

General Description

The DC210 implements a digital rate control for granular and liquid systems typically used to regulate snow and ice highway spreading equipment. The DC210 is a full featured granular control for the spreader systems using conventional conveyor & spinner. The DC210 will also operate an auxiliary liquid pump for pre-wet applications. The DC210 can alternately be configured to operate a de-icing system by connecting the conveyor valve drive to a large volume liquid pump. The DC210 uses advanced digital techniques to regulate the shaft speed of the conveyor in direct response to vehicle speed. The granular spread rate is calibrated and regulated in true units of "pounds per mile". The pre-wet control is calibrated for "gallons per ton" and the De-ice control is calibrated for "gallons per mile". The DC210 accommodates both closed loop and open loop control with calibrations for ground speed input and shaft driven pulse sensor feedback.

Features:

- > Automatic ground speed and manual modes for rate control
- > Blast and Pass (remote switch spot mode)
- > Controls both drag chain conveyor or auger (screw) type spreaders
- > Eight pre-set spinner output settings, detent switch
- > Eight different granular materials, with individual data logging
- > Granular control, 20 to 3000 pounds/mile, open loop or closed loop shaft control
- > Liquid pre-wet control, 0.5 gal/ton to 12 gal/ton, open or closed loop shaft control
- > De-ice control, 250 gal/mile, open or closed loop rate control
- > Electronic or mechanical transmission sensor interface (mph)
- > PWM closed loop current control or open loop voltage control
- > Digital switch input for gearbox or spot spreading options
- > Dual time based data logging; spreader miles, total material output (pounds) per product
- > Supports field printing and PC interface, RS232 interface
- > Supervisory: spread rate limits, manual lockout, spot/pass, Blast, material types
- > Software upgrade via field lap top
- > English or metric operation
- > 10 year real time clock

The DC210 employs a PWM current control for precise open loop shaft control. The DC210 calculates and displays the spread rate and accumulated pounds delivered. The spinner and conveyor automatically start and stop with the vehicle. The digital controller has complete system surveillance with alarm indication for conveyor overrun, failed valve coils, cables and sensor functionality. This compact design is easily adapted to most console/cab layouts. The operator benefits from the large format numeric display with easy to use feed rate and lane width controls.

Field Printer (option)

The DC210 incorporates a standard RS232 communications port for use with remote communications devices. Using the optional field printer p/n FP100 allows you to extract the internal. The print-out includes accumulated totals for both recent and annual usage's, total pounds of material for all eight granular product types, total gallons of liquid, total miles in auto and manual, calibrations, dates and times. Simply connect the printer to the comm. port, turn power ON to the DC210 to print a short menu. Use the Rate knob to select the menu item number. Press Blast to print. When the printing is completed turn the power switch OFF and remove the printer connection.

Operational features

The DC210 has a **manual** mode that gives the operator direct electro-hydraulic control over the conveyor and spinner valves. Manual mode is useful for testing the basic hydraulic system and as backup operation should a sensor fail. Manual mode does not conserve spreading material and does not automatically shut off the feed rate when the vehicle comes to a stop. In manual the display still shows lbs./mile but as the vehicle moves, this number will move up and down since there is no ground speed regulation.

Blast will instantly output 100% and normally is used to lay down a thick coverage of material. Alternately, Pass instantly turns the conveyor off to allow the spreader vehicle to pass or be passed. Both of these features will operate any time the respective switch is pressed, regardless of man/auto mode or vehicle speed. The Blast has an optional off-delay timer that holds the Blast output on for up to 30 seconds. If the operator needs to stop the timer, press the Blast switch momentarily and the Blast timer will instantly end.

To **unload** the spreader select manual mode and turn the Rate knob up (full CW). This will unload conveyor and not add to the data logging, but only while the vehicle is stopped.

Pass works as a push on / push off function. The first push will activate the Pass feature (conveyor off) and the second push will de-activate the Pass feature (conveyor on). There is a option for remote Pass, see the calibration procedure.

The automatic **Rate** control is a hands free operation that maintains a constant feed rate. The operator adjusts the granular rate using the display. The granular rate ranges from 20 lbs/mile on the lowest setting up to 3000 lbs/mile at the maximum setting. There is a spread rate limit that's adjustable from 100 to 3000 lbs/mile

Pulses from the transmission sensor create the ground speed signal. When the vehicle is stopped (zero **MPH**) the display will flash (dimming) the desired spread rate to indicate no ground speed pulses are being received. Once the vehicle begins moving and the pulses are present, the display stops flashing, the feed rate is displayed steady (non-flashing). As the vehicle begins moving the conveyor shaft rpm will automatically increase in direct relation to the vehicle speed, keeping the spread rate constant. At 1/2 mph the spinner automatically drives to a preset level.

The DC210 calculates the **accumulated pounds** of the delivered material. The total weight is always being recorded whether in Manual, Auto or Blast mode. There are eight internal accumulators, one for each product. The display shows this value in 10's of lbs. So that a reading of 1200 will be a weight of 12,000 lbs. All eight product totals are retained and are always available for printing.

