Professional Shop Manual

Compact Hydraulic Log Splitters

NOTE: These materials are for use by trained technicians who are experienced in the service and repair of outdoor power equipment of the kind described in this publication, and are not intended for use by untrained or inexperienced individuals. These materials are intended to provide supplemental information to assist the trained technician. Untrained or inexperienced individuals should seek the assistance of an experienced and trained professional. Read, understand, and follow all instructions and use common sense when working on power equipment. This includes the contents of the product's Operators Manual, supplied with the equipment. No liability can be accepted for any inaccuracies or omission in this publication, although care has been taken to make it as complete and accurate as possible at the time of publication. However, due to the variety of outdoor power equipment and continuing product changes that occur over time, updates will be made to these instructions from time to time. Therefore, it may be necessary to obtain the latest materials before servicing or repairing a product. The company reserves the right to make changes at any time to this publication without prior notice and without incurring an obligation to make such changes to previously published versions. Instructions, photographs and illustrations used in this publication are for reference use only and may not depict actual model and component parts.

MTD Products Inc - Product Training and Education Department

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CHAPTER 1: INTRODUCTION

Professional Service Manual Intent: This manual is intended to provide service dealers with information that will help them maintain and repair the MTD compact log splitter.

Disclaimer: The information contained in this manual is correct at the time of writing. Both the product and the information about the product are subject to change without notice.

About the text format

Certain flags and key words are used to indicate the nature of the text that accompanies them. They are as follows:

CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death of serious injury.

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

NOTE: "NOTE" is used to point-out helpful information that may not fit as a step in a procedure.

1. Numbered steps indicate specific things that should be done, and the order in which they should be done.

   1a. Substeps will be lettered and nested within steps. Two or more substeps may be combined to describe the actions required to complete a step.

- **Bullet points**: Indicate sub-steps or points of interest, without implying order or relative importance.

Disclaimer: This manual is intended for use by trained, professional technicians.

- Common sense in operation and safety is assumed.
- In no event shall MTD be liable for poor text interpretation, or poor execution of the procedures described in the text.
- If the person using this manual is uncomfortable with any procedures they encounter, they should seek the help of a qualified technician.

INTRODUCTION

Safety

This Service Manual is meant to be used along with the Operator's Manual. Read the Operator's Manual and familiarize yourself with the safety and operational instructions for the equipment being worked on. Keep a copy of the Operator's Manual for quick reference. Operator's manuals may be viewed for free at the brand support website. It will be necessary to have the complete model and serial number for the equipment.

- Be prepared in case of emergency:

  Keep a fire extinguisher nearby

  Keep a first aid kit nearby

  Keep emergency contact numbers handy

- Replace any missing or damaged safety labels on shop equipment.
- Replace any missing or damaged safety labels on equipment being serviced.

- Grooming and attire:

  Do not wear loose fitting clothing that may become entangled in equipment.

  Long hair should be secured to prevent entanglement in equipment.

  Jewlery is best removed.

- Protective gear: includeds, but is not limited to

  Clear eye protection_____while working around any machinery

  Protective gloves_____where necessary

  Armored footwear_____when working around any machinery

  Hearing protection_____in noisy environments

  Chemically resistant gloves_____when working with chemicals or solvents

  Respirator_____when working with chemical or solvents

  Apropriate tinted eye protection_____when cutting or welding

  Fame resistant headgear, jacket, chaps___when cutting or welding

- Remember that some hazards have a cumulative effect. A single exposure may cause little or no harm, but continual or repeated exposure may cause very serious harm.

- Clean spills and fix obviously dangerous conditions as soon as they are noticed.
- Lift and support heavy objects safely and securely.

- Be aware of your surroundings and potential hazards that are inherent to all power equipment. All the labels in the world cannot protect a tecchnician from an instant of carelessness.
- Hydraulic fluid under high pressure can be dangerous. A high-pressure hydraulic fluid leak or spray can penetrate the skin. If this happens, seek immediate medical attention to reduce the risk of blood poisoning leading to death or limb amputation.

- Exhaust fumes from running engines contain carbon monoxide (CO). Carbon monoxide is a colorless odorless gas that is fatal if inhaled in sufficient quantity. Only run engines in well ventilated areas. If running engines indoors, use an exhaust evacuation system with adequate make-up air ventilated into the shop.

Fasteners

- The fasteners used on the equipment described in this manual, and the engine that powers it are a combination of metric and fractional inch. For this reason, wrench sizes are frequently identified in the text, and measurements are given in U.S. and metric scales.
- If a fastener has a locking feature that has worn, replace the fastener or apply a small amount of releasable thread locking compound such as Loctite® 242 (blue).
- Some fasteners like cotter pins are single-use items that are not to be reused. Other fasteners such as lock washers, retaining rings, and internal cotter pins (hairpin clips) may be reused if they do not show signs of wear or damage. This manual leaves that decision to the judgement of the technician.

Assembly instructions

- **Torque specifications** may be noted in the part of the text that covers assembly. They may be summarized in tables along with special instructions regarding locking or lubrication. Whichever method is more appropriate will be used. In many cases, both will be used so that the manual is handy as a quick-reference guide as well as a step-by-step procedure guide that does not require the user to hunt for information.
- **Lubricant** quantity and specification may be noted in the part of the text that covers maintnenace, and again in the section that covers assembly. They may also be summarized in tables along with special instructions. Whichever method is more appropriate will be used. In many cases, the information will be found in several places in the manual so that the manual is handy as a quick-reference guide as well as a step-by-step procedure guide that does not require the user to hunt for information.
- The level of assembly instructions provided will be determined by the complexity of reassembly, and by the potential for damage or unsafe conditions to arise from mistakes made in assembly.
- Some instructions may refer to other parts of the manual for subsidiary procedures. This avoids repeating the same procedure two or three times in the manual.

INTRODUCTION

The Compact logsplitter

The compact logsplitter was designed to be useful where a full-size logsplitter is not conventient to transport.
See Figure 1.0.

- It can be lifted into the back of a car or truck for transport, weighing about 165lbs. (75 Kg.).
- It can be easily moved by a single person.
- It colapses into a small package that can be stored in limited space.

Figure 1.0

Understanding model and serial numbers

The model number of a the compact log splitter described in this manual is 24AA5DMK029.
This manual is likely to carry useful information for a range of similar logsplitters that may carry a variety of MTD and private brand names. The break down of what the model number means is as follows:

- 24A - - - - - - - - indicates that this is a log splitter
- - - - A5 - - - - - - indicates the tank size and style
- - - - - -D - - - - - indicates the tonnage
- - - - - - MK- - - indicates the engine
- - - - - - - - - 029 indicates the customer

The serial number is 1J056G10005. The serial number reads as follows:

- 1.....engineering level
- ..J.....month of production (J = October)
- .....05.....day of the month
- .....6.....last digit of the year
- .....G.....plant it was built in
- .....1.....assembly line number
- .....0005.....number of unit built

Additional technical and service information may also be available to our company authorized service center personnel through our company corporate offices, regional parts distributors and regional service center field support personnel. Please contact the designated support office in your area or our corporate offices directly should further service information be needed.

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CHAPTER 2: ENGINE MAINTENANCE

The compact log splitter comes with an engine produced by MTD.
Refer to manual number 769-03354A for complete engine repair procedures.

MAINTENANCE

This Chapter covers the MTD engine, but the general information applies to most outdoor power equipment.

As the saying goes “an ounce of prevention is worth a pound of cure” the same can be said about preventive maintenance on outdoor power equipment. By changing the spark plug, air filter, and oil in annual intervals many failures can be avoided. Sometimes just clearing off yard debris that has collected while in use can make the difference between a properly running piece of equipment or a failure.

Spark plugs

1. The spark plug used in the MTD engine is a Torch model F7RTC gapped to .024”-.032” (.60-.80 mm). See Figure 2.1.

- Champion RN14YC or NGK BPR4ES are physically similar but do not match the F7RTC in exact specification
- This difference in specifications will effect performance and emissions.
- MTD recommends that only the torch F7RTC plug be used in MTD engines.

Figure 2.1

2. The wear rate of the spark plug will vary with severity of the engine’s use. If the edges of the center electrode are rounded-off, or other apparent wear / damage occurs, replace it before the engine fails to start.
3. Cleaning the spark plug: MTD does not recommend cleaning spark plugs.

- Use of a wire brush may leave metal deposits on the insulator that shorts-out the spark plug, killing the spark.
- Use of abrasive blast for cleaning may cause damage to ceramic insulator or leave blast media in the recesses of the spark plug. When the media comes loose during engine operation, severe and non-warrantable engine damage may result.

4. Inspection of the spark plug can provide indications of the operating condition of the engine.

- The presence of light tan colored deposits on insulator and electrodes is normal.
- Dry, black deposits on the insulator and electrodes indicate an over-rich fuel / air mixture (too much fuel or not enough air)
- Wet, black deposits on the insulator and electrodes indicate the presence of oil in the combustion chamber.
- Heat damage (melted electrodes / cracked insulator / metal transfer deposits) may indicate detonation.
- A spark plug that is wet with fuel indicates that fuel is present in the combustion chamber, but it is not being ignited.

ENGINE MAINTENANCE

Air filters

Generally, air filters come in two types:

- Pleated-paper element
- Foam plastic
- Sometimes a combination of the two will be used
- The MTD engine uses a foam pre-filter and a pleated paper element together.

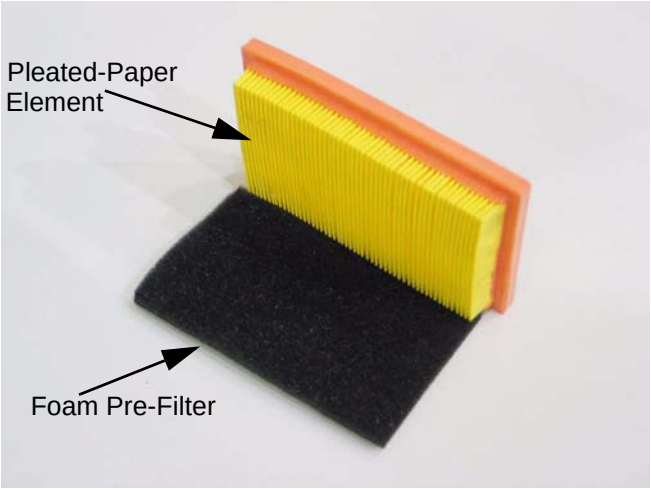

Figure 2.2

1. The main function of the air filter is to trap air-borne particles before they reach the carburetor. Dirt ingested through the carburetor can cause catastrophic internal engine damage.
2. The air filters used on the MTD engine are designed to prevent particles larger than 3-5 micron from passing into the engine. See Figure 2.2.
3. The filter should be checked on a regular basis. Generally several times in a season, or when a change in engine performance becomes noticable. See Figure 2.3.

- Never use compressed air on a paper air filter. Compressed air will remove the tiny fibers that catch the dirt carried by the air. Without these fibers the filter is useless.
- When drying a foam filter, either squeeze it inside of a paper towel, or let it air dry. DO NOT wring it because the filter will tear.
- Always check with factory specification before servicing / replacing any engine components.
- Generally, if a foam pre-filter rides directly against a paper filter element, the pre-filter should not be oiled. If the two are separated by a mesh screen, the pre-filter should be lightly oiled.

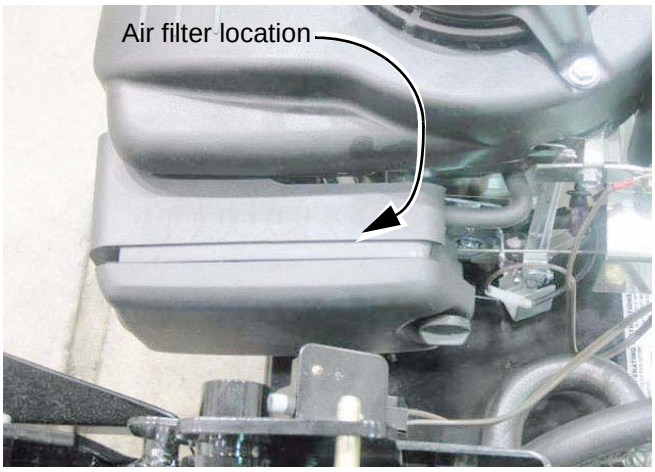

Figure 2.3

4. Typically an ar filter should be changed before every season.
5. If a foam air pre-cleaner is dirty and not in to bad of condition it can be cleaned and reused. The paper pleated filters can be shaken or lightly tapped to free the debris from the filter.
6. Foam pre-filters can be washed in warm soapy water.
7. Before installing any foam filter after washing, it needs to be thoroughly dry.

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Oil type and capacity

- SAE 10W-30 oil with a SF/CD API rating is recommended for most operating conditions up to 97° F(36° C.). See tables 1 & 2
- The oil capacity is 17.0 fl.oz (0.5 liters).
- Check the oil level before each use.
- Change the oil every 25 hours, or more frequently in severe operating conditions.
  Severe operationg condtions include:
  high ambient temperature
  dusty conditions
  high load use in exceptionally thick grass.
- Synthetic oil is a suitable alternative, but it does not extend service intervals.

  NOTE: MTD recommends using petroleum-based oil during the break in period to ensure proper piston ring break-in.

Table 1: Single Viscosity Oils

SAE 10W								
SAE 20W								
SAE 20								
SAE 30								
SAE 40								
Celsius	**-30**	**-20**	**-10**	**0**	**10**	**20**	**30**	**40**
Farenheit	**-20**	**0**	**20**	**40**	**60**		**80**	**100**

Table 2: Multi Viscosity Oils

20W-40 **20W-50**								
15W-40 **15W-50**								
10W-40								
10W-30								
Celsius	**-30**	**-20**	**-10**	**0**	**10**	**20**	**30**	**40**
Farenheit	**-20**	**0**	**20**	**40**	**60**		**80**	**100**

ENGINE MAINTENANCE

Checking the oil

1. When checking the oil thread the dip-stick out of the engine.
2. Clean the oil off of the tip of the dipstick.
3. Re-insert the dipstick **without** threading it in to get the oil level reading. See Figure 2.4.

- **Synthetic vs. Petroleum** based oil: To simply look at synthetic oil and to compare it with Petroleum based oil there is very little difference. However, when you look at the two through a microscope it is easy to see the difference. Synthetic is made up of smaller molecules which allows the oil to get into areas that petroleum based oil cannot.
- **No oil additives** or viscosity modifiers are recommended. The performance of a good oil meeting the SF/ CD specifications will not be improved by the addition of any oil additives.
- Some oil additives may cause severe and non warrantable engine damage, constituting a lubrication failure.

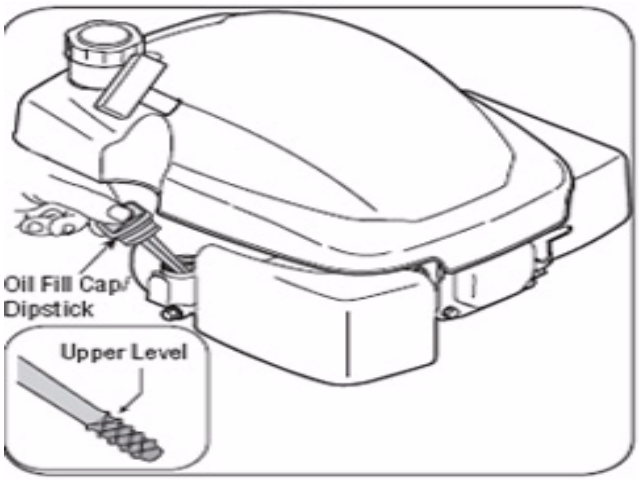

Figure 2.4

4

The oil level is determined by the lowest point on the dipstick that is completely covered with oil.

NOTE: If the oil is noticeably thin or smells of gasoline, a carburetor repair may be needed before the engine can be safely run.

Changing the oil

CAUTION: If the engine has been running, allow the engine to cool before doing any maintenance work.

1. Position a drain pan to collect the oil that is drained from the engine.
2. Oil can be drained by removing the drain plug located at the base of the dipstick tube using a 10mm wrench. See Figure 2.5.

- NOTE: Replace the drain plug sealing washer with a n ew one to ensure that it does not leak.
- Tighten the drain plug to a torque of 84 in.- lbs. (10 Nm) on installation.

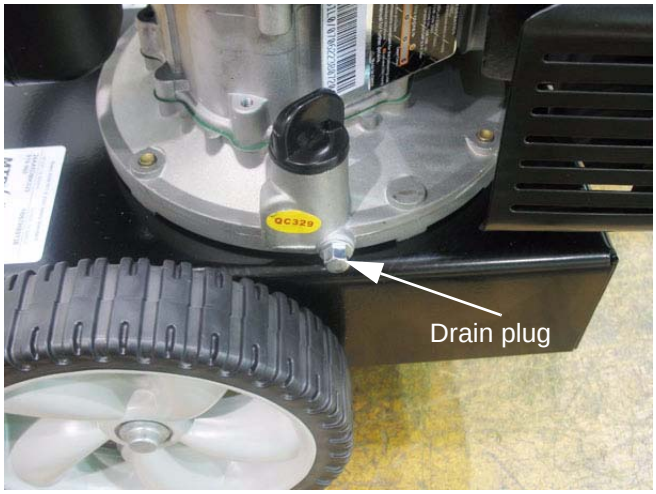

Figure 2.5

3. After the oil has drained, reinstall the oil drain plug.
4. Refill the crankcase with the correct amount of oil.
5. Breifly test-run the engine, and check for leaks.
6. Dispose of the used oil in a legal and environmentally responsible manner.

Fuel

Today's fuels contain mix of ingredients including oxygenators, detergents, benzene, and butane. These additives help reduce emissions. The fuel make up can vary seasonally and geographically.

Alcohol used to oxygenate fuel creates a lot of problems for gasoline engines. The biggest problem is that alcohol attracts and holds water. This corrodes the metal components of the fuel system, especially the carburetor.

Alcohol also does not produce as much heat as gasoline when burnt. This results in less power for the engine.

The stochiometric ratio of alcohol is differnet than gasoline. An engine tuned to run on gasoline will run artificailly lean if too much alcohol is mixed with the fuel. This will cause hard starting and surging RPMs.

Fuel containing up to 10% alcohol is acceptable for MTD engines. Anything higher than that will result in performance issues.

NOTE: E85 fuels are not to be used in any MTD engines.

