

FREEDOM

Freedom XDS Operator's Manual

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Document Revision History

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Purpose

This manual is a guide to assist in operation of the Freedom XDS (FXDS) spreader control unit. This manual leads the user through a step-by-step setup process for several given application examples.

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Getting Started

The FXDS spreader control system is the latest in the line of Certified Power spreader controls. FXDS is next generation spreader control based on the platform of the ACS spreader control. The FXDS features new features such as advanced spinners, dual spreaders, dynamic variable gates and a large user friendly color touch screen.

Operator's Overview

1. This document covers the "User" level login only.
2. The user has access only to the tools required to operate the spreader control while driving the truck.
3. By default the FXDS will start in "User" Mode
4. By default there will be no "USER ID" on startup
5. The system will usually power on automatically when the truck is started. This can vary depending on specific installation.

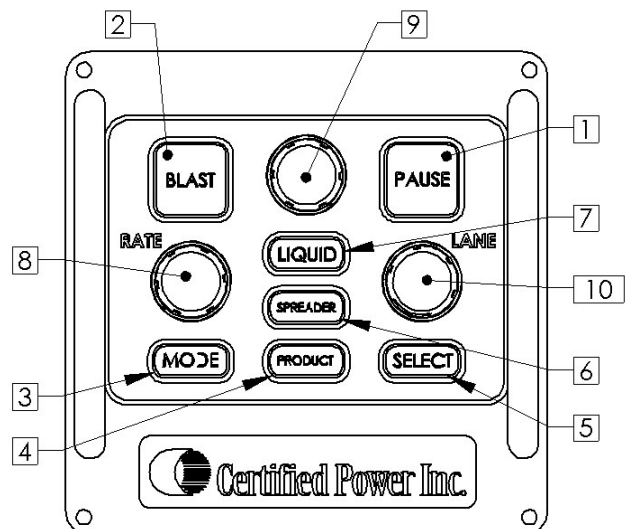
Control Overview

1. Operator Panel
 - a. Controls for easy operation without using screen
 - b. Has 3 knobs to adjust rates up and down
 - c. Has 7 buttons to cycle through and activate various spreader control modes
2. Display
 - a. Displays all of the information used to run the truck
 - b. Touchscreen on display can be used to access menus and manipulate some controls
 - c. Contains USB port for data download



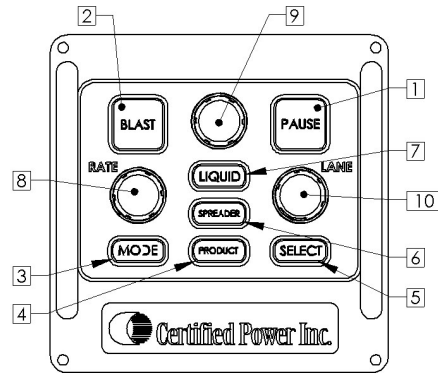
Spreader Controls

1. Pause Button: **Will start and stop the operation of the spreader. Before bringing the spreader out of the pause mode, ensure all personnel and equipment are clear of the spreader.**
2. Blast Button: Engages Blast mode which is a temporary increase to spreader output. When blast is active it will be indicated inside the "Rate" gauge.
3. Mode Button: Changes between the available spreading modes. NOTE: All modes may not be



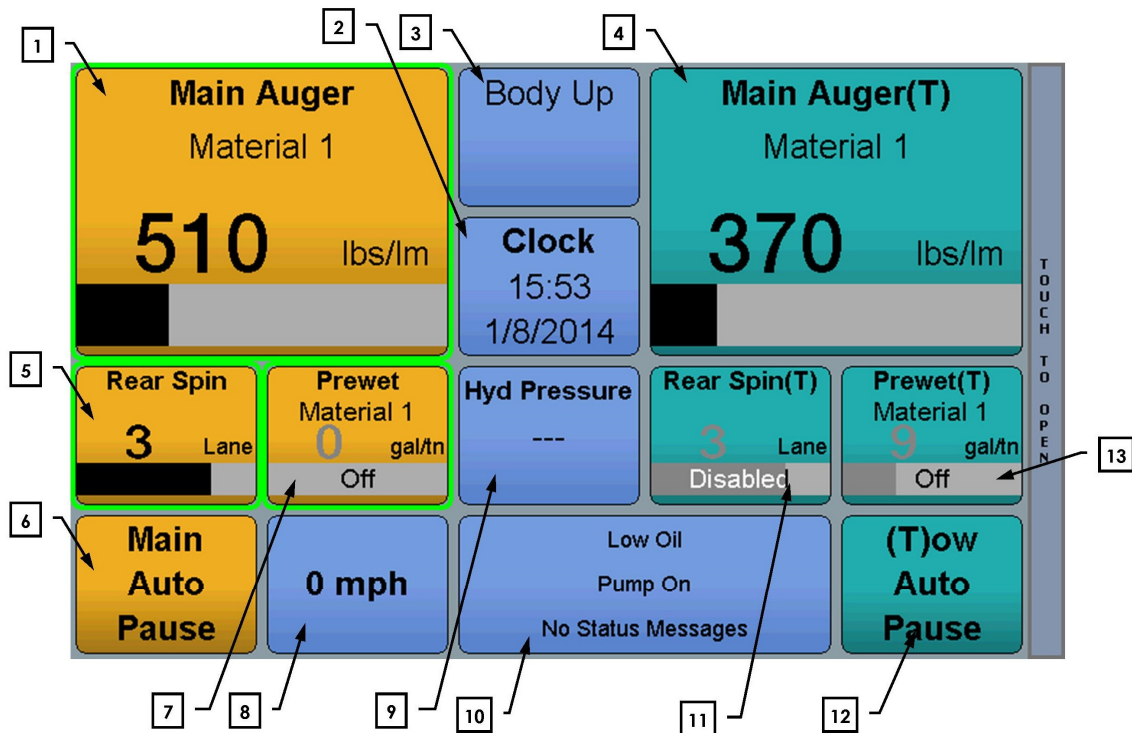
available depending upon spreader control software version.

