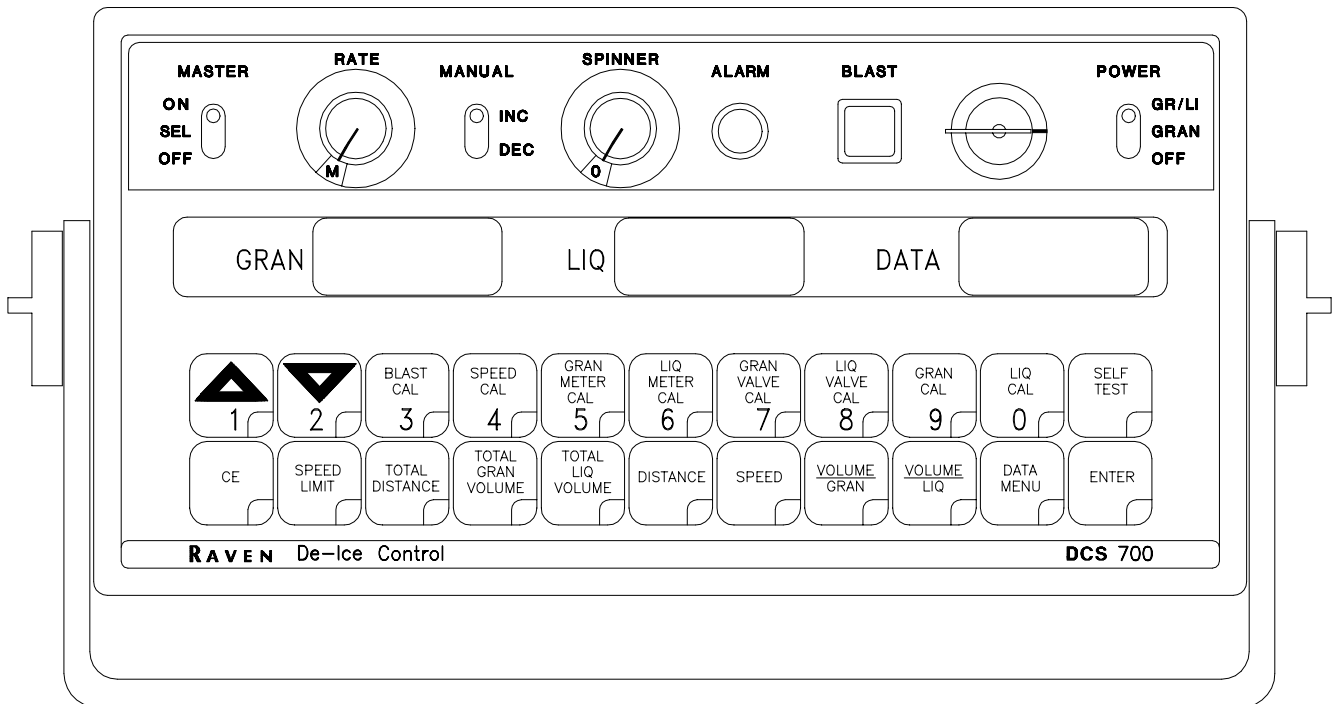


RAVEN

INDUSTRIES

DCS 700



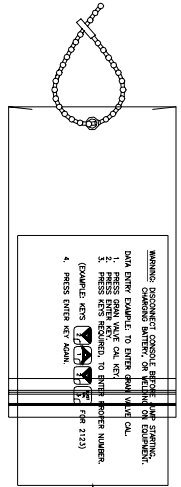
INSTALLATION AND SERVICE MANUAL

N O T I C E

The use of the suspension type slurries will significantly reduce the life of the plastic parts in the Flow Meter and motorized Control Valve. Check the rotor and inlet hub assembly in the Flow Meter frequently for worn parts. Excessive wear can affect accuracy.

Do not attempt to modify or lengthen any of the three-wire Speed Sensor or Flow Meter cables. Extension cables are available from your Dealer.

THIS CARD IS PROVIDED FOR YOUR CONVENIENCE. PENCIL IN YOUR CALIBRATION NUMBERS FOR FUTURE REFERENCE.
 CUT ON DOTTED LINE, FOLD, AND INSERT INTO PLASTIC ENVELOPE.



← INSERT AND ZIP SHUT

← FOLD ON SOLID LINES

CUT ON DOTTED LINE

BLAST CAL 3	BLAST RATE	_____	_____	_____	_____
	SAND	_____	_____	_____	_____
	SALT	_____	_____	_____	_____
	PRD 1	_____	_____	_____	_____
	PRD 2	_____	_____	_____	_____
	BLAST TIME	_____	_____	_____	_____
SPEED CAL 4	SPEED CAL	_____	_____	_____	_____
GRAN METER CAL 5	GRAN METER CAL	_____	_____	_____	_____
	SAND	_____	_____	_____	_____
	SALT	_____	_____	_____	_____
	PRD 1	_____	_____	_____	_____
	PRD 2	_____	_____	_____	_____
LIQ METER CAL 6	LIQ METER CAL	_____	_____	_____	_____
GRAN VALVE CAL 7	GRAN VALVE CAL	_____	_____	_____	_____
LIQ VALVE CAL 8	LIQ VALVE CAL	_____	_____	_____	_____
GRAN CAL 9	GRAN CAL	<u>SAND</u>	<u>SALT</u>	<u>PRD 1</u>	<u>PRD 2</u>
	RATE 1	_____	_____	_____	_____
	RATE 2	_____	_____	_____	_____
	RATE 3	_____	_____	_____	_____
	RATE 4	_____	_____	_____	_____
	RATE 5	_____	_____	_____	_____
	RATE 6	_____	_____	_____	_____
	RATE 7	_____	_____	_____	_____
	RATE 8	_____	_____	_____	_____
	RATE 9	_____	_____	_____	_____
	RATE 10	_____	_____	_____	_____
LIQ CAL 0	LIQ CAL	_____	_____	_____	_____
	SAND	_____	_____	_____	_____
	SALT	_____	_____	_____	_____
	PRD 1	_____	_____	_____	_____
	PRD 2	_____	_____	_____	_____

WARNING: DISCONNECT CONSOLE BEFORE JUMP STARTING, CHARGING BATTERY, OR WELDING ON EQUIPMENT.

DATA ENTRY EXAMPLE: TO ENTER GRAN VALVE CAL.

1. PRESS GRAN VALVE CAL KEY.
2. PRESS ENTER KEY.
3. PRESS KEYS REQUIRED, TO ENTER PROPER NUMBER.
4. PRESS ENTER KEY AGAIN.



(DCS 700)

OFFSET:



SPINNER HIGH	_____
SPINNER LOW	_____
GRANULAR HIGH	_____
GRANULAR LOW	_____
PRE-WET HIGH	_____
PRE-WET LOW	_____

ADDITIONAL NOTES:

TRUCK NUMBER: _____
 LOW GEAR RATIO: _____
 HIGH GEAR RATIO: _____

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REPLACEMENT PARTS SHEETS

SYMBOL DEFINITION

GPM	- Gallons per minute	MPH	- Miles per hour
lit/min	- Liters per minute	km	- Kilometers
PSI	- Pounds per square inch	km/h	- Kilometers per hour
kPa	- Kilopascal	US	- Volume per mile
mm	- Millimeters	SI	- Volume per kilometer
GPT	- Gallons per ton	[]	- Metric numbers
MT	- Metric ton	lb	- Pound
cm	- Centimeters	kg	- Kilogram
dm	- Decimeters		
m	- Meter		

LIQUID METER CAL CONVERSIONS

To convert the METER CAL number simply divide the original number (number printed on Flow Meter label) by the desired conversion factor.

FOR EXAMPLE:

$$\frac{\text{Original METER CAL No.}}{128} = \text{METER CAL No. for displays in Fluid Ounces}$$

$$\frac{\text{Original METER CAL No.}}{3.785} = \text{METER CAL No. for displays in Liters}$$

$$\frac{\text{Original METER CAL No.}}{\text{Weight of one gallon}} = \text{METER CAL No. for displays in Pounds}$$

LIQUID CONVERSIONS

U.S. Gallons x 128 = Fluid Ounces
U.S. Gallons x 3.785 = Liters
U.S. Gallons x 0.83267 = Imperial Gallons
U.S. Gallons x 8.34 = Pounds (Water)

LENGTH

1 millimeter (mm) = 0.039 inch
1 centimeter (cm) = 0.393 inch
1 meter (m) = 3.281 feet
1 kilometer (km) = 0.621 mile
1 inch = 25.4 millimeters; 2.54 centimeters
1 mile = 1.609 kilometers
1 mile = 5,280 feet

PRESSURE

1 psi = 6.89 kPa

AREA

1 square meter = 10.764 square feet

INTRODUCTION

The Raven DCS 700 (DE-ICE CONTROL SYSTEM) is designed to improve the accuracy and uniformity of granular and liquid material applications. Its performance relies on the installation and preventive maintenance of the complete system. It is important that this Installation and Service Manual be reviewed thoroughly before operating the system. This manual provides a simple step-by-step procedure for installing and operating the DCS 700.

The DCS 700 consists of a computer based control console, speed sensor, hydraulic control valves, liquid flow meter, granular rate sensor, and cables. The console mounts directly in the cab of the vehicle for easy operator use. The speed sensor is installed in one of several locations based on the style of the speed sensor used. The hydraulic valves mount in the location available for ease of service and installation. The granular sensor is either integral with the hydraulic motor or mounted to the auger/conveyer shaft. Appropriate cabling is furnished for dealer/field installation.

The operator selects the desired application rate for a particular granular material and the DCS 700 automatically maintains the desired rate regardless of vehicle speed. The operator can also select granular with pre-wetting liquid and the DCS 700 automatically maintains the liquid volume to granular rate ratio regardless of vehicle speed. A manual mode can be selected to allow the operator to manually control the granular application rate. The desired application rate of the granular and liquid being applied is displayed at all times during operation. The DCS 700 also displays additional features such as vehicle speed, recent and annual material volume totals, and distance traveled.

INSTALLATION

1. INSTALLATION OF DRIVE SHAFT SPEED SENSOR

1) Determine position for mounting of switch assembly and magnet assemblies. Choose a location as near as possible to the drive shaft center hanger bearing, if so equipped, or end of transmission. Mount bracket so that if it should loosen, the sensor will not be damaged. The distance between the switch assembly and magnets must remain between 1/4" and 1/2" regardless of load in truck box or severity of terrain being negotiated. (See Figure 1).

2) Mount magnet assemblies on vehicle drive shaft so that magnets are equally spaced. (See Figure 3). If drive shaft diameter is too large for clamps to reach each other, use one of the small hose clamps included in the installation kit between each magnet assembly.

3) On small diameter shafts, it may be necessary to mount the magnet assemblies facing in opposite directions and secure both clamps around shaft. (See Figure 2).

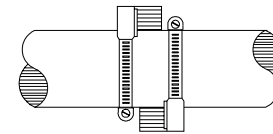


FIGURE 2

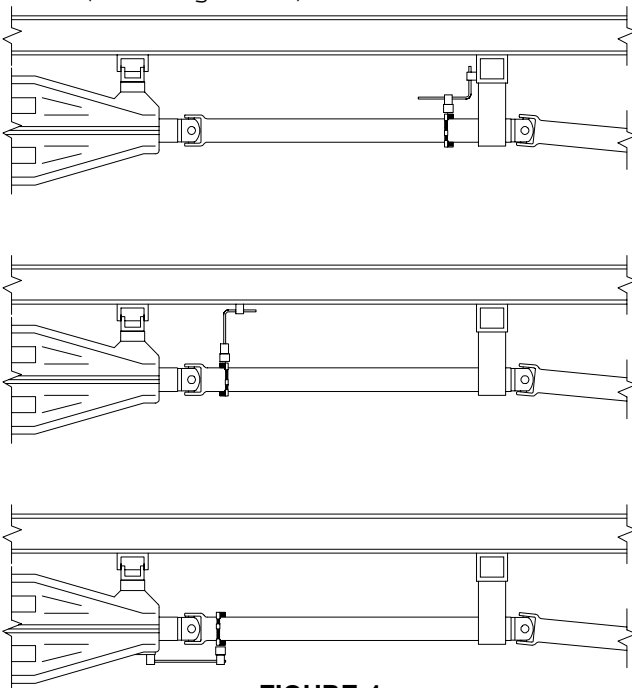
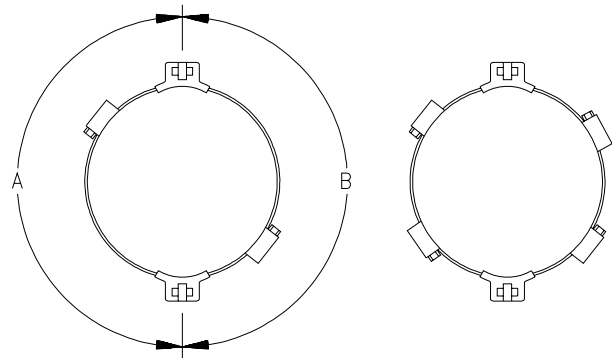


FIGURE 1



NOTE: Distance A and B must be equal.

FIGURE 3

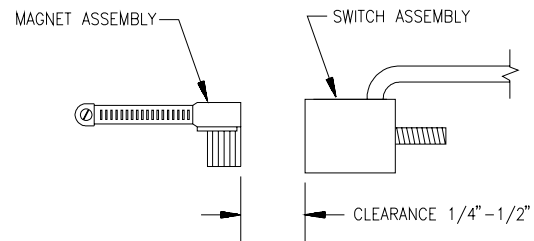


FIGURE 4

4) Mount switch assembly to hanger bracket, cross-member, or bottom of truck box with hardware provided. Position switch assembly so magnets pass across the center of the molded switch assembly. (See Figure 4).

5) Clearance between magnets and switch assembly must be between 1/4" and 1/2". (Adjust switch bracketry if required). Make sure magnets will not strike switch assembly when vehicle is fully loaded.

6) Tighten switch assembly bracketry.