The operator can **view** and/or **clear** the accumulated pounds of the selected product with the Lane switch set to Accum. (prod). To clear hold down the Blast switch. The display will show "AC 30" The 30 will decrement to 0 (approx 3 seconds) and then clear the accumulated totals.

To **change the selected product**. First, set the Lane switch to the Accum. (Prod) position and press the Pass switch up (select). The current product number will show. Next, continue to hold the Pass switch up and turn the Rate knob to select a different product. Release the Pass switch and the new product is locked into memory.

Front Panel Controls

The **mode switch** is located in the upper left corner and is used to select three operational modes.

Off..... When the mode switch is Off all power is removed from the valve drivers, sensors and comm. port. Do not use the mode switch to stop and start the valve drive in order to implement spot spreading. Use instead, the Pass switch for spot spreading.

Granular..... The granular position allows the operator to use the feed Rate knob to directly adjust the granular output, while viewing the feed rate in lbs./mile on the display.

Run Pre-wet... The pre-wet mode operates both the granular spreader and a small liquid pump. The ratio of liquid to granular material is gallons per ton.

Set Pre-wet.... The operator uses this selection to view and/or re-adjust the liquid -granular ratio using the feed Rate knob.

De-icing..... The De-ice mode controls a large liquid pump to deliver liquid at a fixed rate, gallons per mile. There is no spinner output in this mode. Granular spreading equipment and the large liquid tank required for De-icing cannot both fit onto the same truck. The DC210 uses the same output to run either the granular control valve or the De-ice control valve, but not both simultaneously. The vehicle wiring and hydraulic system are changed when switching between the granular and De-ice modes.

The **lane switch** is used to adjust the spinner output and to operate some special features. It's located in the lower left corner of the panel.

Off Turns the spinner output off. The display denotes this mode with a small upper case 0 in the left most digit.

1, 2, 3, 4..... Spinner output is active. The spinner speed has four preset levels established in the calibration procedure. The spinner speed is typically set using actual granular material since the material weight will tend to alter the spinner speed. The spinner drive can be programmed to shut off at zero mph or remain on at zero mph. In manual mode the spinner always remains on at zero mph, requiring the operator to manually set the spinner OFF.

Accum (Prod). View the accumulated pounds dispensed. Similar to a trip odometer this accumulator can be reset to zero. The alternate use for this position is to change the product. Hold the blast switch and use the feed Rate knob to select the product number

Cal This position is used to place the DC210 into the calibration mode. To change calibration settings requires a pass code.

Man This position sets the DC210 into a manual mode. Use the Pass/Blast switch to set the manual mode on or off. The power up default is auto mode. The calibration procedure allows the installer to disallow manual mode by the operator.

The **Rate knob** is located in the lower right In Automatic mode the Rate knob adjusts the desired application spread rate. The full CCW position of the Rate knob always turn the conveyor OFF, regardless of the vehicle speed or selected mode. In Manual mode the Rate knob directly sets the electro-hydraulic output for the conveyor valve.

The **display** shows numeric values between 0 to 99999. For automatic and manual mode the display shows the spread rate in lbs./mile. When the power switch is in the Total position the display shows pounds/10.

Display	Explanation
° 0	Rate knob full CCW (conveyor off), spinner off
20	Minimum feed rate, spinner on
-00-	Manual mode, conveyor = 0% output
bL yy	Blast is active, timer on. yy is timer (seconds)
Prod#	Show the selected product number, (# = 1 thru 8)
AC xx	Clearing the product totals, xx = 3 sec. timer
P zz	Programming menus, zz = menu number 1-56
E zz	Error codes, zz = error number 01 thru 12

Error codes

The DC210 can detect several system failures. Each of these is presented to the operator through a set of error codes. If during operation an error should occur the operator should make note of the code (E01, 02, etc.) and then press the Blast switch to clear the error. If the error does not clear then system will require immediate attention by a qualified technician. Error codes may be reset by pressing Blast.

Er 01	no conv Fb pulses / automatically cross calibrates to open loop calib
Er 02	no conv Fb pulses / cross calib not available
Er 03	conveyor (De-ice) valve, over current
Er 04	conveyor (De-ice) valve, open circuit
Er 05	spinner valve, over current
Er 06	spinner valve, open circuit
Er 07	cpu watchdog, cycle power to reset
Er 08	failed fuse, replace with 5x20mm 5 amp
Er 09	Pre-wet coil, over current
Er 10	Pre-wet coil, open circuit
Er 11	Pre-wet feedback fail
Er 12	De-ice feedback fail

PROGRAMMING

The DC210 uses the front panel to view and modify all settings within the computer's memory. There are no special tools required. The front panel knobs and switches have secondary uses that allow you view each setting and to make changes to the programmed values provided you first enter a password. Without a password you can only view the internal settings. Each programmed variable is selected by scrolling through a list of menus. Each menu is numbered, P01 thru P99.

Before you start --- think **safety**

When making modifications to the program setup of the DC210 caution is recommended because this process will automatically activate certain hydraulic functions. Prior to making any modifications to the program setup ensure all personnel in the area are notified.

