

FurrowForce™

FurrowForce Installation Manual



Contents

Shank Interface Bracket Installation	4
John Deere Shank Interface Bracket Installation	4
White 9000/Precision Planting Ready Row Unit Shank Interface Bracket Installation	5
Harvest International Shank Interface Bracket Installation.....	6
Kinze 3000 Shank Interface Bracket Installation.....	7
CASE 2100 Series Shank Interface Bracket Installation	11
CASE 1200 Series Shank Interface Bracket Installation	18
Gaspardo MTR Shank Interface Bracket Installation	24
Horsch Maestro Shank Interface Bracket Installation.....	26
Monosem NG +4 Shank Interface Bracket Installation	30
Vaderstad Tempo Shank Interface Bracket Installation.....	33
Installing FurrowForce Assembly to the Row Unit	37
Rock Guard Installation.....	38
First Stage Closing Wheel Installation	40
Liquid Tube Attachment Installation.....	45
FurrowForce Control Module (FCM) Installation	48
Compressor Installation.....	50
High Capacity Electric CleanSweep Compressor	50
FurrowForce Hydraulic Compressor	50

Pneumatic Installation	55
Automatic Control	55
Manual Control Systems	57
Manual Control with CleanSweep System Installed	58
Manual Control without CleanSweep System Installed.....	61
Harness Installation	63
Setting the First Stage Closing Wheel Depth	64

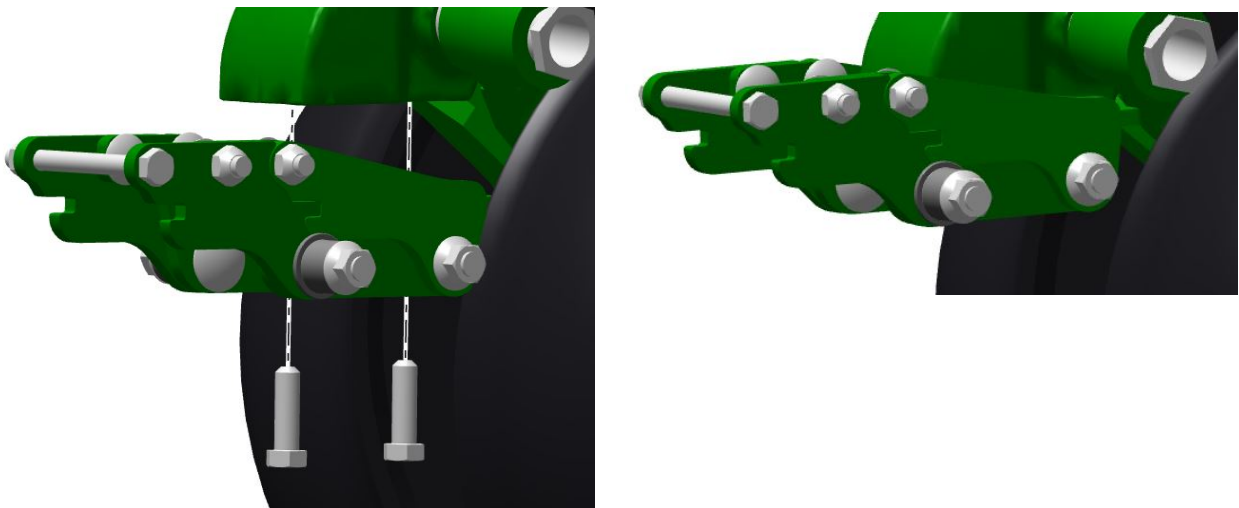
Shank Interface Bracket Installation

The shank interface bracket installation is planter row unit specific. Refer to the appropriate row unit section for which is being installed.

John Deere Shank Interface Bracket Installation

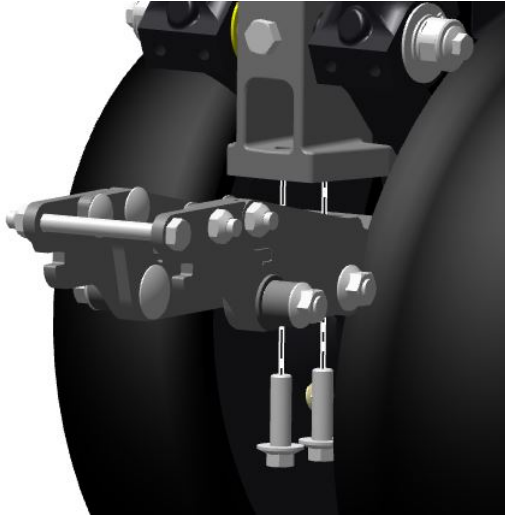
Remove the existing closing system by removing the two bolts that secure it to the shank. Mount the shank interface bracket in the same location using the factory hardware.

Note: If a FurrowJet support bracket is installed, washers will need to be added between the shank interface bracket and the FurrowJet support bracket tab to make up approximately 1/8" of space.



White 9000/Precision Planting Ready Row Unit Shank Interface Bracket Installation

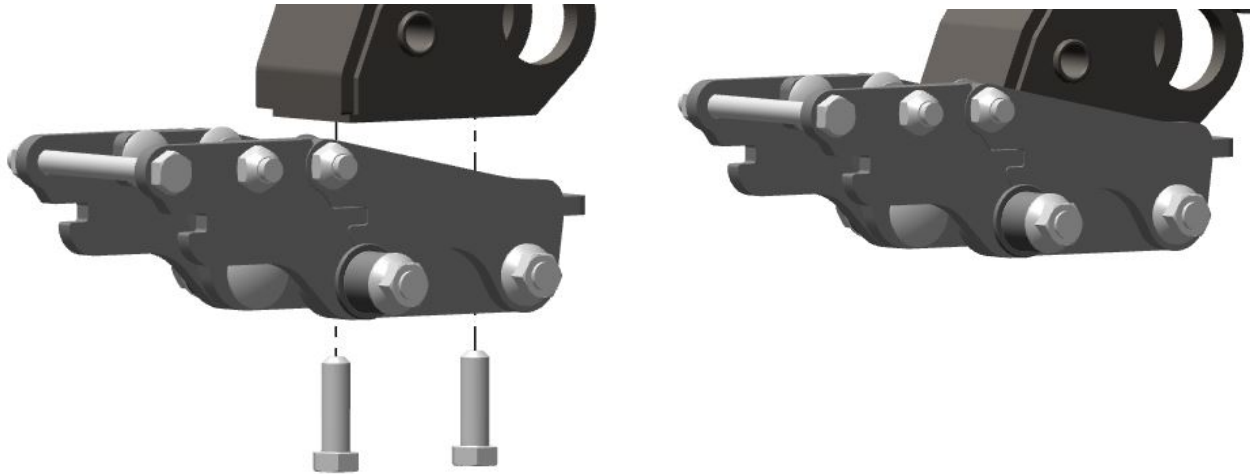
Remove the existing closing system by removing the two bolts that secure it to the shank. Mount the shank interface bracket in the same location using the factory hardware.



Harvest International Shank Interface Bracket Installation

Remove the existing closing system by removing the two bolts that secure it to the shank. Mount the shank interface bracket in the same location using the factory hardware.

Note: If a FurrowJet support bracket is installed, washers will need to be added between the shank interface bracket and the FurrowJet support bracket tab to make up approximately 1/8" of space.



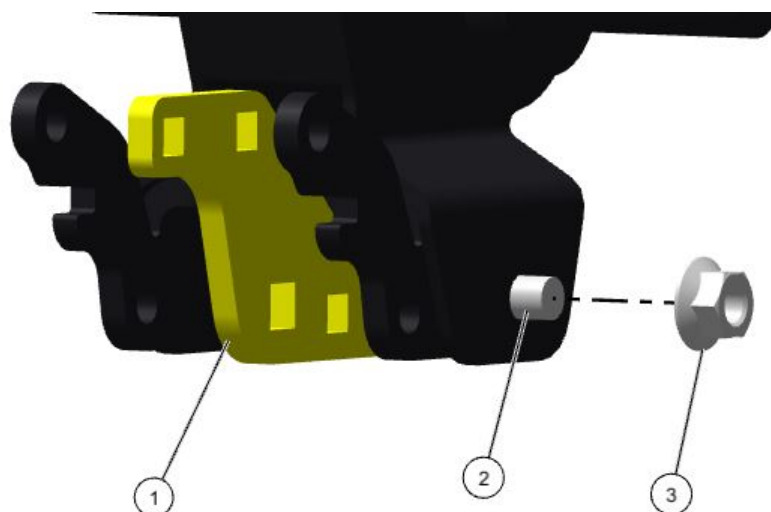
Kinze 3000 Shank Interface Bracket Installation

Remove the existing closing system by removing the hardware that secures it to the shank. Install the shank interface bracket (1) using the supplied 3/8" bolt (2), 3/8" lock washer (3), and four 3/8" flat washers (4) as shown.

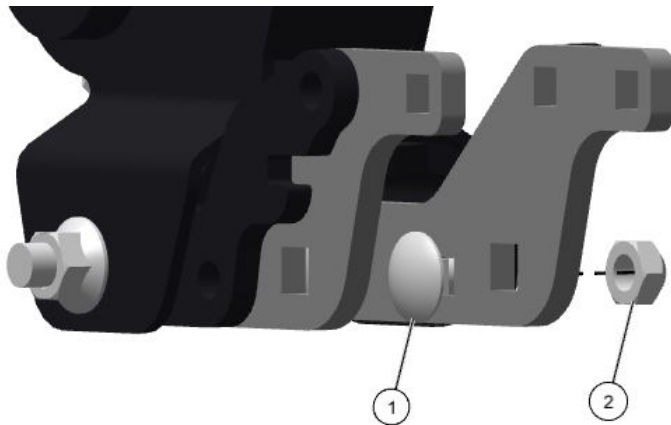
Note: If FurrowJet is installed, place the FurrowJet support bracket tab between the third and fourth washer (5) from the FurrowForce interface bracket.



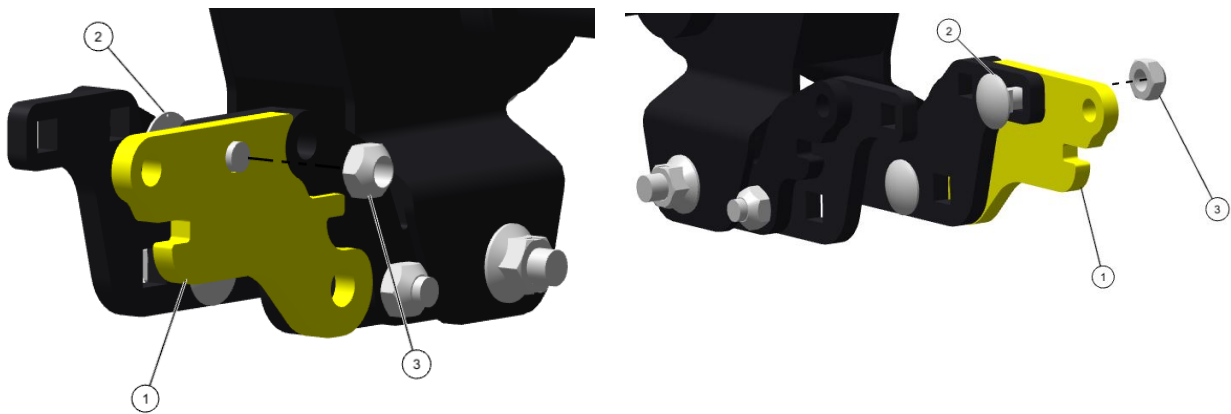
Locate one of the inner setback plates and position it with the interface bracket as shown. Insert a M12x40 carriage bolt (2) through the setback plate, interface bracket, and row unit shank and secure with a M12 flange nut (3). Repeat for the opposite side.



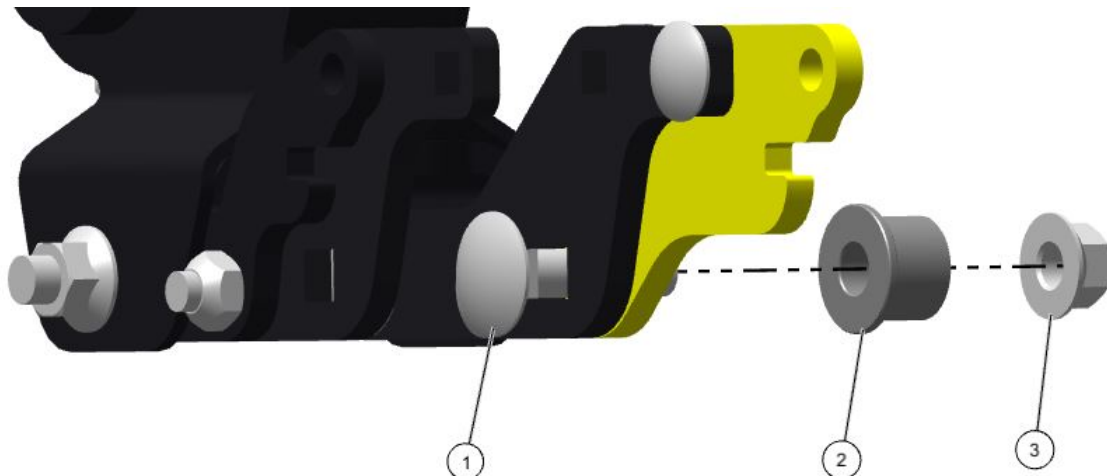
Insert a M10x35 carriage bolt (1) through the inner setback plate and the interface bracket as shown. Secure with a M10 top lock nut (2). Repeat for the opposite side.



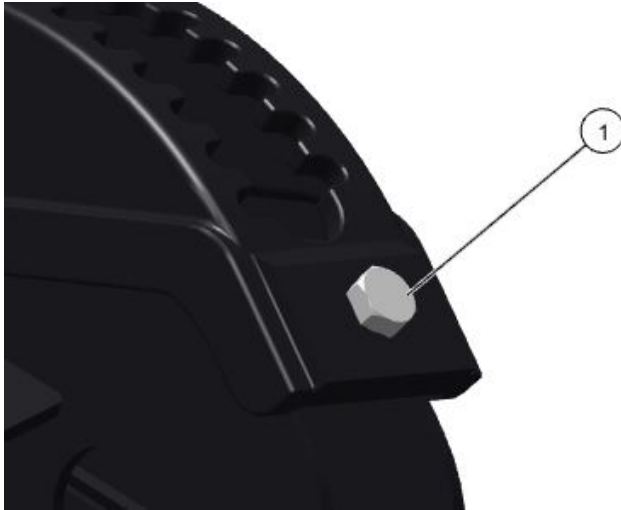
Position an outer setback plate (1) with an inner setback plate as shown and insert a M10x30 carriage bolt (2) through the top hole of the inner and outer setback plates. Secure with a M10 top lock nut (3).



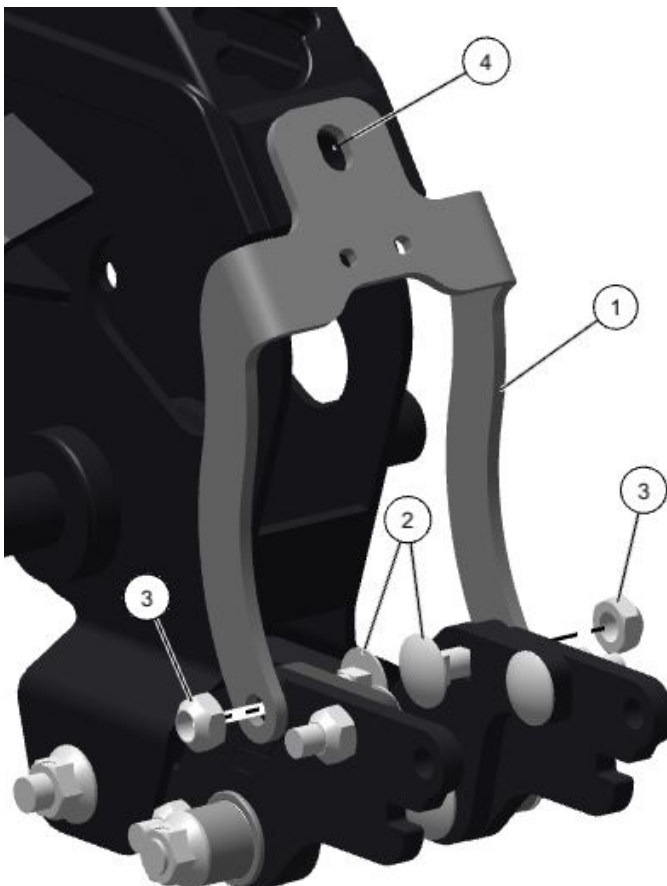
Install a M12x50 carriage bolt (1) through the bottom hole inner and outer setback plates. Place a bushing (2) (flange against the setback plate) on the bolt and secure with a M12 flange nut (3). Repeat for the opposite side.



Remove the bolt (1) at the bottom of the depth adjustment casting.



Position the stiffener bracket (1) with the interface bracket as shown, aligning the holes in the bracket arms with the top holes in the interface bracket. Insert a M10x30 carriage bolt (2) through the interface bracket and stiffener bracket on each side and secure with a M10 top lock nut (3). Rotate the stiffener bracket so the top holes mates up to the hole in the depth adjustment casting (4).



Place a 3/8" lock washer (2) and 3/8" flat washer (3) on the remaining 3/8"-16x1.25 bolt (1). Insert the bolt through the stiffener bracket and thread into the hole in the depth adjustment casting.



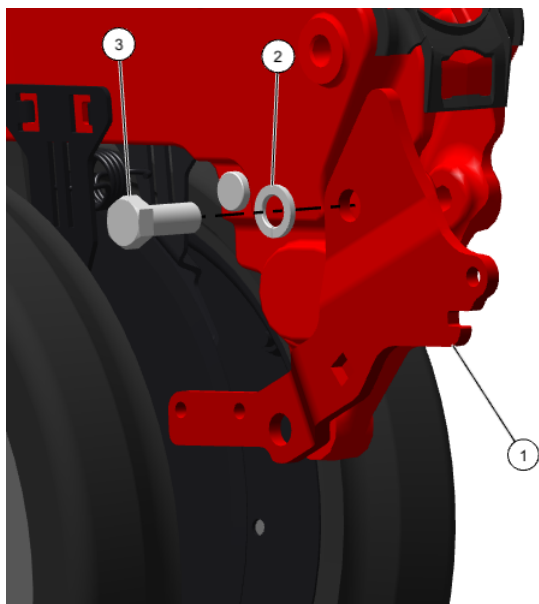
CASE 2100 Series Shank Interface Bracket Installation

Note: If FurrowJet or SmartFirmer are being installed, 756134 kit needs to be installed. Refer to the section below. If FurrowJet or SmartFirmer are being installed AND the FurrowForce first stage wheels need to be installed in the extreme stagger position, extension bracket kit (756193) is required. Proceed to the “756193 Extension Bracket Installation” section.

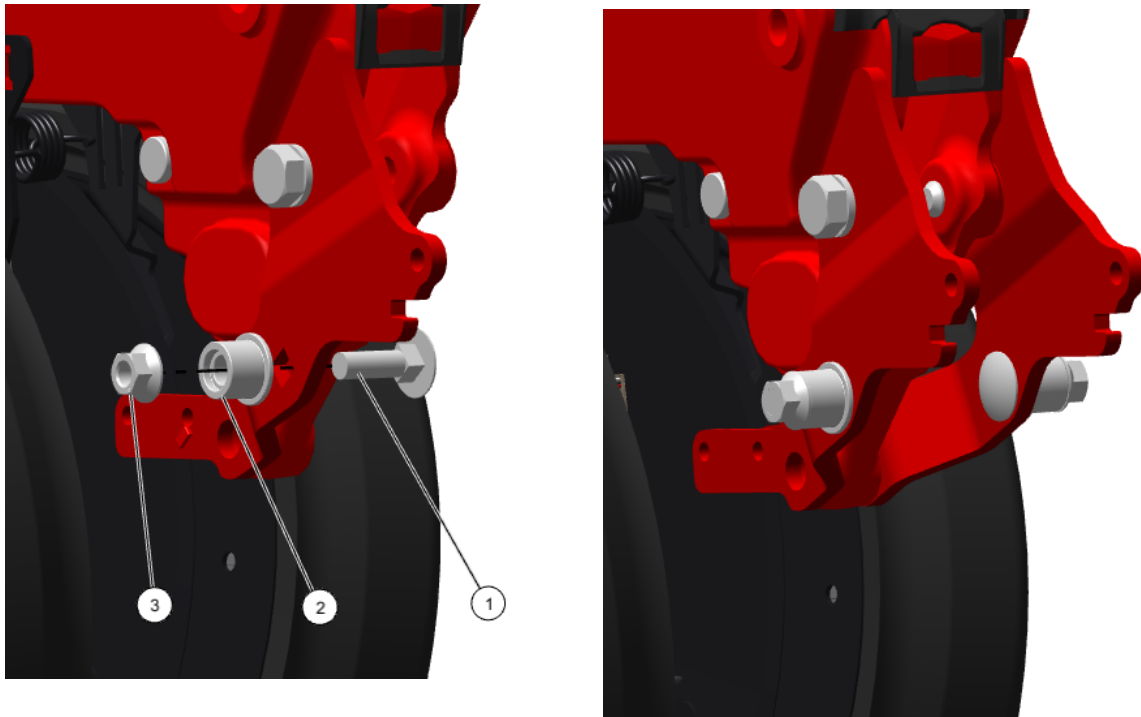
Remove the existing closing system from the row unit. There are two bolts (1) towards the top of the assembly (one on each side) and one through bolt (2) towards the bottom of the assembly. Refer to the image below.



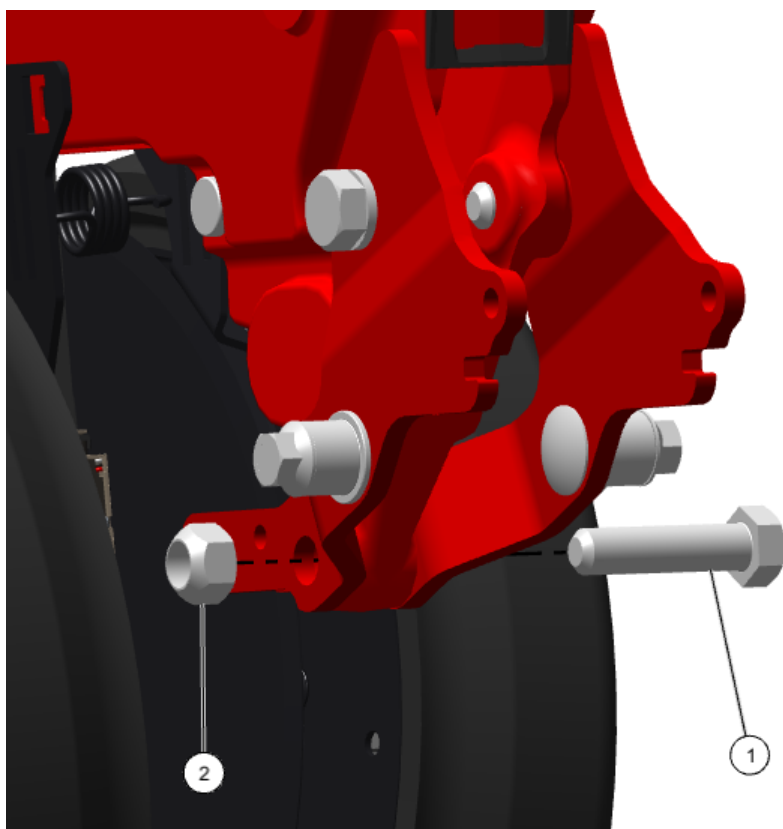
Locate the left shank interface bracket (1) and position to the row unit as shown. The bottom of the bracket should angle in towards the center line of the shank. Place a lock washer (2) on one of the provided M16x2x40 bolts (3) and install through the bracket and into the shank.



