

1 INTRODUCTION

Congratulations on your choice of an Wallenstein Log Grapple Trailer to compliment your operation. This equipment has been designed and manufactured to meet the needs of a discerning timber or landscaping industry.

Safe, efficient and trouble free operation of your Wallenstein Log Grapple Trailer requires that you and anyone else who will be using or maintaining the Trailer, read and understand the Safety, Operation, Maintenance and Trouble Shooting information contained within the Operator's Manual.



This manual covers the Wallenstein Log Grapple Trailer. Use the Table of Contents or Index as a guide to locate required information.

Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Wallenstein dealer or the Distributer if you need assistance, information or additional copies of the manuals.

OPERATOR ORIENTATION - The directions left, right, front and rear, as mentioned throughout this manual, are determined when standing at the operating station and looking over the machine.

2 SAFETY

SAFETY ALERT SYMBOL

This Safety Alert symbol means
ATTENTION! BECOME ALERT!
YOUR SAFETY IS INVOLVED!



The Safety Alert symbol identifies important safety messages on the Wallenstein Log Grapple Trailer and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is SAFETY important to you?

3 Big Reasons

Accidents Disable and Kill
Accidents Cost
Accidents Can Be Avoided

SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING** and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guide-lines:

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 typically for machine components which, for functional purposes, cannot be guarded.

WARNING - Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

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.

If you have any questions not answered in this manual or require additional copies or the manual is damaged, please contact your dealer or Wallenstein, 4144 Boomer Line, St. Clements, ON, N0B 2M0. Phone (519) 669-9283 or Fax (519) 699-4146.

SAFETY

YOU are responsible for the SAFE operation and maintenance of your Wallenstein Log Grapple Trailer. **YOU** must ensure that you and anyone else who is going to use, maintain or work around the Trailer be familiar with the using and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be used while using the Log Grapple Trailer.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** using this equipment is familiar with the recommended using and maintenance procedures and follows all the safety precautions. Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

- Log Grapple Trailer owners must give operating instructions to operators or employees before allowing them to operate the machine, and at least annually.
- The most important safety device on this equipment is a SAFE operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow these. Most accidents can be avoided.
- A person who has not read and understood all using and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to possible serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the equipment.
- Think SAFETY! Work SAFELY!

2.1 GENERAL SAFETY

1. Read and understand the Operator's Manual and all safety signs before using, maintaining, adjusting or cleaning the Trailer.



2. Have a first-aid kit available for use should the need arise and know how to use it.



3. Have a fire extinguisher available for use should the need arise and know how to use it.



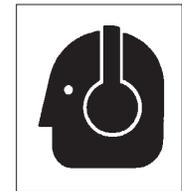
4. Do not allow riders.

5. Wear appropriate protective gear. This list includes but is not limited to:

- A hard hat
- Protective shoes with slip resistant soles
- Protective glasses, goggles or face shield
- Heavy gloves
- Wet weather gear
- Hearing Protection
- Respirator or filter mask



6. Install and secure all guards before starting.



7. Wear suitable ear protection for prolonged exposure to excessive noise.

8. Lower grapple and boom, place all controls in neutral, stop engine, set park brake and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.

9. Clear the area of people, especially small children, before using the unit.

10. Review safety related items annually with all personnel who will be operating or maintaining the Log Grapple Trailer.

2.2 EQUIPMENT SAFETY GUIDELINES

1. Safety of the operator and bystanders is one of the main concerns in designing and developing equipment. However, every year many accidents occur which could have been avoided by a few seconds of thought and a more careful approach to handling equipment. You, the operator, can avoid many accidents by observing the following precautions in this section. To avoid personal injury or death, study the following precautions and insist those working with you, or for you, follow them.
2. In order to provide a better view, certain photographs or illustrations in this manual may show an assembly with a safety shield removed. However, equipment should never be used in this condition. Keep all shields in place. If shield removal becomes necessary for repairs, replace the shield prior to use.
3. Replace any safety sign or instruction sign that is not readable or is missing. Location of such safety signs is indicated in this manual.
4. Never use alcoholic beverages or drugs which can hinder alertness or coordination while using this equipment. Consult your doctor about using this machine while taking prescription medications.
5. **Under no circumstances should young children be allowed to work with this equipment. Do not allow persons to use or assemble this unit until they have read this manual and have developed a thorough understanding of the safety precautions and of how it works.** Review the safety instructions with all users annually.
6. This equipment is dangerous to children and persons unfamiliar with its operation. The operator should be a responsible, properly trained and physically able person familiar with machinery and trained in this equipment's operations. If the elderly are assisting with work, their physical limitations need to be recognized and accommodated.
7. Never exceed the limits of a piece of machinery. If its ability to do a job, or to do so safely, is in question - **DON'T TRY IT.**
8. Do not modify the equipment in any way. Unauthorized modification may result in serious injury or death and may impair the function and life of the equipment.
9. In addition to the design and configuration of this implement, including Safety Signs and Safety Equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence, and proper training of personnel involved in the operation, transport, maintenance, and storage of the machine. Refer also to Safety Messages and operation instruction in each of the appropriate sections of the engine and machine manuals. Pay close attention to the Safety Signs affixed to the tractor and the machine.

2.3 SAFETY TRAINING

1. Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by a single careless act of an operator or bystander.
2. In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence and proper training of personnel involved in the operation, transport, maintenance and storage of this equipment.
3. It has been said, "The best safety feature is an informed, careful operator." We ask you to be that kind of an operator. It is the operator's responsibility to read and understand ALL Safety and Using instructions in the manual and to follow these. Accidents can be avoided.
4. Working with unfamiliar equipment can lead to careless injuries. Read this manual before assembly or using, to acquaint yourself with the machine. If this machine is used by any person other than yourself, or is loaned or rented, it is the machine owner's responsibility to make certain that the operator, prior to using:
 - a. Reads and understands the operator's manuals.
 - b. Is instructed in safe and proper use.
5. Know your controls and how to stop tractor, engine and machine quickly in an emergency. Read this manual and the one provided with your engine.
6. Train all new personnel and review instructions frequently with existing workers. Be certain only a properly trained and physically able person will use the machinery. A person who has not read and understood all using and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to possible serious injury or death. If the elderly are assisting with the work, their physical limitations need to be recognized and accommodated.

2.4 SAFETY SIGNS

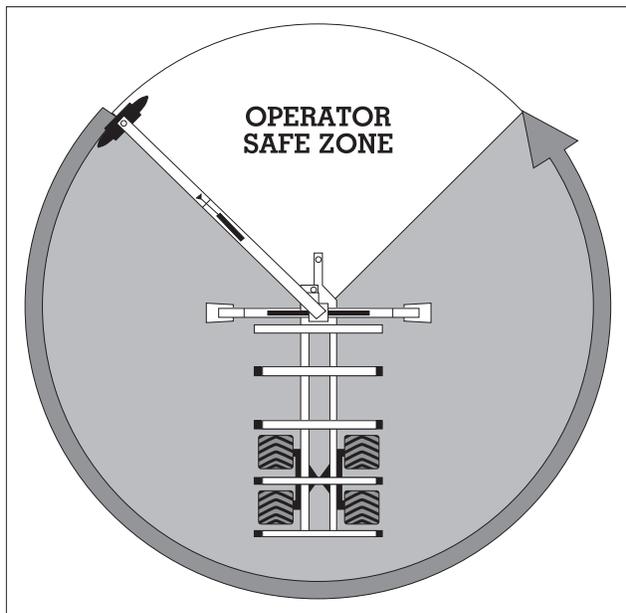
1. Keep safety signs clean and legible at all times.
2. Replace safety signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety signs displayed in Section 3 each have a part number in the lower right hand corner. Use this part number when ordering replacement parts.
5. Safety signs are available from your authorized Distributor or Dealer Parts Department or the factory.

How to Install Safety Signs:

- Be sure that the installation area is clean and dry.
- Be sure temperature is above 50°F (10°C).
- Determine exact position before you remove the backing paper.
- Remove the smallest portion of the split backing paper.
- Align the sign over the specified area and carefully press the small portion with the exposed sticky backing in place.
- Slowly peel back the remaining paper and carefully smooth the remaining portion of the sign in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of sign backing paper.

