

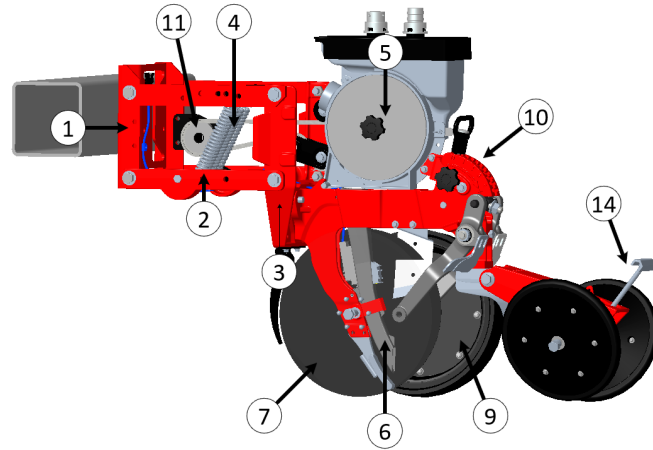
WhiteRow Unit Inspection

Understand that we are trying to create a trench, deposit a seed, then close the trench back to a state as if we were never there. The trench should be impossible to find if closed correctly in good conditions.

Key wear areas of concern by row unit

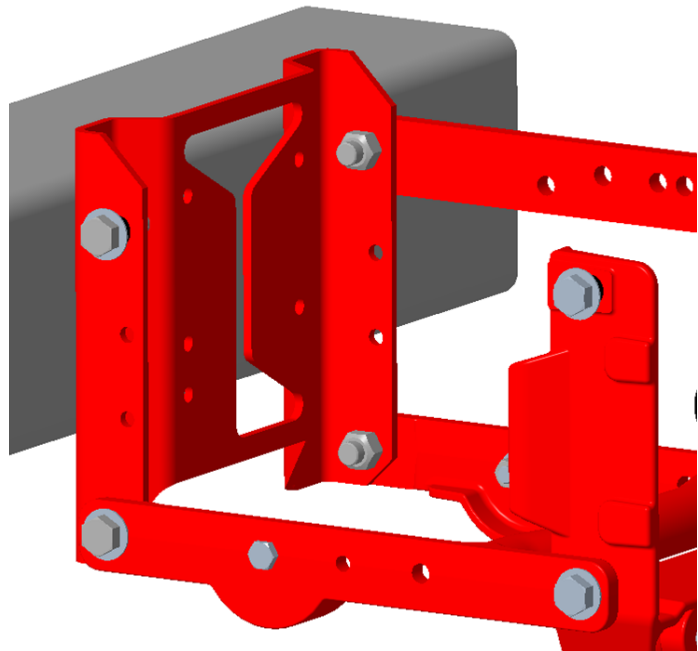
1. W Bracket
2. Parallel Arms
3. Shank & Goal Post
4. Downforce System
5. Meters
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Note: Recommended Settings and Tips will be in italics



W Bracket

- Visual inspection of W plate and attachment bolts, wear/cracks/wallows
- Plate styles and wear points – Welded vs Cast
- W plate is truly vertical to allow uninterrupted movement
- U-bolts are tight and intact



Parallel arms

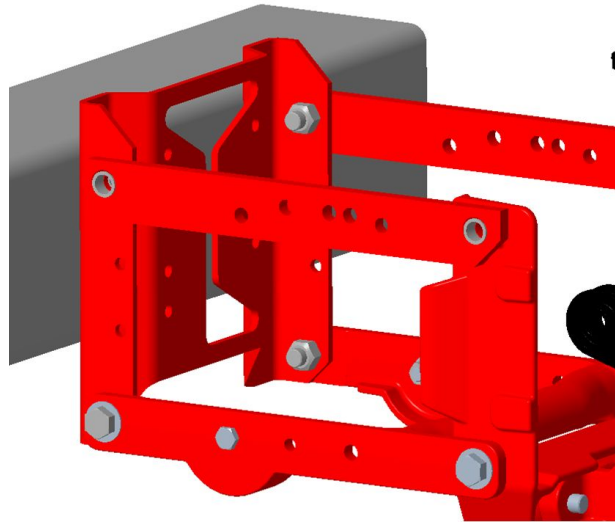
Visual inspection,

- Not Bent
- Bushing Hole
 - Wore -Arm replacement if loose
 - Wore -Arm drilled for oversize bushing
- Various replacement kits

