Read the Raven Manual for Detailed Instructions

The information contained in this instruction comes from Raven Manuals & Instructions. Realizing most people will not read a 60 page manual, NCI has condensed the instructions to the absolute minimum for proper set-up and operation. Raven manuals, replacement parts lists, software updates can be viewed or downloaded at www.ravenhelp.com

There is no substitute for understanding your equipment's specifications, instructions and capabilities.

Important Warnings!

★ Do NOT try to modify or lengthen any of the 3 Speed Sensor or Encoder cables. Please call Newton Crouch Inc. for extension cables
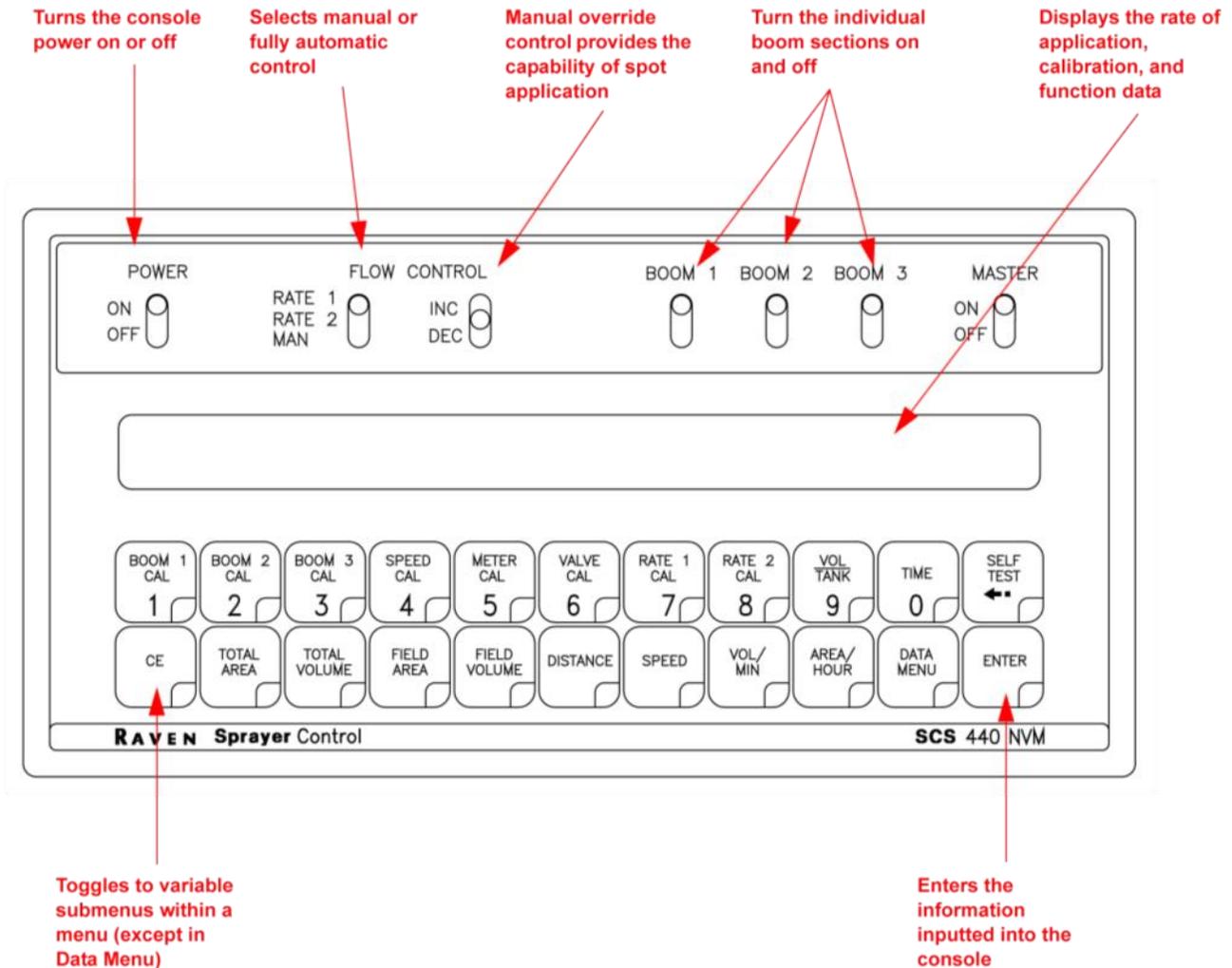
★ ALWAYS disconnect battery from console prior to jump starting, welding, or charging battery.

