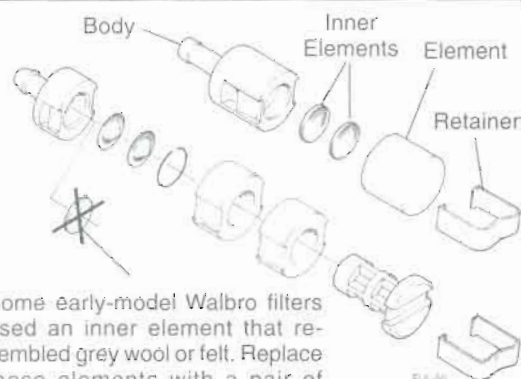


Figure 2.11 Inspect Exhaust Port for Carbon Buildup



Some early-model Walbro filters used an inner element that resembled grey wool or felt. Replace these elements with a pair of metal screens, p/n 22118-85460

Figure 2.12 Fuel Filter Elements

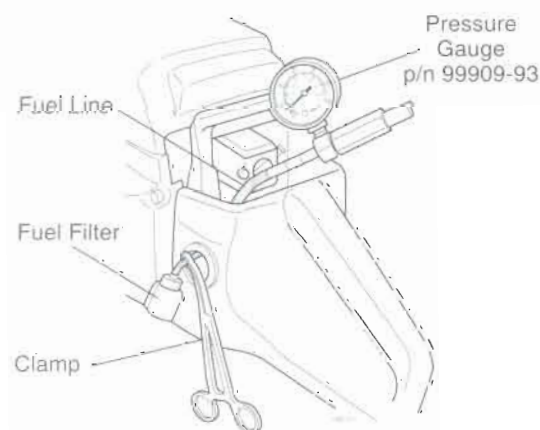


Figure 2.13 Leak-testing the Fuel Line

General Troubleshooting Procedures (continued)

7. Impulse Passage/Crankcase Pressure

Test The Impulse Passage, Models 488 and larger (Figure 2.14)

Disconnect the impulse tube from the fuel pump, and carefully inspect the tube for damage or deterioration.

Connect pressure gauge (Shindaiwa p/n 99909-93 or equivalent) to the impulse tube and then crank the engine.

- A fluctuating gauge reading during cranking indicates the impulse tube is clear and is functioning properly.

- No needle movement indicates a plugged impulse tube or possibly a crankcase leak.

or

The passage can be tested by placing a small droplet of oil over the open end of the impulse tube and then cranking the engine. If the impulse passage is clear, the oil droplet will move rapidly in and out as the engine is cranked.

Test The Impulse Passage, Models 300 through 377 (includes 357) (Figure 2.15)

Remove the carburetor and place a small droplet of oil over the impulse passage hole and test as above.

IMPORTANT!

Never use gasket sealant on any gasket installed over an impulse passage! Gasket sealant can plug the impulse passage, causing the engine to run lean.

Test For Crankcase Leaks

An engine with a rough or erratic idle, or one that is unstable or "runs away" under load may be drawing extra air through leaking crankcase seals or gaskets.

- After blocking the intake and exhaust ports, a gauge such as Shindaiwa p/n 72174-99200 can be used to pressurize the crankcase through the impulse tube or through an adapter as shown (Figure 2.16).
- If the correct block-off plates are not available, the ports can usually be blocked by clamping small sections of heavy rubber or gasket material beneath the muffler and carburetor bases.

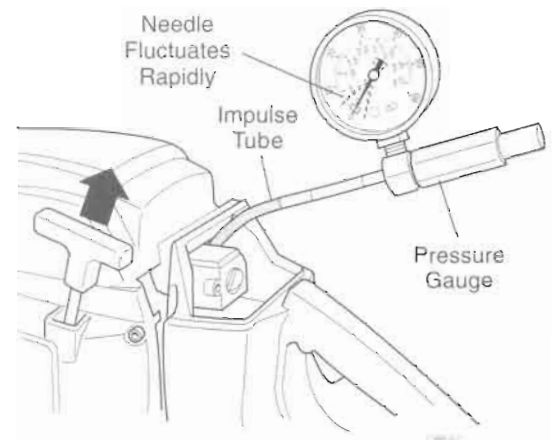


Figure 2.14 Testing Impulse Passage (488 and larger)

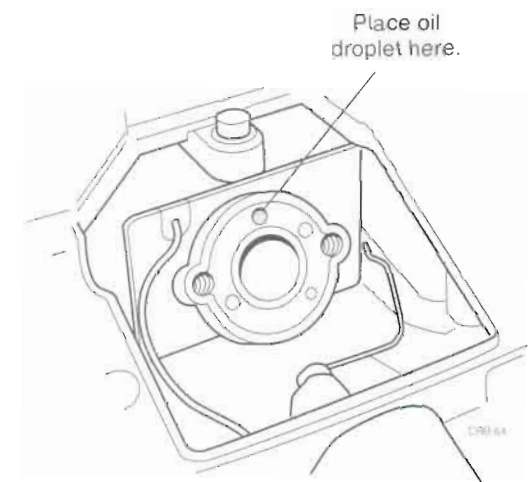


Figure 2.15 Testing the Impulse Passage (300 through 377)

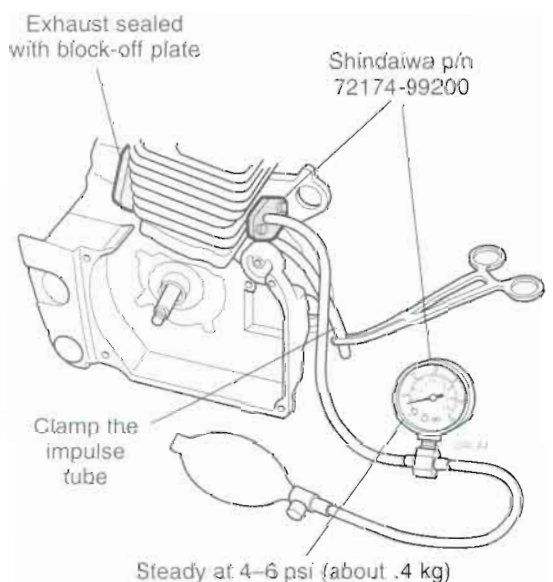


Figure 2.16 Leak-testing with Gauge p/n 72174-99200

General Troubleshooting Procedures (continued)

8. Tank Vent

Inspect the fuel tank vent for damage or clogging, and clean or replace as required.

9. Carburetor Adjustments

Figure 2.17

Using the settings and adjustment procedures outlined in Section 3, reset all carburetor adjustments to factory-recommended settings.

10. Pop-off and Reseat Pressures (metering valve)

(Figure 2.18)

Connect Shindaiwa pressure tester 99909-93 or equivalent to the carburetor fuel inlet, and test the inlet needle assembly for proper pop-off and reseat values.

- Reseat pressure demonstrates the carburetor's ability to block and regulate typical fuel pump pressures of 5-7psi.
- Pop-off pressures can vary considerably, but the inlet needle *must* reseat and hold pressure of at least 10psi.

IMPORTANT!

For accurate pressure testing, the inlet needle must be slightly wet with fuel or solvent.

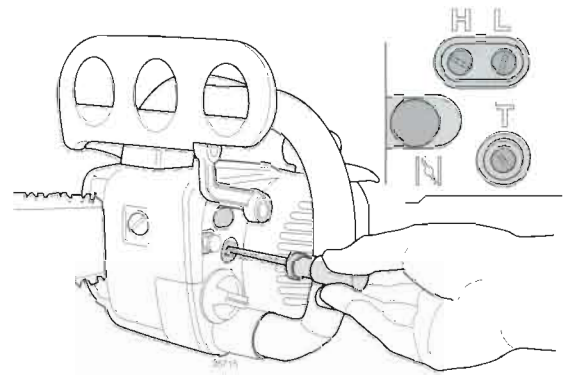


Figure 2.17 Carburetor Adjustments (357 shown)

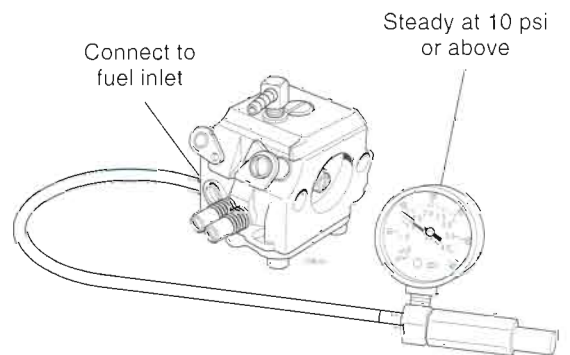


Figure 2.18 Testing Pop-off and Reseat Pressure (HDA shown)

Troubleshooting Guide

THE ENGINE DOES NOT START

What To Check	Possible Cause	Remedy
Does the engine crank?	NO Faulty recoil starter. Fluid in the crankcase. Internal damage.	Refer to the Recoil Section. Refer to the Carburetor Section. Refer to the Engine Crankcase/ Cylinder and Pistons Sections.
YES		
Check compression.	NO Loose spark plug. Excess wear on cylinder, piston, rings.	Tighten and re-test. Refer to the Cylinders and Pistons Section.
YES		
Is the fuel fresh and of the proper grade and mixture?	NO Fuel is out-dated: may also be stale, varnished, or contaminated	Re-fill with fresh fuel of the correct mixture Refer to <i>Fuels</i> in the Appendix
YES		
Is fuel reaching the carburetor? (spray fuel directly into the carburetor venturi to test)	NO Clogged fuel filter, damaged fuel line or impulse passage.	Clean or replace fuel system components as required.
YES		
Is there spark at the spark plug wire terminal?	NO The ignition switch is "OFF". Faulty ignition ground. Faulty spark plug lead. Faulty ignition system.	Move switch to "ON" and re-start. Refer to the Ignition Section.
YES		
Is the spark plug firing properly?	NO Plug is soaked with fuel. The plug is fouled or is improperly gapped. Plug is internally faulty or of the incorrect type.	Crank the engine with the plug removed; replace the plug, and re-start. Clean and regap the plug to 0.024" Replace with the correct plug (see <i>Specifications</i> in the Appendix)
YES		
Flywheel key is sheared.	NO Loose flywheel or "thrown" chain	Replace the key and retorque the flywheel (see <i>Torque Values</i> in the Appendix)
YES		
Is the exhaust system clean and functioning properly? (can prevent the engine from firing)	NO Arrestor screen/cylinder exhaust port is clogged with carbon.	Clean or replace arrestor screen (refer to the Muffler section). Inspect and decarbonize exhaust port (Cylinder and Piston section)

Troubleshooting Guide

(continued)

LOW POWER OUTPUT		
What to Check	Possible Cause	Remedy
Is the engine overheating?	Operator is overworking the machine.	Sharpen the saw chain. Cut at a slower rate.
	Carburetor mixture is too lean.	Adjust the carburetor (Carburetor section). See also "Fuels" in the Appendix. Inspect the boot for leakage.
	Fuel contains excessive oxygenates.	
	Incorrect fuel/oil ratio.	Drain the fuel system and refill with the correct fuel mixture (see the Appendix).
	Flywheel/cylinder fins missing or clogged. Air deflector or cylinder cover missing or damaged.	Clean, repair or replace components as necessary.
	Carbon deposits in cylinder head or on piston.	Decarbonize. Refer to the Piston and Cylinder Section.
The engine runs rough at all speeds.	Clogged air cleaner.	Service the air cleaner.
	Water in the fuel system.	Inspect fuel strainer and screens.
	Loose or damaged spark plug.	Tighten or replace spark plug as required.
Black, sooty smoke at exhaust; may also be unburned fuel at the exhaust.	Choke is closed.	Open the choke.
	Metering needle sticking. Faulty carburetor diaphragm.	Disassemble and thoroughly clean the carburetor (see Carburetor section)
The engine knocks under load.	Engine is overheated.	Refer to Overheating causes/remedies (above).
	Improper fuel or fuel mixture.	Check fuel octane rating. Test for the presence of alcohol or other oxygenates in the fuel (see <i>Fuels</i> in the Appendix).
	Carbon deposits in the combustion chamber.	Decarbonize (see the Cylinder and Piston section).

ADDITIONAL PROBLEMS		
Symptom	Possible Cause	Remedy
Poor acceleration.	Clogged air filter.	Clean the element.
	Spark arrestor (carbon deposits).	Decarbonize. Refer to the Muffler section.
	Clogged fuel filter.	Clean/replace fuel filter (Carburetor section).
	Carburetor mixture incorrectly adjusted.	Adjust carburetor (Carburetor section).
	Idle speed too low.	Adjust. Refer to the Specifications section in the Appendix.
	Dirt, gum, or varnish clogging carburetor.	Overhaul the carburetor (Carburetor section).
	Clogged tank vent.	Clean or replace vent as required.
	Blocked impulse passage. Fuel line is collapsing.	Inspect and pressure-test lines; replace as required (Carburetor section).
	Metering diaphragm is leaking.	Pressure-test the carburetor; overhaul as required (Carburetor section).
	Spark arrestor is clogged.	Clean/replace as required (Muffler section).
Uneven idle; engine may "run away" at higher throttle settings	Air leak at boot, seal, or crankcase.	Remove and inspect boot or insulator block; Pressure test crankcase (Crankcase section).
Saw chain moves at idle speed	Idle speed too high.	Reset idle speed to specification (Appendix)
	Broken clutch spring.	Replace spring, shoes as required (Clutch section).
Excessive vibration.	Damaged A/V cushion.	See Rear Handles and Mounts section.
	Bent crankshaft.	See Crankcase section.
	Damaged flywheel fins.	See the Recoil Starters section.
	Faulty ignition.	See the Ignition section.

Diagnosing Engine Seizure

An engine can seize whenever there is metal-to-metal contact between internal moving parts. Most engine seizures can be traced to at least one of the following:

Lubrication (Figure 2.19)

- **Lack of oil.** Insufficient or poorly mixed oil ratio. Shindaiwa machines are designed to use Shindaiwa Premium 2-cycle Engine Oil at a ratio of 40:1 (3.2 ozs./U.S. gallon).
- **Incorrect oil type.** Generic-brands and some outboard motor mixing oils may not provide sufficient lubrication throughout the broad temperature range associated with high performance air-cooled engine operation.

IMPORTANT!

When Shindaiwa Premium 2-cycle Engine Oil is not available, fuel should be mixed with a premium-grade 2-cycle mixing oil specifically designed for use in high-performance air cooled 2-cycle engines!

Debris (Figure 2.20)

- **Excessive carbon buildup.** Carbon accumulations may be dislodged from the exhaust port, jamming between piston and cylinder.
- **Faulty or missing air filter.** Dirt, water, or other debris enters the crankcase and cylinder, scoring the piston and cylinder and causing rapid component wear.

Severe metal galling/transfer all around the piston; even scoring



Figure 2.19
Piston damaged from lack of lubrication.



Carbon scoring produces soft-edged grooves on the exhaust side of the piston. Piston rings are still free in the grooves.

Ingested debris produces a sandblasted appearance or a dull grey surface on the intake side of the piston (away from the arrow). The piston skirt is worn thin at the base. Ring lands are worn.

Ingested water or snow leaves a shiny, polished area on the intake side (away from the arrow).

Figure 2.20 Operating with debris in the cylinder.

Factors Affecting Engine Durability

All Shindaiwa products are powered by high performance engines that produce the most horsepower from the lightest possible design.

Two factors are critical to the service life and durability of any high performance engine:

1. Lubrication

Proper lubrication is essential for reducing friction between an engine's moving parts.

By reducing friction, lubrication also helps reduce the heat developed during normal engine operation.

Since a 2-cycle engine doesn't have a reservoir of oil in its crankcase, a steady supply of high-quality lubricant must enter the engine as part of the fuel mixture.

Refer to the Fuel and Oil Section in the Appendix for specific fuel/oil mixture information.

2. Cooling

Cooling any high performance engine is a complex task. To remove the heat generated from both friction and the combustion process, Shindaiwa engines rely on:

- Lubricating Oil
- Air-Fuel Mixture
- Cylinder Design
- Flywheel Design

ATTENTION!

Proper lubrication and cooling are essential to both the performance and service life of any two-cycle engine! A partial failure in either of these areas can lead to engine seizure!

Overheating (Figure 2.21)

- **Operating an engine with clogged or damaged cooling fins, or with missing cooling system components.** Overheated internal moving parts may expand beyond normal rates and dimensions, allowing metal-to-metal contact.

IMPORTANT!

Overheat damage is often caused by forcing a saw engine to cut with a dull or improperly sharpened chain, or by failing to select the proper size and capacity saw for the job at hand.

- **Preignition** (Figure 2.22) from incorrect spark plug/carbon buildup (may also result from lean carburetor setting).

- **Incorrect or "lean" fuel-air ratio** (Figure 2.23).

Operating an engine at an oxygen-rich carburetor setting raises combustion temperatures (same effect as pressing the lever on an acetylene cutting torch).

- **Air Leaks**

Air leaking past crankcase seals, cylinder gaskets, or impulse passages can dilute or "lean out" an engine's fuel-air ratio, and can produce the same effect as an improperly adjusted carburetor.

- **Oxygenated fuels, any fuel containing alcohol or ether-based oxygenating compounds.** So-called "clean air" fuels are blended to provide additional oxygen during the combustion process, producing higher combustion temperatures similar to a "lean" carburetor adjustment. For additional information on oxygenated fuels, refer to *Fuel and Oil* in the Appendix.

- **Outdated or low-octane fuel** can burn unevenly, producing excessive combustion pressures that tend to have a hammering effect on pistons and related components (Figure 2.24). Shindaiwa engines require a fuel with an octane rating of at least 87 or above. Unless fuel has been pretreated with an approved fuel stabilizer such as Sta-Bil™, Shindaiwa advises against using any motor fuel stored over 30-days.

Overheating causes a piston skirt to expand and score heavily on the exhaust side of the cylinder, and may produce similar (but reduced) scoring on the cooler intake side as well.



Figure 2.21 Damage caused by overheating.

Preignition typically melts the piston crown at the exhaust side (toward the arrow) of the piston, or may burn a hole completely through the crown. Heat causes the piston to expand and score at the exhaust side, sticking rings in their grooves.



Figure 2.22 Damage caused by preignition.

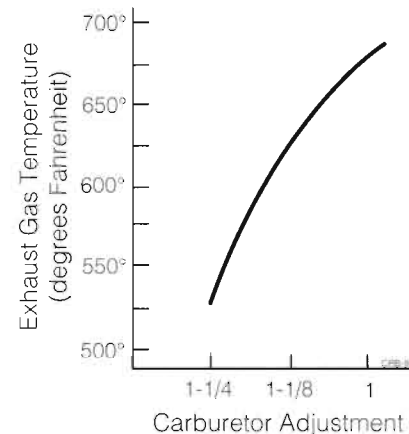


Figure 2.23 Exhaust Gas Temperature vs Carburetor Adjustment

Detonation results when fuel explodes instead of burning, and has a hammering effect that can crack or pound a hole through a piston top.



Figure 2.24 Damage caused by detonation.

Troubleshooting Engine Seizure

(Figure 2.25)

General

Outright mechanical failures are unusual, and the cause of a seizure can often be identified by viewing the piston through the cylinder ports.

When making a diagnosis, enter your findings on the Seizure Checklist shown on the following page.

IMPORTANT!

Most seizures are not covered by warranty! Whenever an air leak is suspected, always pressure test the engine before disassembly!

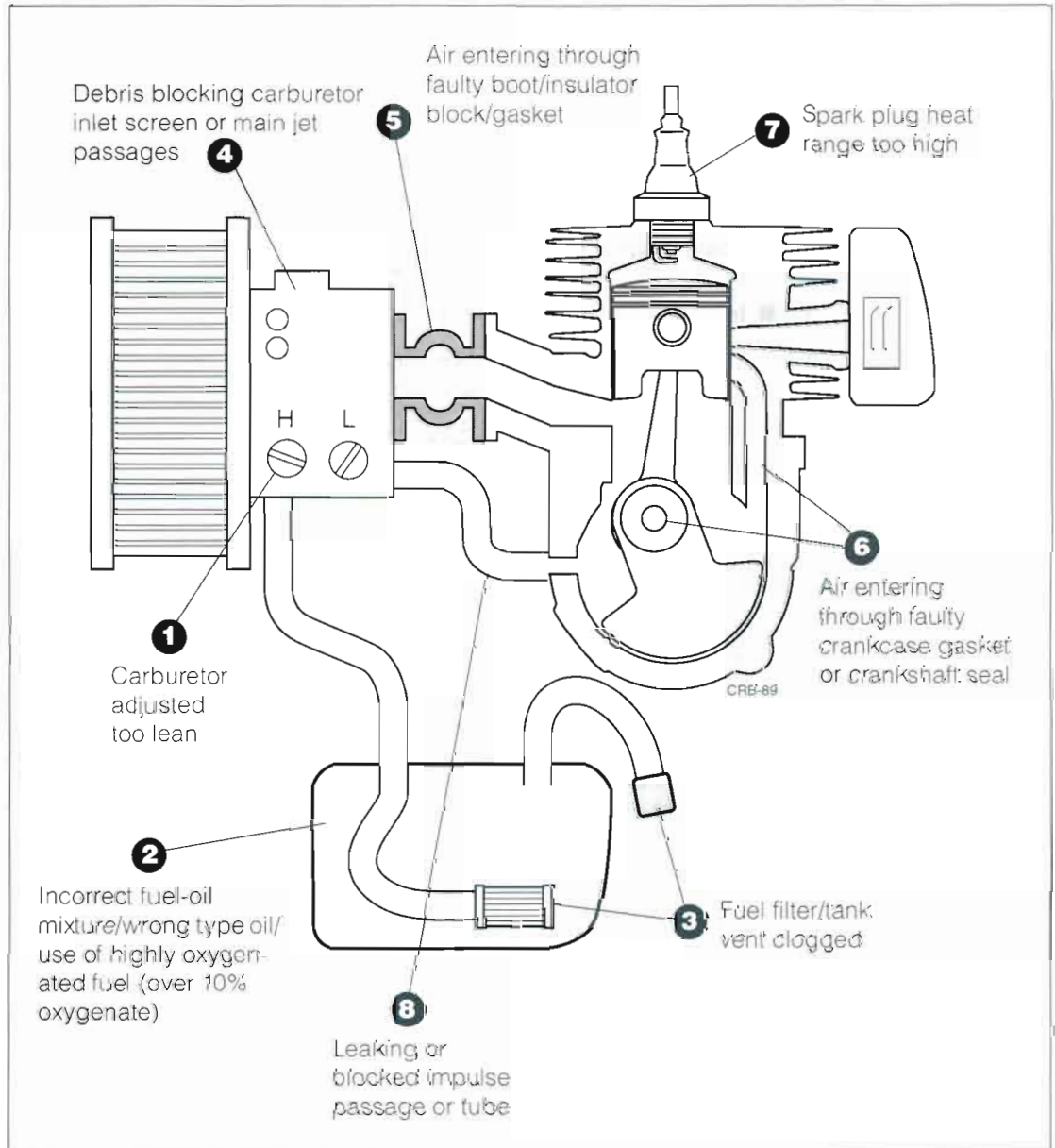


Figure 2.25 Common Causes of Engine Seizure

Seizure Checklist

Shindaiwa
P/N 60127



SEIZURE CHECKLIST

PLEASE CHECK THE APPROPRIATE BOX/RESPONSE

1. Model _____ Serial Number _____
2. Previous Repair? No Yes
3. Previous Seizure? No Yes
4. Gasoline Grade Regular
Unleaded
Unleaded Premium
5. Fuel Oil Mix Ratio
Brand of Mix Oil
6. Was Oil Mixed in Fuel (blotter test)? No Yes
7. Was Alcohol Present (shaker test)? No Yes
Percent: _____
8. Carburetor Adjustment (number of turns) High Low
9. Spark Plug Condition/Color Brown/Tan
White
Fouled
10. Plug Manufacturer
Heat Range
11. Muffler Outlet Color Black
White
12. Muffler - Inside Oily Dry
13. Spark Arrestor No Carbon
Carbon
Recently Cleaned
14. Cylinder Exhaust Port Clean
Heavy Carbon
15. Piston Condition (view through ports):
Exhaust Clean Scuffed
Intake Clean Scuffed
16. Air Filter Clean
Dirty
Torn
17. Flywheel, Cylinder Fins Clean Damaged
Clogged
18. Cylinder, Crankcase Bolts Tight Loose
19. Impulse Line (if equipped) Intact Torn
Clear Plugged
20. Fuel Filter Clean
Dirty/Plugged
21. Fuel Line (pressure check) OK
Torn/Leaking
22. Carburetor Inlet Screen Clean Dirty
23. Boot/Insulator Block Intact
Torn/Cracked
24. Fuel Vent Clear Plugged
25. Crankcase/Cylinder Pressure Check (6 psi) OK
Excessive Leakage

Theory of Operation

A carburetor's only function is to precisely mix air and fuel to accommodate any combination of engine load and rpm. Mixing takes place at a nozzle (or jet) located within the carburetor venturi (Figure 3.1).

- Air drawn through the carburetor accelerates as it enters the venturi, lowering air pressure at the nozzle.
- Low pressure at the nozzle draws fuel through the nozzle and into the air stream entering the engine.
- Venturi air flow rate is regulated by either a butterfly or barrel valve installed in the carburetor bore.
- To provide a fuel-rich mixture during startup, air pressure in the carburetor bore can be further reduced by closing a choke valve installed at the intake (air filter) side of the venturi.

Fuel Flow: Butterfly Carburetors (Figure 3.2)

To compensate for possible fuel shortages from slow venturi airspeed at low throttle settings, one or more low speed nozzles (idle passages) are usually fitted beneath the butterfly valve.

These low speed nozzles usually function only at lower throttle settings, when airflow beneath the butterfly is at maximum.

Slowing the engine reduces venturi airspeeds, and low pressure in the venturi is replaced by atmospheric pressure.

- To prevent air pressure from entering the fuel system through the main jet or nozzle, a check valve is installed in the passageway between the nozzle and the metering chamber.
- The check valve may be of a positive mechanical type, or may be only a capillary screen. The capillary-type system allows fuel to flow through the screen toward the nozzle, but fuel trapped in the screen's fine mesh prevents air from passing through the screen in reverse.

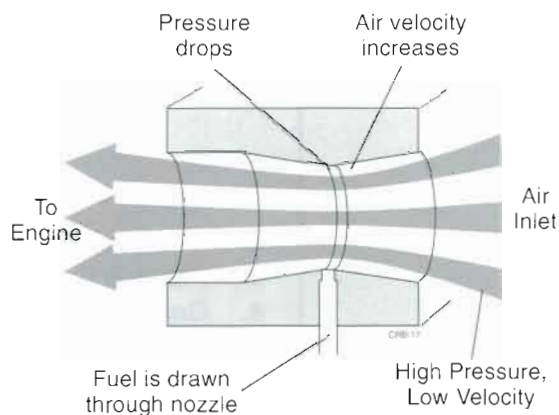


Figure 3.1 The Venturi Principle

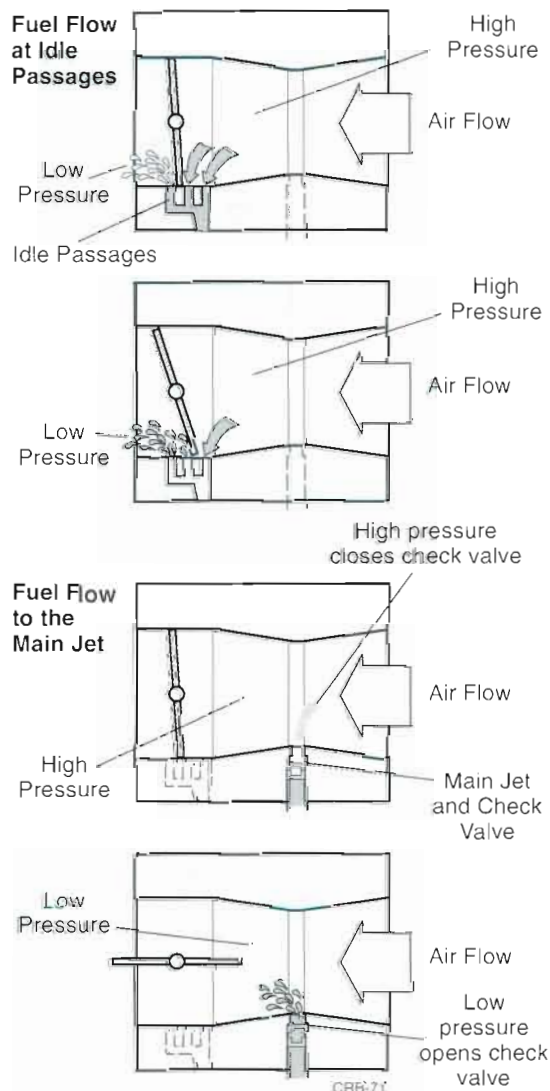


Figure 3.2 Butterfly Carburetor

Fuel Supply

Fuel Pump

To maintain a steady fuel supply throughout varying loads and operating positions, the carburetor features a diaphragm-type fuel pump with internal check valves (Figure 3.3).

The fuel pump diaphragm responds to crankcase pressure changes or "impulses" generated by the engine's moving piston, and pumps fuel from the tank to the metering chamber inside the carburetor body.

Metering Chamber

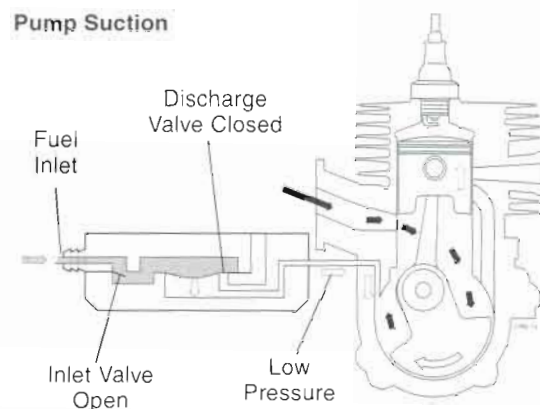
For fuel to enter the metering chamber, fuel pressure must be great enough to unseat the inlet valve in the metering chamber (Figure 3.4).

Valve Closed As the chamber fills, fuel pressure in the chamber forces the metering diaphragm outward until the valve is closed by a spring beneath the metering lever.

Valve Open As the engine consumes fuel from the metering chamber, outside air pressure forces the diaphragm inward against the metering lever until the inlet valve opens and:

$$\text{Fuel Pressure} = \text{Atmospheric Pressure}$$

Pump Suction



Pump Discharge

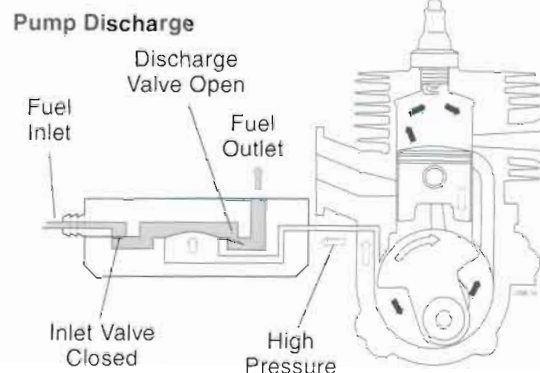
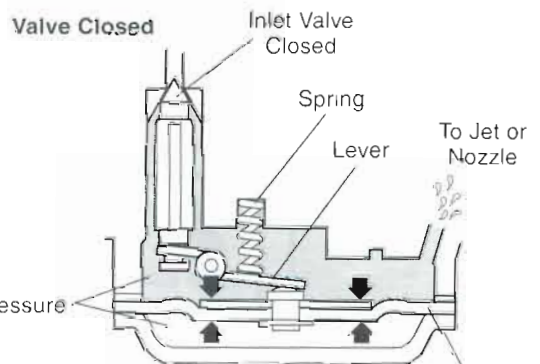


Figure 3.3 Fuel Pump Operation

Valve Closed



Valve Open

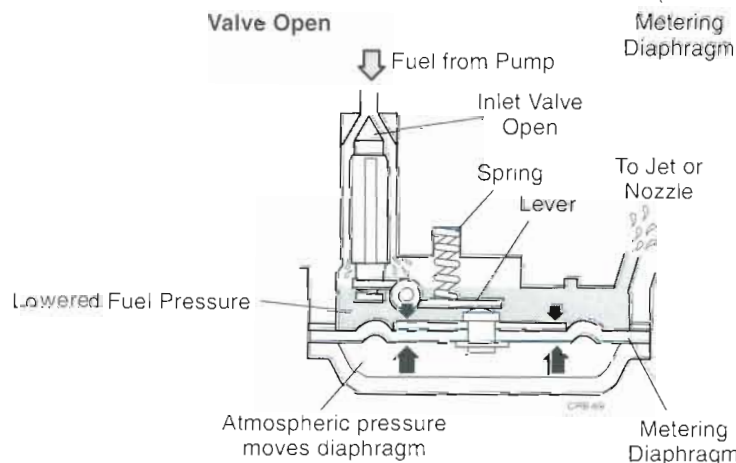


Figure 3.4 Metering Chamber

Basic Adjustments

All Saws

Before attempting any carburetor adjustments or repairs:

- Inspect the air filter, and clean if necessary. (Section 2)
- Inspect the spark arrestor for plugging, and clean if necessary. (Section 9)
- Verify that the fuel filter is clean and that the saw's fuel tank is filled with clean, fresh fuel of the proper octane and mixture (Sections 2 and 14).
- Verify that the chain brake is "off" and that the saw chain is free to rotate. (Section 10)
- Reset carburetor mixture screws to the factory-recommended settings shown in the table (right).



ATTENTION!

- Mixture screw settings affect both the performance and durability of any 2-cycle engine.
- Overtightening either mixture screw can permanently damage the carburetor body!

Walbro HDA and WT Carburetor Adjustments

(except 357, pages 126–127)

Idle Speed Adjustment (except 357)

Figure 3.5

STEP 1. Start the saw and warm the engine to operating temperature.



WARNING!

The saw chain can rotate whenever the saw is started!

STEP 2. Slowly turn the idle speed adjusting screw in or out until the engine idles smoothly at the rpm specified in the table (above).

Low Speed Mixture

(engine idling; at operating temperature)

STEP 1. Using a small screwdriver, slowly turn the idle mixture screw clockwise (lean mixture), and note any changes in engine rpm. Turning the idle mixture screw steadily clockwise should cause engine speed to first increase and then decrease as the mixture becomes leaner.

Basic Carburetor Settings

Model	Idle RPM +/-100	Carb Model	Carb Adjust High/Low	Metering Lever Height
300	3,000	WYM	12-13	.059"
300S	3,000	WYM	12-13	.065"/1.65 mm
360	3,000	WT89	1¼-1½	.065"/1.65 mm
357 ¹	2,800	WT301B	1¼-1½	.065"/1.65 mm
377	3,000	WT229	1¼-1½	.065"/1.65 mm
488	2,800	HDA79	1¼-1½	Level w/body
575	2,800	HDA50	1¼-1½	Level w/body
577	2,800	HDA50A	1¼-1½	Level w/body
680	2,800	HDA29	1¼-1½	Level w/body
695	2,800	HDA29A	1¼-1½	Level w/body
757	2,500	HDA123	1¼-1½	Level w/body

¹ See also Section 13, pages 126–127

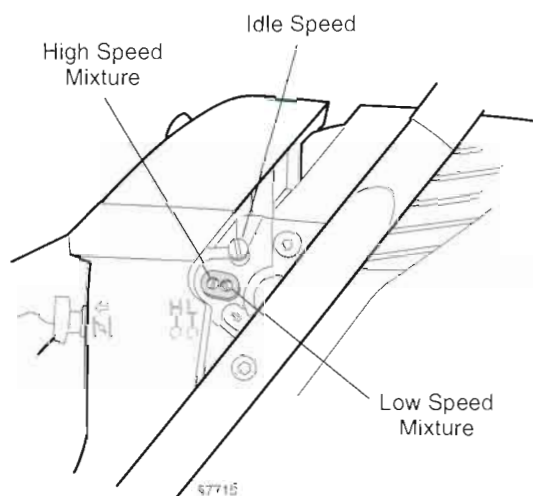


Figure 3.5 Carburetor Adjustment Locations (577 shown)

STEP 2. Note the mixture screw position where engine speed first begins to decrease; this is called the lean drop-off point.

STEP 3. Now turn the idle mixture screw counter-clockwise (rich mixture), and note the point at which engine speed again increases and then just begins to decrease; this is called the rich drop-off point.

STEP 4. Adjust the idle mixture screw to the midway point between the rich and lean drop-off points.

STEP 5. If necessary, readjust the idle speed screw in or out until the engine idles smoothly at the per-model specified rpm.

High Speed Mixture (except 357)

(engine at operating temperature)

STEP 1. Briefly operate the engine at full throttle (no load).



ATTENTION!

Sustained full throttle no-load operation can cause serious engine damage! Never operate any Shindaiwa saw above the maximum rpm limits given in the adjacent Table.

STEP 2. Using a small screwdriver, turn the high speed mixture screw clockwise and then counter-clockwise to find the rich and lean drop-off points at full throttle.

STEP 3. Adjust the high speed mixture screw to the midway point between the rich and lean drop-off points, and note the engine sound at full throttle.

STEP 4. High speed mixture setting is correct when the engine just begins to "stutter" (slightly rich mixture) at full throttle.

STEP 5. Recheck engine idle speed and make sure the engine accelerates smoothly from idle.

■ If the engine appears to "stumble" on acceleration, enrich the idle mixture slightly (counter-clockwise).

■ Recheck and adjust engine idle speed as required.

IMPORTANT!

Adjust the high-speed mixture setting approximately 10% "rich" during engine break-in or when operating with oxygenated fuels.

Recommended Engine Speeds

Model	Idle Speed (± 100)	Maximum RPM
300	3000	13,500
300S	3000	13,500
360	3000	13,000
357	2800	11,500
377	3000	13,500
488	2800	13,500
575	2800	12,000
577	2800	12,000
680	2800	12,000
695	2800	12,500
757	2500	13,000

300 and 300S— Adjusting the WYM

Idle Speed Adjustment (Figure 3.6)

STEP 1. Start the saw and warm the engine to operating temperature.



WARNING!

The saw chain can rotate whenever the saw is started!

STEP 2. Use a screwdriver to turn the idle speed adjustment screw in or out for an engine idle speed of 3000 rpm \pm 100 rpm.

Idle Mixture Adjustments (Fig. 3.7)

The WYM carburetor used on model 300 and 300S saws uses a single nozzle for both high and low speed operation.

- Idle mixture for these saws is adjusted by raising and lowering a threaded low idle needle located in the center of the carburetor's barrel valve.
- High-speed mixture is determined by the size of the replaceable main jet orifice in the carburetor body, and is not otherwise adjustable.

Adjust idle mixture as follows:

STEP 1. Start the saw and warm the engine to operating temperature.

STEP 2. Idle mixture adjustment is made in 1/8-turn increments, and is determined by rotating the low idle needle in and then out to locate a midway position between "lean idle" and "rich idle" operation.

Outright failure of any carburetor is unusual, as most carburetor problems can be traced to debris or other fuel-related problems.

- Carburetor teardown should be performed in a clean and well-lighted area, with all parts contained in a small tray.
- Carburetor components can be easily misplaced or damaged through careless handling or storage. Be aware that variations can exist even within a single carburetor model, so be sure to refer to the appropriate Illustrated Parts List (IPL) during both assembly and disassembly.
- During disassembly, closely examine internal nozzles and passageways for signs of accumulated dirt or debris. Inspect diaphragms and other non-metallic components for possible damage from exposure to stale fuel/fuels with an unusually high alcohol content.

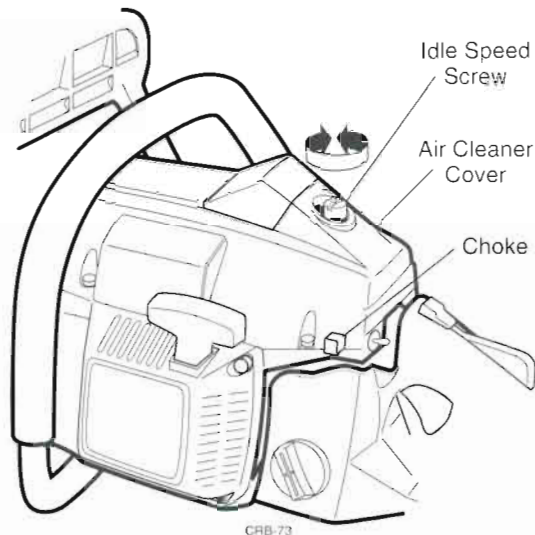


Figure 3.6 300/300S Idle Speed Adjustment

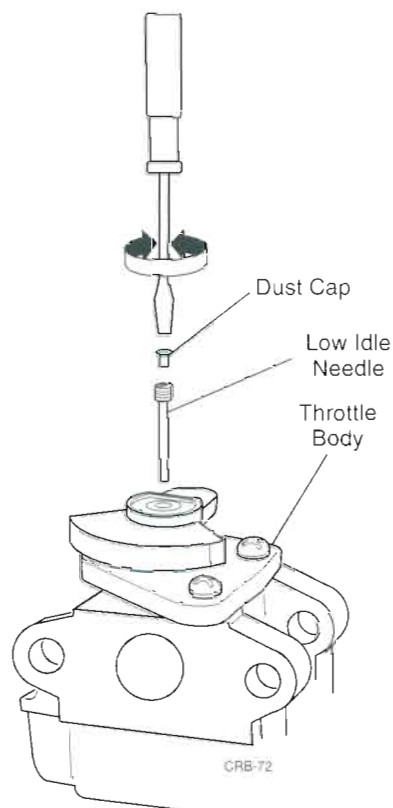


Figure 3.7 300/300S Idle Mixture Adjustment

General Service Notes

(all models)

General Service Notes (continued)

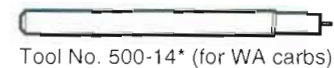
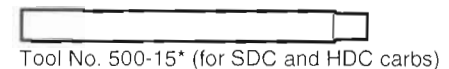
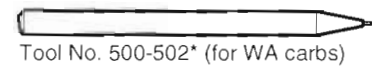
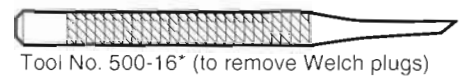
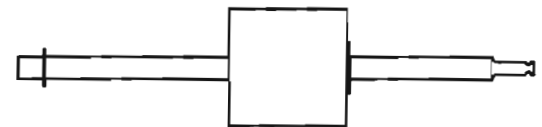
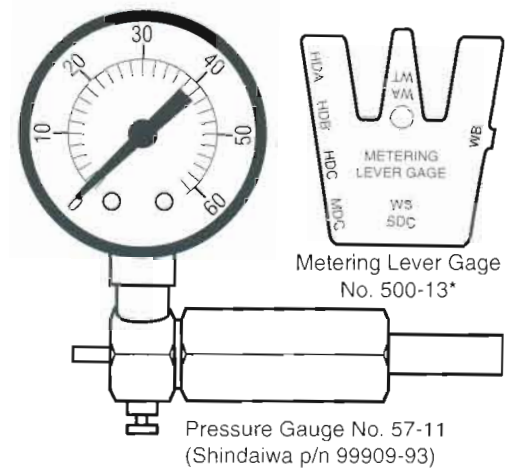
Be alert for stripped threads or adjustments, missing or incorrect parts, or any hidden physical damage.

Finally, beware of possible problems arising from the use of improper tools or service procedures. When a total rebuild is called for, Shindaiwa recommends:

- Walbro p/n 57-11 pressure tester (available as Shindaiwa p/n 99909-93), or equivalent.
- Walbro tool kit p/n 57-500 (Figure 3.8).
- A soft-jawed vise, magnifying glass, and access to compressed air.
- Thoroughly washing the carburetor body in clean solvent before disassembly.
- Total carburetor disassembly to expose all components and fuel circuitry.

IMPORTANT!

Never use scrapers or any metal tool to separate carburetor covers, gaskets, or diaphragms!



CRB-87 * included with Walbro Kit p/n 500-500

Figure 3.8 Walbro Tools

Carburetor Removal

(typical; Figure 3.9)

STEP 1. Remove the air filter cover.

STEP 2. Remove the prefilter (if equipped) and filter, and remove any additional elbows or covers as necessary to gain access to the carburetor.

STEP 3. Carefully remove the fuel line and (where used) impulse tube from the barbed fittings on the carburetor body.

STEP 4. Remove the two carburetor mounting screws.

STEP 5. The carburetor should now be free from the boot or insulator block. While rotating the carburetor body slightly to the right or left as required, disconnect the throttle and choke rods and then remove the carburetor from the saw.

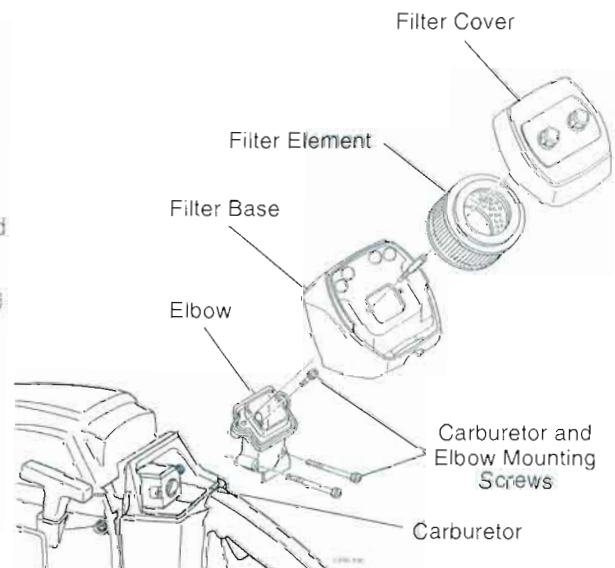


Figure 3.9 Removing the Carburetor (757 shown)

HDA and WT Dissassembly (Figure 3.10)

IMPORTANT!

Components and installation schemes can vary between models. During any carburetor work, always refer to the Illustrated Parts List (IPL) for the specific carburetor at hand!

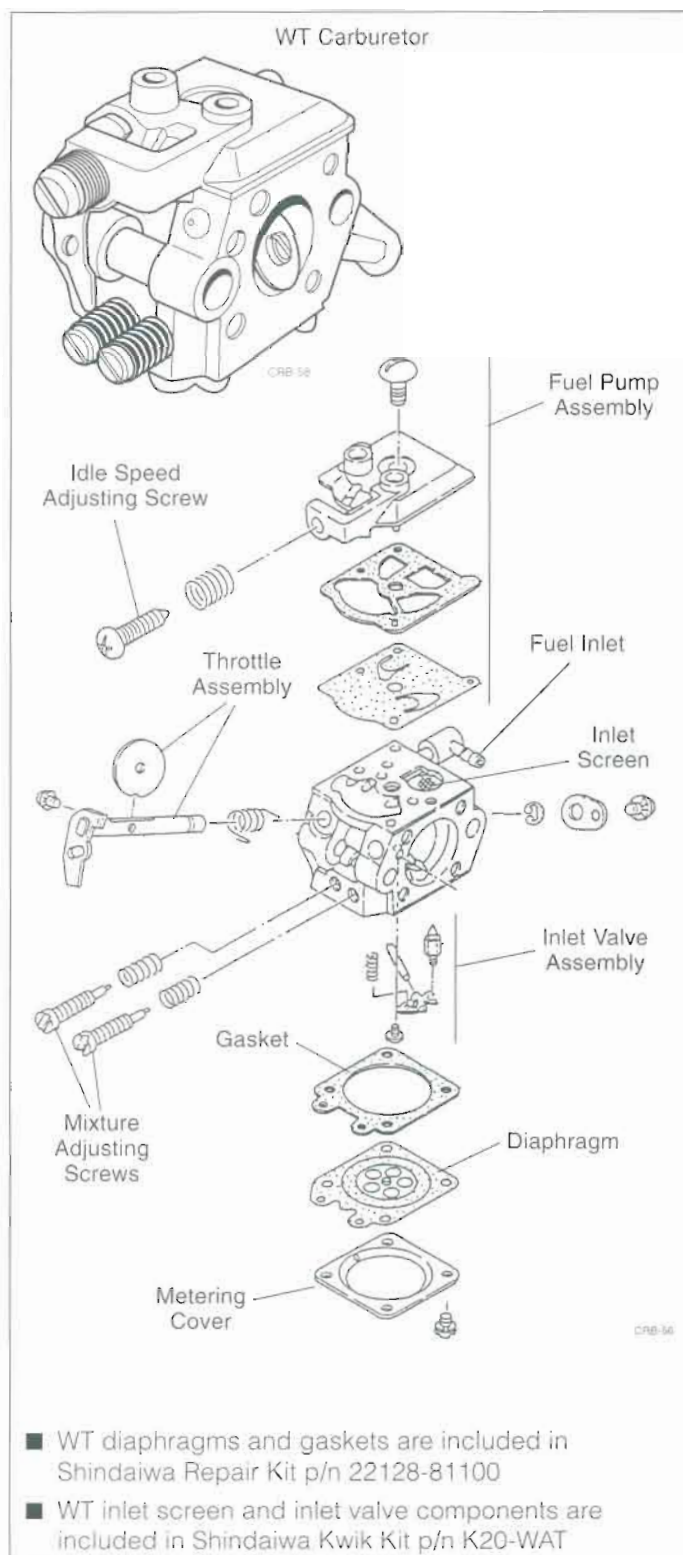
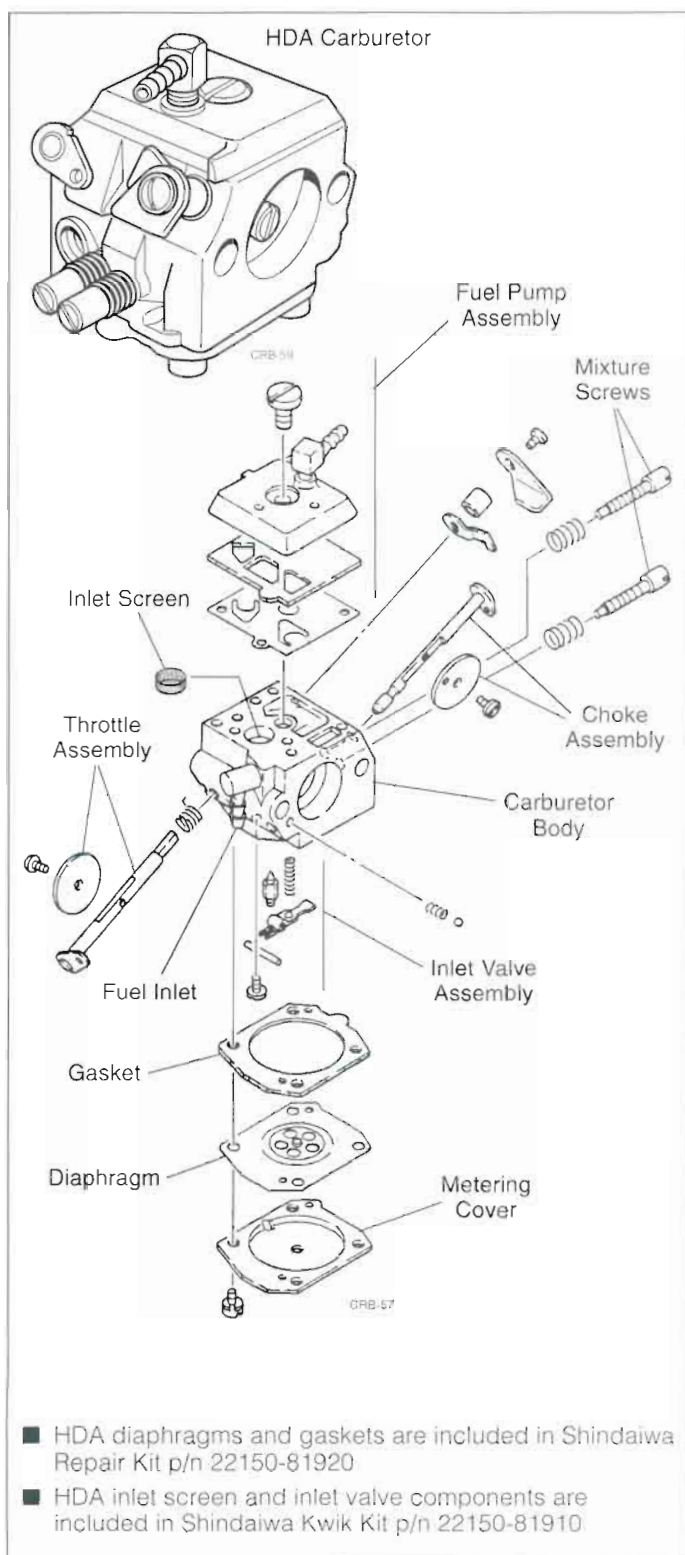


Figure 3.10 HDA and WT Carburetor Components (typical)

HDA and WT Dissassembly (Continued)

Metering System (Figure 3.11)

STEP 1. Unscrew the four metering cover retaining screws, and then remove the metering cover.

