

INSTALLATION & ADJUSTMENT
of
Exapta[®]s UniForce[™]
hydraulic downforce system
for **50-ft JD 1890** air drills, including Pro-series openers
(See different instructions for 60-ft and 30 – 43' drills.)

****With drill folded up, take photos of pinch points, and use chalk to mark them.**

Installing the cylinders:

1) Remove the big coil spring on each opener: Lower the openers until they're touching the ground or shop floor, then put circuit in float. Note: Only remove the first nut from OEM spring's rod (the second nut pre-loads the spring; no need to mess with it). Knock out roll-pin (roll-pin punch provided). Coil spring & rod/clevis apparatus lift out.

2) Install fittings into each cylinder's port (use 90-degree fittings where noted on the schematic). Tighten all fittings (90s should be pointed primarily forward/up).

3) Set cylinder + bushing into large flat washer, then into hole in cast opener (see Photo A).

4) On 90-series openers: From the bottom side of opener casting, the notched plate slides over the cylinder rod and its ears go forward over the opener arm (see Photo A). *Position the angled ear of the plate behind/below the nut on the boot attachment bolt.* On Pro-series: see Photo B for orientation of notched plate.

Secure notched plate with a 3/4" flange locknut, *being sure the prongs on the end of bushing mate into the notches of the plate as you tighten.* Tighten nut sufficiently that the notched plate sucks up tight against the lower end of bushing (Note: the bushing is longer than the hole in the shank).

6) Insert pin into top clevis of cylinder, and secure with roll-pin.

U.S. Patent 9,930,822 & other patents pending.



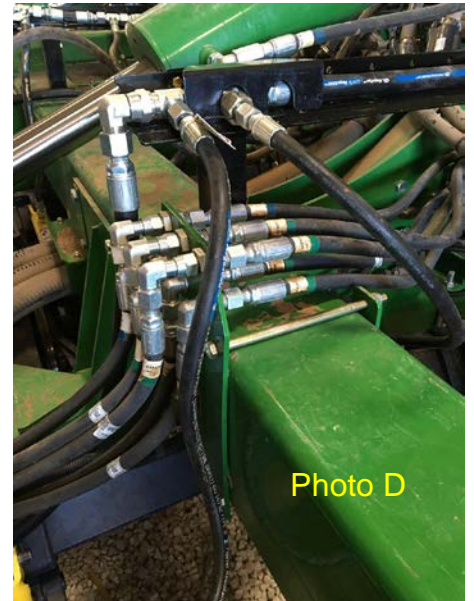
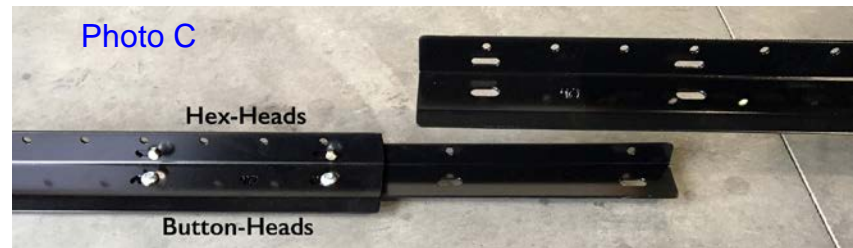
Installing support brackets for header hoses:

1) The center section trays are spliced. Locate them, and prepare* to fasten them together with the $\frac{1}{2} \times \frac{1}{2}$ " button-head bolts and flange locknuts on the bottom (button-heads on the inside, where the hose will lie), and with $\frac{5}{16} \times \frac{3}{4}$ " hex-head bolts & locknuts on the side (upright portion of tray). **Be sure to fasten the tray ends together that have only 4 holes (see photo C), not the series of holes which belong on the outer ends of the tray.**

Next, locate the pedestal brackets #0017 and mount them on the center section's fore/aft frame tubes using bar & threaded rods to secure them (see Photo D); **pedestals for the rear rank should be mounted immediately ahead of the OEM hydraulic lines and touching them (farther forward creates clearance issues when folding)** (again, see Photo D).

Fasten trays to pedestals with $\frac{1}{2} \times \frac{1}{2}$ " button-head bolts **using blue Loctite (provided)**. (Loctite isn't needed on anything secured with a flange locknut.)

