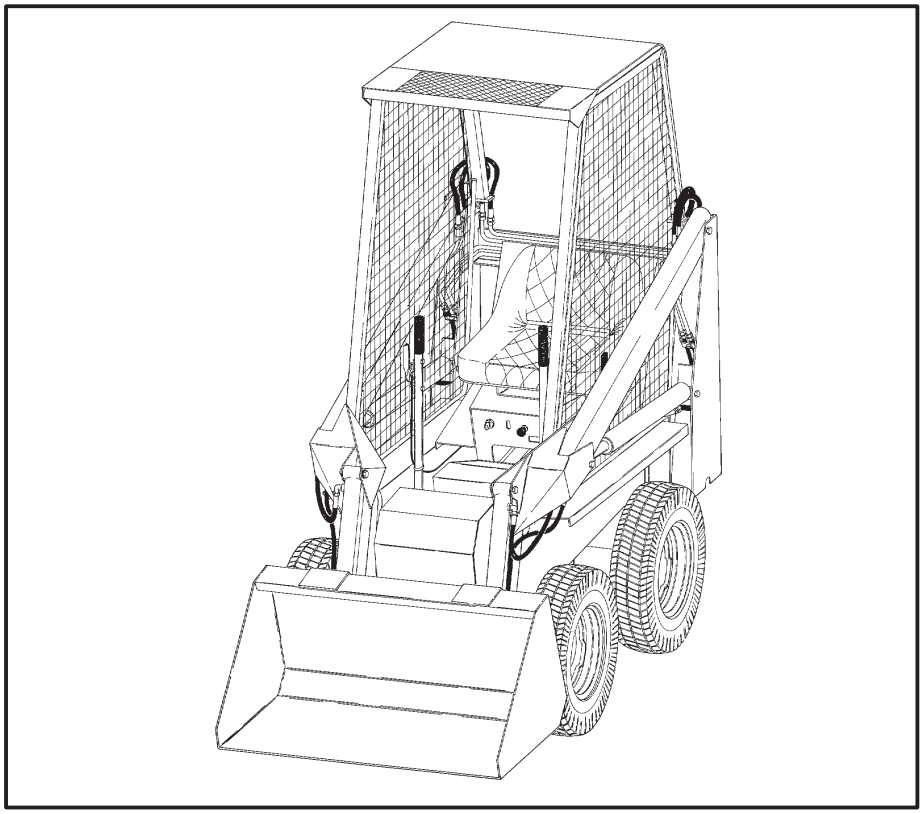
3
7
1

# Service Manual

## (Gasoline & L.P. Gas)



MELROE
INGERSOLL-RAND

bobcat

6545574 (2-84) Printed in U.S.A.

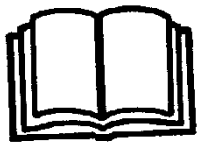
# MAINTENANCE SAFETY

**WARNING**

**Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.** W-2003-0903

**Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.**

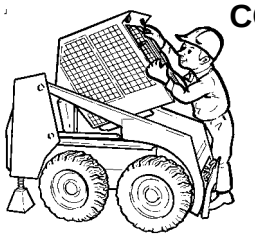
**CORRECT**



B-10731a

**Never service the Bobcat Skid-Steer Loader without instructions.**

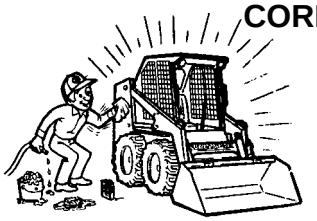
**CORRECT**



B-12365

**Use the correct procedure to lift or lower operator cab.**

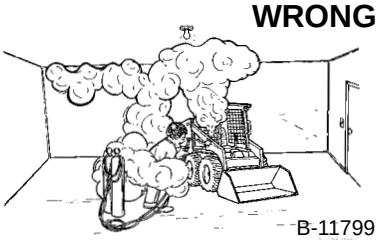
**CORRECT**



B-7469

**Cleaning and maintenance are required daily.**

**WRONG**



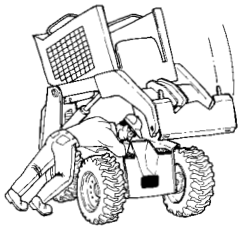
B-11799

**Have good ventilation when welding or grinding painted parts.**

**Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.**

**Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.**

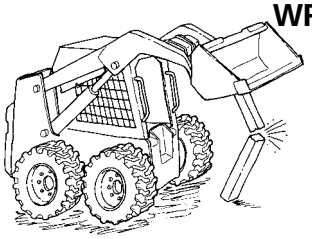
**WRONG**



B-15231

**Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.**

**WRONG**

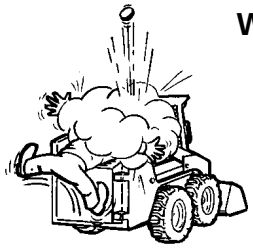


B-15280

**Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.**

**Never modify equipment or add attachments not approved by Bobcat Company.**

**WRONG**



B-6590

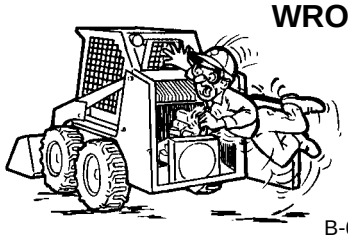
**Stop, cool and clean engine of flammable materials before checking fluids.**

**Never service or adjust loader with the engine running unless instructed to do so in the manual.**

**Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.**

**Never fill fuel tank with engine running, while smoking or when near open flame.**

**WRONG**



B-6580

**Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.**

**Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.**

**Keep rear door closed except for service. Close and latch door before operating the loader.**

**WRONG**

B-6589

**Lead-acid batteries produce flammable and explosive gases.**

**Keep arcs, sparks, flames and lighted tobacco away from batteries.**

**Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.**

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.

MSW01-0805


Bobcat®

# *FOREWORD*



This manual is written in two parts: To provide instruction for proper routine servicing and adjustments of the Bobcat such as the 50 hour check and regularly scheduled periodic inspections established by the Service Schedule, and to provide detailed overhaul instructions of the power train, loader hydraulic system and general machine main frame components.

Refer to the Owners Manual for general operating instructions (Starting Procedure, Daily Checks, Bucket Operation, Minor Maintenance, etc).

INSPECTION:
A general inspection of the following items should be made whenever the machine has been serviced of repaired:

1. Check hydraulic fluid level, engine oil level and fuel supply.
2. Check for any sign of fuel, oil or hydraulic fluid leaks.
3. Lubricate the machine.
4. Check battery condition, electrolyte level and cables.
5. Check air cleaner for damage or leaks. Check element and replace if necessary.
6. Check transmission drive belt and hydraulic drive belt for wear and tension.
7. Check tires for wear and pressure.
8. Check Bob–Tach wedges for condition.
9. Check safety items for condition. (Operator Protective Guard, Seat Belt, Safety Treads on steps, Boom Stop).
10. Make a visual inspection for loose or broken parts or connections.

Advise the owner if any of the above items require service or repair.

## CONTENTS

**ROUTINE SERVICING**

**MAJOR OVERHAUL**

**TO LOCATE DESIRED SECTION PLACE THUMB ON RESPECTIVE TAB AND FLIP PAGES UNTIL CORRESPONDING SECTION TAB IS REACHED.**

# ROUTINE SERVICING

ENGINE SERVICE . . . . . 3
GENERAL MAINTENANCE . . . . . 1
HYDRAULIC SYSTEM SERVICE . . . . . 13
TRACTION DRIVE SYSTEM SERVICE . . . . . 21

# GENERAL MAINTENANCE

Lubrication Points . . . . . 1
Service Schedule . . . . . 2
Tire Service . . . . . 1


**M–371 Loader**
**Service Manual**

## TIRE INFLATION

Inflate the 5:70–16 x 12 tires to 50 PSI maximum. Do not allow the pressure to go lower than 40 PSI or the machine will be hard to turn and tire wear will be much greater.

Inflate 23:00–8.50 x 12 flotation tires to 20–25 PSI. These tires may be inflated to 50 PSI for road travel, or to provide easier steering and more efficient operation on hard surfaces.

## TIRE ROTATION

If both rear or front tires wear excessively, rotate them to the opposite end of the machine as shown in Fig. 1. Excessive wear can be caused by improper tire inflation or by operating the machine with the front wheels held off the ground by the bucket.

## TIRE REPLACEMENT

If you need to replace a damaged or worn tire, it is important that the replacement be the same size as the tires still on the Bobcat. Two different size tires on the same side of the machine will cause undue drive chain and tire wear, and loss of power. To replace two worn tires, install the new ones on the same side of the machine. Put the two used tires on the opposite side.

If tires slip on the rim while loading bucket, increase inflation pressure slightly and be sure to keep all four wheels on the ground while loading.

## LUBRICATION

Fig. 2 shows the grease fitting locations. Use a good lithium base grease on all fittings.