7) Secure cable with plastic cable ties. Route cable into vehicle cab as far away as possible from engine alternator and voltage regulator.

2. MOUNTING FLOW METER

- 1) Mount Flow Meter in the area of the liquid control per Figure 5. All flow through Flow Meter must go to pre-wetting nozzles only, i.e., no return line to tank or pump after Flow Meter.
- 2) Flow must be in direction of arrow on Flow Meter.

GRANULAR WITH PRE-WET SCHEMATIC

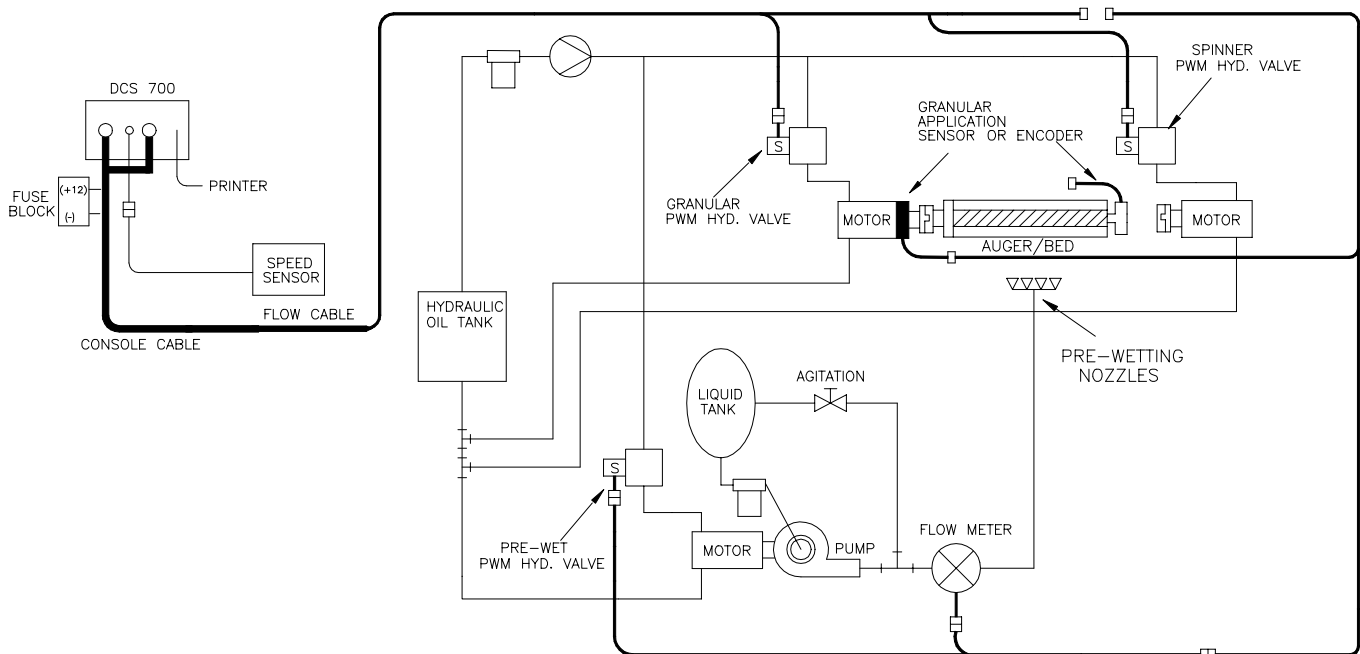


FIGURE 5

NOTE: This is one example of a application schematic.

It is essential, when using suspensions, that the liquid system be thoroughly rinsed out each day after use.

3. MOUNTING GRANULAR ENCODER

- 1) Mount Encoder on output shaft of conveyor or other shaft which rotates at a known ratio to the conveyor.
- 2) Apply grease to Encoder shaft, conveyor shaft, and Encoder coupler (fits 1" diameter conveyor shaft). Secure coupler to Encoder and conveyor shafts with set screws provided.
- 3) Install mounting tabs to Encoder as shown in Figure 6. Connect mounting tab to mounting bracket (not provided) to prevent Encoder from rotating. **DO NOT** rigidly mount Encoder. Encoder is to be supported by coupler **ONLY**.

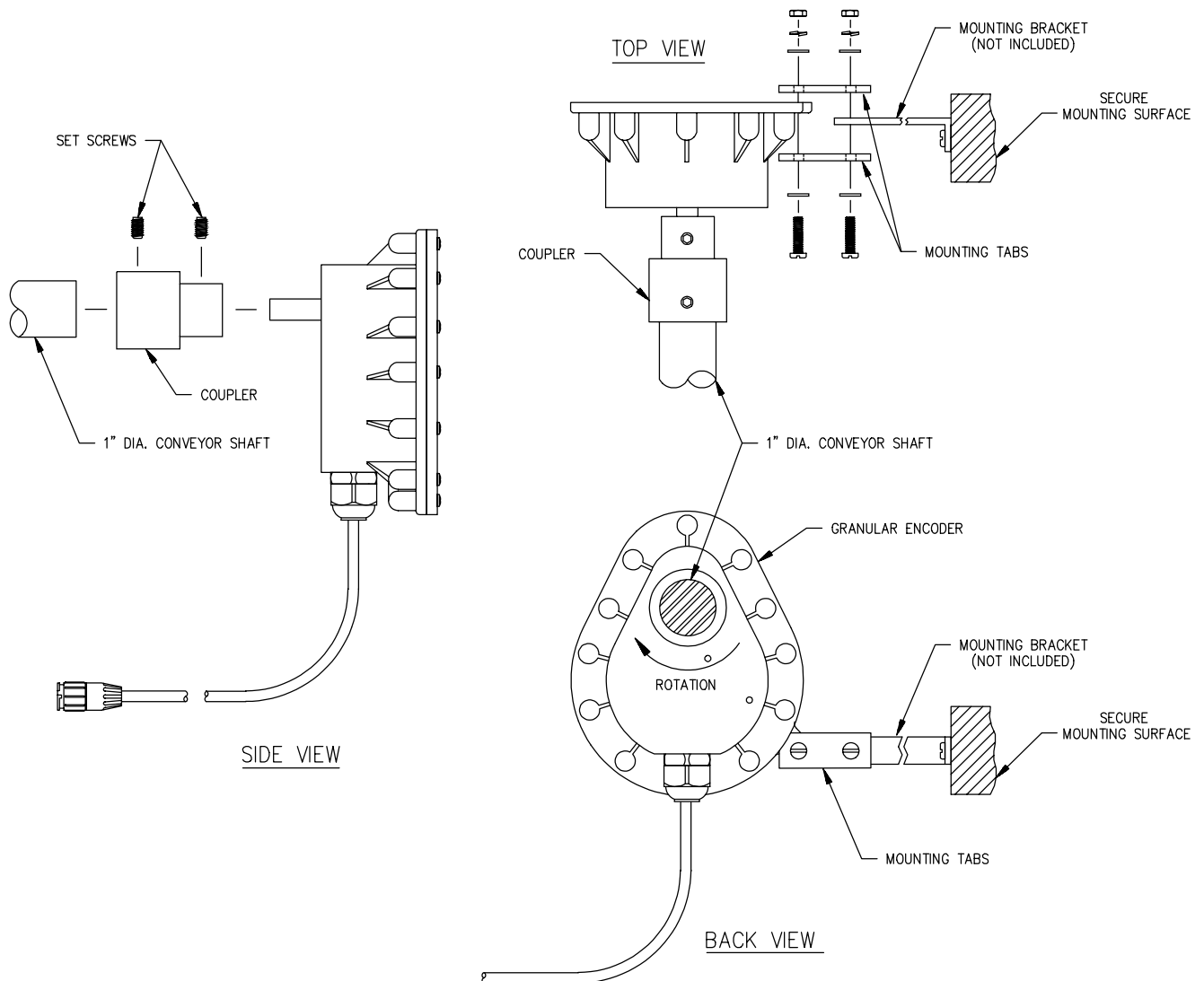


FIGURE 6

4. MOUNTING LIQUID AND GRANULAR CONTROL VALVES

The mounting of the liquid and granular Control Valves are based on the type of pre-wet and hydraulic system of the truck.

5. MOUNTING CONSOLE AND CABLING

NOTE: For instructions on mounting custom cabling, hydraulic valves, and liquid control systems, consult your dealer.

- 1) Mount the Console to a secure support inside the cab of the vehicle without hindering the visibility of the operator.
- 2) Connect the Console Control Cable to the plugs in the back of the Console. (See Figure 7).

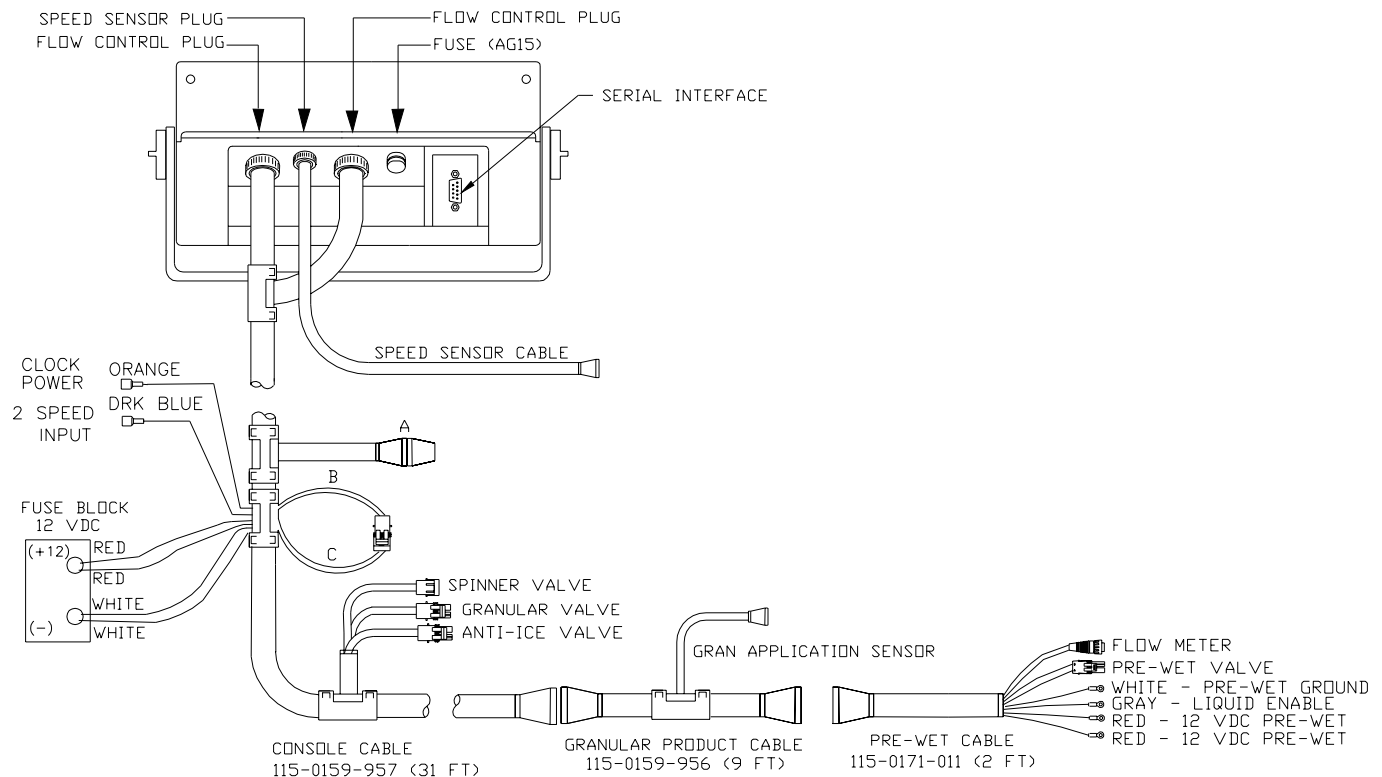
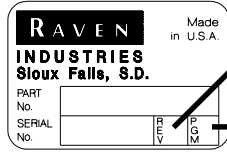


FIGURE 7

- 3) Turn POWER switch to OFF and route the Red wire to the +12 volt fuse block and White wire to the negative connection. **(DO NOT CONNECT WIRES TO THE STARTER)**. Secure the wires with plastic cable ties.
- 4) Connect the Speed Sensor Cable to the plug in the back of the Console.
- 5) Verify connector "A" has plug installed and "B" is connected to "C".

CONSOLE FEATURES

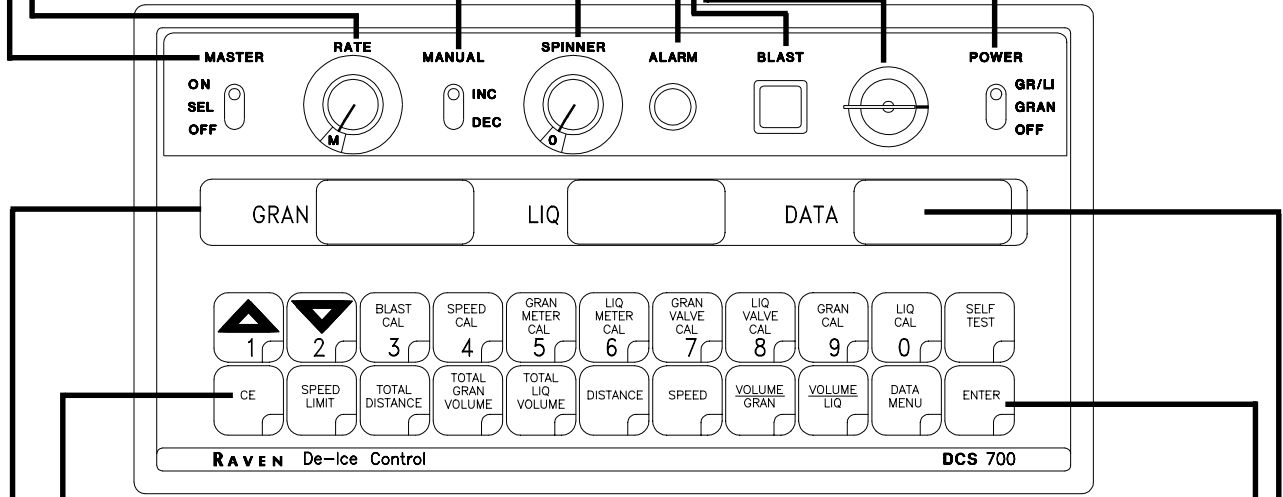
IMPORTANT: This Console requires selection of **US** (miles), **SI** [km] distance; and **SP1** (wheel drive, etc.), **SP2** (radar), or **SP3** (transmission) speed sensor and **2-P** (pulse width modulated), or **2-Sd** (standard/motor control) pre-wet control Valve.



