FurrowForce™

FurrowForce Operator's Guide

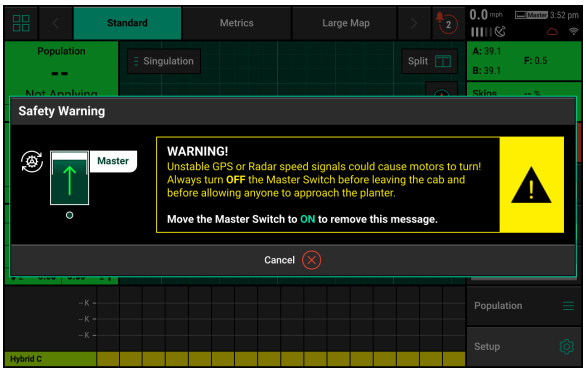
Precision Planting®

955778_2 10/31/22

Contents

Safety Warning

Once any control product is configured on the 20|20 display, the system will require a Cab Control Module (CCM) and will prompt the user to toggle the Master Plant switch on the CCM before any control products can be used. This warning is triggered any time the system is booted up, and when the system has traveled for more than half a mile.

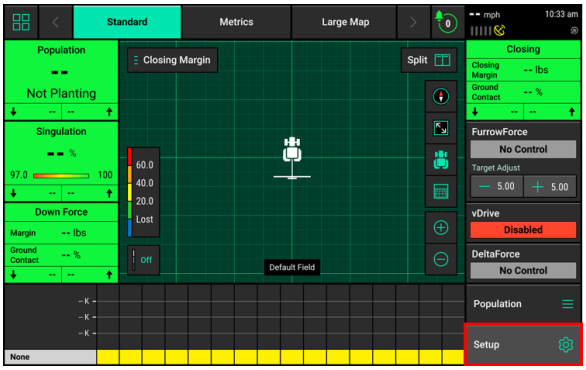


If a CCM is not installed, the cancel button can be used to bypass this warning. No control systems will operate until the Master Plant switch is toggled. This icon will be present in the status button in the top right if the Safety Warning was bypassed using the cancel button.

Assign FurrowForce as the Closing System

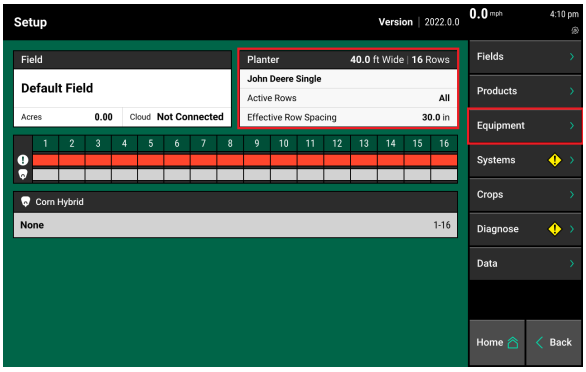
Step 1:

From the home screen, press “Setup”.



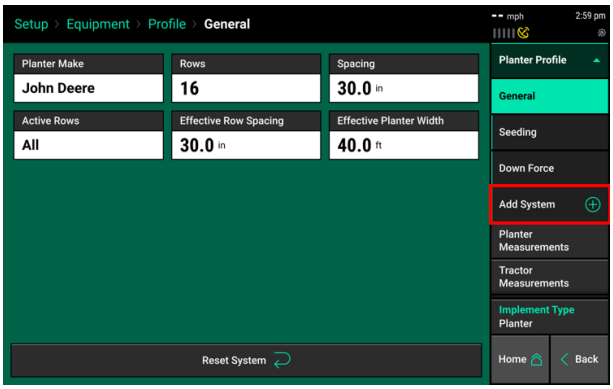
Step 2:

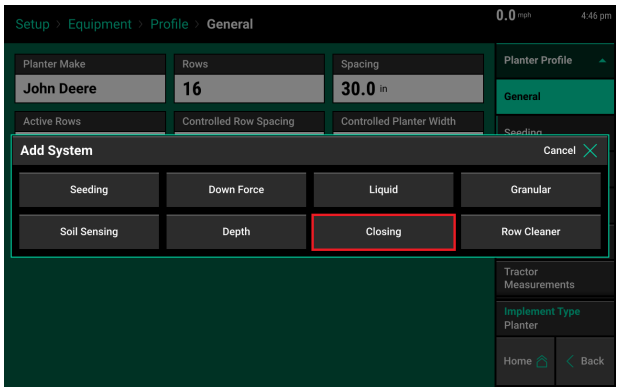
Select “Equipment” from the right menu, or select the “planter” box to go to the Equipment Profile screen.



Step 3:

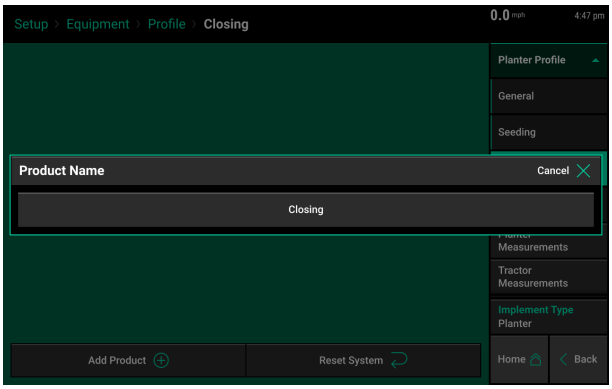
Select “Add System”, then select “Closing”.

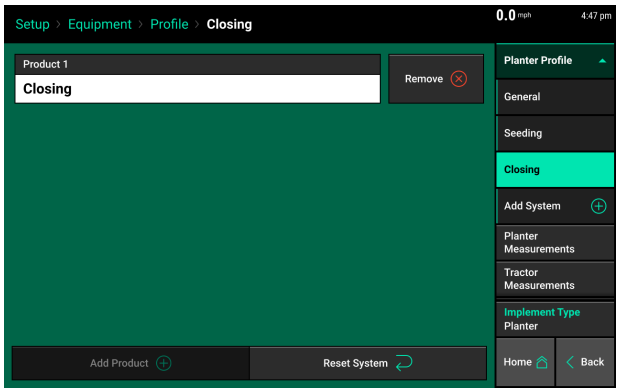




Step 4:

Select the “Add Product” box then select “Closing”.

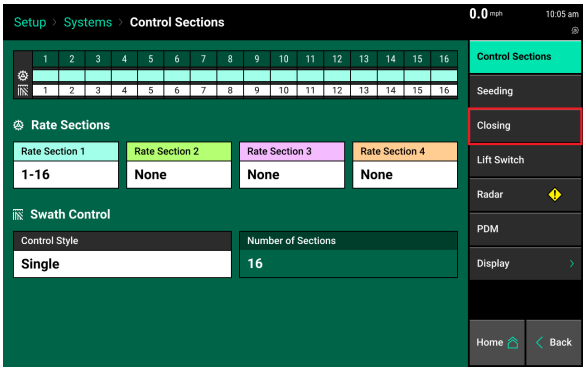




FurrowForce Setup

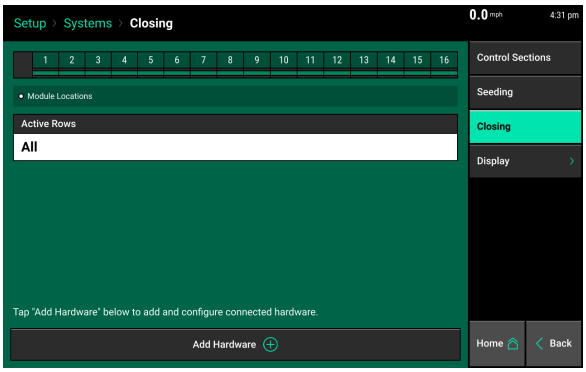
Step 1:

Navigate to “Setup, “Systems”, “Closing”.



