

MEGHO

BEAR CAT



19 SIRIUS ROAD,
LANE COVE, N.S.W. 2066

Plant Number: 07101 001

LOG SPLITTER

LS21E - 21 TON ELECTRIC

LS21160 - 21 TON

LS21160T - 21 TON TOWABLE

LS27270 - 27 TON

LS27270T - 27 TON TOWABLE

LS33340 - 33 TON

LS33340T - 33 TON TOWABLE



OWNER'S MANUAL

Manual P/N 36190-00

Rev. 022510

Companion to P/N 36191-00

SN Range: A02294 - A09846

VIN Range: 5VJAA0019AW002298 - 5VJAA0018AW002678

Before You Begin

DEAR ECHO BEAR CAT CUSTOMER

Thank you for purchasing a ECHO Bear Cat product. The ECHO Bear Cat line is designed, tested, and manufactured to give years of dependable performance. To keep your machine operating at peak efficiency, it is necessary to adjust it correctly and make regular inspections. The following pages will assist you in the operation and maintenance of your machine. Please read and understand this manual before operating your machine.

If you have any questions or comments about this manual, please call us toll-free at 1-800-247-7335.

If you have any questions or problems with your machine, please call or write your local authorized ECHO Bear Cat Dealer.

This document is based on information available at the time of its publication. ECHO Bear Cat is continually making improvements and developing new equipment. In doing so, we reserve the right to make changes or add improvements to our product without obligation for equipment previously sold.

PLEASE SEND US YOUR WARRANTY CARD

A warranty card is included in your owner's kit packaged with your machine. Please take the time to fill in the information requested on the card. When you send your completed card to us, we will register your machine and start your coverage under our limited warranty.

FOR MACHINE SERVICE OR PARTS:

For service assistance, contact your nearest authorized ECHO Bear Cat dealer or the factory. For parts, contact your authorized dealer. The parts manual for your machine is available at <http://bearcatproducts.com/main/support/index.html>. Your dealer will need to know the identification number of your machine to provide the most efficient service. See below for information on how to identify and record the identification number for your machine.

FOR ENGINE SERVICE OR PARTS:

For engine service or parts, contact your nearest authorized engine dealer. ECHO Bear Cat does not handle any parts, repairs or warranties for engines.

ORDERING PARTS

Only genuine ECHO Bear Cat replacement parts should be used to repair the machine. Replacement parts manufactured by others could present safety hazards, even though they may fit on this machine. Replacement parts are available from your ECHO Bear Cat dealer.

Provide the following when ordering parts:

The SERIAL NUMBER OR VIN of your machine.

The PART NUMBER of the part.

The PART DESCRIPTION.

The QUANTITY needed.

IDENTIFICATION NUMBER LOCATION

Your machine will have either a serial number or vehicle identification number (VIN). VINs are located on the left side of the trailer frame near the hitch. They are 17-digit numbers of the format: 5VJAA001XXWXXXXXXX. Serial numbers are located on the machine body. They are 6-digit numbers.

Record your identification number in the space provided and on the warranty registration card.

SERIAL NUMBER OR VIN

HOW TO CONTACT ECHO BEAR CAT

ADDRESS	PHONE	E-MAIL	HOURS
237 NW 12th Street P.O. Box 849 West Fargo, ND 58078	800.247.7335 701.282.5520 FAX: 701.282.9522	sales@bearcatproducts.com service@bearcatproducts.com	Monday - Friday, 8 am to 5 pm Central Time

LIMITED WARRANTY

This warranty applies to all AG and Outdoor Power Equipment manufactured by Crary Industries.

Crary Industries warrants to the original owner each new Crary Industries product to be free from defects in material and workmanship, under normal use and service. The warranty shall extend 1 year from date of delivery for income producing (commercial) applications and 2 years from date of delivery for non-income producing (consumer) use of the product. The product is warranted to the original owner as evidenced by a completed warranty registration on file at Crary Industries. Replacement parts are warranted for (90) days from date of installation.

THE WARRANTY REGISTRATION MUST BE COMPLETED AND RETURNED TO CRARY INDUSTRIES WITHIN 10 DAYS OF DELIVERY OF THE PRODUCT TO THE ORIGINAL OWNER OR THE WARRANTY WILL BE VOID.

In the event of a failure, return the product, at your cost, along with proof of purchase to the selling Crary Industries dealer. Crary Industries will, at its option, repair or replace any parts found to be defective in material or workmanship. Warranty on any repairs will not extend beyond the product warranty. Repair or attempted repair by anyone other than a Crary Industries dealer as well as subsequent failure or damage that may occur as a result of that work will not be paid under this warranty. Crary Industries does not warrant replacement components not manufactured or sold by Crary Industries.

This warranty applies only to parts or components that are defective in material or workmanship.

This warranty does not cover normal wear items including but not limited to bearings, belts, pulleys, filters and chipper knives.

This warranty does not cover normal maintenance, service or adjustments.

This warranty does not cover depreciation or damage due to misuse, negligence, accident or improper maintenance.

This warranty does not cover damage due to improper setup, installation or adjustment.

This warranty does not cover damage due to unauthorized modifications of the product.

Engines are warranted by the respective engine manufacturer and are not covered by this warranty.

Crary Industries is not liable for any property damage, personal injury or death resulting from the unauthorized modification or alteration of a Crary product or from the owner's failure to assemble, install, maintain or operate the product in accordance with the provisions of the Owner's manual.

Crary Industries is not liable for indirect, incidental or consequential damages or injuries including but not limited to loss of crops, loss of profits, rental of substitute equipment or other commercial loss.

This warranty gives you specific legal rights. You may have other rights that may vary from area to area.

Crary Industries makes no warranties, representations or promises, expressed or implied as to the performance of its products other than those set forth in this warranty. Neither the dealer nor any other person has any authority to make any representations, warranties or promises on behalf of Crary Industries or to modify the terms or limitations of this warranty in any way. Crary Industries, at its discretion, may periodically offer limited, written enhancements to this warranty.

CRARY INDUSTRIES RESERVES THE RIGHT TO CHANGE THE DESIGN AND/OR SPECIFICATIONS OF ITS PRODUCTS AT ANY TIME WITHOUT OBLIGATION TO PREVIOUS PURCHASERS OF ITS PRODUCTS.

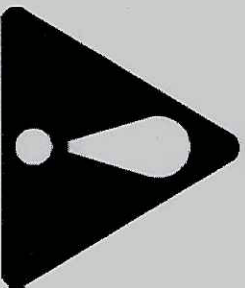
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1 SAFETY

Section

1.1 SAFETY ALERT SYMBOL



The Owner/Operator's manual uses this symbol to alert you of potential hazards. Whenever you see this symbol, read and obey the safety message that follows it. Failure to obey the safety message could result in personal injury, death or property damage.



DANGER



Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



WARNING



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

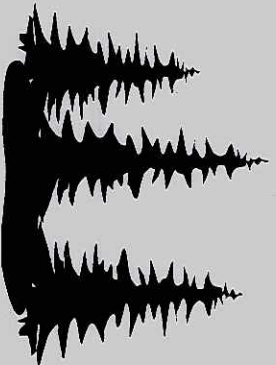


CAUTION



Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

1.2 EMISSION INFORMATION



Under California Law and the laws of several other states, you are not permitted to operate an internal combustion engine using hydrocarbon fuels on any forest covered, brush covered or grass covered land or on land covered with grain, hay or other flammable agricultural crops, without an engine spark arrester in continuous effective working order.

The engine on your power equipment, like most outdoor power equipment, is an internal combustion engine that burns gasoline or diesel fuel (hydrocarbons). Therefore, your power equipment must be equipped with a spark arrester muffler in continuous effective working order. The spark arrester must be attached to the engine exhaust system in such a manner that flames or heat from the system will not ignite flammable material.

Failure of the owner/operator of the equipment to comply with this regulation is a misdemeanor under California law and may also be a violation of other state and/or federal regulations, laws, ordinances, or codes. Contact your local fire marshal or forest service for specific information about which regulations apply in your area.

