

**ECHO**



[www.bearcatproducts.com](http://www.bearcatproducts.com)

# 8 INCH TURNTABLE CHIPPER

CH8993H - 993cc BRIGGS & STRATTON



PN: 18280-00

Rev. 010111

Companion to 18281-00

VIN Range: 5VJAA0016BW002826 - 5VJAA0012CW003750

**OWNER'S MANUAL**

ENGLISH

ESPAÑOL

FRANÇAIS

# Before You Begin

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## DEAR ECHO BEAR CAT CUSTOMER

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

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

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

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

## PLEASE SEND US YOUR WARRANTY CARD

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

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### FOR MACHINE SERVICE OR PARTS:

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

### FOR ENGINE SERVICE OR PARTS:

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

### ORDERING PARTS

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

#### Provide the following when ordering parts:

- The SERIAL NUMBER OR VIN of your machine.
- The PART NUMBER of the part.
- The PART DESCRIPTION.
- The QUANTITY needed.

## IDENTIFICATION NUMBER LOCATION

Your machine will have either a serial number or vehicle identification number (VIN). VINs are located on the left side of the trailer frame near the hitch. They are 17-digit numbers of the format: 5VJAA001XXWXXXXXX. Serial numbers are located on the machine body. They are 6-digit numbers.

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

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### SERIAL NUMBER OR VIN

#### HOW TO CONTACT ECHO BEAR CAT

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

\*Original Instructions

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## LIMITED WARRANTY

This warranty applies to all ECHO Bear Cat Outdoor Power Equipment manufactured by Crary Industries Inc. Crary Industries warrants to the original owner each new ECHO Bear Cat product to be free from defects in material and workmanship, under normal use and service. The warranty shall extend, from date of purchase, 3 years (U.S. and Canada only (2 years outside U.S. and Canada)) for Consumer use of the product, 1 year for Commercial applications and 6 months for Rental applications.

“Consumer” defined as: complete unit for personal, residential or non-income producing use.

“Commercial” defined as: complete unit for commercial, institutional, property management, agricultural, horticultural or income producing use.

“Rental” defined as: complete unit for rental purposes to produce income.

\*Models SC2170, SC2206 & SC3206 are classified as Consumer grade products and will not qualify for warranty coverage if used for Commercial or Rental purposes.

The product is warranted to the original owner as evidenced by a completed warranty registration on file at Crary Industries. Replacement parts are warranted for (90) days from date of installation.

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

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

1. This warranty applies only to parts or components that are defective in material or workmanship.
2. This warranty does not cover normal wear items including, but not limited to: bearings, belts, pulleys, filters, chipper blades, shredder flails or knives.
3. This warranty does not cover normal maintenance, service or adjustments.
4. This warranty does not cover depreciation or damage due to misuse, negligence, accident or improper maintenance.
5. This warranty does not cover damage due to improper setup, installation or adjustment.
6. This warranty does not cover damage due to unauthorized modifications of the product.
7. Engines are warranted by the respective engine manufacturer and are not covered by this warranty.

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

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

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

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

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

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# 1 SAFETY

## Section

### 1.1 SAFETY ALERT SYMBOL



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

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

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

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

 **DANGER** 

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

 **WARNING** 

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

 **CAUTION** 

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

### 1.2 EMISSION INFORMATION



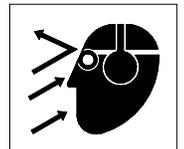
Under California Law and the laws of several other states, you are not permitted to operate an internal combustion engine using hydrocarbon fuels on any forest covered, brush covered or grass covered land or on land covered with grain, hay or other flammable agricultural crops, without an engine spark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

Under California Law and the laws of several other states, you are not permitted to operate an internal combustion engine using hydrocarbon fuels on any forest covered, brush covered or grass covered

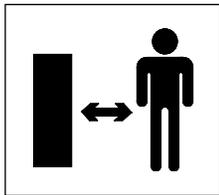
### 1.3 BEFORE OPERATING



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



7. Do not operate this equipment in the vicinity of bystanders. Keep the area of operation clear of all persons, particularly small children. It is recommended that bystanders keep at least 50 feet (15 meters) away from the area of operation.



8. Do not allow children to operate this equipment.
9. Use only in daylight or good artificial light.
10. Do not run this equipment in an enclosed area. Engine exhaust contains carbon monoxide gas, a deadly poison that is odorless, colorless and tasteless. Do not operate this equipment in or near buildings, windows or air conditioners.
11. Always use an approved fuel container. Do not remove gas cap or add fuel when engine is running. Add fuel to a cool engine only.
12. Do not fill fuel tank indoors. Keep open flames, sparks, smoking materials and other sources of combustion away from fuel.
13. Do not operate machine without shields in place. Failure to do so may cause serious injury or death.
14. Keep all guards, deflectors, and shields in good working condition.
15. Before inspecting or servicing any part of this machine, shut off the machine and make sure all moving parts have come to a complete stop. Disconnect the battery and remove the ignition key where applicable.
16. Check that all screws, nuts, bolts, and other fasteners are secured, tightened and in proper working condition before starting the machine.
17. Do not transport or move machine while it is operating or running.

6. The disk will continue to rotate after being disengaged. Shut off the machine and make sure all moving parts have come to a complete stop before inspecting or servicing any part of the machine. Disconnect the battery and remove the ignition key if applicable.
7. Do not insert branches with a diameter larger than the max chipper capacity into machine or machine damage may occur.
8. When feeding material into machine, do not allow metal, rocks, bottles, cans or any other foreign material to be fed into the machine.
9. Ensure debris does not blow into traffic, parked cars, or pedestrians.
10. Keep the machine clear of debris and other accumulations.
11. Do not allow processed material to build up in the discharge area. This may prevent proper discharge and can result in kickback of material through the feed opening.
12. If the machine becomes clogged, the cutting mechanism strikes any foreign object, or the machine starts vibrating or making an unusual noise, shut off machine immediately and make sure all moving parts have come to a complete stop. Disconnect the battery and remove the ignition key if applicable. After the machine stops: A) Inspect for damage, B) Replace or repair any damaged parts, and C) Check for and tighten any loose parts.
13. On electric start models, disconnect cables from battery before doing any inspection or service. Remove key.
14. Check blade bolts for proper torque after every 8 hours of operation. Check blades and rotate or sharpen daily or as required to keep blades sharp. Failure to do so may cause poor performance, damage or personal injury and will void the machine warranty.

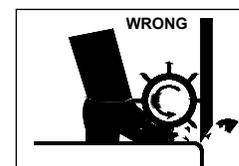
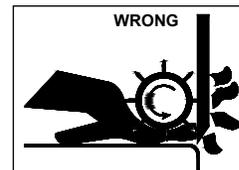
## 1.4 OPERATION SAFETY

1. Always stand clear of discharge area when operating this machine. Keep face and body away from feed and discharge openings.
2. Keep hands and feet out of feed and discharge openings while machine is operating to avoid serious personal injury. Stop and allow machine to come to a complete stop before clearing obstructions.
3. Set up your work site so you are not endangering traffic and the public. Take great care to provide adequate warnings.
4. Do not climb on machine when operating. Keep proper balance and footing at all times.
5. Check cutting chamber to verify it is empty before starting the machine.



## 1.5 FEED ROLLER SAFETY

1. The feed roller can cause serious injury or death. Keep hands, feet and clothing away from the feed roller and chipper disk blades.
2. Never climb onto the feed chute when the unit is operating or running.
3. Do not overreach. Keep proper balance and footing at all times.
4. Never allow anyone to sit on the feed chute.
5. When feeding material into the feed roller wear eye, face and hearing protection.



6. Stand to side of feed chute when feeding material and release material quickly.
7. When inspecting or servicing the feed roller, secure the feed roller in the raised position using the lock pin, if applicable.

## 1.6 MAINTENANCE & STORAGE SAFETY

1. Before inspecting, servicing, storing, or changing an accessory, shut off the machine and make sure all moving parts have come to a complete stop. Disconnect the battery and remove the ignition key where applicable.
2. Replace any missing or unreadable safety decals. Refer to the safety decal section for part numbers.
3. Allow machine to cool before storing in an enclosure.
4. Store the machine out of reach of children and where fuel vapors will not reach an open flame or spark.
5. Never store this machine with fuel in the fuel tank inside a building where fumes may be ignited by an open flame or spark. Ignition sources can be hot water and space heaters, furnaces, clothes dryers, stoves, electric motors, etc.
6. Drain the fuel and dispose of it in a safe manner for storage periods of three months or more.

## 1.7 TOWING SAFETY

1. Position and lock the discharge chute **over the hitch** prior to towing.
2. Insert transport safety pin and clip, and set brake handle to locked position, if applicable.
3. Connect hitch safety chains. Tighten trailer hitch bolts. Do not attempt to tow the trailer if the vehicle is not equipped with a 2" (50 mm) ball.
4. Do not exceed the maximum towing speed indicated on tire sidewall. Inflate tires to manufacturer's specifications as stated on the tire sidewall.
5. Optimum towing performance can be achieved by maintaining a horizontal trailer hitch.
6. Check wheel lug bolts periodically to ensure they are tight and secure.
7. Make sure the jack stand and the rear stabilizer (where applicable) on the trailer are in the UP position during towing. Place the jack stand on a level surface and secure it in the DOWN position before using.
8. Never allow passengers to ride on the machine.
9. If applicable, shut off fuel supply when towing.
10. Towing laws may vary in different countries/regions/states. It is recommended that you contact your local motor vehicle department for any special regulations that pertain to towing and know the laws of any country/region/state you travel through.

## 1.8 BATTERY SAFETY

Improper use and care of the battery on electric start models can result in serious personal injury or property damage. Always observe the following safety precautions.

Poison/Danger - Causes Severe Burns. The battery contains sulfuric acid. Avoid contact with skin, eyes or clothing. Keep out of reach of children.

- **ANTIDOTE-External Contact:** Flush immediately with water.
  - **ANTIDOTE-Internal:** Drink a large amount of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately.
  - **ANTIDOTE-Eye Contact:** Flush with water for 15 minutes. Get prompt medical attention.
1. The battery produces explosive gases. Keep sparks, flame or cigarettes away. Ventilate area when charging battery. Always wear safety goggles when working near battery.
  2. The battery contains toxic materials. Do not damage battery case. If case is broken or damaged, avoid contact with battery contents.
  3. Neutralize acid spills with a baking soda and water solution. Properly dispose of a damaged or worn-out battery. Check with local authorities for proper disposal methods.
  4. Do not short circuit battery. Severe fumes and fire can result.
  5. Before working with electrical wires or components, disconnect battery ground (negative) cable first. Disconnect positive cable second. Reverse this order when reconnecting battery cables.



**1.9 SAFETY DECALS**

See Section 1.10 for decal locations. Familiarize yourself with all of the safety and operating decals on the machine and the associated hazards. See the engine owner's manual or contact the engine manufacturer for engine safety instructions and decals. Make certain that all safety and operational decals on this machine are kept clean and in good condition. Decals that need replacement must be applied to their original locations.

**1 PN 12169**

KEEP HANDS AND FEET OUT OF INLET AND DISCHARGE OPENINGS WHILE MACHINE IS OPERATING TO AVOID SERIOUS PERSONAL INJURY. STOP AND ALLOW MACHINE TO COME TO A COMPLETE STOP BEFORE CLEARING OBSTRUCTIONS.



**7 PN 14942-00**



READ AND UNDERSTAND YOU OWNERS MANUAL BEFORE OPERATING. IF OWNERS MANUAL WAS NOT INCLUDED OR YOU HAVE ANY QUESTIONS, PLEASE CALL 800.247.7335 OR 701.282.5520 (U.S.A.)

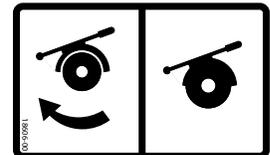
**2 PN 12172**

READ AND UNDERSTAND THIS OWNER/ OPERATORS MANUAL. BE COMPLETELY FAMILIAR WITH THE CONTROLS AND THE PROPER USE OF THIS EQUIPMENT. OBTAIN AND WEAR SAFETY GLASSES AND USE HEARING PROTECTION AT ALL TIMES WHEN OPERATING THIS MACHINE. BEFORE INSPECTING OR SERVICING ANY PART OF THIS MACHINE, SHUT OFF POWER SOURCE, DISCONNECT SPARK PLUG WIRE FROM SPARK PLUG AND MAKE SURE ALL MOVING PARTS HAVE COME TO A COMPLETE STOP.



**8 PN 18606-00**

DO NOT OPERATE CHIPPER WITHOUT TURNTABLE BASE LOCKED IN PLACE. FAILURE TO DO SO MAY RESULT IN DAMAGE TO MACHINE AND/OR SERIOUS BODILY INJURY. FOR TRANSPORT, RETURN CHIPPER TO TRANSPORT POSITION, INSERT TRANSPORT SAFETY PIN AND CLIP, AND SET TURNTABLE BRAKE HANDLE TO LOCKED POSITION. FAILURE TO DO SO MAY RESULT IN DAMAGE TO MACHINE AND/OR SERIOUS BODILY INJURY.



