

Exapta's UniForce™

hydraulic downforce system

for JD 1690/1890/1990 CCS dual-rank air drills including Pro-series openers

Installing the cylinders:

Step 1: Remove coil spring & rod on each opener.

- Lower the openers until they're touching the ground, then put circuit in Float.
- Remove nut and knock out roll-pin (keep pin & roll-pin). Remove coil spring & rod

Step 2: Install fittings into each cylinder's port

- Tighten all fittings (90/45 degree fittings should point primarily up)
- Use schematics as a reference when to use 90/45 degree fittings. (Hint: if cylinder is directly/slightly under the frame, use a 90 or 45)

Step 3: Slide cylinder into cast opener hole. (See photo A & AA)

- Slide large flat washer onto cast bushing
- Set cylinder + bushing + large flat washer into hole in cast opener.
- Slide notched plate over the cylinder rod (ears pointed forward/down). *Position the ear of plate behind nut on boot attachment bolt.*

Note: For 90-series openers: (see photo A). On Pro-series openers: (see Photo B) for orientation of notched plate.

Step 4: Secure notched plate with 3/4" flange locknut.

IMPORTANT: prongs on the end of bushing must mate into notches of plate as you tighten. Tighten nut sufficiently.

Step 5: Insert pin into top clevis of cylinder. Secure with roll-pin.

U.S. Patent 9,930,822; other Patents Pending.
Instr. revised 20 December 2019.



Photo A

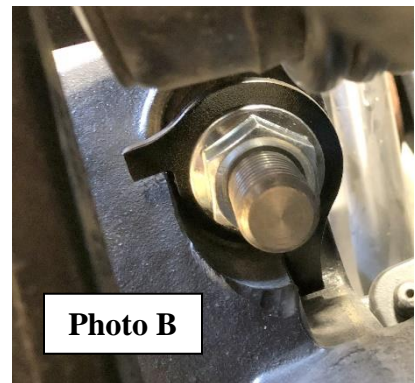


Photo B

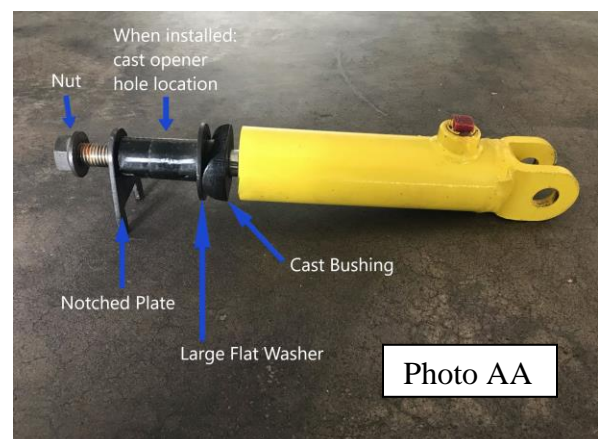


Photo AA

Installing Brackets & Trays:

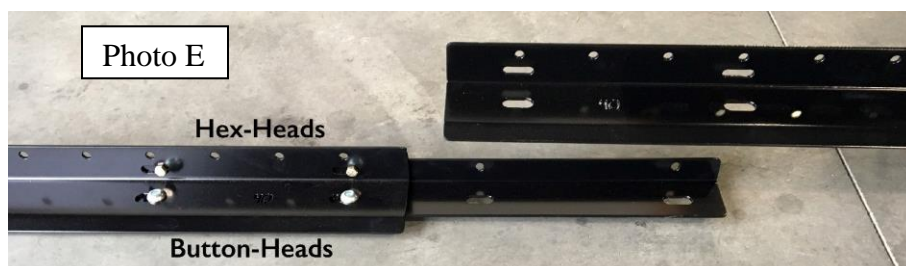
IMPOTANT: Reference the “TRAY OVERVIEW” document for tray positions. Trays must clear when folded, or damage will be caused! Position the FRONT center-section tray farther forward than the wing trays (see photo C). The BACK rank trays are “underhung”. See Tray Overview.

Install Center Brackets/Trays (FRONT RANK)

Step 1: Locate brackets #0002. Mount on the center-section frames (see Photo D and reference schematics), **but don't tighten yet.**

Step 2: Fasten the center tray to brackets with $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts using blue Loctite (provided).

For 40 & 42/43-ft models, the trays are spliced (See Photo E). Connect left & right trays (marked 70" and 78") with splicer using the $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts and flange locknuts (button-heads on the inside, where the hose will lie), and with $\frac{5}{16}$ x $\frac{3}{4}$ " 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 E), not the series of holes which belong on the outer ends of the tray.** For 30-36ft models, use the 119" tray (no splicer needed).