The standard muffler installed on the engine is not equipped with a spark arrester. One must be added before using this machine in an area where a spark arrester is required by law. Contact the local authorities if these laws apply to you. See your authorized engine dealer for spark arrester options.

1.3 BEFORE OPERATING



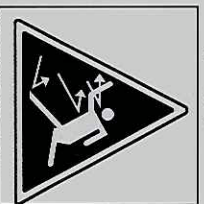
1. Read and understand this owner's manual. Be completely familiar with the controls and the proper use of this equipment. Restrict the use of this power machine to persons who read, understand, and follow the warnings and instructions in this manual and on the machine.
2. Familiarize yourself with all of the safety and operating decals on this equipment and on any of its attachments or accessories.
3. Keep safety decals clean and legible. Replace missing or illegible safety decals.
4. Obtain and wear safety glasses and use hearing protection at all times when operating this machine.
5. Avoid wearing loose fitted clothing. Never operate this machine while wearing clothing with drawstrings that could wrap around or get caught in the machine.
6. Do not operate this machine if you are under the influence of alcohol, medications, or substances that can affect your vision, balance or judgement. Do not operate if tired or ill. You must be in good health to operate this machine safely.

SAFETY

7. Do not operate this equipment in the vicinity of bystanders. Keep the area of operation clear of all persons, particularly small children. It is recommended that bystanders keep at least 50 feet (15 meters) away from the area of operation.
8. Do not allow children to operate this equipment. Allow only adults to operate the log splitter. No one under the age of 18 should be allowed to operate the log splitter.
9. Use only in daylight or good artificial light.
10. Do not run this equipment in an enclosed area. Engine exhaust contains carbon monoxide gas, a deadly poison that is odorless, colorless and tasteless. Do not operate this equipment in or near buildings, windows or air conditioners.
11. Always use an approved fuel container. Do not remove gas cap or add fuel when engine is running. Add fuel to a cool engine only.
12. Do not fill fuel tank indoors. Keep open flames, sparks, smoking materials and other sources of combustion away from fuel.
13. Do not operate machine without shields in place. Failure to do so may cause serious injury or death.
14. Keep all guards, deflectors, and shields in good working condition.
15. Before inspecting or servicing any part of this machine, shut off the machine and make sure all moving parts have come to a complete stop. Disconnect the spark plug.
16. Check that all screws, nuts, bolts, and other fasteners are secured, tightened and in proper working condition before starting the machine.
17. Do not transport or move machine while it is operating or running.

1.4 OPERATION SAFETY

1. This machine should be used for splitting wood only, do not use it for any other purpose.
2. Allow only one (1) person to load and operate the log splitter. If a helper is assisting in loading logs, never activate the control until the helper is a minimum of 10 feet away from the machine.
3. Always operate the log splitter from the operator zones specified in Section 4.6.
4. Do not use any body part, other than your hand, to operate the controls.
5. Always stand clear of discharge area when operating this machine. Keep face and body away from cutting area.
6. Keep hands and feet out of cutting area while machine is operating to avoid serious personal injury. Stop and allow machine to come to a complete stop before clearing obstructions.



7. Set up your work site so you are not endangering traffic and the public. Take great care to provide adequate warnings.
8. Never operate the machine on slippery, wet, muddy, or icy surfaces. The location you choose should be solid, level, dry, and free from any tall grass, brush, or other interferences.
9. Always block machine wheels to prevent unintended movement and lock in either horizontal or vertical position.
10. Ensure the control lever is in the neutral detent position before starting the machine.
11. Keep the machine clear of debris and other accumulations. Immediately remove split wood from around the machine so you do not stumble over it.
12. During operation, hydraulic log splitters develop high fluid pressures. Fluid escaping through a pin hole opening can penetrate your skin and cause blood poisoning, gangrene, or death. Keep in mind the following instructions at all times:
 - a. Do not check for leaks with your hand.
 - b. Do not operate machine with frayed, kinked, cracked, or damaged hoses, fittings, or tubing.
 - c. Stop the engine and relieve hydraulic system pressure before changing or adjusting fittings, hoses, tubing, or other system components.
 - d. Do not adjust the pressure settings of the pump or valve.
13. Leaks can be detected by passing cardboard or wood, while wearing protective gloves and safety glasses, over the suspected area. Look for discoloration of the cardboard or wood.
14. If injured by escaping fluid, see a doctor immediately. Serious infection or reaction can develop if proper medical treatment is not administered immediately.
15. Do not attempt to split two logs with one positioned on top of the other.
16. Check the logs before splitting. Ensure there are no foreign materials, such as nails, present in the wood.
17. Do not attempt to split wood across the grain.
18. Always make sure that both ends of the log you are splitting are cut as square as possible. This will prevent the log from sliding out of position while under pressure. Logs should be 24 inches or shorter in length.
19. Do not load the log splitter while the splitting wedge is moving.
20. Hold the log by the sides when you are positioning it into the log splitter. Do not hold the log by the ends.
21. Always keep your fingers away from any cracks that open in the log during the splitting operation.

22. When the ram of the log splitter is in the return mode, keep your hands off the machine—the log splitter is designed to automatically stop the ram when the cylinder is fully retracted.
23. Do not step across the log splitter while the engine is running.
24. Do not straddle or reach across the splitting area when operating the machine.
25. When splitting logs in the vertical position, stabilize the log before engaging the control. Split as follows:
 - a. Place log on the end plate and turn until it leans against the beam and is stable.
 - b. When splitting extra large or uneven logs, the log must be stabilized with wooden shims or split wood between the log and end plate or ground.
26. When at all possible, keep log splitter attached to a towing vehicle. If you are unable to do this, secure the hitch.



WARNING



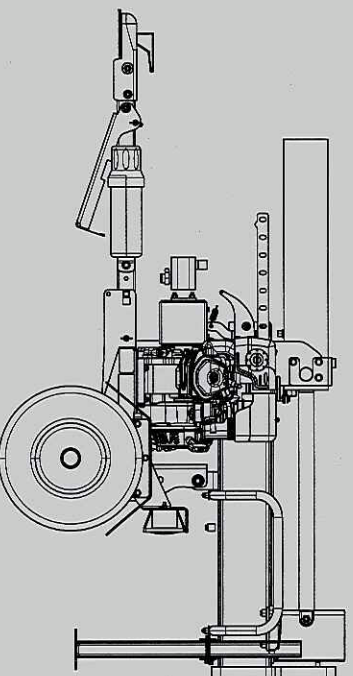
When splitting large and heavy material it is possible for the log splitter to tip. Secure the stand before operating.

1.5 MAINTENANCE AND STORAGE SAFETY

1. Before inspecting, servicing, storing, or changing an accessory, shut off the machine and make sure all moving parts have come to a complete stop. Disconnect the spark plug.
2. Replace any missing or unreadable safety decals. Refer to the safety decal section for part numbers.
3. Allow machine to cool before storing in an enclosure.
4. Store the machine out of reach of children and where fuel vapors will not reach an open flame or spark.
5. Never store this machine with fuel in the fuel tank inside a building where fumes may be ignited by an open flame or spark. Ignition sources can be hot water and space heaters, furnaces, clothes dryers, stoves, electric motors, etc.
6. Drain the fuel and dispose of it in a safe manner for storage periods of three months or more.
7. Replace any worn, cut, abraded, flattened or crimped hydraulic hoses.
8. Wear proper hand and eye protection when searching for a hydraulic leak. Instead of using your hands, use a piece of wood or cardboard as a backstop to identify a leak.

1.6 TOWING SAFETY

1. Ensure the log splitter is locked in the horizontal position before towing.
2. Extend log splitter ram all the way before towing to help maintain stability (see picture below).
3. Connect hitch safety chains. Tighten trailer hitch bolts. Do not attempt to tow the trailer if the vehicle is not equipped with a 2" (50 mm) ball.
4. Inflate tires to manufacturer's specifications as stated on the tire sidewall.
5. Do not tow machine faster than 45 mph (72 kph).
6. Optimum towing performance can be achieved by maintaining a horizontal trailer hitch.
7. Check wheel lug bolts periodically to ensure they are tight and secure.
8. Make sure the jack stand and retractable stand are in the UP position during towing. Place the jack stand and retractable stand on a level surface and secure them in the DOWN position before using.
9. Never allow passengers to ride on the machine.
10. Shut off fuel supply when towing.
11. Towing laws may vary in different countries/regions/states. It is recommended that you contact your local motor vehicle department for any special regulations that pertain to towing and know the laws of any country/region/state you travel through.