Bolt and Bushing Inspection

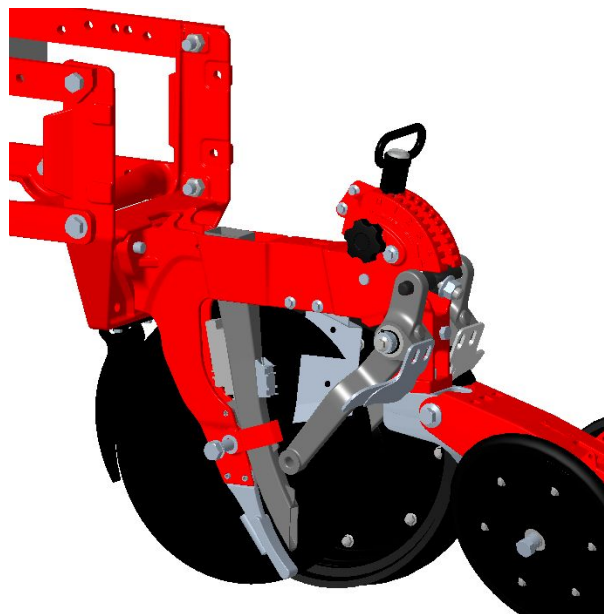
- Threaded bolt – replace yearly
- Solid Shoulder bolt – More surface area for contact
- Oversize – Drill out & replace with oversize bolt/bushing
- Row unit should have slight vertical movement (no more than ½”), if pronounced sideways movement is present – arms or bushings need to be replaced.
- Understand different styles of attachment - tapered bushing, pressed bushings, shouldered bushing or OEM replacement.

Note: Best practices is the use of a cherry picker to lift row unit



Shank and goal post

- Excessive wear stress cracks on shank and goal post. Shank damage is normally due to a rock strike. Goal post damage can occur from rock strike and excessive side shear. Can be accentuated by parallel arm bushing wear or adverse conditions
- Seed Tube Guard inspection makes sense at this point
- Recommendations for examining the shank, what level of deconstruction is needed to do this properly
- Firming point/shoe inspection/Seed tube Guard
 - Compare wear by holding a new point/frog in comparison
 - We only allow ½' wear before replacement



- Compare wear by holding a new point in comparison
- If any marks on Seed tube, guard should be replaced

Downforce System – Visual Inspection

Spring Style

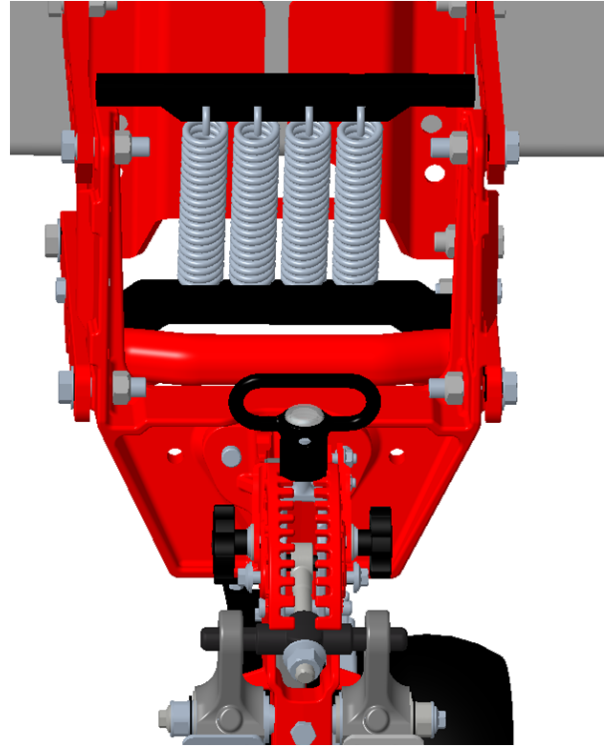
- Broken or uneven tension
- Wear of bracket where rubbing Parallel Arm

