



# C150 HYDRACUTTER INSTRUCTIONS

REIMANN & GEORGER CORPORATION  
CONSTRUCTION PRODUCTS  
P/N 6122055

BUFFALO, NY  
8/25/11

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
<b>1</b>	<b>SAFETY .....</b>	<b>1</b>
1.1	Introduction .....	1
1.2	Safety Definitions .....	1
1.3	Power Source and Saw Safety Labels .....	1
1.4	C150 Saw Safety Rules .....	1
<b>2</b>	<b>SPECIFICATIONS .....</b>	<b>3</b>
2.1	Introduction .....	3
2.2	Technical Data .....	3
2.3	Recommended Hydraulic Oil .....	3
2.4	Nameplate and Serial Number Tag .....	4
<b>3</b>	<b>OPERATION .....</b>	<b>5</b>
3.1	Chain Selection .....	5
3.2	Before Operating the Saw .....	5
3.2.1	Checking the System Hydraulics .....	5
3.2.2	Checking Water Supply .....	6
3.2.3	Checking Chain and Bar .....	6
3.3	Planning the Cut .....	7
3.4	Breaking in a New Chain .....	7
3.5	Cutting Procedure .....	7
3.6	Shutting Down and Storing the Saw .....	8
<b>4</b>	<b>INSPECTION AND MAINTENANCE .....</b>	<b>10</b>
4.1	General Maintenance Rules .....	10
4.2	Bar Inspection and Maintenance .....	10
4.3	Nose Sprocket Replacement .....	11
4.4	Drive Sprocket Inspection and Installation .....	12
4.5	Chain Inspection and Maintenance .....	13
4.6	Chain Installation and Tensioning .....	13
<b>5</b>	<b>TROUBLESHOOTING .....</b>	<b>15</b>
<b>6</b>	<b>FACTORS AFFECTING CHAIN LIFE .....</b>	<b>18</b>
6.1	How Diamond Segments Work .....	18
6.2	Material Factors Affecting Chain Life .....	18
6.3	Operational Factors Affecting Chain Life .....	19
6.4	Chain End-of-Life Modes .....	20
<b>7</b>	<b>PARTS LIST .....</b>	<b>21</b>

## LIST OF FIGURES

FIGURE	DESCRIPTION	PAGE
2-1	Typical C150 Product Nameplate .....	4
3-1	Proper Chain Mounting.....	6
4-1	Dressed Bar Rail .....	11
4-2	Nose Sprocket Clearance .....	11
4-3	Sprocket Assembly .....	12
4-4	Sprocket Wear Measurement .....	13
7-1	C150 HydraCutter Assembly .....	22

# 1 SAFETY

## 1.1 INTRODUCTION

Your Reimann & Georger Corporation C150 HydraCutter has been engineered to provide sawing performance, long term economics and safety advantages that no other type can match. However, even a well-designed and well-built saw can malfunction or become hazardous in the hands of an inexperienced and/or untrained user. Therefore, read this manual and related equipment manuals thoroughly before operating your saw to provide maximum safety for all operating personnel, and to get the maximum benefit from your equipment.

## 1.2 SAFETY DEFINITIONS

A safety message alerts you to potential hazards which could injure you or others or cause property damage. The safety messages or signal words for product safety signs are **DANGER**, **WARNING**, and **CAUTION**. Each safety message is preceded by a safety alert symbol and is defined as follows:

**DANGER:** Indicates an imminently hazardous situation which, if not avoided, **will** cause death or serious injury. This safety message is limited to the most extreme situations.

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

**CAUTION:** Indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury. It may also be used to alert against unsafe practices that may result in property-damage-only accidents.

## 1.3 POWER SOURCE AND SAW SAFETY LABELS

These labels warn you of potential hazards that could cause injury. Read them carefully. If a label comes off or becomes illegible, contact Reimann & Georger Corporation for a replacement.

## 1.4 C150 SAW SAFETY RULES

1. Only trained personnel shall operate the saw or do repairs. A trained person is one who has read and thoroughly understands this instruction manual and related equipment manuals and, through training and experience, has shown knowledge regarding the safe operational procedures.
2. Sawing area must be kept clear of unauthorized personnel at all times. Place barricades or secure the area with signs and a roped boundary to prevent personnel injury.
3. Never use the saw in an explosive atmosphere and/or near combustible material that could be ignited by a spark.
4. Do not use a saw that shows any signs of damage. Do not use the saw if the chain does not stop rotating when the power-activating trigger lever is released.
5. The guard provides protection against contact with moving parts, ejected debris, broken chain, thrown water and concrete slurry. Never run the saw without the chain guard in place.
6. Never allow anyone to stand in front of, or in line with, the chain forward of the guard.
7. **Always** use safety footwear, a snug fitting wet suit, safety goggles or face shields, and hearing and head protection devices. Safety shoes **MUST** provide good footing to prevent slipping or falling down. Gloves protect the hands from chips and should be worn.
8. Do not use the saw when you are tired or fatigued.
9. Never operate the saw under the influence of drugs, alcohol, or medication.
10. Always carry the saw in its de-energized state.

11. Keep the saw handles dry, clean, and free of oil or fuel.
12. Do not start cutting without first de-energizing electrical wiring near the cutting site or imbedded in the concrete.
13. Before cutting through a wall, check both sides for possible obstructions.
14. Prior to cutting, plan your cuts to prevent pinching of the bar or personnel injury from falling concrete.
15. Always hold the saw with both hands during operation. Use a firm grip on the handles.
16. Never exceed the flow and pressure rating of the saw which is 8 gpm at 2500 psi.
17. Do NOT attempt to adjust the saw during operation.
18. Keep clothing and all parts of the body away from moving parts of this saw when connected to a power source or being used.
19. The slurry formed during cutting operations is very slick. Remove while still wet to prevent yourself or others from slipping while cutting. Slurry that has been allowed to dry is very difficult to remove.
20. Always shut off the hydraulic power and cooling water sources before disconnecting the hoses or servicing the saw.
21. Always shut off the hydraulic and cooling water sources when not using the equipment.

## 2 SPECIFICATIONS

### 2.1 INTRODUCTION

Your Reimann & Georger Corporation C150 hydraulic hand-held saw is a rugged versatile tool that makes clean, fast, precise, and straight cuts through concrete, reinforced concrete, masonry, stone, and other aggregates. As with most hydraulic tools, the hydraulic system requirements detailed in the following sections must be met but not exceeded to support tool performance and longevity of equipment.

### 2.2 TECHNICAL DATA

The following specifications apply to the C150 HydraCutter.

