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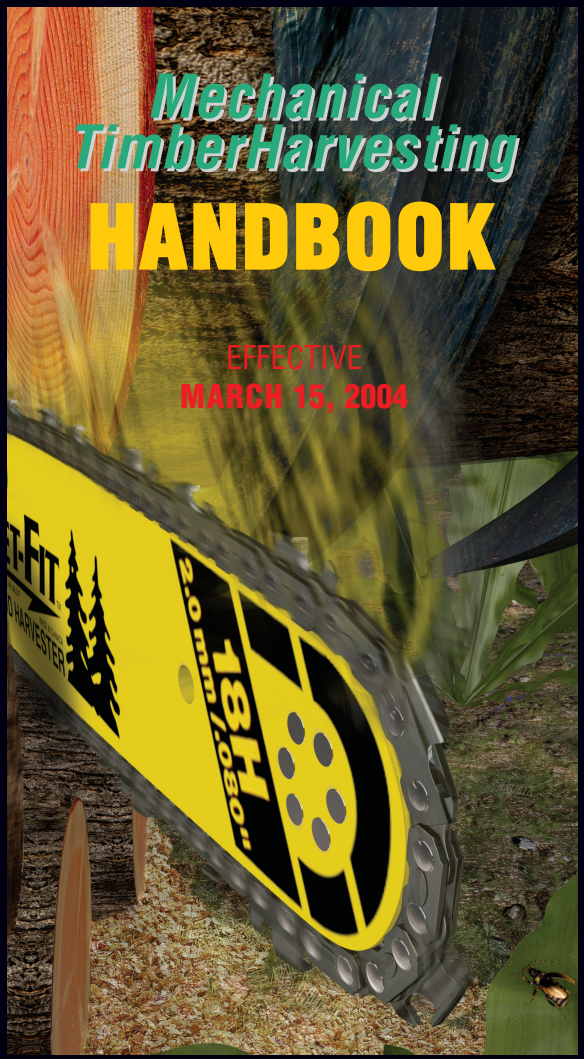
OREGON®



INTRODUCTION

This handbook provides information that Oregon® Cutting Systems considers critical to the successful and safe use of saw-chain-based cutting systems in mechanized wood harvesting and processing. In offering this information, Oregon® does not assume any responsibility for the design or manufacture of machines, nor for the content of literature supplied by machine manufacturers. This handbook is intended for: designers, manufacturers, sellers, and users of wood-harvesting and processing machinery.

The cutting system on a harvester must meet two fundamental objectives:

- **Performance (production, reliability, life)**
- **Safety**

In saw-chain-based cutting systems, a number of inter-related factors influence the degree of success in both performance and safety. This Oregon® Mechanical Timber Harvesting Handbook is intended to help you understand those factors.

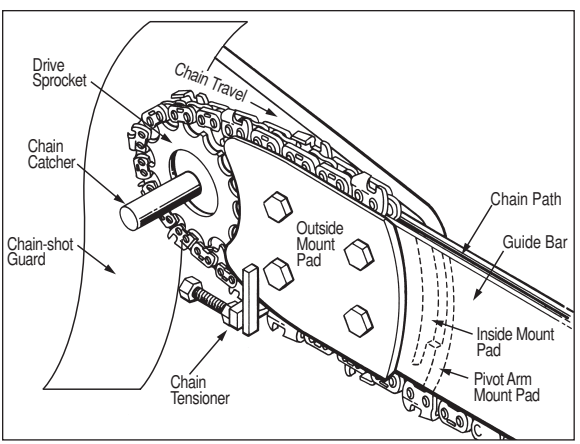
This Mechanical Timber Harvesting Handbook supercedes and replaces all previous Oregon® Mechanical Timber Harvesting Handbooks.

TABLE OF CONTENTS

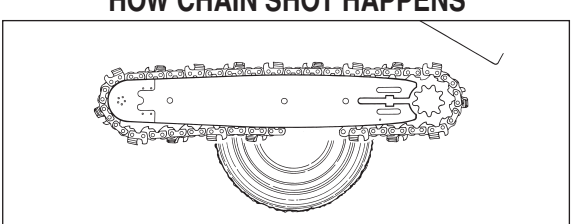
⚠WARNING: There is risk of serious injury or death to machine operators and bystanders from "Chain Shot," which is the high-speed ejection of chain parts that can occur in the event of a derailed or broken chain. Follow the application and maintenance instructions in this handbook, and those provided for the equipment on which cutting chain is used.

For maximum protection, machines should be equipped with a Chain Catcher, and an energy-absorbing Chain Shot Guard

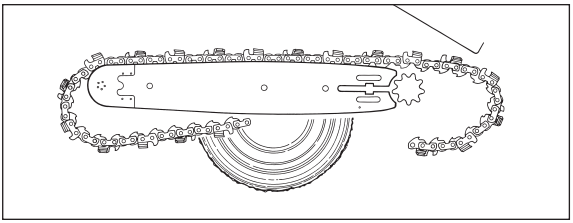
BAR MOUNT, CHAIN CATCHER, AND CHAIN SHOT GUARD



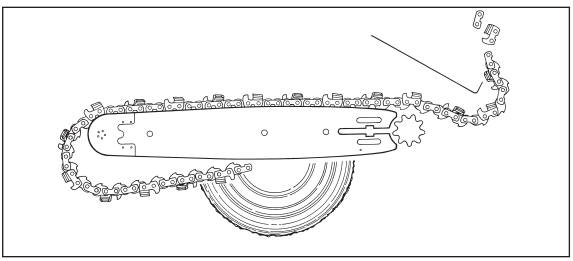
HOW CHAIN SHOT HAPPENS



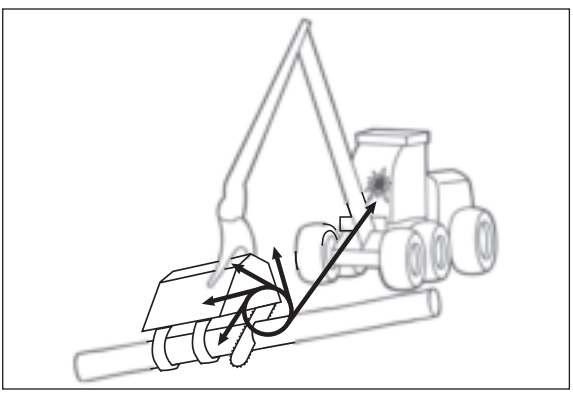
1. After a chain break, the "free" end of the chain begins to whip away from the break.



2. If the chain is not contained by the saw box or an energy-absorbing guard, the broken chain's free end can speed up rapidly and carry immense dynamic energy.



3. At the peak of the whip, chain parts may break loose and be ejected at high speed, especially if the free end of the chain strikes the saw box.



Chain shot can cause chain parts to be thrown in many directions, especially those along the plane of the saw bar.

OPERATOR AND BYSTANDER SAFETY

Guards and Shields: Because of the high speeds, high stress, heavy loads, wear factors, and varying levels of repair and maintenance given to saw-chain-based harvesters, there is a possibility that chain or chain pieces can be thrown from the machine at high speed and with enormous energy. Operators and bystanders are exposed to a risk of serious injury.

Machines should be designed with appropriate guards and shields, and care should be taken to minimize the exposure of users and bystanders to the cutting plane of the saw.

Windows: Window glazing in operator's enclosures should meet OSHA requirements for impact resistance.

Chain Catcher: A Chain Catcher can help contain thrown chain, and is a complement to guards and shields. The Chain Catcher is a sturdy rod placed perpendicular to the center of the drive sprocket. It can be mounted either to the drive shaft, or to the saw box, with a narrow gap to allow for chain installation and removal.

See the Chain Catcher in the illustration on page 2.

Chain Shot Guard: A Chain Shot Guard is an energy-absorbing piece of material (such as heavy rubber) mounted behind the drive sprocket. This guard performs two functions:

- Absorb the energy of a broken chain coming in contact with the saw box, and prevent chain parts from breaking off and being ejected
- Act as an extension of the saw box, reducing the opportunity for thrown chain or chain parts to escape the saw box

See the Chain Shot Guard in the illustration on page 2.

CHAIN SPEED, FEED FORCE, SERVICE LIFE, AND SAFETY

It is well recognized that higher chain speeds and/or feed forces *(with attendant power input)* generally equate to faster cuting speeds. It is also well recognized that faster chain speeds equate to a shorter service life of the chain, bar and sprocket.

In general: Higher chain speeds result in increased wear, shorter service life, and increased occurrence of chain breakage and potential injury.

CHAIN SPEED AND FEED FORCE

Chain speed may be calculated according to the formula on page 6. For quick reference, the charts on page 7 show chain speed as a function of the drive-sprocket tooth count for a variety of chains and over a range of drive-shaft speeds.

Generalized chain-speed and feed-force guidelines are supplied in the “Technical Data” tables on page 12. These guidelines are intended to provide a balance between performance and service life (wear). If guidelines are exceeded, operators must be aware that excessive chain speed or feed force:

- Reduces service life and increases wear
- Requires extra lubrication, and extra attention to tensioning and sharpening
- Increases the incidence of chain breakage and the risk of injury

CHAIN SPEED CALCULATION

SPEED = (RPM) X (T) X (P)

RPM = Motor or drive shaft revolutions per minute

T = Number of teeth on drive sprocket

P_1 = Chain pitch factor for ft/min

P_2 = Chain pitch factor for m/sec

Chain Pitch	FACTOR	
	P_1	P_2
.404"	.067	.00034
3/4"	.131	.00066

ESTIMATING CUTTING RATE

When running at recommended chain speeds *(see Tables that follow)*, an estimate of soft-wood cutting rate may be calculated according to the following expression:

CUTTING RATE = (FACTOR) x (Hp)

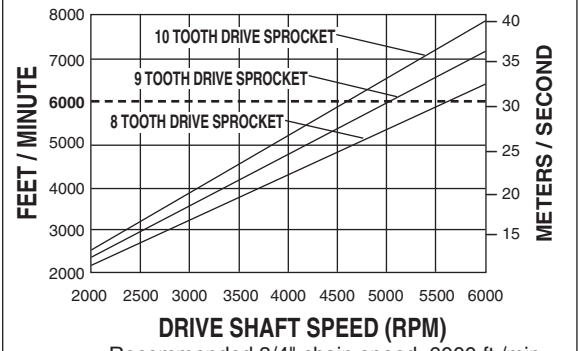
Hp = Horsepower input to chain

F_1 = Factor for in²/sec

F_2 = Factor for cm²/sec

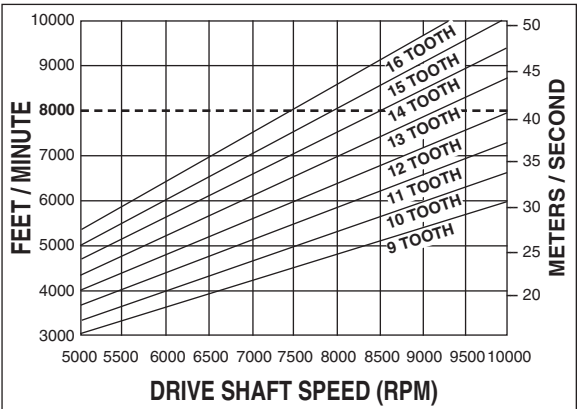
Chain Pitch	FACTOR	
	F_1	F_2
.404"	3.5	22.6
3/4"	2.8	18.1

CHAIN SPEED 3/4" PITCH



---- = Recommended 3/4" chain speed: 6000 ft./min.

CHAIN SPEED .404" PITCH



- - - - = Recommended .404 chain speed: 8000 ft./min.

LUBRICATION

Your chain-bar-sprocket system must receive enough oil, and the oil must stay on the chain, bar, and sprocket long enough to prevent excessive wear.

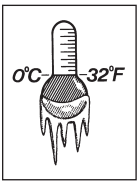
A minimum oil flow rate of 2 cubic inches/min. *(30 cc/min.)* is required. This equates to approx. 1-2 gals *(4-8 litres)* per shift. 3/4" pitch requires up to 25% more lubrication.

A practice on some machinery has been to bleed hydraulic fluid for the purpose of lubricating the guide bar and cutting chain. Hydraulic fluid is not adequate for bar/chain lubrication. A separate oiler utilizing high quality bar/chain lubricant is required.

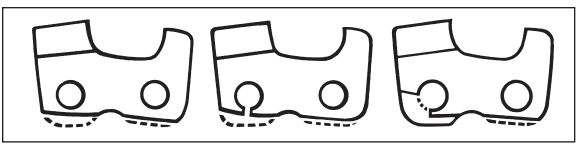
Adequate time must be allowed for lubricant to reach the chain at start up. Cold weather or a new bar will add to this time. Run the chain slowly for several minutes. Under these extreme conditions, increase saw speed gradually over the first few minutes of running time.

Install a fine wire-mesh filter into the oil tank opening to help eliminate debris that could clog the oil pump and oil system.

COLD WEATHER USE



Cutting frozen wood causes heavy wear and can create cracks and possible breakage around the rear rivet holes of cutters. To a large extent, heavy wear is normal for chain used to cut frozen timber. However, good maintenance practices can reduce the amount of wear and can extend service life of the chain *(and guide bar)*.



Following are some useful hints for maximizing service life of the cutting system under very cold conditions:

HELPFUL HINTS DURING COLD WEATHER

LUBRICATION

- Use a winter weight bar and chain oil
  (Double the oil-flow rate when using this mixture)

- Periodically cycle the bar without cutting to increase lubrication, and to make certain the oiler is working.

GUIDE BAR

Maintenance
- Clean bar grooves and keep oil hole open
- Turn the bar over daily to equalize wear.

Shut Down Procedure
- Cycle bar several times to remove moisture from bar-nose sprocket and bearings.

Bar Feed
- Reduce bar feed force or feed speed.

(Helpful hints during cold weather continued)

CHAIN

Tension
• Maintain proper tension • Check often.

Shut Down Procedure
• At the end of each shift, relieve chain tension to prevent damage as the chain cools and contracts.

Sharpening
• Keep cutters properly sharpened • Never force a dull chain to cut • Oregon® recommends sharpening chain at least once each day • See sharpening angles on pages 20-23 • Also see “Optional Sharpening Modifications” for specific cutting conditions on page 20.

Cutter depth gauges
• Check cutter depth gauges at each sharpening
• Adjust as necessary *(Slightly reduced depth gauge settings will help extend service life under these extreme conditions.)* • See depth gauge settings pages 20-23.

Breakage
• Industry groups recommend discarding chain after its second break.

Chain Speed
• Reduce chain speed

DRIVE SPROCKET REPLACEMENT

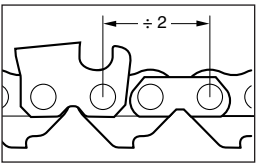
• With .404"-pitch chains, install a new sprocket at the maximum of each 10 chains, or when wear depth on the surface of your sprocket reaches .025" (0.6mm), or when damage occurs.

