

DeltaForce[®]

DeltaForce Operator's Guide For Gen 2 20/20 Displays

Precision Planting[®]

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System Setup and Operation

There are four requirements for the DeltaForce system to function:

1. There must be a speed source.
2. The Master Plant Switch on the Cab Control Module must be in the up position.
3. The planter must be lowered.
4. DeltaForce must be enabled.

Hydraulic Pressure Requirements

1. The hydraulic system must have a Supply Pressure greater than 2250 psi, a Return Pressure less than 100 psi, and a Lift Pressure between 200 psi and the supply pressure.

Configuring Monitor for DeltaForce

Step 1:

Set DeltaForce as the Down Force System.

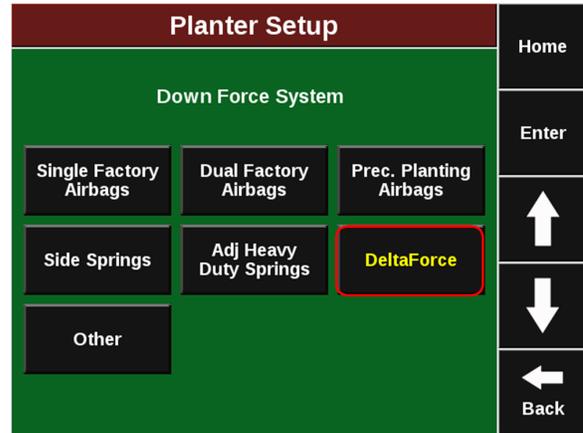
Navigate to the planter setup page by selecting, “Setup” – “Planter”

Step 2:

Ensure that “Planter Make”, “Rows”, “Spacing”, “Active Rows”, and “Meter Type” are correct.

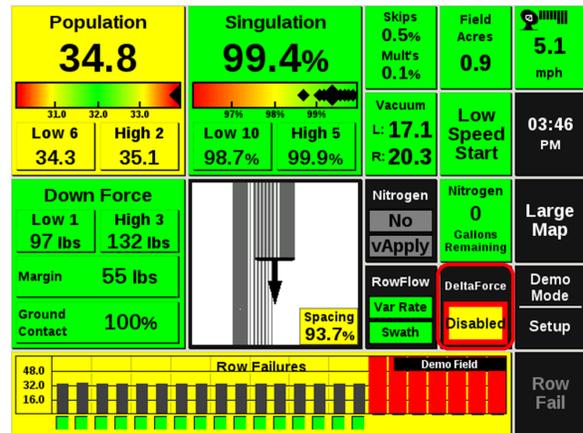
Step 3:

Press “Down Force System” and then select “DeltaForce”.



Step 4:

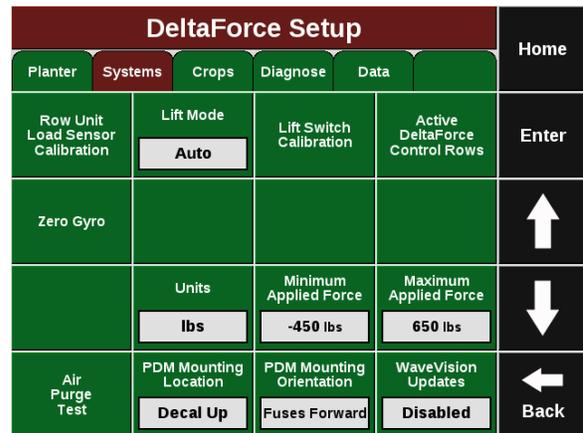
On the home screen the DeltaForce control button will appear on the right hand side of the screen. Use this button to access the DeltaForce control page. For more information, see the DeltaForce Control section in this document.



DeltaForce Setup

Navigate to “Setup” - “Systems” - “DeltaForce”

The default DeltaForce settings will function properly for most situations. Adjust settings only if necessary.



Lift Mode

- Automatic mode is the default setting and the system adjusts the amount of lift force according to the needs of each row’s down force. It is rare that this setting would ever need to be changed.

