WHITE PLANTERS

Product Information Guide

MY2017 9800VE Series Planters

Date:	May 1, 2016
Bulletin:	WP16-001PIG
Subject:	MY2017 9800VE Series Planters
Distribution:	White Planter Dealers & AGCO Field Personnel

Model WP9830VE 24 Row

New factory integration of select advanced planter technologies into the 9800 series White Planter line. These new features and options are available to give customers improved performance, operational intelligence and data management abilities. Technologies such as the new vSet®, vDrive® and SRM meter systems tailored to the White 9000 Series row unit. Each 9830VE row unit acts as an individual planter. This allows the planter to vary seed population by row when ground speeds vary. When planting contours, to maintain consistent seed spacing across the width of the planter. Delta Force®, the Active Hydraulic Down Force system provides independent down force control of each row unit. Down Force information is measured multiple times a second and relayed to the 20/20 Seed Sense® monitor. The incorporation of Precision Planting's 20/20 SeedSense® monitor enables the operator to determine and monitor the minimum and maximum amounts of weight on the press wheels ensuring that all seeds are planted to the correct depth.

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The 9800VE Series features a ninety bushel Central Fill Seed System, vSet® meters and vDrive®; a self-contained and virtually maintenance-free electric drive vacuum meter system with few moving parts and industry leading seed singulation. Also included in the 9800VE series is the 20/20SeedSense® monitor; a command and control center providing the operator in high resolution all pertinent planting process information.

Model Specifications

Model	WP9812VE	WP9816VE	WP9824VE
Frame Type	Narrow Transport	Narrow Transport	Narrow Transport
Rows/Spacing	12R30	16R30	24R30
Hitch on Planter	2pt or Drawbar	2pt or Drawbar	2pt or Drawbar
Frame Flex	21˚ up /21˚ down	21˚ up/ 21˚ down	21˚ up/ 21˚ down
Frame Size in (mm)	7 x 7 (178 x 178)	7 x 7 (178 x 178)	7 x 7 (178 x 178)
Planting Proficiencies	Conventional Till No-Till	Conventional Till No-Till	Conventional Till No-Till
Drive	vDrive ® Electric (12v)	vDrive ® Electric (12v)	vDrive ® Electric (12v)
Carriage and Lift System	Wheel Module Hydraulic Cylinder	Wheel Module Hydraulic Cylinder	Wheel Module Hydraulic Cylinder
Tires	(6) 10:00-15 (TL) Load Range D	(8) VF295/75R22.5	(10) VF295/75R22.5
Metering Units	vSet® Vacuum	vSet® Vacuum	vSet® Vacuum
Seed Tube Sensors	High Rate	High Rate	High Rate
Vacuum Drive (two options)	Direct Drive or PTO Pump	Direct Drive or PTO Pump	Direct Drive or PTO Pump
Seed Hoppers bu. (L)	(2) CFS 90 (3171.52)	(2) CFS 90 (3171.52)	(2) CFS 90 (3171.52)
Onboard Fertilizer Capability gal. (L)	Liquid 300 (1135.62)	Liquid 500 (1892.71)	Liquid 500 (1892.71)
Weight (empty) lbs. (kg)	14,100 (6396)	18,000 (8165)	27,500 (12474)
Working Width ft. (m)	30 (9.14)	40 (12.19)	60 (18.29)
Transport Width ft. (m)	12 (3.65)	12 (3.65)	12 (3.65)
Transport Height ft. (m)	11.83 (3.61)	11.83 (3.61)	11.83 (3.61)
Tractor Requirement (PTO HP)	135 hp	150 hp	200 hp
Tractor Hyd Requirements gpm (lpm)	47 (178)	47 (178)	47 (178)

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Frame

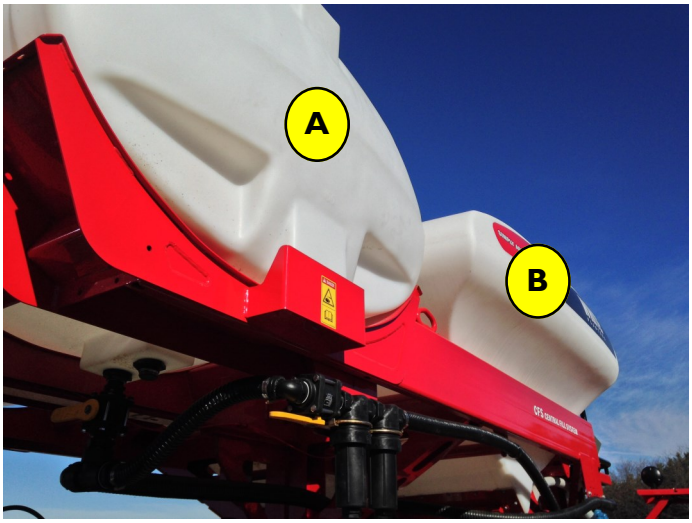
The 9800VE planters feature a 3-section frame which provides exceptional frame durability and a narrow transport of only 12 feet. The planter accepts row unit mounted tillage attachments and liquid fertilizer in combination with the Central Fill System.

Frame Design

The planter accepts liquid fertilizer (A) in combination with the Central Fill System (B).

On Board Fertilizer Capacities:

9812VE 300 gallons (1135.62 liters)
9816VE 500 gallons (2273.05 liters)
9824VE 500 gallons (2273.05 liters)



Frame Wing Section

Each wing flexes 21 degrees up and 21 degrees down in relation to the center section of the frame. The center section supports four rows and depending on the model, four six or ten rows are located on each wing. The flex frame provides uniform row unit depth control in varying terrain across the width of the planter.

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Transport Tires and Lift System

Four transport tires are incorporated under the center frame to support the frame. The rephrasing cylinders assure an equal amount of down force is exerted on each lift wheel. The rephrasing lift cylinders assure the planter raises with the frame parallel to the ground. The transport position provides 18-inches of ground clearance under the row units at the lowest point.

Tires:
9812VE (6) 10.00–15 FI (TL)
9816VE (8) VF295/75R22.5
9824VE (10) VF295/75R22.5

The VF295/75R22.5 tire provides increased load and compaction ratings. Specifically designed for heavy farm equipment; the VF series tires provide 40% more load-carrying capacity, a wider foot print, and less air pressure than a truck tire.

Wing Gauge Wheels

Each wing, depending on the model, has one 10:00x15 gauge wheel tire (9812VE), or two VF295/75R22.5 gauge wheels and tires (9816/24VE) to support the outer end of the wing and maintain the frame height for superior row unit functionality and seed depth placement accuracy.

Hitch 2-Pt or Drawbar

2-Point Hitch (Standard Equipment)

The planter is supported by the two lower links of the tractor category II or III hitch. The hitch is positioned in the lower mode for planting and is raised to the uppermost position for transport. The tractor lower arms support the planter and hold it level in the planting and transport position.

Drawbar Hitch (available on 16 & 24 row planters)

A hydraulically adjusted height drawbar lug hitch is available for tractors without three point hitch. The hitch is raised for transport and lowered for planting . The hitch height adjustment bolts (A) are used to set the hitch to the correct height while in the planting mode - 18 to 22 in (45– 55 cm).

Telescoping Hitch

The main hitch telescopes while transitioning from transport to field mode. The internal tube is guided into the external hitch member on Ultra High Molecular Weight Plastic (UHMW) this provides smooth operation and extended life of the hitch mechanism.

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Frame Fold Control Terminal

A new backlit frame fold control box located in the tractor cab provides convenient positioning of the frame from transport to planting position.
Three auxiliary buttons are incorporated in the frame fold terminal to activate and deactivate any optional equipment on the planter.

Frame Control Operation:
(1) POWER Turns the frame control box on and off.

(2) PLANT/TRANSPORT– Used for field operation when planting & folds and unfolds when in transport.

(3) TONGUE HEIGHT - (for machines with the drawbar hitch)
Raises the hitch for transport and lowers the hitch for field operation.
Raises and lowers the hitch to connect to the tractor.
Raises and lowers the hitch to hook and unhook the wings.
Unlatch the hitch extensions.

(4) WING FOLD -Folds and unfolds the wings.

(5) MARKERS/WING WHEELS - Raises and lowers the markers when plant mode is activated.
Raises and lowers the wing wheels when transport mode is activated.

(6) AUXILIARY 1
(7) AUXILIARY 2
(8) AUXILIARY 3

Operating Notes:

- The machine raises in the folded or unfolded positions without electrical power, but will not lower without electrical power.
- The tongue and the fold cylinders will not operate without electrical power.
- The machine will not lower in the folded or the unfolded position if the PLANT/TRANSPORT button is in the TRANSPORT position.
- The machine will lower and raise in the folded position if the PLANT/RANSPORT button is in the PLANT position. When raising the machine, the wing wheels will lower. Press the button to the TRANSPORT position. Press the WING WHEELS button, then return the WING WHEELS to the TRANSPORT position.

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Central Fill System

Two 45-bushel polyethylene hoppers are standard on all CFS models. The lids are conveniently accessible from the platform for filling hoppers. The hopper's smooth transition design and the sloped sides ensure a continuous supply of seed to the mixing chamber beneath. The oversized hopper openings make filling convenient. Translucent seed hoppers provide visibility of the seed level.

Hydraulic Reservoir

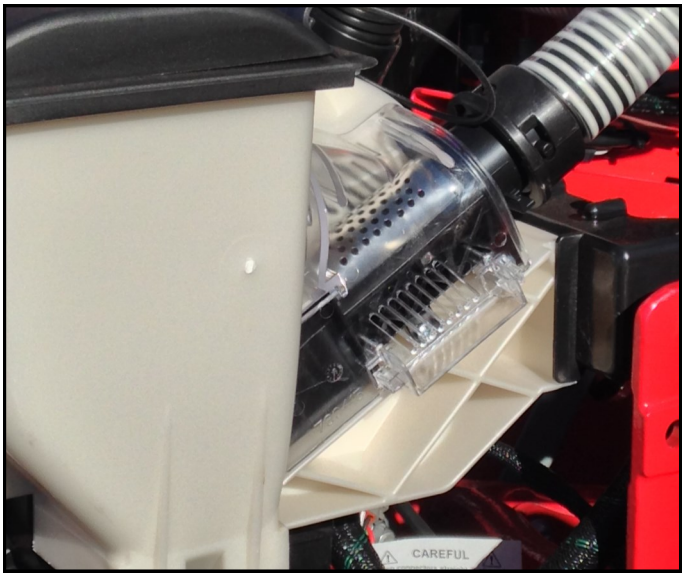
A hydraulic PTO pump and reservoir can provide the hydraulic power to drive the hydraulic vacuum seed singling system of the 9816VE and 9824VE leaving the tractor hydraulics free to perform the remaining hydraulic functions - frame, CFS. And options such as markers, variable rate fertilizer pump, hydraulic down force and alternator if required. A PTO pump added to the 9812VE will drive the CFS blower and the seed singling system leaving the tractor hydraulic system to operate only the planter frame system and optional equipment such as hydraulic row markers and hydraulic down force. The electric operated oil cooler features "on demand" cooling.

Cast Row Unit

The all cast iron 9000 Series row unit provides the strength and durability to meet the demands of today's planting environment. The machining of all assembly points ensure precise alignment of components. The closing wheel assembly is also cast for superior strength and extended life of the unit. The closing wheel pivot bushing design is shared with the parallel link arm bushings.

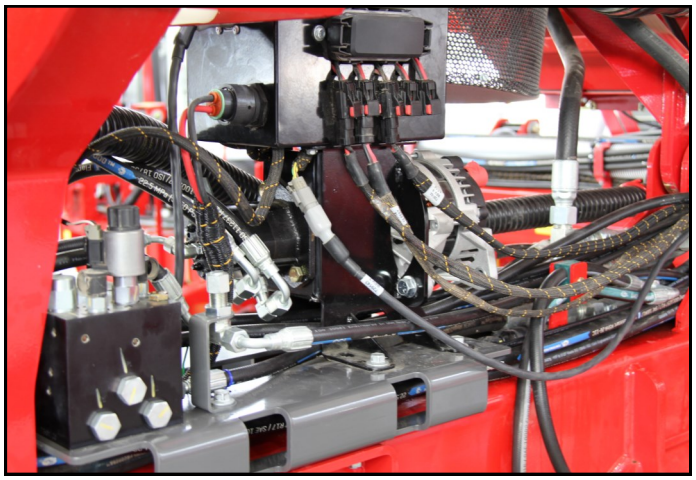
Mini-Hoppers

The mini-hopper on each row holds 0.05 bushel of seed. The hopper separates easily from the meter assembly to provide fast access to change crop kits when converting from one crop type to an-other. The seed supply air discharge screen (A), as seen in the photo, is included as standard equipment. It is used for the larger corn and soybean seeds. Screens for smaller seeds such as milo and sugar beats are also available.

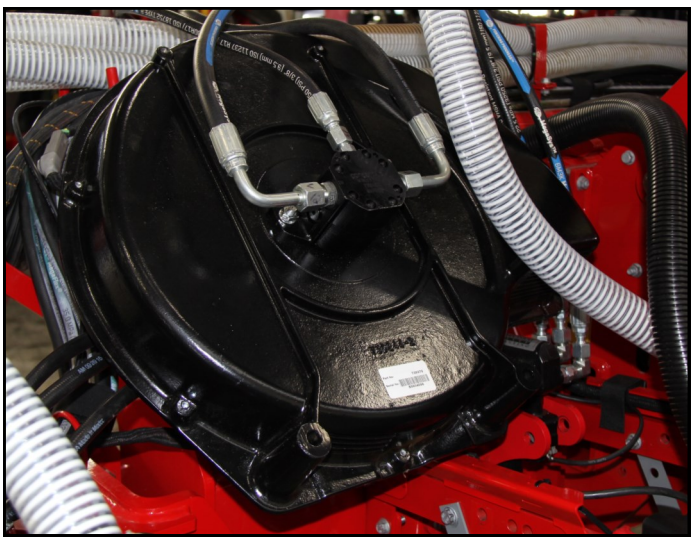


Alternator (Optional)

A hydraulic driven alternator is available to provide additional electric power if needed when options such as DeltaForce or others exceed the recommended thirty-six amps reserve requirement. As seen in the calculator below; the model 9824VE will require the addition of the alternator if the DeltaForce option is present.



Number of Rows	vDrive Amps	DeltaForce Amps	Alternator Not Required / Alternator Required
12	15	12	27
16	20	16	36
24	30	24	54



Vacuum Blower

All models are equipped with two hydraulically driven vacuum blowers. Each blower fan is 17 inches (432 mm) in diameter and operates at a maximum 5000 revolutions per minute. The system produces a vacuum range of 5.0 to 30 inches of water column H_2O (1.24 to 7.47 kPa).

Liquid Fertilizer (For use with CFS)
(Optional)

An on-board fertilizer tank is available as an option for use in combination with the Central Fill System. A piston pump with flow divider or outlet manifold and a variety of fertilizer openers are available to meet the needs of liquid fertilizer application.

