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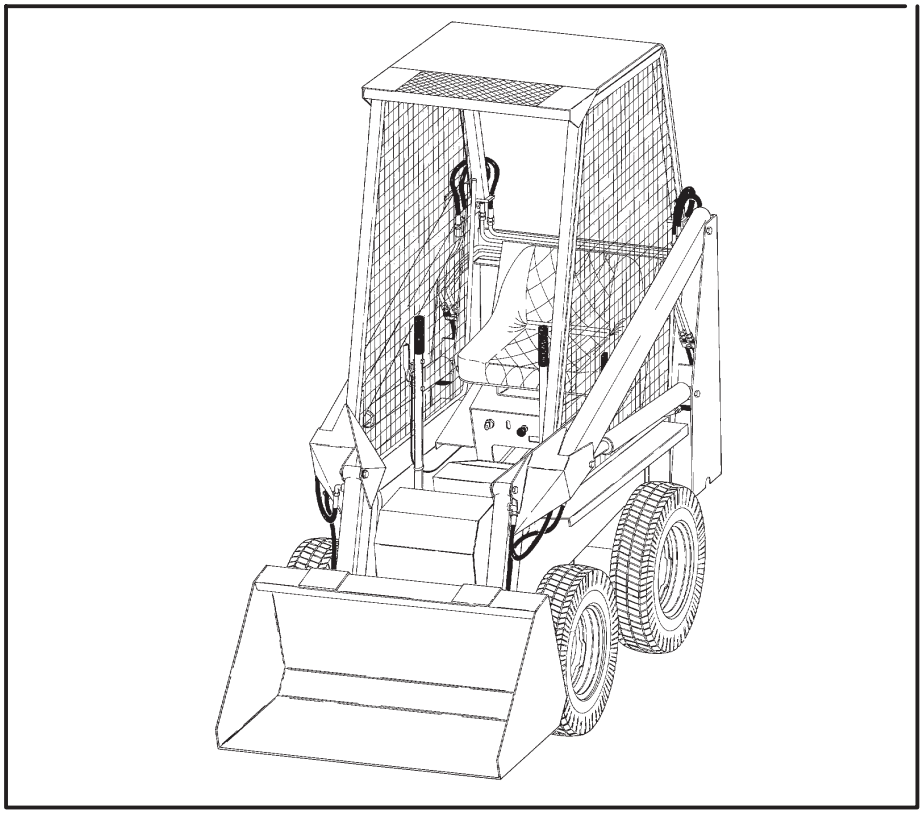
1

Service Manual

(Gasoline & L.P. Gas)



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6545574 (6-12)

Printed in U.S.A.

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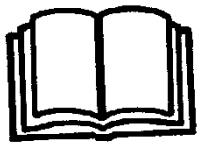
MAINTENANCE SAFETY

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.

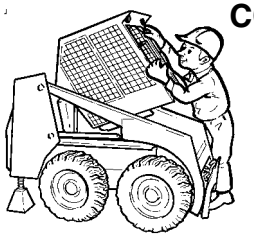
CORRECT



B-10731a

Never service the Bobcat Skid-Steer Loader without instructions.

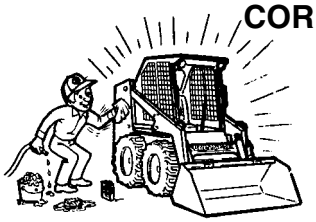
CORRECT



B-12365

Use the correct procedure to lift or lower operator cab.

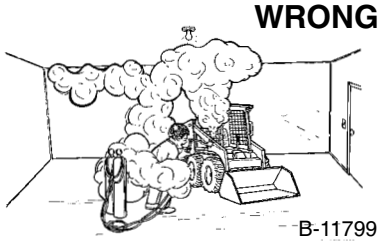
CORRECT



B-7469

Cleaning and maintenance are required daily.

WRONG



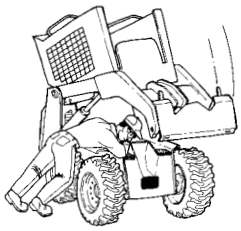
B-11799

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.

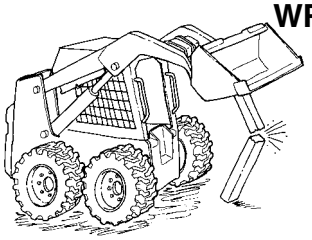
WRONG



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 a n approved lift arm support device. Replace it if damaged.

WRONG

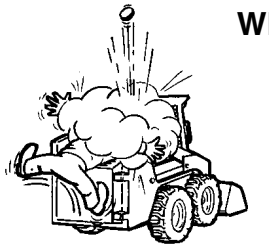


B-15280

Never work on l oader 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

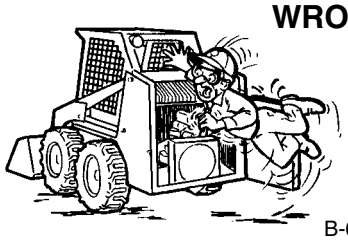
Stop, cool and clean engine of flammable materials before checking fluids.

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 c an penetrate the skin or eyes.

Never fill f uel 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 con tact. Wear protective clothing. If a cid contacts body, flush well wit h water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & M aintenance Manual can be perform ed 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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FOREWORD

This manual is written in two parts: T o 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

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

ROUTINE SERVICING

GENERAL MAINTENANCE


bobcat

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.

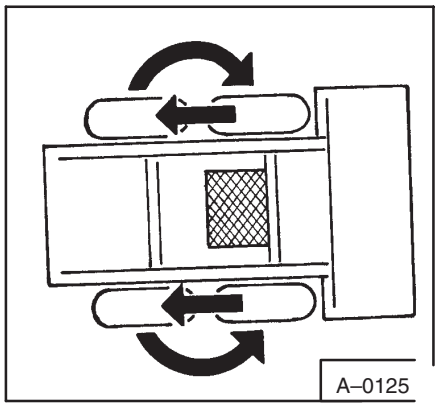


Fig. 1 Tire Rotation

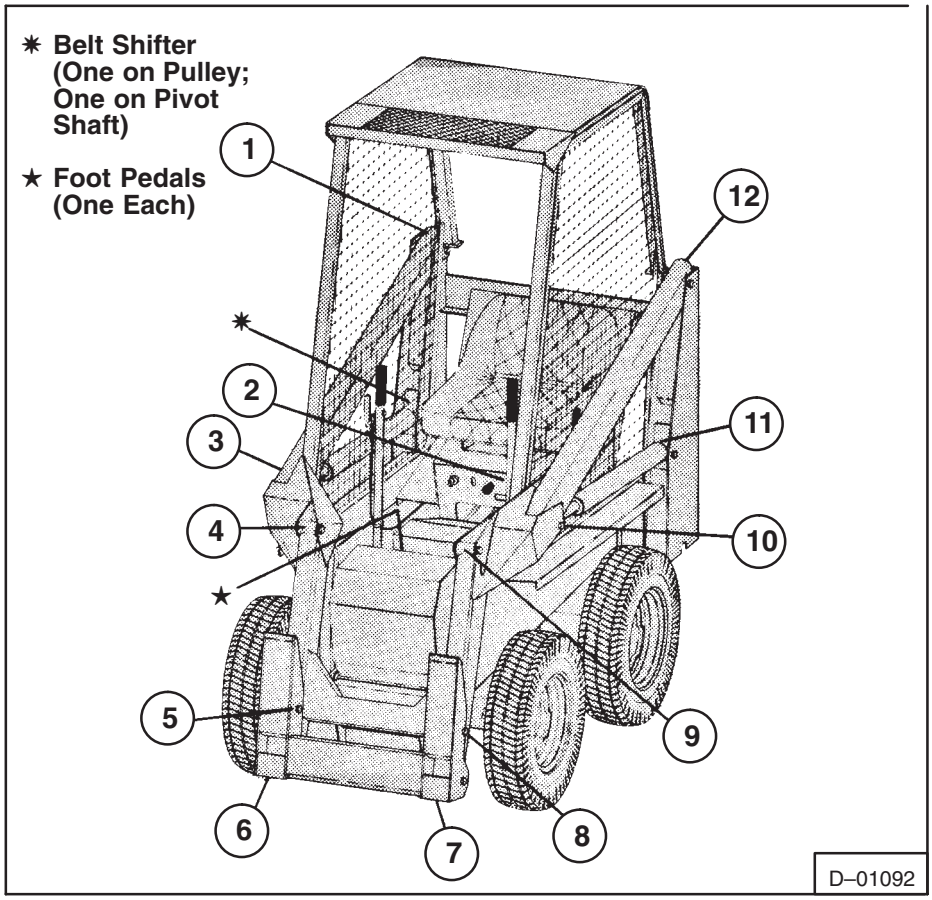


Fig. 2 Lubrication Points

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


bobcat

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.

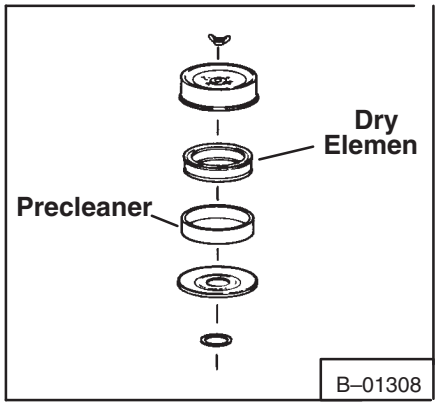


Fig. 3 Engine Air Cleaner

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.

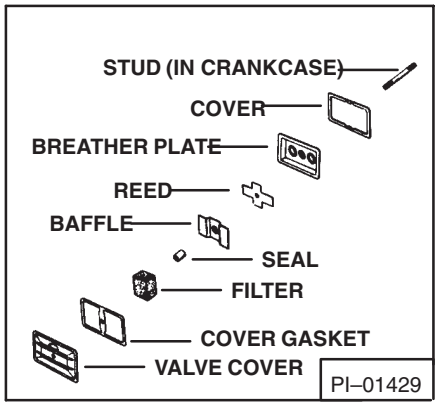


Fig. 4 Crankcase Breather

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 at 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 ef fect on each other, recheck the engine and make final adjustments as necessary to achieve smoothest operation.

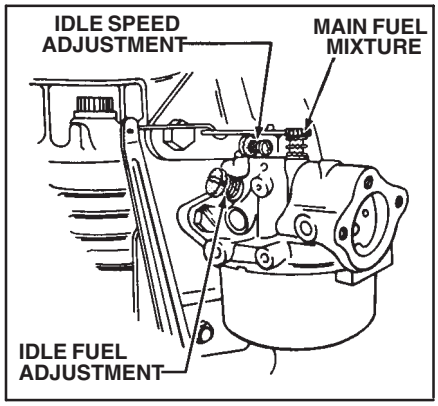


Fig. 5 Carburetor Adjustment

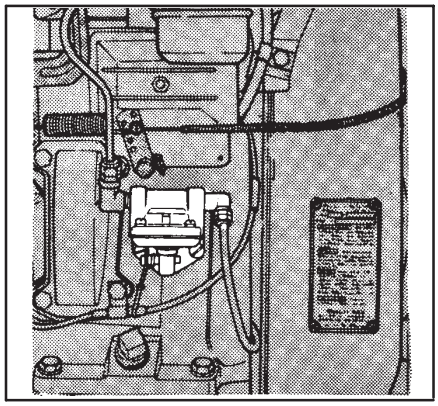


Fig. 5A Fuel Pump

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 of 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 necessarybecause 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.

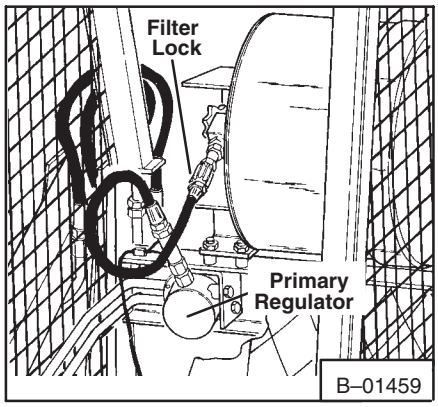


Fig. 6 Filter Lock & Primary Regulator

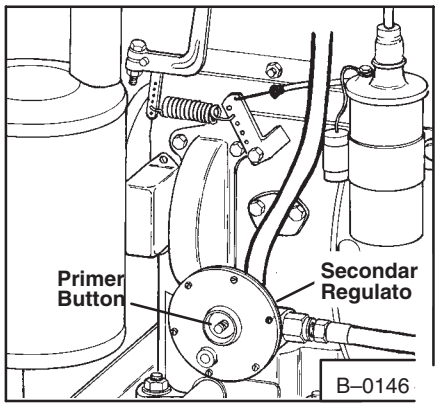


Fig. 7 SecondaryRegulator & Primer Butt

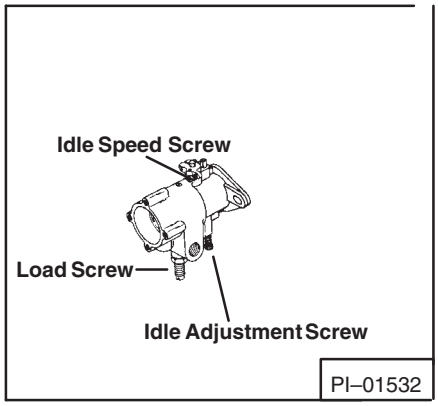


Fig. 8 LP System Carburetor

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.

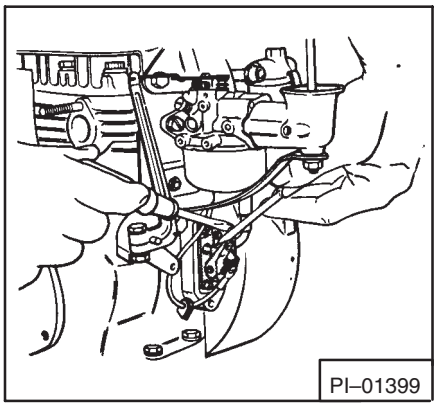


Fig. 9 Setting Breaker Points

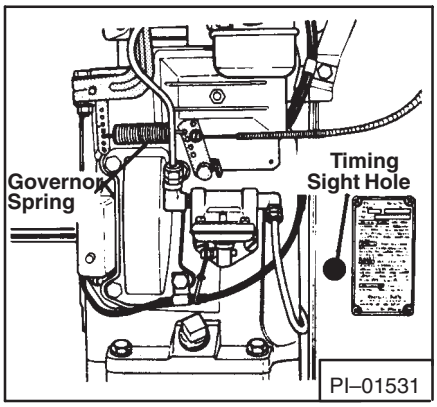


Fig. 10 Timing Sight Hole

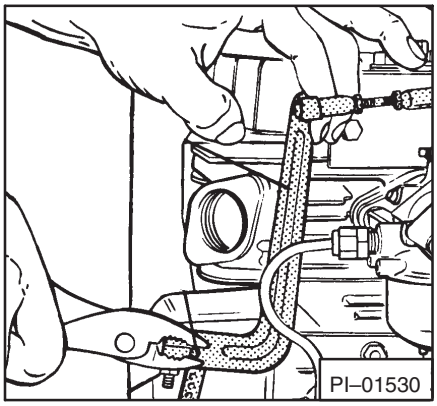


Fig. 11 Adjusting Governor

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 isinstalled 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.

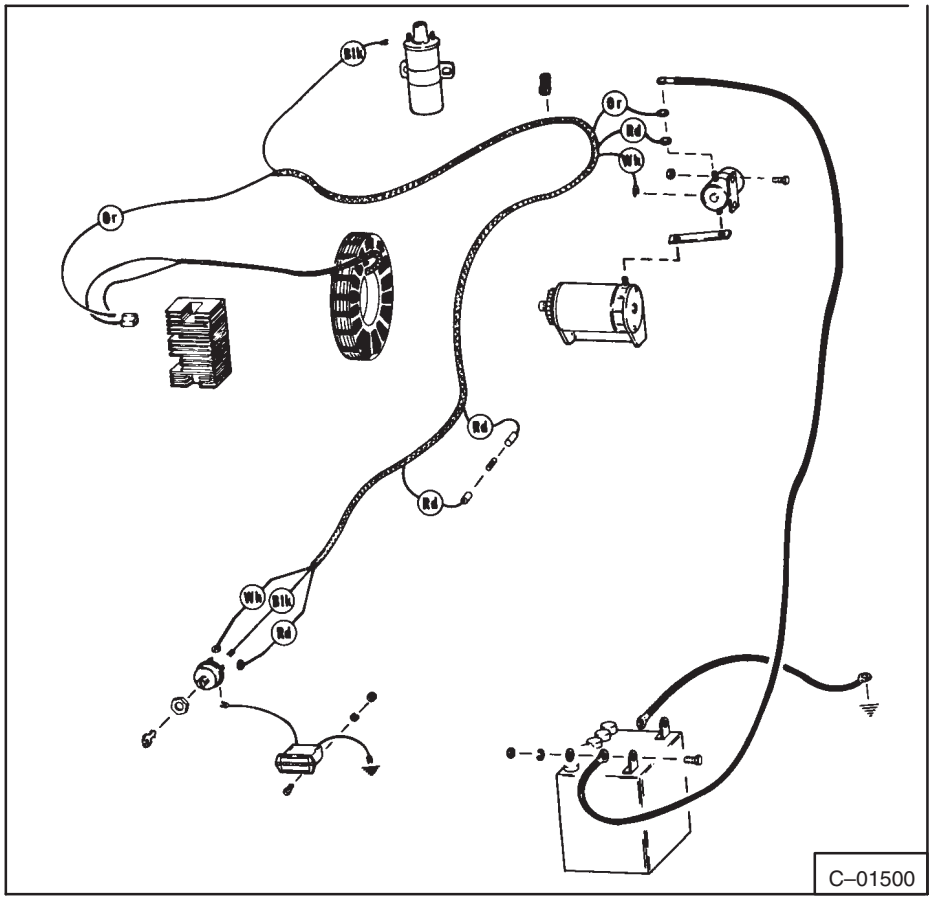


Fig. 12 Electrical Circuitry S/N B–1334 & Below

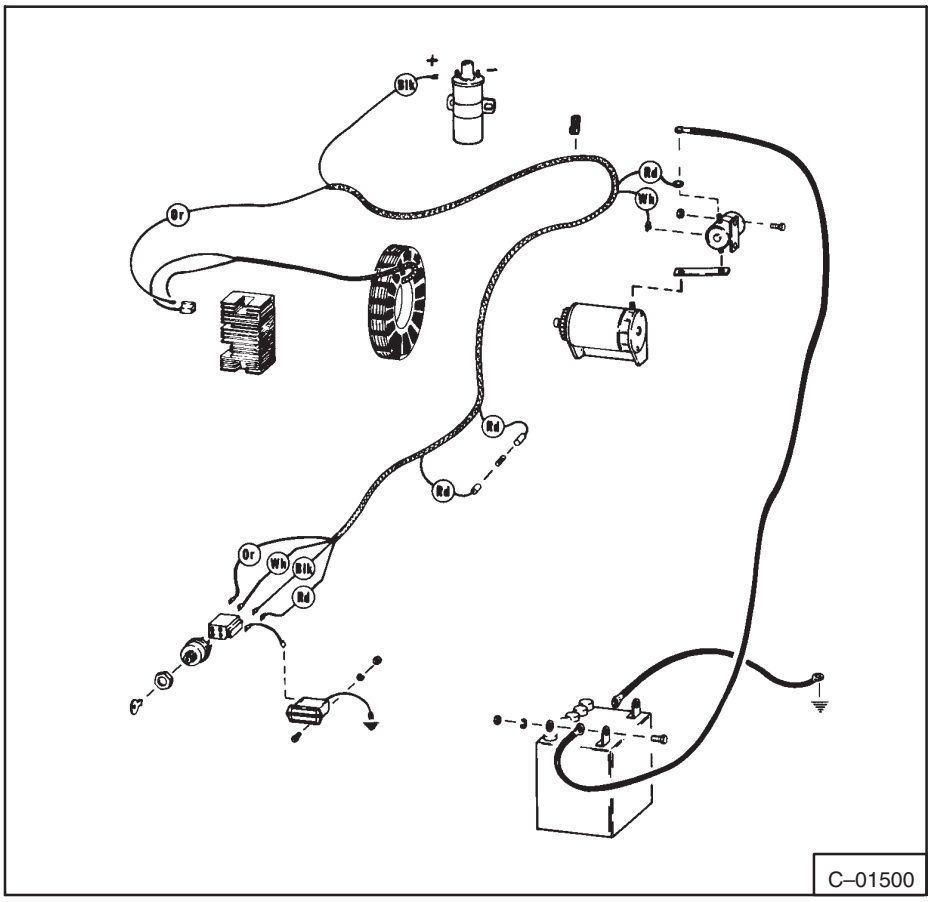


Fig. 13 Electrical Circuitry S/N B–1335 & Above

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.

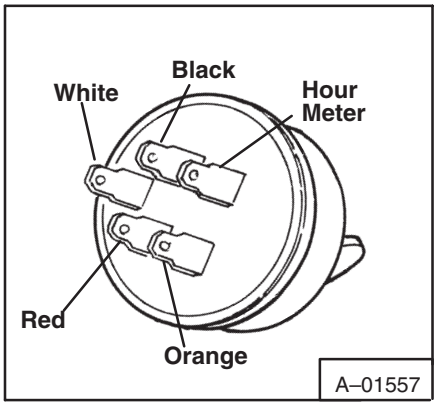


Fig. 14 Switch Terminals

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 leverswill 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 thefuel 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


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. Slightlyover 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 inchesoff 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.

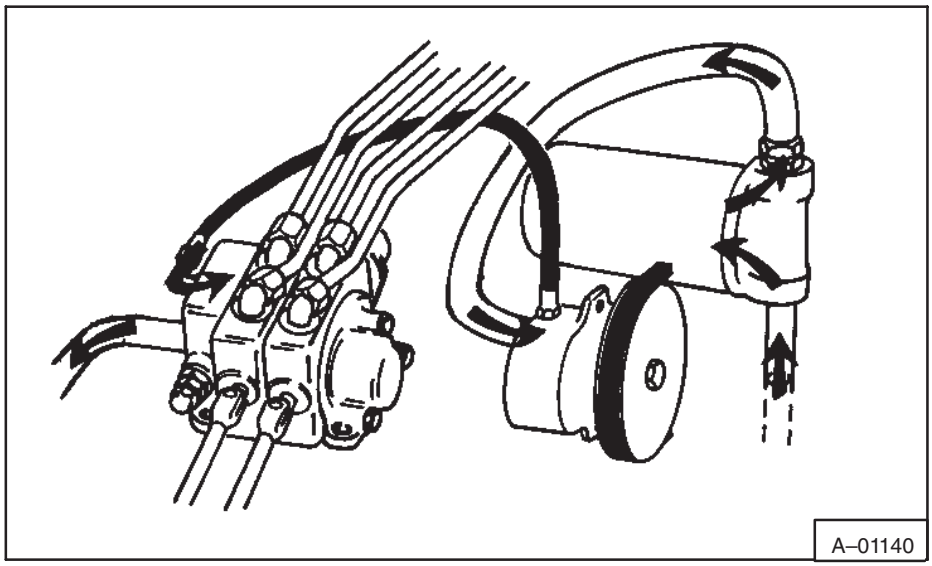


Fig. 15 Hydraulic Circuit

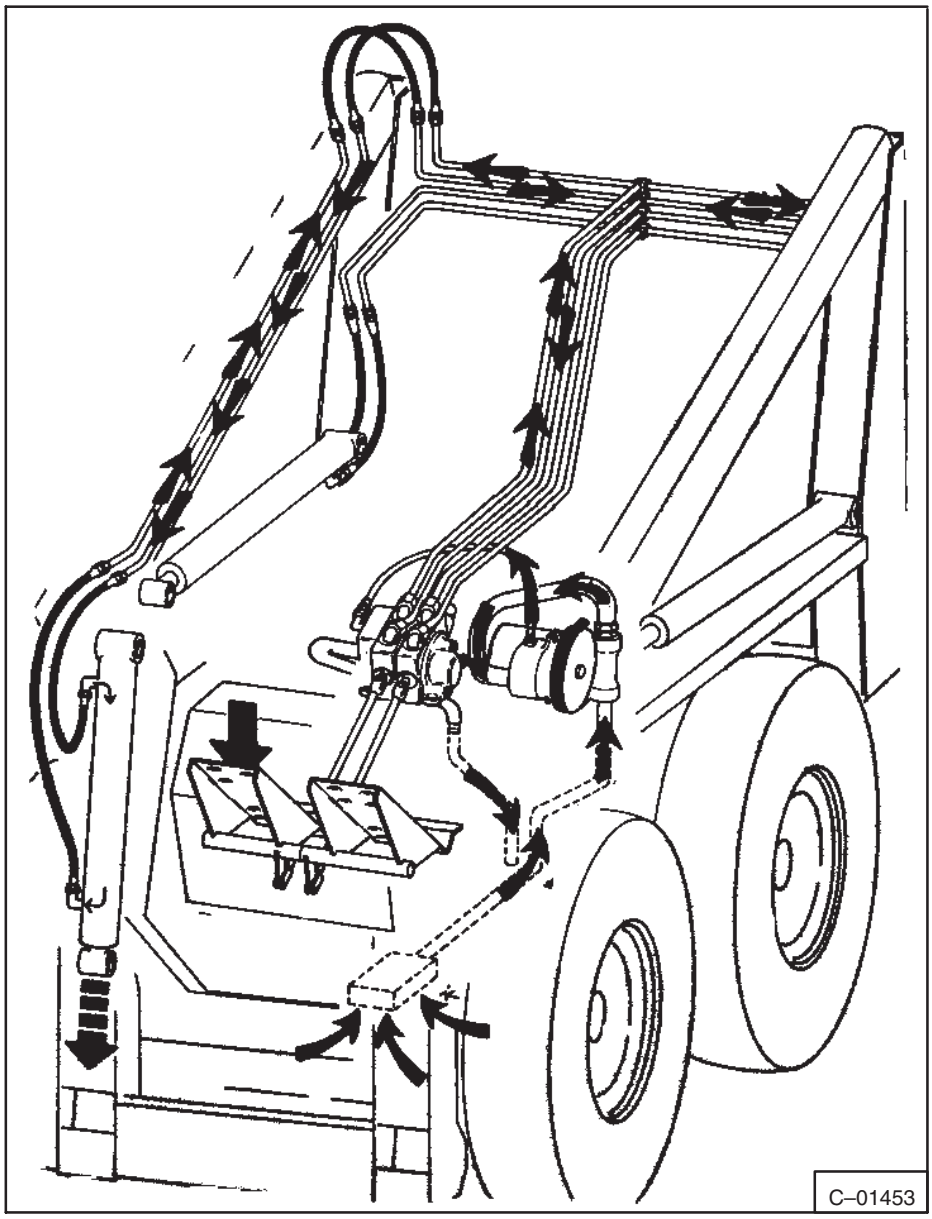


Fig. 16 Hydraulic Cylinder Action & Fluid Flow

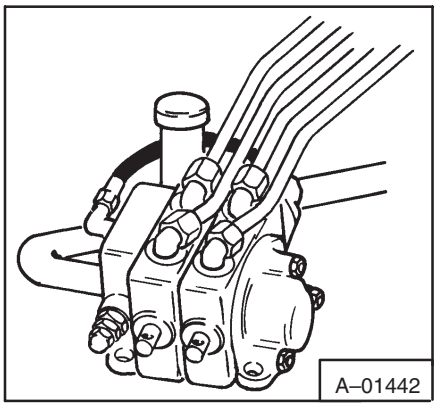


Fig. 17 Hydraulic Fluid Filter

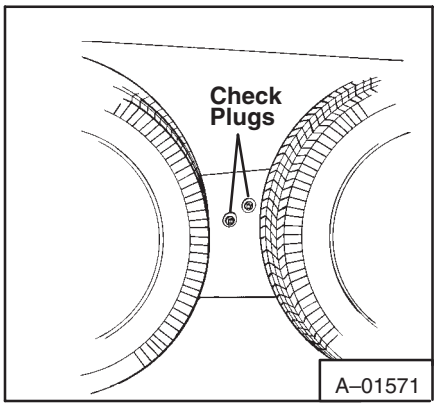


Fig. 18 Reservoir Check Plugs

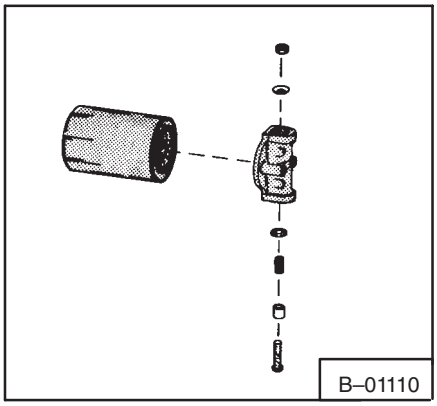


Fig. 18A Hydraulic Fluid Filter

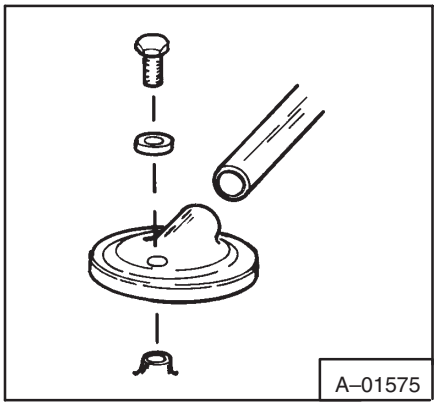


Fig. 19 Fluid Pickup Screen

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. T ighten 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 baf 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 baf fle 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.