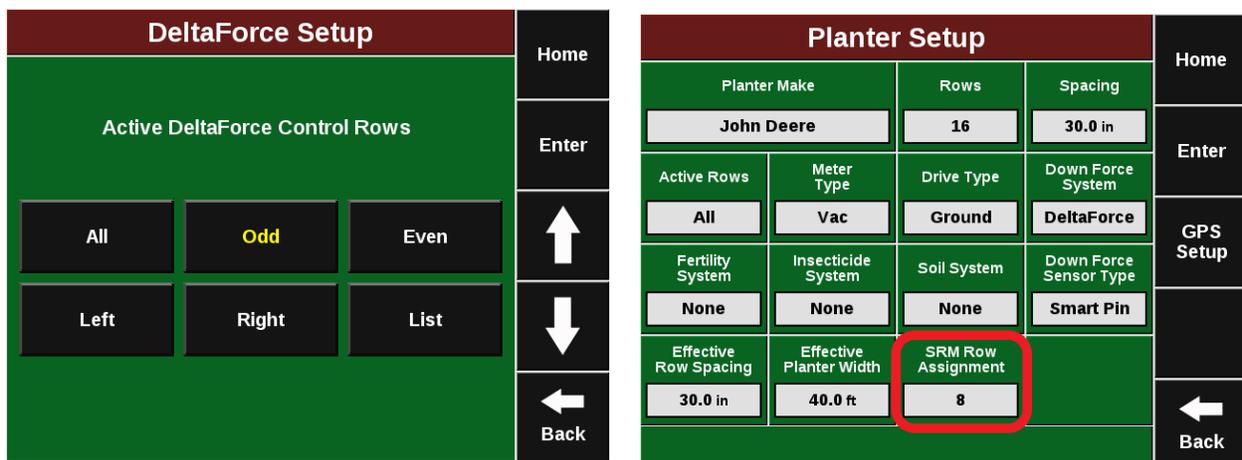
- Manual Mode allows the user to set a consistent manual lift force while still running DeltaForce in an automatic control mode. Adjust the lift force in the DeltaForce Control page. Do not use manual mode unless advised by Precision Planting Product Support.

Note: DeltaForce cylinders must overcome the lift force to hold the row unit to the ground. Excessive manual lift targets can compromise the system’s ability to maintain ground contact.

Active DeltaForce Control Rows - Determine the active rows for DeltaForce. This is typically only changed when DeltaForce is not installed on all rows (Disable rows that do not have DeltaForce installed). It will also be applicable on planters with inter row units. For example on a Kinze planter with pusher and puller row units the pusher units are designated as “Right” in the monitor and the puller row units are “Left”. On a John Deere 1790 with an odd number of total rows (ex. 12/23 or 16/31) the corn rows would be labeled as the “Odd” rows and the bean rows “Even”. On the same planter with an even number of total rows (ex. 12/24 or 16/32) the corn rows are labeled “Even” and the bean rows “Odd”.

Note: Rows that have been disabled in the planter profile will also have DeltaForce disabled and should not also be disabled in the DeltaForce Systems page.

SRM Row Assignment - If anything except ‘All’ DeltaForce Active rows are selected with no SRM based meter control (vDrive, mSet, vSet Select), the SRM Row Assignment box under ‘Setup’ — ‘Planter’ will need to be set up. Select which rows have an SRM and if a PDM is installed.



Example: If the odd rows have been disabled in the planter profile and the Active DeltaForce Control Rows is set to Odd, then the even rows (every other row) of the active rows will have DeltaForce disabled.

Units - Select which unit (lbs or PSI) to display DeltaForce values. Pounds (lbs) are the default unit.

Minimum Applied Force - The minimum amount of force that can be applied to each row unit. The default setting is -450 lbs. This value can be set from -450 to 0.

Maximum Applied Force - The maximum amount of force that can be applied to each row unit. The default setting is 650 lbs. The value can range from 0 to 650.

Load Cells

Navigate to “Setup” – “Systems” – “Calibration”— “Row Unit Load Sensor Calibration”

This page displays Load Cell information as well as control for zeroing and disabling load cells.

Load Cell values can be zeroed by pressing the “Zero All” button on the right side of the page. Ensure the planter is raised when zeroing load cells.

Down Force Calibration				Home
Row	Load Cell lbs	Cal Factor	State	
1	1	143.00	Active	<div style="border: 1px solid red; padding: 2px; margin-bottom: 5px;">Zero All</div> <div style="text-align: center; margin-bottom: 5px;">↑</div> <div style="text-align: center; margin-bottom: 5px;">↓</div> <div style="text-align: center;">← Back</div>
2	0	143.00	Active	
3	0	143.00	Active	
4	-1	143.00	Ignored	
5	1	143.00	Active	
6	1	143.00	Active	
7	1	143.00	Active	
8	1	143.00	Active	
9	0	143.00	Active	

Load Cell Lbs- Displays the current weight that is being measured on each individual row.

Calibration Factor - The calibration factor will auto-populate based on the planter make and model selected and the Downforce Sensor type.

State - displays the state of each load cell. Selecting a row in the state column will allow the operator to disable (ignore) the load cell on that row. To make a load cell active that has been ignored select that row in the state column. Please see the picture above to show ignoring a load cell.

Next, from the home screen, Select “Setup”— “Diagnose”— “Load Cells”

Sensor Source - Identifies the type of module the Load Cell is plugged into.

Reference Value - This is a value that is used to give a Load Cell a true zero. A healthy reference value is between 28 and 36. Reference values will vary across the planter but all should be within this range.

Note: If a load cell is ignored, that row will control DeltaForce to the 80th percentile of all other properly operating rows.

Note: If the system suspects an issue with a load sensor, it will automatically ignore that load sensor.