• With 3/4"-pitch chains, install a new sprocket after a maximum of 2000 hours or more frequently if excessive wear or damage occurs.

OREGON® CHAIN TERMINOLOGY

CHAIN PITCH

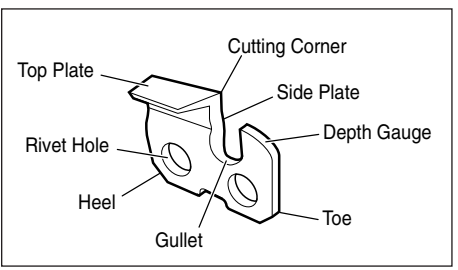
Chain pitch is the distance between the centers of any three consecutive rivets, divided by two.
Oregon® Harvester chain pitches are: **.404" and 3/4"**



CHAIN GAUGE

Chain gauge is the drive link's thickness where it fits into the guide-bar groove. Oregon® chain gauges of .063",.080" and .122" are used for Harvester applications.

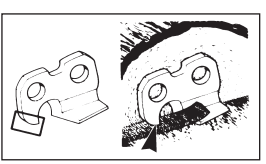
PARTS OF A CUTTER



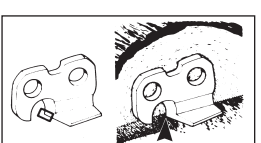
HOW A CUTTER WORKS

Understanding how cutters work can help you see why proper chain maintenance is so important.

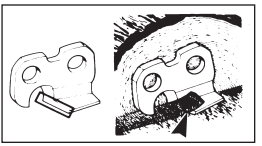
1. The depth gauge rides on the wood and controls the depth at which the cutting corner bites in.



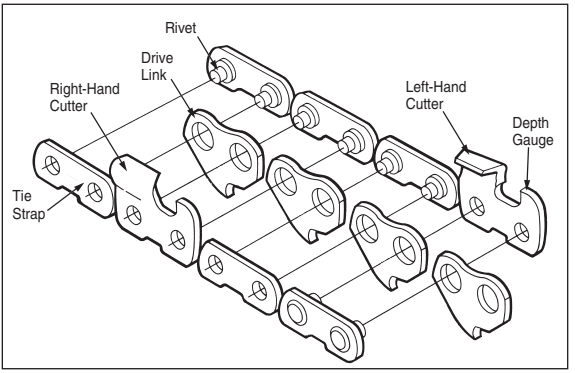
2. The cutting corner and side plate sever the cross grains. This is the hardest part of the work.



3. The top-plate cutting angle chisels out the severed wood fibers, lifting them up and out of the kerf.

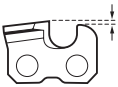


THE PARTS OF A SAW CHAIN

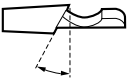


CUTTER MAINTENANCE TERMS

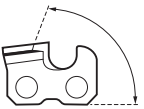
DEPTH-GAUGE SETTING



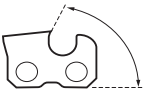
TOP-PLATE FILING ANGLE



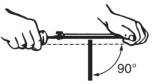
TOP-PLATE CUTTING ANGLE

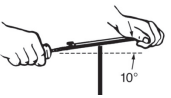


SIDE-PLATE ANGLE



FILE-GUIDE ANGLES





TECHNICAL DATA *(ENGLISH UNITS)*

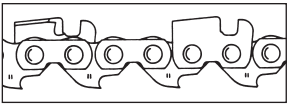
OREGON® CHAIN NUMBER	.404 Pitch		3/4 Pitch	
	16H	18H	11BC	11H
PHYSICAL PROPERTIES				
Weight, lbs/ft	0.220	0.248	0.638	0.630
Tensile Strength, lbs	2600	2700	6700	6700
Kerf, in.	0.34	0.35	0.57	0.57
Gauge, in.	0.063	0.080	0.122	0.122
Actual Pitch, in.	0.4055	0.4055	0.7835	0.7835
Bar Thickness, in min/max	.225/.237	.238/.252	.355/.410	.355/.410
Sprocket, Thickness, in	0.46	0.46		
OPERATING PARAMETERS				
Bar/Chain Oil				
cubic inches/min	2	2	2.5	2.5
cubic inches/stroke	0.5	0.5	0.6	0.6
Power, hp min/max	10/50	10/50	5/55	10/60
Force on Bar to Tension Chain, lbs.	110	110	150	150
Bar Feed Load, at Center, lbs.				
min/max	50/70	50/70	30/100	30/100
recommended	60	60	80	80
Chain Speed, ft/min				
min/max	3000/8000	3000/8000	1500/7000	1500/7000
recommended	8000	8000	6000	6000
Min. Bar Adjustment, in/in of bar	0.015	0.015	0.019	0.019

TECHNICAL DATA *(METRIC UNITS)*

OREGON® CHAIN NUMBER	.404 Pitch		3/4 Pitch	
	16H	18H	11BC	11H
PHYSICAL PROPERTIES				
Mass, kg/m	0.327	0.369	0.949	0.937
Tensile Strength, N	11500	12000	30000	30000
Kerf, mm	8.6	8.9	14	15
Gauge, mm	1.6	2.0	3.1	3.1
Actual Pitch, mm	10.3	10.3	19.9	19.9
Bar Thickness, mm min/max	5.7/6.0	6.0/6.4	9.0/10.4	.9.0/10.4
Sprocket, Thickness, mm	12	12		
OPERATING PARAMETERS				
Bar/Chain Oil				
cc/min	30	30	40	40
cc/stroke	8	8	10	10
Power, kW min/max	7/35	7/35	4/40	7/45
Force on Bar to Tension Chain, N	490	490	668	668
Bar Feed Load, at Center, N				
min/max	220/310	220/310	130/445	130/445
recommended	270	270	355	355
Chain Speed, m/sec				
min/max	15/40	15/40	8/35	8/35
recommended	40	40	30	30
Min. Bar Adjustment, cm/cm of bar	0.015	0.015	0.019	0.019

CHAIN DESCRIPTIONS

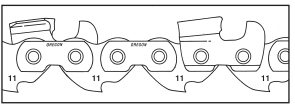
11BC



CHAIN TYPE	PITCH	GAUGE
11BC	3/4"	.122" / 3.1 mm

• The old pro in mechanical cutting • Big 3/4"-pitch .122"-gauge chain
• Excellent for pond and deck applications
• Features aggressive chipper-style cutters with .060" *(1.52 mm)* depth gauge setting
• Delivers performance with heavyweight durability.

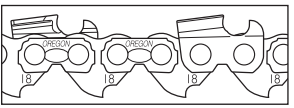
11H



CHAIN TYPE	PITCH	GAUGE
11H	3/4"	.122" / 3.1 mm

• The newest addition to the Oregon® Harvester chain line • Designed and developed for high-speed mechanical applications
• Features aggressive semi-chisel style cutters with advanced chroming technology
• New rivet material and precision assembly process provides both significant reduction in chain stretch and improved durability.

18H



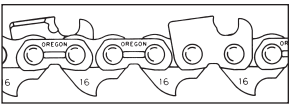
CHAIN TYPE	PITCH	GAUGE
18H	.404"	.080" / 2.0 mm

• The state-of-the-art chain for most mechanical harvesters
• Same aggressive Micro Chisel® cutter with .050" *(1.27mm)* depth-gauge setting as our 16H chain • Extra-thick .080"-gauge drive links
• More chassis material below the rivet holes on cutters and tie straps • More material in the drive-link tang • Maximum performance and maximum durability
• Requires the use of .080"-gauge harvester bars.

(continued)

(Chain Descriptions continued)

16H



CHAIN TYPE	PITCH	GAUGE
16H	.404"	.063" / 1.6 mm

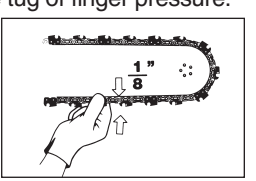
• A chain specifically designed for use on mechanical harvesters • Micro Chisel® cutters deliver top performance with a minimum of maintenance • An aggressive depth-gauge setting gives 16H a powerful bite and maximum cutting speed.

MANUAL CHAIN TENSIONING

To minimize wear and chipping of the bottom of chain components and of the guide bar, chain tension should be “tight” for hard-nose bars, and “tighter” for sprocket-nose bars.

As a rule, chain should be tight enough so that cutter bottoms are pulled firmly against the guide bar at all points around the perimeter of the guide bar. Correctly tensioned, it should still be possible to pull the chain with thumb and forefinger grip, at mid-span, away from the bar rails. For hard-nose bars, the chain should be loose enough that it can be pulled almost to the point that the drivers *(drive-links)* come out of the bar groove. For sprocket nose bars, cutters should come off the rails roughly 1/8 inch, under the tug of finger pressure.

Tension should be checked periodically. Because it expands with heat, chain that is uncomfortably hot to the touch should be allowed to cool before retensioning.



As part of your routine shut-down procedure at the end of each shift, relieve chain tension to prevent damage as the chain cools and contracts.

AUTOMATIC CHAIN TENSIONERS

Automatic chain tensioners can be the most effective means to keep proper chain tension if they are designed to compensate for the dynamic affects of chain moving around the bar at high speeds. A loop of

chain will increase in length as chain speed increases. Automatic chain tensioners can be optimized to respond to the changing loop length. As the chain goes from rest to full speed, the bar will need to move forward, to fill the gap and maintain the proper tension. If the bar does not move forward, the tension will decrease *(sometimes as much as 50%)* and can result in thrown chain.

When the chain comes to a stop the loop length will decrease and the bar must move back or the tension will become excessive.

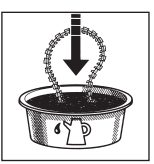
The proper amount of force to apply to the bar during chain tensioning is shown on Technical Data on page 12.

INSTALLATION AND BREAK-IN

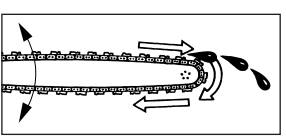
A critical time for saw chain is the break-in period, made particularly difficult under cold conditions where lubrication is marginal *(especially at start-up)*. We highly recommend that new and newly sharpened chain be soaked in oil prior to its use. Chain tension should be adjusted after the first several minutes of use.

The following procedures are recommended for break-in of new chain/newly sharpened chain:

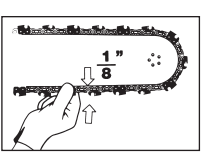
1. Soak chain in oil, preferably overnight.



2) Increase saw speed gradually over the first 2-4 minutes of running time while cycling the bar.



3) Check chain tension and adjust if necessary.



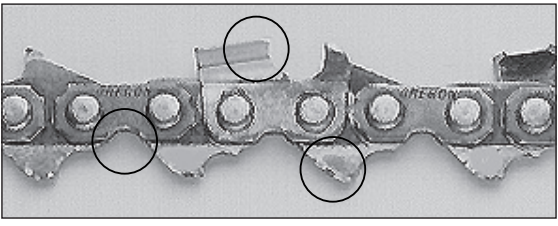
HOW TO SHARPEN CHAIN

⚠WARNING: There is risk of serious injury or death to machine operators and bystanders from "Chain Shot," which is the high-speed ejection of chain parts that can occur in the event of a broken chain caused by incorrect chain repair or by poor chain maintenance. Follow the inspection and maintenance instructions below, and on the following pages. Do not use chain:

- **that has been severely damaged**
- **that has broken components**
- **that has loose rivet joints (if you can rotate the rivets with your fingers, they're too loose)**
- **that has been broken twice (Industry groups recommend discarding chain after its second break)**

For more information on Chain Shot, see pages 2-3.

1. Before sharpening any chain with a grinder, clean oil and grease from the chain. This will prevent build-up on the wheel when grinding.
2. Before sharpening, inspect, repair, or replace damaged chain.
3. During your inspection, check for each of the following:
   - Proper installation of tie straps and drive links.
   - Cracked or broken cutters, cutter top plates, or tie straps.
   - Bent, cracked or burred drive links.
   - Severe abrasive damage.
   - Abnormal chain wear.
   - Wear patterns on the chain that may indicate a worn bar or sprocket.
   - Loose rivets (if you can rotate the rivets with your fingers, they're too loose).

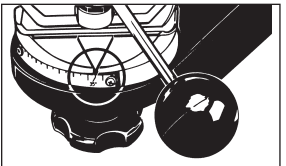


3. Use the correct sharpening specifications for your Oregon® chain type. See pages 20 through 23.
   - If unsure of your Oregon® chain's type, or part number, ask your Oregon® chain dealer.
   - For Sharpening Chain with a Grinder see below.
   - For Sharpening Chain with a Round File see page 18.
4. Check and adjust depth gauges. See page 19 for instructions.
5. After sharpening the chain, clean off any particles of material, then lubricate the chain thoroughly with bar and chain oil. Soaking the chain overnight produces the best results.

SHARPENING CHAIN WITH A GRINDER

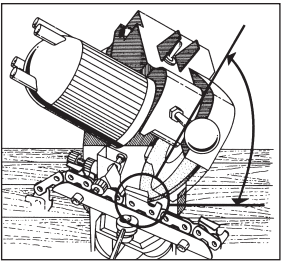
Note: Wear safety goggles.

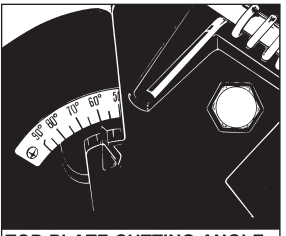
1. Set vise assembly to the proper **top plate filing angle** *(See pages 20-23 for correct angles).*



TOP-PLATE FILING ANGLE

2. To set the proper grinder head angle, use the recommended **top-plate cutting angle** *(See pages 20-23 for correct angles).*

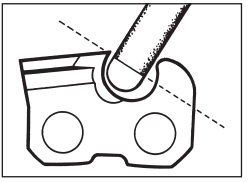




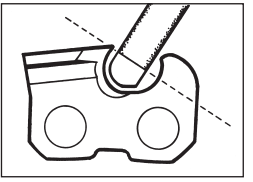
TOP-PLATE CUTTING ANGLE

(Sharpening Chain with a Grinder continued)

3. Dress vitrified grinding wheel often to maintain correct shape *(see illustration)*. Use either rotary wheel dresser or dressing brick.



Full Radius



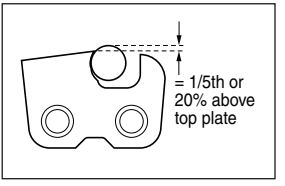
Partial Radius *(for 11H)*
3/16" Radius & 1/8" Flat

NOTE:

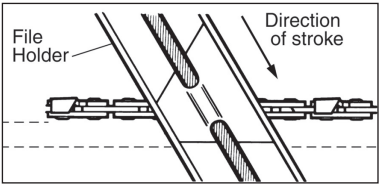
- To avoid burning cutters, use light intermittent strokes.
- Never grind into other chain components.
- If damage is present on the chrome surface of top plate or side plate, grind back until damage is removed.
- Keep all cutter lengths equal.

