

QUANTUM



Operator Training 2023

MORRIS

Training Outline

- A. Tractor and hitch requirements.
- B. Connecting seeding tool to Tractor.
- C. Quantum
 - a. Hitch
 - b. Frame
 - c. Air system
 - d. Row unit
 - e. Opener hydraulics & controlers
- D. Field start-up.
- E. Maintenance and lubrication.
- F. Ground engagement tools.
- G. Appendix A Bleeding opener hydraulic system.
- H. Appendix B Other Morris Quantum ground engaging tools.

QUANTUM Tractor Requirements

Hydraulic Flow & Horsepower

- The **QUANTUM** requires around 20gpm for lifting and lowering the openers quickly
- We recommend setting the hydraulic circuit for opener hydraulics to 40% or ~25 gpm maximum. Full flow to the opener hydraulics will reduce fan speed during lifting/lowering of the openers.
- You typically require 4.5-5.5 hp per opener to pull a **QUANTUM** with common paired-row opener at 5mph.



Hitch Clevis Options



A new greaseable articulating hitch clevis with excellent wear life is part of the new design. This hitch clevis is also used on the quad hitch at the back of the drill for attaching tow-behind carts.

All Quantum Air Drills are equipped with either CAT 4 or CAT 5 clevises. **Customers/Dealers should verify Tractor and Air Cart hitch pin requirements when ordering Quantum drills.**

Note: All Tow Between Carts require the QUANTUM front hitch to have a CAT 4 Clevis.

CAT 5

S64300 Clevis - 2 Diameter Draw Pin (Includes Ball Insert S65738)

S64310 Clevis - 2 3/4 Diameter Draw Pin (Includes Ball Insert S65742)

CAT 4

S66236 Clevis - 1 1/2 Diameter Draw Pin (Includes Ball Insert S65740)

K62145 Clevis - 2 Diameter Draw Pin (Includes Ball Insert S67388)

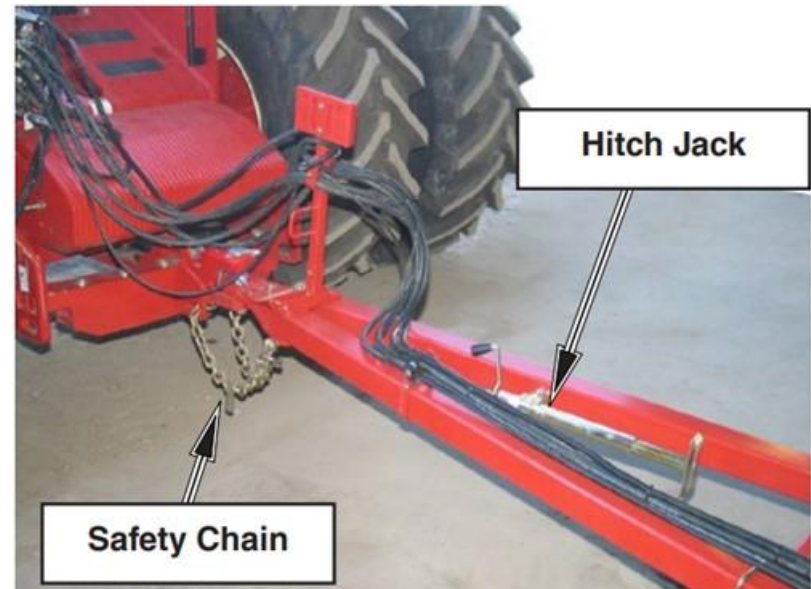
When coupling hydraulics to the tractor:

- Insert case drain first.

When decoupling hydraulics from the tractor:

- Release case drain last.

Note: this regimen will prevent pushing a seal out of an air cart fan motor.

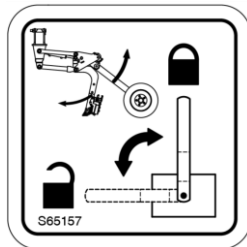


QUANTUM Transport Settings:

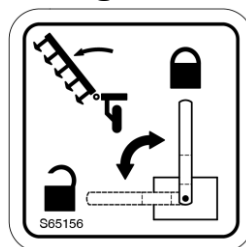


Openers Valve

Wing Valve



S65157



S65156

Wing Lock/Opener Lock Valves:

- Valves shown closed
- Close valves for transporting the drill
- Open valves before winging machine down or adjusting the openers

Ensure that the wing fold hydraulic rams are completely extended.

- ❑ All models: the pin connecting the frames should be in the middle of the slide when the wing fold rams are fully extended.
- ❑ 50' model: the flip wing pin should extend to the outside edge of the slide.

Note: this regimen will allow full travel in the wing sections for better ground following.



Hinge pin is hidden behind primary hoses

QUANTUM Hitch

The pulling hitch has been redesigned on the QUANTUM. The new hitch uses 20% more steel than the C2 Contour predecessor. The re-design moves the center opener to the rear of the drill and this has resulted in a stronger superior hitch. The low pull point design, illustrated by the picture below, reduces draft load on the front tires and helps power the drill through wet spots.



Note: QUANTUM hitches are built to be pulled forward. It is best practice to **NOT** pull the hitch sideways if stuck, as damage can occur.

QUANTUM Frame

Air Drill Frame: The **QUANTUM** Air Drill frame is a simple slab frame system, designed to let the parallel link openers manage depth control during seeding. **No leveling of the frame is required.** During normal operation most of the drill weight is carried on the opener packer tires. The rear tires may even leave the ground while traveling through sharp gullies; this is normal, and it will not affect the seed depth control of the openers. If the tires are in the air consistently, optional weight kits can be applied to the depth beams near the rear axles.



Normal Frame Angle



QUANTUM Air System

- ❑ The new 3” diameter urethane-lined primary hoses are routed on the front of the drill and outside of the frame to eliminate kinking during folding.
- ❑ 3” stainless pipe is used where possible. This improves the air system durability and reduces hose friction that robs air system capacity.



Flat-Fan Divider Heads

- ❑ Highly efficient airflow system with smooth, horizontal flow of product with no abrupt directional changes from the metering to the furrow.
- ❑ Accurate division into secondary hoses.
- ❑ Gentle on seed.
- ❑ Internal area of the 'fingers' have increased by 30% from former design.

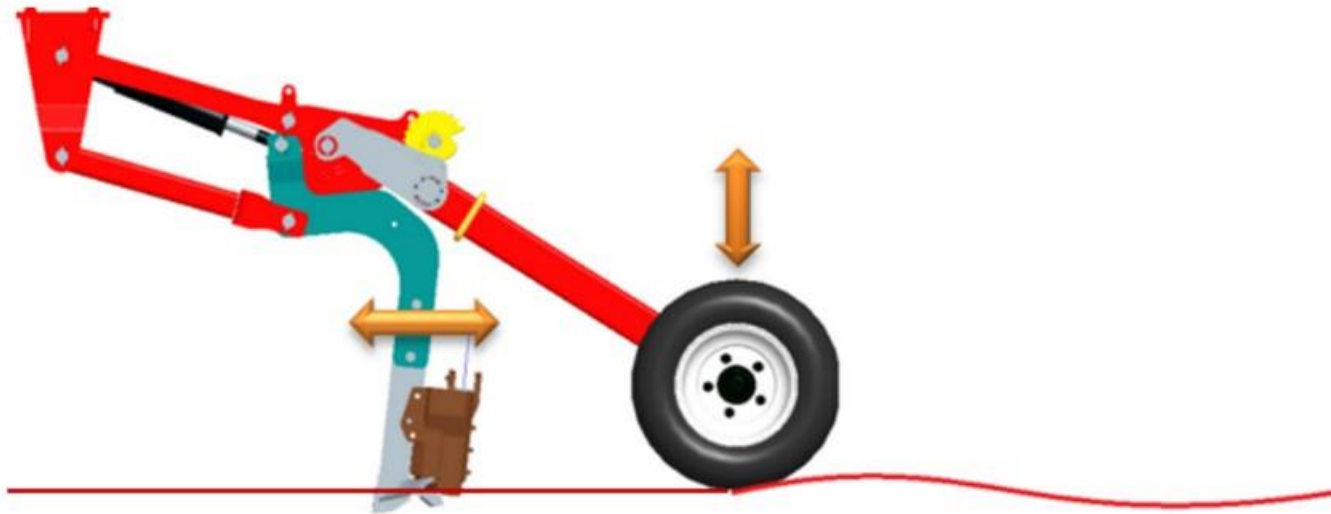


How it Works:

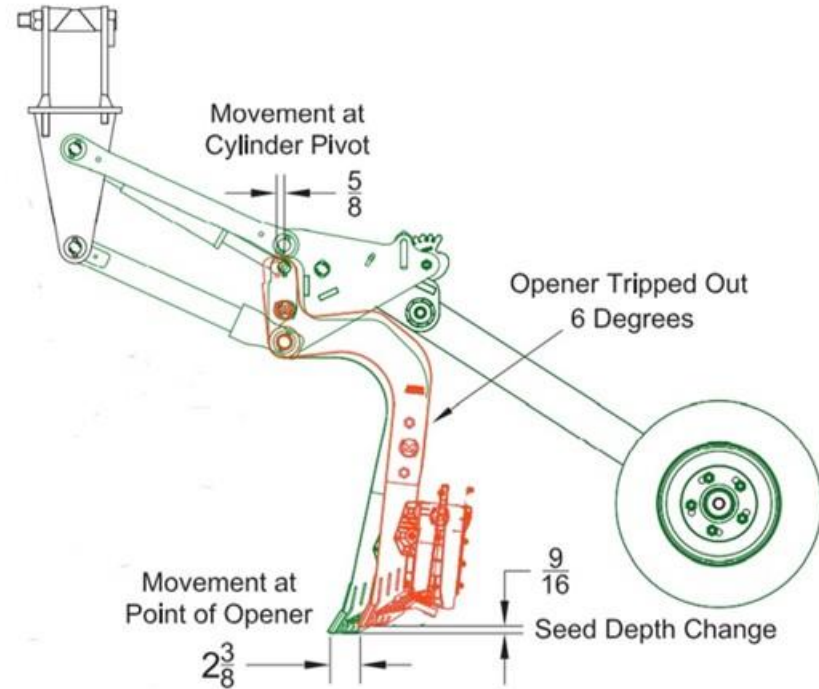
- ❑ Changes to the depth cam effectively raises and lowers the packer tire relative to the opener. Each notch on the depth cam changes depth by $\frac{1}{4}$ ".
- ❑ The parallel linkage with 1:1 contour ratio maintains opener penetration angle and seeding depth precisely over a vertical travel range of 16".
- ❑ The packer tire acts as a gauge wheel and regulates seeding depth.



- ❑ The Quantum row unit is functioning properly when the shank is completely pulled forward and the packer/gauge wheel is rolling smoothly along the ground.
- ❑ If either the shank or packer is not operating as described above the row unit is not placing seed to a consistent depth.



- Note in the example below that when the point of the opener is not fully forward the seed is placed $\frac{9}{16}$ " shallower than intended.





- ❑ While operating the machine you will be able to see if openers are fully locked forward and packers are running smoothly along the soil surface.

Various forces acting on the row unit

Down Force - vertical force that is pushing the opener downwards due to hydraulic pressure.

Trip Force - horizontal force that is holding the shankholder in place in working position, resisting against soil draft forces.

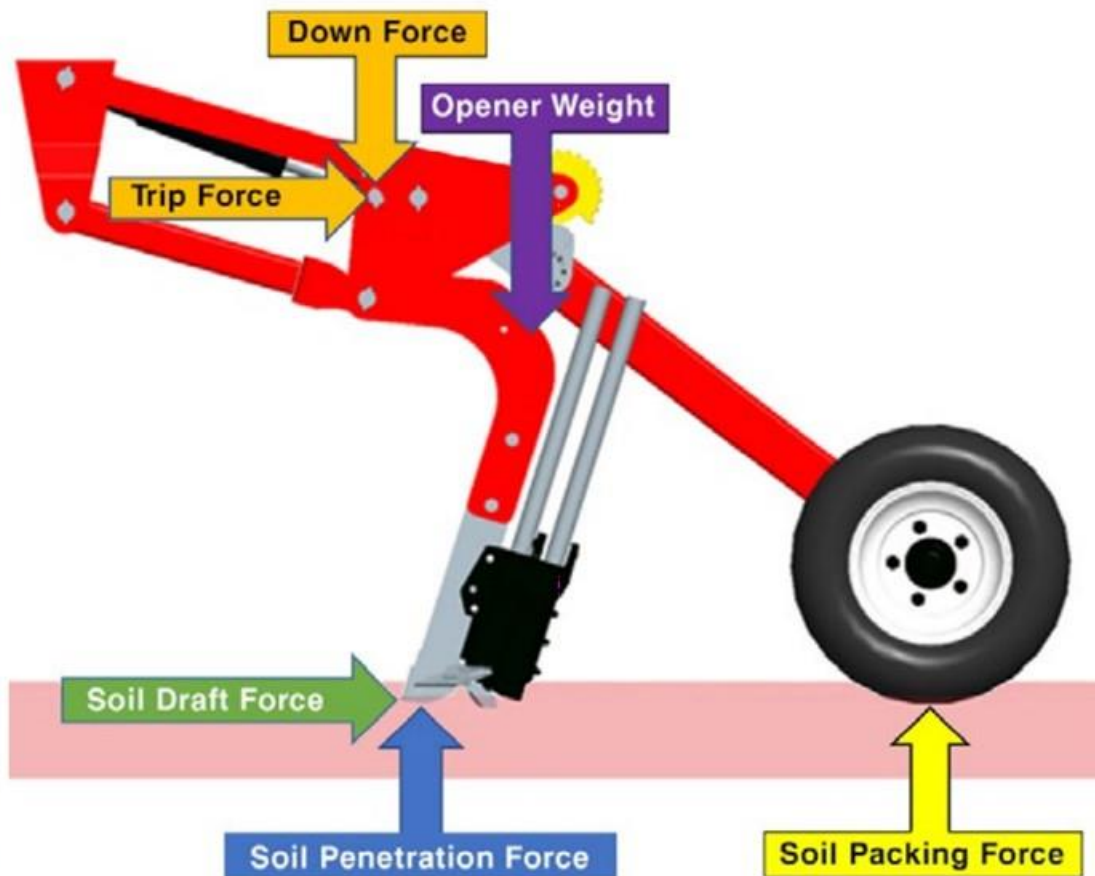
Soil Draft Force - horizontal force from soil resistance on the shank/opener trying to rotate shank backwards.

Soil Penetration Force - the amount of force required to push the shank/opener vertically into the soil; this varies based on:

- Opener type (single shoot, dual shoot paired row, dual shoot sideband etc).
- Soil type (clay, loam, sandy loam etc).
- Moisture conditions.