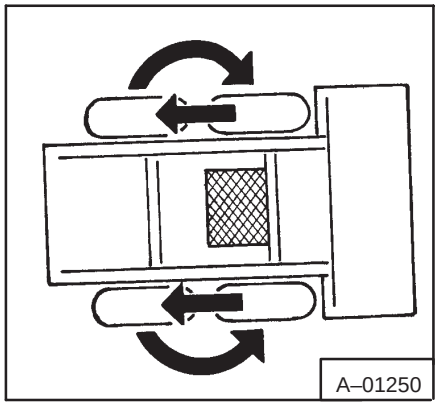



**Fig. 1** Tire Rotation

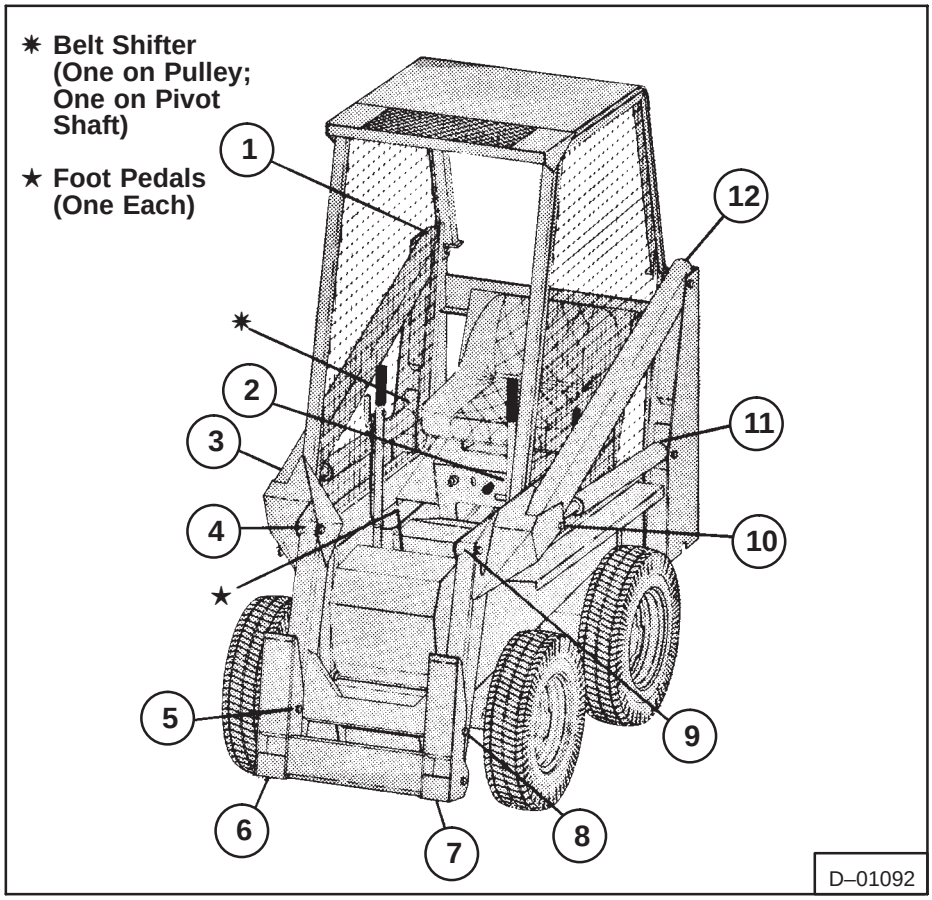



**Fig. 2** Lubrication Points

## GENERAL MAINTENANCE

Maintenance work must be done regularly. Failure to do so will result in damage to the machine or its engine. The service schedule has been prepared as a guide to proper maintenance of the Bobcat loader. Do not depart from this schedule unless it is to shorten the intervals due to extremely hot, cold, dusty or corrosive operating conditions.

| | | HOURS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 8 – 10 | 25 | 40 – 50 | 80 – 100 | 200 | 300 | 500 | 1000 |
| □Engine Air Cleaner | Clean the element (if required). | ■ | | | | | | | |
| All Loader Pivots | Grease fittings until excess shows. | ■ | | | | | | | |
| Control Pedals & Levers | Grease fittings until excess shows. | ■ | | | | | | | |
| Engine Oil | Check and add as needed. | ■ | | | | | | | |
| □Engine Air Inlet Screen | Check and clean. | ■ | | | | | | | |
| Cooling Fins & Shroud | Backflush with air as required. | ■ | | | | | | | |
| Engine Oil | Change. | | ■ | | | | | | |
| Tires | Check inflation. | | ■ | | | | | | |
| Hydraulic/Transmission Fluid | Check level. | | ■ | | | | | | |
| ΔHydraulic Fluid Filter | Replace element after first 50 hours of operation & every 250 hrs. thereafter. | | | ■ | | | | | |
| Drive Chains | Adjust to 1/4” freeplay. | | | ■ | | | | | |
| Battery | Check electrolyte level. | | | ■ | | | | | |
| ✷Boom, Cylinder, Bob–Tach Pivots | Tighten the pivot bolts to 160 ft.–lbs. Torque. (1st 50 hours only) | | | | ■ | | | | |
| Belt Pulleys | Check to be sure the pulley mounting screws or nuts are tight. | | | | ■ | | | | |
| Crankcase Breather | Inspect. Service as required. | | | | ■ | | | | |
| Steering Clutches | Adjust when lever exceeds 3” from neutral in either direction. | | | | ■ | | | | |
| Carb Sed. Bowl | Remove and clean. | | | | ■ | | | | |
| Spark Plug | Remove, clean and regap. Retorque. | | | | ■ | | | | |
| Breaker Points | Remove cover. Check contacts. Replace if pitted. | | | | ■ | | | | |
| Engine Air Cleaner | Replace element (if required). | | | | ■ | | | | |
| Engine Cylinder | Clean carbon from cylinder head. | | | | | ■ | | | |
| Engine Shroud | Remove to clean cooling fins. | | | | | | ■ | | |
| Spark Plug | Replace. | | | | | | ■ | | |
| Ignition Timing | Check and retime as necessary. | | | | | | | ■ | |
| Engine Valve Tappets | Check clearance. Adjust if required. | | | | | | | ■ | |
| Hydraulic/Transmission Fluid | Replace fluid. | | | | | | | | ■ |
| Drive Belts | Check for Wear. | | | | | | | | ■ |

**✷Check every 200 hours thereafter.**

**□On extremely dusty operations, clean more often as needed.**

**ΔChange after first 50 hours. Thereafter, change every 500 hours.**

# ENGINE SERVICE

Air Cleaner . . . . . 3
Carburetor . . . . . 4
Cooling System . . . . . 3
Crankcase Breather . . . . . 3
Electrical System . . . . . 7
Ignition System . . . . . 5
LPG System . . . . . 5
Oil Service . . . . . 3
Troubleshooting . . . . . 9


**M–371 Loader**
**Service Manual**

## CHANGING ENGINE OIL

**WARNING**

**On new engines, run–in (break–in) has been completed at the factory. Do not use break–in or non–detergent type oils in a new engine.**

On a new or rebuilt engine, change after the first 5 hours of operation. Thereafter, change every 25 hours under normal conditions. Under dusty, dirty conditions, change oil more often.

Drain the oil when the engine is hot. To drain oil, remove the 3/4" plug on the elbow at the rear of the machine, below the grill. After oil is drained, replace the plug and fill with 2 quarts of a good quality detergent oil of correct viscosity (see chart below). Check the oil level. Do not overfill.

## OIL SPECIFICATIONS

Use a good quality detergent motor oil that meets API service classification SC. Use the proper SAE viscosity for expected temperature conditions at the time of starting, not for the highest temperature expected during the work day (see chart below).

| AIR TEMPERATURE | OIL VISCOSITY | OIL TYPE |
|---|---|---|
| ABOVE 30° F. | SAE 30 | API SERVICE SC |
| 30° F. TO 0° F. | SAE 10W – 30 | API SERVICE SC |
| BELOW 0° F. | SAE 5W – 20 | API SERVICE SC |

## ENGINE AIR CLEANER (Fig. 3)

Remove the element and tap it lightly on a flat surface to remove loose surface dirt. Replace the element if dirt does not drop off easily. Do not wash the dry element in any kind of liquid or attempt to blow dirt off with air hose as this will damage the filter element.

Handle the element carefully, and check the following when installing:

1. Back plate must be securely tightened to the carburetor. Replace back plate if it is bent or cracked.
2. Gasket surfaces of element must be flat against back plate and cover to seal effectively.
3. A vinyl washer is bonded to the wing nut. Make certain that it is intact or water or dirt may enter. Tighten the wing nut finger tight.
4. Service the pre–cleaner by washing it in soap and water, rinse and squeeze out excess water, let it dry before re–installing. Do not oil this type of pre–cleaner.

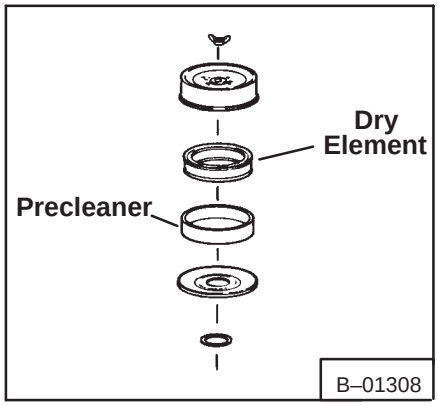



**Fig. 3** Engine Air Cleaner

## CRANKCASE BREATHER (Fig. 4)

A crankcase reed type breather is used to maintain a slight vacuum in the crankcase. All parts must be clean and in good condition. A faulty breather valve may cause high engine temperatures and oil leaks at engine seals.

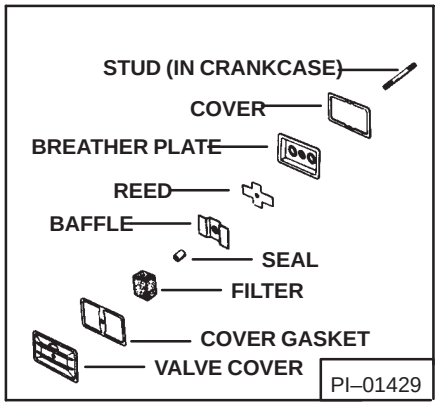



**Fig. 4** Crankcase Breather

## AIR COOLING SYSTEM

Air is drawn into the cooling shroud by fins provided on the flywheel. The air screen and cooling fins must be kept clean and unobstructed at all times. Never operate the engine with the blower housing or cooling shrouds removed. Removal results in improper air circulation.