Console Revision can be determined by the letter stamped in REV box on label.

Console Program can be determined by the letter stamped in PGM box on label.

- MASTER - Controls ON/OFF of granular and selection of Sand, Salt, Prd1, or Prd2.
- RATE - Selects manual or fully automatic rates 1-10.
- MANUAL - Increases or decreases application rate when "M" is selected on RATE.
- SPINNER - Selects spinner OFF (0) or 1-10 RPM speeds.
- ALARM - Visual indicator light for alarm conditions.
- BLAST - Provides blast rate for a selected amount of time.
- KEY SWITCH - Key must be in and turned horizontal to enter data into console.
- POWER - Turns Console OFF or ON. Select either Granular only application or Granular with liquid pre-wetting.



CE - Use like you do the CE key on a calculator.
 Displays actual rate of GRAN (granular) and LIQ (liquid).

ENTER - Used only to enter data into the Console.
 Displays function and calibration DATA.

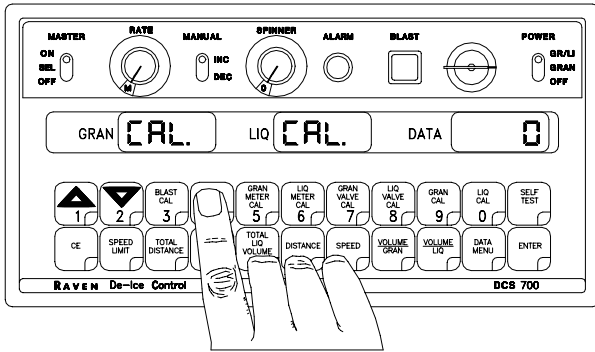
- CALIBRATION KEYS -- Used to enter data into the Console to calibrate the system.
- BLAST CAL -- Selected Blast Rate And Time Period
- SPEED CAL -- Determined by Speed Sensor
- GRAN METER CAL -- Granular Calibration Number
- LIQ METER CAL -- Flow Meter Calibration Number
- GRAN VALVE CAL -- Valve Response Time
- LIQ VALVE CAL -- Valve Response Time
- GRAN CAL -- Granular Target Application Rate (Rates 1-10)
- LIQ CAL -- Liquid Target Application Rate
- SELF TEST -- Simulates Vehicle Speed
- SPEED LIMIT -- Speed at which alarm will sound

- FUNCTION KEYS -- Used to Display Data
- TOTAL DISTANCE -- Total Distance Applied
- TOTAL GRAN VOLUME -- Granular Volume Applied
- TOTAL LIQ VOLUME -- Liquid Volume Applied
- DISTANCE -- Distance Traveled
- SPEED -- Speed of Vehicle
- VOLUME/GRAN -- Volume Remaining in Granular Box
- VOLUME/LIQ -- Volume Remaining in Liquid Tank
- DATA MENU -- Various data options

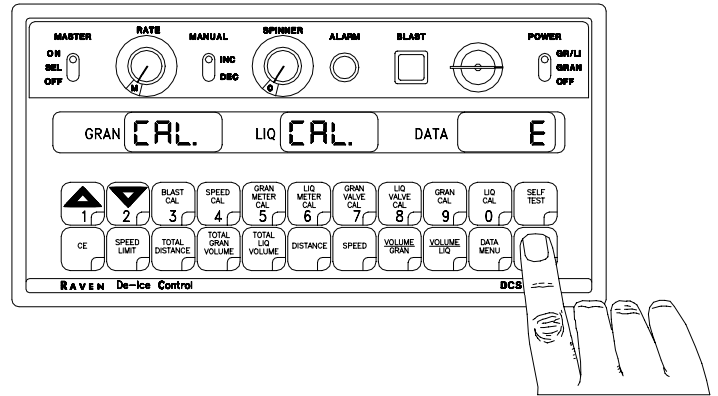
CONSOLE PROGRAMMING

When entering data into the Console, the entry sequence is always the same.

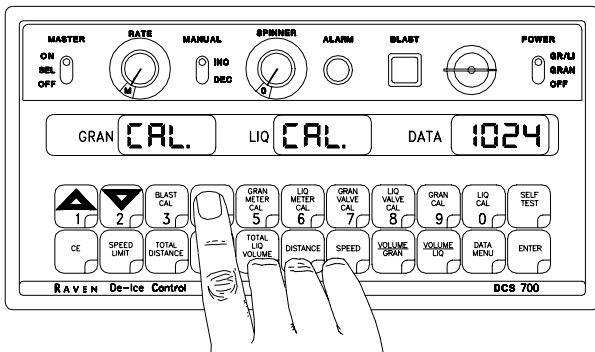
NOTE: DATA MUST BE ENTERED INTO KEYS 3 THRU 0.



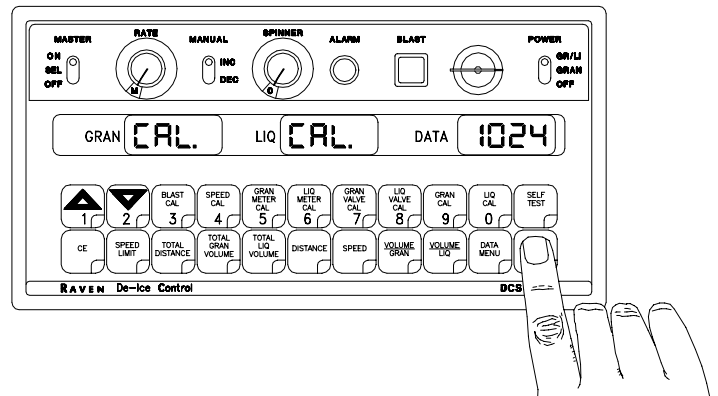
Depress the key in which you wish to enter data.



Depress the ENTER key. An "E" will illuminate in the DATA display.



Depress the keys corresponding to the number you wish to enter (i.e. "1", "0", "2", "4"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

1. INITIAL CONSOLE PROGRAMMING

Verify MASTER switch is OFF. After all installation procedures have been completed, turn POWER switch to GRAN, the Console will flash "CAL" in the GRAN and LIQ displays. This means that the Console must be "programed" before it can be operated. This is a one-time operation which does not have to be repeated. Turning OFF the POWER Switch or disconnecting power to the Console does not affect the Console memory. All data is retained in nonvolatile memory.

NOTE: The KEY switch must be in and turned to the horizontal position to enter data into the Console. This is referred to as the "programming mode".

Only the following keys are an exception:



. A

"0" (zero) may be entered for "day distances", "day granular volumes", "day liquid volume". Refer to 'Distance and Volume Displays' on page 22 for procedure.






IMPORTANT: If an entry selection error is made during Steps 1-3, place the POWER switch to OFF. Place KEY switch to the horizontal position. Depress








and hold while placing the POWER switch to GRAN. This will "reset"


the Console. The GRAN and LIQ displays will flash "CAL" and DATA display will show "US".

The following steps must be followed for proper calibration:

- 1) Selecting US (lbs/mile), or SI (Kg/km).
 - a) To select US or SI, depress  until the desired selection is displayed in the DATA display.
 - b) Momentarily depress , the DATA display will now display SP1.
- 2) Selecting SP1 (drive shaft, wheel drive, etc.), SP2 (radar), or SP3 (transmission).
 - a) To select SP1, SP2, or SP3 depress  until desired selection is displayed.
 - b) Momentarily depress , the DATA display will now display 2-P.
- 3) Selecting Pre-wet Control Valve type 2-P (pulse width modulated-hydraulic or booster amp-electric) or 2-Sd (standard/motor control).
 - a) To select 2-P or 2-Sd, depress  until desired code is displayed.


- b) Momentarily depress , the DATA display will now display "0".
- c) Depress and hold . The previous 3 settings that were selected will be displayed in the DATA display. Verify the selections made are correct before proceeding to the next step. If an error is noted, place POWER switch OFF, depress and hold , place POWER switch to GRAN, and repeat steps 1-3.



NOTE: For the remainder of the Console programming the  and  keys will be used advance through the various selections.

- 4) Enter the following values in . Depress  to advance through the BLAST CAL menu.

DISPLAY SCREENS			
<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>PROCEDURE</u>
SAnd	bL-r	0	Enter the desired Sand Blast Rate (lbs/mile) [kg/km].
SALt	bL-r	0	Enter the desired Salt Blast Rate (lbs/mile) [kg/km].
Prd1	bL-r	0	Enter the desired Product 1 Blast Rate (lbs/mile) [kg/km].
Prd2	bL-r	0	Enter the desired Product 2 Blast Rate (lbs/mile) [kg/km].
	bL-S	0	Enter the desired Blast Time (seconds).

NOTE: Blast Time is the same value for Sand, Salt, Product 1, and Product 2.





- 5) Enter an initial value of "200" in . The actual SPEED CAL number will be obtained after initial programming is completed. Refer to section "CALCULATING SPEED CAL" for more instructions.

- 6) Enter the following values in . Depress  to advance through the GRAN METER CAL menu.

DISPLAY SCREENS



<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>PROCEDURE</u>
SAnd		0	Enter an initial value of "0".
SALt		0	Enter an initial value of "0".
Prd1		0	Enter an initial value of "0".
Prd2		0	Enter an initial value of "0".

The actual GRAN METER CAL values will be obtained after initial programming is completed. Refer to section "CALCULATING GRAN METER CAL" for further instructions.


- 7) Enter the calibration number from flow meter tag in . If the pre-wet system is not controlled by the console (open loop system) enter "0".
- 8) Depress . This console contains a factory default value of "73". Refer to Appendix 3 page 40 to adjust this value if necessary.
- 9) Depress . This console contains a factory default value of "73". Refer to Appendix 3 page 40 to adjust this value if necessary. If pre-wet system is not controlled by the console (open loop system) enter "0".
- 10) Enter the following values in .

DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>PROCEDURE</u>
SAnd	r-01	0	Enter the desired granular application rate (lbs/mile) [kg/km].

Depress the  and  keys to advance through rates 1-10 ("r-01" through "r-10") for Sand.

NOTE: Salt, Prd1, and Prd2 application rates will default to the Sand application rates during initial calibration. These application rates can be changed after initial calibration is completed.

11) Enter the following values in .


DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>PROCEDURE</u>
	SAnd	0	Enter the desired pre-wet application rate (gal/ton) [lit/mt]. A value of "1" or greater must be entered to complete the calibration process. If pre-wet system is not controlled by the console (closed loop system) enter "0" for each product.

NOTE: Salt, Prd1, and Prd2 application rate will default to the Sand application rate during initial calibration. These application rates can be changed after initial calibration is completed.

YOU HAVE NOW COMPLETED PROGRAMMING THE CONSOLE

The flashing "CAL" will now extinguish. If not, repeat procedure starting at Step 4.


12) Depress and hold  until DATA display flashes. Enter number of pulses per revolution from the encoder/granular application sensor. This console contains a factory default value of "36".


CONSOLE CALIBRATION


1. CALCULATING OFFSETS


1) SPINNER HIGH OFFSET

When setting Spinner offsets the truck must be running and associated hydraulics turned on. Place POWER switch on GRAN, SPINNER knob on "1", RATE knob on "M", and MASTER switch ON. If SPINNER knob is on "0" the offsets can be set but the spinner will not be rotating.


a) Depress  until GRAN display shows "oFS". LIQ display will show "Sphi". DATA display will show "254".


b) Depress .

c) Depress  to start the spinner rotating. While spinner is rotating

depress and hold  until the spinner speed begins to decrease.


Continue this procedure until the spinner is rotating at the maximum speed desired.





d) After desired speed is set, depress . HIGH OFFSET is now set.


e) Depress  to advance to SPINNER LOW OFFSET.


2) SPINNER LOW OFFSET

a) GRAN display will show "oFS". LIQ display will show "SpLo". DATA display will show "2".

b) Depress .

c) Depress  and spinner will stop rotating. Depress and hold  until the spinner begins to rotate. Depress  and  until spinner is rotating at the minimum speed desired.


d) After desired speed is set, depress . LOW OFFSET is now set.


e) Depress  to advance to GRANULAR HIGH OFFSET.


3) GRANULAR HIGH OFFSET


When setting the Granular offsets the truck must be running and associated hydraulics turned on. Place POWER switch on GRAN, SPINNER knob on "1", RATE knob on "M", and MASTER switch ON.


a) GRAN display will show "oFS". LIQ display will show "Grhi". DATA display will show "254".


b) Depress .

c) Depress  to start the auger/bed turning. The RPM's of the granular motor/shaft and "oFS" will alternately be displayed in the GRAN display.

While auger/bed is turning, depress and hold  until the RPM's begin


to decrease. Depress  to slowly increase RPM's until the maximum RPM is noticed, then increase offset value displayed in the DATA display by an additional 10.



d) After desired offset value is set, depress . HIGH OFFSET is now set.


e) Depress  to advance to GRANULAR LOW OFFSET.


4) GRANULAR LOW OFFSET


a) GRAN display will show "oFS". LIQ display will show "GrLo". DATA display will show "2".

b) Depress .

c) Depress  and the auger/bed will stop turning. The RPM's of the granular motor/shaft and "oFS" will alternately be displayed in the GRAN display. Depress and hold  until the auger/bed starts turning.