	ENGLISH	METRIC
<b>Tool Physicals</b>		
Weight	30 lbs.	(14 kg.)
Bar Size (15 in. bar)	15 in. x 4 in.	(38.1 x 10.16 cm)
Bar Size (20 in. bar)	20 in. x 4 in.	(50.8 x 10.16 cm)
Dimensions (with 15 in. bar)	43 x 6.5 x 12 in.	(109 x 16.5 x 30.5 cm)
Dimensions (with 20 in. bar)	48 x 6.5 x 12 in.	(121.7 x 16.5 x 30.5 cm)
Depth of Cut (with 15 in. bar)	15 in.	(381 mm)
Depth of Cut (with 20 in. bar)	20 in.	(508 mm)
<b>Chain</b>		
Segments (for 15 in. bar)	76	
Segments (for 20 in. bar)	88	
Segment Dimensions	0.394 x 0.216 x 0.157 in.	(10 x 5.5 x 4 mm)
<b>Bar</b>		
Nose Sprocket		14 tooth
<b>Hydraulic Requirements</b>		
Type of System		Open-Center
Flow Rate	8 gpm	(30 lpm)
Max Pressure Range	2000–2500 psi	(138–172 bar)
Back Pressure (Max)	1000 psi	(69 bar)
Hose Length (Max)	100 ft.	(30 m)
Couplings		½” HTMA flush face
<b>Water Requirements</b>		
Flow Rate	2.5 gpm	(9 lpm)
Pressure (Min)	50 psi	(3 bar)
<b>Operation</b>		
Power @2000 psi	9 Hp	( 7 kw)
Power @2500 psi	11.7 Hp	(8.7 kw)
Torque @2000 psi	150 in.-lbs.	(17 Nm)
Torque @2500 psi	180 in.-lbs.	(21.3 Nm)
Speed (Max)		4100 rpm

### 2.3 RECOMMENDED HYDRAULIC OIL

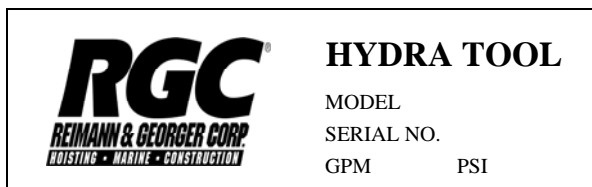
Viscosity	140-225 SUS @ 100°F	(28-45 cSt @ 38°C)
	40 min. SUS @ 210°F	(8 min. cSt @ 99°C)
Flash Point	340°F min.	(170°C min.)
Pour Point	-30°F min.	(-34°C min.)

Many types of compatible hydraulic oil are available through your local dealer/distributor. As an original equipment manufacturer, RGC uses a Grade ISO VG 32 hydraulic turbine oil.

Hydraulic oil types are too numerous to list in this manual. If you have any question concerning the type of oil suitable for C150 operation, please consult your local supplier or Reimann & Georger Corporation for details.

## 2.4 NAMEPLATE AND SERIAL NUMBER TAG

It is important to identify the saw completely and accurately whenever ordering spare parts or requesting assistance in service. The saw has a product nameplate that states the model and serial numbers. The saw label should appear as the sample nameplate shown in Figure 2-1. Record the model and serial numbers for future reference.



**Figure 2-1.**  
**Typical C150 Product Nameplate**

**MODEL** \_\_\_\_\_

**SERIAL NUMBER** \_\_\_\_\_

## 3 OPERATION

### 3.1 CHAIN SELECTION

Correct chain type selection is critical in maximizing chain life and cutting performance. Refer to the table below as a guide in the chain selection. However, no direct rule determines which chain type is optimum because many material factors also influence selection. Refer to Chapter 6 for more information on factors affecting chain life.

Model	Description
SL25 (76 or 88 segments)	For cutting hard/very hard aggregate concrete (flint, chert, granite, etc.) with heavy steel reinforcing. Heavy steel reinforcing is defined as 5/8" [16 mm] or larger rebar—1/2 closer than 4" o.c. ("on center").  It is not advisable to use this chain on soft or medium aggregate concrete, masonry brick, concrete block, or under highly abrasive conditions.
SL25 (76 or 88 segments)	For cutting medium soft/medium hard aggregate concrete (granite, quartz, river rock, etc.) with moderate steel reinforcing. Moderate steel reinforcing is defined as (1/2" [13 mm] or smaller rebar—1/2 farther than 4" o.c.  It is not advisable to use this chain on heavy steel reinforcing (5/8" [16 mm] diameter & larger), soft or very hard aggregate concrete, masonry brick, or concrete block.
SL45 (76 or 88 segments)	For cutting soft/medium soft aggregate such as abrasive and "green" concrete, concrete block, masonry brick or under highly abrasive conditions  Do NOT use this chain on any type of steel reinforcing, or medium or very hard aggregate concrete.

### 3.2 BEFORE OPERATING THE SAW

The following systems must be checked before you can use the saw safely. Running the saw with an undetected defect in any of these systems will quickly cause equipment damage.

1. Hydraulic system
2. Water supply and distribution
3. Chain and bar

#### 3.2.1 Checking the System Hydraulics

1. Read and fully understand the operating manual for the hydraulic power source being used.
2. Always check the hydraulic power supply flow and pressure output. Never exceed the maximum hydraulic flow rate of 8 gpm (30 lpm) and maximum pressure of 2500 psi (172 bar). Overspeeding the chain causes increased chain wear, leading to loss of strength and possible chain breakage.
3. If the oil flow from the hydraulic power supply cannot be adjusted below the maximum flow rate, a flow divider must be installed. This will ensure the saw receives the correct flow and excess oil is returned to the tank.
4. To protect the saw from excessive pressure, the pressure relief valve of the hydraulic power source must be set at 2500 psi (172 bar). If this is not possible, a separate pressure relief valve set at 2500 psi (172 bar) must be installed in the system. If in doubt, contact your dealer.
5. The hydraulic power source must be fitted with a 10-25 micron oil filter.
6. Before making any hydraulic connections, inspect all hoses for leaks and risks of rupture as follows:

- a. Inspect each hose for breaks, cracks, worn spots, bulges, chemical attack, kinks or any other damage. Never try to stop any detected leak with any body parts. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic oil.
- b. Replace a damaged hose immediately. Never repair the hose.



**WARNING:**

**LIQUID UNDER HIGH PRESSURE CAN PIERCE THE SKIN, CAUSING DEATH OR SERIOUS INJURY. IN CASE OF INJURY, GET IMMEDIATE MEDICAL ATTENTION.**

7. The saw uses flush-face quick-release couplings that are durable and easy to clean. Wipe the mating surfaces of the couplings with clean rag prior to making connection. They are always fitted such that the male part gives oil and the female part receives oil.



**WARNING:**

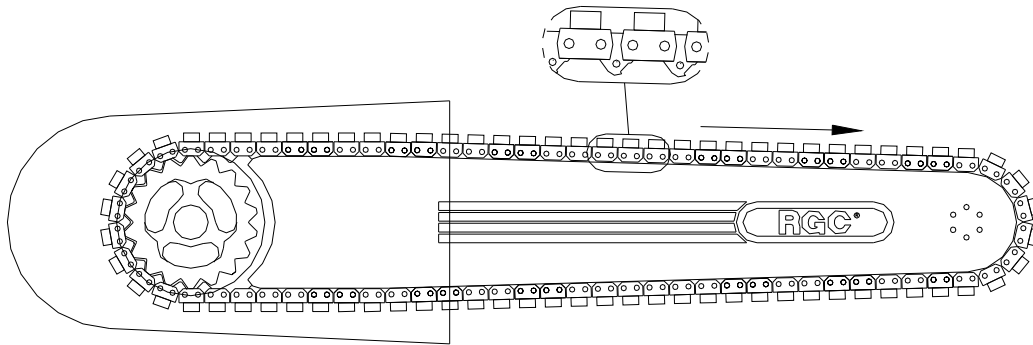
**ENSURE HYDRAULIC HOSES ARE PROPERLY CONNECTED AND IN GOOD CONDITION.**

### 3.2.2 Checking Water Supply

1. The water supply must be connected and tested before operating the saw. Check for proper water distribution by triggering the saw with the hydraulic power supply off and the chain not yet installed. You should see water coming out the three water ports each on the top and bottom of the bar and around the nose sprocket. If not, use a #10 wire to clean the water ports, keeping in mind that the water ports are tilted forward at 30 degrees.
2. The water pressure at the saw must be between 50–160 psi (3–9.6 bar) with a flow rate of 2.5 gpm (9 lpm). For best performance, use an RGC in-line water pump. **Permanent chain, bar, and drive and nose sprocket damage will occur if the saw is run without water, or with a water volume or pressure that is too low. This damage can include excessive chain stretching, excessive drive and nose sprocket wear, and shorter chain life.** The recommended water pressure for most applications is between 80–100 psi.