SHARPENING CHAIN WITH A ROUND-FILE

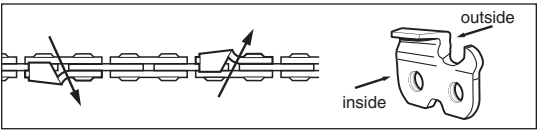
1. Be sure 1/5th, or 20%, of the file's diameter is always held above the cutter's top plate. Using the correct file guide is the easiest way to hold the file in this position.



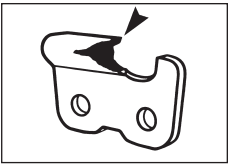
2. Keep the correct Top-plate Filing Angle line on your file guide parallel with your chain.



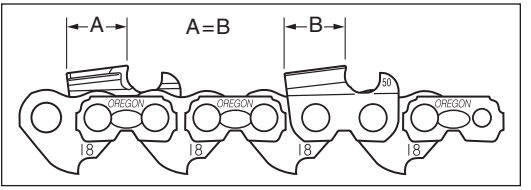
3. Sharpen cutters on one side of the chain first. File from the inside of each cutter to the outside. Then turn your chain around and repeat the process for cutters on the other side.



4. If damage is present on the chrome surface of top plates or side plates, file back until damage is removed.



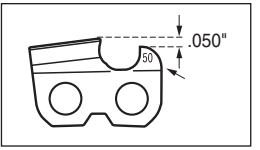
5. Keep all cutter lengths equal.



HOW TO SET DEPTH GAUGES

- Cutters should be sharpened before setting the depth gauge. See pages 20 through 23 for sharpening instructions.
- Oregon® Harvester chains have a number stamped on each depth gauge indicating the correct depth-gauge setting.

Example:



Depth-gauge Setting

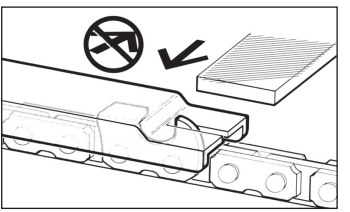
(continued)

(How to set depth gauges continued)

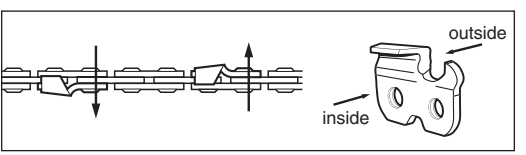
1. Use an Oregon® depth gauge *(Gaugit)* tool with the correct built-in setting for your chain and check your depth gauges with each sharpening.

2. Place the tool on top of your chain so depth gauge protrudes through the slot in the tool.

3. If the depth gauge extends above the slot, file the depth gauge down level with the top of the tool using a flat file.



4. File from the inside of the cutter to the outside.



OPTIONAL SHARPENING MODIFICATIONS

For optimum life and cutting speed the sharpening specifications can be modified. See pages 21 through 23 for factory specifications.
Modify sharpening angles from factory specifications as noted below to optimize for specific cutting conditions.

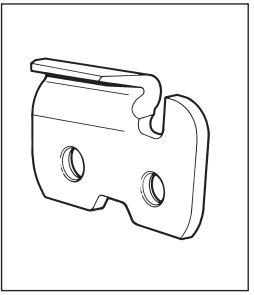
Cutting Conditions	Side Plate Angle	Top Plate Cutting Angle	Top Plate Filing Angle	Depth Gauge Setting
Softwood	Factory -10°	Factory	Factory + 5°	Factory
Hardwood	Factory	Factory	Factory	Factory
Frozen Wood	90° to 85°	Factory	Factory -5°	Factory -.010"*

* Delay setting depth gauges until factory -.010" setting is achieved when cutting in frozen wood.

11BC CHIPPER

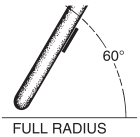
End View

CHAIN TYPE	11BC
GAUGE	.122"
PITCH	3/4"

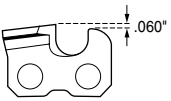


CUTTER MAINTENANCE SPECIFICATIONS

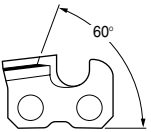
GRINDING-WHEEL



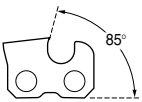
DEPTH-GAUGE SETTING



TOP-PLATE CUTTING ANGLE

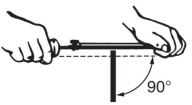


SIDE-PLATE ANGLE



TOP-PLATE FILING ANGLE

FILE-GUIDE ANGLE



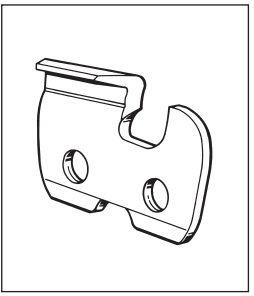
MAINTENANCE TOOLS

PART NO.	DESCRIPTION
90410	5/16" Round File or
OR534-516	5/16" Grinding Wheel
26800	.060" Depth-gauge *(Gaugit)*
12211	Depth-gauge File *(Flat File)*

11H SEMI-CHISEL

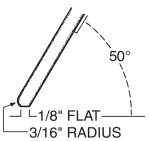
End View

CHAIN TYPE	11H
GAUGE	.122"
PITCH	3/4"

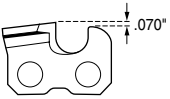


CUTTER MAINTENANCE SPECIFICATIONS

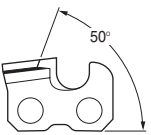
GRINDING-WHEEL



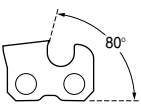
DEPTH-GAUGE SETTING



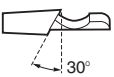
TOP-PLATE CUTTING ANGLE



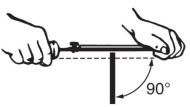
SIDE-PLATE ANGLE



TOP-PLATE FILING ANGLE



FILE-GUIDE ANGLE

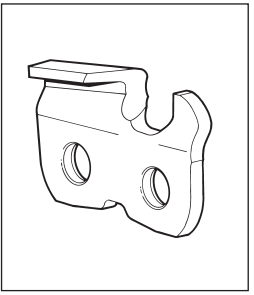


MAINTENANCE TOOLS

PART NO.	DESCRIPTION
90410	5/16" Round File or
OR534-516	5/16" Grinding Wheel
107617	File guide
107529	.070" Depth-gauge *(Gaugit)*
12211	Depth-gauge File *(Flat File)*

16H/18H MICRO-CHISEL

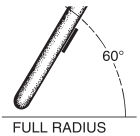
End View



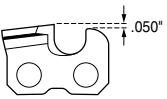
CHAIN TYPE	16H	18H
GAUGE	.063"	.080"
PITCH	.404"	.404"

CUTTER MAINTENANCE SPECIFICATIONS

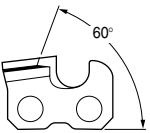
GRINDING-WHEEL



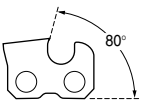
DEPTH-GAUGE SETTING



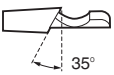
TOP-PLATE CUTTING ANGLE



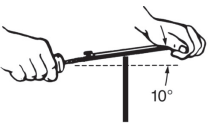
SIDE-PLATE ANGLE



TOP-PLATE FILING ANGLE



FILE-GUIDE ANGLE



MAINTENANCE TOOLS

PART NO.	DESCRIPTION
70502	7/32" Round File or
OR534-316	3/16" Grinding Wheel
31686	7/32" Assembled File Guide
38850	.050" Depth-gauge *(Gaugit)*
12211	Depth-gauge File *(Flat File)*

HOW TO BREAK OUT RIVETS

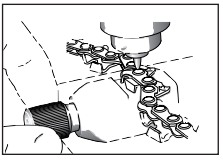
⚠WARNING: There is risk of serious injury or death to machine operators and bystanders from "Chain Shot," which is the high-speed ejection of chain parts that can occur in the event of a broken chain caused by incorrect chain repair or by poor chain maintenance. Follow the inspection and maintenance instructions below, and on the following pages. Do not use chain:

- **that has been severely damaged**
- **that has broken components**
- **that has loose rivet joints (if you can rotate the rivets with your fingers, they're too loose)**
- **that has been broken twice (Industry groups recommend discarding chain after its second break)**

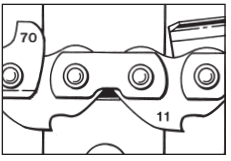
For more information on Chain Shot, see pages 2-3.

Note: Wear safety goggles.

1. Select appropriate anvil. See pages 21 through 23 to determine proper pitch.

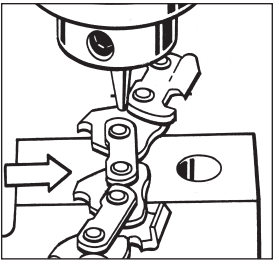


.404"

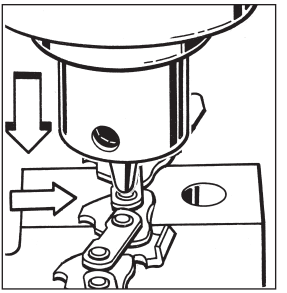


3/4"

2. Place the chain segment you wish to break in the proper slot of the chain anvil and push chain forward until bottom tie strap is flush with the far side of slot. *(Drive link is then supported on both sides of slot).*



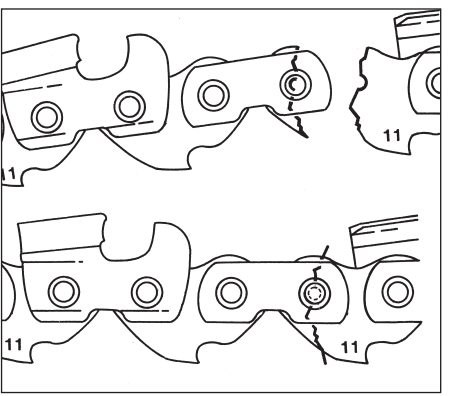
3. Position rivet head directly under punch. Pull handle down if using a bench chain breaker, or hammer out rivet if using a hand-held punch. Do not use excessive force. **Avoid bending drive links as this can cause tight joints.**



Note: Important - when breaking chain at cutter, make sure cutter is in up position.

REMOVING RIVETS FROM BROKEN DRIVE LINKS

1. Position the two broken sections back to the original position prior to breakage.

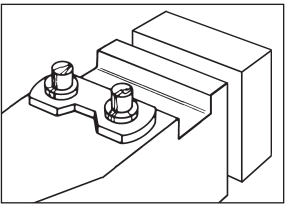


2. Repeat steps 2 and 3 from "How to Break Out Rivets."

HOW TO INSTALL NEW CHAIN PARTS

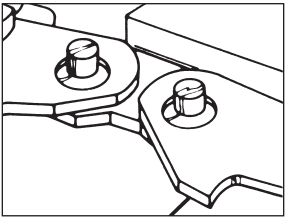
Note: Use only *NEW* Oregon® parts to repair Oregon® chain. And use only parts which are the correct size and type for your chain.

1. Remove rivets, and parts to be replaced, as shown under "How to Break Out Rivets," page 24-25.
2. Place preset tie strap with rivets face up on flat surface of chain-breaker anvil.

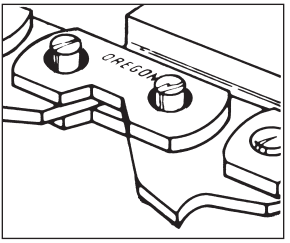


3. Assemble chain to the preset tie strap.

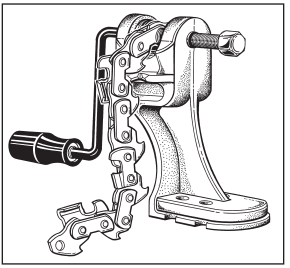
   NOTE: Always use new tie strap and rivet components.



4. Assemble tie strap with brandmark or dot face up, and the notch toward the drive-link tangs.
   NOTE: Be sure parts are assembled in the correct location and orientation.



5. How to form rivet heads: Use an Oregon® rivet spinner. Be sure to use the correct anvil for your pitch of chain.



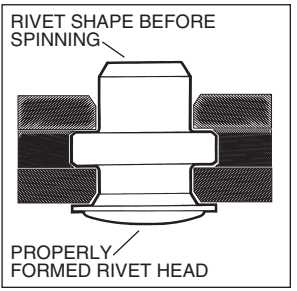
Instruction #5, "How to form rivet heads" continues on the next page

(#5, How to form rivet heads, continued)

Special notes on joining Harvester chain and forming rivet heads

Rivet head shape:

- Rivet heads must be snug and secure while still allowing all joined parts to move freely.



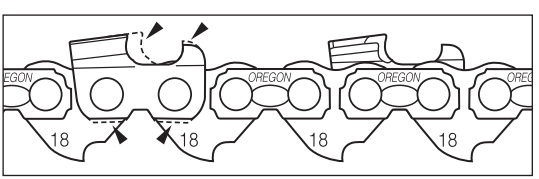
On .404"-pitch 18H and 16H chains:

- Do not use a hammer to form rivet heads. Follow the instructions in paragraph 5 on the previous page.

On 3/4"-pitch 11BC and 11H chains:

- Avoid joining chain loops at the cutters. Join 3/4" chain loops only at the tie straps.
- For best results, Oregon® recommends that 3/4" rivets first be hammered for good hole-fill, then spun on a Oregon® Dura Max™ heavy-duty spinner for good head formation.
- Be careful to strike only the rivet when hammering rivet heads.

6. File new cutters back to match worn cutters and worn tie straps.



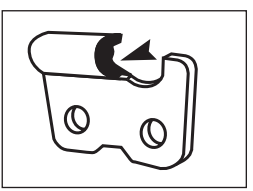
SAW-CHAIN TROUBLESHOOTING

Most harvester chain problems are caused by: excessive chain speed, excessive feed force, incorrect sharpening, lack of lubrication, or incorrect chain tension. Here are the things you should look for, and the corrective actions you should take:

PROBLEM
Chain cuts slow, cuts rough, or won't hold an edge.

Compare your chain's cutters with the illustrations that follow. Also see pages 16 through 20 for the proper sharpening techniques to use when performing the recommended remedies.

1. Light abrasive damage on cutting edges of top and/or side plates.

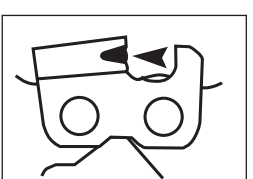


Cause: Cutters came in contact with light abrasive materials.

Result: Very slow cutting.

Remedy: File or grind cutters back until all damage is removed.

2. Severe abrasive damage to side and/or top plates.

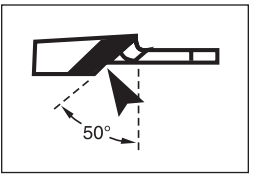


Cause: Cutters hit or cut material other than wood. This type of damage is found when cutting close to the ground as a result of contact with rock, dirt or sand.

Result: Chain won't cut. Chain may cut crooked if damage is to one side of chain. Possible bar rail damage.

Remedy: File or grind all cutters back equally until all damage is removed.

