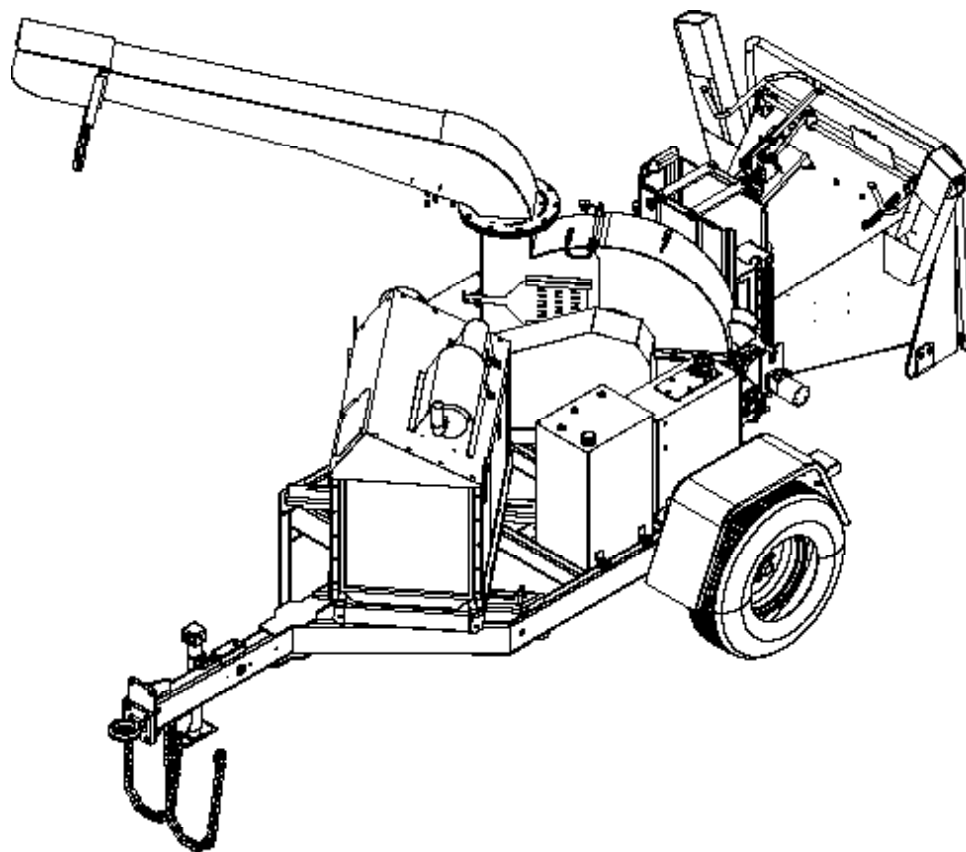




Model DC 1317



Operator's Manual

Altec Environmental Products LLC. reserves the right to improve models and change specifications without notice.

704-482-4356

Copyright © 2008 by Altec Environmental Products LLC.

All rights reserved. No part of this publication may be used or reproduced by any means, or stored in a database or retrieval system, without prior written permission of the publisher. Making copies of any part of this publication for any purpose other than personal use is a violation of United States copyright laws



STANDARD LIMITED WARRANTY

New products manufactured by Altec Environmental Products, LLC ("AEP"), are warranted to be free from defects in materials and workmanship at the time of initial delivery to the original retail purchaser, subject to the following provisions:

For a period of one (1) year from the date of shipment to the original retail purchaser or two thousand hours of use, whichever comes

first, AEP will replace or repair, in its sole discretion and at a location it designates, any parts AEP determines, in its sole discretion to have been defective in workmanship or material upon initial delivery.

This Limited Warranty does not cover (a) equipment not operated and maintained in accordance with AEP operator's and maintenance manuals, (b) equipment and components not manufactured by AEP, (c) equipment damaged through abuse or accident, (d) equipment which has been subjected to unauthorized alteration or repair, or repaired using unauthorized parts, (e) equipment damaged through the failure to replace normal wear items (f) transportation or delivery to an AEP service facility or to the customer's location, and (g) the power unit for the equipment, which is warranted, if at all, by its manufacturer, according to its terms, and not by AEP.

Labor expenses incurred during approved warranty work will be reimbursed by AEP only when AEP has authorized such work in advance, in writing, and then only to the extent stated in the written authorization. Such approved labor credit will be based on reasonable labor rates and factory replacement time. Technician or transport travel time will not be reimbursed unless pre-approved in writing by an authorized AEP representative.

This Limited Warranty is non-transferable unless prior written authorization is obtained from AEP.

This Limited Warranty is expressly in lieu of any and all other warranties, express or implied, including, but not limited to, any warranty of merchantability or fitness for a particular purpose. Remedies under this Limited Warranty are expressly limited to the repair or replacement of parts, as specified above, and any claims for other loss or damages of any type (including, but not limited to, loss from failure of the equipment to operate for any period of time, other economic or moral loss, or direct, immediate, special, indirect, incidental, or consequential damage) are expressly excluded. AEP reserves the right to supply remanufactured replacement parts as it deems appropriate.

This Limited Warranty begins on the date the equipment is sold and shipped from a Ditch Witch dealer or any other authorized Altec shipping site.

Parts Warranty: Parts replaced in the warranty period will receive the balance of the Original Warranty. Replacement parts after the Original Warranty are warranted to be free of defects of material for (90) days or the part will be repaired or replaced, without labor coverage for removal or reinstallation.

Claims for coverage under this Limited Warranty should include the following information:

- 1) Location from which equipment was purchased.
- 2) Date of delivery.
- 3) Chipper serial number.
- 4) Chipper model number.
- 5) Engine make and serial number.
- 6) Length of time in use (number of hours shown).
- 7) Date of failure.
- 8) Nature of failure and events surrounding the failure.

For Information or claims contact:
Altec Environmental Products, LLC
512 North Post Road
Shelby NC 28150
704-482-4356

MODEL DC 1317

CHIPPER
SERIAL NUMBER

ENGINE MAKE
MODEL
SERIAL
NUMBER

DISC
HEAD
NUMBER

CUSTOMER

NAME
ADDRESS
CITY
STATE ZIP CODE -
PHONE NUMBER - -
DELIVERY DATE - -

DEALER NAME

Altec Environmental Products, LLC
512 North Post Road
Shelby, North Carolina 28150 Telephone:
Parts & Service 704-482-4356
Parts & Service Fax 704-482-5926
Sales 704-481-4356
Web site: altecenvironmentalproducts.com

Preface

This unit is the result of Altec Environmental Products, LLC advanced technology and quality awareness in design, engineering and manufacturing. At the time of delivery from the factory, this unit met or exceeded all applicable requirements of the American National Standards Institute. All information, illustrations and specifications contained within this manual are based on the latest product information available at the time of publication. It is essential that all personnel involved in the use and/or care of this unit read and understand the Operator's Manual, all decals and placards.

Given reasonable care and operation, according to the guidelines set forth in the manuals provided, this unit will provide many years of excellent service before requiring major maintenance.

Impacts to and excessive forces on the equipment, though vehicular accidents, rollovers, excessive loading, and the like, may result in structural damage not obvious during a visual inspection. If the equipment is subjected to such impact forces, a qualified person may need to preform additional testing such as magnuflux or ultrasonic testing as applicable. If structural damage is suspected or found, contact Altec Environmental Products, LLC for additional instruction.

WARNING

Death or serious injury could result from component failure. Continued use of equipment with hidden damage could lead to component failure.

Never alter or modify this unit in any way that might affect the structural integrity or operational characteristics without the specific written approval of Altec Environmental Products, LLC. Unauthorized alterations or modifications will void the warranty. Of greater concern, is the possibility that unauthorized modifications could adversely affect the safe operation of this unit, resulting in personal injury and/or property damage.

DANGER

Death or serious injury will result from operation of a chipper, while coupled to an energized aerial device. Non-insulated aerial devices have no dielectric rating. When coupled, chipper to aerial lift and in the proximity of energized conductors, there shall be no operation or contact with the chipper.

Set-up requirements, work procedures, and safety precautions for each particular situation are the responsibility of the personnel involved in the use and/or care of this unit.

Table of Contents

Introduction

About This Manual.....	1
Purpose of the Unit	1

Unit Specifications

General Specifications	2
Major Component Identification	3

Safety

Safety Instructions	4
General Operating Information	4
Capacity	4
Lock-Out Tag-Out Procedure (LOTO)	5
Chipper Personnel Safety Devices	5
A) Panic Bar	5
B) Chip Curtain	6
C) Rotational Indicator	6
D) Disc Cover Padlock	6
E) Disc Blade Change Pin	7
F) Disc Hood Switch	7
G) Guards	7
H) Upper Feed Roll Lock Pin	8
I) Safety Tow Chains	8
J) Break-away Switch	8
K) Accident Prevention Decals	9
Chipper Personnel Safety Device Testing & Inspection Table	9
Placards	10
Personal Protective Clothing and Equipment	19

Daily Pre-Operational Inspection

Important Checks	21
Hitching to Tow Vehicle	21
Chipper Electric Braking System	22
Overview	22
Synchronizing Tow Vehicle Controller	22
Breakaway Braking System	23
Inspection and Maintenance	23
Brake Adjustment	23
Tires and Wheels:	23
Fueling Chipper	23

Operation

Controls	24
Feed Roller Operation	24
PTO/Clutch Engagement	25
Feed Sense	26
Winch Safety and Operation	26

Work Site Preparation

Brush Preparation	28
Starting the Engine	29
Engaging/Disengaging Cutter Head	30
Engaging	30
Disengaging	30
Feeding Brush to the Chipper	31
Proper Brush Feeding Technique	32
Clearing Feed Rollers	34

Chippers with optional lift cylinder kit.....	34
Chippers without optional lift cylinder kit.....	34
Clearing Discharge Chute.....	35
Elimination of Plugs	35
Routine Maintenance	
Engine Oil	36
Engine Coolant	36
Radiator Cleaning	36
Engine Air Filter.....	37
Clutch and Power Take Off (PTO).....	37
Fuel Tank.....	37
Battery:.....	38
Fasteners:	38
Changing Tires:	38
Tongue and Hitch:	38
Axle Bearings:	38
Hinge and Friction Points:.....	39
Disc and Feed Roll Bearings:	39
Blade/Anvil Replacement	
Accessing the Cutter Head	40
Blade Installation and Adjustment	40
Blade Mounting Surface.....	41
Blade Inspection	41
Anvil Installation and Adjustment	41
Re-sharpening Knives	42
Extended Storage	
Engine Storage	43
Chipper Storage.....	43
Appendix	
Trouble diagnostics	44
Glossary.....	45
Fastener Torque Chart	56
Checklist	58

Introduction

About This Manual...

This manual provides instruction for the operation of the unit. The operator must be familiar with the unit and its capabilities before using the unit on the job. This manual is written to provide an understanding of the unit, safety, proper set-up and operation.

Charts and figures are provided to support the text. Because options vary from one model to another, some figures may only be a representation of what is actually on the unit.

Contact the following organizations for additional information.

- American Nation Standards Institute (ANSI)
Z133.1 Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush-Safety Requirements
- American Public Power Association
(Safety Manual for an Electric Utility)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- European committee for Standardization (CEN)
- Fluid Power Society (FPS)
- Hydraulic Tool Manufacturers Association (HTMA)
- International Electrotechnical Commission (IEC)
- International Organization for Standards (ISO)
- Occupational Safety and Health Administration (OSHA)
- Federal Motor Carrier Safety Administration (FMCSA)
- US Department of Transportation (DOT)
- Federal Highway Administration (FHWA)

Dealers, installers, owners, users, operators, renters, lessors, and lessees must comply with the appropriate sections of the applicable ANSI standard.

The Appendix contains reference items to assist in unit operation. A glossary of industry terms is provided for your convenience. This glossary provides an understanding of the industry terms and phases used in Altec manuals. Throughout the manual, the term unit is used to describe the Altec device, subbase, and the associated interface with the vehicle.

Supply the model and serial number found on the serial number placard and the manual part number from the rear cover to assure that the correct manual will be supplied.

Purpose of the Unit

This unit has been designed and built to reduce brush and above ground tree components into uniformed wood chips.

Unit Specifications

General Specifications

This unit is a 13 inch capacity, controlled feed disc chipper. The chipper mechanism is permanently mounted on the tow-able frame assembly. The chipper mechanism is belt driven through a self contained industrial engine. Material is fed utilizing two horizontally mounted, hydraulically controlled feed rolls. Cutter head consists of a 40 inch diameter disc with 7¼ knives. Chip discharge is designed for 360 ° rotation for chip box and road side discharge applications.

Item	Standard Specifications
Chipping capacity	13 Inch
Engine horse power	85 Hp
Noise level *1	80
Weight	5090 lb
Tongue weight (may vary)	449 lb
Travel height	8' 3" Inch
Width	6' 8" Inch
Transport length	15' 1" Inch
Operational length	17" 5" Inch
Feed roller opening	17 Inch Wide x 13 Inch Height
Feed table dimensions	45 Inch Wide x 31 Inch Deep
In-feed chute opening	42 Inch Wide x 30 Inch High
Length to feed roll nip point *2	90 Inch
Disc dimensions	2 Inch Wide x 40 Inch Dia.
Disc Weight	718 lbs
Disc RPM	1250 RPM
Feed rolls	16½ Inch Wide x 7 ½ Inch Dia.
Feed Rate	95 Feet Per Minute
Feed roll motor rating	13.7 Cu. In. Displacement
Hydraulic pressure	2500 PSI
Hydraulic tank capacity	8 Gallon
Fuel tank capacity	25 Gallon
Trailer lighting	L.E.D
Discharge chute rotation	360 Degree

Major Component Identification

1) FENDERS

2) TRAILER FRAME

3) FOLDING FEED TABLE

4) BATTERY BOX

5) HYDRAULIC TANK

6) FUEL TANK

7) CHIP DEFLECTOR

8) DISCHARGE CHUTE

9) DISC HOUSING

10) ENGINE

11) BREAKAWAY SWITCH

12) TOW BAR

13) CLEARANCE LIGHTS

14) BELT GUARD

15) FRONT JACK-STAND

16) REAR JACK STAND

17) PANIC BAR

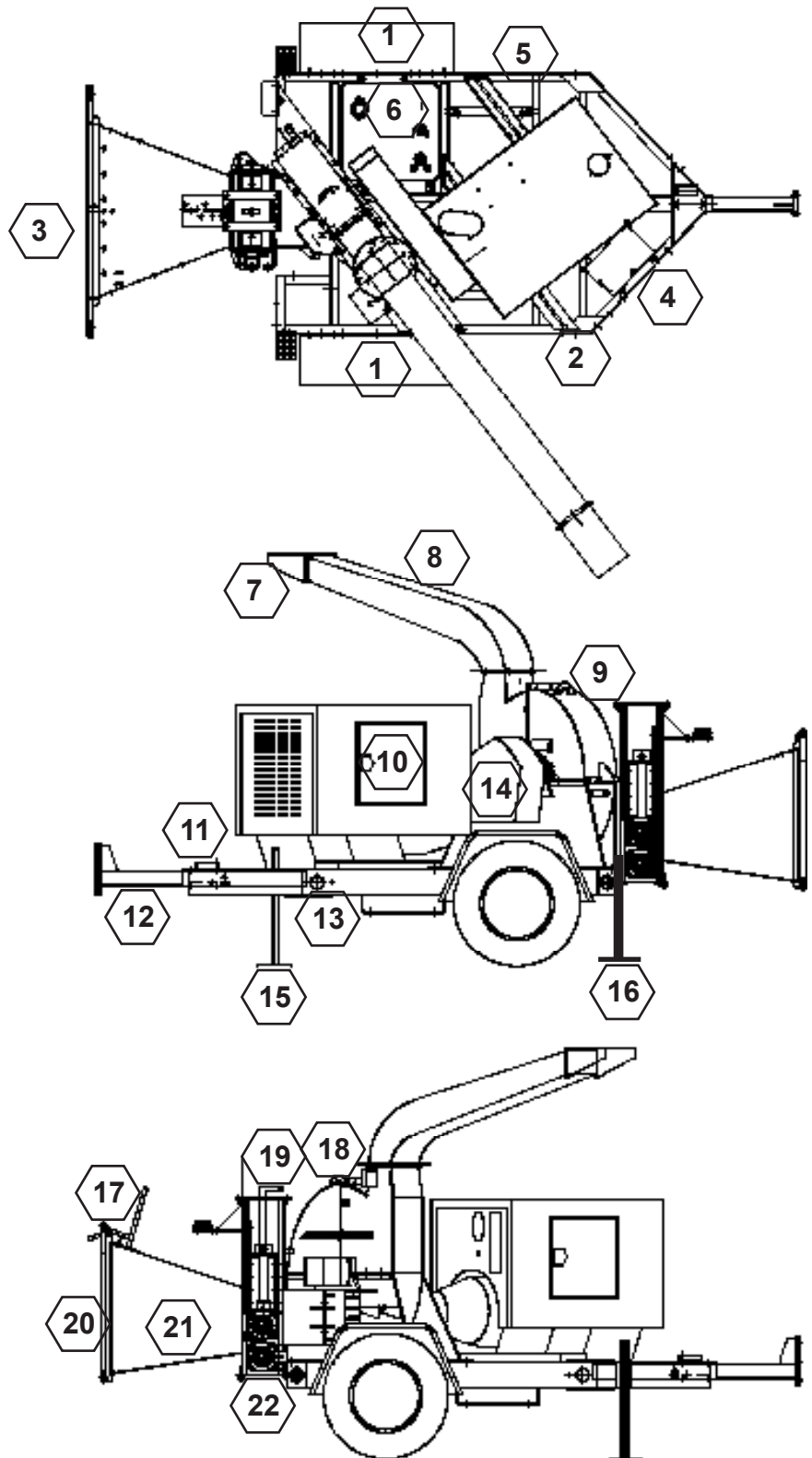
18) CHUTE ROTATION PIN

19) ROLLER SLIDE BOX

20) FEED CONTROL ARM

21) INFEEED CHUTE

22) FEED ROLLER MOTOR



Safety

Safety Instructions

This unit is designed and manufactured with many features intended to reduce the likelihood of an accident. But not all potentially hazardous situations can be addressed in this manual. Management, Owners, Operators, and Mechanics must evaluate all operations and maintenance procedures to insure personnel safety is properly addressed. Safety alerts throughout this manual highlight situations in which accidents may occur. Pay special attention to all safety alerts.

DANGER

Death or serious injury will result from careless or improper use of the unit. Do not operate the unit without proper training.

WARNING

Death or serious injury can result from careless or improper use of the unit. The operator bears ultimate responsibility for following all regulations and safety rules of their employer and/or any state or federal law.

It is very important that all personnel are properly trained to act quickly and responsibly in an emergency, knowing the location of the controls and how they operate. Keep any tools or equipment needed to perform manual operations in a well-marked, designated area. Keep work area well organized and eliminate trip hazards.

DANGER

Death or serious injury can result from entangling with material being feed into the chipper. Insure adherence to all required personal protective equipment and clothing. Insure all safety operational and maintenance parameters are strictly enforced.

Death or serious injury can result from accessing moving components such as cutter drum/disc or drive components. Never attempt access to or attempt to cover moving components.

Death or serious injury will result from unprotected contact with energized conductors. Do not operate or come in contact with a chipper while coupled to an operational aerial lift.

Knowledge of the information in this manual and proper training provides a basis for safely operating the unit. Follow your employer's safe work practices and the procedures in this manual when operating the unit.

General Operating Information

- Do not operate the unit without proper training.
- Be sure that the unit is operating properly, and has been inspected, maintained and, tested in accordance with the manufacturer's and government's requirements.
- Use required personal protective equipment.
- Be aware of your surroundings.
- Perform the Daily Preoperational Inspection before operating the unit each day.
- Apply the tow vehicle parking break and chock chipper and tow vehicle wheels.
- Properly set up chipper operational area, including vehicle and pedestrian control.
- Never exceed the rated capacity values.
- Follow all of your employers work rules and applicable governmental regulations.

Capacity

This unit capacity is the maximum size material which will pass through the feed wheel opening. Always take into consideration general material shape, protrusions and, attached limbs.

This symbol is used throughout this manual to indicate danger, warning, and caution instructions. These instructions must be followed to reduce the likelihood of personal injury or death.



The terms danger, warning and caution represent varying degrees of personal injury and/or property damage that could result if the preventive instructions are not followed. The following paragraphs from ANSI publications explain each term.

DANGER

Indicates a hazardous situation which if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING

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

CAUTION

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

NOTICE

This signal word is used to address practices not related to personal injury.

Lock-Out Tag-Out Procedure (LOTO)

⚠ WARNING

Failure to properly Lock Out Tag Out the chipper may result in Personal Injury or Death.

LOTO procedures must be completed prior to performing maintenance or clearing debris from internal components of the chipper or engine.

Never leave the chipper unattended with the keys in the ignition.

