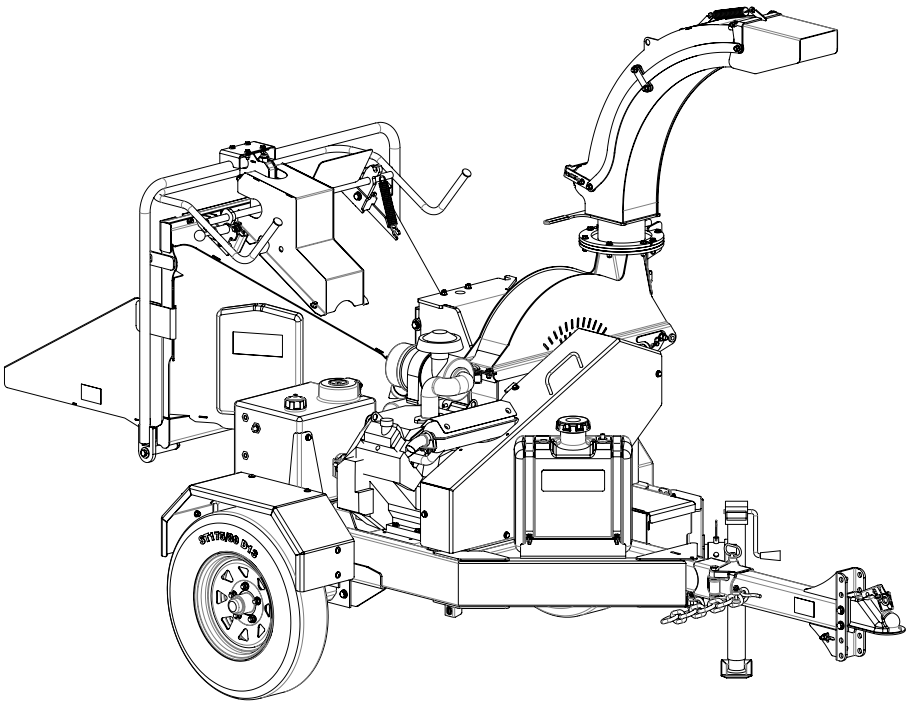
DC 610



Operator's Manual

www.altec.com

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

970266721
2013

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 or this unit.

Table of Contents

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 6 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 commercial engine. Material is fed utilizing one horizontally mounted, hydraulically controlled feed roll. Cutter head consists of a 25 inch diameter disc with 2 knives. Chip discharge is designed for 360 ° rotation for chip box and road side discharge applications.

Item	Standard Specifications
Chipping capacity	6 Inch
Engine horse power (Standard)	22 Hp
Noise level	80
Weight	1900 lb
Tongue weight (may vary)	200 lb
Travel height	7 Foot 4 Inches
Width	5 Foot 4 Inches
Transport length	10 Foot 3 Inches
Operational length	12 Foot Inch
Feed roller opening	10 Inch Wide x 6 Inches Height
Feed table dimensions	40 Inches Wide x 26 Inches Deep
In-feed chute opening	36 Inches Wide x 24 Inches High
Length to feed roll nip point	87 Inches
Disc dimensions	1.25 Inch Wide x 25 Inch Dia.
Disc Weight	205 lbs
Disc RPM	1920 RPM
Feed roll	9.38 Inch Wide x 12.75 Inch Dia.
Feed Rate	125 Feet Per Minute
Feed roll motor rating	11.9 Cu. In. Displacement
Hydraulic pressure	3000 PSI
Hydraulic tank capacity	7 Gallon
Fuel tank capacity	7 Gallon
Trailer lighting	D.O.T. Compliant 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) TOW BAR

12) CLEARANCE LIGHTS

13) BELT GUARD

14) FRONT JACK-STAND

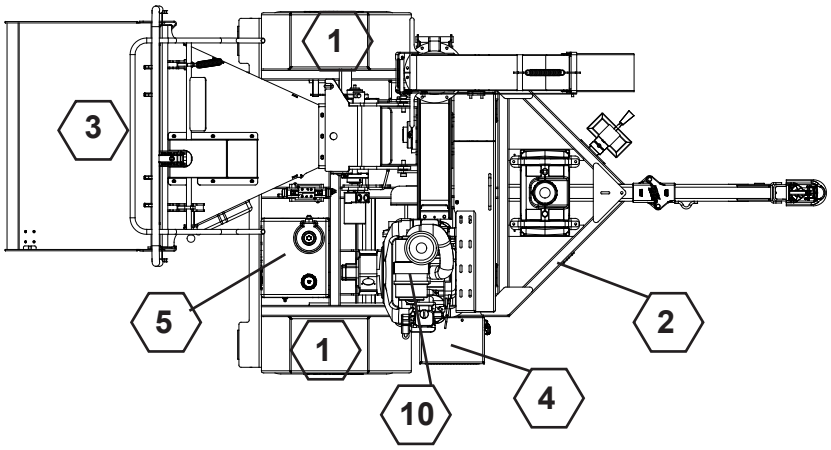
15) PANIC BAR

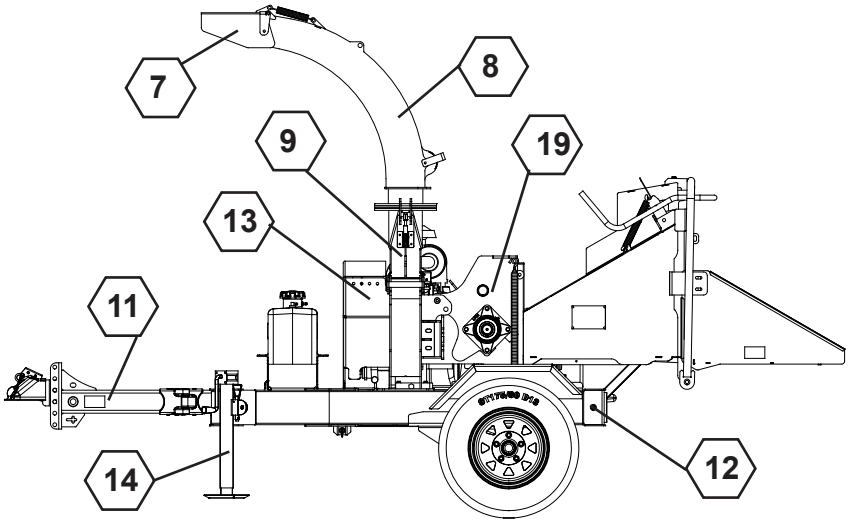
16) FEED ROLLER MOTOR

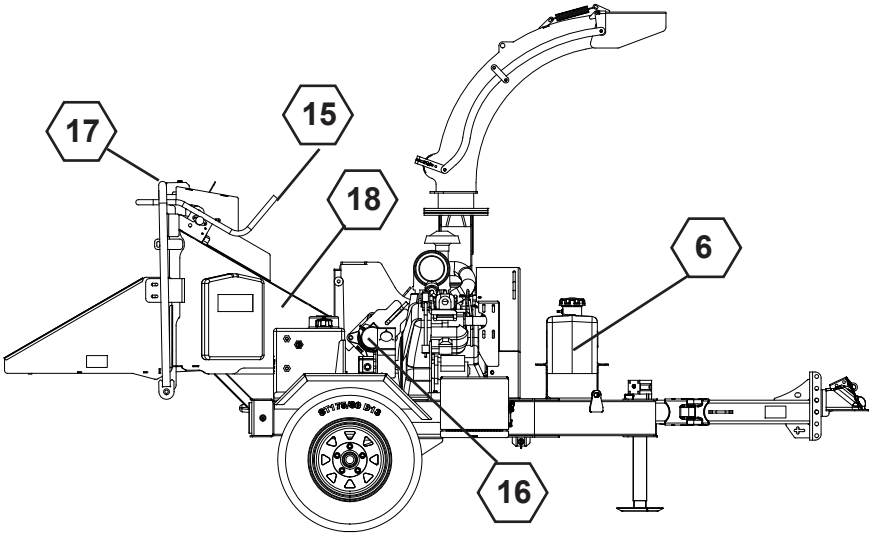
17) FEED CONTROL ARM

18) INFEED CHUTE

19) PIVOT BOX







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.
- Preform 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)