### 3.2.3 Checking Chain and Bar

1. The bottom rail wears at a much faster rate than the top rail because of the downward motion during cutting. It is recommended that the bar be turned over on a regular basis to ensure even wear.
2. Inspect the chain for cracks, missing segments or bumpers, or signs of overheating (discoloration) or other damage before mounting and before each use.
3. Inspect the chain chassis for wear. Wearing of the chain chassis is typically referred to as “chain stretch.” If the bar adjustment screw cannot be tightened sufficiently to prevent the drive tangs from coming completely out of the groove, the chain chassis is considered to be excessively stretched. Discard the chain.
4. Inspect the cutting segment for wear. The segment is considered worn out when the segment height is worn to about 1/16”, or when the segment and chain chassis are the same width.



**Figure 3-1.  
Proper Chain Mounting**

5. The chain **MUST** be installed with the bumper link leading the diamond segment. See Figure 3-1. **Backward (reverse) chain installation can cause excessive vibration, rough cutting, reduced chain life, and chain breakage**
6. Check for proper chain tension as described in Chapter 4.
7. Check that the chain guard is in the mounting grooves and that the socket head screw is tight.
8. Always operate a new chain at the rated rpm for two minutes before cutting to verify proper chain mounting and tension. The chain should be moving away from you (i.e., forward direction) at the top of the power bar. If it is not, change the position of the forward/reverse lever on the power unit, if equipped, or reverse hydraulic connections at power unit.

### **3.3 PLANNING THE CUT**

1. This saw is not insulated. Do not start cutting without first de-energizing electrical wiring imbedded in the concrete and near the cutting site.
2. When cutting a structural member such as a wall, ensure the cut will not weaken the structure such that it will cause a failure.
3. Plan the sequence of cuts to prevent the weight of the material being cut from pinching the bar and chain, causing it to bind. Start with the base horizontal cut and proceed with the remaining cuts.
4. The material being cut must be rigidly supported to prevent it from falling and causing personnel injury.
5. The planned line of cut can be outlined with a permanent marker for a visual guide.
6. For long vertical or horizontal cuts, the cutting line can be first scored with a groove using the nose of the bar. The groove will help guide the bar for a straight cut.

### **3.4 BREAKING IN A NEW CHAIN**

1. Before using a new chain, the cutting segments must be dressed by cutting in an abrasive material such as cinder blocks or bricks.
2. Looking at the cutting segment closely, you should be able to see the diamond particles exposed, raised slightly higher than the surrounding surface.
3. Check the chain tension frequently during the first thirty minutes of operation of a new chain.

### 3.5 CUTTING PROCEDURE



#### **WARNING:**

**THE CHAIN GUARD MUST BE IN PLACE BEFORE STARTUP AND DURING SAW OPERATION. FAILURE TO DO THIS CAN CAUSE SERIOUS PERSONAL INJURY.**

1. Review all safety procedures in Chapter 1 of this manual and in the manual supplied with your hydraulic power unit.
2. Grasp the auxiliary handle with your left hand. Use the appropriate part of the handle for making the first cut.
3. Grasp the trigger with your right hand.
4. Position the saw in the appropriate place to make the desired cut.
5. Disengage the trigger lockout. Then depress (squeeze) the trigger to start the saw.
6. When putting the chain into an existing cut, the cut must be the same width as the chain. Putting the chain into an existing cut narrower than the chain will rapidly wear the side clearance of the chain and could cause chain breakage.
7. When starting a cut, do not bang the chain into the cutting medium. Jarring impacts can decrease the life and performance of the chain.
8. Plan the cutting strategy before starting. Once the saw starts cutting, you cannot change direction of a cut easily. Do not twist the bar in the cut.
9. Do not apply excessive feed force. A constant chain speed is important for optimum cutting.
10. When plunge cutting, increase the opening of the cut by rocking the saw up and down. Aggressive plunge forces may cause the saw to jam when exiting the cut. If the saw does become jammed in a plunge cut, you can release the saw as described in Chapter 5.
11. Check chain tension frequently during cutting.

### 3.6 SHUTTING DOWN AND STORING THE SAW

1. Stop the saw by releasing the trigger lever.
2. Stop the hydraulic power source following the procedure in the respective instruction manual.
3. Clean the slurry off the saw with water before it dries.
4. Shut off water supply.
5. Disconnect the hydraulic hoses from the saw.



#### **WARNING:**

**NEVER DISCONNECT ANY HYDRAULICALLY OPERATED PART OF THE SAW OR REMOVE HYDRAULIC COMPONENTS, LINES, OR FITTINGS WHILE THE POWER SOURCE IS RUNNING OR WHENEVER THE HYDRAULIC FLUID IS HOT.**

6. Allow the water to drain out of the saw by pointing the nose down and triggering the valve on. If available, blow the water out of the saw with compressed air. Spray entire saw with a light coating of oil to make cleanup easier next time. Make sure the chain, bar, and bar nose sprocket have a coating of oil to prevent rusting.
7. Secure the saw and hydraulic power source to prevent unauthorized use.

8. Store the saw away from excessive heat or moisture. Store in a clean, dry area away from exposure to high humidity, water, other liquids, or freezing temperatures. Avoid temperatures low enough to cause condensation on the chain when moving it from storage to a higher temperature. Always handle and store chains carefully.
9. Do not stack material on top of the saw that may cause the chain or bar to bend or deform.

## 4 INSPECTION AND MAINTENANCE

### 4.1 GENERAL MAINTENANCE RULES

Hydraulic fluid can become contaminated after extended periods of use which can cause restrictions in the system. Check to see that the fluid is clean, and change at recommended intervals to extend saw's life. Refer to the respective manual for maintenance information on the hydraulic power source.

1. Proper maintenance of the saw and related equipment requires timely adhering to all the guidelines given in this chapter. Proper maintenance is required to maintain the system in good condition and free of defects.
2. Review and follow all the safety rules given in Chapter 1 before attempting any maintenance.
3. Only authorized personnel should be allowed in the maintenance area. Authorized personnel are the trained people as defined below and their supervision.
4. Repairs must be made only by trained personnel. A trained person is one who has read and thoroughly understands this instruction manual and related equipment manuals and, through training and experience, has shown knowledge regarding the safe operational procedures.