- Use clean, fresh fuel with a pump octane rating of 87 or greater.
- Stale or out-of-date fuel is the leading cause of hard starting issues.
- Pump octane ratings beyond 87 will not improve engine performance.

ENGINE MAINTENANCE

Fuel filters

- Dirty fuel can clog the carburetor and introduce abrasive materials into the engine.
- To help prevent that, the MTD engine is equipped with a fuel filter.
- MTD engines have a fuel filter installed in the fuel tank barb. See Figure 2.6.

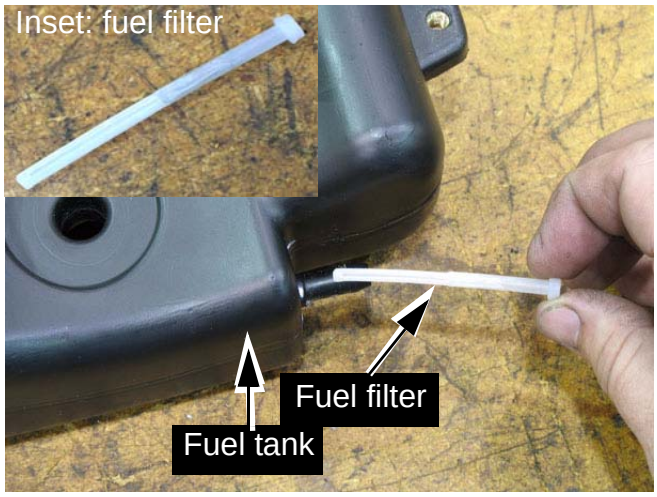

Figure 2.6

Valve lash

Valve lash can be checked and adjusted using the following steps:

1. If the engine has been run, allow it to cool thoroughly. Position the mower for easy access to the cylinder head.
2. Disconnect the high-tension lead from the spark plug and ground it well away from the spark plug hole.
3. Remove the spark plug using a 13/16” or 21mm wrench. See Figure 2.7.

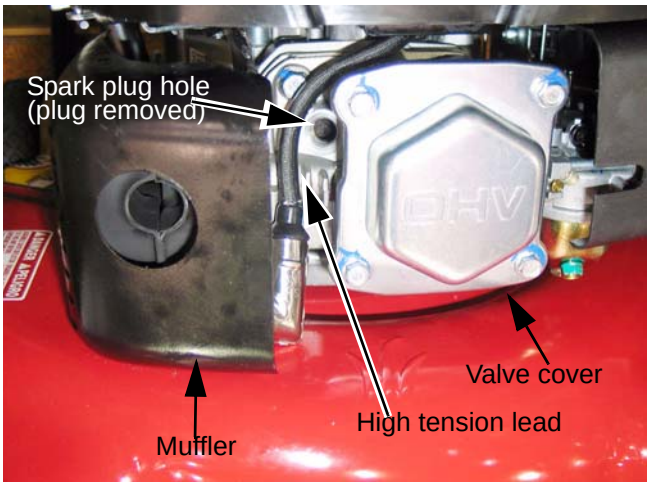

Figure 2.7

NOTE: A flexible coupling or “wobbly” extension will make it easier to remove the spark plug.

4. Remove the four bolts that secure the valve cover using a 10mm wrench, and remove the valve cover from the engine.

   NOTE: If care is used not to damage the valve cover gasket, it can be re-used.

5. Slowly pull the starter rope until air can be heard coming out of the spark plug hole.

6. Confirm that the piston is at Top-Dead-Center on the compression stroke. See Figure 2.8.

- The **compression stroke** can be distinguished from the overlap stroke by the presence of air pressure at the spark plug hole and the fact that neither of the valves should move significantly on the compression stroke.
- There is an **automatic compression release** mechanism that "bumps" the exhaust valve as the piston rises on the compression stroke. At TDC, the exhaust valve should be fully closed.

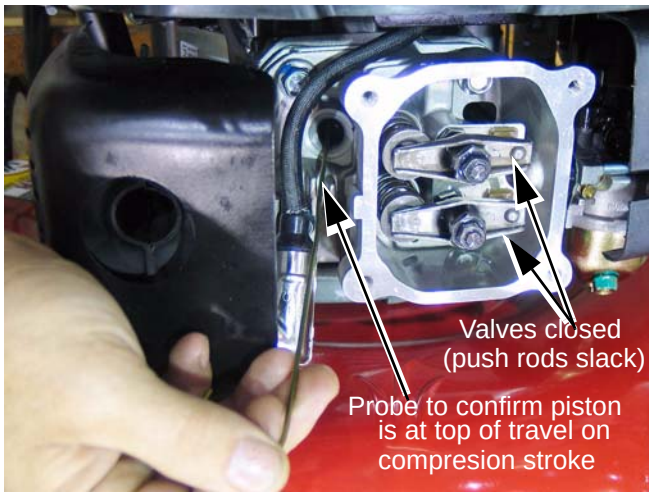

Figure 2.8

7. Check valve lash between each valve stem and rocker arm using a feeler gauge.

8. Valve lash specifications: See Figure 2.9.

   Intake valve lash (top valve) should be .003"-.005" (.10 ± .02mm).

   Exhaust valve lash (bottom valve) should be .005-.007" (.15 ± .02mm).

9. Use a 10mm wrench to loosen the jam nut and a 14mm wrench to adjust the rocker arm fulcrum nut.

- Tighten the rocker arm fulcrum nut to close-up the clearance between the end of the valve stem and the contact point on the rocker arm.
- Loosen the rocker arm fulcrum nut to open-up the clearance between the end of the valve stem and the contact point on the rocker arm.

10. Hold the fulcrum nut with a 14 mm wrench, and tighten the jam nut to a torque of 89 in-lb. (10 N-m) using a 10 mm wrench.

11. Double-check the clearance after tightening the jam nut, to confirm that it did not shift. Re-adjust if needed.

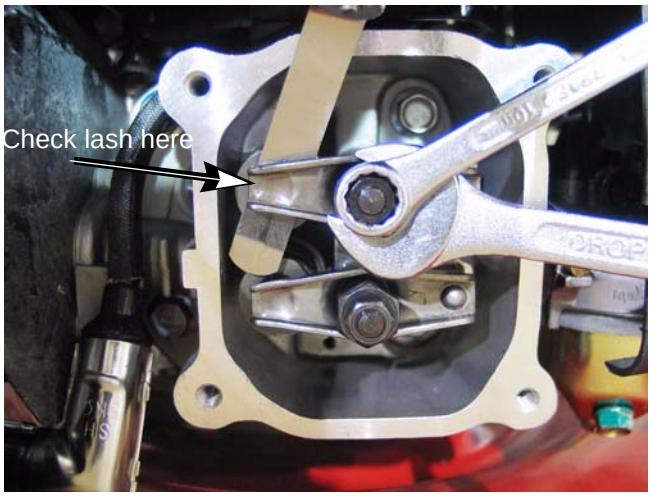

Figure 2.9

7. Rotate the engine through several compression cycles:

- Observe the movement of the valve gear.
- Return the piston to TDC compression stroke and re-check the valve lash to confirm consistent movement of the valve gear, including the slight bump to the exhaust valve from the automatic compression release.

8. Clean-up any oil around the valve cover opening, clean the valve cover, replace the valve cover gasket if necessary.

9. Install the valve cover, tightening the valve cover screws to a torque of 62 - 80 in-lbs (7-9 Nm).

10. Install the spark plug.

Release the spring clamp securing the safety bail, start the engine and test run it long enough to confirm correct operation.

ENGINE USE AND FLYWHEEL INFORMATION

The engine that powers the MTD log splitter is very similar to, but not the same as an engine used on MTD lawnmowers. The primary differences are in the flywheel and safety features. The logsplitter-spec. engine should never be installed on a lawnmower.

⚠ CAUTION

- Lawnmower engines must comply with industry safety standards. When a safety bale is released, the blade must stop within 3 seconds. The logsplitter engine is not equipped with the engine brake that is necessary to meet this standard. If the lotgsplitter engine is mounted on a lawnmower, an unsafe condition will be created.
- Lawnmower engines must comply with industry safety standards. Blade tip speed is regulated to 19,000 feet per minute by ANSI B71.1-1984. The governor setting of the log splitter engine will exceed that speed on some lawnmower applications.
- Many lawnmower engines count on the fly-weight of the blade to create enough inertia to get the piston past top-dead-center on the compression stroke when the engine is being started. Engine applications that do not drive high-inertia implements may have heavy flywheels. Installing a lawnmower flywheel on a log splitter engine may result in very dificult starting and violent starter rope jerk-back.
- Replace any flywheel with any visible damage. Any cracks or broken fins can create a burst hazard. Do NOT operate an engine with a damaged flywheel. Do NOT return an engin with a damaged flywheel to service.

Table 3:

Item	Type	Spec.: U.S.	Spec.: metric
RPM	Engine speed	3,400-3,600 RPM	3,400-3,600 RPM
Spark plug	Torch F7RTC	Gap: .024”-.032”	Gap: .60mm-.80mm
Valve lash	Intake	.003”-.005”	.08mm-.13mm
Valve lash	Exhaust	.005”-.007”	.13mm-.18mm
Oil	SAE 10W-30, SG/SF or better (most conditions)	17 fl.oz.	0.5 litres
Fuel	Minimum octane: 87 Maximum alcohol: 10% by volume	0.32 gallons	1.2 litres

CHAPTER 3: HYDRAULIC DIAGNOSIS

1. OVERVIEW

The main components of the compact log splitter are all fairly expensive. Hip-shot diagnosis will result in wasted time and money for the dealer. Throwing wrong parts at a log splitter gets expensive fast.

The process of diagnosis is a process of developing and testing theories about the problem that caused the customer to bring the log splitter in for repair.

To properly diagnose a problem with the hydraulic system of a log splitter;

1. Get complete information from the customer;
   - 1a. Make sure the customer understands how to operate the log splitter.
   - 1b. Make sure the customer knows what the log splitter is supposed to be able to do.
   - 1c. Get a thorough description of the problem the customer is having with the equipment
   - 1d. Get as much maintenance history of the log splitter as possible.
2. Understand the equipment;
   - 2a. Know how each component works in the system.
   - 2b. Know what symptoms each component might produce if it fails.
   - 2c. Test the components against their specifications to identify the problem.
3. Use your understanding of the equipment to work in a logical sequence; See Figure 3.1.
   - 3a. Check the simple stuff first.
   - 3b. Use symptoms to focus your attention.
   - 3c. Test and eliminate theories.

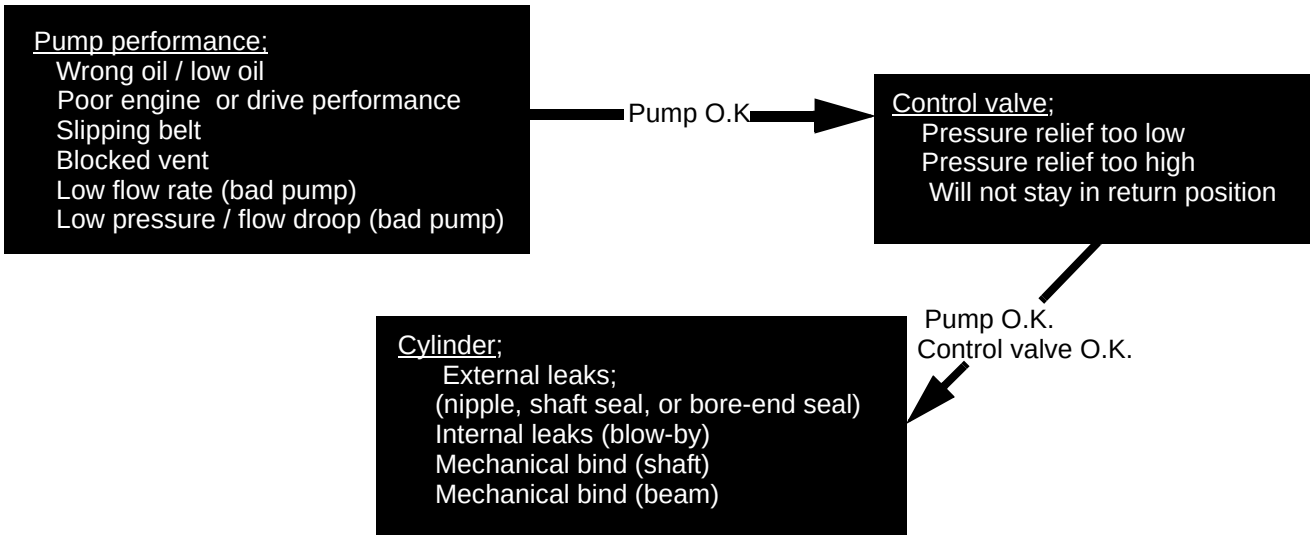

Figure 3.1

4. UNDERSTANDING THE HYDRAULIC FLOW

4.1. It starts at the **reservoir** (tank). See Figure 3.2. See Figure 3.3.

- The tank is built-into the beam of the logsplitter.
- The wedge is welded to the top of the tank / beam assembly.
- There is a pipe plug in the wedge end of the tank.
- Check the level of the hydraulic fluid, and add hydraulic fluid through the plug.
- The tank must be vented. The vent is located on the wedge, directly above the plug.

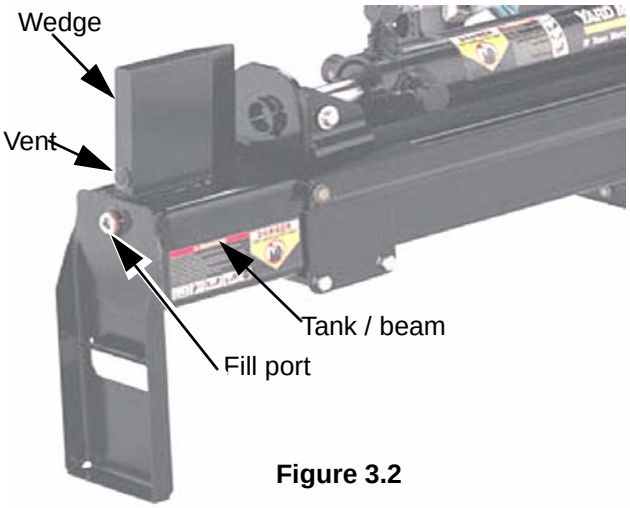

Figure 3.2

- An elbow on the engine end of the tank feeds hydraulic fluid directly to the pump.
- A straight fitting on the engine end of the tank, nearer to the engine, provides a return path to the tank.

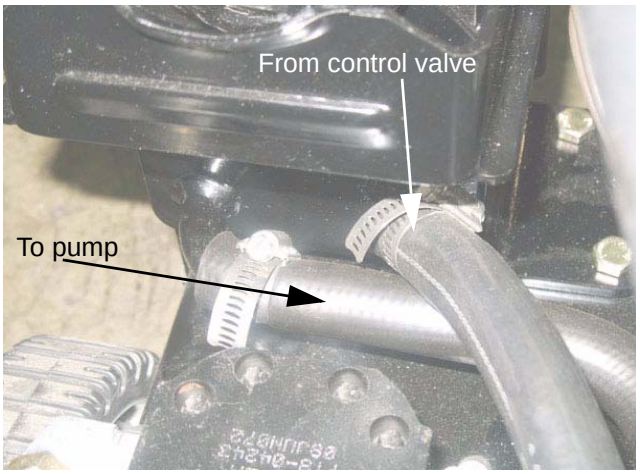

Figure 3.3

4.2. The **pump** draws fluid from the tank, and forces it under pressure to the control valve. See Figure 3.4.

- The pump is capable of producing 3,400 PSI (234 BAR) at a pump speed of 3,600 RPM.
- The pump moves a nominal 2 GPM (7.6 L/M) at a pump speed of 3,600 RPM
- The pump is single-stage.
- There is no relief valve in the pump.
- The pump is belt-driven from the engine.
- The pump delivers pressurized hydraulic fluid to the control valve.

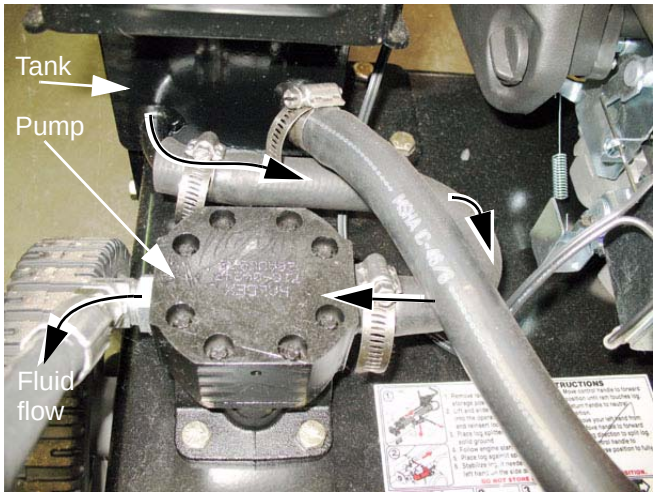

Figure 3.4

4.3. The open-center **control valve** does four things: See Figure 3.5.

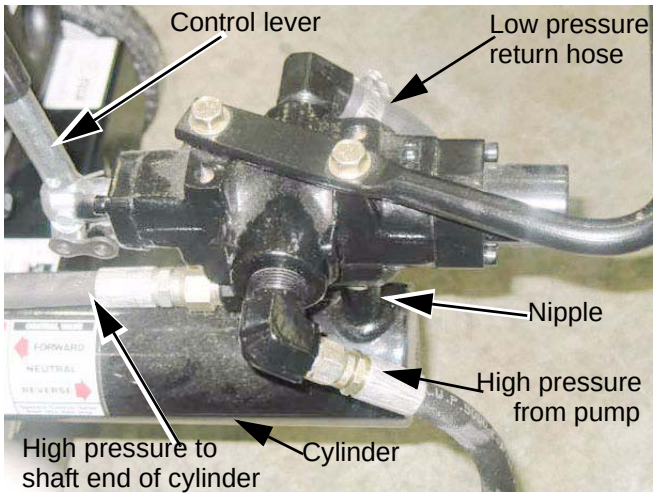

Figure 3.5

Regulate It regulates fluid pressure.

- If the pressure exceeds 3,400 PSI (232 BAR), the relief valve opens, returning fluid directly to the tank.
- In any no-load condition, pressure should not exceed 300 PSI (20.4 BAR).

Forward It drives the ram toward the wedge.