Step 2:

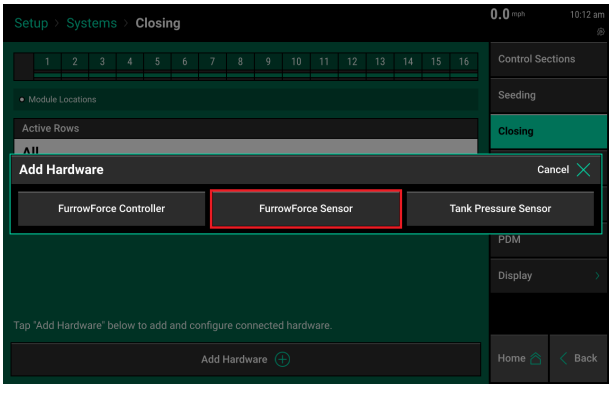
Once on the FurrowForce setup screen, select the “Add Hardware” button at the bottom of the screen to configure the appropriate components.

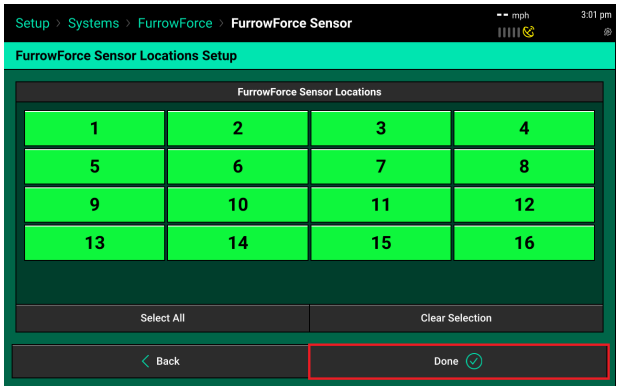


Step 3:

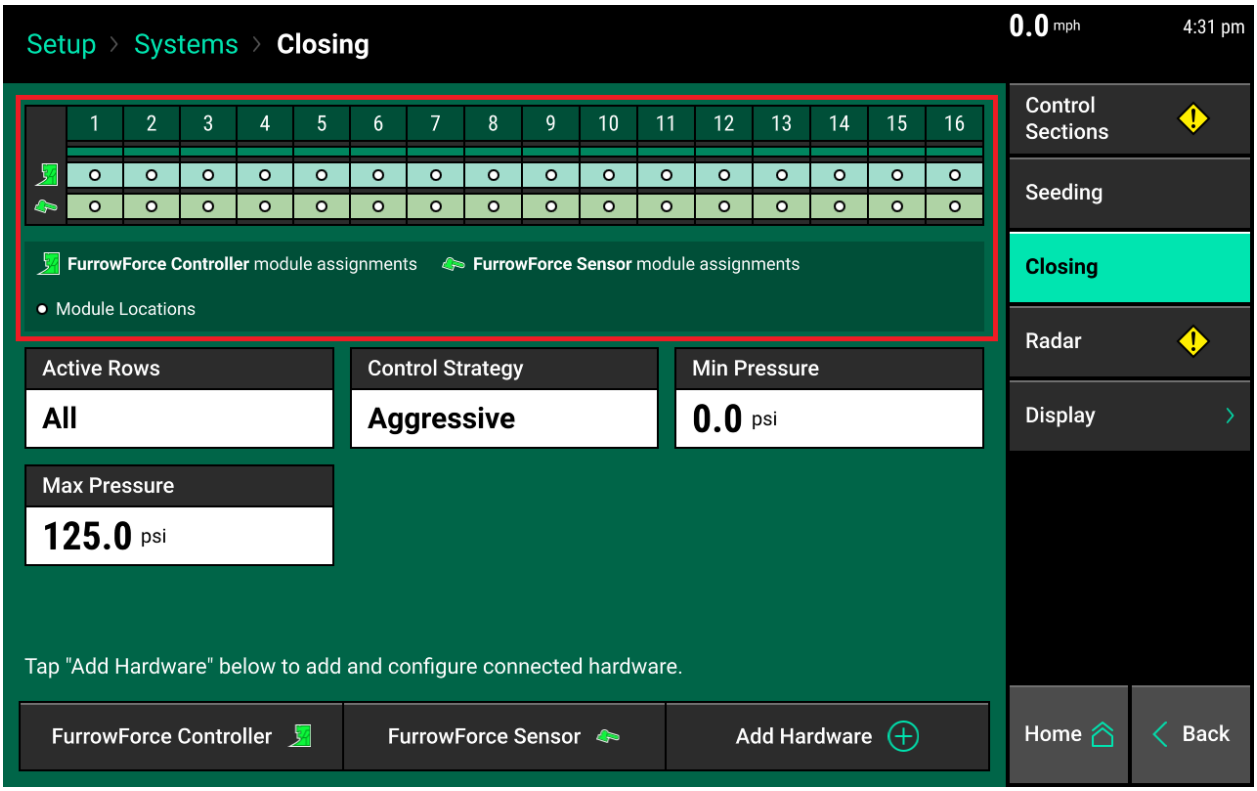
Select “FurrowForce Sensor” and then select the planter rows that sensors are installed on. If installed on all rows, choose “Select All”. Select “Done”.

Note: Row boxes will turn green when selected.





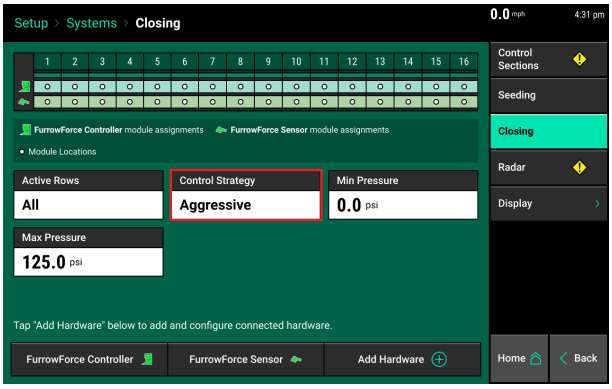
Repeat this step for the FurrowForce Controller and Tank Pressure Sensor, if installed. Once complete, the graphic at the top of the screen will indicate how each component was configured and should match the physical installation.

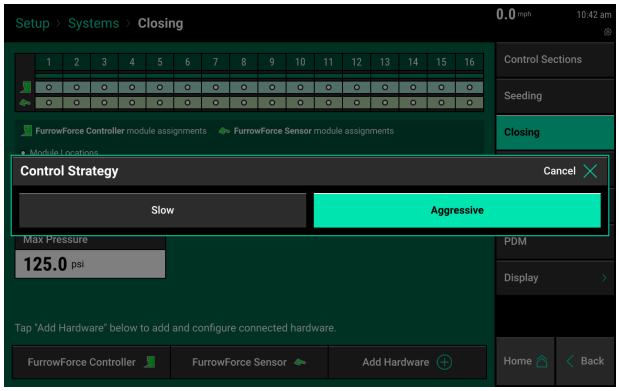


The remaining setup items are set to default values and do not require an initial setting to be made.