3. Too much top-plate filing angle.

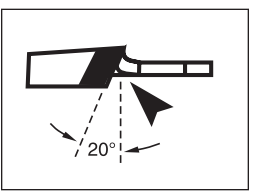


Cause: Excessive top-plate angle while filing or grinding.

Result: Cutting angle is very sharp, but will dull fast. Cutting action rough and erratic.

Remedy: File or grind at the correct top-plate filing angle for your chain. Be sure to use the correct file guide. See pages 20 through 23 for proper angles.

4. Too little top-plate filing angle.

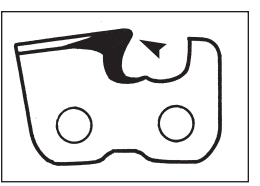


Cause: Filed or ground at less than the recommended angle.

Result: Slow cutting. Requires extra effort to cut. Possible binding in cut.

Remedy: File or grind at the correct top-plate filing angle for your chain. Be sure to use the correct file guide. See pages 20 through 23 for proper angles.

5. Too much top-plate-cutting angle or feathered cutting edge.



Cause: File held too low or the file is too small. For grinders: Chain ground at the wrong top-plate cutting angle or using an incorrect size grinding wheel.

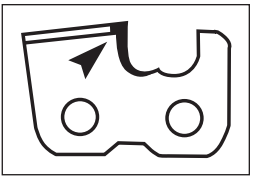
Result: Poor stay-sharp. Rapid dulling. Will cut fast for a short time, then becomes dull.

Remedy: Resharpen cutters with the proper file and file guide held at the recommended angles. For grinders: Set grinder head angle to the proper degree mark for grinding top-plate cutting angles. Use proper size grinding wheel. See pages 20 through 23 for proper angles.

(continued)

(Chain Troubleshooting continued)

6. Too little top-plate-cutting angle.

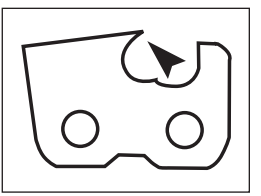


Cause: File held too high or file was too large. For grinders: Chain ground at the wrong top-plate cutting angle or incorrect size grinding wheel.

Result: Slow cutting. Requires extra time. Will cause premature wear to chain and bar rails.

Remedy: Resharpen cutters with the proper file and file guide held at the recommended angles. For grinders: Set grinder head angle to the proper degree mark for grinding top-plate cutting angles. Use proper size grinding wheel. See pages 20 through 23 for proper angles.

7. Too much hook in side plate.

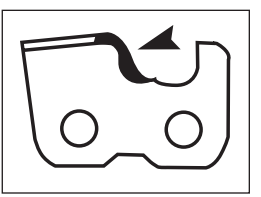


Cause: File held too low or the file is too small. For grinders: Chain ground at the wrong top-plate cutting angle, grinding wheel too small or grinding too deep into body of cutter.

Result: Rough cutting. Chain grabs. Cutters dull quickly or won't hold a cutting edge. Possible top-plate breakage and or chain stretch.

Remedy: Resharpen cutters with the proper file and file guide held at the recommended angles. For grinders: Set grinder head angle to the proper degree mark for grinding top-plate cutting angles. Use proper size grinding wheel. See pages 20 through 23 for proper angles.

8. Backslope on side plate.



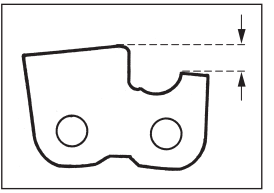
Cause: File held too high or file was too large. For grinders: Chain ground at the wrong top-plate cutting angle,

grinding wheel too large, or grinding wheel not grinding deep enough into body of cutter.

Result: Slow cutting. Requires extra time to cut. Will cause premature wear to chain and bar rails.

Remedy: Resharpen cutters with the proper file and file guide held at the recommended angles. For grinders: Set grinder head angle to the proper degree mark for grinding top-plate cutting angles. Use proper size grinding wheel. See pages 20 through 23 for proper angles.

9. Low depth gauge.
Cause: Wrong or no depth gauge tool used.

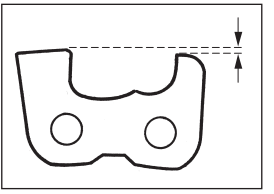


Result: Rough cutting. Chain grabs. Excessive wear to the heel of cutters, opposing tie-straps, and bar rails. Possible top plate breakage and/or chain stretch.

Remedy: If depth gauges are too low the chain may not be serviceable. If there is sufficent top plate length, grind or file the top plate back to proper depth-gauge setting. See pages 21 through 23 for proper depth gauge settings.

10. High depth gauge.

Cause: Depth gauge never lowered.



Result: Slow cutting. Excessive wear to chain and bar rails.

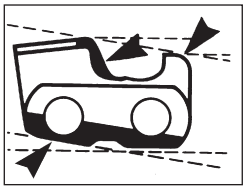
Remedy: Lower depth gauges using the recommended depth gauge tools. See pages 21 through 23 for proper depth gauge settings.

(continued)

(Chain Troubleshooting continued)

PROBLEM
Cutters or tie straps wear heavily or break.

11. Excessive heel wear and possible cracking on cutters and opposite tie straps.

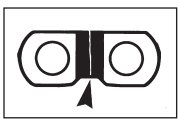


Cause: Forcing a dull chain to cut. Low depth gauge settings. Lack of lubrication. Loose chain tension.

Result: Excessive heel wear on cutters. Possible chain breakage. Excessive chain stretch.

Remedy: Replace worn or cracked cutters and/or tie straps. Sharpen cutters properly and often. Use proper chain tension and plenty of lubrication.

12. Broken tie strap.



Cause: Incorrect field assembly of chain components.

Result: Broken tie straps.

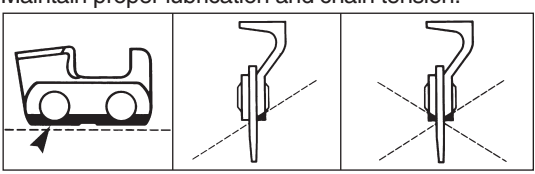
Remedy: Replace broken components. See “HOW TO INSTALL NEW CHAIN PARTS” on page 26-27.

13. Bottoms of tie straps and cutters worn out of square.

Cause: Worn bar rails. See “GUIDE BAR TROUBLESHOOTING” on pages 55-58.

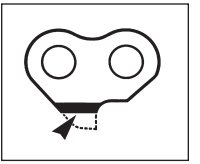
Result: Bottoms of tie straps and cutters worn out of square.

Remedy: If chain is worn excessively, replace the chain. If bar groove is too wide, replace the bar. If rails are worn, dress the top of the guide bar square. Maintain proper lubrication and chain tension.

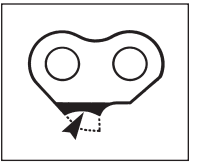


PROBLEM
Drive Links wear or break.

14. Straight or concave bottoms.



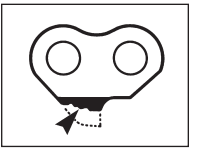
Cause : Straight bottoms are due to shallow bar body groove. Concave bottoms are due to shallow bar-nose groove.



Result: Drive-link tangs worn straight or concave. Drive links can't clean bar groove. Increased tendency to throw the chain from the bar.

Remedy: Replace the bar. If the drive link wear is excessive, replace the chain. If drive link wear is minor, sharpen drive link tang.

15. Battered and broken bottoms.

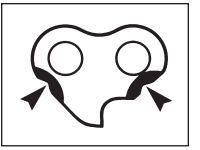


Cause: Worn or broken sprocket. Loose chain tension or chain jumping from bar groove resulting in damage from revolving sprocket.

Result: Drive links are burred or knicked. Drive links may not fit in bar groove. Drive links can't clean bar groove.

Remedy: Replace damaged drive links. Replace sprocket if worn. Maintain proper tension to prevent chain from climbing out of drive sprocket. Keep bar groove clear of debris.

16. Peening in front or back of drive link.



Cause: Worn drive sprocket. Pin sprocket systems have been known to concentrate load to the back of the drive link causing premature wear.

(continued)

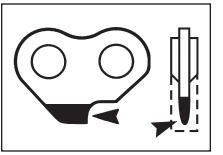
(Chain Troubleshooting continued)

Result: Change in drive link shape. Tight joints in the chain. Eventually chain will stretch. Service life of chain is shortened.

Remedy: Replace worn sprocket and/or pins as necessary. If wear is excessive, replace chain.

Note: Do not attempt to run a new chain on a badly worn sprocket or a badly worn chain on a new sprocket.

17. Side worn round or thin at bottoms.



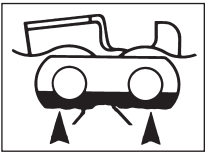
Causes: Bar rails are worn on the inside, spread, or uneven *(See "GUIDE BAR TROUBLESHOOTING" pages 55-58)*, or use of .063 gauge chain in a .080 gauge bar. Chain cutting crooked due to improper sharpening angles and/or one side dull.

Result: Change in drive link shape will accelerate bar rail and chain wear.

Remedy: If chain is worn excessively replace the chain. If bar rails are worn excessively or bar groove is spread too wide, replace the bar. If possible, dress bar rails square. Ensure that bar and chain gauge match. Sharpen cutters frequently and use recommended angles.

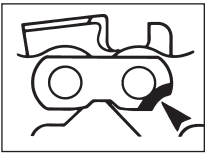
PROBLEM
Chain has tight joints.

18. Peening on bottom or front of cutters and tie straps.



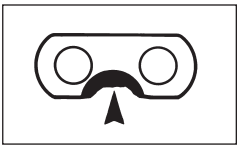
Cause: Improper chain tension. Worn rim drive sprocket.

Result: Possible chain breakage and/or stretch.



Remedy: Replace the chain if peening is excessive. Replace rim sprocket if worn. Maintain proper chain tension.

19. Peening in notch of cutters and tie straps.



Cause: Worn spur drive sprocket.

Result: Possible chain breakage and/or stretch.

Remedy: Replace chain if peening is excessive. Replace spur drive sprocket.

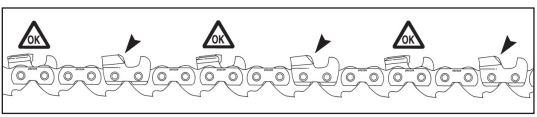
PROBLEM
Chain cuts crooked.

20. Damage to cutters on one side of the chain *(most often found on cutters nearest the ground).*

Cause: Cutters on one side of chain damaged by hitting the saw box or the ground/debris.

Result: Bar and chain get bound in tree. This could result in bar and chain breakage when removing bar from tree. Uneven bar-rail wear.

Remedy: File cutters back enough to remove all damage. Square up bar rails if uneven.

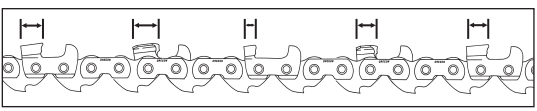


21. Different cutter top-plate lengths.

Cause: Inconsistent sharpening.

Result: Bar and chain get bound in tree. This could result in bar and chain breakage when removing bar from tree. Uneven bar-rail wear.

Remedy: File cutters back to even cutter top-plate lengths. Square up bar rails if uneven.



BAR MOUNT TYPES & SPROCKET TOOTH COUNTS

Use this table to cross-reference bar-mount types and drive-sprocket tooth counts.

.404" PITCH		3/4" PITCH	
Bar-Mount Type	**Drive Sprocket Tooth Count**	**Bar-Mount Type**	**Drive Sprocket Tooth Count**
B	14-16	C	7
D	17-18	J	8
L	11-13	K	7-8
M	9-11	T	9-10
N	14-16	V	9-10
Y	13		

.404" BAR MOUNTS

L003

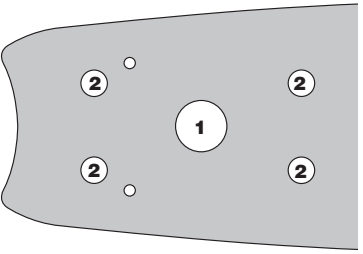
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = 7/8" (.875")

2 = .448"



L104

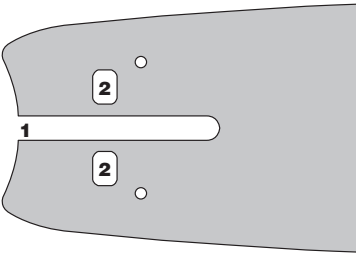
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"



.404" BAR MOUNTS

L114

DRIVE SPROCKET TOOTH COUNT:

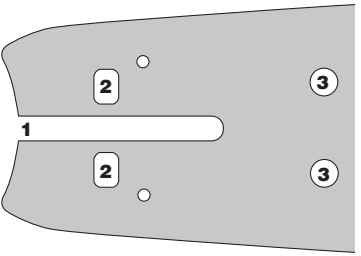
11, 12, 13

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"

3 = .435"



L128

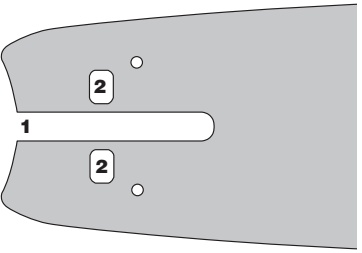
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .472" (12mm) x 3.338"

2 = .555" x .404"



L131

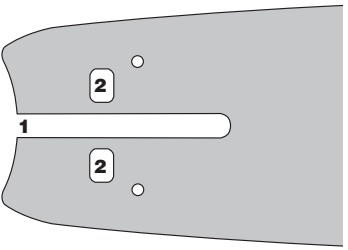
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .394" (10mm) x 3.600"

2 = .555" x .404"



L148

DRIVE SPROCKET TOOTH COUNT:

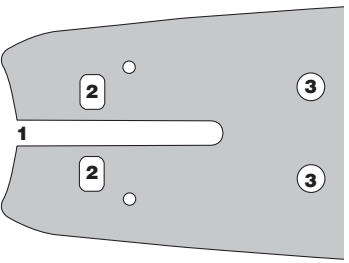
11, 12, 13

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"

3 = .435"



(continued)

.404" BAR MOUNTS *(continued)*

L205

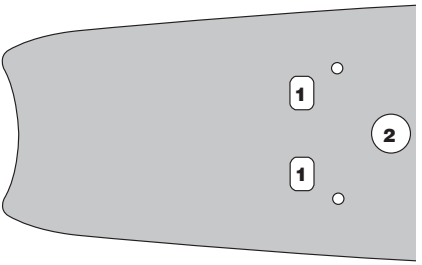
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 =.555" x .404"

2 = .640"



M104

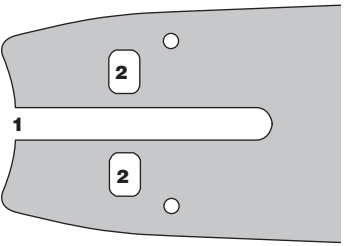
DRIVE SPROCKET TOOTH COUNT:

9, 10, 11

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"



