Model

200

250

300

# McCULLOCH SHOP MANUAL

380

## 1965 Supplement to Shop Manual No. 60270

380A

440

450

640

Chain Saws

McCULLOCH CORPORATION
6101 WEST CENTURY BOULEVARD
LOS ANGELES, CALIFORNIA 90045



MANUFACTURER'S SUGGESTED NET PRICE — ONE DOLLAR

NO. 63328

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This Shop Manual Supplement should be used in conjunction with McCulloch Shop Manual #60270

## MODELS COVERED

1963, 1964 and 1965 model chain saws in the 1-40, 1-50 and 1-60 Series consist of the following models: 200, 250, 300, 380, 380A, 440, 450 and 640.

Except as specifically noted in descriptions of the new models, and for which new material has been prepared, the service procedures outlined in the McCulloch Shop Manual (#60270) for the 1-40, 1-50, 1-60 Series chain saws will apply.

### *Model 200 (see Figure 1)*

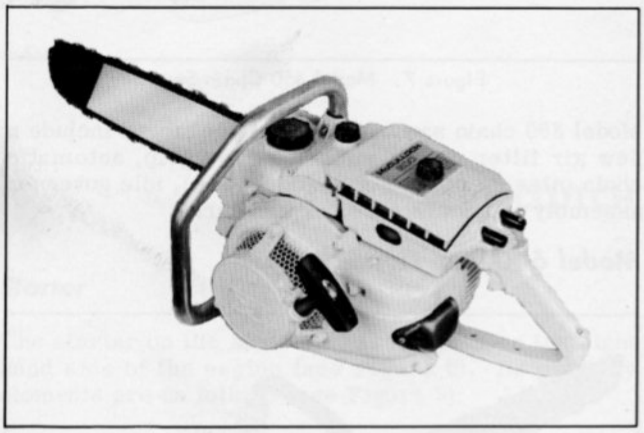

Figure 1. Model 200 Chain Saw

The 1963-64 model is basically an up-dated Model 1-43 and may be considered identical for all maintenance procedures except that the Model 200, while retaining a Tillotson carburetor, is furnished with a butterfly choke, in contrast to the choke plug used on Model 1-43.

### *Model 250 (see Figure 2)*

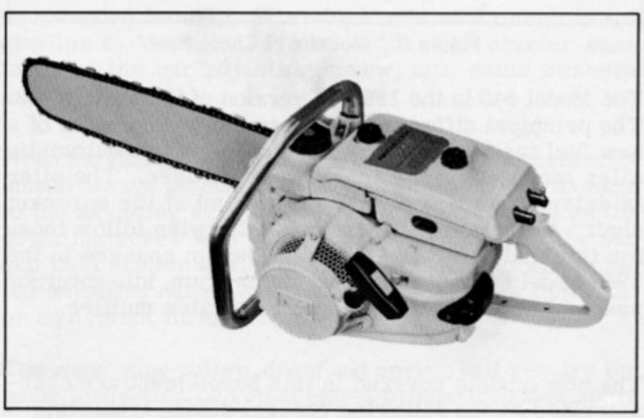

Figure 2. Model 250 Chain Saw

The 1963-64 Model 250 was the first of the new engines introduced in the model year and replaced the Model 1-46. McCulloch "Powerboost" carburetors with primer and excess fuel collector are standard on this model.

**NOTE**

This type of carburetion was first adopted on late production 1-46 engines.

Changes incorporated in the 1965 Model 250 include the following: Tillotson carburetor, straight stack muffler and an air cleaner cover similar to the Model 380.

### *Model 300 (see Figure 3)*

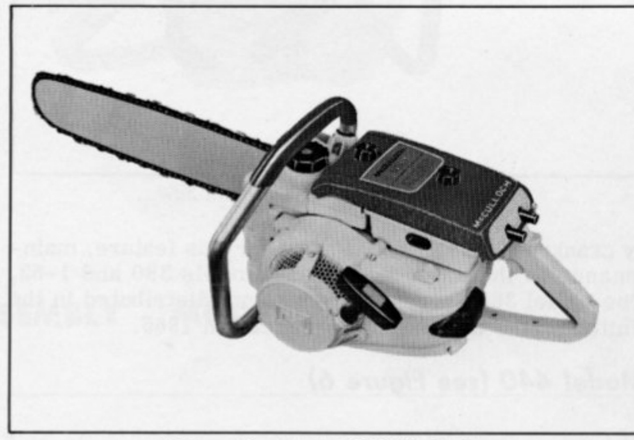

Figure 3. Model 300 Chain Saw

The Model 300 replaces the Model 380 for 1965 and features a Tillotson carburetor and spark arrester muffler.

### *Model 380 (see Figure 4)*

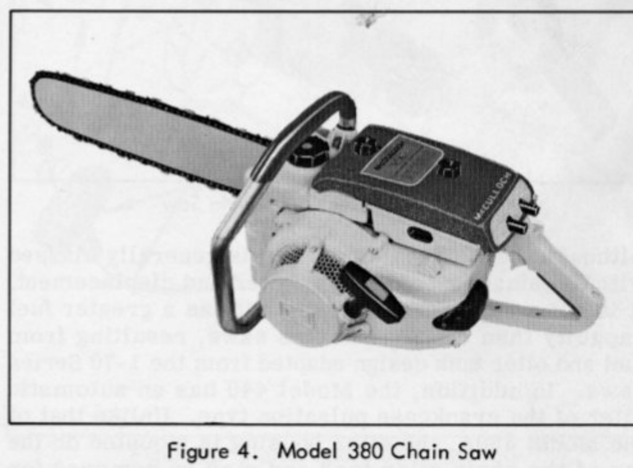

Figure 4. Model 380 Chain Saw

The 1963-64 Model 380 replaces Model 1-53 and is similar in construction. All phases of maintenance, repair and overhaul are the same except for carburetion. The Model 380 uses a McCulloch carburetor with primer and excess fuel collector similar to the 1963-64 Model 250. The Model 380 also incorporates a tapered-end crankshaft on the clutch side of the engine.

### *Model 380A (see Figure 5)*

The 1963-64 Model 380A is distinguished by an automatic oiler housed in the fuel tank (cast integrally) and operated

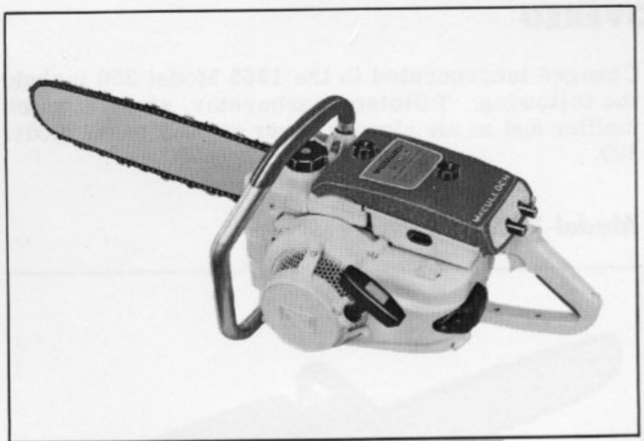

Figure 5. Model 380A Chain Saw

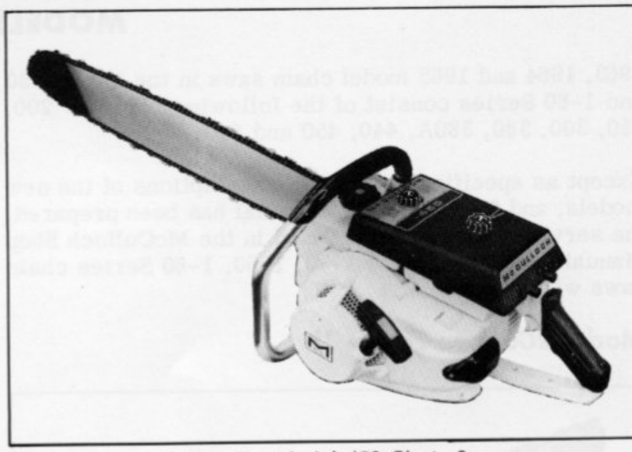

Figure 7. Model 450 Chain Saw

by crankcase pulsations. Except for this feature, maintenance is the same as for the Models 380 and 1-53. The Model 380A for 1963-64 was not distributed in the United States and was not produced in 1965.

### *Model 440 (see Figure 6)*

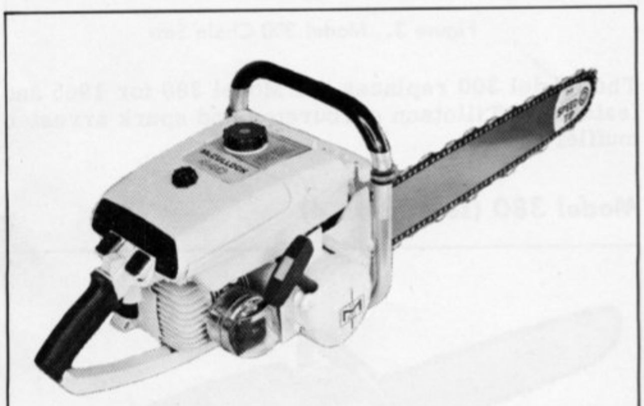

Figure 6. Model 440 Chain Saw

Although the 1963-64 Model 440 is generally classed with the smaller engines in power and displacement, it is not a replacement model. It has a greater fuel capacity than the 1-53 Series saws, resulting from fuel and oiler tank design adapted from the 1-70 Series saws. In addition, the Model 440 has an automatic oiler of the crankcase pulsation type. Unlike that of the Model 380A, the oiler housing is mounted on the top of the chain oiler tank and may be removed for service or replacement. In addition to the fuel and oiler tank design, the Model 440 is furnished with a right hand starter and clutch assembly, comparable to the Model 1-76 chain saw. In other respects, including the powerhead, fan housing and muffler, Model 440 is similar to Model 1-53. Model 440 production was discontinued in 1965.

### *Model 450 (see Figure 7)*

The 1965 Model 450 has been adapted from the 1963-64 Model 380 chain saw. Major design changes include a new air filter cover, rubber handle grip, automatic chain oiler (similar to the Model 380A), idle governor assembly and spark arrester muffler.

