

INSTALLATION & ADJUSTMENT
of
Exapta[®]s UniForce[™]
hydraulic downforce system
for JD 1850, 1860, 1890 (3-section), 1895, 1990, 1690 air drills
including CCS drills
(See different instructions for box drills, 5-section 1890s.)

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: On 60/90-series, 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) The lower end of cylinder's rod slides into the cast bushing, and **seat it with several whacks with a rubber mallet** on a solid surface (adding a drop of red Loctite may be prudent; provided) (Note: turning the bushing on the rod by hand often allows it to go easily; if the bushing won't go into position, use fine emory cloth to clean any paint that may have gotten into the bushing's hole).

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

4) From the bottom side of opener casting, the notched plate slides over the cylinder rod and its ears go forward over the opener arm on 60/90 openers (see photo A) (50-series: the ears go rearward). *Position the angled ear of the plate behind/below the nut on the boot attachment bolt on 60/90s.* Secure 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).

5) Insert pin into top yoke of cylinder, and secure with roll pin. (50-series: new pin provided)



Installing the support brackets for header hoses:

1) Trays are positioned directly over the rank of openers that they serve. Position the center trays at an offset fore/aft so they aren't directly in line with wing trays (see photo B) (they need



clearance when wings fold). The center section trays are spliced on 40 & 42/43-ft models (also rear center tray on all CCS drills). Locate the halves, and prepare* to fasten them together using the tray splicer (sheet metal piece that fits on *underside* of tray to join the halves) along with the ½" x ½" button-head bolts and flange locknuts on the bottom (button-heads on the inside, where the hose will lie), and with 5/16 x 3/4" hex-head bolts, flat washer & locknuts on the side (upright portion of tray). **Be sure to fasten the tray ends together that have only 4 holes, not the series of holes which belong on the outer ends of the tray (see photo C).** (*Some tray splices are most easily joined after sliding each half



Photo B. Yellow lines show the offset of tray position on center vs wings. This is an 1895, hence the extra towers and extra rank. All trays go on top the framework, except on CCS models where the center-rear is under the frame.

into position, rather than pre-assembling.) Next, locate the 8"-wide U-brackets and place them over the drill frame (see photos D & E). Fasten the tray to the U-bracket with ½" x ½" button-head bolts **using blue Loctite (provided)**. (Loctite isn't needed on anything secured with a flange locknut.) On everything except the rear rank of CCS drills, slide the 8" bar over the U-bracket's bolts from underneath the frame, and then ½" flange nuts—but don't tighten yet. (CCS drills, center, rear rank: the U-brkt goes onto the frame from underneath, and the bar on top.)



Photo D. Rear ctr section of CCS drill

2) The trays for wings are single-piece. The front-rank wing trays attach to the frame using the same method as Step 1, but with the appropriate width of U-bracket. Install the front trays as far forward as possible (but square to the drill frame, not angled). Tighten all bolts & locknuts.

3) The rear wing trays on the inside end use a slotted U-shaped piece (see Photo F) that sets over

the rear edge of a frame tube, with a 1/2 x 5.5" thru-bolt holding it. The outer end of the tray is fastened in the same way that the front tray is, although the U-bracket has a larger, nearly square plate and 1.5" riser (see Photo G) except on 1895s.



Photo E. RH wing, front, outer end (on 40-ft drill). Tray attached via ½ x ½" buttonhead bolts threaded into U-bracket. Assembly pulled up off the frame tube for viewing. The center section's trays attach the same way.

4) On 1890/1990 CCS drills where the rear rank is being equipped with UniForce, swap out the OEM bracket that holds the electrical box for Exapta's (see Photo H). **This must be done for clearance when folding.**

5) Carefully fold the drill's wings, making sure the trays don't hit each other. Now, tighten the flange locknuts holding the trays in place.



Photo F. LH wing, rear tray, inner end on 1890. Thru-bolt not yet installed here.



Photo G. RH wing, rear tray, outer end (40' 1890). Button-head bolts need to be tightened yet. Header hose is already installed & lying across the U-bracket here. 1895 is slightly different at this location.



Photo H. On CCS drill when rear rank gets UniForce.

Installing the header hoses:

1) For each rank of each drill section, organize the header hoses & fittings per the schematics provided. *These are ¾" hoses of different lengths (which are the numbers—in inches—on the hose in the schematic).* 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). On T-outlets for drop hoses that are ¾", install the reducer fitting to ½" JIC.

2) Tighten all the fittings on the header hose such that all of the 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).*

3) Install fittings into each cylinder's port (use 90-degree fittings where noted on the schematic); **this is tapered pipe-thread and must have Teflon tape (provided). Use 2 full wraps of tape.** Tighten all fittings (90s should be pointed forward/up). These fittings need to be quite tight to avoid leaks.

4) Install the drop hoses (the ½" hoses from the header to each cylinder), *using the specific lengths as noted in the schematic: S = 21", M = 31", L = 38", XL = 44".* Tighten all fittings.

5) Install the ~46" 'bridge' hoses at the hinge points for the wings—these are ¾" hoses that span the gap between the header hoses (see Photo M). Tighten all fittings. Tether the hoses so they stay away from pinch points.