1. Turn Ignition key off and remove key. Secure the key in a safe location with controlled access.
2. Insure chipper rotor or disc comes to a complete stop.
3. Remove negative battery cable.
4. Lock and tag battery box.
5. Follow all appropriate LOTO Procedures according to OSHA Standards 29 CFR Standard 1910.147 (The Control of Hazardous Energy).
6. Follow any addition Federal, State, Local or Controlling Agency Standards or Procedures that may apply.

Chipper Personnel Safety Devices

⚠ DANGER

Improper or careless use of this chipper can result in serious injury or death. All personnel using this chipper must be trained and qualified in all aspects of the operations, maintenance, repair and safety procedures defined in this manual prior to conducting any operations or procedures. All Maintenance Personnel and Operators SHALL Ensure the proper operation of each safety device prior to starting the engine or operating the chipper. Contact Altec Environmental Products for replacement parts.

⚠ WARNING

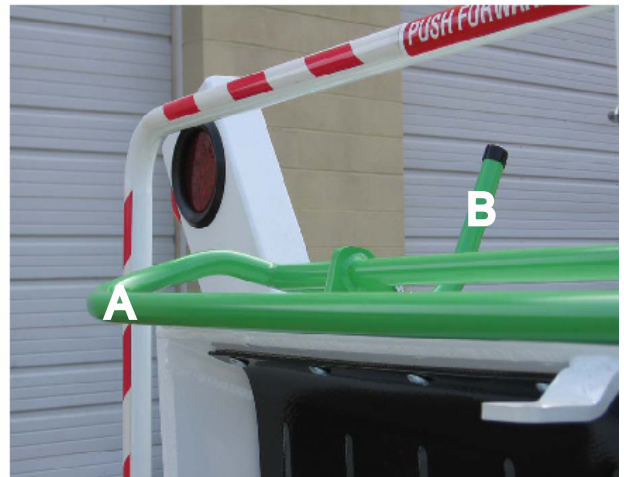
Serious injury or death may occur when operating this unit. Safety devices are not a substitution for proper operation. Read the entire manual and all safety decals and placards.

A) Panic Bar

See fig A-1 & A- 2

In the event of an unforeseen emergency situation the

panic bar can be activated by pulling down on bar "A" . This action will stop all movement of the feed roller. The panic bar may also be activated by pulling or pushing bar "B" towards the rear of the chipper.



Panic Bar Description

The Panic Bar Assembly consists of two bars (A & B), the hydraulic valve (C) and the bar linkage (D). When you pull down on bar A or push towards the rear of the chipper on bar B, the bar connecting linkage D activates the handle on valve C. This action stops all movement of the feed rollers. To continue operation you must manually reset the handle on valve C to the Run position.

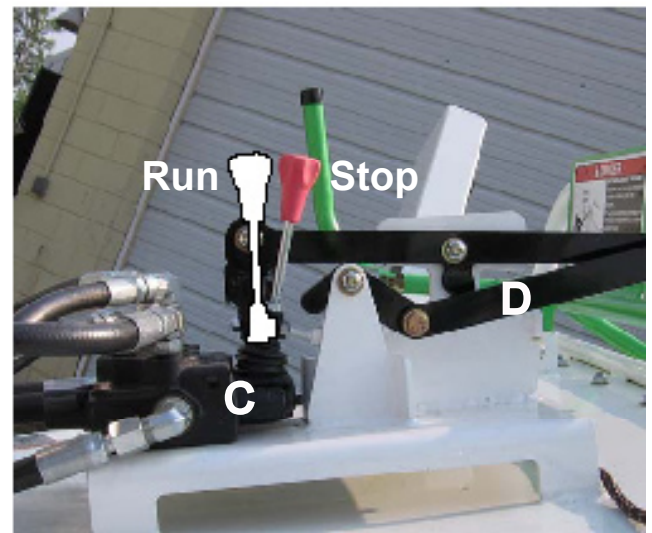


fig A-2

⚠ WARNING

Entrapment, loss of limb or life hazard. Serious injury or death can occur if entrapped in roller movement. Feed rollers begin movement as soon as valve handle is activated. Insure all operators

are advised prior to your actions and that infeed chute is clear of all personnel and tools before reactivation of feed system.

1. Test daily and whenever new personnel are assigned to the chipper.
2. After completing all appropriate safety and operational checks and with no material in the feed chute, pull or push the feed bar so as to activate the feed roller in the forward direction. Visually verify the rotation of the feed roller.
3. Push down on bar A or move bar B .
4. Feed roller movement must stop.
5. If feed rollers do not stop, repair as necessary prior to operating the chipper.

B) Chip Curtain

See Fig B

The kickback curtain stops or deflects chips and small debris from leaving the feed chute area. This also helps in decreasing the amount of clean up around the chipper.

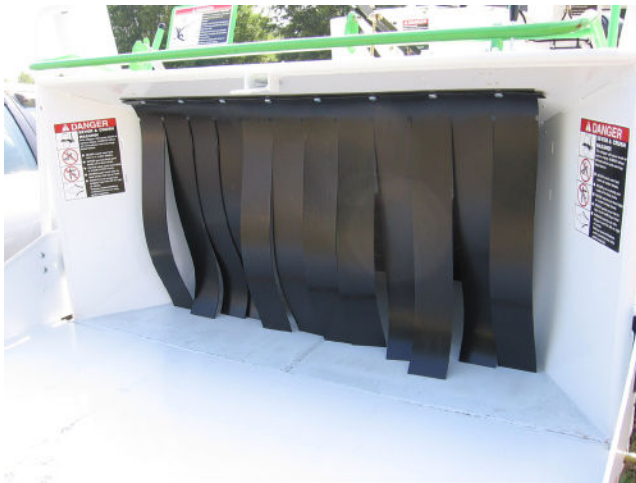


fig B

⚠ WARNING

Flying object hazard. Personal injury may occur from flying debris. Always insure the chip curtain is properly bolted in place and in good condition. Insure personal protective eye wear is always worn.

Inspect chip curtain for damage or missing segments.

C) Rotational Indicator

See fig C

The rotational indicator is located in the center of the disc bearing cover guard. Movement of the bolt head seen through this guard indicates movement of the disc and drive components.



fig C

⚠ DANGER

Crushing, cutting hazard. Equipment damage, serious injury or death can occur when attempting to access moving components. Never attempt access to moving components. Never attempt to replace covers on moving components. This is extremely critical on disc movement.

Inspect visibility of the rotational indicator. Insure no debris is blocking view.

D) Disc Cover Padlock

See fig D

This padlock is keyed different from other locks on the chipper. This allows management /supervisors to control access to the disc cutter area.



fig D

⚠ DANGER

Crushing, cutting hazard. Equipment damage, serious injury or death can occur when attempting to access moving components. Only trained personnel should access the cutter disc.

Verify padlock is in place and insure management control of hood lock key.

E) Disc Blade Change Pin

See fig E. Note; For clarity pin is shown with discharge hood/chute removed.

Complete LOTO procedures prior to performing maintenance on the blades.

Pin is used to lock disc while performing blade maintenance. After disc hood has been opened, place pin through disc housing access tube. Slowly rotate the disc until the pin goes through the disc assembly. The disc will now be in the proper position for blade maintenance. Remove and rotate the disc 180° for proper access to the second blade. Remove prior to attempting to start the chipper. Insure pin is in good condition and tethered to the chipper.



fig E

⚠ WARNING

Cutting hazard. Serious injury may occur while performing blade maintenance. Always wear cut resistant gloves when performing blade maintenance or inspections.

F) Disc Hood Switch

See fig F

The disc hood switch prohibits the starting of the engine while the disc is open. Test switch operation by removing the switch actuator plate and attempt to start the engine. Depending on your engine model, the starter may engage, but the engine must not start. If the engine starts, do not operate the chipper until the switch circuit is repaired.



fig E

⚠ DANGER

Crushing, cutting hazard. Equipment damage, serious injury or death can occur when attempting to access moving components. Only trained personnel should access the cutter disc.

G) Guards

See fig G

Your chipper is equipped with safety guards protecting you from personal injury. Do not start or operate the chipper with these guards removed. Inspect all guards to insure they are in place, in good condition, and properly secured. Never attempt to install a guard or close the disc hood while the chipper is running. Make any necessary repairs prior to starting the chipper



fig G

⚠ DANGER

Crushing, cutting hazard. Equipment damage, serious injury or death can occur if starting or operating this chipper without the guards in place. Always insure all guards are in place prior to

operation.

H) Upper Feed Roll Lock Pin

See fig H

The upper feed roll lock pin is used to hold the upper roll in the raised position so as to assist operators in clearing infeed material clogs. Insure pin is in good condition and tethered to the chipper. If used, jackstand must be in good operating condition. Inspect jackstand attachment points for damage. If equipped with a lift cylinder, insure proper operation of the system.

If your chipper is equipped with a hydraulic lift cylinder:

1. Disengage clutch, Wait for all disc movement to stop.
2. With the lift cylinder controls, fully raise the upper feed roll. Hold while inserting pin.
3. Slide the pin through the feed roll slide-box and feed roll assembly. Insure the pin goes completely through both feed roll assembly and slide-box uprights.
4. Using the lift cylinder control, Slowly lower the feed roller. Do not apply down pressure.
5. Complete LOTO procedures.

If your chipper is not equipped with a hydraulic lift cylinder:

1. With chipper hitched to the tow vehicle.
2. Complete LOTO Procedures.
3. Remove the front jackstand and place on the jackstand mount located on the front side of the slide-box upright.
4. Jack the feed roll assembly up until holes in the slide-box uprights and feed roll assembly are aligned.
5. Slide the pin through the feed roll slide-box and feed roll assembly. Insure the pin goes completely through both feed roll assembly and slide-box uprights.
6. Slowly lower the feed roller.



fig H

DANGER

Crushing, cutting and release of stored energy hazards. Serious injury or death can occur. Never place any part of your body in a potential pinch point.

I) Safety Tow Chains

Tow chains are to be utilized every time a chipper is transported. Chains must be routed under trailer tongue in an "X" pattern between tow vehicle and trailer.

Slack in chain should be adjusted by installing the hook in the proper chain link to permit turning but not dragging on the ground. Inspect chain, clevis and hook for damage or excessive wear.

J) Break-away Switch

In the event of a unwanted separation of the chipper from the tow vehicle, the tongue should drop into the cradle formed by the "X" pattern of the chains. The breakaway cable must pull the plunger from the switch before the entire tongue weight of the chipper comes to a rest in the chain cradle.

When the breakaway switch is activated full voltage from the chipper battery is applied to the brakes. The chipper will come to a complete stop, but will not lock up the wheels.

Testing of the breakaway can be accomplished by jacking up the chipper, spinning the wheel and pulling the plunger. The brakes should apply. This test only insures the basic braking circuit is properly functioning. For complete testing and tow vehicle controller set-up, refer to the chipper brake section in this manual.

NOTICE

The breakaway switch is to be used for emergencies only. The breakaway system rapidly discharges the battery when the plunger pin is removed. Reinstall plunger immediately after completion of test.

K) Accident Prevention Decals

This unit was equipped with accident prevention decals at the time of manufacture, If any of these are lost or become illegible, obtain replacements from your Altec representative.

The location, part number and, description of all placards are listed in the Parts and Operations Manuals. Refer to the Accident Prevention Decals and Diagram for examples of the placards and their locations.

IT IS THE RESPONSIBILITY OF THE OWNERS OF THE CHIPPER TO ENSURE ALL DECALS ARE IN PLACE, LEGIBLE AND IN GOOD OVERALL CONDITION.

Decals are strategically located on your machine to provide important information that can help you operate the machine properly and safely.

Please insure that the decals remain in place and keep them in good condition by following the instructions listed below.

- Keep all decals clean. Use a mild soap and water to clean the decals. Never use chemical or abrasive cleaners on the decals.
- Before painting the unit, mask off the decals or replace the decals after painting.
- Inspect the decals on your unit daily and replace any missing or damaged decals immediately.
- You may purchase replacement decals from your authorized dealer.

Apply safety labels to a clean surface with temperature of at least 40° F (5° C). Spray a small amount of mild soapy water to the back of each safety label before placement. The soapy water will allow movement and positioning of the label, if necessary. After the correct placement of the safety label has been achieved, press out any excess water and air pockets on the safety label.

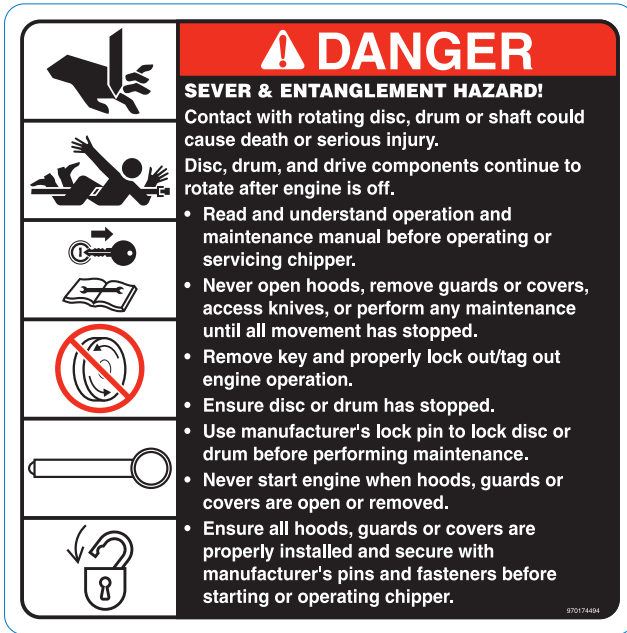
WARNING

Serious injury or death may occur if proper safety instructions are not provided and followed. Insure all safety, instructional decals, and placards are properly placed, legible and in good overall condition. Insure all operators and maintenance personnel are familiar with all decal messages.

Note:
Decals may vary according to model, options and engine supplied.

Chipper Personnel Safety Device Testing & Inspection Table		
Device	Frequency	Method
A) Panic Bar	Daily and New Operators	Activate Bar
B) Chip Curtain	Daily	Inspection
C) Rotational Indicator	Daily	Inspection
D) Disc Cover Padlock	Daily	Inspection
E) Disc Blade Change Pin	Prior to Performing Maintenance	Inspection
F) Disc Hood Switch	Daily	Activate Switch
G) Guards	Daily	Inspection
H) Upper Feed Roll Lock Pin	Prior to Performing Maintenance	Inspection
I) Safety Tow Chains	Daily	Inspection
J) Break-away Switch	Weekly	Test Activation
K) Accident Prevention Decals	Daily	Inspection





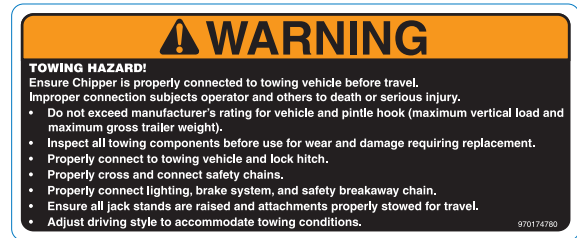
Item # 10 / Part # 970174494
7½" Wide x 7½" Tall



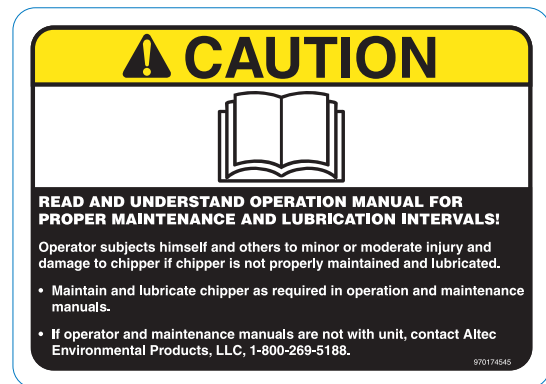
Item # 11 / Part # 970174727
5½" Wide x 5¼" Tall



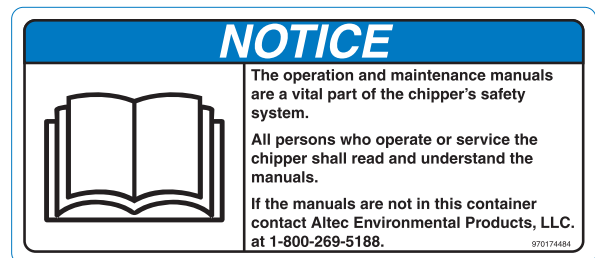
Item # 12 / Part # 970176501
4½" Wide x 4¾" Tall



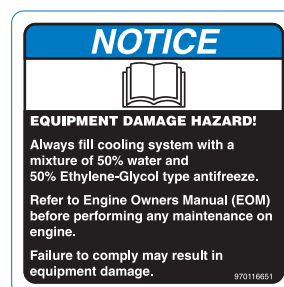
Item # 13 / Part # 970174780
5¾" Wide x 2¼" Tall



Item # 14 / Part # 970174545
5½" Wide x 3¾" Tall



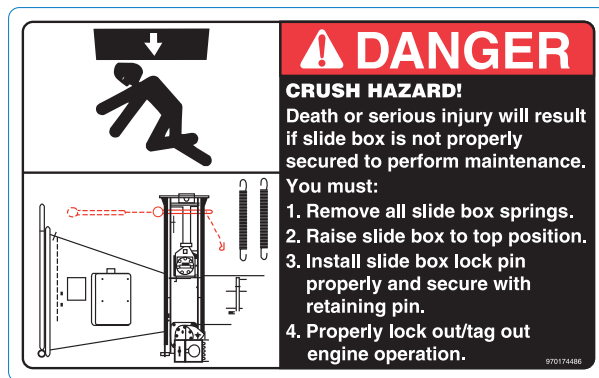
Item # 15 / Part # 970174484
6" Wide x 2½" Tall



Item # 16 / Part # 970116651
2¾" Wide x 2¾" Tall



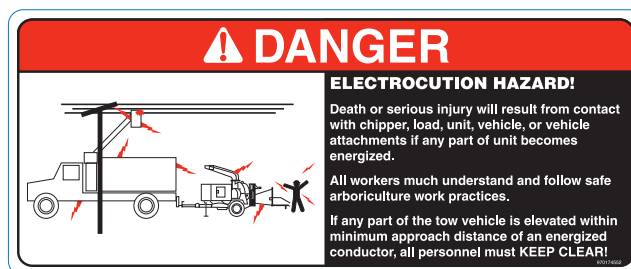
Item # 17 / Part # 970174568
2³/₄" Wide x 2³/₄" Tall



Item # 20 / Part # 970174486
6³/₄" Wide x 4" Tall



Item # 18 / Part # 970116652
4¹/₂" Wide x 4¹/₂" Tall



Item # 21 / Part # 970174552
4¹/₂" Wide x 4¹/₂" Tall



Item # 19 / Part # 970174499
4¹/₂" Wide x 4¹/₂" Tall



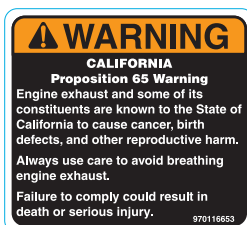
Item # 22 / Part # 970174489
4³/₄" Wide x 2³/₄" Tall



Item # 23 / Part # 970174538
6½" Wide x 6½" Tall



Item # 24 / Part # 970116649
4½" Wide x 4½" Tall



Item # 25 / Part # 970116653
2¼" Wide x 2" Tall



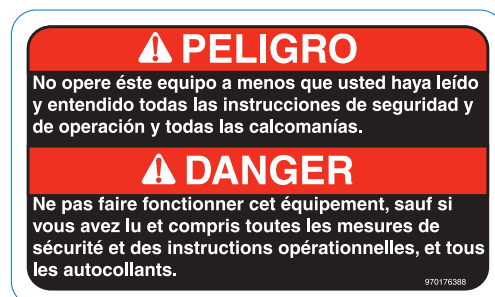
Item # 26 / Part # 970116640
3¾" Wide x 1¼" Tall



Item # 28 / Part # 970174493
7½" Wide x 9½" Tall



Item # 29 / Part # 970116642
2¾" Wide x 1" Tall



Item # 30 / Part # 970116640
4½" Wide x 2¾" Tall

WARNING

ALL DECALS AND PLACARDS SHALL BE PROPERLY POSITIONED ON THE EQUIPMENT, COMPLETELY LEGIBLE AND UNDERSTOOD BY ALL OPERATIONAL AND MECHANICAL PERSONNEL PRIOR TO OPERATION OR MAINTENANCE OF THIS EQUIPMENT. FAILURE TO INSURE THIS COULD RESULT IN EQUIPMENT DAMAGE, SERIOUS INJURY OR DEATH. TO OBTAIN DECAL & PLACARD PLACEMENT GUIDES OR REPLACEMENT DECALS & PLACARDS, CONTACT ALTEC ENVIRONMENTAL PRODUCT AT:
1-800-269-5188
OR ONLINE AT:
www.altecenvironmentalproducts.com