How to access the program settings

Entering the program mode

1. Set the Lane switch = Cal and then turn the power, rotate the power switch to Run Gran. Display should show [=====] five double-dashes
2. Next, Press-n-hold Pass switch and turn Rate knob, display reads P01. [password menu]
3. Next, Press-n-hold the Blast switch and turn Rate knob until display reads the correct password refer to the last page of this manual for the correct password
4. Release Blast switch, You are now ready to edit program settings.

To select the desired menu

5. Hold **Pass sw.** and turn the Rate knob until the display = Pxx (xx = desired menu number)
6. Release the Pass sw., display now shows the current data value for the selected menu

Edit an existing setting

7. Hold **Blast sw.** and turn the Rate knob until the display shows the desired new value
8. Release the Blast sw. and the new value is automatically saved. When you release the Blast sw. you will notice a brief dimming of the display indicating a save to memory has been made.

The procedure for making program changes repeats steps 5 thru 8. When you have completed editing the settings you can return to a running mode by moving the Lane switch from the Cal back to the Off. As long as the unit remains powered up the password is retained. This allows you to move between calibration mode and a run mode without re-entering the password each time.

Tips

You can verify the menu number you're presently viewing by simply pressing the Pass switch but do not move the Rate knob.

Some menus offer a choice between features, so instead of changing a numeric value the display will show alpha symbols, such as; rP PAS gEAR C-PEr ,etc.

To assist the installer, some menus activate the conveyor or spinner to run directly from the program mode. And there are options to view sensors output pulse rates and valve current. Refer to the menu list for any menu with the **+Prod** option. **+Prod** means you are to rotate the Lane Sw one position CW to the product selection to access the alternate display of action.

Open loop dump

Weigh the truck w/ material before and after the dump to obtain the total weight dumped. When performing the material dump always set the conveyor speed to 100%. Record the time duration of the dump, use at least ¼ of the trucks load to get a reasonable average. Ensure the material feeds correctly into the conveyor, prevent voids that will throw off you calibration efforts.

$$\text{Calculation of open loop } \frac{\text{starting weight} - \text{ending weight}}{\text{starting time} - \text{ending time}} = \frac{\text{lbs}}{\text{minutes}} = \frac{\text{XXXX}}{\text{Y.Y}} = \text{ZZZ}$$

XX is whole pounds Y.Y is time in 1/10's of a minute ZZ is the final calculation (enter into P30)

Open loop example starting weight 29,350lbs, ending weight 27,250lbs, total time 5min 36sec
 $29350 - 27250 = 2100$, $5\text{min } 36\text{sec} = 5.6\text{min}$
 $2100 / 5.6 = \mathbf{375 \text{ lb/min}}$

The DC210 can assist you with the open loop timed dump. Using menu P31, press and hold the Blast sw, watch the display count down, the conveyor will turn on (don't forget to turn the rate knob all the way CW, 100% so the timed dump will be accurate). Use you wrist watch to time the dump. when you're ready to end the dump turn the rate knob CCW, Off. Record your time and weight, make the calculation as shown in the above example and enter the result into P30.

Closed loop dump

Weigh the truck w/ material before and after the dump to obtain the total weight dumped. When performing the closed loop material dump you should set the conveyor speed to ~50%. Record pulses received, use at least ¼ of the trucks load to get a reasonable average. Ensure the material feeds correctly into the conveyor, prevent voids that will throw off you calibration efforts.

$$\text{Calculation, closed loop } \frac{\text{starting weight} - \text{ending weight}}{\text{pulses}} = \frac{\text{lbs}}{\text{pulses}} = \frac{\text{XXXX}}{\text{YYY}} = \text{ZZZ}$$

XX is whole pounds YYY is the total number of pulses ZZ is the final calculation (enter into P30)

Closed loop example starting weight 29,350lbs, ending weight 27,250lbs, total pulses
 $29350 - 27250 = 2100$, 4210
 $2100 / 4210 = \mathbf{0.498 \text{ lb/pulse}}$

The DC210 can assist you with the closed loop pulse dump. Using menu P31, press and hold the Blast sw, watch the display count down, the conveyor will turn on. Use the display to observe the accumulated pulses from the conveyor sensor. When you're ready to end the dump turn the rate knob CCW, Off. Record your pulses and weight, make the calculation as shown in the above example and enter the result into P30.