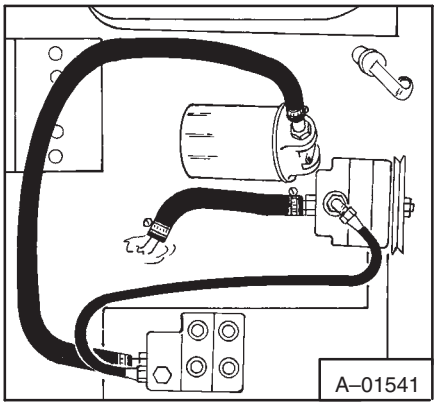


Fig. 20 Fluid Filter S/N B–1575 & Below

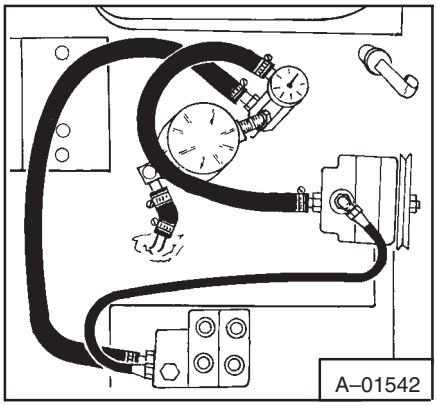


Fig. 21 Retrofit For Early Models

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.

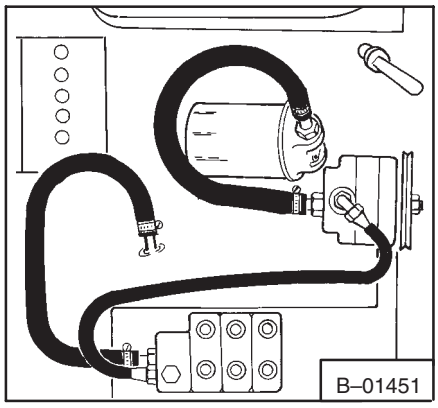


Fig. 22 Fluid Filter S/N B–1576 through B–2006

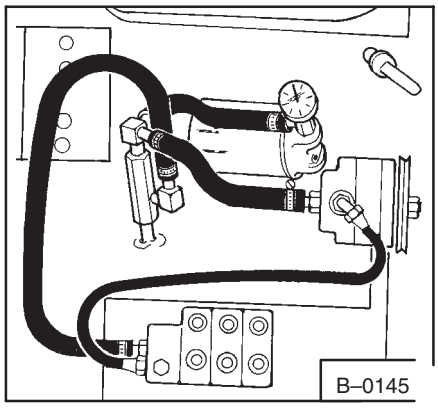


Fig. 23 Retrofit For Later Models

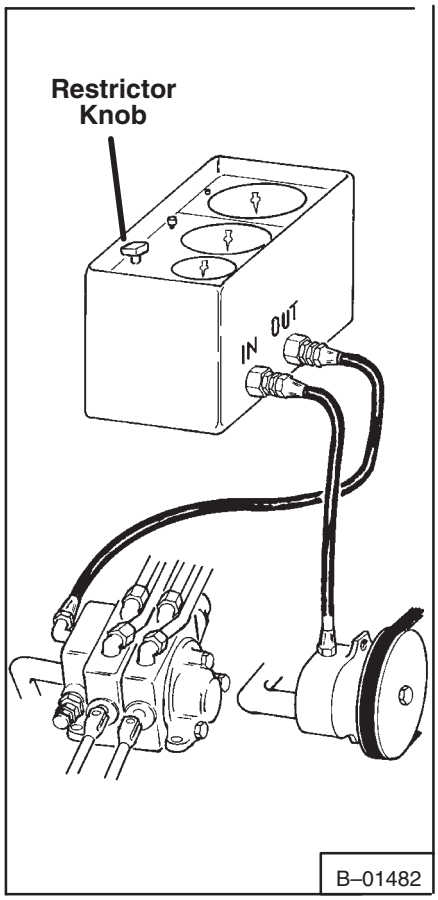


Fig. 24 Testing Hydraulic Pump

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 of1/16" 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:

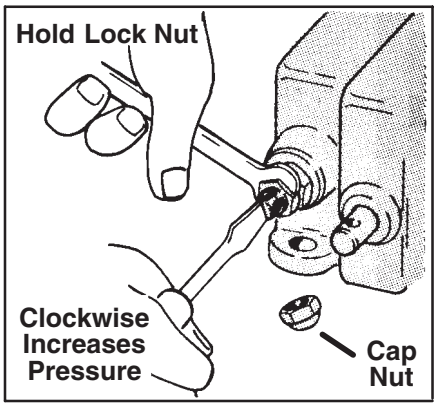


Fig. 25 Adjusting Relief Pressure

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).

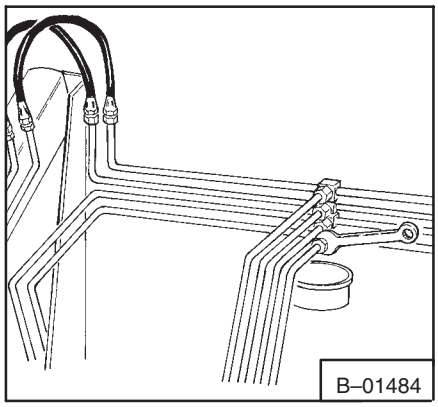


Fig. 26 Checking Lift Cylinder Seals

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).

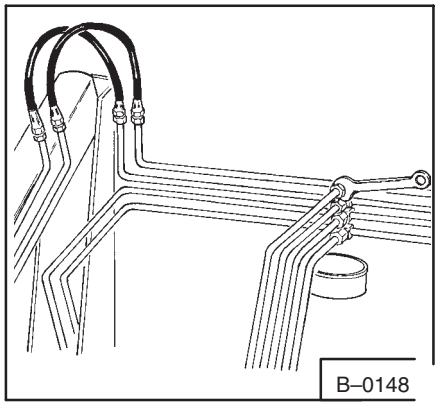


Fig. 27 Checking Tilt Cylinder Seals

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

PROBLEM	CAUSE	CORRECTION	PAGE
	Air entering pickup tube in sump.	Install baffle on pickup tube. Check for pin hole in tube.	13
	Hydraulic pump is not delivering its rated capacity.	Check condition of pump and repair or replace if defective.	16
	Fluid leak past spool in lift control valve.	Replace spool seals. If valve body is cracked or scored, replace the valve.	– 16
	Lower tube line restrictor is blocked. (Located at rear up–right crossmember).	Remove and clean the restrictor.	–
Boom lowers extremely slow.	Lower tube line restrictor is blocked. (Located at rear up–right crossmember).	Remove and clean the restrictor.	–
	Pedal linkage adjusted improperly.	Re–adjust the pedal linkage.	
Sticky control valve action.	Control pedals are sticking due to lack of lubrication.	Re–lubricate.	–
	Spool centering device in valve is broken.	Repair as necessary.	46
	Warped valve body due uneven mounting surface.	Shim as necessary.	13
	Spool interference with valve body.	Rotate spool 180 degrees.	–
	Dirt in valve body.	Clean valve body.	
Loss of hydraulic fluid from system.	Fluid may have been used to fill the hydraulic system of an attachment.	Check fluid level and fill to full mark on dipstick or upper check plug.	16
	Fluid is leaking from a hole in the reservoir.	Pin holes may be peened with a punch. Larger holes may need to be welded shut.	– 16
	Loose connections in hydraulic system.	Tighten or replace connectors, as necessary.	16
	Fluid leaking past cylinder shaft seals.	Replace cylinder shaft seals and inspect cylinder shafts for damage.	16
	Fluid is leaking from a hole at the welded cylinder ports.	Remove the cylinder and weld the holes shut.	16, 17 45, 46

PROBLEM	CAUSE	CORRECTION	PAGE
The bucket will not remain tilted back with the control in neutral position.	External leak between tilt control valve & the cylinders.	Check for external leaks and correct as required.	16, 17
	The spool is not centering in the valve body when the control pedal is released.	Adjust pedal to spool with spool in neutral position.	16
		Check for sticky spool or pedal action.	16
		Check for broken spool centering spring or parts, repair as necessary.	47, 48
	Fluid leaking past cylinder piston seals.	Check and repair the piston seals.	16,45,46
	Fluid leaking past spool and valve body.	Replace seals if worn or damaged. Replace valve section if scored.	16,47,48
Noisy hydraulic pump.	Low fluid supply.	Check level and add to full mark on dipstick or upper check plug.	13
	Air leak on pump suction plumbing.	Check fittings and clamps for tightness.	
	Filter and/or screen is plugged.	Clean screen in sump, or replace filter, as required.	14
Hydraulic fluid is heating (Normal maximum temperature is air temperature plus 60°.	Fluid supply is low.	Check and fill to full mark on dipstick or upper check plug.	13
	Fluid is contaminated.	Drain reservoir, flush and refill with clean fluid.	13, 14
	Relief valve setting is too low.	Check and set pressure to 1200 PSI.	16
	Worn hydraulic pump.	Repair with kit or replace pump, as required.	46, 47
Foaming hydraulic fluid.	Fluid supply is low.	Check and fill to full mark on dipstick or upper check plug.	13
	Air leak in pump suction plumbing.	Check fittings and clamps for tightness.	
	Using wrong type fluid.	Drain reservoir and refill with non–foaming fluid. (Refer to page 58 for type).	13, 14
Hydraulic fluid looks milky.	Water in fluid.	Drain the reservoir and refill with new fluid.	13, 14

TRACTION DRIVE SYSTEM SERVICE


bobcat

DESCRIPTION OF DRIVE

The Bobcat has two separate drive trains (located beside each other in the transmission case). Each drive train uses two clutches. Power is transmitted from the engine to the upper jackshaft by a belt. The upper jackshaft drives the outside clutches using a No. 40 roller chain (Fig. 28).

On either side of the machine, the clutch toward the rear controls the forward travel of the machine and the clutch toward the front controls the reverse travel of the machine.

The clutches are actuated by a large square thread screw mechanism on each clutch. One clutch on each side of the machine is controlled by a right hand thread nut, the other by a left hand thread nut. Moving the operating lever turns both the clutch actuating nuts in the same direction at the same time (Fig. 29). Because one is a right hand thread and the other is a left hand, they will cause only one clutch to engage at a time.

In Fig. 29, when the operating lever is moved forward, the front clutch (left hand thread nut) would disengage and the rear clutch (Right hand thread nut) would engage. When operating lever is straight up and down, it is in neutral position and neither clutch should engage.

The outside clutch plates always rotate in the same direction. The inside clutch plates will rotate in the same direction when either clutch is engaged, but because of the chain routing on their sprockets (under B and over A, Fig. 30) rotation of sprocket C will depend on which clutch is engaged.

The small sprocket on the lower jackshaft drives the axle sprockets. The direction of rotation of sprocket C and the lower jackshaft determines the direction the machine will move or turn.

CLUTCH ADJUSTMENT

When lever travel (from neutral) is more than three inches in either direction, the clutches need adjustment. This may occur shortly (about 50 hours) aftera new machine is put into service. After the first adjustment, adjust whenever needed.

Adjust according to the following procedure:

1. Shut off the engine before adjusting the clutches.

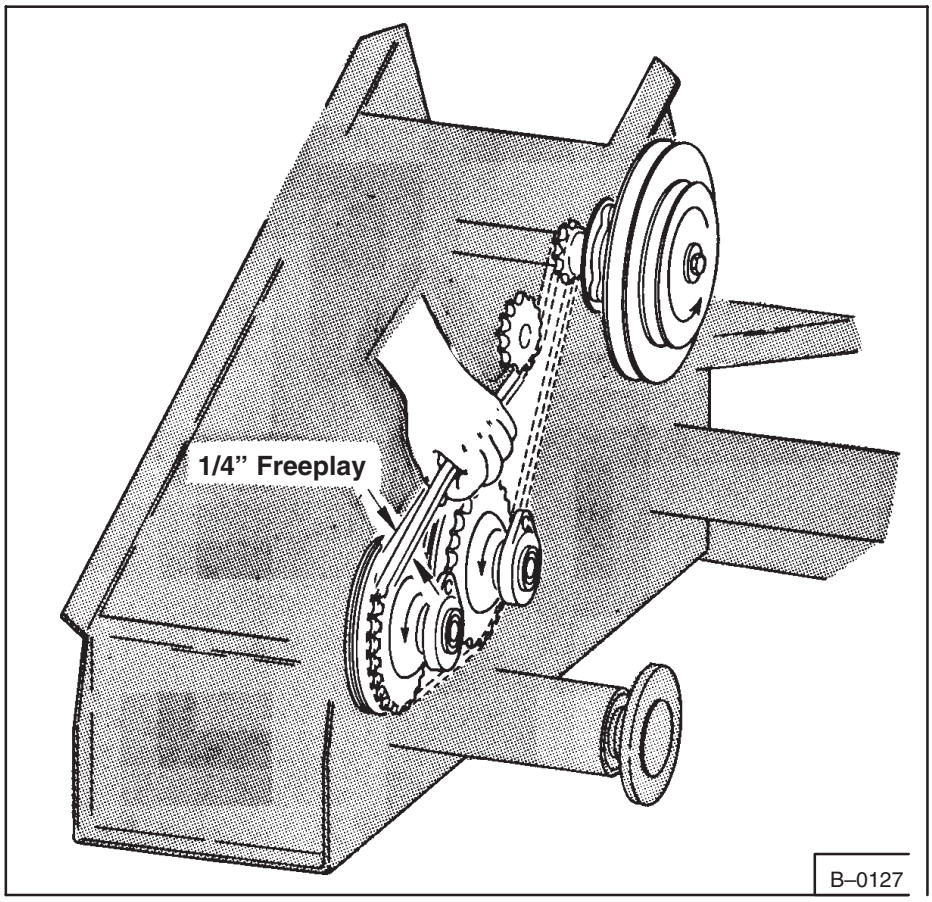


Fig. 28 Outside Clutches & Chain

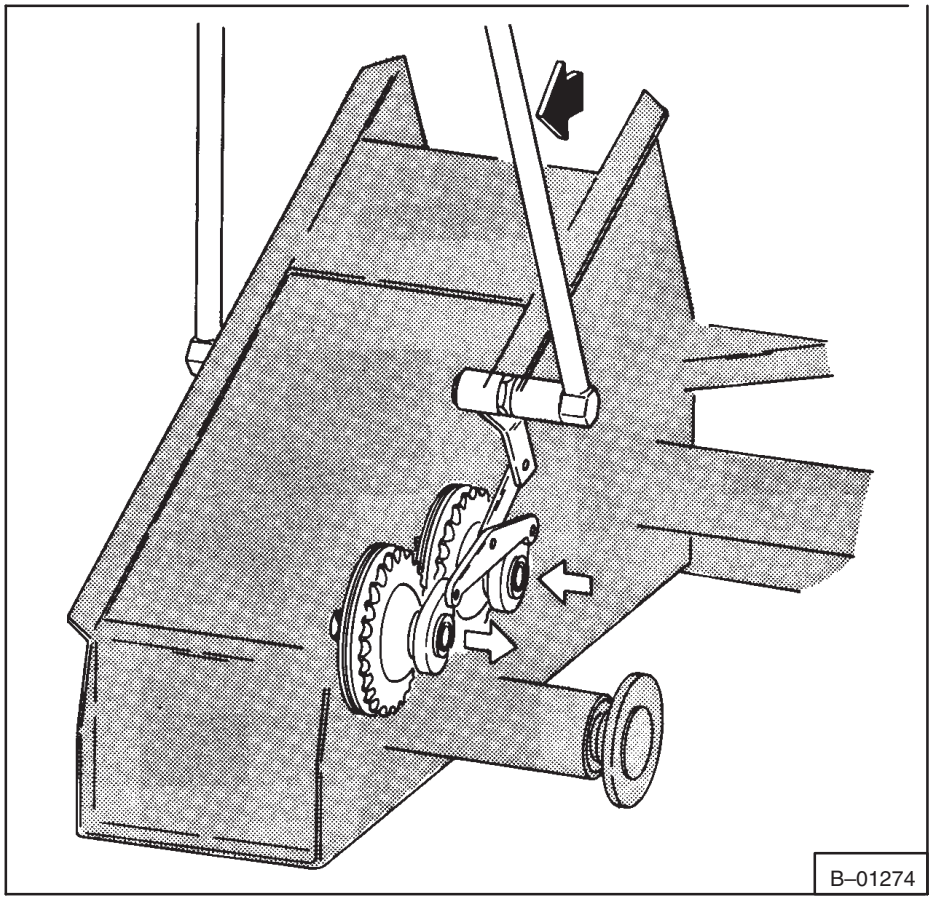


Fig. 29 Drive & Steering Principle

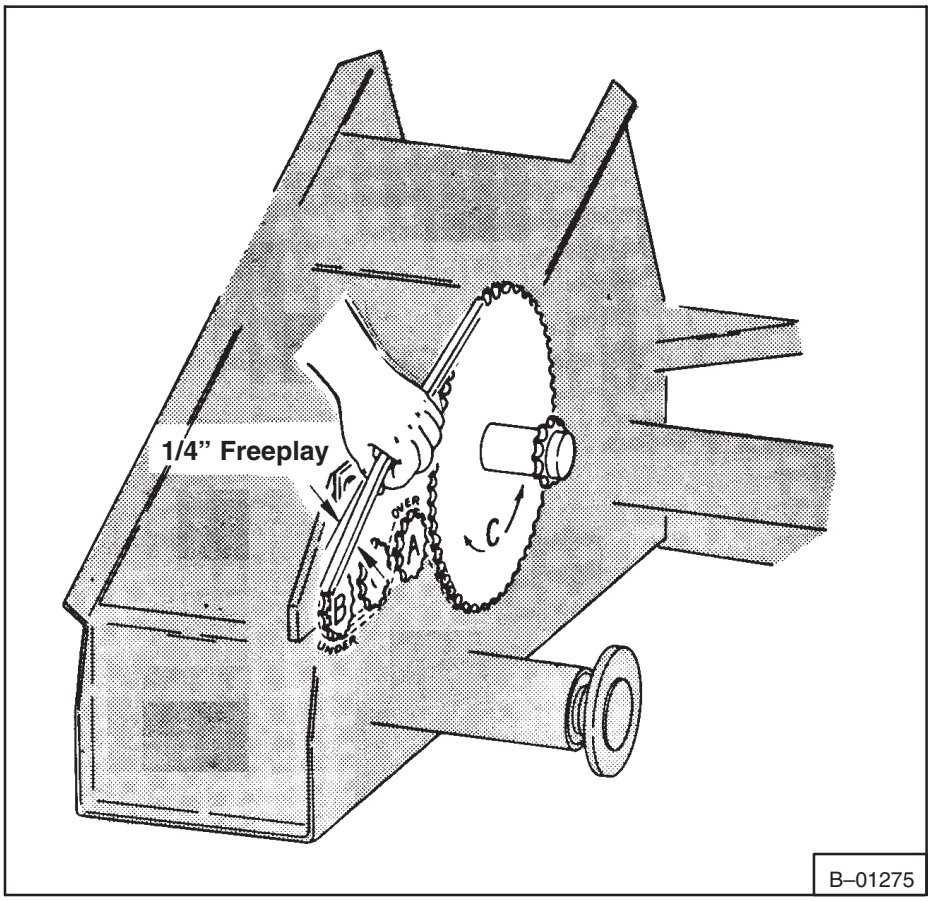


Fig. 30 Inside Clutch Chain & Sprockets

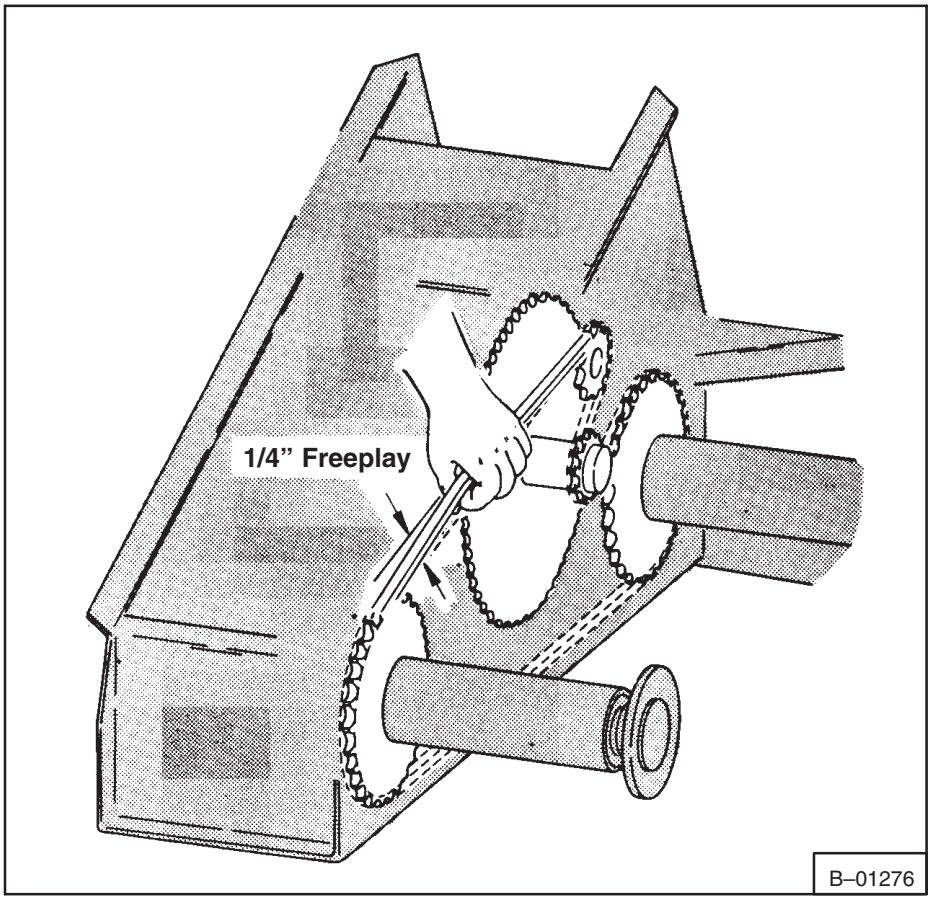


Fig. 31 Final Drive Chain & Sprocket

2. Move the lever forward to check the adjustment. If the hand grip is more than 3" or less than 2" forward of neutral loosen the 3/8" locking nut (Fig. 32) at the rear clutch pin.

3. Loosen the 5/8" nut one turn, hold the nut on other end to prevent the shaft from turning.

4. Put a mark by the adjustment nut for reference (Fig. 32). Turn the adjustment nut 1/8" or as necessary to increase or decrease the lever travel.

5. Tighten the 3/8" locking nut. Tighten the 5/8" locking nut to 60 ft.–lbs. torque.

6. Move the lever back as far as it will go. If the front clutch needs adjustment, follow the same procedure as you used on the rear clutch.

Check the travel of the other operating lever and adjust the clutches on the other side of the machine, if necessary.

DRIVE CHAIN ADJUSTMENT

All the chains have idler sprockets for adjusting chain tension. To check for loose chains, raise the Bobcat so all four wheels are off the ground. Block it up securely. Stop the engine and set both steering levers in neutral.

Try to turn the wheels by hand. There should be a slight freeplay (1/8" at the tread). Do this on both sides of the machine.

If any chains are too loose, or too taut, adjust according to the following procedure:

1. Disconnect the foot pedal linkages from the hydraulic control valve.

2. Remove the transmission case cover to expose the drive system. Do this in a clean area.

3. Check the tension of the final drive chains. They should have about 1/4" of freeplay with slight finger pressure (Fig. 31). Final drive idler sprockets are adjusted from outside of the machine (Fig. 33, Item 1). To adjust, loosen the 15/16" and 3/4" bracket holding nuts and turn the adjusting nuts until desired tension is set. After the chain tension has been set it is necessary to align the sprocket while tightening the holding nuts. With the holding nuts loose the sprocket may be "cocked" at a slight angle.