Active Rows — Enable/Disable FurrowForce components for monitoring and/or control.

Control Strategy — Adjusts how quickly FurrowForce Control Modules will make a control value change. The default value is “Aggressive”. “Slow” will limit module reaction time and should only be used in instances where a compressor is unable to keep up with airflow requirements, for example.





Min. Pressure — Default value is 0 psi. Adjusting this will change the minimum pressure FurrowForce Control Modules will adjust to.

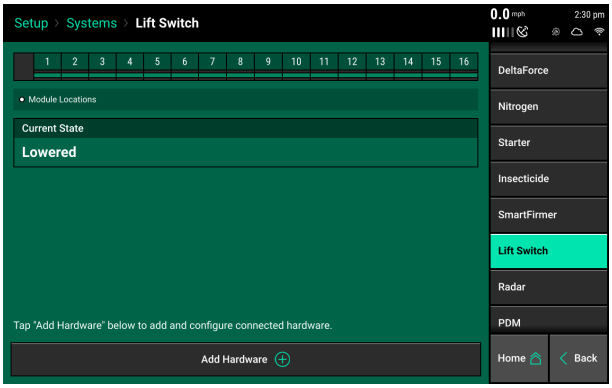
Max Pressure — Default value is 125 psi. Adjusting this will change the maximum pressure FurrowForce Control Modules will adjust to.

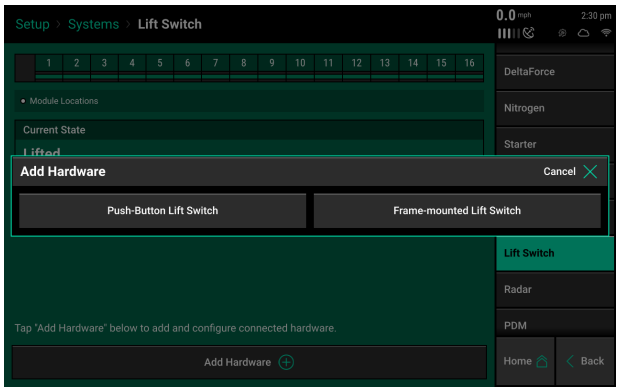
Lift Switch

One of the requirements for all control products to function is for a lift switch to be installed, and reading lowered.

Configure the connected lift switches by selecting ‘Add Hardware’. Select the type of lift switch (es) plugged in. A summary of lift switch locations will be displayed at the top of the screen.

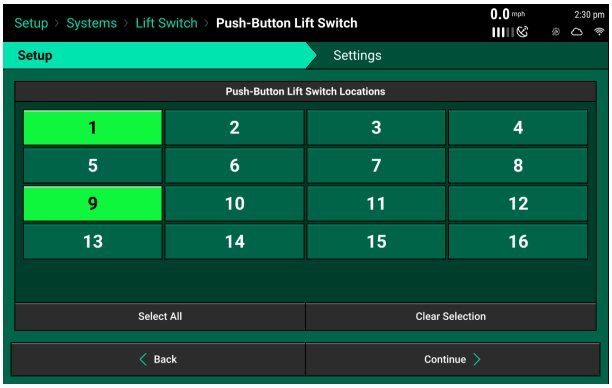
Note: Configuration of lift switch row locations is only required on 2020.1.x and newer software.

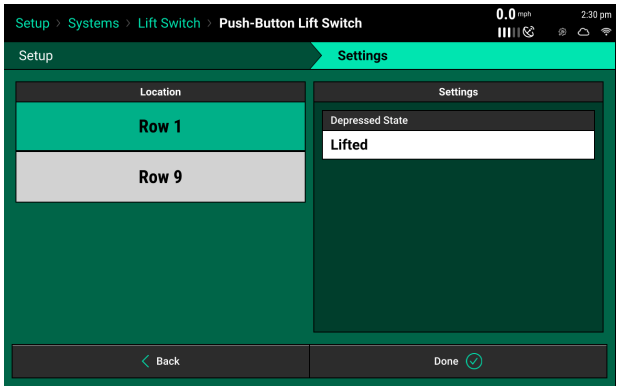




Push Button Lift Switches

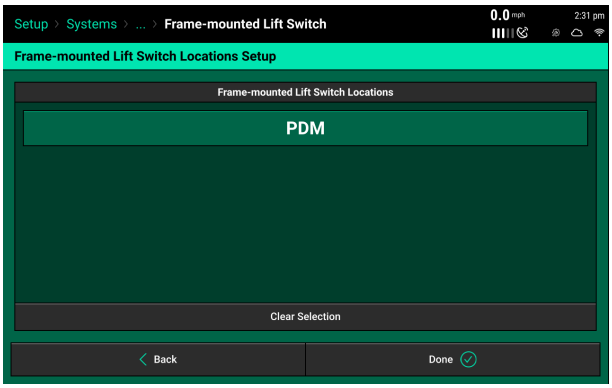
Select what rows have push button lift switches installed, then press ‘Continue’. In the settings page, select if the push button is depressed (pushed in) when lifted or lowered. A calibration will not need to be performed for push button lift switches.

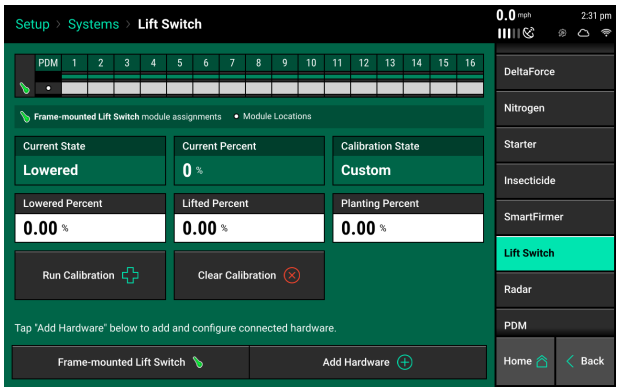




Frame Mounted Lift Switches

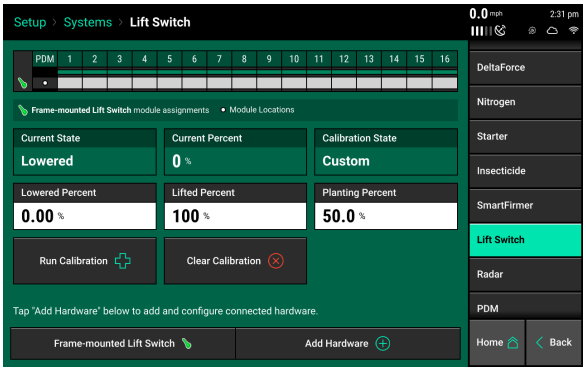
For a frame mounted switch, configure the plug in location as the PDM. Once the PDM is selected as the location, the system will then need to be calibrated for lifted and lowered position.





Calibrate Lift Switch

To complete the Lift Switch calibration, press the "Run Calibration" button at the bottom of the screen. Follow the on-screen instructions for the different positions the planter must be in. The results will then be displayed on the main Lift Switch Page. For issues with the lift switch not calibrating or functioning correctly, see the Troubleshooting Guides for Lift Switches in the Dealer Service Manual. After a calibration has been completed, verify the system is reading the lift switch correctly by watching the "Current State" information on the Lift Switch page. Ensure the "Current State" is correct when lowering and lifting the planter.



