

CS 440RC

Solid De-icer Controller Detailed Configuration and Set-up Manual



Table of Contents

1	Overview	5
1.1	CS-440RC Front Layout	6
1.2	A Typical Solid De-icer (Salt/Sand) System	6
1.3	A Typical Pre-wetting System	7
2	Configuring and Setting Up the CS-440RC	9
2.1	How to Configure the CS-440RC	9
3	System Configuration	12
3.1	Resetting the Parameters to Default Settings	12
3.2	Setting the Location ID	12
3.3	Setting the Truck ID	12
3.4	Setting the Units of Measurement	13
3.5	Setting the Mode of Control	13
3.6	Setting the Date and Time	14
3.7	Enabling GPS Mode	14
4	Ground Speed Configuration	15
4.1	Overview	15
4.1.1	Driving the Vehicle Over a Measured Distance	16
4.1.2	Auto Calibration Using a Hand Held GPS Unit	17
4.1.3	Auto Calibration Using the GPS Provider's Ground Speed Signal	17
4.1.4	Auto Calibration Using the Vehicle's Speedometer	17
4.1.5	Auto Calibration Procedure	17
4.1.6	Verification of Ground Speed	17
4.1.7	Simulated Ground Speed	19
5	Conveyor Hydraulic Valve Configuration	20
5.1	Nulling of the Valve Solenoid	20
5.1.1	Minimum Nulling	20
5.1.2	Maximum Nulling	21
5.1.3	Auto Nulling	21
5.1.4	Forward Gain	22
6	Conveyor Speed Sensor Configuration	23
6.1	Setting the Pulses per Revolution	23
7	Gate Setting Configuration	24
7.1	Selecting the Gate Mode of Operation	24
7.2	Calibrating the Gate "Read Back" Sensor	24
7.3	Closed Loop Gate	25
8	Material Configuration	26
8.1	Naming the Material	26
8.2	Programming the Material Spread Rates	26
8.3	Calibration Procedure	26
8.3.1	Gate Setting for Calibration	26

8.3.2	Automatic Calibration	27
8.4	Verifying Calibration with Simulated Ground Speed	28
9	Spinner Hydraulic Valve Configuration	29
9.1	Selecting the Spinner "Mode of Operation"	29
9.2	Selecting the Spinner "Stop" Mode	29
9.3	Adjusting the Spinner Speed	30
9.4	Nulling the Spinner Solenoid	30
9.4.1	Minimum Nulling	30
9.4.2	Maximum Nulling	31
9.4.3	Auto Nulling	31
9.5	Positive Placement System	31
9.5.1	Setting the Spinner Speed Sensor "Pulses per Revolution"	31
9.5.2	Setting the Spinner Maximum RPM	31
9.5.3	Setting the Spinner's PPS Factor	32
9.6	Spinner Calibration in the "gm/mm2" Mode	32
10	Pre-wetting System	33
10.1	Selecting the Pre-wetting System's "Mode of Operation"	33
10.2	Selecting the "Solid Reduction" Rate When Liquid is Applied	33
10.3	Naming the Material	34
10.4	Programming the Material Spread Rates	34
10.5	Nulling of the Pre-wet Valve Solenoid	34
10.5.1	Minimum Nulling	34
10.5.2	Maximum Nulling	35
10.5.3	Auto Nulling	35
10.6	Automatic Calibration	36
11	Anti-icing Mode	38
11.1	Simulated Anti-icing Mode	38
11.1.1	Selecting the Simulated Anti-icing Mode	38
11.1.2	Setting the System for Simulated Anti-icing	38
11.1.3	Change LIQUID1 to Read PREWET	38
11.1.4	Entering the Pre-wetting Liquid Rates	38
11.1.5	Change LIQUID3 to Read ANTI-I	39
11.1.6	Entering the ANTI-ICING Liquid Rates	39
11.2	Multiple Boom Anti-icing	39
11.2.1	Selecting the Multi Boom Anti-icing Mode	39
11.2.2	Setting the System for Multiple Boom Anti-icing	40
11.2.3	Change LIQUID3 to Read ANTI-I	40
11.2.4	Entering the Anti-icing Liquid Rates	40
12	Blast Mode Configuration	41
12.1	Setting the Solid De-icer Blast "Mode of Operation"	41
12.2	Setting the "Fixed Ration Pre-wetting" Blast "Mode of Operation"	41
12.3	Setting the Blast "Auto Off" Time	41

12.4	Setting the "Maximum" Blast Rate	42
12.5	Blast Rate Setting the "Closed Loop"	42
13	Operator Option Configuration	43
13.1	Presetting the Gate Opening	43
13.2	Presetting the Material Selection	43
13.3	Presetting the Pre-wet Selection	44
13.4	Setting the Operator Options	44
13.5	Resetting the Season Total	44
14	High Speed Alarm Set-up	45
14.1	Setting the High Speed Alarm	45
15	Temperature Sensor Configuration	46
15.1	Selecting the Temperature Sensor Manufacturer	46
15.2	Temperature Compensation	46
16	Error Message Configuration	47
16.1	Operational Errors	47
16.2	Inputs and Outputs Errors	47
16.3	Error Time Delay	48
16.4	Error Action	48
17	Frequently Asked Questions (FAQs)	50
17.1	CS-440RC	50
17.2	Hydraulic	56

Bosch Rexroth Canada Corp. reserves the right to revise this information at any time and for any reason and reserves the right to make changes at any time, without notice or obligation, to any of the information contained in this piece of literature.

Please check for updates at: www.boschrexroth.ca/compu-spread

1 Overview

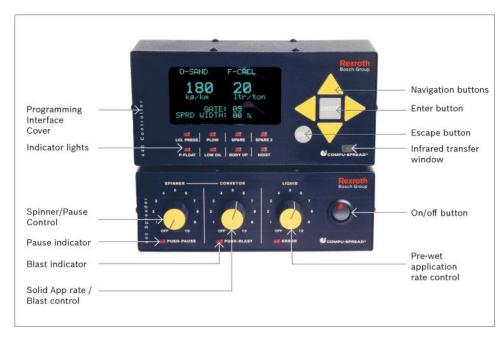
The logged data can be downloaded via Palm Pilot technology to the computer-based software.

Configuration data can be transferred via the Palm Pilot technology both to the computer as well as from the computer back to the CS-440RC.

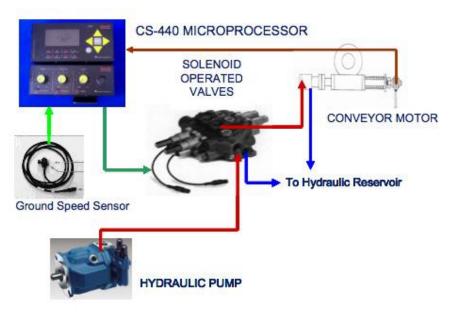
The system can be configured directly into the CS-440RC in the vehicle or a standard configuration can be generated in the computer software and transferred to the CS-440RC. This technique saves time, as much of the configuration data is the same for all vehicles and in this manner configuring only needs to be done once.



1.1 CS-440RC Front Layout



1.2 A Typical Solid De-icer (Salt/Sand) System

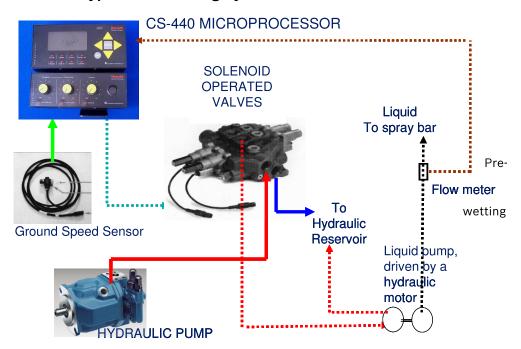


A typical system consists of a closed loop solid de-icer system. Components making up a system consist of the following:

- CS-440RC Microprocessor
- Electrically operated conveyor hydraulic valve
- Electrically operated spinner hydraulic valve
- Conveyor speed sensor
- Ground speed sensor
- Conveyor Motor
- Spinner Motor

There are other components such as cables and hydraulic hoses to consider. These are covered in the Installation Manual and are not covered in the Configuration and Setting up Manual.

1.3 A Typical Pre-wetting System



The Pre-wetting system:

- CS-440RC Microprocessor
- Electrically operated liquid pump hydraulic valve
- Flow meter

There are other components such as cables, hoses, spray bars and tanks to consider. These are covered in the Installation Manual and are not covered in the Configuration and Setting up Manual.

This manual has been broken down in sections covering each of the components as well there are sections dealing with calibration etc. See the "Table of Contents" (pages 2-4) for the complete list of topics.

2 Configuring and Setting up the CS-440RC

2.1 How to Configure the CS-440RC

The manual is broken down into the various components that make up a system, when troubleshooting a section of the system go directly to the page covering that particular section. (See Table of Contents.)

The following instructions apply to all of the sections making up a system, becoming familiar with these steps will allow you to Configure and Set-up any individual section.

SETTINGS

SYSTEM SETUP
SENSORS & VALVES
MATERIAL SETUP
ERROR CONFIG

Cursor

To set up the CS-440RC a programming key is needed, this is to prevent unauthorized personnel from making adjustments. Make sure only authorized staff has access to the key.

Insert the key and turn same ¼ turn and the screen to the left will appear.

Using the navigation button move the cursor to the area to be configured and press the Enter button.

NAME - ID
SYSTEM UNITS
CONTROL MODE
BLAST MODE
PREWET MODE
SIMSPD+LIQ
OPERATIONAL SETTINGS
SYSTEM RESET

Place the cursor in front of "SYSTEM" and press the Enter button. The screen to the left will appear.

