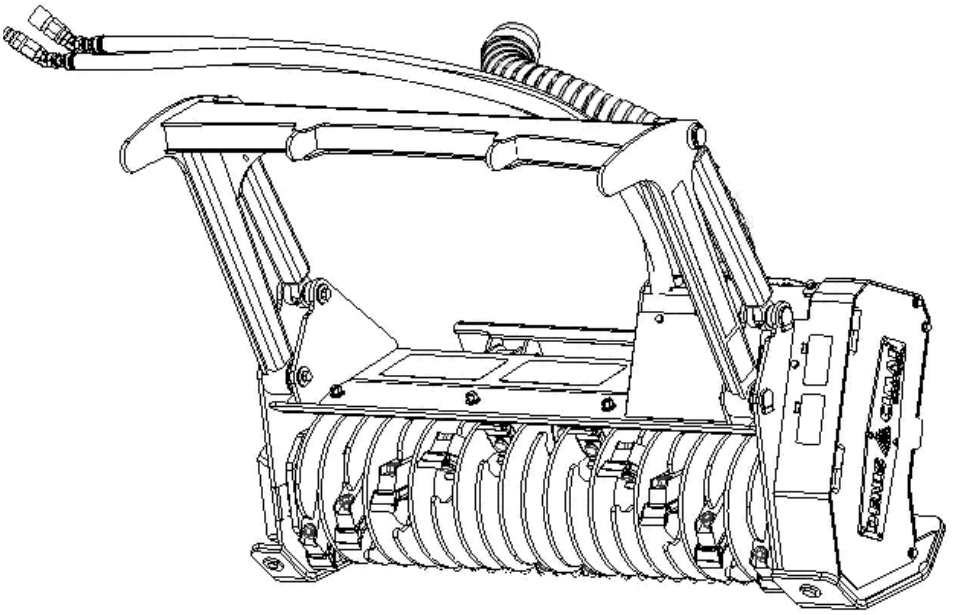
DENIS CIMAF

DAF-150D

ORIGINAL INSTRUCTIONS

FORESTRY MULCHER

OPERATOR ▪ SERVICE ▪ MAINTENANCE MANUAL



This Operator's Manual is an integral part of the safe operation of this machine and must be maintained with the unit at all times. READ, UNDERSTAND, and FOLLOW the Safety and Operation Instructions contained in this manual before operating the equipment.

RAYCO

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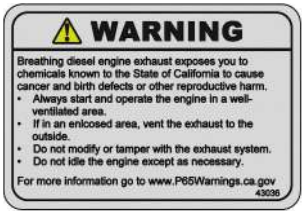
INDEX: OSMPMDAF-150D-22

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Each machine shipped contains operation, maintenance & parts manuals to familiarize the operator with the proper operating, lubricating and maintenance instructions. This helps to ensure the best possible performance and service from the machine. Read and understand all instructions before attempting to operate this machine. This manual should be readily available for reference at all times. Additional copies of this manual may be purchased from Rayco.

This Rayco machine was designed and manufactured by Rayco Manufacturing, LLC, Wooster, Ohio. Due to continuous improvements, Rayco reserves the right to make changes in engineering, design and specifications, or discontinue manufacture, at any time, without notice or obligation.

Always have a record of the model numbers and serial numbers for your machine to specify when ordering parts. Record your machine model and serial numbers on this page for your personal records.





Identification Numbers

	Model Number	Serial Number
Machine		

Dealer Information

Name	
Address	

	Dealer Contact	Phone Number	Hours
Sales			
Parts			
Service			

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1 Introduction

1.1 Documentation and Machine Information

This *Installation Manual* has been written to ensure you can use your mulcher in a safe and trouble-free manner. The purpose of this manual is to get you familiarized with the DAF-150D Mulcher to safely exploit its capabilities.

This Maintenance Manual is intended to help you maintain your DAF-150D mulcher and keep it operating safely and smoothly for many years to come. Read this manual carefully before performing any maintenance on your machine as well as:

- Make sure that any new operator of this mulcher does the same before using the machine for the first time.
- Keep this manual nearby in a safe place.
- If the mulcher is sold or transferred, it is important for this manual to be forwarded to the new owner.
- This manual includes the most recent pictures, drawings, specifications, and information at the time of printing. However, they are subject to change without prior notice.
- DENIS CIMAF may also provide a digital copy of this publication for your convenience by calling the Technical Support.

1.2 Equipment Description

The DAF is a high power, forestry brush cutting-mulching system that can be installed on most compact loaders or other dedicated forestry carriers. DAF brush cutters and mulchers are designed for vegetation control work.

1.3 Technical Support and Service

If you have any general questions or technical concern to address about your DAF-150D, please contact your dealer or your DENIS CIMAF Inc. Technical Support. We will be happy to help you.

Always feel free to give us your suggestions or report any concern about our products. Your suggestions will be studied carefully.

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1.4 Terminology

Throughout this document, the term *carrier* refers to machines on which the **DAF-150D** can be mounted.

	**DANGER identifies the highest risk for which a lack of respect towards the procedures indicated will cause high risk of death or serious injuries.**
	**WARNING states that there is a risk of serious injury or death if you don't take care or related safety precautions.**
	**ATTENTION is used in cases where not respecting the procedures can result in injury, damages to components or system failure.**
	**This symbol designates important instructions for maintaining or operating this unit efficiently and economically.**

1.5 Environmental Regulations

The mulcher you have purchased is probably one of the most efficient and thus the most environment friendly piece of equipment for land clearing. It requires less hydraulic HP per area of land cleared than any competing brands.

Although the hydraulic system is made of high-quality parts designed for safe and leak-free operation, a component with a manufacturing defect or a worn part may cause oil to leak.

Please comply with the environmental regulations applicable in your area with respect to oil spills. Remember that machinery owners could be held liable for environmental impacts and be subject to prosecution and fines.

1.6 General Safety Rules

DENIS CIMAF inc. objective is to produce reliable and safe machines. Nevertheless, how well designed is the equipment, there is always a risk when using heavy equipment.

A certain number of safety rules will have to always be followed and respected to reduce the risks and assure the health and safety of the employees.

1.7 Safety Precautions for Maintenance

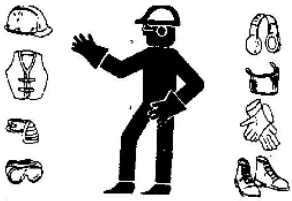
1.7.1 First Aid Kit

Always keep a complete first aid kit accessible. It is your responsibility to consult the health and safety instructions in the manual of the vehicle on which this mulcher is fixed.



1.7.2 Protective Wear

Use protective wear such as gloves, steel toed boots, a hardhat, safety glasses and if necessary, ear protectors.

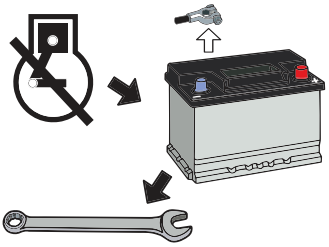


Maximum Noise Levels for this equipment were recorded at 119 dB(A). Hearing protection must be worn in the vicinity of this equipment when in use.

1.7.3 Wait for Machine to Stop

Never make checks or repairs on mulcher while the carrier engine is ON or before the rotor of the mulcher is stopped completely.

For maintenance and repairs on the equipment, stop the engine and unplug the positive (+) cable from the battery. Place a lock on the main breaker.



Please consult the instruction manual before fixing or doing maintenance work on any equipment.

1.7.4 Handle Gas and Oil with Care

Be extremely careful when draining hot liquids from the vehicle. Splashes of hot liquids can cause serious burns. Wait until liquid being cooled down or use necessary equipment for safe handling.

Diesel, gas, or hydraulic liquid under pressure may not be visible, can penetrate the skin and cause serious injuries, blindness or even death. In case of the penetration of a fluid under the skin, this liquid must be surgically removed within a few hours by a trained doctor.

Always wear working gloves when checking for leaks. Use a piece of cardboard or wood to help you find leaks.

In case of injury caused by under pressure oil leakage, go immediately to the nearest emergency department.

Never use your bare hands to check for leaks.



1.7.5 Release Pressure Prior to Work

There is still a lot of pressure in the hydraulic system long after the energy source and the pump are stopped.

Lower all hydraulic elements to the ground and release the pressure from components prior unplugging the hoses.



Never modify the pressure and safety settings without having the instructions of an authorized person.

1.7.6 Work in a Ventilated Area

Work in a well-ventilated area: If it's necessary to have the engine running in a closed space, use an extension pipe to evacuate the exhaust smoke.

Keep the engine running only when it's necessary for test and setting. If you don't have an extension pipe, work outside, or open the shop doors. Prevent asphyxiation: If you must operate in a building or other enclosed area, be sure that there is sufficient ventilation at that area for effective dispersion of the engine exhaust. If your machine is equipped with an enclosed cabin, be certain there is adequate ventilation.



1.7.7 Respect Environmental Regulations

Correctly eliminate the liquids. Never pour the liquids on the ground, in rivers, ponds or lakes.

Conform to local environmental regulations to eliminate filters, batteries, fuel, coolant, brake liquid and other dangerous waste.



1.7.8 Walk Around Inspection

On arrival of the machine to site, the operator and mechanic should walk around the machine, check it carefully according to the check list of the machine after it was unloaded.

The following parts of the machine are often requiring particular attention and frequent inspections:

- Tires
- Tracks
- Linkage
- Leaks
- Radiator
- Reservoir
- Air Cleaner
- Protection Structure
- Working Tools

2 Intended Use / Foreseeable Misuse

2.1 Intended Use

This forestry mulcher is intended to be used only to mulch vegetation. This includes trees, brush, vines, etc.

This forestry mulcher is intended to be installed on most excavators or other carriers with articulated masts and have the appropriate hydraulic connections and flow.

Do not connect or use this Denis Cimaf mulcher unless trained properly. Do not interact with the cutting head unless full LOCK OUT/TAG OUT procedures have been employed.

2.1.1 Mover Requirements

The DAF-150D is only to be attached to a mover that meets these requirements:

- Is equipped with a front mounting attachment plate
- Has a minimum continuous flow of hydraulic fluid to the attachment of 85 L/min (20 gal/min)
- Has appropriate hydraulic connections that correspond with the mulcher

  Pressure Line (I.D.): **#12 (0.75 in)**

  Return Line (I.D.): **#12 (0.75 in)**

  Drain Line (I.D.): **#8 (0.50 in)**

2.1.2 Environmental Conditions

It is recommended that the forestry mulcher is only used between 0°F and 100°F (-17°C and 38°C). This is due to an increased risk of component failure due to extreme temperatures.

Extreme cold can lead to seals and O-Rings within the hydraulic system hardening. This hardening will lead to leaks internally as well as externally in the system.

Extreme heat can lead to excessive hydraulic oil temperature. This heat reduces the viscosity of the oil, which in turn reduces the oil's ability to lubricate components. This can lead to hydraulic motor failure.

2.2 Foreseeable Misuse

This forestry mulcher is not intended to be used to crush rocks, or as a tilling/trenching attachment. It is not to be used on metal, construction materials, railroad ties, cinder blocks, cement, concrete, or other things of this nature.

The DAF-150D must be started up and shutdown in a specific way. The mover must be at an idle before the mulcher is engaged or stopped. Abrupt stops or starts will damage hydraulic components. Do not use the ignition or safety switches to turn off the mulcher. Always use the switch that controls hydraulic implements for startup and shutdown.

The DAF-150D hydraulic lines must be installed in a specific order. Failure to hook up in the correct order will result in catastrophic damage to the DAF-150D. The order is as follows:

1. Case Drain
2. Return
3. Pressure

Failure to follow these guidelines will result in damage to the Denis Cimaf attachment, as well as to the mover.

3 Decals

3.1 Safety Decals

The following decals are affixed to the mulcher. If any of these decals become damaged or lost. Make sure to replace them immediately. Failure to do so could result in injury or death.

D312 801 – Sticker 20”

39748 – P65 General Warning

D920 800-02EN – Flying Debris **(X2)**

D920 801-02EN – Cut Hazard **(X2)**

D920 802-01EN – Belt and Pulley

D920 803-01EN – Risk of Crushing **(X2)**

D920 805-02 – Lubrication **(X2)**

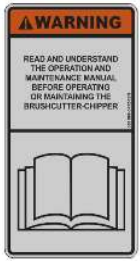
D920 806-03 – Stand Clear 300FT **(X2)**

D920 808-01EN – Read and Understand

D920 839 – Technician Tune up Warning





















4 Residual Risk

While Denis Cimaf has made every effort to ensure that the mulcher is as safe as possible, there are still risks associated with operating this equipment.

4.1 Injury

Injury can occur in the following ways but is not limited to:

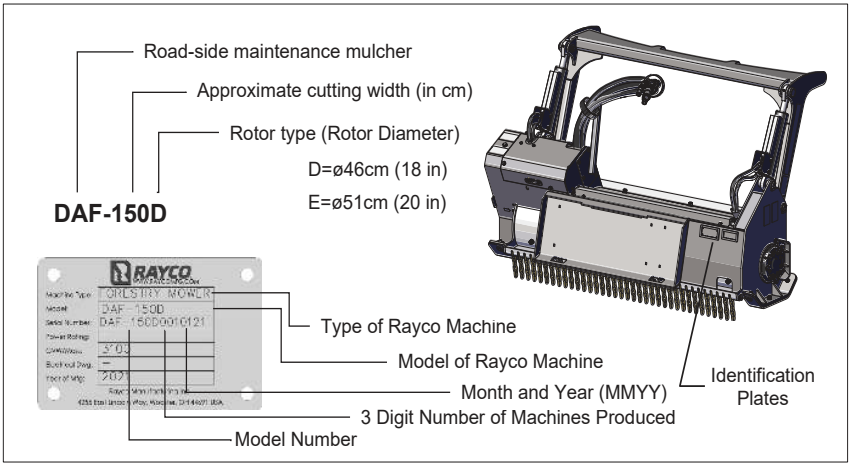
- Contact with Rotating Blades
- Flying Debris
- Excessive Noise
- Contact with a hot liquid (Hydraulic Fluid)
- Entanglement Hazards associated with the belt drive system of the mulcher

Pictograms reflecting these risks are shown and defined in the Safety Section of this manual, as well as in the Safety Decal Section.

5 Mulcher Characteristics

5.1 Model and S/N

The model's name and size of the mulcher are indicated on the identification plate located on the rear side of the frame.



5.2 Specifications

The table below presents the main features of the DAF-150D line covered in this **Maintenance Manual**.

Specifications	
Cutting Width	150 cm (59 in)
Rotor Diameter	46 cm (18 in)
Cutting Distance from Ground Level	2.0 cm (0.8 in)
Required Hydraulic Flow	135 LPM (36 GPM)
Rotor Speed	2750 r/min
Typical Weight[1]	1043 kg (2300 lb)
Number of Blades	27
Number of Motors	1

[1] Standard weight with no mounting bracket or tilt system

5.3 Mulcher's Orientation

The sides of the mulcher have been stated in relation with the Operator's location as shown in the following view.

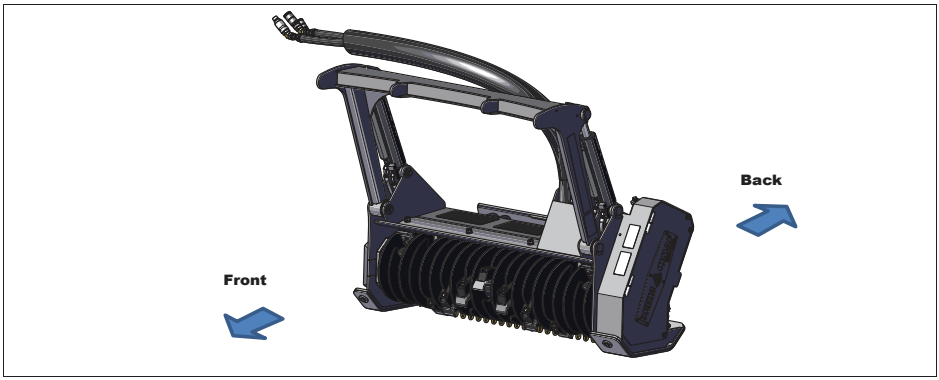


Fig. 2-1 Mulcher Orientation (reference direction)

5.4 Rotor Speed & Direction

The mulcher rotates counterclockwise when you're looking at it from the left side of the machine; the blades are pointing toward the ground, facing the mulcher.

Hydraulic motors are used on all DAF-150D mulchers. They can handle up to 450 bar (6500 psi) but we recommend a MAX service pressure of 350 bars (5000 psi).

The rotor must operate at approximately 2750 rpm. If the rotor speed is not enough, its performance will decrease leading to higher fuel consumption, an increased hydraulic oil temperature and a shorter lifespan of the components.

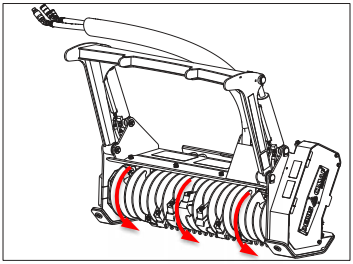
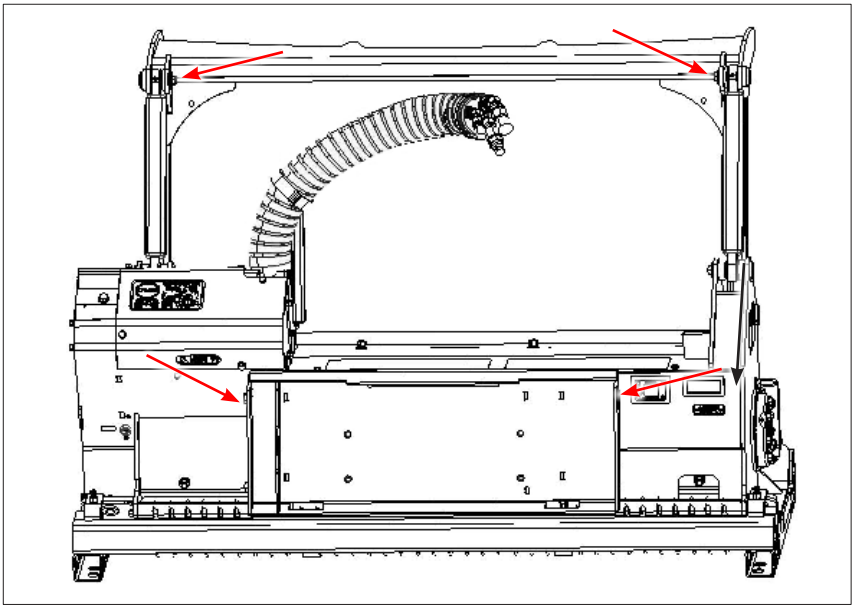


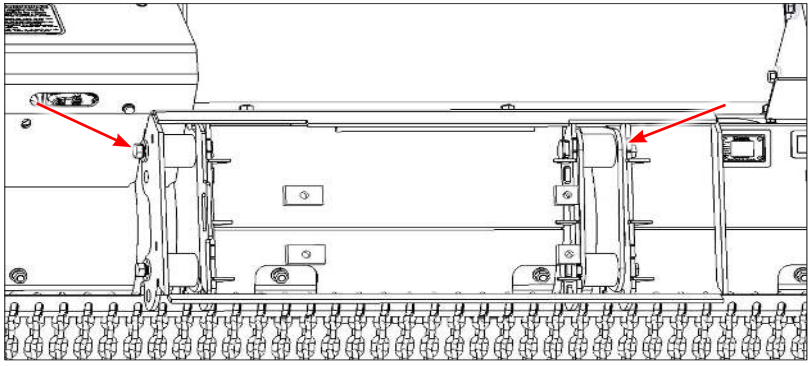
Fig. 2-2 Mulcher Rotor Direction

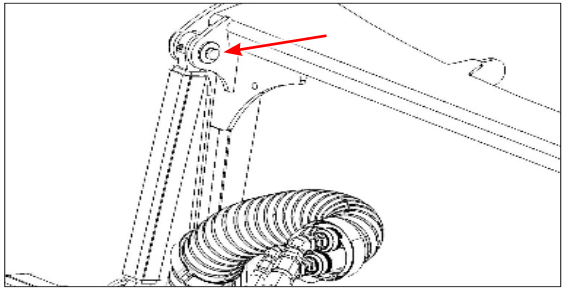
5.5 Lifting and Handling

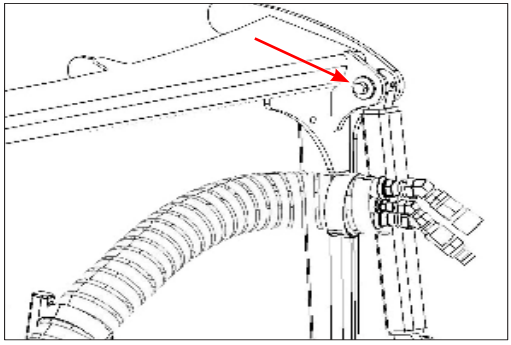
This mulcher leaves the factory on a specially designed stand that allows for safe and easy movement when the mulcher is not attached to a machine. It is recommended that this stand remains with the mulcher. If it becomes necessary to move the mulcher without the stand, or the stand is no longer with the mulcher, Denis Cimaf has determined the appropriate lift points. All the lift points must be used at the same time. The bolts must be removed in the pins to access the threads used for lifting. The thread size for the upper lift points is M16 X 2. The thread size for the lower lift points is M20 X 2.5. Only use grade 10.9 bolts for this process.