Programming menus

Menu #	Variable name	Range or Selection
Information settings		
P01	Password	[4836] required to edit calibration settings
P02	Truck number	[0 - 250]
P03	Serial number	[set by factory]
P04	Checksum	[xxxx] used program verification
P05	Firmware version	[yyyy] used for program upgrades
Ground speed sensor settings		
P10	MPH calib, counts / mile	Display [250 - 15280] X10 actual [2500 - 152800]
P10 + Prod	View actual mph	Press Blast use Rate knob, display = speedometer
P11	mph sensor type	[dc - AC] dc = hall effect and World, AC = VRM
P12	20 mph simulated	[S-OFF / S-on] simulates a 20 mph signal input
Valve settings for granular mode		
P13	PWM frequency	[30-250 hertz]
P14	Conveyor min speed	[2-100%] or [50-2500ma]
P14 + Prod	Conveyor min speed	[view feedback hertz if conveyor if set to closed loop]
P15	Conveyor max speed	[2-100%] or [50-2500ma]
P15 + Prod	Conveyor max speed	[view feedback hertz if conveyor if set to closed loop]
P16	Conveyor cross calib.	[10-999 max hertz] or [nA = no cross calib]
P17	Conveyor test mode	[view conv. valve ma] Rate knob sets conv. output
P17 + Prod	Conveyor test mode	[view conv. feedback hertz] Rate knob sets conv. output
P20	Lane 1 spinner speed	[0-100%] or [10-2500ma]
P20 + Prod	Lane 1 spinner current	SC ** [hold blast to view actual spinner current Releasing blast sw will save setting]
P21	Lane 2 spinner speed	[0-100%] or [10-2500ma]
P21 + Prod	Lane 2 spinner current	SC **
P22	Lane 3 spinner speed	[0-100%] or [10-2500ma]
P22 + Prod	Lane 3 spinner current	SC **
P23	Lane 4 spinner speed	[0-100%] or [10-2500ma]
P23 + Prod	Lane 4 spinner current	SC **
P24	Lane 5 spinner speed	[0-100%] or [10-2500ma]
P24 + Prod	Lane 5 spinner current	SC **
P25	Lane 6 spinner speed	[0-100%] or [10-2500ma]
P25 + Prod	Lane 6 spinner current	SC **
P26	Lane 7 spinner speed	[0-100%] or [10-2500ma]
P26 + Prod	Lane 7 spinner current	SC **
P27	Lane 8 spinner speed	[0-100%] or [10-2500ma]
P27 + Prod	Lane 8 spinner current	SC **

Calibration settings for conveyor sensor

P30	Conveyor calib	[50 - 1499 lbs / minute open loop mode] [0.020 - 1.499 lb/pul closed loop mode]
P31	Conveyor pulse dump	[cd 10] hold Blast, display counts down 10,9,8...2,1,0 release Blast to view the accumulated pulses received from the conveyor sensor. Use the Rate knob to adjust the conveyor speed. Rate knob = CCW stops the conveyor. Blast resets the accumulated pulses.

Granular Product settings

Note, Product 1 is always the product used to calibrate the conveyor

P32	Prod 2	[ratio] = weight prod 2 / weight prod 1
P33	Prod 3	[ratio] = weight prod 2 / weight prod 1
P34	Prod 4	[ratio] = weight prod 2 / weight prod 1
P35	Prod 5	[ratio] = weight prod 2 / weight prod 1
P36	Prod 6	[ratio] = weight prod 2 / weight prod 1
P37	Prod 7	[ratio] = weight prod 2 / weight prod 1
P38	Prod 8	[ratio] = weight prod 2 / weight prod 1

Granular System settings

P40	Conveyor servo mode	[OP = open loop] [CL = closed loop]
P41	DC210 Run mode	[An] = (both auto and manual modes enabled) [AO] = (auto mode only)
P42	Maximum feed rate	[100-3000] lbs/mile. Limits operator's upper setting
P43	Blast off delay timer	[1-10 seconds] [b-OFF timer off, Rate knob = CCW]
P44	Blast rate	[rl] Blast = maximum valve [rA] Blast = maximum rate
P45	Option input	PAS = remote pass input gEAR = gearbox input BLA = Blast PSI = pressure sw input
P46	Gearbox ratio	[nA = not used] [.20 - 5.0] = gearbox ratio
P47	Spinner mode	[A OFF] = (spinner will turn on/off with mph) [n OFF] = (spinner will NOT turn on/off with mph)
P48	Conveyor drive	[C-PER] calibrations in percent mode, % [C-cur] calibrations in current mode, ma
P49	Spinner drive	[S-PER] calibrations in percent mode, % [S-cur] calibrations in current mode, ma

Real time clock settings

P50	Minutes	0-59
P51	Hours	0-23 (24 hour mode)
P52	Day of week	1-7 (Sun - Sat)
P53	Day of month	1-31
P54	Month	1 - 12 (Jan - Dec)
P55	Year	1997 - 2096 (Y2K compliant)
P56	metric/English	[rc = metric] [EH = English]

Pre-wet settings

P60	Maximum pre-wet rate	[2.0 - 16.0 gal/ton] set operators upper limit
P61	Max pre-wet output	[2.00 - 23.99 gal/min] open loop <u>measure at valve max</u> [200 - 2399 pul/gal] closed loop <u>use sensor manf rating</u>
P62	Min pre-wet output	[0.1 - 2.0 gal/min] open loop <u>measure at valve min</u> for closed loop operation this variable is not used
P63	Pre-wet valve min	[1-97%] set for minimum acceptable spray pattern
P64	Pre-wet valve max	[1-97%] set for maximum liquid pump output
P65	Pre-wet servo mode	[P OPn = open loop] [P CLO = closed loop]
P66	Pre-wet drive	[P PCn = percent mode] [P CUr = current mode]