★ The use of suspension type fertilizers and lime 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.

A Guide to the Raven SCS 440

Turns the console power on or off

Selects manual or fully automatic control

Manual override control provides the capability of spot application

Turn the individual boom sections on and off

Displays the rate of application, calibration, and function data

POWER   FLOW   CONTROL   BOOM 1   BOOM 2   BOOM 3   MASTER

ON   RATE 1   INC   ON

RATE 2

OFF   MAN   DEC   OFF

| BOOM 1 CAL 1 | BOOM 2 CAL 2 | BOOM 3 CAL 3 | SPEED CAL 4 | METER CAL 5 | VALVE CAL 6 | RATE 1 CAL 7 | RATE 2 CAL 8 | VOL/TANK 9 | TIME 0 | SELF TEST ← |
| CE | TOTAL AREA | TOTAL VOLUME | FIELD AREA | FIELD VOLUME | DISTANCE | SPEED | VOL/MIN | AREA/HOUR | DATA MENU | ENTER |

RAVEN Sprayer Control   **SCS 440 NVM**

Toggles to variable submenus within a menu (except in Data Menu)

Enters the information inputted into the console

Calibration buttons are used to enter data into the console when calibrating the system.

Button Name	Function
BOOM CAL 1	Length of boom section 1
BOOM CAL 2	Length of boom section 2
BOOM CAL 3	Length of boom section 3
SPEED CAL	Determined by speed sensor
METER CAL	Meter calibration number
VALVE CAL	Valve response time
RATE 1 CAL	Target application rate 1
RATE 2 CAL	Target application rate 2
TIME	24 hour clock (military time)

Function buttons are used to display the data on a particular aspect of the application.

Button Name	Function
TOTAL AREA	Displays total area applied. ★
TOTAL VOLUME	Displays total volume applied. ★
FIELD AREA	Displays field area applied. ★
FIELD VOLUME	Displays volume applied to the field. ★
DISTANCE	Displays distance traveled. ★
SPEED	Displays the vehicle's speed.
VOL / MIN	Displays the volume per minute applied.
AREA / HOUR	Calculates the total area covered per hour at the present speed (not average)
DATA MENU	Used for data logging and variable rate commands
SELF TEST	Displays data after selecting volume rate, speed sensor type or valve type.

★ To zero out this figure, press ENTER, 0, ENTER in this menu.

Getting Ready to Program the Raven SCS 440

Console calibration is a one-time procedure that, once it has been performed, does not have to be repeated. Turning the POWER ON/OFF switch does not affect the console's memory—all data is retained.

Your console must be calibrated with these selections before using. Programming is easiest if you mark the correct selection here and have this with you when you start the process.   The most commonly used selections on NCI equipment are indicated by ⭐

Area: _____
      US - per Acre …………... ⭐
      SI -   per Hectare
      TU - per 1000 Sq Ft   (for turf primarily)

Sensor: _____
      SP 1—Wheel drive
      SP 2—Radar…………... ⭐

Valve Type: _____
      C-SD (Standard Valve) = 2123………. ⭐
      C-F (Fast Valve) = 743
      C-FC (Fast Close Valve) = 743
      C-P (PWM Valve) = 43
      C-PC (PWM Close Valve) = 43

> The entries below are explained on ▷ pages 5—8. Understand your data BEFORE entering it into your console.
> The quality of your work depends on correct data!

▷ 5 **Boom Cal:**   _____ Boom1 Cal
      Width of swath in INCHES
      Example: a 60 Ft Swath = 720 In   _____ Boom 2 Cal
      You MUST enter a # for each boom.
      If you have only 1 boom, enter 0 (zero) in   _____ Boom 3 Cal
      Boom 2 and Boom 3

▷ 6 **Speed Cal:**   _____
      Raven Radar—598
      Phoenix 10 Speed Sensor—785
      This number will have to be calibrated if
      Using wheel drive speed sensors

     Meter Cal: _____
      Value is stamped on a tag attached to
      Your flow meter. Make a record of this #!