#### **CAUTION:**

**BEFORE STARTING ANY MAINTENANCE, DISCONNECT SAW FROM HYDRAULIC POWER SOURCE TO PREVENT ACCIDENTAL STARTUP.**



#### **WARNING:**

**DURING ANY MAINTENANCE OR REPAIR PROCEDURES, DO NOT ATTEMPT ANY SAWING. THIS CAN CAUSE EQUIPMENT DAMAGE AND/OR PERSONAL INJURY.**

### 4.2 BAR INSPECTION AND MAINTENANCE

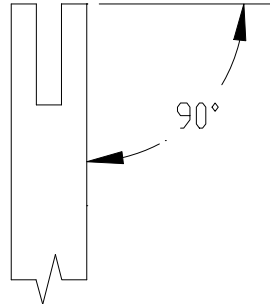
1. Before installing the bar, insure the bar is not bent or twisted.
2. Ensure that the bar rails are dressed squarely as shown in Figure 4-1 with the wire edges removed. As the bar rails wear down, sharp burrs are formed on the edge of the rails, which are typically referred to as wire edges. If ignored, wire edges mushroom over and affect cutting performance.
3. Ensure the nose sprocket rotates freely.
4. Check the clearance between the nose of the bar side-plates and the chain chassis; when new, there is 1/32" clearance. The nose sprocket must be replaced before the chain chassis begins to ride directly on the nose of the bar side-plates. Refer to Figure 4-2.
5. The bottom rail wears at a much faster rate than the top rail because of the downward motion during cutting. It is recommended that the bar be turned over on a regular basis to ensure even wear.
6. Check the bar rail wear. The bar is considered worn-out when any section of the chain groove bottom contacts the chain.
7. Install the bar by aligning the mounting holes on the bar with the holes on the bar clamp (#1) and bar adapter (#30) as shown in Figure 7-1. Use the 1/4" Allen wrench provided to securely fasten the four bar-mounting screws (#2).
8. Check the water ports for proper water distribution by triggering the saw with the water connected and hydraulics disconnected. Water should be coming out of the three water ports each on the top and bottom of the bar and around the nose sprocket. If not, use a #10 wire to clean the water ports. Note that water ports are tilted forward at a 30° angle.
9. Ensure water is completely drained out of the saw. If available, blow the water out with compressed air.



## CAUTION:

NEVER RUN THE SAW WITH PLUGGED WATER PORTS. THIS CAN CAUSE OVERHEATING AND RESULTING EQUIPMENT DAMAGE.

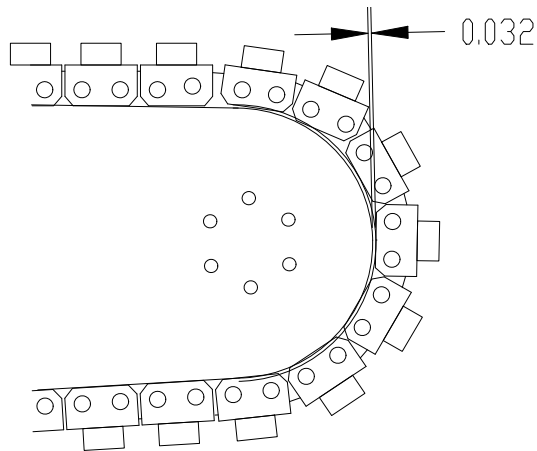
10. Ensure the bar and nose sprocket have a light coat of oil to prevent rusting.



**Figure 4-1**  
**Dressed Bar Rail**

### 4.3 NOSE SPROCKET REPLACEMENT

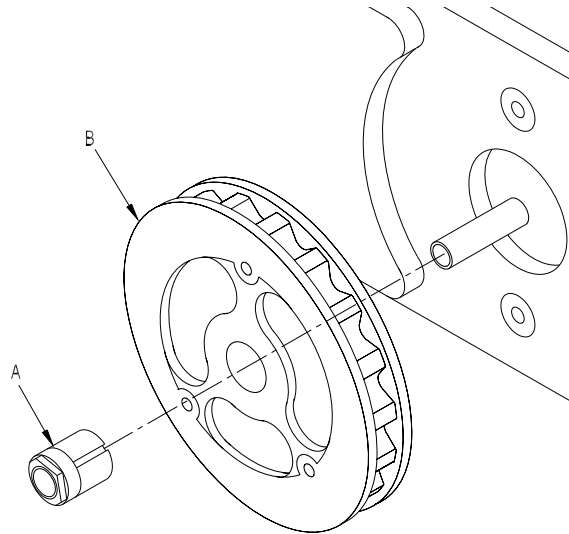
The nose sprocket will wear more quickly than the bar rails under normal working conditions. When new, there is 1/32" clearance between the nose of the bar side-plates and the chain chassis. The nose sprocket must be replaced before the chain chassis begins to ride directly on the nose of the bar side-plates.



**Figure 4-2**  
**Nose Sprocket Clearance**

1. Using the chain breaker, punch out the six rivets and discard.
2. Use a slotted screwdriver to carefully spread the bar side-plates apart. Be careful not to deform the bar side-plates by over-bending them.
3. Use a rag or paper towel to clean the nose sprocket area. Inspect the inner surfaces where the bearings ride. If a groove has formed, it is not advisable to replace the nose sprocket. Replace the bar instead.
4. With the side-plates spread apart the minimum space needed, install the new nose sprocket by sliding the assembly on the insertion card into position. Align the six rivet holes. Insert the six rivets into the holes without breaking through the insertion card and lightly hold them in place. Carefully remove the insertion card and screwdriver.

5. Place the insertion card over the rivets. Holding the rivets in place with the insertion card, turn the bar over onto a flat steel surface. Remove and discard insertion card. With the bar solidly supported on a flat steel surface, carefully peen the rivet heads with the flat end of a hammer. Be very careful not to hit the bar body because it will pinch the nose sprocket. Rivet heads must completely fill the countersinks in the bar body to hold the nose sprocket securely while still allowing the sprocket to turn freely.
6. File the rivet heads as close to the bar body as possible.



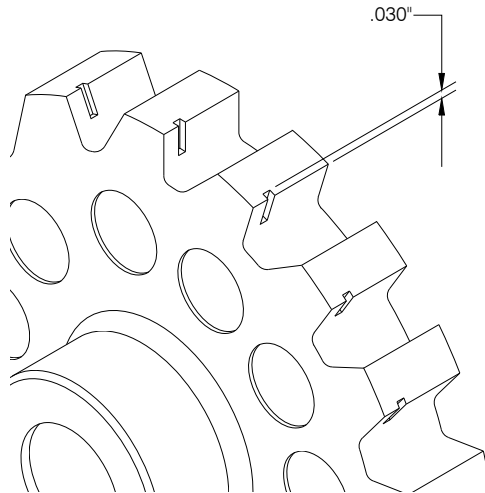
**A. Trantorque® bushing**  
**B. Drive sprocket**

**Figure 4-3**  
**Sprocket Assembly**

#### **4.4 DRIVE SPROCKET INSPECTION AND INSTALLATION**

Refer to Figure 4-3. The sprocket assembly consists of the Trantorque® bushing “A” and the drive sprocket “B.” Proceed as follows:

1. Check the wear marks on the driving face. Replace the drive sprocket before the wear marks are deeper than 1/32” as shown in Figure 4-4. The outside diameter is also wearing surface. Do NOT turn around and continue using a worn drive sprocket. A worn drive sprocket will increase wear on the chain chassis.
2. Before installing the drive sprocket, carefully inspect the Trantorque® bushing for scoring on the inside diameter, dried slurry or other debris on the threads and between the moving parts of the assembly. Do NOT lubricate the bushing.
3. Slide Trantorque® onto shaft so that shaft extends completely through the bore.
4. Slide the drive sprocket over the Trantorque® so that gold portion is within the bore approximately 1/16” past the edge. Be sure the nut flats protrude so that a wrench can be used.
5. Hand tighten the Trantorque® nut clockwise until snug. Looking from the top, the center of the drive sprocket must be centered with the bar groove.
6. Make any fine adjustments to the position of the drive sprocket. Holding the drive sprocket with the supplied drive sprocket lock handle, tighten the nut of the unit with a torque wrench to 200 in.-lbs., 17 ft.-lbs., or 22.6 newton-meters. Do NOT use a pipe wrench or pliers.