- In the forward position, the control valve directs pressurized fluid through the pipe nipple that supports it, to the port at the base of the cylinder.
- This drives the piston down bore, displacing fluid from the shaft side of the cylinder.
- The control valve allows displaced fluid to leave the shaft end of the cylinder through the high pressure hose, returning to the control valve.

  The control valve dumps displaced fluid back into the tank

Retract It draws the ram away from the wedge.

- In the retract position, the control valve sends fluid through the hose to the port at the shaft end of the cylinder.
- This drives the piston up the bore, displacing fluid from the base side of the cylinder.
- The control valve allows displaced fluid to leave the base end of the cylinder through the nipple, returning to the control valve.
- The control valve dumps displaced fluid back into the tank through the low presure hose.

  The control lever is held in the retract position by a detent. When the piston bottoms-out, the build-up of pressure of between 500 and 1,250 PSI forces the valve out of detent, returning it to neutral.

Neutral In the neutral position, fluid from the pump is dumped directly back into the tank through the low pressure hose.

4.4. **Cylinder** See Figure 3.6.

- Both ports of the cylnder are connected to the control valve.
- When pressure is applied to the port at the base of the cylinder (through the nipple), the ram extends.
- When pressure is applied to the port at the shaft end of the cylinder (through the flexible high-presssure hose), the ram retracts.
- When pressure is applied to one port, fluid from the other port is forced back to the control valve by the movement of the piston in the cylinder bore.

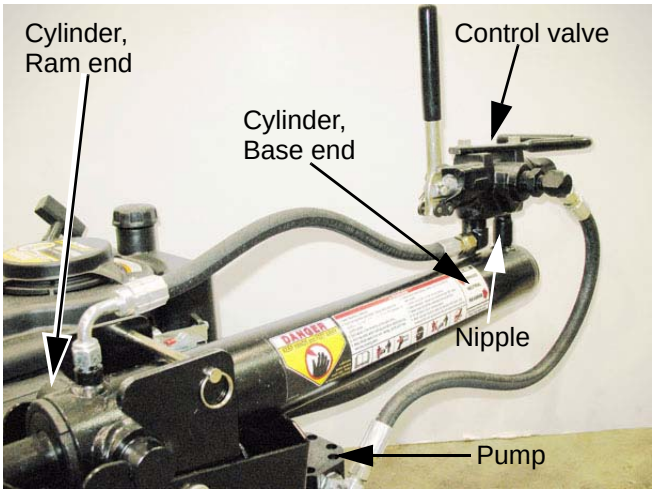

Figure 3.6

4.5. **Hoses**: high pressure and low pressure

- **High-pressure** hoses connect the pump to the control valve and the control valve to the shaft end of the cylinder.
- High pressure means 3,500 PSI working pressure.

- **Low pressure** hoses connect the tank to the pump and the control vave to the tank.
- The hose from the tank to the pump is molded.
- Hoses must not collapse under the suction pressure ot the pump.
- Low pressure hoses are fastened with hose clamps.

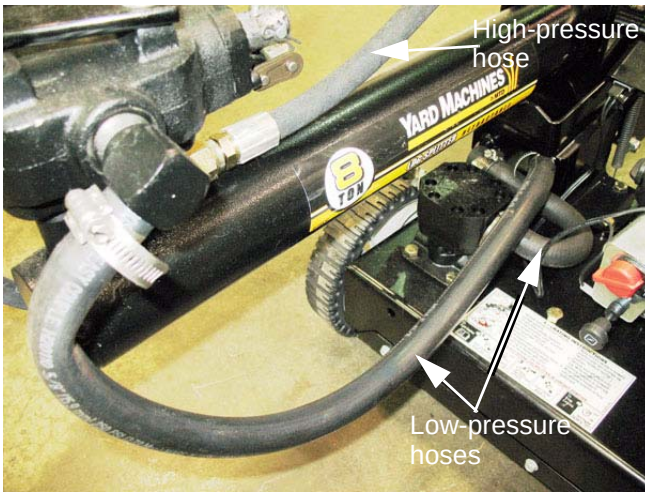

Figure 3.7

NOTE: The low pressure hose that supplies the pump carries fluid under suction. If it leaks, it will draw-in air, but may leak very little fluid out. This entrained air will create cavitation in the pump. Poor pump performance accompanied by whining or growling noises can indicate a leaky suction-side hose.

5. CHECKING THE PUMP

Just because a hydraulic pump is not pumping well does not mean the pump is bad. Before condemning parts or getting into deeper diagnosis, check the basics.

External factors that will effect pump performance include:

5.1. Engine performance See Figure 3.8.

- The engine should be adjusted to run at 3,500 ± 100 RPM. Check it with a tachometer.
- The engine must be in good state of tune: good spark plug, clean air filter, fresh fuel, clean carburetor, correct valve lash.
- The engine must be in good mechanical condition: good compression.
- If the engine speed is set correctly, but it slows-down excessively under load, there is an angine performance issue.
- The engine performance issue must be fixed before valid pump tests can be made.

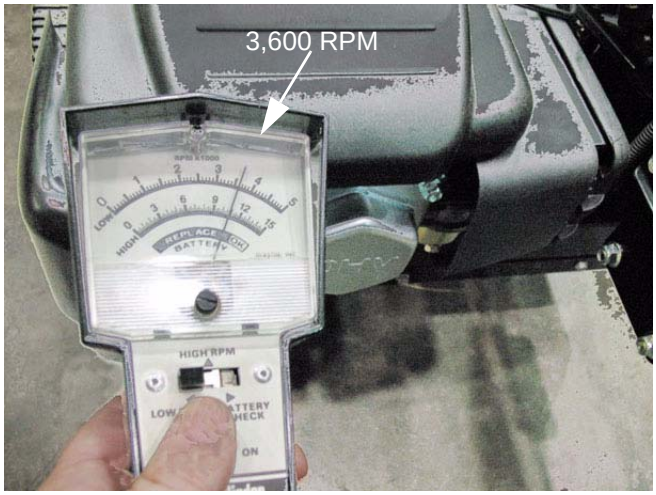

Figure 3.8

5.2. Belt slippage See Figure 3.9.

- If the pump does not perform well, and the engine shows no signs of laboring under load, check for belt slippage.
- Belt slippage may be accompanied by unusual noises or burning smells.
- Remove bottom cover from the bottom of the log splitter to reach the belt.
- Use only the correct MTD belt. The part number is usually printed on the belt.
- When replacing a belt, check the hardware: The idler pulley should spin freely and apply tension to the belt. The engine and pump pulleys should be firmly connected to their shafts.

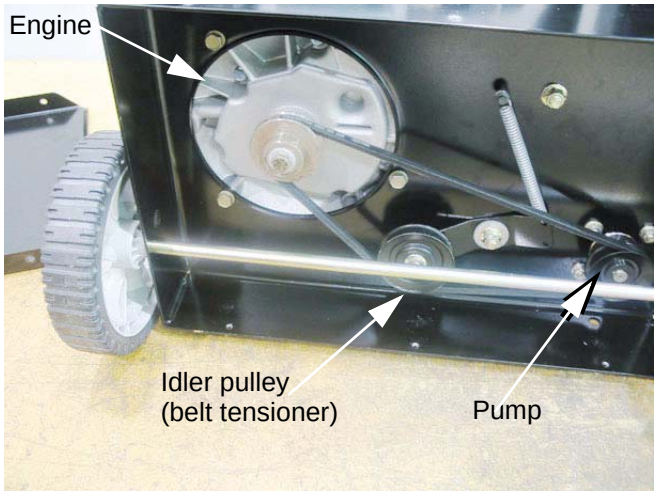

Figure 3.9

5.3. Low fluid / wrong fluid See Figure 3.10.

- With the log splitter on level ground, remove the plug at the wedge end of the tank to check the fluid.
- Check fluid cold. It expands when it gets hot.
- The logsplitter should contain 1.5 gallons (5.68 litres) of hydraulic fluid.
- Use either Dexron III ATF or 10 Weight AW hydraulic fluid. Do not mix the two
- If in doubt, drain it out; replace the fluid with known correct hydraulic fluid.
- Too little fluid will starve the pump.
- Too much fluid will slow performance and spill from the vent.

Figure 3.10

CAUTION Hot hydraulic fluid can cause burns. Do not check the fluid until the hydraulic system has cooled to ambient temperature after use.

5.4. Cold temperatures

- Hydraulic fluid gets thick at low temperatures; the splitter should not be used with hydrualic fluid temperature below 20 deg. f. (-6.66 deg. c.)
- Hydraulic tests should be performed with the fluid warmed-up to 120 deg. f. (49 deg. c.) to get accurate results.
- When the fluid it too cold, pressure will be high and flow will be low.
- When the fluid is too cold, logsplitter operation will be sluggish.

5.5. Fluid not getting to the pump See Figure 3.11.

- If fluid is not reaching the pump, the log slitter will not work
- Continued running with a dry pump wil destroy the pump. This is not warrantable damage.
- To check the fluid supply to the pump: place a drain pan under the pump, and disconnect the formed hose that feeds the pump. Fluid should flow freely from it.
- Watch the formed hose that feeds the pump while the ram is in motion. If the hose is collapsing, it will block-off the supply of ffluid to the pump.
- Entrained air from a suction hose leak will cause a loss of splitting force and a noisy pump.

Figure 3.11

5.6. Sealed tank vent See Figure 3.12.

- The tank vent is near the base of the wedge.
- The vent consists of a plastic plug with a felt washer; it allows air to flow in and out of the tank.
- As the fluid moves from the tank to the cylinder, it draws air in. As fluid moves from the cylinder back to the tank, air is forced out of the tank.
- If the tank cannot “breath” through the vent, extending the ram will form a vacuum in the tank.
- If the tank cannot “breath” through the vent, retracting the ram will pressurize the tank.
- The ram will move through part of its’ stroke, then stop as the vaccum or pressure builds.

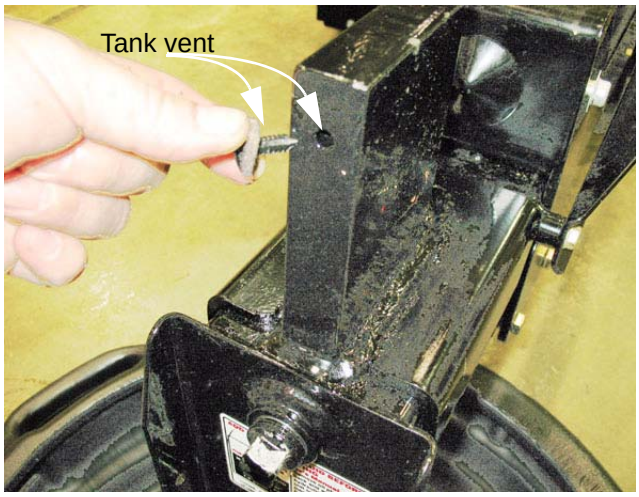

Figure 3.12

WARNING If the tank is pressurized by a blocked vent, relieve the pressure by extending the ram before attempting to remove the plug. Removing the plug from a pressurized tank can launch a dangerous projectile.

5.7. To check the tank vent: See Figure 3.13.

5.7. a. Remove the the threaded plug from the tank, and carefully pry-out the tank vent plug.

5.7. b. Blow compressed air, regulated to about 30 PSI (2 Bars), into the threaded check-fill port.

5.7. c. Check the vent port. A flow of air that is equal to the flow going into the check/fill port should be coming out of the vent port.

Figure 3.13

5.8. To test the pump: See Figure 3.14.

5.8. a. With the engine turned-off, relieve hydraulic pressure from the system by moving the lever on the control valve through it's full range of travel.

5.8. b. Connect the flow and pressure test gauge set (P/N 759-3742) between the pump and the control valve.

- The pressure gauge should be nearest the pump.
- The flow meter should be nearest the control valve.

5.8. c. Confirm that the snubber valve on the test gauge set is fully open and all connections are tight.

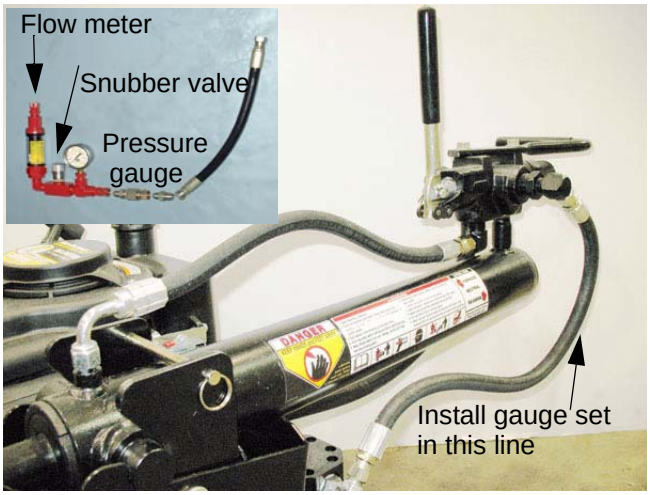

Figure 3.14

DANGER Hydraulic fluid under high pressure can be dangerous. A high-pressure hydraulic fluid leak or spray can penetrate the skin. If this happens, seek immediate medical attention to reduce the risk of blood poisoning leading to death or limb amputation.

DANGER If a hydraulic fluid leak develops at any time during testing or operation of the log splitter, turn it off and repair the leak before any further work is done.

5.8. d. Start and run the log splitter to warm-up the fluid and check the test set connections for leaks. Cycle the ram 12 times to purge air from the hydraulic system.

5.8. e. Read the flow meter. The reading should be a minimum of 1.85 GPM (7 LPM).

NOTE: The metric scale (Liters Per Minute) provides a more usable flow reading than the U.S. scale (Gallons Per Minute) for this test.

WARNING Do NOT exceed 3,200 PSI (220 Bars). This test is performed up-stream of the relief valve in the log splitter hydraulic system, rendering the relief valve ineffective during the test. Over-loading the system will damage the pump.

DANGER Slowly close the snubber valve to build 2,000 PSI (220 Bars).

5.8. f. Note the reading on the flow meter.

5.8. g. IMMEDIATELY open the snubber valve, then turn-off the engine.

5.9. Interpreting the test results: See Figure 3.15.

NOTE: The change in flow rate from unloaded to 2,000 PSI (138 Bars) is called “Flow droop”.

NOTE: The engine governor should hold engine RPMS constant during the test.

- If the pump fails to produce the base-line flow rate {1.85 GPM (7 LPM)}, but engine RPM is 3,500, there is aproblem with the drive system (belt and pulleys) or the pump.
- Flow droop should be less than .26 GPM (1 LPM).
- If flow droops more than .26 GPM (1 LPM), and the engine RPM falls, there is an engine problem
- .If pressure fails to build, there is a problem with the drive system (belt and pulleys) or the pump.

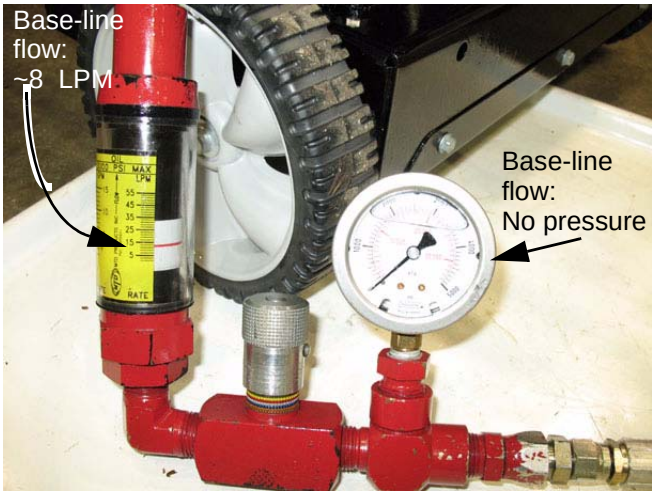

Figure 3.15

- If flow drops more than .26 GPM (1 LPM), the engine RPM does not change, and the engine exhaust note does not change, there is a problem with the drive system (belt and pulleys) or the pump.
- If base-line flow is 1.85 GPM (7 LPM), pressure builds to 2,000 PSI (138 Bars) when the snubber valve is closed, and pressure droop is less than .26 GPM (1 LPM), the pump, engine, and drive are working properly.
- To identify drive problems remove the bottom cover and examine the belt and pulleys.

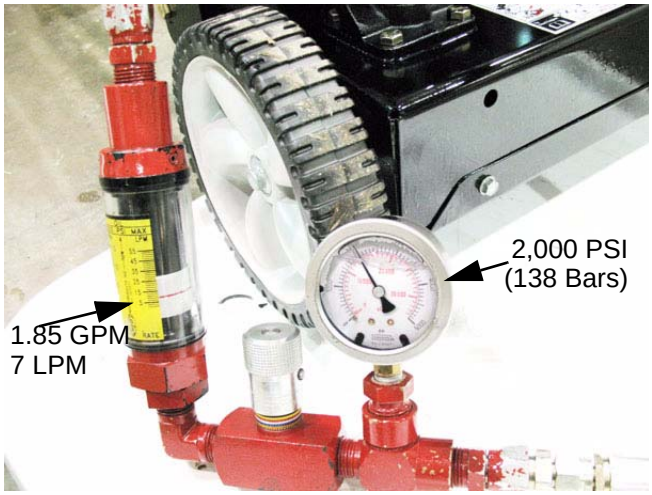

Figure 3.16

6. CHECKING THE CONTROL VALVE AND CYLINDER

6.1. After it is established that the engine, drive system, and pump are working correctly, if the log splitter still does not work as it should, check the control valve.

6.2. With the engine turned-off and hydraulic pressure relieved from the system by moving the lever on the control valve through it's full range of travel, proceed with the test.

6.3. Install the test gauges between the log splitter control valve and the fitting at the ram end of the hydraulic cylinder. See Figure 3.17.

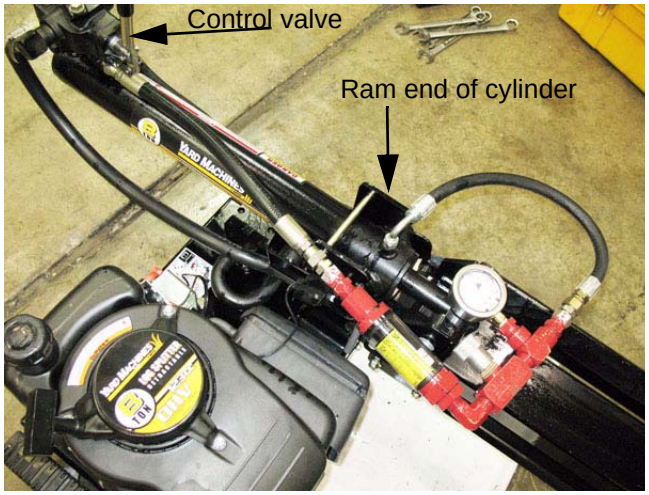

Figure 3.17

6.3. a. Remove the test gauges from between the pump and the control valve.