▷ 7 **Valve Cal:** _____
    Based on VALVE TYPE:
    Select value above (2123 or 743 or 43)

▷ 8 **Rate Cal:** _____ Rate Cal 1
    Desired Gallons per acre

    Desired Gallons per acre _____ Rate Cal 2
    (If a different second rate is not being used,
    enter the same value as entered for rate 1)
    Rate 2 should be within + or—20% of rate 1

With these selections you are now ready to enter the data into your console.

If you make an entry or selection error during the first 6 steps, turn the POWER ON/OFF switch to the OFF position, depress the CE button and hold it down while turning the POWER ON/OFF switch to the ON position.

This will reset the console

Console Identification

There may be situations that arise during which it may be necessary to contact Raven Industries with questions about the SCS 440 system. The SCS 440 console has an identification label affixed that contains information useful to the Raven customer support team to identify potential issues with the console or system. Please refer to this information on the console when calling to request assistance.

FIGURE 1. **Identification Label**

Indicates the Raven part number. This number would be needed to order a replacement console.

Indicates the identification number unique to the console. Used to identify when the console was manufactured and to track the console if it is sent back for repair.

Indicates the revision level of the console.
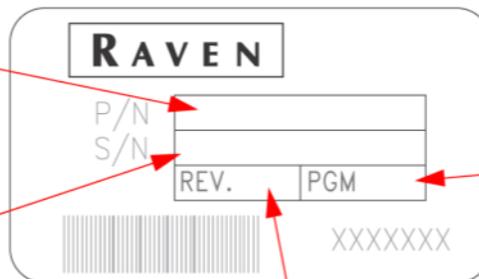
Indicates the firmware version that was loaded on the machine at the time it was manufactured.
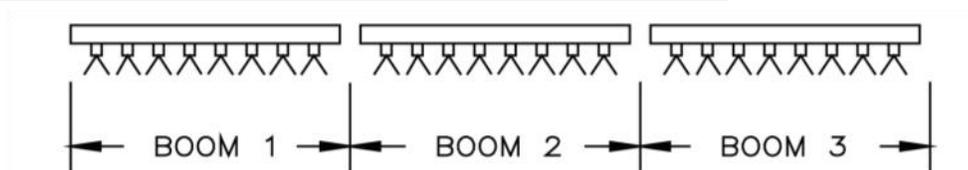
Determining YOUR Data

Calculate the Boom Cal Value

Broadcast Spraying

Calculate the Boom Cal value in inches [cm] by multiplying the number of tips by the spacing between the tips. Be sure to write down these figures for future reference when programming the console.

FIGURE 1. **Boom Sections**

Band Spraying

Calculate the Boom Cal value in inches [cm] by multiplying the number of tips by the spacing between the tips. Calculate the Adjusted Applied Rate by multiplying the Broadcast Rate by the Band Width in inches [cm], then divide by the spacing in inches [cm].

For Example:

Broadcast Rate	=	20 GPA [200 lit/ha]
Spacing	=	40 inches [100 cm]
Band Width	=	14 inches [40 cm]

$$\frac{GPA \times Band\ Width}{Spacing} = Adjusted\ Applied\ Rate$$

$$\frac{20 \times 14}{40} = 7\ GPA$$

Determining YOUR Data

Calculate the Speed Cal Value

Raven Radar Only

The initial Speed Cal value for Raven radar is 598 [152]. After the initial console programming has been performed, this value may be adjusted to optimize the system's performance.

Phoenix 10 Speed Sensors Only

The initial Speed Cal value for Phoenix 10 speed sensors is 785 [200]. After the initial console programming has been performed, this value may be adjusted to optimize the system's performance.

Wheel Drive Speed Sensors Only

Important: *This procedure should be performed only after the entire system installation is complete. This procedure is critical to the console's performance, so measure carefully. This procedure should be performed on the same soil conditions in which you will be spraying, since wheel circumference varies in soft soil versus hard-packed soil.*

FIGURE 2. **Speed Cal Value Calculation**
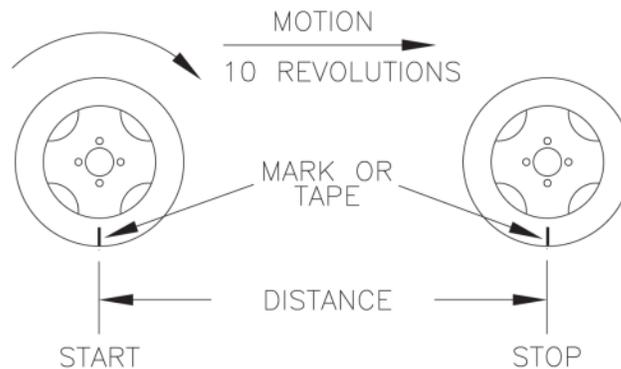
1. Place a chalk mark or tape on the tire on which the speed sensor is mounted.
2. Mark the spot on the ground directly below the chalk mark or tape.
3. Drive the machine straight ahead, counting 10 full rotations of the wheel.

