EVALUATE AND ADJUST PLANTERS IN NO-TILL

(specifically for JD 7000 & newer, all Kinzes, White 6000 & newer, Great Plains, Monosem NG+)

Exapta solutions, inc.

1a) Get the planter so it's truly perfectly level to slightly nose-up. *Do this!* Carefully, thoroughly! —Everyone thinks their planter is level, but when we go look, 75% are still nose-down. Do a test run on reasonably smooth terrain *using the tractor that normally pulls the planter (with tire pressure adjusted) and with normal ballast on the planter (e.g., partially fill liquid fertilizer tanks with water), and at the depth and down-force you typically plant when in drier conditions.* From a distance (a couple hundred feet off to the side), look at the square or rectangular end of the toolbar at toolbar height (thigh-high), and compare to surrounding terrain (lower edge of tractor tires may help guide the eye, but adjust if you have duals on the back but not the front, etc.). Any markers should be at 90º to nearby terrain. Without markers, figure out what is supposed to be level on the planter and judge from that (sheet metal holding hopper boxes, hopper box lids, CCS tank framework or decals, etc). Don't go by the angle of the parallel linkage, nor the planter's tongue, and don't use a carpenter's level. Take a digital photo to reference—to dial this in, you need the image on a largish flat-screen and use a straight-edge to guide your eye, or print it out and draw lines (the best method). Adjust drawbar or 2-point until planter is *unquestionably, absolutely level to 5º nose-up.*

1b) Planter frame sections should be level L to R, at the same height across planter. If not, check hydraulic cylinders and phasing, transport-wheel bolt holes, etc.

2) Choose typical conditions, i.e., the same stubble type you will be planting. Put some seed in at least a few rows. Run at normal planting speeds. If there is slope, drive directly uphill (to better see how planter components are tracking). Try to run at an angle to previous field operations to eliminate row units running continually on old rows or combine tracks.

3) Observe the planter units: Are they bouncing around considerably? If so, then either the field is very rough, or down-pressure is inadequate. Or you have the depth setting far deeper than it should be (a common mistake).

4) Slow down and creep to a stop, not allowing tractor to settle or roll back even the slightest. Set parking brake before you take your foot off the brake pedal.

5) Carefully excavate several segments of different rows, including some in harder or drier areas (combine tracks) as well as in moist or soft areas.

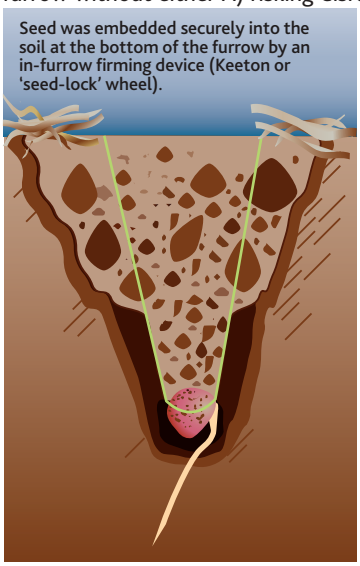
6) Is the furrow at a consistent depth (not varying more than 1/4") and at the intended depth? If it varies too much, either the down-pressure is too low, or frame weight (ballast) insufficient. (If the frame has lifted, the ballast is too little.) *Down-pressure and frame weight must be set correctly before proceeding with Steps 7 – 10.* If fertilizer openers are used, check their depth and location laterally from the seed row (preferably 4+" away from the seed row; seed placement can be adversely affected if the fertilizer cut is too close). From an agronomic standpoint, fertilizer openers only need to go 1 – 1.5" below the soil surface; anything deeper requires inordinate frame weight.

7) If row cleaners are used, how much residue has been moved out of the row? Look at *all* the rows to get a better idea (if some rows are noticeably more or less aggressive, check to see if the row cleaner is set differently, if the bracket is bent, or if the row-unit depth or its down-force are set differently). Adjust row cleaners to move less than 50% of residue and not disturb any soil. Coulters generally hinder good seed placement and shouldn't be used.

8) If adjustments were made in Steps 6 & 7, run planter again. Carefully excavate several rows being careful not to disturb the seeds. Are all seeds in the bottom of the furrow? What percent isn't in the bottom? If you find any seeds *not* in the bottom of the furrow, check the seed tube for cracked or frayed edges. Also check for premature sidewall collapse, i.e., how crisply the furrow is defined (before the closing wheels have altered it—i.e., tie up or remove the closing bracket on a row). Premature sidewall collapse has many causes, including RID gauge tires as well as inadequate down-pressure on the standard gauge tires (not keeping the gauge wheel firmly on the soil surface). There must be enough packing of the sidewall by the blades and gauge wheels to keep the sidewall together until the seed has come to rest in the bottom of the furrow. Blades flexing inward away from the gauge wheels also causes more sidewall lifting and collapse—blade flex is caused by worn or thin blades, by worn seed tube guards, and also by slop in the gauge wheel arm's pivot point (allows the gauge wheel to splay out away from blades when running). Rusty blades will also cause more sidewall lift/collapse until they get shiny again.