Soil Packing Force - the amount of force applied at the packer wheel of the row unit to pack/firm the furrow and maintain depth

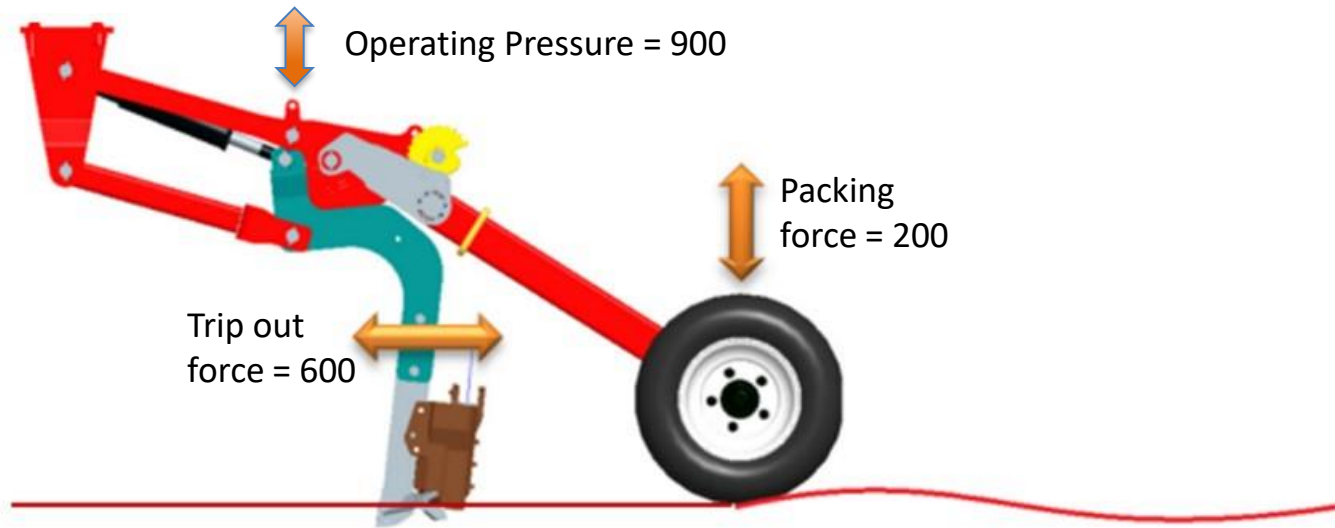
Opener Weight - approximate static weight of opener affecting packer force.



QUANTUM Operating Pressure, Trip out and Packing Force

Shank Trip Force: Shank trip force (lbs.) is 2/3 of the system pressure (ex. 900psi display pressure = 600lbs shank trip force)

Packing Force: Packing force is roughly 1/3 of the shank trip force (ex. 600lbs shank trip force would give approximately 200lbs of packing force).



QUANTUM Opener Hydraulics



Operating Valve:

- ❑ The QUANTUM uses an active hydraulic control system.
- ❑ This means the tractor's hydraulic circuit to the QUANTUM openers are **permanently engaged into the working position** through manifold block (S64940) which controls the Lift-Lower and packing pressure functions via a controller and an in-cab display.
- ❑ Valve "S1" controls the lift/lower function of the openers.

CAUTION: Default valve position is Openers Down when applying flow at "Pressure" port.

- ❑ Valve "S2" regulates hydraulic pressure to the openers.

Warning: Crushing Hazard

To prevent serious injury or death:

- Stand Clear - openers move rapidly under hydraulic pressure.
- Before servicing hydraulics - Lower openers to ground and relieve pressure from hydraulic system.
- Shut tractor off and remove key before servicing or adjusting depth.
- Place "Openers" valve in locked position before adjusting depth or servicing.



QUANTUM Opener Hydraulic Controller Options



JEM CC PILOT Display Screen and ESX Controller

Option A:

- Morris Air Cart ground drive units Air Carts use a JEM CC Pilot Drill Control system package.
- Non-Morris Air Carts coupled with the Quantum.



TopCon X35 monitor and Apollo ECU

Option B:

- Variable rate and ICT sectional control Air Carts use X35 TopCon Monitors with Apollo ECU.
- Lift Control will automatically Lift/Lower the openers when entering and exiting a headlands or previous applied coverage.
- Pack Control is an option. This option provides consistent pack force across soft and hard regions of a given field by automatically adjusting opener pressure.
- Note: Pack Control - (Opener Pressure Control) requires a complete spare drive channel on Apollo ECU. A 4 Tank Cart would require an additional EM40.**

Hydraulic Pressure Setting

JEM CC Pilot Display Shown

- Pressure can be adjusted on the go from the tractor cab using the display.
- Pressing the Pressure “INC” button on the display will increase the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will lift the pressure value by approximately 25 psi (172 kPa).
- Pressing the Pressure “DEC” button on the display will decrease the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will drop the pressure value by approximately 25 psi (172 kPa).
- The system will remember the last pressure setting that it operated at and revert to that at next start up.



Warning

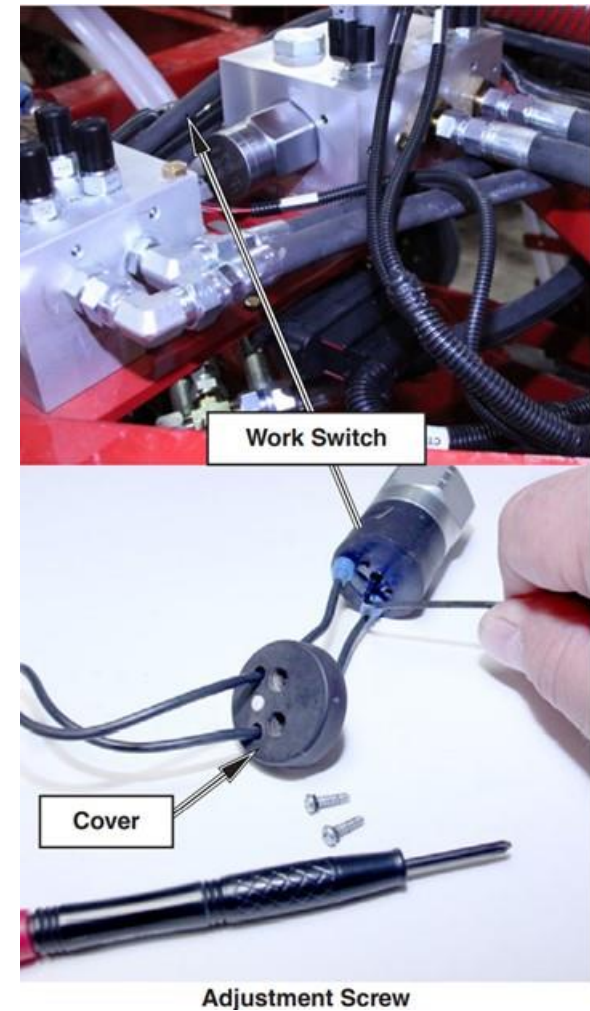
Openers drop with full down force when powering up or rebooting the controller with hydraulics engaged.



QUANTUM Work Switch Option

Quantum Work Switch Option for Standard Drive Air Carts.

- ❑ The work switch, located on the opener hydraulic block, controls seed and fertilizer metering at the air cart as openers are lifted/lowered on headlands.
- ❑ It is a pressure activated switch that responds to opener oil pressure and turns off the main clutch on the air cart.
- ❑ The work switch comes pre-set, but can be adjusted by removing the plastic cover and using an allen wrench. Turning the allen screw clockwise increases sensitivity, and anti-clockwise decreases sensitivity



TopCon X35 Lift Control Window

The screenshot shows the 'Seeder Controller (Sim)' interface. At the top, there are icons for a fan, a wheel, and two buttons labeled '1' and '2'. Below these is a large display showing '800 psi' as the target pressure and '794 psi' as the current pressure. To the left of the current pressure is a gauge icon. Below the target and current pressure are four buttons: a minus sign, a plus sign, a lightning bolt with 'A', and a circular arrow. At the bottom, there are two preset buttons for '700 psi' and '800 psi', and two more buttons with icons of a lift arm and a lock. Callout boxes on the left and right describe these controls.