2.5 OPERATOR SAFETY AREA

1. Heavy objects can fall or be dropped and injure people that are not in the safety area.
2. Stay out of shaded hazard area.
3. Always know where all additional personnel are located when operating the trailer. Never allow anyone within the hazard area.

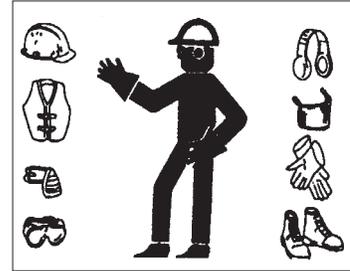


OPERATOR SAFETY AREA

2.6 PREPARATION

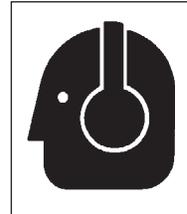
1. Never use the engine and machine until you have read and completely understand this manual, the Engine Operator's Manual and each of the Safety Messages found on the safety signs on the engine and machine.

2. Personal protection equipment including hard hat, safety glasses, safety shoes, and gloves are recommended during assembly, installation, operation, adjustment, maintaining, repairing, removal, cleaning, or moving the unit. Do not allow long hair, loose fitting clothing or jewellery to be around equipment.



3. **PROLONGED EXPOSURE TO LOUD NOISE MAY CAUSE PERMANENT HEARING LOSS!**

Power equipment with or without equipment attached can often be noisy enough to cause permanent, partial hearing loss. We recommend that you wear hearing protection on a full-time basis if the noise in the Operator's position exceeds 80db. Noise over 85db on a long-term basis can cause severe hearing loss. Noise over 90db adjacent to the Operator over a long-term basis may cause permanent, total hearing loss. **NOTE:** Hearing loss from loud noise (from tractors, chain saws, radios, and other such sources close to the ear) is cumulative over a lifetime without hope of natural recovery.



4. Clear working area of stones, branches or hidden obstacles that might be hooked or snagged, causing injury or damage.
5. Use only in daylight or good artificial light.
6. Be sure machine is properly mounted, adjusted and in good operating condition.
7. Ensure that all safety shielding and safety signs are properly installed and in good condition.

2.7 MAINTENANCE SAFETY

1. Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
2. Follow good shop practices.

- Keep service area clean and dry.
- Be sure electrical outlets and tools are properly grounded.
- Use adequate light for the job at hand.



3. Make sure there is plenty of ventilation. Never operate the engine of the towing vehicle in a closed building. The exhaust fumes may cause asphyxiation.
4. Before working on this machine, shut off the engine, set the brake, and turn fuel valve off.
5. Never work under equipment unless it is blocked securely.
6. Always use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance work.
7. Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.

8. A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.



9. Periodically tighten all bolts, nuts and screws and check that all electrical and fuel connections are properly secured to ensure unit is in a safe condition.
10. When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

2.8 REFUELING SAFETY

1. Handle fuel with care. It is highly flammable.
2. Allow engine to cool for 5 minutes before refueling. Clean up spilled fuel before restarting engine.
3. Do not refuel the machine while smoking or when near open flame or sparks.
4. Fill fuel tank outdoors.
5. Prevent fires by keeping machine clean of accumulated trash, grease and debris.

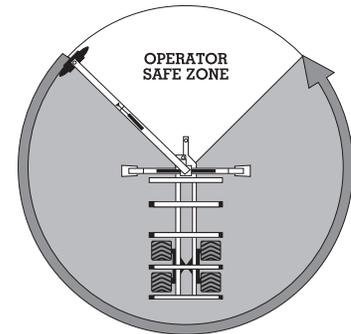


2.9 TIRE SAFETY

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious injury or death.
2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
3. Have a qualified tire dealer or repair service perform required tire maintenance.
4. When replacing worn tires, make sure they meet the original tire specifications. Never undersize.

2.10 OPERATING SAFETY

1. Please remember it is important that you read and heed the safety signs on the Log Grapple Trailer. Clean or replace all safety signs if they cannot be clearly read and understood. They are there for your safety, as well as the safety of others. The safe use of this machine is strictly up to you, the operator.
2. All things with moving parts are potentially hazardous. There is no substitute for a cautious, safe-minded operator who recognizes potential hazards and follows reasonable safety practices. The manufacturer has designed this Log Grapple Trailer to be used with all its safety equipment properly attached, to minimize the chance of accidents. Study this manual to make sure you have all safety equipment attached.
3. Close and secure all guards and shields before starting and operating.
4. Read and understand operator's manual before starting. Review safety instructions annually.
5. Personal protection equipment including hearing protection, hard hat, safety glasses, safety shoes, and gloves are recommended during assembly, installation, operation, adjustment, maintaining, repairing, removal, or moving. Do not allow long hair, loose-fitting clothing, or jewellery to be around moving parts.
6. Keep hydraulic lines and fittings tight, in good condition and free of leaks.
7. Never place any part of your body where it would be in danger if movement should occur during assembly, installation, operation, maintenance, repairing or moving.
8. Lower grapple and boom, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing. adjusting, repairing or maintaining.
9. Install boom lock pin before moving, storing or transporting.
10. Do not run machine inside a closed building to prevent asphyxiation from engine exhaust.
11. Extend stabilizers to support frame during loading and unloading.
12. Position the trailer to provide a firm base for the stabilizer pads before loading or unloading.
13. Fully extend the stabilizers before operating.
14. Never use alcoholic beverages or drugs which can hinder alertness or coordination while operating this equipment. Consult your doctor about operating this machine while taking prescription medications.
15. Do not allow riders on this machine at any time. There is no safe place for any riders.
16. Never allow children or unauthorized people to operate or be around this machine.
17. Stay away from overhead utilities and obstructions. Review position of power lines.
18. Stay 50 ft (15 m) away from power lines. Electrocutation can occur without direct contact.
19. Keep the working area clean and free of debris to prevent tripping. Operate only on level ground.
20. Keep all bystanders at least 20 ft (6 m) away from trailer, grapple and logs when loading or unloading or when the engine is running.
21. Do not operate machine unless located in safe zone behind controls.
22. Do not move or carry people on boom or grapple.
22. Do not overload lift or trailer capacity.
23. Do not exceed a safe travel speed when transporting. Use safety chain on trailer model when attaching to truck.



2.11 HYDRAULIC SAFETY

1. Make sure that all the components in the hydraulic system are kept in good condition and are clean.
2. Before applying pressure to the system, make sure all components are tight, and that lines, hoses and couplings are not damaged.
3. Do not attempt any makeshift repairs to the hydraulic lines, fittings or hoses by using tapes, clamps or cements. The hydraulic system operates under extremely high pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.

4. Wear proper hand and eye protection when searching for a high pressure hydraulic leak. Use a piece of wood or cardboard as a backstop instead of hands to isolate and identify a leak.



5. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.
6. Relieve pressure on hydraulic system before maintaining or working on system.

2.12 STORAGE SAFETY

1. Store the unit in an area away from human activity.
2. Do not allow children to play on or around the stored machine.
3. Store the unit in a dry, level area. Support the frame with planks if required.

2.13 TRANSPORT SAFETY

1. Comply with state and local laws governing safety and transporting of machinery on public roads.
2. Check that all the lights, reflectors and other lighting requirements are installed and in good working condition.
3. Do not exceed a safe travel speed. Slow down for rough terrain and cornering.
4. Retract and lower boom and clip grapple to frame or log before moving or transporting.
5. Be sure the trailer is hitched positively to the tractor and a retainer is used through the drawbar. Always attach a safety chain between the hitch and the tractor.
6. Do not drink and drive.
7. Be a safe and courteous driver. Always yield to oncoming traffic in all situations, including narrow bridges, intersections, etc. Watch for traffic when operating near or crossing roadways.
8. Never allow riders on the machine.

2.14 GAS MOTOR SAFETY

BEFORE STARTING ENGINE, READ AND UNDERSTAND THE OPERATING AND MAINTENANCE INSTRUCTIONS THAT CAME WITH YOUR ENGINE.