Important: *The mark must stop at the same position (with the chalk mark or tape perpendicular to the ground at the bottom of the tire) as before it was before the measurement began.*

4. Measure the distance (in inches/cm) from the ground starting mark to the stopping mark. Round off fractions of an inch/cm.
5. Write down this number as it will be used as the Speed Cal value when programming the console.

Note: *Large tires and very low speed applications may require additional magnets to ensure accurate speed readings. Any even number of magnets may be used as long as they alternate in color and are equally spaced. After calculating the Speed Cal value, the number must be adjusted according to the actual number of magnets used.*

For Example:

$$\frac{\text{Normal Number of Magnets}}{\text{Actual Number of Magnets}} \quad \times \quad \text{Calculated Speed Cal} \quad = \quad \text{Adjusted Speed Cal}$$

$$\frac{4}{6} \quad \times \quad 1200 \quad = \quad 800$$

Determining YOUR Data

Calculate the Valve Cal Value

The Valve Cal figure is used to control the response time of the control valve motor to the change in the vehicle's speed. After operating the system, this number may be refined. The initial recommended control valve values are:

- C-SD (standard valve) = 2123
- C-FC (fast-close valve) = 743
- C-F (fast valve) = 743
- C-P (PWM valve) = 43
- C-PC (PWM close valve) = 43

FIGURE 3. **Valve Calibration Definitions**
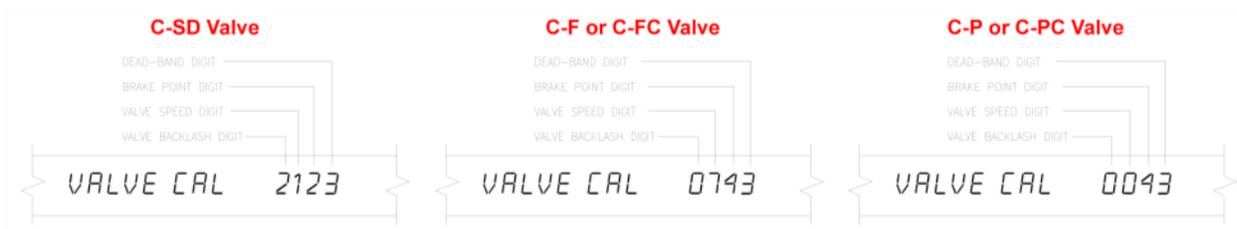
Digit	Description	Range	Range Definition
Valve Backlash	Controls the time of the first correction pulse after a change in correction direction is detected (INC to DEC, or DEC to INC)	1 - 9	1 = Short Pulse 9 = Long Pulse
Valve Speed	Controls the response time of the control valve motor. **Caution: Running the control valve too fast will cause the system to oscillate.**	Refer to specific valve	Refer to specific valve
	C-SD Valve	1 - 9	1 = Slow 9 = Fast
	C-F and C-FC Valve	0 - 9	0 = Fast 9 = Slow
	C-P and C-PC Valve	0 - 9	0 = Slow 9 = Fast
Brake Point	Sets the percentage away from target rate at which the control valve motor begins turning at a lower rate.	0 - 9	0 = 5% 1 = 10% 9 = 90%
Dead Band	Allowable difference between the target and actual application rate, where rate correction is not performed.	1 - 9	1 = 1% 9 = 9%

Determining YOUR Data

Calculate the Rate 1 and Rate 2 Cal Values

Determine the application rate at which the chemical is to be sprayed, and then consult with your Raven dealer to verify that the spray nozzles are capable of applying at that rate. To determine which spray nozzles to use with the sprayer, the following information must be known:

Nominal Application Pressure	_____ PSI (kpa)
Target Application Rate	_____ GPA (lit/ha)
Target Speed	_____ MPH (km/h)
Nozzle Spacing	_____ inches (cm)

With this information, calculate the volume per minute, per nozzle using the following formula:

$$\frac{\text{GPA (lit/ha)} \times \text{MPH (km/h)} \times \text{inches (cm)}}{5{,}940 \ [60{,}000]} = \text{GPM (lit/min)}$$

Refer to the following chart to determine which nozzle to use based on the desired output.