- a. The current mode is displayed in the status box in the middle of the screen.
 - b. Automatic Mode: Material output is based on ground speed.
 - c. Manual Mode: 0-100% control of material output. This mode does not change with ground speed.
 - d. Unload Mode: Used to unload the truck.
 - i. Unload mode is canceled if the truck goes 5 MPH or higher. The unit returns to pause in auto mode or manual mode.
 - ii. **IMPORTANT!!** Storm totals are not recorded while in unload mode.
4. Product Button: Used to access the material selection menu
 5. Select Button: Used to change the liquid knob focus between Anti-Ice and Prewet. This is only active when there is both anti-ice and prewet enabled
 6. Spreader Button: Used to toggle between front, rear, and both spreaders
 7. Liquid Button: Used to turn liquid on and off
 8. Rate Knob: Used to adjust the rate of the selected feeder(s).
 - a. Turn knob to increase or decrease the feeder rate.
 - b. The gauge on the screen labeled for the feeder(s) will follow this knob
 - c. The bar on the gauge will show the amount of available spread rate used
 - d. The number inside the gauge will show the current spread rate and current material
 9. Liquid Knob: Used to adjust the rate of the selected liquid(s)
 - a. Turn knob to increase or decrease the liquid rate.
 - b. The gauge on the screen labeled for the liquid(s) will follow this knob
 - c. The bar on the gauge will show the amount of available spray rate used
 - d. The number inside the gauge will show the current spray rate and current material
 10. Lane Knob: Used to adjust the rate of the selected spinner(s)
 - a. Turning the knob changes the spinner speed.
 - b. The gauge above will show the current spinner speed in either lanes or percentage depending on the truck configuration.
 - c. The bar on the gauge will show the amount of spinner rate used.



Operating Screen Examples

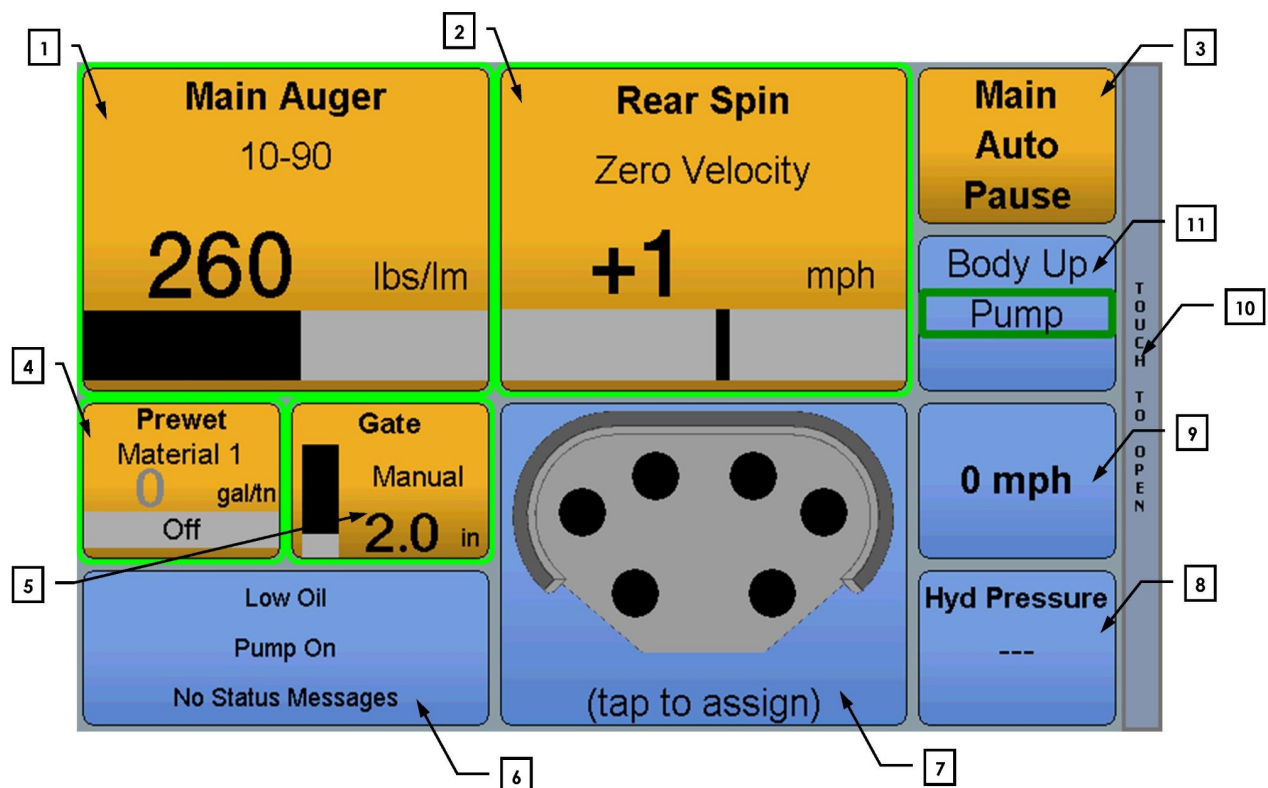
The FXDS spreader control main screen is highly configurable with a nearly infinite number of screen layouts available. Below are a few examples of operating screens and the panels contained in them. Colors can be assigned to individual spreader boxes or spreader groups. When colors are assigned to spreader groups it helps to differentiate between controls for each spreader