Air Bag System Inspection

- Inspect for leakage
- Inspect for cracking on sidewall
- If lift bags – check these as well
- Inspect load pin wiring & routing
- Run health check if possible
- Change air filter annually (Nylon Cover)
- Belt/idler pulley inspection

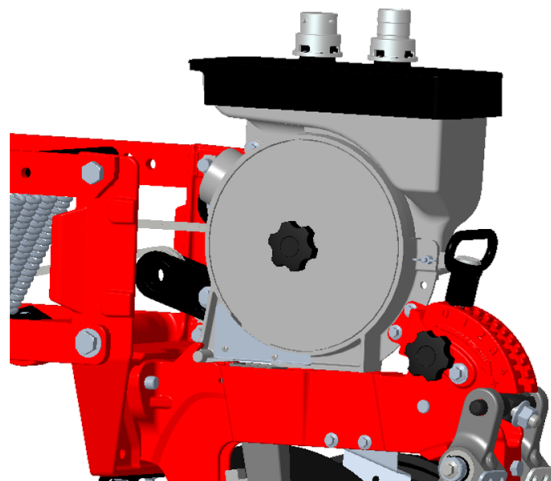
Hydraulic Downforce

- Ram/rod inspection
 - Leaking
 - Scoring
- Filter Nut retention kit installed
- Fitting- Check for leaks
- Inspect load pin wiring & routing
- Run health check if possible
- Change filter (Every 5 years)



Meters & Hoppers

- Check hoppers for cracking at mounting points
- Check latches - set properly & correct tension
- Visual Meter inspection/Disassembly
- Metermax - Utilize Your Meter training for all inspection - too many differences to list here
- Run at least 1-2 meters - if possible, all meters to be tested on stand with grower's seed



Seed Delivery System

Seed Tube Style

- Every tube needs to be pulled out for proper inspection. Verify hook is in correct position
- Inspect/ feel bottom of the tube, check for hangnails or curled plastic.
- Check for side wear when blades are removed.
- If visual wear on side of tubes, immediately check the seed tube protector.
- If older style that has hole through tube for seed eye – Replace with Bullseye to reduce ricochet

Note: Replace seed tubes and protector in tandem

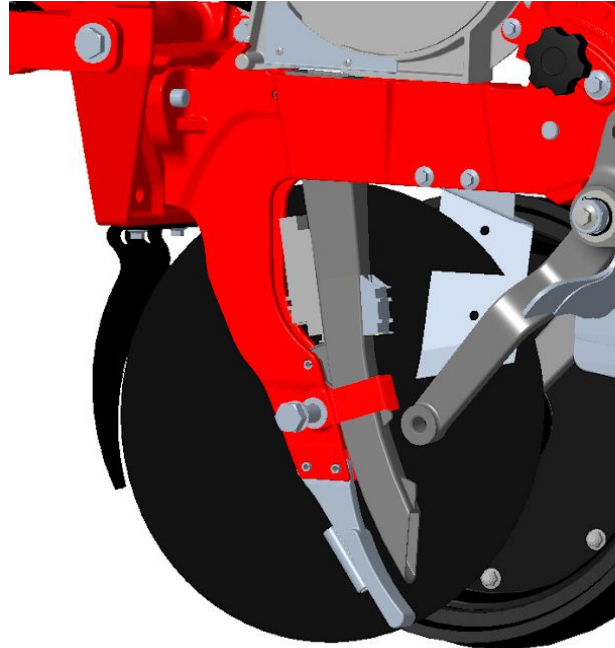
Speed Tube System

- Recommendation is that the ST belt is removed during off-season
- Check feeder wheels for wear & replace if necessary (annual replacement is normal)
- Check housing, seed lens sensor, belt pulleys and belt for wear
- Check wear liner for grooving - make sure it has metal liner and replace as necessary.
- Inspect guard for wear - replace if worn

