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EX54SS

Owner's Manual
(Provisional)



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Roughwater Industries Ltd.. ("RWI") warrants to the Customer that commencing from the date of delivery to the Customer and continuing for a period of 365 days, the RWI Hardware (i) to be free of defects in material and workmanship under normal use and service, and (ii) to conform in all material respect to the printed specifications for the Equipment which have been delivered to the Customer in connection with the Customer's purchase of the Equipment. This limited warranty covers only the original purchaser of the Equipment. RWI's and its supplier's sole obligation and the Customer's sole remedy for any failure of the Equipment is limited to the repair or replacement of any part of the Equipment at RWI's discretion. RWI's and its supplier's liability is limited to the amount paid for the Equipment. RWI and its suppliers shall not be liable for indirect, special, consequential or liquidated damages or penalties, including claims for lost revenues, profits or business opportunities, even if RWI had or should have had knowledge, actual or constructive, of the possibility of such damages.

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This warranty shall be void if Customer fails to use or maintain the Hardware in accordance with RWI's specifications or instructions, or if the Hardware or any part thereof have been subject to any unauthorized modifications, improper operation, user negligence, service by unauthorized person, company, association, use with any unauthorized attachment, device or feature, accidental neglect, misuse, tampering, acts of God, or any event other than ordinary use.

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You agree that you will not export, either directly or indirectly, any RWI Product, material or data provided in the course of receiving Standard Limited Hardware Warranty services without first obtaining any required license or other approval from the Canadian Department of Consumer and Corporate Affairs or any other agency or department of the Government of Canada. In the event that You export any RWI Product from Canada, or re-export it from a foreign destination, You agree to ensure that the distribution and export/re-export or import of the RWI Product is in compliance with all laws, regulations, orders, or other restrictions of Canadian Export Controls Legislation Regulations and the appropriate foreign government. You agree that neither You nor any of Your subsidiaries will export/ re-export any RWI Product, material or data provided in the course of receiving Standard Limited Hardware Warranty, directly or indirectly, to any country for which the Government of Canada or any agency thereof or the foreign government from where it is shipping required and export license, or other governmental approval, without first obtaining such license or approval.



Torrent EX54SS Operations and Maintenance

The EX54SS is a horizontal shaft type, belt driven, rotary forestry mulching attachment designed for use in conjunction with boom-equipped carriers. The unit is comprised of a cutting frame and cutting drum driven by a hydraulic motor equipped with anti-cavitation and overpressure protection. The unit is fitted with guarding to limit access to the cutting drum and designed to limit flying debris that may be ejected during clearing operations.

The unit is designed for use in the safe and efficient reduction to chips/mulch of all types of vegetation and is to be used only in applications where personnel, property and roadways are greater than 150 yards from where the mulching equipment is being operated.

Audience

This user guide is written for operators who use and maintain the Torrent EX54SS Forestry Mulching Attachment during **forestland clearing** activities.

Precautions

Failure to follow and respect the following **WARNINGS** can result in damage to the mulcher, the carrier, other property or injury or death of operation personnel or pedestrians. This unit must not be used within 150 yards of objects, other machinery, livestock, pedestrians or personnel (other than the operator).

WARNING: This machine must be operated only by qualified equipment operators with thorough knowledge and understanding of the contents of this manual. RWI accepts no responsibility for damage or injury resulting from inappropriate or misuse of its products.

WARNING: Before starting the supply of hydraulic oil to the mulcher the operator must verify that equipment, personnel, property and roadways are greater than 150 yards from where the mulching equipment is being operated. As well, the operator must be inside the operator's compartment of the machine with the doors and windows closed.

WARNING: The EX54SS must not be approached by persons (including the operator) or by other equipment while the cutting drum is turning. Because of the risk of entanglement or debris that may be ejected from the unit, the EX54SS must be in a ZERO ENERGY STATE (that is, the drum is stationary, the cutting frame is squarely



on the ground and prime mover (carrier engine) is shut down before being approached for inspection or maintenance).

WARNING: Because of the nature of the protective valves supplied on the mulching unit, the cutting drum will continue to rotate after the unit is shut down until all inertial energy is expended from the cutting drum. Always allow the unit at least two minutes to “run-down” after the carrier has been shut down before approaching the unit for any reason.