De-ice settings

P70	Maximum De-ice rate	[10 - 500 gal/mile] set operators upper limit
P71	Max De-ice output	[2.0 - 149.9 gal/min] open loop <u>measure at valve max</u> [2.0 - 149.9 pul/gal] closed loop <u>use sensor manf rating</u>
P72	Min De-ice output	[0.5 - 20.0 gal/min] open loop <u>measure at valve min</u> for closed loop operation this variable is not used
P73	De-ice valve min	[2-100%] set for minimum acceptable spray pattern
P74	De-ice valve max	[2-100%] set for maximum liquid pump output
P75	De-ice servo mode	[d OPn = open loop] [d CLO = closed loop]
P76	De-ice drive	[d PCn = percent mode] [d CUr = current mode]

Comm Port

The CS102 is equipped with a communications port on the front panel. The purpose of this comm. port is to provide the user with a convenient method for transferring data to and from the controller using a standard laptop computer. **Upload** defines the action of sending data from the laptop to the controller and **download** is the act of transferring data from the controller to the laptop.

Upload

From time to time the factory may create a new version of the spreader application program. Typically this is done to fix a bug, improve or add a new feature. The user can upload the new application program (aka field upgrade) through the comm. port using the built in monitor program and a laptop computer.

To perform an upload procedure the user needs the following;

- 1) a comm. port cable ref. p/n CS100C1A
- 2) a laptop computer running Windows™ with a resident terminal emulator program
- 3) the new application program, this may be contained on a disk or received by e-mail

The field upgrade programs use the following file naming convention.

example: CS102F2A.S19

Note, all application programs for the CS102 controller are under copyright protection. All rights are reserved by Ditco Inc. You are NOT authorized to copy or use this program for any reason other than to upgrade an existing version within a CS102 controller.

The integrity and identification of the application program can be confirmed by the checksum. The program version and checksum can be determined from the front panel controls, see Program section. note, menu # P04 displays the checksum and menu # P05 displays the version.

Setup your terminal emulator

Use the following chart to setup the Windows™ resident terminal emulator program. This program may be referred to a HyperTerminal™ depending on the version of Windows™ you are using. Make sure you know how to locate the various control parameters. The first time through you'll have to setup an icon, pick a comm. port and then setup the following values into the comm. port properties.

Baud rate	9600	(comm. port properties)
Data bits	8	(comm. port properties)
Parity	None	(comm. port properties)
Stop Bits	1	(comm. port properties)
Flow control	Xon / Xoff	(comm. port properties)
Transmit buffer	set for a low speed	(comm. port properties) (advanced)
ASCII setup	character delay 1ms	(properties, settings, ASCII setup)

Upload procedure **VERY IMPORTANT** *Before you start with step one, make sure you have a clear path to the new program you are attempting to upload. If the program is on a disk make sure you can read the disk. Note; If the process of uploading a new program to the CS102 is for whatever reason interrupted, (typically due to incorrect terminal settings, a power interruption or faulty cable connection), the CS102 may not be able to try again. If the worse case happens you will have to send the unit back to the factory for re-programming.*

Step one With your terminal emulator program setup and running. With the cable installed, leaving the vehicle engine off, Power up the CS102 with the front panel switch. The other front panel controls have now effect during this process.

“ “ indicate the characters to be typed, use enter key to send
(the xy command must be lowercase, all other commands can be either case)

Step two Type “xy” and press enter. A banner and a command menu will be displayed on your terminal

Step three Type “P” and press enter. This will put the CS102 into program receive mode
The CS102 will send a Ready back to your terminal

Step four From your terminal emulator command a Transfer text file or Send text file and then select the new application program you wish to upload <filename.S19>

Step five During the file transfer you will observe four digits constantly changing. This represents the various bytes of data being transferred. When the transfer is complete type “C” hit enter. This command instructs the CS102 to calculate the new checksum for your verification.

Note The following are the commands available from the monitor.

R = restart the program, this is the same as cycling the power

P = send new program, upload a new application

L = clear the current program, DO NOT use this command, reserved for factory use only

C = get new checksum

Downloads

The CS1 spreader control can create a download of data when polled using an RS232C dumb terminal.
Comm port protocol: RS232C (9600,N,8,1) 9600 baud, no stop bits, 8 data bits, 1 start bit

To direct the CS1 to send serial data (download) via the comm. port to the printer or any dumb terminal connected to the comm. port, the operator has the option to either use the Feed **Rate** knob and the **Blast** button on the front panel, or a serial command. Either will cause the same information to be sent out through the comm. port.

Serial printer port download commands:

To put the CS1 into 'printer mode' send a XON character (\$11 or ctrl q) from your dumb terminal.
Note; This is automatically done when connecting in a FP1 Field printer. The moment it powers up the printer sends out a XON character.

The CS1 will respond with its standard opening printer banner.