6.3. b. Reinstall the original hydraulic hose that connected the pump to the control valve.

6.3. c. Disconnect the hydraulic hose that runs from the log splitter control valve to the ram end of the hydraulic cylinder.

6.3. d. Install the test gauge set with the pressure gauge nearest the cylinder connection and the flow meter nearest the control valve.

6.3. e. Start and run the log splitter to warm-up the fluid and check the test gauge set connections for leaks. Cycle the ram 12 times to warm-up the fluid and purge air from the hydraulic system.

NOTE: The nipple that supplies fluid from the control valve to the base end of the hydraulic cylinder also supports the control valve. This makes it difficult to connect the test gauge set to the side of the hydraulic system that extends the ram.

6.4. Test the control valve and cylinder. See Figure 3.18.

6.4. a. Extend the cylinder fully using the log splitter control valve.

- As the ram reach the wedge, pressure will build to a maximum of 3,200 PSI (220 Bars), then the relief valve will spill-off fluid.
- If the pressure fails to reach the maximum seen in the pump test, the problem lies in the control valve.

6.4. b. Retract the cylinder using the log splitter control valve. The flow meter will work in the retract direction.

- If the needle on the pressure gauge moved too fast to get a good reading on the extension stroke, close the snubber valve while retracting the cylinder. This will provide the same test results, but allows more control over the rate of pressure build-up.
- If flow rate drops more than 1 LPM (.26 GPM) as pressure builds using the snubber valve, the log splitter control valve is leaking internally, and should be replaced.
- If the cylinder is retracted fully with the snubber valve open, and the flow continues to register on the flow meter as pressure builds, this indicates blow-by: the cylinder is leaking internally.

Figure 3.18

7. WHAT TO DO ABOUT FAILURES:

7.1. If a pump is bad:

- Replace the pump. The pump is not servicable.
- If the pump failed becuase of an external cause, identify and eliminate the cause.

  NOTE: Any disassembly of the pump WILL VOID THE WARRANTY. Do not take the pump apart if the repair is warrantable.

7.2. If the control valve is bad:

- If the repair is warrantable, replace the control valve.

  NOTE: Any disassembly of the control valve WILL VOID THE WARRANTY. Do not take the control valve apart if the repair is warrantable.

- If the relief valve is set too high or too low, and the control valve repair does not fall within the warranty policy, it may be adjusted.

7.3. If the cylinder is bad:

- If the cylinder is leaking at a seal, it may be repaired using a cylinder rebuild kit.
- If the cylinder is leaking at a welded seam, or has mechanical damage such as a bent shaft, replace the cylinder.

8. SYSTEM DRAWINGS

Control valve in Neutral

- The pump drives hydraulic fluid to the control valve.
- Fluid is shunted directly back to the reservoir
- No cylinder movement results

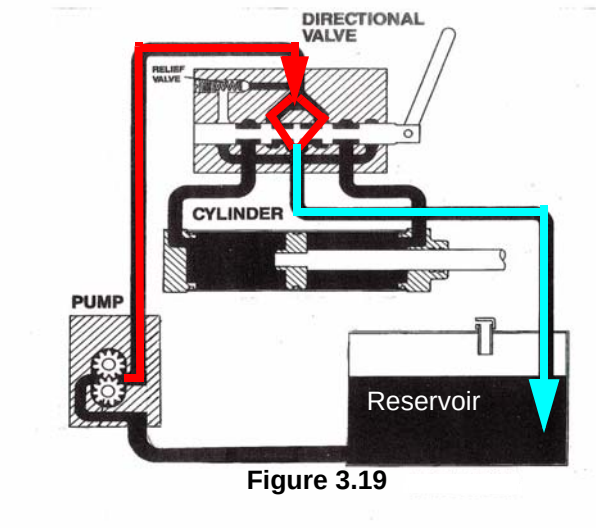

Figure 3.19

Control valve in Extend (splitting)

- The pump drives hydraulic fluid to the control valve.
- The spool in the control valve directs pressurized fluid to the base end of the cylinder.
- The pressurized fluid forces the piston up the bore of the cylinder.
- As the piston moves up the bore, it displaces fluid that is on the ram side of the piston.
- The spool in the control valve also connects ports joining the ram end of the cylinder to the reservoir.
- This allows displaced fluid to return to the reservoir.

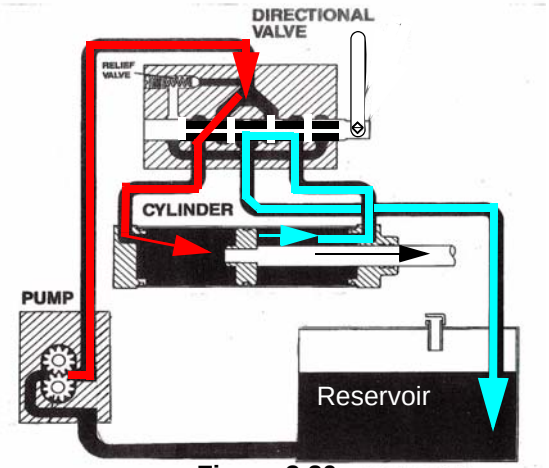

Figure 3.20

Control valve in Retract

- The pump drives hydraulic fluid to the control valve.
- The spool in the control valve directs pressurized fluid to the ram end of the cylinder.
- The pressurized fluid forces the piston down the bore of the cylinder.
- As the piston moves down the bore, it displaces fluid that is on the base side of the piston.
- The spool in the control valve also connects ports joining the base end of the cylinder to the reservoir.
- This allows displaced fluid to return to the reservoir.

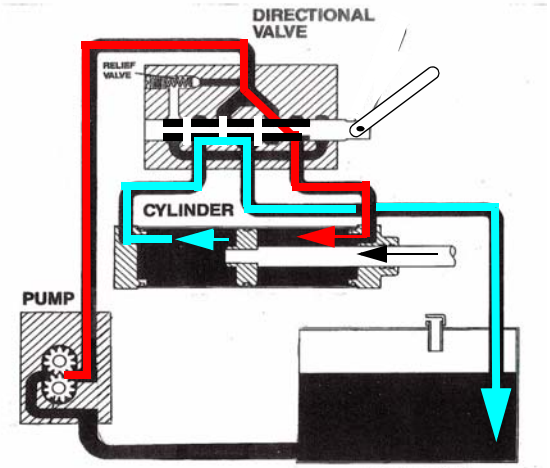

Figure 3.21

Relief in Neutral

- This drawing shows the relief valve in action with the control valve in neutral.
- The relief action is the same no matter what position the control valve is in.
- If pressure builds beyond 3,500 PSI (in neutral this could happen if the fluid is too cold), the relief valve opens, spilling fluid through a port that returns it to the reservoir.

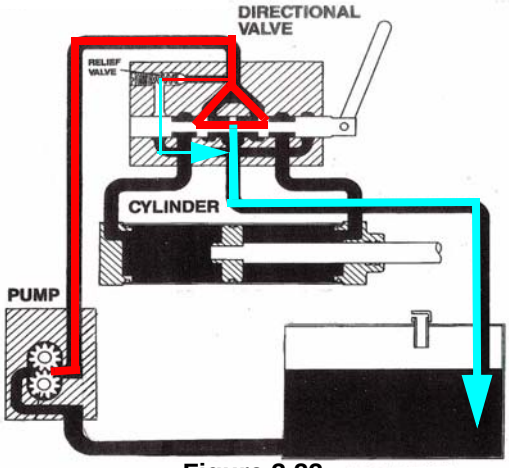

Figure 3.22

CHAPTER 4: COMPONENTS

INTRODUCTION

This chapter covers the removal and replacement procedures for the wear items and major assemblies of the MTD compact log splitter. Where applicable, there is also component service information.

1. DRIVE BELT

The belt that transfers power from the engine to the pump should provide years of service. The exact life depends on the frequency and severity of use. If the belt fails prematurely, find and fix the problem that caused the failure before returning the log splitter to the customer.

1.1. Drive belt replacement:

1.1. a. Allow the engine and hydraulic system to cool before working on the log splitter.

1.1. b. Disconnect the high-tension lead from the spark plug.

1.1. c. Empty the fuel tank, or seal the fuel tank cap vent.

NOTE: The vent can be sealed by removing the cap, placing a piece of plastic sheet or bag over the filler neck of the fuel tank, and reinstalling the cap over the plastic.

1.1. d. If the beam is not in the extended position (ready for splitting), extend it and lock it.

1.1. e. Remove the three bolts that hold the back edge of the belt cover to the frame using a 3/8" wrench. See Figure 4.1.

1.1. f. Tilt the log splitter up on-end.

1.1. g. Remove the three bolts that hold the front (beam side) edge of the belt cover to the frame using a 3/8" wrench, and lift away the cover. See Figure 4.1.

1.1. h. Relieve tension from the idler pulley. See Figure 4.2.

1.1. i. Remove the belt.

1.1. j. Inspect the old belt, pulleys, and surrounding area to determine the cause of the belt failure.

1.1. k. If the failure was from any cause other than the operational life of the belt, fix the problem.

1.1. l. Install the replacement belt by reversing the removal procedure.

1.1. m. Remove the plastic from the fuel tank vent.

1.1. n. Re-connect the high-tension lead to the spark plug.

1.1. o. Test-run the log splitter before returning it to service.

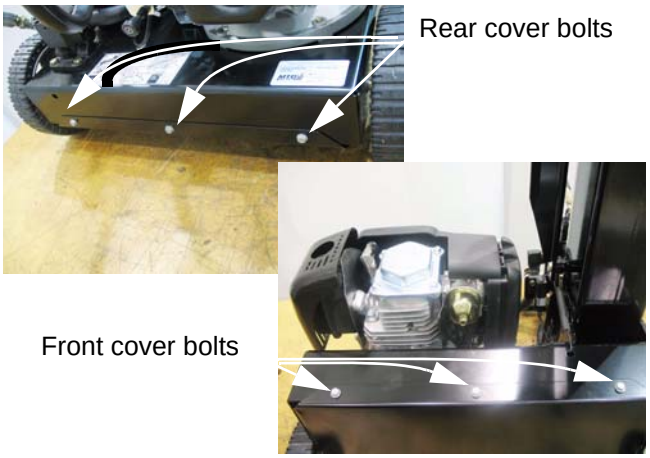

Figure 4.1

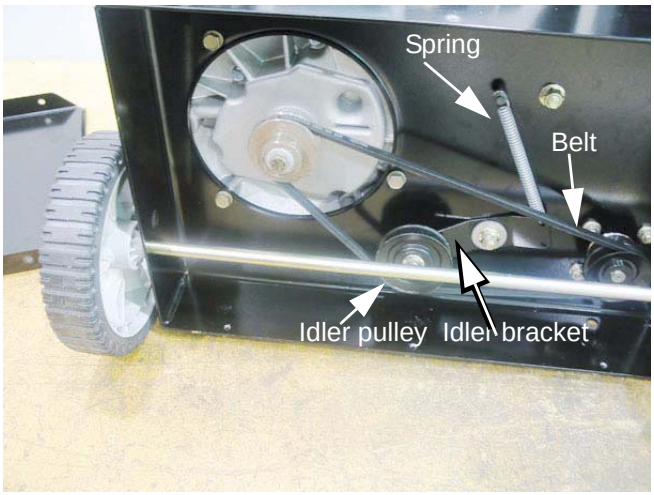

Figure 4.2

COMPONENTS

1.2. Likely causes of premature belt failure on the compact log splitter include: See Table 1:.

Table 1:

Description	Cause	Solution
Black dust inside Cover or glazed belt	belt slipppage wrong belt	Install the correct MTD or Arnold replacement belt. The part number can be found in the Operator's Manual, which is available on-line.
Glazed belt, may be separating	belt slippage oil on belt	Engine oil or hydraulic fluid are likely to be inside belt cover. Clean-up the fluid, identify and fix the leak, replace the belt.
Black dust inside Cover or glazed belt,	belt slippage improper belt tension	2-3 lbs. (0.9-1.4 Kg.) force at the longest span of the belt thould result in 3/8" (0.95 cm) deflection. Check the condition of the spring that pulls the idler bracket. Confirm that the idler bracket moves freely.
Narrow spot in belt, vibration	over-load	Check for pump siezure, wrong fluid, exreme low temperature, or relief valve that is not working properly.
Belt chafed / abraded Pulley contact surface may be streaked	pulley problem	Check the condition and alignment of the pulleys. Clean inside the belt chamber to prevent recurrence, replace the belt, and install the belt cover.
Small radial cracks in body of belt	age	Replace the belt, it is near the end of its service life. Heat will accelerate the aging process.
Cords stretched- Clean break in body of belt	shock-load, tensile failure	Check for pump siezure, wrong fluid, exreme low temperature, or relief valve that is not working properly.
Cords stretched- Clean break in body of belt	piercing	This is a form of foreign object damage where the belt is partially cut. It sometime occurs when a belt is pried onto the pulleys. The localized damage creates a weak spot that acts as a stress riser until failure occurs. Replace the belt
Clean break in belt	faulty belt	Belt fault will usually show-up almost immediately. Replace the belt.
Foreign object or small animal damage	Operation or storage without belt cover	Clean inside the belt chamber to prevent recurrence, replace the belt, and install the belt cover.
Heavy radial cracks in belt	wrong belt over-heat	A belt of too-heavy cross section has been used. Internal friction from bending and straightening is over-heating the belt.

1.3. Idler pulley and bracket. See Figure 4.3.

- The idler pivot bracket is sandwiched between a shouldered spacer and the frame.
- One side of the idler pulley has a spacer. The spacer on the idler pulley steps it out 1/8” from the idler bracket.
- Assembly in the wrong orientation will create an alignment probelm.
- A 3/8-18 nut and bolt hold the bracket to the frame and the pulley to the bracket.
- Use a pair of 9/16” wenches to remove the bracket and pulley,
- An extension spring keeps tension on the idler.

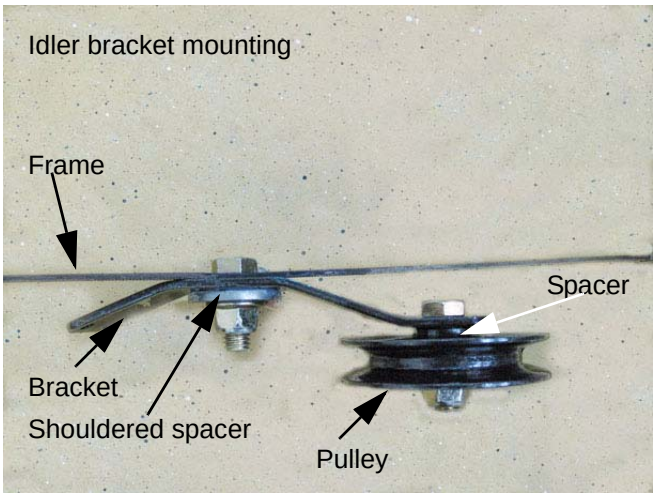

Figure 4.3

1.4. To check belt alignment. See Figure 4.4.

- If the engine pulley, pump pulley, and idler pulley are not in the same horizontal plane, the belt will wear quickly.
- Measure the distance from bottom top edge of the belt to the bottom of the log splitter frame near each pulley.
- The distance should be about 1-3/8” at all three points.
- The distance itself is not as important as the fact that the three measurements should not vary from each-other.
- When the bottom lip of the pulley is even with the pump shaft, the pulley will usually be aligned correctly.

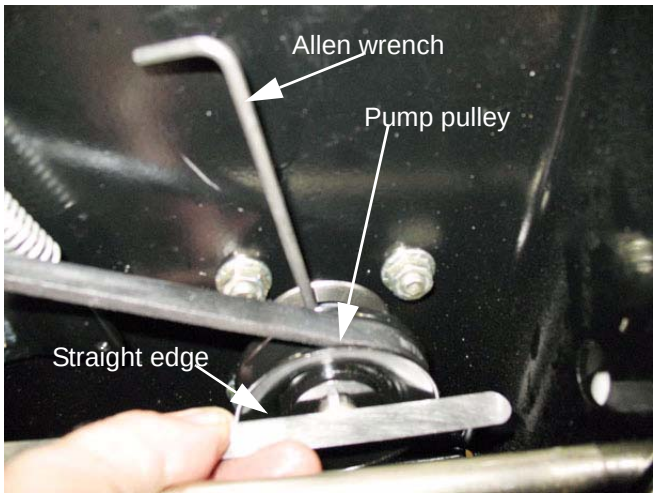

Figure 4.4

1.5. Pulley alignment: it is important that the pulleys be aligned with the belt.

- If the engine crankshaft or pump shaft pulley is askew, confirm that the engine and pump are firmly mounted to the frame and that the frame is not bent.
- If the idler pulley is askew, check for a bent idler arm.
- None of the pulleys should wobble on their axis.

2. ENGINE REPLACEMENT

NOTE: Complete engine service procedures can be found in the Engine manual, publcation number 769-03354A.
Basic engine service procedures can be found in chapter 2 of this manual: Engine.

2.1. Allow the engine and hydraulic system to cool before working on the logsplitter.

2.2. Disconnect the high-tension lead from the spark plug.

2.3. Disconnect the beam position safety switch from the engine. See Figure 4.5.

2.3. a. Disconnect the block ground using a 10mm wrench.

2.3. b. Unplug the bullet connector that ties the switch into the ignition module primary circuit.

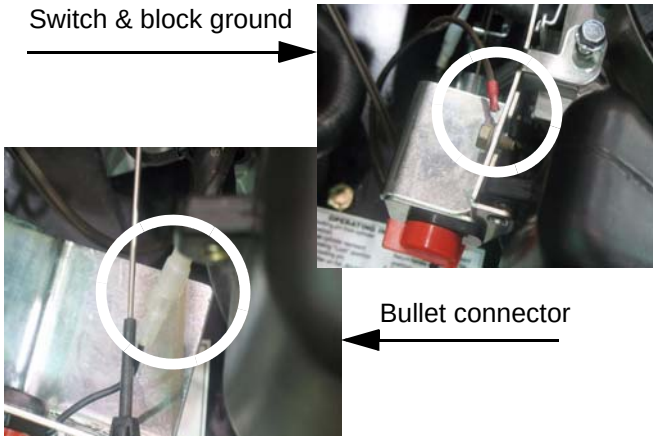

Figure 4.5

2.4. Empty the fuel from the fuel tank and the oil from the crankcase.

2.5. Remove the drive belt, as described in the drive belt section of this chapter.

2.6. Remove the drive belt pulley from the engine crankshaft using a 5/8” wrench. See Figure 4.6.

NOTE: It may be necessary to remove the starter housing and fan shroud to block the flywheel from turning.

