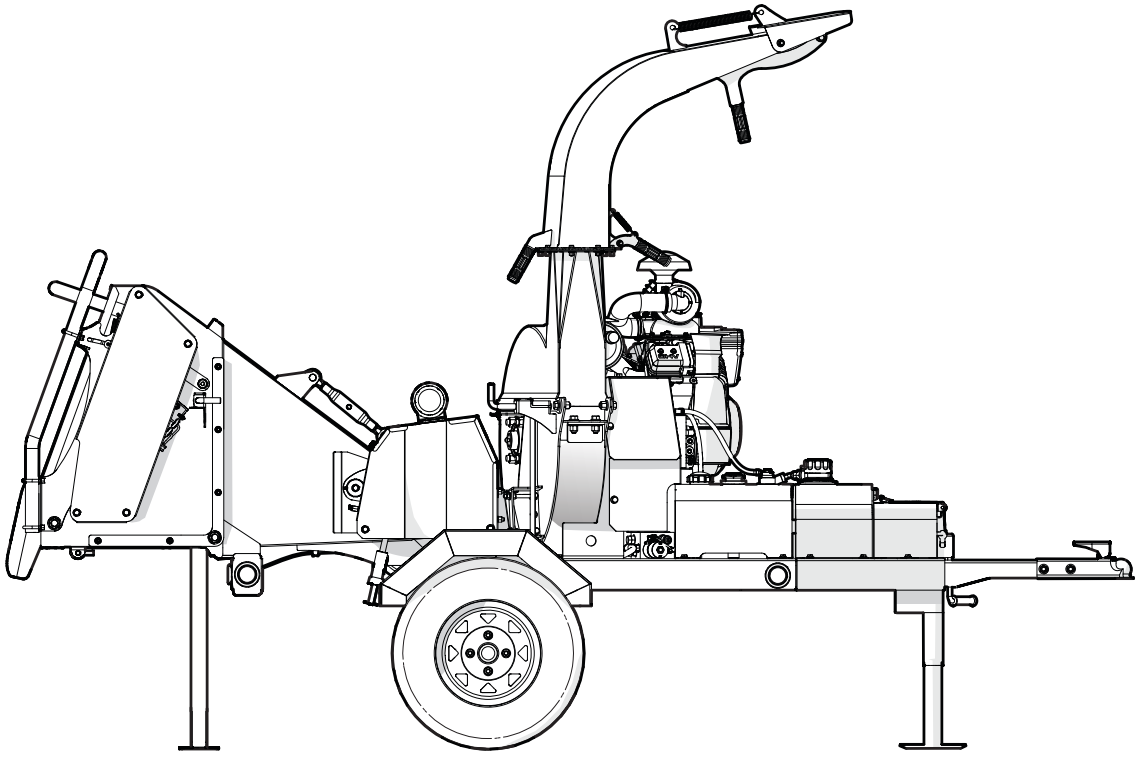
OPERATOR'S MANUAL

Serial numbers
2E9US1110PS051113 to 2E9US1118PS051117, 1100000 and up

BXTR5224
Wood Chipper



Rev Jul-2023

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WALLENSTEIN

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1. Introduction

⚠ WARNING!

Do not attempt to start or operate the machine before you read this manual thoroughly. Make sure that you understand how to operate the machine correctly and safely before you use it.

Keep this manual with the machine at all times.

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Congratulations on your choice of a Wallenstein BXTR5224 Wood Chipper!

This high-quality machine is designed and manufactured to meet the needs of the small timber and landscaping industries.

The BXTR5524 wood chipper is a towable, gas engine powered machine. The hydraulic roller feed pulls wood material into the machine. The rotor and ledger knives cut the wood material into chips that are released through the discharge chute.

For available accessories, go to WallensteinEquipment.com.

For safe, efficient, and trouble-free operation of this Wallenstein Equipment product, it is necessary that anyone using or maintaining the machine reads and understands the safety, operation, and maintenance information in this manual and the engine manufacturer's manual.

Keep this manual available for frequent reference and to give to new operators or owners. Call your local Wallenstein dealer or the distributor if you need assistance, information, or additional copies of the manuals.

Units of measurement in Wallenstein technical manuals are written as: US Customary (SI metric)

For support or service, contact your local Wallenstein Equipment dealer or distributor.

This manual is subject to change without notice. For the most current information, go to WallensteinEquipment.com.

1.1 Delivery Inspection Report

Wallenstein BXTR5224 Wood Chipper

To register your product and start the warranty, go to WallensteinEquipment.com.

This form must be completed by the dealer at the time of delivery, and then signed by the dealer and customer.

I received the product manuals and was thoroughly instructed about the care, adjustments, safe operation, and applicable warranty policy.

Customer

Address

City, State/Province, ZIP/Postal Code

( )

Phone Number

Contact Name

Model

Serial Number

Delivery date

I thoroughly instructed the customer about the equipment care, adjustments, safe operation, and applicable warranty policy, and reviewed the manuals with them.

Dealer

Address

City, State/Province, ZIP/Postal Code

( )

Phone Number

Dealer Inspection Checklist

_____ Rotor turns freely and the knife clearance is correct.

_____ All cutting edges are sharp and in good condition.

_____ Feed table and control handle move freely.

_____ Lock pins align and move freely.

_____ Discharge chute and deflector move freely.

_____ All belts are aligned and the tension is correct.

_____ Engine clutch and rotor sheave align.

_____ Engine starts and runs, and fluid levels are correct.

_____ All fasteners are torqued to the correct torque.

_____ All grease points are lubricated.

_____ Purchased accessories are included, if applicable.

_____ Operator's Manual is in the storage tube.

_____ Hydraulic fluid reservoir level is correct.

_____ Hydraulic connections are tight, and hoses and fittings are in good condition.

_____ There are no hydraulic leaks.

_____ Tire pressure is correct (see the tire sidewall).

_____ Tires are in good condition.

_____ Electrical harness connection is secure.

_____ Wire connections are secure and wires are in good condition.

_____ P3 Pulse indicator panel or display functions correctly.

Safety Checks

_____ All safety labels are applied and legible.

_____ Operating and safety instructions were reviewed.

_____ Make sure that all guards and shields are installed, and the covers are closed.

_____ A retainer is installed through each hitch point.

_____ Safety chains are on the ball-mount hitch.

_____ All lights operate correctly (for example; running, brake, turn signal, license plate).

_____ Wheel lug nuts are torqued to the correct torque.

1.2 Serial Number Location

Always provide the model and serial number of your Wallenstein product when ordering parts, or requesting service or other information. The product information plate location is shown in the following illustration.

Record the model and serial number of your product here:

Model	
Serial Number	

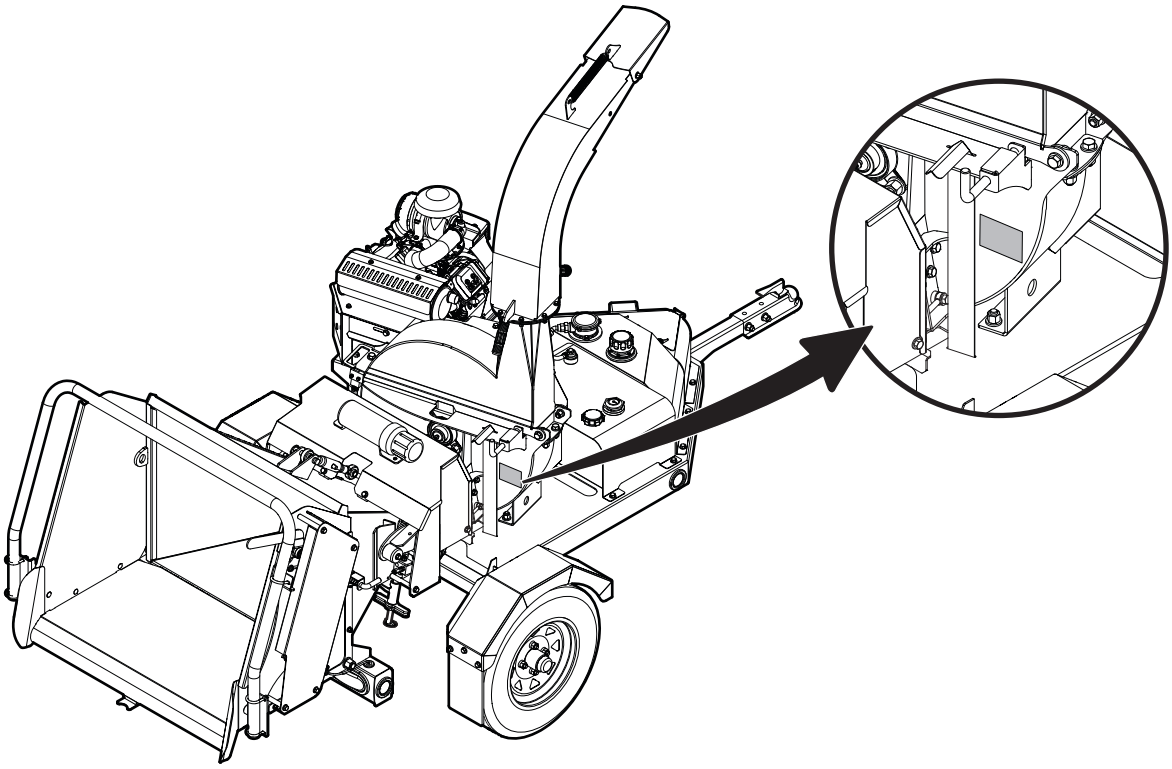


Figure 1–Product information plate location

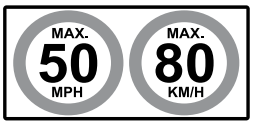
1.3 Types of Labels on the Machine

When getting familiar with the Wallenstein product, notice that there are numerous labels located on the machine. There are different types of labels for safety, information, and product identification. The following section explains what they are for and how to read them.

Safety labels are pictorial with a yellow background and generally two panel. They can be either vertical or horizontal.

Mandatory action labels are pictorial with a blue background and usually rectangular with single or multiple symbols. This label shows the type of personal protective equipment (PPE) that is necessary for safe operation.

Information labels are usually pictorial with a white background and the number of panels can be different. This type of label provides information for the operator or shows the operation of a control.



Product labels show the machine model and serial number. For more product information, scan the quick response (QR) code.

Maintenance labels have a green background and the number of panels can be different. This label shows the type of maintenance and how frequently it is necessary.

For safety label definitions, see *Safety Label Definitions on page 16*. For illustrations of the labels and label locations, download the parts manual for your Wallenstein product at WallensteinEquipment.com.

2. Safety

Read and understand all safety information before operating the machine.

2.1 Safety Alert Symbol

This Safety Alert Symbol means:

ATTENTION! BE ALERT!

YOUR SAFETY IS INVOLVED!

The safety alert symbol identifies important safety messages on the machine and in the manual.

When you see this symbol, be aware of the possibility of personal injury or death. Follow the instructions in the safety message.

2.2 Signal Words

The signal words **DANGER**, **WARNING** and **CAUTION** identify the severity of a hazard to anyone who uses the machine. The applicable signal word for each message was selected using the following guidelines:

DANGER

Identifies a hazardous situation that, if not avoided, **will** result in serious injury or death. This signal word is used to tell anyone who uses the machine about the most hazardous situations and machine components that cannot be guarded against.

WARNING

Identifies a hazardous situation that, if not avoided, **could** result in serious injury or death. This signal word includes hazards that occur when guards are removed and can be used to tell anyone who uses the machine about unsafe practices.

CAUTION

Identifies a hazardous situation that, if not avoided, **could** result in minor or moderate injury. It can also be used to tell anyone who uses the machine about unsafe practices.

IMPORTANT – Identifies a situation that could result in damage to the machine or property, but is not a personal injury hazard.

☞ Provides additional information that is helpful.

2.3 Why Safety is Important

- **Accidents disable and kill people.**
- **Accidents cost money.**
- **Accidents are preventable**

YOU are responsible for the safe operation and maintenance of your Wallenstein product. **YOU** must make sure that you and anyone else who uses, maintains, or works around the machine is familiar with the operation and maintenance procedures and related **SAFETY** information contained in this manual. Follow the safety best practices included in this manual while using your machine.

YOU are responsible for your own safety. Follow safety best practices to protect yourself and the people around you. Make these practices part of your safety program. Make sure that **EVERYONE** who uses this machine is familiar with the recommended operation and maintenance procedures, and obeys all the safety instructions. Most accidents can be prevented.

Do not risk injury or death by ignoring safety instructions and best practices.

2.4 Safety Rules

⚠ WARNING!

Never bypass or remove a safety function. Never operate the machine when a safety function does not work. Safety functions are intended to protect people from hazards that can cause serious injury or death. Keep safety components maintained and in working condition.

⚠ CAUTION!

Hearing loss hazard. Prolonged exposure to loud noise may cause permanent hearing loss. Use suitable protection while operating the machine.

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Wallenstein Equipment puts considerable effort into designing products that are safe to use; however, it is also the responsibility of the operator to use the equipment safely.

For safety information that is specific to machine operation, service, or maintenance, see the applicable section in this manual.

- It is the operator's responsibility to read, understand, and follow ALL safety and operating instructions in this manual.
- If you do not understand any part of this manual or need assistance, contact your local dealer, the distributor, or Wallenstein Equipment.
- Do not allow anyone to use this machine until they have read this manual. The operator must have a thorough understanding of the safety precautions and how the machine works. Review the safety instructions with all users annually.
- Operators must be responsible, familiar with, and physically able to use the machine. Each operator must be trained before using the machine. Before operation, evaluate the physical and/or mental limitations of each operator to make sure that they can use the machine safely. Never let a child operate the machine.
- Make sure that all users understand the safety labels on the machine before operating, servicing, adjusting, or cleaning it. For safety sign label definitions, see *Safety Label Definitions on page 16*.
- Learn the controls and how to stop the machine quickly in the event of an emergency. For instructions, see *Emergency Stop on page 44*.
- Keep a first-aid kit available and know how to use the contents of it.

- Keep a fire extinguisher available and know how to use it.

- Wear the appropriate PPE when operating, servicing, or maintaining the machine.
  This includes, but is not limited to:
  - A hard hat.
  - Heavy gloves.
  - Hearing protection.
  - Protective shoes with steel toes and slip resistant soles.
  - Protective glasses, goggles, or a face shield.
- Prolonged exposure to loud noise may cause permanent hearing loss. Power equipment with or without a vehicle attached can often be noisy enough to cause permanent, partial hearing loss.

- Wear hearing protection on a full-time basis if the noise in the operator's position exceeds 80 dB. Noise over 85 dB on a long-term basis can cause severe hearing loss. Noise over 90 dB adjacent to the operator on a long-term basis may cause permanent, total hearing loss.
- Avoid wearing loose fitting clothing, loose or uncovered long hair, jewelry, and loose personal articles. These can get caught in moving parts and cause injury. Jewelry may also ground a live electrical circuit causing injury and machine damage.
- Never consume alcohol or drugs before or during machine operation. Alertness or coordination can be affected. Consult your doctor about operating this machine while taking prescription medications.
- Only use the machine in daylight or good artificial light.
- Make sure that all guards and shields are installed, and the covers are closed. If removal is necessary for repair, replace them before using the machine.
- Never allow anyone to ride on the machine during transport.
- Keep bystanders a minimum of 20 ft (6 m) from the discharge area. Mark the discharge area with safety cones.
- Before starting the engine, make sure that the machine is clear of debris.
- Do not touch hot engine parts, the muffler cover, hoses, engine body, or engine oil during operation or after the engine stops. Contact with hot surfaces can cause burns.

2.5 Equipment Safety Guidelines

Safety 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.

Avoid hazards by observing the following precautions. Insist anyone working with you follow them as well.

- Replace safety or instruction labels that are not readable or are missing. For locations and explanations, see *Safety Labels on page 13*.
- Do not modify the equipment in any way. Unapproved modification can result in serious injury or death. In addition, unapproved modification can cause incorrect operation and decrease the life of the machine. Unapproved modification voids the warranty.
- Make sure that the machine is correctly stationed, adjusted, and in working condition.
- Keep the machine free of accumulated grease and debris to prevent fires and machine damage.
- Make sure that the discharged wood chips do not interfere with the safe operation of the machine.
- Look for and avoid overhead hazards (for example; branches, cables, and electrical wires).
- Never exceed the limitations of the machine. If the machine is not operating normally or you feel unsafe, stop the machine!

2.6 Safe Condition

The term **Safe Condition** is referenced throughout this manual. This means the machine is in a condition that makes it safe to service or maintain.

Before you start service or maintenance, complete the following:

⚠ SAFE CONDITION

1. If the machine is attached to a tow vehicle, set the tow vehicle's parking brake, stop the tow vehicle, and remove the ignition key.
2. Stop the machine.
   For instructions, see *Stop the Machine on page 44*.
3. Disconnect the engine spark-plug wire and keep it away from the spark plug.
4. Disconnect the cable from the negative (-) battery terminal and keep it away from the battery.
5. Remove all material from the chipper hopper.
6. Wait until the engine and machine are cool.

2.7 Safety Training

An untrained operator can cause serious injury or death to themselves or others. Review the safety instructions with all users annually. The *Sign-Off Form on page 10* can be used to keep a training record.

- When someone does not understand the operation of a machine, they can create dangerous situations very quickly. Operators must understand the safety information in this manual and the safety labels that are on the machine
- The owner has the responsibility to provide instruction to anyone who is going to operate the machine. This machine is dangerous to anyone who is unfamiliar with its operation.
- If the machine is loaned or rented, it is the owner's responsibility to make sure that, before using the machine, every operator:
  - Reads and understands this manual.
  - Is instructed in the safe and correct use of the machine.
  - Understands and knows how to set the machine to a **Safe Condition**.
    For instructions, see *Safe Condition.*

2.8 Sign-Off Form

Everyone who uses this machine must read and fully understand all safety, operation, and maintenance information in this manual. An untrained operator should never use this machine.

Schedule an annual review of machine safety and operation for all operators. The following sign-off form can be used to record the completed training.

The design and manufacture of this product conforms to the applicable provisions in the following standards:

- ANSI/ASAE S318.17 JUN2009 Safety for Agricultural Field Equipment.
- ISO 3600 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Operator's manuals – Content and format.

The product design does not comply with WorkSafe BC or OSHA standards. The machine is not intended for commercial use.

Training Sign-Off Form

Date	Owner's signature	Operator or technician's signature

2.9 Work Site

CAUTION!

It is the responsibility of the operator to be fully familiar with the work site before starting work. Prevent unsafe situations and make every effort to prevent accidents.

2.9.1 Select a Work Site

Select a safe work area and machine location:

- The ground should be firm and level.
- Make sure that there is sufficient amount of space and clearance for the operator, the machine, and the wood chip discharge.
- Remove all stones, branches, or hidden obstacles that might cause a tripping, hooking, or snagging hazard.
- Make sure that there are no overhead hazards such as branches, cables, and electrical wires.
- Select a location for the discharged wood chips. Make sure that the wood chips do not interfere with the safe operation of the machine.

2.9.2 Create a Safe Work Area

Read and obey the instructions for safe operation of the machine.

Keep bystanders and workers safe from hazards. Obey the following guidelines:

- Use safety cones to identify the work zone perimeter. The work zone perimeter should be a minimum of 20 ft (6 m) away from any hazard in the work zone. The area outside the work zone perimeter is the safe zone.
  For more information, see *Figure 2 on page 12.*
- Never let people approach the work zone during machine operation. Everyone must signal and make eye contact with the operator before they approach the work zone
- Keep all bystanders in the safe zone. Never let bystanders in the work zone.
- Only the operator can let people enter the work zone. The operator must make sure that it is safe for a person to enter the work zone.
- When there are two or more workers, they must agree on a system of hand-signals to use for communication.
- When there are two or more workers, they must agree on a system of hand-signals to use for communication.

A safe work area is divided into two zones:

1. **Safe Zone**
   The safe zone is the area outside the work zone perimeter. All people who are not directly involved with the work can be in this area. There are minimal hazards in the safe zone.
2. **Work Zone**
   The work zone is the area where the operator must be to operate the machine. People who are helping with the work and wearing the necessary PPE can be in this zone. The operator must know where all the people in the work zone are. The operator must make eye contact with people before they enter the work zone. There are possible hazards in the work zone.

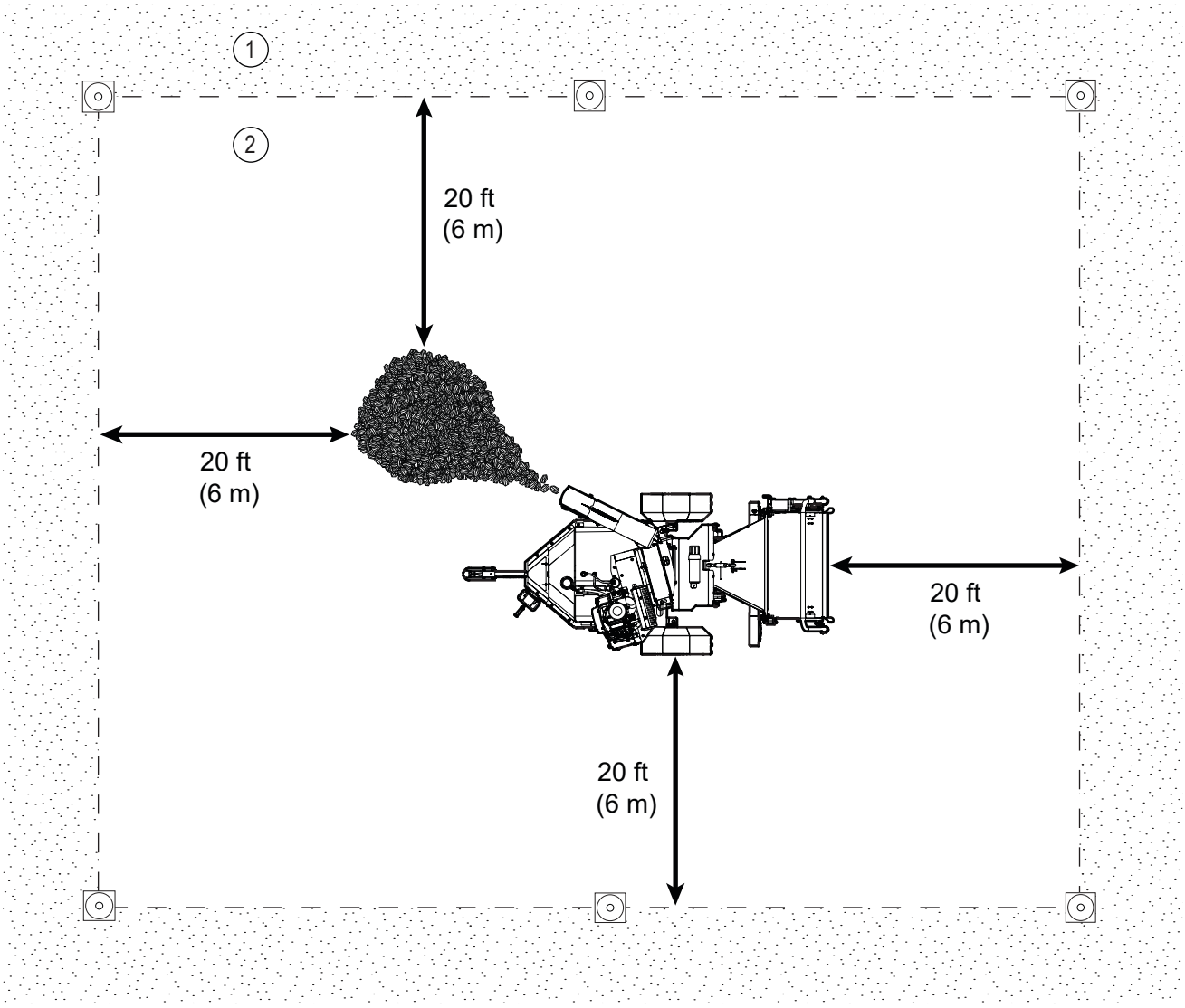

Figure 2–Safe work area

3. Safety Labels

⚠ WARNING!

Replace all safety labels that are missing, damaged, or illegible. If a component is replaced and it has a safety label on it, apply a safety label to the new component. Operating the machine with missing, damaged, or illegible safety labels puts the operator at risk of serious injury or death.

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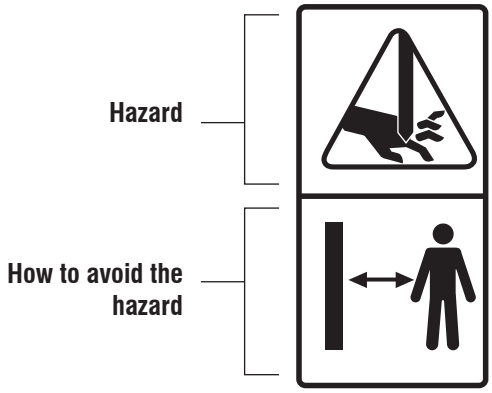
Learn what the safety labels mean and know the safety hazards. A safety label can be vertical or horizontal. Vertical safety labels have a top panel and a bottom panel. Horizontal safety labels have a left side panel and a right side panel.
The top or left side panel shows the safety alert (possible hazard), and the bottom or right side panel shows the action message (how to prevent illness, injury, or death).



Think SAFETY! Work SAFELY!

Safety

3.1 Safety Label Locations

The numbers correspond with the *Safety Label Definitions on page 16*.

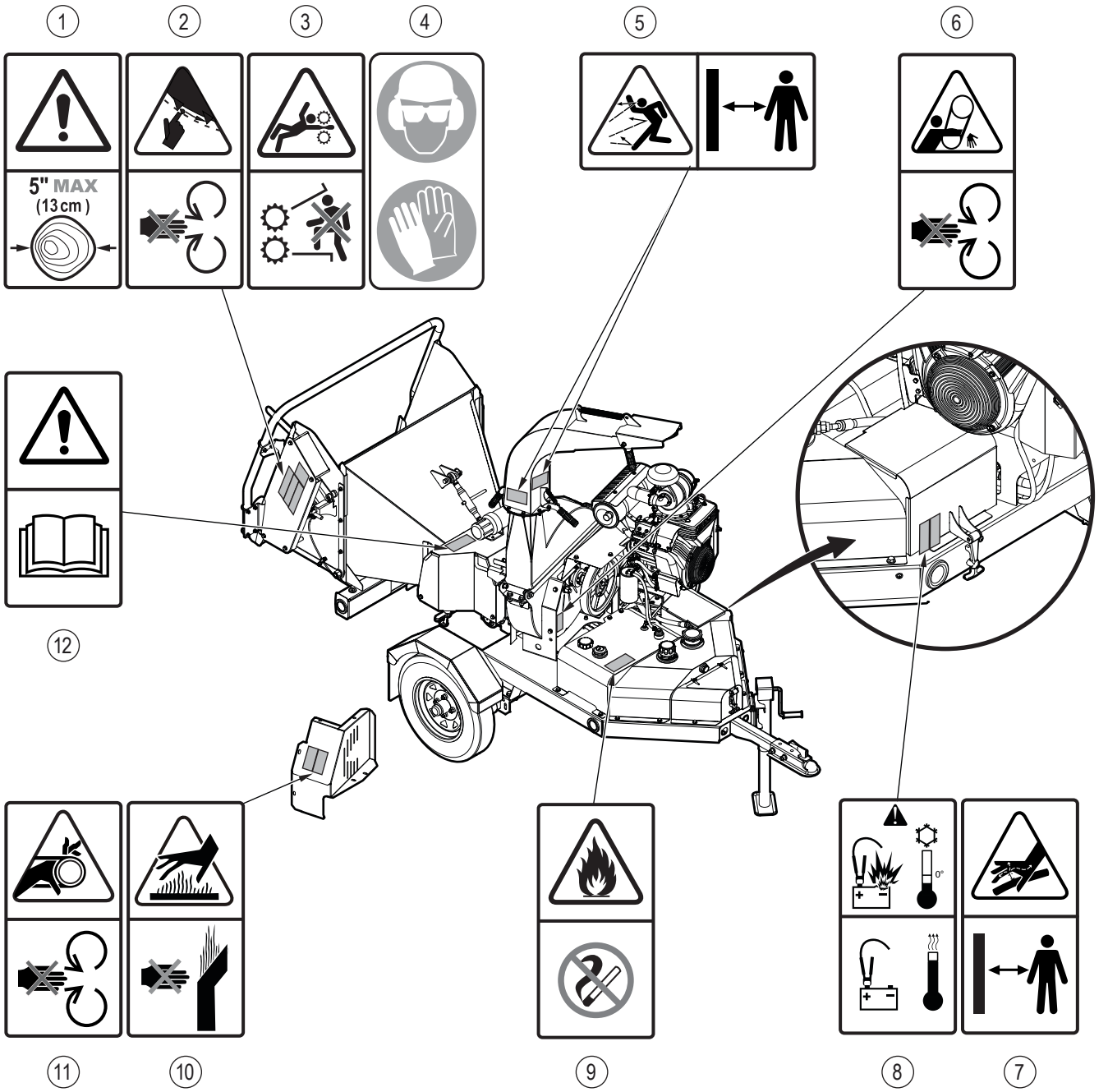


Figure 3–Safety label locations - right side

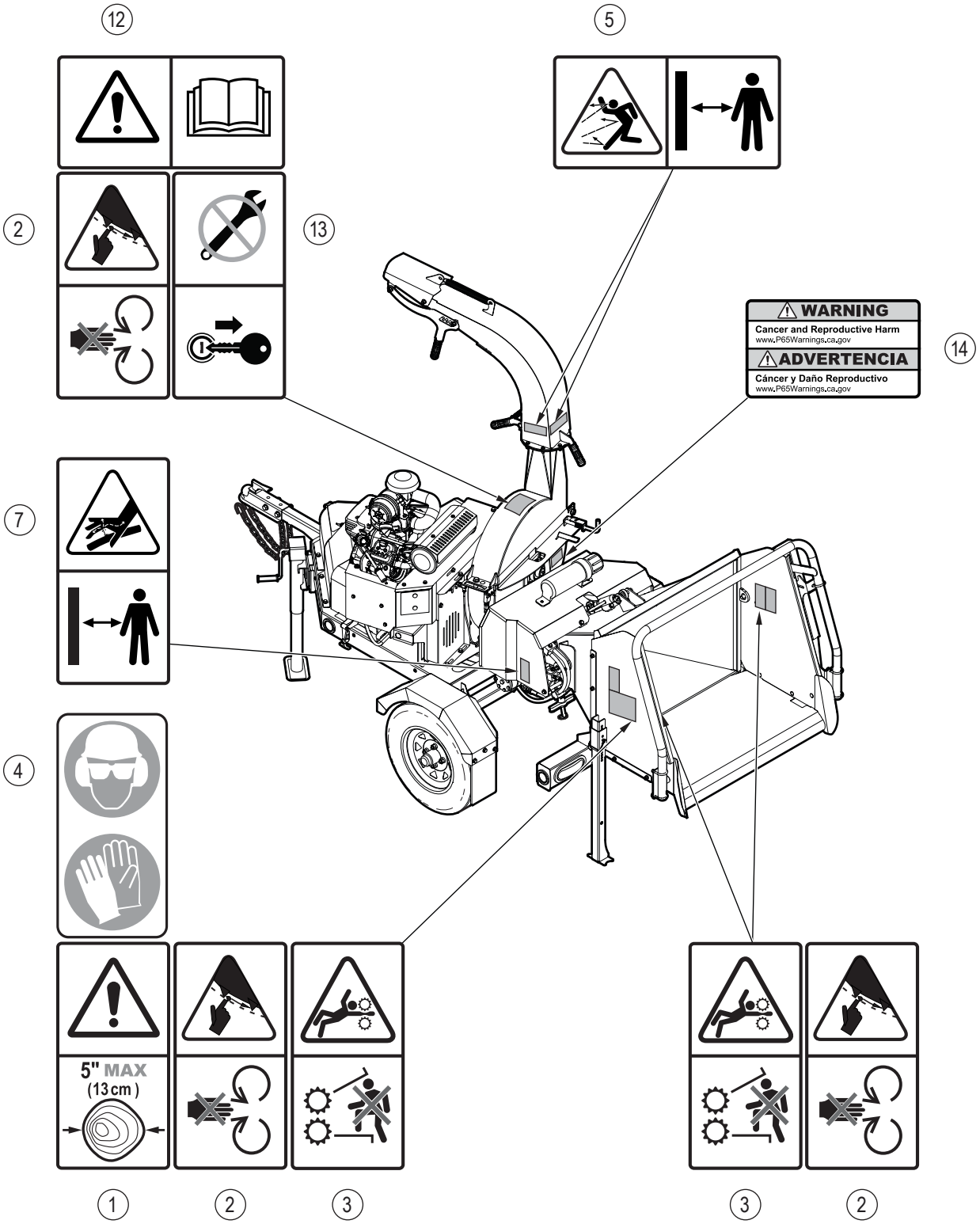


Figure 4–Safety label locations - left side

3.2 Safety Label Definitions

1. Warning!

Machine damage and possible entanglement hazard

Oversize material will overload the machine, which can stall the engine or cause machine damage. Trying to force material into the machine can result in serious injury from a fall or entanglement. Reverse the roller feed and carefully remove oversize material from the machine.