Never lift the mulcher using any other points than the ones shown in this section. Failure to follow these instructions could lead to serious injury or death.









5.6 Parts Description

5.6.1 Frame

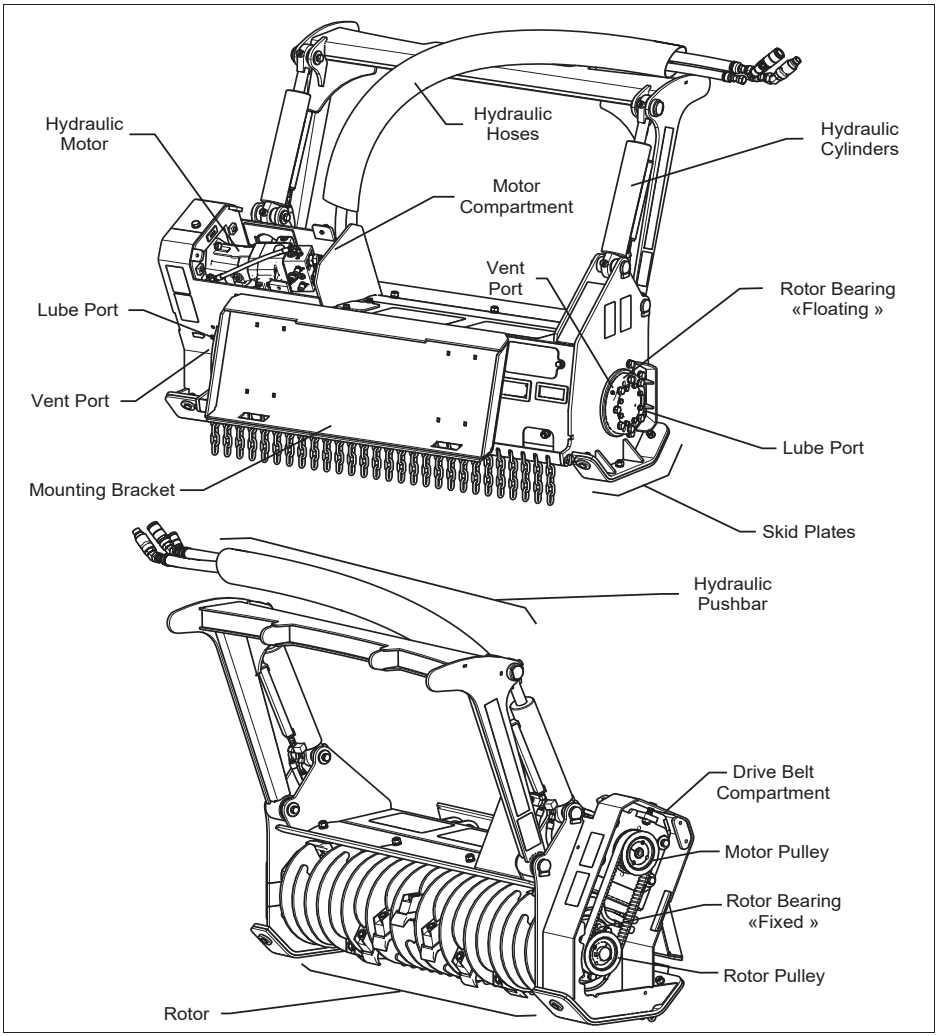


Fig. 2-3 Overview of the DAF-150D Mulcher (with Optional Hydraulic Push Bar)

5.6.2 Drive & Motor Compartments

The transmission of the DAF-150D mulchers is made of many “maintenance free” components to reduce the downtime to its minimum. It is designed with the following elements:

- 1x Drive Belt (PN: *D11183*)
- 1x Motor Pulley (30 teeth) (PN: *763904*)
- 1x Rotor Pulley (38 teeth) (PN: *805753*)
- 1x Taper Lock Bushing for the motor shaft (PN: *D131 107*)
- 1x Taper Lock Bushing for the rotor shaft (PN: *763058*)
- 1x Hydraulic Motor (85cc) (PN: *D13056*)

The motor shaft is coupled to the rotor through the drive belt and the two pulleys. These pulleys are mounted on the shafts with taper lock bushing tightened with two ½”-13 x 1” Set screws.

A lubrication hose is connected to the fixed bearing housing and to an outlet port on the top of the compartment for daily lubrication purposes while a vent hose let the air or overflow grease to exit the bearing.

On the “floating bearing” side, the outlet port and the vent are directly mounted on the housing.

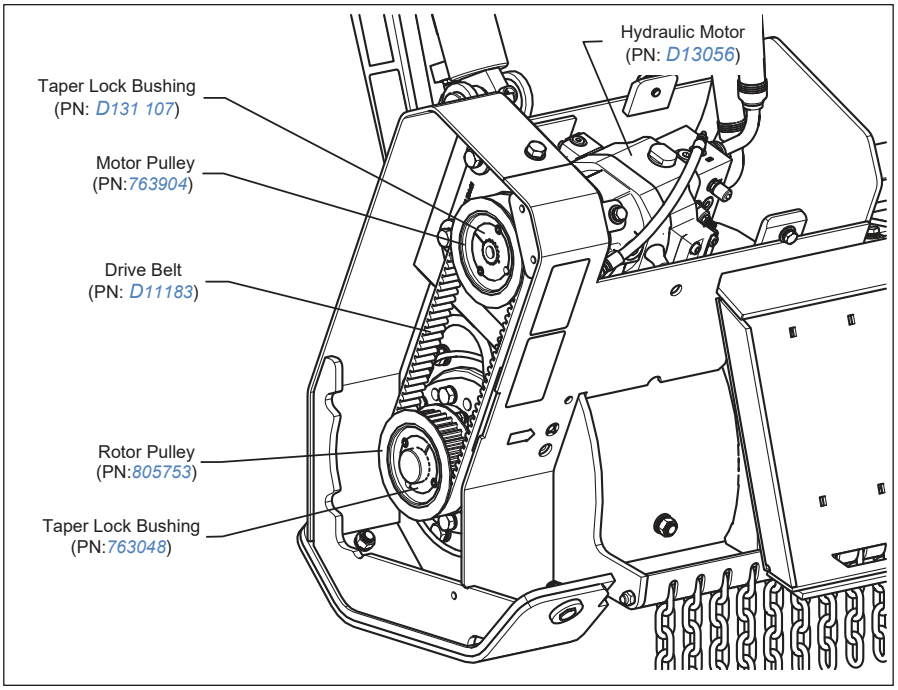


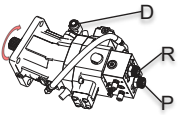
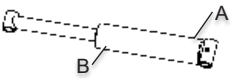
Fig. 2-4 Drive Compartment Description (covers removed for clarity)

5.7 Hydraulic System

5.7.1 Hydraulic Supply

The mulcher is provided with a set of 3 main hoses set which supply the hydraulic motor (through a hyd. block) with the oil flow coming from the carrier.

These hoses set include the necessary adapters, fittings and quick disconnects to be coupled to the carrier bulkhead adapters.

Purpose	Rec'd. Dimension	Fit. Type	Location
Pressure (P) Line/ Fitting	#12 (0.75 in ID)	1 x ORFS12	
Return (R) Line/ Fitting	#12 (0.75 in ID)	1 x ORFS12	
Drain (D) Line/ Fitting	#10 (0.625 in ID)[2]	1 x ORFS10	
Hydraulic Push Bar Cyl.	#6 (0.375 in ID)	2 x ORF M06	

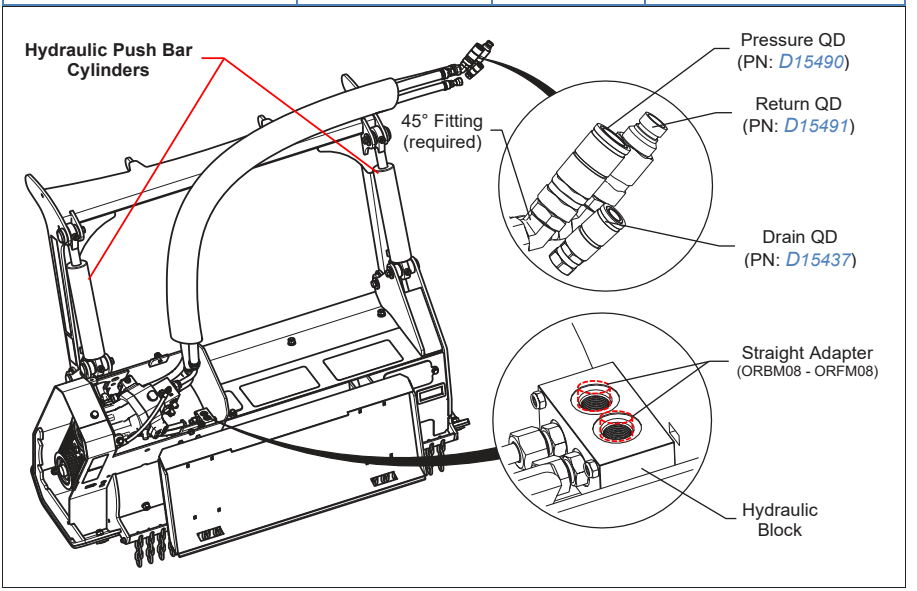
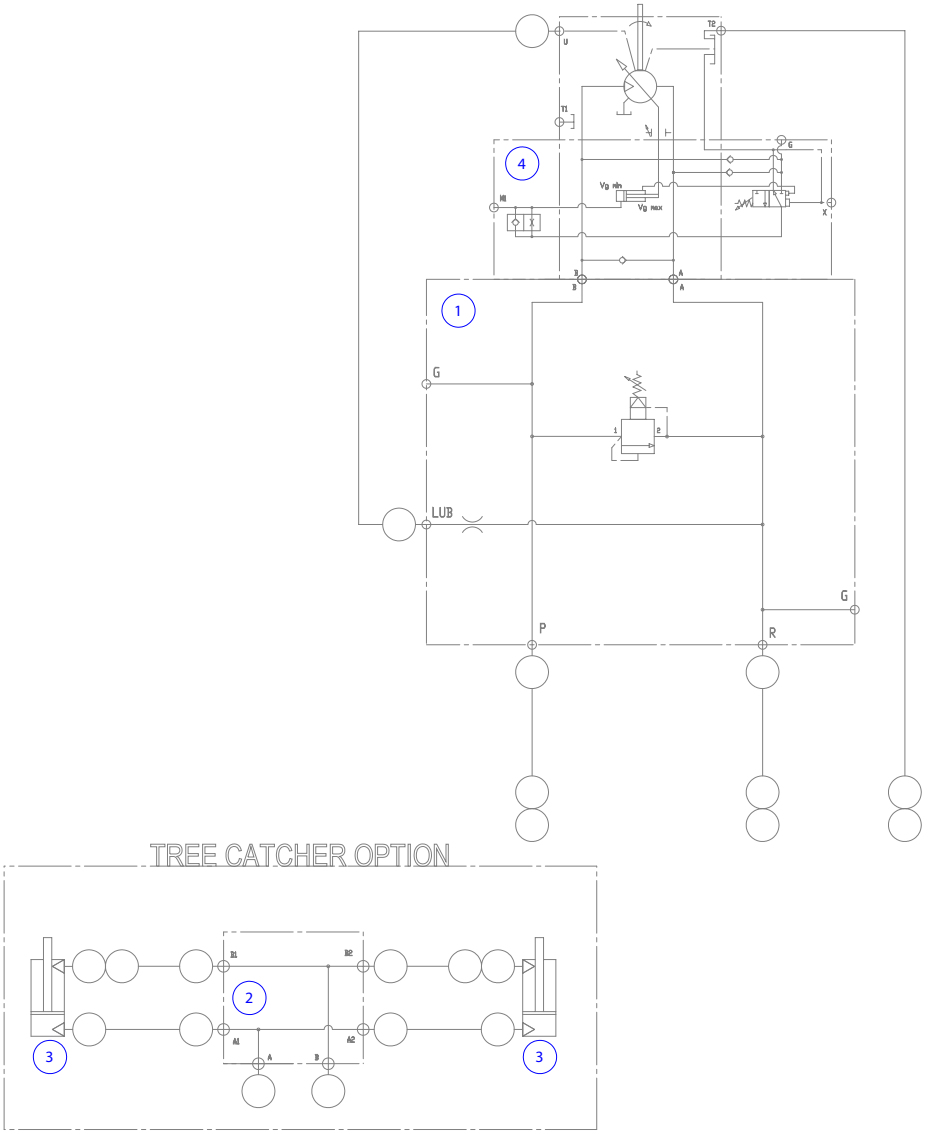


Fig. 2-5 DAF-150D Hydraulic Supply

[2] If the CTL is an ASV, Bobcat, or Kubota, the case drain line MUST be updated to comply with Denis CIMAF mulching head specifications

5.7.2 Hydraulic Schematic



ITEM	QTY.	PART #	DESCRIPTION
1	1	D311 509	HYD BLOCK ASM FOR REXROTH 85CC MOTOR
2	1	D311 116	HYDRAULIC JUNCTION BLOCK
3	2	D14218	CYLINDER-3" X 1.5" X 11" PUSH BAR
4	1	D13056	Rexroth Hydraulic Motor 85cc

5.7.3 Motor Specifications (According to Mulcher Limitations)

Model Type: **A6VM85HA1/71AL (Rexroth)**	
Motor Max. Displacement (Vg Max.) [cc]	85
Motor Max. Torque (V_g Max. & D_p = 450 bars) [N·m (lbf·ft)]	610 (450)
Min. Required Continuous Flow [L/min (gal/min)]	87 (23)*
Max. Operating Pressure [bar (psi)]	240 (3500)*
Rotor Speed [rpm]	2500
Weight [kg (lbs)]	36 (80)

* These specifications are set according to the DAF-150D mulcher limitations only.

5.7.4 Hydraulic Motor Benefits

The hydraulic motor on the DAF-150D is a variable displacement axial piston motor. This type of motor changes its displacement as the hydraulic pressure changes.

The main benefit of this variable displacement system is that it considerably reduces the use of the relief valve. Hence, less heat is produced.

Another advantage is to allow for faster re-acceleration. Since torque rises as a result of a load-related drop in speed, the pre-determined rotation speed resumes more quickly when the load eases off.

An axial-piston, variable speed motor runs at roughly 95% efficiency, compared with a gear motor, which operates at about 80% efficiency.

The motor is initially adjusted for a specified speed in terms of optimal hydraulic flow. Under a heavier workload, the pressure will rise and cause the displacement to increase. This change in displacement slows the rotation, increases the torque and brings down the pressure. When the pressure drops below a certain level, the displacement returns to its original position.

5.7.5 Motor Operation

This motor operates in the following manner:

1. A “lens” plate rests on a min. adj. screw which sets the min. volume (V_g min) of the motor’s pistons so the initial/max speed of the motor.
2. In light work, feeding pressure remains relatively low as flow is going through the motor.
3. When pressure increases, the feeding pressure pushes a control valve that let oil going through passage to a small “piston valve” which actuates the lens plate to give more angle (i.e. volume) to the pistons. This increase of volume will also raise the output torque of the motor.
4. This is what we call a “load sensing” type motor.

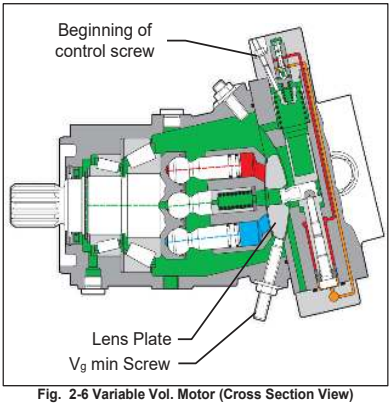


Fig. 2-6 Variable Vol. Motor (Cross Section View)

5.7.6 Motor and Hydraulic Block

The hydraulic motor has been mounted on a hydraulic block for flow control and monitoring purposes.

This block is provided with an adjustable relief valve for pressure control, a lube line to divert some oil from the outgoing flow for bearing lubrication/cooling purposes and test ports for pressure monitoring.

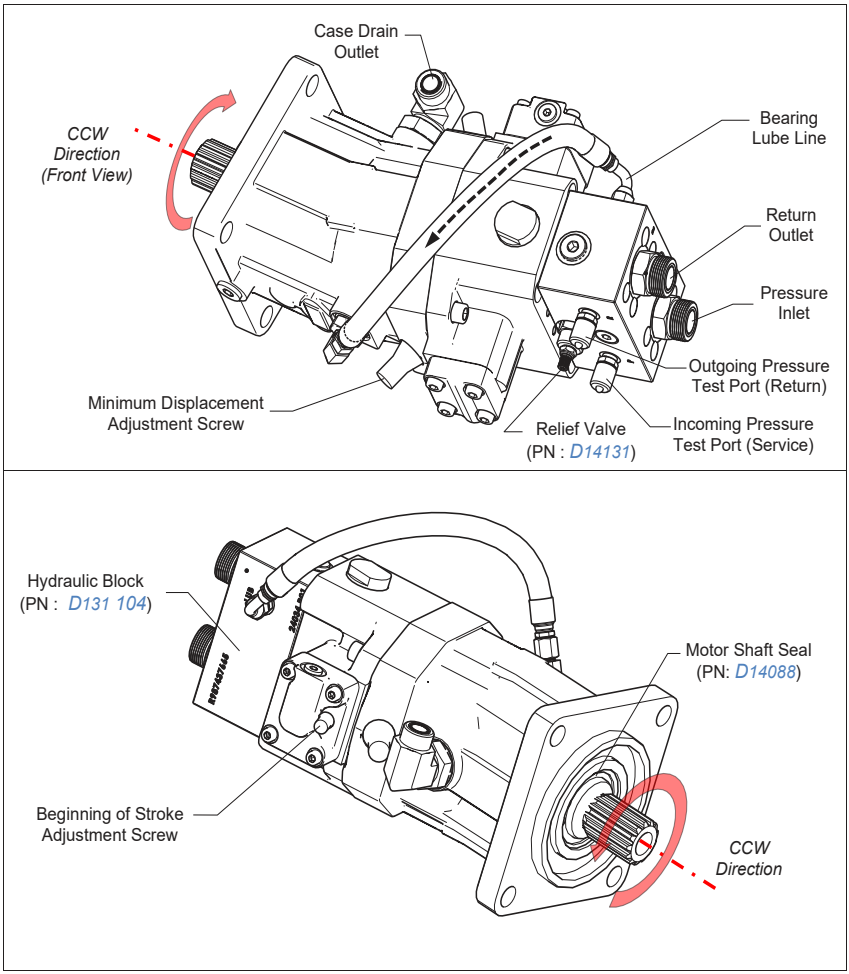


Fig. 2-7 Hydraulic Block Mounted on the Hydraulic Motor

5.7.7 Hydraulic Block Purposes

The hydraulic block includes the following parts:

- 1x Hydraulic Block PN: *D131 104 (PN: D311 512 Hydro Leduc)*
- 1x Relief Valve for motor PN: *D14131*
- 2x Test Pressure Fitting (TCM20-7/16) PN: *D13865*

It has three main purposes:

A. Providing all the hoses adapters for the incoming and outgoing flow to the motor;

B. Providing a lube / line from the outgoing (return) flow to the motor bearing. The oil flow is limited through a small restrictor (i.e. 1/16" I.D. orifice) installed in the lube line adapter.

C. Protecting the motor from high pressure peaks or surge that may come from the carrier by the use of adjustable relief valve.

The carrier service pressure has to be set according to the motor limitations, as recommended (ref.: *5.6.2 Motor Specifications (According to Mulcher Limitations), p.22*).

Once the carrier pressure has been adjusted, the mulcher pressure must be set (150 psi higher) using the relief valve installed on the hydraulic block (ref.: *8.3 Service Pressure Too Low/High, p.60*).

5.7.8 Automatic High-Pressure Control (HA1 Motor)

The automatic high-pressure related control, type HA1, adjusts the displacement automatically depending on the operating pressure.

The displacement of the A6VM motor with HA control is Vg min (maximum speed and minimum torque). The control device measures internally the operating pressure at A or B (no control line required) and upon reaching the set beginning of control, the controller swivels the motor from Vg min to Vg max with increase of operating pressure.

An operating pressure increase of Δp (≤ 10 bars approx.) results in an increase of displacement from V_g min towards V_g max. The "Beginning of control" range is adjustable from 80 to 350 bar.