WARNING: This machine must be installed according to the product technical specifications contained herein by competent, trained, qualified installation personnel. RWI accepts no responsibility for damage or injury resulting from inadequate or improper installation of its products.

WARNING: This machine must be used only in conjunction with equipment fitted with forestry guarding, including safety screening certified roll-over-protection and anti-crush structure to protect the operator from felled trees and ejected debris.

WARNING: This machine must be used only with the debris control guard (guards) in place. RWI accepts no responsibility for damage or injury resulting from alterations to or removal of components from its products.

WARNING: When servicing cutters, the cutting drum must be mechanically prevented from turning (that is, wedged or blocked) so as to minimize the risk of injury to the maintainer.

WARNING: The EX54SS is manufactured from metal components and, as such, is a highly efficient electrical conductor. Extreme caution must be used when working around electric power transmission lines whether above or belowground!

WARNING: This machine must be used in observance of all laws, rules and regulations as laid out by local regulatory bodies in the country in which it is being used.

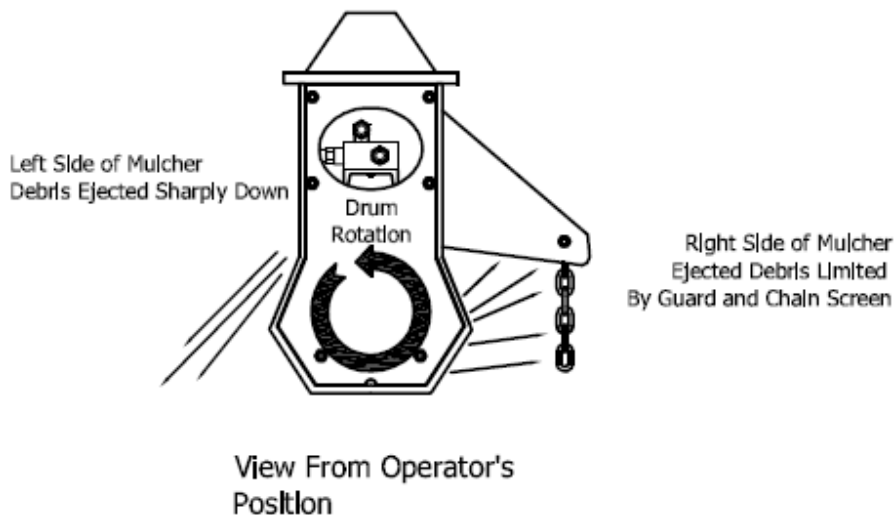


Operation

Clearing operations should be carried out only by a competent equipment operator familiar with the safe operation of the EX54SS when installed to the applicable carrier. **The operator must understand the contents of this manual.**

Before starting the supply of hydraulic oil to the mulcher the operator must verify that equipment personnel, property and roadways are greater than 150 yards from where the mulching equipment is being operated. As well, the operator must be inside the operator's compartment of the machine with the doors and windows closed. It is imperative that the operator remains inside the operator's compartment at all times while the mulcher drum is turning.

For lighter growth, such as bush and smaller trees up to 4 inches material is most efficiently reduced by approaching the work from the left, such that material is introduced into the "open side" or left side of the mulcher. This allows the cutting drum easy access to the material for quick reduction. Smaller material and tree tops may be approached as well from the "right hand" or guarded side allowing the material to be pulled up between the drum and cutting frame for quick reduction.





Trees, 6 inches or larger in diameter, often require that the top be cut off and mulched separately on the ground. In addition, with respect to larger growth, it is faster and more efficient to chip/mulch as much of the tree as possible while it is standing (still on the stump). For efficient mulching of larger trees the steps to remember are as follows:

1. Reach as high as safely practicable (that is, boom highest position with mulching head horizontal) toward the left side of the tree.
2. Using the left or "topping" side of the mulching drum, slowly cut into the right portion of the tree top being careful not to cut the top off completely.
3. As the top weakens, apply increasing left swing pressure until the combination of cutting and swing forces cause the top to fall away from the machine and operator.
4. Using slight down pressure, in conjunction with short smooth swings over the stem, the tree can be reduced to slightly below grade.
5. Using the right or "feed side", reduce the top in much the same way as described above for lighter growth.