Do not place material that is larger than 5" (13 cm) in diameter into the chipper hopper. Never try to force material into the machine.

2. Warning!

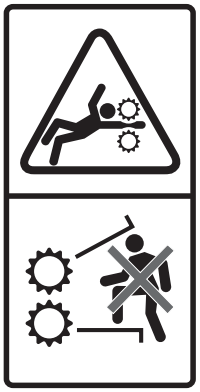
Cut hazard

Sharp rotating parts can cut or sever fingers, hands, toes, or feet.

Keep hands and feet out of the chipper hopper or discharge chute when the machine is on and not in a safe condition.

3. Warning!

Entanglement and crush hazards



Rotating parts can pull you in and cause serious injury or death.

Do not put any part of your body into the chipper hopper when the machine is on or not in a safe condition. Keep hands, feet, long hair, and loose clothing away from the chipper hopper.

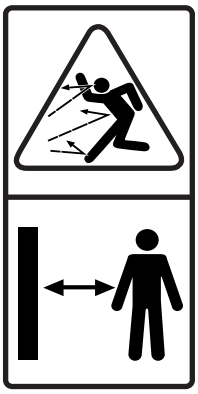
4. Warning!

Wear the necessary PPE

- A hard hat.
- Heavy gloves.
- Hearing protection.
- Protective footwear with steel toes and slip resistant soles.
- Protective goggles or a face shield.

5. Caution!

Impact, cut, and puncture hazards



The machine expels wood chips fast enough to cause personal injury and property damage.

Stay away from the area around the discharge chute and never point the discharge chute at people, animals, or structures.

6. Warning!

Entanglement, pinch, and crush hazards

Rotating parts can pull in, pinch, and crush fingers and hands. Install the guard when work is complete.

Keep your hands away from the drive belt. Turn off the machine and put it in a safe condition before service or maintenance. Wear heavy gloves and use caution when working in this area.

7. Warning!

High-pressure injection hazard

Injection of hydraulic fluid can cause serious illness, injury, or death.

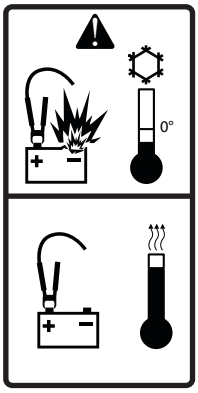
Hydraulic fluid is under pressure. If you think there is a hydraulic fluid leak, move away from the area. Do not use your hands to inspect for hydraulic fluid leaks. Wear the correct hand and eye protection, and always use a piece of cardboard, wood, or plastic to find a leak.

8. Warning!

Explosion hazard

Attempting to charge a frozen battery can cause it to explode. An explosion can cause serious injury or death from projectiles, extreme heat, chemicals, and loud noise.

Warm the battery to a minimum of 60 °F (16 °C) before charging it.



9. Warning!

Explosion hazard

Smoking, flames, sparks, or other sources of ignition can cause an explosion. An explosion can cause serious injury or death from projectiles, extreme heat, chemicals, and loud noise.

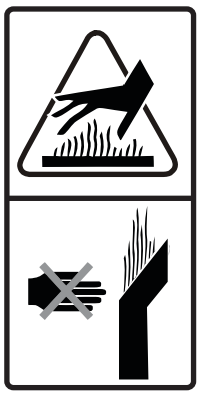
Do not smoke when you add fuel to the tank.

10. Warning!

Burn hazard

The area is hot and can cause burns if touched.

Keep hands and body parts away from this area. Wait for the machine to cool. Use a no-touch thermometer to measure the temperature.



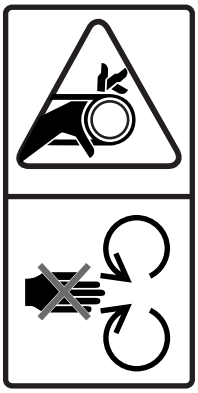
11. Warning!

Entanglement, pinch, and crush hazards

Keep hands away from this area. Do not put your hands inside the guard.

Never operate the machine with a guard removed. Make sure that all of the guards and shields are installed and the covers are closed before you start the machine.

Rotating parts that can entangle, pinch, or crush fingers and hands are exposed when the guard is removed.

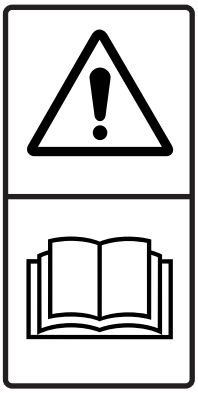


12. Caution!

Read the Operator's Manual

There is important safety information and instructions in the Operator's Manual.

Read all the safety information and instructions in the Operator's Manual. Know what all the safety labels mean.

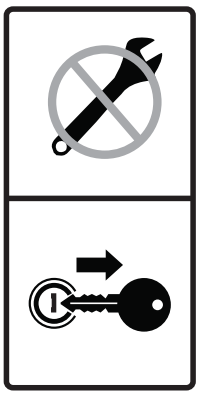


13. Warning!

Turn off the machine before service or maintenance

Working on a machine that it is not in a safe condition can cause serious injury or death.

Stop the engine, remove the key, and disconnect the spark-plug wire before starting any service or maintenance procedures.



14. Warning!

Risk of cancer and reproductive harm

The machine materials contain chemicals or machine operation can produce gases or dust that are identified by the state of California as causes of cancer, birth defects, or other reproductive harm.

This warning is a requirement of the state of California, USA to comply with Proposition 65: the Safe Drinking Water and Toxic Enforcement Act of 1986.

3.3 Replace a Safety Label

- Always replace safety labels that are missing or have become illegible. Replacement safety labels are available from your local Wallenstein Equipment dealer or distributor.
- Keep the safety labels clean and legible at all times.
- When a part that has a safety label on it is replaced, the correct safety label must be applied to the replacement part.

3.3.1 Conditions

- The installation area must be clean and dry.
- The application surface must be clean and free of grease or oil.
- The ambient temperature must be above 50 °F (10 °C).

3.3.2 Tool

Use a squeegee, plastic card, or similar tool to smooth out the label.

3.3.3 Procedure

1. Identify the label location.
2. Peel the label off the backing paper.
3. Hold the label above the location where you are going to apply it.
   Align the edges of the label with an edge of the machine.
4. Start at one edge and carefully press the center of the adhesive side of the label onto the machine.
5. Use an appropriate tool to smooth the label. Work from one side to the other.
6. If there are small air pockets:
   a. Use a pin to pierce the air pocket.
   b. Use a piece of the label backing paper to smooth out the air pocket.

4. Familiarization

The Wallenstein BXTR5224 wood chipper is a strong, rugged machine that is designed to cut small tree trunks or branches that are a maximum of 5" (13 cm) in diameter into consistent size wood chips. A gas engine supplies power to the machine.

4.1 New Operator

⚠ WARNING!

Make sure all operators understand how to place the machine in a safe condition before performing any service, maintenance work, or storage preparation. For instructions, see *Safe Condition on page 9*.

It is the responsibility of the owner and the operator to read this manual, and to train all operators before they work with the machine. Obey all safety instructions.

Only a fully trained operator is approved to use the machine. A person who operates the machine without the correct training is a danger to them self and others, and can cause property damage.

4.2 Training

Each operator must be trained in the correct operating procedures before using the machine. The *Sign-Off Form on page 10* can be used to keep a training record.

1. Teach the new operator the control locations, functions, and movement directions.
2. Put the machine in a large open area and let the new operator learn the control functions and machine responses.
3. After the new operator knows and is comfortable with the machine, they can start work.

4.3 Operator Orientation

IMPORTANT! When describing controls throughout this manual, the directions for left-hand (LH), right-hand (RH), backward, and forward are determined when standing at the operator controls, facing the direction of forward machine travel.

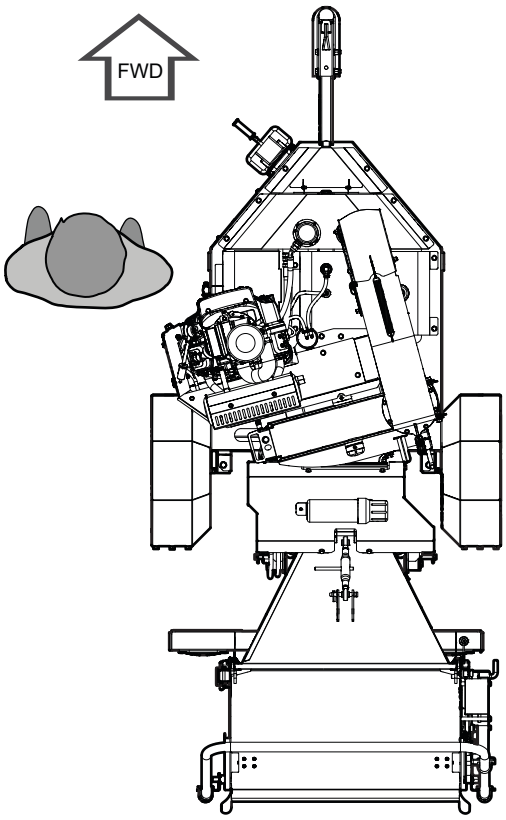


Figure 5–Direction of forward machine travel

4.4 Machine Components

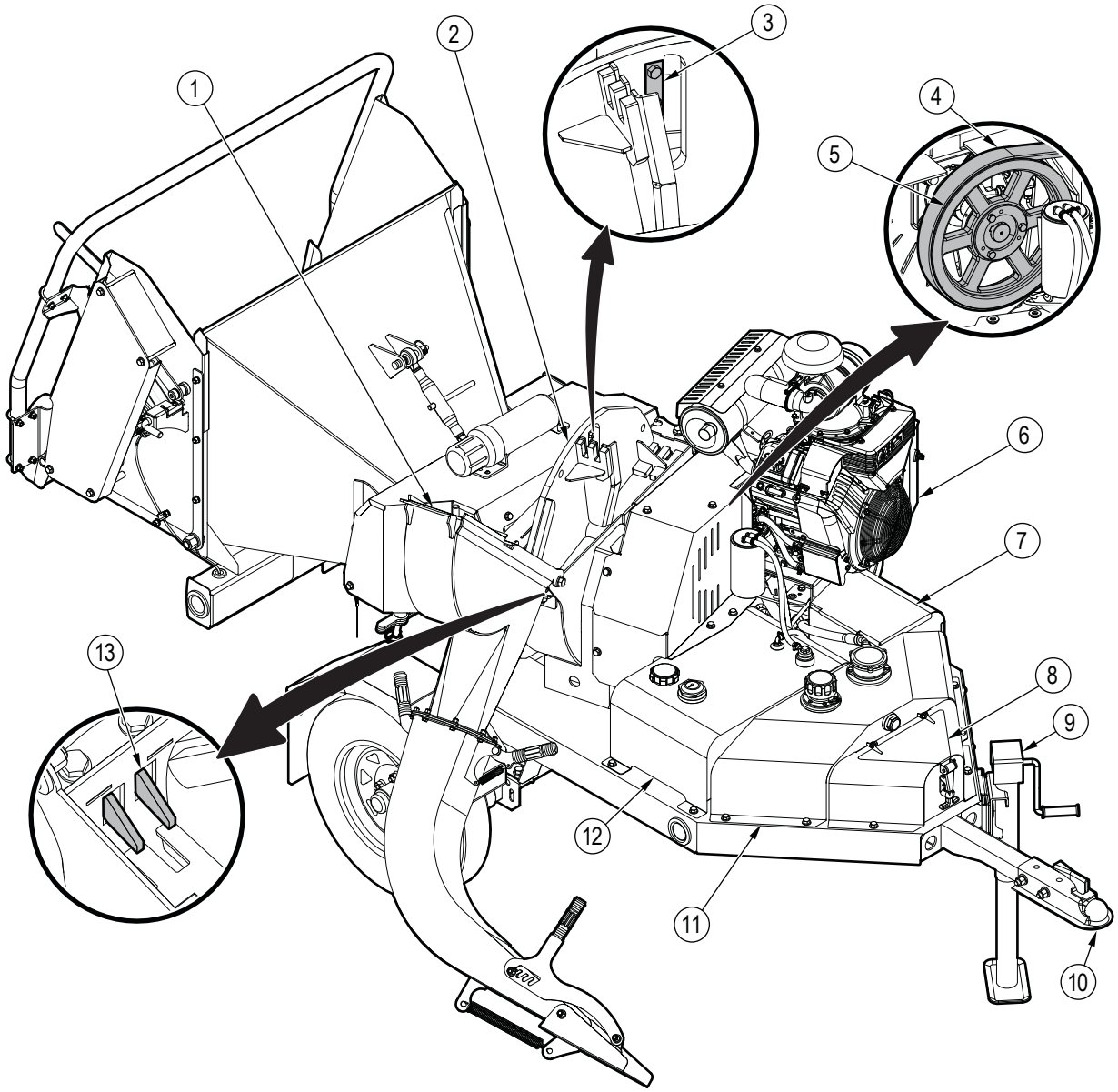


Figure 6–Machine components

1. Upper rotor housing
2. Rotor
3. Rotor knife (1 of 2)
4. Rotor drive belt
5. Rotor sheave
6. Engine
7. Battery
8. Toolbox
9. Trailer jack
10. Ball-mount hitch (2")
11. Hydraulic fluid reservoir
12. Fuel tank
13. Twig breaker

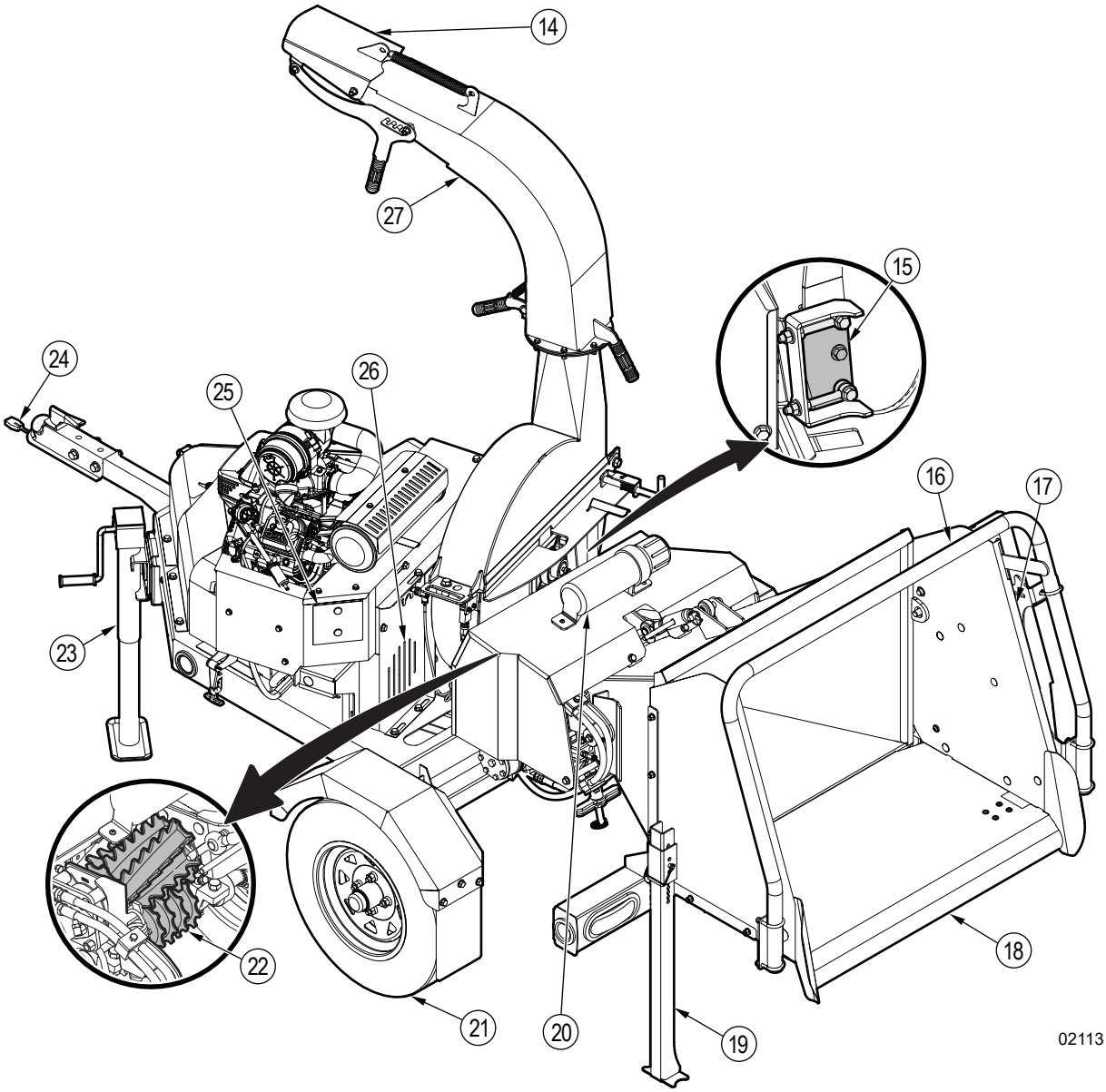


Figure 7 – Machine components continued

14. Hood deflector
15. Ledger knife assembly
16. Roller-feed control bar
17. Chipper hopper
18. Feed table
19. Rear jack stand
20. Operator's manual tube
21. Tire (1 of 2)
22. Roller-feed assembly
23. Trailer jack
24. Light-system electrical connector
25. P3 Pulse user interface
26. Centrifugal clutch
27. Discharge chute

5. Controls

⚠ WARNING!

Do not operate the machine until you are thoroughly familiar with the position and function of the various controls. Read the operator's manual thoroughly. Your safety is involved!

W065

5.1 Engine Controls

⚠ WARNING!

Before you start the engine, read and understand the safety and operating information under *Engine Operation Safety on page 38*.

IMPORTANT! For complete information about the engine controls, see the engine manufacturer's manual.

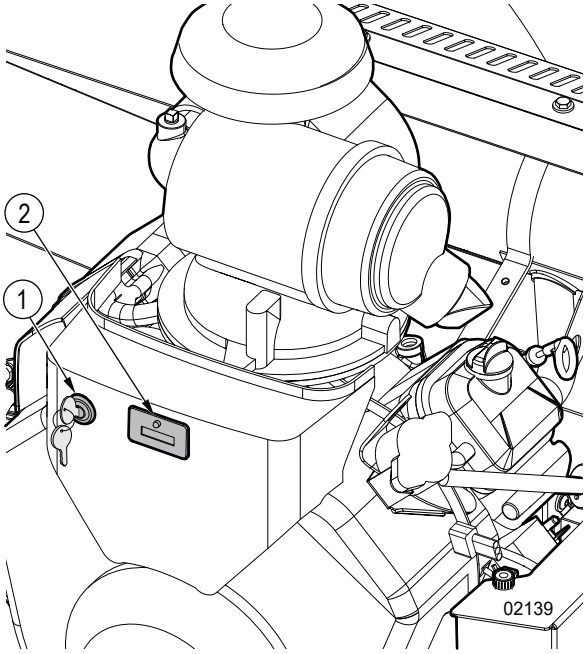


Figure 8–Engine controls

1. Ignition switch
2. Tachometer, hour meter, and check engine light

5.1.1 Throttle Control

The throttle controls the engine speed. An operator can set the engine to the minimum speed (**Slow**), the maximum speed (**Fast**), or to any speed that is between the minimum and maximum.

Slow
Engine speed is slow.

Fast
Engine speed is fast.

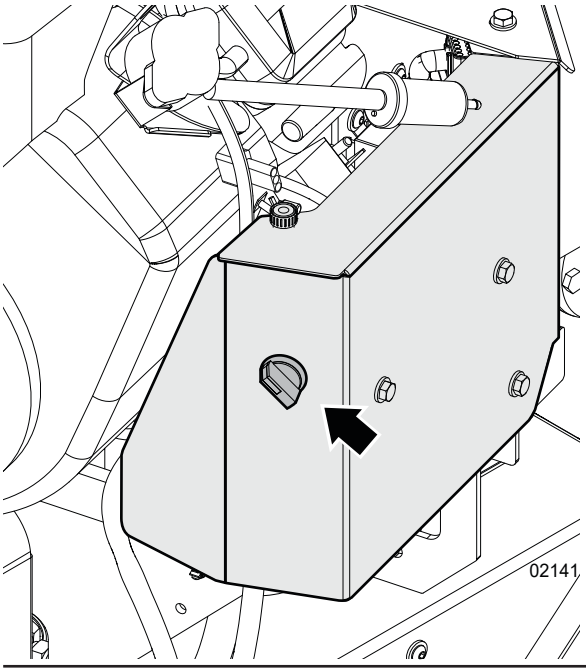


Figure 9–Throttle control switch

5.1.2 Tachometer and Hour Meter Display

Tachometer	When the engine is on (the ignition switch is in the RUN position), the display shows the current engine revolutions per minute (RPM).
Hour meter	While the engine is in the process of starting or stopping the display shows the total number of hours that the engine has been on since it was manufactured. This number cannot be reset.

5.1.3 Check Engine Light

The red check engine light communicates the following information:

Light	Engine Status
On	The engine is in the process of starting or stopping.
Flashing	There is an electronic fuel management (EFM) malfunction.
Off	The engine is off or on.

5.1.4 Ignition Switch

⚠ WARNING!

The engine can cause serious bodily harm or death to a person who is not trained in the correct operation. Always remove the key and keep it in a secure location to prevent an unauthorized person from starting the engine.

IMPORTANT! Long start cycles may decrease the life of the starter. Use short start cycles (five seconds maximum) and wait one minute between cycles.

The key-operated ignition switch controls the electric power to the engine. The ignition switch has the following positions:

STOP
The engine is off and the fuel shut-off valve is closed.

RUN
The engine is on.

START
Engine ignition.
When the engine starts, the key turns to the RUN position.

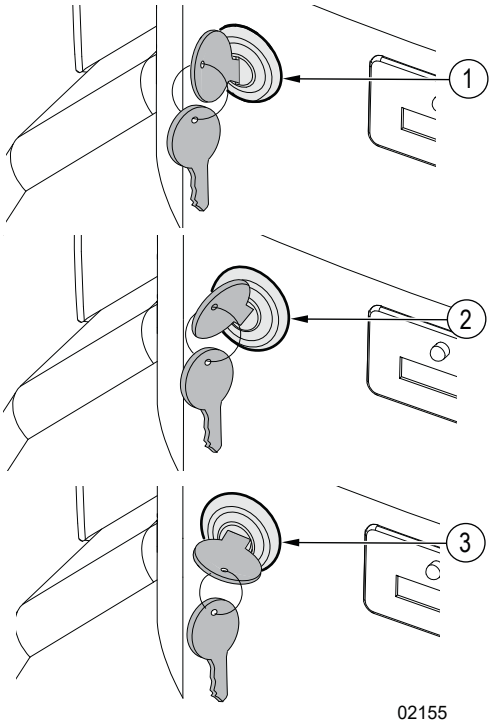


Figure 10–Ignition switch positions

1. STOP position
2. RUN position
3. START position

5.2 Discharge Chute

The discharge chute directs the wood chips in the selected direction. The discharge chute can be turned 270°. The latch-handle pin holds the discharge chute in position.

1. Push and hold the latch handle down until the pin disengages from the hole in the round plate.
2. Use the handle to turn the discharge chute to the position you want.
3. Release the latch handle.
   Make sure that the pin engages with a hole in the round plate to hold the discharge chute in position.

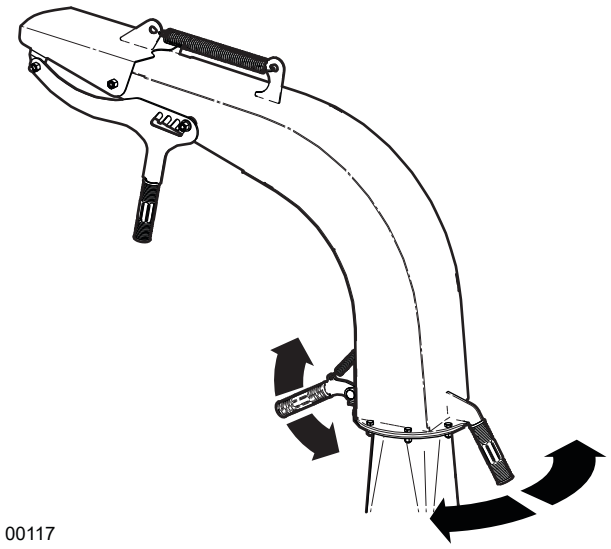


Figure 11 – Turn the discharge chute

5.3 Hood Deflector

The hood deflector is located on the end of the discharge chute. It directs the wood chips closer to or further from the machine. The slotted-position handle holds the hood deflector in the set position.

1. Push up on the handle until the pin disengages from the slot.
2. Use the handle to raise or lower the deflector hood.
   Align a slot with the pin.
3. Lower the handle to engage the pin in the slot.
   The pin holds the deflector hood in position.

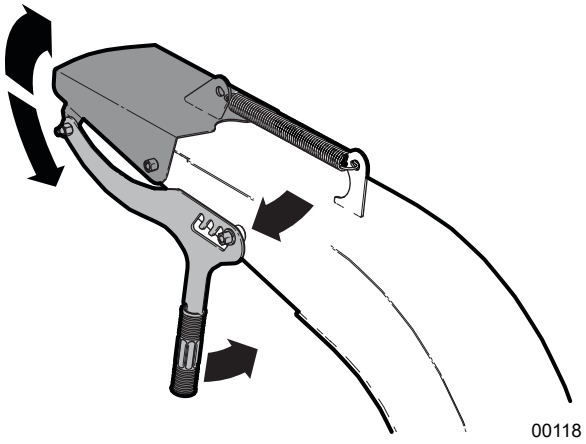


Figure 12 – Adjust the hood deflector

5.4 Roller-Feed Control Bar

WARNING!

Keep hands, feet, clothing, and long hair away from the feed rollers when the machine is operating. Never climb on the feed table or hopper. The feed rollers can entangle and crush causing serious injury or death.

W023

The roller-feed control bar moves freely between forward and reverse.

The roller-feed control bar is located on the back of the chipper hopper. It controls the speed and direction of material into or out of the chipper hopper.

A label on each side of the chipper hopper shows the roller-feed control bar positions.

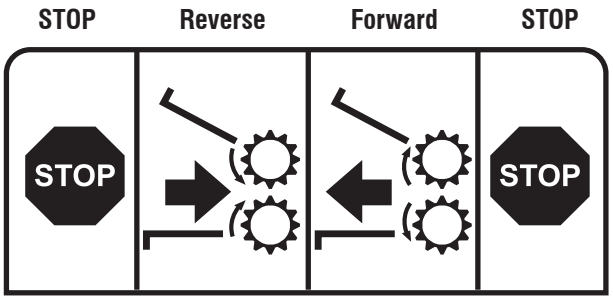


Figure 13–Roller-feed control bar label (right side shown)

The roller-feed control bar can be moved freely between the forward and reverse positions. The roller-feed control bar is locked when it is in the forward or rear stop position. The release lever is used to unlock the roller-feed control bar when changing to the forward or reverse positions.

5.4.1 Release Lever

The roller-feed control bar is locked when it is in the forward or rear STOP position. Unlock the release lever to move the roller-feed control bar out of the forward or rear STOP position.

Pull the release lever up to unlock it. When the release lever is unlocked, you can move the roller-feed control bar to the forward or reverse position.

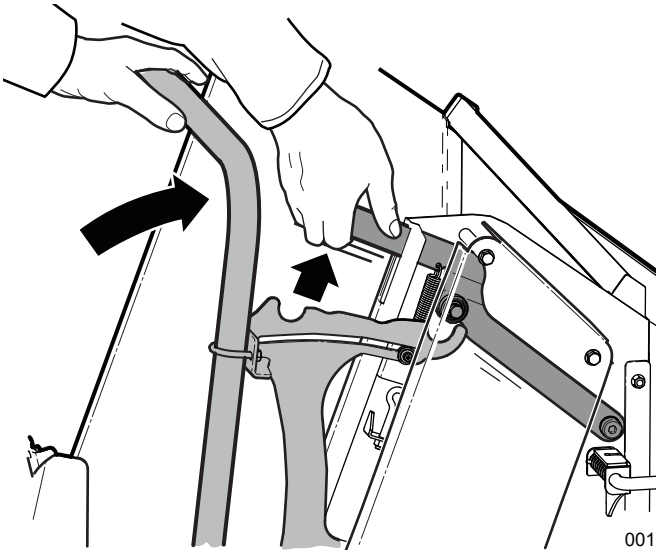


Figure 14–Release lever

5.4.2 Stop Positions

Forward STOP position	Push the roller-feed control bar fully forward (toward the chipper hopper) to stop the rollers.
Rear STOP position	Pull the roller-feed control bar fully toward the rear (away from the chipper hopper) to stop the rollers.