-----Standard Opening Banner -----

```
Spreader Control
  Truck ID# 123
  Use Rate to Select
  Press BLAST to Print
1 Recent Totals
2 Annual Totals
3 Clear Recent Totals
4 Clear Annual Totals
5 Calibrations
6 Print All
```

The available commands use this syntax format 'xx' followed by a **ctrl-t**.
Where **xx** = 01 - 06 relating to the printer output commands as seen on the banner.
Always use a preceding **0** before the 1 thru 6

During printer outputs the CS1 will halt spreading operations and after the data is extracted the user can either; 1) Send the command **00 ctrl-t** (in hex = \$30 \$30 \$14) and the CS1 will RESET itself and return to normal spreader mode. or 2) cycle the power switch to reset the CS1

EXAMPLE 1: Print out the Recent Totals

Send the command **01 ctrl-t** (in hex = \$30 \$31 \$14)
CS1 will send Recent Totals, see below

Recent Totals
For Truck Number 123
From:20:00 Tue Dec 28,04
To:15:30 Sun Jan 02,05
Product #1
12691 Lbs Granular
42 Gal of Pre-Wet
0 Gal of De-Ice
13 Total Miles Auto
0 Total Miles Manual
0 Total Miles De-Ice

repeats same info for each of Product 2-8

xx Lbs Granular
x Gal of Pre-Wet
x Gal of De-Ice
x Total Miles Auto
x Total Miles Manual
x Total Miles De-Ice

EXAMPLE 2: Annual Totals

Send the command **02 ctrl-t** (in hex = \$30 \$32 \$14)
The CS1 will send out its Annual Totals.

Annual Totals
For truck Number 123
From:20:00 Tue Oct 5,04
To:15:35 Wed Mar 16,05
Product #1
75391 Lbs Granular
42 Gal of Pre-Wet
156 Gal of De-Ice
250 Total Miles Auto
75 Total Miles Manual
44 Total Miles De-Ice

repeats same info for each of Product 2-8

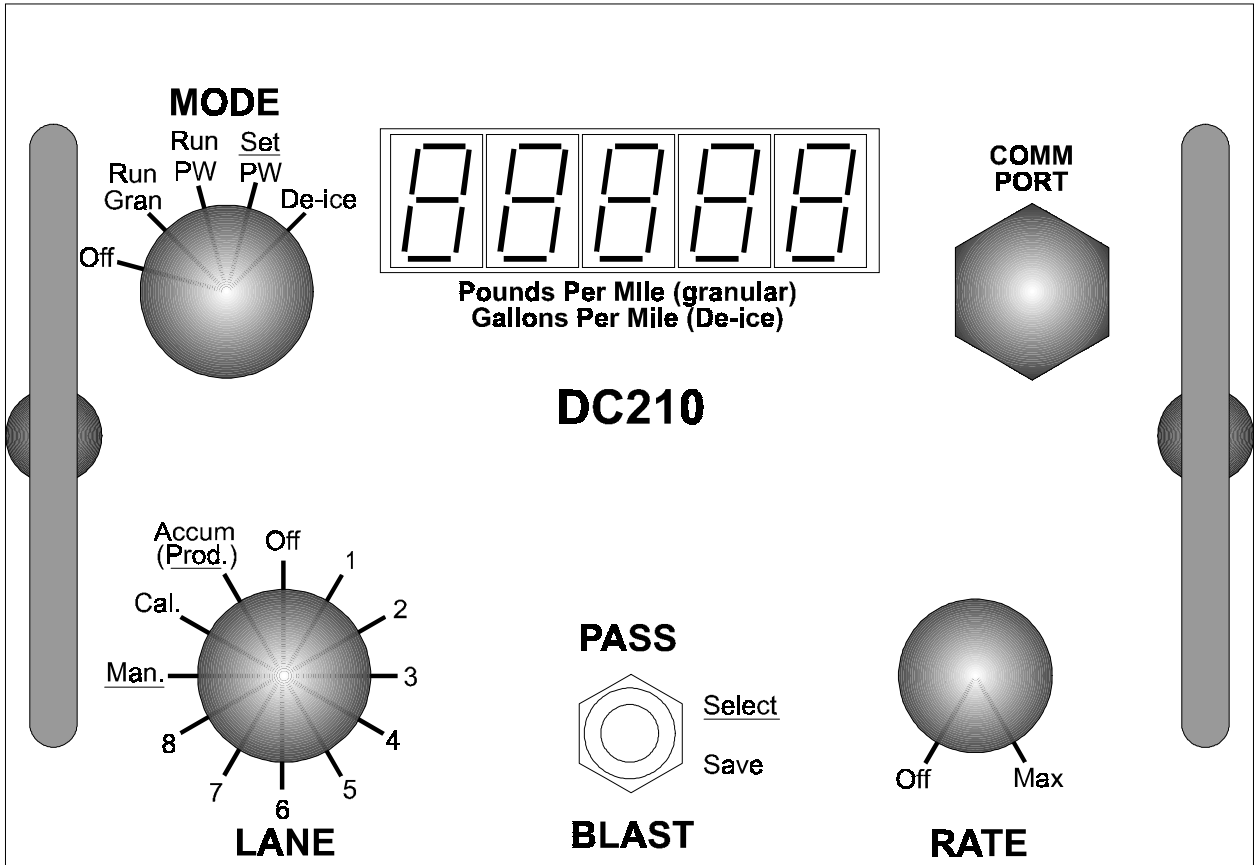
xxxx Lbs Granular
xx Gal of Pre-Wet
xx Gal of De-Ice
xx Total Miles Auto
x Total Miles Manual
xx Total Miles De-Ice