Lubricant

Consult the lubricants provider for the Rolling Bearing Lubricant recommendation to suit your operating climate. Below find lubricant as recommended by bearing manufacturer.



FAG Rolling Bearing Grease Arcanol MULTITOP

Properties, applications: Bearing grease for high loads, low and high speeds, low and high temperatures, low noise, low friction

Characteristics	Unit	Value	Test method
Marking:		KP2N-40	DIN 51825
Density:	[kg/dm ³]	ca. 0,9	
Specifications:			
Thickener:		lithium soap	
Type of base oil:		part synth oil	
Temperature range:	[°C]	-40 to 140	DIN 51825
Longtime limit temperature:	[°C]	80	
Base oil viscosity at 40°C:	[mm ² /s]	≥ ISO VG 68	DIN 51562 - 1
Worked penetration:	[0,1 mm]	265-295	DIN ISO 2137
Drop point:	[°C]	≥ 190	DIN ISO 2176
Water resistance:	[Range]	≤ 1-90	DIN 51807 - 1
Corrosion Emcor Test:	[Corr.Grad]	0/0	DIN 51802
1% NaCl:	[Corr.Grad]	≤ 1/1	
Copper corrosion after 24 h/120 °C:	[Corr.Grad]	≤ 1	DIN 51811
FE8 tests run Wear behaviour		Running time 500 hours, no failure	
536048 - 3000/10-RT	[mg]	vWk50 ≤ 35mg	DIN 51819
536048 - 75/80-RT	[mg]	vWk50 ≤ 35mg	DIN 51819
536050MP - 7,5/80-120	[mg]	vWk50 ≤ 35mg	DIN 51819
FE9 tests run (grease service lifetime)			
A/1500/6000-130	[h]	F50 ≥ 200 h	DIN 51821-02
	[h]	no failure < 100h	
Speed range:	Unit	Ball bearings and cylindrical roller bearings	Other roller bearings*)
Speed limit n*dm	[mm/min]	800.000	350.000

*) not cylindrical roller thrust bearings and spherical roller thrust bearings

WARNING: 33 percent of premature bearing failures are caused by incorrect specification and inadequate application of the lubricant.



EX54HSS Technical Specifications

Operating weight (Standard)	2800 lb/1250 Kg
Cutting width	54 inches
Rotational speed	2000 - 2700 RPM (maximum)
Carrier power requirement	140 Hp or 104 Kw (minimum)
Cutter type	Fixed spherical or fixed beaver
Cutter quantity	27
Drive type	Synchronous Belt
Hydraulic motor type	Variable axial piston
Maximum hydraulic system pressure	5000 psi/345 bar (maximum continuous)
Hydraulic oil flow requirement	45 us gpm or 170 lpm (minimum)



Preventive Maintenance Instructions

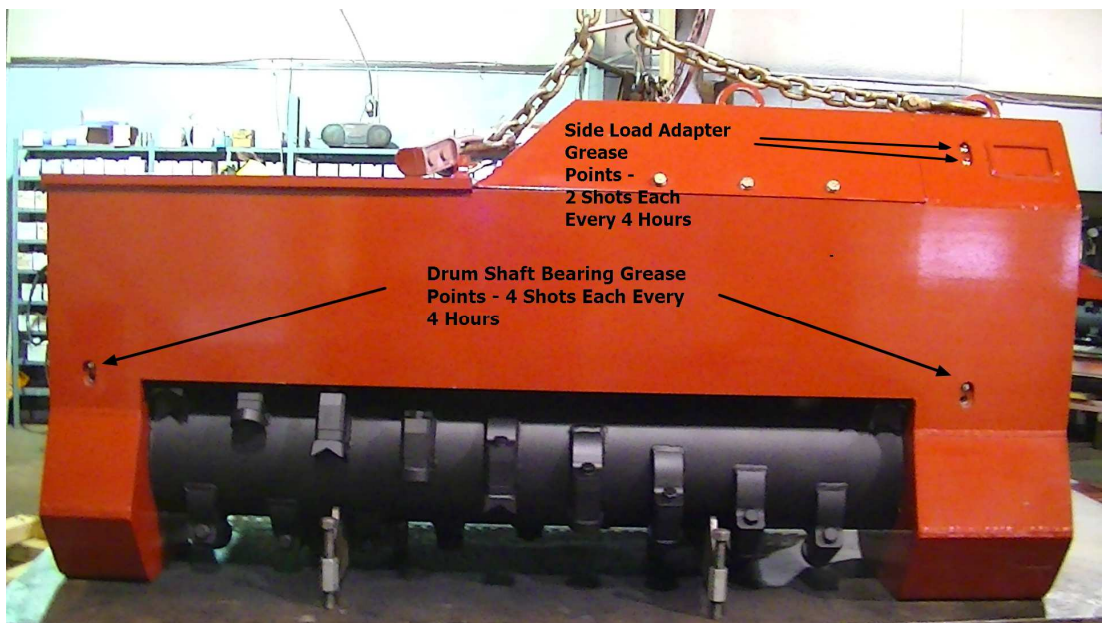
This section provides the information necessary to ensure safe and effective maintenance of the EX54SS forestry mulching attachment. Periodic checks and lubrication requirements are described in detail.