This must be corrected during tightening of the holding nuts or chain scuffing, sprocket wear or bearing failure will result. Tighten the lower 15/16" holding nut first. This will tend to draw the idler up squarely. Further prying with a bar against the innermost edge of the bracket while tightening the 3/4" nut should assure correct alignment. Torque the 15/16" nut to 120 ft.–lbs. and 3/4" nut to 80 ft.–lbs. Tighten the adjusting nuts securely.

4. Check the tension of the outside clutch chains (Fig. 28). They should have a minimum of 1/4" freeplay at the high spot on the sprocket with slight finger pressure. The outside clutch chain idler sprockets are adjusted from outside of the machine (Fig. 33, Item 2). To adjust, loosen the 5/8" nut and move the idler until desired tension is set. Tighten the nut to 60 ft.–lbs. torque.

5. Check the tension of the inside clutch chains (Fig. 30). They should have about 1/4" freeplay with slight finger pressure. The inside clutch chain idler sprockets are located on the divider plate, between the left and right hand drive systems (Fig. 33, Item 3). To adjust, loosen the mounting bolts and slide the idlers until desired tension is set. T ighten the holding nuts to 40 ft.–lbs. torque.

After all chains have been correctly set, rotate the drive for at least three complete revolutions of the chains, checking each chain at various points of rotation for correct tension. Radial high spots on the sprockets may occur which could cause over–tension of a chain. Readjust chains as necessary to assure that freeplay is not less than 1/4" at any point during rotation.

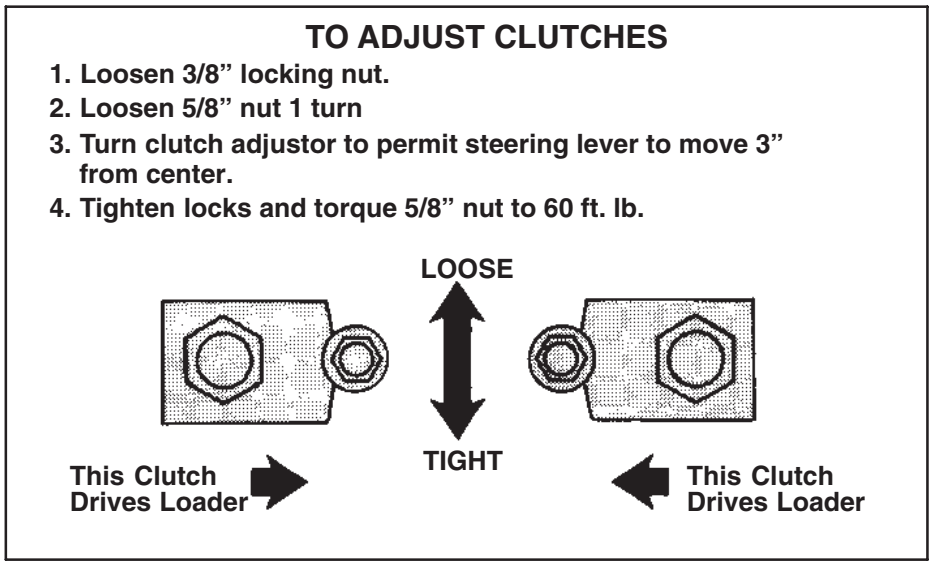


Fig. 32 Clutch Adjusting Procedures

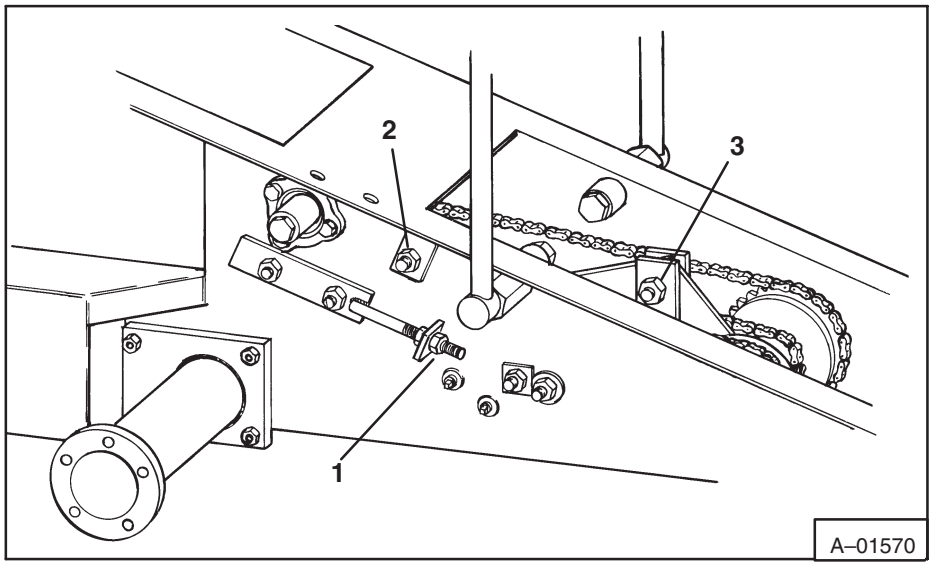


Fig. 33 Drive Train Adjustments

PROBLEM	CAUSE	CORRECTION	PAGE
Sudden increase in steering lever travel in one direction.	A clutch thrust bearing has failed.	Replace thrust bearing. Turn around or replace thrust races.	50, 51
	Clutch linkage screw has come loose.	Replace linkage screw.	50
	The actuating nut threads are stripped.	Replace the actuating nut; also the actuating thread on the clutch pin if necessary. Adjust the clutch pin for proper lever travel.	21,22,50
	Clutch lining has broken and dropped into reservoir.	Replace clutch lining.	50
The clutches will not engage properly.	The bearings are not properly located in the clutch plate hubs. clutch plates may be floating.	The clutch plate bearings (two in each hub) should be pressed into the hub only far enough so each bearing is flush with its end of the hub.	51
The clutches will not remain engaged. The levers return to neutral when released. (Correct only if objectional for machine operation). This condition does not indicate a serious defect.	The actuating threads and nuts are worn.	Replace the actuating threads and nuts if you want the levers to remain engaged when placed into an engaged position.	50
Clutch slippage.	Linkage is traveling against the shoulder of the actuating nut.	Adjust the clutches so the operating levers will go only 2–3 inches forward and back from neutral.	21, 22
	Wrong oil is being used.	Refer to page 58 for fluid type.	58
Premature clutch thrust bearing failure.	The hardened races on the clutch races may be rough or pitted, causing seizing of the bearing.	Replace the bearing and turn or replace the races. If one thrust bearing fails, replace them both.	50
	The operator may be using too much lever pressure.	Use only enough lever pressure to engage and maintain drive.	
		Check the hardened races for pitting and roughness.	50
Clutch lining breaks and falls out of the clutch.	The clutch lining has been forced onto the shoulder of the inside clutch plate, cracking the lining.	Be sure the clutch lining fits loosely on the shoulder of the inside clutch plate. Do not force lining onto shoulder. File or sandpaper inside diameter of lining.	50

PROBLEM	CAUSE	CORRECTION	PAGE
Premature clutch lining failure or excessive wear.	Nicks on one or both clutch faces.	Replace the clutch face and lining.	50, 51
	Lining is not free on shoulder of inside clutch plate.	File or sandpaper inside diameter of lining to fit shoulder.	50
	The clutches are adjusted too tightly.	Replace the lining and adjust the clutches for 2–3 inches lever travel from neutral.	50, 21, 22
Excessive drive chain wear.	The chain is too tight.		22, 23
	The sprockets are misaligned.	Check the alignment of the sprockets. Lower jackshaft sprocket can be aligned by re–locating shims.	51
Drive chain breakage.	Worn chains and sprockets.	Replace worn parts.	44, 54
	Front and rear tires on one side of the machine are not the same diameter.	Use the same air pressure in all tires.	1
		Rotate the tires.	1
		Replace excessively worn tires.	1
Drive belt slipping.	Oil on the faces of the pulleys.	Clean belt and pulleys and check for oil leaks.	
	Idler spring tension is low.	Relocate or replace the spring.	


bobcat

MAJOR OVERHAUL


bobcat

ENGINE OVERHAUL


bobcat

ENGINE OVERHAUL

Engine overhaul should be accomplished only by a qualified and experienced mechanic. Care must be taken during disassembly of the engine to prevent damage to the various polished surfaces on the crankshaft, camshaft and cylinder wall. Proper tools must be available and used in the removal and installation of bearings. Torques, tolerances and correct gear alignment must be carefully observed to insure proper engine performance and long service life.

The engine should be removed from the machine to a bench and overhauled in a clean work area.

To remove the engine from the machine, follow these steps:

1. Remove the protective grill.
2. Disconnect fuel line, battery cables, wiring, choke and throttle cables.
3. Remove the two drive belts.
4. Remove the stabilizer rod.
5. Remove the engine plate mounting nuts. (Engine is removed with plate attached).
6. Remove the engine from the machine.

To install engine onto the machine, reverse the above steps.

ENGINE SHOCK MOUNTS AND STABILIZER ROD

Engine shock mounts contain sleeve spacers. Tighten the nuts until they fully meet the spacers. Do this before installing the stabilizer rod.

The stabilizer rod must be properly adjusted. Improper adjustment of the stabilizer rod will cause excessive engine vibration. After engine mounting nuts have been tightened securely, install the stabilizer rod. Alternately tighten the rod lock nuts so that there is an even amount of tension on both sides of the rod support tab, against the rubber shock absorbers. The shock absorbers should be equally compressed, but not too tight (Fig. 35A).

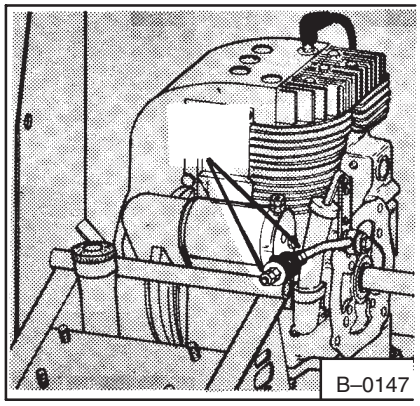


Fig. 35A Engine Shock Mounts

REPAIR–REPLACEMENT METHODS

There are several different methods to choose when repairing a failed engine. If complete shop facilities are available to rebore cylinders and regrind crankshafts, you may choose to completely overhaul the engine using appropriate oversize and/or undersize replacement parts. If bore, piston or connecting rod are damaged but the crankshaft and all other parts are in good condition, the miniblock may be the best repair method.

The miniblock can be considered as a crankless block as only the crankshaft and bearing plate are omitted.

If an engine is in bad shape, both internally and externally , it is generally more economical to replace it with a new complete engine of the same specification. See parts book for part number.

Fig. 36 shows the components of a miniblock assembly.

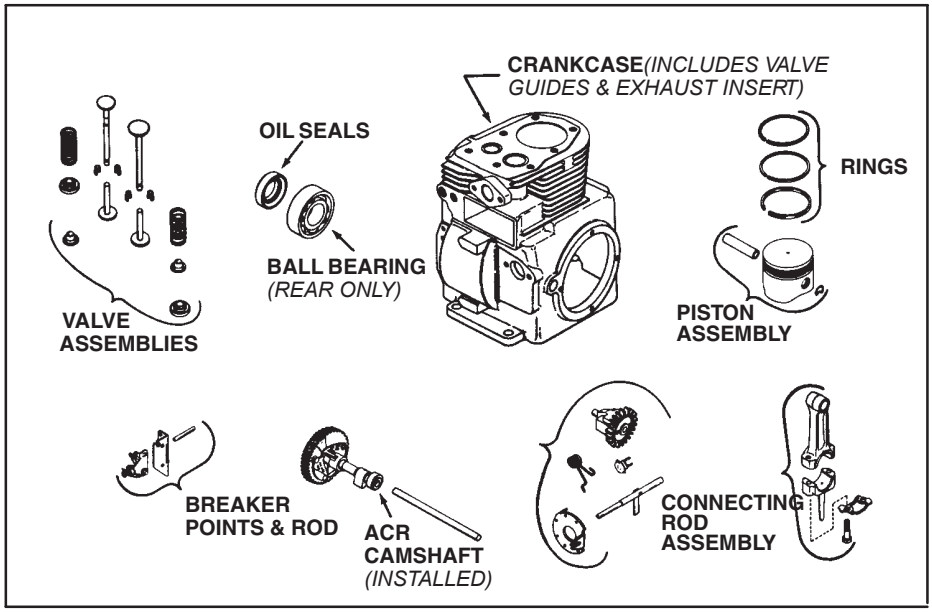


Fig. 36 Miniblock Assembly

INSPECTION–DISASSEMBLY

When disassembling an engine, carefully inspect and note the physical appearance of each of the components. Often the appearance of parts will indicate operation under other than ideal conditions. Some of the things to look for are:

1. Excessive sludge and varnish formation.
2. Scoring of the cylinder walls.
3. Severe piston damage.
4. Evidence of external oil leakage.

Sludge is a natural by–product of combustion and a small accumulation is normal. Excessive sludge formation could indicate several things. The most common cause is perhaps too infrequent lubricating oil changes. It can also indicate operation with improper ignition timing or overrich carburetor adjustment or a poorly serviced clogged air cleaner which restricts air intake and also results in an overrich mixture.

SCORING OF THE CYLINDER WALL

Unburnt fuel not only adds to sludge formation but can, in severe cases, cause scuffing and scoring of the cylinder walls. As raw fuel seeps down the cylinder walls, it washes the necessary lubricating oils of the piston and cylinder walls so that the piston rings make metal to metal contact with the walls. Scoring of the cylinder wall can also be caused by localized hot spots resulting from blocked cooling fins or from inadequate or contaminated lubrication.

SEVERE PISTON DAMAGE

Major damage to piston and rings can take various forms. The top of the piston ring may be burned through or the top groove may be excessively worn and the ring broken or stuck in the groove. This can be attributed to abnormal combustion. If ignition timing is overadvanced, ignition will occur while the piston still has a long distance to travel on its compression stroke. As a result, the combined heat of compression plus the heat of pre–ignited fuel raises temperatures to values comparable to that of an acetylene torch. This of course, acts mainly on the top land and top ring of the piston and results in early failure. Severely worn rings, indicate improper air cleaner service procedures.

EVIDENCE OF EXTERNAL OIL LEAKAGE

If excessive oil leakage is evident, this may indicate improperly serviced breather systems. Normally, an engine operates internally at pressures under atmospheric or, in other words, with a negative crankcase pressure. If positive pressures build up within the crankcase from a clogged breather or from piston blow–by, oil will be forced out of an engine at oil seals, gaskets or any other available spot.

These are just a few of the more common indicators. Numerous others exist and are obvious to the experienced mechanic. Often the cause will become apparent in view of the particular condition of the part. Always look for these signs when disassembling an engine prior to reconditioning. Advise the customer of these findings so that he may take steps to improve machine maintenance.

DISASSEMBLY PROCEDURE

The following is intended as a guide to disassembly of the M–371 engine:

1. Disconnect lead and remove spark plug.
2. Remove fuel line at carburetor.
3. Remove air cleaner from carburetor intake.
4. Remove carburetor.
5. Remove blower housing, cylinder baffle and head baffle.
6. Remove rotating screen and starter.

7. Flywheel is mounted on tapered portion of the crankshaft. Use of a puller (Fig. 37) is recommended for removing flywheel. Bumping end of crankshaft with hammer to loosen flywheel should be avoided as this can damage crankshaft.

8. Remove breaker point cover, breaker point lead, breaker assembly and push rod.

9. Remove valve cover and breather assembly.

10. Remove cylinder head.

11. Raise valve springs with a spring compressor (Fig. 38) and push valve keepers off valve stems. Remove valve spring retainers, springs and valves.

12. Remove oil base and unscrew connecting rod cap. Remove piston assembly from cylinder block.

13. Remove crankshaft, oil seals and, if necessary antifriction bearings. It may be necessary to press crankshaft out of cylinder block. Bearing plate should be removed first if this is done (Fig. 39).

14. Turn cylinder block upside down and, using a small punch, drive camshaft pin out from power–take–off side of engine. Pin will slide out easily after it is driven free of block.

15. Remove camshaft and valve tappets.

16. Loosen and remove governor arm from governor shaft.

17. Unscrew governor bushing nut and remove governor shaft from inside of cylinder block.

18. Loosen (do not remove) screw located to lower right of governor bushing nut until governor gear is free to slide off stub shaft.

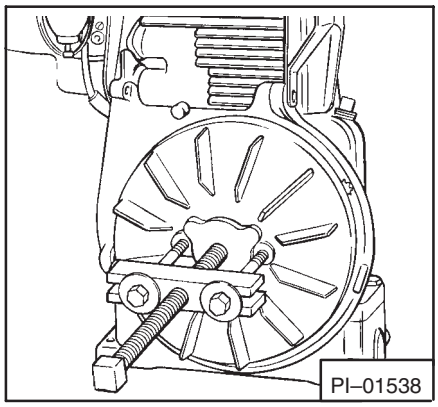


Fig. 37 Removing Flywheel

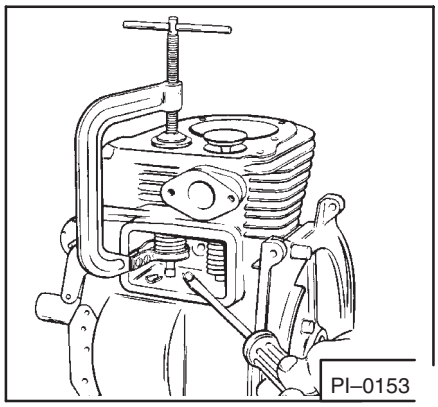


Fig. 38 Using Valve Compressor

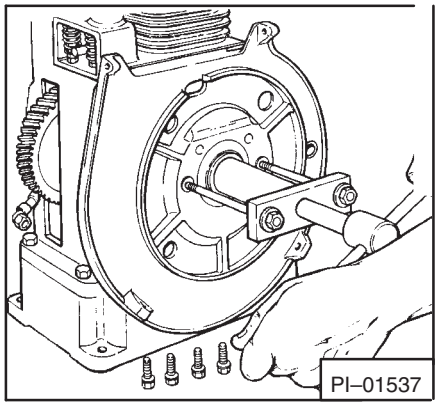


Fig. 39 Removing Bearing Plate

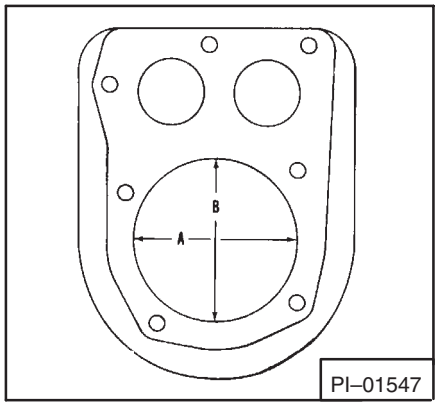


Fig. 40 Measuring Cylinder Bore

ENGINE RECONDITIONING

All parts should be thoroughly cleaned–dirty parts cannot be accurately gauged or inspected properly for wear or damage. There are may commercially available cleaners that quickly remove grease, oil and grime accumulation from engine parts. If such a cleaner is used, make sure that all trace of the cleaner is removed before the engine is reassembled and placed in operation. Even small amounts of these cleaners quickly break down the lubricating properties of engine oils.

CYLINDER BLOCK

1. INSPECTION
   A. Gasket surfaces – Check all surfaces to make sure that they are free of gasket fragments and sealer materials. Surfaces must also be free of deep scratches or nicks.

   B. Bearings – (Crankshaft) – One bearing is pressed into the cylinder block–the other is located in the bearing plate. Do not remove bearings unless they show signs of damage and are to be replaced. (See Reconditioning – Cylinder Block.) If the bearings turn easily and noiselessly and there is no evidence of scoring or grooving on the races, the bearings can be reused.

   C. Cylinder bore – If badly scored, excessively worn or tapered or out of round more than .005, reboring is necessary. Use an inside micrometer to determine amount of wear (See Fits and Clearance Section). If cylinder bore is not damaged and is within tolerances, only light deglazing may be necessary.

2. RECONDITIONING–CYLINDER BLOCK
   A. Remove old oil seal from block but do not install new seal until after crankshaft is reinstalled.

   B. Reboring procedure–See Clearance Section for original cylinder bore size. Use an inside micrometer to measure wear then select nearest suitable oversize of either .010, .020 or .030 (Fig. 40). Reboring to one of these oversizes will allow

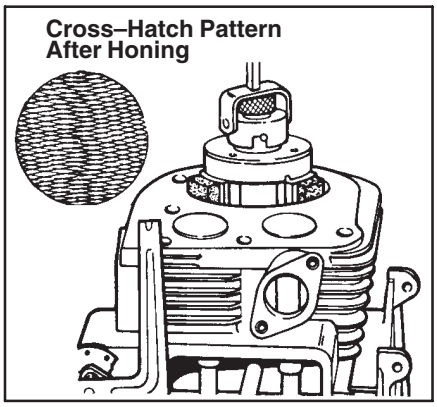


Fig. 40A Honing Cylinder Walls

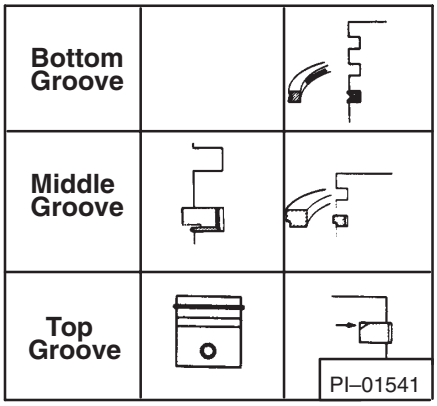


Fig. 41 Piston Ring Sequence

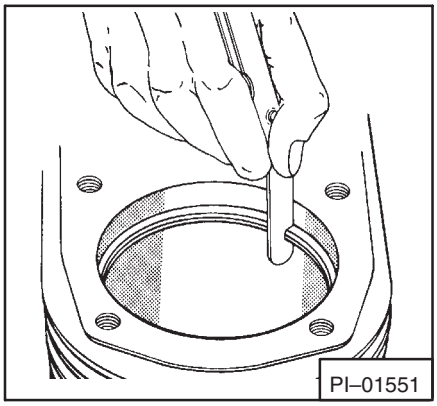


Fig. 42 Measuring Piston Ring End Gap

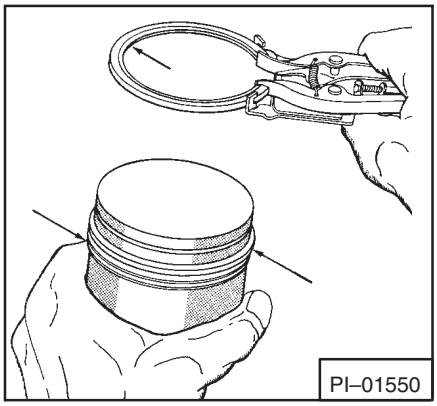


Fig. 43 Ring Installation Sequence

usage of the available oversize piston and ring assemblies. While most commercially available cylinder bores can be used with either portable drills or drill presses, the use of a low speed drill press is preferred as it facilitates more accurate alignment of the bore in relation to the crankshaft crossbore. Reboring is best accomplished at drill speed of about 600 RPM. After installing coarse stones in hone, proceed as follows:

1. Lower hone into bore and after centering, adjust so that stones are in contact with walls. Diesel fuel oil or kerosene can be applied to the stones as a cutting–cooling agent.

2. With the lower edge of each stone positioned even with the lowest edge of the bore, start drill and honing process. Move hone up and down (Fig. 40A) while reboring to prevent formation of cutting ridges. Check size frequently.

3. When bore is within .0025 of desired size, remove coarse stones and replace with burnishing stones. Continue with burnishing stones until within .0005 of desired size then use finish stones and polish to final size. (Use grit size 200–280 on the finished stone.)

4. After reboring, carefully clean cylinder wall with soap and water , then after drying thoroughly, apply light coat of SAE 10 oil to prevent rust.

CRANKSHAFT

1. Keyways–Gears–If keyways for flywheel are badly worn or chipped, replacement of the crankshaft may be necessary. Broken or badly worn cam gear teeth will also necessitate replacement of shaft.

2. Crankpin–Inspect crankpin for score marks or metallic pickup. Slight score marks can be cleaned with crocus cloth soaked in oil. If wear limits, as stated in Clearance Section, are exceeded by more than .002", it will be necessary to either replace crankshaft or regrind the crankpin to .010" undersize. If wear is moderate, the .010" undersize connecting rod (big end) must then be used to achieve proper running clearance.

CONNECTING ROD

1. Check bearing area (big end) for excessive wear, score marks, running and side clearance. Replace rod and cap if worn beyond limits stated.

2. Connecting rods with bearing area .010" undersize are available for use with reground crankpin.

PISTON–PISTON RINGS (Fig. 41)

Service type ring replacement sets are available in the standard size plug .010", .020" and .030" oversize sets. The standard type set is used only when cylinder is not worn or out of round. Production oversize sets are used only when cylinder has been rebored to the corresponding oversize. Service type sets are used when cylinder is worn but within wear and out of round limits (wear limit .005" oversize, out of round limit .004"). Sets include expanders to provide uniform pressure on ring and better conformity to cylinder wall regardless of wear. Cylinder bore must be deglazed before service ring sets are used.

1. If the cylinder block does not need reboring and if the old piston is within wear limits and free of score or scuff marks, it may be reused. Never reuse old rings, however.

2. Remove old rings and clean up grooves.

3. Before installing new rings on piston, place each ring in turn in its running area in cylinder bore and check end clearance (Fig. 42).

4. Rings must be installed according to markings on rings. Compression rings must be installed with bevel up.

Ring installation instructions are included with new ring sets. Follow instructions carefully. Use ring expander to install rings and check side clearance of each ring after installation (Fig. 43).

PISTON–ROD ASSEMBLY

Normally very little wear takes place in the piston boss–piston area. If the original piston and connecting rod can be reused after conditioning, the pin will usually not have to be replaced. A new piston pin should be used when a new connecting rod is used with the original piston. After checking pin, rod and piston boss to make sure proper clearances are available, lubricate pin then assemble piston to rod with pin (light interference to loose fit) and lock pin with new retainers–make sure retainers are fully engaged in grooves.

VALVES–VALVE MECHANISM (Fig. 44)

Carefully inspect valve mechanism parts. Check valves and valve seat or inserts for evidence of deep pitting, cracks or distortion. Check clearance of valve stems in guides–refer to specifications chart for valve details.