STEP 2. Gently peel the metering diaphragm and cover gasket from the carburetor body, exposing the metering lever assembly below.

STEP 3. Loosen the lever retaining screw, and then lift out the metering lever, hinge pin, inlet valve, and spring.

Fuel Pump and Inlet Screen

STEP 1. Turn the carburetor body over, and unscrew the pump cover screw. Remove the pump cover, gaskets and diaphragm (Figure 3.12).

IMPORTANT!:

The pump cover gasket and diaphragms are provided with protruding tabs to aid in proper orientation during reassembly.

STEP 2. Using a small pick, carefully remove the fuel inlet screen from the pump body (Fig. 3.13).

Throttle and Choke Shafts Figure 3.6

Failure of shaft-type throttles and choke controls is rare, but can allow air to leak into the carburetor. When such wear is noted, Shindaiwa recommends carburetor replacement.



ATTENTION!

Do not remove choke shaft and throttle shaft components unless absolutely necessary! When reinstalling shaft-mounted choke or throttle plates, always install new plate retaining screws! Choke plate and throttle plate retaining screws must be firmly "staked" after installation. Failure to properly secure either screw can result in serious engine damage from ingested components (Figure 3.14).



Figure 3.14 Throttle Plate Retaining Screw

Mixture Adjustment Screws

Remove the two tapered mixture screws and springs, and label each screw for later reinstallation in the same hole.

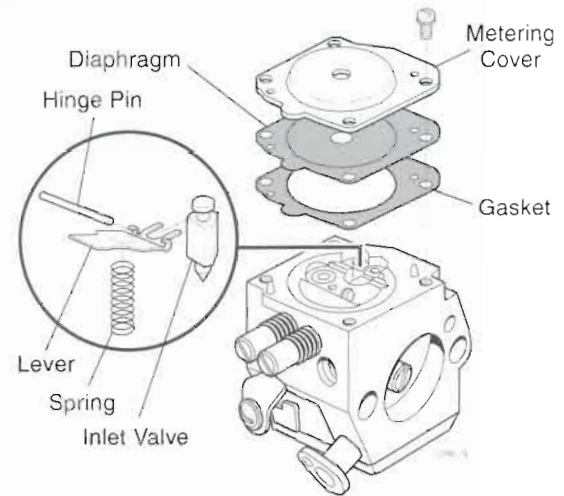


Figure 3.11 Inlet Valve and Diaphragm

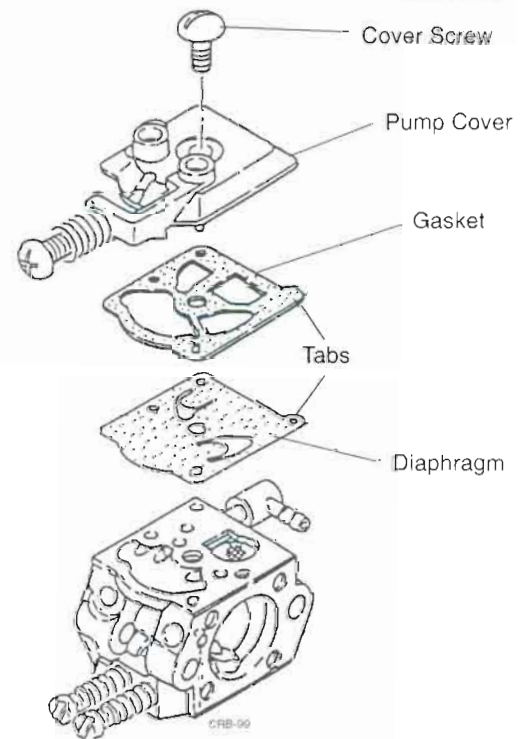


Figure 3.12 Fuel Pump Diaphragm (WT Carburetor)

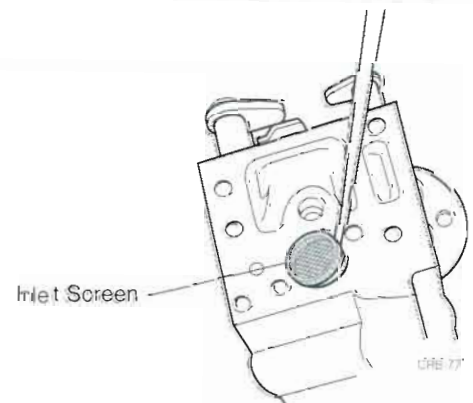


Figure 3.13 Removing the Inlet Screen (HDA shown)

HDA and WT Dissassembly (continued)

Welch and Cup Plug Removal

To expose the idle progression holes, remove the soft metal welch plug from the metering chamber.

Welch Plug. Remove the welch plug by punching a small hole through its center, and then gently pry the plug out as shown in Figure 3.15.

Cup Plug. Using a 4 mm screw or No. 8 bottoming tap, remove the soft metal cup plug from over the main nozzle check valve (Figure 3.16).

Cleaning. Use Stoddard Solvent (or equivalent) to thoroughly clean all components, and then blow dry with not more than 75 psi compressed air.



ATTENTION!

Some dip-type carburetor cleaners are highly caustic and may remove protective coatings and casting fillers from aluminum carburetor parts! Never soak plastic or rubber carburetor parts in dip-type cleaners! Use dip-type carburetors only when absolutely necessary, and for brief periods only!

Idle Progression Holes

Use solvent to thoroughly clean the idle progression holes and related circuitry (Figure 3.17).



ATTENTION!

Never insert drills or other hardened tools into the idle progression holes! The idle holes are factory-drilled to precise tolerances, and can be easily damaged by careless handling.

Main Nozzle Check Valve

The main nozzle check valve may be either:

- A mechanical type (Figure 3.18),
- or,
- A fine-mesh capillary screen (Figure 3.19).

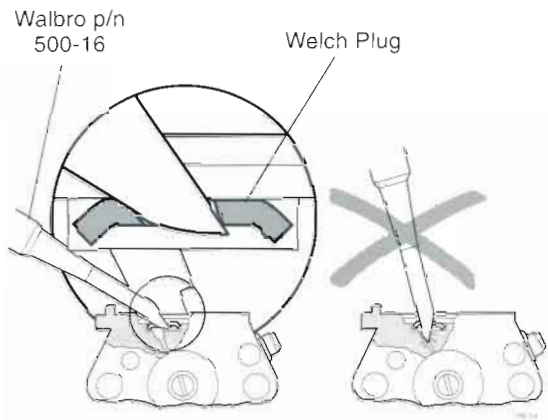


Figure 3.15 Welch Plug Removal

Thread a No. 8 bottoming tap or 4 mm screw into the cup plug, then use pliers to pull the plug straight out from the carburetor body.

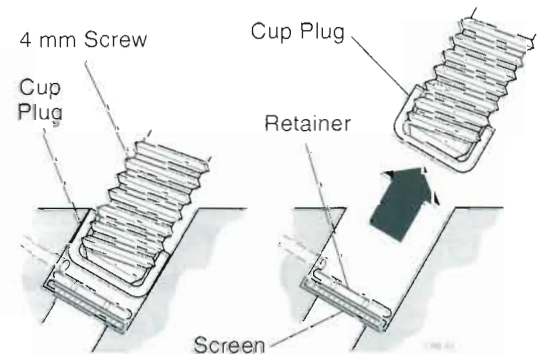


Figure 3.16 Cup Plug Removal

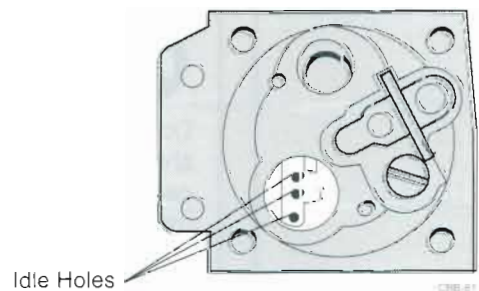


Figure 3.17 Idle Progression Holes

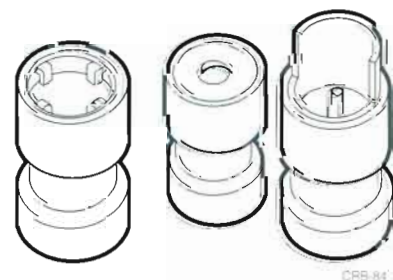


Figure 3.18 Mechanical Check Valves

HDA and WT Dissassembly (continued)

IMPORTANT!

Neither valve type should be removed unless replacement is required. A capillary screen should always be inspected and cleaned of any dirt or other debris.

Inspection

Carefully inspect all components for any signs of damage or wear that might permit air or fuel leakage on reassembly. If the carburetor body itself is worn or damaged beyond serviceability, the entire carburetor will have to be replaced.

Throttle body

- Inspect the throttle body casting for physical damage such as stripped threads, cracks, distortion, damaged nozzles, or other defects.
- Operate the throttle lever by hand. The shaft should rotate smoothly with no side-to-side movement.
- Inspect the fuel inlet fitting for damage, and verify that it is tightly seated in the carburetor body.

Mixture Adjustment Screws

Carefully inspect both mixture adjustment screws for any signs of damage or distortion. Be especially alert for damage to the screw threads or to the tapered adjustment tip, and replace if noted (Figure 3.20).

IMPORTANT!

Distortion or damage to either the taper or screw threads on mixture screws is almost always the result of operator abuse. When such damage is found, similar damage will usually be found in the softer metal of the carburetor body.

Pump Body

- Inspect the pump cover for warpage or other damage, and confirm that the impulse tube fitting (where used) is tightly in place.
- Use a straightedge to check the pump body mating surfaces (Figure 3.21).

Diaphragms

- Inspect the metering and fuel pump diaphragms for hardening or cracking. A stiff or wrinkled diaphragm has likely been damaged by gasoline with a high alcohol content, and must be replaced.

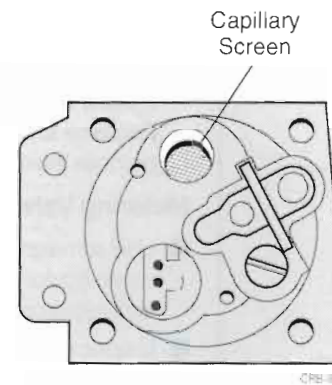


Figure 3.19 Capillary Screen

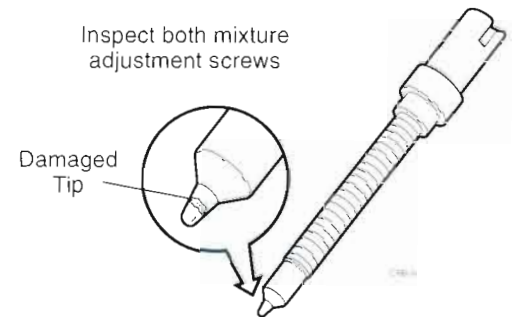


Figure 3.20 Mixture Adjustment Screw

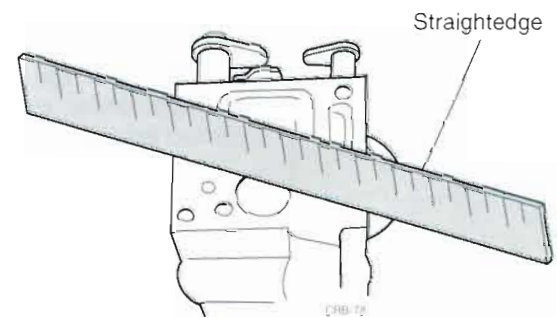


Figure 3.21 Inspecting the Pump Body Mating Surface.

HDA and WT Dissassembly (continued)

Diaphragms (continued)

- Place the individual diaphragms over a lighted flashlight lens or microfiche screen. Replace any diaphragm showing evidence of pinhole leaks or other damage.

Metering Valve

- Use a magnifying glass to inspect the inlet valve tip for signs of measureable wear, and replace if noted (Figure 3.22)
- Inspect the metering lever spring for deformation or other damage, and replace if noted.
- Inspect the metering lever for signs of wear at the forks, hinge-pin, or tip. Replace any lever showing signs of measureable wear (Figure 3.23).

IMPORTANT!

A worn metering lever cannot be properly adjusted, and could cause the saw to run in either a fuel "rich" or fuel "starved" condition! If valve serviceability remains doubtful, reinstall the metering assembly and then pressure-test the carburetor for pop-off and reseal pressures as described on page 34.

Main Nozzle Check Valve

Mechanical check valves can be quickly tested by gently blowing through a small hose inserted in the cup plug bore.

- If the valve is functioning properly, it will permit airflow towards the venturi only.
- If the valve must be replaced, remove the high speed adjustment screw and press or drive the defective valve out through the venturi bore.

Installation of a new valve (available from Walbro) is similar, except that the new valve is installed from the metering chamber.

IMPORTANT!

Capillary screen valves function by maintaining a thin film of fuel over the screen mesh, allowing fuel to pass through the screen but blocking air from entering the carburetor through the main nozzle.

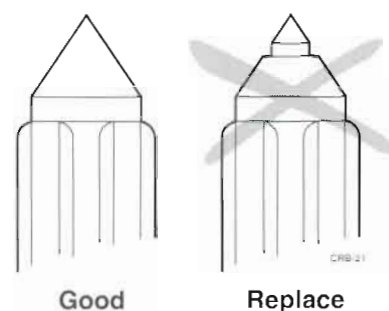


Figure 3.22 Check Inlet Valve Tip for Wear

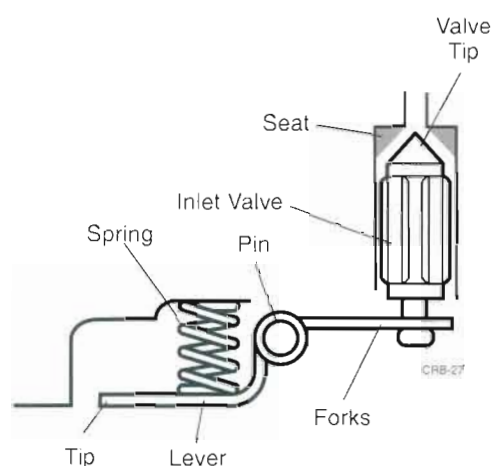


Figure 3.23 Metering Valve Installation

HDA and WT Reassembly

Reassembly is basically the reverse of disassembly, with the following additions or exceptions:

Cup Plug and Screen

When replacing a capillary screen, be especially careful to seat all components to their original depth and orientation! Incorrect installation may block the fuel supply opening to the main nozzle, causing the saw to run in a lean (fuel starved) condition (Figure 3.24).

- Install the capillary screen and retainer in the reverse order of removal.
- Using an appropriate driver, carefully seat a new cup plug p/n 88-119 in the bore above the main nozzle.

IMPORTANT!

Careless cup plug installation can block fuel flowing from the high speed needle! Drive the new cup plug *only* until its upper edge is even with the metering chamber floor!

Welch Plug

- Using Walbro driver p/n 500-15 and a small hammer, install a new welch plug p/n 88-28 as shown in Figure 3.25.

IMPORTANT!

A leaking welch plug may cause an engine to respond poorly to idle mixture adjustments. If necessary, additional sealing can be guaranteed by applying a thin coating of nail polish around the edge of the welch plug installation.

Metering Assembly

- Lightly lubricate the metering valve with fresh fuel mixture, and then install the valve assembly in the reverse order of removal.
- After installing the metering lever assembly, use a straightedge and thickness gauge or use Walbro gauge p/n 500-13 to check for proper metering lever height (Figure 3.26).
- Install the metering lever gasket, diaphragm, and cover, and then install and firmly tighten the four cover screws.

Fuel Pump

Install the fuel pump gaskets and diaphragm in the reverse order of disassembly.

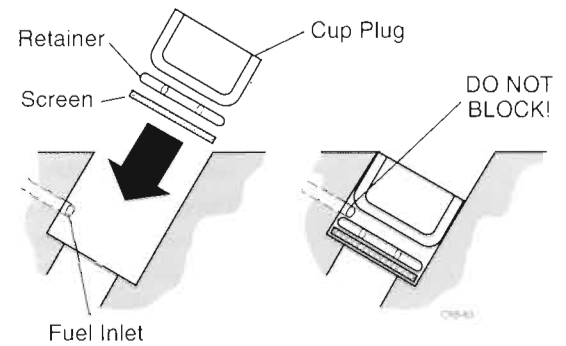


Figure 3.24 Screen and Cup Plug Installation

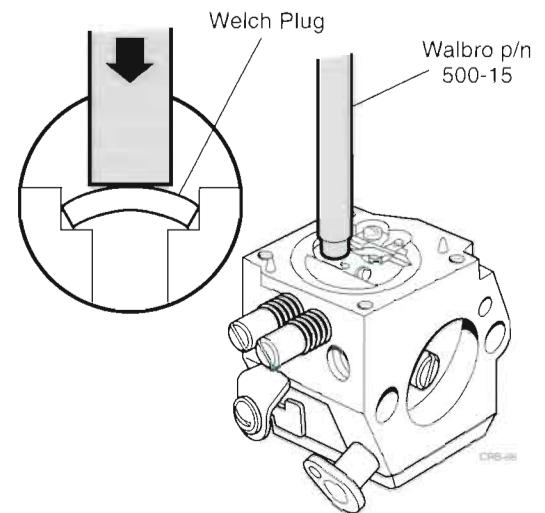


Figure 3.25 Welch Plug Installation

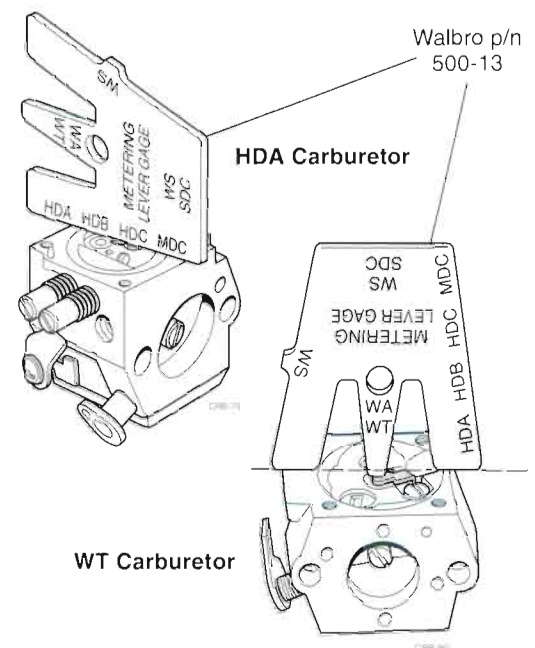


Figure 3.26 Checking Metering Lever Height

HDA and WT Reassembly (continued)

Mixture Screws

- Reinstall the high-speed and low-speed mixture screws and springs.
- Preset each screw to the specifications listed in the table on page 24.
- Pressure test the assembled carburetor for pop-off and reseal values (Figure 3.27). Any carburetor that fails to reseal and hold a pressure of at least 10 psi must be disassembled and inspected for an incorrectly adjusted, dirty, sticking, or otherwise defective metering valve.

IMPORTANT!

The metering valve must reseal and hold a minimum of 10 psi during pressure testing, or the valve may be overcome by fuel pump pressure during operation.

- Install the carburetor on the saw in the reverse order of disassembly.

IMPORTANT!

Do not use gasket sealant to install the insulator block or carburetor gaskets! Gasket sealants are unnecessary, and can plug carburetor passages!

- Install the air cleaner assembly and cover in the reverse of disassembly, and (where used) pay special attention to the correct orientation and seating of the rubber throttle rod grommet (Figure 3.28).

For final adjustment of fuel mixture and idle settings, refer to the procedures described on pages 24-25, and 126-127.

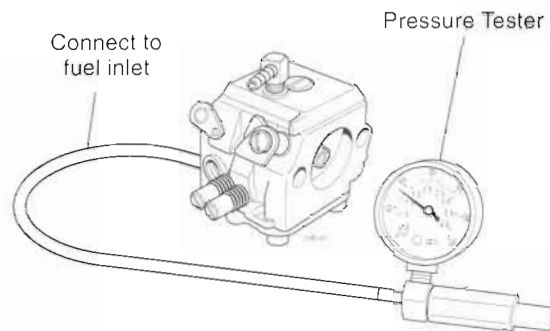


Figure 3.27 Test for Pop-off and Reseat Pressure

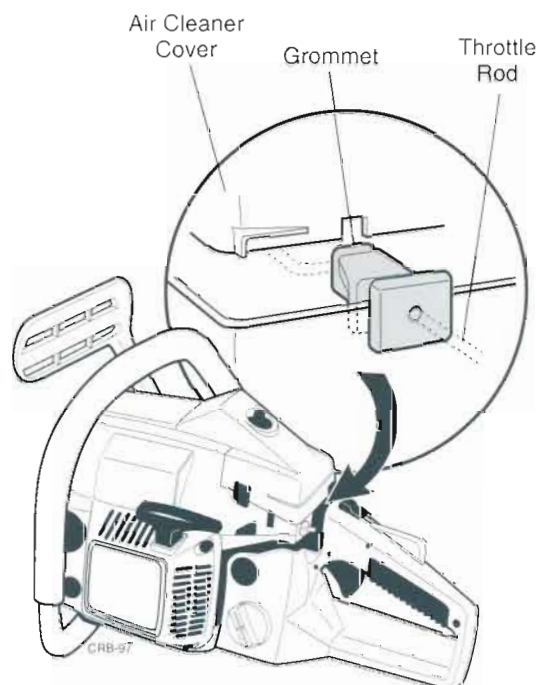


Figure 3.28 Throttle Rod Grommet Orientation

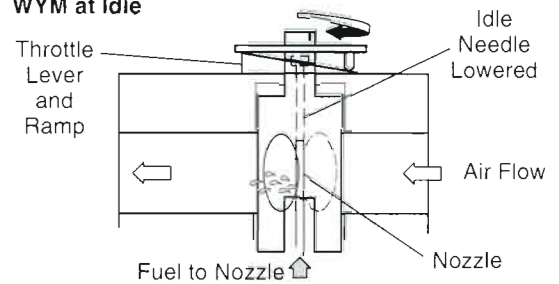
WYM Carburetors

Fuel Flow (Figure 3.29)

Walbro WYM carburetors feature a single fuel nozzle inside an adjustable venturi or barrel valve. Rotating the barrel valve causes more or less of the venturi to be exposed, controlling airflow within the carburetor. The fuel nozzle is located at the center of the airstream in the venturi, allowing nearly instant throttle response at any throttle setting.

- Fuel flow at idle can be adjusted by raising or lowering an "low idle needle" (dotted line in illustration) in the WYM nozzle.
- Fuel flow at or near full throttle setting is determined by the size of a replaceable jet orifice located within the carburetor body, and is not otherwise adjustable.

WYM at Idle



WYM at Wide-open Throttle

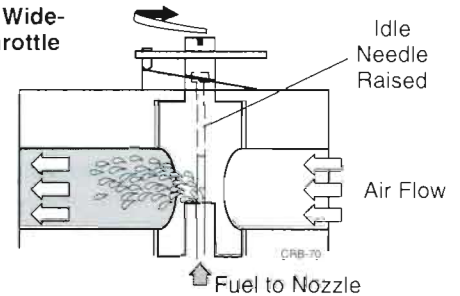


Figure 3.29 WYM Carburetor (Models 300 and 300S)

WYM Barrel Valve Carburetor

Saw Models 300 and 300S (Figure 3.30)

Dissassembly

(Figure 3.31)

- STEP 1.** Unscrew the four metering cover retaining screws, and then remove the metering cover.
- STEP 2.** Gently peel the metering diaphragm from the pump body assembly, and then lift the pump body from the carburetor body.
- STEP 3.** Using a small screwdriver, gently pry the metering lever assembly from the pump body.

IMPORTANT!

The WYM inlet needle valve can be removed for cleaning, but is not available as a separate part number!

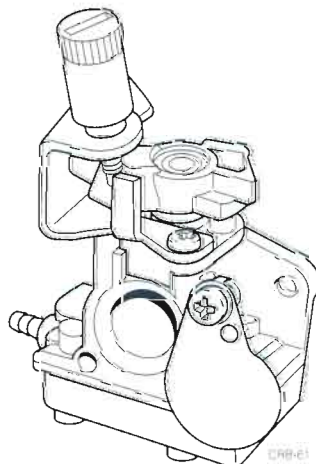


Figure 3.30 The WYM Carburetor

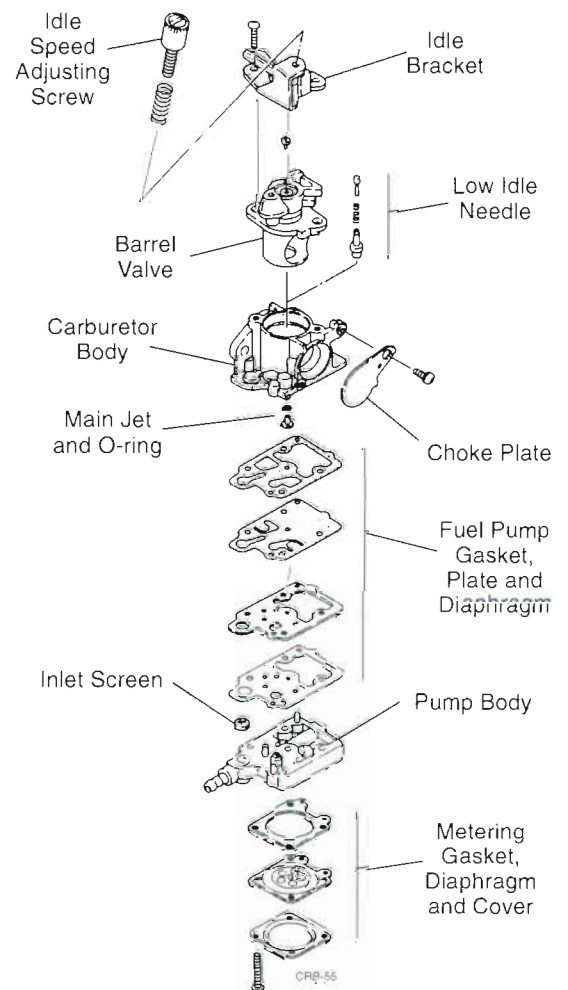


Figure 3.31 WYM Carburetor (typical)

WYM Rotary Valve Carburetor, Disassembly

(continued)

STEP 4. Turn the pump body over, and then remove the pump gasket, diaphragm, plate, and plate gasket.

STEP 5. Using a small pick, carefully remove the fuel inlet screen from the pump body.

STEP 6. Unscrew the choke plate retaining screw from the carburetor body, and then remove the choke plate.

STEP 7. Unscrew the two idle bracket screws, and then remove the bracket assembly from the carburetor body.

IMPORTANT!

Unless the idle adjustment screw is damaged, it does not need to be removed from the bracket assembly.

STEP 8. Lift the barrel valve assembly from the carburetor body.

- Use a fingernail or small screwdriver to pry the plastic plug from the top of the barrel valve.

- Using a small screwdriver, turn the low idle needle counter clockwise to remove.

STEP 9. Using tweezers, carefully remove the inner idle needle and spring from the fuel nozzle in the carburetor body venturi.

STEP 10. Turn the carburetor body over, and use a small screwdriver to pry out the main jet and O-ring (Figure 3.32).

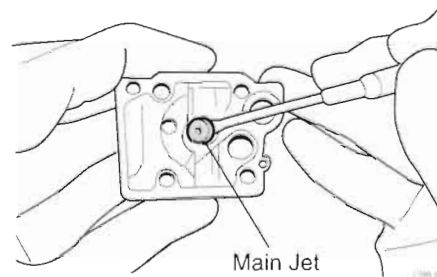


Figure 3.32 Removing the Main Jet and O-ring

The WYM carburetor should now be completely disassembled.

Throttle Body and Nozzle

Inspect the carburetor body casting for physical damage including stripped threads, cracks, distortion, damaged nozzle, or other defects.

- If the carburetor body is worn or damaged beyond serviceability, the entire carburetor will have to be replaced.

Barrel Valve

- Rotate the throttle lever by hand. The barrel valve should raise and lower smoothly with no side-to-side movement.

- Inspect the throttle lever for wear at the throttle cable hole or at the idle adjustment ramp.

Inspect the idle stop screw for damaged threads, and inspect the screw's plastic head for cracking or other damage.

Inspecting the WYM

Main Jet and O-ring

Damage to the main jet is unusual, as the jet can usually be cleaned in solvent and then cleared with compressed air.



ATTENTION!

Never insert drills or other hardened tools into the main jet orifice! The main jet should be cleaned with solvent and compressed air only!

Pump Body

- Inspect the plastic pump body for cracks or other damage, and confirm that the brass fuel inlet fitting is tightly in place in the pump body.
- Use a straightedge to check the pump body mating surfaces (Figure 3.33).

Metering Valve (Figure 3.34 and 3.35)

- Use a magnifying glass to inspect the inlet valve tip.
- Inspect the metering lever for signs of wear at the forks, hinge-pin, or from contact with the diaphragm.
- Inspect the metering lever spring for stretching or other damage, and replace if noted.

If you are unsure of the condition of the metering assembly, reinstall the needle and lever assembly and then reassemble and pressure-test the carburetor for pop-off and reseat pressures as described on page 39.

IMPORTANT!

The WYM metering valve components are supplied only as a complete assembly with pump body p/n 22154-81190.

Diaphragms

- Inspect the metering and fuel pump diaphragms for hardening or cracking, and replace if noted.

IMPORTANT!

A stiff or wrinkled diaphragm has likely been damaged by gasoline with a high alcohol content, and must be replaced.

- Place the individual diaphragms over a lighted flashlight lens or microfiche screen. Replace any diaphragm showing evidence of pinhole leaks or other damage.

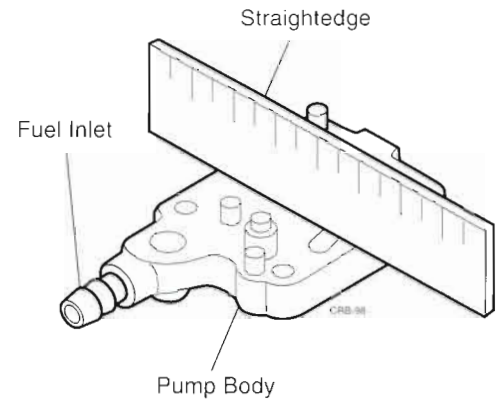


Figure 3.33 Checking the Pump Body Mating Surfaces

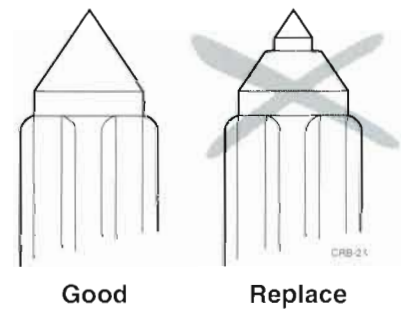


Figure 3.34 Check Inlet Valve Tip for Wear

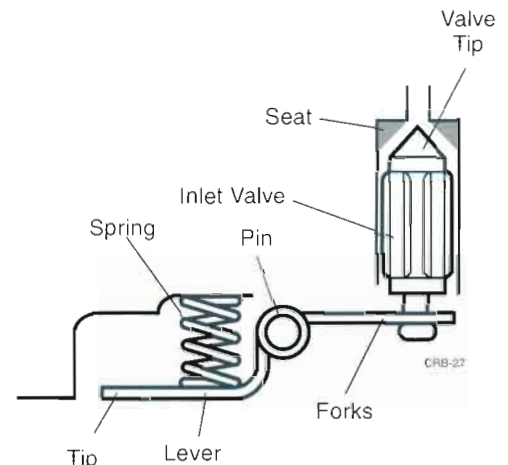


Figure 3.35 Metering Valve Installation

Reassembling the WYM

Fig. 3.36

Reassembly is basically the reverse of disassembly, with the following additions or exceptions:

- Using a clean pencil eraser or Walbro Tool No. 500-15, install a new fuel inlet screen in the pump body.
- Lightly lubricate the metering valve with fresh fuel mixture, and then install the metering valve in the reverse order of disassembly.
- After installing the metering lever assembly, use a straightedge and thickness gauge or use Walbro gauge p/n 500-13 to check for proper metering lever height (Figure 3.37).

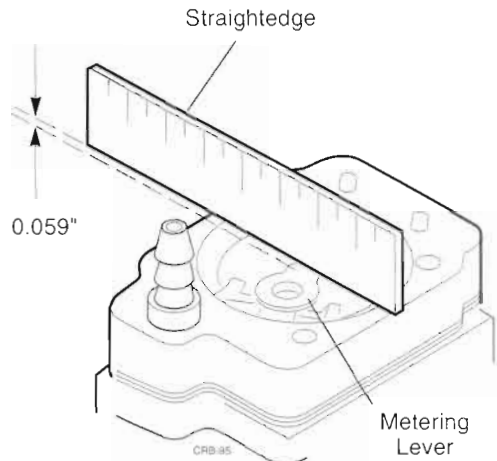


Figure 3.37 Checking Metering Lever Height

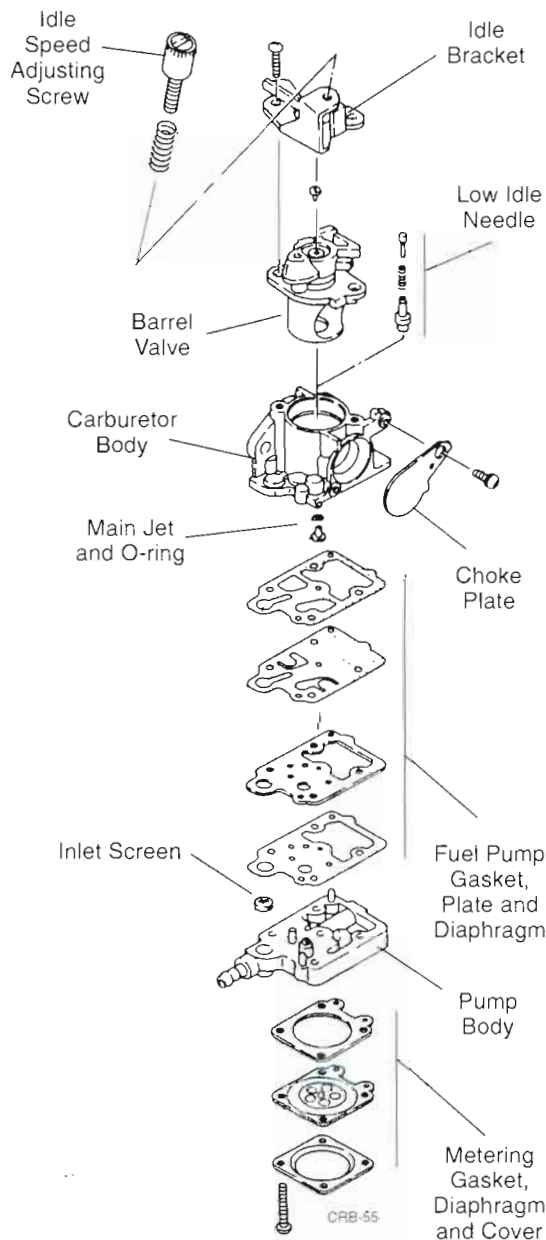


Figure 3.36 The WYM Carburetor

CARBURETORS

- Initial setting of the low idle needle should be 12-13 turns **clockwise** from first thread engagement.
- Pressure test the assembled carburetor for pop-off and reseat values (Figure 3.38). A carburetor that fails to reseat and hold a pressure of at least 10 psi must be disassembled and inspected for an incorrectly adjusted, dirty, sticking, or otherwise defective metering valve.

IMPORTANT!

The metering valve must reseat and hold a minimum of 10 psi during pressure testing! A reseat value of at least 10 psi with no leakage is essential, or the carburetor may flood during operation.

- Install the carburetor on the saw in the reverse order of disassembly. Make sure the impulse passage holes in the gasket align with the impulse hole in the insulator block (Figure 3.39).

IMPORTANT!

Do not use gasket sealant to install the insulator block or carburetor! Gasket sealants can plug the impulse passage, causing the engine to run lean!

- Install the cylinder cover in the reverse of disassembly, and pay special attention to the correct orientation of the rubber sealing grommets for the choke rod and throttle control (Figure 3.40).

For final adjustment of fuel mixture and idle settings, refer to the procedures described on page 26.

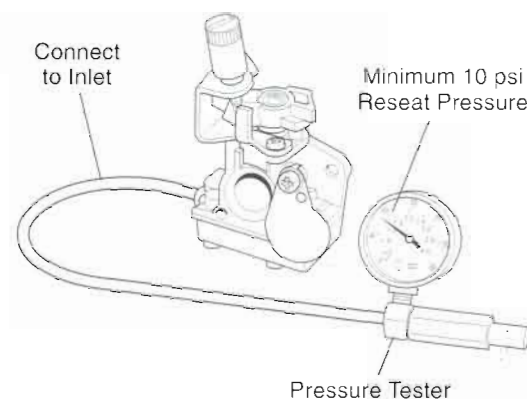


Figure 3.38 Test for Pop-off and Reseat Pressures

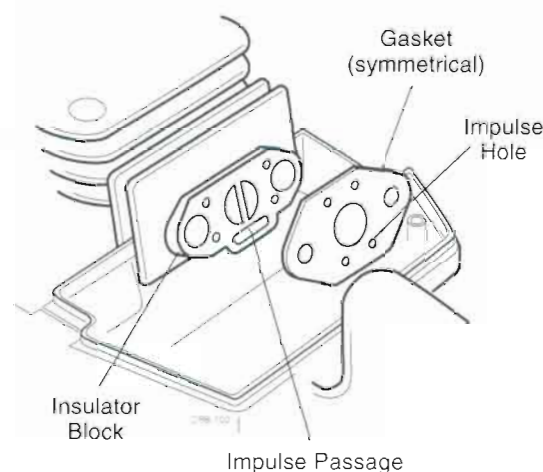


Figure 3.39 Impulse Passage Locations

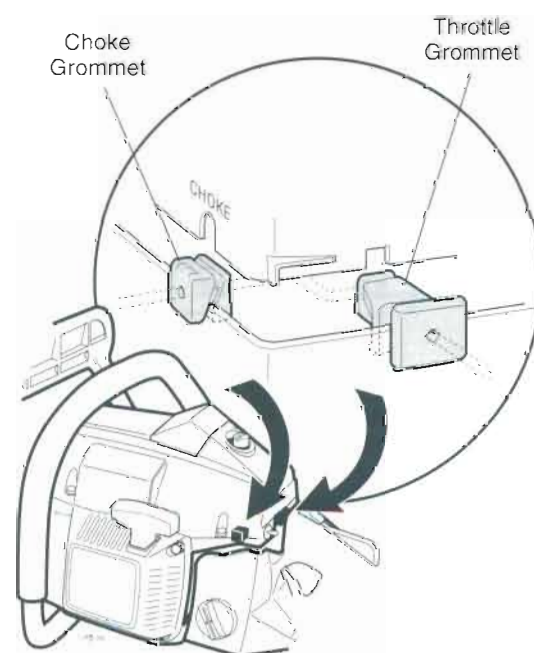


Figure 3.40 Correct Grommet Orientation

Operation

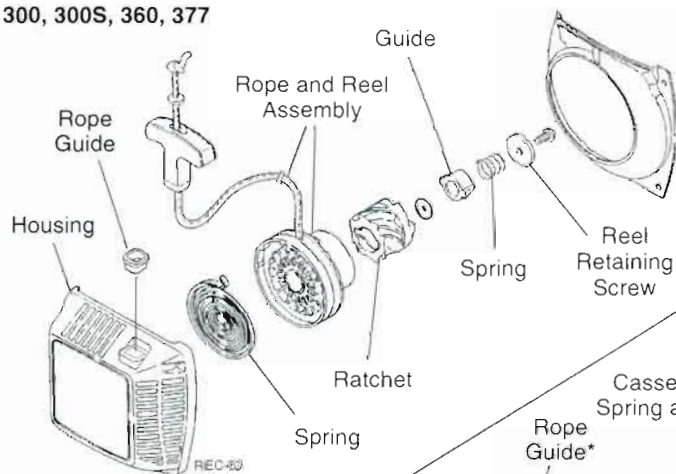
Extending the starter rope rotates the starter reel, winding a recoil spring while simultaneously causing a ratchet to engage and turn the flywheel rotor.

- Releasing the starter rope allows the recoil spring to reverse reel rotation, disengaging the ratchet and rewinding the starter rope on the reel.
- The basic mechanism is extremely durable, and will usually last the life of the saw with only minimal maintenance.

IMPORTANT!

A damaged starting mechanism can usually be traced to a "hard starting" engine. When you encounter a starter with a frayed rope, broken rewind spring, or other mechanical damage, always verify both engine condition and operator starting procedures!

300, 300S, 360, 377



Before ordering or replacing any Shindaiwa recoil starter or related components, always consult the appropriate Illustrated Parts List (IPL).

488, 575, 577, 680, 695, 757

* Rope guide is not replaceable on Models 575, 680, and 695.

357

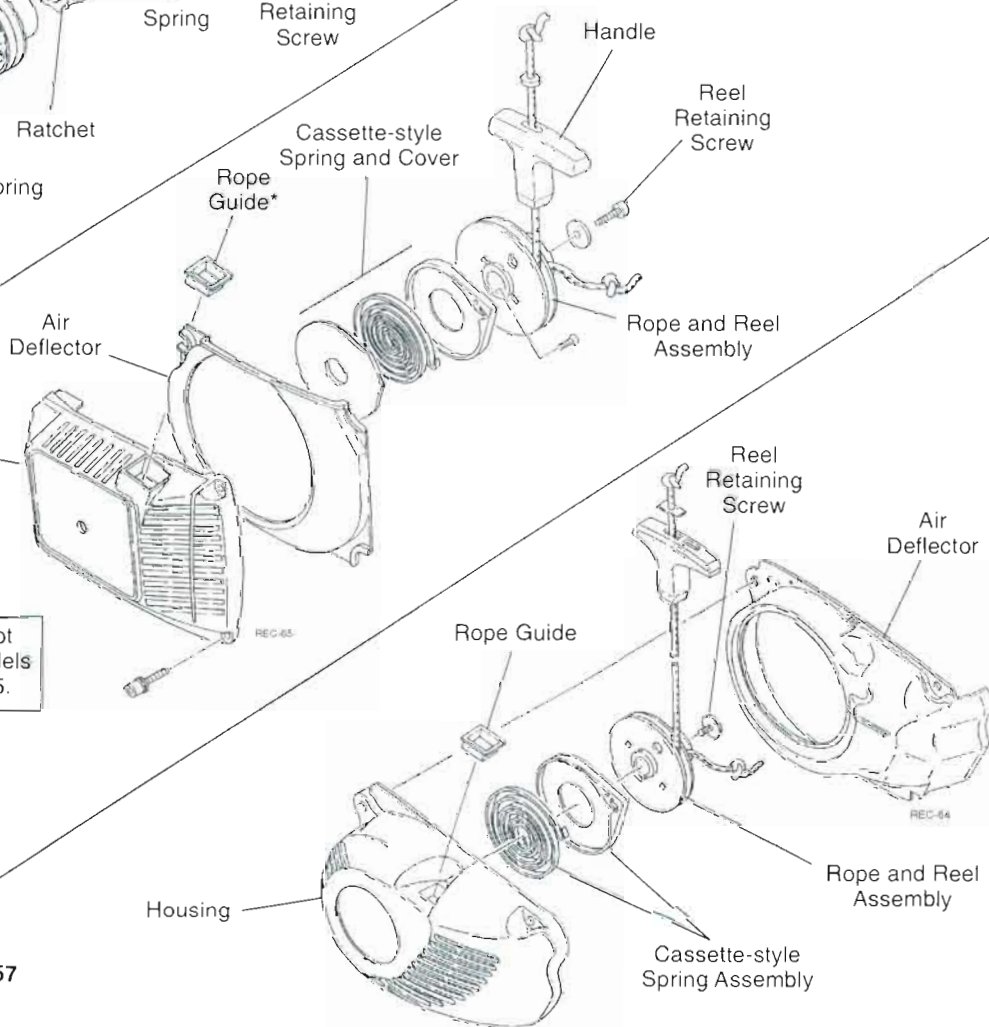


Figure 41 Recoil Starters Used on Shindaiwa Saws

Variations by Model

Recoil starters used on Shindaiwa saws can be divided into the three basic types shown in Figure 4.1.

Although some interchangeability exists between similar starter types, beware of variations in mounting dimensions, cooling intake capacity, or internal specifications.

IMPORTANT!

The p/n 72230-7510 three-bolt starter used on model 680 saws can be replaced with p/n 22152-75100 four-bolt 575/695 starter by using the replacement starter as a guide to drill and tap one additional 5mm mounting screw.

Disassembly

(refer to the exploded views)



WARNING!

Wear eye and face protection when servicing recoil starters! Coiled starter springs contain stored energy that can cause injuries if suddenly released!

Remove the four Allen head screws (three screws used on Model 680) securing the starter housing to the saw body, and then lift the starter assembly from the saw.

Release Spring Tension

Pull approx. 8-10 inches of starter rope from the recoil housing, and then tie a slip knot to prevent the rope from reentering the housing. (Figure 4.2).

- **If the rope is to be replaced:** Cut the rope where it enters the handle. While holding your thumb on the starter reel, untie the slip knot. Using your thumb as a brake, allow the rope to slowly rewind back into the recoil housing.
- **If the rope is to be reused:** Use needle-nose pliers to withdraw the knot from the operator side of the starter handle, and then untie the knot and slide the handle from the rope. While holding your thumb on the starter reel, untie the slip knot. Using your thumb as a brake, allow the rope to slowly rewind back into the recoil housing.

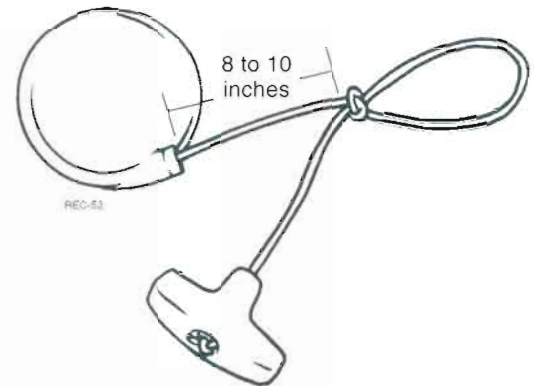
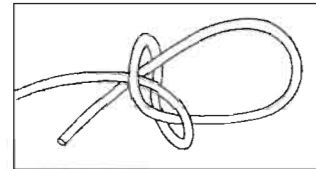


Figure 4.2 Tying the Slip Knot

Disassembly (continued)

Remove the Starter Reel

- Remove the recoil reel retaining screw (counter-clockwise to remove).

IMPORTANT!

The reel retaining screw threads have been coated with ThreeBond™ adhesive. To ease the screw's removal from a cast metal recoil housing, use a heat gun to pre-heat the housing threads to approximately 212°F (100°C).

Models 300, 300S, 357, 360 and 377 remove the starter ratchet mechanism.

- Lift the starter reel from the recoil housing.

Remove the Recoil Spring

- **Models 300, 300S, 360 and 377** Use a needle-nose pliers to remove the recoil spring from the starter reel. (Figure 4.3)
- **Models 357 and 488 through 757** Carefully lift the recoil spring cassette assembly from the recoil housing.

IMPORTANT!

The cassette assembly is available for replacement as a single part number; but the spring itself can be removed for cleaning or inspection by following the same procedure as for Models 300-377 (above).

Remove the Rope Guide

(except Models 575, 680, 695)

If the rope guide is to be replaced, use a small hammer and punch to drive the guide out from the inside of the housing.

Removing the Starter Pawls

(Models 357 through 757; Figure 4.4)

If the pawls or springs are damaged or are being moved to another flywheel, they can be easily removed as follows:

- STEP 1.** Lock the engine crankshaft by inserting a plastic piston stop or length of starter rope into the spark plug hole. (Figure 4.5)
- STEP 2.** Use a 10 mm socket wrench to remove the starter pawl retaining bolts in a counter-clockwise rotation.

IMPORTANT!

Failure of the starter pawls is unusual, and the pawls are not normally removed for inspection purposes.

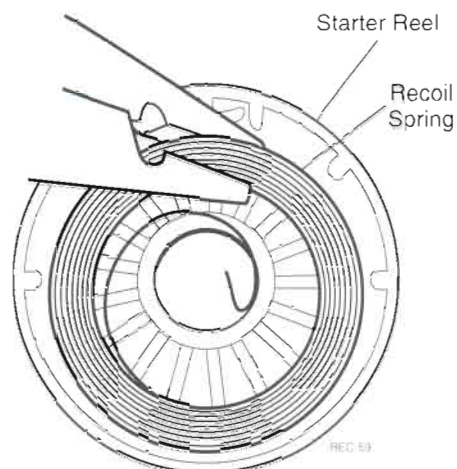


Figure 4.3 Removing the Recoil Spring (300-377)

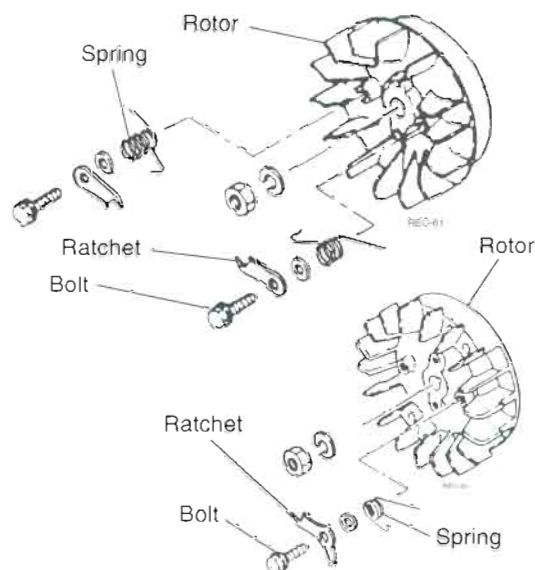


Figure 4.4 Typical Ratchet Installations

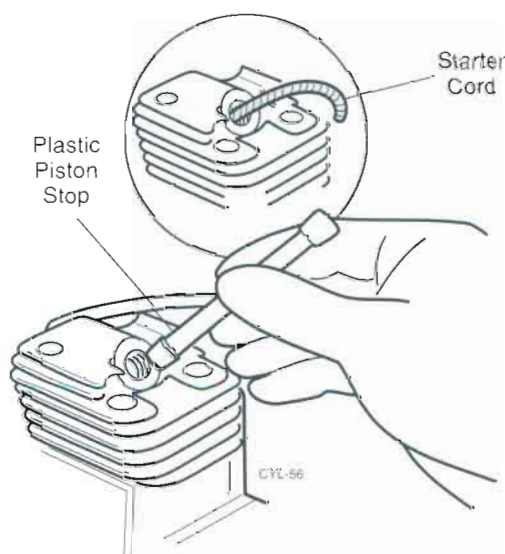


Figure 4.5 Locking the Crankshaft

General Cleaning and Inspection

Use clean solvent to wash all parts except the rope and handle, and blow dry with compressed air.

- Inspect the starter rope for chafing, wear or deterioration, and replace if noted.

IMPORTANT!

Rope length and diameter are critical to both recoil spring life and overall starter performance! If Shindaiwa pre-cut replacement starter rope is not available, refer to the rope replacement chart at right. Shindaiwa rope has controlled stretch and is available in pre-cut lengths to fit specific saw models.