SETTINGS

SYSTEM SETUP SENSORS & VALVES MATERIAL SETUP ERROR CONFIG

Cursor

Each of these sections can be configured from this screen, refer to the Table of Contents for the proper page number and instruction for each section.

To return to the first screen, press the Escape button.

► DITHER FREQUENCY GROUND SPD SENSOR CONVEYOR SETUP SPINNER SETUP PREWET SETUP GATE SETUP TEMP SENSOR Using the navigation button move the cursor in front of "SENSOR AND VALVES" and press the Enter button. The screen to the left will appear.

SETTINGS

SENSORS & VALVES
MATERIAL SETUP
ERROR CONFIG

Cursor

Each of these sections can be configured from this screen, refer to the Table of Contents for the proper page number and instruction for each section.

To return to the first screen, press the Escape button.

➤ SOLID 1 - SALT--

SOLID 2 - SAND--

SOLID 3 - MAX---

SOLID 4 - -----

PREWET 1 - LIQUID1

PREWET 2 – LIQUID2

PREWET 3 - LIQUID3

PREWET 4 – LIQUID4

Using the navigation button move the cursor in front of "MATERIAL SETUP" and press the Enter button. The screen to the left will appear.

SETTINGS

⇒►SYSTEM SETUP SENSORS & VALVES MATERIAL SETUP ERROR CONFIG

Cursor

Each of these sections can be configured from this screen, refer to the Table of Contents for the proper page number and instruction for each section.

To return to the first screen, press the Escape button.

► OPERATION INPUTS AND OUTPUTS

Using the navigation button move the cursor in front of "ERROR CONFIG" and press the Enter button. The screen to the left will appear.

Each of these sections can be configured from this screen, refer to the Table of Contents for the proper page number and instruction for each section.

To return to the first screen, press the Escape button.

When "Configuration and Setting Up" are completed, remove the programming key.

3 System Configuration

3.1 Resetting the Parameters to Default Settings

Insert the programming key, select "SYSTEMS", and select "SYSTEM RESET". The screen to the left will appear.

If the parameters are to be reset, move the cursor to "YES" and press the Enter button. If the parameters are not to be reset, press the Enter button.

Press the Escape button to return to the first screen.

RESET PARAMETERS TO DEFAULT SETTINGS

PLEASE CONFIRM

► NO YES

REGION ▶ REGIONNM

TRUCK ID

3.2 Setting the Location ID

Insert the programming key and select "SYSTEMS", and select "NAME-ID". The screen to the left will appear.

To add or edit the REGION name, press the Enter button.

There are 8 digits available for the name, using the Left or Right navigation button, move the cursor under the letter or number to be added or changed.

Using the Up or Down navigation button, change the letter or number as required.

Once all the letters or numbers have been added or changed. Press the Enter button.

Press the Escape button twice to return to the first screen.

3.3 Setting the Truck ID

Insert the programming key, select "SYSTEMS", and select "NAME-ID". The screen to the left will appear.

Use the Down navigation button to move the cursor to "TRUCK ID" and press the Enter button.

There are 8 digits available for the truck ID, using the Left or Right navigation button move to the letter or number to be added or changed.

Using the Up or Down navigation button, change the letter or number as required.



TRUCK ID TRUCK-ID Once all the letters or numbers have been added or changed press the Enter button

Press the Escape button twice to return to the first screen.

3.4 Setting the Units of Measurement

Insert the programming key, select "SYSTEMS", and select "SYSTEM UNITS". The screen to the left will appear.

Use the Up or Down navigation buttons to move the cursor to the desired units and press the Enter button.

Press the Escape button to return to the first screen.

UNIT

► METRIC – Kg,Km,Ltr IMPERIAL – Ib,mi,gal

CONVEYOR

AUTOMATIC
OPEN LOOP
MANUAL
WT/AREA
KOMBI SPREADER

3.5 Setting the Units of Measurement

Insert the programming key, select "SYSTEMS SETUP", select "CONTROL MODE" and select "CONVEYOR". The screen to the left will appear.

Automatic

Is the wt/distance Closed Loop selection. In this mode both the Ground Speed Sensor and the Conveyor Speed Sensor are in use.

Open Loop

In this mode only the ground speed sensor is in use.

Manual

In this mode neither the ground speed sensor nor the conveyor speed sensor is in use.

Closed Loop (wt/area)

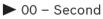
In this mode the ground speed sensor, the conveyor speed sensor and the spinner speed sensor are all I use.

Kombi Spreader

Customer specific use only.

Using the Down navigation button to move the cursor in front of the mode of operation desired and press the Enter button.

The screen will return to the previous screen, the system is now in the proper mode of operation.



00 - Minute

00 - Hour

00 - Date

00 - Month

00 - Year

3.6 Setting the Date and Time

Insert the programming key, select "SYSTEMS", select "OPERATION SETTINGS", and select "DATE & TIME". The screen to the left will appear.

To edit the Second, Minute, Hour, Date, Month or Year use the Navigational arrow, move the Cursor in front of the item to be edited and press the Enter button.

Using the Left or Right navigation button, move the cursor under the number to be changed.

Using the Up or Down navigation button, change the number as required.

Once all the numbers have been changed, press the Enter button.

Once all the items have been corrected, press the Escape button three (3) times to return to the first screen.

3.7 Enabling GPS Mode

Insert the programming key, select "SYSTEMS SETUP", select "CONTROL MODE" and then select either 0 for OFF and 1 for ON.

4 Ground Speed Configuration

4.1 Overview

The CS-440RC Controller determines ground speed by monitoring the pulses it receives from the ground speed sensor mounted in the vehicle transmission. This sensor is the same sensor providing the vehicle's odometer with the necessary input for the odometer to have the ability to indicate speed and distance.

In order for the CS-440RC to have the ability to calculate ground speed and distance it must first be accurately calibrated. The process of calibration tells the CS-440RC exactly how many pulses per KM or Mile it will receive from the transmission mounted sensor.

The process of calibration needs to be completed for each vehicle, as each vehicle's system is not exactly the same. Discrepancies may occur due to sensor mounting differences, tire sizes differences etc.; thus, calibrating each vehicle independently is the only way of ensuring accuracy.

There are a number of methods for calibrating the ground speed input and each method may result in varying levels of accuracy. Listed below are the most common techniques which may be used, the accuracy level for each technique is reflected in the numbering with number one (1) being the most accurate.

- 1. Driving the vehicle over a measured distance. By measuring out the distance of one (1) KM for metric system users or one (1) Mile for Imperial system users and driving the vehicle over this measured distance allows the CS-440RC to count the pulses it receives over this distance. This pulse count can then be entered into the "Pulses per KM/Mile screen and once this value has been entered the CS-440RC ground speed is properly calibrated.
- 2. Auto-calibration to a hand held GPS unit. By driving the vehicle at a predetermined speed using a handheld GPS unit as the speed indicator. Using a hand held GPS unit will result in greater accuracy then using the vehicle speedometer. The accuracy level is only as accurate as the GPS Unit's calibration. During the calibration process the CS-440RC will determine the pulses per KM or Mile; this count will be reflected on the "Speed input" screen once the auto calibration process has been completed.
- 3. If the vehicle is equipped with a GPS system, auto-calibration to the GPS provider's ground speed signal. By driving the vehicle at a predetermined speed using the GPS provider's ground speed signal as the speed indicator. The accuracy level is only as accurate as the GPS system's calibration. During the

calibration process the CS-440RC will determine the pulses per KM or Mile; this count will be reflected on the "Speed input" screen once the auto calibration process has been completed.

4. Auto-calibration to the vehicle's speedometer. By driving the vehicle at a predetermined speed using the vehicle's speedometer as the speed indicator. The accuracy level is only as accurate as the speedometer calibration. During the calibration process the CS-440RC will determine the pulses per KM or Mile; this count will be reflected on the "Speed input" screen once the auto calibration process has been completed.

4.1.1 Driving the Vehicle Over a Measured Distance

Accurately measure out a distance of one (1) KM or one (1) Mile on a low traffic volume section of road and mark the starting and end point with clearly visible markers.

- Drive the vehicle to the starting point and stop with the vehicle's front bumper in line with the marker.
- On the CS-440RC, press the Escape button. (The programming key is not needed for this.)
- With the cursor arrow pointing at "Trip Summery", press Enter.
- The top line of the transaction screen will reflect "XXXXX KM/Mile Total Dist".
- Press the Escape button to leave the Trip Summery screen and press the Escape button again to re-enter.
- With the cursor arrow pointing at "Transaction screen", press Enter.
- The top line will now read "XXXXX Pls Total dist."
- Press the Enter button to reset all values to Zero (0).
- Drive the vehicle over the measured KM/Mile and stop with the front bumper in line with the End point marker.
- On the CS-440RC, press the Escape button. (The programming key is not needed for this).
- With the cursor arrow pointing at "Trip Summery screen", press Enter.
- The top line will now read "XXXXX Pls Total dist.", write down the number of pulses indicated.

Insert the programming key, select "SENSORS AND VALVES", and select "GRND SPD SENSOR". The screen to the left will appear.

► SPEED INPUT

AUTO CALIBRATION

000 kph or mph

INPUT

XXXXX0 PULSES/km or mi

Press Enter and the screen to the left will appear.

- Using the Down navigation button to move the cursor in front of "XXXXO" and press the Enter button.
- Using the Left or Right navigation button, move the cursor under the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three (3) times to return to the first screen.

4.1.2 Auto Calibration Using a Hand Held GPS Unit

Follow the auto calibration procedure below, hold the vehicle speed to the speed indicated on the hand held GPS unit.

4.1.3 Auto Calibration Using the GPS Provider's Ground Speed Signal

Follow the auto calibration procedure below, hold the vehicle speed to the speed indicated on the GPS provider's system. Note: cell phone communication with the GPS provider will be necessary.