Dual Spreader Screen


1. Main Auger status panel
 - a. Shows the current spread rate in lbs/lm or percent in manual mode
 - b. Shows the current usage of available spread rate via the bar graph
 - c. Shows the currently selected material. The current material for this spreader is “Material 1”
2. Clock shows the current date and time
3. Input status panel
 - a. Can be assigned to any input in the system
 - b. If an input is active a box will be shown around the input name indicating that it is active
 - c. Up to 2 of these panels can be on the screen for up to 6 status panels
4. Auger Status panel shows second auger
5. Spinner Status panel
 - a. Shows the current spinner speed in lanes or percent
 - b. Shows the current usage of available speed via the bar graph
6. Main Spreader Status Panel
 - a. Label at the top shows which spreader the status panel belongs to
 - b. The middle text indicates what mode the spreader is in.
 - i. Auto
 - ii. Manual
 - iii. Unload
 - c. The lower text shows if the spreader is in or out of pause.
 - i. If the spreader is in pause it will say “Pause”
 - ii. If the spreader is out of pause it will be blank
 - d. Touching this box on the screen will cycle the spreader pause state

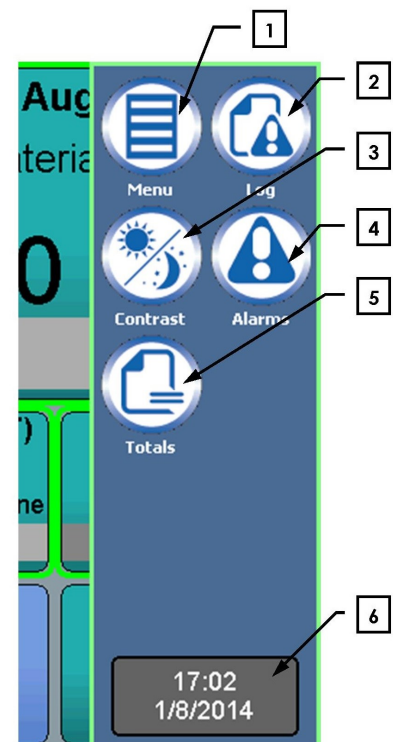
7. Main Prewet status panel
 - a. Shows the current spread rate in gal/ton or percent in manual mode
 - b. Shows the current usage of available prewet rate via the bar graph
 - c. Shows the currently selected material. The current material for this spreader is "Material 1"
8. Speed box: shows the current speed of the vehicle in MPH or km/h.
9. Hydraulic pressure shows the current system pressure in psi.
10. The system status panel shows current errors and status of the operation of the spreader control
11. Spinner status panel for second spreader
12. Spreader status panel for second spreader
13. Prewet status panel for second spreader

Single spreader screen



1. Auger status panel
 - a. Shows the current spread rate in lbs/lm or percent in manual mode. When in percent mode the user can select 0-100% of auger rate.
 - b. Shows the current usage of available spread rate via the bar graph
 - c. Shows the currently selected material. The current material for this spreader is "Material 1"
2. Spinner Status panel
 - a. Shows the current spinner speed in lanes or percent
 - b. Shows the current usage of available speed via the bar graph
 - c. This spinner is configured for Zero Velocity. See the Zero Velocity section of this manual for details. Other spinner options include, material positioning, percent, and lane mode.

3. Main Spreader Status Panel
 - a. Label at the top shows which spreader the status panel is associated with
 - b. The middle text indicates what mode the spreader is in.
 - i. Auto
 - ii. Manual
 - iii. Unload
 - c. The lower text shows if the spreader is in or out of pause.
 - i. If the spreader is in pause it will say "Pause"
 - ii. If the spreader is out of pause it will be blank
 - d. Touching this box on the screen will cycle the spreader pause state. This can also be done with the operator panel "PAUSE" button
4. Main Prewet status panel
 - a. Shows the current spread rate in gal/ton (automatic mode) or percent in (manual mode). When in percent mode the user can select 0-100% of prewet rate.
 - b. Shows the current usage of available spread rate via the bar graph
 - c. Shows the currently selected material. The current material for this spreader is "Material 1"
5. Gate status panel shows the current gate opening
 - a. See gate section of the manual for more details
 - b. The bar graph shows graphically the current opening of the gate
 - c. Touching the bar graph will allow you to change the gate height setting in manual mode without a sensor and semi-automatic gate mode.
6. The system status panel shows current errors and status of the operation of the spreader control
7. The joystick status panel will show the currently selected button and function on a multi function joystick
8. Hydraulic pressure shows the current system pressure in psi.
9. Speed box: Shows the current speed of the vehicle in MPH or km/h.
10. Quick tab drawer: Touching this will open the Quick Tab. See the Quick Tab section for more details
11. Input status panel
 - a. Can be assigned to any input in the system
 - b. If an input is active a box will be shown around the input name indicating that it is active.
 - c. Up to 2 of these panels can be on the screen for up to 6 status indicators



“Quick Tab”

1. Menu Button opens the main menu
2. Log button opens the current status/error log
3. Contrast button switches between day and night mode. Day and night mode contrast can be adjusted via the menu.
4. Shows the current active alarms, alerts, and status of the control

5. Accesses the storm totals screen
6. Current Time and Date

User ID (Logging In)

1. Optionally the driver can login via their "User ID"
2. User ID grants no permissions more than a standard user login. It only allows the data collection features of the FXDS to identify the User.
3. To change the User ID or "Log In"
 - a. Enter the *Main Menu*
 - b. Select *System Setup*
 - c. Select *User ID*
 - d. Enter your assigned user id into the text box
 - e. Press "OK"
 - f. Your User ID is now saved until the unit is restarted or manually cleared
 - g. To Log out, either cycle power on the FXDS unit or delete your log-in from the "User ID" menu
 - h. You will need to enter the USER ID every time the unit is restarted

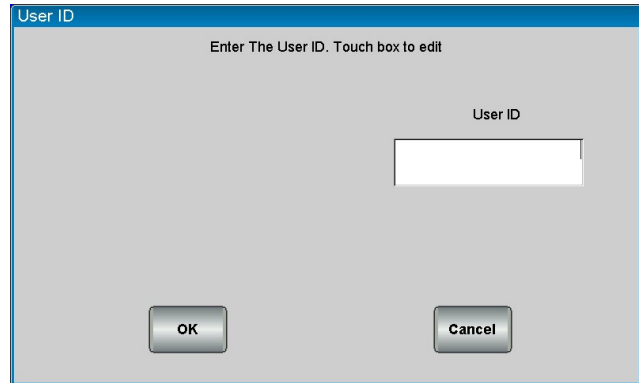


Figure 1: Touching the USER ID box will bring up an on screen keyboard. Enter your user ID and press "OK".