2) Header hoses (see next section) for wings' front rank are held with pillow blocks attached to small brackets #0027 & 0028 (see Photos E & F). **The brackets are reversible (can go either on L or R side of tube) to help find a spot that the pillow blocks avoid the fittings**, but make sure there's clearance at the hinge between inner and outer wings if you mount the bracket so it protrudes towards the hinge.



Installing the header hoses:

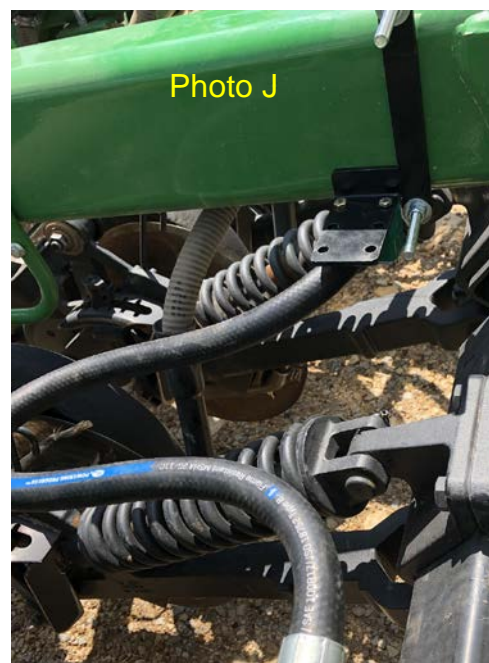
1) For each rank of each drill section, organize the header hoses & fittings per the schematics provided. These are $\frac{3}{4}$ " hoses. Put all the pieces together, but don't tighten them yet (these are all **flared [JIC] fittings that don't need Teflon tape**; also note that flared fittings should thread on easily for a good long way before you need a wrench—if not, you are cross-threaded).

2) Tighten all fittings on header hoses such that *all fittings for drop hoses (to cylinders) are aimed generally rearward, except far end of front outer wing should be pointed forward (fittings for feeder hoses from the manifold should be pointed straight up; fittings for cross-flow hoses should also be straight up)*. **Ends of header hoses on center section must not extend past OEM hydraulic fittings for clearance when folding (see Photo D), and preferably are closer to the frame than OEM fittings.**

4) Install the drop hoses (the $\frac{1}{2}$ " hoses from the header to each cylinder). *The length needed for each cylinder is on the schematic: S = 21", M = 31", L = 38", XL = 44", XL+ = 50"; XXL = 60"*. Tighten all fittings. **Route hoses for clearance when folded; zip-tie where needed (see Photo G & consult your chalk marks for pinch points).**



End of header for front rank's outer wing may be tethered to OEM cylinder fitting (red oval) to prevent hoses from rubbing on UniForce cylinder, etc. Note: drop hose for end cylinder goes forward & around arbor casting.



5) Install the 'bridge' hoses at the hinge points for the wings—these are $\frac{3}{4}$ " hoses (of lengths indicated in schematic) that join the header hoses. Bridge hoses go *below* the frame when joining the *rear* inner & outer wings. Tighten all fittings. Tether the hoses so they stay away from pinch points at the hinges (see Photos H, J—in Photo J, the bridge hose makes a big loop: no tethering is shown in the photo but do what you need to prevent rubbing—use hose protector if need be).

6) Install the 56" cross-flow hose between the front & back ranks in the center section, and the 46" cross-flow hoses on the outer wings. These are $\frac{3}{4}$ " hoses with large elbows built-in. Tighten all fittings.

7) Route the 222" feeder hoses from ~2 ft behind where the manifold will set to where they go into the header hoses at the middle of each inner wing (see schematics). Keep the feeder hoses towards the middle of the drill's frame to avoid pinch points (see photos below of a 60-ft drill).

8) Zip-tie drop hoses and feeder hoses away from pinch points. See previous photos).

9) Zip-tie the header hose for the wings' rear rank to the OEM hydraulic hoses. For the 3 – 4 ft closest to the center section, the header hose must be *below* the OEM hoses (for clearance when folded). See photos below.