Install Wing Brackets/Trays (FRONT RANK)

Step 1: Attach bracket #0005 at the *inner* end of each wing (See Photo F).

Step 2: For *outer-end*, use bracket #0004 for each wing (See Photo G).

Install all wing trays as far to the outer-end as possible.

Step 3: Fasten 119" trays (L & R) to brackets with $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts using blue Loctite (provided). Tighten all bolts & locknuts. Trays for wings are single-piece.



Installing Brackets and Trays (continued):

Install Center Brackets/Trays (BACK RANK)

Step 1: Install brackets #0007. Mount on the center-section frames (see Photo H and reference schematics).

Step 2: Fasten the center tray to brackets with $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts using blue Loctite (provided).

Connect left & right trays (marked L and R, and low-profiled) with splicer using the $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts and flange locknuts (button-heads on the inside, where the hose will lie), and with $\frac{5}{16}$ x $\frac{3}{4}$ " 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 E, on Page 2), not the series of holes which belong on the outer ends of the tray.**



Photo H

Install Wing Brackets/Trays (BACK RANK)

Step 1: Attach bracket #0006 (slotted) at the *inner* end of wing See Photo J. Using $\frac{1}{2}$ " x 5.5" thru-bolt holding it.

Step 2: For *Outer* end, use bracket #0003. See Photo JJ.

Step 3: Fasten 119" trays (L & R) to brackets with $\frac{1}{2}$ " x $\frac{3}{4}$ " button-head bolts using blue Loctite (provided). Tighten all bolts & locknuts. Trays for wings are single-piece.

FINAL STEP: Carefully fold drill's wings, making sure trays don't hit each other. Now, tighten flange locknuts holding center tray brackets in place.

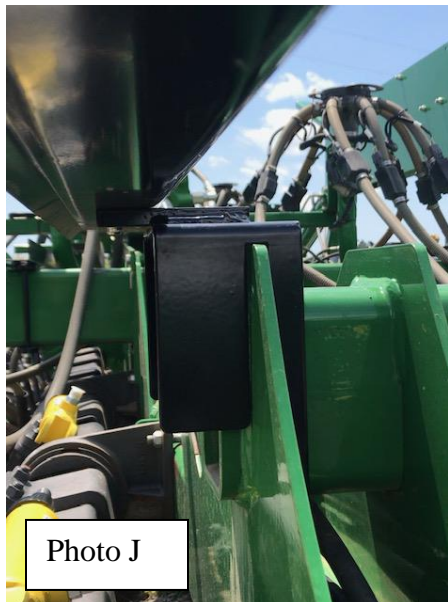


Photo J

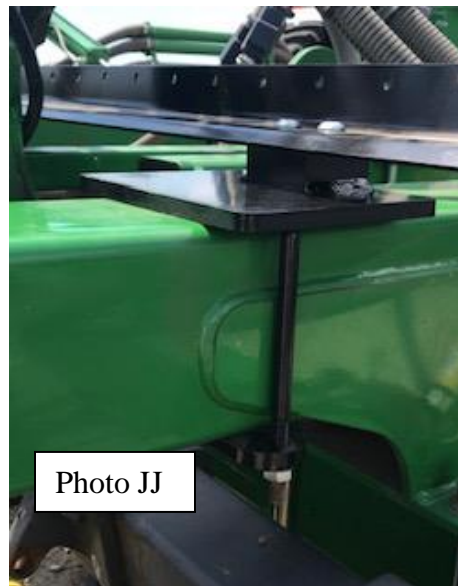


Photo JJ

Installing header hoses: *use schematics*

Step 1: Assemble header hoses & fittings per schematics provided for each drill section. *These are $\frac{3}{4}$ " hoses of different lengths (which are the numbers—in inches—on the hose in schematic). Put all pieces together, finger tight. On T-fittings for drop hoses that are $\frac{3}{4}$ ", install the reducer fitting to $\frac{1}{2}$ " JIC. (Note that flared fittings should thread on easily for a long way before you need a wrench—if not, you are cross-threaded). On T-fittings for drop hoses that are $\frac{3}{4}$ ", install the reducer fitting to $\frac{1}{2}$ " JIC.*