**Figure 4-4  
Sprocket Wear Measurement**

#### 4.5 CHAIN INSPECTION AND MAINTENANCE

Inspect the chain before mounting and before each use.

1. Ensure there are no missing segments or bumpers. There must be either 38 or 44 segments with a bumper link between each segment.
2. Ensure there are no signs of cracking, overheating, or other damage.
3. Check the wear of the chain chassis, typically referred to as “chain stretch”, by tensioning the chain as described in Section 4.6. The chain chassis is considered worn out or excessively “stretched” if the chain cannot be tensioned sufficiently to prevent the drive tangs from coming completely out of the groove. Discard the chain.
4. Check the segment wear. The segment is considered worn-out when the height is worn down to about 1/16”, or when the segment width is the same as the chain chassis.

After each use clean the slurry and debris off the chain; then apply a light coating of oil to prevent rusting.

A broken chain that is not worn-out can be repaired. There is a complete line of chain repair accessories available from RGC. Separate instruction manuals are provided for the chain breaker and rivet spinner. Read these manuals before attempting these repair procedures.

#### 4.6 CHAIN INSTALLATION AND TENSIONING

Refer to the Figure 7-1 assembly drawing in Chapter 7 throughout the following procedure.



**WARNING:**  
**FAILURE TO DISCONNECT THE POWER SUPPLY BEFORE STARTING CAN CAUSE EQUIPMENT DAMAGE AND/OR PERSONAL INJURY.**

1. Ensure the hydraulic hoses to the saw are disconnected before starting.
2. With the guard removed, loosen the four bar-adapter-mounting screws (#26) and back out the bar adjustment screw (#29) all the way by turning it counter-clockwise.
3. Inspect the drive sprocket (#4) and the bar (#25) as described in sections 4.4 and 4.2 respectively.

4. Install the chain by placing it around the drive sprocket making sure the bumpers lead the segments. Then, run the drive tangs into the top groove of the bar and rotate it around the bar. **Backward (reverse) chain installation can cause excessive vibration, rough cutting, reduced chain life, and chain breakage.** Make sure all drive link tangs are positioned inside the groove of the bar.
5. Tighten the bar adjustment screw (#29) clockwise until chain is snug to the bar but still able to rotate around the bar. Chain tension needs to be readjusted before the drive tangs can come completely out of the groove.



**CAUTION:**

**IF THE CHAIN IS TOO LOOSE DURING SAW OPERATION, THERE IS AN INCREASED RISK OF CHAIN THROWING. THE PRE-INSTALLED BOLT ON THE #1 BAR CLAMP PREVENTS THE CHAIN FROM COMPLETELY FLYING OFF THE SAW DURING A CHAIN THROW, BUT A CHAIN THROW CAN STILL CAUSE EQUIPMENT DAMAGE.**

6. Tighten the bar-adapter-mounting screws (#26).
7. Slide the guard into the lower mounting groove first, then the top groove. Secure the guard in place by tightening the screw (#15).



**WARNING:**

**NEVER OPERATE THE SAW WITHOUT THE GUARD INSTALLED. DOING THIS CAN CAUSE PERSONAL INJURY.**

## 5 TROUBLESHOOTING

The following chart is intended to assist with troubleshooting the C150 HydraCutter. While not all inclusive, the chart outlines the most common causes of a problem and the recommended course of action.

Consult your hydraulic power supply manual for troubleshooting this part of your system.

SYMPTOM	CAUSE	CORRECTIVE ACTION
Saw will not cut straight.	<p>Operator feed force not applied directly over centerline of bar.</p> <p>Frame is bent.</p> <p>Uneven bar rail wear.</p> <p>Uneven chain segment profile.</p> <p>Operator unable to maintain a level and straight saw position.</p> <p>Bent or twisted bar.</p> <p>Excessive clearance in wall walker pivot points.</p>	<p>Move hand closer to centerline of bar.</p> <p>Repair or replace frame.</p> <p>Dress rails square or turn bar over as described in Section 4.2.</p> <p>Replace bar.</p> <p>Redress segment by cutting in an abrasive medium such as concrete, cinder blocks, or bricks.</p> <p>Use an attached guide on wall (i.e., 2 x 4, wood rails).</p> <p>Use a precut slot in the wall the full length of desired cut to be made.</p> <p>Replace bar.</p> <p>Replace wall walker.</p>
Premature chain stretch.	<p>Chain is mounted backwards with bumper side of diamond segment not being the side to first contact the cutting groove.</p> <p>Insufficient water supply.</p> <p>Hydraulic flow is exceeding 8 gpm (30 lpm).</p> <p>Loose chain tension.</p> <p>Excessive groove worn in drive sprocket.</p> <p>Improper operator technique.</p>	<p>Inspect chain as described in Section 4.5 before re-installing.</p> <p>Plugged bar water ports:</p> <ul style="list-style-type: none"> <li>(a) Clean ports with #10 wire.</li> <li>(b) Check and verify that water supply is clean.</li> <li>(c) Install inline water filter.</li> <li>(d) If unable to maintain water pressure between 50–160 psi (3.5–9.6 bar) with a minimum flow rate of 2.5 gpm (9.5 lpm), use an RGC inline water pump.</li> </ul> <p>Adjust power supply or use a flow divider to limit hydraulic flow to 8 gpm (30 lpm).</p> <p>Maintain the chain tension as described in Section 4.6.</p> <p>Replace drive sprocket.</p> <p>Minimize impacting when cutting steel.</p> <p>Minimize rapid chain stops, such as jamming.</p>