Guides:
Guides must be replaced if worn sufficiently to allow valve stem–guide clearance to exceed limits stated in the Wear Tolerance Chart. To remove, press guide down into valve chamber and carefully break protruding end until guide is completely removed–be careful not to damage block when removing old guide. Use an arbor press to install new guides–press to depth specified then use a valve guide reamer and ream new guide to specified I.D.

Valves and Valve Seats:
Consult parts manual for correct valve numbers when replacing valves. Exhaust valves are always hard faced. Intake and exhaust valves seat on special hardened inserts. Seating surfaces should be held as close as possible to 1/32" width. Seats with more than 1/16" must be reconditioned with 45° and 15° cutters to obtain proper width. Reground or new valves must be lapped in to provide proper fit. Use a hand valve grinder with suction cup for final lapping. Lightly coat valve face with "fine" grade of grinding compound then rotate valve on seat with grinder Continue grinding until smooth surface is obtained on seat and on valve face.

Valve Clearance:
Valve clearance must be checked after resurfacing and lapping in. Install valves in guides, rotate camshaft to position where cam has no effect on tappet–hold valve firmly on seat and check clearance between valve stem and tappet (Fig. 45).

Adjustable tappets are used. Loosen the locking nut, turn adjusting nut in or out until proper clearance is attained then securely tighten locknut.

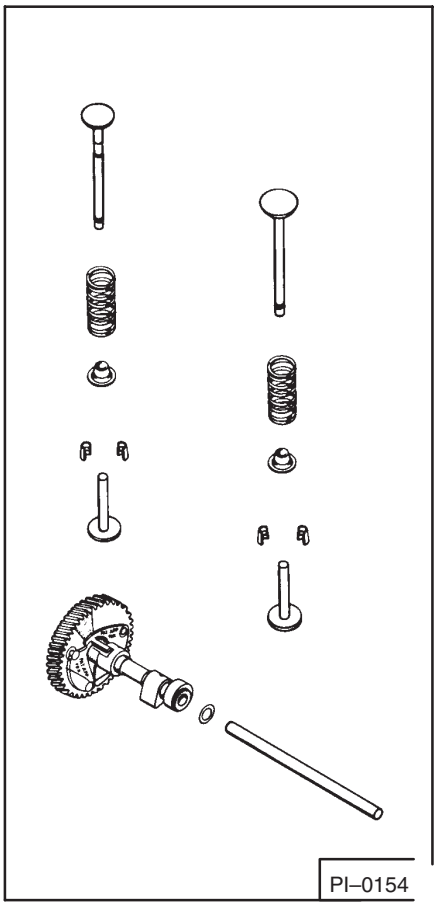


Fig. 44 Camshaft & Valve Mechanism

CYLINDER HEAD

Blocked cooling fins often cause localized "hot spots" which can result in "blown" cylinder head gaskets. If gasket fails in area surrounding one of the retaining capscrews, high temperature combustion bases can burn away portions of aluminum alloy head. If no evidence of this is found, head should be checked for flatness. A slightly warped head can be resurfaced by simply rubbing it on a piece of sandpaper positioned on a flat surface. Carefully clean carbon deposits from cylinder head if it is to be reused–use putty knife or similar blade to scrape deposits. Be careful not to nick or scratch aluminum, especially in gasket seat area.

RING GEAR

If inspection of the ring gear reveals broken, excessively worn or otherwise damaged teeth, the ring gear must be replaced. The ring gear is press fitted into a recess on the outer perimeter of the flywheel. The flywheel must be off the engine for ring gear replacement.

Several methods may be used to remove the damaged ring gear. One method is to break the gear with a cold chisel and/or a hack saw. Another way is to heat the ring gear with a torch, then drive the gear off the flywheel. If the latter method is used, the flywheel will also absorb some heat and it must be allowed to cool before the new ring gear can be installed.

The new ring gear must be expanded with heat before installation. This can be done by submerging the gear in hot oil or heating in an oven to about 400 to 450° F. Position the heated gear on the flywheel, then after making sure it is not cocked, either press the gear on with an arbor press or drive it on with a soft–head hammer As the gear cools, it will contract to form a tight press fit on the flywheel. Be sure to tighten the flywheel retaining nut to the proper torque valve after reinstalling the flywheel on the engine.

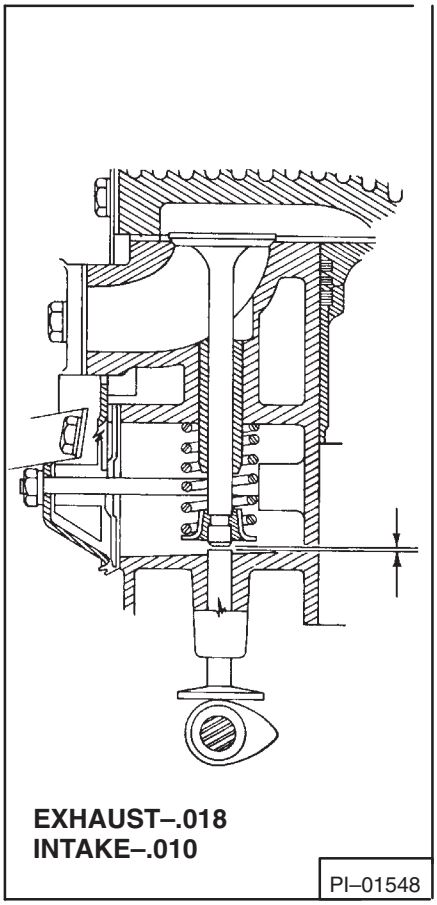


Fig. 45 Valve Tappet Clearance

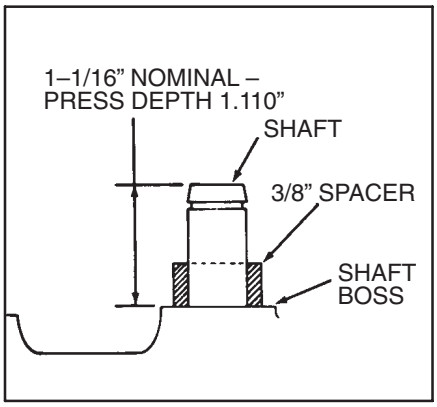


Fig. 46 Balance Shaft Installation

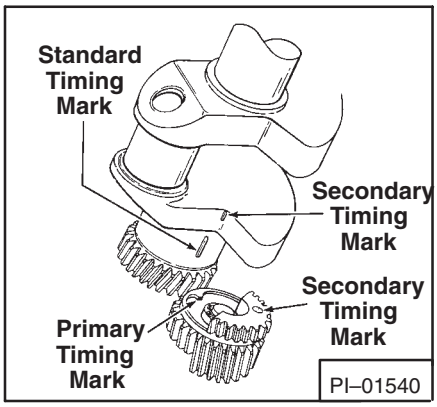


Fig. 46A Timing Marks

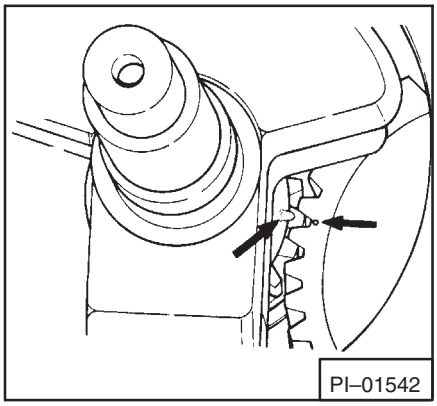


Fig. 46B Timing Marks

DYNAMIC BALANCE SYSTEM

The engine in the 371 has a dynamic balance system. This system is two balance gears on needle bearings that operate off the crankshaft and rotate in the opposite direction of the crankshaft. Replace the shafts for the balance gears when the shafts have wear or damage.

To replace the shafts for the balance gears:

1. Use a press to remove the shafts.
2. Use a press to install the new shaft. The shaft must be 1.110" above the boss (Fig. 46).
3. Install the 3/8" spacer and a .010" spacer on the shaft.
4. Install the balance gears and bearings. If you will not be using the special tool for timing the balance gears, do not install the bottom balance gear now.
5. Put the .005", .010" and .020" spacers on the shaft. The .020" spacer must be against the retainer. Install the retainer.
6. Check the axle movement. Add or remove .005" spacers to get .002" to .010" movement.

TIMING THE BALANCE GEARS

The procedure for timing the balance gears without a special tool is:

1. Put the crankshaft into the cylinder block. Align the primary timing mark on the top balance gear with the standard timing mark on the crankshaft (Fig. 46A). Use a press to push the crankshaft into the crankcase until you engage the crankshaft gear into the timing gear 1/16".
2. Rotate the crankshaft and align the timing marks on the crankshaft gear and the cam gear. Push the crankshaft the remainder of the way into the crankshaft (Fig. 46B).
3. Rotate the crankshaft until it is approximately 15° past BDC. Align the secondary timing mark on the crankshaft with secondary timingmark on the balance gear (Fig. 46A). Install the bottom balance gear as in Dynamic Balance System Steps 5 & 6).

The procedure for timing the balance gears with special tool is:

1. Turn the balance gears so the primary timingmarks will fit the tool (Fig. 47).
2. Hold the tool against the cylinder block. Align the standard timing marks on the crankshaft with the bearing oil drain hole (Fig. 47). Use a press to push the crankshaft into the crankcase until you engage the crankshaft gear into the timing gears 1/16".
3. Remove the tool. Rotate the crankshaft and align the timing marks on the crankshaft gear and the cam gear. Push the crankshaft the remainder of the way into the crankcase.

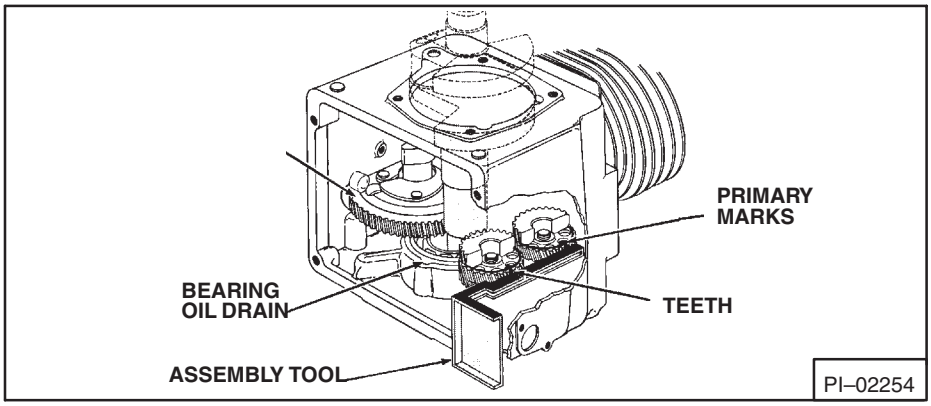


Fig. 47 Timing Tool

REASSEMBLY

1. Rear Main Bearing
   a. Install rear main bearing by pressing it into cylinder block with shielded side facing toward inside of block–if using unshielded type bearing, either side can face inside.

2. To Install Governor (Fig. 48)
   a. Place cylinder block on its side. Slide governor shaft into place from inside of block. Place speed control disc on governor bushing nut and thread bushing nut into block, clamping throttle bracket into place.

   b. The governor shaft can be adjusted for end clearance by moving needle bearing in block. Set bearing to allow a slight back–and–forth movement of the shaft.

   c. Place space washer on stub shaft and slide governor gear assembly into place.

   d. Tighten holding screw from outside of cylinder block. Screw prevents governor gear from sliding off stub shaft during assembly.

   e. Rotate governor gear assembly to be sure holding screw does not contact weight section of gear.

3. Camshaft Installation (Fig. 49)
   a. Turn cylinder block upside down.

   b. Tappets must be installed before camshaft is placed. Lubricate and insert tappets in valve guides. Intake and exhaust tappets are interchangeable.

   c. Position camshaft inside block.

   d. Lubricate rod then insert into block (bearing plate side). Before pushing rod through camshaft, slip one .005" washer (end play) between end of camshaft (opposite gear end) and block. Push rod through camshaft and tap lightly until rod just starts into bore at P.T.O. end of block. Check end play with feeler gauge (Fig. 50) if within tolerance press rod into final position or remove rod and add (or subtract) .005 and .010" thick washers as necessary to attain proper endplay (See Fits and Clearance Section).

   e. While rod is a tight press fit at P.T.O. end of block, a light to loose fit is necessary at the bearing plate end. New bearing plate gaskets have notch to allow any oil that may leak past to drain back into block. If gasket is not notched, apply gasket sealer around end of rod (outside block) to seal when bearing plate and gaskets are installed.

4. Crankshaft Installation
   a. Place block on base of arbor press and carefully insert tapered end of crankshaft through inner race of antifriction bearing.

   b. Turn crankshaft and camshaft until timing mark on shoulder of crankshaft lines up with mark (dot) on cam–gear as shown in Fig. 51.

   c. When marks are aligned, press crankshaft into bearing–make sure gears mesh as shaft is pressed into bearing. After shoulder bottoms against inner race, recheck timing mark to make sure they are still aligned (Fig. 51).

   d. Crankshaft end play is controlled by the thickness of gaskets used between the bearing plate and block. End play must be checked after bearing plate is installed–directions stated in Step 6.

5. Bearing Plate
   a. Press front main bearing into bearing plate (Fig. 52). Make sure bearing is straight and true in bore and bottomed properly. If cocked, crankshaft end play will be adversely affected.

   b. Crankshaft end play is determined by thickness of gaskets used between block and bearing plate. Initial use of one .020" and one .010" gasket should bring end play within limits–this must be checked after bearing plate is installed.

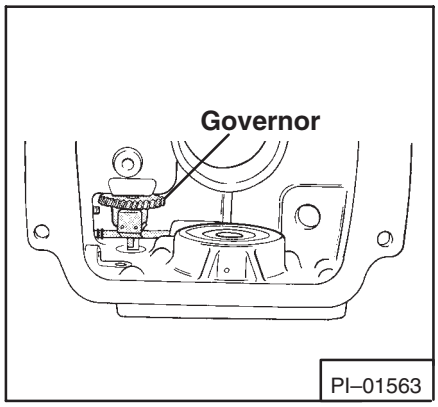


Fig. 48 Installing Governor

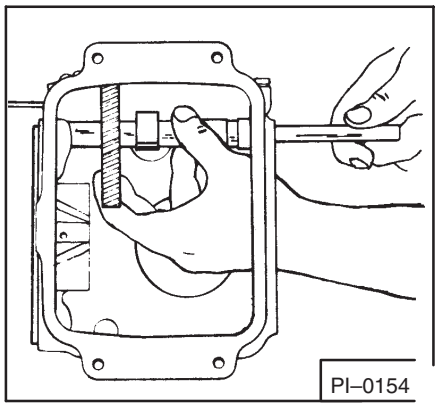


Fig. 49 Installing Camshaft

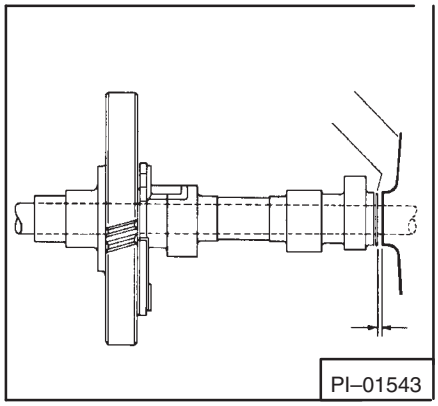


Fig. 50 Checking End Play

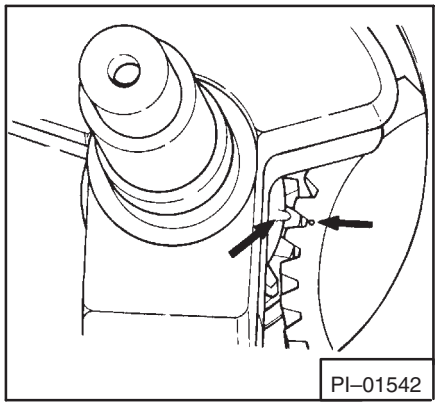


Fig. 51 Timing Marks

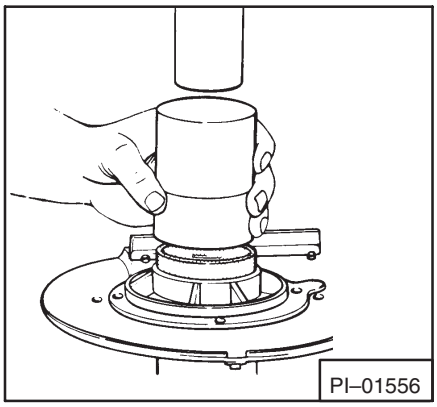


Fig. 52 Pressing Bearing Plate

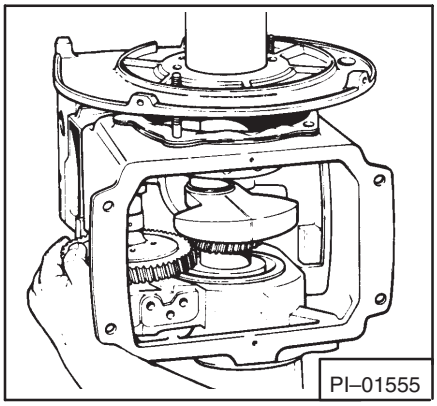


Fig. 53 Installing Bearing Plate

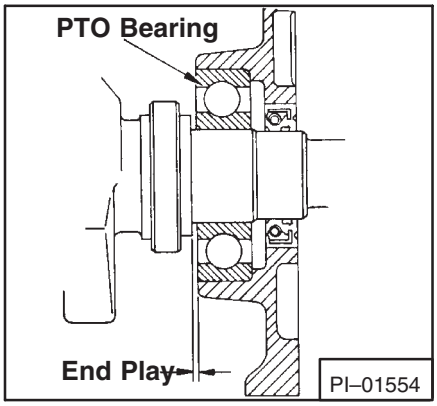


Fig. 54 Crankshaft End Clearance

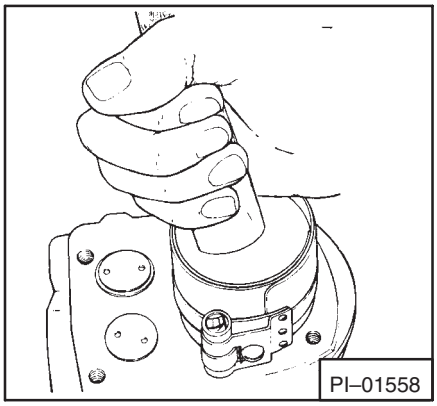


Fig. 55 Installing Piston–Ring Assembly

a. Install gaskets with thicker gasket next to block, place bearing plate on crankshaft and carefully press plate onto shaft and into position on block (Fig. 53). Install cap screws with copper washers and secure bearing plate to block. Draw screws up evenly to avoid distortion of bearing plate.

b. Crankshaft end play is measured (with feeler gauge) between inner race of rear bearing (P.T.O. end) and shoulder on crankshaft (Fig. 54). If end play is not within tolerance as stated in Clearance Section, remove bearing plate and add or subtract gaskets to achieve proper clearance.

6. Piston and Rod Assembly
   a. Lubricate pin then assemble piston to connecting rod and secure piston pin with retainer rings. Always use new retainer rings. Be sure retainer rings are fully engaged in grooves in piston bosses.

   b. After making sure rings are in proper position in correct grooves, oil complete assembly, stagger ring gaps so they are not in line and insert complete assembly into cylinder bore. Be sure connecting rod marking is toward flywheel side of engine. Use a ring compressor to prevent ring breakage during installation. Gently push piston into bore with hammer handle–do not pound (Fig. 55).

7. Attaching Rod to Crankshaft
   a. After piston assembly is installed, place block on end and oil connecting rod big end and crank pin.

   b. It is important that marks on connecting rod and cap line up and face flywheel end of engine (Fig. 56).

   c. Rod cap, lock tabs or lock washers and cap screws are then attached to connecting rod. Use a torque wrench to tighten cap screws to proper torque value as stated in Clearance Section.

   d. If locking tabs are used, bend tabs to lock cap screws.

8. Installation of Oil Seal on Crankshaft
   a. Apply grease to lip then guide oil seals into position on crankshaft without damaging lips of seals. Any foreign matter on knifelike edge or any bending of seal may cause damage and an oil leak can result.

   b. After oil seals are started on shaft, place block on its side. The oil seals may now be driven squarely into bearing plate and cylinder block.

   c. Use seal driver and seal sleeve of correct size and install carefully to prevent the seal lip from rolling and creasing. Press against outer edge of seal and press squarely into position (Fig. 57).

   d. Install front seal to a depth of 1/2” from outer edge of bearing plate (Fig. 58).

   e. Install rear seal to a depth of 1/8” from outer edge of bearing plate (Fig. 59).

9. Oil Base
   a. Use pilot studs to align cylinder block, gasket and oil base.

   b. A new gasket must be used to prevent oil leakage.

   c. Assemble oil base to block with four screws.

   d. Torque pan bolts to 25 ft.–lbs.

10. Installing and Setting Valves
    a. Valves, valve seats and ports should be thoroughly cleaned. Valves should be ground and lapped–in to obtain a good valve seat. Keep valve seat from 1/32” to 1/16” in width.

    b. Valve clearance should be checked cold (Fig. 60). Adjust tappets to correct clearance.

c. After correct clearance is obtained, remove valves and install valve springs and retainers and rotators if used. Lubricate stems then replace valves, compress spring and place locking keys in grooves of valve stems.

11. Cylinder Head
    a. Always use a new gasket when head has been removed for service work.

    b. Check cylinder head on face plate to be sure gasket surfaces make good contact at all points.

    c. It is important that head cap screws be lubricated then tightened evenly and in sequence until proper torque is reached (Fig. 61).

    d. Install new spark plug and tighten to specified torque. Spark plug gap should be .025 or .020 for radio shielded spark plugs.

12. Breather Assembly
    a. Reed type breathers are used to maintain slight vacuum in crankcase. All parts must be clean and in good condition. Use new gaskets, reed and filter for reconditioned engine.

    b. Fig. 4 on page 3 shows the correct order of assembly. Make sure reed valve is installed properly.

    c. Cover must be securely tightened to prevent oil leakage.

13. Flywheel
    a. Place wave washer on crankshaft and place flywheel in position. The square key holds flywheel on shaft.

    b. Install lock washer and holding nut. Insert a bar between flywheel fins and tighten holding nut to torque value specified in Clearance Section (Fig. 62).

    c. The rotating screen is fastened to flywheel with screws.

14. Breaker Points
    a. Install push rod.

    b. Fasten breaker in place with two screws.

    c. Place cover gasket in position and attach magneto lead.

    d. Set breaker gap at .020 full open. For ignition setting, refer to Ignition System Service.

    e. Make preliminary adjustments before installing breaker point cover. Be sure breaker lead grommet is in place.

15. Carburetor
    a. Insert a new gasket and assemble carburetor to intake port with two screws.

    b. Refer to Routine Service Section on carburetor adjustment procedure.

16. Governor Arm and Linkage
    a. Insert carburetor linkage in throttle arm.

    b. Connect governor arm to carburetor linkage and slide governor arm onto governor shaft.

    c. Before tightening clamp bolt, turn shaft counterclockwise as far as possible with a pair of pliers, pull arm as far as possible to left (away from carburetor), tighten nut and check for freedom of movement.

17. Blower Housing
    a. The engine is now ready for (1) head baffle, (2) cylinder baffle, and (3) blower housing – assembled in sequence stated. These parts are

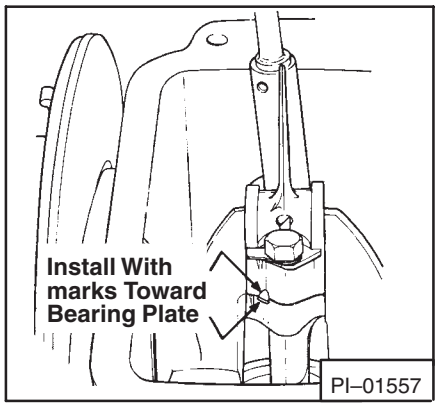


Fig. 56 Installing Connecting Rod Cap Screws

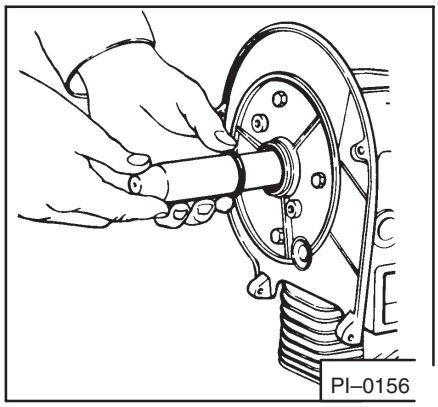


Fig. 57 Installing Seals with Sleeve

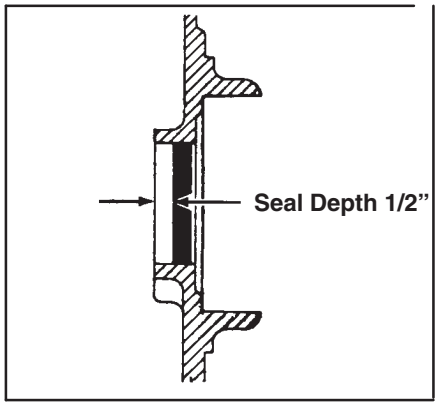


Fig. 58 Front Seal

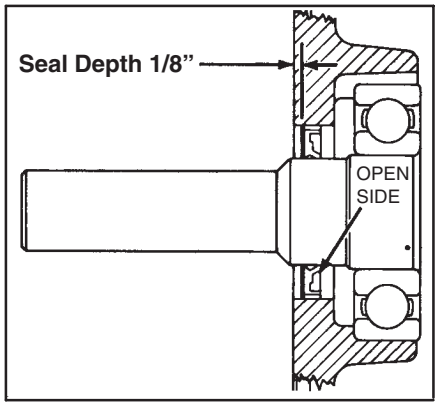


Fig. 59 Rear Seal

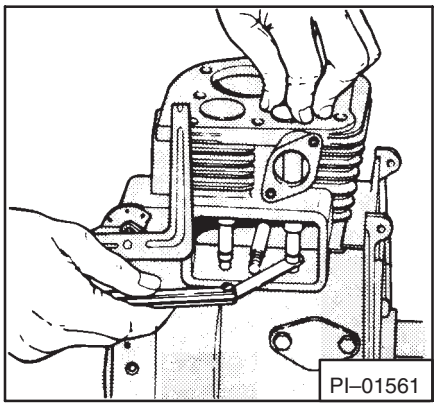


Fig. 60 Checking Valve–Tappet Clearance

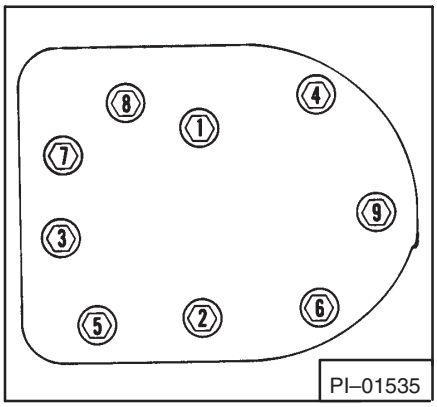


Fig. 61 Cylinder Head Tightening Sequence

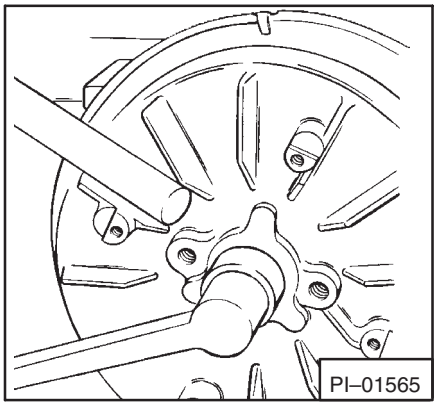


Fig. 62 Installing Flywheel

fastened to engine by cap screws which attach to cylinder head and bearing plate. Shorter screws go into lower portion of blower housing.