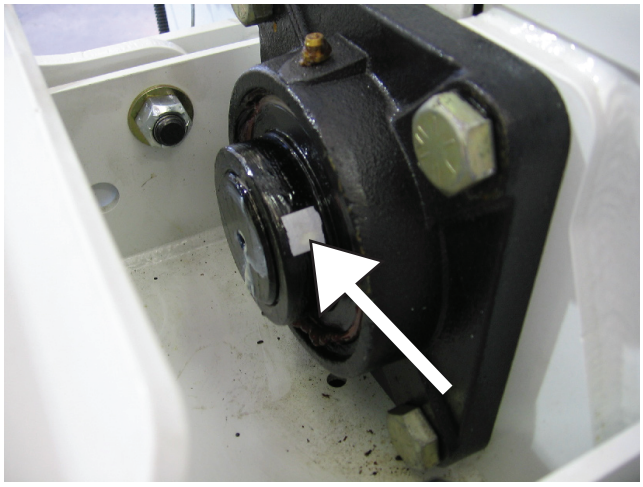
⚠ WARNING

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

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 death or serious injury. 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

Death or serious injury 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

The Panic Bar Assembly consists of two bars (A & B), The re-activation plunger (C) and electrical switch (not shown). 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 roll. The panic bar may also be activated by pulling or pushing bar “B” towards the rear of the chipper. To resume operation, plunger C must be pulled out allowing the panic bar to move back into it’s starting position and activate the electrical switch. The feed roll control bar must than be temporarily placed into the neutral position prior to moving the feed roll control bar to either the forward or reverse activation positions.

Fig A-1

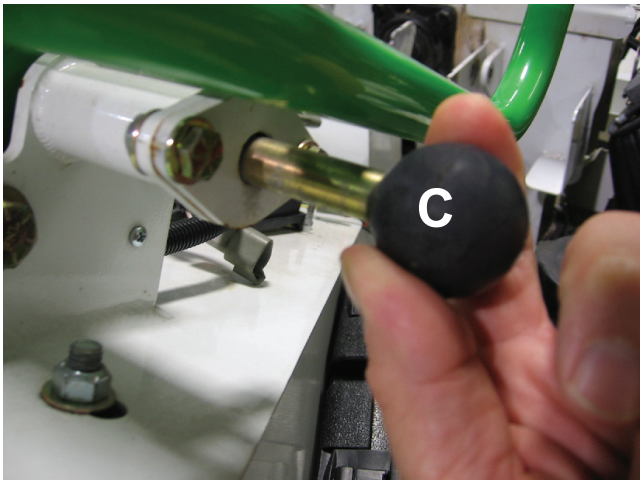


Fig A-2

⚠ WARNING

Entrapment, loss of limb or life hazard. Death or serious injury can occur if entrapped in roller movement. Feed roller begins movement as soon as feed roll directional bar 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 roll in the forward direction. Visually verify the rotation of the feed roll.
3. Push down on bar A or move bar B .
4. Feed roll movement must stop.
5. If feed roll does 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. Replace chip curtain if damaged.

C) Rotational Indicator
See Fig C
The disc rotational indication is best seen by examining the end of the disc shaft. Movement of the shaft indicates movement of the disc and drive components.
Inspect visibility of the rotational indicator area. Insure no debris is blocking view.

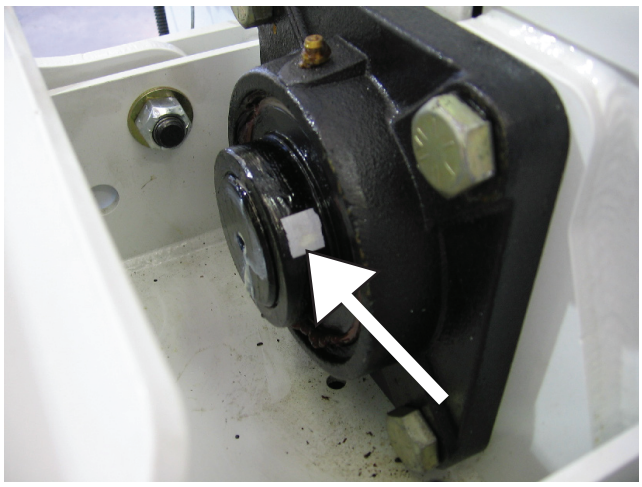


Fig C

⚠ DANGER

Crushing, cutting hazard. Equipment damage, death or serious injury 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. Only after all movement has stopped, can trained/authorized personnel access the cutter disc.

D) Disc Cover Padlock
See fig D
This allows management /supervisors to control access to the disc cutter area.

⚠ DANGER

Crushing, cutting hazard. Equipment damage, death or serious injury 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.

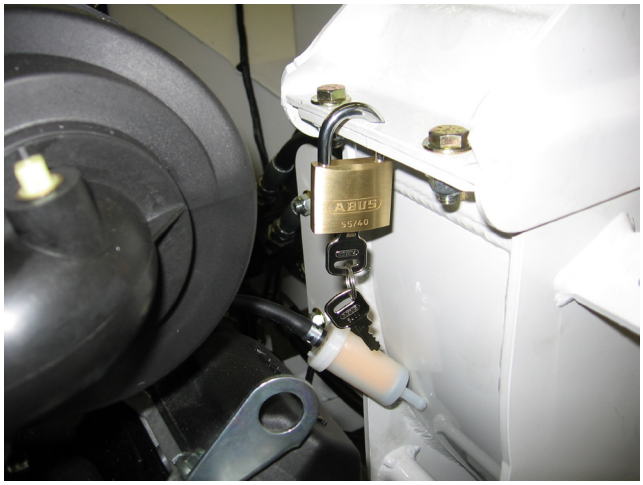


fig D

E) Disc Hood Switch

See fig E1 & E2

The disc hood switch prohibits the starting of the engine while the disc is open. Test switch operation by opening the disc hood. Remove the two hood bolts and hood padlock and attempt to start the engine. Depending on your engine model, the starter may engage, and the engine may start, but should not run long enough to rotate the disc.. If the engine starts, and rotates the disc, do not operate the chipper until the switch circuit is repaired.

fig E1

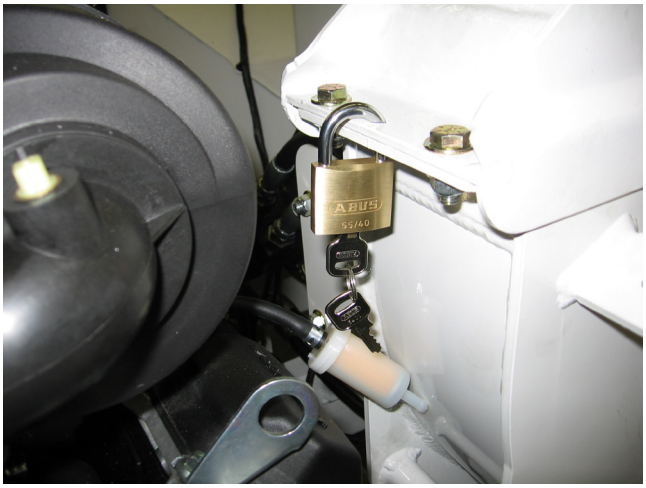


fig E2

⚠ DANGER

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

F) Guards

See fig F

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 staring the chipper.

fig F1

⚠ DANGER

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

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 Hood Switch	Daily	Activate Switch
F) Guards	Daily	Inspection
G) Feed Roll Lock Pin	Prior to Performing Maintenance	Inspection
H) Safety Tow Chains	Daily	Inspection
I-) Accident Prevention Decals	Daily	Inspection

G) Feed Roll Lock Pin
See fig G1, G2, & G3
The feed roll lock pin is used to hold the feed 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. Jackstand must be in good operating condition. Inspect jackstand attachment points for damage.