2.7. Unbolt the engine from the frame using a 1/2” wrench, and remove it from the logsplitter.

2.8. Reverse the removal process to install the engine.

2.8. a. Tighten the engine mounting bolts to a torque of 200-450 in-lbs. (22.5-50 N-m).

2.8. b. Tighten the crankshaft bolt to a torque of 23-27 ft-lbs. (31-36.5 N-m) .

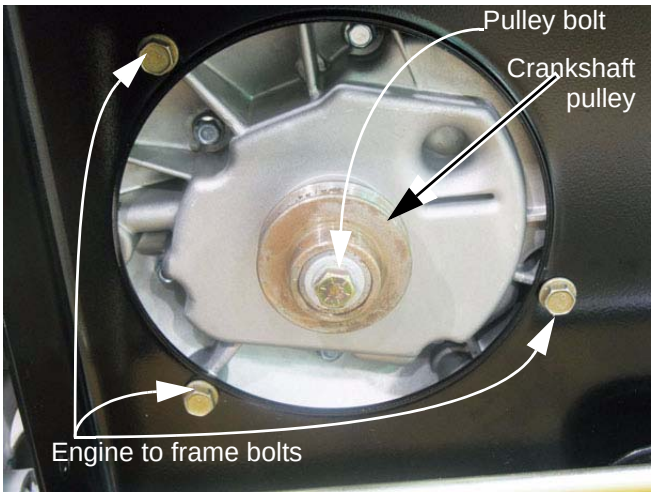

Figure 4.6

2.9. Fill the engine with fresh fuel and oil, and test-run the log splitter before returning it to service.

3. PUMP REPLACEMENT

NOTE: If the pump fails within the warranty period, it will be called back by MTD Vendor Recovery. If the pump has been disassembled, MTD will deny the warranty claim. Pumps MUST be returned to MTD intact.

⚠ CAUTION Hot hydraulic fluid can cause burns. Do not drain the fluid until the hydraulic system has cooled to ambient temperature after use.

3.1. Allow the engine and hydraulic system to cool before working on the log splitter.

3.2. Disconnect the high-tension lead from the spark plug.

3.3. Remove the drive belt from the log splitter as described in the drive belt section of this chapter.

3.4. Loosen the set screw that holds the pulley to the pump shaft using a 1/8" allen wrench, and slide the pulley as far down on the shaft as possible. See Figure 4.8.

3.5. Place a clean drain pan under the pump.
The drain pan should be capable of holding at least 2.5 gallons (9.5 liters) of fluid.

3.6. Clamp (pinch) the supply hose that leads to the pump from the reservoir, and loosen the hose clamp that holds the hose to the pump.

3.7. Drain the system: See Figure 4.7.

3.7. a. Pull the supply hose off of the fitting that connects it to the pump, and insert a length of tubing into the hose.

3.7. b. Release the pinch clamp, allowing the draining fluid to be directed into the drain pan.

3.7. c. Elevate the wedge end of the log splitter to help drain the reservoir.

3.7. d. Remove the fill plug using a 1/2" wrench.

3.7. e. Disconnect the pressure hose from the pump using a pair of 3/4" wrenches, and drain it into the catch pan.

3.7. f. Move the control valve lever into the retract position. A detent will hold it there.

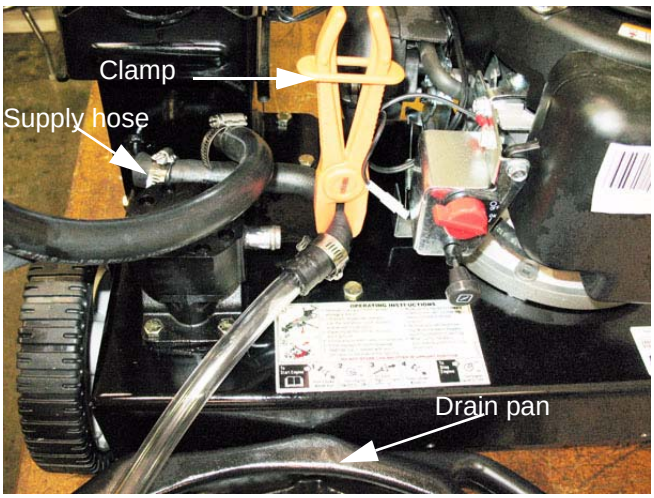

Figure 4.7

3.7. g. If the log splitter cylinder is not fully retracted, push the ram back into the cylinder. This will force any remaining fluid out of the pressure line.

3.7. h. Return the control valve to center.

3.8. Unbolt the pump from the frame using a pair of 1/2” wrenches. See Figure 4.8.

3.9. Lift the pump off of the frame, slipping the pulley and key off of the shaft as the pump comes up.

3.10. Take the flare elbow off of the old pump and transfer it to the new pump using a 3/4” wrench and a 7/8” wrench.

3.11. Fit the pulley and its drive key onto the pump shaft as the new pump is installed to the frame.

3.12. Position the pulley so that the bottom of the pulley is flush with the bottom of the shaft. Tighten the set screw.

3.13. Install the belt and check alignment. Adjust the pulley height if necessary.

3.14. Install the supply hose and pressure hose, and re-fill the log splitter with fresh fluid.

3.15. Test-run the log splitter before returning it to service.

3.16. Examine the drained fluid for contamination.

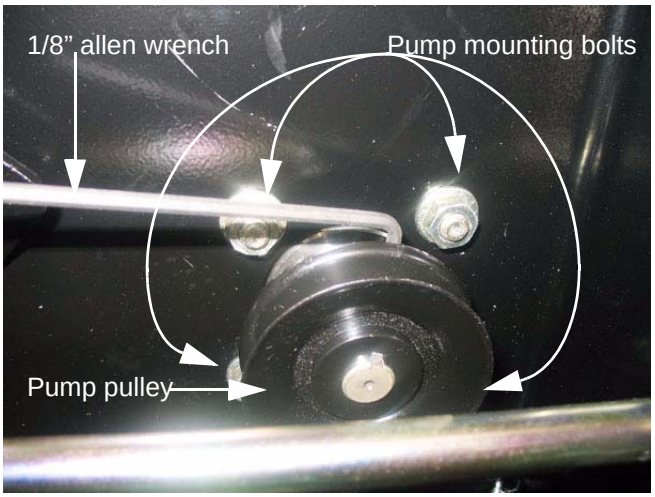

Figure 4.8

4. CONTROL VALVE

CAUTION Hot hydraulic fluid can cause burns. Do not drain the fluid until the hydraulic system has cooled to ambient temperature after use.

DANGER Hydraulic fluid under pressure can penetrate the skin. This will cause blood poisoning that may result in amputation or death. Relieve pressure from the hydraulic system before disconnecting any fittings. This can be done by moving the hydraulic control lever through it's full rage of travel with the engine turned-off.

NOTE: If the control valve fails within the warranty period, it will be called back by MTD Vendor Recovery. If the valve has been disassembled or tampered with in any way, MTD will deny the warranty claim. Valves MUST be returned to MTD intact.

4.1. Replacement Parts See Figure 4.9.

- The control lever bracket and link are the only available service parts for the hydraulic control valve.
- The control valve lever is part # 947-0583
- The control valve bracket is part # 718-0522
- The screws that hold the bracket to the control valve body are part # 710-1503. Order 2.
- If the bracket is replaced, install new screws. They are patch screws that are treated with thread locking compound.
- The link that connects the lever to the valve is a standard chain link. It can be purchased locally as a #60 master link with 3/4" pitch..

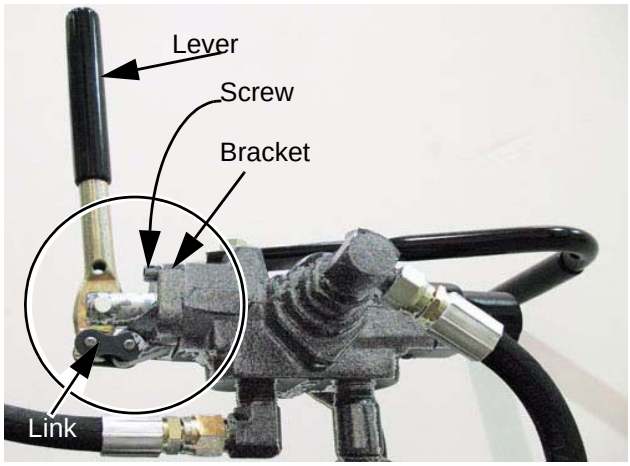

Figure 4.9

4.2. Adjusting pressure:

4.2. a. Turn the engine off and relieve pressure from the system.

4.2. b. Remove the plug that conceals the pressure adjustment screw using a 5/8" wrench.

- The plug is located under the low pressure return line from the valve to the tank.
- DO NOT remove the plug while the engine is running.

4.2. c. Use the adjustment screw to set the relief pressure. See Figure 4.10.

- Turn the adjustment screw in (clockwise) to raise the relief pressure.
- Back the adjustment screw out (counter-clockwise) to lower the relief pressure.
- Make adjustments in 1/4-turn increments.
- DO NOT set the relief pressure above 3,200 PSI (220 Bars).

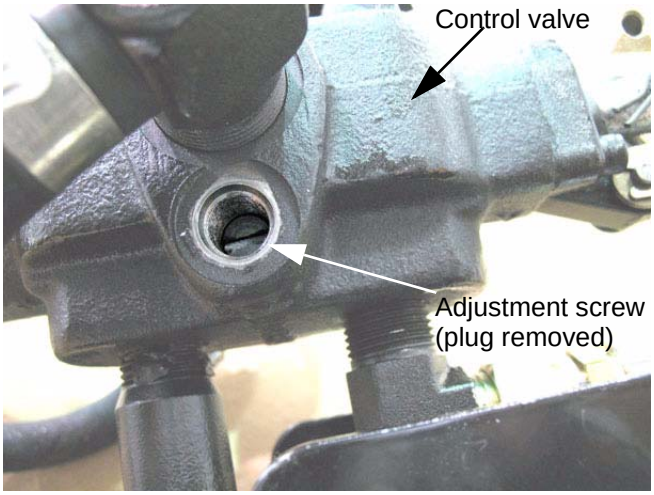

Figure 4.10

4.2. d. Install the plug that conceals the adjustment screw, run and test the log splitter.

4.3. Control Valve Replacement

CAUTION Hot hydraulic fluid can cause burns. Do not drain the fluid until the hydraulic system has cooled to ambient temperature after use.

DANGER Hydraulic fluid under pressure can penetrate the skin. This will cause blood poisoning that may result in amputation or death. Relieve pressure from the hydraulic system before disconnecting any fittings. This can be done by moving the hydraulic control lever through it's full rage of movement with the engine turned-off.

4.3. a.Relieve hydraulic pressure from the system by moving the control lever through its full range of travel.

4.3. b. Lock the hydraulic cylinder into the bracket that supports it for splitting use.

4.3. c. Clean the area around the control valve, and place a catch pan under the control valve.

4.3. d. Loosen the hose clamps that hold the low pressure return hose to the valve and the tank.

4.3. e. Disconnect the hose and direct the fluid into the catch pan. See Figure 4.11.

4.3. f. When the fluid has drained, remove the elbow fitting that it connected to on the valve using a 1-1/8" wrench.

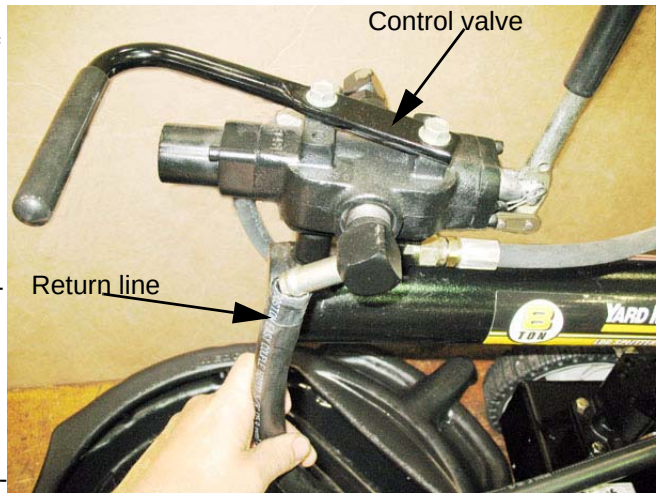

Figure 4.11

4.3. g. Disconnect valve end of the pressure hose that leads to the valve from the pump using a 7/8" wrench and a 3/4" wrench.

4.3. h. Remove the elbow fitting (for the pressure line) from the pump using a 3/4" wrench.

4.3. i. Disconnect the valve end of the pressure line that connects the control valve to the ram end of the hydraulic cylinder. Direct any draining fluid into the catch pan.

4.3. j. Rotate the entire control valve counter-clockwise to remove it from the cylinder.

4.3. k. Holding the elbow fitting on the bottom of the control valve in a vise, rotate the control valve counter-clock-wise to remove the fitting from the valve. See Figure 4.12.

4.3. l. Clean and inspect the hydraulic fittings removed from the valve.

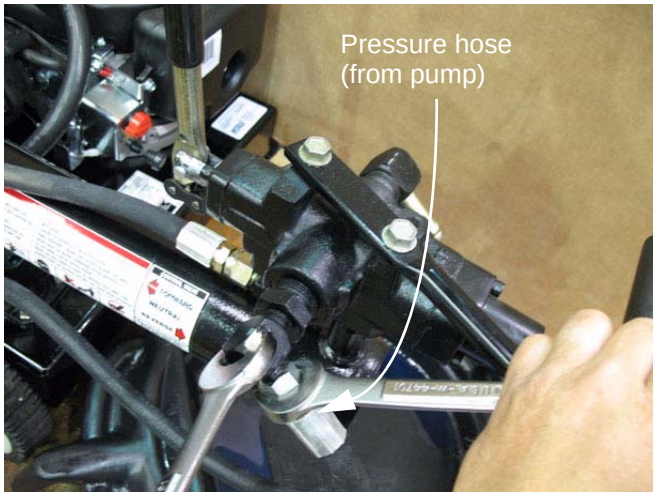

Figure 4.12

4.3. m. If suitable for reuse, install the elbow on the bottom of the valve. Apply thread sealant such as Loctite 545™ to the threads of the fitting before installation.

NOTE: Do not use PTFE (Teflon™) tape to seal the threads on MTD log splitters. Tape flash may come off inside the hydraulic system.

4.3. n. Transfer the grab handle from the old valve to the new valve using a 9/16” wrench.

4.3. o. Install the replacement valve to the log splitter cylinder. Apply thread sealant such as Loctite 545™ to the threads of the nipple on the cylinder before installation. See Figure 4.13.

4.3. p. Install the return hose elbow and the pump pressure line elbow onto the replacement control valve. Apply thread sealant such as Loctite 545™ to the threads of the fittings before installation.

4.3. q. Connect and tighten the pump pressure line.

4.3. r. Connect and tighten the return hose.

4.3. s. Refill the log splitter with fresh fluid or additional fluid of the same type drained during valve removal.

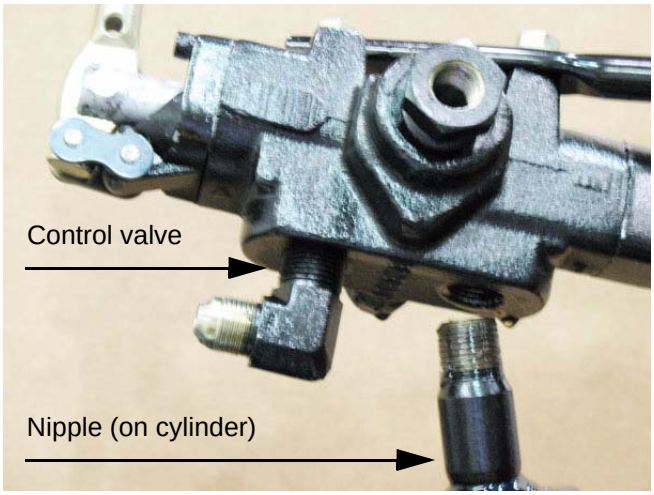

Figure 4.13

4.3. t. Test-run the log splitter, checking for leaks and confirming correct operation, then re-check the fluid level before returning the log splitter to service.

5. BEAM REPLACEMENT

NOTE: The fluid reservoir (tank) is integrated with the log splitter beam.

5.1. Remove the detent pin that secures the valve and cylinder to the log splitter frame.

5.2. Pry-off and dispose-of the push cap that secures the pin connecting the push bracket to the ram. See Figure 4.21.

5.3. Remove the push bracket pin, capturing the spacers.

5.4. Lift the cylinder off of the log splitter, and set it aside. See Figure 4.14.

NOTE: There is no need to disconnect the high pressure hose.