Daily – Every Four Hours of Operation

Grease Drum Shaft Bearings

Lubricate main shaft bearings after every four hours of operation with four shots of special purpose grease suitable for operating conditions (see “Recommended Rolling Bearing Lubricant Specifications” for lubricant requirements).

Note: Lubrication points may be located on either left or right side of unit depending on rotation ordered.



Lubricate Side Load Adapter Bearings

Lubricate side load adapter bearings after every four hours of operation with two shots of special purpose grease suitable for operating conditions (see “Recommended Rolling Bearing Lubricant Specifications” for lubricant requirements).



Grease Side Load Adapter Bearings

Apply 15 shots of multi-purpose or bearing quality grease to the side load adapter extension shaft once every 40 hours of operation. Current models (2016 and newer) are fitted with an access plug in the belt drive ends cover, the removal of which allows access to the grease fitting (see figure below). 2015 and earlier models require removal of the drive end cover in order to gain access to the grease fitting





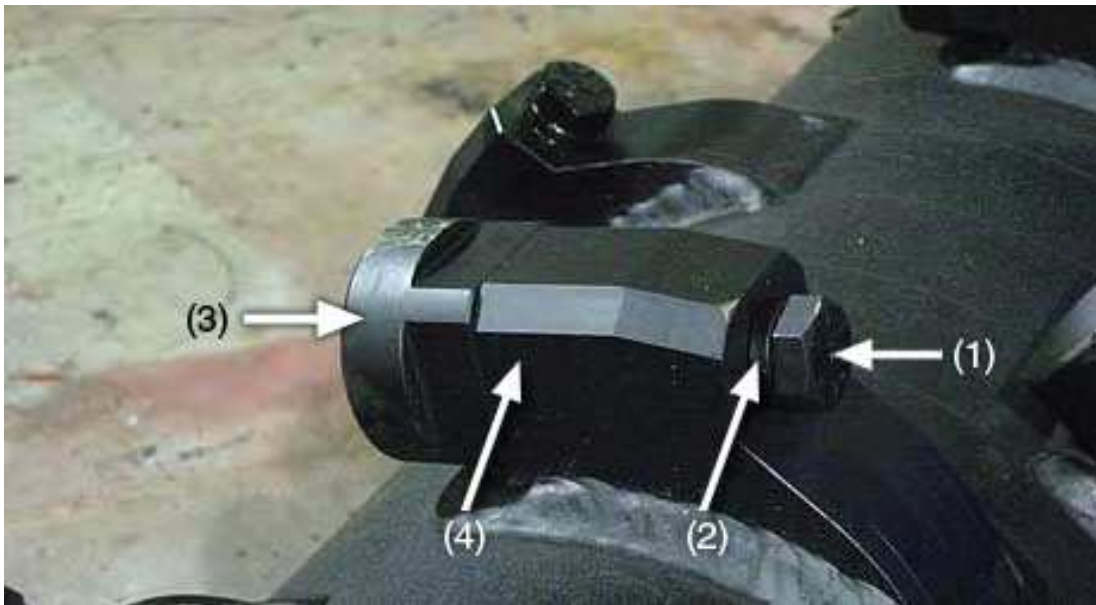
Inspect Cutters for Excessive Wear or Breakage

Inspect cutters for excessive wear or breakage. As cutters wear they become less efficient. Rotate cutters as required.