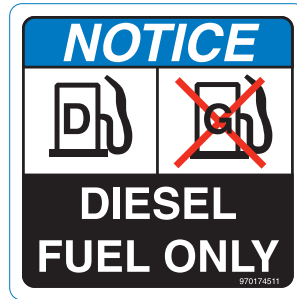
DO NOT REMOVE THIS TAG

970122659

Item # 31 / Part # 970122659
5" Wide x 6³/₄" Tall



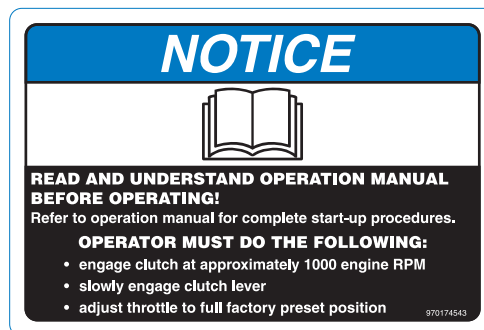
Item # 32 / Part # 970116654
4¹/₂" Wide x 7¹/₂" Tall



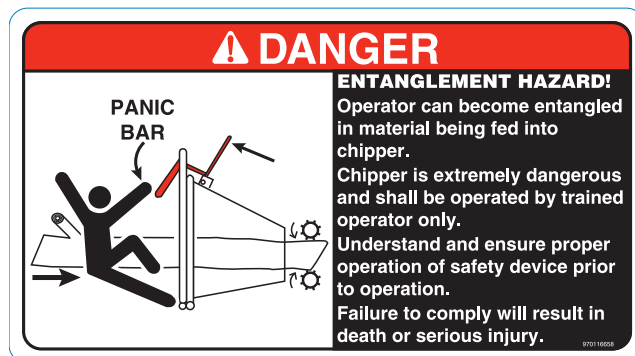
Item # 33 / Part # 970174511
2³/₄" Wide x 2³/₄" Tall



Item # 34 / Part # 970176387
2³/₄" Wide x 2³/₄" Tall



Item # 35 / Part #9701745433
4¹/₂" Wide x 3" Tall



Item #40 / Part # 970116658
8" Wide x 4¹/₂" Tall



Item #41/ Part # 970121130
6½" Wide x 2½" Tall

PUSH FORWARD TO REVERSE FEED WHEELS

Item #56 / Part # 970116644
18" Wide x 1½" Tall

PLACARD ORIENTATION

ITEM NO.	QTY	PART NUMBER	DESCRIPTION
		970191095	ASSEMBLY,PLACARD,ORIENTATION,DC-912A
1	1	970176549	PLACARD KIT, ENGLISH, DRUM AND DISC CHIPPERS,
2	1	970176550	PLACARD KIT, ENGLISH, PANIC BAR,
51	1	970116665	PLACARD, ENGLISH, ALTEC LOGO, FEED TABLE, YELLOW "A" BLACK LETTERS, 8 IN W X 23
52	1	970116662	PLACARD, ENGLISH, ALTEC LOGO, 6 IN W X 17 IN L, YELLOW "A" BLACK LETTERS,
53	1	970116666	PLACARD, ENGLISH, WEBSITE, FEED TABLE,
54	1	970122677	PLATE, ENGLISH, INFORMATION, HEAD, SERIAL NUMBER,
55	1	970122676	PLATE, ENGLISH, SERIAL, GVWR,
56	1	970116644	PLACARD,ENGLISH,OPERATION,FEED CONTROL HANDLE,PUSH FORWARD TO REVERSE

PLACARD ORIENTATION

ITEM NO.	QTY	PART NUMBER	DESCRIPTION
		970176549	PLACARD KIT, ENGLISH, DRUM AND DISC CHIPPERS
10	2	970174494	PLACARD, ENGLISH, DANGER, SEVER AND ENTANGLEMENT, HAZARD,
11	1	970174727	PLACARD, ENGLISH, WARNING, ROTATING SHAFT,
12	2	970176501	PLACARD, ENGLISH, WARNING, ENTANGLEMENT HAZARD, DRIVE BELTS,
13	1	970174780	PLACARD, ENGLISH, WARNING, TOWING HAZARDS,
14	1	970174545	PLACARD, ENGLISH, CAUTION, READ AND UNDERSTAND, 6.00 IN L X 4.25 IN W
15	1	970174484	PLACARD, ENGLISH, NOTICE, OPERATION AND MAINTENANCE, 6.25IN L X 2.75 IN W,
16	1	970116651	PLACARD, ENGLISH, NOTICE, ENGINE, EQUIPMENT DAMAGE HAZARD,
17	1	970174568	PLACARD, ENGLISH, NOTICE, HYDRAULIC OIL ONLY,
18	1	970116652	PLACARD, ENGLISH, WARNING, ENGINE, BURN HAZARD,
19	2	970174499	PLACARD, ENGLISH, WARNING, FLYING OBJECT HAZARD,
20	1	970174486	PLACARD, ENGLISH, DANGER, CRUSH HAZARD, SLIDEBOX,
21	2	970174552	PLACARD, ENGLISH, DANGER, ELECTROCUTION HAZARD,
22	2	970174489	PLACARD, ENGLISH, WARNING, SLIDEBOX CRUSH AND SEVER,
23	2	970174538	PLACARD, ENGLISH, DANGER, OPERATION BY QUALIFIED PERSON,
24	1	970116649	PLACARD, ENGLISH, WARNING, EXPLOSION HAZARD, BATTERY,
25	1	970116653	PLACARD, ENGLISH, WARNING, ENGINE, CALIFORNIA PROPOSITION G5,
26	1	970116640	PLACARD, ENGLISH, WARNING, DISC HOUSING, SEVER HAZARD,
28	2	970174493	PLACARD, ENGLISH, DANGER, SEVER AND CRUSH HAZARD, INFEED CHUTE,
29	4	970116642	PLACARD, ENGLISH, NOTICE, BEARINGS, LUBRICATE DAILY,
30	2	970176388	DANGER, SPANISH/FRENCH, OPERATION,
31	1	970122659	PLACARD, ENGLISH, WARNING, ENGINE, DO NOT REMOVE THIS TAG, ALTEC LABEL,
32	1	970116654	PLACARD, ENGLISH, WARNING, FUEL TANK, EXPLOSION & BURN HAZARD,
33	1	970174511	PLACARD, ENGLISH, NOTICE, DIESEL FUEL ONLY,
34	1	970176387	PLACARD, ENGLISH, NOTICE, GASOLINE ONLY,
35	1	970174543	PLACARD, ENGLISH, NOTICE, READ AND UNDERSTAND, OPERATION MANUAL,

PLACARD ORIENTATION

ITEM NO.	QTY	PART NUMBER	DESCRIPTION
		970176550	PLACARD KIT,ENGLISH,PANIC BAR
40	2	970116658	PLACARD, DANGER, PANIC BAR, ENTANGLEMENT HAZARD,
41	2	970121130	PLACARD, ENGLISH, WARNING, PANIC BAR TEST,

Personal Protective Clothing and Equipment

WARNING

Serious injury or death may occur if proper personal protective equipment is not utilized. To decrease the possibility of injury or death. All chipper operators **MUST** wear appropriate protective equipment and clothing.

NOTICE

Definition:

Chipper Operational Area

The area around the chipper that:

- Has the potential for flying debris from the discharge chute or in-feed chute.
- Has the potential for material to be engaged by the chipper or to be fed by an operator into the chipper (material being dragged to the chipper).

PROTECTIVE EQUIPMENT SPECIFICATIONS:

WARNING

Death or serious injury can result from falling or rapidly shifting objects. Hard hats are required.

Head Protection:

- Head protection must conform to ANSI Z89.1 and under chin strapping shall not be worn while operating or within the operational area of the chipper.

WARNING

Death or serious injury can result from flying objects. Always wear eye protection.

Eye Protection:

- Wrap around eye protection that meets ANSI Z87.1 shall be worn at all times when operating or working within the operational area of the chipper.

WARNING

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protective devices such as earplugs to protect against objectionable or uncomfortable loud noise.

Hearing Protection:

- Plug type ear protection or full ear coverage devices (muff type) shall be worn at all times when operating or within the operational area of the chipper. Full ear coverage devices (muff type) are

vulnerable to being entangled by branches when feeding the chipper.

CAUTION

Exposure to dust can result in respiratory difficulties. Always wear appropriate respiratory protection.

Breathing Protection:

- Some locations or jobs may require the use of breathing protection. Use paper filter type dust masks that will tear away if entangled in brush being fed into the chipper. Dust type, tear away respirators shall be worn if circumstances require breathing protection. Respiratory protection shall comply with applicable federal regulations as well as with ANSI Z88.2.

WARNING

Death or serious injury can result if operator becomes entangled. Gloves must easily release from the hand when pulled from the palm, cuff or fingers. Never wear gauntlet, cuffed or strapped gloves.

Hand Protection (Gloves):

- Chipper Operation
When operating or handling brush within the operational area of the chipper, loose fitting gloves are the only gloves that shall be worn.
- Blade Maintenance
When handling or working around the blades, insure that the gloves are of sufficient material to prevent personal injury from cutting (Heavy leather palmed work gloves or Kevlar material).

WARNING

Death or serious injury can result if operator becomes entangled in material being feed into chipper. Always wear appropriate clothing.

Clothing:

- Work clothes shall be close fitting, but not restrictive of movement, without any decorations or loose parts that may become entangled in the material being fed to the chipper. Items such as jewelry, chains and backpacks, shall not be worn while operating this unit.
- Jackets or shirts with straps at the cuff or shoulders, scarves, neckties, or gauntlet, cuffed or strapped type gloves must not be worn.
- Hooded sweat shirts may be worn only if the hood is tightly drawn around the face with the drawstring

- and the drawstrings tucked into the outer garment. Tuck the hood under the outer garment when not in use. Jackets, shirts, or other outer garments must be closed and free from pockets, straps, buckles, etc. which could become entangled in the equipment or on brush being fed into the chipper.
- Remove all chaps, climbing equipment, full body harness, bucket harness or any other protective equipment that is not required and may be an entanglement source when operating or within the operational area.

WARNING

Death or serious injury may occur when proper traffic control is not maintained. Always control both pedestrian and vehicular traffic.

Some work areas may require the wearing of reflective or highly visible garments such as a vest or chaps to alert passing traffic. When using high reflective or high visibility garments insure that the garments are constructed and worn in a manner as to "tear away" from the operator in the event of entanglement with brush. High-visibility safety apparel and headgear, when required, shall conform to ANSI-ISEA 107-2004 and US Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD), when required. Effective means for controlling pedestrian and vehicular traffic shall be instituted on every job site where necessary, in accordance with the U.S. Department of Transportation Manual on Uniform Traffic Control Devices or applicable state and local laws and regulations.

CAUTION

Serious injury may occur without the use of proper protective footwear. Always wear footwear as approved by your employer appropriate to the work location and conditions.

Daily Pre-Operational Inspection

NOTICE

Before your chipper is put into operation it is very important to read and follow procedures outlined in the engine manufacturer's Engine Owner's Manual, (EOM).

To assist the reader in determining when to refer to the Engine Owner's Manual, look for this symbol. (EOM) You will find this symbol used throughout the rest of this manual.

For specific information regarding the following checks please refer to the "Maintenance" section of this manual and the (EOM).

DANGER

Serious injury or death will occur when accessing moving components. Do not access the rotor, disc or drive components until you have read and understand the operations manual and all safety decals and placards. Drum and drive system continue to move after the clutch has been disengaged and the engine has been cut off. Ensure that the drum and drive system have come to a complete stop before attempting any maintenance in this area. Blades are extremely sharp. Care must be taken to avoid contact with the blades and blade pinch points.

WARNING

Serious injury can occur when accessing blades or sharp components. Always secure cutter to prevent rotation before tightening fasteners or performing maintenance in the drum housing areas. See Accessing The drum. Never place any part of the body under or behind guards or any other visually obscured area.

Important Checks

Note: The following checks should be performed prior to leaving the storage area.

- Check engine fuel, coolant and oil levels. (EOM)
- Check the engine air filter. (EOM)
- Check all bolts and nuts to ensure they are tight.
- Check cutting knives to ensure all attachment bolts are tight and knives are in good condition.
- Inspect anvil to ensure all attachment and adjustment bolts are secure.
- Check all controls for free and proper operation.
- Inspect discharge chute to determine if it is clear, properly positioned and secure.

- Inspect the chipper frame and structure for any bent, broken, cracked, missing or loose parts. This includes the tongue tube, hitch and all hardware associated with these items. Note: Damage may be hidden on "removable tongues" by the receiver section of the frame. Insure that this area is undamaged and replace if unit has been jack knifed or there is indications of fatigue in this area.
- Check all guards to ensure they are undamaged, in place and properly secured, including the chip deflector curtain.
- All decals must be in place and legible prior to operating the chipper.
- Check hydraulic fluid level, fluid must be between 2 to 3 inches from the top of the tank when the fluid is cold.
- Check feed roller for debris.
- Check the transition area for debris that could "lock" the drum or disc during start up.
- Insure that all safety devices are properly installed and functioning properly.
- Insure that the folding feed table extension is in place and secure for both operation and travel.
- Verify that there are no loose tools or materials on the chipper or on the feed chute.
- Insure tires are properly inflated and wheel lug nuts properly torqued.
- Verify proper operation of the panic bar.
- Inspect the hydraulic system and look for signs of leaks or wear. Leaks shall be corrected, worn components replaced and the hydraulic level checked.

DANGER

Moving components are extremely dangerous and will cause severe injury or death. Never open the disc hood while the disc is in motion.

Hitching to Tow Vehicle

WARNING

Improper towing or hitching of the chipper to the tow vehicle may cause serious injury or death. Properly hitch chipper to tow vehicle, verify the road-worthiness of the chipper and tow vehicle, and verify all equipment is properly stowed. Check the tow vehicles operating manual for rated towing capacity.

Do Not tow the chipper unless all the important checks listed below are satisfactorily completed.

The chipper and tow vehicle, as well as the hitch and receiver create "pinch points" that can cause damage, injury or death. Stay clear of these points

during all operations and be aware as they change during movement of vehicles.

The chipper tongue weight is too great for one person to lift safely. Serious muscle strains may occur if attempted alone. Get help when hitching and unhitching the chipper.

Never stand between the tow vehicle and the chipper while the tow vehicle is backing. Ensure that the tow vehicle is securely parked and the driver notified before approaching the area between the chipper unit and the tow vehicle.

1. Secure hitch to tow vehicle and ensure all safety pins, latches or hitch locking devices are secured.
2. To ensure safe chipper weight distribution when towing:
 - Frame must be level or the tongue slightly lower than the rear of the chipper. The hitch height may have to be adjusted when towing with vehicles of varying hitch height.
 - Discharge chute must be secured in the forward position.
 - Folding feed table must be in the folded (travel) position.

WARNING

Injury or death may occur when towing a chipper with improper weight distribution. Loss of vehicle control may occur. Always check and adjust if necessary for proper weight distribution.

3. Installed safety chains correctly:
 - Chains routed under trailer tongue in an "X" pattern between tow vehicle and trailer.
 - Slack in chain should be adjusted to permit turning but not dragging on the ground.
 - Insure that the chains and connection points are secure and undamaged.
4. Connect trailer wiring to the tow vehicle and ensure that all trailer lighting is operating properly.
5. Ensure that the safety breakaway switch plunger lanyard is attached securely to the tow vehicle. The lanyard should be long enough to allow for turning corners, yet short enough to disengage the plunger pin from the switch before the safety chains on the hitch become taut in a chipper disconnect situation.

NOTICE

The breakaway switch is to be used for emergencies only. The breakaway system rapidly discharges the battery when the plunger pin is removed. Reinstall plunger immediately after completion of test.

6. Ensure the tow vehicle has a properly adjusted brake controller. Refer to the brake controller's operating manual for proper operating, adjusting and maintenance information.
7. Check the general condition of the tires, tire pressure and ensure that all lug nuts are securely fastened.
8. Verify there are no loose tools or materials on the chipper or in the feed chute.
9. Check all cones, wheel-chocks, signs or other support tools and materials to ensure proper stowage.
10. Ensure jackstand(s) are secured in the travel position.

Chipper Electric Braking System

Overview

The primary activation of the braking system is through the brake controller of the tow vehicle to the electrical chipper/tow vehicle connection through the chipper wiring harness and into the electrically operated brake assemblies. A secondary system starts with the chipper battery through the breakaway switch, chipper wiring harness and into the electrically operated brake assemblies. This secondary system is only operational when the breakaway switch is activated. This system should never be activated except for testing or in a emergency chipper / tow vehicle separation.

Synchronizing Tow Vehicle Controller

To insure safe brake performance and synchronizing, read the brake controller manufacture's instructions completely before attempting any synchronization procedure.

CAUTION

Before road testing, make sure the area is clear of vehicular and pedestrian traffic. Failure to brake safely could result in an accident and personal injury to yourself and others.

Make several hard stops from 20 mph on a dry paved road free of sand and gravel. If the trailer brakes lock and slide, slightly decrease the gain setting on the controller. If they do not slide, slightly increase the gain setting. Adjust the controller just to the point of impending brake lockup and wheel skid.

NOTICE

Not all trailer brakes are capable of wheel lockup. Loading conditions, brake type, wheel and tire size can all affect whether a brake can lock up. It is not generally considered desirable to lock up the brakes and slide the tires. This can cause

unwanted spotting of tires and could also result in a loss of control.

If the controller is applying the trailer brakes before the tow vehicle brakes, then the controller adjustments should be made so the trailer brakes come on in synchronization with the tow vehicle brakes. For proper braking performance, it is recommended that the controller be adjusted to allow the trailer brakes to come on just slightly ahead of the tow vehicle brakes. When proper synchronization is achieved there will be no sensation of trailer “jerking” or “pushing “ the tow vehicle during braking.

Breakaway Braking System

To ensure proper operation of the breakaway system, the chipper battery and charging system must be operating properly. The chipper must be properly hitched to the tow vehicle, this must include:

- The hitch properly fastened and all retaining pins secured.
- Safety chains crossed in an “X” pattern under the tongue and secured to the tow vehicle. Only enough slack in the chains to allow turning.
- Breakaway cable must be of shorter length than the chains.

In the event of a unwanted separation of the chipper from the tow vehicle, the tongue should drop into the cradle formed by the “X” pattern of the chains. The breakaway cable must pull the plunger from the switch before the entire tongue weight of the chipper comes to a rest in the chain cradle.

When the breakaway switch is activated full voltage from the chipper battery is applied to the brakes. The chipper will come to a complete stop, but will not lock up the brakes.

Testing of the breakaway can be accomplished by jacking up the chipper, spinning the wheel and pulling the plunger. The brakes should apply. Further testing can be done on a wet, icy, or gravel covered road surfaces. With the tow vehicle traveling at 10 to 15 miles per hour activate the breakaway switch. The tires may lock up on a slick or unstable surface.

NOTICE

The breakaway switch is to be used for emergencies only. The breakaway system rapidly discharges the battery when the plunger pin is removed. Reinstall plunger immediately after completion of test.

Inspection and Maintenance

Your chipper brakes must be inspected and serviced immediately if a loss of performance is indicated. With normal use, servicing at one year intervals is usually adequate. With increased usage, this work should be done more frequently as required. Magnets and shoes

must be changed when they become excessively worn or scored, a condition which can reduce vehicle braking.

Brake Adjustment

Brakes should be adjusted:

1. After the first 200 miles of operation when the brake shoes and drums have “seated”.
2. At 3,000 mile intervals.
3. As use and performance requires.

Tires and Wheels:

- Refer to tire manufacturer specification for proper tire inflation. Insure tires are in good condition.
- Wheel lug nuts torqued to value in the Specific Application Fasteners Table.

Fueling Chipper

Fill the fuel tank at the end of each work shift leaving a gap at the top of the tank for expansion of fuel. A full tank will not only maximize the work shift but will also reduce the possibility of condensation forming in the tank and moisture entering the fuel lines.

WARNING

Gasoline and diesel fuel are dangerous, first and foremost they are highly flammable, they are easy to ignite and they burn explosively. Secondly, exposure to gasoline or diesel fuel liquid or vapor can adversely affect health. Always insure proper handling and storage of fuels. Improper handling and storage of fuels may result in serious injury, illness or death.

To Avoid Fire:

- Turn off all ignition sources (Chipper & Tow Vehicle).
- Keep fuel away from any flame or spark.
- Discharge potential static electric charge buildup by touching chipper metal away from fuel tank with your hand prior to touching the fueling nozzle to the fuel tank.
- Do not smoke.

Operation

Controls

⚠ WARNING

Serious injury or death can occur if the following procedures are not verified.

Always ensure that the PTO is disengaged before starting the engine.

Always ensure that the hydraulic feed roller Feed Control Bar is in its "Neutral" position before starting the engine.

Always ensure all guards are in place and properly secured.

All operators must be properly trained.

⚠ CAUTION

Improper engine operation may result in equipment damage. For engine operation always refer to the Engine Operations Manual (EOM) *PRIOR* to starting the engine.