Insert one of the provided carriage bolts (1) through the shank and square hole in the interface bracket. Install a bushing (2) with the flange against the bracket and secure with the flange nut (3) as shown. Repeat the previous two steps for the right side interface bracket.

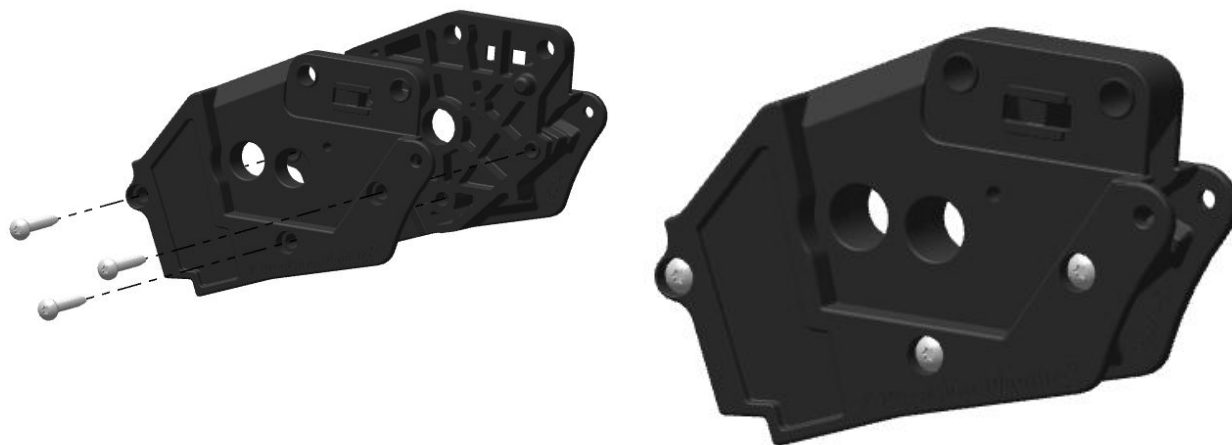


Insert the provided M16x2x65 bolt (1) through the bottom hole in each interface bracket and shank. Secure with a top lock nut (2).

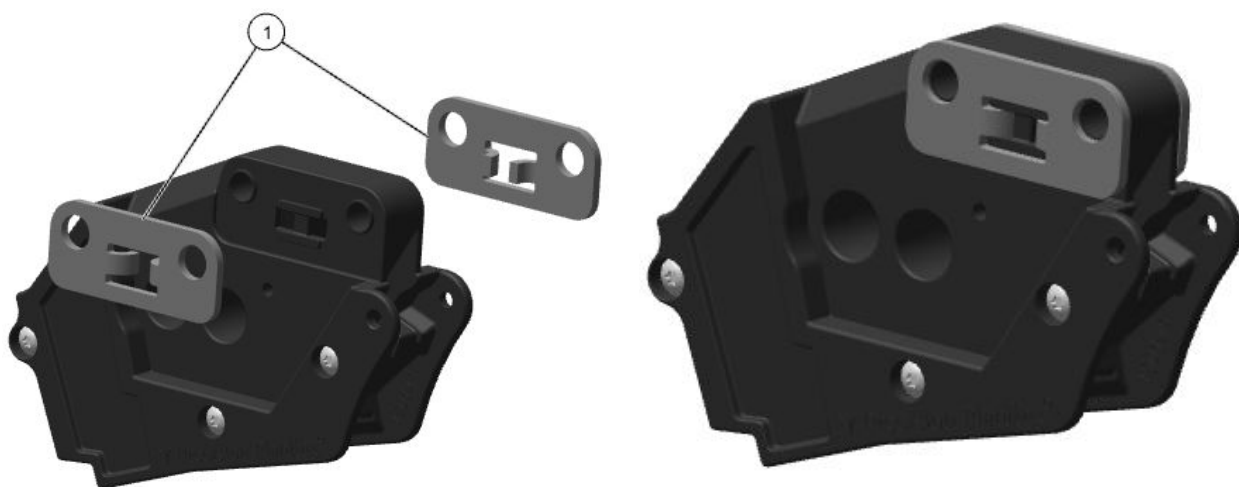


756134 FurrowJet/SmartFirmer Quick Attach Bracket Installation

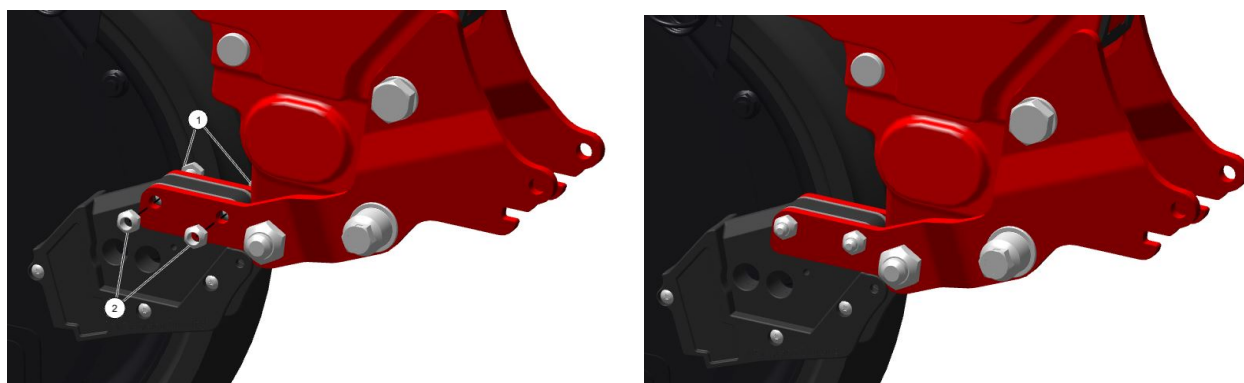
Locate the two bracket sides and assemble as shown using the three provided 1.25" screws.



Attach the metal spacers (1) to each bracket side as shown. The spacers are not side specific.



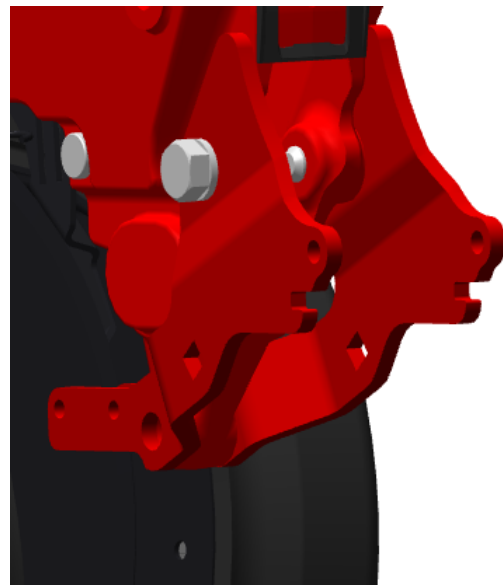
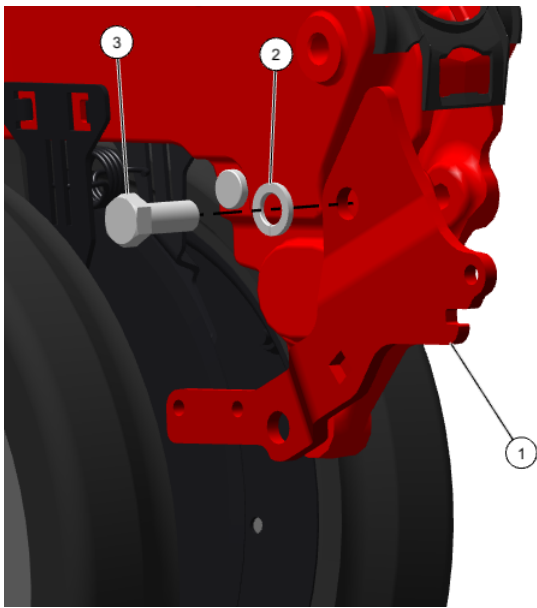
Align the bracket assembly between the two FurrowForce shank interface brackets (on the front side of the shank). Insert the two M8X1.25 X 55 screws (1) through the interface brackets and QA bracket and secure with each with a M8 top lock nut (2).



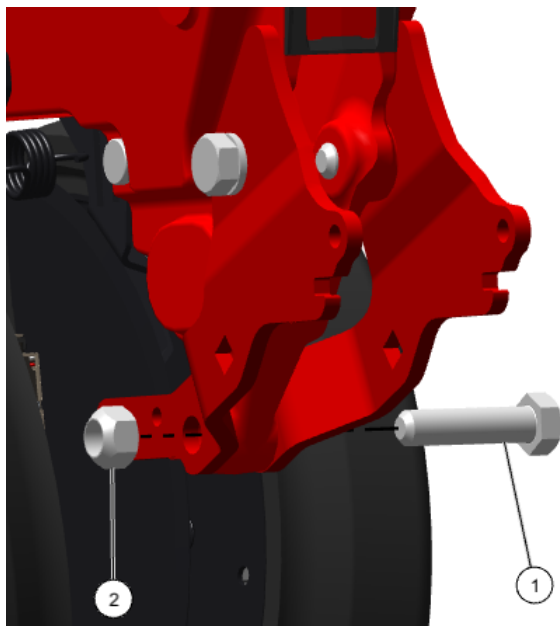
756193 Extension Bracket Installation

Note: 756193 Extension Bracket is required if installing FurrowJet or SmartFirmer and installing the first stage wheels in the extreme stagger position.

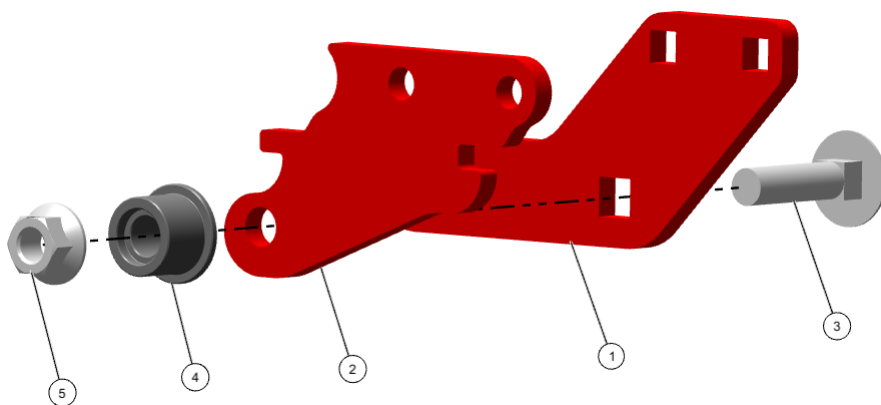
Locate the left shank interface bracket (1) and position to the row unit as shown. The bottom of the bracket should angle in towards the center line of the shank. Place a lock washer (2) on one of the provided M16x2x40 bolts (3) and install through the bracket and into the shank. Repeat for the right shank interface bracket.



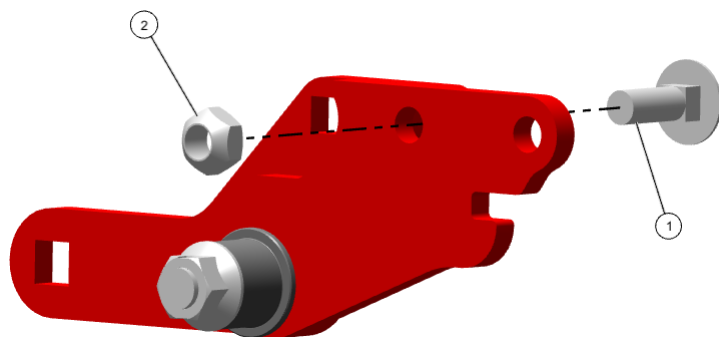
Insert the provided M16x2x65 bolt (1) through the bottom hole in each interface bracket and shank. Secure with a top lock nut (2).



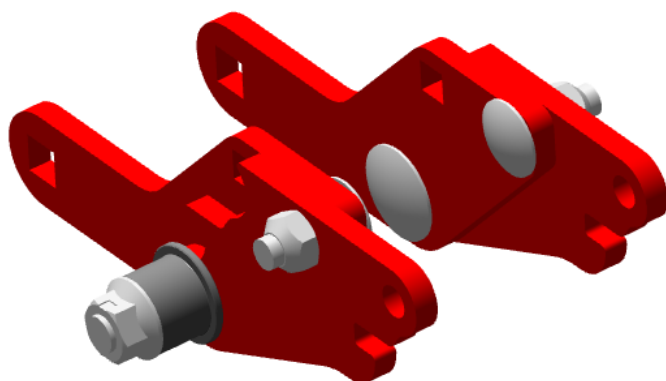
Locate an inner setback bracket (1) and outer setback bracket (2) and position the outer setback as shown. Insert a M12x50 carriage bolt (3) through the inner and outer setback brackets. Install a bushing with the flange against the outer setback and secure with a flange nut (3).



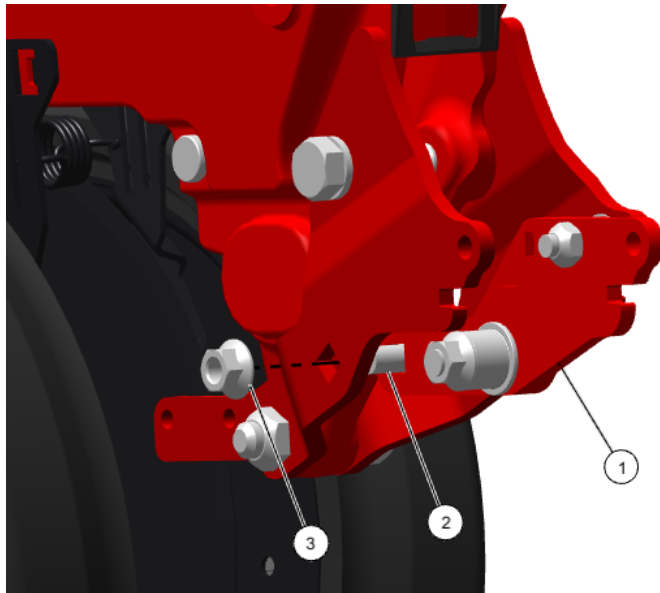
Insert a M10x30 carriage bolt (1) through the inner and outer setback brackets as shown and secure with a top lock nut (2).



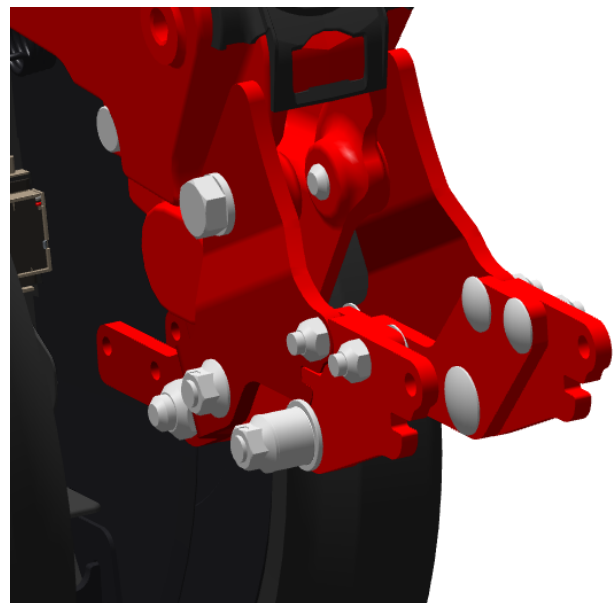
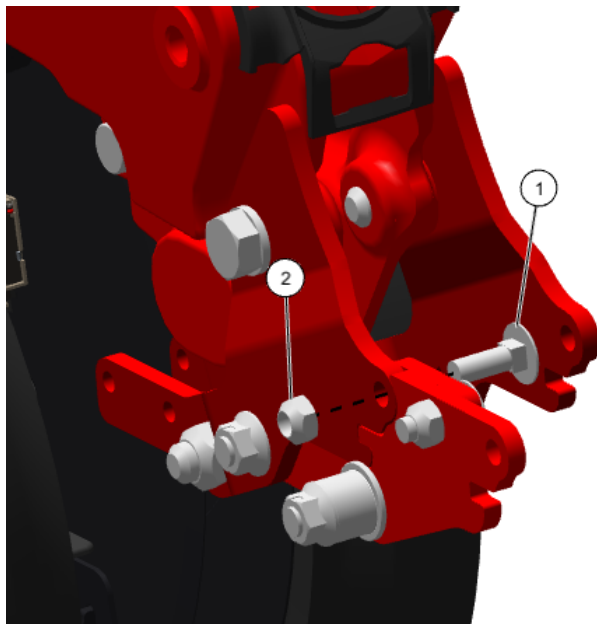
Repeat this process for the other inner and outer setback brackets. **Ensure that the outer setback brackets are installed on opposite sides of each inner setback bracket.** Reference the image below for the correct installation.



Locate the extension assembly with the outer setback on the left of the inner setback (1) and align with the left interface bracket on the row unit as shown. Insert a M12x30 carriage bolt (2) through the inner setback and interface bracket and secure with a flange nut (3). The outer setback bracket should follow the contour of the interface bracket.



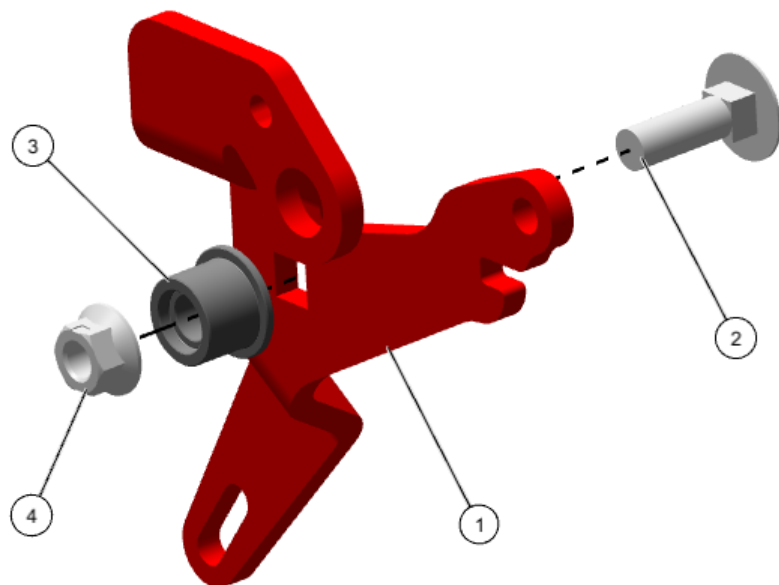
Place a M10x30 carriage bolt (1) through the remaining holes in the inner setback and interface brackets as shown. Secure with a top lock nut (2). Repeat the previous two step to install the right extension assembly. Refer to the right image for the final installation.



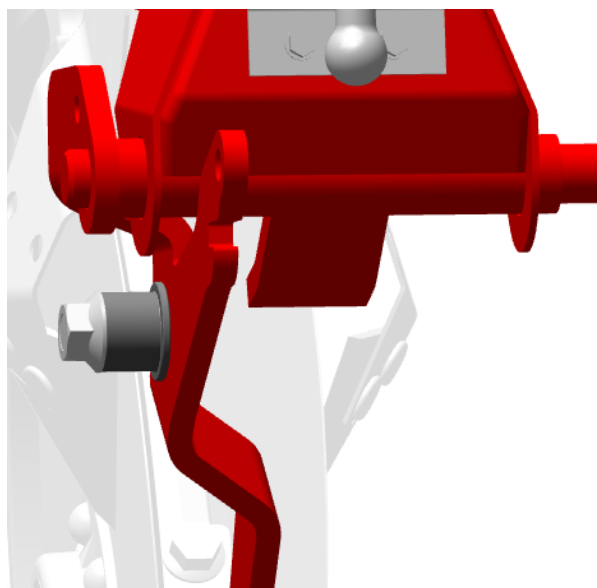
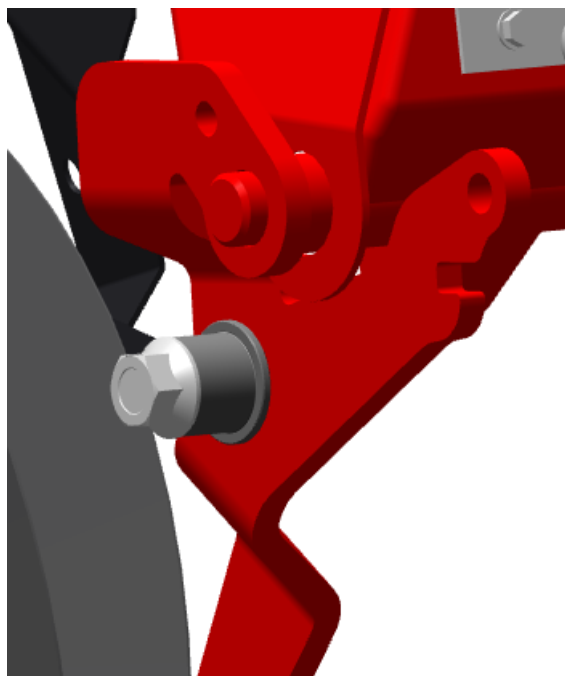
CASE 1200 Series Shank Interface Bracket Installation

Remove the existing closing system from the row unit. Retain the bolt and nut that attaches the closing disc arms to the shoe. This will be re-used to secure the FurrowForce interface brackets.

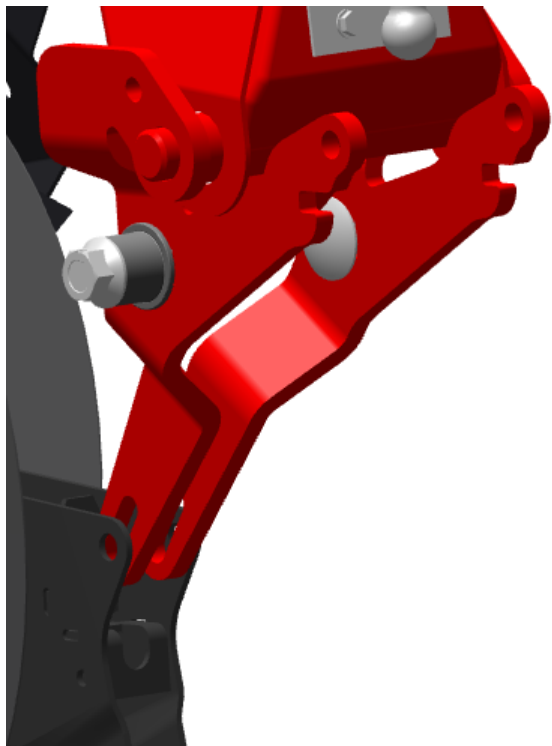
Locate the left shank interface bracket (1) and insert one of the provided M12x40 carriage bolts (2) through the square hole. Install a bushing (3) with flange against the bracket and secure with a lock nut (4) as shown.