TIP COLOR	TIP NO. 80 DEG.	TIP NO. 110 DEG.	LIQUID PRESSURE IN PSI	CAPACITY 1 NOZZLE IN GPM	CAPACITY 1 NOZZLE IN OZ/MIN	GALLONS PER ACRE 5 MPH	6 MPH	7 MPH	8 MPH
YELLOW	XR8002	XR11002	15	.12	15	7.3	6.1	5.2	4.5
			20	.14	18	8.4	7.0	6.0	5.3
			30	.17	22	10.3	8.6	7.4	6.4
			40	.20	26	11.9	9.9	8.5	7.4
			60	.25	32	14.6	12.1	10.4	9.1
BLUE	XR8003	XR11003	15	.18	23	10.9	9.1	7.8	6.8
			20	.21	27	12.6	10.5	9.0	7.9
			30	.26	33	15.4	12.9	11.0	9.7
			40	.30	38	17.8	14.9	12.7	11.1
			60	.37	47	22.0	18.2	15.6	13.6
RED	XR8004	XR11004	15	.24	31	14.5	12.1	10.4	9.1
			20	.28	36	16.8	14.0	12.0	10.5
			30	.35	45	21.0	17.2	14.7	12.9
			40	.40	51	24.0	19.8	17.0	14.9
			60	.49	63	29.0	24.0	21.0	18.2
BROWN	XR8005	XR11005	15	.31	40	18.2	15.2	13.0	11.4
			20	.35	45	21.0	17.5	15.0	13.1
			30	.43	55	26.0	21.0	18.4	16.1
			40	.50	64	30.0	25.0	21.0	18.6
			60	.61	78	36.0	30.0	26.0	23.0

For Example:

|		
Nominal Application Pressure	30	PSI (kpa)
Target Application Rate	20	GPA (lit/ha)
Target Speed	5.2	MPH (km/h)
Nozzle Spacing	20	inches (cm)

$$\frac{20 \text{ GPA} \times 5.2 \text{ MPH} \times 20 \text{ inches}}{5{,}940} = .35 \text{ GPM}$$

Based on these calculations and a PSI of 30, tip XR8004 should be selected since it comes closest to providing the desired output.
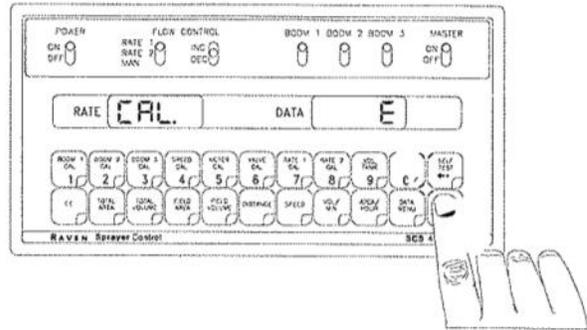
SCS 440 Console Programming

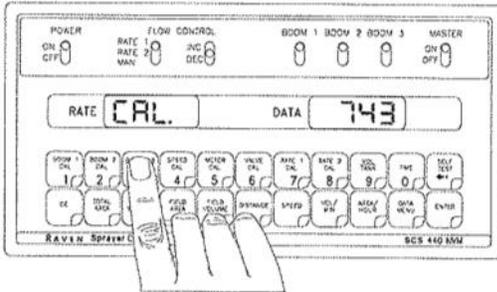When entering data into the Console, the entry sequence is always the same.

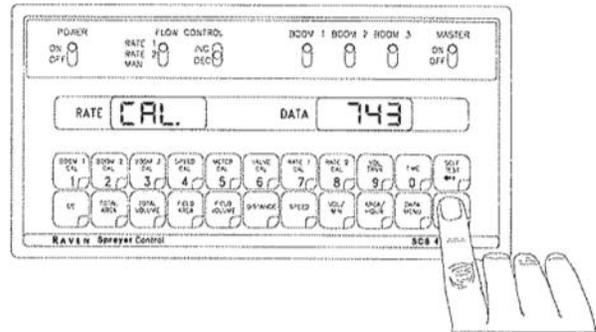**NOTE:** DATA MUST BE ENTERED INTO KEYS 1 THRU 8.
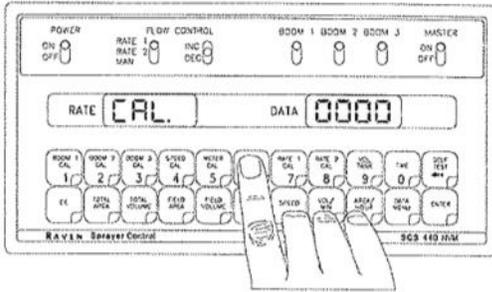
Depress the key in which you wish to enter data.