**3 PN 12173**

DO NOT OPERATE THIS EQUIPMENT IN THE VICINITY OF BYSTANDERS. DO NOT ALLOW CHILDREN TO OPERATE THIS EQUIPMENT. ALWAYS STAND CLEAR OF DISCHARGE AREA WHEN OPERATING THIS MACHINE. KEEP FACE AND BODY AWAY FROM DISCHARGE AREAS.



**9 PN 32109-00**

DO NOT OPERATE THIS EQUIPMENT IN THE VICINITY OF BYSTANDERS. DO NOT ALLOW CHILDREN TO OPERATE THIS EQUIPMENT. ALWAYS STAND CLEAR OF DISCHARGE AREA WHEN OPERATING THIS MACHINE. KEEP FACE AND BODY AWAY FROM DISCHARGE AREAS. ROTATE THE DISCHARGE TUBE OVER THE HITCH BEFORE TOWING AND LOCK SECURELY IN PLACE.



**4 PN 12174**

DO NOT OPERATE MACHINE WITHOUT SHIELDS IN PLACE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

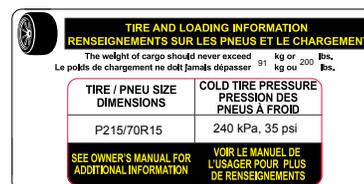


**5 PN 12175**

KEEP HANDS AND FEET OUT OF INLET AND DISCHARGE OPENINGS WHILE MACHINE IS OPERATING TO AVOID SERIOUS PERSONAL INJURY. STOP AND ALLOW MACHINE TO COME TO A COMPLETE STOP BEFORE CLEARING OBSTRUCTIONS.



**10 PN 32154-00**



**6 PN 12250**

CHECK BLADE BOLTS FOR PROPER TORQUE AFTER EVERY 8 HOURS OF OPERATION. CHECK BLADES AND ROTATE OR RESHARPEN DAILY OR AS REQUIRED TO KEEP BLADES SHARP. REFER TO OWNERS MANUAL FOR INSTRUCTIONS. FAILURE TO DO SO MAY CAUSE POOR PERFORMANCE, DAMAGE OR PERSONAL INJURY AND WILL VOID THE MACHINE WARRANTY.



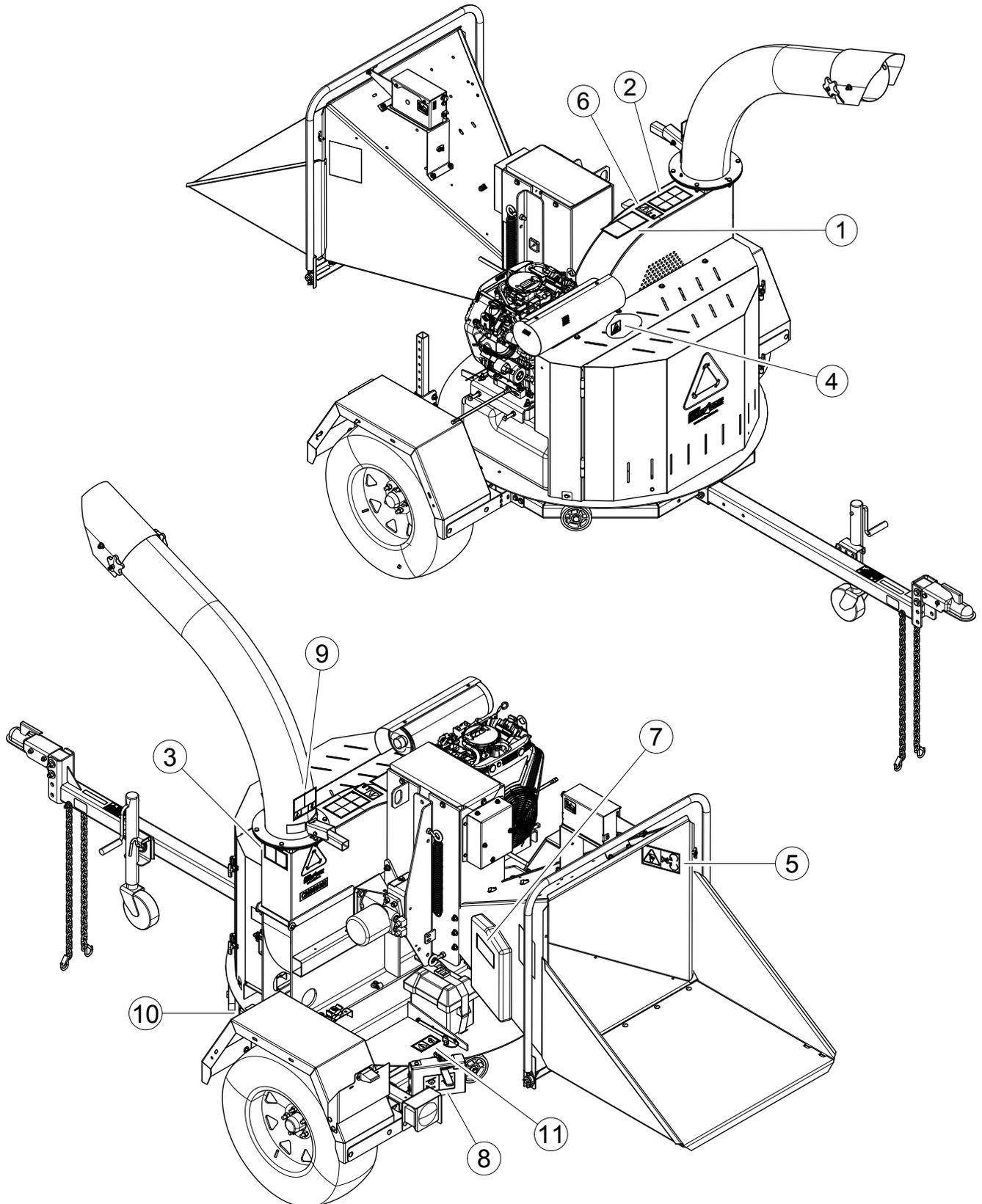
**11 PN 36378-00**

LOCK IN PLACE WITH LOCK PIN BEFORE REPAIRING OR SERVICING. FAILURE TO DO SO MAY RESULT IN SERIOUS PERSONAL INJURY.



## 1.10 SAFETY DECAL LOCATIONS

The numbers below correspond to the decals in Section 1.9. Familiarize yourself with all of the safety and operational decals on the machine and the associated hazards. See the engine owner's manual or contact the engine manufacturer for engine safety instructions and decals. Make certain that all safety and operating decals on this machine are kept clean and in good condition. Decals that need replacement must be applied to their original locations.



# 2 ASSEMBLY

## Section

### ⚠ WARNING ⚠

If any bolts or nuts are dropped in the machine, be sure to remove them before starting the machine.

### 2.1 TIRES & RIMS

1. Mount tires and rims to the axle using the lug nuts.
2. Attach the fender supports to the trailer using three 1/2 x 3-1/2" hex bolts, washers & nuts.
3. Attach the fenders to the fender supports using four 3/8 x 1" carriage bolts, washers and nuts.

### 2.2 TRAILER HITCH

#### NON CE COMPLIANT (FIGURE 2.1)

1. Place hitch pole assembly (8) into the frame, align mounting holes to desired length and secure using two 1/2" x 4-1/2" bolts, washers and nuts (hardware not shown in Figure 2.1). Torque to 75 ft-lbs.
2. Attach coupler mount (7) to hitch pole using two 5/8" x 4 1/2" bolts (1), washers (2) and centerlock nuts(5). Torque to 150 ft-lbs.
3. Attach 2" coupler (6) to coupler mount using two 1/2 x 4" bolts (3) and centerlock nuts (4). Torque to 75 ft-lbs.

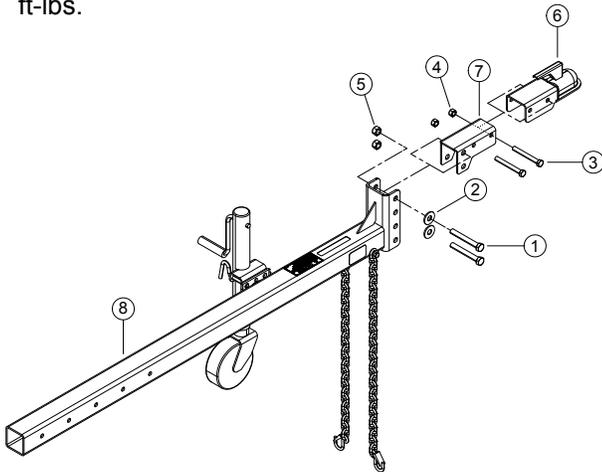


Figure 2.1, Non-CE Compliant Hitch Assembly

#### CE COMPLIANT (FIGURE 2.3)

1. Place hitch pole (13) into machine frame. Place one 1/2" x 4 1/2" bolt, washer and centerlock nut through frame and end hole of hitch pole. Next, align the brake rod hanger bracket (11) (as shown in figure 2.3) to the other mounting hole and secure by placing the second 1/2" x 4 1/2" bolt (5) through the frame and hanger bracket, add washer (6) and centerlock nut (7). Torque both to 75 ft-lbs.

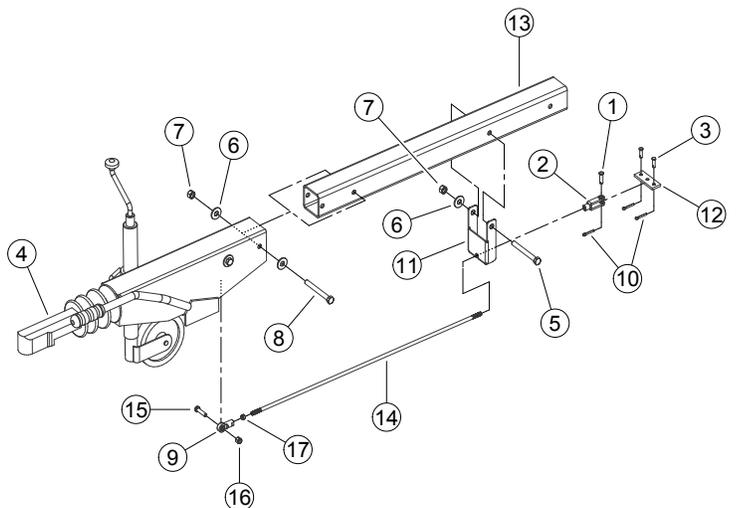


Figure 2.3, CE Compliant Hitch Assembly

2. Attach 50mm coupler (4) to hitch pole (13) using two 1/2 x 4" bolts (8), washers (6) and nuts (7). Torque to 75 ft-lbs.
3. Attaching the brake rod (14) to the coupler will require the removal of the clevis shown in Figure 2.2. Figure 2.2 is an underneath view of the coupler.

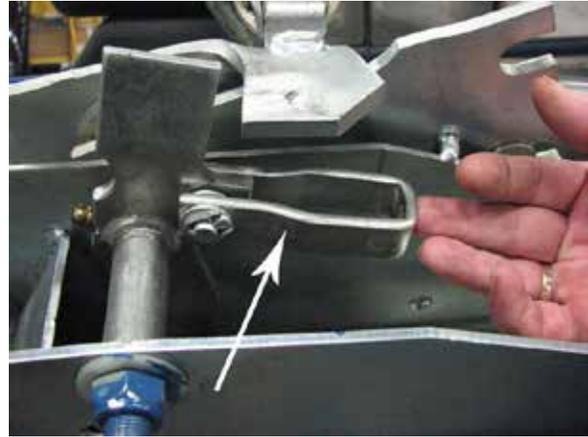


Figure 2.2, Remove this clevis on 50mm coupler

4. Route the brake rod (14) through the brake rod hanger bracket (11). Once routed, thread 3/8 jam nut (17) and 3/8" bearing rod end (9) on to the brake rod. Connect rod end to the coupler, at the location where the clevis was removed in step 3. Secure to coupler with 3/8 x 1 1/2" bolt (15) and nylock nut (16).
5. Attach 3/8" adjustable clevis (2) to other end of break rod. Connect clevis to brake bar plate (12) with 3/8 pin (1) and cotter pin (10).
6. Attach brake bar plate to the brake cables of the machine with 5/16 pins (3) and cotter pins (10)

### 2.3 REAR STABILIZER

Verify that the rear stabilizer is installed. To install the rear stabilizer, slide the stabilizer into the corresponding bracket beneath the rear of the chipper frame. Adjust the stabilizer and secure with the provided snap pin.