- Inspect the rope guide for roughness or excessive wear, and replace if noted.
- Inspect the recoil spring for bends, cracks, or corrosion, and replace if noted.
- Inspect the recoil housing for damage to the cooling slots, mounting bosses or center post, and also for cracks or other damage.
- Inspect the starter pawls and springs on the rotor, and replace damaged or visibly worn parts as necessary. If in doubt as to serviceability, compare with new parts.

Lubrication

Lubricate the recoil spring and housing center post with a thin film of Shindaiwa Premium Gearcase Lubricant.

Reassembly (typical)

Rope Guide

The Micarta™ guide used on all Shindaiwa nylon recoil assemblies is replaceable, and can be quickly glued in place with several drops of Super Glue™ or similar adhesive (Figure 4.6). The rope guide used on 550, 575, 680 and 695 saws is integral with the metal recoil housing and is therefore not replaceable.

Recoil Spring Installation

Cassette Type

STEP 1. Working from the locking post toward the center of the cassette, install the spring in a counterclockwise direction (Figure 4.7).

STEP 2. Carefully place the assembled cassette face down into the recoil housing.

Replacement Starter Rope for Shindaiwa Saws

Saw Model	Rope Part Number	Length (in./mm)	Diameter (in./mm)
300, 300S, 360, 377	22154-75410	29.5/750	.150/3.8
357	72320-75410	27.5/700	.150/3.8
488	22160-75510	27.5/700	.150/3.8
575, 577, 680, 695, 757	22150-75510	37.4/950	.157/4.0

NOTE: No provision for compression (diameter) or stretch. For minimum stretch and longest service life, always use genuine Shindaiwa replacement starter rope.

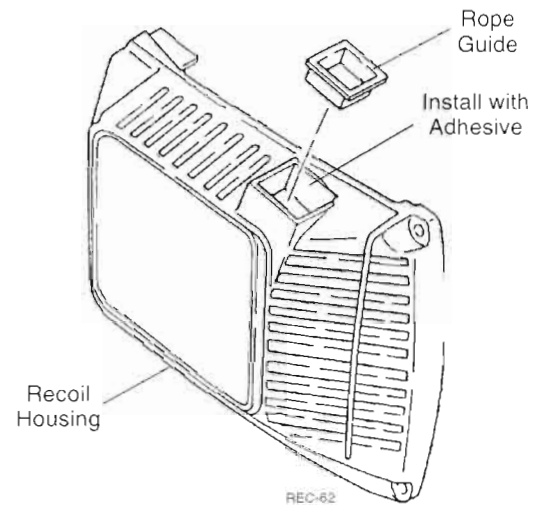


Figure 4.6 Rope Guide Installation

These saw models ...use rope guide

300, 300S, 360, 377, 357	p/n 99909-36077
488, 577, 757	p/n 22169-75230

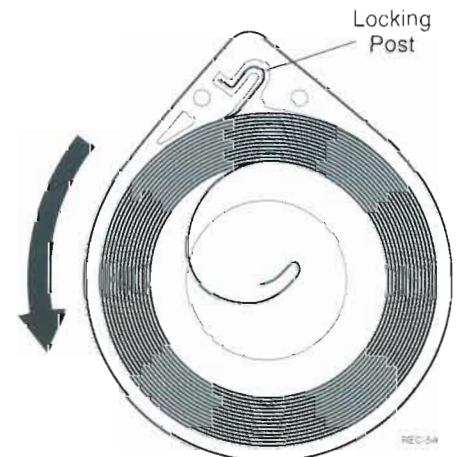


Figure 4.7 Cassette Type Spring Installation

Reassembly

(typical,
continued)

Install the Cord**Install the Reel****Retainer Type**

STEP 1. Engage the recoil springs's outer hook with the locking post on the starter reel (Figure 4.8).

STEP 2. Install the spring in a clockwise direction, working toward the center of the reel.

STEP 1. Tie a stopper knot at one end of the starter rope (Figure 4.9).

STEP 2. Wind the rope on the reel in the reverse order of removal, but leave the last 6-8 inches of rope exposed and hanging from the reel notch as shown in Figure 4.10.

STEP 1. Install the reel onto the recoil housing. During installation, slowly rotate the reel in a clockwise rotation until you feel it engage the recoil return spring.

STEP 2. While holding 6 to 8 inches of exposed starter rope in the reel notch, wind the reel 2-3 turns **clockwise**.

STEP 3. While holding the reel in place with your thumb, pull the starter rope from the reel notch and then thread the rope through the rope guide in the reverse order of disassembly. To prevent the rope from rewinding into the housing, tie a slip knot in the rope where it exits the rope guide. (Figure 4.11)

STEP 4. Working in the reverse order of removal, replace any additional components removed from the recoil center post. Before moving to Step 3, verify that the reel is properly "seated" in the housing.

STEP 5. Install and hand-tighten the reel retaining screw. If tightening the retaining screw causes the reel to bind, remove the reel and make sure all parts are installed in the correct order.

IMPORTANT!

The reel retaining screw p/n 20035-75170 used on saw models 300 through 377 is precoated with ThreeBond™ liquid screw lock and should always be replaced during starter overhaul. When overhauling starters on saw models 488 through 757, apply ThreeBond™ p/n 1401 Liquid Screw Lock or similar adhesive to the reel retaining screw during final assembly.

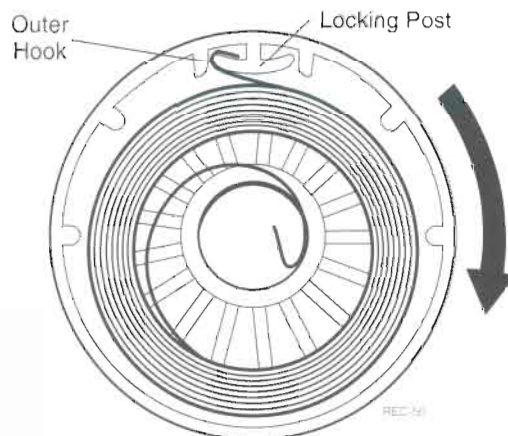
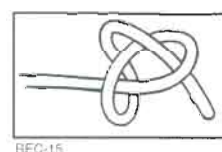


Figure 4.8 Retainer-type Spring Installation



Use a stopper knot to install the rope in the reel

Figure 4.9 Tying the Stopper Knot

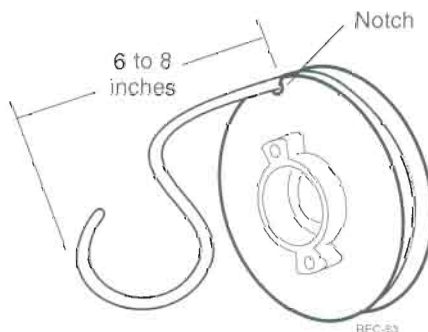


Figure 4.10 Starter Rope Installation



Figure 4.11 Use of Slip Knot

STEP 6. Thread the handle and stop washer onto the starter rope in the reverse order of removal, and tie a stopper knot to lock the handle on the rope. Figure 4.12.

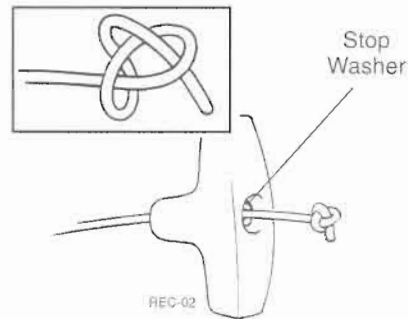


Figure 4.12 Tying the Stopper Knot

Testing Spring Tension

STEP 1. Remove the slip knot, and allow the recoil spring to fully retract the starter rope.

STEP 2. While holding the recoil assembly in one hand, grasp the starter handle and fully extend the starter rope.

- With the rope fully extended, you should still be able to wind the reel an additional 1/2 to 3/4 turn by hand.
- When the handle is released, the rope should retract fully and hold the starter handle tightly against the recoil housing.

STEP 3. If the starter rope fails to extend or retract properly as above, repeat the previous steps 3-5 to adjust recoil spring tension accordingly.

IMPORTANT!

A rope that still fails to fully retract is usually the result of using bulk starter rope of the wrong diameter or that has stretched or was cut over-length.

Replace the Starter Pawls (Models 357 through 757)

STEP 1. Coat the starter pawl bolt threads with Three Bond™ p/n 1401 Liquid Screw Lock, and then install the starter pawls, springs, and bolts in the reverse order of removal.

STEP 2. Use a suitable piston stop to lock the flywheel (page 42), and then firmly tighten both starter pawl bolts.

Install the Recoil

STEP 1. Position the recoil on the saw powerhead. If the recoil fails to engage the flywheel, pull the starter rope slowly while holding the recoil in position.

STEP 2. While holding the starter on the saw, gently pull the starter rope to test for proper ratchet engagement.

STEP 3. Coat the recoil mounting screws with Three Bond™ p/n 1401 Liquid Screw Lock, and then install and firmly tighten all mounting screws.

IMPORTANT!

Recoil mounting screws for saw model 357 are of a special serrated design (for use in nylon), and should be installed dry.

Testing (Figure 4.13)

Verify proper starter engagement and retraction as follows:

STEP 1. Switch the saw ignition to "off."

STEP 2. Grasp the starter handle and slowly pull the rope to its full length.

STEP 3. While holding the starter handle, allow the rope to fully retract into the recoil housing.

- If the starter fails to engage, make sure the starter pawls and springs are properly installed and can move freely. On models 300 through 377, verify that the recoil ratchet mechanism is extending when the starter rope is pulled.

- If the starter binds on either extension or retraction, remove the starter and check for possible incorrect rope assembly.



Figure 4.13 Testing the Starter

Section 5 Ignition Systems

Construction

(Figure 5.1)

All current model Shindaiwa saws feature solid-state magneto systems with electronically controlled spark advance.

- Smaller saw models utilize transistor "TCI" switching circuitry to directly control magneto primary current.
- Larger saw models use capacitive-discharge "CDI" ignitions, storing peak magneto voltages in a large capacitor for later discharge through a conventional spark coil.

All systems are fully transistorized, with solid-state components completely sealed and protected from the elements by an elastomeric "potting" compound.

- Operating temperatures for all systems are maintained by cooling air drawn from fins on the engine's flywheel.
- Spark timing for all saws is determined by rpm-dependent changes in internal system voltages.
- With no breaker points or other mechanical systems to wear or go out of adjustment, a Shindaiwa solid-state ignition will often outlast the equipment it's installed on.

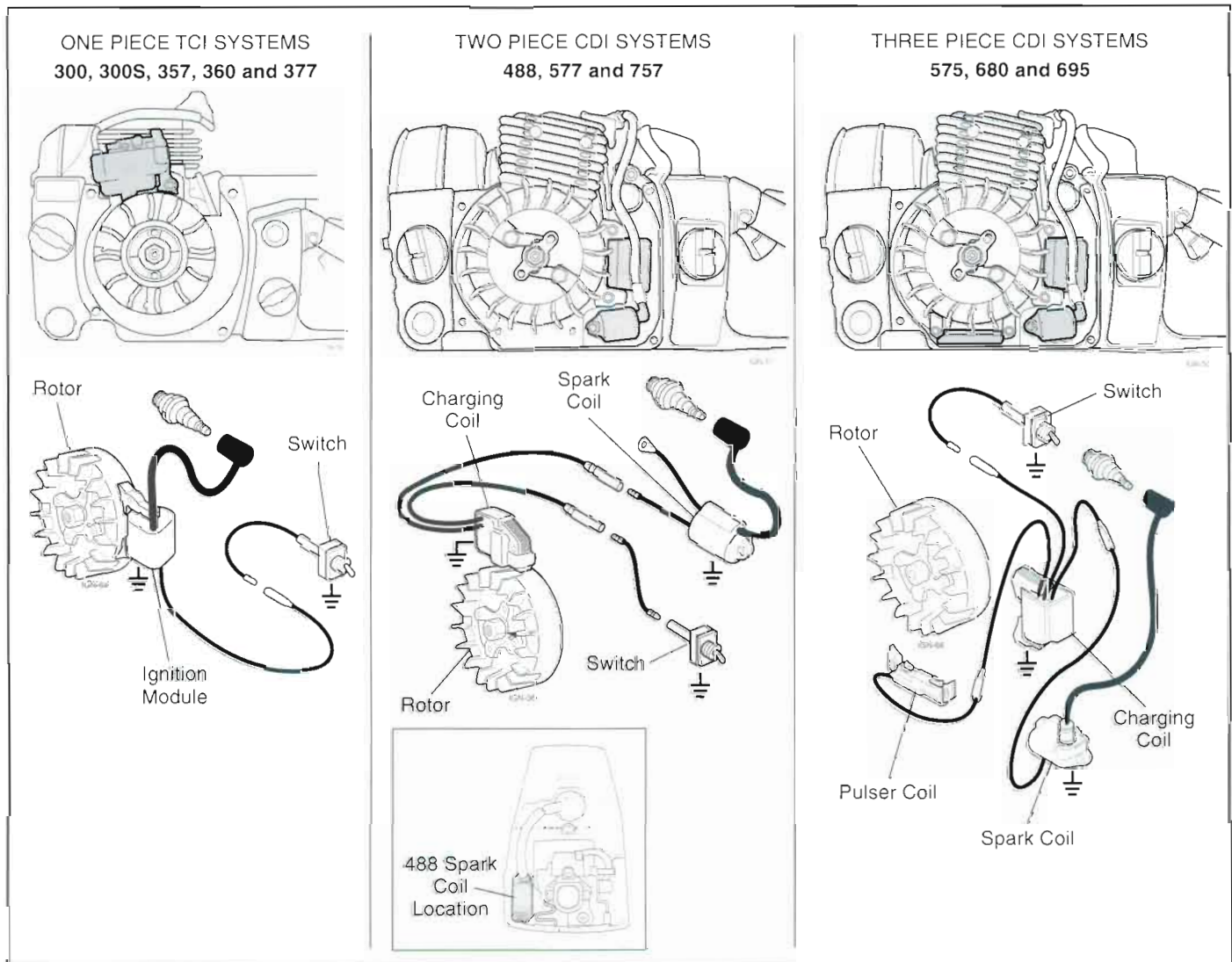


Figure 5.1 Ignition Systems Used on Shindaiwa Chain Saws

Theory of Operation:TCI

Models 300, 300S, 360, 357, 377 (Figure 5.2)

The TCI (transistor controlled ignition) operates as a normally-closed grounding switch that allows current to flow through the magneto primary windings whenever the moving flywheel magnets approach the coil.

1. When the TCI is closed, current flows and approximately 200 volts is generated in the magneto primary windings.
2. Current flow in the primary windings creates a powerful magnetic field around the entire magneto coil.
3. The TCI switches off at a preset current level, breaking the circuit and causing the magnetic field to collapse suddenly.
4. The rapidly moving magnetic field induces a voltage in the secondary windings, and voltage rises until it can jump the spark plug gap and complete the circuit to ground.

IMPORTANT!

Ignition shutdown is accomplished by closing a switch to physically ground the primary coil windings.

Ignition Part Numbers by Application

Model	Coil Assembly (modular 1-piece)	Exciter Coil	Ignition Coil (spark coil)	Pulser Coil
300	20024-71610	n/a	n/a	n/a
300S	20024-71610	n/a	n/a	n/a
360	20024-71610	n/a	n/a	n/a
377	20024-71610	n/a	n/a	n/a
357T	72320-71600	n/a	n/a	n/a
488	n/a	22160-71510	22160-71700	n/a
575	n/a	22155-71500	22150-71700	22155-71600
577	n/a	22169-71510	22150-71700	n/a
680	n/a	22150-71510	22150-71700	22150-71610
695	n/a	22155-71500	22150-71700	22155-71600
757	n/a	22169-71510	22169-71700	n/a

n/a = not applicable

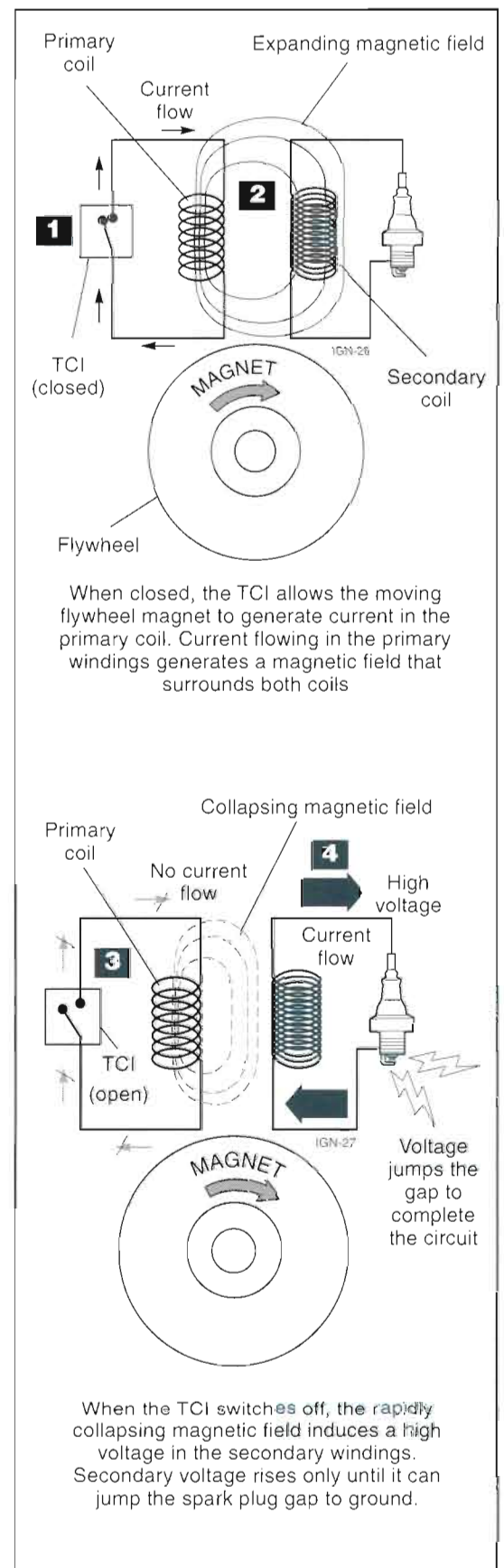


Figure 5.2 TCI Ignition Operation

Theory of

Operation: CDI

488,575,577,680,
695,757
(Figure 5.3)

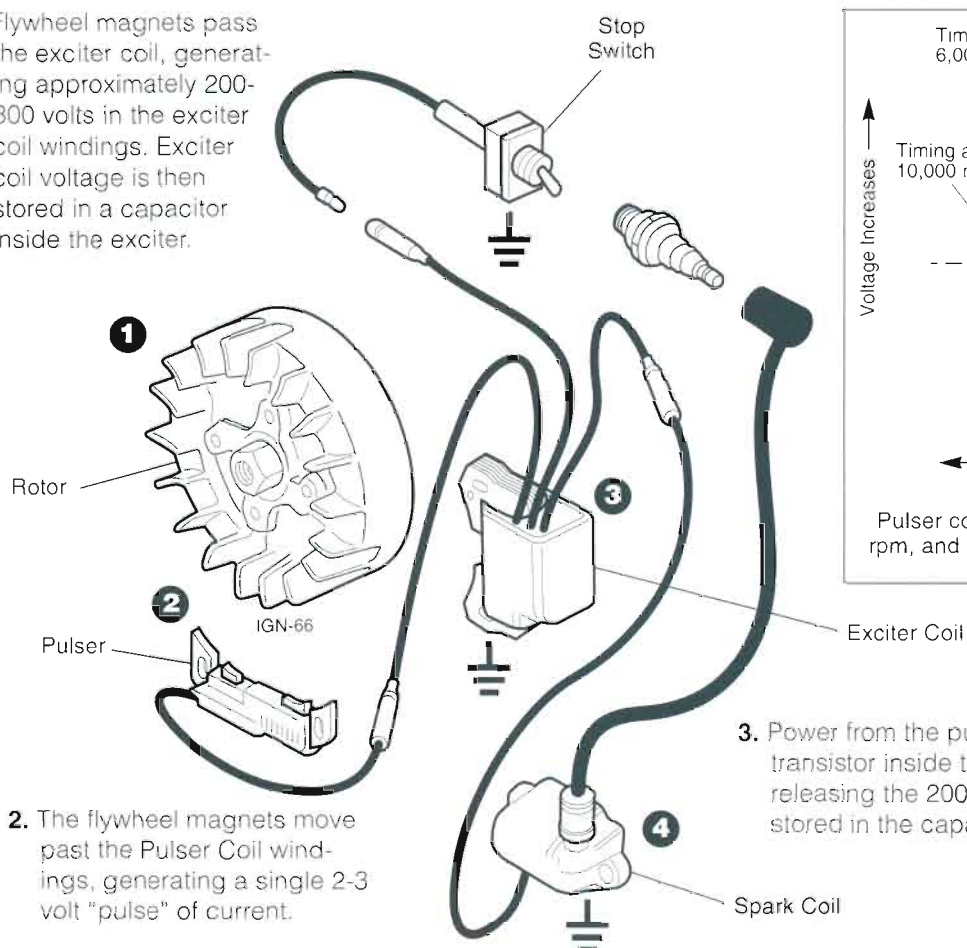
For larger high-performance saws, Shindaiwa uses a CDI (Capacitive Discharge Ignition) system. The CDI system provides a hotter and more precisely timed spark by temporarily storing peak primary coil voltages inside a large capacitor.

Using a switching transistor controlled by a flywheel-driven pulser coil, stored primary voltages can then be delivered to a conventional spark coil as a single pulse of very high intensity.

IMPORTANT!

Shindaiwa CDI ignitions can produce voltages as high as 25,000 volts or more, although a properly gapped spark plug may require only 7000-8000 volts to fire at cranking speeds.

1. Flywheel magnets pass the exciter coil, generating approximately 200-300 volts in the exciter coil windings. Exciter coil voltage is then stored in a capacitor inside the exciter.



2. The flywheel magnets move past the Pulser Coil windings, generating a single 2-3 volt "pulse" of current.

3. Power from the pulser switches a transistor inside the Exciter to "ON", releasing the 200-300 volt pulse stored in the capacitor during Step 1.

4. The 200-300 volts released from the capacitor now enters the spark coil, and is multiplied into the high-voltage pulse needed to bridge the spark plug gap.

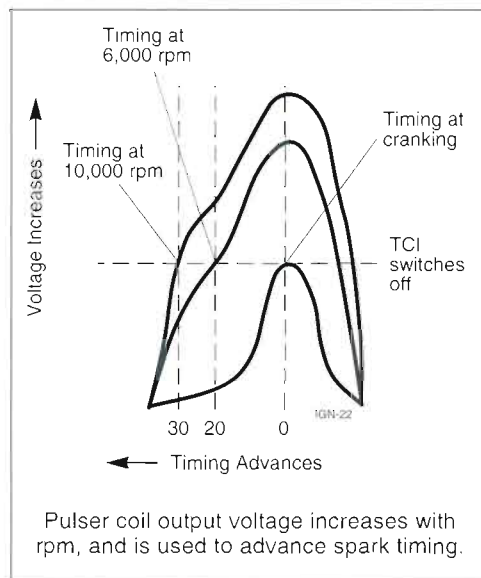


Figure 5.3 Operation of the CDI Ignition System (three-piece shown)

Basic Troubleshooting

Most ignition failures can be traced to a single component or connection. The goal of basic troubleshooting is to quickly perform a "pass-fail" diagnosis on all wiring and connections, and to evaluate ignition components that can be accurately tested with a minimum of equipment.

The following procedures can be used on any Shindaiwa saw. Basic ignition troubleshooting requires a reliable ohmmeter, an adjustable-gap spark tester (Figure 5.4), and a systematic approach to the problem at hand.

IMPORTANT!

Most ignition troubleshooting can be completed in five minutes or less, and can be performed without disassembling the saw.

The Spark Plug

Remove and inspect the spark plug for proper size, gap, and condition (refer to the accompanying Table). A plug with a worn, damaged, or improperly gapped electrode will require a higher firing voltage and will "cut out" under load whenever its required voltage approaches the maximum voltage available from the ignition system (Figure 5.5).



ATTENTION!

Spark plug heat range and dimensions are critical to the performance and lifespan of any gasoline engine! Installing a plug with a heat range higher than specified may cause pre-ignition, and can shorten engine life drastically! Always verify the correct plug is installed!

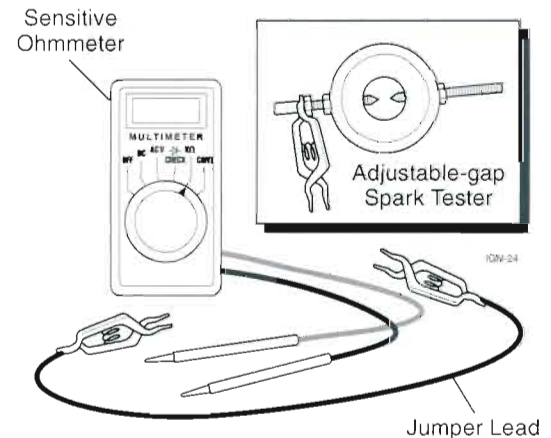
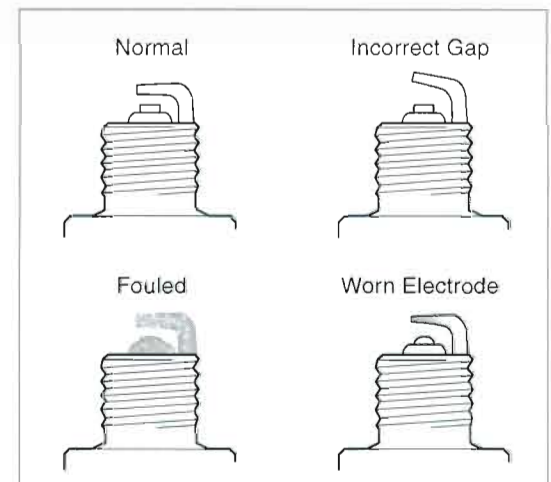


Figure 5.4 Essential Tools



IGN-28

Figure 5.5 Spark Plug Troubleshooting

Model	Spark Plug (Champion /NGK)	Spark Plug Gap (in./mm)	Exciter Coil Air Gap (in.)	Pulser Coil Air Gap (in.)
300	CJ8Y/BPM6A	.024/.6	.018-.020	n/a
300S	CJ8Y/BPM6A	.024/.6	.018-.020	n/a
360	CJ6Y/BPM7A	.024/.6	.018-.020	n/a
377	CJ6Y/BPM7A	.024/.6	.018-.020	n/a
357T	CJ6Y/BPM7A	.024/.6	.012-.014	n/a
488	CJ6Y/BPM7A	.024/.6	.012-.014	n/a
575	CJ6Y/BPM7A	.024/.6	.018-.020	.018-.020
577	CJ6Y/BPM7A	.024/.6	.018	n/a
680	CJ6Y/BPM7A	.024/.6	.012-.014	.012-.014
695	CJ6Y/BPM7A	.024/.6	.018-.020	.018-.020
757	CJ6Y/BPM7A	.024/.6	.020	n/a

n/a = not applicable

Ignition System Tests

STEP 1.

Test with an adjustable-gap spark tester

Remove the spark plug and install the adjustable-gap tester (Figure 5.6). Turn the ignition switch to the "run" position, and crank the engine vigorously.

- To simulate the higher voltage requirements of a spark plug firing under compression, test for spark at several settings out to approximately 1/4".
- If a previously "dead" ignition produces a strong bluish spark at the tester, the saw's spark plug is internally shorted and must be replaced.
- If there's no spark at the tester, or if the spark is weak, yellow-orange in color, or seems to fire only occasionally, move on to Step 2.

STEP 2.

Test the ignition stop switch

Test the ignition "stop" switch by disconnecting it and then retesting for spark as in Step 1.

- If a spark now appears or is stronger with the ignition switch disconnected, set the ohmmeter to "low ohms" and then test the stop switch for internal grounding.

IMPORTANT!

This test must show "∞" (open circuit) whenever the switch is in the "run" position.

STEP 3.

Inspect wiring and connections

Inspect the entire ignition system for broken wires or connections. Clean and tighten all connectors and ground connections and then retest for spark as in Step 1.

- If a steady blue spark now appears with each rotation of the flywheel, consider removing and cleaning all metal-to-metal grounding connections.

IMPORTANT!

Many ignition problems are caused by nothing more than faulty or corroded wiring or ground connections. Industry-wide, over 50% of all ignition components returned for warranty have nothing wrong with them internally.

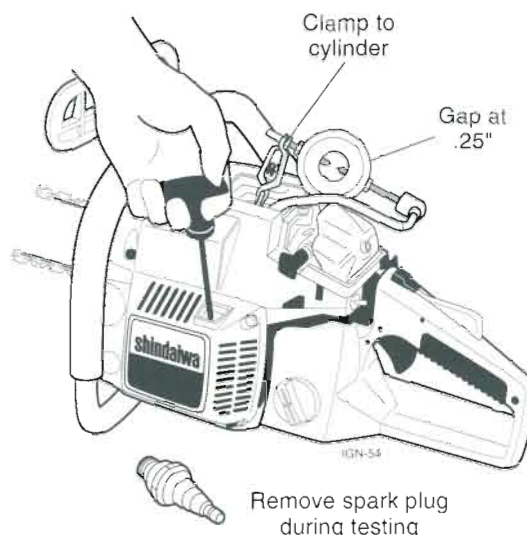


Figure 5.6 Using an Adjustable-gap Spark Tester

STEP 4. Check the Exciter Coil Air Gap (Figure 5.7)

Verify that the exciter coil air gap is adjusted to the proper specification as listed in the Spark Plug and Coil Gaps table on page 49.

Finally, consult the appropriate IPL to confirm that all ignition components are correct and have been properly installed.



ATTENTION!

Electronic components can be damaged by excessive heat! Be alert to the overall condition of the saw's cooling system, and to the correct installation of any required air baffles, shields, or insulator washers!

STEP 5. Test the Spark Coil

Test the Secondary Windings (All Saws)

Set the ohmmeter to the R x 1000 scale, and then measure the resistance between the spark plug lead and a reliable ground (such as the coil base or engine cylinder head). See Figure 5.8.

- A typical reading will be approximately 2.1-2.2 k Ω . If possible, compare with a new coil for the same model saw.
- A reading of "0" indicates the coil is internally shorted and must be replaced.
- A reading of " ∞ " (infinity) indicates a bad ground connection, a broken spark plug lead, or a possible internal break in the spark coil's secondary windings.

Further testing of modular (one piece) ignition systems is impractical without additional equipment.

IMPORTANT!

A broken or damaged spark plug lead can often be repaired with Shindaiwa Spark Plug Wire Repair Kit p/n 22104-97800 (Figure 5.9).

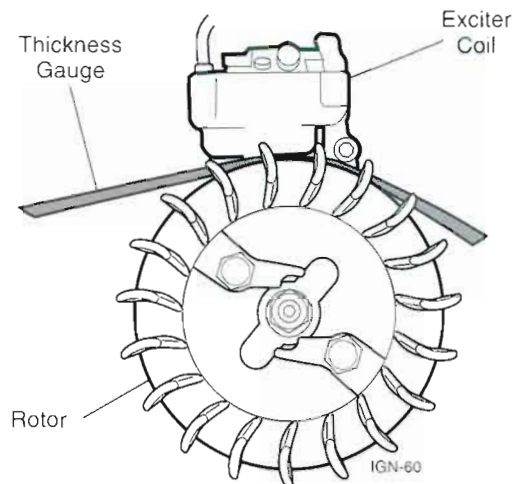


Figure 5.7 Checking the Air Gap

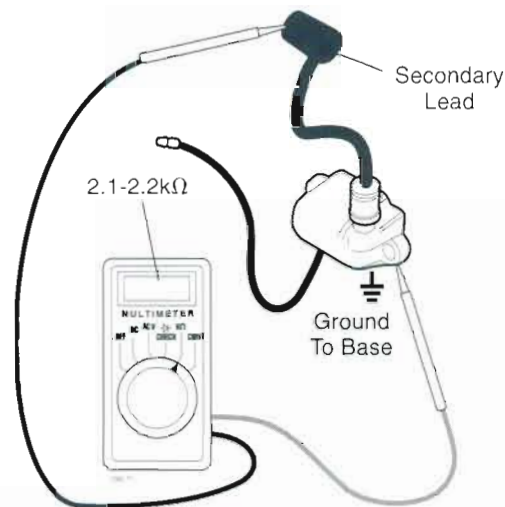


Figure 5.8 Testing Coil Secondary Windings



Figure 5.9 Shindaiwa Spark Plug Wire Repair Kit

Test the Primary Windings

(Model 488 and larger)

Disconnect the spark coil primary lead, set the ohmmeter to read R x 1 or "low ohms," and then measure the resistance between the coil's primary lead and ground (Figure 5.10).

- A typical reading should be approximately .3-.4 Ω . If possible, compare with a new coil for the same model saw.
- A reading of "0" indicates the coil is internally shorted.
- A reading of " ∞ " (for 'infinity') indicates a bad ground connection, a faulty primary-wire connector, or an internal break in the coil's primary windings.

STEP 6. Test the pulser (575, 680, 695 only)

The pulser contains a small coil of lightweight wire, and also has an internal diode that allows an ohmmeter to read coil resistance when the test leads are connected in one direction (polarity) only (Figure 5.11).

IMPORTANT!

The pulser coil must be disconnected during this test.

To test the pulser, set your ohmmeter to the "k-ohms" scale and measure the resistance between the pulser coil lead and ground.

- This test should produce an ohmmeter reading of 1000k Ω –1600k Ω , depending on saw model and the type of meter used. Pulser-coil failures are unusual, however, and the primary goal of this test is to verify continuity within the pulser's internal coil windings.
- Meter reading should be at or near " ∞ " (for 'infinity') when the test leads are reversed.

Further testing of pulser coils is impractical without additional equipment.

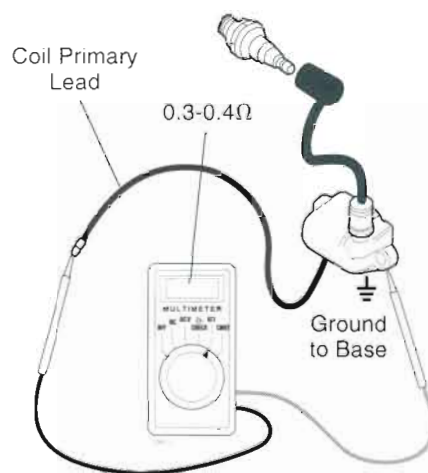


Figure 5.10 Testing the Coil Primary Windings

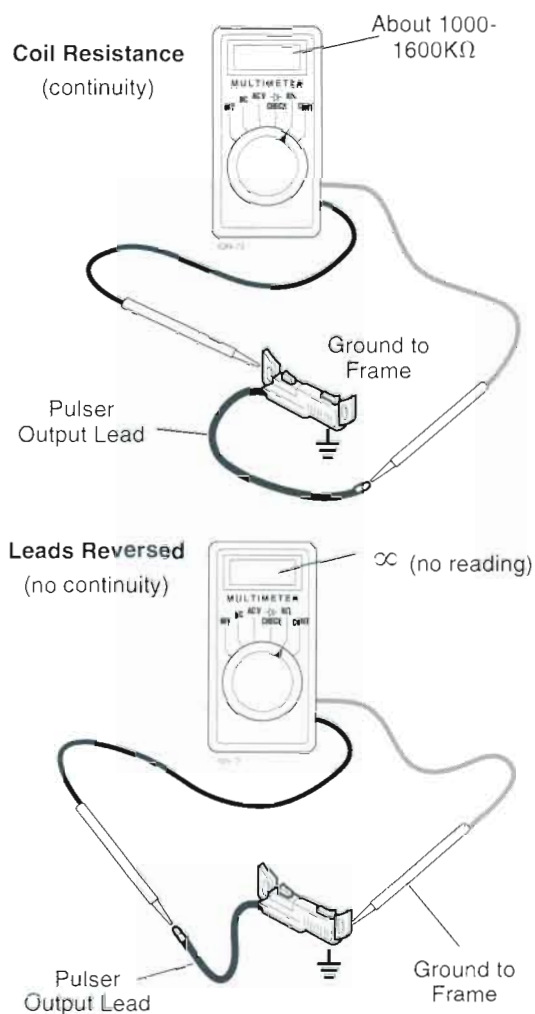


Figure 5.11 Testing the Pulser

Advanced Troubleshooting Techniques

Use of Ignition Analyzers (Figure 5.12)

An ignition analyzer can provide you with a visual display of an ignition system's performance, even when the engine is operating and under a load.

Since different analyzers vary in configuration and capability, only basic guidelines can be given here. For specifics and additional test procedures, consult the owners manual for your particular analyzer.



ATTENTION!

The solid state components common to CDI ignition systems can be easily damaged by careless testing procedures! Before testing, consult the owners manual for your particular analyzer.

Troubleshooting with an Analyzer (general)

IMPORTANT!

Always disconnect the Ignition stop switch during troubleshooting!

Test the maximum firing voltage available from the ignition system
(Figure 5.13).

STEP 1. Set the analyzer to the high voltage "kV" scale, and connect the appropriate analyzer leads between the saw's high tension lead and ground.

STEP 2. Crank the saw vigorously with the recoil starter, and record the maximum reading from the analyzer.

The reading obtained is the maximum open-circuit voltage available from the ignition system.

- If the available voltage reading is at least 12kV or above, proceed to *Test the voltage required to fire the spark plug* (next page).
- If available voltage is low, test for improper grounding or magneto air gap as described earlier in this chapter. If available firing voltage still tests low or reads "0", test the spark coil output (next page).

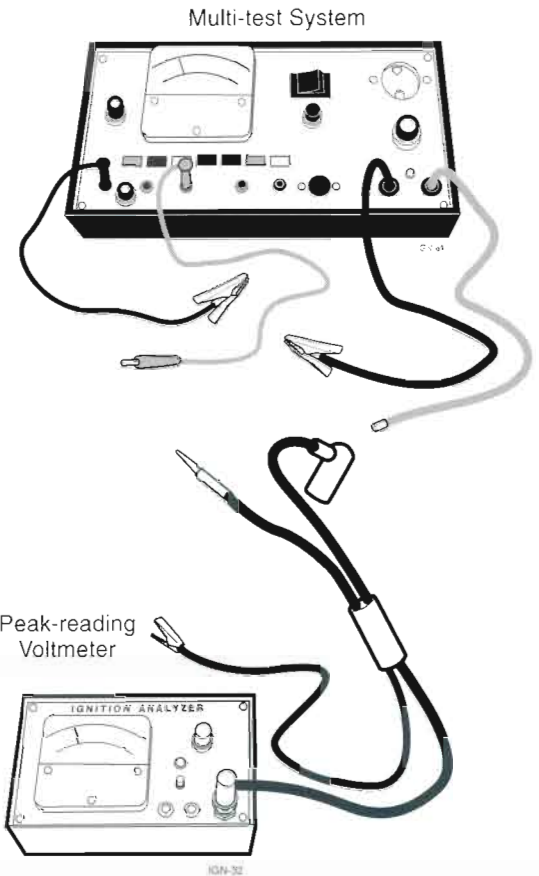


Figure 5.12 Ignition Analyzers

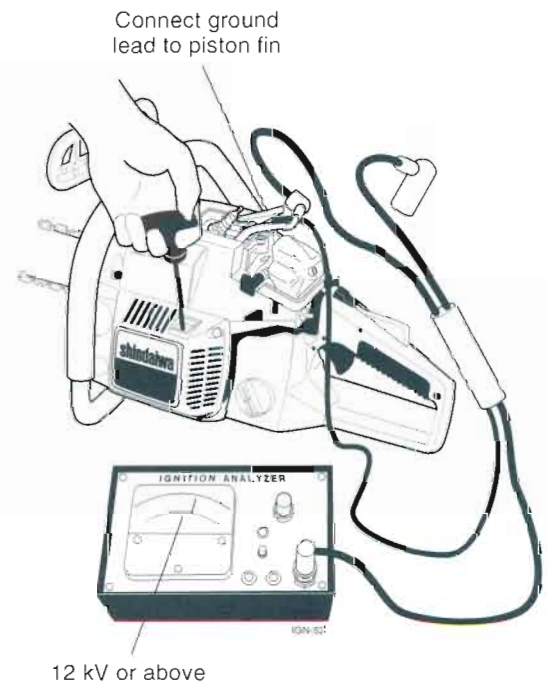


Figure 5.13 Testing Available Voltage

Test the voltage required to fire the spark plug (Figure 5.14).

- STEP 1.** Connect and adjust the analyzer as in testing for maximum firing voltage (previous page), and then connect the analyzer's second high-voltage lead to the engine spark plug terminal.
- STEP 2.** Start the saw if possible, or crank the engine vigorously with the recoil starter.
- The reading obtained is the voltage required to fire the spark plug.
 - If the required voltage at cranking speed is more than 50% of available voltage, regap or replace the spark plug and retest as above.

IMPORTANT!

Available voltage must always be greater than required (firing) voltage, or the plug will misfire and fail under load! As a general rule of thumb, required firing voltage will usually increase about 1kV (1000 volts) for every .001" of additional spark plug gap.

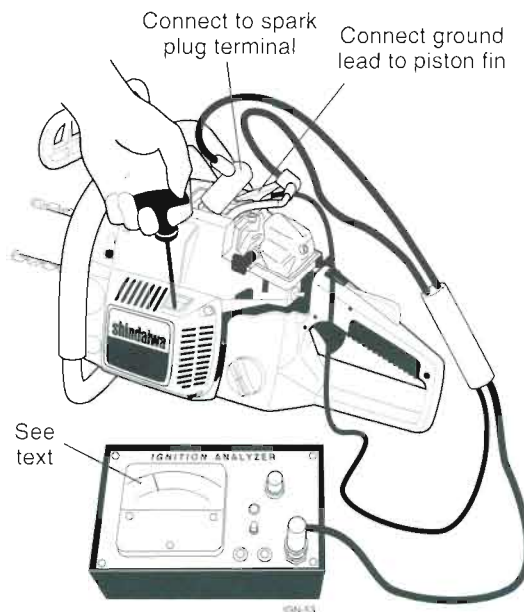


Figure 5.14 Testing Required Firing Voltage

Test the Spark Coil Output (2-pc and 3-pc systems; Figure 5.15)

Some analyzers can bench-test a spark coil by supplying the 200-300 volt pulses normally provided by the CDI exciter coil. If your analyzer has this capability, you should be able to test any spark coil independently from the rest of the saw ignition.

- STEP 1.** Connect the analyzer's coil testing output leads between the spark coil primary lead and ground.
- STEP 2.** Connect a kV meter or adjustable-gap spark tester between the spark coil's secondary (output) lead and ground.
- STEP 3.** Switch on the analyzer, and observe the coil's output at the secondary lead.
- When tested with a kV meter, a coil should produce a minimum of 12,000 volts during this test.
 - When tested with an adjustable-gap spark tester, a strong coil should be able to produce an approximately 1/4" spark during this test.

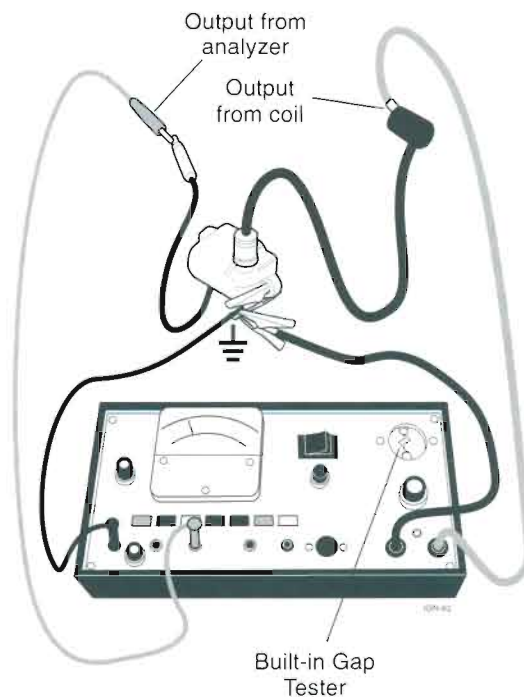


Figure 5.15 Spark Coil Output Test

Test the coil for leakage

(Figure 5.16).

This test will reveal high voltage arcing or "leakage" through the spark coil or secondary lead insulation, and requires an analyzer with an insulation test probe.

STEP 1. Connect the analyzer as for the coil output test as previously described in Testing Spark Coil Output, and then connect an adjustable-gap spark tester to the coil's output lead.

STEP 2. Set the spark tester gap to approximately .25" (6 mm). Switch on the analyzer, and pass the analyzer test probe over the exposed surface of the coil and then over the coil secondary lead (spark plug lead) insulation.

If sparks jump from the insulation to the probe during this test, the coil assembly is "leaking" and must be replaced.

IMPORTANT!

A very faint spark, or "corona" at the test probe is normal and usually does not indicate a faulty coil.

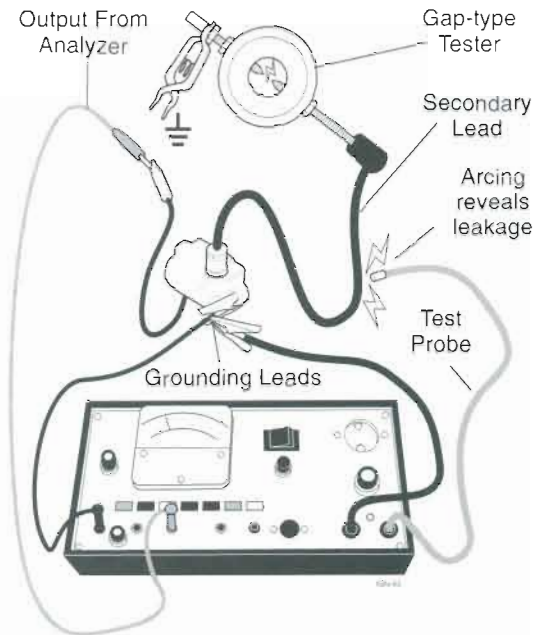


Figure 5.16 Test for High-voltage "Leakage"

Test the Exciter Coil Output

2-piece and 3-piece systems (Figure 5.17)

STEP 1. Disconnect the spark coil primary and ignition stop switch leads.

STEP 2. Connect the analyzer to the exciter output leads (orange wire) and to a reliable ground as shown.

STEP 3. Set the analyzer to the 400VDC (or nearest) scale. Crank the engine briskly, and note the reading on the analyzer meter.

- If there's no reading, or if the reading is below 125 volts, check all wiring connections and grounds.
- If there's still no reading, or if the reading is still low, check and adjust the air gap between the exciter coil and the engine flywheel.
- If exciter coil output remains below 125 volts, the exciter is defective and must be replaced.

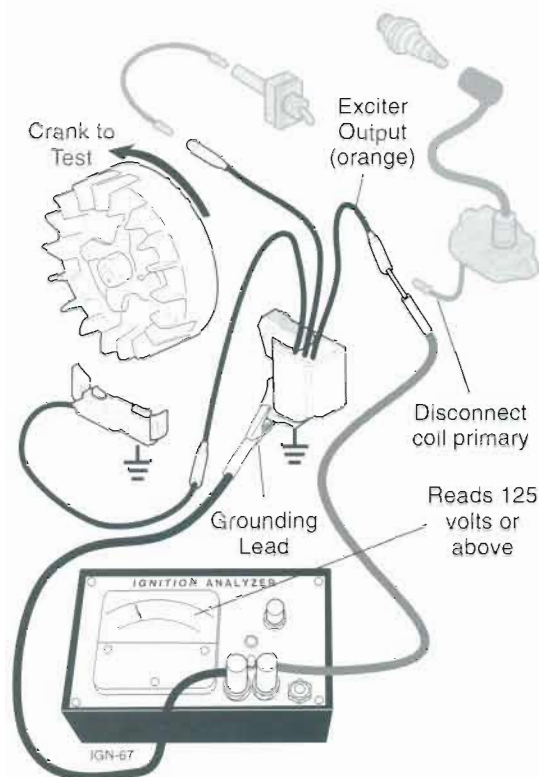


Figure 5.17 Testing Exciter Coil Output

Test for Pulser Coil Output

3-piece systems only (Figure 5.18)

STEP 1. Unplug the pulser coil from the system, connect the appropriate analyzer leads between the pulser output lead and ground, and set the analyzer to the "low-voltage" scale.

STEP 2. Crank the engine briskly, and read pulser coil output on the analyzer.

- If there's no reading, reverse the test leads and repeat the test as above.
- If there's still no reading or if the reading is below 2 volts, check all wiring connections and grounds, and then check and adjust the pulser coil air gap to the specifications given in the table on page 49.
- If there's still no pulser output or if output remains low, replace the pulser and retest.

IMPORTANT!

Pulser coils can be incorrectly installed on some models, changing ignition timing and lowering overall performance. Most pulser coils have a small molded-in arrow that should be clearly visible when the pulser is correctly installed on the engine (Figure 5.19).

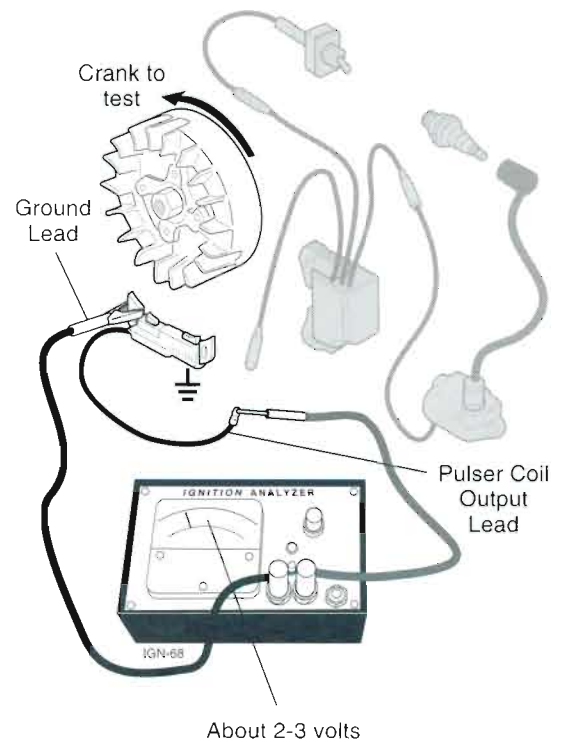


Figure 5.18 Testing Pulser Coil Output

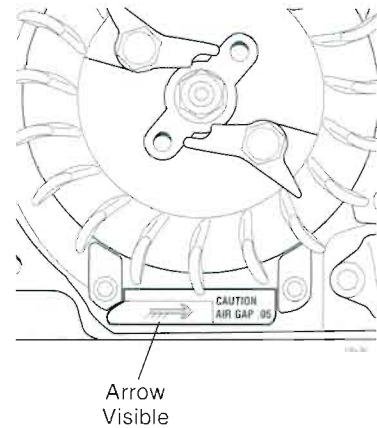


Figure 5.19 Correct Pulser Coil Installation

Use of Flywheel Simulators

A flywheel simulator can duplicate the pulsating magnetic field of a moving flywheel, allowing you to test "basket case" ignitions that have been removed from an engine.

- One-piece (modular) ignitions can be quickly tested on a flywheel simulator (Figure 5.20).
- Two-piece ignitions can be tested by placing the ignition exciter coil on the simulator and then connecting leads and installing a jumper (grounding) wire to the spark coil.
- Three-piece ignitions can be tested by placing both the exciter coil and pulser coil on the simulator at the same time, and then making the remaining plug-in and jumper connections to the spark coil (Figure 5.21).

When combined with an ignition analyzer to measure component output performance, a flywheel simulator can also be used to test individual components from 2-piece and 3-piece ignition systems.

- A pulser coil can be excited with the simulator and its output measured with the analyzer.
- An exciter coil can be charged with the simulator, and its output measured on the analyzer.
- Using a simulator, the output from a known-good exciter coil can be used to test a spark coil of unknown condition.