Target – Pressure

INC / DEC

Preset 1 - 2

Current Hydraulic pressure

AUTO MODE / Manual Mode (set to Auto)

FLOAT Mode -Turns Pack Control On / Off

Drill Lift Track Master (Auto Lift)

Lift Control (Up / Down) Over Ride

Warning

Openers drop with full down force when powering up or rebooting the controller with hydraulics engaged.



QUANTUM Hydraulic Pressure Setting

TopCon X35 Pack Control Window



The screenshot shows the 'Seeder Controller' interface. At the top, there are icons for a seeder, a wheel, and two numbered buttons (1 and 2). Below these, a red-bordered box contains the 'Target - Pack Force' set to '200 lb' and the 'Actual - Pack Force reading from Spindle' also at '200 lb'. Below the target box, the 'Actual - Hydraulic Pressure applied to the Openers' is shown as '785 psi'. The interface includes a control panel with minus (+) and plus (-) buttons, a lightning bolt icon with 'A', a refresh icon, and a bottom row with '200 lb' and '250 lb' buttons, a green arrow icon, and a lock icon.

Target - Pack Force

Actual - Pack Force reading from Spindle

Actual - Hydraulic Pressure applied to the Openers

Warning

Openers drop with full down force when powering up or rebooting the controller with hydraulics engaged.



QUANTUM Field Start-up

Air System Check

- 1) Lower openers to the ground.
- 2) Set air cart to deliver seed only.
- 3) Prime the air system with seed.
- 4) Check that seed is coming out the side port (s) of the openers.
- 5) Take the time to check for audible air leaks at the various connection points of the air system.



Setting Seed Depth

- 1) Lift openers into transport position.
- 2) Adjust the depth cams of 4 openers on one side of the drill in one letter increments (e.g. D,E,F&G).
- 3) With the drill and air cart fully operational, seed ~ 100 feet.
- 4) Choose the optimal seed depth by uncovering the soil above the seed from the top down (seed will in a 1" ribbon at the edge of the furrow and the fertilizer will be central and $\frac{3}{4}$ " below the seedbed).
- 5) Lift openers back into transport position and set each opener to the letter increment that is optimal for seeding depth. Some growers set openers one notch deeper in implement wheel tracks depending on soil type and wheel lug depth.

Agronomist Tip: Don't seed shallower than $\frac{3}{4}$ ". The root cause of most crop emergence complaints I've investigated are due to shallow seeding and/or excessive operating pressure.

QUANTUM Field Start-up

Setting Opener Pressure

- 1) Set operating pressure at 900 psi on your controller in the tractor cab. In most direct seeding situations this is a more than adequate operating pressure.
- 2) While seeding decrease the operating pressure gradually (25 psi increments) until you notice opener packer tires not running smoothly or shanks begin to tremble or trip back.
- 3) Increase the operating pressure by 50 psi from this threshold.
- 4) You may find some fields (ie pulse stubble) require less operating pressure.



QUANTUM Seeding into pre-worked soil

The **QUANTUM** Air Drill is designed primarily for direct seeding (no prior tillage). If seeding into loose soil:

Goal:

Limit soil throw onto already seeded furrows.

Settings:

1. Reduce opener pressure (500-600 range).
2. Other operation tips:
 - a. Reduce seeding depth and/or
 - b. Reduced seeding speed



QUANTUM Maintenance

After 50 hours:

- Torque check 1" bolts that mount openers to the frame. 400 ft lbs.
- Visually check other bolts on the frame for tightness. Torque spec is 270 lb lbs for $\frac{3}{4}$ " bolts and 350 ft lbs for 1" bolts.

Pre-Seeding Check:

- 600/50-22.5 tire pressure should be 38 psi.
- Wheel stud torque spec is 400 foot pounds.



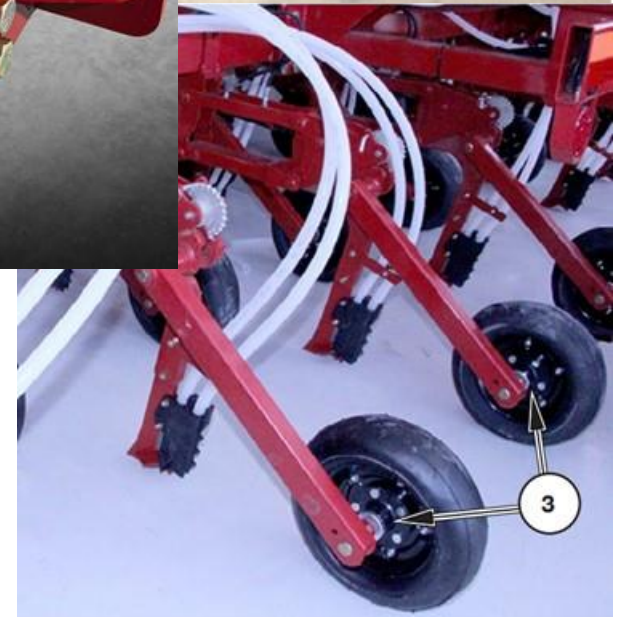
Lubrication

50 hour interval

1. Wheel hubs.
2. Castor wheel pivots
3. Row unit hubs.

10 hour interval

Clevis hitch ball (front hitch and tow behind quad hitch)





Morris Double Shoot Openers are outfitted with:

Proven IP boots

- Modified to eliminate issues with spreading at the base.

Stainless wear guards

- Protect IP boots from wearing due to soil flow.

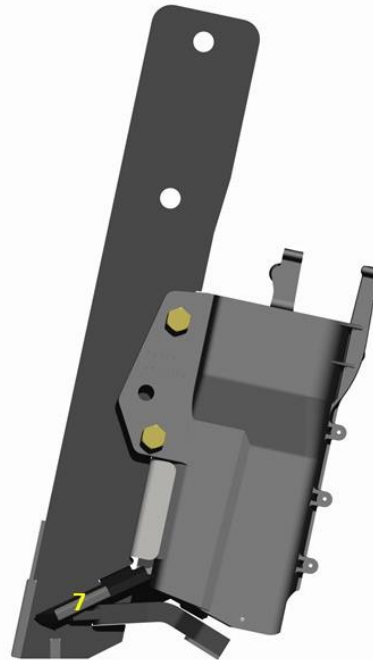
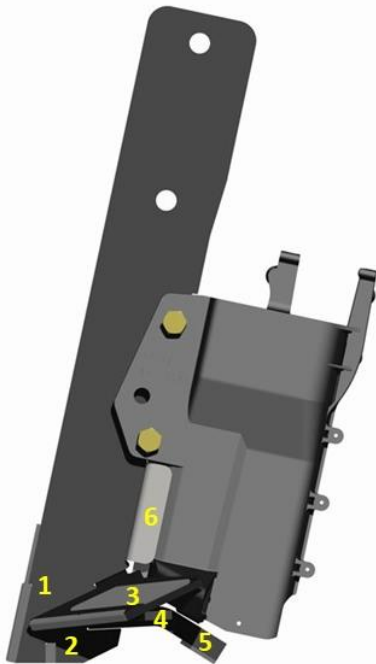
Grommets

- Prevents straw from entering the top of the boot that results in product plugging

Paired Row and Sideband Fertilizer Options:

- Apply granular fertilizer
- Apply NH₃ with 1/8" OD stainless steel tube insert*
- Apply liquid fertilizer 1/4" OD stainless steel tube insert*

*tubes for NH₃ or liquid fertilizer supplied by application manufacturer.