Manual entry of values can be done by selecting the "Lowered Percent", "Lifted Percent", or "Planting Percent" buttons and entering a value.

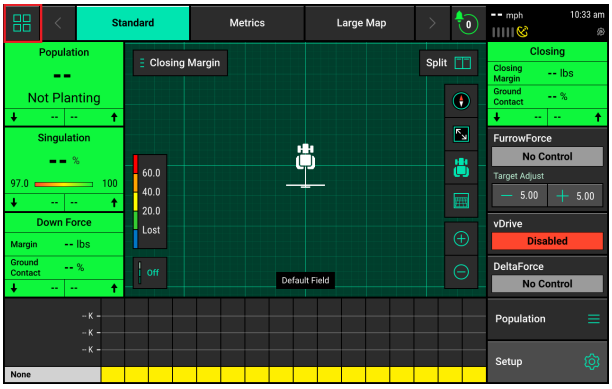
To clear out the current calibration press the "Clear Calibration" button located at the bottom of the screen.

Configure and Enable FurrowForce Control

Note: If operating a sensing and manual control system, it is only necessary to configure the Closing Margin widget. Control and adjustments will be made with the manual pressure regulator in the cab.

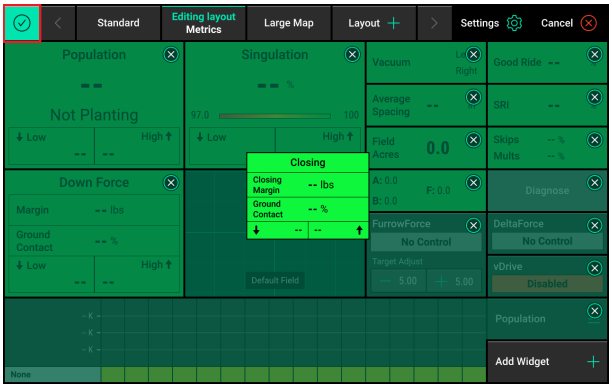
Once FurrowForce Setup is complete, the Closing Margin widget and FurrowForce Control widget should be added to a home screen layout.

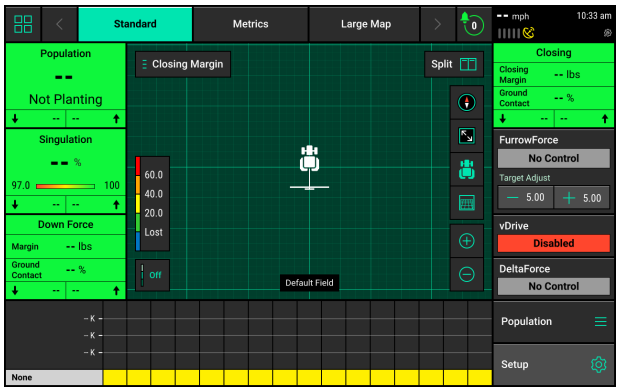
Select the “edit home screen” button in the upper left corner of the home screen to open the edit widget page, then select “Add Widget” in the bottom right corner.



Select “Metrics”, then choose the “Large” size option. Scroll through the list and select the “Closing Metric” widget.

Place the widget in the desired position on the home screen layout and select the “check mark” in the upper left corner to save the layout.

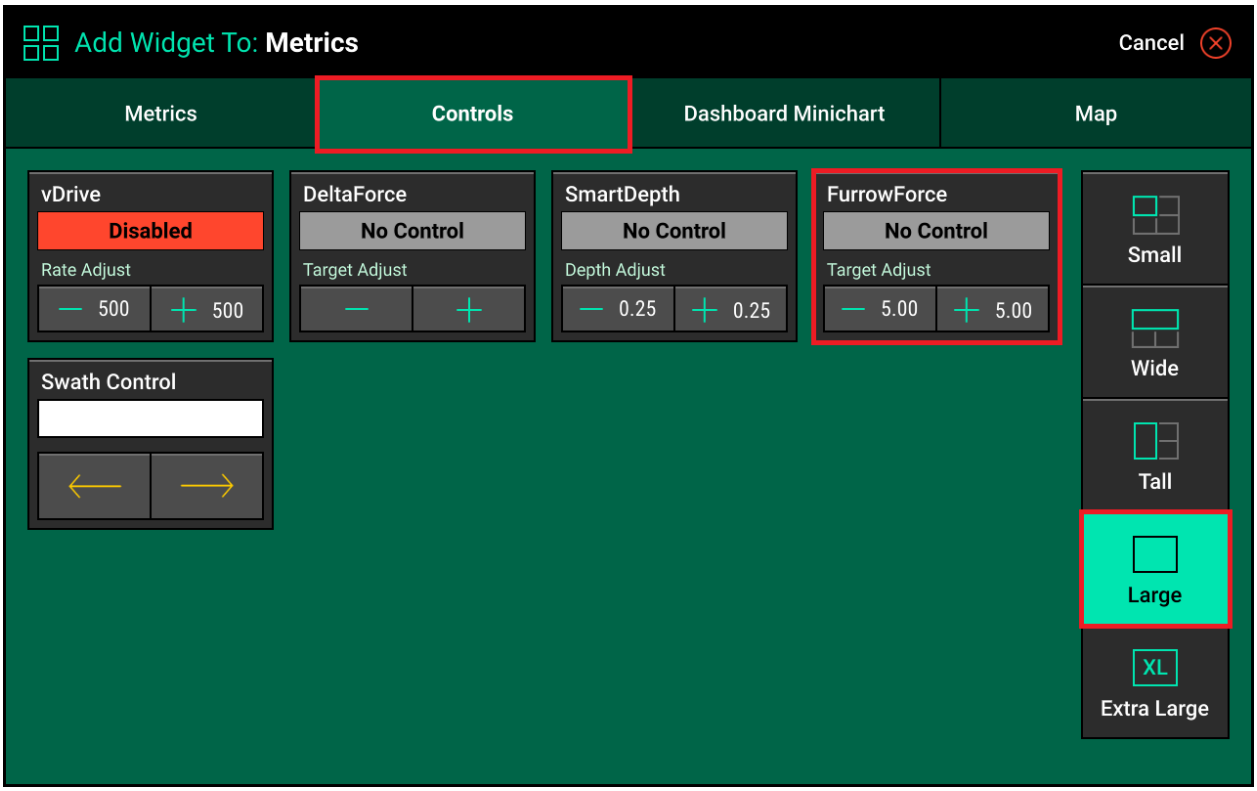


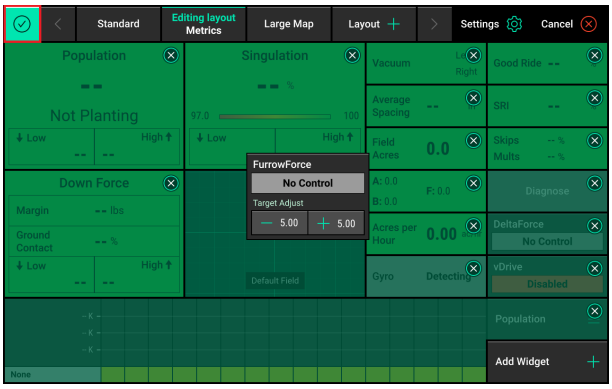


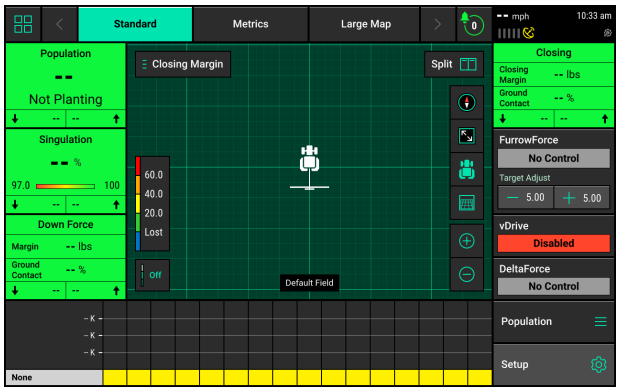
Go through the same steps to add a widget, select “Controls” and choose the desired widget size.