<p>Excessive vibration and rough cutting.</p>	<p>Segment(s) broken or missing from chain.</p> <p>Loose chain tension.</p> <p>Loose bar mounting bolts.</p> <p>Chain installed backwards on saw as described above under the heading “Premature Chain Stretch.”</p> <p>Worn bar nose sprocket.</p> <p>Worn drive sprocket.</p> <p>Excess feed force when cutting rebar.</p>	<p>Remove and repair broken chain section as described in Section 4.5.</p> <p>Maintain chain tension as described in Section 4.6.</p> <p>Tighten bolts as described in Section 4.6.</p> <p>Inspect chain as described in Section 4.5 before re-installing.</p> <p>Replace parts as described in Section 4.3.</p> <p>Replace drive sprocket.</p> <p>Reduce feed force.</p>
<p>Bar nose sprocket does not turn</p>	<p>Nose bearings worn and are jammed between inner and outer race.</p> <p>Bent or twisted bar.</p>	<p>Replace bar nose sprocket as described in Section 4.3.</p> <p>Replace bar.</p>
<p>Saw cuts slowly</p>	<p>Loss of diamond segment side or top clearance.</p> <p>Chain segment dulled because of continuous use in hard material or steel.</p> <p>Wire edged bar rails.</p> <p>Hydraulic flow is below 8 gpm.</p> <p>Hydraulic pressure relief is set below 2500 psi.</p> <p>Drive sprocket slipping on drive shaft.</p> <p>Chain tension too tight or too loose.</p> <p>Chain slipping through worn teeth on drive sprocket.</p> <p>Hydraulic hoses too long or too small in diameter.</p> <p>Hydraulic oil leaking on chain.</p> <p>Chain slipping through worn teeth on drive sprocket.</p>	<p>Replace chain.</p> <p>Redress segment by cutting in abrasive material such as concrete building block or brick.</p> <p>Choose the right chain for the cutting condition. Select either CH, or CR as described in Section 3.1.</p> <p>Dress the top and sides of the bar rails squarely with a grinder or belt sander. See Section 4.2.</p> <p>Adjust hydraulic power source.</p> <p>Adjust hydraulic power source.</p> <p>Readjust and tighten Trantorque® shaft adapter. See Section 4.4.</p> <p>Readjust chain tension as described in Section 4.6.</p> <p>Install new drive sprocket. See Section 4.4.</p>

<p>Saw cuts slowly. (continued)</p>	<p>Hydraulic hoses too long or too small in diameter.</p> <p>Hydraulic oil leaking on chain.</p>	<p>Select the shortest hose that is feasible. The maximum hose length for 1/2" hose is 100 feet.</p> <p>Check the following locations for leaks:</p> <ul style="list-style-type: none"> <li>(a) Quick disconnect fittings.</li> <li>(b) Saw control valve assembly.</li> <li>(c) Saw motor hydraulic fittings.</li> <li>(d) Saw motor shaft.</li> <li>(e) O-ring leak at valve spool assembly which controls both oil and water flow—replace O-ring.</li> </ul> <p>Adjust or replace appropriate part.</p>
<p>Saw wedged tightly in plunge cut.</p>	<p>Excessive feed force when exiting back side of plunge cut.</p>	<p>Turn off power supply; then loosen chain tension and remove saw from cut.</p>
<p>Saw is binding in the cut.</p>	<p>Bar is bent or twisted.</p> <p>Frame is bent.</p> <p>Saw not cutting a straight line.</p> <p>Side clearance of chain worn.</p> <p>Excessive clearance in wall walker pivot points.</p> <p>Wire edged bar rails.</p>	<p>Replace bar.</p> <p>Repair or replace frame.</p> <p>Refer to "Saw Will Not Cut Straight" part of troubleshooting chapter.</p> <p>Replace chain.</p> <p>Replace wall walker.</p> <p>Dress top and sides of the bar rails squarely with a grinder or belt sander. See Section 4.2.</p>

## 6 FACTORS AFFECTING CHAIN LIFE

Optimum performance from your chain saw will depend largely on selecting the proper chain for the application. If the cutting medium is too soft for the chain rating used, you may get fast chain wear. If the cutting medium is too hard for the chain rating used, you will get segment glazing and/or very poor cutting performance. This chapter is a guide in making the proper chain selection.

### 6.1 HOW DIAMOND SEGMENTS WORK

Cutting concrete, stone, and other hard, brittle materials is a grinding or abrading action. Cutting segments are composed of hard, abrasion resistant diamond particles distributed randomly in a metal matrix. The diamonds abrade or scratch out particles of the hard substrates during the cutting operation. Even though diamond is the hardest substance known to man, it does wear out or break down. New diamonds are exposed as the metal bond wears away. Abrasive particles will wear down a metal bond faster than hard, brittle particles.

### 6.2 MATERIAL FACTORS AFFECTING CHAIN LIFE

There are several material factors that affect the performance and life of diamond segmented chain. Six major factors are summarized as follows:

1. Aggregate Hardness—There are many different types of rocks used as concrete aggregate. Some aggregates are very hard like flint and some are very soft like limestone. A general rule is that the harder the aggregate, the softer the segment bond that is needed. Another general rule is that the harder the aggregate, the slower the chain will cut. A common way of measuring aggregate hardness is the Moh’s Scratch Test.

#### MOH’S SCALE HARDNESS CRITERIA

STANDARD	SCALE	HARDNESS CRITERIA
DIAMOND	10	
CORUNDUM	9	Very hard aggregates (flint, chert, some basalt, some quartz, some trap rock)
TOPAZ	8	
QUARTZ	7	
FELDSPAR	6	Hard aggregates (some quartz, some granite, some basalt, some river gravel, some trap rock)
APATITE	5	Medium hard aggregates (some granite, some river rock)
FLUORITE	4	
CALCITE	3	Medium aggregates (dense limestone, sandstone, dolomite, marble)
GYPSUM	2	Medium soft aggregates (soft limestone)
TALC	1	

2. Aggregate Size—As the rock size increases, cutting generally will be slower and the chain life will decrease. Common U.S. aggregate sizes are sieved at 1-1/2”, 1”, 3/4”, and 3/8”.
3. Size and Quantity of Reinforcing—Steel reinforcing critically affects diamond chain life. Quantifying the amount of reinforcing can generally be divided into two levels:

Heavy

- 5/8” (16 mm) diameter or larger with any center distance
- 1/2” (13 mm) diameter or larger with less than 4” (100 mm) center distance
- Pre-stressed cable/wire

Light

- 1/2” (13 mm) diameter with greater than 4” (100 mm) center distance
- 3/8” (10 mm), 1/4” (6 mm) or smaller diameter with any center distance
- Wire mesh

Steel reinforcing creates large impact forces on both the diamonds and the chain chassis, reducing both the segment life and chain life. Generally, as the ratio of steel in the concrete cross section increases, the performance and chain life are greatly reduced. When steel is encountered while cutting, the feed force should be reduced.

4. Sand Shape—Angular types of sand such as manufactured (crushed) and bank sand are more abrasive than rounded sand such as river or wind-blown sand.

Angular sands decrease both the segment life and chain life. The diamond segment bond is abraded at a higher rate. Sharp, fine sand increases the wear on the chain chassis, especially if the sand penetrates the rivet joints. Proper water flow rate is critical in maximizing chain life in abrasive conditions. Generally, a harder segment bond is desired for abrasive conditions.

5. Compressive Strength of Concrete—Strength of concrete is a combination of many factors and is usually measured in pounds per square inch (psi). Even though the compressive strength does not indicate the aggregate hardness, there is a relationship between the compressive strength and the hardness of the concrete. A general rule is that the higher the compressive strength, the harder the concrete. Generally, higher strength concretes decrease expected chain life.

**COMPRESSIVE STRENGTH**

<b>CONCRETE HARDNESS</b>	<b>CONCRETE STRENGTH (PSI)</b>	<b>TYPICAL APPLICATIONS</b>
Very hard	8000 or more	Nuclear plants
Hard	6000 - 8000	Bridges, Piers
Medium	4000 - 6000	Roads
Soft	3000	Sidewalks, Patios

6. Green or Cured Concrete—A very important material factor is the cure time of the concrete. Green concrete is fresh poured, typically less than 24 hours. It is more abrasive because the sand is not fully bonded with the cement and coarse aggregate. Chain life is decreased in both the chassis joints and diamond segments. A harder segment bond is desired for abrasive conditions.