EXAMPLE 3: Calibrations

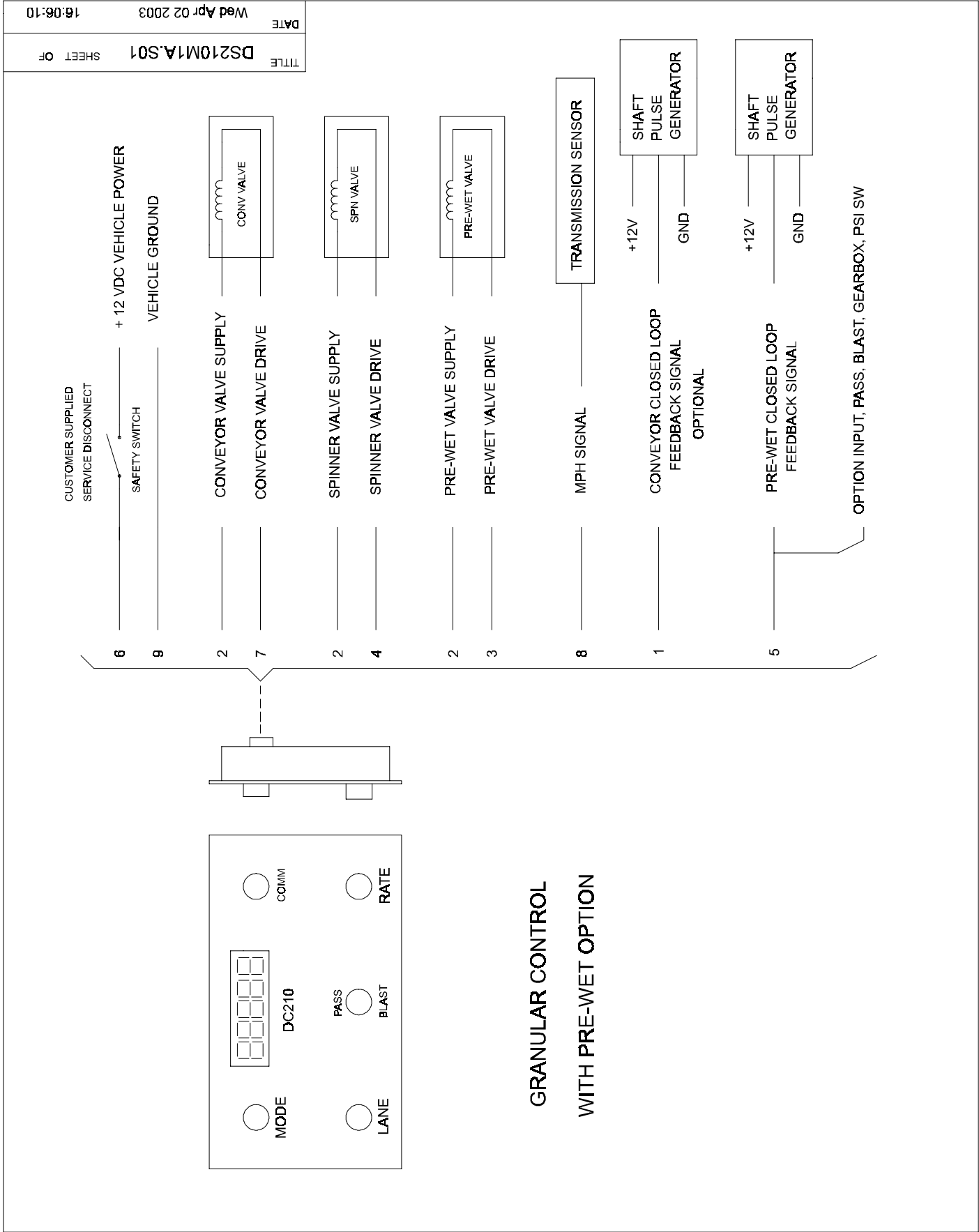
Send the command **05 ctrl-t** (in hex = \$30 \$35 \$14)
The CS1 will send out its Calibration data.

```
Calibrations          (P #)
 123 Truck ID        (2)
 238 S/N             (3)
D4D8 Checksum        (4)
2F1A Program Version (5)
 2780 Cts/Mi         (10)
MPH Sensor AC        (11)
 100 PWM Frequency   (13)
 39 % Conv Min       (14)
 78 % Conv Max       (15)
 23 % Lane Sw #1     (20)
 35 % Lane Sw #2     (21)
 43 % Lane Sw #3     (22)
 51 % Lane Sw #4     (23)
 0 % Lane Sw #5      (24)
 0 % Lane Sw #6      (25)
 0 % Lane Sw #7      (26)
 0 % Lane Sw #8      (27)
 230 Lbs/Min         (30)
1.00 Prod. Ratio #2 (32)
1.00 Prod. Ratio #3 (33)
1.00 Prod. Ratio #4 (34)
---- Prod. Ratio #5 (35)
---- Prod. Ratio #6 (36)
---- Prod. Ratio #7 (37)
---- Prod. Ratio #8 (38)
  Open Loop Conv.    (40)
Manual Enabled       (41)
2000 Lb/Mi Max Rate (42)
 0 Sec. of Blast     (43)
Blast Uses Max Trim (44)
Pass Mode            (45)
1.00 Gear Ratio      (46)
Spinner Auto         (47)
12.0 G/T P-W Max SP (60)
  .50 G/Mn P-W Cal. (61)
 0.5 Gpm P-W Min Out (62)
 41 % Pre-Wet Min    (63)
 71 % Pre-Wet Max    (64)
  Open Loop Pre-Wet (65)
Pre-Wet Pcnt Mode    (66)
 250 G/Mi D-I Max SP (70)
 250 Pul/G D-I Cal. (71)
 1.0 Gpm D-I Min Out (72)
 700 mA De-Ice Min   (73)
1800 mA De-Ice Max   (74)
Closed Loop De-Ice   (75)
De-Ice Curr Mode     (76)
Last Calibrated:
18:07 Mon Feb 9,04
-----
```