Correct towing configuration with ram extended and stands up

1.7 SAFETY DECAL LOCATIONS

Familiarize yourself with all of the safety and operational decals on the machine and the associated hazards. See the engine owner's manual or contact the engine manufacturer for engine safety instructions and decals. Make certain that all safety and operating decals on this machine are kept clean and in good condition. Decals that need replacement must be applied to their original locations.

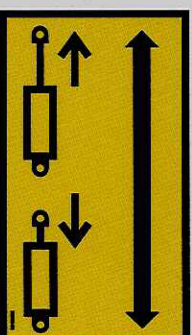
1 PN 12174



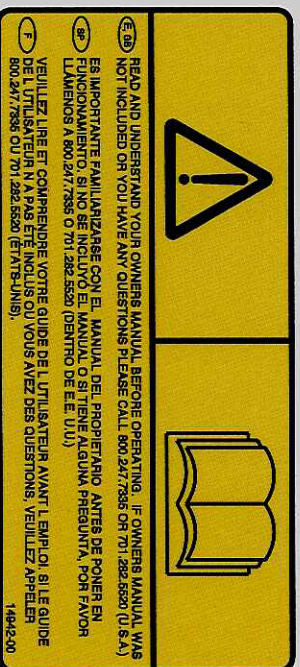
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4 PN 36090-00

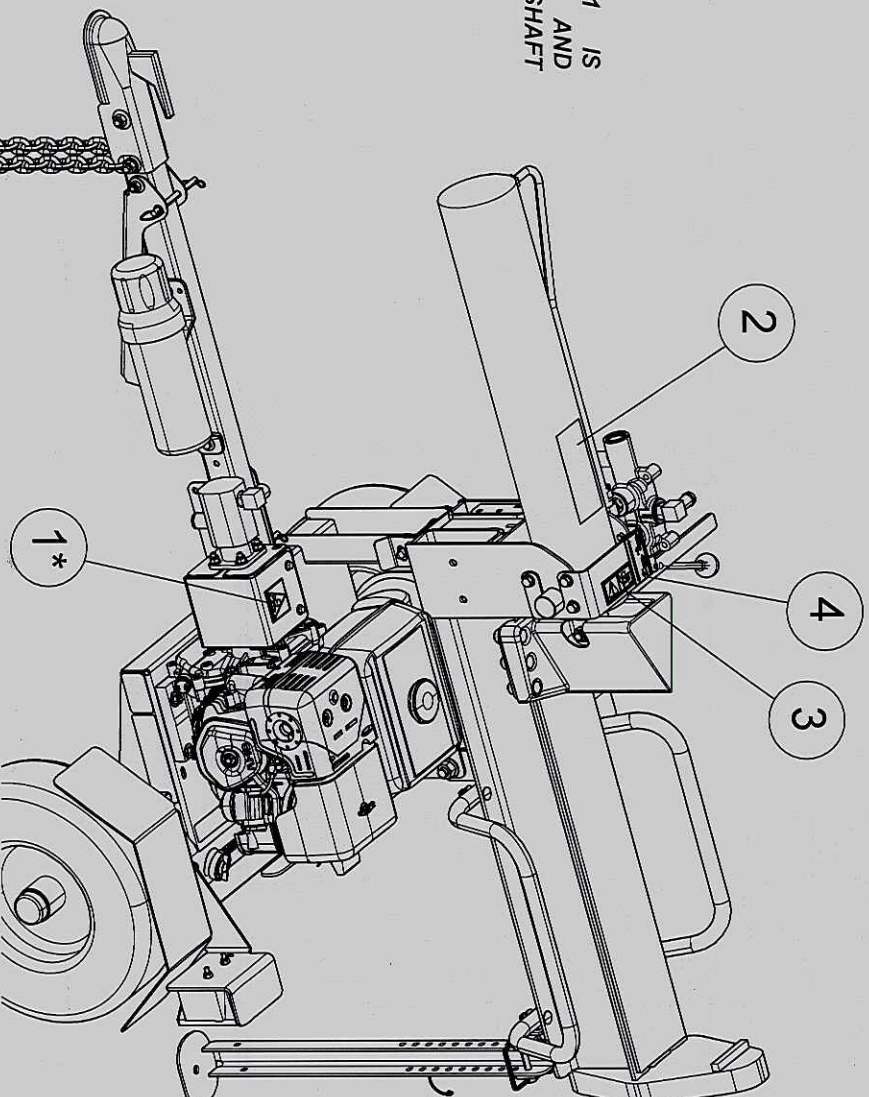


2 PN 14942-00



TURN ENGINE OFF BEFORE SERVICING MACHINE. KEEP ALL BODY PARTS CLEAR OF THE CUTTING AREA WHILE SPLITTING WEDGE IS IN MOTION. THE HYDRAULIC CYLINDER AND SPLITTING WEDGE CAN CAUSE SEVERE BODILY HARM. BEFORE OPERATING LOG SPLITTER, CONSULT OWNERS MANUAL FOR PROPER OPERATION AND MAINTENANCE TECHNIQUE.

*NOTE: DECAL #1 IS LOCATED OUTSIDE AND INSIDE THE DRIVE SHAFT SHIELD.