### *Model 640 (see Figure 8)*

Figure 8. Model 640 Chain Saw

The Model 640 is the 1963-64 version of the Model 1-63. The principal difference between the two consists of a new fuel tank (similar to Model 440) and an automatic oiler mounted on the transmission cover. The oiler is driven by a worm gear on the end of the sprocket shaft. Maintenance procedures otherwise follow those for the Model 1-63. Additional design changes in the 1965 Model 640 include a lined clutch drum, idle governor assembly and redesigned spark arrester muffler.

The new models covered in this Supplement are characterized by the following general design features:

1. All models have integral head crankcases.
2. Models 200, 250 (1965) and 300 (1965) are equipped with Tillotson carburetors, while Models 250, (1963-64) 380, 380A, 440, 450 and 640 are equipped with McCulloch "Powerboost" carburetors with primer and excess fuel collector.

**NOTE**

One type of fuel collector is used on Models 250, (1963-64) 380, 380A and 450; a second type is used on Models 440 and 640.

Contained in the McCulloch carburetors, on models so equipped, are high speed ball check valves replacing the previously used capillary seals.

3. All models except Models 200 and 250 have tapered-end crankshafts on the clutch side of the engine.

4. All models have an improved fuel cap assembly.

5. Models 380A, 440, 450 (1965) and 640 have automatic chain oilers in addition to the regular manual oiler.

6. Models 450 and 640 for 1965 are equipped with idle governor assemblies.

# STARTER AND CLUTCH ASSEMBLY - MODEL 440

## Starter

The starter on the Model 440 is mounted on the right hand side of the engine (see Figure 6). Its primary elements are as follows (see Figure 9):

1. Cover
2. Rope pulley
3. Drum
4. Spring
5. Base
6. Shaft
7. Sawdust cover
8. Rope and handle

The starter base serves a dual purpose in that it has an extended forward plate which acts as a clutch guard similar to Models 1-46 and 1-53. The starter base includes the bar adjusting screw, nut, guide washers and nut.

When servicing the Model 440 starter, the base assembly should always be inspected for possible wear or damage to the adjusting screw and nut. A rounded head on the adjusting screw will make it difficult to adjust the bar and hold proper chain tension. Thread damage to the bar adjusting nut may be repaired by use of a Heli-Coil or equivalent thread repair kit.

The rope, rope pulley, drum and spring will require the same inspection or replacement procedures that apply to the 1-50 Series saws.

**NOTE**

The starter rope pulley furnished for replacement on the Model 440 does not include Pulley Bearing, P/N 103536, which must also be installed. Be sure, whenever the starter rope pulley is replaced, to order and install the pulley bearing.

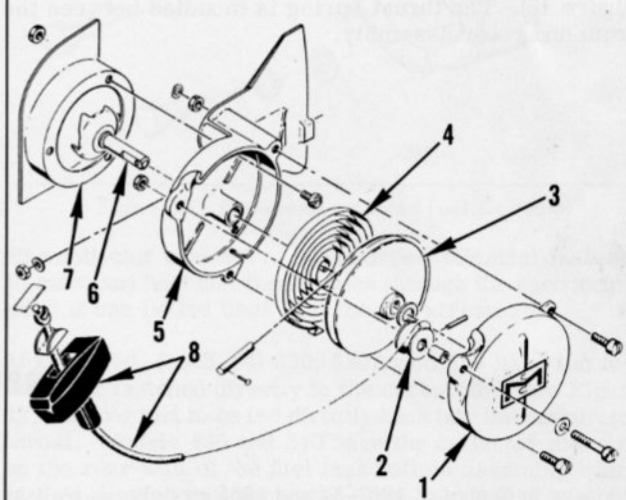


Figure 9. Starter and Clutch Assembly

Inspect the four teeth on the shaft to be sure that they engage correctly with the starter pawls on the clutch. Be sure that the teeth are not bent or rounded off to a degree that would prevent firm engagement with the pawls.

## Clutch

The clutch assembly on the Model 440 is similar to that of Model 1-53. The primary difference is the rotor assembly which, like the Model 1-63, supports the starter pawls. Additional parts include the two pawl

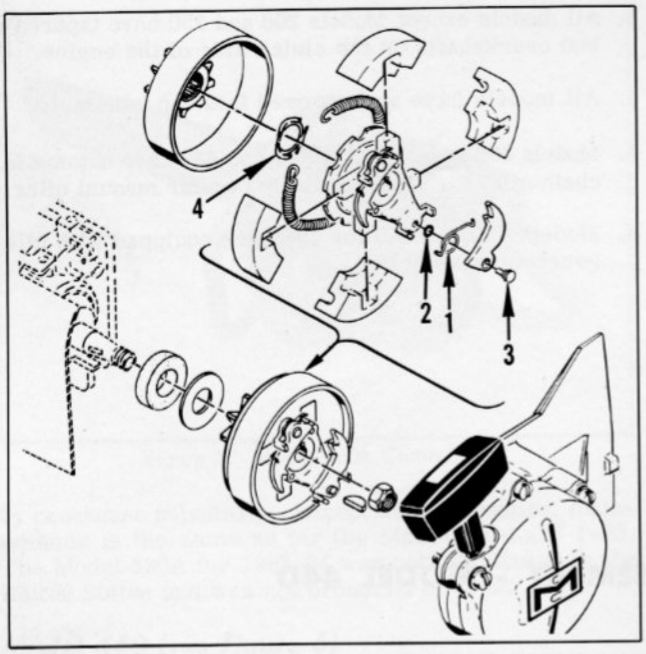


Figure 10. (1) Pawl Springs, (2) Spacers, (3) Special Pins, (4) Thrust Spring

springs, special pins, spacers and a thrust spring (see Figure 10). The thrust spring is mounted between the drum and rotor assembly.

Follow the existing service or replacement procedures outlined for the sprocket and drum assembly, clutch shoes and shoe retaining spring for the Model 1-53. The thrust spring and the two pawl springs will require replacement only if they are deformed or broken.

If the starter pawls require replacement, file off the round ends of the special pins on the underside of the rotor assembly. When filed flush with the rotor surface, drive out the pins with a punch.

Before reassembly, inspect the pawl pin holes, which may have a small chamfer as the result of a de-burring operation. The chamfer allows the pins to pull up too tight on the pawls, binding the pawls and preventing free movement of the pawls on the pawl pins. This situation will require the replacement of the pawls.

When reassembling the clutch with new pawls, use new pins, inserting them first through the pawls, pawl springs, spacers and into the rotor assembly. Check the position of the pawl springs to see that they are correctly installed (short end of the spring hooked on the rotor mount stud and the long end of the pawl). Peen the ends of the pins on the underside of the rotor assembly to securely fasten the pawls. After peening, check to make sure that both pawls turn freely on the pins.

## CARBURETORS

Changes in design of 1963-64 and 1965 models, as well as the addition of new functional parts, affect operation, service and replacement procedures in several areas. The most important of these changes affect carburetion and other portions of the fuel and chain oiler systems.

Of the new models only Models 200, 250 (1965 only) and 300 (1965) are equipped with Tillotson carburetors. All others are furnished with McCulloch carburetors; for both carburetors, use the existing service and replacement procedures as described in the 1-40, 1-50, 1-60 Series Shop Manual.

Attachment and design changes include the following: Primer, "Powerboost" Jet Venturi, and Excess Fuel Collector. After the first production run for the model year, design improvements also included an improved carburetor fuel inlet control valve needle and ball check valve for the high speed fuel inlet.

**NOTE**

Late production units on Model 1-46 were also furnished with McCulloch "Powerboost" carburetors and excess fuel collectors of the same type as those on Model 250 (1963-64) engines. Inspection, service or replacement procedures for these components will also apply to Model 1-46 engines, so equipped, as well as to current production engines.

### *MODELS 250 (1963-64 ONLY), 380, 380A, 440, 450 AND 640*

#### *Primer Operation*

Fuel is drawn into the primer assembly through a passage from the fuel pump to the inlet control needle; then pumped by the primer button through another passage, directly into the carburetor bore. This outlet is near the downstream end of the venturi. The discharge passage contains a ball check valve designed to prevent fuel from being drawn back into the primer assembly.

The primer assembly (see Figure 11) may be removed from the carburetor allowing carburetor passages (1) to be cleaned, inspection or replacement of "O" rings, (2) check valve, (3) spring, (4) ball, (5) valve body, (6) or mounting bracket, (7) inspect each part carefully; replace any part that inspection proves to be doubtful.

**NOTE**

The primer body assembly is replaceable only as a complete unit.

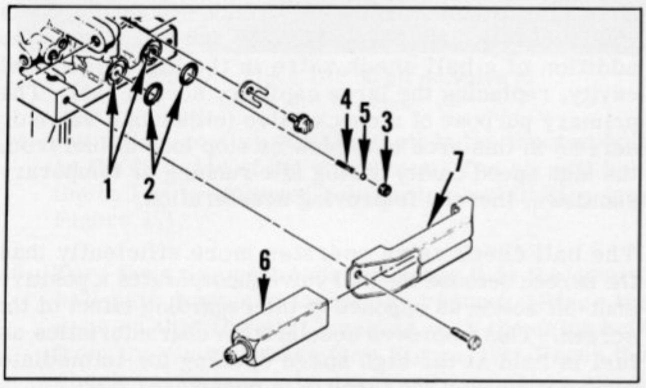


Figure 11. Primer Assembly

## *"Powerboost" Jet Venturi and Fuel Collectors*

The high speed outlet of the carburetor opens into the highly restricted passage of a "boost" venturi cast within the normal venturi of the carburetor body (see Figure 12). The flared portions of both the "boost" and normal venturi are designed to near the same point, or in the same vertical plane. The restricted passage of the "boost" venturi causes a pressure drop at the outlet hole and creates more lift for entering fuel.