To clean cylinder head fins, first remove the rotating screen, then remove the blower housing (attaching parts must also be removed from the blower housing before is can be removed).

## CARBURETOR

Improper carburetor setting can cause fouled spark plugs, overheating, excessive valve wear or other problems.

If black exhaust smoke is noted, check the air cleaner first, since an over rich mixture is usually caused by poorly serviced, clogged air cleaner element, not an improperly adjusted carburetor.

| PROBLEM | CAUSE | CORRECTION |
|---|---|---|
| Black sooty exhaust smoke. Engine sluggish. | Mixture too rich. | Readjust main fuel needle. |
| Engine misfires and backfires at high speed. | Mixture too lean. | Readjust main fuel needle. |
| Engine starts, sputters and dies under cold weather starting. | Mixture too lean. | Turn main fuel adjustment 1/4 turn counterclockwise. |
| Engine runs rough or stalls at idle speed. | Improper idle adjust–ment. | Readjust idle fuel needle. |

If any of the above problems exist, follow these procedures:

1. Stop the engine. Carefully turn the MAIN FUEL and IDLE FUEL NEEDLE adjusting screws all the way in (clockwise) until they bottom (Fig. 5). DO NOT FORCE SCREWS as this will damage needle valves

2. For initial adjustment, turn the MAIN FUEL screw 2 TURNS counterclockwise. Turn the IDLE FUEL screw 1–1/4 TURNS counterclockwise (out)

3. Start the engine and operate at normal speed until its normal operating temperature is reached.

4. MAIN FUEL ADJUSTMENT – With the engine running a full throttle and full load, turn the MAIN FUEL screw in (clockwise) until the engine slows down (lean). Note the position of the screw. Turn the needle out (counterclockwise) until the engine regains speed and then again slows down (over rich). Turn the needle back in until it is positioned halfway between the lean and over rich settings. If adjusted properly, the engine should accelerate smoothly with a steady governor action.

5. IDLE FUEL ADJUSTMENT – Operate the engine at idle speed of about 1000 RPM. Adjust the IDLE SPEED screw until you attain this speed. Check with a tachometer. Turn the IDLE FUEL screw in (clockwise) until engine slows down and idles rough. Then turn the screw out until the engine speeds up and idles smoothly at the desired engine speed.

6. Since the MAIN FUEL and IDLE FUEL adjustments have some effect on each other, recheck the engine and make final adjustments as necessary to achieve smoothest operation.

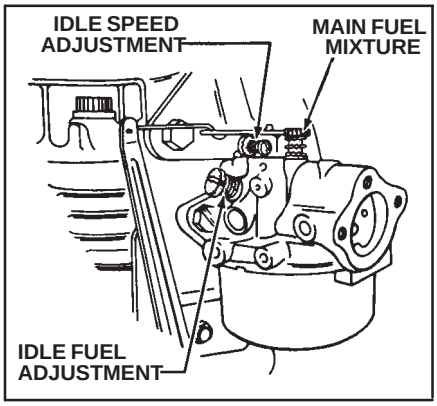


**Fig. 5** Carburetor Adjustment

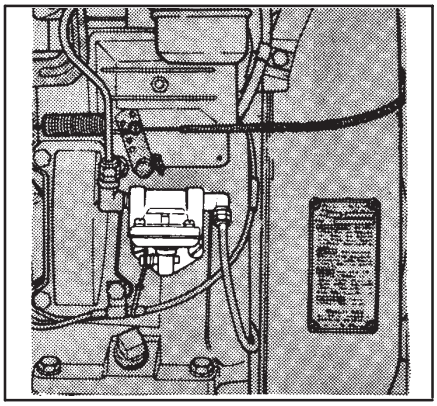


**Fig. 5A** Fuel Pump

**NOTE: If these adjustments do not remedy carburetor problems, carburetor reconditioning may be necessary.**

**⚠ WARNING** **Do not use force on adjustment needle screws.**

## FUEL PUMP (Fig. 5A)

The fuel pump operates off a cam on the camshaft. The external lever is for hand priming. A fuel pump which will not deliver fuel is usually due to a ruptured diaphragm within a pump. Replace the faulty pump by removing fuel lines and mounting screws. Use a new mounting gasket when installing a new pump.

## LP GAS FUEL SYSTEM

On LP gas engines a sealed fuel system includes a carburetor, primary regulator and a secondary regulator. LPG is stored under pressure up to approximately 200 PSI, depending on the ambient temperature. Fuel is withdrawn under pressure from the tank as vapor and the primary regulator reduces the pressure to 4 to 8 ounces per square inch.

An electrically operated “Filter Lock” is installed on the fuel line to the primary regulator (Fig. 6). This lock opens when the ignition switch is turned on and closes when the switch is turned off.

The secondary regulator (Fig. 7) withholds gas until a vacuum, created by turning the engine over at a continuous rate, opens the regulator valve allowing fuel to enter the carburetor.

The carburetor is adjusted at the factory and under normal operating conditions will require no readjustment. If adjustment is necessary because of gas valves or air conditions, use the following procedure:

1. Open the fuel supply valve on the fuel tank.
2. Depress the primer button on the secondary regulator for an instant so that enough fuel will enter the carburetor for starting (Fig. 7).
3. Open the throttle fully and start the engine.
4. After the engine has been allowed to warm up, return the throttle to idle position and adjust the idle setting. The idle adjustment is made on the carburetor (Fig. 8).
5. Set the engine at full throttle and put under a full load. Adjust the load adjustment screw for maximum engine RPM (Fig. 8). If possible, a tachometer should be used for final power adjustment.

Refer to the Engine Overhaul Section of this manual for repair of the carburetor or regulators.

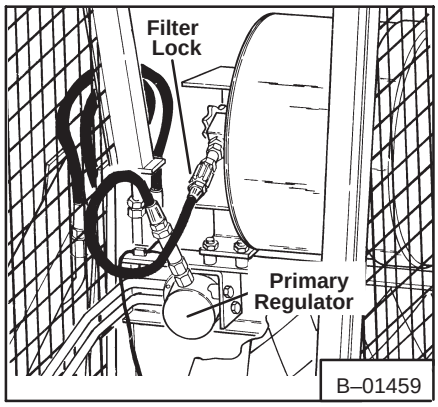



**Fig. 6** Filter Lock & Primary Regulator

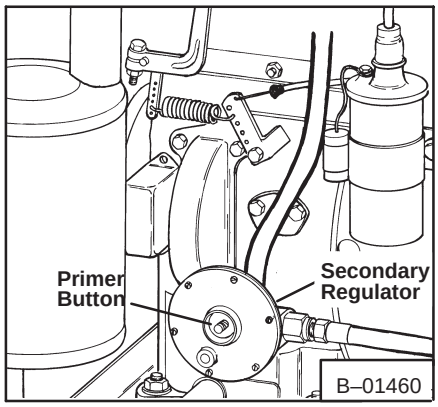



**Fig. 7** Secondary Regulator & Primer Button

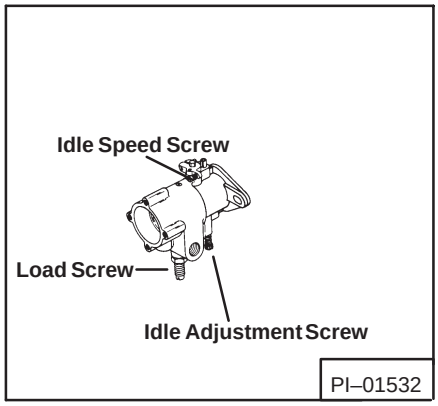



**Fig. 8** LP System Carburetor

## IGNITION SYSTEM

Hard starting, roughness, low power and erratic operation are often attributed to faulty ignition. All components must be in top condition. The ignition spark must be properly timed.

## OPERATIONAL TEST

Remove the high tension lead at the spark plug. Hold the end terminal about 1/16” to 1/8” away from the cylinder. Crank the engine, if a sharp, snappy spark occurs, the trouble is apparently not in the ignition coil, condenser or breaker points. It could be caused by a faulty spark plug. If no spark or a very weak spark occurs, ignition trouble is indicated.

## SPARK PLUG

Always clean the area around a spark plug before removing to prevent dirt falling into the engine. Remove the plug and note its condition. Plugs fail for various reasons. Often the porcelain insulator cracks or becomes coated with dirt. This causes the ignition impulse to travel from the center electrode to ground without jumping the spark gap. As an engine operates, the electrodes are gradually burned or worn away. In time, the gap becomes so wide that the spark cannot jump the gap and the engine misses.

Every 100 hours remove the plug, check its condition and reset the gap. Good operating conditions are indicated if a plug has a light coating of gray or tan deposit. A dead white, blistered coating could indicate overheating. A black (carbon) coating may indicate an “over rich” fuel mixture caused by a clogged air cleaner or improper carburetor adjustment. DO NOT sandblast, wire brush or scrape a plug which is in poor condition, use a new plug. Set the spark gap at .025 in. Tighten the plug to 27 ft.–lbs. torque. The standard spark plug is an H–10, 14 mm size. Replace the spark plug after 300 hours of operation.