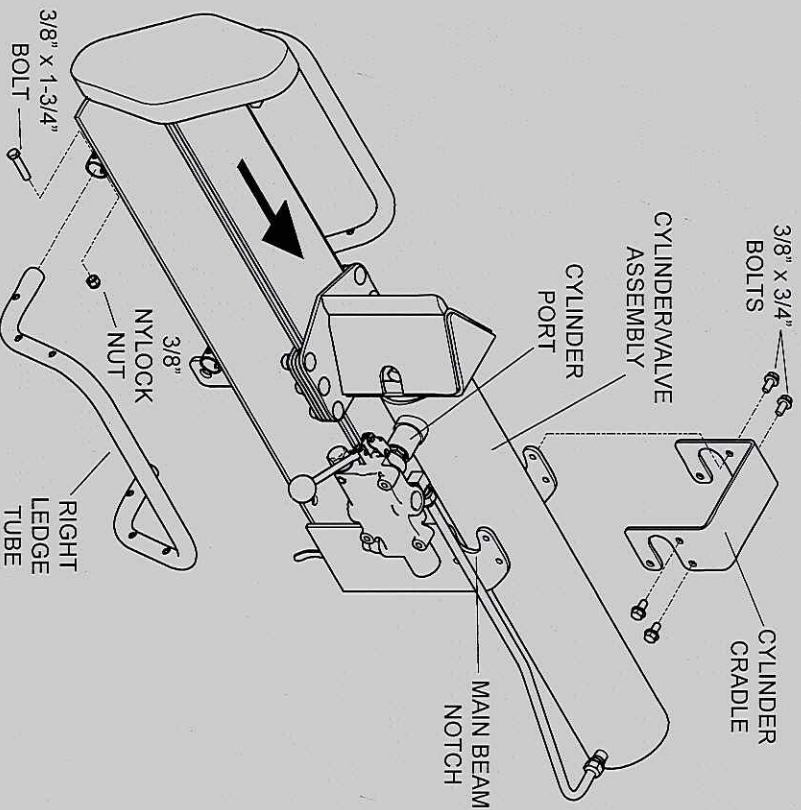
2 ASSEMBLY

Section

2.1 INSTALL THE HYDRAULIC CYLINDER

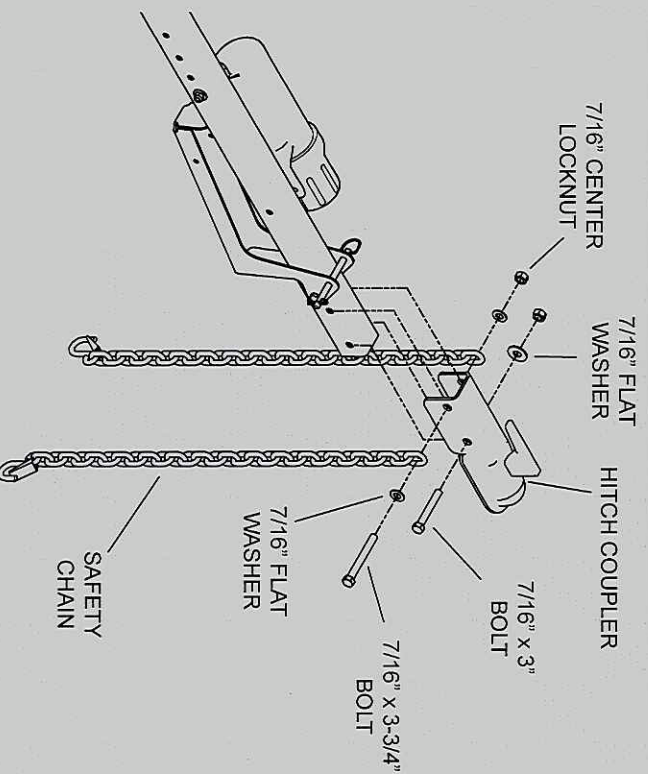
The log splitter is shipped with the hydraulic cylinder moved forward on the main beam. To install the hydraulic cylinder:

1. Remove the right ledge tube by removing two $3/8"$ x $1-3/4"$ bolts and nylock nuts.
2. Remove the six $3/8"$ x $3/4"$ bolts that connect the cylinder cradle to the main beam.
3. Slide the hydraulic cylinder and valve assembly back until the ports at the ram end of the cylinder rest in the notches of the main beam.
4. Secure the hydraulic cylinder by reinstalling the cylinder cradle from step 2. Use the six $3/8"$ x $3/4"$ bolts.
5. Reinstall the right hand ledge tube with the two $3/8"$ x $1-3/4"$ bolts and nuts.



2.2 ATTACH THE HITCH COUPLER

1. Insert a $7/16"$ x $3"$ bolt through the front hitch coupler hole and front hitch pole hole. Install a $7/16"$ flat washer and center locknut on the bolt.
2. Position a safety chain on each side of the hitch coupler.
3. Insert a $7/16"$ x $3-3/4"$ bolt through the top link of the safety chains and rear coupler hole. Install two $7/16"$ flat washers and a center locknut on the bolt.



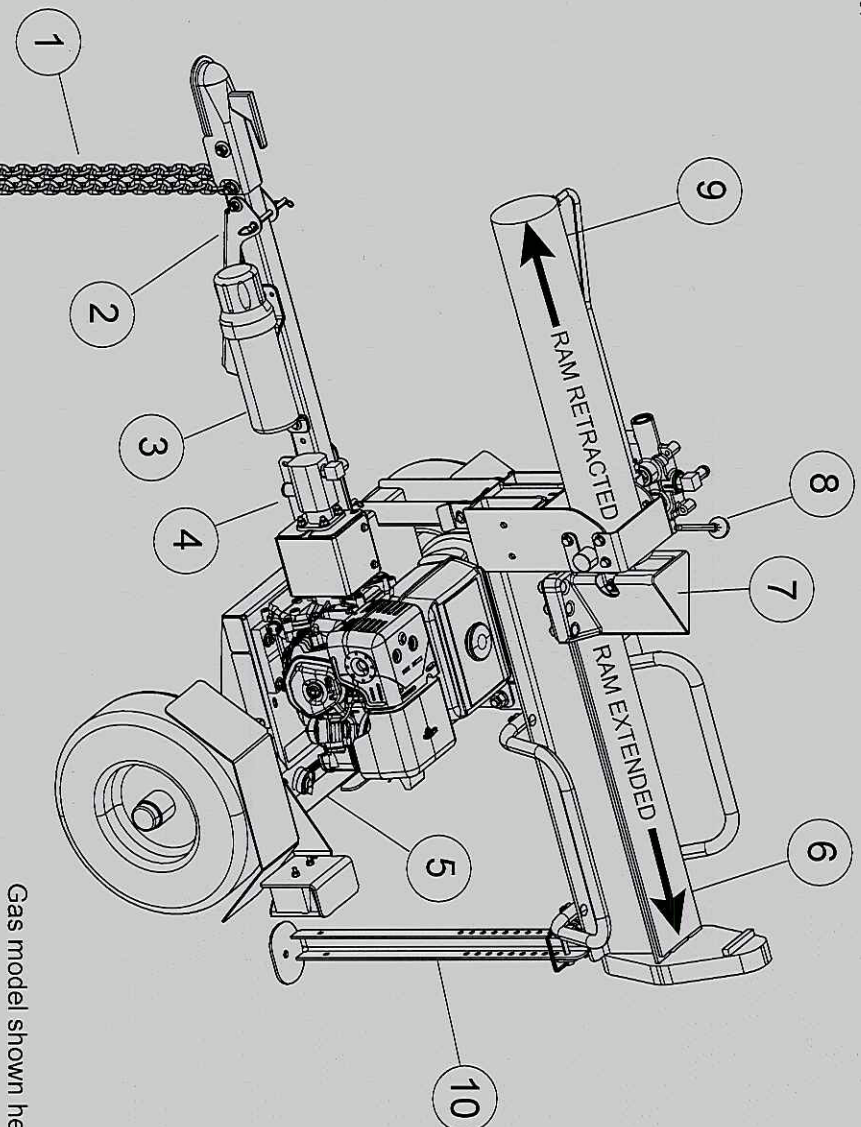
3 FEATURES & CONTROLS

Section

3.1 LOG SPLITTER CONTROLS

Understanding how your machine works will help you achieve the best results when using your machine. The following descriptions define the features and controls of your machine.

- Hitch safety chains:** Safety chains are used during towing to prevent the machine from completely separating from the tow vehicle in the event the coupler detaches from the tow vehicle. Cross the safety chains under the hitch and connect to the towing vehicle.
- Hitch jack:** Always have in UP position and clear from the ground when machine is moving. When machine is in use, place in DOWN position on a level surface.
- Manual holder:** Stores owner's manual and safety goggles for easy access.
- Hydraulic pump:** The pump provides hydraulic power to the system.
- Hydraulic fluid tank:** The hydraulic pump requires premium hydraulic fluids containing high quality rust, oxidation, and foam inhibitors. These include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluids meeting Allison C-3 or Caterpillar TO-2, and certain specialty agricultural tractor fluids.
- Cutting area:** Place logs to be cut in the cutting area. Keep all body parts clear of the cutting area when the splitting wedge is in motion.
- Splitting wedge:** The splitting wedge is connected to the ram of the hydraulic cylinder.
- Log splitter control lever:** Push the lever toward the cutting area to extend the ram of the hydraulic cylinder. Pull the lever away from the cutting area to retract the ram. The lever will automatically return to the neutral position when the ram is fully retracted.
- Hydraulic cylinder:** Extend and retract the ram of the hydraulic cylinder with the log splitter control lever.
- Support leg:** Use the leg to stabilize the log splitter during operation. Adjust the leg up as high as possible or remove when towing the log splitter or rotating the log splitter into vertical position (see Section 4.7).



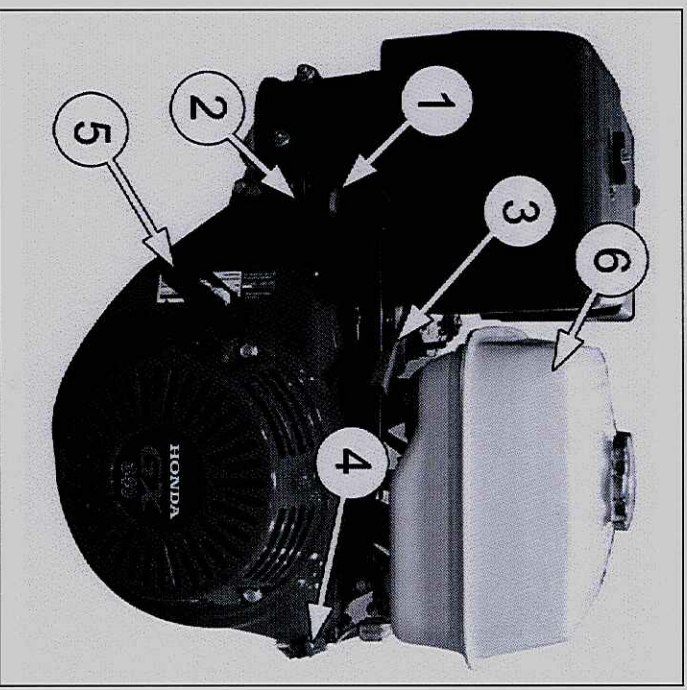
Gas model shown here.