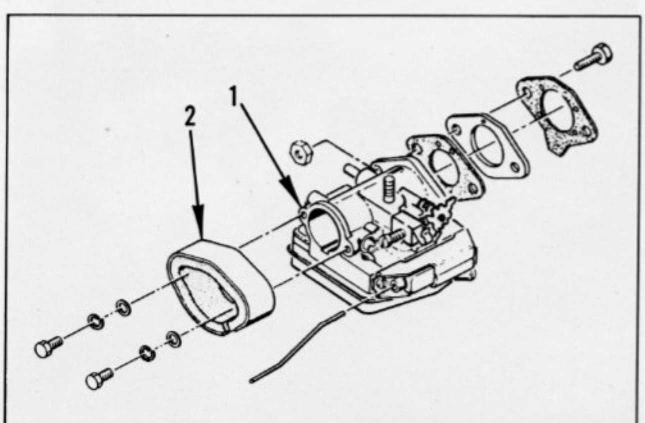


Figure 12. (1) "Powerboost" Jet Venturi and (2) Fuel Collector

Benefits are obtained in two ways: (1) a quicker response from the carburetor high speed fuel opening allows smoother acceleration with a leaner setting of the idle fuel adjustment needle, (2) more power is available under conditions which have lugged the saw down under load, or caused binding in the cut, resulting in lower engine RPM. In ordinary carburetors, whenever the throttle is wide open under load, RPM may drop enough to reduce fuel lift through the high speed opening, and a lean out condition may result. The "boost" venturi maintains correct fuel lift under these conditions.

No particular or unusual inspection, service, maintenance or adjustments are required for the "boost" venturi since it is integral with the carburetor body.

With the introduction of the "Powerboost" carburetor, an excess fuel collector was adopted. Except for a basic understanding of the method of fuel collection (and return to air flow) no requirements for operation, service or replacement need be considered.

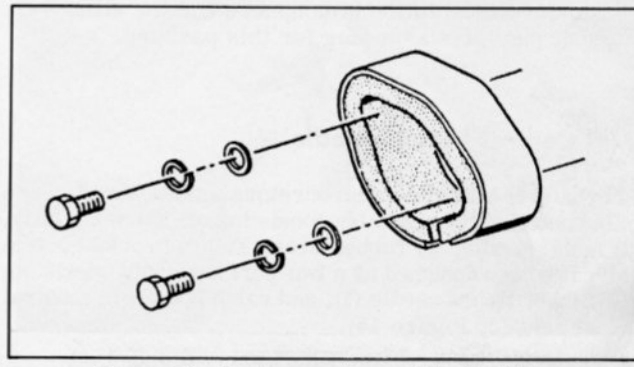

Figure 13. Carburetor-mounted Fuel Collector

The collector consists of an absorbent material designed to catch and hold fuel thrown back through the carburetor, until it can be fed back into the air stream.

Models 250, (1963-64) 380, 380A and 450 have the fuel collector fastened directly to the carburetor (see Figure 13) allowing fuel to be fed directly back into the carburetor throat. Models 440 and 640 have the collector mounted on the rear wall of the fuel tank bottom assembly which feeds collected fuel through a hose, into a fuel tube and then into the carburetor venturi just above the high speed outlet hole (see Figure 14).

**NOTE**

Service replacement carburetor bodies are furnished with both a fuel collector tube (used only on Models 440 and 640) and an air cleaner attachment stud (used only on Models 250, (1963-64) 380, 380A and 450). The collector tube, although not used on Models 250, (1963-64) 380, 380A and 450, may be left in the carburetor body or removed, as desired, since it does not affect carburetor operation.

If a service replacement carburetor body is installed on either a Model 440 or 640, the air cleaner attachment

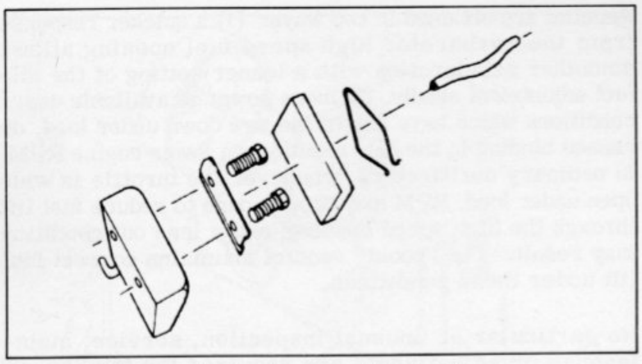

Figure 14. Tank-mounted Fuel Collector

stud must be filed off flush with the top of the carburetor body.

**NOTE**

Do not attempt removal of the attachment stud. The fuel inlet passage to the control valve must remain closed to the atmosphere and the attachment stud acts as a plug for this passage.

## *Inlet Control Valve Needle*

Previously, McCulloch carburetors used a three-piece inlet control valve assembly consisting of: (1) valve body, (2) metal needle, (3) rubber seat. The improved control valve has been designed as a two-part assembly consisting of: rubber tipped needle (1), and valve body with integral metal seat (2, Figure 15).

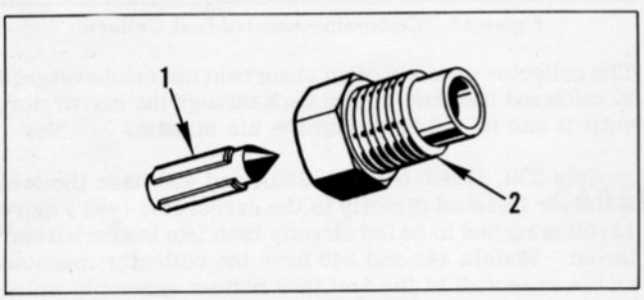


Figure 15. Inlet Control Valve

The improvement of the control valve affects maintenance requirements only to the extent that the control lever can be initially installed at the correct operating position, flush to 0.010 inch (0.254 mm) below the diaphragm mounting face. The pre-set adjustment for the lever, to a higher than normal operating position, as described in the 1-40, 1-50, 1-60 Shop Manual, no longer applies.

As the rubber seat has been eliminated from the control valve, it is not required as a service replacement part on any of the current production models. The washer, however, is retained and is installed in the fuel cavity under the valve body.

When servicing the valve assembly, look for any roughness on the metal seat of the valve body. Make sure that the seat is free from nicks, scratches or burrs. See that the needle moves easily in the bore and that there is no sign of uneven seating caused by slight imperfections in the seat. The rubber tip of the needle should be smooth and symmetrical. Replace any needle with a deformed or worn tip and any body with visible defects in the seat.

**CAUTION**

The two-piece valve assembly must be used as a set. Neither part may be used in combination with any part from a three-piece valve assembly.

## *High Speed Fuel Inlet Ball Check Valve*

Design improvements in the carburetion system of Models 250 (1963-64), 380, 380A, 440, 450 and 640 include the addition of a ball check valve in the high speed fuel cavity, replacing the large capillary screen seal. The primary purpose of a check valve (either ball valve or screen) in this area is to slow or stop loss of fuel from the high speed cavity during idle running or temporary shutdown, thereby improving acceleration.

The ball check valve operates more efficiently than the screen because the ball valve incorporates a positive shut-off action as opposed to the regarding effect of the screen. This improves acceleration characteristics as fuel is held at the high speed opening for immediate pickup whenever the throttle is opened.

Carburetors having the screen type capillary seal should be converted to the new valve assembly whenever brought into the shop for repair or overhaul. To make this conversion, proceed as follows:

1. Remove the 1-inch (25.4 mm) expansion plug from the carburetor body as described in the manual.
2. Pry out the capillary seal (screen) (see Figure 16).
3. Clean the cavity thoroughly with solvent and allow to dry.

Figure 16. Removing the capillary seal

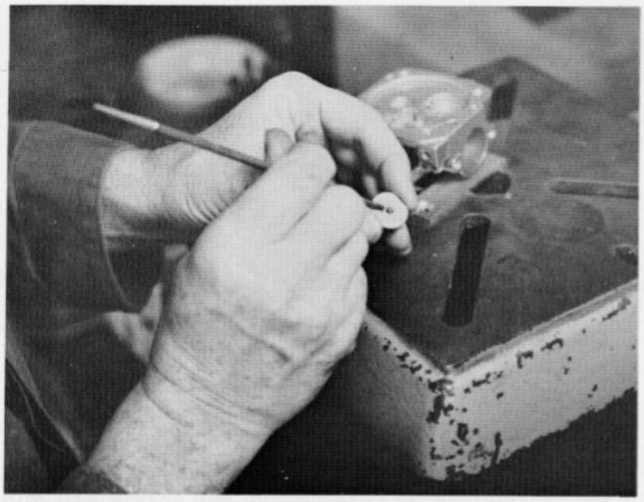

Figure 17. Place SAE 30 oil on valve to hold ball in place

4. Put a light coating of SAE 30 oil in the tapered hole on the flat side of the valve seat. The oil will hold the ball in the tapered hole during installation (see Figure 17).

5. Turn the valve seat over and place it in the cavity, ball side down and facing the venturi. Place the seat so that the slot lines up with the inlet hole from the control valve (see Figure 18). Press the check valve seat into place with an arbor press and an installation tool made for the purpose (see Figure 19).

**NOTE**

A suitable tool may be made from a 5/8 inch (15.87 mm) rod with a 0.325 inch (8.255 mm) bored recess in one end. Bore the recess to a depth of 0.187 inch (4.75 mm) or deep enough to clear the raised and slotted portion of the valve seat (see Figure 20).

**CAUTION**

Do not attempt to drive the seat into position with a hammer and punch as the ball may be jarred loose and fall into tne main fuel cavity and block fuel flow.

Figure 18. Check Valve Seat

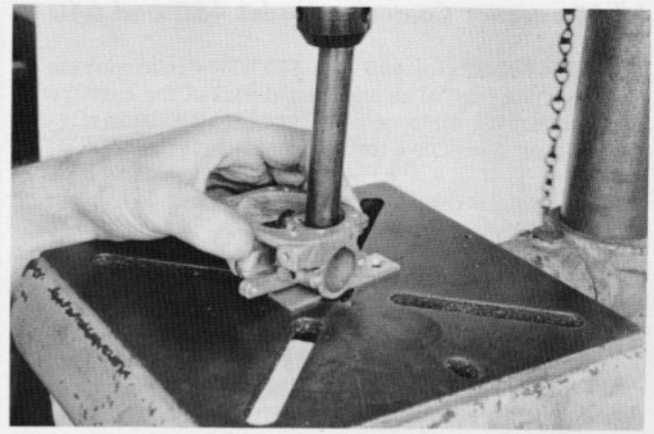

Figure 19. Installing check valve

Figure 20. Installation tool for check valve

After installing the seat, make a visual check to be sure that the ball can be seen through the hole in the seat.