Feed Roller Operation

The feed roller(s) is controlled by pushing or pulling the feed control bar which is located on the top and both sides of the feed chute. The 3 (three) control positions are:

Reverse - activates the rollers to push material out of the chipper rotor cutting zone.

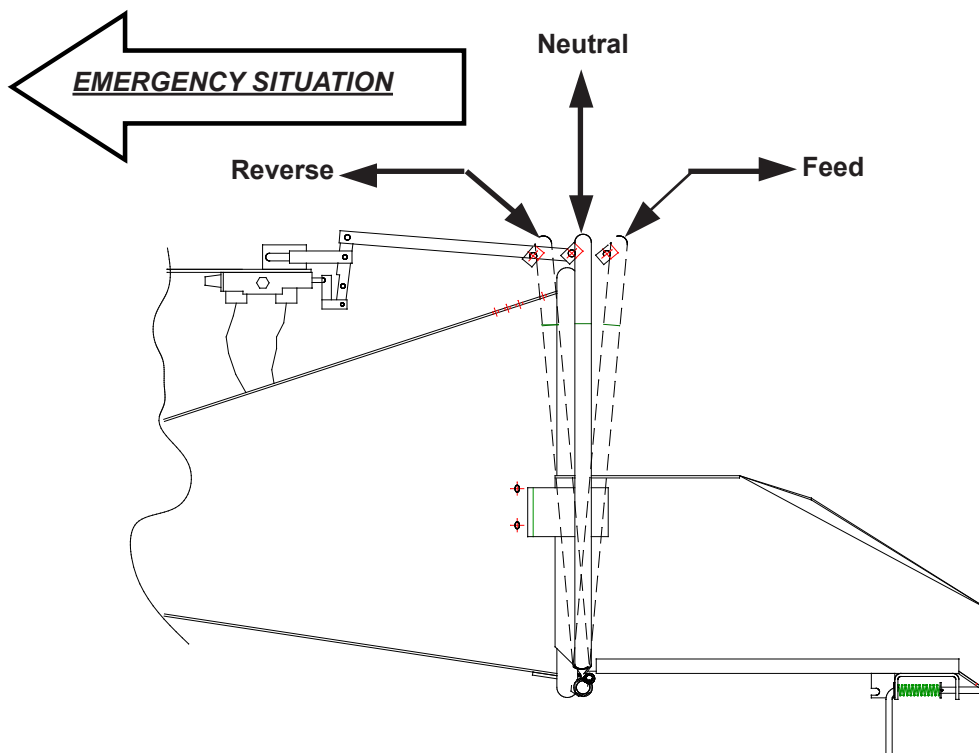
Neutral - stops movement of the feed rollers.

Feed - pulls material into the chipper cutting zone

⚠ DANGER

Serious injury will occur if controls are not operating properly. Insure that the feed roller control bar operates properly and freely before using the chipper. Do not operate the chipper if the components are damaged or do not operate smoothly, completely and, without binding.

Feed Roller Control Arm Movement



PTO/Clutch Engagement

⚠ WARNING

Serious injury or death may occur when working in the proximity of moving components.

The rotor/disc and drive system will continue to rotate after the engine has stopped and the clutch has been disengaged.

Do not attempt to perform service on the PTO, Engine or Chipper Head until all movement has come to a complete stop.

Remove ignition keys, remove negative battery cable and lock battery box. Follow OSHA statute 1910.147 for proper lock-out procedures.

Do not leave the chipper unattended until all movement of the engine, disc or drum has stopped.

NOTICE

Shown is a Stein PTO. The PTO supplied with your chipper may operate in a different manner. Please familiarize yourself with the proper operation of your PTO prior to chipper operation. Clutch/Cutter engagement procedure

1. Verify infeed chute and feed roller areas are free from materials.
2. Verify discharge chute is properly directed and secured. Materials left in cutter housing or discharge chute may discharge during clutch engagement and RPM run-up.

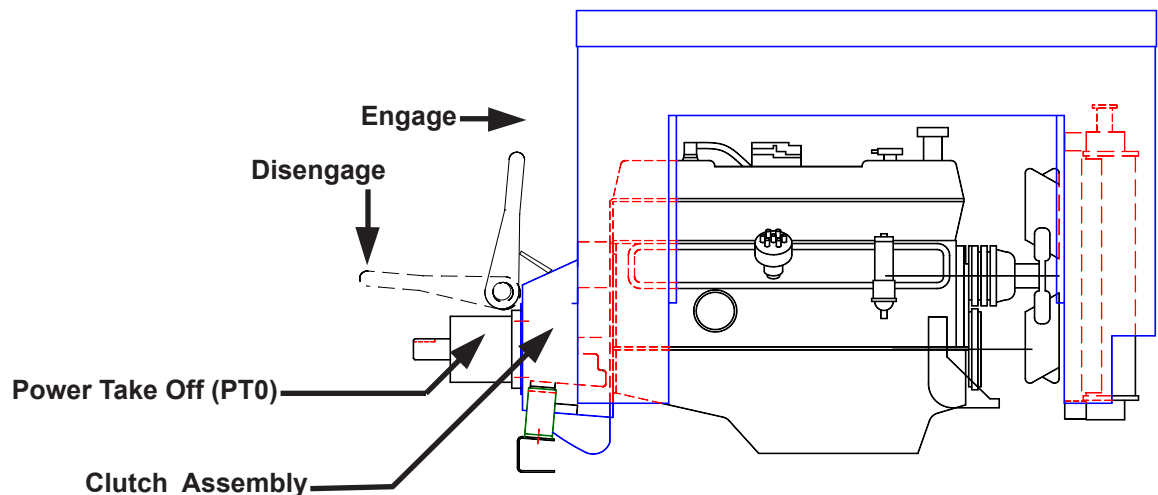
⚠ WARNING

Flying materials may cause injury or death. Always ensure discharge chute is not pointed towards personnel.

3. Engine RPM should be at approximately 1000 RPM or the engagement setting on fixed position throttles.
4. Slowly engage the clutch. Stop if any unusual sounds are heard. Investigate prior to proceeding.
5. After engine has stabilized at the engagement RPM, slowly increase engine RPM to the preset operating speed.

NOTICE

Equipment damage will occur when attempting a clutch engagement with a plugged cutter housing or discharge chute. Never attempt to unplug a chipper using rapid or repeated clutch engagements.



Feed Sense

Maintaining proper operating RPM is a critical part of efficient chipper operation. If RPM is allowed to fall below design parameters the velocity of discharging chipped material will fall. This will result in discharge chute clogging.

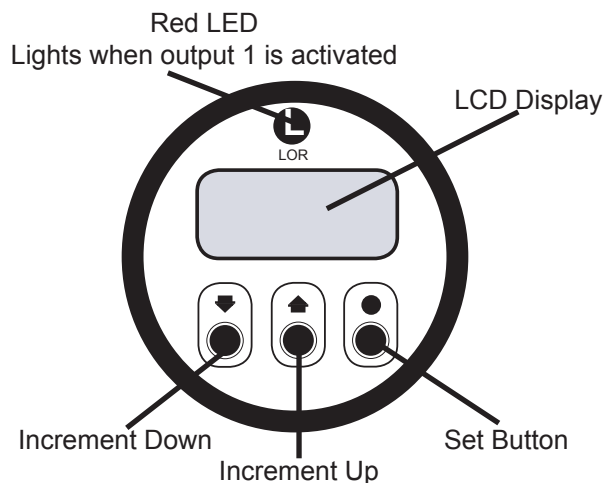
The Feed Sense system automatically controls RPM through control of the hydraulically driven feed roller(s). When the system is on the controller senses cutter speed. When the cutter drops to a preset minimum RPM, the feed roller(s) is temporarily stopped until the engine recovers to its preset operating RPM. After engine recovery the Feed Sense automatically begins the forward feeding process and continues as long as RPM is maintained above the low set point.

DANGER

Serious injury or death may occur when entangled with material being feed into the chipper. Sudden and automatic advancement of the material will occur when the Feed Sense is activated. After material has been engaged by the chipper always stay clear of possible entanglement hazards.

Operating sequence

- The Feed Sense controller automatically comes on when starting the engine. The chipper will operate in the Feed Sense “On” mode of operation.
- Turning your Feed Sense off, press and hold the left button for 4 seconds, then release.
- To turn it back on, press and hold the right button for 4 seconds.

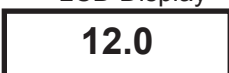


Operation:

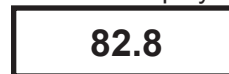
To View Battery Voltage:

LCD Display

Press and Hold Both Buttons



To View Total Hours:
LCD Display



Press and Hold



To Disable Output:
LCD Display



Press and Hold For 4 Seconds



In this mode the LCD will alternate displaying engine RPMs for 9 to 10 seconds and “off” for 1 second. To revert to ENABLE OUTPUTS simply press Set Button  once.

Restoring Factory Settings:

Press and hold  +  while turning ignition key to the “ON” position. Continue to hold until the display reads 

Release buttons.

Scroll Feature:

The scroll briefly displays each of the OEM program settings once. This allows the user to view every parameter without risking an inadvertent programming change.

Press and hold  while turning ignition key to “ON” position. Release button

After each of the OEM Program settings have been displayed once, the gauge reverts back to normal operation.

Winch Safety and Operation

You must read and understand the entire manual prior to operation of the chipper or the winch.

WARNING

Improper use of the winch may result in serious injury or death. Only those properly trained and authorized by the employer shall operate the winch.

WARNING

Engagement of the cable in the feed roller or cutter could result in equipment damage, serious injury or death. Always remove the cable assembly prior to feeding material into the chipper.

WARNING

Serious injury or death may occur due to personnel entanglement or crushing. Always insure personnel are aware of cable/material location and changing pinch point hazards.

the desired location. Secure the cable to the material to be chipped two to three feet from the end. This will allow you to place the end of the material on the infeed chute or by lifting the feed roller into the feed roll bite. After hoisting the material to the desired position. Remove the cable and secure the hook in the storage position putting slight tension on the cable so as to remove any slack in the cable/hook assembly. To begin chipping, reposition the panic bar into the operational position.

Note: Use of a separate choker strap or rope will extend the life of your winch cable.

Safety

Wear all personal protective clothing and equipment as designated by your company policy, OSHA or other governing organization.

You must insure you place yourself and co-workers in proper, safe positions while hoisting. Always increase chipper operational area during winch operations. While hoisting always be aware of the pinch points between hand, foot, and body with the cable, wood and between towed object and any fixed objects. These pinch points are constantly changing during the hoisting operation. Cable may create cable loops on the ground, caution must be taken to avoid entrapment in these loops. Never pull with tow vehicle using the cable as a dragline. Always attempt to pull from directly behind the chipper. When not in use always properly stow hook and cable out of the feed zone area. Chipper must always be properly hitched to the tow vehicle and the vehicle must be properly chocked in place.

Daily Inspection

Inspect cable, hook assembly, and winch structure for damage or excessive wear prior to use. Insure proper operation of winch controls. Cable must be inspected for broken/worn strands, or other physical damage which would degrade the operational load capacity. The hook must be inspected for wear and deformation such as hook opening spread. Hoist must be in good condition and all fasteners in place and properly tightened. Winch structure must be inspected for structural deformation, cracked or broken welds and proper fasteners in place and tight.

Operation

Place panic bar in the non-operational position. This will stop feed-roller movement, and allow the winch and lift cylinder to continue operation. The winch control valve is located on the curb side of the infeed chute. Always keep tension on the cable while de-reeling. Have an assistant "walk" the cable out to

Work Site Preparation

WARNING

Improper chipper setup or work site preparation can result in serious injury or death.

If you are unhitching the chipper from the tow vehicle confirm the chipper wheels are blocked. Ensure the jackstand is undamaged and properly configured to support the weight of the chipper. Damaged jack stands should be replaced before supporting the chipper. Do not operate the chipper without being properly hitched to the tow vehicle. Failure to do so may cause serious personal injury and/or property damage.

The chipper tongue weight is too great for one person to lift safely. Serious muscle strains may occur if attempted alone. Get Help when hitching and unhitching the chipper.

Never stand between the tow vehicle and the chipper while the tow vehicle is backing. Ensure that the tow vehicle is securely parked and the driver notified before approaching the area between the chipper unit and the tow vehicle. Coordinate signals with all personnel to insure accurate communication.

Check to ensure discharge chute is properly directed and locked in place.

Prior to starting the engine, check feed chute to insure it is clear of foreign material such as wrenches, axes, etc.

Organization and preparation of the work site and brush is a major factor in safe chipper operations. Operating personnel must observe the following outlines to insure safety.

- Work sites should be clear of vehicle and pedestrian traffic.
- Signs, cones, ropes, barriers and or flagmen may be required to provide adequate warning and diversion of automotive and or pedestrian traffic.
- Do not operate the chipper beneath a potential drop zone and verify that no one is performing work overhead of the chipper or chipper work zone.
- Provide a clear area on the curb side of the chipper to allow the operator to maneuver while feeding the chipper.
- Position the chipper in an area free of flammable materials to reduce the risk of starting a fire from sparks emitted from the engine exhaust or heat.

DANGER

An electrically energized tow vehicle (such as a aerial device or crane) can also energize the chipper and will cause serious injury or death. Never approach a chipper that is connected to a

vehicle operating in the proximity of power lines.

- Confirm that all operators are wearing the proper clothes and personal protective equipment.
- Restrict all personnel, except the operators feeding the chipper, from the feed and discharge area's of the chipper.

WARNING

Serious injury or death may occur from projectiles associated with the normal operation of the chipper. Insure that pedestrian traffic, spectators or any other personnel not operating the chipper are prevented from entering the work area around the chipper, or the chipper operational area*. Secure and maintain an adequate work zone to insure that material being feed, flying debris and chips can not come in contact with those not operating the chipper.

The action of chipping produces projectiles such as chips and un-chipped debris (sticks, limbs, brush, etc.) that may cause personal injury from both the discharge chute as well as the infeed chute.

- Set the chipper up on level ground with no stumps or trip hazards in the loading area. During chipper operation keep the loading area free of limbs, tools or other objects which may become a trip hazard.
- Confirm all operators are properly trained, have read and understand all placards and decals, and are authorized by the employer.
- Insure that all tools, ropes and other work related objects are clear of the chipper and the chipper operational area and can not come into contact or be drug into the chipper with the brush. Ropes, especially climbing ropes attached to someone, may result in personal injury or death.

Definition:

***Chipper Operational Area**

The area around the chipper that:

- Has the potential for flying debris from the discharge chute or infeed chute.
- Has the potential for material to be engaged by the chipper or to be fed by an operator into the chipper (material being drug to the chipper).

Brush Preparation

WARNING

Improper brush preparation can result in serious

injury or death. Inspect all brush for all non-wood material such as anything made of metal, glass or stone. Feeding such materials into the chipper will not only damage the cutting blades, they may even shatter, scattering blade fragments. These fragments can cause serious personal injury, death and or property damage.

Remove vines from the material being chipped and dispose of properly. Do not leave vines in the area around the chipper and **DO NOT ATTEMPT** to place vines into the chipper. Material clothing or personnel entangled in vines can result in personnel becoming entangled resulting in serious injury or death. Vines may hide foreign materials that can cause equipment damage.

Inspection and organizing the brush prior to chipping will allow the job to be performed more efficiently and provide added safety in performing the job by minimizing the danger of foreign material, vines, etc. from entering the chipper. Pre-trimming and proper delimbing will allow the brush to be drawn easily through the chipper.

- Arrange trees, tree limbs, or brush with the cut ends facing the chipper infeed chute.
- **Do Not** cut the trees, tree limbs, or brush into short pieces, i.e. short logs or sticks.
- **Do** cut the trees, tree limbs, or brush into the longest lengths that can be **safely** and **easily handled**. This will reduce the number of pieces of material that have to be handled and fed into the chipper and will reduce the time required to perform the job. Cut wood at an angle to help ease the feed roller open and facilitate feeding. Chipper performance is best when the feed wheels are securely gripping the material as it is feeding into the cutter.

WARNING

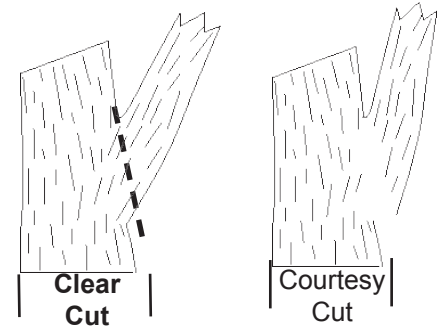
Serious injury can occur from improper handling or materials. Be sure to cut all trees, tree limbs, and brush into lengths that can be safely handled by the operating personnel available. Do not attempt to lift material that is too heavy to be lifted safely. Serious back injury can result from attempting to lift material that is too heavy or from improper lifting technique. Always keep your back straight when lifting and lift with your legs.

NOTICE

Know the limitations of your chipper. Never attempt to feed material too large for your chipper, always pre-cut large crotches to ensure adequate

clearance through the transition area.

When preparing large material for feeding the chipper, properly trimming the crotches will greatly reduce the amount of downtime clearing transition/feed roller jammed materials. Either clear cut the limbs off the largest material to be chipped, or courtesy cut partially though the limbs which will allow the smaller limbs to fold back during the chipping operation.



Consider the total width when utilizing a “courtesy cut”. The total width will include the diameter and radius of the bend of limbs as they fold back during the feeding process. Exceeding the opening size may result in lodging of material in the transition area.

Starting the Engine

DANGER

Serious injury or death may occur if operators are not properly trained. You must read and understand the entire operations manual and all safety decals/placards prior to operation of the chipper.

DANGER

Serious injury or death can occur when chipper is operated without guards in place. Never start the engine with the rotor hood open.

Before starting the engine, recheck the feed chute to insure that it is clear of any foreign objects and that the discharge chute is directed away from personnel.

NOTICE

Disengage clutch and place feed control bar in the center neutral position. Never force the clutch lever, you may damage the linkage. Ensure the clutch handle has adequate free play before operating.

Never engage the starter for more than 30

seconds continuously. Allow (2) two minutes between attempts to start. This will allow the starter to cool down.

Failure to observe this notice will cause damage to the starter.

The greatest amount of wear to an engine occurs when it is first started and is cold. The lubricating oil has drained back into the oil pan and does not flow freely to the entire engine when first started. To achieve the greatest life from your engine, do not operate at high speed or heavy loads until the engine has warmed up.

NOTICE

Engine life will be significantly increased by allowing the engine to operate at a fast idle for 7 to 10 minutes before engaging the clutch.

See Engine Operating Manual supplied with your chipper for specific start-up, operational and, maintenance instructions.

Engaging/Disengaging Cutter Head

Engaging

⚠ WARNING

Serious injury or death may occur with unexpected chip discharge or equipment movement. Insure that all personnel and individuals, not actively involved in the chipper feeding process, are removed from the chipper operational area and all personnel within the chipper operational area are notified before starting the engine on the chipper.

NOTICE

Failure to properly engage the PTO can damage the drive system and the PTO, which will not be a warrantable repair.

- When the engine has reached operating temperature and is running smoothly at 1/4 to 1/3 throttle, slowly engage the clutch. Engaging the clutch too quickly or slowly can cause excessive clutch wear. During clutch engagement the operator must ensure clutch shaft movement. If no movement is heard or seen you must stop and investigate immediately. The ideal rate of engagement will cause the cutter to rotate up to speed without causing the engine to lose speed or stall. If any unusual sounds or noises are heard you must stop engagement and investigated immediately.
- With the clutch fully engaged and the engine running smoothly, set the throttle control to its

maximum setting to bring the cutter up to the factory set cutting speed.

NOTICE

Always operate the chipper at full factory throttle position. The maximum throttle setting is factory preset. This provides maximum efficiency of the chipper. Tampering with the engine speed can cause equipment damage and will void the warranty.

Disengaging

⚠ DANGER

Serious injury or death may occur if contact is made with rotating or moving components. Disengaged clutch does not stop rotation of cutter or drive system. Cutter and drive system continue to move after the clutch has been disengaged and the engine has been cut off. Insure that the cutter and drive system have come to a **COMPLETE STOP** before attempting any maintenance or inspection in the drive or cutter areas.

Turn engine off. Remove keys from the chipper ignition. Place these keys in your pocket. Visually inspect rotational indicator on the cutter shaft and belt at the clutch output shaft to ensure there is no movement in the drive system.

Reengage clutch, reinspect the rotational indicator on the cutter and belt at the clutch output shaft to ensure there is no movement in the drive system.

Do not leave chipper unattended until all movement has come to a complete stop.



- Disengage the hydraulic feed system by moving the feed control bar to the "NEUTRAL" or center

- position.
- Reduce engine speed to idle.
- When the engine and rotor reach idle speed, disengage clutch.
- Turn off the ignition switch, and remove the key.

WARNING

Serious injury or death can occur if attempts are made to access the cutter or drive system.