9812	300 gallon (1136 L) on-board tank
9816/9824	500 gallon (1893 L) on-board tank

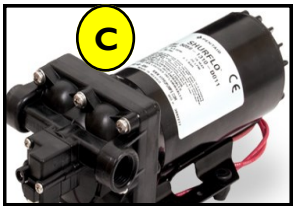
Pumps

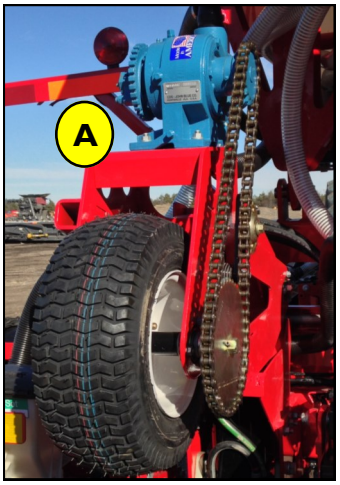
Factory installed fertilizer pumps available:

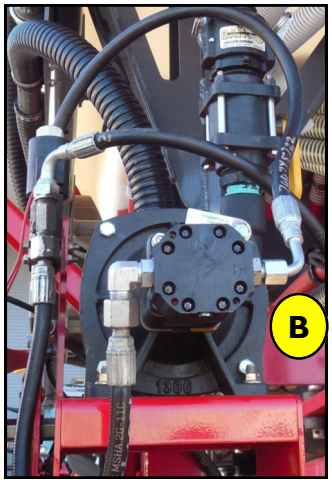
9812VE - Single piston John Blue pump Contact Drive (A)

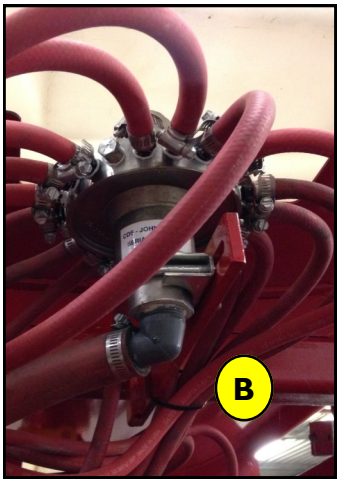
Single piston John Blue pump Contact Drive (A) on the 9816VE and a Dual Piston (not shown) John Blue Contact Drive Pump on the 9824VE

Hypro Centrifugal Pump with Variable Rate Drive (B)







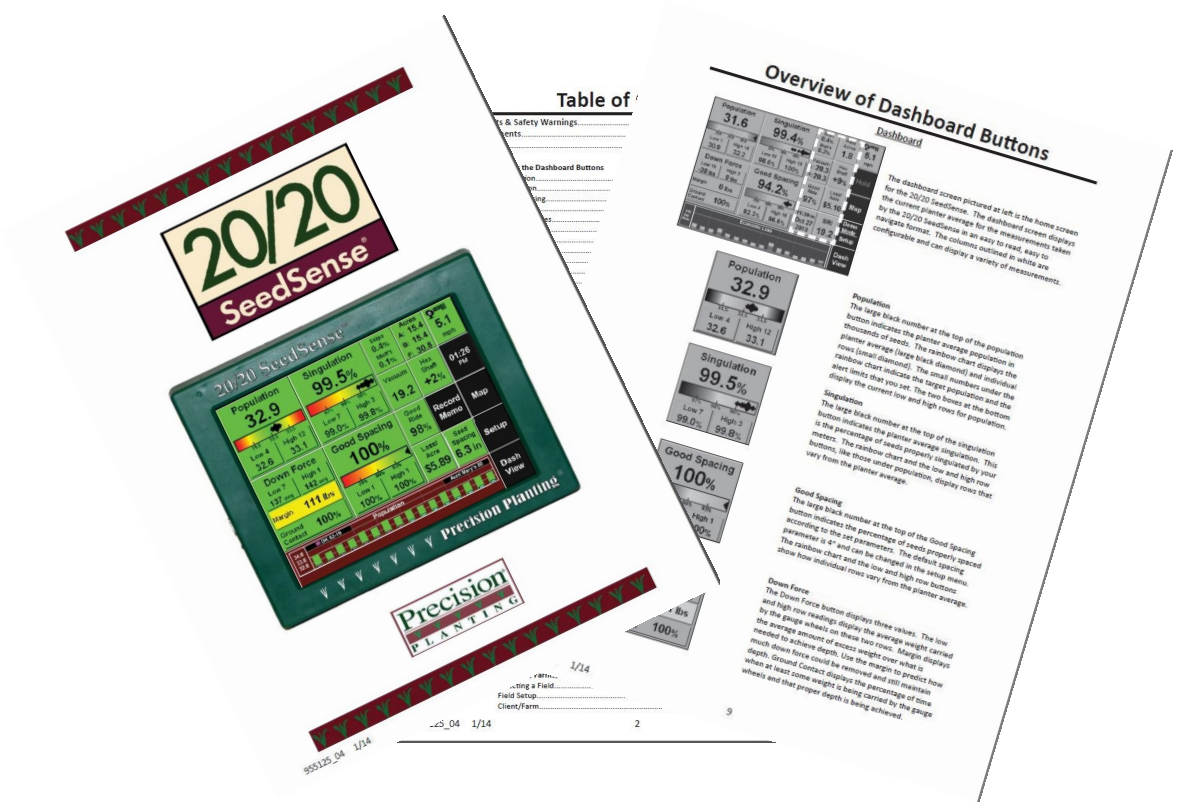


Plumbing

The stainless steel booms (A) with TeeJet nozzle bodies, orifices and 20 psi check valves are all factory installed. Or, flow divider (B).

Note: The factory installed plumbing extends to the nozzle body. Hose from the nozzle body to the 2x2 opener or in-furrow applicator tube is not included in the factory set-up.

What makes the 9800VE planters different and why it matters



Let's first understand the agronomics.

The Seed

Every seed contains the potential to excel, and every single seed has the chance to produce this type of return.

What's the value in one ear of corn? Corn ears are measured by the number of rows and the number of seeds in each row.

All else being equal...each ear having 18 rows and 35 seeds per row as in this example:

Twenty-nine ears in 17.4 feet (1/1000th of an acre) x (eighteen rows x thirty-five seeds in a row = 630 seeds per ear) = 18,270 x .01162 (one one-thousandth of an acre) = 212.3 bushels per acre.

The addition of one more ear, 30 rather than 29, would add 7 bushels per acre to the harvest. Did you know the difference between eighteen rows and sixteen rows on the ear is a value of twenty-two additional bushels per acre?

- 29x18x35x.01162=212.3
- 30x18x35x.01162=219.6
- 1 ear = 7 bushels

Now, let's consider a common scenario:

An 80 acre field has 34,000 seeds invested and has the potential to return 2.7 million seeds. Two out of three plantings have a 90% well planted rating.

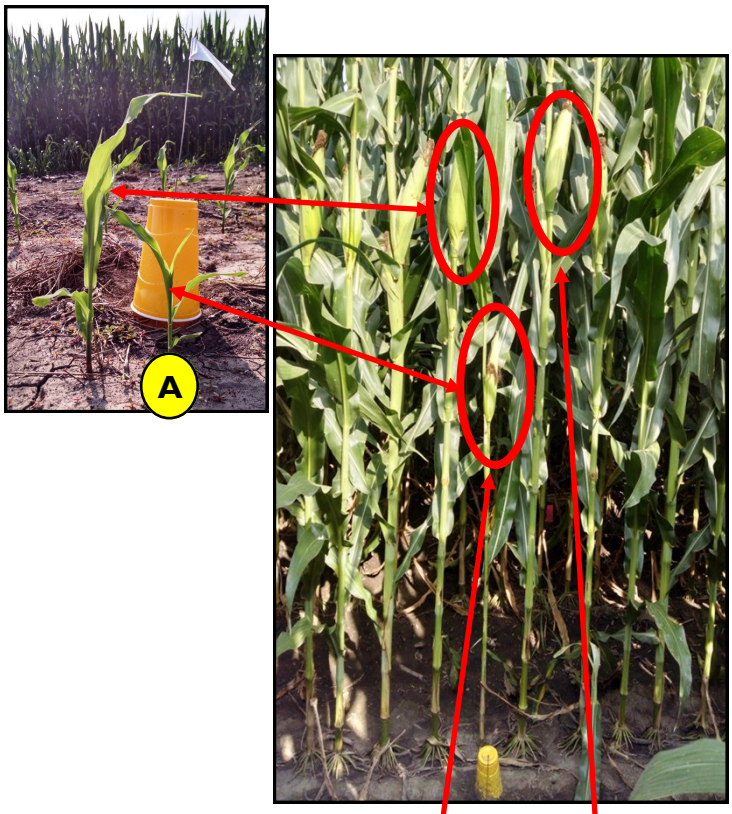
A 90% planting efficiency rate means 272,000 errors. Accuracy as defined in the planting world….90% is poor as compared to the 99% efficiency Precision Planting considers a good rating.

How do we lose 272,000 ears in eighty acres? How are ears lost? Skips, doubles and what about late emergence?

How are Ears Lost?

Late Emergence:
This late emerged plant (A) was marked in May, it's just one leaf behind the neighboring plants.

The picture at right is the same plant in August. Its potential was lost, it's really been a weed in the field all season.



The seed spacing was good, as well as singulation.

The ear size of the late emerged plant as compared to its neighbors tell the yield loss story. It may have developed about ½ an ear but produced almost zero grain. This is due to the late emerged plant pollinating late. When this happens the insects in the field will migrate to the only remaining pollen source for food. Late emerged plants rarely produce harvestable grain.

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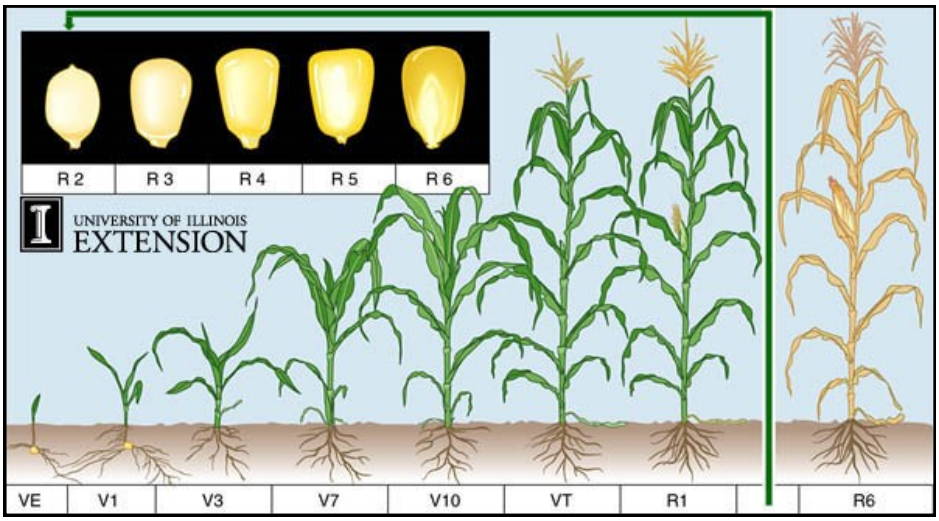
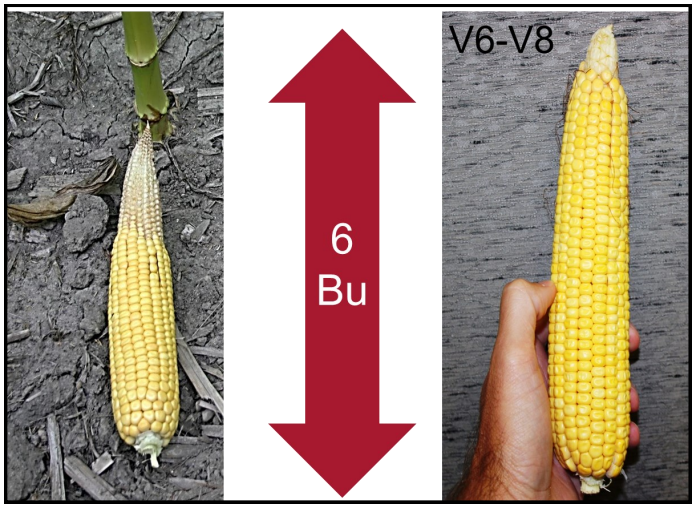
Size Matters

Ear size impacts yield. This example would equate to a difference of 22 bushels per acre (all else being equal). The V4 to V6 periods of the growing season is when it's determined the stress the plant is under and what size of ear it will be capable of producing. Stress can be from poor performance from the planter, insects, weather…a lot of things.

The V3 stage marks the end of the seed being the primary food source of the plant. It is dependent now on the photosynthetic process and the nodal root system. The soil environment is key to the development of the nodal root system. It's in these next stages, V4-V6, the plant will determine the number of kernel rows and initiate the uppermost ear and tassel development.



From V6 to V8 the row length is set. There are six bushels per acre difference in this example. The difference could be from planter issues, running out of nitrogen or heat stress. A seed potential of 40 seed length loosing 5 and producing a 35 seed row compared to a 25 seed row potential loosing 5 and producing only a 20 seed row is a difference of 6 bushels. When does a seed have its highest potential? (when it's in the bag)



Maximum yield is set early

Maximum yield is set between the time the seed is placed in the furrow and the closing wheel comes along to close. From this point on the plant is beginning to set yield. This begins between 4 to 8 leaves.

How Can Ears Disappear?
A late emerged barren plant is one way and a skipped plant is another. Failing to put a seed in the ground guarantees a loss of an ear. Using the earlier scenario of planting a rate of 34,000 seeds per acre, failing to plant 1000 seeds each acre (less than 3%) would cause a yield loss of 5.7 bushels per acre You math majors would contest this as being incorrect as the calculation would suggest a 7 bushels per acre loss. The reality is the neighboring plants would utilize the unused nutrients and moisture not consumed by the absent plants to produce a more vigorous stalk and larger ear.

How Can Ears Disappear?
Doubles produce smaller stalks. Sometimes they'll produce a harvestable ear. This misses the 100% return on investment of these two seeds, harvesting approximately 150% of the potential 200%. A double in every 1/1000th (17.4 ft) would produce 1000 doubles per acre and would equate to 2.8 to 3 bushel loss per acre. This is a planter error, it seems like a small detail but extrapolated over all corn acres means the loss of some serious money. This is a deficiency that can be corrected on the planter

Full Potential From Each Seed

Consistency is what we're wanting the planter to produce….. and it can be produced.

The negative impact to yield by skips or doubles is easily understood and most planter monitors readily inform us as to their occurrence. It's far more difficult to address the causes of late emergence.

It's really about the entire planting process.

(1) Know what the planter is doing throughout the entire process.
(2) Clean the soil surface of old crop residue ahead of the opener blades.
(3) Set the planting depth correctly.
(4) Place the seed properly.
(5) Firm the seed into the soil.
(6) Correctly close the seed trench.

Knowledge is power but remember what Albert Einstein said, "Information is not knowledge." The knowledge is the correct *application* of the information.

Know, Place, Clean, Set, Firm and Close

The goal is to find this scene repeated in every field. Consistency….that's the goal. Consistent spacing….every plant is there and every plant is at the same growth stage. This establishes the opportunity to achieve full plant potential. How do we successfully manage the planting process? How do we control that which is controllable? How do we know what is happening in each of the planting process functions?

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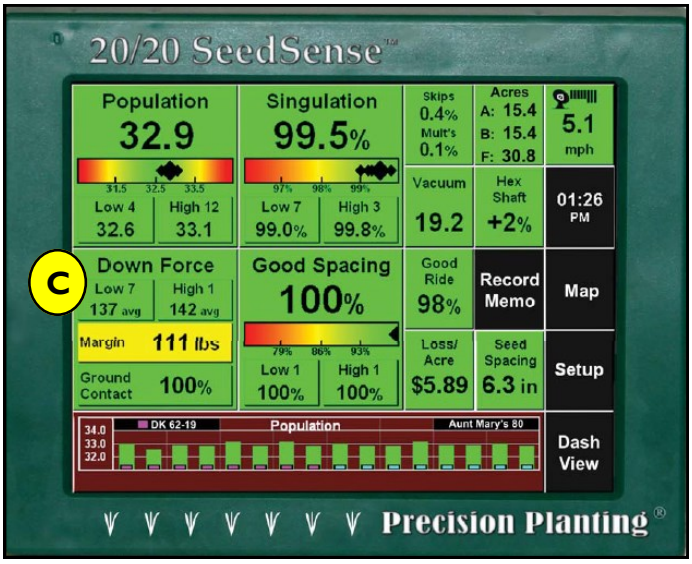
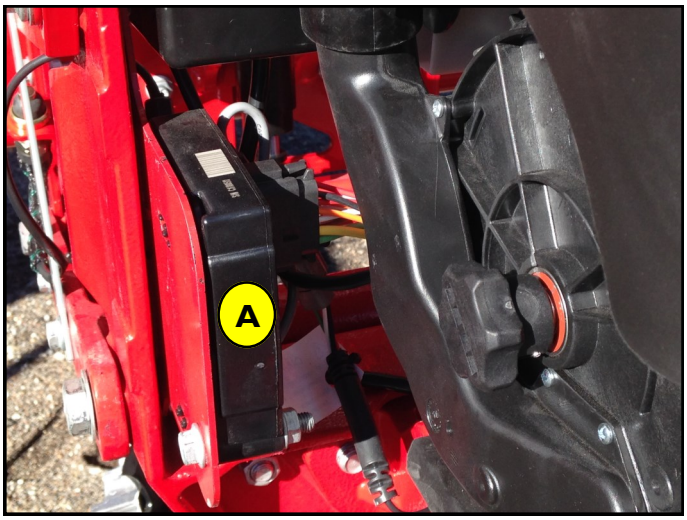
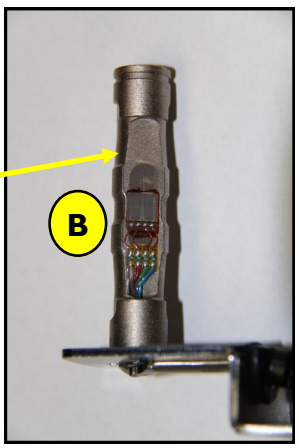
The 20/20 Seed Sense Monitor System

It's a monitor designed to give the operator a complete view of what's happening with the planter. In the SRM (Single Row Module (A)) is an accelerometer that measures the vertical movement of the row unit. Erratic vertical movement causes poor seed spacing. A drop in good ride and good spacing may be telling the operator to slowdown to improve both. If slowing improves the ride but the seed spacing is still poor the monitor may be indicating a different problem such as a failing opener bearing. This could create a vibration causing seed to drop from the seed disc. The DeltaForce system has weigh pins (B) in each row to measure the amount of force being exerted on the gauge wheels. The weigh pin is engaged when the seed depth determined by the operator is attained. The ground contact percentage is displayed in the Down force area of the monitor (C). The ground contact percentage is calculated from the last three seconds the weigh pin has been under stress. The system allows the operator to set parameters of minimum/maximum additional down force on the row unit to maintain constant contact with the depth stop and ground contact. A low ground contact percentage would indicate that greater down force is required. Excess down force is not desirable. If a beginning amount of 100 pounds of down force produces a 100% ground contact then reducing this amount until a drop is registered will enable the dialing in of the ideal down force. The correct down force will ensure constant depth while keeping soil compaction to a minimum. This vital information is possible with a spring down pressure 20/20 system if weigh pins are added. Without the down force information from the pins the operator too often applies more spring down pressure on the row unit than is required. This is real planter function information made available by the 20/20 system. Information that becomes actionable knowledge to increase profit by reducing the losses in the planting process.