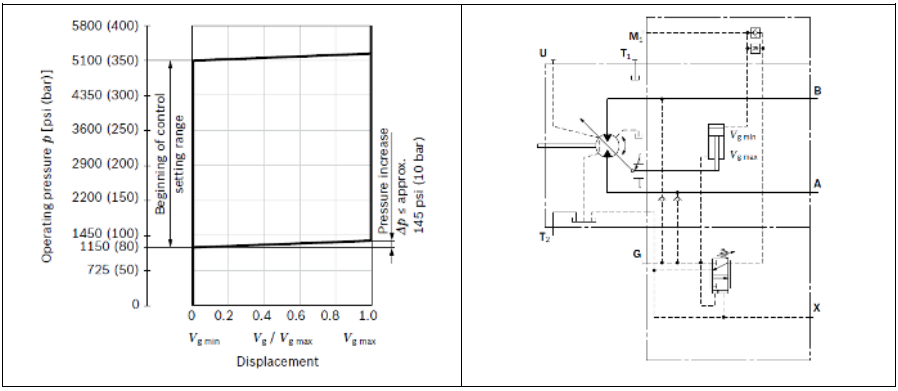


Fig. 2-8 Characteristic Curve and Schematic Diagram for HA1 type Motor (see Rexroth spec. sheet)

5.7.9 Installation Recommendations

A. We always recommend the use of 45° adapters in combination of the 3 hydraulic QD mounted to the skid steer bulkhead to provide a smooth curve to the hydraulic hoses during operation.

B. We also suggest the use of the shortest parts as possible.

C. Since we request the use of specific design adapters, we also recommend that a QD protective guard[3] be mounted on the bulkhead to prevent branches and flying material to hit the QD.

Make sure the Quick Disconnect are well secured to the skid steer bulkhead adapters. Otherwise, a closed return line will make the motor housing crack under the operating pressure.

D. We also highly recommend offering good protection to the hoses set to prevent any pressure surge in hydraulic system, and possible damage to the motor. A kink or collapsed drain line or return line will lead the motor shaft seal to fail and in the worst cases, the motor housing will crack under the pressure (i.e. Motor housing max pressure ≤ 30 psi).

E. After coupling the mulcher to the carrier, we encourage every user/operator to call our head office to appoint a Denis Cimaf technician for a “formal” start up as stated in the documentation provided with the new mulcher.

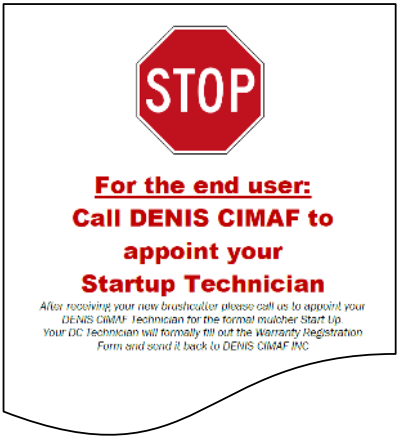


Fig. 2-9 Request for Startup Technician

[3] The protective guard is currently used on CAT299 skid steers to protect the QD against contact with debris, branches and removed material.

6 Preventive Maintenance

6.1 Awareness

Every DAF-150D mulcher has been tested prior to shipment.

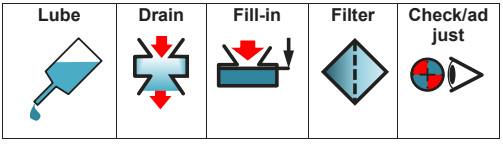
However, we recommend that you include this mulcher in your regular Maintenance Planning before using it for the first time.

Pay attention to the safety notes at the beginning of this manual to make sure all the safety gear and methods will be applied during the maintenance.

The recommended maintenance routine is described further for a **10-hour (daily) /50-hour (weekly)/ 1000-hour (yearly)** working period. Following the routine will help preserve optimal performance of the mulcher throughout the year. It will also help enhance productivity because it will prevent you from having to stop unexpectedly to do maintenance work.

6.2 Inspect Equipment Regularly

Before beginning your work, check all the equipment, components to detect signs of damages or abnormal wear, leaks or defective functioning and make sure the machine is operating correctly (i.e., in good state of order).



- Inspect for any evidence of physical damage such as cracking, bending or deformation of plates or welds. Check various system for leaks. Inspect all plugs, filler caps and fittings for any signs of leaks.
- Lubricate components where needed according to maintenance schedule stated in this section or provided with your carrier.
- Check the level of all fluids in the brake, transmission, power steering, engine coolant, hydraulic system. Fill low reservoirs only to proper level.
- Change filter as recommended

6.3 Maintenance Reminders

	Description	Daily	50	500	1000
1.	✓ Clean dust and debris ✓ Check for leaks, lose or damaged parts, odor of fuel, odor of burned devices ✓ Listen for any unusual system noise(s) that can indicate that service is required ✓ Notice all fire risks and make necessary repairs immediately				
2.	✓ Sharpen the blade using the Gauge provided (ref.: *4.1.2.3 Sharpening Gauge, p.30*) ✓ Check the blade tightness (Torque = 400 lbf·ft) using the socket (PN: *D52001*) provided with your customer kit (PN: *CK-DAF150*)				
3.	✓ Check the state/ tightness of the hydraulic flexibles and fittings				
4.	✓ Grease the RH and LH rotor bearings as required, 2-3 squirts/ day (ref.: *4.5 Rotor Bearing Lubrication, p.40*) ✓ After 1000 service hours, check for wear/play on the rotor bearings (ref.: *4.7.3 Rotor Bearings Inspection/Replacement, p.50*)				
5.	✓ Check for grease leakage ✓ Check for hydraulic oil leakage				
6.	✓ Clean and inspect the drive compartment (ref.:*4.6 Drive Compartment Inspection, p.43*) ✓ Check the drive belt for wear, alignment and tension (ref.: *4.6.3 Belt Inspection/Replacement, p.44*)				
7.	✓ Inspect the push bar pivot/pin location for damages and loose parts ✓ Grease the push bar lubrication points				
8.	✓ ON THE CARRIER: check oil level of the hyd. reservoir				
9.	✓ Inspect the liner for wear and damages (ref.: *4.3.1 Liner Inspection, p.38*)				
10.	✓ Check the pressure setting of the hydraulic motor (ref.: *2.6.5 Motor and Hydraulic Block, p.23*) ✓ Case drain pressure ≤ 30 psi ✓ Return line pressure: 150 psi ≤ Pr ≤ 250 psi			 As needed	

	Description	Daily	50	500	1000
	✓ Service pressure ≤ 4000 psi				
11.	✓ ON THE CARRIER: Check the filter electrical clogging indicator (if installed). The filter should be changed whenever the fluid is changed or whenever the filter indicator shows that it is necessary to change the filter.				
12.	✓ Remove the belt to perform an exhaustive inspection ✓ Replace drive belt as needed (ref.: *4.6.3 Belt Inspection/Replacement,* p.44)				 Remove to inspect
13.	✓ ON THE CARRIER - Change hydraulic oil: It is recommended that the fluid and filter be changed per the vehicle/machine manufacturer's recommendations or at the following intervals: ✓ First change: 500 operating hours after start up ✓ Second and subsequent changes: every 1000 operating hours or once a year.			 1st oil change only	

Legend:

Inspect/ Adjust	Lube	Fill-in	Drain	Filter
				

7 Decommissioning and Disposal

7.1 Decommissioning the mulcher

7.1.1 Cutting the Hydraulic Lines

All hydraulic lines that are attached to the mulcher must be cut in a manner that renders them incapable of use in the future.

7.2 Disposal of Components

Every part of the mulcher must be disposed of in accordance with applicable Local and National regulations, this includes any hydraulic fluid that is still contained within the mulcher.



Disposal is the responsibility of the entity that decommissions the mulcher. All Local and National regulations that are required for disposal are the duty of said entity to abide by.

8 Maintenance Procedures

8.1 Blade Sharpening

8.1.1 Benefits from Blade Sharpening

Mulcher blades need to be sharpened on a regular basis. The frequency of sharpening will vary depending on the job. We recommend sharpening the blades **before you start working**, and then touch up the edge in the middle of the day (**after about 5 hours of operation**). It takes about **1 minute** to sharpen each blade.

Reasons for regular sharpening:

1. It will be **easier** to touch up the edge (i.e., “sharpening refresh”) in the middle of the day instead of waiting until the blades are severely worn.
2. A properly sharpened blade **will not heel** and as a result will wear less rapidly. You will therefore not need to replace blades as frequently.
3. A properly sharpened blade **will increase your productivity by 25% to 40%** and produce less wear and tear on the machinery.
4. The average **service life** of a regularly sharpened blade used under ideal conditions is about **450 hours**.

8.1.2 Tools for Sharpening

8.1.2.1 DENIS CIMAF Gas Powered Sharpening Tool

A gas-powered sharpening tool i.e., sharpener (PN: *D25558*) has been designed specifically for use in cases where no electric power source is available.

The sharpener is designed for use of a **7 in (17.8 cm)** grinding disc or the Cubitron® (carbides) paper as an abrasive.

The gas-powered sharpening tool is supplied with the purchase of the mulcher.

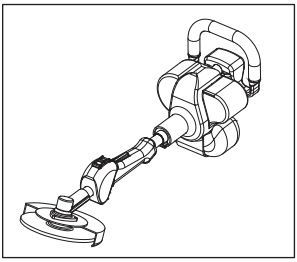


Fig. 4-1 DENIS CIMAF Gaz-Powered Sharpening Tool (PN: *D25558*)

8.1.2.2 Electric Grinder

It is also possible to sharpen blades with an electric grinder equipped with a 6 in (15.2 cm) grinding disc. This tool is not included with the purchase of a mulcher.

8.1.2.3 Sharpening Gauge

A sharpening gage (PN: *D900 124*) was especially designed to facilitate blade measurement after sharpening.

Contact DENIS CIMAF to purchase the new gauge.

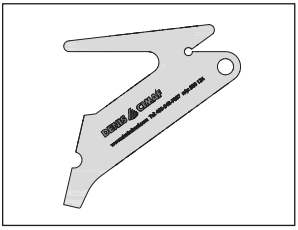


Fig. 4-2 Sharpening Gauge (PN: *D900 124*)

8.1.3 Sharpening Method

The tip of the used blade is normally rounded off from wear.

To sharpen the blade, enough of the tip must be removed while maintaining the original angle of the blade.

1. Sharpen the top of the blade with the gas-powered tool from DENIS CIMAF or an electric grinder using the grinding wheel or the Cubitron® (carbides) paper as an abrasive.
2. Sharpen the blade with the flat of the grinding disc or Cubitron® paper. This will make it far easier to retain the original cutting angle.
3. Use the tip of the disc to sharpen the blade, if needed, but finish off sharpening using the flat side of the disc to ensure the surface is flat.
4. Never sharpen just the tip of the blade. That could lead to the blade heeling during mulching operations (ref.: *5.2.5 Effects of Sharpening on Mulcher Performance, p.32*).

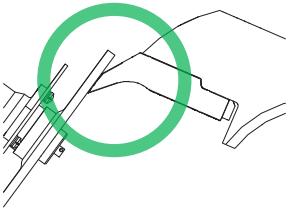


Fig. 4-3 Sharpen with the flat of the disk

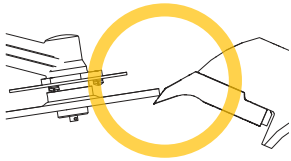


Fig. 4-4 Sharpen with the tip of disk

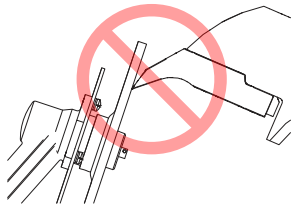


Fig. 4-5 Never sharpen just the tip of the blade

5. Deburr the top of the blade with the grinding wheel (as necessary). You do not need to remove too much material. Deburring the underside of the blade is not recommended.

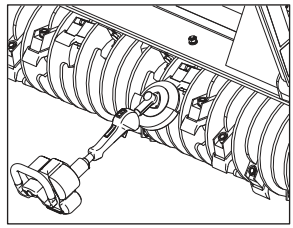


Fig. 4-6 Sharpen the top of the blade

For sharpening, comply with the safety instructions provided with the DENIS CIMAF gas-powered grinding tool or your electric grinder.

Never place any part of your body under the mulcher when sharpening the blades.

8.1.4 Cutting Angle Verification

With the sharpening gauge included in the spare parts kit make sure the blade has the recommended cutting angles.

A. The ideal cutting angle perfectly matches the shape of the gauge.

B. There should be no gap between the tip of the blade and the gauge.

C. Blade is good until the gauge may no longer be employed (i.e. blade is used up)

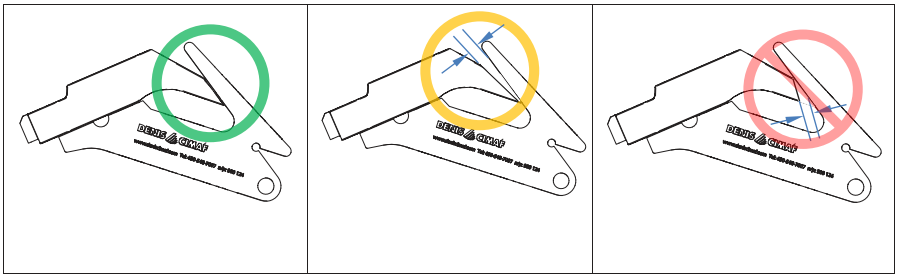


Fig. 4-7 Optimal, Acceptable and Unacceptable Cutting Angle

8.1.5 Effects of Sharpening on Mulcher Performance

Sharpening is critical to mulcher performance. The errors illustrated earlier will have a direct impact on your productivity as well as your maintenance costs.

The effects of each sharpening error are illustrated when the machine is in operation.

8.1.5.1 Properly Sharpened Blade

Achieving the cutting angle as indicated by the gauge will lead to optimal mulcher operations.

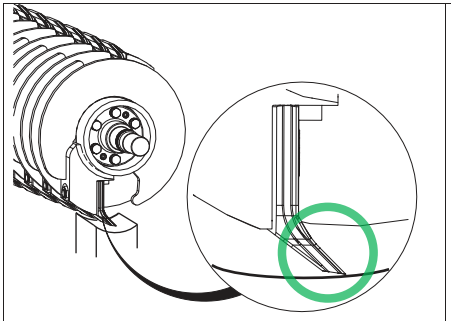


Fig. 4-8 Optimal Cutting Angle during Mulching

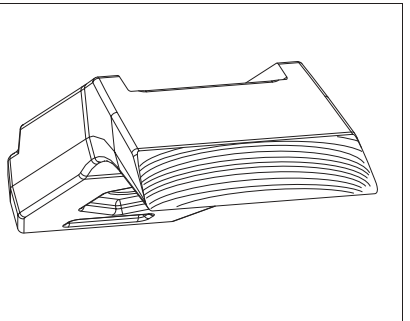


Fig. 4-9 Circular Furrowing Caused by Sharpening Disk

8.1.5.2 Heeling Phenomenon

Heeling occurs when the heel of the blade hits the material to be cut. Mulcher performance will decline considerably, and more power will be consumed.

Heeling is detected by visually checking for furrowing on the flat surface of the blade; straight furrowing from the tip of the blade and a polished-looking surface are the result of heeling.

When blades heel during mulching operations, you'll notice that certain tree species are ejected from the rotor shreds, not chipped.

Heeling can however be more difficult to detect if you're working with small diameter trees.

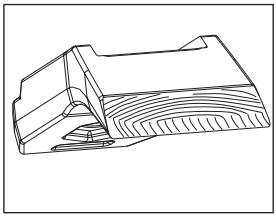


Fig. 4-10 Straight Furrows Form the Tip of the Blade (i.e. Sign of Heeling)

Causes:

A. A poor sharpening angle can cause the complete blade to heel.

B. Sharpening only the tip of the blade can cause the end of the blade to heel.



Fig. 4-11 Heeling of Complete Blade



Fig. 4-12 Heeling of the End of the Blade

8.1.5.3 Risk of Tip Fracture

Blades are fairly costly, so it is worthwhile following the sharpening procedures and keeping the blades in good condition as long as possible.

Causes:

A. Poor sharpening technique can lead to breakage.

B. An overly pointed cutting angle can weaken the tip of the blade and result in frequent breakages.



Fig. 4-13 Overly Pointed Blade Angle

8.2 Blade Replacement

8.2.1 Identification

The blade type identification is embossed in a notch located on the blade itself (see the figure besides).

The DAF-150D mulcher rotor may be assembled with different kind of blades according to the performances required for the working conditions the operator will encounter.

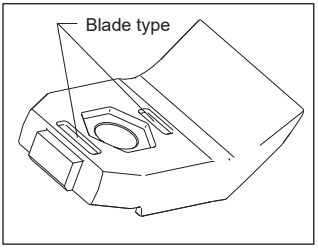


Fig. 4-14 Blade Identification (typical)

8.2.2 Blade Selection

DENIS CIMAF DAF, DAH and DER mulcher technologies were developed using specific type of blades, so they are the natural choice for replacement tools.

Each of these blades has the same shape but is made with a different **type of steel**, forged, hardened steel which is heat treated differently according to the required properties related to the work conditions they will be used.

They each have their own specific operating and maintenance features.

To guide you in the selection of the right blade required, we classified our blades according to their resistance criteria (IMPACT, ABRASION, COLD) and operation characteristics (fibrous material, cold climates, sandy soils, rock/debris soils, cost, balanced prop. and reduced sharpening time)[4].

Resistance Criteria		Operational Properties	
	IMPACT		Recommended for fibrous material like palmettos
	ABRASION		Recommended for cold climates
	COLD		Recommended for sand rich soils
			Recommended for rock/debris rich soils
			Lower cost per blade
			Well balanced blade for general uses
			Maintenance time reduced / More power required

[4]For a complete description of these products, contact your Denis Cimaf's Rep. to get a copy of our Blade Specifications Brochure or just contact our Technical Support for details.

8.2.3 Tools

For installation/removal of a blade, we recommend the use of a 30 mm socket (PN: *D52001*) with a ¾" drive which is included in the Customer Kit provided with the mulcher.

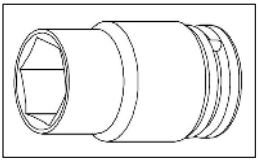


Fig. 4-15 Socket for 30 mm Nut (PN: *D52001*)

8.2.4 Fasteners

8.2.4.1 Screws and Nuts

Screws and nuts are sensitive to wear when blades are operating in difficult conditions. It is therefore recommended you replace them every time you put on new blades.

8.2.4.2 NORD-LOCK™ Lock Washer

NORD-LOCK™ washers help prevent the nuts from loosening from the vibration and impacts on the blades. It is recommended that they be replaced every time you remove a blade, because the vibration of the mulcher causes wear on the cams.

- Always install NORD-LOCK™ washers on the blade nuts.
- Install the lock washer's cam-to-cam between the tightening surface and the nut.

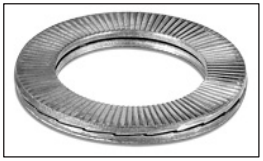


Fig. 4-16 NORD-LOCK™ Lock Washer

If the washers are not properly installed, the blades could loosen and cause serious damage to blade holders.

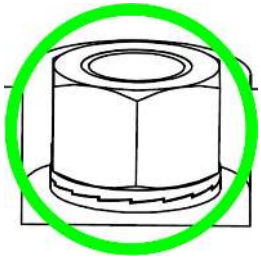


Fig. 4-17 Properly Installed NORD-LOCK™



Fig. 4-18 Improperly Installed NORD-LOCK™

8.2.5 Method

8.2.5.1 Measuring Blade

Blade service life will vary depending on the quality of the maintenance procedures and the working environment.

In the case of new blades, the distance between the tip of the blade and the bottom of the blade holder is about 4 5/8” (118 mm).

It is recommended that you replace the blade when the use of the sharpener gauge becomes impossible.

The nuts, screws and washers are also sensitive to wear. Change them every time you replace worn blades.

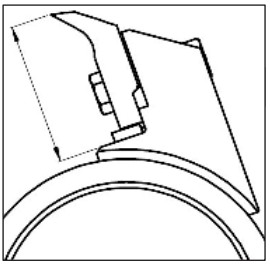


Fig. 4-19 Measuring Wear on Blade

8.2.5.2 Changing Blade

1. Use the special socket provided in the tool kit to remove the nut. It is normal to have to use more torque to unscrew than tighten bolts. You will hear a pop when the lock washers are released.
2. Dispose of old blades properly
3. Inspect and clean the blade holder. The critical points shown in the illustration should be clean and in good condition.
4. Assemble the new blade. The head of the bolt should fit perfectly into the slot on the front of the blade. The nut and the lock washers go into the slot behind the blade holder. Make sure the NORD-LOCK™ washers are properly inserted.

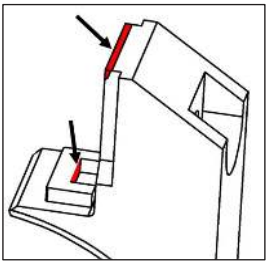


Fig. 4-20 Blade Holder Inspection

Recommendations:

A. Replace the bolts, nuts and washers with new ones every time the blades are changed. However, should you decided to re-use them, check the condition of each component (out of alignment or thread wear).

B. If you re-use screws, make sure you re-install them with the same nut and in the same direction.

C. Replace the blades in pair, 180° apart, to keep the rotor balanced

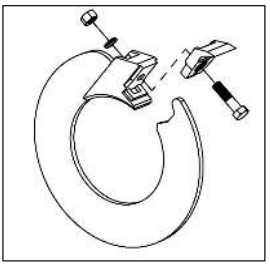


Fig. 4-21 Installing Blade

8.2.5.3 Tightening

It is essential to regularly check that the blades are tightly fastened. Heeling and impacts on the blades can lead to the bolts loosening. A loose blade can bounce around and damage the blade holder.