FINAL ADUSTMENTS

Follow instructions in the Routine Service section for final adjustment on the engine.

RUN–IN PROCEDURES (Re–Conditioned Engines)

After an engine has been reconditioned and reassembled, it must be “run–in”on non–detergent oil and under load for a period of about five hours. This should be sufficient time to seat the piston rings.

After the initial run–in period, drain the non–detergent type oil and refill with detergent type API service SC oil of proper weight.

Do not continue using non–detergent oil after the first five hours of operation.

CARBURETOR RECONDITIONING (Gasoline)

Service difficulties with fuel systems usually originate from improper carburetor adjustments or dirt, gum or varnish in components. It will be necessary to completely disassemble carburetor to clean thoroughly . Normally only pre–season cleaning will be required; however , the frequency of cleaning will depend upon use and operating conditions.

All parts should be cleaned in a solvent. Gum is easily removed with an alcohol or acetone solvent. Be sure all deposits are removed from bore, especially where throttle plate seats in casting. Blow out all passages with compressed air. Replace all worn and damaged parts. Always use new gaskets. Carburetor repair kits are available. They include the bowl nut gasket, bowl ring gasket, float pin, bowl lid gasket and fuel inlet needle and seat.

DISASSEMBLY OF CARBURETOR (Fig. 63)

1. Remove carburetor from engine.
2. Remove bowl nut, gasket and bowl.
3. Remove float pin, float, needle and needle seat. Check float for dents, leaks and wear on float lip or in float pin holes.
4. Remove bowl ring gasket.
5. Remove idle fuel adjusting needle, main fuel adjusting needle and springs.
6. Do not remove choke and throttle plates and shafts. If these parts are worn, replace carburetor assembly.

ASSEMBLY OF CARBURETOR

1. Install needle seat, needle, float and float pin.
2. Set float level. With carburetor casting inverted and float resting lightly against needle in its seat, there should be 11/64” plus or minus 1/32 of an inch clearance between machined surface of casting and free end of float (side opposite needle seat).
3. Adjust by bending lip of float with small screwdriver.
4. Install new bowl ring gasket, new bowl nut gasket and bowl nut. T ighten securely after making sure bowl is centered on gasket.
5. Install main fuel adjustment needle. Turn in until needle seats in nozzle and back out two turns.
6. Install idle fuel adjustment needle. Back out approximately 1–1/4 turns after seating lightly against jet. DO NOT USE FORCE ON ADJUSTMENT NEEDLES.

LPG FUEL SYSTEM RECONDITIONING

CARBURETOR
To disassemble the carburetor: (Fig. 64 shows breakdown of carburetor)

1. Remove the carburetor from the engine.
2. Remove load screw assembly.
3. Remove throttle valve (discs, screws, throttle valve and throttle shaft).
4. Remove idle adjustment screw and spring.

Clean all parts and wipe free of oil and grease. Use an air hose to blow out all internal openings and passageways. Inspect all areas subject to wear and make sure all areas are fee from dirt.

To reassemble the carburetor:

1. Install idle adjustment screw and spring.
2. Install throttle shaft, throttle valve and throttle valve screws.
3. Install load adjustment screw and lock nut.
4. Install carburetor on the engine.
5. Connect fuel line, governor linkage and air cleaner hose.

Adjustment:

1. Check the throttle shaft to make sure it turns freely from closed to open position.
2. Turn the idle stop adjusting screw approximately two turns, so the throttle valve is held slightly open.
3. Use a screwdriver to close the idle fuel adjustment screw completely, then open it about two turns.
4. Completely close the load adjustment screw, then open it 4 turns.
5. Open the throttle fully and start the engine.
6. Adjust the load adjustment screw until engine runs smoothly at governed speed and no load.
7. Return the throttle to idle position and, if necessary , adjust idle fuel adjustment screw until engine is idling smoothly . Set the idle speed adjustment screw until desired idle speed is reached.
8. Set throttle at full RPM and put loader under load. Readjust load screw for maximum RPM. Use a tachometer, if possible.

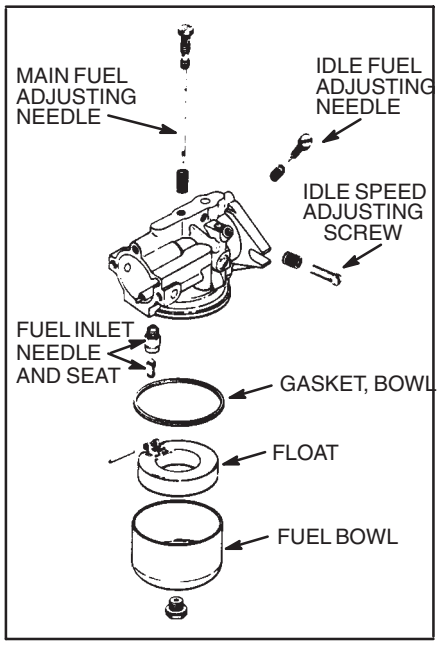


Fig. 63 Carburetor Breakdown

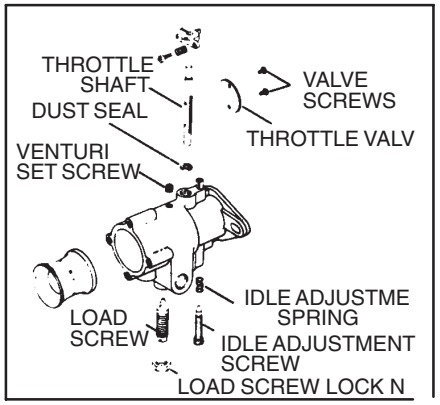


Fig. 64 LPG Carburetor

PRIMARY REGULATOR

Description: The function of the primary regulator is to provide initial control of the fuel under pressure as it comes from the fuel supply tank. The inlet pressure for the primary regulators should never exceed 250 PSI. The primary regulator is adjusted for an outlet pressure of approximately 6 ounces per square inch.

Disassembly (Fig. 65):

1. Remove assembly screws.
2. Remove housing cover and adjustment spring.
3. Remove diaphragm.
4. Remove diaphragm lever, retaining screws and lever assembly.

Inspection of Parts:

1. Inspect diaphragm for breaks, cracks or weak areas. Replace if necessary

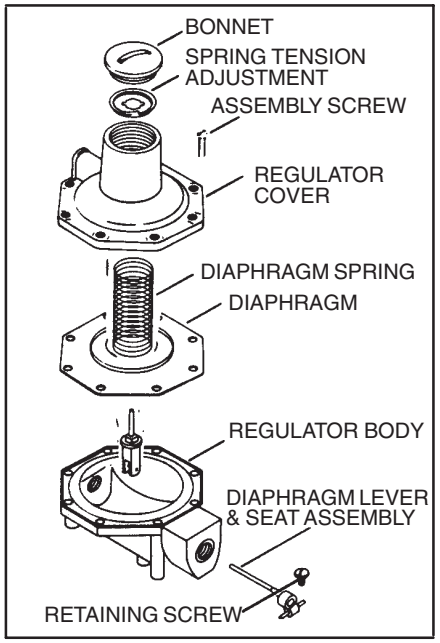


Fig. 65 Primary Regulator

2. Inspect brass orifice seating area for nicks. Do not remove unless replacement is necessary.

3. Inspect rubber seat for foreign material or excessive seat indentation. Replace diaphragm lever and seat assembly if necessary.

Reassembly:
1. Make sure all parts are clean and free from dirt.

2. Insert diaphragm lever into position making sure that diaphragm lever and diaphragm are properly engaged.

3. Place diaphragm into position making sure that diaphragm lever and diaphragm are properly engaged.

4. Place adjustment spring on top of diaphragm in proper position. Place housing cover in position making sure that the housing vent is above the outlet of regulator. Start all assembly screws and tighten evenly.

Adjustment: After reassembly it will be necessary to check the outlet pressure. The outlet pressure should be approximately 6 ounces per square inch. If adjustment is necessary, remove the bonnet cap. Using a large screwdriver, adjust the spring tension to vary the pressure. Turning in or clockwise increases the outlet pressure and turning out decreases the outlet pressure.

It is important that the inlet be kept clean when mounting or servicing the regulator. Pipe dope should be used on the inlet fitting but car should be taken that no pipe dope enters into the regulator for it can lodge on the seat and orifice.

SECONDARY REGULATORS (Fig. 66)

Description: The secondary regulators are compact single diaphragm type. This regulator will regulate the flow of gas to the carburetor accurately and will shut the gas off automatically when the engine demand ceases.

Operation: With the engine shut off, the diaphragm spring holds the fuel inlet valve against the fuel inlet valve seat. The diaphragm spring tension is transferred to the fuel inlet valve by the diaphragm lever. Upon cranking the engine, a pressure drop occurs on the fuel outlet side of the regulator diaphragm. Since one side of the diaphragm is exposed (vented) to atmospheric pressure while the outlet side is exposed only to the pressure drop (vacuum) from cranking, the diaphragm pushes against the diaphragm lever and spring. At this pressure drop, the gas inlet valve begins to open and admits fuel to the engine for starting. As the engine accelerates and pulls more and more air through the regulator, the pressure drop in the regulator increases until the fuel inlet valve is completely open.

Disassembly:
1. Remove assembly screws.

2. Remove housing cover.

3. Remove diaphragm and gasket(s). Some diaphragms are attached to the diaphragm lever. To remove diaphragm, put a knife under the retainer clip on the end of the lever assembly so that the end of the pusher pin will come up and slide out the end of the retainer clip.

4. Remove diaphragm lever and spring. The inlet plunger or valve must be removed through the fuel inlet fitting hole by first removing the brass orifice. The brass orifice should not be removed unless absolutely necessary; it should, however, be inspected for dirt or nicks on the seating surface.

Reassembly:
1. Make sure all parts are clean and free from dirt.

2. Insert diaphragm lever and spring and secure with retaining screw. Do not tighten the retaining screw more than enough to hold the lever in place. If it is too tight, it will bind the lever. The inlet plunger (valve) is inserted through the fuel inlet fitting hole.

3. Place leaf spring on tip of adjusting screw. Tighten fuel inlet fitting.

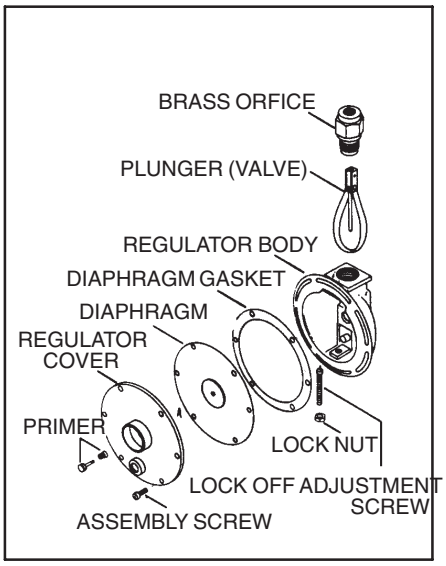


Fig. 66 Secondary Regulator

4. Place gasket/diaphragm into position. Make sure diaphragm is engaged with diaphragm lever.

5. Place regulator housing in position and start assembly screws. Before tightening, it is necessary to blow in the outlet fitting to set the diaphragm slack. Tighten screws.

Adjustment:
Secondary regulators require the lock off or fuel control adjustment. When making this adjustment, the following procedure should be followed:

1. Connect the regulator inlet to a source of compressed air or gas, but not over 10 PSI. If gas is used, adjustment should be make in a well ventilated area.

2. Turn the air/fuel supply on.

3. Depress the primer button for an instant. This will allow fuel to flow from the outlet. When primer is released, the fuel flow should stop. Soap can be used to check fuel shut off. If a bubble breaks, loosen the adjustment screw lock nut and turn the adjustment screw in until fuel flow stops (bubble is stable) then turn in one additional turn. Check the adjustment several times by depressing the primer. After proper adjustment is reached, tighten the lock nut.

ENGINE SPECIFICATIONS

TORQUES:

Oil Base Pan	25 ft.–lbs.
Cylinder head	25–30 ft.–lbs.
Connecting rod	25 ft.–lbs.
Flywheel nut	60 –70 ft.–lbs.
Spark plug	18 –22 ft.–lbs.

FITS & CLEARANCES:

Bore and stroke	3–1/2 x 3–1/4
Bore diameter, new	3.500
Crankshaft end play (free)	.003/.020
Crankshaft–conn. rod journal size (Std.)	1.5000/1.4995
Crankpin–conn. Rod side clearance	.007/.015
Crankpin length	1.180
Main bearing journal diameter	1.575
Connecting rod to crankpin running clearance	.001/.002
Connecting rod to piston pin clearance	0003/.0008
Piston pin to piston boss	One Thumb Push Fit
Piston to cylinder bore (thrust face)	.0035/.0045
Piston to cylinder bore (top of skirt)	.007/.010
Piston pin diameter (Std.)	.8753
Ring side clearance, top ring	.002/.004
Ring side clearance, middle ring	.002/.004
Ring side clearance, oil ring	.001/.003
Ring end gap	.010/.020
Ring width, top ring	.093
Ring width, middle ring	.077
Ring width, oil ring	.187
Gear reduction shaft end play	.005/.010
Camshaft pin to camshaft clearance	.001/.003
Camshaft pin to block (Bearing plate end)	.0005/.00
Camshaft pin to block (P.T.O.E.) (Int.)	.0015/.00
Camshaft pin to breaker cam	.0010/.002
Camshaft end play	.005/.010
Valve stem clearance in guide, intake	.0010/.0025
Valve stem clearance in guide, exhaust	.0025/.0040
Valve guide in block (Interference)	.0005/.0020
Valve seat in block (Exhaust) (Interference)	.003/.005
Valve clearance, intake (Cold)	.008/.010
Valve clearance, exhaust (Cold)	.017/.019
Valve seat angle	44.5
Valve face angle	45
Valve seat width	.037/.045
Valve tappet clearance in block	.0008/.0023
Governor bushing to gov. cross shaft clear.	.0010/.0025
Governor gear to governor shaft	.0005/.0020
Governor cross shaft end play	.005/.030
Ball bearing to cylinder block (Interference)	.0006/.0022
Ball bearing to bearing plate (Interference)	.0012/.0028
Ball bearing to crankshaft (Int. to loose)	.0004/.0005

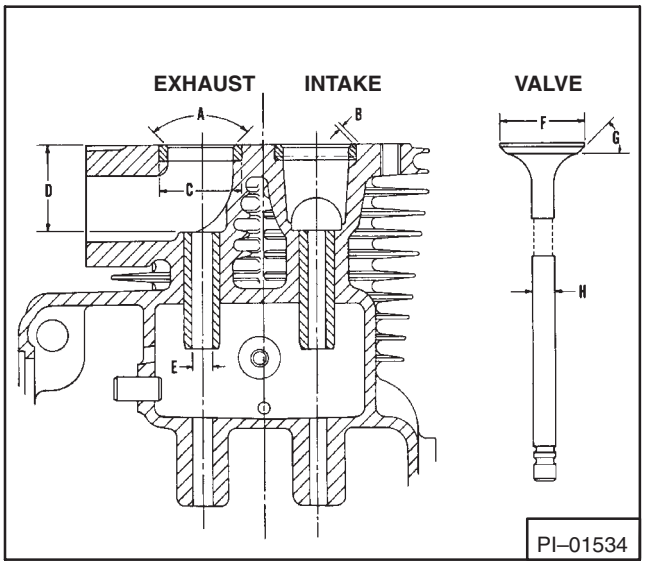


Fig. 68 Valve Detail Drawing

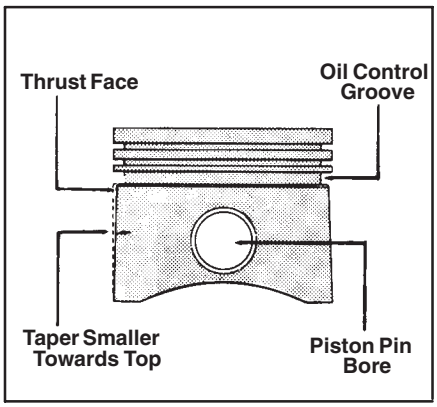


Fig. 69 Piston Measurement Details

MAXIMUM WEAR TOLERANCES & CLEARANCES:

SPECIFICATIONS (INCHES)*

CYLINDER BORE	
Maximum Oversize Diameter	3.503
Maximum Allowable Taper	.0015
Maximum Out of Round	.005
CRANKSHAFT CRANKPIN	
Maximum Out of Round	.0005
Maximum Taper	.001
CONNECTING ROD	
Maximum Wear Diameter–Big End	1.5025
Rod to Crankpin–Max. Clear.	.0035
PISTON–THRUST FACE	
Maximum Wear Diameter	3.4945
PISTON RING	
Maximum Side Clearance	.006
VALVE STEM TO GUIDE**	
Exhaust–Maximum Clearance	.0065
Intake–Maximum Clearance	.0045

**Maximum allowable before replacement, reboring, regrinding.*
***Measure at top of guide with valve closed.*

DIMENSION (SEE FIG. 68)	INTAKE	EXHAUST
A. SEAT ANGLE	89°	89°
B. SEAT WIDTH	.037/.045	.037/.045
C. INSERT O.D.		
(Engine # Suffix “A, B & C”)		
	1.5035/1.5045	1.2535/1.2545
(Engine # Suffix “D”)		
	1.5035/1.5045	1.5035/1.5045
D. GUIDE DEPTH	1–15/32	1–15/32
E. GUIDE I.D.	.312/.13	.312/.313
F. VALVE HEAD DIAMETER		
(Engine # Suffix “A, B & C”)		
	1.281	1.063
(Engine # Suffix “D”)		
	1.281	1.281
G. VALVE FACE ANGLE		
	45°	45°
H. VALVE STEM DIAMETER		
	.3105/.3110	.3090/.3095

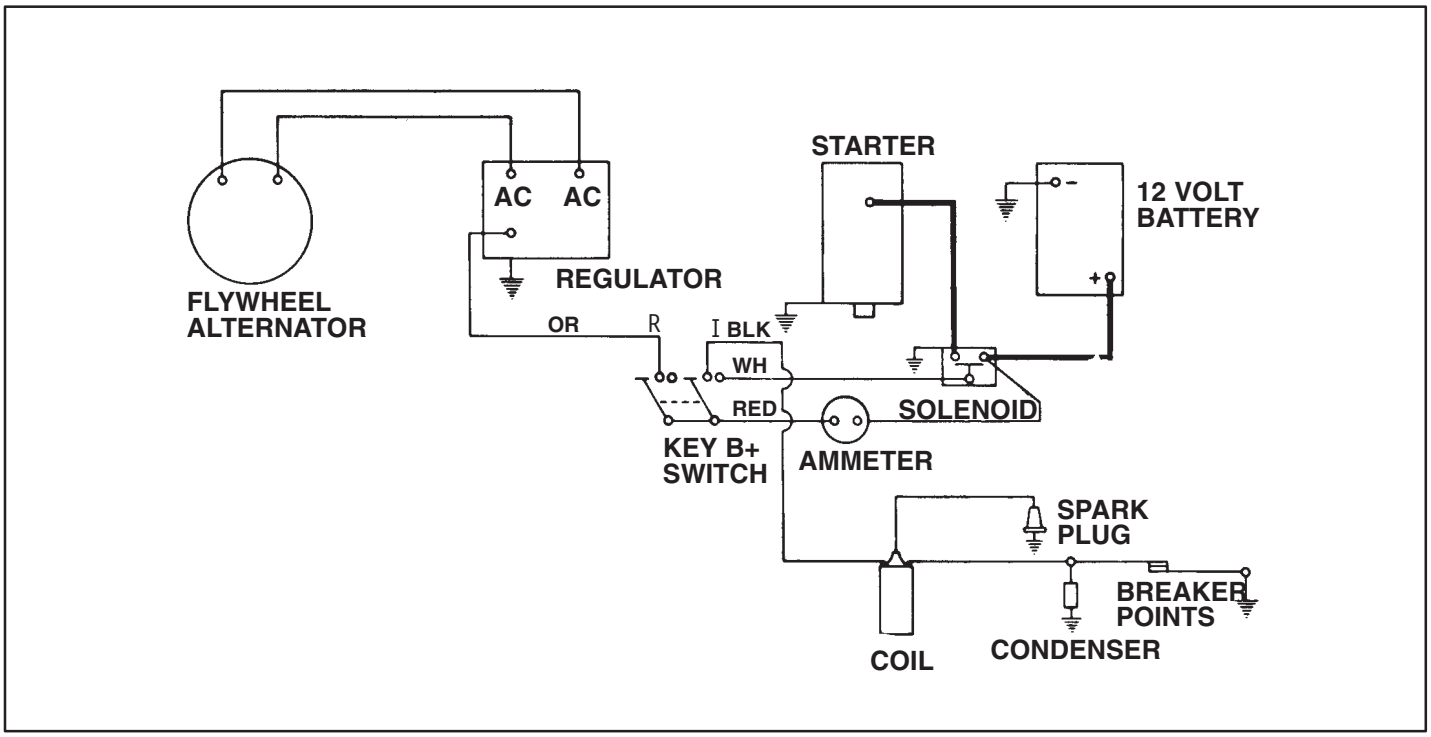


Fig. 70 Electrical System Schematic

ALTERNATOR/RECTIFIER–REGULATOR SERVICE

No adjustments are possible on the alternator system and field service on this system is not recommended. The faulty part should be replaced by a new part. To pinpoint a faulty part, use the following procedure:

PROBLEM	CAUSE	CORRECTION
Dead Battery or Weak Battery.	No charge to battery.	Perform Test 1.
		Perform Test 2.
	Faulty battery.	Perform Test 3.
	Engine not grounded.	Ground engine to frame.
Faulty Battery.	Low electrolyte level.	Check.
	Low specific gravity.	Check.
	Dead cell.	Replace the battery.
Overcharged Battery (uses excessive amount of water, or feels hot to touch).	The rectifier–regulator is not functioning properly.	Perform Test 3.

CHARGE SYSTEM SERVICE

Adjustment of the charging circuit cannot be made. The rectifier/regulator is a sealed unit and repair can not be made. Replace any part that has a defect. A defective rectifier/regulator will often have an odor.

NOTE: Do not run the engine without a battery in the system. It will cause damage to the rectifier/regulator unit.

NOTE: Disconnect the wires from rectifier/regulator while welding on the Bobcat.

PROBLEM	CAUSE	CORRECTION
Battery has defect.	Electrolyte level is low.	Add distilled water.
	Specific gravity is low.	Charge battery.
	A cell is dead.	Battery replacement.
Battery has low or no charge.	Moisture in ignition switch.	Clean switch.
	No charge to battery.	Do test 1 & 2.
	Battery has defect.	Do test 3.
	Engine does not have electric ground.	Mark ground from engine to frame.
Excessive charge to battery (battery uses excessive amount of water or feels hot to touch).	The rectifier/regulator is not operating correctly.	Do test 3.

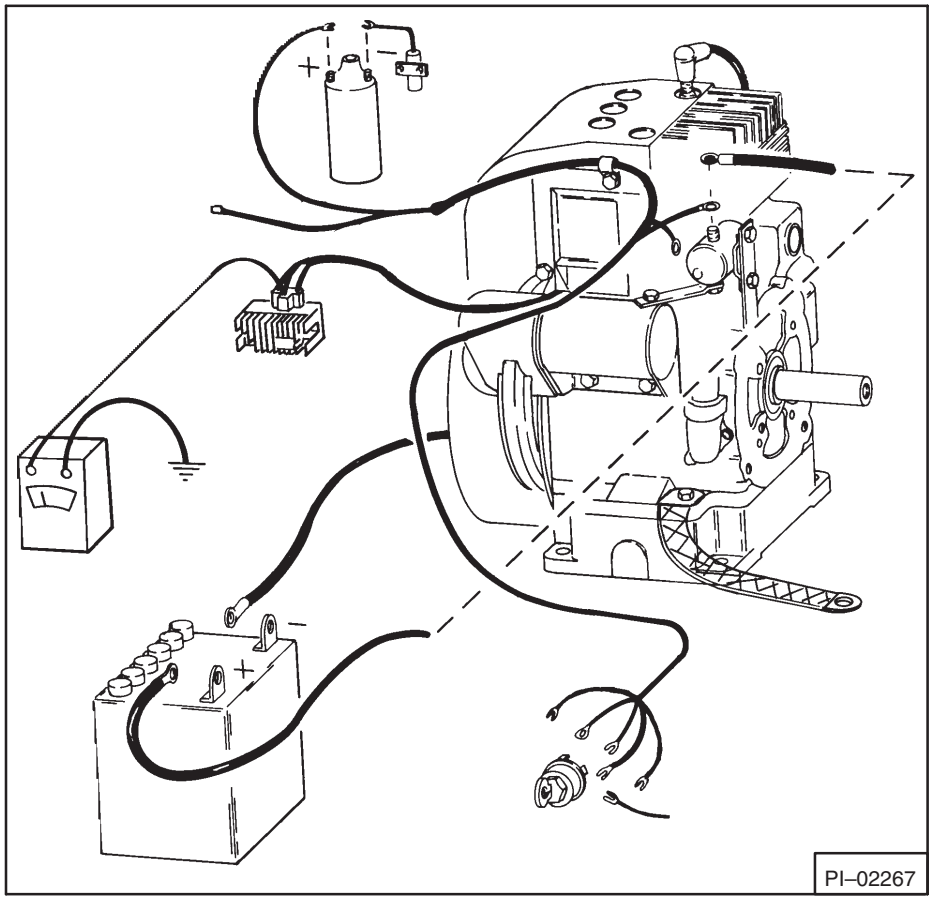


Fig. 71 Test One

CHARGE SYSTEM CHECKS

Test No. 1 (Fig. 71).