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. "7","4","3"). The numbers will be displayed as they are entered.

Complete the entry by again depressing the ENTER key.

SCS 440 Console Programming

1. INITIAL CONSOLE PROGRAMMING

When Console power is turned on, after all installation procedures have been completed, the Console will flash "CAL" in the RATE display. This means the console must be "calibrated", or programed, before it can be operated. This is a one-time operation which does not have to be repeated. Turning OFF the POWER ON/OFF switch does not affect the Console memory. All data is retained.

> *IMPORTANT:* If an entry selection error is made during Steps 1-6, place the POWER ON/OFF switch to OFF. Depress [CE] and hold while placing the POWER ON/OFF switch to ON. This will "reset" the Console.

The DATA display will show "US", and the RATE display will show "CAL". The following Steps must be followed:

1) Display US (acres), SI [hectares], or TU {1000 sq. ft.}.

    a)   Depressing momentarily [CE] steps the DATA display from US to SI.

    b)   Depressing momentarily [CE] steps the DATA display from SI to TU.

    c)   Depressing momentarily [CE] steps the DATA display from TU to US.

2) Selecting US, SI, or TU.

    a)   To select US, SI, or TU, step [CE] until the desired code is displayed.

    b)   Momentarily depress [ENTER], the DATA display will now display SP1.

3) Display SP1 (wheel drives, etc.) or SP2 (radar sensor).

    a)   Depressing momentarily [CE] steps the DATA display from SP1 to SP2.

    b)   Depressing momentarily [CE] steps the DATA display from SP2 to SP1.

4) Selecting SP1 or SP2.

    a)   To select SP1 or SP2, step [CE] until desired code is displayed.

    b)   Momentarily depress [ENTER], the DATA display will now display C-Sd.

SCS 440 Console Programming

5) Display C-Sd (Standard Valve) or C-FC (Fast Close Valve).

   a) Depressing momentarily [CE] steps the DATA display from C-Sd to C-FC.

   b) Depressing momentarily [CE] steps the DATA display from C-FC to C-Sd.

6) Selecting C-Sd or C-FC.

   a) To select C-Sd or C-FC, step [CE] until desired code is displayed.

   b) Momentarily depress [ENTER], the DATA display will now display "0".

7) Enter width in inches [cm] of BOOM 1 in the [BOOM 1 CAL 1].

8) Enter width in inches [cm] of BOOM 2 in [BOOM 2 CAL 2].

   If there is only one boom, enter a "0" for width of BOOM 2.

9) Enter width in inches [cm] of BOOM 3 in [BOOM 3 CAL 3].

   If there is only one or two booms, enter a "0" for width of BOOM 3.

10) Enter SPEED CAL calibration number in [SPEED CAL 4].

11) Enter the METER CAL calibration number in [METER CAL 5].

12) Enter VALVE CAL calibration number (2123 or 743) in [VALVE CAL 6].

13) Enter the target RATE 1 (GPA) [lit/ha] {GPK} in [RATE 1 CAL 7].

14) Enter the target RATE 2 (GPA) [lit/ha] {GPK} in [RATE 2 CAL 8].

   (If a second rate is not used, enter the same rate as RATE 1 CAL).

> **NOTE:** RATE 2 should not be more than 20% different from RATE 1 or else spray pattern may suffer.

PROGRAMMING THE CONSOLE IS NOW COMPLETED.

The flashing "CAL" will now extinguish. If not, repeat procedure starting at Step 7.

NCI keeps records for each spreader or sprayer manufactured.

- These records are stored by serial number and will have complete information on your equipment as built.
- It will not reflect any changes made by the purchaser or other alterations.
- There may be differences in replacement part numbers due to technical improvements or changes in vendors / vendor supplies.

Before you call NCI for technical assistance, know the serial number from your equipment located on the left side rail on the unit.

1-800-241-1350