For productive operations, check to see the blades bolts are well tightened while you sharpen them.

1. Tap the blades with a metal object to check they are properly fastened by how they sound. If a blade sounds different, the bolt may not be tightened enough.
2. Tighten the nuts on all the mulcher blades with a properly adjusted torque wrench.

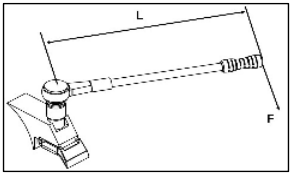


Fig. 4-22 Using Ext. Bar Torque Wrench

"S and C" Rotor Blade Bolt Torque:

Tightening torque (imperial)		400 lb·ft					
L - Length of lever arm	**ft**	1	2	3	4	5	6
F - Force to apply	**lb**	400	200	133	100	80	67

Tightening torque (metric)		540 N·m			
L - Length of lever arm	**m**	.5	1	1.5	2
F - Force to apply	**N**	1080	540	360	270

8.3 Liner Maintenance

8.3.1 Liner Inspection

A liner is installed on the machine frame where the rotor is housed.

This replaceable part is used to protect the bottom of the mulcher from abrasion caused by chips/material ejected from the rotor.

Under high abrasion conditions, the liner should be carefully inspected to ensure the machine frame is not subject to wear.

To do so, proceed as follows:

1. Visually inspect the liner and frame. Pay special attention to the critical wear areas.

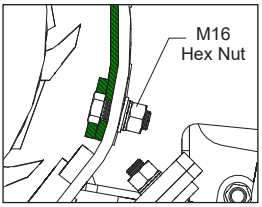


Fig. 4-23 Wear Part (Liner)

2. Replace liner if it has holes or is overly worn.

If there are holes in the liner, projectiles could cause serious damage to the frame.

If ever the liner breaks and a part detaches, it could interfere with the blades and cause serious damage.

8.3.2 Liner Replacement

8.3.2.1 Tools



Fig. 4-24 Wrench for torque (24 mm)

24 mm wrench with Torque Wrench

Before replacing the liner, remove the rotor blades to prevent damaging the blades and injuring yourself.

8.3.2.2 Method

1. Remove rotor blades and the motor compartment panel.
2. Remove the liner bolts.
3. Remove the liner and dispose of it properly.
4. Insert the new liner.

The liner bolt holes are not positioned symmetrically. Before installing the liner on the frame, make sure you have it oriented properly.

5. Install the new nuts, screws and washers supplied with the replacement liner.
6. Tighten the liner nut/bolts to **209 lbf·ft** (**283 N·m**). Space is tight so you may not be able to tighten the bolts inside the motor compartment with a torque wrench. If so, tighten these as much as possible with a combination wrench.
7. Reinstall the blades and motor compartment panel.

8.4 Anvils Maintenance

8.4.1 Anvil Inspection

Serious harm can occur operating a mulcher with an anvil in poor condition.

Spare anvils should always be kept on hand.

How to proceed:

1. Visually inspect the anvils and frame. Pay special attention to critical wear areas.
2. Replace anvils that have holes or are excessively worn.

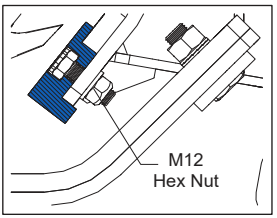


Fig. 4-25 Wear Part (Anvil)

If an anvil has holes in it or broken parts, projectiles can seriously damage the frame or it could come into contact with the blades, causing serious damage and be projected to a considerable distance.

8.4.2 Anvils Replacement

8.4.2.1 Tool

19 mm wrench with *Torque Wrench*



Fig. 4-26 Wrench for torque (19 mm)

8.4.2.2 Method

1. Loosen anvil bolts.
2. Remove the anvils and dispose of them properly.
3. Install new anvils.
4. Tighten anvil nut/bolts to **63 lbf·ft (85 N·m).**

Anvil nut/bolts torque = 63 lbf·ft (85 N·m).

8.5 Rotor Bearing Lubrication

8.5.1 Tools

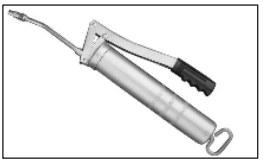


Fig. 4-27 Manual Grease Gun

A manual grease gun rather than an electric grease gun is recommended for lubricating mulcher bearings.

Since the bearings require only small amounts of grease, it will be easier to inject the right quantity with a manual gun.

The gun should be equipped with a **1/8 in** grease adaptor.

8.5.2 Lubrication Method

1. Apply **2-3 shots** from the grease gun into the grease adaptor **once a day**.
2. Turn the rotor manually to ensure the grease fills the bearing evenly.
3. In the first week of operations, it is recommended that you verify the temperature of the bearing housing covers with an infrared thermometer (max 100°C/ 212°F).

The quantity of grease injected may vary by up to twice as much depending on the grease gun you use. You may therefore have to change the number of shots if the bearings seem to be overheating.

8.5.3 Grease Point Locations

1. Small diam. flexible - channels the grease to the bearing. The grease penetrates the bearings from below and partially fills the space between the bearings. If the bearing is entirely full of grease, there's a risk its operating temperature will be higher than normal.
2. Large diam. flexible - is the overflow line when the bearings are greased or during changes in temperature. This helps prevent a surge in pressure that could damage the seals.

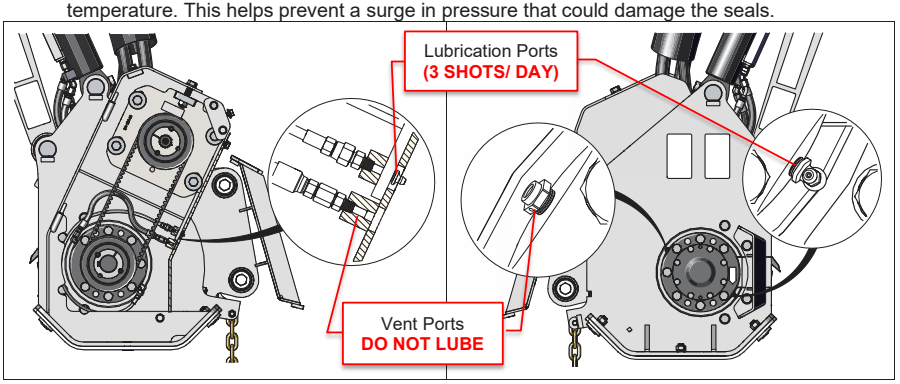


Fig. 4-28 Fixed Bearing Housing and Floating Bearing Housing Lubrication Ports

Insufficient grease will cause the bearings to overheat.

Too much grease will overflow. If ever this should happen, refrain from lubricating that bearing for a day or two.

8.5.4 Grease Properties

Alimex- 1™ made by **Lubri-Lab** is the grease used in the factory and included in the repair kit. This brand of grease may well not be available in your region. The main characteristics of this grease are described below so that you can select an equivalent grease from the supplier of your choice.

Make sure the bearings are properly lubricated. It is important to use the recommended grease. This grease is specially designed to meet extreme temperatures.

8.5.4.1 Bearing Rotation Speed and Temperature

The normal rotation speed for bearings is about **2500 r/min.** The operating temperature of rotor bearings normally ranges from **45°C to 60°C (113°F to 140°F).**

8.5.4.2 EP designation

Only grease with an **EP** (Extreme Pressure) designation should be used to lubricate the bearings on your mulcher. Greases with an EP designation contain additives that ensure high performance in conditions where there is a substantial load on the bearings.

8.5.4.3 NLGI Grade

NLGI grade 2 grease is used in the factory. The grade defines the viscosity of the grease ranging from 000 (semifluid) to 6 (solid). A grade 2 grease is considered normal. You may need to change grades if you're working in an area with extreme ambient temperatures.

8.5.4.4 Dropping Point

The grease dropping point used in the factory is **318°C (605°F)**. This is the temperature at which grease starts to turn into a liquid.

8.5.4.5 Temperature Range

NLGI grade 2 grease performs over a temperature range of between **-40°C and 318°C (-40°F and 605°F).**

8.5.4.6 Grease Compatibility

The soap used for the grease in the factory and provided with the maintenance kit is a **calcium sulfonate complex**. Some types of soap may be incompatible. If you decide to use a different brand of grease, refer to the diagram below to check for compatibility.



Mixing incompatible type of grease could lead to a change in the consistency of the grease and affect lubrication performance.

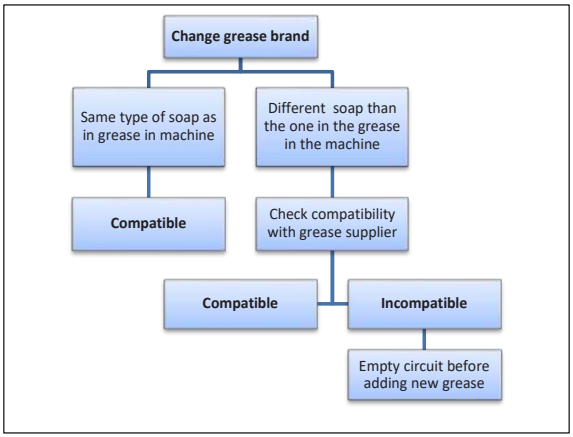


Fig. 4-29 Compatibility Decision Tree

	Aluminum Complex	Calcium Complex	Calcium Sulfonate	Lithium 12-Hydroxy	Lithium Complex	Polyurea	Clay
Aluminum Complex	C	I	M	I	I	M	I
Calcium Complex	I	C	M	I	M	C	I
Calcium Sulfonate	M	M	C	M	C	I	I
Lithium 12-Hydroxy	I	I	M	C	C	M	I
Lithium Complex	I	M	C	C	C	M	I
Polyurea (shear stable)	M	C	I	M	M	C	M
Clay	I	I	I	I	I	M	C

C: Compatible
M: Moderately Compatible
I: Incompatible

Fig. 4-30 Table of Grease Basis “Compatibilities”

8.6 Drive Compartment Inspection

8.6.1 Tools

16mm, 18mm, 19mm, 24mm wrenches
16mm, 18mm, 19mm and 24mm wrenches are required to remove the drive compartment cover and door, and adjust the adjusting screw.



Fig. 4-31 Wrench type for 18 mm, 19 mm, and 24 mm hex. Head screws

Breaker bar, extension, 24 mm socket

A breaker bar and extension are required to reach the 4 screws on the motor support housing.



Fig. 4-32 Breaker bar, extension, 24 mm socket

Set square
Set square is recommended to check for play in the belt.

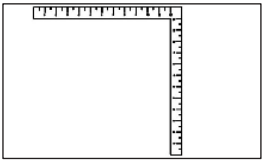


Fig. 4-33 Set Square

8.6.2 General Inspection

Debris can penetrate the drive compartment while the mulcher is in operation. It is recommended to clean the drive compartment **every week**.

At the beginning of each working day make sure there is no debris blocking the pulleys or belt. Also take this opportunity to inspect the condition of the pulleys and belt:

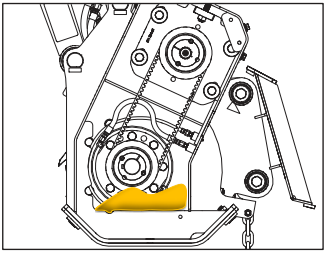


Fig. 4-34 Clean Drive Compartment from Dirt and Debris

1. Open the drive compartment door.
2. Clean the drive compartment of any dirt or debris.
3. Check to ensure the bolts are tight.
4. Manually turn the rotor to ensure the belt is not blocked.
5. Check the drive belt teeth.
6. Measure the play in drive belt (ref.: *4.6.4 Belt Tightening,* p.45).
7. Check for excessive play in the pulleys and try to move them manually (ref.: *4.6.5 Pulleys Inspection,* p.46).

8.6.3 Belt Inspection/Replacement

The mulcher is equipped with a Kevlar-reinforced timing belt. This belt has a long service life and requires little maintenance. However, you should still check it weekly.

Prior to start your mulcher, check **belt tension** after the first two hours of operation is finished. The belt tends to shrink slightly due to heat generation so it is essential to make its inspection when it is cold as well as at operating temperature.

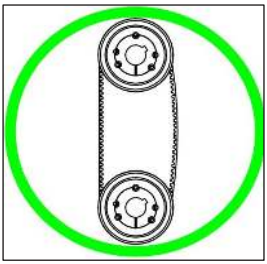


Fig. 4-35 Flexing of rotating belt (exaggerated for illustrative purpose)

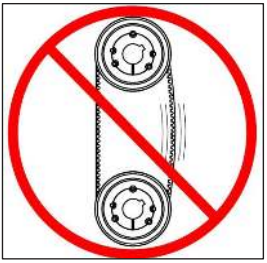


Fig. 4-36 Belt vibration Caused by Overly Loose Belt

When the belt has to be replaced, just loosen the taper lock bushing on the motor shaft (ref. *4.6.6.1 Removing Motor Pulley from Shaft,* p. 47) so it will be quick and easy to remove and replace the belt without changing the belt adjustment.

8.6.4 Belt Tightening

1. Loosen the 4 motor plate screws just enough so that there is still some friction between the bearing housing and the machine housing.
2. Loosen the tension screw and locknut.
3. Adjust belt tension:
   a) To increase tension, turn the tension screw clockwise, this will raise the drive support.
   b) To decrease tension, turn the tension screw counter-clockwise, this will lower the drive support.
4. Check belt tension:
   a) Place set square against inside of frame between the two pulleys. Measure the position of the belt at rest. Push the belt inward and measure it when it is at maximum extension. The difference between these two measurements should be from **5/8″ to 3/4″ (16 mm to 19 mm)** when **cold**.
   b) Check belt tension by trying to move it on the pulleys. You should always be able to move the belt, regardless of temperature.

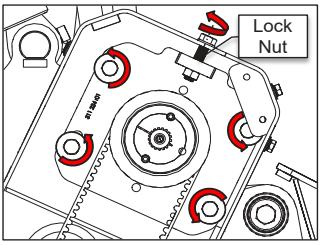


Fig. 4-37 Loosen the motor plate screws and tension screw locknut

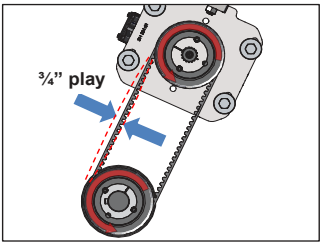


Fig. 4-38 Measuring Belt Play

Over-tightening the drive belt will cause bearings to overheat, premature wear, and reduce belt life.

5. Tighten the locknut.
6. Tighten the 4 drive support screws.
7. Start the machine and observe the rotating belt. At nominal speed, the belt will be straight at one end and curved outward at the other end. The shape of the curve should be stable without excessive vibration.
8. After 2 hours of operation check to see whether it is still possible to move the belt on the pulleys. Given that the belt shortens as it heats, it is essential to confirm belt tension at operating temperature.

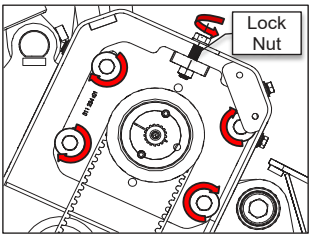
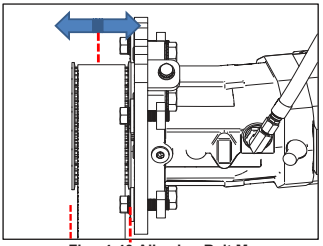


Fig. 4-39 Tighten the motor plate screws and tension screw locknut


Fig. 4-40 Allowing Belt Move

8.6.5 Pulleys Inspection

Excessive play in the pulleys may be caused by loose taper lock bushing or by worn bearings. Drive system pulleys must be inspected and adjusted regularly, as follows:

1. Check pulley side races to make sure they are still firmly assembled to the main part and not been warp or distorted.
2. Check if pulleys must be repaired, aligned or tightened.

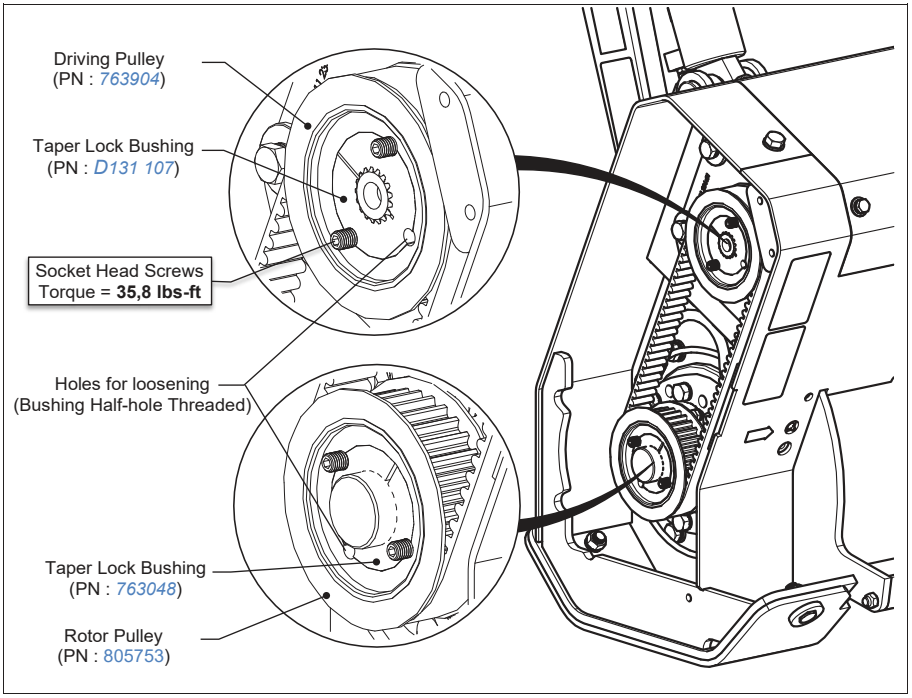


Fig. 4-41 Driving/Driven Pulley Installation & Tightening

8.6.6 Motor Pulley Adjustment

8.6.6.1 Removing Motor Pulley from Shaft

To loosen the taper lock bushing, use one of the 2 socket head screws in the single half-threaded hole as a "puller" – *Bushing half of hole threaded, hub half of hole not threaded.*

To remove motor pulley from drive shaft, proceed as follows:

1. Remove the drive compartment access panel.
2. Take off the 2 x ½" socket head screws holding the taper lock bushing in place.
3. Screw back one of them in the empty hole of the taper lock bushing. This will separate the bushing from the pulley. If necessary, loosen the taper lock bushing by sliding a small wedge in the slot of the taper lock.
4. Slide the taper lock bushing with the pulley gently out of the shaft.

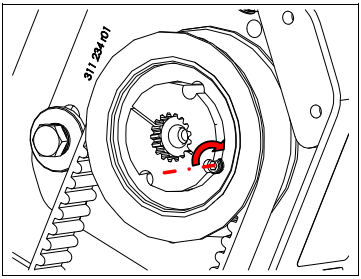


Fig. 4-42 Pulley Removal (Screw Used as a Puller)

DON'T OVERTIGHTEN; don't put too much torque on the set screw. If the pulley and taper bushing don't separate, hit the pulley with a punch and retighten the screw, it should release easily.

8.6.6.2 Installing Motor Pulley on Shaft

To install motor pulley on drive shaft, proceed as follows:

1. Slide the taper lock bushing with pulley on the splined motor shaft.
2. "LIGHTLY" oil the screws and thread them into the half-threaded "installation holes".
3. Start tightening taper lock bushing with the 2 x ½" set screws.
4. Gently hit the bushing with a punch to make sure that the parts are not seized with each other.
5. Verify that the motor pulley and the rotor pulley are aligned. If not, release the taper lock bushing and slide it inwards or outward accordingly.

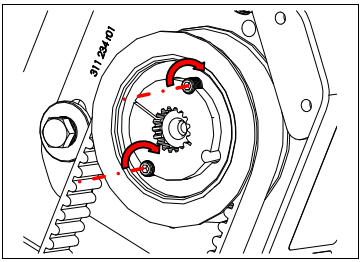


Fig. 4-43 Pulley Installation (Tightening Screws)

6. When pulleys are aligned, complete tightening of the 2 socket head screws.
7. Reinstall the access panel.

Taper Lock Bushing Screw Torque = 36 lbf·ft (49 N·m).

8.6.7 Rotor Pulley Adjustment

8.6.7.1 Removing Pulley from Shaft

To loosen the taper lock bushing, use one of the 2 x 1/2″ socket head screws in the single half-threaded bushing hole as a “puller” – *Bushing half of hole threaded, hub half of hole not threaded*.

To remove rotor pulley from rotor shaft, proceed as follows:

1. Remove the drive compartment access panel.
2. Take off the 2 x 1/2″ screws holding the taper lock bushing in place.
3. Screw back one of them in the empty hole of the taper lock bushing. This will separate the bushing from the pulley. If necessary, loosen the taper lock bushing by sliding a small wedge in the slot of the taper lock.
4. Slide the taper lock bushing with the rotor pulley gently out of the shaft.