Calibration Factors for each type of load cell:		
Load Cell	Row Units	Calibration Factor
1/2” Load Pin	John Deere 7000 and Kinze 2000 row units	85
5/8” Load Pin	John Deere 7200 row units and newer	85
Kinze Link	Kinze 3000 & 4900 row units	65
White Smart Link	White 6000 & 8000 row units	65

White Smart Pin	White 9000/Precision Ready Row units	143
Case 1200 Sensor	Case IH 1200 row units	65
Case 2100 Sensor	Case IH 2100 row units	196
Monosem 5/8" Load Pin	Monosem NG+ 3 and 4	88

SRM System Calibrations

For DeltaForce to function the planter must be lowered and there must be speed.

Note: If the Lift Switches, Radar, and PDM have already been configured and calibrated during the setup of a different product (e.g. vDrive) this process does not have to be repeated.

1. Ensure that the Lift Switches have been calibrated and are functioning correctly. The Lift Switch systems page can be found by navigating to “Setup” – “Systems” – “DeltaForce” — “Lift Switch Calibration”.
2. Both GPS and Radar should be used as speed sources. If Radar is installed, verify that the Radar calibration has been completed. The Radar Status systems page can be found by navigating to “Setup” – “Systems” – “Calibrations” — “Radar State”.
3. The PDM must also be setup correctly for DeltaForce to have optimal performance. Ensure the PDM Mounting Location & Orientation are set correctly and zero the gyro. This can also be done from the DeltaForce set up screen.

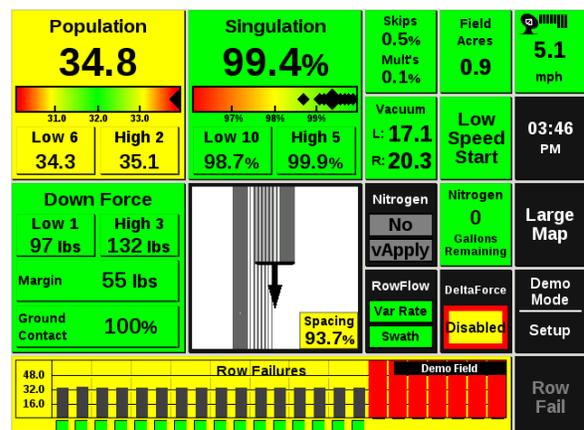
Note: The other requirements for DeltaForce to function are:

- DeltaForce must be configured on the display
- DeltaForce must be enabled
- Master Plant Switch must be set to the up/on position.

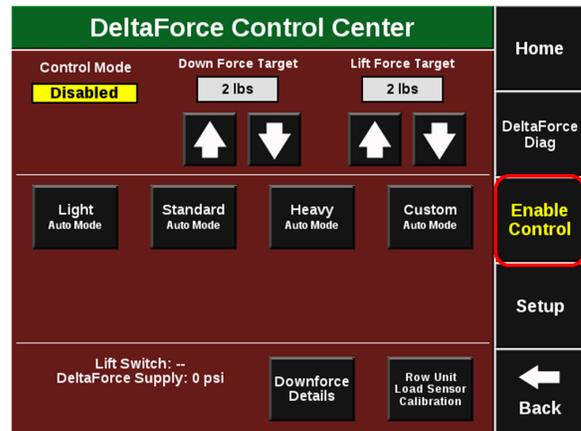
DeltaForce Control

The DeltaForce system control button controls the system and displays the status.

If the DeltaForce system is disabled, the DeltaForce control button will be red/yellow and display Disabled.



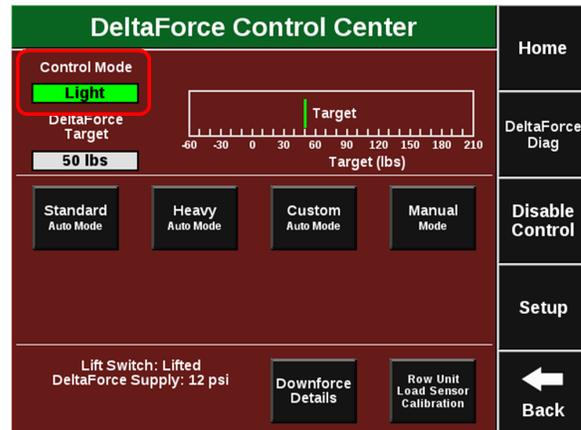
Press the DeltaForce Control button to access the control pages. Use the control page to adjust the automatic target or manually control the DeltaForce system. Use the buttons on the right hand side to Enable or Disable the DeltaForce System.