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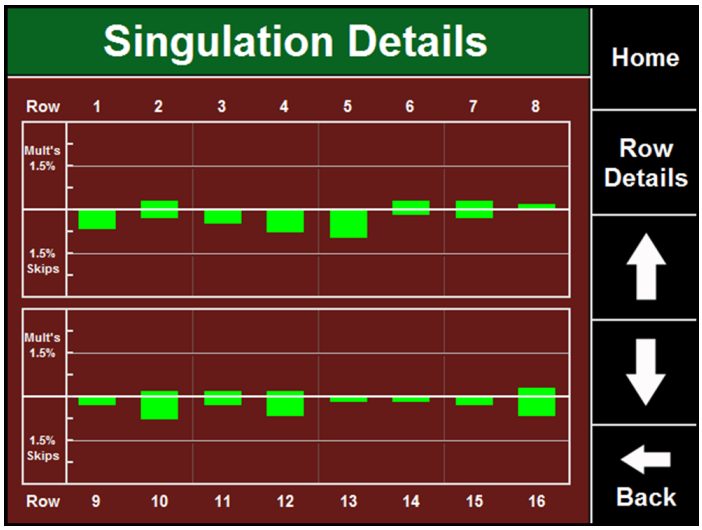
The 20/20 Seed Sense Monitor System A Closer Look

The Single Row Module transforms the planter from a collection of rows into a collection of individual planters. This provides control and monitoring of each individual row. The SRM enables the operator to check each row's individual performance by simply tapping the screen to check the singulation detail of each row for skips and doubles.



Row Performance

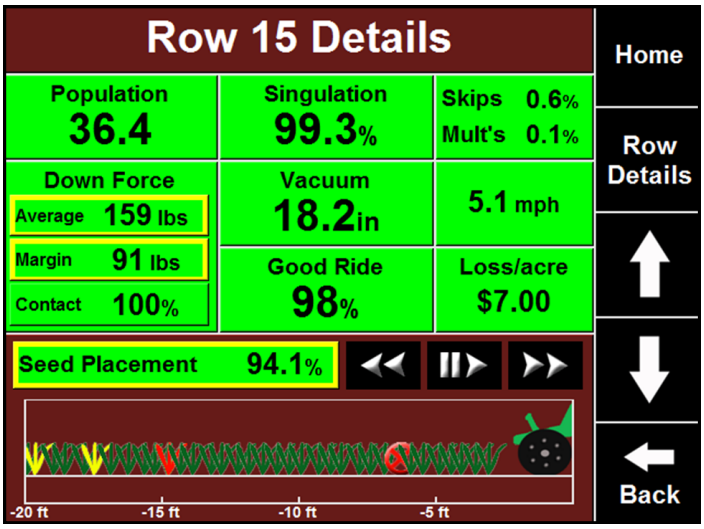
This screen shows examples of the type of information the 20/20 seed sense system supplies the operator. Tap the screen to view individual row details. Every seed going past the sensor is displayed here. This system shows misplaced seed, multiples or skips. It will tell you if a seed cell is blocked by foreign matter or if a regular occurring skip is evident.

Plant Color Code:

Yellow = Misplaced Seed (spacing error)

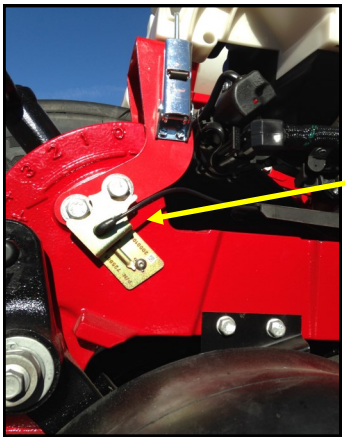
Red = Multiple Seeds (doubles)

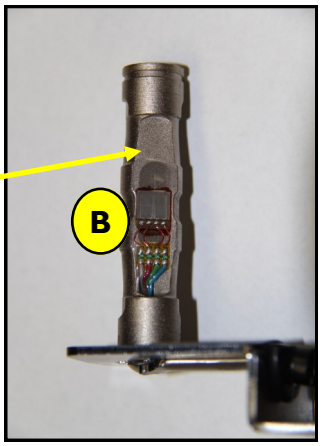
⊗ = Skipped Seed



Applied Down Force

The 20/20 SeedSense system is capable of acquiring and relaying row unit down force information provided the optional weigh pins are present. The weigh pins are included in the DeltaForce option and are available as an option if the H.D. Spring down force option selected. This information is invaluable to ascertain that the correct down pressure is being applied. Only DeltaForce provides in the cab down force adjustment.





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HOW CAN 20/20 SeedSense HELP YOU?

- Correct or eliminate poor spacing from rough ride
- Correct or eliminate inconsistent depth from lack of applied downforce
- Correct or eliminate singulation errors due to debris in the meter
- Maximize speed by having accurate information
- Increase seed rows around the ear by minimizing down force margin
- Obtain information for adjusting vacuum, pressure or changing double eliminators and seed disks
- Plant with confidence!!

FieldView (The Next Step)

Field View is an iPad application. Plug the iPad into the back of the 20/20 monitor's USB port. Everything that is visualized in numerical form on the 20/20 is then mapped on the iPad. The operator has his data now and can take it with him or share the data in real time.

Down Force Map

The system lets growers see the following:
Each row is mapped. Each square is a fifth of a second. Each blue square means the row unit lost ground contact (came off the depth stop). Anywhere its green the row unit had between 0-100 pounds of down force on it. Red indicates that for a fifth of a second the row unit had in excess of 200 pounds on the depth stop….this contributes to poor root development due to compaction around the seed.

Hybrid Map

Maps hybrids as they are planted - simply press the button and record.

All maps are displayed over the iPad's satellite imagery

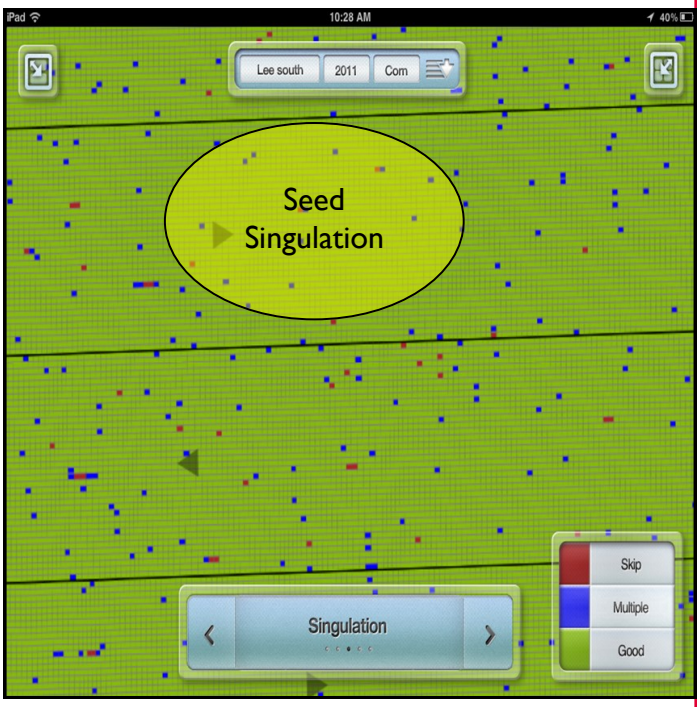
Seed Singulation

Skips and doubles are highlighted – allowing the grower to see a developed pattern.

Every red square is a skip

Every blue square is a double

Green squares are properly singulated seeds



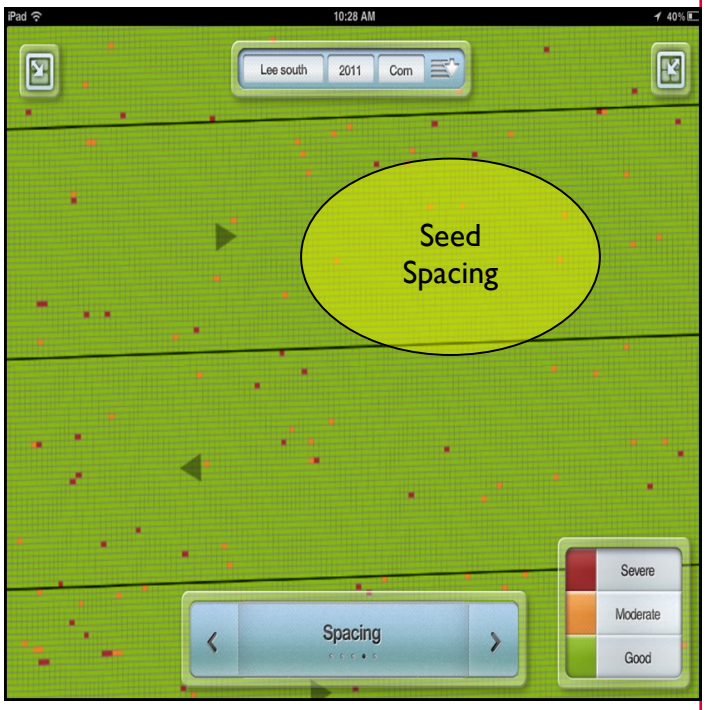
Seed Spacing

Poor seed spacing is highlighted– allowing the grower to see a pattern.

Every red square is a severely misplaced seed.

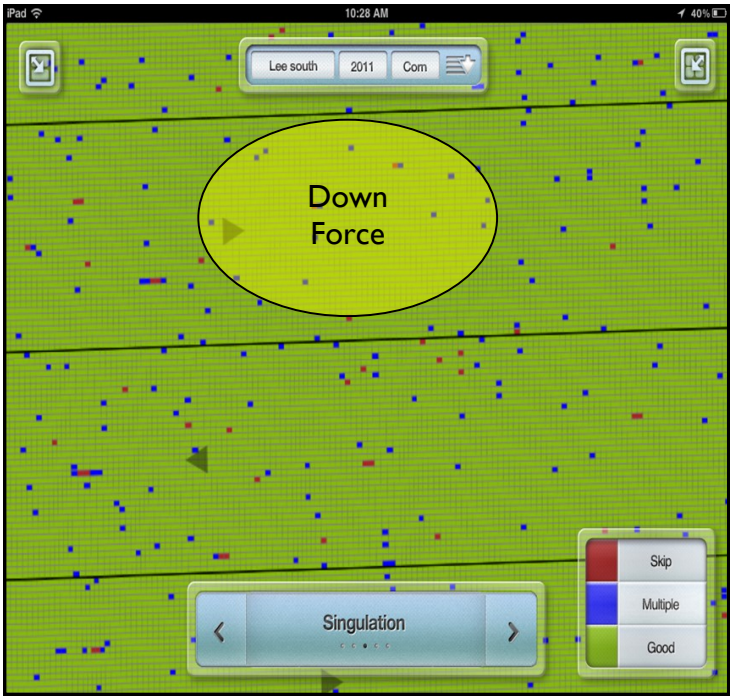
Every orange square is a moderately misplaced seed.

Every green square is a properly placed seed.



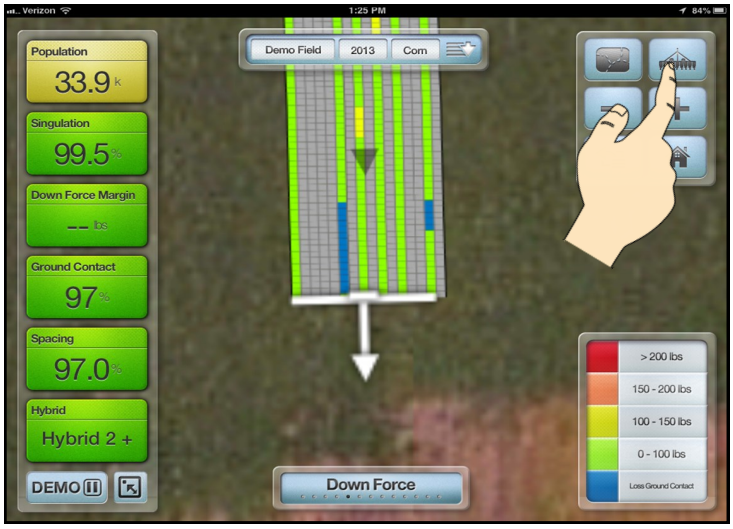
Down Force (Map)

Down Force information shows rows with excess compaction or loss of ground contact on rows equipped with the optional weigh pins. Each square is a 1/5th second of time and is color coded green with targeted down force exerted. Each blue square shows a loss of ground contact and each colored square shows the amount of extra weight carried on the gauge wheels



Down Force Map

Ability to see and map Down Force as applied across the entire array of weigh pins, "Live."



Field Summary Report

Field Summary Report: One for the field (actual) and the other for simulation. These are useable reports in real time as the field is being planted.

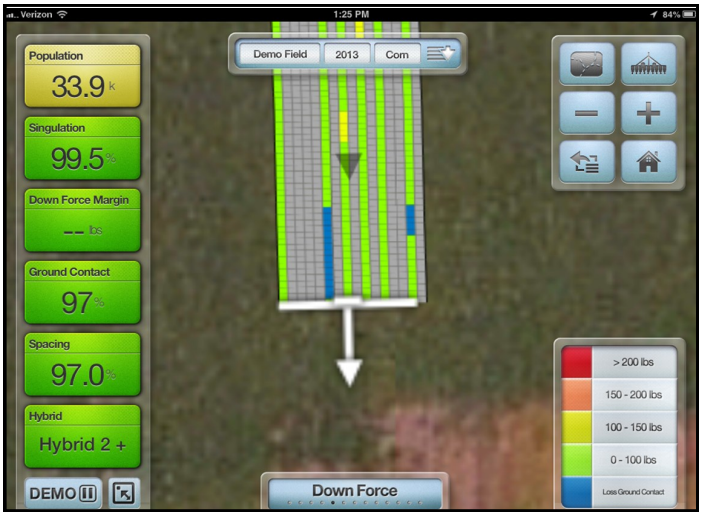
Planting performance: Singulation, spacing and ride.

Down Force: Loss of ground contact, good down force, excess compaction.

Hybrid: Acres planted of each hybrid.

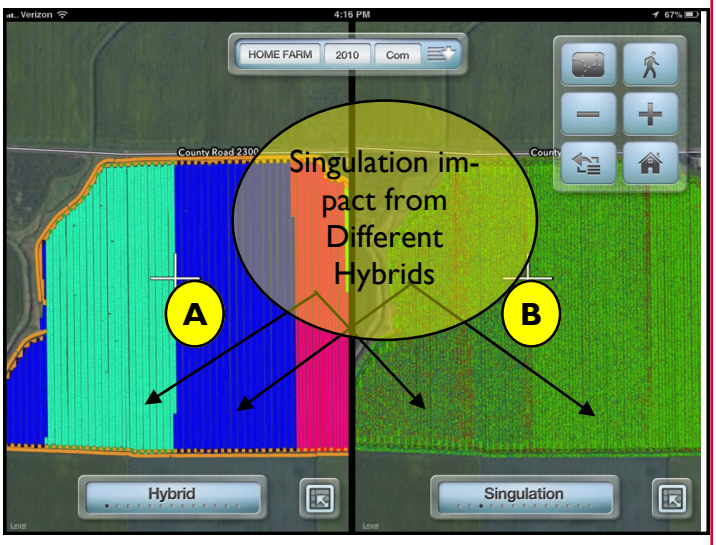
Down Force Live

Ability to see Down Force across entire planter,



SplitView

Split screen showing where each hybrid was planted (A) and also how the seed size of various hybrids can affect the meter with more skips and doubles from a certain hybrid (B).