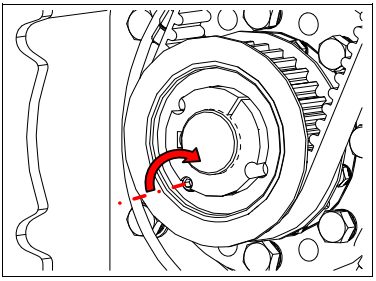


Fig. 4-44 Pulley Removal (Screw Used as a Puller)

DON’T OVERTIGHTEN; don’t put too much torque on the set screw. If the pulley and taper bushing don’t separate, hit the pulley with a punch and retighten the screw, it should release easily.

8.6.7.2 Installing Pulley on Shaft

To install rotor pulley on rotor shaft, proceed as follows:

1. Slide the taper lock bushing with rotor pulley on the keyed shaft.
2. Make sure shaft key is in place.
3. Start tightening taper lock bushing with the 2 set screws in the appropriate holes.
4. Gently hit the bushing with a punch to make sure that the parts are not seized with each other.
5. Verity that the rotor pulley and the drive pulley are aligned. If not, release the taper lock bushing and slide it inwards or outward accordingly.
6. When pulleys are aligned, complete tightening of the 2 set screws.
7. Reinstall the access panel.

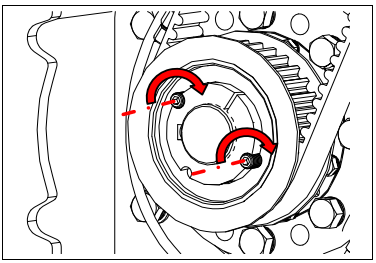


Fig. 4-45 Pulley Installation (Tightening Screws)

Taper Lock Bushing Screw Torque = 36 lbf·ft (49 N·m).

8.7 Rotor Inspection

Excessive play from the rotor may be due to untightened parts in the bearing housing or bearing wear beyond acceptable tolerances.

Bearings have an average service life of about **2,500 hours**. They should be inspected **monthly**.

8.7.1 Tools

Pry Bar

A fairly long pry bar is needed to check the rotor bearings.



Fig. 4-46 Pry Bar

Feeler Gauge

The feeler gauge is used for the housing bearing gap inspection.

Support block

A support block can be used as a balancing point between the pry bar and the rotor. You could for example use a block of wood.

8.7.2 Rotor Bearing Clearance

To quickly evaluate un-tightened parts on the rotor or some wear of rotor bearings, lower the stopped mulcher on the ground and proceed as follows:

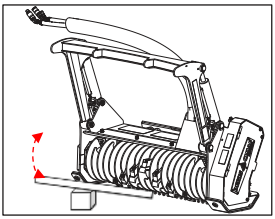


Fig. 4-47 Check for Play in Rotor Bearing

1. Place the pry bar under the end of the rotor.
2. Using the balancing point for support, try to lift the rotor and move it upward and sideways.
    a. If an “out-of-spec” vertical move is measured, the rotor bearing will certainly have to be replaced.
    b. If an “out-of-spec” side move is measured, the rotor bearing may have to be changed but some untightened parts may also be the cause.
3. Repeat the procedure at the other end of the rotor.
4. When you suspect the bearing clearance to be excessive proceed further with the inspection of the rotor bearings (ref.: *4.7.3 Rotor Bearings Inspection/Replacement, p.50*).

If the play is excessive (e.g. over 0.010”), you should check for bearing wear and replace any worn bearings.

8.7.3 Rotor Bearings Inspection/Replacement

8.7.3.1 Fixed Bearing Housing Removal

To access the rotor bearings for inspection/replacement or to remove the rotor from the frame, proceed as follows:

1. Stabilize the mulcher on wooden beams or other supports, to prevent the rotor from falling after the bearing housing is removed.
2. Remove the drive compartment access panels.
3. Remove the pulley, the rotor taper lock bushing (ref.: *4.6.7.1 Removing Pulley from Shaft, p.48*) and the shaft key from the rotor shaft and keep it aside.
4. Remove the greasing and vent hoses from the bearing housing.
5. Remove cover (PN: *D102 057*) from the bearing housing with the sealing gasket (PN: *D11258*).
6. Using a feeler gauge, take some readings of the MAX gap between the bearing outer race and the upper rollers to make sure the bearing is in the specs, otherwise, complete this procedure.
7. Straighten up the locking tab of the lock washer (PN: *D11547*) that is folded in a slot of the lock nut.
8. Remove the lock washer and the lock nut (PN: *D15250*).
9. Remove the bearing housing screws M16 x 60 (PN: *806619*) and the 4 socket head screws M20 x 30 (PN: *806514*).
10. In two opposite mounting screw holes let empty, insert/tighten the 2 socket hd screws (PN: *806546*) provided with the customer kit (PN: *CK-DAF150D2*) until they are slightly tight on the rotor. They will keep the rotor in place while pulling the bearing housing out.
11. Insert the 4 square head screws (PN: *806547*).
12. Tighten the 4 square head screws evenly to smoothly extract the housing (PN: *D102 056*). This will make the bearing housing to come out of its enclosure.

Tighten each square head screw, one after the other, in order to smoothly extract the bearing housing from its frame enclosure, avoiding damages to the rotor.

13. Remove the housing and inspect the bearing assembly.

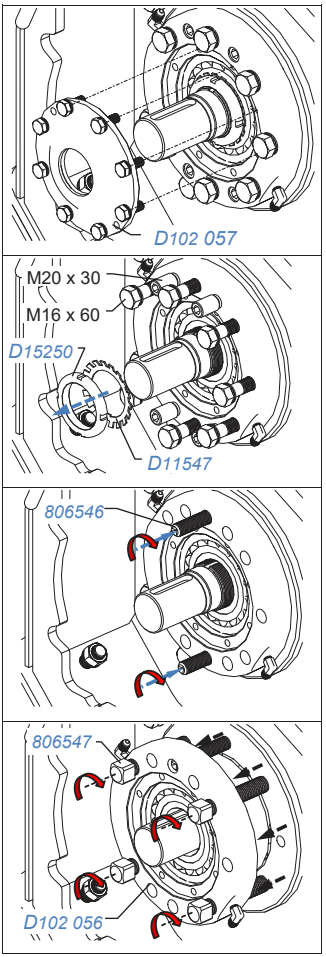


Fig. 4-48 Bearing Housing Removal

8.7.3.2 Fixed Bearing Housing Installation

To replace a rotor bearing housing back in place, proceed as follows:

1. Thoroughly clean the shaft corresponding to the bearing housing to be mounted.
2. Apply grease compound or appropriate grease on the shaft and on the inner surface of the bearing housing enclosure.

Insertion of the bearing in the housing may be made by the use of a manual press (ref.: *4.7.3.6 Assembling Bearing Housing, p.55*).

3. Temporarily install the mounting cover (PN: *D900 084*) on the bearing housing in order to protect the bearings and keep them in place during housing installation.
4. Slide the bearing housing (PN: *D102 056*) along the 2 head socket screws that hold the rotor in position on the frame.
5. Install temporarily the 4 longest mounting screws (PN: *806553*) provided with the customer kit (PN: *CK-DAF150D*) and tighten them to the bottom of the threads.
6. Remove the longest screws and install temporarily the 4 medium mounting screws (PN: *806512*).
7. Tighten medium screws to the bottom of the threads.
8. Remove medium screws and the 2 socket screws (PN: *806546*) previously used for aligning.
9. Install the housing screws (PN: *806619*) with the lock washers and tighten until a 1/8” gap remains between the housing and the frame.
10. Remove the mounting cover (PN: *D900 084*) from the bearing housing.
11. Tighten the housing screws (**T= 210 lbf·ft/ *285 N·m***).
12. Check that the bearing is well in place. To do so, gently knock with a properly-sized tube against the bearing until you hear a firm sound or use mounting socket (PN: *D900 083*). This will indicate the bearing is well seated.

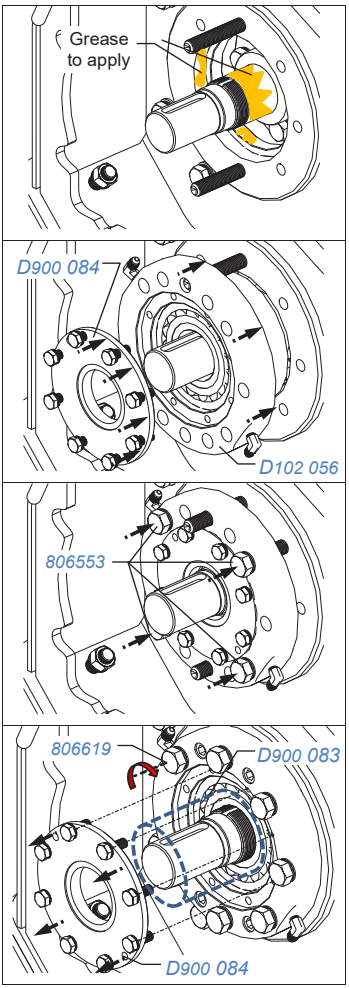


Fig. 4-49 Bearing Housing installation (1/2)

13. Install the lock washer (PN: *D11547*) and the lock nut (PN: *D15250*) in place until it seats firmly against the bearing.
14. Turn the lock nut once more to align the next lock washer tab with the nut notch.
15. Fold down the lock washer tab into one notch of the lock nut.
16. Connect the lubrication hose to the housing inlet fitting.
17. Start greasing the bearing housing using the appropriate greasing point until you see grease coming between the bearing rollers and the bearing race.

When greasing a bearing, manually turn the rotor to allow the grease to fill in the bearing properly.

18. Thoroughly clean the bearing housing cover from grease and potential impurities.
19. Install the housing cover (PN: *D102 057*) with the sealing gasket (PN: *D11258*).
20. Torque housing cover screws firmly (**T= 48 lbf·ft/ *65 N·m***).

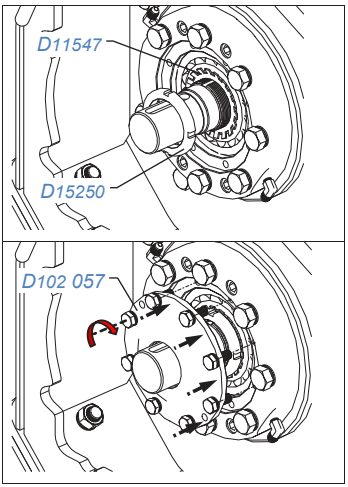


Fig. 4-50 Bearing Housing installation (2/2)

21. Complete greasing of the bearing housing with 1/3 of a grease tube.
22. Manually rotate the rotor to make sure it rolls easily.
23. At this stage, if the mulcher is upside down after a rotor change, you can position it back up using appropriate lifting equipment.
24. Install the shaft key on the rotor end.
25. Install the rotor pulley back in place with taper bushing (ref.: *4.6.7.2 Installing Pulley on Shaft, p.48*).
26. Install the belt around the pulleys, making sure the cogs of the belt are placed to interlace with the cogs of the pulleys.
27. Adjust tension of the belt (ref. *4.6.4 Belt Tightening, p.45*).

If you just loosen/remove the taper rotor taper bushing from the pulley, the belt does not have to be readjusted. Just torque the taper bushing screws as recommended.

8.7.3.3 Floating Bearing Housing Removal

In order to access the rotor bearings for inspection/replacement or to remove the rotor from the frame, proceed as follows:

1. Stabilize the mulcher on wooden beams or other supports, to prevent the rotor from falling after the bearing housing is removed.
2. Remove the cover (PN: *D102 055*) from the bearing housing.
3. Using a feeler gauge, take some readings of the MAX gap between the bearing outer race and the rollers to make sure the bearing is in the specs, otherwise, complete this procedure.
4. Remove the lube hose/fittings and vent hose/fittings.
5. Remove the bearing housing screws M16 x 60 (PN: *806619*).
6. Remove the 4 socket head screws M20 x 30 (PN: *806514*).
7. In two opposite mounting screw holes let empty, insert/tighten the 2 socket head screws (PN: *806546*) provided with the customer kit (PN: *CK-DAF150*) until they are slightly tight on the rotor. They will keep the rotor in place while pulling the bearing housing out.
8. Insert the 4 square head screws (PN: *806547*).
9. Tighten the 4 square head screws evenly to smoothly extract the housing (PN: *D102 056*). This will make the bearing housing come out of its enclosure.
10. Remove the housing and inspect the bearing ass'y (ref.: *4.7.3.5 Disassembling Bearing Housing, p.55*).

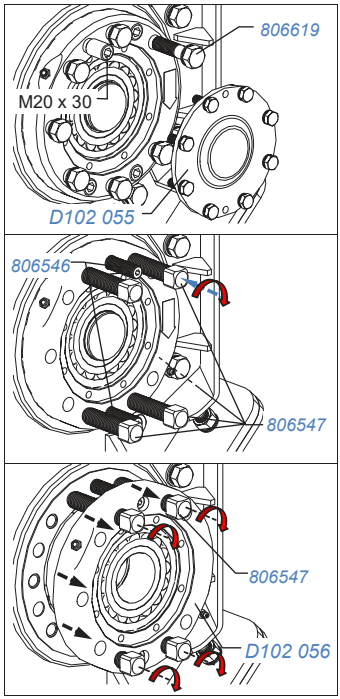


Fig. 4-51 Bearing Housing Removal

Tighten each square head screw evenly in order to smoothly extract the bearing housing from its frame enclosure, avoiding seizing.

8.7.3.4 Floating Bearing Housing Installation

To replace a rotor bearing housing back in place, proceed as follows:

1. Thoroughly clean the shaft corresponding to the bearing housing to be mounted.
2. Apply grease compound or appropriate grease on the shaft and on the inner surface of the bearing housing enclosure.

> **Insertion of the bearing in the housing may be made by the use of a manual press (ref.: 4.7.3.6 Assembling Bearing Housing, p.55).**

3. Temporarily install the mounting cover (PN: *D900 084*) on the bearing housing in order to protect the bearings and keep them in place during housing installation.
4. Make sure that the housing spacer (PN: *D106 247*) is well in place.
5. Slide the bearing housing (PN: *D102 056*) in its location along the 2 head socket screws that hold the rotor in position on the frame.
6. Install temporarily the 4 longest mounting screws (PN: *806553*) provided with the customer kit (PN: *CK-DAF150*) and tighten them to the bottom of the threads.
7. Remove the longest screws and install temporarily the 4 medium mounting screws (PN: *806512*).
8. Tighten medium screws to the bottom of the threads.
9. Remove medium screws and the 2 socket screws (PN: *806546*) previously used for aligning.
10. Install the housing screws (PN: *806619*) and tighten until a 1/8” gap remains between the housing and the frame.
11. Remove the mounting cover (PN: *D900 084*) from the bearing housing.
12. Tighten the housing screws (**T= 210 lbf·ft/ *285 N·m***).
13. Check that the bearing is well in place. To do so, gently knock with a properly sized tube against the bearing until you hear a firm sound or use mounting socket (PN: *D900 083*). This will indicate the bearing is well seated.

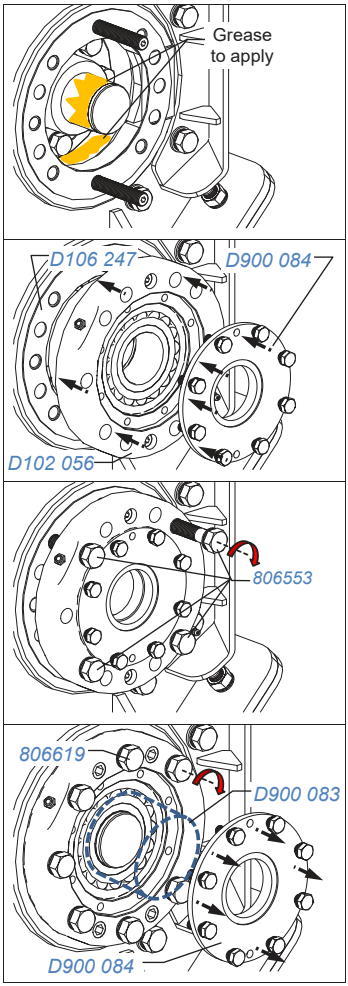


Fig. 4-52 Bearing Housing installation (1/2)

14. Reinstall the lube hose/fittings and vent hose/fittings.
15. Start greasing the bearing housing using the appropriate grease fitting until you see grease coming between the bearing rollers and the bearing race.

When greasing a bearing, manually turn the rotor to allow the grease to fill in the bearing properly.

16. Thoroughly clean the bearing housing cover from grease and potential impurities.
17. Install the housing cover (PN: *D102 055*).
18. Torque housing cover screws firmly (**T= 48 lbf·ft/ *65 N·m***).
19. Manually rotate the rotor to make sure it rolls easily.
20. At this stage, if the mulcher is upside down after a rotor change, you can position it back up using appropriate lifting equipment.

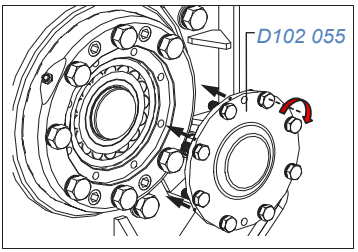


Fig. 4-53 Bearing Housing installation (2/2)

8.7.3.5 Disassembling Bearing Housing

To remove the bearing and shaft seal from a rotor bearing housing proceed as follows:

1. Put rotor bearing housing face down on a work table or other clean and flat surface.
2. Push the bearing downwards.
3. To take off the rotor shaft seal (PN: *D11265*) from inside the bearing housing, use a flat screwdriver, taking care not to damage the seal enclosure in the bearing housing.

8.7.3.6 Assembling Bearing Housing

To assemble the bearing housing with shaft seal, bearing and related components proceed as follows:

1. Thoroughly clean the bearing housing from grease and potential impurities.
2. Check that there is no sign of wear inside the bearing housing at the bearing level and replace the shaft seal if needed (PN: *D11265*) with new one.
3. Using a manual press and the appropriate jig, insert the shaft seal (PN: *D11265*) inside the bearing housing (PN: *D102 056*).
4. Still using the manual press and an appropriate jig or the mounting cover provided with the customer kit, insert the bearing (PN: *D11152 N*) inside the bearing housing.
5. Make sure that both the seal (PN: *D11265*) and the bearing are well inserted in the bottom of the housing.

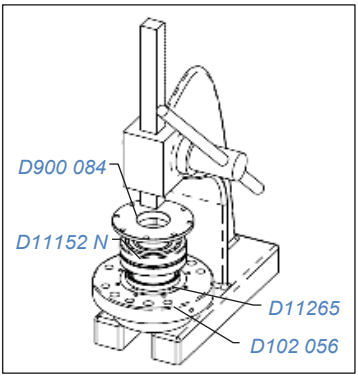


Fig. 4-54 Assembling Bearing in the Housing using Manual Press

8.8 Hydraulic Oil

8.8.1 Hydraulic Oil Check (Daily)

FIRST OF ALL, CHECK THE OIL LEVEL OF THE HYDRAULIC MOTOR. If the oil level is not at its maximum level when starting the motor can suffer permanent damage.

The motor was tested at the factory, in our workshop, the motor oil level should already be optimal. However, the first startup or startup after storage, we recommend leaving the mulcher turning at low speed for **five** minutes allowing the oil to reach the motor and fill all the hoses and piping.

8.8.2 Oil Properties

8.8.2.1 Operating viscosity range

The motor manufacturer recommends an oil viscosity range between **80 SUS and 170 SUS** (**16 cSt and 36 cSt**). Viscosity is measured at tank temperature for an open circuit, and in the loop for a closed circuit. With the oil viscosity range and temperature, you can determine the grade of hydraulic oil to use in the mulcher. If you have the option of two grades of oil, select the one with the highest viscosity.

8.8.2.2 Maximum temperature

The motor manufacturer recommends that the oil temperature never exceed **115°C (240°F)** at any point in the circuit. It is normal for the drain line temperature to be higher than in the rest of the circuit.

8.8.2.3 Purity grade

The purity grade is obtained by determining the number of contaminants in an oil sample. The recommended purity grade is **ISO 18/15 /DIS 4406**. If the temperature of your circuit is between **90°C and 115°C (195°F and 240°F)**, the minimum recommended grade is **ISO 17/14 /DIS 4406.**

9 Troubleshooting

9.1 Hydraulic Oil Leakage

Never check for oil leakage with your bare hands. Oil leakage under pressure can penetrate skin and cause serious injury.

Always check for oil leakage using a piece of cardboard or a thick rag.

In case of injury caused by oil leakage under pressure, go immediately to the nearest emergency department.

9.1.1 Checking for Hydraulic Oil Leaks

The mulcher is provided with water drainage holes to drain the moisture or water from the frame.

Also, the motor compartment and belt compartment are provided with access panel to allow inspection and detection of hydraulic oil leaks occurring from the motor or the hoses.

Should a hydraulic oil leak occur, the oil will remain in these compartments and the leak will be detected.

Cleaning the area around these holes on a regular basis is in essential so that leaks can be detected.