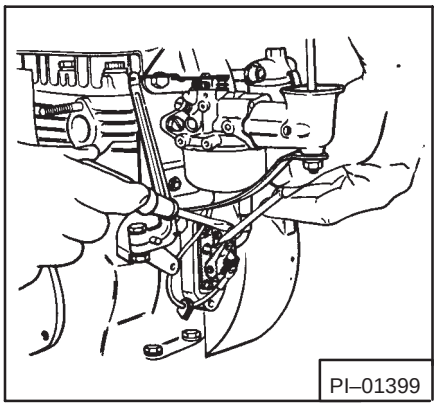



**Fig. 9** Setting Breaker Points

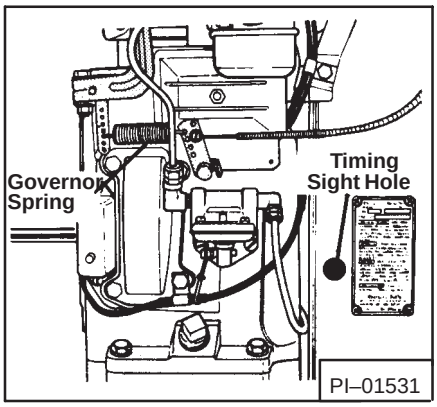



**Fig. 10** Timing Sight Hole

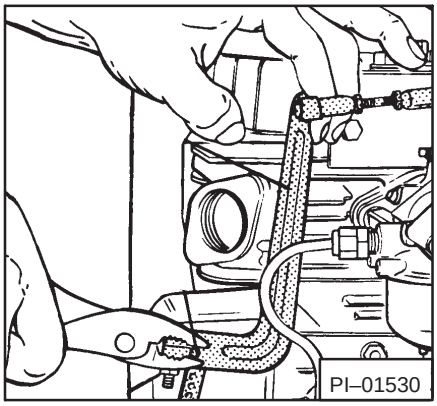



**Fig. 11** Adjusting Governor

## BREAKER POINTS

If points are burned or badly oxidized, little or no current will pass. As a result, the engine may not operate at all. If it does run it is likely to miss, particularly at full throttle.

Always replace badly burned or pitted breaker points. A certain amount of build–up or metal transfer occurs under normal operating conditions; however, if this occurs too frequently and becomes excessive, the condenser may be a fault. Slightly pitted points can be dressed down with a point file (Fig. 9). This should be done only as a temporary field fix. Replace points at the first opportunity after filing. If the points are oxidized, rub a piece of coarse cloth between the surfaces. Clean dirty or oily points with a cloth, but be sure not to leave lint between the surfaces. Set clearance at .020 in.

## CONDENSER

If the condenser shorts out, the coil will be unable to produce output voltage. On the other hand, if it opens or decreases in capacitance, the output voltage will be greatly reduced and the ignition points will burn excessively. If badly burned breaker points occur too frequently, the condition of the condenser should be suspected. If the condenser has too small capacitance, metal will transfer from the stationary contact to the movable contact. If its capacitance is too large, the metal will build up on the stationary contact.

## IGNITION TIMING PROCEDURE

The engine is equipped with a timing sight hole in the blower housing. The timing marks can be seen thru this hole. Two marks are stamped on the flywheel. The “T” mark indicates Top Dead Center (TDC), while the “S” mark indicates the spark point, which is 20 degrees before TDC. You can rotate the flywheel until the “S” mark can be seen thru the sight hole and scratch a mark on the air screen and blower housing for easier use and a quick visual check of the timing.

When you install new points:

1. Set the points at .020 gap.

2. Rotate the engine. The “S” mark should be in the sight hole when you hear the spark as the points open.

When using a timing light to time the engine, the following procedure should be used:

1. Start the engine and run it at 1200 to 1800 RPM. Aim the timing light into the sight hole (Fig. 10). The light should flash just as the “S” mark is centered in the sight hole.

2. If the timing is off, remove the breaker point cover. Loosen the gap adjusting screw and shift the breaker plate until “S” mark is exactly centered. Retighten the adjusting screw and replace the cover.

## GOVERNOR

### Initial Adjustment

The governor was adjusted at the factory and no further adjustment should be necessary unless the arm or linkage works loose or becomes disconnected. If this happens, make the following initial adjustment with the engine shut off:

1. Loosen (do not remove) the nut which holds the governor arm to the cross shaft (Fig. 11).

2. Grasp the end of the cross shaft with pliers, turn it in a counterclockwise direction as far as it will go (the tab on the cross shaft will stop against the rod on the governor gear assembly, inside the crankcase. Be careful excessive pressure can break the tab off the cross shaft).

3. Pull the governor arm as far away from the carburetor as possible, while holding the cross shaft. Then tighten the nut holding the arm to the shaft.

After making the initial adjustment, start the engine and check the operating speed with a tachometer. Maximum allowable speed is 3100 RPM. DO NOT EXCEED THIS SPEED!

### Speed Adjustment

Set the throttle at full RPM. Loosen the cap screw on the high speed stop and set the stop to limit the throttle cable travel at 3100 RPM. Tighten the cap screw.

### Sensitivity Adjustment

If a large speed drop occurs when load is applied to the machine, the governor should be set for greater sensitivity. This may be done by placing the governor spring (Fig. 10) into holes further apart on the governor arm bracket and speed control bracket.

## AUTOMATIC COMPRESSION RELEASE

The engine is equipped with an automatic compression release mechanism for the purpose of relieving cylinder head compression during cranking operation. The mechanism is centrifugally actuated upon starting the engine and permits full compression as soon as a predetermined RPM has been reached. The mechanism is located on the camshaft gear and can bee seen by removing the cam gear cover.

Because of the automatic compression release feature, the throttle must always be fully opened when starting the engine.

## COMPRESSION

The procedure to check the engine compression is:

1. Operate the engine until it is warm, then stop the engine.
2. Remove the spark plug. Put a compression tester in the hole.
3. Put the throttle at the fast position. Open the choke.
4. Rotate the engine manually in a counterclockwise direction (opposite normal rotation) seven or more revolutions. The compression should be 90 PSI (620 kPa) or higher. If the reading is much below 90 PSI it can be an indication of several conditions or a combination of the following condition.

| POSSIBLE CAUSE | REMEDY |
|---|---|
| A. Cylinder head gasket blown. | A. Remove head, replace gasket, reinstall head, recheck compression. |
| B. Cylinder head warped or loose. | B. Remove head, check for flatness (See Cylinder Head Service), reinstall and secure in proper sequence to specified torque value. |
| C. Piston rings worn–blowby occuring. | C. Recondition engine. |
| D. Valves leaking. | D. Recondition engine. |

Higher then normal compression indicate excessive carbon deposits.

## ELECTRICAL SYSTEM

The M–371 Bobcat has an alternator/battery charging system. The alternator system consists of three major components:

1. A permanent magnet ring bolted to the inside rim of the flywheel.
2. An alternator stator assembly which is affixed to the engine bearing plate.
3. A rectifier–regulator unit assembly which is externally mounted.

The electrical circuitry is protected by a 30 ampere fuse which is installed on the wiring harness, under the seat pan.

Problems were experienced with early model machines (serial number B–1334 and below) due to electrical wiring which caused battery drain when the machines were shut down for extended periods. A retrofit kit was made available as a temporary measure to correct the problem, until a new five position switch and wiring harness could be made available for installation. The retrofit kit consisted of a relay which would break the circuit when the switch was turned off.