6. Install a new expansion plug over the check valve using a hammer and flat punch of the proper size as described in the 1-40, 1-50, 1-60 Shop Manual.

7. Paint the sealing edge of the plug with Seal-All or similar sealant and allow to dry. Be very careful that the sealant does not enter the idle fuel entry hole near the plug.

If it becomes necessary to remove the valve seat because of damage or wear, proceed as follows:

1. Using a Number 35 drill, 0.110 inch (2.8 mm), drill a hole just through the valve seat, in an area away from the inlet hole.

**CAUTION**

Be careful not to drill into or damage the carburetor body during the drilling operation.

2. Insert a 6-32 self-tapping screw into the drilled hole. Turn the screw clockwise until the valve seat is forced out from the carburetor body. Remove the seat and replace it with a new one.

## *Idle Governor Control - Model 450 and 640*

The 1964-65 Model 450 and 640 saws incorporate an idle governor control as an integral part of the carburetor. The control consists of an offset throttle butterfly and a spring on a notched throttle shaft lever arm.

The function of the idle governor control is to prevent stalling of the engine at idle speed as a result of temporary over-rich fuel conditions following prolonged idling in one position, or when the position of the saw is changed.

The butterfly (see Figure 21) acts as an air vane to close the throttle whenever the force of air passing through the venturi builds sufficiently, as shown at "A". This force of air is opposed by spring pressure trying to open the throttle at "B". The spring tang is held in one of a series of notches on the lever arm "C" and may be moved to adjust spring tension as desired. When the opposing forces of the butterfly and spring are equal, the engine idles at normal speed and automatically compensates for changes in fuel mixture and position of the saw. In addition to idle control, the idle governor serves as a starting aid, holding the throttle open by means of the governor spring, until the engine starts.

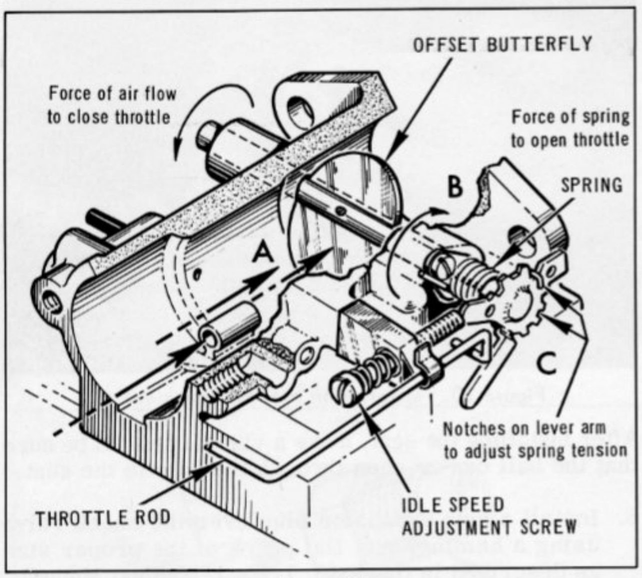


Figure 21.

After idling in one position for a prolonged period of time a change in the position of the saw may permit an accumulation of wet or unmixed fuel in the crankcase to be drawn into the cylinder resulting in an over-rich condition and causing an immediate reduction of both engine speed and flow of air through the carburetor venturi. As the air flow drops, the force on the butterfly is reduced and the governor spring, under tension to open the throttle, takes effect. This action occurs immediately and the throttle is opened enough to accelerate the engine to normal idle speed, or to the point where air flow will again act on the throttle butterfly to limit the throttle opening.

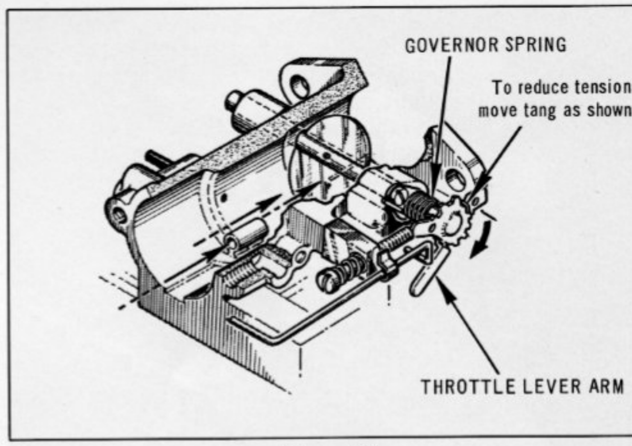


Figure 22.

If the spring tension is too great, the engine will idle too fast, run erratically or tend to "hunt" and may cause chain movement at idle. If spring tension is too light the spring may be slow to react or ineffective. Spring tension is adjustable and may be changed by resetting the spring tang in another notch on the throttle lever arm (see Figure 22).

### *Service*

During normal overhaul of the carburetor, disassemble and inspect all parts of the idle governor control. After disassembly and before reassembly, clean all parts in solvent or gasoline and blow dry with compressed air. During service, look for the following:

1. Bent or broken throttle pushrod clip.
2. Distorted throttle pushrod.
3. Bent throttle lever arm or damaged notches.
4. Compressed, bent or broken spring.
5. Damaged butterfly.
6. Damaged screws or threads.

After careful inspection and replacement of damaged parts, reassemble the idle governor control in the carburetor body, in the reverse order of disassembly.

### *Adjustment*

To achieve efficient operation of the idle governor control, after reassembly of the carburetor, adjust the carburetor as follows:

Preliminary

1. Install the carburetor on the saw and make the necessary connections.
2. Install the bar and chain, making sure the chain has the proper tension.
3. Slowly turn the main and idle fuel adjustment needles

clockwise with a screwdriver until the needles just seat.

**CAUTION**

Do not turn needles beyond the point of slight resistance as damage to the carburetor may result.

4. Turn the main and idle fuel adjustment needles counterclockwise one full turn.
5. Start and run the engine until it is thoroughly warm.
6. Adjust the idle fuel adjustment needle for acceleration.

**NOTE**

If the idle adjustment needle is turned too far clockwise, the engine will falter and hesitate on acceleration. If it is turned too far counterclockwise, the engine will run rough and smoke heavily on acceleration. Adjust the needle to the leanest setting (clockwise) that will obtain smooth, rapid acceleration without faltering. Turn the needle slowly and gradually to the desired position in steps of about 1/16 turn. Check acceleration after each step.

7. Turn the idle regulator screw counterclockwise until there is no contact with the throttle lever arm. Engine idling will be erratic (governor will "hunt"). Turn the idle screw clockwise until contact is made with the throttle arm, hunting will diminish. Continue to turn the screw clockwise until the desired idling speed is reached.

**NOTE**

The engine should idle just below clutch engagement speed and the governor should control idle speed without "hunting", except for changes in saw position and fuel mixture strength. If there is occasional movement of the chain during idling, reduce spring tension on the governor by moving the spring tang to the next notch clockwise on the throttle lever arm.

### *Control of Idle Speed*

At engine idling speed, the throttle opening is limited by the idle regulator screw on the low side, and by the end of the throttle pushrod on the high side (see Figure 23).

The governor spring, reacting to reduced air flow through the venturi, opens the throttle until contact is made by the lower lever arm against the throttle pushrod.

In some cases it may be difficult to adjust the idle governor spring as there may be too much space between the two arms of the throttle lever. This may be eliminated by bending the lower arm slightly upwards, reducing the amount that the throttle butterfly can open.

The lower arm may be bent by gently squeezing the two arms together with pliers. When properly spaced, there should be 1/8-inch (3.175 mm) clearance between the

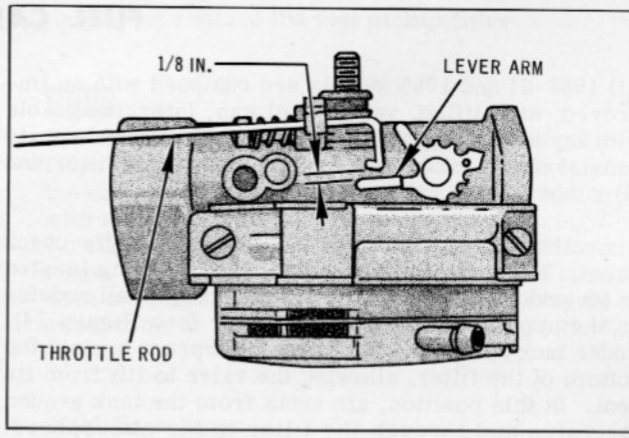


Figure 23. Lever Arm

lower arm and the throttle rod when the throttle is closed. (Refer to Figure 23).

**NOTE**

Be sure that the throttle butterfly is fully closed when measuring this space, and squeeze gently, to avoid over-bending or breaking the arm. There should be not less than 1/8-inch (3.175 mm) available travel when the governor spring opens the throttle.

### *Final Adjustment*

**CAUTION**

Final adjustment of the main fuel adjustment needle should be made only for full load conditions and maximum power. High speed engine operation when the saw is too lean, it may cause engine damage due to overheating and lack of lubrication.

1. Start and run the engine until thoroughly warm.
2. Start the saw into a cut and check to be sure that the engine runs smoothly and evenly under load.

**CAUTION**

Remove the saw from the cut whenever making adjustments to the needle setting. Never try to adjust the needle when the chain is moving.

3. Turn the main fuel adjustment needle counterclockwise approximately 1/16-turn, and with this slightly enriched mixture, again check engine operation under load.
4. Repeat this adjustment and check in gradual steps until the engine begins to run roughly under load.
5. Turn the main fuel adjustment needle clockwise just enough to eliminate the roughness. The McCulloch carburetor incorporating the idle governor control may be installed on Models 450 and 640 not so equipped if desired. A complete carburetor assembly and a different throttle pushrod must be installed on Model 450 and 640 chain saws not originally equipped with the idle governor control as carburetor components are not interchangeable.