**6.3 OPERATIONAL FACTORS AFFECTING CHAIN LIFE**

There are eight operational factors affecting chain life which are summarized as follows:

1. Water Flow Rate—The water flow rate to the chain is a critical factor in both the segment life and chain life. Water is the system coolant and flushing agent for grit and particulate. It is important to note that the required water flow is the flow to the chain and not the flow from the hose or water supply. Water leaks or plugged water orifices may actually decrease the flow to the chain. The minimum water flow to the chain is 2.5 gpm from the guide bar at a pressure between 50-160 psi. The recommended pressure for most applications is between 80-100 psi. Higher water pressures are desired for abrasive conditions.

Insufficient water supply decreases chain life two (2) ways:

- a. Chassis wear or “stretch” is increased, resulting in wearing out of the chassis rivets and/or drive link holes.
- b. Segment bond wear is increased due to the abrasive slurry not being flushed out.

2. Mode of Cutting  
 Plunge vs. Slab—Plunge cutting increases diamond segment wear because both impact and loading increase. Depending on the ratio of plunges and the cutting depth, chain life can be reduced.  
  
 Buried nose vs. Through cut—When cutting with the bar nose buried in the cut, the slurry increases the wear on both the chain and segment. It can be expected that both the segment life and chain life will be decreased.
3. Direction of Cutting (Horizontal vs. Vertical)—Cutting horizontally decreases chain life. When cutting vertically (up or down), feed load is applied mainly to the top diamond surface. Cutting horizontally applies downward load to the diamond top and gravitational load to the diamond side from the tool weight. This side load creates non-uniform side wear on the segment and can eventually cause side clearance loss.
4. Cutting Technique (Impact vs. Smooth)—Impacting the cutting surface with the chain decreases the chain life. Impact forces create excessive stress and wear in the chain components. Impact forces also dull the diamond segments, decreasing the segment life and performance.
5. Rotational Speed—Optimum cutting performance is achieved when operating with a hydraulic input of 8 GPM (4100 RPM). Operating with a hydraulic input of less than 8 GPM will give less than optimum performance, whereas a hydraulic input in excess of 8 GPM will decrease the life of both the segment and chain.
6. Excessive Feed Force—Excessive feed force dulls the diamond segments, decreasing the segment life and performance.
7. Chain Tension—Improper chain tension increases chassis wear in the rivets and/or drive link holes, possibly “stretching” the chain beyond its usable pitch diameter.
8. Improperly Maintained Bar and/or Drive Sprocket—Improperly maintained bar rails, nose sprocket, and/or drive sprocket can increase the chain chassis wear, causing premature “stretching” and possibly uneven segment wear.

#### **6.4 CHAIN END-OF-LIFE MODES**

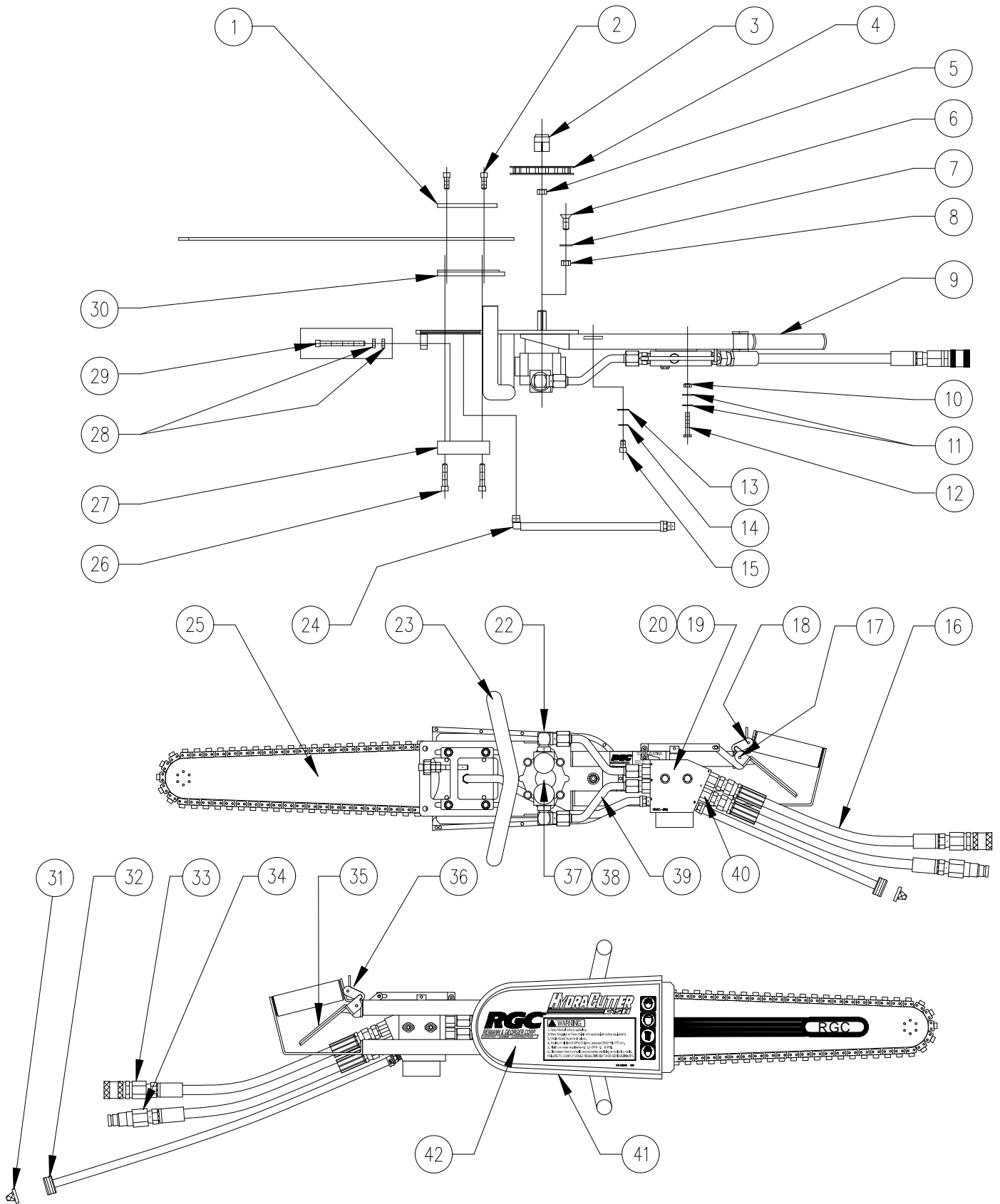
There are three different end-of-life conditions that can occur, depending on a specific combination of factors as discussed in Sections 6.2 and 6.3. These conditions are as follows:

1. Wear Out of Diamond Top Surface—This condition occurs when the diamond segment height is worn down to about 1/16” (0.0625” or 1.5 mm) remaining.
2. Loss of Diamond Side Clearance—This condition occurs when the diamond side surfaces are worn at a rate higher than the diamond top surfaces. The resulting end-of-life condition is a diamond segment width of about 0.187” (4.7 mm).
3. Wear Out of Chain Chassis—This condition is characterized by worn chain rivets and chain drive link holes, and appears as “stretch.” This mode leaves a portion of the diamond segment unused. Excessive “stretch” is evident when the drive tangs can come completely out of the groove after tensioning the chain mounted on the bar.

