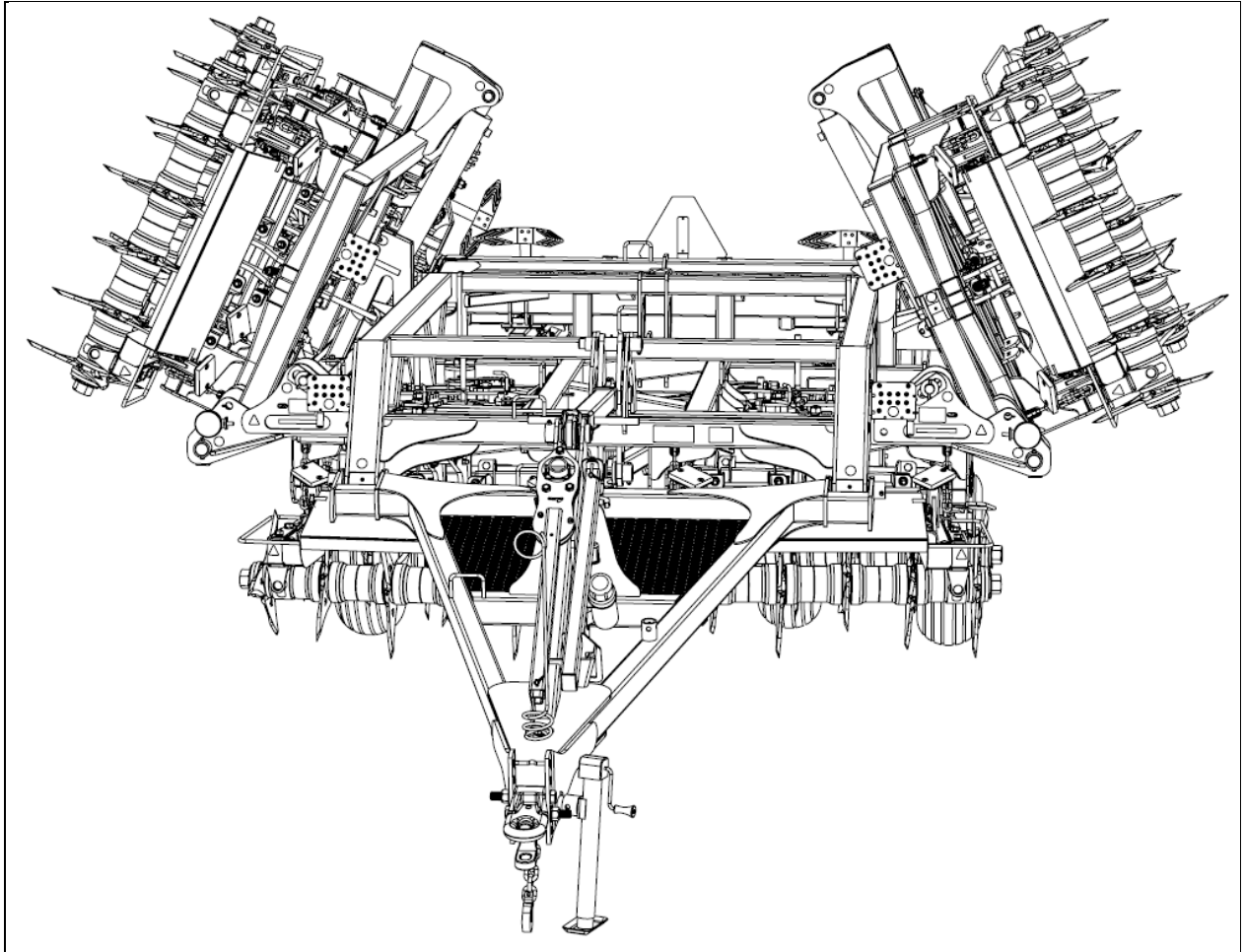


OWNERS MANUAL

CurseBuster Tillage Machine

www.soilcursebuster.com



Version 2017-04-24

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INTRODUCTION

Dear Owner,

We will present the various areas in which our knowledge may assist you in Ownership of your CurseBuster machine in the following order, taking delivery of new unit, initial assembly(if required), towing to the field in transport mode, running in the field in operating mode, and storage upon completion of field work. Also necessary are; maintenance, adjustment, troubleshooting, proper instruction of other operators, and a firm commitment to ensure the safety of all persons involved, at all times. We also suggest faith in God, and often giving of thanks to Him.

Taking delivery of a new machine requires that certain forms be filled out by the new owner and delivery personnel. First, a Pre-delivery form must be followed and filled out with copies given to the new owner, the dealer(if any), and Soil Regeneration Unlimited. Find copies of this form printed on the next three pages. Secondly, a Delivery form must be followed and filled out with copies given to the new owner, the dealer(if any), and Soil Regeneration Unlimited. Find copies of this form printed on the three pages following the three copies of the Pre-delivery form.

Pre-delivery Form - Customer Copy

After the machine has been completely assembled, inspect it to be sure it is ready to be operated, before it is delivered to the customer. The following checklist is a reminder of important items to be inspected. Check off each item after it is found to be satisfactory.

- ☐ SMV sign and road lighting installed and functional.
- ☐ All rolling, ground engaging, assemblies rotate freely enough to indicate proper assembly.
- ☐ Safety chain is attached.
- ☐ Safety decals are legible and intact.
- ☐ Hydraulic connections do not leak.
- ☐ Hydraulic hoses routed and secured properly, and hydraulics work as required (lift, fold/unfold, etc.).
- ☐ Entire machine has been inspected for loose bolts, nuts, etc.
- ☐ Tires inflated properly.
- ☐ All wheel studs/nuts tightened to proper torque.
- ☐ Spindle nuts tightened to set proper end play in wheel bearings.
- ☐ Any scratches to paint have been touched up.
- ☐ All grease fittings have been lubricated.
- ☐ Ensure machine is leveled in the fully raised position for an 18" drawbar.
- ☐ Operators manual, and Parts manual have been stored in canister on hitch.
- ☐ Rear harrows are leveled with main machine frame.
- ☐ Model/Serial No. plate secured on center main-frame.
- ☐ Roller angle adjusters all properly zeroed
- ☐ All rollers angled in proper direction to achieve net zero end thrust
- ☐ Roller angle offset configuration matches customer request(diamond, or tandem offset)
- ☐ This machine has been inspected thoroughly, and to the best of my knowledge is ready for delivery to the customer. Date Signature

Leave this page attached as part of the Owner's manual for their reference.

PERFORATED

Pre-delivery Form - Dealer Copy

After the machine has been completely assembled, inspect it to be sure it is ready to be operated, before it is delivered to the customer. The following checklist is a reminder of important items to be inspected. Check off each item after it is found to be satisfactory.

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- ☐ This machine has been inspected thoroughly, and to the best of my knowledge is ready for delivery to the customer. Date Signature
- ☐ Detach and return to the Dealer or their authorized representative.

Pre-delivery Form - Soil Regeneration Unlimited Copy

After the machine has been completely assembled, inspect it to be sure it is ready to be operated, before it is delivered to the customer. The following checklist is a reminder of important items to be inspected. Check off each item after it is found to be satisfactory.

- ☐ SMV sign and road lighting installed and functional.
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- ☐ Detach and return to Soil Regeneration Unlimited or their authorized representative.

PERFORATED

Delivery Form - Customer Copy

At the time the machine is delivered certain information will be conveyed to the new owner. That information is listed below. Check off each item once it has been successfully conveyed to the new owner.

- ☐ Make the new owner aware of all safety precautions that must be exercised while performing activities involving machine; such as hitching, towing, operating, maintaining, folding/unfolding, etc.
- ☐ Give the owner's manual to the customer. Encourage the new owner to read the entire manual.
- ☐ Explain all operating adjustments.
- ☐ Review recommended procedures for attaching machine to towing tractor or implement.
- ☐ Explain to the customer that the life expectancy of this or any other machine depends on regular lubrication as directed in the owner's manual.
- ☐ Familiarize the new owner with the lap-in process of retightening rollers to their final fit to ensure roller assemblies do not become loose and become damaged by ingress of dirt and debris.
- ☐ Record the serial No. in the specification's section, and draw the new owner's attention to this for easy reference during future service inquiries.
- ☐ To the best of my knowledge, this machine has been delivered ready for field use and the new owner has been fully informed as to its proper operation and care.

Date Signature(New Owner)

Date Signature(Salesman)

Date Signature(Service Technician)

Leave this page attached as part of the Owner's manual for their reference.

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Date Signature(Salesman)

Date Signature(Service Technician)

- ☐ Detach and return to Soil Regeneration Unlimited or their authorized representative.

PERFORATED

Initial Assembly(If required)

Service technician will direct and new owner and their employee's may assist at their own convenience and at their own risk. Service technician and their parent company may not be held liable for harm received by the new owner or their employee(s) including but not limited to; damage to property, loss, injury, and death. This section must be read to the new owner before any initial assembly takes place.

The suggested procedure for assembly is as follows:

1. Attaching of axle(s) to main-frame
2. Install hydraulic cylinders for main-frame lift
3. Raise rear of main-frame and install cylinder stop(s) on main-frame lift cylinder(s)
4. Mounting of wheels to axle(s)
5. Attach hitch
6. Attach hitch controlling linkage and/or hydraulic cylinder(s)
7. (if equipped) Raise front of main-frame and install cylinder stop(s) on main-frame leveling cylinder(s)
8. Secure hitch jack into lowered(engaged) position
9. Install roller mounting framing and parts under main-frame
10. Mount rollers under main-frame in desired configuration (diamond or tandem)
11. (if folding unit) Mount wings to main-frame and support outer ends until supported by fold cylinders
12. Attach wing fold cylinders (and linkages, if equipped) to support wing frames
13. Install roller mounting framing and parts under wing frames
14. Mount rollers under wing frames in correct configuration
15. (if equipped) install axles, wheels, and lift cylinders in wings. Secure with cylinder stops
16. (if equipped) Assemble and attach rotary harrows
17. Follow Pre-delivery checklist

First Use and Pre-season checks

If this is the first time the machine will be operated or the first time it will be operated this season, use the following checklist to ensure that the machine is ready to work.

1. Use a hammer to check each roller for proper tension by striking at least three times from each roller with one of those times being at a position outside the bearings. If times all make a sound indicating a high degree of tension, the shaft is sufficiently tight. If only the time that is outside the bearings makes a dull sound, this may mean that a roller shim (PN 2014130C0) needs to be installed so that the part that clamps onto the outside times can do so properly. These shims are available free of charge.
2. Be sure that all locking flanges are bent to lock roller nuts in place.
3. Lubricate all grease points and check to be sure that no grease lines are punctured or leaking.
4. Be sure that wheel bearings are lubricated in accordance with their repacking schedule.
5. Check tire pressure, and re-inflate where needed.
6. Check all bolts, nuts and roll-pins. Re-tighten where loose and replace where missing.
7. Inspect hydraulic hoses, electrical wiring, and grease lines and secure where necessary to avoid damage from rotating wheels, frame movements, wing folding/unfolding, etc.
8. Check all hydraulic connections and repair where necessary if there are any leaks.
9. Test all hydraulic functions to ensure proper operation.
10. Spin all rolling ground engaging assemblies to check for damaged bearings.

Here we will address hitching procedure, hooking up hydraulic connections, and road navigation safety.

Be sure not to get anybody crushed between the tractor and the implement when moving the tractor back. Once implement is secured with hitch pin, attach safety chain, and electrical connection(s).

High pressure hydraulic fluid can cause severe injury. Be sure the tractor is shut off and that the circuits are de-pressurized before connecting any hoses to the tractor. Clean all hydraulic couplings before connecting.

Once machine is fully lifted, secure cylinder stops onto main lift cylinder(s) and hydraulic leveling cylinder(s) (if equipped) and lower machine until the machine weight is supported by the cylinder stops. Only approach machine to install cylinder stops at the operator's instruction, and do not place any part of your body beneath any part of the machine before cylinder stops are all in place.

If machine is equipped with wings, wings must be folded for transport. Do not fold wings unless machine is securely hitched to tractor and safety chain is attached. Wing locking pins must be installed as soon as wings are fully lifted. Be sure that no person approaches or enters the wing area during folding or unfolding, severe injury or death may result. Keep clear of electrical lines and poles to avoid electrocution. Direct contact is not necessary to conduct electricity.

(cont'd on page 13)

Max highway speed is 30mph, go slower on rough roads. Avoid steep up-grades, and down-grades. Weight of the towing vehicle or tractor must be at least 2/3 of the implements' weight. Always be aware that the towed implement may be wider and/or taller than the lead vehicle or tractor. Be especially careful of this when approaching low-hanging overhead electrical lines, low clearance bridges, narrow bridges, and oncoming traffic. Plan the route before departing. Electrocuting can occur without direct contact with electrical lines; proceed very cautiously around electrical lines and poles. See the specifications section for the transport dimensions of your machine. On some models, machine may be wider and/or taller than the listed specifications if rotary harrows (if equipped) are not rotated in line with the direction of travel.

General Operation

CAUTION: Harrows can interfere with wheels. Be sure that harrows are rotated against their working position stops before lowering machine.

Checks

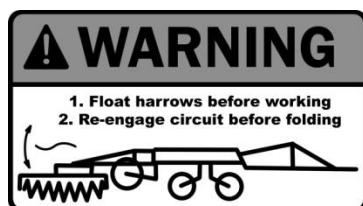
Always be sure the safety chain is attached, and that all desired hydraulic functions are connected.

Unfolding

Wings (if equipped) may only be lowered under certain conditions. Only lower wings once all persons are clear of wing area, and are aware that wings are about to be lowered. Do not remove wing lockup pins if they are under pressure, use wing hydraulics to move wings until pins are free, and then remove. Only unfold while stationary and with the machine in the fully raised position, or resting on cylinder stops. Electrocution can occur without direct contact with electrical lines; proceed very cautiously around electrical lines and poles.

Starting a pass

If hydraulically reversing rotary harrows, be sure that all have reversed completely. Start the tractor in a low gear moving forward with at least 3mph forward speed and lower the implement while moving. Do not lower the machine while stationary or moving backwards as this may cause the rear rotary harrows (if equipped) to damage the tires on some models. Some models require the hydraulic circuit that controls front hitch leveling cylinder to be in float while working. Some models require the hydraulic circuit that controls harrow lift cylinders to be in float while working.



Speed

Tine rollers will operate properly at any speed, but excessive speed, above 9mph, may accelerate tine wear because of heat buildup. Rotary harrows (if equipped) operate best at speeds above 5mph, and will continue to increase in effectiveness as speed increases to as much as 9mph.

Turning while lowered

The machine may be engaged while making turns only if the rollers are arranged in a diamond configuration, and if harrows are not engaged (if equipped).

Storage

Store in an area where children normally do not play.

Retract cylinders to protect rods from premature corrosion and/or damage. If a cylinder is holding load in its retracted position, unpin its rod end and retract it. Ensuring that no cylinder is bearing load while in storage will greatly reduce the chance that air will be ingested into the hydraulic system.

If storing on soft ground, block up rollers before lowering machine so that tines do not become lodged in ground as a result of winter freeze and thaw cycles.

Clean machine as much as possible. Be sure that all threaded parts are free of dirt; bolt threads, adjusting rods, turnbuckles, etc.

Lubricate all grease points, and re-pack wheel bearings if 2500 acres, or 1 year since last re-packing.

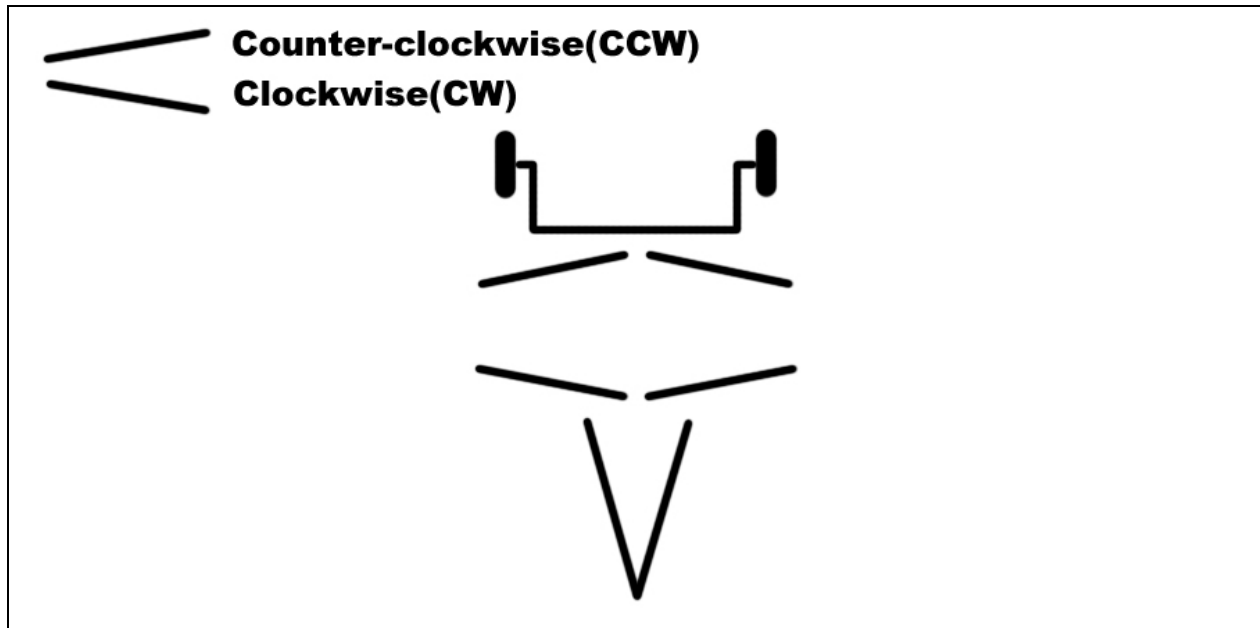
Touch up paint where damaged if desired.