## FUEL CAP ASSEMBLY

All 1963-64 and 1965 models are equipped with an improved, simplified, vented fuel cap, interchangeable with any vented cap previously used. Replaceable parts consist of the following: (1) sintered metal filter and (2) rubber check valve.

Air enters through the filter and also through the check valve. The valve contains a duckbill opening located on the underside, and either six or three, small nodules on the upper side, next to the filter (see Figure 24). Under tank pressure, the nodules compress against the bottom of the filter, allowing the valve to lift from its seat. In this position, air vents from the tank around the valve and through the filter to the atmosphere. Proper venting will always depend upon free movement of the valve whenever tank pressure is created.

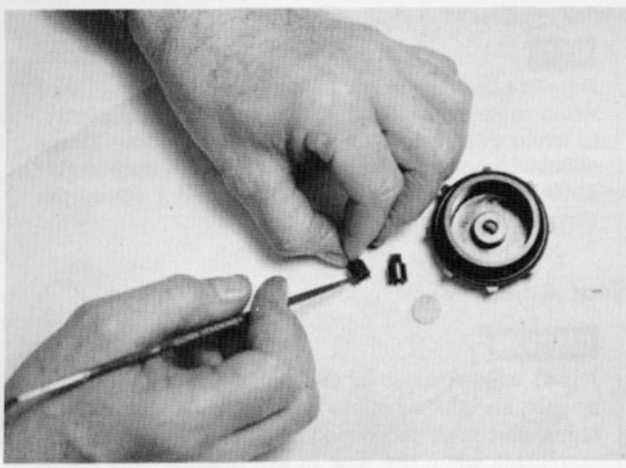

Figure 24. Fuel Cap Assembly

If the cap does not vent properly or fails to vent, three causes are possible:

1. Too much resistance is offered by the six nodules on the top of the valve, and as a result, tank pressure is insufficient to cause valve displacement.
2. Dirt prevents the valve from lifting off its seat.
3. The filter presses too tightly against the valve nodules, preventing valve lift.

Resistance may be eliminated by cutting every other nodule off the valve top reducing resistance to one-half the original value.

**NOTE**

Valve resistance will not be found in valves containing three nodules.

Dirt may be eliminated by sloshing the cap in solvent. then blowing compressed air through from the underside of the cap. Filter pressure may be relieved by carefully inserting a flat punch through the duckbill opening of the valve and gently tapping the underside of the filter.

**CAUTION**

Extreme care must be taken when inserting the punch through the valve and tapping the filter. If the valve opening is damaged or the filter is cracked, the fuel cap will leak. A properly positioned filter will just touch but not compress the valve nodules.

If the valve and filter are kept clean, and the filter correctly positioned, additional maintenance will not be necessary.

**NOTE**

When replacing the filter in the fuel cap, always place the smooth side of the filter down, against the valve.

## FUEL TANK ASSEMBLY - MODELS 440 AND 640

Models 440 and 640 differ in external appearance from earlier models in the same class. This difference is due primarily to the fuel tank assembly which serves as an airbox as well as a fuel tank.

Structurally, the tank is a connected three-piece assembly (see Figure 25), consisting of the following: air cleaner cover (1), fuel tank cover (2), fuel tank bottom assembly (3). The fuel tank bottom assembly has a center dividing wall to separate the airbox portion from the fuel tank. This wall has a matching upper divider in the tank cover. Fuel delivery, from the tank to the carburetor, is accomplished by means of hose connections from the tank pickup, through the cover wall, to the carburetor inlet tube.

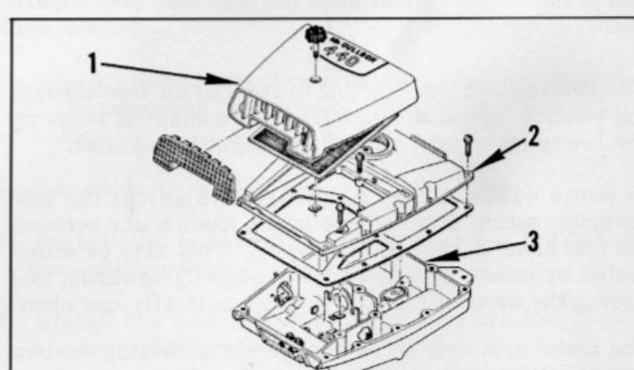


Figure 25. Fuel Tank Assembly

Components of the fuel tank assembly which will require periodic inspection for dirt or damage, and may require replacement, include the following:

1. Air Cleaner Screen
   Remove the air filter cover for access. Clean thoroughly and frequently with solvent and allow to dry before reinstalling. Check for damaged flocking and replace the screen if damage is noted.

2. Inlet Hose - Carburetor Fuel Pump
   Remove the air cleaner cover for access. Examine the fuel hose carefully for cuts, splits and pinholes. Replace any hose that shows damage.

3. Fuel Tank Gasket
   Remove the fuel tank cover. Look for torn or split gaskets. Replace any gasket that inspection shows to be doubtful.

4. Fuel Pickup Hose
   Remove the fuel tank cover or fuel cap. Examine the pickup hose for cracks, cuts or splits. If necessary, replace the pickup hose.

5. Fuel Pickup Assembly
   Remove the fuel tank cover or fuel cap. Clean thoroughly or replace the fuel pickup filter.

**NOTE**

Either of two types of fuel pickup filters may be found, depending upon the date of manufacture of the engine. One type consists of a metal casting with a felt filter secured by a pin and two rings. To change the filter remove the pin and the two rings. The second type consists of a metal core with a cylindrical jacket (felt) which may be slipped on or off without removal of any other part.

6. Fuel Tank Liner
   Remove the fuel tank cover. Look for cracks or broken pieces of the liner, especially where the material is narrow and not fully supported by the floor of the tank.

Models 200, 250, 300, 380, 380A and 450 are furnished with fuel tank assemblies similar to those used on the 1-40 and 1-50 Series. Service and maintenance instructions described in the 1-40, 1-50, 1-60 Shop Manual will apply.

## AUTOMATIC OILER - MODEL 440

Model 440 chain saws are equipped with a pulse-type automatic chain oiler in addition to the conventional manual oiler. This model mounts the automatic oiler on top of the oiler tank and is operated by crankcase pulsations.

### *Operation*

Chain oil is drawn from the oil tank into the automatic oiler housing, then pumped to the bar mounting pad through a series of internal connecting passages inside the oiler tank and automatic oiler housing. Figure 26 illustrates the passages in the oiler tank after removal of the automatic oiler housing. Internal passages are indicated by dotted lines.

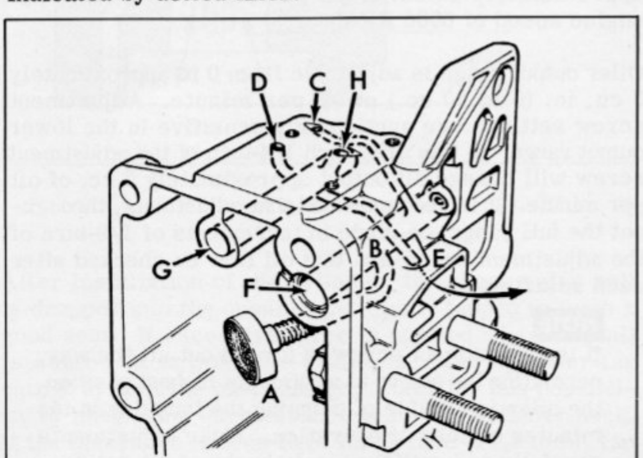


Figure 26.

Oil is drawn from the tank through the pickup assembly (A), into a passage (B), emerging at the opening on top of the tank (C), where it enters the automatic oiler housing. After circulating through the automatic oiler housing, oil re-enters the tank at opening (D), passing to the bar mounting pad (E).

Opening (F), is the manual oiler piston and pushrod entry point. Crankcase pulsations are transmitted from opening (G), through the oiler tank to the automatic oiler, reaching the oiler piston at (H).

**NOTE**

Passage (B) is the oil inlet line for both the automatic and manual oiler.

The oil supply system serves three main purposes:

1. Provides for the use of the manual oiler as a supplementary unit to the automatic oiler whenever needed or desired.

2. Permits independent use of the manual oiler when required.

3. Provides a method for the manual oiler to prime the automatic oiler immediately, to deliver high volume output after refilling the oiler tank.

**NOTE**

Always prime the automatic oiler after refilling the oiler tank. If the manual oiler is slow to prime the system after a brief period idleness.

or after running the oiler tank dry, turn the saw over on the right side to flood the passage with oil. This creates a seal at the oiler piston allowing full priming with only a few strokes of the manual oiler button.

### *Operation - Automatic Oiler (see Figures 27 and 28)*

Crankcase pulsations actuate the automatic oiler piston (A), which pumps oil from the oiler tank into the oiler body at (B), then through a passage to an opening in the oiler cylinder (C). The upward piston stroke lifts a charge of oil from the cylinder, past a ball check valve (D), to the outlet passage (E), through the outlet hole (F), to the oiler tank passage and bar mounting pad. Note that the piston stroke is limited by a movable sleeve (G), in the oiler body. Sleeve position may be changed, either up or down, by means of the adjusting screw (H).

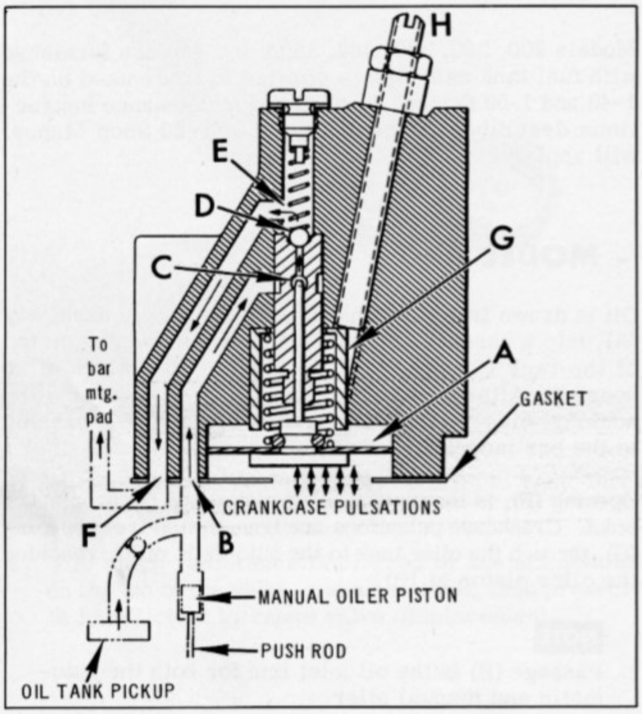


Figure 27.