Depress  to slowly decrease RPM's until "0000" is displayed, then decrease offset value displayed in the DATA display by an additional 10.


d) After desired offset value is set, depress . LOW OFFSET is now set.


e) Depress  to advance to PRE-WET HIGH OFFSET.


The following offsets only need to be set if the pre-wet system is controlled by the console (closed load system) and 2-P was selected during initial console programming.




5) PRE-WET HIGH OFFSET

a) GRAN display will show "oFS". LIQ display will show "Prhi". DATA display will show "254".







b) Depress .

c) Depress  to start running the liquid pump. The vol/min of pre-wet liquid and "Prhi" will alternately be displayed in the LIQ display.




While liquid pump is running, depress and hold  until the vol/min






- begins to decrease. Depress  to slowly increase the vol/min until the maximum vol/min is noticed, then increase offset value displayed in the DATA display by an additional 10.
- d) After desired offset value is set, depress . HIGH OFFSET is now set.
- e) Depress  to advance to PRE-WET LOW OFFSET.

6) PRE-WET LOW OFFSET

- a) GRAN display will show "oFS". LIQ display will show "PrLo". DATA display will show "2".
- b) Depress .
- c) Depress  and the liquid pump will stop running. The vol/min of the liquid and "PrLo" will alternately be displayed in the LIQ display. Depress and hold  until the pump starts running. Use  to slowly decrease the vol/min until "0000" is displayed, then decrease offset value displayed in the DATA display by an additional 10.
- d) After desired offset value is set, depress . LOW OFFSET is now set.
- e) Depress  to advance to SPINNER HIGH OFFSET.


2. CALCULATING "SPEED CAL"


- 1) Depress  until the GRAN display shows "CAL". The LIQ display will show "SPEd". DATA display will show "on" or "oFF".
- 2) Momentarily depress  to turn CAL speed "on".
- 3) Depress .






- 4) While driving the vehicle at normal operating speed, depress the  and  keys to match the speed displayed in the DATA display to the speedometer of the truck.
- 5) When matched, depress  and depress  to turn CAL speed "oFF" when calibrated.
- 6) Depress  and record value for future reference.


NOTE: This is not an exact reading. For a more accurate calibration or for radar speed calibration refer to Appendix 1, Section 2 for "CALCULATING SPEED CAL".

3. CALCULATING "GRAN METER CAL"

- 1) Weigh loaded truck and record as weight #1.
- 2) Depress  and enter a value of "0" for Sand, Salt, Prd1, or Prd2 depending on which product is being calibrated.

NOTE: "SAnd" will be displayed in GRAN display. Depress  to advance GRAN display to "SALt", Prd1", or "Prd2".


- 3) Depress  until the GRAN display shows "CAL". The LIQ display will show "SPed". DATA display will show "on or oFF".
- 4) Depress . The GRAN display will show "CAL". The LIQ display will show "GrAn". DATA display will show "oFF". Turn GRAN CAL "on" by depressing .
- 5) Place the RATE knob to "M" and the MASTER switch to SEL. Depress  and  to select the respective product (Sand, Salt, Prd1, or Prd2) being calibrated. Place MASTER switch to ON and use the MANUAL INC/DEC switch to unload approximately 800-1500 pounds of material.

- 6) Place MASTER switch to OFF.
- 7) Weigh the truck and record the weight as weight #2.
- 8) Depress . The GRAN display will show "CAL". The LIQ display will show "Grto". The DATA display will show "0".
- 9) Calculate and enter in the total pounds (kg) of material unloaded.

EXAMPLE:



Weight #1 =	32590	
Weight #2 =	<u>-31450</u>	
Total unloaded	1140	Enter 1140 pounds (kg) as "Grto"


- 10) After total pounds are entered the DATA display will show "0".



- 11) Depress  and the DATA display will show the new Meter Cal number for that product.

4. VERIFYING "GRAN METER CAL"

Factors which can affect the product GRAN METER CAL numbers are the product particle size, density, temperature, and humidity. Always calibrate the material you have purchased. Complete INITIAL CONSOLE PROGRAMMING before proceeding with this procedure. The GRAN METER CAL value is verified using the following procedure:

- 1) Use a pre-weighed box to capture the material as it is metered out.
- 2) Verify calculated GRAN METER CAL value is entered into .
- 3) With the MASTER switch in the OFF position, place RATE knob to "M".
- 4) Depress . The GRAN display will show "SAnd". The LIQ display will show "dAY".

The DATA display will show the volume. Depress  to advance the GRAN display to Salt, Prd1, or Prd2. Enter a "0" in this key.

- 5) Place MASTER switch to SEL and verify the correct product is displayed or depress  and  to select the appropriate product. Place MASTER switch to ON to begin unloading material. Use the manual INC/DEC switch to adjust the auger/bed speed. During verification test, monitor material to ensure bridging or tunneling does not occur.

- 6) Place MASTER switch to OFF when DATA display reads 0.2 [0.2 MT].
- 7) Weigh the collected material. If the actual weight is not 0.2 tons [0.2 MT] perform the following calculation:

EXAMPLE:

Calculated GRAN METER CAL = 200
 TOTAL GRAN VOLUME reading = 0.2 [0.2]
 Weight of collected material = 328 lbs = 0.164 tons [150 kg = 0.15 MT]

$$\text{Corrected GRAN METER CAL} = \frac{\text{Calculated GRAN METER CAL} \times \text{TOTAL GRAN VOLUME reading}}{\text{Weight of collected material}}$$

ENGLISH UNITS:	METRIC UNITS:
$= \frac{200 \times 0.2}{0.164} = 244$	$= \frac{200 \times 0.2}{0.15} = 267$

Corrected GRAN METER CAL = 244 [267]

This is the new GRAN METER CAL value. Repeat this procedure (starting with Step 4) until the weight of the metered material equals the value in the TOTAL GRAN VOLUME display.

- 8) To verify Salt, Prd1, Prd2, and GRAN METER CAL repeat the above described procedure.

5. CALCULATING "LIQ METER CAL"



The Flow Meter calibration number is stamped on the label attached to each Flow Meter.

6. CALCULATING "GRAN AND LIQ VALVE CAL"


See Appendix 3 on page 40.

OTHER CONSOLE FEATURES

1. SELF TEST FEATURE

- 1) SELF TEST allows speed simulation for testing the system while the vehicle is not moving. Enter the simulated operating speed in . If 6 MPH [9.6 km/h] is desired, enter 6.0 [9.6] (See CONSOLE PROGRAMMING). Verify speed by depressing , 6.0 [9.6] will appear in the DATA display. The SELF TEST speed will clear itself when motion of the vehicle is detected by the Speed Sensor. The speed displayed may be different than the self test speed entered depending on the SPEED CAL value.

NOTE: To prevent nuisance clearing of self-test speed, disconnect speed connector on back of the Console.

- 2) Display the Console set-up selections depress and hold . DATA display will cycle through the set-up selections (US or SI, SP1, SP2, SP3, 1-P, 2-P or 2-Sd). 1-P is a default selection and will also be displayed at this time. Depressing the calibration keys (keys 3-0) at any time will display that particular calibration number in the DATA display. With the MASTER switch


in the OFF position, depress  and  to advance through Sand, Salt,

Product 1 and Product 2 calibration numbers as well as to advance through GRAN CAL r-01 and r-10. When the MASTER switch is positioned to ON only that product calibration number will be displayed. Likewise, the position of the RATE switch will only allow that particular application rate to be displayed.

- 3) The following is an example on how to use the DCS 700 as a troubleshooting tool. When placed in the self-test mode it allows the operator and technician to duplicate system operation.

EXAMPLE:


To determine the maximum application rate that the truck is capable of applying at a given speed.

- 1) Depress . Enter a self-test speed of 25 mph.
- 2) Place the RATE knob to the "M" position.
- 3) Use the INC switch until application rate in the GRAN display no longer increases.
- 4) The rate in the GRAN display is the maximum application rate at 25 mph.
- 5) Enter a self test speed of 30 mph and the GRAN display will show the maximum application rate for that speed.
- 6) Repeat this procedure of increasing the speed to obtain all maximum application rates at specific speeds.

EXAMPLE:



The operator wants to travel at 30 mph and apply a rate of 1800 pounds per mile. After performing the procedure stated above it was determined that the maximum application rate at 30 mph was 1600 pounds per mile. At that speed and rate the hydraulic system of the truck is at the maximum capacity. The operator has 2 choices; 1) decrease the vehicle speed, or 2) accept a lower application rate at that speed.

2. SPEED LIMIT FEATURE



- 1) Enter maximum application speed in . A beeping alarm will sound if actual speed is over maximum speed entered. Enter "0" to disable SPEED LIMIT alarm.

3. DISTANCE & VOLUME DISPLAYS

To zero out distance and volume totals that have "day" in the LIQ display screen

depress , zero (0), . To zero out distance and volume totals that have

"totL" in the LIQ display screen the key switch must be turned to the horizontal position and then perform the same procedure as mentioned above.

- 1) To display sand, salt, product 1, or product 2 day distances and total distances, depress . To advance through the categories depress .

DISPLAY SCREENS			
<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>DESCRIPTION</u>
SAnd	dAY	.0	Distance traveled while applying sand material during day, event, etc.
SALt	dAY	.0	Distance traveled while applying salt material during day, event, etc.
Prd1	dAY	.0	Distance traveled while applying product 1 material during day, event, etc.
Prd2	dAY	.0	Distance traveled while applying product 2 material during day, event, etc.
SAnd	totL	0	Cumulative distance traveled while applying sand material.
SALt	totL	0	Cumulative distance traveled while applying salt material.
Prd1	totL	0	Cumulative distance traveled while applying product 1 material.
Prd2	totL	0	Cumulative distance traveled while applying product 2 material.

2) To display sand, salt, product 1, or product 2 day volumes and total volumes,



To advance through the categories depress



DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>DESCRIPTION</u>
SAnd	dAY	.0	Volume of sand applied during day, event, etc.
SALt	dAY	.0	Volume of salt applied during day, event, etc.
Prd1	dAY	.0	Volume of product 1 applied during day, event, etc.
Prd2	dAY	.0	Volume of product 2 applied during day, event, etc.
SAnd	tOtL	0	Cumulative volume total of sand material applied.
SALt	tOtL	0	Cumulative volume total of salt material applied.
Prd1	tOtL	0	Cumulative volume total of product 1 material applied.
Prd2	tOtL	0	Cumulative volume total of product 2 material applied.

3) To display pre-wet day volume and pre-wet total volume, depress



To advance

through the categories depress





DISPLAY SCREENS


<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>DESCRIPTION</u>
PrE-	dAY	0	Volume of pre-wet liquid applied during day, event, etc.
PrE-	tOtL	0	Cumulative volume total of pre-wet liquid applied.

4. VOLUME/GRAN AND VOLUME/LIQ

The following features may be used but are not necessary for the console to operate. These features allow the operator to monitor the amount of granular or liquid material remaining in the truck. The key is not required to enter these values in the console.

- 1) Enter the estimated volume (tons)[MT] of material in spreader/truck box in  and volume of liquid (gal)[lit] in pre-wet tank in . These volumes must be re-entered each time box or tank is loaded.

5. BLAST BUTTON

- 1) Depressing the BLAST button will cause the system to go to the programmed Blast Rate. The system will remain at the Blast Rate for as long as the button is depressed plus the programmed Blast Time after the button is released. If the BLAST button is used with zero speed the Console will assume a speed of 5 MPH [7 Km/hr].
- 2) To display the number of times the BLAST feature was used, depress and hold  for 5 seconds until DATA display flashes. To zero this total, enter a "0".


6. MANUAL MODE LOCK OUT

If the key switch is in the vertical position (operate mode) and the Manual Control is off (see DATA MENU); the manual position (M) of the RATE knob will only function under two (2) conditions:

- 1) No speed (typical scenario to unload truck).
- 2) No granular signal.

With the RATE knob placed to the manual position (M) the Console will default to RATE 1 unless the above conditions exist. If the key is in the horizontal position (program mode); **OR** the key is vertical and the manual control is ON (see DATA MENU); the manual position (M) is active for all conditions. Using the MANUAL INC/DEC switch will increase or decrease your application rate.

7. CONTROL VALVE DELAY

Depress  until DATA display flashes. The first digit, (X 0 0 0), is

the Control Valve delay digit. This feature allows the user to set a delay between the time the MASTER is turned on and when the Console begins to control the application rate. A value of 1-9 means a delay of 1-9 seconds respectively. A value of 0 means no delay.

8. AUTOMATIC RATE +/-



This feature allows an increment to be set at which flow may be increased or decreased while in automatic operation (rates 1-10). To select RATE +/- depress



for granular or



for liquid until DATA display flashes. To enter a



value depress , increment value, and . When using this feature the preprogrammed application rates will be changed accordingly.



EXAMPLE: If granular rate is to change by "10":

Enter a value of 10 for RATE +/- . When in RATES 1-10, each time the MANUAL INC/DEC switch is positioned to INC, the RATE for that product will increase by "10". Likewise, when positioned to DEC, the RATE will decrease by "10". When POWER switch is on GRAN it increases or decreases granular rates, when on GR/LI, it increases or decreases liquid rates.

9. LOW TANK ALARM

This feature will sound the alarm when the granular or liquid volume drops below an entered value. If the granular or liquid volume falls below the low tank value entered, the alarm will sound 8 beeps every 15 seconds and depending on which tank is low the GRAN or LIQ display screen will flash "LEul". The alarm will stop when a value equal to or greater than the Low Tank Alarm value is entered into VOLUME/GRAN, VOLUME/LIQ or the MASTER switch is turned OFF. Entering "0" into Low Tank Alarm disables the alarm.


a) Depress  for granular or  for liquid until the DATA display flashes.


b) To enter a value, depress , LOW TANK ALARM value, and .

NOTE: Go to DATA MENU to silence audible alarm.