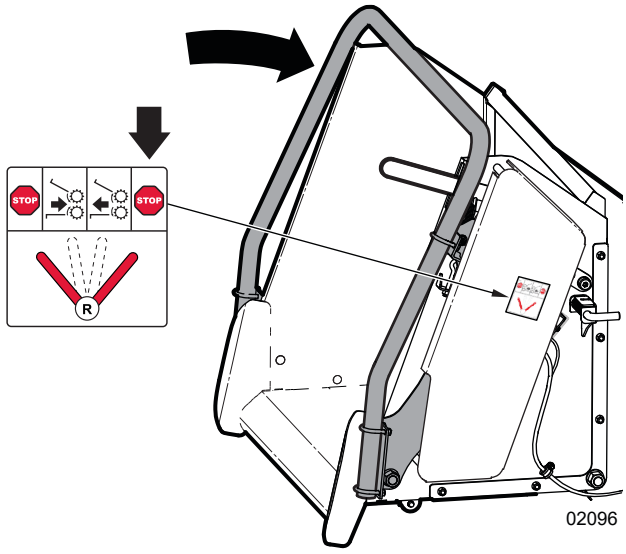


Figure 15–Forward STOP position

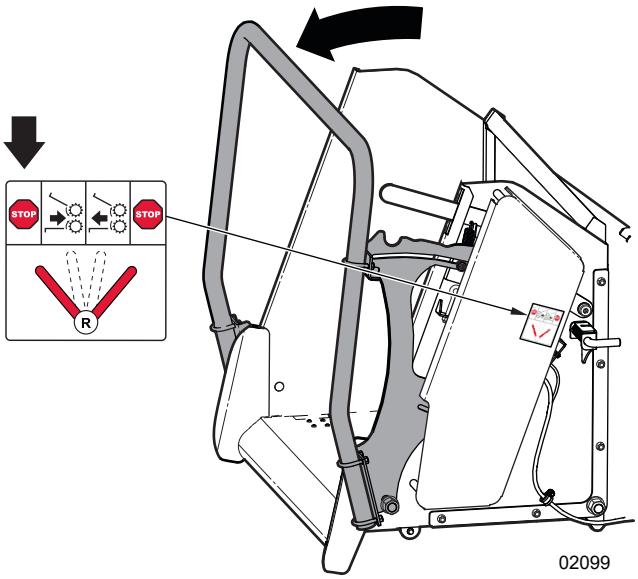


Figure 16–Rear STOP position

5.4.3 Forward Position

The engine and rotor must be at full speed for the roller feed to operate in **Forward**.

Pull the roller-feed control bar toward the rear (away from the chipper hopper)to the **Forward** position. This is the normal operating position. The roller-feed control bar stays in this position (detent) until the operator moves it.

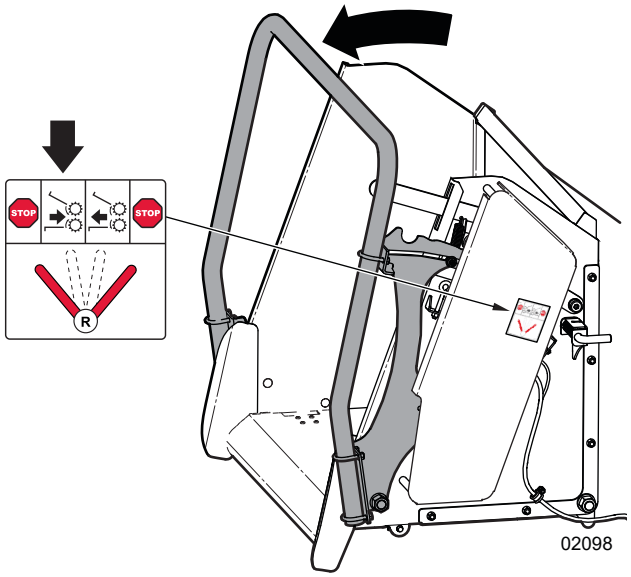


Figure 17–Move material forward (into the machine)

5.4.4 Reverse Position

The roller feed operates in **Reverse** when the engine and rotor are at any speed, including idle.

Push the roller-feed control bar forward (toward the chipper hopper) to the **Reverse** position. The rollers operate in reverse to push material out of the chipper hopper. The roller-feed control bar stays in this position (detent) until the operator moves it.

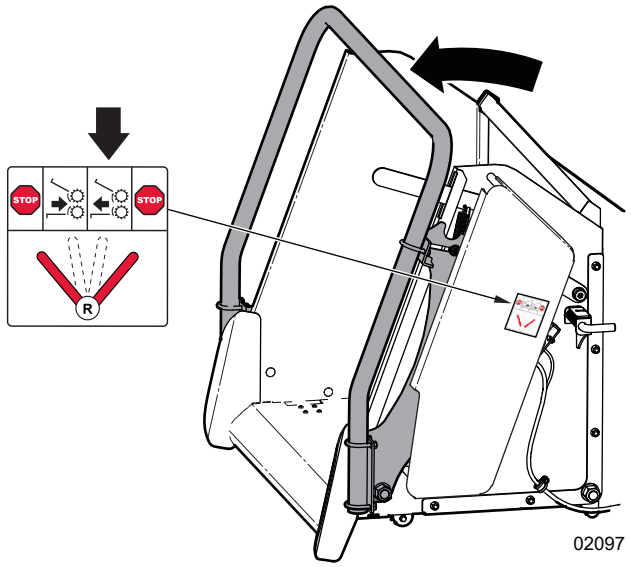
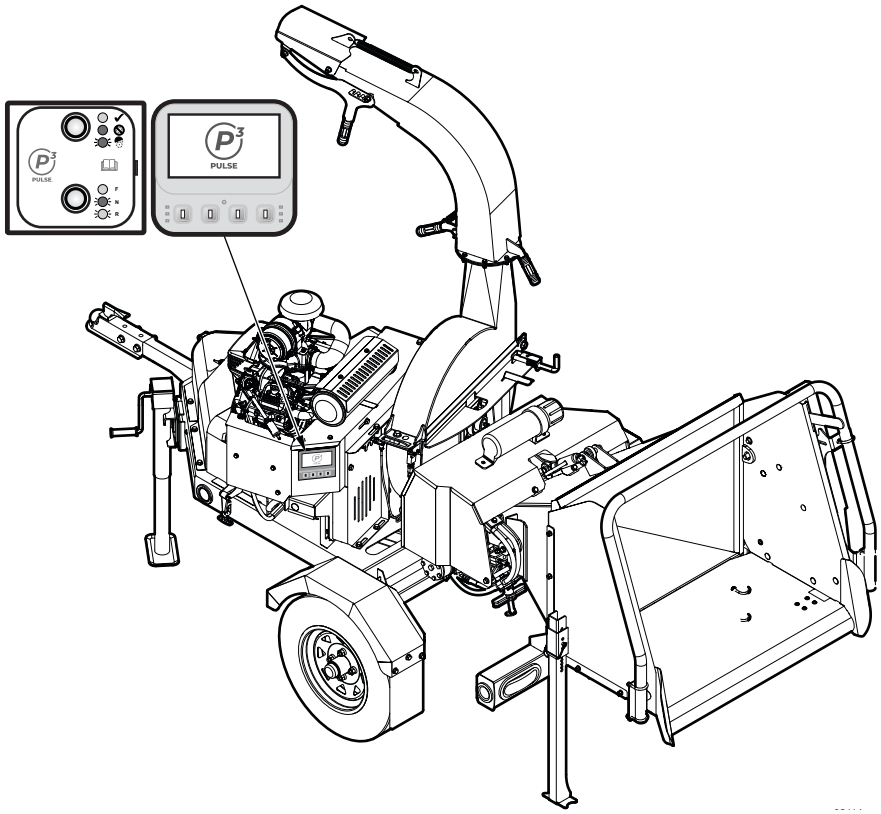


Figure 18–Move material to the rear (out of the machine)

5.5 P3 Pulse Electronic Control System

Software version 3.0.0



5.5.1 Overview

IMPORTANT! The controller and indicator panel or display are not serviceable. In the event of a failure, return them to your local Wallenstein Equipment dealer or distributor.

The Wallenstein P3 Pulse Electronic Control System optimizes the capacity of the wood chipper.

The P3 Pulse consists of an electronic controller and indicator panel. A rugged, user-friendly 4.3" (109 mm) display is available as an option and replaces the indicator panel.

The P3 Pulse tracks the rotor hours-of-operation and keeps the wood chipper working in the peak operating range by matching the feed rate with the rotor speed. As material is put into the chipper, a sensor on the rotor sheave continually monitors rotor rpm. If the rotor slows down under load, the P3 Pulse slows the roller speed, which allows the rotor to recover. If the rotor slows to below the minimum rotor speed setting, the P3 Pulse auto-reverses the rollers to pull material away from the rotor. When the rotor speed returns to the operating rpm, the P3 Pulse returns the rollers to forward motion to resume feeding material into the wood chipper. In the unlikely event the rotor becomes blocked with material, the P3 Pulse quickly stops the engine to prevent clutch burn out.

Indicator Panel Features

The indicator panel has LED lights that communicate the following:

- The machine status (ready to operate, rotor is blocked, or upper rotor housing open).
- The roller feed status (forward, neutral, or reverse).

Display Option Features

The display provides a method for operators to:

- See the roller feed position, rotor speed, and total machine operating hours.
- Adjust feed settings to customize the chip size when chipping any type of material.
- See the diagnostic operating parameters.
  Parameter setup depends on the machine model.
- Use the four soft-key navigation buttons to navigate through the screens.
  Soft-key navigation buttons are located below the display screen. Icons on each screen indicate the soft-key functions.

5.5.2 Indicator Panel

The indicator panel is part of the P3 Pulse electronic control system. Two LED lights illuminate to communicate the current machine and roller feed status.

Read the Operator's Manual
For more information about the meaning of the status light indicators, read this manual.

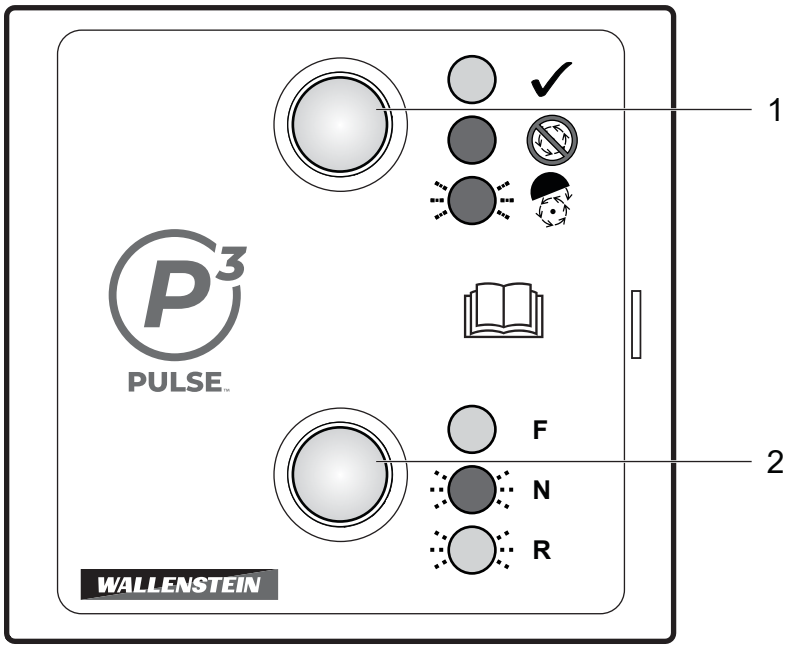


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Figure 19–Indicator panel

1. Machine status light
2. Roller-feed status light

Machine Status Light

Symbol	Light color	Light mode	Indicates
✓	Green	Solid	**Ready** The machine is ready to operate.
	Red	Solid	**Rotor is blocked** Clear the blockage to continue operation.
	Red	Fast flash	**Upper rotor housing is open** Close the upper rotor housing to continue operation.

Roller-Feed Status Light

Symbol	Light color	Light mode	Indicates
F	Green	Solid	**Forward** The roller feed direction is forward. The rollers pull material into the rotor.
N	Red	Slow flash	**Neutral** The roller feed is stopped.
R	Green	Slow flash	**Reverse** The roller feed direction is reverse. The rollers pull material away from the rotor.

5.5.3 Display Option

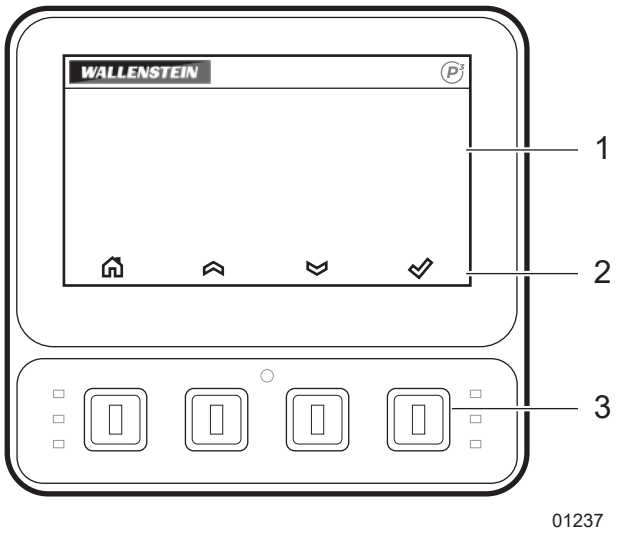


Figure 20–P3 Pulse Display

1. Display Screen

The display screen is part of the P3 Pulse electronic control system display. The screen is an anti-glare coated, 4.3 in (109 mm) color display.

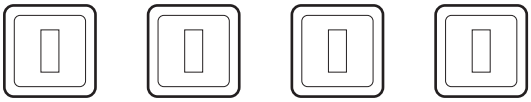
2. Soft-Key Icons

These icons are displayed directly above the soft-key navigation buttons. They indicate the current selection options and are only shown when a selection is available.

	Settings
	Home
	Up arrow
	Down arrow
	Select (enter)
	Cancel

3. Soft-Key Navigation Buttons

Use the four context-dependent soft keys located on the front of the display to navigate through the information and configuration screens.



Start-up Screen

The start-up screen briefly displays the P3 Pulse™ logo when the key is turned ON.

01247

Main Screen

The Main screen is the default screen that is displayed when the ignition key is in the ON position. Press the soft key below *Home* on any screen to open the Main screen.

If the display is left unattended (approximately 60 seconds), the system returns to the Main screen.

The Main screen displays:

1. Feed Position

Roller feed drive position is communicated with colored icons that indicate the roller feed direction.

REVERSE	REVERSE (red arrows) – rollers are going in reverse. Material in the rollers is pulled back, away from the rotor.
NEUTRAL	NEUTRAL (amber) – rollers are stopped.
FORWARD	FORWARD (green arrows) – rollers are going forward. Material in the rollers is pushed into the rotor.
LOW RPM	LOW RPM (green arrows) – with the roller-feed control bar in Forward, the rollers are not moving because rotor RPM is too low for chipping. When the engine speed increases above the minimum start speed and the rollers start to move, FORWARD is displayed.

2. Rotor Speed (rpm)

Displays the speed (revolutions per minute) that the rotor is turning. A value of 0000 indicates that the rotor is not turning.

3. Hours

Counts the total rotor operating hours.
Engine hours are displayed on the hour meter that is located beside the ignition key. Use the engine hours as a service interval guide.

4. Settings

Press the soft key below *Settings* to open the **Settings Menu** screen.

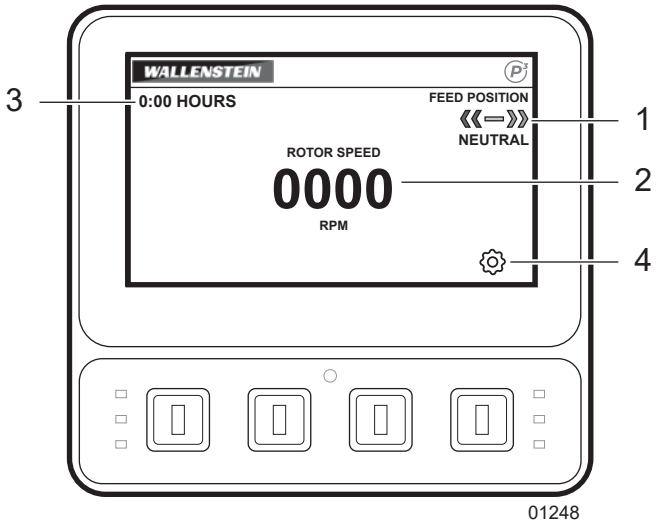


Figure 21 – Main screen

Settings Menu Screen

On the **Main** screen, press the soft key below ⚙ *Settings* to open the **Settings Menu** screen. Use this screen to select a settings option. All settings are retained when the machine is shut down.

The Settings Menu screen includes:

- FEED SETTINGS – Opens the Feed Settings screen (see *page 32*) to set the maximum or minimum roller feed speed, roller feed start speed, or minimum rotor speed.
- RESET DEFAULTS – Opens the Reset Defaults screen (see *page 34*) to confirm that you want to return all settings to the factory default values.
- DIAGNOSTICS – Opens the Diagnostics screen (see *page 34*) to see an overview of the machine operating parameters (for example; roller feed position, rotor speed, solenoid valve current, or current feed settings).
- OEM SETTINGS – Only authorized Wallenstein Equipment personnel are permitted to access the original equipment manufacturer (OEM) settings (see *page 35*).

Open a screen:

1. Use the soft key below the ⌃ *Up arrow* or ⌄ *Down arrow* to scroll through the menu options. The active selection is highlighted.
2. Press the soft key below ✓ *Select* to open the highlighted screen.

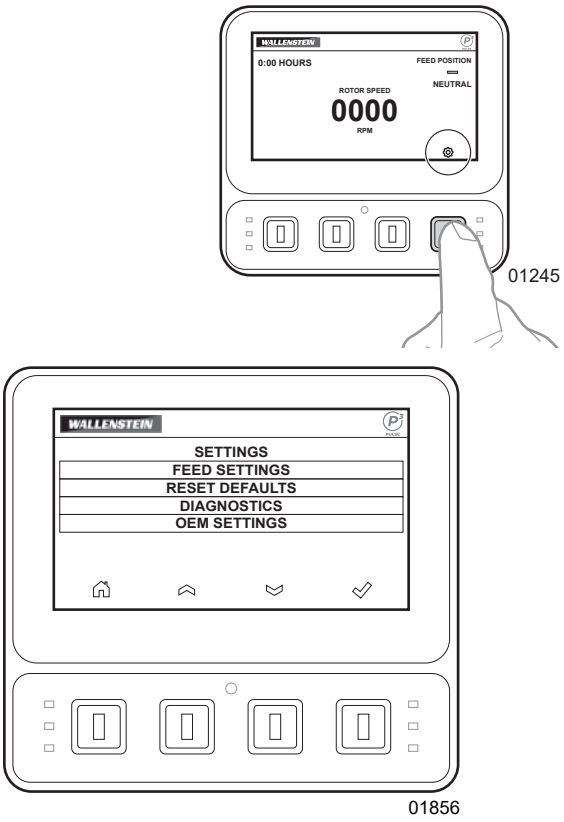


Figure 22–Settings Menu screen

Feed Settings Screen

The **Feed Settings** screen provides access to the four main P3 Pulse program settings. The active selection is highlighted.

The initial selection is MAX FEED SPEED.

Change settings:

1. If necessary, press the soft key below the ⌃ *Up arrow* or ⌄ *Down arrow* to change the setting number.
2. Press the soft key below ✓ *Select* to save the displayed number and select the setting to the right.
3. Repeat Steps 1 and 2 three times to change the settings, if necessary, and return to **Settings Menu** screen.

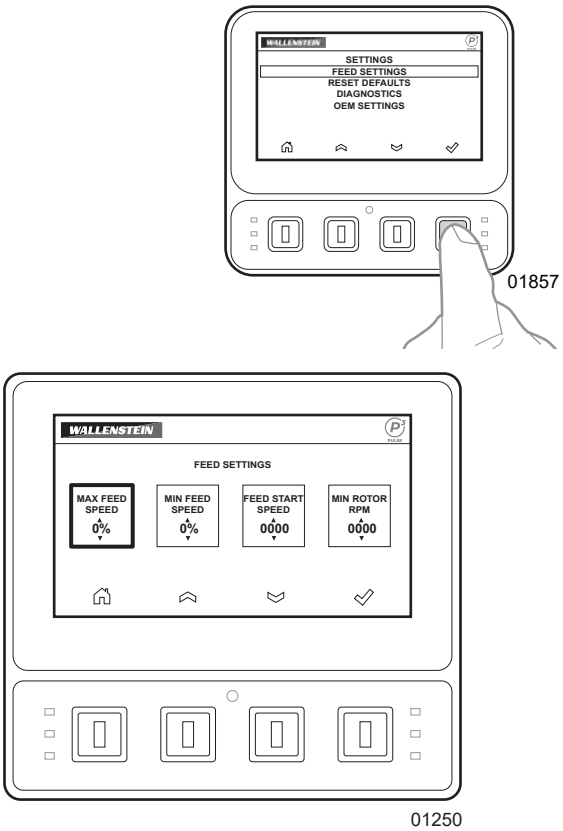


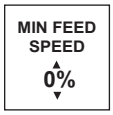
Figure 23–Feed Settings screen

Max Feed Speed

Sets the maximum (max) roller speed in 5% increments. The value is shown as a percentage of the maximum speed (100%).

- Set MAX FEED SPEED higher for larger chip size. It can be set and left at 100%.
- Set MAX FEED SPEED lower (close to the MIN FEED SPEED) for smaller consistent chip size.

Min Feed Speed



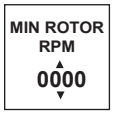
Sets the minimum (min) roller speed in 5% increments. The number is shown as a percentage of the maximum speed (100%). Setting the MIN FEED SPEED higher provides a larger chip size and prevents the chipper from slowing down as much when wood is fed through.

The MIN FEED SPEED cannot be set higher than 5% below the MAX FEED SPEED.

Feed Start Speed

Sets the rpm point where the rollers start to operate.

Min Rotor rpm



Sets the low rpm point where the rollers auto-reverse. If the rotor speed slows down under load below this setting, the P3 Pulse auto-reverses the rollers. When the rotor regains speed, forward feed resumes. If the engine stalls, the MIN ROTOR RPM is set too low.

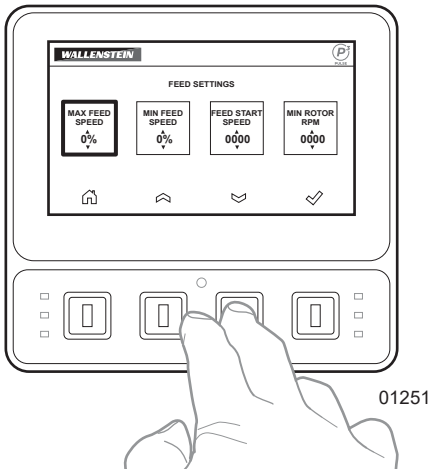


Figure 24– Select a setting

Performance Tips

The factory settings provide good overall performance for the machine; however, you may choose to customize performance.

Some helpful hints:

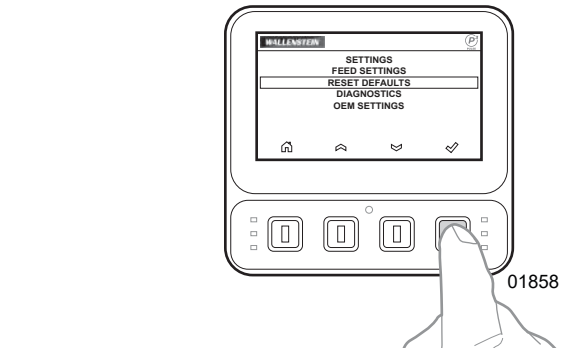
- For very heavy brush – decrease MAX FEED SPEED to slow the roller speed.
- For smaller, consistent chip size – decrease MAX FEED SPEED closer to MIN FEED SPEED.
- For larger chip sizes and more aggressive feeding – Leave MAX FEED SPEED at 100% and raise MIN FEED SPEED.

Reset Defaults Screen

The Reset Defaults screen provides the option to return the P3 Pulse setup parameters to the factory settings or cancel and keep the current settings.

Complete one of the following:

- To cancel and return to the **Settings Menu** screen without changing the current settings, press the soft key below ✗ *Cancel*.
- To reboot the P3 Pulse and reset the system to the factory default settings, press the soft key below ✓ *Select*.



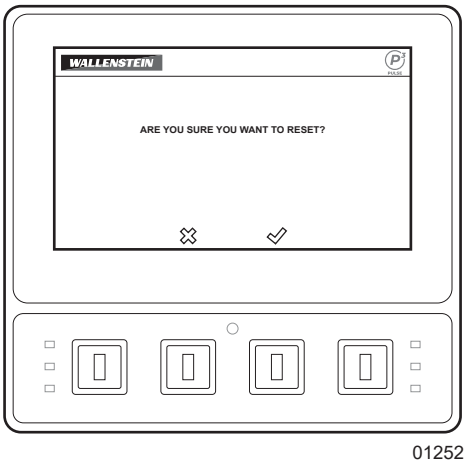


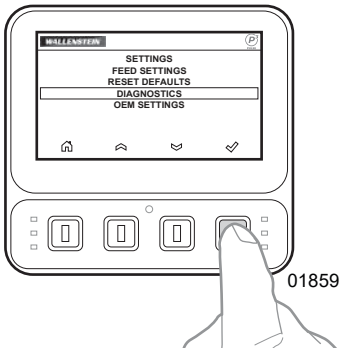
Figure 25–Reset Defaults screen

Diagnostics Screen

The Diagnostics screen is typically used by technicians for debugging and testing purposes. However, during operation you can observe all the machine parameters on this screen.

The Diagnostics screen displays the following information:

- ENGINE RPM (for example; 3600).
- Machine model (for example; BXTR5224).
- Current state of the roller feed drive (for example; NEUTRAL).
- ROTOR SPEED – the speed (rpm) the rotor is turning. 0000 indicates that the rotor is not turning.
- VALVE CURRENT – the electrical current (amperes) supplied to the forward solenoid on the control valve. 0000 indicates that no electrical current is being received.
- Current feed settings that are available on the Feed Settings screen (see *page 32*).
- Controller software version (for example; CV:3.0.0).
- Display software version (for example; DV:3.0.0).



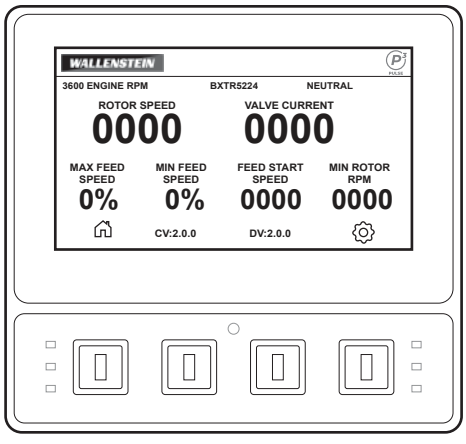
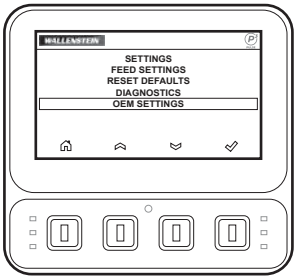


Figure 26–Diagnostics screen

OEM Settings

IMPORTANT! Only authorized Wallenstein Equipment personnel are permitted to access the OEM settings. If an unauthorized person accesses the OEM settings, it immediately voids the machine warranty.

OEM settings are password protected.



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6. Operating Instructions

Read and understand the operating instructions before using the machine.

6.1 Operating Safety

⚠ WARNING!

Wear the personal protective equipment (PPE) that is required to complete the work safely.

This includes, but is not limited to a hard hat, hearing protection, a face shield, protective footwear, a respirator, and heavy gloves.

W101

⚠ WARNING!

Never reach into the feed hopper. There are sharp knives that can trap, cut, and/or sever your fingers or hand. Use a stick or branch to push material that does not move into the machine.

If the machine is jammed, set the machine to a safe condition, and then clear the jam.

W004

⚠ WARNING!

Always use the machine outdoors and park the machine in a position where the prevailing winds blow the engine exhaust away from the operator. Exhaust from the engine contains carbon monoxide (CO) that can accumulate to a dangerous level, even in an area with good air flow.

W006

⚠ CAUTION!

Maintain a safe distance from the area where the machine expels the wood chips. Use the discharge chute and/or hood deflector to direct the expelled material away from the work area, all people, animals, and objects.

The machine can expel wood chips fast enough to cause eye, cut, and impact injuries and/or property damage.

W024

IMPORTANT! Do not put metal objects, bottles, cans, rocks, glass, or other unapproved material into the wood chipper. These items will damage the machine.

If these items get into the wood chipper, stop the machine. Set the machine to a safe condition before removing the items. Examine the machine for damage and loose parts.

- Read and understand this manual before you start the machine. Review all safety information annually.
- Park the machine in a clear location on dry, level ground. Do not operate the machine on a hillside or area that is cluttered, wet, muddy, or icy to prevent slips, trips, and falls.
  For more information, see *Work Site on page 11.*
- Keep the work area clean and free of debris.
- Only operate the engine in a location that has good air flow. Engine exhaust gases contain carbon monoxide (an odorless gas) that can cause asphyxiation.
- Attach all guards and shields, and close all covers before starting the machine. If a guard, shield, or cover was removed, install it.
- Do not move or transport the machine when the engine is on.
- Stop the engine before leaving the machine unattended.
- Cut large, curved branches into smaller, straighter sections. Some branches and brush move unpredictable directions when they enter the roller feed. Move away from the feed table after you put material into the machine.
- Never stand, sit, or climb on any part of the machine, especially while the engine is on.
- Never operate the machine alone. Always have a minimum of two trained people:
  - There should be one operator and one spotter present during machine operation. The operator and spotter must know all the machine safety, controls, and operating functions.
  - The operator must be in control of the machine at all times. The spotter must stay outside of the hazard zone while the machine is operating.
- Keep bystanders a minimum of 20 ft (6 m) from the machine and wood chip discharge area. Mark the safe zone with safety cones.
- Do not reach into the chipper hopper. Keep your feet on the ground and make sure you are stable when you put material into the chipper hopper.

- Keep your hands, feet, clothing, and long hair away from the roller-feed assembly. The roller feed can entangle hands, feet, clothing, and long hair, causing serious injury or death.