Selecting an Operating Mode

1. Pressing the "MODE" button on the operator panel will cycle through the available spreading modes
 - a. Auto
 - b. Manual
 - c. Unload
2. Manual Mode
 - a. Manual mode may not be available for use. This is configurable during system setup. Check with your supervisor if you are unable to operate in Manual mode.
 - b. Do not use Manual mode to unload vehicle. It will incorrectly record the material dumped to storm totals if truck is moving.
 - c. Rates in manual mode are 0-100% speed/rate only
 - i. There is no automatic feed rate increase in ground speed
 - ii. Precise material delivery per mile is not available
 - iii. Spinner lane mode is unavailable
3. Unload Mode
 - a. Unload mode has identical functionality as Manual Mode except it does not write material data into logs. Use "unload mode" instead of manual mode to unload the vehicle at the yard. This will keep the Storm and Annual Totals from being mistakenly recorded; generating false Granular and Liquid spread data.



Figure 2: Spreader status showing the Main Spreader in "Auto" mode and in "Pause"

- b. The controller limits the vehicle speed while unloading to less than 5 mph or the controller will default back into Auto mode/pause.
- 4. Automatic Mode
 - a. Auto mode provides the most accurate material delivery.
 - b. Ground speed is tracked to increase and decrease the material feed rate as necessary to place the set amount of material per lane mile.
 - c. Selected liquid will also follow ground speed
 - d. If lane mode is enabled as the spinner lanes are increased the material feed rate is increased to distribute the same amount of material on the second lane as was being spread on the first lane. See section on setting rates for more details.

Selecting a Spreader (Dual Spreader Operation)

1. Dual spreader operation is identical to operating a single spreader with the exception of the ability to select and control both spreaders together or independently
2. By pressing the "Spreader" button the unit will toggle through 3 modes of operation
 - a. Main Spreader Only
 - b. Second Spreader Only
 - c. Both Spreaders
3. When a spreader or function is selected you will be able to tell because there will be a green highlight box around the currently active selections
4. If only one spreader is selected using the controls of the operator panel will only adjust its values.
5. If both are selected it will adjust both values
 - a. If one spreader was adjusted then control is switched spreader rates may not match
 - b. If one control is paused and the other is running
 - i. If the pause button is pressed it will put both spreaders in pause
 - ii. The second press of pause will bring both spreaders out of pause.

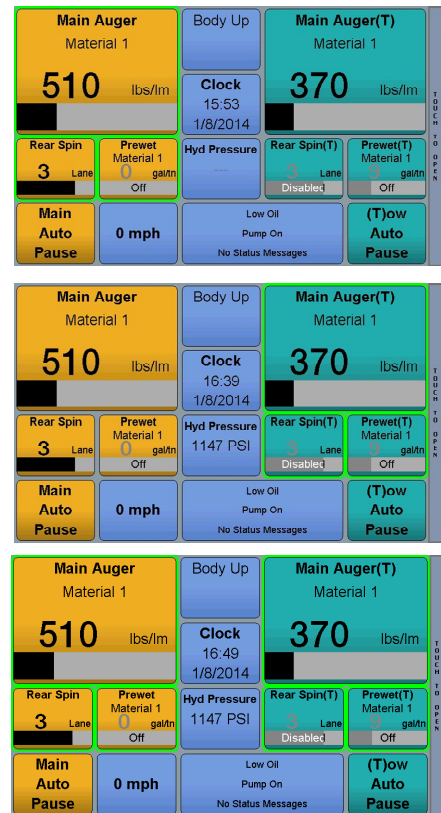


Figure 3: The images above show the main auger selected only, the tow spreader only and both spreaders selected in order

Selecting a Material

1. In order to select a material ensure the vehicle is stopped
2. Press the product button on the operator panel
3. You will see a list of available spreading devices.
4. Select one of the named materials listed in the drop down box by touching the product name on the screen.
5. Press "OK" to accept material.

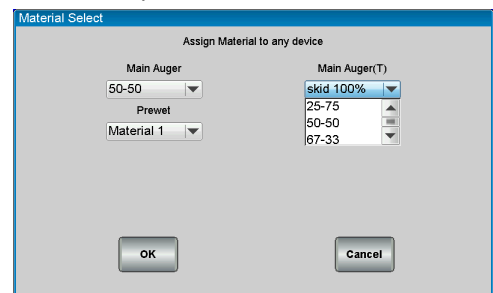


Figure 4: Material Selection Screen; Shown selecting Main Auger(T) material

(NOTE: It is important to select to the correct material so the FXDS can accurately spread material.)

Setting Granular/Liquid Rates

1. In auto mode turning the knob clockwise will increase the rate to the next higher increment step.
2. Turning the knob counter clockwise decreases the rate to the next lower increment step.
3. The increment steps are adjustable and are pre determined by a supervisor during setup.
4. In manual mode the same adjustment applies only it will increase or decrease the percent of available trim/speed from 0-100% in 5% increments.

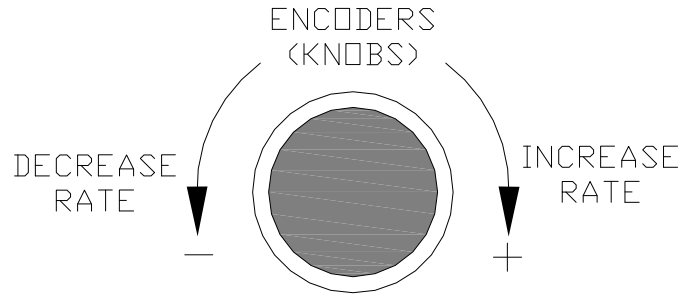


Figure 5: Encoder operation

Setting Spinner Rate

1. Using Percent % mode spinner.
 - a. The spinner speed is adjustable and controlled from 0-100% in 5% increments.
 - b. The feeder operates independently of the Spinner: Granular feed rate is NOT ADJUSTED for changes in the spinner lane width.