4.1.4 Auto Calibration Using the Vehicle's Speedometer

Follow the auto calibration procedure below, hold the vehicle speed to the speed indicated on the vehicle's speedometer.

4.1.5 Auto Calibration Procedure

Select "SENSORS AND VALVES" and select "GRND SPD SENSOR". The screen to the left will appear.

SPEED INPUT

AUTO CALIBRATION

000 kph or mph

SPEED

➤ 30 kph or mph

drive to the speed

START

Using the navigation button move the cursor to the "AUTO CALIBRATION" and press the Enter button. The screen to the left will appear.

Press Enter and set the speed at which you will be driving during the calibration process.

Use the Right or Left navigation button to move the cursor under the number to be changed, use the Up or Down navigation buttons to set the speed. Once the speed has been set, press the Enter button.

DRIVING TRUCK AT SELECTED SPEED

IT TAKES 5 SECONDS

PLEASE WAIT

Drive the vehicle at the speed entered above, once the vehicle is steady at this speed press the Enter button and the screen to the left will appear.

► SPEED INPUT

AUTO CALIBRATION

30 kph or mph

Hold the vehicle speed steady while this screen is on the display, once this screen disappears and returns to the previous screen, the calibration is complete.

The speed at which you are driving will now be reflected on the screen in the lower, right hand corner.

► SPEED INPUT

AUTO CALIBRATION

30 kph or mph

4.1.6 Verification of Ground Speed

If ground speed verification is carried out, for example using a hand held GPS navigator and the ground speed is found to be inaccurate, an adjustment in the pulses per KM or Mile can be made on the "SPEED INPUT" screen to correct this.

During the verification process the screen to the left would be on the display.

While driving the vehicle, the vehicle speed reading on this screen is compared to the GPS speed reading.

INPUT

XXXXX0 PULSES/km or mi

- If the speed calibration is off, Press the Enter button to enter the SPEED INPUT phase.
- Using the Left or Right navigation button, move the cursor under the number to be changed.
- Using the Up or Down navigation button, change the pulses per kilometer or mile as required to correct the inaccuracy.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three (3) times to return to the first screen.

A-SALT V-BRINE

O Kg/km

U Ltr/ton

GATE: 5 R AIR T: -10 WIDTH: 00% PAV T: -12

4.1.7 Simulated Ground Speed

Simulated ground speed activation in operation mode (without a key):

Make sure that the vehicle is stationary (ground speed = 0) and display is on main OPERATION SCREEN, as shown to the left.

TRIP SUMMARY SOLID PREWET

05

- GATE

000000 - DRVR ID

OPERATION MODE

Hold Enter button down, press Escape button, and let go both buttons at the same time.

Press Escape to switch to OPERATOR SCREEN, as shown to the left.

STATUS

0405 - App Rate

0030 - Grnd Spd

0210 - Conv RPM

0020 - Prewet Flow

0005 - Gate Back

Press Up and Down buttons to adjust simulated ground speed, as shown to the left.

The speed will increase and decrease in 5 mile or kilometer per hour increments.

5 Conveyor Hydraulic Valve Configuration

5.1 Nulling of the Valve Solenoid

Nulling of the solenoids is the process required to set the minimum and maximum Controller amperage outputs to the solenoid, for efficient operation.

"Minimum nulling" sets the controller output amperage at the minimum amperage required to overcome the system friction. This enhances conveyor start up during the spreading operation as the Controller starts its output at this minimum amperage rather than zero amps.

"Maximum nulling" sets the maximum Controller output at the amperage required to obtain the maximum hydraulic motor speed without exceeding the maximum motor design speed.

"Forward Gain" is another factor to be considered for prompt start up. This is built into the system to overcome an inherit hydraulic motor pulsing problem. Once the hydraulic motor inlet oil pressure is sufficient to create motion, the motor will pulse during start up until it receives enough oil flow for continuous motion.

As continuous motion is required for even spreading, we need to give the motor a "boost", thus an additional increase in the Controller output is provided for to take the motor past the pulsing stage. Forward Gain is only temporary and it will disappear once the conveyor is turning.

5.1.1 Minimum Nulling

Insert the programming key, select "SENSORS AND VALVES", and select "CONVEYOR SETUP". The screen to the left will appear.

CONVEYOR SENSOR

VALVE SETTINGS

AUTO NULLING

XX.X % Min Out
XX.X % Max Out
XX.X - Fwd Gain
Manual Rates %
0010 0020 0030
0040 0050 0060
0070 0080 0090 rpm
99.99 % - Blast 000

Using the Navigational Arrow, move the cursor down to "VALVE SETTING" and press Enter. The screen to the left will appear.

Start the truck and operate the engine at 1500 RPM to ensure good hydraulic oil flow.

Press the Enter button and using the Navigational arrow move the cursor under the last digit.

Using the Up navigational arrow increase the output until the conveyor starts to turn (see RPM reading in lower corner).

Using the Down navigational arrow, slowly decrease the output in small increments until the conveyor stops.

The reading on the screen for "Min Out" is the % of maximum amperage required to start the conveyor.

Press the Enter button to return the cursor in front of the Min reading.

5.1.2 Maximum Nulling

Using the Down navigational arrow move the cursor in front of "Max Out". Press the Enter button and using the navigational arrow move the cursor under the last digit.

The conveyor should now be turning and the RPM reading should show in the lower corner.

Using the Up or Down navigational arrows, adjust the RPM to the maximum hydraulic motor design RPM. If the hydraulic motor specs are not available, slowly increase the speed until there are no further increases in the RPM reading. Now slowly lower the output until the RPM reading just starts to go down.

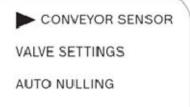
The reading on the screen is % of maximum controller output allowed, permitting the conveyor motor to operate only to its maximum speed.

Press the Enter button to return the cursor in front of the Max reading. Press the Escape button once to return to the previous screen.

5.1.3 Auto Nulling

The nulling of the solenoids for minimum and maximum speed can also be accomplished automatically.

Move the cursor in front of "AUTO NULLING", press the Enter button, and the screen to the left will appear.



SYSTEM WILL RUN!



AUTO NULLING TAKES ABOUT 90 SECONDS

PLEASE WAIT...

CONVEYOR SENSOR

VALVE SETTINGS

AUTO NULLING

➤ XX.X % Min Out XX.X % Max Out XX.X - Fwd Gain Manual Rates % 0010 0020 0030 0040 0050 0060 0070 0080 0090 rpm 99.99 % - Blast 000 The cursor is in front of "START" and as the warning states, once you press "Enter" to start the Auto Nulling process, the conveyor will start up. Use caution before proceeding to make sure other personnel are clear of the truck.

With the engine running at 1500 RPM, press the Enter button to start the process. The screen will show the message depicted on the left.

The conveyor will start and increase in speed until it reaches its maximum speed. When the controller does not sense any increase in the pulses from the sensor, it knows maximum speed has been established.

The conveyor will now gradually slow down until the controller does not receive any more pulses from the sensor indicating the conveyor has stopped.

Note: Auto Nulling may take place twice for low speed hydraulic motors, as the controller will verify the first readings to make sure the small range between minimum and maximum is correct.

When Auto Nulling is completed the screen will return to the previous screen.

5.1.4 Forward Gain

Move the cursor in front of "VALVE SETTINGS" and press Enter, the screen to the left will appear.

Using the Down navigational arrow move the cursor in front of "Fwd Gain". Press the Enter button and using the navigational arrow to move the cursor under the last digit.

Set the Forward Gain to 50% at first, this can be adjusted up or down once the spreader action has been observed under actual operating conditions.

Press the Enter button to return the cursor in front of the "Fwd Gain" reading.

6 Conveyor Speed Sensor Configuration

The calibration of the system configures the controller for the KG or LBS of material discharging from the conveyor for every revolution of the conveyor speed sensor. As the sensor transmits pulses, the controller needs to know how many pulses per revolution are generated.

6.1 Setting the Pulses per Revolution

The pulses per revolutions generated by the conveyor speed sensor vary depending on the make of hydraulic motor. The most common hydraulic motor makes and matching pulses per revolution are as follows:

	Pulses per Revolution
Standard externally mounted sensor	16
White Hydraulic Motor	50
Parker Hydraulic Motor	30
Char-Lynn Hydraulic Motor	40

CONVEYOR SENSOR

VALVE SETTINGS

AUTO NULLING

Insert the programming key, select "SENSORS AND VALVES", and select "CONVEYOR SETUP". The screen to the left will appear.

CONVEYOR SENSOR

XX PULSES/REV.

Use the Up or Down navigation buttons move the cursor to 'CONVEYOR SENSOR" and press the Enter button. The screen on the left will appear.

Press the Enter button to enter the "XX" Pulses per Rev.

Use the Right or Left navigation button to move the cursor under the number to be changed.

Use the Up or Down navigation buttons to change the number as required to suit the Pulses per Rev. for the appropriate hydraulic motor.

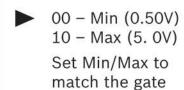
Once all the numbers have been changed, press the Enter button.

Press the Escape button three times to return to the first screen.

GATE

➤ OFF READ BACK HYDRAULIC GATE CLOSED LOOP

GATE



opening

7 Gate Setting Configuration

7.1 Selecting the Gate Mode of Operation

Insert the programming key, select "SYSTEM SETUP", select "CONTROL MODE" and select "GATE". The screen to the left will appear.

If the Hopper Gate is equipped with a "Location Detection Sensor", select "READ BACK", if not select "OFF".

Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen.

7.2 Calibrating the Gate "Read Back" Sensor

Insert the programming key, select "SENSORS AND VALVES", and select "GATE SETUP". The screen to the left will appear.