6.2 Pre-Start Checklist

Complete the following before you start the machine the first time and every time thereafter:

Items to Complete	✓
Read and obey the *Operating Safety on page 36*, *Engine Operation Safety on page 38,* and *Electronic Fuel Management System Operation Safety on page 39*.	
Check the rotor drive belt tension and alignment. Adjust if necessary. For instructions, see *Set the Rotor Drive Belt Tension on page 71.*	
Check the hydraulic pump drive belt tension. Adjust if necessary. For instructions, see *Set the Hydraulic Pump Drive Belt Tension on page 69.*	
Check the condition and clearance of the twig breaker, rotor knives, and ledger knife. Adjust or replace them, if necessary.	
Check the engine oil, fuel, and hydraulic fluid levels. If necessary, add engine oil, fuel, or hydraulic fluid.	
Make sure that the engine spark plug, muffler, fuel cap, and air filter cover are attached and tight.	
Check the battery, electrical harness, sensors, and P3 Pulse electronic controller. Make sure that all of the electrical components are in working condition and the connectors are connected. Replace damaged or corroded electrical components.	
Make sure that the machine is lubricated, as specified in the *Maintenance Schedule on page 58*.	
Use a safe method to check the hydraulic system for leaks. Tighten fittings or replace components, if necessary. For more information, see *Hydraulic Fitting Torque on page 88.*	
Remove anything that is entangled on the machine. For example, branches or vines.	
Remove all material from the rotor housing and discharge chute. For example, wood chips, bark, or leaves. Material in the rotor housing can cause the engine to stall when you start the machine.	
Make sure that the rotor bearings turn freely. If the bearings are damaged or do not turn freely, lubricate them or contact your local Wallenstein dealer to have them replaced.	
Make sure that the roller-feed bearings turn freely. If the bearings are damaged or do not turn freely, contact your local Wallenstein dealer to have them replaced.	
Check the RPM sensor position. Make sure that the sensor indicator light is on. For more information, see *Set the Rotor RPM Sensor Position on page 80*.	
Make sure that all guards and shields are installed, and the covers are closed. Replace guards, shields, or covers, if necessary.	
Make sure that all of the fasteners are installed and torqued to the correct torque. For more information, see *Bolt Torque on page 87* and *Lug Nut Torque on page 88.*	
Make sure that the operator and spotter are wearing the necessary PPE. The PPE must be in good condition.	
Make sure that the operator and spotter are not wearing loose-fitting clothing or jewelry, and long hair is tied up.	
Make sure that there are no bystanders inside the work zone and the spotter is not near a hazard. For zone definitions, see *Work Site on page 11.*	

6.3 Machine Break-In

Before and during the first eight hours of operation, do the following tasks.

6.3.1 Before Initial Startup

1. Read and understand all safety and break-in information in this manual and the engine manufacturer's manual.
2. Review the *Machine Components on page 20.*
3. Review the operation and function of the *Controls on page 22.*
4. Complete the *Pre-Start Checklist.*

6.3.2 After One to Five Hours of Operation

Complete each of the following:

- Check the fasteners and make sure that they are torqued to the correct torque. For more information, see *Bolt Torque on page 87* and *Lug Nut Torque on page 88.*
- Use a safe method to check the hydraulic system for leaks. Tighten fittings or replace components, if necessary. For more information, see *Hydraulic Fitting Torque on page 88.*
- Check the electrical system components. Make sure that they are in working condition and the connectors are connected.
- Check the engine oil, fuel, and hydraulic fluid levels. If necessary, add engine oil, fuel, or hydraulic fluid.
- Check the rotor drive belt tension and alignment. Adjust if necessary.
- Check the hydraulic pump drive belt tension. Adjust if necessary.
- Check the condition of the rotor bearings. Make sure that the rotor bearings turn freely.

- Check the condition and clearance of the twig breaker, rotor knives, and ledger knife. Adjust or replace them, if necessary.
- Check the tire air pressure, and the wheels, hubs, and axle. See the side of the tire for the correct air pressure.
- Remove vine and other material that is entangled on the machine.
- Remove material from the rotor housing and discharge chute.

6.3.3 After Eight Hours of Operation

1. Complete the tasks listed under *After One to Five Hours of Operation on page 37.*
2. Tighten the wheel lug nuts to the correct torque. For more information, see *Lug Nut Torque on page 88.*
3. Complete the *Pre-Start Checklist.*

6.4 Engine Operation

⚠ CAUTION!

Before starting the engine, review the safety, operating, and maintenance instructions in the engine manual.

W019

6.4.1 Engine Operation Safety

⚠ WARNING!

Never operate the engine indoors. Park the machine outdoors in a position where the prevailing winds blow the exhaust away from you.

Engine exhaust contains carbon monoxide (CO) that can quickly accumulate to a dangerous level. Carbon monoxide can cause illness, unconsciousness, or death.

W072

⚠ WARNING!

Keep the end of a disconnected battery cable away from the battery. Electricity can arc from the battery to the end of a battery cable and cause the battery to explode. An explosion can cause serious injury or death from heat, impact, and chemical hazards.

IMPORTANT! In some regions, when an engine is used on any forest covered, brush covered, or grass covered unimproved land it is necessary by law to have a spark arrestor installed on the muffler. A spark arrestor traps exhaust particles that are expelled from the engine. It is the responsibility of the operator to comply with the local laws and regulations. To purchase a spark arrestor, contact your local Wallenstein dealer or distributor.

- Keep the cylinder fins and engine shrouds free of debris to prevent the engine from overheating.
- Keep the engine free of wood chips and other debris that can affect the engine speed.
- Use fresh fuel (less than three months old). Stale fuel creates deposits that cause the carburetor to be clogged and leak.
- Check the fuel lines and fittings on a regular basis for cracks or leaks. Replace damaged fuel lines or fittings if necessary.
- Store fuel away from all wood material.
- Only operate the engine in a location that has good air flow. Engine exhaust gases contain carbon monoxide (an odorless gas) that can cause asphyxiation.
- Do not put your hands or feet near moving parts.
- Do not tamper with governor springs, governor links or other parts that may increase the governed speed. Engine speed is selected by the original equipment manufacturer.
- Do not check for a spark with the spark plug or spark plug wire removed.
- Do not attempt to start the engine with the spark plug removed. If the engine floods, set the throttle control to **Fast**, and then try to start the engine again.
- Do not hit the flywheel with a hard object or metal tool. This can cause the flywheel to shatter during operation. Use the correct tools to service the engine.
- Do not touch a hot muffler, cylinder, or fins. Contact may cause burns. Wait for the machine to cool. Use a no-touch thermometer to measure the temperature.
- Do not operate the engine in the following situations:
  - When there is an accumulation of wood chips, dirt, or other combustible materials in the muffler area.
  - In an area where there is a fuel spill. Move the machine away from the spill until the fuel evaporates.Make sure that are no sources of ignition in the area of the fuel spill.
  - With the air filter or air filter cover removed. This can damage the engine.
  - Without a muffler or heat shield. Inspect the muffler and heat shield on a regular basis. Replace muffler or heat shield that is damaged.

6.4.2 Electronic Fuel Management System Operation Safety

The engine has an electronic fuel management (EFM) system that monitors the engine speed, temperature, and battery voltage. The EFM system cannot be adjusted.

- Never start the engine if the battery cables are loose.
- Turn the key to the OFF position or remove the starter switch before disconnecting, removing and/or installing the battery.
- Never use a battery charger to start the engine.
- Never disconnect the battery cables while the engine is running.
- When connecting the battery cables, first connect the positive (+) cable and then connect the negative (-) cable to the battery.
- When charging the battery, turn the ignition switch to the off position and disconnect the negative (-) battery cable from the battery.
- Do not spray water directly on the Electronic Control Unit.

6.4.3 Check the Engine Oil Level

IMPORTANT! For more information about engine oil, see the engine manufacturer's manual and *Engine Oil on page 57*.

Operating the engine with a low oil level can cause engine damage that is not covered by the warranty.

The engine must be in a level position for the dipstick to show the oil level correctly.

Check the engine oil level before each use.

1. Park the machine on level ground.
2. Stop the machine.
   For instructions, see *Stop the Machine on page 44.*
3. Remove the oil-level dipstick and clean it.
4. Fully insert the oil-level dipstick.
5. Remove the oil-level dipstick and check the oil level.
   The oil level is correct when the oil is visible on the dipstick from the end to the full (upper) mark.
6. Do one of the following:
   - If the oil level is correct, continue with step 7.
   - If the oil level is low, add oil until the oil level is at the full (upper) mark. For instructions, see *Add Oil to the Engine on page 40.*
7. Install the oil-level dipstick and make sure that it is tight.

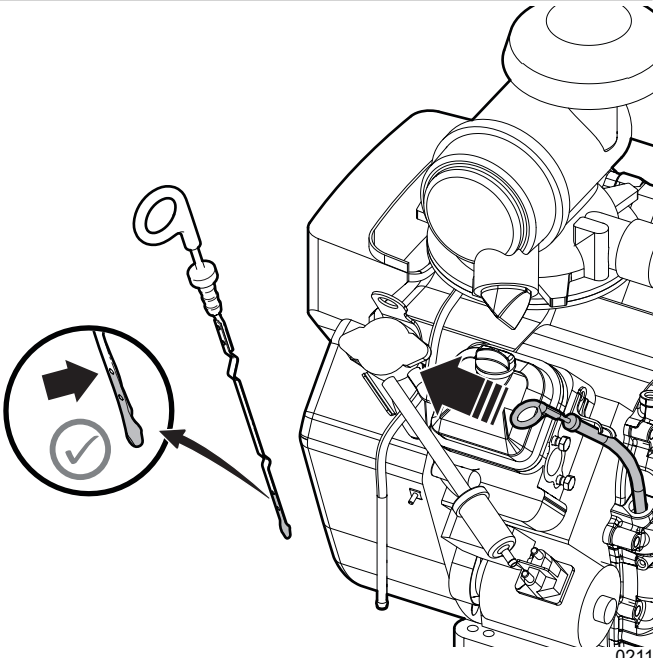


Figure 27–Engine oil level check

6.4.4 Add Oil to the Engine

IMPORTANT! For more information about engine oil, see the engine manufacturer's manual and *Engine Oil on page 57*.

1. Check the engine oil level to make sure that the oil level is low. For instructions, see *Check the Engine Oil Level.*
2. Turn the oil-fill cap counterclockwise to remove it.
3. Use a clean funnel to slowly add the correct type and amount of oil. **Do not overfill.**
4. Wait a minimum of one minute.
5. Remove the funnel, and then check the engine oil level.
6. Install the oil-fill cap and make sure that it is tight.

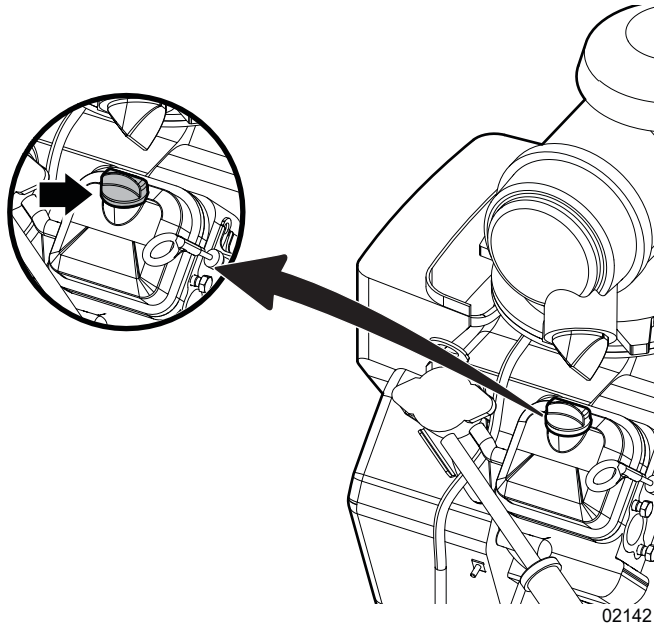


Figure 28–Engine oil-fill location

6.5 Engine Fuel Tank

The fuel tank is located at the front of the machine on the right side of the trailer tongue.

6.5.1 Fuel Safety

⚠ WARNING!

Never smoke or vape while working with fuel. Fuel vapors can explode causing injury or death. Keep sparks, flames, and hot components away.

W027

⚠ WARNING!

Fuel and vapors are extremely flammable and explosive. Fire or explosion can cause severe burns, bodily harm, or death. Keep fuel away from sparks, open flame, pilot lights, heat, and any other source of ignition.

⚠ CAUTION!

Fuel vapors are very toxic. Breathing fuel vapors can cause irritation, illness, or unconsciousness. Check the fuel level or add fuel to the engine outdoors or in an area that has good air flow.

- Engine fuel is highly flammable. Handle it with care.
- Turn off the engine and let it cool before adding fuel to the tank.
- Do not overfill the fuel tank.
- Carefully remove any spilled fuel, and then wait until any remaining fuel dries before you start the engine.
- After refueling, make sure that the fuel cap is tight.

6.5.2 Check the Fuel Level

Check the fuel level before each use.

Start work with a full fuel tank to decrease operating interruptions for refueling. Do not let the fuel tank become empty.

1. Park the machine on level ground.
2. Stop the machine.
   Stop the Machine on page 44.
3. Wait a minimum of five minutes for the engine to cool.
4. Turn the fuel cap counterclockwise to remove it.
5. Check the fuel level. The fuel tank is full when the fuel level is visible 1/2" (12 mm) below the filler neck. There must be room for fuel expansion.
6. Do one of the following:
   - If the fuel level is sufficient, install and the fuel cap and make sure that it is tight.
   - If the fuel level is not sufficient, add fuel to the tank. For instructions, see *Add Fuel to the Tank*.

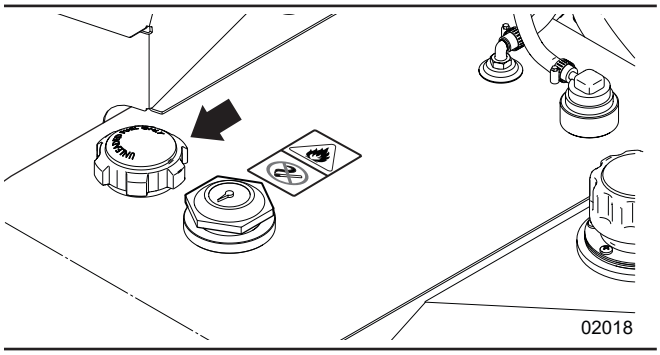


Figure 29–Fuel filler cap

6.5.3 Add Fuel to the Tank

The engine needs clean, fresh, unleaded gasoline with a pump octane rating of 87 or higher (research octane number [RON] of 91 or higher). Gasoline with up to 10% ethanol (gasohol) is acceptable. For more information, see *Engine Fuel on page 57.*

For information about the fuel that is necessary for engine use at high altitudes, see the engine manufacturer's manual.

Fuel tank capacity: **6.5 US gal (24.6 L).**

1. Stop the machine.
   For instructions, see *Stop the Machine on page 44.*
2. Wait a minimum of five minutes for the engine to cool.
3. Clean the area around the fuel filler cap. See *Figure 29.*
4. Turn the fuel cap counterclockwise to remove it.
5. Use a clean funnel to add the correct type and amount of fuel to the tank. Add fuel until the fuel level is visible 1/2 inch (12 mm) below the filler neck. Leave room for expansion. Do not overfill the tank.
6. Carefully remove any spilled fuel, and then wait until any remaining fuel dries before you start the engine.
7. Install the fuel cap and make sure that it is tight.

6.6 Hydraulic System Operation

IMPORTANT! Check the hydraulic fluid quality every 50 hours. If the fluid is dirty or smells burnt, replace it.

IMPORTANT! Be aware of high fluid temperatures. Temperatures higher than 180 °F (82 °C) can cause damage to the seals and degrade the hydraulic fluid quality.

The hydraulic system is a closed-loop system that uses pressurized automatic transmission fluid (ATF) to control the roller feed assembly.

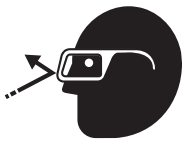
6.6.1 Hydraulic System Operation Safety

IMPORTANT! Optimal hydraulic fluid temperatures are between 120° F and 140° F (50° C and 60° C). If the hydraulic fluid temperature is higher than 180° F (82° C), it can cause seal damage and degrade the hydraulic fluid. High hydraulic fluid temperatures often indicate that there is a problem.

For more information, see *Hydraulic System Maintenance Safety on page 63.*

- Make sure that all hydraulic system components are kept clean and in working condition.
- Replace a hydraulic hose that shows signs of swelling, wear, leaks, or damage immediately. A swollen, worn, damaged, or leaking hose can burst and cause a hazardous and unsafe condition.
  For more information, see
- High-pressure hydraulic oil leaks:
  - Do not use your hand to check for hydraulic fluid leaks. Hydraulic fluid that leaks under pressure can penetrate the skin and cause serious injury or death. Use a piece of cardboard, wood, or plastic to check for leaks. Put on heavy gloves.

  - Put on the correct eye protection when doing an inspection for a high-pressure hydraulic leak.



  - Get medical attention immediately if injured by a concentrated high-pressure stream of hydraulic fluid. Serious infection or a toxic reaction can occur after hydraulic fluid pierces the skin.
- Do not bend or hit high-pressure hydraulic hoses.
- Never adjust a pressure relief valve or other pressure-limiting device to a pressure that is greater than the specified rating.

6.6.2 Check the Hydraulic Fluid Level

IMPORTANT! Do not operate the machine if the hydraulic fluid level is low. Damage to the motor and other components can occur.

Do not fill the hydraulic-fluid reservoir higher than the top of the hydraulic-fluid level sight glass.

Check the hydraulic fluid level before each use, after changing the filter, and after servicing hydraulic components. The hydraulic-fluid level sight glass is on the hydraulic-fluid reservoir.

1. Park the machine on level ground.
2. Look at the hydraulic fluid reservoir sight glass.
   The hydraulic fluid reservoir is full when the hydraulic fluid fills the bottom half of the sight glass.
3. If the hydraulic fluid level is low, add hydraulic fluid to the reservoir.
   For instructions, see *Add Hydraulic Fluid to the Reservoir on page 43.*

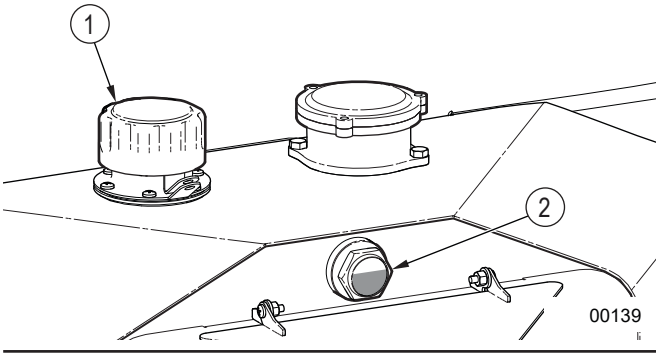


Figure 30 – Check the hydraulic fluid level

1. Fill cap
2. Hydraulic fluid tank sight glass

6.6.3 Add Hydraulic Fluid to the Reservoir

IMPORTANT! Do not fill the hydraulic-fluid reservoir higher than the top of the hydraulic-fluid level sight glass.

The hydraulic system uses **Dexron® III ATF**. Dexron VI or Mercon® are acceptable substitutes.

1. Check the hydraulic fluid level to make sure that the fluid level is low.
   For instructions, see *Check the Hydraulic Fluid Level on page 42.*
2. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
3. Clean the area around the fill cap. See *Figure 30 on page 42.*
4. Remove the fill cap.
5. Use a clean funnel to add hydraulic fluid to the reservoir until the fluid fills the bottom half of the sight glass.
   Do not overfill the reservoir.
6. Remove the funnel.
7. Install the fill cap and male sure that it is tight.
8. Clean the area around the fill cap and remove any spilled fluid.

.

6.7 Start the Machine

⚠ WARNING!

Before you start the machine, read and understand all of the safety information in this manual and the engine manufacturer's manual.

IMPORTANT! Use short starting cycles (maximum five seconds) and wait one minute between cycles. If the engine does not start after repeated attempts, contact your local dealer or go to VanguardPower.com**.**

Before you start the machine, see the information under *Controls on page 22.*.

1. Do the tasks described in the *Pre-Start Checklist on page 37.*
2. Make sure that the machine is set up correctly, and is in a level, stable position.
3. Move the throttle control to the **FAST** position.
4. Insert the key, and then turn the ignition switch clockwise to the **START** position. When the engine starts or after five seconds, release the key.
   The ignition switch automatically turns counterclockwise to the **RUN** position.
5. Do one of the following:
   - If the engine starts, continue with step 6.
   - If the engine does not start, wait a minimum of one minute, and then return to step 4.
6. Wait a minimum of three minutes for the rotor speed to increase.

6.8 Stop the Machine

1. Stop putting material into the machine.
2. Wait for a minimum of 30 seconds to let all the material blow out of the machine.
   Material in the rotor housing can cause the engine to stall the next time you start the machine.
3. Move the roller-feed control bar to the **STOP** position.
4. Move the throttle control to the **SLOW** position.
5. Wait a minimum of one minute for the engine to decrease the rotor speed.
6. Turn the ignition switch to the **STOP** position.
7. Remove the key.
   Keep the key away from unapproved users and children.

6.9 Emergency Stop

In an emergency:

1. Stop putting material into the machine.
2. On the engine, turn the ignition switch to the **STOP** position.
3. Remove the key and keep it with you.
   Do not let anyone start the machine until the emergency is resolved.

6.10 Set Up the Machine

WARNING!

Always use the machine outdoors and park the machine in a position where the prevailing winds blow the engine exhaust away from the operator. Exhaust from the engine contains carbon monoxide (CO) that can accumulate to a dangerous level, even in an area with good air flow.

W006

For more information, see *Figure 31 on page 45.*

1. Select a work site and set up a safe work area.
   For more information, see *Work Site on page 11.*
2. Do one of the following:
   - Disconnect the machine from the tow vehicle.
     For instructions, see *Disconnect from a Ball-mount Hitch on page 51.*
   - If more stability is necessary, leave the machine attached to the tow vehicle. Set the tow vehicle's parking brake, stop the engine, and then remove the key from the ignition.
3. Lower the trailer jack to support the machine in a level position. The machine should be as level with the ground as possible.
4. Open the feed-table latches, and then lower the feed table.
5. Lower the rear jack stand so that the feed table is in a level position.
6. Turn the discharge chute to direct the wood chips away from the operator and in the direction of the wind.
   For instructions, see *Discharge Chute on page 24.*
7. Move the hood deflector to direct the wood chips further away from or closer to the machine.
   For instructions, see *Hood Deflector on page 24.*
8. Make sure that the upper rotor housing is closed and the fastener is tight.
9. Make sure that all of the guards and shields are installed and the covers are closed.

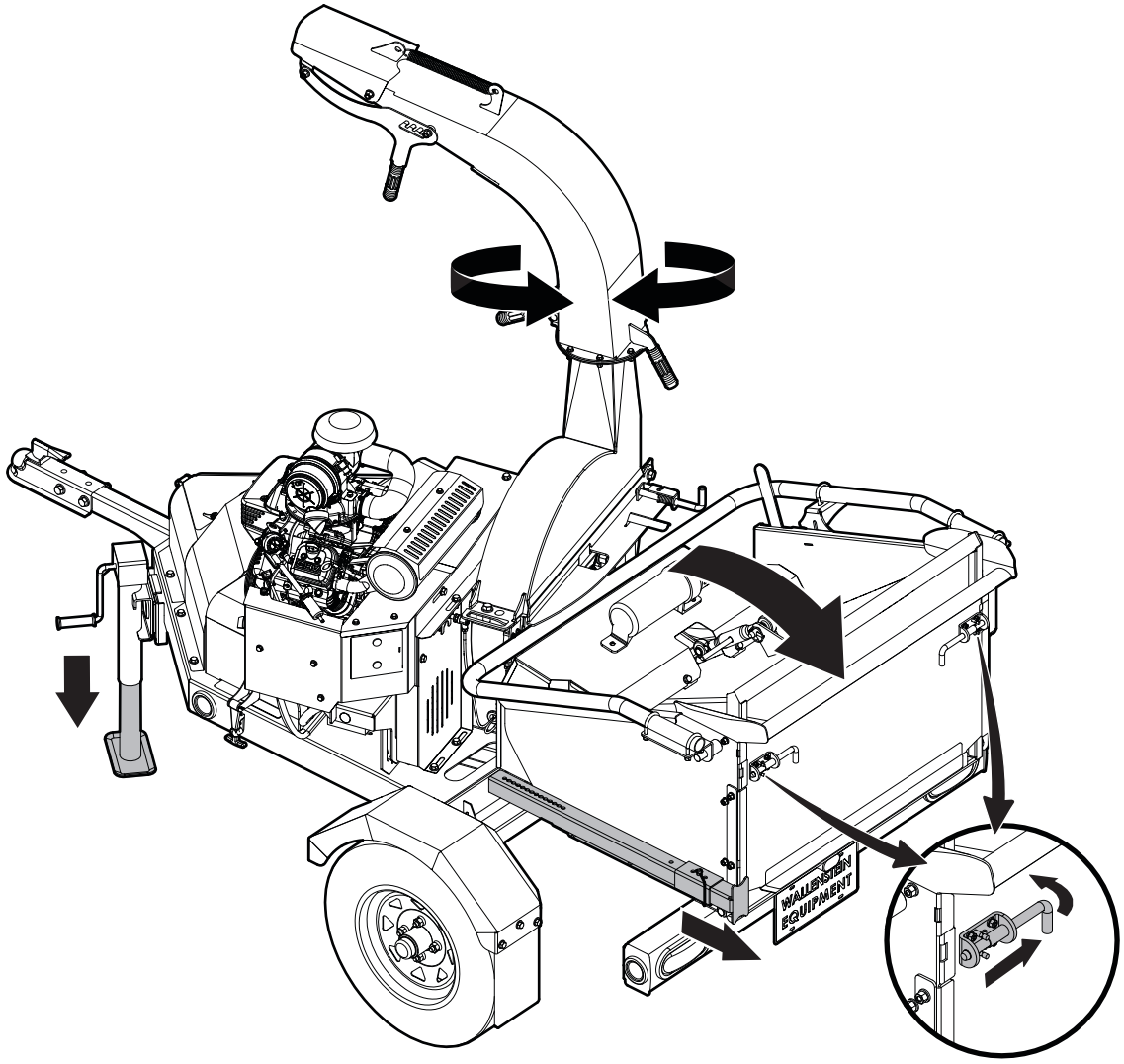


Figure 31 – Set up the machine

6.11 Operate the Wood Chipper

⚠ WARNING!

Wear the personal protective equipment (PPE) that is required to complete the work safely.

This includes, but is not limited to a hard hat, hearing protection, a face shield, protective footwear, a respirator, and heavy gloves.

W101

6.11.1 P3 Pulse Operation

The P3 Pulse electronic control system prevents the engine from becoming overloaded when material is put into the chipper too fast. The control system monitors the rotor RPM and automatically regulates the roller speed.

If the rotor RPM is at the low speed setting, the P3 Pulse sets the roller feed to **Reverse**. The roller-feed assembly pulls material away from the rotor, which gives the rotor time to regain speed. When the rotor RPM increases to the full speed setting, the P3 Pulse sets the roller feed to **Forward**.

For more information, see *P3 Pulse Electronic Control System on page 28.*

6.11.2 Prepare the Material

- Remove the limbs from large branches and trees. The limbs on large branches that stick out of the chipper hopper can move the roller-feed control bar, and stop the roller-feed assembly.
- Cut large, curved branches into smaller, straighter sections. Some branches and brush move in unpredictable directions when they enter the roller feed.
- Hold small diameter branches together in a bundle and put them into the chipper hopper together.
- Put short branches on top of longer branches to avoid reaching into the chipper hopper.

6.11.3 Chip Wood

⚠ WARNING!

Never reach into the feed hopper. There are sharp knives that can trap, cut, and/or sever your fingers or hand. Use a stick or branch to push material that does not move into the machine.

If the machine is jammed, set the machine to a safe condition, and then clear the jam.

W004

⚠ WARNING!

Keep hands, feet, clothing, and long hair away from the feed rollers when the machine is operating. Never climb on the feed table or hopper. The feed rollers can entangle and crush causing serious injury or death.

W023

⚠ CAUTION!

Maintain a safe distance from the area where the machine expels the wood chips. Use the discharge chute and/or hood deflector to direct the expelled material away from the work area, all people, animals, and objects.

The machine can expel wood chips fast enough to cause eye, cut, and impact injuries and/or property damage.

W024

IMPORTANT! Do not put metal objects, bottles, cans, rocks, glass, or other unapproved material into the wood chipper. These items will damage the machine.

If these items get into the wood chipper, stop the machine. Set the machine to a safe condition before removing the items. Examine the machine for damage and loose parts.

☞ The operator can move the roller-feed control bar to **Reverse** or **STOP** at any time. The machine does not have to be at full speed to reverse or stop the rollers.

For information about the roller-feed control functions, see *Roller-Feed Control Bar on page 25.*

1. Set up the machine.
   For instructions, see *Set Up the Machine on page 44.*
2. Prepare the material.
   For instructions, see *Prepare the Material on page 46.*

3. Start the machine.
   For instructions, see *Start the Machine on page 43.*
4. Make sure that the engine speed is set to **FAST** and the rotor is at full speed (wait three minutes).
5. Pull the release lever up to unlock the roller-feed control bar.
6. Move the roller-feed control bar to **Forward**.
   The roller-feed control bar stays in this position (detent) until the operator moves it.
7. Stand beside the feed table and slowly put material (branches and brush) into the chipper hopper until it engages with the roller feed.
   Do not force material into the machine. The roller feed pulls the material into the machine.

6.12 Clear a Blockage

WARNING!

Put the machine in a safe condition before you clear a blockage. Do not reach into the machine when it is not in a safe condition. When the machine is not in a safe condition, there are crush, sever, and entanglement hazards that can cause serious injury or death.

CAUTION!

Avoid reaching into the rotor housing. The rotor and ledger knives are very sharp. If it is necessary to reach into the rotor housing, set the machine to a safe condition, wear heavy gloves, and use extreme caution.

W003

The machine is designed to handle a wide range of materials. However, if material collects in the machine, follow this procedure to clear the blockage:

1. Set the rollers to **Reverse** to move the material out of the chipper hopper.
2. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
3. Remove all of the material from the chipper hopper and feed table.
4. Remove material from the discharge chute and hood deflector.
   Use a stick to loosen the blockage. Make sure that the discharge chute and hood deflector are clear.
5. Start the machine to see if the blockage is cleared.
   If the machine does not operate, remove the blockage from inside the machine.
   For instructions, see *Clear an Internal Blockage.*

6.12.1 Clear an Internal Blockage

WARNING!

Put the machine in a safe condition before you clear a blockage. Do not reach into the machine when it is not in a safe condition. When the machine is not in a safe condition, there are crush, sever, and entanglement hazards that can cause serious injury or death.

CAUTION!

Avoid reaching into the rotor housing. The rotor and ledger knives are very sharp. If it is necessary to reach into the rotor housing, set the machine to a safe condition, wear heavy gloves, and use extreme caution.

W003

IMPORTANT! Do not operate the chipper with the toplink connected to the bridge. It can cause damage to the machine.

1. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
2. Remove the upper-rotor-housing retainer bolt, and then open the upper rotor housing. See *Figure 34 on page 48*.
3. Remove material from the upper rotor housing and discharge chute. See *Figure 35 on page 48.*
4. Use a tool or stick to remove all material from the rotor housing.
5. Carefully and slowly, turn the rotor to make sure that there is not a blockage between the rotor and ledger knife.
   Do not reach into the rotor housing while the rotor is moving
6. Remove the bridge guard to access the toplink.
7. Remove the linchpin and hitch pin from the toplink.
8. Turn the toplink until it aligns with the bridge mount.
9. Connect the toplink to the bridge mount.
   Install the linchpin and hitch pin through the toplink. See *Figure 32 on page 48.*
10. Turn the toplink to lift the bridge. See *Figure 33 on page 48.*
11. Carefully reach through the chipper hopper, into the roller-feed assembly, and remove the material.
12. When you have removed the material, turn the toplink to lower the bridge.
13. Remove the linchpin and hitch pin from the toplink and disconnect the toplink from the bridge mount.

14. Install the bridge guard.
15. Turn the toplink until it aligns with the bridge guard mount.
16. Connect the toplink to the bridge guard mount.
    Install the linchpin and hitch pin through the toplink.
17. Close the upper rotor housing.
18. Install the upper-rotor-housing retainer bolt. See *Figure 34.*
    For more information, see .
    Use a calibrated torque wrench to torque the bolt to **80 lbf•ft (110 N•m)**.
19. Start the machine to see if the blockage is cleared.
    If the machine does not operate, do steps 1-16 again until the blockage is cleared.

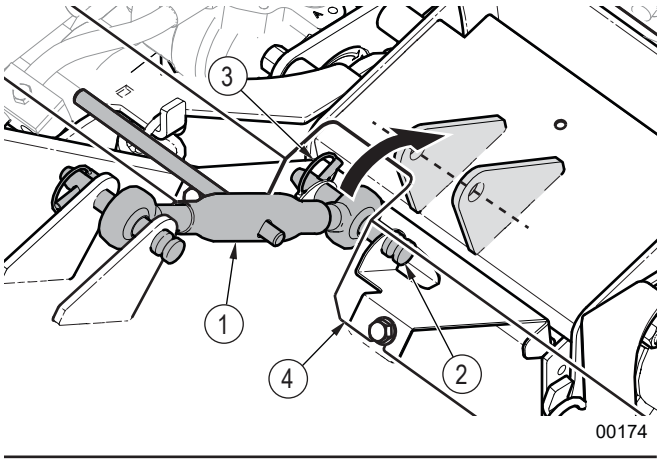


Figure 32–Connect the toplink to the bridge

1. Toplink
2. Hitch pin
3. Linchpin
4. Bridge guard

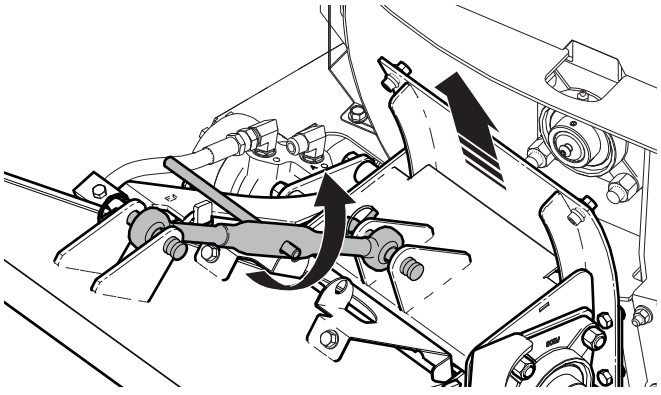


Figure 33–Lift the bridge

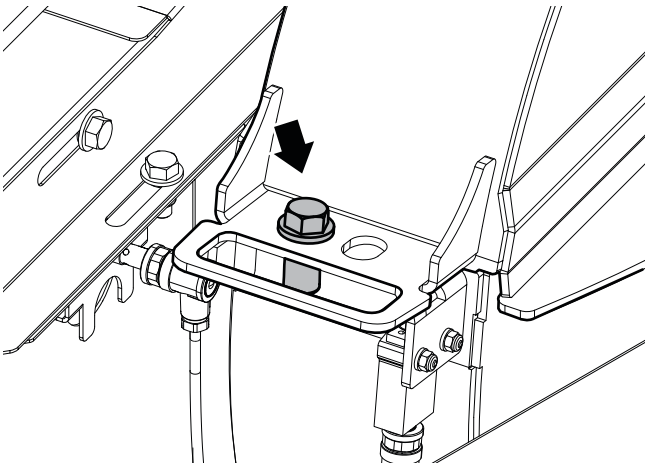


Figure 34–Upper-rotor-housing retainer bolt

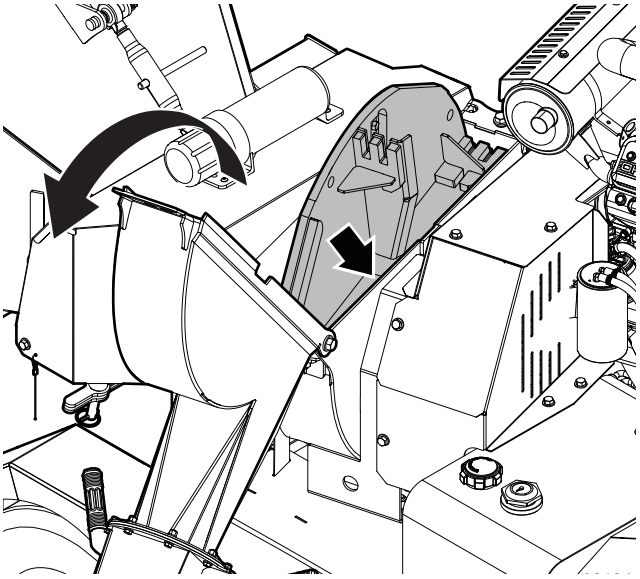


Figure 35–Open the upper rotor housing

7. Transport

IMPORTANT! Equipment that is transported on a public roadway must comply with the local laws that govern the safety and transport of machinery.

Before taking the machine on a public roadway, make sure that it has the necessary lighting, reflectors, and markings, and that they are in good, working condition.

This machine includes lights, reflectors, and markings; however, it does not have a vehicle identification number (VIN). For the specific requirements to license the machine, contact your local transportation authority.

7.1 Transport Safety

- Make sure that the machine is safely attached to the tow vehicle with a retainer through the hitch.
- Always attach the safety chains between the machine and the tow vehicle.
- Do not let people ride on the machine.
- Do not exceed a safe travel speed. Decrease your speed for rough terrain and around corners.
- Plan your route to avoid heavy traffic.
- Do not transport or move the machine with the engine on.
- Make sure that the fuel tank and hydraulic reservoir caps are on and tight.
- Examine wheel rims for damage, and torque the wheel lug nuts to the specified torque. For more information, see *Lug Nut Torque on page 88.*
- Examine the tires for cuts or damage.
- Make sure that the tires are filled to the specified pressure. For the correct tire pressure, see the tire sidewall.
- Examine the axle dust caps for leaks and damage. Replace a dust cap that is leaking or damaged.
- Make sure the tow vehicle has the correct size ball-mount hitch (2 inches).
- Make sure that the trailer jack and rear jack stand are retracted and stowed.
- Make sure that all of the guards and shields are installed and the covers are closed.
- Remove all debris from the machine.
- After the machine is ready for transport, do a circle check to make sure that everything is safe and the lights function correctly.

7.2 Prepare the Machine for Transport

1. Stop the machine.
   For instructions, see *Stop the Machine on page 44.*
2. Remove all material from the feed table and chipper hopper.
3. Fold up and latch the feed table. Retract the rear jack stand and install the pin.
4. Turn the discharge chute toward the back of the machine to decrease the machine width.
   For instructions, see *Discharge Chute on page 24.*
5. Make sure that the upper rotor housing is closed, and the retainer bolt is installed and tight.
6. Attach the machine to a tow vehicle.
   For instructions, see *Attach to a Tow Vehicle on page 51.*

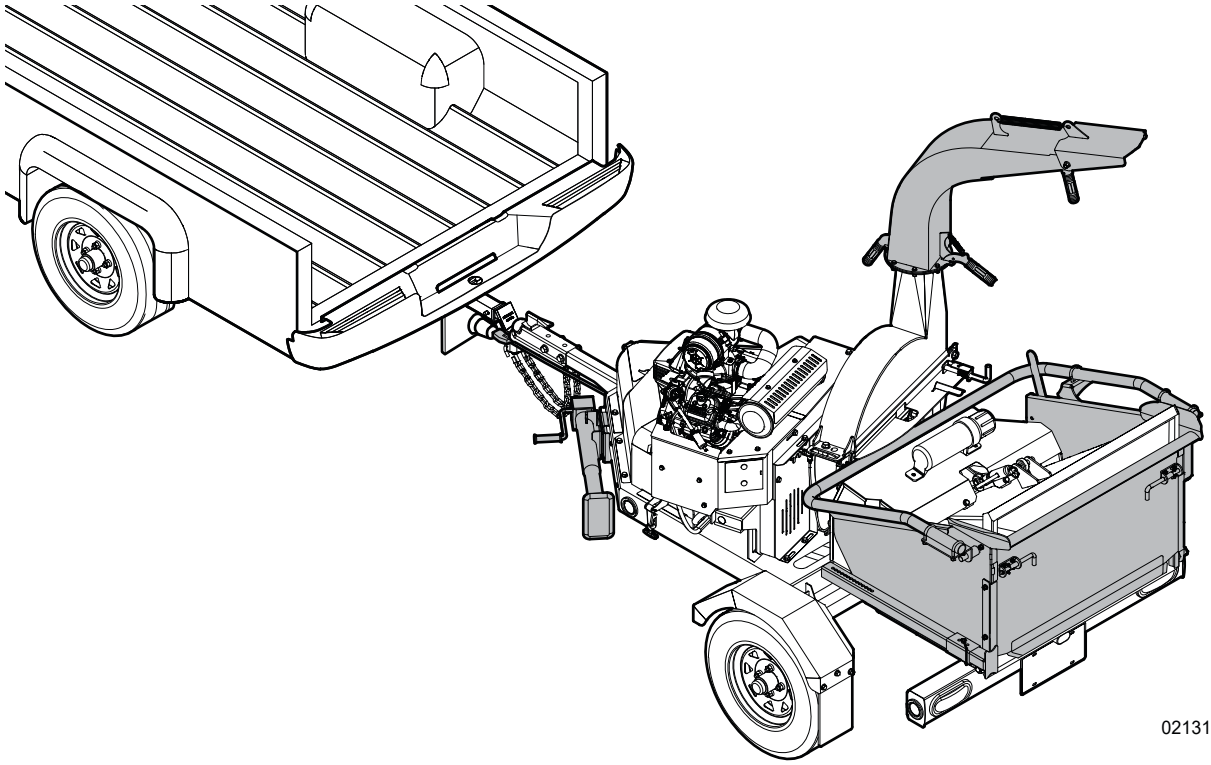


Figure 36– Transport position

7.3 Attach to a Tow Vehicle

⚠ WARNING!

Before moving the tow vehicle, make sure the safety chains are securely attached.

W103

Always park the machine on level, dry ground that is free of debris and other objects before connecting or disconnecting a hitch.

The machine has a trailer tongue with a two-inch ball-mount hitch coupler.

7.3.1 Connect to a Ball-mount Hitch

Make sure there is space and clearance to safely reverse the tow vehicle to the machine.

1. Reverse the tow vehicle to the machine. Stop approximately 1 ft (30 cm) away from the hitch coupler. If a back-up camera is not available, have another person guide you.
2. Use the trailer jack to lift the trailer tongue until the hitch coupler is higher than the ball-mount hitch.
3. Remove the pin from the hitch-coupler latch. Lift the latch to the vertical (unlocked) position.
4. Slowly, reverse the tow vehicle until the ball-mount hitch is below the hitch coupler.
5. Stop the tow vehicle and apply the parking brake.
6. Use the trailer jack to lower the machine and attach the hitch coupler to the ball-mount hitch.
7. Lower the hitch-coupler latch to the locked position. Install a pin through the latch to hold the hitch coupler on the ball-mount hitch.
8. Retract and stow the trailer jack.
   For instructions, see *Trailer Jack on page 52.*
9. Cross the two safety chains below the trailer tongue, and then attach them to the tow vehicle (one on each side of the ball-mount hitch).
10. Do the following:
    a. Connect the light-bar cable harness to the tow vehicle. Make sure the cables can make turns without tension and do not touch the ground.
    b. Operate each light and have another person make sure that it functions correctly.

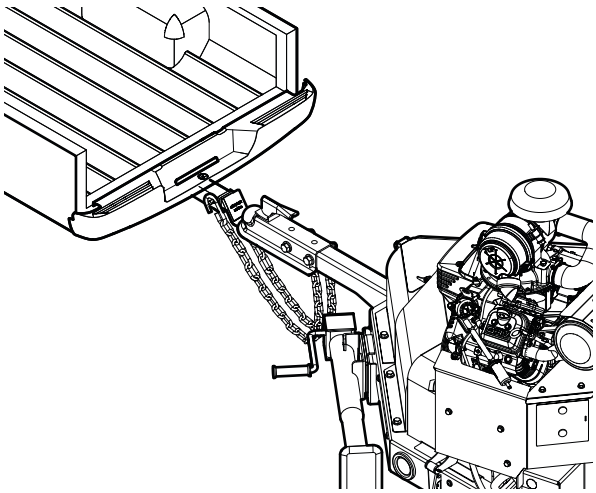


Figure 37 – Ball-mount hitch connection

7.3.2 Disconnect from a Ball-mount Hitch

Make sure there is space and clearance to safely drive the tow vehicle forward, away from the machine.

1. Stop the tow vehicle in a location where it and the machine are on dry, level ground. Stop the engine and apply the parking brake.
2. Turn and lower the trailer jack to support the machine.
   For instructions, see *Lower the Trailer Jack on page 52.*
3. Disconnect the light-bar cable harness from the tow vehicle. Stow the cable harness on the machine in a location that prevents damage.
4. Remove the two safety chains from the tow vehicle and stow them safely on the machine.
5. Remove the pin from the hitch-coupler latch. Lift the latch to the vertical (unlocked) position.
6. Use the jack to lift the trailer tongue until the hitch coupler is higher than the ball-mount hitch.
7. Slowly, drive the tow vehicle forward until the ball-mount hitch is clear of the hitch coupler.
8. Stop the tow vehicle and apply the parking brake.
9. Use the trailer jack to lower the machine until it is level with the ground.
10. Lower the hitch-coupler latch to the locked position. Install the pin through the latch.

7.4 Trailer Jack

CAUTION!

Do not pull the pin out of a trailer jack when there is weight on the jack. The machine can move unexpectedly and cause minor to severe injuries. Attach the machine to a tow vehicle or put blocks under the trailer tongue to hold the weight before you remove the pin from a trailer jack.

The trailer jack has two functions. It supports the machine when it is not attached to a tow vehicle or helps to keep the machine stable when it is attached to a tow vehicle.

7.4.1 Lower the Trailer Jack

1. Pull the pin out of the bracket.
2. Turn the trailer jack to the vertical position.
3. Insert the pin through the bracket to hold the trailer jack in the vertical position.
4. Turn the handle clockwise to lower the base.

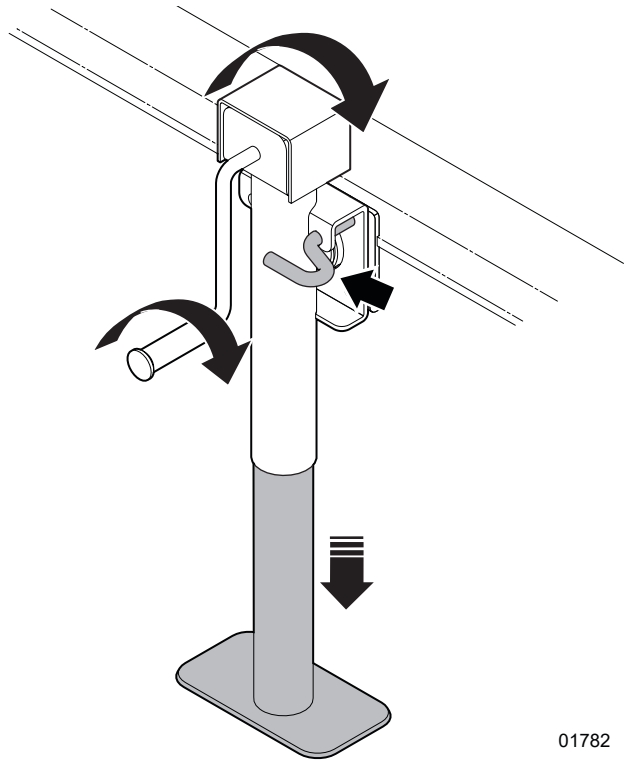


Figure 38–Trailer jack in the lowered position

7.4.2 Stow the Trailer Jack

1. Support the machine to remove weight from the trailer jack. Attach the machine to a tow vehicle or support the trailer tongue with blocks.
2. Turn the handle counterclockwise to retract the base.
3. Pull the pin out of the bracket.
4. Turn the trailer jack to the horizontal position.
5. Insert the pin through the bracket to hold the trailer jack in the horizontal position.

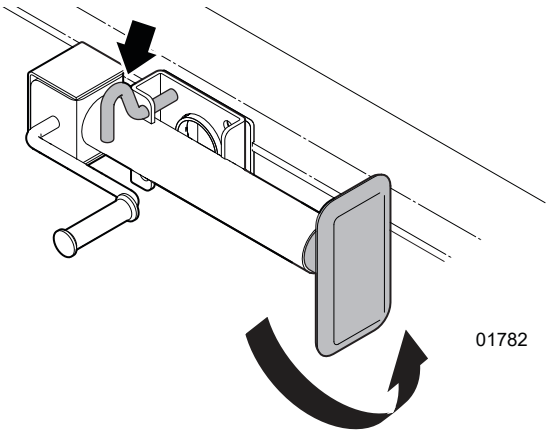


Figure 39–Trailer jack in the stowed position

7.5 Ladder Hitch

If the ladder hitch accessory is installed, you can adjust the height of the machine's hitch.

The ladder hitch has two height positions and two safety chains. Select the height that is appropriate for the tow vehicle.

1. Disconnect the machine from the tow vehicle.
   For instructions, see *Disconnect from a Ball-mount Hitch on page 51*.
2. Have another person hold the hitch coupler or support it with blocks to prevent it from falling.
3. Remove the two bolts and nuts.
4. Move the hitch coupler to the correct position on the hitch ladder.
5. Install the two bolts and nuts through the hitch ladder and coupler.
6. Use a calibrated torque wrench to torque the two bolts to **160 ft•lb** (**215 N•m**).

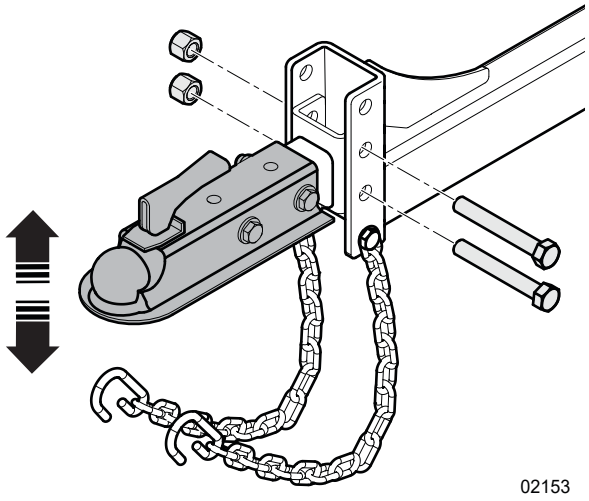


Figure 40 – Adjust the ladder hitch height

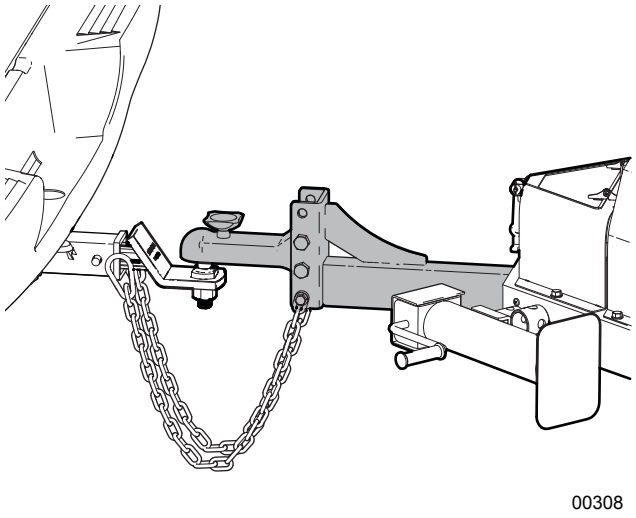


Figure 41 – Ladder hitch connected to a tow vehicle

8. Storage

At the end of the season or when the machine is not going to be used for an extended length of time, store the machine correctly to prevent damage.

For reference, see *Figure 42 on page 55.*

8.1 Storage Safety

⚠ WARNING!

Do not permit children to play on or around stored machinery or equipment. Sharp edges, unexpected movement, trips, falls, and other hazards can cause serious injury or death.

W105

⚠ CAUTION!

Store the machine away from furnaces, stoves, water heaters, or other appliances that have a pilot light or other ignition source. A pilot light or other source of ignition can ignite fuel vapors.

IMPORTANT! A pressure washer can damage the machine's product identification plate and make it unreadable. Do not direct the spray from a pressure washer onto the product identification plate. Use a clean, soft cloth that is dampened with water to remove dirt.

- Store the machine in a dry, level location away from human activity.
- Store the machine indoors, if possible.
- Support the machine with blocks for stability, if necessary.

8.2 Put the Machine in Storage

For information about engine storage, see the engine manufacturer's manual.

1. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
2. Check all of the moving parts and remove all entangled material.
3. Clean the machine.
   For instructions, see *Clean the Machine on page 81.*
4. Start the machine, let it run for a few minutes to remove any moisture, and then stop the machine.
5. Do step 1 again.
6. Examine the machine fully, including internal components. Replace or repair any worn or damaged components.
7. Paint scratches and dents to prevent rust.
8. Do one of the following:
   - If the machine will be in storage for one to three months, add stabilizer to the engine fuel, and then operate the engine for a minimum of three minutes to move the stabilizer through the engine.
   - If the machine will be in storage for longer than three months, replace the engine fuel with an alkylate or appropriate engineered fuel. These fuel types prevent the buildup of deposits in the engine.
     For more information, see *Engine Fuel on page 57.*
     For instructions, see *Replace the Engine Fuel on page 55.*
9. Park the machine in the storage location.
10. Disconnect the tow vehicle.
    For instructions, see *Disconnect from a Ball-mount Hitch on page 51.*
11. Adjust the trailer jack to make the machine as level as possible.
    If the machine must be on soft ground, put boards or plates under the jack stand to increase the surface area.
12. Block the machine wheels to prevent accidental movement and increase the wheel bearing life.
13. Remove the battery.
    Store the battery in a cool, dry place, where it cannot freeze. Connect a battery maintainer to keep it at full charge. For instructions, see *Remove the Battery on page 67.*
14. If the machine must be stored outdoors, cover the machine with a waterproof tarp.
    The machine be stored indoors, if possible.

8.3 Remove the Machine from Storage

1. Install the battery.
   For instructions, see *Install the Battery on page 67.*
2. Do the *Pre-Start Checklist on page 37*.
3. Do the necessary maintenance.
   For necessary maintenance, see the *Maintenance Schedule on page 58*.

8.3.1 Replace the Engine Fuel

⚠ WARNING!

Never smoke or vape while working with fuel. Fuel vapors can explode causing injury or death. Keep sparks, flames, and hot components away.

W027

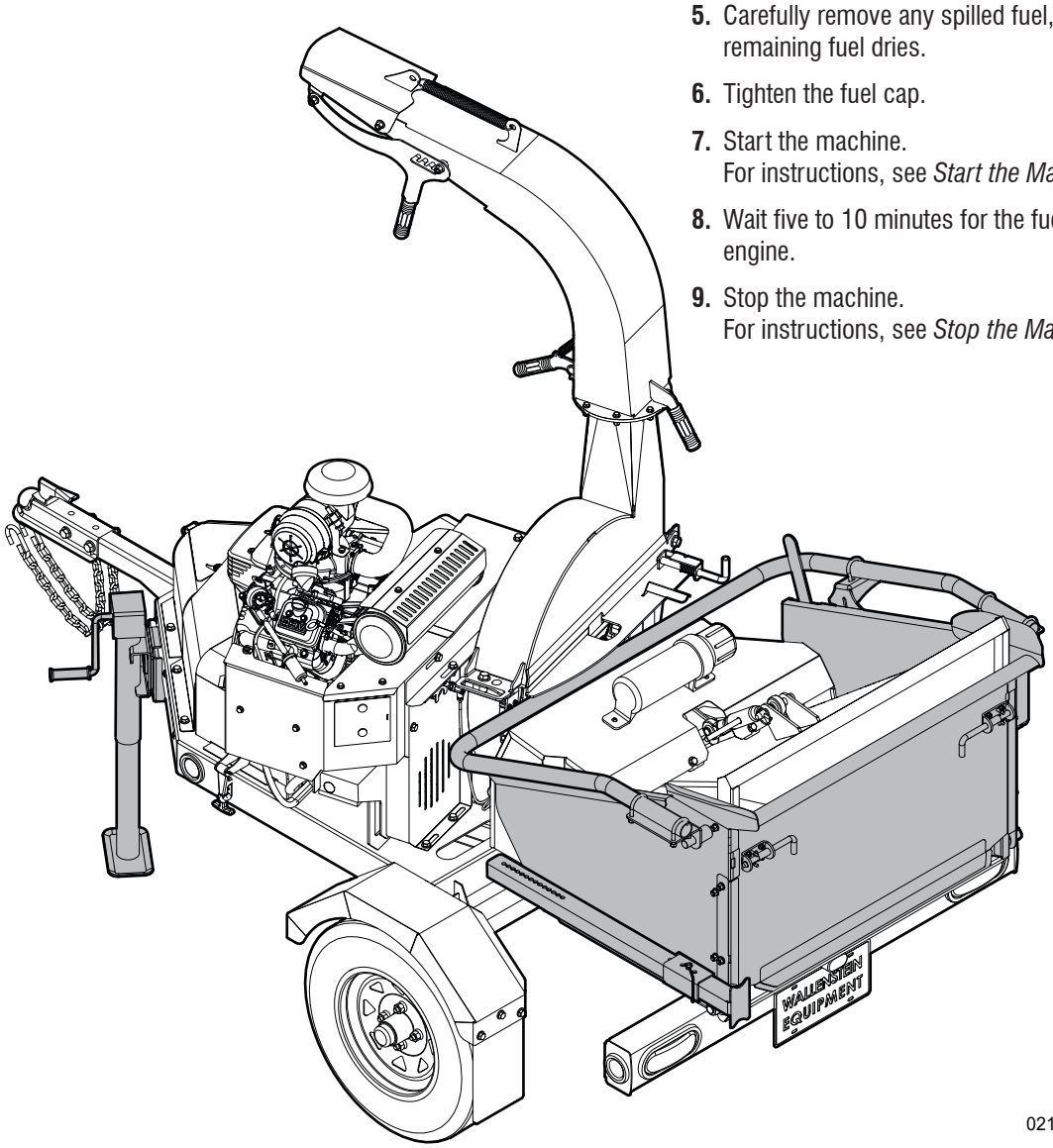
⚠ WARNING!

Fuel and vapors are extremely flammable and explosive. Fire or explosion can cause severe burns, bodily harm, or death. Keep fuel away from sparks, open flame, pilot lights, heat, and any other source of ignition

⚠ CAUTION!

Fuel vapors are very toxic. Breathing fuel vapors can cause irritation, illness, or unconsciousness. Check the fuel level or add fuel to the engine outdoors or in an area that has good air flow.

1. Stop the machine.
   For instructions, see *Stop the Machine on page 44.*
2. Wait for the engine and fluids to cool.
3. Remove the current fuel from the engine.
   Operate the machine until the fuel tank is empty or drain the fuel tank and properly dispose of the fuel.
4. Add new fuel to the engine.
   For instructions, see *Add Fuel to the Tank on page 41*.
5. Carefully remove any spilled fuel, and then wait until any remaining fuel dries.
6. Tighten the fuel cap.
7. Start the machine.
   For instructions, see *Start the Machine on page 43.*.
8. Wait five to 10 minutes for the fuel to go through the engine.
9. Stop the machine.
   For instructions, see *Stop the Machine on page 44.*.



02132

Figure 42–Storage position

9. Service and Maintenance

Regular preventive maintenance can improve performance and prolong the life of the machine. Machine maintenance is your responsibility.

9.1 Service and Maintenance Safety

⚠ WARNING!

Risk of serious personal injury. Stop engine before performing ANY service or maintenance procedure. Reinstall all covers and shields removed before putting machine back into service.

W033

⚠ WARNING!

Before you start service or maintenance work:

- **Set the machine to a safe condition.**
- **Wait for the machine to cool down. Engine components and fluids may be hot enough to cause burns.**
- **Read and understand all of the service and maintenance safety information.**

W041

⚠ WARNING!

Wear the personal protective equipment (PPE) that is required to complete the work safely.

This includes, but is not limited to a hard hat, hearing protection, a face shield, protective footwear, a respirator, and heavy gloves.

W101

Set the machine to a safe condition before you start any service or maintenance:

SAFE CONDITION

1. If the machine is attached to a tow vehicle, set the tow vehicle's parking brake, stop the tow vehicle, and remove the ignition key.
2. Stop the machine.
   For instructions, see *Stop the Machine on page 44*.
3. Disconnect the engine spark-plug wire and keep it away from the spark plug.
4. Disconnect the cable from the negative (-) battery terminal and keep it away from the battery.
5. Remove all material from the chipper hopper.
6. Wait until the engine and machine are cool.

- Follow good shop practices:
  - Keep the work area clean and dry.
  - Ground electrical outlets and tools.
  - Have adequate light for good visibility.
- Use tools that are in working condition and correct for the task. Make sure that you know how to use the tools before you use them.
- Only operate the engine in a location that has good air flow. Engine exhaust gases contain carbon monoxide (an odorless gas) that can cause asphyxiation.
- Never work under equipment unless it is safely supported with blocks.
- Never do service or maintenance work alone. Always have a minimum of two people in case an emergency situation occurs.
- Keep a fire extinguisher and first aid kit available at all times.
- When service or maintenance is complete, do the following:
  - Replace all guards and shields, and close the covers.
  - Torque the fasteners to the correct torque.
  - Make sure that all the electrical, hydraulic, and fuel connections are connected in a safe working condition.
- Do not use gasoline or diesel fuel to clean parts. Use a regular cleanser.
- When replacement parts are necessary, use genuine factory replacement parts to restore your machine to the original specifications. The manufacturer cannot be responsible for injuries or damages caused by use of unapproved parts and/or accessories.

9.2 Fluids and Lubricants

The machine needs various fluids and lubricants for operation and maintenance.