DC210 Front Panel layout



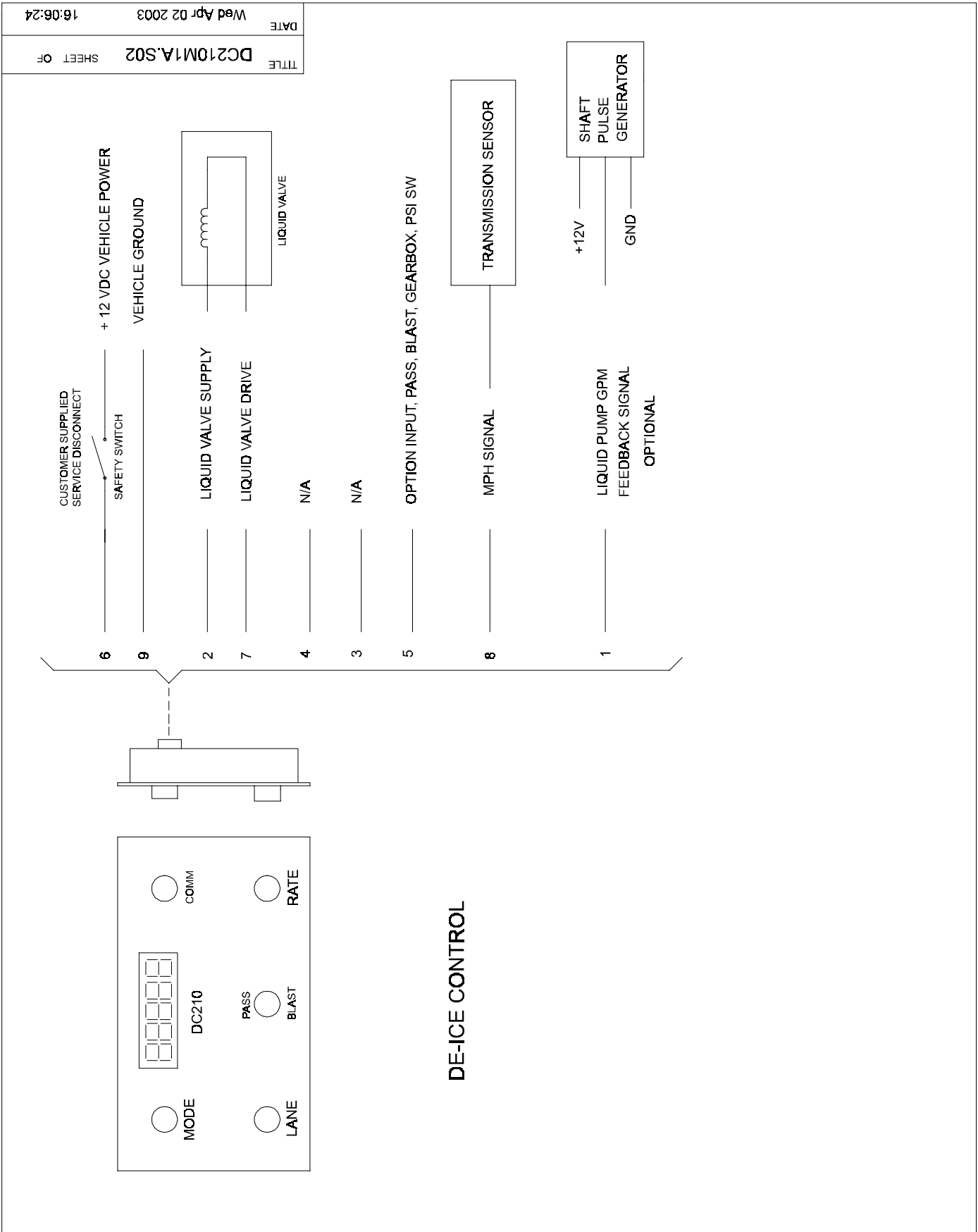
Granular cable connections



GRANULAR CONTROL WITH PRE-WET OPTION

TITLE DS210M1A.S01 SHEET OF
DATE Wed Apr 02 2003 16:06:10

De-Ice cable connections



TITLE DC210M1A.S02 SHEET OF
 DATE Wed Apr 02 2003 16:06:24

DE-ICE CONTROL

Special information

1. Password (4836)