Note: See Speed Tube Maintenance Manual for further details

Disk Openers

- The right balance between holding the trench open long enough for the seed to reach the bottom of the trench vs being too tight and causing excessive wear and strain on bearings. Common rule of thumb - if disk is worn $\frac{1}{2}$ " in diameter replace disc
- Not all disc and hubs are created equal. Important to check for trueness or runout on any new blades
- 3mm 2" - 2 1/2" contact
- 3.5mm 1-1/2" - 2" contact
- 4mm $\frac{3}{4}$ " - 1" contact
- Disk opener size requires by row unit



- White 9000 - 16", 3.5mm 1-1/2" – 2" of contact
- White 8000 - 15" 3 mm (2 Shims)

How to determine proper disk contact

- Business card check or 2-3 thickness of paper - slide in from front & back marking a chalk line at both and measure the distance between the 2 marks. Keep in mind that when blade compresses against seed tube protector - additional shim removal may not change touch. This can result in excess bearing damage or dragging of blade.
- Opening disk needs to be checked 180 degrees of rotation to show how concentric blade is. (No more than 1/4-3/8" variance.)

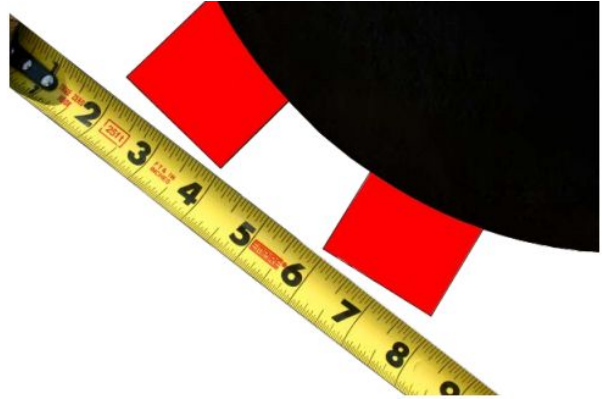
Inside disc scrapers

- Rotary - If 1/2 of material vs new is wore - needs replaced
- Straight blade - If 1/2 of material vs new is wore - needs replaced
 - Springs - Verify no binding & tension is adequate

If Serrated Blades (usually 4mm thickness) claims: No need for coulters, eliminate side wall smear, eliminate hair-pinning.
Allowance for 1/2 of tooth wear

Seed Firmers

- Do the tails appear to be true or do they have a bend? If bent, they need to be replaced.
- Are the tails flat on the bottom or are they formed into a "v"? If no longer flat they should be replaced.
- Older Style Firmers - Conduct a rigidity test, Planter should be in the lowered position with the firmers setting flat on the surface or ground. Attach a string or twine to the firmer and lift it off the ground measuring with a fish scale. A good firmer should have between 16--32 ounces of resistance. Some look/listen for good snap when contacting floor. If the

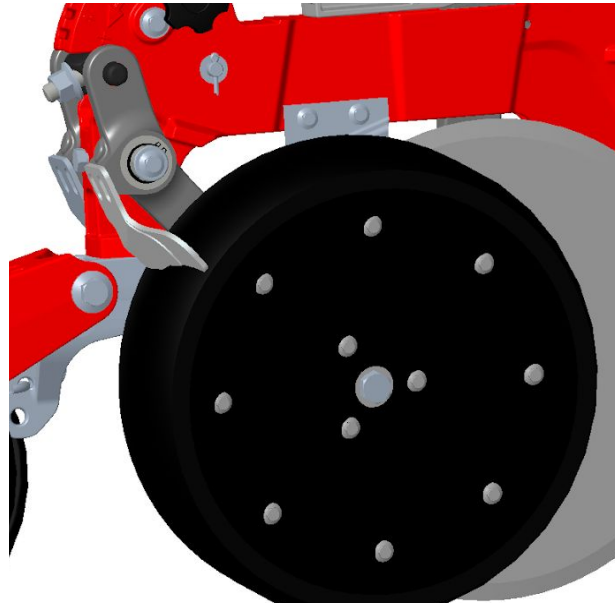


firmer has a tension screw add tension or replace if out of specs.