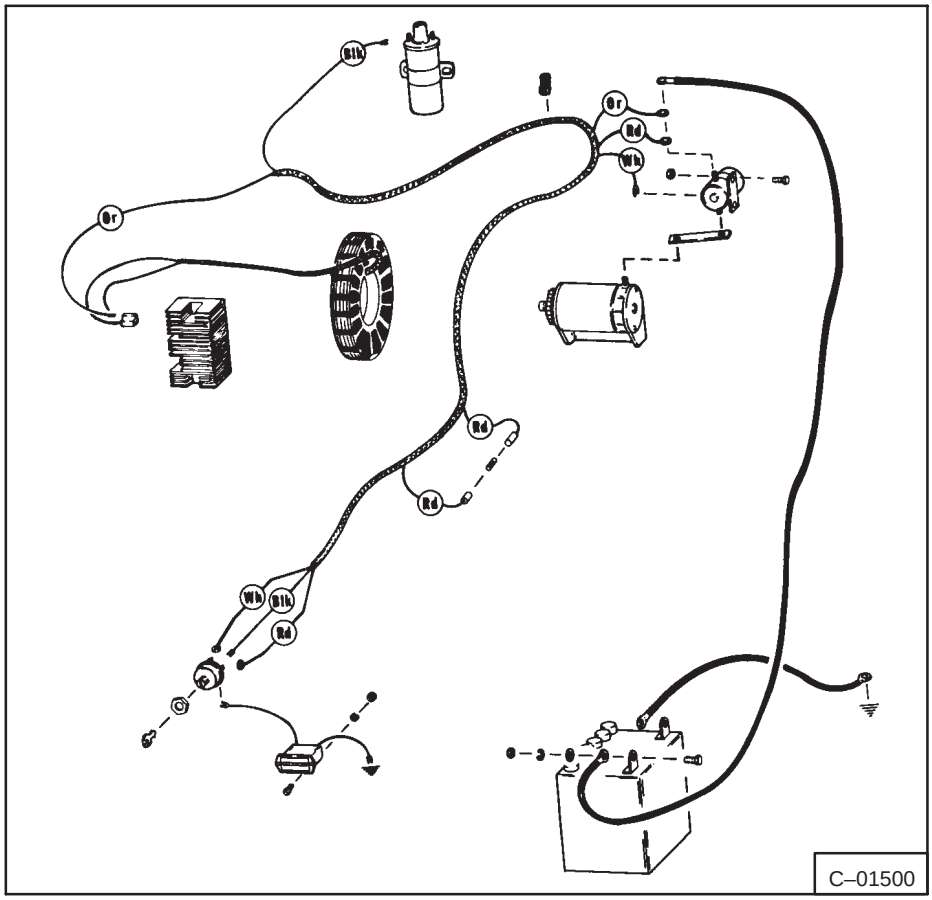



**Fig. 12** Electrical Circuitry S/N B–1334 & Below

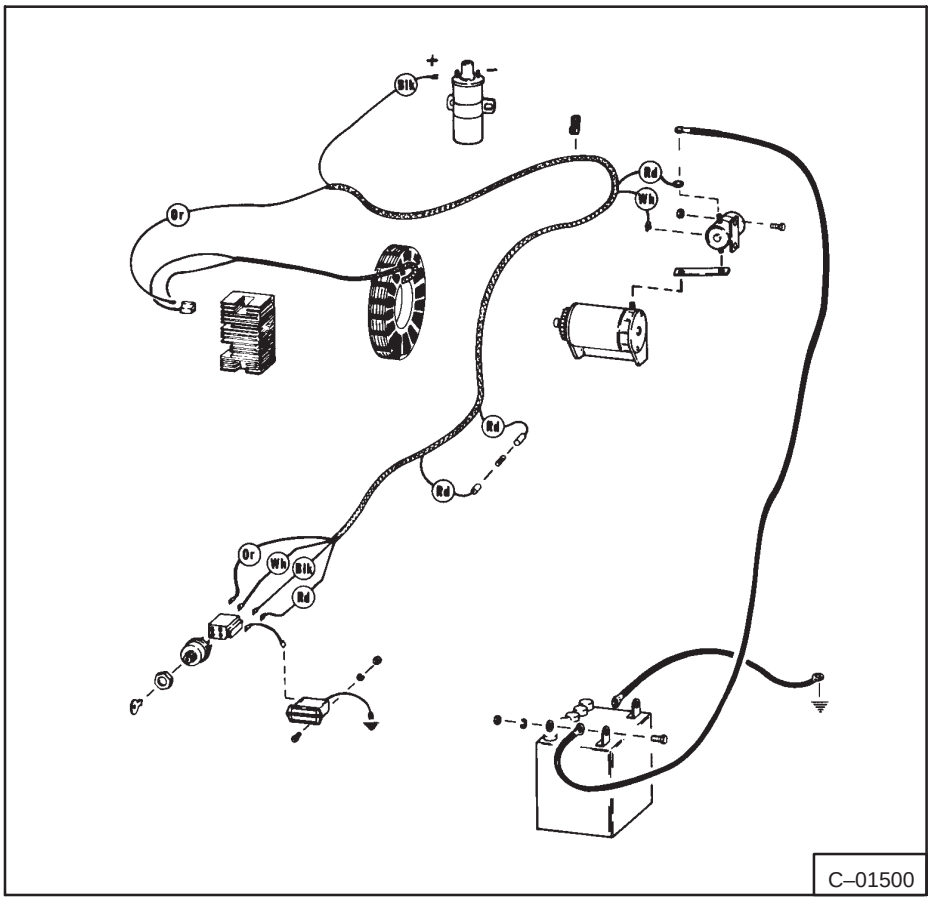



**Fig. 13** Electrical Circuitry S/N B–1335 & Above

Fig. 12 illustrates the circuitry as installed on the early M–371's.

Fig. 13 illustrates the circuitry as installed on later model M–371's. A five position switch and new wiring harness has been incorporated on these models.

To correct battery drain problems on early model machines replace the three terminal switch and wiring harness with a new five terminal switch and new wiring harness.

A blown fuse is an indication that there is an overload somewhere in the circuitry. Check for broken or bare wiring.

Check connections for tightness. Clean battery cables and coat them with a light film of Vaseline or silicone grease.

To correct charging system problems refer to the Overhaul Section of this manual.

**NOTE: Machine serial numbers B–1196 and below were produced without a ground cable from engine to frame. Ground was made through the choke cable assembly. To avoid possible battery charging problems install a ground cable between the engine and the frame.**

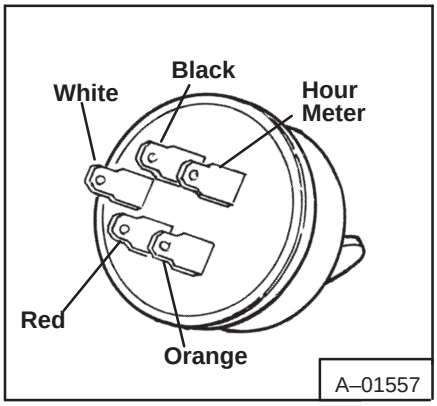



**Fig. 14** Switch Terminals

**RECTIFIER–REGULATOR**

The rectifier–regulator is a sealed unit on which repairs cannot be made.

The rectifier–regulator will be damaged if the engine is operated for any length of time without a battery in the system. A battery with a cracked case with all the acid drained out will also ruin the rectifier–regulator. Under these conditions, the rectifier–regulator over–heats which ruins the solid state electronic devices inside the unit.

Damage will not occur if an engine is run with a dead or completely discharged battery or with a shorted battery.

Check the following:

1. Battery polarity must be correct. A negative ground system is used.

2. Prevent alternator (AC) leads from touching or shorting. This could permanently damage the stator.

3. Disconnect leads at the rectifier–regulator before electric welding is done on the loader.

4. Check the leads on the terminal plug on the wiring harness to see that they are in the correct location (Fig. 14). The battery or hot (orange) wire must go to the B+ terminal on the rectifier–regulator.

| PROBLEM | CAUSE | CORRECTION | PAGE |
|---|---|---|---|
| Engine will not turn over with starter. | Loose battery connections. | Clean the battery terminals and replace the cables, tightening them securely. | 8 |
| | Battery in backwards. | Turn battery and connect the cables to the correct terminals. | 7,8 |
| | Blown fuse in wiring harness. | Replace fuse and check for short. | 41 |
| | Battery is discharged. | Re–charge the battery. Check the function of the charging system. | |
| | Defective starter switch. | Replace the switch. | 8 |
| | Loose starter connections or battery connections. | Tighten the connections securely. | 8 |
| | Broken or disconnected wiring harness. | Reconnect or replace the wiring harness. | 8 |
| Engine fails to start or is difficult to start. | The clutches are partially engaged with the steering levers in neutral position. The loader will tend to rock or move while starting. | Adjust the clutches so the levers will travel 2 to 3 inches from neutral position in each direction. | 21 |
| | Improper starting procedure. | Refer to “Starting Procedure” in the Bobcat Operation section of this manual. | O/M |
| | No fuel in tank. | Refuel. | O/M |
| | Faulty fuel pump. | Readjust, repair or replace. | 4 |
| | Leaky fuel line. | Correct as required. | 4,5 |
| | The engine air cleaner is dirty. | Service the air cleaner. | 3 |
| | The air vent hole in the fuel tank cap is plugged. | Remove and clean the cap. | |
| | The crankcase oil is too heavy (cold weather) | Use an engine oil of the proper viscosity (Refer to Specifications Chart). | 3 |
| | The valves are leaking or sticking. | Clean and reseat the valves. | 31 |
| | The carburetor is not being choked sufficiently, especially if the engine is cold. | Choke as required. If the carburetor starts to flood, push the throttle control all the way forward. Start. | O/M |

| PROBLEM | CAUSE | CORRECTION | PAGE |
|---|---|---|---|
| Engine fails to start (Cont'd) | The choke linkage is not adjusted properly. | Adjust the linkage to obtain proper choking action. | |
| | Water, dirt or gum in the gasoline is interfering with fuel flow. | Drain and clean the fuel systems. Refill with clean fuel. | |
| | The cylinder is flooded with gasoline. | Crank the engine a few times with the spark plug removed. | |
| | Auxiliary valve is in detent. | Put all hydraulic controls in neutral. | |
| | Engine ground strap. | Clean and tighten. | |
| | The ignition cable is disconnected from the ignition coil or spark plug. | Reconnect the ignition cable. | |
| | Broken ignition cable, causing short circuit. | Replace broken ignition cable. | |
| | The ignition cable, coil or spark plug is wet. | Dry and clean them. | |
| | The spark plug is wet, dirty or fouled. | Clean or replace the spark plug. Check the carburetor adjustment. | 4,5 |
| | The spark plug gap is wrong. | Re–gap or replace the plug. | 5 |
| | The ignition is out of time. | Time the engine according to the instructions in this manual. | 6 |
| | Faulty condensor or coil. | Replace with a new one. | 6 |
| | Poor compression. | Tighten the cylinder head and spark plug. | 5, 35 |
| | | Check the condition of the valves and rings. | 30 |
| | Clutches too tight. | Adjust clutches for 3" lever travel. | 21, 22 |
| Engine stops. | Engine is overloaded. | Operate at a 3/4 to full throttle setting in low range. | |
| | Poor electrical ground. | Clean & tighten the ground strap. | |
| | No fuel in tank. | Refuel. | |
| | The vent in the fuel cap is plugged. | Remove and clean the fuel tank cap. | |
| | Faulty fuel pump. | Repair or replace. | 4 |

| PROBLEM | CAUSE | CORRECTION | PAGE |
|---|---|---|---|
| Engine stops (cont'd) | Ignition cable off spark plug. | Replace cable. | |
| | Leaky fuel line. | Correct as required. | 4, 5 |
| | The engine air cleaner is dirty. | Service the air cleaner. | 3 |
| | Defective ignition. | Check the ignition system. | 6 |
| | Water, dirt or gum in fuel line due to excessive heat around engine (vapor lock). | Wait until the engine cools before attempting to restart. Check the condition of the engine cooling fins. | 3 |
| | Vapor lock due to excessive heat around engine. | Use the proper grade fuel for ambient temperatures. | |
| Engine overheats. | Engine is overloaded. | Operate at a 3/4 to full throttle setting. | |
| | Engine cooling fins are dirty. | Clean the cooling fins thoroughly. | 3 |
| | Engine has been operated with part of the shrouding removed. | Clean the cooling fins and replace the shrouding. | 3 |
| | Dirty engine oil. | Change engine oil. | 3 |
| | Using incorrect grade of engine oil. | Charge to proper grade of oil for ambient temperatures. | 3 |
| | The crankcase is over–filled. | Drain to proper level. | 3 |
| | The crankcase oil level is low. | Replenish immediately. | 3 |
| | Restricted exhaust. | Clear and clean. | |
| | Ignition timing is wrong. | Re–time the engine. | 6 |
| | Carbon in the engine. | Clean the carbon from the cylinder head and piston. | 7, 31 |
| | Operating at a too lean fuel mixture. | Adjust the carburetor. | 4 |