Prevent water entry into bearings when storing outside by unfolding wings for storage.

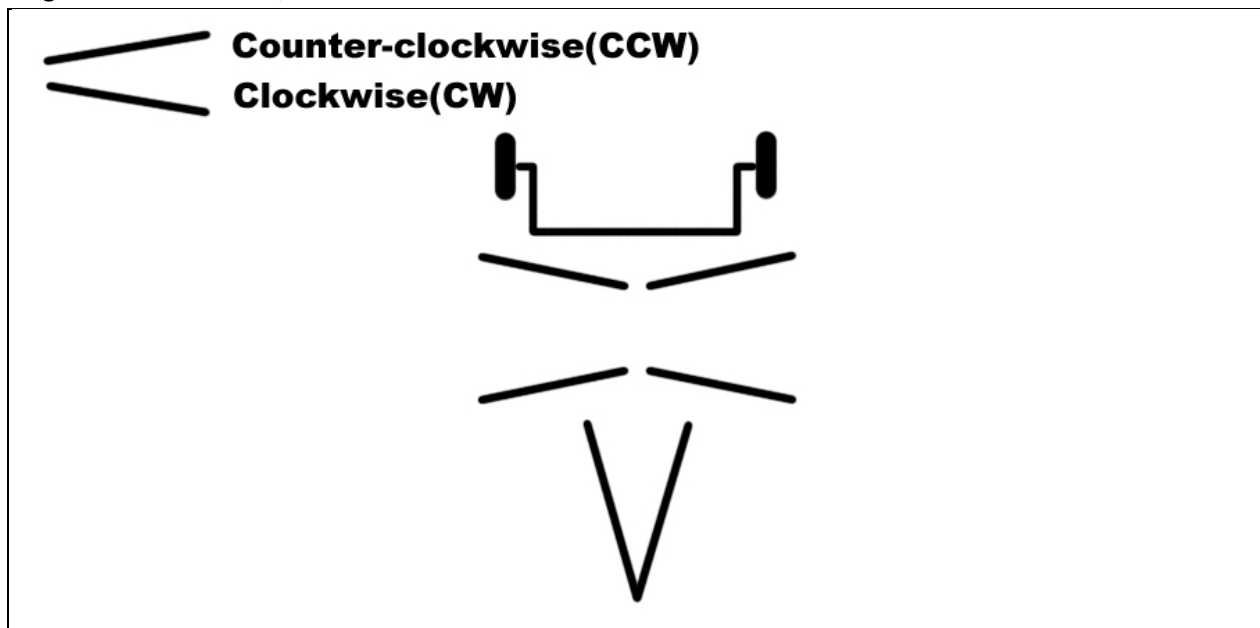
Roller Offset Angle Configurations

Rollers offset angles can be arranged across the machine in a diamond, or tandem offset. The figures below are representative of the configuration when viewed from above. See section on “Tine Replacement” starting on (PAGE NO.) for a method of determining whether a roller is a CW or a CCW.

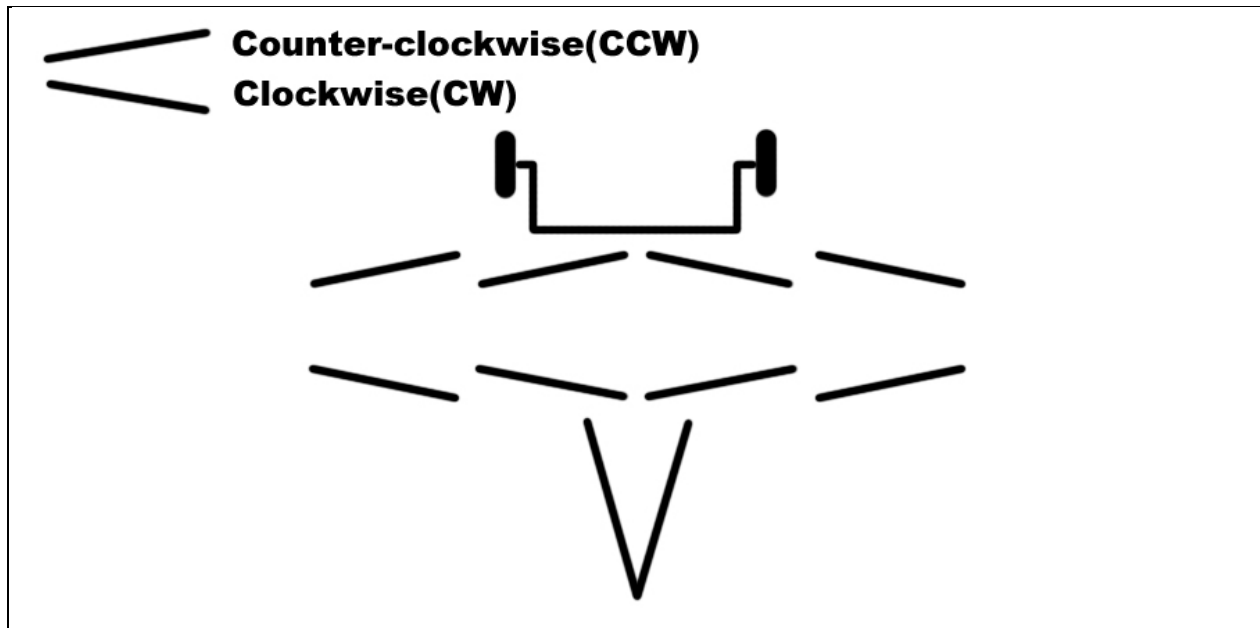
Single section machine, **diamond** offset



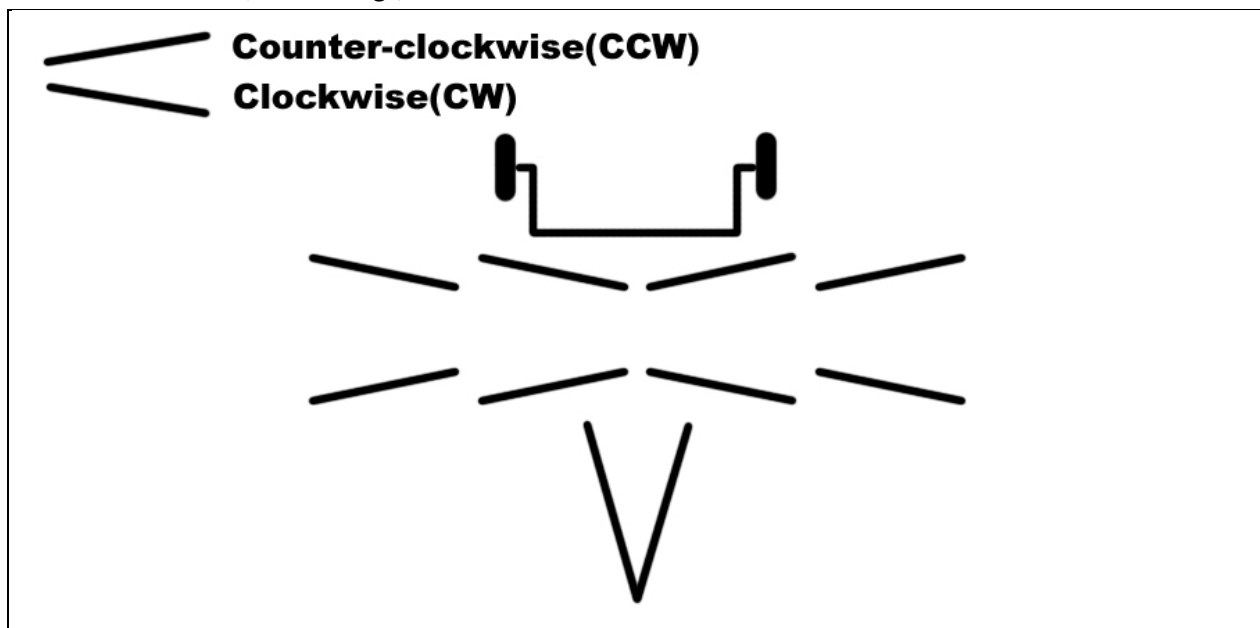
Single section machine, **tandem** offset



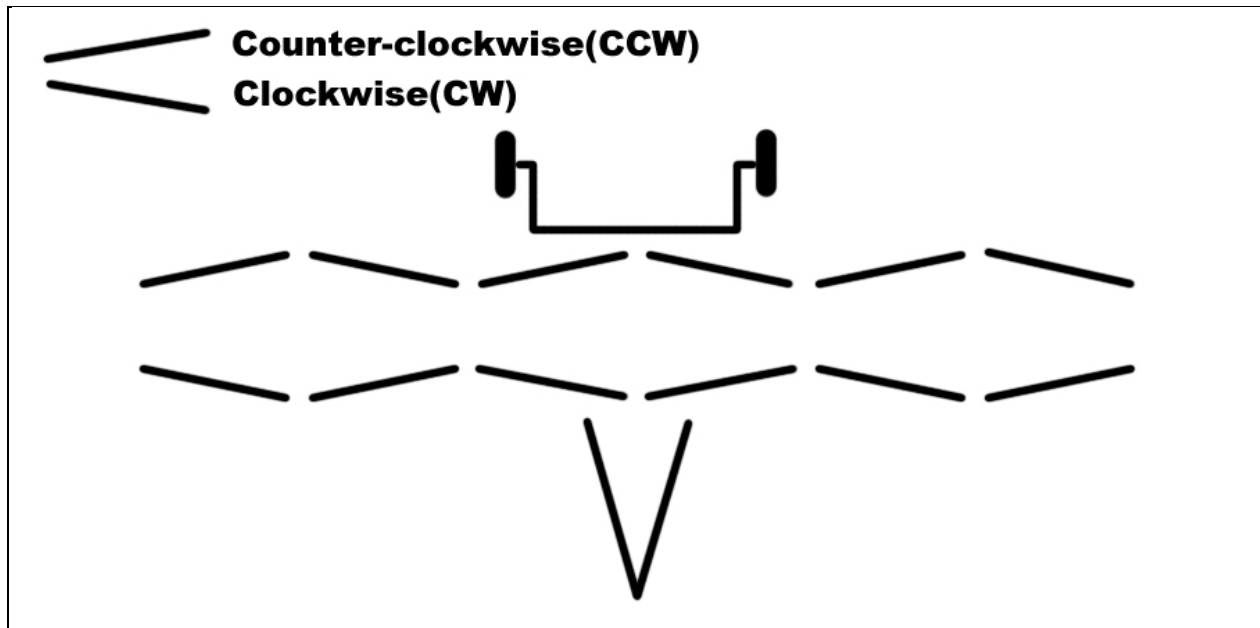
Three section frame, short wings, **diamond** offset



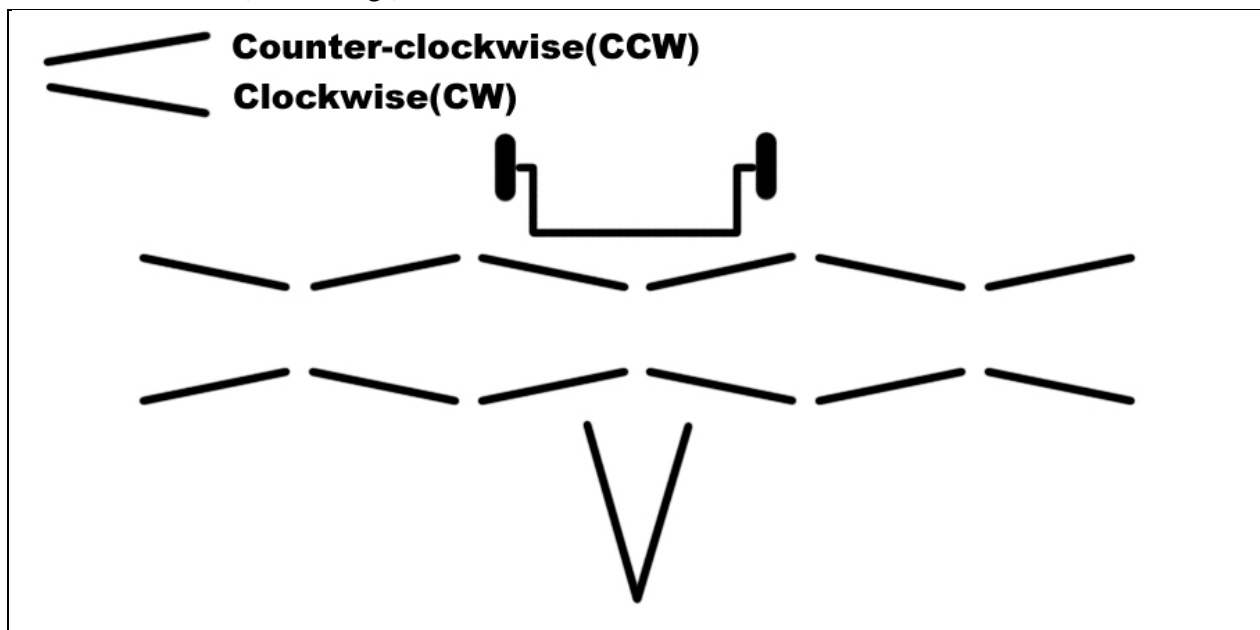
Three section frame, short wings, **tandem** offset



Three section frame, wide wings, **diamond** offset



Three section frame, wide wings, **tandem** offset



Maintenance

Support machine before servicing

Always install all cylinder stops before servicing so that all weight is being supported by the stops; not supported by cylinders. Inspect cylinder stops for any damage or defect before installing. If damage or defect exists in the cylinder stops, do not service machine until cylinder stops are repaired or replaced. It is best if machine is hitched securely to tractor and parking brake is set. Remove key in tractor, to ensure that the tractor cannot be started while you are servicing the machine. If tractor is not available, support tongue using blocking. Do not use the transport jack to support tongue while servicing. Block all wheels securely. Remove any payload from machine to keep weight to a minimum. If wings are folded, be sure wing lock pins are in place to keep wings from falling.

Make sure all hydraulic system pressure is relieved.

First Season

Check periodically for loose bolts, nuts, and migrating roll pins. When loose or missing, tighten or replace. Do not reuse roll pins that have been migrating. Check and tighten any leaking hydraulic connections. Some leaking connections may require an O-ring to be replaced if tightening does not stop leakage.

Lubrication

Tine **roller** bearings are greased every **8hrs** or **daily**.

Rotary **harrow** (if equipped) bearings are greased every **50hrs** or weekly.

Other joints that are used **seldom** or that have a **cavity** for grease are marked to be greased every **50hrs** or **weekly**. **Lower** the machine **onto** the **ground** to grease these joints.

Other joints that are used **frequently** and have **no cavity** for grease are marked to be greased every **8hrs** or **daily**. **Lower** the machine **onto** the **ground** to grease these joints.

Re-pack wheel bearings every 300 hrs, or annually.

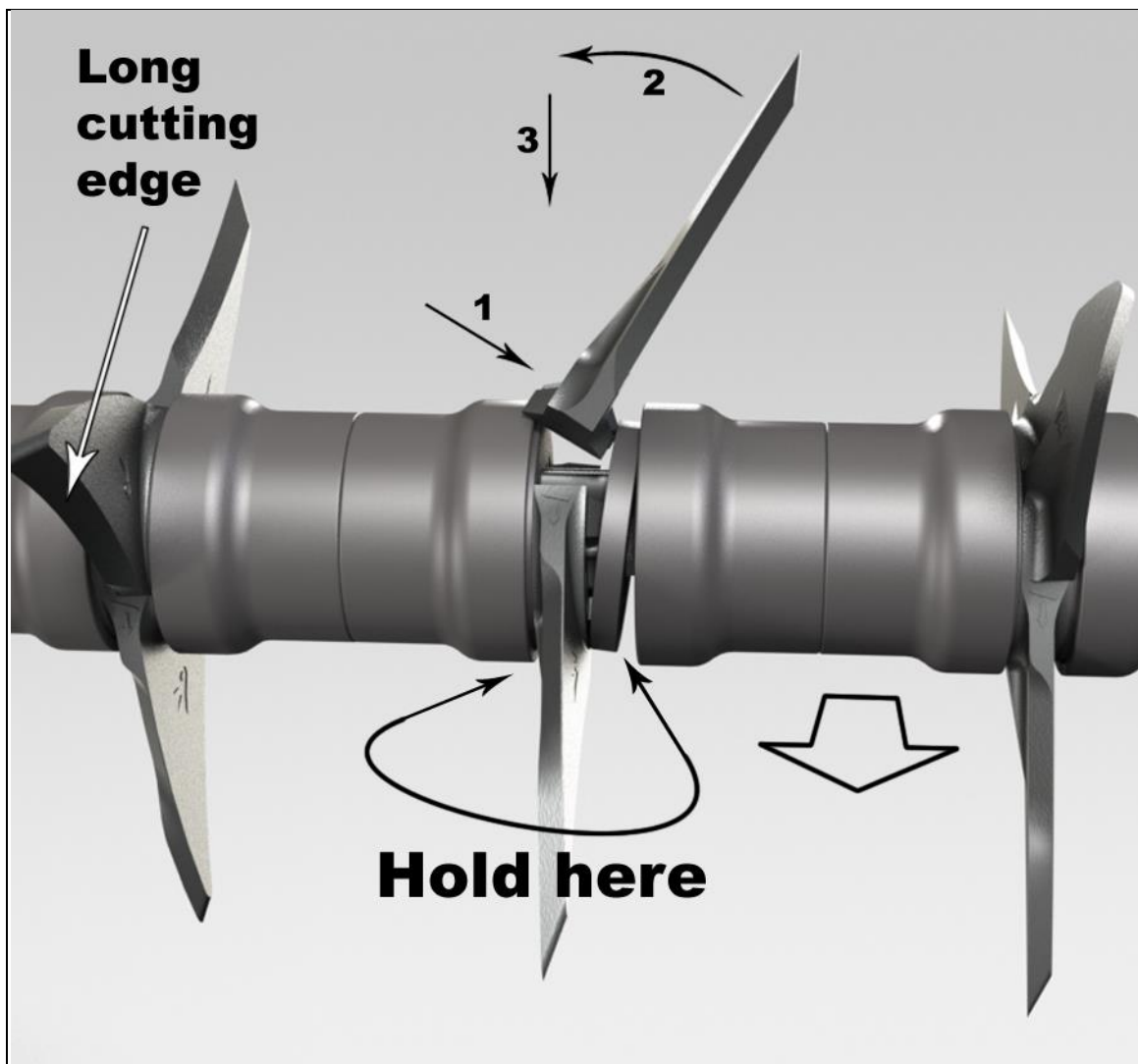
Tine replacement

If a tine breaks or is bent, or if the shaft becomes loose; tines may need to be replaced. This must be done while maintaining the proper helical timing of the tines. To ensure that replacement tines are inserted into the proper position, replace one tine at a time. Please refer to the following instructions for tine replacement.