3.2 ENGINE CONTROLS

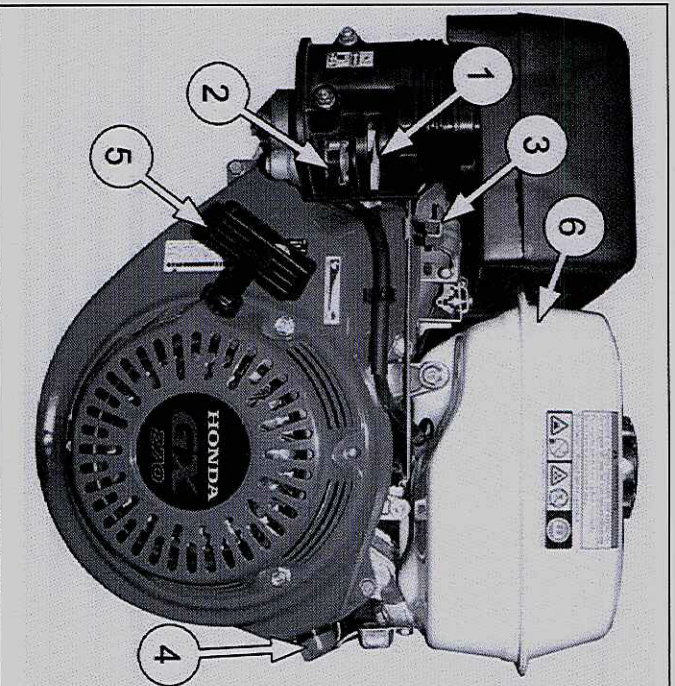
NOTE

Refer to the engine owner's manual for more detailed engine information.

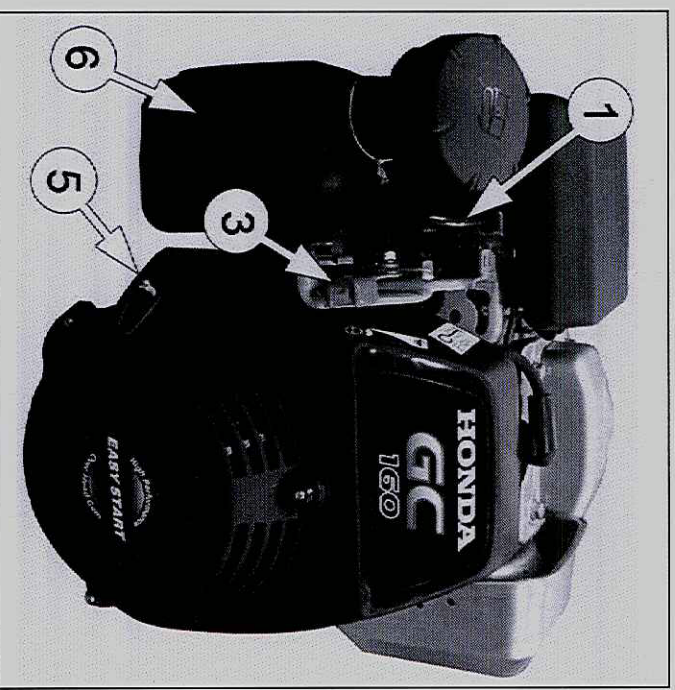
1. **Engine choke:** Use when starting a cold engine. To use, push the lever to the left. Gradually turn off as the engine warms. Full choke may not be necessary when starting a warm engine. In this case, partial or no choke may work best.
2. **Fuel cut-off switch:** Push lever to the ON position to start and run engine. Push lever to OFF position when engine is not in use and during transport.
3. **Engine throttle:** This changes engine speed. Push lever all the way to the fast position for full throttle operation. Push the opposite way for engine idle. Push all the way to the slow position to shut engine off. Refer to engine manual for further engine operating instructions.
4. **Engine switch:** Turn to ON position to start and run engine. To stop, turn to OFF position.
5. **Starter cord:** To start, pull the cord until light resistance is felt and then pull briskly.
6. **Fuel tank:** Fill only with fuel types specified in your engine owner's manual.



Model LS33340



Model LS27270



Model LS21160

4 OPERATION

Section

As with any other piece of outdoor equipment, getting the feel for how your machine operates and getting to know the best techniques for particular jobs are important to overall good performance.



WARNING



Move machine to a clear, level area outdoors before starting. Do not operate in the vicinity of bystanders.

4.2 FILL HYDRAULIC FLUID

The hydraulic tank is located in the back of the machine. Check the fluid level with the dipstick before each use. Check the fluid on level ground with the jack stand in the down position.

Fill the hydraulic fluid tank with the ram retracted. The hydraulic pump requires premium hydraulic fluids containing high quality rust, oxidation, and foam inhibitors. Do not overfill.

4.1 FILL THE FUEL TANK (GAS MODELS ONLY)



WARNING



Gasoline and diesel fuels are highly flammable and their vapors are explosive. To prevent personal injury or property damage:



Store fuel only in approved containers, in well ventilated, unoccupied buildings, away from sparks or flames. A container with a capacity of 2 gallons or less with a pouring spout is recommended. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel. Never use fuel as a cleaning agent. **DO NOT MIX OIL WITH FUEL.**

Use only those types of fuels that are recommended in your engine owner's manual.

To add fuel:

1. Stop engine, wait for all parts to stop moving and disconnect spark plug wire. Allow the engine and muffler to cool for at least three minutes.
2. Clean area around fuel fill cap and remove cap.
3. Using a clean funnel, fill fuel tank to 1/2" below bottom of filler neck to provide space for any fuel expansion. Install fuel fill cap securely and wipe up any spilled gasoline.

4.3 STARTING A GAS LOG SPLITTER

Move the machine to a clear, level area outdoors before starting. Do not operate in the vicinity of bystanders.

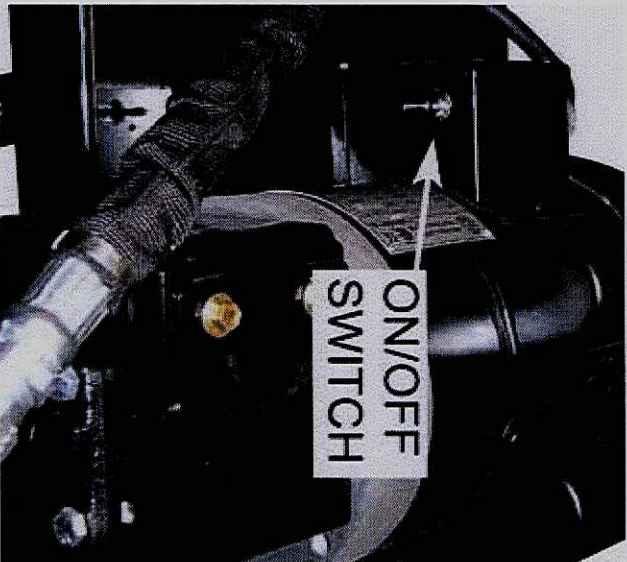
1. Check engine oil and hydraulic oil levels before starting.
2. Turn the fuel cut-off switch to the ON position, if applicable.
3. Turn the engine switch to the ON position, if applicable.
4. Place the throttle control midway between the SLOW and FAST positions. If starting a cold engine, move the choke control into the CHOKE position.
5. Pull the recoil starter until light resistance is felt. Then, pull briskly. Repeat until the engine starts. Make sure the starting cord retracts after each pull.
6. As the engine warms, gradually turn the choke off.
7. Move the throttle to the FAST position.