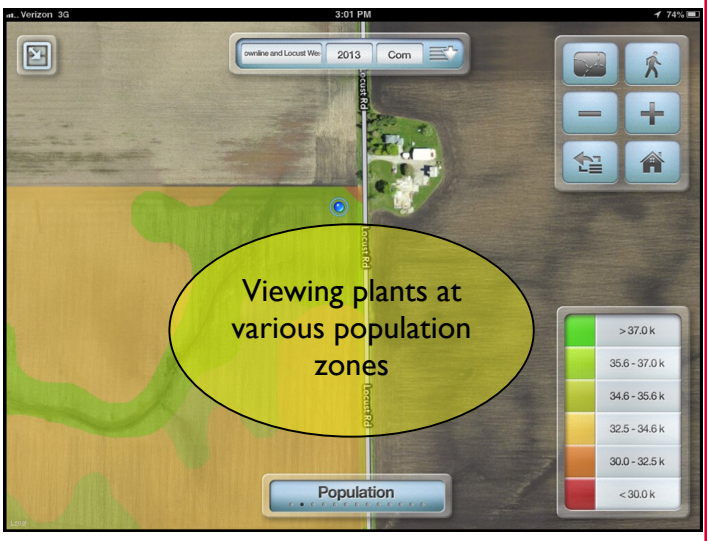


Scouting

Use the iPad to scout the field. The blue dot marks current position.

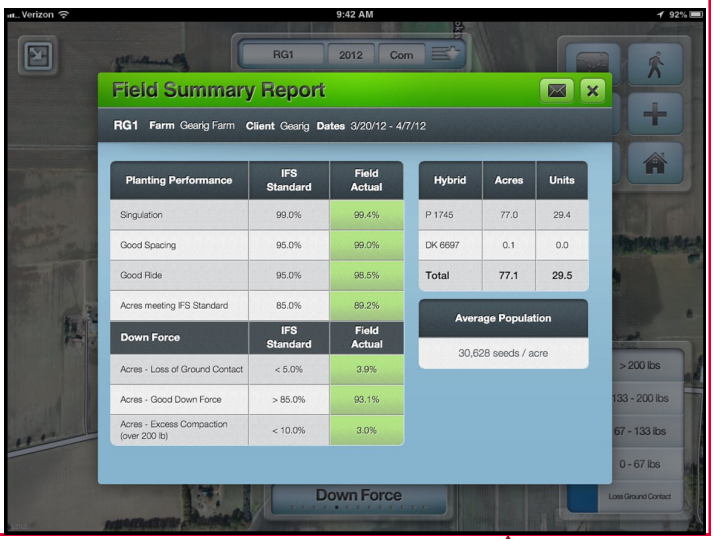
Population Maps

Allows viewing of different population rates at the touch of the screen.



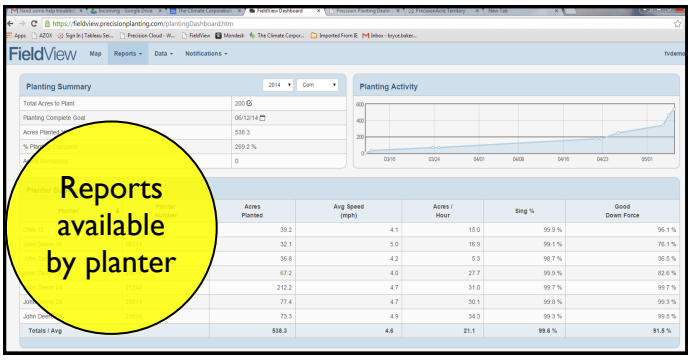
Field Summary Report

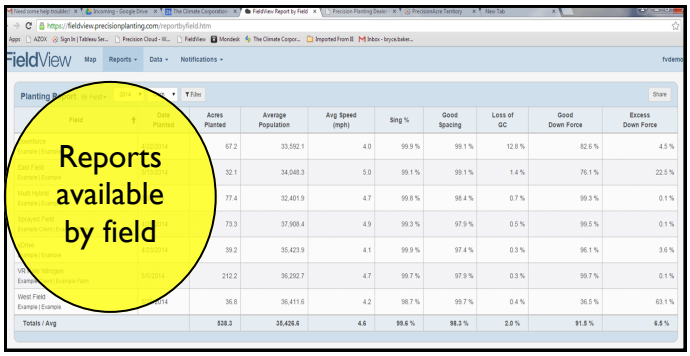
Summarizes all planting process functions. This report is all green signaling that this planter & operator did a great job!



Map from the Web

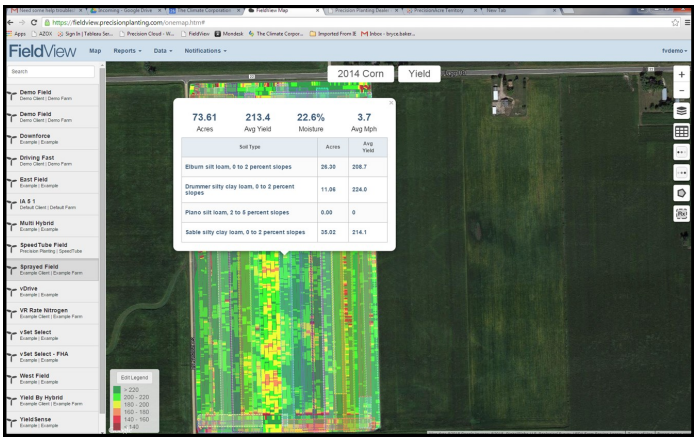
FieldView maps available showing a summary of performance by planter as well as planting data by individual field.





Combined Maps

FieldView will combine planting data with yield data producing valuable Big Data information useful in evaluating crop inputs estimated results.



Subject: WP MY2017 WP9800VE Series Planters

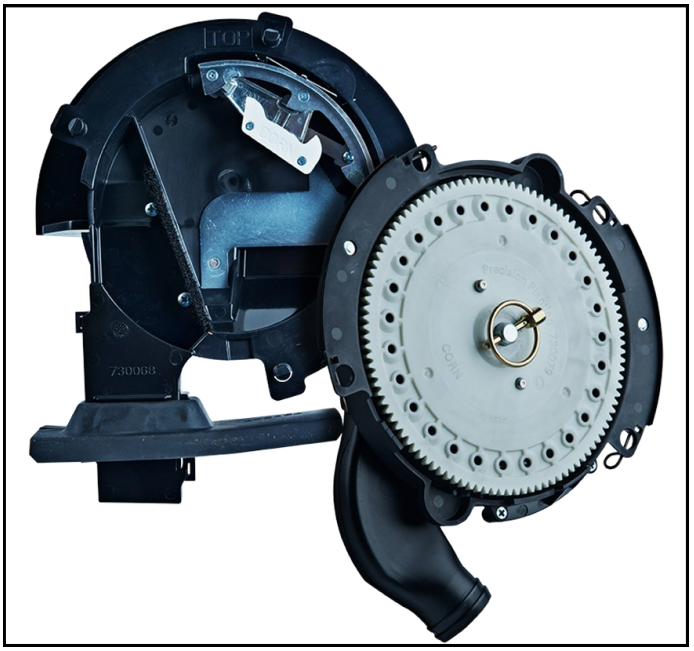
How Do We Get Where We Need To Be?

Now that we know the abundance of useful planting systems information from the 20/20 system….how can we convert this information into useful knowledge?
Realizing the negative impact to yield from a poor planting performance, what's the best course of action to ensure the planter is performing at maximum precision? Let's start at the beginning...

Place the Seed

Accurate planting begins with accurate seed metering…..one seed selected and delivered to the furrow followed by the next, time after time, exactly the same.

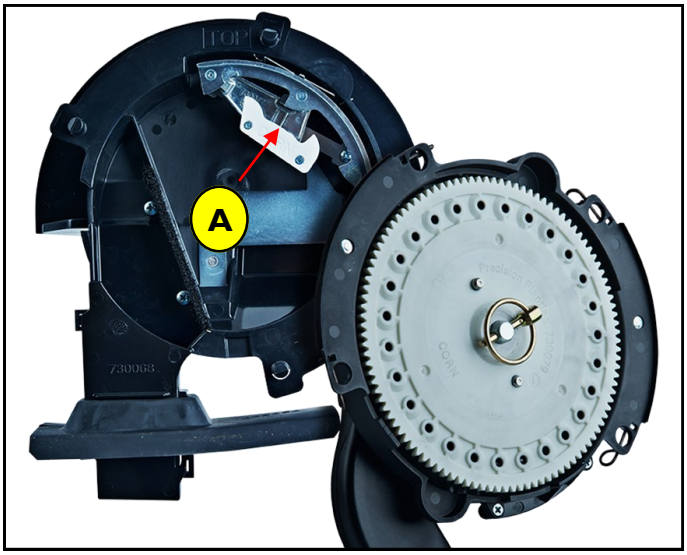
The Seed Meter



The meter has to preform flawlessly. Every time all the time!
The vSet vacuum meter functions perfectly at approximately twenty-two water column inches of vacuum. The design of the seed disc is smaller, as compared to other vacuum meter systems. The space between the cells has been reduced to hold only one seed per cell. The disc has blunt edges around the hole to help agitate the seed in the seed pool. This is helpful in loading the seed into the hole. As many as three seeds can be picked up from the seed pool. The hole in the disc is flat (it is not a cell) and therefore less sensitive to seed shape or size. The flat hole ensures the seed drops straight down as opposed to "rolling out" as is the case with a cupped seed cell.

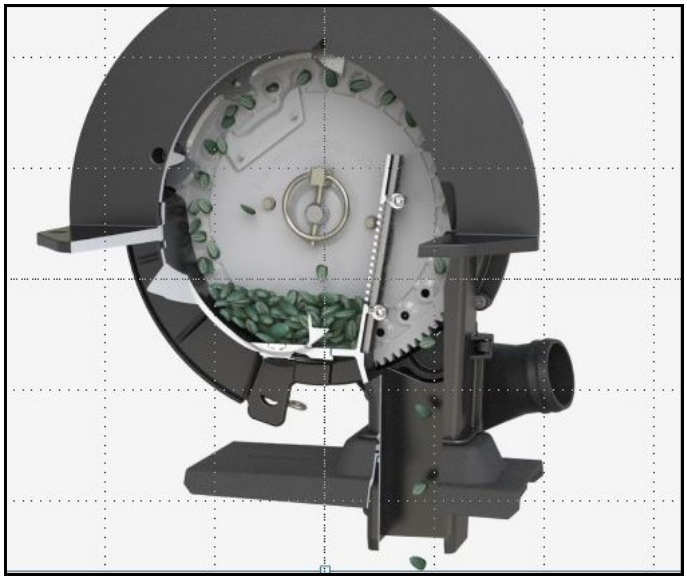
Singulation and Delivery

The singulator (A) is not adjustable. It is spring loaded and follows the outside circumference of the seed disc. It rides on the disc to follow any wobbling or movement of the seed disc. The relationship of the singulator to the hole in the disc remains constant. The singulator is not mounted to the meter; it rides on the seed disc. Lacking adjustment, it requires a change of singulator for various crops and seed size.



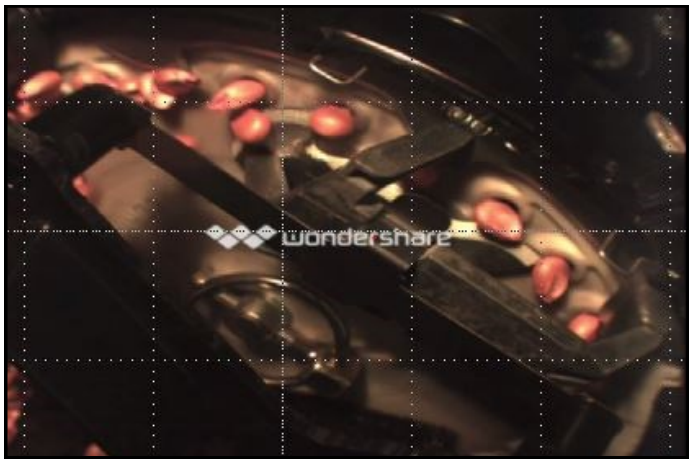
Singulation

The singulator partially covers the hole, both top and bottom, forcing all but one seed from the hole. The vacuum is cut which releases the seed down the center of the seed tube. The fragment extractor can be seen operating behind the seed disc. The meter is very LOW torque which requires very little power to operate. The meter also has a smaller vacuum chamber as compared to most competitive vacuum meters. The collective smaller vacuum chambers lower the required water column inches of vacuum.



Singulation

The left side shows the initial contact of seed to the singulator. The 22 inches of vacuum will hold several seeds on the disc. As the seeds encounter the series of singulator lobes (5) the multiple seeds are sloughed off. As you can see at the right side of the singulator, only one seed remains. The high vacuum doesn't permit skips….maintaining one seed in the hole. Is there a potential of a skip? Yes, but a *very slight chance*. The design idea is to use enough vacuum to ensure the selection of one seed and a mechanical device to eliminate excess seeds.

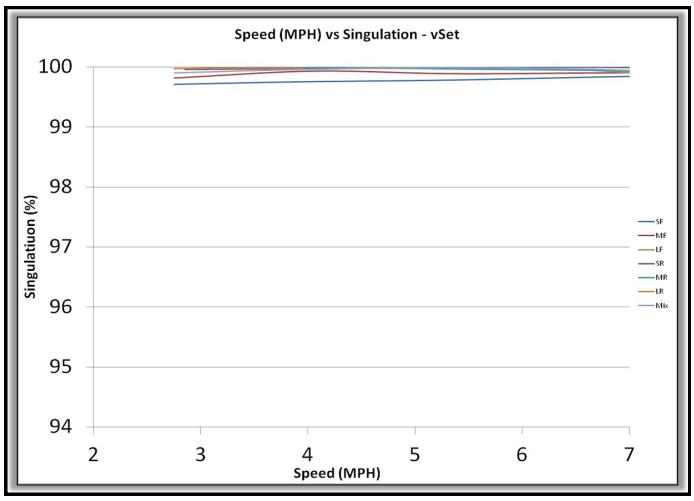


20/20 Singulation Report

Looking at the performance screen: Singulation report….99.5% singulation accuracy for this hybrid. The system is promoted as a 99% performance meter without required adjustment to vacuum or singulator. The 9800VE system is capable of accurately planting a wide range of crops using a specified singulator and seed disc.

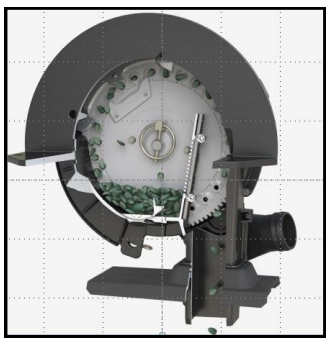
Singulation

The vSet meter maintains seed singulation accuracy even as ground speed increases. As shown in this report; singulation accuracy remains greater than 99.5% through the entire corn seed samplings….. small, medium and large rounds and flats, as well as a mixture of them all.



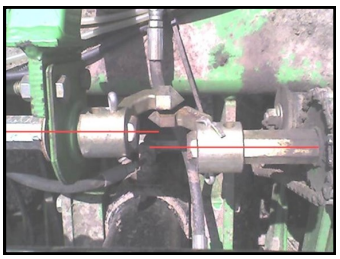
vSet Advantage?

Does the vSet meter really have a singulation advantage as compared to the positive air White meter? When compared side by side on a test stand both meters can consistently achieve 99.5% seed singulation accuracy. The real world advantage of the vSet meter over the positive air meter is its ability to singulate poorly graded and irregular or inconsistent seed.



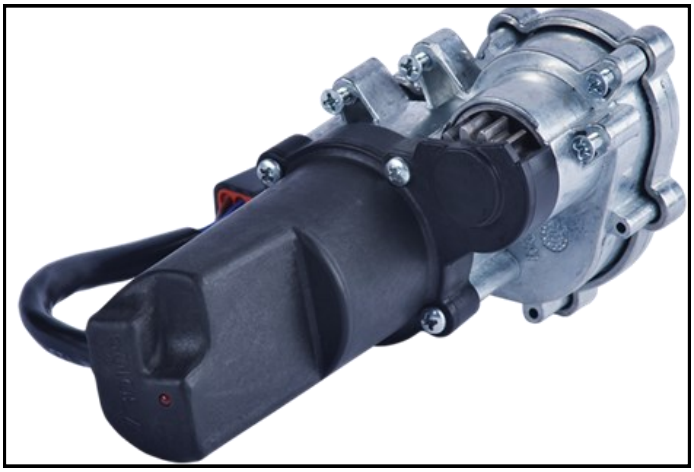
Meter Drive

Planter maintenance is very important. Shown here are some of the "Pain Points" common with most planters - Misaligned hex shafts, stiff chains, worn out sprockets. The existence of one or all of these conditions will cause spacing errors. What if we could eliminate all of these potential "Planter Pain Points"? Everyone would approve of that. That's the opportunity Precision Planting affords the White Planter VE series electric drive .