To rotate, or remove, a cutter perform the following steps:

1. Remove the cutter fastener (1) and lock washer (2).
2. Remove the cutter (3) from the tool holder (4).
3. Turn 90 degrees, or as required, to expose a new cutting edge – if no new edges remain, replace the cutter with a new one.
4. Replace the cutter fastener and lock washer and torque to 75 ft-lb.

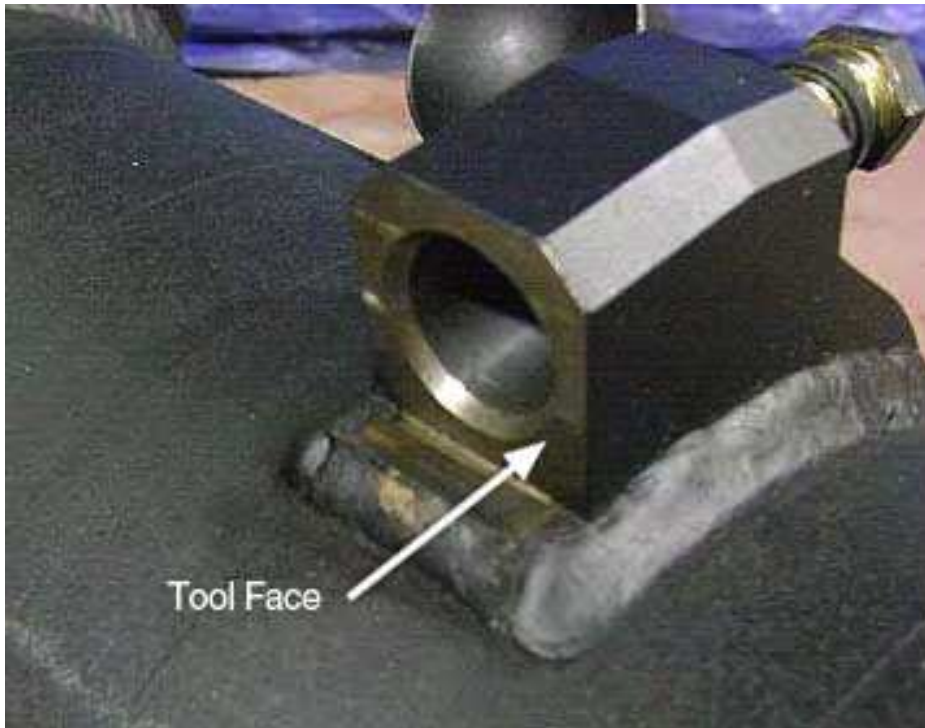
Do not use an impact wrench to tighten the cutters.





Inspect Tool Holders for Excessive Wear or Damage

In cases of severe damage to cutters involving loss of the entire cutting head, the tool holder tool face may be exposed to impact with potential for damage to the machined surface. Any damage to the machined surface must be corrected. In cases of severe damage, a new tool holder must be installed.





Clean Drive and Idler End Drains

To avoid the build up of a liquid level in the idler and drive end compartments it important to clean out the drains located at the bottom of the respective covers regularly.





Weekly – Every 50 Hours of Operation

Check Cutter Fasteners Torque

Using a torque wrench, check that all cutter fasteners are tightened to a value of 75 ft-lb .

Inspect Bearings for Excessive Radial Clearance or End Play

With the unit squarely on the ground, or other flat solid surface, and with the carrier in a ZERO ENERGY STATE, place a pry bar between the drum and the surface upon which the unit is sitting. Check for excessive radial clearance. A small amount of clearance is built into the bearings (approximately 0.008” or 0.2mm). An audible clunk, or readily visible movement while moving the pry bar up and down, may indicate worn or damaged bearings.

Excessive end-play may be detected by placing a pry bar between the cutting frame and either end of the cutting drum. A small amount of end-play is built into the bearing. If total axial play (in excess of 0.060” or 1.5 mm) is detected, bearings may be excessively worn or damaged and further inspection is required.

Monthly – Every 200 Hours of Operation

Inspect Hydraulic Motor, Protective Valves and Hydraulic Hose Connections for Leaks

Place the unit squarely on the ground, or other flat solid surface, and ensure that the carrier is in a ZERO ENERGY STATE. Allow the unit to cool to ambient temperature. Remove the drive end cover and inspect the hydraulic motor, protective valves and hose connections for leaks or seepage of hydraulic oil and correct as necessary.