Setting the MIN calibration:

- 1. Close the Hopper gate to its minimum opening.
- 2. Measure this opening of the gate (see note on next page).
- 3. Using the navigation buttons, move the cursor to the "00-Min" option and press the Enter button.
- 4. Use the Right or Left navigation button to move the cursor under the number to be changed.
- 5. Using the Up or Down navigation buttons change the setting to match the gate opening.
- 6. Note: the Volts reading will change to reflect the actual reading from the sensor.
- 7. Once the numbers have been changed to match the gate opening, press the Enter button.

Setting the MAX calibration:

- 1. Open the Hopper Gate to its maximum opening.
- 2. Measure this opening (see note on next page).
- 3. Using the navigation buttons, move the cursor to the "10 Max" option and press the Enter button.
- 4. Use the Right or Left navigation button to move the cursor under the number to be changed.
- 5. Using the Up or Down navigation buttons change the setting to match the gate opening.
- 6. Note: the Volts reading will change to reflect the actual reading from the sensor.
- 7. Once the numbers have been changed to match the gate opening, press the Enter button.

Press the Escape button twice to return to the first screen.

Note: The measurement is from the bottom of the metal gate to the chain/conveyor. Not from the bottom of the rubber flap (if equipped). Inaccurate gate regulation will result if the gate measurement isn't correct.

7.3 Closed Loop Gate

The function is only available in Version X.18 and higher. And it requires a hydraulic gate cylinder to raise and lower the gate.

Select SYSTEM SETUP->CONTROL MODE->GATE.

Before operating the hydraulic cylinder make sure to adjust the stroke limiter to provide smooth gate movement.

Now you can calibrate the gate cylinder and gate read back sensor. Select SENSOR & VALVES->GATE screen. Follow the instruction in section 7.2.

Lower the gate all the way down by pressing DOWN button. Once the gate is at the bottom position move cursor to 00 – Min, press ENTER to set min position and press ENTER again to record the setting. Then Raise the gate all the way up by pressing UP button. Once the gate is at the up position move cursor to 10 – Max, press ENTER to set max position and press ENTER again to record the setting.

You can also manually raise/lower gate in the operator screen (with-out the key) if the gate is in CLOSED LOOP mode.

With the vehicle stationary press Escape to flip the screen. Press and hold the Up or Down buttons to raise or lower the gate manually.

When a vehicle is stationary you can only open the gate by selecting UNLOAD function. For safety reason the gate doesn't come down when the vehicle is stopped. As soon as the vehicle moves the CS-440RC controller would move the gate to the lowest starting gate position. While the vehicle is moving the gate would be closed when the APP rate is dialed to OFF position or in PAUSE mode.

If there is a gate sensor failure, the operator will be prompted to stop the vehicle, check and enter the gate setting before continuing. The screen to the left will appear after an Error 16 – gate sensor failure. The gate mode will now be in manual. Once the gate sensor fault has been corrected, the gate mode must be changed back to closed loop with the programming key.

GATE

OFF READ BACK HYDRAULIC GATE CLOSED LOOP

- 1 Stop truck
- 2 Check gate
- 3 up/dn to change
- 4 enter to proceed



01

SALT 0030 0060 0090 KG 0120 0150 0180 / 0210 0240 0270 KM 0270 - blast 05 - gate 01.00 - wt/rev CALIBRATION

SALT
0030 0060 0090 KG
0120 0150 0180 /
0210 0240 0270 KM
0270 - blast
05 - gate
01.00 - wt/rev
CALIBRATION



8 Material Configuration

8.1 Naming the Material

Insert the programming key, select "MATERIAL SETUP" and select "SOLID 1". The screen to the left will appear.

- Using the Left or Right navigation button move to the letter or number to be added or changed.
- Using the Up or Down navigation button, change the letter or number as required.
- Once all the letters or numbers have been added or changed press the Enter button.

8.2 Programming the Material Spread Rates

Insert the programming key, select "MATERIAL SETUP" and select desired solid. The screen the left will appear.

- Use the Down navigation button to move the cursor to the desired line to be changed and press the Enter button.
- Using the Left or Right navigation button move to the letter or number to be added or changed.
- Using the Up or Down navigation button, change the letter or number as required.
- Once all the letters or numbers have been added or changed press the Enter button.

8.3 Calibration Procedure

Insert the programming key, select "MATERIAL SETUP" and select the desired solid. The screen to the left will appear.

8.3.1 Gate Setting for Calibration

Adjust gate to a position for the material.

Enter the GATE setting to be used during the calibration procedure.

If gate is in manual mode:

- 1. Use the Down navigation button to move the cursor to "GATE" and press the Enter button.
- 2. Using the Left or Right navigation button, move to the number to be changed.
- 3. Using the Up or Down navigation button, change the number as required.
- 4. Once all the numbers have been changed, press the Enter button.

If the gate is in Read Back:

Physically move the hopper gate and the controller will automatically update the gate # after the calibration process.

If the gate is in Closed Loop:

Enter the gate position the calibration is to be performed at, and the gate will move automatically to that position.

8.3.2 Automatic Calibration

Load the vehicle hopper with the material to be calibrated.

Insert the programming key, select "MATERIAL SETUP" and select desired solid. The screen to the left will appear.

SYSTEM WILL RUN!

0030 0060 0090 KG

0210 0240 0270 KM

0120 0150 0180 /

> SALT

0270 - blast 05 - gate 01.00 - wt/rev CALIBRATION

SYSTEM RUNNING!

START

SELECT NORMAL RATE. CHECK THE MATERIAL BEING SPREAD

► ENTER TO STOP

Use the Down navigation button to move the cursor to "CALIBRATION" and press the Enter button. The screen to the left will appear.

Note: The screen message is a warning that the system will run during the calibration process, make sure all personnel is clear of moving parts.

Operate the truck engine at 1500 RPM to ensure good hydraulic oil flow.

Material will be discharging from the vehicle during the calibration process, a means of collecting this material will be necessary.

Use the Down navigation button to move the cursor to "START" and press the Enter button. The screen to the left will appear.

Set the Conveyor button to 3. The system will now be running and material is discharging from the vehicle.

Allow the system to run for several minutes.

ENTER MATERIAL WT



ACCEPT VALUE

SALT
0030 0060 0090 KG
0120 0150 0180 /
0210 0240 0270 KM
0270 - blast
05 - gate
01.00 - wt/rev
CALIBRATION

Press the Enter button to stop the calibration process. The screen to the left will appear.

Weigh the material discharged from the vehicle during the calibration process.

Press the Enter button and using the Right/Left navigation arrows move the cursor under the number to be changed.

- Using the Up/Down navigational arrow, enter the weight of the material.
- Once the proper weight has been entered, press the Enter button.
- Using the Down navigational arrow, move the cursor to "ACCEPT VALUE"
- Press the Enter button again to confirm acceptance of the weight value, the screen will return to the starting screen.

NOTE: The "WT/REV" number now reflects the weight per revolution calculated from the results of the calibration process.

Repeat this process for all materials to be calibrated.

8.4 Verifying Calibration with Simulated Ground Speed

Obtain a material catch container with a known volume and weight capacity. The higher the capacity, the more accurate it will be. Calculate the time required to fill the box with a specific rate and vehicle speed.

- 1. Place the catch box under the chute.
- 2. Set the simulated ground speed to the determined speed:
 - Press Enter then Escape and release both at the same time.
 - Use the up arrow button to increase the speed by 5km/mile increments.
 - Press Escape to see the status screen and monitor the speed.
- 3. Pause the unit by pushing the spinner dial.
- 4. Set the conveyor rate.
- 5. Increase the engine RPM to 1500 to achieve good hydraulic flow.
- 6. Un-pause the conveyor and time the discharge.
- 7. Pause the conveyor when the time has elapsed.
- 8. If the box is low, change the wt/rev value lower. If it has overflowed then change the value highter.
- 9. Repeat the test until the container fills.
- 10. Cycle the CS-440 power to stop the speed simulation.

9 Spinner Hydraulic Valve Configuration

9.1 Selecting the Spinner "Mode of Operation"

Insert the programming key, select "SYSTEMS", select "CONTROL MODE" and select "SPINNER". The screen to the left will appear.

Closed Loop

Used if the spinner has a speed sensor and is to be activated for closed loop operation, for example "gm/mm2" mode. This mode is not supported at this time!

PPS

Used when the Positive Placement System mode is to be activated.

Manual

Used for all spinners without a speed sensor.

Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen.

Press the Escape button twice to return to the first screen.

9.2 Selecting the Spinner "Stop" Mode

Insert the programming key, select "SYSTEMS", select "OPERATION SETTINGS" and select "SPINNER OPTIONS". The screen to the left will appear.

Always On

Once its operation is selected, the spinner will be in operation continuously.

Zero Speed Only

Once the spinner operation is selected, the spinner will start and stop with the trucks movement.

Pause Only

Once the spinner operation is selected, the spinner will stop when Pause is activated.

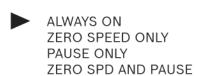
Zero Speed and Pause

Once the spinner operation is selected, the spinner will start and stop with truck movement as well as when Pause is activated.

SPINNER



STOP AT



Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen.

Press the Escape button twice to return to the first screen.

9.3 Adjusting the Spinner Speed

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "VALVE SETTINGS". The screen to the left will appear.

The lines numbered from 0010 to 0090 reflect the spinner speed for each setting of the Spinner Speed Control knob as a percentage of the maximum spinner speed.

These setting can be adjusted if desired, for more even spread patterns.

In instances where the operator is allowed one spinner speed only, the optimum speed can be determined and all settings can then be set to this value. In this manner the operator can select any setting of the spinner control knob but receive only one constant speed.

- Use the Down navigation button to move the cursor to first line and press the Enter button.
- Using the Left or Right navigation button, move to the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed as desired, press the Enter button.
- Move down to the next line and repeat the process.
- Press the Escape button three times to return to the first screen.