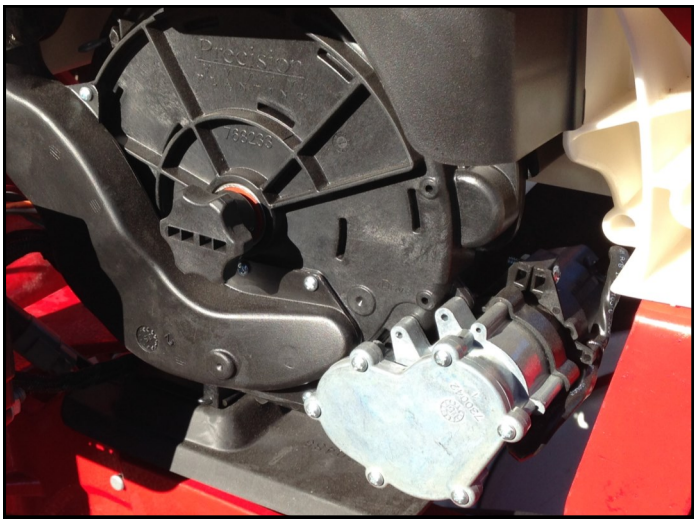
Meter Drive

The vDrive of the VE system mounts to the outside of the meter assembly. The drive directly engages the seed disc, totally eliminating what has traditionally been the drive (mechanical ground drive or hydraulic). Let's change how we think of a planter… think of each row as being an independent planter. Rather than having a 12 row planter we now have 12 planters connected by a common toolbar. We can think of them this way because we now have complete and independent control of each one of them.



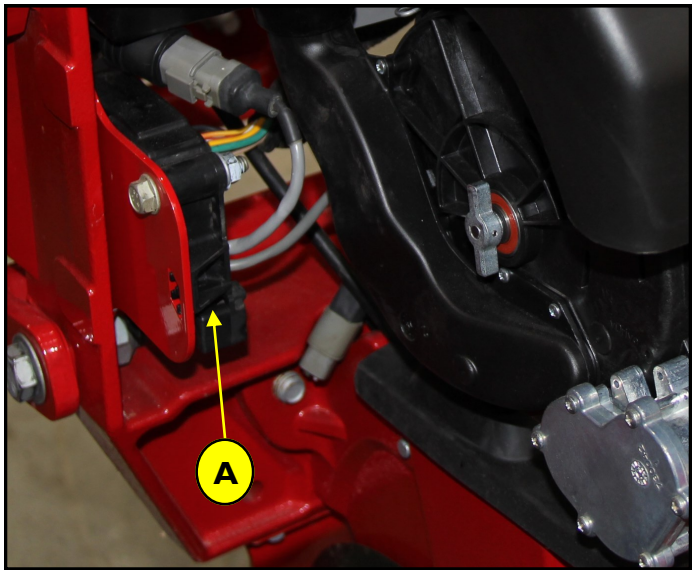
vDrive

Consider what's been eliminated from the planter - ground drive transmissions, chains, sprockets, hex shafts, cables, clutches, bearings, hydraulic motors, hydraulic hoses and more…all gone! All replaced by a 12 volt, low torque electric motor giving us total and instantaneous drive control. This paring of meter and drive equals precision.



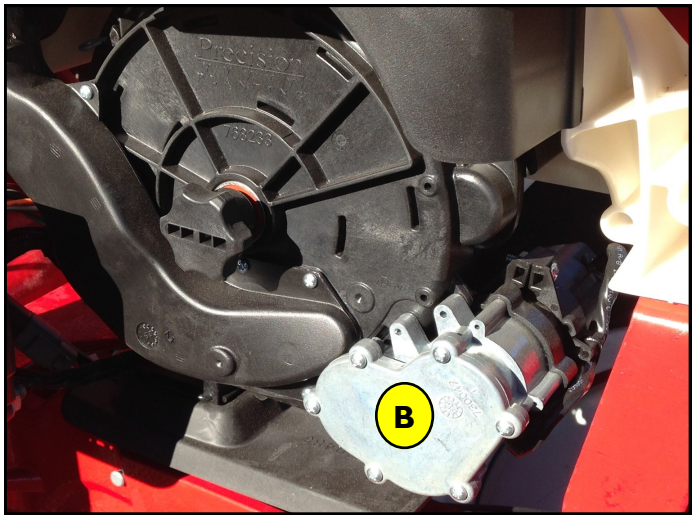
Single Row Module

The SRM (Single Row Module (A)) enables a row to perform differently from the row next to it, if necessary. Other positives are: Common harnessing and modules on the row which enable the addition of other capabilities; Hydraulic Down Force; High Performance Seed Tubes; and others as they become available. The SRM transforms a planter from a group of row units operating in lockstep on a toolbar into a toolbar of individual planters capable of independent operation.



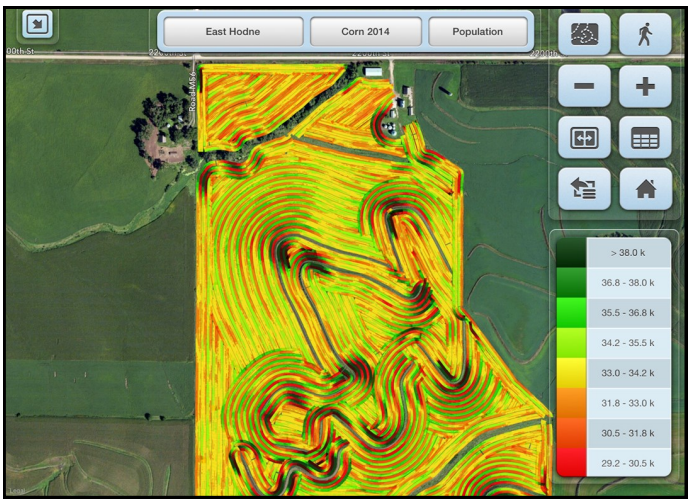
Meter Drive

In the VE system the motor (B) drives the seed disc which provides variable seed rate control, swath control, turn compensation control, and eliminates all those "Planter Pain Points". This meter and drive combination has had three years of successful field experience. We anticipate that customers may consider replace existing variable rate hydraulic drives and row clutches with this system in order to have the accuracy and simplicity this system affords them.



Population Control

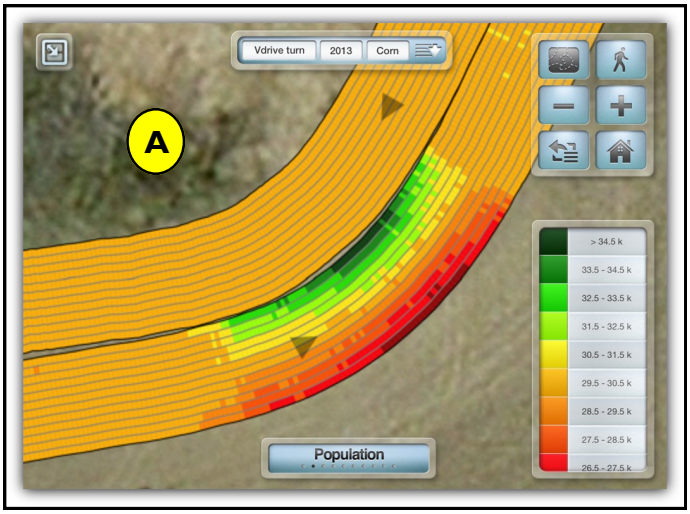
There are several agronomic benefits to the VE drive system. Population control is one and it's important. As seen in the example of this field; the population varies greatly across the planter as it negotiates the necessary curves. In this example the planter is equipped with a hex shaft drive system and this is really the best performance expected with this technology.

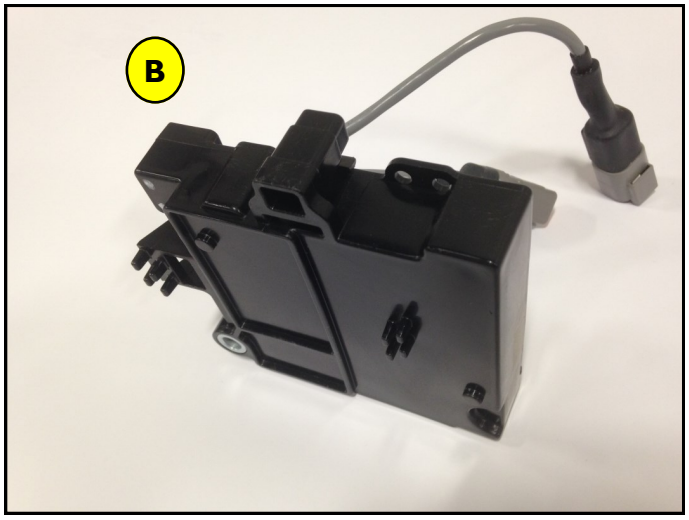


Turn Compensation

Another agronomic benefit of the VE system is turn compensation. Consider the example in field (A). A 12 row planter is set at a 30,000 seed population target utilizing a hex shaft drive system. A planter such as this, when negotiating a turn will experience the ground speed of the inside row units physically slowing down with the speed of the outside rows increasing. So what happens to the seeding rate set at a 30,000 seeds per acre? The planter will continue to plant the target rate. The result would be the inside rows planting in excess of 40,000 seeds per acre while the outside rows are only dropping seeds at a 22,000 rate per acre. The population average hasn't changed but the seed spacing in the inside rows is now at 2 to 3 inches while the outside rows are spaced in the 10 inch range. The seed spacing/rate will vary across the width of the planter. The VE system, because of the SRM (B), won't experience this seed spacing/rate failure due to the control of each row acting as a single row planter. The system contains a gyro that senses the turn and knows the position of each row from the center of the toolbar. Throughout the turn, the motor speed of each row will be adjusted to slow down or speed up as necessary to maintain the correct population and seed spacing. Is it perfect? No, it may vary by a one to two percent of population target but it's much improved over the 33 percent seed variance of a hex shaft driven planter.

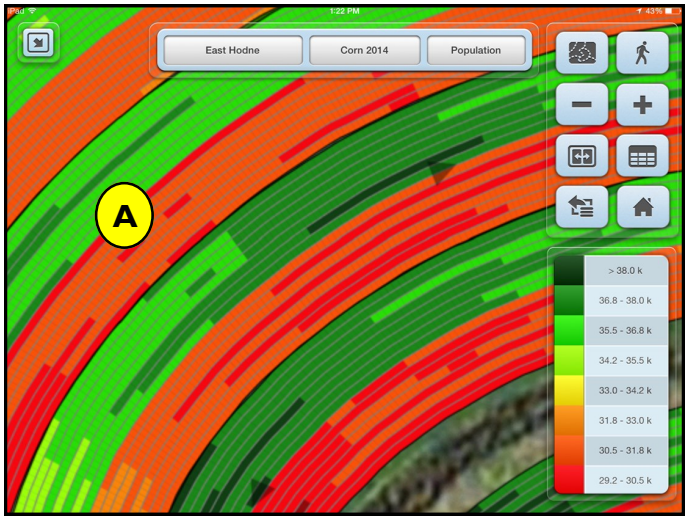
Field (C) has a similar layout with many curves but the planter is equipped with the VE System drives. The turn compensation capability of the VE drive system provides individual row control. This reduces the seed variation window to a much lower 1400 seed variation through the curve.





Turn Compensation

To further highlight the value of the SRM, let's take a look at a competitive planter lacking this feature. The Kinze planter's ground drive system is split with drive wheels on each end. Placing this planter in a similar field requiring a tight curve to the inside, drive tires would slow and reduce the seed rate of all the rows on that side of the planter. The opposite would happen on the outside of the curve….the drive tires on the outside of the curve would go much faster increasing the seed rate of all the rows on that side of the planter. The result would look like this (A).

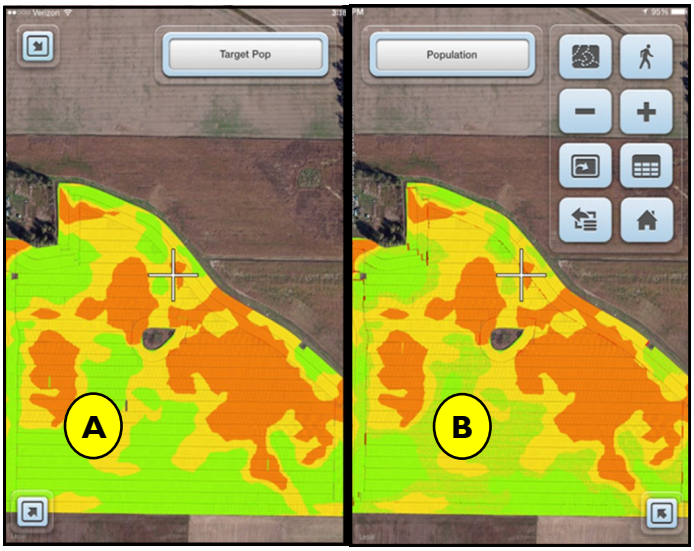


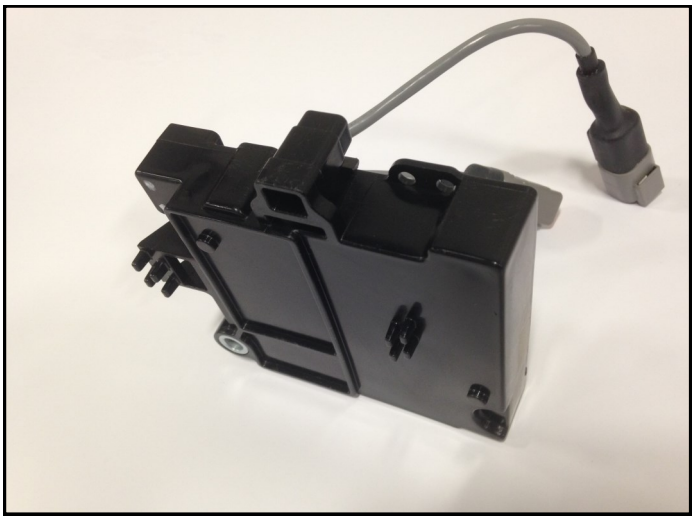
The population screen shows the dramatic variation of seed population from one side to the other.

You can see the drastic population difference in the field. The plants in the red oval were in the inside curve half of the planter and are very bunched. The plants in the yellow oval were in the outside curve of the planter. These are spaced much wider apart. The VE drive system eliminates these problems.

Precise Population Control

A hydraulic drive planter with rate control over one half or one third of the planter has been considered good technology. Could such a planter follow the population map as shown on the left side of the screen (A)? This is an actual grower's population map. A planter only being able to vary the seed rate of one half or one third of the rows would find it very difficult to match the assigned populations of this map. Some areas of the planter would be correct and other areas incorrect. The VE drive system with individual row control can vary the population by row. The map on the right side of the screen (B) is the "actual as planted" map of this field. Is it one hundred percent accurate? No, but it's about ninety-five percent accurate. As you can see, where the management zones were not squared off to match the planter the individual rows of the VE system made the correct rate adjustment row by row to match the prescribed population. Remember, the White 9800VE is not a twelve, sixteen or twenty-four row planter but a tool bar comprising twelve, sixteen or twenty-four individual planters.

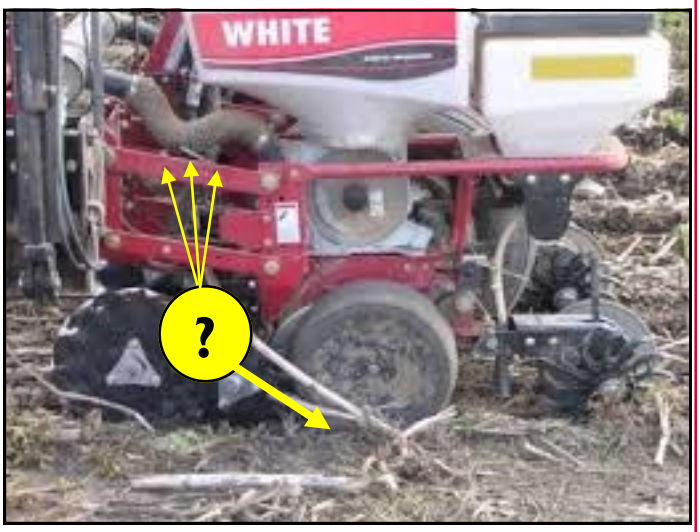




Swath control in the VE drive system is very good and doesn't require the additional purchase of clutches for each row. It's all controlled by the SRM (C) and operates at twelve volts and low amperage.