Movement of the piston within the oiler body is up and down. Upward motion occurs when crankcase pressure reaches the oiler piston head after traveling through the pulsation passages in the oiler tank.

Downward motion is effected by a combination of three forces:

1. Alternate crankcase suction which tends to pull the oiler piston down in the chamber.

2. Reaction of the spring, located under the sleeve, which compresses with every upward stroke.

3. Expanded air that is trapped and compressed in a surge chamber on one side of the oiler body above

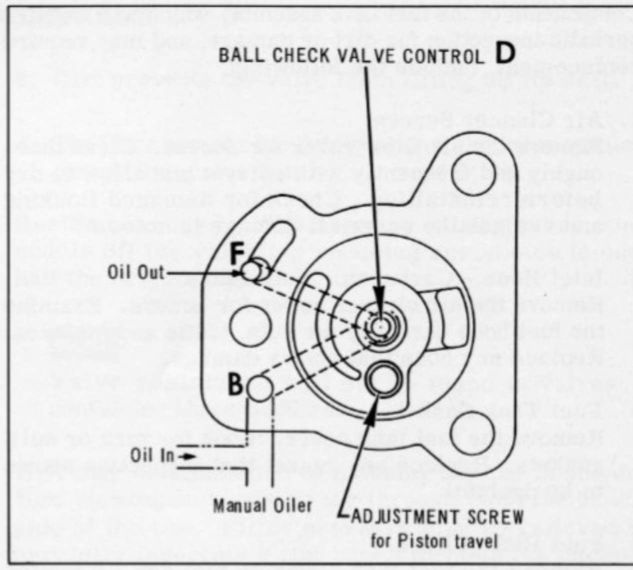


Figure 28.

the piston. The surge chamber also acts as a dampener, cushioning the piston on its upward stroke.

### *Adjustment*

The volume of oil (rate of output) from the automatic oiler is determined by the length of the oiler piston stroke. This stroke is limited and controlled by the position of the movable sleeve. The sleeve may be adjusted up or down by the setting of the adjustment screw. If the adjustment screw is turned all the way out, the sleeve assumes its highest position, allows maximum piston stroke and delivers maximum oil flow. If the adjustment screw is turned all the way in, the sleeve will be forced to the bottom of the chamber and prevent the piston from stroking. In this position, no oil will be delivered although the engine is running.

To set the adjustment screw for initial operation after reassembly, turn the screw to the closed position (all the way in). Open the screw two full turns and lock it in this position with the locknut. This setting will deliver approximately 10 cc. of oil per minute at an average engine speed of 6000 RPM.

Oiler output range is adjustable from 0 to approximately 3 cu. in. (0 to 50 cc.) of oil per minute. Adjustment screw settings are particularly sensitive in the lower output range. In this area each 1/4-turn of the adjustment screw will change oil output approximately 3 cc. of oil per minute. It is recommended that adjustment, throughout the full range, be made in increments of 1/8-turn of the adjustment screw and that oil flow be checked after each adjustment.

**NOTE**

If the adjustment screw is turned out all the way, permitting the sleeve to assume its highest position, the oiler is capable of pumping the tank dry in ten minutes or less of operation. Make adjustments carefully and with frequent checks of oil delivery at the bar.

After desired oil flow is obtained, be sure to tighten the locknut on the adjustment screw firmly. Vibration may otherwise loosen the screw allowing oil flow to increase rapidly.

## *Trouble Shooting*

Satisfactory performance of the automatic chain oiler will normally depend upon adequate oil supply, correct adjustment screw position and unrestricted oil flow through tank and oiler passages. If trouble develops, check oil supply and adjustment screw setting first. Make sure that the adjustment screw is not all the way in (closed position). Look for operational faults in the following areas:

1. Piston Sticking
   Crankcase pulsations may be ineffective because of a stuck or binding piston. Water swelling or foreign particles drawn in from the crankcase could restrict free movement of the piston ring in the chamber. Inspect the piston for binding, swelling or distortion and if necessary, clean and dress the ring with emery cloth until it moves easily and smoothly in the chamber. Clean the body assembly in solvent to remove any foreign particles.

2. Cylinder Mis-aligned with Inlet Passage
   During assembly of the automatic oiler, the cylinder is pressed into the body at the point where the inlet passage aligns with the center opening of the cylinder. At this point the lower neck of the cylinder is 15/32 inch (11.9 mm) above the lower face of the oiler body (see Figure 29).

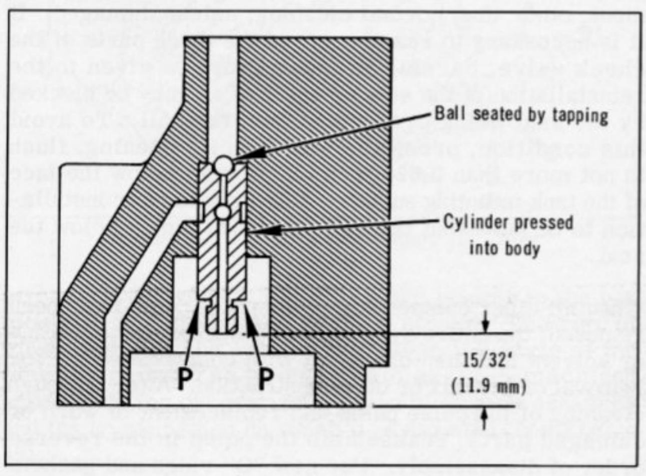


Figure 29.

After installation of the cylinder, the check valve ball is dropped into the opening and lightly tapped to form a good seat. If excessive force is applied when the ball is seated, it is possible to displace the cylinder far enough to block the inlet passage. Check for this possibility by measuring the clearance below the cylinder neck. If the clearance is less than 15/32 inch (11.9 mm), tap the cylinder up into the body until the proper clearance is obtained.

**CAUTION**

If it becomes necessary to reposition the cylinder, tap the shoulder (P, Figure 29) of the cylinder rather than the lower extension. This will avoid damage to the tip where the piston rod enters.

3. Check Valve Ball Not Seated
   An improperly positioned ball due to insufficient impact during assembly, dirt accumulation on the seat or a broken spring will cause inefficient operation and make the oiler difficult to adjust. Dirt may be removed by cleaning in solvent and allowing the oiler to dry.

**CAUTION**

Dirt can plug the oil hole, the passage to the bar, the bar mounting pad and even the bar groove until back pressure builds enough to cause a leaking gasket. Oil can be forced from the discharge area into the pulse opening and back into the crankcase. To avoid extreme leakage problems of this kind, it is recommended that the oil hole, passage and bar groove be cleaned thoroughly three times each week.

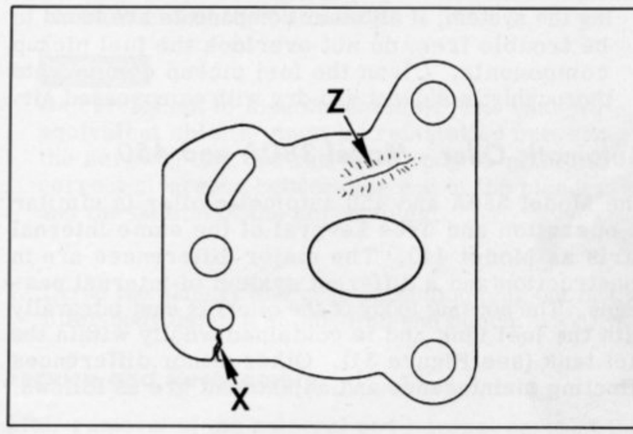


Figure 30.

Replace a broken or deformed spring. If a poorly formed seat is found a new body assembly will be required.

4. Damaged Gasket (see Figure 30)
   A torn or damaged gasket at or near the outlet passage (X), will allow oil to leak and accumulate on the top of the tank. Wrinkling or buckling on the surface of the gasket (Z) will prevent the piston from opening the inlet passage to the ball check valve. Both these defects will retard or prevent oil delivery to the bar even though the pump is operating. If this condition is found, replace the gasket.

5. Automatic Oiler Inoperative
   All preceding faults pertaining to the operation of the automatic oiler also affect operation of the manual oiler as the same passages and check valves are used for both. There is, however, one situation in which the manual oiler will not operate when the engine is shut

off. If the oiler piston is on the upward stroke when the engine stops, the inlet passage will be blocked by the end of the oiler piston rod (see Figure 27). The manual oiler button cannot be pumped and will give all indications of being locked or jammed. To relieve this condition, pull the engine through several times, allowing crankcase suction to draw the oiler piston to its lowest position which will open the inlet passage and permit passage of oil. An alternate method of relief for a locked condition is as follows: turn the automatic oiler adjusting screw all the way in (closed position). This will force the piston to the lowest position, opening the inlet passage and allowing oil to flow into the cylinder, permitting free movement of the manual oiler button.

**NOTE**

If the alternate method is used, be sure to readjust the automatic oiler adjustment screw prior to starting the engine.

6. Oil Pickup Defective
Dirt may plug the screen in the oil pickup weight assembly or the oil pickup check valve. This condition will prevent oil from reaching the automatic and manual oiler inlet passage. When trouble shooting the system, if all other components are found to be trouble free, do not overlook the fuel pickup components. Clean the fuel pickup components thoroughly in solvent and dry with compressed air.