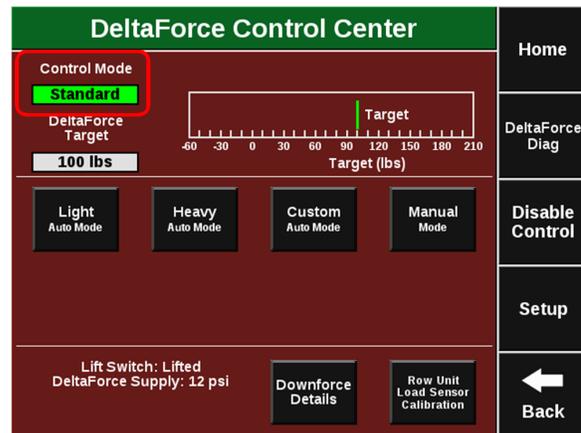
Automatic Target Control – Set a target value of weight that the operator wants to maintain between the ground and the gauge wheels on each row. The system will adjust the applied force and/or lift as needed on each row independent of each other to maintain the target value that was set. All DeltaForce adjustments will be based on the load cell readings measuring the weight on each gauge wheel. Select between: Light, Standard, Heavy, or Custom.

Note: For recommendations on how to set DeltaForce and what Automatic setting to use, refer to the section of this manual on how to set DeltaForce.

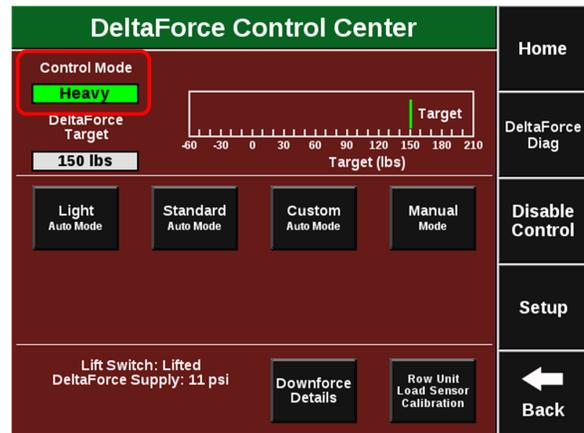
Light – The light target is 50 pounds. Meaning the system will target 50 lbs of force between the gauge wheel and the ground.



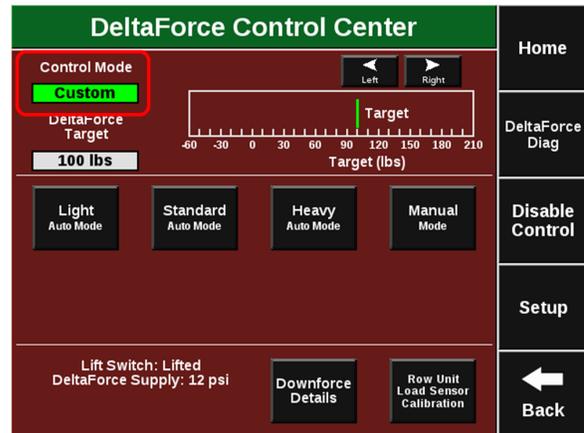
Standard – The standard target is 100 pounds. This is the default setting.



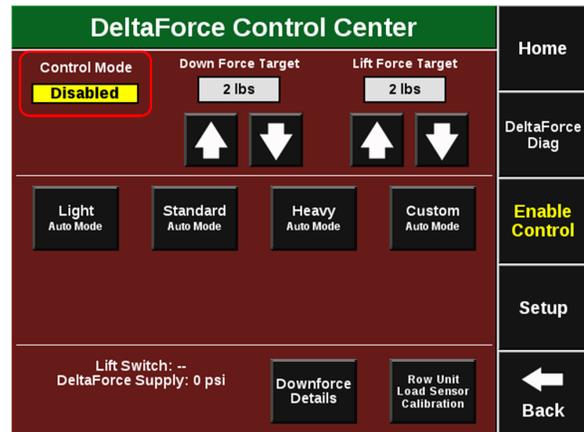
Heavy – The heavy target is 150 pounds.



Custom – This control mode allows the operator to set any target value (up to 195 lbs.) while still maintaining automatic control. Use the left and right arrows to adjust the target value.



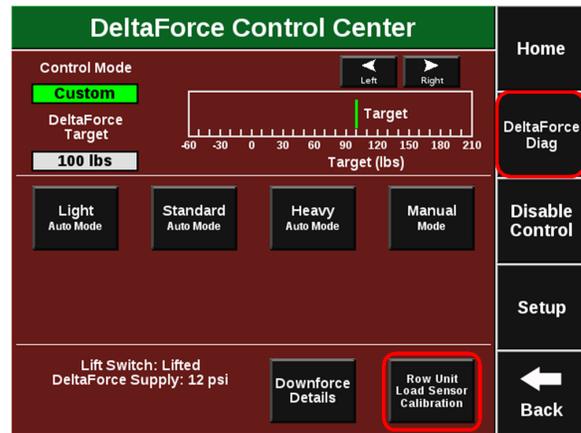
The DeltaForce system may also be operated in **Manual Mode**. This control mode allows the operator to designate a desired force for the system to maintain. Both a Lift Force and a Down Force value can be entered. When using Manual Mode, weigh pin readings are not taken into account and all cylinders will apply a single force to all rows until manually changed by the operator.