N104

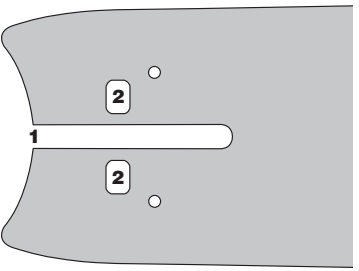
DRIVE SPROCKET TOOTH COUNT:

14, 15, 16

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"



N114

DRIVE SPROCKET TOOTH COUNT:

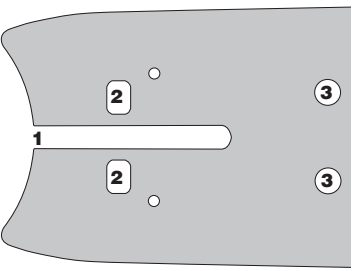
14, 15, 16

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"

3 = .435"



N125

DRIVE SPROCKET TOOTH COUNT:

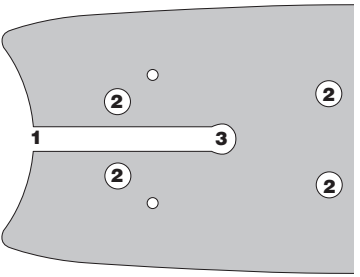
14, 15, 16

DIMENSIONS:

1 = .394" (10mm) x 3.418"

2 = .448"

3 = .250" Radius



Y104

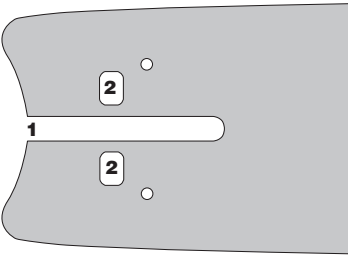
DRIVE SPROCKET TOOTH COUNT:

13

DIMENSIONS:

1 = .394" (10mm) x 3.338"

2 = .555" x .404"



.404" JET-FIT® BAR MOUNTS

B149

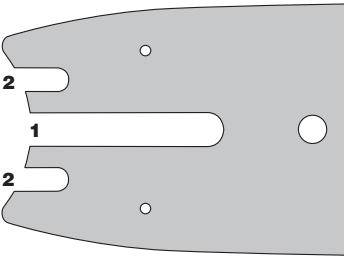
DRIVE SPROCKET TOOTH COUNT:

14, 15, 16

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .848"



B163

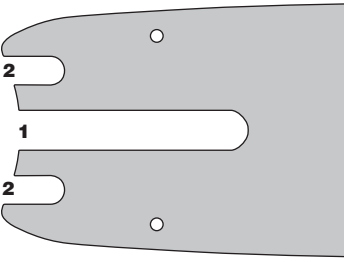
DRIVE SPROCKET TOOTH COUNT:

14, 15, 16

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .848"



(continued)

.404" JET-FIT® BAR MOUNTS *(continued)*

D149

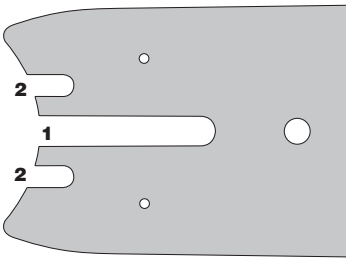
DRIVE SPROCKET TOOTH COUNT:

17, 18

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .814"



L149

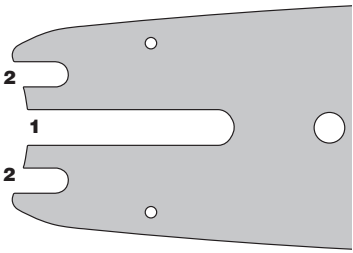
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .814"



L163

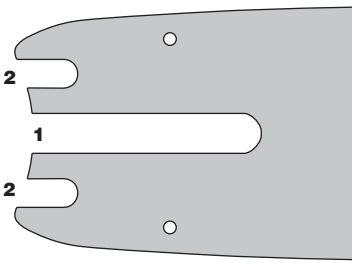
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .814"



L172

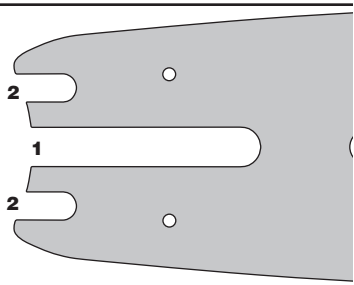
DRIVE SPROCKET TOOTH COUNT:

11, 12, 13

DIMENSIONS:

1 = .581" (15mm) x 3.406"

2 = .413" x .814"



3/4" BAR MOUNTS

C159

DRIVE SPROCKET TOOTH COUNT:

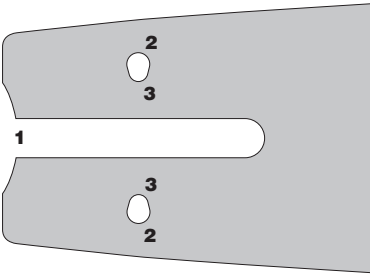
7

DIMENSIONS:

1 = .635" x 4.052"

2 = .190" Radius

3 = .151" Radius



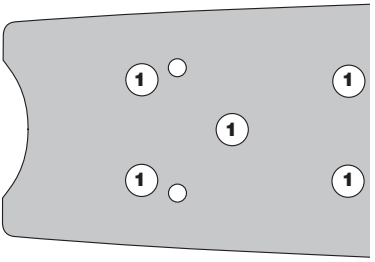
J134

DRIVE SPROCKET TOOTH COUNT:

8

DIMENSION:

1 = .562"



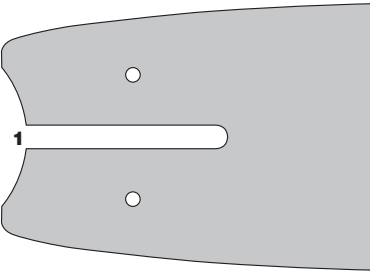
K186

DRIVE SPROCKET TOOTH COUNT:

7, 8

DIMENSION:

1 = .405" x 3.510"



K205

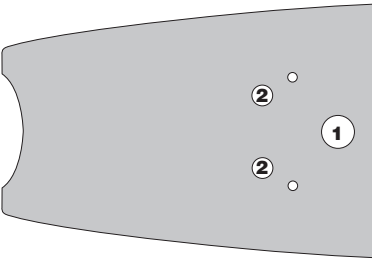
DRIVE SPROCKET TOOTH COUNT:

7, 8

DIMENSIONS:

1 = .645"

2 = .410"



(continued)

3/4" BAR MOUNTS *(continued)*

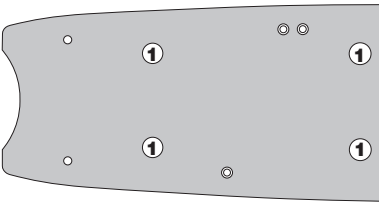
T043 AT

DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSION:

1 = .563"



T043 RSN

DRIVE SPROCKET TOOTH COUNT:

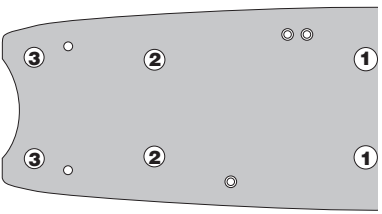
9, 10

DIMENSIONS:

1 = .609"

2 = .562"

3 = .531"



T130

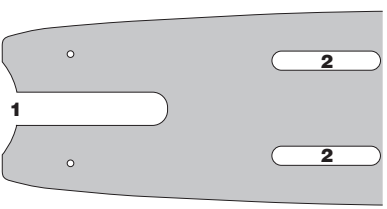
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .875" x 4.502"

2 = .531" x 3"



T132

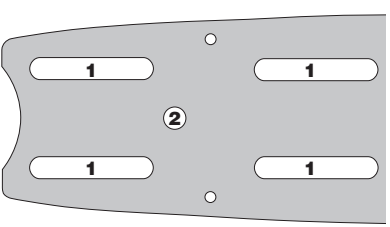
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .531 x 3.064"

2 = .562"



3/4" BAR MOUNTS

T133

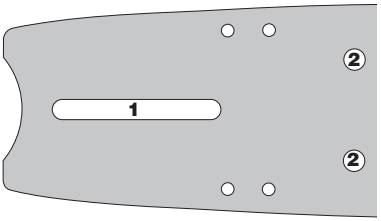
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 =.515" x 4.129"

2 = .515"



T135

DRIVE SPROCKET TOOTH COUNT:

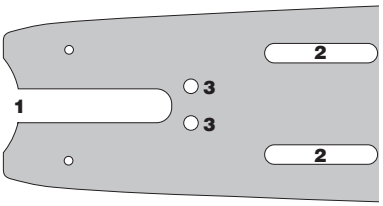
9, 10

DIMENSIONS:

1 = .906" x 4.054"

2 =.531" x 3"

3 = .375"



T138

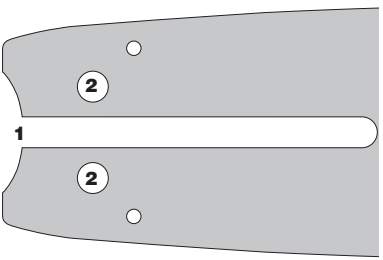
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .635" x 7.410"

2 = .650"



T140

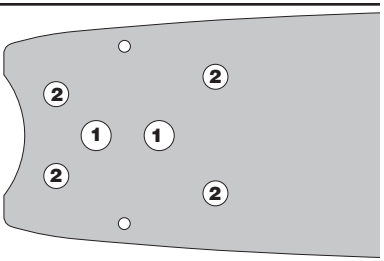
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .656"

2 = .531"



(continued)

3/4" BAR MOUNTS *(continued)*

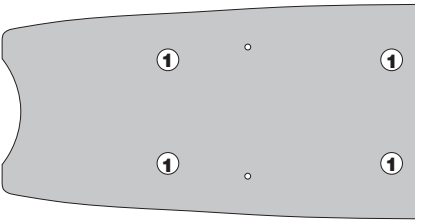
T145

DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSION:

1 = .570"



T146

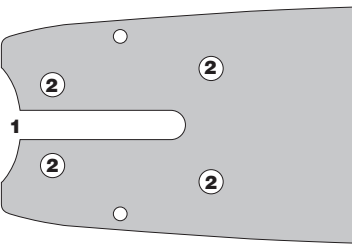
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .637" x 3.627"

2 = .531"



T151

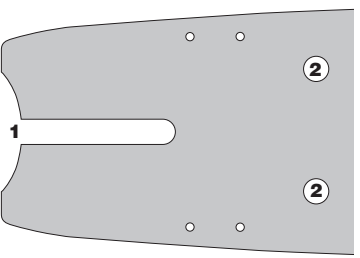
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .535" x 3.226"

2 = .531"



T152

DRIVE SPROCKET TOOTH COUNT:

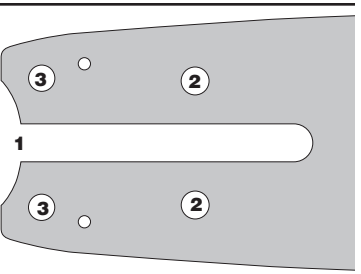
9, 10

DIMENSIONS:

1 = .760" x 5.910"

2 = .562"

3 = .531"



3/4" BAR MOUNTS

T156

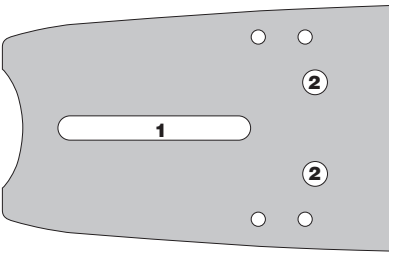
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 =.515" x 4.129"

2 = .531"



T157

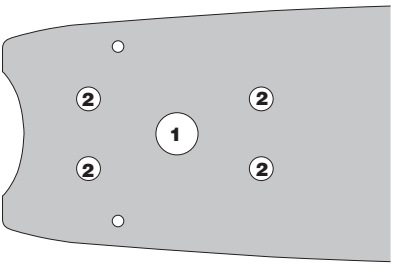
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 =.875"

2 =.500"



T160

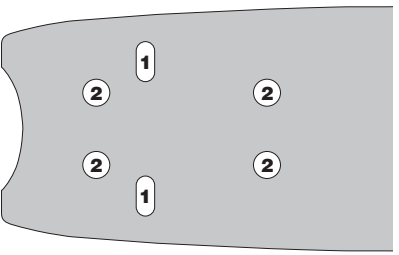
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 =.824" x .374"

2 = .572"



T161

DRIVE SPROCKET TOOTH COUNT:

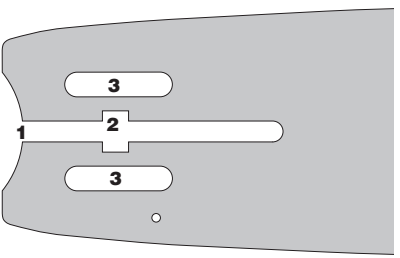
9, 10

DIMENSIONS:

1 =.447" x 5.500"

2 =.880" x .568

3 =.531" x 2.281"



(continued)

3/4" BAR MOUNTS *(continued)*

T168

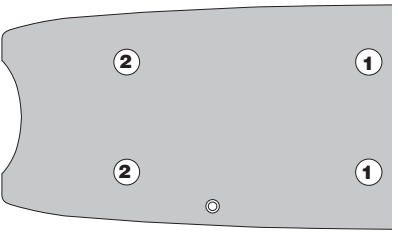
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .609"

2 = .562"



T190

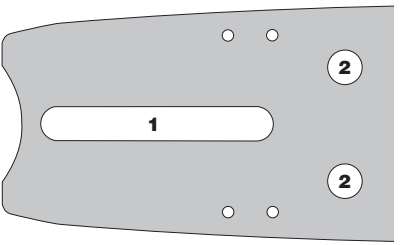
DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSIONS:

1 = .760" x 5.25"

2 = .760"



V127

DRIVE SPROCKET TOOTH COUNT:

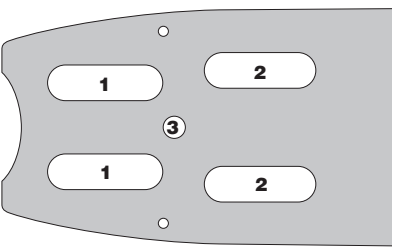
9, 10

DIMENSIONS:

1 =.812" x 2.577"

2 =.812" x 2.453"

3 = .500"



SYMMETRICAL 2-ENDED BAR MOUNTS

9135

DRIVE SPROCKET TOOTH COUNT:

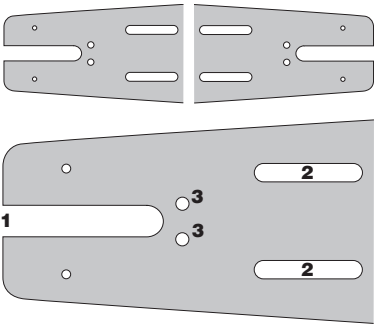
9, 10

DIMENSIONS:

1 = .906" x 4.500"

2 = .531" x 3"

3 = .375"