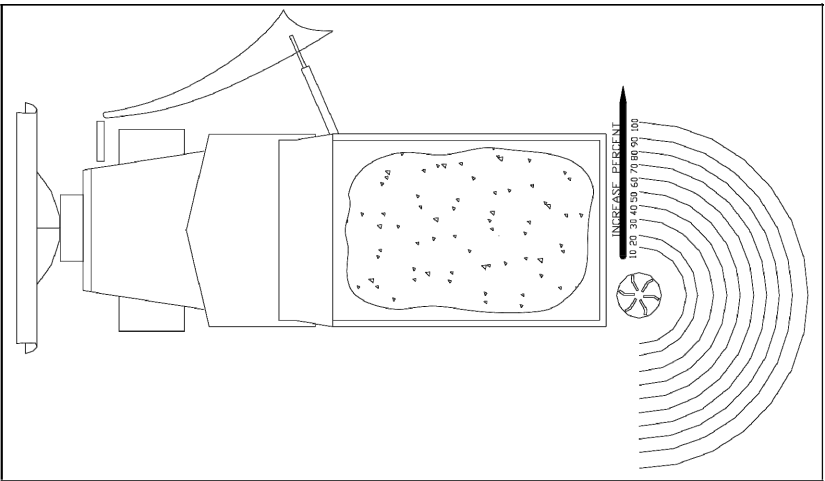


Figure 6: Percent mode spinner operation

2. Using Lane mode Spinner.
 - a. LANE CONTROL SPINNER: Lanes have been pre-calibrated for you. You simply choose 0-1-2-3 or 4 lanes. (Max number of lanes is set by your systems supervisor during setup). Note: If 0 lanes are selected the feeder will not run.

- b. The Feeder is controlled by the spinner in 'LANE' mode: Granular feed Lbs./LnM (Pounds per Lane-Mile) is automatically adjusted for your selected lane width to maintain uniform coverage for your set granular rate.

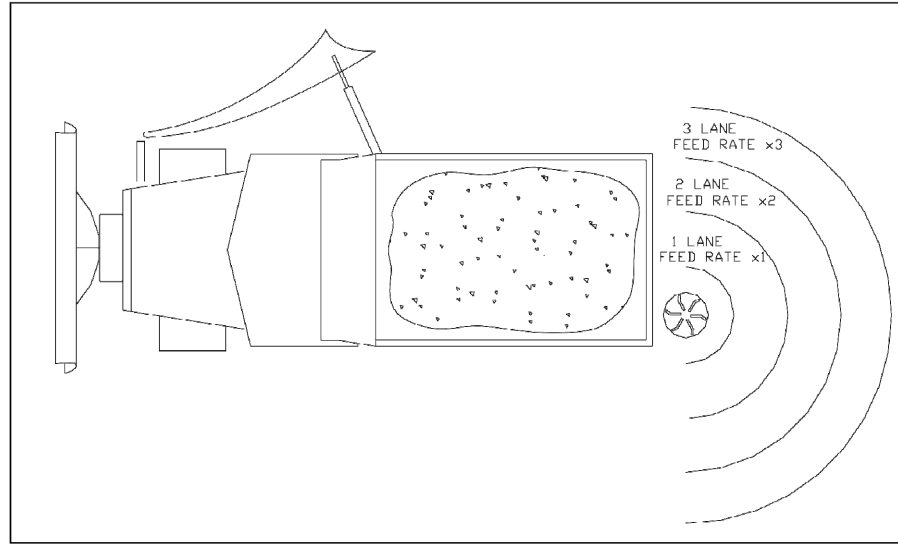


Figure 7: Lane mode spinner operation

- c. Turning the spinner knob clockwise increases the lanes being spread, turning the spinner knob counterclockwise decreases the lanes.
- d. The number of lanes being spread will be shown in the middle of the lane gauge.



Figure 8: Lane control spinner panel

3. When in Lane or Percentage mode and not in pause the spinner may be active! The spinner may not stop with ground speed if the administrator has selected this option in system setup.

Using a Zero Velocity Spinner (ZV)

1. You must have a Zero Velocity Spinner installed and calibrated to use Zero-Velocity mode.
2. Basic theory of operation :
 - a. Material being distributed to the road surface is accelerated at a speed equal to the current vehicle speed in Miles Per hour or [Kilometer per hour *metric mode*] but, in opposite direction to which the vehicle is traveling, therefore canceling material velocity in relation to the road surface.
 - b. This allows the material to drop at essentially 0 MPH to help eliminate material bounce therefore it's possible to place material in an exact location such as on the crown of the road reducing the amount of wasted material that scatters to areas of little usefulness.
3. Operating Zero velocity in AUTOMATIC MODE
 - a. The ZV Spinner speed is automatically controlled based on Vehicle MPH.
 - a. Operators shouldn't have to adjust spinner speed unless environmental factors, chute angle or other unusual conditions require adjustment.
 - b. The Operator has the ability to increase or decrease spinner speed in relation to the speed of the vehicle.

- c. This offset is shown in the ZV spinner control box (see Figure 1Figure 9)
- 4. When the vehicle stops the spinner stops
- 5. When the control is put into "PAUSE" the Spinner stops.
- 6. Operating screen and Operator panel controls
- 7. Zero Velocity in Manual mode
 - a. When in Manual control or UNLOAD mode of operation, 0-100% control of Spinner speed is available.
 - b. Changes in rate are shown in the bar graph
 - c. The operator will have to determine spinner setting by eye



Figure 9: The image on the left shows the ZV spinner spreading at the road speed. The image on the right shows the ZV spinner is spreading 3 MPH greater than road speed.