Installing the manifold (valve block), etc:

1) Locate bracket to hold UniForce manifold onto the frame, and attach it to the underside of the valve block with 4 screws with countersink heads (use blue Loctite, provided). Set the bracket's legs (threaded rods) over the frame at the front-center of the drill. Locate the bars that clamp the bracket into position, slide them over the bracket's stud bolts, and then flange locknuts—do not tighten yet.

2) For drills with 53 – 76 openers, 3 cartridges & 3 rear ports are used on the manifold. For drills with 77 or more openers, all four of the $\frac{3}{4}$ " ports are used (all four should have cartridges inserted in the front). Connect the short (17") feeder hoses to the rear ports that correspond to where the cartridges are located. The feeder hoses will have additional equalizer fittings that connect the 3 feeder hoses just rearward of the manifold. The long feeder hoses join these equalizer fittings and go out to the appropriate fitting in each header hose for the inner wings. See Photo M.

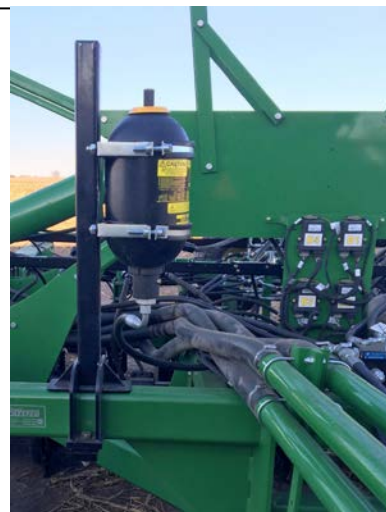
3) Using the UniForce manifold's 1" ports on RH side (RH when facing the direction of travel) (these are engraved 'P1' & 'T1') screw in the 90° elbows, and then to the 165" x $\frac{3}{4}$ " hoses that go to the tractor, then into the high-flow (5/8" body) male quick-coupler tips (provided) + adaptors (provided). Tighten all fittings. Zip-tie the long hoses as they run along drill's tongue (large zip-ties provided).

4A) If the tractor has a spare remote, the preferred setup is to run UniForce separately on that remote. The LH ports (3/4") ('P2' & 'T2') of the UniForce manifold should have plugs in them.

4B) If no extra remote is available, UniForce can run on the same circuit as the OEM rockshaft *unless the drill has been updated to a Power-Beyond valve block*. (There are some minor complications when running both systems on the same circuit, such as the pressure going to maximum [whatever the tractor's output, usually 2700 – 3000 psi] when rockshaft is raised, which isn't a concern except for creating more leaks and additional safety hazard; also our in-cab adjustment option cannot be used.) Remove the OEM rockshaft hoses from the OEM valve block, leaving behind all reducers and fittings in that valve block. Using the LH ports (3/4") ('P2' & 'T2') of the UniForce manifold, install the reducer fittings, and then connect to the OEM valve block using a pair of 5/8" x 40" hoses (one end female JIC, the other end female face o-ring). *The upper port of the UniForce manifold ('P2') goes to the port of the OEM valve block*



Photo M. Manifold installed on a 60-ft drill with TBT cart. 3 cartridges used, so 3 short feeder hoses going into 4 long 222" feeders, with places for 2 accumulators to plumb into the ends of equalizer fittings.



Accumulator on 60-ft w/ TBT cart. On 50-ft drills, accumulator must be far enough away from midline to avoid being struck by dolly wheels of wings when folded.

marked 'V2'; lower port ('T2') of the UniForce manifold goes to the port of the OEM block marked 'V1'. Tighten all fittings.



5) If an accumulator is being used: assemble it, mount it on the frame (see photos), and connect it to the fittings that equalize the feeder hoses just behind the valve block (*don't use the port on the valve block*). The accumulator should arrive pre-charged, unless the system was shipped by air. Pre-charge on accumulator should be 400 psi. Tighten all fittings.

6) Tighten the flange locknuts that hold the UniForce manifold bracket onto the frame.