EX54SS Installation

Installation of the EX54SS must be carried out by a competent technician with training and experience in heavy equipment or industrial mechanics, with extensive knowledge of hydraulic fluid power systems and components. The technician must possess knowledge and/or documentation specific to the carrier to which the unit is to be fitted and should commence installation of the EX54SS only after having read and understood the contents of this manual.

Warning: All installation and any other maintenance or mechanical procedures to be carried out on the EX54SS must be performed with the unit resting squarely on the ground or other flat solid surface, and with the carrier in a ZERO ENERGY STATE.

The EX54SS is a hydraulically driven, rotary mulching attachment driven by a variable displacement axial piston hydraulic motor rated for a maximum continuous operating pressure of 5000 psi (345 bar). The motor is protected by an anti-cavitation check valve and an overpressure relief valve.

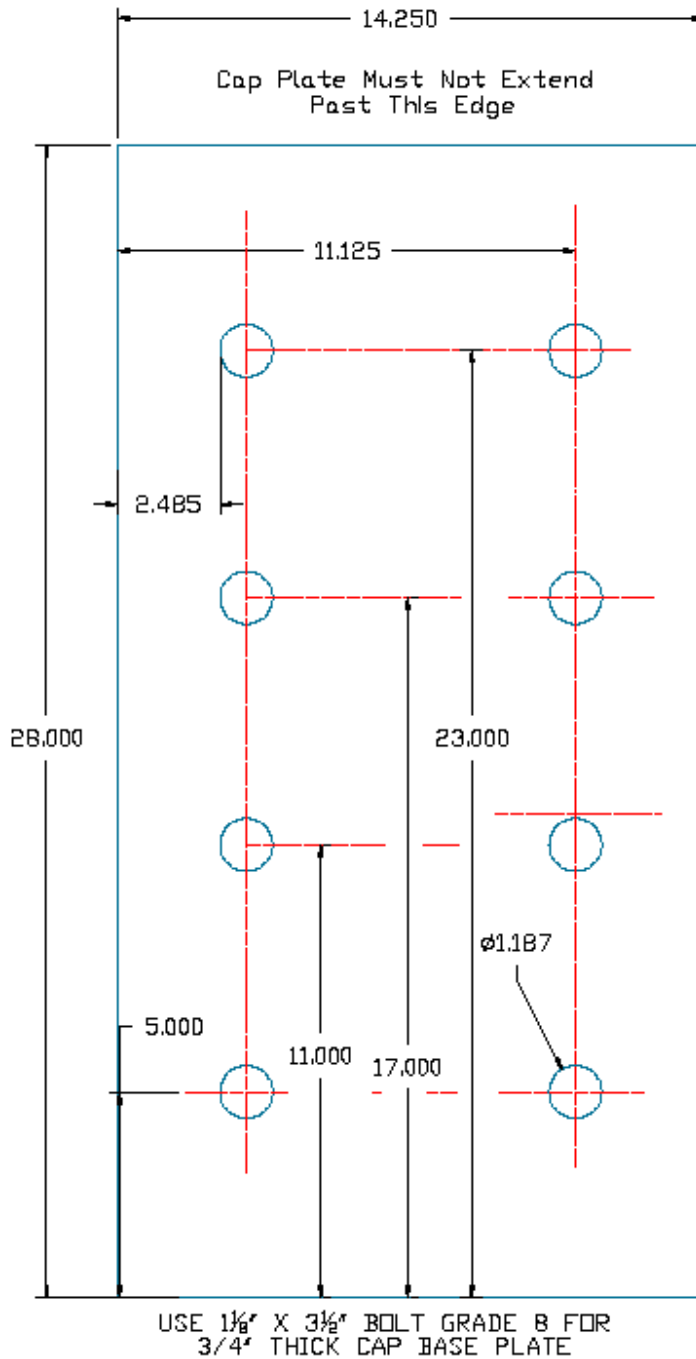
The unit's main shaft is fitted with a set of two double row spherical roller bearings rated for a total basic dynamic radial load of 78 tons. Limited by the bearing sealing system, the maximum permissible rotational speed of the EX54SS cutting drum is 2700 rpm.