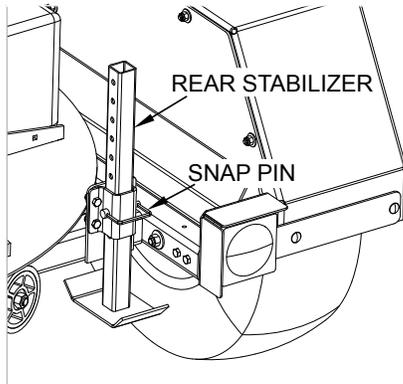


Figure 2.4, Rear stabilizer

### 2.4 ATTACH CHIPPER CHUTE



## WARNING



Do not operate this unit without the chipper chute correctly installed. Rotating cutting blades can cause serious personal injury.

1. Mount the chipper chute (1) to the chipper housing (2) using eight 3/8 x 1" bolts (3), washers (5) and locknuts (4). Use three bolts on each side and two on the bottom (Figure 2.5).
2. To insert the top bolts, rotate the feed roller until the notches (one on each side) on the feed roller are aligned with the top bolt holes.
3. Connect the three wires coming from the feed chute to the connectors that are located underneath the feed roller.

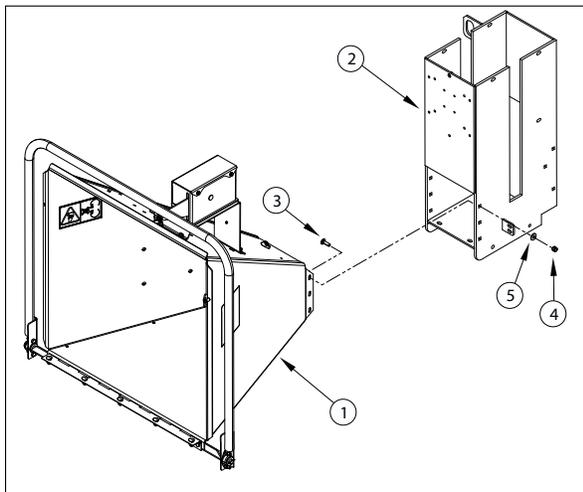


Figure 2.5, Attaching chipper chute

### 2.5 ATTACH CHUTE EXTENSION TRAY

1. Tilt the extension tray (1) up, so the bottom of the tray is facing outward (Figure 2.6). Slide the extension tray lips between the extension hinge and chipper chute lips (2).
2. Tilt the extension tray down until the tray rests on the extension hinge, and the extension tray lips contact the back of the chipper chute lips.
3. Insert five 3/8 x 1" carriage bolts (3) (included in owner's kit) through the extension tray and hinge. Secure the bolts with washers (4) and nylock nuts (5) from the bottom.
4. Attach the chute support weldment to the middle hole of the chipper chute by using the existing bolt.

### NOTE

Make sure that you position the lip on the extension tray behind the lip on the chipper chute. This provides a flatter surface and prevents obstructions while feeding the machine.

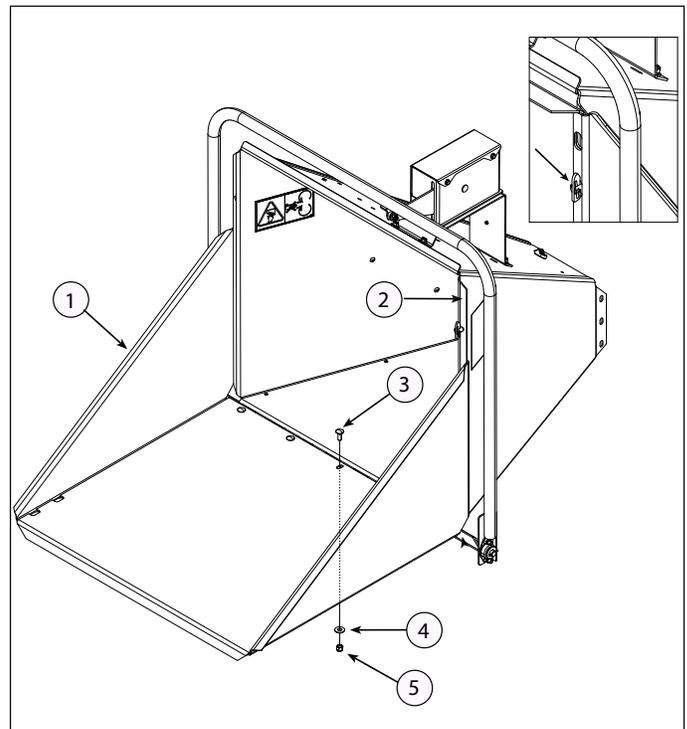


Figure 2.6, Attaching the extension tray

## 2.6 ATTACH DISCHARGE TUBE

1. Attach one clamping ring (1) and one spacer ring (2) to discharge tube base (3) using three 3/8 x 1 1/4" bolts (4) and nylock nuts (5). Tighten leaving 1/16" gap to assist in mounting to flange. See Figure 2.7.

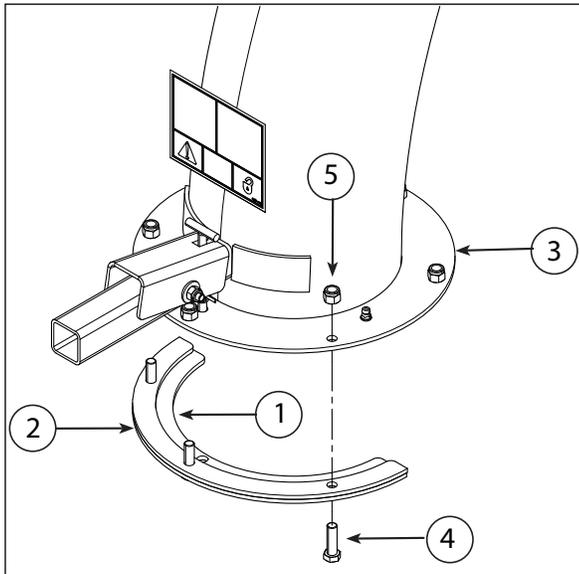


Figure 2.7, Attach clamp ring and spacer

2. Slide the tube onto the mounting flange on the chipper frame. The discharge clamp (1) should slide underneath the lip of the flange. Tighten the bolts to secure it.
3. Install the second half of the spacer (2) and clamp ring (1) on the discharge tube with 3/8 x 1-1/4" bolts (4) and nylock nuts (5).

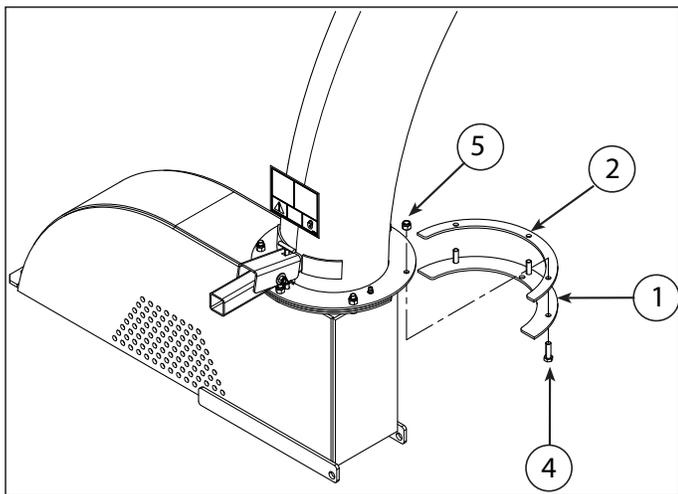


Figure 2.8, Attach discharge tube

### NOTE

Keep nuts as tight as possible while allowing the discharge tube to freely turn.

4. Lubricate the chute by applying grease to the grease zerk at the base of the chute. Rotate the chute and apply grease until the chute rotates freely.
5. Rotate the tube 360 degrees and lock it in place with the lock pin to make sure it is mounted correctly.
6. Attach the discharge deflector (6) to the discharge tube. Connect the deflector with two 5/16 X 1 1/4" bolts (7) through the lower hole in the discharge tube. Run these bolts through the inside of the tube, washer, deflector, washer, and then knob (8).
7. Finish bolting the deflector to the tube with two 5/16 x 1" bolts (9) through the end hole in the discharge tube and secure with 5/16 washers & nylock nuts(10).

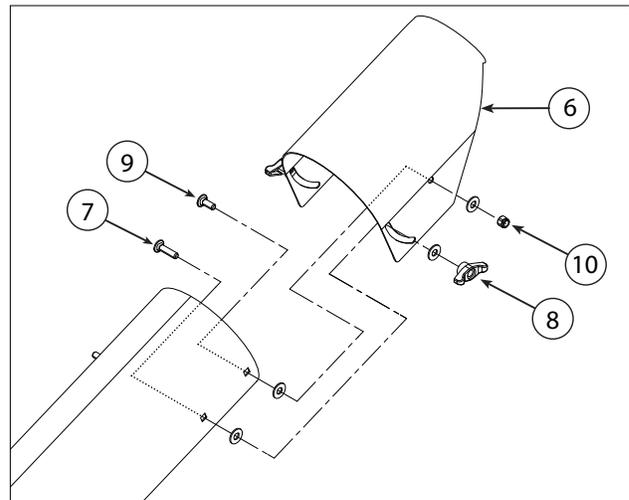


Figure 2.9, Attach discharge deflector

## 2.7 CHECK REAR ROLLER WHEELS

After the chipper is fully assembled, check the rear roller wheels to make sure they are touching the turntable base that is directly above them. If there is a gap, the wheels will not adequately support the trailer base. To adjust the wheels, see Sec. 5.16.

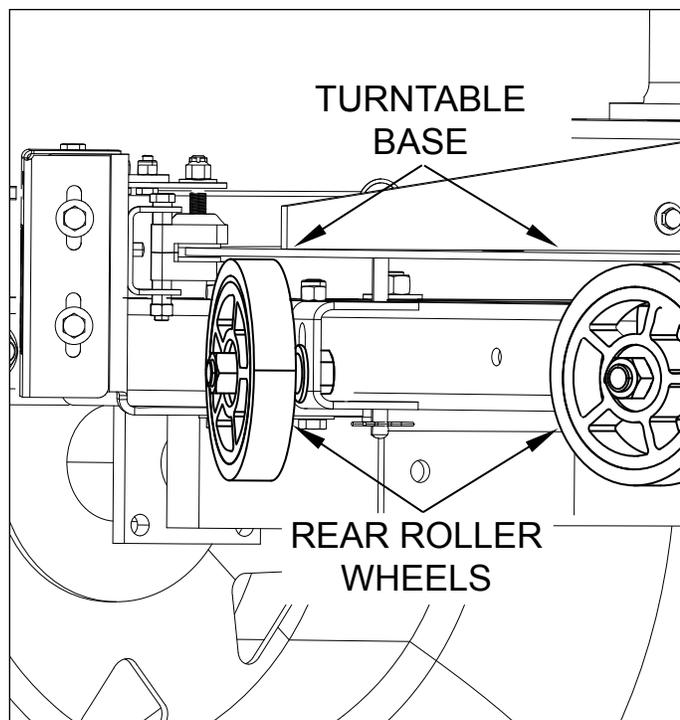


Figure 2.10, Rear roller wheel adjustment

## 2.8 CHECK/ADD HYDRAULIC FLUID

Hydraulic fluid drives the feed roller. The machine was shipped with fluid, as it was tested at the factory. However, check the fluid levels before initial operation and add if necessary.

The hydraulic pump requires premium hydraulic fluids containing high quality rust, oxidation, and foam inhibitors. These include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluids meeting Allison C-3 or Caterpillar TO-2, and certain specialty agricultural tractor fluids.

## 2.9 ADD OIL TO ENGINE

Check the oil level and, if needed, fill the engine crankcase with the type and amount of oil specified in the engine owner's manual.

## 2.10 CONNECT THE BATTERY

You will need to purchase a battery. Choose a battery that meets or exceeds the engine manufacturer's specifications. Consult your engine owner's manual or authorized dealer for specification details.

To install the battery:

1. Open the battery box (8 1/4" x 5 1/2" x 6") and insert battery into the battery box.
2. Attach the positive (red) battery cable from the engine to the positive (+) battery terminal.
3. Attach the negative (black) battery cable from the engine to the negative (-) battery terminal.
4. Secure the cover on the battery box with the strap.



### WARNING



To avoid sparks and a possible explosion or fire due to a short circuit, do not touch the positive (+) battery terminal and any surrounding metal with tools, jewelry or other metal objects. When installing battery cables, connect the positive (+) cable first and the negative (-) cable last.