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 side of the feed roll assembly.

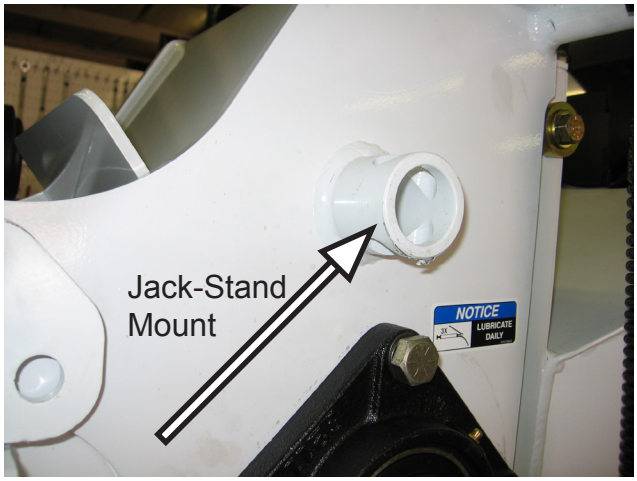


fig G1

4. Jack the feed roll assembly up until it clears the hole in head frame near the feed role pivot point. See fig G3

fig G2

5. Slide the pin though the hole in the frame under the previously raised feed role assembly. Insure the pin goes completely through both holes in the frame weldment.

fig G3

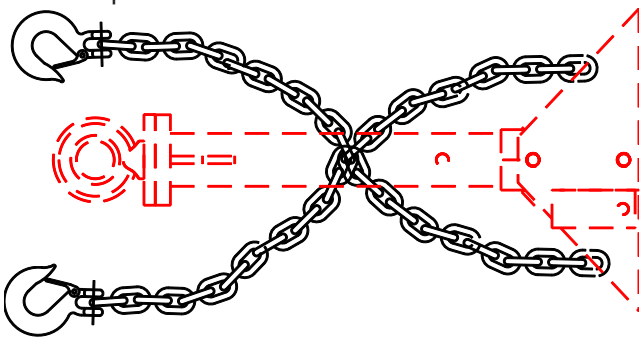
6. Using the jack, slowly lower the feed roller until the weight of the feed role assembly is supported on the pin.

⚠ DANGER

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

H) 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.

I) 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 Altec Environmental Products at 1-800-269-5188.

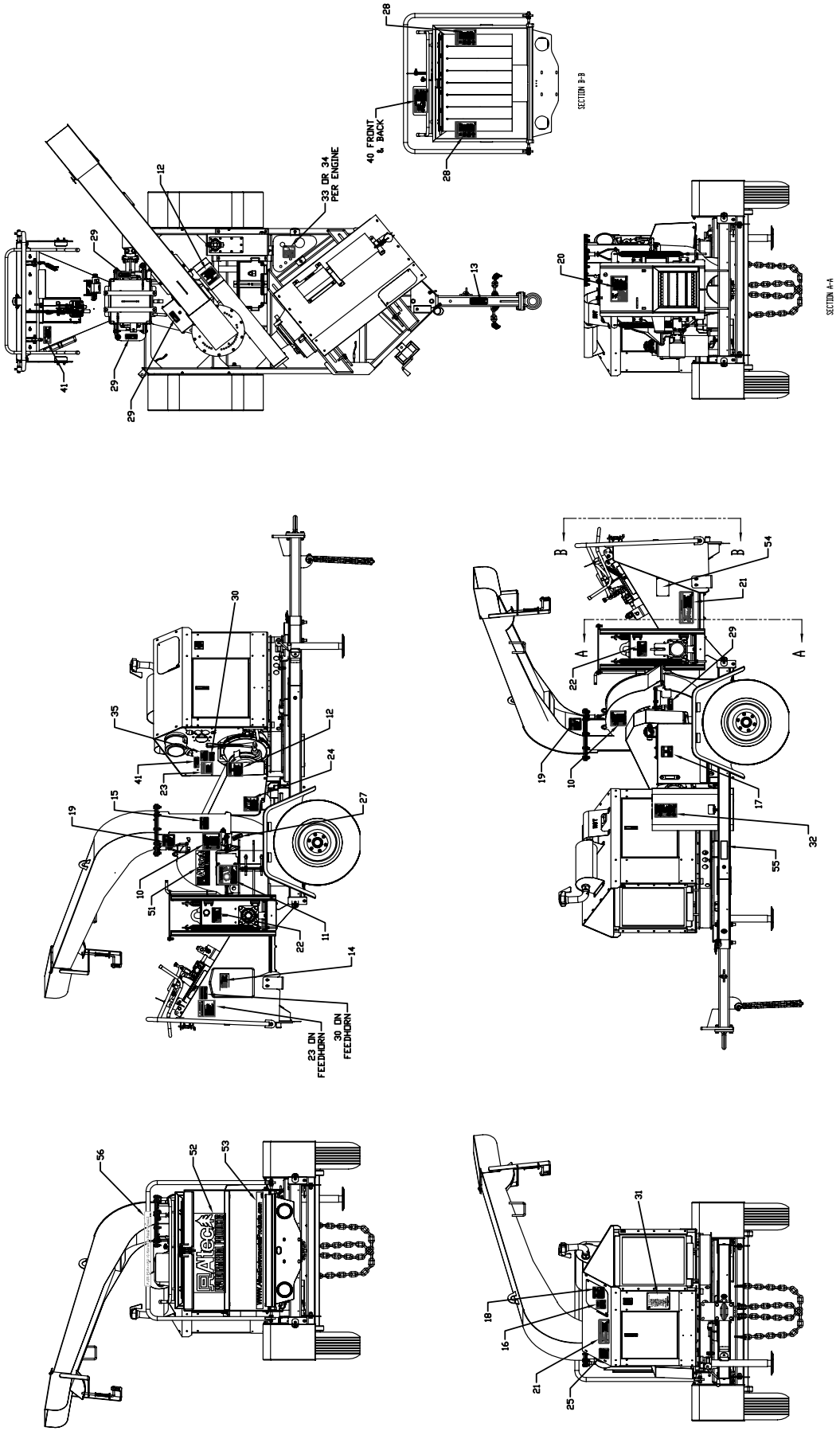
Apply safety labels to a clean surface with temperature of at least 40º F (5º C). Spray a small amount of mild soapy water to the back of each safety label before placement. The soapy water will allow movement and positioning of the label, if necessary. After the correct placement of the safety label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

⚠ WARNING

Death or serious injury 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.

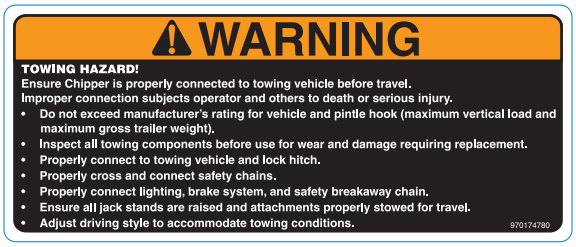
Note:
Decals may vary according to model, options and engine supplied.