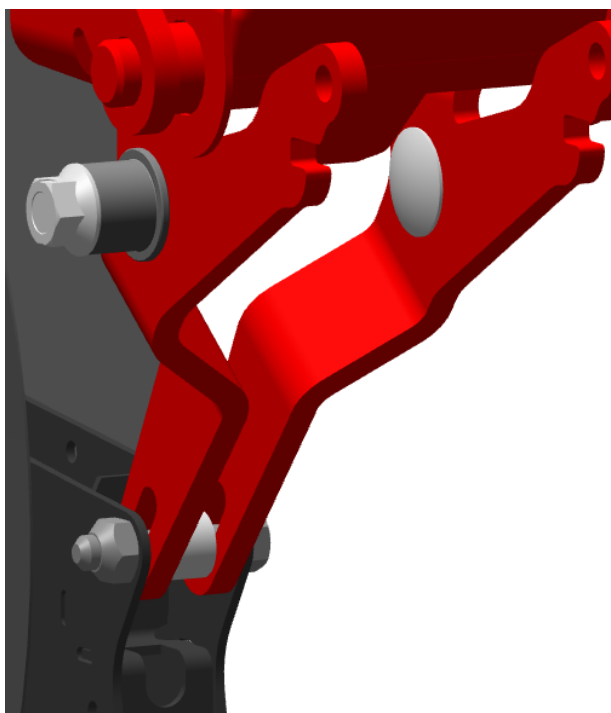
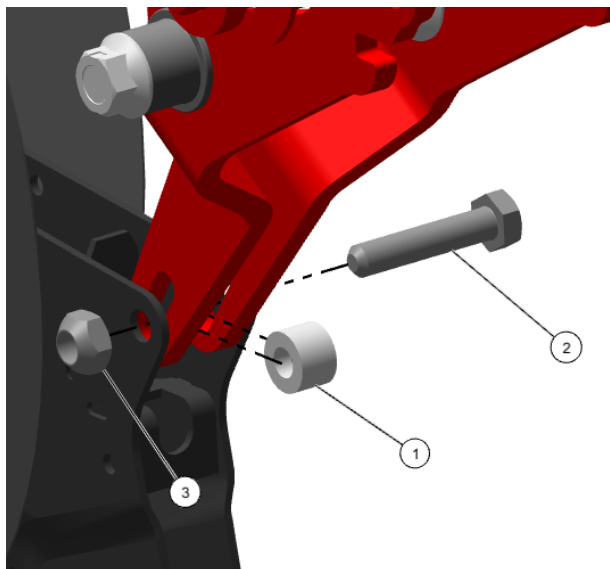
Align the top hole in the interface bracket with the pivot shaft on the row unit. Rotate the bracket so the FurrowForce assembly attachment is inside the row unit frame as shown.



Repeat the previous two steps for the right side interface bracket.

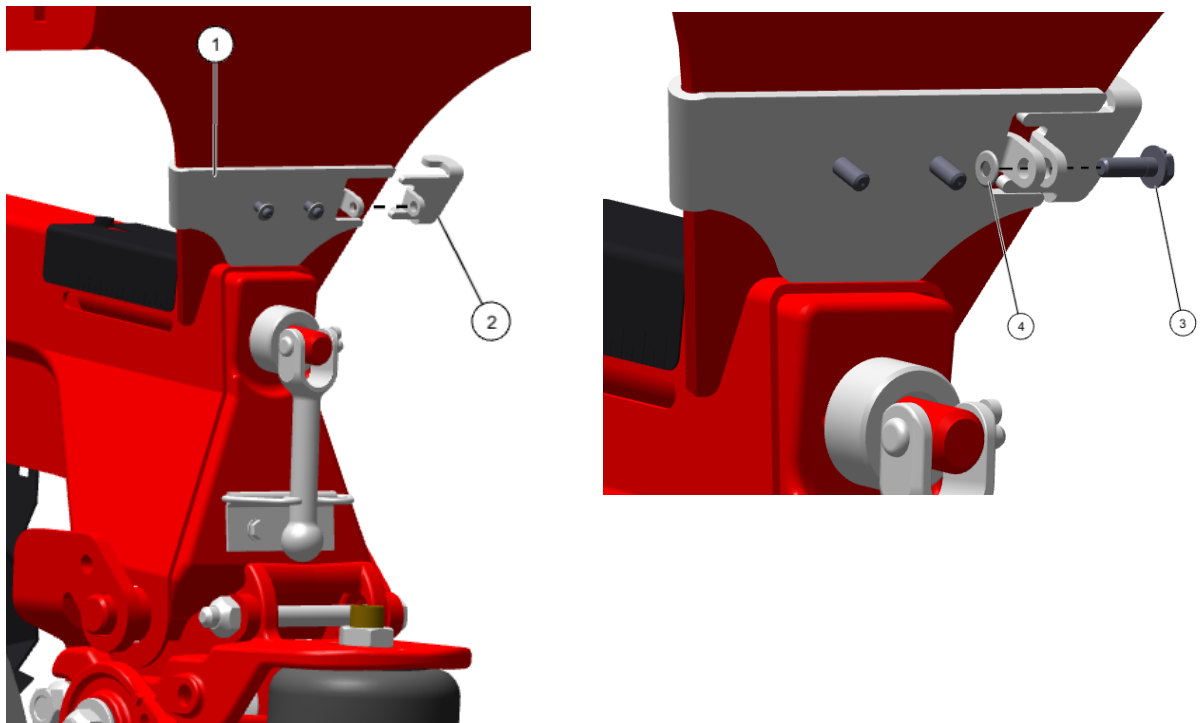


Rotate each interface bracket so the bottom slots align inside the shoe. Locate the provided spacer bushing (1) and insert it between the interface brackets, so that it aligns with the bottom slots. Insert the OEM bolt (2) and secure with the OEM lock nut (3) as shown.

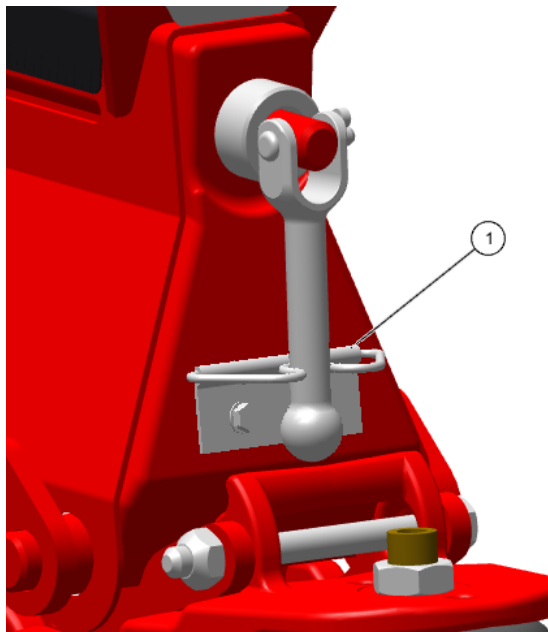


Note: Installing FurrowForce on CASE 1200 series row units may require the depth adjustment handle to be repositioned for proper clearance and adjustment. **Pre 2011 model year planters have a curved rear post and the depth adjustment kit cannot be used. If it is desired to reposition the depth handle on those planters, remove the OEM handle retainer, drill a hole(s) through the retainer and rear support, and re-install the retainer.**

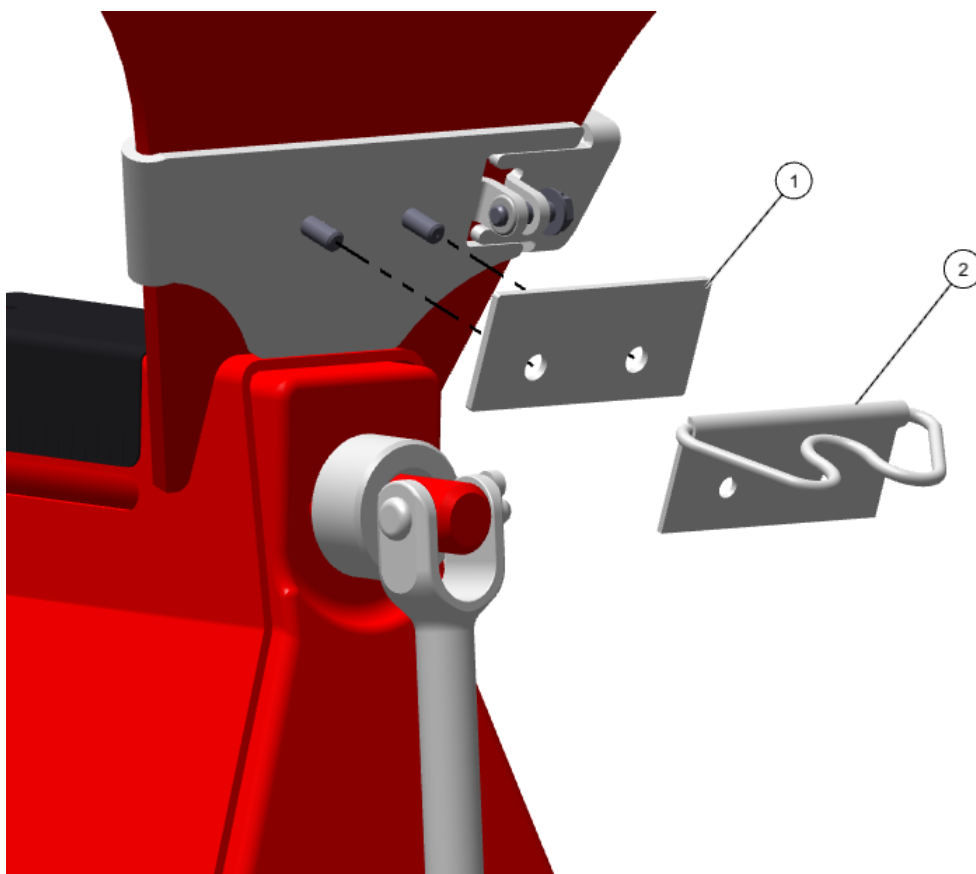
Locate the depth adjustment offset kit and position the left bracket (1) on the rear support as shown. The left side of the bracket should wrap around the left side of the rear support (viewing from behind the row unit). Place the right bracket (2) on the right side of the rear support, aligning it with the left bracket as shown. Install the #10–24 screw (3) through the right and left bracket and secure it with a lock nut (4). Tighten the lock nut until the brackets are drawn tight against the rear support.



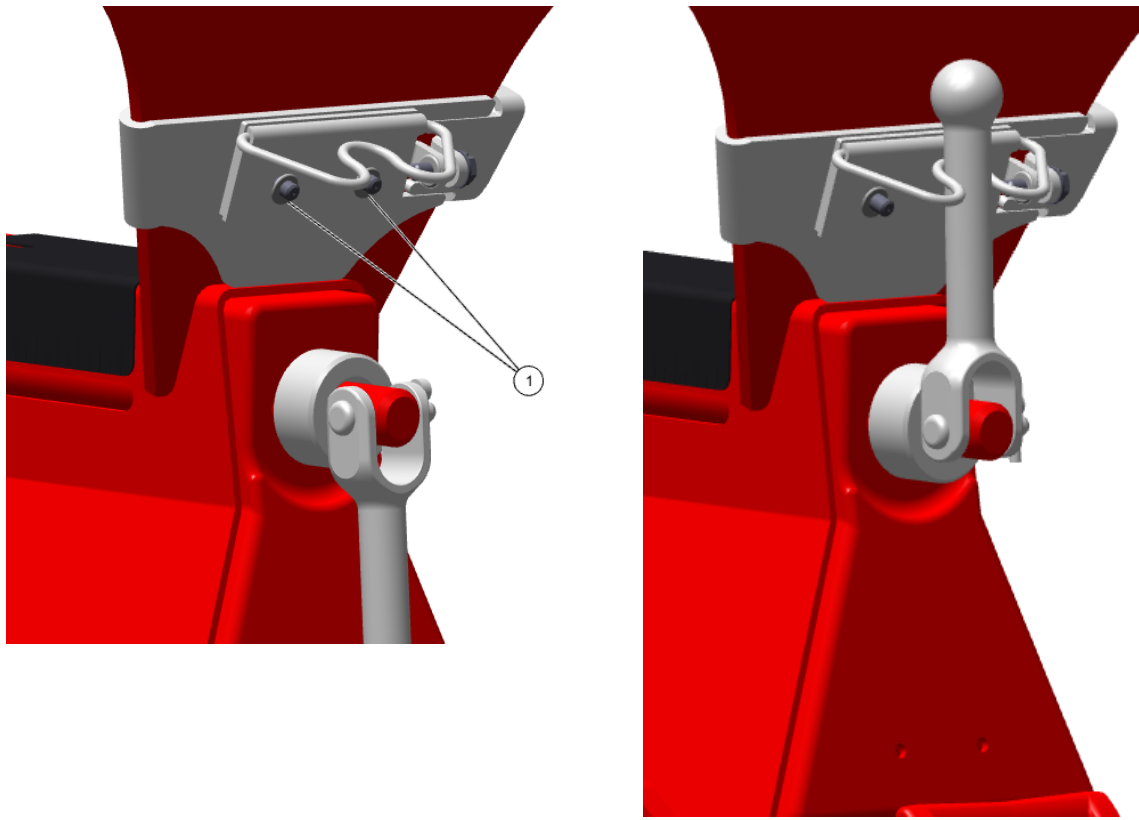
Remove the depth handle retainer (1) from the row unit by removing the two bolts that secure it.



Slide the depth handle shim (1) and the depth handle retainer (2) onto the mounting studs of the depth adjustment offset bracket.

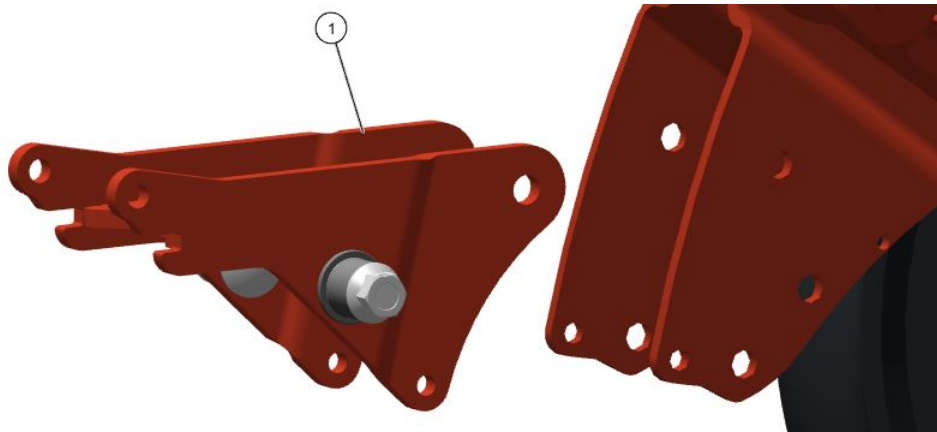


Secure the pieces with two provided lock nuts (1). Flip the depth adjustment handle 180 degrees to latch in the new position as shown.

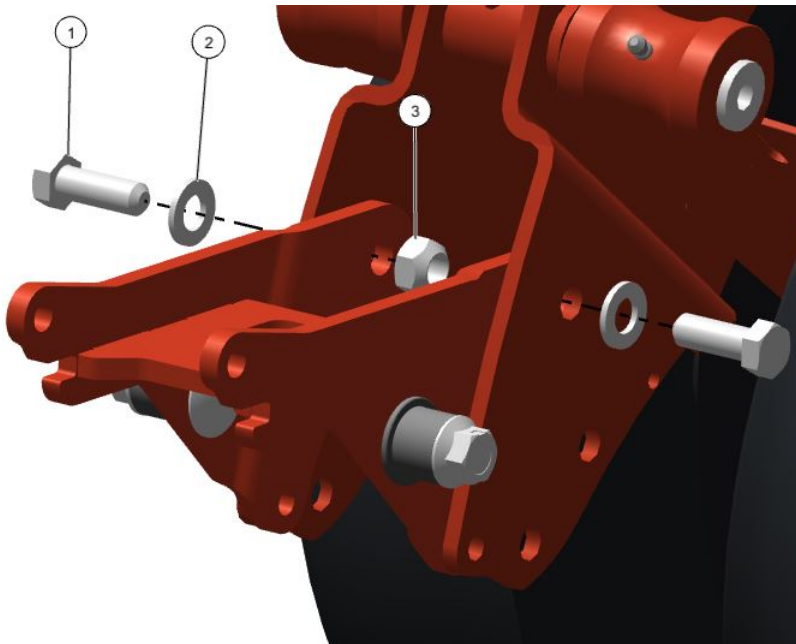


Gaspardo MTR Shank Interface Bracket Installation

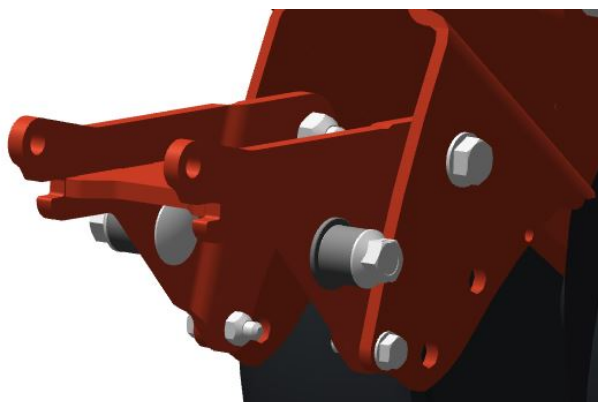
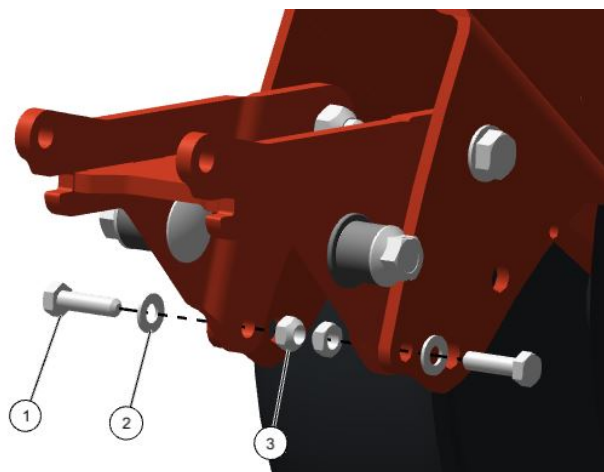
Remove the existing closing system from the row unit. Locate the shank interface bracket and position to the row unit as shown.



Install a M12 bolt (1) through the row unit and the top hole in the interface bracket, placing a M12 washer (2) between the bolt head and the row unit. Secure with a M12 top-lock nut (3). Repeat for the opposite side.



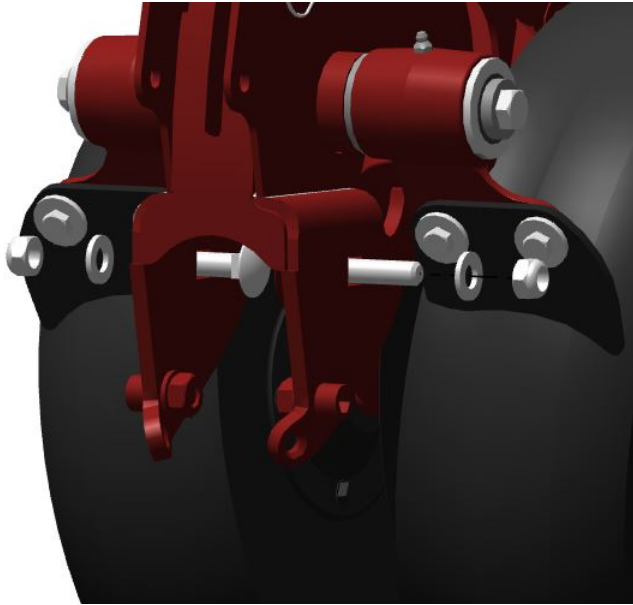
Install a M8 bolt (1) through the row unit and the bottom hole of the interface bracket, placing a M8 washer (2) between the bolt head and interface bracket. Secure with a M8 top-lock nut. Repeat for the opposite side.



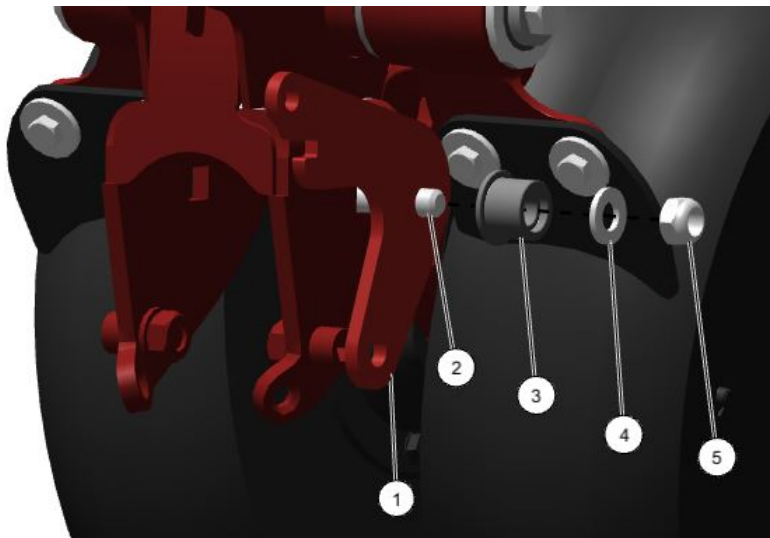
Horsch Maestro Shank Interface Bracket Installation

Note: If installing the FurowForce first stage wheels in the extreme stagger position, the 756635 Setback Bracket is used. Proceed to the “756635 Setback Installation” section.