## 2.11 FILL THE TANK



### DANGER



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

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

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

To add fuel:

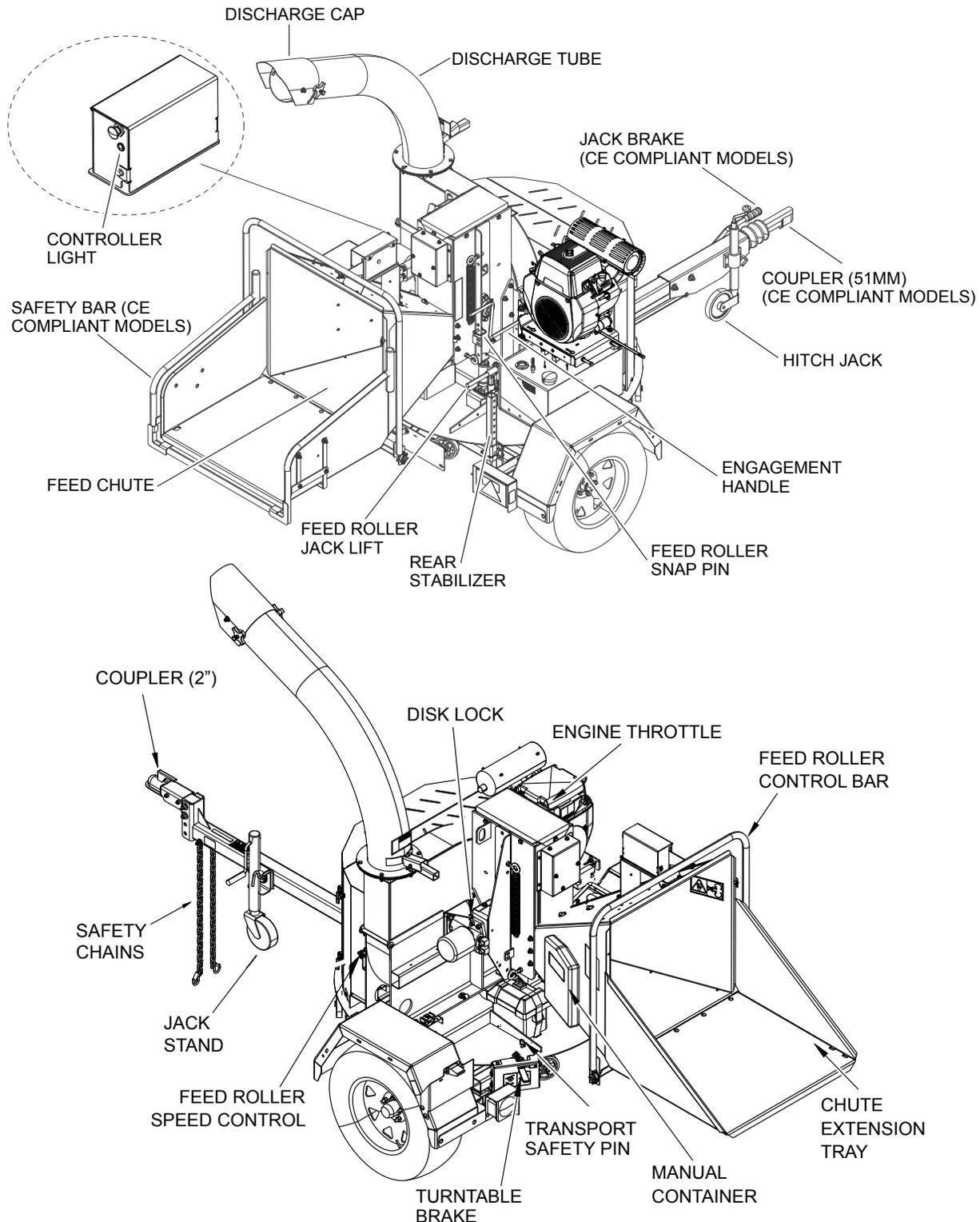
1. Stop engine, wait for all parts to stop moving and disconnect spark plug wire. Remove key from key switch. Allow the engine and muffler to cool for at least three minutes.
2. Clean area around fuel fill cap and remove cap.
3. Using a clean funnel, fill fuel tank to 1/2" below bottom of filler neck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

# 3 FEATURES & CONTROLS

## Section

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

**REFER TO ENGINE OWNER'S MANUAL FOR FURTHER ENGINE OPERATING INSTRUCTIONS.**



**CHUTE EXTENSION TRAY**

The feed chute has an extension tray that folds down. Raise the extension tray to an upright position before towing the machine. Secure with the fastener located near the top of the chute.

**CONTROLLER LIGHT**

When the light is flashing green, increase RPM. The feed roller can be shifted into Forward when the controller light is steady green. See Section 6 for more information.

**DISCHARGE CAP**

Directs the discharge of material vertically. Adjust the discharge cap by turning the knob located on the side. Turn knob counterclockwise to loosen discharge cap. Adjust to desired position. Turn knob clockwise to secure discharge cap.

**DISCHARGE TUBE**

Directs the discharge of chipped material horizontally. The discharge tube can be rotated 360° horizontally by pressing down on the lock lever and rotating the discharge tube until the discharge deflector faces the desired position. Release the discharge lock lever and slightly rotate the discharge tube until the lock pin snaps into place in one of the holes on the base of the discharge tube.

**DISK LOCK**

Use the disk lock to hold the chipper in place when doing any maintenance work on it. See Section 5.2.

**ENGAGEMENT HANDLE**

During engine start-up, the engagement handle must be in the disengaged (UP) position. With the engine at 1/4 throttle, carefully engage the disk by slowly pushing the engagement handle down, allowing the disk to speed up gradually. Engaging the chipper too quickly with the engine at full or half throttle will bog down the engine and will shorten the life of the belt. To disengage the disk, first idle the engine down and then pull the engagement handle up.

**ENGINE THROTTLE**

This controls the speed of the engine. Increase the throttle by moving the switch to the FAST position. To decrease the throttle, move the switch to the SLOW position.

**FEED CHUTE**

Materials to be chipped are fed into the feed chute, through the feed roller, to the chipper blades.

**FEED ROLLER CONTROL BAR**

To engage the feed roller move the control bar. The cycle of the control bar, front to back, is REVERSE (R), FORWARD (F), STOP, REVERSE (R).

**FEED ROLLER LIFT JACK**

Used to lift the feed roller. The feed roller can be raised to inspect and service the machine and to clear a plugged disk. Secure the feed roller in the raised position using the provided snap pin.

**FEED ROLLER SPEED CONTROL**

Controls the speed of the feed roller. Allows the operator to have better control over the material being fed into the chipper. Turning the knob clockwise will decrease the speed of the feed roller. Turning the knob counterclockwise will increase the speed of the feed roller.

**HITCH JACK**

Used to adjust the height of the hitch. Always have in UP position and clear from ground when moving. When in use, place in DOWN position on a level surface.

**MANUAL CONTAINER**

Conveniently holds your manuals.

**REAR STABILIZER**

Prevents the chipper from tipping when disconnected from tow vehicle. Always have in UP position and clear from ground when moving. When in use, place in DOWN position on a level surface.

**SAFETY BAR****CE COMPLIANT MODELS ONLY**

Push the Safety Bar in the event of an emergency and forward feed will stop. Push the reset/override button to resume forward feed.

**SAFETY CHAINS**

Safety chains are used, during towing, to prevent the chipper from completely separating from the tow vehicle in the event the chipper detaches from the tow vehicle. Cross the safety chains under the hitch and connect to tow vehicle.

**TURNTABLE BRAKE**

Locks the turntable to the frame for any chipping position (0°-360°). The chipper base must always be locked in place. Failure to do so may result in machine vibration, serious bodily injury or death.

# 4 OPERATION

## Section

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

### CHIPPING OPERATION

The chipping operation takes place on the front of the machine, where hardened steel chipper blades are mounted on a rotating disk assembly. Material fed into the chipper chute is sliced into small chips and propelled out through a discharge tube.

 **WARNING** 

Before operating your machine, be sure you read and understand all safety, controls and operating instructions in this owner's manual and on your machine. Failure to follow these instructions can result in serious injury or property damage.

 **WARNING** 

Move machine to a clear, level area outdoors before starting. Do not operate in the vicinity of bystanders. Make sure cutting chamber is empty before starting.

### 4.1 STARTING THE MACHINE

1. Before starting, fill engine with oil to the correct level (see engine manual for operation and maintenance instructions).
2. Fill fuel tank with unleaded regular gasoline. **DO NOT MIX OIL WITH GASOLINE.**
3. Check hydraulic fluid level and fill to correct level if necessary.
4. Make sure the feed roller control bar is in the Stop position. The controller will flash red until the bar is in Stop. See Sec. 6 for a table of all flash codes for the controller light.
5. Move engagement handle upward to disengage drive belts
6. Start the engine (see engine owners manual).
7. Once engine is running and no choke is needed, set engine to 1/4 throttle and slowly release the engagement handle. This will engage the drive belt and the disk will turn.
8. If the engine stalls when engaging the drive belt, either use more choke or increase engine RPM.
9. Bring engine to full RPM.

### NOTE

If forward and reverse feed positions are reversed when you power up the machine, you may have plugged the connectors into the wrong plug.

### 4.2 STOPPING THE MACHINE

1. Move throttle to SLOW position.
2. Move engagement handle upward to disengage drive belt.
3. Shut off engine (see engine owner's manual).
4. Allow machine to come to a complete stop.

### NOTE

The disk will continue to turn for some time after the engine has been shut off. Make sure disk has stopped completely before inspecting or servicing machine.

### 4.3 ROTATE CHIPPER BASE

1. Disengage turntable brake.
2. Rotate the turntable to desired position.
3. Once the turntable has been properly positioned, engage brake.



### WARNING



The chipper base must always be locked in place. Failure to do so may result in machine vibration, serious bodily injury or death.

#### 4.4 DIRECTING THE DISCHARGE TUBE

The discharge tube can rotate 360° and lock into different positions using the discharge lock lever. The discharge cap directs how high and how far the chipped material blows.

Adjust the discharge tube by pressing down on the lock lever and rotating the discharge tube until the discharge deflector faces the desired position. Release the discharge lock lever and slightly rotate the discharge tube until the lock pin snaps into place in one of the holes on the base of the discharge tube (Figure 4.1).

Adjust the discharge cap by turning the knob located on the side. Turn knob counterclockwise to loosen discharge cap. Adjust to desired position. Turn knob clockwise to secure discharge cap.

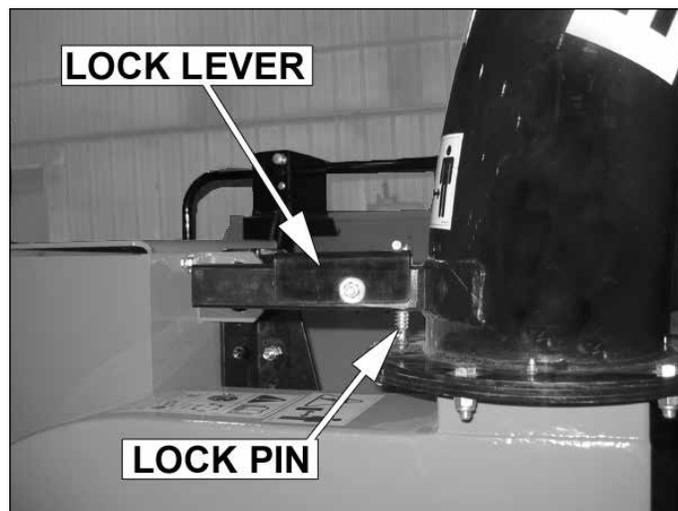


Figure 4.1 - Directing the Discharge Tube/Cap.

#### 4.5 OPERATING THE CHIPPER



### WARNING



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



### WARNING



**Never** lean over the chipper chute to push objects into the cutting device. Use a push stick or brush paddle.

**Never** use shovels or forks to feed brush. They can cause extensive damage if they contact the blades. In addition, metal pieces can be ejected from the chipper chute and cause serious injury or death.

**Never** feed brush into the chute with your feet.

**Never** use hands or feet to clear materials that build up in the chute.



### CAUTION



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

Do not wear loose fitting clothing.

The operator should always wear heavy boots, gloves, pants and a long-sleeved shirt.

Use common sense and practice safety to protect yourself from branches, sharp objects, and other harmful objects.

The machine chips a variety of materials into a more readily decomposed or handled condition. The following guidelines will help you get started.