Use the Plus and Minus arrows to adjust the Lift and Down Force targets.

Links to the Load Sensor Calibration and DeltaForce Diagnostic screens are located on the right side of the screen.

System PSI displays the current PSI reading from the pressure sensor located on the DeltaForce Lift Manifold. The lift switch status can also be viewed.



If the DeltaForce system is not functioning and all requirements for running it have been met, use the Troubleshooting Trees in the Dealer Service Manual for assistance.

How to Set DeltaForce

When DeltaForce is enabled for the first time it is in Standard Mode at 100lbs. If DeltaForce is installed on a John Deere, Kinze, or White planter, Standard Mode is a reasonable starting point when planting at 5 miles per hour. When planting faster, a higher target may be needed. If DeltaForce is installed on a CaseIH planter, Heavy Mode (150 lbs.) is the recommended starter setting. This is because the Reduced Inner Diameter (RID) gauge wheel style allows for increased flowability of soil between the opening disks and gauge wheels. An increased DeltaForce target will ensure that soil along the RID is properly firmed, and will not allow dry soil from a crumbling sidewall to fall into the furrow. This principle also applies to RID gauge wheels on a different equipment manufacturer's planter.

From an agronomic perspective, if this is the first time running DeltaForce; err on the side of heavy — too much downforce. While both compaction (excessive downforce) and shallow planted seeds are yield robbing events, the consequences of shallow planting seeds are greater than losing a row(s) around an ear from soil compaction. Once the first pass is complete, look to the first two tools listed below (20/20 metrics and High Definition Mapping) to help maintain near 100% ground contact. Once this is either achieved or closely achieved, start to evaluate the furrow and dig seed. Below is an in depth look at each tool.

Ground Contact Percentage (20/20) - On the home page of the 20/20 there is a box that displays a percentage of ground contact. This is the percentage of time that the gauge wheels are pushing against the depth stop. This number is updated every second based on a three second rolling average per row and then averaged across the planter. The goal is to maintain 100% ground contact. If the ground contact is not near 100%, the DeltaForce target should be increased until near 100% is achieved. Depending on the conditions of the field, 100% ground contact may not be unobtainable. On the other hand, just because 100% ground contact is achieved does not mean this is the proper setting. A lighter setting may be needed if excessive force is being used

and the furrow reveals compaction. A heavier setting may be needed if additional soil firming is needed.

Using High Definition Mapping - The Down Force high definition map displays weigh pin readings through the field. This can be used to look for any row units that are consistently showing a loss of ground contact, as represented by a blue dot. If these dots are showing up frequently through the field, consider increasing the DeltaForce target.

Looking in Ground- Investigating the furrow is vital for properly setting downforce. After selecting a downforce setting, drive a few hundred feet with the closing system held up on a few rows.

The ideal furrow should have formed sidewalls that do not crumble without being touched. If the side wall was manipulated or pressure was applied, the side wall should start to collapse or cave from the bottom up.

If digging reveals slick sidewalls or sheen development, these are good indicators of moisture present in the furrow that could cause compaction. This is something to take into consideration when finding the proper setting. The seed should also be placed at a depth where there is a consistent moisture layer on either side.

Lastly, if the closing system was set, it should be difficult to try and go back and dig to find the furrow. If an in-ground evaluation shows the setting should be lighter the operator will need to re-evaluate if they are as close as they can be to 100% ground contact.

Bear in mind that 100% ground contact is simply the point where the downforce system has engaged the mechanical depth stop on a row unit. More firming force may be needed to firm the sidewall and hold the furrow open for the whole row unit pass. Finding the right DeltaForce target requires finding the setting that forms the furrow for optimal seed placement, soil structure, and plant development.

In-Season Adjustments- To optimize the downforce management system, it may be necessary to change DeltaForce target settings as environment and soil conditions change. One example that may help illustrate this point is a significant rain event. It would be reasonable to think a lighter setting may be needed to still form the proper furrow after the event occurs. Even though factors in the field may change, the ways to evaluate the proper setting will remain the same.

The HD maps and monitor metrics will show a grower information that would be difficult to see in the field. Digging and evaluating the furrow will show conditions that would not be viewable on a map. Thus, for best results a grower should balance using these tools. Although the 20/20 and HD Maps are useful tools, no number on a map can replace checking in ground to make sure a good furrow is being formed. It is conceivable that a map shows minimal/no loss of ground contact or excess downforce and still not be the appropriate target. For example, a field report may show 100% ground contact but digging in ground reveals (sidewall compaction or) crumbling furrow walls.

Home Screen

In the Down Force Metrics box the monitor will display Margin, Ground Contact, and the lowest and the highest weigh pin readings.

Margin-The lowest measured load cell reading in a given period of time on each row (varies with down force system installed). The Margin value displayed on the home screen Down Force button is an average of this value across all load cell-equipped rows on the planter.