PLACARD ORIENTATION

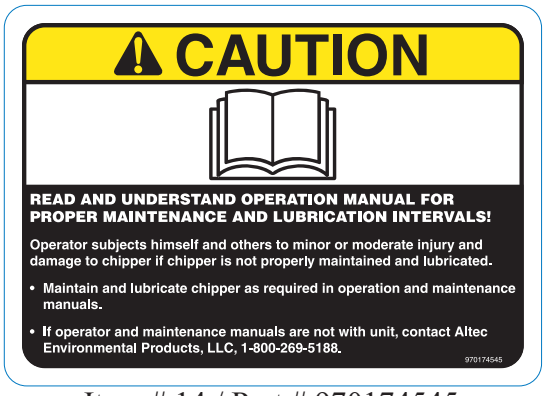


Accident Prevention Placards

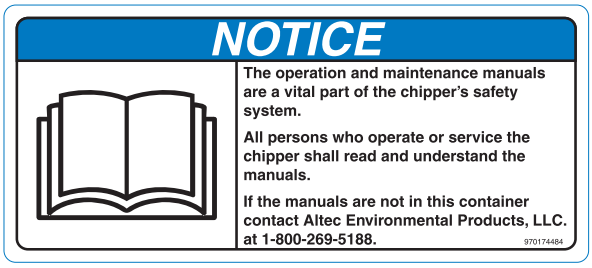
Item #10 / Part # 970174494
7½" Wide x 7½" Tall



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

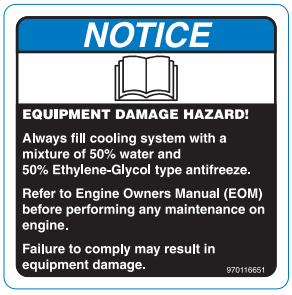


Item # 14 / Part # 970174545
5½" Wide x 3¾" Tall



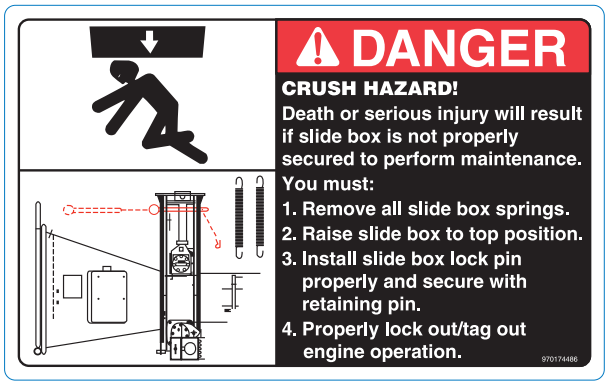
Item # 15 / Part # 970174484
6" Wide x 2½" Tall

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



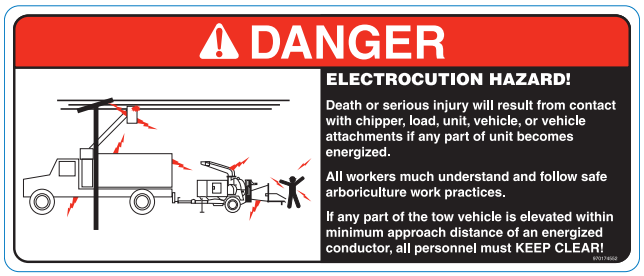
Item # 16 / Part # 970116651
2¾" Wide x 2¾" Tall

Item # 17 / Part # 970174568
2¾” Wide x 2¾” Tall



Item # 20 / Part # 970174486
6¾” Wide x 4” Tall

Item # 18 / Part # 970116652
4½” Wide x 4½” Tall



Item # 21 / Part # 970174552
4½” Wide x 4½” Tall

Item # 19 / Part # 970174499
4½” Wide x 4½” Tall

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

Accident prevention signs

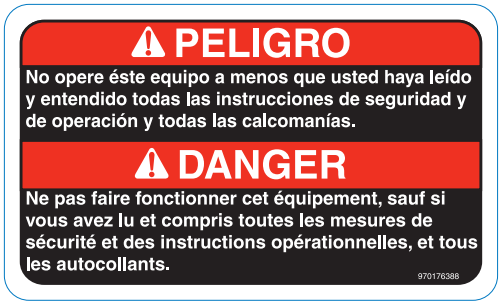
Item # 24 / Part # 970116649
4½" Wide x 4½" Tall

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

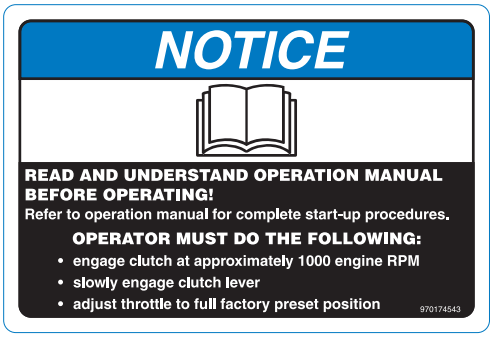
Item # 29 / Part # 970116642
2¾" Wide x 1" Tall



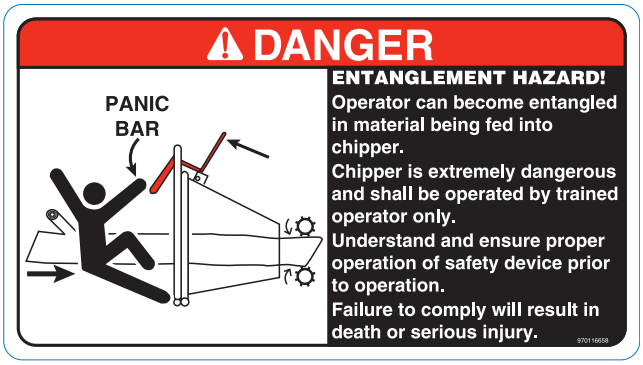
Item # 30 / Part # 970176388
4½" Wide x 2¾" Tall

Accident prevention signs

Item # 32 / Part # 970116654
4½" Wide x 7½" Tall



Item # 35 / Part #9701745433
4½" Wide x 3" Tall



Item #40 / Part # 970116658
8" Wide x 4½ " Tall

Item #33 Part # 970174511
2¾" Wide x 2¾" Tall

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

Item #34 Part # 970176387
2¾" Wide x 2¾" Tall

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 HAZZARD, 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 LABLE,
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

Death or serious injury 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 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.

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

Death or serious injury 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 or disc and drive system continue to move after the clutch has been disengaged and the engine has been cut off. Ensure that the disc/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/disc housing areas. See Accessing The Drum/Disc. 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 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 oil level. When the system is cold the level should be within the site bubble.
- 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.
- 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 death or severe injury. 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 death or serious injury. 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. Ensure folding tongue is in the towing position. Hitch Pin, Hair Cotter Pin, Bolt, and Nut all in place and properly secured.
2. Secure hitch to tow vehicle and ensure all safety pins, latches or hitch locking devices are secured.

3. 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

Death or Injury 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.

4. 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.
5. Connect trailer wiring to the tow vehicle and ensure that all trailer lighting is operating properly.

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 death, serious injury, or illness.

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.
- If fuel spills wait until it evaporates prior to starting.

Controls

⚠ WARNING

Death or serious injury can occur if the following procedures are not verified.