Using a Material Positioning Spinner

1. You must have a material positioning spinner installed and calibrated on your truck to use the functions of a material positioning spinner
2. The spinner bar graph will be slightly different in material positing mode than in standard mode. It will not fill up the entire bar graph even at max rate
3. The graph will grow and shrink normally with increases and decreases in rate
4. The graph will also move from right, to center to left showing how the spinner is currently positioned in the back of the truck
5. There will be a switch or similar device mounted in the control console of the system to angle the spinner



Figure 10: The image on the left shows the directional spinner centered. The image on the right shows the directional spinner angled almost completely to the right side of the truck.

Using a Swenson PPS G2 Directional Spinner

1. You must have a Swenson PPS G2 directional spinner installed and calibrated on your truck to use the functions of this type of material positioning spinner
2. The Spinner bar graph will work the same as standard lane and percent modes
3. Spinner speed will be controlled via the operator panel as with a standard spinner
4. There will be an additional box on the screen that shows the spread pattern/spinner drop zone in a graphical manner
5. At all times the control will tell you what automatic spread pattern the control is currently in or if it is in manual mode.
6. Auto Mode
 - a. There are (6) pre-programmed spread points as calibrated by the truck technician

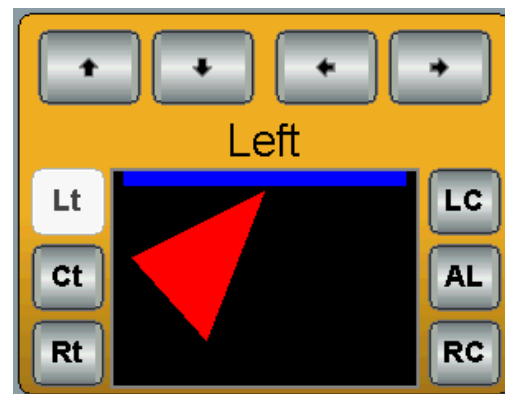


Figure 11: Swenson PPS G2 control showing the spinner in the preprogrammed "Left" spread position. Note the Manual positioning arrows above the spread depiction and the Automatic positions shown to the left and right.

- i. Left
 - ii. Center
 - iii. Right
 - iv. Left-Center
 - v. All
 - vi. Right-Center
- b. Pressing any one of those buttons will move the spreader to a pre determined position and spread pattern
 - c. If in manual mode pressing one of the automatic mode keys will return the spinner to automatic mode

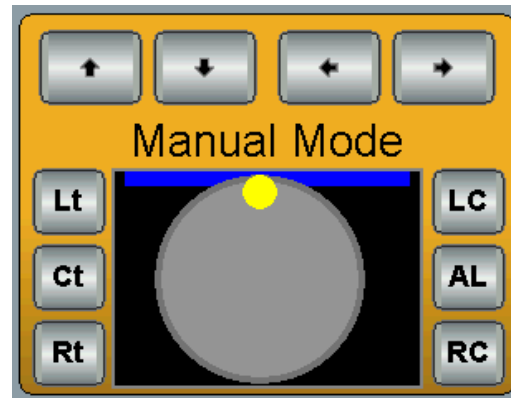


Figure 12: The Swenson PPS G2 control shown in Manual Mode. The dot represents the chute's position above the spinner disc.

7. Manual Mode
 - a. At any time it is possible to direct a custom spread pattern if the conditions require it
 - b. Pressing the 4 directional arrows will move the cursor on the screen giving a relative position that the salt is currently falling on the spreader disc
 - c. When manual mode is no longer desired at any time one of the pre programmed automatic buttons can be pushed to restore Auto Mode

Setting Liquid Rate (Prewet & Anti-ice)

1. Liquid rates can be changed using the "LIQUID" knob on the top center of the operator panel
2. Before liquid can be set it must be in focus with the yellow box around it. This can be changed by using the "SELECT" key on the operator panel and the "SPREADER" key if there are multiple spreaders installed on the truck.
3. Pressing the "LIQUID" button while a liquid function is in focus will activate or deactivate the currently selected liquid. If a liquid is OFF, it will say "OFF" in the liquid bar graph.
 - a. Prewet is set in
 - i. 0-100% in manual mode
 - ii. 0-40 gallons/ton in automatic mode
 - b. Anti-ice is set in
 - i. 0-100% in manual mode
 - ii. 0-120 gallons/lane-mile in automatic mode
4. Prewet will follow spread rate in automatic mode delivering the desired gallons of liquid per ton of material spread.
5. Liquid can be turned on and off independent of the granular rate by pressing the "LIQUID" button on the operator panel
 - a. If the rate is displayed in grey and it says "OFF" in the bar graph the liquid is off
 - b. If the rate is displayed in white the prewet is on

Using a Cross Auger

1. The FXDS has the ability to run a cross auger
2. There are two types of cross augers available. Automatic and Manual.

- a. In automatic mode the cross auger is automatically controlled by the spreader control. It is ramped proportionally with the main auger control.
- b. Regardless of whether the spreader is in Auto or Manual mode the automatic cross auger will track the main auger
3. In manual mode the cross auger operates manually only
 - a. You must touch the bar graph on screen to adjust the cross auger rate
 - b. In order to prevent jams the manual cross auger is limited to 5% trim minimum when the main auger is running

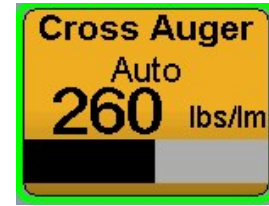


Figure 13: Automatic auger panel. In manual cross augers the word "Manual" replaces "Auto".