Charging System Test

Remove orange wire. Connect all other wires. Insert a small blade into the regulator end of connector to release the retainer on the spade terminal. Pull out the wire.

Connect a red DC voltmeter to the B^+ terminal on rectifier/regulator. Connect the black wire from the voltmeter to ground. Run the engine at full throttle with no load. Check the voltage.

1. Above 14 volts–the alternator system is ok. Check the battery cable connections at the battery and the starter solenoid.

2. Less than 14 volts–check for a defective rectifier/regulator (Test No. 2).

3. 0 volts–check for a defective stator or rectifier/regulator (Test No. 2). Test No. 2 (Fig. 72)

Test No. 2 (Fig. 72)

Generator Stator Test

Remove connector at rectifier/ regulator. Connect voltmeter tostator wires. Connect all other wires. Also test the stator for circuit to ground. Stop the engine for this test. Use the ohmeter scale on the tester . The ohmeter should read infinity.

Use tester with AC voltage scale.

Disconnect the AC wire from the rectifier/regulator. Connect an AC voltmeter to the AC terminal and the AC wire. Run the engine at full throttle with no load. Check the voltage.

1. 28 volts or more–the stator is correct. The rectifier/regulator has a defect. Replace the rectifier/regulator.

2. Less than 28 volts–the stator has a defect. Replace the stator.

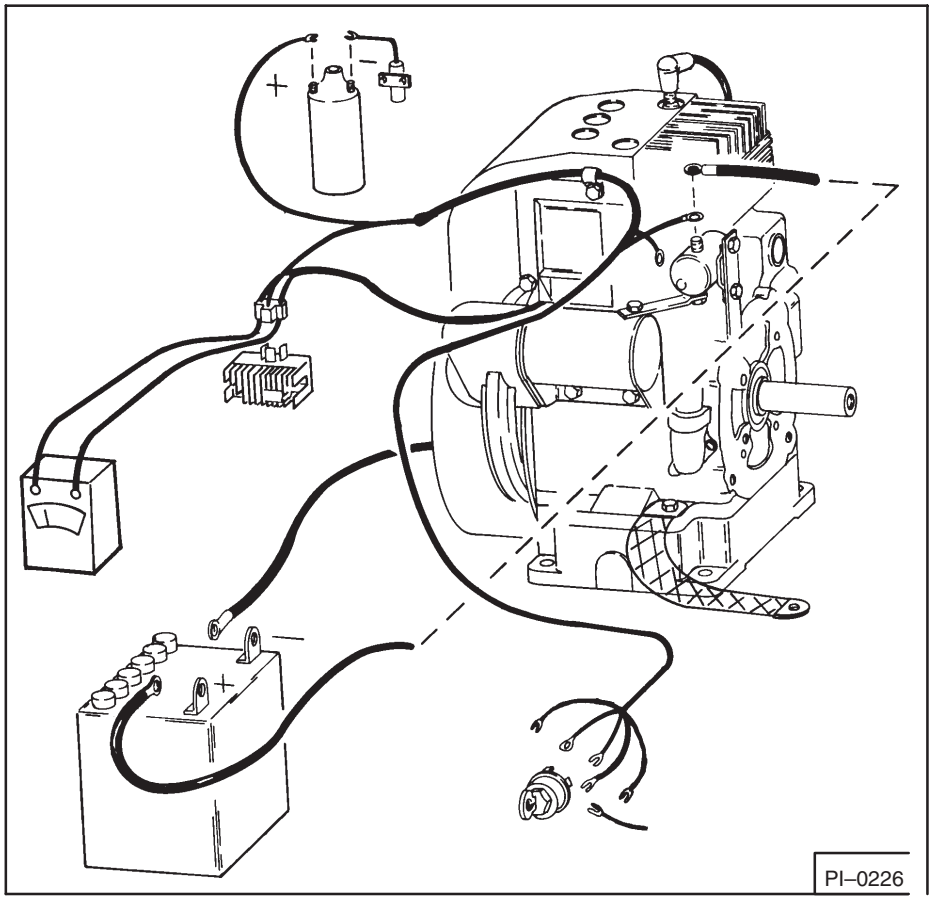


Fig. 72 Test No. 2

Test No. 3 (Fig. 73)

Overcharge Test

Connect all wires and cables as in normal operation. Connect the red wire from a DC voltmeter to the common terminal of the starter solenoid. Connect the black wire from the voltmeter to the engine. Run the engine at full throttle with no load. Check the voltage.

1. Less than 14.7 volts–the alternator is correct. The battery has a defectand will not hold charge. Test the specific gravity of the battery . Replace the battery if necessary.

2. 14.7 volts or more–the rectifier/ regulator has a defect. Replace the rectifier/regulator.

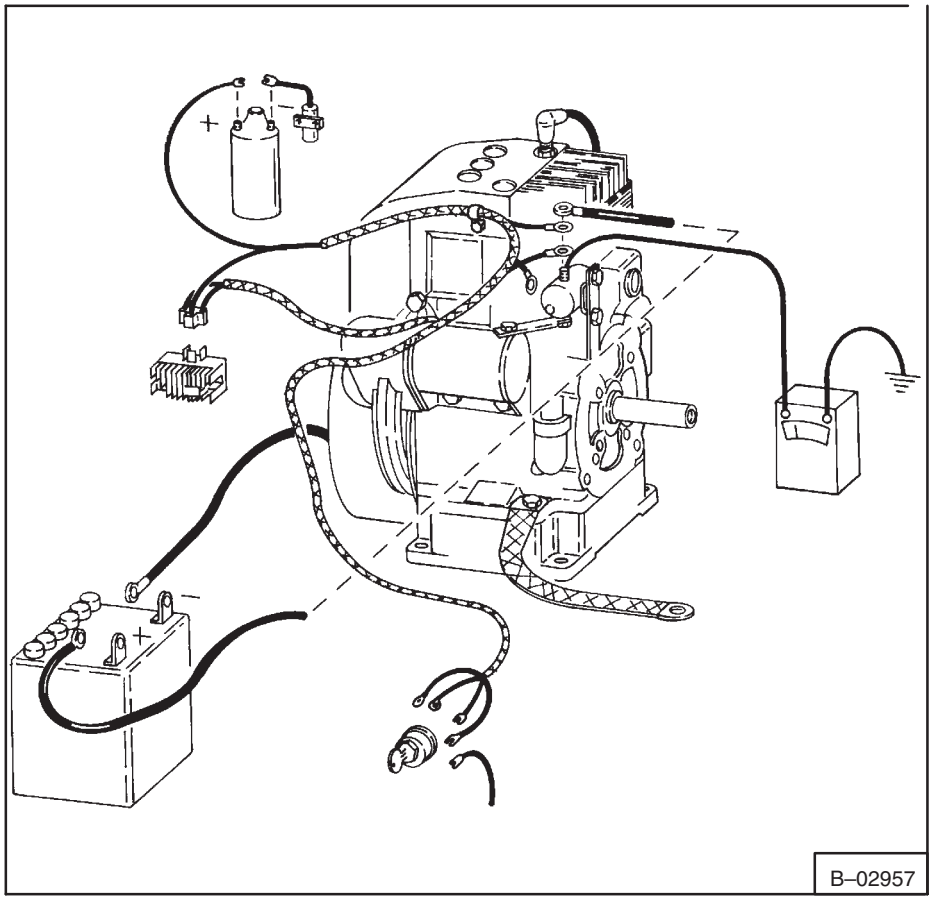


Fig. 73 Test No. 3

STARTER SERVICE

To Check Starter

1. Lift the Bobcat on safe blocks. Keep the ignition switch in the off position. Be sure the battery has full charge and the connections are clean & tight.

2. Turn the ignition switch to engage the starterIf the starter turns but does not engage check if the battery is installed with correct polarity or replace the starter drive. If the starter does not turn, do this.

3. Connect a jumper wire to by–pass the starter switch. If the starter now turns, the defect is in the starter switch. If the starter does not turn, do this.

4. Connect a jumper cable to by–pass the starter solenoid. If the starter now turns the defect is in the starter solenoid.

5. When the starter turns slowly the problem may be worn brushes.

Removal of Starter

To remove the starter:

1. Disconnect the negative battery cable.

2. Disconnect the wires from the starter connections.

3. Remove the two bolts which hold the starter in place. Remove the starter.

HYDRAULIC SYSTEM OVERHAUL


bobcat

HYDRAULIC SYSTEM

HYDRAULIC CYLINDERS INSPECTION

There are several conditions that can cause hydraulic cylinder failure. They are:

1. A nick on a cylinder shaft can cause seal damage in the cylinder head and external leaks. Occasionally check the shaft by running your hand up and down the length of it. This is particularly important when handling gravel, stone or scrap metal. Shaft inspection can detect nicks or scratches before they are large enough to damage the cylinder head seals. Carefully dress down any nicks or scratches on a cylinder shaft with a fine Carborundum stone (Fig. 74).

2. Pinholes at either of the cylinder ports can cause external leaks. Pinholes can be welded by gas or electric arc welding. When welding cylinders at the pivot end, extend the cylinder to prevent heating and weakening the piston seals. Loosen the fluid port fitting to relieve any pressure resulting from heat. When welding at the head (rod) end of cylinder, disassemble the cylinder to prevent damage to seals in the head. Use a low hydrogen type welding rod (#7018).

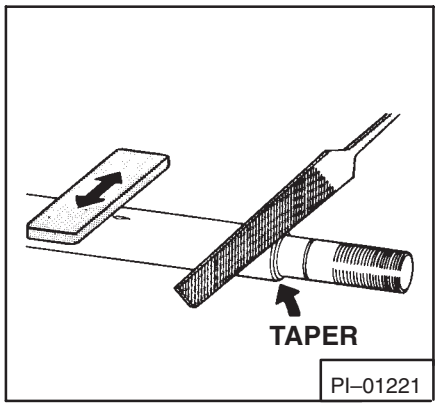


Fig. 74 Dressing Down Nicks

When using an arc welder, do not apply the ground clamp on the cylinder shaft. This would cause a burned spot on the shaft. Place ground clamp on the cylinder body.

⚠ WARNING

When welding on the machine, separate the terminal plug from the rectifier–regulator to prevent damage to the alternator (Fig. 74A).

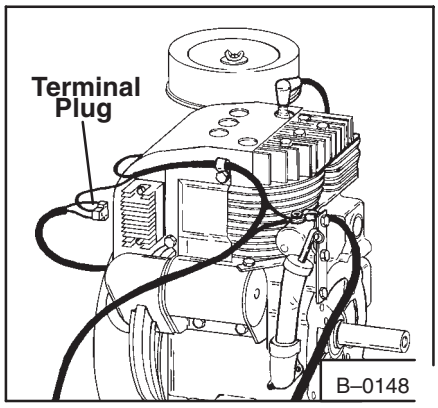


Fig. 74A Terminal Plug

3. A dented cylinder case can cause the piston to be worn flat and result in internal leakage.

   If a cylinder case has been dented and the piston worn flat, it is not economical to repair the cylinder in most cases. Replace the cylinder with a new one.

HYDRAULIC CYLINDER REPAIR

To disassemble a hydraulic lift or tilt cylinder:

1. Remove the hydraulic cylinder from the machine.

2. With the special spanner wrench, remove the head from the cylinder.

3. Pull the shaft and piston assembly from the cylinder case.

To replace the cylinder seals:

1. Remove the piston from the shaft.

2. File or grind a slight bevel on the shoulder at the piston end of the shaft (Fig. 74). This will allow the seals to be installed over the shoulder without damaging them. Dress all the nicks of the shaft. Do not use a power grinder or a file for this purpose.

3. Soak the Teflon piston seal in warm oil or water for several minutes before installing it. This will make it softer and easier to install.

To reassemble the hydraulic cylinder:

1. Install the cylinder head seals (Fig. 75, Items 2, 3, 4, 6 & 7) and place the cylinder head carefully onto the cylinder shaft.

2. Install the spacer (Item 14, if used) onto the shaft.

3. Install the piston seals (Items 11, 12 & 13) and place the piston onto the end of the cylinder shaft.

4. Install the piston locking nut (Item 9) and tighten its securely.

5. Use the special cylinder repair tool (Fig. 76) when installing the piston into the cylinder. The tool will prevent the threads in the end of the cylinder case from damaging the piston seals.

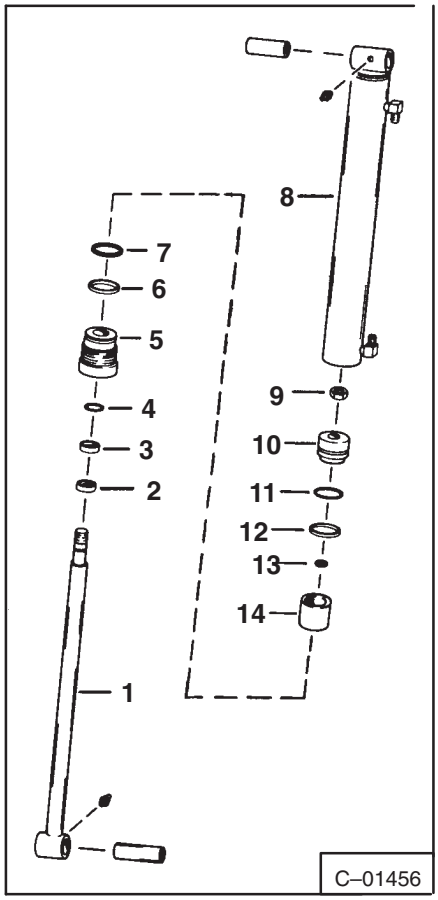


Fig. 75 Hydraulic Cylinder Breakdown

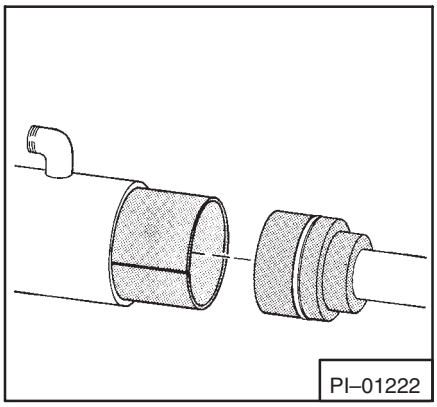


Fig. 76 Reassembling Cylinder

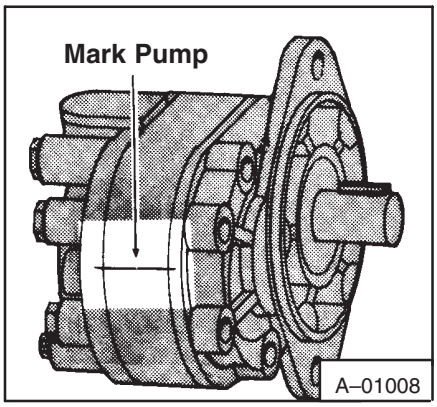


Fig. 77 Marking Pump

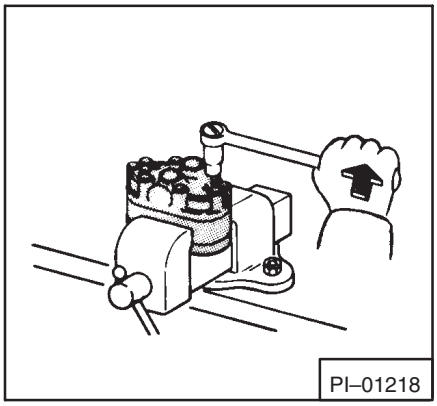


Fig. 78 Disassembly of Hydraulic Pump

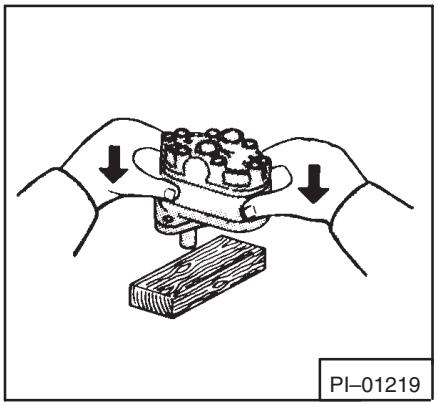


Fig. 79 Separation of Plates

6. Use extreme care, when inserting the cylinder head into the cylinder, to prevent o–ring damage.

7. Tighten the cylinder head with the special spanner wrench.

HYDRAULIC PUMP REPAIR

When the hydraulic pump will not deliver 4.5 GPM at 1250 PSI at full engine RPM the pump is worn. Repair or replace as necessary.

Disassembly of the hydraulic pump:

1. Remove the key from the pump drive shaft.

2. Thoroughly clean the outside of the pump. Scratch a line across the edges of the cover, gear plate and body to aid in assembly (Fig. 77).

3. Clamp the pump in a vise. Remove the bolts that hold the pump plates together (Fig. 78).

4. Remove the pump from the vise. Separate the plates by striking the shaft onto a wooden block (Fig. 79).

5. Remove these items from the front plate (shaft end) of the pump.

Cessna hydraulic pump (Fig. 80):
(1) Seal and check ball
(2) Diaphragm
(3) Phenolic Gasket
(4) Protector Gasket
(5) Diaphragm Seal
(6) Shaft Seal

Parker hydraulic pump (Fig. 80A):
(1) Wearplate
(2) Heat shield
(3) Gasket
(4) V–Seal
(5) O–Ring seal
(6) Snapring
(7) Shaft Seal

6. Clean and dry all pump parts.

7. Inspect the pump drive shaft for broken keyway. Inspect the pump drive shaft and idler gear shaft at bearing points and seal areas. Rough surfaces or wear may be found at these points. Replace the pump if wear is present on the shaft or at the bearing points.

8. Inspect the gear faces for scratches or excessive wear. Replace the pump if the gears are badly worn.

9. Replace the pump if the bearings in either the front or back plate are badly worn.

10. Inspect the gear chambers in the pump body for excessive wear or scratches. If the bearings were badly worn, excessive wear in the pump body can be expected. Replace the pump.

Assembly of Cessna hydraulic pump:

NOTE: The large o–ring, diaphragm, phenolic gasket, protector gasket, diaphragm seal and shaft seal are available as a kit (Fig. 80). Replace these with new parts.

1. Place the diaphragm seal into the grooves in the front plate.

2. Press the protector gasket and phenolic gasket into the diaphragm seal.

3. Drop the steel balls into their seats and place the springs over the balls.

4. Place the diaphragm over the phenolic gasket, bronze face up.

NOTE: The entire diaphragm must fit inside the raised rim of the diaphragm seal.

5. Put the gear assemblies into oil and install them into the front plate bearings.

6. Apply a thin coat of heavy grease on both faces of the pump body (gear plate) and place the gear plate over the gears. Check the scratch marks on the sides of the plates to be sure you assemble the pump correctly.

7. Slide the back plate over the gear shafts until the dowel pins are engaged. Check the scratch marks on the sides of the plates to be sure you assemble the pump correctly.

8. Insert bolts and tighten to 25–28 ft.–lbs. (34–38 mm) torque.

9. Install the pump drive shaft seal over the shaft. Use care to not cut the rubber sealing edge. Apply oil to the seal for easier installation. Tap the seal with a plastic hammer to seal it.

The pump should turn with hand pressure if it was assembled correctly.

10. Install the spacer & sheave on the pump. The spacer goes around the snap ring on the Parker pump & against the snap ring on the Cessna pump.

NOTE: Use care when tightening the sheave holding nut. If it is over–tightened it may break the pump shaft at the threaded area. If the nut is under–tightened, the sheave may become loosened and wear the shaft and sheave.

After the sheave is seated on the shaft, the sheave nut must be tightened to 35 ft.–lbs. (47.5 Nm) torque.

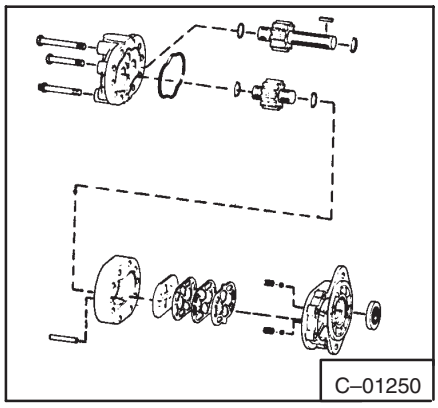


Fig. 80 Cessna Hydraulic Pump

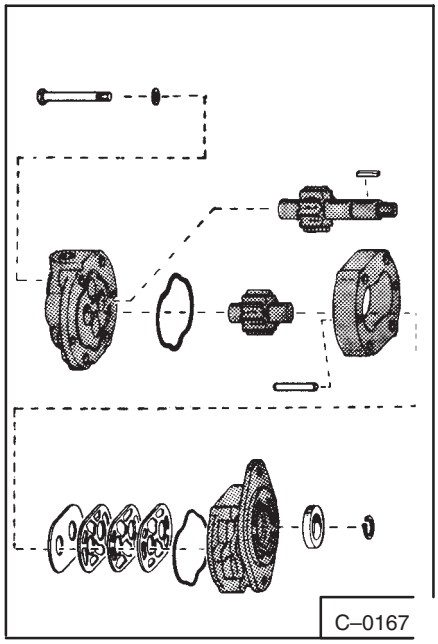


Fig. 80A Parker Hydraulic Pump

CONTROL VALVE BANK REPAIR

If the control valve is leaking or otherwise needs repair, it should be removed from the machine and disassembled in a clean work location.

Use care in the disassembly of the valve. Do not allow parts to become mixed with parts from another valve section. Repair only one valve section at a time. Spools are not interchangeable between valve sections. Each spool is factory "lapped" to fit it' s particular valve body only.

Refer to the parts manual for correct assembly of internal parts.

To repair the control valve:

1. Disconnect the pedal linkage and tube lines and remove the control valve from machine. Clean the outside of the valve thoroughly.

2. Remove the tie rod nuts and carefully slide the valve sections off the tie rods. Be careful to avoid losing the circuit check and poppet spring, which is enclosed between valve sections. The poppet must be kept with it's valve section. An "O" ring is also installed between the sections.

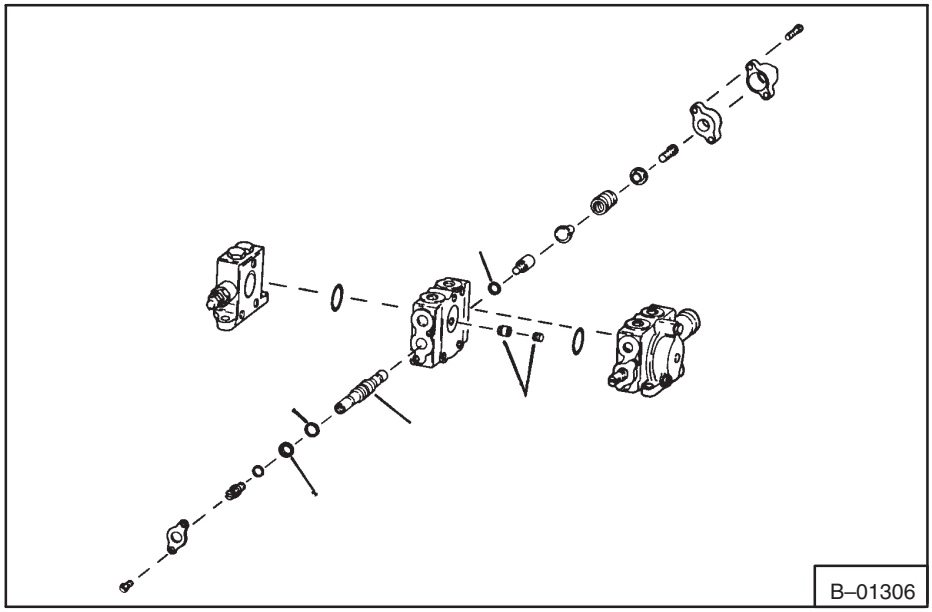


Fig. 81 Valve Section Disassembly (Husco)

An O–ring spool seal, protected by a one–piece molded wiper is used at each end of the spool. Replace them as follows:

1. Remove the seal plate from the linkage end of spool (Fig. 81).
2. Remove the end cap, spacer , cap screw, spring seats and compression spring.
3. Remove the spool from the valve section.
4. Remove the worn seals from the spool.
5. Inspect the seal counterbores to be sure the surfaces are smooth and completely free of dirt, pits, rust and metal particles.
6. Select new seals and wiper and coat them with hydraulic fluid. Thoroughly clean the seal counterbore in the housing and install the seal, followed by the wiper.
7. Carefully install the spool, with seals, into the valve section.
8. Reassemble spool components and end cap. T ighten the cap screw until spool centers in neutral.
9. Install the seal plate and spool control end.

⚠ WARNING

When reassembling the control valve bank, tighten the 5/16" tie rod nuts to 14 ft.–lbs. and the 3/8" nuts to 33 ft.–lbs. torque. Do not exceed these torque values, or warping the sections will ruin the valve.

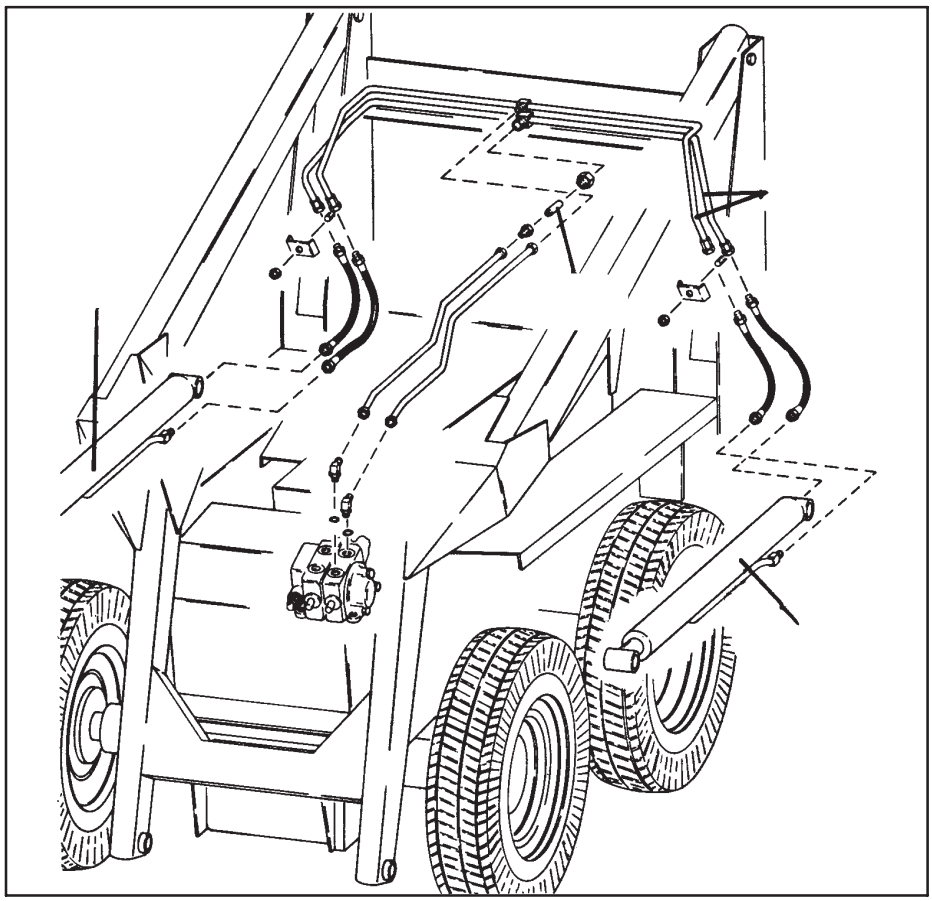


Fig. 83 Lift Cylinder Line Restrictor

LIFT CYLINDER LINE RESTRICTOR

A restrictor spool is located in the lowest "Tee" on the upright crossmember (Fig. 83). The function of the restrictor is to control lowering speed of the boom without restricting the boom raising circuit.