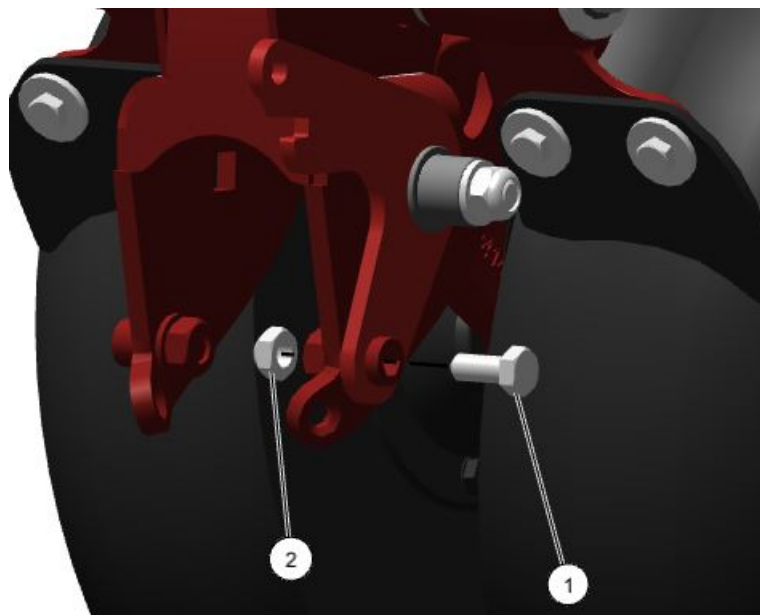
Remove the existing closing system from the row unit. Retain the carriage bolts, washers, and lock nuts shown below to be re-used.



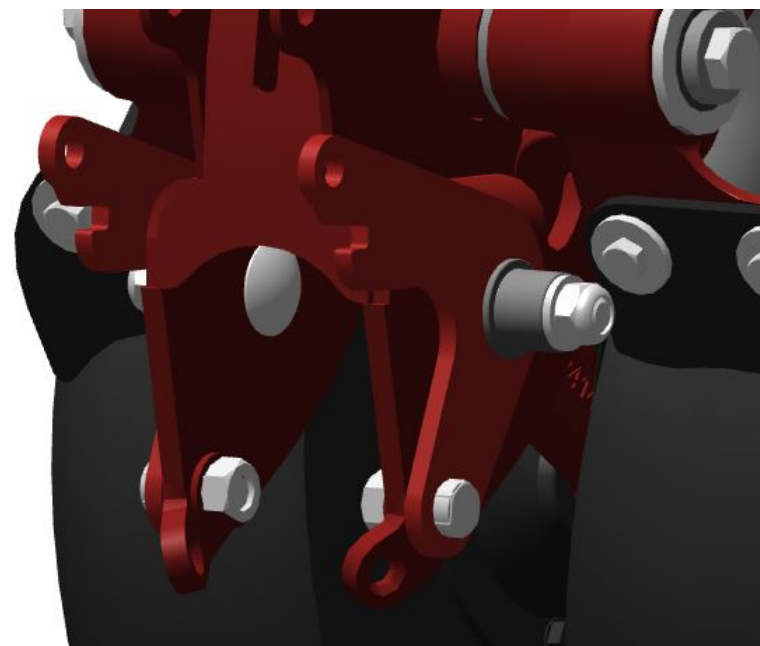
Locate a shank interface bracket (1) and position it on the outside of the row unit as shown. Align the front hole in the bracket with the closing system mounting hole in the row unit. Insert the previously removed bolt (2) through the row unit and the interface bracket. Install one of the provided pivot bushings (3) so that the flange is against the row unit. Install the previously removed washer (4) and lock nut (5) to secure.



Insert a provided M10 bolt (1) through the bottom hole in the interface bracket and row unit. Secure with a M10 top-lock nut (2).

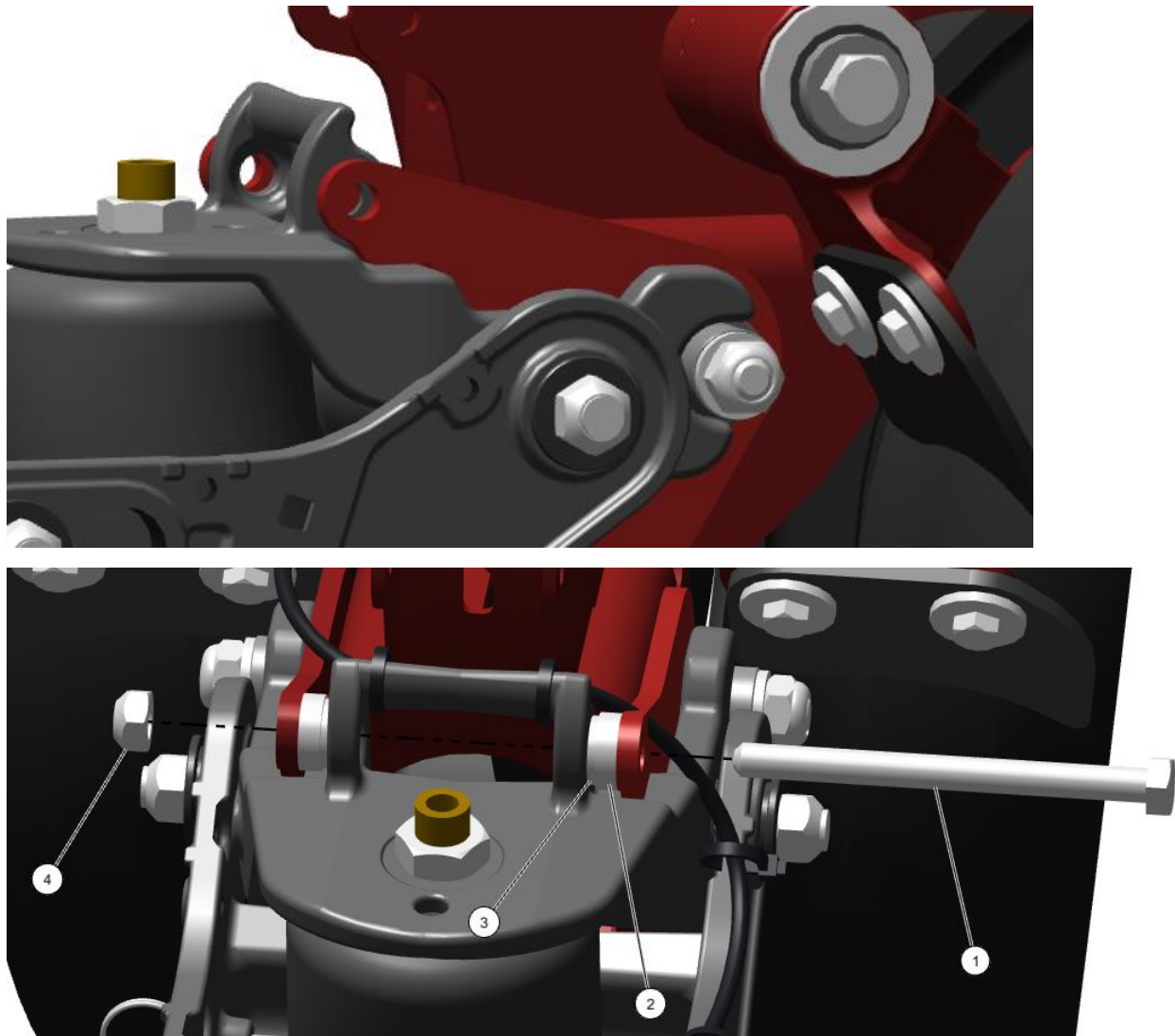


Repeat the previous two steps for the adapter bracket on the opposite side.



Install the FurrowForce assembly on the interface brackets so that the ears on the assembly line up with the mounts on each interface bracket as shown. Install the M10 cross bolt (1) through the interface brackets and FurrowForce assembly, placing a spacer shim (2) and M10 washer (3) between the interface bracket and assembly on each side. Secure with a M10 top-lock nut (4).

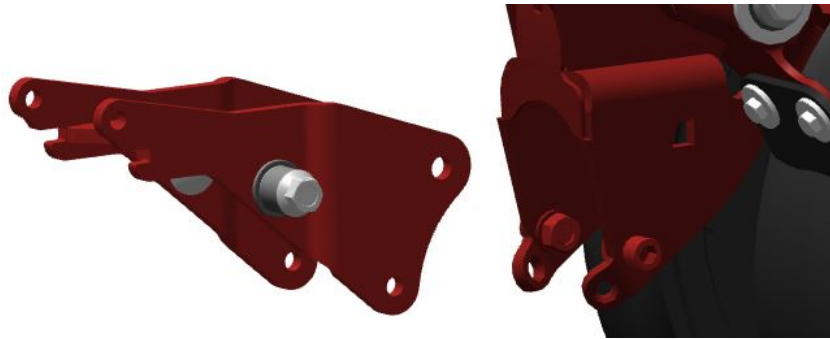
Note: The spacers should be installed against each interface bracket.



756635 Closing Setback Installation

Note: This section is only necessary if installing the FurrowForce first stage wheels in the extreme stagger position.

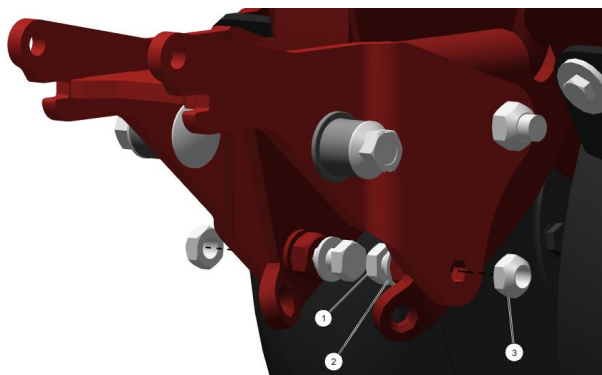
Remove the existing closing system from the row unit. Locate the setback bracket and position to the row unit as shown. Align the front hole in the bracket with the closing system mounting hole in the row unit. The setback bracket should go on the outside of the row unit on each side.



Insert a M12 bolt (1) through the row unit and setback bracket as shown. Secure with a M12 top-lock nut (2). Repeat for the opposite side.



Insert a provided M10 bolt (1) through the row unit and the bottom hole in the interface bracket, placing a M10 washer (2) between the bolt head and the row unit. Secure with a M10 top-lock nut (3). Repeat for the opposite side.



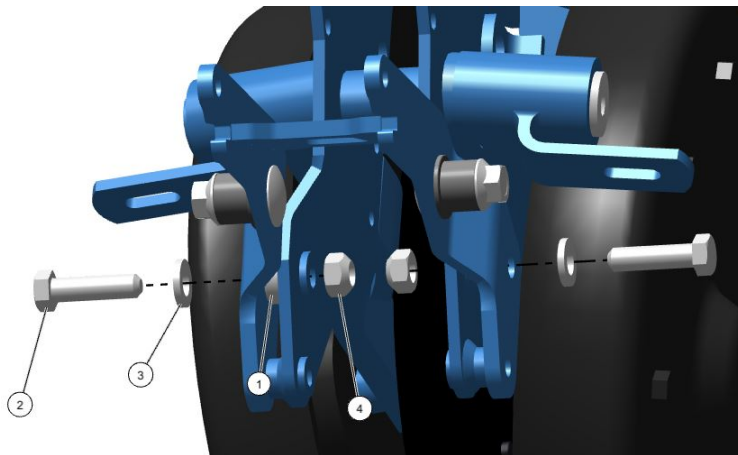
Monosem NG +4 Shank Interface Bracket Installation

Note: If installing the FurrowForce first stage wheels in the extreme stagger position, the 141250 Setback Bracket is used. Proceed to the “141250 Setback Installation” section.

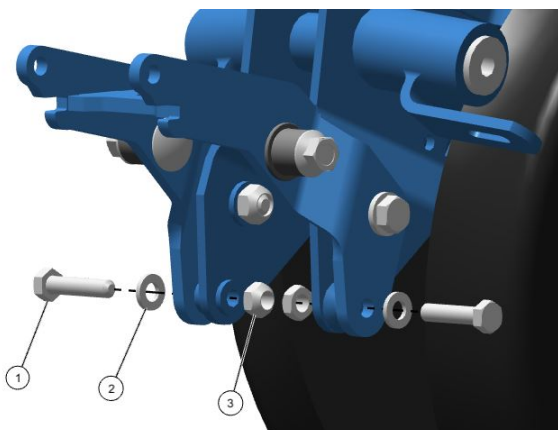
Remove the existing closing system from the row unit. Locate the shank interface bracket (1) and position to the row unit as shown.



Install a bushing (1) between the interface bracket and the row unit, aligning it with the top hole in each as shown. Insert a M12 bolt (2) through the hole, placing a M12 washer (3) between the bolt head and interface bracket. Secure with a M12 top-lock nut (4). Repeat for the opposite side.



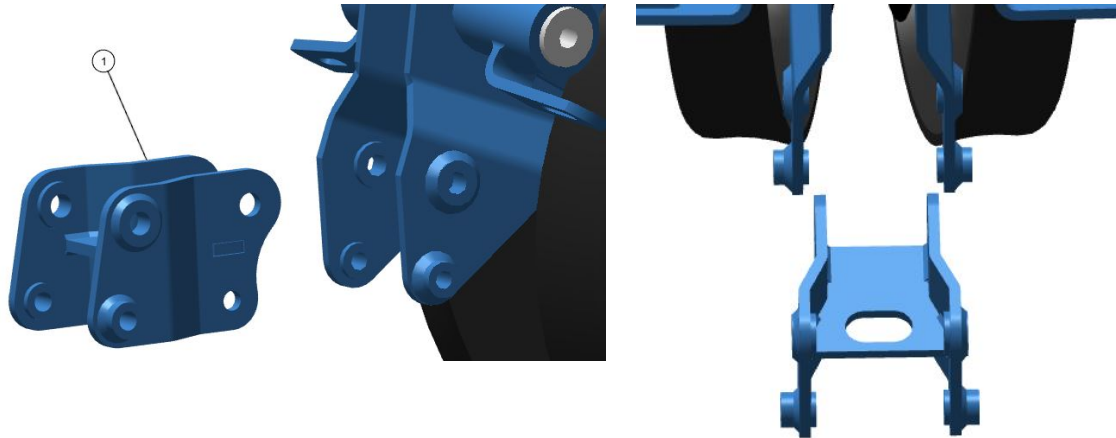
Install a M10 bolt (1) through the bottom hole of the interface bracket and row unit, placing a M10 washer (2) between the bolt head and interface bracket. Secure with a M10 top-lock nut. Repeat for the opposite side.



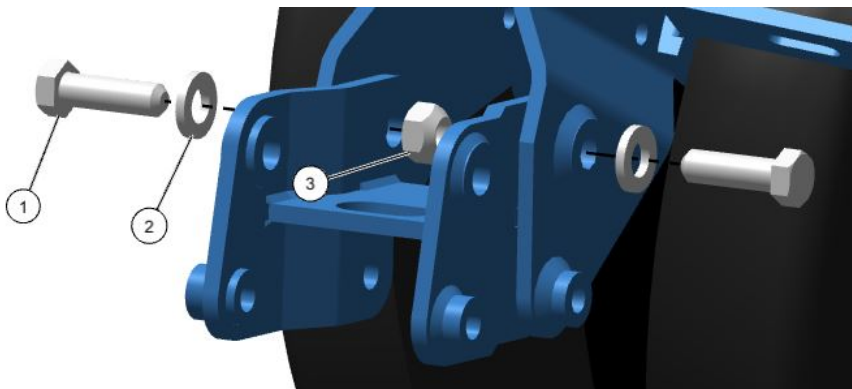
141250 Setback Installation

Note: This section is only necessary if installing the first stage wheels in the extreme stagger position.

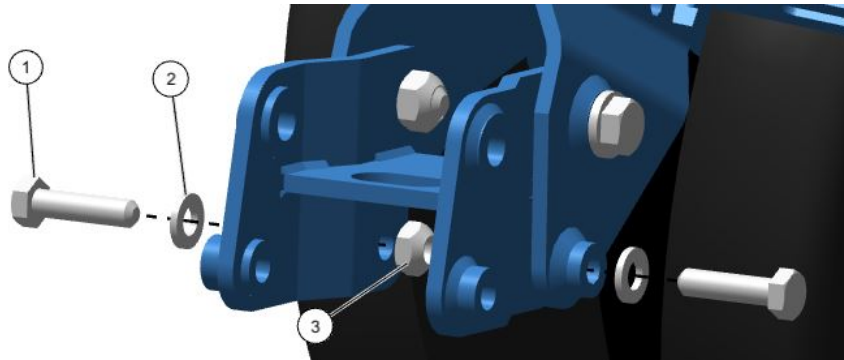
Remove the existing closing system from the row unit. Locate the setback bracket (1) and position to the row unit as shown. The narrow portion of the bracket should install inside the row unit.



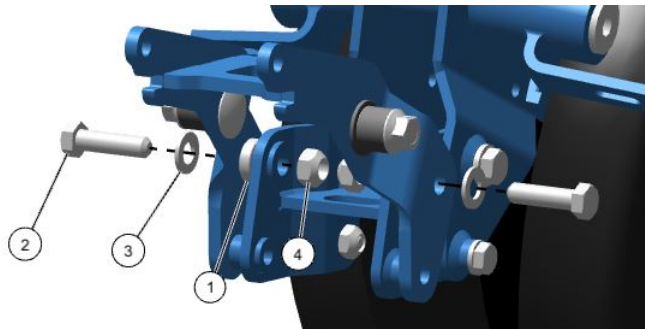
Insert a M12 bolt (1) through the top hole of the row unit and setback bracket, placing a M12 washer (2) between the bolt head and the row unit. Secure with a M12 top-lock nut (3). Repeat for the opposite side.



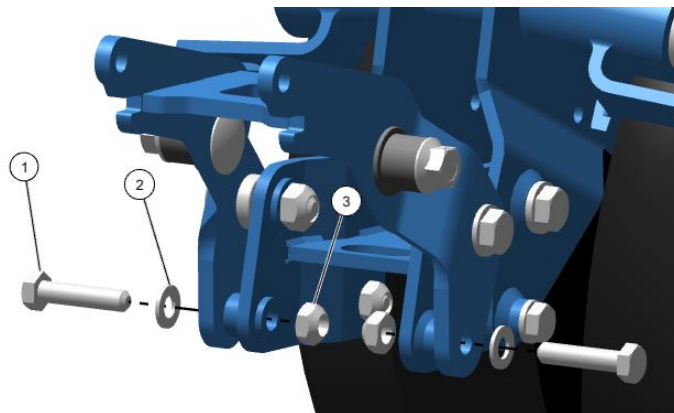
Install a M10 bolt (1) through the bottom hole of the row unit and setback bracket, placing a M10 washer (2) between the bolt head and row unit. Secure with a M10 top-lock nut. Repeat for the opposite side.



Position the shank interface bracket with the setback bracket. Install a bushing (1) between the interface bracket and setback bracket, aligning it with the top hole in each as shown. Insert a M12 bolt (2) through the hole, placing a M12 washer (3) between the bolt head and interface bracket. Secure with a M12 top-lock nut (4). Repeat for the opposite side.

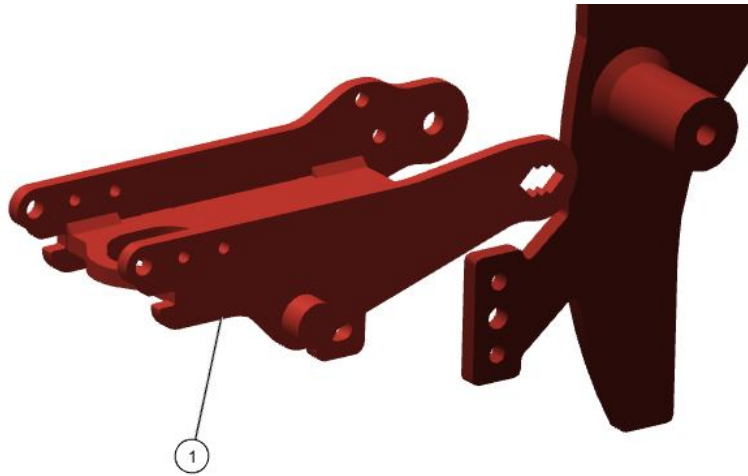


Install a M10 bolt (1) through the bottom hole of the interface bracket and the setback bracket, placing a M10 washer (2) between the bolt head and interface bracket. Secure with a M10 top-lock nut. Repeat for the opposite side.

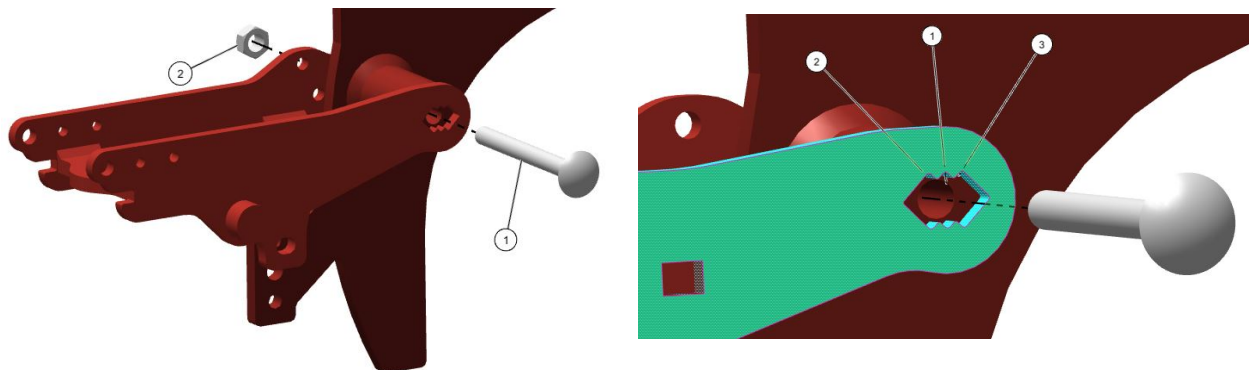


Vaderstad Tempo Shank Interface Bracket Installation

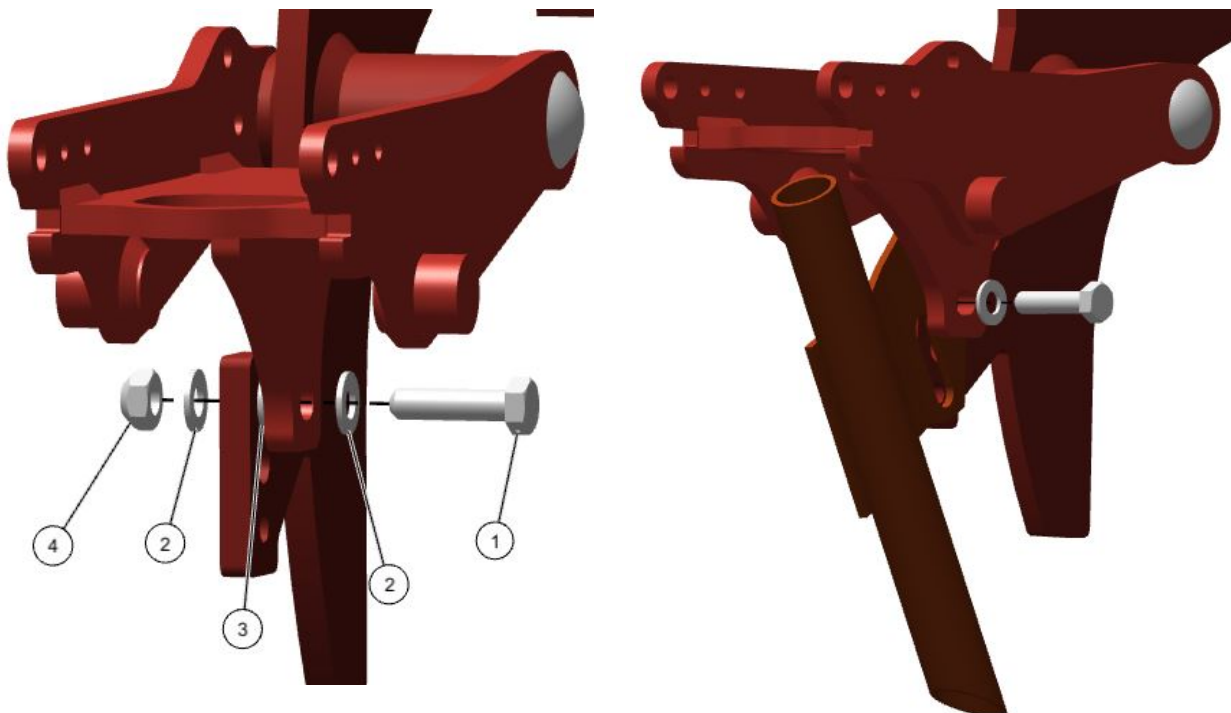
Remove the existing closing system from the row unit. Locate the shank interface bracket (1) and position to the row unit as shown.