Note: The large size is recommended as it provides a ±5lb. closing target adjustment directly from the home screen.

For the size chosen, select the “FurrowForce” control widget to add it to the screen layout. Place the widget in the desired position on the home screen layout and select the “check mark” in the upper left corner to save the layout.

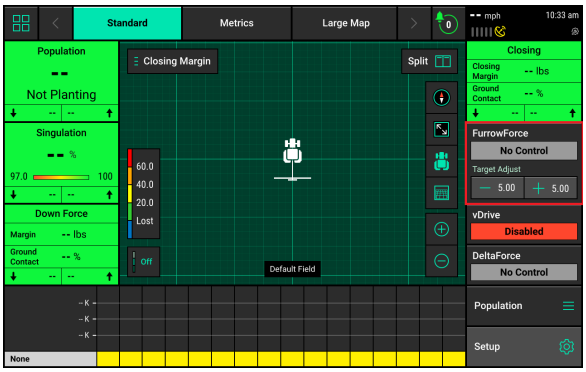




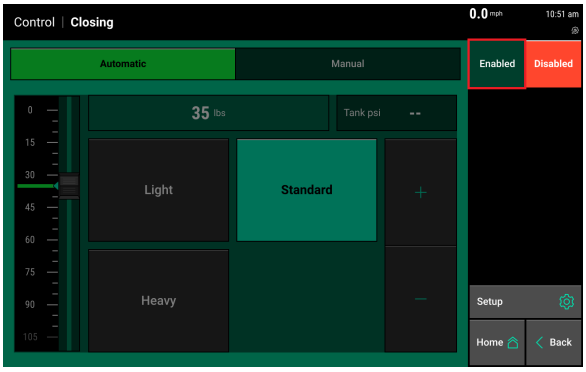


Enable FurrowForce Control

Select the “FurrowForce” widget on the home screen to navigate to the FurrowForce control screen.



Select “Enabled” to enable FurrowForce Control. FurrowForce must be enabled for the system to function. If all other requirements are met, but control is not enabled, it will not function.



Note: When FurrowForce is “Disabled”, bag pressure will release and go to 0 psi. If FurrowForce remains enabled and the Master Plant switch is shut off, the current pressure will remain in the airbags.

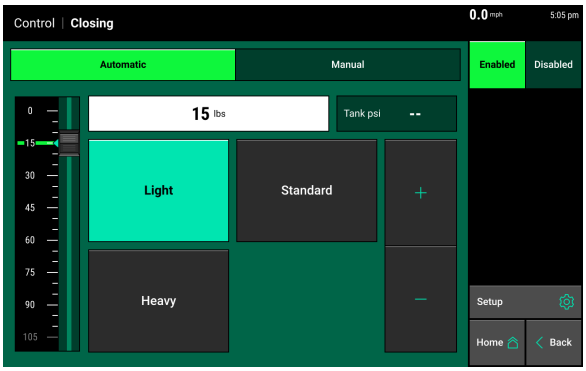
There are two control modes available: “Automatic” and “Manual”.

Automatic

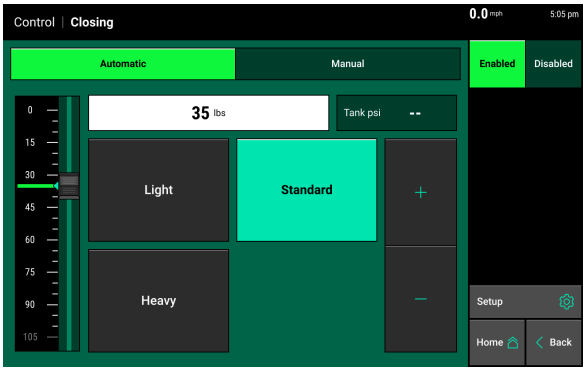
Automatic should be selected as default. The operator will set a closing target value of weight to maintain on the second stage wheels. The system will automatically adjust the airbag pressure (row by row) to maintain the Closing Target setting (lbs) based on sensor readings.

When Automatic is selected, there are three pre-configured target settings:

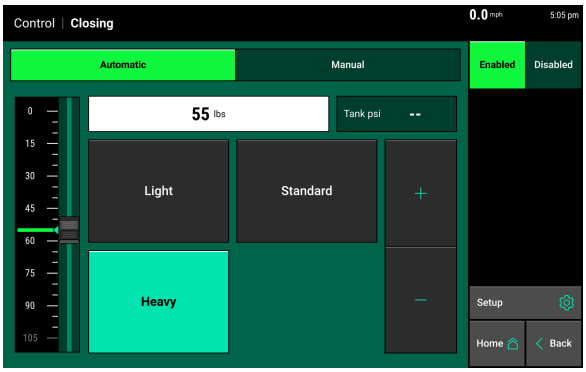
Light — Closing Target is set to 15 lbs.



Standard — Closing Target is set to 35 lbs.



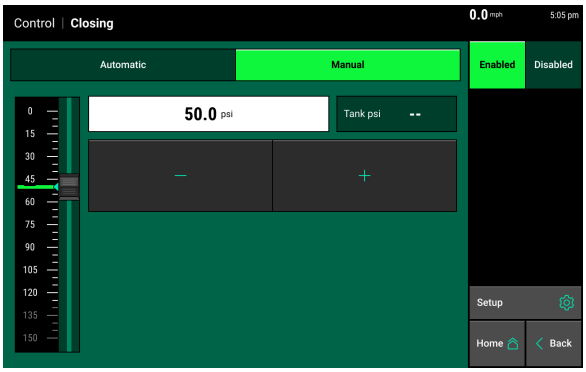
Heavy — Closing Target is set to 55 lbs.



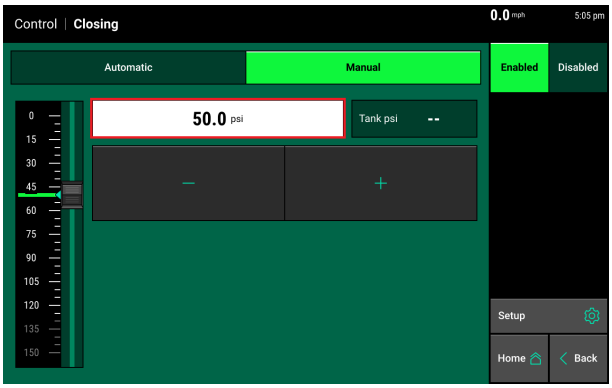
Note: The operator may also set a different target by selecting the weight box and entering a value. The slider or +/- button may also be used to change the target by 5 lb. increments.