1. Identify which type of roller assembly is to be serviced; CW or CCW. To identify which assembly type the roller is, inspect one of its tines. Be sure that the tine that is inspected is the same as all the others on the shaft. This is to ensure that tine types have not become mixed in the assembly due to previous assembly errors. Inspect the tine by approaching it from the front and rotating it until it is pointed downward. Observe the face of the tine that is flat, and the face that has the rib feature. The flat face is the "push" face, and the ribbed face is the trailing face. If the push

face is to the left when viewed from the front (viewed with the tractor at your back) then the roller is a CCW assembly. If the push face is to the **right**, under the same conditions, it is a **CW** roller assembly.

2. Choose the correct type of tine to install; CW or CCW.
3. Block roller from rotating using provided service tool.
4. Loosen end nut by 1".
5. Support nut with blocks, chain, ratchet strap, etc.
6. Place tine(s) to be inserted within easy reach.
7. Hold harrowing ring to keep remaining tines from falling out.
8. Remove damaged tine (if applicable)
9. Slide parts on shaft to provide clearance to insert new tine.
10. While holding harrowing ring, use new tine to spread opening between harrowing rings, and insert new tine. Position long cutting edge of tine so that it enters soil first.



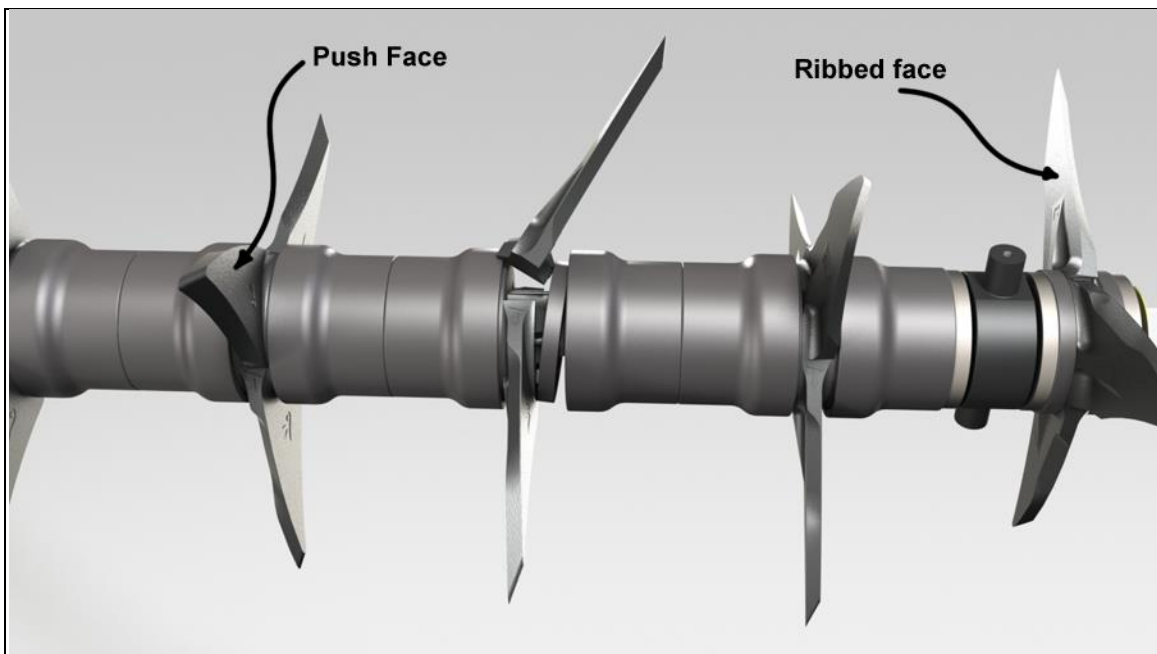
11. Slide parts against harrowing ring to keep tines from falling out.

12. Repeat steps 5-9 for any other tines to be inserted.
13. When all replacement tines are installed, align end cap and tighten nut to 1200-1400 ft/lb. If enough hex shaft protrudes to allow the end cap to register, no special care to its alignment is necessary. If the end cap is free to rotate before tightening the nut, it must be aligned in order not to be damaged when the hex shaft attempts to tighten into it.

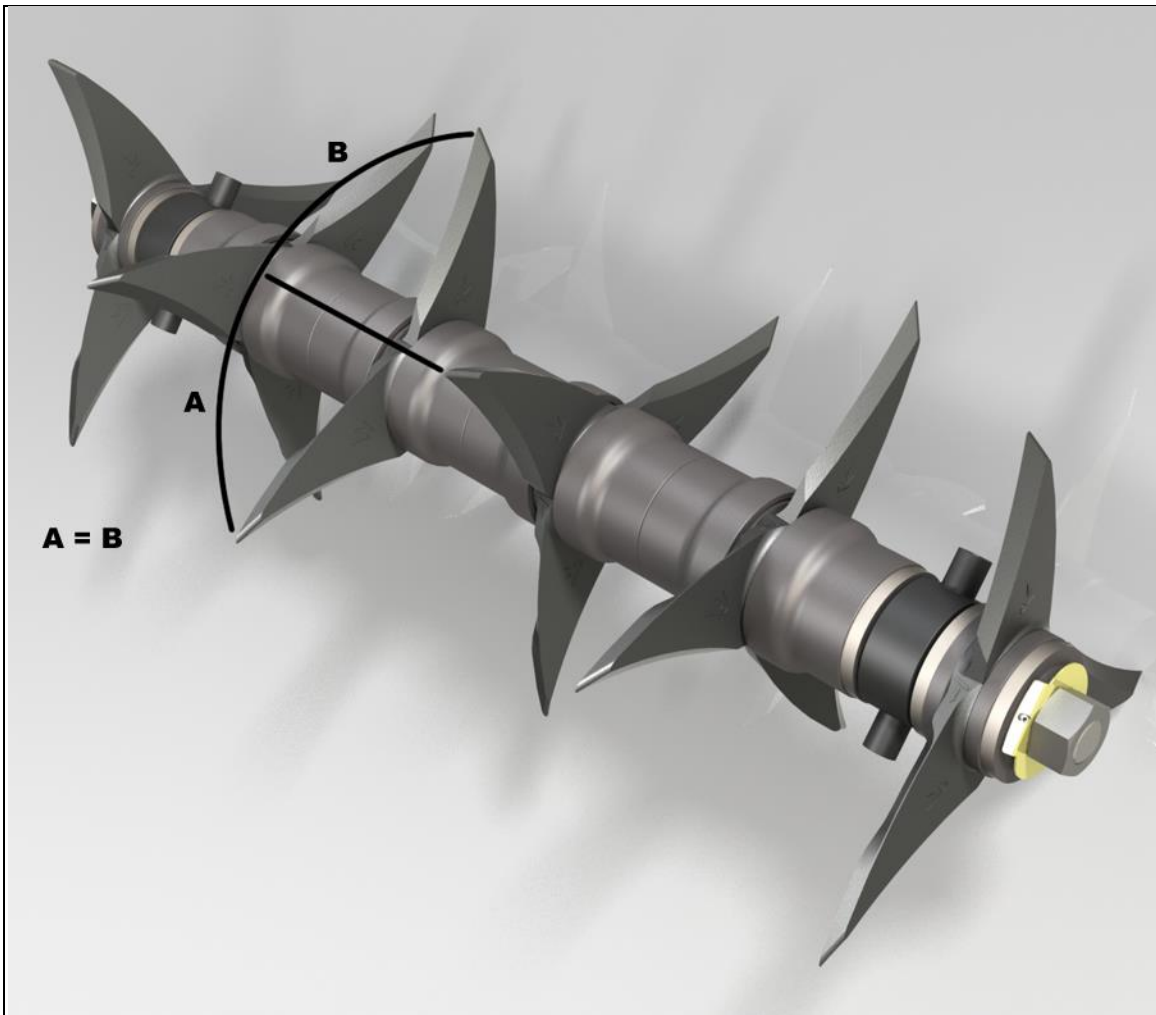
If sufficient amount of tines have been lost to make determining correct installation location of replacement tines difficult or unreliable, it is recommended to remove the assembly and rebuild it according to the separate **tine roller assembly manual**.

Please use the following section to determine correct installation location of replacement tines **without rebuilding** the entire assembly.

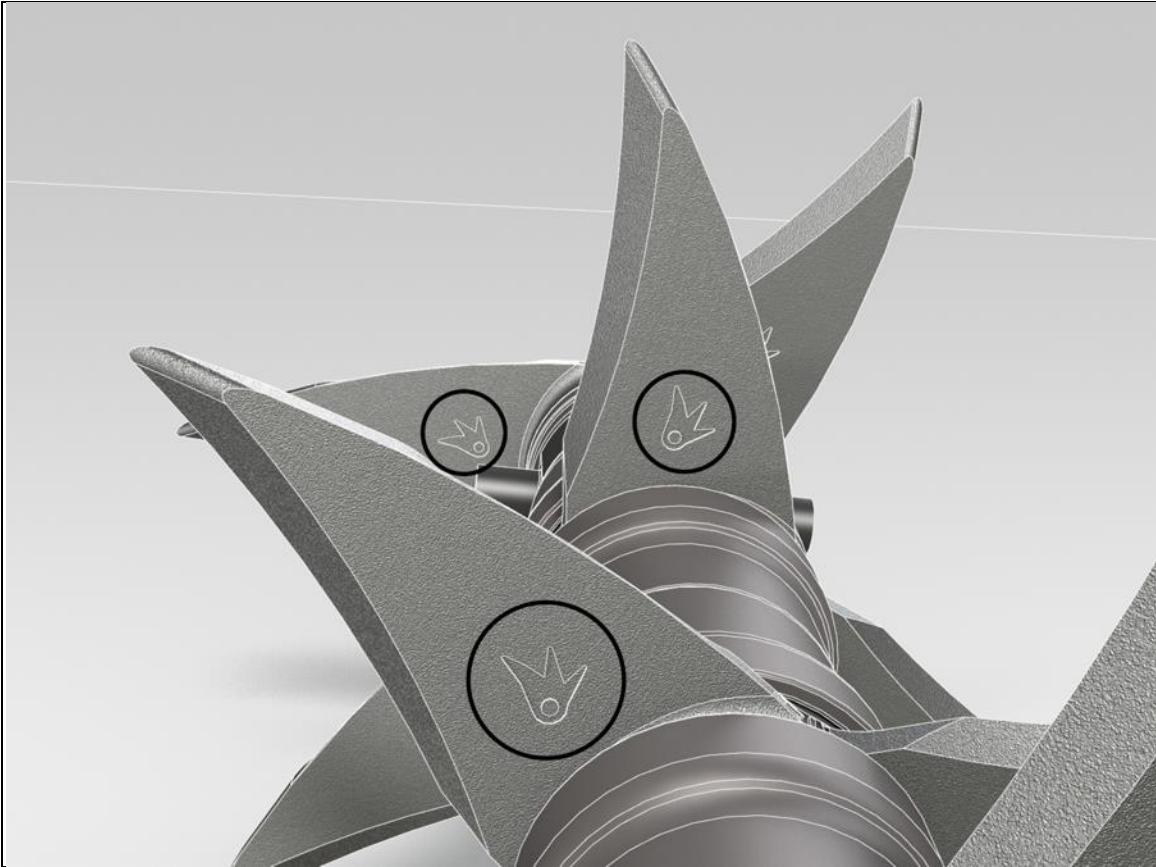
1. Identify which type of roller assembly is to be serviced; CW or CCW. To identify which assembly type the roller is, inspect one of its tines. Be sure that the tine that is inspected is the same as all the others on the shaft to ensure that the tines have not become mixed in the assembly due to previous assembly errors. If tines types are mixed in this assembly, refer to the section on machine configurations(PAGE NO.) to determine which type of roller should be in this position on the machine. Inspect the tine by approaching it from the front and rotating it until it is pointed downward. Observe the face of the tine that is flat, and the face that has the rib feature. The flat face is the “push” face, and the ribbed face is the trailing face. If the push face is to the left when viewed from the front (viewed with the tractor at your back) then the roller is a CCW assembly. If the push face is to the **right**, under the same conditions, it is a **CW** roller assembly.



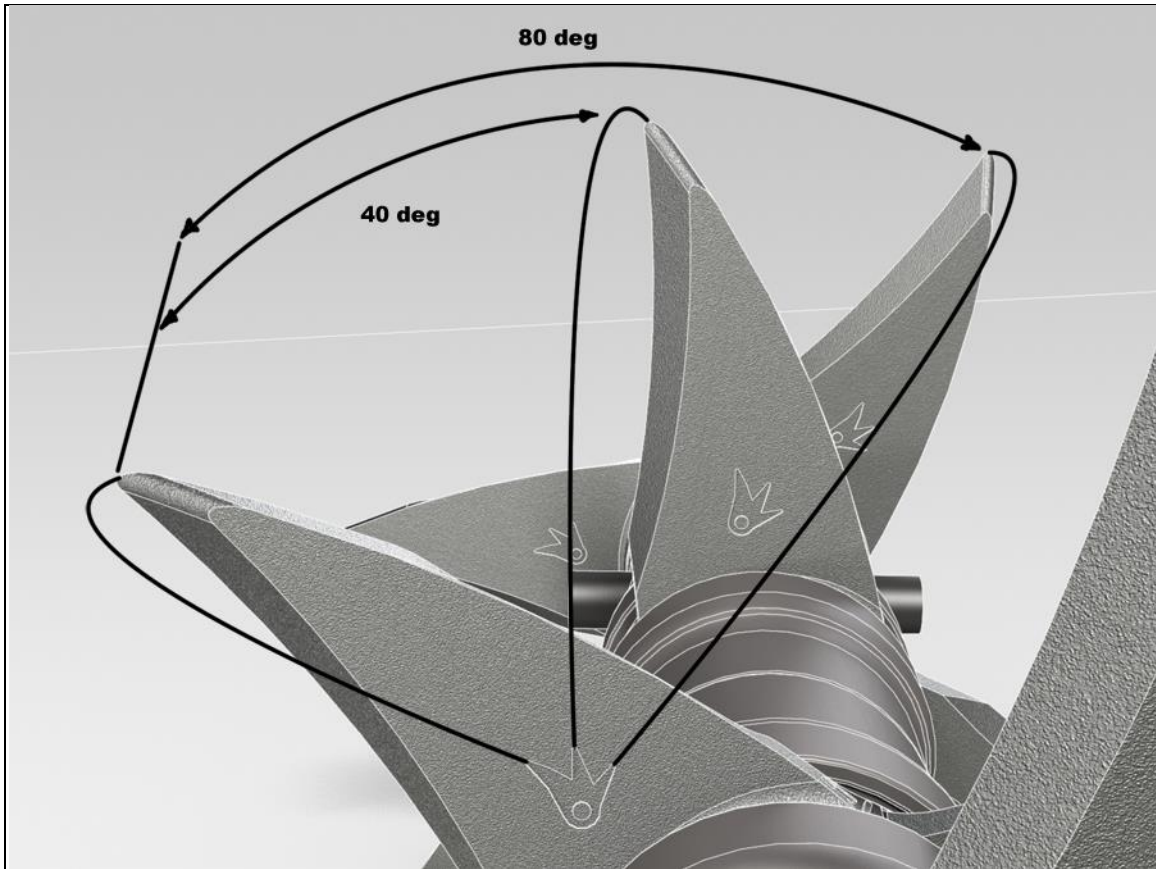
2. Determine whether or not you are replacing a tine that has other tine groups within its helix phase that you can reference. Every roller is comprised of helix phases. A helix phase consists of three groups of tines. The three groups of tines are next to each other; they are not spread throughout the roller assembly. For example, a (6) star roller (5ft working width) has two phases, one phase on the driver's side, and the other phase on the passenger's side. Each phase is offset from the previous and succeeding (if any) phase(s) by 20 degrees. To determine if the phases are offset from each other correctly, observe the two tine groups that are next to each other at the phase change. These two tine groups should be offset from each other so that the tines from one group split the middle on the other group.