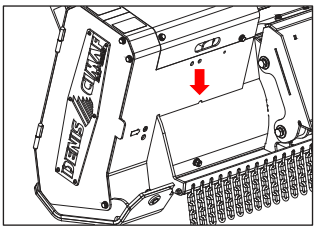


Fig. 5-1 Water Drainage Hole

9.1.2 Causes

A. Defective motor shaft seal.

B. Defective seal along the service pressure line, return line, drain line or push-bar cylinder's lines (if applicable).

C. Excessive pressure in drain line.

D. Loose or defective hydraulic adaptor.

9.1.3 Corrective Actions

1. Inspect frame of the mulcher for clues as to the source of the leak (damaged seal, untightened fitting or adapter).
2. If the inspection shows a defective shaft seal, replace the motor shaft seal (ref.: *5.1.4 Shaft Seal Replacement, p.58*).
3. Turn the mulcher on and measure the pressure in the drain line.
4. Determine whether the seal failure was caused by a steady high pressure or a sudden cause that produced a pressure surge in the drain line as too small hoses or defective quick disconnect (ref.: *5.2 Excessive Drain Line Pressure, p.59*).

9.2 Defective Motor Shaft Seal

9.2.1 Causes

A. Momentary pressure surge produced by a crushed/squeezed drain line, return line or use of quick fitting couplers that fail to let the oil flowing through the return/drain line.

B. General overpressure due to a drain line smaller than recommended.

9.2.2 Shaft Seal Replacement

1. Remove the motor pulley ass'y (ref.: *4.6.6.1 Removing Motor Pulley from Shaft, p.47*).
2. Locate the snap ring, flat washer, and shaft seal (PN: *D14088*) on the motor shaft.

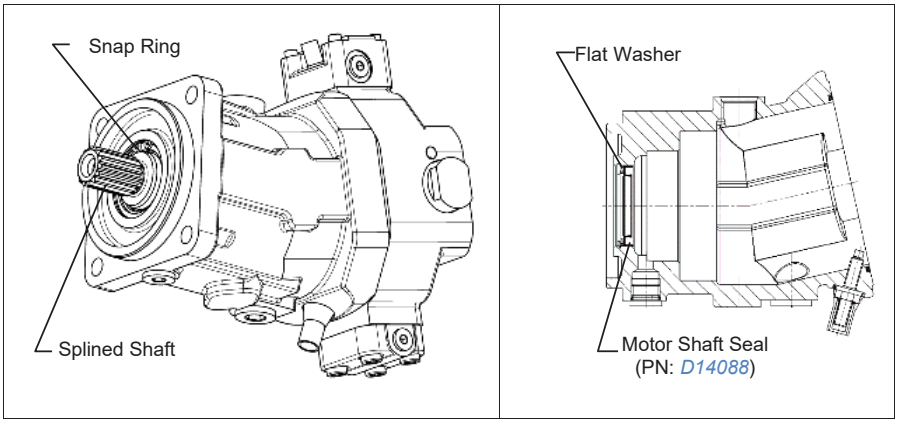


Fig. 5-2 Motor Flange View (Pulley & Bushing removed – Typical)

3. Remove the snap ring that secure the washer and seal in the its housing.
4. Remove the seal: when it is a genuine Rexroth parts, you will see 2 small dots on the seal. You may drill a small hole in the face of the used seal and take hook or small screw to pull the seal out of its location or use a self tapping screw.
5. Replace the damaged seal by a new one: insert the new seal (don't push too far), the flat washer and the snap ring.

Since there is no shoulder behind the seal, DO NOT PUSH THE SNAP RING TOO FAR.

6. Reinstall the motor pulley assembly (ref.: *4.6.6.2 Installing Motor Pulley on Shaft, p.47)*.

9.3 Excessive Drain Line Pressure

9.3.1 Causes of excessive pressure ($P°_{Drain} \leq 30$ psi / 2.7 bar)

A. Clogged drain line filter.

B. Diameter of drain line hose too small[5]

C. Drain line hose stuck or bunched up

D. Excessive wear on internal motor components increasing the oil flow through the drain line.

9.3.2 Pressure Reading

This test should be done when the oil is cold, that is, when the drain line pressure will be highest.

1. Place a protective device in front of the rotor to ensure you keep a safe distance.
2. Remove the motor compartment cover.
3. Install the T connector on the drain line adaptor (identified by letter D).
4. Start the mulcher. The drain line pressure should not exceed 45 psi (2.7 bar) at start when oil is cold. Once the machine has reached operating temperature, the pressure should not exceed 30 psi (2 bar). Higher pressure could cause the motor shaft seal to fail.
5. Stop the mulcher and the carrier engine.
6. Remove the T connector.
7. Reconnect the lubricating or drain line hose.
8. Replace the motor compartment cover.
9. Once the rotor has stopped turning, remove the protective devices from in front of the rotor.

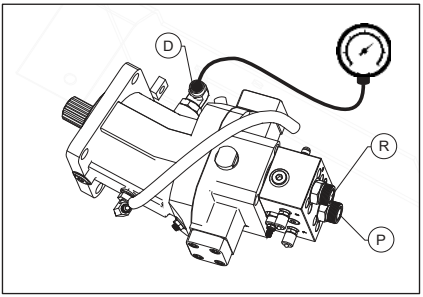


Fig. 5-3 Drain Line Pressure Reading

9.3.3 Corrective Actions

1. Replace the drain line filter.
2. Install drain line hose with larger diameter (contact DENIS CIMAF After-sales/ Technical Service department for detailed information).
3. Replace the drain line hose if damaged.

[5] If the CTL is an ASV, Bobcat, or Kubota, the case drain line MUST be updated to comply with Denis CIMAF mulching head specifications

9.4 Service Pressure Too Low/High

When the service pressure remains too low, the performance of the mulcher will decrease accordingly, mulcher rotor will be easily slowing down in Vg min or Vg max operation.

When the pressure is too high, risks of mulcher damages may occur so, the incoming pressure must be set according to the carrier and mulcher capabilities as follows:

1. Secure the rotor to avoid any rotation keeping it in stall position (use piece of wood, chain, …).
2. Install a 0-6000 psi gauge on test port (ref. : *2.6.5 Motor and Hydraulic Block, p.23*).
3. Use a 9/16 wrench and release the lock nut.

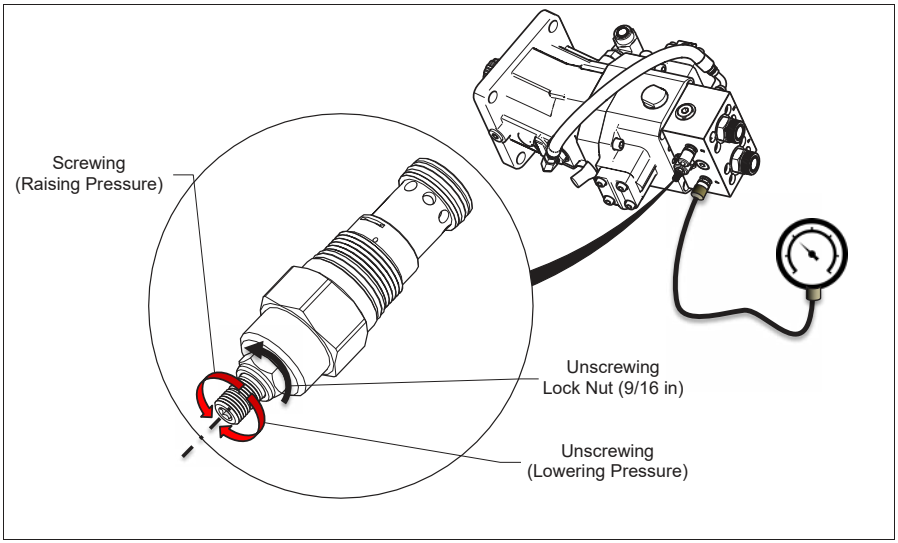


Fig. 5-4 Adjusting Mulcher (Main) Relief Valve (Typical)

4. Put a 5/32 Allen key in the set screw, lower the pressure by turning counter clockwise for few turns.
5. Activate the hydraulic system with engine at ¾ throttle and make sure the pressure is set as recommended.
6. You should hear a whistle coming from the relief valve. If not, unscrew the relief valve set screw until you hear the flow bypassing and screw clockwise to increase the main relief pressure until you stop hearing the whistle (i.e. you reach the system pressure).
7. Rotate the set screw ¼-turn more to set the pressure 300 psi higher than the carrier's main relief.
8. Lock the jam nut with 9/16 wrench. This relief cuts pressure spikes.
9. Stop the hydraulic system.
10. Remove the piece of wood.

9.5 Grease Leakage

9.5.1 Leakage from Rotor Ends

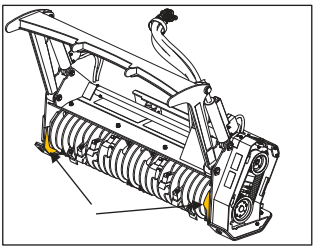


Fig. 5-5 Leaks from Ends of Rotor

9.5.1.1 Cause

A. Defective bearing housing seal from the RH or LH housing.

9.5.1.2 Corrective Action

1. Remove the bearing housing where the grease seems to be leaking and replace the seal.

9.5.2 Leakage from Drive Compartment

9.5.2.1 Causes

A. Defective bearing housing seal.

B. Improperly connected or damaged grease hose.

C. Motor shaft seal that failed. Overpressure in the case drain line due to bad quick coupler, bad hose condition or set-up.

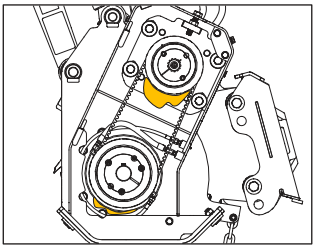


Fig. 5-6 Leaks from Drive Compartment

It is advisable to check for the presence of leaks in the drive compartment **once a week**. We recommend you check the sides of the rotor when you **sharpen the blades**.

9.5.2.2 Corrective Action

1. First, ensure that the lubricating hoses are properly connected. Reconnect if necessary.
2. Check for breaks or crack vs in the lubricating hoses.
3. Remove cover where the grease is leaking and replace seal.

9.5.3 Grease Leakage from Overflow (i.e. Vent)

9.5.3.1 Cause

A. Excess of grease in bearing.

9.5.3.2 Corrective Actions

1. If there is excess grease in a bearing, the internal bearing pressure will cause the excess grease to be discharged through the overflow.
2. Excess or grease can cause the temperature of a bearing to rise to an above-normal level. If you have exceeded the recommended number of grease shots, hold off on lubricating the bearing for about 2 days.
3. Check also to ensure the overflow line is not clogged up.
4. If there is smoke along with grease emerging from the overflow, the grease may be incompatible not mixing with the recommended one or the bearing may be just burn out!

9.6 Bearing Overheating

9.6.1 Checking Overheating

With regular maintenance, bearings have a normal service life of between 2,000 and 2,500 hours.

Normal bearing temperature when the mulcher is in operation should not exceed 100°C (212°F).

We strongly recommend that the operator frequently but carefully touch the side door, the rotor RH/LH bearing housing, the hydraulic motor and check the temperature on a regular basis (i.e. after each day of work. He will be able to detect whether the machine temperature is higher than normal that would signal a potentially serious problem.

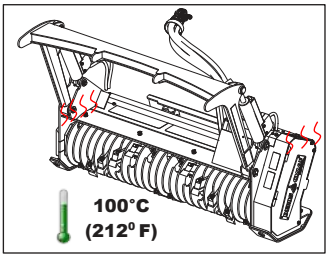


Fig. 5-7 Checking Temperature (typical)

However, an infrared thermometer is still the best way of verifying machine temperature.

If the bearing continues to overheat, it may be a sign of the end of its service life (ref.: *4.7.3 Rotor Bearings Inspection/Replacement, p.50*).

9.6.2 Sources of Overheating

The 4 main sources of bearing overheating is the following:

- Lack of grease on the bearing which will make the rotor bearing or the side door/panel to be hotter than usual;
- Too much grease overfilling the bearing;
- Wrong type of grease is used so, instead of high-speed grease properly made for bearing, general purpose grease has been used;
- Drive belt that have been overtightened.

9.6.3 Lack of Grease on the Rotor Bearing

Very high temperatures on the rotor LH/RH bearing housing is most likely a sign that the bearing is lacking grease:

1. First, make sure that the grease hoses are well connected. Reconnect if necessary
2. Grease the bearing immediately with 5 to 10 grease shots and continue greasing on a daily basis at 3-4 shots a day. When greasing a bearing, manually turn the rotor to allow the grease to fill in the bearing properly
3. Check if there is sign of grease leakage on the frame near the rotor's end, inside the rotor's room. If so, disassemble the right rotor bearing housing and replace its shaft seal.
4. If problem persists, the bearing might have reached the end of its service life. Check bearing condition and replace if necessary.

9.6.4 Too Much Grease on the Rotor Bearings

Higher-than-usual temperature but not excessively hot is most likely a sign that the bearing has been overfilled:

1. The bearing might have too much grease in it. Stop greasing for a couple of days.
2. Check also that the overflow is not clogged up or the outlet “vent” has been replaced by a plug.
3. If none of the above resolves the problem, the bearing might be near the end of its service life. Check bearing condition and replace if necessary.

DON’T GREASE UNTIL LUBRICANT GETS OUT OF THE VENT

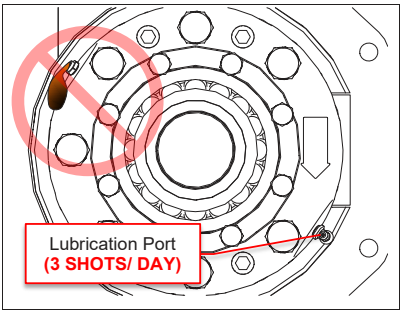


Fig. 5-8 Rotor Bearing Overfilled

9.6.5 Improperly Adjusted Belt

Most of the overheating problem occurrence comes from wrong tightening procedure that lead the operator to overtighten the belt which will apply an excessive force on the bearings.

Unlike regular cogged belt, the mulcher belt must be let relatively loose because it will shrink a little after warming up during normal operation:

1. Check the belt tension and loosen as necessary (ref.: *4.6.4 Belt Tightening,* p.45).

9.7 Mulcher Vibrations

Since every rotor is balanced using a balancing machine before leaving the factory, excessive vibration is usually caused by imbalance of the rotor or too high rotation speed during operation.

Some vibrations are still normal at low speed but they should decrease as the speed increase until the rotor reach the recommended speed (i.e. 2750 RPM).

Check with a tachymeter that the rotation speed is still around 2750 rpm. If not, please contact DENIS CIMAF technical support for instruction on how to adjust rotation speed.

If the abnormal vibrations still persist, make the following verifications:

1. Check if one or more blade is broken. If so, replace with new one.
2. Check if pieces of wood have gotten caught between a knife and a deflector. If so, remove it.
3. Check that the balancing counterweights are all present on the rotor. If not, please contact DENIS CIMAF support.

In other situations, after some unexpected mechanical shock when the rotor encountered some foreign debris, rocks or metallic body, vibrations could appear. It may be a sign that a bearing has been damaged.

Worn parts may also generate vibrations specially when the bearing play is out of tolerance (i.e. ≥ 0.010”). In such case, the bearing should be replaced (ref.: *4.7.3 Rotor Bearings Inspection/Replacement, p.50*).

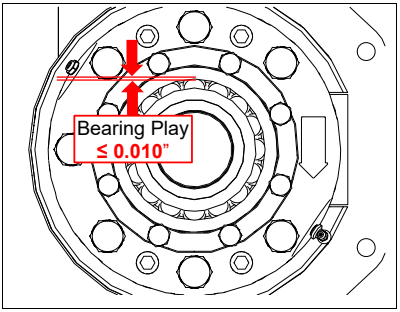


Fig. 5-9 Rotor Bearing MAX Play

9.8 Rotor Slow Recovery

9.8.1 Awareness

When going through heavy material, it is normal that the rotor speed decrease but after going out from such “heavy” work, the rotor should get back to full speed in few seconds (considering a flow of 40 gal/min at 3000 psi).

If you experience unusually slow speed recovery, there might be a problem of adjustment (i.e. tune up need) with the hydraulic motor. In such case, some verifications must be performed.

Proceed as follow for verifications:

1. Check if there is debris blocking anti-cavitation check valve on the hydraulic motor. If so, clean it and/or replace it.
2. Check if the relief valve is whistling and letting some flow bypassing through it.
3. Check if beginning of stroke is too low on the motor.
4. Check the backup pressure on the Return line.

Also, you may call your Denis Cimaf Technical Support for further investigation and/or advice.

9.8.2 Back Pressure Verification

It remains suitable to have the lowest back pressure possible and maximize the output power from the skid steer by selecting the good hose sizes and using only the required adapters. More adapters create more back-pressure. The more back-pressure you have; the less horsepower is available to the mulcher.

However, a “good” back pressure for nice operation and recovery of the hydraulic motor must be in the range of 10 – 15 bars (150 to 225 psi). To do such verification use the gauge port adapter located on block by connecting the pressure gauge in and taking a reading of the return pressure.

If return pressure is too low, the installation of a *restrictor*[6] in the outlet adapter of the hydraulic block may be necessary. It will give to the pilot sensor the signal to change the motor cylinder displacement/volume to minimum and recover its maximum speed.

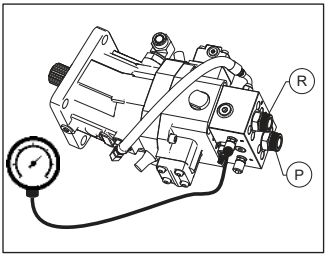
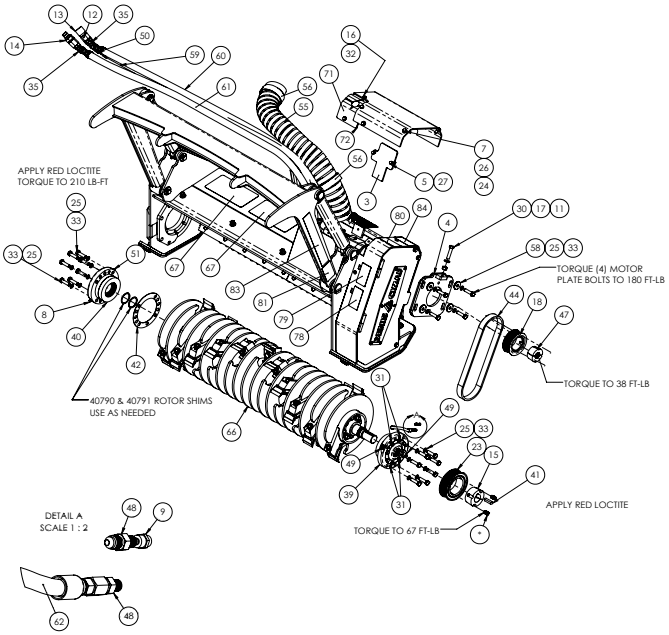
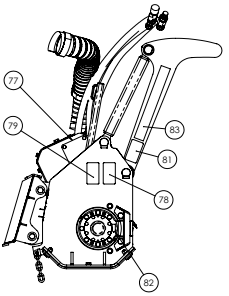


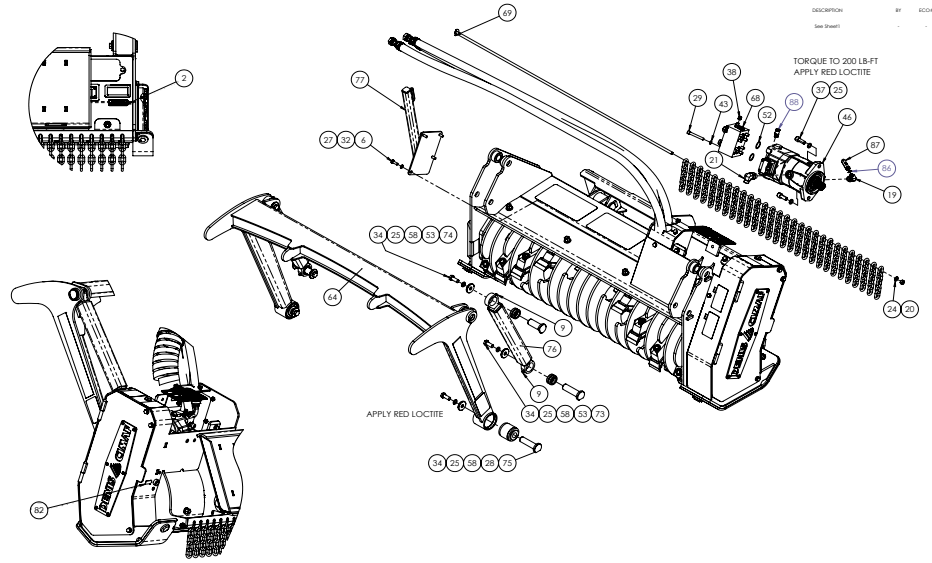
Fig. 5-10 Motor Return Hyd. Pressure Reading

[6] For details, refer to Service Bulletin *SB180808 DAF-180D Restrictor for Return Line.*