| PROBLEM | CAUSE | CORRECTION | PAGE |
|---|---|---|---|
| External oil leaks. | Clogged crankcase breather. | Check the crankcase vacuum. | 3 |
| | Worn oil seals or gaskets. | Replace. | 28, 34 |
| | Piston blow–by. | Check compression. | 7 |
| | Leaky valves. | Check compression. Grind or replace the valves if necessary. | 7, 31 |
| Engine speed surges or hunts under load. | Improper governor adjustment. | Readjust the governor linkage. | 6 |
| Engine vibrates excessively. | “V” belt sheave is bent or flares are squeezed together. | Straighten or replace the sheave. | |
| | Loose sheaves on engine, pump or jackshaft. | Tighten loose sheave. | |
| | Drive belt has a flat spot. | Replace the belt. | |
| | Engine stabilizer rod improperly adjusted. | Re–adjust stabilizer rod. | 27 |
| | Loose or under–torqued engine mounts. | Re–torque mounting bolts. | 27 |
| | Engine balancer is improperly timed. | Disassemble the engine and correctly balance the timing gears. | 32 |

# HYDRAULIC SYSTEM SERVICE

Control Valve . . . . . 16
Hydraulic Fluid Filter . . . . . 14
Hydraulic Fluid Reservoir . . . . . 13
Hydraulic System Description . . . . . 13
Hydraulic Tests . . . . . 15
Pedal Linkage Adjustment . . . . . 16
Pump Drive Belt Adjustment . . . . . 16
Troubleshooting . . . . . 18


bobcat

## DESCRIPTION OF HYDRAULIC CIRCUIT

Hydraulic fluid is drawn from the reservoir through the filter by the hydraulic pump. The pump forces the fluid through the control valve and back to the pump/reservoir (Fig. 15). This occurs when the control pedals are in neutral.

When a control is activated, fluid is diverted into one end of the selected cylinders. Fluid flows from the other end of the double–acting cylinders back to the control valve bank and on to the pump/reservoir. When the control pedal is returned to neutral, fluid is trapped in the cylinders, holding the load in place.

Fig. 16 shows fluid flow path when a pedal is depressed. When a cylinder reaches the end of its stroke or when the load exceeds the machines rated lifting capacity, a relief valve opens. This allows the fluid to by–pass the overloaded circuit and return to the pump/reservoir. The relief valve is pre–set to open at 1200 PSI at full engine RPM. Do not change the relief setting unless a hydraulic check shows that it is too slow or too high (See "Testing the Hydraulic System").

## CHECKING HYDRAULIC FLUID

To check the hydraulic fluid level, drive the Bobcat onto a level surface. Check the fluid level on the dipstick attached to the filler cap (Fig. 17) or, on later model machines, at the lower check plug on the right side of the machine (Fig. 18). If low, add approved fluid (Refer to page 58 for type) to the full mark on the dipstick or the upper check plug. Slightly over filling will not interfere with the operation of the machine.

## DRAINING CONDENSATION

Condensation should be drained from the reservoir frequently when the loader is operated in a high humidity environment.

Raise the rear of the Bobcat so that the rear wheels are several inches off the ground. Leave it in this position for 3 to 4 hours. Remove the drain plug (located at the lower front of the reservoir/transmission case) just long enough to permit accumulated water to drain out. Check the fluid level after lowering the Bobcat and add fluid, if required.