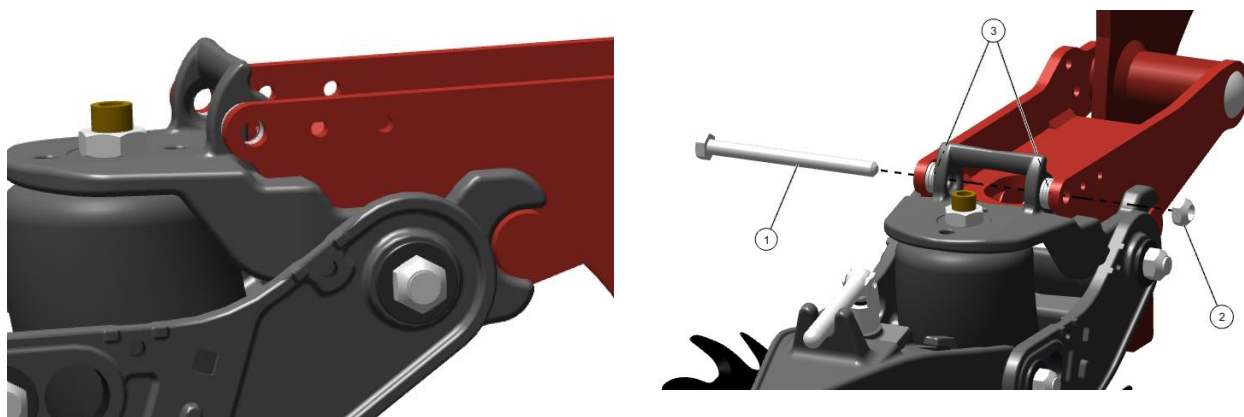
Install the M12 carriage bolt (1) through the interface bracket and the row unit as shown. Secure with the M12 top-lock nut (2). There are three positions the interface bracket and carriage bolt can be installed to help align the FurrowForce assembly with the row unit shank. Position (1) will center the FurrowForce assembly with the shank and should be used when no offset is needed. Position (2) will offset the FurrowForce assembly to the right. Position (3) will offset the FurrowForce assembly the left. Offset direction is viewed as standing behind the row unit.



Install a M10 bolt (1) through the interface bracket and the row unit as shown, placing a M10 washer (2) between the bolt head and interface bracket and the row unit and nut. If an insecticide tube is not being used, install two washers (3) between the shank and interface bracket. If an insecticide tube is being used, install it between the shank and interface bracket. Washers will not be used in that location. Secure with a M10 top-lock nut (4).

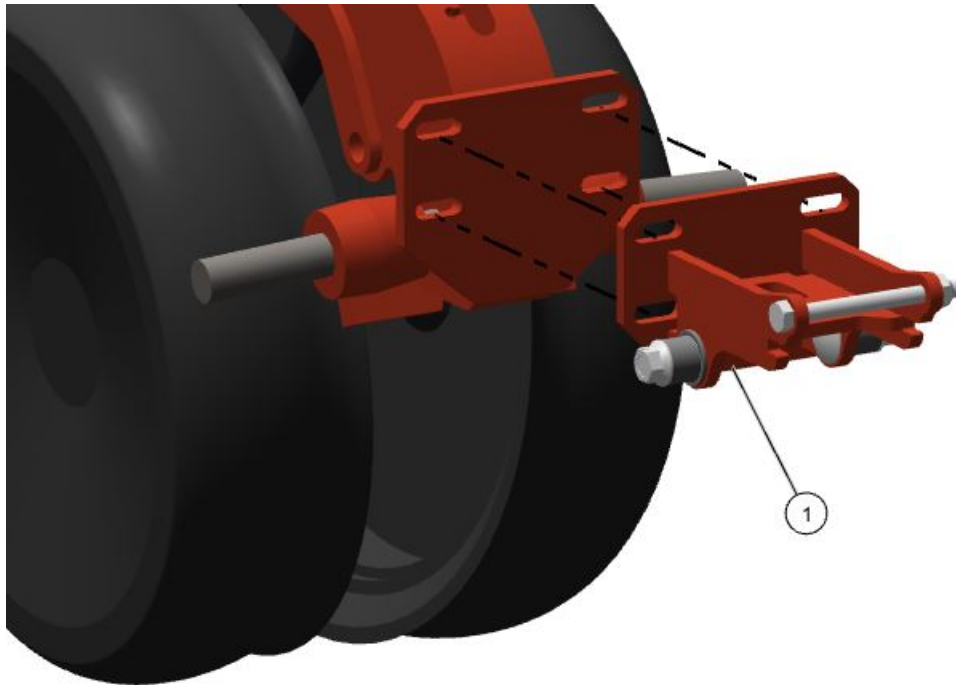


Install the FurrowForce assembly on the interface bracket so that the ears on the assembly mount to interface bracket as shown. Insert the M10 cross bolt (1) through the interface bracket and FurrowForce assembly, while placing washers (3) between the assembly and each side of the interface bracket. Ensure that the FurrowForce assembly is tight to the interface bracket. Secure with the M10 top-lock nut (2).

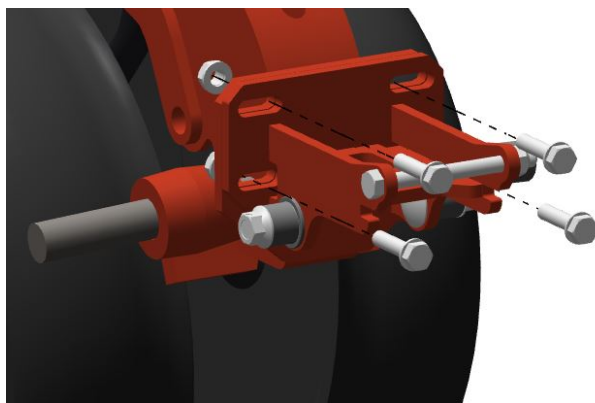


Kuhn Maxima 2 Shank Interface Bracket Installation

Remove the existing closing system from the row unit and retain the OEM hardware. Locate the shank interface bracket (1) and position it to the row unit as shown.

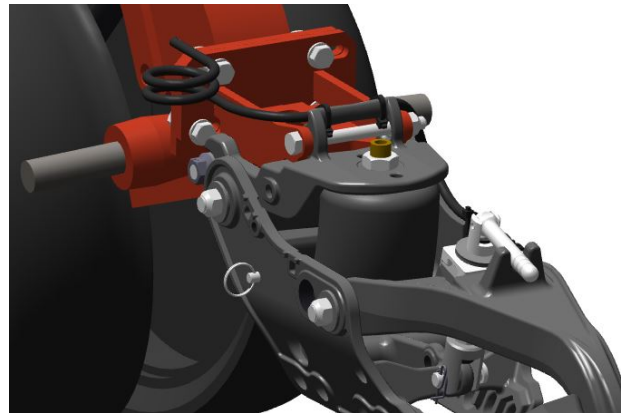
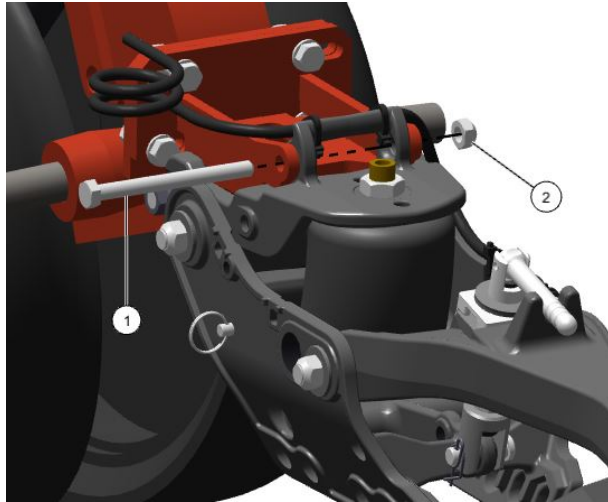


Align the four mounting slots in the interface bracket with the mounting slots in the shank. Reinstall the OEM closing system hardware in the four mounting locations and had tighten the nut.



Remove the M10 cross bolt (1) and M10 lock nut (2) from the interface bracket. Place the FurrowForce assembly on the interface bracket so the ears on the assembly rest on the bushing mounts on the bracket. Insert the M10 bolt through the interface bracket and assembly and secure with the M10 top lock nut.

Note: Torque the nut until the interface bracket is tight to the FurrowForce assembly. The interface bracket may bend slightly.



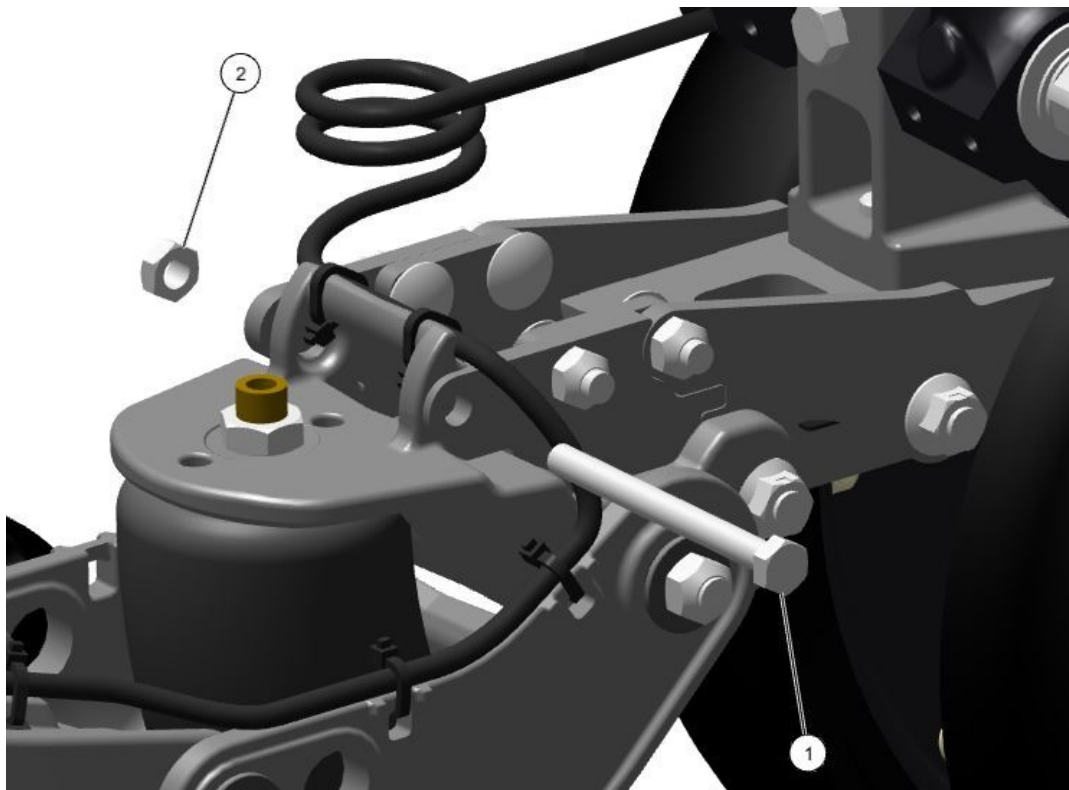
Installing FurrowForce Assembly to the Row Unit

Note: This step is universal across all row units unless noted in the specific row unit interface bracket installation.

Remove the M10 cross bolt from the interface bracket (if pre-installed).

Place the assembly on the respective interface bracket so that the ears on the FurrowForce assembly line up with the bushing mounts on the interface bracket as shown. Install the M10 cross bolt (1) through the interface bracket and the FurrowForce assembly. Secure with the top-lock nut (2).

Note: Torque the nut until the interface bracket is tight with the FurrowForce assembly.

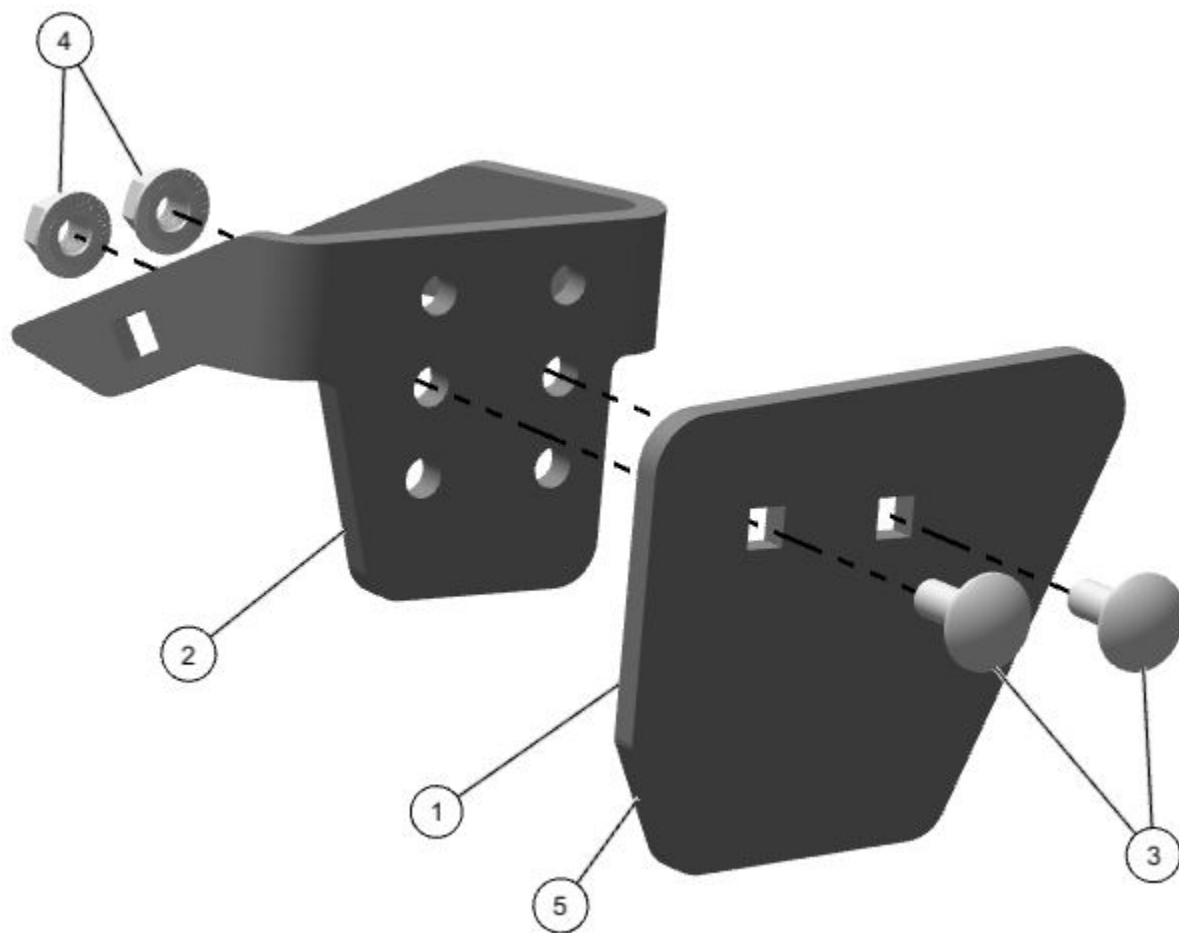


Rock Guard Installation

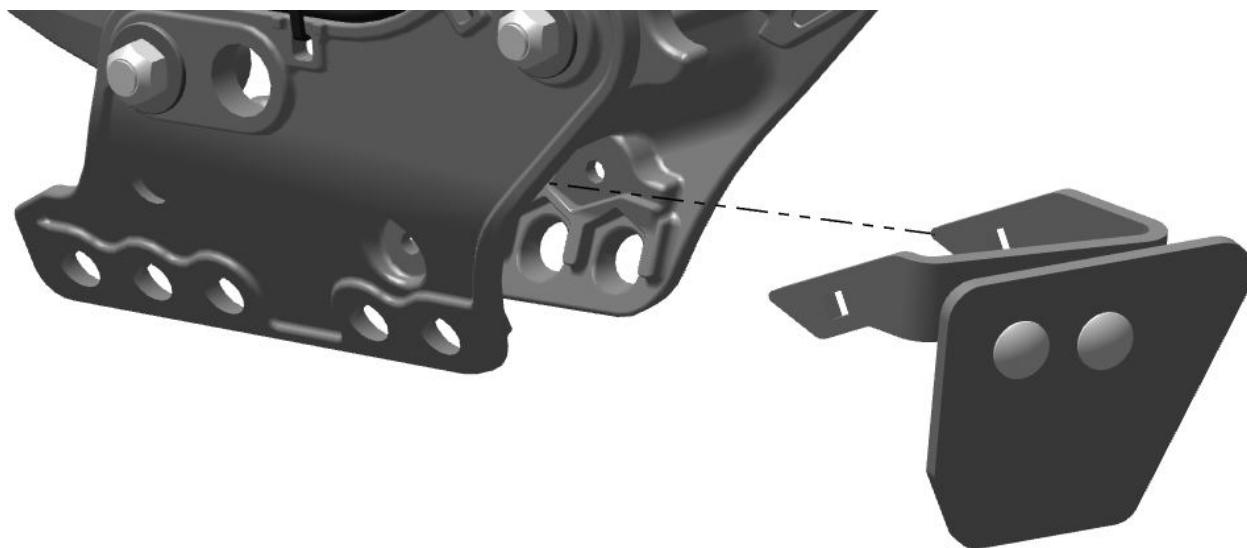
Note: This section only applies if installing the 754154 Rock Guard, which is only compatible with the 5 hole FurrowForce assembly. It should be installed before the first stage wheels on a new install.

Install the plate (1) to the bracket (2) using two of the carriage bolts (3) and secure with flange nuts (4). The plate should be installed so that the short angle portion (5) is in the bottom left (as viewed from the front).

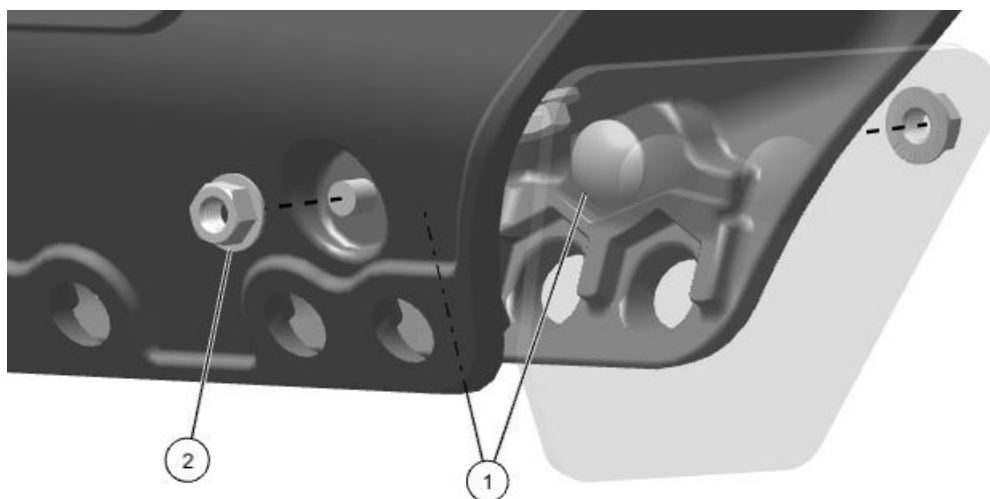
Note: There are three mounting positions in the bracket for the plate. The middle set of holes will position the plate approximately 1.75" above ground at a closing depth of 1.5" or 1.25" above ground at a closing depth of 2". The top set of holes adjusts the plate up by 0.75" and the bottom set of holes adjusts the plate down by 0.75". The plate should be installed so that it runs as close to the top of the ground as possible, without plowing soil. In field adjustment may be needed.



Position the bracket and plate assembly in front of the FurrowForce assembly, aligning it between the two sides of the casting as shown. The bracket should fit into the casting above the front, first stage wheel mounting holes.



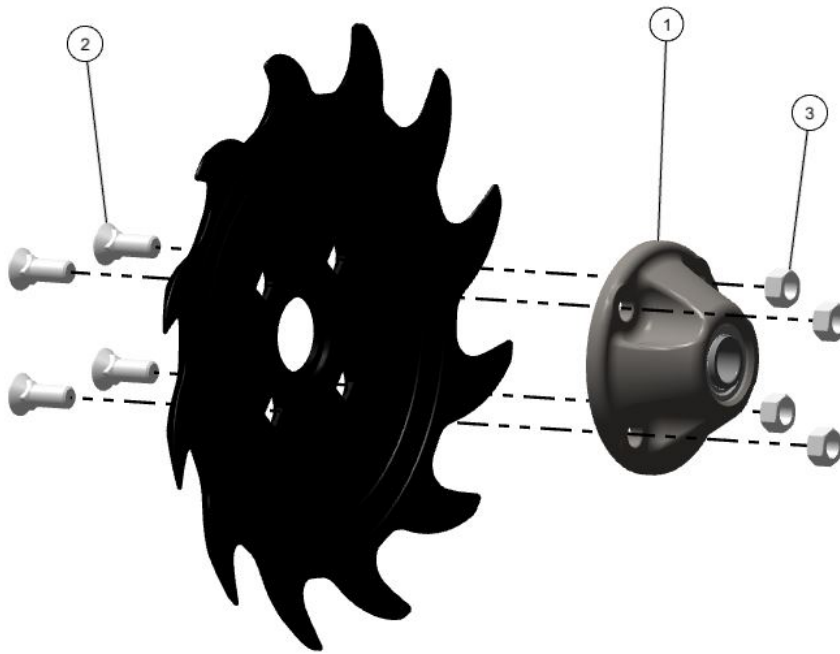
Install the remaining two carriage bolts (1) through each side of the bracket and casting and secure with a flange nut (2).