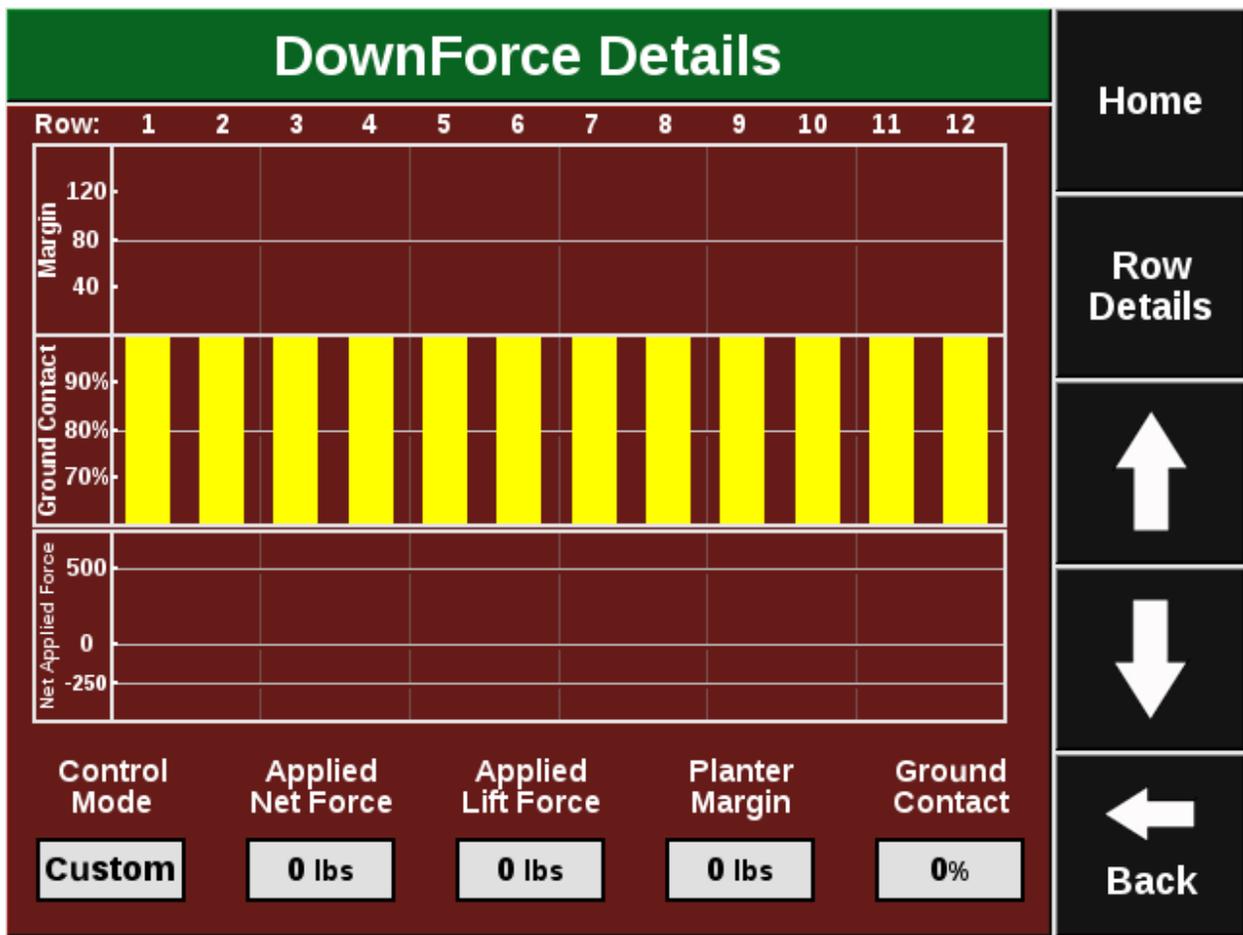
Down Force	
Low 1 97 lbs	High 3 132 lbs
Margin	55 lbs
Ground Contact	100%

Ground Contact- The percentage of time the system can confirm that the gauge wheels have met the depth stop, which generally indicates that the row unit is planting at the depth to which it has been set. This is calculated by the percentage of time that the load cell is measuring 20 pounds or more.

Low and High Row – Shows the average weigh pin readings for the lowest and highest rows.

Select the Down Force metric by clicking “Down Force” from the home screen to view row by row load cell information.

This setting can display down force average in place of the Low/High row by going to ‘Setup’ — ‘Systems’ — ‘Display’ — ‘Down Force Mode’.



Once 'DownForce' is selected from the Home screen, the page will display Margin, Ground Contact, and Net Applied Force for each row that has a load cell. The planter average Net Applied Force, Applied Lift Force, Margin, and Ground Contact are displayed at the bottom of the page.

Note: Net Applied Force is the commanded amount of force being applied to the row unit.