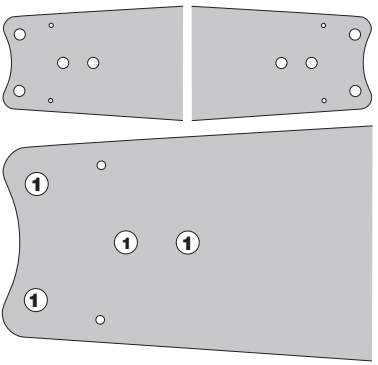
9136

DRIVE SPROCKET TOOTH COUNT:

9, 10

DIMENSION:

1 = .516"



9137

DRIVE SPROCKET TOOTH COUNT:

9, 10

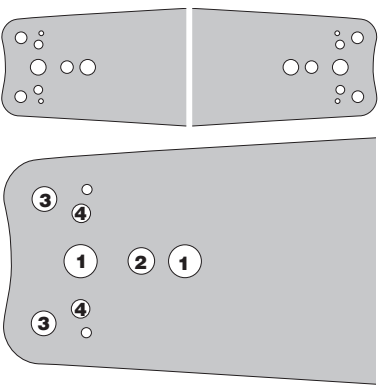
DIMENSIONS:

1 = .687"

2 = .553"

3 = .512"

4 = .384"



(continued)

SYMMETRICAL 2-ENDED BAR MOUNTS *(continued)*

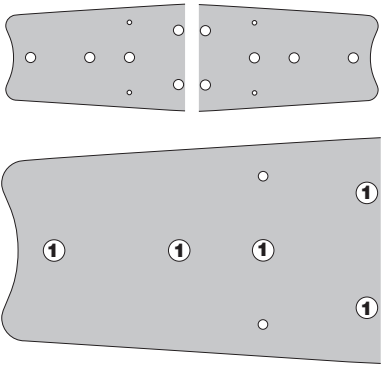
9164

DRIVE SPROCKET TOOTH COUNT:

9

DIMENSION:

1 = .531"



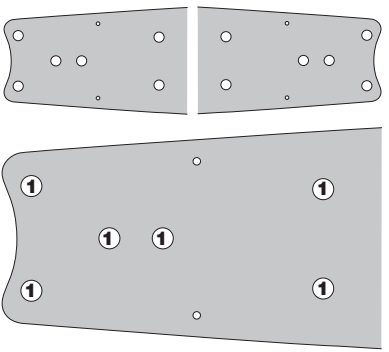
9177

DRIVE SPROCKET TOOTH COUNT:

9

DIMENSION:

1 = .531"



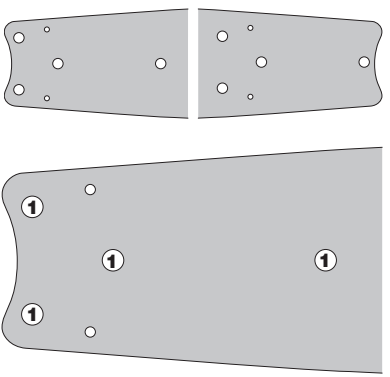
9178

DRIVE SPROCKET TOOTH COUNT:

9

DIMENSION:

1 = .516"



3/4" ASYMMETRICAL DOUBLE-ENDED

9155

DRIVE SPROCKET TOOTH COUNT:

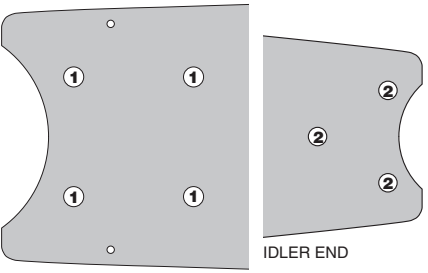
15

SPROCKET END DIMENSION:

1 = 4 at .656"

IDLER END DIMENSION:

2 = 3 at .531"



IDLER END

9170

DRIVE SPROCKET TOOTH COUNT:

15

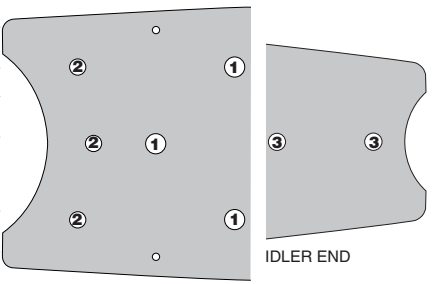
SPROCKET END DIMENSIONS:

1 = 3 at .656"

2 = 3 at .531"

IDLER END DIMENSION:

3 = 2 at .531"



IDLER END

9191

DRIVE SPROCKET TOOTH COUNT:

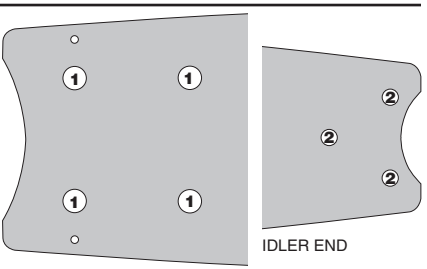
14

SPROCKET END DIMENSION:

1 = 4 at .760"

IDLER END DIMENSION:

2 = 3 at .531"



IDLER END

H175

DRIVE SPROCKET TOOTH COUNT:

12

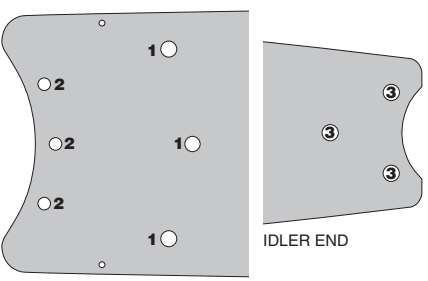
SPROCKET END DIMENSIONS:

1 = 3 at .656"

2 = 3 at .531"

IDLER END DIMENSION:

3 = 3 at .531"



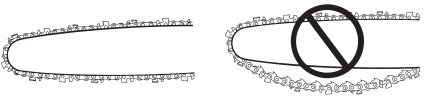
IDLER END

OREGON® GUIDE-BAR MAINTENANCE

For proper mounting of your guide bar, refer to the operator's manual for your harvesting equipment.

BASIC GUIDE-BAR-MAINTENANCE TASKS

▲	Before each use.	●	Daily.
■	Often *(Hourly)*	♦	Weekly, periodically.

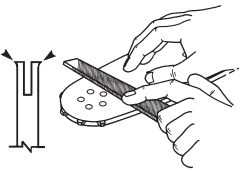


1. ▲ ■ Chain tensioning

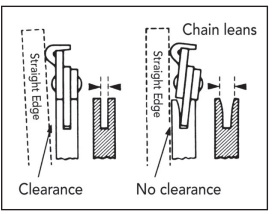
2. ● Clean bar groove

3. ♦ Clean oil holes

4. ♦ Dress the rail
Note: If using a grinding wheel, direct debris towards tail, then clean out grooves. Grinding debris can cause the nose components to wear quickly or jam.

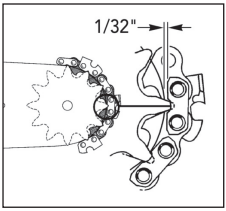


5. ♦ Check bar groove with chain on the bar, hold a straight edge against the bar body and against a cutter side plate. A good groove will hold the chain straight, leaving a



small gap between the straight edge and bar body. A worn groove will let the chain lean until straightedge is flush with bar body. Replace bar if groove is worn.

6. ♦ On sprocket-nose bars, check for clearance around the bar tip between the top of rails and the bottom of cutters or tie straps. Replace nose sprockets before cutters or tie straps contact the bar rails.

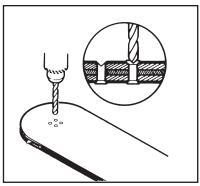


HOW TO REPLACE OREGON® HARVESTER NOSE SPROCKETS

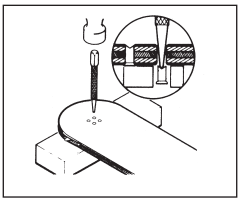
Note: Wear safety goggles.

NOTE: Select a new Harvester nose sprocket with the correct gauge for your bar and chain.

1. Using a 1/4" drill bit, drill out head from each of the nose-sprocket rivets.



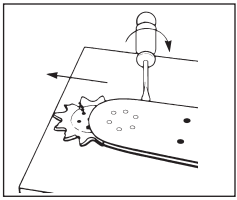
2. Punch out the remainder of the rivets. Use a punch narrow enough to keep from damaging the rivet holes in the nose of the bar.



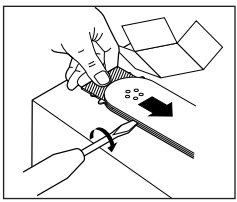
(continued)

(Replace Nose Sprockets continued)

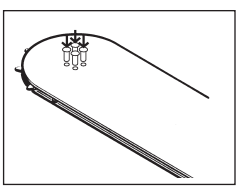
3. Use a small screwdriver to spread the bar nose rails just enough to remove the old nose sprocket. Clean debris from the sprocket area.



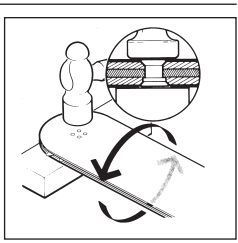
4. Inside the nose-sprocket package you'll find the new sprocket wrapped in a tissue. Be careful to keep the sprocket inside the tissue as you remove it from the package – bearings are easily lost. Slide the tissue and the new sprocket, together, into the bar's nose. Once fully inside the nose, hold the sprocket in place, then remove the tissue.



5. Align the sprocket's inner race holes with the holes in the bar nose. Insert rivets into each hole through the bar. On used bars the nose rails may tend to spread apart. Use a small clamp to hold the nose rails together when inserting and securing the rivets.



6. With the bar and rivets solidly supported on a strong, flat metal surface, carefully peen the rivet heads down with the flat end of a hammer. Be careful to hit only the rivet head. Do not hit the bar body-this will pinch the nose sprocket. Rivet heads must be snug and secure while still allowing the sprocket to turn freely.

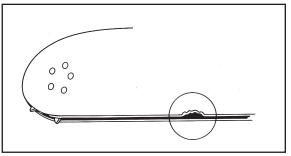


HOW TO STRAIGHTEN OREGON® HARVESTER BARS

Note: Wear safety goggles.

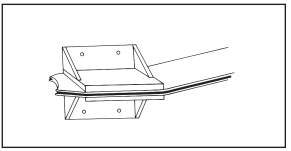
BROKEN BAR RAILS

Check the bar for broken rails. If broken rails are found, it's likely the bar won't function well even if it is straightened.

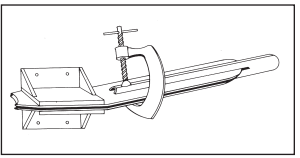


BENT BARS

If the bar is bent place it between two rigidly held parallel plates *(a bar and drivelink thickness apart)* with the bent area aligned at the edge of the plates.

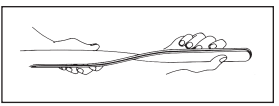


Attach a clamping bar to the bar extending from plates and proceed to remove the bend in the bar. The bar will have to be bent in the opposite direction to get it straight.

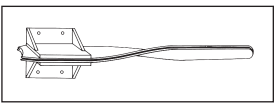


TWISTED BARS

Sight down the bar to identify which way it's twisted.



Place the bar between the plates so that the twisted section just protrudes from the plates.



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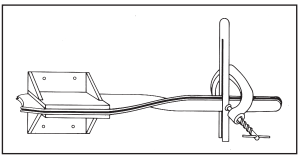
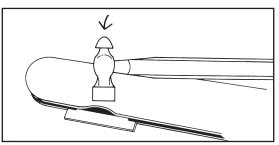
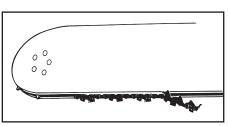
(How to straighten continued)



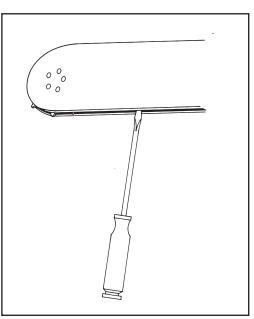
Place the clamping bar across the bar 6 inches from the opening on the side of the plates and torque the bar in the opposite direction of twist. Proceed along the bar in 6 inch increments until the twist is removed.



Remove the bar from the bar straightening tool and place it on a hard working surface. Insert a piece of metal *(the same width as the bar groove)* where the bar was bent. Hammer any small kinks out of the bent section. Take care to keep the groove width tool in place so the rails cannot be hammered shut. Hammer the bar with the cupped side down.

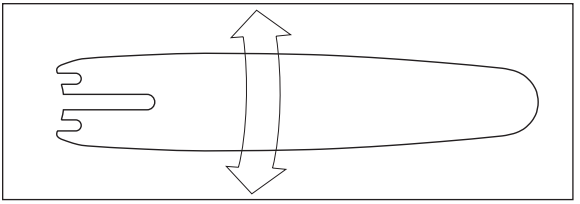


Slide cutting chain into the bar groove. Make sure that there are no pinch points between the rails.



Open up the rails with a screw driver at pinch points.

TORQUE-TO-FAILURE INFORMATION



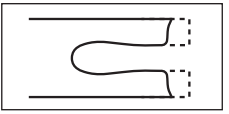
Bar Type	Pitch-Gauge	Bar Mount (Tail) Type	Average Torque to Failure
Jet-Fit®	.404" – .080"	B	5200 ft-lbs. 7050 N-m
		L	4800 ft-lbs. 6507 N-m

GUIDE-BAR TROUBLESHOOTING

Most guide bar problems occur in the bar rails, and are caused by four things: lack of lubrication, incorrect chain tension, accidents, or irregular operation techniques which pinch the rails or push the drive links sideways against the bar rails. Here are the things you should look for, and the corrective actions you should take.

PROBLEM
Rail Conditions

1. Rails are worn down, groove becomes shallow.

   Cause: Normal wear on rails.

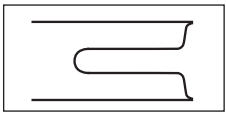
   Result: Chain rides on groove bottom causing drive link damage and chain leans during cutting.

   Remedy: Bar is at end of life, replace bar. If wear occurs too quickly check for proper lubrication, chain sharpness, and bar feed load.

(continued)

(Guide-bar troubleshooting continued)

2. Outside edge of rails develop wire edges.

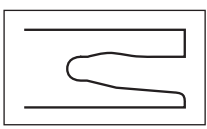


Cause: Normal wear on the rails.

Result: Left alone, wire edges can break off and chip away rail material.

Remedy: Use a flat file or grinder to square up the bar's rails and remove wire edges. If wire edges develop too quickly, check for proper lubrication, chain sharpness and bar feed load.
Note: If using a grinding wheel, direct debris towards tail, then clean out grooves. Grinding debris can cause the nose components to wear quickly or jam.

3. Rail on one side is worn thin.

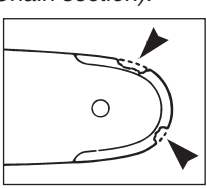


Cause: Damaged or dull cutters on one side *(see chain section)*. Chain leaning over in a worn groove or using a .063 gauge chain in an .080 gauge bar.