WARNING: DO NOT

1. DO NOT run engine in an enclosed area. Exhaust gases contain carbon monoxide, an odourless and deadly poison.
2. DO NOT place hands or feet near moving or rotating parts.
3. DO NOT store, spill, or use gasoline near an open flame, or devices such as a stove, furnace, or water heater which use a pilot light or devices which can create a spark.
4. DO NOT refuel indoors where area is not well ventilated. Outdoor refuelling is preferred.
5. DO NOT fill fuel tank while engine is running. Allow engine to cool for 5 minutes before refueling. Store fuel in approved safety containers.
6. DO NOT remove fuel tank cap while engine is running.
7. DO NOT operate engine if gasoline is spilled. Move machine away from the spill and avoid creating any ignition until gasoline has evaporated.
8. DO NOT smoke while filling fuel tank.
9. DO NOT choke carburetor to stop engine. Whenever possible, gradually reduce engine speed before stopping.
10. DO NOT run engine above rated speeds. This may result in injury or engine failure.
11. DO NOT tamper with governor springs, governor links or other parts which may increase the governed speed.
12. DO NOT tamper with the engine speed selected by the original equipment manufacturer.
13. DO NOT check for spark with spark plug or spark plug wire removed.
14. DO NOT crank engine with spark plug removed. If engine is flooded, place throttle in "FAST" position and crank until engine starts.
15. DO NOT strike flywheel with a hard object or metal tool as this may cause flywheel to shatter in operation. Use proper tools to service engine.
16. DO NOT operate engine without a muffler. Inspect periodically and replace, if necessary. If engine is equipped with a muffler deflector, inspect periodically and replace, if necessary with correct deflector.
17. DO NOT operate engine with an accumulation of grass, leaves, dirt or other combustible materials in the muffler area.
18. DO NOT use this engine on any forest covered, brush covered, or grass covered unimproved land unless a spark arrester is installed on the muffler. The arrester must be maintained in effective working order by the operator. In the state of California the above is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal land.
19. DO NOT touch hot muffler, cylinder or fins because contact may cause burns.
20. DO NOT run engine with air cleaner or air cleaner cover removed.

WARNING: DO

1. ALWAYS DO remove the wire from the spark plug when servicing the engine or equipment TO PREVENT ACCIDENTAL STARTING. Disconnect the negative wire from the battery terminal if equipped with a 12 volt starting system.
2. DO keep cylinder fins and governor parts free of grass and other debris which can affect engine speed.
3. DO examine muffler periodically to be sure it is functioning effectively. A worn or leaking muffler should be repaired or replaced as necessary.
4. DO use fresh gasoline. Stale fuel can gum carburetor and cause leakage.
5. DO check fuel lines and fittings frequently for cracks or leaks. Replace if necessary.

3 SAFETY SIGN LOCATIONS

The types of safety signs and locations on the equipment are shown in the illustrations that follow. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!

A

 **CAUTION**

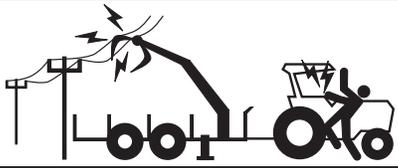
- Read Operator's Manual before using. 
- Lower grapple and boom, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
- Install boom lock pin before moving, storing or transporting.
- Extend stabilizers to support frame during loading and unloading.
- Position the trailer to provide a firm base for the stabilizer pads before loading or unloading.
- Fully extend the stabilizers before operating.
- Stay away from overhead utilities and obstructions. Review position of power lines.
- Stay 50 feet (15 m) away from power lines. Electrocutation can occur without direct contact.
- Keep all bystanders at least 20 feet away from trailer, grapple and logs when loading or unloading or when engine is running.
- Do not operate machine unless located in safe zone behind controls.
- Do not move or carry people on boom or grapple.
- Do not overload lift capacity.
- Review safety instructions annually.

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B

 **DANGER**



ELECTROCUTION HAZARD

To prevent serious injury or death from electrocution:

- Stay 50 feet (15 m) away from power lines.
- Electrocutation can occur without direct contact.

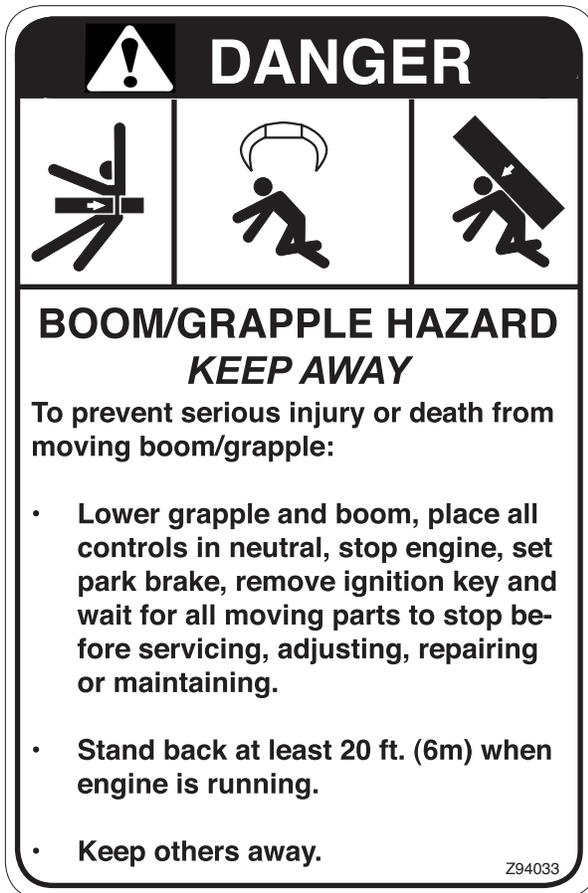
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REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without safety signs, new signs must be applied. New safety signs are available from your authorized dealer.

The types of safety signs and locations on the equipment are shown in the illustrations that follow. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!

C



D



REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without safety signs, new signs must be applied. New safety signs are available from your authorized dealer.

4 OPERATION



OPERATING SAFETY

- Read Operator's Manual before using.
- Lower grapple and boom, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
- Install boom lock pin before moving, storing or transporting.
- Extend stabilizers to support frame during loading and unloading.
- Position the trailer to provide a firm base for the stabilizer pads before loading or unloading.
- Fully extend the stabilizers before operating.
- Stay away from overhead utilities and obstructions. Review position of power lines.
- Stay 50 feet (15 m) away from power lines. Electrocutation can occur without direct contact.
- Keep all bystanders at least 20 feet away from trailer, grapple and logs when loading or unloading or when engine is running.
- Do not operate machine unless located in safe zone behind controls.
- Do not move or carry people on boom or grapple.
- Do not overload lift or trailer capacity.
- Review safety instructions annually.

4.1 TO THE NEW OPERATOR OR OWNER

The Wallenstein Log Grapple Trailer is designed to lift, load and transport wood or logs out of the woods or woodlot.

It is the responsibility of the owner or operator to read this manual and to train all other operators before they start working with the machine. Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the worksite. Untrained operators are not qualified to use the machine.

Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the worksite. Untrained operators are not qualified to operate the machine.

Many features incorporated into this machine are the result of suggestions made by customers like you. Read this manual carefully to learn how to use the trailer safely and how to set it to provide maximum field efficiency. By following the using instructions in conjunction with a good maintenance program, your Log Grapple Trailer will provide many years of trouble-free service.

4.2 MACHINE COMPONENTS

The Wallenstein Log Grapple Trailer is a heavy-duty 4 wheel trailer for hauling logs or woodstock out of the woods or a woodlot. A boom and a pivoting grapple is mounted on the front of the frame for loading the logs.

The controls are mounted on the front of the frame behind the front frame. All hydraulic power is provided by a small gas engine mounted on the front of the frame or by a tractor.

Stabilizers are mounted to the front corners of the frame and are extended for loading to provide extra stability.

- A Trailer Frame
- B Front Frame
- C Boom
- D Dipper
- E Grapple
- F Grapple Pivot
- G Stabilizers
- H Controls
- J Gas Engine
- K Logs
- L Hydraulic Reservoir



Fig. 1 PRINCIPLE COMPONENTS

4.3 MACHINE BREAK-IN

Although there are no operational restrictions on the Log Grapple Trailer when used for the first time, it is recommended that the following mechanical items be checked:

A. After operating for 1 hour:

1. Check that all boom pivot points move freely.
2. Check that the grapple and pivot move freely.
3. Check for leaks in the hydraulic system. Tighten leaking fittings. Repair or replace any damaged components.
4. Torque all fasteners and hardware.
5. Check fluid levels in the engine and hydraulic reservoir. Top up as required.
6. Check for entangled material. Remove all entangled material before resuming work.
7. Check tire pressure. Inflate as required.