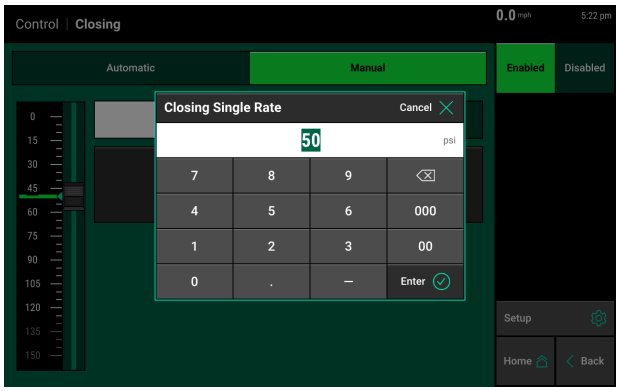
Manual

If Manual is selected, the operator sets a static planter wide airbag pressure (psi) to be maintained by the system. Load sensor(s) data will be reported, but is not used for control or automatic adjustment. This mode could be used for plot work, or if a compressor is unable to keep up with airflow requirements.



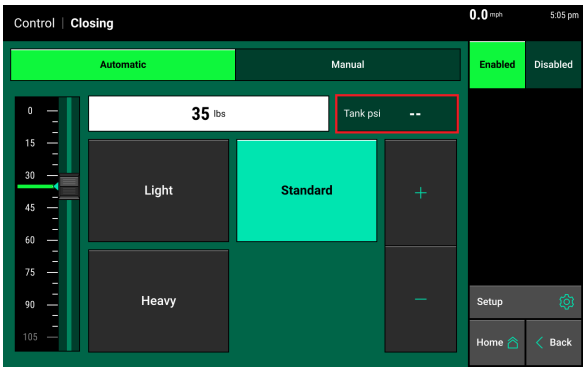
Select the Closing Target box or use the +/- buttons to adjust the target.





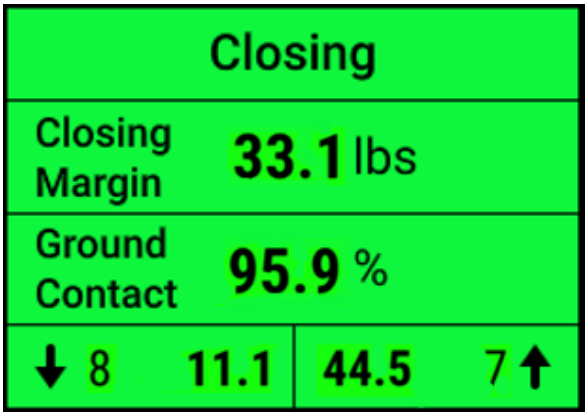
Tank PSI

Tank PSI will display the system pressure if the optional Tank Pressure Sensor (756555) is installed and configured.



FurrowForce Metrics and Operation

Closing Metric Box

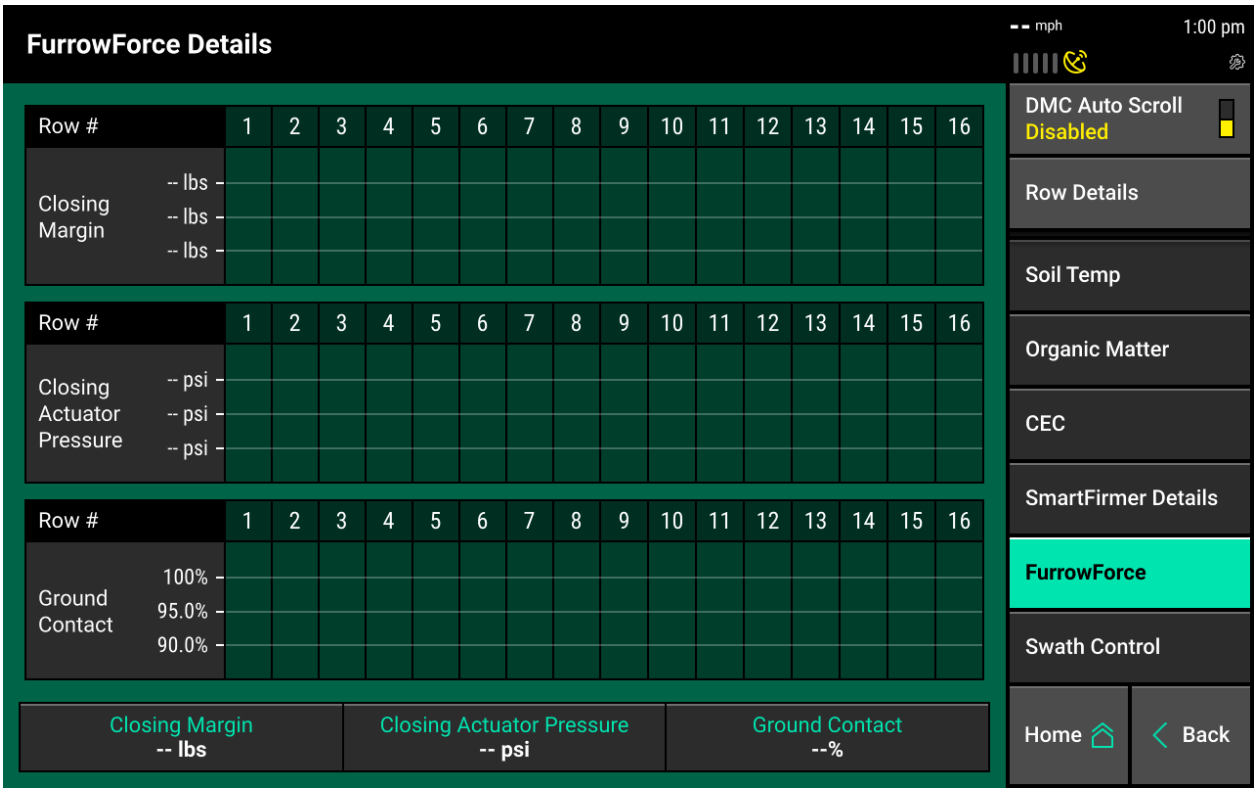


Closing Margin — The lowest measured sensor reading in a given period of time for each row. The Closing Margin value displayed in the metric box is an average value across all sensors installed and functioning on the planter.

Ground Contact — The percentage of time the second stage wheels have a load on them (greater than 5 lbs.). 100% would indicate the first stage wheels are achieving the closing depth setting.

Low and High Row — The average sensor reading for the lowest and highest rows.

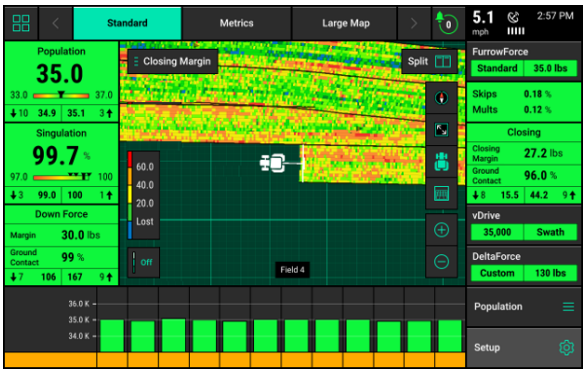
Select the Closing Metric box to view row by row FurrowForce information.



This page displays Closing Margin, Closing Actuator Pressure (Automatic Control Systems only), and Ground Contact for each row with the appropriate components installed. Planter average values are displayed at the bottom of the page.