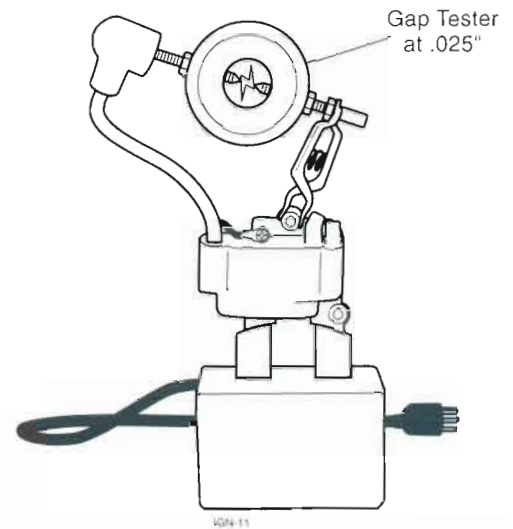


Figure 5.20 Modular Coil on Simulator

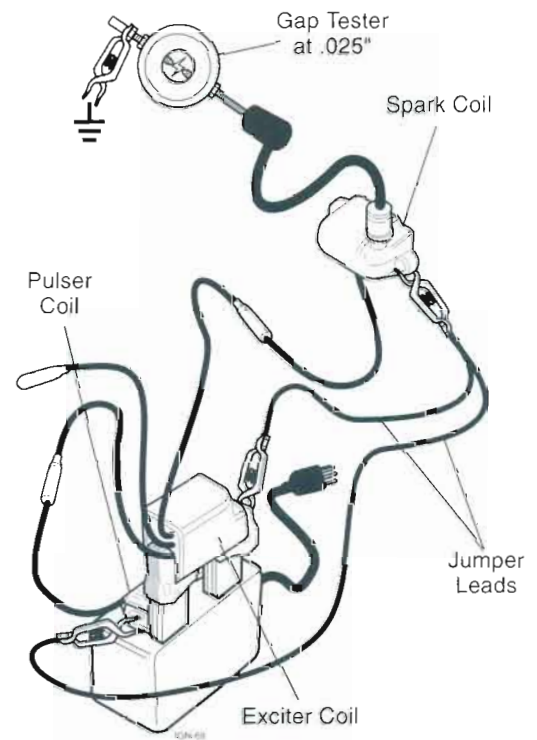


Figure 5.21 Three-piece Coil on a Simulator

Troubleshooting

Figures 5.22, 5.23,
5.24)

300, 300S, 357, 360 and 377

1. Is the switch on? Is the switch working properly? (The switch should pass current in the OFF position only)
2. Test high voltage output with a gap tester or kV meter. Check spark plug for proper size and condition.
3. Clean and tighten all ground connections. Inspect for broken or damaged wiring or connectors.
4. Reset magneto air gap to the specifications listed on page 49.
5. Check the Illustrated Parts List for correct parts and installations. Are required insulators properly installed under the exciter coil?
6. Test coil secondary for open or shorted windings. Performance-test assembly with kV meter or flywheel simulator if possible.
7. Inspect for sheared flywheel key (affects timing only).

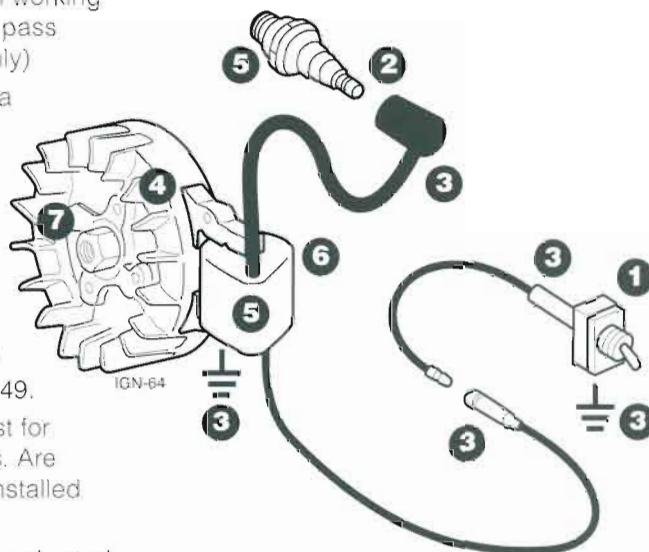


Figure 5.22 Troubleshooting One Piece Systems

488, 577 and 757

1. Is the switch on? Is the switch working properly? (The switch should pass current in the OFF position only)
2. Test high voltage output with a gap tester or kV meter. Check spark plug for proper size and condition.
3. Clean and tighten all ground connections. Inspect for broken or damaged wiring or connectors.
4. Reset magneto air gap to the specifications listed on page 49.
5. Check the Illustrated Parts List for correct parts and installations. Mismatched components may not perform to specifications!
6. Test CDI output with a kV meter or flywheel simulator.
7. Test spark coil for open or shorted windings. Performance-test assembly with kV meter.
8. Inspect for sheared flywheel key (affects timing only).

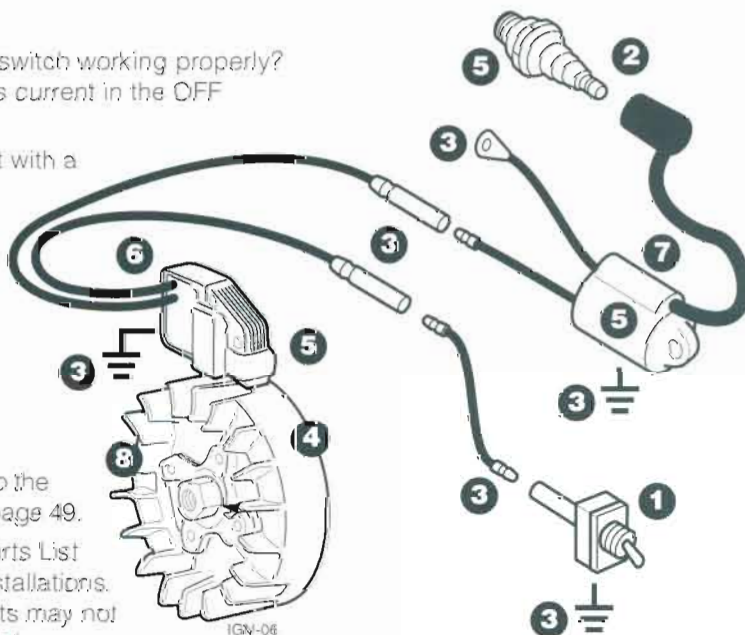


Figure 5.23 Troubleshooting Two Piece Systems

550, 575, 680 and 695

1. Is the switch on? Is the switch working properly? (The switch should pass current in the OFF position only)
2. Test high voltage output with a gap tester or kV meter. Check spark plug for proper size and condition.
3. Clean and tighten all ground connections. Inspect for broken or damaged wiring or connectors.
4. Reset magneto air gap to the specifications listed on page 49.
5. Check the Illustrated Parts List for correct parts and installations. Make sure the pulser is correctly installed (directional arrow on pulser should be visible).
6. Test pulser coil with ohmmeter set to "k-ohms". Pulser coil has built-in diode and should pass current in one direction only.
7. Test exciter coil output with a kV meter or flywheel simulator.
8. Test the spark coil for open or shorted windings. Performance-test the coil with a kV meter.
9. Inspect for sheared flywheel key (affects timing only).

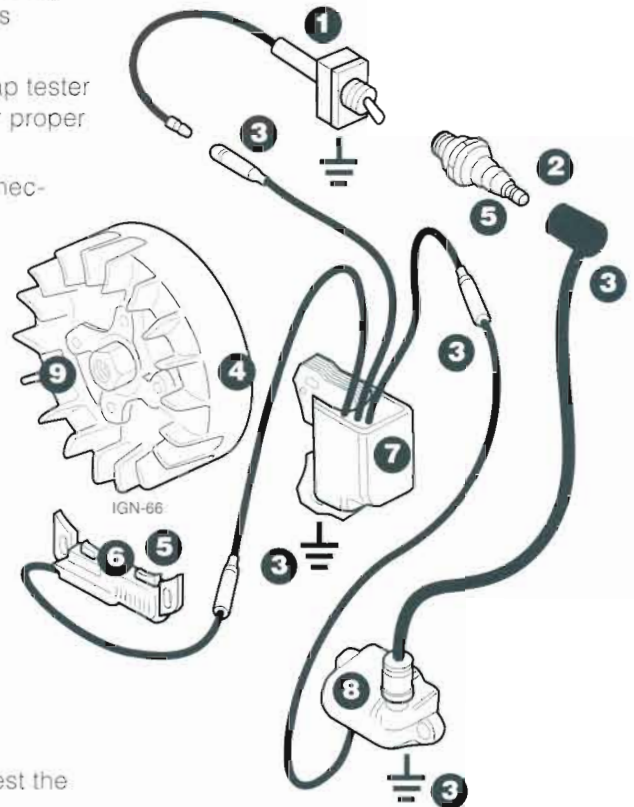


Figure 5.24 Troubleshooting Three Piece Systems (obsolete)

General

A centrifugally engaged two-shoe or three-shoe clutch is standard on all Shindaiwa chainsaws (Figure 6.1).

All models use metal shoes that engage to a drawn steel clutch drum carried on needle bearings of an open-caged design (Figure 6.2). Shoe retraction on Models 357, 488 and larger is accomplished with multiple springs designed to operate under compression rather than extension.

Clutch Identification (Figure 6.3)

Some clutch interchangeability exists between models, but you should always verify that substitute parts are identical in weight and dimensions to the components being replaced. Clutch spring length, rate, gauge, and number of coils are critical to overall performance and must all be accounted for.

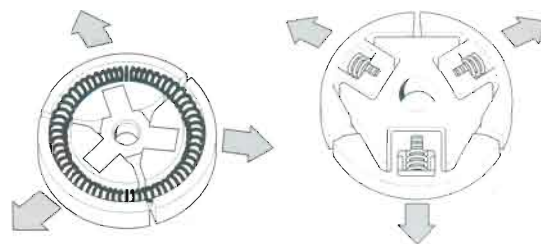


Figure 6.1 Clutch Shoe Operation

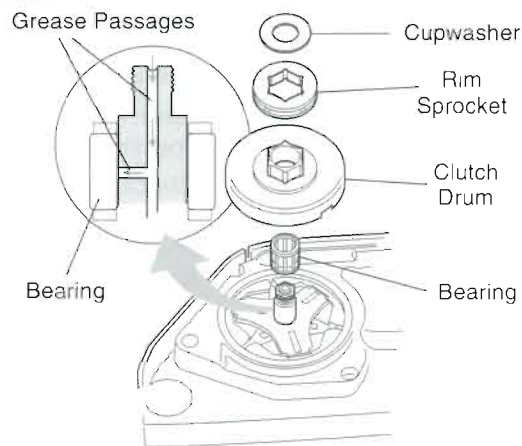


Figure 6.2 Model 757 Clutch System Components









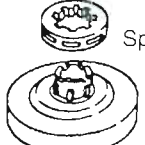



















300/300S/360	377	357*, 488, 575, 577, 680, 695	757
 Bearing  Drum with Spur Sprocket  Boss "A"  Shoe Assembly  Spring  Boss "B" <small>CLH-65</small>	 Bearing  Rim Sprocket  Drum  Shoe Assembly  Spring  Boss "B" <small>CLH-66</small>	 Cover  Rim Sprocket  Drum  Bearing  Shoes*  Springs  Boss "B" <small>CLH-67</small> *Two shoes used on Model 357	 Boss "B"  Shoes  Springs  Boss "A"  Bearing  Drum  Rim Sprocket  Cup Washer  E-ring <small>CLH-68</small>

Figure 6.3 Clutch Systems Used on Shindaiwa Saws

Clutch Removal (except Model 757)

IMPORTANT!

ALWAYS replace clutch shoes as an assembly! Partial clutch replacement can cause clutch vibration and performance problems!

STEP 1. Verify that the chain brake is released and the chain is free to rotate.

STEP 2. Remove the clutch cover nut(s) in a counter-clockwise direction, and then remove the clutch cover (Figure 6.4).

■ Removing the clutch cover from model 357 also requires depressing a lock-tab button located on the top rear of the clutch cover (Figure 6.5).

STEP 3. Loosen the saw chain (Figure 6.6), and then remove both the saw chain and guide bar.

Clutch Shoe Interchange

Model	Shoe Assembly p/n	Clutch Drum Assembly p/n
300, 300S, 360	22154-51200	22163-51110*
357	72320-51200	72320-51110
377	22154-51200	72326-51100
488	22160-51200	22160-51501
575, 577, 680, 695	22155-51200	22155-51500
757	22169-51200	22169-51100

* Will interchange with 377 drum assembly p/n 72326-51100 (allows use of rim sprocket)

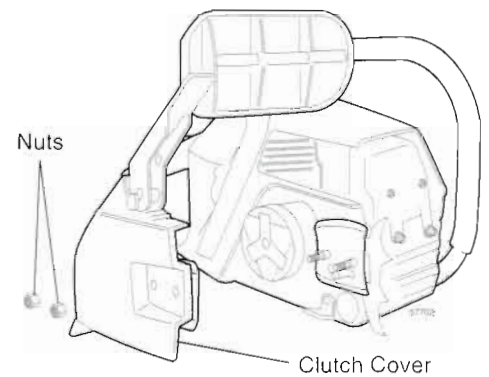


Figure 6.4 Remove the Clutch Cover

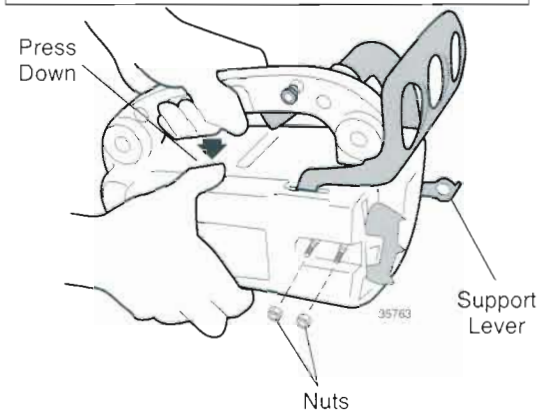
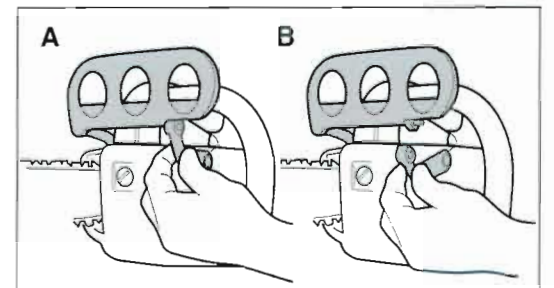


Figure 6.5 Removing the 357 Clutch Cover

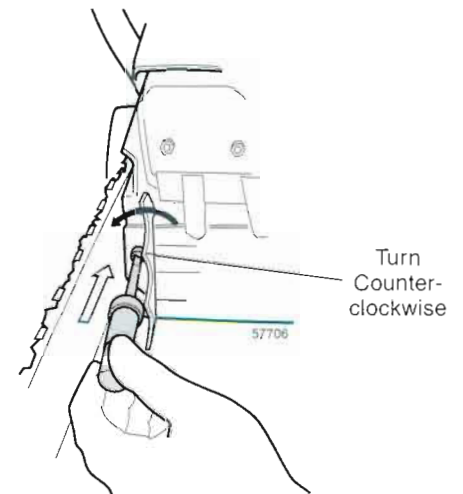


Figure 6.6 Loosen the Saw Chain

Clutch Hub/ Drum Removal (except Model 757, continued)

STEP 4. Lock the engine crankshaft by removing the spark plug and then inserting a plastic piston stop or length of starter cord through the spark plug hole (Figure 6.7).

STEP 5. Using the appropriate clutch shoe puller tool, rotate the clutch shoe assembly clockwise to remove (Figure 6.8).

STEP 6. Remove the shoe assembly, clutch drum, and bearing (Figure 6.9).

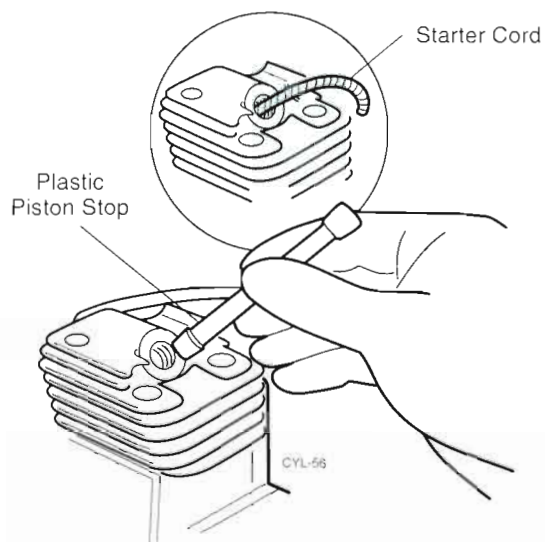


Figure 6.7 Locking the Crankshaft

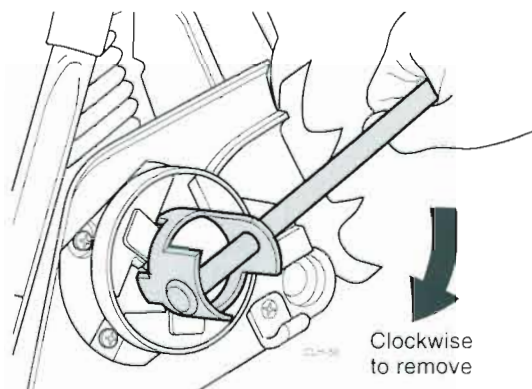


Figure 6.8 Removing the Clutch Shoe Assembly

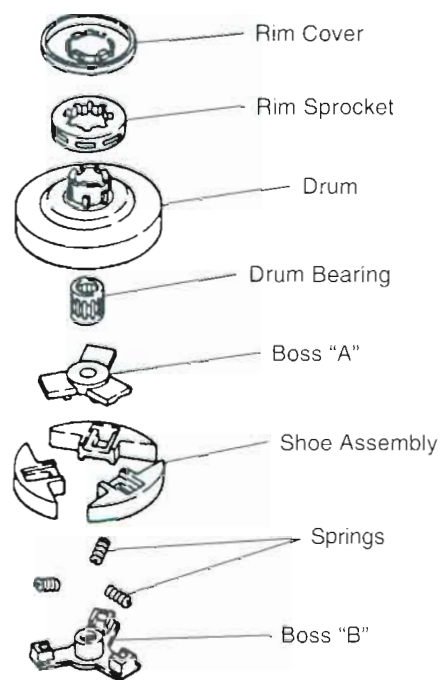


Figure 6.9 Typical Clutch Assembly

Clutch Hub/ Drum Removal (Model 757)

STEP 1. Make sure the chain brake is released and that the saw chain is free to rotate

STEP 2. Lock the engine crankshaft by removing the spark plug and then inserting a plastic piston stop or length of starter cord through the spark plug hole (Figure 6.7).

STEP 3. Remove the clutch cover nuts, and then remove the clutch cover. If the saw chain and guide bar have not been previously removed, loosen the guide bar adjusting screw and remove the chain and bar now.

STEP 4. Remove the E-ring from behind the crankshaft nut. (Figure 6.10)



ATTENTION!

The crankshaft nut forms the slot for the E-ring, and should never be removed unless damaged. If the crankshaft nut must be removed, use hand tools only and remove the nut in a **clockwise** direction (Figure 6.11).

STEP 5. Remove the cup washer, and then remove the clutch drum and bearing. If the rim sprocket is to be replaced, it can be lifted from the clutch drum at this time. (Figure 6.12)

STEP 6. Using clutch shoe puller tool p/n 22169-96580, rotate the clutch shoe assembly clockwise to remove (Figure 6.13).

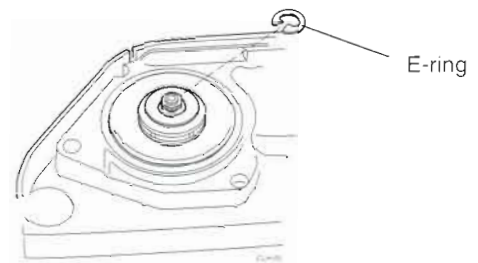


Figure 6.10 Removing the E-ring

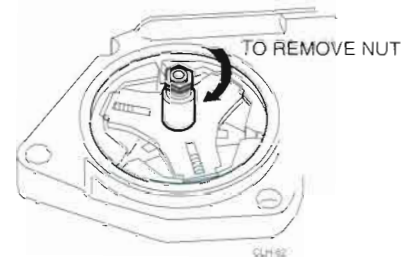


Figure 6.11 Crankshaft Nut Removal

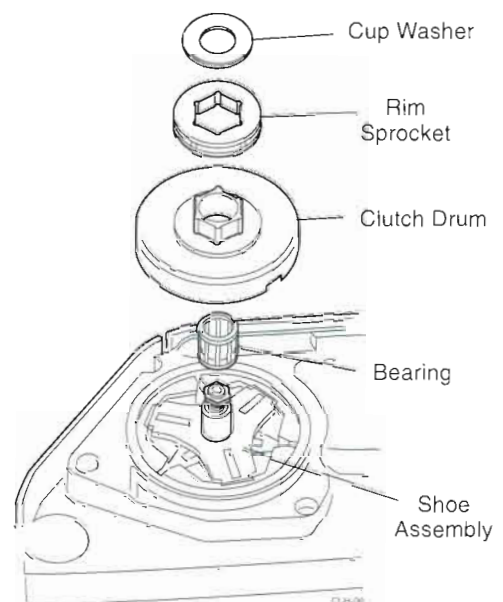


Figure 6.12 Drum Assembly

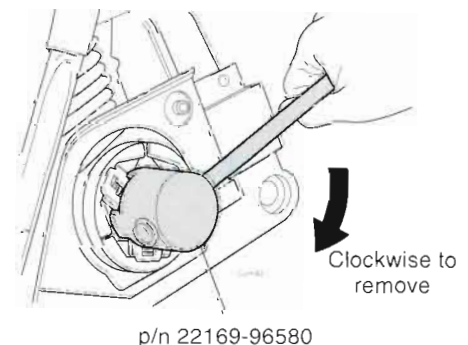


Figure 6.13 Removing the 757 Clutch Shoe Assembly

Disassembly

**WARNING!**

Always wear protective eyewear when working with clutch springs! Assembled clutch springs contain stored energy, and can escape unpredictably during disassembly!

Models 300, 300S, 360 and 377

STEP 1. Grasp the clutch shoe assembly firmly with both hands, and then use your thumb to push Boss "B" from the shoe assembly (Figure 6.14).

STEP 2. Place the shoe assembly on the workbench, and then carefully remove the individual clutch shoes from the circular retraction spring (Figure 6.15).

STEP 3. Remove inner clutch boss "A" (where used), and then remove the clutch drum and bearing.

Model 357, and 488 through 757

STEP 1. Place the clutch shoe assembly on the workbench, with clutch boss "A" facing up.

STEP 2. Use a screwdriver to pry clutch boss A from the clutch body as shown (Figure 6.16).

STEP 3. Lift the individual clutch shoes and springs from the clutch body (Figure 6.17).

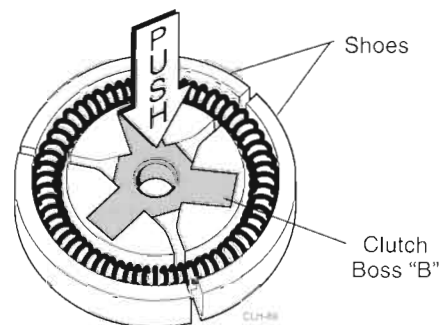


Figure 6.14 Push Boss "B" from the Shoe Assembly

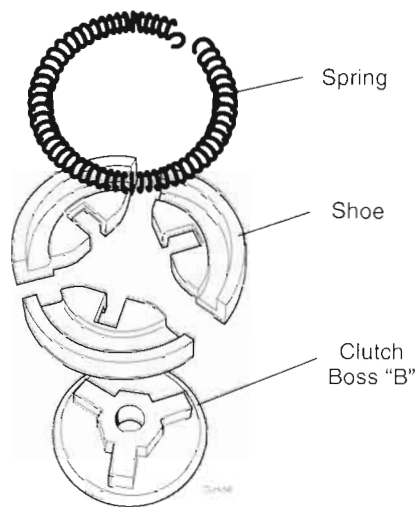


Figure 6.15 Exploded View of Shoe Assembly (300-377)

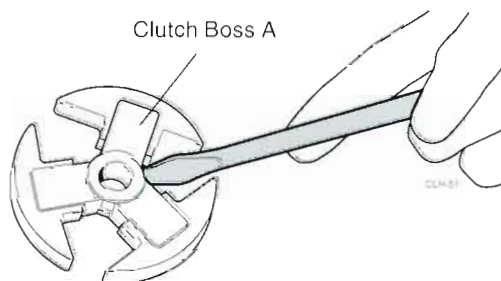


Figure 6.16 Prying the Boss from the Clutch Body

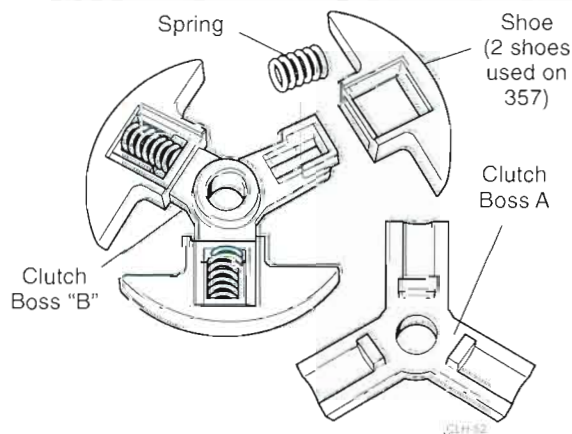


Figure 6.17 Clutch System Used on 357 and 488-757

Inspection (all)

Clean all parts in solvent and then blow dry with compressed air. During inspection, replace any clutch component showing visible evidence of scoring, overheating, or cracking.

IMPORTANT!

Never replace only one clutch shoe or spring from a set!

STEP 1. Inspect clutch spring(s) for breakage, and also for signs of overheating.

STEP 2. Compare spring length with that of new parts. For hook-type springs used on Models 300, 300S, 360 and 377, inspect for signs of stretching or other deformation including wear at the hooks.

STEP 3. Inspect the clutch shoes for wear and for damage from overheating. Wear limit for clutch shoes is .010" (.25 mm) when compared with new parts (Figure 6.18).

STEP 4. Inspect the clutch drum for signs of overheating, scoring, visible wear or physical damage. Replace if noted.

■ (Except 757) Inspect oil pump drive gear lugs for signs of wear or damage, and also verify drive lug alignment with the matching lugs on the oil pump drive gear (Figure 6.19).

■ (Model 757) Inspect the oil pump drive tang slot in the clutch drum for excessive wear, and then test-fit the drive tang on the oil pump drive gear.

IMPORTANT!

Early model 757 pump drive gear has been upgraded with a wider and more durable drive tang (Fig. 6.20). When upgrading an older drive gear, replace gear p/n 22169-55110 and clutch drum p/n 22169-51110 as a matched set.

STEP 5. Inspect the clutch drum bearing for missing or damaged rollers.

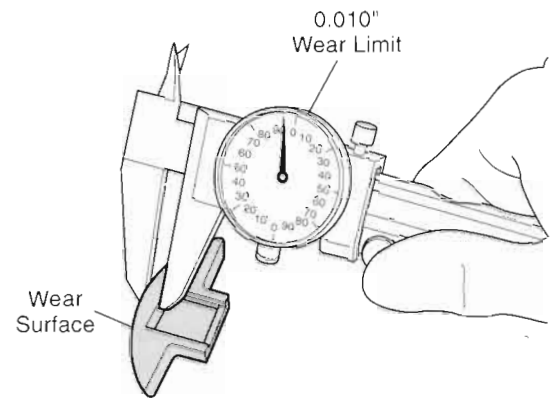


Figure 6.18 Measuring Shoe Wear

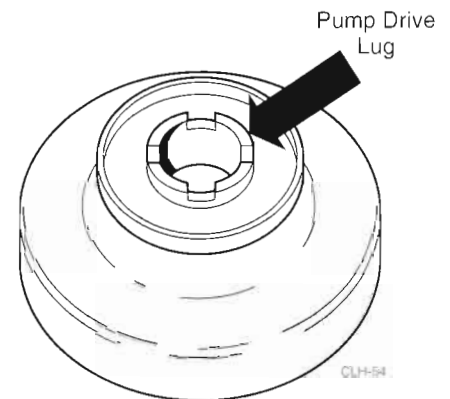


Figure 6.19 Oil Pump Drive Lugs (except 757)

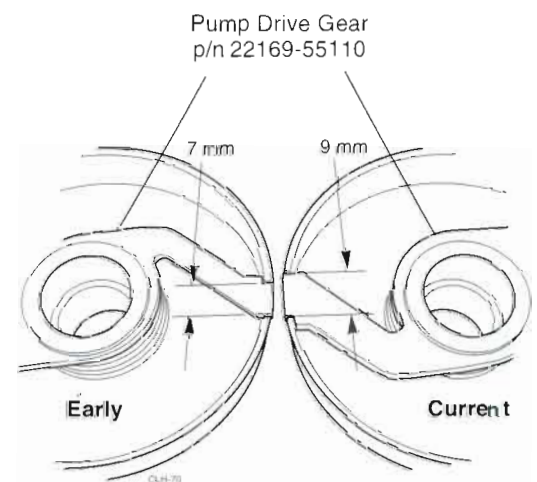


Figure 6.20 757 Oil Pump Drive Tang

Reassembly Except 757 (Figure 6.20)

During reassembly, apply a light film of grease to the clutch bearing, the oil pump drive gear thrust plate, and the inside bore of the oil pump drive gear.

STEP 1. Replace the oil pump drive gear (if removed) on the engine crankshaft.



ATTENTION!

The thrust plate used on Models 300, 300S, 360, 377, and 488 saws has a chamfered bore. Where used, this type thrust plate must be installed with the chamfer toward the powerhead. Improper thrust plate orientation can permanently damage the engine crankshaft. See Figure 6.22

STEP 2. Assemble the clutch drum and bearing to the crankshaft in the reverse order of removal.

STEP 3. Slide clutch boss "A" (models 300 through 377 only) over the crankshaft.

STEP 4. Using hand pressure only, assemble the clutch shoes and spring(s) to clutch boss "B" in the reverse order of disassembly. (Figure 6.23)

STEP 5. Use a plastic piston stop or length of starter rope to lock the engine crankshaft (see Removal, page 62). Thread the clutch onto the engine crankshaft assembly in a counter clockwise rotation.

STEP 6. In the reverse order of removal, use the appropriate clutch tool to firmly tighten the clutch hub on the engine crankshaft.

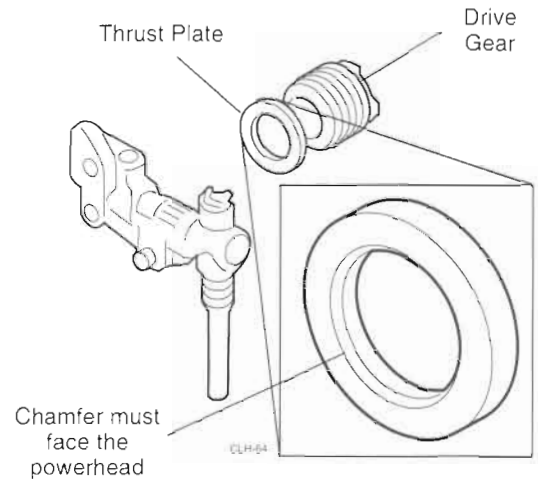


Figure 6.22 Thrust Plate Chamfer

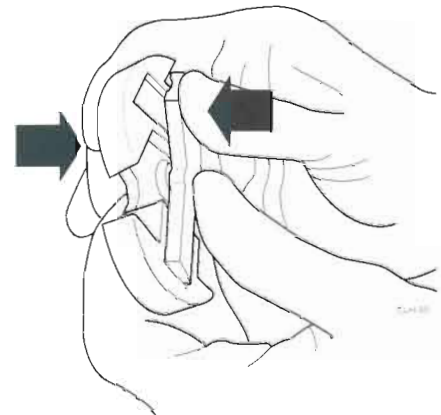


Figure 6.23 Assembling the Clutch Shoes

Reassembly Model 757 only

Apply a light film of grease to the clutch bearing, the drive gear collar bore, and the inside bore of the oil pump drive gear.

STEP 1. Install the drive gear collar and oil pump drive gear on the engine crankshaft.

STEP 2. Using hand pressure only, assemble the clutch shoes and spring(s) to clutch boss "A" in the reverse order of disassembly (Figure 6.24).

STEP 3. Use a plastic piston stop or length of starter rope to lock the engine crankshaft (see Removal, page 62), and then thread the clutch onto the crankshaft by turning in a counter clockwise rotation (Figure 6.25).

STEP 4. In the reverse order of removal, use clutch tool p/n 22169-96580 to firmly tighten the clutch hub on the engine crankshaft (Figure 6.26).

STEP 5. Assemble the clutch drum and bearing to the crankshaft in the reverse order of removal.



ATTENTION!

The oil pump drive gear tang must engage the slot in the clutch drum!

STEP 6. Assemble the rim sprocket (if removed), cup washer, and E-ring to the engine crankshaft.

IMPORTANT!

The crankshaft nut forms part of the slot for the clutch drum E-ring. After assembly, verify that the E-ring is fully seated in its slot on the crankshaft.

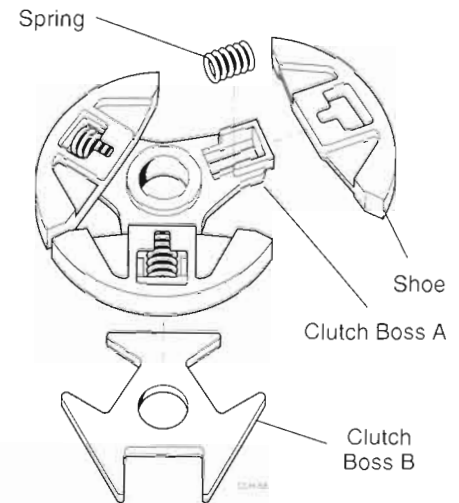


Figure 6.24 757 Clutch Assembly

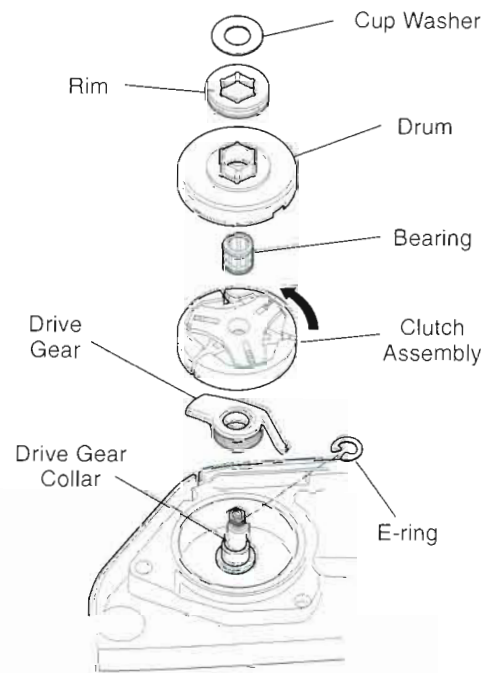
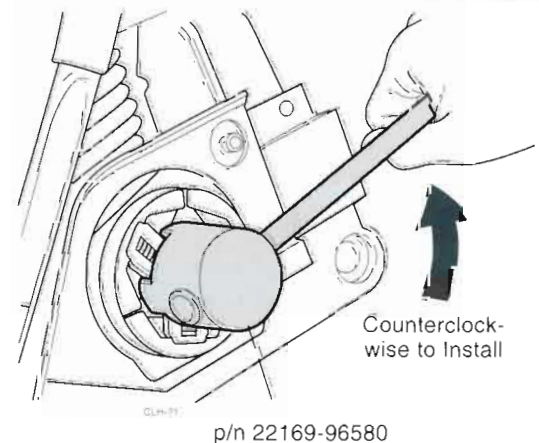


Figure 6.25 757 Clutch Assembly Installation



p/n 22169-96580

Figure 6.26 Tighten the Clutch Hub on the Crankshaft

Final Assembly and Testing (all saws)

IMPORTANT!

Clutch performance is directly related to chain and guide bar condition and adjustment!

STEP 1. Replace the chain and guide bar in the reverse order of removal. Check to be sure the saw chain drive links are fully engaged with the sprocket.

STEP 2. Install the clutch cover assembly, and secure finger-tight with the clutch cover nut(s).

STEP 3. Adjust the guide bar for proper chain tension. Tighten bar nut(s) securely (Figure 6.27).



ATTENTION!

Allow the saw chain to cool before adjusting chain tension. A saw chain becomes hot and stretches during use, and then shrinks as it cools.

STEP 4. While wearing heavy gloves, push the chain around the bar to verify smooth operation. Adjust chain tension if necessary (Figure 6.28).

STEP 5. Start the saw and warm the engine to operating temperature. Adjust engine idle speed to the specifications given on the following page.



WARNING!

The saw chain must never rotate at engine idle speeds!

STEP 6. Briefly accelerate the engine, and test for proper clutch engagement and disengagement.

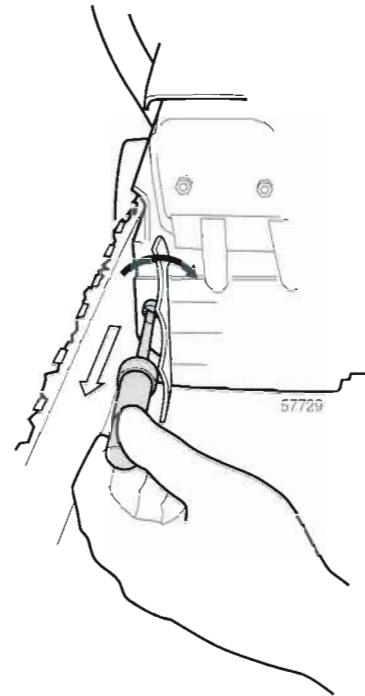


Figure 6.27 Adjusting Chain Tension

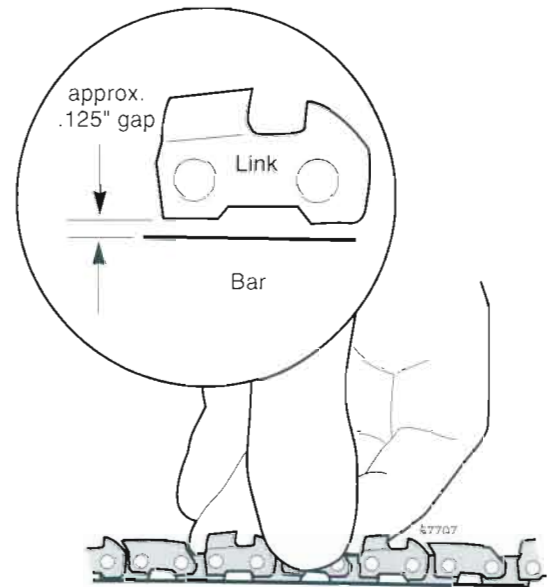


Figure 6.28 Proper Chain Tension (slightly tighter for sprocket-nose bars)

STEP 7. Using full throttle, make a test cut in a log or wooden block of a diameter equal to about one-half the saw's guide bar length.

■ The saw clutch must engage smoothly and maintain full engagement throughout the cut.

■ When engine speed is returned to idle, the clutch must completely disengage (no chain movement).

STEP 8. If the saw clutch performs as per Step 7 above, it can be returned to service. If the clutch fails to engage or disengage completely, the clutch assembly must be disassembled and reinspected for damaged/incorrect parts or assembly.

Recommended Idle Speeds

Model	RPM
300, 300S, 360, 377	3000
357	2800
377	3000
488, 575, 577, 680, 695	2800
757	2500



Section 7 Cylinders and Pistons

Construction

(Figure 7.1)

All Shindaiwa saws feature cast aluminum cylinders with hard-chrome plated bores.

- Cylinder bores are peened for oil retention, producing an extremely durable and long-lived surface.
- Except for Model 357 (Section 13), the cylinder is secured by four bolts threading into the crankcase through an integral cylinder base flange.
- Additional cylinder-to-crankcase alignment is provided by a locating "spigot" (except Model 357) that engages a matching bore in the crankcase.
- All Shindaiwa saw models except 300-300S feature a two-ring piston.
- The second piston ring allows the engine to develop more power through better sealing, and also provides better piston support for longer product life.
- The cutaway or "slipper skirt" piston provides a shorter pathway for the incoming fuel-air mixture to cool the underside of the piston crown, enabling the engine to be operated at a higher state of tune.
- A caged-needle piston pin bearing is standard on all Shindaiwa saws.

IMPORTANT!

Crankshaft thrust control for all saws is provided at the piston rather than at the big end of the connecting rod. This combination allows for better bearing lubrication at higher RPM, while minimizing wear at the thrust surfaces.

Cylinder Removal

STEP 1. Remove the air cleaner and cylinder covers, and then remove the air cleaner and carburetor as described in Section 3. On saw models with boot-mounted carburetors, push the rubber carburetor boot through the carburetor flange in the air box (Figure 7.2).

STEP 2. Disconnect the spark plug lead, unscrew the spark plug, and remove the muffler.

STEP 3. Remove the four cylinder base mounting screws.

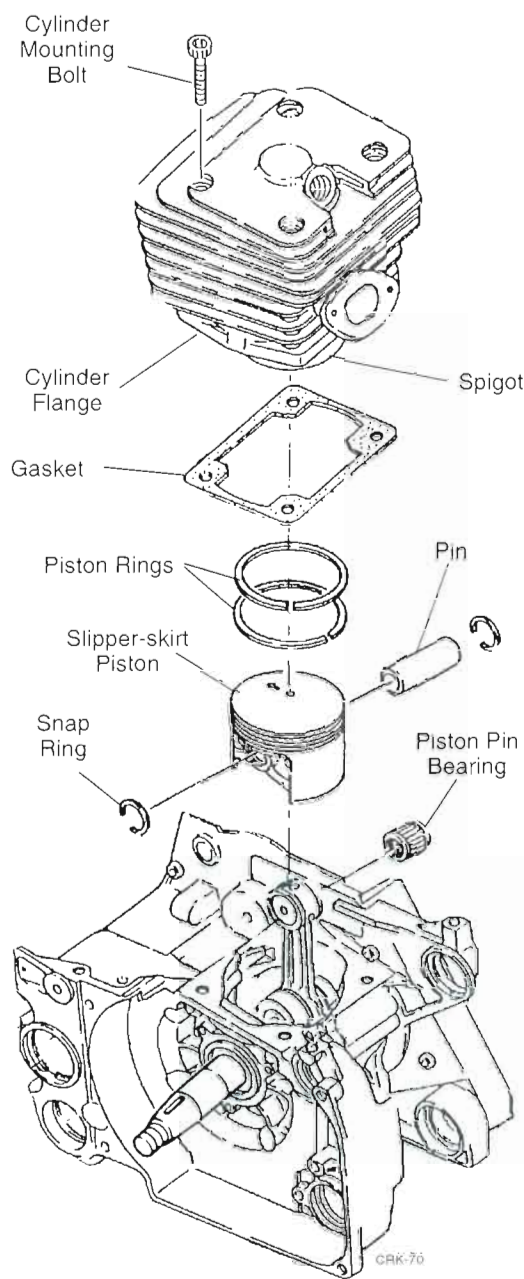


Figure 7.1 Typical Cylinder Installation (757 shown)

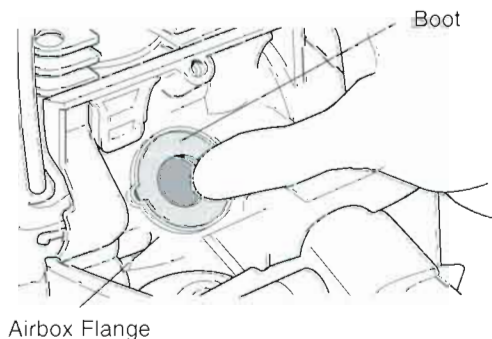


Figure 7.2 Pushing the Boot Through the Airbox Flange (575)

Cylinder Removal (continued)

STEP 4. Carefully pull the cylinder from the piston and crankcase assembly. If removal is difficult, loosen the cylinder by tapping it gently with a soft-faced hammer.



ATTENTION!

Do not rotate the cylinder on the piston! Rotating the cylinder may fracture the piston rings in the cylinder ports, possibly damaging the cylinder bore.

Piston Removal (all models)

Before removing the piston, note the orientation of the cast-in arrow on the piston crown. The arrow on the piston crown must always point toward the exhaust side of the cylinder (Figure 7.3).

STEP 1. Use a tapered pick to remove the two piston pin snap rings (Figure 7.4).



WARNING!

Wear eye protection when working with snap rings! Snap rings are installed under tension, and can escape suddenly during removal!

STEP 2. Remove the piston pin, bearing, and thrust washers (where used) by the appropriate method as described below:

Model 757 Only

While supporting the piston by hand, use a dead-blow hammer and an appropriate guide-pin tool to drive the pin through the piston (Figure 7.5).



ATTENTION!

Never attempt to drive a pin from an unsupported piston! Failure to properly support a piston during the above procedure can permanently damage the piston and possibly distort the crankshaft as well!

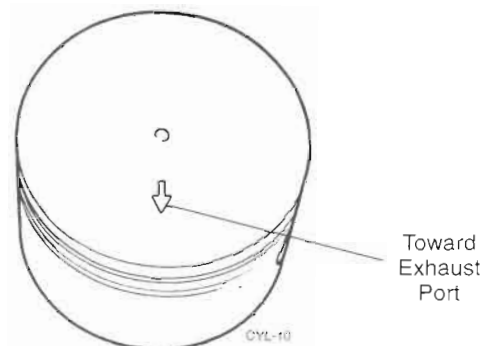


Figure 7.3 Correct Piston Orientation

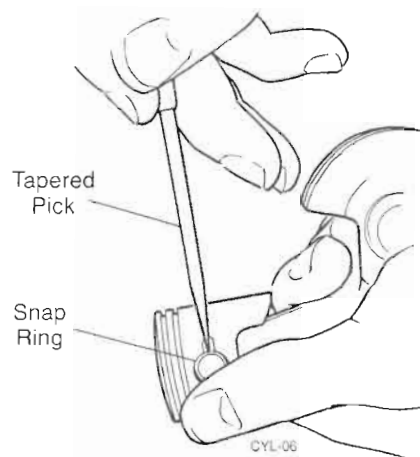


Figure 7.4 Removing Piston Snap Rings

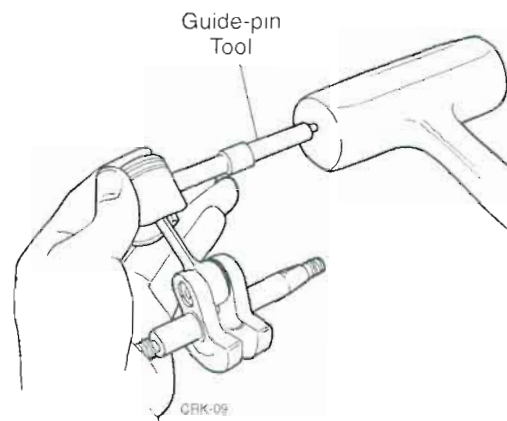


Figure 7.5 Removing the Piston Pin (757 shown)

Piston Removal (continued))

All Models

Install piston pin removal tool p/n 72282-96300 and the appropriate pin adapter over the piston.

STEP 1. Before tightening the threaded screw on the pin remover, make sure both piston ring end gaps are correctly oriented over their locating pins in the piston ring grooves (Figure 7.6),

STEP 1. Press the pin through the piston by turning the pin remover screw clockwise as shown in Figure 7.7.

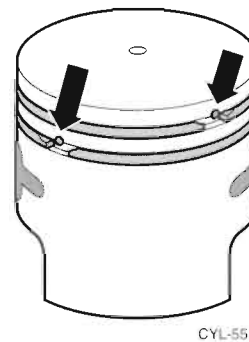


Figure 7.6 Piston Ring Locating Pins

Cleaning

Use clean solvent to thoroughly degrease all components, and then blow dry with compressed air.



ATTENTION!

Never allow dirt, grease, or other contaminants to enter the engine crankcase!

Decarbonizing

Use a plastic or wooden scraper to remove carbon accumulations from the exhaust port and combustion chamber.



ATTENTION!

Decarbonize with plastic or wooden tools **only**! Never use metal tools, wire brushes, or abrasives to remove carbon deposits!

Base Gasket

Use a sharp gasket scraper to remove hardened or "baked on" cylinder base gasket material from the engine crankcase (Figure 7.8)



ATTENTION!

Use conventional gasket scrapers only! Sealing surfaces can be easily ruined by incorrect tools or by careless cleaning procedures!

If necessary, stubborn gaskets can be softened with a small quantity of commercial paint remover.

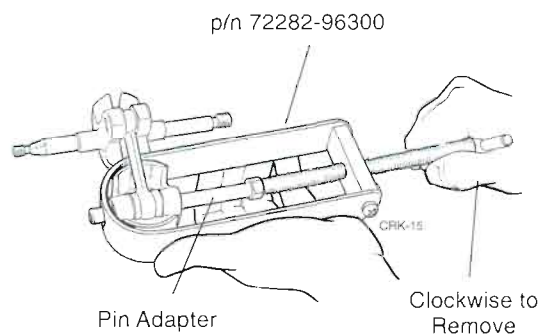


Figure 7.7 Removing the Piston Pin

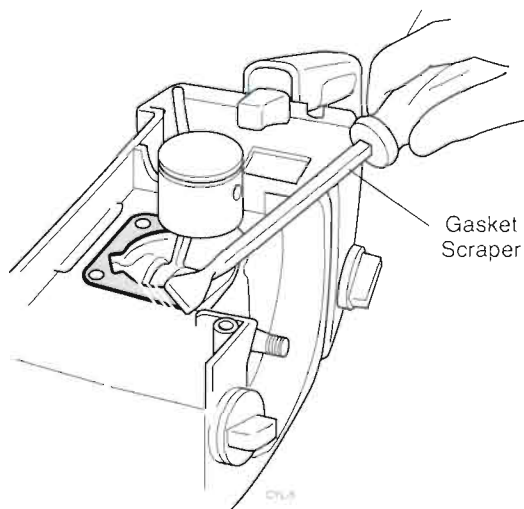


Figure 7.8 Removing Baked-on Gasket Material

Inspection

Cylinder Bore

Shindaiwa hard-chrome plated cylinders cannot be bored for reuse, and oversize pistons are likewise not available.

The cylinder bore plating is extremely durable, however, and will often withstand even a total engine seizure.

Suggested Cleaning Procedure

STEP 1. Aluminum deposits adhering to cylinder walls can often be removed with a full-strength treatment of muriatic acid (concrete cleaner).

STEP 2. Stubborn or glazed-over deposits on cylinder walls can be loosened by light sanding across the bore with a small section of emery cloth.



WARNING!

Wear eye and skin protection when working with acids. Follow manufacturer's instructions as to additional safety and disposal precautions.



ATTENTION!

Apply the acid to chrome surfaces only! Never allow acid to contact aluminum components, as deterioration will be immediate!

Use a telescoping gauge and micrometer to measure cylinder bore diameter and taper. Compare your readings with the Tolerances and Wear Limits given in the Appendix. See Figure 7.9.

Replace any cylinder exhibiting visible damage or with measurable wear beyond the tolerances listed in the Appendix.

IMPORTANT!

- Never install a used piston in a new cylinder!
- Always verify cylinder condition before reassembly.
- Never attempt to install a new piston in a used cylinder that has been damaged, distorted, or is worn beyond specified tolerances.