9.4 Nulling the Spinner Solenoid

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "VALVE SETTINGS". The screen to the left will appear.

9.4.1 Minimum Nulling

- Start the truck and operate the engine at 1500 RPM to ensure good hydraulic oil flow
- Press the Enter button and using the Navigational arrow move the cursor under the last digit.
- Using the Up navigational arrow increase the output until the spinner starts to turn.
- Using the Down navigational arrow, slowly decrease the output in small increments until the spinner stops.
- Press the Enter button to return the cursor in front of the Min reading.

XX.X % - Min Out XX.X % - Max Out 0500 - Max RPM

0010 0020 0030 0040 0050 0060 % 0070 0080 0090 rpm 11 - PPS Factor 000

XX.X % - Min Out XX.X % - Max Out 0500 - Max RPM

0010 0020 0030 0040 0050 0060 % 0070 0080 0090 rpm 11 - PPS Factor 000

9.4.2 Maximum Nulling

- Using the Down navigational arrow move the cursor in front of "Max Out". Press
 the Enter button and using the navigational arrow move the cursor under the
 last digit.
- The conveyor should now be turning.
- Using the navigational arrows adjust the spinner speed to the maximum speed required during the spreading operation.
- The reading on the screen is % of maximum controller output allowed, permitting the spinner motor to operate to this maximum speed only.
- Press the Enter button to return the cursor in front of the Max reading.
- Press the Escape button once to return to the previous screen.

9.4.3 Auto Nulling

Auto nulling of the spinner is possible only if the spinner is equipped with a speed sensor.

9.5 Positive Placement System

9.5.1 Setting the Spinner Speed Sensor "Pulses per Revolution"

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "SPINNER SENSOR". The screen to the left will appear.

- Determine the "pulses per Revolution" from the manufacturer's specifications.
- Use the Up or Down navigation button to move the cursor in front of "0022 Pulses/Rev" and press the Enter button.
- Using the Left or Right navigation button, move to the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

9.5.2 Setting the Spinner Maximum RPM

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "VALVE SETTING". The screen to the left will appear.

- Determine the hydraulic motor's maximum speed from the manufacturer's specifications.
- Use the Down navigation button to move the cursor in front of "0500 Max RPM" and press the Enter button.
- Using the Left or Right navigation button move to the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

SENSOR



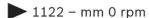
0022 Pulses / Rev

Spinner Gram/Area 1122 – mm 0 rpm 12.7 – mm per rpm

XX.X % - Min Out XX.X % - Max Out 0500 – Max RPM

0010 0020 0030 0040 0050 0060 % 0070 0080 0090 rpm 11 - PPS Factor 000 XX.X % - Min Out XX.X % - Max Out 0500 – Max RPM

0010 0020 0030 0040 0050 0060 % 0070 0080 0090 rpm 11 - PPS Factor 000



SELECT SPINNER KNOB SELECT CONV KNOB CHECK THE WIDTH TURN BOTH KNOBS OFF

PROCEED

9.5.3 Setting the Spinner's PPS Factor

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "VALVE SETTING". The screen to the left will appear.

- Determine the system's PPS Factor Spinner RPM / Maximum Spreading Speed.
- Use the Down navigation button to move the cursor in front of "11 PPS Factor" and press the Enter button.
- Using the Left or Right navigation button move to the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

9.6 Spinner Calibration in the "gm/mm2" Mode

Insert the programming key, select "SENSORS AND VALVES", select "SPINNER SETUP" and select "WIDTH CALIBRATION". The screen to the left will appear.

PREWET MODE

OFF FIXED PREWET CLOSED – pulses/rev CLOSED – flow/min MANUAL MODE RETURN OIL PREWET

10.1

10.1 Selecting the Pre-wetting System's "Mode of Operation"

Insert the programming key, select "SYSTEM SETUP" and select "PREWET MODE". The screen to the left will appear.

Off

The pre-wetting system is not activated.

10 Pre-wetting System

Fixed Pre-wet (F)

The pre-wet rate is a calibrated fixed rate, the pre-wetting system is operated by the conveyor motor exhaust oil.

Closed Loop - pulses/rev.

The pre-wetting system has a hydraulic motor speed sensor, which is used for input to control the pre – wetting rate.

Closed flow/min (V)

The pre-wetting system has a flow meter, which is used for input to control the pre-wetting rate.

Manual (M)

The pre-wetting system is set to manual mode.

Return Oil Pre-wet (S)

The pre-wet rate is a variable rate system, the pre-wetting system is operated by the conveyor motor exhaust oil.

- Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen.
- Press the Escape button twice to return to the first screen.

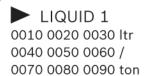
10.2 Selecting the "Solid Reduction" Rate When Liquid is Applied

Insert the programming key, select "SYSTEM SETUP" select "OPERATION SETTINGS" and select "SOLID REDUCTION". The screen to the left will appear.

- Using the Up or Down navigation button, move the cursor in front of the material to be reduced and press Enter.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

REDUCTION

● 00 % - SALT 00 % - SAND 00 % - MIX 00 % - -----



00400 - pulses/ltr

RUN CALIBRATION

LIQUID 1 0010 0020 0030 ltr 0040 0050 0060 / 0070 0080 0090 ton

00400 - pulses/ltr

RUN CALIBRATION

10.3 Naming the Material

Insert the programming key, select "MATERIAL SETUP" and select "PREWET 1", the screen to the left will appear.

- Press Enter.
- Using the Left or Right navigation button move to the letter or number to be added or changed.
- Using the Up or Down navigation button, change the letter or number as required.
- Once all the letters or numbers have been added or changed press the Enter button.

10.4 Programming the Material Spread Rates

Insert the programming key, select "MATERIAL SETUP", and select desired material. The screen to the left will appear.

Note: The liquid rates are in "ltrs/tonne" or "gallons per tonne". Select the proper rates from percentage pre-wetting rate charts.

- Use the Down navigation button to move the cursor to the desired line to be changed and press the Enter button.
- Using the Left or Right navigation button move to the letter or number to be added or changed.
- Using the Up or Down navigation button, change the letter or number as required.
- Once all the letters or numbers have been added or changed press the Enter button.

10.5 Nulling of the Pre-wetting Valve Solenoid

10.5.1 Minimum Nulling

Note: Remove the spray nozzels from the spray bar before commencing the nulling process.

Insert the programming key, select "SENSORS AND VALVES" and select "PREWET SETUP". The screen to the left will appear.



AUTO NULLING

MIN OUT ► XX.X%

MAX OUT

LPM 000 Using the Navigational Arrow move the cursor down to "MIN & MAX FLOW" and press Enter. The screen to the left will appear.

- Start the truck and operate the engine at 1500 RPM to ensure good hydraulic oil flow
- Press the Enter button and using the Navigational arrow move the cursor under the last digit.
- Using the Up navigational arrow increase the output until the PRE-WET PUMP starts to turn, (see LPM reading in lower corner).
- Using the Down navigational arrow, slowly decrease the output in small increments until the PUMP stops.
- The reading on the screen for "Min out" is the % of maximum amperage required to start the conveyor.
- Press the Enter button to return the cursor in front of the Min reading.

10.5.2 Maximum Nulling

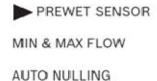
- Using the Down navigational arrow move the cursor in front of "Max Out".
- Press the Enter button and using the navigational arrow move the cursor under the last digit.
- The PRE-WETTING PUMP should now be turning and the LPM reading should show in the lower corner.
- Using the navigational arrows, adjust the LPM to the maximum operational flow requirement.
- The reading on the screen is % of maximum controller output allowed for output to this maximum only.
- Press the Enter button to return the cursor in front of the Max reading.
- Press the Escape button once to return to the previous screen.

10.5.3 Auto Nulling

The nulling of the solenoids for minimum and maximum speed can also be accomplished automatically.

Move the cursor in front of "AUTO NULLING", Press the Enter button and the screen to the left will appear.

The cursor is in front of "START" and as the warning states, once you press "Enter" to start the Auto Nulling process, the pre-wetting pump will start up. Use caution before proceeding to make sure other personnel are clear of the truck.



SYSTEM WILL RUN!



AUTO NULLING TAKES ABOUT 90 SECONDS

PLEASE WAIT...

With the engine running at 1500 RPM, press the Enter button to start the process. The screen will show the message depicted to the left.

The pump will start and increase in speed until it reaches its maximum speed. When the controller does not sense any increase in the pulses from the sensor, it knows maximum output has been established.

The pump will now gradually slow down until the controller does not receive any more pulses from the sensor indicating the flow has stopped.

Note: Auto Nulling may take place twice as the controller will verify the first readings to make sure the small range between minimum and maximum is correct.

When Auto Nulling is completed the screen will return to the previous screen.

10.6 Automatic Calibration

Fill the LIQUID TANKS with the material to be calibrated.

Insert the programming key, select "MATERIAL SETUP" select desired MATERIAL A and press Enter, the screen to the left will appear.

LIQUID 1 0010 0020 0030 ltr 0040 0050 0060 / 0070 0080 0090 ton

00400 - pulses/ltr

RUN CALIBRATION

Use the Down navigation button to move the cursor to "RUN CALIBRATION" and press the Enter button. The screen to the left will appear.

Note: Screen message is a warning that the system will run during the calibration process, make sure all personnel is clear of moving parts.

Operate the truck engine at 1500 RPM to ensure good hydraulic oil flow.

Liquid will be discharging from the spray bar during the calibration process, a means of collecting this material will be necessary.

Use the Down navigation button to move the cursor to "START" and press the Enter button. The screen to the left will appear.

Set the Pre-wet application rate button to 3.

The system will now be running and material is discharging from the vehicle.