1. **With the engine slightly above idle, engage the chipper blades** by slowly pushing the chipper engagement handle down.
2. **Gradually increase engine speed with the throttle until full idle is achieved.** When the controller light is steady green the engine speed is high enough to begin to chip.
3. **Engage the hydraulic feed** by pushing the feed roller control arm into forward position.
4. **Limbs fed in to the chipper chute must be 8 inches (20 cm) in diameter or less.** Trim side branches that cannot be bent enough to feed into the chipper chute. Hold small diameter branches together in a bundle and feed in simultaneously.
5. **Place limb, butt end first, into the chipper chute** until it contacts the chipper blades. The actual feed rate of the limb into the chipper will depend on the type of material fed and sharpness of the cutting blades.
6. **Do not feed** pieces of metal, rocks, bottles, cans, or other foreign objects into the machine.
7. **Feed brush from the side of the chipper chute,** rather than from the front. Step aside to avoid being hit by the brush moving into the chipper.
8. **If the chipper disk slows, stop feeding material.** The feed roller will stop automatically to process backed up material. Feed material more evenly.
9. **If the chipper jams,** the feed roller will reverse momentarily to remove the branch.
10. **Do not use the clutch to clear a plugged rotor.** This may cause belt damage. Refer to the instructions for clearing a plugged rotor in the Service and Maintenance section.
11. **Alternate greener material with dry material** to lubricate the chipping blades for longer life and better performance. Chipping dead, dry material will create heat and dull the chipping blades quickly.
12. **Sharpen the chipping blades periodically.** Check the sharpness of the blades every 5-15 hours. Refer to the Service and Maintenance section for sharpening instructions.

#### 4.6 RAISE/LOWER ACCESS COVER

1. Rotate the discharge chute so it is parallel to the access cover.
2. Remove the two 3/8" x 1-1/4" bolts, nuts and washers securing the access cover to the chipper housing.
3. After lowering the access cover, secure the access cover to the chipper housing using two 3/8" x 1-1/4" bolts, nuts and washers.

#### 4.7 FEED ROLLER SPEED CONTROL

The feed roller speed control is used to control the speed of the feed roller allowing the operator to have better control of material being fed into the chipper.

For optimum chipping, it is recommended that the feed roller operate at a faster rate for smaller branches and at a slower rate for larger branches.

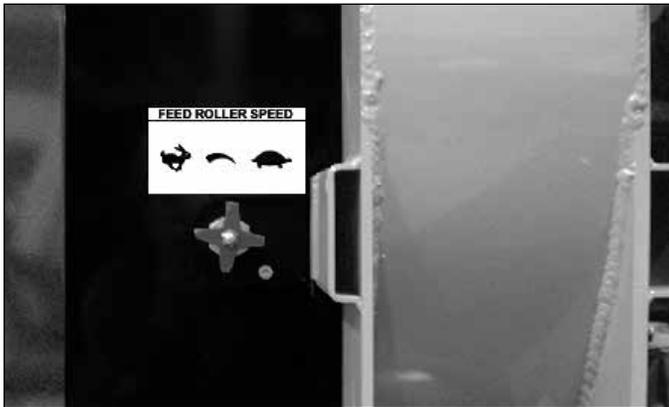


Figure 4.2, Feed Roller Speed Control.

#### 4.8 CHIPPER FEED CONTROLLER

This machine is equipped with a Plus 1 Controller. The controller monitors the chipper disk RPM and regulates the feed roller.

**When chipper disk RPM drops too low**, the feed roller is stopped automatically to allow the chipper disk to process material.

**When the chipper disk returns to chipping RPM**, the feed roller will automatically reengage.

**Try Again Feature:** If the feed roller becomes obstructed, the controller will reverse the feed roller momentarily to clear the obstruction. The controller will then engage the feed roller and feed the material again.

**If this cycle continues**, remove or reposition the material manually.

**Remember to sharpen blades frequently so material will feed smoothly.**

**The controller light will flash the following codes (See Sec. 6 for more information):**

- **Normal Operating RPM:** Steady green light indicates engine has reached full RPM.
- **Feed Bar Not in STOP:** Flashing red light indicates operator must put feed bar in STOP position.
- **Service Code:** Flashing amber light is a reminder to check blade sharpness.
- **RPM Too Low:** Flashing green light indicates operator must increase engine RPM before starting to chip.
- **Safety Bar Activated:** Steady red light (CE COMPLIANT models only).

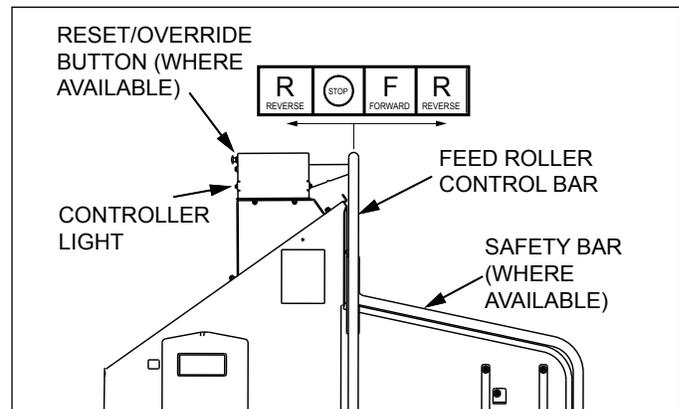
#### NOTE

The disk sensor and feed roller control bar sensors must be set to the correct clearance or the chipper will not operate. Set the clearance to 1/32" (the width of a credit card). The sensor will flash with every rotation of the chipper disk when the clearance is set correctly.

#### 4.9 FEED ROLLER CONTROL BAR

The Feed Roller Control Bar is used to manually control the direction of the feed roller rotation.

- Move the feed roller control bar to FORWARD (F) when you want the materials to feed into the chipper. The controller light must be steady green.
- Move the feed roller bar to REVERSE (R) when you want the chipper push materials back out of the feed chute.
- Move the feed roller bar to STOP to halt the rotation of the feed roller.



#### CE COMPLIANT MODELS ONLY

**Push the Safety Bar in the event of an emergency** and forward feed will stop. Push the reset/override button to resume forward feed after returning the safety bar to its normal operating position.

**Upon start-up**, the controller light will glow a steady red. Push the reset/override button to reset.

**If false trips occur**, the reset button can be held in for 5 seconds to override the system.

## 4.10 TOWING

### NON-CE COMPLIANT MODELS: HOOKING

1. Rotate the discharge tube to face the opposite direction of the towing vehicle before towing.
2. Insert transport safety pin and clip, and set turntable brake handle to locked position.
3. Raise rear stabilizer.
4. Raise the extension tray to an upright position before towing the machine. Secure with the fastener located near the top of the chute.
5. Open the coupler latch.
6. Raise the trailer hitch until the coupler is above the height of the hitch ball on the towing vehicle.
7. Align the coupler over the hitch ball and lower the trailer hitch until the coupler fully engages the hitch ball.
8. Close the coupler latch securing the coupler to the hitch ball.
9. Install the hitch pin through the coupler latch.
10. Cross the safety chains under the hitch and connect to towing vehicle.
11. Connect the wire harness to the tow vehicle.
12. Raise the jack stand and secure to the hitch using a hitch pin.

### UNHOOKING:

1. Unhook the safety chains from the towing vehicle. Latch safety chains to the hitch to prevent them from interfering with chipping.
2. Disconnect the wire harness from tow vehicle.
3. Remove the hitch pin from the coupler latch.
4. Unlatch the coupler and disconnect the hitch coupler from the hitch ball.
5. Move the hitch of the chipper away from the hitch ball and lower the jack stand. Secure with a hitch pin.
6. Lower rear stabilizer.

### NOTE

Optimum towing performance can be achieved by maintaining a horizontal trailer hitch.

### CE COMPLIANT MODELS: HOOKING

1. Rotate the discharge tube to face the opposite direction of the towing vehicle before towing.
2. Insert transport safety pin and clip, and set turntable brake handle to locked position.
3. Raise rear stabilizer.
4. Raise the extension tray to an upright position before towing the machine. Secure with the fastener located near the top of the chute. If your model is equipped with a safety bar, once the extension tray is in an upright position, push the safety bar down to lock the bar. To unlock, lower the extension tray and push in the safety bar.
5. Open the coupler latch.
6. Raise the trailer hitch until the coupler is above the height of the hitch ball on the towing vehicle.
7. Align the coupler over the hitch ball and lower the trailer hitch until the coupler fully engages the hitch ball.
8. Close the coupler latch securing the coupler to the hitch ball.
9. Connect the wire harness into the tow vehicle.
10. Raise the jack stand and secure to the hitch.

### UNHOOKING

1. Disconnect the wire harness from the tow vehicle.
2. Unlatch the coupler and disconnect the hitch coupler from the hitch ball.
3. Move the hitch of the chipper away from the hitch ball, lower the jack stand and secure.
4. Lower rear stabilizer.



## WARNING



Return chipper to transport position, insert transport safety pin and clip, and set turntable brake handle to locked position. Failure to do so may result in damage to the machine and/or serious bodily injury.

# 5

## Section

# SERVICE & MAINTENANCE

### 5.1 MAINTENANCE SCHEDULE

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

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

SERVICE AND MAINTENANCE SCHEDULE								
COMPONENT	MAINTENANCE REQUIRED	REFER TO ENGINE OPERATOR'S MANUAL	FREQUENCY					
			BEFORE EACH USE	EVERY 8 HOURS	EVERY 25 HOURS	EVERY 50 HOURS	EVERY 200 HOURS	EVERY YEAR
AIR CLEANER	CHECK AND CLEAN (1)	●						
AIR INTAKE	CLEAN (1)	●						
ENGINE OIL	CHANGE (1)	●						
FUEL FILTER	REPLACE	●						
SPARK PLUG	CHECK CONDITION AND GAP	●						
HYDRAULIC OIL	CHECK/FILL		●					
ENGINE OIL	CHECK/FILL		●					
FUEL TANK	CHECK/FILL		●					
ALL INTERNAL AND EXTERNAL NUTS AND BOLTS	CHECK TIGHTNESS		●					
TIRE PRESSURE	CHECK		●					
BATTERY CONNECTIONS	CHECK		●					
CHIPPER ANVIL	CHECK CLEARANCE AND RE-TORQUE TO 75 FT-LBS. (2)			●				
CHIPPER BLADES	CHECK SHARPNESS AND RE-TORQUE TO 120 FT-LBS. (2)			●				
ENTIRE MACHINE	CLEAN			●				
DRIVE BELT	CHECK				●			
HYDRAULIC DRIVE BELT	CHECK				●			
BELT TENSION	CHECK				●			
BELT/PULLEY ALIGNMENT	CHECK				●			
GREASE ZERKS	LUBE					●		
HYDRAULIC OIL FILTER	REPLACE						●	
WHEEL BEARINGS	CHECK AND REPACK							●
COOLING SHROUDS	CLEAN (1)							●
STARTER DRIVE	SERVICE							●

(1) PERFORM MORE FREQUENTLY UNDER EXTREMELY DUSTY CONDITIONS.

(2) PERFORM MORE FREQUENTLY WHEN CHIPPING DRY OR DIRTY WOOD.

**As the Limited Warranty states, failure by the Owner to perform normal maintenance will void the machine's warranty. The aggressive, high-speed nature of chipping REQUIRES THE OWNER TO PERFORM THE ABOVE LISTED NORMAL MAINTENANCE. Special consideration to maintain and re-torque the CHIPPER ANVIL, CHIPPER BLADES, AND ALL INTERNAL AND EXTERNAL NUTS AND BOLTS is the sole responsibility of the Owner. Failure by the Owner to do so shall be cause for denial of warranty.**

**! WARNING !**

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

**5.2 DISK LOCK**

**! WARNING !**

The disk assembly has a lock mechanism. When working on the disk assembly, use the lock mechanism at all times.

Follow the steps below to install the disk lock:

1. There is a hole in the shaft cap, the disk jack shaft and a matching hole in the bracket mounted to the disk bearing front side.
2. Rotate the disk assembly until the hole on the disk jack shaft lines up with the holes in the disk shaft cap and bracket.
3. Install a punch or screwdriver into the disk shaft cap, bracket and shaft.
4. Remove punch or screwdriver when service and/or maintenance is completed.

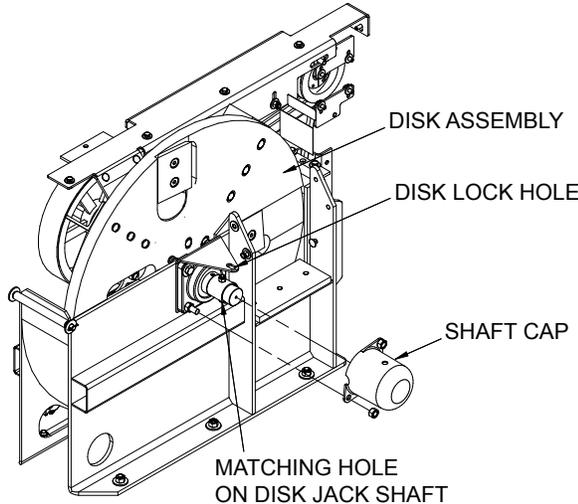


Figure 5.1, Disk Lock

**5.3 CHIPPER BLADE MAINTENANCE**

The chipper blades will eventually become dull, making chipping difficult and adding extra strain on the machine. **CHECK THE SHARPNESS OF THE BLADES EVERY 5 - 15 HOURS OF OPERATION AND SHARPEN AS NEEDED.**

The controller light will flash an amber code every 15 hours as a reminder to check the chipper blades. To reset the controller, see Sec. 6.