Mounting

The EX54SS is shipped standard with a mounting deck plate (below) featuring an eight bolt pattern for the purpose of anchoring a cap plate suited to the coupling system utilized by the carrier to which the unit is to be installed. The dimensions of the deck plate and the bolting pattern are supplied in the following diagram.





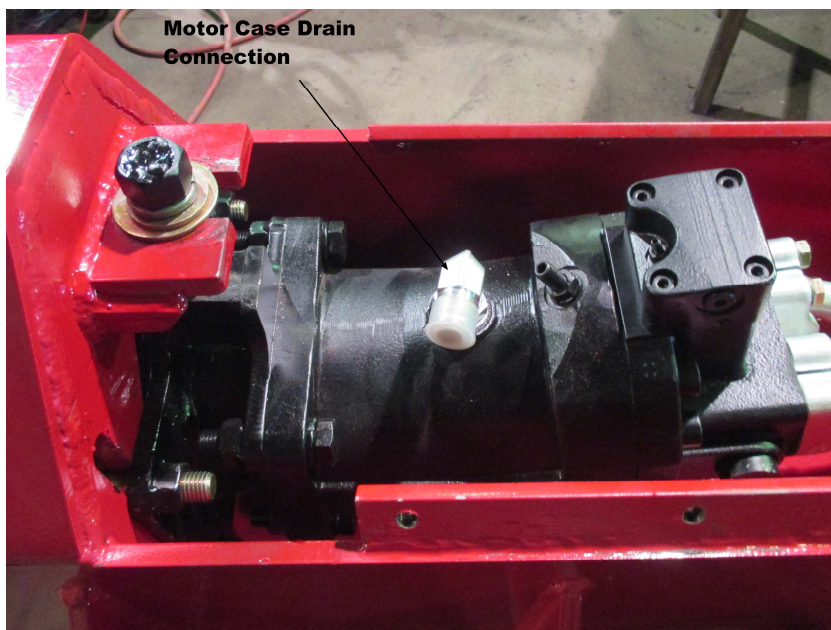
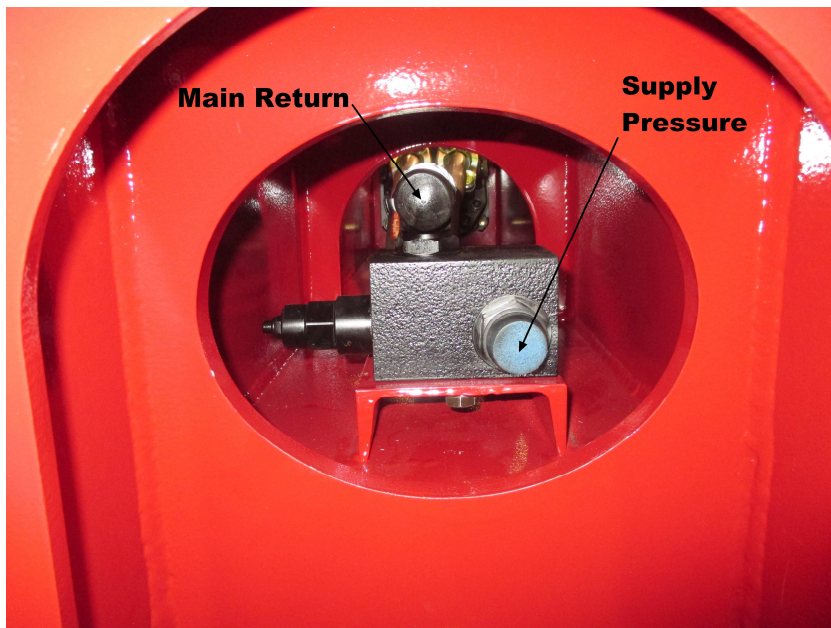
Boom End



Hydraulic Connections

Referring to the following figure the hydraulic conductor connection points are Supply Pressure, Main Return and Case drain.

Note: Motor Cover must be removed to make case drain connection.





Pressure Oil

Main pressure oil should be supplied to the unit at a value as close to 4800 psi or 330 bar (200 psi or 14 bar below mulcher on-board relief pressure setting of 5000 psi or 345 bar) as possible for optimum performance. Motor torque is directly proportional to the value of the supplied pressure and so lower supplied pressure translates into decreased performance.