The cutter and drive system will continue to rotate after the engine has stopped and the clutch has been disengaged. The hydraulic feed system may continue to be operational until the cutter and drive system stop rotating.

Do not leave chipper unattended until all movement has come to a complete stop.

Do not attempt to remove guards or attempt repairs until the cutter and drive system have come to a complete stop.

Feeding Brush to the Chipper

WARNING

Feeding brush, limbs and trees into the chipper is a potentially dangerous task and one that requires constant attention, proper training, authorization by the employer, an awareness of the dangers associated with this machine. Only those personnel meeting these requirements shall be allowed to operate or maintain this chipper. Failure to observe these rules can result in serious injury or death and equipment damage.

Following the procedures outlined in this Manual prior to operation, reading the ENTIRE Manual, proper training, safe operations, preparation for operation, proper equipment and clothing, work site preparation, and brush preparation will reduce the risk of injury. However, every situation and action can not be anticipated by Altec Environmental Products. All operators must use common sense and be constantly aware of the surroundings and situation. Traffic, coworkers, spectators, debris, brush and other equipment constantly change the hazards so constant awareness and adaptation to those changes must be practiced. Placing yourself, or others into a dangerous situation, being careless or simply not paying attention can result in serious injury or death.

Never place hands, arms, legs or feet into the infeed chute.

Never attempt to push material into the infeed chute using your hands or feet. Loss of life or limb will occur.

Do not use any item with metal components as a

tool to push brush into the cutter mechanism. Blade failure can occur and cause violent discharge from the cutter mechanism causing serious personal injury or death. Only materials which are being chipped should be used as push or drag tools.

- Feeding brush to the chipper involves a technique that requires a smooth continuous motion. Placing the prepared brush on the feed apron, pushing it into the throat of the cutter housing, and then moving quickly to the curb side of the chipper.
- Please follow the procedures and safety designations listed below:

WARNING

Insure that the brush is not too large for the machine. Placing material that is too large for the opening may result in clogging or jamming of the material.

The operator shall stand to the side when operating chipper. Material in the transition area could be kicked back while positioning the material into the feed chute. In the event there is debris in the transition, use another piece of wood to clear the transition area before standing behind the feed chute with the feed roller in a raised position.

While feeding the chipper it is common for material to be suddenly and violently kicked up or to the side. Never stand or position yourself directly above or beside material while being feed. Once material is engaged quickly move away from the material. Unexpected advancement or movement of material could result in serious injury or death.

On equipment equipped with FeedSense®, special care must be taken since the material starts and stops at intervals without warning. Never approach the material once it has become engaged by the feed roller. In the event that material has not advanced in a reasonable amount of time, reverse the material completely with the control bar and start the material again. Insure that the throttle is completely advanced to the factory preset setting to insure proper operation of the FeedSense®.

Insure the Chip Deflector Curtain is in proper condition, in place and secure. This device is provided to stop or reduce the velocity of any kickbacks during chipping operations. Operations without this device can cause serious personal injury.

During chipping operations, never position yourself directly behind the infeed chute. Brush or debris can be kicked back or up without warning, possibly causing personal injury.

Do not feed material while another operator is between you and the infeed chute. Only one operator should feed the unit at any given time.

Never place hands, arms, legs or feet into the infeed chute.

Never attempt to push material into the infeed chute using your hands or feet. Loss of life or limb will occur.

Never attempt to lift material that is beyond your lifting capabilities and incorporate proper lifting techniques to avoid injury.

Improper use of cranes, winches and tractors to load material may result in severe personal injury or death and can severely damage the equipment. The use of these types of lifting tools should be operated by experienced personnel that are trained in their proper use, understand the limitations of the chipper, can comprehend the ramifications and dangers of improper use and have been authorized

by the employer to perform these procedures. Damage to the equipment through the use of non-attached or improperly used lifting devices may not be covered under the warranty.

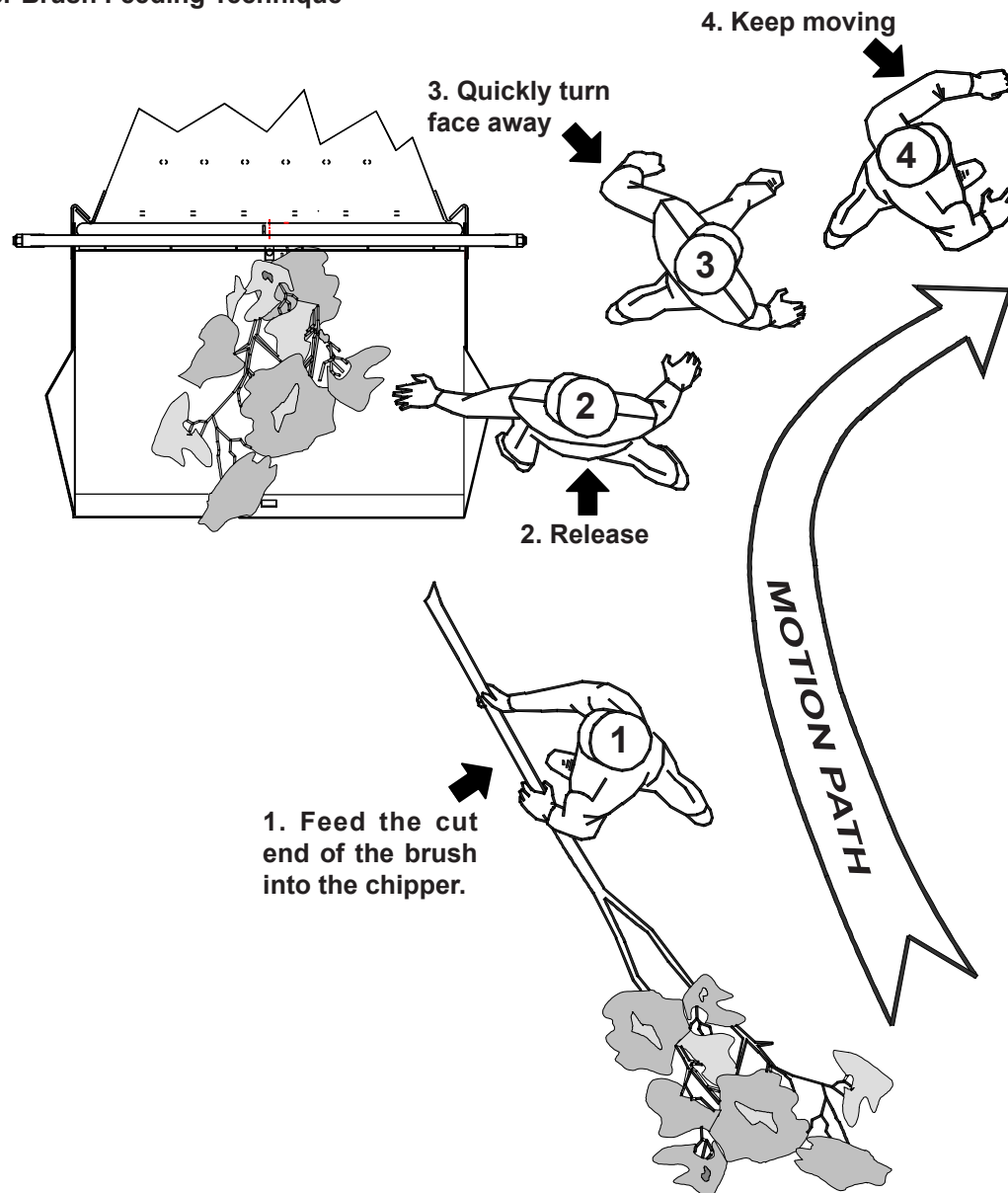
Do not feed crotches or multiple pieces of wood that can become a pinch point during feeding.

Do not lean, stand, sit or, permit others to lean, stand or sit on the feed apron during chipping operations. Loss of balance can result in serious injury or death.

Never reach into or lean over the feed table or into the feed chute. Death or serious injury will occur.

Keep the working area clear of limbs and debris. Tripping or entanglement can allow the operator to be drug into the chipper causing serious injury

Proper Brush Feeding Technique



or death.

Do not throw clean up sweepings into the cutter mechanism. Foreign material such as stones, wire or metal scrap can cause blade failure, resulting in serious personal injury.

- Position the cut end of the brush toward the feed apron, approach the feed apron from the curb side at an angle that will not position you directly in front but to the side of the feed apron to avoid brush kickback and traffic hazards.
- Place the brush on the feed table. Feed the cut end toward the throat of the cutter housing. Release the brush before the hydraulic feeding mechanism fully grabs it and hydraulic auto-feed begins. Smaller pieces of brush may be thrown in on larger pieces being pulled.
- As the brush begins to self-feed, quickly turn your face away from the chipper.
- Keep moving quickly forward and to the curb side of the feed apron and do not wait for the brush to finish feeding. The distinctive sound of the chipper cutting will confirm proper operation.
- If the hydraulic feed wheels fail to grab and self-feed the brush, use a separate piece of brush to push the stalled brush toward the cutter until it begins to self-feed. Never position yourself directly behind the feed apron during this operation. Stand to the curb side of the apron.
- Do not attempt to feed or re-feed small pieces of brush which remain on the feed apron. Reserve a large piece of brush as the last piece to be fed to the chipper. This will clean up any small pieces left on the feed apron.
- When feeding large material into the chipper, place the leading edge of the material onto the infeed chute and feed it from the rear by lifting the material and pushing forward. Never stand or position yourself directly above or beside material while being feed. Once material is engaged quickly move away from the material.

NOTICE

Some chippers may be equipped with “Push Paddles”. Employers/Owners with this option shall insure that all operators are instructed as to the following special requirements involved with its use:

- Instruct operators to grip the handle with a “Relaxed” Grip and to release if entrapped in brush or feed-roller.
- Replace damaged or missing pusher. Do not use the paddle to push rakings that may contain rocks,

⚠ DANGER

metal or other non-wood materials. Serious injury or death may occur if proper feeding techniques are not followed. Never place any part of the body including hands, arms, face, or torso above a piece of material that is being engaged into the feed rollers. Material can be violently “kicked up” or shifted causing severe injury or death through direct impact or entrapment between the material being fed and the chipper infeed chute

- Always release material as it engages with the feeding mechanism.



- Slide large material along bottom of feed chute from the rear pushing it into the chipper feeding rolls. Release material as soon as it engages with the rolls.



Clearing Feed Rollers

⚠ DANGER

Serious injury or death may occur if proper plug clearing procedures are not followed. Only personnel that have been properly trained, comprehend the dangers and are authorized by the employer may perform this operation.

Extreme care must be taken when removing material or performing service in the feed roller area.

Never place any part of the body into the feed roller area. Use a stick or other nonmetallic object to clear this area of debris.

In the event of material "jammed" between the feed rollers and the disc attempt the following actions before performing the mechanical actions contained in this section.

1. By pushing forward on the control bar attempt to reverse the material backward.
2. With the disc at operational speed, attempt to load another log into the feed rollers. This action may advance the "jammed" material.
3. With the disc at operational speed, attempt to load brush on the "top" of the "jammed" material. This action may advance the "jammed" material.
4. If equipped with a lift cylinder, raising or lowering the cylinder may advance the material.

⚠ DANGER

Serious injury or death may occur if proper plug clearing procedures are not followed. Only personnel that have been properly trained, comprehend the dangers and are authorized by the employer may perform this operation.

Extreme care must be taken when removing material or performing service in the transition chute area. Before beginning any procedure ensure that all movement of the engine, disc and feed roller have come to a complete stop. Remove keys from the ignition and place in pocket. Follow LOTO procedures.

Always insure the feed roller assembly is secure before attempting maintenance in the feed roller/transition area.

Never reach into or place any part of the body into the transition chute.

Always use appropriate tools to remove jammed materials. Never reach into the feed chute.

Chippers with optional lift cylinder kit.

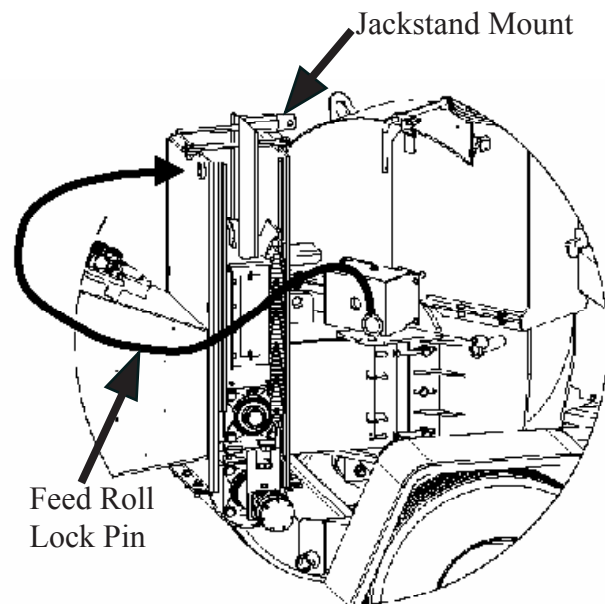
1. Move feed roller control arm to the neutral

position. Ensure the feed rollers have come to a complete stop.

2. Using the lift cylinder valve, raise the upper feed roll assembly to its maximum position.
3. Install the upper feed roll lock pin into position.
4. Turn engine off and remove keys.
5. Remove negative battery cable.
6. Lock battery box.
7. Insure all movement of drive components and cutter assembly have come to a complete stop.
8. Using appropriate tools remove any material interfering with the rotation of the cutter mechanism.
9. Reconnect battery cable.

⚠ DANGER

Serious injury or death may occur if proper chipper configuration is not used. Do not feed material into the chipper with the upper feed roll in the locked open position.



10. Restart engine.
11. Return upper feed roll too the normal operating position.

Chippers without optional lift cylinder kit.

1. Move feed roller control arm to the neutral position. Ensure the feed rollers have come to a complete stop.
2. Insure the chipper is properly coupled to the tow vehicle.
3. Turn engine off and remove keys.
4. Remove negative battery cable.
5. Lock battery box.
6. Remove the front jackstand and re-mount on the front side of the slide box assembly.
7. Using the jackstand, raise the upper feed roll

- assembly to its maximum position.
8. Install the upper feed roll lock pin into position.
 9. Insure all movement of drive components and cutter assembly have come to a complete stop.
 10. Using appropriate tools remove any material interfering with the rotation of the cutter mechanism.
 11. Return upper feed roll too the normal operating position.
 12. Restart engine.

DANGER

Serious injury or death may occur When personnel come in contact with pinch points. Never attempt to "pry" open the feed rollers. Rollers must only be opened using either the lift cylinder or the Altec Environmental Products, supplied jack.

Always be aware of pinch points during the lifting operation. These dangerous pinch points are changing during the lifting operation. Never place any part of your body in-between the feed roller

Clearing Discharge Chute

DANGER

Serious injury or death may occur if proper plug clearing procedures are not followed. Only personnel properly trained and authorized may preform this operation.

Never operate the chipper with the discharge chute removed or material jammed in the chute.

Never attempt to clear the discharge chute while the chipper is in operation.

Always insure the engine is shut off, all drive and cutter components have come to a complete stop.

Follow LOTO procedures.

Always use proper hoisting equipment.

The plugged discharge chute can weigh more than 200 pounds. Use appropriate hoisting equipment when removing the chute.

1. Attach hoisting equipment to chute.
2. Unbolt the eight 5/16 inch bolts, remove the split ring.
3. Using the hoisting equipment remove the chute.
4. Use appropriate tools to unplug the chute.
5. Check disc housing/chute transition and clean out if necessary.
6. Reinstall discharge chute.

NOTICE

PTO or drive train may be damaged from chute plugging or attempting to start the chipper with

obstructions in the disc housing or discharge chute. This damage is not covered under the chippers warranty policy

There are many factors contributing to discharge chute clogging. Most of these factors are controllable through proper maintenance and operator training.

Listed below are the most common problems associated with chute clogging and the suggested corrective action.

Elimination of Plugs

Stringy chip discharge:

- Dull or damaged knives / Change knives
- Dull or damaged anvil / Change anvil
- Incorrect anvil/knife clearance / Adjust to proper gap
- Improperly sharpened knives

Poor chip discharge velocity:

- Engine must operate at the maximum factory preset governor speeds. During operation the engine speed must not be permitted to drop more than 200 to 300 rpm. You control engine speed using the control bar and through proper brush preparation and feeding techniques.

Chipping leafy or wet materials:

- Feed chipper slower than dry material and mix large heavier limbs with leafy wet material so as to purge the disc housing and discharge chute of smaller wet materials.

Units equipped with FeedSense®:

- Insure FeedSense® is in the on position.

Disc speed slows but engine RPM remains high:

- Insure belts are properly adjusted and belt or pulleys are not worn.
- Insure clutch is properly adjusted.

Routine Maintenance

NOTICE

Use check sheets provided as daily, weekly, monthly, and yearly guides for preventative maintenance.

WARNING

Only qualified and authorized personnel shall preform repairs or maintenance on this equipment. Improper maintenance or repair can result in equipment damage and or serious injury or death.

NOTICE

Only properly trained personnel should perform maintenance or repair of their equipment. Consult Altec Environmental Products, LLC before performing any maintenance procedure that is not specifically covered in this or the maintenance manuals. Improper maintenance or repair may void any and all warranties on this equipment.

The following engine information is general in nature and applies to some of the popular engines available for your chipper. For specific information please refer to your engine owner's manual (EOM).

WARNING

Disengage clutch and the hydraulic feed system.

Remove keys from the ignition switch and place in pocket.

Never reach into the engine cowlings or within the engine panels with the engine running. Making contact with moving parts may result in serious injury or death.

Use caution when accessing the engine cowlings or in the vicinity of the engine exhaust. Components may be extremely hot and could result in serious injury should contact be made between components and flesh.

Engine Oil

The engine oil level should be checked each day or when the engine has been operated for 10 hours, whichever comes first. It is preferable to check the oil level after the engine has been stopped for a period of time. This allows the oil in the upper section of the engine to drain down into the oil pan. This will allow you to obtain an accurate measurement of the level of oil in your engine. If the level is low, refer to your (EOM) for the recommended viscosity and type of oil for your engine.

Change the engine oil and filter according to schedules

and instructions provided in your engine owners manual (EOM).

Engine Coolant

WARNING

Severe burns will occur if you attempt to remove the radiator cap off a hot engine. Never check the coolant when the engine is HOT! Allow the engine to cool down first. Refer to the Engine Owners Manual (EOM) for proper procedures. Always ensure proper eye and hand protection is worn when servicing the coolant system.

Check the coolant level before starting the engine at the beginning of each work period. The coolant level should not be less than one inch below the top of the radiator upper tank. Refer to EOM for proper coolant and mixture ratio.

WARNING

Severe burns will occur if you attempt to remove the radiator cap off a hot engine. You must NEVER attempt to clean or inspect the radiator with the engine running or while the engine is hot. Engine coolant is extremely hot. Do not attempt to remove the radiator cap until the engine has cooled to a safe temperature range. Always remove the radiator cap slowly and with extreme caution due to temperature and pressures in the coolant system

Radiator Cleaning

The engine radiator can quickly become plugged with wood particles. This WILL cause improper engine cooling, and may cause extensive damage to your engine. Many factors contribute to the buildup of wood particles in the radiator. The main contributor to radiator plugging is clouding of particles from the chipper discharge to the engine radiator area. Directing your discharge downwind of the engine radiator area or if discharging into a chip bed the use of chip box screens or canvases will greatly reduce this clouding effect. Proper belt condition and coolant mix-ratio/ level are also critical to proper engine cooling. The radiator should be inspected and cleaned on a daily basis using compressed air only. Do not use water to flush the coolant fins of the radiator. Any wood particles left from a water flush will harden and become extremely difficult to remove.

NOTICE

Improper radiator maintenance can result in engine damage that will not be covered under the engine

warranty.

Engine Air Filter

Due to the varying degrees of dust produced during the normal chipper operation, it is critical to the life of your engine to maintain a clean air filter. Do not hit the filter against an object to clean the filter. Check your filter weekly and clean or replace as specified in your EOM. Failure to properly maintain the engine intake system and filters can quickly decrease the engine's effective horse power and cause failure of your engine. Note: Failures due to improper air intake system maintenance are not covered under engine warranty.

Clutch and Power Take Off (PTO)

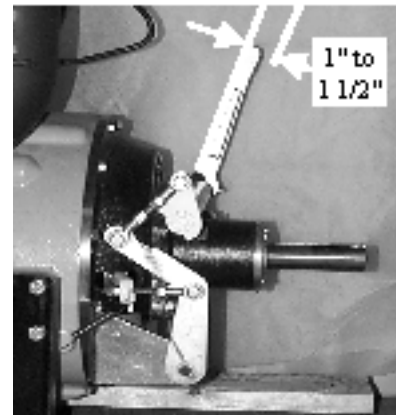
The engine power takeoff (PTO) clutch mechanism is supplied by the engine manufacturer. It is very important to lubricate the PTO bearings, clutch levers and linkage. For specific information and lubrication interval requirements refer to your Clutch/Power Take Off Owners Manual. Proper Inspection, Operation and Maintenance of the clutch will greatly increase the useful life of your chipper clutch. Improper Operation or Maintenance of the clutch will void clutch warranty.