B. After operating for 10 hours:

1. Repeat steps 1 through 7 listed above. (Section A)
2. Change engine oil.
3. Go to the normal servicing and maintenance schedule as defined in the Maintenance Section.

4.4 PRE-OPERATION CHECKLIST

Efficient and safe operation of the Wallenstein Log Grapple Trailer requires that each operator reads and understands the using procedures and all related safety precautions outlined in this section. A pre-operation checklist is provided for the operator. It is important for both the personal safety and maintaining good mechanical condition that this checklist is followed.

Before operating Trailer and each time thereafter, the following areas should be checked off:

1. Lubricate the machine per the schedule outline in the Maintenance Section.
2. Check that all boom pivot points move freely.
3. Check that the grapple and pivot move freely.
4. Check for leaks in the hydraulic system. Tighten leaking fittings. Repair or replace any damaged components.
5. Torque all fasteners and hardware.
6. Check fluid levels in the engine and hydraulic reservoir. Top up as required.
7. Check for entangled material. Remove all entangled material before resuming work.
8. Check tire pressure. Inflate as required.
9. Make sure that all guards and shields are in place, secured and functioning as designed.

4.5 CONTROLS

Before starting to work, all operators should familiarize themselves with the location and function of controls.

A. Gas Engine:

Always read the engine Operator's manual supplied with the machine for detailed procedures.

a. Ignition Switch (Manual Start):

This rotary switch controls the electrical power to the engine electrical system. Turn the switch clockwise to turn the electrical system ON and the engine will run. Turn counter-clockwise to stop the engine.

b. Fuel Shut-Off Valve:

Each engine is equipped with a valve between the fuel tank and the carburetor. Slide the fuel valve toward the block to turn ON and away to turn OFF. Turn the fuel OFF before transporting.

c. Throttle:

This lever controls the engine RPM. Move the lever laterally to increase or decrease the RPM. Always run at maximum throttle while operating.

d. Choke:

The choke controls the fuel/air mixture to the engine. Close the choke when starting if the engine is cold. Open the choke as the engine warms. Always open the choke fully during operation.

e. Starting Rope:

This retracting rope and T-bar is used to turn the engine over before starting. Grasp the T-bar firmly and pull the rope sharply to start the engine..



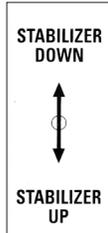
Fig. 2 ENGINE CONTROLS

B. Boom Hydraulic Control Levers:

All hydraulic control valves are mounted on top of the main frame. The two outer levers control the position of the stabilizers and the outer joy sticks control the function of the boom, dipper and bucket.

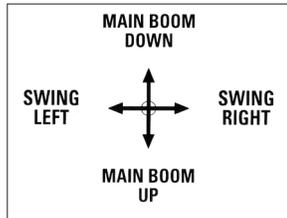
a. Left Lever - Left Stabilizer Position:

This 2 position spring-loaded-to-neutral-center lever controls the flow of oil to the left stabilizer cylinder. In its centered position, the stabilizer does not move. Push and hold to lower the left stabilizer to the desired position. Release the lever to stop the stabilizer movement. Pull and hold the lever to raise the left stabilizer. Release the lever when the stabilizer is in its desired position.



b. Left Center Lever - Boom Position:

This 4 position spring-loaded-to-neutral-center lever (joy stick) controls the angular position of the boom. Move and hold the lever to the left to swing the boom to the left. Move and hold the lever to the right to swing the boom to the right. Push and hold the lever to extend the boom. Pull and hold the lever to pull the boom toward the main frame. Release the lever to stop the motion of the boom and it will stay in position.



c. Center Lever - Grapple Position:

This 2 position spring-loaded-to-neutral-center lever controls the flow of oil to the grapple. Push on the lever and hold to open the grapple. Pull and hold to close the grapple. Release the lever and it will return to its centered neutral position. The grapple will stop opening and closing.

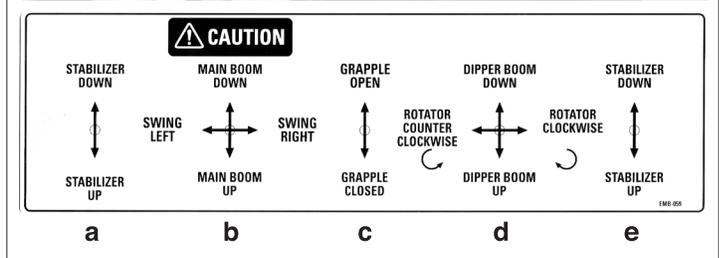
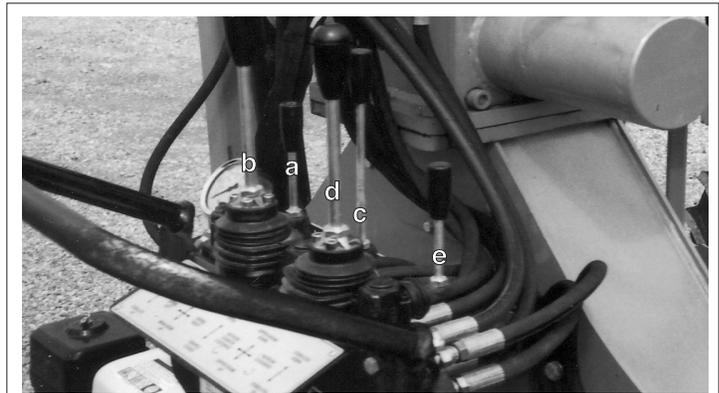
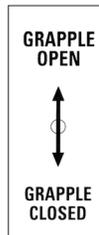
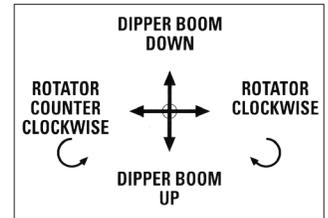


Fig. 3 HYDRAULIC CONTROLS

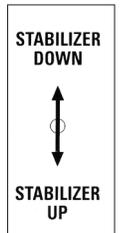
d. Right Center Lever - Dipper (Outer Boom) and Grapple Angle:

This 4 position spring-loaded-to-neutral-center lever (joy stick) controls the position of the dipper and grapple angle. Move and hold the lever to the left to rotate the grapple counter clockwise. Move and hold the lever to the right to rotate the grapple clockwise. Push and hold the lever to move the dipper down. Pull and hold the lever to move the dipper up. Release the lever to stop the motion of the dipper boom and the grapple rotation and they will remain in their position.



e. Right Lever - Right Stabilizer Position:

This 2 position spring-loaded-to-neutral-center lever controls the flow of oil to the right stabilizer cylinder. In its centered position, the stabilizer does not move. Push and hold to lower the right stabilizer to the desired position. Release the lever to stop the stabilizer movement. Pull and hold the lever to raise the right stabilizer. Release the lever when the stabilizer is in its desired position.



4.6 ATTACHING/UNHOOKING

The Log Grapple Trailer should always be located on a level, dry area that is free of debris and other foreign objects. When attaching the machine to a power unit, follow this procedure:

1. Make sure that all bystanders, especially small children, are clear of the working area.
2. Make sure there is enough room and clearance to safely back up to the machine.
3. Slowly back the tractor until the hitch and drawbar are aligned.
4. Use the jack to place the hitch at the correct height.
5. Back the tractor up until the holes are aligned.
6. Stop tractor engine, set park brake, remove ignition key and wait for all moving parts to stop before dismounting.
7. Install the drawbar pin and retainer.
8. Attach the safety chain securely to the drawbar cage to prevent unexpected separation.
9. Pull out the lock pin, remove jack and place in its stowed position. Install anchor pin.