5.5. Clamp-off the hose that supplies hydraulic fluid to the pump.

5.6. Loosen the hose clamps at both ends of the supply hose.

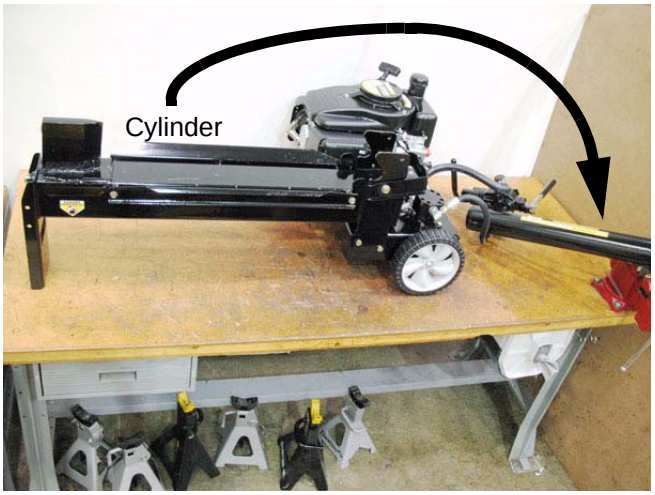

Figure 4.14

5.7. Disconnect the hose from the pump, and connect a suitable extension tube to it. See Figure 4.15.

5.8. Drain the tank into a clean drain pan capable of holding at least 1.5 gallons (5.7 liters) of fluid.

5.9. Unbolt the safety switch from its bracket using a 5/16" wrench.

Figure 4.15

5.10. Unhook the spring that keeps tension on the cylinder lock bracket. See Figure 4.16.

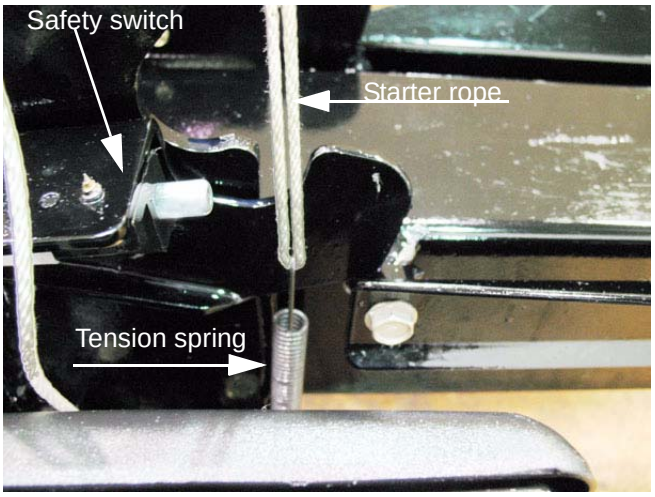

Figure 4.16

5.11. Unbolt the cylinder lock bracket from the frame using a 9/16” wrench. See Figure 4.17.

5.12. Remove the cylinder lock bracket.

5.13. Loosen the hose clamp that holds the low-pressure return hose onto the fitting on the tank.

5.14. Disconnect the hose.

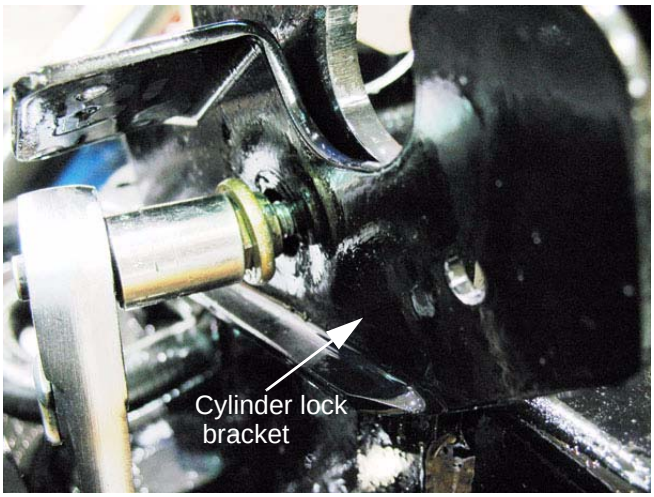

Figure 4.17

5.15. Unbolt the push bracket from the beam using a pair of 9/16” wrenches. See Figure 4.18.

5.16. Support the tank side of the log splitter frame using blocks or dimensional lumber.

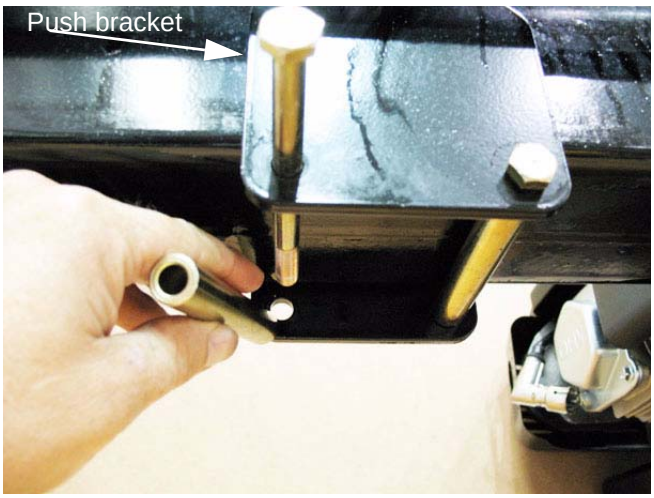

Figure 4.18

5.17. Unbolt the beam from the frame using a pair of 9/16” wrenches, and carefully remove it from the log splitter. See Figure 4.19.

5.18. Transfer the support bracket rails, vent, and plug to the replacement beam using a 1/2” wrench.

5.19. Install the replacement beam by reversing the steps used to remove the old beam.

NOTE: Tighten horizontal beam-to-frame bolts before tightening vertical beam-to-frame bolts.

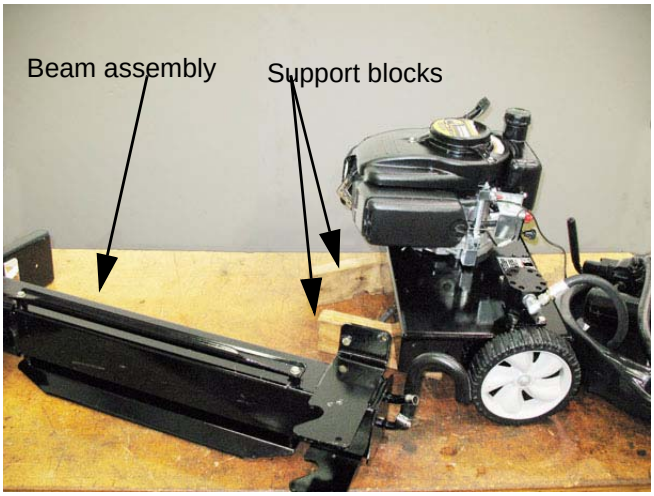

Figure 4.19

6. CYLINDER REPLACEMENT

CAUTION Hot hydraulic fluid can cause burns. Do not drain the fluid until the hydraulic system has cooled to ambient temperature after use.

DANGER Hydraulic fluid under pressure can penetrate the skin. This will cause blood poisoning that may result in amputation or death. Relieve pressure from the hydraulic system before disconnecting any fittings. Thic can be done by moving the hydraulic control lever through it's full rage of movement with the engine turned-off.

NOTE: There are two styles of hydraulic cylinder used on the compact log splitter: E-type and X-type.

- E-type cylinders can be identified by the notched lock ring that secures the end cap.
- X-type cylinders can be identified by the presence of two retaining bolts in the end cap.
- Both cylinders have the same part number and are completely interchangeable.

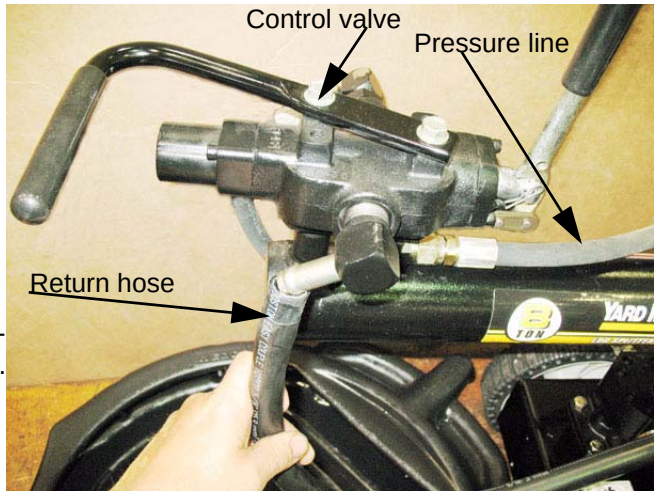

Figure 4.20

6.1. Allow the engine and hydraulic system to cool to ambient temperature before starting work on the log splitter.

6.2. Relieve hydraulic pressure from the system by moving the control lever through its full range of travel.

6.3. Remove the control valve as described in the "Control Valve Replacement" section of this chapter. See Figure 4.20.

6.4. Loosen, but do not remove the cylinder-end connection of the pressure line previously disconnected from the the control valve, using an 11/16" wrench.

6.5. Pry-off the push cap that holds the pin connecting the push bracket to the ram. See Figure 4.21.

6.6. Remove the push bracket pin, capturing the spacers.

6.7. Slide the push bracket away from the ram.

6.8. Direct the hose loosened in step 6.4 into a drain pan, and manually extend the cylinder to empty the hydraulic fluid from the ram end of the cylinder.

6.9. Remove the hose.

6.10. Remove the detent pin, release the latch, and lift the cylinder off of the log splitter.

6.11. Drain any residual fluid into the drain pan.

6.12. Install the replacement cylinder by reversing the steps used to remove the old old one.

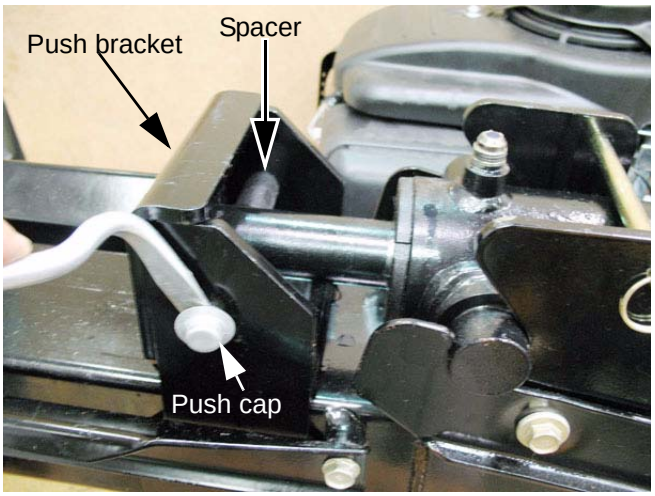

Figure 4.21

6.13. Fill the log splitter with fresh fluid matching the type drained (10W hydraulic fluid is light-honey colored, Dexron III is dyed red for identification).

6.14. Test-run and purge the log splitter by cycling it 12 times before returning it to service.

Table 2:

Fastener	Torqe in in-lbs. or ft-lbs.	Torque in N-m
Engine mounting bolts	200-450 in-lbs.	22.5-50 N-m
Crankshaft pulley bolt	23-27 ft-lbs	31-36.5 N-m
Pump pulley set screw	70-80 in-lbs +loctite 242™	8-9 N-m
Pump mounting bolts	144-168 in-lbs.	16-19 N-m

CHAPTER 5: CYLINDER REBUILD

1. CYLINDER IDENTIFICATION

1.1. There are two types of cylinder used on the Compact log splitter: E-type and X-type.

- The E-type cylinder uses a notched lock-ring to retain the end-cap..
- End of ram is painted.
- Rebuild parts are not presently available.
- Replace complete for warrantable failures.

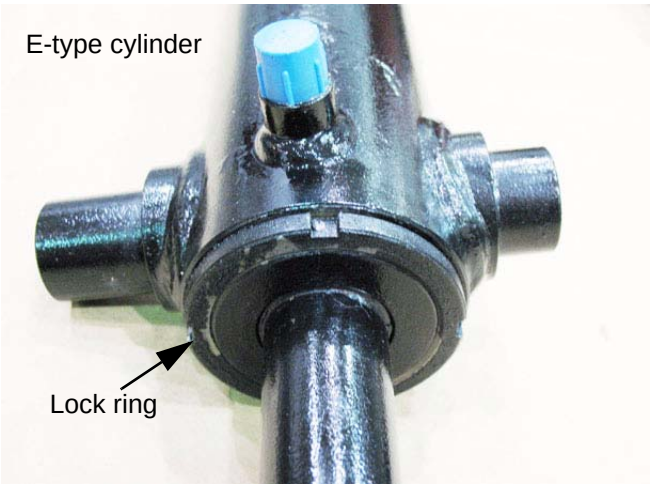

Figure 5.1

- The X-type pump uses two bolts and D-shaped plates to retain the end cap..
- The end of the ram is chrome lated, but not painted..
- Rebuild kits are presently available.
- If the seals fail in a warrantable situation, the cylinder will be repaired in the field.
- If seals fail outside of warranty, the cylinder can be repaired in the field, at the customer's expense.
- If hard parts are damaged, replace the cylinder complete

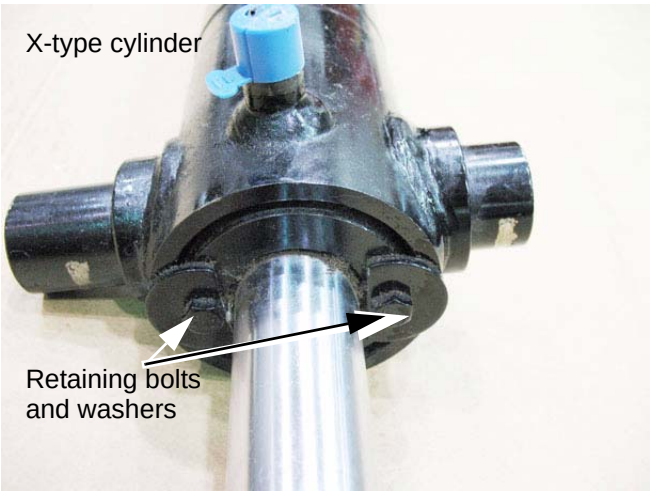

Figure 5.2

1.2. In service, the cylinders are interchangeable as complete units.

1.3. Seal kits are <u>not</u> interchangeable between the two cylinder types.

1.4. Rebuild procedures for both cylinders are covered in this chapter.

2. E-TYPE CYLINDER REBUILD

⚠ CAUTION Hot hydraulic fluid can cause burns. Do not work on the cylinder until the hydraulic system has cooled to ambient temperature after use.

⚠ DANGER Hydraulic fluid under high pressure can be dangerous. A high-pressure hydraulic fluid leak or spray can penetrate the skin. If this happens, seek immediate medical attention to reduce the risk of blood poisoning leading to death or limb amputation.

⚠ DANGER If a piece of hydraulic equipment develops a high pressure leak, turn it off immediately. Do not operate it until the leak is repaired.

2.1. Disconnect the hydraulic cylinder as described in the CYLINDER REPLACEMENT section of this manual, purging the fluid from both ends of the cylinder..

2.2. Remove the cylinder from the log splitter.

2.3. Heat the end cap lock ring to a pale straw yellow color, and dab a bit of paraffin around the inside diameter of the lock ring.

⚠ DANGER Use open flame with caution.
Keep at least 10’ (3.5 meters) from flammables.
Work in a well ventilated area wearing appropriate protective gear: eye protection, flame retardant gloves, and flame retardant clothing.

Figure 5.3

2.4. Use a spanner or drift to turn the lock ring counter-clockwise, loosening it. See Figure 5.3.

NOTE: The cylinder may be carefully placed back on the log splitter for convenient support after the ring has been heated.

2.5. The threaded end cap will be exposed.

2.6. Carefully drive the end cap back into the cylinder about 3/4” (1.5cm), exposing the heavy wire retaining ring seated in the cylinder bore.

2.7. Pry the retaining ring out of its groove. See Figure 5.4.

NOTE: Be careful not to scratch the bore of the cylinder.

2.8. After the retaining ring is free, pull the shaft out of the cylinder.

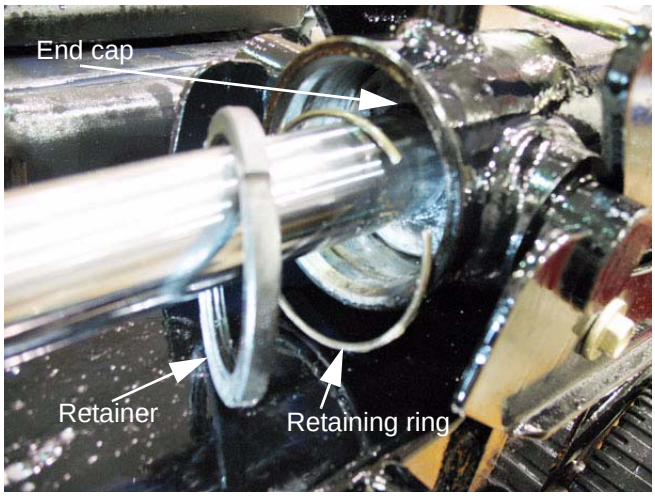

Figure 5.4

⚠ CAUTION Do not use compressed air to force the piston out of the log splitter bore. Compressed air may eject the piston with dangerous force.

2.9. Prepare to separate the piston, shaft, and end cap from the cylnder: support the cylinder in a soft-jawed vise. See Figure 5.5.

2.10. Take the end cap retainer off the shaft.

2.11. Take the retaining ring off the shaft.

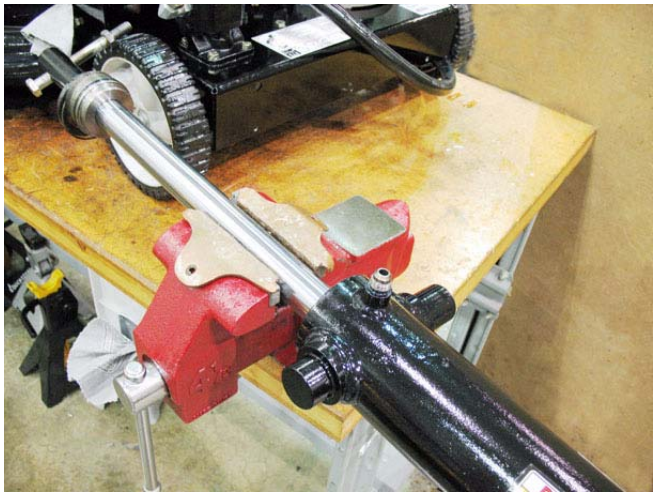

Figure 5.5

2.12. Clean the paint form the end of the shaft.

NOTE: The thickness of the paint on the shaft is enough to jam the end cap, making it nearly impossible to remove.

2.13. Slide the end cap off of the shaft. See Figure 5.6.

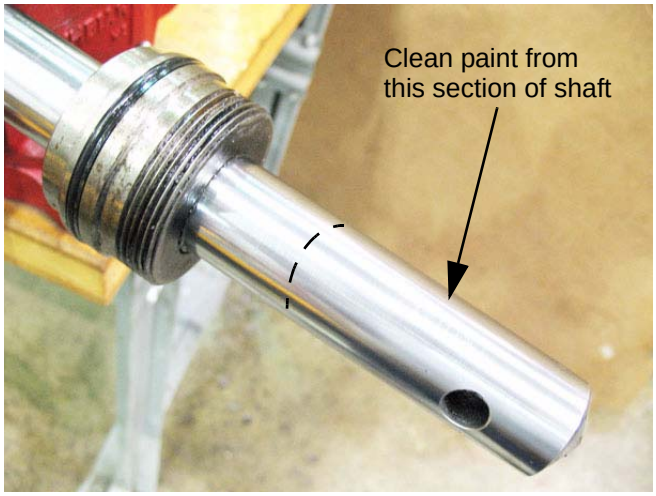

Figure 5.6

2.14. Before proceeding: See Figure 5.7.

2.14. a. Inspect the shaft and piston to confirm that the cylinder is rebuildable.