Result: Incomplete cuts, leading cuts, or bar bound in the cut.

Remedy: Replace bar, check for correct chain gauge, and replace chain if it continues to cut crooked after sharpening *(see Chain section).*

4. Rails around the tip of solid-nose bars show small cracks or broken-out sections.

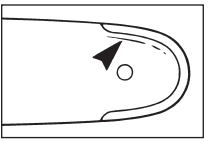


Cause: Accidents or irregular operating techniques which push the drive links sideways or place excessive pressure on the side of the nose can cause breaks or cracks.

Result: Damage to tie straps and cutters, chain throws, short bar life.

Remedy: Your dealer may be able to repair minor damage on a relatively new bar.

5. Rails around the tip of solid-nose bars are split at the bottom of the bar groove.

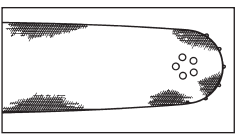


Cause: Accidents or irregular operating techniques which push the drive links sideways or place excessive pressure on the side of the nose can cause breaks or cracks.

Result: Rails spread and chain rides on groove bottom causing drive link damage and chain leans during cutting.

Remedy: Your dealer may be able to repair minor damage on a relatively new bar.

6. Rails along the bar body or around the tip of sprocket-nose bars show blue discoloration.

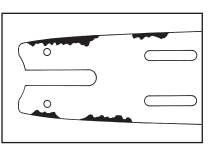


Cause: Pinched rails, lack of lubrication, or accidents and cutting techniques which can push the drive links sideways in the groove creating extreme friction-generated heat.

Result: Blue spots on rails indicate temperatures reached 600° F *(315° C)* and softened the rails. The rails will wear quickly. Chain drive links will also be damaged.

Remedy: Replace the bar and chain.

7. Blue spots at the tail of the bar.



Cause: Misaligned sprocket or rails pinched because debris was not removed from saw pad or bar when the bar was installed.

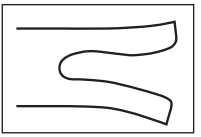
Result: Blue spots on rails indicated temperatures reached 600° F *(315° C)* and softened the rails. The rails wear quickly. Chain drive links will also be damaged.

Remedy: Realign sprocket and bar using proper shims. Clean bar and saw pad when installing a bar. Replace chain.

(continued)

(Guide-bar troubleshooting continued)

8. Spread rails.

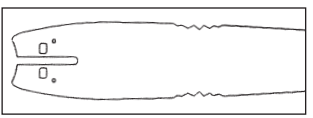


Cause: (#1) The chain was struck broadside by a tree, log, or branch stub. (#2) The chain was pushed sideways, forcing the drive links to pry the bar rails apart.

Result: Bar will not enter the log during a cut or can not make a complete cut.

Remedy: (#1) Hammer the rails together with a drive link in the groove as a spacer. Adjust the "saw return" to allow the bar to go farther into the saw box. Sharpen delimbing knives. Avoid moving the tree/log when the bar and chain are out of the saw box. (#2) Reduce bar feed speed.

9. Rail chipping in the middle of the bar.

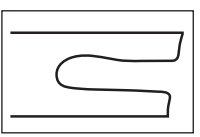


Cause: Excessive pressure on the bar, excessive bar feed speed, cold conditions, lack of lubrication, aggressive chain cutting in frozen wood.

Result: Damage to the chain and reduced bar life.

Remedy: Replace the bar if rail wear is extensive. Decrease the bar feed force when cutting consists mostly of small-diameter trees. Increase lubrication especially in cold conditions. Reduce aggressiveness of chain when cutting frozen wood.

10. Rail on one side is worn low.



Cause: Damaged or dull cutters on one side, or chain leaning over in a worn groove, or using a .063 gauge chain in an .080 gauge bar.

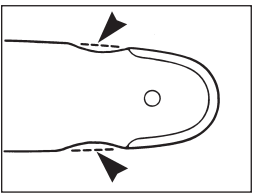
Result: Incomplete cuts, leading cuts, or bar bound in the cut.

Remedy: Replace the bar and the chain as well if it continues to cut crooked after sharpening *(see Chain section)*.

NOTE: ***Most often one short rail is caused by cutters contacting rocks on one side of the chain, usually the cutters closest to the ground .***

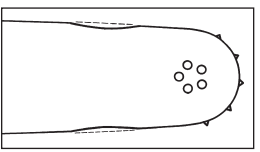
PROBLEM
Bar Nose Failures

11. Chipped rails or excessive rail wear just behind the hard stellite on solid-nose bars, or near the nose on sprocket-nose bars.



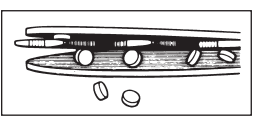
Cause: Loose chain tension.

Result: Chain damage, chain throwing, and shortened bar life.



Remedy: Use proper chain tension and invert the bar on the saw periodically to distribute the wear.

12. Rails in the tip of a sprocket-nose bar have spread, allowing loss of bearings.

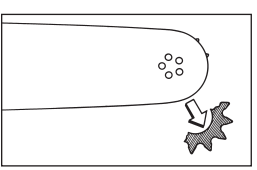


Cause: Accidents or irregular operating techniques which twist the nose or push the drive links sideways against the nose's rails.

Result: Sprocket breakage.

Remedy: Replace sprocket components. Keep bar nose away from objects not intended to be cut.

13. The sprocket in a sprocket-nose bar breaks.



Cause: High chain tension, accidents, or chain broadsided by a log which pulled the chain out of the bar rails.

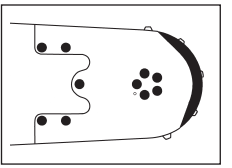
Result: Bar nose sprocket no longer functions.

Remedy: Replace sprocket components. Use proper chain tension.

(continued)

(Guide Bar Troubleshooting continued)

14. Nose burned at tip from chain sliding on the rails of a sprocket-nose bar, or from the sprocket being recessed into the tip.

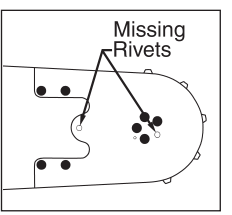


Cause: High chain tension from automatic chain tensioners.

Result: Nose breakage from the bearings wearing quickly and jamming.

Remedy: Decrease the tension applied by the automatic chain tensioner.

15. Loose or missing nose and attachment rivets.

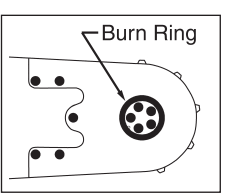


Cause: Bar tip flexing during operation from difficult cutting conditions or accidents.

Result: Rivets will continue to loosen until laminates spread and bearings are lost.

Remedy: Check the rivets every 100 machine hours. Rehammer loose rivets and replace rivets if rivet head is missing. Always use new rivets.

16. Burn ring around the nose rivets.

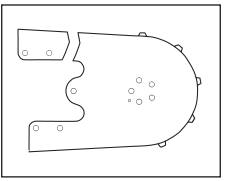


Cause: Bearings over-heated.

Result: Premature breakage, jamming, or wearing of sprocket nose components.

Remedy: Check for proper oil flow rates. Saw chips will plug the oil line or bar oil hole. Clean out bar oil hole daily. Install a wire mesh screen on the oil tank filler spout to prevent chips from getting into the tank.

17. Tabs on replaceable nose sprocket *(RSN)* break off.



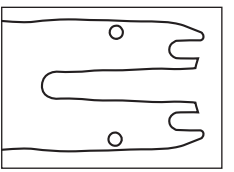
Cause: Accidental bending of the nose.

Result: RSN no longer functions.

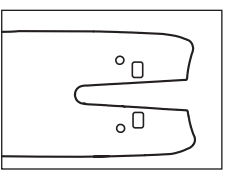
Remedy: Install a new RSN. Avoid bending the RSN.

PROBLEM
Bar Mount Failures

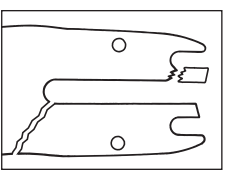
18. Spread or broken bar mounting slot



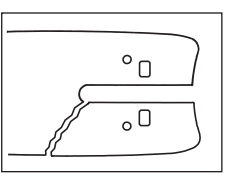
Cause: Holding pins/bolts were not inserted into the bar-mount holes.



Result: Bar mount slot spreads or bar breaks at the slot prematurely because the bar is not properly supported when minor accidents or pinches occur.



Remedy: Replace broken bars and use the holding pins/bolts originally supplied with the bar holder. When purchasing a new harvester head, consider purchasing a head compatible with Oregon® Jet-Fit® bars.



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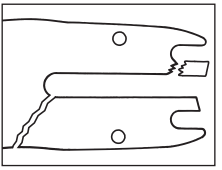
(Guide Bar Troubleshooting continued)

PROBLEM
Jet-Fit® Bar-Mount Failures

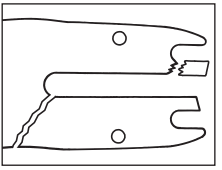


19. Chronic or frequent bar-mount breakage on Jet-Fit® bars when no accident has occurred.

Causes:
(#1) Bar-retraction speed is too fast.
(#2) Forward bar-sweep speed is too fast, causing the bar holder to stop quickly at its end of rotation. In either case, the inertia of the bar causes it to over-rotate in the bar mount, putting excessive stress on the bar mount.

Results:
(#1) Bar-mount breakage without the bar being involved in an accident.
(#2) Unexplained bar-mount breakage.

Remedy: Reduce the pressure, or flow, to the cylinder that sweeps the bar forward, out of the saw box, or retracts the bar back into the saw box.

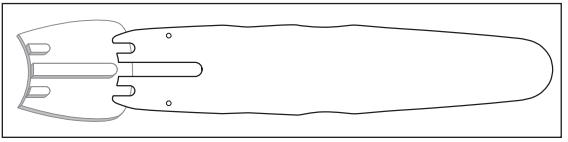


20. Occasional failure of Jet-Fit® bars when accidents occur.

Cause: Bar becomes stuck in the cut, or an accident occurs causing the bar to become stuck.

Result: Force required to dislodge the bar approaches the strength of the bar holder, during which the bar-mount breaks.

Remedy: In this case, the Jet-Fit bar breaks, as designed, to prevent damage to the more expensive bar holder. Avoid accidents and avoid getting the bar stuck whenever possible.



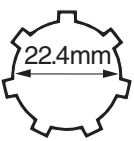
DRIVE SPROCKETS

Your drive sprocket is an integral component of your "cutting team," transferring the power from your harvester to your chain to drive it around your bar. Your sprocket, chain and bar work as a team, they will wear as a team, and should be inspected and maintained as a team

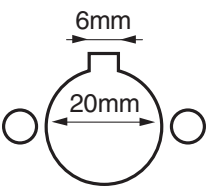
TYPE	ADVANTAGES	DISADVANTAGES
SPUR 	• No chain alignment problem unless worn. • Less expensive.	• No side support. • Damages chain if thrown.
RIM 	• Best chain support for cutters and tie straps.	• Needs to align with bar.*
	*Check the alignment of your rim sprocket regularly, and use shims to adjust the rim's position into correct alignment. See the next page for more information on sprocket alignment.	
PIN 	• Replaceable pins.	• Concentrates loads on back of drive link. • May cause drive link chipping.

COMMON DRIVE SHAFT CONFIGURATIONS

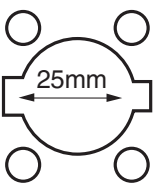
TYPE A



TYPE B



TYPE C



DRIVE SPROCKET ALIGNMENT

To prevent damage to the bar, chain and drive shaft, the sprocket must be aligned with the bar's groove. Here's how to align your sprocket:

1. Mount the bar on your harvester's head.
2. Use a flat metal ruler of the correct thickness for your bar -
   - For 3/4"-pitch bars the ruler should be 1/8" thick
   - For .404"-pitch bars running 18H chain, the ruler should be as close as possible to .080" thick, or slightly thinner
   - For .404"-pitch bars running 16H chain, the ruler should be as close as possible to .063" thick, or slightly thinner
3. Place the ruler in the bar's groove and slide it back until it extends to the sprocket.
4. Adjust the sprocket's position on the drive shaft until it is centered on the ruler.
5. Install shims as necessary to keep the sprocket in this centered, aligned, position.
6. Secure the sprocket in place.

DRIVE SPROCKET REPLACEMENT

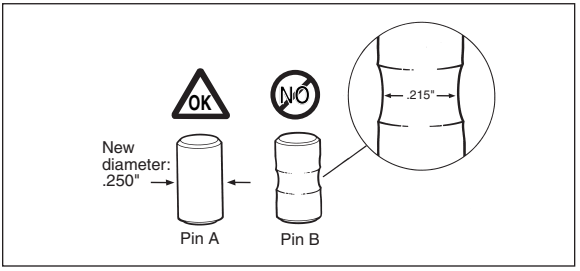
- With .404"-pitch chains, install a new sprocket at the maximum of each 10 chains, or when wear depth on the surface of your sprocket reaches .025" (0.6mm), or when damage occurs.

- With 3/4"-pitch chains, install a new sprocket after a maximum of 2000 hours or more frequently if excessive wear or damage occurs.

INSPECTING & REPLACING 3/4"-PITCH SPROCKETS

WHEN TO REPLACE 3/4"-PITCH PIN SPROCKETS

When to replace pins: Check the pins on your sprocket periodically for wear. The pins should be changed when wear of .017" deep is evident. The diameter of the pin should not be less than .215" when measured across the worn part of the pin (see Pin B). If the worn pins are not replaced they will damage the chain and pin sprocket.



How to remove pins: Place sprocket on a secure flat surface. With the end of a screwdriver, insert blade between the removal notch in the retaining ring and the sprocket (see figure A.) Twist the screwdriver to remove the retaining ring. When the retaining ring is removed, tip the sprocket so the pins fall out. If needed, insert a small wire into the small holes on the opposite side of the retaining ring and push the pins out.

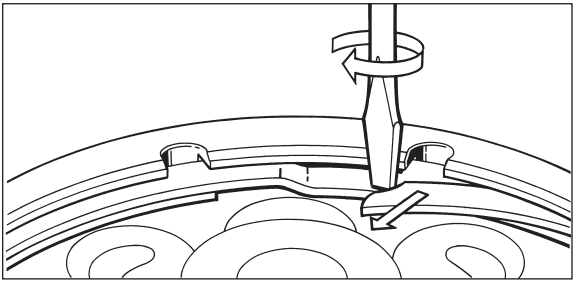


Figure A

Pin hole inspections: Use the small wire to clean out all debris from the bottom of the pin holes. Extended use of worn pins may cause the pin holes to become oblong. If this condition is present, the entire sprocket must be replaced.

Pin assembly: Insert new pins into the Pin Holes. Insert the end of the new retaining ring into the sprocket groove. Slightly twist the ring to allow the edge to slip into the groove (Fig. B). While inserting the retaining ring make sure the Ring Gap, between the Bottom End and the Bend, is not directly above a Pin Hole. (Figure C) The pin will slide into the gap, decreasing the life of the pin and sprocket. Continue to insert the retaining ring into the groove. If the retaining ring will not fit into the groove, it may be bent or damaged and should be replaced.