4.4 STOPPING A GAS LOG SPLITTER

1. Move the throttle to the SLOW position.
2. On 160cc engines, stop the engine by pushing the throttle all the way down to the STOP position. On all other engines, stop the engine by turning the engine switch to the OFF position.
3. Turn the fuel cut-off switch to the OFF position, if applicable.

4.5 STARTING AN ELECTRIC LOG SPLITTER

1. Plug the log splitter into a 120-volt outlet.
2. Flip the switch on the motor to start it.
3. The log splitter is ready for operation.



4.6 STOPPING AN ELECTRIC LOG SPLITTER

1. Flip the switch on the motor to turn it off.
2. Unplug the log splitter.



IMPORTANT



If you need to attach an extension cord to the log splitter, make sure the cord is 12 gauge or greater.

4.7 OPERATING THE LOG SPLITTER



WARNING



Read and follow all safety instructions in this manual. Failure to operate the machine in accordance with the safety instructions **MAY RESULT IN PERSONAL INJURY!**



WARNING



Keep all body parts away from the cutting area while the splitting wedge is in motion.



CAUTION



Obtain and wear safety glasses at all times when operating the machine.

Do not wear loose fitting clothing.

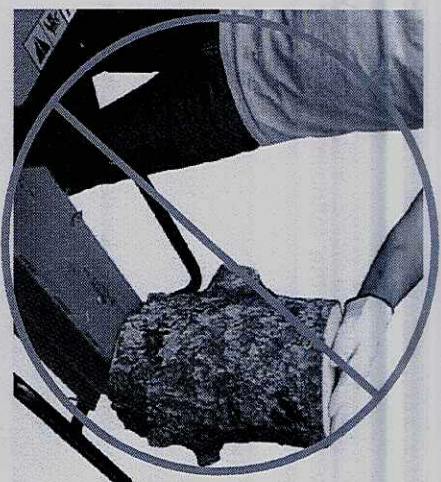
The operator should always wear heavy boots, gloves, and pants.

1. Adjust the support leg so that the log splitter cutting area sits horizontally.
2. Ensure the engine is running at full RPM before attempting to split wood.
3. Select a log no more than 24 inches (61 cm) in length to split. The log should be free from foreign materials. Both ends of the log must be cut square.



OPERATION

4. Grasp the log by the sides and place it in the cutting area. Center the log on the beam. Do not attempt to split wood against the grain.



⚠ WARNING ⚠

Do not place your hands on the ends of the log when loading the log splitter. If necessary, you may support the log on the main beam by placing your hand on the side of the log. **Do not place your hand between the log and splitting wedge.** Only support the log with your hand until the splitting wedge makes contact with the log. Then, remove your hand from the cutting area, stand clear and resume operation.



5. Stand behind the cutting area on the control lever side of the log splitter.
6. Using your hand, push the control lever toward the cutting area. Keep all body parts clear of the cutting area while the splitting wedge is in motion.

⚠ CAUTION ⚠

Depending upon the type of wood being split, a log may not always break into two pieces and fall to the ground. If a log sticks to the wedge and starts to return with the wedge during reverse, stop the cylinder retraction and remove the wood. Care should be taken to prevent the wood piece from falling on parts of your body.

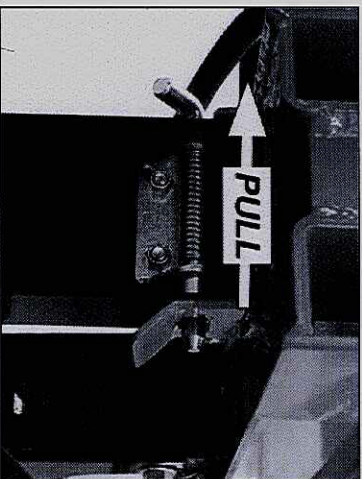


7. Hold the control lever in the forward position until either the log is split or the ram has reached its full extension. If the log starts to split in an undesired fashion, reverse the ram, reposition the log and try again.
8. Pull the control lever back to the reverse position. The lever will automatically return to the neutral position when the cylinder is fully retracted. Keep all body parts clear of the ram while it retracts.
9. Remove the split pieces and repeat the steps above with a new log.

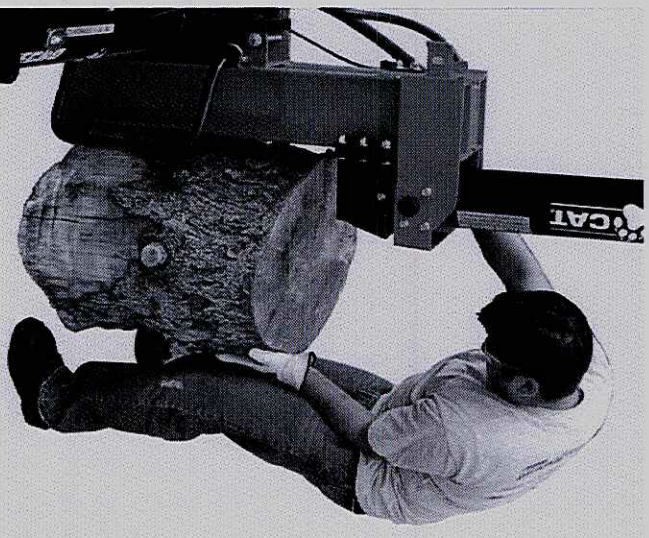
4.8 VERTICAL OPERATION

The main beam of the log splitter can be flipped vertically to split wood. Perform the following steps for vertical operation:

1. Turn the engine off.
2. Adjust the support leg to the highest position or remove.
3. Pull the spring-loaded pin located under the main beam.



4. Lift the base of the hydraulic cylinder to flip the main beam into vertical position.
5. Resume normal operation.



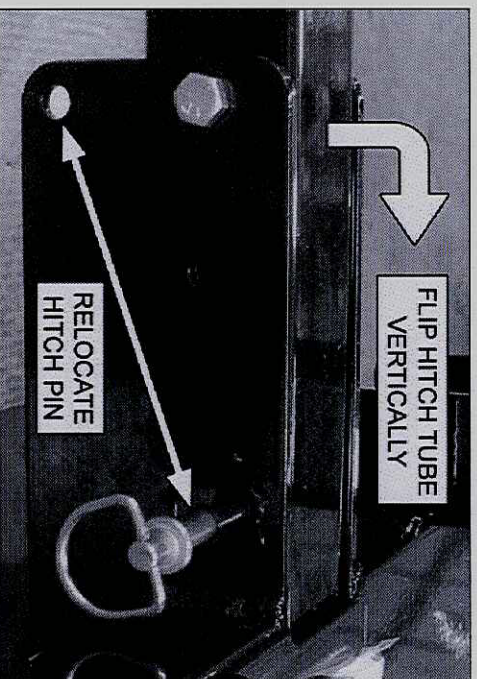
When splitting logs in the vertical position, stabilize the log before engaging the control. Split as follows:

1. Place log on the end plate and turn until it leans against the beam and is stable.
2. When splitting extra large or uneven logs, the log must be stabilized with wooden shims or split wood between the log and end plate or ground.

4.9 STORAGE MODE

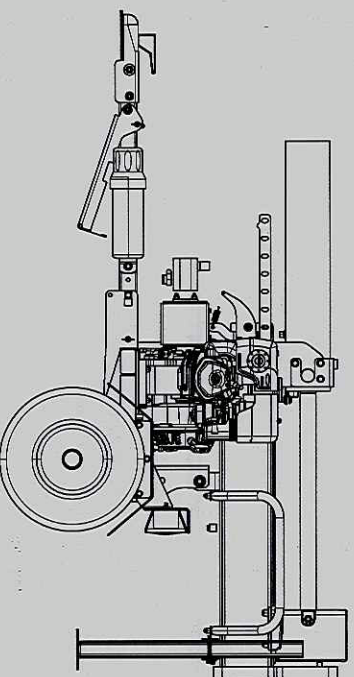
The log splitter can be adjusted for storing in tight spaces. Perform the following steps to transform the machine into storage mode:

1. Turn the engine off.
2. Flip the main beam into vertical position (see Section 4.8).
3. Remove the hitch pin from the hitch channel and hitch tube. Flip the hitch tube into vertical position (see below).
4. Secure the hitch tube in the upright position by installing the hitch pin in the hole below the 3/8" hitch bolt.