Always ensure that the hydraulic feed roll, 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 Roll Operation

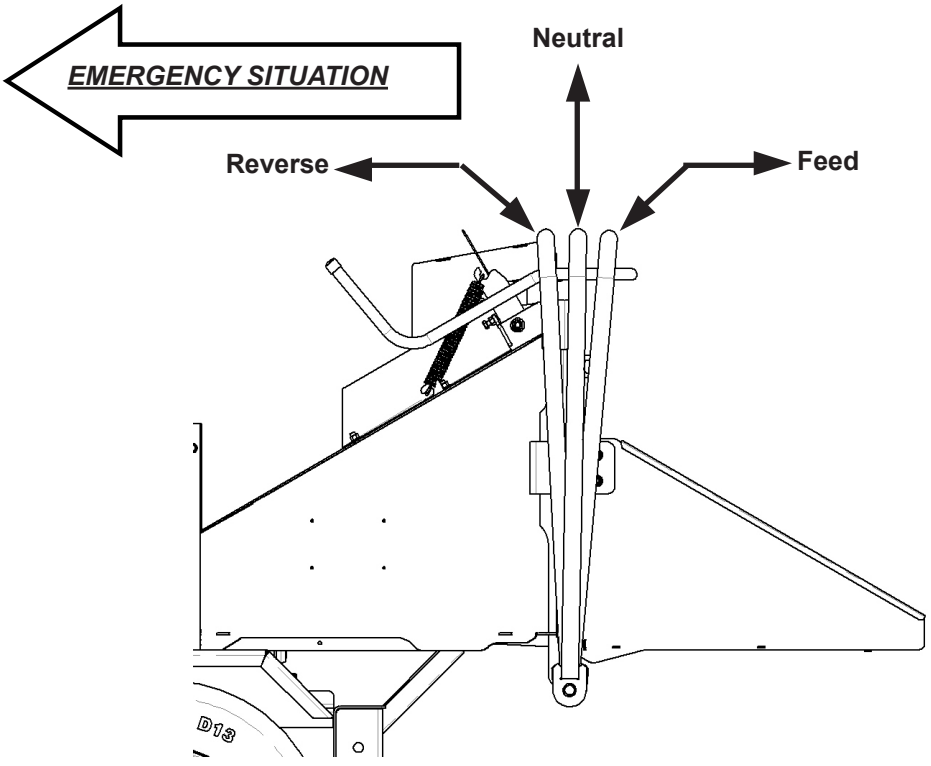
The feed roll is controlled by pushing or pulling the feed control bar which is located on the top and both sides of the feed chute. The 3 (three) control positions are:

Reverse - activates the feed roll to push material out of the chipper cutting zone.
Neutral - stops movement of the feed roll.
Feed - pulls material into the chipper cutting zone

⚠ DANGER

Serious injury will occur if controls are not operating properly. Insure that the feed roll 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 Roll Control Arm Movement



Clutch Engagement

⚠ WARNING

Death or serious injury may occur when working in the proximity of moving components.

The 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 Clutch, 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/tag-out procedures.

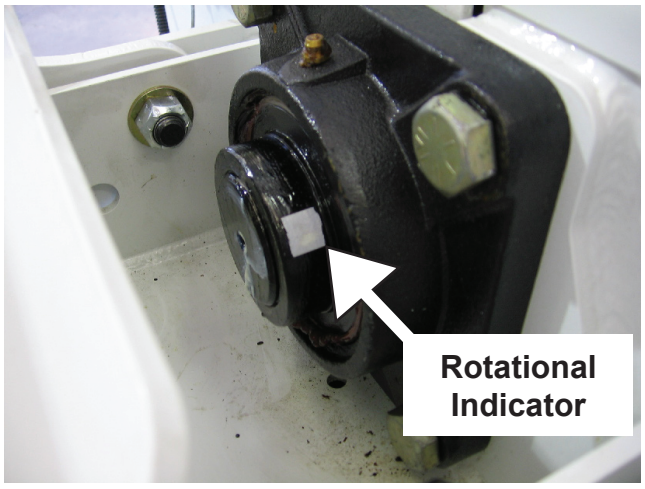
Do not leave the chipper unattended until all movement of the engine, disc/drum has stopped.

1. Verify infeed chute and feed roll areas are free from all objects or 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 death or injury. Always ensure discharge chute is not pointed towards personnel.

3. The standard Centrifugal Clutch supplied on the DC 610 engages automatically at approximately mid range of the throttle control.
4. Start Engine at the low RPM setting.
4. Let Engine warm up for 30 Seconds.
5. Increase RPM to the maximum setting .Stop if any unusual sounds are heard, or if disc does not begin to rotate as engine speed increases. Shut Engine down and investigate prior to proceeding.

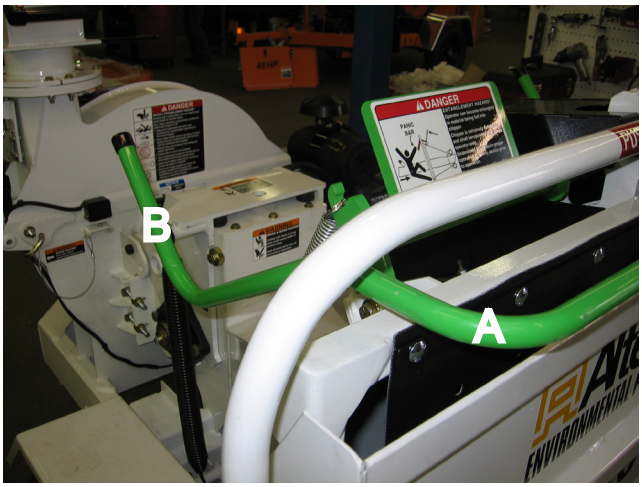


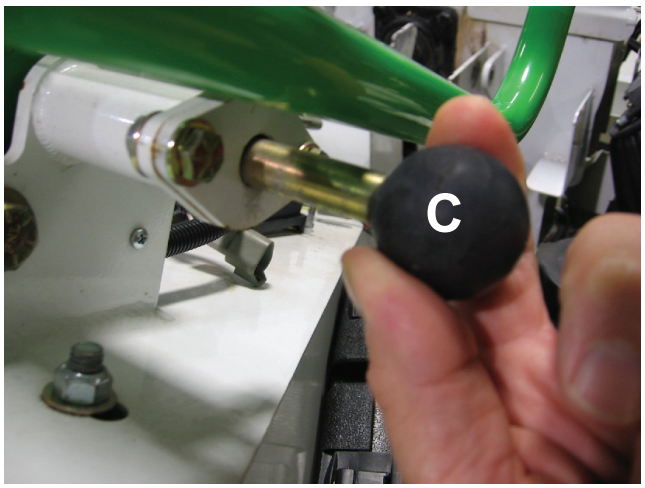
NOTICE

Equipment damage will occur when attempting a clutch engagement with a plugged cutter housing or discharge chute. Never attempt to start a chipper with a clogged disc housing or discharge chute.

Panic Bar

The Panic Bar Assembly consists of two bars (A & B), The re-activation plunger (C) and electrical switch (not shown). 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 roll. The panic bar may also be activated by pulling or pushing bar “B” towards the rear of the chipper. To resume operation, plunger C must be pulled out allowing the panic bar to move back into it’s starting position and activate the electrical switch. The feed roll control bar must then be temporarily placed into the neutral position prior to moving the feed roll control bar to either the forward or reverse activation positions.





⚠ WARNING

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

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 death or serious injury. 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 clothing and personal protective equipment.
- Restrict all personnel, except the operators feeding the chipper, from the feed area. All personnel must keep clear of the discharge area.

⚠ WARNING

Death or serious injury 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) which 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 death or serious injury. 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 death or serious injury. 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 de-limbing 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 roll open and facilitate feeding. Chipper performance is best when the feed roller is securely gripping the material as it is feeding into the cutter.

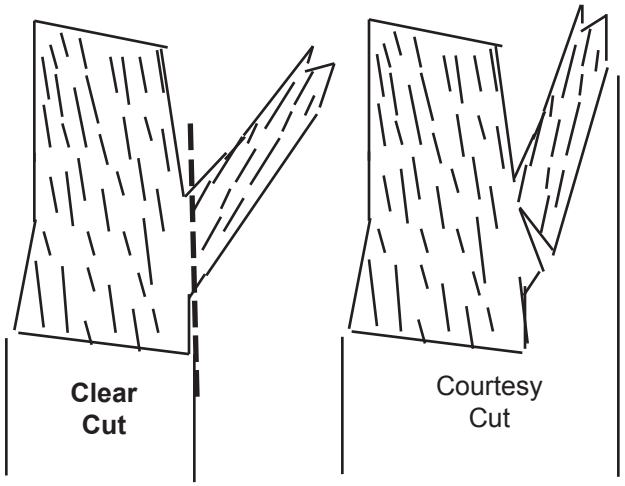
⚠ WARNING

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.