SYSTEM WILL RUN!

→ START

SYSTEM RUNNING!

SELECT NORMAL RATE. CHECK THE MATERIAL BEING SPREAD

ENTER TO STOP

ENTER MATERIAL WT

➤ 0000 kg or lb

ACCEPT VALUE

LIQUID 1 0010 0020 0030 ltr 0040 0050 0060 / 0070 0080 0090 ton

00400 - pulses/ltr

RUN CALIBRATION

Allow the system to run until the CALIBRATED catch pail is almost full.

Press the Enter button to stop the calibration process. The screen to the left will appear.

Check the volume in the CALIBRATED catch pail and enter this value into the controller.

- Press the Enter button and using the Right/Left navigation arrows move the cursor under the number to be changed.
- Using the Up/Down navigational arrow, enter the volume of the material.
- Once the proper volume has been entered, press the Enter button.
- Using the Down navigational arrow, move the cursor to "ACCEPT VALUE".
- Press the Enter button again to confirm acceptance of the weight value, the screen will return to the starting screen.

Note: The "pulses/ltr" number now reflects the value calculated from the results of the calibration process.

Repeat this process for all liquids to be calibrated.

11 Anti-icing Mode

The 440 has the capability of operating as an Anti-icing Controller for a single boom or a multiple boom anti-icing system.

11.1 Simulated Anti-icing Mode

In the simulated anti-icing mode the spreader is equipped with a single boom across the back of the truck and is capable of applying salt/sand and pre-wetting the salt/sand or applying a liquid de-icer for a single lane anti-icing application.

11.1.1 Selecting the Simulated Anti-icing Mode

Insert the programming key, select "SYSTEM SETUP" and select SIMSPD+ANTI-ICE", the screen to the left will appear.

Using the navigation buttons, move the cursor to "SIM ANTI-ICING" and press the Enter button. The screen will return to the previous screen.

Press the Escape button to return to the first screen.

11.1.2 Setting the System for Simulated Anti-icing

Using the navigation buttons, move the cursor to "MATERIAL SETUP", select "PREWET 1" and press the Enter button. The screen to the left will appear.

11.1.3 Change LIQUID1 to Read PREWET

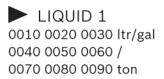
- Press Enter and using the Left or Right navigation button, move to letter to be changed.
- Using the Up or Down navigation button, change the letter as required.
- Once all the letters have been changed, press the Enter button.

11.1.4 Entering the Pre-wetting Liquid Rates

- Move the cursor to the first line of rates and press Enter.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.

Calibrate this liquid as per calibration procedure under "PREWETTING AUTO CALIBRATION".

NONE
SPD SIM ONLY
SIM ANTI-ICING
3 BOOM ANTI-ICING
3 BOOM ANTI +SPD



0040 - pulses/ltr/gal

RUN CALIBRATION

11.1.5 Change LIQUID3 to Read ANTI-I

- Using the navigation buttons, move the cursor to "MATERIAL SETUP", select "PREWET 3" and press the Enter button.
- Using the Left or Right navigation button, move to letter to be changed.
- Using the Up or Down navigation button, change the letter as required.
- Once all the letters have been changed, press the Enter button.

11.1.6 Entering the ANTI-ICING Liquid Rates

- The screen rates are in ltr or gal per ton, treat this as ltr/km or gal/mile
- Move the cursor to the first line of rates and press Enter.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.

Calibrate this liquid as per calibration procedure under "PREWETTING AUTO CALIBRATION".

Have the operator set up the system for "PRE-WETTING" on start-up, once anti-icing is to be used, the operator switches the selector switch to ANTI-ICING and the operator display screen will now reflect anti-icing conditions.

11.2 Multiple Boom Anti-icing

In the three booms anti-icing mode the vehicle is equipped with booms for single, double or three lane applications. When selecting each boom, the appropriate boom selected will be indicated on the screen of the display console.

11.2.1 Selecting the Multi Boom Anti-icing Mode

Insert the programming key, select "SYSTEM SETUP", and select "SIMSPD+LIQ". The screen to the left will appear.

Using the navigation buttons, move the cursor to "3 BOOM ANTI-ICING" and press the Enter button. The screen will return to the previous screen.

Two other options are available if desired:

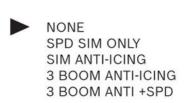
3 Boom + Password

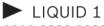
If password protection is desired while in the Multi Boom Anti-icing mode.

3 Boom + Speed Simulator

If speed simulation is desired while in the Multi Boom Anti-icing mode.

Press the Escape button to return to the first screen.





0010 0020 0030 ltr/gal 0040 0050 0060 / 0070 0080 0090 ton

0040 - pulses/ltr/gal

RUN CALIBRATION

11.2.2 Setting the System for Multiple Boom Anti-icing

Using the navigation buttons, move the cursor to "MATERIAL SETUP", select "PREWET 3" and press the Enter button. The screen to the left will appear.

11.2.3 Change LIQUID3 to Read ANTI-I

- Press Enter and using the Left or Right navigation button, move to letter to be changed.
- Using the Up or Down navigation button, change the letter as required.
- Once all the letters have been changed, press the Enter button.

11.2.4 Entering the Anti-icing Liquid Rates

- The screen rates are in ltr or gal per ton, treat this as ltr/km or gal/mile.
- Move the cursor to the first line of rates and press Enter.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.

Calibrate this liquid as per calibration procedure under "PREWETTING AUTO CALIBRATION".

Press the Escape button twice to return to the first screen.

SOLID

MAX OUTPUT STATIONARY MAX CLOSED LOOP OFF

PREWET ▶ OFF

ON

Note: Set Prewet Blast On/Off

BLAST ► SOLID PREWET

00 Sec – Auto Off Note: 00 - Disabled

12 Blast Mode Configuration

12.1 Setting the Solid De-icer Blast "Mode of Operation"

Insert the programming key, select "SYSTEM SETUP", select "BLAST MODE" and select "SOLID". The screen to the left will appear.

MAX OUTPUT

When BLAST is activated in this mode, the conveyor speed will increase to maximum speed and maximum material output.

STATIONARY MAX

Allows you to activate the BLAST function while the vehicle is stationary, the conveyor speed will increase to maximum speed and maximum material output.

CLOSED LOOP

Allows you to set the BAST function at a predetermined rate, when the BLAST function is activated the output will be controlled at that rate.

OFF

The BLAST function is turned off and cannot be activated by the operator.

12.2 Setting the "Fixed Ratio Pre-wetting" Blast "Mode of Operation"

Insert the programming key, select "SYSTEM SETUP", select "BLAST MODE" and select "PREWET". The screen to the left will appear.

In the Fixed Pre-wetting mode the pump is not capable of producing the required flow for the BLAST mode. Turn the system to OFF if a fixed pre-wet system is being used.

Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen.

12.3 Setting the Blast "Auto Off" Time

Insert the programming key, select "SYSTEM SETUP" and select "BLAST MODE". The screen to the left will appear.

- Use the Down navigation button to move the cursor to "00 Sec Auto Off" and press the Enter button.
- Using the Left or Right navigation button, move the cursor under the number to be changed.
- Using the Up or Down navigation button, change the number as required.

➤ XX.X % Min Out XX.X % Max Out XX.X – Fwd Gain Manual Rates % 0010 0020 0030 0040 0050 0060 0070 0080 0090 rpm

99.99 % - Blast 000

SALT
0030 0060 0090 KG
0120 0150 0180 /
0210 0240 0270 KM
0270 - blast
05 - gate
01.00 - wt/rev
CALIBRATION

- Once all the numbers have been changed, press the Enter button.
- Press the Escape button twice to return to the first screen.

12.4 Setting the "Maximum" Blast Rate

Insert the programming key, select "SENSORS AND VALVES", select "CONVEYOR SETUP" and select "VALVE SETTINGS". The screen to the left will appear.

- Use the Down navigation button to move the cursor to "99.99% BLAST" and press the Enter button.
- The percentage reflected here is a percentage of maximum conveyor speed. Thus reducing this percentage will limit the Blast mode output.
- Using the Left or Right navigation button, move the cursor under the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

12.5 Blast Rate Setting the "Closed Loop"

Insert the programming key, select "MATERIAL SETUP" and select "SOLID 1 - SALT", the screen to the left will appear.

- Use the Down navigation button to move the cursor to "0000 BLAST" and press the Enter button.
- The RATE reflected here is the actual rate in Kg/Km or lbs/mile as the Blast mode output.
- Using the Left or Right navigation button, move the cursor under the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button twice to return to the first screen.

13 Operator Option Configuration

The number of inputs to be set by the operator can be limited depending on the requirements of the vehicle.

The options are:

- None
- Mat
- Gate
- Mat + Gate
- Mat + Gate + Mode

If, for example the vehicle will spread all materials using the same gate setting, the Gate setting option can be removed from operator access. Before removing the operator access the function must be set as follows.

13.1 Presetting the Gate Opening

Insert the programming key, select "SYSTEM SETUP", select "OPERATION SETTINGS" and select "GATE SETTING". The screen to the left will appear.

- Use the Down navigation button to move the cursor to "05" and press the Enter button.
- Using the Left or Right navigation button, move to the number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button three times to return to the first screen.

13.2 Presetting the Material Selection

Insert the programming key, select "SYSTEM SETUP", select "OPERATION SETTINGS" and select "SOLID SELECT". The screen to the left will appear.

Use the Down navigation button to move the cursor to "Material to be selected" and press the Enter button.

Press the Escape button twice to return to the first screen.

GATE

O5

SOLID

SALT SAND MIX

PREWET

LIQUID 1 LIQUID 2 LIQUID 3 LIQUID 4

OPTIONS

NONE
MAT
GATE
MAT+GATE
MAT+GATE+MODE

13.3 Presetting the Pre-wet Selection

Insert the programming key, select "SYSTEM SETUP", select "OPERATION SETTINGS" and select "PREWET SELECT". The screen to the left will appear.