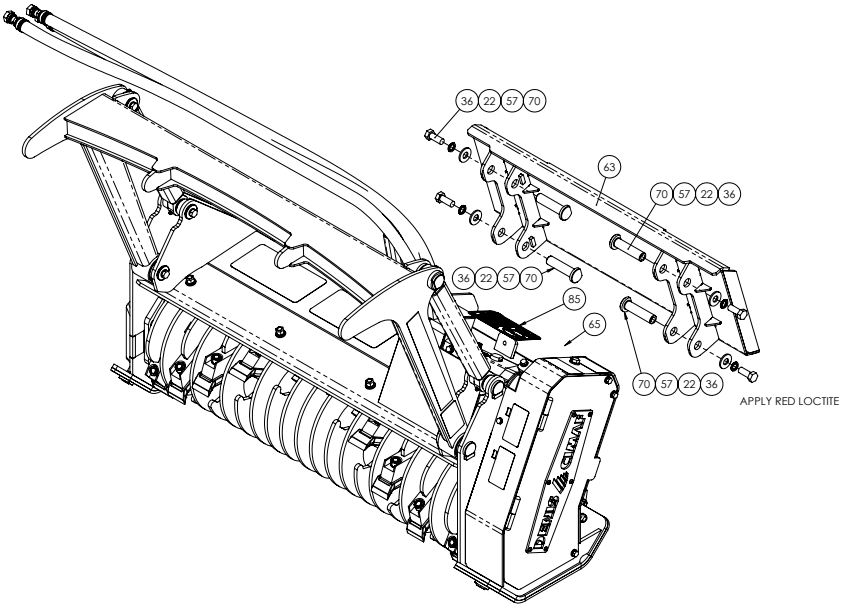
D311 001 DAF-150D with Standard Push Bar Rev-S







D311 001 DAF-150D with Standard Push Bar Rev-S

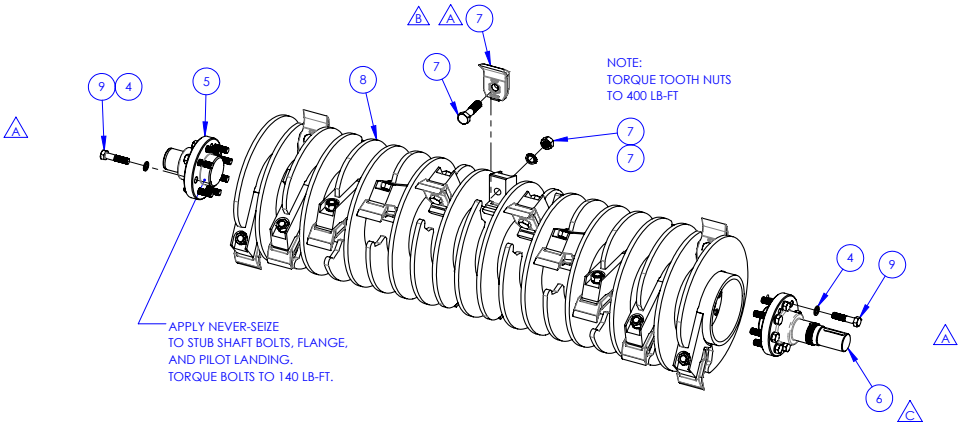


ITEM	QTY.	PART #	DESCRIPTION
1	1	37398	TAG- SN/VIN CE EPA
2	1	39748	DECAL-P65 GENERAL WARNING
3	1	43269	COVER, FRONT ACCESS PANEL
4	1	44540	HYDRO LEDUC MOUNTING PLATE WELD
5	2	722835	BOLT METRIC 10 X 1.5 X 35
6	4	722838	BOLT METRIC 10 X 1.5 X 30
7	4	722843	BOLT - HEX M12 X 1.75 X 30
8	1	729999	ZERK-GREASE 1/8"NPT 90DEG
9	5	730080	GREASE ZERK 1/8 PTF STR
10	4	750463	RIVET-3/16 X 3/8 STL-MAND
11	1	760317	NUT HEX M16 X 2
12	1	761270	COUPLER-QD 3/8" SAE F
13	1	762561	COUPLER-QD 3/4 SAE FF
14	1	762562	NIPPLE-QD 3/4 SAE M C85
15	1	763048	BUSHING-3020 X 2
16	3	763300	BOLT METRIC 10 X 1.5 X 25
17	1	763434	WASHER FLAT 5/8" HARDEN GR8
18	1	763904	SPROCKET-30(14MX)37 2517
19	1	765176	FIT- EL90 -6MJ -10MOR
20	1	800828	NUT METRIC 12MM-1.75
21	1	802103	FF6801-10-12
22	4	805650	WASHER-NORD LOCK M20
23	1	805753	SPROCKET-38(14M)37 3020
24	5	806448	WASHER FLAT METRIC M12 ZP
25	26	806452	WASHER-NORD LOCK M16 ZP
26	4	806456	WASHER-NORD LOCK M12/1/2" ZP
27	6	806473	NUT-MHNNL M10 X1.50 ZP
28	2	806475	BUSHING, TORQUE ROD
29	8	806509	BOLT-SHCS 7/16-14 X 3.25 GR8 ZP
30	1	806512	BOLT-MHHCS M16 X 2.0 X 70MM 8.8 ZP
31	8	806514	SCREW-SET M20 X 2.5 X 30
32	9	806552	WASHER FLAT M10 ZINC PLATED

D311 001 DAF-150D with Standard Push Bar Rev-S

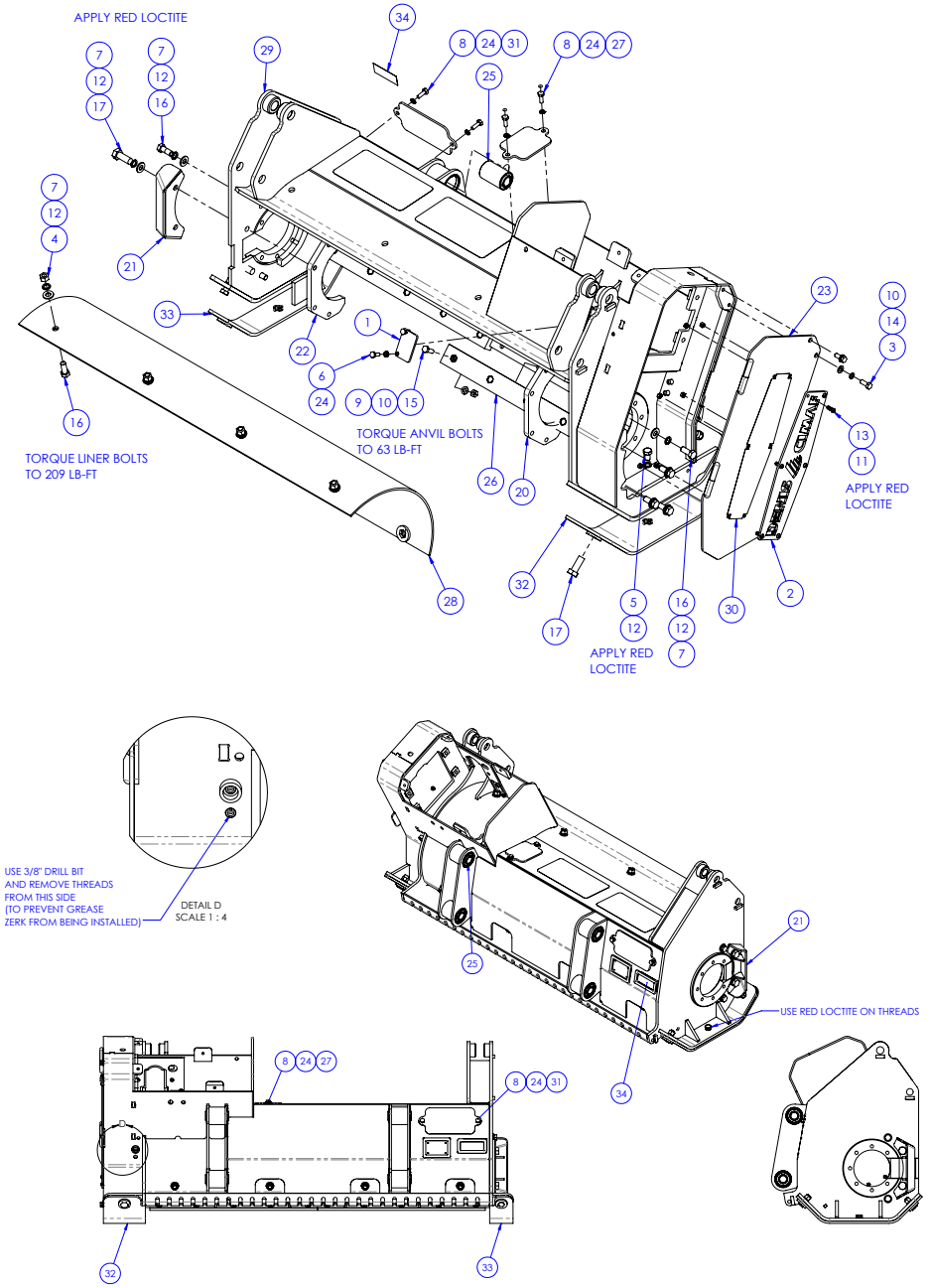
33	18	806619	BOLT-MHHCS 16 X 2.0 X 60-38 GR. 10.9 ZP
34	6	806622	BOLT-MHHCS 16 X 2.0 X 40 GR. 10.9 ZP
35	2	806742	FIT-EL45-12MOFS-12MORB
36	4	807430	MHHCS 20 X 2.5 X 50 GR10.9 ZINC
37	2	807833	BOLT-MSCHS M16-2.00 X 40MM GR 12.9 BLACK
38	1	808316	FIT-CAP -4MJ
39	1	D102 039	BEARING HOUSING ASS'Y, D FAMILY
40	1	D102 040	FAMILY D, BEARING HOUSING ASS'Y
41	1	D102 087	KEY 1/2" X 1/2" X 2 3/8" LG
42	1	D102 163	SPACER FOR CAGE TYPE D
43	8	D10467	LOCK WASHER "HIGH COLLAR" 7/16", 41/64" X 29/64" X 9/64", BL
44	1	D11183	POLYCHAIN-1260(14MM)37
45	1	D11375-002	HOSE SYNFLEX 1/8" X 28" LG, 2 STRAIGHT FITTINGS JICF 04
46	1	D13056	Rexroth Hydraulic Motor 85cc
47	1	D131 107	BUSHING-2517 SPLINED BORE 17T 12/24DP
48	2	D13120	STRAIGHT ADAPTER JICM4 - NPTFM1/8"
49	2	D13337	90° ADAPTER JICM4 - NPTFM1/8"
50	1	D13585	45° ADAPTER ORBM8 - ORFM10
51	1	D13707	RELIEF VALVE #5677
52	2	D13809	O'RING NBR90;1 5 /16' X 1 9/16'X 1/8 ' #2-219(150E)
53	4	D14210	PLAIN BEARING, GEZ 31ES
54	28	D16005	CHAIN-3/8" X 7.25"L - 5 LINKS
55	1	D19522-66	SIDEWINDER SLEEVE, PARTS #SL-3.0-1050B, 3" DIA. X 66" LONG
56	2	D19524	PYTHON STRAPS CS410H
57	4	D21063	STRUCTURAL FLAT WASHER 3/4", 2" X 7/8" X 3/16", ZINC
58	10	D21243	FLAT WASHER O.D. 2" X I.D. 11/16" X 1/4" THICKNESS
59	1	D21411	HOSE-5/8" ID X 93"
60	1	D21412	HOSE-3/4" ID X 75"
61	1	D21413	HOSE-3/4" ID X 80"
62	1	D24196	HOSE 2 WIRES 1/4" OF 16" LG + 2 STRAIGHT FITTINGS JICF0
63	1	D311 403	MOUNTING PLATE FOR DAF-150D/E
64	1	D311 413	STANDARD WELDED PUSH-BAR DAF-150D
65	1	D311 417	Motor housing cover
66	1	D311 505	DAF-150D GENERATION 2 ROTOR
67	1	D311 507	FRAME AND ACCESSO-RIES DAF-150D
68	1	D311 509	HYD BLOCK ASM FOR REXROTH 85CC MOTOR
69	1	D312 403	CHAIN ROD ASS'Y
70	4	D313 109	ATTACHMENT PIN
71	1	D315 292	RUBBER, HOSE CROSSING GUARD
72	1	D315 432	COVER, RUBBER SUP-PORT WELD
73	2	D317 119	PUSH BAR PIN OF CYL-INDER SIDE DAF-180
74	2	D324 103	PUSH BAR PIN OF SHAFT SIDE DAF-180
75	2	D324 106	PUSH BAR PIN DAF-180
76	2	D324 403	ARM, FIXED TREE CATCHER
77	1	D324 406	HOSE SUPPORT DAF-180
78	2	D920 800-02EN	SECURITY STICKER "FLYING DEBRIS"
79	2	D920 801-02EN	SECURITY STICKER "CUT HAZARD"
80	1	D920 802-01EN	SECURITY STICKER "BELT AND PULLEY"
81	2	D920 803-01EN	SECURITY STICKER "RISK OF CRUSHING"
82	2	D920 805-02	SECURITY STICKER "LUBRICATION"

D311 505 DAF-150D Generation 2 Rotor Rev-D

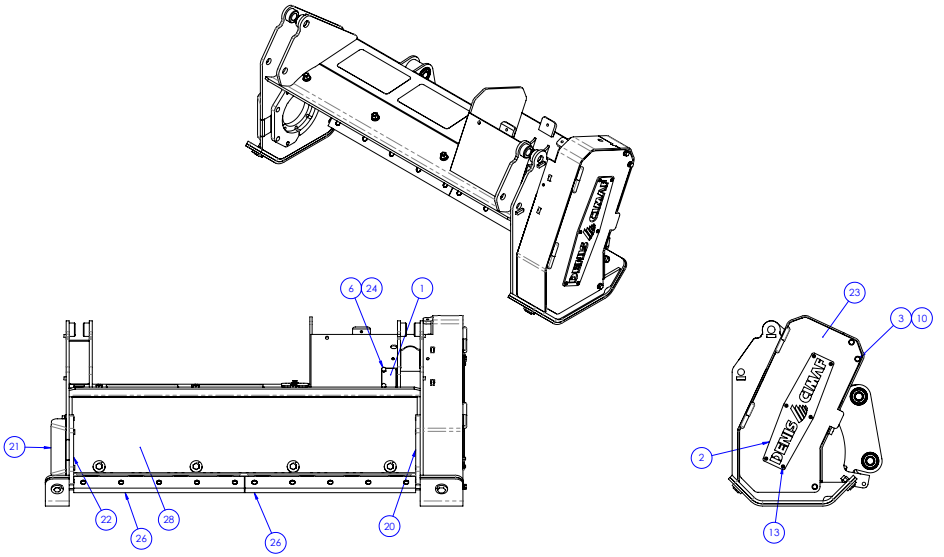


ITEM	QTY.	PART #	DESCRIPTION
1	2	40552	WEIGHT, RING ROTOR 1.75LB
2	1	41133	WEIGHT, SNAP BALANCE (1 OZ SQUARES)
3	1	41562	WEIGHT, SNAP BALANCE (5 OZ SQUARES)
4	16	806452	WASHER-NORD LOCK M16 ZP
5	1	D102 042	SHORT ROTOR SHAFT D FAMILY
6	1	D102 043	LONG ROTOR SHAFT D FAMILY
7	21	D102 900	ASSEMBLY TOOTH W/ BOLTS (57 RC)
8	1	D311 410	ROTOR WELDED STRUCTURE WITH 1" TUBE & 1/2" RINGS
9	16	D10543Z	BOLT-MHHCS M16-2.0 X 70MM GR10.9, ZP DIN 931

D311 507 Frame and Accessories Assembly Rev-J

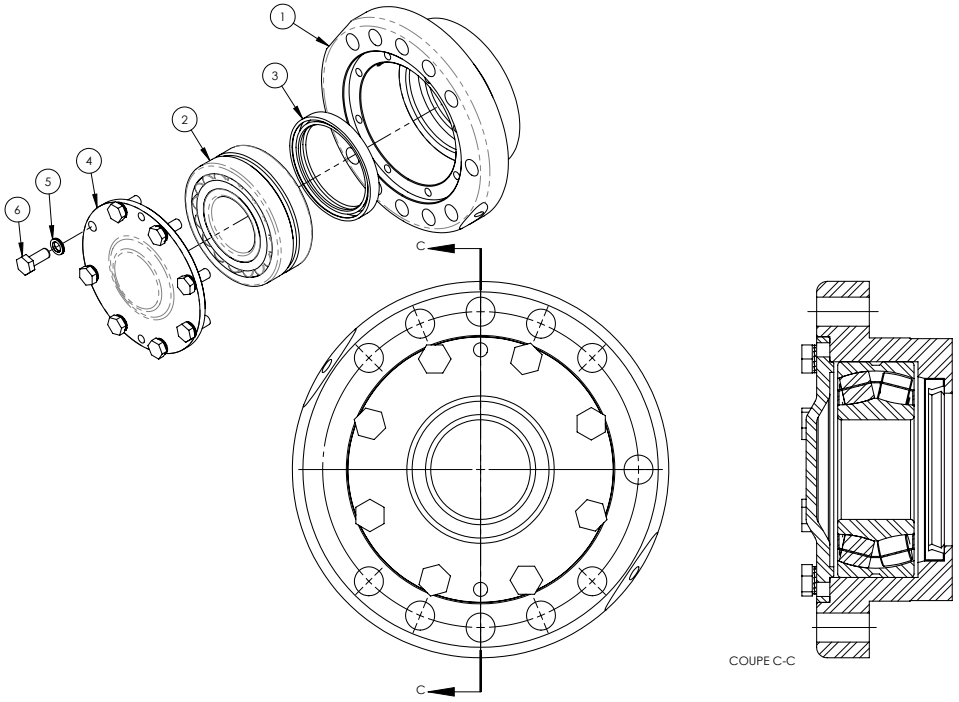


D311 507 Frame and Accessories Assembly Rev-J



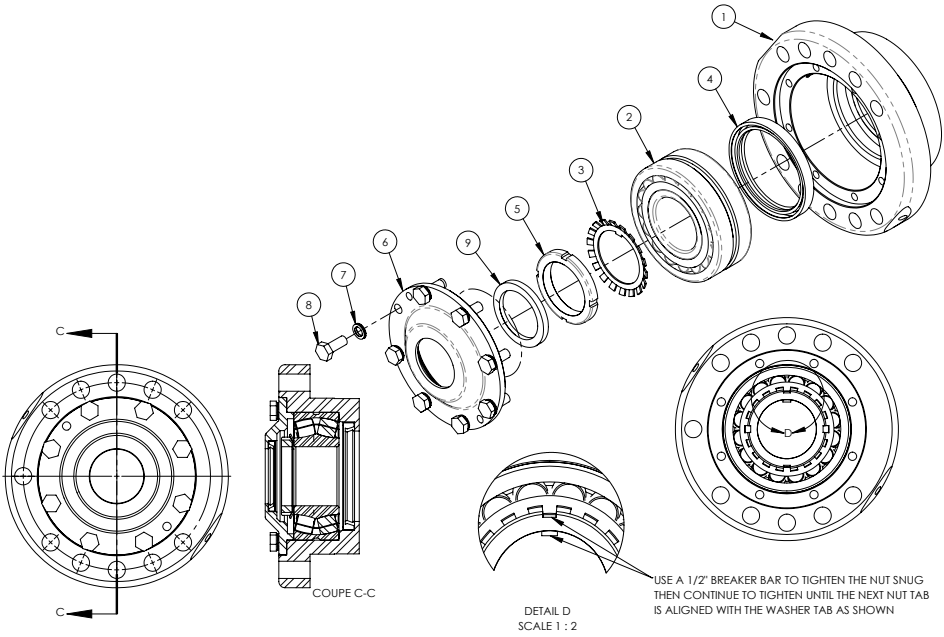
ITEM	QTY.	PART #	DESCRIPTION
1	1	44581	COVER, LINER BOLT ACCESS PANNEL
2	1	45162	Logo 20", DENIS CIMAF
3	3	722843	BOLT - HEX M12 X 1.75 X 30
4	12	760317	NUT HEX M16 X 2
5	2	761017	BOLT-MHHCS M16 X 2.0 X 25
6	2	763300	BOLT METRIC 10 X 1.5 X 25
7	16	763434	WASHER FLAT 5/8" HARDEN GR8
8	4	764684	BOLT METRIC 10 X 1.25 X 30
9	10	800828	NUT METRIC 12MM-1.75
10	13	806448	WASHER FLAT METRIC M12 ZP
11	6	806450	NUT-MHNML M8-1.25 ZP
12	22	806452	WASHER-NORD LOCK M16 ZP
13	6	806453	BOLT-MBHCS M8-1.25 X 25mm ZP
14	3	806456	WASHER-NORD LOCK M12/1/2" ZP
15	10	806457	BOLT-MHHCS 12 X 1.75 X 35 CL. 8.8
16	14	806622	BOLT-MHHCS 16 X 2.0 X 40 GR. 10.9 ZP
17	4	807430	MHHCS 20 X 2.5 X 50 GR10.9 ZINC
18	2	807431	BOLT-MHHCS 16 X 2.0 X 45 10.9 ZINC
19	2	D00963-12	ANTI-SLIP SELF-ADHESIVE 6" WIDE X 12" LG
20	1	D102 012Y	FAMILY D, BEARING HOUSING PROTECTOR
21	1	D102 061	BEARING HOUSING PROTECTOR
22	1	D102 068	ROTOR PROTECTOR ASSEMBLY
23	1	D102 176	DRIVE HOUSING DOOR ASSEMBLY
24	6	D10480	LOCK WASHER "NORD-LOCK" M10, 16.6 X 10.7 X 2.6(MM), ZINC
25	4	D10626	ANTI-VIBRATION BUSHING
26	2	D311 201	BOLTED ANVIL
27	1	D311 246	UPPER COVER
28	1	D311 401	WEAR PLATE WITH WELDED WASHERS
29	1	D311 412	WELDED FRAME DAF-150D
30	1	D312 801	STICKER 20"
31	1	D313 258	BACK COVER
32	1	D315 412	LEFT WEAR PAD
33	1	D315 413	RIGHT WEAR PAD
34	1	D90039	PATENT NUMBER PLATE