9) Are all seeds embedded in the bottom of the furrow? Good seed-to-soil contact is essential for consistent germination, and the seeds should be securely pressed into the bottom of the furrow. Except possibly for the mellowest of soils in cool regions, the seed should be embedded sufficiently that it must be pried loose with a pocketknife. If seeds are not firmed adequately, check the pressure on the firming device (Keeton or in-furrow 'seed-lock' wheel). Keetons should have 4 – 9 lbs of pressure on them (use a fish scale). For wrap-around Keetons, if the firmer mysteriously lacks pressure even after cinching the tensioning screw, make sure the tail popped (clicked) all the way into place during install—some require a strong jabbing to get them to go in far enough so that the tension screw is below the 'thumb' of the tail. Also check to make sure the Mojo wire hasn't gotten bent, broken, or yanked out of position. If some seeds are loose despite good pressure on the firming device, again look at premature sidewall collapse (Step #8: dust falling in ahead of seed, or seeds in lateral fissures and not being engaged by the firming device), as well as seeds being pulled loose by spoked closing wheels (Step #10). For this evaluation, you can eliminate the effect of the spoked closing wheels by tying up the closing bracket on a row or two.

10) Is furrow closing and sidewall breakage acceptable? Is the soil loose over the seed? You should be able to brush away the fill material over the seed easily with your finger. Is the top 2/3 or 3/4 of the sidewall broken up? If seeds are truly embedded in the bottom of the furrow (Step #9), it is rather difficult for spoked closing wheels to pull them out. However, depending on spoke design and pressure applied, spoked closing wheels can be quite aggressive in pulling up soil and chunks of sidewall with seeds attached. In many conditions it is difficult to completely close the furrow without either A) risking disruption of seed placement, or B) doing too much packing over the seed. But failing to break up the sidewall adequately can cause tomahawk rooting which may be disastrous if timely rains do not occur.



The radicle (first root) initially encounters the denser soil created by the firming device, with a gradual return to normal soil density below the furrow. The radicle develops naturally and robustly in these conditions.

Spoked closing wheel aggressiveness can be increased by: A) more pressure applied to the closing bracket; B), adjusting the spacing of whls—too far away from each other (2.5 – 3") causes Thompson wheels to do a poor job, while too close results in only superficial nibbling of the very edge of the furrow lip; C) making sure no closing brackets are askew or bent (same for row units); D) rotating Exapta's closing wedge closer to the full 6 degrees (horizontal, with thick end of wedge forward); and, E) checking *one more time* that planter isn't the slightest bit nose-down.

EVALUATING AND ADJUSTING GAUGE-WHEEL DRILLS IN NO-TILL

(specifically for JD 50/60/90-series gauge-wheel drills; also applicable—in general—to Case SDX drills outfitted with the seed-lock in-furrow firming wheel) (N/A to press-wheel drill designs, i.e., where the trailing packer wheel limits the depth)

1) Choose typical conditions, i.e., the same stubble type you will be seeding, and with normal ballast on the drill (e.g., partially fill liquid fertilizer tanks with water). Put a small amount of seed in the compartment.

2) Run at normal drilling speeds, i.e, the fastest you will ever run the drill. If there is slope, drive directly uphill (to better see how opener components are tracking). Try to run at an angle to previous field operations to eliminate openers running continually on old rows or combine tracks.

3) Observe the openers: Are they jumping around considerably? If so, then either the field is very rough, or down-pressure is inadequate. Or the depth setting is much too deep (a common mistake) (with new blades, the 60/90-series set in the 4+3rd notches [from shallowest] will cut ~ 2" deep if pressure and weight are sufficient to keep the gauge-whl on the soil surface at operating speed; for 50-series, equivalent would be 3d notch [from shallowest]).

4) Stop with the drill still in the ground. If using a box drill with a 2-point tongue, adjust the 2-pt until the drill frame is level in relation to the surrounding terrain. The lower edge of the tractor tires can help guide your eye. *Look at the drill from a couple hundred feet off to the side.*

5) Carefully excavate several segments of different rows, including some in harder or drier areas (combine tracks, hilltops, areas with less mulch cover) as well as in moist or soft areas.

6) Is the furrow cut to a consistent depth (not varying more than 3/8") and at the *intended* depth? (where drill was at full speed) If it varies too much, either the down-pressure is too low, or frame weight (ballast) insufficient. Hydraulic down-pressure requirements often go far into the red area of the indicator gauge, which requires heaps of additional ballast if both front and back drill ranks are being used.