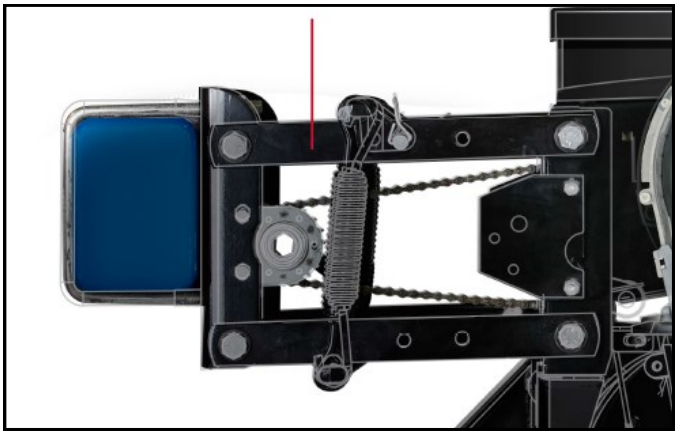
Set

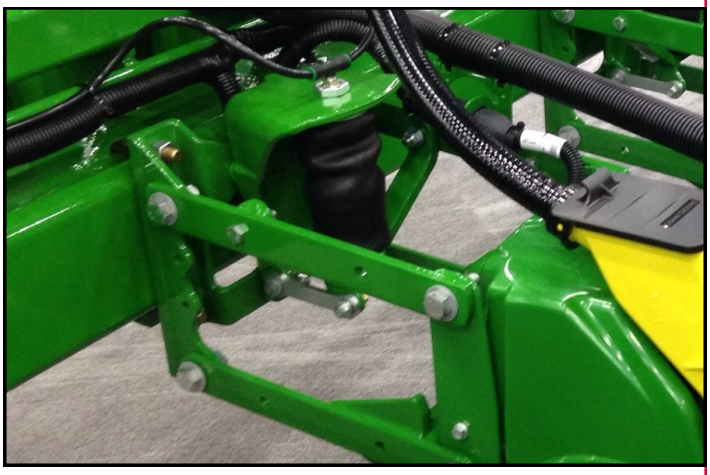
We understand and appreciate the effect down force can have on yield. Yet setting the down-force control of the planter, as critical as it is, is probably the least understood by operators than any other aspects of the tool. Farmers appreciate the need for accuracy in the meter, the value of even spacing, and a clean area to plant into…but downforce? Not being able to really see what's going on under the soil surface a farmer will normally put down force on the row unit until he's convinced that the seed will always be at the set depth. One adjustment and done.



Down Force

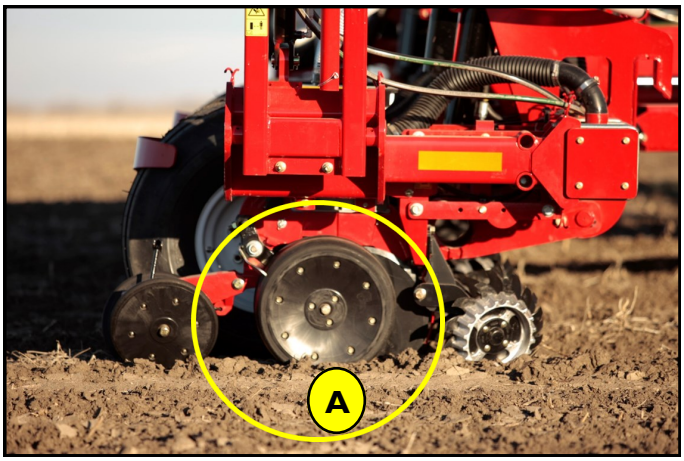
There is a lot of talk about downforce control and about the best way to apply it. First we must understand what we're trying to accomplish by automating downforce control. The goal is to achieve "consistent" seed depth. By planting at a consistent depth each seed planted should be exposed to consistent moisture and temperature to germinate and emerge consistently. There's also a compaction factor that must be considered, too, in getting to full depth. Are all down force systems equally efficient? Spring and air downforce systems exert the down force pressure much the same way to maintain the desired seed depth. The air system is more conveniently adjusted but both systems often times place too much pressure on the soil when the actual soil resistance is requiring less penetration force to meet the targeted planting depth. This "more than required force" compacts the soil around the seed.

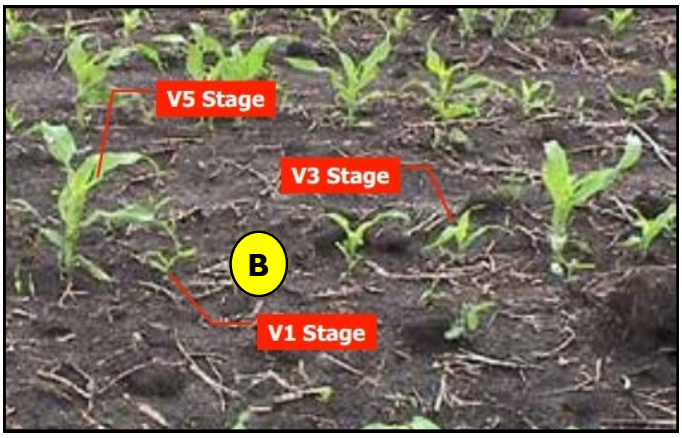




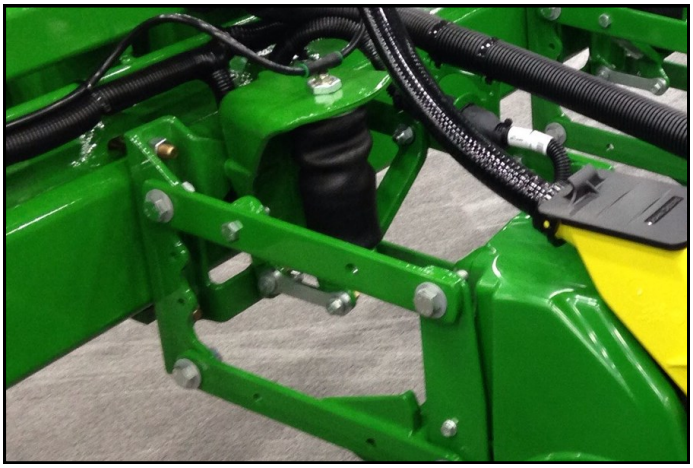
Down Force

The area of concern is highlighted here (A). The down force system, whether spring or air, exerts the operator's selected down force for each row. The opener blades will penetrate the soil until they cause the depth wheels to move upward and their linkage to impact the depth stop. In a perfect world, the down force would have been set to achieve the planting depth with just enough pressure to firm the soil around the seed. What happens if the down force setting is not sufficient to penetrate an area of hard dry soil the planter has encountered? The disc openers have penetrated as deep as possible but the gauge wheels have not impacted the linkage stop. The seed has been placed at a shallower depth (B) than desired and in a different environment than the seeds planted at the set depth. The soil is dryer at the shallower depth and germination will be delayed causing late emergence.





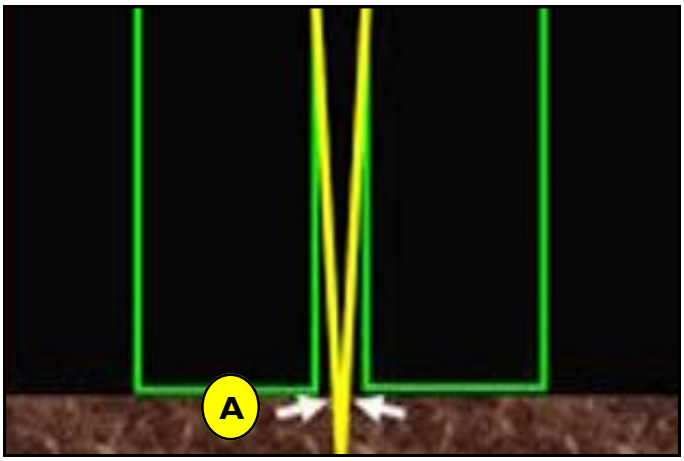
In contrast ….. IF, it takes one hundred pounds of down force for the opener blade to penetrate the soil to the planting depth of two inches. The row unit weighs two hundred pounds and the down force system is set to two hundred pounds of force, be it spring or air. The total down force generated on the opener blades equals four hundred pounds when only one hundred is required. The opener blades penetrate to the two inch depth and the gauge wheels impact the depth stop. One hundred of the three hundred pounds of down force has been consumed. How are the remaining three hundred pounds impacting our seed environment?

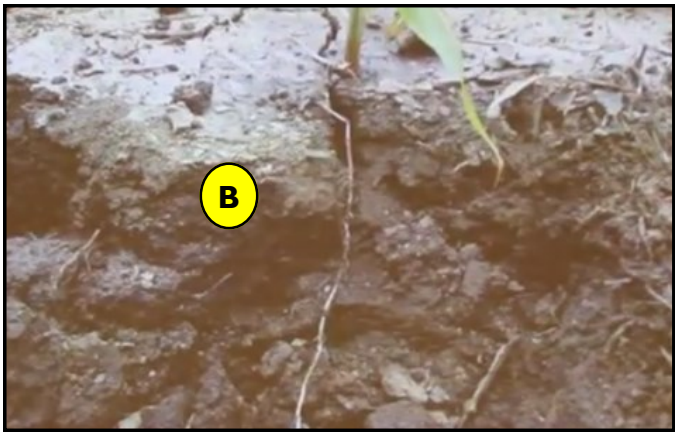


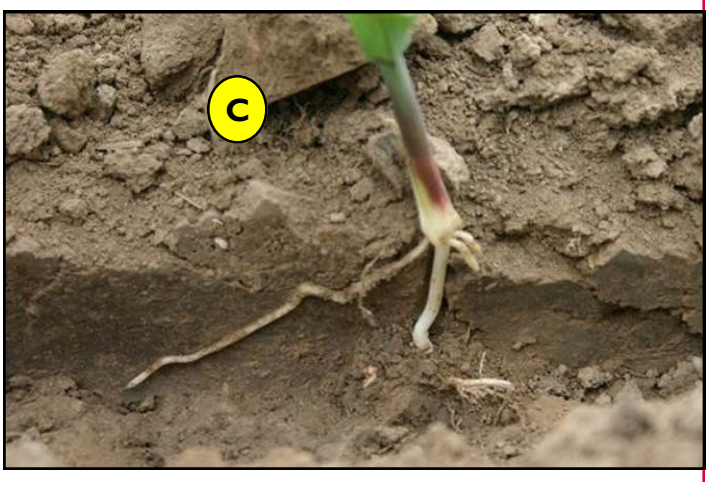
Down Force

The remaining three hundred pounds are carried by the gauge wheels. The soil captured between the opener blades and the press wheels….this is the seed trench side wall…. is excessively compressed by the unneeded, but present, additional three hundred pounds of force. In moist soil conditions the side wall can be smeared and the soil under the press wheels can be compacted (A) and lose pore space. This seed environment can negatively impact our maximum yield potential. If the plant is at the V4 to V8 stage of development, which is when the maximum plant potential is determined, root stress can occur. This happens when the plant sends forth a root, especially a "crown root", the impacts this compacted area. The root may turn downward (B) when the smeared sidewall is encountered, getting smaller and having a more difficult time breaking through the compacted area. The root stress will trigger the plant to set smaller ears because the less robust root structure (C) won't be sufficient to support the larger ear. We need a balance… enough down force to open the furrow at depth and firm the soil enough to maintain the furrow structure so it's not collapsing into the furrow. Too firm soil, however will hinder plant development.

How do growers determine how much down force is enough? Generally, with the row unit engaged at depth, the gauge wheel is turned by hand.
If it turns freely…more down force is needed. If it can't be turned at all….that's too much. Turned with some effort required is probably enough.
But how can you know the down force is set correctly at any given point in the planting process?

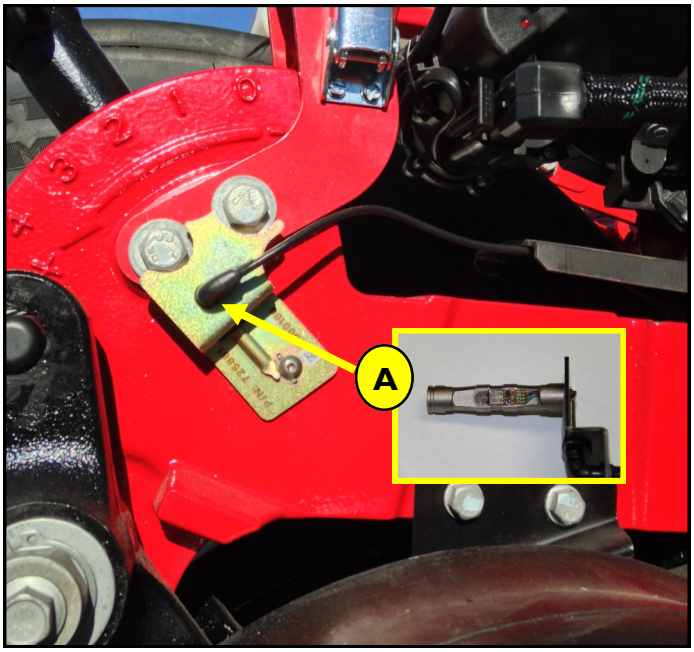






Down Force

A planter equipped with 20/20 SeedSense can measure and monitor the down force of each row equipped with a weigh pin (A). Most down force systems on planters will have an air bag or springs to apply force downward. This "applied force" is applied equally across the planter and remains constant across the field. These down force systems are adjusted manually. The spring system is adjusted at each row and the air system from a central location, usually in the cab of the tractor.



In FieldView where we're measuring and mapping down force, what does too much (B) or too little (C) down pressure look like? Over two hundred pounds of gauge wheel weight shows in red. That's over two-hundred pounds more weight than necessary on every seed in this field. Fifty to one-hundred pounds would be the targeted range. The report shows that 94% of the seeds planted were planted with excess weight on them. In the screen shot of (C) the planting was with a row hopper planter and static spring down pressure. As the planter off-loaded the seed, both the row unit weight and the down force decreased (D) . The static springs didn't have sufficient down force to maintain planting depth. Fill the planter again (E) and we're back in business. The report shows 38% of this field was planted without weight on the gauge wheels….planted shallow with a very good chance of emergence problems and reduced yield. The 20/20 SeedSense system with weigh pins will inform the operator when too much, too little or the targeted amount of down force was applied.

The information can become applied knowledge but only if and when adjustments are made.

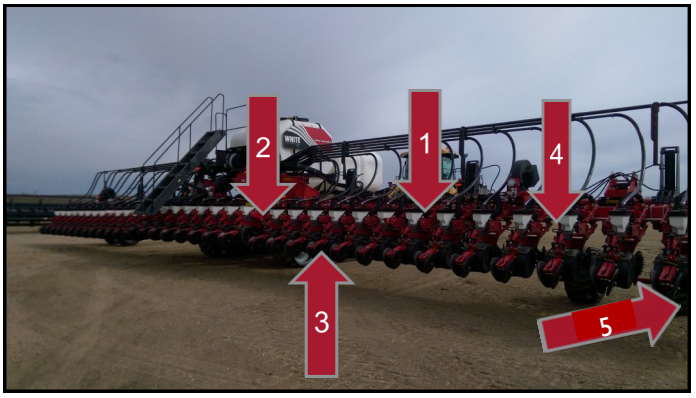
DeltaForce

So why a down force system with individual row control? Let's take a look at a typical large frame planter. There are several areas of the planter being impacted differently:

Area (1) This soil is not being impacted by the tires of the tractor or planter, but prior traffic may have affected soil density in this area.
Areas (2 & 3) The soils density is impacted by the planter and tractor tires.
Area (4) The soil's density is affected by the wing wheels on both sides of the planter.
Area (5) The soil between the two wing tires is affected by both tires on each wing.

It's a fact that soil density will be impacted by these forces but by how much? With a sectional down force system which condition should be addressed? Set the air pressure higher to meet the soil density in and around the tractor and planter tires? That would put excessive down force in area (1). A mechanical spring system would enable more down force where needed but would not address the potential variances of soil density across the breadth of the planter. The reality is that each row in these areas will at some time require a different down force setting. This is why the DeltaForce system was developed. It was designed with a single row positive or negative applied force.

The individual row control empowers each row to respond to sudden soil density variability caused by pre-plant activities like harvest or tillage. Even a floater applying pre-plant fertilizer or herbicides may create wheel tracks that would require a spike of two-hundred more pounds of down force for a rows running in tracks made by its pass.