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 roll. The controller senses cutter speed. When the cutter speed drops to a preset minimum RPM, the feed roll movement is reversed and 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

Death or serious injury 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.

Engine/Disc Operation

⚠ DANGER

Death or serious injury 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.

⚠ WARNING

Death or serious injury 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.

⚠ DANGER

Death or serious injury can occur when chipper is operated without guards in place. Never start the engine with the disc or 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

Place feed control bar in the center neutral position.

Engine/Disc Starting

- Ensure that the spark plug, muffler, fuel cap and air cleaner are in place and secure.
- Do not crank engine with spark plug removed.

1. Check oil level. (See engine manual)
2. Move throttle control to the Slow position.
3. Pull out the choke control to the closed position.

Note: Do not use choke to start warm engines.

4. Turn the electric start switch to the on/start position.

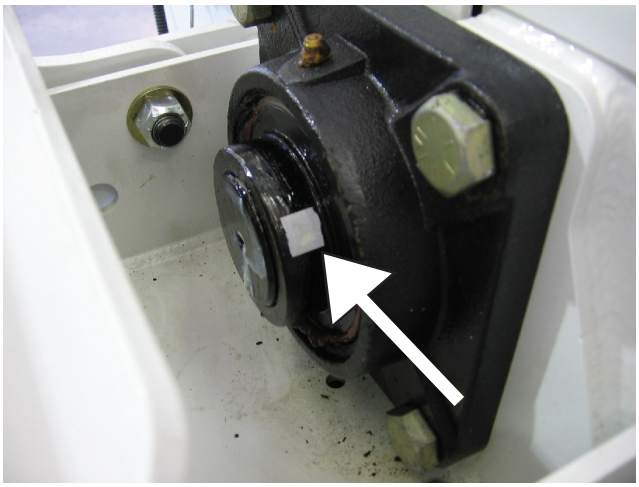
Note: To extend the life of the starter, use short starting cycles (five seconds maximum). Wait one minute between starting cycles.

5. As the engine warms up, move the choke control to the open position.

Note: if the engine does not start after three attempts, see the trouble shooting guide located in the engine operations manual.

Note: 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.

6. When the engine has reached operating temperature and is running smoothly at 1/4 to 1/3 throttle, move throttle to the Fast position. During clutch engagement the operator must ensure disc movement. See figure below. If no movement is heard or seen you must stop and investigate immediately.



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.

Stopping Engine/Disc

⚠ DANGER

Death or serious injury may occur if contact is made with rotating or moving components. Stopping the engine does not stop rotation of cutter or drive system. Cutter and drive system continue to move after the engine has been stopped. Ensure the cutter and drive system have come to a *COMPLETE STOP* before attempting any maintenance or inspection in the drive or cutter areas.

1. Reduce engine speed to Slow RPM.
2. Allow engine/disc RPM time to stabilize at the

slow RPM setting.
3. Turn ignition key to the Off position.
4. Remove keys from the engine ignition. Place in a secure location.
5. Visually inspect rotational indicator on the cutter shaft, ensure there is no movement in the drive system.

⚠ DANGER

Death or serious injury may occur if contact is made with rotating or moving components. Do not leave chipper unattended until all movement has come to a complete stop.

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

⚠ WARNING

Death or serious injury 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 death or serious injury 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 situations. 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 death or serious injury.

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 death or serious personal injury. 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 to 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 the 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 death or serious injury.

On equipment equipped with Feed Sense, 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 roll. 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 Feed Sense system.

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 death or serious injury.

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 death or serious injury.

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 wheel fails 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.

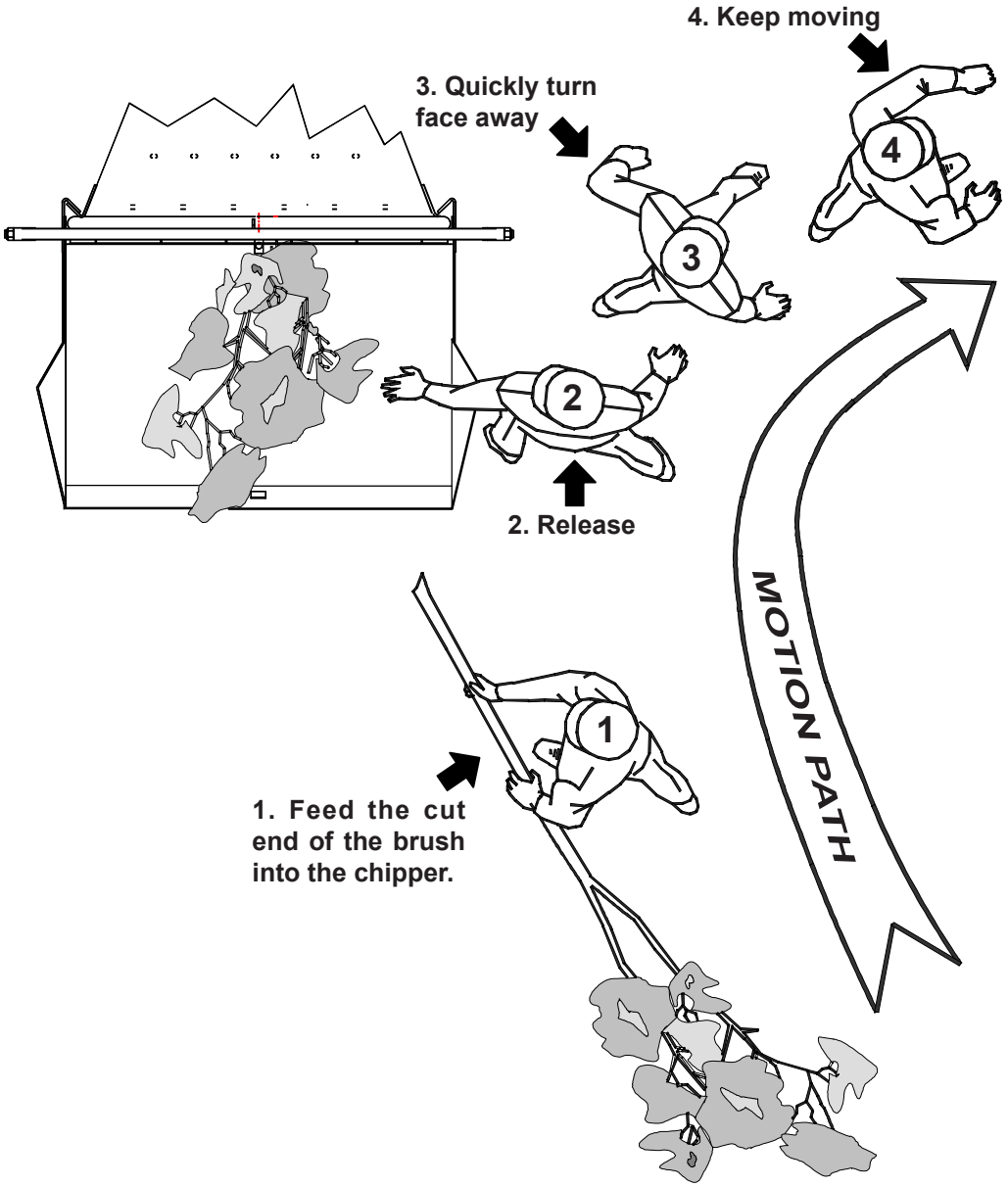
NOTICE

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, metal or other non-wood materials.

Proper Brush Feeding Technique



⚠ DANGER

Death or serious injury 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 roller. 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 roll. Release material as soon as it engages with the roll.