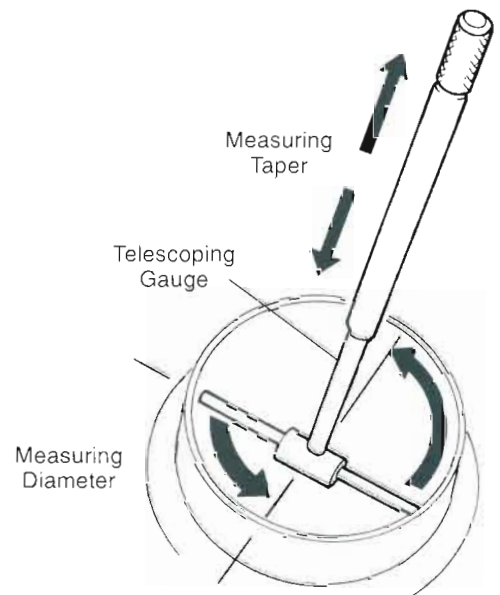


Figure 7.9 Measuring Cylinder Bore Wear

Inspection (continued)

Piston (Figure 7.10)

- Inspect the piston for damage or wear. Discard any piston showing signs of scuffing, scoring, cracking, loose pin, or other physical damage.
- When assessing wear, inspect and compare key wear areas with the specifications and tolerances listed in the Appendix.
- Be especially alert for piston damage caused by overheating, poor lubrication, or ingested water/debris. When in doubt as to cause of damage, consult the piston diagrams in Section 2 "Troubleshooting."

IMPORTANT!

Pistons used on model 695 (and replacement pistons for 680) are supplied with a 4 to 6 micron grey/black molybdenum-disulfide coating. This coating is provided as additional break-in lubrication, and may still be visible after 100+ hours of operation.

Rings

Using finger pressure alone, gently spread each piston ring only enough to enable it to clear the piston crown.

IMPORTANT!

Always replace both piston rings as a complete set! Unless an engine has extremely low time and is being disassembled for reasons other than a piston-related failure, always replace both piston rings during teardown.

STEP 1. If rings are to be reused, carefully inspect each ring for signs of wear, rounding, cracking, or chipping.

STEP 2. Measure piston ring thickness and width with a micrometer, and compare your readings with the specs in the Appendix.

STEP 3. Use the piston crown to squarely locate each ring approximately midway in the cylinder bore, and then use a thickness gauge to measure piston ring end gap. If either ring's end gap is greater than tolerances listed in the Appendix, replace both rings as a set (Figure 7.11).

Piston Pin and Bearing (Figures 7.10, 7.12)

Inspect the pin for signs of wear including chipping, fracturing, galling, or discoloration.

Use a micrometer to measure pin diameter at both ends and also at the center of the pin, and discard any pin worn beyond the tolerances given in the Appendix.

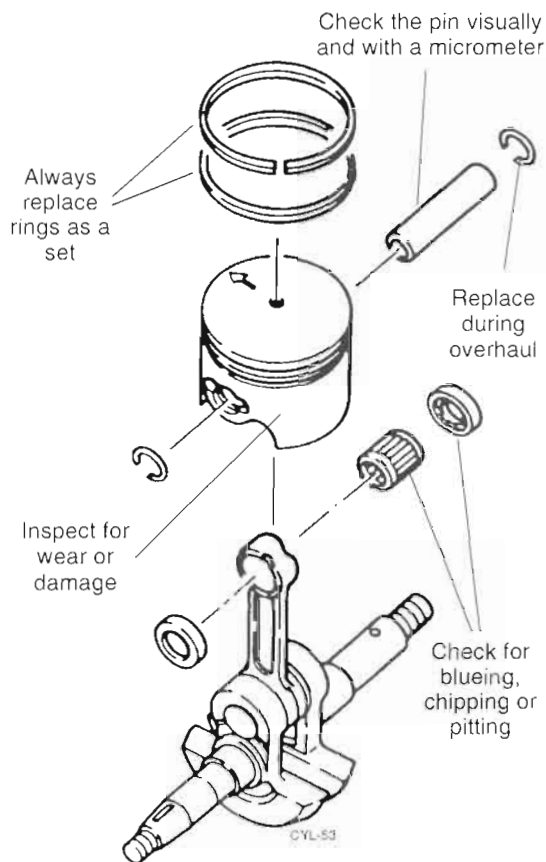


Figure 7.10 Common Wear Areas

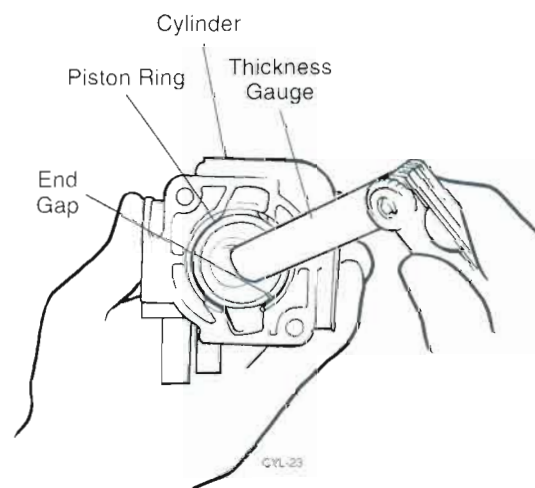


Figure 7.11 Checking Piston Ring End Gap

IMPORTANT!

Shindaiwa piston pins are heat treated to produce a hardened surface for extended durability and longer product life. Any pin with visible damage or measurable variation in diameter must be rejected!

- Use a magnifying glass to inspect the condition of the piston pin bearing rollers and cage, and discard any bearing showing discoloration, pitting, metal transfer, or other visible damage.
- If either thrust washer shows signs of wear or discoloration, replace both washers as a set.

Piston Pin/Bearing/Thrust Washers

The piston pin is press-fit into the piston and requires careful installation to avoid damaging or distorting the piston/crankshaft assembly (Figure 7.12).

The 757 piston pin can usually be installed by hand pressure alone. Piston pin installation on other Shindaiwa saws requires special tool p/n 72282-96300.

IMPORTANT!

Coating the piston pin with an assembly lubricant such as Never-Seize® can help minimize friction during the installation process. Assembly may also be easier if the piston itself is first heated to not more than 212°F (100°C).



ATTENTION!

The arrow on the piston crown must point toward the exhaust (muffler) side of the engine! Failure to properly orient the piston to the crankshaft can result in serious engine failure! See Figure 7.13.

Model 757

- STEP 1.** Pre-lubricate the piston pin bearing and thrust washers with a light coating of high quality engine oil.
- STEP 2.** Using the appropriate alignment tool, assemble the pin bearing and thrust washers between the two piston bosses.
- STEP 3.** Using hand pressure alone, push the piston pin through the piston boss and bearing until it is centered between the two retaining ring grooves (Figure 7.14).

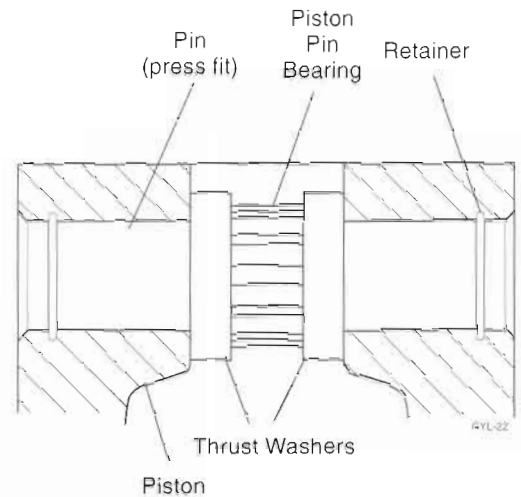


Figure 7.12 Piston Pin, Bearing, and Thrust Washer Assembly

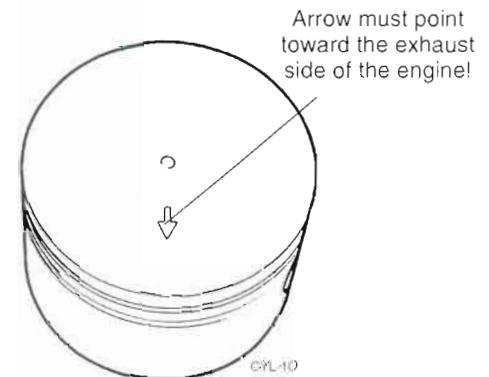


Figure 7.13 Piston Orientation

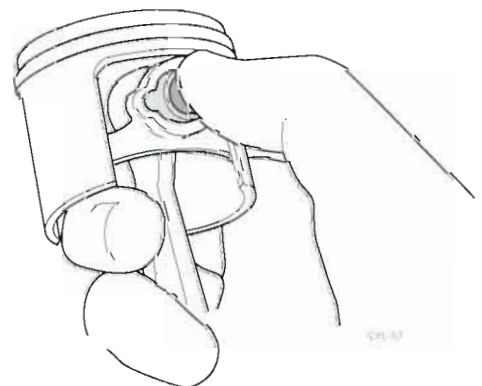


Figure 7.14 Piston Pin Installation (757 only)

IMPORTANT!

The 757 piston pin can also be installed using either of the two methods described under "All Models" (following page).

Reassembly

Reassembly

All Models Other than 757 (Figure 7.15)

STEP 1. Lubricate the piston pin bearing and thrust washers with a light coating of high quality engine oil.

STEP 2. Using the appropriate alignment tool, assemble the pin bearing and thrust washers between the two piston bosses.

STEP 3. Using either of the following two installation methods, assemble the piston pin to the bearing and connecting rod.

- While supporting the piston by hand, use a soft-faced hammer and an appropriate driver to install the pin in the piston pin bosses (Figure 7.16).
- Use pin puller tool p/n 72282-96300 and the appropriate push pin to assemble the pin to the piston (Figure 7.17)

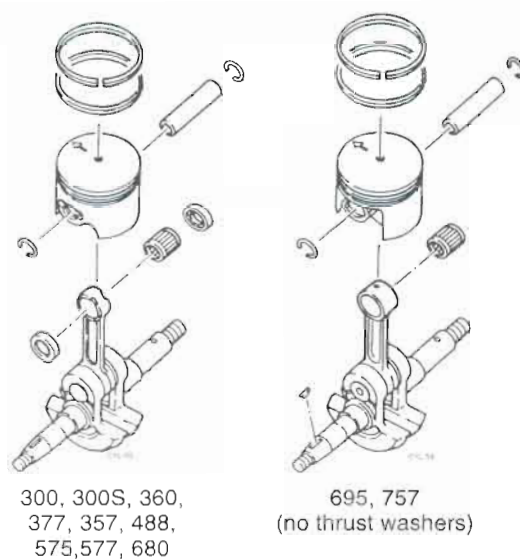


Figure 7.15 Assembly Variations

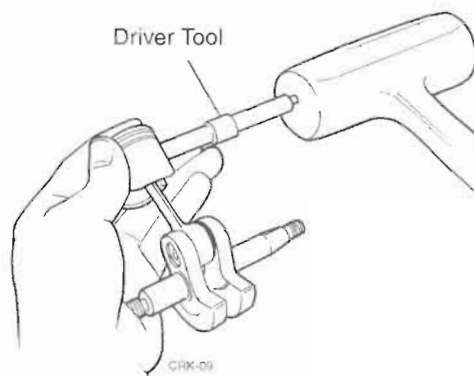


Figure 7.16 Using a Driver Tool

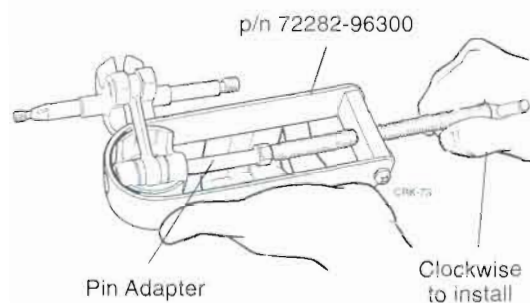


Figure 7.17 Using a Puller Tool

Parts Interchangeability—575-680-695

Component	575 p/n	577 p/n	680 p/n	695 p/n
Crankshaft	22150-42001	22150-42002	22150-42001	22155-42001
Piston	22152-41110	22152-41112	22150-41113	22155-41113
Piston Rings	22152-41210	22152-41210	22150-41210	22150-41210
Piston Pin	22152-41220	22152-41220	22150-41220	22155-41221
Retaining Ring	22152-41230	22152-41230	99900-01734	22155-41230
Bearing	22150-41280	22150-41280	22150-41280	22155-41281
Thrust Washer	22152-41250	22152-41250	22152-41250	NONE

Snap Ring Installation (Figure 7.18)

IMPORTANT!

- Never attempt to reuse piston pin snap rings!
- Never substitute snap rings from another model or brand!

STEP 1. Install two new snap rings with their open ends facing either to the six o'clock (toward the crankcase) or the twelve o'clock (toward the cylinder head) position. Each ring should produce an audible "click" as it seats in its groove in the piston.

STEP 2. Use a magnifying glass to visually confirm the correct seating of each ring. As an added safeguard, use a pick to verify that each ring is properly seated in its groove.



ATTENTION!

An improperly installed snap ring can cause a major engine failure!

Piston Ring Installation

Using hand pressure only, carefully expand each piston ring just enough to slip over the piston crown and into its respective ring groove. If necessary, gently rotate each ring until its end gap is correctly aligned with the appropriate locating pin. See Figure 7.19.

Cylinder Installation (Figure 7.20)

- For ease of installation, use a slotted scrap of wood or plastic to stabilize the piston.
- The cylinder can be installed by hand pressure alone, but a ring compressor will often speed the installation process.

STEP 1. Place a new cylinder base gasket on the crankcase assembly.

IMPORTANT!

Always install a new base gasket. Use no sealants: The cylinder base gasket must be installed **dry**!

STEP 2. Lightly oil both the piston assembly and cylinder bore.

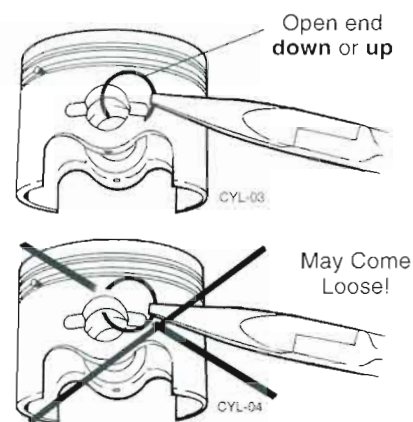


Figure 7.18 Snap Ring Installation

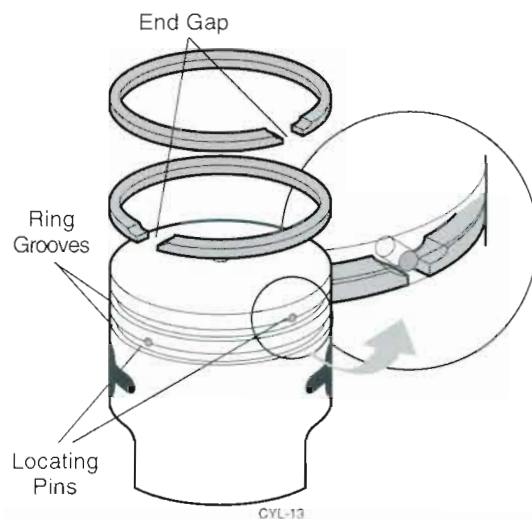


Figure 7.19 Correct Piston Ring Orientation

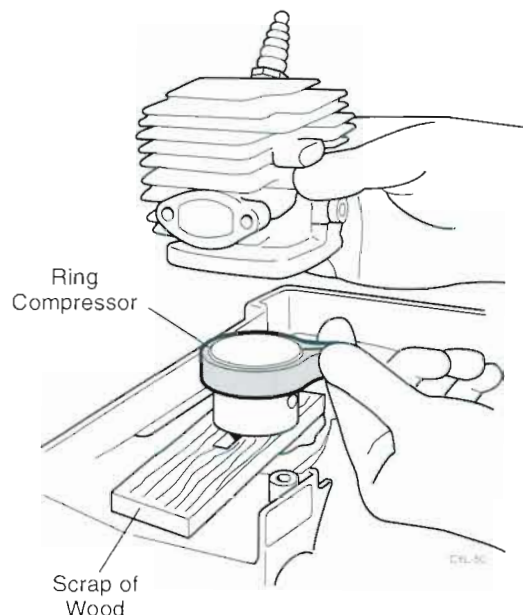


Figure 7.20 Using a Ring Compressor

Reassembly (Continued)

STEP 3. Orient the cylinder over the piston, and align the cylinder exhaust port with the arrow on the piston crown. While using a ring compressor (or finger pressure) to hold the piston rings in their grooves, carefully slide the cylinder over the piston.



ATTENTION!

Do not rotate the cylinder on the piston! Rotating the cylinder may fracture the piston rings in the cylinder ports, possibly damaging the cylinder bore.

STEP 4.

All Models (except 695 and 757) Apply ThreeBond p/n 1360 to the threads of each of the four cylinder base mounting screws, and then loosely assemble the cylinder to the crankcase. Tighten each screw only until it just contacts the cylinder base, less about 1/2–3/4 turn.

Models 695 and 757 Using four new precoated cylinder base mounting screws, loosely assemble the cylinder to the crankcase. Tighten each screw only until it just contacts the cylinder base, less about 1/2–3/4 turn.

Cylinder Alignment

STEP 1. Place one hand on the cylinder as shown, and then center the cylinder in the crankcase by slowly rotating the crankshaft while checking for binding between the piston and cylinder. If necessary, move the cylinder slightly until the piston can travel freely in the cylinder bore (Figure 7.21).

STEP 2. Once the cylinder has been properly centered, hold it firmly in place on the crankcase while hand-tightening the cylinder base screws.

IMPORTANT!

Failure to properly center the cylinder can increase stresses on internal engine components, causing lowered engine performance, increased wear, and higher operating temperatures.

Torquing

Use an accurate torque wrench to final-tighten the cylinder base mounting screws to the correct per-model specifications (Figure 7.22).

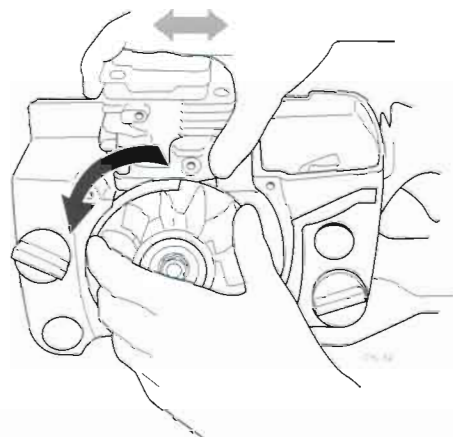


Figure 7.21 "Centering" the Cylinder in the Crankcase

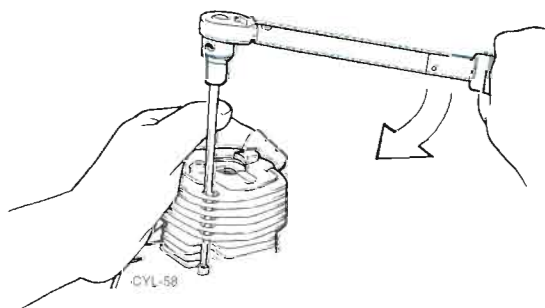


Figure 7.22 Torque All Mounting Bolts

Cylinder Base Torque Values

Saw Model	Cylinder Screw p/n	Torque in/lbs (Kg/cm)
300, 300S, 360, 377	22154-12130	61-70 (70-80)
488	22157-12130	61-70 (70-80)
575, 577, 680, 695	22155-12190	70-80 (80-90)
757	22169-12190	78-104 (90-120)

Final Assembly

The following procedures are typical. When in doubt, refer to the appropriate section of this manual and also to the torque and adjustment specifications in the appendix.

IMPORTANT!

Variations exist between models! Always consult the appropriate IPL during assembly!

STEP 1. Install the carburetor boot (insulator block on 300-series) and carburetor in the reverse order of removal, and firmly torque all fastenings.

STEP 2. Coat the muffler screw threads with ThreeBond p/n 1360 High Temperature Liquid Screw Lock, and install the muffler over a new muffler gasket.

STEP 3. Gap and install a new spark plug (see the appendix for proper size and gap), and torque to 148-165 in/lbs (170-190 Kgcm). Reconnect the spark plug lead.

STEP 4. Clean or replace the air cleaner element, and then install the air cleaner assembly and cylinder cover(s) in the reverse order of removal.

STEP 5. If the front handlebar was removed during disassembly, reinstall it now and then firmly tighten all handlebar mounting screws.



ATTENTION!

Over-length front handle screws may contact the oil tank on some saws, causing vibration and eventually ruining the tank. During reassembly, verify correct fastener and component usage through the appropriate Illustrated Parts List.

Break In

A rebuilt engine may run slightly hotter than normal until new parts have had time to conform or "seat in" against one another. This heat is usually the result of initial friction and also compression blow-by between the unseated piston rings and cylinder walls.

Following any major engine rebuild, Shindaiwa recommends the following:

- Reduce operating temperatures by adjusting the engine's carburetor settings slightly richer than normal.
- Operate the engine at varying speeds and reduced loads for at least the first 10 to 15 hours of operation.

IMPORTANT!

Mixing additional lubricating oil beyond the recommended 40:1 ratio provides no overall benefit.

Construction

(Figure 8.1)

All Shindaiwa saw crankcases feature diecast aluminum alloy construction, producing the lightest possible product with no sacrifice in strength or durability. Crankcase machining is computer-controlled to extremely close tolerances, allowing crankcase halves to be replaced as individual part numbers.

- Crankshaft assemblies are supported by large ball bearings installed in precision-machined bores in the crankcase halves.
- Crankshaft thrust control is provided at the small end of the connecting rod, allowing greater oil flow to the big-end bearings on the crankshaft throw.
- Lubrication and overall product durability are further enhanced by the use of caged needle bearings at both ends of the connecting rod.

IMPORTANT!

Crankcase halves are identified by either an "M" or "C" following the part description in the Illustrated Parts List:

M refers to the crankcase half closest to the magneto/starter side of the engine.

C refers to the half closest to the clutch (output) side of the engine.

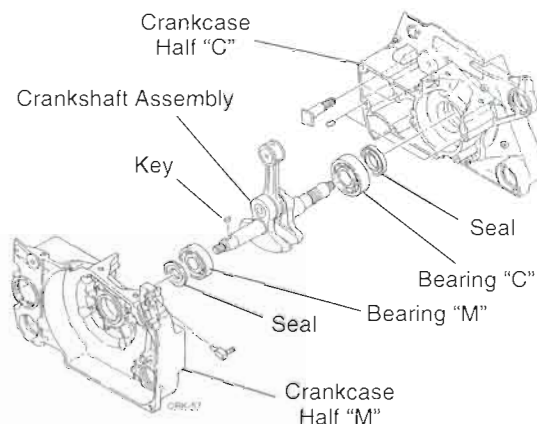


Figure 8.1 Crankcase Components (757 shown)

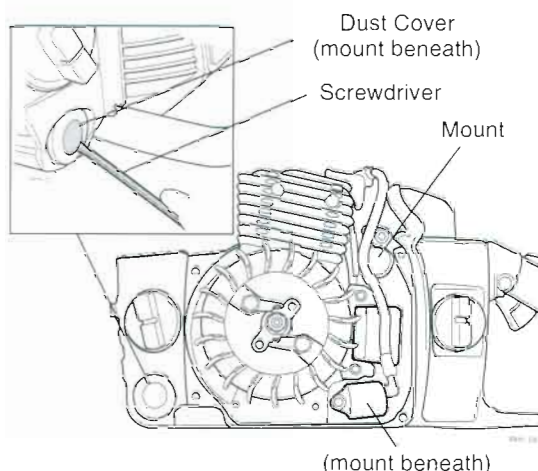


Figure 8.2 Mount Locations (575 shown)

Crankcase Disassembly

(except model 357)

Before disassembly, drain all fuel and oil from the saw.

Remove Accessories

STEP 1. Remove all covers, and then remove the starter and clutch assembly.

STEP 2. Remove the carburetor and muffler, but leave the cylinder installed at this time. For details on removing specific components, consult the appropriate sections within this manual.

Remove the Rear Handle

STEP 1. Use a screwdriver to pry the dust caps from over the A-V mounting cushions. Loosen and remove all mounting screws or limiter bolts from the five A-V cushions (six cushions used on Model 757 (Figure 8.2)

STEP 2. While holding the rear handle in one hand, grasp the cylinder with your other hand and then push the cylinder/crankcase assembly from the handle (Figure 8.3).

IMPORTANT!

If the saw has a boot-mounted carburetor, it may be necessary to guide the carburetor boot through the flange on the airbox (Figure 8.3, inset).

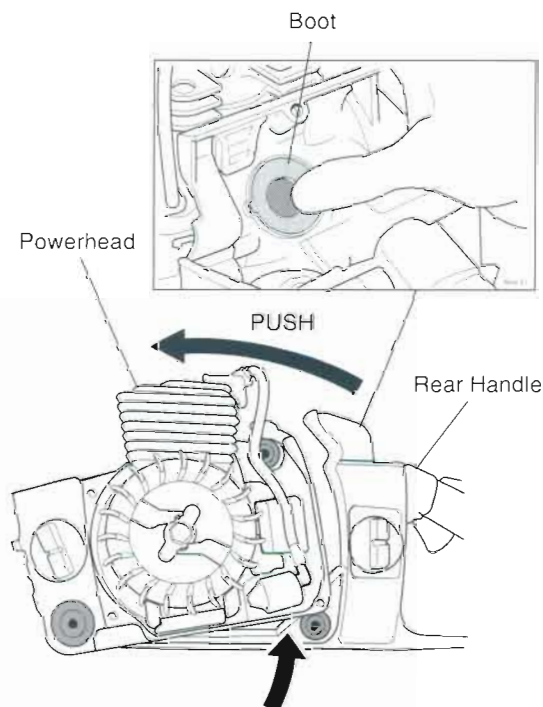


Figure 8.3 Removing the Powerhead

Disassembly (Typical)

STEP 1. Lock the crankshaft by inserting a soft piston stop through the spark plug hole (Figure 8.4), and then remove the flywheel nut (counter-clockwise to remove).

STEP 2. Remove the four cylinder mounting bolts, and remove the cylinder as described in Section 7 "Cylinders and Pistons."

STEP 3. Install p/n 22150-96101 flywheel puller as shown, and remove the flywheel from the crankshaft. (Figure 8.5)

STEP 4. Use diagonal pliers to remove the crankshaft woodruff key from the machined slot on the flywheel end of the crankshaft (Figure 8.6).

STEP 5. Loosen and remove the two Allen screws securing the crankcase halves at the front of the saw (Figure 8.7).



ATTENTION!

Saw model 757 has an additional crankcase screw located in a recess near the oil tank filler cap.

STEP 6. Loosen and remove the three/four Allen screws from around the crankshaft.

STEP 7. Remove the phillips head screw at the rear of the crankcase (Models 300, 300S, 360, 377, 488 only). See Figure 8.8 and the Table below.

Crankcase Fastener Locations

Model	Location	Quantity
300, 300S 360, 377	Crankcase	3
	Oil Tank	2
	Rear	1
488	Crankcase	4
	Oil Tank	2
	Rear	1
575, 577, 680, 695	Crankcase	4
	Oil Tank	2
757	Crankcase	4
	Oil Tank	3

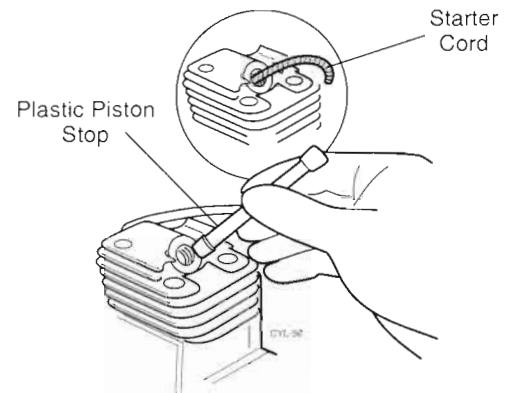


Figure 8.4 Lock the Crankshaft

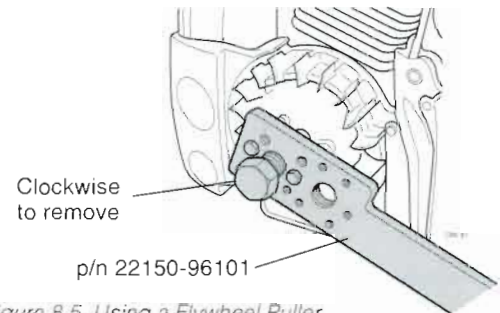


Figure 8.5 Using a Flywheel Puller

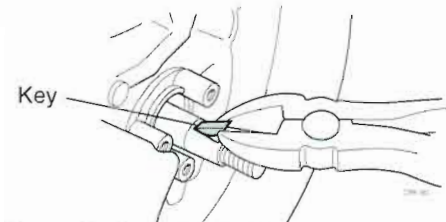


Figure 8.6 Removing the Woodruff Key

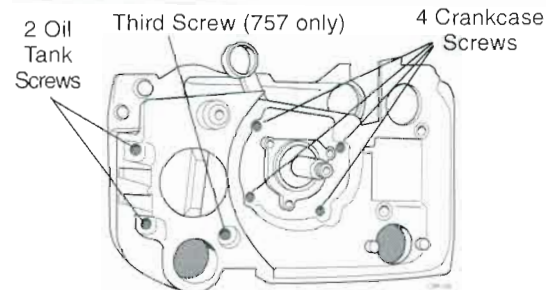


Figure 8.7 Crankcase Fasteners (757)

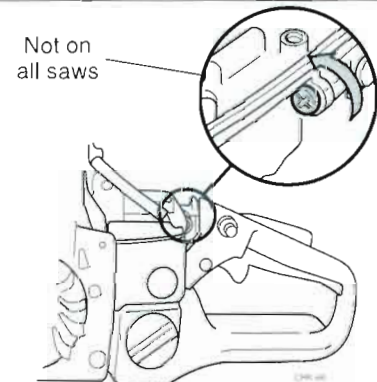


Figure 8.8 Crankcase Rear Screw Location

Separate the Crankcase Halves

(Two methods)

Method 1 (Figure 8.9)

STEP 1. While holding the crankcase as shown, separate the crankcase halves by *gently* tapping the crankshaft with a dead-blow hammer. If necessary, use a heat gun to pre-heat the clutch-side bearing area to not more than 210°F.

STEP 2. Using a dead-blow hammer, gently tap the crankshaft from the remaining crankcase half.

STEP 3. Remove the piston assembly from the connecting rod as described in Section 7.

Method 2 (Figure 8.10)

STEP 1. Install a crankcase separator tool and center it over the saw crankshaft.

STEP 2. Separate the crankcase halves by tightening the separator's threaded puller stud against the crankshaft end.

STEP 3. Using a dead-blow hammer, gently tap the crankshaft from the remaining crankcase half.

■ The crankcase separator can also be used to push the crankshaft from the remaining crankcase half.

■ Remove the piston assembly from the connecting rod as described in Section 7.

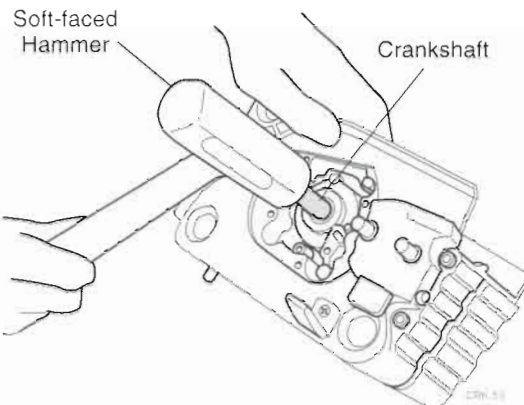


Figure 8.9 Separating the Case Halves

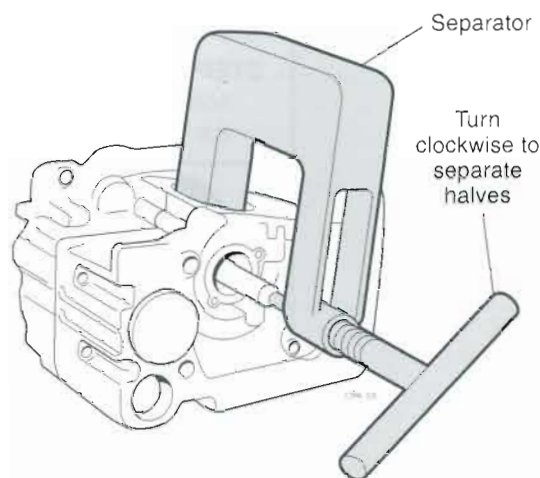


Figure 8.10 Using a Case Separator

Bearing and Seal Removal

Crankshaft bearings typically remain in the crankcase halves. Crankshaft bearings are a slip-fit on crankshafts, and a press-fit into crankcase halves.

STEP 1. Use a screwdriver or hook-type seal remover to pry the seals from the individual crankcase halves (Figure 8.11).

■ To remove the seals from an assembled crankcase, use a seal puller such as p/n 22150-96600 (Figure 8.12).



ATTENTION!

Never drill through a seal shell! Chips or other drilling debris may lodge in crankshaft bearings, leading to early bearing failure. *Never* allow puller tips or other tools to contact the crankshaft bearings.

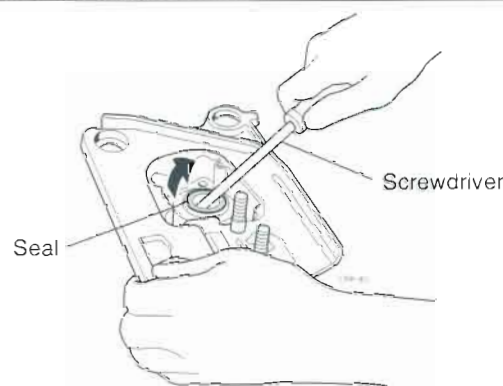


Figure 8.11 Seal Removal

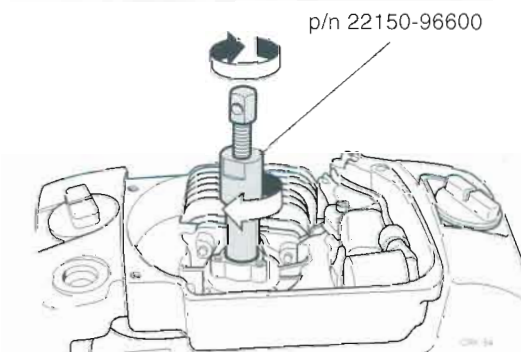


Figure 8.12 Using a Seal Puller

Cleaning

STEP 2. Using an appropriate bearing driver and a soft-faced hammer, carefully tap each bearing from its bore in the crankcase (Figure 8.13).

IMPORTANT!

Bearing removal is generally unnecessary unless the engine has suffered a major internal failure, has extremely high hours, or has ingested large amounts of debris. If a bearing must be removed, however, always replace it with a new one. For maximum performance and service life, use only Shindaiwa factory replacement bearings as listed in the accompanying table.

If bearing removal is difficult, the bearing bore can be expanded slightly by using a heat gun to pre-heat the bearing bore to not more than 210°F (Figure 8.14).

- Clean all parts in solvent and blow dry with compressed air. Stubborn gasket compound or sealant can be removed with acetone, or can be softened with paint remover.
- Residue can be carefully scraped from sealing surfaces with a plastic scraper or conventional gasket scraper, but be extremely careful to avoid nicking or scratching crankcase sealing surfaces.



WARNING!

Wear eye and skin protection when working with any solvent or paint remover. Follow manufacturers instructions as to other safety and disposal precautions!

Inspection

Crankshaft bearings (Figure 8.15)

Inspect both crankshaft bearings for damage or accumulated debris. Shindaiwa engines are high performance engines and require premium bearings for maximum performance and service life.

- Inspect bearings visually and manually. Carefully spin each bearing by hand.
- Replace any bearing that feels "rough" or appears to "catch" when rotated.

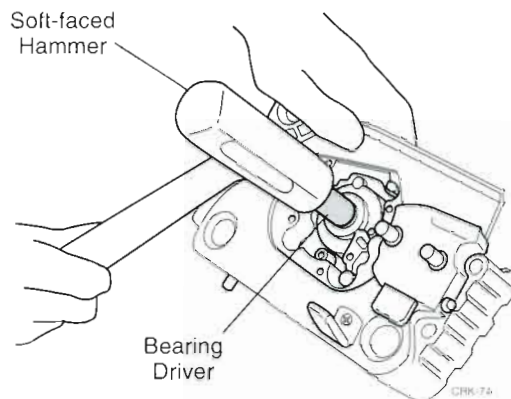


Figure 8.13 Removing Bearing with a Driver

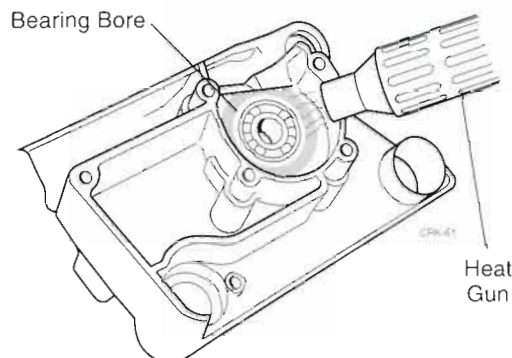


Figure 8.14 Expanding the Bearing Bore

Bearing Part Numbers

Model	Bearing p/n (M)	Bearing p/n (C)
300, 300S, 360	02030-06001	02030-06201
357	12900-62010	12900-62010
377	12900-60010	12900-62010
488	02030-06201	02030-06201
575, 695	02030-06202	02030-06202
577	12900-62020	12900-62020
680	02000-06202	02000-06202
757	02030-06202	02030-06203

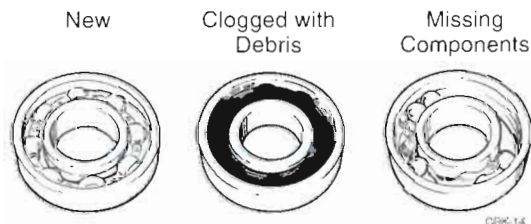


Figure 8.15 Bearing Inspection

Inspection (continued)

Crankshaft (Figure 8.16)

The crankshaft assembly requires careful inspection, especially if the engine has been disassembled for a major component failure or sudden stoppage.

Slide the connecting rod gently from side to side across the crankpin and note any excessive drag. Carefully inspect the needle bearings and cage for any signs of damage including pitting, chipping, or overheating.

A crankshaft that fails any of the inspections described in Figure 8.16 must be rejected.

- A damaged crankpin can cause the connecting rod to "ratchet" as it's moved across the crankshaft. This kind of damage often results from the hammering effects of detonation, and detonation damage can often be traced to operating an engine on low-octane fuel.
- The 757 crankshaft has a machined shoulder that forms part of the slot for the clutch assembly retaining ring (E-ring). Inspect this area carefully for signs of damage from a loose or incorrect E-ring installation.
- Irregular piston wear may indicate a distorted connecting rod.

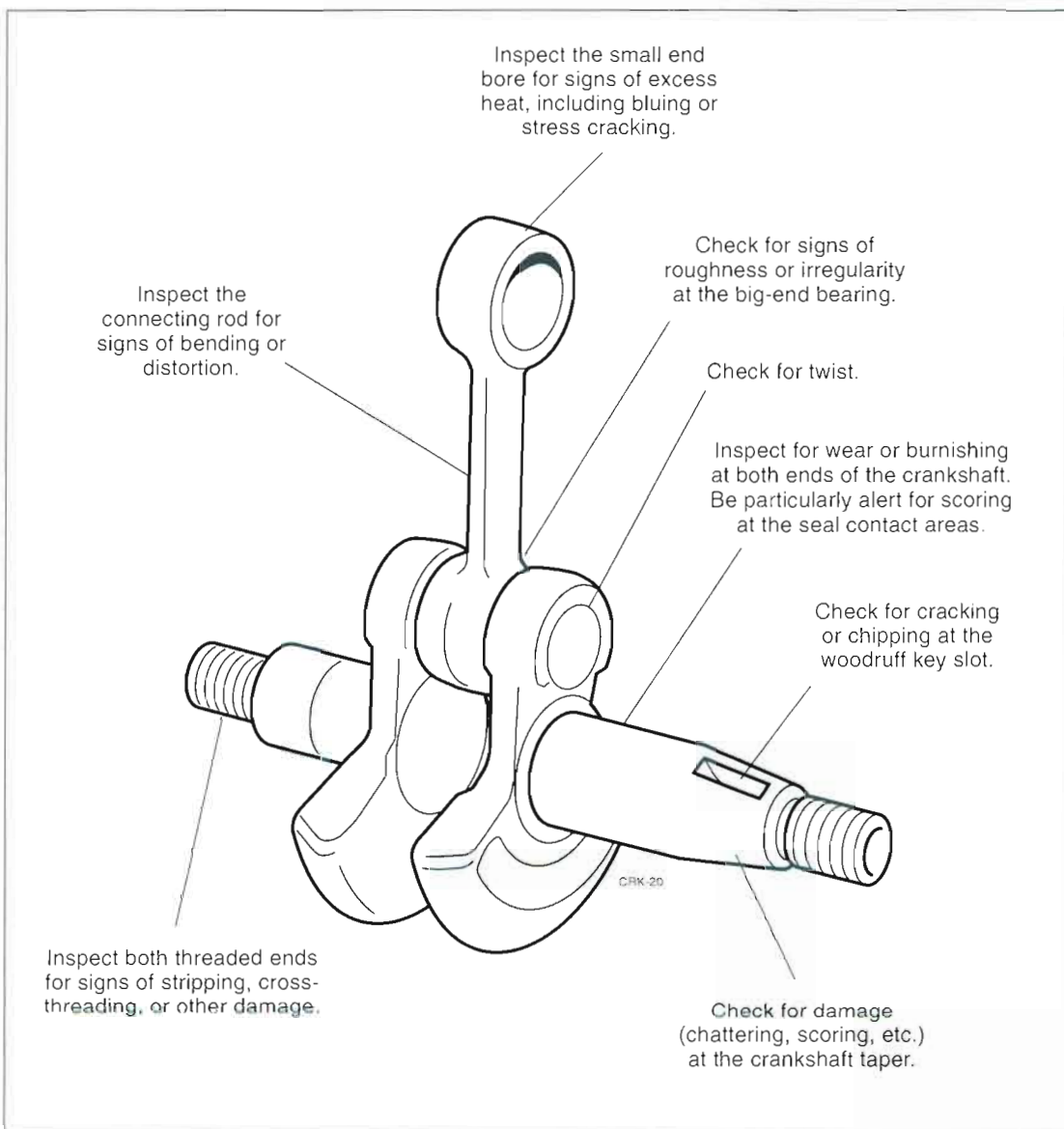


Figure 8.16 Key Crankshaft Inspection Areas

Twist

A crankshaft assembly can be twisted and permanently damaged from a severe impact such as sudden stoppage from a thrown chain or broken piston. Excessive use of impact tools during service can distort and ruin a crankshaft as well.

- A twisted crankshaft will often reveal itself to a user by difficult or uneven cranking, leaking seals, or loose crankshaft bearings.
- A severely twisted crankshaft may even display a visible wobble or "runout" when the flywheel is slowly rotated.

The preferred and most accurate method of checking for crankshaft runout requires mounting the crankshaft between centers and then measuring runout with a dial indicator (Figure 8.17).

Any crankshaft with runout exceeding 0.0027" must be rejected.

If a dial indicator and centers are not available, runout in an assembled engine can usually be detected by placing a thickness gauge between the engine's flywheel and coil and then slowly rotating the crankshaft. (Figure 8.18)

IMPORTANT!

The crankshafts used on Shindaiwa engines cannot be rebuilt!

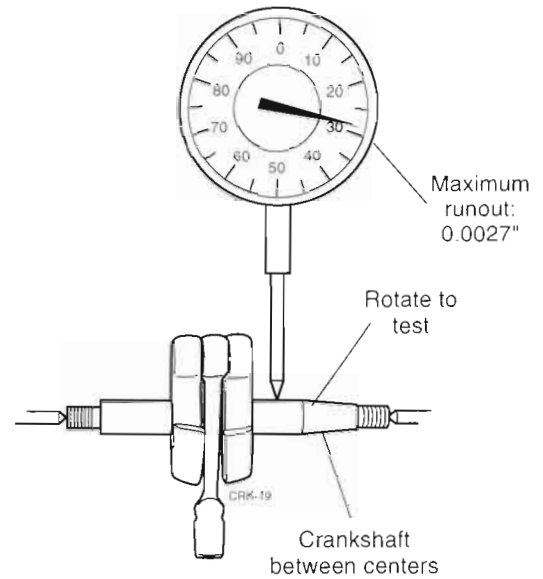


Figure 8.17 Checking Runout with a Dial Indicator

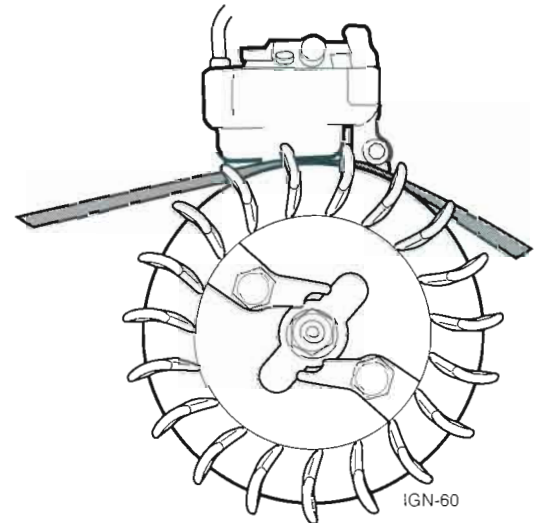


Figure 8.18 Measuring Runout with a Thickness Gauge

Crankcase Inspection (Figure 8.19)

Crankcase integrity is essential to the basic durability of any engine. A crankcase half that fails in any of the following inspections should be considered unreliable and must be rejected.

IMPORTANT!

Bearing bore damage may have been caused by careless service procedures, but can also indicate a twisted or otherwise damaged crankshaft assembly.

IMPORTANT!

Crankcase dimensions determine crankshaft end play. Crankcase halves must *never* be exchanged between model groups!

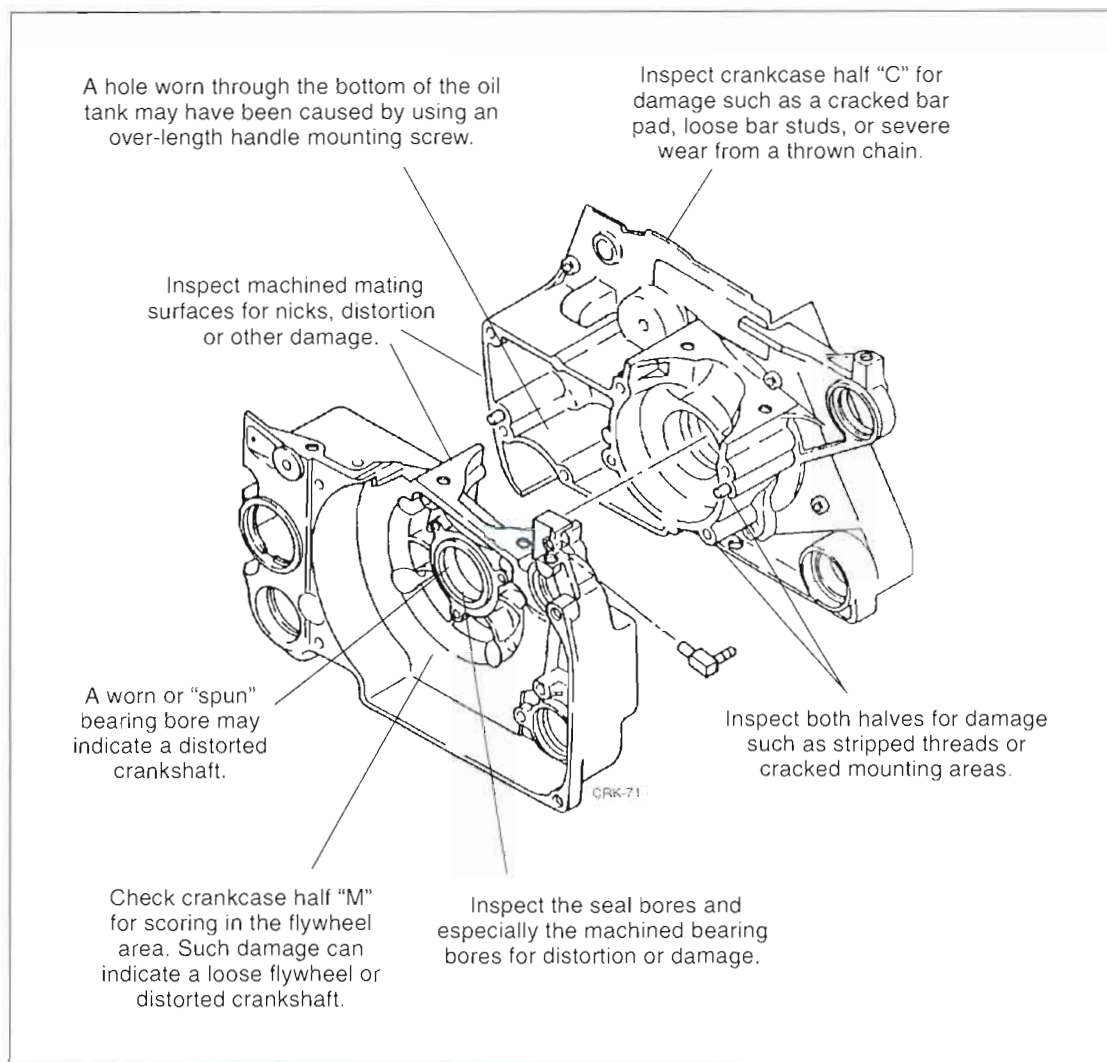


Figure 8.19 Crankcase Inspection Areas

Reassembly

Bearing Installation

Special crankcase holders are required to properly support the individual crankcase halves during bearing installation, and are listed along with bearing drivers in the Special Tools section of the Appendix of this manual.

- Holders for a specific saw model are further identified by either the letter "M" or "C," and must be matched to the crankcase half being serviced.
- Bearing installation is easiest if the crankcase bearing bore is first expanded slightly by heating to not more than 210°F. (Figure 8.20).

STEP 1. Working on a sturdy block of wood, place the appropriate crankcase holder beneath the outer face of the crankcase half.

STEP 2. Using the appropriate bearing driver and a dead blow hammer, carefully tap the new bearing into place until it just contacts the base of the bearing bore (Figure 8.21).

STEP 3. Spin the installed bearing and observe any roughness or unusual drag.

IMPORTANT!

Use of a steel hammer in place of the recommended "dead-blow" type can cause bearing rebound, resulting in an improperly seated bearing.

- Avoid excessive hammering when installing bearings
- Drive the bearing only until it contacts the base of the bearing bore.
- If a bearing must be removed for any reason, replace it with a new one.

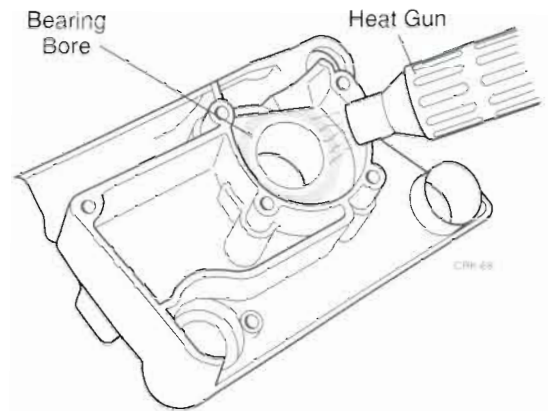


Figure 8.20 Expanding the Bearing Bore

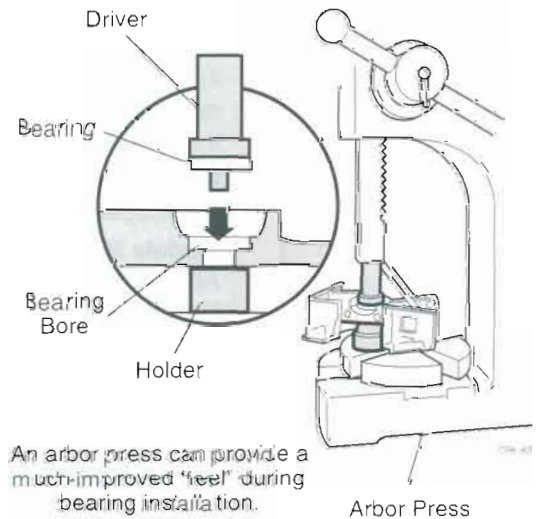
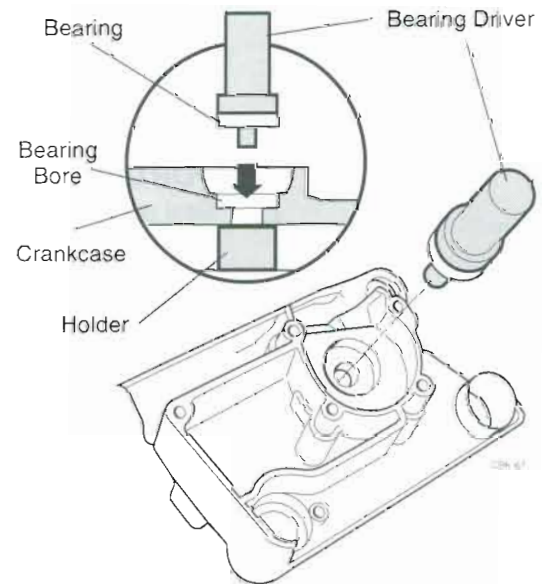


Figure 8.21 Bearing Installation Techniques

Seal Installation

IMPORTANT!