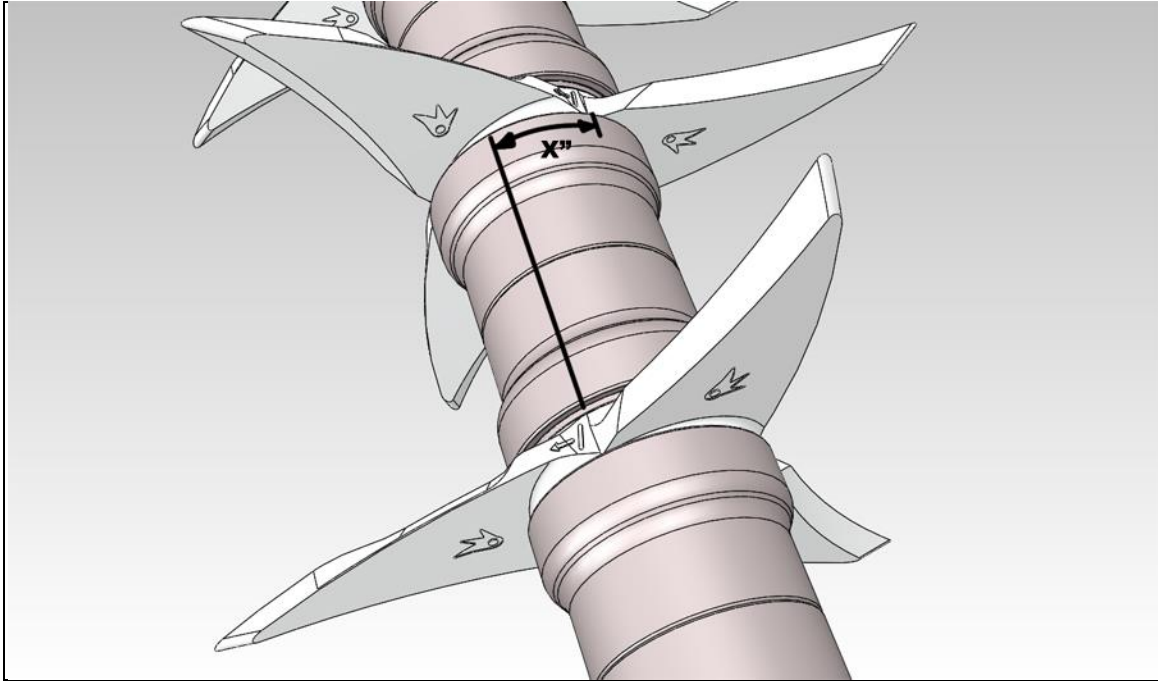
3. Use a remaining tine that is in its original position to determine correct position of replacement tine(s). On each tine you will see a “helix emblem”. Use this emblem to determine when the replacement tine has been inserted in the correct position.



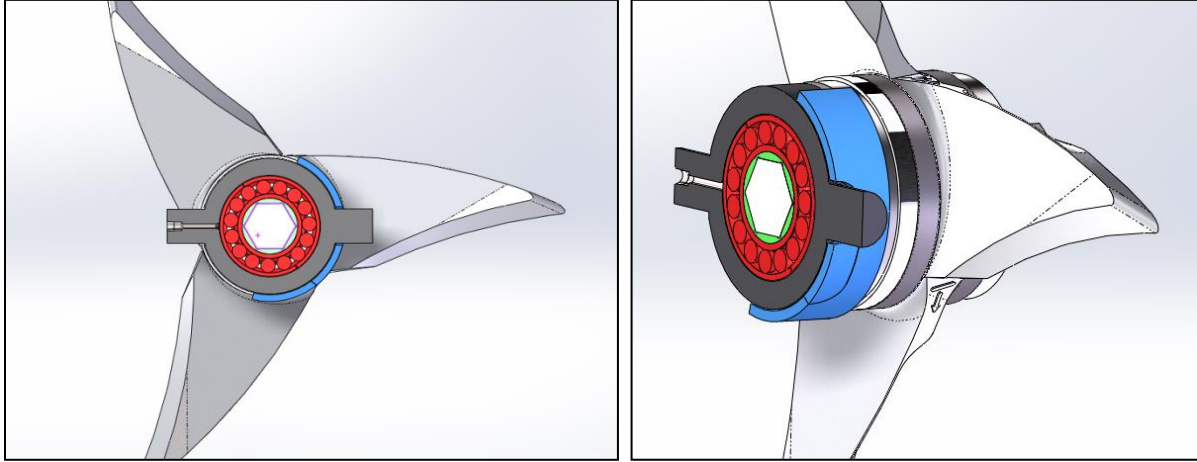
4. Use this step only if you are replacing a tine that has other tines within its helix phase that you can reference. The helix emblem shows three tines as three points of different sizes and the center of the shaft as the round portion of the emblem. The emblem is showing what you should see when you look down the length of the assembly. The large point on the emblem is the tine in which the emblem is cast, while the smaller points represent tines in the background. The second largest point is the tine in the closest group of tines that is in the background and **40** degrees offset from the current tine. The smallest point is the tine in the second closest group of tines that is in the background and **80** degrees offset from the current tine.



5. The 40 degrees of offset can be measured using a tape measure. Measure the change in position between two tine groups as it appears on the OD of the spacers that separate the two groups of tines. We will use the positions where tines meet each other in their respective groups. This distance (X'') will be approximately $1\frac{15}{16}''$ for 40 degrees of offset, $\frac{15}{16}''$ for 20 degrees of offset, and $2\frac{7}{8}''$ for 60 degrees of offset.



Bearing wear shoes



Roller assemblies are equipped with wear shoes to protect bearing housings from being worn on the bottom. If a wear shoe is no longer effective, it may be reversed, once, to present a new wear surface. To reverse a wear shoe:

1. Remove the trunnion mount
2. Remove shoe (hammer may be helpful)
3. Break out tongue in wear shoe piece
4. (If desired) Re-weld tongue into opposite position so that the hole will be at the other end of the slot.
5. Re-install wear shoe.
6. Re-bolt trunnion mount.
7. Re-torque trunnion mount bolt to 225-265 ft/lb.

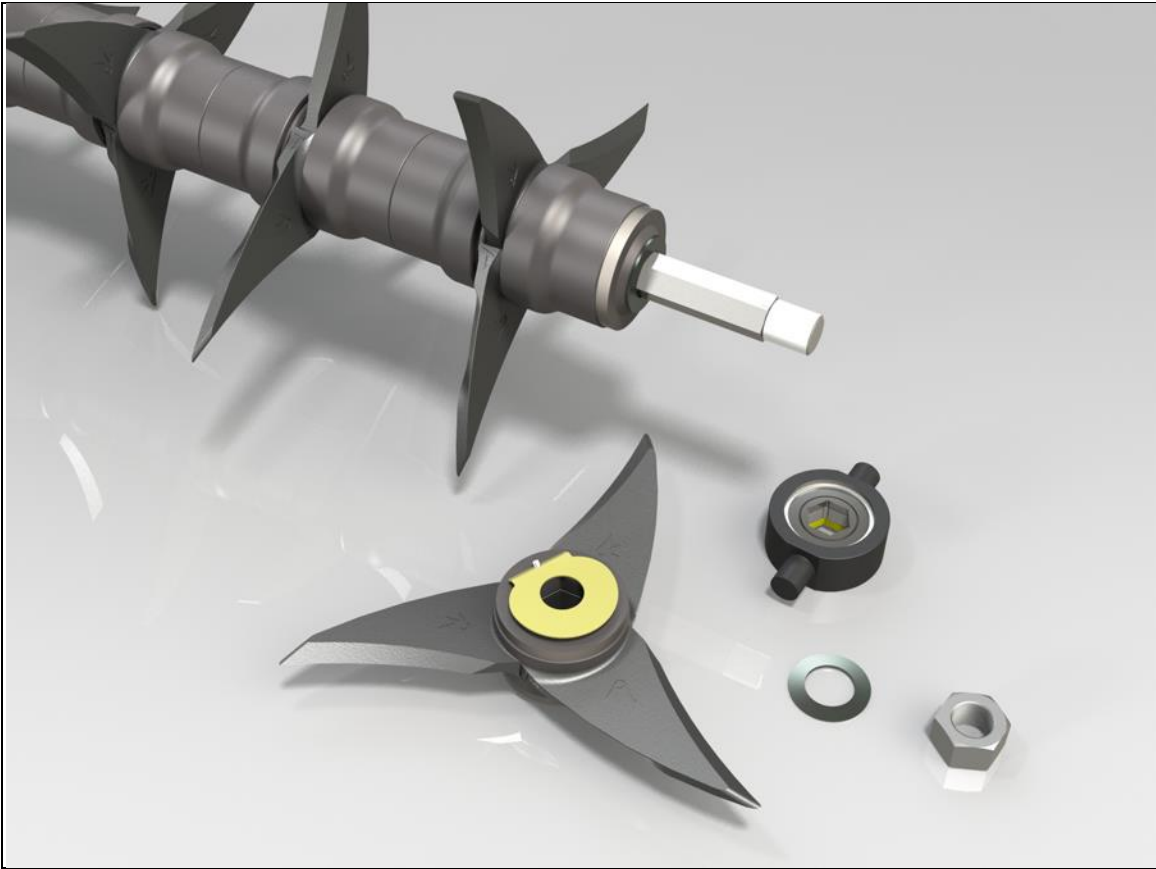
Replacing roller bearings

To replace a bearing in a roller assembly please follow these steps:

1. Support roller with blocking, chain, ratchet strap, etc.
2. Block roller from rotating using provided service tool.

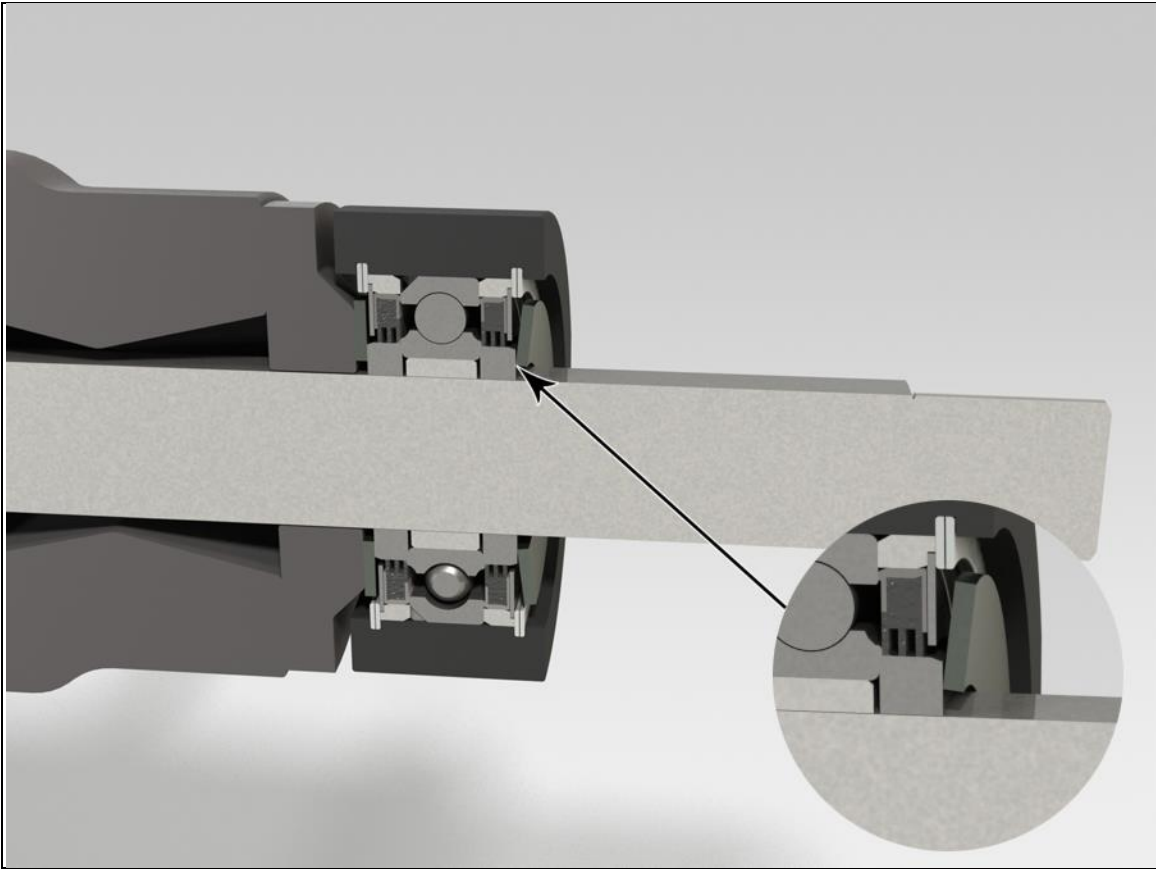


3. Remove shaft end nut.
4. Remove parts and bearing.

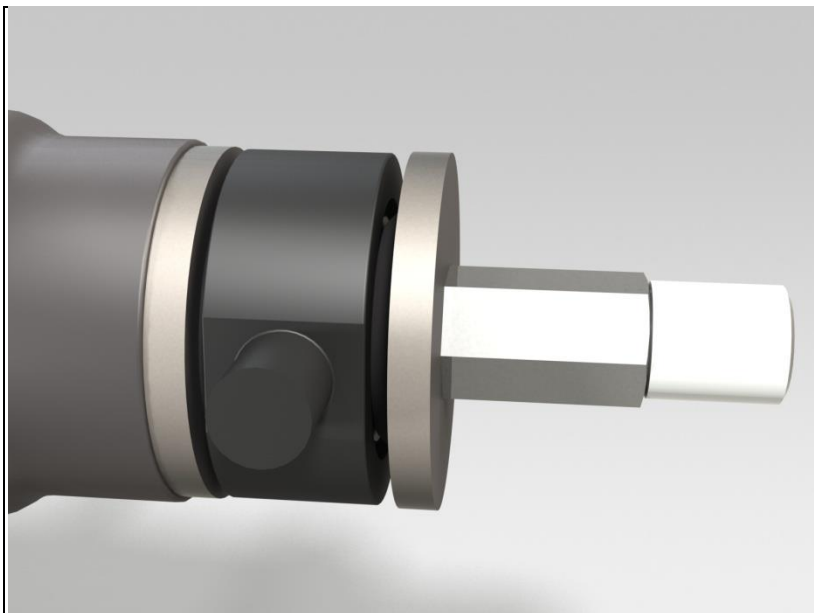


5. Install new bearing by first aligning its ID hex part(s) with shaft hex, then installing.

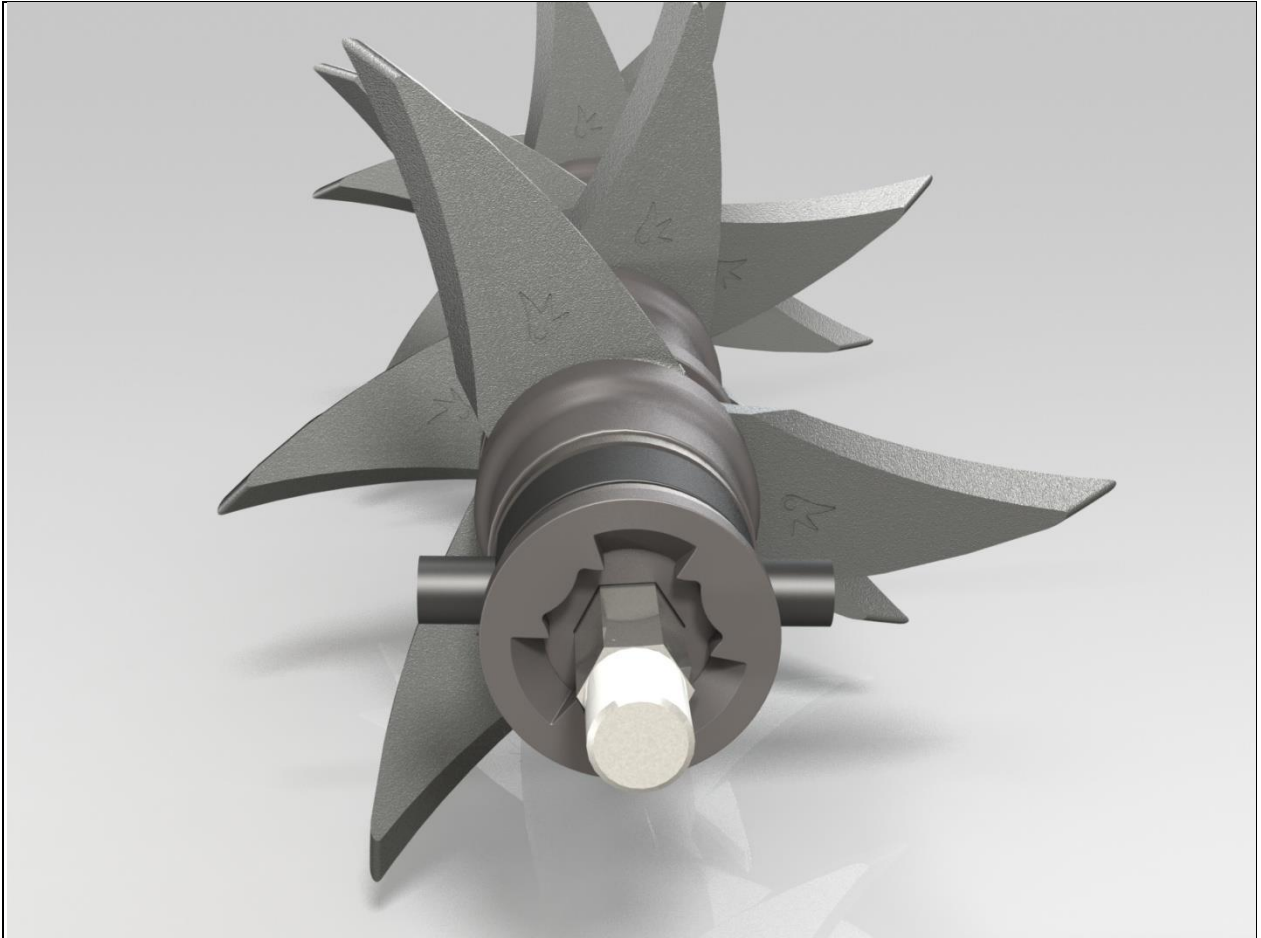
6. Replace bearing thrust washer. If washers are cone shape, **ID** of washer should be touching bearing inside race.