Design Changes with the Forged Double Shoot Opener.

- Elimination of hard surfacing.
- IP boot wear guard is stainless steel.
- Carbide plate on the shovel surface (3).
- 5/8" carbide tablet through shank (2).
- Carbide on non-shovel side (7). Side band only.

	Features	'new' double shoot Morris GETs
1	Nose carbide	2 carbide tablets
2	Shank below the shovel	5/8" carbide through shank
3	Shovel surface	carbide face
4	Steel plate below the shovel	yes
5	Wear tail	carbide tablet
6	IP boot wear guard	341 stainless steel
7	Sideband non-shovel side	carbide tablet


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	new Morris High Penetration Paired Row Opener	new Morris Paired Row Opener
Part #	S72322 (assembly kit)	S722321 (assembly kit)
Market Fit	Medium - fine textured soils that are difficult to penetrate	<ol style="list-style-type: none"> 1. Medium textured, mellow soils 2. Glacial till soils with stones
Key Design Criteria	<ul style="list-style-type: none"> 9 ° shovel angle 20° shank tip nose 	<ul style="list-style-type: none"> 6 ° shovel angle no shank tip nose
Benefits	<ol style="list-style-type: none"> 1. Low seedling mortality and rapid uniform emergence. 2. Outstanding product separation allows for high fertilizer rates. 3. Superior penetration in higher clay content soils at lower operating pressures. 4. Reduced soil disturbance by eliminating hard surface ribs. 5. Improved wear life - carbide in all the right places. 	<ol style="list-style-type: none"> 1. Low seedling mortality and rapid uniform emergence. 2. Outstanding product separation allows for high fertilizer rates. 3. Reduced soil disturbance from lower shovel angle and eliminating hard surface ribs 4. Reduced rock pulling 5. Improved wear life - carbide in all the right places.

QUANTUM Ground Engagement Tools

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Part #	new Morris Sideband Opener (left hand version illustrated)
	S72323 (right assembly kit) & S72324 (left assembly kit)
	
Market Fit	Suitable for a wide range of soil types and conditions.
Key Design Criteria	6 ° shovel angle
	no shank tip nose
Benefits	1. Low seedling mortality and rapid uniform emergence.
	2. Outstanding product separation allows for high fertilizer rates.
	3. Reduced soil disturbance.
	4. Attractive 'single row' canola emergence.
	5. Good air flow through crop canopy to reduce disease severity.
	6. Improved wear life - carbide in all the right places.

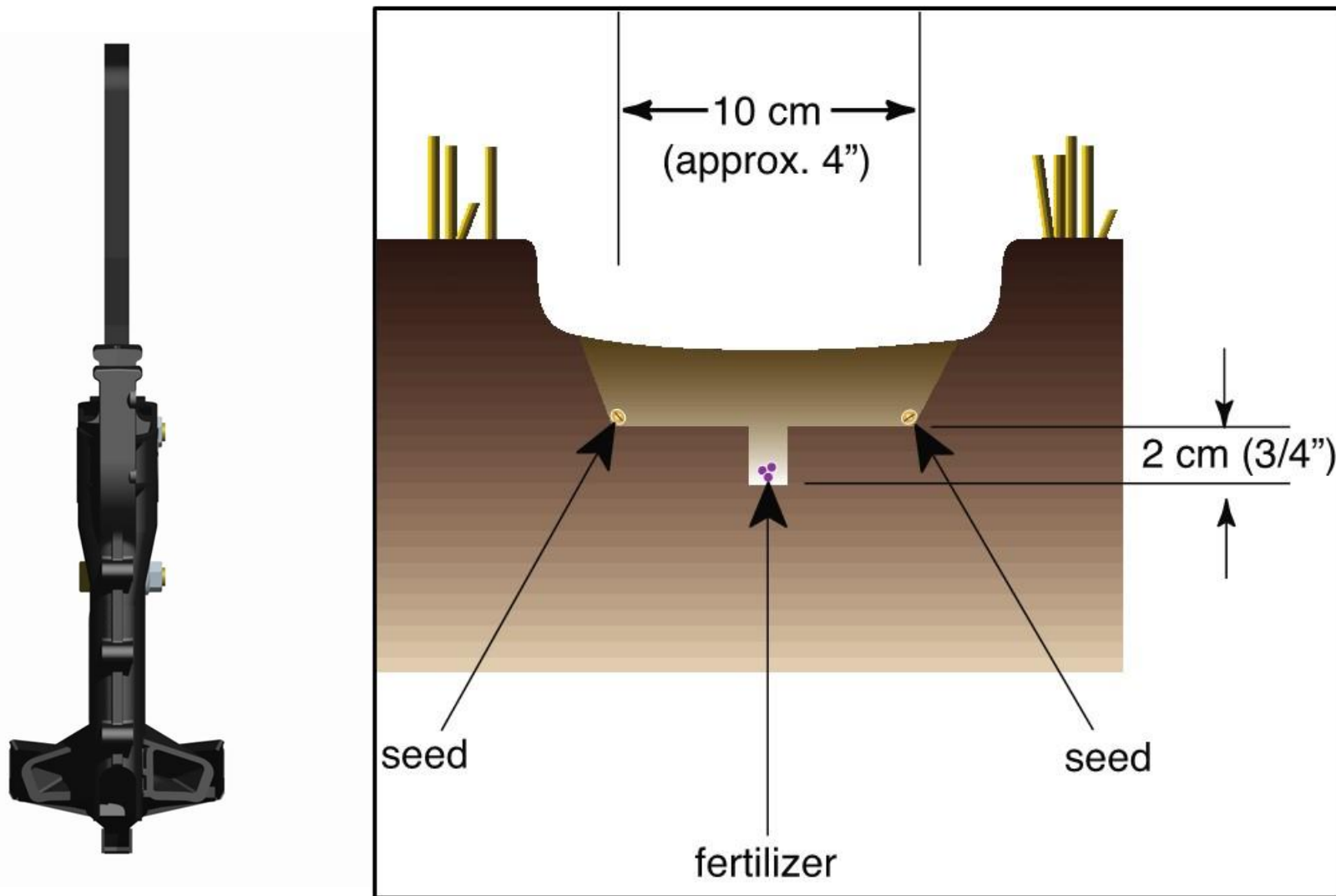
Double-Shoot Openers - Paired Row



This opener places 2 – 1" wide ribbons of seed to the outside edge of the furrow. Fertilizer is placed between the seed rows $\frac{3}{4}$ " below. Available with 12" spacing, the distance between rows is approximately (8").

Advantages: superior weed competition and stubble support for swathing and reduced in-row seedling competition.