DeltaForce Diagnostic Information

Prior to planting, ensure that all planter diagnostic information is ok. Select “Setup” – “Diagnose”. Everything should be green on the diagnose page. If there is an issue on a row or rows, it will be indicated on the level 1 diagnose page by displaying the system that is having an issue in a color other than green.

Color Legend:

Green - the system is working correctly and communications are good. Select “Color Legend” to view an explanation of what each color indicates.

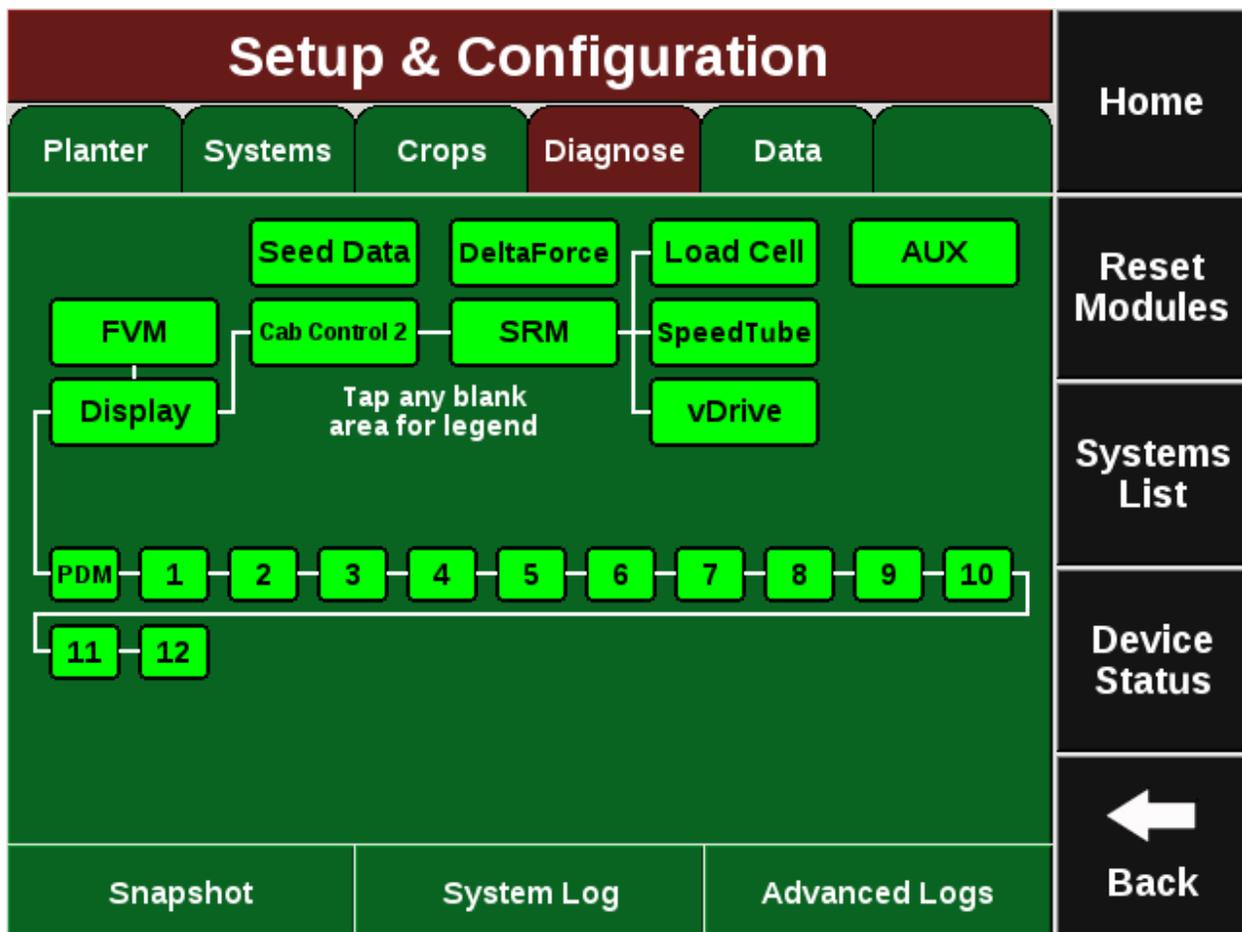
Yellow – Device or sub-component is not 100%.

Red – Device has failed, or is expected, but not detected.

White – Device is detected, but is not expected.

Black – Row has been disabled in the planter configuration.

Gray – Device is being detected, updating firmware, or unreachable.



Note: Modules may be updating during initial connection. Once updates are complete, all modules should be green. If the modules are not green, confirm that the number of rows and planter setup is correct. If still experiencing issues, refer to the Dealer Service Manual.

The DeltaForce button will be green if the system is configured and communication is established. If it is not green, press it to view DeltaForce level 2 row-by-row diagnostics.

Load Cell (lbs) – Displays the current weight being measured on each individual row by the load cell.

Solenoid Volts – Voltage being sent to the solenoid controlling the valve for the DeltaForce cylinder.