### *Automatic Oiler - Model 380A and 450*

The Model 380A and 450 automatic oiler is similar in operation and uses several of the same internal parts as Model 440. The major differences are in construction and a different system of internal passages. The housing (body of the oiler) is cast integrally with the fuel tank and is contained wholly within the fuel tank (see Figure 31). Other minor differences affecting maintenance and adjustment are as follows:

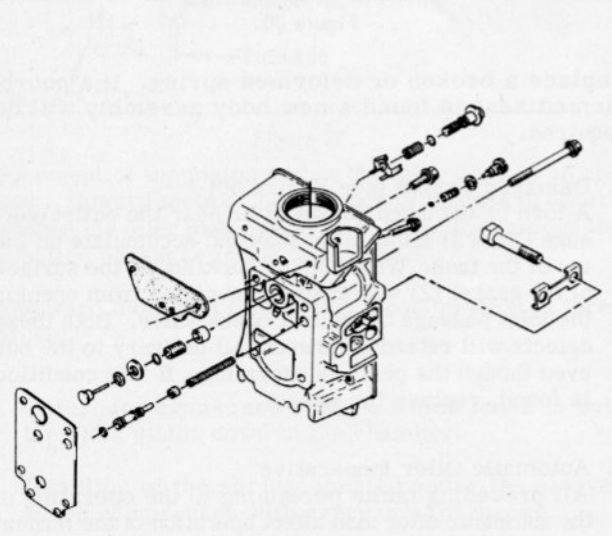

Figure 31. Integral Automatic Oiler

1. Crankcase pulsations reach the oiler piston directly; instead of through a passage in the tank.

2. Movement of the oiler piston on both strokes is horizontal rather than vertical.

3. Oil is delivered to the pump by gravity flow rather than through an oil pickup assembly.

4. Access to the oiler adjustment screw is through the fuel tank filler hole after the fuel cap has been removed.

To disassemble the saw for service, or parts replacement of the pump, proceed as follows:

1. Remove the fuel and oil from their respective tanks; remove the clutch guard, frame, fuel tank cover, fuel tank, oiler tank cover and oil tank.

2. From the crankcase side of the fuel tank, remove:
   a. Fuel tank gasket, automatic oiler piston with washer, piston ring and "O" ring.
   b. Oiler piston spring and piston adjusting sleeve.
   c. Manual oiler piston, "O" ring, spring and seat.

3. From the inside of the fuel tank, remove:
   a. Adjusting screw, "O" ring, spring and detent.
   b. Special ball check screw, washer, ball check spring and ball.

A check valve consisting of a ball seat, steel ball and snap ring, controls oil delivery from the oiler tank, through the inlet passage to the pump. These three parts are replaceable but should not require replacement, other than normal cleaning, unless damaged. If it is necessary to remove any of the three parts of the check valve, careful attention must be given to the reinstallation of the seat or entry of oil may be blocked by the seat being pressed against the ball. To avoid this condition, press the seat into its opening, flush to not more than 0.020 inch (0.508 mm) below the face of the tank mounting surface. Use a probe after installation to be sure that the ball can move freely below the seat.

When all other components of the pulse pump have been removed, the entire system can be flushed with gasoline or solvent and then blown out with compressed air for removal of any dirt or other obstruction. After thorough cleaning of the pulse pump and replacement of worn or damaged parts, reassemble the pump in the reverse order of disassembly. Use new "O" rings and gaskets throughout.

### *Adjustment*

Initial adjustment of the automatic oiler should be made before installation of the fuel tank cover because of easy access to the star-wheel adjustment screw. To make this adjustment, turn the star-wheel all the way in (closed position). Using this position as a starting point, open the pump, by turning the star-wheel outward, 2-3/4 turns. At this setting, oil delivery should be approximately 10 cc. of oil per minute at an engine speed of 6000 RPM. This is the rate at which the pump is set before shipment from the factory and is suitable for average cutting conditions.

In the field, the adjustment star-wheel is accessible through the fuel tank filler hole after the fuel cap has been removed. Use a screwdriver to turn the star-wheel for any further adjustment that may be necessary or desired. If increased oil delivery is desired, turn the star-wheel inwards to decrease piston travel. It may be assumed that for every notch the wheel is opened, oil delivery will increase approximately 16 drops per minute.

### *Automatic Oiler - Model 640*

The Model 640 automatic oiler is mounted on the transmission cover in the location formerly occupied by the sprocket shaft cover. The oiler is mechanically driven by a worm gear on the end of the sprocket shaft, which engages a splined plunger located within the oiler body. The plunger incorporates a camway on one end and a machined flat on the opposite end. Reciprocating plunger action draws oil into the oiler body during the back-

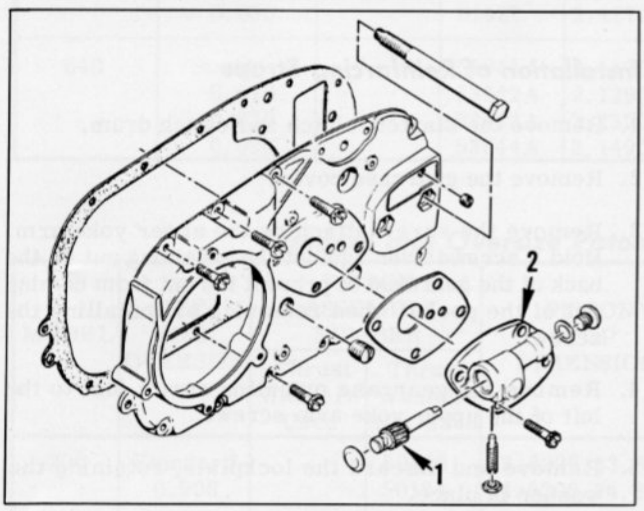


Figure 32. (1) Splined Plunger, (2) Oiler Body

stroke and delivers it into a passage leading to the bar mounting pad during the forward stroke. The rate of oil delivery to the bar depends upon the angle of the plunger cam. The plunger cam angle is machined specifically for the gear ratio of the oiler body assembly and the transmission on which it is mounted (see Figure 32).

Two automatic oiler bodies are available for the Model 640. One body is used with a 2 to 1 gear ratio transmission and the other with a 3 to 1 gear ratio transmission. Gear ratios are stamped on the oiler bodies so they may be quickly identified for installation on the appropriate transmission. Neither oiler is adjustable.

The only difference between oilers for the 2 to 1 and 3 to 1 gear ratio transmissions is the cam angle of the plunger. As an aid to identification, plungers are color coded with a Dykem coloring to indicate the gear ratio. Low volume output (3-1/2 to 5 cc. of oil per minute) plungers for 2 to 1 gear ratio transmissions are colored orange, plungers for high volume output, (5 to 7 cc. of oil per minute) are colored red. On 3 to 1 gear ratio transmissions, low volume output plungers are colored red and high volume output plungers are colored blue. All plungers are interchangeable in the oiler body assemblies and it is possible to vary the volume of oil delivery by changing to a plunger with a different cam angle. Such a change might be desirable under conditions that were expected to last several days. Example: A blue colored plunger installed in a 2 to 1 oiler body would deliver maximum oil output; conversely, an orange colored plunger installed in a 3 to 1 oiler body, would deliver minimum oil output.

### *Disassembly*

1. Remove the four screws attaching the oiler body to the transmission cover and remove the body and gasket.

2. Loosen the locknut on the cam guide screw and remove the screw and locknut from the underside of the oiler body.

3. Remove the screw (plug) and the shim(s) from the forward end of the oiler body.

**CAUTION**

Be careful not to lose the shim(s). The same or equivalent shim(s) must be reinstalled between the screw (plug) and the oiler body to maintain correct clearance between the end of the plunger and the bottom of the screw (plug).

4. Drive the plunger and rear expansion plug out of the oiler body using a small, flat-end punch.

### *Service and Reassembly*

After removal of the external and internal parts of the oiler body the internal passages should be washed in solvent to remove any accumulated dirt then blown dry with compressed air.

A new expansion plug should always be installed when the oiler is reassembled. If the same plunger is reinstalled in the body, the same or equivalent shim(s) may be used under the screw (plug). A new plunger requires measurement to determine the number of shim(s) needed. To determine shim(s) requirement, proceed as follows:

1. Insert the selected plunger in the oiler body and install the cam guide screw and locknut.

2. Turn the cam guide screw in until it bottoms in the plunger camway, then back the screw out one full turn and lock the screw with the locknut at this setting.

3. Using a screwdriver, rotate the plunger through the sprocket shaft opening while observing plunger movement visible through the screw (plug) opening.

4. When the end of the plunger is closest to the screw (plug) opening, stop turning the plunger.

5. Install the screw (plug) without shims and turn it in until the screw bottoms on the end of the plunger.

6. Measure the space between the screw (plug) head and the oiler body with a feeler gauge, then remove the screw.

7. Install shim(s) which are 0.015 inch thick (0.038 mm) equal to the space between the screw (plug) head and the oiler body plus 0.003 inch (0.076 mm) for minimum clearance.

   Example: Space measured 0.025 inch. Install two 0.015-inch shims under screw head. Clearance will be 0.005 inch.

   Example: Space measured 0.035 inch. Install three 0.015-inch shims under screw head. Clearance will be 0.010 inch.

8. Install a new expansion plug in the cam end of the oiler body.

9. Fill the plunger spline cavity with Lubriplate or equivalent lubricant and install a new gasket. Position the oiler body on the transmission cover, mesh the splines with the worm gear on the end of the sprocket shaft and install and tighten the four screws.

## GEARCASE ASSEMBLY - MODEL 640

Gearcase assemblies for Model 640 are strengthened by the addition of metal straps installed on the idler gear yoke assembly. The straps reduce wear on the yoke screw holes and also protect against looseness caused by worn or distorted holes.

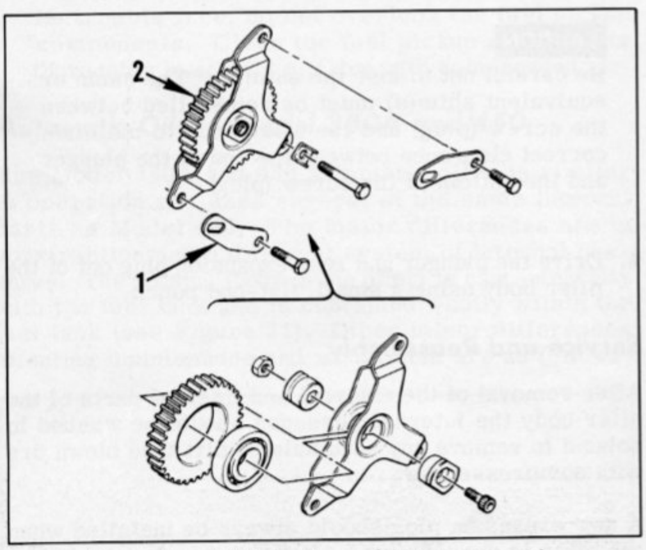


Figure 33. (1) Yoke Strap, (2) Yoke Assembly

Two straps are used to re-enforce the yoke assembly. One strap is installed on the upper arm, the other strap is installed on the lower left arm of the yoke assembly. Each strap is anchored by the gearcase mounting screw closest to the yoke mounting screw (see Figure 33).