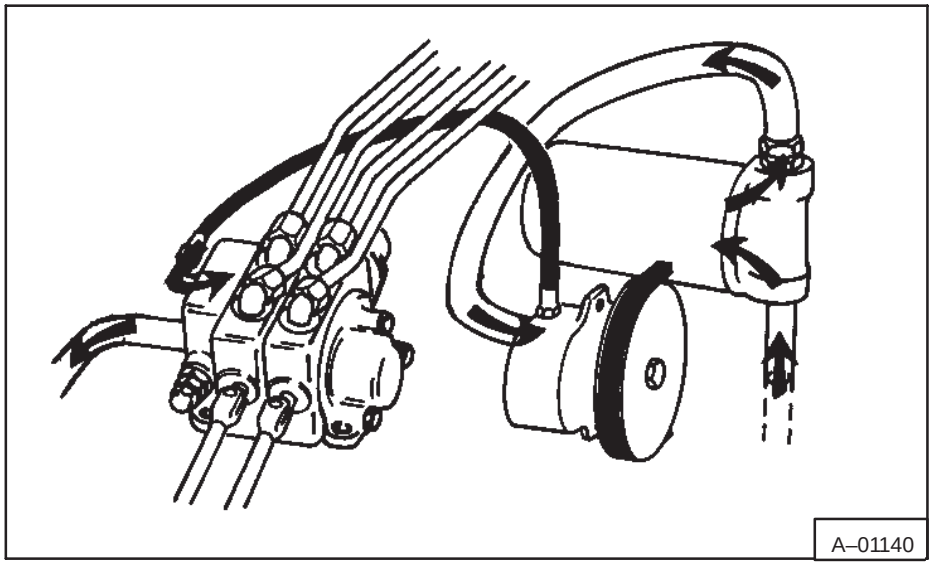



**Fig. 15** Hydraulic Circuit

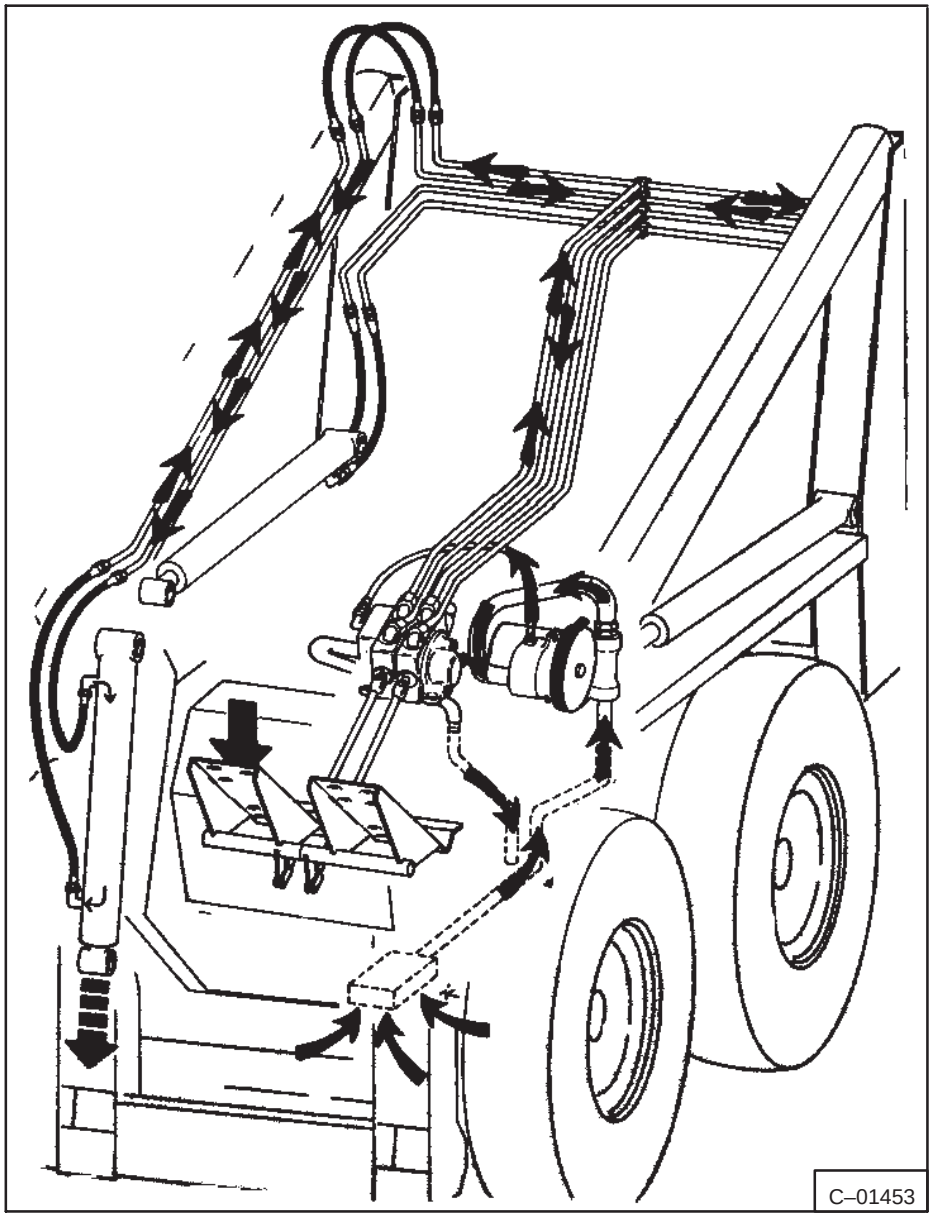



**Fig. 16** Hydraulic Cylinder Action & Fluid Flow

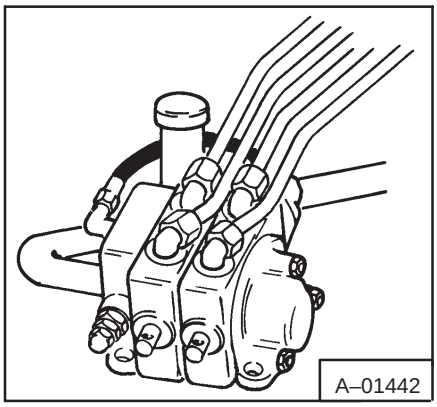



**Fig. 17** Hydraulic Fluid Filter

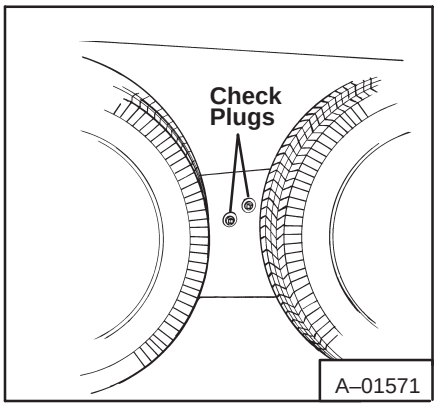



**Fig. 18** Reservoir Check Plugs

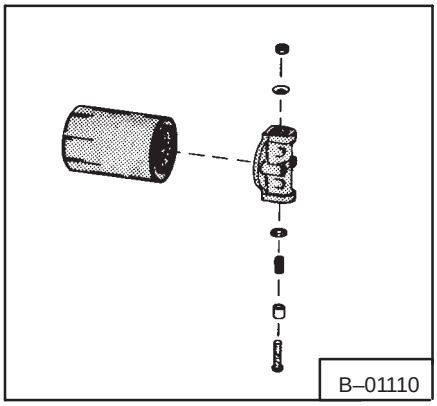



**Fig. 18A** Hydraulic Fluid Filter

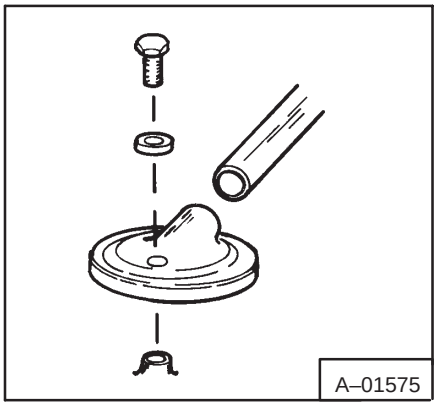



**Fig. 19** Fluid Pickup Screen

## CHANGING HYDRAULIC FLUID

**NOTE: Under normal operating conditions, change the fluid in the reservoir after every 1000 hours of operation. If the loader is operated under unusual conditions (corrosive atmosphere such as fertilizer) or if there has been damage to the drive train (sprocket, chain or bearing failure) or if water, dirt, etc. have entered the reservoir, the fluid should be drained, reservoir flushed and refilled with new fluid.**

To change fluid raise the rear of the machine so that the wheels are several inches off the ground. Remove the drain plug and drain the reservoir. The hydraulic fluid filter should also be changed at this time.

The transmission case cover should be removed and the reservoir flushed if abrasive contaminants are present in the fluid. Refill the reservoir with approved fluid to the full mark on the dipstick, or to the upper check plug. Approximately six gallons are needed to fill the reservoir. Refer to page 58 for recommended fluid.

## HYDRAULIC FLUID FILTER

The loader is equipped with a 33 micron spin–on paper element filter. To change the filter, twist the element container to separate it from the filter base.

Coat the gasket surface of the new element with fluid. Turn it on until the gasket is in full contact with the filter base. Tighten it an additional one–half turn (hand tight).

The filter head contains a by–pass valve which will open if the filter element becomes blocked (Fig. 18A). If the filter is not changed often enough it can become clogged and dirt can enter the system through the by–pass valve.

On earlier model machines (S/N B–1575 & Below) fluid is drawn from the reservoir through a 100 mesh pickup screen (Fig. 19). This screen is part of the pickup baffle located on the end of the pickup tube, under the sprocket divider plate at the bottom of the fluid reservoir. This screen should be removed and cleaned whenever the transmission is opened for any reason.

Several significant changes have been made to the hydraulic system on later model Bobcats. Machines, S/N B–1576 through B–1874, were manufactured with the screen baffle removed and pump suction re–routed to a 3/4" pickup tube. Some cavitation problems occurred as a result of air entering the system due to agitation caused by the clutch sprockets. A box type baffle was made available as a retrofit to be installed on these machines.

First M–371 Bobcats (S/N B–1575 and below) featured the oil filter on the fluid return line (Fig. 20). A retrofit kit (kit number 6541901) was made available which incorporated a relief valve for regeneration of return oil and re–location of the filter to the suction side of the pump (Fig. 21).

Later production machines were produced with the filter on the pump suction line (S/N B–1576 through B–2006) as shown in Fig. 22. A retrofit kit (kit number 6541904) was made available. It includes a valve which permits regeneration of return oil to the pump (Fig. 23).

Machines, S/N 2007 and up, were produced with full suction, filtration and regeneration.

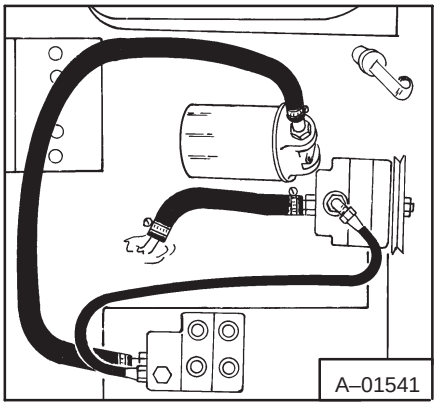



**Fig. 20** Fluid Filter S/N B–1575 & Below

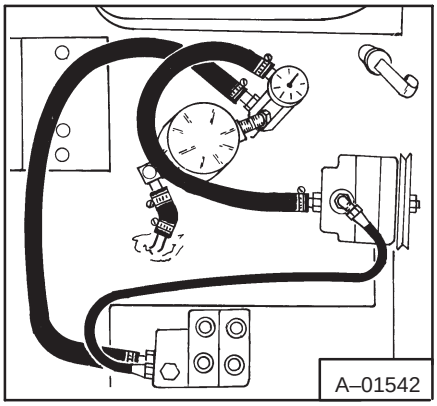



**Fig. 21** Retrofit For Early Models

## CHECKING THE HYDRAULIC SYSTEM

**NOTE: Be sure that the hydraulic fluid is at the proper level in the reservoir.**

Check the overall condition of the hydraulic system in the following manner:

1. With a full rated load in the bucket, start the engine and set the throttle at full RPM.

2. Press the heel of the left foot pedal and note how long it takes to raise the load to full height. The hydraulic system should be considered satisfactory if the load can be raised to full height in eight seconds.

If the time required to raise the load exceeds eight seconds, one or more of the following may be occurring:

1. The pump drive belt is defective or slipping. Check belt condition or tension and replace or adjust it (1/16" deflection).

2. The pedal linkage may be improperly adjusted. The linkage should be adjusted so the heel of the pedal will not hit the floor when tilted fully back.

3. The engine speed may be low. Check the engine RPM with a hand tachometer. If it is below 3000 RPM at full throttle see "Governor Adjustment" in Engine Section of this manual.

4. The relief valve may be blocked partially open to set too low (below 1200 PSI). When a cylinder reaches the end of its stroke a "squeal" should be heard as the relief opens to allow fluid by–pass. If a squealing noise can be heard while lifting (before full height is reached) check the relief valve using a hydraulic tester (see "Relief Valve Adjustment" section).

5. There may be a fluid leak past one or both of the piston seals in the lift cylinder or a leak in the control valve bank.

## TESTING THE HYDRAULIC SYSTEM

**NOTE: The following checks are made using the OTC Y–90 (or comparable) tester. The tester reads hydraulic flow in gallons per minute (GPM), pressure in pounds per square inch (PSI) and oil temperature in degrees Fahrenheit.**

**⚠ WARNING**

**Because the machine must be running when you perform these tests, remove drive belt for your own safety.**

To check condition of hydraulic pump:

1. Remove the pump pressure hose from the control valve (Fig. 24).

2. Using adapters, connect the pressure hose to the tester inlet, and connect the tester outlet to the control valve inlet port.

3. Open the restrictor on the tester by turning the right hand knob (pressure restrictor) counterclockwise, as far as it will go. Also turn the left knob (needle dampener) a few turns counterclockwise.

4. Start the engine and advance the throttle to full RPM (3000 RPM).

5. Observe the flow meter. It should read approximately 5 GPM. A more accurate flow reading can be had by pressing the "Low Flow Reading Control" button.

6. Decrease the throttle setting to low RPM.

7. Slowly turn the restrictor (right hand knob) clockwise and watch the pressure gauge. Turn the knob until pressure reaches 1250 PSI. DO NOT increase pressure beyond this point or the pump will be damaged.

8. If the pump will not produce 1250 PSI, regardless of how far you turn the restrictor knob, the pump is defective and should be replaced.