Fig. 4 DRAWBAR PIN AND RETAINER



Fig. 5 STOWED JACK

4.7 FIELD OPERATION



OPERATING SAFETY

- Read Operator's Manual before using.
- Lower grapple and boom, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
- Install boom lock pin before moving, storing or transporting.
- Extend stabilizers to support frame during loading and unloading.
- Position the trailer to provide a firm base for the stabilizer pads before loading or unloading.
- Fully extend the stabilizers before operating.
- Stay away from overhead utilities and obstructions. Review position of power lines.
- Stay 50 feet (15 m) away from power lines. Electrocutation can occur without direct contact.
- Keep all bystanders at least 20 feet away from trailer, grapple and logs when loading or unloading or when engine is running.
- Do not operate machine unless located in safe zone behind controls.
- Do not move or carry people on boom or grapple.
- Do not overload lift capacity.
- Review safety instructions annually.

Although the Log Grapple Trailer is easy to use, each operator should review this section to familiarize himself with the detailed safety and operating procedures. When using this machine, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Review and follow the Pre-Operation Checklist (see Section 4.4).
3. Attach the machine to the tractor (see Section 4.6).
4. Move the trailer next to the wood/logs to be loaded.



Fig. 6 POSITIONED

5. **Starting the Machine:**

- a. Stop tractor engine, set park brake, remove ignition key and wait for all moving parts to stop before dismounting.
- b. Close the choke if the engine is cold.
- c. Move the throttle to its 1/4 throttle position.
- d. Open the fuel supply valve.
- e. Pull sharply on the starting rope to start engine..
- f. Run the engine for a few minutes to allow it to warm.
- g. Gradually open the choke.
- h. Increase engine speed to 3/4 throttle.
- i. Lower stabilizers and proceed with work.

6. **Stopping:**

- a. Clamp grapple to trailer frame or log.
- b. Slow engine RPM.
- c. Stop engine using ignition switch.

7. **Emergency Stopping:**

Stop machine engine if an emergency occurs. Correct emergency situation before starting engine and resuming work.

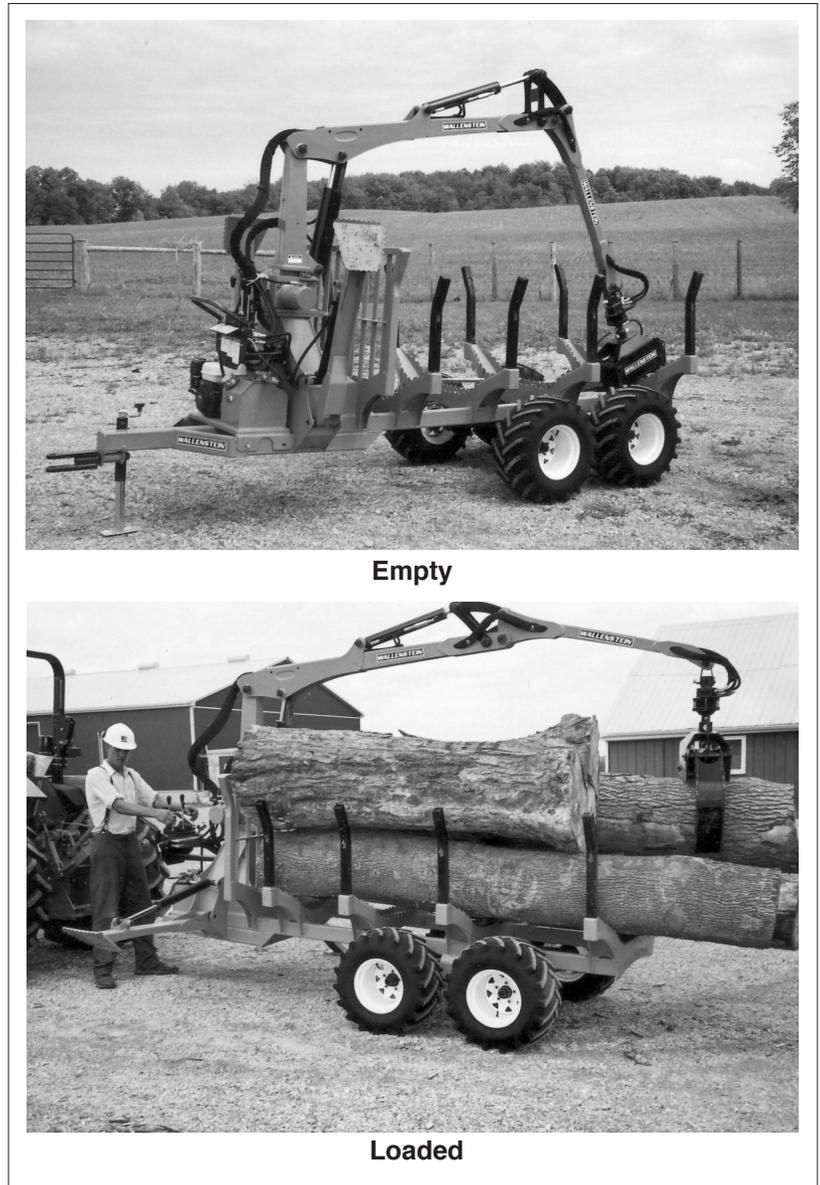


Fig. 7 STARTING/STOPPING

8. a. **Extending Stabilizers:**
Use the outer levers to extend and lower the stabilizers on both sides. Be sure each one supports part of the frame weight so the base is solid.



Left



Right



Extended

- b. **Training:**
It is recommended that all new or experienced operators at the start of a new season, move the trailer to an open area without obstructions or bystanders to practice moving the boom, dipper and grapple. Practice moving and manipulating each component to be familiar and comfortable with how they function. Time invested in training and practice will insure a more efficient operation and a safer working environment.

Fig. 8 STABILIZERS

9. Loading:

Use the boom, dipper and grapple to grab the log or wood and place on the trailer frame.

- a. Move the boom, dipper and grapple out over the log or wood to be picked up.
- b. Turn the grapple until it is at right angles to the longitudinal position of the log or wood.
- c. Open grapple and lower over log.

IMPORTANT

Estimate the position of the log center of gravity to keep it balanced when moving, lifting or swinging.

- d. Close grapple, lift log and slowly swing and align over the trailer.
- e. Lower and release log.
- f. Repeat with the next log(s) until loaded.
- g. Do not load trailer above rated capacity.



First Log



Second Log



Lifting and Swinging



Last Log

Fig. 9 LOADING

10. **Unloading:**

- a. Extend the stabilizers using the outer hydraulic lever controls. Be sure to transfer part of the weight of the trailer onto each stabilizer to insure the pad is supported and will supply the required stability.
- b. Release the grapple from its stowed position.
- c. Raise, swing and move the boom, dipper and grapple into position to pick up a log.
- d. Rotate the grapple so the jaws are at right angles to the longitudinal axis of the log.
- e. Open the jaws and lower the grapple.

IMPORTANT

Estimate the position of the log center of gravity to keep it balanced when moving, lifting or swinging.

- f. Close grapple and lift load/log.
- g. Slowly swing the load/log away from the trailer and lower it to the ground.
- h. Open the jaws and release the log.
- i. Repeat with the next log(s) until unloading is completed.
- j. Stow grapple by clamping to trailer frame.



Stabilizers Extended



First Log



Second Log



Unloaded

Fig. 10 UNLOADING

11. Grapple Swivel:

The grapple is designed with a hydraulic driven swivel in its mounting head. Use the right hand joy stick on the control panel to operate the swivel. Use the swivel to align the log with the trailer or pile as required.



Fig. 11 SWIVEL

12. Power Lines:

The boom and dipper assembly can be raised high enough during operation to contact some overhead power lines. Stay at least 50 feet (15 m) away from power lines. Remember, electrocution can occur without direct contact.



13. Load Distribution:

Always place the load in the centre of the trailer to maintain a balanced weight distribution on the tires and trailer frame. The best results are obtained when the logs are placed on the side opposite where the load is picked up.

14. Tie Downs:

Do not pile the load above the side posts to minimize the chance of logs rolling off the load. Always tie down and secure load before moving or transporting.



Fig. 12 DISTRIBUTION

15. **Slopes:**

The machine can be used in a variety of conditions including rugged terrain. The best results are obtained when the trailer is positioned going up and down the slope rather than across to eliminate the chance to tip the unit over. Always place the logs or load on the high side to reduce the tendency to tip.