Changing Gate Height

1. The FXDS is equipped with multiple types of gate control
2. Gate control may not be present on your equipment
3. Manual
 - a. Gate height is changed at the back of the truck by hand
 - b. The driver then returns the cab and manual enters the gate height into the control by pressing the bar on the gate height screen.
 - c. The FXDS will automatically adjust spread rates based on the new gate height
 - d. Optionally manual gates can be equipped with a sensor so the driver only has to change the gate height and the new setting will be automatically entered into the control
4. Semi-Automatic
 - a. The gate height is either changed by hand at the back of the truck or by a pneumatic/hydraulic/electric actuator that is actuated by a switch in the cab or by using the on screen controls
 - b. A sensor on the gate will automatically read the new gate height and change the gate height in the FXDS.
 - c. The FXDS will automatically adjust spread rates based on the new gate height
5. Fully Automatic
 - a. When the spreader is set in automatic mode the FXDS is in 100% control of the gate height
 - b. Based on current spread rate and vehicle speed the gate will adjust to an optimum height to spread material.
 - c. No user interaction is required with this type of gate
 - d. If the spreader is put in manual mode a fully automatic gate will function in Semi-Automatic Mode

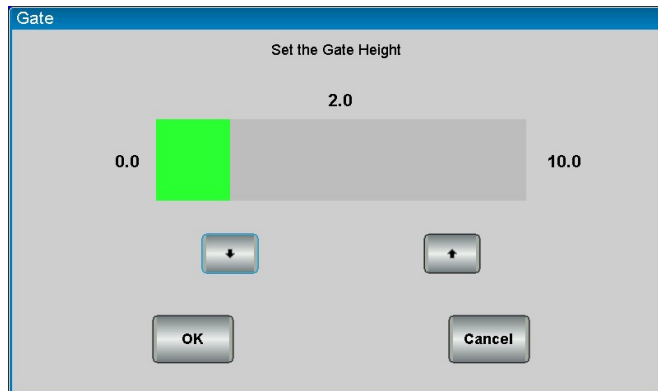


Figure 14: The gate height can be adjusted by touching the bar graph or using the arrows on screen.

Using the Screen to Change Spread Rates

1. As an alternate method to changing rates via the operator panel rate changes can be made on screen
2. When making changes on screen it doesn't matter if the control is currently selected or even active
3. Press the status bar of the control you'd like to change
4. Then in the rate adjustment window that pops up simply touch on the bar or use the up and down arrows to set a new spread rate
5. When you press save the new spread rate will take effect
6. Do not change spread rates via the screen while the truck is moving

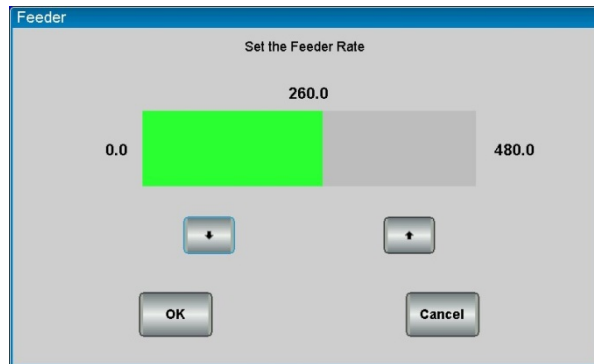


Figure 15: The rate can be adjusted by touching the bar graph or using the arrows

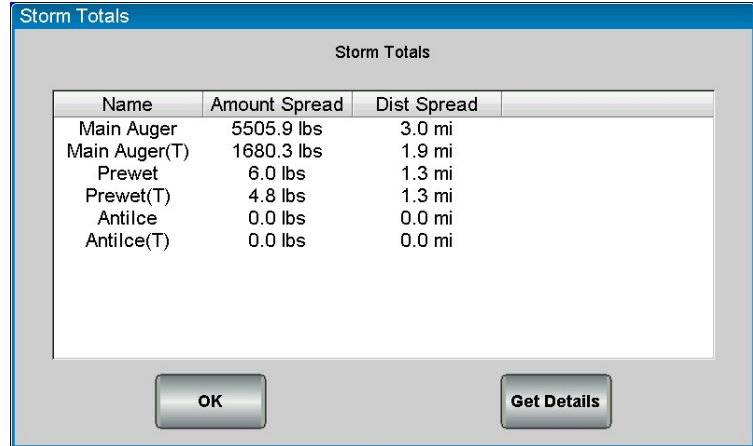
Blast

1. Blast can be used for Feeder, Prewet, and Anti-ice
 - a. Blast is used to increase the amount of material over current spread rate for use in intersections and bridge decks or other places where icing is an issue.
 - b. Ask your supervisor where and when to use Blast.
 - c. All Blast settings are set up individually with each material by your equipment supervisor.
2. Blast types:
 - a. ON/OFF: Press Blast to activate function. Blast runs indefinitely until Blast button is pressed again.
 - b. MOMENTARY: Blast functions only while Blast switch is held
 - c. TIMED: Blast will function for pre-set time (1-99 seconds) after the button is released. Pressing the Blast button again will stop the blast mode before the timer runs out.
3. Ground Speed Required: Blast can be configured to require ground speed for activation
4. When in Blast output goes to:
 - a. MAX TRIM: Feeder will go to maximum speed allowed by trim settings
 - b. MAX RATE: Maximum feeder rate in pounds per lane/mile or lbs/mile set up by your equipment supervisor for each granular material. If running "Lane mode" spinner the number of lanes is factored into the Blast output to keep a true pounds/Lane mile output.
 - c. OTHER RATE: Any configured rate between 1-9,999 lbs/lane mile.

Viewing/Saving/Clearing Storm Totals

1. Viewing Storm Totals
 - a. Do not view storm totals while driving the truck

- b. To view Storm Totals for the selected material simply press the "Storm Totals" button on the quick tab
- c. Clear functionality may not be available to the "User" level operator based on settings. This is configurable by the system administrator.
- d. The selected material will be displayed on the top of the window along with all storm data since the last time the control was cleared
- e. Alternatively to view all storm totals enter the *Main Menu*
- f. Press *Data View*
- g. You can select to view Storm or Annual totals for the truck.