NOTE: A bend or surface damage on the shaft will make the cylinder unfeasible to rebuild.

2.14. b. Inspect the cylinder bore for deformations and surface damage.

2.14. c. Inspect the hydraulic fittings on the cylinder for damage.

2.14. d. Inspect the cylinder for cracks around the fittings and welds. Magna-flux if in doubt.

Figure 5.7

2.15. Remove the nut that holds the piston to the shaft using a 1-5/16” wrench. See Figure 5.8.

NOTE: It may be necessary to apply heat to the nut.

2.16. Remove the piston and backing sleeve from the shaft.

2.17. Remove the O-ring that seals the gap between the piston and the shaft.

2.18. Install a fresh O-ring.

2.19. Install the sleeve, piston, and nut, applying thread locking compound such as Loctite 262™ (red).

2.20. Tighten the nut to a torque of 100 ft.-lbs (136 N-m).

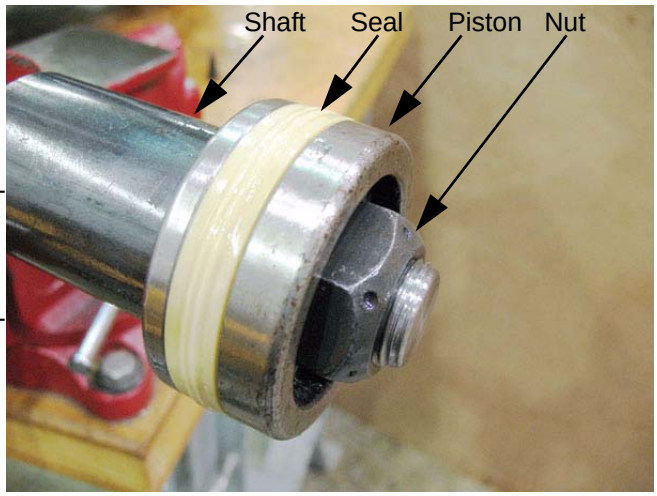

Figure 5.8

2.21. Carefully pry the outer piston seal off of the piston.

2.22. Carefully pry the piston seal back-up ring out of the groove in the piston.

2.23. Install a new back-up ring and piston seal. See Figure 5.9.

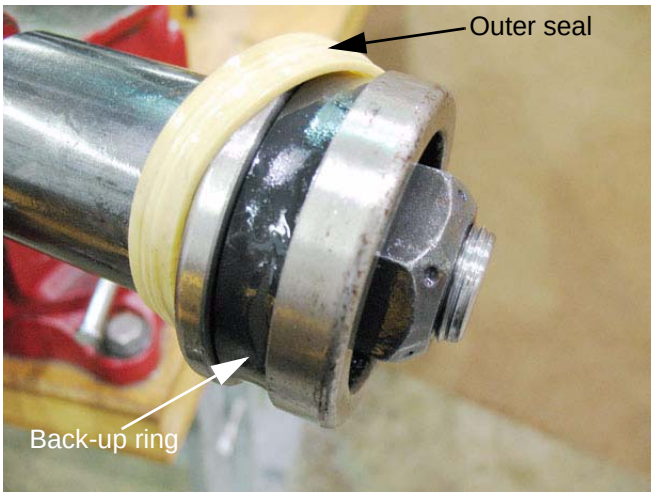

Figure 5.9

2.24. Carefully pry the O-ring seal out of the groove in the outside diameter of the end cap. See Figure 5.10.

2.25. Carefully pry the square-edged O-ring out of the groove in the outside diameter of the end cap.

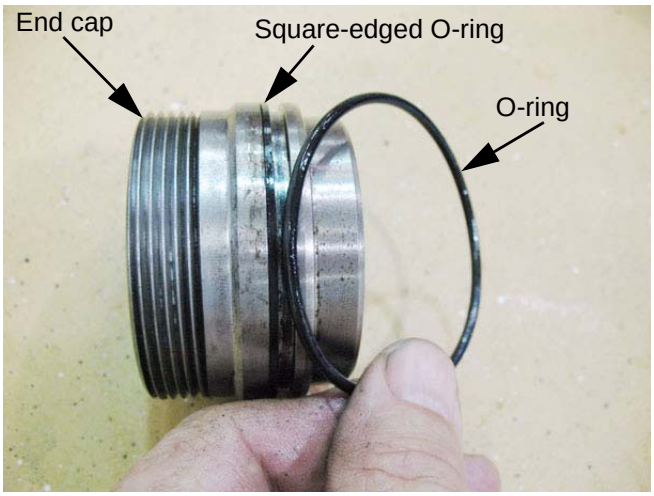

Figure 5.10

2.26. Carefully pry the scraper out of the recess in the threaded end of the end cap. See Figure 5.11.

2.27. Carefully pry the blue internal seal out of its recess in the end cap.

Figure 5.11

2.28. Warm the new scraper and blue seal in hot water to make them more pliable.

2.29. Compress the new seal into the jaw of a 1-1/4" wrench, so that it fits into the bore of the end cap,

2.30. Press the new seal into position with the lip facing away from the threaded end of the end cap, then let it expand into the groove that it will ride in.
See Figure 5.12.

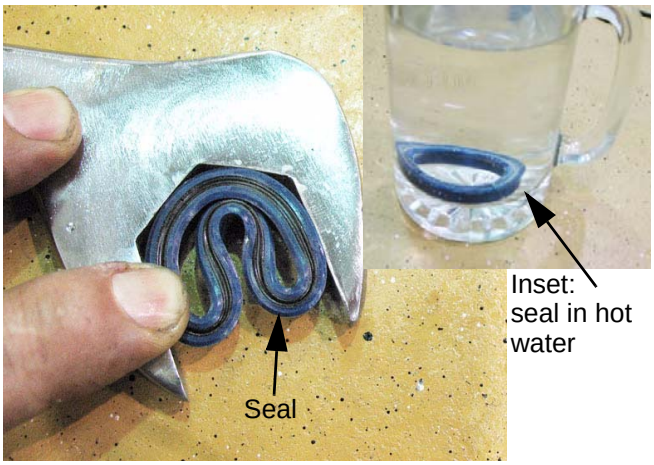

Figure 5.12

2.31. Install the new scraper in the recess in the threaded end of the end gap. See Figure 5.13.

NOTE: The scraper has an "L" shaped cross-section. The leg of the L should face the threaded end of the end cap.

2.32. Install a new square-edged O-ring in the groove, positioned at the edge of the groove that is nearer to the threads on the end cap.

2.33. Install a new O-ring seal in the groove, next to the square-edged O-ring.

Figure 5.13

2.34. Lubricate the piston with the same type of fluid that will be used in the hydraulic system of the log splitter: 10W hydraulic fluid, or Dexron III automatic transmission fluid. See Figure 5.14.

2.35. Insert the shaft and piston into the bore of the cylinder.

2.36. Lubricate the seals on the end cap using the same type of fluid that will be used in the hydraulic system of the log splitter.

2.37. Slip the end cap over the shaft and into the bore of the cylinder.

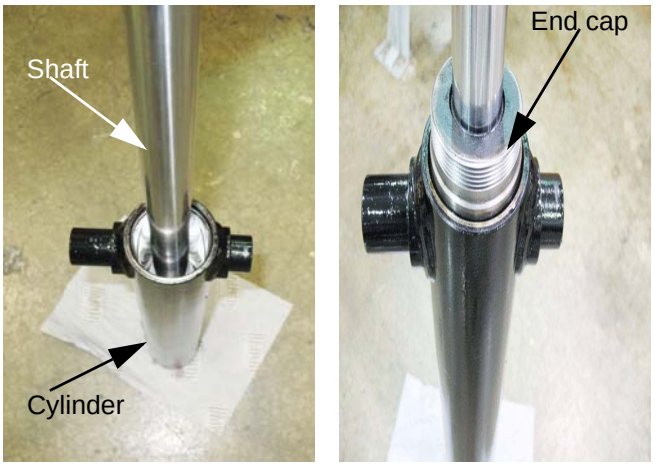

Figure 5.14

2.38. Use a length of 1-1/2” iron pipe (or similar driver) to drive the end cap into the bore, past the groove that the wire snap ring locks into.

2.39. Install the snap ring. See Figure 5.15.

2.40. Pull the shaft and piston up to the top of the bore, so that the piston moves the end cap back into place against the snap ring.

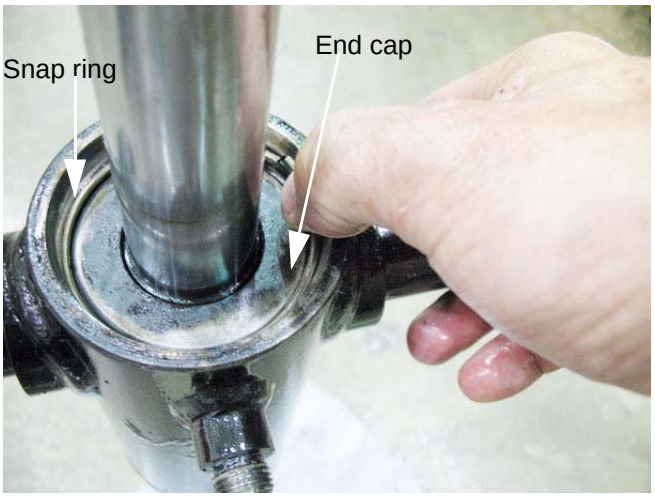

Figure 5.15

2.41. Position the cylinder in the log splitter, with the gimble pins latched into the cylinder lock bracket.

2.42. Install the lock ring; apply threadlocking compound such as Loctite 262™ (red) to the threads, and tighten it with a spanner or a hammer and drift.
See Figure 5.16.

2.43. Finish installing the cylinder:

2.43. a. Install the hydraulic control valve.

2.43. b. Connect the hydraulic lines.

2.43. c. Secure the cylinder using the detent pin.

2.43. d. Connect the push bracket to the shaft.

2.44. Re-fill the hydraulic system.

2.45. Run, purge, and test the log splitter before returning it to service.

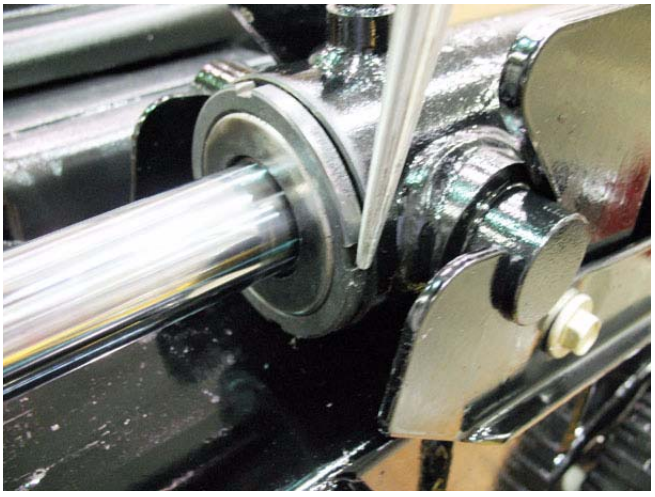

Figure 5.16

NOTE: Cycle the cylinder 12 times to purge air from the hydraulic system, then top-up the fluid.

3. X-TYPE CYLINDER REBUILD

CAUTION Hot hydraulic fluid can cause burns. Do not work on the cylinder until the hydraulic system has cooled to ambient temperature after use.

DANGER Hydraulic fluid under high pressure can be dangerous. A high-pressure hydraulic fluid leak or spray can penetrate the skin. If this happens, seek immediate medical attention to reduce the risk of blood poisoning leading to death or limb amputation.

DANGER If a piece of hydraulic equipment develops a high pressure leak, turn it off immediately. Do not operate it until the leak is repaired.

3.1. Disconnect the hydraulic cylinder as described in the CYLINDER REPLACEMENT section of this manual, purging the fluid from both ends of the cylinder..

3.2. Remove the two retaining bolts and D-shaped washers from the end cap using a 10mm wrench.
See Figure 5.17.

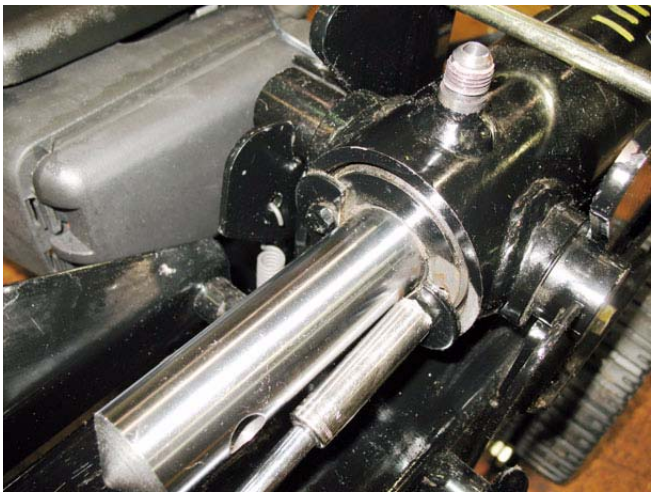

Figure 5.17

3.3. Carefully drive the end cap back into the cylinder about 3/4” (1.5cm), exposing the heavy wire retaining ring seated in the cylinder bore.

3.4. Pry the retaining ring out of its groove.
See Figure 5.18.

NOTE: Be careful not to scratch the bore of the cylinder.

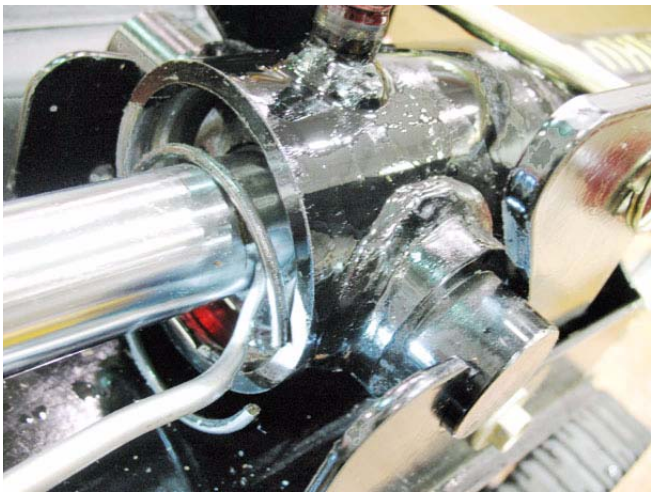

Figure 5.18

3.5. Reinstall the bolts in the end cap; just part way.

3.6. Use the bolt heads to pry against, using the cylinder lock bracket as a fulcrum to pry the end cap out of the cylinder. See Figure 5.19.

NOTE: At this point, the shaft can be drawn most of the way out of the cylinder, but it will hit the wedge at the end of the beam before it comes all the way out.

3.7. Remove the cylinder from the log splitter.

3.8. Pull the shaft out of the cylinder.

3.9. Slip the end cap off of the shaft.

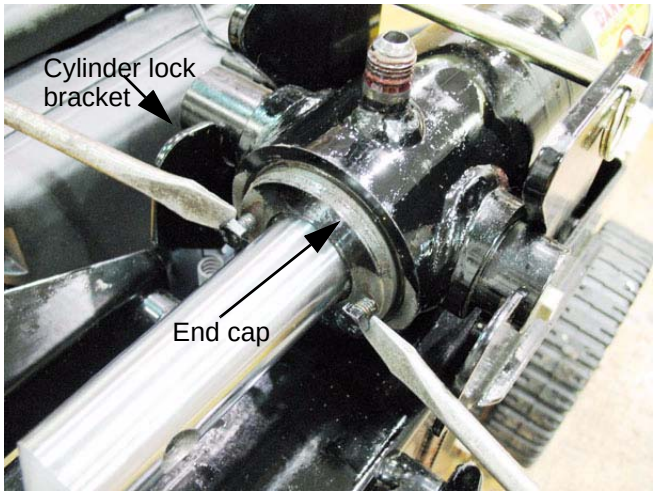

Figure 5.19

3.10. Before proceeding: See Figure 5.20.

3.10. a. Inspect the shaft and piston to confirm that the cylinder is rebuildable.

NOTE: A bend or surface damage on the shaft will render the cylinder unrebuildable.

3.10. b. Inspect the cylinder bore for deformations and surface damage.

3.10. c. Inspect the hydraulic fittings on the cylinder for damage.

3.10. d. Inspect the cylinder for cracks around the fittings and welds. Magna-flux if in doubt.

Figure 5.20

3.11. The cylinder rebuild kit consists of: See Figure 5.21.

- Instructions
- 2-piece piston ring seal (A)
- Piston-to-shaft O-ring seal (B)
- End cap outside diameter seal (C)
- End cap shaft seal (D)
- End cap shaft scraper (E)

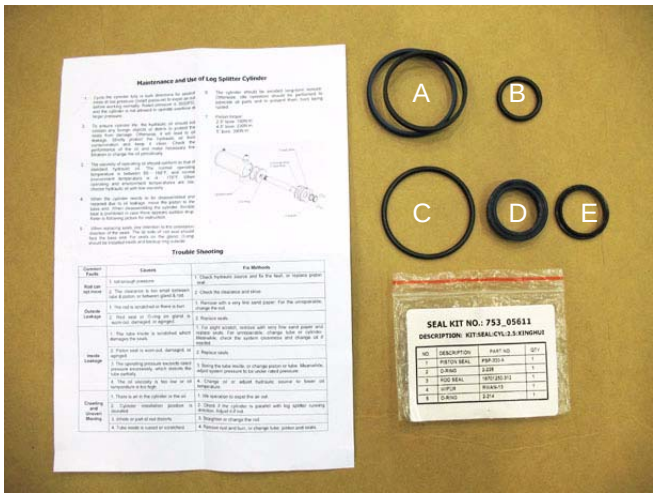

Figure 5.21

3.12. Remove the set screw that locks the piston from rotating on the threaded shaft, using a 3mm allen wrench. See Figure 5.22.