Always extend stabilizers and be sure that the soil under them provides sufficient support for the frame during operation.

16. **Operator Safety Area:**

The boom and dipper can extend a considerable distance from the control panel. Do not lift or move the load or log over people, animals when operating. Keep others away. Stop operation immediately if anyone enters the hazard area.

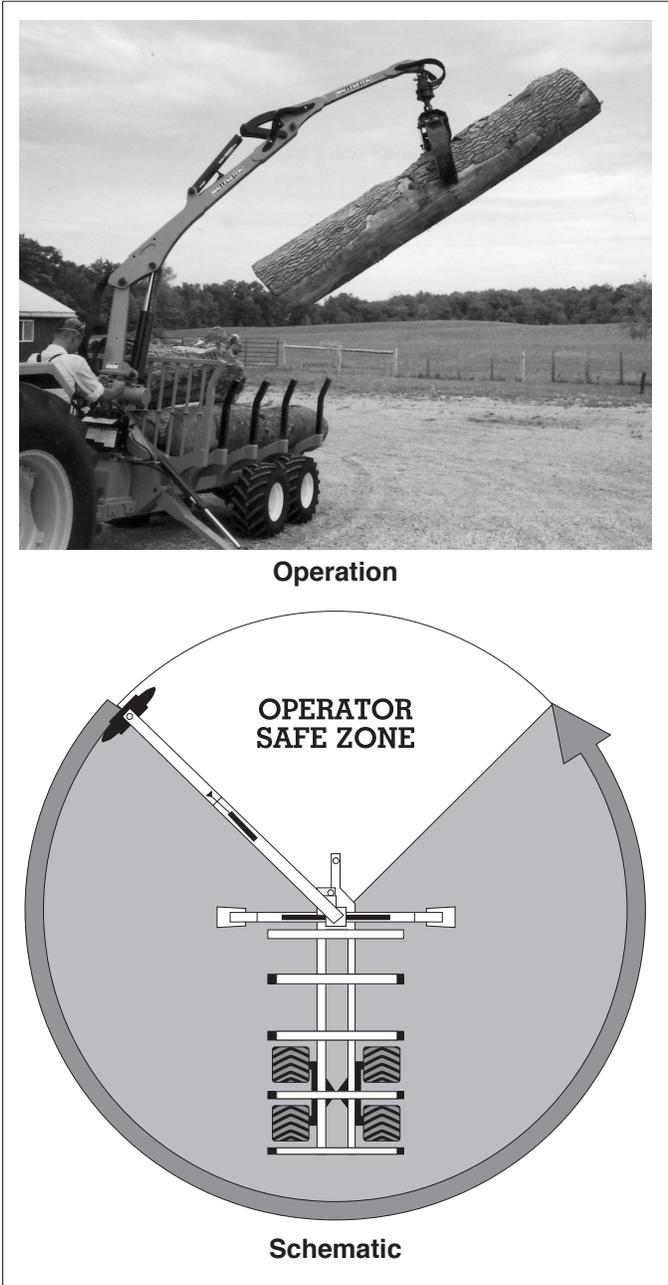


Fig. 13 OPERATOR SAFETY AREA

17. Refuelling:

The fuel tank is located on the engine. Do not overfill. Do not smoke when refuelling.



Fig. 14 FUEL TANK

18. Cleaning:

Clean the machine frequently to prevent a build-up of dust, chips and trash on the frame. A clean machine reduces the chance of rusting and fire.



Fig. 15 CLEANING

18. Operating Hints:

- a. Be sure the trailer is always securely attached to the tractor with a retainer through the drawbar pin and a safety chain around the drawbar cage.
- b. Stay away from overhead power lines to prevent serious injury or death from electrocution. Remember, electrocution can occur without direct contact.



- c. Always fully extend the stabilizers to provide stability to the machine during operation. Be sure the area under the stabilizers can provide the required support.
- d. Place chocks in front of and behind the tractor tires if operating in rugged, steep terrain to be sure the trailer does not move when loading or unloading.



Fig. 16 STABILIZERS

- e. Do not swing the log over people or animals when loading or unloading.



Fig. 16 SWINGING

4.8 TRANSPORTING



TRANSPORT SAFETY

- Comply with state and local laws governing safety and transporting of machinery on public roads.
- Check that all the lights, reflectors and other lighting requirements are installed and in good working condition.
- Do not exceed a safe travel speed. Slow down for rough terrain and cornering.
- Retract and lower boom and clip grapple to frame or log before moving or transporting.
- Be sure the trailer is hitched positively to the tractor and a retainer is used through the drawbar. Always attach a safety chain between the hitch and the tractor.
- Do not drink and drive.
- Be a safe and courteous driver. Always yield to oncoming traffic in all situations, including narrow bridges, intersections, etc. Watch for traffic when operating near or crossing roadways.
- Never allow riders on the machine.

When transporting the machine, review and follow these instructions:

1. Clear the area of bystanders, especially small children.
2. Check that all the lights and reflectors required by the highway authorities are in place, clean and working.
3. Insure that the machine is securely attached to the tractor with a mechanical retainer through the drawbar pin. Always use a safety chain.
4. Do not allow riders.
5. Never exceed a safe travel speed. Slow down when encountering rough road conditions and cornering.
6. Do not drink and drive.
7. Install the boom swing lock pin and retainers.



Fig. 18 BOOM SWING LOCK PIN

8. Clamp the grapple to the back of the trailer frame or a log. Do not let it swing free.



Frame



Log

Fig. 19 GRAPPLE

4.9 STORAGE



OPERATING SAFETY

- Store the unit in an area away from human activity.
- Do not permit children to play on or around the stored machine.
- Store the unit in a dry, level area. Support the frame with planks if required.

5.9.1 PLACING IN STORAGE

After the season's use or when the machine will not be used for a period of time, completely inspect all major systems of the Log Grapple Trailer. Replace or repair any worn or damaged components to prevent any unnecessary down time at the beginning of the next season.

Follow this procedure before storing:

1. Remove all material from the machine.
2. Clamp the grapple to the back of the trailer frame.
3. Swing the boom straight out behind and install the boom lock pin.
4. Stop engine and turn fuel valve off.
5. Thoroughly wash the machine with a pressure washer or water hose to remove all dirt, mud or debris.
6. Inspect all moving parts for entangled material. Remove all entangled material.
7. Check the condition of the hydraulic components. Tighten or replace leaking fittings.
8. Touch up all paint nicks and scratches to prevent rusting.
9. It is best to store the machine inside. If that is not possible, cover with a waterproof tarpaulin and tie down securely.
10. Store in an area away from human activity.
11. Do not allow children to play around the stored unit.

5.9.2 REMOVING FROM STORAGE

When removing this machine from storage, follow this procedure:

1. Remove the tarpaulin if covered.
2. Review and follow the pre-operation checklist.

IMPORTANT

If the machine has been stored for more than 6 months, warm the engine by running it for 2-3 minutes and drain the oil. Change the oil while the oil is warm to remove any condensation. Refer to Maintenance section.



Fig. 20 STORED

5 SERVICE AND MAINTENANCE



MAINTENANCE SAFETY

- Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
- Follow good shop practices.
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
- Make sure there is plenty of ventilation. Never operate the engine of the towing vehicle in a closed building. The exhaust fumes may cause asphyxiation.
- Before working on this machine, shut off the engine, set the brake, and turn fuel valve off.
- Never work under equipment unless it is blocked securely.
- Always use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance work. Use heavy or leather gloves when handling blades.
- Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.
- A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
- Periodically tighten all bolts, nuts and screws and check that all electrical and fuel connections are properly secured to ensure unit is in a safe condition.
- When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

5.1 SERVICE

5.1.1 FLUIDS AND LUBRICANTS

1. **Grease:**
Use an SAE multipurpose high temperature grease with extreme pressure (EP) performance. Also acceptable is an SAE multipurpose lithium base grease.
2. **Engine Oil:**
Use an SAE 10W30 or 10W40 multi-viscosity oil meeting the American Petroleum Institute (API) classification of SF, SG, SH or SJ for normal operating temperatures. Consult the engine manual for unusual operating conditions. Do not mix oil types or viscosities.

Crankcase Capacity: 1.6 L (1.7 US qt)
3. **Engine Gasoline:**
Use a standard automotive super unleaded gasoline for all operating conditions.