Clearing Feed Rollers

⚠ DANGER

Death or serious injury 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 preforming 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 roll and the disc attempt the following actions before preforming 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.

⚠ DANGER

Death or serious injury 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 roll have come to a complete stop. Remove keys from the ignition and place in a secure location. 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.

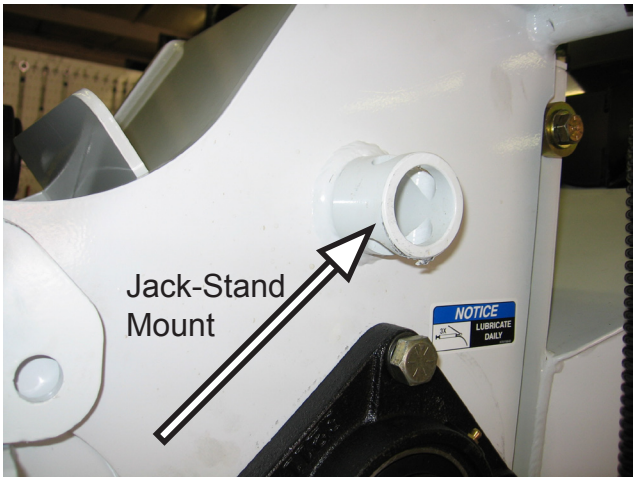
Always use appropriate tools to remove jammed materials. Never reach into the feed chute.

⚠ DANGER

Death or serious injury 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.

Securing Feed Roller in the Open Position

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



8. Using the jackstand, raise the feed roll assembly to its maximum position.

9. Install the feed roll lock pin into position.

10. Using appropriate tools remove any material interfering with the rotation of the cutter mechanism. Or jammed in the transition area.

11. Return feed roll too the normal operating position.
12. Reconnect battery cable, Restart engine.

⚠ DANGER

Death or serious injury may occur When personnel come in contact with pinch points. Never attempt to "pry" open the feed roll. Roll must only be opened using 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 under the feed roller

Clearing Discharge Chute

⚠ DANGER

Death or serious injury 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.

1. Rotate the discharge chute to the front of the chipper.
2. Remove the two .38 inch bolts and the hood safety padlock connecting the upper disc housing/discharge chute assembly to the lower disc housing.
3. Remove the Inspection Hood Pin
4. Carefully open the upper disc housing/discharge chute assembly.

5. Install the Inspection Hood Pin.
6. Use appropriate tools to unplug the chute.
7. Ensure chute is clear and disc turns freely prior to reinstalling disc/chute assembly.
8. Lower chute assembly, reinstall the 2 three eights inch bolts, lock and hood pin.
9. Ensure all bolts and pins are properly installed prior to starting the engine.

NOTICE

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.

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.

Disc speed slows but engine RPM remains high:
- Insure belts are properly adjusted and belt or pulleys are not worn.

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 death or serious injury.

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.

Engine

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

Remove keys from the ignition switch and place in secure location.

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

Use caution when accessing the engine cowling 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 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 engines effective horse power and cause failure of your engine. Note: Failures due to improper air intake system maintenance are not covered under engine warranty.

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 death, serious injury, or illness.

To Avoid Fire:

- Turn off all ignition sources (Chipper & Tow Vehicle). Allow Engine to cool for at least 2 minutes before removing fuel cap.
- Refuel in well ventilated areas.
- 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.
- If fuel is spilled, wait until fuel evaporates before starting the Engine

⚠ 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, which ever 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 chart.

Changing Tires:
With the chipper hitched to the tow vehicle:
- Remove the front jackstand.
- Note the jack pipe mount.
- Locate the rear pipe jack mount on the side you wish to change,
- Attach the front jackstand and raise chipper.

Tires and Wheels:

- Refer to tire manufacturer specification for proper tire inflation. Insure tires are in good condition.
- Refer to axle and rim manufacturers manual for proper wheel lug torque.

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 death or serious injury if the tube fails while being transported.

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

- 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.

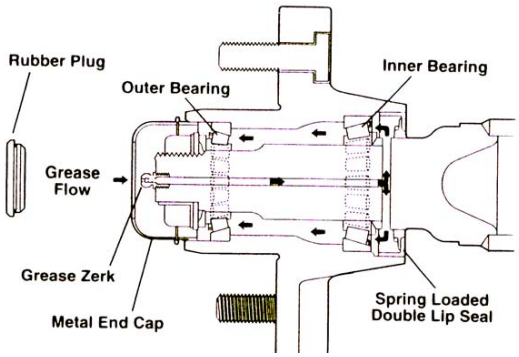
Axle Bearings:

⚠ WARNING

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

Standard axles on Altec Environmental Products, LLC Chippers have the Ulta-Lube feature. This feature flushes and lubricates both the inner and outer wheel bearings. If your axle is equipped with the Ulta-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.

Disc and Feed Roll Bearings:
Lubricate daily with a premium quality NLGI # 2 grade multipurpose roller bearing grease. Grease each bearing daily with (3) three or (4) four pumps with a standard grease gun.

Feed Roller Pivot Points
Feed Roller Pivot Points have a non-greaseable - oil impregnated bushing. Lubrication of these points will inhibit the designed method of lubrication and may cause excessive wear of the bushings and shaft.

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

Lubrication Recommendations

			Lubrication Intervals			
Component	**Lubricant Type**	**Applicator**	**10 Hrs Daily**	**50 Hrs Weekly**	**200 hrs Monthly**	**1000 Hrs Yearly**
Cutter Bearings	A	Grease Gun	■			
Feed Roller Bearings	A	Grease Gun	■			
Hydraulic Oil	ISO 46 or Altec MV22	Filter Pump	As Required for Proper Oil Level			
Chute Rotation	A	Grease Gun		■		
Hinges, Friction Points	B, C	Spray or Brush		■		
Linkages	B, C	Spray or Brush		■		
*Jack	A	Grease Gun			■	
Axle Bearings	A	Grease Gun				■
Engine			As Required by Engine Manufacturer			
A - Use a premium grade, high temperature lithium based grease. Some suggested greases are: Mobil Mobilith AW 2, Shell Alvaina Grease 2, Texaco 1939 premium RB, Amoco Ryko Premium Grease #2 or an equivalent.						
B - General purpose spray lubricant						
C - Anti-seize compound. Extreme pressure lubricant that prevents seizure, corrosion, rust and galvanic pitting.						
* If Required						

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 engine supplied with your chipper.

CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
Starter will not crank engine.	• Battery discharged. • Battery terminals corroded or poor ground connection. • Defective ignition switch or starter solenoid. • Malfunctioning starter.	• Charge Battery • Clean and tighten connections • Replace defective components • Replace starter
Engine will not start.	• Fuel tank empty. • Hood safety switch not engaged or damaged • Choke inoperative. (Gasoline Engines Only) • Engine flooded. • Battery partially discharged. • Faulty engine carburetion or ignition.	• Refuel • Verify disc hood and switch activator plate properly secured. • See Engine Operations manual. • See Engine Operations manual. • Charge Battery. • See Engine Operations manual.
Engine runs but disc doesn't turn	• Material lodged against disc. • Slipping or broken drive belt. • Defective clutch.	• Clear material in disc housing, transition or discharge chute. • See maintenance manual. • See maintenance manual
Feed roll does not turn. Green "Disc Speed" LED light is ON	• Panic bar activated. • Ensure proper control bar position. • Wiring connections loose or wires broken. • Improper Hydraulic Fluid Level. • See Maintenance Manual for additional steps.	• Reset panic bar and return feed control bar to neutral position. • Place in forward or reverse position. • Check controller and hydraulic valve connections. Inspect wiring for damage. • Fill hydraulic tank
Feed roll does not turn. Green "Disc Speed" LED light is Flashing	• Engine RPM's to low. • Disk not turning at correct RPM, material lodged in disc. • See Maintenance Manual for additional steps.	• Increase engine speed to maximum setting. • Clear material in disc housing, transition or discharge chute.
Feed roll only turns in reverse	• Engine not operating at full throttle. • Disk not turning at correct RPM. • Material lodged in disc. • Belt slippage • Clutch slippage • See Maintenance Manual for additional steps.	• Increase engine speed to maximum setting. • Clear material in disc housing, transition or discharge chute • See maintenance manual. • See maintenance manual
Engine Over-heats	• Engine fins not clean.	• Clean engine cooling fins.(Let engine cool first)
Discharge Chute Clogging	• Dull knives. • Improper Knife/Anvil gap. • Feeding wet or sappy material • Feed system not operating properly.	• Replace or sharpen knifes. • Reset gap to 0.063" (1.6 mm). • Mix heavier stock in with lighter/wet materials • Repair feed system. (See Maintenance Manual)

access hood — hinged part of the disc housing used to access the cutter disc

actuator — a device for converting hydraulic energy into mechanical energy, such as a or cylinder.