Double-Shoot Openers - Paired Row

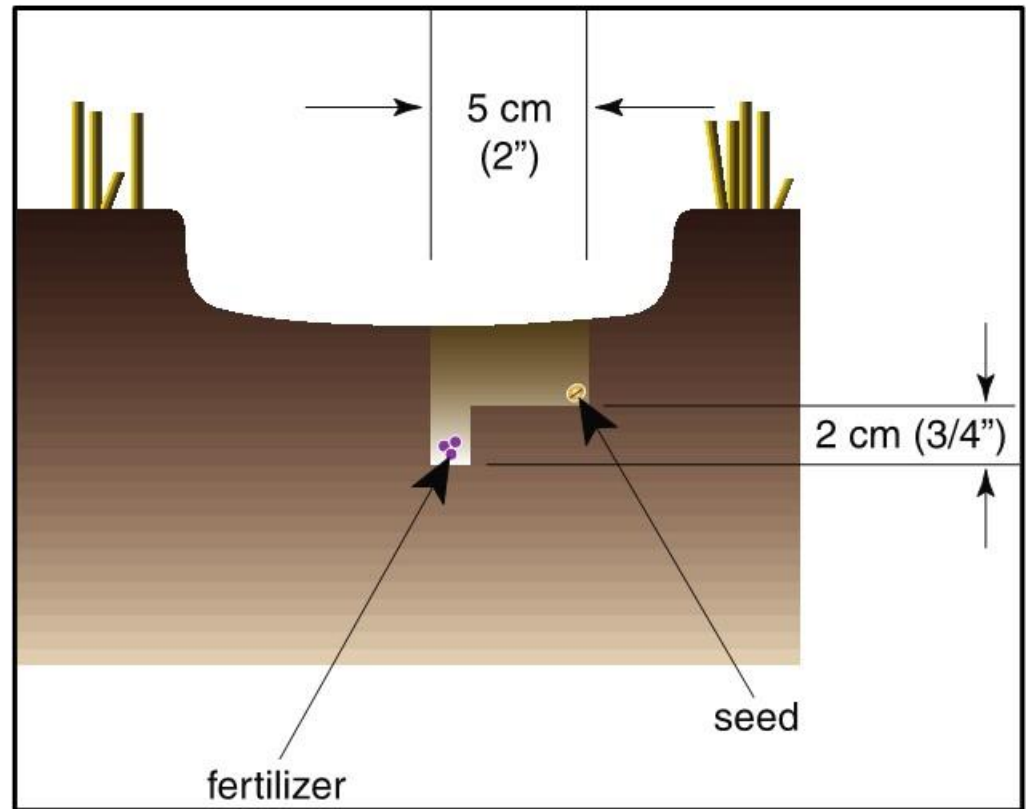


Double-Shoot Openers – Side band



- ❑ This opener places a 1" wide ribbon of seed to the outside edge of the furrow. Fertilizer is placed in the center of the furrow and $\frac{3}{4}$ ' below the seed. Available with 10 or 12" spacing.
- ❑ Advantages: Reduced soil disturbance, pretty canola emergence, delayed crop canopy closure in pulse crops to mitigate disease severity.

Double-Shoot Openers - Side Band

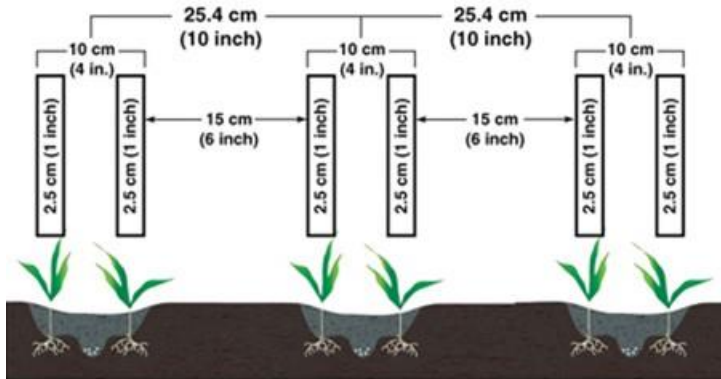


Comparative SBU (Seed Bed Utilization)

Paired Row Opener vs Side Band Opener

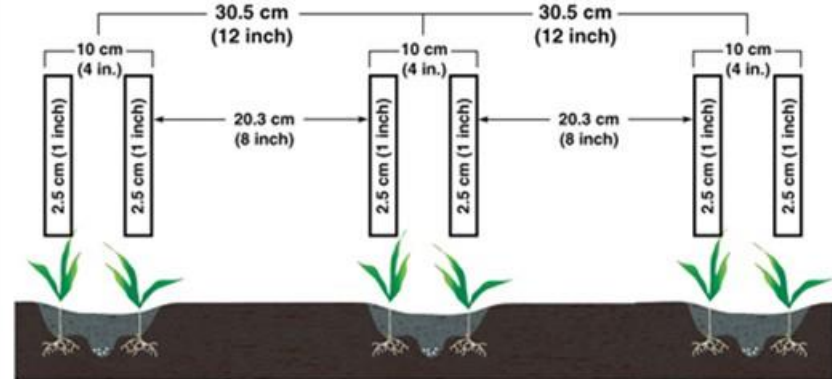
Paired Row Opener

Paired Row 10 inch Spacing



SBU (Seed Bed Utilization) Paired Row 25.4 cm (10 inch) spacing = 20%

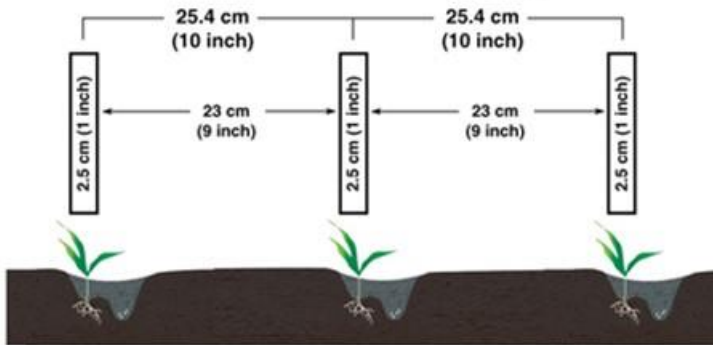
Paired Row 12 inch Spacing



SBU (Seed Bed Utilization) Paired Row 30.5 cm (12 inch) spacing = 17%

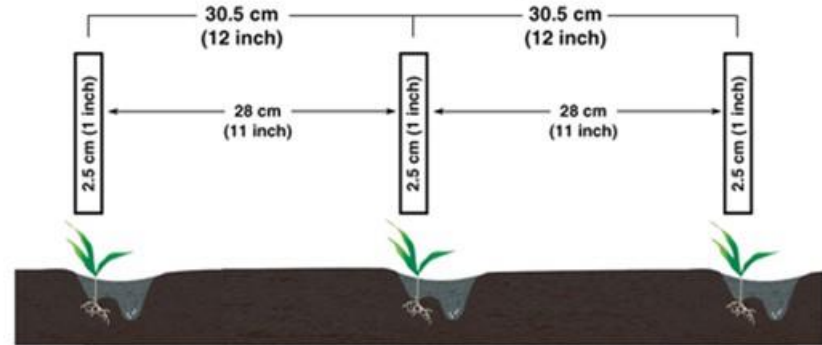
Side Band Opener

Side Band 10 inch Spacing



SBU (Seed Bed Utilization) Side Band 25.4 cm (10 inch) spacing = 10%

Side Band 12 inch Spacing



SBU (Seed Bed Utilization) Side Band 30.5 cm (12 inch) spacing = 8%

QUANTUM

The End



MORRIS

Appendix A

Procedure for removing air from the opener hydraulic system.

Bleeding Air From Opener Hydraulic System

The **QUANTUM** Air drill must have all air removed from the opener hydraulic system before seeding. The following steps are used to bleed the hydraulic system:

1. Check the machine for external leaks. Adjust hydraulic fittings as required. With JIC fittings, loosen the fitting first and then retighten it.
2. Lift openers up and lock tractor remote into continuous oil flow in the lift position.
3. Open the bleed-off valves located on the outer drill wings. Typically openers will drop to the ground. Gradually close the valve until the openers are all the way up but oil continues to flow.