Seal integrity is vital to both engine performance and durability! Always replace both crankcase seals during overhaul. Following assembly, always pressure-test the engine for possible air leaks!

STEP 1. Grease the seal lips. Prior to installing either seal, apply a small amount of clean grease both around and behind the seal's neoprene lip (Figure 8.22).

A seal with a plain metal O.D. should also receive a thin coating of ThreeBond 1104 (or equivalent) prior to installation.

STEP 2. Install the new seals. Using the appropriate seal driver (see Appendix, *Special Tools*) and a dead-blow hammer, install and seat each seal to the depth allowed by the seal driver (Figure 8.23).

IMPORTANT!

Seal driver part numbers for a specific saw model must be matched to the crankcase half being serviced.

STEP 3. Carefully inspect the completed seal installations. A seal that contacts an inner bearing race or that is bent or damaged in any way must be replaced.

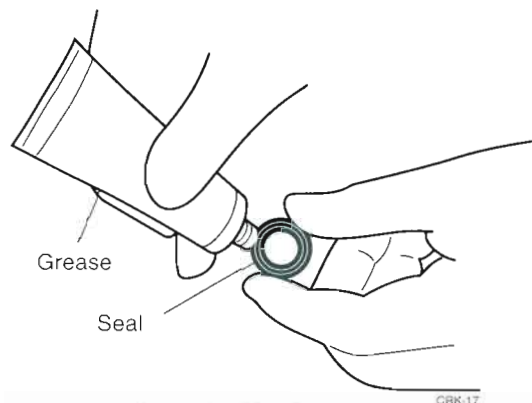


Figure 8.22 Grease the New Seal

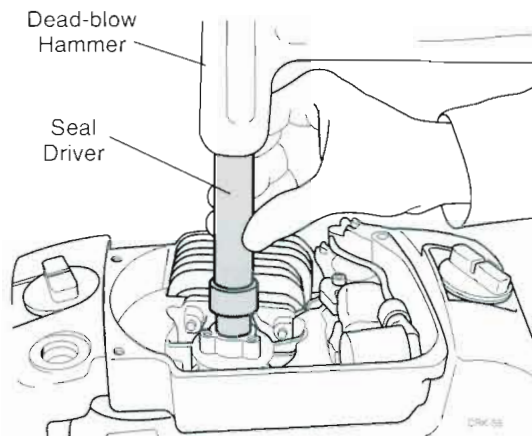


Figure 8.23 Seal Installation

Crankcase/ Crankshaft Reassembly

STEP 1. Push the tapered end of the crankshaft assembly through the crankcase bearing.

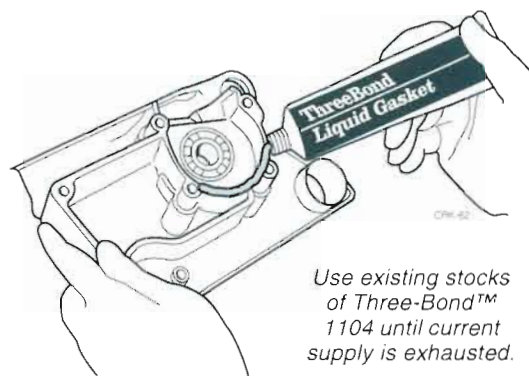
■ Crankshaft bearings are press-fit on crankshafts used on Models 488, 695, and 757. For easier bearing installation on these models, pre-heat the bearings to not more than 210°F.

STEP 2. Install the appropriate crankcase gasket/gasket compound:

Models 300, 300S, 360, 377, 577, 757–
Apply a thin bead of Three-Bond™ No. 1207C or 1104 Liquid Gasket to the mating surfaces of crankcase "C." (Figure 8.24).

Models 488, 575, 695

Place the appropriate p/n crankcase gasket over the locating pins on crankcase half "C." Gasket is installed **dry** (no sealant).



Use existing stocks of Three-Bond™ 1104 until current supply is exhausted.

Figure 8.24 Applying Liquid Gasket
(not used on Models 488, 575 and 695)

IMPORTANT!

Gasket thickness determines crankshaft end play. Do not interchange crankcase gaskets between Models 575/695 and Model 680. Grey-colored gasket used on Models 575/695 is .005 thicker than the manila gasket required for Model 680.

STEP 3. Push the crankshaft through the bearing in crankcase "M," align the two case halves, and then push the two halves firmly together.

STEP 4. Coat all crankcase bolt threads with ThreeBond 1401 Liquid Screw Lock, and then install and hand-tighten all bolts.



ATTENTION!

Interchanging crankcase bolt lengths can permanently damage crankcase halves! For correct crankcase bolt p/n and specifications, refer to The Crankcase Bolt Specifications Table below.

STEP 5. Working sequentially and in stages, torque all crankcase bolts to the values shown in the table below.

STEP 6. Working sequentially and in stages, torque all oil tank bolts (see Table below).

Crankcase Bolt Specifications

Model	Bolts Used	Quantity	Part Number	Diameter x Length	Torque in./lbs. (Kg/cm)
300, 300S 360, 377	Crankcase	3	01020-05300	5 mm x 30 mm	61-70 (70-80)
	Oil Tank	2	22910-12480	5 mm x 40 mm	
	Rear	1	11021-05180	5 mm x 20 mm	
488	Crankcase	4	22157-21750	5 mm x 30 mm	61-70 (70-80)
	Oil Tank	2	22157-12130	5 mm x 20 mm	
	Rear	1	22157-21760	5 mm x 12 mm	
575, 577, 695, 680	Crankcase	4	01020-05350	5 mm x 35 mm	70-80 (80-90)
	Oil Tank	2	01020-05500	5 mm x 50 mm	
757	Crankcase	4	22169-21910	5 mm x 35 mm	70-80 (80-90)
	Oil Tank	3	22169-21910	5 mm x 35 mm	

Crankcase/ Crankshaft Reassembly (continued)

Final Assembly

STEP 7. Inspect bearing preload by slowly rotating the crankshaft by hand and noting any unusual drag or stiffness. If such preload is noted, it can usually be eliminated by sharply tapping each crankshaft end with a dead-blow hammer.



ATTENTION!

Excessive bearing preload will cause an engine to run hotter than normal, and can drastically shorten overall engine life.

STEP 1. Install the piston and cylinder as per the procedures outlined in Section 7, and then leak-test the crankcase assembly by sealing both cylinder ports and pressurizing the crankcase to 4–6 psi for 3–5 minutes as described in Section 2 "Troubleshooting" (Figure 8. 25).



ATTENTION!

Crankcase air leaks can cause a two-cycle engine to operate in a "lean" (fuel-starved) condition, possibly causing serious damage from overheating! Following any major repair or overhaul, *a/ways* pressure-test the assembled engine for possible air leaks!

STEP 2. Install the crankcase in the rear handle assembly in the reverse order of disassembly, and then install and firmly tighten all limiter bolts and A-V mounting screws.

IMPORTANT:

On crankcases equipped with an impulse tube, be sure the tube is correctly oriented and doesn't become pinched or kinked during assembly.

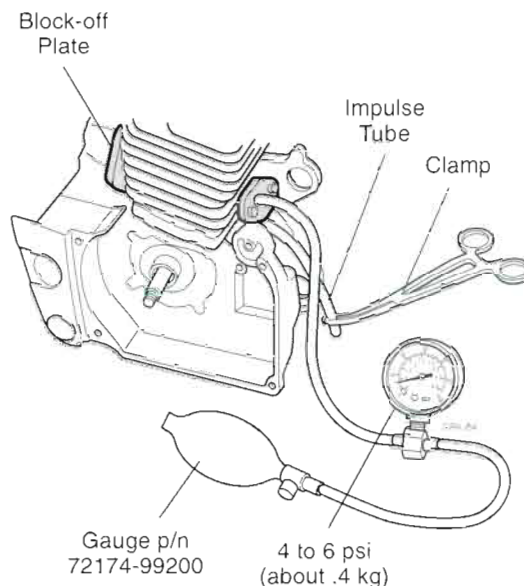


Figure 8.25 Pressure Testing the Crankcase

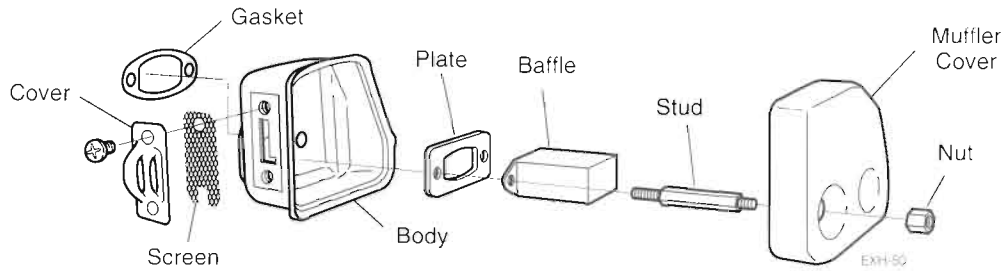
STEP 3. Install the remaining accessories and components in the reverse order of removal. Consult appropriate sections of this manual as necessary.

STEP 4. Start the saw, and adjust the carburetor according to the procedures described in Section 3.

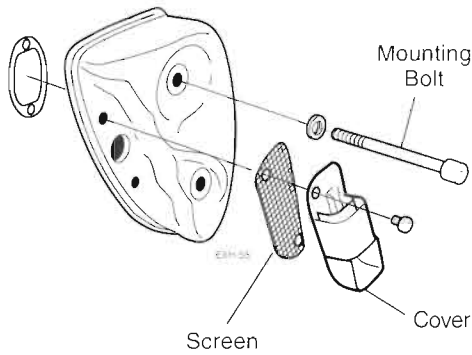
IMPORTANT!

Following any major overhaul, Shindaiwa recommends a break-in period of approximately 15 to 20 hours. During break-in, adjust carburetor high-speed settings approximately 10% richer than normal and operate the saw at varying speeds and reduced loads until new components have had time to "seat" or "wear in."

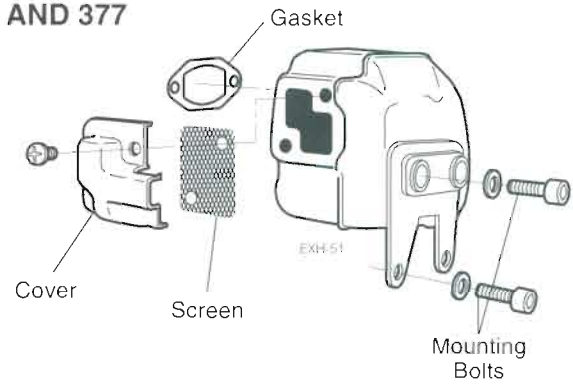
300, 300S



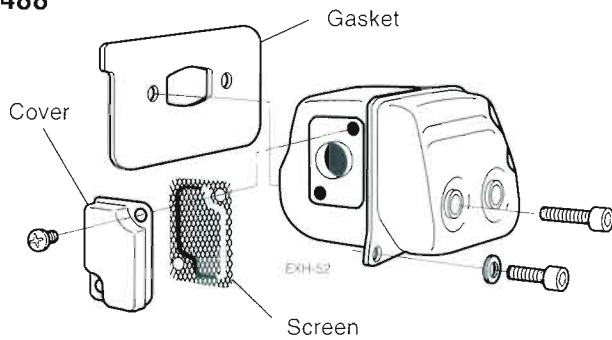
357



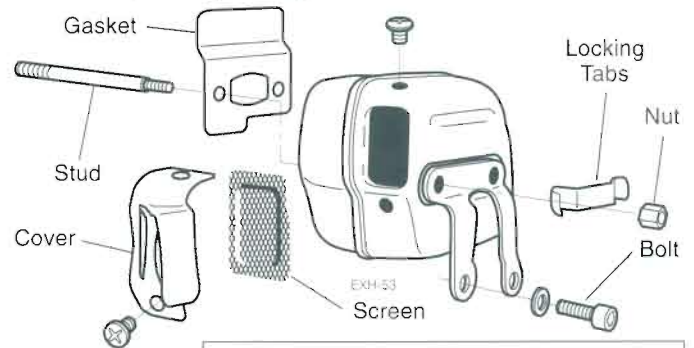
360 AND 377



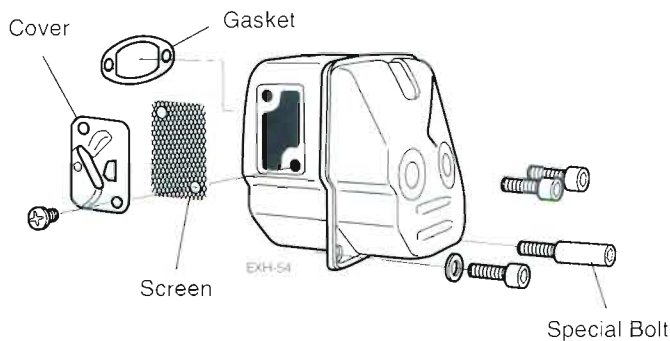
488



575, 577, 680 (LATE), 695



757



EARLY 680

(p/n 72230-15000)

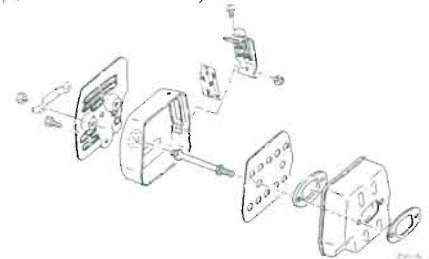


Figure 9.1 Muffler Installations, by Model

Construction

(Figure 9.1)

All Shindaiwa saws feature high capacity steel mufflers with internal baffling and spark arrestor screens.

- Mufflers are bolted to the engine cylinder flange through either a metal or composition gasket.
- Except for saw Models 300, 300S and 357, all mufflers also feature one or more external mounting lugs.
- Mufflers used on saw models 357, 360 and larger are of one-piece unitized construction, minimizing the chance of components loosening during operation.

Service

Spark arrestor screens are susceptible to clogging over time, and should be inspected periodically and cleaned on at least a seasonal basis.

- Hard starting, gradual power loss, and poor high-RPM operation may indicate a clogged arrestor screen.
- More frequent inspection is required if an engine is operated with rich oil/fuel ratios, excessively rich carburetor adjustments, or at low RPMs for long periods of time.

Spark Arrestor Removal and Cleaning

(Figure 9.2)

The arrestor screens used on most Shindaiwa saws can be removed without removing the muffler from the saw. However, actual component use and installation may vary between models, so always consult the IPL for your particular saw.

STEP 1. Remove the spark arrestor cover screws, and then remove the arrestor cover and lift out the arrestor screen.

STEP 2. Use a propane or acetylene torch to burn deposits from the arrestor screen,

or

deposits can be removed by soaking the screen in oven cleaner and then thoroughly rinsing the screen in a solvent bath.



WARNING!

Oven cleaner is highly corrosive! Oven cleaner should never be used without proper eye, respiratory, and skin protection! Before using any oven cleaner, read and follow the manufacturer's instructions and warnings!

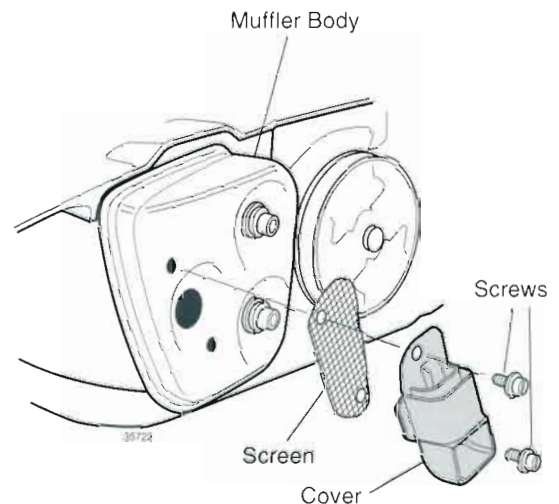


Figure 9.2 Arrestor Screen Installation (357 shown)



ATTENTION!

Never allow oven cleaner to contact aluminum components! Oven cleaner can quickly corrode and ruin aluminum!

Muffler Removal

(refer to the exploded views on the previous page)

Models 300 and 300S

STEP 1. Unscrew the two 5 mm muffler cover nuts, and then remove the muffler cover.

STEP 2. Unscrew the two 5 mm muffler stud bolts, and then remove the muffler pipe, plate, muffler base, and gasket from the cylinder mounting flange.

Saw Models 360, 377, 488, and early 757

STEP 1. Unscrew the two 5 mm bolts securing the muffler body to the cylinder flange.

STEP 2. Unscrew the two 5 mm muffler support bolts securing the muffler base lugs to the crankcase.

STEP 3. Remove the muffler and muffler gasket, exposing the cylinder exhaust port.

IMPORTANT!

Current-production 757 saws use four 6 mm muffler mounting bolts.

Saw Models 575, 577, 680 (later production) and 695

STEP 1. Bend the lock plate tabs from around the muffler retaining nuts, and then unscrew the two 8 mm nuts securing the guard and muffler body to the cylinder flange (Figure 9.3).

STEP 2. Unscrew the two 5 mm muffler support bolts securing the muffler base lugs to the crankcase (not used on early 680)

- Remove the muffler and muffler gasket from the cylinder flange.
- Unscrew the two muffler mounting studs from the cylinder flange.

IMPORTANT!

Early Production 680 saws utilized a component-type muffler p/n 72230-15000 (Figure 9.1).

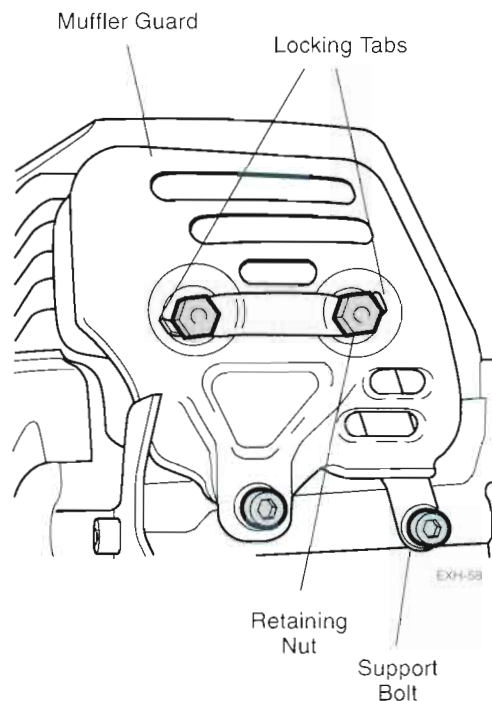


Figure 9.3 Muffler Installation: 575, 577, late-production 680, 695 (typical)

Inspection

STEP 1. Inspect the muffler body for damage such as broken seams, stripped arrestor bolt threads, or loose baffles, and replace if noted.

- Heavy carbon deposits can sometimes be removed by heating the muffler with an acetylene torch, but the muffler must be completely clean and free of restrictions before being returned to service.

STEP 2. Carefully inspect the cylinder flange and muffler mounting holes for any signs of distortion, cracking, or other damage, and repair/replace components as required.

STEP 3. Look through the spark plug hole and inspect the cylinder exhaust port for carbon buildup (Figure 9.4).

- A light sooty coating is normal and requires no further attention, but any layering or solid carbon deposits will require cylinder removal for a thorough decarbonization.



ATTENTION!

Never attempt to decarbonize cylinder ports while the cylinder is assembled to the engine! Carbon deposits can become trapped between the piston and cylinder walls, causing severe mechanical damage! For cylinder removal procedures, see Section 7.

Look through the spark plug hole.

Carbon Buildup on Exhaust Port



Figure 9.4 Inspect Exhaust Port for Carbon Buildup

Muffler
Installation

Muffler installation is the reverse of disassembly, but includes the following additional steps or procedures:

- STEP 1.** Use a gasket scraper to carefully clean the mating surfaces on both the muffler and cylinder flange.
- STEP 2.** Use a new muffler gasket during reassembly.
- STEP 3.** Coat all bolt/stud threads with ThreeBond 1360 high-temperature liquid screw lock or equivalent product (see inset *Notes on Thread Sealants*, right), and then assemble and tighten the muffler to the engine cylinder flange.

IMPORTANT!

Under severe conditions, muffler bolts on larger saws and especially on Model 757 may require the added holding power of a high-temperature thread sealant such as LocTite™ 272.

- STEP 4.** Torque the muffler support bolts and then the two muffler mounting bolts to the specifications given in the Muffler Torque Values table on the following page.

**ATTENTION!**

A loose or missing muffler support bolt may allow the muffler to loosen during operation, elongating the muffler mounting bolt threads and possibly damaging the cylinder mounting flange.

IMPORTANT!**Notes on Use of Thread Sealants**

Proper use of thread sealants can help prevent muffler bolts from loosening under heat and vibration.

ThreeBond 1360 and most other shop-grade thread sealants are anaerobic, meaning the sealant is designed to remain liquid in the presence of oxygen. When applied to muffler bolt threads, the sealant doesn't begin to "cure" until after the bolt is tightly installed in the cylinder flange.

Once cured, the bond can only be broken by heating the sealant above its operating limits or by physically turning the bolt itself. Turning or "retorquing" a treated bolt after cure will cause the hardened sealant to crumble, reducing its overall holding power.

For maximum holding power from any thread sealant, Shindaiwa recommends:

- *Thoroughly clean and degrease all bolts and internal threads immediately before final assembly.*
- *Final-torque all treated bolts at the time of installation.*
- *Before using the saw, allow sufficient time for treated bolts to completely cure per the sealant manufacturer's recommendations.*
- *If a treated bolt or other fastening must be retorqued, it should first be removed, cleaned, and coated with fresh sealant before reinstallation and tightening.*

STEP 5. Install the spark arrestor components in the reverse order of disassembly. Coat the threads on both arrestor bolts with ThreeBond 1360, and then install and firmly tighten both bolts.

IMPORTANT!

Never attempt to move or retorquer muffler bolts after thread sealant is cured! For maximum holding power, thread sealants must be allowed to cure overnight before the saw is started or returned to service.



ATTENTION!

Operating a chainsaw that has a damaged, missing or incorrectly installed exhaust system is a fire hazard, and is illegal in some areas! For applicable safety notices and regulations, consult the USFS and appropriate state/local authorities.

Muffler Torque Values

Model	Bolt/Thread Size*	Torque in.lbs (KgfcM)
300, 300S, 360, 357, 377, 488	5mm	61-70 (70-80)
575, 577, 680, 695	5mm	70-79 (80-90)
757 (early)	5mm	70-79 (80-90)
757 (current)	6mm	105 (120)

*Thread sealant is recommended for all muffler fastenings.

General

Every Shindaiwa saw features a lever-operated chain brake designed to instantly stop all chain rotation whenever the brake is activated.

Moving the brake lever forward (away from the operator) allows a powerful spring to tighten a metal band around the saw's clutch drum, stopping the chain.

The brake is released by physically pulling the lever back toward the operator, compressing the spring and releasing the brake band from around the clutch drum (Figure 10.1).

When the saw is in use, any sudden upward or rearward thrust of the saw's guide bar (such as during a "kickback") forces the operator's left hand to activate the chain brake lever and stop the saw chain from rotating (Figure 10.2). Figure 10.3 illustrates how Shindaiwa chain brakes operate.

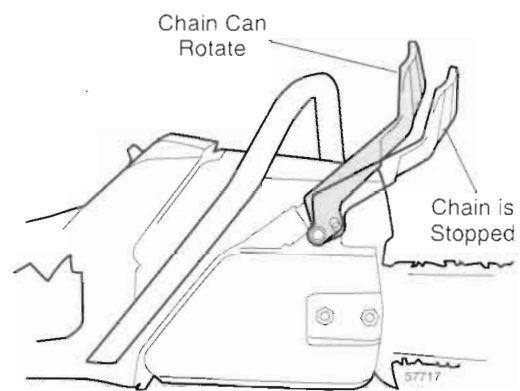


Figure 10.1 Chain Brake Lever Operation

Adjustment

(except Models 357, 377 and 757)

Except for models 357, 377 and 757 with non-adjustable brake assemblies, Shindaiwa chain brakes can be adjusted using the following general procedure:

IMPORTANT!

Prior to installing a rebuilt brake assembly on a saw, preliminary adjustment is easier if a spare clutch drum is first inserted in the brake band.

STEP 1. Disengage the chain brake by pulling the brake lever to the rear (off) position.

STEP 2. Insert a thin screwdriver into the slotted head on the brake spring adjustment screw, and tighten (clockwise to tighten) or loosen the adjuster until the brake band completely releases the drum (Figure 10.4).

- To help a new or replacement band conform to shape, cycle the brake lever on and off 8 or 10 times before starting the saw.

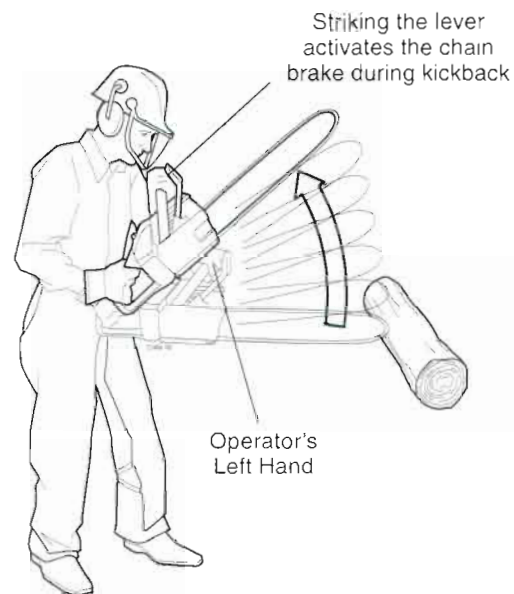
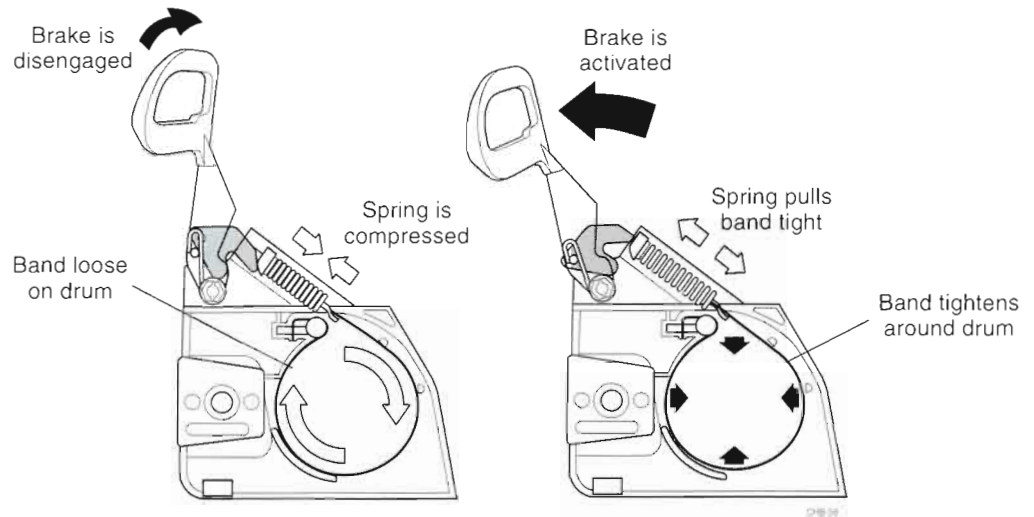


Figure 10.2 Activating the Chain Brake

All Shindaiwa Models EXCEPT 357, 377 and 757 (360 shown)



Models 357, 377 and 757 (377 shown)

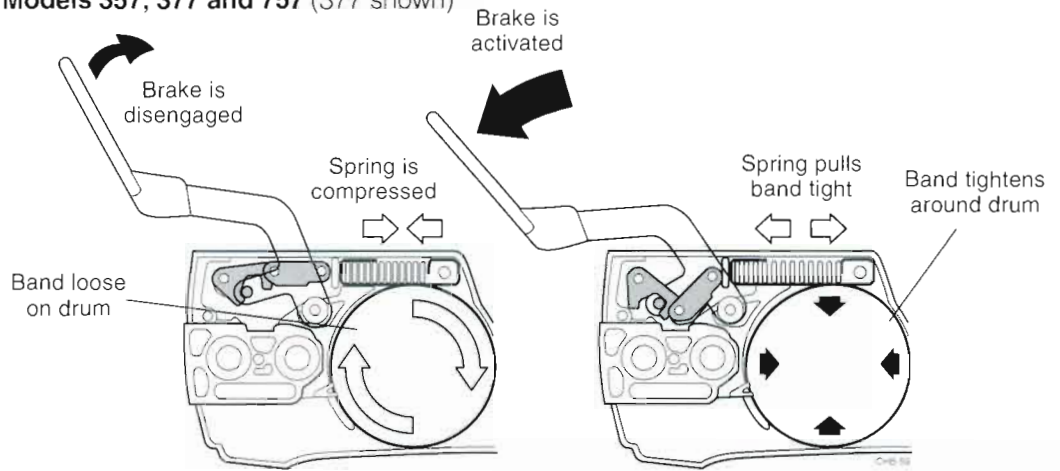


Figure 10.3 Chain Brake Operation (2 types used)

STEP 3. Start the saw and test the brake for operation at maximum engine RPM. The chain brake is properly adjusted if the chain stops the instant the brake is activated, yet moves freely when the lever is disengaged.



WARNING!

Never attempt to adjust the chain brake while the saw engine is running!



WARNING!

Regardless of engine speed, the saw chain must stop immediately whenever the chain brake is activated!

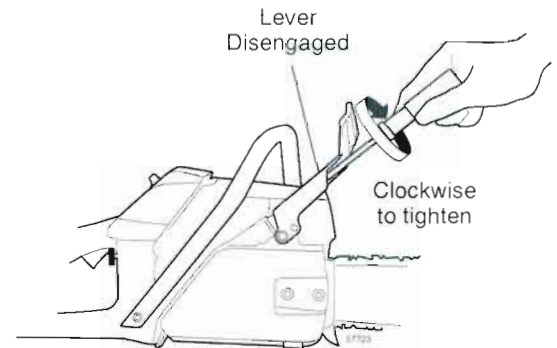
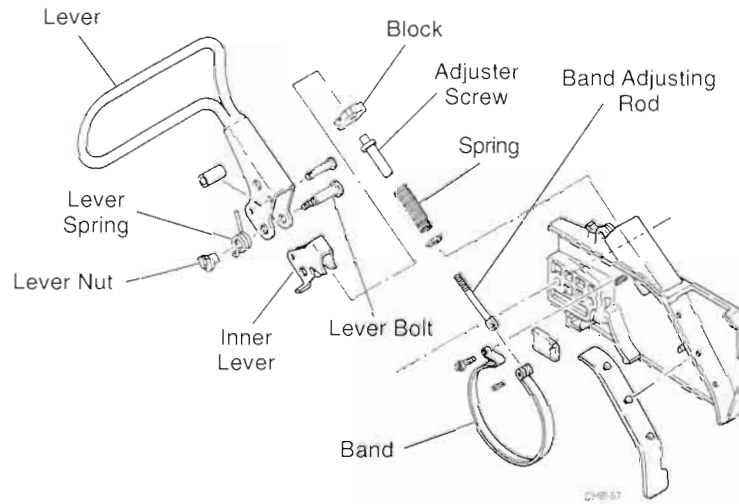


Figure 10.4 Adjusting the Chain Brake (except 357, 377 and 757)

**300, 300S, 360,
488, 575, 577,
680, 695 Chain
Brakes**

(Figure 10.5)

488, 575, 577, 680, AND 695



300, 300S, AND 360

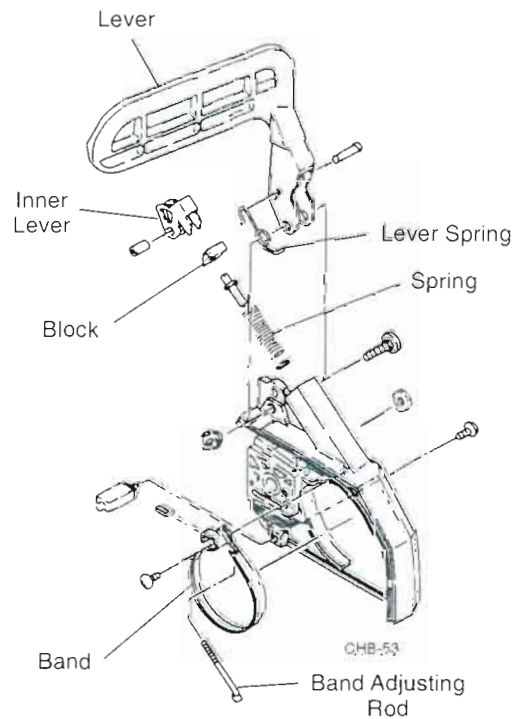


Figure 10.5 Chain Brake Components, typical

Disassembly (Typical)

Remove the clutch cover from the saw (Figure 10.6), and thoroughly clean all chips and oil residue from the cover and brake assembly.

- For easier handling during service, clamp the cover between two blocks of wood in a vise (Figure 10.7).

Using the illustrations in Figure 10.5 as a reference, disassemble in the following order:

STEP 1. While preventing the lever bolt from turning, loosen but do not remove the lever nut.

STEP 2. Use pliers (575-695 requires spring tool p/n 22150-96510) to release tension on the lever spring (Figure 10.8), and then remove the lever nut and spring.

STEP 3. Reinstall the lever nut, and then push the lever forward to activate the chain brake mechanism.

STEP 4. Remove the lever nut, unscrew the lever bolt, and then remove the brake lever and inner lever assemblies.

STEP 5. Loosen the adjuster screw (counter clockwise to loosen), and then remove the block, adjuster screw, and spring.

STEP 6. Remove the band retaining screw, and then remove the band and screw as an assembly.

Wash all parts in clean solvent, and then wipe or blow dry. Visually inspect all hardware for signs of wear, bending, or cracking, and replace components as necessary.

- Inspect the brake lever and inner lever for distortion, and especially for any measurable wear at pivot holes or contact areas.
- Inspect the coil spring and also the brake lever spring for damage or distortion, as well as for any signs of fatiguing that might lead to failure under load.
- Carefully inspect the threads on the lever bolt and band adjustment bolt, and discard either piece if cross-threaded or otherwise damaged.

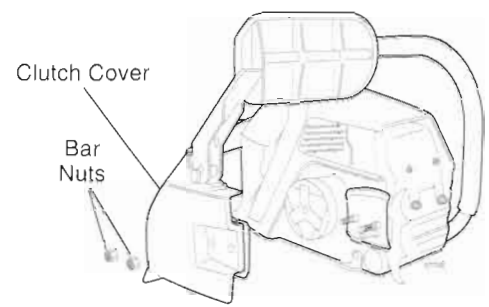


Figure 10.6 Removing the Clutch Cover (577)

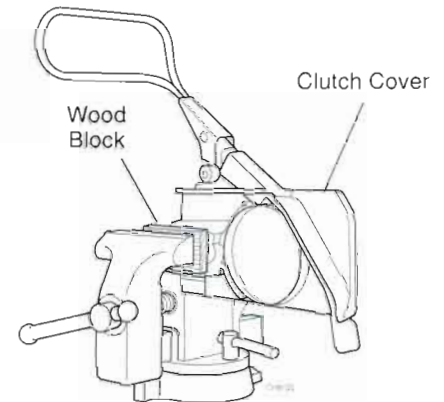


Figure 10.7 Securing the Cover During Disassembly

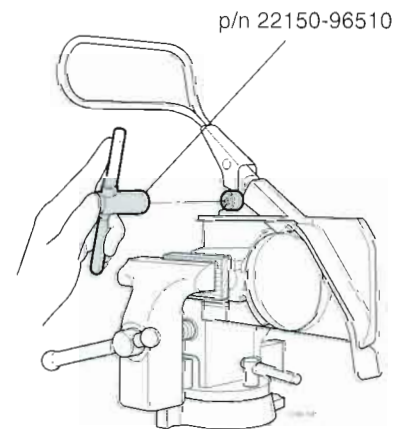


Figure 10.8 Releasing Lever Spring Tension (575 shown)

Inspection

Inspection

(continued)

Brake Band

- Inspect the brake band and discard any band showing signs of excessive wear, bluing, cracking, or other physical damage.
- Use a vernier or micrometer to measure brake band thickness at several contact points (Figure 10.9). Discard any band worn beyond 50% of original thickness.

Reassembly

Reassemble the chain brake in the reverse order of disassembly, but include the following additional steps or procedures:

- When installing a brake band in a metal housing (models 575-695), coat the band attachment screw threads with ThreeBond 1360 sealant and then torque the screw to 30 in/lb. (36 kg/cm²).
- Apply a thin coating of grease to the coil spring and block.
- Use ThreeBond 1360 sealant to install the brake lever nut, and then tighten the nut firmly.



ATTENTION!

ThreeBond 1360 Thread Sealant is a powerful adhesive, and should never be used on Phillips-head screws or any fastener under 4 mm in diameter.

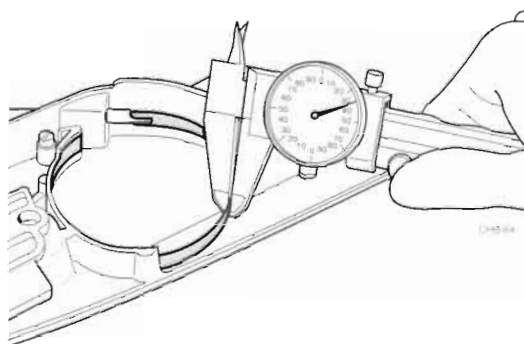


Figure 10.9 Measuring Brake Band Thickness

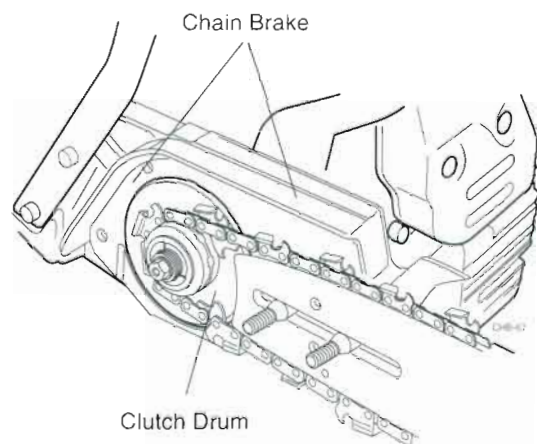


Figure 10.10 757 Chain Brake Cassette

757 Chain Brake

(Figure 10.10)

Removal

The 757 chain brake is a modular cassette, and can be quickly removed from the saw for service or repair.

- STEP 1.** Disengage the brake by pulling the brake lever back toward the front handle.
- STEP 2.** Remove the nylon brake lever, and then remove the clutch cover and chain guide plate.
- STEP 3.** Remove the four 4 mm brake assembly mounting screws, and then remove the single 5 mm mounting screw located above the rear bar bolt (Figure 10.11).

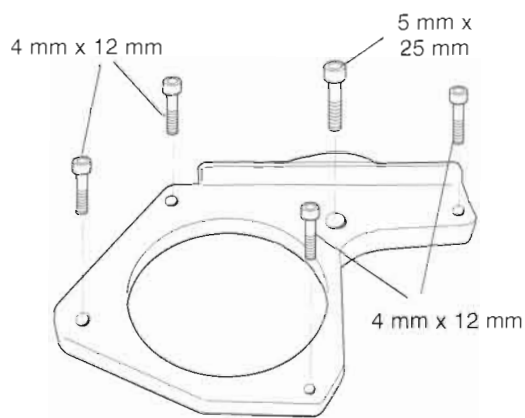


Figure 10.11 757 Chain Brake Mounting Locations

STEP 4. Insert a thin screwdriver between the brake assembly and the crankcase, and gently pry the brake assembly from the saw. (Figure 10.12)

IMPORTANT!

When removing the brake assembly, note the location and orientation of the spring cover.

Disassembly

STEP 1. To reduce spring tension on the brake lever components, install and tighten a 5 mm x 30 mm allen screw through the rear of the cassette and into the end of the coil spring holder (Figure 10.13).

STEP 2. Use snap ring pliers to remove the snap ring from the brake lever pivot pin, and then remove the metal brake lever, spacer, washer, and spring (Figure 10.14).

STEP 3. Remove the inner lever pivot bolt, and then remove the lever.

STEP 4. Remove the 5 mm screw installed during Step 1, and then lift the band and spring assembly from the chain brake casting (Figure 10.15).

Inspection

Wash all parts in clean solvent and then wipe or blow dry. Inspection procedures for the 757 brake components are similar to those for other Shindaiwa saws, with the following additions:

- Be particularly alert for wear, damage or distortion to the metal brake lever, and replace if noted.
- Inspect the nylon brake lever for damage. A burned or melted lever may have resulted from a loose bracket bolt or from excessive wear within the brake assembly, and must be replaced.

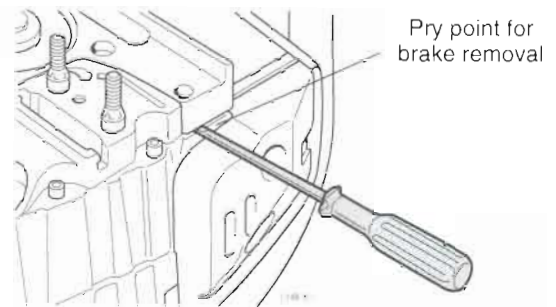


Figure 10.12 Prying the Brake Assembly from the Saw

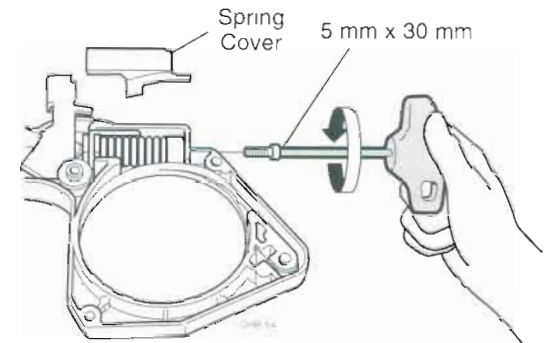


Figure 10.13 Reducing Brake Spring Tension

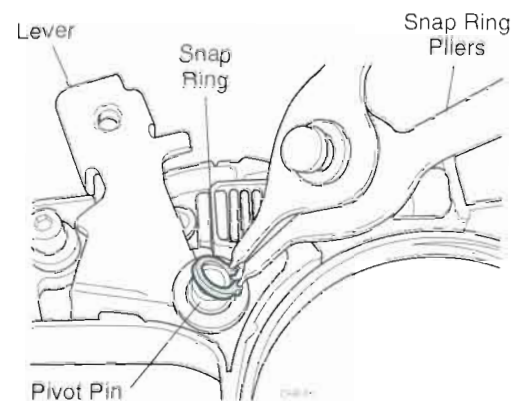


Figure 10.14 Removing the Pivot Pin Snap Ring

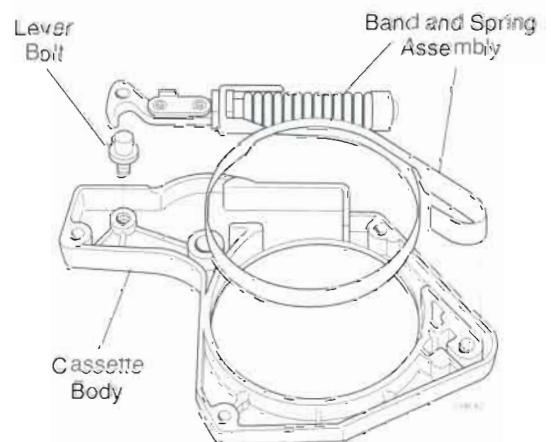


Figure 10.15 Band and Spring Removal

757 Chain Brake

(Continued)

- Inspect the brake band for proper thickness (Figure 10.16) and also for possible wear or "slotting" from the band supports on the cassette casting.
- Examine the rivets securing the links between the brake band and inner lever, and replace if damaged or worn.

NOTE:

To replace the rivets or to install a new band, grind the old rivet heads and then replace with new rivets p/n 22169-54570 (new rivets can be set with a small hammer).

Reassembly

Reassemble the chain brake in the reverse order of disassembly, but include the following additional steps or procedures:

- Replace the brake lever snap ring with a new ring p/n 02430-08080. After installation, check to see that the snap ring is undamaged and is properly seated in its groove.
- Apply a generous layer of lithium-based grease to the coil spring and also beneath the coil spring cover.
- After installing the brake assembly, cycle the brake lever on and off 8-10 times before starting the saw.

Testing

Manual Operation should be tested as described on page 99 of this manual. Regardless of engine speed, the chain must stop immediately whenever the chain brake is activated.

IMPORTANT!

The 757 chain brake is not adjustable. If the brake fails to engage completely or appears to "drag" while disengaged, the entire assembly must be removed and inspected for worn, damaged, or improperly assembled components.

Inertial Operation can be tested by following the procedures described on page 107 of this manual.

**WARNING!**

The saw **must** be OFF during inertial testing!

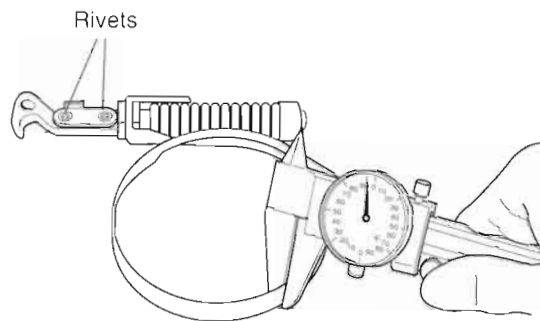


Figure 10.16 Check Band Thickness

357 and 377 Chain Brake

(Figures 10.17 and 10.18)

The 357 and 377 chain brake mechanisms are similar in appearance to the 757, except that all internal components are contained within the clutch cover. Additionally, the 357 chain brake can be activated *inertially* as well as manually.

- **Manual Operation** The chain brake is designed to engage whenever the brake lever strikes the operator's hand.
- **Inertial Operation (357 only)** A sudden thrust or impact on the guide bar can also cause the chain brake to engage.

Removal

STEP 1. Disengage the brake by pulling the brake lever back toward the front handle.

STEP 2. Loosen and remove both bar nuts, and (357) disengage the brake lever support arm from the left side of the saw (Figure 10.19).

STEP 3. Remove the clutch cover.

- **377** Remove the clutch cover and brake assembly from the saw.

- **357** Depress the cover locking tab, and then remove the clutch cover and brake assembly from the saw (Figure 10.19)

Disassembly

(refer to the Illustrated Parts List)

Thoroughly clean all chips and oil residue from the cover and brake assembly.

STEP 1. Remove the guide plate retaining screw, and then remove the guide plate.

STEP 2. Remove the three cover plate retaining screws (two on model 377), and then remove the cover plate.

STEP 3. Lift out the lever return spring, and then temporarily reinstall the cover plate and retaining screws.

STEP 4. Push the brake lever forward until the coil spring releases (brake engaged).

STEP 5. Remove the cover plate as in Step 2.

- **377** Remove the stop pin and pivot bolt from the brake lever, and then lift the lever from the housing.

- **357** Lift the brake lever from the cover assembly. Remove the brake band and inner lever assembly.

STEP 6. Push the free end of the brake band to one side, and then slide the coil spring from the rod on the band assembly.

STEP 7. If the inner lever, tie strap, or band are to be replaced, grind and remove the two rivets on the tie strap.

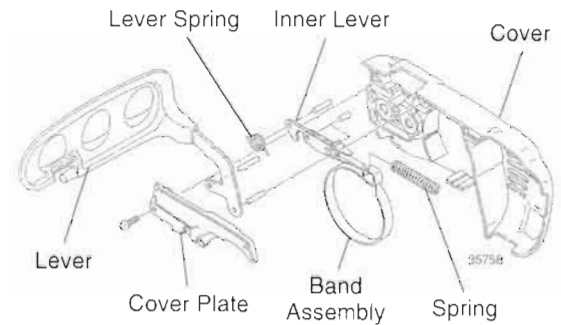


Figure 10.17 357 Chain Brake

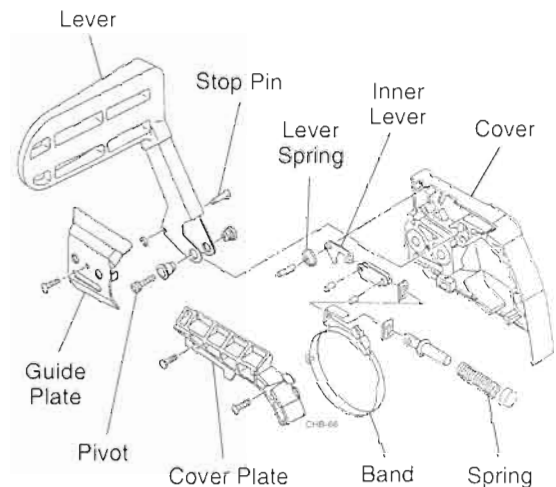


Figure 10.18 377 Chain Brake

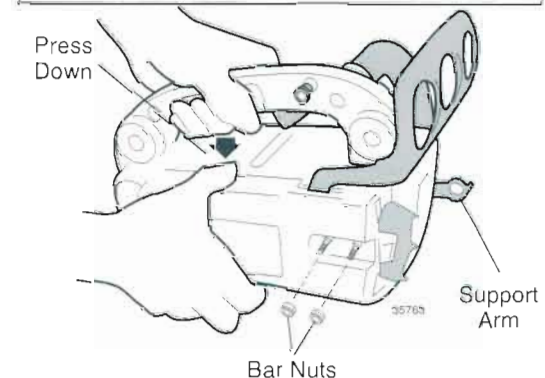
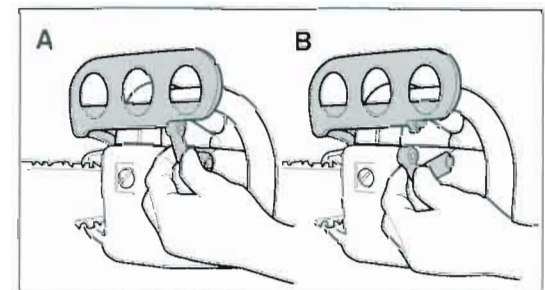


Figure 10.19 Model 357 Clutch Cover Removal

357 and 377 Chain Brake

(continued)

Inspection

Wash all parts in clean solvent and then wipe or blow dry. Inspection procedures for Models 357 and 377 brake components are similar to those for the Model 757 and for other Shindaiwa saws, with the following additions:

- Be particularly alert for wear, damage or distortion to the brake activating lever. If noted, replace the lever.
- Inspect the brake band for proper thickness (see page 102).
- Carefully examine the clutch cover housing for distortion or impact damage, and replace if noted.
- Examine the rivets securing the links between the brake band and inner lever, and replace if damaged or worn.