adapter — a device used to connect two parts of different type or diameter.

allen wrench — a six sided wrench that fits into the hex socket of a cap screw or set screw.

ANSI — American National Standards Institute.

antifoam additive — an agent added to hydraulic fluid to inhibit air bubbles from forming and collecting together on the surface of the fluid.

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.

anvil — The stationary blade on a chipper cutting mechanism

ASTM— America Society for Testing Materials

AWS — American Welding Society

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.

baffle — a device, usually a plate, installed in a reservoir to separate the return line inlet from the suction line outlet.

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

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.)

bore — the inside diameter of a pipe, tube, cylinder barrel, or cylindrical hole in any of various other components.

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.

break-away switch — a device which automatically activates the breaking system of a towed unit when unintentionally separated from the towing vehicle

breather — a device that permits air to move in and out of a container or component to maintain atmospheric pressure.

burst pressure — the minimum internal pressure that will cause a hose, tube, cylinder, or other hydraulic or pneumatic component to rupture or split open.

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.

bypass — a secondary passage for fluid flow.

bypass valve — a hydraulic valve that allows for an alternate passage for fluid flow.

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.

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.

caution — a signal word which indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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.

charge — to fill an accumulator with fluid under pressure.

charge pressure — the pressure, above atmospheric pressure, at which replenishing fluid is forced into the hydraulic system.

chassis — a vehicle on which a unit is mounted, such as a truck, trailer, or all-terrain vehicle.

check valve — a valve that permits flow of fluid in one direction, but not in the reverse direction.

chip curtain — rubberized deflection curtain attached to the infeed chute

chip defector — 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 knifes 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 knifes 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.

EFC — (Electronic Feed Control) 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

l**ight 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 lead 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.

swage — to taper or reduce the diameter of a rod, tube or fastener by forging, squeezing or hammering.

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.

tachometer — an instrument used for displaying the speed of rotation of an engine output shaft.

tank — the hydraulic reservoir.

tension spring — springs controlling downward force of the upper feed roll

terminal block — an insulating mounting used for making electrical terminal connections.

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.

thread locking adhesive — an anaerobic adhesive that is applied to fastener threads to prevent loosening due to vibration or repeated loading.

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.

three-way valve — a valve having three ports for direction of fluid flow.

throttle control — a manual, hydraulic, or electrical device used to regulate vehicle or auxiliary engine speed.

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.

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.

torque — 1: a rotational twisting force. 2: to preload a threaded fastener by application of a rotational twisting force.

tow vehicle (towing vehicle) — the vehicle that pulls a trailer or towed vehicle.

trace element analysis — analysis of a small sample of hydraulic fluid to determine contamination level and condition of additives.

transducer — a device that converts input energy of one form into output energy of another, such as hydraulic pressure into an electrical signal.

transition — the area between the feed box and the cutter mechanism

troubleshoot — to locate and diagnose problems in a system or a component.

trunnion — a mounting device consisting of a pair of opposite, projecting cylindrical pivots on which something can be rotated or tilted.

trunnion bearing — a bearing that a trunnion pin pivots in.

trunnion pin — a cylindrical pivot pin that is a part of a trunnion.

turnbuckle — a link with screw threads at both ends that is turned to bring the ends closer together for tightening purposes.

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.

two-position valve — a valve having two positions for direction of fluid flow, such as open and closed.

two-way valve — a valve having two ports for direction of fluid flow, with one internal flow path which can be open or blocked.

UNC — Unified National Coarse, a thread description.

under tighten — to torque a threaded fastener below the recommended value.

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 Table

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**	**DC 610**	**CFD 1217**	**DC 912A**	**DC 1317**	**DC 1317 HP**	**DC 1419**	**DC 1820 2 Axle**
Blade /Anvil									
Anvil Bolts	Hex Head	226 (306)	64 (87)	160 (217)	107 (145)	107 (145)	107 (145)	160 (217)	160 (217)
Blade Bolts	Flat Socket Holo-Krome	N/A	140 (190)	N/A	70 (95)	70 (95)	70 (95)	140 (190)	140 (190)
Blade Bolts	Hex Head, Bowmalloy	N/A	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	N/A
Bearings									
Cutter Bearing (cutter side)	Ferry Cap or Hex Head	226 (306)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)
Cutter Bearing (pulley side)	Ferry Cap or Hex Head	226 (306)	160 (217)	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)	127 (172)
Structural									
Pintle Ring Bolts	Hex Head	211 (286)	**105 (142)	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	N/A
Folding Tongue Pivot Bolt	Hex Head	N/A	50 (68)	N/A	N/A	N/A	N/A	N/A	N/A
Engine/Frame Bolts	Hex Head	107 (145)	15 (20)	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	N/A
Disc Paddle Bolts	Hex Head 5/8-11	N/A	N/A	N/A	160 (217)	160 (217)	160 (217)	160 (217)	160 (217)
Disc Draw Ring Bolts	Hex Head	N/A	108 (146)	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	N/A
Axle									
Axle Mounting Bolts	Hex Head	115 (156)	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)	*150 (203)
Wheel Lug Nuts	Wheel Lug	105 (142)	105 (142)	105 (142)	105 (142)	105 (142)	105 (142)	300 (407)	*105 (142)
Specific Component									
Hydraulic Motor Shaft Nut	Hex Nut	N/A	26 (35)	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)								
	** 2 Inch Ball Coupler								

Check List
See Engine Manual for Complete Engine Maintenance Schedules

DAILY PRE-OPERATIONAL CHECK LIST

Equipment #	
VIN #	**Completed**
Check engine fuel, and oil levels. (See Engine Operating Manual).	
Check engine cooling fins and ensure free passage of air.	
Check all bolts and nuts to ensure they are tight.	
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 the sight gauge, of the tank, when the fluid is cold.	
Lubricate cutter bearings.	
Inspect and operate panic bar	
Inspect and repair any hydraulic leaks	
Insure that the tires rims are torqued to specifications and properly inflated.	
Insure a complete AEP Operations Manual is available for all Operators to review.	

Insure area around muffler and exhaust is free of flammable materials.

Signature	**Date**

WEEKLY CHECK LIST

Equipment #	
VIN #	**Completed**
Complete daily pre-operational checklist	
Check hitch, safety chains and tongue for damage or wear.	
Check general condition of tires and tire pressure.	
Inspect anvil to ensure all attachment and adjustment bolts are secure.	
Check the engine air filter. (See Engine Operating Manual).	
Check cutting knives to ensure all attachment bolts are tight and knives are in good condition.	
Lubricate all pivot points requiring lubrication, and all 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 drive roller bearings.	
Lubricate chute rotation.	
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 hydraulic fluid.	
Signature **Date**	