Use the Down navigation button to move the cursor to "DESIRED LIQUID" and press the Enter button.

Press the Escape button twice to return to the first screen.

13.4 Setting the Operator Options

Insert the programming key, select "SYSTEM SETUP", select "OPERATION SETTINGS" and select "OPERATOR OPTIONS". The screen to the left will appear.

Note: MODE is the mode of operation for the liquid system.

Use the Down navigation button to move the cursor to "DESIRED OPTION" and press the Enter button.

Press the Escape button twice to return to the first screen.

13.5 Resetting Season Total

To clear the season total RIGHT, LEFT, and Enter buttons need to be pressed and let go at the same time.

14 High Speed Alarm Set-up

SPEED

88 KMH or MPH

14.1 Setting the High Speed Alarm

Insert the programming key, select "SYSTEM SETUP", select "OPERATION SETTINGS" and select "ALARM SPEED". The screen to the left will appear.

- Use the Down navigation button to move the cursor to "88 KMH (MPH)" and press the Enter button.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Press the Escape button twice to return to the first screen.

SENSOR

NOT INSTALLED SPRAGUE CONTROLS RW SS 01% Rate Inc

15 Temperature Sensor Configuration

15.1 Selecting the Temperature Sensor Manufacturer

Insert the programming key, select "SENSORS AND VALVES" and select "TEMP SENSOR". The screen to the left will appear.

Use the Down navigation button to move the cursor to "THE DESIRED OPTION" and press the Enter button.

15.2 Temperature Compensation

Then enter the desired temperature compensation percentage. E.g. 2% means the application rate will increase by 2% for each degree the temperature goes down since the last dial selection. 00% turns this feature off.

Press the Escape button twice to return to the first screen.

Note: In order to reduce rate fluctuations, the temperature must change 3 degrees for a rate adjustment to occur. Also, the temperature compensation feature is disabled when the sensor reads below -16 deg.

Error Message Configuration 16

16.1 **Operational Errors**

Insert the programming key, select "ERROR CONFIG", and select "OPERATION". The screen to the left will appear.

The operational errors cannot be changed; these are all by factory default. The only variable allowing changes are the TIME and ACTION for each error message. See section below.

Error Message	Description	
UNDER APPLICATION	The controller cannot produce the desired solid output. Possible caused are: • Wrong gate setting • Low Engine RPM • Hydraulic pump wear • High speed	
LIQUID UNDER APP	Same as above for the liquid output.	
KNOBS NON ZERO	Application buttons are not at zero and equipment could start without warning.	
BLAST TOO LONG	The Blast mode exceeded its time limit.	
OVERSPEED	Vehicle speed exceeded the preset limit	
CALIBRATION	The setting desired cannot be produced, check settings.	

Inputs and Outputs Errors

Insert the programming key, select "ERROR CONFIG", and select "INPUTS AND OUTPUTS". The screen to the left will appear.

Error Message	Description
KNOB INPUT FAILURE	The spinner, Conveyor or pre-wet application rate buttons are not functioning.
VALVE OUTPUT ERROR	The Controller output to the valves has failed.
MC08 SYSTEM FAILURE	The system mobile controller (MC08) has failed.
NO MATERIAL	This error indicates there is no material on the conveyor (optional).
NO GROUND SPEED INPUT	The controller is not receiving a signal from the ground speed sensor.
NO CONVEYOR SENSOR OUTPUT	The controller is not receiving a signal from the conveyor speed sensor.

- ► 1 UNDER APPLICATION
 - 2 LIQUID UNDER APP
 - 3 KNOBS NON ZERO
 - 4 BLAST TO LONG
 - 5 OVERSPEED
 - 6 CALIBRATION

- ▶ 09 KNOB INPUT FAIL
 - 16 NO GATE SENSOR

Error Message	Description
NO PREWET SENSOR OUTPUT	The controller is not receiving a signal from the pre-wetting flow meter.
NO GATE SENSOR OUTPUT	The controller is not receiving a signal from the Gate Location sensor.

16.3 Error Time Delay

The time delay before the error message is activated can be set here. Setting a delay will prevent error messages from being activated as a result of temporary faults.

Insert the programming key, select "ERROR CONFIG" and select "OPERATION". The screen to the left will appear.

Use the Down navigation button to move the cursor to the desired error function and press the Enter button. The screen to the left will appear.

- Use the Down navigation button to move the cursor to "05 Seconds delay" and press the Enter button.
- Using the Left or Right navigation button, move to number to be changed.
- Using the Up or Down navigation button, change the number as required.
- Once all the numbers have been changed, press the Enter button.
- Repeat the same for each error function.

16.4 Error Action

This option allows you to select the desired action the controller is to activate after the error message is acknowledged by the operator.

Insert the programming key, select "ERROR CONFIG", and select "OPERATION". The screen to the left will appear.

- ► 1 UNDER APPLICATION 2 - LIQUID UNDER APP
 - 3 KNOBS NON ZERO
 - 4 BLAST TO LONG
 - 5 OVERSPEED
 - 6 CALIBRATION

► 05 Seconds Delay

ACTION

- 1 UNDER APPLICATION
- 2 LIQUID UNDER APP
- 3 KNOBS NON ZERO
- 4 BLAST TO LONG
- 5 OVERSPEED
- 6 CALIBRATION

O5 Seconds Delay
ACTION

Use the Down navigation button to move the cursor to the desired error function and press the Enter button. The screen to the left will appear.

► DISABLED
TAKE NO ACTION
GO TO OPEN LOOP
GO TO MANUAL
OUTPUT FROZEN
OUTPUT ZERO
LIQUID ZERO
LIQUID GO TO MANUAL

Use the Down navigation button to move the cursor to "ACTION" and press the Enter button. The screen to the left will appear.

Error Message	Description	
DISABLED	The error has been disabled from the system and is not functioning.	
TAKE NO ACTION	The error message is a warning or reminder only and requires no action to be taken.	
GO TO OPEN LOOP	The system will continue to function in the Open Loop Mode, the application rates are now a percentage of the maximum conveyor speed but the system still responds to ground speed input.	
GO TO MANUAL	The system will continue to function in the Manual Mode, the application rates are now a percentage of the maximum conveyor speed, neither ground speed nor conveyor speed input are available.	
OUTPUT FROZEN	All outputs to the valves are frozen and the system will be operating. Outputs return to normal control once the operator acknowledges the alarm.	
OUTPUT TO ZERO	All outputs go to zero when the error is activated and will remain at zero once the operator acknowledges the alarm. The application rate button will no longer function.	
LIQUID TO ZERO	As above for the liquid only.	
LIQUID TO MANUAL	The liquid system will continue to function in the Manual Mode, the application rates are now a percentage of the maximum pump speed, neither ground speed nor flow meter input is available.	

Using the navigation buttons, move the cursor to the desired option and press the Enter button. The screen will return to the previous screen. Repeat the same for each error function.

Once all the error functions have been configured, press the Escape button once, select "INPUTS AND OUTPUTS" and press Enter. Configure all of the "Inputs and outputs" errors; press the Escape button twice to return to the first screen.

17 Frequently Asked Questions (FAQs)

17.1 CS-440RC

1. What do those Headers in log data reports mean?

Headers	Meaning	
Date and Time	This is the absolute time, at the start of the event	
Event Type	 This is the cause of the event, as follows: STAT - System-Generated event, send the database to Compu-Spread for diagnosis INIT - rebooted the controller RATE - Application Rate change, solid or liquid GATE - Gate Position change 6HRS - Duration of event is 6 hours DEIC - Deice-simulation turned on or off ERR - Error occurred CTRL - Change in control mode for conveyor MATL - Change of solid or liquid material GSLP - gate or solid or liquid change when leaving PROGRAM mode CTUP - control mode or system units change leaving PROGRAM mode SPIN - Spin Rate change when in g/m**2 mode 	
Solid Rate	Normally kg/km	
PreWet Rate	Normally liter/tonne	
Boom Status	LCR to indicate whether left, centre, or right boom is on	
Ground Speed	Calculated speed, based on Total Time and Total Distance	
Total Time	Total Time of duration of this event, including blasting and pausing	
Blast Time	Total time of blasting during this event	
Pause Time	Total time of pausing during this event	
Total Dist.	Total distance travelled during this event, including blasting and pausing	
Blast Dist.	Total distance travelled while blasting	
Pause Dist.	Total distance travelled while pausing	
Total Solid	Total solid delivered during this event, including blasting and pausing	
Blast Solid	Total solid delivered while blasting	
Blast Number	Number of times the Blast button was pushed	
Total PreWet	Total pre-wet delivered during this event, including blasting and pausing	

Spin Rate	Spinner Rate, normally % output

Headers	Meaning
Ctrl Mode	Conveyor control mode
Gate/Error	Gate position in inches, and error code
Temp.	Temperature

2. What is the spreading time for an event in reports?

Total Spread Time = Total Time - Blast Time - Pause Time.

3. Does the Total Time equal to the difference between the start times of the present event and the next event?

The only exception being in the case of a reboot, which will show up as an INIT event.

4. What are the CS-440RC error codes and error messages?

- 01 Under-Application of Solid
- 02 Under-Application of Liquid
- 03 Output Non-Zero on a start up
- 04 Blast too long
- 05 Over Speed Warning
- 06 Sensor Calibration Error
- 09 Knob Input Failure
- 10 PWM Output Failure
- 11 MC08 System Error
- 12 No Solid Material
- 13 No Ground Speed
- 14 No Conveyor Sensor
- 15 No Flow Sensor
- 16 No Gate Sensor
- 17 Leaving Ground Speed Simulation mode, warning only
- 18 Gate Position is zero, warning
- 20 No communication between display and RC

5. Why does units of Total Dist. Trip Summary toggle between km/mi and pls?

This field shows both Total Dist. in km/mi or Dist. in pulses. The field toggles between two values each time Trip Summary is accessed. The feature can be used to count pulses for a designated distance, which is one way to set up GROUND SPEED input.