Reassembly

Chain brake assembly is basically the reverse of disassembly, with the following exceptions or additions:

- Apply a thin layer of lithium-based grease to the coil spring and all linkage components.
- After installing the band and coil spring assembly in the clutch cover, the brake assembly must be disengaged before the brake lever return spring can be installed (see below).

Return Spring Installation

STEP 1. Temporarily install the actuating lever, and then install the cover plate and cover plate retaining screws.

STEP 2. Disengage the brake assembly by pulling the actuating lever straight back until the lever "clicks" and then moves freely within the clutch cover.

STEP 3. Being careful not to engage the brake, remove the cover plate screws and then lift off the cover plate.

STEP 4. Install the lever return spring, cover plate, and retaining screws.

- Install the guide plate and then install and firmly tighten the guide plate retaining screw.
- Install the completed assembly on the saw in the reverse order of removal.

Inertial Testing

Manually Testing, 357 and 377

Follow the test procedures described on page 99 of this manual. The saw chain must stop immediately whenever the chain brake is activated!

Inertial Testing, 357 and 757 only

(Figure 10.20)



WARNING!

The saw engine **must** be OFF during inertial testing!

In addition to the manual test procedure described at the beginning of this section, the 357 and 757 brakes should also be tested inertially. The following procedure is recommended, and should be performed with the saw fully assembled and the engine "off."

STEP 1. Hold the saw with the bar tip about 20" (50 cm) above a soft wooden block.

STEP 2. Quickly release the front handle, allowing the guide bar tip to strike the wooden block.

STEP 3. The chain brake must engage instantly when the bar tip strikes the wooden block.



WARNING!

The 357, 377, and 757 chain brakes are not adjustable. If either brake fails to engage completely or appears to "drag" while disengaged, the entire assembly must be removed and inspected for worn, damaged, or improperly assembled components.

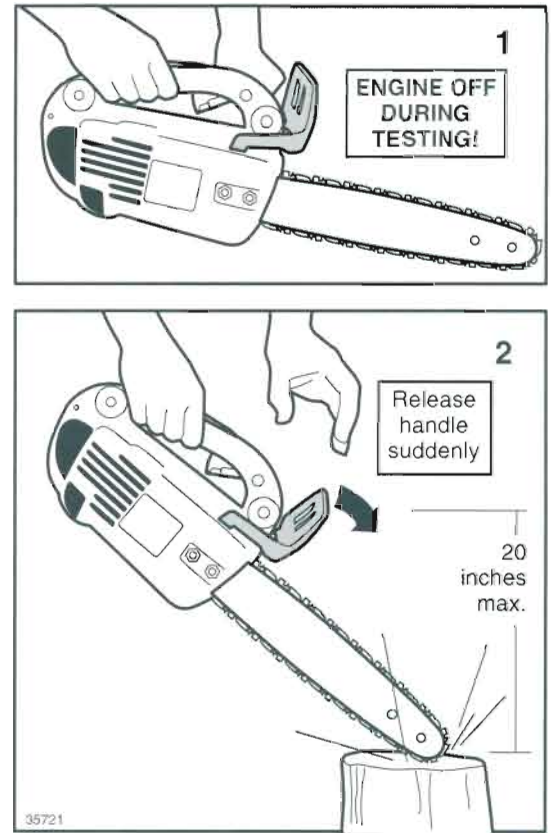


Figure 10.20 Testing Inertial Brake Operation (357 shown)

Operation

All Shindaiwa saws feature Mikuni™ positive displacement oil pumps. See the accompanying Table for specific applications.

The pump is driven by a worm gear attached to the saw's clutch drum, and delivers oil to the guide bar only when the clutch is engaged and the saw chain is moving.

The pump shaft is spring loaded and has a bevel at one end, causing the shaft to travel fore-and-aft in the pump body bore and function as a piston whenever the shaft is rotated (Figure 11.1).

Except for Model 357, pump flow rate on all saws can be regulated by turning an *adjuster shaft* to increase or decrease pump shaft stroke.

Oil Pump Part Numbers

Model	Pump Part No.	Output @ Max. (cc/min)
300, 300S	22154-55200	16.5
360, 377	22156-55200	15
357	72320-55200	10
488, 575, 577	22160-55200	16.5
680, 695	22160-55200	16.5
757	22169-55200	12.6

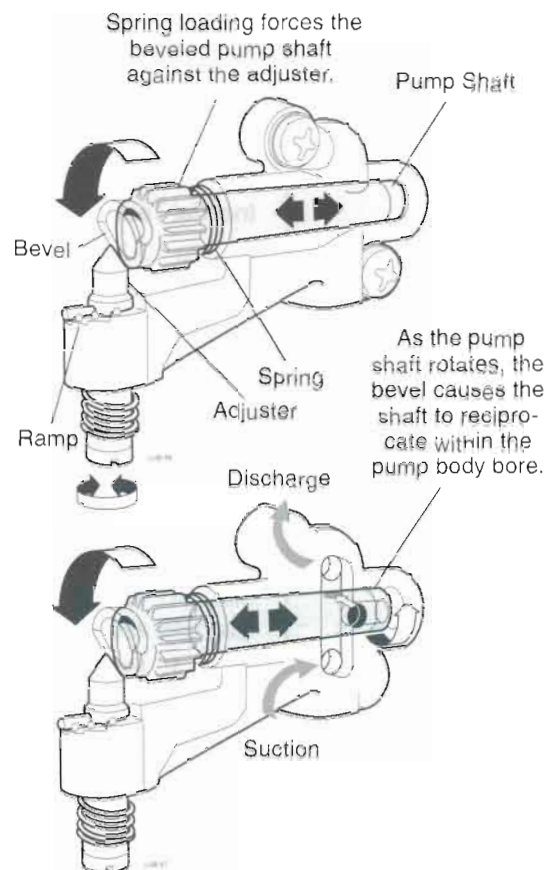


Figure 11.1 Oil Pump Operation

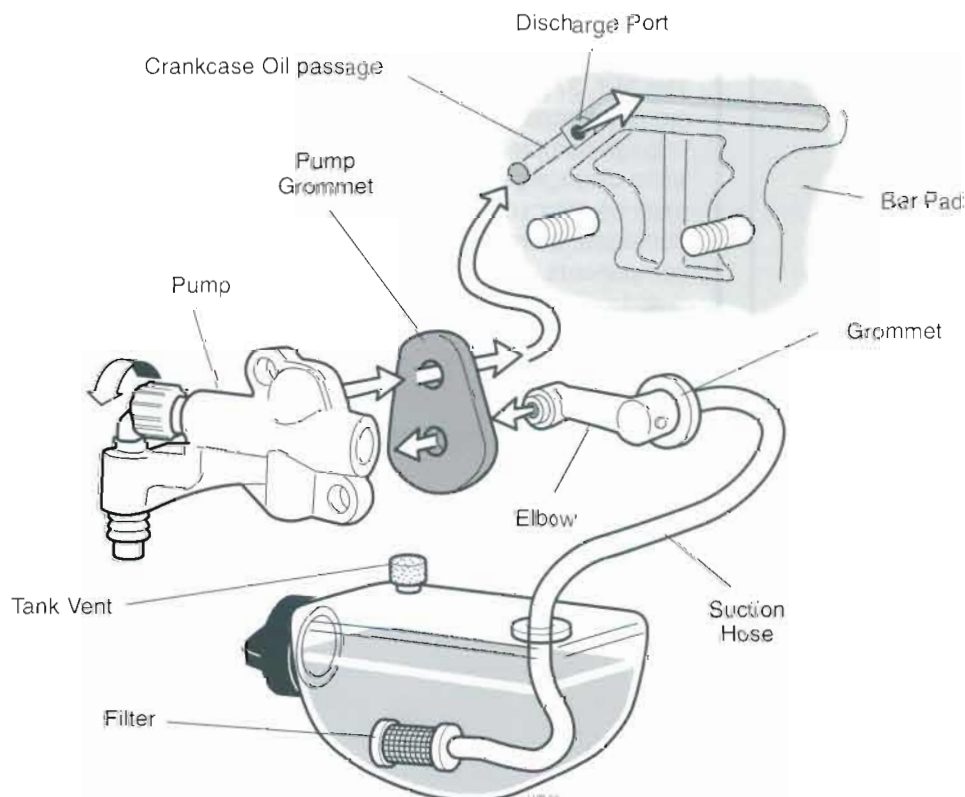


Figure 11.2 Pump Components and Flow Routing (installation may vary)

Oil Pump Troubleshooting (Figure 11.2)

Symptom	Possible Cause	Solution
Steady flow at bar pad; no oil to chain	<ul style="list-style-type: none"> ■ System is functioning properly 	Check guide bar passages
Bubbles appear at discharge port	<ul style="list-style-type: none"> ■ Oil tank is empty ■ Air leak in the suction side of the system 	Refill the tank Check pump gasket/elbow (where used); suction line
Flow is weak	<ul style="list-style-type: none"> ■ Flow adjustment set too low ■ Clogged filter or tank vent ■ Oil suction tube is collapsing ■ Wrong type or weight of oil ■ Pump is scored internally ■ Pump shaft worn at the bevel 	Reset adjustment to higher setting Clean filter or vent as required Replace tube Replace with correct oil Replace pump Replace pump
No or irregular oil flow	<ul style="list-style-type: none"> ■ Clogged filter or tank vent ■ Tank is empty ■ Pump drive is broken ■ Pump gear is stripped ■ Crankcase damage (bar pad cracked) 	Clean filter or vent as required Refill tank Replace pump drive Replace gear or pump as required Replace crankcase
Oil is leaking from saw	<ul style="list-style-type: none"> ■ Oil is wrong type/viscosity ■ Oil fill cap/gasket is damaged ■ Tank vent faulty/missing ■ Bar studs are loose ■ Oil tank or gasket is damaged 	Refill with Shindaiwa Premium Bar and Chain Oil Repair or replace cap as required Repair or replace as required Repair or replace crankcase half Replace gasket (where used) or crankcase as required

Outright pump failure is unusual, and scoring or galling of the polished pump bore can usually be traced to acids or particulates from pumping reclaimed or dirty oil. Damage to the oil pump driven gear is often the result of operating the saw with accumulations of dirt or grit trapped in the pump gears. For operation in very dusty conditions, special oil pump cover kits are available for saw models 488, 577, 680, 695, and 757 (Figure 11.3).

IMPORTANT!

Pump gears can also be damaged by excessive lash from operating with incorrect bar oil or with air bubbles entering through the suction side of the system.

Provided the pump gears are intact and the pump shaft is free to move, most oil delivery problems can be traced to the suction side of the oiling system. Such problems are often caused by:

- Incorrect bar oil (type or weight)
- Clogged oil filter; dirty or contaminated oil
- Air entering suction side of system
- Clogged oil tank vent

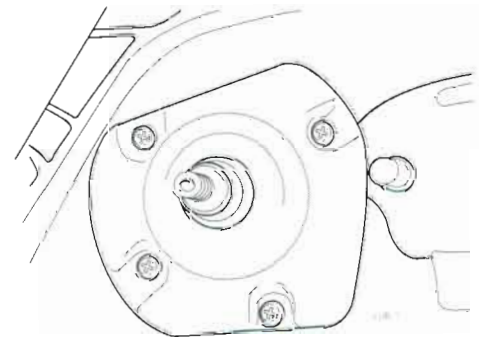


Figure 11.3 "Fuzzy" Cover for Very Dusty Conditions.
(Model 695 shown)

Troubleshooting

(continued)

The quickest and most reliable way to measure pump output is to run the saw with the guide bar and chain removed (Figure 11.4).

**WARNING!**

Danger of injury from rotating parts! The clutch cover must be installed during this test!

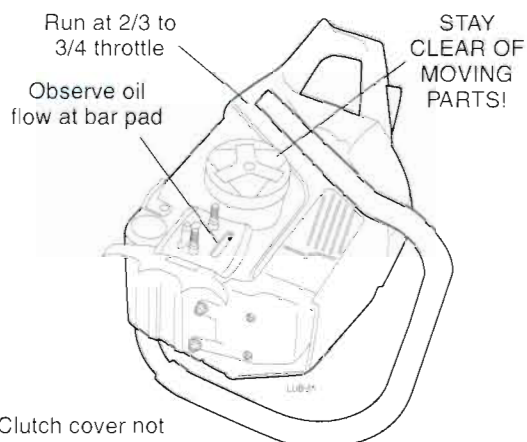
If no oil appears or if the flow is irregular, refer to the troubleshooting chart on the previous page.

If the lubrication system is being dismantled to repair a component failure, be especially alert for evidence leading to the actual cause of the problem.

STEP 1. Remove the oil filler cap, drain all bar oil, and then extract the oil filter from the oil tank (Figure 11.5). Disconnect the oil filter from the oil suction hose.

STEP 2. Remove the clutch cover, clutch, clutch drum, pump drive and gear.

STEP 3. Remove the oil pump dust cover (Figure 11.6).



Clutch cover not shown for clarity.

Figure 11.4 Testing for Oil Flow

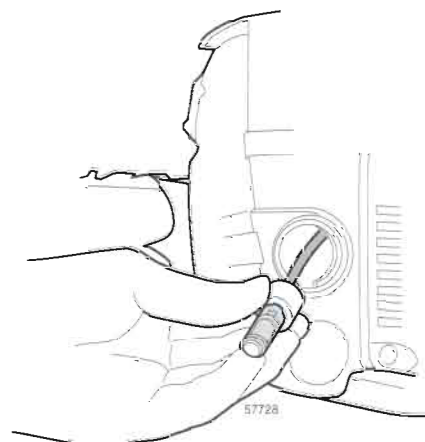


Figure 11.5 Extract the Oil Filter

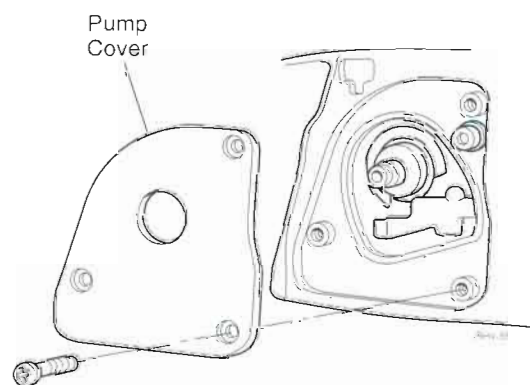


Figure 11.6 Removing the Pump Cover (357 shown)

General Disassembly

Inspection

STEP 4. Remove the oil pump, and then remove the pump elbow and gasket (where used). (Figure 11.7).

STEP 5. Remove the oil suction tube (Figure 11.7).

Wash all parts thoroughly in clean solvent, and then blow dry. Replace any non-repairable components showing damage or measurable wear.

- Inspect the oil pump drive lugs for condition (tang used on Model 757). Figure 11.8.
- Carefully inspect the drive (worm) gear for signs of cracking, deformation, or measurable wear, and replace if noted.
- Gently stretch the oil suction tube, and discard any tube showing evidence of hardening, softening, or other deterioration. Connect a Shindaiwa pressure tester p/n 99909-93 to the inlet (filter) end of the suction tube. Use a tubing clamp or suitable plug to block the opposite end of the tube, and then pressure-test for leaks to a maximum of 5 psi (Figure 11.9).
- Inspect the oil tank vent for damage, clogging, or deterioration.
- **Saw models 488 through 695** draw oil through a plastic elbow installed beneath the oil pump in the engine crankcase. This elbow should be carefully inspected for possible blockage, and also for any signs of leakage from the sealing plug at the end of the elbow (Figure 11.10).
- Inspect the oil filter screen for damage, and replace if noted.

IMPORTANT!

A missing or melted oil filter screen may have been damaged by an engine over-heat. **Check carburetor adjustments.** See also pages 18–21, Engine Seizure.

- Rotate the oil pump driven gear by hand. The pump shaft should turn easily and should reciprocate smoothly in the pump bore with every shaft revolution. A seized or otherwise internally damaged pump cannot be repaired and must be discarded.
- Carefully inspect the oil pump driven gear for any signs of worn, chipped, or missing teeth. If serviceability is doubtful, compare with new parts.

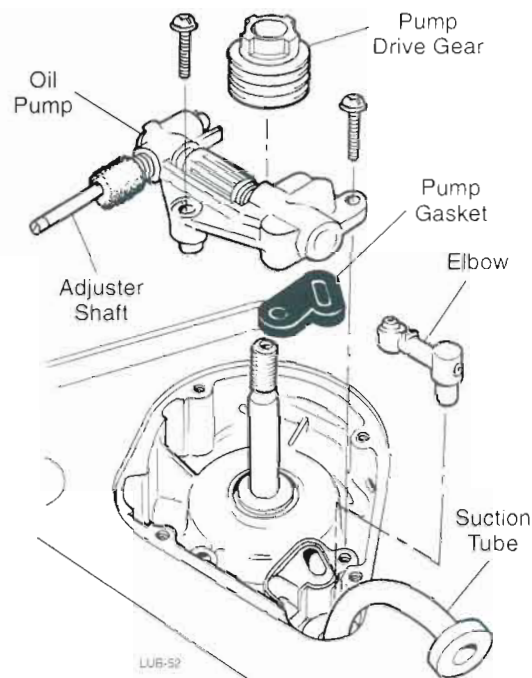


Figure 11.7 Pump and Drive (488 shown)

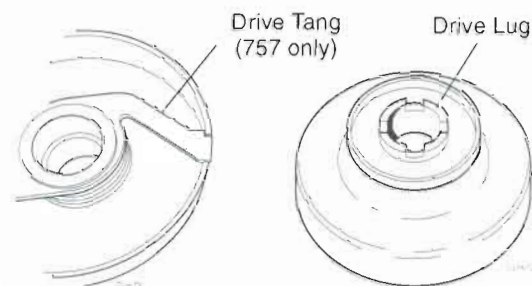


Figure 11.8 Oil Pump Drive Systems

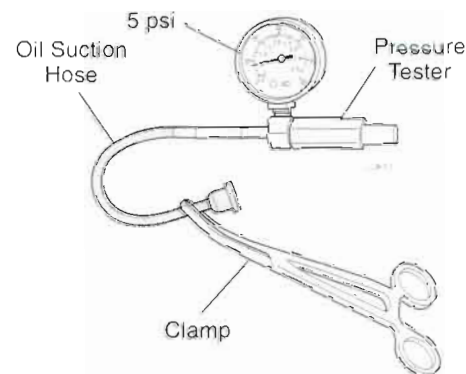


Figure 11.9 Leak-testing the Oil Suction Tube



Figure 11.10 Plastic Elbow (488-695)

Pump Repairs

The driven gear on pumps used on saw Models 488, 575, 577, 680, and 695 is replaceable, and is available as Shindaiwa repair kit p/n 99909-89. For gear replacement on these models, follow the procedure below (Figure 11.11).

Pump Disassembly

STEP 1. Remove the plastic end cap from the adjuster end of the pump body.

STEP 2. Remove the E-ring from the adjuster shaft **or** remove the 2 x 10 mm roll pin from the opposite end of the adjuster shaft.

STEP 3. Slide the pinion gear against the shaft spring (away from the adjuster shaft), and then withdraw the adjuster shaft and spring from the pump body.

STEP 4. Using a small, flat punch, gently tap the 2 x 8 mm roll pin from the pump shaft.

STEP 5. Remove the pump shaft, gear, and spring. If the shaft doesn't slide easily, a quick blast of compressed air through the pump ports may help force the shaft from the pump body.

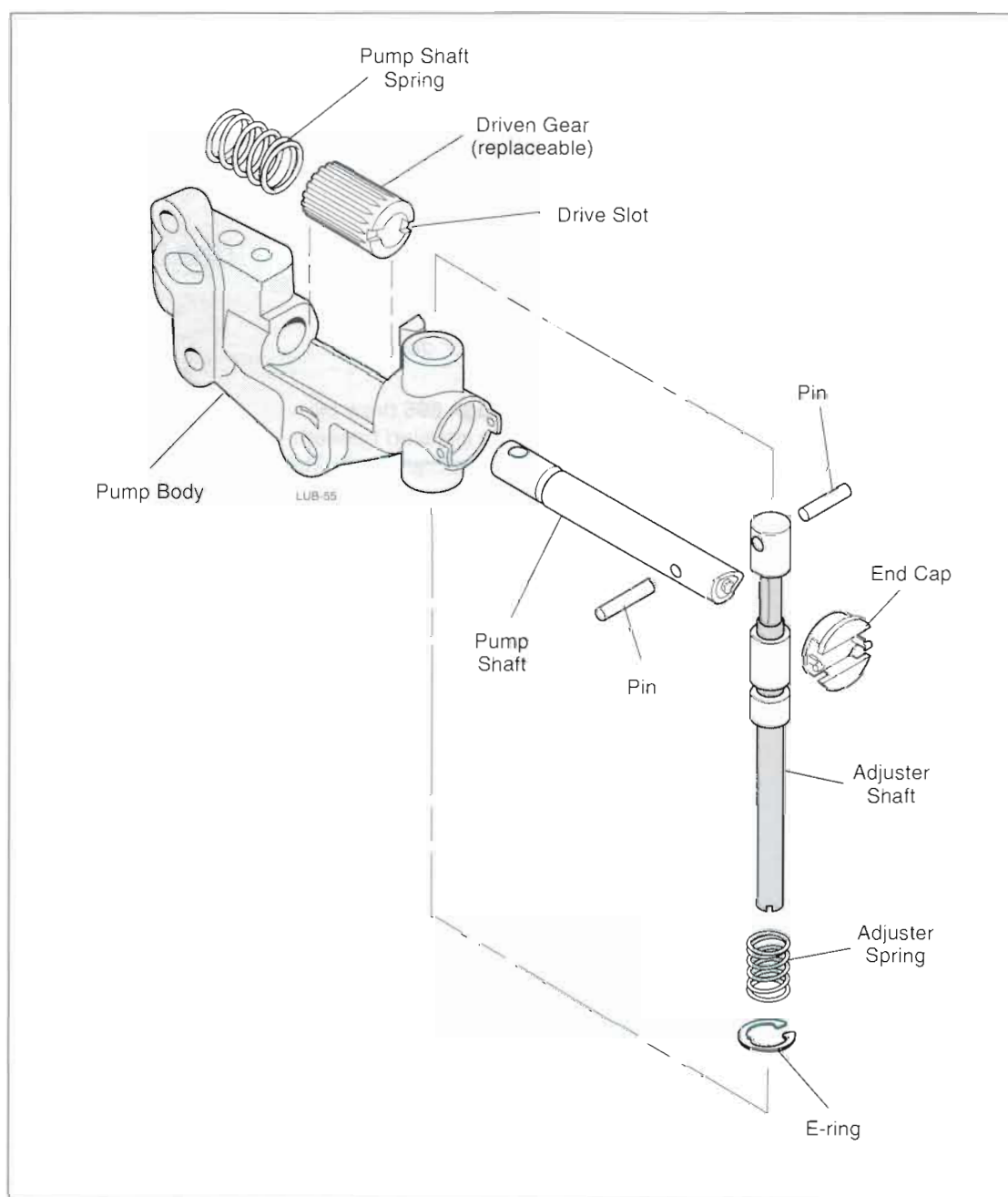


Figure 11.11 Pump (used on 488, 575, 577, 680 and 695)

Pump Inspection

Using a magnifying glass and a strong light, inspect the pump shaft and bore for any signs of scoring or "etching" from dirty or contaminated oil.

IMPORTANT!

The pump shaft and body are not repairable and are not available as individual part numbers. Damage to either component requires complete pump replacement.

Pump Assembly

(Requires Repair Kit p/n 99909-89)

STEP 1. Apply a light coating of oil to the pump shaft, adjuster, and new pump gear.

STEP 2. Using a new pinion gear and working in the reverse order of disassembly, insert the pump shaft into the pump body and then through the pinion gear and spring. Make sure the pinion gear drive slot is positioned toward the pump shaft roll pin.

STEP 3. Align the pinion gear drive slot with the matching hole in the pump shaft, and then install the new 2 x 8 mm roll pin from the repair kit.

STEP 4. Slide the adjuster spring over the adjuster shaft, and then install the shaft in the reverse order of disassembly.

IMPORTANT!

Where used, the flat side of the adjuster shaft must face toward the pump shaft and pinion gear.

STEP 5. Using new parts from the repair kit, lock the adjuster shaft in position by replacing the 2 x 10 mm roll pin/E-ring in the reverse of disassembly.

STEP 6. Install a new plastic end cap.

General Reassembly

The oil pump and related components can now be reinstalled on the saw in the reverse order of disassembly. For maximum gear life, however, the following additional steps must be carefully followed:

Pump Installation and Alignment

STEP 1. Apply ThreeBond 1401 to the oil pump retaining screws, and then install and loosely tighten the pump in place.

STEP 2. Temporarily install the oil pump drive gear on the crankshaft.

STEP 3. Rotate the pump drive gear by hand. Any roughness or binding between the drive gear and oil pump can indicate misaligned gear teeth. If necessary, loosen and move the oil pump slightly until the drive and driven gears mesh smoothly as the drive gear is rotated.

STEP 4. Torque the two pump retaining screws to 20 in/lb. (22 kg/cm²).

Cover Installation and Alignment

STEP 1. Apply ThreeBond 1401 to the dust cover retaining screws, and then install and loosely tighten the cover in place.

STEP 2. Temporarily install the oil pump drive gear on the crankshaft.

STEP 3. Rotate the gear by hand, and check carefully for any friction or misalignment between the gear and cover. If necessary, loosen and move the pump cover slightly until the drive gear can rotate freely and without binding.

STEP 4. Torque the pump cover retaining screws to 20 in/lb. (22 kg/cm²).

IMPORTANT!

When installing the oil pump drive gear, apply a light coating of lithium-based grease on the drive gear bore and teeth.

General

All Shindaiwa saws feature extensive use of rubber mounting cushions designed to isolate the saw operator from fatiguing (and potentially harmful) engine vibrations.

The typical anti-vibration (or A-V) cushion is a conical or cylindrical section of sturdy rubber installed between the saw's rear handle and powerhead. Five cushions are used on saw models 300-488, and six cushions are used on all larger saws.

To minimize the risk of damaging an A-V during rough handling (such as when the saw binds in a cut), one or more cushions on any given saw will also have a hollow steel core centered around a special limiter bolt (Figure 12.1).

Cushion hardness is measured in *durometers*, and heavy-duty cushions are available for some Shindaiwa saw models.

Rear handles are molded from fiberglass reinforced nylon (Models 680, 695, 575 and early production 300-series saws used die-cast aluminum), and feature an integrated fuel tank incorporated within the handle. The nylon tanks are color-impregnated, and all seams are vibration-welded (Figure 12.2).

To simplify the installation of A-V cushions and other accessories, numerous attachment "bosses" are molded into each tank during the manufacturing process.

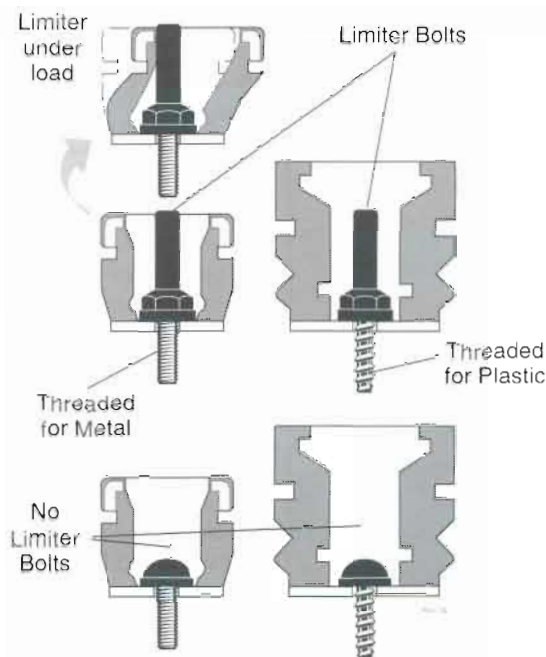


Figure 12.1 A-V Cushions (typical)

Anti-vibration Cushions used, by model

Saw Model	No. Required	Cushion p/n
300, 360, 377	5	22154-33731
488	3	22160-33710
	2	22160-97810
575, 680, 695	3	22155-33710 ¹
	2	22155-33730 ¹
577	3	72330-33710 ²
	2	22155-33730 ³
	1	22150-33760
757	3	72330-33710 ²
	3	22169-33740 ²

¹ For heavy-duty cushions, replace -33710 with -97810, and -33730 with 97820

² For heavy-duty cushions, replace with p/n 22169-97530 and p/n 22169-97540

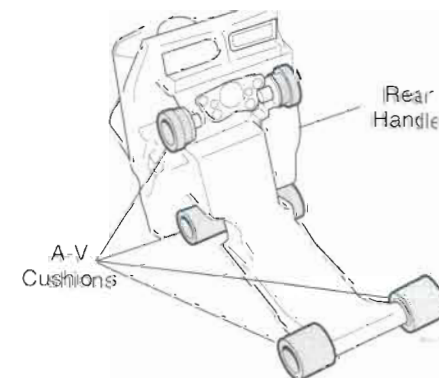


Figure 12.2 Cushion Location (757 shown)

Disassembly

(Typical, except Model 357)

Remove the handle from the saw.

STEP 1. Drain all fuel from the tank, and remove the cylinder cover, air cleaner, carburetor, and metal boot sleeve.

STEP 2. Disconnect the stop switch wires.

STEP 3. Remove the clutch cover, guide bar, and chain.

STEP 4. Remove the front handle.

STEP 5. Using a small screwdriver, gently pry the dust caps loose to expose the cushions retaining screws beneath (Figure 12.3).

STEP 6. Remove all cushion screws and limiter bolts. Models 300 through 488 are assembled with five A-V cushions. Models 575-757 are assembled with six A-V cushions (see Table on page 114).



ATTENTION!

Be certain that all cushion bolts have been identified and completely removed!

STEP 7. Hold the rear handle firmly with one hand, and use your other hand to gently force the powerhead away from the A-V cushions (Figure 12.4). For saws equipped with a carburetor boot, use your thumb to force the boot through the airbox flange (Figure 12.5).



ATTENTION!

Do not use excess force! Be alert for possible damage to any hoses passing through the rear handle, and to the possibility of tearing the carburetor boot through careless handling.

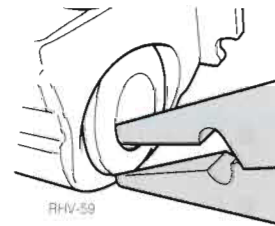
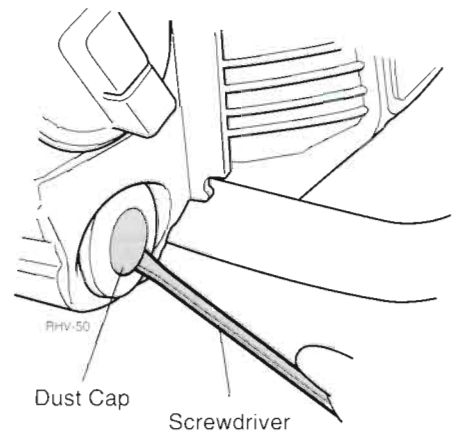
Inspection

Wash all parts in clean solvent, and then blow dry with compressed air.

- Carefully inspect all A-V cushions for deterioration such as cracking or "soft spots." Flex each cushion by hand, and be especially alert for signs of tearing or separation. During annual inspections, replace all A-V cushions.

IMPORTANT!

Shindaiwa recommends annual replacement of all A-V cushions and carburetor boot! When replacing damaged A-V cushions, always inspect the carburetor boot for possible tearing from over-extension!



In many cases, the A-V cushion must be twisted with a pliers for removal.

Figure 12.3 Removing the Dust Caps

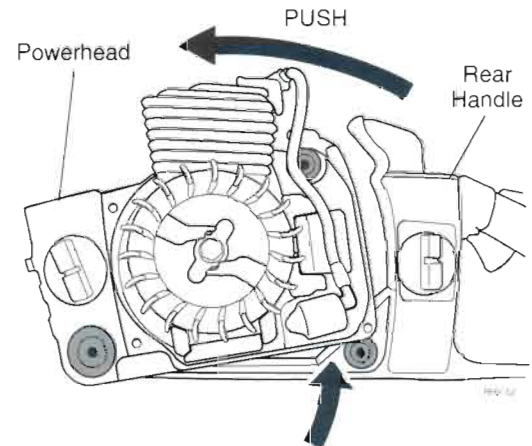


Figure 12.4 Removing the Powerhead

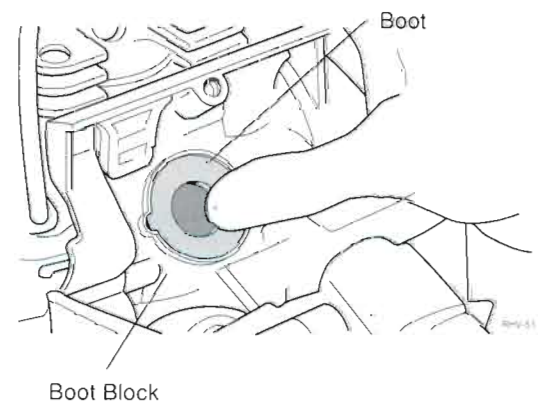


Figure 12.5 Pushing the Boot Through the Airbox Flange

Inspection

(Typical, except Model 357)

- Inspect the rear handle for abuse or damage such as stripped mounting holes, and discard if unrepairable. Be alert for any sign of possible fuel leaks. Any suspect tank should be pressure-tested at not more than 3psi and discarded if leaks are discovered (Figure 12.6).

**WARNING!**

A damaged or otherwise leaking rear handle is an extreme fire hazard, and cannot be reliably repaired! When found, any damaged handle must be replaced before the saw is returned to service!

- Inspect the fuel cap and gasket, and replace worn components as necessary.
- Inspect the fuel tank vent and all hoses and grommets, and replace as necessary.
- Check to see that the throttle, throttle lock lever, and lock button controls are working properly, and repair or replace components as required.

IMPORTANT!

To install or replace the rubber grip on the 575/680/695 rear handle, clean both the handle and grip with acetone and use contact cement to reattach the grip.

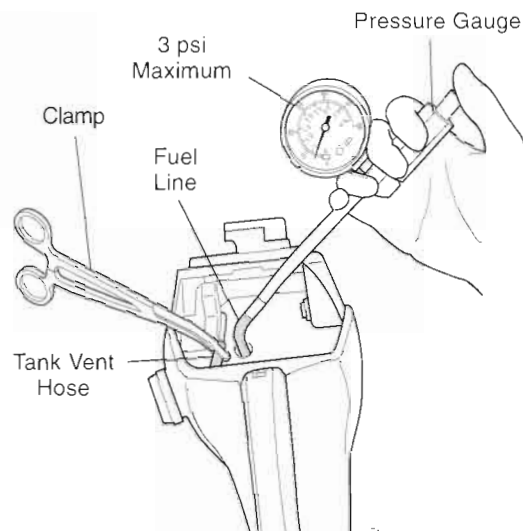


Figure 12.6 Pressure Testing the Fuel Tank

Reassembly

- STEP 1.** Lubricate each cushion with a light film of oil or grease, and then install all cushions in the crankcase assembly. Pay special attention to the correct location of any cushions requiring limiter bolts.
- STEP 2.** Slide the rear handle part way into the crankcase.
- STEP 3.** Route the carburetor boot and impulse tube (where used), as well as any fuel and vent tubes through their appropriate holes or passageways in the rear handle.
- STEP 4.** While using care to avoid pinching any tubing or damaging the boot, slide the rear handle completely into the engine crankcase.

Reassembly

(continued)

STEP 5. Replace all mounting screws and limiter bolts in the reverse order of removal.

- Screws installed in nylon handles should be installed "dry" and then tightened firmly by hand pressure alone.
- Screws installed in diecast handles (obsolete) should be precoated with ThreeBond 1401 screw locking agent and then firmly tightened by hand.

STEP 6. For saw Models 575, 680, and 695 using diecast rear handles, final-tighten all five A-V cushion screws to 55 in/lb (65 kg/cm²).

STEP 7. Use a few drops of grease or light oil to lubricate the edges of each dust cap, and then reinstall the dust caps in the reverse order of removal.

IMPORTANT!

A blunted screwdriver tip can aid in dust cap installation.

STEP 8. Replace the front handle and then install and firmly tighten all mounting screws.



ATTENTION!

Use of over-length mounting screws can puncture the fuel tank or engine crankcase! For correct screw size, always consult the appropriate IPL for the saw being serviced.

STEP 9. Connect the stop switch, and then reinstall the boot sleeve (where used, Figure 12.7), carburetor, air cleaner, and cylinder cover in the reverse order of removal.

STEP 10. Install the bar, chain, and clutch cover in the reverse order of removal.

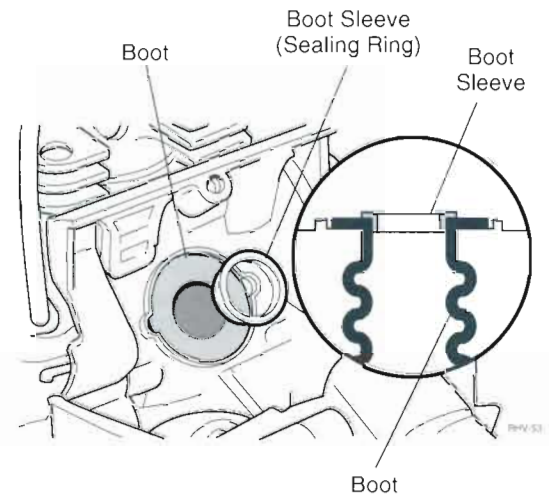


Figure 12.7 Typical Boot Sleeve Installation

General

The 357 "Top Handle" saw is unique in the Shindaiwa product line, and was designed and built specifically for the professional tree care market (Figure 13.1).

In the hands of a professional arborist or "climber," a 357 will usually be found idling while hanging bar-down from a rope clipped to the climber's belt.

When the climber reaches a work site within the tree, however, the saw must be ready to deliver full power from any cutting angle or position. As a specialty saw, the 357 looks, feels, and even sounds quite different from any other saw in the Shindaiwa line.

Teardown

(Figure 13.2)

The following sequences are intended as a guide to familiarize you with the general layout and construction of the 357, and include several service "tips" that could save you time during service operations. When servicing specific subassemblies, however, refer to the appropriate sections within this manual.

IMPORTANT!

Before teardown, drain all fuel and oil from the saw.

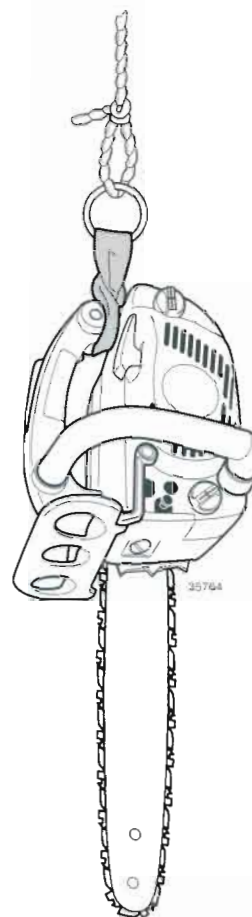


Figure 13.1 357 Professional Arborist Saw

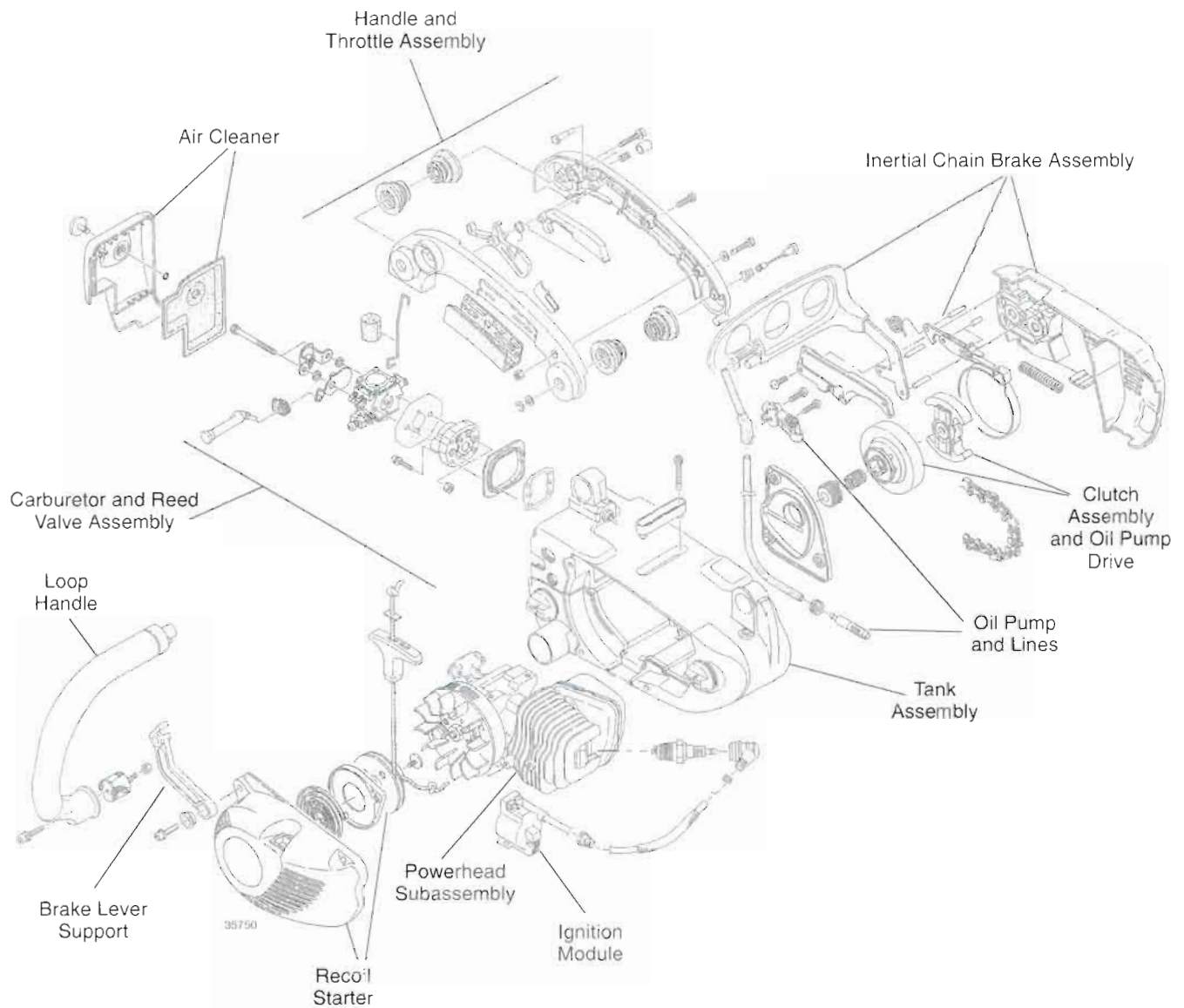


Figure 13.1 Major Components of the 357 Top-handle Saw

Teardown (continued)

Remove the Clutch Cover (Figure 13.3)

STEP 1. Disengage the brake by pulling the brake lever back toward the front handle.

STEP 2. Loosen and remove both bar nuts, and then disengage the brake lever support arm from the left side of the saw.

STEP 3. Depress the cover to unhook the cover locking tab, and then remove the clutch cover and brake assembly from the saw.

Remove the Muffler (Figure 13.4)

STEP 1. Use an Allen wrench to remove the two 5 mm x 55 mm muffler bolts.

STEP 2. Use a screwdriver to remove the two screws securing the spark arrestor assembly.

Remove the Clutch Assembly

STEP 1. Remove the spark plug, and then lock the crankshaft by inserting a plastic piston stop or length of starter cord through the spark plug hole (Figure 13.5).



ATTENTION!

Hardened piston stops will damage the piston and cylinder!

STEP 2. Use a 13 mm wrench to remove the clutch shoe assembly in a clockwise rotation (Figure 13.6).

STEP 3. Remove the clutch drum and bearing.

Remove the Oil Pump and Engine Mounting Screw (Figure 13.7)

STEP 1. Use a screwdriver to pry the metal guide plate from the bar pad.

STEP 2. Unscrew the three pump cover screws, and remove the cover.

STEP 3. Use an Allen wrench to remove the single 5 mm x 20 mm engine mount screw.

STEP 4. Remove the nylon oil pump drive gear.

STEP 5. Unscrew the two pump retaining screws, and then remove the oil pump.

STEP 6. Pull the oil suction tube from the oil pump grommet, remove the grommet, and then remove the discharge tube from the bar pad.

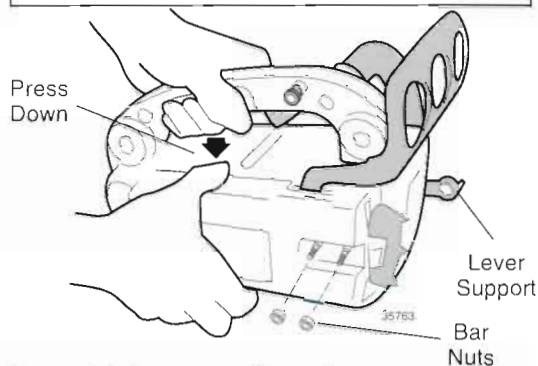
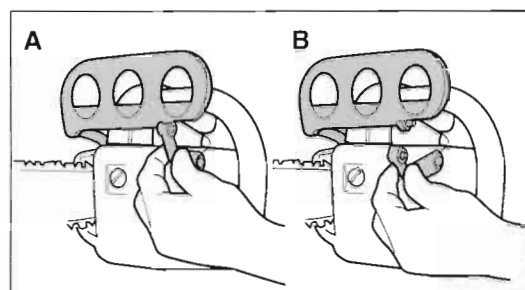


Figure 13.3 Remove the Clutch Cover

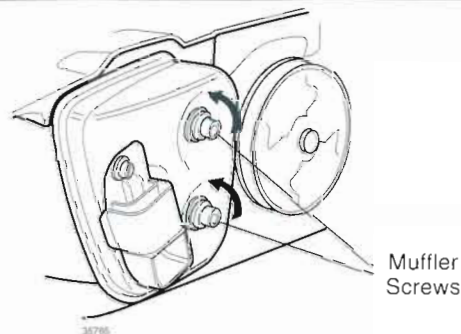


Figure 13.4 Remove the Muffler

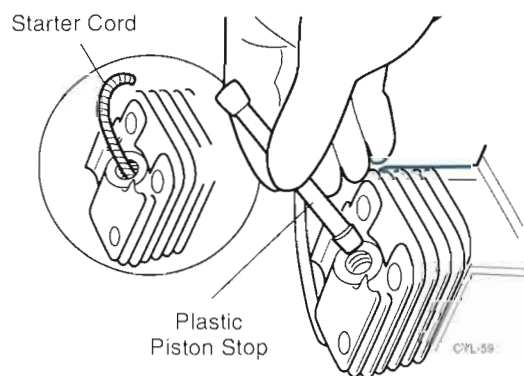


Figure 13.5 Lock the Crankshaft

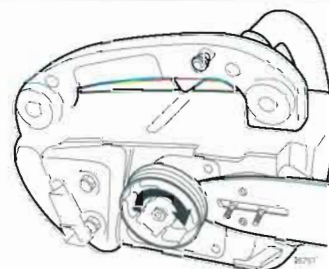


Figure 13.6 Remove the Clutch Assembly

Teardown (continued)

Remove the Starter Assembly (Figure 13.8)

STEP 1. Remove the four starter assembly mounting screws, noting the orientation of the chain brake support arm and metal spacer.

STEP 2. Lift out the black plastic air baffle, and expose the ignition coil and cylinder fins.

Remove the Flywheel and Ignition

STEP 1. Insert an appropriate piston stop in the spark plug hole, and then use a 14 mm wrench to remove the flywheel nut in a counter-clockwise rotation (Figure 13.9).

STEP 2. Remove the black plastic inner baffle plate.

STEP 3. Use Shindaiwa puller p/n 22150-96101 to remove the flywheel assembly from the crankshaft (Figure 13.10).

STEP 4. Unplug the switch wire from the top of the ignition coil, remove the two 4 mm x 20 mm coil mounting screws, and then remove the coil. When removing the ignition coil, note the use and orientation of the two brown insulators separating the coil from the cylinder.

IMPORTANT!

To remove the coil without removing the powerhead, remove the spark plug boot from the high-tension lead.

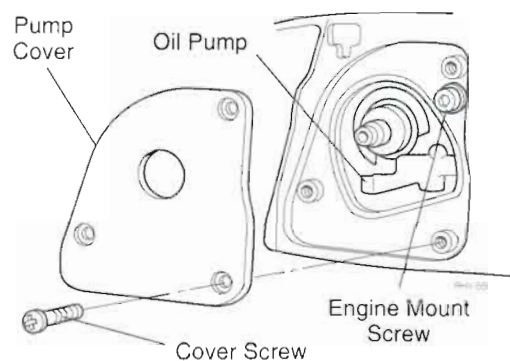


Figure 13.7 Pump Cover and Engine Mount

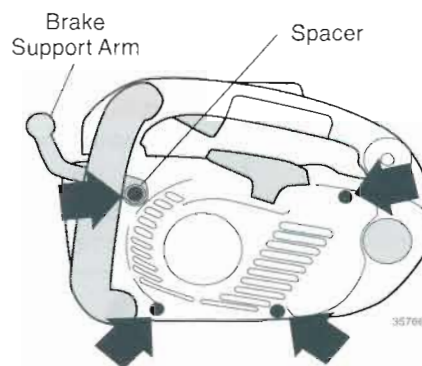


Figure 13.8 Remove the Four Starter Screws

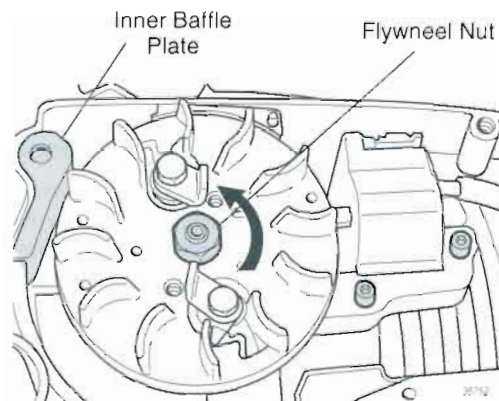


Figure 13.9 Removing the Flywheel Nut

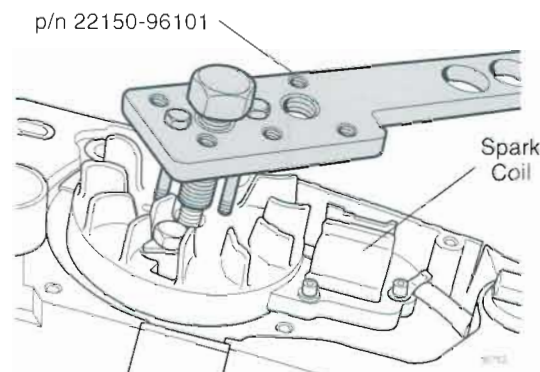


Figure 13.10 Removing the Flywheel

Teardown (continued)

Remove the Air Cleaner, Carburetor, and Reed Valve Assembly (Figure 13.11)

For easier access during 357 carburetor service, install the guide bar and hang the saw vertically from a vise as shown (Figure 13.12).

STEP 1. Loosen the air cleaner cover screw, and then remove the cover and internal element.

STEP 2. Remove the two 5 mm x 50 mm carburetor mounting screws, and then remove the air cleaner mounting bracket, choke plate, and lever.

STEP 3. Disengage the throttle rod from the lever on the carburetor, and then lift the carburetor from the saw. If throttle removal is difficult, loosen the carburetor's idle adjustment screw.

STEP 4. Lift out the carburetor mounting gasket, and then remove the four 4 mm x 20 mm reed valve mounting screws.



ATTENTION!

The reed valve can be easily damaged by careless handling!

STEP 5. Remove the rubber grommet, and then lift out the reed valve assembly and gasket.

Remove the Handles (Figure 13.13)

STEP 1. Remove the two screws securing the front handle to the saw, and then remove the handle. During disassembly, note the length and location of each of the two different screw types used.