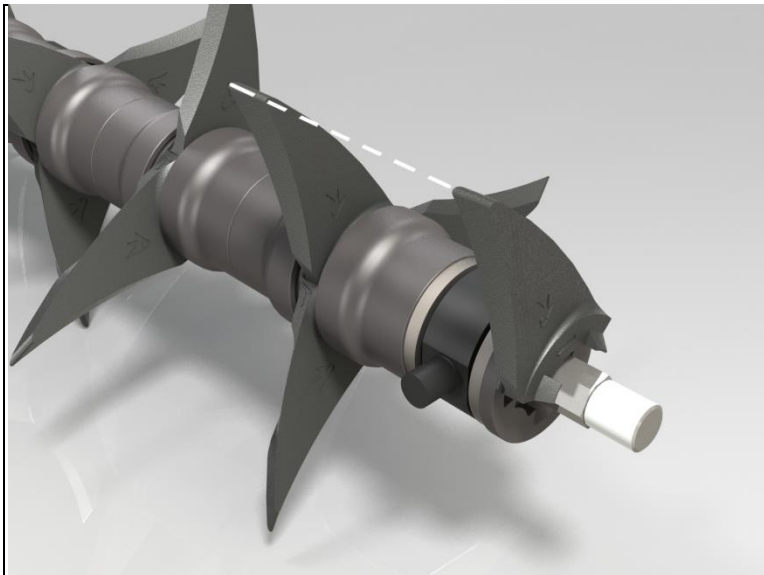
7. Re-install end cap casting.



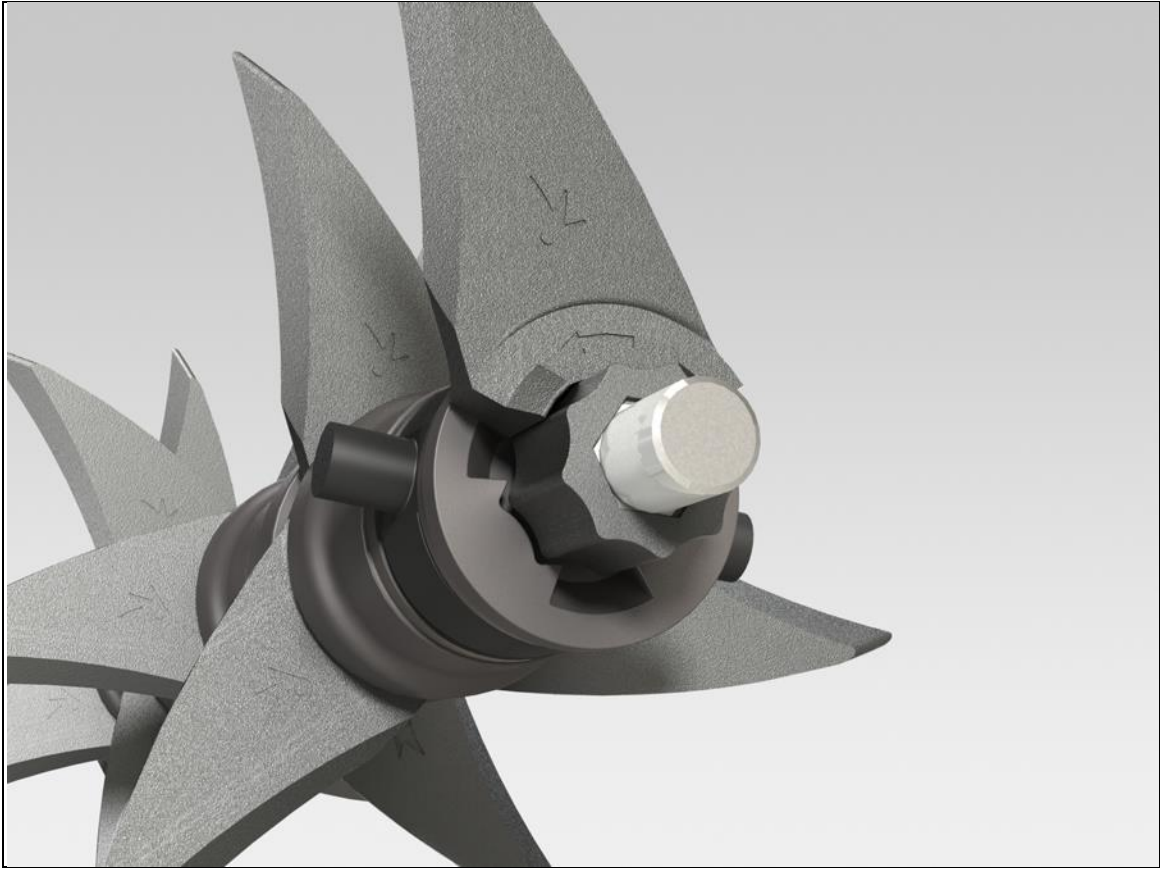
8. Re-install harthing ring.



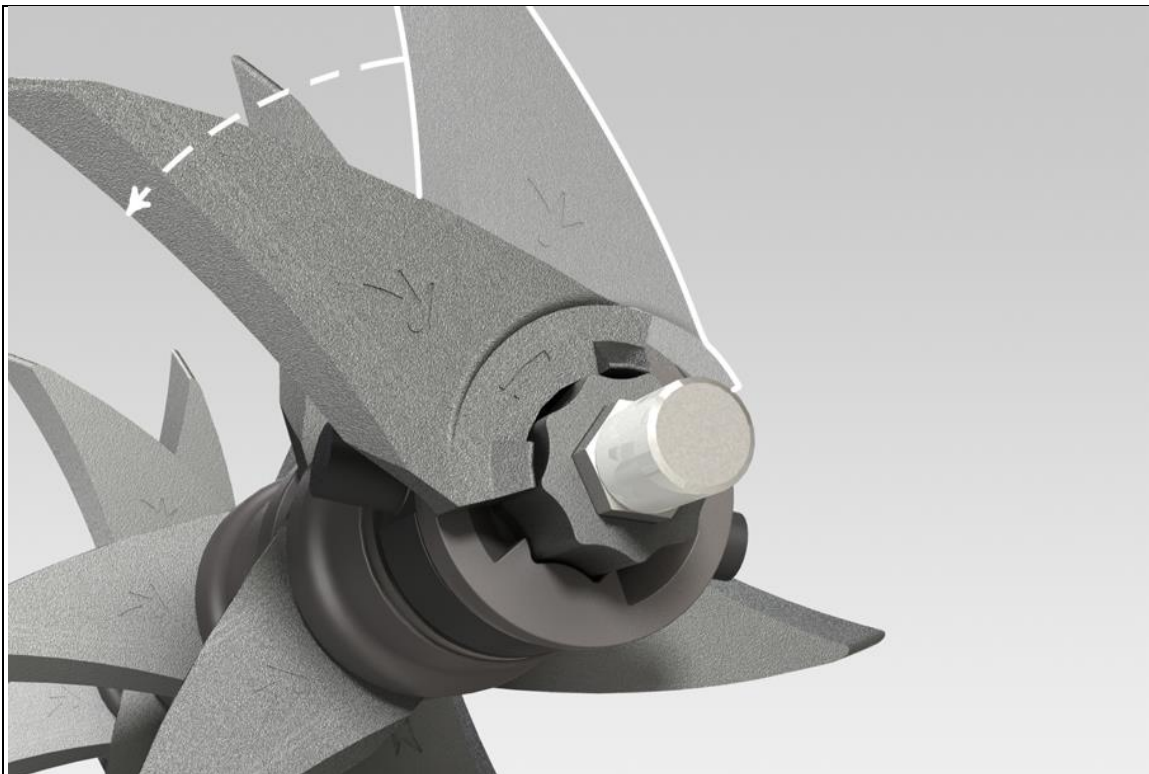
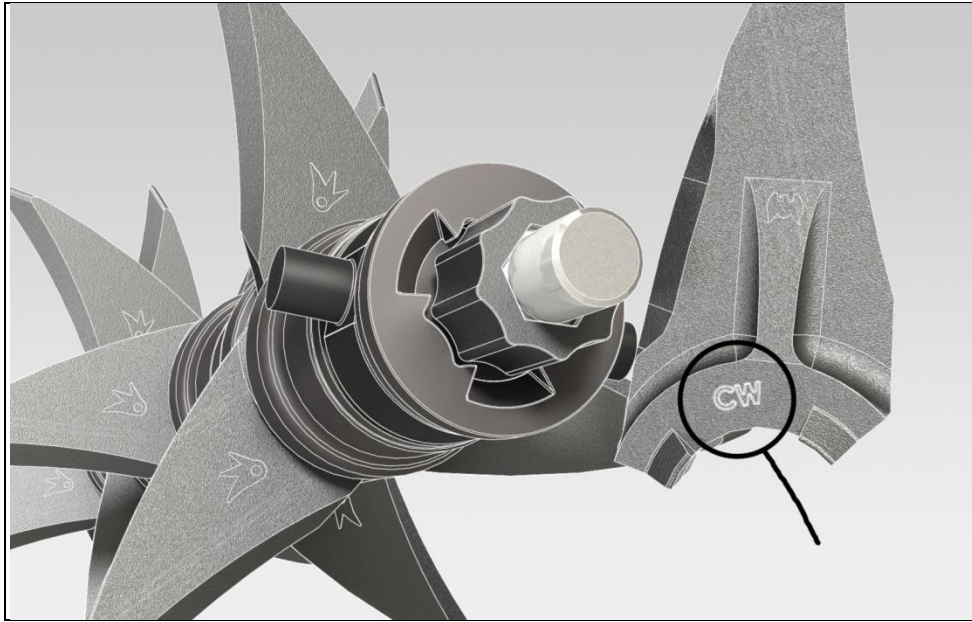
9. Place one tine onto harthing ring and align tine with the nearest tine on the opposite side of bearing.



10. Slide driving hub onto shaft so that it's outside ridges are aligned with harthing ring inside ridges.



11. Change position of harthing ring on driving hub ridges by one ridge. Rotate harthing ring clockwise if tine is marked CCW, and rotate counter-clockwise if tine is marked CW.



12. Install two remaining tines, final harthing ring, and end cap. Align end cap and tighten nut to 1200-1400 ft/lb. If enough hex shaft protrudes to allow the end cap to register, no special care to its alignment is necessary. If the end cap is free to rotate before tightening the nut, it must be aligned in order not to be damaged when the hex shaft attempts to tighten into it.

Torque Values

Use the following charts to determine the proper torque when tightening fasteners, hydraulic couplings, and arbor shafts on the machine.

Nominal Size	Threads/Inch NC/NF Pitch (mm)	Grade 2 flat head (may have mfg stamp)		Grade 5, 3 radial lines on head		Grade 8, 5 radial lines on head	
		N-m	ft-lb	N-m	ft-lb	N-m	ft-lb
$1/4$	20	7.4	5.6	11	8	16	12
	28	8.5	6	13	10	18	14
$5/16$	18	15	11	24	17	33	25
	24	17	13	26	19	37	27
$3/8$	16	27	20	42	31	59	44
	24	31	22	47	35	67	49
$7/16$	14	43	32	67	49	95	70
	20	49	36	75	55	105	78
$1/2$	13	66	49	105	76	145	105
	20	75	55	115	85	165	120
$9/16$	12	95	70	150	110	210	155
	18	105	79	165	120	235	170
$5/8$	11	130	97	205	150	285	210
	18	150	110	230	170	325	240
$3/4$	10	235	170	360	265	510	375
	16	260	190	405	295	570	420
$7/8$	9	225	165	585	430	820	605
	14	250	185	640	475	905	670
1	8	340	250	875	645	1230	910
	14	385	285	995	735	1410	1035
$1-1/8$	7	480	355	1080	795	1750	1290
	12	540	395	1210	890	1960	1440
$1-1/4$	7	680	500	1520	1120	2460	1820
	12	750	555	1680	1240	2730	2010
$1-3/8$	6	890	655	1990	1470	3230	2380
	12	1010	745	2270	1670	3680	2710
$1-1/2$	6	1180	870	2640	1950	4290	3160
	12	1330	980	2970	2190	4820	3560

Roller assembly arbor bolts to be tensioned to 1200-1400 ft-lb

Hydraulic connections

JIC swivel nuts by wrench size

9/16 - 10-12 ft-lb

11/16 - 18-20 ft-lb

7/8 - 27-39 ft-lb

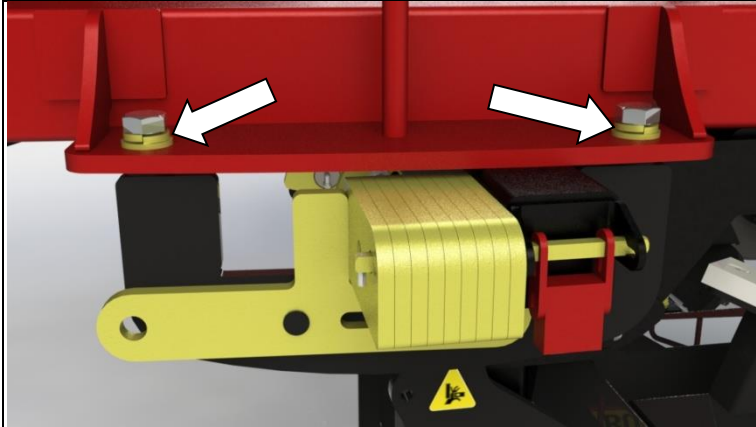
Grease line swivel nuts (1/2" wrench size) - 8-10 ft-lb

Adjustments

Zeroing Roller angle adjusters

Swingarms are mounted in saddles that can be moved in slots to allow fine adjustment of working angle. The following procedure will ensure that working angle is accurate to within $\frac{1}{4}$ degree.

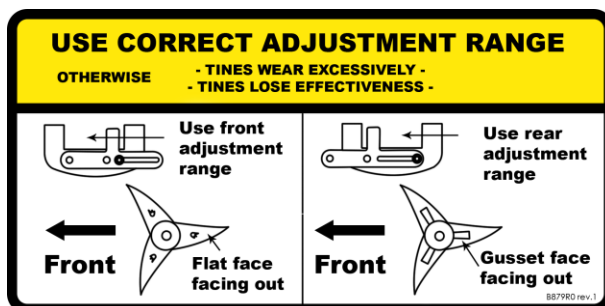
1. Loosen two bolts that hold saddle that is equipped with the selector tab. Loosen only until lock washers are partially released.



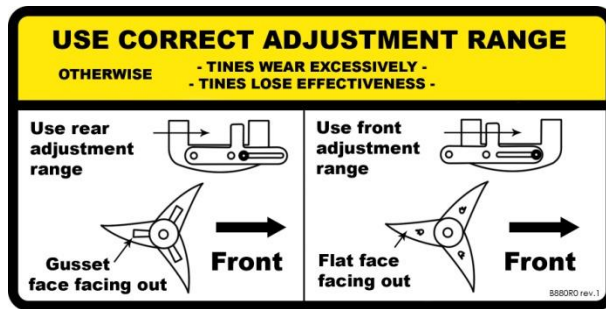
2. Measure from two points on swingarm to two corresponding points on the machine frame. The two measurements must be at least 30 inches apart. Move swingarm until two measurements have a difference of no more than $\frac{1}{8}$ inch.
3. Move saddle until selector tab touches swingarm and re-tighten two bolts that fasten the saddle to 265-295 ft/lbs.

Roller working angle

There are two stickers placed on the machine that will help you determine the correct range of adjustment. When you adjust a roller and approach it from the driver's side the sticker below applies.



When you adjust a roller and approach it from the passenger's side the sticker below applies.

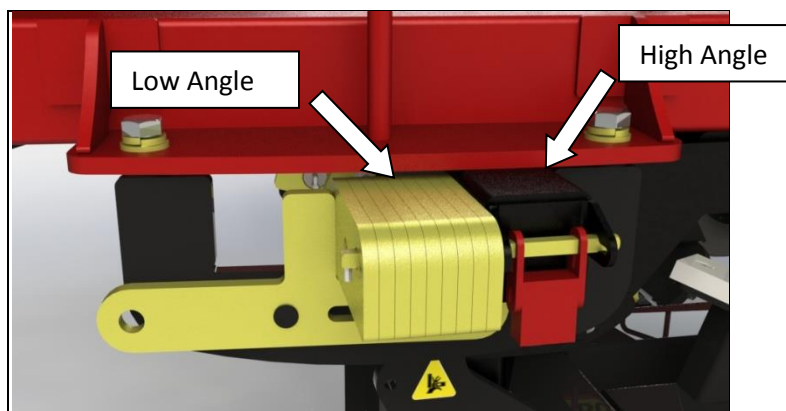


With ratcheting turnbuckle

1. Use turnbuckle to move swingarm so that shims that are between the swingarm and saddle, or between swingarm and range selector tab(if any) are loose enough to remove.
2. Add or remove shims to set desired angle; 0-5 degrees are available.
3. Use turnbuckle to move swingarm so that shims are tight.