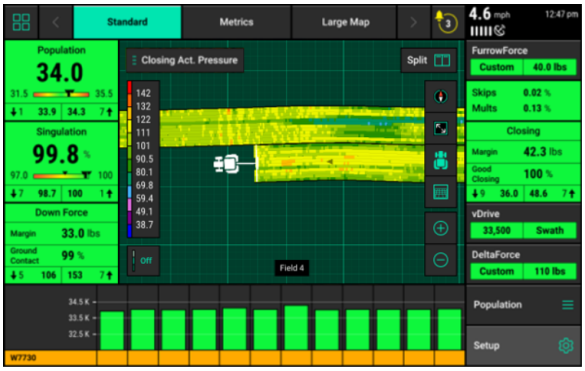
FurrowForce Maps

Closing Margin — Displays the weight (lbs.) on the second stage wheels for each row as reported by the FurrowForce Load Sensors. A blue dot on the Closing Margin map indicates potential loss of closing, or a spot where the furrow may not be closed. Select the legend to edit the map range and number of steps. Refer to the "FurrowForce Operation" section below for more information on how to use this map.



Closing Act. Pressure — Only available with Automatic Control Systems. Displays the pressure (psi) in the airbag for each row as reported by the FurrowForce Control Module.

This map can be useful for diagnosing potential issues with a compressor or FurrowForce Control Module(s), for example. Select the legend to edit the map range and number of steps.



Initially setting FurrowForce

Below are general recommendations for initially setting FurrowForce Closing Target for Automatic Controlled Systems.

How to Initially Set the Closing Target?

Light Target (10 – 20 lbs.)	Standard Target (25 – 40 lbs.)	Heavy Target (40 – 55 lbs.)
• Conditions prone to compaction • Marginal or wet conditions in all tillage practices • Running too heavy in these conditions will reduce emergence	• Most good planting conditions • Not prone to compaction or drying out • No-Till, Strip Till, Stale Seedbed, Conventional Till **IF** it is not cloddy and has had substantial rain after field cultivator	• Conditions prone to drying out • Concerned about trying to preserve moisture • Most Conventional Till, Loose Vertical Till, or Strip Freshener • Use the higher end for very cloddy conditions

Note: These are only recommendations. Each operator is responsible for using all the available information and checking in-ground performance to ensure the system is set correctly for specific conditions. Refer to the section below for details on when\how to make in-season adjustments.

FurrowForce Operation

Note: Before considering a Closing Target adjustment, ensure the closing depth is set properly for the specific crop/planting condition. Refer to the "Setting the First Stage Wheel Depth" section at the end of this document, or in the FurrowForce Installation Manual.

Closing Margin Map — This will provide the operator the most comprehensive and accurate view of FurrowForce performance, but is only one piece of information to consider. As stated above, a blue dot indicates a potential loss of closing. If blue dots are appearing consistently on the Closing Margin map and closing ground contact is dropping below 100%, in-ground closing performance should be checked and the Closing Target should be increased as needed.

A red dot on the Closing Margin map indicates potentially running to high of a Closing Target, which could cause compaction from FurrowForce. Again, in-ground performance should be checked and the Closing Target should be decreased as needed.

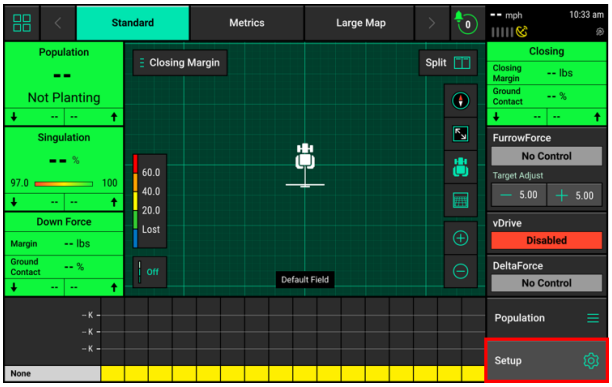
Note: Ensure the map legend is displaying a representative operating range before making Closing Target adjustments.

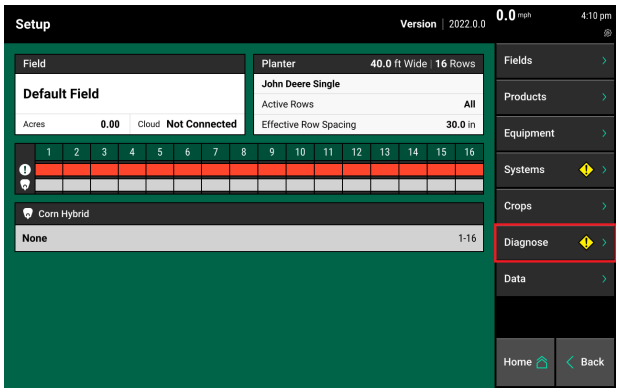
Ground Contact % — The Closing Metric box displays ground contact % as a planter wide average. The goal is to maintain 100% ground contact or as close to 100% as possible. There could be certain conditions however that 100% or close to 100% will not be obtainable, but the furrow is still being closed properly. It is also possible to achieve 100% ground contact, but the closing target is too heavy, creating compaction. It is critical to use ground contact as an indicator to check the closing margin map and in-ground performance before making a Closing Target adjustment.

In-Ground Checks — Investigating and confirming in-ground closing performance is an important step in verifying system operation. Digging should be performed on the initial start-up/operation, when conditions change, or if inconsistencies are seen in the Closing Margin map, for example. There are conditions that will not be viewable on a map/metric and can only be confirmed by digging and evaluating the furrow. For best results, the operator should balance using the available information on the 20|20 and confirming operation by evaluating how the furrow is physically being closed.

FurrowForce Diagnostic Information

Prior to planting, ensure that all planter diagnostic information is ok. Select “Setup”, “Diagnose”.