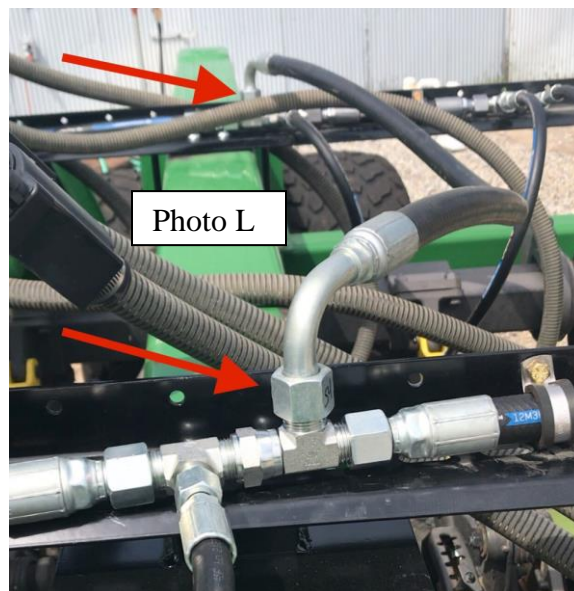
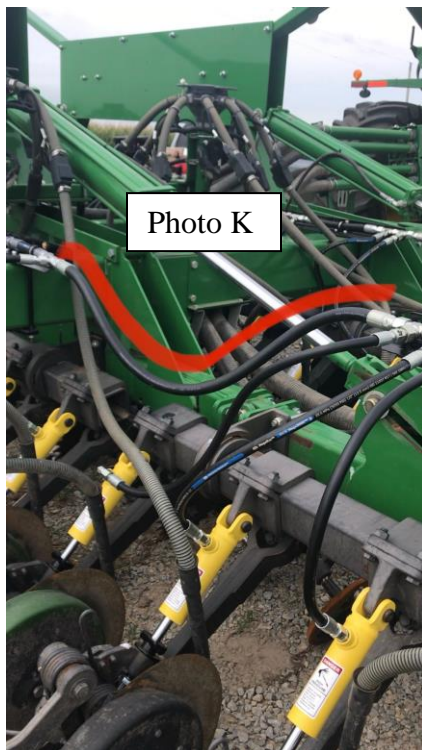
Step 2: Tighten all fittings on header hose such that *all T-fittings for drop hoses are aimed horizontal & rearward (fittings for feeder hoses from the manifold should be pointed straight up; and fittings for cross-flow hoses on each wing should be pointed straight up).*

Step 3: Lay the assembled header hoses on the designated location on each drill section.

Step 4: Install drop hoses (the $\frac{1}{2}$ " hoses from header hose to cylinder), *using specific lengths as noted in the schematic: S = 21", M = 31", L = 38", XL = 44"*. Tighten all fittings.

Step 5: Install ‘bridge’ hoses. Using $\frac{3}{4}$ " x 46" ‘bridge’ hoses to connect the header hoses from section to section at the hinge points (see Photo K). Tighten all fittings. Tether hoses so they stay away from pinch points.

Step 6: Install ‘cross flow’ hoses. These are $\frac{3}{4}$ x 56" cross-flow hoses between front & rear ranks on each wing section (see Photo L). These have large elbows built-in on both ends. Tighten all fittings.



Installing the Manifold (Valve Block), etc:

Step 1: Attach the Manifold to the Bracket using (4) screws with countersink heads (use blue Loctite, provided). Attach Bracket to the frame —do not tighten yet.

Step 2: Connect Feeder Hoses and Equalizer Fittings.

(Note: hoses & equalizer fitting assembly may vary for your drill) See Photo M.

There will be either 2 or 3 cartridges installed in the front ports below gauge, and 2 – 3 corresponding rear ports used for short feeder hoses.

Equalizer fittings are used to connect the 2 – 3 short feeder hoses (3/4"x 17.5" from the valve block) to the longer feeder hoses connecting to the front and back rank header hoses (30" [front rank] and 85" [back rank].

Note: If an accumulator is used, it plumbs into this location as well.

Step 3: Connect hoses from Manifold to Tractor

Using port #1 on the manifold's RH side (RH when facing the tractor)(these are engraved 'P1' & 'T1') screw in the 90° elbows, and connect 165" x 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).

Step 4: 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 will have plugs.

Step 5: Tighten the flange locknuts that hold the UniForce manifold bracket onto the frame.

Step 6: If an accumulator is used, install it – *see separate instructions*.