Inspection:

- Verify all bolts, pins and linkage components are in good condition and properly tightened.
- Verify adequate free-play on the clutch handle/linkage assembly. With the clutch in the engaged position (handle vertical) there should be approximately 1" to 1 1/2" of free-play at the end of the handle without pressure being applied to engage the clutch.
- Without proper free-play premature failure of the clutch will occur.

NOTICE

Damage occurring from improper clutch adjustment will not be covered under warranty. See Power Take Off owners manual for detailed adjustment procedures.



Fuel Tank

Fill the fuel tank at the end of each work shift leaving a gap at the top of the tank for expansion of fuel. A full tank will not only maximize the work shift but will also reduce the possibility of condensation forming in the tank and moisture entering the fuel lines.

⚠ WARNING

Gasoline and diesel fuel are dangerous, first and foremost they are highly flammable, they are easy to ignite and they burn explosively. Secondly, exposure to gasoline or diesel fuel liquid or vapor can affect health adversely. Always insure proper handling and storage of fuels. Improper handling and storage of fuels may result in serious injury, illness or death.

To Avoid Fire:

- Turn off all ignition sources (Chipper & Tow Vehicle).
- Keep fuel away from any flame or spark.
- Discharge potential static electric charge buildup by touching chipper metal away from fuel tank with your hand prior to touching the fueling nozzle to the fuel tank.
- Do not smoke.

⚠ WARNING

Health Warning:

Long term exposure to vapors has caused cancer in lab animal. Engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

To Minimize Health Risk:

- Avoid prolonged breathing of vapors.
- Keep face away from nozzle & gas tank.

- Keep away from eyes & skin.
- Never siphon by mouth.

Battery:

⚠ WARNING

Battery acid can burn skin and cause severe eye injuries. Use eye and hand protection when performing battery maintenance.

After 100 hours of operation or once per month, whichever occurs first, inspect the battery for accumulated corrosion at the terminals, if found, mix two tablespoons of baking soda to one pint of water and apply with a small brush to terminals. When finished, be sure to flush the surface of the battery with water. Remove any excess water and coat the terminals with light grease or petroleum jelly to reduce the possibility of corrosion forming. Also check the battery cables for wear and all cable connections and battery tie downs to be certain that they are not loose.

Fasteners:

Fasteners should be visually inspected on a daily basis. Physically torqued weekly for the first 30 days of operation and monthly thereafter. All fasteners must be in place at all times and properly torqued. Torque values are given for specific fasteners where applicable. For fasteners in general, refer to the torque value charts.

Changing Tires:

With the chipper hitched to the tow vehicle:

- Remove the front jackstand.
- Note the jack pipe mount.
- On the side you wish to change, locate the rear pipe jack mount.
- Attach the front jackstand and raise chipper.

Tongue and Hitch:

⚠ WARNING

Never attempt to tow this chipper if the hitch or tongue tube is damaged or fatigued. Damage as a result of "jackknifing" the chipper may require the removal of the tongue tube (on units with removable tongue tubes) from the frame for a thorough inspection. Towing with a damaged tongue tube could result in serious injury or death if the tube fails while being transported.

Transporting with a damaged hitch or tongue tube may result in equipment damage serious injury or death.

- Inspect tongue and hitch bolts for wear or elongation of the mounting holes.
- Grease all contact and moveable components of the hitch.
- If tongue or hitch show any wear they must be repaired or replaced immediately.

NOTICE

Always utilize a "spotter" when backing to prevent "jackknifing" and the resulting serious damage that will occur.

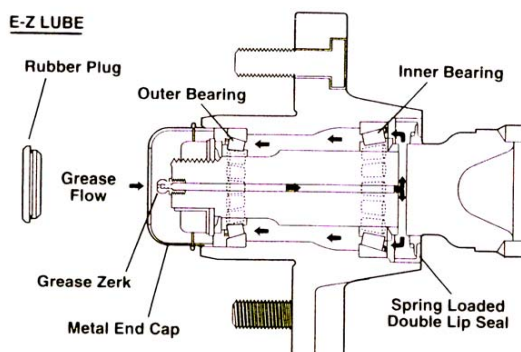
Axle Bearings:

⚠ WARNING

Failure to properly maintain the wheel bearings may result in axle failure, additional equipment damage, serious injury or death.

Standard axles on Altec Environmental Products, LLC Chippers have the E-Z Lube feature. This feature flushes and lubricates both the inner and outer wheel bearings. If your axle is equipped with the E-Z Lube feature, the bearings can be periodically repacked and lubricated without removing the hubs.

- The procedure is as follows:
- Remove the rubber plug from the end of the grease cap.
- Place a standard grease gun onto the grease zerk located in the end of the spindle. Make sure the grease gun is fully engaged on the fitting.
- Pump grease into the zerk. The old, displaced grease will begin to flow back out the cap around the grease gun nozzle.
- When the new, clean grease is observed, remove the grease gun, wipe off any excess, and replace the rubber plug in the cap.
- The trailer wheel bearings should be repacked once a year or every 20,000 miles (whichever comes first). Use a premium grade, high temperature lithium based EP #2 grease.



Hinge and Friction Points:

Chipper operation and longevity can be improved by keeping all hinges and friction points lubricated. Altec Environmental Products, LLC recommends that lubrication be performed weekly. Use SAE 30 weight oil on hinges and a premium grade, high temperature lithium based EP #2 grease on friction points.

This will displace any moisture in the bearings and tanks. Also lubricate thoroughly prior to any extended shutdown or storage.

Due to extended use or extreme conditions, additional maintenance intervals and/or component inspections may be necessary.

Disc and Feed Roll Bearings:

Lubricate daily with a premium quality NLGI #2 grade multipurpose roller bearing grease. Some suggested greases are: Mobile Mobilith AW 2, Shell Alvania Grease 2, Texaco 1939 Premium RB, Amoco Rykon Premium Grease #2 or an equivalent. Grease each bearing daily with (3) three or (4) four pumps with a standard grease gun.

NOTICE

Always lubricate bearings and fill fuel and hydraulic tanks at the end of each work day.

Maintenance Intervals				
MANUAL OPERATION	10 HOURS DAILY	25 HOURS WEEKLY	100 HOURS MONTHLY	1000 HOURS YEARLY
Engine Oil Level	✓			
Radiator Coolant Level	✓			
Fuel Level	✓			
Pre-Operation Procedures	✓			
Grease Clutch Bearings		✓		
Inspect Engine Air Filter		✓		
*Battery Water Level			✓	
Fasteners	✓		✓	
Head Alignment/Drive Belt Tension		✓		
Change Engine Oil & Filter			✓	
*Grease Clutch Lever & Linkage			✓	
Grease Trailer Wheel Bearings				✓
Replace Fuel Filter				✓
Flush & Replace Engine Coolant				✓
Anvil Knife Rotation	(As Required)			
Blade Change	(As Required)			
* Only Where Applicable				

Blade/Anvil Replacement

DANGER

Serious injury or death may occur when blade changing or adjusting procedures are not followed. Only properly trained, authorized personnel which have read and understand the entire manual, placards and decals shall access the cutter head or perform blade maintenance.

Accessing the Cutter Head

1. Reduce engine speed to low idle.
2. Turn engine off. Remove keys from the chippers ignition. Place these keys in your pocket.
3. Remove negative battery cable.
4. Properly lock-out chipper. (See LOTO Procedure)
5. Inspect cutter and drive train to insure no movement of drive components.

DANGER

Accessing disc or drive areas prior to all movement coming to a complete stop will cause serious injury or death. Disc and drive system continue to move after the clutch has been disengaged and the engine has been cut off. Insure the disc and drive system have come to a complete stop prior to accessing this area.

WARNING

Never place any part of the body in a potential pinch point This not only applies to the head and feed roller, but also disc and engine sheave/belt contacts.

Blades are extremely sharp. Care must be taken to avoid contact with the blades and blade pinch points. Always wear appropriate hand protection When performing inspections or replacing blades. Failure to do so will result in severe injury.

The recommend service interval for blade maintenance is 8 hours or daily. However the actual service interval may be more or less, depending upon the wood being chipped and the chipping conditions. Always complete a thorough inspection if foreign objects are feed through the chipper.

WARNING

Always replace blades as sets. Disc balance can be affected if matched blades are not kept together.

Blade Installation and Adjustment

WARNING

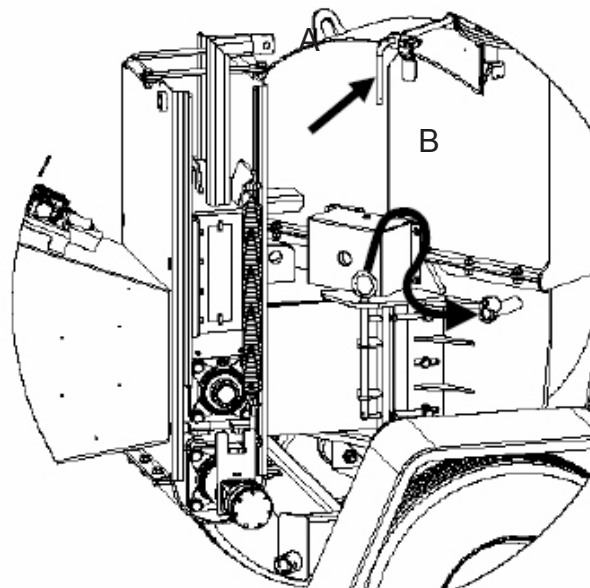
Do not operate the chipper with damaged or chipped knives. Failure to change damaged or chipped knives may result in the breakage and discharge of knives during operation and possible equipment damage, severe injury or death.

1. Follow shutdown lock out procedure.

DANGER

Never start the engine with the disc hood open. Never attempt to open or close the disc hood with the disc moving. Failure to insure the disc has come to a complete stop prior to opening or closing the disc hood may cause equipment damage serious injury or death.

2. Remove hood-pin lock and hood-pin from position "A". Remove two 1/2" bolts from the hood base.
3. Position the disc and install disc locking pin "B".
4. Loosen anvil screws (do not remove) and push anvil back so as to achieve maximum blade/anvil clearance.
5. Remove blade bolts, Do not use impact tool to remove or install bolts.
6. Ensure all mating surfaces between the cutter blades and disc are clean and free of debris and corrosion.



Blade Mounting Surface

- When a blade is removed from the disc, the blade mounting surfaces must be clean of any debris or corrosion and inspected for any damage. An uneven or damaged surface may cause blade separation.
- 7. Inspect blades for cracks or distortion. Replace if cracks or distortion are found.

Blade Inspection

- Thoroughly clean the blades and inspect both sides of each knife for cracks. If any cracks are found, discard the blade.
- Using a straightedge against the blade mounting surface. Check for any blade distortion by sliding the straightedge both perpendicular and parallel to the bolt holes. Any light seen between the blade and the straightedge indicates a distorted blade. Any distorted blade must be discarded.
- 8. Inspect bolts for damage or corrosion. Replace as necessary. Blade bolts can be used twice. Always replace blade bolts when using re-sharpened or new blades.

NOTICE

- The knives used in your chipper are designed with (2) two cutting edges. After the first edge becomes dull you simply remove the knives from their mounting pocket and turn them 180 degrees and reinstall.
- Operation with worn or dull blades will result in poor chip quality, stringy material output, possible discharge chute clogging, additional fuel consumption, unnecessary stress on structural components, engine overheating and excessive wear on drive components i.e. drive belt, drive pulleys, bearings, drive clutch and engine. Equipment damage that results from the use of worn or damaged blades will not be considered for warranty. Operators and others are exposed to unnecessary risk by operating a unit in this negligent condition. Owners subject themselves to increased operating costs, significant downtime and premature equipment wear as a result of improper blade maintenance.
- 9. Place blades in blade pockets with the sharp edge protruding. Install all of the bolts and nuts per specifications in the torque table.

WARNING

DO NOT over-torque bolts. This will overstress the knife and may cause knife breakage. Knife breakage may result in equipment damage, serious injury or death.

10. Adjust anvil (See Anvil installation and

adjustment)

Anvil Installation and Adjustment

1. If cutter knife change is required this procedure should be completed prior to anvil adjustment or replacement.

WARNING

Do not operate the chipper with damaged or chipped knives. Failure to change damaged or chipped knives may result in the breakage and discharge of knives during operation and possible equipment damage, severe injury or death.

2. Follow shutdown lock out procedure.

DANGER

Never start the engine with the disc hood open. Never attempt to open or close the disc hood with the disc moving. Failure to insure the disc has come to a complete stop prior to opening or closing the disc hood may cause equipment damage serious injury or death.

With no anvil currently installed:

3. Remove the (2) two 1/2 bolts securing the hinged hood. Carefully open the hood.

WARNING

Never place any part of the body in a potential pinch point This not only applies to the head and feed roller, but also disc and engine sheave/belt contacts.

Blades are extremely sharp. Care must be taken to avoid contact with the blades and blade pinch points. Always wear appropriate hand protection When performing inspections or replacing blades. Failure to do so will result in severe injury.

4. Slide the anvil into the anvil slot with the sharpest edge to the right and away from you.
5. Install the Three 5/8 inch hex head cap bolts. Slide the head of the three bolts with the anvil to the far left position in the slotted holes. This allows ample clearance for the initial knife/anvil gap adjustment.
6. Place the anvil adjusting angle against the left side of the anvil and install the (2) two adjusting bolts.
7. Snug the 5/8 bolts until the anvil is secure but still capable of sliding using the adjusting bolts.



8. Carefully rotate the disc while observing the clearance between the knives and the anvil. Stop the disc when the anvil and one set of the knives are adjacent to each other.
9. Slide the anvil gauge into position between the anvil and the knives. Let the top of the gauge rest against the disc.
10. Slide the anvil forward until the anvil, gauge and knives are pressed together. Anvil/knife gap should be 1/16 inch (0.0625)
11. Snug the hex head cap bolts holding the anvil.
12. Remove the anvil gauge.
13. Torque the hex head cap bolts holding the anvil according to the specified torque in the torque table..
14. Tighten the adjusting bolts/adjusting angle against the anvil.
15. Tighten the adjusting bolt jam nuts.
16. Using a light, look between the anvil and knives and note the approximate clearance.
17. SLOWLY AND CAREFULLY rotate the disc ensuring consistent gap between the anvil and all knives. Never use pry bars or other tools against the disc paddles while rotating the disc.
18. Replace all guards and covers. Reinstall hood lock pin, pin padlock and hood switch plug.

WARNING

Ensure that all tools and hardware are removed from the head and discharge chutes or any other area where maintenance, inspection or service was performed.

Ensure that all fasteners and adjustments are secured properly before starting the unit.

Do not operate the equipment until the hood pin is secured and padlocked, and all covers and guards are in place and properly secured.

Re-sharpening Knives

Altec Environmental Products, LLC strongly recommends that severely worn or damaged cutter knives be replaced rather than ground. Any knives with chips greater than 1/8 " in depth, or knives having any signs of cracks on the cutting edges extending into the body of the blade, or cracks located around the bolt holes must be immediately replaced. Proper knife edges can be maintained using hand honing or filing procedures. The proper frequency of "dressing " or sharpening the knife edges varies greatly with the amount and type of material being chipped, experience will determine the proper dressing frequency necessary. Any sharpening of the knives decreases the amount of cutting action per revolution, and may increase the overall wear on the disc surface. If you should choose to re-grind worn cutter knives, consult with the cutter knife manufacturer for proper procedures. For knives supplied by Altec Environmental Products, LLC as original equipment or replacement knives refer to sharpening instructions contained in this manual.

DANGER

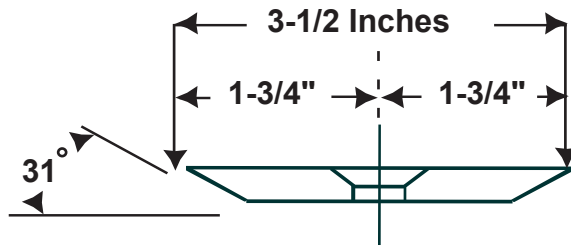
Improper grinding procedures can result in blade failure and cause extensive equipment damage and serious personal injury or death. Always ensure knife sharpening is completed by a qualified facility.

NOTICE

Operation with worn or dull knives will result in poor chip quality, stringy material output, possible discharge chute clogging, additional fuel consumption, unnecessary stress on structural components and excessive wear on drive components ie. drive belt, drive pulleys, bearings, drive clutch and engine.

Equipment damage that results from the use of worn, damaged or dull blades will not be considered for warranty. Operators and others are exposed to unnecessary risk by operating a unit in this negligent condition. Owners subject themselves to increased operating costs, significant downtime and premature equipment wear as a result of improper blade maintenance.

Minimum knife dimensions



Extended Storage

Engine Storage

Prior to extended storage, please refer to your engine owners manual for proper storage procedure.

Chipper Storage

Prior to extended chipper storage:

- Let the chipper cool to ambient temperature.
- While slowly rotating the disc, grease both disc bearings until new grease is seen purging from the bearing shaft/seal area.
- Repack wheel bearing.
- While slowly rotating the drive rollers, grease all drive roll bearings until new grease is seen purging from the shaft seal area.
- Insure fuel tank is full and not containing water.
- Insure hydraulic tank is full and not containing water.
- Insure that the exhaust system is protected from water intake.
- Insure that the air intake system is protected from water intake.
- Disconnect or remove the battery.
- Insure that the chipper has a secure "footing" and that the supporting jack stand is properly positioned.
- Insure that the tires are properly inflated.
- Secure all padlocks and remove the ignition keys.

Appendix

Trouble diagnostics

The following chart lists possible chipper malfunctions along with the probable causes. Refer to the Engine Owner's Manual (EOM) for repair of the heavy-duty industrial engine supplied with your chipper.

CONDITION	POSSIBLE CAUSE
Starter will not crank engine.	• Battery discharged. • Battery terminals corroded or poor ground connection. • Defective ignition switch or starter solenoid. • Malfunctioning starter. • Hood safety switch not engaged or damaged.
Engine will not start.	• Automatic shutdown button not pushed in. • Fuel tank empty. • Engine flooded. • Choke inoperative. (Gasoline Engines Only) • Battery partially discharged. • Faulty engine carburetion or ignition. • Air in fuel line. (Diesel Only) • Pre-heater not working. (Diesel Only) • Hood safety switch not engaged or damaged.
Engine runs but disc doesn't turn	• Material wedged against disc. • Slipping or broken drive belt. • Defective clutch.
Chipper cuts too slowly.	• Cutter head not operating proper at proper RPM • Dull knives. • Hydraulic system not operating properly. • Material is too large for the chipper. • Drive System not properly adjusted or damaged.
Feed rollers do not turn.	• Ensure proper control bar position and operation. • Engine RPM's too low. (FeedSense® option only) • Debris jammed in roller area. • Improper Hydraulic Fluid Level. • Damaged feed wheel coupler.
Engine Overheats	• Radiator fins clogged. • Improper coolant level or mixture. • Damaged fan or fan belt.
Chute Clogging	• Cutter head not operating at proper RPM • Dull knives. • Hydraulic system not operating properly. • Material is too large for the chipper. • Drive System not properly adjusted or damaged. • FeedSense® not engaged. • Disc Vents covered.