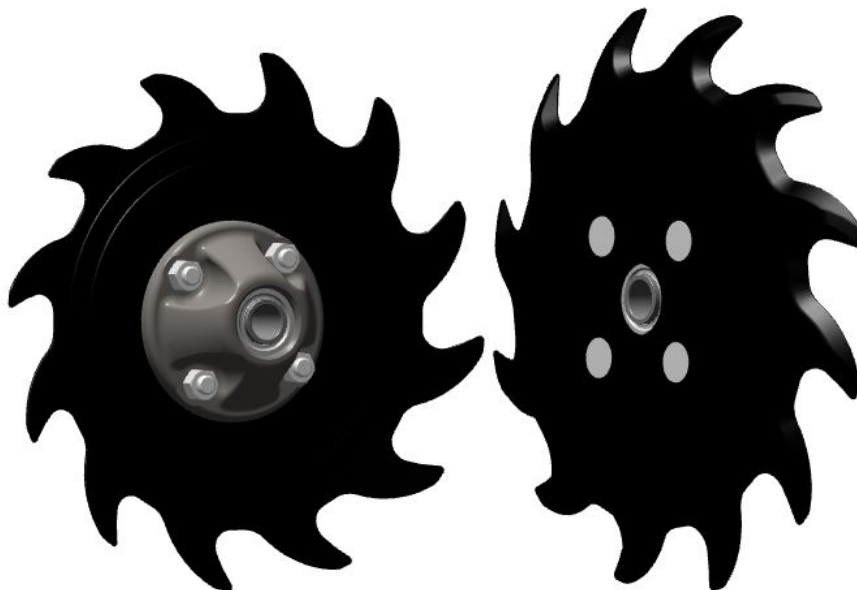
First Stage Closing Wheel Installation

The hub and bearing assembly needs to be installed on each wheel before the wheel is mounted to the FurrowForce frame. The hub should be mounted on the outward facing side of the wheel that includes the depth indicator rings.

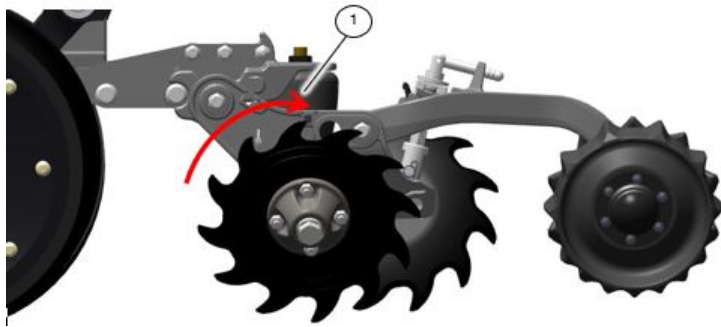
Locate a hub and align the four smaller mounting holes with the holes on the wheel (1). Insert one of the provided plow bolts into each hole (2). Install one of the provided top lock nuts on each plow bolt (3).



Hold the plow bolt head in the wheel pocket and tighten the lock nut. The head of each plow bolt should be flush with the wheel surface when fully installed.



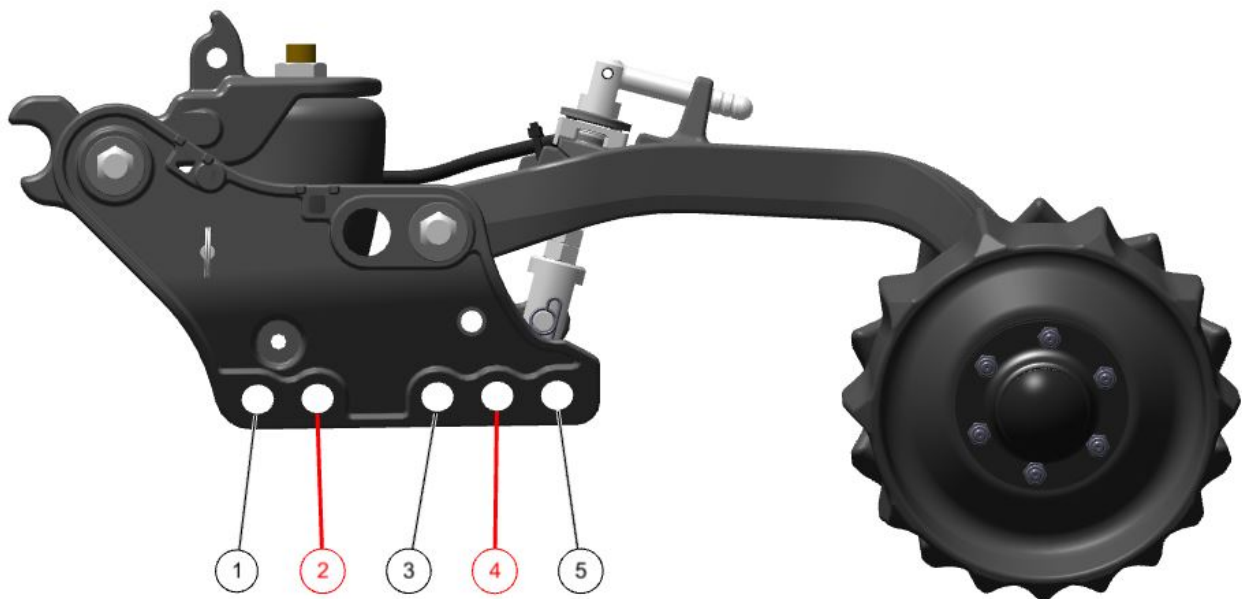
The wheels are side specific and labeled (left and right) on the inside face of the wheel. When standing behind the unit facing the planter bar, the “left” wheel should be installed on the left side, and the “right” wheel on the right side. They are installed on the correct side when the top-side notches are swept rearward, away from the planter bar (1).



Note: If installing the first stage wheel mounted liquid tube attachment(s), proceed to the “Liquid Tube Attachment” section before installing the wheel and hardware.

Wheel configuration for all row units except Case IH.

There are five wheel mounting locations per side. The default wheel mounting locations are left wheel in position 2, and right wheel in position 4. This positioning is to improve residue flow through the first stage wheels and reduce the risk of plugging from rocks or residue. If plugging occurs with the wheels installed in the default positions, the left wheel can be installed in position 1 and the right wheel in position 4 (or 5 as needed). **If a system will be running in rocky conditions, the first stage wheels should initially be installed in positions 1 (left wheel) and 5 (right wheel) to reduce the risk of plugging and provide the best experience.**



Install each wheel using the provided hardware. For systems that **WILL NOT** be running in rocky conditions, install **two washers** (1) and **one spacer** (2) between each wheel and the casting as shown in Figure 1. This will result in a wheel spacing of approximately 2.5”.

Note: For systems potentially operating in rocky conditions, it is recommended to install the first stage wheel wedge kit to reduce the probability of catching rocks. Refer to document 955947 for installation steps. If the wedge kit is not available, refer to the configuration below for rocky conditions.

For systems that **WILL** be running in rocky conditions, install **three washers** (1) and **one spacer** (2) between each wheel and the casting as shown in Figure 2. This will result in a wheel spacing of approximately 2.75” and further reduce the occurrence of a rock plug between the first stage wheels.

Install the M16 top-lock nut (3) in the respective pocket on the inside of the frame and thread the M16 bolt (4) through. Ensure that the nut is correctly seated when tightening. In some cases, letting the wheel assembly hang from the frame when tightening (instead of supporting the wheel) can make it easier to keep the nut from spinning in the pocket.

Once the bolt is tight, install the metal dust cap (5) on the hub.

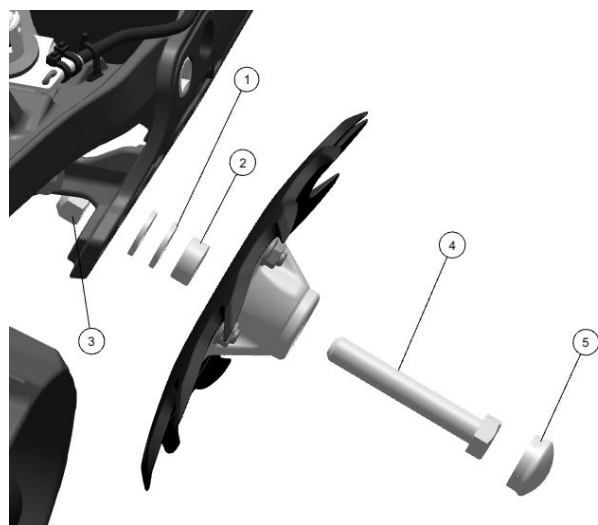


Figure 1.
Non-Rock Configuration

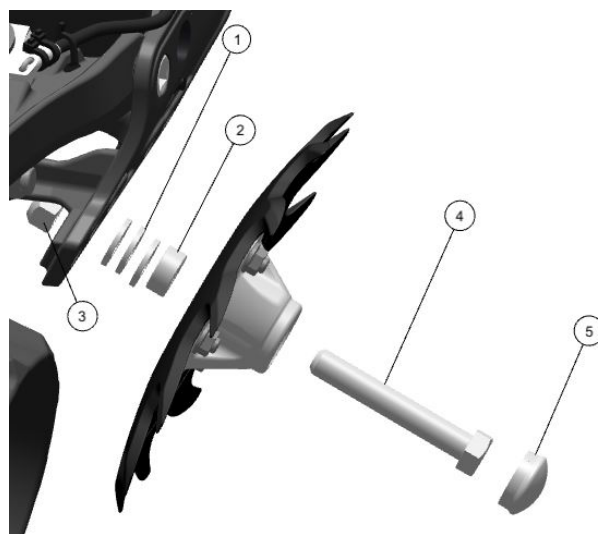


Figure 2.
Rock Configuration (no wedge kit)

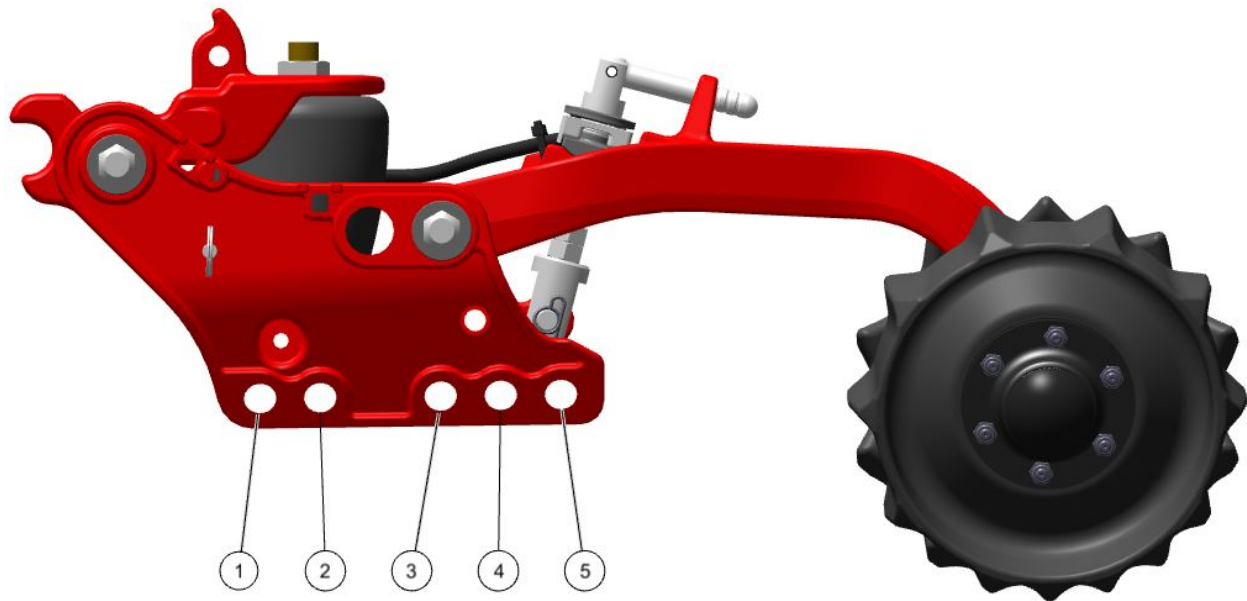
Note: For more information on setting and adjusting FurrowForce, please refer to the Setting and Adjusting FurrowForce document.

Case IH Default Configuration

There are five wheel mounting locations per side. The default mounting position varies with planting speed:

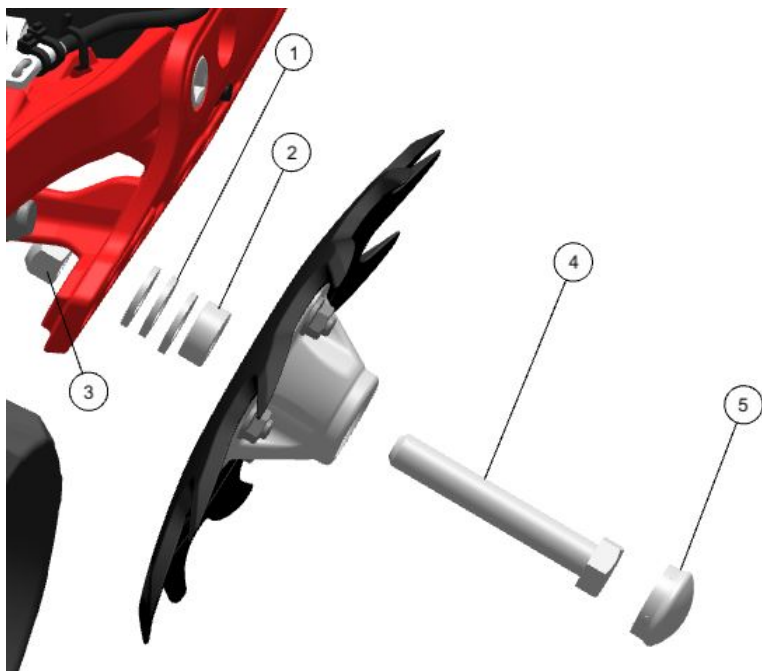
- Non High Speed (5 MPH or less) — Left wheel in position 1, right wheel in position 3
- High Speed Planting — Left wheel in position 1, right wheel in position 2

If plugging occurs with the wheels installed in the default positions, leave the left wheel in position 1 and install the right wheel in position 4 (or 5 as needed).



Install each wheel using the provided hardware. Install **three washers** (1) and **one spacer** (2) between each wheel and the casting as shown. This will result in a wheel spacing of approximately 2.75". Install the M16 top-lock nut (3) in the respective pocket on the inside of the frame and thread the M16 bolt (4) through. Ensure that the nut is correctly seated when tightening. In some cases, letting the wheel assembly hang from the frame when tightening (instead of supporting the wheel) can make it easier to keep the nut from spinning in the pocket.

Once the bolt is tight, install the metal dust cap (5) on the hub.



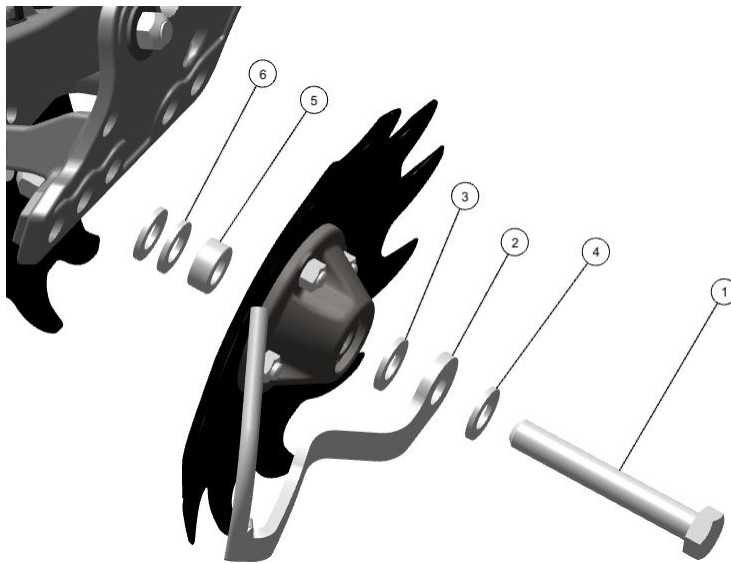
Note: For more information on setting and adjusting FurrowForce, please refer to the Setting and Adjusting FurrowForce for Case IH document.

Liquid Tube Attachment Installation

If neither liquid tube attachment is being installed, skip this section and proceed to the “Compressor Installation” section.

First Stage Wheel Mounted Liquid Attachments

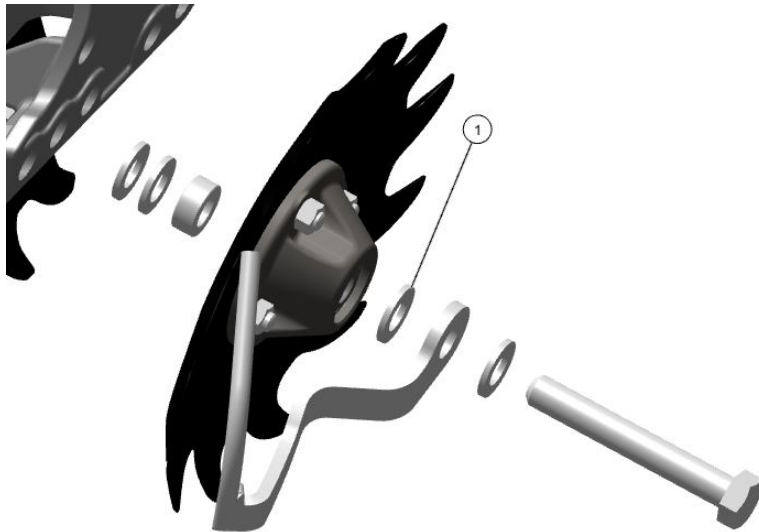
The liquid tube attachment is side specific. Locate the correct tube for the side that is being installed and align with the first stage wheel as shown. Each liquid attachment kit includes a longer spindle bolt (1) and additional spacer washers. The liquid bracket (2) should always be assembled with at least one washer between it and the wheel hub (3) and bolt head (4), to provide the necessary clearance. Install two washers (6) and one spacer (5) between each wheel and the casting as shown. This will result in a wheel spacing of approximately 2.5”. Extra washers can be stored under the bolt head for future use.



Position the liquid tube attachment so that the liquid discharge point is 1.5”-2” above ground. Tighten the lock nut in the FurrowForce frame. It may be necessary to adjust the discharge height in-field after the first stage wheel depth is set.



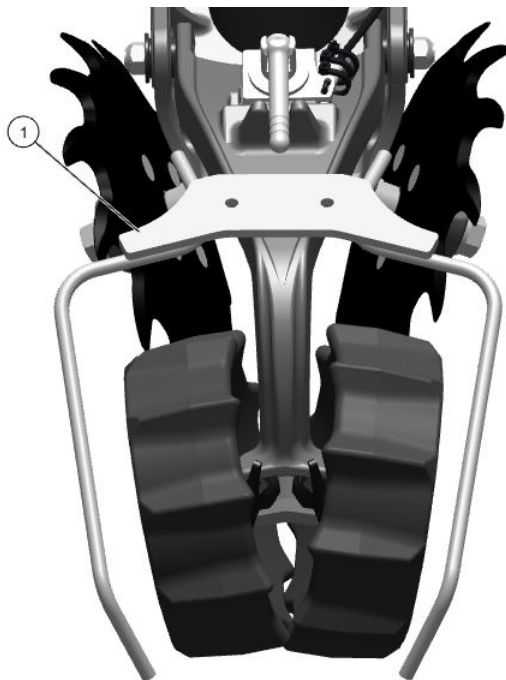
Rotate each wheel one full revolution. If the wheel catches the liquid tube attachment at any point, it will be necessary to install an additional washer(s) between the wheel hub and the liquid tube attachment (1). The liquid tube bracket should run as close to the wheel as possible without touching.



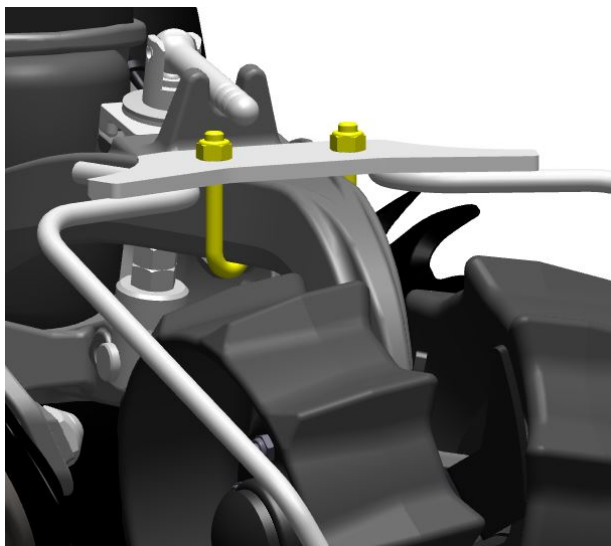
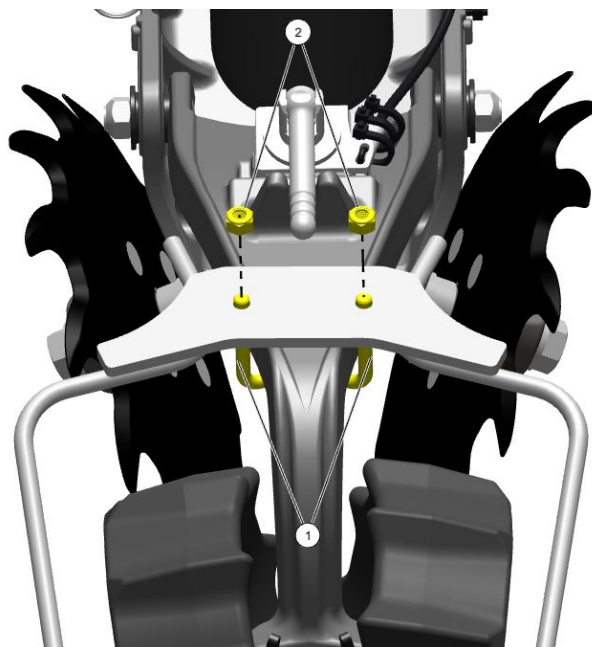
The stainless steel liquid tube is 3/8" OD. It will be necessary to adapt to liquid tubing on the planter.

Rear Mount Liquid Attachment

Locate the bracket assembly (1) and place it on top of the FurrowForce tail frame as shown.



Insert a j-bolt (1) up through one of the holes in the bracket assembly and hook on the underneath side of the tail frame. Secure with a locknut (2). Repeat for the opposite side.