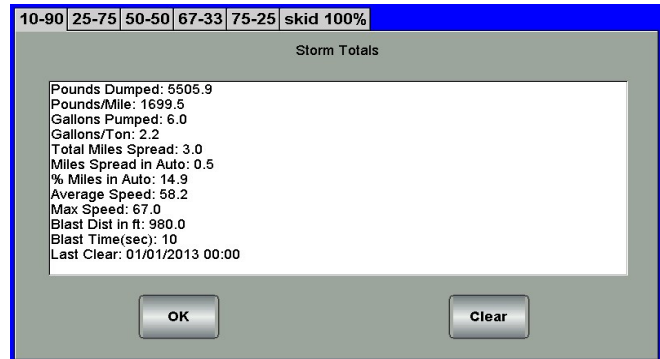


Name	Amount Spread	Dist Spread
Main Auger	5505.9 lbs	3.0 mi
Main Auger(T)	1680.3 lbs	1.9 mi
Prewet	6.0 lbs	1.3 mi
Prewet(T)	4.8 lbs	1.3 mi
Antilce	0.0 lbs	0.0 mi
Antilce(T)	0.0 lbs	0.0 mi

Figure 16: Storm total screen accessed via the operating screen.

2. Saving Storm Totals

- a. If you have a USB thumb drive inserted into the front USB port of the FXDS it is also possible to save the Storm Totals to a .CSV file for importation into a database.
 - i. Plug the USB drive in before entering the *Main Menu*.
 - ii. Browse to the *Data*
 1. *View* menu
 - iii. Press "Save To USB"
 1. Note: if you have a previous save on the drive the FXDS will prompt you to Replace and start a new file or Add the new data to the existing file
 2. **It is recommended that you select "ADD" data. This will keep all existing data while appending the latest data to the drive**
 3. **By selecting "Replace" you risk losing data that may have not been already saved to the database.**
 - iv. Wait for the FXDS to confirm the save is complete.



Material	Pounds Dumped	Pounds/Mile	Gallons Pumped	Gallons/Ton	Total Miles Spread	Miles Spread in Auto	% Miles in Auto	Average Speed	Max Speed	Blast Dist in ft	Blast Time(sec)	Last Clear
10-90	5505.9	1699.5	6.0	2.2	3.0	0.5	14.9	58.2	67.0	980.0	10	01/01/2013 00:00

Figure 17: Storm total detail screen for the main auger. Note the various materials across the top of the screen.

3. Clearing Storm Totals

- a. If the administrator has given the permission for users to clear storm totals in the main storm total screen there will also be a button marked "Clear".
- b. Press "Clear" to clear the totals for the material you are currently viewing.

- c. The FXDS will ask for confirmation if you are sure you want to clear the totals. If you are, press . “Yes” to clear the totals
- d. Each Material must be cleared separately
- e. To clear annual totals you must be logged in as administrator or technician

Day/Night Brightness

1. Enter the Menu and go to the “SYSTEM SETUP” sub menu
2. Here you can access the Day&Night brightness setup screens
 - a. Day Brightness: Allows the operator to change the day time screen brightness
 - b. Night Brightness: Allows the operator to change the night time brightness

Units (Imperial/Metric)

1. The FXDS is capable of running in Imperial and Metric units.
 - a. The FXDS is capable of switching from one unit system to the other and back again as the user desires. However it is recommended that before setup begins the system is put into the measuring unit desired
 - b. Metric label abbreviations are as follows: This applies to ALL setup and operating values
 - i. km – Kilometer
 - ii. MT – Metric Ton or tonne
 - iii. kg/Ln.km – Kilogram per Lane Kilometer
 - iv. l/kg - Liters per Kilogram
 - v. l/min. – Liters per Minute
 - vi. km/h - Kilometers per Hour
 - vii. kg/min. – Kilograms per Minute

Appendix I: FXDS Errors

Setting not Saved, Min exceeds Max: This is a common message seen while saving trims. Usually occurs if saving a minimum trim percent that is over the maximum trim percent. Try setting max trim first then set minimum trim last. The error also appears if no feedback is being received from the closed-loop sensor when a Save is applied.

Setting not Saved, Valve open: This error message appears when saving trims and the FXDS cannot detect current flowing through the Hydraulic valve electrical circuit. Suspect a connector or broken wire between the FXDS control and Valve coil connection on the hydraulic valve.

Ground Speed Error: This error appears if trying to save a "Speed Cal" and not having any groundspeed signal present at the MPH Ground Speed input. Try a different "Speed Type" and watch for the "Pulses Per minute" value to reflect a frequency indicating a good groundspeed signal at the input.

Sensor Power Error: If the sensor power supply line is shorted to ground or has more than 750mA. of current draw the sensor power supply from the FXDS is being overloaded. Suspect a faulty Feeder sensor or Liquid Flow-meter sensor. Also suspect a pinched or crushed wire, corroded connector or any fault that may cause a short to chassis ground.

Feeder Rate limited: If the Feeder is running at max speed and the current target application rate is NOT being met, this error will display. Sometimes this error would be indicative of a system that has not been calibrated or has been calibrated improperly. This error also applies to Liquid, and the Spinner. This error clears itself when the target rate is being met.

Feeder Rate Overrun: If the Feeder is running at its lowest speed and the current target application rate is NOT being met, this error will display. Sometimes this error would be indicative of a system that has not been calibrated or has been calibrated improperly. This error also applies to Liquid, and the Spinner. Usually this error will only display at very low sustained vehicle speeds of usually 5mph or less and low target rates. This error clears itself when the target rate is being met.

Sensor fault and Feeder Override: This error occurs when the FXDS was operating in closed-loop mode and was not receiving sensor feedback. The FXDS automatically defaults into open-loop after this error occurs. Suspect a stalled motor or conveyor, or dry or stalled liquid pump. This could also be caused by a failed sensor or faulty harness. This error occurs for any closed-loop function. The error condition is cleared with a power cycle.

Liquid Tank Empty: The liquid tank is empty