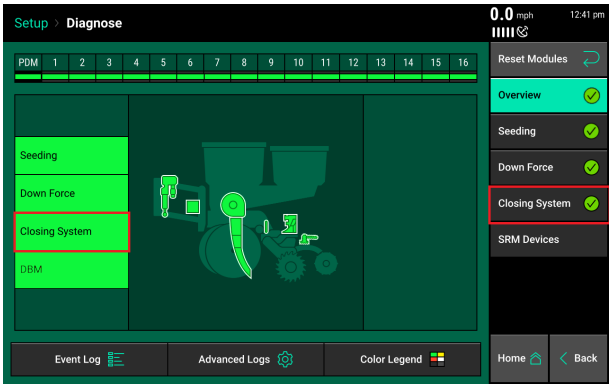


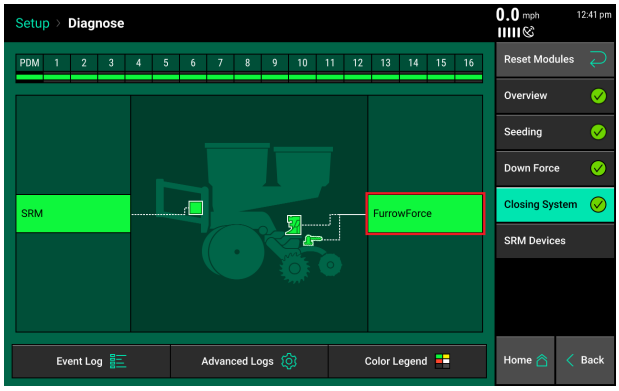


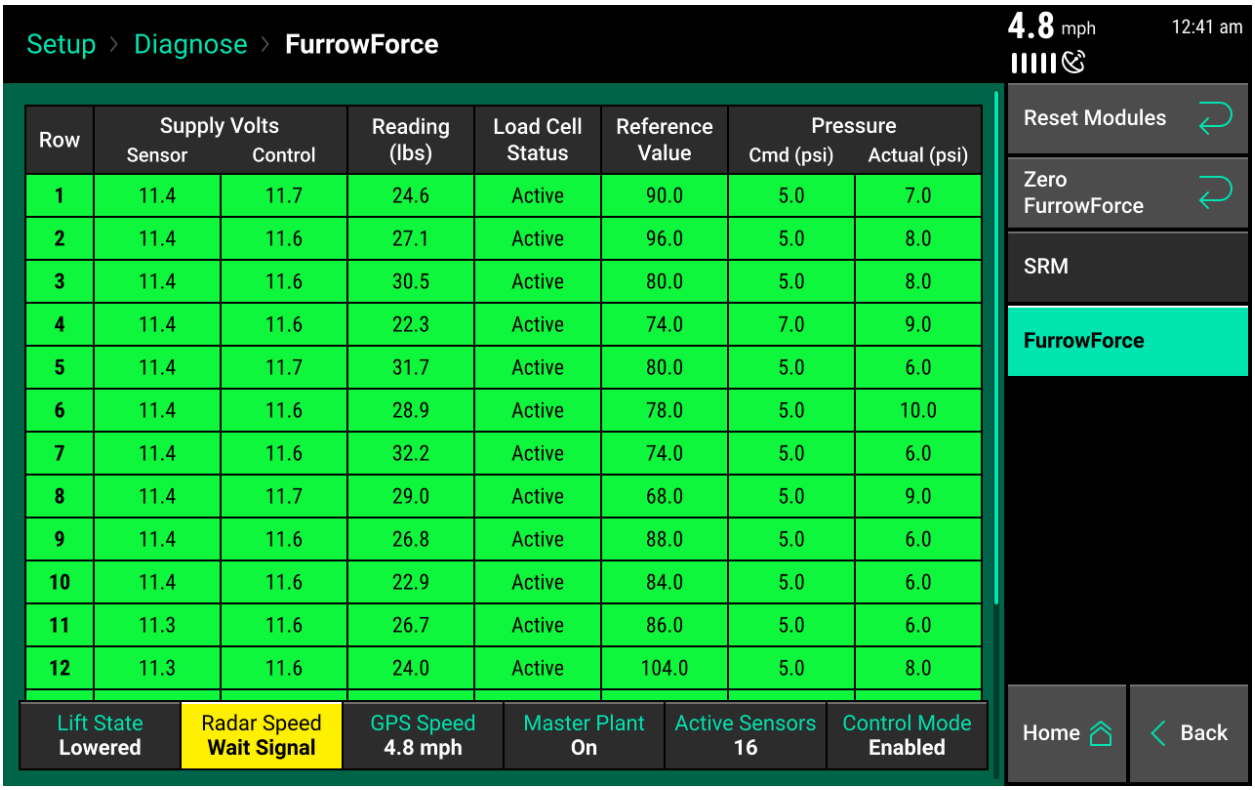
All systems should be green on the diagnose page. Select “Color Legend” to view an explanation of what each color indicates.

Note: Modules may be updating during initial connection. Once updates are complete, all modules should be green. If the modules are not green, confirm the planter/system setup is correct.

Select the “Closing System” box in the diagram or from the right menu. Select “FurrowForce” to view the FurrowForce Level 2 Diagnose Page, which includes detailed information for FurrowForce components.







Row	Supply Volts Sensor	Supply Volts Control	Reading (lbs)	Load Cell Status	Reference Value	Pressure Cmd (psi)	Pressure Actual (psi)
1	11.4	11.7	24.6	Active	90.0	5.0	7.0
2	11.4	11.6	27.1	Active	96.0	5.0	8.0
3	11.4	11.6	30.5	Active	80.0	5.0	8.0
4	11.4	11.6	22.3	Active	74.0	7.0	9.0
5	11.4	11.7	31.7	Active	80.0	5.0	6.0
6	11.4	11.6	28.9	Active	78.0	5.0	10.0
7	11.4	11.6	32.2	Active	74.0	5.0	6.0
8	11.4	11.7	29.0	Active	68.0	5.0	9.0
9	11.4	11.6	26.8	Active	88.0	5.0	6.0
10	11.4	11.6	22.9	Active	84.0	5.0	6.0
11	11.3	11.6	26.7	Active	86.0	5.0	6.0
12	11.3	11.6	24.0	Active	104.0	5.0	8.0

The following information is listed for each FurrowForce row:

Supply Volts Sensor — Displays the supply voltage for the FurrowForce Load Sensor

Supply Volts Control — Displays the supply voltage for the FurrowForce Control Module

Reading (lbs.) — Weight being carried on second stage wheels as measured by the FurrowForce Load Sensor

Load Cell Status — Sensor state/status (Active, Faulted, Ignored)

Reference Value — Baseline for each sensor

Pressure Cmd (psi) — Commanded pressure needed to achieve closing target based on sensor reading

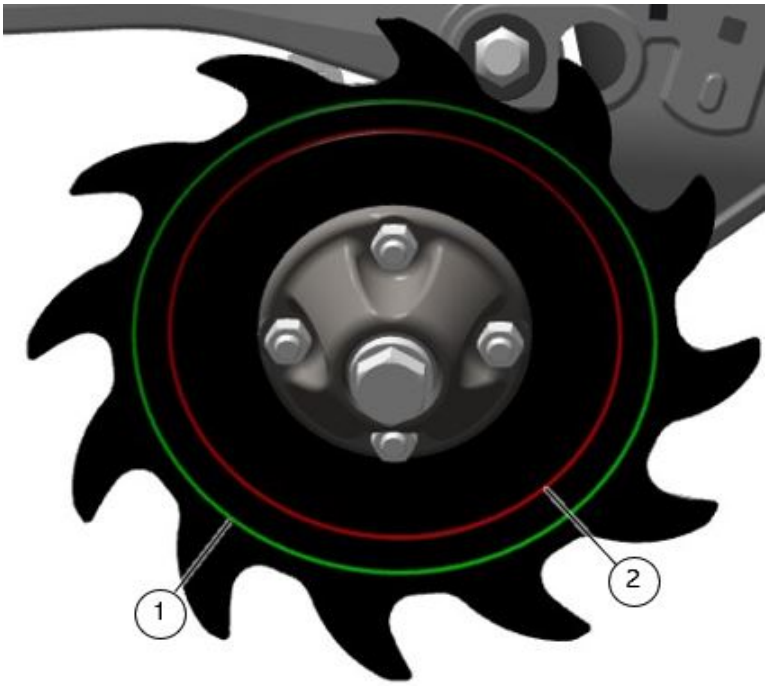
Pressure Actual (psi) — Actual airbag pressure as measured by the FurrowForce Control Module

Note: On an automatic control system, if a FurrowForce control module or load sensor loose power or communication, the entire row will go red on the diagnose page. Navigate to the system schematic page and expand the row to see which component is faulted. If a FurrowForce Load Sensor is ignored, that row will control FurrowForce to the average of all other properly operating rows.

Setting the First Stage Closing Wheel Depth

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

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



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

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