Fuel Tank Capacity: 2.0 US gal (7.5 liter)
4. **Storing Lubricants:**
Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture and other contaminants.

5.1.2 GREASING

Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use a hand-held grease gun for all greasing.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If fittings will not take grease, remove and clean thoroughly. Also clean lubricant passageway. Replace fittings if necessary.

5.1.3 SERVICING INTERVALS

The period recommended is based on normal operating conditions. Severe or unusual conditions may require more frequent lubrication or oil changes.

8 Hours or Daily

1. Check engine oil level.
2. Check fuel level.
3. Check hydraulic reservoir oil level (sight glass).



Fig. 21 ENGINE

40 Hours or Weekly

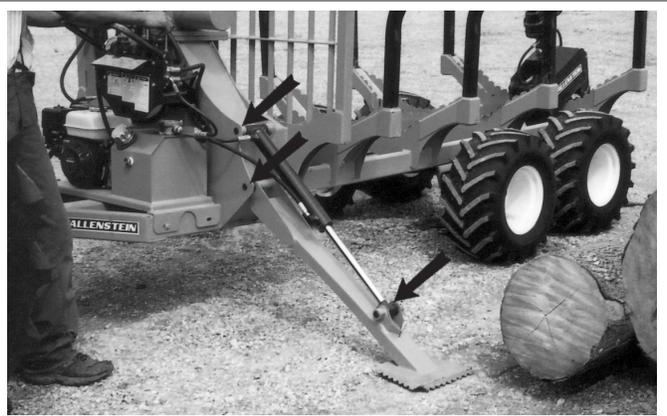
1. Clean engine air cleaner.



Fig. 22 ENGINE AIR CLEANER

40 Hours or Weekly

2. Grease stabilizer pivot pins (3 locations each stabilizer).



Right

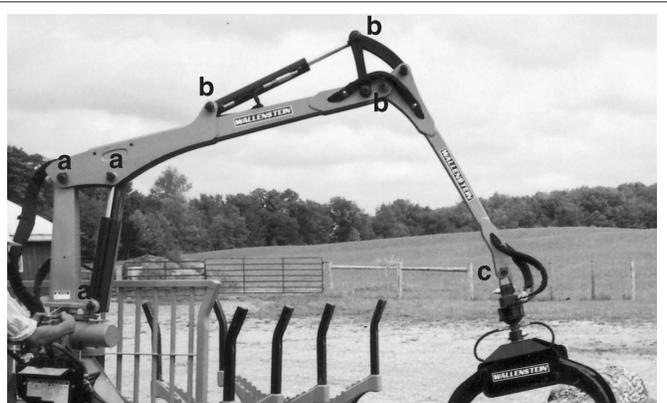


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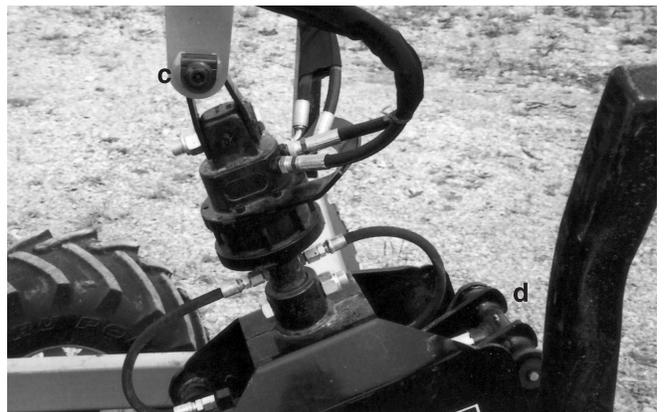
Fig. 23 STABILIZERS

3. Grease boom, dipper and grapple pivots points:

- a. Boom lift pivots.
- b. Dipper extend pivots.
- c. Grapple pivot.
- d. Grapple cylinder pivots.



Boom



Grapple

Fig. 24 PIVOTS

100 Hours or Annually

1. Change engine oil.
2. Check tire pressure.



Fig. 25 DRAIN PLUG

3. Change hydraulic system oil filter.



Fig. 26 HYDRAULIC SYSTEM OIL FILTER

100 Hours or Annually

5. Replace engine air cleaner.

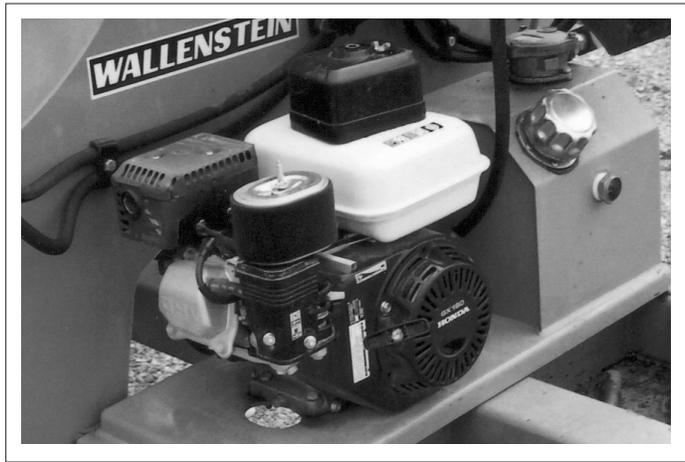


Fig. 27 AIR CLEANER

6. Change hydraulic system oil.



Fig. 28 HYDRAULIC RESERVOIR

7. Clean machine.



Fig. 29 MACHINE

5.1.4 SERVICE RECORD

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

ACTION CODE CK CHECK CL CLEAN R REPLACE
 G GREASE CH CHANGE

MAINTENANCE	HOURS												
	SERVICED BY												
8 Hours or Daily													
CK Engine Oil Level													
CK Fuel Level													
CK Hydraulic Oil Res. Level													
40 Hours or Weekly													
CL Air Cleaner													
G Stabilizer Pivots Points													
G Boom Pivots Points													
G Dipper Extend Pivot Points													
G Grapple Pivot													
G Grapple Cylinder Pivots													
100 Hours or Annually													
CH Engine Oil													
CK Tire Pressure													
CH Hydraulic System Oil Filter													
R Air Cleaner													
CH Hydraulic System Oil													
CL Machine													

5.2 MAINTENANCE

By following a careful service and maintenance program for your machine, you will enjoy many years or trouble-free operation.

5.2.1 CLEANING AIR CLEANER

1. Review the Operator's Manual for the engine.
2. Place all controls in neutral, stop engine and remove ignition key and place in pocket before maintaining.
3. Remove the cover over the air cleaner.
4. Remove the filter from the engine.
5. Use an air house to blow the dust and debris out of the filter.
6. Install filter.
7. Install and secure the cover.



Fig. 30 AIR CLEANER

5.2.2 CHANGING ENGINE OIL AND FILTER

1. Review the Operator's Manual for the engine.
2. Place all controls in neutral and stop engine.
3. Allow the engine to cool before changing the oil. Hot oil can cause burns if it contacts exposed skin. It is best to change oil while the engine is warm to keep the contaminants in suspension.
4. Place a pan under the drain plug.
5. Remove the drain plug and allow the oil to drain for 10 minutes.
6. Install and tighten the drain plug.
7. Dispose of the used oil in an approved container.
8. Fill the crankcase with the specified oil.
9. Run the engine for 1-2 minutes and check for oil leaks.
10. If leaks are found around the drain plug, tighten slightly.
11. Check engine oil level. Top up as required.