9.2.1 Lubricant Handling and Storage

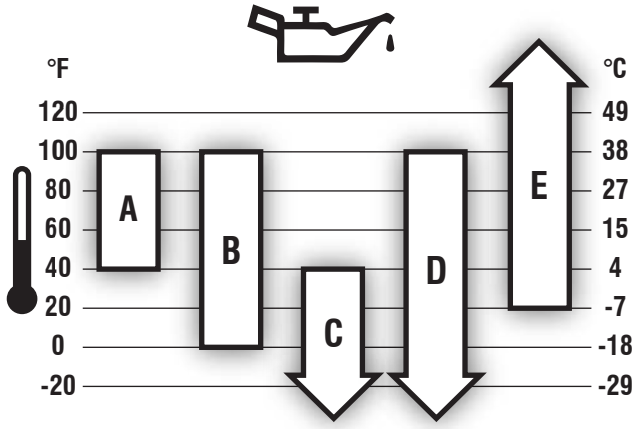
For optimal machine efficiency, use clean lubricants and clean containers to handle all lubricants. Store lubricants in a location that is protected from dust, moisture, and other contaminants.

9.2.2 Engine Oil

For engine maintenance and service information, see the engine manufacturer's manual.

For the best engine performance, use Briggs & Stratton® Warranty Certified oils. Other high-quality detergent oils are permitted if they are classified for service SF, SG, SH, SJ, or higher. Do not use special additives.

Use the correct oil viscosity for the expected outdoor temperature range. The following chart is a guide:



- **A** **SAE 30** – Below 40 °F (4 °C) the use of SAE 30 results in hard starting.
- **B** **10W-30** – Above 80 °F (27 °C) the use of 10W-30 can cause increased oil consumption. Check the oil level frequently.
- **C** **5W-30**
- **D** **Synthetic 5W-30**
- **E** **Vanguard® Synthetic 15W-50**

9.2.3 Engine Fuel

For complete fuel information and use at high altitudes, see the engine manufacturer's manual.

Fuel must meet the following specifications:

- Clean, fresh, unleaded gasoline.
- Minimum of 87 octane / 87 AKI (91 RON).
- Gasoline with up to 10% ethanol (gasohol) is acceptable if the fuel is fresh (less than three months old).

If the machine will be in storage for longer than three months, replace the fuel with one of the following fuel types:

- An alkylate fuel
- An engineered fuel that is high octane, ethanol-free, and formulated with power detergent to prevent the buildup of deposits.

For instructions, see *Replace the Engine Fuel on page 55*.

9.2.4 Grease

Use an SAE multi-purpose high temperature grease with extreme pressure (EP) performance. An SAE multipurpose lithium-based grease is an acceptable substitute.

9.2.5 Hydraulic Fluid

Use Dexron® III automatic transmission fluid (ATF) for all operating conditions.

The following ATFs are acceptable substitutes:

- Dexron VI
- Mercon®

9.3 Maintenance Schedule

IMPORTANT! For more information, see the engine manufacturer's manual.

Complete maintenance tasks at the specified time or hour interval, whichever comes first.

Task	8 hours or daily	50 hours or annually	100 hours or annually	250 hours	400 hours or annually	Reference
Check the engine oil level and quality.	●					See *page 39*.
Check the engine fuel level.	●					See *page 41*.
Clean the engine around the muffler and controls.	●					N/A[1].
Check that all fasteners are torqued to the specified torque.	●					See *page 87*.
Check that the wheel lug nuts are torqued to the specified torque.	●					See *page 88*.
Remove all debris and entangled material.	●					N/A.
Check the drive belt operation.	●					See *page 68*.
Check the rotor knife, ledger knife, and twig breaker sharpness.		●				See *page 75*.
Check the battery condition.		●				See *page 66*.
Lubricate pivot points and hinges.		●				See *page 62*.
Grease the machine.		●				See *page 60*.
Check the drive belt tension and alignment.		●				See *page 68*.
Check the tire pressure.			●			See the tire sidewall.
Clean the machine.			●			See *page 81*.
Service the engine exhaust system.			●			See the engine manual.
Clean the engine air filter.[2]			●			See *page 66*.
Change the engine oil and replace the oil filter.			●			See the engine manual.
Replace the engine spark plug.			●			See the engine manual.
Check the valve clearance.				●		See the engine manual.
Replace the engine fuel filter.					●	See the engine manual.
Service the engine cooling system.[2]					●	See the engine manual.
Replace the engine air filter.[3]					●	See the engine manual.
Clean the oil-cooler fins.[2]					●	See the engine manual.

1 N/A indicates that a reference is not applicable.
2 In dusty conditions or when airborne debris is present, clean more often.
3 Every third air filter change, replace the air safety filter.

9.4 Grease Points

IMPORTANT! Do not over grease a bearing. Too much grease can cause the bearing seals to fail.

Look for this type of label on the machine. Each label identifies a greasing interval in hours.

For grease specifications, see *Grease on page 57.*

- Use a clean cloth to clean each grease fitting before you apply grease. This prevents grease and dirt from getting inside the component.
- Use a hand-held grease gun to apply **one pump** of grease to each grease point.
- If a grease fitting is damaged, replace it immediately.
- If a grease fitting does not accept grease:
  a. Remove the grease fitting.
  b. Clean the passageway behind the grease fitting.
  c. Clean the grease fitting thoroughly or get a new grease fitting.
  d. Install the grease fitting.

9.4.1 Grease Fitting Locations

Item	Location	Frequency	Number of Locations
1	Rotor-shaft bearings	50 hours or annually	2
2	Wheel bearings	50 hours or annually	2

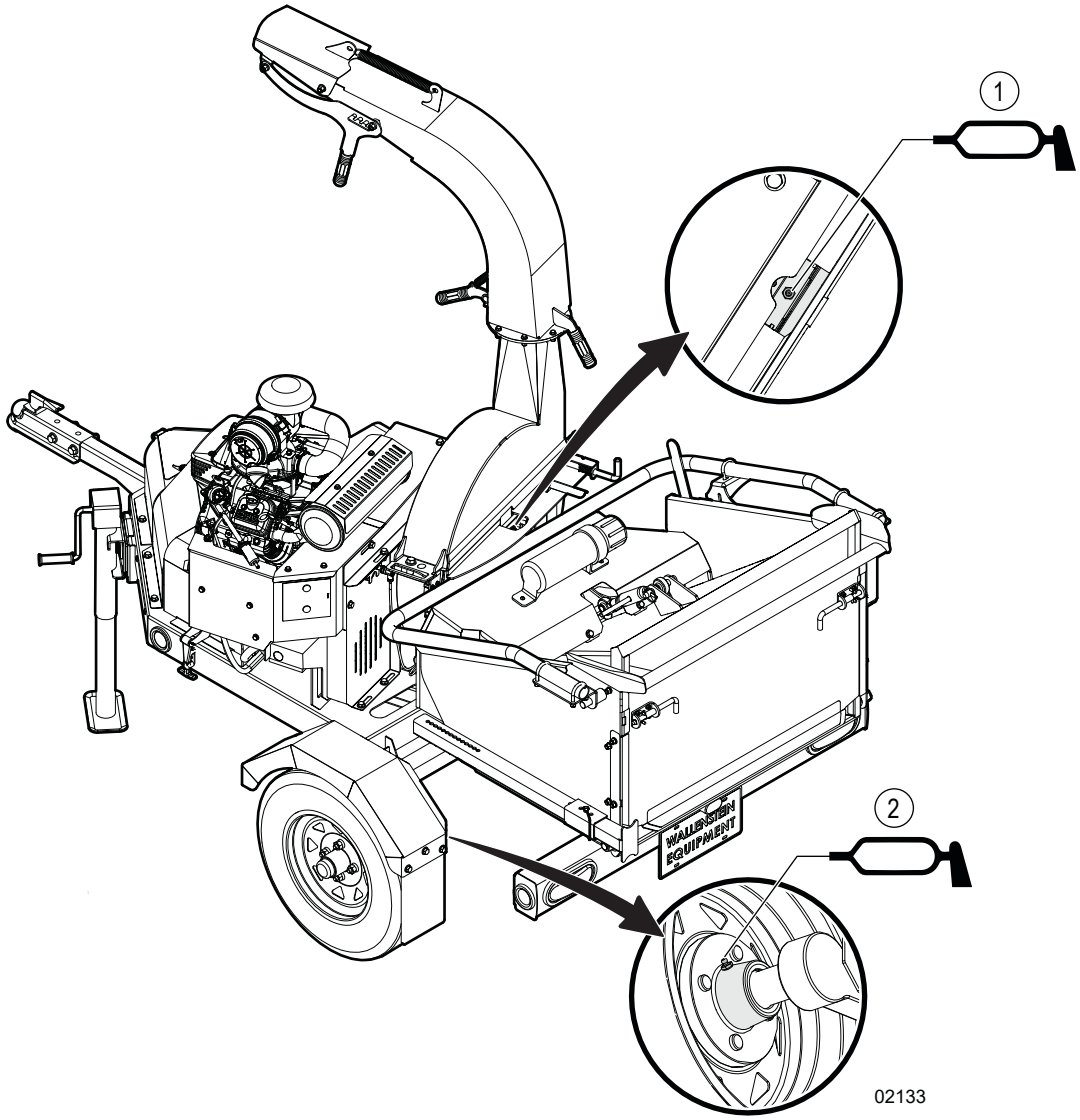


Figure 43– Grease fitting locations - left side

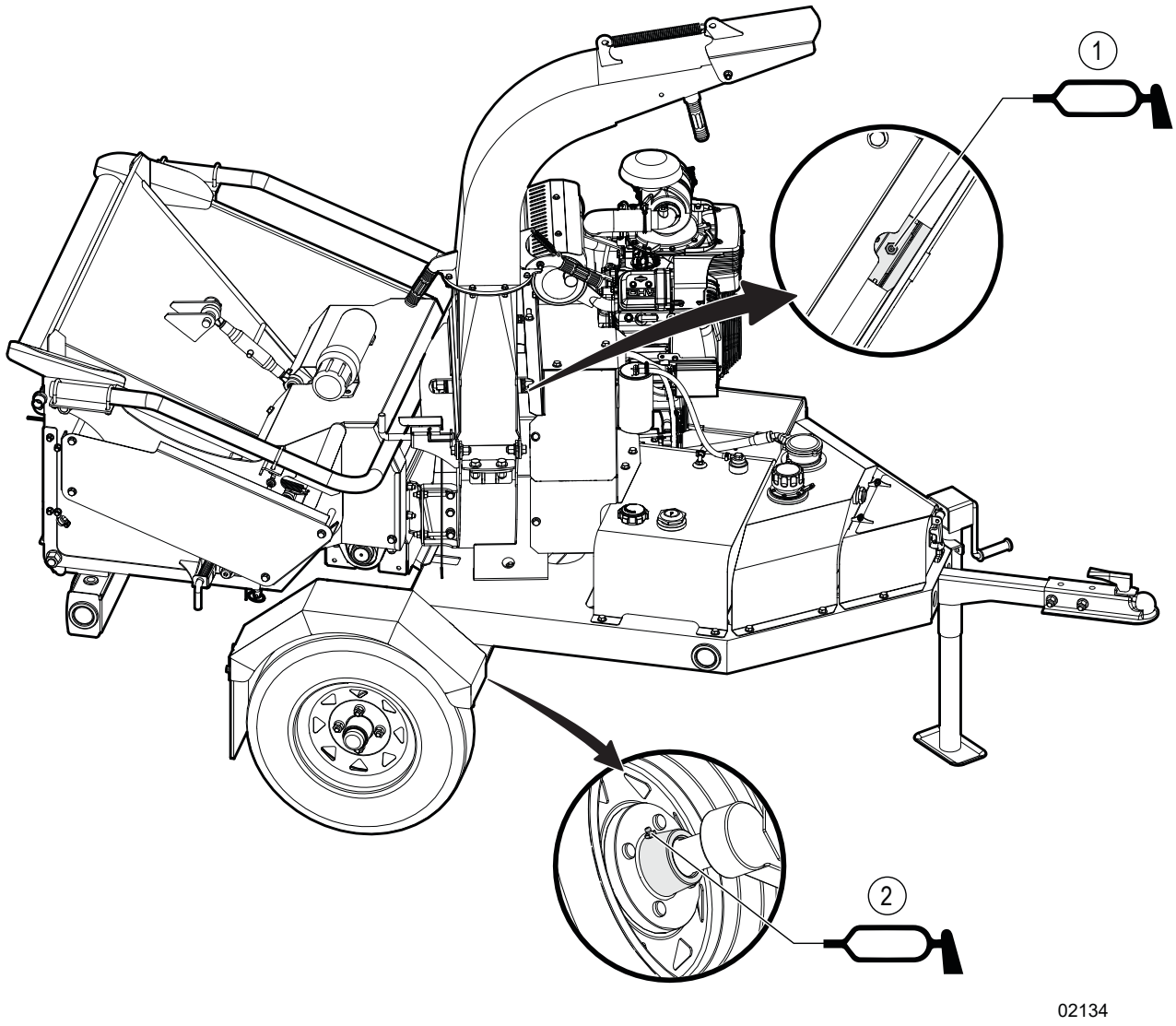


Figure 44–Grease fitting locations - right side

9.4.2 Hinge and Pivot Point Locations

Item	Location	Frequency	Number of Locations
1	Discharge chute and hood deflector	50 hours or annually	2
2	Upper rotor housing and access cover hinges	50 hours or annually	2
3	Roller-feed control bar linkage	50 hours or annually	2
4	Feed table hinges	50 hours or annually	2
5	Trailer jack and hitch coupler	50 hours or annually	2

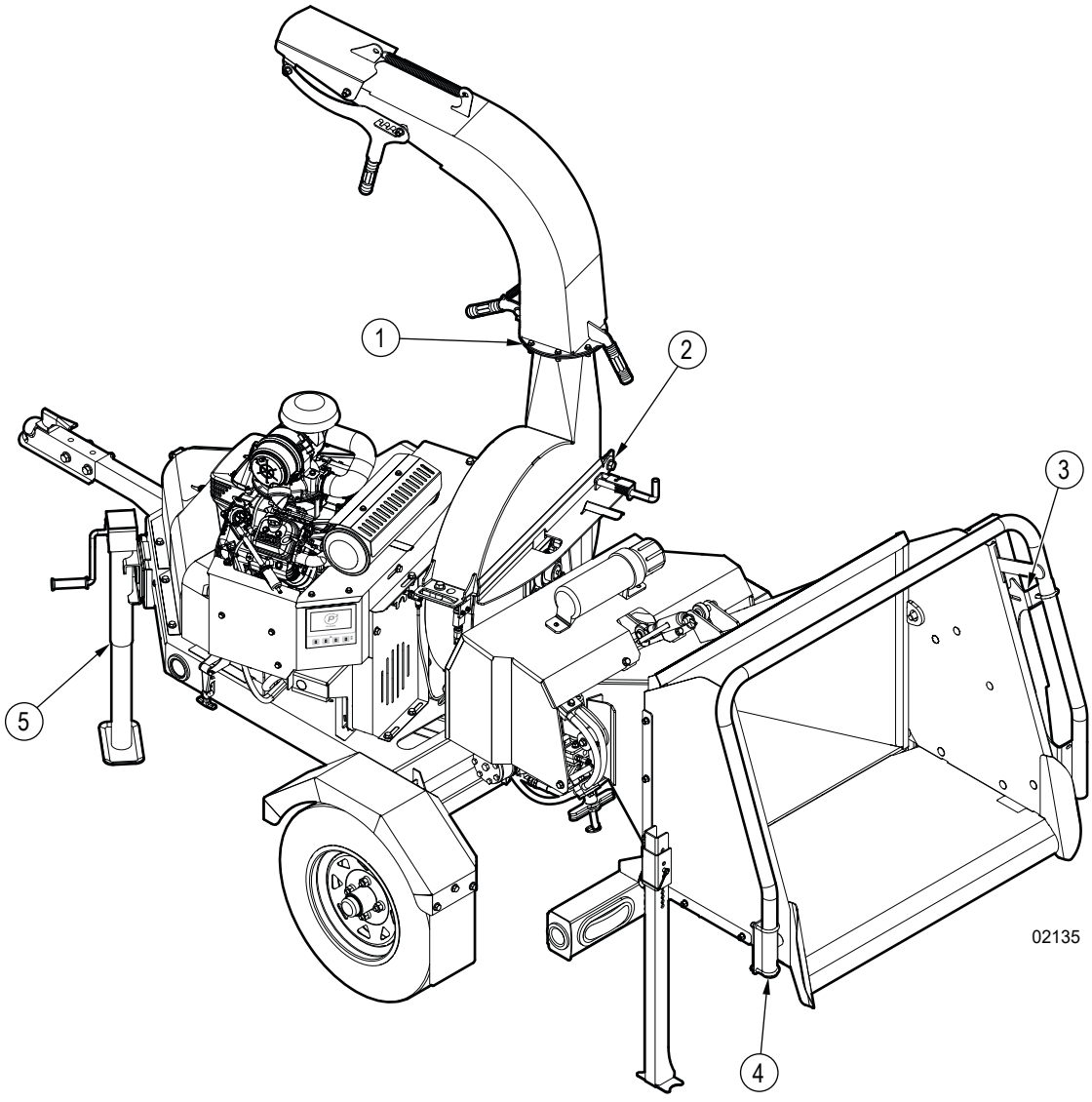


Figure 45–Hinge and pivot point greasing locations

9.5 Hydraulic System Maintenance

The hydraulic system controls the roller feed assembly.

9.5.1 Hydraulic System Maintenance Safety

CAUTION!

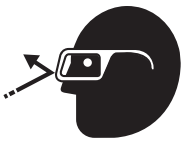
Risk of burns to exposed skin. Hydraulic fluid gets hot during operation, which makes hoses, lines, and other parts hot as well. Wait for the fluid and components to cool before starting maintenance or service.

IMPORTANT! Optimal hydraulic fluid temperatures are between 120° F and 140° F (50° C and 60° C). If the hydraulic fluid temperature is higher than 180° F (82° C), it can cause seal damage and degrade the hydraulic fluid. High hydraulic fluid temperatures often indicate that there is a problem.

For more information, see *Hydraulic System Operation Safety on page 42.*

- Make sure that all hydraulic system components are kept clean and in working condition.
- Relieve pressure on the hydraulic system before working with it. The hydraulic system operates under extremely high pressure.
- Before applying pressure to the hydraulic system, make sure that all the connections are tight, and the hoses and fittings are not damaged.
- Replace hydraulic hoses that show signs of swelling, wear, leaks, or damage. A swollen, worn, damaged, or leaking hose can burst and cause a hazardous and unsafe condition.
  For more information, see *Hydraulic Hose Specifications on page 86*.
- High-pressure hydraulic oil leaks:
  - Do not use your hand to check for hydraulic fluid leaks. Hydraulic fluid that leaks under pressure can penetrate the skin and cause serious injury or death. Use a piece of cardboard, wood, or plastic to check for leaks. Put on heavy gloves.

  - Put on the correct eye protection when doing an inspection for a high-pressure hydraulic leak.



  - Get medical attention immediately if you are injured by a concentrated high-pressure stream of hydraulic fluid. Serious infection or a toxic reaction can occur after hydraulic fluid pierces the skin.
- Do not make any temporary repairs to the hydraulic hoses or fittings. Do not use tape, clamps, or cements to attempt a repair. This can cause sudden failure and create a hazardous and unsafe condition.
- Do not bend or strike high-pressure hoses or reinstall them in a bent or damaged condition.
- Make sure that hydraulic hoses are routed to avoid chafing.
- Never adjust a pressure relief valve or other pressure-limiting device to a pressure that is higher than the specified rating.

9.5.2 Change the Hydraulic Fluid and Filter

CAUTION!

Risk of burns to exposed skin. Hydraulic fluid gets hot during operation, which makes hoses, lines, and other parts hot as well. Wait for the fluid and components to cool before starting maintenance or service.

Change the hydraulic fluid and filter every 100 hours of operation or annually.

For replacement filter information, contact your local Wallenstein Equipment dealer or distributor.

Wait for the machine to cool before changing the hydraulic fluid. However, it is best to change the fluid while the machine is warm to keep any contaminants in suspension.

The hydraulic fluid filter is located on top of the hydraulic fluid reservoir.

The drain plug is located on the bottom of the machine, on the left side of the trailer tongue. The drain plug must be removed to fully drain the fluid.

1. Set the machine to a safe condition.
   For instructions, *Safe Condition on page 9.*
2. Put a drain pan under the drain plug.
   Make sure that the drain pan is large enough to collect and contain the hydraulic fluid that drains from the reservoir.

3. Clean the area around drain and remove the drain plug.
   See *Figure 46*.
4. Wait for the hydraulic fluid to fully drain from the reservoir.
5. Have a drain pan ready to catch any fluid that drips from the filter.
6. Remove the three screws from the filter cover, and then remove the cover.
   See *Figure 47*.
7. Remove the filter element.
8. Clean the bottom of the filter bowl.
9. Check the O-rings for damage. Replace damaged O-rings, if necessary.
10. Install a new filter element.
11. Install the filter cover, and then tighten the screws to **9 lbf•in (12 N•m)**.
12. Install the drain plug.
13. Fill the reservoir to the correct level (fill the bottom half of the sight glass) with Dexron III ATF or an acceptable substitute. **The reservoir capacity is 7 US gal (30 L)**.
    For more information, see *Add Hydraulic Fluid to the Reservoir on page 43.*
14. Start the machine.
    For instructions, see *Start the Machine on page 43.*
15. Operate the roller-feed control for 1–2 minutes to remove air from the hydraulic system.
16. Stop the machine.
    For instructions, see *Stop the Machine on page 44.*
17. Check the hydraulic fluid level. Add fluid, if necessary.
18. Safely discard the used hydraulic fluid.

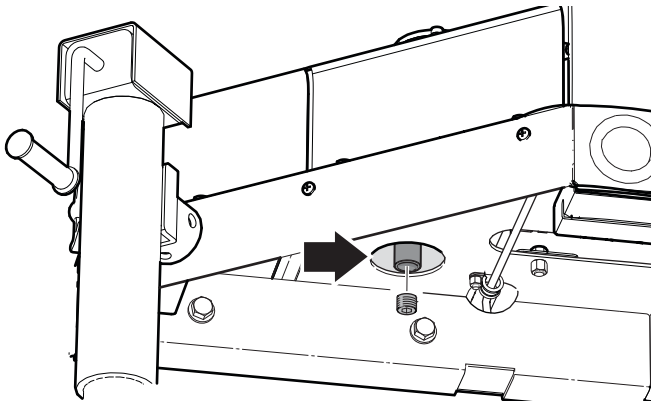


Figure 46–Hydraulic-fluid reservoir drain-plug location

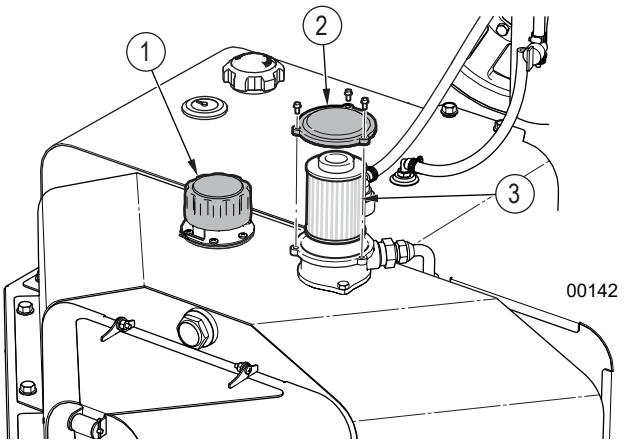


Figure 47–Hydraulic fluid fill cap and filter

1. Filter element
2. Filter cover
3. Reservoir fill cap

9.6 Engine Maintenance

For full engine maintenance information, see the engine manufacturer's manual.

9.6.1 Engine Maintenance Safety

WARNING!

Never operate the engine indoors. Park the machine outdoors in a position where the prevailing winds blow the exhaust away from you.

Engine exhaust contains carbon monoxide (CO) that can quickly accumulate to a dangerous level. Carbon monoxide can cause illness, unconsciousness, or death.

W072

WARNING!

Keep the end of a disconnected battery cable away from the battery. Electricity can arc from the battery to the end of a battery cable and cause the battery to explode. An explosion can cause serious injury or death from heat, impact, and chemical hazards.

For more information, see *Engine Operation Safety on page 38.*

- Remove the wire from the spark plug before servicing the engine or equipment to prevent the engine from starting.
- Examine the muffler on a regular basis to make sure that it operates effectively. Repair or replace a worn or leaking muffler.
- Before storage, replace fuel that contains ethanol with an alkylate or appropriate engineered fuel to prevent the buildup of deposits.
- Check the fuel lines and fittings frequently for cracks or leaks. Replace damaged fuel lines or fittings, if necessary.
- Store fuel away from all wood material.
- Do not check for a spark with the spark plug or spark plug wire removed.
- Do not hit the flywheel with a hard object or metal tool. This can cause the flywheel to shatter during operation. Use the correct tools to service the engine.
- Do not touch a hot muffler, cylinder, or fins. Contact can cause burns.

9.6.2 Electronic Fuel Management System Maintenance Safety

The engine has an electronic fuel management (EFM) system that monitors the engine speed, temperature, and battery voltage. The EFM system cannot be adjusted.

For more information, see *Electronic Fuel Management System Operation Safety on page 39.*

- Never start the engine if the battery cables are loose.
- Turn the key to the OFF position or remove the starter switch before disconnecting, removing and/or installing the battery.
- Never use a battery charger to start the engine.
- Never disconnect the battery cables while the engine is running.
- When connecting the battery cables, first connect the positive (+) cable and then connect the negative (-) cable to the battery.
- When charging the battery, turn the ignition switch to the off position and disconnect the negative (-) battery cable from the battery.
- Do not spray water directly on the Electronic Control Unit.

9.6.3 Clean the Engine Air Filter

IMPORTANT! Operating the engine without an air filter, or with a damaged air filter, can let dirt into the engine and cause rapid engine wear. This type of damage is not covered by warranty.

Clean the air filter after every 100 hours of operation or annually.

A dirty air filter can restrict air flow to the engine and decrease the engine performance. If the engine is operated in very dusty areas, clean the air filter more often than specified.

1. Open the two air-filter cover latches.
2. Remove the cover.
3. Remove the air filter.
4. Gently tap the air filter on a hard surface to loosen and remove dust and debris.
5. If the air filter is excessively dirty or damaged, replace it with a new air filter.
6. Install the air filter in the engine.
7. Install the cover.
8. Close the two air-filter cover latches.

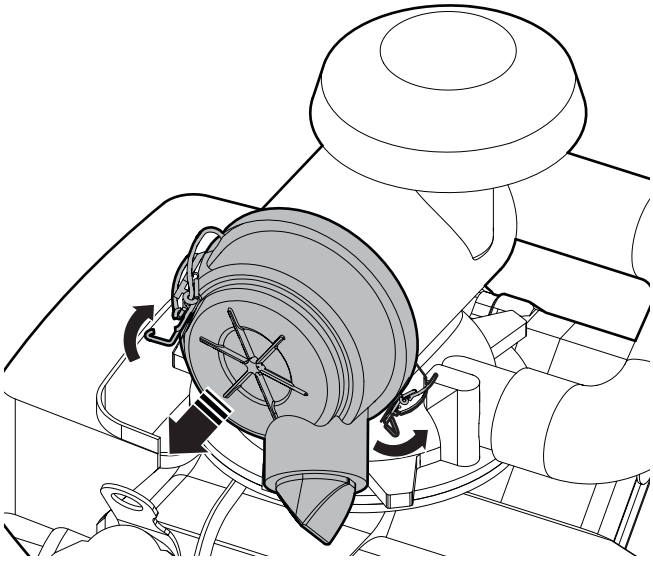


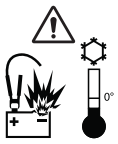
Figure 48–Remove the air-filter cover

9.7 Battery Maintenance

For more information, see *Electronic Fuel Management System Operation Safety on page 39.*

9.7.1 Battery Safety

⚠ WARNING!



Charging a frozen battery can cause it to explode. Warm the battery to 60 °F (16 °C) before charging.

W030

⚠ CAUTION!

Risk of explosion or fire! Do not let metal objects come in contact with the battery terminals. Arcing can cause a fire or explosion. Cover terminals if working near batteries.

W021

⚠ CAUTION!

Risk of burns! Battery electrolyte is extremely corrosive and poisonous. Contact with the eyes, skin, or clothing can result in severe burns or other serious personal injury. If contact occurs seek medical attention immediately. Handle batteries carefully.

W020

⚠ CAUTION!

Battery posts, terminals and related accessories contain lead and lead compounds. These chemicals are known to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

W031

⚠ WARNING!

Keep the end of a disconnected battery cable away from the battery. Electricity can arc from the battery to the end of a battery cable and cause the battery to explode. An explosion can cause serious injury or death from heat, impact, and chemical hazards.

- Never jump-start a frozen battery. The battery can explode.
- Wear gloves and safety glasses or a face shield when working on or near a battery.
- Use a battery carrier to lift the battery or put your hands on the opposite corners to avoid spilling acid into the vents.
- Avoid contact with battery electrolyte:
  - **External contact:** immediately flush the area with water.
  - **Eye contact:** flush the eyes with water for 15 minutes. Get urgent medical attention. Immediately remove any spilled electrolyte.
- Avoid contact with the battery posts, terminals, and related accessories. They contain lead and lead compound chemicals that are known to cause harm if they are ingested.
- Clean your hands immediately after handling a battery.
- Keep all sparks and flames away from batteries. Gases from electrolyte are explosive.
- Avoid injury from a spark or short circuit. Disconnect the battery ground cable before servicing any part of an electrical system.

9.7.2 Remove the Battery

1. Disconnect the battery cable from the negative (–) battery terminal.
2. Disconnect the battery cable from the positive (+) battery terminal.
3. Remove the battery hold-down bracket.
4. Remove the battery from the machine.

9.7.3 Install the Battery

1. Put the battery on the machine.
2. Install the battery hold-down bracket.
   Make sure that the battery cannot move.
3. Connect the positive (+) battery cable (usually red) to the positive (+) battery terminal.
4. Connect the then negative (–) battery cable (usually black) to the negative (–) battery terminal.
5. Apply a coat of dielectric grease or petroleum jelly to each battery terminal.

9.7.4 Clean the Battery

When the battery cable ends are not connected to the battery terminals, keep them away from the battery.

1. Disconnect the battery cable from the negative (–) battery terminal.
2. Disconnect the battery cable from the positive (+) battery terminal.
3. Coat the battery terminals and battery-cable ends with baking soda.
4. Pour a small amount of water over the baking soda.
5. Use a wire brush to clean the battery cable ends and the terminals.
6. Rinse the battery cable ends and terminals with clean water.
7. Wait until all of the water evaporates or use compressed air to remove the water. Make sure that the battery cable ends and terminals are fully dry before connecting them.
8. Connect the positive (+) battery cable (usually red) to the positive (+) battery terminal.
9. Connect the negative (–) battery cable (usually black) to the negative (–) battery terminal.
10. Apply a coat of dielectric grease or petroleum jelly to each battery terminal.

9.7.5 Charge the Battery

IMPORTANT! Do not fast charge the battery. Use a battery charger that is between 4 A and 7.5 A. Never use a charger that is higher than 10 A.