Machines equipped with wardcontrol valves have the restrictor located in the rear port of the lift valve section.

If boom raises or lowers too slowly and hydraulic pump, lift cylinder or control valve (linkage) are not at fault, the problem may be due to a faulty restrictor spool.

Remove the spool and check for foreign material. Replace the spool if it is defective.

Do not operate the loader withoutthe restrictor installed. This could cause structural failure due to cylinder cavitation and create a safety hazard.

WARD CONTROL VALVE REPAIR

Figure 83A shows the parts assembly of the tilt valve section of the ward control valve. “O” ring seals are also shown between the valve sections.

To disassemble a valve section remove the bonnet assembly at the rear of the valve. The spool can then be withdrawn from the valve body . Always remove or reinstall the spool from the rear of the valve. Do not attempt to install the spool through the front of the valve as this will damage the “O” ring seals.

The rear seal, (Figure 83A, Item 1) must be installed after the spool has been installed in the valve section.

The four through bolts must be tightened to 16 ft.–lbs. torque.

Foreign material may get caught in the master relief valve and cause weak, slow hydraulic response. When this happens, remove the relief valve from the control valve. Depress the plunger at the end of the valve and wash the valve in solvent. Then blow it dry with an air hose.

Reinstall the valve and check the relief pressure as described on page 16.

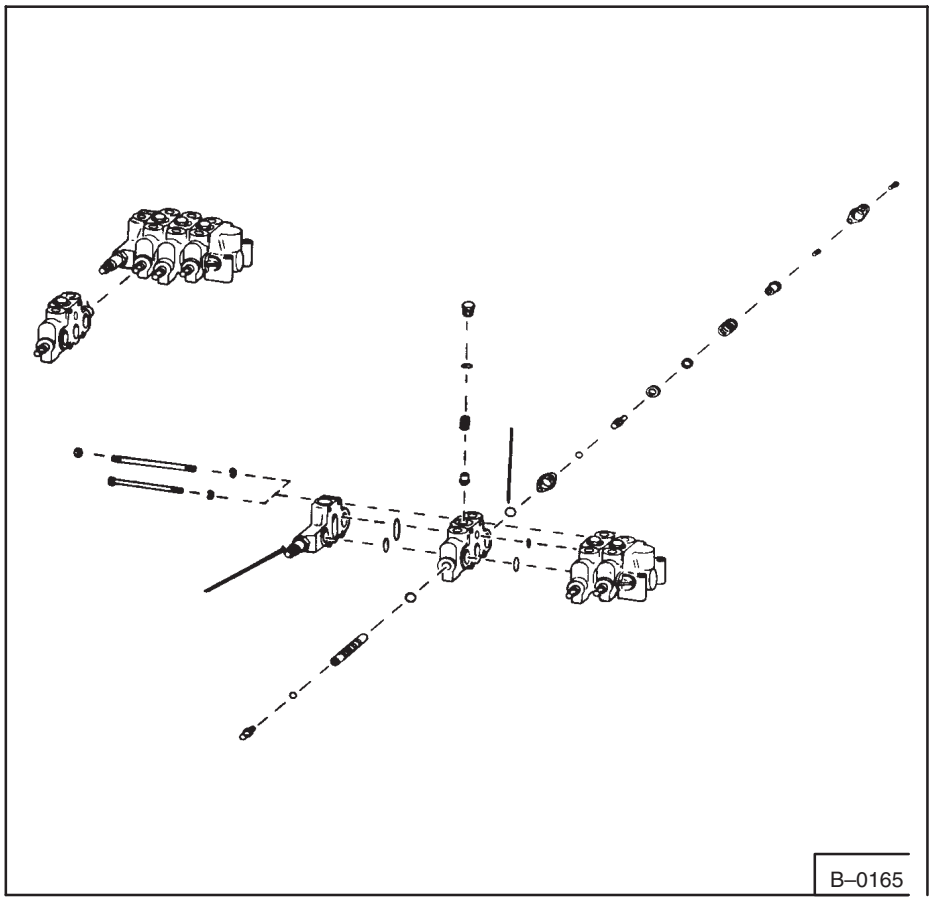


Fig. 83A Valve Section (Tilt) Assembly

When foreign material is found in the relief valve, the hydraulic system must be flushed. This can be done by disconnecting the fluid return hose from the control valve and plugging the end of the hose. Connect another hose to the valve and place the free end into the reservoir fill pipe.

Start the Bobcat engine, raise and lower the lift arms and operate the tilt hydraulic controls to the full limit of travel several times. Continue this for ten minutes then reconnect the fluid return hose.

To check for a scored valve spool or porous valve casting perform the flow and pressure test as described on page 15.

The lift circuit restrictor (Fig. 83B, Item 2) must move freely in the bore to let fluid flow normally when the lift arms are being raised. If the restrictor poppet becomes stuck in the bore, it will cause the lift arms to be slow when they are being raised. When this happens, remove the poppet and polish the outer surface of the poppet. Also round or level the top edge of the poppet to remove the sharp edge which could cause it to bind in the bore.

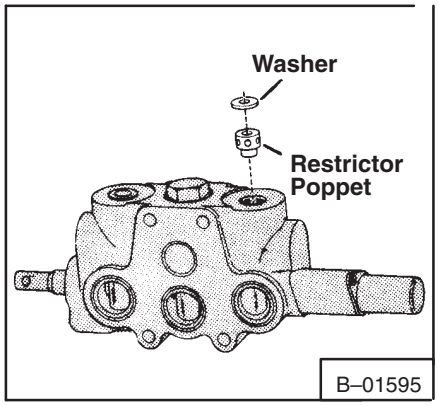


Fig. 83B Lift Circuit Restrictor (Ward Drive)


bobcat

TRACTION DRIVE SYSTEM OVERHAUL


bobcat

TRACTION DRIVE SYSTEM CHAIN REMOVAL

NOTE: When maintenance is to be performed on the transmission case, it is recommended that the Operator Protective Guard and fenders first be removed.

To remove the protective guard:

1. Remove the 5/8" nuts from the boom uprights at the rear of the cab.
2. Remove the 3/8" screws and nuts from the front supports of the protective guard and lift the guard from machine.

To remove the fenders:

1. Disconnect the battery cables, remove the battery holddown bracket and lift the battery out of the machine.
2. Remove the seat and pan assembly from the machine.
3. Unhook the drive idler spring.
4. Remove the 3/8" nuts and screws from the fenders and remove the fenders.

To remove a drive chain:

1. Raise the machine so that all four wheels are off the ground. Block securely.
2. Disconnect the foot pedal linkages from the hydraulic control valve.
3. Remove all of the 3/8" nuts from transmission cover and remove the cover to expose the drive system.
4. Turn the chain being removed until the connector link is at the top and easy to get at.
5. Loosen the idler bracket until the chain is very loose and remove the connector link.
6. Pull the chain out of the machine.

NOTE: Pull the final drive chains out over the top of the rear axle sprocket. If you try to pull them out under the sprocket the chain can "bunch up" and keep it from passing underneath (Fig. 84).

CHAIN REINSTALLATION

Chains can be threaded around all the sprockets by hand. The wheels should be off the ground so that the sprockets can be turned while treading the chain.

See Fig. 85 for routing of the various chains.

Chains should be routed around the sprockets from underneath and up, over the back side. A long soft wire is helpful in threading the chains around sprockets (Fig. 87).

Fabricate a wire clip (Fig. 86) from stiff wire and use it to hold the lead link in place when threading the chain around the large lower jackshaft sprocket (Fig. 88).

Install the connector links so that they point in, toward the divider plate. This will permit easier removal in the future.

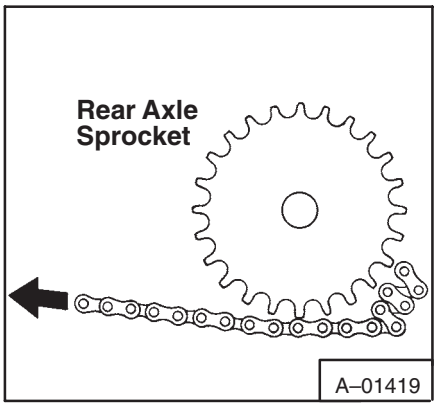


Fig. 84 Chain "Bunch–up"

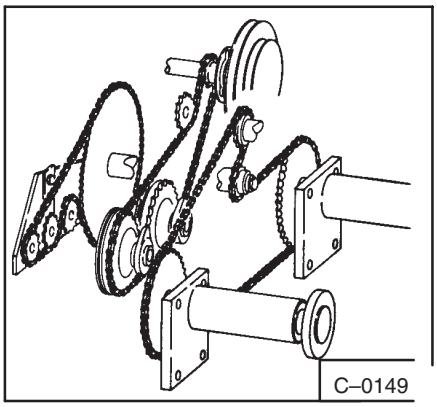


Fig. 85 Chain Routing

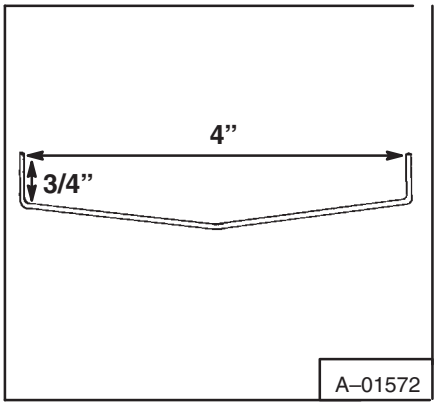


Fig. 86 Wire Threading Clip

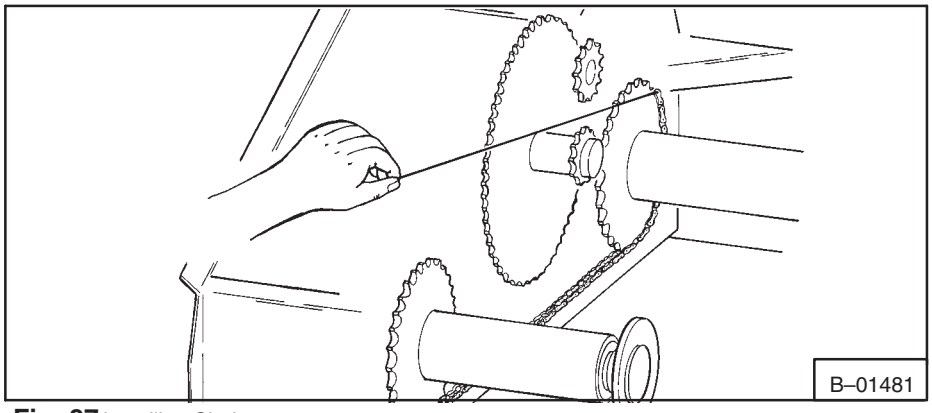


Fig. 87 Installing Chain

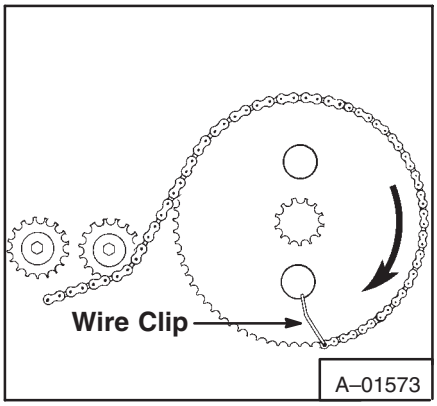


Fig. 88 Threaded Lower Jackshaft

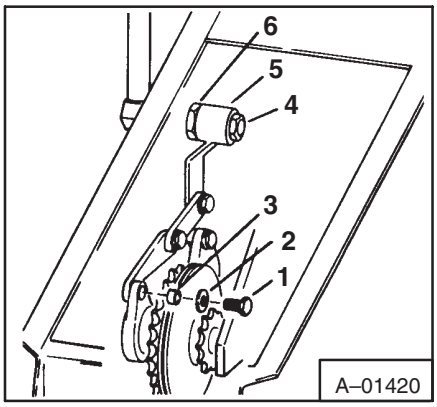


Fig. 89 Clutch Linkage Hardware

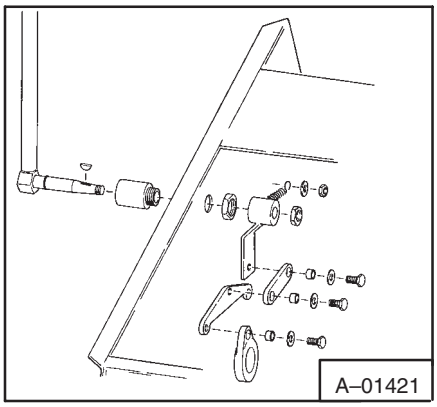


Fig. 90 Steering Linkage Parts

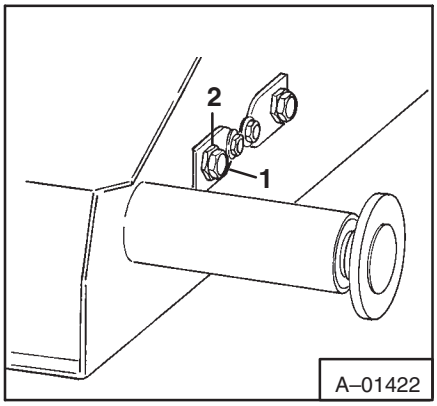


Fig. 91 Adjusting & Locking Nuts

REMOVING STEERING LINKAGE

To remove the clutches or other internal parts, the steering linkage must first be detached.

Remove the hex screw (Fig. 89, Item 1), flat washer (Item 2) and bushing (Item 3) from the front and rear clutch actuating nuts. Be careful not to drop these parts into the tank.

The steering lever and inside linkage may also be removed to allow more working room. Remove the nut and washer that hold the centering spring to the transmission case wall. Remove the large hex nut (Fig. 89, Item 4) from the end of the pivot shaft. Tap the end of the shaft with a rubber or plastic hammer to release the linkage arm (Item 5) from the tapered shaft. Be sure to remove the Woodruff (half moon) key. Remove the other large hex nut (Item 6) and pull the lever and pivot shaft out of the machine.

During reassembly, torque the 1–1/2" bushing nut to 130 ft.–lbs. (Item 6) Fig. 90 shows the steering linkage parts. (For help in reassembly).

NOTE: When you install clutch linkage to the clutch actuating nuts, use loctite and torque the bolts to 20 ft.–lbs. (Fig. 89, Item 1) maximum so you do not crush the bushings (Fig. 89, Item 3).

REMOVING CLUTCHES

To remove a clutch assembly:

1. Drain the fluid from the transmission case. The drain plug is located at the bottom front of the transmission case. Catch the fluid in a clean container.
2. Remove the inside and outside clutch chains of clutch assembly being removed.
3. Disconnect the steering linkage from the clutch or clutches being removed.
4. Loosen the 5/8" locking nut (Fig. 91, Item 1) from the clutch being removed.

NOTE: One of the 5/8" locking nuts may be welded in place on the shaft. In this case, remove the nut on the other end of the shaft and pull shaft out.

5. Pull the adjusting nut and "O" ring off the shaft.
6. Reach into the transmission case and support the clutch assembly with your hand. Pull the clutch shaft until the end is at the center divider plate, just free of the clutch assembly. The clutch assembly may now be lifted out of the transmission case. Fig. 92 shows the parts of a clutch assembly.

When reassembling clutches, inspect the hardened races (thrust race) for scuff marks or damage. Replace defective races. Replace the thrust bearings if they show wear or damage. Be sure races fit flush in their carriers. It should be impossible to insert a feeler gauge at any point around the circumference of the race.

When installing a new clutch lining, place it over the shoulder on the inside clutch plate. Be sure it fits easily over the shoulder . If it doesn't, file or sandpaper the inside diameter of the lining until it fits properly.

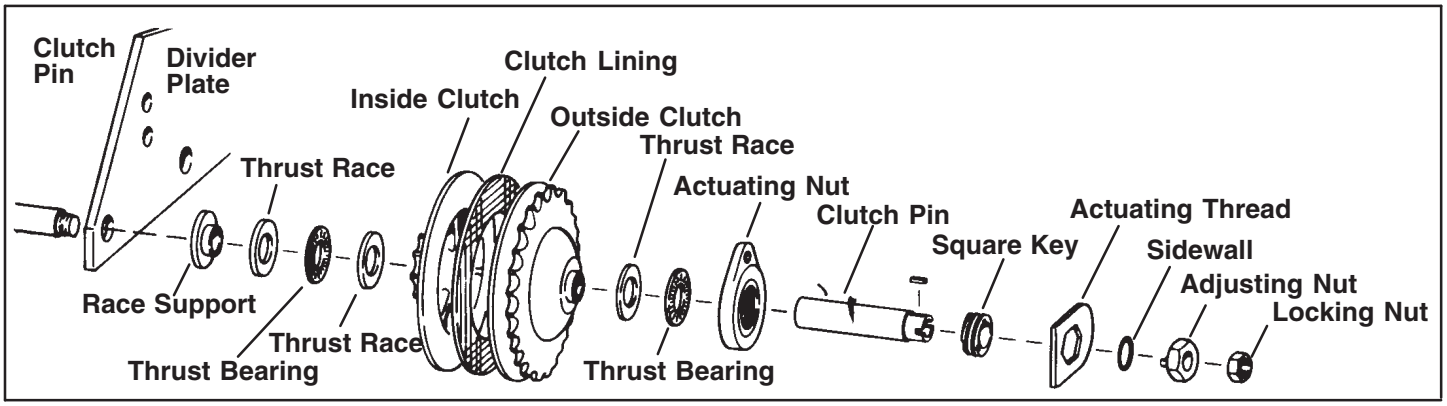


Fig. 92 Clutch Assembly Parts

WARNING

If you force the lining onto the shoulder of the clutch plate it may crack the center member of the lining and cause failure after only a few hours service. The lining MUST turn freely on the clutch plate.

When installing the adjusting nut be sure to install the "O" ring first.

Inside clutch idlers are located on the divider plate. Fig. 95 shows the breakdown of the idlers.

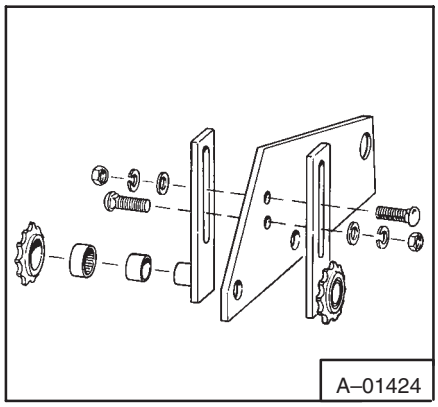


Fig. 95 Inside Clutch Idlers

REPLACING CLUTCH NEEDLE BEARINGS

When replacing clutch needle bearings, press one bearing in from each side of clutch hub. Press against the namebrand end of bearing only. Press the bearings in so they are flush with the outside of the hub (Fig. 96).

After a clutch assembly has been installed the steering lever travel will need to be adjusted. See "Clutch Adjustment".

When reinstalling drive chains, check their tension adjustment. See "Drive Chain Adjustment".

NOTE: Whenever the transmission case has been drained of fluid, refill, then check the level at the dipstick or check plug. Fill it to the full mark with Dexron automatic transmission fluid, or equivalent.

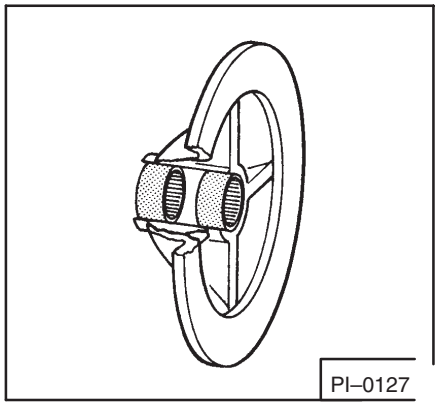


Fig. 96 Needle Bearings

REMOVING THE LOWER JACKSHAFT

To remove the lower jackshaft:

1. Follow the procedure under "Clutch Removal" to remove all four clutches.
2. Remove the final drive chains. (Refer to chain removal instructions.)
3. Remove the 15/16" hex nut from the end of the jackshaft (Fig. 97, Item 1).
4. Remove the large washer (Fig. 97, Item 2) and "O" ring from the shaft.
5. There may be several alignment washers on either side of the sprocket assemblies (Fig. 98). Check for them as you pull the jackshaft through. Note how many there are and where they are located. When installing the lower jackshaft check the sprocket alignment and, if necessary, relocate the washers to obtain correct alignment.

Be careful not to drop washers into tank when installing the race sleeves.

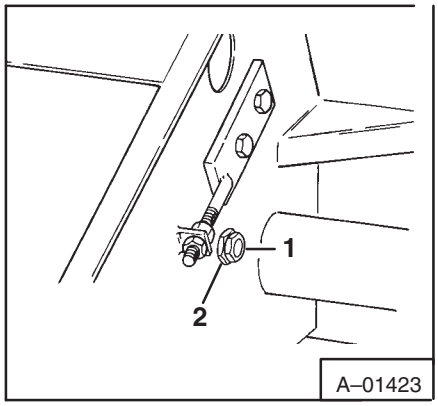


Fig. 97 Lower Jackshaft Nut

REPLACING SPROCKET BEARINGS

Needle bearings are not available to repair your lower jackshaft sprockets. Order the kit which has a spacer and bushing to replace the bearing. Use a reamer to make the bushing fit over the inner bearing race on the shaft. If the sprocket already has a bushing, replace the worn bushing. Use a press to remove and install the bearings or bushings. Install the bushings so they are level with the ends of the sprocket (Fig. 96). Use a spacer between the bushings.

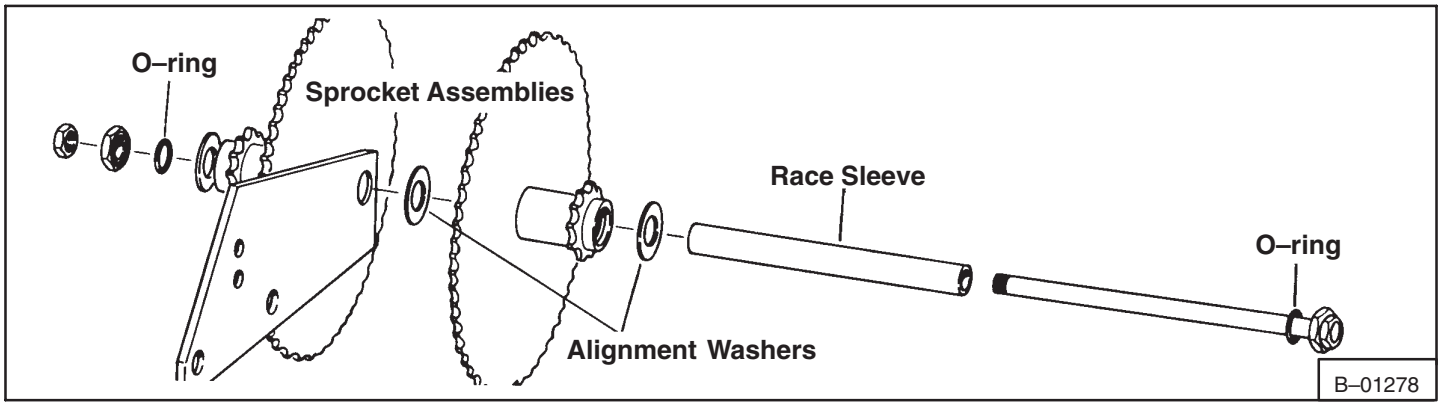


Fig. 98 Lower Jackshaft Breakdown

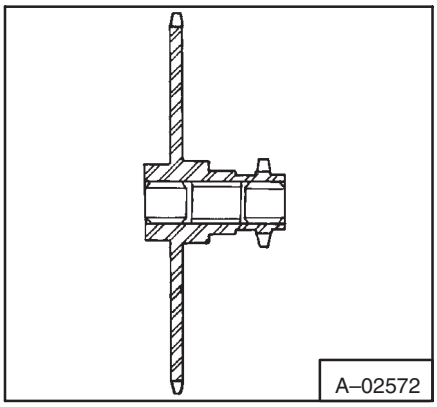


Fig. 99 Sprocket Assembly Bushings

Removing Upper Jackshaft

1. Disconnect the pedal linkages from the control valve and remove the transmission case cover.
2. Remove the transmission drive belt from the pulleys.
3. Remove the outside clutch chains.
4. Remove the 1–1/8" hex nut or , on later model machines, the cap screw washer and spacer sleeve from the jackshaft end opposite from the drive pulleys.
5. Remove the six (three in each) hex nuts and screws that hold the bearing housings and seal plates to the transmission case sidewalls.
6. With a rubber or plastic mallet, drive the jackshaft out through the pulley side of transmission case side wall.