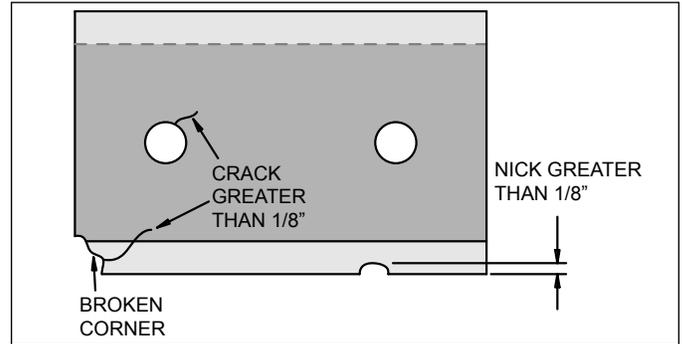
Your blades need to be sharpened if:

- Machine vibrates severely when material is fed into the chipper.
- Small diameter branches do not self-feed.

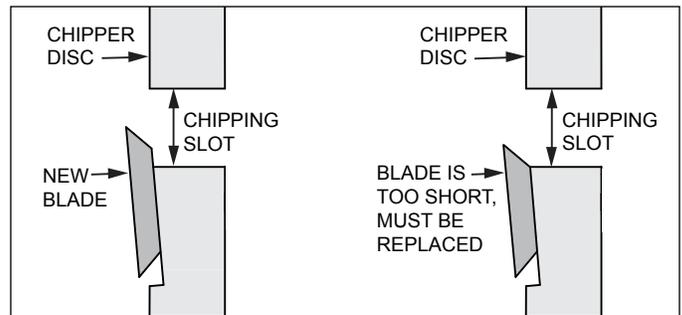
- Chips discharge unevenly or have stringy tails, especially when chipping green branches.

Before you sharpen the chipping blades, check for permanent damage. Replace the blade if:

- There are cracks, broken corners or nicks greater than 1/8" (see below).



- The base of the cutting edge is worn or has been re-sharpened so that it no longer extends past the chipping slot (see below).



**5.4 REMOVING THE BLADES**

**! WARNING !**

Chipping blades are sharp! Use caution when working on machine to avoid injury.

1. Remove the two 3/8" retaining bolts securing the access cover to the main frame assembly.
2. Tilt access cover over to allow access to disk. Rotate the disk so that the bolts holding the chipper blades are accessible.
3. Install the disk lock (Section 5.2). The disk is now restrained for removing the blades. To access the remaining blades, remove the punch or screwdriver and reposition disk. Return the punch or screwdriver to the disk lock hole.
4. Remove the two bolts that hold the blade to the disk. The hardware can be reused. Repeat for the remaining blade.
5. The blades have two edges and can be reversed one time before sharpening.

ENGLISH



**WARNING**



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

**5.5 SHARPENING THE BLADES**

The blades can be ground on a bench grinder or by a professional.

1. Never sharpen or grind the mounting surfaces of the blades. This will cause the edge to roll and the blade will be damaged, resulting in poor chipping performance.
2. Regrind the angled edge of the chipping blades to 45 degrees (Figure 5.2). Make sure some type of fixture is used to correctly hold the blade at the proper angle.
3. Be careful when grinding so that the blade does not become overheated and change color. This will remove the heat-treated properties.
4. Use short grinding times and cool with water or some type of liquid coolant.
5. Remove an equal amount off each blade to maintain rotor balance.
6. Small imperfections such as nicks and burrs on the flat side of the blade will not affect the chipping performance of the machine.
7. For blades that have been repeatedly sharpened, ensure that the sharpened surface extends past the chipping slot opening. If it does not extend past the opening, the blades should be replaced.

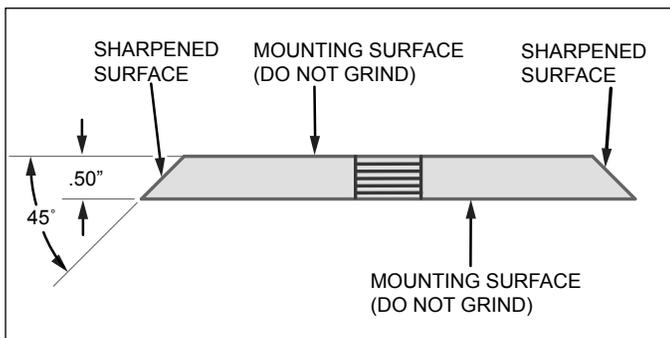


Figure 5.2, Chipper Blade Surfaces

**5.6 INSTALLING THE BLADES**

1. Install the disk lock (Section 5.2). The disk is now restrained for installing the blades.
2. Place a blade on the disk and attach using original hardware. Torque the bolts to 120 ft.-lbs (162 Nm). Repeat for the remaining blade.
3. Lower the access cover and secure to the chipper housing using two 3/8" retaining bolts.
4. Remove disk lock.

**5.7 SETTING CHIPPER BLADE CLEARANCE**

The chipping blades should clear the chipper block located directly under the chipper chute by 1/16" to 1/8" (Figure 5.3). To adjust the blade clearance, proceed as follows:

1. Remove the two 3/8" bolts securing the access cover to the main frame. Tilt access cover over to allow access to anvil
2. Loosen the three 1/2" bolts that hold the chipper anvil to the frame.
3. Measure the amount of clearance between chipping blades and chipping anvil from inside of housing. Adjust inward or outward to desired measurement.
4. Check clearance on all the blades.
5. Tighten bolts on chipping anvil to 75 Ft-lb and resume operation.
6. If chipping anvil edge is damaged or worn unevenly, remove the three bolts holding the anvil and use one of the other three edges. Adjust for correct measurement.

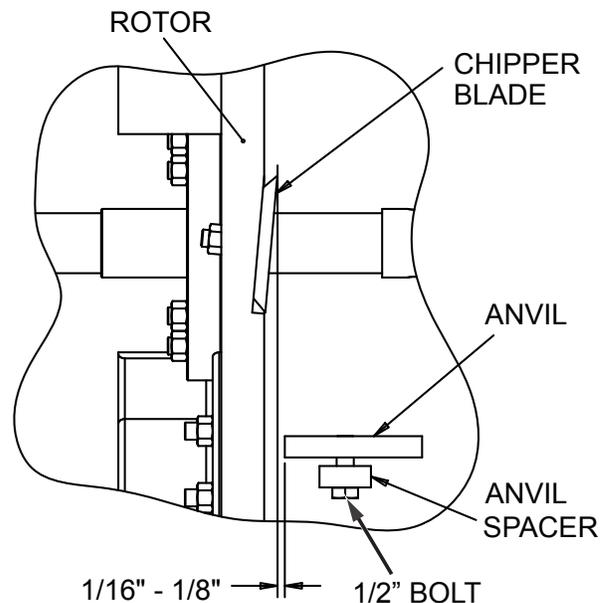


Figure 5.3, Chipper Blade/Anvil Clearance

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**5.8 CLEARING A PLUGGED DISK****! WARNING !**

If the machine becomes plugged, lift the engagement handle, shut off the engine, disconnect the spark plug wire and allow the machine to come to a complete stop before clearing debris. Do not operate the machine without proper guards and shields in place.

Feeding too large or too much material at once may plug the chipper. To clear a plugged disk, proceed as follows:

1. Lift the engagement handle and turn off engine key switch. Allow all moving parts to come to a complete stop.
2. Remove the two 3/8" retaining bolts holding the access cover to the chipper frame and lift up access cover.
3. Remove the lock pin from storage position (see below).
4. Turn check valve clockwise to engage the jack pump.
5. Pump the handle to raise the feed roller until the lock pin position aligns with one of the support bracket holes.
6. Secure the position by putting the lock pin through the support bracket and lock pin position.
7. Clean the debris away from the chipper disk. Turn the disk by hand to be sure it is free to rotate. Be careful to avoid the chipper blades when cleaning out the debris.
8. Remove the lock pin and put it back in storage position. **LEAVING THE LOCK PIN IN ANY OTHER POSITION MAY INTERFERE WITH FEED ROLLER OPERATION.**
9. Turn the check valve counterclockwise to disengage the pump and lower the jack.
10. Close access cover and replace bolts.
11. Start the engine. Lower the engagement handle when engine is running to engage drive belt. Resume operation at 1/4 throttle.

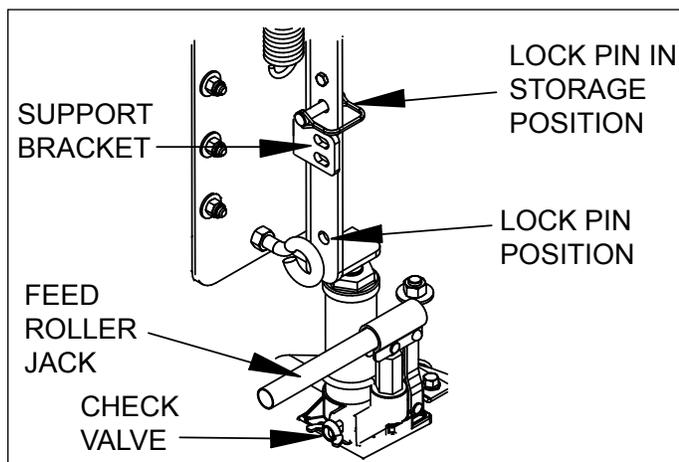


Figure 5.4, Feed Roller Jack

**5.9 TRAILER SERVICE TIPS**

1. Check wheel bolt torque monthly.
2. Check air pressure in tires monthly.
3. Check and repack wheel bearings with grease every 12 months.
4. When towing, always connect the safety chains. Make sure trailer hitch bolts are tight.
5. Check trailer lights periodically.

**5.10 DRIVE BELTS****5.10.1 REPLACING DISK DRIVE BELT**

Check the condition of the drive belt annually or after every 25 hours of operation, whichever comes first. If the belt is cracked, frayed, worn or stretched, replace it. Replace belt with original banded type belt only. Do not use single type belts.

1. Lift engagement handle to disengage drive belt.
  2. Loosen bolt on engine tie. **DO NOT REMOVE.**
  3. Loosen the bolts securing the belt kicker to the engine (located above the small sheave). **DO NOT REMOVE.**
  4. Assure the belt tensioning bolts on the engine mount plate are tight against the engine mount.
  5. Turn each of the two bolts eight revolutions counterclockwise.
  6. Loosen the four engine mount bolts and slide engine towards chipper housing.
  7. Remove the large idler pulley.
  8. Using a wrench, pull the small idler pulley away from the hydraulic belt to release the tension.
  9. Remove the hydraulic drive belt from the drive pulley on the engine.
  10. Remove the old disk drive belt and install new disk drive belt on engine and large pulley.
- NOTE**

If belt does not easily install, turn the two belt tension bolts counterclockwise an equal number of turns and slide engine closer to chipper until belt can be installed.
11. Install large idler pulley
  12. Lower engagement handle to engage drive belt



**WARNING**



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13. Alternately turn each of the belt tension bolts clockwise an equal number of turns until the belt deflection at the center of the belt is 7/16" when a 20 lb load is placed against the belt (Figure 5.6).
14. Check pulley alignment using a straight edge and adjust the appropriate belt tension screw if required.
15. Tighten the four engine mount bolts to the appropriate torque.
16. Tighten the bolts securing the belt kickers to the engine. There should be .028" gap between the drive belt and the kickers when the belt is engaged.