Glossary

access hood — hinged part of the disc housing used to access the cutter disc	break-away switch — a device which automatically activates the breaking system of a towed unit when unintentionally separated from the towing vehicle
actuator — a device for converting hydraulic energy into mechanical energy, such as a or cylinder.	breather — a device that permits air to move in and out of a container or component to maintain atmospheric pressure.
adapter — a device used to connect two parts of different type or diameter.	burst pressure — the minimum internal pressure that will cause a hose, tube, cylinder, or other hydraulic or pneumatic component to rupture or split open.
allen wrench — a six sided wrench that fits into the hex socket of a cap screw or set screw.	button head — a type of cap screw with a rounded head containing a socket into which a tool can be inserted to turn the cap screw.
ANSI — American National Standards Institute.	bypass — a secondary passage for fluid flow.
antifoam additive — an agent added to hydraulic fluid to inhibit air bubbles from forming and collecting together on the surface of the fluid.	bypass valve — a hydraulic valve that allows for an alternate passage for fluid flow.
antiwear additive — an agent added to hydraulic fluid to improve the ability of the fluid to prevent wear on internal moving parts in the hydraulic system.	cap screw — a cylindrical fastener with external screw threads at one end and a head configuration such as hexagonal, hex socket, flat countersunk, round, or slotted at the other end, which conforms to the dimensional and material specifications published for cap screws.
anvil — The stationary blade on a chipper cutting mechanism	cartridge — 1: the replaceable element of a fluid filter. 2: the replaceable pumping unit of a vane pump, composed of the rotor, ring, vanes and side plates. 3: A removable hydraulic valve that is screwed into place in a cavity in a hydraulic manifold or cylinder.
ASTM — America Society for Testing Materials	caution — a signal word which indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
AWS — American Welding Society	cavitation — the formation of gaseous voids in hydraulic fluid caused by a low pressure condition which typically occurs when inlet starvation prevents the pump from filling completely with fluid. The characteristic sound of cavitation is a high pitched scream.
back pressure — existing in the discharge flow from an actuator or hydraulic system. It adds to the pressure required to operate an actuator under a given load.	charge — to fill an accumulator with fluid under pressure.
baffle — a device, usually a plate, installed in a reservoir to separate the return line inlet from the suction line outlet.	charge pressure — the pressure, above atmospheric pressure, at which replenishing fluid is forced into the hydraulic system.
bearing — a machine part that is installed between two adjacent machine parts to allow those parts to rotate or slide with respect to each other. Commonly used to decrease friction or wear on components	chassis — a vehicle on which a unit is mounted, such as a truck, trailer, or all-terrain vehicle.
bolt — a cylindrical fastener with external screw threads at one end and a head configuration such hexagonal, square, or round at the other end, which conforms to the dimensional and material specifications published for bolts. (These specifications are different from those for cap screws.)	check valve — a valve that permits flow of fluid in one direction, but not in the reverse direction.
bore — the inside diameter of a pipe, tube, cylinder barrel, or cylindrical hole in any of various other components.	chip curtain — rubberized deflection curtain attached to the infeed chute
brake controller — interface between tow vehicle and electric trailer brakes. Can be inertia activated or based on time delay from activation of vehicle brakes. Typically in the tow vehicle's driving compartment with electrical line running to the trailer wiring connector. Most require the user to adjust brake gain to compensate for varying trailer load. Necessary for the use of electric trailer brakes.	chip deflector — directs chip discharge

circuit — the complete path of flow in a hydraulic or electrical system.
circuit breaker — a form of electrical switch which opens (trips) to interrupt a circuit when it senses excessive current flow that may be caused by a short circuit, to protect wiring and components from damage. Some types of circuit breakers reset automatically when the excessive current discontinues and others must be reset manually.
clean out — clean out area under the lower feed roll
clevis — a U-shaped fastening device secured by a pin or bolt through holes in the ends of two arms.
closed center — a directional valve design in which pump output is blocked by the valve spool(s) when the valve spool(s) is in the center or neutral operating condition.
clutch — the device on a reel lifter which allows the connection and disconnection of the arbor bar and the driver.
clutch — controlled transfer of rotational power from engine to output pto shaft
compensator — a valve spool that is used to maintain a constant pressure drop regardless of supply or load pressure.
compensator control — a control for a variable displacement pump that alters displacement in response to pressure changes in the system as related to its adjusted pressure setting.
component — a single part or self-contained assembly.
compressibility — the change in volume of a unit volume of a fluid when it is subjected to a unit change in pressure.
conductive — having the ability to act as a transmitter of electricity. Electricity will flow through metal, therefore metal is conductive.
contaminate — to render unfit or to soil by introduction of foreign or unwanted material.
control — a device, such as a lever or handle, which is actuated by the operator to regulate the direction and speed of one or more functions of a unit.
control bar — when manually activated controls the movement of feed roll(s) on a chipper
control feed — a wood-chipper which controls the infeed rate to the cutting mechanism
control station — a position where controls for unit operation are located.
control valve — a directional valve controlled by an operator, used to control the motion or function of an actuator or system.

cooler — a heat exchanger used to remove heat from the hydraulic fluid.
counterbalance valve — a load holding valve that can be opened to allow flow in the normally blocked direction by applying hydraulic pressure to a pilot port, and which contains a relief capability to allow flow from the blocked direction if the blocked pressure exceeds a certain value.
courtesy cut — partial cut through limbs so as to allow limbs to fold towards tree trunks and allow ease of feeding chipper
cracking pressure — the pressure at which a pressure actuated valve, such as a relief valve, begins to pass fluid.
cross-ported — a hydraulic path connected between the two opposite flow paths of a hydraulic circuit that allows a route for flow between the two paths in lieu of flow thru an actuator. To allow sensing of the pressure in one path by a component installed in the other path.
curb side — the side of a vehicle which is opposite from oncoming traffic when the vehicle is traveling forward in the normal direction in a lane of traffic.
curb weight — the empty weight of a vehicle full of fuel and all fluids. Curb weight does not include passengers or payload.
cushion — a device built into a hydraulic cylinder that restricts the flow of fluid at the outlet port to slow the motion of the rod as it reaches the end of its stroke.
custom option — an option which is not shown on a standard order form and which requires additional engineering work to supply.
cylinder — a device that converts fluid power into linear mechanical force and motion. It usually consists of a moveable piston and rod, or plunger, operating within a cylindrical bore.
danger — a signal word which indicates a hazardous situation which, if not avoided, will result in death or serious injury.
dead band — the area or range near the center rest position of a hand control where the function does not respond to movement of the lever or handle.
decal — a thin sheet of flexible material which is attached to another surface by adhesive, and is used to convey instructions, information and warnings.
deenergize — to remove electrical power from a device, as from the coil of a solenoid valve.
delivery — the volume of fluid discharged by a pump in a given time, usually expressed in gallons per minute (gpm).

demulsibility — the ability of a liquid to expel another type of liquid. Commonly used to describe a fluid's ability to cause water to separate out rather than being held in suspension.
detent — a device for positioning and holding one mechanical part in relation to another so that the device can be released by force applied to one of the parts.
diagnostic — relating to the practice of investigation or analysis of the cause or nature of a condition, situation, or problem.
dial indicator — a meter or gauge with a calibrated circular face and a spring-loaded plunger, used as a measuring device.
digital signal — an electrical signal that communicates information by the use of two distinct levels of voltage or current, a high "on" level and a low "off" level, which are sent in a series of pulses. The timing of the pulses is used to indicate the level of an input parameter such as control lever position, or information such as the address setting of a radio control transmitter linking it to its receiver.
directional valve — a valve that selectively directs or prevents fluid flow through desired passages.
disc — the rotating component, housing the knives on a disc chipper
disc chipper — a wood-chipper which utilizes a disc shaped, rotating cutter mechanism
disc housing — weldment housing the cutting disc, comprising of the base, stationary hood and access hood
discharge chute — directs chip discharge from the cutter mechanism in the desired direction
displacement — the quantity of fluid that can pass through a pump, motor or cylinder in a single revolution or stroke.
double-acting cylinder — a cylinder in which fluid pressure can be applied to either side of the piston to move the rod in either direction.
double-pole, double-throw (DPDT) switch — a six-terminal electrical switch or relay that connects, at the same time, one pair of terminals to either of two other pairs of terminals.
double-pole, single-throw (DPST) switch — a four-terminal electrical switch or relay that, at the same time, opens or closes two separate circuits or both sides of the same circuit.
drain — a passage or a line from a hydraulic component that returns leakage fluid to the reservoir.
drive pulley — directly coupled to a power source output shaft.

driven pulley — requires a belt connection to achieve rotation.
drum — the rotating component, housing the knives on a drum chipper.
drum chipper — a wood-chipper which utilizes a drum shaped, rotating cutter mechanism
dump valve — a normally open, two-position, two-way valve that sends pump flow through a path going directly to the reservoir or bypassing hydraulic circuit when it is not actuated, preventing operation of the hydraulic system or circuit. When it is actuated, it closes off this path, redirecting flow to the hydraulic system or circuit to allow operation.
FeedSense® — Automatically maintains cutter mechanism speed
efficiency — the ratio of output to input. Volumetric efficiency of a pump is the actual output in gpm divided by the theoretical or design output. The overall efficiency of a hydraulic system is the output power divided by the input power. Efficiency is usually expressed as a percent.
electrical harness — an assembly of electrical wires that is used to deliver electrical current between components.
electro hydraulic — a combination of electric and hydraulic control mechanisms in which an electrically controlled actuator is used to shift the spool in a hydraulic control valve.
electro hydraulic control system — a control system in which the function control handles are connected to electric controls. The electric controls actuate electro hydraulic valves to operate the functions of the unit.
electro hydraulic valve — a directional valve that receives a variable or controlled electrical signal which is used to control or meter hydraulic flow.
electrocution — receiving an electrical shock resulting in death.
end gland — a hollow, cylindrical part that screws into or is retained in the open end of a hydraulic cylinder barrel, through which the rod protrudes.
energize — to send electrical power to a device, as to the coil of a solenoid valve.
energized conductor — an apparatus that is transmitting electric current.
energy — the ability or capacity to do work, measured in units of work.
engine protection system — a system which detects when the auxiliary engine oil pressure or temperature is out of the proper range and shuts the engine off.

fan — part of the disc or drum chipper which propels chipped debris and increases airflow into the discharge chute
feed box — assembly housing the feed roll(s)
feed roll — a mechanical controlled roll or rollers used to control the feed rate to the cutter mechanism
feed table — folding or fixed position guard which restricts operators access to the cutter mechanism
feedback (feedback signal) — the return of part of an output signal to the input for the purpose of modification and control of the output.
filler breather cap — the component on the top of a reservoir that allows air to enter and exit the reservoir as the fluid level changes, and which can be removed to access a fill hole when adding hydraulic fluid to the reservoir.
filter — a device through which fluid is passed to remove and retain insoluble contaminants from a fluid.
filter cart — a portable device which can be connected to a unit's hydraulic system to filter water and/or other contaminants out of the hydraulic system fluid.
filter cartridge — a component containing filtration material which is installed within a filter housing or attached to a filter receptacle for use, and can be removed and replaced as a self-contained unit.
firm footing — positioning of the unit in accordance with the instructions in a unit's operator's manual to ensure proper leveling of the vehicle and adequate stability when operating the unit.
fixed displacement pump — a pump in which displacement is constant, so that the output flow can be changed only by varying the drive speed.
flow — the movement of fluid generated by pressure differences.
flow control valve — a valve that regulates the rate of fluid flow.
flow rate — the volume, mass or weight of a fluid passing through any conductor per unit of time.
flowmeter — an instrument used to measure the flow rate of fluid in a hydraulic tube or hose.
fluid — a liquid that is specially compounded for use as a power transmitting medium in a hydraulic system.
force — any push or pull measured in units of weight.
four-way valve — a valve having four ports for direction of fluid flow.
FPS — Fluid Power Society.

frequency — the number of times an action occurs in a unit of time.
gasket — a packing made of a formable material, usually in the form of a sheet or ring, used to make a pressure tight fit between stationary parts.
gate valve — see shutoff valve.
gauge pressure — a pressure scale that ignores atmospheric pressure by establishing atmospheric pressure as its zero point. Its zero point is 14.7 psi absolute.
gauge snubber — see snubber valve.
gearbox — an assembly with internal speed changing gears; a transmission. Gearboxes are commonly used to transmit power from a hydraulic motor to operate a function through an output shaft.
gib assembly — secures cutter knives in place on drum chippers
gpm — gallons per minute.
grease fitting — a small fitting that acts as the connection between a grease gun and the component to be lubricated.
gross combined vehicle weight — (GCVW) total combined weight of the two coupled vehicles, including all passengers and payload.
gross trailer weight — (GTW) the total weight of a trailer including all of its contents.
gross vehicle weight — (GVW) the total weight of a vehicle including all of its contents and passengers.
gross vehicle weight rating — (GVWR) the weight specified by a manufacturer as the recommended maximum weight of a vehicle when fully loaded.
ground — 1: a large conducting body with a potential of zero volts used as a common current return for an electric circuit. 2: an object that makes an electrical connection with a ground or with the earth.
hand control — a hand operated control lever or handle located at a control station used to regulate a function of a unit, where the speed of the function is proportional to the distance the control is moved.
heat — the form of energy that has the capacity to create warmth or to increase the temperature of a substance. Any energy that is wasted or used to overcome friction is converted to heat. Heat is measured in calories or British thermal units (Btu). One Btu is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.
heat exchanger — a device that transfers heat through a conducting wall from one fluid to another or into the atmosphere.

hertz (Hz) — a unit of frequency equal to one cycle per second.
holding valve — see load holding valve.
hood pin — in conjunction with bolts, secures the two top halves of the disc housing together
horsepower (HP) — the power required to lift 550 pounds one foot in one second or 33,000 pounds 1 foot in one minute. One horsepower is equal to 746 watts or to 42.4 British thermal units per minute.
HTMA — Hydraulic Tool Manufacturer's Association.
hydraulic control — a control that is actuated by hydraulically induced forces.
hydraulic schematic — a drawing that uses common hydraulic symbols to represent the hydraulic system of the unit.
hydraulics — an engineering science pertaining to liquid pressure and flow.
hydrostatic hydraulic system — any hydraulic drive in which a positive displacement pump and motor transfer rotary power by means of fluid under pressure.
infeed chute — tapered weldment attached prior to the feed/cutter mechanisms, assisting in the centering of the tree canopy
in-line — the installation of a component in series between two portions of a hydraulic line or electrical conductor so that flow in the line or conductor toward the component passes through the component and continues on in the line or conductor on the other side.
insulated aerial device — an aerial device with dielectric components designed and tested to meet the specific electrical insulating rating consistent with the manufacturer's name plate.
ISO — International Standards Organization.
jackknife — an extreme turning maneuver that risks damage to the tow vehicle and the trailer when the trailer tongue or body swings into the contact with the tow vehicle. Jackknife accidents usually occur while backing up.
jam nut — a nut that is screwed down firmly against another nut to prevent loosening.
junction box — an enclosed central connecting point for electrical wiring.
key — a parallel-sided piece that fits into grooves in two adjacent parts to prevent movement between the parts. Often used as the driving member between a shaft and a sheave or winch drum.
keyway — a groove that is cut in a shaft or bore for a key to fit into.

knife — the rotating blade on a chipper cutting mechanism
lift cylinder — a hydraulic cylinder assembly used to raise the top feed roll on a controlled feed chipper
light emitting diode (LED) — a semiconductor diode that emits light when subjected to an applied voltage. LEDs are used for electronic display.
line — a tube, pipe or hose used as a passageway to move hydraulic fluid.
live hydraulics — hydraulic system is operational as soon as engine is started.
load holding valve — a hydraulic valve which blocks fluid flow from a hydraulic actuator, such as a cylinder or motor, to prevent motion when the control valve is not being operated or in case of a hydraulic line failure.
lock washer — a solid or split washer that is placed underneath a nut or cap screw to help prevent loosening by exerting pressure against the fastener.
locknut — see self-locking nut.
lockwire — a wire that is installed to prevent loosening of fasteners or components.
lunette eye — a round metal ring used in place of a ball coupler on a trailer. It attaches to a pintle hook on the towing vehicle.
magnetic suction strainer — a suction filter consisting of a strainer which contains one or more magnets to trap ferrous metallic contaminants that are small enough to pass through the strainer.
manual override — a means of manually actuating an automatically or remotely controlled device.
master cylinder — a cylinder in which motion of the piston under an external force transfers hydraulic fluid to a slave cylinder to produce corresponding motion.
may — this word is understood to be permissive
meter — to regulate the amount of fluid flow.
meter-in — to regulate the amount of fluid flow into an actuator or system.
meter-out — to regulate the flow of the discharge fluid from an actuator or system.
micro switch — a small electrical device that is used to turn an electrical current on or off, or to change the connections in a circuit.
micron (micrometer) — one-millionth of a meter or about 0.00004".
micron rating — the minimum size of the particles that a filter is designed to remove.
moly — see molybdenum disulfide.

molybdenum disulfide — a black inorganic chemical that is used as a dry lubricant and as an additive for grease and oils. Molybdenum disulfide has a very high melting point and is insoluble in water.
motor — a device that converts hydraulic or electrical energy into continuous rotary motion and torque.
multiviscosity — the viscosity characteristic of a fluid which contains additives that increase the viscosity index. The fluid does not become as thin at high temperatures or as thick at low temperatures as a fluid without these additives. This allows the fluid to be used over a wider temperature range.
Nm — Newton Meter. The unit of moment (torque) in the SI (International System or Units) system.
normally closed switch — a switch which is closed to allow current to flow through it when it is not actuated, and opens to interrupt current flow when actuated.
normally closed valve — a two-way valve which is closed to block fluid from flowing through it when it is not actuated, and opens to allow flow when actuated.
normally open switch — a switch which is open to prevent current from flowing through it when it is not actuated, and closes to allow current flow when actuated.
normally open valve — a two-way valve which is open to allow fluid to flow through it when it is not actuated, and closes to block flow when actuated.
notice — the preferred signal word to address practices not related to personal injury.
NPT — National Pipe Thread.
NPTF — National Pipe Thread Fluid, a pipe thread form which is modified from the NPT form to improve the resistance to fluid leakage through the threads in a connection.
ohmmeter — an instrument used to measure the resistance in ohms between two points in an electrical component or circuit.
on/off circuit — circuit that supplies constant electrical power to a solenoid or other component when a relay or switch is closed and removes the power when the relay or switch is opened.
open center — a directional valve design in which pump output returns freely to the reservoir when the valve spool(s) is in the center or neutral position.
open circuit — an electric circuit that has infinitely high resistance, resulting in no current flow. An open circuit may be caused by a loose connection, broken wire, corrosion or poor contact where an electrical component is grounded to the unit structure.

operational area — the area surrounding a chipper effected by chip discharge, noise, or any chipper operations
operator — a person trained, authorized and engaged in the operation of the unit.
orifice — a restriction in a hydraulic or pneumatic circuit, the length of which is small in respect to its diameter.
O-ring — a ring of material with a circular cross section that is used as a gasket, usually made of synthetic rubber.
OSHA — Occupational Safety and Health Administration.
over tighten — to torque a threaded fastener beyond the recommended torque value.
over travel — movement of a mechanism beyond its normal stopping point.
overload — the condition existing when a load greater than the rated capacity or design load is applied to a unit or component.
paddle — part of the disc assembly which propels chipped debris into the discharge chute
panic bar — a safety system which when manually activated stops movement of the feed roll(s) on a chipper
particle count — a visual count of the numbers of particulate contaminants in a quantity of a hydraulic fluid.
passage — a machined or cored fluid conducting path that lies within or passes through a component.
payload — any tools, materials, fuel and occupants carried by the mobile unit that are not permanently attached.
pilot operated — condition in which a valve is actuated by hydraulic fluid pressure.
pilot operated check valve — a check valve that can be opened to allow flow in the normally blocked direction by applying hydraulic pressure to a pilot port.
pilot pressure — auxiliary pressure used to actuate or control hydraulic components.
pilot valve — an auxiliary valve used to control the operation of another valve.
pin — a cylindrical structural device used to allow a pivoting joint or to connect mating parts.
pin retainer — a device which is used to hold a pin in place in an assembly.
pinch point — a particular location in which a human body or a part of the body may become pinched or pinned between moving mechanical parts.

pinion — a gear with a small number of teeth that has been designed to mesh with a larger gear.
pintle hitch — a common heavy-duty coupling type which utilizes a pintle hook attached to a tow vehicle to pull a trailer having a lunette eye.
pintle hook — the “jaw” portion of a pintle hitch which attaches to the tow vehicle.
piston — a cylindrically shaped part that fits within a cylinder or cylindrical bore and transmits or receives linear motion by means of a connecting rod or other component.
piston pump — a pump in which motion and force are applied to fluid by a reciprocating piston(s) in cylindrical bore(s).
placard — 1: a thin sheet of rigid material which is attached to another surface by adhesive and/or mechanical fasteners, and is used to convey instructions, information and warnings. 2: May also refer to a decal.
plunger — a cylindrically shaped part that is used to transmit thrust; a ram.
polyethylene — a moisture proof plastic.
poppet — that part of certain valves that prevents flow when it closes against a seat and allows flow when it moves away from the seat.
port — an internal or external opening for intake or exhaust of fluid in a component.
position — a term which describes the number of possible positions a valve spool or mechanism can be shifted to.
pour point — the lowest temperature at which a fluid will flow or pour under specific conditions.
power — work per unit of time, measured in horsepower (HP) or watts.
power take-off (PTO) — a supplementary mechanism enabling vehicle engine power to be used to operate non-automotive apparatus such as a pump, or auxiliary driven apparatus
precharge pressure — the pressure of compressed gas in an accumulator before any fluid is added.
pressure — the force applied in a given area. It can be expressed in pounds per square inch (psi).
pressure compensator — a device on a variable displacement pump that adjusts pump output flow to develop and maintain a preset maximum pressure.
pressure differential — the difference in pressure between two points in a system or component.
pressure drop — the reduction in pressure between two points in a line or passage due to the energy required to maintain flow.