- Quick Attach firmers are non-adjustable regarding tension Use flatness or droop (lack of tension) for replacement test

Gauge Wheels

- Lift each gauge wheel up to contact the stop, turn the GW and check for contact with the disk.
- If hard to turn and turning blades, shim out. If wheel does not gently scrub disk, shim in. Is there enough rubber lip left to scrub disc when shimmed in. If metal on metal - gauge wheel needs replacement.
- Visual inspection of socket on the arm – Wear issue if moving in & out and not tight. Bushing and/or arm need replacement
- If newer style that has threaded bushing on arm - rotate threads and verify not a flat spot on threads. (Replace every 2 years to eliminate thread wear.)



Depth System

Check depth consistency by lowering row unit onto 4x4 blocks

- Lower each row unit down onto blocks while each row unit is set to the same depth.
- Measure from bottom of disc to floor
- Compare dimensions from row to row - are we within $\frac{1}{4}$ - $\frac{1}{2}$ "?
- Will need to compensate on depth settings to accommodate variance - mark row unit to reflect correct depth
- Walking gauge wheel style
 - Inspect rocker arm for wear - Is the hole round or elongated
 - Is shoulder bolt showing wear?

Inspect gauge wheel arm

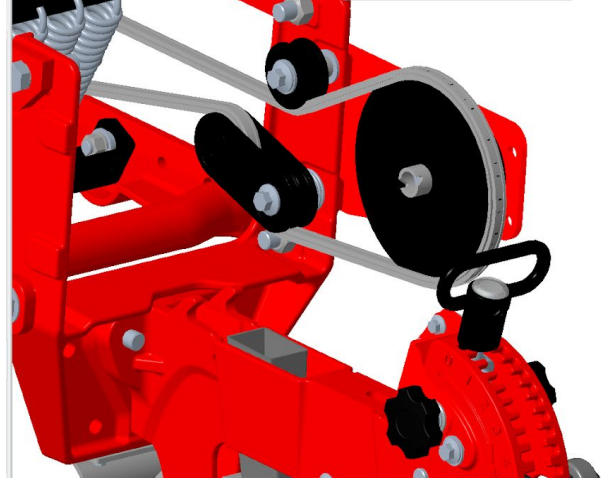
- Is pivot socket wore - needing replaced?
- If bushing style - replace bushing

- Arm wear where riding on rocker arm
- can they be reversed for extended wear.

Drive System

Chain drive systems

- Inspect for rusty or locked chains
- Stretched chains, have a length of new chain to compare
- Verify side to side movement of chain for chain roller wear - best done on a flat surface. Compare new to old chain
- Ideally - annual replacement
- Sprocket wear - teeth cupping
- Idler sprocket wear - inside & outside groove wear



Shaft Drive

- Inspect and lubricate cable shaft
- Rotate gearbox for roughness
- If possible, run live seed for SRI variance

Electric Drive

- Inspect teeth engagement to disc
- Run health check for amperage draw
- Visual inspection of electric connections

No-Till Coulters

- Place planter on floor and verify that coulters are minimum of 1/2" above the disc opener bottom. (Creates a false bottom if wrong) Spin to verify lowest point
- Shim washers can be installed between front side of row unit frame and no-till bracket on bottom bolts to tip coulters up for clearance if there is not enough vertical adjustment.
- Must be sharp, dull coulters will hairpin trash.