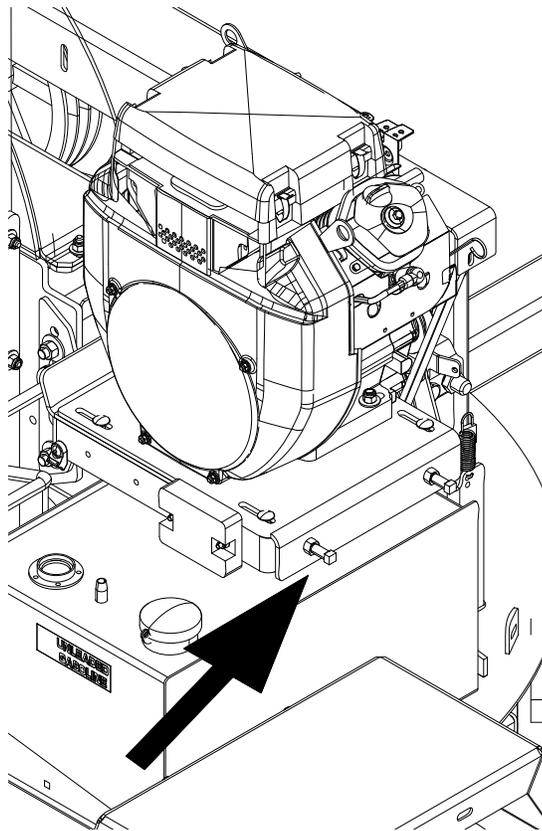
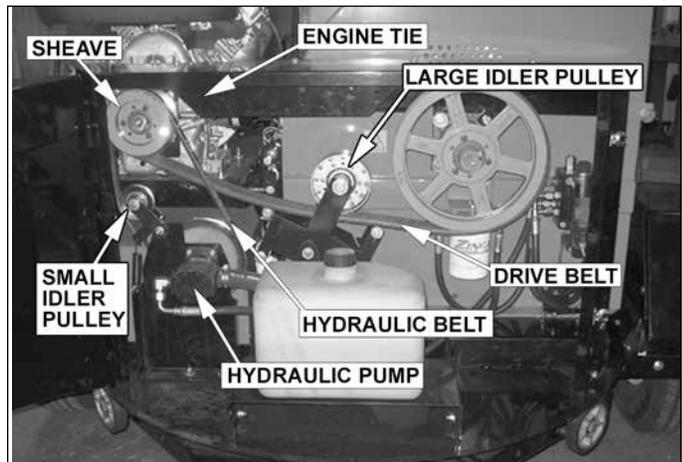


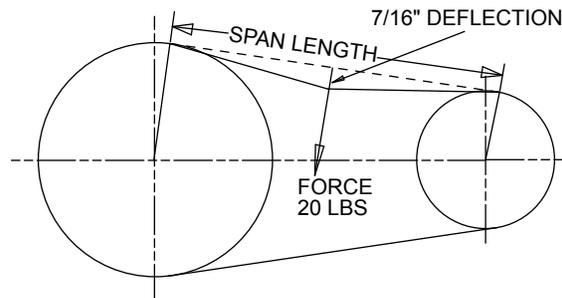
Figure 5.5, The tension bolts are pointed out in the drawing.

**5.10.2 REPLACING HYDRAULIC DRIVE BELT**

Check the condition of the drive belt annually or after every 25 hours of operation, whichever comes first. If the belt is cracked, frayed, worn or stretched, replace it. Follow procedure below to replace the drive belt.

1. Using a wrench, pull the small idler pulley away from the hydraulic belt to release the tension
2. Remove the hydraulic drive belt from the drive pulley on the engine and the hydraulic pump
3. Using a wrench, pull the small idler pulley towards the center of the chipper
4. Install the hydraulic drive belt on the hydraulic pump, on outside of idler pulley and on engine drive pulley. (figure 5.5)
5. Release idler to apply tension on hydraulic pump drive belt.

17. Tighten the engine tie bolt
18. Using a wrench, pull the small idler pulley towards the center of the chipper
19. Install the hydraulic drive belt on the hydraulic pump (on outside of idler pulley) and on engine drive pulley (Figure 5.5).
20. Release idler to apply tension on hydraulic pump drive belt.
21. Lift the engagement handle, start engine and lower engagement handle to test units. Adjust pulleys and belt tension as needed.



**WARNING**

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**5.10.3 ADJUSTING DRIVE BELTS**

1. Lower the engagement handle
2. Loosen bolt on engine tie. **DO NOT REMOVE.**
3. Verify the belt tensioning bolts on the engine mount plate are tight against the engine mount.
4. Loosen the four engine mount bolts.
5. Alternately turn each of the belt tension bolts clockwise an equal number of turns until the belt deflection at the center of the belt is 7/16" when a 20 lb load is placed against the belt (figure 5.6)
6. Check pulley alignment using a straight edge and adjust the appropriate belt tension bolt if required.
7. Tighten the four engine mount bolts to the appropriate torque
8. Tighten the engine tie bolt
9. Lift the engagement handle, start engine and lower engagement handle to test units. Adjust pulleys and belt tension as needed.

**5.11 DISK BEARINGS**

Replacing disk bearings should be only performed by a qualified service technician.

**5.11.1 CHIPPER BLADE SIDE BEARING**

1. Remove the two 3/8" retaining bolts holding the access cover to the main frame assembly.
2. Tilt access cover over to allow access to disk.
3. Raise feed roller to allow removal of bearing cap.

Option 1

- Disconnect feed roller springs.
- Connect hoist to top feed roller spring eyebolts.
- Lift feed roller assembly to allow clearance to bearing cap.
- Block feed roller to prevent falling.

Option 2

- Fully collapse the feed roller lift jack.
  - Screw the hydraulic jack center shaft out until it again touches the bottom of the feed roller plate.
  - Fully extend jack to raise feed roller mechanism.
  - Block feed roller to prevent falling.
4. Remove bearing cap and bearing lock.
  5. Loosen both bearing set screws.
  6. Remove four bearing mounting bolts.

7. Remove bearing and install new bearing with grease zerk facing away from engine towards hinge side of rotor cover.
8. Install the four bearing mounting bolts with washers through the bearing, bearing mount bracket and frame. Torque to 75 ft lb.
9. Install the bearing lock.
10. Verify that there is no shaft end play.
11. If there is no shaft end play, proceed to Step 14.
12. If end play is detected:
  - Loosen bearing spacer on belt side bearing.
  - Loosen both belt side bearing set screws.
  - Drive shaft towards belt side.
  - Push belt side bearing spacer tight against bearing and lock in place.
  - Tighten belt side bearing set screws.
13. Tighten blade side bearing set screws.
14. Install the bearing cap with grease zerk facing towards hinge side of rotor cover.
15. Remove blocking from feed roller
16. Lower feed roller assembly and, depending on lift method used, reinstall springs or screw hydraulic jack center shaft down.
17. Verify blade to anvil clearance is 1/16 to 1/8" on all blades.
18. Tilt access cover over disk.
19. Replace the two 3/8 inch retaining bolts holding the access cover to the main frame assembly and tighten.

**5.11.2 CHIPPER BELT SIDE BEARING**

1. Remove the two 3/8" retaining bolts holding the access cover to the main frame assembly.
2. Tilt access cover over to allow access to disk.
3. Lift engagement handle to disengage drive belt.
4. Loosen bolt on engine tie. **DO NOT REMOVE.**
5. Verify the belt tensioning bolts on the engine mount plate are tight against the engine mount.
6. Turn each of the two bolts eight revolutions counterclockwise.

**NOTE**

Orientation of bearing lock hole in lock is not centered in bracket.

**NOTE**

The large idler pulley may need to be removed for easier removal of the drive belt.

 **WARNING** 

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7. Loosen the four engine mount bolts and slide engine towards chipper housing.
8. Remove the drive belt from the disk shaft pulley.
9. Remove the bolts attaching the pulley bushing to the pulley.
10. Install the bushing push bolts and tighten alternately one flat at a time to remove the bushing from the pulley.
11. Remove the pulley and the pulley bushing.
12. Loosen the bearing spacer bolt and remove the bearing spacer.
13. Loosen the two bearing set screws.
14. Remove four bearing mounting bolts and proximity sensor bracket.
15. Remove bearing and install new bearing with grease zerk facing engine.
16. Install the four bearing mounting bolts with washers through the proximity sensor bracket, bearing, bearing mount bracket and frame. Torque to 75 ft lb.
17. Tighten the two bearing set screws.
18. Install the bearing spacer tight against the bearing and lock in place.
19. Adjust the proximity sensor to within 1/32" to 1/16" from bearing spacer bolt head.
20. Place pulley bushing on shaft.
21. Place pulley on bushing.
22. Align pulley with engine pulley using a straight edge.
23. Alternately tighten bushing bolts 1 flat at a time.
24. Install drive belt on pulley.
25. Install large idle pulley if previously removed.
26. Lower engagement handle to engage drive belt.
27. Alternately turn each of the belt tension bolts clockwise an equal number of turns until the belt deflection at the center of the belt is 7/16" when a 20 lb load is placed against the belt (figure 5.6)
28. Check pulley alignment using a straight edge and adjust the appropriate belt tension screw if required.
29. Tighten the four engine mount bolts to the appropriate torque.
30. Tighten engine tie bolt.
31. Verify blade to anvil clearance is 1/16 to 1/8" on all blades.
32. Tilt access cover over disk.
33. Replace the two 3/8 inch retaining bolts holding the access cover to the main frame assembly and tighten.

**5.12 FILLING HYDRAULIC FLUID**

 **WARNING** 

Handle pressurized hydraulic fluid carefully. Escaping pressurized hydraulic fluid may penetrate your skin causing serious injury. This fluid may also be hot enough to burn. Serious infection or reactions can develop if immediate proper medical treatment is not administered.

Hydraulic fluid drives the feed roller. Check the fluid level daily and fill as needed. The fluid and filter should be changed and system cleaned if the fluid becomes contaminated with foreign matter (water, dirt, grease, etc.) or if the fluid has been subjected to temperatures greater than the maximum recommended.

The hydraulic pump requires premium hydraulic fluids containing high quality rust, oxidation, and foam inhibitors. These include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluids meeting Allison C-3 or Caterpillar TO-2, and certain specialty agricultural tractor fluids.

In the unlikely event that the oil is completely drained from the hydraulic system, oil must be added and any air bubbles must be purged from the system. To do this:

1. Clean all system components (reservoir, fittings, etc.).
2. Fill the hydraulic reservoir.
3. Start the engine and run at the lowest possible RPM.
4. As you purge air from the unit, the oil level in the reservoir will drop and bubbles may appear in the fluid. Refill the reservoir as necessary.
5. Run the feed roller in both directions for several minutes until any remaining air purges from the unit. Refill the reservoir as necessary.
6. Shut down the engine, check for and correct any fluid leaks, and check the reservoir level. Add fluid if necessary. The hydraulic pump is now ready for operation.

**NOTE**

Hydraulic pressure controlled by the relief valve is factory set at 2500 PSI.

**! WARNING !**

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**5.13 CHANGE HYDRAULIC OIL FILTER**

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

To change the hydraulic oil filter:

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

**5.14 CHANGE OIL**

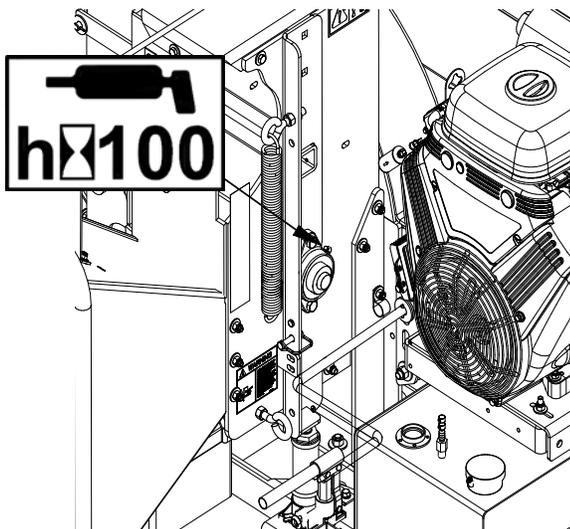
Check the oil level before each use. Change oil as directed in the engine owner's manual.

**5.15 LUBRICATION****! WARNING !**

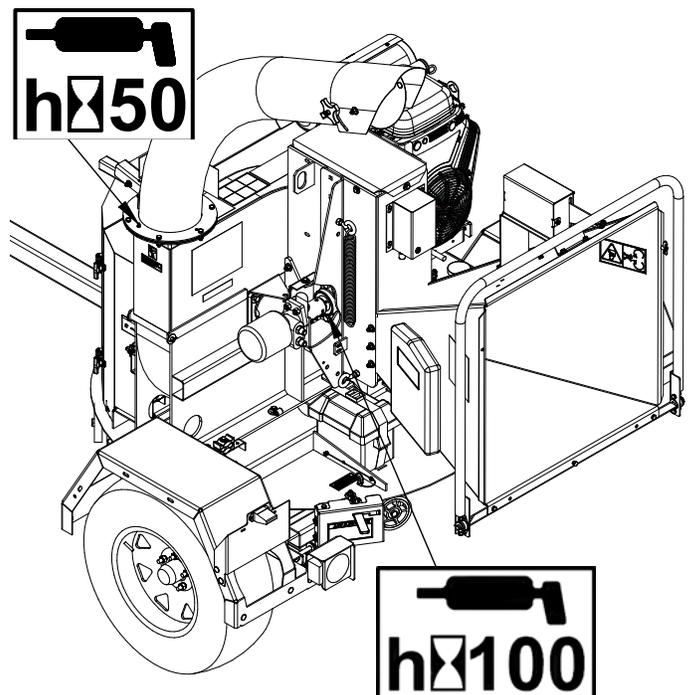
Polyurea and lithium-based greases are not compatible. Mixing the two grease types may lead to premature failure.

Lubricate the machine periodically with a lithium-based grease. Extreme working conditions will require more frequent greasing.