Always read and follow the information that is provided with the battery and the battery charger. For more information and instructions, contact the battery manufacturer and battery charger manufacturer.

1. Remove the battery from the machine.
   For instructions, see *Remove the Battery*.
2. Use a battery carrier or put your hands on opposite corners to lift the battery out of the machine.
   Keep the battery level to avoid spilling battery acid through the vents.
3. Put the battery in a dry, cool place that is away from activity and has good air flow.
4. Use a battery charger to charge the battery.
   For instructions, see the battery charger manufacturer information.

9.8 Drive Belt Maintenance

⚠ WARNING!

Wait for hot machine components to cool before you work on the machine. Hot machine components can cause serious burns or start a fire. Do not touch hot machine components. Use a no-touch thermometer to measure the temperature.

⚠ WARNING!

Never operate a machine with any guards or shields removed. The machine is shown here with guards and/or shields removed for illustrative purposes only.

W001

The machine has a clutch mounted on the engine shaft that drives the rotor sheave and the hydraulic pump. When a drive belt is loose or damaged, the machine operation is affected. Therefore, it is important to examine the drive belt condition and tension on a regular basis. Replace a drive belt that is damaged.

9.8.1 Replace the Hydraulic Pump Drive Belt

1. Remove the lower drive-belt guard fasteners and the guard. See *Figure 49.*
2. Loosen, but do not remove the fasteners on the hydraulic pump mount plate. See *Figure 50.*
3. Use the drive-belt tensioning bolt to remove tension from the drive belt. See *Figure 51 on page 69.*
4. Remove the hydraulic pump drive belt.
5. Do one of the following:
   - If it is necessary to replace the rotor drive belt, replace the rotor drive belt.
     For instructions, see *Replace the Rotor Drive Belt on page 70.*
   - If it is not necessary to replace the rotor drive belt, continue with the following steps.
6. Install a new hydraulic pump drive belt on the hydraulic pump sheave and the clutch flywheel.
7. Set the hydraulic pump drive belt tension.
   For instructions, see *Set the Hydraulic Pump Drive Belt Tension on page 69.*
8. Align the rotor drive belt.
   For instructions, see *Align the Rotor Drive Belt on page 72.*
9. Check the rotor drive belt tension.
   For instructions, see *Set the Rotor Drive Belt Tension on page 71.*
10. Install the lower drive-belt guard fasteners and the guard.
11. Set the clutch RPM sensor position.
    For instructions, see *Set the Clutch RPM Sensor Position on page 79.*
12. Use a calibrated torque wrench to torque the bolts to **33 lbf•ft (45 N•m)**.

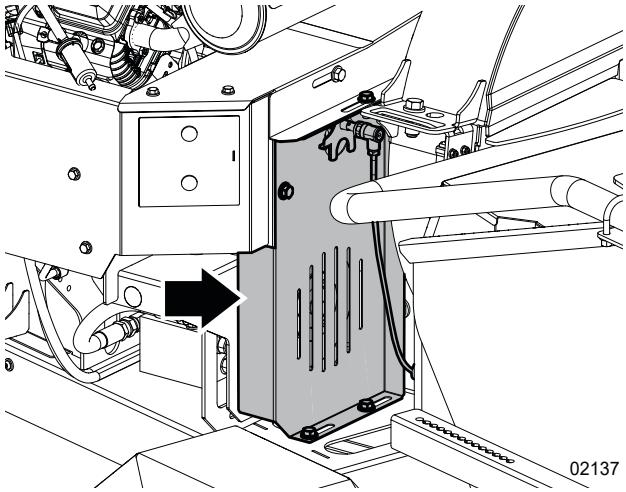


Figure 49–Lower drive-belt guard

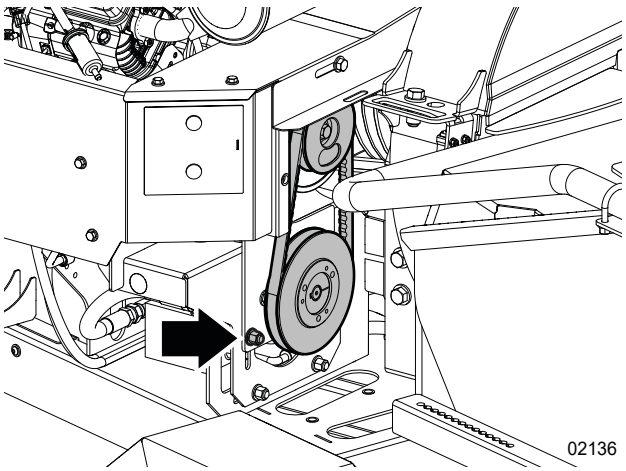


Figure 50–Hydraulic pump mount plate fasteners

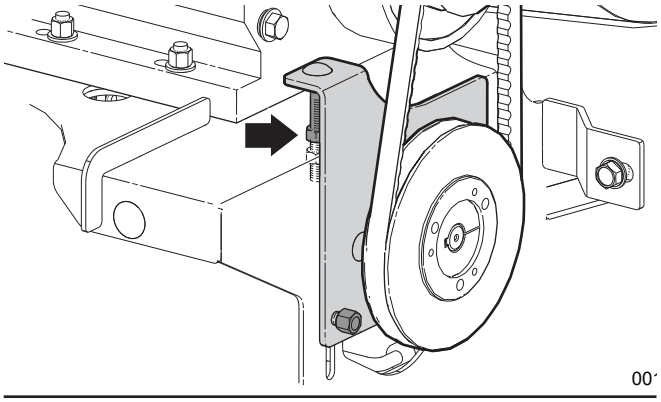


Figure 51 – Belt-tensioning bolt

9.8.2 Set the Hydraulic Pump Drive Belt Tension

A drive-belt tension gauge, ruler, or tape measure is necessary for this procedure. A drive-belt tension gauge is the most accurate tool.

Check the hydraulic pump drive belt tension after every 50 hours of operation.

1. Press on the side of the hydraulic pump drive belt and measure the distance it moves. See *Figure 52.*
2. Do one of the following:
   - If the drive belt movement measures **between 3/8" (10 mm) and 7/16" (12 mm)**, the drive belt tension is correct. You do not need to set the drive belt tension.
   - If the drive belt tension is not correct, continue with the following steps to set the drive belt tension.
3. Loosen the fasteners on the hydraulic pump mounting plate. See *Figure 50 on page 68.*
4. Use the drive-belt tensioning bolt to set the drive belt tension. See *Figure 51.*
5. Do steps 1, 2, and 4 again, until the hydraulic pump drive belt tension is correct.
6. Tighten the hydraulic pump mounting plate fasteners.
7. Do step 1 again.
8. Do one of the following:
   - If the belt alignment is correct, continue with step 9.
   - If the belt tension is not correct, do steps 3 through 7 again.
9. Use a calibrated torque wrench to torque the hydraulic pump mounting plate fasteners to **33 lbf•ft (45 N•m)**.
10. Check the hydraulic pump drive-belt tension after 10 hours of operation.

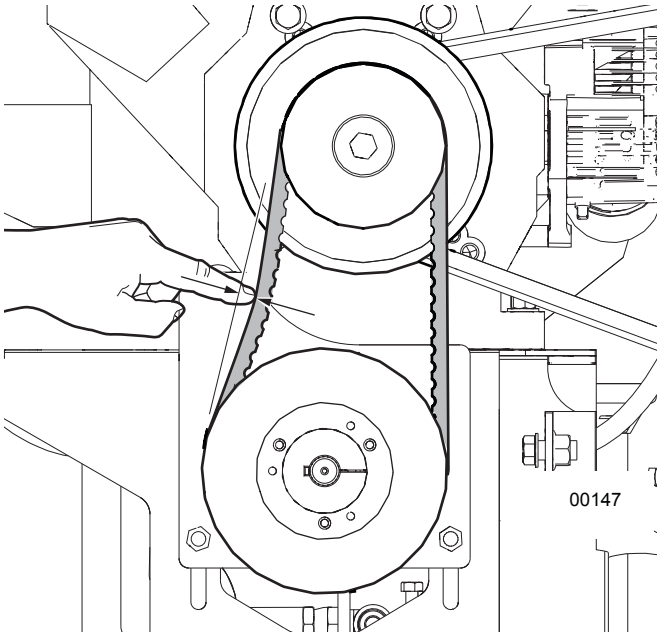


Figure 52 – Check the hydraulic pump drive belt tension

9.8.3 Replace the Rotor Drive Belt

IMPORTANT! After the rotor drive belt is replaced, set the belt tension and make sure that the alignment is correct.

1. Remove the upper and lower drive-belt guard fasteners and the guards. See *Figure 53.*
2. Remove the hydraulic pump drive belt.
   For instructions, see *Replace the Hydraulic Pump Drive Belt on page 68.*
3. Loosen (do not remove) the four bolts that attach the engine mount to the machine frame. See *Figure 55 on page 71.*
4. Use the drive-belt tensioning bolt to remove tension from the rotor drive belt. See *Figure 51 on page 69*.
5. Remove the rotor drive belt.
6. Install a new drive belt on the rotor sheave and the clutch flywheel.
7. Align the rotor drive belt.
   For instructions, see *Align the Rotor Drive Belt on page 72.*
8. Set the rotor drive belt tension.
   For instructions, see *Set the Rotor Drive Belt Tension on page 71.*
9. Install the hydraulic pump drive belt
   For instructions, see *Replace the Hydraulic Pump Drive Belt on page 68.*
10. Set the hydraulic pump drive belt tension.
    For instructions, see *Set the Hydraulic Pump Drive Belt Tension on page 69.*
11. Install the upper and lower drive-belt guards and fasteners.
12. Set the clutch RPM sensor position.
    For instructions, see *Set the Clutch RPM Sensor Position on page 79.*
13. Use a calibrated torque wrench to torque the bolts to **33 lbf•ft (45 N•m)**.

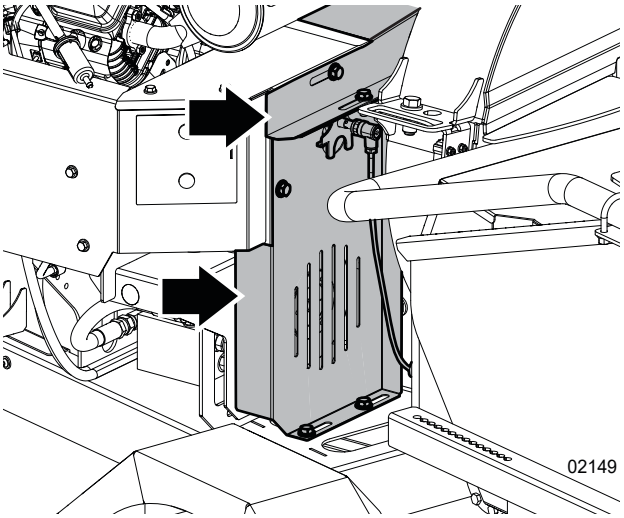


Figure 53–Upper and lower drive belt guards

9.8.4 Set the Rotor Drive Belt Tension

A drive-belt tension gauge, ruler, or tape measure is necessary for this procedure. A drive-belt tension gauge is the most accurate tool.

Check the drive belt tension after every 100 hours of operation.

1. Press on the top centre of the rotor drive belt and measure the distance it moves. See *Figure 54.*
2. Do one of the following:
   - If the drive belt movement measures **between 3/8" (10 mm) and 7/16" (12 mm)**, the drive belt tension is correct. You do not need to set the drive belt tension.
   - If the drive belt tension is not correct, continue with the following steps to set the drive belt tension.
3. Loosen (do not remove) the four bolts that attach the engine mount to the machine frame. See *Figure 55.*
4. Use the drive-belt tensioning bolt to set the drive belt tension. See *Figure 55.*
5. Do steps 1, 2, and 4 again, until the rotor drive belt tension is correct.
6. Tighten the four engine mount bolts.
7. Do step 1 again.
8. Do one of the following:
   - If the belt tension is correct, continue with step 9.
   - If the belt tension is not correct, do steps 3 through 7 again.
9. Align the rotor drive belt.
   For instructions, see *Align the Rotor Drive Belt on page 72.*
10. Use a calibrated torque wrench to torque the four engine mount bolts to **19 lbf•ft (25 N•m)**.
11. Check the drive belt tension again after 10 hours of operation.

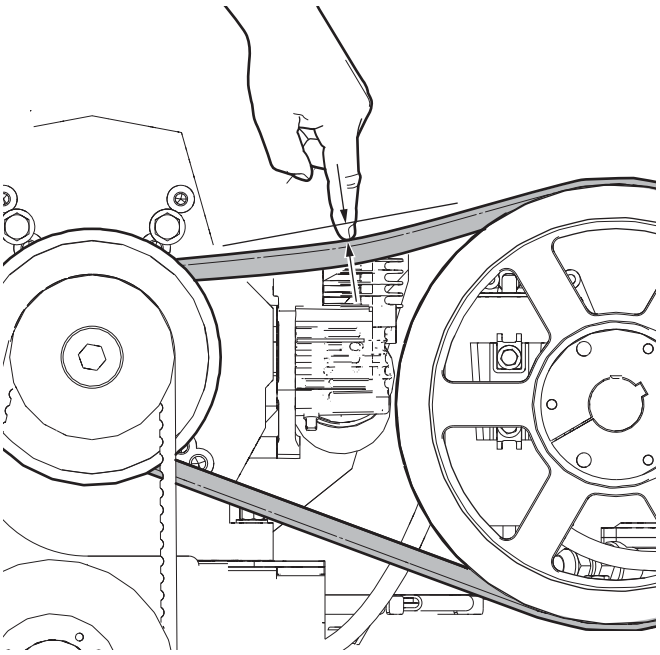


Figure 54–Check the rotor drive belt tension

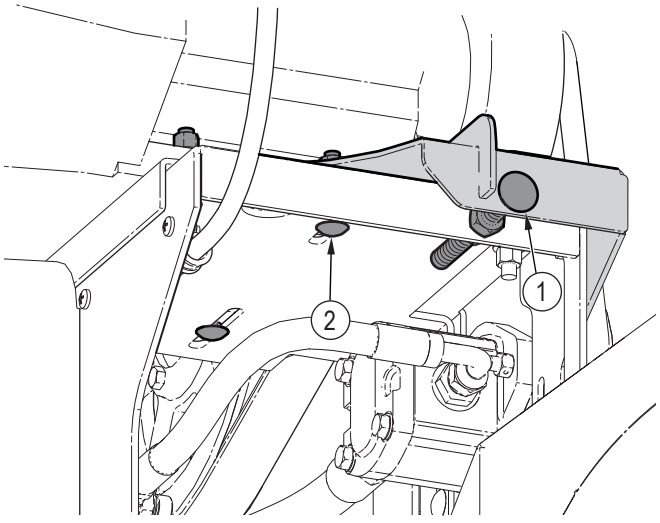


Figure 55–Engine mount

1. Drive-belt tensioning bolt
2. Engine mount bolt

9.8.5 Align the Rotor Drive Belt

A laser alignment tool or 50" (127 cm) straight edge is necessary for this procedure. A laser alignment tool is the most accurate.

Check the drive belt alignment after every 8 hours of operation.

The maximum misalignment is 1/32" (1 mm).

1. Align a laser beam or straight edge (alignment tool) with the back edge of the rotor sheave and the engine clutch. See *Figure 56.*
2. Examine the distance between the drive belt and the alignment tool, along the length of the drive belt.
3. Do one of the following:
   - If the distance between the drive belt and the alignment tool is the same along the length of the drive belt, the drive belt is aligned. The following steps are not necessary.
   - If the distance between the drive belt and the alignment tool are not the same along the length of the drive belt, continue with the following steps to align the drive belt.
4. Measure the distance between the drive belt and the alignment tool at the rotor sheave and at the engine clutch.
5. Subtract the low number from the high number.
6. Do one of the following:
   - If the calculated number is less than or equal to the maximum misalignment, the drive belt is aligned. Do steps 11 and 12 of *Replace the Rotor Drive Belt on page 70.*
   - If the calculated number is more than the maximum misalignment, continue with the following steps to align the drive belt.
7. Find the cause of the misalignment, and then adjust one of the following:
   - The engine mount.
     For instructions, see *Align the Engine Mount.*
   - The rotor sheave.
     For instructions, see *Align the Rotor Sheave on page 73.*

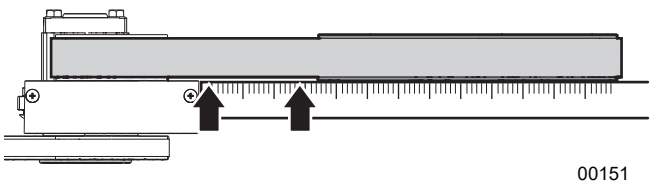


Figure 56–Check the rotor drive belt alignment

9.8.6 Align the Engine Mount

The engine mount can move and cause drive-belt misalignment.

1. Loosen (do not remove) the four engine mount bolts. See *Figure 55 on page 71.*
2. Turn the engine a small amount to adjust the clutch and align the belt.
3. Check the rotor drive belt alignment.
   For instructions, see *Align the Rotor Drive Belt.*
4. Do one of the following:
   - If the belt alignment is correct, continue with step 5.
   - If the belt alignment is not correct, do steps 2 through 4 again.
5. Tighten the four engine mount bolts.
6. Do steps 3 and 4 again.
7. Do one of the following:
   - If the belt alignment is correct, continue with step 8.
   - If the belt alignment is not correct, do steps 1 through 4 again.
8. Use a calibrated torque wrench to torque the four engine mount bolts to **19 lbf•ft (25 N•m)**.
9. Check the rotor drive belt tension.
   For instructions, see *Set the Rotor Drive Belt Tension on page 71.*
10. Set the clutch RPM sensor position.
    For instructions, *Set the Clutch RPM Sensor Position on page 79.*

9.8.7 Align the Rotor Sheave

The rotor sheave can become loose on the shaft and cause drive-belt misalignment.

The numbers in brackets refer to *Figure 57.*

1. Remove the set screw (1) from the sheave (6).
   Put the set screw aside. It is necessary for assembly.
2. Remove the sheave bolts (5).
3. Thread the sheave bolts into the puller holes (4) on the sheave hub (2).
4. In an even pattern, turn each of the bolts clockwise in 1/4 turn increments.
5. Do step 4 until there is space between the sheave hub and the sheave, and they can move on the shaft.
6. Lightly tap the sheave hub with a small rubber mallet to move it on the shaft and align the drive belt.
7. Check the drive belt alignment.
   For instructions, see *Align the Rotor Drive Belt on page 72.*
8. Do one of the following:
   - If the belt alignment is correct, continue with step 9.
   - If the belt alignment is not correct, do steps 6 through 8.
9. Remove the sheave bolts from the puller holes.
   Turn them counterclockwise in 1/4 turn increments.
10. Install the sheave bolts in the sheave hub.
11. Do step 4 until the sheave bolts are tight.
12. Insert, and then tighten the set screw (1).
13. Do step 6 again.
14. Do one of the following:
    - If the belt alignment is correct, continue with step 15.
    - If the belt alignment is not correct, do steps 1 through 14.
15. Use a calibrated torque wrench to torque the three sheave bolts to **19 lbf•ft (25 N•m)**.
16. Check the rotor drive belt tension.
    For instructions, see *Set the Rotor Drive Belt Tension on page 71.*

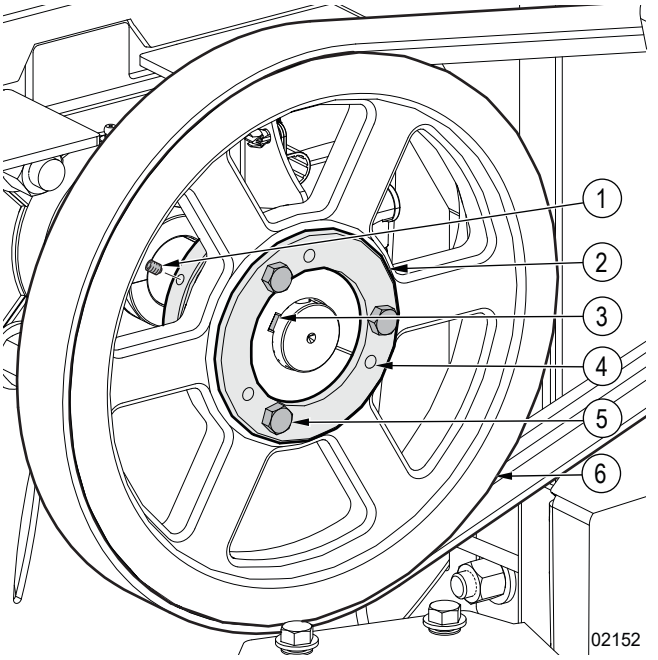


Figure 57 – Rotor sheave

1. Set screw
2. Sheave hub
3. Shaft key
4. Puller holes
5. Sheave bolts
6. Sheave

9.9 Adjust the Upper Roller-Feed Assembly Tension

IMPORTANT! Set the tension on both sides of the rollers equally. To check that the springs are adjusted equally, measure the length of the adjustment threads.

The rollers pull material from the chipper hopper into the rotor, where the material is chipped. The lower roller assembly is fixed and does not move. The upper roller assembly is mounted on hinged pivot arms so that it can move up and down with different sizes of material. Tension from springs on the pivot arms holds the roller down onto the material as it enters the roller-feed assembly.

Make the spring tension tighter for smaller material, and looser for larger material.

If you need to adjust the spring tension, follow this procedure:

1. On the bottom of the machine, use the handles to loosen the nuts on the spring tensioner bolts. See *Figure 58*.
2. Turn the handles to set the spring tension.
   The upper roller should be able to grip material, but also move up and down to allow large material to move through the roller-feed assembly.
3. Use the handles to tighten the nuts on the spring tensioner bolts.

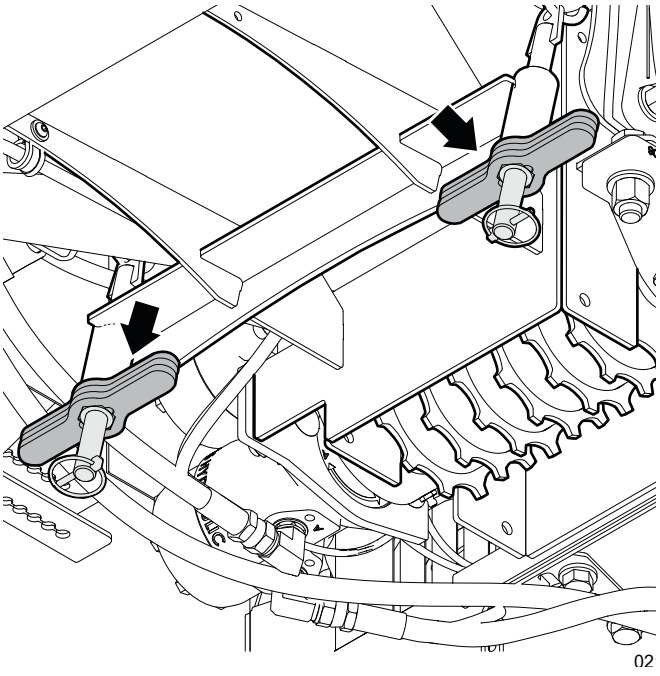


Figure 58–Upper roller-feed assembly spring tensioner bolts

9.10 Rotor Knife Maintenance

WARNING!

Never operate a machine with any guards or shields removed. The machine is shown here with guards and/or shields removed for illustrative purposes only.

W001

CAUTION!

Avoid reaching into the rotor housing. The rotor and ledger knives are very sharp. If it is necessary to reach into the rotor housing, set the machine to a safe condition, wear heavy gloves, and use extreme caution.

W003

There are two offset, evenly-spaced rotor knives attached to the rotor. There is one ledger knife attached to the bottom of the chipper hopper.

9.10.1 Replace a Rotor Knife

1. Stop the engine. Wait for the rotor to stop turning.
   For instructions, see *Stop the Machine on page 44.*
2. Remove the fastener and open the upper rotor housing.
3. Turn the rotor to access one of the rotor knives.
4. Push the rotor lock pin into the rotor to prevent it from turning.
   Make sure that the rotor cannot move.
5. Remove the rotor knife fasteners.
6. Carefully remove the rotor knife.
7. Clean the rotor knife recess.
8. Do one of the following:
   - If the rotor knife has a sharp edge, install the rotor knife with the cutting edge facing toward the ledger knife.
   - If the rotor knife does not have a sharp edge, sharpen or replace the rotor knife.

     For instructions, see *Sharpen a Rotor Knife on page 76.*
9. Apply blue 242 thread locker to the threads of each rotor knife fastener.
10. Put the rotor knife in the recess and install the rotor knife fasteners. See *Figure 59.*
11. Use a calibrated torque wrench to torque the fasteners to **45 lbf•ft (63 N•m)**.
12. Do steps 3 to 11 again for each rotor knife.
13. Release the rotor. Pull out the rotor lock pin.
    Make sure that the rotor can turn freely.
14. Close the upper rotor housing and install the fastener.
15. Use a calibrated torque wrench to torque the fasteners to **80 lbf•ft (110 N•m).**

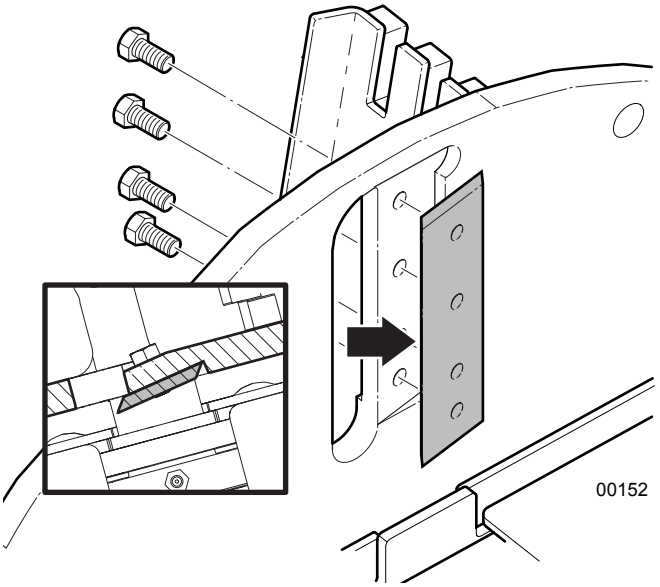


Figure 59–Install a rotor knife

9.10.2 Sharpen a Rotor Knife

CAUTION!

Wear heavy gloves and handle the rotor knives with care. The rotor knives are sharp.

IMPORTANT! If the rotor knife gets hot during sharpening, stop and wait for the rotor knife to cool.

1. Remove the rotor knife from the machine.
   For instructions, see *Replace a Rotor Knife on page 75.*
2. Clean the rotor knife.
3. Examine the rotor knife for damage. If the rotor knife is damaged, replace all the rotor knives.
4. Put the rotor knife in a bench vice with the cutting edge facing up.
   Make sure that the rotor knife is clamped safely in the bench vice.
   Remove the same amount of material from all the rotor knives.
5. Use a grinder to sharpen the cutting edge of the rotor knife. Sharpen the cutting edge to a 45-degree angle.
6. Do steps 4 and 5 for the opposite cutting edge.
7. Do steps 1 to 5 for the remaining rotor knives.

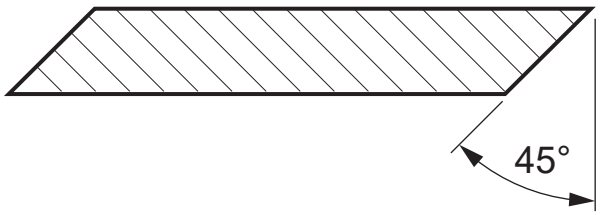


Figure 60–Sharpen rotor knives to a 45° angle

9.11 Ledger Knife Maintenance

WARNING!

Never operate a machine with any guards or shields removed. The machine is shown here with guards and/or shields removed for illustrative purposes only.

W001

CAUTION!

Avoid reaching into the rotor housing. The rotor and ledger knives are very sharp. If it is necessary to reach into the rotor housing, set the machine to a safe condition, wear heavy gloves, and use extreme caution.

W003

9.11.1 Replace a Ledger Knife

1. Stop the engine. Wait for the rotor to stop turning.
   For instructions, see *Stop the Machine on page 44.*
2. Remove the fastener and open the upper rotor housing.
3. Loosen the nuts on the ledger knife adjustment rod. See *Figure 62 on page 77.*
4. Remove the three ledger knife fasteners.
5. Carefully remove the ledger knife.
6. Do one of the following:
   - If the ledger knife has a square (90-degree) edge, install the ledger knife with the square edge pointing toward the rotor knife.
   - If the ledger knife does not have a square edge, sharpen or replace the ledger knife.

     For instructions, see *Sharpen a Ledger Knife on page 77.*
7. Align the ledger knife with the bolt holes in the lower rotor housing.
8. Install the ledger knife fasteners.
9. Set the ledger knife clearance.
   For instructions, see *Set the Ledger Knife Clearance on page 77.*
10. Use a calibrated torque wrench to torque the fasteners to **45 lbf•ft (63 N•m).**
11. Close the upper rotor housing and install the fasteners.
12. Use a calibrated torque wrench to torque the fasteners to **80 lbf•ft (110 N•m).**

9.11.2 Sharpen a Ledger Knife

IMPORTANT! If the ledger knife gets hot during sharpening, stop and wait for the ledger knife to cool.

1. Remove the ledger knife from the machine.
   For instructions, see *Replace a Ledger Knife on page 76.*
2. Clean the ledger knife.
3. Examine the ledger knife for damage. If a ledger knife is damaged, replace the ledger knife.
4. Put the ledger knife in a bench vice with the cutting edge facing up.
   Make sure that the ledger knife is clamped safely in the bench vice.
5. Use a grinder to sharpen the cutting edge of the ledger knife to a 90-degree angle. See *Figure 61.*
6. Do steps 4 and 5 for the opposite cutting edge.