pressure gauge — an instrument which displays the hydraulic or pneumatic pressure sensed at a port on the device.
pressure line — the line carrying fluid from a pump outlet to the pressurized port of a valve or actuator.
pressure override — the difference between the cracking pressure of a valve and the pressure reached when the valve is passing full flow.
pressure reducing valve — a pressure control valve whose primary function is to limit its outlet pressure.
pressure switch — an electric switch which is actuated when the hydraulic or pneumatic pressure applied to a port on the switch reaches a specified value.
pressure transducer — a pressure measuring device which produces a variable electrical signal that is proportional to the hydraulic pressure applied to a port on the device.
proportional circuit — a circuit that supplies a varying voltage to a coil in a pilot valve as electrical current applied to the circuit is varied by a hand control.
proximity alarm — a system which measures the distance from a detector to another object, and sounds an alarm when this distance is less than a specified value. Commonly used to inform the operator of an HLIW of the distance between the boom tip nozzle and a power line insulator or support structure.
psi — pounds per square inch.
PTO — see power take-off.
PTO — (Power Take Off) out-put drive shaft assembly attached to the clutch assembly
pump — a device that converts mechanical force and motion into hydraulic flow and pressure.
quick disconnect couplings — hydraulic fittings designed for fast and easy attachment and separation.
radial ball bearing — an anti friction bearing with rolling ball contact in which the direction of action of the load transmitted is perpendicular to the axial center line of the bearing.
rear jack stand — adjustable rear support used when the chipper is in operation and not coupled to the tow vehicle
relay — an automatic switch with contacts that can be closed or opened by electrical current in a coil.
relief valve — a pressure operated valve that bypasses pump delivery to the reservoir to limit system pressure to a predetermined maximum value.

reservoir — a container for storage of liquid in a fluid power system.
resistance — the opposition to the flow of electricity or hydraulic fluid.
restriction — a reduced cross-sectional area in a line or passage that produces a pressure drop.
retaining ring — a hardened, washer-like ring that may be spread apart or compressed and installed into a groove or recess to serve as a retaining device.
return line — a hydraulic line used to carry discharge flow from a hydraulic system or actuator back to the reservoir at low pressure.
return line filter — a filter located in a hydraulic system return line or at the inlet of a hydraulic reservoir which cleans fluid flowing from the hydraulic system to the reservoir.
reversing valve — a four-way directional valve used to change the direction of movement of a double-acting cylinder or reversible motor.
rod — the cylindrically shaped part of a cylinder which extends and retracts from the barrel to actuate or move a component.
rod end — the end of a cylinder that the extending component or rod is on.
rope — a stout, flexible cord, which consists of many strands of wire or fibers that are twisted or braided together.
rpm — revolutions per minute.
SAE — Society of Automotive Engineers.
safety alert symbol — a symbol that indicates a potential personal injury hazard, It is composed of an equilateral triangle surrounding an exclamation mark.
safety chains — the chains that are attached to the trailer tongue with hooks on their free ends. These chains keep the trailer connected to the tow vehicle should the coupler or hitch ball detach from the tow vehicle. Safety chains must be secured every time you tow.
safety messages — a word message that provides information primarily about the nature of a hazardous situation, the consequence of not avoiding a hazard situation, and/or methods(s) for avoiding a hazardous situation, or that direct readers to such information. Safety symbols and other graphics may be used to supplement or substitute for part or all of a word message.
safety symbol — a graphic representation intended to convey a message without the use of words. It may represent a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages.

saybolt universal viscosity — A measure of viscosity equal to the time it takes in seconds for 60 milliliters of fluid to flow through a capillary tube in a Saybolt universal viscosimeter at a given temperature.
seating in — an initial microscopic surface deformation of components that are clamped together with threaded fasteners. This causes a slight reduction in the dimension of the components, reducing the clamping force applied by the fasteners.
selector switch — a switch which is used to direct electrical current to one of two or more electrical circuits.
selector valve — a valve which is used to direct hydraulic fluid to one of two or more hydraulic circuits.
self feed — a wood-chipper with no control of the infeed rate to the cutting mechanism
self-locking nut — a nut which contains a built-in device or shape to increase thread friction so as to resist loosening due to vibration or repeated loading.
self-lubricating bearing — an anti friction bearing in which lubricating material is incorporated in the bearing.
sense line — a line that carries a hydraulic pressure signal from a valve or actuator to the compensator control on a variable displacement pump.
sense selector valve — a valve which prevents hydraulic fluid in the sense line from reaching the pump until a certain function(s) is operated.
sequence — 1: the order of a series of operations or movements. 2: to divert flow to accomplish a subsequent operation or movement.
set screw — a short screw, typically with an Allen type head, that is used as a clamp to bind parts together.
shackle — see clevis.
shall — this word is understood to be mandatory
shear — an action or stress resulting from opposing applied forces that attempt to separate a part into two pieces that would then slide along each other in opposite directions along the plane of separation.
shear stability — resistance of a hydraulic fluid viscosity index improver additive to shearing.
short circuit — an inadvertent path of low resistance established between two points of an electrical circuit. A short circuit will result in excessive current flow.
should — this word is understood to be advisory

shutoff valve — a device which is used to stop hydraulic fluid flow.
shuttle valve — a three-port valve that accepts hydraulic fluid pressure from two inlets and allows only the highest pressure fluid to pass through it to a single outlet while keeping the inlet fluid pressure isolated from one another.
signal — a command or indication of a desired position, velocity, flow or pressure.
signal word — a word that calls attention to a safety message or messages, or a property damage message or messages, and designates a degree or level of hazard seriousness.
single-pole, double-throw (SPDT) switch — a three-terminal electrical switch or relay that connects one terminal to either of two other terminals.
single-pole, single-throw (SPST) switch — a two-terminal electrical switch or relay that opens or closes one circuit.
slave cylinder — a cylinder in which motion of the piston is produced by the transfer of hydraulic fluid from a master cylinder, resulting in corresponding motion.
snubber valve — a two-port valve with a manually adjustable orifice that restricts the flow of fluid through the valve.
socket head — a cylindrical cap screw head design containing a hexagonal (six-sided) female socket into which an Allen wrench can be inserted to turn the cap screw.
solenoid — a coil of insulated wire that produces a magnetic field within the coil when electrically energized. When attached to a hydraulic valve, the magnetic field acts upon the valve to move internal valve parts.
solenoid valve — a valve which is actuated by a solenoid to controlling the flow of hydraulic fluid.
spherical bearing — a bearing with a spherically shaped inner race that is allowed to move freely inside a stationary outer race to accommodate misalignment.
spline — one of a number of equally spaced, load carrying teeth that have been cut on the outside diameter of a shaft or inside diameter of a bore, parallel to the shaft or bore center line.
spool — a moving, cylindrically shaped part of a hydraulic valve that moves to direct flow through the valve.
sprocket — a wheel with teeth along the circumference which are shaped so as to engage with a chain, used to support and guide the chain at a point of change in the direction of motion of the chain.

SSU (Saybolt Second Universal) — the unit of measure for Saybolt universal viscosity.
stability — a condition of a mobile unit in which the sum of the moments which tend to overturn the mobile unit is less than the sum of the moments tending to resist overturning; the mobile unit's ability to resist tipping.
stabilize — to provide adequate stability for a mobile unit to allow operation of the vehicle-mounted device(s).
stake — to slightly deform the threads of a fastener or material at the joint between two components by placing the blade of punch or chisel on the threads or joint and tapping on the handle with a hammer. The deformed material serves to prevent loosening of the components.
stall torque — the torque produced by a rotating device such as a motor or gearbox at zero rotational speed.
standard option — an option which can be ordered from a standard order form and can be supplied without additional engineering work.
stationary hood — normally non-removable part of the disc housing in which the discharge chute attaches
strainer — a coarse filter.
strainer basket — a coarse, basket shaped filter which is mounted in the fill hole of a reservoir and projects into the reservoir.
strand — 1: one of the groups of individual fibers or wires within a synthetic winch line or wire rope. 2: see suspension strand.
street side — the side of a vehicle toward oncoming traffic when the vehicle is traveling forward in the normal direction in a lane of traffic.
stroke — 1: total linear movement in either direction of a piston or plunger. 2: to change the displacement of a variable displacement pump or motor.
sub weldment — a smaller welded subassembly used within a more complex welded structure.
suction filter — a filter located in a hydraulic system suction line or at the outlet of a hydraulic reservoir which cleans fluid flowing from the reservoir to the pump inlet.
suction line — the hydraulic line connecting the pump inlet port to the reservoir outlet.
surge — a momentary rise of pressure in a circuit.

surge brake system — a surge brake system is entirely self-contained on the trailer and is activated when the tow vehicle decelerates. The momentum of the trailer pushes the surge brake housing forward. This drives the push rod that is connected to the coupler into the master cylinder. Brake fluid is then forced out of the master cylinder into the wheel cylinders or pistons that apply the trailer brakes. The entire activation process is completed in less than one second.	tow vehicle (towing vehicle) — the vehicle that pulls a trailer or towed vehicle.
swage — to taper or reduce the diameter of a rod, tube or fastener by forging, squeezing or hammering.	trace element analysis — analysis of a small sample of hydraulic fluid to determine contamination level and condition of additives.
synthetic winch line — a winch line made from nonmetallic synthetic fibers which are formed into strands that are then braided together to make a complete rope.	transducer — a device that converts input energy of one form into output energy of another, such as hydraulic pressure into an electrical signal.
tachometer — an instrument used for displaying the speed of rotation of an engine output shaft.	transition — the area between the feed box and the cutter mechanism
tank — the hydraulic reservoir.	troubleshoot — to locate and diagnose problems in a system or a component.
tension spring — springs controlling downward force of the upper feed roll	trunnion — a mounting device consisting of a pair of opposite, projecting cylindrical pivots on which something can be rotated or tilted.
terminal block — an insulating mounting used for making electrical terminal connections.	trunnion bearing — a bearing that a trunnion pin pivots in.
test block — a manifold with ports for connecting a hydraulic pressure source, pressure gauge and a cartridge valve such as a counterbalance valve or relief valve used for testing and adjusting the relief setting of the valve.	trunnion pin — a cylindrical pivot pin that is a part of a trunnion.
thread locking adhesive — an anaerobic adhesive that is applied to fastener threads to prevent loosening due to vibration or repeated loading.	turnbuckle — a link with screw threads at both ends that is turned to bring the ends closer together for tightening purposes.
three-position valve — a valve having three positions for direction of fluid flow, such as neutral, flow in one direction, and flow in the opposite direction.	turns from finger tight (T.F.F.T.) — a method of counting the number of turns of a hydraulic adapter to establish a torque value.
three-way valve — a valve having three ports for direction of fluid flow.	two-position valve — a valve having two positions for direction of fluid flow, such as open and closed.
throttle control — a manual, hydraulic, or electrical device used to regulate vehicle or auxiliary engine speed.	two-way valve — a valve having two ports for direction of fluid flow, with one internal flow path which can be open or blocked.
toggle switch — an electrical switch operated by a short projecting lever combined with a spring to quickly open or close a circuit when the lever is pushed through a small arc.	UNC — Unified National Coarse, a thread description.
tongue weight — the downward weight applied by the towable equipment on the hitch ball. Generally tongue weight should not be more than 10% of the gross trailer weight.	under tighten — to torque a threaded fastener below the recommended value.
torque — 1: a rotational twisting force. 2: to preload a threaded fastener by application of a rotational twisting force.	UNF — Unified National Fine, a thread description.
	unit — the Altec device(s), sub base, outriggers, body and associated interface items mounted on a chassis.
	unload — to release hydraulic flow, usually directly to the reservoir, to prevent pressure buildup.
	unloaded vehicle weight — the total weight of the completed mobile unit without payload.
	unloading valve — a valve that bypasses flow to the reservoir when a set pressure is maintained on its pilot port.
	vacuum — the absence of pressure. A perfect vacuum is the total absence of pressure; a partial vacuum is some condition less than atmospheric pressure. Vacuum is measured in inches of mercury (in. Hg.).

valve — a device that controls fluid flow direction, pressure or flow rate.
vane pump — a type of pump with a rotor and several sliding vanes in an elliptical chamber. Hydraulic fluid enters the expanding area and is forced out as the fluid is moved to the decreasing chamber area.
variable displacement pump — a pump in which the size of the pumping chamber(s) can be changed, so that the output flow can be changed by moving the displacement control or varying the drive speed or both.
vehicle — a carrier for a unit.
velocity — the speed of linear motion in a given direction.
vent — an air breathing device on a fluid reservoir or hydraulic line.
VI — see viscosity index.
viscosity — a measure of the internal friction or resistance to flow of a fluid.
viscosity index (VI) — a measure of the resistance to change in viscosity of a fluid with change in temperature. The higher the number, the less the viscosity will change as the temperature changes.
voltmeter — an instrument used to measure the potential difference in volts between two points in an electrical circuit.
volume — 1: the size of a space or chamber in cubic units. 2: loosely applied to the output flow of a pump in gallons per minute (gpm).
vortex — a whirlpool of liquid.
warning — a signal word which indicates a hazardous situation which, if not avoided, may result in death or serious injury.
water removal filter cartridge — a special filter cartridge designed to absorb and remove water from hydraulic fluid. It is not intended for use during normal operation, but is for use when water removal is required.
way — a term which describes how many ports are in a valve or valve section.
weldment — a structural unit formed by welding together an assembly of pieces.
wheel chock — a wedge or block placed on the ground in front of or behind the wheel of a vehicle to block the movement of the wheel.
winch — a mechanism consisting of a gearbox with a cylindrical rotating drum on which to coil a line for load hoisting or line tensioning.

winch capacity — the maximum load, specified by the manufacturer, that can be pulled on the first layer of line on the winch drum at rated system pressure.
winch line — a load hoisting line consisting of a synthetic or wire rope.
winch line rated working load — the average breaking strength of a winch line (as specified by the line manufacturer) divided by the appropriate design factor as specified by ANSI.
wire rope — a rope made from steel wires which are formed into strands that are then twisted about each other in a spiral configuration.
wood chipper — reduces above ground tree materials to uniform chips
work — the exertion of a force moving through a definite distance. Work is measured in units of force multiplied by distance; for example, pound feet.
worm gearbox — a gearbox that utilizes a gear which has a continuous helix tooth or teeth similar to a large screw thread along shaft (worm), that drives a gear which has teeth cut at an angle along a its outside diameter (worm gear). The rotational axis of the worm is perpendicular to the rotational axis of the worm gear.
wrap — a single coil of winch line on a winch drum.
zerk — see grease fitting.

Fastener Torque Chart

GENERAL FASTENER TORQUES:		Torque (ft- lbs)		
Bolt Size - Thread Pitch		Grade 5 Hex Head Cap Screw	Grade 8 Hex Head, Socket Head, and Twelve Point Cap Screw	Button Head Cap Screw and Flat Head Socket Screw
1/4" - 20		5	7	6
5/16" - 18		10	15	13
3/8" - 16		19	26	22
7/16" - 14		30	42	36
1/2" - 13		45	64	55
9/16" - 12		65	92	79
5/8" - 11		90	127	109
3/4" - 10		160	226	193
7/8" - 9		258	364	312
1" - 8		386	545	467
1. Values are lbs-ft. 2. Values apply for both lubed and non-lubed applications with any style nut or threaded hole 3. Values apply for torque applied to either the head of the bolt or the nut				
STANDARD NUMBER Parts extracted from: SDS-0018-B REVISION DATE 03-18-09				

BUSHING-SHEAVE TORQUES:		
Bushing Size	Cap Screw Size & Thread	Torque (ft-lbs)
SK	5/16-18	15
SF	3/8-16	30
E	1/2-13	60
F	9/16-12	75
J	5/8-11	135

Fastener Specific Torque Application									
		Torque in Foot Pounds (N*m)							
Item Description	Fastener	WC126A, 166A	CFD 1217	DC 912A	DC 1317	DC 1317 HP	DC 1419	DC 1820 2 Axle	
Blade /Anvil									
Anvil Bolts	Hex Head	226 (306)	160 (217)	107 (145)	107 (145)	107 (145)	160 (217)	160 (217)	
Blade Bolts	Flat Socket Holo-Krome	N/A	N/A	70 (95)	70 (95)	70 (95)	140 (190)	140 (190)	
Blade Bolts	Hex Head, Bowmalloy	N/A	210 (285)	N/A	N/A	N/A	N/A	N/A	
Blade Gib Screws	Square Head	105 (142)	N/A	N/A	N/A	N/A	N/A	N/A	
Bearings									
Cutter Bearing Bolts	Ferry Cap or Hex Head	226 (306)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	
Feed Roller Bearing Bolts	Hex Head 5/8-11	N/A	127 (172)	127 (172)	127 (172)	127 (172)	127 (172)	127 (172)	
Structural									
Pintle Ring Bolts	Hex Head 5/8-11	211 (286)	211 (286)	211 (286)	211 (286)	211 (286)	211 (286)	211 (286)	
Removable Tongue	Hex head	200 (271)	N/A	N/A	N/A	N/A	N/A	N/A	
Engine/Frame Bolts	Hex Head 1/2-13	107 (145)	107 (145)	107 (145)	107 (145)	107 (145)	107 (145)	107 (145)	
Head/Frame Bolts	Hex Head 3/4-10	376 (510)	N/A	N/A	N/A	N/A	N/A	N/A	
Disc Paddle Bolts	Hex Head 5/8-11	N/A	N/A	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	
Disc Draw Ring Bolts	Hex Head	N/A	N/A	127 (172)	315 (427)	315 (427)	315 (427)	315 (427)	
Feed Plate	U Bolt 1/2-13	107 (145)	N/A	N/A	N/A	N/A	N/A	N/A	
Axle									
Axle Mounting Bolts	Hex Head	115 (156)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	
Axle Spindle Nut	Hex Nut	150 (203)	150 (203)	150 (203)	150 (203)	150 (203)	150 (203)	*150 (203)	
Wheel Lug Nuts	Wheel Lug	105 (142)	105 (142)	105 (142)	105 (142)	105 (142)	300 (407)	*105 (142)	
Specific Component									
Hydraulic Motor Shaft Nut	Hex Nut	N/A	265 (359)	265 (359)	150 (203)	265 (359)	N/A	N/A	
*DC 1820 Single 10K Axle - Wheel Lug 200 (271) / Spindle Nut 125 (170)									

Checklist

DAILY PRE-OPERATIONAL CHECK LIST	
Equipment #	
VIN #	Completed
Chip Curtain is properly fastened and in good repair.	
Rotation Indicator is clear of debris and fully visible.	
Disc Cover Padlock is in place and key is in responsible parties possession.	
Disc Hood Switch is working properly.	
Inspect Safety Tow Chains for wear or damage.	
Check engine fuel, coolant and oil levels. (See Engine Operating Manual).	
Check radiator fluid level (See Engine Operating Manual).	
Check clutch handle free play	
Check radiator fins and ensure free passage of air through the radiator.	
Check all bolts and nuts to ensure they are tight.	
Inspect anvil to ensure all attachment and adjustment bolts are secure.	
Check all controls for free and proper operation.	
Inspect the chipper frame and structure for any bent, broken, cracked, missing or loose parts.	
Check all guards to ensure they are undamaged, in place and properly secured.	
All decals must be in place and legible prior to operating the chipper.	
Hydraulic fluid level must be within 2" to 3" of top of the tank when the fluid is cold.	
Inspect for hydraulic leaks	
Lubricate cutter bearings.	
Inspect and operate panic bar	
Insure that the tires are secure and properly inflated.	
Insure a complete AEP Operations Manual is available for all Operators to review.	
Signature	Date

WEEKLY CHECK LIST

Equipment #	
VIN #	Completed
Complete daily pre-operational checklist	☐
Test break-away switch system	☐
Check general condition of tires and tire pressure.	☐
Lubricate clutch bearings (See Clutch Operation Manual).	☐
Check the engine air filter. (See Engine Operating Manual).	☐
Inspect hitch for wear, or damaged components.	☐
Check cutting knives to ensure all attachment bolts are tight and knives are in good condition.	☐
Lubricate all hydraulic valve connecting linkages	☐
Signature	Date

MONTHLY CHECKLIST

Equipment #	
VIN #	Completed
Complete weekly checklist	
Where applicable check battery water level.	
Check drive belt tension and alignment.	
Where applicable check pump belt and alignment.	
Lubricate clutch lever and linkage (See Clutch Operation Manual).	
Lubricate drive roller bearings.	
Lubricate chute rotation and slide box.	
Lubricate all pivot points and pins.	
Signature Date	

YEARLY CHECKLIST

Equipment #	
VIN #	Completed
Complete monthly checklist	☐
Change hydraulic oil filter.	☐
Lubricate trailer wheel bearings.	☐
Replace fuel filter (see Engine Operating Manual).	☐
Flush and replace engine coolant (see Engine Operating Manual).	☐
Flush and replace hydraulic fluid.	☐
Signature Date	

Altec Environmental Products, LLC
512 North Post Road
Shelby, North Carolina 28150 Telephone:
Parts & Service 704-482-4356
Parts & Service Fax 704-482-5926
Sales 704-481-4356
Website: altecenvironmentalproducts.com

DC 1317 Operations Manual Part Number— 970163265 Rev B