Note: Understand risk of furrowing of dirt on high speed planters

Note: Understand how coulters play into the planter down force conversation

Row Cleaner

- Is the vertical movement free? Replace any bent row cleaners brkts or arms.
- Inspect for bushing wallow - should be no horizontal movement
- Visual inspection of spike, finger, blade. Excessive wear? Understand style of teeth - is it correct? No till vs Conventional conversation.
- Spike= less chance of moving dirt.
- Blade style (Shark tooth) = better at cutting of residue.
- Visual inspection of "treader" wheel

- wear allowance = ½ the tread. Wear affects traction & depth
- If not installed – discuss need for maximum performance
- Floating style - if observing fixed style discuss accuracy and % time too shallow or too deep and why we only recommend floating style.

Note: Cover crops and understanding/discussion on how that affects this choice.

Closing System

Rubber Wheel

- If planting 1"-2-½" deep - 2 ½" spacing, center of wheel to center of wheel
- Discuss with grower too wide vs too narrow - all in relation to planting depth.
- Inspect wheel bearings
- Centered over row - verify it trails true (Over the center of trench)
- Recommendation of staggered closing wheel if possible

Spiked Wheel styles

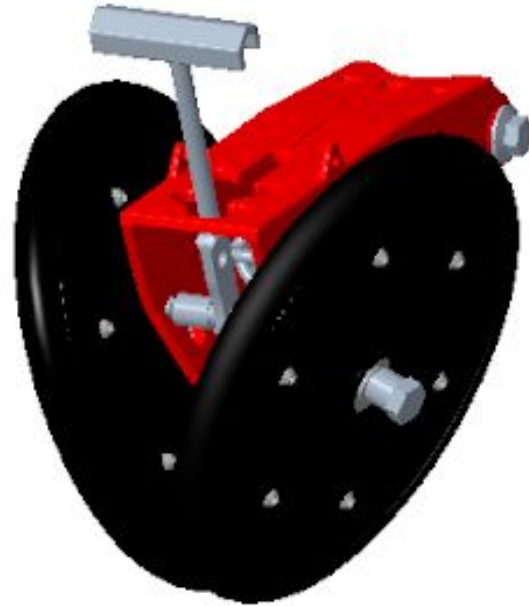
- Recommendation of staggered wheel forward - essential if using starter in a 2x2 system and spiked wheels.
- Check bushing and bearing in wheels.
- Verify distance between wheels depending on the style of spike and if needed - it needs to be widened out.
- Wheel spacing of 2" center of wheel at bottom of wheel

Staggered vs Non-staggered closing wheels; promotes proper trench creation, and insurance for rock and debris flow as well as proper pinching of the trench.

Verify tail assembly wear - bushing adjustment options, weld-on, concentric, OEM replacement, etc.

- How much side to side movement - no more than ¼-½"?
- Examine for loose bushings.

*Note: Majority of growers have at least aftermarket wheel. Issue arises when manufacturer's instructions on mounting positions are ignored or not referenced.



Drag chains

- Height set correctly, 3 to 5 links contacting soil only. Too many will be too aggressive and over sift (paving a road), and drag residue (beaver hutting)
- Is the vertical movement free?
- Use twisted chain so the chain does not get caught on the closing system.
- Weld attachment links at a 90-degree angle to avoid catching on spike wheels - if needed.

Row Unit Fertilizer – see Frame Section for Tanks & Pumps

Single Disc 2x2 System

- Inspect Wheel & bearing for wear & drag
- Inspect coulter & bearing for wear & drag
- Inspect knife/boot for wear – is it affecting depth placement
- Inspect row filter/check valve for cleanliness

Furrow Jet System

- Inspect the firmer for flatness & tension – if less than 12 oz of force, replace.
- Visually inspect depth setting to make sure not set too deep. Always use wing height adjustment tool in field to verify.
- Inspect FJ wings for wear – The wing height tool has a replacement mark to verify. Failing to do so may cause nozzle damage and incorrect flow issues.
- Verify wing retention pin installed if in areas with rocks
- Verify nozzles are not plugged
- Inspect row filter/check valve for cleanliness