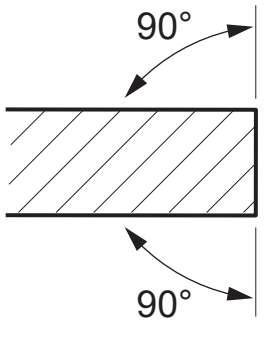


Figure 61 – Sharpen a ledger knife

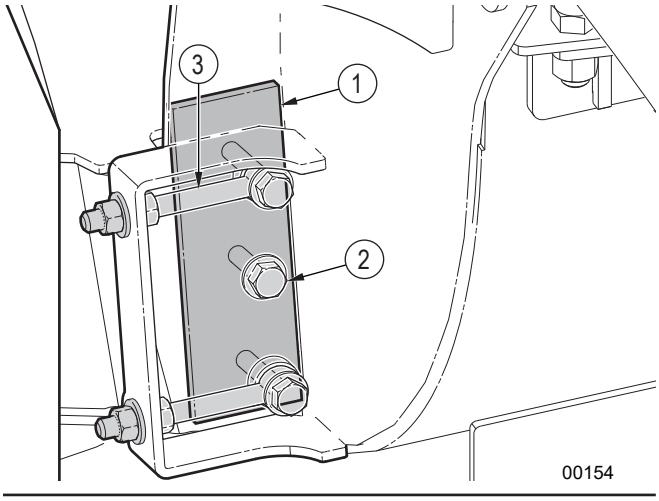


Figure 62 – Ledger knife adjustment assembly

1. Ledger knife
2. Ledger knife fastener
3. Ledger knife adjustment rod

9.11.3 Set the Ledger Knife Clearance

1. Stop the engine. Wait for the rotor to stop turning.
   For instructions, see *Stop the Machine on page 44.*
2. Remove the fastener and open the upper rotor housing.
3. Turn the rotor to align a rotor knife with the ledger knife. Select the rotor knife that has the least space between the rotor knife and the ledger knife.
4. Loosen the ledger knife fasteners.
5. Do one of the following:
   - Insert a ledger knife clearance gauge between the rotor knife and the ledger knife.
     Use the ledger knife adjustment rod to set the position. Tighten or loosen the nuts on the ledger knife adjustment rod until the ledger knife touches the ledger knife clearance gauge.
   - Use the ledger knife adjustment rod to set the position. Tighten or loosen the nuts on the ledger knife adjustment rod to set the clearance between 1/32" and 1/16" (1 mm to 1.5 mm).
6. Tighten the ledger knife fasteners.
7. Use a calibrated torque wrench to torque the fasteners to **45 lbf•ft (63 N•m).**
8. Do one of the following:
   - If you are using a ledger knife clearance gauge, remove it and then put it in the holder.
   - If you are not using a ledger knife clearance gauge, continue with step 9.
9. Close the upper rotor housing and install the fasteners.
10. Use a calibrated torque wrench to torque the fasteners to **80 lbf•ft (110 N•m)**.

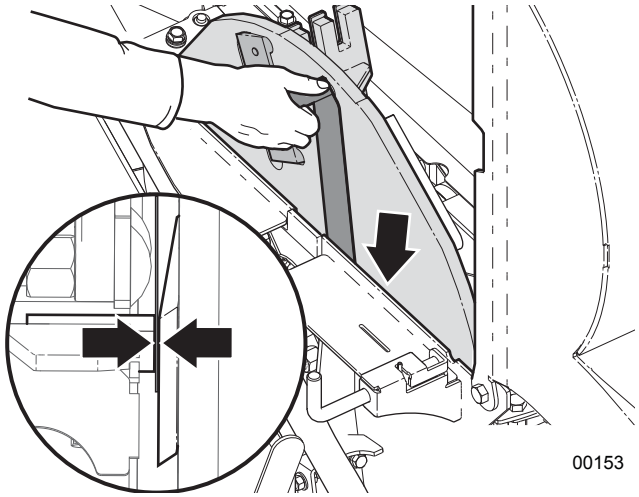


Figure 63 – Check the ledger knife clearance

9.12 Twig Breaker Maintenance

The twig breaker is located on the side of the lower rotor housing. When the rotor turns, the discharge paddles on the rotor push the material to the twig breaker. The twig breaker breaks the material into smaller pieces to make mulch.

Examine the twig breaker for damage on a regular basis. Replace a twig breaker that has cut, broken, or bent teeth.

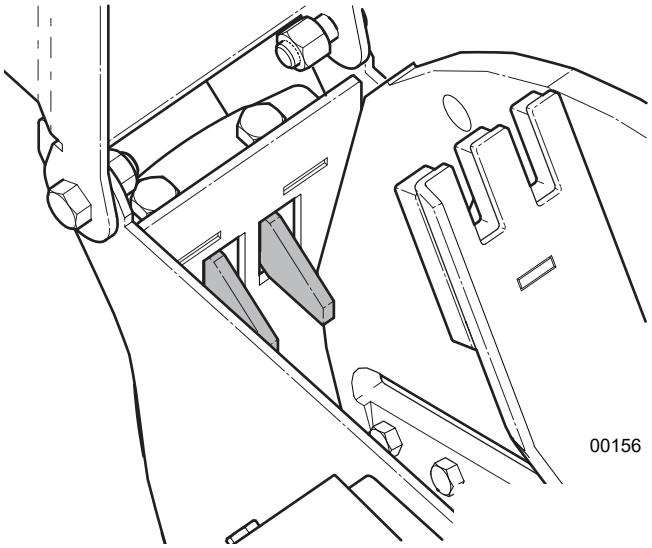


Figure 64– Twig breaker

9.13 Electrical System Maintenance

IMPORTANT! Do not spray water directly on any electrical components, including the engine's EFI electronic control module, P3 Pulse electronic control system components, and electrical cables.

IMPORTANT! Before connecting a wire harness, apply a thin coating of silicone dielectric grease to the wire harness connectors.

IMPORTANT! Remove sensitive electronic components from the machine before welding on the machine. Welding can produce stray voltage spikes that can damage electrical components.

9.13.1 Connect a Wire Harness

1. Remove corrosion or loose particles from the two connectors.
2. Apply a small amount of silicone dielectric grease to the surfaces of each connector where they meet.
   The grease helps to prevent corrosion.
3. Connect the wire harness.
4. Remove any grease that is on the outside of the connectors.

9.13.2 Disconnect Electrical Components

1. Disconnect the machine from the tow vehicle.
2. Disconnect and remove the P3 Pulse controller and indicator panel or display.
3. Disconnect the battery.
   For instructions, see *Remove the Battery on page 67*.
4. Disconnect the engine spark plug.
   Keep the spark plug wire away from the spark plug to prevent an electrical arc.
5. Put the welder ground clamp as close to the work area as possible.
   Keep the welder cables away from the P3 Pulse control system electrical harnesses.

9.13.3 Set the Clutch RPM Sensor Position

IMPORTANT! The sensor must not touch the target. If the sensor touches the target, the target will hit the sensor during operation and damage it.

IMPORTANT! The RPM sensor must not be aligned with the recess in the clutch flywheel. If the RPM sensor is aligned with the recess, the sensor will be positioned too closely to the clutch and could be damaged during operation.

The P3 Pulse control system uses data from the clutch RPM sensor to calculate the engine revolutions per minute (RPM). The sensor face must be a set distance from the target for the sensor to work correctly.

1. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
2. Loosen the nuts on the RPM sensor adjustment bolt and remove the RPM sensor.
3. Clean the sensor.
   Use a clean, soft cloth to remove dirt and debris.
4. On the engine, turn the ignition switch to the **RUN** position.
   For more information, see *Ignition Switch on page 23.*
5. Install the RPM sensor into the lower drive belt guard.
6. Tighten the nuts on the RPM sensor adjustment bolt.
   Stop tightening the sensor when the indicator light turns on.
   The sensor indicator light is on the side of the sensor body.
7. With a flashlight, look through the lower drive belt guard sight hole to make sure that the sensor is not aligned with the recess in the clutch flywheel.
8. If the sensor is aligned with the recess in the clutch flywheel, align the clutch with the RPM sensor.
   a. Remove the upper and lower drive-belt guard fasteners and the guards. See *Figure 53 on page 70.*
   b. Use a rachet to slowly turn the engine clutch bolt.
   c. Turn the flywheel until the recess in the flywheel is below the clutch shaft. See *Figure 67.*
   d. Install the upper and lower drive-belt guard fasteners and the guards.
   e. Use a calibrated torque wrench to torque the bolts to **33 lbf•ft (45 N•m)**.
9. On the engine, turn the ignition switch to the **STOP** position.

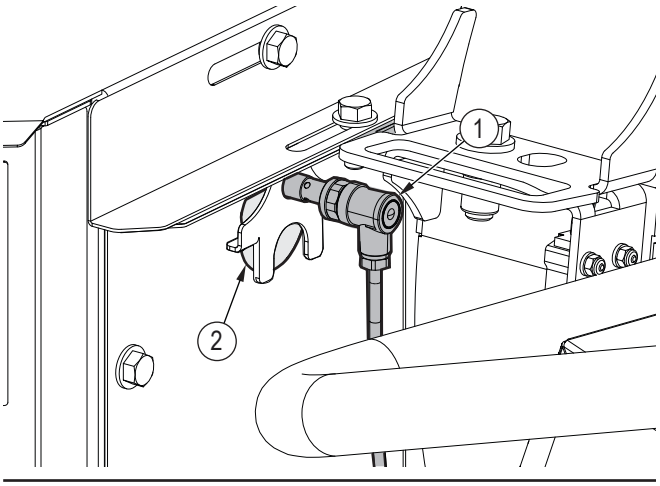


Figure 65– Check the RPM sensor position

1. Clutch RPM sensor
2. Lower drive belt guard sight hole

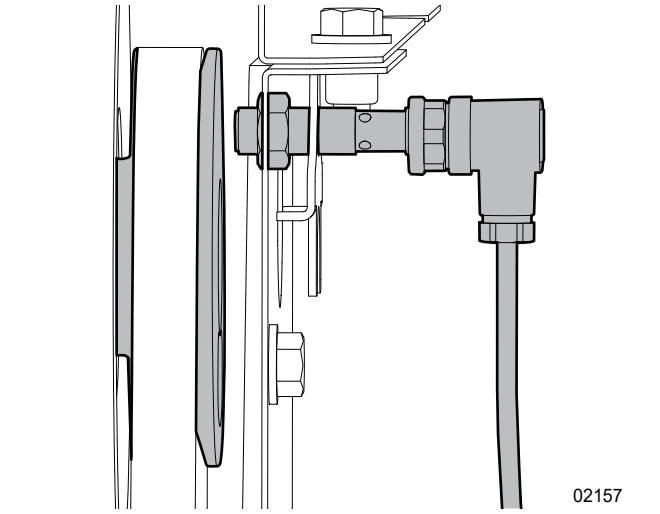


Figure 66– Set the clutch RPM sensor position

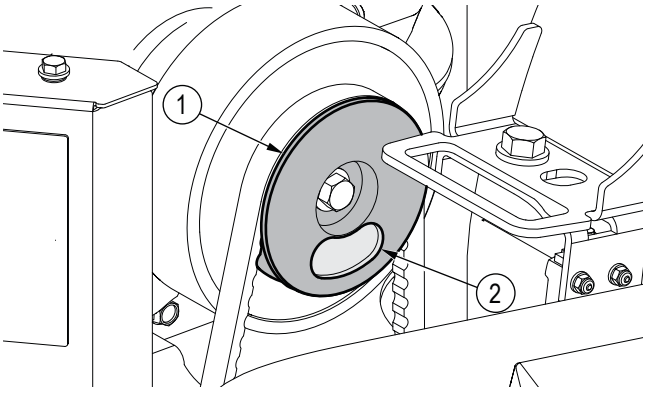


Figure 67– Engine clutch flywheel

1. Engine clutch flywheel
2. Recess

9.13.4 Set the Rotor RPM Sensor Position

IMPORTANT! The sensor must not touch the target. If the sensor touches the target, the target will hit the sensor during operation and damage it.

The P3 Pulse control system uses data from the rotor RPM sensor to calculate the rotor speed. The sensor face must be a set distance from the target for the sensor to work correctly.

1. Set the machine to a safe condition.
   For instructions, see *Safe Condition on page 9.*
2. Remove the upper drive-belt guard bolts and the guard.
3. Clean the rotor RPM sensor.
   Use a clean, soft cloth to remove dirt and debris.
4. Find the indicator tab on the rotor shaft.
   See *Figure 68.*
5. Move the rotor drive belt to turn the rotor shaft until the tab is aligned with the rotor RPM sensor.
6. Put a **0.157" (4.0 mm)** feeler gauge against the bottom of the tab.
7. Adjust the sensor position until the sensor face almost touches the feeler gauge.
8. Remove the feeler gauge.
9. On the engine, turn the ignition switch to the **RUN** position.
   For more information, see *Ignition Switch on page 23*.
10. Check the sensor indicator light to make sure that it is on.
    The sensor indicator light is on the side of the sensor body.
11. Do one of the following:
    - If the sensor indicator light is on, the sensor is in the correct position. Continue with step 11.
    - If the sensor indicator light is off, do steps 2 through 10 again.
12. On the engine, turn the ignition switch to the **STOP** position.
13. Install the upper drive-belt guard and bolts.
14. Use a calibrated torque wrench to torque the bolts to **33 lbf•ft (45 N•m)**.

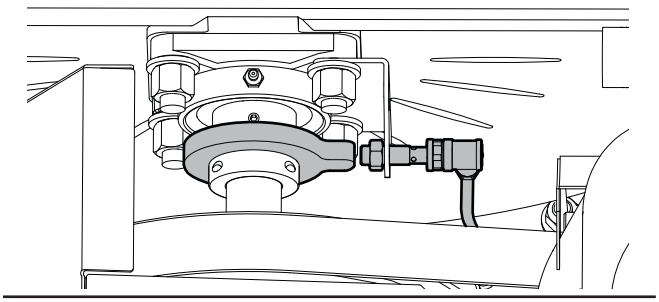


Figure 68–Indicator tab and rotor RPM sensor

9.14 Tire Maintenance and Safety

WARNING!

Failure to follow the proper procedures when mounting a tire on a wheel or rim can produce an explosion, which may result in serious injury or death. Do not attempt to mount a tire unless you have the correct equipment and experience. Have a qualified tire dealer or repair service perform tire maintenance.

IMPORTANT! Replace worn tires with tires that meet the original tire specifications. Never undersize tires.

Check the tire pressure every 100 hours of operation or annually.

- Tighten the wheel lug nuts to the correct torque daily. For torque specifications, see *Lug Nut Torque on page 88*.
- Check the tire pressure before towing the machine on a roadway. See the tire sidewall for the correct pressure.

9.15 Clean the Machine

IMPORTANT! Using harsh chemicals can damage the machine finish. Do not use gasoline, diesel fuel, or thinners for cleaning.

IMPORTANT! A pressure washer can damage the machine's product identification plate and make it unreadable. Do not direct the spray from a pressure washer onto the product identification plate.

IMPORTANT! A pressure washer can damage bearings. Do not direct the spray from a pressure washer directly onto bearings.

IMPORTANT! Do not spray water directly on any electrical components, including the engine's EFM electronic control module, P3 Pulse electronic control system components, and electrical cables.

1. Use a hose or pressure washer and mild detergent to remove dust, dirt, and debris.
2. Use a clean, soft cloth, that is dampened with water to remove dirt from the product identification plate.
3. Start the machine.
   For instructions, see *Check the Hydraulic Fluid Level on page 42*.
4. Let the engine run for a few minutes to dry.
5. Stop the machine.
   For instructions, see *Stop the Machine on page 44*.
6. Apply grease to the areas where the pressure washer possibly removed it.
   For instructions, see *Grease Points on page 59*.

10. Troubleshooting

The following table lists some of the problems that you may encounter, and provides possible causes and solutions.

If you encounter a problem that is difficult to solve, even after reading this information, please contact your local dealer, the distributor, or Wallenstein Equipment. Before you call, please have the serial number for your product handy. To find the serial number on your machine, see *Serial Number Location on page 5*.

Problem	Possible cause	Solution
The rotor does not turn.	The discharge chute is obstructed.	Clear debris from the discharge chute.
	The rotor is blocked.	Clear the blockage. For instructions, see *page 47*.
	The drive belt is loose or broken.	Set the drive belt tension. For instructions, see *page 71*.
	The clutch is seized.	Replace the clutch.
Material is moving into the machine too slowly.	The engine or rotor speed is too slow.	Set the engine throttle to Fast to increase the rotor RPM. See *page 22*.
	The knives are not sharp or the clearance is incorrect.	Check the rotor and ledger knives. Rotate, sharpen, or replace the knives, if necessary. For instructions, see *page 75* and *page 76*.
	The rotor knife angle is incorrect.	Sharpen the rotor knives to the specified 45° angle and check that knives are installed correctly. For instructions, see *page 75*.
	The hydraulic fluid flow is too slow.	Check the hydraulic fluid and filter for dirt, debris, or foam. If necessary, change the hydraulic fluid and filter. For instructions, see *page 63*.
	The discharge chute is obstructed.	Clear all debris from the discharge chute.
	P3 Pulse with optional display: the program settings are incorrect.	Check the P3 Pulse settings. Restore the factory settings, if necessary. For more information, see *page 28*.
There is unusual machine vibration during operation.	A rotor knife is broken or missing.	Check the rotor knives. Rotate, sharpen, or replace the knives, if necessary. For instructions, see *page 75*.
	The rotor may be bent.	Turn the rotor to see if it wobbles. If the rotor wobbles, replace the rotor.
	The rotor bearings failed.	Replace the rotor bearings.
	Fasteners are loose.	Use a calibrated torque wrench to tighten the fasteners to the specified torque. For specifications, see *page 87*.
The engine does not start.	The upper rotor housing is open.	Close the upper rotor housing and install the fastener.. Make sure that the safety-interlock switch cable is connected.
	The safety-interlock switch is dirty, damaged, or misaligned.	Check the safety-interlock switch for dirt, debris, damage, or misalignment. Replace the switch if it is damaged.
	The safety-interlock switch cable harness is damaged.	Inspect the cable harness and connections. Repair or replace the cable harness, if necessary.
	There is a problem with the engine.	See the engine manufacturer's manual.
	The clutch is seized.	Replace the clutch.
The wood chip quality is poor.	The knives are not sharp.	Rotate, sharpen, or replace the knives, if necessary. For instructions, see *page 76* and *page 75*.
	The rotor drive belt is loose or worn.	Inspect the rotor drive belt. Adjust the tension or replace the rotor drive belt, if necessary. For instructions, see *page 68*.
	The material being chipped is poor quality.	The material is small or rotting. Mix the material with higher quality material.
	The ledger knife clearance is incorrect.	Use a ledger-knife clearance gauge to set the correct space. For instructions, see *page 77*.

Problem	Possible cause	Solution
The machine needs excessive power or the engine stalls.	The discharge chute is obstructed.	Clear all debris from the discharge chute.
	Too much material is being put into the chipper hopper.	Place smaller amounts of material in the chipper hopper.
	Material is being put into the chipper hopper too quickly.	Place large material into the chipper hopper slowly.
	The rotor is blocked.	Clear the blockage. For instructions, see *page 47*.
	Wet (green) material does not discharge.	Wait for the material to dry or alternate between dry and wet material.
	The ledger knife clearance is incorrect.	Use a ledger-knife clearance gauge to set the correct space. For instructions, see *page 77*.
	The knives are not sharp or the clearance is incorrect.	Check the rotor and ledger knives. Rotate, sharpen, or replace the knives, if necessary. For instructions, see *page 75* and *page 76*.
	There is a problem with the engine.	See the engine manufacturer's manual.
	P3 Pulse with optional display: the program settings are incorrect.	Check the P3 Pulse settings. Restore the factory settings, if necessary. For more information, see *page 28*.
The drive belt is noisy or there is premature wear.	The drive belt is loose, worn, or the tension is too tight.	Examine the drive belt. Adjust the tension or replace the drive belt, if necessary. For instructions, see *page 68*.
	An incorrect replacement belt was installed.	Replace the drive belt. For instructions, see *page 68*.
	The rotor sheave is misaligned.	Check the rotor sheave alignment. Adjust the alignment, if necessary. For instructions, see *page 73*.
	The rotor is blocked.	Clear the blockage. For instructions, see *page 47*.
	The rotor sheave is worn.	Inspect the rotor sheave and bearings. Replace components, if necessary.
	There is lubricant (for example, oil or grease) on the drive system components.	Find the source of the lubricant and correct the situation. Clean the drive system components. The drive belt may need to be replaced.
	The rotor bearings are worn or damaged.	Inspect the rotor bearings. Replace a worn or damaged bearing.
The roller feed operates intermittently or is not turning.	The roller-feed control bar is set to STOP.	Move the roller-feed control bar to the Forward or Reverse position.
	The engine speed is not at or above the minimum setting.	Set the engine throttle control to Fast for maximum RPM. P3 Pulse with optional display: adjust the settings. For instructions, see *page 30*.
	The P3 Pulse is not receiving a signal from the safety-interlock switch.	Check the safety-interlock switch for dirt, debris, damage, or misalignment. Replace the switch if it is damaged.
		Check the P3 Pulse control unit for an output signal. Replace the control unit if it is damaged or not functioning.
		Check the cable harness and the ground connection. Replace the cable harness if it or the ground connection are damaged.
	The P3 Pulse is not receiving a signal from the RPM sensors.	Check the rotor RPM sensor position. Set the position, if necessary. For instructions, see *page 80.*
		Check the clutch RPM sensor position. Set the position, if necessary. For instructions, see *page 79.*
		The rotor or clutch RPM sensor is dirty. Clean the sensor.
	The hydraulic control valve is not functioning correctly.	Inspect the hydraulic control valve for damage and check the functionality. Replace the valve, if necessary.
	Roller-feed control bar malfunction.	Check roller-feed control bar switches. Replace, reposition pickup trigger.
	The hydraulic fluid flows too slowly.	Check the hydraulic fluid and filter for dirt, debris, or foam. If necessary, change the hydraulic fluid and filter. For instructions, see *page 63*.
	There is no electrical power.	Check the battery and engine charging system. For more information, see the engine manufacturer and battery manufacturer manuals.
	The hydraulic motor is slow.	Check the condition of the hydraulic system, fluid, and motor. Replace if necessary.
	The roller-feed drive key is sheared.	Inspect the roller-feed drive key. Replace the drive key if it is sheared.
	The hydraulic motor is not functioning correctly.	Repair or replace the hydraulic motor.
	P3 Pulse with optional display: the program settings are incorrect.	Check the P3 Pulse settings. Restore factory settings, if necessary. For more information, see *page 28*.

Problem	Possible cause	Solution
The hydraulic fluid is too hot or the hydraulic motor is noisy.	The hydraulic fluid level in the reservoir is too low.	Add hydraulic fluid to the reservoir. For instructions, see *page 43*.
	The hydraulic-fluid filter is dirty.	Change the hydraulic-fluid filter. For instructions, see *page 63*.
	The hydraulic fluid is contaminated.	Check the hydraulic fluid for dirt, debris, or foam. If necessary, change the hydraulic fluid and filter. For instructions, see *page 63*.
	The roller feed is binding.	Inspect the roller-feed bearings. Replace the bearings, if necessary.
	A hydraulic hose is crimped or pinched.	Inspect the hydraulic hoses. Move or replace a hose that is crimped or pinched.
	The hydraulic motor is not functioning correctly.	Repair or replace the hydraulic motor.
	There is a hydraulic fluid leak.	Use a safe method to inspect hydraulic hoses and connections for leaks. Repair or replace damaged hoses and connections, if necessary.
	There is a hydraulic motor leak.	The hydraulic motor seals are worn. Replace the seals or the hydraulic motor.
	The hydraulic motor makes excessive noise when it starts.	The hydraulic fluid temperature is too low. Wait for the machine to warm up before operating it.

11. Specifications

For engine specifications, see the engine manufacturer's manual.

For available accessories, go to WallensteinEquipment.com.

11.1 Machine Specifications[1]

Parameter	BXTR5224
Control system	P3 Pulse
Chipper type	Disc
Feed system	Hydraulic roller feed
Maximum roller feed speed	85 fpm (26 mpm)
Engine	Vanguard® 23 hp (627 cc) EFM
Chipper hopper opening (height x width)	24" x 35" (61 cm x 89 cm)
Rotor housing opening (height x width)	5-1/4" x 9" (13.3 cm x 23 cm)
Number of rotor knives	2
Rotor diameter	25" (64 cm)
Rotor weight	117 lb (53 kg)
Discharge chute height	80" (203 cm)
Discharge chute rotation	270°
Drive system	Centrifugal clutch, dual belt drive
Engine speed	3600
Rotor speed	1340
Tires	5.30-12
Hitch	2" ball coupler
Total weight	1425 lb (646.4 kg)
Dimensions: feed table open (length x height x width)	126" x 80" x 54" (320 cm x 203 cm x 137 cm)
Dimensions: feed table folded (length x height x width)	107" x 80" x 54" (272 cm x 203 cm x 137 cm)
Hydraulic-fluid reservoir capacity	5 US gal (19 L)
Fuel tank capacity	6.5 US gal (25 L)
Capacity: round material (diameter)	5" (13 cm)
Capacity: flat material (width)	9" (23 cm)
Roller feed	Dual, horizontal rollers with a hydraulic drive
Knife material	Hardened tool steel
Roller-feed reach distance (from the rollers to the feed table edge to the ground)	70" (178 cm) (Note: The product design does not comply with WorkSafe BC or OSHA standards. The machine is not intended for commercial use.)
Axle	Full flex axle, 1800 lb x 48" HF
Tongue weight	90 lb (41 kg)

1 Specifications are subject to change without notice.

11.2 Hydraulic Hose Specifications

Hose	Type	Working pressure
High-pressure	SAE 100R17 braided 1/2" (12.5 mm) inside diameter (SAE -8) 3/8" (10 mm) inside diameter (SAE -6)	3,000 psi
Suction line (pump to reservoir)	Tank truck hose 1" (25 mm) inside diameter (SAE -16)	150 psi

11.3 Bolt Torque

IMPORTANT! If you replace hardware, use fasteners of the same grade.

IMPORTANT! The torque specifications in these tables are for non-greased or non-oiled threads. Do not grease or oil fastener threads unless otherwise indicated. When using a thread lock, increase the specified torque 5%.

Bolt grades are identified by the marks on top of the bolt head.

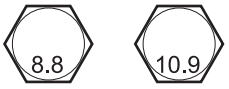
These bolt torque specification tables provide the correct torque settings for common bolts and capscrews. Tighten all bolts to the torque that is specified in the table, unless otherwise indicated. Check the bolt tightness periodically.

Imperial Bolt Torque Specifications

Bolt Diameter	Torque					
	SAE Gr. 2		SAE Gr. 5		SAE Gr. 8	
	lbf•ft	N•m	lbf•ft	N•m	lbf•ft	N•m
1/4 inch	6	8	9	12	12	17
5/16 inch	10	13	19	25	27	36
3/8 inch	20	27	33	45	45	63
7/16 inch	30	41	53	72	75	100
1/2 inch	45	61	80	110	115	155
9/16 inch	60	95	115	155	165	220
5/8 inch	95	128	160	215	220	305
3/4 inch	165	225	290	390	400	540
7/8 inch	170	230	420	570	650	880

Metric Bolt Torque Specifications

Bolt Diameter	Torque			
	Gr. 8.8		Gr. 10.9	
	lbf•ft	N•m	lbf•ft	N•m
M3	0.4	0.5	1.3	1.8
M4	2.2	3	3.3	4.5
M6	7	10	11	15
M8	18	25	26	35
M10	37	50	52	70
M12	66	90	92	125
M14	83	112	116	158
M16	166	225	229	310
M20	321	435	450	610
M30	1,103	1,495	1,550	2,100



11.4 Hydraulic Fitting Torque

Tighten flare-type tube fittings:

1. Check the flare and flare seat for defects that might cause leaks.
2. Align the tube with the fitting before tightening.
3. Hand-tighten the swivel nut until it is snug.
4. To prevent the tube from twisting, use two wrenches. Place one wrench on the connector body and tighten the swivel nut with the second wrench. Torque the fitting to the correct specification.

If a torque wrench is not available, use the flats from finger tight (FFFT) method.

Hydraulic Fitting Torque Specifications

Tube size OD	Hex size across flats	Torque		Flats from finger tight	
Inches	Inches	lbf•ft	N•m	Flats	Turns
3/16	7/16	6	8	2	1/6
1/4	9/16	11–12	15–17	2	1/6
5/16	5/8	14–16	19–22	2	1/6
3/8	11/16	20–22	27–30	1-1/4	1/6
1/2	7/8	44–48	59–65	1	1/6
5/8	1	50–58	68–79	1	1/6
3/4	1-1/4	79–88	107–119	1	1/8
1	1-5/8	117–125	158–170	1	1/8

Specifications are for non-lubricated connections.

11.5 Lug Nut Torque

WARNING!

Wheel lug nuts must be installed and kept at the correct torque to prevent loose wheels, broken studs, or possible separation of a wheel from the axle.

It is an extremely important safety procedure to apply and maintain the correct torque on lug nuts that secure the wheel to the trailer axle. A calibrated torque wrench is the best tool to make sure that the correct amount of torque is applied to a fastener.

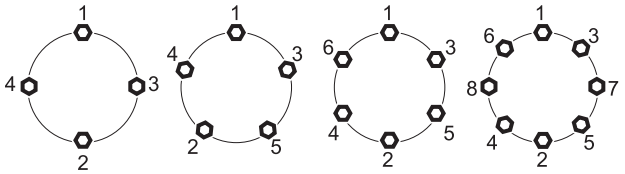
Tighten wheel lug nuts to the correct torque before the first use and after each wheel removal. After a wheel is installed, check and torque the lug nuts after the first 10 miles (16 km), 25 miles (40 km), and 50 miles (80 km). Check the lug nut torque periodically thereafter.

- Start all lug nuts onto the threads by hand.
- Tighten lug nuts in stages, following the pattern shown below the Lug Nut Torque Specifications table.

Lug Nut Torque Specifications

Wheel size	Units	First stage	Second stage	Third stage
8 inch	lbf•ft N•m	12–20 16–26	30–35 39–45.5	45–55 58.5–71.5
12 inch	lbf•ft N•m	20–25 26–32.5	35–40 45.5–52	50–60 65–78
13 inch	lbf•ft N•m	20–25 26–32.5	35–40 45.5–52	50–60 65–78
14 inch	lbf•ft N•m	20–25 26–32.5	50–60 65–78	90–120 117–156
15 inch	lbf•ft N•m	20–25 26–32.5	50–60 65–78	90–120 117–156
16 inch	lbf•ft N•m	20–25 26–32.5	50–60 65–78	90–120 117–156

Lug nut torque pattern:



4 bolts 5 bolts 6 bolts 8 bolts

12. Product Warranty

LIMITED WARRANTY

Wallenstein products are warranted to be free of defects in materials and workmanship under normal use and service, for a period of

Five Years for Consumer Use

Two Years for Commercial/Rental Use

from the date of purchase, when operated and maintained in accordance with the operating and maintenance instructions supplied with the unit. Warranty is limited to the repair of the product and/or replacement of parts.

This warranty is extended only to the original purchaser and is not transferable.

Repairs must be done by an authorized dealer. Products will be returned to the dealer at the customer's expense. Include the original purchase receipt with any claim.

This warranty does not cover the following:

1) Normal maintenance or adjustments
2) Normal replacement of wearable and service parts
3) Consequential damage, indirect damage, or loss of profits
4) Damages resulting from:
   - Misuse, negligence, accident, theft or fire
   - Use of improper or insufficient fuel, fluids or lubricants
   - Use of parts or aftermarket accessories other than genuine Wallenstein parts
   - Modifications, alteration, tampering or improper repair performed by parties other than an authorized dealer
   - Any device or accessories installed by parties other than an authorized dealer
5) Engines. Engines are covered by the manufacturer of the engine for the warranty period they specify. For the details of your engine warranty, see your engine owner's manual. Information about engine warranty and service is also available in the FAQ section at www.wallensteinequipment.com

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