D102 040 Bearing Housing Assembly (Non-Drive Side)



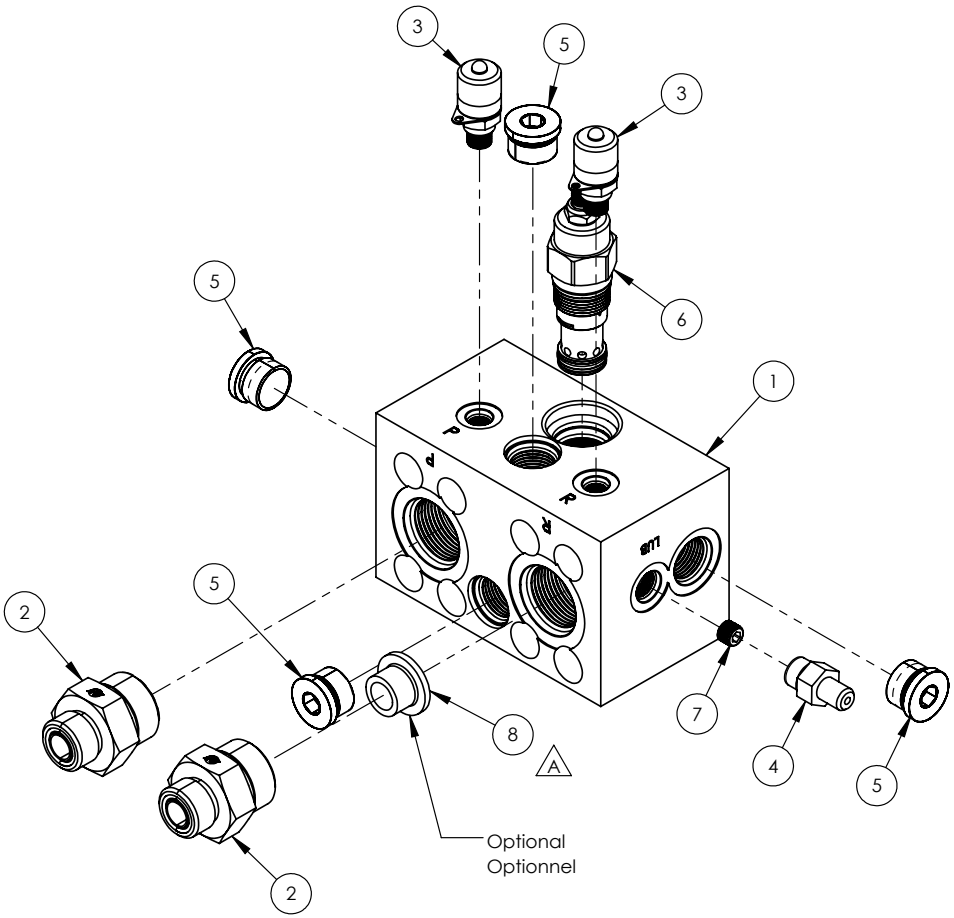
ITEM	QTY.	PART #	DESCRIPTION
1	1	D102 056	D FAMILY BEARING HOUSING
2	1	D11152 N	BEARING 22312CAME4-VS4
3	1	D11267	SEALING GASKETS 90 X 110 X 12 TC VITON
4	1	D102 055	BEARING HOUSING COVER, FREE SIDE
5	8	D10480	LOCK WASHER “NORD-LOCK” M10, 16.6 X 10.7 X 2.6(MM), ZINC
6	8	763300	BOLT METRIC 10 X 1.5 X 25

D102 039 Bearing Housing Assembly (Belt Drive Side)



ITEM	QTY.	PART #	DESCRIPTION
1	1	D102 056	D FAMILY BEARING HOUSING
2	1	D11152 N	BEARING 22312CAME4-VS4
3	1	D11547	LOCK WASHER MB12 60MM
4	1	D11267	SEALING GASKETS 90 X 110 X 12 TC VITON
5	1	D15250	LOCK NUT KM12, M60 x 2.0
6	1	D102 057	BEARING HOUSING COVER FIXE SIDE
7	8	D10480	LOCK WASHER "NORD-LOCK" M10, 16.6 X 10.7 X 2.6(MM), ZINC
8	8	763300	BOLT METRIC 10 X 1.5 X 25
9	1	D11258	SEAL 55/72/7 TC VITON

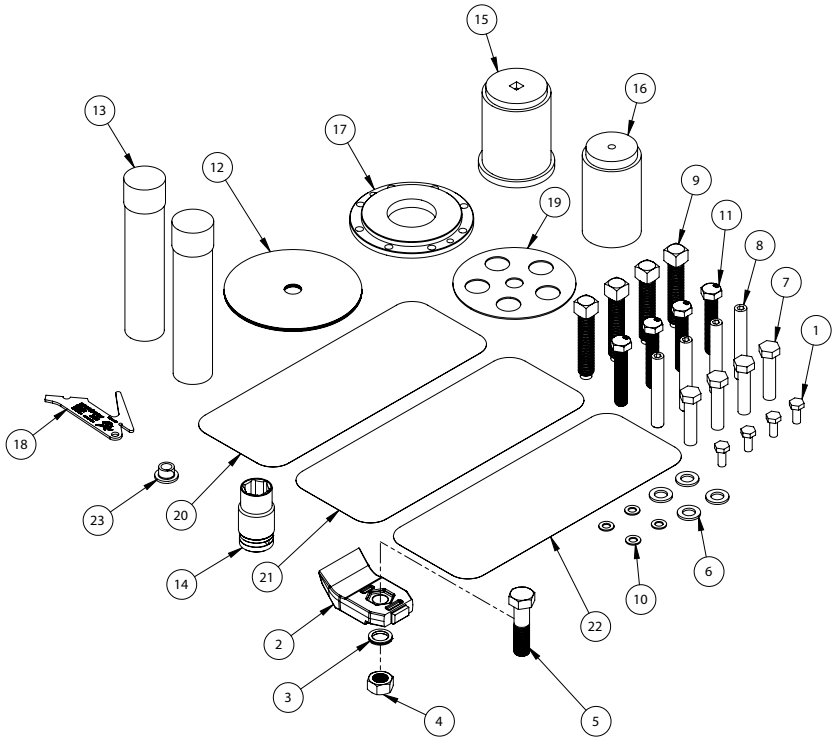
D311 509 Hydraulic Block Assembly Rev-A



ITEM	QTY	PART #	DESCRIPTION
1	1	D131 104	BLOCK-HYD 85CC REXROTH
2	2	802489	FIT- 12MORFS X -16MOR
3	2	D13865	Pressure test adapter (1620 serie, 7/16-20 UNF)
4	1	738140	FITTING 4MJIC X 6MOR
5	4	807279	FIT-PLUG-10MOR
6	1	D14131	CARTRIDGE RPGE-LCV (PR 14130)
7	1	D13249-062	FLOW REGULATOR
8	1	DR0002	RESTRICTOR-FLANGED .391"

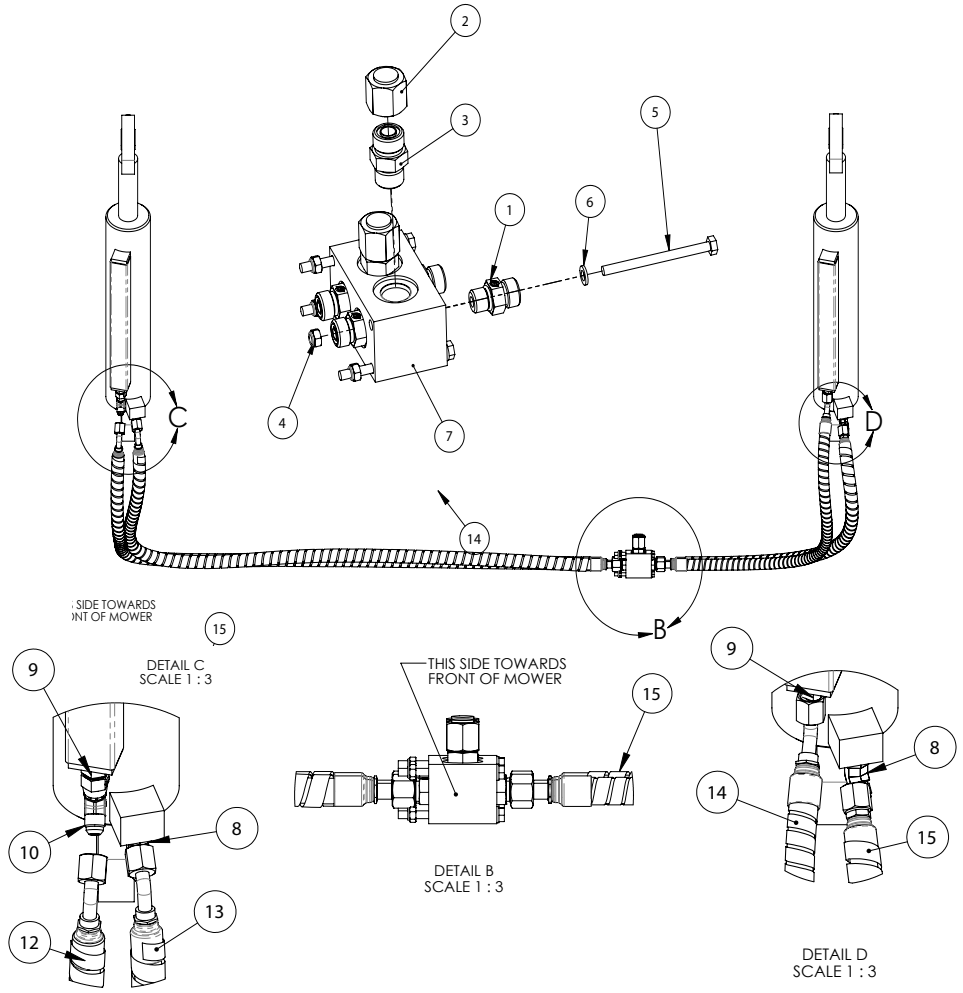
CK-DAF-150D Customer Kit

CK-DAF-150D Customer Kit



ITEM	QTY.	PART #	DESCRIPTION
1	4	763300	BOLT METRIC 10 X 1.5 X 25
2	4	806449	WASHER FLAT METRIC M16 ZP
3	4	806512	BOLT-MHHCS M16 X 2.0 X 70MM 8.8 ZP
4	4	806546	SCREW-SET M16-2.00 X 110 CUP POINT
5	4	806547	BOLT-SQ HD M20-2.50 X 100
6	4	806552	WASHER FLAT M10 ZINC PLATED
7	4	806553	BOLT-MHHCS 16 X 2.0 X 90
8	1	D102 900	ASSEMBLY TOOTH W/ BOLTS (57 RC)
9	5	D00116	FIBER DISC
10	1	D900 061	KM12 NUT TIGHTENING TOOL
11	1	D900 083	MOUNTING BUSHING FOR BEARING HOUSING
12	1	D900 084	MOUNTING BUSHING FOR BEARING HOUSING
13	1	D900 124	SHARPENING JIG
14	1	D900 516	STEEL DISK FOR SHARPENING WITH PAPER
15	1	D920 806-01	DISTANCE LIMIT (STICKER 100m)
16	1	D920 806-02	DISTANCE LIMIT (STICKER 300pi)
17	1	D920 806-02EN	DISTANCE LIMIT (STICKER 300pi)
18	2	D10039	GREASE TUBE, ALIMEX-1 EP #2
19	1	D52001	REWORK, SOCKET 30MM
20	1	DR0002	RESTRICTOR-FLANGED .391”

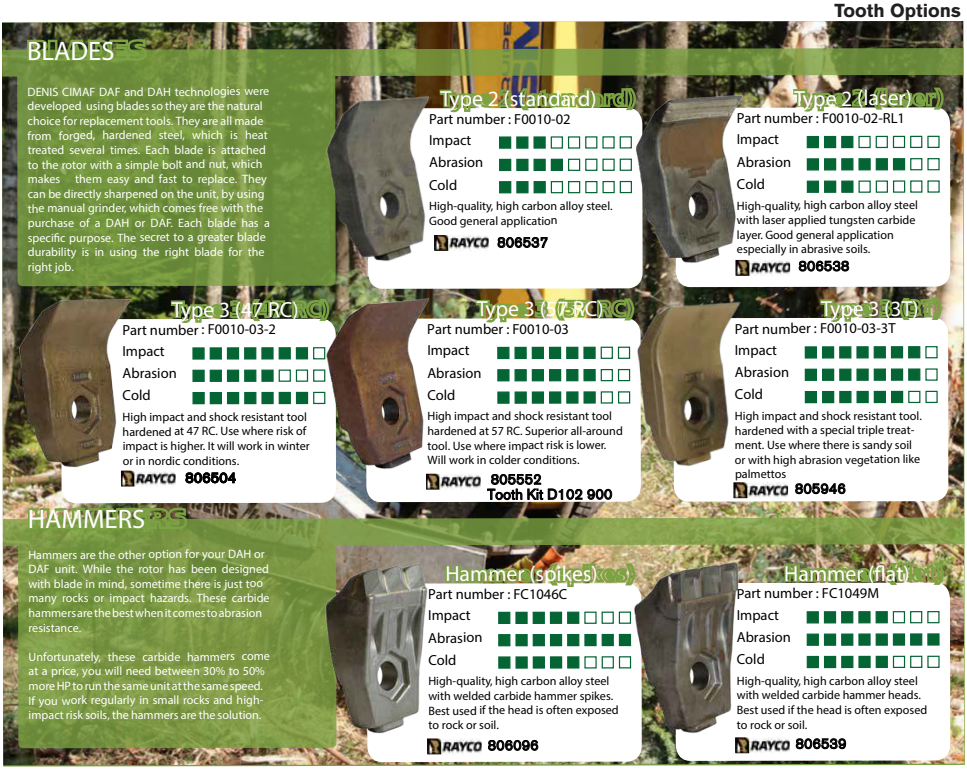
43981 Hydraulic Push Bar Assembly (Option)



ITEM	QTY.	PART #	DESCRIPTION
1	4	806890	FIT- -6MORFS X -6MOR
2	2	800395	FIT-CAP-08 ORFS
3	2	800427	FIT-08ORFS X -08MOR
4	4	803881	NUT METRIC NYLOC 6MM-1.0
5	4	760779	BOLT METRIC 6 X 1.0 X 75
6	4	760777	WASHER-FLAT M6
7	1	D311 116	HYDRAULIC JUNC-TION BLOCK

8	2	760120	FIT-EL45 -6MJ -6MOR
9	2	750933	FIT- 6JIC-6MOR
10	1	802510	FIT-EL45 -6MJ -6FJX
11	2	D14218	CYLINDER-3" X 1.5" X 11" PUSH BAR
12	1	D311 803	HOSE-3/8 -6JIC45 X -6ORFS-53"
13	1	D311 802	HOSE-3/8 -6JIC45 X -6ORFS-55"
14	1	D311 801	HOSE-3/8 -6JIC45 X -6ORFS-31"
15	1	D311 800	HOSE-3/8 -6JIC X -6ORFS-31"

PARTS
Tooth Options



SPARE PARTS		
QTY.	**PART #**	**DESCRIPTION**
21	D102 900	ASSEMBLY TOOTH W/BOLTS (57 RC)
2	D311 510	BOLTED ANVIL WITH HARDWARE
1	D311 511	LINER WITH MOUNTING HARDWARE
1	D315 512	KIT, LEFT WEAR PAD W/HARDWARE DAF-180D
1	D315 513	KIT, RIGHT WEAR PAD W/HARDWARE DAF-180D

A. General Outline

Rayco Manufacturing, Inc. warrants to the first user that the products it supplies will be free from defects in material and workmanship under normal and proper usage for a period of 365 days from the date of delivery to the first user. In addition, with respect to "Mini Work-Force" models, the mainframe and control bar will be free from defects in material and workmanship under normal and proper usage for a period of two (2) years from said date of delivery.

This warranty does not cover and Rayco makes no warranties with respect to (i) any product that has been subject to abuse, misuse, misapplication, neglect, alteration or accident; to improper or incorrect repair or maintenance; or to abnormal conditions of use, temperature, moisture, dirt or corrosive matter; and (ii) any material, parts or other components that are manufactured by someone other than Rayco, which items carry only the manufacturer's warranty, if any. Furthermore, this warranty does not cover expendable parts.

Individual components such as engines, engine drive systems, batteries, and hydraulic components, etc. shall be covered by standard warranties of their respective manufacturers. Any claims must be submitted within 30 days of the repair.

B. Individual Components

1. Engines

All engines have specific warranties issued by OEM and honored thru their respective dealer.

2. Hydraulic Components

Hydraulic components have variable warranties. Rayco must preauthorize all hydraulic component product warranties prior to removal from the machine, and all warranty considerations are the sole responsibility of the manufacturer.

3. Batteries

Batteries have a warranty that is honored thru manufacturer. For warranty service, the purchaser is to contact manufacturer directly.

4. Various Components

a. Belts will be covered under warranty only if Rayco receives warranty from their supplier.

b. Sprockets Sheaves have a six month limited warranty.

c. Electric clutches have a six month limited warranty.

d. Hydraulic Cylinders will be covered under warranty only if Rayco receives warranty from their supplier.

5. Pockets and Teeth

Pockets and Teeth will be covered under warranty only if they are defective before they are mounted on a stump grinder. Once they are used, all warranty stops.

C. Items not Covered

Rayco is not responsible for the following:

1. Premiums charged for overtime labor requested by the purchaser.
2. Transporting the product to and from the place at which warranty work is performed.
3. Any product that has been altered or modified in ways not approved by Rayco.
4. Depreciation or damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions, misuse, lack of proper protection during storage, or accident.

D. Unapproved Service Modification

Rayco is relieved of its obligation under this warranty if:

1. Service (other than normal maintenance and replacement of service items) is performed by someone other than an authorized Rayco dealer; or
2. The product is modified or altered in ways not approved by Rayco.

E. Obtaining Warranty Service

To obtain performance of this warranty, the original retail purchaser must request warranty service from a Rayco dealer authorized to sell the product to be serviced. When making such a request, the purchaser must present evidence of the product's delivery date, make the product available at the dealer's place of business, and inform the dealer in what way the purchaser believes the product to be defective.

Warranty repairs can be made in the field if the purchaser and servicing dealer so desire. However, travel time expense to and from the job site will be purchaser or dealer responsibility.

F. No Implied Warranty or Other Representation

Where permitted by law, neither Rayco nor any company affiliated with it makes any warranties, representations or promises, expressed or implied, as to the quality or performance, or freedom from defect of its products other than those set forth above, and NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS MADE.

G. Limitation of Purchaser's Remedies

Where permitted by law, the purchaser's only remedies in connection with the branch of performance on any warranty on any Rayco product are those set forth on this page. In no event will the dealer and or Rayco be liable for incidental or consequential damages, including but not limited to: loss of profits, rental of substitute equipment, or other commercial loss.

H. No Dealer Warranty

The selling dealer makes no warranty of his own on any item warranted by Rayco, and makes no warranty on other items unless he delivers to the purchaser a separate written warranty certificate specially warranting the item. A dealer has no authority to make any representation to promise on behalf of Rayco, or to modify the terms or limitations of this warranty in any way.

If you have a situation where you are not sure if a component is covered under warranty, please do not hesitate to contact us. Rayco wants you and your customer to be 100% satisfied with our products and service.

Read and understand all instructions before attempting to operate this machine. This manual should be readily available for reference at all times.

Additional copies of this manual may be purchased. Contact your Authorized Rayco Dealer or Rayco Manufacturing Inc.

RAYCO Manufacturing, LLC
4255 E Lincoln Way
Wooster, OHIO 44691 U.S.A.
800.392.2686
raycomfg.com

Think Smart, Think Safe……
We care about your safety. When operating your RAYCO® machinery always wear an approved helmet complete with ear muffs, face shield and the proper eye wear. Never operate under the influence of alcohol or drugs. Know your RAYCO, read and understand your owner's manual cover to cover.

RAYCO Manufacturing LLC retains the right to make changes in design and specifications; engineering; add or remove features; add improvements; or discontinue manufacturing at any time without notice or obligation.

Thank you for buying and using RAYCO Equipment.

RAYCO

"The Stump Cutter People"