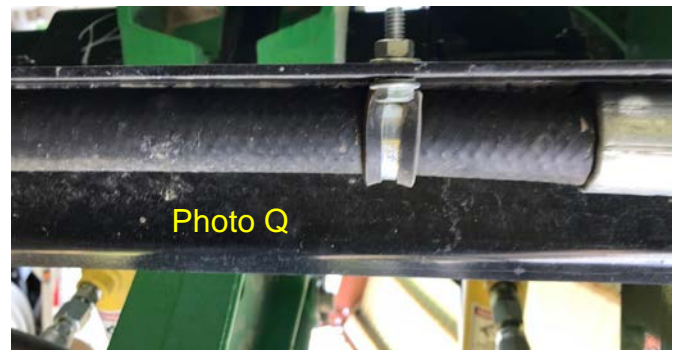
7) if the in-cab pressure adjustment option is used, install it—see separate instructions.

Securing header hoses on center sections:

1) Slide the header hoses from side to side until the drop hoses and various fittings are in their best location. Using the hose clamps (see photo), secure the header hose for the center section to the trays. Tighten locknuts.

2) Fold up the wings carefully, making sure none of the bridge or drop hoses get caught or pinched. Adjust if necessary, or tether them away from the pinch points.

3) Use zip-ties to further secure the header hoses so they don't slide around on the trays.



Prepare the system

Get all the air out of the lines! The easiest way is to set the tractor's flow for the UniForce circuit to 5% (aka "0.5") so it's just a trickle. Put blocks under all the openers, so that when you rotate the rockshaft into the 'down' position, the UniForce cylinders are completely collapsed. Remove the plug (or hose) from the upper LH port ('P2') on the manifold—remove it completely. Note: the pressurized hose should be the one going into the top port ('P1') on RH side of UniForce manifold; if not, reverse the hoses at the tractor remote. After activating the circuit for 45 seconds or so, oil should start coming out this port (it won't geyser out, due to the low flow). Shut off the circuit, reinstall the plug & tighten it.

Next, loosen some fittings (several turns) on the ends of each header hose. Activate the circuit again, and let it go until the oil is no longer foamy, and a steady stream (not sputtering). Shut off the circuit, and tighten all fittings. You will need to add hydraulic oil to the tractor during or after this process.

Remove the blocks, and cycle the rockshaft up and down a couple times with the UniForce circuit activated. The openers should all rest at the end of their stroke, whether or not the opener (UF) circuit has pressure on it. If openers are suspended in the air, this weird occurrence is due to air remaining (try to purge it). Keep working at getting the air out until all this ceases.

If you followed this procedure, most of the air should be out of the system, but some always remains trapped, especially when the oil is warm. Run the drill over a sharp change in elevation with all the openers powered up—good examples would be the lip of a waterway, or the edge of a crowned dirt or gravel road (terraces aren't sufficient), or a modest gully. The more times you go over that jump in terrain with the system powered up, the sooner you'll get the last bit of air out of the system for top performance. Also, letting the oil cool down completely (overnight) allows the remaining air bubbles to migrate upward where they can be more easily purged when oil resumes flowing.

It's probably a good idea to change hydraulic filters on your tractor after running UniForce for an hour or so—there's always some bits of Teflon tape, hose shavings, etc., and the number of fittings and hoses is large.

Operation & adjustment

1) Adjust the knob for *the rockshaft pressure to 2200+*: it cannot lift the drill frame by itself anymore. You want the rockshaft rolled over completely so that it's sloped downward at the rear by 15 – 20 degrees – it should remain in this position at all times during operation. Running the rockshaft at 2200 – 3000 helps it to quickly overcome the resistance from the opener circuit (which remains pressurized when rockshaft raises) when lowering the openers to begin the pass.

2) Adjust the knob for the opener pressure (the UniForce system) until you are maintaining a reasonably uniform depth of cut. Running more than necessary, however, will cause sidewall compaction. Common range is 800 – 1600.

3) If you're drilling in steep terraces and the pressure on the opener circuit drops unacceptably after the opener rank has passed over the terrace peak, this means that hydraulic flow is too low which can be remedied by: 1) *increasing the flow setting for that remote on the tractor (we prefer setting it at max flow)*; 2) using a tractor with greater hydraulic capacity, 3) installing Exapta's accumulator for the UniForce system, 4) teeing two remotes together (especially useful on older tractors).

4) Keep pressure on the cylinder circuit during transport, to prevent openers from flopping around and causing damage to themselves or other structures.