If the frame has lifted at all, the ballast is too little. Most of the added ballast, including suitcase weights, should be approximately over the rear rank and centered on each section. This will require making your own weight brackets on air drill wings. *Down-pressure and frame weight must be set correctly before proceeding with Steps 8 – 10.*

How much hairpinning of residue is occurring? Hairpinning is worsened by planting very shallow, inadequate down-pressure, and dull blades (or blades being installed backwards—the bevel must be away from the gauge wheel.) Hairpinning is also worsened by damp residues, poorly distributed residues, and by soft unstructured soil (tilled, or within the first 5 yrs of low-disturbance no-till). Some 1850 drills need a kit to lower the rockshafts to make the openers function properly.

In tougher soils in warmer climates, or eroded low-OM soils elsewhere, it can really be a struggle to get enough frame weight stacked onto the drill, and the hydraulic pressure will be 'crazy' high on the gauge to get the drill to work properly. Note that narrow gauge wheels and sharper opener blades will reduce the down-pressure needed on the opener to maintain depth. As will slowing down.

If your drill has mega-acres of hard running on it, and you're getting 2.5 – 3" of compression on the big coil spring of each opener but the opener still isn't staying at depth in moderate soil conditions, consider the possibility that the big coil springs are fatigued—compare to a new one.

7) If an air drill is being used, check the seed velocity by removing a secondary line from the opener and aiming it straight up into the air. Run at normal ground speed and blowing the normal amount of product (seed + fertilizer). Product should blow about 12 – 18 inches up into the air. Adjust fan speed until this is achieved. Seed velocity can be further slowed by air diffusers a.k.a. 'Seed Brakes' or similar.

8) If adjustments have been made in Steps 6 & 7, run drill again. Carefully excavate several lengths of different rows where drill was at full speed, being careful not to disturb the seeds. Are most of the seeds in the bottom of the furrow? What percent isn't in the bottom? If you find more than 10 or 15% not in the bottom of the furrow, check the seed boot for wear on the outside lower corner, and inspect for broken leaf springs, as well as worn out, bent, or missing seed-bounce flaps (flaps wearing to a point is okay/good, but losing >0.5" of length is a problem); 60-series boots should be replaced with 90-series for better seed placement. Lower edge of boot should skim the soil surface. Also check for premature sidewall collapse, i.e., how crisply the furrow is defined (before the closing wheels have altered it). Premature sidewall collapse has many causes, including RID gauge tires as well as inadequate down-pressure on the regular gauge tires (not keeping the gauge wheel firmly on the soil surface).

9) Are all seeds embedded in the bottom of the furrow? Good seed-to-soil contact is essential for consistent germination, and the seeds should be securely locked into the bottom of the furrow. Except possibly for the mellowest of soils in cool regions, the seeds should be embedded sufficiently that they must be pried loose with a pocketknife. If seeds are not firmed sufficiently, check the spring pressure on the firming wheel (max for most conditions) and look for broken, stretched, or fatigued torsion springs. (If using the Fin, do the same inspection.) If many seeds are loose despite good pressure on the firming device, look to see if the firming device's edge is staying down to the bottom of the furrow, or if some seeds are getting past the firming device. If some seeds are loose despite good engagement of the firming device, again look at premature sidewall collapse (Step #8: dust falling in ahead of seed, or seeds in lateral fissures and not being engaged by the firming device), as well as seeds being pulled loose by spoked closing wheels (Step #10). For this evaluation, you can eliminate the effect of the spoked closing wheels by tying up the closing arm (or removing it) on a row or two.

10) Is furrow closing and sidewall breakage acceptable? Is the soil loose over the seed? (You should be able to brush away the fill material over the seed easily with your finger.) Is the top 2/3 or 3/4 of the sidewall broken apart? If seeds are truly embedded in the bottom of the furrow (Step #9), it is rather difficult for spoked closing wheels to pull them out. However, depending on spoke design and pressure applied, spoked closing wheels can be quite aggressive in pulling up soil and chunks of sidewall with seeds attached. In many conditions it is difficult to completely close the furrow without either A) risking disruption of seed placement, or B) doing too much packing over the seed. And yet it's quite important to break up the sidewall as much as possible for good lateral root development.

In addition to reducing spring pressure on the closing arm, the closing wheels can be spaced further from the row to *reduce* the aggressiveness. And note that the closing arms on all these drills can get bent, including the cast arms on the 60 & 90-series. At their lowermost tip, the inner edge of the Thompson wheels should track about 1 – 1.25" away from centerline of the furrow. Spoked closing wheels of a thicker design may need to be closer to the furrow in general.