With hydraulic cylinders

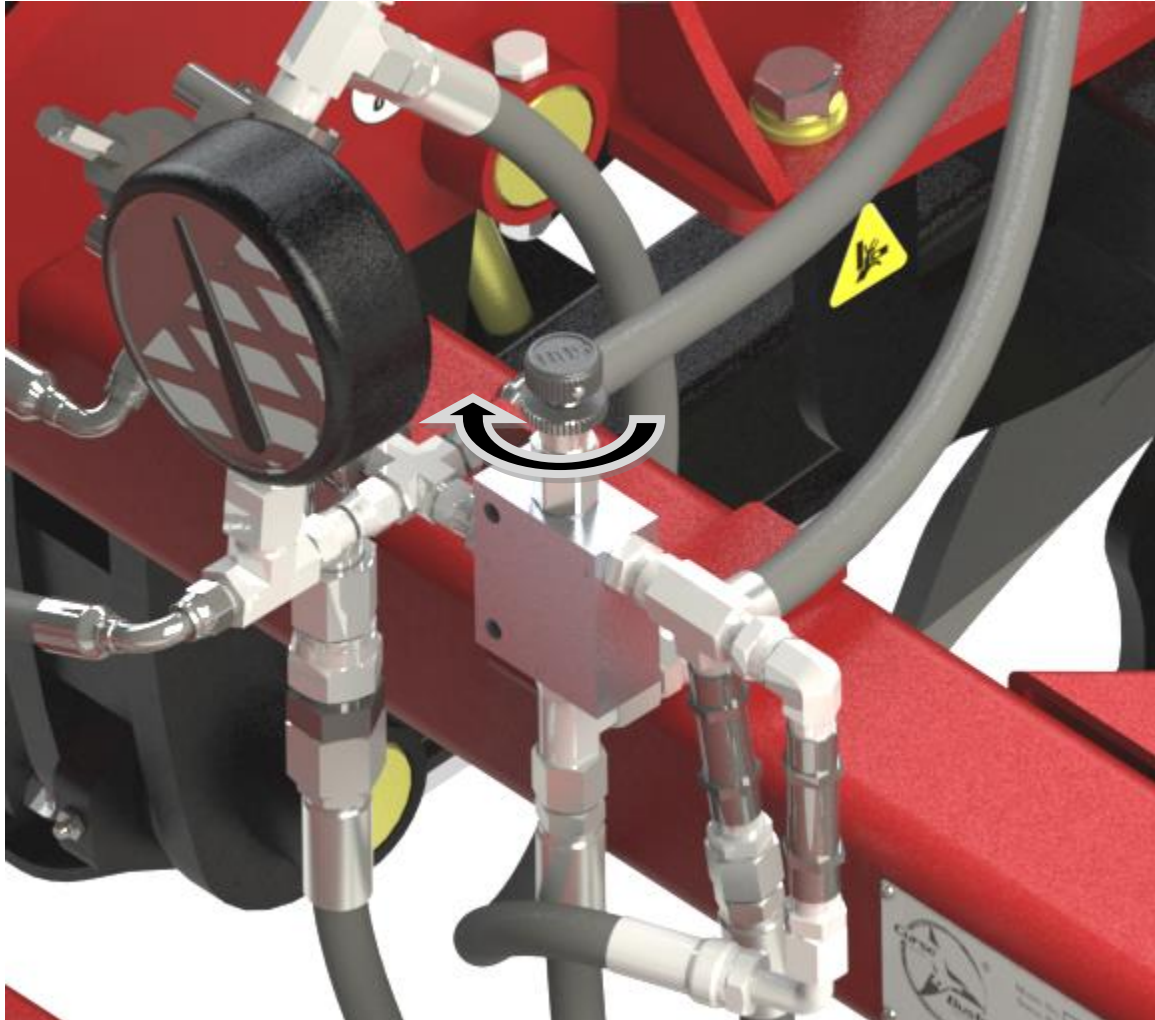
1. Use hydraulics to move swingarms so that shims(if any) are loose enough to remove.
2. Add or remove shims between swingarm and selector tab to set desired low angle; 0-5 degrees are available.
3. Add or remove shims between swingarm and end of opening in saddle to set desired high angle; 0-5 degrees are available.
4. Use hydraulics to move swingarms against shims for the high angle or low angle as desired.



Roller down pressure

The amount of machine weight carried the front and rear ranks of rollers is independently adjustable to achieve maximum penetration and ideal surface finish. Down pressure **settings** should be **adjusted until the frames to which the rollers mount run level**. Failure to do so can result in abnormal residue **plugging**.

1. If more down pressure is required, adjust valve in as shown below.
2. If less down pressure is required, adjust valve out.



Roller offset angle configuration

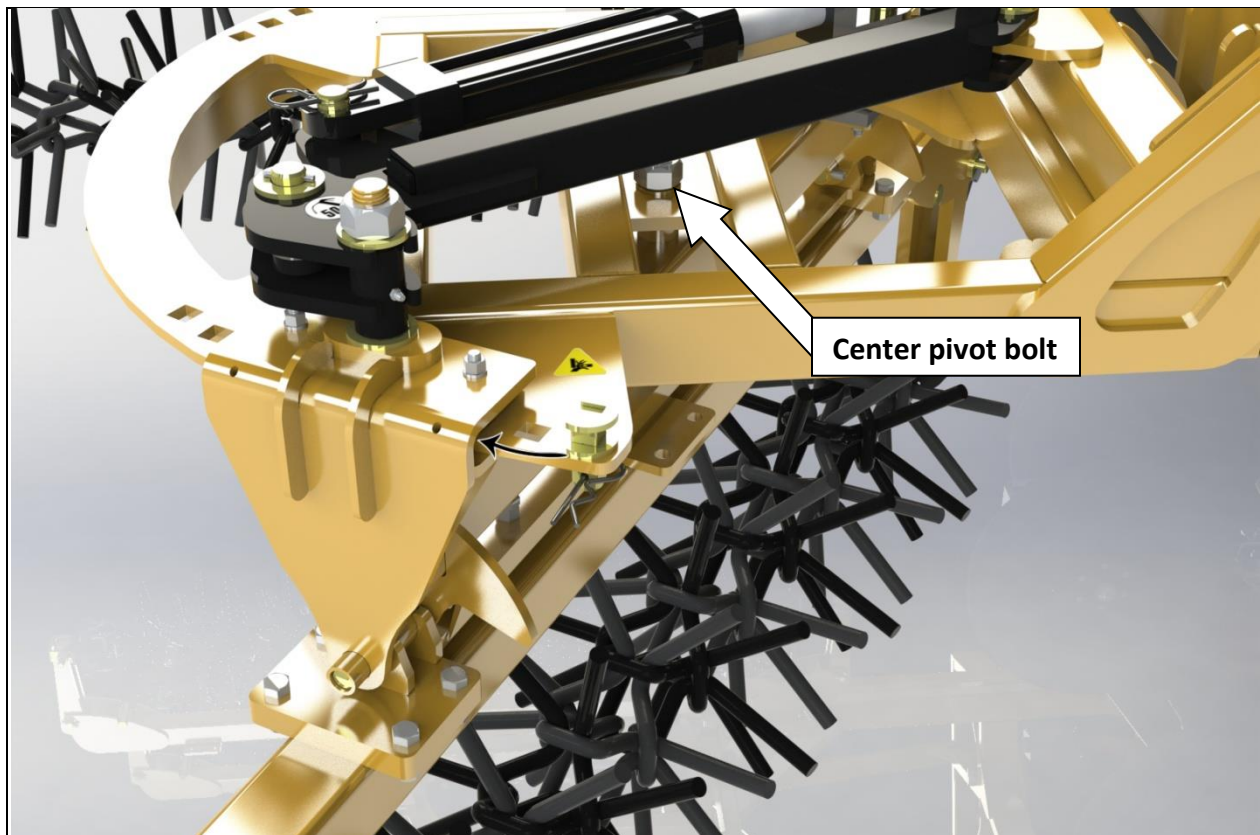
Changing the layout of roller offset angles on a machine may be accomplished by moving the front rollers to the rear corresponding positions. Refer to Page No. 16 for the various configurations.

1. Detach grease lines (if any) from roller.
2. Unbolt (2) trunnion mounts; either the front two, or the rear two.
3. Remove roller safely, and re-mount into new location. 5ft rollers weigh approximately 400lbs, 7.5ft rollers: 600lbs; move with great care. Tines can puncture, and roller can crush; severe injury or death can result.
4. Reattach grease lines (if any).

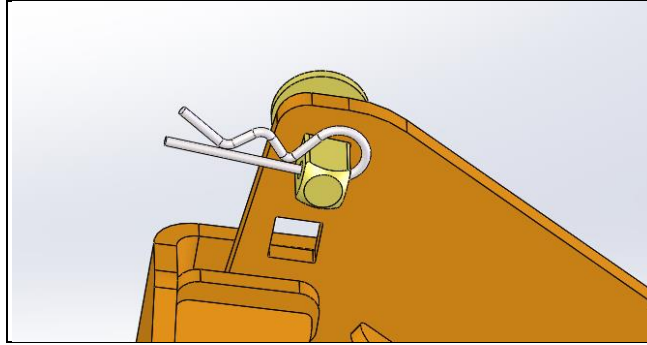
Rotary harrow working angle

If equipped with harrow reversing hydraulics

1. Change harrow working angle by using hydraulics to move harrow control swingarm away from stop pin.



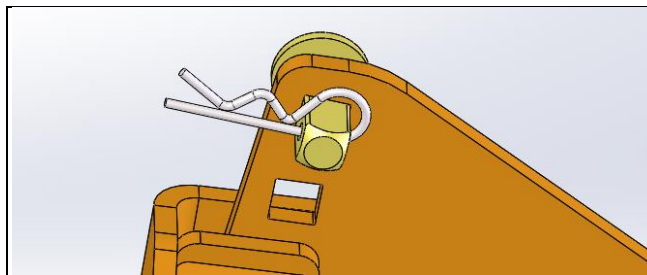
2. Move stop pin(s) to desired working angle (25 to 40 degrees, in 5 degree increments).
3. Secure stop pins by pushing R-clips in until pin shank seats in innermost portion of clip.



4. Use hydraulics to move harrow control swingarm against stop pin.
5. If a module moves slowly than desired while being rotated by the reversing hydraulic cylinder, it may be necessary to loosen the module's center pivot bolt(see image above).

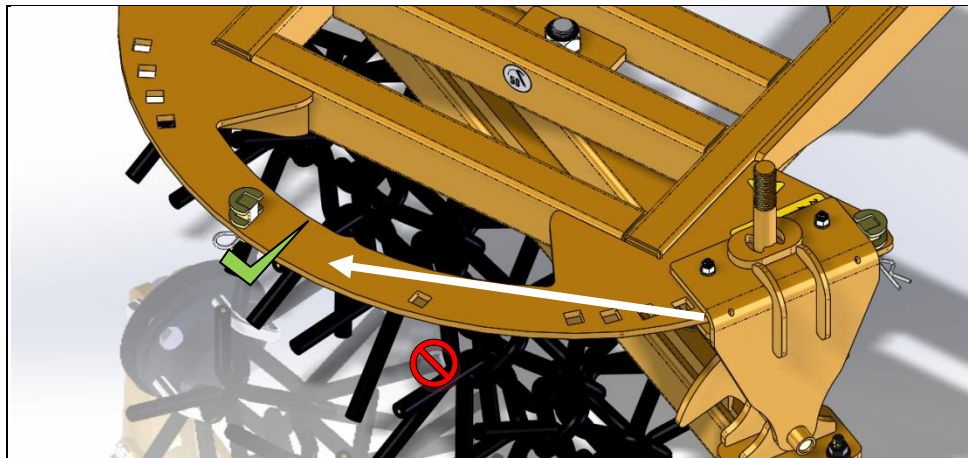
If changing by hand

1. Remove stop pins
2. Move stop pin(s) to desired working angle (25 to 40 degrees, in 5 degree increments).
3. Secure stop pins by pushing R-clips in until pin shank seats in innermost portion of clip.



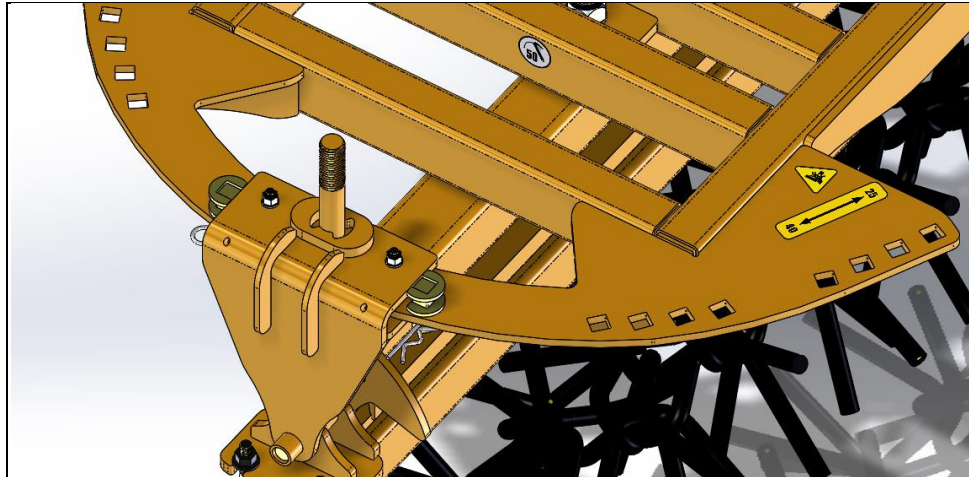
Locking in transport position

1. Set a stop pin in the center hole **farthest** from the current swingarm position.



2. Rotate the swingarm until it rests in the middle and then clip the second stop pin in place.

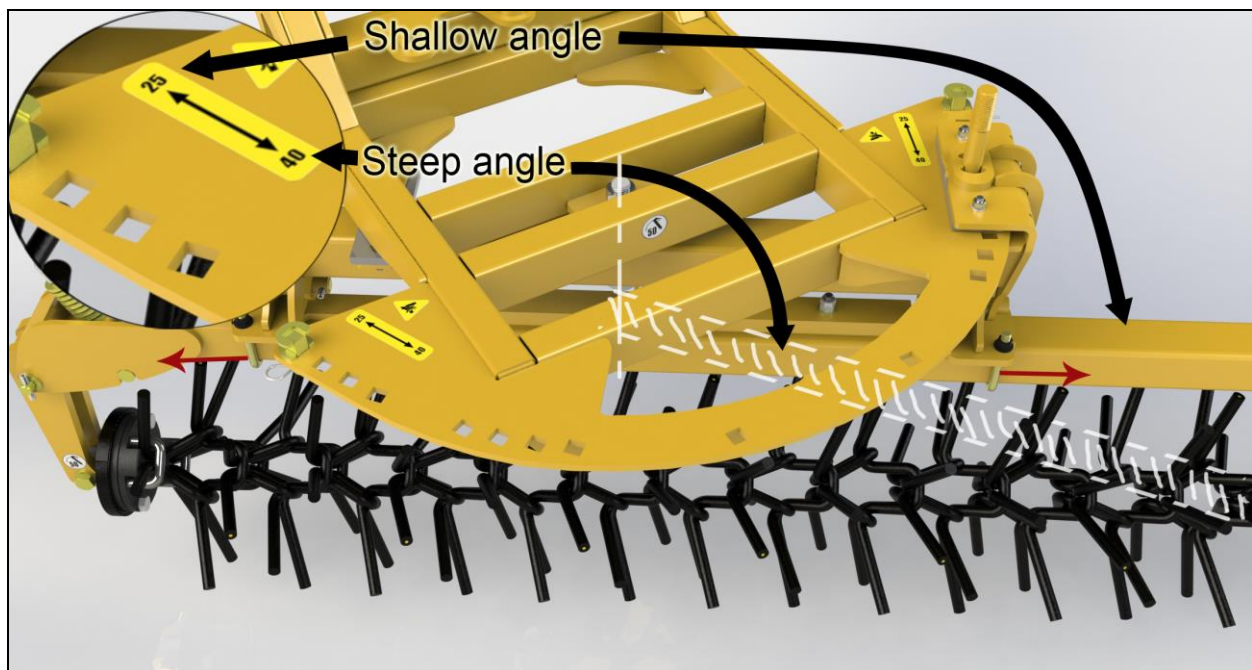




Harrow Mode

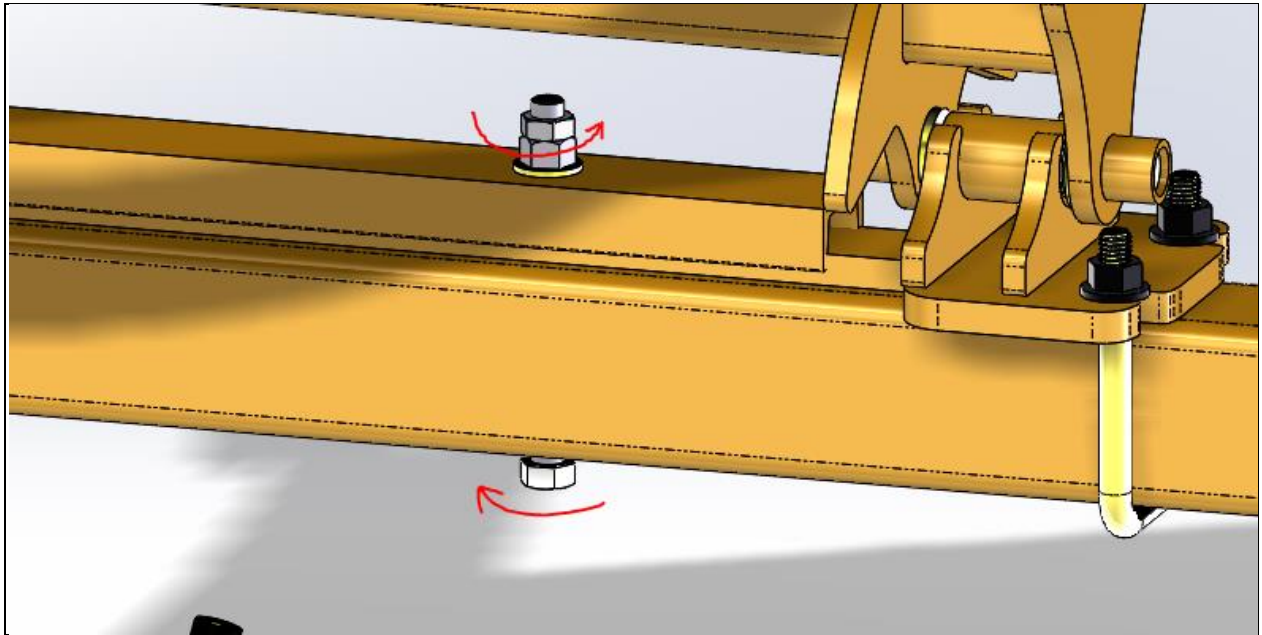
Harrows can be run in two modes: aggressive and passive. Aggressive mode is typically used to create finer finish in wet conditions or uproot more deeply rooted weeds. Passive mode is typically used to cultivate, or improve surface finish while keeping uprooting to a minimum. To swap modes please follow these steps:

1. Loosen one nut on each U-bolt by 1-3 turn, then move the u-bolts out



(continued on next page)

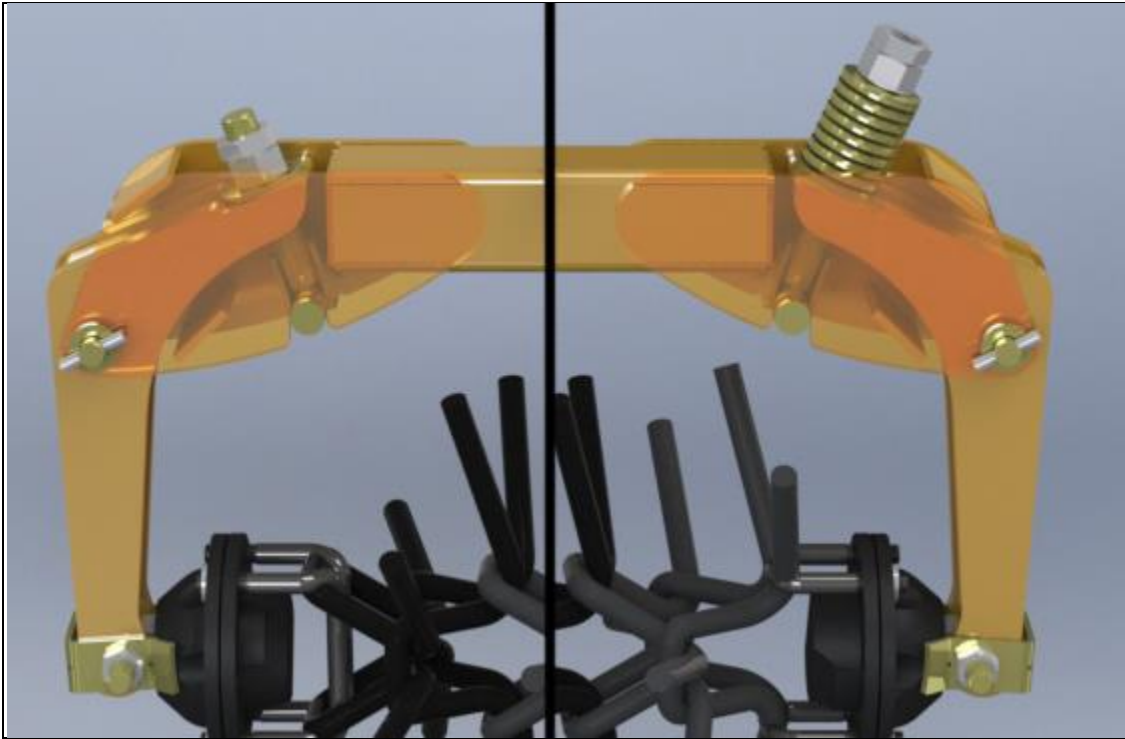
2. Loosen center pivot bolt until backbone pivots freely.



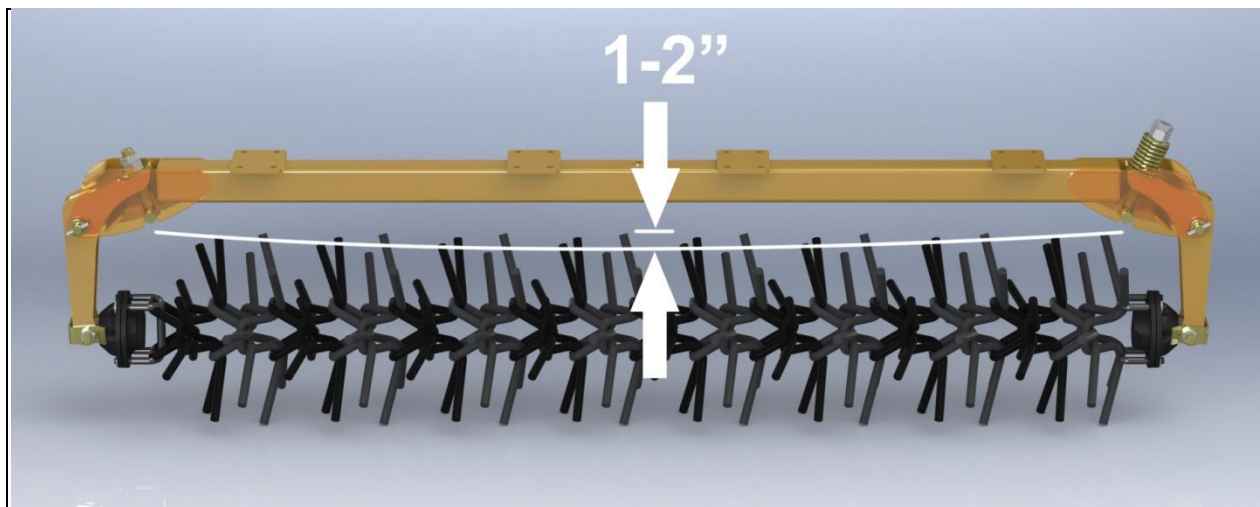
3. Rotate backbone 180 degrees or until u-bolts re-align with slots.
4. Re-tighten (2) nuts on U-bolts and tighten to 76-85 ft/lb.
5. Tighten nuts on center pivot bolt until they jam.
6. Repeat for remaining modules.

Harrow Tension

Rotary harrows are tensioned by tightening the two tensioning bolts. See below:



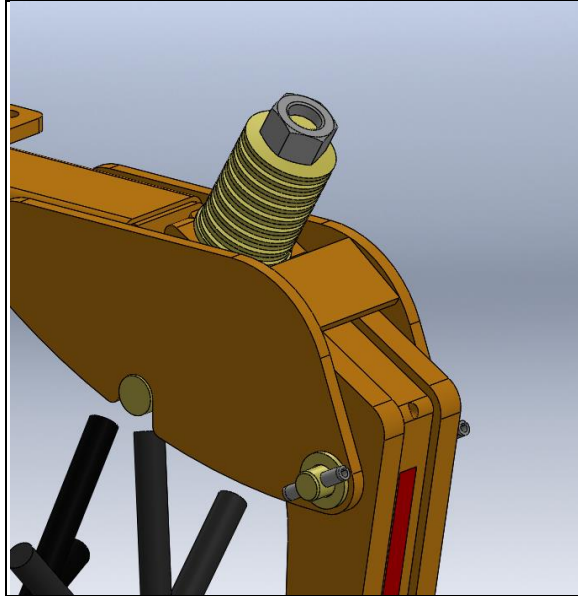
Of the two tensioning bolts, one is rigid, and the other is spring-loaded. If sufficient tightening is not achievable by tightening the rigid bolt, then tighten the spring-loaded bolt. Tooling chain should be tightened until tooling sag is limited to 1-2 inches.



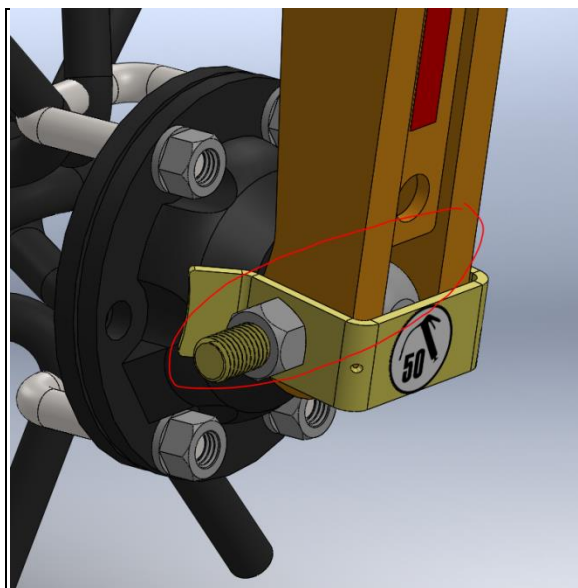
If both tensioning bolts have been drawn up completely and tooling sags more than 2 inches, remove one or more pairs of tools from tooling chain. See next page for procedure to remove harrow tooling pairs.

Shortening the Tooling Chain

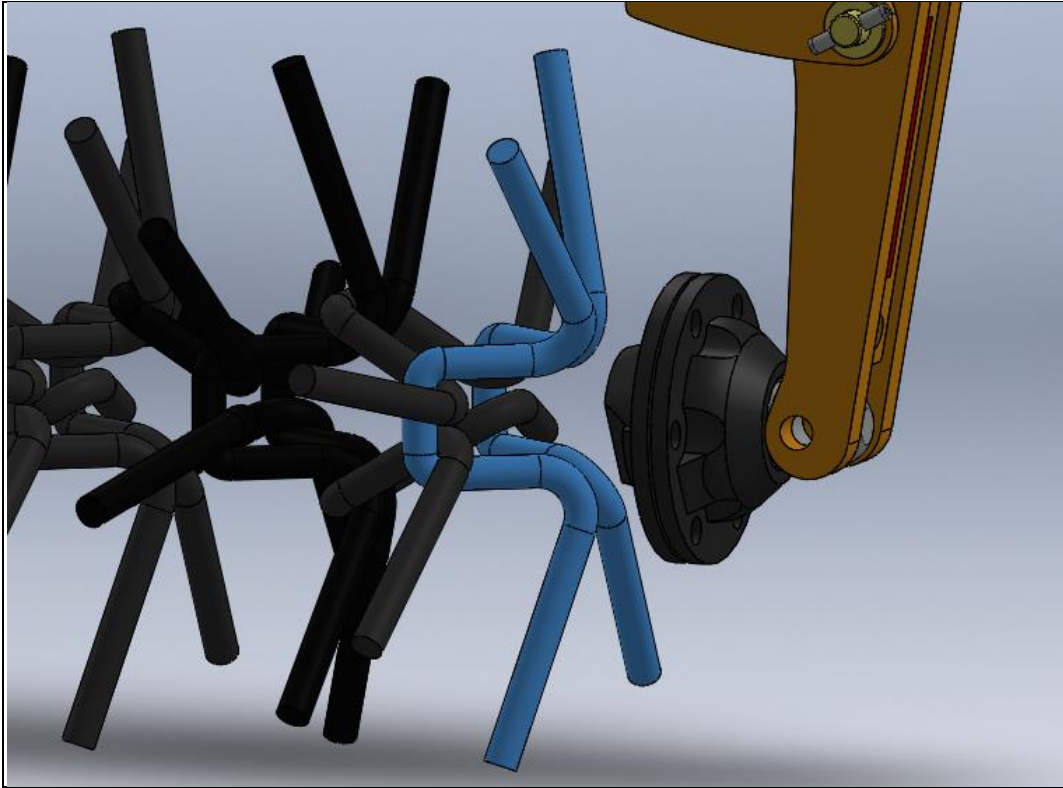
1. Lower the tooling chain until its entire length is supported by either the ground ,pallets, etc.
2. Remove jam nuts from tensioning T-bolts.
3. Regular nuts on T-bolts to be backed off until only a half a nut is caught on the end of the T-bolts' threads.



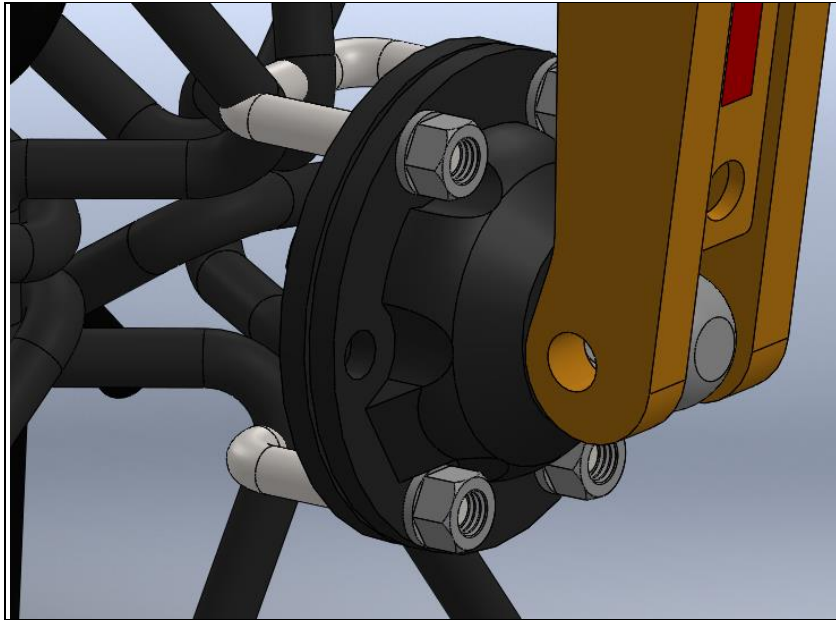
4. Remove two u-bolts from desired end of chain.
5. Loosen nuts on u-bolts at other end of chain until half a nut is caught at the ends of the u-bolts' threads.
6. Remove spindle bolt through bearing spindle at end of tooling chain where u-bolts were removed.



7. Remove tooling pair(s) at end where u-bolts were removed.



8. Re-install u-bolts at end where removed. Spin nuts onto u-bolts until a half a nut is engaged.

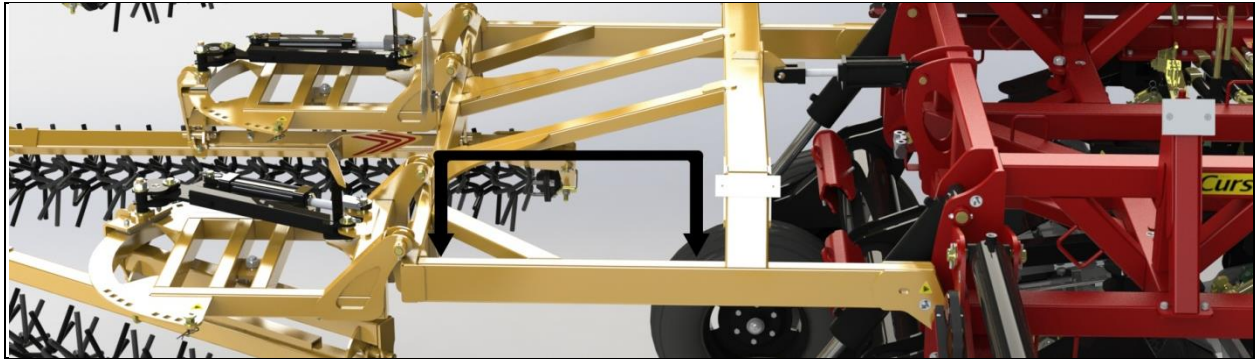


9. Pull tooling chain, and reinstall bolt through bearing spindle where removed.
10. Re-tighten nuts on u-bolts at both ends. Tighten all nuts until snug, then final tighten all in turn to keep u-bolts from pulling off to one side excessively.

Harrow Leveling

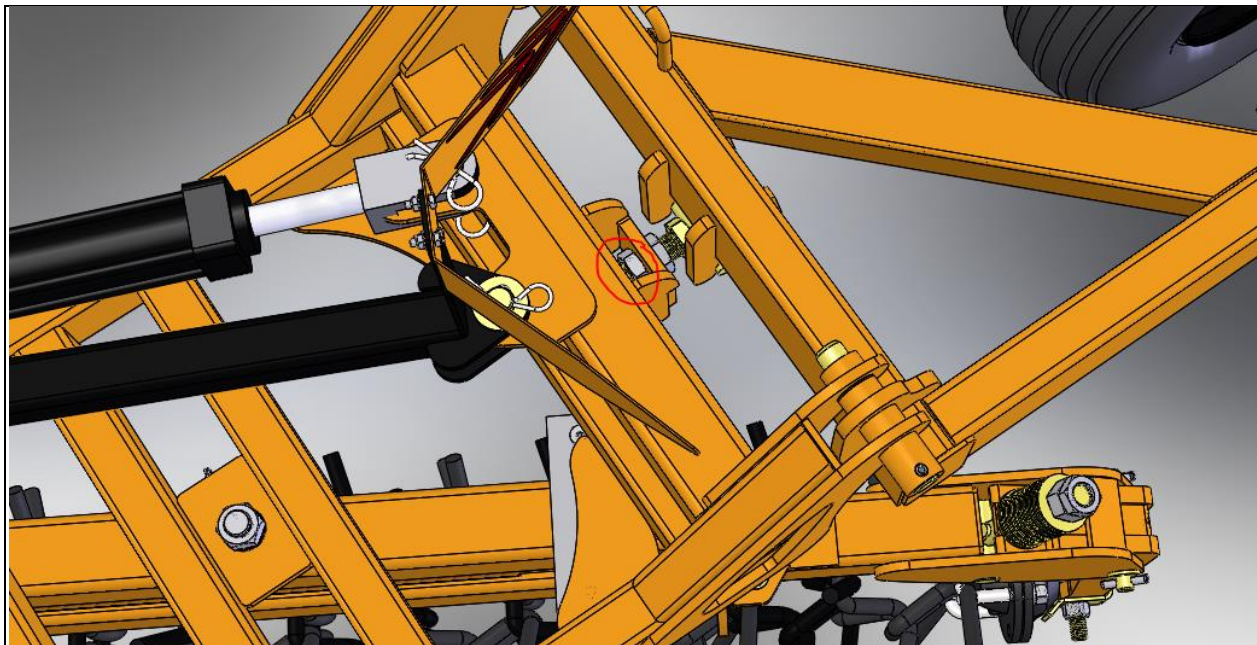
Level harrow assemblies by adjusting the harrow lift cylinder yoke, and the T-bolts that level the individual modules.

1. Level main **machine frame** using a framing level.
2. Level **suspension frames** using a framing level.



Support suspension frame using a jack placed on a forklift. The forklift places the jack within operating range of the suspension frame's bottom surface. The jack provides fine adjustment for leveling.