3.13. Use a pin spanner, or improvise a pin spanner using a pair of 5/16” bolts or dowel pins in the holes of the piston face, to unthread the piston from the shaft.

NOTE: It may be necessary to apply heat to the piston.

3.14. Replace the O-ring seal that goes between the piston and the shaft.

3.15. Apply thread locking compound such as Loctite 262™ (red) to the threads, and reinstall the piston.

3.16. Tighten the piston to a torque of 140 ft-lbs (190 N-m).

3.17. Reinstall the set screw to lock the piston onto the shaft.

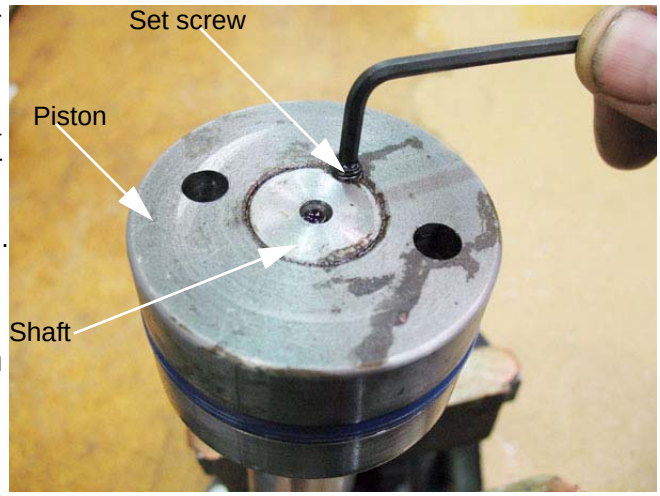

Figure 5.22

3.18. Carefully pry the outside diameter seals off of the piston.

3.19. Warm-up the new two-part piston seal set in hot water. See Figure 5.23.

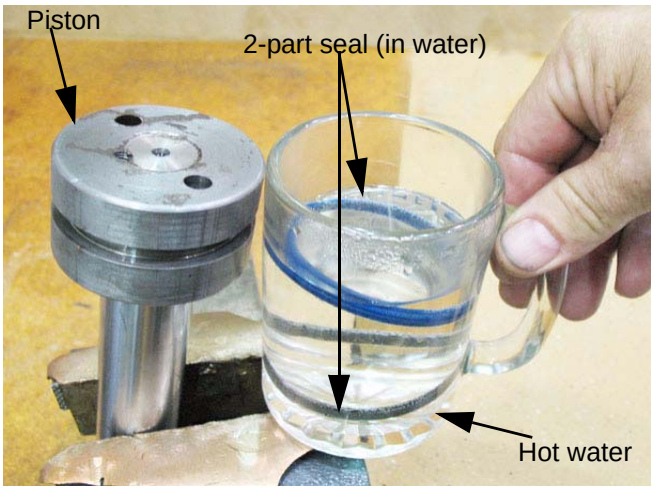

Figure 5.23

3.20. Slip the black seal back-up into the groove on the piston.

3.21. Slip the blue outer seal into the groove, on top of the seal back-up. See Figure 5.24.

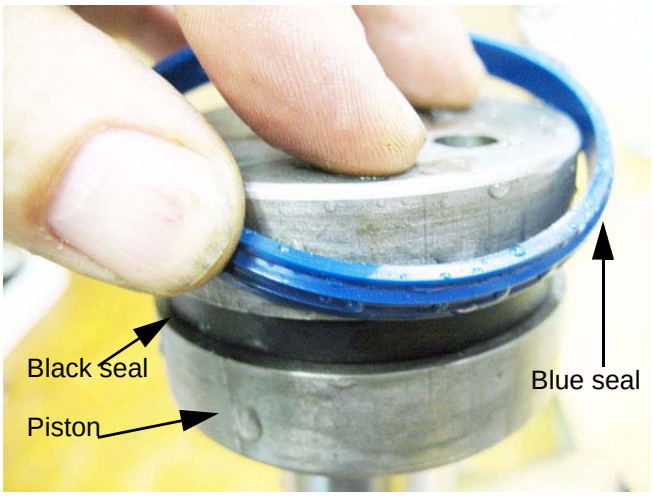

Figure 5.24

3.22. Carefully pry the O-ring seal out of the groove in outside diameter of the end cap. See Figure 5.25.

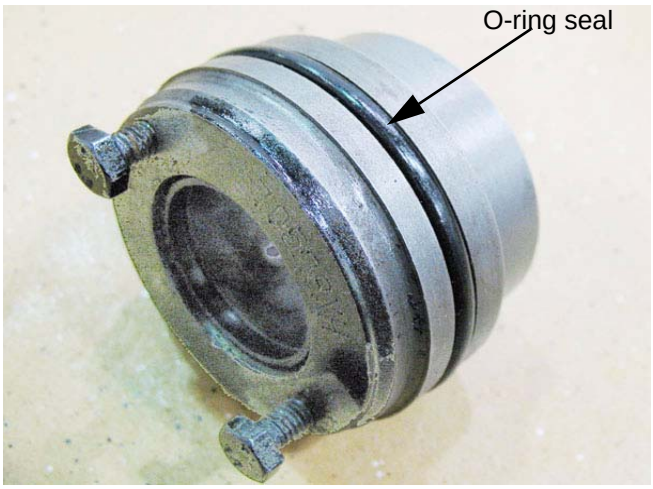

Figure 5.25

3.23. Carefully pry the scraper out of the groove near the outside face of the end cap. See Figure 5.26.

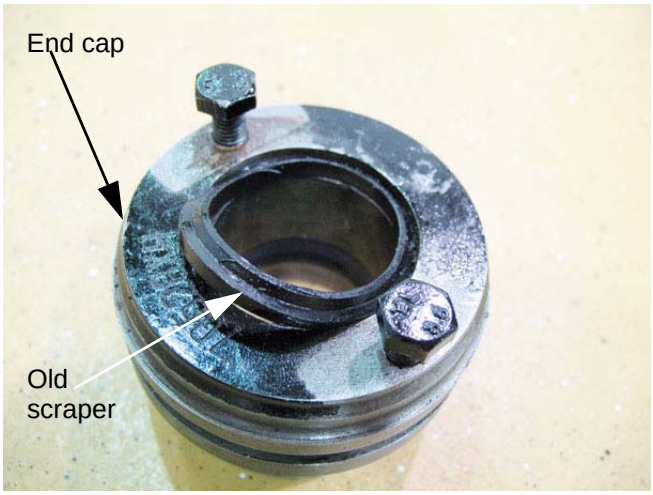

Figure 5.26

3.24. Carefully pry the blue inner seal out of the groove in the inside diameter of the end cap. See Figure 5.27.

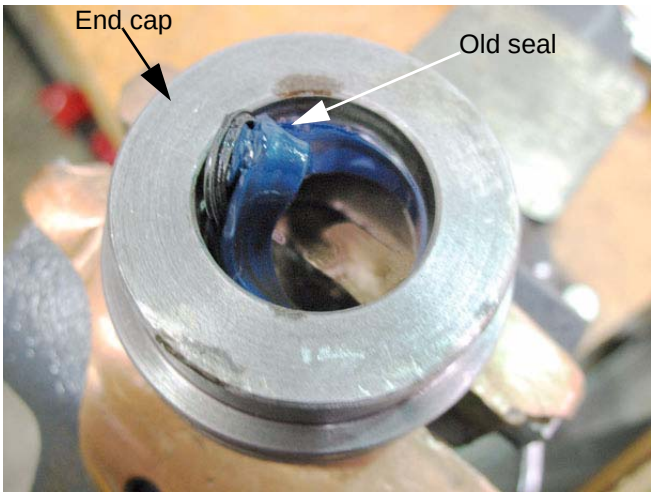

Figure 5.27

3.25. Soften the new shaft seal by soaking it in hot water just before installation.

3.26. Compress the new seal into the jaw of a 1-1/4” open-end wrench. See Figure 5.28.

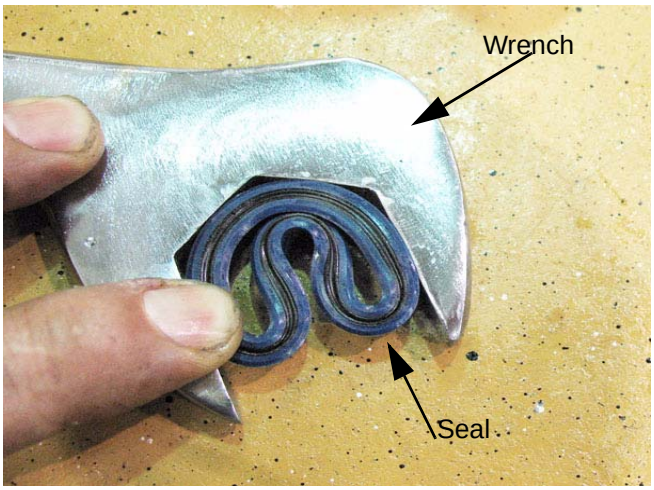

Figure 5.28

3.27. Install the seal: See Figure 5.29.

3.27. a. Position a socket or similar item with an outside diameter that is slightly smaller than the inside diameter of the end cap in a vise, so that when the end cap is placed over it, the top surface of the socket is level with the bottom land of the O-ring groove.

3.27. b. Push the seal out of the wrench and into the end cap, with the lip and black inner part of the seal facing what would be the inside of the cylinder.

3.27. c. When the seal stops againns the socket, allow it to expand into the groove.

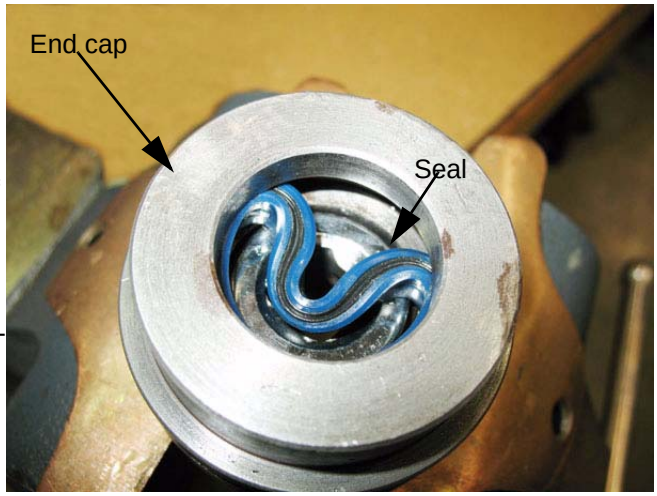

Figure 5.29

3.28. Install the scraper: See Figure 5.30.

3.28. a. Slip the scraper into the groove near the outer surface the end cap.

3.28. b. The lip of the scraper should face the outer surface of the end cap.

NOTE: The outer surface of the end cap has the two threaded holes in it.

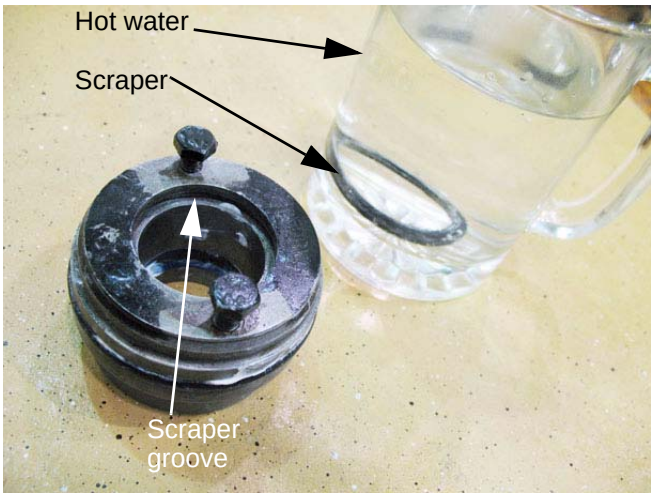

Figure 5.30

3.29. Slip the end cap over the end of the shaft. See Figure 5.31.

3.29. a. Lubricate the seal and scraper with the same type of fluid that will be used in the log splitter hydraulic system.

3.29. b. Insert a protector sleeve through the seal and scraper to prevent damage during installation.

3.29. c. Push the end cap onto the shaft.

3.29. d. Install the new O-ring seal

3.29. e. Lubricate the shaft and the outside diameter seal on the end cap with the same hydraulic fluid that will be used in the log splitter hydraulic system.

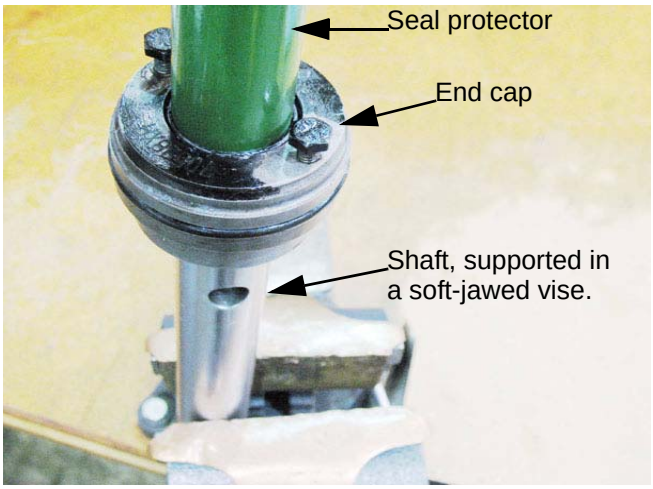

Figure 5.31

3.30. Install the piston and end cap:

3.30. a. Insert the piston into the bore of the cylinder.

3.30. b. Press the piston down the bore.

3.30. c. Push the end cap into place.

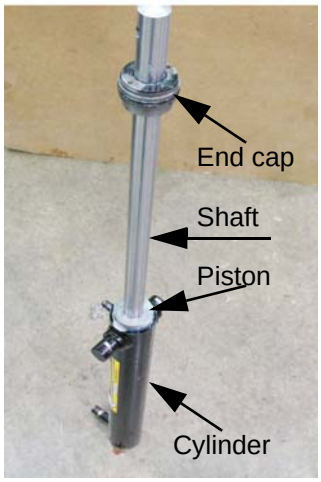

Figure 5.32

3.31. Use a length of 1-1/2” iron pipe (or similar driver) to drive the end cap into the bore, past the groove that the wire snap ring locks into.

3.32. Install the snap ring. See Figure 5.33.

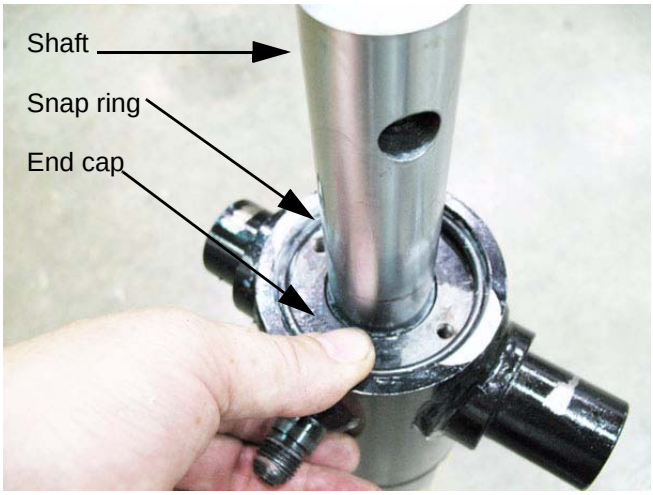

Figure 5.33

3.33. Pull the shaft and piston up to the top of the bore, so that the piston moves the end cap back into place against the snap ring. See Figure 5.34.

NOTE: The bolts may be installed temporarily, for use as pry-points.

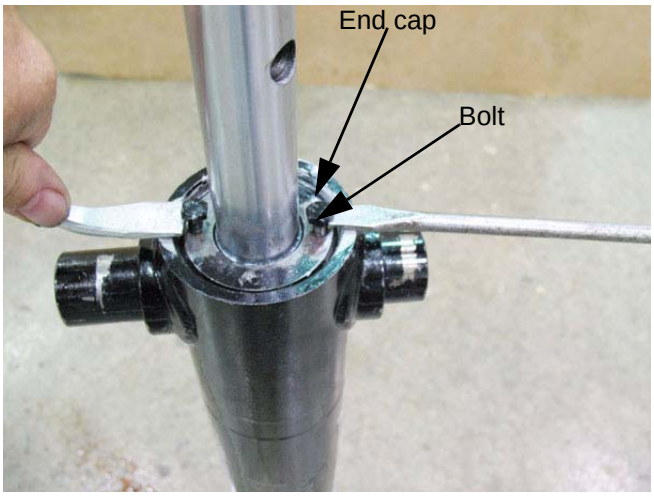

Figure 5.34

3.34. Install the bolts and D-shaped washers to lock the end cap in place. See Figure 5.35.

NOTE: Do not allow the washers to rotate so that they drag against the shaft as the bolts are tightened. They will scratch the shaft, destroying the cylinder.

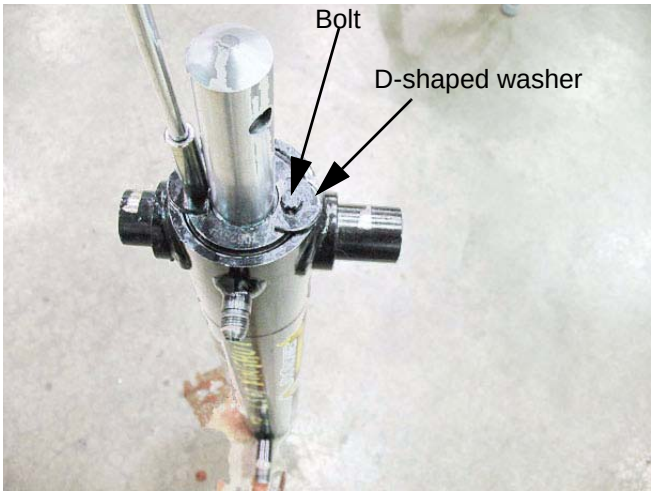

Figure 5.35

3.35. Finish installing the cylinder:

3.35. a. Install the hydraulic control valve.

3.35. b. Connect the hydraulic lines.

3.35. c. Secure the cylinder using the detent pin.

3.35. d. Connect the push bracket to the shaft.

3.36. Re-fill the hydraulic system.

3.37. Run, purge, and test the log splitter before returning it to service.

NOTE: Cycle the cylinder 12 times to purge air from the hydraulic system, then top-up the hydraulic fluid.