10. LOW LIMIT FLOW ALARM

The low limit feature allows the operator to set a minimum vol/min in the console for the system to maintain regardless of vehicle speed. If the actual vol/min reaches the set minimum vol/min, the control valve will stop closing to ensure the low limit flow is maintained. When this occurs the console will be over applying material until the actual vol/min exceeds the low limit flow value. An audible and visual alarm will alert the operator. The visual alarm will display

"-LL-" in the GRAN or LIQ display screen. Depress  until the GRAN display shows "Fr". LIQ display will show "FLGr". DATA display will show ".0". To advance

through the categories depress .

<u>GRAN</u>	<u>DISPLAY SCREENS</u>		<u>DESCRIPTION</u>
	<u>LIQ</u>	<u>DATA</u>	
Fr	FLGr	.0	Displays actual vol/min of granular material.
Fr	FLPr	.0	Displays actual vol/min of pre-wet liquid.
Fr	LLGr	.0	Granular system minimum vol/min value.
Fr	LLPr	.0	Liquid system minimum vol/min value.

Example:

- 1) Place RATE knob to the lowest application rate, typically this will be RATE 1.
- 2) Enter a SELF TEST speed.
- 3) Observe the granular or pre-wet volume/minute.
- 4) Enter a lower SELF TEST speed.
- 5) Repeat steps 3 & 4 until auger/bed begins to stall.
- 6) Record minimum volume/minute when auger/bed turns smoothly. Enter this value for the minimum flow ("LLGr" or "LLPr").

DATA MENU

DEFINITION OF DATA MENU KEYS:



Depressing this key displays the selected Data Menu category in the GRAN display.



Depressing this key again increments through the Data Menu categories ("SPr", "GPS", "dAtE", etc...) in the GRAN display.




Depressing this key (after desired category is shown in GRAN display) advances up through desired features within a category. Selected feature is shown in the LIQ display.








Depressing this key (after desired category is shown in GRAN display) advances down through desired features within a category. Selected feature is shown in the LIQ display.


SERIAL PORT SCREENS

CONSOLE DATA PRINTOUT


- a) GRAN display will show "SPr". LIQ display will show "Prn". DATA display will show "CAL". To print calibration numbers, depress .

- b) Depress  to advance to print begin. GRAN display will show "SPr". LIQ display will show "Prn". DATA display will show "bEGn". To print beginning totals, depress .
- c) Depress  to advance to print end. GRAN display will show "SPr". LIQ display will show "Prn". DATA display will show "End". To print ending totals, depress . While "End" is in the DATA display; if a beginning total or calibration numbers printout is required, depress  to advance the DATA display to "bEGn" or "CAL".



NOTE: If "End" is printed and a CAL number has been changed, a warning will be printed (print CAL to see which number has changed).

- d) Depress  to advance to TRUCK NUMBER.


TRUCK NUMBER

- a) GRAN display will show "SPrt". LIQ display and DATA display will show "0". The truck number can be entered in as 8 digits.
- b) Enter the truck number.
- c) Depress  to advance to BAUD RATE.


BAUD RATE

- a) GRAN display will show "SPr". LIQ display will show "bAUd". DATA display will show "1200".
- b) Depressing  steps the DATA display between "1200" and "9600".
- c) Depress  to advance to RATE CHANGE ALARM ON/OFF.


RATE CHANGE ALARM ON/OFF

- a) GRAN display will show "SPr". LIQ display will show "rAtE". DATA display will show "on".
- b) Depressing  steps the DATA display between "on" and "oFF". A value

of "on" means alarm is enabled; a value of "oFF" means alarm is disabled.


- c) Depress  to advance to DATA LOGGER TRIGGER VALUE.

DATA LOGGER TRIGGER VALUE


- a) GRAN display will show "SPr". LIQ display will show "triG". DATA display will show "0".
- b) Enter the TRIGGER VALUE.
- c) Depress  to advance to DATA LOGGER TRIGGER UNITS.

IMPORTANT: The TRIGGER VALUE default value is "0". This value **must** be changed to a desired number ranging from 1-9999. The DATA LOGGER features will not work if this number is "0".


DATA LOGGER TRIGGER UNITS



- a) GRAN display will show "SPr". LIQ display will show "Unit". DATA display will show "Ft"["MEtr"].
- b) Depressing  steps the DATA display between "Ft"["MEtr"] and "SEC".

A value of "Ft"["MEtr"] means feet [meters], or a value of "SEC" means seconds have been chosen as the unit of measurement for the TRIGGER VALUE programmed previously.

- c) Depress  to advance to DATA LOGGER.


DATA LOGGER ON/OFF

- a) The DATA LOGGER uses the communications strings listed in Appendix 12 to pass data out through the serial port. The data is sent at a set time interval or a set distance traveled, as determined by the values entered in the DATA LOGGER TRIGGER VALUE and DATA LOGGER TRIGGER UNITS. Upon each trigger, the Actual Rate string, Data Strings 1, 2, 3, 4, and 5, and the Time/date string are sent, in that order. When a Console calibration value is changed, the Console will automatically send out the Cal 1, 2, 3, 4, and 5 strings. When a Console switch is changed, the Data 1, 2, 3, 4, 5, Time/Date, and Cal 1, 2, 3, 4, 5 strings will be sent by the Console. The Data, (with Time/Date string included) and Cal strings can also be requested by the data logger using the request strings shown in Appendix 12.
- b) GRAN display will show "SPr". LIQ display will show "dLoG". DATA display will show "oFF".
- c) Depressing  steps the DATA display between "oFF" and "on". A value of "oFF" means DATA LOGGER is disabled; a value of "on" means DATA LOGGER is enabled.



- d) Depress  to advance to CONSOLE DATA PRINTOUT.
- e) Depress  to advance to the GLOBAL POSITIONING SYSTEM SCREENS.

GLOBAL POSITIONING SYSTEM SCREENS

GPS FILE REFERENCE


- a) GRAN display will show "GPS". LIQ display will show "FILE". DATA display will show a "1".
- b) Enter the GPS file number.
- c) Depress  to advance to GPS SYSTEM OPTIONS.

GPS SYSTEM OPTIONS

- a) GPS is inactive when the GRAN display shows "GPS", the LIQ display shows "SYSt", and the DATA display shows "inAC". The GPS features are explained further in the APPLICATION MANAGEMENT SYSTEM manual.
- b) Depress  to advance to GPS FILE REFERENCE.
- c) Depress  to advance to the DATE SCREENS.


DATE SCREENS

TIME

- a) GRAN display will show "dAtE". LIQ display will show "tiME". The DATA display will show "0:00".
- b) Enter the current time of day.
- c) Depress  to advance to MONTH.

NOTE: This is a 24 hour clock. Therefore, all time after 12:59 p.m., add 12 hours. Thus, 8:30 a.m. is entered as 8:30, but 1:30 p.m. is entered as 13:30 in the keyboard.

MONTH

- a) GRAN display will show "dAtE". LIQ display will show "onth". The DATA display will show "0".
- b) Enter the current month by number (i.e. 1 = January, 2 = February, etc.).
- c) Depress  to advance to DAY.

DAY

- a) GRAN display will show "dAtE". LIQ display will show "dAY". The DATA display will show "0".


b) Enter the current day of the month.

c) Depress  to advance to YEAR.

YEAR

a) GRAN display will show "dAtE". LIQ display will show "YEAr". The DATA display will show "00".

b) Enter the current year.

c) Depress  to advance to POWER DOWN.


POWER DOWN

a) If the Console is not used for 30 days, it will go into a power down (low power) mode of operation. In this mode, all data is retained, but the time of day clock will reset to 0:00. The delay time is initially set at 30 days; but can be changed by the user.

b) GRAN display will show "dAtE". LIQ display will show "P dn". The DATA display will show "30".

c) To change the delay time enter a new number from 0 to 200 days.


d) Depress  to advance to TIME.

e) Depress  to advance to the FLOW RATE SCREENS.

FLOW RATE SCREENS


GRANULAR VOLUME/MINUTE

a) GRAN display will show "Fr". LIQ display will show "FLGr". The DATA display will show the volume per minute of granular material.

b) Depress  to advance to PRE-WET VOLUME/MINUTE.

PRE-WET VOLUME/MINUTE

a) GRAN display will show "Fr". LIQ display will show "FLPr". The DATA display will show the volume per minute of pre-wet liquid.

b) Depress  to advance to GRANULAR LOW LIMIT FLOW ALARM.



GRANULAR LOW LIMIT FLOW ALARM

a) If the actual volume per minute falls below the set limit, the valve stops closing, an alarm sounds and the GRAN display flashes "-LL-".

b) GRAN display will show "Fr". LIQ display will show "LLGr". DATA display will show ".0".

c) Enter the low limit of the system (lb/min) [kg/min].



PRE-WET LOW LIMIT FLOW ALARM

- a) If the actual volume per minute falls below the set limit, the valve stops closing, an alarm sounds and the LIQ display flashes "-LL-".
- b) GRAN display will show "Fr". LIQ display will show "LLPr". DATA display will show ".0".
- c) Enter the low limit of the system (gal/min) [lit/min].
- d) Depress  to advance to GRANULAR VOLUME/MINUTE.
- e) Depress  to advance to ALARM SCREENS.

ALARM SCREENS


AUDIBLE ALARM ON/OFF

The DCS 700 has several alarm indicators. The alarms can be turned on or off to accommodate the operators preference.

- a) GRAN display will show "ALr". LIQ display will show "ALrM". DATA display will show "on".
- b) Depressing  steps the DATA display between "on" and "off". A value of "on" enables the audible alarm; a value of "off" disables the audible alarm.
- c) Depress  to advance to GRANULAR OFF RATE ALARM.

GRANULAR OFF RATE ALARM


Alarm sounds and GRAN display will show "or" when the actual rate is off from the application rate by a specified percentage for 5 seconds. The off rate value is preset to 12%, but may be changed to a different number. A value of "0" will disable this alarm.


- a) GRAN display will show "ALr". LIQ display will show "Gror". DATA display will show 12.
- b) Depress  to advance to LIQUID OFF RATE ALARM.

LIQUID OFF RATE ALARM

Alarm sounds and LIQ display will show "or" when the actual rate is off from the application rate by a specified percentage for 5 seconds. The off rate value is preset to 30%, but may be changed to a different number. A value of "0" will disable this alarm.

- a) GRAN display will show "ALr". LIQ display will show "Lior". DATA display will show 30.

b) Depress  to advance to AUDIBLE ALARM ON/OFF.

c) Depress  to advance to MISCELLANEOUS SCREENS.

NO SPEED ALARM

This sounds if the MASTER switch is ON, the RATE knob is on 1-10, and there is a no ("0") speed detected.

- a) The NO SPEED ALARM is 3 beeps followed by an 8 second pause which is repeated continuously.
- b) The alarm light will follow in sequence.

NOTE: When operating in P valve mode the console has an automatic zero speed shut off feature. The NO SPEED ALARM will sound in this case. The alarm will discontinue when vehicle begins moving.

CAUTION: Do not rely on zero speed shut off when performing maintenance on vehicle. A stray speed signal could suddenly turn the system on, especially when a radar speed sensor is being used.

SPEED LIMIT ALARM

This sounds when the programmed maximum application speed is exceeded (See OTHER CONSOLE FEATURES).

- a) This alarm sounds a constant beep and flashes the alarm light.
- b) Slowing vehicle speed will clear this alarm.
- c) This alarm can be disabled by turning the calibration key to the horizontal position and entering a "0" in the SPEED LIMIT KEY.



LOW TANK ALARM

This sounds when the VOLUME/GRAN or VOLUME/LIQ reaches the programmed alarm level (See OTHER CONSOLE FEATURES).



- a) This alarm sounds eight (8) beeps every 15 seconds. The console automatically displays "LEuL" in the GRAN or LIQ display screen depending on which material has reached the alarm level.
- b) Depress VOLUME/GRAN or VOLUME/LIQ key for 5 seconds until DATA display flashes and enter a "0" to disable this feature.

MISCELLANEOUS SCREENS


DISPLAY SMOOTHING ON/OFF

- a) GRAN display will show "MiSC". LIQ display will show "diSP". DATA display will show "on".
- b) Depressing  steps the DATA display between "on" and "oFF". A value of "on" means smoothing is enabled; a value of "oFF" means smoothing is disabled, therefore the actual granular and liquid rates will be displayed at all times. The percent smoothing is determined by the third digit of the GRAN VALVE CAL or LIQ VALVE CAL value.
- c) Depress  to advance to MANUAL CONTROL ON/OFF.



MANUAL CONTROL ON/OFF

- a) GRAN display will show "MiSC". LIQ display will show "MAN". DATA display will show "oFF".
- b) Depressing  steps the DATA display between "on" and "oFF". A value of "on" enables manual control when the key switch is in the vertical position, a value of "oFF" disables manual control when key switch is in the vertical position.
- c) Depress  to advance to SPINNER CONTROL ON/OFF.

SPINNER CONTROL ON/OFF


- a) GRAN display will show "MiSC". LIQ display will show "SPin". DATA display will show "oFF".
- b) Depressing  steps the DATA display between "on" and oFF". A value of "on" means spinner is on whenever MASTER is ON; a value of "oFF" means spinner goes on and off when granular bed/auger is on and off.

NOTE: Spinner must be "on" to calibrate spinner offsets.

- c) Depress  to advance to DISPLAY SMOOTHING.
- d) Depress  to advance to OFFSET SCREENS.

OFFSET SCREENS


a) See pages 14, 15, 16, and 17 for OFFSET SCREENS.



b) Depress  to advance to CAL SCREENS.


CAL SCREENS

CAL SPEED ON/OFF


a) GRAN display will show "CAL". LIQ display will show "SPED". DATA display will show "on or oFF".

b) Depress  to turn CAL speed to "on". This will allow the use of the

 and  keys to match the speed of the truck with the console.


Depress  to turn CAL speed to "oFF" when calibrated.

NOTE: This is not an exact reading. See Appendix 1, section 2 "CALCULATING SPEED CAL" for further instructions.


c) Depress  to advance to GRANULAR CAL.

GRANULAR CAL

a) GRAN display will show "CAL". LIQ display will show "GrAn". DATA display will show "on or oFF".

b) Depress  to turn GRAN CAL to "on".


c) For calibration see section "CALCULATING GRAN METER CAL".

d) Depress  to advance to GRANULAR CAL TOTAL.