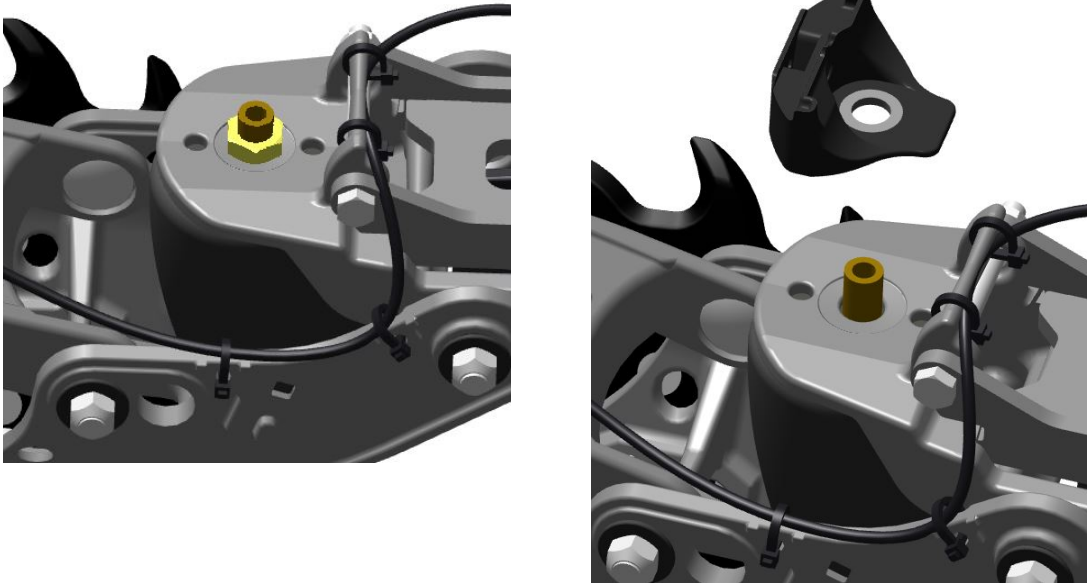


The stainless steel liquid tube is 3/8" OD. It will be necessary to adapt to liquid tubing on the planter.

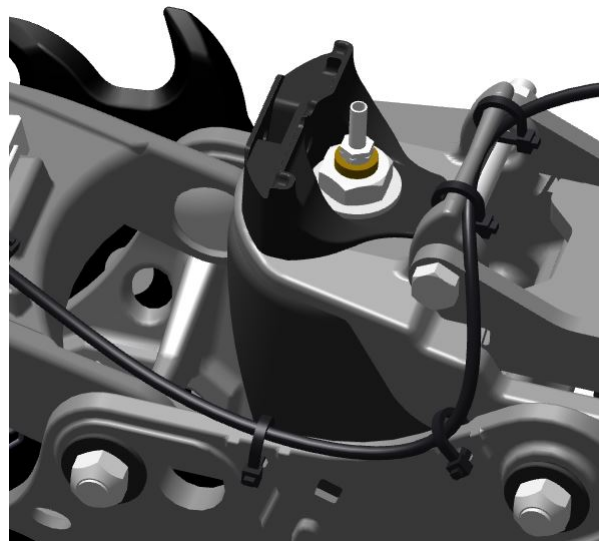
FurrowForce Control Module (FCM) Installation

Note: If you are installing and operating a manual control system (no FurrowForce Control Module), install a 1/8" NPT x 1/4" PTC fitting into each airbag stem. Refer to the "Manual Control Systems" section in "Pneumatic Installation" for details. Skip the following steps and proceed to the next section.

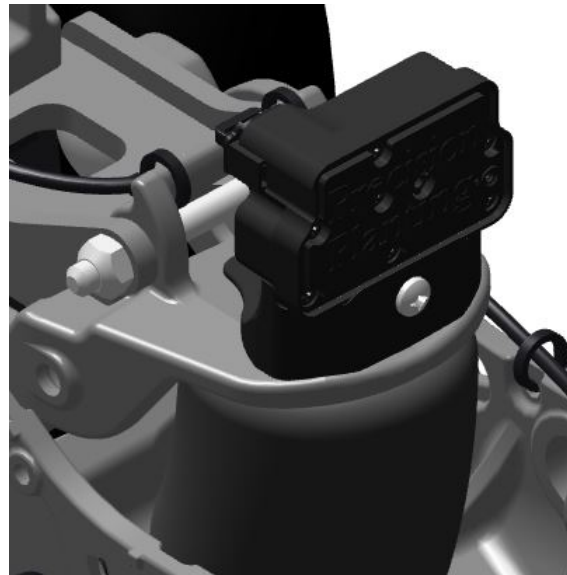
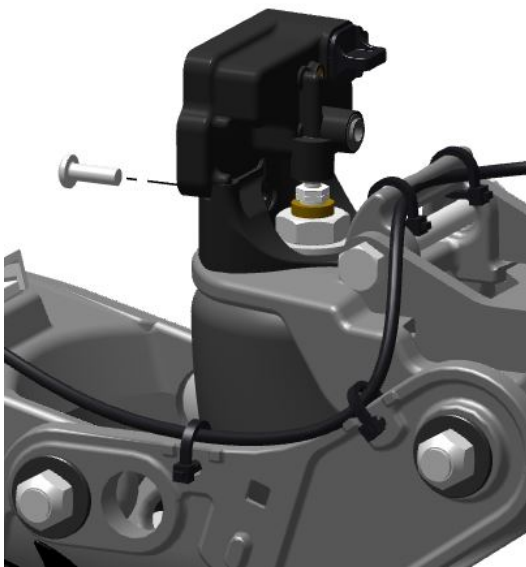
Remove the 5/8" nut on top of the airbag stem. Locate the control module base and place it over the airbag stem, oriented as shown.



Install the washer that was provided in the FCM kit, then reinstall the airbag nut. **Torque nut to 16-20 ft. lbs. DO NOT OVERTIGHTEN, or brass stem may crack.** Thread the 1/8" NPT x 1/4" OD stem into the airbag fitting. Tighten hand tight, plus one full turn. **DO NOT OVERTIGHTEN, or brass stem may crack.**



Place the Furrowforce Control Module onto the base and stem. Align the mounting hole in the module and base and secure with the provided screw.



Compressor Installation

High Capacity Electric CleanSweep Compressor

Mount the compressor to the planter using the selected mounting bracket.

Connect the compressor harness to a power source. If supplying from a PDM, connect the APEX to CleanSweep Power Adapter (729195) to the compressor harness, then to an APEX connector on the PDM. If supplying from the tractor battery, connect the CleanSweep Compressor Power Harness (755015) to the compressor, then to the tractor battery. A 12' Compressor Power Harness Extension (755100) may also be needed depending on compressor mounting location.

FurrowForce Hydraulic Compressor

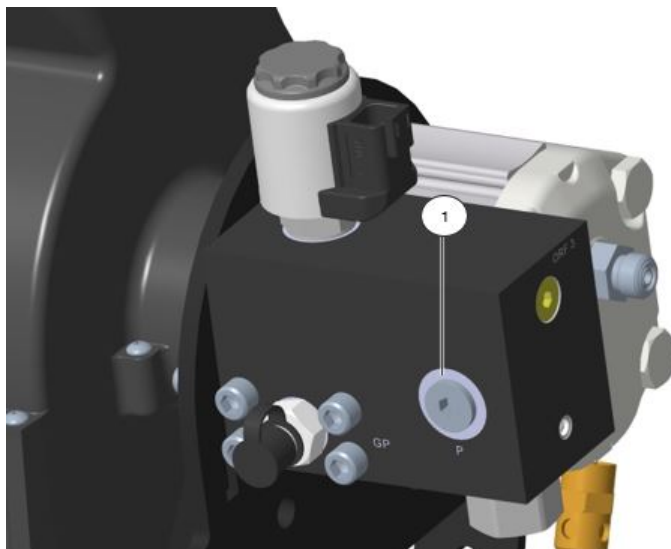
Mount the compressor to the planter using the selected mounting bracket.

Hydraulic Connections

Note: The FurrowForce hydraulic compressor requires 4 gallons per minute hydraulic oil flow. This could be supplied from a stand alone SCV or the power beyond port on the tractor. It could also be supplied from a PTO pump or tee'd in with other hydraulic systems, DeltaForce for example. If tee'd in with another system, ensure the main supply and return lines are sized adequately for the total flow on that circuit. The motor also requires a 1/4" case drain line. This could be run directly back to the tractor or tee'd in with an existing case drain line. Ensure case drain line pressure does not exceed any components rated case drain pressure.

Hydraulic Supply Connection

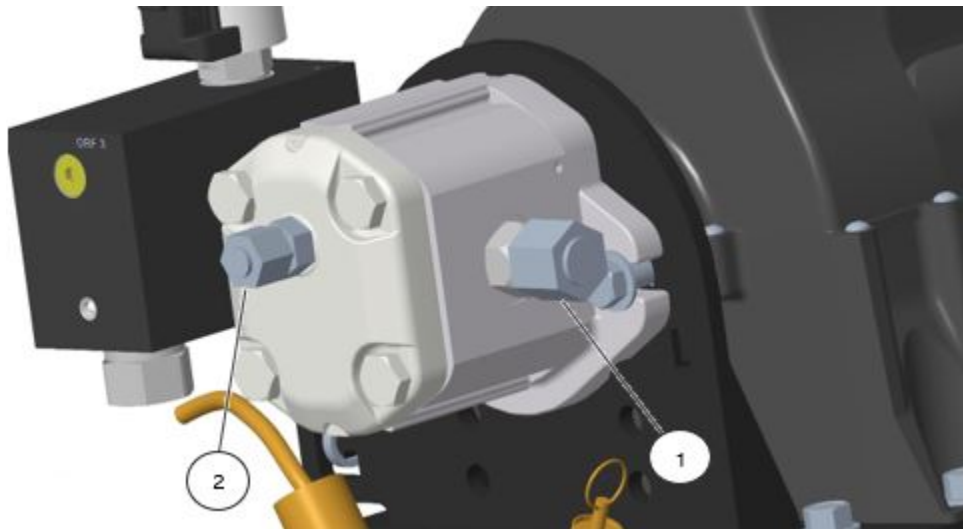
The hydraulic supply port is located on the side of the manifold and labeled "P". Remove the supply line plug (1) and install a —6 ORB fitting. Connect a 3/8" hydraulic supply hose to the fitting.



Hydraulic Return and Case Drain Connections

The hydraulic return port is located on the motor on the opposite side from the manifold (1). Remove the cap from the pre-installed —8 ORFS check valve fitting and connect a 1/2" (or 3/8") return hose. **DO NOT remove the pre-installed check valve fitting.**

The hydraulic case drain port (2) is on the end of the motor. Remove the cap and connect a 1/4" hose to the —4 ORFS fitting. Tee into an existing case drain line to the tractor, or route directly to the case drain port on the tractor.



Harness Connections

The FurrowForce hydraulic compressor requires 12 volt supply for the pressure switch and valve solenoid. It can be sourced from a CAN expansion hub, a PDM, or the tractor battery.

CAN Expansion Hub Power

If sourcing from a CAN expansion hub, use the (756560) FurrowForce Compressor Power Harness and connect the 2 pin Deutsch connector to the valve solenoid (1). Connect the 2 pin Weatherpack connector to the pressure switch (2). Connect the 6 pin Deutsch connector to a Row CAN extension and plug the extension into a CAN expansion hub.



PDM Power

If sourcing from a PDM, locate the (756561) FurrowForce Compressor Power Harness and connect the 2 pin Deutsch connector to the valve solenoid (1). Connect the 2 pin Weatherpack connector to the pressure switch (2). Connect the 3 pin AMP connector to the APEX to CleanSweep Power Adapter Harness (729195). Connect to an APEX connector on the PDM.



Tractor Battery Power

If sourcing from the tractor battery, locate the (756561) FurrowForce Compressor Power Harness and connect the 2 pin Deutsch connector to the valve solenoid (1). Connect the 2 pin Weatherpack connector to the pressure switch (2). Connect the 3 pin AMP connector to the CleanSweep Compressor Power Harness (755015), then connect it to the tractor battery. A 12' Compressor Power Harness Extension (755100) may also be needed depending on compressor mounting location.



Tank Pressure Sensor (756555)

Note: Installation of the tank pressure sensor (756555) is not required, but it allows for tank (system) pressure to be displayed on the 20|20.

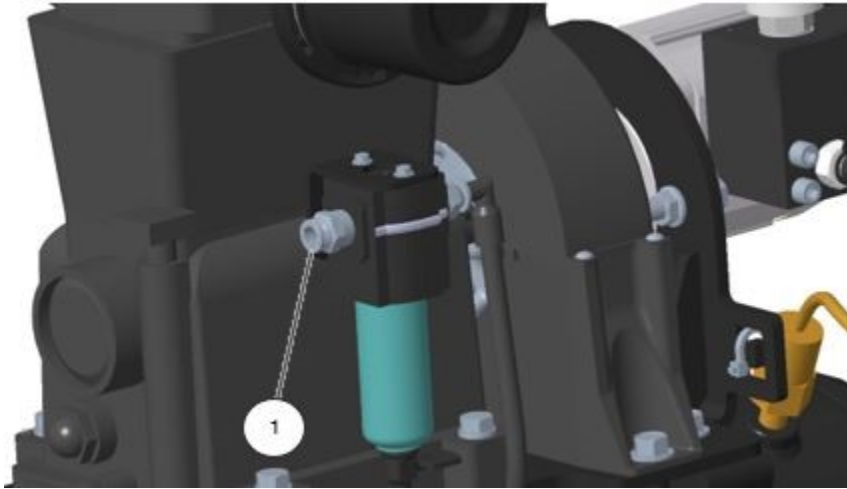
Install the tank pressure sensor to an open connection on any CAN expansion hub. Connect a 1/4" air line (tee'd from the main system supply line) to the PTC fitting (1).



Pneumatic Installation

Automatic Control

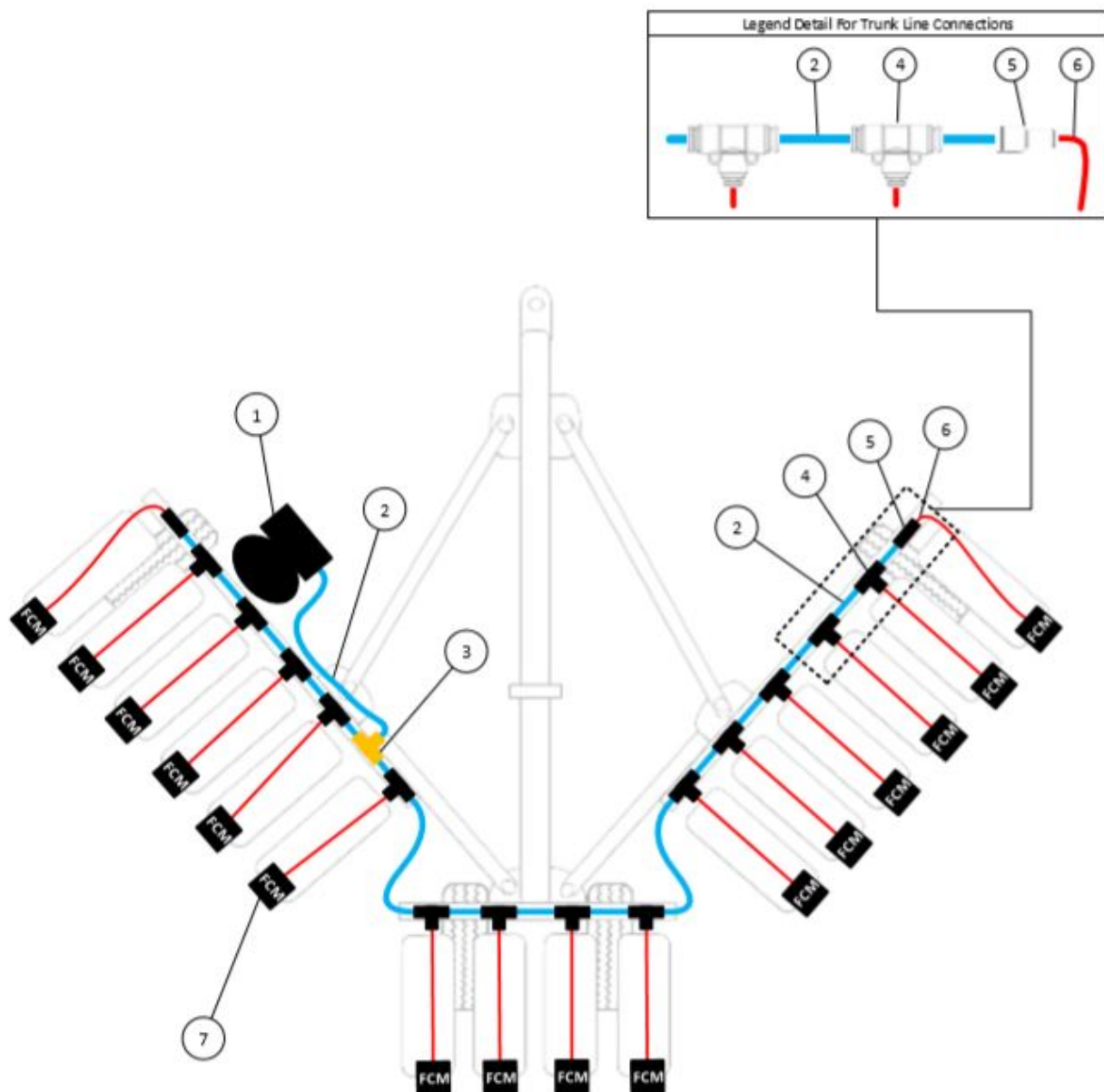
Install 3/8" air line in compressor outlet, after the water separator (1). Install a 3/8" air line across the planter bar and use a 3/8" x 3/8" x 3/8" PTC tee to connect to the supply line from the compressor. At each row, splice in a 1/4" x 3/8" x 3/8" PTC tee. Install 1/4" line on each row unit and connect to the FurrowForce Control Module. Estimate 5 feet of 1/4" line per row. Refer to the example diagram on the following page.



FurrowForce Automatic Control – Airline Diagram

Item	Part NO	Description	QTY
1	Varies	Air Compressor	1 per planter
2	326474	3/8" Black Nylon Tubing	150'
3	724390	3/8" x 3/8" x 3/8" PTC Tee	1 per planter
4	724498	1/4" x 3/8" x 3/8" PTC Tee (10 pack)	14
5	724078	1/4" x 3/8" PTC Union	2
6	726323	1/4" Black Nylon Tubing	150'
7	768300	FurrowForce Control Module	16

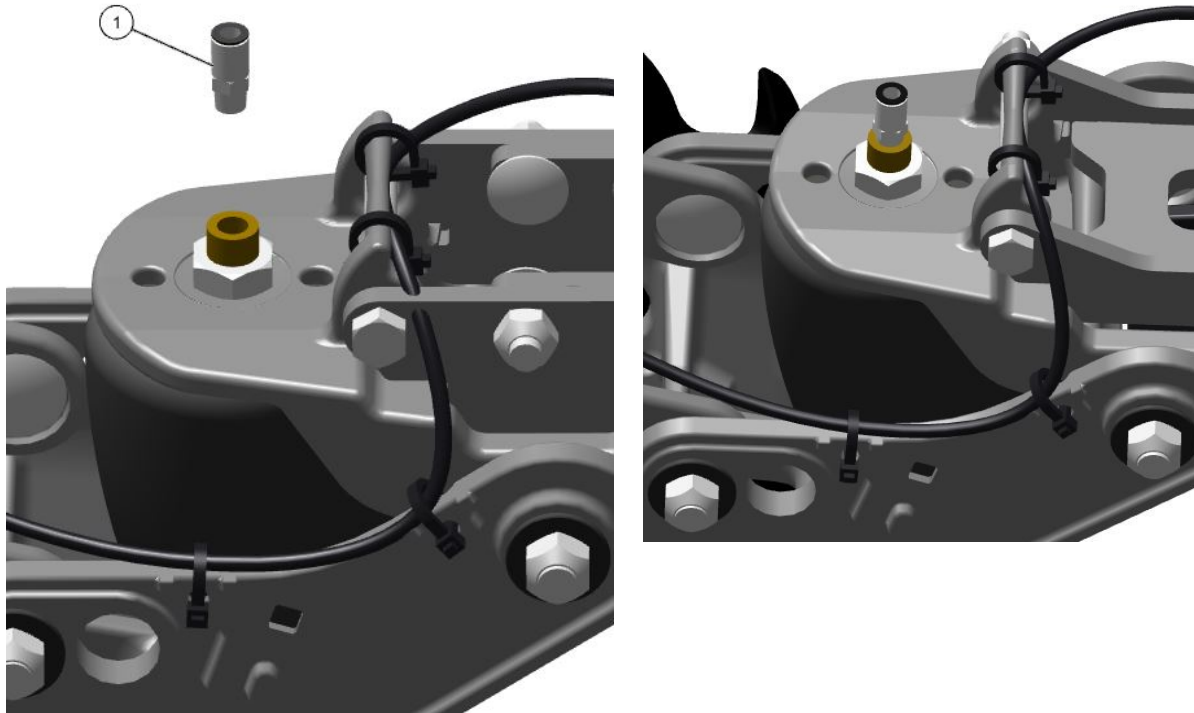
*Estimate ~5 ft. of 1/4" tubing per row



Manual Control Systems

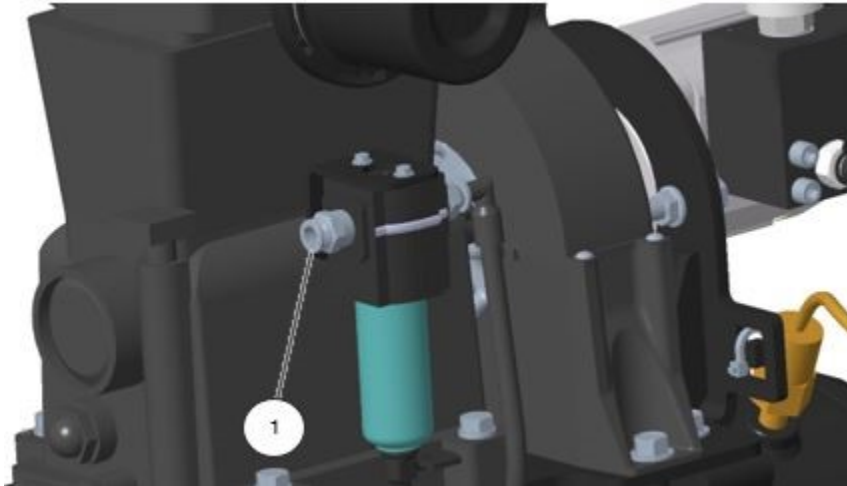
All manual control systems require a fitting to be installed in the airbag stem. This will allow the air line to be connected to the airbag.