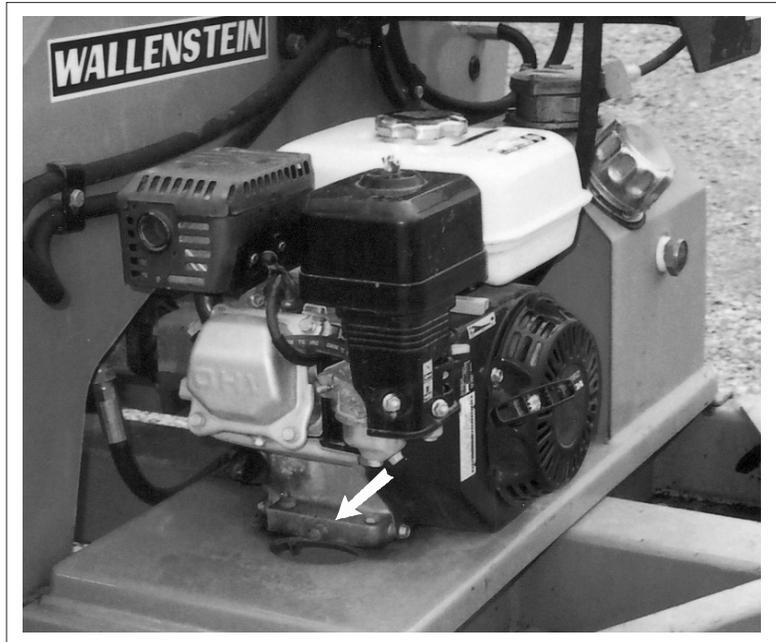


Fig. 31 ENGINE OIL - DRAIN PLUG

5.2.3 CHANGING HYDRAULIC SYSTEM OIL AND FILTER

1. Place all controls in neutral and stop engine.
2. Allow the machine to cool before changing the oil. Hot oil can cause burns if it contacts exposed skin. It is best to change oil while the machine is warm to keep the contaminants in suspension.
3. Place a pan under the drain plug.
4. Remove the drain plug and allow the oil to drain for 10 minutes.
5. Install and tighten the drain plug.
6. Dispose of the used oil in an approved container.
7. Remove oil filter.
8. Apply a light coat of oil to the **O** ring and install the replacement filter. Snug up by hand and then tighten 1/2 turn.
9. Fill the reservoir with the specified oil.
10. Run the machine for 1-2 minutes and check for oil leaks.
11. If leaks are found around the drain plug or filter, tighten slightly. Repeat step 8.
12. Check oil level. Top up as required.

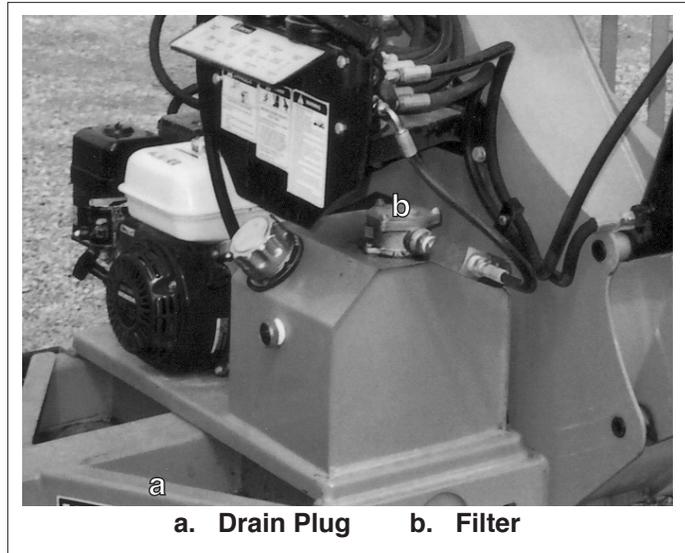


Fig. 32 HYDRAULIC RESERVOIR

6 TROUBLE SHOOTING

The Wallenstein Log Grapple Trailer is designed to lift, load and transport wood or logs out of the woods or woodlot. It is a simple and reliable system that requires minimal maintenance.

In the following section, we have listed many of the problems, causes and solutions to the problems that you may encounter.

If you encounter a problem that is difficult to solve, even after having read through this trouble shooting section, please call your local distributor or dealer. Before you call, please have this Operator's Manual from your unit and serial number ready.

PROBLEM	CAUSE	SOLUTION
Boom does not move.	No oil.	Start engine and bring to rated speed.
	Filter plugged.	Replace filter.
<hr/>		
Dipper does not move.	No oil.	Start engine and bring to rated speed.
	Filter plugged.	Replace filter.
<hr/>		
Grapple does not move.	No oil.	Start engine and bring to rated speed.
	Filter plugged.	Replace filter.

7 SPECIFICATIONS

7.1 MECHANICAL

	<u>LX100/LT40</u>	<u>LX125/LT100</u>
Lifting Capacity	1200 lbs. (545 kg)	1800 lbs (816.5 kg)
Maximum Reach	10 feet (3 m)	12.5 feet (3.8 m)
Max. Grapple Opening	36 in. (914 mm)	50 in. (1270 mm)
Min. Grapple Opening	4 in. (101.6 mm)	4 in. (101.6 mm)
Boom Rotation	270°	270°
Stabilizer Width	10 feet (3 m)	12 feet (3.6 m)
Recommended Hydraulic Flow	2 gpm (7.5 lpm)	5 gpm (18 lpm)
Axle Capacity	9800 lb. (4445 kg)	20,000 lbs (9072 kg)
Load Capacity	4900 lb. (2222.6 kg)	10,000 lbs (4536 kg)
Overall Length	13 feet (4 m)	17.8 feet (5.4 m)
Overall Width	64 in. (1626 mm)	69 in. (1752.6 mm)
Overall Height	58 in. (1473 mm)	118 in. (2997 mm)
Load Length	8 feet (2.4 m)	11 feet (3.35 m)
Dipper Cylinder	2.5 in. (63.5 mm)	3.5 in. (89 mm)
Main Boom Cylinder	3 in. (76.2 mm)	4 in. (101.6 mm)
Stabilizer Cylinder	2 in. (50.8 mm)	3 in. (76.2 mm)
Grapple Cylinder	2.5 in. (63.5 mm)	3 in. (76.3 mm)

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

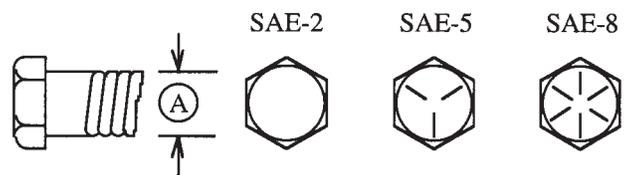
7.2 BOLT TORQUE

CHECKING BOLT TORQUE

The tables shown below give correct torque values for various bolts and capscrews. Tighten all bolts to the torques specified in chart unless otherwise noted. Check tightness of bolts periodically, using bolt torque chart as a guide. Replace hardware with the same strength bolt.

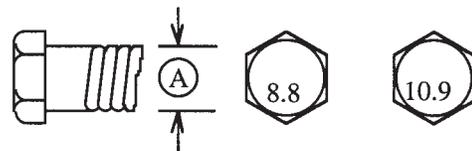
ENGLISH TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*					
	SAE 2 (N.m) (lb-ft)		SAE 5 (N.m) (lb-ft)		SAE 8 (N.m) (lb-ft)	
1/4"	8	6	12	9	17	12
5/16"	13	10	25	19	36	27
3/8"	27	20	45	33	63	45
7/16"	41	30	72	53	100	75
1/2"	61	45	110	80	155	115
9/16"	95	60	155	115	220	165
5/8"	128	95	215	160	305	220
3/4"	225	165	390	290	540	400
7/8"	230	170	570	420	880	650
1"	345	225	850	630	1320	970



METRIC TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*			
	8.8 (N.m) (lb-ft)		10.9 (N.m) (lb-ft)	
M3	.5	.4	1.8	1.3
M4	3	2.2	4.5	3.3
M5	6	4	9	7
M6	10	7	15	11
M8	25	18	35	26
M10	50	37	70	52
M12	90	66	125	92
M14	140	103	200	148
M16	225	166	310	229
M20	435	321	610	450
M24	750	553	1050	774
M30	1495	1103	2100	1550
M36	2600	1917	3675	2710



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%.

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

7.3 HYDRAULIC FITTING TORQUE

Tightening Flare Type Tube Fittings *

1. Check flare and flare seat for defects that might cause leakage.
2. Align tube with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting the tube(s), use two wrenches. Place one wrench on the connector body and with the second tighten the swivel nut to the torque shown.

Tube Size OD (in.)	Nut Size Across Flats (in.)	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
		(N.m)	(lb-ft)	(Flats)	(Turn)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	18	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1-1/4	102	75	3/4	1/8
7/8	1-3/8	122	90	3/4	1/8

- The torque values shown are based on lubricated connections as in reassembly.

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