6) For drills with 2 ranks, install the 56" cross-flow hoses between the front & back ranks on each wing section. These are ¾" hoses with large elbows built-in. Tighten all fittings.



Photo M. Note the 'bridge' hose between drill sections in upper-left of pic.

Installing the valve block, etc:

For single-rank (15-inch) CCS drills, you'll have a line-body valve block (see Photo K):

1) Attach line-body valve block to its pedestal (with port # engraving up), and secure that to the 4x6 frame tube with the square U-bolt provided. Mount this near the center of the drill or slightly L of centerline.

2) Install gauge behind the port with '1' engraved near it (the gauge's threads need Teflon tape) by using T fitting and reducers.

3) Route the 180" x 1/2" hoses along the tongue, and secure with large zip-ties. On tractor end of hose, install the high-flow (5/8" body) quick-couplers (provided) and adaptors on the tractor end of the hoses. Tighten fittings.

4A) If the tractor has a spare remote, the preferred setup is to run UniForce separately on that remote. The '2' & '3' ports of the UniForce valve block go to tractor (*Port '2' is pressure*). Tighten fittings.

4B) If no extra remote is available, UniForce can run on the same circuit as the OEM rockshaft (there are some minor complications, such as the pressure going to maximum [whatever the tractor's output, usually 2700 – 3000 psi] when the rockshaft is raised, which isn't a concern except for creating more leaks and additional safety hazard, but also that the 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 extra T-fittings and pair of 44" hoses, connect the UniForce valve block to the OEM valve block: *Port '2' of the UniForce valve block goes to the port of the OEM valve block marked 'V2'; Port '3' of the UniForce valve block goes to the port of the OEM block marked 'VI'* Tighten fittings.

For all other air drills (drills that have 2+ ranks), you should have a large manifold (see Photo N):

1) Locate bracket to secure UniForce manifold (valve block) onto frame, and attach it to the underside of valve block with 4 screws w/ countersunk heads (use blue Loctite, provided). Set the bracket's legs (bolts) 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.



Photo K. Line-body valve block installed on box drill. Yours should have a 90-degree fitting on the outboard side to reduce the loop of hose needed.



Photo N. 'Equalizer' fittings joining the feeder hoses. Photo shows a 60-ft with 72 openers, so 3 cartridges go into 4 feeder hoses that go out to the headers, whereas on 3-section drills, only 2 feeders go to the headers.

2) There will be at least 2 cartridges installed (the 2 rear ports closest to the gauge), and 2 rear ports used for the short feeder hoses. There will be fittings to connect the 2 short feeder hoses (3/4") to each other approx 20" downstream (rearward) of the UniForce valve block (if an accumulator is used, it plumbs into this location as well). See Photo N.

Using the UniForce manifold's 1" ports on RH side ('RH' when facing direction of travel), install the 90° reducers aimed forward, then attach the 165" x 3/4" hoses, then into the high-flow (5/8" body) male quick-coupler tips (provided) + adaptors (provided). Tighten fittings. Zip-tie the long hoses as they run along the drill's tongue (large zip-ties provided).

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

3B) **If no extra remote is available**, UniForce can run on the same circuit as the OEM rockshaft (there are some minor complications, such as the pressure going to maximum [whatever the tractor's output, usually 2700 – 3000 psi] when the rockshaft is raised, which isn't a concern except for creating more leaks and additional safety hazard, but also that the 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") of the UniForce manifold, install the reducer fittings, and then connect to the OEM valve block using a pair of 1/2" x 21" hoses. *The upper port of the UniForce manifold goes to the port of the OEM valve block marked 'V2'; lower port of the UniForce manifold goes to the port of the OEM block marked 'VI' (usually this results in the hoses crossing each other to make an 'x').* Tighten fittings.

4) If an accumulator is being used: assemble it, mount it on the frame (see photo), 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.



5) Tighten the flange locknuts that hold the UniForce valve block's bracket onto the frame.

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

7) if a tow-between cart is used, route the extra hoses thru it.

Securing the header hoses:

1) Slide the header hoses from side to side until the drop hoses and various fittings are in their best location. Using the 'clamping brackets' (see Photo M), secure the header hose to the tray via the 5/16" hex-head bolts and flange locknuts (bolt head towards inside of tray). Use one clamping brkt on far ends of each tray, and one in the middle of each wing tray (for 36-ft & larger drills), and one in the middle of each center section. Tighten locknuts. **The center-rear rank on CCS drills is tethered entirely by zip ties—no clamping brackets are used.**

- 2) Fold up the wings carefully, making sure none of the bridge 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.
- 4) Attach warning tags to header hose. **These are an important reminder to not crack any fittings open until the pressure gauge reads zero. *The UniForce system remains pressurized when openers are in the 'up' position.* Don't assume you'll always remember this—install the tags.** Also, someone else might be operating the drill, and try to repair something.

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 on the manifold—remove it completely. Note: the pressurized hose should be the one going into the top port 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 uphill end 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. Operating 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 2000+*: 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 2000 – 3000 helps it to quickly overcome the resistance from the opener circuit (which remains pressurized with openers up) 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 – 1400.

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, CCS tanks, or other structures.