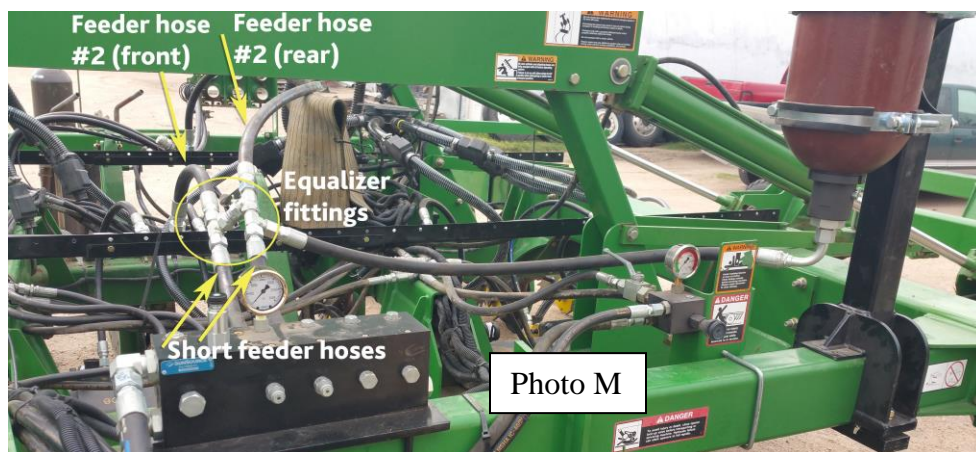


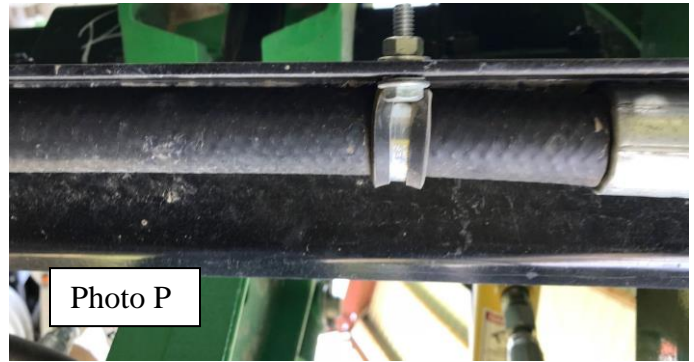
Photo M - Using 2 cartridges and accumulator. 'Equalizer' fittings joining the feeder hoses.
Photo N - Using 3 cartridges (to supply higher numbers of openers) and accumulator. 3 short feeder hoses merge into the 2 long feeder hoses (one for each rank).



Securing the header hoses:

Step 1: Slide the header hoses from side to side until the drop hoses and various fittings are in their best location. Using the rubber-lined hose clamps (see Photo P), secure the header hose to the trays. Tighten locknuts.

Step 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.

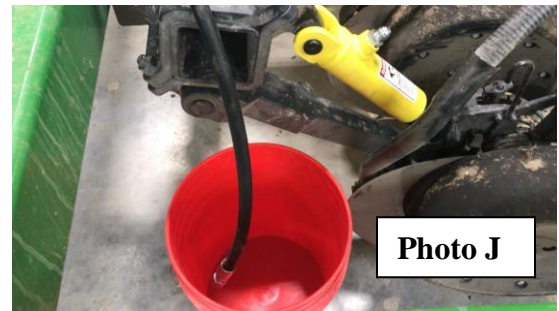


Step 3: Use zip-ties to further secure the header hoses so they don't slide around on the trays.

Prepare the system: Purge all air out of the system

Step 1: Set tractor's flow for UniForce circuit to 5%. Rotate rockshaft into 'down' position, the UniForce cylinders must be collapsed as far as possible.

Step 2: Place a 5-gallon bucket at each outside end of wings on front and back ranks (4 total buckets). Undo the drop hose from the cylinder and let it drop into the bucket. (See Photo J)



Step 3: Activate circuit. *Note: the pressurized hose should be the one going into the top port ('P1') on RH side of UniForce manifold; if not, reverse hoses at tractor remote. After several minutes, oil will start pouring into the buckets (it won't geyser out, due to the low flow). It will be foamy/bubbly. You will need to add hydraulic oil to the tractor during or after this process.*

Step 4: When the oil on one end is no longer foamy, and is a steady stream (not sputtering), shut off circuit. Re-secure drop hose onto cylinder.

Repeat Step 3 and 4 for the all ends.

Once air is purged and all four drop hoses reinstalled, pressure will now be building in the system.

For Step 5 and 6: Use caution when tightening leaky fittings. If you need to change a fitting, or undo to reroute a hose after the system is charged with oil and pressurized, use extreme caution! All hydraulic pressure must be released first! This can be dangerous, even deadly, if not done correctly.

Step 5: Activate circuit. Turn knob on the Valve Block clockwise to build pressure up-to 800 psi – check for leaks. Increase to 1200 psi – check for leaks. By now the openers should be trying to raise the frame. Increase to 1800 psi – check for leaks. Increase to 2000 psi – check for leaks. The UF cylinders should be extended & transport ties should be off the ground.

Step 6: Cycle rockshaft up and down a couple times with UniForce circuit activated and increase tractor's flow circuit. *This will also expose all fittings that aren't properly tightened.*

The openers should all rest at 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 air out until all this ceases.

Operation & adjustment

Step 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 is raised) when lowering the openers to begin the pass.

Step 2: Adjust knob for 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.

Step 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).

Step 4: Keep UniForce system pressurized at all times – including turnaround passes, transport and folding to prevent openers from bouncing and causing damage to themselves, or other structures.