GRANULAR CAL TOTAL



a) GRAN display will show "CAL". LIQ display will show "Grto". DATA display will show "0".

b) Enter in total pounds (kg) of material unloaded when GRAN CAL is on.



c) Depress  to advance to CAL 2 SPEED.

CAL 2 SPEED



NOTE: The 2 speed wire has to be hooked up to the 2 speed enable on truck.

- a) GRAN display will show "CAL". LIQ display will show "LSPd". DATA display will show "0.00".
- b) Enter in the low gear ratio as indicated on the line sheet or tag.
- c) Depress . GRAN display will show "CAL". LIQ display will show "hSPd". DATA display will show "0.00".
- d) Enter the high gear ratio as indicated on the line sheet or tag.
- e) Depress  to advance to CAL FREQUENCY.



CAL FREQUENCY

- a) GRAN display will show "CAL". LIQ display will show "FrEq". DATA display will show "180".
- b) Enter in the frequency of the PWM valve (16 hz to 4000 hz). **As specified by the manufacture of the Hydraulic Valve.** Refer to Appendix 3 for recommended values for different coil types.
- c) Depress  to advance to CAL SPEED.
- d) Depress  to advance to SAND BLAST SCREENS.



SAND BLAST SCREENS

- a) Displays blast day distance, total distance, day volume, and total volume for sand product.
- b) Depress  to advance through sand blast screens.
- c) Depress  to advance to SALT BLAST SCREENS.



SALT BLAST SCREENS

- a) Displays blast day distance, total distance, day volume, and total volume for salt product.
- b) Depress  to advance through salt blast screens.
- c) Depress  to advance to PRODUCT 1 BLAST SCREENS.



PRODUCT 1 BLAST SCREENS

- a) Displays blast day distance, total distance, day volume, and total volume for product 1 material.
- b) Depress  to advance through product 1 blast screens.
- c) Depress  to advance to PRODUCT 2 BLAST SCREENS.

PRODUCT 2 BLAST SCREENS

- a) Displays blast day distance, total distance, day volume, and total volume for product 2 material.
- b) Depress  to advance through product 2 blast screens.
- c) Depress  to advance to PRE-WET BLAST SCREENS.

PRE-WET BLAST SCREENS

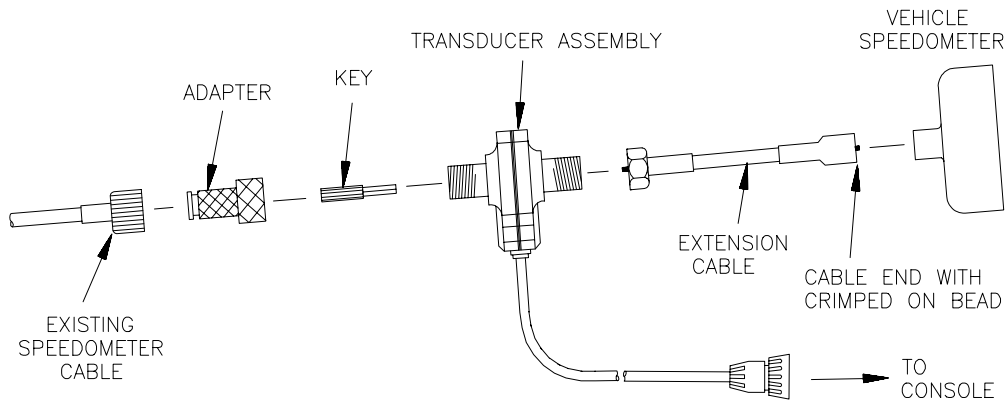
- a) Displays blast day distance, total distance, day volume, and total volume for pre-wet product.
- b) Depress  to advance through pre-wet blast screens.
- c) Depress  to advance to SERIAL PORT SCREENS.

APPENDIX 1

SPEEDOMETER DRIVE SPEED SENSOR INSTALLATION AND CALIBRATION PROCEDURE

1. MOUNTING THE SPEEDOMETER DRIVE SPEED SENSOR

- 1) Remove the existing speedometer cable from the back of the vehicle speedometer. Pull cable through fire wall into engine compartment.
- 2) Install adapter and key on speedometer cable and connect to Transducer Assembly. (Some units do not use adapter and key).
- 3) Connect Extension Cable to Transducer Assembly.



- 4) Push Extension Cable through fire wall and re-install on speedometer.
- 5) Connect the cable on the Transducer Assembly to the Console.
- 6) Secure all cables with plastic cable ties.

You are now ready to calibrate the Speedometer Drive Speed Sensor.

2. CALCULATING "SPEED CAL"

- 1) Complete "INITIAL CONSOLE PROGRAMMING" before doing this procedure.

2) Enter "0" in

3) Enter a SPEED CAL of 612 [155] in

- 4) Drive 1 mile [1 km].

CAUTION: Do not use vehicle odometer to determine distance. Use section lines or highway markers, or measured distance.

5) Read DISTANCE by depressing



- a) DISTANCE should read a value of approximately 5280 [1000]. If it reads between 5200-5350 [990-1010], the SPEED CAL for your vehicle is 612 [155].
- b) If the DISTANCE display reads any other value, perform the following calculation:

Multiply the SPEED CAL by the target distance reading, then divide the sum by the actual value in DISTANCE display. This will give you the corrected value to enter for SPEED CAL. **You must round off to the nearest 3 digit whole number.**

EXAMPLE: SPEED CAL = 612 [155]
 Target distance reading = 5280 [1000]
 Assume the actual DISTANCE display reads 5000 [980]

ENGLISH UNITS:	METRIC UNITS:
$= \frac{612 \times 5280}{5000} = 646.3$	$= \frac{[155] \times [1000]}{[980]} = [158.1]$

- 6) The corrected number to enter for SPEED CAL is 646 [158].
- 7) Verify the corrected SPEED CAL number calculated above:
 - a) Zero out the DISTANCE display as in Step 2.
 - b) Enter the corrected SPEED CAL number as in Step 3.
 - c) Repeat Steps 4 and 5a. If DISTANCE value does not read correctly repeat Steps 5b, 6, and 7.

APPENDIX 2

CALCULATING "GRAN METER CAL"

Calculate initial GRAN METER CAL using the following formula:

- 1) Find the cubic feet of discharge per 1 revolution of the Raven encoder.

L = belt length traveled per 1 revolution of Raven encoder in inches.
 GH = gate height in inches
 GW = gate width in inches

Cubic feet of Discharge per 1 revolution of encoder:

$$= \frac{L \times GH \times GW}{1728} = \text{cubic feet}$$

EXAMPLE: $\frac{13" \times 7" \times 15"}{1728} = \frac{1365}{1728} = .789 \text{ cu. ft./rev. of encoder}$

- 2) Density = weight of 1 cubic foot of material

$$\text{Density} = D$$

- 3) GRAN METER CAL for Rate in 1 Pound Increments:

$$\text{GRAN METER CAL} = 180 \div D \times \text{cu. ft./rev. of encoder} \times 10$$

EXAMPLE: D (density) = 65 lb/cu. ft.
 cu. ft./rev. = .789 (found in Step 1)
 GRAN METER CAL = $\frac{180}{65 \times .789} = \frac{180}{51.28} = 3.5 \times 10 = 35$

- 4) GRAN METER CAL for Rate in 10 pound increments:

Multiply GRAN METER CAL found in Step 3, by 10.

EXAMPLE: GRAN METER CAL found in Step 3 = 35
 $10 \times 35 = 350$
 $350 = \text{GRAN METER CAL Rate in 10 lb increments}$

- 5) Perform this procedure for Sand, Salt, Product 1, and Product 2.

IMPORTANT: Verify GRAN METER CAL by performing catch test before road application.

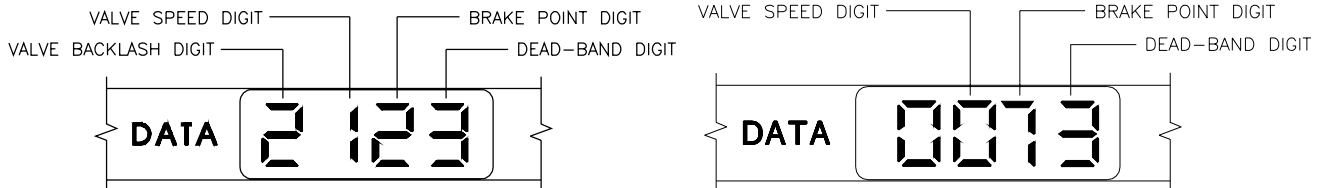
APPENDIX 3

CALCULATING "GRAN AND LIQ VALVE CAL"

- 1) The default control valve calibration number is 73. These initial VALVE CAL numbers are used for both the GRAN and LIQ VALVE CAL. After operating the system, you may desire to refine this number. See definitions below:

For **STANDARD VALVE/
MOTOR CONTROL (Sd):**

For **PULSE-WIDTH MODULATED/
BOOSTER AMP (P):**



Valve Backlash Digit -- Controls the time of the first correction pulse after a change in correction direction is detected. (INC to DEC -or- DEC to INC).

Range: 1 to 9 1-Short Pulse, 9-Long Pulse

Valve Speed Digit -- Controls response time of Control Valve motor. **CAUTION:** Running the Control Valve too fast will cause the system to oscillate.

Range: 0 to 9 0-Slow, 9-Fast

Brake Point Digit -- Sets the percent away from target rate at which the Control Valve motor begins braking, so as not to overshoot the desired rate.

Range: 0 to 9 0 = 5%, 1 = 10%, 9 = 90%

Dead-Band Digit -- Allowable difference between target and actual application rate, where rate correction is not performed.

Range: 1 to 9 1 = 1%, 9 = 9%







<u>MANUFACTURER</u>	<u>VALVE CAL NUMBER</u>	<u>COIL FREQUENCY</u>
Brand	136	90-115
Compact	145	100
Energy	136	90-115
Gresen	125	50
Hydroforce	136	100-150
Rexroth	73	180-200
Vickors	136	

APPENDIX 4 ENTERING OFFSET VALUES






To enter known or previously obtained offsets without engaging the hydraulic system of the vehicle the operator must perform the following procedure.

NOTE: When setting offsets the MASTER switch must be ON, and the RATE knob must be on "M".





1) SPINNER HIGH OFFSET


- a) Depress  until GRAN display shows "oFS". LIQ display will show "SPHi". DATA display will show "254".
- b) Depressing  allows the user to use the  and  keys to set to offset desired.
- c) After desired value is set, depress . HIGH OFFSET is now set.
- d) Depress  to advance to SPINNER LOW OFFSET.

2) SPINNER LOW OFFSET

- a) GRAN display will show "oFS". LIQ display will show "SPLo". DATA display will show "2".
- b) Depressing  allows the use of the  and  keys to set the offset desired.
- c) After desired value is set, depress . LOW OFFSET is now set.
- d) Depress  to advance to GRANULAR HIGH OFFSET.




3) GRANULAR HIGH OFFSET


- a) GRAN display will show "oFS". LIQ display will show "Grhi". DATA display will show "254".
- b) Depressing  allows the use of the  and  keys to set the offset desired.
- c) After desired value is set, depress . HIGH OFFSET is now set.


D) Depress  to advance to GRANULAR LOW OFFSET.

4) GRANULAR LOW OFFSET

A) GRAN display will show "oFS". LIQ display will show "GrLo". DATA display will show "2".

B) Depressing  allows the use of the  and  keys to set the offset desired.




C) After desired value is set, depress . LOW OFFSET is now set.


D) Depress  to advance to PRE-WET HIGH OFFSET.


NOTE: The following offsets are only needed if pre-wet system is controlled by the console (closed loop system) and 2-P was selected during initial console programming. To enter known offset an application rate must be entered in Sand, Salt, Prd1 or Prd2 LIQ CAL

5) PRE-WET HIGH OFFSET

A) GRAN display will show "oFS". LIQ display will show "Prhi". DATA display will show "254".




B) Depressing  allows the use of the  and  keys to set the offset desired.


C) After desired value is set, depress . HIGH OFFSET is now set.


D) Depress  to advance to PRE-WET LOW OFFSET.

6) PRE-WET LOW OFFSET

A) GRAN display will show "oFS". LIQ display will show "PrLo". DATA display will show "2".

B) Depressing  allows the use of the  and  keys to set the offset desired.

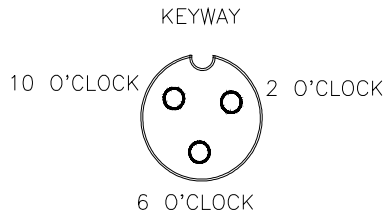
C) After desired value is set, depress . LOW OFFSET is now set.

D) Depress  to advance to SPINNER HIGH OFFSET.

APPENDIX 5

PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES

Disconnect extension cable from Speed Sensor Assembly cable. Hold extension cable connector so that keyway is pointing in the 12 o'clock position.



PIN DESIGNATIONS



2 o'clock socket location is power.
10 o'clock socket location is ground.
6 o'clock socket location is signal.

VOLTAGE READINGS

- 1) 10 o'clock socket to 6 o'clock socket = +5 VDC.
- 2) 10 o'clock socket to 2 o'clock socket = +5 VDC or +12 VDC (RADAR).

If a +5 VDC voltage reading is not present, disconnect the Flow Sensor cable. If the Speed reading is restored, Test the Flow Sensor cable per Appendix "PROCEDURE TO TEST FLOW METER CABLES".

PROCEDURE TO CHECK CABLE:

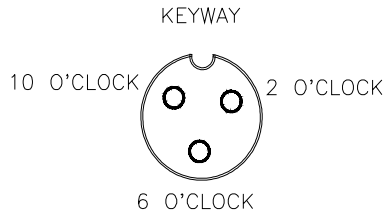
- 1) Enter SPEED CAL number of 9999 in .
- 2) Depress .
- 3) With small jumper wire (or paper clip), short between the 10 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the DISTANCE total should increase by increments of 1 or more counts.
- 4) If DISTANCE does not increase, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.
- 5) Perform above voltage checks.
- 6) If all cables test good, replace Speed Sensor.