Row by Row Adjustment

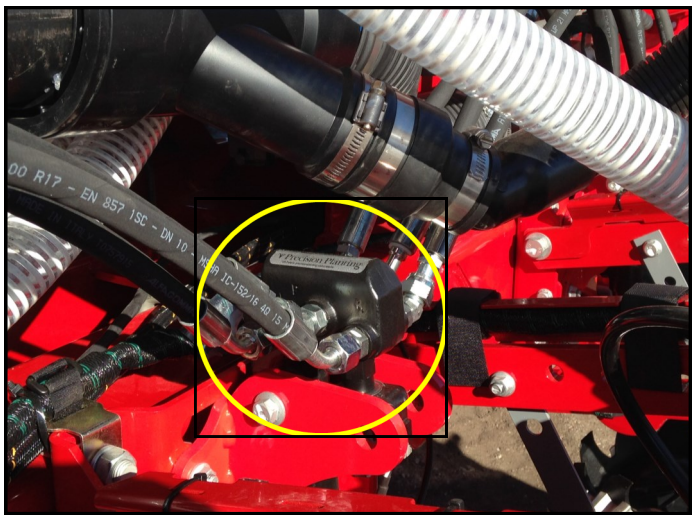
Subject: WP MY2017 WP9800VE Series Planters

DeltaForce

DeltaForce is an "Automatic Control" applied force system that is not simply measured but automatically adjusted to the targeted down force. Using a system that actively measures and adjusts the pressure means you're in control. "DeltaForce" is an individual row SRM based down force control system. So what does DeltaForce do? It eliminates the guesswork regarding how much additional weight is needed on the row. Or how much excess weight is on the row. DeltaForce enables the operator to set how much full force he wants to add. DeltaForce then measures *multiple times a second* how much extra force is being applied *on each row* and adjusts up or down to maintain the targeted gauge wheel setting. In some cases the system will call for more down force to be applied. The system also has the capability to lift weight off the row unit and transfer it back to the planter toolbar. Such a scenario would be a full row hopper planter in mellow soil….on each row, one-hundred pounds of seed, two-hundred pounds of row unit weight for a total of three-hundred pounds. In this mellow soil only one-hundred pounds of down force is needed. The DeltaForce system can transfer the unwanted three-hundred pounds back to the toolbar. This is exclusive to the DeltaForce system as this is the only hydraulic down force system with this dual action capability. All other hydraulic down force systems only exert force downward. As in the scenario just described, a competitive system would have not applied down force but two-hundred unneeded excess pounds would still be applied.

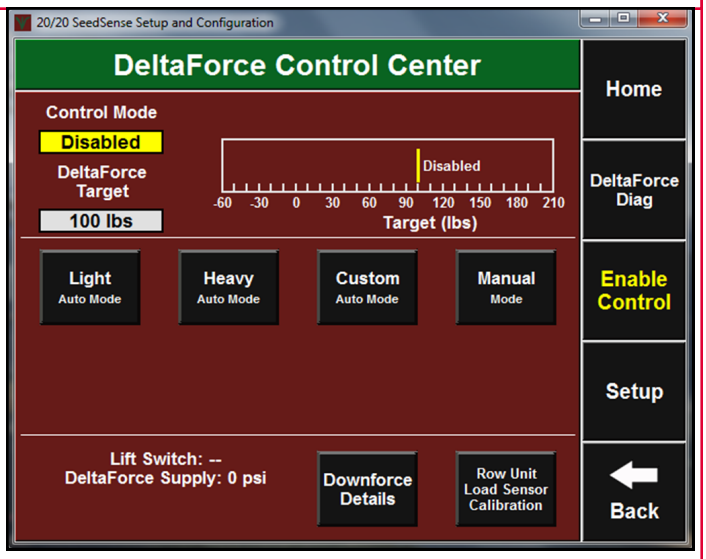
There are three hoses on each row: Down pressure, return and lift.

Row by Row Adjustment



DeltaForce Control

With DeltaForce the operator doesn't have to guess what position to put the springs in or how much air to put in the air bags. He determines what the gauge wheel weight target should be and how much weight is needed beyond what it takes to make depth. A standard number is one-hundred pounds. If two-hundred pounds are required to penetrate to depth then the total applied will equal three-hundred pounds. This is a good starting point. The FieldView map will inform the operator if the loss of ground contact or excess pressure percentages are too high so adjustments can be made.



DeltaForce Control

Row by row variable applied force provides consistent weight on the planter gauge wheels.

Map (A) A FieldView maps showing down force as applied on a row by row bases.

Map (B) Shows the actual resulting weight on the gauge wheels row by row. The results are a consistent green in sharp contrast to the very inconsistency shown on the map displaying the varying adjustments made by the system.

Subject: WP MY2017 WP9800VE Series Planters

DeltaForce

This Applied Down Force map (A) highlights where the planter drafted down the hill and some row units were running in tire tracks requiring additional force.

The down force field report (B) informs the grower of each row's experience by percentages as to loss of soil contact, good soil contact or excessive soil contact with a summary at the bottom of the report.

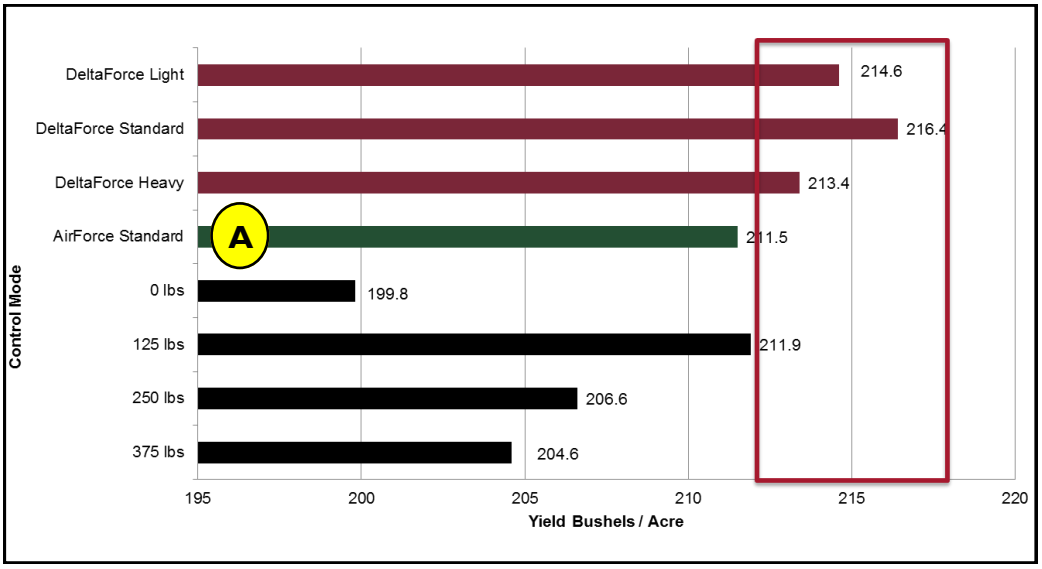
Beck's Seed Company Study

This chart compares down force systems; AirForce to DeltaForce. (AirForce is Precision Planting Company's pneumatic down force system)

As part of the Becks PFR Research, they use AirForce Standard (A) as the standard yield goal. You'll notice that the black lines below the AF Standard line represent spring settings of common mechanical down force systems.

DeltaForce, above and beyond the AF standard shows a yield increase of 3.3 bu. per acre on average.

This gives DeltaForce an 11 bu. average advantage over spring settings.



SPECIFICATIONS

GENERAL

Model	9812VE, 9816VE, and 9824VE
Frame Type	Forward Fold Flex Frame
Hoppers	
Central Fill Hoppers (CFS Only)	2
Hopper Material	Translucent Polyethylene
Hopper Capacity bu. (L)	45 (1,586)
Total Seed Capacity bu. (L)	90 (3,172)

ROW WIDTH

Model	
9812VE - 12 row in (cm)	145 (76)
9816VE - 16 row in (cm)	145 (76)
9824VE - 24 row in (cm)	145 (76)

TRACTOR REQUIREMENTS (Minimum)

Horse Power - Minimum	
9812VE hp (kw)	145 (108)
9816VE hp (kw)	145 (108)
9824VE hp (kw)	154 (115)
Hitch	
Three Point	Category II or III
Operating Height in (mm)	12 (305)
Transport Height in (mm)	36 (914)
Drawbar; 11,000 lb. (4,990 kg) Vertical Load Capacity	Category IV
Hydraulic Operating Pressure	
Minimum psi (kPa)	2,250 (15,514)
Maximum psi (kPa)	3,000 (20,385)

Hydraulic Remotes: 9812VE	
40 GPM PTO Pump and Reservoir	2
Tractor Hydraulics Plus Power Beyond	2
40 GPM PTO Pump and Reservoir and DeltaForce	3
Tractor Hydraulics Plus Power Beyond and DeltaForce	3

SPECIFICATIONS

TRACTOR REQUIREMENTS (Minimum)

Hydraulic Remotes: 9812VE Electric Drive and CFS

40 GPM PTO Pump and Reservoir	2
Tractor Hydraulics Plus Power Beyond	2
40 GPM PTO Pump and Reservoir and DeltaForce	3
Tractor Hydraulics, Power Beyond and DeltaForce	3

Hydraulic Flow Requirements: 9812VE Electric Drive and CFS

Total Minimum Required Using Only Tractor Remotes gpm (Lpm)	47 (177.9)
Total Minimum Required Using PTO Pump gpm (Lpm)	12 (45.4)
CFS Seed Distribution (PTO Pump) gpm (Lpm)	15 (56.78)
Frame Raise and Lower (Hyd, Remote) gpm (Lpm)	12 (45.4)
Frame Fold and Markers (Hyd. Remote) gpm (Lpm)	12 (45.4)
Seed Vacuum Blower (PTO Pump) gpm (Lpm)	20 (75.7)
Optional Equipment; Minimum Hydraulic Required	
Delta Downforce gpm (.25 gpm/row) (Hyd. Remote) gpm (Lpm)	3 (11.36)
Optional Alternator (DeltaForce Down Force Required) gpm (Lpm)	6 (22.7)

Hydraulic Remotes: 9816VE & 9824VE Electric Drive and CFS

14 GPM PTO Pump and Reservoir	3
Tractor Hydraulics	4
14 GPM PTO Pump and Reservoir and DeltaForce	4
14 GPM PTO Pump and Reservoir, Delta Downforce and Cent. Fertilizer Pump	5
Tractor Hydraulics, DeltaForce and Centrifugal Fertilizer Pump	6

Hydraulic Flow Requirements: 9816VE & 9824VE Electric Drive and CFS

9816VE Total Minimum Required Using Only Tractor Remotes gpm (Lpm)	47 (177.9)
9824VE Total Minimum Required Using Only Tractor Remotes gpm (Lpm)	47 (177.9)
9816VE Total Tractor Minimum Required Using PTO Pump gpm (Lpm)	27 (102.2)
9824VE Total Tractor Minimum Required Using PTO Pump gpm (Lpm)	27 (102.2)
CFS Seed Distribution (PTO Pump) gpm (Lpm)	15 (56.78)
Frame Raise and Lower (Hyd. Remote) gpm (Lpm)	12 (45.4)
Frame Fold and Markers (Hyd. Remote) gpm (Lpm)	12 (45.4)
Seed Vacuum Blower (PTO Pump) gpm (Lpm)	20 (75.7)
Optional Equipment; Minimum Hydraulic Required (Add to Above)	
9816VE Delta DF (Hyd. Remote) gpm (.25 gpm/row) (Lpm)	3 (11.36)
9824VE Delta DF Generator (PTO Pump) (6 gpm) gpm (Lpm)	12 (45.42)
Liquid Fertilizer Pump (Hyd. Remote) gpm (Lpm)	4 (15.14)

SPECIFICATIONS

TRACTOR REQUIREMENTS (Minimum)

Electrical

Voltage	12
Ground	Negative
Alternator (Amperage Capacity)	160
Connector for Tail and Warning Lamps	7-Pin

Seed Rate Drive

vDrive, Electric Drive (Variable Rate)	1.25 amp/row
Electric Drive Control	Single Row Module

CENTRAL FILL SYSTEM COMPONENTS

Central Fill Hoppers

Quantity	2
Hopper Material	Rotational Molded Polyethylene
Hopper Capacity bu. (L)	45 (1,586)
Total Seed Capacity bu. (L)	90 (3,172)
Hopper Supports	Tubular Steel
Hopper Fill Opening in (mm)	22 (559)
Hopper Lid	Screw-on
Hopper Cleanout Door	(3) Three Compartment Door, (1) One Door per Hopper
Hopper Access Platform	Perforated Non-Skid Steel Decking
Hopper Access Steps	(5) Five Perforated Non-Skip Steel Steps
Hopper Access	Center Rear of Planter

Plenum and Mixing Chamber Outlets (per hopper)

Total Outlets	12
Outlet Size Diameter in (mm)	1.5 (38)

Hydraulic System

Blower Drive	1
Hydraulic Flow Limit Valve	1

Hopper Frame

Length in (mm)	118 (2,997)
Width in (mm)	75 (1,915)

SPECIFICATIONS

CENTRAL FILL SYSTEM COMPONENTS

Seed Hopper	
Length in (mm)	87 (2,210)
Width in (mm)	41 (1,038)
Height in (mm)	52 (1,321)
Height from Platform to Top of Hopper in (mm)	42 (1,067)
Hopper Access Platform	
Length in (mm)	61 (1,564)
Width in (mm)	36 (925)
Hopper Access Steps (width) in (mm)	13.5 (342)
Platform Railing Height	40 (1,016)

SEED DISTRIBUTION AIR SYSTEM

Blower and Motor	1
Fan Impeller Diameter in (mm)	12.88 (327.2)
Fan Speed Maximum	5000 rpm
Fan Motor Type	12cc Piston Type Orbit Motor
Fan Width in (mm)	3 (76.2)
Fan Motor Displacement	12 cc
Operating Air Pressure	
Minimum Working Air Pressure in H2O (kPa)	15 (3.73)
Maximum Working Air Pressure in H2O (kPa)	25 (6.22)
Hydraulic Requirements gpm (Lpm) (min/max)	12/15 (45/57)
Blower Outlet Hose Diameter in (mm)	5.0 (127)
Seed Delivery Hose Diameter in (mm)	1.5 (38)

SEED METERING VACUUM AIR SYSTEM

Blower Motor and Fan	
Blower Fan Diameter in (mm)	17 (432)
Blower Fan Width in (mm)	2.73 (69.4)
Max Fan Speed	5000 rpm
Minimum Working Air Pressure in H2O (kPa)	5 (1.24)
Maximum Working Air Pressure in H2O (kPa)	30 (7.47)
Hydraulic Requirements gpm (Lpm) (min/max)	3.5/7 (13.2/26.4)
Seed Vacuum Hose Diameter in (mm)	1.5 (38)

SPECIFICATIONS

FRAMES

Frame Flex - 3 Sections - Flex each Wing	+/- 21 degrees
Frame Flex - Total	+/- 42 degrees
Lift System	Series Rephasing
Number of Wheels	
Model 9812VE	6
Transport Wheels	4
Wing Gauge Wheels	2
Model 9816VE	8
Transport Wheels	4
Wing Gauge Wheels	4
Model 9824VE	10
Transport Wheels	4
Wing Gauge Wheels	Inner Wing 1, Outer Wing 2
Rear Tow Hitch	Optional
Towing Capacity lb. (kg)	2,000 (7,570)
Row Markers with Break-Away Feature	Optional
Model 9812VE	Flat Folding Bi-fold Arm
Model 9816VE and 9824VE	Flat Folding Three-Fold Arm
Sequencing	Automatic Hydraulic

Seeding Rate Controller: Terminal/Monitor	20/20 SeedSense
SRM (Single Row Module) Controller	Micro-processor Controlled Infinitely Variable
Type	Electric Drive
Seeding Rate Settings	Infinite Adjustment
Energy Source	Tractor Electrical System
On-the-go Seed Rate Change Limits	
Increments	Infinite
Adjustment Range	Infinite

HYDRAULIC SYSTEM

Lift System	Dual Master Slave
Lift Cylinders (Transport Wheels)	Double Acting
Frame Fold Cylinder	Double Acting
Marker Cylinders (Optional) - Automatic Sequencing	Double Acting

MONITOR

Seed Monitor	20/20 SeedSense
Auto Guide	C1000 or C3000
Fertilizer (Optional)	C1000 or C3000

SPECIFICATIONS

CAPACITIES

9812VE PTO Pump Hydraulic Reservoir Fluid Capacity gal (L)	25 (95)
9816VE & 9824VE PTO Pump Hydraulic Reservoir Fluid Capacity gal (L)	8.5 (32)

DIMENSIONS AND WEIGHTS

Model 9812VE Main Frame Tube Size in (mm)	7x7 (178x178)
Main Frame Tue Wall Thickness in (mm)	.25 (6.35)
Center Section Hitch Member Wall Thickness in (mm)	.375 (9.53)
Wing Section Hitch Member Wall Thickness in (mm)	.375 (9.53)
Model 9816VE and 9824VE Main Frame Tube Size in (mm)	7x7 (178x178)
Main Frame Tue Wall Thickness in (mm)	.375 (9.53)
Center Section Hitch Member Wall Thickness in (mm)	.375 (9.53)
Wing Section Hitch Member Wall Thickness in (mm)	.375 (9.53)
Main Frame Length	
Model 9812VE - 30-inch Spacing	
Total ft (m)	30’ 6” (9.30)
Center Section with 4 row units ft (m)	11’ 3” (3.42)
Each Wing with 4 row units ft (m)	10’ 0” (3.05)
Model 9816VE - 30-inch Spacing	
Total ft (m)	39’ 4” (11.98)
Center Section with 6 row units ft (m)	11’ 3” (3.42)
Each Wing with 5 row units ft (m)	14’ 0” (4.26)
Model 9824VE - 30-inch Spacing	
Total ft (m)	59’ 4” (18.08)
Center Section with 8 row units ft (m)	11’ 3” (3.42)
Each Wing with 8 row units ft (m)	24’ 0” (7.31)
Wheels and Tires: Model 9812VE	
Wheels, Center Frame in	8.00” x 15”, 8 Bolt
Wheels, Wing Frame in	8.00” x 15”, 8 Bolt
Tires, Center Frame in	10.00-15FI (TL) Load Range D
Tires, Wing Frame in	10.00-15FI (TL) Load Range D
Wheels and Tires: Model 9816VE and 9824VE	
Wheels, Center Frame in	8.25” x 22.5”, 8 Bolt
Wheels, Wing Frame in	8.25” x 22.5”, 8 Bolt
Tires, Center Frame in	VF295/75R x 22.5
Tires, Wing Frame in	VF295/75R x 22.5
Marker Disc (Optional)	
Notched Marker Disc Diameter in (mm)	14 (356)

SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Model 9812VE Hydraulic Cylinders	
Lift Cylinders Center Frame Wheels in (mm)	3.5X15.75 (88.9X400.1)
Lift Cylinders Wing Wheels in (mm)	3.25X15.75 (82.55X400.1)
Frame Fold Cylinder (1) in (mm)	5.20X20 (127X400.1)
Marker Cylinder (Optional) in (mm)	2X24 (50.8X609.6)
Model 9816VE and 9824VE Hydraulic Cylinders	
Lift Cylinders Center Frame Wheels in (mm)	4.5X125 (114.3X304.8)
Lift Cylinders Wing Wheels in (mm)	4X12 (101.6X304.8)
Frame Fold Cylinder (1) in (mm)	5X20 (127X508)
Marker Cylinder (Optional) in (mm)	3X20 (76X508)
Model 9812VE	
Operating Height ft (m)	9' 3" (2.82)
Operating Width ft (m)	30' 6" (9.30)
Operating Length ft (m)	22' 0" (6.71)
Transport Height ft (m)	11' 10" (3.61)
Transport Width ft (m)	12' 0" (3.65)
Transport/Storage/Shipping Length 2-Point Hitch ft (m)	31' 2" (9.50)
Tongue Weight on CFS Loaded lbs. (kg)	9,970 (4,255)
Transport Ground Clearance (Lowest Point of Row Unit) ft (m)	18' (0.46)
Model 9816VE	
Operating Height ft (m)	9' 0" (2.74)
Operating Width ft (m)	40' 10" (12.45)
Operating Length ft (m)	33' 0" (10.86)
Transport Height ft (m)	12' 8" (3.86)
Transport Width ft (m)	12' 0" (3.65)
Transport/Storage/Shipping Length 2-Point Hitch ft (m)	34' 4" (10.46)
Transport/Storage/Shipping Length Drawbar Hitch ft (m)	36' 0" (10.97)
Shipping Height ft (m)	11' 10" (3.60)
Shipping Width ft (m)	11' 8" (3.55)
Rear of Row Unit to Center of CFS Opening Length ft (m)	5' 0" (1.52)
Tongue Weight on CFS Loaded lbs. (kg)	9,970 (4,255)
Transport Ground Clearance (Lowest Point of Row Unit) ft (m)	15' (0.38)
Model 9824VE	
Operating Height ft (m)	9' 0" (2.74)
Operating Width ft (m)	60' 10" (18.54)
Operating Length ft (m)	43' 10" (13.36)
Transport Height ft (m)	12' 8" (3.86)
Transport Width ft (m)	12' 0" (3.65)

SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Model 9824VE (cont.)

Transport/Storage/Shipping Length 2-Point Hitch ft (m)	45' 2" (13.75)
Transport/Storage/Shipping Length Drawbar Hitch ft (m)	46' 10" (14.27)
Shipping Height ft (m)	11' 10" (3.60)
Shipping Width ft (m)	11' 8" (3.55)
Rear of Row Unit to Center of CFS Opening Length ft (m)	5' 0" (1.52)
Tongue Weight on CFS Loaded lbs. (kg)	10,700 (4,853)
Transport Ground Clearance (Lowest Point of Row Unit) ft (m)	15' (0.38)

Approximate Shipping Weights

Model 9812VE CFS lb. (kg)	14,100 (6,396)
Model 9816VE CFS lb. (kg)	18,000 (8,165)
Model 9824VE CFS lb. (kg)	26,000 (11,964)

Transport Chain	Standard Equipment
Transport Lighting System	Standard Equipment
Enhanced Turn Signal	Standard Equipment
Transport Lockup Devices	Standard Equipment
Slow Moving Vehicle Sign	Standard Equipment

ROW UNITS

GENERAL

Make	White Planters
Row Unit	9000VE Series
Frame Style	9800VE Series Planters
Seed Metering	Individual Row
Seed Singulation	Vacuum
Row Unit Linkage	Parallel Arm

Design

Seed Trench Opener	Double Disc
Disc Position	Opposing
Disc Scraper Design	Flat
Gauge Wheel Type	Equalized Walking Beam

SPECIFICATIONS

ROW UNITS (cont.)

Gauge Wheel Pivot Arm	Non-metallic composite bushings with inner and outer seals
Seed Delivery	Curved Seed Tube
Seed Tube Sensors	(Dickey John) High Rate or Seed Smart Sensors
Closing Wheels	
Angled Rubber	Optional
Down Pressure (Mechanical)	
Minimum lb. (kg)	72 (33)
Maximum lb. (kg)	270 (123)
Angled Cast	Optional
Down Pressure (Mechanical)	
Minimum lb. (kg)	107 (49)
Maximum lb. (kg)	304(138)
Single "V" Trench Press Wheel	Optional
Down Pressure (Mechanical)	
Minimum (Single Spring at 1 1/2-inch Depth) lb. (kg)	51 (23)
Maximum (Dual Spring at 1 1/2-inch Depth) lb. (kg)	134 (61)
Row Unit Down Force (Springs)	Optional
Heavy Duty Down Pressure Springs	
Minimum lb. (kg)	13 (6)
Maximum lb. (kg)	414 (118)
Row Unit Down Force (Hydraulic)	Optional
Alternator (On Board)	Optional
Hydraulic Down/Up Force	
Minimum lb. (kg)	-200 (-90.72)
Maximum lb. (kg)	650 (294.84)
Operating Range in Relation to the Planter Frame	
Upward from Parallel in (mm)	5.2 (132)
Downward from Parallel in (mm)	5.8 (147)
Row Unit Bearings	
Disc Opener - Double Row Ball Permanently Lubed and Sealed in (mm)	1.02 (26)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel - Double Row Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel Pivot Arm	
Bushing Diameter in (mm)	1.26 (32.2)
Bushing Length in (mm)	0.79 (20)

SPECIFICATIONS

ROW UNITS (cont.)

Gauge Wheel Pivot Arm	Non-metallic composite bushings with inner and outer seals
Seed Delivery	Curved Seed Tube
Seed Tube Sensors	(Dickey John) High Rate or Seed Smart Sensors
Closing Wheels	
Angled Rubber	Optional
Down Pressure (Mechanical)	
Minimum lb. (kg)	72 (33)
Maximum lb. (kg)	270 (123)
Angled Cast	Optional
Down Pressure (Mechanical)	
Minimum lb. (kg)	107 (49)
Maximum lb. (kg)	304(138)
Single "V" Trench Press Wheel	Optional
Down Pressure (Mechanical)	
Minimum (Single Spring at 1 1/2-inch Depth) lb. (kg)	51 (23)
Maximum (Dual Spring at 1 1/2-inch Depth) lb. (kg)	134 (61)
Row Unit Down Force (Springs)	Optional
Heavy Duty Down Pressure Springs	
Minimum lb. (kg)	13 (6)
Maximum lb. (kg)	414 (118)
Row Unit Down Force (Hydraulic)	Optional
Alternator (On Board)	Optional
Hydraulic Down/Up Force	
Minimum lb. (kg)	-200 (-90.72)
Maximum lb. (kg)	650 (294.84)
Operating Range in Relation to the Planter Frame	
Upward from Parallel in (mm)	5.2 (132)
Downward from Parallel in (mm)	5.8 (147)
Row Unit Bearings	
Disc Opener - Double Row Ball Permanently Lubed and Sealed in (mm)	1.02 (26)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel - Double Row Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel Pivot Arm	
Bushing Diameter in (mm)	1.26 (32.2)
Bushing Length in (mm)	0.79 (20)

SPECIFICATIONS

ROW UNITS (cont.)

Row Unit Bearings (cont.)

Disc Opener - Double Row Ball Permanently Lubed and Sealed in (mm)	1.02 (26)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel - Double Row Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Gauge Wheel Pivot Arm	
Bushing Diameter in (mm)	1.26 (32.2)
Bushing Length in (mm)	0.79 (20)
Angled Rubber Closing Wheel - Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Angled Cast Closing Wheel - Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Single "V" Trench Press Wheel - Permanently Lubed and Sealed in (mm)	1.57 (40)
Attaching Bolt in (mm)	0.63 (16)
Bearing, Oil Impregnated in (mm)	.66X.88X.57 (16.8X22.4X14.5)

MONITORS

C1000

Maximum Rows	24
TopCon	ISO Compliant
Display Communication	Scroll Wheel and Touch Key Navigation and Interface
GPS	Receiver is Required via CAN or RS232 Communication

C3000

Maximum Row	24
TopCon	ISO Compliant
Display Communication	Touch Screen Interface
GPS	Receiver is Required via CAN or RS232 Communication

20/20 SeedSense (Required)

Maximum Row	24
Precision Planting	"NOT" ISO Compliant
Display Communication	Touch Screen Interface
GPS	Receiver is Required via CAN or RS232 Communication

SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Hopper Capacity	
Mini Hopper (CFS) Per Row bu. (L)	0.5 (17.62)
Row Unit Weight lb. (kg)	200 (90.72)
Parallel Arm	
Width in (mm)	0.5 (13)
Depth in (mm)	3 (106)
Length in (mm)	14.5 (368)
Double Disc Seed Trench Opener Disc	
Diameter in (mm)	16 (406)
Thickness in (mm)	.14 (3.5)
Seed Tube Length in (mm)	18 (457)
Seed Depth	
Settings in (mm)	18 settings X 1/4-inch Increments (6.35)
Minimum in (mm)	0.25 (6.35)
Maximum in (mm)	4.5 (114)
Gauge Wheel	
Tire Width in (mm)	4.5 (114)
Tire Diameter in (mm)	16 (406)
Dual Rubber Closing Wheel Tire	
Tire Width in (mm)	1 (25)
Tire Diameter in (mm)	12 (305)
Assembly Weight (including bracket) lb. (kg)	23 (11)
Dual Cast Closing Wheel	
Tire Width in (mm)	1 (25)
Tire Diameter in (mm)	12 (305)
Assembly Weight (including bracket) lb. (kg)	50 (23)
Single "V" Trench Closing Wheel	
Tire Width in (mm)	4 (100)
Tire Diameter in (mm)	12 (305)
Assembly Weight (including bracket) lb. (kg)	20 (23)

SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Seed Meter

Make	Precision Planting
Model	9800VE White Planters
Type	Vacuum Electric
Construction	

Seed Hopper

Mini Hopper (CFS) Per Row bu. (L)	0.5 (17.62)
Construction	
Lid	

Seed Disc

Construction	
Design	Side Drop
Diameter in (mm)	6.75 (174.45)

Seed Disc Options

Corn, Popcorn, Soybean, Sunflower, Edible Bean, Snap Bean, NATTO Beans, Cotton, Sorghum, Milo, Sugar Beet, Peanut, Wheat

LIQUID FERTILIZER

9812VE

Tank Type	Elliptical, Polyethylene
Capacity g (L)	300 (1892.71)
Fill Opening in (mm)	10 (254)
Outlet/Drain in (mm)	1.25 (31.75) drain, 1.25 (31.75) outlet
Length in (cm)	69 (1752.6)
Width in (mm)	38 (965.20)
Height (including sump) in (mm)	38 (965.20)
Bands (2) in (mm)	2 (50.8) x 80(2032)

9816VE & 9824VE

Tank Type	Elliptical, Polyethylene
Capacity g (L)	500 (1892.71)
Fill Opening in (mm)	16 (406.4)
Sump Depth in (mm)	2 (50.8)
Outlet/Drain in (mm)	1.25 (31.75) drain, 1.25 (31.75) outlet
Length in (cm)	82 (2082.8)
Width in (mm)	57 (1147.8)
Height (including sump) in (mm)	44 (1117.6)
Bands (3) in (mm)	2 (50.8) x 94 (2387.6)

SPECIFICATIONS

LIQUID FERTILIZER (Cont.)

Piston Pumps

9812VE, 9816VE & 9824VE

Model	John Blue NGP-6055 Single Piston-Double Acting
Maximum Flow gpm (lpm)	21 (79.49)
Pump Port Sizes in (mm)	1.50 (38.10) FPT inlet, 1.50 (38.10) outlet
Maximum Pressure psi (bar)	120 shut off (8.27)
Maximum Temperature F (C)	140° (60°)
Maximum RPM	450
Length (pump and drive) in (mm)	14.4 (365.76)
Width in (mm)	10 (254.00)
Height in (mm)	8.75 (222.25)
Weight lb. (kg)	65 (29.48)
Crankcase Oil Capacity pints (L)	1.5 (0.71)
Crankcase Lubrication	SAE 90 Gear Oil
Contact Drive, (Theoretical) hp	2.25
Rotation	Clockwise or Counter-clockwise
Drive	No. 50 Roller Chain
Drive Sprocket	18T

9816VE & 9824VE

Model	John Blue NGP-8055 Double Piston-Double Acting
Maximum Flow gpm (lpm)	42 (185.49)
Pump Port Sizes in (mm)	1.50 (38.10) FPT inlet, 1.50 (38.10) outlet
Maximum Pressure psi (bar)	120 shut off (8.27)
Maximum Temperature F (C)	140° (60°)
Maximum RPM	450
Length (pump and drive) in (mm)	14.4 (280.67)
Width in (mm)	14 (355.60)
Height in (mm)	8.75 (222.25)
Weight lb. (kg)	125 (56.70)
Crankcase Oil Capacity pints (L)	2.5 (1.18)
Crankcase Lubrication	SAE 90 Gear Oil
Contact Drive, (Theoretical) hp (mph)	4.50 (4.56)
Rotation	Clockwise or Counter-clockwise
Drive	No. 50 Roller Chain
Drive Sprocket	18T

SPECIFICATIONS

LIQUID FERTILIZER (Cont.)

Centrifugal Pumps
9816VE & 9824VE

Model	Hypro Centrifugal 9302CT-GMI-B
Maximum Flow gpm (lpm)	63 (238)
Pump Port Sizes in (mm)	1.25 (31.75) NPT inlet, 1.0 (25.4) outlet
Maximum Pressure psi (bar)	105 shut off (6.6-10.3)
Maximum Temperature F (C)	140° (60°)
Length (pump and drive) in (mm)	11.05 (280.67)
Width in (mm)	7.66 (194.56)
Height in (mm)	8.44 (214.38)
Weight lb. (kg)	26 (11.8)
Motor Drive, Hydraulic	For open center, closed center and load-sensing systems
Port Sizes in (mm)	0.5 (12.7 mm) NPT, Inlet, 0.75 (19.05 mm) NPT Outlet Minimum
Required Hyd. Oil Flow	3 gpm (11.34 lpm)
Motor	Internal Gear Gerotor

Electric Pumps
9816VE & 9824VE

Model	5059. Shurflo Electric Fertilizer Pump
Maximum Flow gpm (lpm)	5.3 (20.1)
Pump Port Sizes in (mm)	0.5 (12.7) NPTF inlet, 0.5 NPTF (12.7) outlet
Maximum Pressure psi (bar)	80 shut off (5.52)
Bypass Setting	
Cracking Bypass psi (bar)	35 (2.54)
Full Bypass psi (bar)	90 (6.30)
Self-Priming, Up To ft (m)	8 (2.4)
Length (pump and drive) in (mm)	9.29 (235.89)
Width in (mm)	4.40 (111.8)
Height in (mm)	4.03 (102.5)
Motor Drive	12 volt electric, continuous duty, sealed motor
Maximum AMP Draw	18 Amps
Connector	Metri Pack 480 2 pin, Delphi 12065863
Pin A	12 volt DC
Pin B	Ground