Commanded Pressure – The pressure that the DeltaForce system is commanding each row to apply.

Row Loc	Load Cell Lbs	Solenoid Volts	Command Press PSI	Command Force Lbs	Net Applied Down Force
POM	0	0.0	0	0	0
1	0	0.0	0	0	0
2	0	0.0	0	0	0
3	0	0.0	0	0	0
4	0	0.0	0	0	0
5	0	0.0	0	0	0
6	0	0.0	0	0	0
7	0	0.0	0	0	0
8	0	0.0	0	0	0
9	0	0.0	0	0	0
99-12	---	---	---	---	---

Commanded Force (lbs) – The amount of weight in pounds which the DeltaForce system is commanding each row to apply. Negative values represent lift while positive values represent applied force.

Net Applied Downforce (lbs) – Amount of weight that the DeltaForce system is adding or subtracting to the weight of the row unit.

At the bottom of the DeltaForce diagnostic page there is an indicator for the state of the Lift Switch, Master Plant Switch, and the Control Mode. The Supply Pressure value is the current pressure reading on the lift valve of the Lift Manifold (Pressure must be greater than 2250 for optimal performance from DeltaForce). Additionally, both GPS and Radar speed readings are displayed.

DeltaForce Health Checks

Always perform a health check on the DeltaForce system after installation and at the start of every season. The health checks will show yellow if they have never been ran. Access the DeltaForce health check page by selecting “Setup” — “Systems” — “Health Checks” or by pressing the “DeltaForce Health Checks” button on the DeltaForce level 2 diagnose page. There are five DeltaForce Health Checks that can be run.

DeltaForce Health Checks		
Voltage/Current <small>All DeltaForce Systems</small> <small>Tests for Electrical Shorts and High Currents</small>	No Seed Logging <small>Allows downforce mapping without seeding</small>	Applied Force <small>All DeltaForce Systems</small> <small>Tests for hydraulic and mechanical connections</small>
Air Purge Test <small>Cycles DeltaForce valves to purge air from the cylinders</small>		Advanced Applied Force <small>All DeltaForce Systems</small> <small>Tests for hydraulic and mechanical connections</small>

The Air Purge Test, Applied Force Test, and Advanced Applied Test are visual tests and the operator must determine if the system passed or failed the health check. The Voltage Current Test

will give the user a report card to determine if each row passed the health check. If the test is failed, the area it failed will be highlighted in yellow along with the row number on the results screen.

Follow the on screen instructions when performing the tests. Below is a brief explanation of each test.

Voltage Current: Power will be cycled to each of the DeltaForce solenoids to assess the stability of the system. It will test for electrical shorts and high currents. Row units will not move during this test. At the completion of the test a pass/fail will be given to each row.

DeltaForce Voltage Current Test - Passed				Home
Test Passed - Results:				
ROW	volts idle	volts active	volts drop	Enter
Lift	12.91	10.68	2.23	
1	12.92	11.53	1.39	
2	12.98	11.45	1.53	
3	13.04	11.84	1.20	
4	13.04	11.64	1.40	
5	12.80	11.36	1.44	
6	12.89	11.20	1.69	
7	12.96	11.58	1.38	
8	12.92	11.49	1.43	
9	12.93	11.60	1.33	
10	12.90	11.51	1.39	
11	12.93	11.60	1.33	
12	12.97	11.61	1.36	Back

Air Purge Test: Cycles pressure to each DeltaForce cylinder to purge air from the system. It is necessary to run this test after doing an installation or opening up any lines in the hydraulic system. The bottom pin used to pin the DeltaForce cylinder to the bottom bracket MUST BE UNPINNED. At the completion of the test, the cylinders should be extended. It may be necessary to run the Air Purge Test multiple times to fully purge air from the hydraulic system. Visually inspect each row before reinstalling the bottom pin.

Applied Force Test: Tests the health of the DeltaForce hydraulic and mechanical system. Ensure that everyone is clear of the planter before performing this health check. Once the test is started, all row units should rise. Next, each row unit should lower, individually, in order. This is a visual

test – Pass or Fail must be determined by the operator. If all row units do not rise and then lower one at a time, see the DeltaForce Diagnostic Trees in the Dealer Service Manual.

Note: If the system passes the Applied Force Test there is no need to run the Advanced Applied Force test.

Advanced Applied Force Test: Tests the health of the DeltaForce hydraulic and mechanical system. Ensure that everyone is clear of the planter before performing this health check. During this test, row units will rise and then lower, one at a time, in order. This test may be ran if the planter cannot pass or has issues with an Applied Force Test and further diagnostics are needed. This is a visual test – Pass or Fail must be determined by the operator. If each row does not rise and then lower one at a time in order, see the DeltaForce Diagnostic Trees in the Dealer Service Manual.

No Seed Logging: Allows the user to operate the system in the field without planting seed. It is recommended that the user be connected to Climate FieldView to view and become familiar with the downforce maps.