NOTE: After testing is complete, re-enter correct SPEED CAL number before application.

APPENDIX 6

PROCEDURE TO TEST FLOW METER CABLES

Disconnect cable from Flow Sensor. Hold Flow Sensor cable so that the keyway is pointing in the 12 o'clock position:



PIN DESIGNATIONS





2 o'clock socket location is ground.
 10 o'clock socket location is power.
 6 o'clock socket location is signal.

VOLTAGE READINGS

- 1) 2 o'clock socket to 6 o'clock socket = +5 VDC.
- 2) 2 o'clock socket to 10 o'clock socket = +5 VDC.

If a +5 VDC voltage reading is not present, disconnect the Speed Sensor cable. If the Flow reading is restored, Test the Speed Sensor cable per Appendix "PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES".

PROCEDURE TO CHECK CABLE:

- 1) Enter a METER CAL number of one (1) in  for granular cable;  for liquid cable.
- 2) Depress  for granular cable;  for liquid cable.
- 3) Place MASTER switch to ON, POWER switch to GR/LI, and enter self test speed of 5 mph.
- 4) With small jumper wire (or paper clip), short between the 2 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the TOTAL VOLUME should increase by increments of 1 or more counts.
- 5) If TOTAL VOLUME does not increase, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.
- 6) Perform above voltage checks.
- 7) If all cables test good, replace Flow Sensor.

NOTE: After testing is complete, re-enter correct METER CAL numbers before application.



APPENDIX 7

FLOW METER MAINTENANCE AND ADJUSTMENT PROCEDURE

- 1)** Remove Flow Meter from pre-wet system and flush with clean water to remove any chemicals.
- 2)** Remove flange bolts or clamp from the Flow Meter.
- 3)** Remove the turbine hub and turbine from inside Flow Meter.
- 4)** Clean turbine and turbine hub of metal filings or any other foreign material, such as wetttable powders. Confirm that the turbine blades are not worn. Hold turbine and turbine hub in your hand and spin turbine. The turbine should spin freely with very little drag inside the turbine hub.
- 5)** If transducer assembly is replaced or if turbine stud is adjusted or replaced, verify the turbine fit before reassembling. Hold turbine hub with turbine on transducer. Spin turbine by blowing on it. Tighten turbine stub until turbine stalls. Loosen turbine stud 1/3 turn. The turbine should spin freely.
- 6)** Re-assemble Flow Meter.
- 7)** Using a low pressure (5 psi) [34.5 kPa] jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/16 turn until the turbine spins freely.
- 8)** If the turbine spins freely and cables have been checked per Appendix "PROCEDURE TO TEST FLOW CABLES", but Flow Meter still is not totalizing properly, replace Flow Meter transducer.

APPENDIX 8

PROCEDURE TO RE-CALIBRATE FLOW METER

- 1) Enter a LIQ METER CAL number of 10 [38] in  .
- 2) Enter a TOTAL LIQ VOLUME of 0 in  .
- 3) Place MASTER switch to OFF.
- 4) Remove hose and place in calibrated 5 gallon [19 liter] container.
- 5) Place POWER switch to GR/LI and MASTER switch to ON. Enter a self test speed of 5 mph. Pump exactly 10 gallons [38 liters].
- 6) Readout in DATA display is the new METER CAL number. This number should be within +/-3% of the number stamped on the tag on Flow Meter.
- 7) Repeat this procedure several times to confirm accuracy. (Always "zero out" the TOTAL LIQ VOLUME display before retesting).

NOTE: For greatest precision, set METER CAL to 100 and pump 100 gallons (378 liters) of water.

- 8) To verify Flow Meter calibration, fill applicator tank with a predetermined amount of measured liquid (i.e. 250 gallons). **DO NOT RELY ON GRADUATION NUMBERS MOLDED INTO APPLICATOR TANK.** Empty the applicator tank under normal operating conditions. If the number displayed under TOTAL LIQ VOLUME is different from the predetermined amount of measured liquid by more than +/-3%, complete the following calculation.

EXAMPLE:

LIQ METER CAL		= 720 [190]
TOTAL LIQ VOLUME		= 260 [984]
Predetermined amount of measured liquid		= 250 [946]

Corrected METER CAL = $\frac{\text{LIQ METER CAL} \times \text{TOTAL LIQ VOLUME}}{\text{Predetermined amount of measured liquid}}$

ENGLISH UNITS:	METRIC UNITS:
= $\frac{720 \times 260}{250} = 749$	= $\frac{[190] \times [984]}{[946]} = [198]$

Corrected LIQ METER CAL = 749 [198]

- 9) Enter corrected LIQ METER CAL before resuming application.

NOTE: For RFM 200 series Flow Meter, use old METER CAL number of 164 [43] and calibrate as described in Step 8.

APPENDIX 9

REMOTE SWITCH OPTIONS

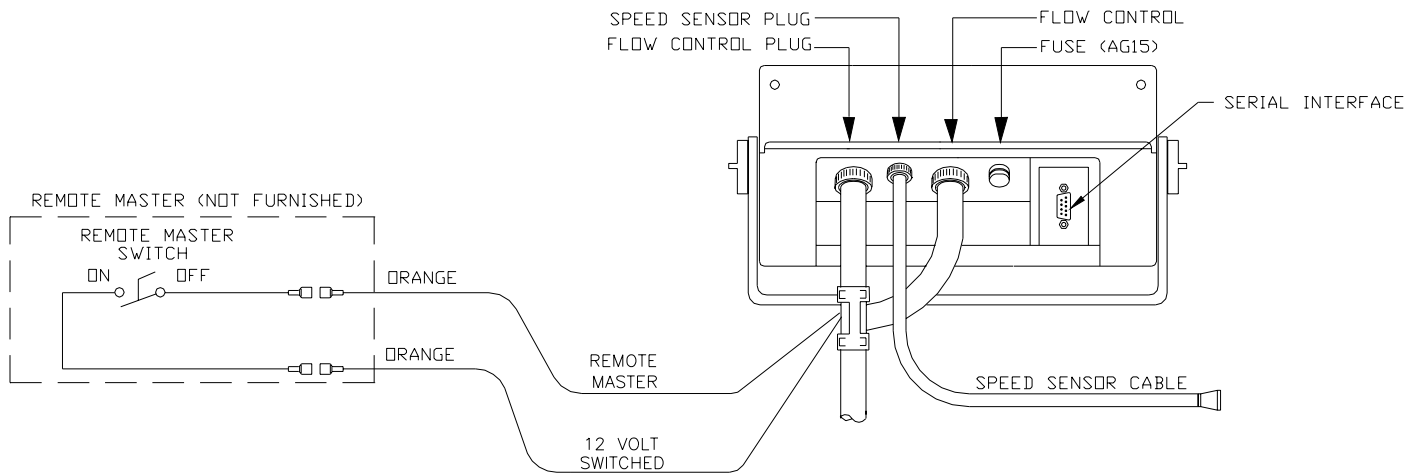


FIGURE 8

REMOTE MASTER

The REMOTE MASTER supplies power to the MASTER switch. Therefore switching the REMOTE MASTER ON when the MASTER switch is in the ON position will energize the granular applicator. The REMOTE MASTER only switches on the applicator. It does not select the material type. Only the Console MASTER switch will select Sand, Salt, Prd1, or Prd2.

INSTALLATION

To install a REMOTE MASTER, locate the solid orange wire within the console cable. Cut the orange wire and use both ends to install the REMOTE MASTER as shown in Figure 8.

APPENDIX 10

INSTALLATION OF RAVEN RADAR

For mounting the Radar, the following guidelines will assure proper installation: It is suggested that a large heavy mounting bracket, (P/N 107-0159-693) be attached to the vehicle frame for mounting the Radar. (See Appendix 1 for Speedometer Speed Sensor installation instructions).

- 1) Park vehicle on level surface.
- 2) Select mounting site by considering the following:
 - a) The line of sight from the lens to the ground must not be obstructed by structures or tires. Road surface must not come closer than 20 inches to the bottom of the Radar. See Figures 9 and 10.
 - b) The Radar lens must be parallel to the ground from front to back. Radar can be tilted out 0-15 degrees to provide more clearance and miss obstructions. See Figure 10.
 - c) The Radar should be mounted so that the **length** of the Radar is **parallel** with direction of vehicle travel.
- 3) Use carpenters level to verify that mounting bracket is parallel to the ground.
- 4) Bolt mounting bracket to vehicle.
- 5) Bolt Radar to mounting bracket using mounting hardware. See Figure 11.
- 6) Connect Radar with Radar Interface Cable (P/N 115-0159-539), to the DCS 700 Console. The Red wire should be connected to switched 12VDC power. The White wire should be connected to the ground.

CAUTION: The connection of the Radar power in reverse polarity could result in damage to the Radar.

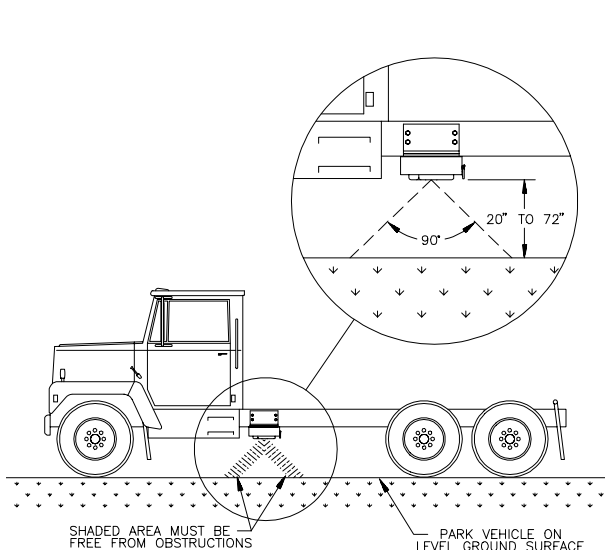


FIGURE 9

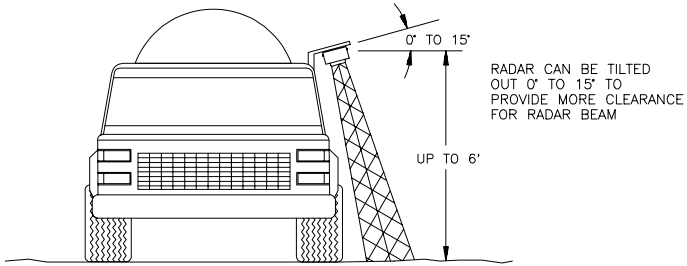


FIGURE 10

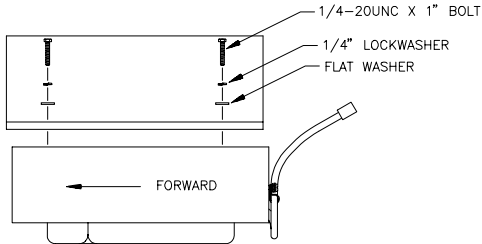
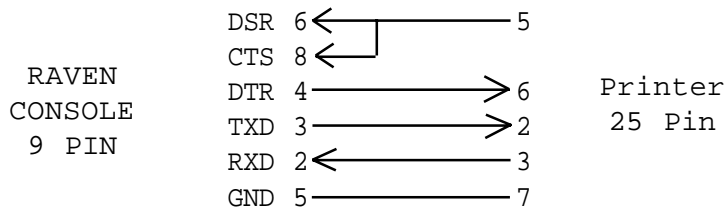


FIGURE 11

APPENDIX 11 SERIAL INTERFACE

- 1) Cable pinout (P/N 115-0159-624), supplied with Thermal Printer Kit (P/N 117-0159-529).



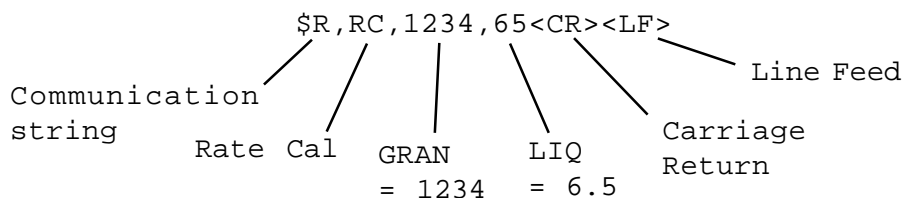
- 2) Changing GRAN CAL and LIQ CAL by remote computer.

- a) Configuration of RS-232C serial port:

1200 or 9600 Baud Rate
NO Parity
8 Data Bits
2 Stop Bits

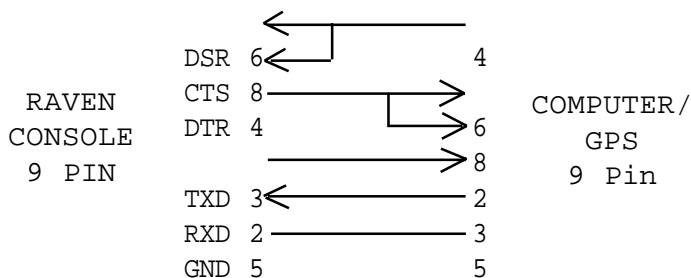
- b) Data stream to Raven Console.

EXAMPLE: Change GRAN to 1234 and LIQ to 6.5



Decimal point is not sent from Remote Computer to Raven Console.

- 3) Optional 9 pin to 9 pin cable pinout [(P/N 115-0159-822) - 10 ft.
(P/N 115-0171-040) - 3 ft.]



APPENDIX 12

DCS 700 COMMUNICATION STRINGS

COMPUTER TO DCS 700 CONSOLE

All request strings begin with \$R, to indicate a Raven communication string.