4.10 TOWING THE LOG SPLITTER

1. When towing, always connect the safety chains. Make sure trailer hitch bolts are tight. Secure support leg in its highest position.
2. Extend log splitter ram all the way before towing to help maintain stability (see picture below).
3. Towing speed must not exceed 45 mph (72 kph).
4. Make sure the jack stand and retractable stand are in the UP position during towing. Place the jack stand and retractable stand on a level surface and secure them in the DOWN position before using.



Correct towing configuration with ram extended and stands up

5 SERVICE & MAINTENANCE

Section

5.1 MAINTENANCE SCHEDULE

The items listed in this service and maintenance schedule are to be checked, and if necessary, corrective action taken. This schedule is designed for units operating under normal conditions. If the unit is operating in adverse or severe conditions, it may be necessary for the items to be checked and serviced more frequently.

SEE ENGINE OWNER'S MANUAL FOR FURTHER ENGINE MAINTENANCE AND TROUBLESHOOTING INFORMATION.

⚠ WARNING ⚠

To prevent personal injury or property damage: shut off engine and make sure that all moving parts have come to a complete stop before, servicing, adjusting or repairing. Disconnect the spark plug.

COMPONENT	MAINTENANCE REQUIRED	REFER TO ENGINE OPERATOR'S MANUAL	FREQUENCY			
			BEFORE EACH USE	EVERY 8 HOURS	EVERY 200 HOURS	EVERY YEAR
AIR CLEANER	CHECK AND CLEAN (1)	●				
ENGINE OIL	CHANGE (1)	●				
FUEL FILTER	REPLACE	●				
SPARK PLUG	CHECK CONDITION AND GAP	●				
HYDRAULIC OIL	CHECK/FILL		●			
ENGINE OIL	CHECK/FILL		●			
FUEL TANK	CHECK/FILL		●			
ALL INTERNAL AND EXTERNAL NUTS AND BOLTS	CHECK TIGHTNESS		●			
TIRE PRESSURE	CHECK		●			
ENTIRE MACHINE	CLEAN			●		
HYDRAULIC OIL FILTER	REPLACE				●	
WHEEL BEARINGS	CHECK AND REPACK					●

(1) PERFORM MORE FREQUENTLY UNDER EXTREMELY DUSTY CONDITIONS.

As the Limited Warranty states, failure by the Owner to perform normal maintenance will void the machine's warranty.

5.2 TRAILER SERVICE TIPS

1. Check wheel bolt torque monthly.
2. Check air pressure in tires monthly.
3. Check and repack wheel bearings with grease every year of use.
4. Check trailer lights periodically.

⚠ WARNING ⚠

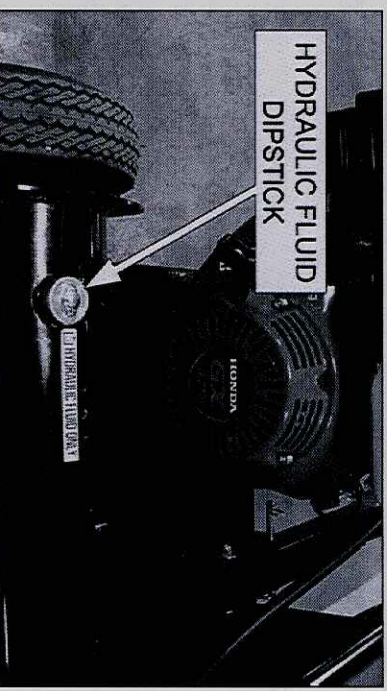
BEFORE INSPECTING OR SERVICING ANY PART OF THIS MACHINE, SHUT OFF POWER SOURCE, AND MAKE SURE ALL MOVING PARTS HAVE COME TO A COMPLETE STOP.

5.3 FILLING HYDRAULIC FLUID

The hydraulic tank is located in the back of the machine. Check the fluid level with the dipstick before each use.

Check the fluid on level ground with the jack stand in the down position. The hydraulic pump requires premium hydraulic fluids containing high quality rust, oxidation, and foam inhibitors. These include premium turbine oils, API CD engine oils per SAE J183, M2CC33F or G automatic transmission fluids meeting Allison C-3 or Caterpillar TO-2, and certain specialty agricultural tractor fluids.

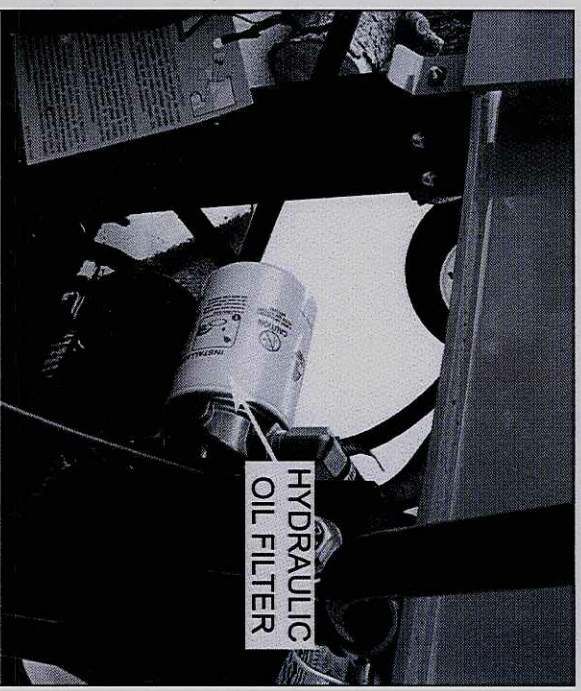
Do not overfill. **Fill the hydraulic fluid tank with the ram retracted.**

**5.4 CHANGING HYDRAULIC OIL FILTER**

Change the hydraulic oil filter after the first 50 hours of operation and every 200 hours thereafter.

To change the hydraulic oil filter:

1. Using an oil filter wrench, turn the filter counterclockwise.
2. Once the filter becomes loose, turn it out the rest of the way with your hand.
3. Properly discard old filter.
4. Lube the rubber seal on the new filter (PN 16922) with clean hydraulic oil.
5. Install the filter onto the threaded pipe. Turn with your hand until the filter is finger tight.
6. Using an oil filter wrench, tighten the filter another ½ turn.
7. Check hydraulic oil level and fill if necessary.

**5.5 LUBRICATION**

Lubricate the machine periodically with a lithium-based grease. Extreme working conditions will require more frequent greasing. Check the wheel bearings after the first 20-25 hours of use and repack with grease once a year.

⚠ IMPORTANT ⚠

Polyurea and lithium-based greases are not compatible. Mixing the two grease types may lead to premature failure.

NOTE

Do not over grease bearings. Overfilling can lead to excessive heat and/or unseating of the seals. Add grease slowly and under light pressure. Whenever possible, rotate bearing slowly while lubricating.



6 TROUBLESHOOTING

Section

Before performing any of the corrections in this troubleshooting chart, refer to the appropriate information contained in this manual for the correct safety precautions and operating or maintenance procedures. Contact your dealer or the factory for service problems with the machine.