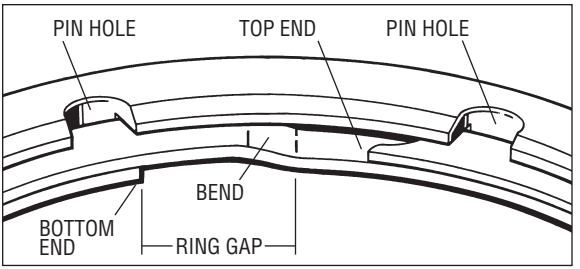


Figure B: **CORRECT** Retaining Ring Position

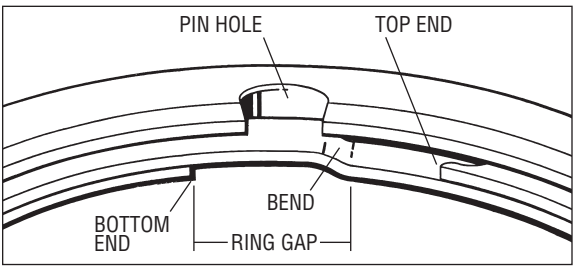


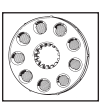
Figure C: **INCORRECT** Retaining Ring Position

When to replace a pin sprocket:
The pin sprocket should be replaced if the pin holes become oblong or if cracks are observed on the sprocket.

The pins should have uniform wear at the center because they slowly rotate during use. Replace the pin if it has wear on one side only.
If one pin needs replacing all the pins should be changed as a set. Mixing new and old pins will cause the new pins to be quickly damaged.

WHEN TO REPLACE 3/4"-PITCH SPUR SPROCKETS

Spur sprockets should be replaced when wear depth reaches .025" on the spur teeth. Using an over worn sprocket will cause damage to the chain chassis including tie-strap burrs and peened drive links, which can lead to chain breakage.



WHEN TO REPLACE 3/4"-PITCH RIM SPROCKETS

Rim sprockets should be replaced when wear depth reaches .025" on the rim surface, or when the rim sprocket's tooth tips are worn below the sprocket's outer diameter (the rim surface). Using an over worn sprocket will cause damage to the chain chassis including tie-strap burrs and peened drive links, which can lead to chain breakage.

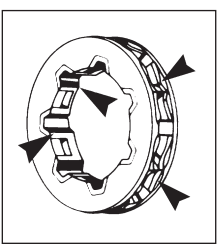
DRIVE SPROCKET TROUBLESHOOTING

Your drive sprocket, the third member of the cutting team, deserves regular attention and maintenance just like your bar and chain. A misused sprocket can cause unnecessary patterns of chain wear, which can damage the guide bar and reduce the life of all three components. A damaged sprocket cannot be repaired, it can only be inspected and replaced.

NOTE:
A new chain can be ruined if installed on a worn rim or spur sprocket. Check the wear on your rim sprocket or spur sprocket daily, and before each session of use. If worn, replace the sprocket before installing a new chain. In abrasive conditions, wear will be increased.

Here are the things you should look for, and the corrective actions you should take.

Worn Rim Sprocket

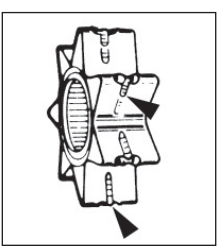


Cause: Use beyond service life causing excessive wear on the outer and inner surfaces of the rim sprocket.

Result: Chain breakage. Drive link wear and breakage.

Remedy: Replace rim sprocket.

Worn Spur Sprocket



Cause: Use beyond service life causing excessive wear on the tips of sprocket teeth, and between the teeth.

Result: Chain breakage. Drive link wear and breakage.

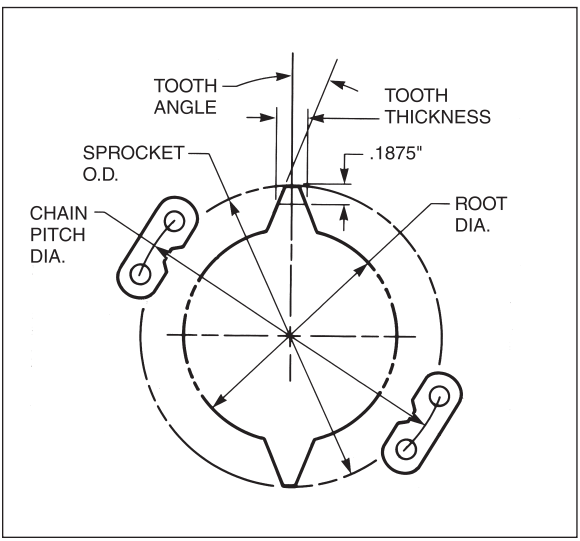
Remedy: Replace spur sprocket.

DESIGN INFORMATION

SPUR SPROCKET .404" PITCH (16H, 18H)

(ENGLISH UNITS)

Tooth Count	Tooth Angle	Sprocket O.D. ±.005 in	Sprocket Root Dia. ±.005 in	Tooth Thickness at .1875 Dim. ±.005 in	Chain Pitch Dia. in	Rev/ft.
9	20	2.103	1.406	.212	2.338	1.650
10	22	2.364	1.666	.229	2.600	1.480
11	23.64	2.625	1.927	.244	2.854	1.350
12	25	2.885	2.187	.256	3.111	1.230
13	26.15	3.145	2.447	.266	3.369	1.140
14	27.14	3.405	2.707	.275	3.628	1.060
15	28	3.664	2.966	.282	3.885	.987
16	28.75	3.924	3.226	.289	4.144	.925
17	29.41	4.183	3.485	.295	4.402	.870
18	30	4.442	3.744	.300	4.660	.822
19	30.53	4.701	4.004	.305	4.918	.779
20	31	4.961	4.263	.309	5.177	.740
21	31.43	5.220	4.522	.313	5.435	.700
22	31.82	5.479	4.781	.317	5.693	.670

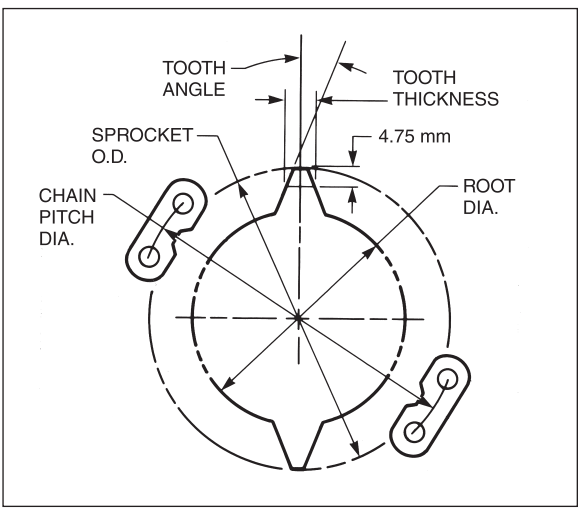


DESIGN INFORMATION

SPUR SPROCKET .404" PITCH (16H, 18H)

(METRIC UNITS)

Tooth Count	Tooth Angle	Sprocket O.D. ±.13 mm	Sprocket Root Dia. ±.13 mm	Tooth Thickness at 4.75 Dim. ±.13 mm	Chain Pitch Dia. mm	Rev/m
9	20	53.42	35.71	5.38	59.39	5.41
10	22	60.05	42.32	5.82	66.04	4.86
11	23.64	66.68	48.95	6.20	72.49	4.43
12	25	73.28	55.55	6.50	79.02	4.04
13	26.15	79.88	62.15	6.76	85.57	3.74
14	27.14	86.49	68.76	6.99	92.15	3.48
15	28	93.07	75.34	7.16	98.68	3.24
16	28.75	99.67	81.94	7.34	105.26	3.03
17	29.41	106.25	88.52	7.49	111.81	2.85
18	30	112.83	95.10	7.62	118.36	2.70
19	30.53	119.41	101.70	7.75	124.92	2.56
20	31	126.01	108.28	7.85	131.50	2.43
21	31.43	132.59	114.86	7.95	138.05	2.30
22	31.82	139.17	121.44	8.05	144.60	2.20

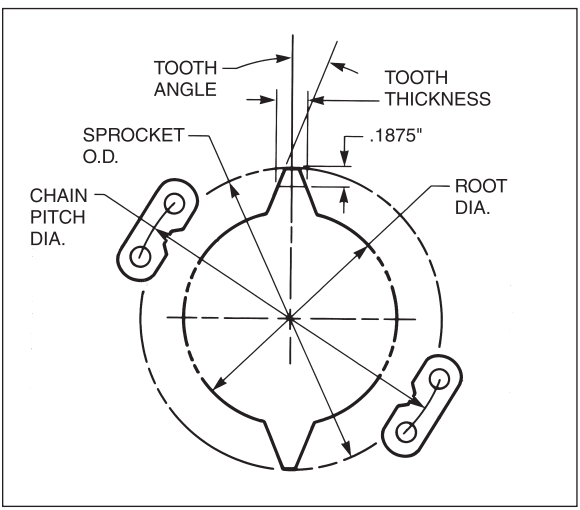


DESIGN INFORMATION

SPUR SPROCKET 3/4" PITCH (11BC, 11H)

(ENGLISH UNITS)

Tooth Count	Tooth Angle	Sprocket O.D. ±.005 in	Sprocket Root Dia. ±.005 in	Tooth Thickness at .1875 Dim. ±.005 in	Chain Pitch Dia. in	Rev/ft.
7	19.29	3.120	2.065	.303	3.544	1.100
8	22.5	3.627	2.571	.331	4.036	.959
9	25	4.131	3.036	.353	4.532	.852
10	27	4.635	3.539	.370	5.027	.767
11	28.64	5.137	4.042	.383	5.522	.697
12	30	5.639	4.543	.394	6.018	.639
13	31.15	6.141	5.045	.403	6.516	.590
14	32.14	6.642	5.546	.411	7.012	.548
15	33	7.142	6.047	.418	7.509	.511
16	33.75	7.643	6.547	.424	8.007	.479
17	34.41	8.143	7.047	.429	8.504	.451
18	35	8.643	7.548	.430	9.001	.436
19	35.53	9.143	8.048	.437	9.499	.404
20	36	9.643	8.547	.441	9.997	.384
21	36.43	10.143	9.047	.444	10.495	.365
22	36.82	10.643	9.547	.447	10.994	.349

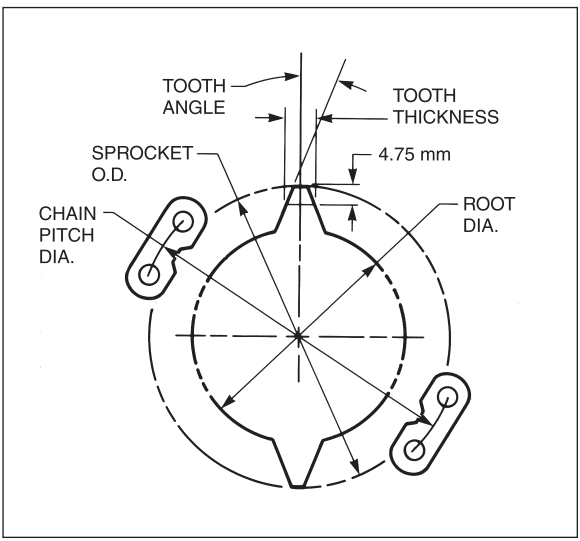


DESIGN INFORMATION

SPUR SPROCKET 3/4" PITCH (11H, 11BC)

(METRIC UNITS)

Tooth Count	Tooth Angle	Sprocket O.D. ±.13 mm	Sprocket Root Dia. ±.13 mm	Tooth Thickness at 4.75 Dim. ±.13 mm	Chain Pitch Dia. mm	Rev/m
9	25	104.93	77.11	8.97	115.11	2.80
10	27	117.73	89.89	9.40	127.69	2.52
11	28.64	130.48	102.67	9.73	140.26	2.29
12	30	143.23	115.39	10.01	152.86	2.10
13	31.15	155.98	128.14	10.24	165.51	1.94
14	32.14	168.71	140.87	10.44	178.10	1.80
15	33	181.41	153.59	10.62	190.73	1.68
16	33.75	194.13	166.29	10.77	203.38	1.57
17	34.41	206.83	178.99	10.90	216.00	1.48
18	35	219.53	191.72	10.92	228.63	1.43
19	35.53	232.23	204.42	11.10	241.27	1.33
20	36	244.93	217.09	11.20	253.92	1.26
21	36.43	257.63	229.79	11.28	266.57	1.20
22	36.82	270.33	242.49	11.35	279.25	1.14



DEFINITIONS

Hp = Horsepower	**r** = Radius
RPM = Revolutions per min.	**psi** = Pounds per sq. in.
d = Displacement, cu. in.	**GPM** = Gallons per min. *(US)*
T = Torque	

PUMP CALCULATIONS

$$Hp = \frac{GPM \times psi}{1714 \times eff.\ (pump)} \quad \text{or} \quad Hp = \frac{.000583 \times GPM \times psi}{eff.\ (pump)}$$

$$Hp = \frac{T \times RPM}{5252} \text{ Torque (lb.-ft.)} \quad \text{or} \quad Hp = \frac{T \times RPM}{63025} \text{ Torque (lb.-in.)}$$

$$Hp = \frac{volts \times amperes}{745.7}$$

PUMP OUTPUT FLOW

$$GPM = \frac{RPM \times d}{231\ cu.\ in.} \qquad 1\ gal. = 231\ cu.\ in.$$

PUMP/MOTOR TYPE

SPECIFICATIONS	MODEL							
	F11-5	F11-10	F11-19	F11-28	F12-30	F11-39	F12-40	F11-58
Displacement (cu. in./rev)	0.3	0.6	1.16	1.72	1.83	2.36	2.44	3.55
Operating pressure (psi)								
Max. intermittent	6,000	6,000	6,000	6,000	7,000	6,000	7,000	6,000
Max. continuous	5,000	5,000	5,000	5,000	6,000	5,000	6,000	5,000
Operating speed (rpm)								
Max. short duration	12,000	10,000	7,500	6,500	7,100	5,200	6,400	4,500
Max. continuous	8,500	6,800	5,400	5,000	5,600	4,200	5,000	3,600
Min. continuous	200	200	150	150	50	125	50	125
Flow (theoretical) @1000 rpm (gpm)	1.29	2.5	5.02	7.42	7.92	10.2	10.6	15.4
Torque (theoretical) @ 1000 psi (lb.-in.)	47	95	184	273	290	375	387	564
Power output (hp)								
Max intermittent	30	50	80	105	147	125	174	160
Max continuous	20	35	60	75	94	90	114	135

NOTE: Other pump/motor types are used on some harvesters. Check with your harvester's manufacturer for specifications on other pump/motor types.

(continued)