Rate Change Request:

To set Prod Cal values for both products:

```
$R,RC,<sand_1_cal>,<prewet_sand_cal>,<salt_1_cal>,<prewet_salt_cal>,<prd1_1_cal>,<prewet_prd1_cal>,<prd2_1_cal>,<prewet_prd2_cal>,<CR><LF>
```

To set pre-wet value for product 2 only:

```
$R,RC,,,,,,,,prewet_prd2_cal<CR><LF>
```

Calibration String Values Request:

```
$R,CR<CR><LF>
```

Data String Request:

```
$R,DR<CR><LF>
```

DCS 700 CONSOLE TO REMOTE COMPUTER

All console output strings begin with \$045G, the \$R indicates a Raven communication string, the 045 is the last three digits of the current DCS 700 programmed chip part number and G is the software revision.

Calibration Strings:

```
$R045G,C1,<switch_byte_1>,<switch_byte_3>,<rate_switch_position>,<spinner_switch_position>,<blast_rate_sand>,<blast_rate_salt>,<blast_time><speed_cal>,<salt_meter_cal>,<sand_meter_cal>,<prewet_meter_cal>,<gran_valve_cal>,<prewet_valve_cal>,<CR><LF>
```

```
$R045G,C2,<sand_1>,<sand_2>,<sand_3>,<sand_4>,<sand_5>,<sand_6>,<sand_7>,<sand_8>,<sand_9>,<sand_10>,<prewet_sand_rate><CR><LF>
```

```
$R045G,C3,<salt_1>,<salt_2>,<salt_3>,<salt_4>,<salt_5>,<salt_6>,<salt_7>,<salt_8>,<salt_9>,<salt_10>,<prewet_salt_rate>,<speed_limit><CR><LF>
```

```
$R045G,C4,<blast_rate_prd1>,<prd1_meter_cal>,<prd1_1>,<prd1_2>,<prd1_3>,<prd1_4>,<prd1_5>,<prd1_6>,<prd1_7>,<prd1_8>,<prd1_9>,<prd1_10>,<prewet_prd1_rate>,<CR><LF>
```

```
$R045G,C5,<product selection>,<blast_rate_prd2>,<prd2_meter_cal>,<prd2_1>,<prd2_2>,<prd2_3>,<prd2_4>,<prd2_5>,<prd2_6>,<prd2_7>,<prd2_8>,<prd2_9>,<prd2_10>,<prewet_prd2_rate>,<CR><LF>
```

Switch Byte 1

- 1 blast
- 2 master
- 3 selection
- 4 liquid
- 5 key switch

Switch Byte 3

- 1 Pre-wet/Anti-ice switch
- 2 Left Boom
- 3 Center Boom
- 4 Right Boom
- 5 tier 2
- 6 tier 3

NOTE: For switch byte bits;
0 = off 1 = on

NOTE: For switch byte 3; bit 1;
0 = pre-wet 1 = anti-ice

	<u>RATE SWITCH POSITION</u>	<u>SPINNER SWITCH POSITION</u>
0	manual	off
1	rate 1	rate 1
2	rate 2	rate 2
3	rate 3	rate 3
4	rate 4	rate 4
5	rate 5	rate 5
6	rate 6	rate 6
7	rate 7	rate 7
8	rate 8	rate 8
9	rate 9	rate 9
10	rate 10	rate 10

Data Strings:

\$R045G,D1,<sand_day_distance>,<salt_day_distance>,<prd1_day _distance>,<prd2_day _distance>,<sand_total_distance>,<salt_total_distance>,<prd1_total_distance>,<prd2_total_distance><CR><LF>

\$R045G,D2,<day_sand_volume>,<day_salt_volume>,<day_prd1_volume>,<day_prd2_volume>,<day_prewet_volume>,<total_sand_volume>,<total_salt_volume>,<total_prd1_volume>,<total_prd2_volume>,<total_prewet_volume><CR><LF>

\$R045G,D3,<blast_sand_day_distance>,<blast_salt_day_distance>,<blast_prd1_day_distance>,<blast_prd2_day_distance>,<blast_prewet_day_distance>,<blast_sand_total_distance>,<blast_salt_total_distance>,<blast_prd1_total_distance>,<blast_prd1_total_distance>,<blast_prewet_total_distance>,<CR><LF>

\$R045G,D4,<blast_sand_day_volume>,<blast_salt_day_volume>,<blast_prd1_day_volume>,<blast_prd2_day_volume>,<blast_prewet_day_volume>,<blast_sand_total_volume>,<blast_salt_total_volume>,<blast_prd1_total_volume>,<blast_prd2_total_volme>,<blast_prewet_total_volume>,<CR><LF>

\$R045G,D5,<blast_count>,<gran_tank_volume>,<liq_tank_volume>,<distance>,<speed>,<CR><LF>

Actual Rate:

\$R045F,AR,<sand_rate>,<prewet_sand_rate>,<salt_rate>,<prewet_salt_rate>,<prd1_rate>,<prewet_prd1_rate>,<prd2_rate>,<prewet_prd2_rate><CR><LF>

Time/Date:

\$R045G,TD,<hr:min>,<month/day/year>,<file-reference>,<truck_number><CR><LF>

APPENDIX 13

DCS 700 DATA MENU REFERENCE GUIDE

DATA MENU

The DCS 700 has multiple features that are located in the DATA MENU key. The following are brief descriptions of features available under the DATA MENU and the default settings for these features:

DISPLAY SCREENS			<u>FEATURE and DESCRIPTION</u>
<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	
<u>SERIAL PORT</u>	<u>SCREENS</u>		
SPr	Prn	CAL/bEGn/End	<p>CONSOLE DATA PRINTOUT</p> <p>Sends data through serial port to computer or optional printer to print day begin and day end pages. Calibration numbers can also be printed.</p>
SPrt		0	<p>TRUCK NUMBER</p> <p>Allows user to enter up to an 8-digit number to represent a truck's number. Truck number is included in field begin and field end pages and the data logger time/date string.</p>
SPr	bAUd	1200	<p>BAUD RATE</p> <p>Used in GPS mode and data logging mode. Selectable between 1200 or 9600 baud.</p>
SPr	rAtE	on	<p>RATE CHANGE ALARM ON/OFF</p> <p>Turns rate change alarm ON or OFF. When rate change alarm is selected ON; alarm sounds 4 long beeps when a rate calibration number is changed via the serial port using a valid change request data string.</p>
SPr	triG	0	<p>DATA LOGGER TRIGGER VALUE</p> <p>Used in data logging mode. The trigger determines how often actual rate data string (See Appendix 11 for data communication string formats) is sent to the serial port. The trigger may be either feet [meters] or seconds.</p>
SPr	Unit	Ft	<p>DATA LOGGER TRIGGER UNITS</p> <p>Used in data logging mode. The trigger unit is selectable between feet [meters] or seconds.</p>
SPr	dLoG	oFF	<p>DATA LOGGER ON/OFF</p> <p>Turns data logger ON or OFF.</p>

DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>FEATURE and DESCRIPTION</u>
GLOBAL POSITIONING SYSTEM SCREENS			
GPS	FILE	1	GPS FILE REFERENCE Used only with Raven Grid Application System. See Grid Application System manual for more details.
GPS	SYSt	inAC	GPS SYSTEM OPTIONS Used only with Raven Grid Application System. See Grid Application System manual for more details.
DATE SCREENS			
dAtE	tiME	0:00	TIME Time of day.
dAtE	onth	0	MONTH Current month of year.
dAtE	dAY	0	DATE Current date of month.
dAtE	YEAr	0	YEAR Current year.
dAtE	P dn	30	POWER DOWN Puts Console into low power mode.
FLOW RATE SCREENS			
Fr	FLGr	.0	VOLUME/MINUTE GRANULAR Displays volume per minute of granular.
Fr	FLPr	.0	VOLUME/MINUTE PRE-WET Displays volume per minute of pre-wet
Fr	LLGr	.0	GRANULAR LOW LIMIT ALARM Turns alarm on if actual granular volume per minute falls below this limit.
Fr	FLPr	.0	PRE-WET LOW LIMIT ALARM Turns alarm on if actual pre-wet volume per minute falls below this limit.
ALARM SCREENS			
ALr	ALrM	on	AUDIBLE ALARMS ON/OFF Turns audible alarms ON or OFF for the following: 1) Granular Off Rate Alarm 2) Liquid Off Rate Alarm

DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>FEATURE and DESCRIPTION</u>
			3) Low Tank Fault 4) Speed Limit 5) 0 Speed Alarm
ALr	Gror	12	GRANULAR OFF RATE ALARM Turns alarm ON if actual Granular rate is off the set percentage level for 5 seconds.
ALr	Lior	30	LIQUID OFF RATE ALARM Turns alarm ON if actual Liquid rate is off the set percentage level for 5 seconds.
MISCELLANEOUS SCREENS			
MiSC	diSP	on	DISPLAY SMOOTHING ON/OFF Turns display smoothing ON or OFF. Selecting display smoothing ON means the RATE window displays target rate when actual rate is within a percentage of target rate. The third digit of VALVE CAL determines this percentage.
MiSC	Man	oFF	MANUAL CONTROL ON/OFF Turns manual control for ON or OFF when key switch is OFF.
MiSC	SPin	on	SPINNER CONTROL ON/OFF Stops Spinner when granular bed stops. ON - Spinner runs all the time when Master is ON (must be ON to set offsets). OFF - Spinner is OFF when granular bed stops.
OFFSET SCREENS			
oFS	SPhi	254	SPINNER HIGH OFFSET The High offset of the spinner valve.
oFS	SPLo	2	SPINNER LOW OFFSET The Low offset of the spinner valve.
oFS	Grhi	254	GRANULAR HIGH OFFSET The High offset of the granular valve.
oFS	GrLo	2	GRANULAR LOW OFFSET The Low offset of the granular valve.
oFS	Prhi	254	PRE-WET HIGH OFFSET The High offset of the pre-wetting valve

DISPLAY SCREENS

<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>FEATURE and DESCRIPTION</u>
oFS	PrLo	2	PRE-WET LOW OFFSET The Low offset of the pre-wetting valve.
CAL SCREENS			
CAL	SPEd	oFF	SPEED CALIBRATION Turns ON to calibrate the Speed Cal.
CAL	GrAn	oFF	GRANULAR CALIBRATION Turns ON to calibrate the GRAN METER CAL for sand, salt, product 1 or product 2.
CAL	Grto	0	GRANULAR TOTAL Enter in the total pounds unloaded when in granular cal.
CAL	LSPd	0.00	TWO SPEED CAL Enter in low gear ratio for a two speed rear-end.
CAL	hSPd	0.00	Enter the high gear ratio for a two speed rear-end.
CAL	FrEq	180	CAL FREQUENCY Enter in the frequency of the pulse-width signal.
SAND BLAST SCREENS			
bLSd	ddAY	0.00	SAND DAY DISTANCE Day distance the blast was on for sand.
bLSd	dtoL	0	SAND TOTAL DISTANCE Total distance blast was on for sand.
bLSd	udAY	0.00	SAND DAY VOLUME Day volume of sand when blast was on.
bLSd	utoL	.0	SAND TOTAL VOLUME Total volume of sand when blast was on.
SALT BLAST SCREENS			
bLSt	ddAY	0.00	SALT DAY DISTANCE Day distance the blast was on for salt.
bLSt	dtoL	0	SALT TOTAL DISTANCE Total distance blast was on for salt.
bLSt	udAY	0.00	SALT DAY VOLUME Day volume of salt when blast was on.

DISPLAY SCREENS			
<u>GRAN</u>	<u>LIQ</u>	<u>DATA</u>	<u>FEATURE and DESCRIPTION</u>
bLSt	utoL	.0	SALT TOTAL VOLUME Total volume of salt when blast was on.
PRODUCT 1 BLAST SCREENS			
bLP1	ddAY	0.00	PRODUCT 1 DAY DISTANCE Day distance the blast was on for product 1.
bLP1	dtoL	0	PRODUCT 1 TOTAL DISTANCE Total distance blast was on for product 1.
bLP1	udAY	0.00	PRODUCT 1 DAY VOLUME Day volume of product 1 when blast was on.
bLP1	utoL	.0	PRODUCT 1 TOTAL VOLUME Total volume of product 1 when blast was on.
PRODUCT 2 BLAST SCREENS			
bLP2	ddAY	0.00	PRODUCT 2 DAY DISTANCE Day distance the blast was on for product 2.
bLP2	dtoL	0	PRODUCT 2 TOTAL DISTANCE Total distance blast was on for product 2.
bLP2	udAY	0.00	PRODUCT 2 DAY VOLUME Day volume of product 2 when blast was on.
bLP2	utoL	.0	PRODUCT 2 TOTAL VOLUME Total volume of product 2 when blast was on.
PRE-WET BLAST SCREENS			
bLPPr	ddAY	0.00	PRE-WET DAY DISTANCE Day distance the blast was on for pre-wet.
bLPPr	dtoL	0	PRE-WET TOTAL DISTANCE Total distance blast was on for pre-wet.
bLPPr	udAY	0	PRE-WET DAY VOLUME Day volume of pre-wet when blast was on.
bLPPr	utoL	0	PRE-WET TOTAL VOLUME Total volume of pre-wet when blast was on.

NOTES



RAVEN INDUSTRIES

LIMITED WARRANTY

WHAT IS COVERED?

This warranty covers all defects in workmanship or materials in your Raven Flow Control Product under normal use, maintenance, and service.

HOW LONG IS THE COVERAGE PERIOD?

This warranty coverage runs for 12 months from the purchase date of your Raven Flow Control Product. This warranty coverage applies only to the original owner and is not transferrable.

HOW CAN YOU GET SERVICE?

Bring the defective part, and proof of date of purchase, to your local dealer. If your dealer agrees with the warranty claim, he will send the part, and proof of purchase to his distributor or to Raven for final approval.

WHAT WILL RAVEN INDUSTRIES DO?

When our inspection proves the warranty claim, we will, at our option, repair or replace the defective part and pay for return freight.

WHAT DOES THIS WARRANTY NOT COVER?

Raven Industries will not assume any expense or liability for repairs made outside our plant without written consent. We are not responsible for damage to any associated equipment or product and will not be liable for loss of profit or other special damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person is authorized to assume for us any liability. Damages caused by normal wear and tear, mis-use, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.