Grease the following points every 50-100 hours of operating time:

**NOTE**

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





**WARNING**



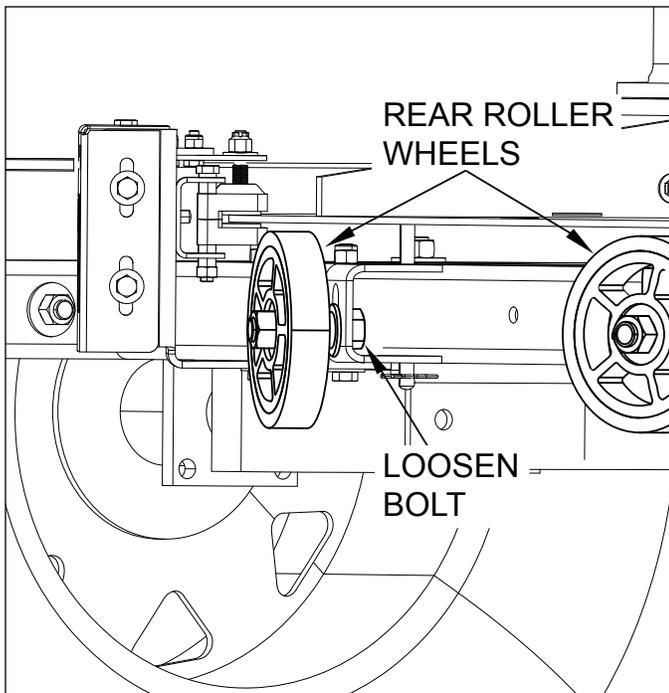
BEFORE INSPECTING OR SERVICING ANY PART OF THIS MACHINE, SHUT OFF POWER SOURCE, DISENGAGE THE HYDRAULICS, OPEN SHIELD AND MAKE SURE ALL MOVING PARTS HAVE COME TO A COMPLETE STOP.

## 5.16 CHECK ROLLER WHEEL CLEAR- ANCE

The height of the rear roller wheels can be adjusted to provide more support for the trailer base. Check the rear roller wheels periodically and make sure that they are touching the turntable base. If there is a gap, adjust the wheels. If your machine vibrates excessively when it is towed, this is also an indication that the rear roller wheels should be adjusted.

To adjust the rear roller wheels:

1. Rotate the feed chute until it is above the hitch and lock in place.
2. Push down on the feed chute and keep applying pressure while the wheels are adjusted.
3. Loosen the 5/8 x 2-1/2" hex bolt that holds the wheel to the frame.
4. Adjust the wheel upward until it touches the trailer base.
5. Tighten the 5/8 x 2-1/2" hex bolt to proper torque.
6. Repeat for the second rear roller wheel.
7. Check the turntable brake and adjust if necessary (see Sec. 5.17)



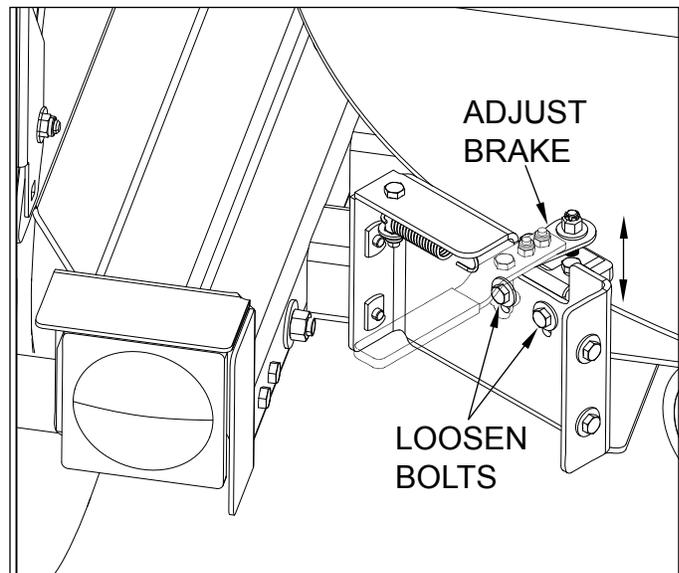
## 5.17 ADJUST TURNTABLE BRAKE

Periodically check the turntable brake to make sure it properly grips the turntable base.

To adjust the turntable brake:

1. Remove the brake cover by removing the four (4) 5/16 x 5/8" hex bolts.
2. Loosen the two (2) 5/16 x 5/8" bolts shown below.
3. Adjust the brake vertically by moving the handle up or down as needed.
4. Retighten the 5/16 x 5/8" bolts.
5. Rotate the turntable and check the brake in five or six places to see if it holds properly.

The brake should be tight enough to hold the turntable base in place when clamped down, but also allow the base to turn freely when released. If it needs further adjustment, go back to step 2.



# 6

Section

# TROUBLESHOOTING

## 6.1 FLASH CODES FOR THE CONTROLLER

GUIDE TO THE CONTROLLER FLASH CODES			
SIGNAL	FREQUENCY	CAUSE	ACTION TO TAKE
<b>GREEN</b>			
GREEN	SOLID	Chipper has reached default chipping RPM and forward feed is available.	Machine available for standard use.
GREEN	"½ second on, ½ second off"	Chipper has not reached chipping RPM upon initial startup.	Slowly increase RPM.
GREEN	"½ second on, ½ second off"	Chipper RPM dropped while chipping.	Feed roller will automatically reverse to bring RPM back up.
<b>RED</b>			
RED	"½ second on, ½ second off"	Feed bar not in NEUTRAL upon initial startup.	Place feed bar in NEUTRAL.
RED	SOLID	Safety bar was activated and forward coil or reverse coil faults are not active.	Push Safety Bar Reset/Override Switch.
RED	FLASHING	Machine has been below operational RPM for more than 10 minutes.	10 minute timer is a safety feature and will require the safety bar to be returned to NEUTRAL position before operation can resume.
<b>AMBER</b>			
AMBER	"2 seconds on, 2 seconds off"	Blade service code is active, feed bar was placed in NEUTRAL after power up and the control system has not detected chipper RPM.	Service blades. Reset code by turning key on and shift the feed bar from REVERSE to REVERSE then back 3 times. This must be done within 60 seconds of turning key on and the engine cannot be running.
AMBER	Solid for 7 seconds, then a long pause, then repeat	Forward infeed coil fault. If active all other codes are ignored.	Test wiring to forward coil. Replace coil if out of specification.
AMBER	"½ second on, ½ second off"	Reverse coil fault. If active all other codes are ignored.	Test wiring to reverse coil. Replace coil if out of specification.

**6.2 TROUBLESHOOTING GUIDE**

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

<b>PROBLEM</b>	<b>POSSIBLE CAUSES</b>	<b>REMEDY</b>
Controller light flashes green.	Chipper disk RPM not high enough to chip.	Increase throttle gradually until light turns solid green.
		The belt could be slipping. Adjust belt tension or replace belt if worn.
Forward feed is not available.	Chipper disk RPM not high enough to chip.	Flashing green light on the controller indicates RPM is not high enough. Increase throttle gradually until light turns solid green.
		Flashing red light on the controller indicates the chipper is not in STOP position. Put control bar in STOP and then reengage.
Controller light flashes red.	Feed roller control bar is not in STOP position.	Put control bar in STOP.
	RPM dropped too low for 10 seconds.	Put control bar in STOP position and then reengage.
Upon shifting to STOP, controller flashes red.	Sensors are not adjusted properly.	Check sensors located above the feed chute. Gap should be 1/32" (thickness of a credit card).
During chipping the sensor gives a solid green light, but feed roller runs intermittently.	Disk RPM sensor is set too far away from the disk.	Open the shield and check disk sensor. Gap should be 1/32" (thickness of a credit card).
Controller light is not on.	No power to controller.	Check the resettable fuse breaker.
Controller flashes amber light	Controller is giving service code.	Consult Flash Codes Guide and perform necessary maintenance. Reset controller.
Engine will not start.	Kill switch on access cover is damaged.	Test kill switch. Replace if it is not working.
	Spark plug disconnected.	Connect spark plug.
	Dirty, stale or contaminated gas.	Refill gas tank with fresh, clean unleaded regular gasoline.
	Internal engine problems.	See your engine dealer.
	Lack of fuel.	Fill fuel tank.
Engine or disk stalls or stops.	Discharge tube is plugged.	Use branch or similar object to clear discharge tube.
	Chipper disk housing is plugged.	Disengage chipper and shut off engine. Refer to manual for information on clearing a plugged rotor. Do not use the belt engagement to clear rotor.
	Feeding material that is too large.	Reduce size of material.

Machine chips poorly.	Dull chipper blades.	Flip or sharpen blades.
	Drive belts loose or worn.	Inspect drive belts, adjust or replace if needed.
	Attempting to feed branches that are too large.	Limit branch size to 8 inches in diameter.
Engine overheats.	Cooling system plugged.	Clean cooling fan and cooling fins on the radiator.
	Improper coolant level.	Fill engine to correct coolant level. Refer to the engine owners manual.
Hard to feed chipper; requires excessive power to chip.	Dull chipper blades.	Flip or sharpen blades.
	Obstructed discharge.	Use branch or similar object to clear discharge.
	Improper blade clearance.	Set blade/anvil clearance to recommended distance.
Engine stalls or belt squeals when engaging belt.	Engaging belt too fast.	Engage belt more slowly.
	Belt tension too loose.	Replace belt or spring.
Excessive vibration while running.	Dull chipper blades.	Flip or sharpen blades.
	Drive system vibration.	Check drive belts, bearings, and pulleys for bad or worn areas. Check for dull chipper blades or shredder knives.
	Disk out of balance.	Inspect rotor for damaged or missing chipper blades; replace if needed.
	Chipper blade to anvil clearance is incorrect.	Set blade/anvil clearance to recommended distance.
Cannot engage belt.	Improper belt installation; belt not under belt guide.	Install belt properly; install belt under belt guide.
	Improper belt tension.	Adjust belt tension. Replace belt or spring if needed.
Excessive belt wear.	Not using correct belt.	Contact your nearest authorized dealer to order the correct belt for your chipper.
	Pulley(s) damaged or worn.	Replace pulley(s).
	Pulley(s) not in alignment.	Align pulley(s) to within 1/16" with straight edge.
	Belt(s) tension too loose.	Replace belt or spring.
Trailer sways during towing.	Discharge tube and/or extension tray not in correct towing position.	Before towing the machine, position the discharge tube over the hitch poll and raise the extension tray.
	Tire air pressure is not correct.	Check tire sidewall for inflation limits.

# 7

Section

# SPECIFICATIONS

CH8993H		
DESCRIPTION	ENGLISH	METRIC
OVERALL SIZE*	136" x 79" x 95"	345cm x 200cm x 241cm
OVERALL WEIGHT*	2,225 lbs. (CH8720iH) 2,320 lbs. (CH8720iH-XE)	1009kg (CH8720iH) 1052kg (CH8720iH-XE)
MAX CHIPPER CAPACITY	8" dia.	20cm dia.
FEED CHUTE OPENING	30-1/4" x 30-3/4"	76.8cm x 78.1cm
CHIPPER BLADES	4 reversible heat treated (5.09"x4"x0.375")	12.9cm x 10cm x .95cm
CHIPPING ANVIL (ADJUSTABLE)	9.25" L x 3.5" W x 5/8" thick	23.49cm L x 8.89cm W x 1.59 cm thick
DISC SPEED	1600 RPM	
DISC SIZE	30" dia. x 1-1/4" thick	76.2 dia. x 3.175cm thick
DISC WEIGHT	275 lbs.	125kg
DISCHARGE BLOWER DIAMETER	8"	20cm
DISCHARGE BLOWER HEIGHT	95"	2.41m
DRIVE TYPE	Belt	
BELT SIZE	3B83 Banded	
WHEEL BASE	75.13"	190.8cm
TIRE SIZE	P215/70R15 or ST225/75R15	
JACK (ADJUSTABLE)	850 lb. rating	372 kg rating
ENGINE	993CC Briggs & Stratton	
FUEL TANK CAPACITY	10 gal.	37 liters
HYDRAULIC FEED RATE	0-155 feet/min (100 feet/min average)	0-47 meters/min (30 meters/min average)
HYDRAULIC OIL TANK CAPACITY	3 gal.	11.5 liters

\* DOES NOT APPLY TO F MODELS

**BOLT TORQUE**

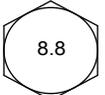
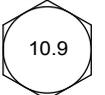
The tables below are for reference purposes only and their use by anyone is entirely voluntary, unless otherwise noted. Reliance on their content for any purpose is at the sole risk of that person and any loss or damage resulting from the use of this information is the responsibility of that person.

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

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

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

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

METRIC Grade and Head Markings	4.8	8.8	10.9	12.9	BOLT DIAMETER
					

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

# 8 OPTIONS

Section

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PART NUMBER	DESCRIPTION
14900-00	PINTLE HITCH
31605-00	TACH/HOUR METER KIT
74581-00	LOW PROFILE DISCHARGE
76195-00	KIT, 8 INCH SAFETY BAR
76293-00	CHIPPER BLADE IT
77232-00	KIT, COUPLER REPLACEMENT