Thread a 1/8" NPT to 1/4" PTC fitting (1) into the airbag stem on each row. Tighten hand tight, plus one full turn. **DO NOT OVERTIGHTEN, or brass stem may crack.**

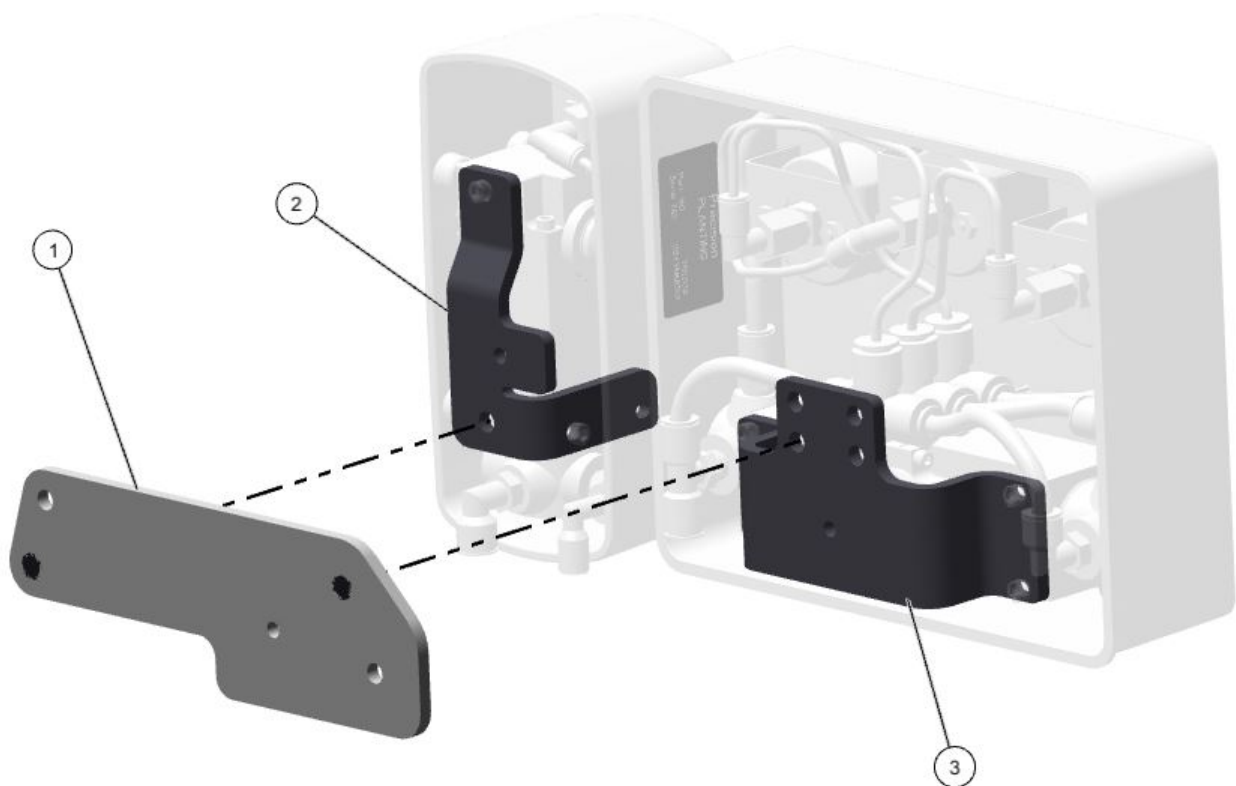


Manual Control with CleanSweep System Installed

Install 3/8" line at the compressor outlet, after the water separator (1). Adapt to the existing 1/4" line supplying the CleanSweep control box and splice in a 1/4" x 1/4" x 1/4" PTC tee at the controller to feed the FurrowForce manual controller.

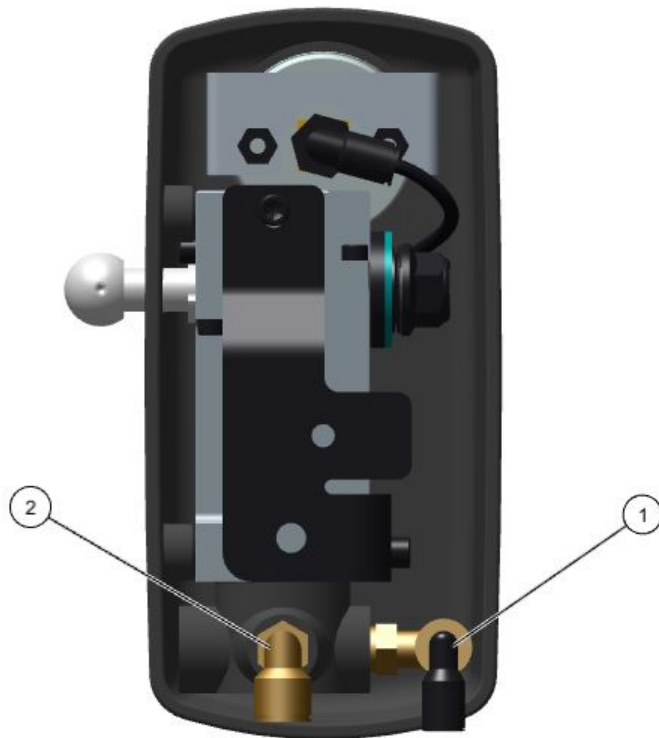


If the FurrowForce to CleanSweep mounting bracket (1), 756107, was purchased, orient the bracket as shown, aligning a pin with both the FurrowForce Manual Controller (1) and the CleanSweep Controller (2). Mount to each.



If the 756107 mounting bracket was not purchased, the FurrowForce Manual Controller can be mounted separately using the Universal Cab Metal Mounting Bracket (725804) or a RAM mount.

There are two fittings on the FurrowForce manual controller. While looking at the back of the controller, the supply fitting is the black fitting on the right (1), and the output fitting is the brass fitting on the left (2).



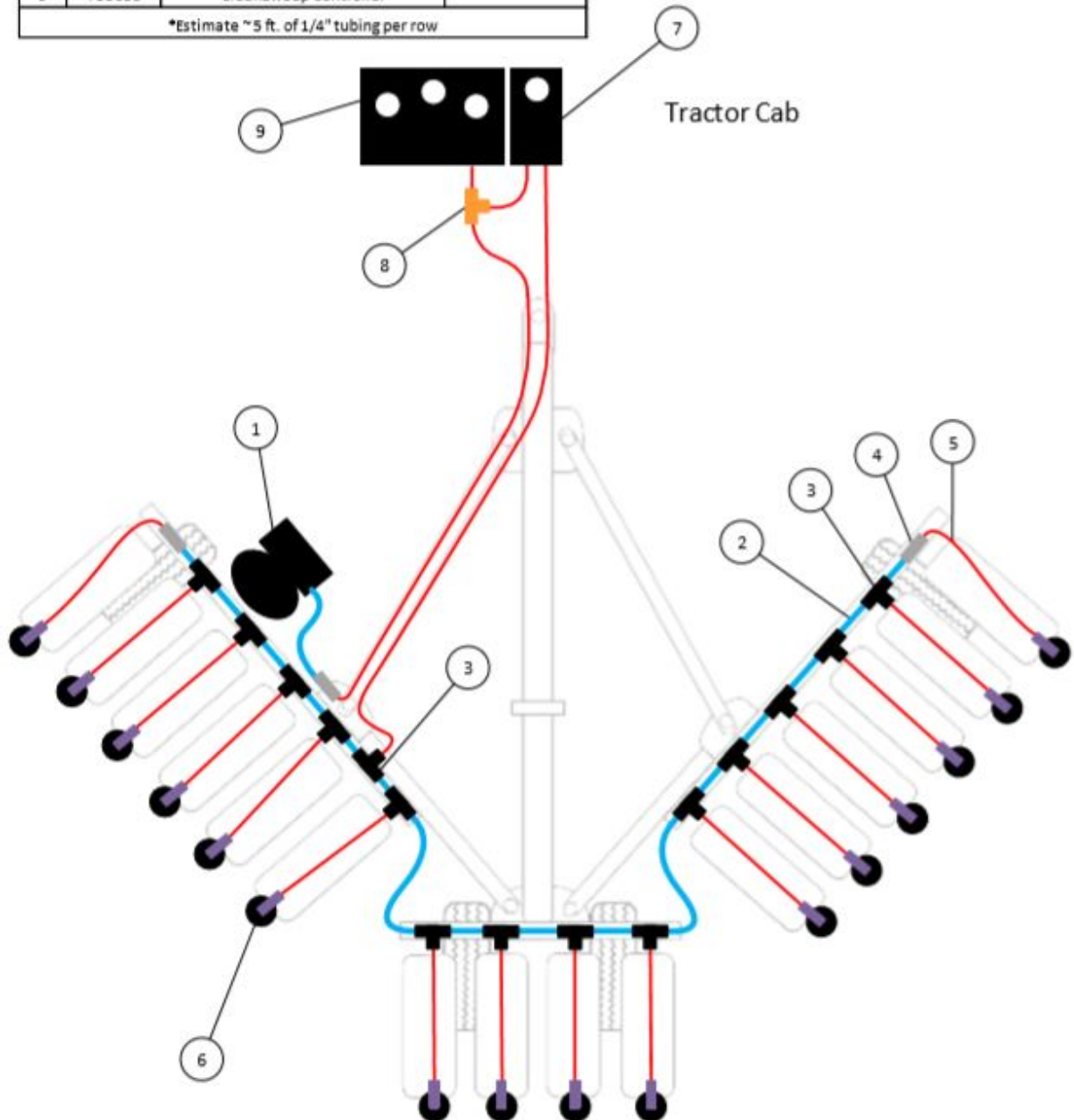
Connect a line from the 1/4" x 1/4" x 1/4" PTC tee to the supply fitting. Install 1/4" air line to the output fitting and route back to the planter bar.

Install a 3/8" air line across the planter bar. Install a 1/4" x 3/8" x 3/8" PTC tee on the main trunk line and attach the 1/4" air line from the manual controller. At each row, splice in a 1/4" x 3/8" x 3/8" PTC tee. Install 1/4" line on each row unit and connect to the 1/4" PTC fitting installed on each FurrowForce airbag. Estimate 5 feet of 1/4" line per row. Refer to the example diagram on the following page.

FurrowForce Manual Control with CleanSweep – Airline Diagram

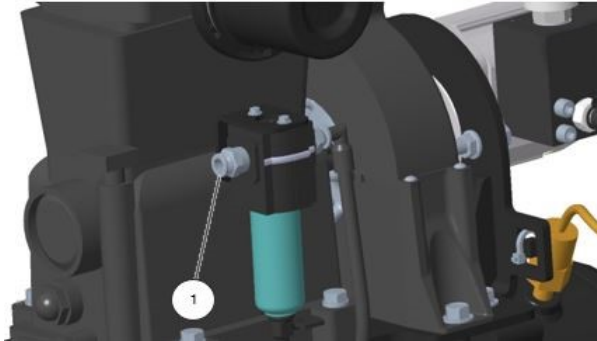
Item	Part NO	Description	QTY
1	Varies	Air Compressor	1 per planter
2	326474	3/8" Black Nylon Tubing	150'
3	724498	1/4" x 3/8" x 3/8" PTC Tee (10 pack)	15
4	724078	1/4" x 3/8" PTC Union	3
5	726324	1/4" Black Nylon Tubing	200'*
6	726757	1/8" NPT x 1/4" PTC (10 pack)	16
7	756100	Manual Controller	1
8	724327	1/4" x 1/4" x 1/4" PTC Tee	1
9	755055	CleanSweep Controller	

*Estimate ~5 ft. of 1/4" tubing per row



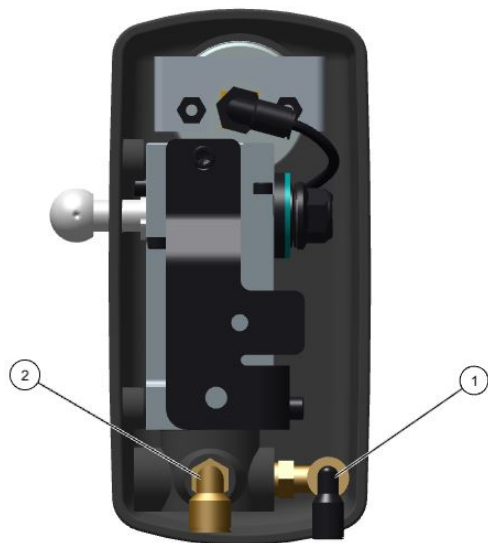
Manual Control without CleanSweep System Installed

Install 3/8" line in the compressor outlet, after the water separator (1). Install a 1/4" to 3/8" PTC union on the 3/8" line. Install 1/4" air line and route to the FurrowForce Manual Controller in the tractor cab.



Mount the FurrowForce Manual Controller in the cab using the Universal Cab Metal Mounting Bracket (725804) or a RAM Mount.

There are two fittings on the FurrowForce manual controller. While looking at the back of the controller, the supply fitting is the black fitting on the right (1), and the output fitting is the brass fitting on the left (2). Install the supply line to the supply fitting. Install 1/4" air line to the output fitting and route back to the planter bar.

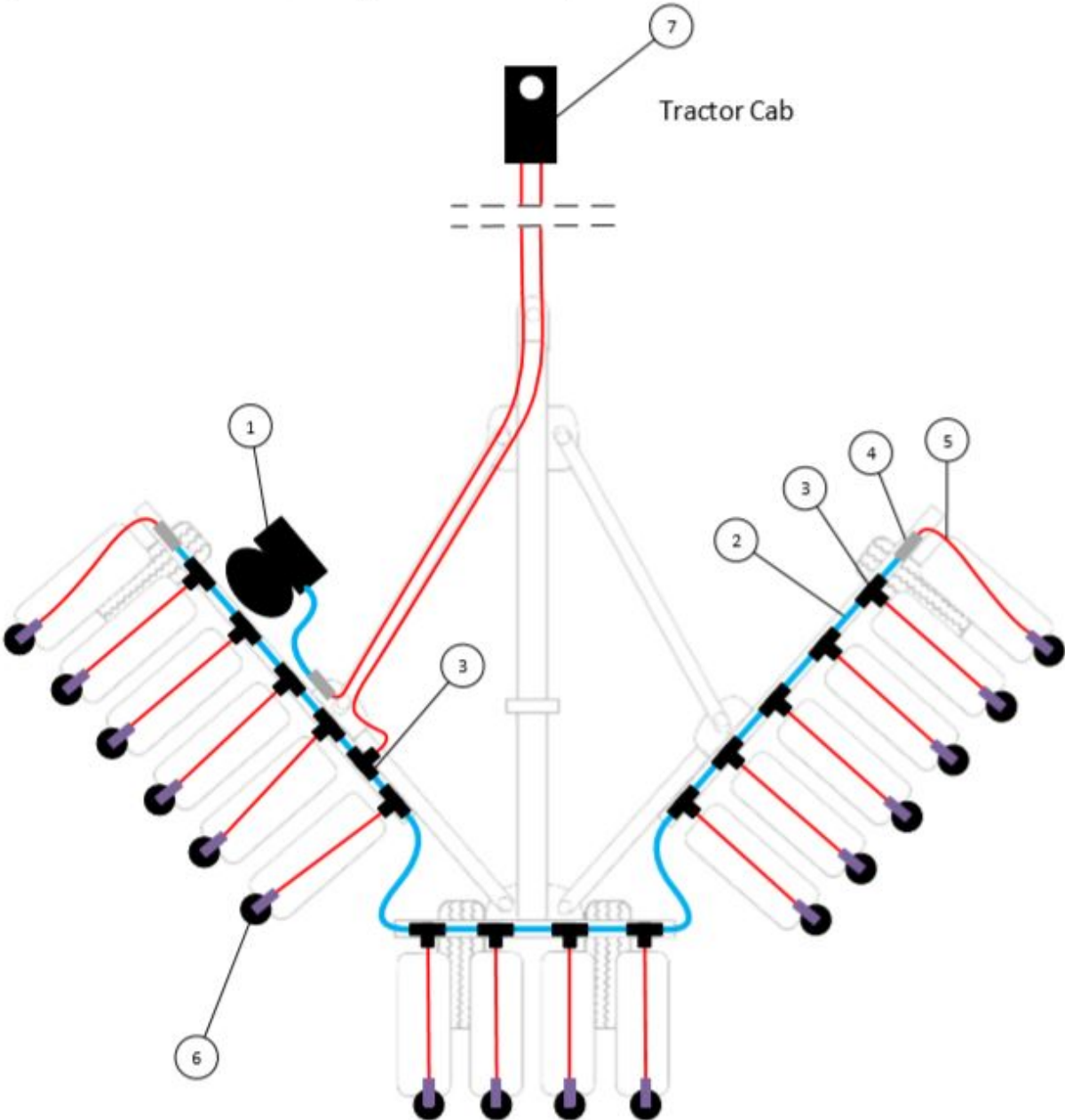


Note: 3/8" air line could also be used for the supply and return lines from the planter to the manual controller. The lines would need to be adapted to 1/4" at the manual controller.

Install a 3/8" air line across the planter bar. Install a 1/4" x 3/8" x 3/8" PTC tee on the main trunk line and attach the 1/4" air line from the manual controller. At each row, splice in a 1/4" x 3/8" x 3/8" PTC tee. Install 1/4" line on each row unit and connect to the 1/4" PTC fitting installed on each FurrowForce airbag. Estimate 5 feet of 1/4" line per row. Refer to the example diagram on the following page.

FurrowForce Manual Control non CleanSweep – Airline Diagram

Item	Part NO	Description	QTY
1	Varies	Air Compressor	1 per planter
2	326474	3/8" Black Nylon Tubing	150'
3	724498	1/4" x 3/8" x 3/8" PTC Tee (10 pack)	15
4	724078	1/4" x 3/8" PTC Union	3
5	726324	1/4" Black Nylon Tubing	200'*
6	726757	1/8" NPT x 1/4" PTC (10 pack)	16
7	756100	Manual Controller	1
*Estimate ~ 5 ft. of 1/4" tubing per row			

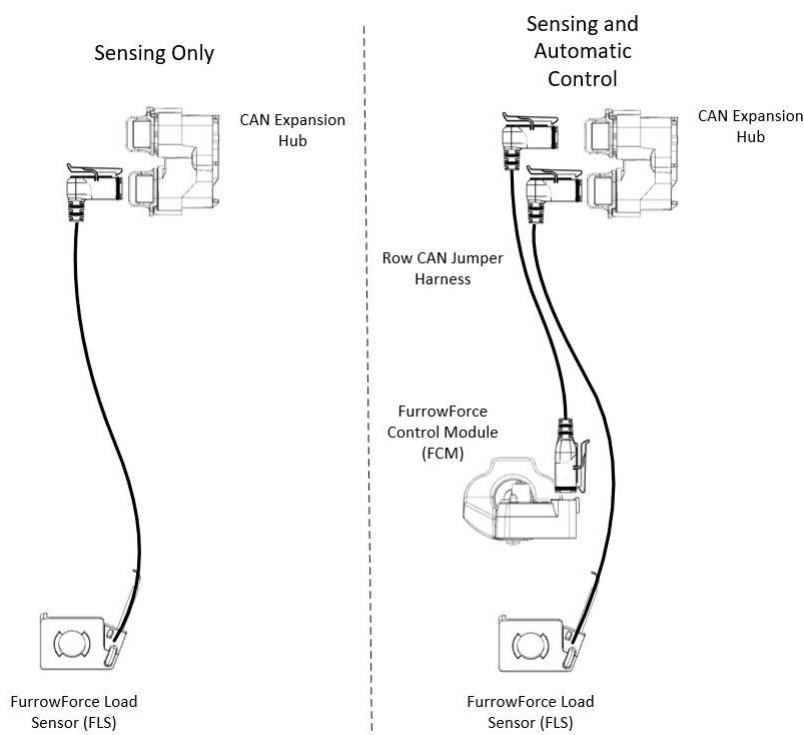


Harness Installation

Note: If a manual control only system (no FurrowForce Load Sensors or FurrowForce Control Modules) is being installed, skip this section as it does not apply.

FurrowForce requires at most two 6 pin CAN connections (per row) in a CAN expansion hub. A sensing only system (no FCM), requires one open connection for the load sensor. A sensing and control system requires two open connections, one for the load sensor and one for the control module. If a CAN expansion hub is not present, one will need to be added per row of FurrowForce. If an existing CAN expansion hub does not have the available connections required, a second CAN expansion hub will need to be installed.

The load sensor includes an integrated harness to plug into the CAN expansion hub, while the control module requires a Row CAN jumper harness to plug into the CAN expansion hub.



Sensing Only System

Route the FurrowForce Load Sensor harness towards the front of the row unit. Bundle with the airline and zip tie to secure locations along the shank ensuring it is away from pinch points and free from gauge wheel travel, etc. It should also be routed such that there is enough slack to travel with FurrowForce and row unit movement.

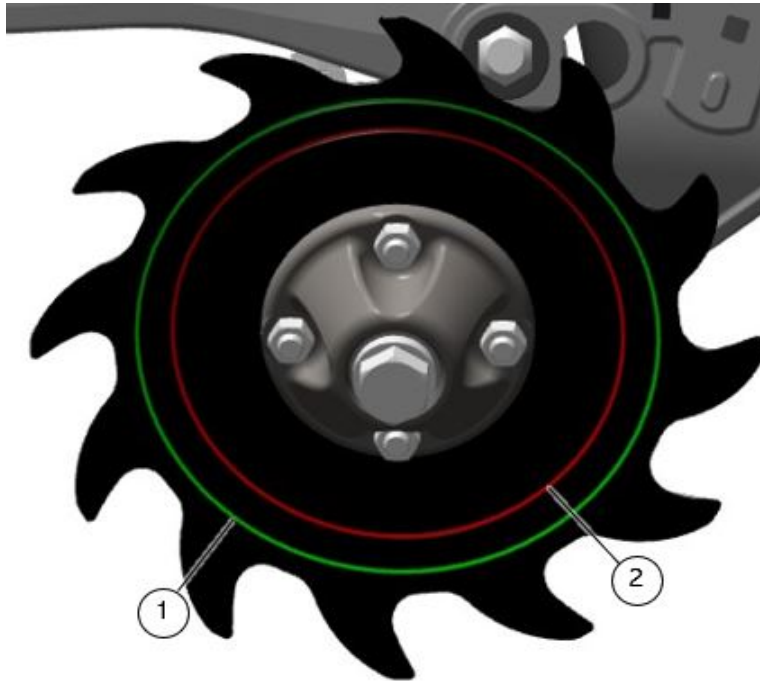
Sensing and Automatic Control System

Install the necessary CAN Jumper into the FurrowForce Control Module. Bundle the FLS harness, the airline, and the CAN jumper from the FCM and rout towards the front of the row unit. Zip tie to secure locations along the shank making sure it is away from pinch points and free from gauge wheel travel, etc. It should also be routed such that there is enough slack to travel with FurrowForce and row unit movement.

Setting the First Stage Closing Wheel Depth

After installation is complete, the first stage closing wheel depth needs to be set. This will need to be done and checked in the field.

The first stage wheels have two closing depth indicator rings cast into the outside face of the wheel. The outer diameter ring indicates approximately 1.5" closing depth (1) The inner diameter ring indicates approximately 2" closing depth (2).



For planting depths of 1.5" or deeper, start with the wheel depth set to approximately 0.5" above planting depth. For example, if planting depth is 2", initially set the closing depth to operate at the 1.5" ring. Shallower planted crops may require running the first stage wheel depth at, or below planting depth. Caution should be used if planting on extreme contours with the wheels set at or below planting depth as there could be increased risk of seed disturbance.

Note: When initially setting closing depth, operate the closing force target (or pressure) such that the closing system is fully in the ground and achieving 100% ground contact. Check closing performance in-field to adjust as necessary.