Note: If the drill is larger than 60' do one bleed-off at a time.

4. Allow oil to cycle for 10 minutes then change the tractor remote direction to lower openers and cycle for another 10 minutes. The valve can be completely open in the 'opener down' cycle.
5. Close bleed-off ball valves and lift openers up.
6. Repeat steps 2 to 5 a second time.
7. Lock "Openers" valve on the front main frame of the drill and check that openers stay firmly in the transport position.
8. If openers are spongy repeat procedure until the air from the hydraulics are removed.

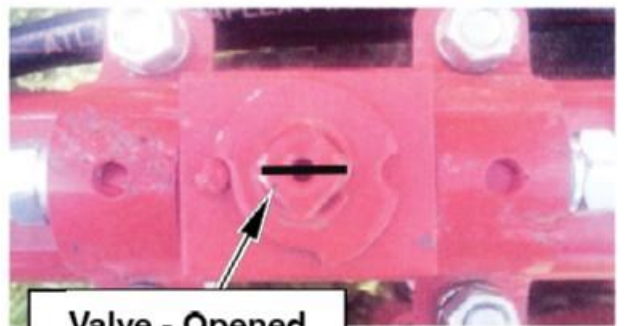
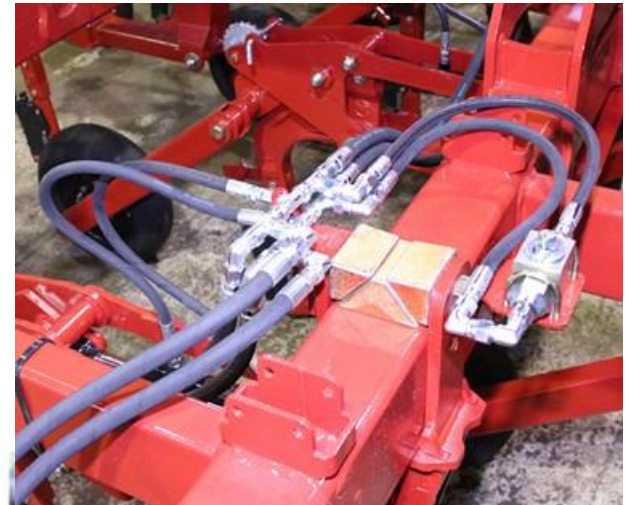
Important

Once air is purged from the cylinders, raise openers fully.

Place hydraulic lever into float position, all openers should drop to the ground under their own weight.

If it requires pressure to push an opener down to the ground during this procedure, one or more of the pivot bolts are over tightened.

Check and adjust pivot bolts as required.