## 7 PARTS LIST

The following parts list applies to the 8gpm C150 HydraCutter only. The parts list for the hydraulic power source is in the separate manual supplied for this item. Each item number on the following parts list can be matched with the item number shown on the Figure 7-1 assembly drawing.

Item Number	Part Number	Quantity	Description
1	1917149	1	BAR CLAMP
2	5800798	4	BAR MOUNTING SCREW 5/16-18 X 3/4
3	5807195	1	TRANSTORQUE
4	1907135	1	DRIVE SPROCKET 4"
5	7404780	1	FELT GASKET FOR MOTOR SHAFT
6	5806313	2	FLAT HEAD SCREW 3/8-16 X 1
7	5806406	2	SAE FLAT WASHER 3/8
8	5806368	2	LOCKNUT 3/8-16
9	1901590	1	C150 SAW FRAME
10	5806366	2	LOCKNUT 1/4-20
11	5806393	4	SAE FLAT WASHER 1/4
12	5806210	2	HHCS 1/4-20 X 1-3/4
13	5806401	2	SAE FLAT WASHER 5/16
14	5806402	5	EXTERNAL TOOTH WASHER 5/16
15	5806307	1	SCREW SOCKET HEAD 5/16-18 X 1/2
16	1697502	2	12" HOSE WHIP
17	5806759	1	CLEVIS PIN 1/4 X 1-3/4
18	5806757	1	CLEVIS PIN 1/4 X 1-1/2
19	6004623	1	VALVE 3 PORT
20	7404676	1	VALVE SEAL KIT
22	5604684	2	ADAPTER FITTING
23	6407173	2	FOAM GRIP
24	1903135	1	SAW WATER HOSE WITH FITTINGS
25	1927015	1	15" BAR
25	1927020	1	20" BAR
26	5806196	4	BAR ADAPTER MOUNTING SCREW 5/16 X 1-1/4
27	1903150	1	C-150 BAR TENSIONER
28	5805590	2	JAM NUT
29	5806311	1	BAR ADJUSTING SCREW 5/16-18 X 3
30	1917148	1	BAR ADAPTER
31	7407160	1	HOSE WASHER WITH FILTER
32	1903120	1	WATER HOSE WHIP
33	6001886	1	COUPLING 1/2" FEMALE
34	6001885	1	COUPLING 1/2" MALE
35	5023970	1	TRIGGER ASSEMBLY
36	5023960	1	TRIGGER LOCKOUT
	5806792	1	TRIGGER LOCKOUT SPRING
37	6506732	1	MOTOR W/ MOUNTING HDWR #5,6,7,&8
38	7404808	1	HYDRAULIC MOTOR SEAL KIT
39	6007146	2	HYDRAULIC TUBE
40	5604680	4	ADAPTER FITTING
41	1917101	1	GUARD WITH DECAL
42	6205693	1	DECAL
	5804769	1	"L" HANDLE HEX WRENCH 1/4 "
	5804768	1	"T" HANDLE HEX WRENCH 1/4"
	1906150	2	TIP CLEANER
	1920546	1	DRIVE SPROCKET LOCK HANDLE



**Figure 7-1.**  
**C150 Hydracutter Assembly**

## **LIMITED PRODUCT WARRANTY**

**Reimann & Georger Corporation  
Hoisting and Construction Products**

### **A. LIMITED WARRANTY**

Reimann & Georger Corporation (the “Manufacturer”) warrants to the original purchaser (the “Buyer”) that all Reimann & Georger Hoisting and Construction products shall be free of defects in material and workmanship for a period of one (1) year from date of original purchase.

### **B. MANUFACTURER’S OBLIGATIONS**

The Manufacturer’s sole obligation under this Limited Warranty is the repair or, at the Manufacturer’s discretion, the replacement of parts found to be defective. Parts and equipment must have authorization from the Manufacturer prior to return to the Manufacturer or repair by an authorized service person. Costs of transportation and other expenses connected with replacing or repairing parts are not covered under this Limited Warranty.

### **C. PARTS MANUFACTURED BY OTHERS**

This Limited Warranty does not cover any parts manufactured by others. Such parts are subject to the warranty, if any, of their respective manufacturers, and are to be repaired only by a respective authorized service person for such parts. The Manufacturer shall have no obligation to undertake repairs of parts manufactured by others.

### **D. NO SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES**

**IN NO EVENT SHALL THE MANUFACTURER BE LIABLE TO THE BUYER OR ANY OTHER PERSON FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL LOSSES OR DAMAGES CONNECTED WITH THE USE OF THE PRODUCT UNDER THIS LIMITED WARRANTY. SUCH DAMAGES FOR WHICH THE MANUFACTURER SHALL NOT BE RESPONSIBLE INCLUDE, BUT ARE NOT LIMITED TO, LOST TIME AND CONVENIENCE, LOSS OF USE OF THE PRODUCT, THE COST OF A PRODUCT RENTAL, COSTS OF GASOLINE, TELEPHONE, TRAVEL, OR LODGING, THE LOSS OF PERSONAL OR COMMERCIAL PROPERTY, AND THE LOSS OF REVENUE.**

### **E. NO LIABILITY IN EXCESS OF PURCHASE PRICE**

**IN NO EVENT SHALL THE MANUFACTURER’S OBLIGATIONS UNDER THIS LIMITED WARRANTY EXCEED THE PURCHASE PRICE OF THE PRODUCT.**

### **F. NO EXTENSION OF STATUTE OF LIMITATIONS**

**ANY REPAIRS PERFORMED UNDER THIS WARRANTY SHALL NOT IN ANY WAY EXTEND THE STATUTES OF LIMITATIONS FOR CLAIMS UNDER THIS LIMITED WARRANTY.**

### **G. WAIVER OF OTHER WARRANTIES**

**THE EXPRESS WARRANTIES SET FORTH IN THIS LIMITED WARRANTY ARE IN LIEU OF AND EXCLUDE ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

### **H. PROCEDURE FOR WARRANTY PERFORMANCE**

If the product fails to perform to the Manufacturer’s specifications, the Buyer must provide the Manufacturer with the applicable model and serial numbers, the date of purchase, and the nature of the problem.

**I. ADDITIONAL EXCLUSIONS FROM THIS LIMITED WARRANTY. THIS LIMITED WARRANTY DOES NOT COVER ANY OF THE FOLLOWING:**

1. Equipment which has been abused, damaged, used beyond rated capacity, or repaired by persons other than authorized service personnel.
2. Damage caused by acts of God which include, but are not limited to, hailstorms, windstorms, tornadoes, sandstorms, lightning, floods, and earthquakes.
3. Damage under conditions caused by fire or accident, by abuse or by negligence of the user or any other person other than the Manufacturer, by improper installation, by misuse, by incorrect operation, by "normal wear and tear", by improper adjustment or alteration, by alterations not completed by authorized service personnel, or by failure of product parts from such alterations.
4. Costs of repairing damage caused by poor or improper maintenance, costs of normally scheduled maintenance, or the cost of replacing any parts unless done as the result of an authorized repair covered by the one (1) year Limited Warranty.
5. Costs of modifying the product in any way once delivered to the Buyer, even if such modifications were added as a production change on other products made after the Buyer's product was built.

**J. NO AUTHORITY TO ALTER THIS LIMITED WARRANTY**

No agent, representative, or distributor of the Manufacturer has any authority to alter the terms of this Limited Warranty in any way.