**NOTE**

Whenever idler yoke straps are installed on the idler yoke assembly, the additional thickness of the strap material will require longer hold-down screws. Use new and longer screws as follows:

1. Upper yoke arm, use screw, P/N 102504 - 1/4-28 X 3/4 inch long.

2. Lower left yoke arm, use screw, P/N 102901 - 1/4-28 X 1 inch long.

### *Installation of Reinforcing Straps*

1. Remove the starter, clutch and clutch drum.

2. Remove the gearcase cover.

3. Remove the screw attaching the upper yoke arm. Hold a screwdriver against the retaining nut on the back of the gearcase to prevent the nut from coming out of the pocket when removing or installing the screw.

4. Remove the gearcase mounting screw just to the left of the upper yoke arm screw.

5. Remove and discard the lockplate, retaining the washer in place.

6. Install one idler yoke strap on the upper yoke arm and on the gearcase mounting boss. Place the slotted end of the strap on the boss with the concave edge of the strap toward the top of the gearcase.

7. Install the gearcase mounting screw and the yoke mounting screw. Tighten both screws securely. Bend the ends of the strap up tight against the screw heads to lock them.

8. Remove the lower left yoke arm screw and the gearcase mounting screw, retaining the washer in place.

9. Install the second yoke strap with the concave edge toward the bottom of the gearcase. Install the gearcase mounting screw and the yoke mounting screw. Tighten both screws securely and bend the ends of the strap up against the screw heads.

10. Replace the gearcase cover, clutch drum, clutch and starter.

# TABLES

## *Standard and Oversize Piston and Ring Dimensions in inches*

| MODEL | SIZE AND OVERSIZE | PISTON ASSEMBLY NUMBER Thrust Washers Used | PISTON ASSEMBLY NUMBER Thrust Washers Not Used | PISTON TOP DIMENSION | PISTON SKIRT DIMENSION | CYLINDER ASSEMBLY NUMBER | CYLINDER INTERIOR DIMENSION | RING SET |
|---|---|---|---|---|---|---|---|---|
| 200 | Standard | | 50206 | 2.1190/2.1185 | 2.1220/2.1215 | 58971A | 2.1260/2.1250 | 55123 |
| | 0.020 | | 50134 | 2.1390/2.1385 | 2.1420/2.1415 | | | 55125 |
| 250 | Standard | 48695 | 53927 | 2.1190/2.1184 | 2.1220/2.1214 | 58971A | 2.1260/2.1250 | 48691 |
| | 0.010 | 48684 | 53924 | 2.1290/2.1284 | 2.1320/2.1314 | | | 48692 |
| | 0.020 | 48685 | 53925 | 2.1390/2.1384 | 2.1420/2.1414 | | | 48693 |
| | 0.030 | 48686 | 53926 | 2.1490/2.1484 | 2.1520/2.1514 | | | 48694 |
| 300 | Standard | | 53941A | 2.1190/2.1184 | 2.1220/2.1213 | 53563 | 2.1260/2.1250 | 55123 |
| 380 | 0.010 | | 53942A | 2.1290/2.1284 | 2.1320/2.1313 | | | 55124 |
| 380A | 0.020 | | 53943A | 2.1390/2.1384 | 2.1420/2.1413 | | | 55125 |
| 440 | 0.030 | | 53944A | 2.1490/2.1484 | 2.1520/2.1513 | | | 55126 |
| 450 | Standard | | 61428 | 2.1570/2.1564 | 2.1600/2.1594 | 61406 | 2.1640/2.1630 | 58881 |
| | 0.020 | | 61426 | 2.1770/2.1764 | 2.1800/2.1794 | | | 58889 |
| | 0.030 | | 61427 | 2.1870/2.1864 | 2.1900/2.1894 | | | 58893 |
| 640 | Standard | | 53941A | 2.1190/2.1184 | 2.1220/2.1213 | 53528A | 2.1260/2.1250 | 55123 |
| | 0.010 | | 53942A | 2.1290/2.1284 | 2.1320/2.1313 | | | 55124 |
| | 0.020 | | 53943A | 2.1390/2.1384 | 2.1420/2.1413 | | | 55125 |
| | 0.030 | | 53944A | 2.1490/2.1484 | 2.1520/2.1513 | | | 55126 |

## *Standard and Oversize Piston and Ring Dimensions in Millimeters*

| MODEL | SIZE AND OVERSIZE | PISTON ASSEMBLY NUMBER Thrust Washers Used | PISTON ASSEMBLY NUMBER Thrust Washers Not Used | PISTON TOP DIMENSION | PISTON SKIRT DIMENSION | CYLINDER ASSEMBLY NUMBER | CYLINDER INTERIOR DIMENSION | RING SET |
|---|---|---|---|---|---|---|---|---|
| 200 | Standard | | 50206 | 53.8226/53.8099 | 53.8988/53.8861 | 58971A | 54.0004/53.9750 | 55123 |
| | 0.508 | | 50134 | 54.3306/54.3179 | 54.4068/54.3941 | | | 55125 |
| 250 | Standard | 48695 | 53927 | 53.8226/53.8074 | 53.8988/53.8836 | 58971A | 54.0004/53.9750 | 48691 |
| | 0.254 | 48694 | 53924 | 54.0766/54.0614 | 54.1528/54.1376 | | | 48692 |
| | 0.508 | 48685 | 53925 | 54.3306/54.3154 | 54.4068/54.3916 | | | 48693 |
| | 0.762 | 48686 | 53926 | 54.5846/54.5694 | 54.6608/54.6456 | | | 48694 |
| 300 | Standard | | 53941A | 53.8226/53.8074 | 53.8988/53.8836 | 53563 | 54.0004/53.9750 | 55123 |
| 380 | 0.254 | | 53942A | 54.0766/54.0614 | 54.1528/54.1376 | | | 55124 |
| 380A | 0.508 | | 53943A | 54.3306/54.3154 | 54.4068/54.3916 | | | 55125 |
| 440 | 0.762 | | 53944A | 54.5846/54.5694 | 54.6608/54.6456 | | | 55126 |
| 450 | Standard | | 61428 | 54.7878/54.7626 | 54.8640/54.8476 | 61406 | 54.9656/54.9402 | 58881 |
| | 0.508 | | 61426 | 55.2958/55.2725 | 55.3720/55.3567 | | | 58889 |
| | 0.762 | | 61427 | 55.5498/55.5345 | 55.6260/55.6107 | | | 58893 |
| 640 | Standard | | 53941A | 53.8226/53.8074 | 53.8988/53.8836 | 53528A | 54.0004/53.9750 | 55123 |
| | 0.254 | | 53942A | 54.0766/54.0614 | 54.1528/54.1376 | | | 55124 |
| | 0.508 | | 53943A | 54.3306/54.3154 | 54.4068/54.3916 | | | 55125 |
| | 0.762 | | 53944A | 54.5846/54.5694 | 54.6608/54.6456 | | | 55126 |

## *Specifications*

| Transmission | DIRECT DRIVE | | | | | | | GEAR TRAIN |
|---|---|---|---|---|---|---|---|---|
| Model | 200 | 250 | 300 | 380 | 380A | 440 | 450 | 640 |
| Weight - pounds | 19-1/2 | 19-1/2 | 21 | 21 | 21 | 22 | 21 | 25-1/2 |
| Weight - kilograms | 8.84 | 8.84 | 9.52 | 9.52 | 9.52 | 9.98 | 9.52 | 11.57 |
| Bore - inches | 2.125 | 2.125 | 2.125 | 2.125 | 2.125 | 2.125 | 2.165 | 2.125 |
| Bore - millimeters | 53.97 | 53.97 | 53.97 | 53.97 | 53.97 | 53.97 | 54.99 | 53.97 |
| Stroke - inches | 1.375 | 1.375 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.375 |
| Stroke - millimeters | 34.92 | 34.92 | 38.10 | 38.10 | 38.10 | 38.10 | 38.10 | 34.92 |
| Displacement - cu. in. | 4.9 | 4.9 | 5.3 | 5.3 | 5.3 | 5.3 | 5.5 | 4.9 |
| Displacement - cu. cent. | 80.3 | 80.3 | 86.86 | 86.86 | 86.86 | 86.86 | 90.14 | 80.3 |
| Compression Ratio | 6.25:1 | 6.25:1 | 6.25:1 | 6.25:1 | 6.25:1 | 6.25:1 | 6.25:1 | 6.25:1 |
| Crankcase (type) | Int. hd. | Int. hd. | Int. hd. | Int. hd. | Int. hd. | Int. hd. | Int. hd. | Int. hd. |
| Main Bearings | 1 Ball 1 Needle | 1 Ball 1 Needle | 2 Ball | 2 Ball | 2 Ball | 2 Ball | 2 Ball | 1 Ball 1 Needle |
| Connecting Rod Bearings | Needle | Needle | Needle | Needle | Needle | Needle | Needle | Needle |
| Upper Rod Bearings | Bushing | Needle | Needle | Needle | Needle | Needle | Needle | Needle |
| Fuel Tank Capacity - pints | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.8 | 2.5 | 2.8 |
| Fuel Tank Capacity - liters | 1.18 | 1.18 | 1.18 | 1.18 | 1.18 | 1.32 | 1.18 | 1.32 |
| Chain Oiler Tank Capacity - pints | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 1 | 0.7 | 1/2 |
| Chain Oiler Tank Capacity - liters | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.473 | 0.33 | 0.23 |

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