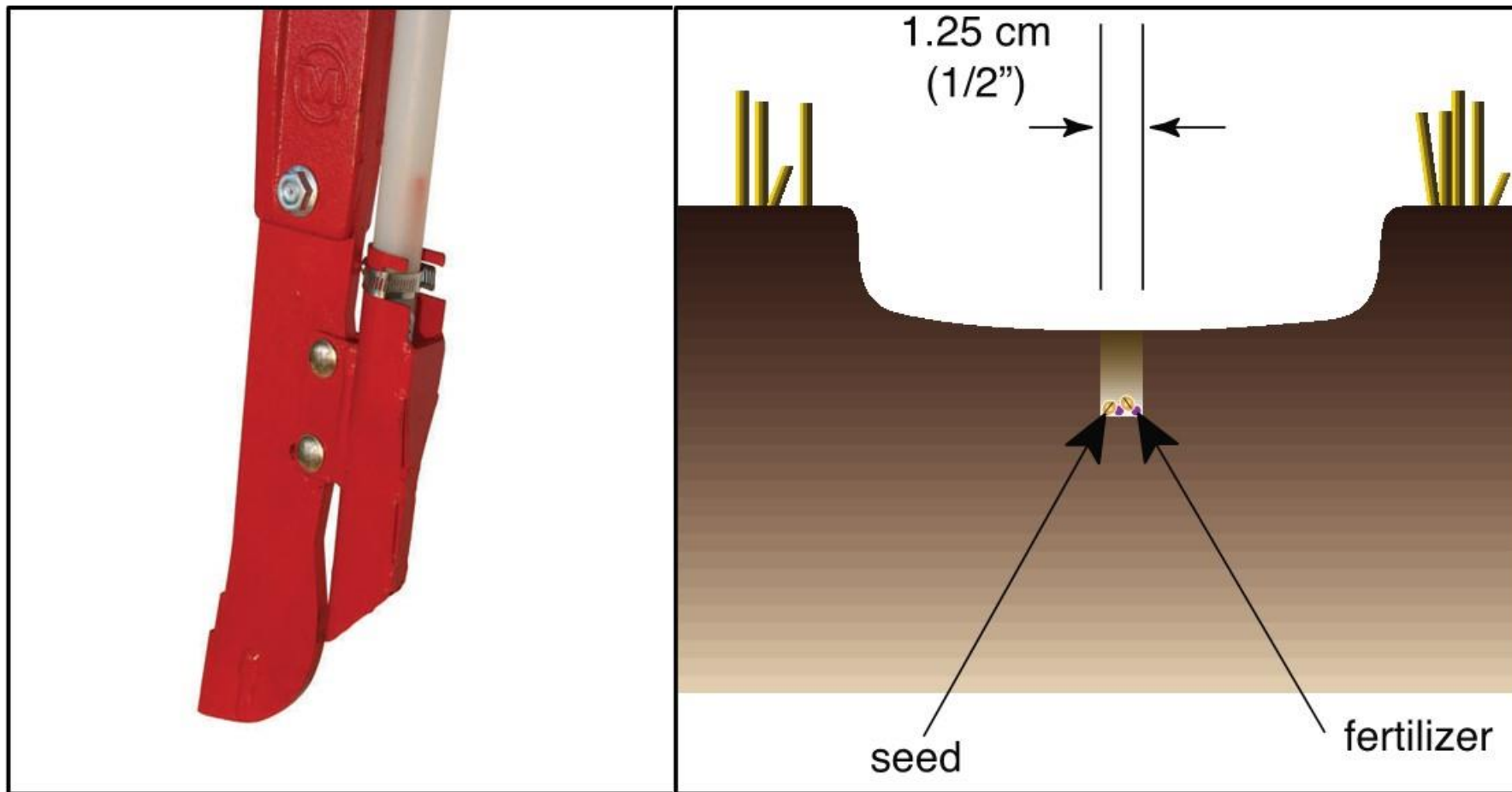


Valve - Opened

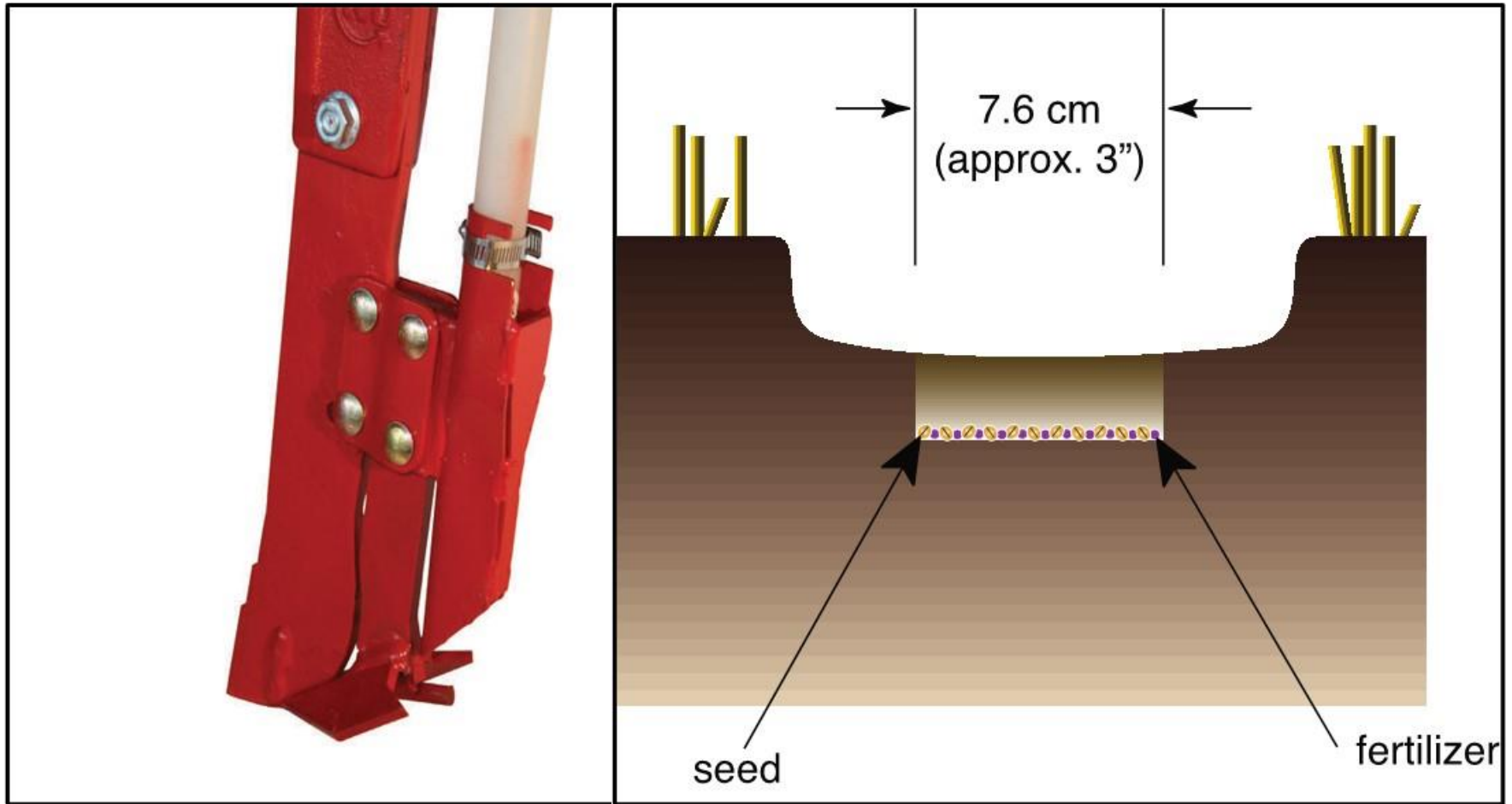
Appendix B

**Other ground engagement tools for
the Morris QUANTUM.**

Single-Shoot Openers - Narrow Knife



Single-Shoot Openers - Spread Tip

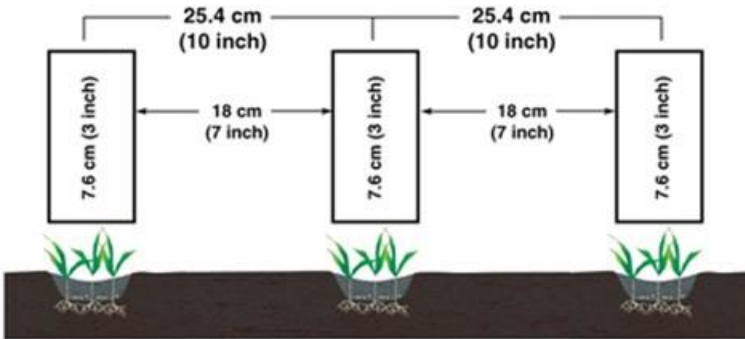


Comparative SBU (Seed Bed Utilization)

Spreader Tip vs Single Shoot Opener

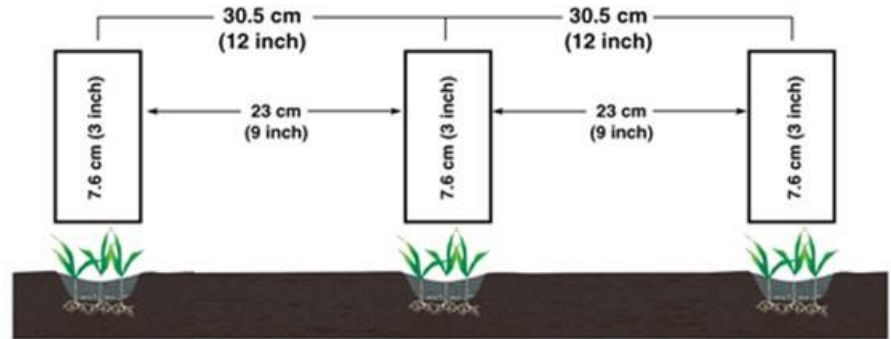
Spreader Tip

Spreader Tip 10 inch Spacing



SBU (Seed Bed Utilization) Spreader Tip 25.4 cm (10 inch) spacing = 30%

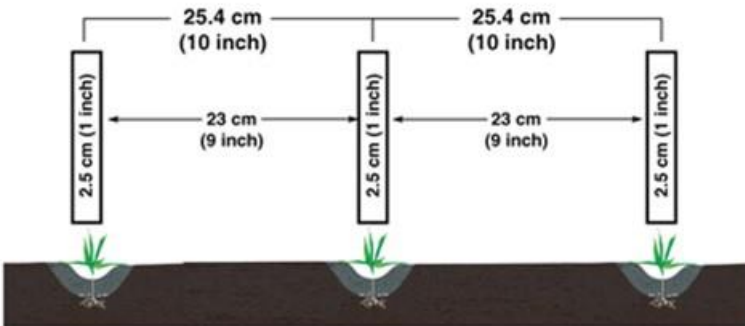
Spreader Tip 12 inch Spacing



SBU (Seed Bed Utilization) Spreader Tip 30.5 cm (12 inch) spacing = 25%

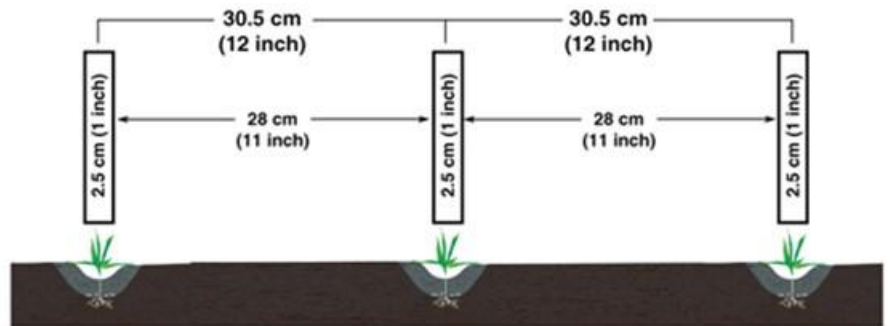
Single Shoot Opener

Single Shoot 10 inch Spacing



SBU (Seed Bed Utilization) Single Shoot 25.4 cm (10 inch) spacing = 10%

Single Shoot 12 inch Spacing



SBU (Seed Bed Utilization) Single Shoot 30.5 cm (12 inch) spacing = 8%