STEP 2. Remove the screw from the front of the top handle.

STEP 3. Remove the E-ring from the cable securing the handle to the rear of the saw (Figure 13.14).

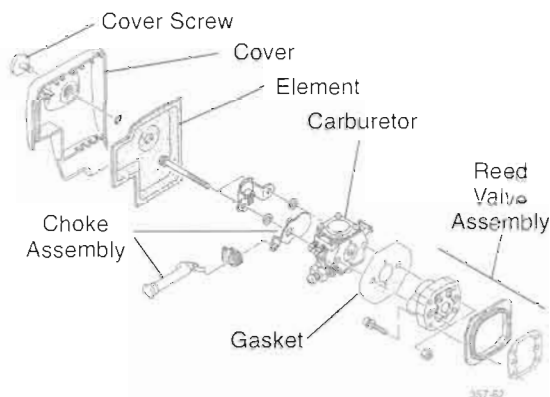


Figure 13.11 Carburetor and Reed Valve Assembly

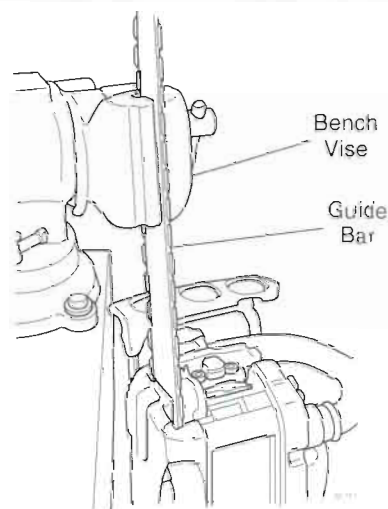


Figure 13.12 Access to the Carburetor

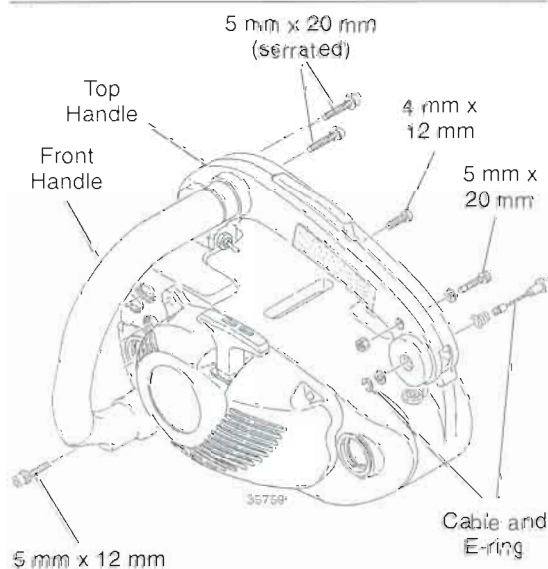


Figure 13.13 Handle Fastener Locations

STEP 4. Peel the rubber grip from the handle, and then remove the phillips-head screw from the center of the handle.

STEP 5. Remove the 5 mm x 20 mm screw and captive nut from near the rear of the handle.

STEP 6. Unhook the throttle lever from the end of the throttle rod, and then remove the handle halves, throttle hardware and rubber A-V cushions from the saw.

Remove the Powerhead (Figure 13.15)

STEP 1. Loosen and remove the two powerhead mounting screws from the top of the saw.

STEP 2. Loosen and remove the two powerhead mounting screws from the bottom of the saw.

STEP 3. If not previously removed, loosen and remove the single 5 mm x 20 mm screw and flat washer from above the oil pump on the right-hand side of the saw.

STEP 4. Remove the powerhead through the left side of the saw.

IMPORTANT!

The 357 powerhead is held in place by five mounting screws!

Remove the Crankshaft (Figure 13.16)

STEP 1. Remove the four 5 mm x 20 mm crankcase screws, and then separate and remove the lower half of the crankcase. If separation is difficult, tap the lower crankcase half gently with a wooden or plastic hammer.



ATTENTION!

Never insert metal tools between the case halves! The case halves have highly machined surfaces, and can be permanently damaged by careless handling.

STEP 2. Lift the crankshaft from the cylinder end of the crankcase, and then gently pull the piston from the cylinder.

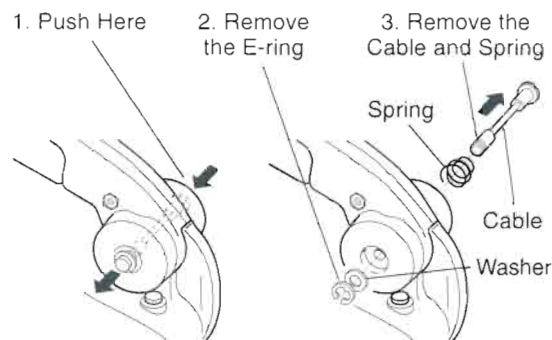


Figure 13.14 Removing the E-ring

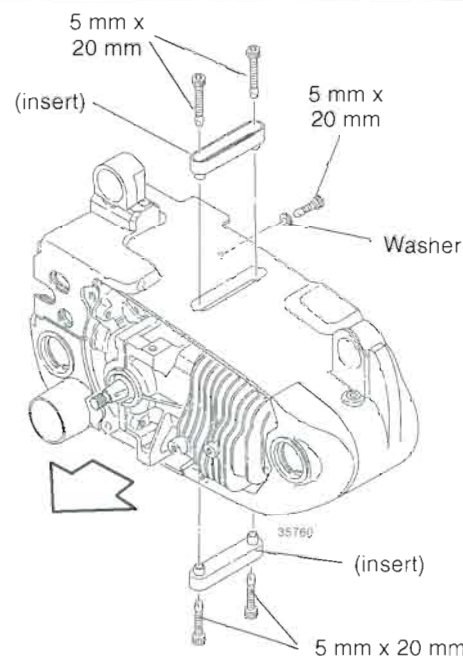


Figure 13.15 Removing the Powerhead

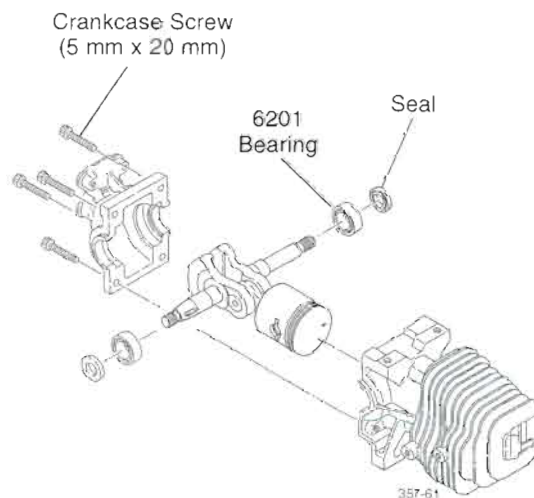


Figure 13.16 Removing the Crankshaft Assembly

Inspection

Reed Valve Theory

(Figure 13.17)

Disassembly of the 357 should now be complete. For general information on servicing sub-assemblies such as the chain brake, crankshaft, or muffler, consult the appropriate sections within this manual. For information on servicing the 357 reed valve, however, see below:

The reed valve operates as a one-way "check valve" for the air-fuel mixture entering the crankcase through the carburetor venturi, and opens only during negative crankcase pressure (piston is moving toward the cylinder head).

When the piston changes direction and pressurizes the crankcase, however, any leakage past the reed valve can cause dramatic changes in overall performance.

IMPORTANT!

A quality reed valve assembly will generally outlast the equipment it's installed on, but any reed valve can become damaged through careless operation or poor air filter maintenance.

Reed Valve Inspection

(Figure 13.18)

Failure in any of following areas is cause for rejection, and will require replacement of the reed valve and mounting block as a complete assembly.

STEP 1. Visually inspect the reed valve base for any signs of cracking or other damage.

STEP 2. Inspect (but do not disassemble) the reed valve itself. Discard any reed valve assembly showing signs of:

- Damage or warpage to the reed's outer edges (usually caused by over-speeding the saw).
- Damage to the "hinge area" near the reed mounting (usually caused by ingested debris).

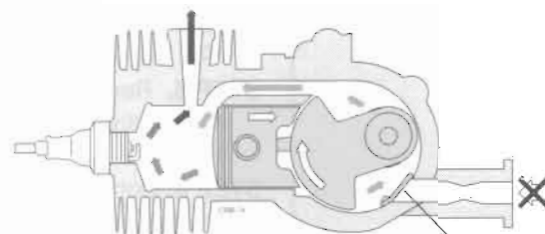
IMPORTANT!

The reed valve and mounting block can not be disassembled for service!

Reassembly

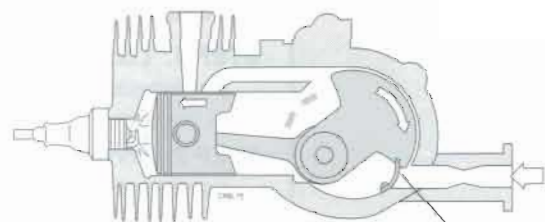
Wash all parts in clean solvent and wipe or blow dry. Use special care when cleaning mating surfaces, as sealants will not adhere properly to oily surfaces. Reassembly is basically the reverse of teardown, with the following additions or exceptions:

INTAKE



Reed Valve Closed

POWER



Reed Valve Open

Figure 13.17 Reed Valve Operation

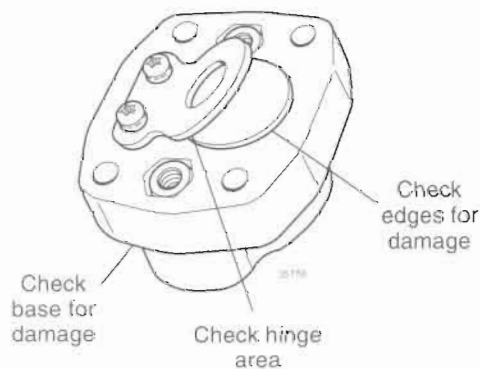


Figure 13.18 Reed Valve Inspection

Crankcase Assembly

- Coat both crankcase mating surfaces with a thin, even coating of ThreeBond 1104 Liquid Gasket. Use only enough sealant to do the job, and be especially careful to prevent the sealant from running into bolt holes or inside the crankcase halves.
- Coat the four crankcase screws with ThreeBond 1104 Liquid Screw Lock and install and torque to 52-69 inch/lbs.



ATTENTION!

Following any crankcase service, always pressure test the assembled crankcase! (For testing procedures, see Section 2, *Troubleshooting*)

Powerhead Installation

- Coat the five powerhead mounting screws with ThreeBond 1104 Liquid Screw Lock and then install and firmly tighten all five screws.

Ignition Coil (Figure 13.19)

- Make sure the plastic insulators are in place between the ignition coil and cylinder, and that the coil-to-flywheel gap is correctly set at .012-.014" (0.30-0.35 mm).

Reed Valve and Carburetor

- All gaskets and mating surfaces for the reed valve and carburetor must be installed dry.
- For easier handling during carburetor installation, install the guide bar and hang the saw in a vise as previously shown in Figure 13.12 of this section.

Throttle Lever and Handle

(Figures 13.20 and 13.21)

- When assembling the handle halves over the throttle lever, lockout lever, and spring, use a short section of soft wire tie to temporarily hold all components in place.
- Use a new E-ring when installing the cable at the rear of the top handle, and make sure the E-ring groove is in good condition and that the E-ring is completely seated in its groove.
- Install the rubber handle grip. If necessary, the grip can be secured with a few drops of contact cement or similar adhesive.

IMPORTANT!

Be sure to install all handle screws exactly as removed!

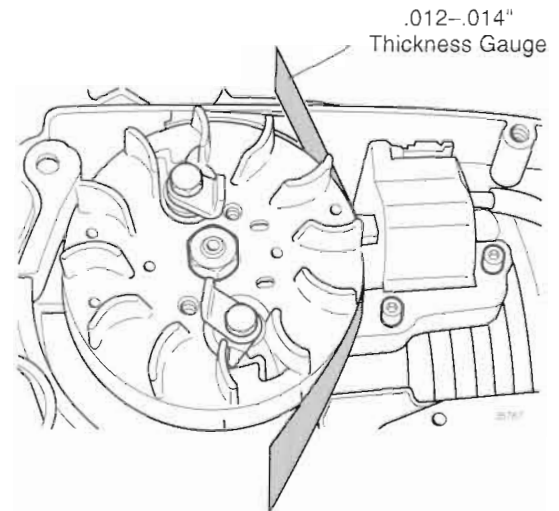


Figure 13.19 Setting the Magneto Air Gap

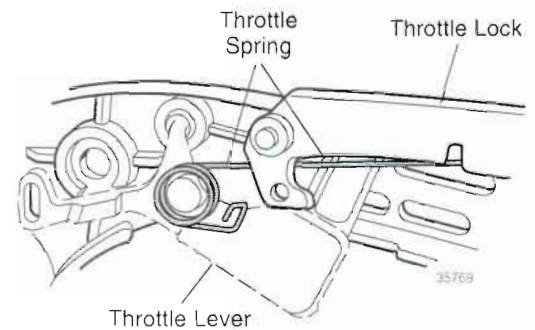


Figure 13.20 Throttle Spring Orientation

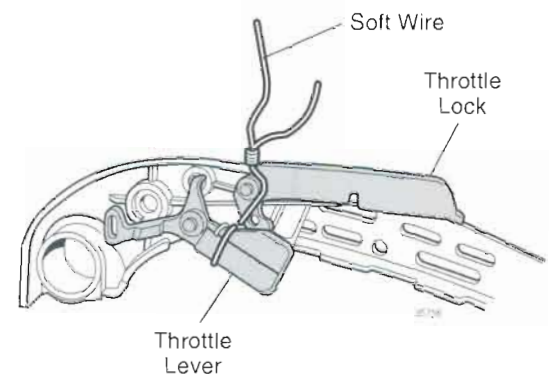


Figure 13.21 Throttle Assembly

Reassembly (continued)

Startup and Adjustments (Figure 13.22)

Oil Pump

- When installing the oil pump, grommet and hose assembly, be sure the grommet is correctly seated in its recess in the saw body.
- When installing the oil pump, be especially careful to avoid overtightening the two pump mounting screws.
- After installing the oil pump drive gear on the crankshaft, rotate the gear several times to check for possible binding.

General

IMPORTANT!

Shindaiwa recommends operating any new or rebuilt Shindaiwa saw at light engine loads and varying rpms for at least the first 10–15 hours of operation.

- STEP 1.** Fill the saw's fuel tank with fresh, clean fuel mixed as in the Appendix.
- STEP 2.** Fill the bar oil reservoir with Shindaiwa Premium Bar and Chain oil (or equivalent).
- STEP 3.** Adjust the carburetor to the standard settings as given below.

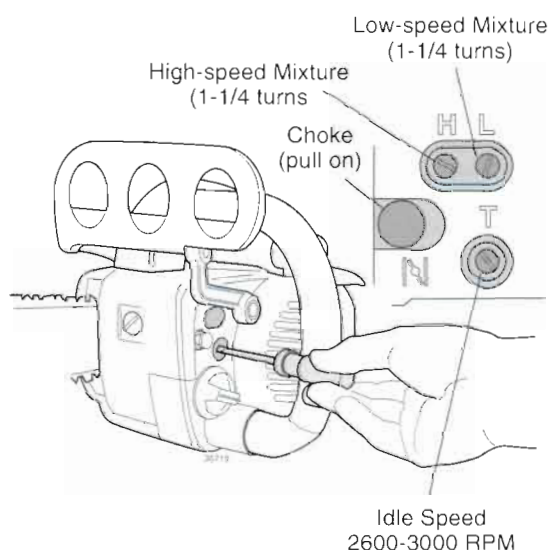


Figure 13.22 Carburetor Adjustments

Standard Carburetor Settings

- Low-speed mixture, from closed = $1\frac{1}{4} \pm \frac{1}{4}$ turns
- High-speed mixture, from closed = $1\frac{1}{4} \pm \frac{1}{8}$ turns

STEP 4. Start the saw, and allow the engine to gradually warm to operating temperature (2–3 min.).

STEP 5. Use a screwdriver to slowly turn the idle adjusting screw in or out until the engine idles smoothly at 2600–3000 rpm



WARNING!

The saw chain must never rotate when the engine is at idle rpm!

Adjust the Low Speed Mixture

(Engine idling, warm)

- STEP 1.** Slowly turn the idle mixture screw clockwise (lean mixture) and note any changes in engine rpm. Turning the mixture screw clockwise should cause engine speed to increase and then to decrease as the mixture becomes leaner.
- STEP 2.** Note the mixture position where engine speed first begins to decrease. This is referred to as the *lean drop-off point*.
- STEP 3.** Turn the idle mixture screw counter clockwise (rich mixture) and note the point at which engine speed increases and then begins to decrease. This is referred to as the *rich drop-off point*.
- STEP 4.** Adjust the idle mixture screw midway between the rich and lean drop-off points.
- STEP 5.** If necessary, readjust the idle speed screw so the engine idles smoothly at 2600–3000 rpm.

Adjust the High Speed Mixture

(Engine running, warm)

STEP 1. Briefly operate the engine at full throttle (no load).



ATTENTION!

Sustained full throttle no-load operation can cause serious engine damage. Never operate the 357 saw above 11,500 rpm.

STEP 1. Turn the high speed mixture screw clockwise and then counter clockwise, and note the rich and lean drop-off points at full throttle.

STEP 2. Starting from the rich drop-off point, turn the high speed mixture screw clockwise until the engine produces a single exhaust note (lean mixture) at full throttle.

STEP 3. Turn the high speed mixture screw counter-clockwise approximately 3/8–1/2 turn (noticeably rich mixture), or until the engine begins to "stutter" at full throttle.

STEP 4. Test throttle response, and then test actual performance under load by making several test cuts with the saw.

- If the saw appears to hesitate on acceleration, enrich the idle mixture by turning the idle mixture screw slightly counterclockwise.
- If the saw appears to lack power under load, readjust the high speed mixture screw slightly richer for maximum power in the cut.

IMPORTANT!

Final 357 carburetor settings must be based on performance under load, rather than on engine sound alone! **When tuned for maximum performance, the 357 saw typically produces a somewhat "soft" (fuel rich) exhaust note.**

STEP 5. Recheck and adjust engine idle speed as required.



ATTENTION!

The high speed mixture screw setting affects both engine performance and durability. Never operate the 357 saw with the high speed mixture screw adjusted to less than 1-1/8 turns!

	300	300S	357	360	377	488	550	575	577	680	695	757
ENGINE												
Displacement (cu. in.)	1.7	1.7	2.2	2.1	2.3	2.9	3.5	3.5	3.5	4.1	4.1	4.5
Displacement (cc)	28.5	28.5	35.5	35.2	37.7	47.9	57.3	57.3	57.3	67.9	67.9	73.5
Bore/stroke (mm)	36x28	36x28	37x33	40x28	40x30	43x33	45x36	45x36	45x36	49x36	49x36	51x36
Horsepower	1.5 hp	1.7 hp	1.8 hp	2.5 hp	2.5 hp	3.5 hp	4.0 hp	4.0 hp	4.0 hp	4.8 hp	4.8 hp	5.6 hp
Maximum no-load rpm	13,500	13,500	11,500	13,500	13,500	13,500	12,000	12,000	12,000	12,000	12,500	13,000
Idle rpm (+/- 100)	3,000	3,000	2,800	3,000	3,000	2,800	2,800	2,800	2,800	2,800	2,800	2,500
Clutch engag. rpm (+/- 250)	4,000	4,000	3,800	4,000	4,000	2,800	2,800	2,800	2,800	2,800	2,800	2,500
Weight (lb/kg)	9.0/4.1	8.8/4.0	9.1/4.1	8.8/4.0	9.0/4.1	10.1/4.6	12.7/5.8	13.0/5.9	12.8/5.8	12.7/5.8	13.2/6.0	14.9/6.8
Crankshaft	3 piece	3 piece	3 piece	3 piece	3 piece	2 piece	3 piece	3 piece	3 piece	3 piece	2 piece	2 piece
Crankshaft bearings	6201	6201	6201	6201	6201	6201	6202	6202	6202	6202	6202	1-6202 1-6203
Conrod			Forged conrod—all models									
Bearing, large end			Caged needle—all models except 757							Silver plated caged needle (757)		
Bearing, small end			Caged needle—all models									
Thrust control			Small end—all models									
Piston			Forged Silicon Alloy Aluminum—all models									
Rings	1	1	2	2	2	2	2	2	2	2	2	2
Cylinder surface	"Beaded" Chrome Plating—all models											
Crankcase pressure test	6 psi/0.4 kg/cm ² —all models											
FUEL SYSTEM												
Carburetor	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro	Walbro
Model	WYM-1	WYM-1A	WT-301B	WT89	WT229	HDA79A	HDA50A	HDA50A	HDA132	HDA29A	HDA29A	HDA123
H-Adjustment	Non-adj.	Non-adj.	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1
L-Adjustment	12-13	12-13	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1
Mounting method	Ins. Block	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot
Air cleaner type (std)	Stainless Steel	Flocked StnlessSteel		Nylon Mesh		Stainless Steel				Paper Element		
Prefilter	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Air cleaner options	None	None	None	Snorkle- Nylon Mesh	Flocked	Flocked	Flocked	Flocked K & N	Pro Filter (paper)	Flocked K & N	Flocked K & N	K & N LowProfile
Fuel tank material	Diecast	Nylon	Nylon	Nylon	Nylon	Nylon	Diecast Magnesium	Diecast Magnesium	Nylon	Diecast Magnesium	Diecast Magnesium	Nylon
Fuel tank capacity (oz)	11.5	11.5	9.3	13.5	13.5	20.3	20.3	23.7	26.0	23.7	23.7	26.0
Fuel tank capacity (cc)	340	340	275	400	400	600	600	700	770	700	700	770
Recommended fuel	Unleaded 87 octane (300 through 377)						Unleaded 89+ octane (488 through 757)					
Fuel/oil ratio	40:1 with Shindaiwa Premium 2-cycle Engine Oil											
CLUTCH												
Material	Metal shoe—all models											
Number of shoes	3	3	2	3	3	3	3	3	3	3	3	3
RECOIL												
Housing material	Nylon	Nylon	Nylon	Nylon	Nylon	Nylon	Diecast Magnesium	Diecast Magnesium	Nylon	Diecast Magnesium	Diecast Magnesium	Nylon
Attachment points	4	4	4	4	4	4	4	4	4	3	4	4
Recoil Spring	Reel	Reel	Cassette	Reel	Reel	Cassette	Cassette	Cassette	Cassette	Cassette	Cassette	Cassette
Cord diameter	3.8 mm	3.8 mm	3.8 mm	3.8 mm	3.8 mm	3.8 mm	4 mm	4 mm	4 mm	4 mm	4 mm	4 mm
Cord length (mm)	750	750	700	750	750	700	950	950	950	950	950	950

300 300S 357 360 377 488 550 575 577 680 695 757

IGNITION

Ignition type	Transistor "TCI" (300 through 377)						CDI (488 through 757)					
No. of Components	1	1	1	1	1	2	3	3	2	3	3	2
Minimum output voltage	12kV—all models											
Shutdown method	Grounding-type Stop Switch—all models											
Rev limiter	Models 695 and early 575 <i>only</i>											
Coil/Flywheel air gap	.020" .5mm	.020" .5mm	.012-.020" .3-.5mm	.020" .5mm	.020" .5mm	.014" .35mm	.020-.022"/.50-.55mm—550 through 757					
Ignition timing	1°–28° BTDC—all models											
Spark Plug recommended	CJ8Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y	CJ6Y
Spark Plug Alternative	BPM6A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A	BPM7A
Spark plug gap in/mm	0.24 in./0.6 mm—all models											

MUFFLER (Spark Arrestor, all models)

Attachment points	2	2	2	4	4	4	3	4	4	3 (4 late)	4	4
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ANTI-VIBRATION

Number of cushions	5	5	5	5	5	5	5	5	6	5	5	6
Material	Synthetic Rubber—all models											
Heavy-duty Option	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

SAFETY EQUIPMENT

Chain Brake Type	Manual	Manual	Inertial	Manual	Manual	Manual	Manual	Manual	Manual	Manual	Manual	Inertial
Adjustability	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Chain Catcher	Yes—all models											
Rear handguard	Yes—all models											
Ign. Switch at throttle grip	Yes—all models											
Throttle lockout system	Yes—all models											

CHAIN OILER (Clutch Driven Piston Type, all models)

Oil tank capacity (oz)	8.5	8.5	6.8	8.5	8.5	10.1	11.2	11.2	11.2	11.2	11.2	12.2
Oil tank capacity (cc)	250	250	200	250	250	300	330	330	330	330	330	360
Maximum volume (cc/min.) @ 7000 rpm	16.5	16.5	10	15	15	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Adjustable	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Winter use	Use Winter Grade Bar and Chain Oil—all models											
Recommended oil	Use Any Oil Designed Specifically as Bar and Chain Oil: DO NOT USE RECLAIMED OIL!											
Repair kit available	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No

CUTTING ATTACHMENTS

Bar mount	Oregon A041/K041 (300 through 488)						Oregon H009/H005 (550 through 757)					
Bar stud	8 mm shank/8 mm thread (300 through 488)						9 mm shank/8 mm thread (550 through 757)					
Bar nut size (mm)	19	13	13	19	19	13	13	13	13	13	13	19
Bar length (inches)	14, 16	14, 16	14, 16	14, 16	16	16–20	16–20	16–20	16–20	16–28	16–28	16–28
Oregon chain	91SG	91SG	91SG	91SG	33SL	33SL	76SL	77SL	76SL	77SL	77SL	72LE
Standard sprocket	3/8	3/8	3/8	3/8	.325	.325	3/8	3/8	3/8	3/8	3/8	3/8
Optional sprocket	N/A	N/A	.325	.325	3/8	3/8	.325	.325	.325	.325	.325	.325
Std. drive link count	53, 57	53, 57	53, 57	53, 57	66	66–16" 72–18" 78–20"	60–16" 66–18" 72–20"	60–16" 66–18" 72–20"	60–16" 66–18" 72–20"	60–16" 66–18" 72–20" 84–24" 93–28"	60–16" 66–18" 72–20" 84–24" 93–28"	60–16" 66–18" 72–20" 84–24" 93–28"
Optional chains	None	None	33SL	33SL	91SG	N/A	33SL	33SL	N/A	73LP	73LP	72LG0/77SL0

Section 14 Appendix Torque Values

Values given in inch/pounds and (Kg-cm)

1 inch/pound = 1.152 Kg-cm

1 Kg-cm = 0.868 in. lbs.)

Location*	300, 300S, 360, 377, 488	575, 680, 695	577	757	357
Engine Crankcase	61-70 (70-80)	70-80 (80-90)	70-80 (80-90)	61-70 (70-80)	52-69 (60-80)
Cylinder to Crankcase	61-70 (70-80)	70-80 (80-90)	70-80 (80-90)	79-104 (90-120)	N/A
Boot/Insulator to Cylinder	**	17-22 (20-25)	17-22 (20-25)	79-104 (90-120)	**
Flywheel Nut	104-122 (120-140)	122-140 (140-160)	200-208 (230-240)	200-208 (230-240)	104-122 (122-140)
Muffler Bolt	61-70 (70-80)	70-79 (80-90)	70-79 (80-90)	5 mm: 70-79 (80-90) 6 mm: 105 (120)	61-70 (70-80)
Spark Plug	148-165 (170-190)	148-165 (170-190)	148-165 (170-190)	148-165 (170-190)	148-165 (170-190)
Oil Pump	17-22 (20-25)	17-22 (20-25)	17-22 (20-25)	17-22 (20-25)	17-22 (20-25)
TCI/Spark Coil	35-44 (40-50)	26-30 (30-35)	26-30 (30-35)	26-30 (30-35)	N/A
Exciter Coil	35-44 (40-50)	26-44 (30-50)	26-44 (30-50)	26-44 (30-50)	N/A
Carburetor (4 mm)	17-25 (20-30)	17-25 (20-30)	17-25 (20-30)	17-25 (20-30)	17-25 (20-30)
Carburetor (5 mm)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)
Front Handle (5 mm)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)	25-35 (30-40)
Front Handle (5.5 mm)	25-44 (30-50)	25-44 (30-50)	25-44 (30-50)	25-44 (30-50)	25-44 (30-50)
Pulser Coil	N/A	26-44 (30-40)	N/A	N/A	N/A

*Use Three Bond™ 1401 to secure Phillips head screws and all other fasteners 4mm in diameter and smaller. Except for screws pre-coated from the factory, apply Three Bond™ 1360 to all muffler and crankcase screws.

**Install with Three Bond™ 1401 and tighten per "Other Fasteners" (below).
DO NOT OVERTIGHTEN!

All Other Fasteners	Socket Head	Phillips Head	Nut
4 mm	25-39 (30-45)	13-22 (15-25)	—
5 mm	43-61 (50-70)	25-35 (30-40)	23-30 (26-35)
6 mm	79-104 (90-120)	35-52 (40-60)	—
8 mm	—	—	90-106 (104-122)

Appendix Metric Conversions Section 14

Length	1 in. = 25.4 mm	1 mm = .03937 in. Values given in inch/pounds (Kgfcm)
	1 in. = 2.54 cm	1 cm = .3937 in.
	1 ft. = 30.48 cm	1 cm = .0328 ft.
	1 ft. = .304 meter	1 meter = 3.28 ft.
	1 mile = 1.609 km	1 km = .621 mile
Volume	1 cu. in. = 16.39 cc	1 cc = .061 cu. in.
	1 cu. in. = .061 liter	1 liter = 61.02 cu. in.
	1 fl. oz. = 29.574 ml	1 ml = .0338 fl. oz.
	1 fl. oz. = .02957 liter	1 liter = 33.81 fl. oz.
	1 gal. = 3.785 liter	1 liter = .264 gal.
Weight	1 oz. = 28.35 gm	1 gm = .0353 oz.
	1 lb. = .4536 kg	1 kg = 2.2 lb.
Force	1 in. lb. = 1.152 kg/cm	1 kg/cm = .868 in. lb.
	1 in. lb. = .112 n/m	1 n/m = 8.844 lb.
	1 ft. lb. = .138 kg/m	1 kg/m = 7.23 ft. lb.
	1 ft. lb. = 1.36 n/m	1 n/m = .737 ft. lb.
Power	1 hp (SAE) = .746 kw	1 kw = 1.34 hp (SAE)
	1 hp (SAE) = .9861 hp (DIN)	1 hp (DIN) = 1.104 hp (SAE)
	1 hp (SAE) = 1.017 psi	1 psi = .9836 hp (SAE)
Pressure	1 psi = .0689 bar	1 bar = 14.5 psi
	1 psi = 6.89 kpa	1 kpa = .145 psi
	1 psi = .07031 kg/sq cm	1 kg/sq cm = 14.22 psi
Temperature	$^{\circ}\text{F to }^{\circ}\text{C} = \text{Temperature in F} - 32 \times 5/9 (.555)$	$^{\circ}\text{C to }^{\circ}\text{F} = \text{Temperature in C} \times 9/5 (1.8) + 32$
Miscellaneous	1 mph = 1.6 km/hr	1 km/hr = .625 mph
	1 mpg = .425 km/liter	1 km/liter = 2.35 mpg

Section 14 Appendix Tolerances and Wear Limits

Dimensions: inches (mm)	300	300S	357	360	377	488
Piston Diameter use a micrometer to measure						
Standard	1.4157-1.4163 (35.96-35.975)	1.4157-1.4163 (35.96-35.975)	1.5732-1.5788 (39.96-39.975)	1.691-1.692 (39.96-39.975)	1.691-1.692 (39.96-39.975)	1.691-1.692 (42.95-42.965)
Limit	1.413 (35.9)	1.413 (35.9)	1.453 (36.9)	1.571 (39.9)	1.571 (39.9)	1.688 (42.88)
Piston Pin Bore Diameter (Pin Boss Diameter) use a hole gauge to measure						
Standard	0.394 (10)-0.0004 (.01)—Models 300 through 488					
Limit						
Ring Groove Width use a caliper to measure (remove carbon first)						
Standard	0.059 (1.5) +0.001-0.002 (+.03-.06)			0.039 (1.0) +.001-.002 (+.03-.05) .051 (1.3)+.001/.002 (+.03-.06)		
Piston/Cylinder Clearance use a thickness gauge to measure						
Standard	0.00236-0.0078 (.025-.06)—Models 300 through 377					.00138-.00197 (.035-.050)
Ring/Ring Groove Clearance						
Standard	0.0015-0.0035 (.04-.09)—All Models					
Limit	0.0079 (.20)—All Models					
SHINDAIWA CYLINDERS CAN NOT BE BORED (Replace if deviation is found).						
Cylinder Inside Diameter use a telescoping gauge and micrometer to measure						
Standard	1.417 (36)	1.417 (36)	1.457 (37)	1.575 (40)	1.575 (40)	1.693 (43)
Limit	1.421 (36.1)	1.421 (36.1)	1.461 (37.1)	1.579 (41.1)	1.579 (41.1)	1.697 (43.1)
Cylinder Out of Round use a telescoping gauge and micrometer to measure						
Standard	0.0002 (.005)—All Models					
Limit	0.001 (.03)—All Models					
Cylinder Taper use a telescoping gauge and micrometer to measure						
Standard	0.0004 (.01)—All Models					
Limit	0.0020 (.05)—All Models					
Compression	Standard	140 psi-156—All Models				
Piston Ring Width use a caliper to measure						
Standard	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.0519 (1.3)
Limit	0.054 (1.3)	0.054 (1.3)	0.054 (1.3)	0.054 (1.3)	0.054 (1.3)	0.0468 (1.19)
Piston Ring Thickness use a micrometer to measure						
Standard	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.059 (1.5)	0.063 (1.6)
Limit	0.051 (1.3)	0.051 (1.3)	0.051 (1.3)	0.051 (1.3)	0.051 (1.3)	0.0551 (1.4)
Piston Ring End Gap use a thickness gauge to measure						
Standard	0.1-0.3 mm	0.1-0.3 mm	1.6-1.8 mm	1.6-1.8 mm	1.6-1.8 mm	0.1-0.3 mm
Limit	0.7 mm	0.7 mm	2.2 mm	2.2 mm	2.2 mm	0.7 mm
Piston Pin Diameter use a micrometer to measure						
Standard	0.3937 (10)—Models 300 through 488					
Limit	0.3929 (9.98)—Models 300 through 488					
Inside Diameter of Small End of Connecting Rod use a caliper to measure						
Standard	0.5512 (14)—Models 300 through 488					
Limit	0.5528 (14.04)—Models 300 through 488					
Crankshaft Off-Center (runout) use a dial indicator to measure						
Standard	0.0007 (0.02)—All Models					
Limit	0.0027 (0.07)—All Models					
Crankshaft End Play use a thickness gauge to measure						
Standard	0.0089-.0138	0.0089-.0138	0.09-.3 mm	0.0089-.0138	0.0089-.0138	0.0012-.0094
Limit	0.1-0.35 mm	0.1-0.35 mm	0.09-.3 mm	0.1-0.35 mm	0.1-0.35 mm	0.03-.24 mm

Appendix Tolerances and Wear Limits Section 14

Dimensions: inches (mm)	550	575	577	680	695	757
Piston Diameter use a micrometer to measure						
Standard	1.7685-1.7690 (44.920-44.935)	1.7685-1.7690 (44.920-44.935)	1.7685-1.7690 (44.920-44.935)	1.926-1.927 (48.920-48.935)	1.926-1.927 (48.920-48.935)	2.3366-2.0047 (50.935-50.92)
Limit	1.7665 (44.885)	1.7665 (44.885)	1.7665 (44.885)	1.924 (48.8)	1.924 (48.8)	2.0007 (50.82)
Piston Pin Bore Diameter (Pin Boss Diameter) use a hole gauge to measure						
Standard	0.433 (11)-0.0004 (.01)—Models 550 through 680				0.472 (12)	0.472 (12)
Limit	0.437 (11.1)—Models 550 through 680				0.476 (12.1)	0.476 (12.1)
Ring Groove Width use a caliper to measure (remove carbon first)						
Standard	0.059 (1.5)+ 0.001-0.002 (+.03-.06)—Models 550 through 757					
Piston/Cylinder Clearance use a thickness gauge to measure						
Standard	0.00256-0.00394 (.065-.10)—Models 550 through 757					
Ring/Ring Groove Clearance						
Standard	0.0015-0.0035 (.04-.09)—All Models					
Limit	0.0079 (.20)—All Models					
SHINDAIWA CYLINDERS CAN NOT BE BORED (Replace if deviation is found).						
Cylinder Inside Diameter use a telescoping gauge and micrometer to measure						
Standard	1.772 (45)	1.772 (45)	1.772 (45)	1.930 (49)	1.930 (49)	2.008 (51)
Limit	1.776 (45.1)	1.776 (45.1)	1.776 (45.1)	1.933 (49.1)	1.933 (49.1)	2.012 (51.1)
Cylinder Out of Round use a telescoping gauge and micrometer to measure						
Standard	0.0002 (.005)—All Models					
Limit	0.001 (.03)—All Models					
Cylinder Taper use a telescoping gauge and micrometer to measure						
Standard	0.0004 (.01)—All Models					
Limit	0.0020 (.05)—All Models					
Compression	Standard	140 psi-156—All Models (minimum 100 psi)				
Piston Ring Width use a caliper to measure						
Standard	0.059 (1.5)—Models 550 through 757					
Limit	0.054 (1.3)—Models 550 through 757					
Piston Ring Thickness use a micrometer to measure						
Standard	0.059 (1.5)—Models 550 through 757					
Limit	0.051 (1.3)—Models 550 through 757					
Piston Ring End Gap use a thickness gauge to measure						
Standard	0.1-0.3 mm	0.1-0.3 mm	0.1-0.3 mm	0.15-0.35 mm	0.15-0.35 mm	0.15-0.35 mm
Limit	0.7 mm	0.7 mm	0.7 mm	0.75 mm	0.75 mm	0.75 mm
Piston Pin Diameter use a micrometer to measure						
Standard	0.433 (11)	0.433 (11)	0.433 (11)	0.433 (11)	0.472 (12)	0.472 (12)
Limit	0.432 (10.98)	0.432 (10.98)	0.432 (10.98)	0.432 (10.98)	0.470 (11.98)	0.470 (11.98)
Standard	0.5906 (15)—Models 550 through 757					
Limit	0.5921 (15.04)—Models 550 through 757					
Crankshaft Off-Center (runout) use a dial indicator to measure						
Standard	0.0007 (0.02)—All Models					
Limit	0.0027 (0.07)—All Models					
Crankshaft End Play use a thickness gauge to measure						
Standard	0.0024-.011—Models 550 through 757					
Limit	0.06-0.28 mm—Models 550 through 757					

Gasoline

What you need to know about today's motor fuels...



ATTENTION!

Under certain conditions, so-called "oxygenated" motor fuels can raise engine combustion chamber temperatures beyond acceptable limits, and can lead to major engine failure!

Oxygenated Fuel

Under the provisions of the Federal Clean Air Act of 1990, gasoline sold in many "non-attainment" areas is now blended with an oxygen-bearing compound on at least a seasonal basis.

The most common oxygenates in use contain either alcohol or an ether additive. Since both alcohol and ether contain oxygen, an engine burning either compound will have a hotter rate of combustion from the leaner air-fuel ratio.

Some states require that the use of oxygenates be posted at the pump. Ethanol alcohol is a commonly used oxygenate, and may contain as much 35% oxygen. Ether-based compounds may contain as much as 18% oxygen and are often marketed as MTBE, TAME, or ETBE.

IMPORTANT!

Ether-based compounds contain approximately one-half the oxygen of ethanol, and are usually less damaging to a two-cycle engine!

Octane Rating

Igniting a fuel within a cylinder causes a rapid expansion of burning gasses. This expansion is what forces the piston to move down the cylinder and rotate the crankshaft.

Fuel with a low octane rating can ignite violently (detonate) in a high compression engine, however, and may produce cylinder pressures 2 to 3 times higher than engine design limitations. Such pressures can have a "hammering" effect on pistons and bearings, and can shorten an engine's performance life significantly.

Higher octane fuels are designed to burn longer, producing a steady and controlled increase in combustion chamber pressures.

For maximum performance and engine life, Shindaiwa chain saws require a fuel with an octane rating of at least 87.

IMPORTANT!

Ethanol will increase fuel octane rating by 2 to 3 points and is often blended with gasoline as an octane enhancer or "booster".

Volatility

For easy starting and maximum engine performance, gasoline must remain in a liquid state only until it enters the carburetor venturi.

Gasoline evaporates more rapidly in a warm climate than in a cool climate, and a *high-volatile* gasoline will cause performance problems if it vaporizes in the engine's fuel lines or carburetor.

The opposite is true in cool weather. A *low-volatile* fuel can "puddle" in the combustion chamber, and may cause an engine to be hard to start.

IMPORTANT!

Non-seasonal gasoline can cause hard starting due to either vapor-lock or puddling! Always purchase fresh gasoline from a name-brand dealer!

Alcohol and Water

Condensation can produce water droplets on the inner walls of fuel tanks and other storage containers. These droplets can be readily absorbed by alcohol present in the fuel.

- If the alcohol involved has been blended with gasoline, this new alcohol-water mixture is prone to *phase separate* and form a separate and highly corrosive layer at the bottom of the fuel tank.
- If this layer is drawn in through an engine's fuel filter, the engine will burn a highly oxygenated lean fuel mixture containing little or no lubricating oil!

IMPORTANT!

Alcohol blended with gasoline can absorb water, and may "phase separate" to form a water-alcohol mixture that can shorten engine life drastically!

Storage

Gasoline is a complex blend of many different compounds, some of which may degrade during storage.

Old or "stale" gasoline in an engine's fuel system can attack or deteriorate fuel lines, carburetor diaphragms, and related fuel system components.

Shindaiwa Recommends...

If a trimmer or brushcutter must be stored longer than **30 days**, Shindaiwa recommends either:

- all unused fuel be removed from the fuel system by draining the fuel tank and then running the unit until it stops from fuel starvation.
- or
- pre-treating all fuel supplies with a fuel stabilizer such as StaBil™ (follow the manufacturer's directions).

IMPORTANT!

Gasoline octane and volatility can degrade rapidly during storage, and some gasoline compounds may deteriorate certain fuel system components!

- If gasoline is to be stored longer than 30 days, Shindaiwa recommends the use of a high-quality fuel stabilizer such as StaBil™ or similar product!
- Before storing any chain saw, always drain the fuel tank and then operate the engine until all remaining fuel is drained from the carburetor and fuel lines!

Recommendations

When using oxygenated fuels:

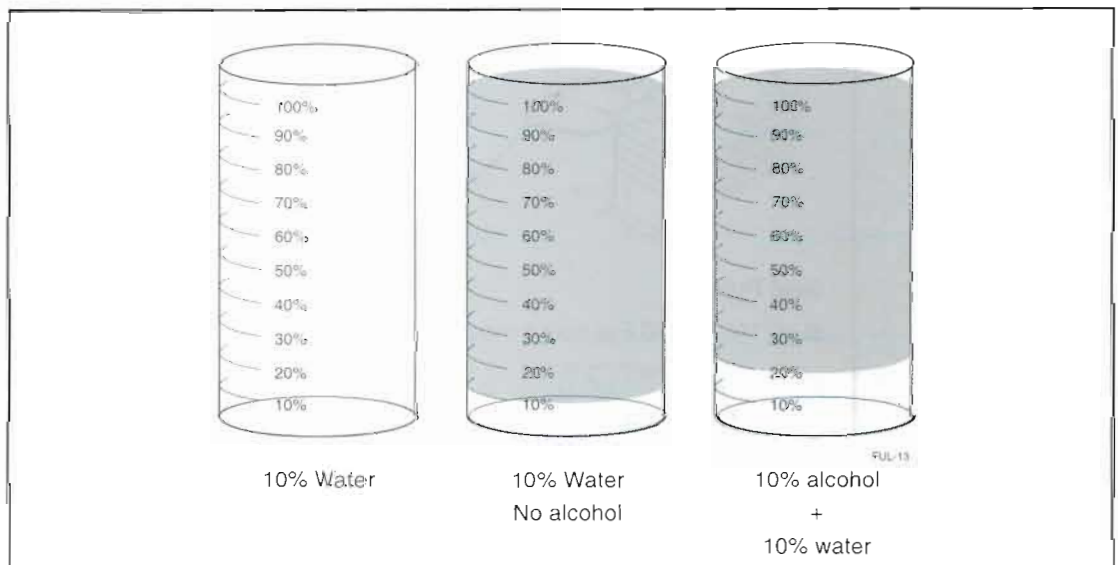
- **Never** use any fuel containing more than 10% alcohol by volume. See *Shaker Test*, below.
- When an oxygenated fuel **must** be used, choose an ether-based oxygenate over one containing alcohol.

- To minimize the risk of lean seizure when using oxygenated fuels, Shindaiwa recommends enriching carburetor fuel settings by at least 5%.
- Use only fuels with an octane rating of 87 or higher, and purchase only seasonally blended fuels from a high-volume dealer.
- **Never** store a chain saw with fuel remaining in the carburetor or fuel lines. Pre-treat all stored fuels with an appropriate fuel stabilizer such as StaBil™.
- Always use Shindaiwa Premium 2-Cycle Engine Oil mixed at a fuel/oil ratio of 40:1 (3.2 ozs./U.S. gallon). If Shindaiwa-brand engine oil is not available, fuel should be mixed with a premium grade 2-cycle oil specifically designed for air-cooled engines.
- The bright stocks used in two-cycle mixing oils tend to lower overall fuel octane ratings. Whenever possible, use only Shindaiwa Premium 2-Cycle Engine Oil blended at a ratio of 40:1.

IMPORTANT!

Under certain conditions, oxygenated fuel can cause an engine to operate "lean"!

- If a two-cycle engine must be operated with oxygenated fuel, the engine's high-speed adjustment should be enriched at least 5%!
- If you suspect fuel-related engine damage, refer to *Engine Seizure* in the Troubleshooting Section.



Shaker Test

Piston Puller Assembly (all models)

- 72282-96300

Piston Pin Adapter

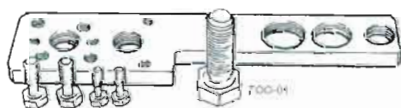
- 20021-96660 (300/300S, 345, 350, 360, 377, 415, 416, 450, 451, 500)
- 20021-96650 (488)
- 22150-96350 (550, 575, 577, 680)
- 22155-96350 (695)
- 22169-96350 (757)

Pin Guide

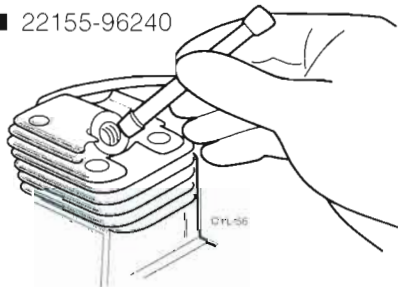
- 20000-93361 (300/300S, 345, 350, 360, 377, 415, 416, 450, 451, 488, 500)
- 22150-96360 (550, 575, 577, 680, 695)
- 22169-96360 (757)

**Flywheel Puller**

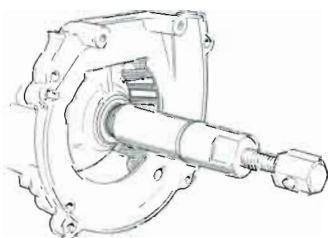
- 22150-96101 (All models)

**Piston Stop (Nylon, all models)**

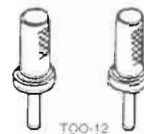
- 22155-96240

**Seal Puller**

- 22150-96600 Fits some models

**Seal Drivers**

- 22154-96440 (300, 300S, 360),
- 22154-96420 (360, 377)
- 22150-96420 (575M, 577M)
- 22150-96450 (575C, 577C, 680C, 695C)
- 22155-96420 (488, 695M)
- 22169-96420 (757M)
- 22169-96450 (757C)

**Bearing Drivers**

- 22154-96430 (300/300S, 360, 377)
- 22154-96410 Crankcase holder for above
- 22160-96440 (488)
- 22160-96410 Crankcase holder for above
- 22150-96430 (575, 577, 680, 695)
- 22150-96410 Crankcase holder M for above
- 22150-96440 Crankcase holder C for above
- 22169-96470 (757)
- 22169-96440 Crankcase holder C for above
- 22169-96430 (757)
- 22169-96410 Crankcase holder M for above

Bearing Driver

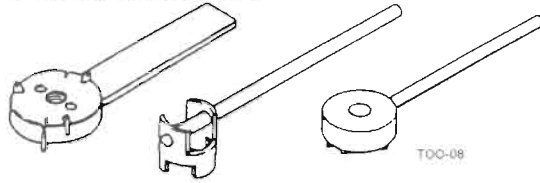
- 22154-96430 (300, 300S, 360, 377, 577,



CLUTCH TOOLS

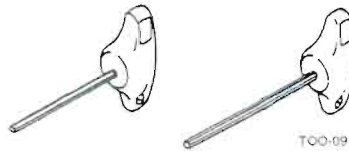
Clutch Shoe Puller

- 22154-96110 (300/300S, 345, 350, 360, 377, 415, 416, 450, 451, 500)
- 22155-91580 (550, 575, 577, 680, 695)
- 22169-96580 (757)



T-Wrench

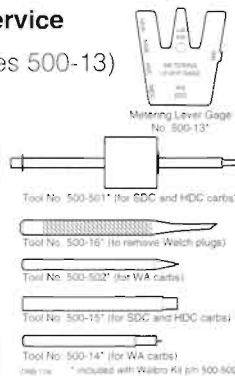
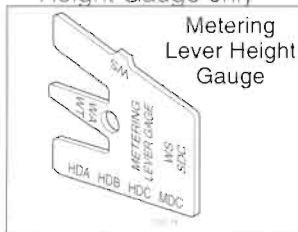
- 22155-96521 (3mm Allen® type wrench)
- 22155-96531 (4mm Allen® type wrench)
- 22155-96540 (5mm Allen® type wrench)



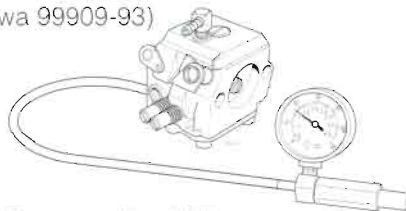
CARBURETOR TOOLS (WALBRO)

Diaphragm carburetor service

- 500-500 Tool kit (includes 500-13)
- 500-13 Metering Lever Height Gauge only

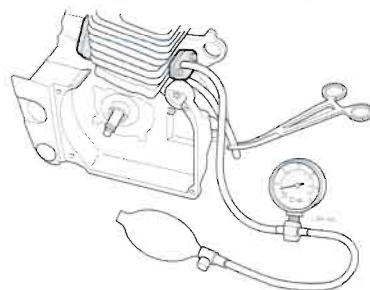


- 57-11 Pressure test gauge (Shindaiwa 99909-93)



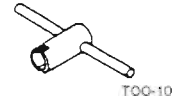
Crankcase Pressure Test Kit

- 72174-99200 (fits most models)



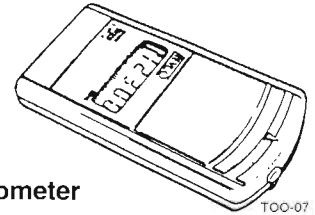
CHAIN BRAKE SERVICE

Brake Spring Wrench



- 22150-96510 (488, 575, 577, 680, 695)

TUNE UP



Revco Tachometer

- REVCO/HS-02 (all models)

Flywheel Air Gap Gauge

- 22154-96210 (300/300S, 360, 377)
- 22102-96211 (345, 350, 415, 416, 450, 451, 500)



- 22160-96210 (488)
- 22155-96220 (575, 577, 680, 695, 757)

MISCELLANEOUS

Seizure Checklist

- 60127 (all models)



Spark Plug Wire Repair Kit

- 22104-97800

Three Bond Adhesives

Liquid Gasket

- 1207-C Crankcase sealant
- 1104 Crankcase sealant

Liquid Screw Lock

- 1401 General use thread adhesive

High Temperature Liquid Screw Lock

- 1360 Heavy duty



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