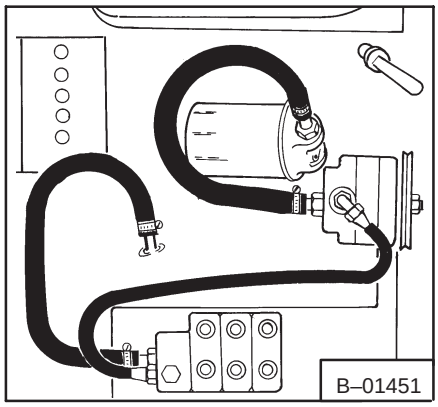



**Fig. 22** Fluid Filter S/N B–1576 through B–2006

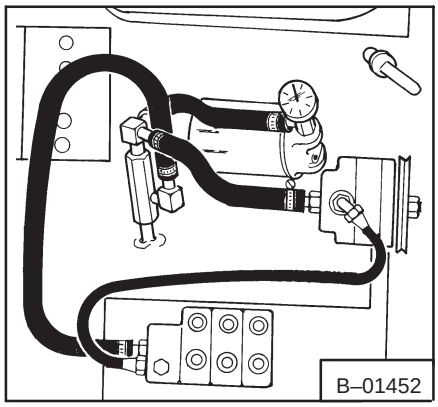



**Fig. 23** Retrofit For Later Models

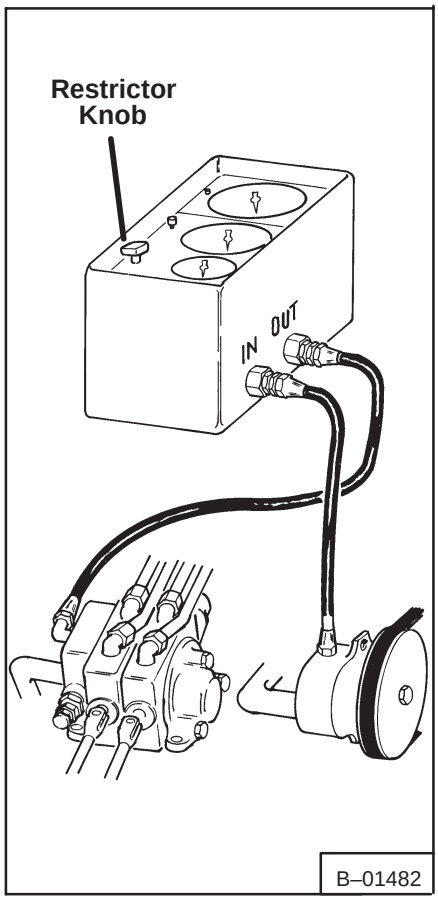



**Fig. 24** Testing Hydraulic Pump

a

**NOTE: Failure of the pump to provide adequate pressure could be due to a loose, slipping pump drive belt. Check the tension of the belt. It should have a maximum midpoint deflection of 1/16" at 8 lbs. force.**

To check relief valve setting:

1. With the Y–90 tester connected as in checking the pump, turn the restrictor counterclockwise, as far as it will go. Also open the left hand knob a few turns.
2. Advance the throttle to 1/2 to 3/4 position.
3. Press the toe of the left foot pedal and observe the pressure gauge on the tester.
4. With the boom completely lowered, holding the pedal in a depressed position should cause fluid to go over the relief valve and the pressure gauge should read 1200 PSI. If the relief pressure is not at 1200 PSI, adjustment can be made on the Ward and Husco valve as follows; the Cessna valve is not adjustable:

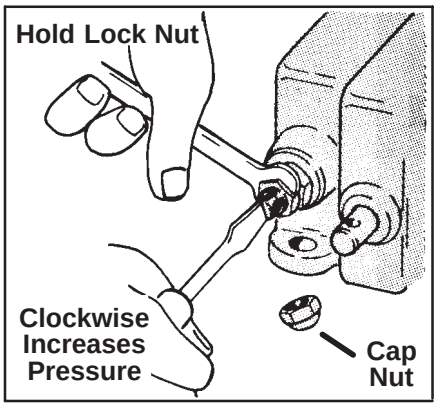



**Fig. 25** Adjusting Relief Pressure

1. Remove the cap nut from the relief valve and loosen the lock nut (Fig. 25).
2. Turn the adjusting screw to get the desired pressure (clockwise to increase pressure; counterclockwise to decrease pressure), as shown in Fig. 25
3. After setting the adjusting screw to the desired pressure, hold the adjusting screw and tighten the lock nut. Replace the cap nut.
4. If correct pressure cannot be set by turning the adjusting screw, remove the relief valve and check for foreign material caught under the valve seat. If the seat is scored or if the spring is broken, replace the relief valve, or parts, as needed.

**PUMP DRIVE BELT ADJUSTMENT**

To adjust the pump drive belt, loosen the pump mounting bolts behind the pulley. Using a pry, move the pump away from the engine until there is 1/16" of deflection at the midway point of the belt. Retighten the nuts and recheck the belt tension. Use 8–10 pounds of force to check deflection.

**PEDAL LINKAGE ADJUSTMENT**

Improper pedal linkage adjustment can cause the boom or bucket to raise, lower, or tilt too slowly, or keep the control valve spool from centering in neutral.

Adjust the linkage so that the pedals will not touch the floor when the pedals are in the "heel down" position. Valve spools must stroke fully when pedals are depressed.

To adjust a linkage rod:

1. Remove the connecting pin at the control valve spool.
2. Loosen the yoke lock nut on the rod.
3. Turn the yoke on the rod, as required, to lengthen or shorten the rod.
4. Retighten the lock nut and install the yoke pin and cotter pin.

**CONTROL VALVE**

If the control valve is removed for any reason, be sure to remove foreign material from the mounting plate (gravel, sand, etc.) before reinstalling the valve. A foreign object under the valve could cause distortion of the valve body when mounting bolts are tightened. This would cause the spools to stick.

A spool which sticks and will not return to neutral may sometimes be corrected by removing the pedal linkage and rotating the spool 180 degrees.

A broken centering spring will prevent the spool from returning to neutral. See the "Overhaul" section in this manual for disassembly and repair of control valve.

Checking lift cylinder seals:

1. Lower the boom all the way down.

2. Disconnect the bottom tube line on the “T” at the rear of the machine (Fig. 26). Plug the tube with a 1/2” NF SAE male plug.

3. Place a shallow pan under the open port to catch any fluid.

4. Start the engine and run at idle. Press the toe of the left pedal and watch for oil leaking at the open port. Advance the throttle to full RPM while watching for oil leaking from the open port.

5. If no oil leaks from the open port the piston seals are good.

6. If there is oil leaking from the open port the seals are leaking. The cylinder(s) will require overhauling (see “Overhaul” section of this manual).

7. If oil leaks from the rod end of the cylinder during this check the head seal is leaking and will require replacement (see “Overhaul” section of this manual).

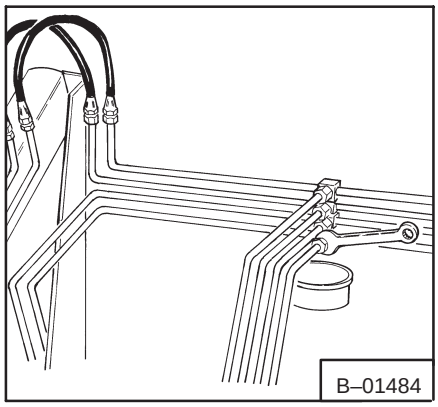



**Fig. 26** Checking Lift Cylinder Seals

Checking tilt cylinder seals:

1. Lower the boom all the way down. Remove the bucket or attachment from Bob–Tach. Roll the Bob–Tach all the way back.

2. Remove the top tube on the “T” at the rear of the machine. Plug the tube with a 1/2” NF SEA male plug (Fig. 27).

3. Start the engine and run at idle. Press the heel of the right pedal and watch for oil leaking at the open port. Advance the throttle to full RPM while watching for oil leaking at the open port.

4. If no oil leaks from the open port the piston seals are good.

5. If there is oil leaking from the open port, the piston seals are leaking. The cylinder(s) will require overhauling (see “Overhaul” section of this manual).

6. If oil leaks from the rod end of the cylinder during this check the head seal is leaking and will require replacement (see “Overhaul” section).

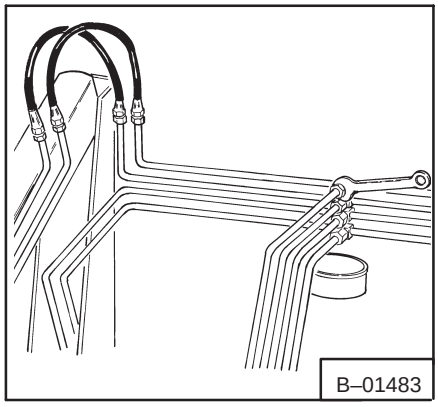



**Fig. 27** Checking Tilt Cylinder Seals

| PROBLEM | CAUSE | CORRECTION | PAGE |
|---|---|---|---|
| Hydraulic system fails to respond. | Reservoir fluid level is low. | Fill to full mark on dipstick or upper check plug. | 13 |
| | Hydraulic pump not driving. | Check pump drive belt. | 16 |
| | Pedal linkage not adjusted. | Adjust pedal linkage. | – |
| | Relief valve is stuck open. | Remove and clean the relief valve. Re–adjust to correct pressure. | 16 |
| Jerky hydraulic action. | Air is trapped in the hydraulic system. | Bleed the air out of the tube lines and cylinders by extending cylinders as far as they will go in both directions, several times. | – |
| | Leak in suction side of the pump, allowing air to enter pump. | Check the fittings, hoses and clamps for tightness. Also check sump pickup tube in frame for welding pin hole. Repair. | – |
| | Air entering pickup tube in sump, due to agitation of fluid by rotating sprockets. | Install baffle on pickup tube, in sump. | – |
| | Air entering pump through pump shaft seal. | Replace the seal. | 46 |
| Boom raises slowly at full engine RPM. | Reservoir fluid level is low. | Fill to full mark on dipstick or upper check plug. | 13 |
| | Attempting to lift more than machines rated capacity. | Decrease the size of the load. | – |
| | Pump drive belt is slipping. | Check for correct tension and for oil on the belt. | 16 |
| | Pedal linkage is adjusted improperly. | Adjust pedal to spool in neutral position. | – |
| | Engine RPM is too low. | Check RPM and adjust, as required. | 16 |
| | Relief valve is blocked partially open. | Remove and clean the relief valve Re–adjust to correct pressure. | 16 |
| | Relief valve is set too low. | Check and adjust for 1200 PSI. | 16 |
| | Cylinder piston seals leaking. | Check piston seals and repair, if necessary. | 16, 17 45, 46 |