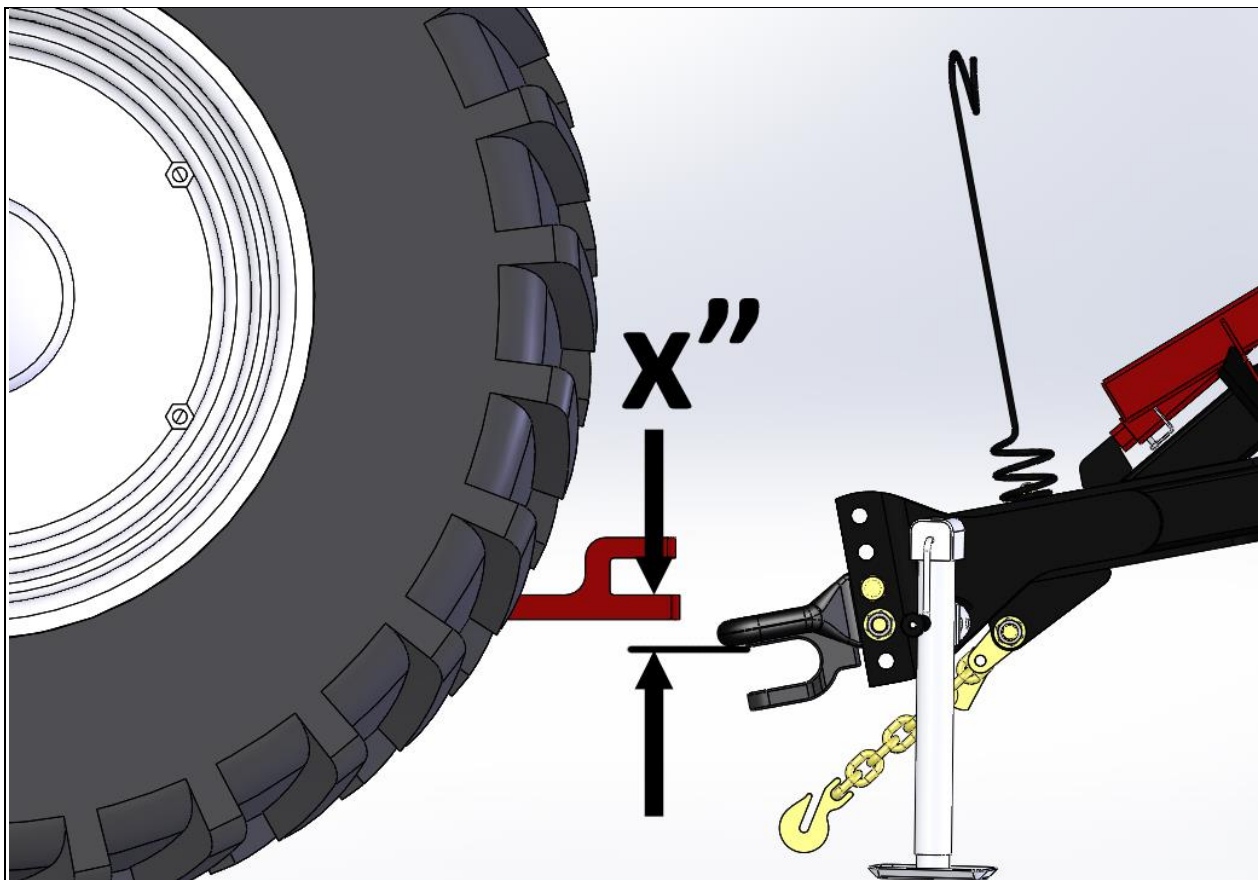
3. Level **individual modules**. Loosen jam nut on back side of plate that T-bolts are inserted through.



Turn jam nut on front side until module frame reads level with a framing level. Spin rear jam nut until snug against mounting plate. Hold rear jam nut with a wrench and final tighten front jam nut.

Frame Leveling

1. Move pintle to proper position on machine hitch. Lowest holes are for 15-3/4" drawbar height, higher holes are for drawbar heights of 18", 20-1/4", and 22-1/2".
2. Hitch to machine with tractor to be used with machine for field work.
3. Attach hydraulics for raising and lowering machine.
4. Raise machine to full transport height.
5. Lower transport jack to support hitch so that pintle sits above drawbar by about 1/4 inch.
6. Unpin pintle from tractor drawbar.
7. Move tractor forward 6" or until pintle clears drawbar by 2" or more.
8. Adjust hitch height with transport jack until machine frame is level.
9. Record vertical distance between contact faces on pintle and drawbar; X".



10. Lower machine until lift cylinders are fully retracted.
11. Adjust hitch with turnbuckle by amount recorded in step 9; X". If hitch was adjusted **up** in step 8, adjust hitch **down** in this step and vice versa.
12. Secure pintle to drawbar.
13. Raise machine to full height
14. Re-check for level, and adjust as necessary.
15. Harrow tooling mount frames should trail to the rear with approx. 45deg angle.

Wheel Bearing End Play

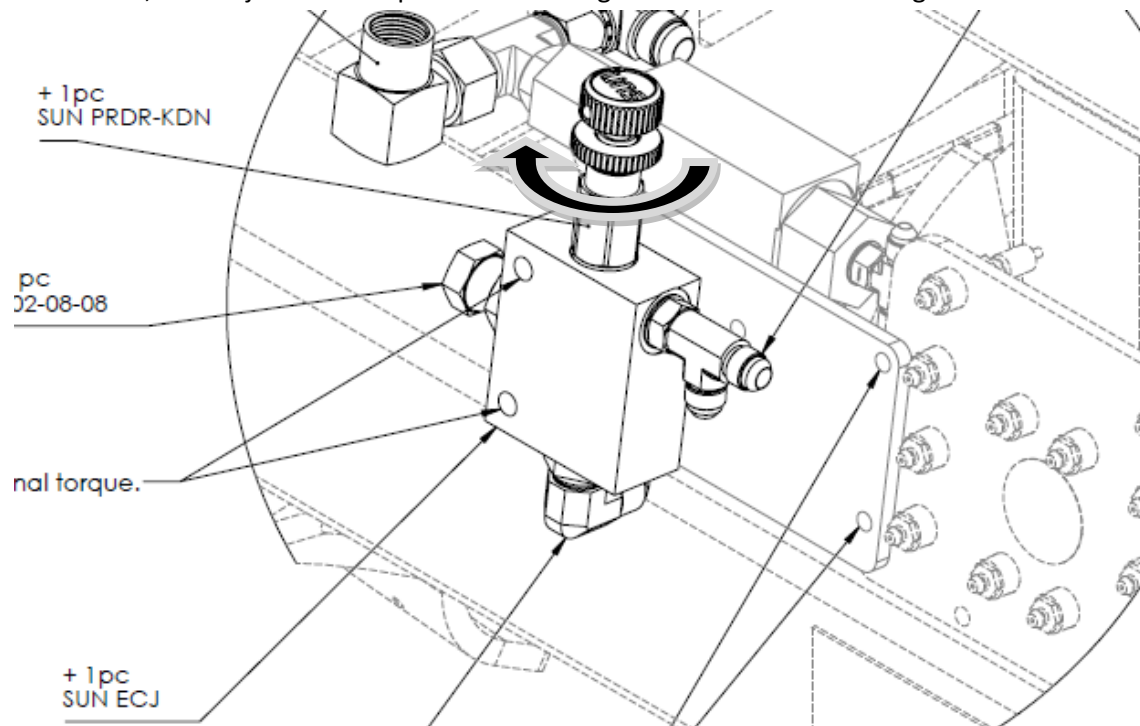
To set end play on tapered roller wheel bearings, please follow the procedure below.

1. Support spindle so that tire rotates freely.
2. Clean dust cap and remove
3. Remove cotter pin
4. Tighten spindle nut while rotating wheel; tighten to 100 ft/lb
5. Re-install cotter pin to secure spindle nut after loosening spindle nut by $\frac{1}{4}$ turn or until nearest notch after $\frac{1}{4}$ turn aligns with the cotter pin.
6. Check for excessive end play.
7. If satisfactory, spread cotter pin and re-install dust cap.

Wing down pressure system

To set the amount of weight transferred from the center section of a folding machine to its wings, please follow the procedure below.

1. Start with the machine in the fully raised position.
2. Move lever in cab to lower wings until wings are fully lowered and pressure gauge reading stops increasing(100-500psi).
3. Lower machine and observe whether too much or too little is being transferred. Fully raise machine.
4. If the outsides of the wings are digging in too much, skip to step 6. If not enough weight is being transferred, turn adjustment on pressure reducing valve to the left. See image below:



5. Repeat steps 2-4 until desired amount of transfer is achieved.
6. If the outsides of the wings are digging in too much, turn adjustment on pressure reducing valve to the right.
7. Move lever in cab to raise wings until pressure gauge reading falls to a low pressure, less than 100psi.
8. Move lever in cab to lower wings until wings are fully lowered and pressure gauge reading stops increasing(100-500psi).
9. Repeat steps 2-4 until desired amount of transfer is achieved.

Troubleshooting

Use the following table to identify common problems and possible solutions.

Condition	Possible Cause	Possible Correction
Clods of soil pulled up, or Excessive root balls pulled up	Harrows not aggressive enough Rear roller working angle too aggressive	Set harrows to steeper angle (max) and/or swap harrows to aggressive mode Decrease rear roller working angle to 0-2 degrees
Still too many clods and root balls being pulled up	Roller working angles too aggressive	Decrease front roller working angle to 0-1 degrees, rear to 0 degrees.
Still too many clods and root balls coming up !!	Soil conditions are too wet	Pray for drier conditions; be sure to pray in faith, believing. (Matt.21:22)
Tines appear short	Tines are at end of service life	If in front roller assembly, replace at 4" length If in rear, move to front or replace at 6" length
Rollers not penetrating fully	Hard soil conditions Too little down pressure on front rollers	Increase relative down pressure on front rollers Increase relative down pressure on front rollers
Rollers bulldozing soil	Too much relative down pressure on front rollers Soft soil conditions Machine is carrying payload	Increase relative down pressure on rear rollers Lower wheels to carry weight Lower wheels to carry weight
Roller mounting frames are not level	Relative down pressure setting incorrect	Increase or decrease relative down pressure setting
Seedbed too shallow	Tines not aggressive enough Harrows not aggressive enough	Replace worn tines or increase working angle Increase angle (40max) or set to aggressive mode
Harrows plugging	Harrows are in aggressive mode	Swap harrows to passive mode
Harrows running deeper at one end of each tooling chain	Machine frame not level Harrow suspension frames not level Harrow module frames not level	Level machine frame Level harrow suspension frames Level harrow module frames
Harrow chains bouncing	Tooling chains are too slack	Increase tension on tooling chains
Harrow chains are hitting mounting framework	Machine height too low Machine frame not level Harrows not level from front to rear	increase relative down pressure on rollers till roller mounting frames are level Level machine frame Level harrow suspension frames Level harrow module frames
Harrows hitting tires	Harrows are not at a proper working angle (25-40 degrees) Harrow chains are swept forward instead of rearward	Replace missing harrow angle set pins Use hydraulics to move harrow swingarms against stop pins Lower the machine while moving forward; not while stationary or moving backward.
Roller will not turn freely	Frozen soil between shaft parts and bearing assembly Wear shoe is scrapping shaft OD Bearing is damaged	Thaw affected areas using heat that will not damage rubber seals Break in over 10 acres or less Replace bearing
Harrow tooling chain will not turn	Bearing is damaged Tooling chain is under too much tension	Replace bearing Loosen spring loaded tensioning bolt until tooling sags by at least 1 inch.
Afraid of facing God on Judgment Day	Your works are evil in God's sight	Repent and believe on the Lord Jesus Christ for forgiveness of sins and receive his Holy Spirit for sanctification unto new life in Christ.

Specifications and Capacities

Your Model No. _____ and Serial. _____. Keep for reference when ordering spare parts.

Model No.	230-G10	230-R10	245-G15	245-R15	245-F15	260-R20	290-R30
HP Req.	150	150	225	225	225	300	450
Working width	10	10	10	15	15	20	30
Transport width	9' 2"	10' 11"	14' 10"	15' 11"	9' 10"	14' 10"	14' 10"
Transport height	5' 9"	5' 9"	5' 10"	5' 10"	12' 3"	8' 11"	13' 5"
Length	30'	30'	30'	30'	30'	30'	30' 6"
Weight	8100	9100	11900	12900	13050	16000	23700
Lbs/ft	810	910	795	860	870	800	790
Max base payload	1000lb	200lb	1800	3000	200	500	2500
Max optional payload	2000	1000	4000	5000	3500	8000	2500
Tire size(s)	11L-15FI	11L-15FI	12.5L-15	12.5L-15	32x15.5x16.5	11L-15FI	32x15.5x16.5 9.5L-15
Ply rating	12	12	10	10	14	12	14, & 8
Hub bolts	6	6	6	6	6	6	8, & 6
Can equip brakes	NO	NO	NO	NO	NO	YES	YES
5ft rollers	4	4	4	4	4	8	12
2.5ft rollers	0	0	4	4	4	0	0
Frame sections	1	1	1	1	2	3	3
Harrow modules	2	2	3	3	3	4	6
Roller angle offsetting options	Manual Hydraulic	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.
Harrow reversing options	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.	Manual Hyd.
Harrow angle setting options	Manual Hyd.-Semi auto	Manual Hyd. Semi auto	Manual Hyd. Semi auto	Manual Hyd. Semi auto	Manual Hyd. Semi auto	Manual Hyd. Semi auto	Manual Hyd. Semi auto
Can equip rear hitch	YES	YES	YES	YES	YES	YES	YES
Hydraulic circuits	1-3	1-3	1-3	1-3	2-4	2-4	2-4
Compatible Valmar air seeders	1655, 2055	1655,2055 2455,3255	1655-3255	1655-3255	1655	1655-3255	1655-3255

Safety information

Warning and Caution Decals

Warning decals are placed on the machine in locations where potential hazards exist. Failure to heed these warnings may result in severe injury or death. Please read the meanings of these decals below.



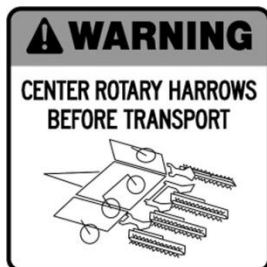
Install cylinder stops onto main lift cylinder rods, and hydraulic leveling cylinder rods (if equipped) when the machine is fully raised before servicing machine or towing on public roads.



Whether towing with a tractor or truck, 30mph is the maximum safe speed for transporting the machine on public roads. Slower speeds are necessary for sharp curves, and where posted speed limit is lower. Travel at a speed that allows adequate braking distance and ability to change direction in an emergency.



Never move machine with wings folded unless stop pins or other approved devices are in place to secure wings against falling.



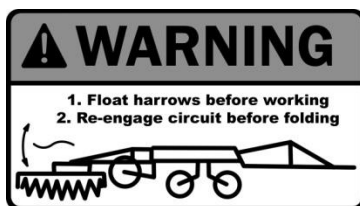
Harrows can extend beyond height and width listed in specifications section if not rotated to the rear. Failure to rotate harrows to the rear may result in electrocution from striking power lines, or a hazard of striking objects beside the path of travel, including oncoming traffic.



This decal is placed near moving parts that present a **crushing hazard**. Failure to heed this warning may result in severe injury or death.

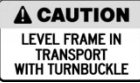


This decal is placed near moving, pointed, or sharp parts that present a **puncture hazard**. Failure to heed this warning may result in severe injury or death.



Failure to heed this warning will cause damage to rotary harrows.

Caution decals are placed on the machine to alert the owner to conditions that may cause machine to operate poorly or that may damage the machine, and to provide instruction.



Instructs operator to level the machine when fully lifted by adjusting the turnbuckle which is part of the hitch leveling linkage.



Instructs operator to always secure safety chain from machine hitch to tractor or other towing implement.



Cautions operator to install hitch into tongue frame at proper location for drawbar height of tractor that will be used with machine.

Warranty and Registration

Material and workmanship are guaranteed for (1) year from date of first use. No other guarantees are implied or otherwise expressed.

Claims for replacement parts or for service are to be made within (30) days from failure. Claims must be submitted in writing, by fax, or by an e-mail confirmed with a phone call.

Gospel

Romans 1:20-21: "For since the creation of the world His invisible attributes are clearly seen, being understood by the things that are made, even His eternal power and Godhead, so that they are without excuse, because, although they knew God, they did not glorify Him as God, nor were thankful, but became futile in their thoughts, and their foolish hearts were darkened." We must acknowledge God as the Creator of everything and accept our humble position in God's creation.

Romans 3:23 "For all have sinned, and fall short of the glory of God." We must all realize that we are sinners and that we need forgiveness. We are not worthy of God's grace.

Romans 5:8 "But God demonstrates His love toward us, in that, while we were still sinners, Christ died for us." Through Jesus, God gave us a way to be saved from our sins. God showed us His love by giving us the potential for life through the death of His Son, Jesus Christ.

Romans 6:23 "For the wages of sin is death, but the gift of God is eternal life in Christ Jesus our Lord." If we remain sinners, we will die. However, if we accept Jesus as our Lord and Savior, and repent of our sins, we will have eternal life.

Romans 10:9-10 "That if you confess with your mouth the Lord Jesus and believe in your heart that God has raised Him from the dead, you will be saved. For with the heart one believes unto righteousness, and with the mouth confession is made unto salvation." Just confess that Jesus Christ is Lord and believe in your heart that God raised Him from the dead and you will be saved!

Romans 10:13 "For whoever calls on the name of the LORD shall be saved." There are no religious formulas or rituals -- Call upon the name of the Lord and you will be saved!

Romans 11:36: "For of Him and through Him and to Him are all things, to whom be glory forever. Amen."

Determine in your heart to make Jesus Christ the Lord of your life today

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