PROBLEM	POSSIBLE CAUSES	REMEDY
Engine will not start.	Improper control settings.	Use proper settings.
	Lack of fuel.	Fill fuel tank.
	Spark plug disconnected.	Connect spark plug.
Engine overheats.	Dirty, stale or contaminated gas.	Refill gas tank with fresh, clean unleaded regular gasoline.
	Internal engine problems.	See your engine dealer.
	Cooling system plugged.	Clean cooling fan and fins.
Engine stalls while splitting wood	Improper oil level.	Fill engine to correct oil level. Refer to the engine owners manual.
	Engine not operating at full RPM.	Move engine throttle to maximum RPM.
Trailer sways during towing.	Tire air pressure not correct	Check tire sidewall for inflation limits.
	Low hydraulic fluid levels.	Check the hydraulic fluid tank and fill if needed.
Log splitter loses hydraulic power.	There is a leak in the hydraulic system.	Check for hydraulic fluid leaks by using a piece of cardboard. Do not check for leaks with your hands or other body parts.
	Hydraulic fluid level is low.	Check hydraulic fluid level.
	Damaged coupler.	Check the coupler that connects the engine shaft to the hydraulic pump. Replace if needed.
	Damaged hydraulic cylinder.	Replace the cylinder if needed.
Hydraulic cylinder will not extend with control lever in forward position.	Damaged hydraulic motor.	Replace the motor if needed.
	The splitting wedge or track is damaged.	Check for damage. Replace parts if needed.
	The valve assembly is not functioning properly.	Check valve assembly. Replace if needed.
Machine vibrates excessively when running.	Hydraulic pump is out of alignment.	Remove coupler cover and loosen the four bolts holding the hydraulic pump to the bracket. The pump will move back into alignment. Retighten the four bolts and reinstall coupler cover.

7 SPECIFICATIONS

Section

7.1 MACHINE SPECIFICATIONS

		LS21E	
DESCRIPTION	English	Metric	
OVERALL SIZE	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	
OVERALL WEIGHT	380 lbs.	172.4 kg	
DRIVE TYPE	Direct	Direct	
TIRE SIZE	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	
MOTOR	1.5 hp Electric	1.5 hp Electric	
HYDRAULIC OIL TANK CAPACITY	5 gallons	18.9 liters	
HYDRAULIC PUMP TYPE	2 stage, 10 gal./min.	2 stage, 37.9 L/min.	
HYDRAULIC CYLINDER FORCE	21 tons	19 metric tons	
MAX. LOG LENGTH	24 in.	61 cm	
HITCH TYPE	2 in. coupler	50mm coupler	

		LS21160		LS21160T	
DESCRIPTION	English	Metric	English	Metric	
OVERALL SIZE	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	
OVERALL WEIGHT	380 lbs.	172.4 kg.	395 lbs.	179.2 kg.	
STARTER	Recoil	Recoil	Recoil	Recoil	
DRIVE TYPE	Direct	Direct	Direct	Direct	
TIRE SIZE	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	
ENGINE	160cc Honda	160cc Honda	160cc Honda	160cc Honda	
FUEL TANK CAPACITY	0.48 gallons	1.8 liters	0.48 gallons	1.8 liters	
HYDRAULIC OIL TANK CAPACITY	5 gallons	18.9 liters	5 gallons	18.9 liters	
HYDRAULIC PUMP TYPE	2 stage, 10 gal./min.	2 stage, 37.9 L/min.	2 stage, 10 gal./min.	2 stage, 37.9 L/min.	
HYDRAULIC CYLINDER FORCE	21 tons	19 metric tons	21 tons	19 metric tons	
MAX. LOG LENGTH	24 in.	61 cm	24 in.	61 cm	
HITCH TYPE	2 in. coupler	50mm coupler	2 in. coupler	50mm coupler	




SPECIFICATIONS

		LS27270		LS27270T	
DESCRIPTION	English	Metric	English	Metric	
OVERALL SIZE	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	
OVERALL WEIGHT	415 lbs.	188 kg.	430 lbs.	195 kg.	
STARTER	Recoil	Recoil	Recoil	Recoil	
DRIVE TYPE	Direct	Direct	Direct	Direct	
TIRE SIZE	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	
ENGINE	270cc Honda	270cc Honda	270cc Honda	270cc Honda	
FUEL TANK CAPACITY	1.4 gallons	5.3 liters	1.4 gallons	5.3 liters	
HYDRAULIC OIL TANK CAPACITY	5 gallons	18.9 liters	5 gallons	18.9 liters	
HYDRAULIC PUMP TYPE	2 stage, 13 gal./min.	2 stage, 49.2 L/min.	2 stage, 13 gal./min.	2 stage, 49.2 L/min.	
HYDRAULIC CYLINDER FORCE	27 tons	24.5 metric tons	27 tons	24.5 metric tons	
MAX. LOG LENGTH	24 in.	61 cm	24 in.	61 cm	
HITCH TYPE	2 in. coupler	50mm coupler	2 in. coupler	50mm coupler	





		LS33340		LS33340T	
DESCRIPTION	English	Metric	English	Metric	
OVERALL SIZE	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	45.75" x 75.7" x 38.4"	116.2cm x 192.3cm x 97.5cm	
OVERALL WEIGHT	447 lbs.	202.8 kg.	462 lbs.	209.6 kg.	
STARTER	Recoil	Recoil	Recoil	Recoil	
DRIVE TYPE	Direct	Direct	Direct	Direct	
TIRE SIZE	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	4.8"-8" Pneumatic	12 cm-20 cm Pneumatic	
ENGINE	340cc Honda	340cc Honda	340cc Honda	340cc Honda	
FUEL TANK CAPACITY	1.6 gallons	6.1 liters	1.6 gallons	6.1 liters	
HYDRAULIC OIL TANK CAPACITY	5 gallons	18.9 liters	5 gallons	18.9 liters	
HYDRAULIC PUMP TYPE	2 stage, 16 gal./min.	2 stage, 72.7 L/min.	2 stage, 16 gal./min.	2 stage, 72.7 L/min.	
HYDRAULIC CYLINDER FORCE	33 tons	29.9 metric tons	33 tons	29.9 metric tons	
MAX. LOG LENGTH	24 in.	61 cm	24 in.	61 cm	
HITCH TYPE	2 in. coupler	50mm coupler	2 in. coupler	50mm coupler	

7.2 BOLT TORQUE

The tables below are for reference purposes only and their use by anyone is entirely voluntary, unless otherwise noted. Reliance on their content for any purpose is at the sole risk of that person and any loss or damage resulting from the use of this information is the responsibility of that person.

SAE Grade and Head Markings	SAE - 2	SAE - 5	SAE - 8	BOLT DIAMETER
				

BOLT DIAMETER (A)	ENGLISH							
	BOLT TORQUE *							
	SAE 2		SAE 5		SAE 8			
	N.m	Ft-lb.	N.m	Ft-lb.	N.m	Ft-lb.	N.m	Ft-lb.
1/4"	7.5	5.5	11	8	16	12		
5/16"	15	11	23	17	34	25		
3/8"	27	20	41	30	61	45		
7/16"	41	30	68	50	95	70		
1/2"	68	50	102	75	149	110		
9/16"	97	70	149	110	203	150		
5/8"	122	90	203	150	312	230		
3/4"	217	160	353	260	515	380		
7/8"	230	170	542	400	814	600		
1"	298	220	786	580	1220	900		
1-1/8"	407	300	1085	800	1736	1280		
1-1/4"	570	420	2631	1940	2468	1820		

METRIC Grade and Head Markings	4.8	8.8	10.9	12.9	BOLT DIAMETER
					

BOLT DIAMETER (A)	METRIC							
	BOLT TORQUE *							
	4.8		8.8		10.9		12.9	
	N.m	Ft-lb.	N.m	Ft-lb.	N.m	Ft-lb.	N.m	Ft-lb.
M3	0.5	0.4	-	-	-	-	-	-
M4	3	2.2	-	-	-	-	-	-
M5	5	4	-	-	-	-	-	-
M6	6	4.5	11	8.5	17	12	19	14.5
M8	15	11	28	20	40	30	47	35
M10	29	21	55	40	80	60	95	70
M12	50	37	95	70	140	105	165	120
M14	80	60	150	110	225	165	260	190
M16	125	92	240	175	350	255	400	300
M18	175	125	330	250	475	350	560	410
M20	240	180	475	350	675	500	800	580
M22	330	250	650	475	925	675	1075	800
M24	425	310	825	600	1150	850	1350	1000
M27	625	450	1200	875	1700	1250	2000	1500

* Torque value for bolts and capscrews are identified by their head markings.

Torque figures indicated above are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or capscrews unless otherwise specified in this manual. When using locking elements, increase torque values by 5%.



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