Main Return Oil

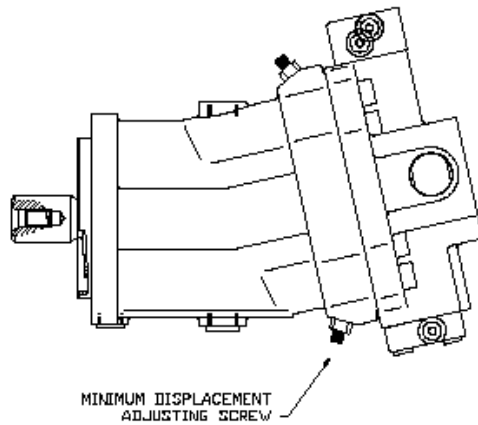
The main return oil line should ideally be connected to the main return header up stream of the hydraulic cooler. Alternatively the main return oil may be routed directly to the hydraulic reservoir via a suitably sized auxiliary hydraulic oil filter system. Main returns are commonly allowed to return to tank through the directional control valve from which the pressure oil is supplied although this is the least efficient configuration due to increased back pressure and heat generated due to throttling losses through the directional control valve.

Case Drain Oil

Under normal operating conditions, motor case drain oil line pressure must not exceed 44 psi (3 bar). Momentary case pressure is acceptable under cold start conditions but must not exceed 73 psi (5 bar). Operation with case drain pressure in excess of the specified limits may result in external leakage due to damage to motor seals, gaskets or housing.



Adjusting The AA6VM 160HA1 Hydraulic Motor



The EX54SS comes standard with a Bosch Rexroth 160 cc variable displacement motor with pressure dependant control.

The hydraulic motor will shift from minimum displacement and higher speed and less torque to maximum displacement and maximum torque depending on how the motor is set up and load pressure. The motor is shipped with a shift (or begin of regulation) point of 3500 psi or 241 bar which basically means that the motor will begin to shift from minimum to maximum displacement at 3500 psi or 241 bar.

For example, when cutting lighter material (brush and smaller trees) load pressure will typically be lower (say for the purpose of this discussion 2500 psi or roughly 170 bar). In this case the motor will be running at minimum displacement and the rotation speed will be at (or closer to) maximum i.e. 2700 rpm. Moving to heavier material (larger trees and stumps) load pressure will typically increase during these heavier grinding operations. Once the load pressure climbs to 3500 psi or 241 bar, the motor will automatically shift to maximum displacement and torque (to prevent stalling) and rotor speed will decrease significantly as a result. The motor will remain at maximum displacement (regardless of how high the pressure climbs) until the rate at which the mulcher is introduced into the material is reduced – allowing the load



pressure to drop and rotor speed to recover to maximum. Likewise the motor will shift to maximum displacement when the mulcher drum is accelerating or “spooling” from zero allowing a **typical dead stall to full speed recovery time of 5 seconds (assuming a 160 horsepower or 120 kw carrier with 4800 psi or 330 bar circuit pressure available to the mulcher)**

The motor maximum and minimum displacements are adjustable however only adjustment of the minimum displacement will be discussed here.

Referring to the figure above, the minimum adjustment screw is located on the bottom of the motor as installed to the EX54SS. The adjustment consists of a socket head. This adjustment should be carried out when the oil temperature is low so as to avoid injury due to contact with the hot surface of the motor.

Using a 6mm hexagon key (Allen key) measuring no more than $\frac{3}{4}$ ” or 19mm on the short leg and no more than 2” or 50mm on the long leg, and a $\frac{3}{4}$ ” or 19mm stubby or short handled combination wrench, loosen the locking nut and then hold in place.

Insert the hex key and back the adjusting screw out to increase speed or turn the adjusting screw in to reduce speed. Adjust rotor speed to approximately 2500 rpm plus minus 200 rpm depending on conditions. Consult Torrent Mulchers technical support for advice regarding your specific carrier and operating conditions.



Replacement Wear Parts

Description	Part #
Cutter Bolt 5/8" x 2" UNF Gr 8	5420001
Cutter Bolt Lock Washer 5/8" High Collar	5420002
2" Tool Holder	5423000
2 1/2" Spherical Cutter	5427000
2 1/2" Square Cutter	5428000