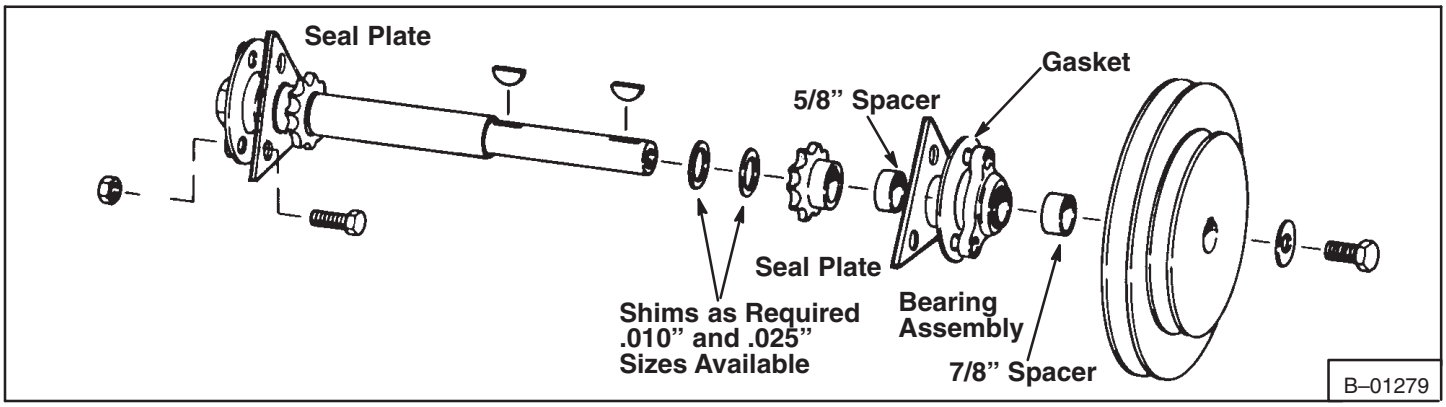


Fig. 100 Upper Jackshaft Breakdown

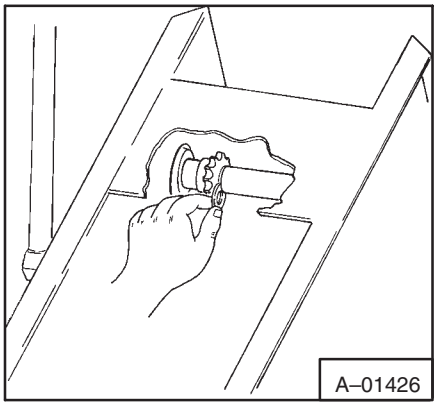


Fig. 102 Checking for Clearance

To Disassemble the Upper Jackshaft

Pull the spacer off the end of the jackshaft. Note whether there are any spacers between the sprocket and the shaft shoulder (Fig.100). These spacers should be installed, as required, to obtain a negative (free) pre–load on bearings and, correct alignment.

Upper jackshaft installation:
Fig. 100 shows the breakdown of the upper jackshaft.

1. Reassemble the upper jackshaft in the order shown in Fig. 100. Install the shims, as required to obtain a negative pre–load.
2. Place the double pulley (large pulley inward) on the shaft.
3. Secure the pulley with the washer and the 1/2" cap screw. Torque the screw to 60 ft.–lbs.
4. Screw the bearing housings to the side walls using hex screws, lock washers and hex nuts. Torque to 30–35 ft.–lbs.
5. Tighten the 1–1/8" locking nut to 120 ft.–lbs. On models using 3/8" cap screw, torque to 60 ft.–lbs.
6. Try to spin the shaft by turning the pulley by hand. The shaft should be free to spin three times. If it is too loose, check for clearance between the sprocket and jackshaft shoulder using .010" and .025" shims (Fig. 102). Install shims equal to any clearance found.
7. Reinstall the chains, transmission case cover, pedal linkage and drive belt.

REMOVING AN AXLE

To remove a hub and axle assembly:

1. Raise the machine so all four wheels are off the ground, and block securely Remove Operator Protective Guard and fenders.
2. Drain the fluid from the transmission case. Catch fluid in a clean container.
3. Disconnect the foot pedal linkages from the hydraulic control valve.
4. Remove the transmission cover to expose the drive system.
5. Remove the wheel from the axle to be removed.
6. Remove the final drive chain from the side which the axle is being removed. See “Chain Removal”.
7. If a rear axle is to be removed, it is first necessary to remove the lower jackshaft and clutch assembly.
8. Remove the two sprocket retaining cap screws and cap. Remove the sprocket from the axle.
9. Remove the hex nuts and lock washers that hold the axle housing to the frame.
10. Remove the axle, housing and gasket from the machine.

Fig. 103 shows an axle breakdown.

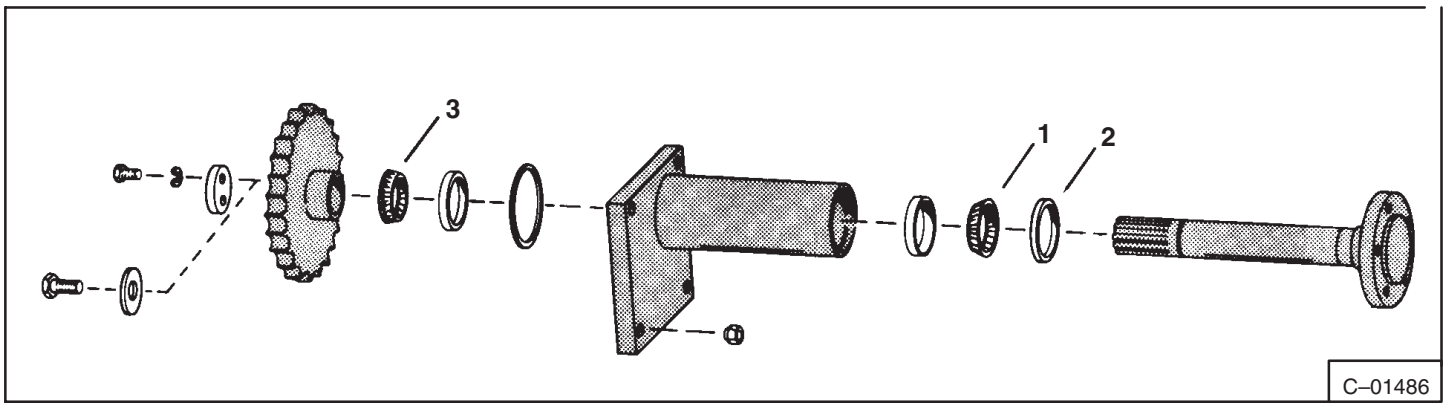


Fig. 103 Axle Breakdown

To assemble an axle housing assembly:

1. Press both outer races into the axle housing.
2. Place the outside bearing (Fig. 103, Item 1) into the outer race. Press the seal (Fig. 103, Item 2) into place.
3. Press the axle through the outside bearing, over both bearing rests. A driver (20” long x 2” OD x 1–9/16” ID) may be used to drive bearings in place. Be sure that the seal remains in place.
4. Using the same driver, drive the inside bearing (Fig. 103, Item 3) into place.
5. If a new sprocket is being installed, pre–fit it onto the axle first before installing the axle housing to the machine. This is done to insure that there are no burrs, etc. on the sprocket. Remove the sprocket.
6. Mount the axle housing onto the frame, being sure to include the gasket. Tighten the mounting nuts to 60 ft.–lbs. torque.
7. Slide the sprocket over the axle splines.

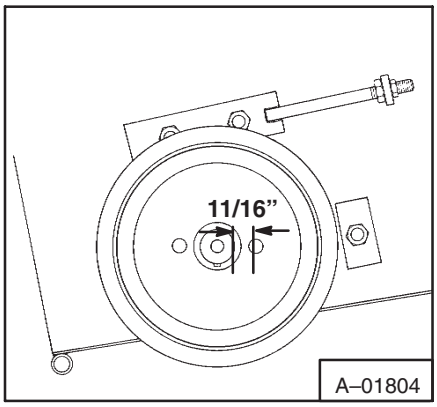


Fig. 103A Sprocket Assembly Bushings

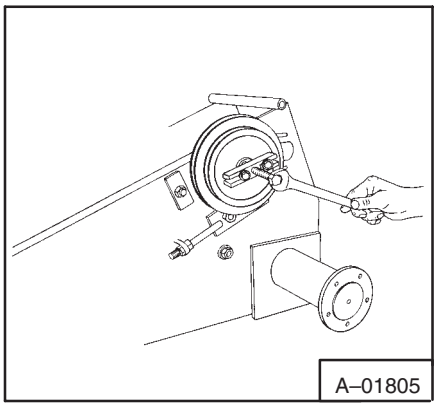


Fig. 103B Removing Sheaves.

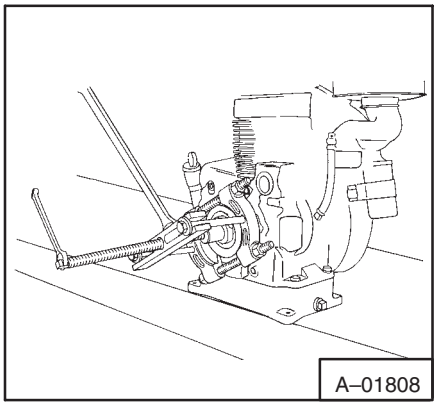


Fig. 103C Removing pump drive sheaves.

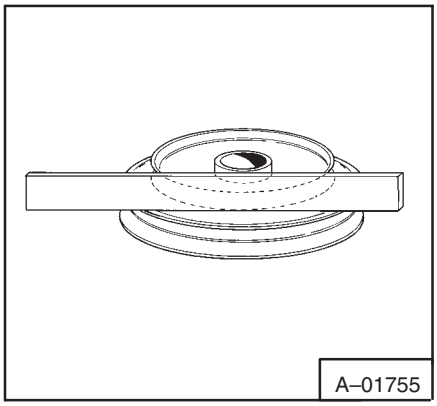


Fig. 103D Checking sheave clearance.

8. Fasten the end cap to the axle using the 3/8” lock washers and 3/8” x 1” cap screws. Put Loc–Tite on the screws first. Torque the screws to 20 ft.–lbs. Tap the end cap with a rubber or plastic mallet and retorque the screws to 20 ft.–lbs. Be sure the axle can be rotated by hand.

9. Re–install the final drive chain. See “Re–installing Chains” and “Drive Chain Adjustment”.

TRANSMISSION CASE & COVER

Transmission case cover and tank sealing must be maintained to prevent fluid leaks and/or foreign matter from entering the reservoir. Be sure that the contact surfaces are flat and free of dents. If the cover becomes bent it must be straightened or replaced.

When installing a new gasket, staple the corners together to aid in holding the gasket sections in place while mounting the cover . Torque the 3/8” screws to 12–15 ft.–lbs. Do not over–tighten.

DRIVE AND DRIVEN SHEAVES

The drive sheave assembly consists of three separate sheaves; one each for high and low range and the hydraulic pump drive sheave. On early model M–371 Bobcats the three sheaves were made up into one single unit.

The driven sheave assembly which is installed on the upper jackshaft consists of two separate sheaves, one for each speed range.

The sheaves are keyed to their shafts and fit tightly, making their removal difficult.

To remove sheaves which do not already have the 1/2” holes drilled on each side of the hub, first drill the holes as shown in Figure 103A. The sheaves can then be removed using a puller as shown in figure 103B.

To remove the inner (pump drive) sheave on the engine, use the method shown in figure 103C.

When reassembling sheaves, prior to their installation, first check the sheave spacing using a straight edge ruler as shown in figure 103D. Arrange the two sheaves so that the most belt clearance is obtained.

LOADER MAIN FRAME OVERHAUL


bobcat

BOOM ALIGNMENT

The boom and cylinder pivots are equipped with self–seating bushings. These bushings have edges which are tapered to a chisel like point around the circumference (Fig. 104). When the pivot bolts are tightened, these edges “bite” into the supporting framework to maintain a secure support.

If the boom pivot bushings are replaced or if they have become loose, boom must be aligned before tightening the pivot bolts. Before tightening, lower the boom until it is resting against the boom stops. See that the boom is squarely centered with respect to the frame of the machine.

Tighten the pivot bolts to 160 ft.–lbs. After tightening, strike the head of the bolt a few times with a heavy hammer and re–tighten the bolts. This will help assure a good seat.

If the cylinder pivot bushings have been removed, it is not necessary to re–align the boom as long as the boom pivot bushings have not been disturbed.

Tighten the cylinder pivot bolts to 160 ft.–lbs. Also use the hammer to obtain a secure seat.

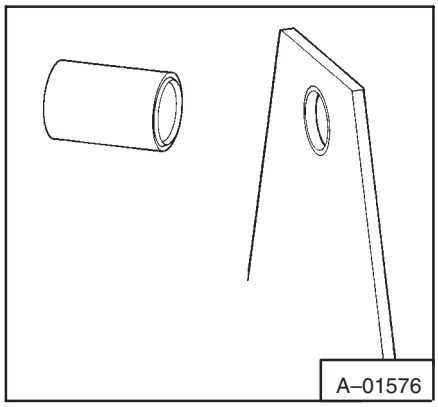


Fig. 104 Self–Seating Pivot Bushing

STRAIGHTENING BENT BOOMS

A bent boom may be straightened by securing one of the boom arms with a chain. Place a jack or other lifting device under the other (bent) boom and force it until it is aligned with the other boom. A stationary structure, such as a building upright “I” beam is best when securing one of the booms with the chain.

OPERATOR PROTECTIVE GUARD

The Operator Protective Guard is installed to provide maximum safety for the Operator. It should not be removed unless it is to facilitate maintenance and then is should always be re–installed before the loader is operated.

Check the heavy screen and pivot bracket welds for cracks and reweld where required. Be sure all bolts are in place and securely tightened when cab is mounted. (Check boom alignment before tightening the boom pivot bolts).

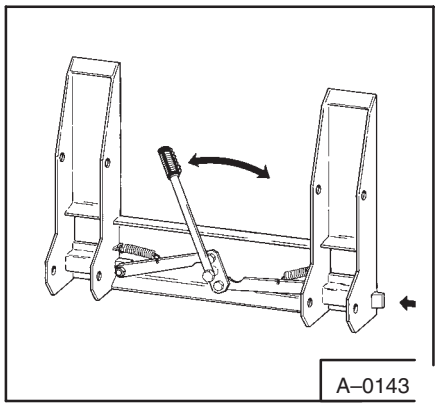


Fig. 105 Bob–Tach

THE BOB–TACH (Fig. 105)

Replace worn or bent Bob–Tach wedges and worn linkage. Tension springs must be in good condition to insure that the lever remains in locked position.

Check the wedges to be sure that they travel to the full locking distance when the lever is placed in lock position.

BOOM CYLINDER SUPPORT BRACKET

If the boom is left in the raised position while performing maintenance, it must be securely supported. A satisfactory support bracket can be made from a piece of channel iron, 23–3/4” long x 3” wide (Fig. 106). Do not work on the machine with the boom in a raised, unsupported position.

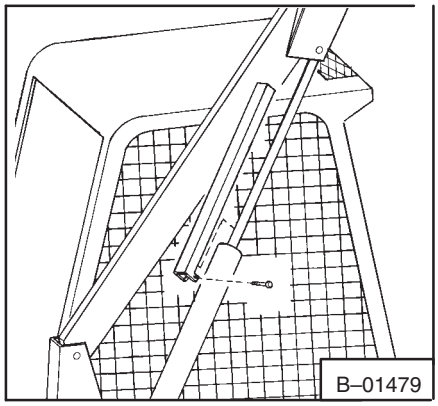


Fig. 106 Boom Safety Support

FUEL TANK

The fuel tank is supported by two rubber straps under the tank and two rubber blocks on the top. The fuel fill hose is supported by a bracket–clamp to hold it away from the engine.

If the brackets are too loose, the tank may move, causing the filler hose to come into contact with the engine rotating flywheel screen. The hose may wear completely through, resulting in fuel splashing out.

If the tank is loose within the frame, new rubber straps and blocks should be installed. Use the following procedure to install new rubber straps and blocks:

1. Remove the engine with it’s mounting plate.

2. Position the new rubber parts according to Fig. 107. Cement them to the fuel tank with rubber cement. It is important that they be located exactly as shown to keep them from contacting the engine mounting bolts.

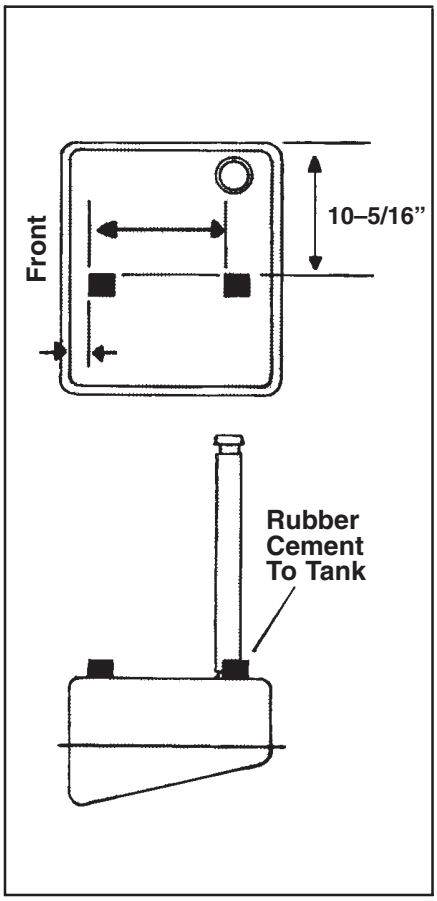


Fig. 107 Locating Rubber Bumpers on Tank

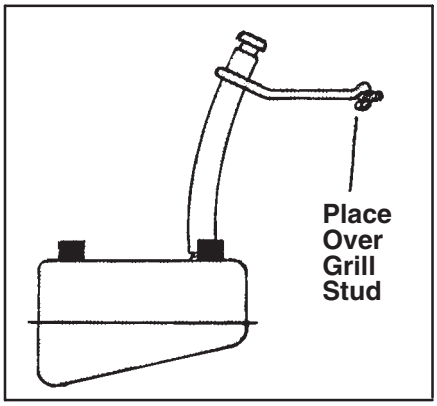


Fig. 108 **Fastening Tube Away From Engine**

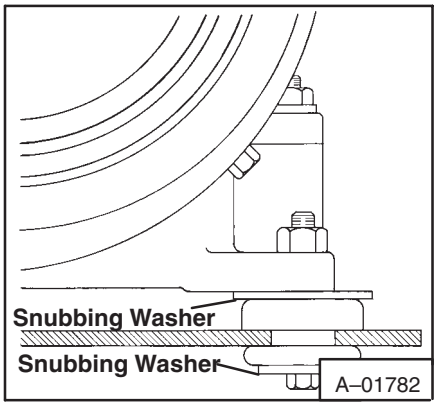


Fig. 108A Vibration Mount

3. Relocate the engine in the frame, moving it to the right as far as possible.

4. Reinstall the engine, with mounting plate.

Fill hose support bracket should be installed as shown in Fig. 108.

ENGINE VIBRATION MOUNTS

The new style larger engine vibration mounts installed on later production M–371 Bobcats may also be installed on earlier machines in place of the old style mounts. A new engine mounting plate must be installed or the holes in the existing engine mounting plate will have to be enlarged to 1–1/4 inches in diameter before the rubber mounts can be installed.

The holes in the tank cover must also be enlarged to 3 inches in diameter to make room for the larger snubbing washers. As an alternative smaller 1–3/4” OD washers, P/N 616786, may be used instead. Figure 108A shows the vibration mount installed, using smaller snubbing washers at the bottom.

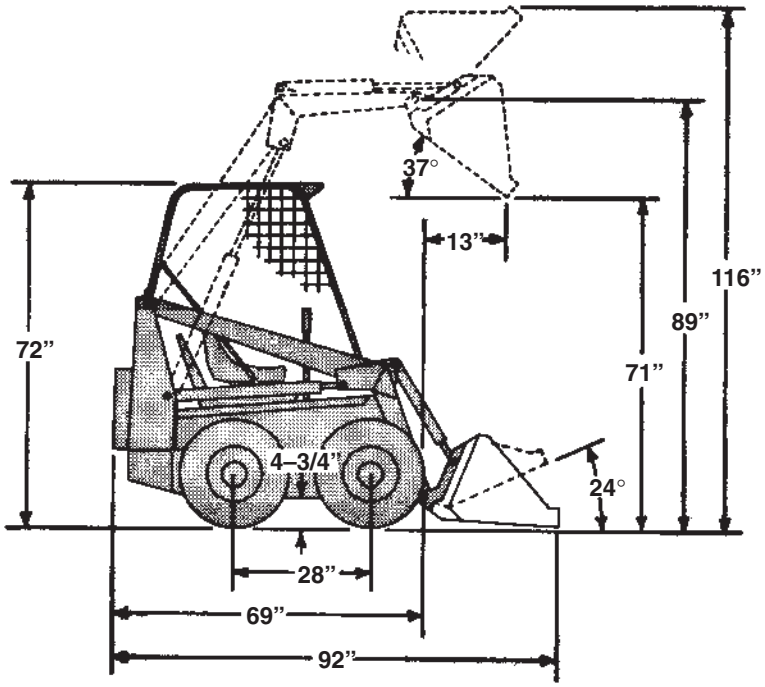
When installing the new mount tighten the nuts to compress the mount as shown. Tighten the nut until it contacts the spacer within the rubber mount. When this point is reached, proper compression of the rubber mount is accomplished.

SPECIFICATIONS

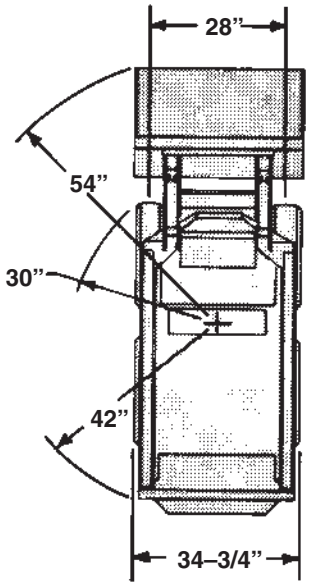
SPECS


bobcat

LOADER SPECIFICATIONS



Dimensions are given for loader equipped with dirt bucket and may vary with other bucket types.



Where applicable, specifications conform to IEMC & SAEstandards and are subject to change without notice.

OPERATIONAL & PERFORMANCE

Operating Weight . . . . . 1900 lbs.
Rated Operating Capacity . . . . . 500 lbs.
Lifting Capacity to Maximum Height . . . 800 lbs.
Tipping Load . . . . . 800 lbs.
Hydraulic Function Time:
- Raise to Maximum Height . . . . . 7 sec.
- Lower from Maximum Height . . . . . 6 sec.
- Dump Bucket . . . . . 4.6 sec.
- Rollback Bucket . . . . . 3.5 sec.

Travel Speed:
- Low Range . . . . . to 2.1 MPH forward & reverse
- High Range . . . . . to 3.7 MPH forward & reverse

Controls:
- Vehicle . . . . . Forward, reverse & steering functions controlled by two hand levers.
- Travel Speed . . . . . Manual belt shift
- Loader . . . . . Lift, tilt & auxiliary functions controlled by separate foot pedals.
- Engine . . Hand lever throttle, manual choke & key type ignition – starter switch.

ENGINE

Make . . . . . Kohler
Model . . . . . K 321–S
Fuel . . . . . Gasoline
Governed Flywheel Horsepower 13 @ 3000 RPM
Maximum Torque . . . 23.3 ft.–lbs. @ 2200 RPM
Number of Cylinders 1
Bore & Stroke . . . . . 3–1/2 x 3–1/4
Displacement . . . . . 31.27 cu. in.
Ignition . . . . . 12 volt breaker
Cooling . . . . . Air
Lubrication . . . . . Splash
Crankcase Ventilation . . . . . Internal breathing
Air Cleaner . . . Replaceable dry cartridge type

LOADER HYDRAULICS

Pump . . . . . Belt driven gear type
Maximum Pump Capacity . . . . 5 GPM @ 3000 engine RPM
System Relief Setting . . . . . 1000 PSI
Filtration . . . . . Full flow on return line with bypass & 33 micron replaceable paper element.
Cylinders . . . . Doubleacting with Teflon Seals & wear rings

Function	Lift	Tilt
Bore Diameter	2"	2"
Rod Diameter	1"	1"
Stroke	21–7/8"	14"

Valves . . . . . Open center type lift & tilt w/float position on lift only. Optional – auxiliary valve.
Fluid Lines . . . . . SAE standard full flow tubes, hoses & fittings.

ELECTRICAL

Alternator . . . . 15 amp. enclosed flywheel ty
Battery . . . . . 30 amp.–hr. rating 12 volt
Starter . . . . . 12 volt gear drive

POWER TRAIN

Transmission . . . . . V–belt drive
Clutches . . . . . 4 (2 each side) single disc oil bath lubricated.
Final Drive . . . . . #60 roller chain running in sealed oil bath
Total Engine to Wheel Reduction:
- High Range 47.4:1
- Low Range 85.0:1

CAPACITIES

Fuel . . . . . 5.5 gal.
Engine Lubricant . . . . . 2 qt.
Hydraulic Reservoir & Final Drive Case . . 7 gal.

TIRES

Standard . . . . . 5.70 x 12 – 4 ply nylon lawn & garden tread.
Optional . . . . 23.00 x 8.50 x 12 – 4 ply flotation

MACHINE WEIGHT (w/o bucket)

Shipping . . . . . 1600 lbs.

Hydraulic Fluid

When it becomes necessary to replace fluid or add fluid to maintain reservoir level, use 10W–30 or 10W–40, PAI Class SE, motor oil.

TABLE OF MACHINE TORQUES

	Torque to (Ft.–Lbs.)
Wheel Hub Bolts	60
Wheel Lug Bolts	45–50
Wheel Sprocket Retaining Cap Bolts (Lubricated)	45
Outside Clutch Chain Idler Sprocket	60
5/8" Clutch Pin Lock Nut	60
Lower Jackshaft Assembly Shaft Nut	60
Inside Chain Idler Sprocket Bolts	40
Steering Lever Bushing Nuts	130
Upper Jackshaft 1–1/8" Nut (Early Model Machines)	120
Upper Jackshaft Cap Screw (Late Model Machines)	60
Upper Jackshaft Sheave (Pulley) Bolt	60
Final Drive Chain Idler Sprocket Bolts	(5/8" bolt) 120 (1/2" bolt) 80
Pivot & Cylinder Rod Bolts	160
Crankshaft Sheave Bolt (On Engine)	60
Hydraulic Pump Sheave Bolt	35
Transmission Case Cover Bolts	12–15
Control Valve Tie Rod Nuts (HUSCO)	(5/16") 14 (3/8") 33
Control Valve Tie Rod Nuts (WARD)	16
Pump Assembly Screws	25
Engine Cylinder Head Bolts	25 – 30 ft.–lbs. (34 – 40,7 Nm)
Spark Plugs	20 ft.–lbs. (27 Nm)

Bobcat

SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	
SERVICE MANAGER	X
SALES MANAGER	

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **371 - 1**
Date: **15 June 2012**
Product: **Bobcat Loader**
Model: **371**
Manual No: **6545574 (2-84)**

The following Sections are a revision to the above Service Manual.

COVER	


Bobcat®