6. How to check the Conveyor/Spinner/Prewet/Gate Operation modes?

The Conveyor mode and Material selected are shown on the top left Operator Screen as: X-MAT001

- X: A-Automatic/Closed, O-Open, M-Manual, C-Wt/Area
- MAT001: Name of the Material selected

The Prewet mode and Liquid selected are shown on the top right Operator Screen as: X-LIQ001

- X: F-Fixed, V-Variable, M-Manual
- LIQ001: Name of the Liquid selected

If the Gate Read Back is on a 'R' is added after the gate position, for instance, 'Gate: 04 R'.

7. What is the default PASSWORD?

'CS-440RC' is the factory default password.

8. What is the Simulated Ground Speed and how to set up?

It simulates the ground speed signal, and to allows for diagnostics and calibration without moving. To set it up, here are the steps:

- Set to program mode by turning the programming key
- Select SYSTEM SETUP->SPD SIM+ANTI-ICING->SPD SIM
- Press ENTER key
- Set back to operation mode
- Press ESC to show operator screen
- Scroll Up/Down to adjust ground speed

9. What are the modes for BLAST?

- MAX OUTPUT, set to max valve output
- STATIONARY MAX, set to max valve output irrelevant of ground speed
- CLOSED LOOP, regulate to the configured BLAST rate
- OFF

10. How does the SOLID REDUCTION work?

It designed to reduce salt usage by a pre-configured percentage when PREWET is used. Here are the steps to set up:

- Turn the key to program mode
- Select SYSTEM SETUP->OPERATION SETTINGS->SOLID REDUCTION
- Set a percentage of reduction for each material

11. What is the RETURN OIL PREWET?

It uses the conveyor motor exhaust oil to operate the Pre-wet system.

12. Why is Trip Summary lost when CS440RC is turned off?

Since the Trip Summary is the duplicated information as the logged data it is not stored in battery backed memory, and it loses upon power off.

13. What are ways to calibrate ground speed?

- Use INPUT PULSES. Check total pulses per km/mi from truck transmission datasheet. Put it into ->PROGRAM MODE ->SENSORS & VALVES->GRND SPD SENSOR->INPUT. It is recommended for trucks with new tires. Once tires wear out it would affect accuracy.
- Use Ground Speed AUTO CALIBRATION. ->PROGRAM MODE->SENSORS & VALVES->GRND SPD SENSOR-AUTO CALIBRATION. On the SPEED screen set the speed to the typical driving speed, drive to the speed, and Press START. It takes a few seconds to complete. Upon completion the current driving speed would show up on the bottom right corner of the screen.
- Use TRIP SUMMARY. This needs to be done on a section of measured road.
 Clear the TRIP SUMMARY, drive from the beginning to the end of the marked distance, check the total pulses for the distance, calculate the total pulses for 1 km/mi, and put into GROUND SENSOR->INPUT. (The first line of the Trip Summary toggles units between km/mi and pulses each time it is accessed.)

14. How to set up or null min/max outputs of a Conveyor valve?

- To set up manually, ->PROGRAM MODE->SENSORS & VALVES->CONVEYOR SETUP->VALVE SETTINGS, ensure that correct pulses are put in, Select Min Out, Press ENTER to go into edit mode (an cursor should show up under one digit), Press Up/Down on the keypad to adjust valve output to a point that the conveyor barely starts to move(rpm reading on the bottom right about to ramp up), Press ENTER again to exit edit mode.
- To set up automatically, ->PROGRAM MODE->SENSORS & VALVES->CONVEYOR SETUP->VALVE SETTINGS, ensure that correct pulses are put in, Select AUTO NULL, Press ENTER to select, and ENTER again to start. Once AUTO NULL stops it completes.

Note: For very slow conveyors (max RPM < 100) the AUTO NULL may start twice to calculate correct max RPM value.

15. How to set up or null min/max outputs of a Spinner valve?

• For MANUAL operation (default) no feedback sensor is required. Select - >PROGRAM MODE->SENSORS & VALVES->SPINNER SETUP->VALVE SETTINGS->Spinner, Select Min Out or Max Out, Press ENTER to go into edit mode (an

- cursor should show up under one digit), scroll Up/Down on the keypad to adjust valve output to the Min or Max speed, and ENTER to save settings.
- For Wt/Area (g/m*m) operation a feedback sensor is required. Select >PROGRAM MODE->SENSORS & VALVES->SPINNER SETUP->AUTO NULL, Press ENTER to select, and ENTER again to start. Once AUTO NULL stops it completes. Also a width calibration is required. From the SPINNER SETUP menu select WIDTH CALIBRATION. On the screen you need to put in the spreading width at 0 rpm (typically the diameter of the spinner), and then select CONVEYOR knob to start the conveyor. Gradually increase the spinner setting to the maximum spreading width required, measure the width, turn all knobs to off, key in measured spreading width in mm, and then select ACCEPT VALUE.

16. How to set up or null min/max outputs of a Prewet/Liquid pump?

- For MANUAL operation, select MANUAL MODE on SYSTEM SETUP->PREWET
 MODE menu screen, then select Min Out or Max Out, press ENTER to go into
 edit mode (an cursor should show up under one digit), Press Up/Down on the
 keypad to control the flow of the pump to the desired Min or Max flow rates,
 press ENTER to store the value and exit edit mode.
- For CLOSED LOOP operation, either pulses/rev or flow/min, ->PROGRAM MODE->SENSORS & VALVES->CONVEYOR SETUP->VALVE SETTINGS, ensure that correct pulses are put in, Select AUTO NULL, Press ENTER to select, and ENTER again to start. Once AUTO NULL stops it completes.

Note: For very slow conveyors (max RPM < 100) the AUTO NULL may start twice to calculate correct max RPM value.

17. Why does conveyor valve auto-null run twice with some trucks?

The max RPM for a typical conveyor motor is over 250, and the CS-440RC controllers set parameter ranges to accommodate that. In cases of max conveyor RPM less than 250 the CS-440RC controllers would detect the low conveyor RPM on the first null attempt to adjust RPM range, and then determine the Min and Max the second time.

18. How does Fwd Gain work?

"Forward Gain" is designed to help conveyor overcome the inherited hydraulic motor pulsing problem by boosting the conveyor valve output when vehicle starts to move. Once the hydraulic motor inlet oil pressure is sufficient to create motion, the motor will pulse during start up until it receives enough oil flow for continuous motion. Forward Gain is only temporary and it will disappear once the conveyor is turning. The feature is very helpful to eliminate conveyor pulsing at start up.

19. Do engines need to be ramped up to normal RPM instead of idle RPM during nulling?

It is recommended to ramp up engine RPM to ensure sufficient hydraulic flow for valves to operate. Possibly for vehicles with bigger pumps there is enough hydraulic flow at idle RPM.

20. What types Temp Sensors do CS-440RC controllers support?

Currently the CS-440RC controllers support two types of Infra-re temp sensors, Sprague Roadwatch and 996D Temp sensor from Controls Products Inc.

21. What are the pin outs of the CS-440RC digital inputs?

For Solid + Pre-wet Operation	For Anti-Icing Operation
1 – Material Detection 2 – Material Change 3 – Low Liquid Pressure 4 – Plow Indicator 5 – Spare 6 – P-Float Indicator 7 – Low Oil Indicator	1 – Left Boom 2 – Liquid Change 3 – Low Liquid Pressure 4 – Right Boom 5 – Centre Boom 6 – P-Float Indicator 7 – Low Oil Indicator
8 – Body Up Indicator	8 – Body Up Indicator

22. The Display screen is blank:

If the power switch light is not illuminated then:

- Possible sensor or solenoid short circuit
- Possible extender cable short circuit
- Unplug peripheral sensors and solenoids until problem goes away
- Replace defective sensor/solenoid

There is a time delay breaker in the knob console that may take a few seconds to trip upon a fault condition. This will cause the display to blank. The breaker will reset when the fault is corrected.

Some severe short circuits or circuit misuse can cause damage to the knob console.

If the power switch remains illuminated then:

- Unplug peripheral cables on the back of the display (i.e. temp sensor, GPS, digital input cable)
- Check/replace the short interconnect between the display and the knob console
- If problem persists, the console may require service form the factory

17.2 Hydraulic

- 1. Conveyor does not start or will not run
- Check override on coil; either push in or screw in override dependent on valve type
- If MP18 valve turn in manual stroke limiter
- Check pump for flow and pressure
- Check if the conveyor is jammed
- If neither of these works remove spool from valve and check for scoring

2. Spinner does not start or will not run

- Check override on coil; either push in or screw in override dependent on valve type
- If MP18 valve turn in manual stroke limiter
- Check pump for flow and pressure
- Check if the conveyor is jammed
- If neither of these works remove spool from valve and check for scoring

3. Dump body will not raise when loaded

- Check pump flow and pressure
- Check port relief if installed
- Push override on coil or stroke limiter

4. Slow hydraulic function

- Check pump flow and pressure
- Check return line filter for clogging
- Check Load sense line for correct pressure setting
- Check line sizes for appropriate flow

5. Hydraulic functions will not shut off

- Check drain line from MP18 valve
- Check spools in sections for scoring
- Check for correct plumbing

6. Hydraulic system is heating up

- Check pressure setting
- Check return filter
- Check pressure filter

7. Hydraulic oil is milky or foaming

- Air in hydraulic oil
- Check connections

• Check pump suction line for cavitation

Notes: