

SCS 4600

by **R A V E N**

Operators Manual

NOTICE

The use of the 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. Excessive wear can affect accuracy.

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

WARNING

Disconnect console before jump starting, charging, or welding on equipment.

CALIBRATION REFERENCE SHEET

(Record Cal Values for future reference or contacting service technician)

Circle Settings Selected

| | | | | | |
|---------------------|----------------------|------------------------|----------------------------|-----------------------|-----------------|
| UNITS | US (ACRES) | SI (HECTARES) | TURF (1000 SQUARE FEET) | | |
| SPEED SENSOR | SP1 (WHEEL SPEED) | SP2 (RADAR) | | | |
| CONTROL | LIQUID | GRAN 1 (SINGLE BED) | GRAN 2 (SPLIT BED) | GRAN 3 (DUAL FLOW) | |
| VALVE | STANDARD VALVE | FAST VALVE | FAST CLOSE VALVE | PWM VALVE | PWM CLOSE VALVE |

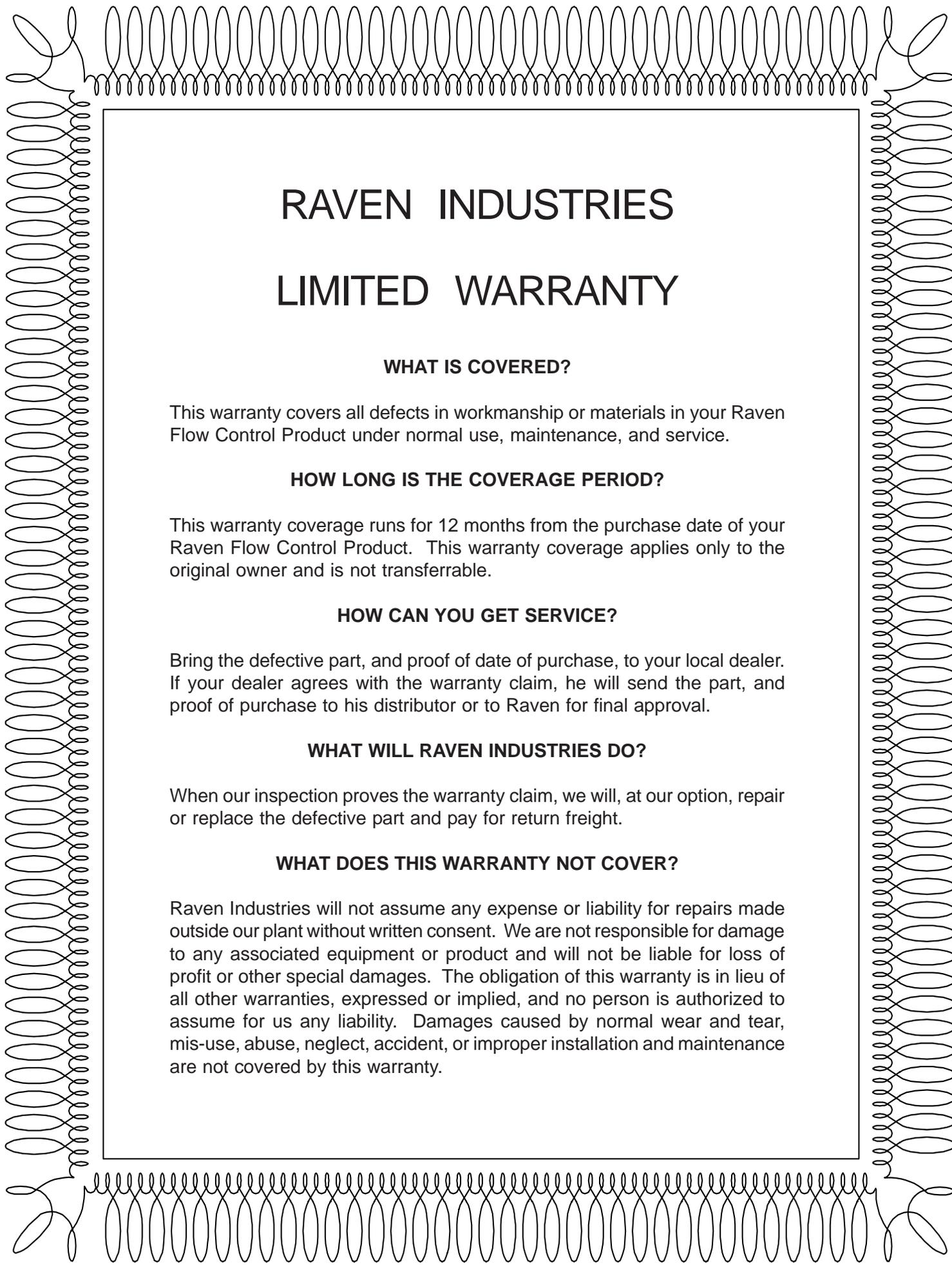
| | | | |
|--------------------|------------------|-----------------------|---------------------------|
| BOOM WIDTHS | METER CAL | RATE CAL | |
| 1 _____ | 1 _____ | 1 _____ | |
| 2 _____ | 2 _____ | 2 _____ | |
| 3 _____ | 3 _____ | 3 _____ | |
| 4 _____ | | | |
| 5 _____ | VALVE CAL | VOLUME IN TANK | SPEED CAL _____ |
| 6 _____ | | | |
| 7 _____ | | | |
| 8 _____ | 1 _____ | 1 _____ | |
| 9 _____ | 2 _____ | 2 _____ | |
| 10 _____ | 3 _____ | 3 _____ | |

DATA ENTRY EXAMPLE: TO ENTER VALVE CAL

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

(EXAMPLE: KEYS     FOR 2123)

4. PRESS ENTER KEY AGAIN.

A decorative border resembling a spiral notebook, with a series of overlapping loops forming a frame around the text.

RAVEN INDUSTRIES

LIMITED WARRANTY

WHAT IS COVERED?

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

HOW LONG IS THE COVERAGE PERIOD?

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

HOW CAN YOU GET SERVICE?

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

WHAT WILL RAVEN INDUSTRIES DO?

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

WHAT DOES THIS WARRANTY NOT COVER?

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



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SYMBOL DEFINITION

| | | | |
|---------|-----------------------------|------|----------------------------|
| GPM | - Gallons per minute | PPK | - Pounds per 1,000 sq. ft. |
| lit/min | - Liters per minute | mm | - Millimeters |
| dl/min | - Deciliter per minute | cm | - Centimeters |
| PSI | - Pounds per square inch | dm | - Decimeters |
| kPa | - Kilopascal | m | - Meter |
| GPA | - Gallon per acre | MPH | - Miles per hour |
| lit/ha | - Liter per hectare | km | - Kilometers |
| ml/ha | - Milliliter per hectare | km/h | - Kilometers per hour |
| GPK | - Gallons per 1,000 sq. ft. | US | - Volume per acre |
| PPM | - Pounds per minute | SI | - Volume per hectare |
| kg/min | - Kilograms per minute | TU | - Volume per 1,000 sq. ft. |
| PPA | - Pounds per acre | [] | - Metric numbers |
| kg/ha | - Kilograms per hectare | {} | - 1,000 sq. ft. numbers |

METER CAL CONVERSIONS

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

FOR EXAMPLE:

Original METER CAL No. = METER CAL No. for displays in Fluid Ounces
128

Original METER CAL No. = METER CAL No. for displays in Liters
3.785

Original METER CAL No. = METER CAL No. for displays in Pounds
Weight of one gallon

LIQUID CONVERSIONS

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

LENGTH

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

PRESSURE

1 psi = 6.89 kPa
1 kPa = 0.145 psi

DRY CONVERSIONS

Pounds x 2.2 = Kilograms
Kilograms x .455 = Pounds

AREA

1 square meter = 10.764 square feet
1 hectare (ha) = 2.471 acres; 10,000 square meters
1 acre = 0.405 hectare; 43,560 square feet
1 square mile = 640 acres; 258.9 hectares

VOLUME

1 cubic meter = 1000 liters
1 cubic centimeter = 1 milliliter

INTRODUCTION

The Raven SCS 4600 (SPRAYER CONTROL SYSTEM) is designed to improve the uniformity of sprayer/spreader applications. Its performance relies on the installation and preventive maintenance of the complete sprayer. It is important that this Installation and Service Manual be reviewed thoroughly before operating the system. This manual provides a simple step-by-step procedure for installing and operating.

The SCS 4600 system consists of a computer-based control Console, a Speed Sensor, a turbine type Flow Meter or Encoder, a motorized or hydraulic Control Valve, and appropriate cabling. The Console mounts directly in the cab of the vehicle for easy operator use. The Radar Speed Sensor is mounted to the frame of the vehicle or implement (other speed sensors are also available). For liquid applications, the motorized Control Valve and Flow Meter mount to the framework supporting the boom. Injection modules (if applicable) mount to the framework of the sprayer with the In-line Mixer mounted just before the Boom On/Off Valves. For granular applications, the Hydraulic Control Valve mounts to the framework of the vehicle and the Encoder mounts to the conveyor drive shaft. Appropriate cabling is required for field installation.

The operator sets the target application rate to be applied and the SCS 4600 automatically maintains the application rate regardless of vehicle speed or gear selection. A manual override switch allows the operator to manually control application for system check-out and spot spraying. Actual volume per area or weight per area being applied is displayed at all times. The SCS 4600 additionally functions as an area monitor, speed monitor, and volume totalizer.

The SCS 4600 in conjunction with a DGPS receiver, has the additional capability to record valuable application data. This information is recorded in different formats to best fit the users needs. The data is transferred via a CF Card (Compact Flash) to an office computer.

This manual is divided into three sections. Section 1 contains information for setting up the control console for Liquid or Granular Applications. Section 2 contains information specific to Granular Applications. Section 3 provides an overview of Controller Area Network, or CAN, Applications.

NOTE: The SCS 4600 control system is designed to be used with external boom switches. In order for the system to know when and which boom is ON or OFF, boom signal wires are provided.

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SECTION 1

LIQUID AND GRANULAR APPLICATIONS

INSTALLATION

1. MOUNTING THE FLOW METER AND OPTIONAL PRESSURE TRANSDUCER (LIQUID APPLICATIONS)

FLOWMETER

- 1) Mount Flow Meter in the area of the boom valves per Figure 1. All flow through Flow Meter must go to booms only, i.e., no return line to tank or pump after Flow Meter.
- 2) Mount Flow Meter horizontal to the ground. Use the bracket to secure the Flow Meter.
- 3) For best results, allow a minimum of 7 1/2 inches [20 cm] of straight hose on inlet of Flow Meter. Bend radius of hose on outlet of Flow Meter should be gradual.
- 4) Flow must be in direction of arrow on Flow Meter.

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

OPTIONAL PRESSURE TRANSDUCER

- 1) Mount optional pressure transducer, Raven P/N 422-0000-059, on desired location. Use appropriate cabling.
- 2) With pump turned off and 0 PSI [kPa] on the lines, enter 0 for pressure calibration (ENTER PSI[KPA]) under Data Menu Key.

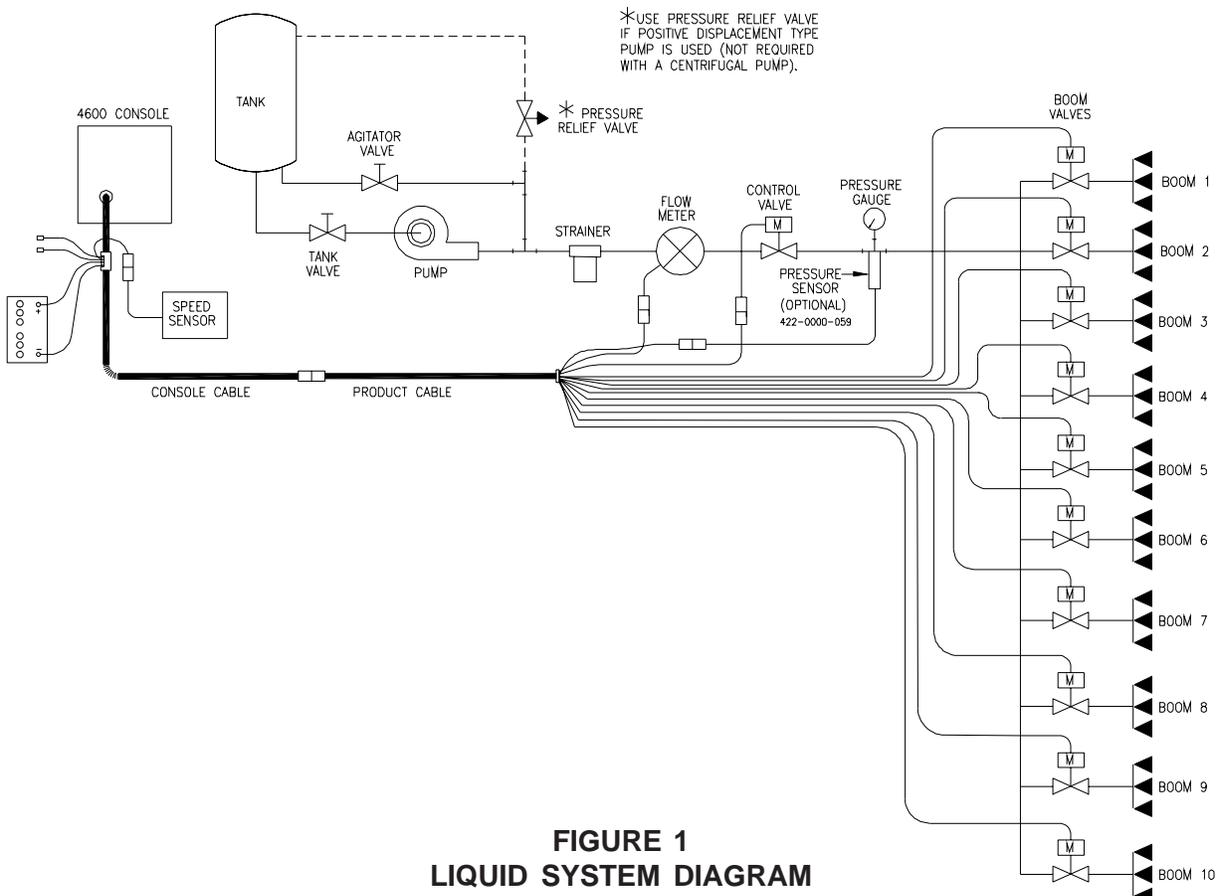


FIGURE 1
LIQUID SYSTEM DIAGRAM

2. MOUNTING THE CONTROL VALVE (LIQUID APPLICATIONS)

- 1) Mount the motorized Control Valve in the main hose line between the Flow Meter and the booms, with motor in the upright position. (For flow less than 3 GPM [11 lit/min], the motorized Control Valve is mounted in a by-pass line. Refer to Appendix 2 for alternate plumbing diagram).
- 2) Connect the Product Cable connectors to boom valves, Flow Meter, and motorized Control Valve (Reference Figure 1). NOTE: Black wire to boom valve #1, Brown wire to boom valve #2, Blue wire to boom valve #3, Black/White wire to boom valve #4, Brown/White wire to boom valve #5, Blue/Wht wire to boom valve #6, White/Black wire to boom valve #7, White/Brown wire to boom valve #8, White/Blue wire to boom valve #9 and Pink wire to boom valve #10.

3. MOUNTING THE CONSOLE AND CABLING

- 1) Mount the Console to a secure support inside the cab of the vehicle.
- 2) Connect the Adapter Cable to the plug in the back of the Console. (Reference Figure 2). Route the Adapter Cable to A-Post and terminate. (Flow Meter extension cables are available from your Dealer).

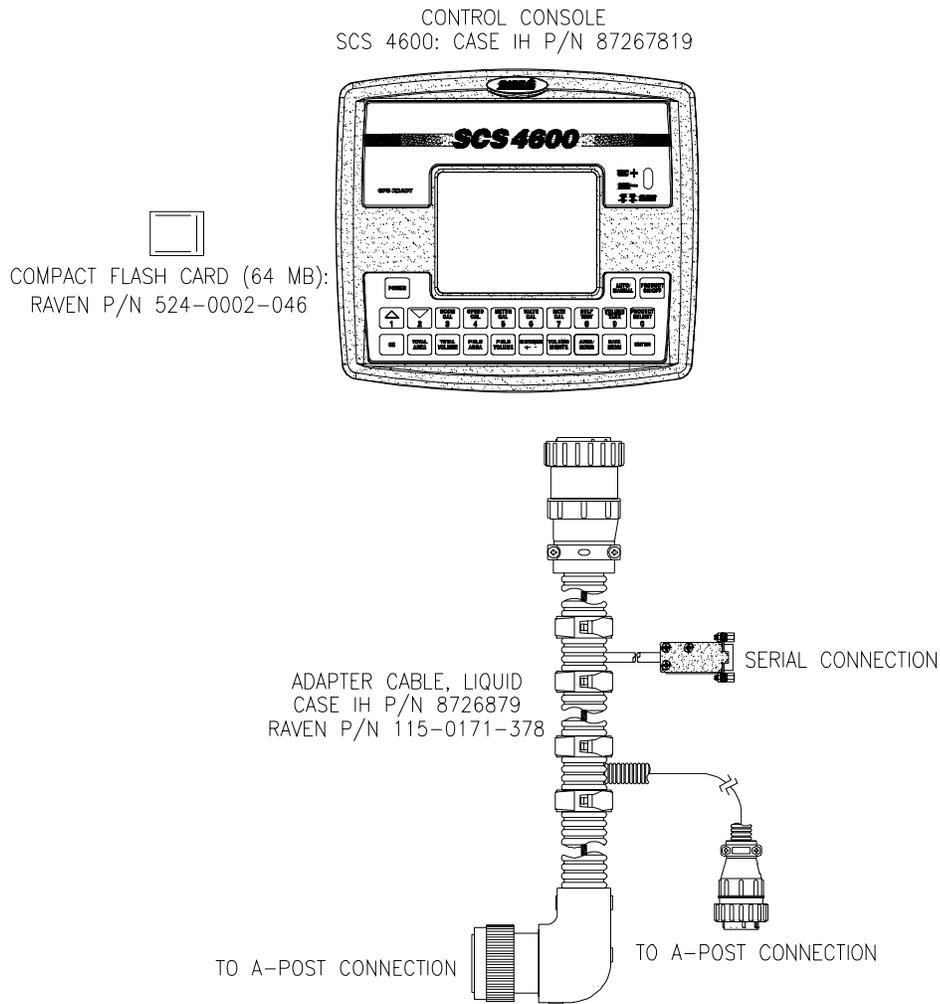


FIGURE 2
SCS 4600 LIQUID CABLING

- 3) Initial installation of the system is now complete.

BATTERY CONNECTIONS

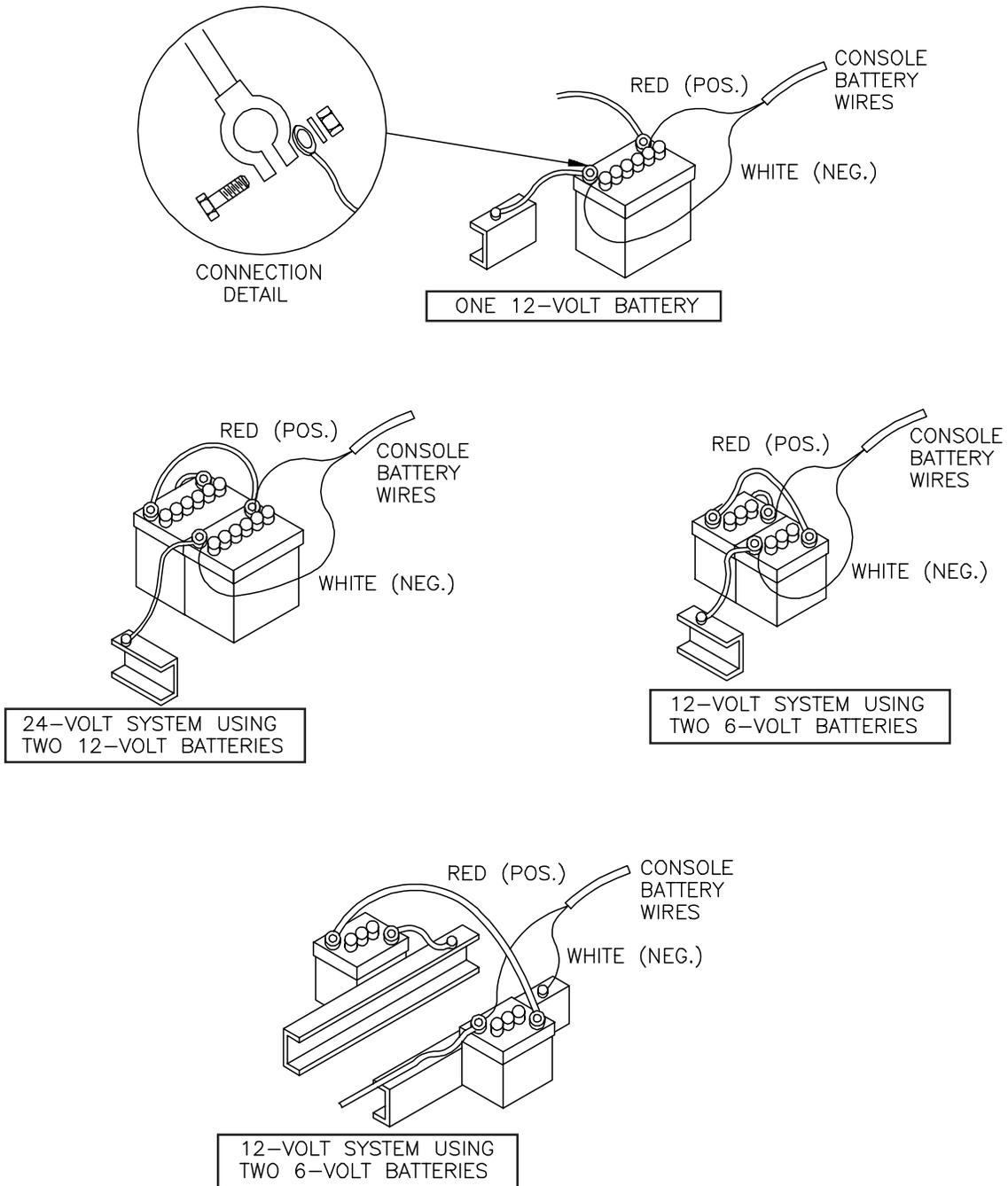
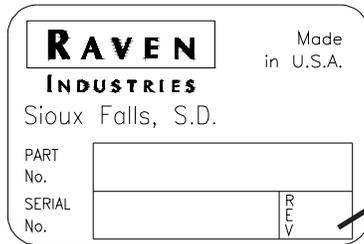


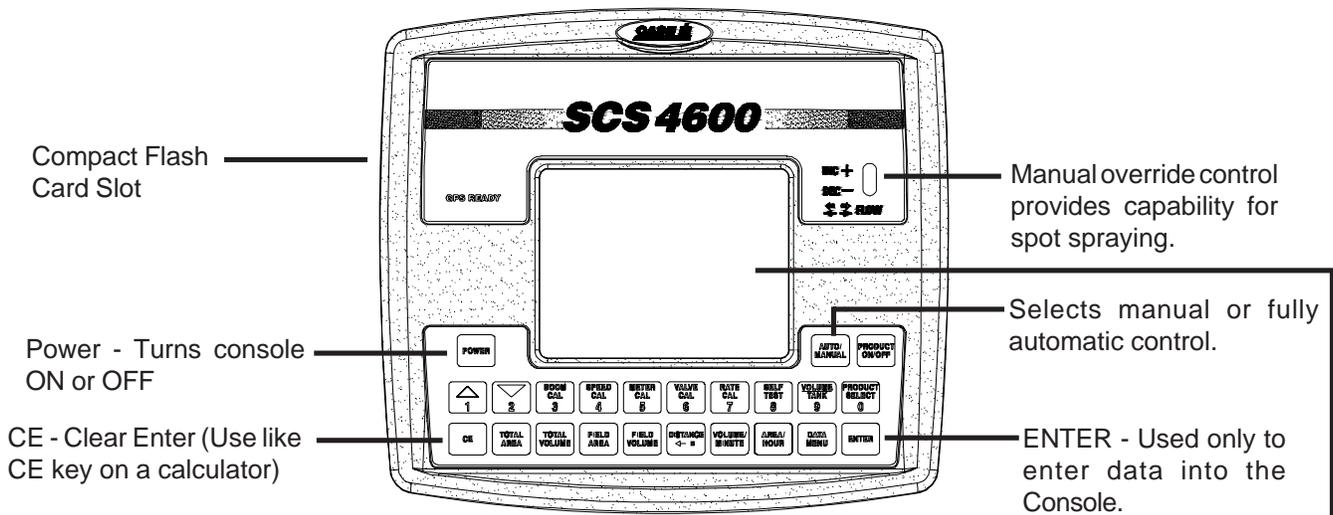
FIGURE 3

CONSOLE FEATURES

IMPORTANT: This Console requires selection of **US (VOLUME PER ACRE)**, **SI [VOLUME PER HECTARE]**, or **TU {1,000 SQ. FT.}** area; **LIQUID**, **GRAN 1 SINGLE**, **GRAN 2 SPLIT**, or **GRAN 3 DUAL FLOW**; **SP1 WHEEL DRIVE**, or **SP2 RADAR SPEED SENSOR**; and **AIM COMMAND**, **FAST VALVE**, **FAST CLOSE VALVE**, **PWM VALVE** or **PWM CLOSE VALVE**. Hold **SELF TEST** key to view selections. Depressing **SELF TEST** key for 12 seconds allows changing of selections without clearing out other calibration values.



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



Compact Flash Card Slot

Power - Turns console ON or OFF

CE - Clear Enter (Use like CE key on a calculator)

Manual override control provides capability for spot spraying.

Selects manual or fully automatic control.

ENTER - Used only to enter data into the Console.

Displays actual rate of application, speed, PSI, calibration and function data, control mode (AUTO or MAN), compact flash % used, and boom status.

CALIBRATION KEYS -- Used to enter data into the Console to calibrate the system.

- BOOM CAL -- Width of Booms
- SPEED CAL -- Determined by Speed Sensor
- METER CAL -- Meter Calibration Number
- VALVE CAL -- Valve Response Time
- RATE CAL -- Target Application Rate
- SELF TEST -- Simulates Vehicle Speed

FUNCTION KEYS -- Used to Display Data

- TOTAL AREA -- Total Area Applied
- TOTAL VOLUME -- Total Volume Applied
- FIELD AREA -- Field Area Applied
- FIELD VOLUME -- Volume Applied to Field
- DISTANCE -- Distance Traveled
- VOLUME/MINUTE -- Flow Rate
- AREA/HOUR -- Present Area per Hour
- DATA MENU -- Additional Features and Functions
- PRODUCT ON/OFF -- Toggles Product Control ON or OFF
- PRODUCT SELECT -- Selects active product for programming or manual control.

CONSOLE CALIBRATION

1. CALCULATING "BOOM CAL" (LIQUID APPLICATIONS)

1) Broadcast Spraying

Calculate the width of each boom in inches [cm] by multiplying the number of tips times the spacing. Write these boom widths down for future reference when programming the Console.

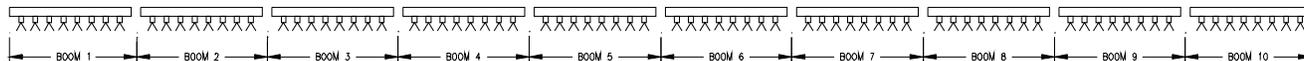


FIGURE 4

2) Band Spraying

Calculate the width of each boom in inches [cm] by multiplying the number of tips by the spacing. Calculate the Adjusted Applied Rate by multiplying the Broadcast Rate by Band Width in inches [cm] divided by Spacing in inches [cm].

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

$$\begin{aligned} \text{Adjusted Applied Rate} &= \frac{\text{GPA} \times \text{Band Width}}{\text{Spacing}} \\ &= \frac{20 \times 14}{40} = 7 \text{ GPA} \\ &= \frac{[200] \times [40]}{[100]} = [80 \text{ lit/ha}] \end{aligned}$$

2. CALCULATING "SPEED CAL"

Initial SPEED CAL is 598 [152] when using the Raven radar. Complete Steps 1 thru 6 to refine this number **after** "INITIAL CONSOLE PROGRAMMING" has been completed.

- 1) Set POWER switch to ON, all other switches to OFF.
- 2) Enter "0" in  .
- 3) Drive 1 mile [1 kilometer]. To achieve the most accurate calibration, accelerate and decelerate slowly.

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

- 4) Read DISTANCE by depressing  .

DISTANCE should read a value of approximately 5280 [1000]. If it reads between 5260-5300 [990-1010], the SPEED CAL for the vehicle is 598 [152]. If the DISTANCE display reads any other value, perform the following calculation:

EXAMPLE: Assume DISTANCE reads 5000 [980].

$$\text{Corrected SPEED CAL} = \frac{\text{Old SPEED CAL} \times 5280}{\text{DISTANCE}}$$

ENGLISH UNITS:
$$= \frac{598 \times 5280}{5000} = 631.48$$

METRIC UNITS:
$$= \frac{[152] \times [1000]}{[980]} = [155]$$

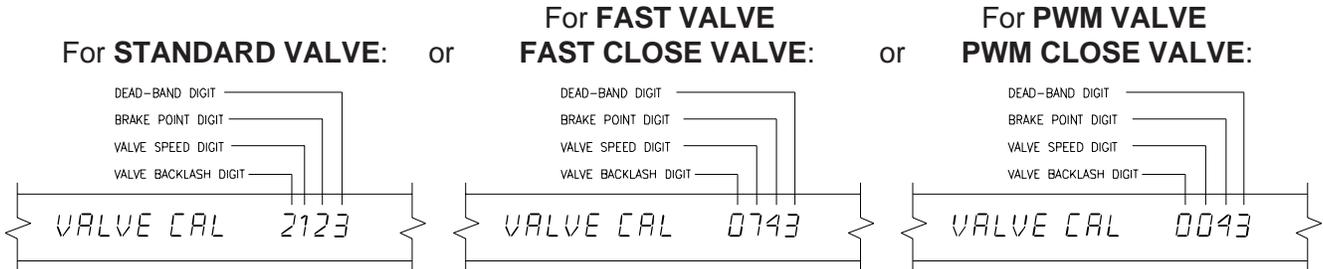
- 5) The number to enter for SPEED CAL is 631 [155].
- 6) Recheck the new SPEED CAL derived in Step 5 by repeating Steps 2 thru 4.

3. CALCULATING "METER CAL" (LIQUID APPLICATIONS)

The Flow Meter calibration number is stamped on the tag attached to each Flow Meter. Write down this number for future reference when programming the Console.

4. CALCULATING "VALVE CAL"

The initial recommended Control Valve calibration number for VALVE CAL is 2123 for Standard Valve, 743 for Fast Close Valve, 743 for Fast Valve, 43 for PWM Valve or 43 for PWM Close Valve. The VALVE CAL number is used to control response time of the control valve motor to the change in vehicle speed. After operating the system, this number may be refined. See definitions below:



Valve Backlash Digit

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

Range: 1 to 9

1-Short Pulse
9-Long Pulse

Valve Speed Digit

Controls response time of Control Valve motor.

CAUTION: Running the Control Valve too fast will cause the system to oscillate.

Standard Valve Control

Range: 1 to 9

1-Slow
9-Fast

Fast, Fast Close Valve Control

Range: 0 to 9

0-Fast
9-Slow

PWM, PWM Close Valve Control

Range: 0 to 9

0-Slow
9-Fast

Brake Point Digit

Sets the percent away from target rate at which the Control Valve motor begins turning at a slower rate, so as not to overshoot the desired rate.

Range: 0 to 9

0 = 5%
1 = 10%
9 = 90%

Dead-Band Digit

Allowable difference between target and actual application rate, where rate correction is not performed.

Range: 1 to 9

1 = 1%
9 = 9%

5. CALCULATING "RATE CAL" (LIQUID APPLICATIONS)

Determine the application rate at which chemical is to be sprayed. Consult with a dealer to ensure these spray nozzles are capable of applying at this rate. In determining which spray nozzles to use with the sprayer the following must be known:

- 1) Nominal Application Pressure _____ PSI [kpa]
- 2) Target Application Rate _____ GPA [lit/ha]
- 3) Target Speed _____ MPH [km/h]
- 4) Nozzle Spacing _____ inches [cm]

From this information, calculate the volume per minute, per nozzle as follows:

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

- EXAMPLE:**
- 1) Application Pressure = 30 PSI
 - 2) Target Application Rate = 20 GPA
 - 3) Target Speed = 5.2 MPH
 - 4) Nozzle Spacing = 20 inches

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

Using GPM .35 and pressure 30 select tip number XR8004 from the chart below, since it comes closest to providing the desired output.

| TIP COLOR | TIP NO. | | LIQUID PRESSURE IN PSI | CAPACITY 1 NOZZLE IN GPM | CAPACITY 1 NOZZLE IN OZ/MIN | GALLONS PER ACRE 20" SPACING | | | |
|-----------|---------|----------|------------------------|--------------------------|-----------------------------|------------------------------|-------|-------|-------|
| | 80 DEG. | 110 DEG. | | | | 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 |

VERIFYING FLOW RATE LIMITS:

The flow rate of spraying must be within the range of that specified for the Flow Meter included.

FLOW METER MODEL

RFM 5
RFM 15
RFM 60P
RFM 100
RFM 200/200 Poly
RFM 400

FLOW RANGE

0.05-5 GPM [0.2-18.9 lit/min]
0.3-15 GPM [1.1-56.8 lit/min]
1-60 GPM [3.8-210 lit/min]
3-100 GPM [11.4-380 lit/min]
15-200 GPM [56.8-760 lit/min]
25-400 GPM [94.6-1515 lit/min]

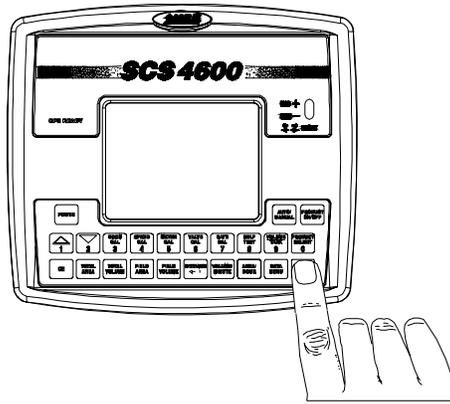
CONSOLE PROGRAMMING

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

NOTE: DATA MUST BE ENTERED INTO KEYS 3 THRU 7.



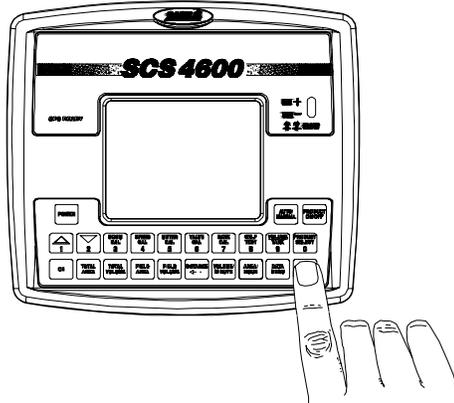
Depress the key in which you wish to enter data.



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



Depress the keys corresponding to the number you wish to enter (i.e. "2", "1", "2", "3"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

1. INITIAL CONSOLE PROGRAMMING

When Console power is turned on, after all installation procedures have been completed, the Console will flash CAL and display ACRE US. This means the console must be "calibrated", or programmed, 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.

NOTE: If an entry selection error is made during steps 1-6, turn console power OFF.

Depress  and hold while turning console power ON.

Display will show Initial Contrast Adjustment. Use key  to lighten or key  to darken contrast.

Press  when done.

- 1) Display ACRE-US, HECTARE-SI, or TURF-SQ FEET.
 - a) Depressing momentarily  steps the display from ACRE-US to HECTARE-SI.
 - b) Depressing momentarily  steps the display from HECTARE-SI to TURF-SQ FEET.
 - c) Depressing momentarily  steps the display from TURF-SQ FEET to ACRE-US.
- 2) Selecting ACRE, HECTARE, or TURF
 - a) To select ACRE, HECTARE, or TURF, step  until the desired code is displayed.
 - b) Momentarily depress , the display will now display LIQUID.
- 3) Display LIQUID (liquid sprayer), GRAN 1 (single belt bed), GRAN 2 (split belt bed) or GRAN 3 (split belt bed, dual encoders).
 - a) Depressing momentarily  steps the display from LIQUID to GRAN 1.
 - b) Depressing momentarily  steps the display from GRAN 1 to GRAN 2.
 - c) Depressing momentarily  steps the display from GRAN 2 to GRAN 3.
 - d) Depressing momentarily  steps the display from GRAN 3 to LIQUID.
- 4) Selecting LIQUID, GRAN 1, GRAN 2, or GRAN 3.
 - a) To select product control, step  until desired code is displayed.
 - b) Momentarily depress , the display will now display STD VALVE.
- 5) Display AIM COMMAND, FAST VALVE, FST CLS VALVE, PWM VALVE, or PWM CLS VALVE.
 - a) Depressing momentarily  steps the display from AIM COMMAND to FAST VALVE.
 - b) Depressing momentarily  steps the display from FAST VALVE to FST CLS VALVE.
 - c) Depressing momentarily  steps the display from FST CLS VALVE to PWM VALVE.
 - d) Depressing momentarily  steps the display from PWM VALVE to PWM CLS VALVE.
 - e) Depressing momentarily  steps the display from PWM CLS VALVE to AIM COMMAND.

- 6) Selecting AIM COMMAND, FAST VALVE, FST CLS VALVE, PWM VALVE or PWM CLS VALVE.
 - a) To select AIM COMMAND, FAST VALVE, FST CLS VALVE, PWM VALVE or PWM CLS VALVE, step  until desired code is displayed.
 - b) Momentarily depress , the display will now display METER CAL (liquid mode) or SPREADER CONSTANT (granular mode).
 - 7) For Liquid applications, enter METER CAL calibration number. For Granular applications, enter SPREADER CONSTANT and PRODUCT DENSITY or METER CAL. Use  to toggle between Spreader Constant and Product Density/Meter Cal.
 - 8) Enter appropriate VALVE CAL calibration number (2123, 743, or 43).
 - 9) Enter the target RATE CAL (GPA) [lit/ha] {GPK}.
 - 10) Repeat steps 3-9 for multiple products. Active product will be highlighted.
 - 11) Display WHEEL-SP1 or RADAR-SP2.
 - a) Depressing momentarily  steps the display from WHEEL-SP1 to RADAR-SP2.
 - b) Depressing momentarily  steps the display from RADAR-SP2 to WHEEL-SP1.
 - 12) Selecting WHEEL-SP1 or RADAR-SP2.
 - a) To select WHEEL-SP1 or RADAR-SP2, step  until desired code is displayed.
 - b) Momentarily depress , the display will now display SPEED CAL.
 - 13) Enter SPEED CAL calibration number.
 - 14) Enter BOOM CAL calibration numbers. Definition of Boom Calibration Keys.
 -  Depressing this key displays selected boom number in display. **EXAMPLE:** Boom 1 will be displayed as BOOM 1 CAL.
 -  Depressing this key after selecting BOOM CAL changes the boom number. **EXAMPLE:** BOOM 1 CAL 0 to BOOM 2 CAL 0.
 -  Depressing this key after selecting BOOM CAL changes the boom number. **EXAMPLE:** BOOM 2 CAL 0 to BOOM 1 CAL 0.
- Enter Boom Data:
- a) Select Boom 1 CAL.
 - b) Use boom width as calculated under "CALCULATING BOOM CAL".
 - c) If a boom is not needed, enter a "0" for the length.

PROGRAMMING THE CONSOLE IS NOW COMPLETED.

The flashing "CAL" will now extinguish. After the console is programmed, if there is a need to change initial console programming (working units, control selection, valve driver, or speed sensor) hold  for 12 seconds. The display will show the current program setting. Press  to switch to the desired selection. Press  to complete entry. Repeat procedure as necessary for speed (WHEEL-SP1, RADAR-SP2), product type (LIQUID, GRAN 1, GRAN 2, or GRAN 3) and valve driver selections (AIM COMMAND, FAST VALVE, FST CLS VALVE, PWM VALVE, or PWM CLS VALVE).

ENTERING ADDITIONAL DATA:

Data may be entered in  although it is not required for the operation of the system.

- 1) ENTERING VOLUME:
Entering the estimated VOLUME in the TANK in . Each time the tank is refilled, this number must be re-entered.

2) OTHER DISPLAY FEATURES

- 1) To display TOTAL AREA covered, momentarily depress .
To "zero out" this total at any time, enter a "0" in this key.
- 2) To display TOTAL VOLUME applied, momentarily depress .
To "zero out" this total at any time, enter a "0" in this key.
- 3) To display FIELD AREA covered, momentarily depress .
To "zero out" this total at any time, enter a "0" in this key.
- 4) To display FIELD VOLUME applied, momentarily depress .
To "zero out" this total at any time, enter a "0" in this key.
- 5) To display DISTANCE (feet) [meters] traveled, momentarily depress .
To "zero out" this total at any time, enter a "0" in this key.
- 6) To display VOL/MIN, momentarily depress .
- 7) To display Calibration Units, ACRE-US, HECTARE-SI, or TURF-SQ FEET; LIQUID, GRAN 1, GRAN 2, or GRAN 3; WHEEL-SP1 or RADAR-SP2; and AIM COMMAND, FAST VALVE, FST CLS VALVE, PWM VALVE or PWM CLOSE VALVE after being selected, hold . After 12 seconds, units can be recalibrated.

3. SELF TEST FEATURE

SELF-TEST allows speed simulation for testing the system while vehicle is not moving. Enter the simulated operating speed in . If 6 MPH [10 km/h] is desired, enter 6.0 [10.0]. Verify speed in lower left corner of display. The SELF-TEST speed will clear itself when motion of vehicle is detected by the Speed Sensor. A SPEED CAL value of 900 [230] or greater is recommended when operating in this mode.

NOTE: To prevent nuisance clearing of self-test speed, disconnect speed connector on Console Cable when Radar Speed Sensors are used.

4. DECIMAL SHIFT

The DECIMAL SHIFT feature is used to increase system accuracy at low application rates. Shifting of the decimal point is done during the entry of METER CAL/PRODUCT DENSITY. After entering METER CAL/PRODUCT DENSITY mode depress , the decimal shift, , enter the meter calibration constant number or product density, and depress . The sequence to unshift the decimals while in METER CAL/PRODUCT DENSITY is to enter the meter calibration constant number and depress . The following tables illustrate how shifting the decimal point can increase system accuracy.

| DECIMAL PLACE LOCATIONS IN LIQUID MODE* | | | | | | |
|---|---------|-------|---------|-------|---------|-------|
| | US | | METRIC | | TURF | |
| | UNSHIFT | SHIFT | UNSHIFT | SHIFT | UNSHIFT | SHIFT |
| RATE DISPLAY | 000.0 | 00.00 | 0000 | 000.0 | 00.00 | 00.00 |
| RATE CAL | 000.0 | 00.00 | 0000 | 000.0 | 00.00 | 00.00 |
| TANK VOLUME | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| TOTAL AREA | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| TOTAL VOLUME | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| FIELD AREA | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| FIELD VOLUME | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| VOL/MINUTE | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| AREA/HOUR | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| RATE +/- | 000.0 | 00.00 | 0000 | 000.0 | 00.00 | 00.00 |
| LOW TANK LEVEL | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| LOW VOL/MIN | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |

*When entering RATE CAL, remember that 2 GPA [20 lit/ha] is entered as 2.0 [20.0] when unshifted and 2.00 [20.00] when shifted.

| DECIMAL PLACE LOCATIONS** | | | | | | |
|----------------------------------|----------------|--------------|----------------|--------------|----------------|--------------|
| | US | | METRIC | | TURF | |
| | <i>UNSHIFT</i> | <i>SHIFT</i> | <i>UNSHIFT</i> | <i>SHIFT</i> | <i>UNSHIFT</i> | <i>SHIFT</i> |
| RATE DISPLAY | 00000 | 0000.0 | 00000 | 0000.0 | 0000.0 | 0000.0 |
| RATE CAL | 00000 | 0000.0 | 00000 | 0000.0 | 0000.0 | 0000.0 |
| TANK VOLUME | 000000 | 00000.0 | 000000 | 00000.0 | 00000.0 | 00000.0 |
| TOTAL AREA | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| TOTAL VOLUME | 000000 | 00000.0 | 000000 | 00000.0 | 00000.0 | 00000.0 |
| FIELD AREA | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| FIELD VOLUME | 000000 | 00000.0 | 000000 | 00000.0 | 00000.0 | 00000.0 |
| VOL/MINUTE | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| AREA/HOUR | 000.0 | 000.0 | 000.0 | 000.0 | 0000 | 0000 |
| RATE +/- | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| LOW TANK LEVEL | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |
| LOW VOL/MIN | 0000 | 000.0 | 0000 | 000.0 | 000.0 | 000.0 |

** When entering RATE CAL, remember that 200 PPA [kg/ha] is entered as 200 when unshifted and 200.0 when shifted.

5. DATAMENU

The following are brief descriptions of features available under the DATA MENU key. There are four submenus (Serial, Product, Console, and CAN) included in the Data Menu. To access

options under each category, use keys  and . To advance to the next category, press the  key. Use  to toggle selections or  to input data.

SUBMENU: SERIAL

| <u>DISPLAY</u> | <u>DESCRIPTION</u> |
|----------------------------|--|
| DATA LOGGER | Enables or disables data logging through serial port. Must have Trigger Value and unit selected to enable. |
| FIELD REFERENCE | Allows user to enter up to a four-digit number to represent a field. Field reference is included in field begin and field end pages and the data logger time/date string. |
| GPS BAUD RATE | Select between 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 baud for communicating with GPS receiver. |
| VARIABLE RATE CHANGE ALARM | Enable or disable audible and visual alarm upon a variable rate change. When ON, alarm sounds 4 long beeps when a rate calibration number is changed via the serial port using a valid change request data string. |
| TRIGGER VALUE | Used in data logging mode. The trigger determines how often data (See data communication string formats) is sent to the serial port. The trigger may be either in feet [meter] or seconds. Data Logger functions will not work until trigger value is nonzero. |
| TRIGGER UNITS | Used in data logging mode. The trigger unit is selectable between feet [meters] or seconds. |
| DATA DIRECTION | Select between Saving Data To Flashcard or Passing Data Through Com Port. |
| COM 1 STOP BITS | Select between one or two stop bits for communicating with GPS receiver. |
| DATALOG MODE | Select between logging GPS and Console Data (Master Switch Pauses Log) or GPS Data only (Continuous Log). |

SUBMENU: PRODUCT (PAGE 1)

| | |
|-------------|--|
| BOOM SELECT | This feature allows the user to assign specific booms to be used only with certain products. These products will only be enabled when the assigned booms are turned on. Note that the system plumbing must accommodate selections made for this feature. Once entering boom select mode, use the CE key to toggle between products and keys 1 through 0 to toggle the boom selection ON or OFF for Booms 1-10 respectively. The boom status display indicator will show the selected booms for the active product. All booms are initially selected ON for each product. Press ENTER to exit boom select mode. |
|-------------|--|

| <u>DISPLAY</u> | <u>DESCRIPTION</u> |
|-----------------------|---|
| OFF RATE % | Off Rate Alarm is enacted when actual application rate (volume/area) is off from the target rate by the specified percentage for more than 5 seconds. |
| PWM HIGH OFFSET | Used to set the maximum desired RPM or hydraulic output of Pulse Width Modulated control valve. To calibrate, place console in manual mode and turn boom and master switches ON. Hold INC/DEC switch to increase. If motor exceeds desired RPM, decrease number by 10 and push INC again. Repeat until motor runs at desired maximum RPM, then enter a number of 10 more. |
| PWM LOW OFFSET | Used to set the minimum desired RPM or hydraulic output (zero point of shut-off point) of Pulse Width Modulated control valve. To calibrate, place console in manual mode and turn boom and master switches ON. Hold INC/DEC switch to decrease until motor stops. Increase the number until motor runs, then enter a number of 10 less. Hold INC/DEC switch to decrease. If motor does not stop, lower offset number by 10 and repeat. |
| PWM FREQUENCY | Use to set the coil frequency of PWM valve (default is 122 Hz). |
| PRESET PWM OFFSET | When valve selection is programmed in PWM-Close mode, this can be set to provide an initial pulse width to the valve upon turning on booms or product. When programmed to zero, pulse width will return to previous state. When non-zero, initial pulse width can be selected between 1 (slow) and 255 (full scale). When programmed in PWM Valve mode, PWM output will not exceed this value if non-zero when booms are off. |
| RATE BUMP DELTA | Sets the increment at which rate cal is increased or decreased using INC/DEC switch while in AUTO operation. |
| LOW FLOW LIMIT | If actual Volume/Minute falls below assigned limit, Control Valve steps closing and Low Limit Alarm is enacted. This value is automatically proportioned to the percentage of booms that are ON. (i.e. if the entered low limit is 4 and half the total boom length is shut off, the console automatically reduces the low limit to 2). Low Limit Value is entered in GPM [lit/ha] or PPM [ka/ha]. |
| LOW TANK | When level in tank falls below assigned minimum level, low level alarm is enacted. Alarm stops when a value equal to or greater than the low tank value is entered into VOLUME/TANK or the booms are turned OFF. Entering "0" into Low Tank Level disables it. |
| VALVE DELAY | Set a time delay between when the booms are turned ON and when the Console begins to control the flow rate. A value ranging from 0.1-10.0 means a delay of 0.1-10.0 seconds respectively. A value of "0" means no delay. This delay is active if the time between turning OFF and turning ON the booms is less than 30 seconds. |
| VALVE CAL 2 | Can be used when programmed in PWM mode to fine tune valve control response. Helps control oscillations. Refer to appropriate CASE IH Applicator Manual for correct value. |

SUBMENU: PRODUCT (PAGE 2)

| <u>DISPLAY</u> | <u>DESCRIPTION</u> |
|---------------------------------|--|
| SPREADER CONSTANT | Not applicable in liquid mode. A value of zero should be used when applying liquid. See Granular Applications Section for calculating when in granular mode. Spreader constant can be entered during initial programming or through the DATA MENU. |
| PUMP CAL / FAN CAL | Set the number of pulses per revolution of the pump/fan for Pump/Fan RPM readout. |
| DUAL SENSOR ALARM % | For Liquid Chemical Injection applications, sets tolerance between flow switch monitor and flow readings before "FLOW SW" alarm is enacted. For Gran 3 applications, sets tolerance between dual encoder readings before "DUAL FLOW" alarm is enacted. (Boom Select feature must be set up for only booms being used.) Out of tolerance condition must be met for 5 seconds before alarm occurs. |
| VACUUM ALARM or BIN LEVEL ALARM | When controlling chemical injection, the vacuum alarm can be enabled or disabled. Disable when not controlling injection. For granular applications, bin level sensor can be enabled or disabled. Disable when bin level sensor is not present. |
| FLOW SWITCH ALARM | When controlling chemical injection, the flow switch alarm can be enabled or disabled. Disable when not controlling injection. |
| PRESSURE | Displays PSI [KPA] of pressure transducers. |
| BOOM PRESSURE | Used to calibrate Pressure Transducer #1. With pump turned off and 0 PSI [KPA] on the line, enter a Pressure 1 of 0. |
| SPARGE PRESSURE | Used to calibrate Pressure Transducer #2. With pump turned off and 0 PSI [KPA] on the line, enter a Pressure 2 of 0. |
| HIGH BOOM PRESSURE | If Boom PSI transducer (Pressure 1) is installed, sets the maximum pressure allowable for the boom. If maximum pressure is exceeded, control will be overridden and the control valve will be closed until a safe operating pressure is reached. Function is disabled if a value of "0" is entered. |
| PWM OUTPUT | Status of PWM Output (if applicable) can be monitored. Output will range from 0-255. A value of 0 indicates an OFF state. A value of 255 indicates the PWM valve is wide open. |

SUBMENU: CONSOLE

| | |
|---------------|--|
| CONTRAST | Press  to adjust LCD contrast. Press and hold  to lighten or  to darken. Press  again when complete. |
| AUDIBLE ALARM | Turn audible alarm ON or OFF. |

DISPLAY

DESCRIPTION

| | |
|--------------------|--|
| DISPLAY SMOOTHING | Turns display smoothing ON or OFF. Selecting display smoothing ON means the RATE displays target rate when actual rate is within 10% of target rate. Actual rate is displayed if unit does not reach deadband within 10 seconds. Display smoothing OFF means RATE displays actual rate at all times. |
| TIME | Set the current time of day. |
| MONTH | Set the current month. |
| DAY | Set the current date. |
| YEAR | Set the current year (two digits). |
| DAYS WAIT | Set the number of days after console is powered off before console goes into very low power consumption mode and time settings are lost. |
| DATALOCK | Prohibits the entry of data without first entering the DATA-LOCK code. Enter a 4-digit security code or "0" to disable. |
| PGM UPDATE | Press  to initialize console update procedure via serial port. Requires programming software, PC with null modem cable, and replacement firmware. (See Appendix 12) |
| PGM REV LEVEL | Displays console software program number and revision level. |
| ZERO SPEED SHUTOFF | Enable or disable Low Speed Shutoff feature. If enabled, product control will be shut off if speed drops below 0.7 MPH [km/H] in automatic mode. The Master switch must be cycled OFF and then ON to restart the system. If a constant speed greater than 0.7 MPH [km/H] is not attained within 10 seconds, the low speed shutoff will be enacted again. |

SUBMENU: CAN

| | |
|-------------------------|--|
| BOOM SENSE AND SPD NODE | Installed onboard with SCS 4600. |
| BOOM CONTROL NODE | Enable or disable CAN communication with CAN Boom Control Node. Program and revision of node will appear if installed. |
| PRODUCT CONTROL NODE 1 | Installed onboard with SCS 4600. |
| PRODUCT CONTROL NODE 2 | Enable or disable CAN communication with CAN Product Control Node #2. Program and revision of node will appear if installed. |
| PRODUCT CONTROL NODE 3 | Enable or disable CAN communication with CAN Product Control Node #3. Program and revision of node will appear if installed. |
| READDRESS CONTROL NODES | Reconfigure Product Control Node Order. See PROCEDURE TO READDRESS CAN PRODUCT CONTROL NODES in CAN Applications Section. |

6. ALARMS DEFINITION

The following are brief descriptions of the visual and audible alarms of the console. The audible alarm can be enabled or disabled from the Console Menu within the Data Menu.

| Data Display | Audible Alarm (*) | Alarm Description |
|--------------------------------------|--------------------------|---|
| CHECK CAN NODES OR CAN COMMUNICATION | 4 | Console is not communicating with CAN nodes (See Troubleshooting Section). |
| CHECK CONTROL NODE X | 4 | Console is not communicating with Product Control Node X (See Troubleshooting Section). |
| CHECK BOOM NODE | 4 | Console is not communicating with Boom Control Node (See Troubleshooting Section). |
| Mode Display | Audible Alarm (*) | Alarm Description |
| VAR RATE | 1 | When Variable Rate Change Alarm is enabled, visual and audible alarms will occur for 4 seconds to indicate that a valid rate change string has changed the target rate. Function acts independent of Audible Alarm setting. |
| BIN LEVEL | 1 | When Bin Level Alarm (Granular mode only) is enabled, alarm occurs to indicate low bin level. (See Bin Level Alarm) |
| VAC ERR | 1 | When Vacuum Alarm (Liquid Chemical Injection mode only) is enabled, alarm occurs to indicate a vacuum error. (See Vacuum Alarm) |
| FLOW SW | 1 | When Flow Switch Monitor Alarm (Liquid Chemical Injection mode only) is enabled, alarm occurs to indicate out of tolerance difference between flow switch monitor and flow reading (See Dual Sensor Alarm Percent). |
| LOW LIM | 2 | When a Low Flow Rate Limit is entered, alarm occurs to indicate that Volume/Minute has dropped below low limit (automatic mode only). (See Low Flow Limit) |
| DUAL FLOW | 2 | When programmed in Gran 3, Dual Flow Alarm will occur when difference between dual encoder readings becomes out of tolerance (See Dual Sensor Alarm Percent). |
| OFF RATE | 3 | Alarm occurs when Volume/Area rate is out of tolerance from the target application rate for more than 5 seconds (See Off Rate Percent). |
| LOW LEVEL | 4 | When a Low Tank value is entered, alarm will occur when Volume/Tank is less than Low Tank limit (See Low Tank). |
| NO PSI [KPA] | 3 | When a pressure transducer (PSI 1) is installed (liquid applications only), alarm will occur to indicate that there is no pressure in the lines. After 20 seconds of a no pressure condition, product control will be shut off. |

| Mode Display | Audible Alarm (*) | Alarm Description |
|------------------------|-------------------|---|
| LOW SPD | 3 | When Low Speed Shutoff is enabled, an alarm will occur when speed drops below 0.7 MPH [km/H]. Product control will not be resumed until the Master Switch is cycled (See Zero Speed Shutoff). |
| AUTO NOBM -or- MANNOBM | n/a | "NOBM" indicates that no boom sections are turned ON for the given product. See Boom Select feature if boom sections are turned ON. |

NOTE:

Audible Alarms:

- 1) Beeps for 1/2 second once per second
- 2) Beeps for 1/4 second twice per second
- 3) Continuous
- 4) Beeps for 2 seconds every 16 seconds

7. DATALOGGER

The data logging system, connected to a DGPS receiver, saves on-the-go application information to a compact flash (CF) card. It combines GPS position with controller information to create a database of records that are recorded at an interval programmed by the user (see Trigger Value and Trigger Units). This information can be transferred to a desktop or laptop computer. With the appropriate software, maps can be created showing the path driven by the operator, along with controller information such as rate applied, boom status, time, area, and more.

Setup:

1. Insert CF card prior to powering ON console.
2. With console power ON, press  key to bring up Data Logging Options. Press  to advance to Trigger Value. Enter in desired increment.
3. Press  to advance to Trigger Units. Units of FEET [METERS] or SECONDS can be chosen (toggled using  as the unit of measurement for the trigger value programmed perviously).
4. Press  to advance to GPS Baud. Use  key to select the baud rate of the GPS receiver connected.
5. Press  to advance to GPS Stop Bits. Use  key to select the number of stop bits used by the GPS receiver connected.
6. Press  to advance to logging mode. Use  key to select between logging GPS AND CONSOLE DATA (MASTER SWITCH PAUSES LOG) or GPS DATA ONLY (CONTINUOUS LOG).

NOTE: GPS AND CONSOLE DATA (MASTER SWITCH PAUSES LOG)
 A shapefile (.SHP, .SHX, .DBF) is created using the GPS GGA string from the receiver along with the console data. The file names will be numbered sequentially from DATA001.SHP, DATA001.SHX, and DATA001.DBF to DATA999.SHP, DATA999.SHX, and DATA999.DBF.

GPS DATA ONLY (CONTINUOUS LOG)
 A shapefile (.SHP, .SHX, .DBF) is created using only the location points obtained from the GPS GGA string from the receiver.

7. Data logging is now ready to begin. Press  until DATA LOGGGER OFF appears. Press  to turn DATA LOGGGER ON. The percentage of the CF card used will appear in the lower section of the LCD. If no card is inserted, the display will read "DISK NONE". If the card is full, the display will read "DISK FULL". A flashcard graphic appears above the disk percentage to indicate that data is being saved to the card. A GPS icon appears above the disk percentage to indicate the GPS signal is being received. (See Figure 5)
8. Proceed with application normally. When finished with operation, press the  key to bring up DATA LOGGGER ON. Press  key to turn DATA LOGGGER OFF. When finished with operation, switch power OFF and then remove CF card.
9. Data logging settings will be saved for future use. When starting a new operation, press the  key to turn DATA LOGGGER ON.

CAUTION: DO NOT REMOVE OR INSERT COMPACT FLASH CARD WITH CONSOLE POWER TURNED ON. DATA MAY BECOME CORRUPTED. USE ONLY SANDISK BRAND COMPACT FLASH CARDS.

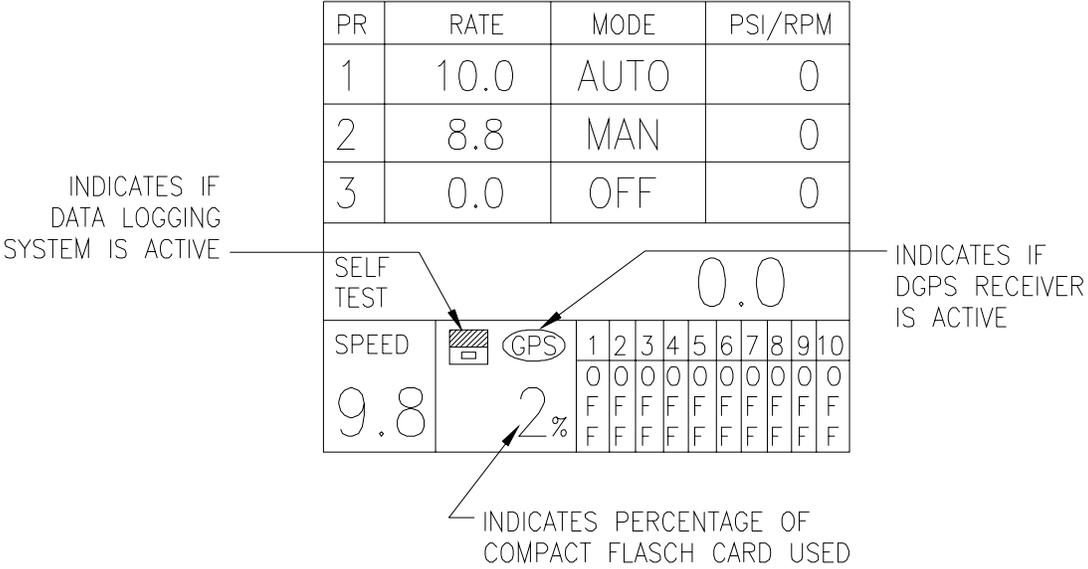
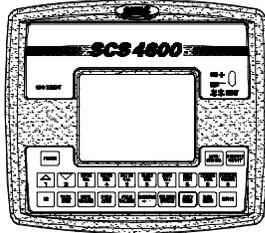


FIGURE 5
SCS 4600 DISPLAY

CONTROL CONSOLE
SCS 4600: CASE IH P/N 87267819



SCS 4600 WITH GUIDANCE SYSTEM

COMPACT FLASH CARD (64 MB):
RAVEN P/N 524-0002-046

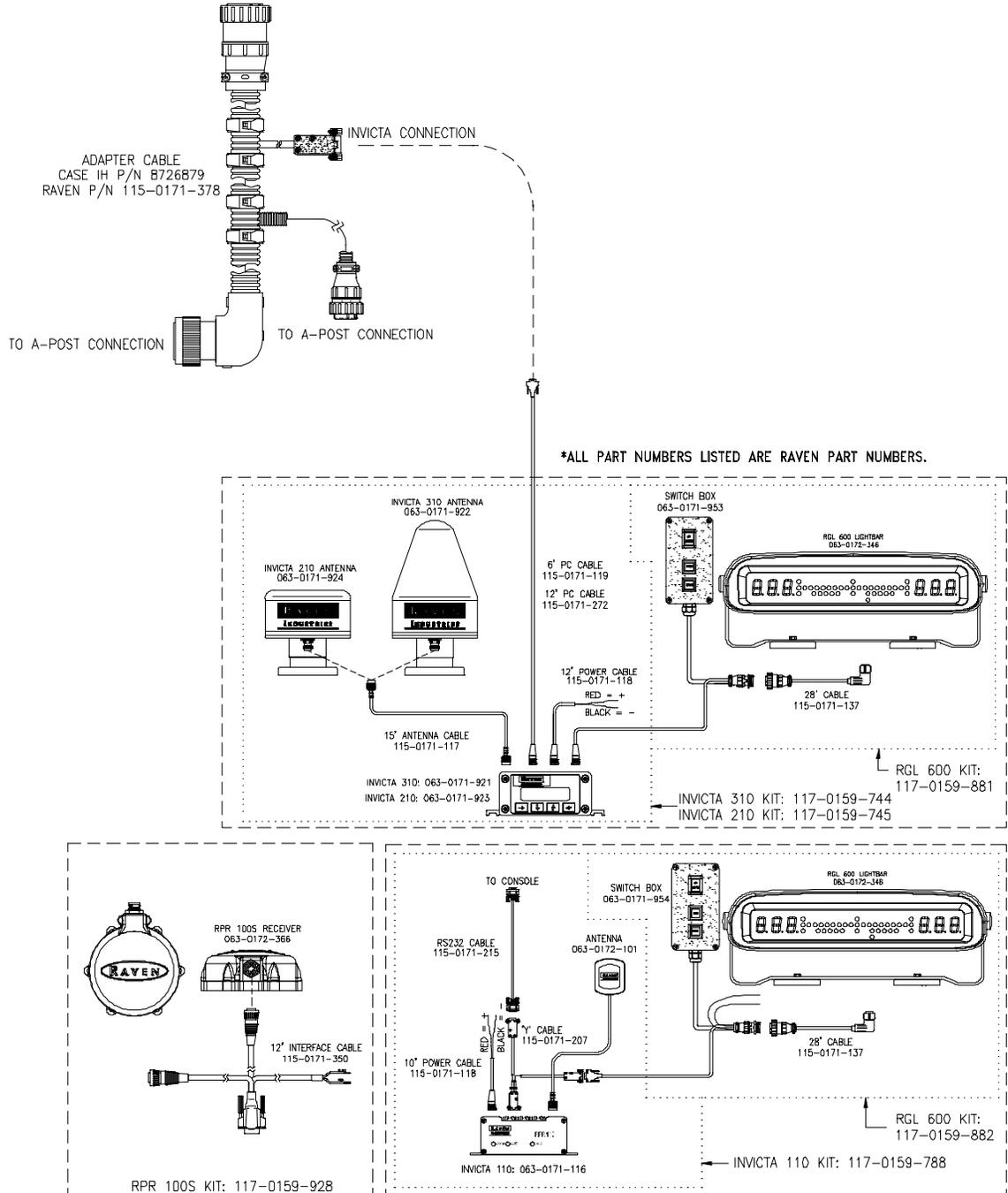


FIGURE 6

INITIAL SYSTEM SET-UP (LIQUID APPLICATIONS)

- 1) Fill tank with water only. (If positive displacement pump is used, open pressure relief valve, PRV).
- 2) Place MASTER ON/OFF switch to ON and BOOM ON/OFF switches to OFF.
- 3) Turn console POWER ON.
- 4) Put console in MANUAL mode using AUTO/MANUAL key.
- 5) Verify that Boom Widths, SPEED CAL, METER CAL, VALVE CAL, and RATE CALs have been entered correctly into the Console. In SELF TEST mode, enter the normal sprayer operating speed.
- 6) Run pump at normal operating RPM.
- 7) If centrifugal pump is used, proceed with Step 8. If positive displacement pump is used, set pressure relief valve (PRV) to 65 PSI [450 kPa].
- 8) Verify that boom valves operate and that no nozzles are plugged by operating the BOOM ON/OFF switches.
- 9) Place all BOOM ON/OFF switches to ON.
- 10) Hold the FLOW CONTROL switch in INC position until pressure is at its maximum. This assures that the motorized Control Valve is fully open. Verify maximum pressure and RATE. (Pressure gauge is not supplied).

NOTE: A pressure gauge MUST be installed to properly monitor the system.

- 11) Adjust agitator line hand valve for desired agitation. Verify maximum pressure is still present.
- 12) Hold the FLOW CONTROL switch to DEC position until pressure is at its minimum. This assures that the motorized Control Valve is fully closed. Verify minimum pressure and RATE. If minimum pressure and RATE can not be obtained, consider by-pass plumbing system in Appendix 3.

INITIAL SYSTEM FIELD TEST (LIQUID APPLICATIONS)

- 1) Drive down field or road at target speed with sprayer booms off, to verify SPEED readout on Console.
- 2) Turn on sprayer and booms and place the console in AUTO mode. Increase or decrease speed by one MPH [2 km/h]. The system should automatically correct to the target application rate.
- 3) If for any reason, the system is unable to correct to the desired RATE, check for an empty tank, a plugged line, a malfunctioning pump, improper vehicle speed, or a defect in the system.
- 4) If the system does not appear to be correcting properly, first review INITIAL SYSTEM SET-UP, then refer to TROUBLESHOOTING GUIDE.
- 5) At the end of each row, switch the MASTER ON/OFF to OFF to shut off flow. This also shuts off the area totalizer.
- 6) Verify area covered and volume used.

PREVENTIVE MAINTENANCE (LIQUID APPLICATIONS)

Preventive maintenance is most important to assure long life of the system. The following maintenance procedures should be followed on a regular basis:

- 1) Flush entire system with water after use of suspension type chemicals. Failure to clean system can result in crystallization of chemicals which may plug the Flow Meter, lines, and/or tips.
- 2) Flush and drain sprayer before storing. **FREEZING TEMPERATURES MAY DAMAGE FLOW METER IF WATER IS NOT DRAINED.**
- 3) Remove Flow Meter at the end of each spraying season. Clean Flow Meter turbine and inlet hub. Clean off all metal filings and wettable powders which have hardened on the plastic and metal parts. Check the inlet hub and turbine assembly for worn or damaged turbine blades and bearings. Flush Flow Meter with clear water and drain.

KEEP FROM FREEZING

- 4) Remove Console when not in use for extended periods.

SECTION 2 GRANULAR APPLICATIONS

CONTROL CONSOLE
 SCS 4600: CASE IH P/N 87267819



COMPACT FLASH CARD (64 MB):
 RAVEN P/N 524-0002-046

ADAPTER CABLE, GRANULAR
 CASE IH P/N 87266849
 RAVEN P/N 115-0171-343

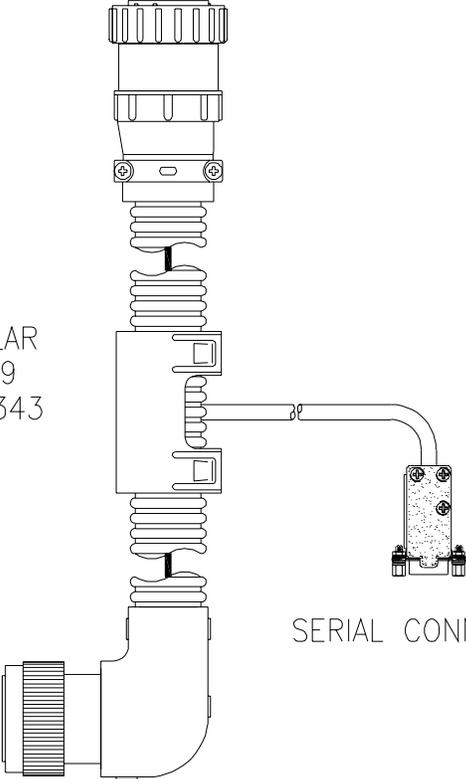


FIGURE 7

INSTALLATION

1. MOUNTING THE ENCODER

- 1) Mount Encoder on output shaft of conveyor, or other shaft which rotates at a known ratio to the conveyor. (See Figures 9-12).
- 2) Apply grease to Encoder shaft, conveyor shaft, and Encoder coupler (fits 1" diameter conveyor shaft). Secure coupler to Encoder and conveyor shafts with set screws provided.
- 3) Install mounting tabs to Encoder as shown in Figure 8. Connect mounting tab to mounting bracket (not provided) to prevent Encoder from rotating. **DO NOT** rigidly mount Encoder. Encoder is to be supported by coupler **ONLY**.

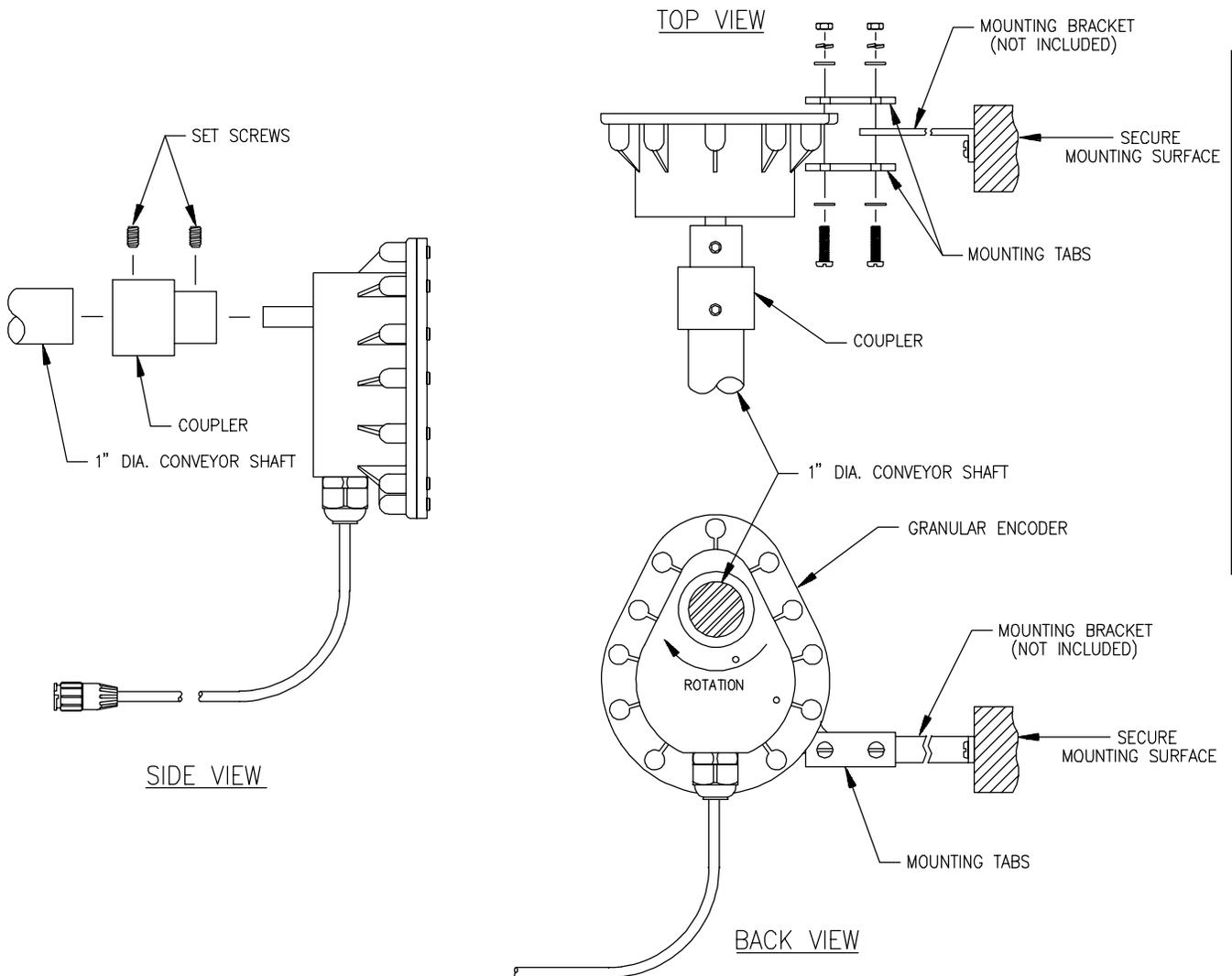


FIGURE 8

2. MOUNTING THE HYDRAULIC CONTROL VALVE

- 1) Refer to Figures 9-12 for typical placement of the Hydraulic Control Valve.
- 2) Valve is to be mounted with motor in the upright position.
- 3) Connect the product cable connectors to hydraulic control valve and encoder(s). If applicable, also connect fan sensor, bin level sensor, clutches, and boom vlves.

SPINNER SYSTEM

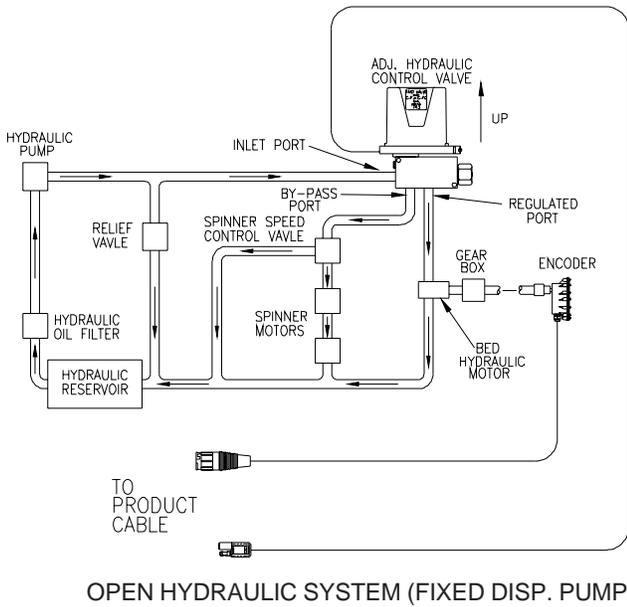


FIGURE 9

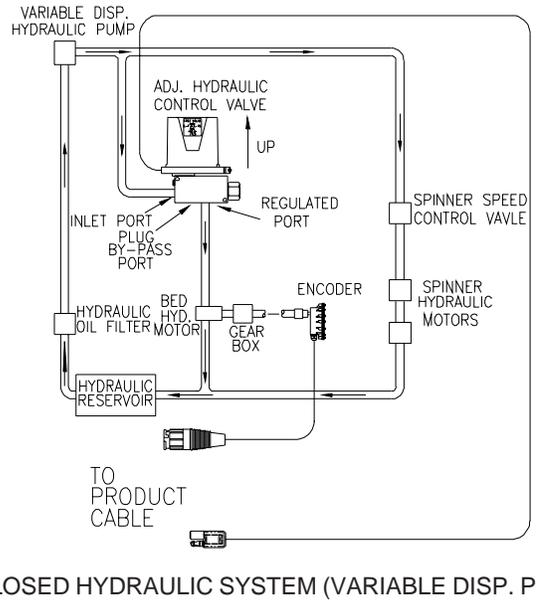


FIGURE 10

PNEUMATIC SYSTEM

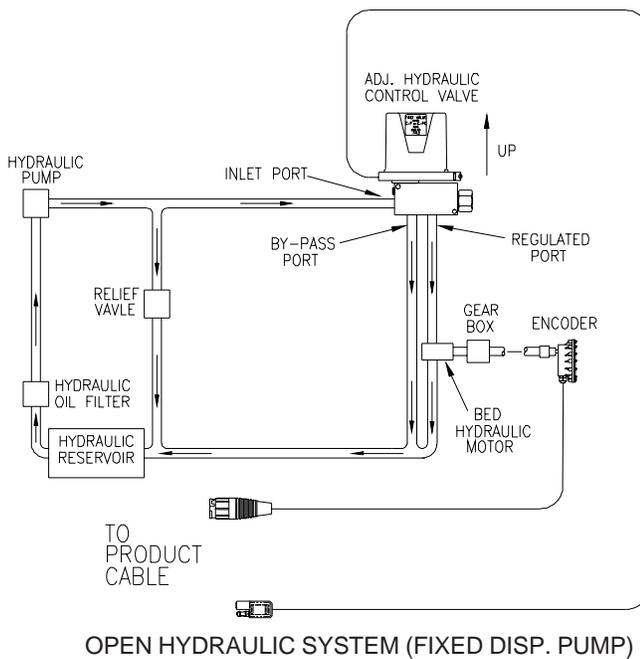


FIGURE 11

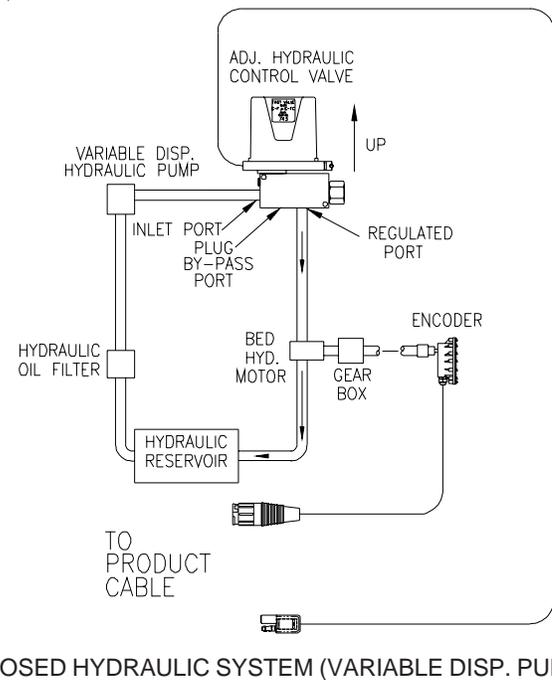


FIGURE 12

CONSOLE CALIBRATION

1. CALCULATING "BOOM CAL"

For Gran 1 (single belt) applications, enter the total width of the spread pattern in inches [cm] as BOOM CAL 1. For Gran 2 (split belt) or Gran 3 (dual encoder) applications, enter the left side spread pattern as BOOM CAL 1 and right side spread pattern as BOOM CAL 2.

2. CALCULATING "SPREADER CONSTANT"

1) Find the cubic feet [Cubic cm] of discharge per 1 revolution of the sensor.

L = Length in inches [cm] of belt travel per 1 revolution of sensor

GH = Gate Height in inches [cm]

GW = Gate Width in inches [cm]

NOTE: For Gran 2 or Gran 3 applications, Gate Width is the total of both openings.

Cubic Feet [cubic cm] of Discharge per 1 revolution of sensor:

$$\text{cu ft/rev. of sensor} = \frac{L \times GH \times GW}{1728}$$

$$\text{cu cm/rev. of sensor} = L \times GH \times GW$$

EXAMPLE: 1) L = 13 inches [33 cm]
2) GH = 1 inch [3 cm]
3) GW = 44.8 inches [114 cm]

$$\text{cu ft/rev. of sensor} = \frac{13" \times 1" \times 44.8"}{1728} = .337$$

$$\text{cu cm/rev. of sensor} = 33 \times 3 \times 114 = 11,286$$

2) For RATE displayed in 1 lb increments:

$$\text{Spreader Constant (1 lb)} = \frac{\text{counts per rev of sensor}}{\text{cu ft/rev. of sensor}}$$

EXAMPLE: For 360 counts per rev, Spreader Constant = $\frac{360}{.337} = 1068$

For RATE displayed in 1 kg increments

$$\text{Spreader Constant (1 kg)} = \frac{\text{counts per 1 rev of sensor} \times 100,000}{\text{cu cm / rev of sensor}}$$

EXAMPLE: For 360 counts per rev, Spreader Constant = $\frac{360 \times 100,000}{11,286} = 3190$

NOTE: Counts per 1 rev of sensor may be determined by entering a METER CAL number of 10, SPREADER CONSTANT of 0, and TOTAL VOLUME of 0 and turning sensor exactly 1 revolution. The number in TOTAL VOLUME will be the counts per 1 rev of sensor.

NOTE: Flowability of product will affect actual results. Spreader Constant should be verified by performing Spreader Constant Calibration Procedure in Appendix 7 before field application.

- 3) For systems where calculating volume of discharge is difficult (metering wheels, augers, etc.), Spreader Constant can be determined by performing a catch test.

Confirm that Spreader Constant is zero (no decimal point in Meter Cal) and enter a Meter Cal of 200. Enter zero in Total Volume. Run machine and collect a sample large enough to weigh accurately and perform following calculation.

$$\text{Spreader Constant} = \frac{\text{Meter Cal} \times \text{Total Volume} \times \text{Product Density}}{\text{Actual volume} \times 10}$$

| | | |
|-----------------|------------------------------|-------------------|
| EXAMPLE: | Meter Cal | = 200 |
| | Total Volume | = 2000 |
| | Weight of collected material | = 1600 |
| | Product Density | = 50.0 lbs/cu.ft. |

$$\text{Spreader Constant} = \frac{200 \times 2000 \times 50.0}{1600 \times 10} = 1250$$

Enter this number as Spreader Constant and enter Product Density as Meter Cal (now with a decimal point).

NOTE: Verify Spreader Constant by performing Spreader Constant Calibration procedure in Appendix 7 before field application.

3. CALCULATING "METER CAL"

Product Density in lbs/cu.ft. [grams/cc] is entered under METER CAL key when Spreader Constant is used.

NOTE: To increase the system accuracy when applying at low rates, use the decimal shift feature as explained in CONSOLE PROGRAMMING.

4. CALCULATING "RATE CAL"

The application rate in lbs/acre [kg/ha] is entered as RATE CAL. Consult the equipment manual to insure that the selected gate opening is capable of applying at this applicaiton rate.

NOTE: The Spreader Constant must be recalculated anytime the gate opening is changed.

5. CONTROLLING SPINNER RPM

When using a CAN control node capable of controlling spinner speed, set up the product in GRAN 1 mode and use calibration values as follows:

$$\text{METER CAL} = \frac{\# \text{ of pulses (bolt heads)} \times 10}{1 \text{ revolution of spinner}}$$

$$\text{SPREADER CONSTANT} = 0$$

$$\text{RATE CAL} = \text{Target RPM}$$

See Boom Select feature in DATA MENU and configure boom selections accordingly.

INITIAL SYSTEM SET-UP (GRANULAR APPLICATIONS)

- 1) Verify that **NO** product is in bin.
- 2) Place BOOM ON/OFF switches to OFF.
- 3) Turn console POWER ON.
- 4) Put console in MANUAL mode using AUTO/MANUAL key.
- 5) Verify correct Boom Widths, SPEED CAL, METER CAL, VALVE CAL, and RATE CALs have been entered in the Console.
- 6) Enter the normal operating speed into SELF TEST.
- 7) Place boom ON/OFF switches to ON.
- 8) Verify that each boom operates by operating boom ON/OFF switches.
- 9) Hold the INC/DEC switch in INC position for approximately 12 seconds. Note maximum rate displayed in the display.
- 10) Hold the INC/DEC switch in DEC position for approximately 12 seconds. Note minimum rate displayed in the display.
- 11) The target application rate must be between the maximum and minimum rate displayed.

INITIAL SYSTEM FIELD TEST (GRANULAR APPLICATIONS)

- 1) Drive down field or road at target speed with boom ON/OFF switches OFF, to verify SPEED readout on Console.
- 2) Turn on appropriate boom switches, and place the product control in AUTOMATIC mode. Increase or decrease speed by one MPH [2 km/h]. The system should automatically correct to the target application rate.
- 3) If for any reason, the system is unable to correct to the desired RATE, check for improper vehicle speed or a defect in the system.
- 4) If the system does not appear to be correcting properly, first review INITIAL SYSTEM SET-UP, then refer to SERVICE MANUAL and TROUBLESHOOTING GUIDE.
- 5) At the end of each row, switch the boom ON/OFF switches to OFF to shut off application. This also shuts off the area totalizer.
- 6) Verify area covered and volume used.

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SECTION 3

CONTROLLER AREA NETWORK (CAN)

INTRODUCTION

Controller Area Network, or CAN, is a high-integrity serial data communications bus for real-time control applications. CAN messaging within the agriculture industry operates at a data rate of 250 kilobits per second. The CAN protocol also has excellent error detection and error confinement capabilities, making it very suitable and reliable for agriculture applications.

CAN applications allow for additional products to easily be added to a control system at any time. The SCS 4600 allows for up to three products in the control system (two additional via the CAN bus). The products may be any combination of liquid, granular, chemical injection, or spinner control applications.

Two CAN terminators are required as means of terminating the CAN bus lines to provide optimal signal integrity. The terminators should be located at each end of the CAN bus. CAN power, obtained from switched power, runs throughout the bus to act as a shield.

To add products to the system, simply remove the terminator from the end of the CAN bus, tie into the CAN bus using a “T” extension cable (Raven P/N 115-0171-326 [6’], 115-0171-362 [12’], 115-0171-363 [24’], or 115-0171-364 [6’’]), provide high current power (if applicable) and logic power to the control node using the control node cable, connect to the appropriate sensors and valves (if applicable), and replace the terminator on the end of the CAN bus. Power to the CAN node(s) should be obtained from a switched power source capable of handling the required current for the given node(s). The required current can be approximated from the fuse rating of the fuse within the power leads. Relay, Raven P/N 415-1001-009 can provide up to 40 Amps and should be wired as seen in the following diagrams. The node(s) will automatically be recognized upon reboot of the console.

Although the control algorithm, or “brains”, is located within the CAN node, all of the same troubleshooting techniques as used in a traditional hard-wired system still apply. CAN allows for modularization of the control system, but the behavior of the system remains the same. Flow and speed sensors, as well as the control valve and boom valves are used in the same fashion.

The following diagrams show individual control modules that can be added to a CAN system. For connecting multiple CAN modules, connect the modules in series and place a terminator at the end of the CAN bus.

PROCEDURE TO READDRESS CAN PRODUCT CONTROL NODES

From CAN submenu of DATA MENU, select “PRESS ENTER TO READDRESS PROD NODES” and press ENTER. Console will display “REBOOT NODES IN SEQNC, PRESS ENTER WHEN DONE.” At this point, CAN product control nodes should be rebooted, or repowered, in the order they are to be addressed. For instance, to assign Product Control Node 1, reboot the desired node first, Product Control Node 1 should be rebooted second, etc. To reboot a control node, either disconnect the power connector to the node or pull the fuse on the logic power wire (typically the 5 Amp fuse), wait a few seconds, then reconnect. When finished rebooting all product control nodes, press ENTER on the console to resume operation.

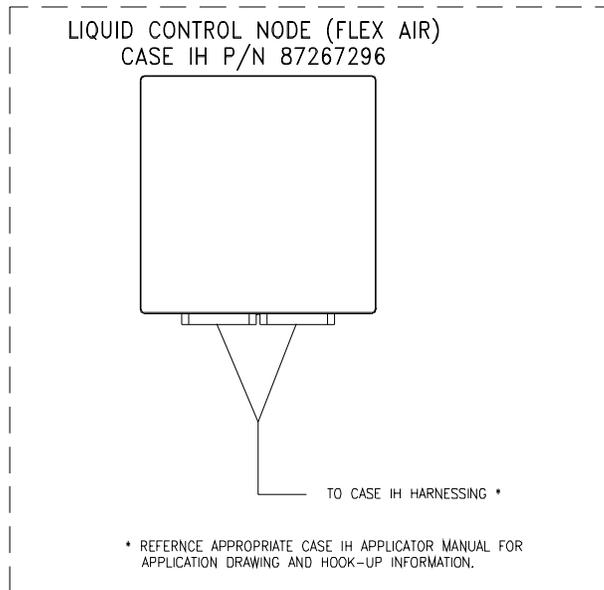


FIGURE 13

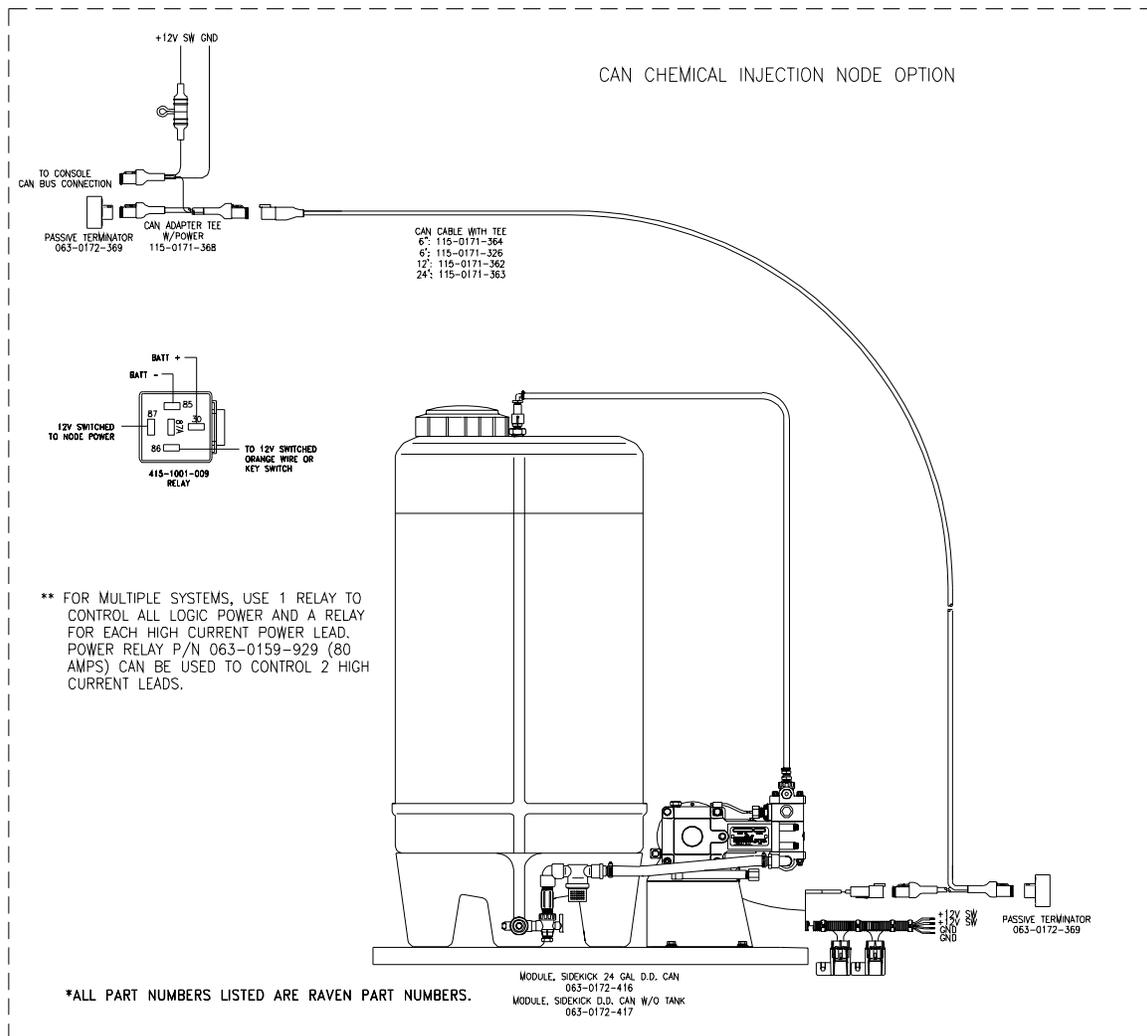


FIGURE 14

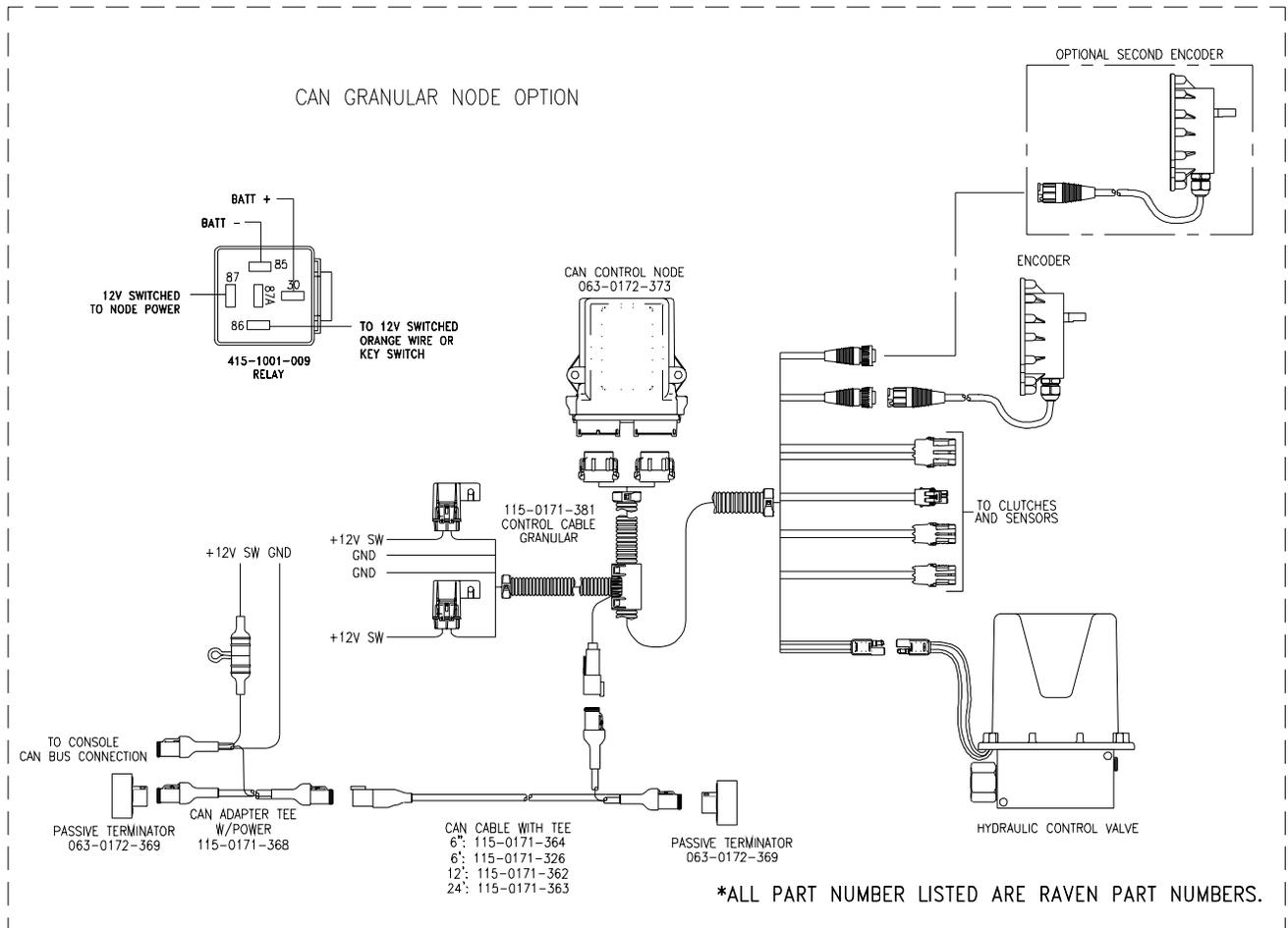


FIGURE 15

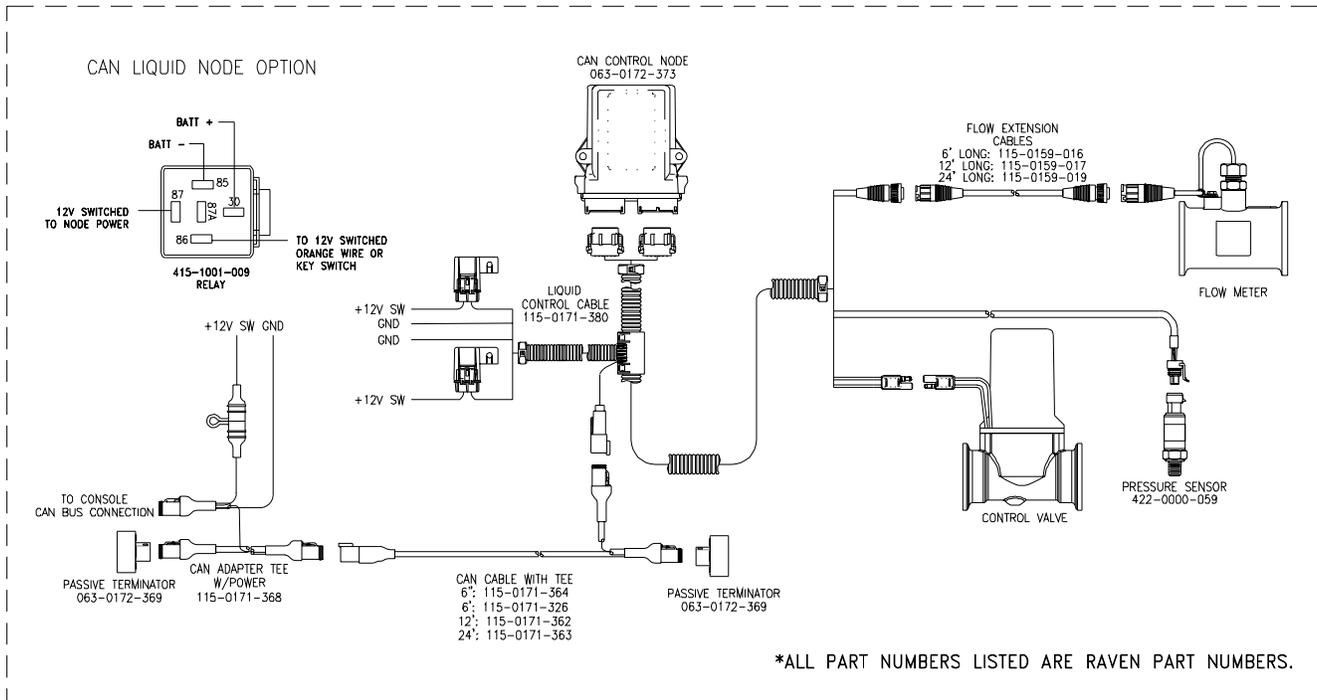


FIGURE 16

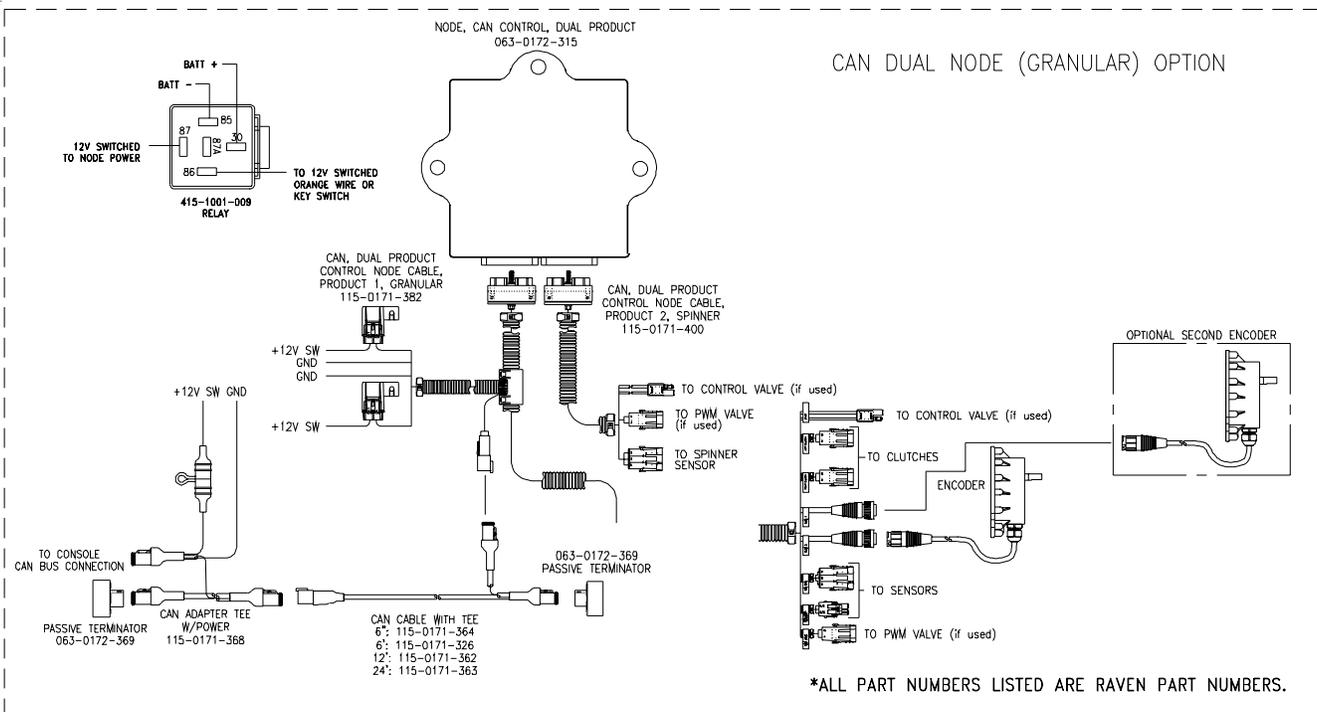


FIGURE 17

CAN APPLICATIONS

TROUBLESHOOTING GUIDE

| <u>PROBLEM</u> | <u>CORRECTIVE ACTION</u> |
|--|--|
| 1) NO DISPLAY WITH POWER ON. | 1) Check fuses in console cabling. 2) Check battery connections. 3) Hold key 2 to darken LCD contrast. 4) Return Console to your Dealer for service. |
| 2) A DIGIT CANNOT BE ENTERED VIA KEYBOARD. | 1) Return Console to your Dealer to replace keypad. |
| 3) CONSOLE DISPLAYS FLASHING "CAL" WHENEVER VEHICLE ENGINE IS STARTED. | 1) Check battery voltage and battery connections. |
| 4) CONSOLE DISPLAYS FLASHING "CAL" WHENEVER MASTER SWITCH IS TURNED ON OR OFF. | 1) Check battery voltage and battery connections. |
| 5) CONSOLE DISPLAYS FLASHING "CAL" WHENEVER SPEED IS CHANGED. | 1) Check battery voltage and battery connections. |
| 6) "TIME" FUNCTION IS INACCURATE OR DRIFTING. | 1) Verify Console is connected to 12V continuous power. 2) Return Console to Dealer to replace Processor Board Assembly. |
| 7) ONE DISPLAY DIGIT HAS ONE OR MORE MISSING SEGMENTS. | 1) Return Console to Dealer to replace LCD Display Board Assembly. |
| 8) SPEED DISPLAY "0". | 1) Check Speed Sensor cable connector and plug on back of Console for loose pins. 2) Clean pins and sockets on Speed Sensor cable connectors. 3) If no extension cable is used, replace Speed Sensor Switch Assembly. 4) If Speed Sensor Extension Cable is used, see Appendix 3. |
| 9) SPEED INACCURATE OR UNSTABLE (WHEEL DRIVE SPEED SENSOR). | 1) Run speed check on hard surface road. If SPEED is accurate, investigate Speed Sensor on different wheel. 2) Remove one red magnet and one black magnet from the wheel. (Reposition remaining red and black magnets directly across from each other). Enter a SPEED CAL number in the Console twice as large as the correct SPEED CAL number. Run |

(Cont. next page)

speed check on hard surface road. Remove these two magnets and replace with other two. Run speed check. If SPEED is inaccurate with only one set of magnets, replace the bad set. If SPEED is inaccurate with both sets, replace Speed Sensor Assembly.

NOTE: Re-enter original SPEED CAL number after testing is complete.

10) SPEED INACCURATE OR UNSTABLE (SPEEDOMETER DRIVE SPEED SENSOR).

- 1) Wiggle cable at the Speed Sensor connector. If speed is displayed, tighten connector or replace Transducer Assembly.
- 2) Check Speedometer Cable Adapter, Key, and Transducer Assembly for proper connections and engagement.
- 3) Check for kinked speedometer cable or too sharp of bend.
- 4) Replace Speedometer Transducer Assembly.

11) RATE READS "0".

- 1) Verify SPEED is registering accurately. If SPEED is zero, refer to Troubleshooting Problem 8.
- 2) Verify TOTAL VOLUME is registering flow. If not, refer to Troubleshooting Problem 15.
- 3) Enter a typical speed in SELF TEST. With Boom 1 ON and MASTER ON, verify AREA/HOUR is registering. If not, check wiring from console to BOOM Switch.

12) RATE INACCURATE OR UNSTABLE.

- 1) Verify that all calibration numbers and settings keyed into the Console are correct. Verify SPEED is registering accurately. If SPEED is inaccurate, refer to Troubleshooting Problem 9 or 10.
- 2) In MAN (manual) operation, verify that RATE display holds constant. If not, refer to Troubleshooting Problem 16.
- 3) In MAN (manual) operation, check low end and high end pressure range. Pressure range must be per initial system set-up on page 25. If pressure cannot be adjusted manually, refer to Troubleshooting Problem 15.
- 4) If problem persists, return Console to Dealer for service.

- | | |
|---|--|
| 13) CANNOT VARY RATE IN MANUAL OPERATION OR IN AUTO. | <ol style="list-style-type: none"> 1) Check cabling to motorized Control Valve for breaks. 2) Check connections in cabling for cleanliness. 3) Verify that there is voltage at the valve connector by placing MASTER switch ON; AUTO/MAN switch to MAN; and POWER ON. Manually operate INC/DEC switch to verify voltage. 4) Verify that valve is turning, if not, replace Control Valve. |
| 14) SPRAYER PRESSURE IS CORRECT BUT RATE IS LOW. | <ol style="list-style-type: none"> 1) Verify that nozzle strainer screens or check valves are not plugged. 2) Verify that pressure at each boom is the same. 3) Verify all nozzles are of proper and same orifice size. See Page 14 of Installation Manual. |
| 15) TOTAL VOLUME DOES NOT REGISTER. | <ol style="list-style-type: none"> 1) Check Flow Meter/Encoder Cable for breaks and shorts. See Appendix 4 for test procedure. 2) Check internals of Flow Meter/Encoder; clean and adjust. See Appendix 5 for Flow Meter cleaning and adjustments. 3) Replace Flow Meter Transducer/Encoder. |
| 16) TOTAL VOLUME REGISTERS FLOW INACCURATELY. | <ol style="list-style-type: none"> 1) Verify that arrow on Flow Meter is pointing in direction of flow. See Appendixes 5 and 6. |
| 17) MOTORIZED CONTROL VALVE ROTATES MORE THAN 1/4 TURN. | <ol style="list-style-type: none"> 1) Replace motorized Control Valve. |
| 18) WATER INSIDE COVER OF MOTORIZED CONTROL VALVE. | <ol style="list-style-type: none"> 1) Replace Isolation Flange Assembly and coupler shaft. 2) Replace entire motorized Control Valve if PC board or motor is corroded and will not run. |
| 19) BOOM VALVE(S) WILL NOT OPERATE. | <ol style="list-style-type: none"> 1) Check cable for wires with breaks. 2) Check connectors for cleanliness. 3) Check BOOM switch and MASTER switch for operation. 4) Replace Boom Valves. |
| 20) CAN'T OBTAIN GPS SIGNAL | <ol style="list-style-type: none"> 1) Verify connections to GPS receiver. 2) Verify GPS baud rate and stop bits are properly configured. |

- | | | |
|-----|--|--|
| 21) | COMPACT FLASH CARD NOT RECOGNIZED. | <ol style="list-style-type: none"> 1) Reboot console. 2) Replace compact flash card. 3) Return console to dealer for service. |
| 22) | DISPLAY READS "LOOKING FOR DATA TO FLASH IC WITH" | <ol style="list-style-type: none"> 1) Console was put into program update mode. Unhook cable from console, wait 30 seconds, and reboot console. Wait for program to be restored. |
| 23) | LCD CONTRAST IS TOO DARK OR TOO LIGHT | <ol style="list-style-type: none"> 1) To lighten LCD contrast, hold key [1]. After one second, contrast will begin to lighten until key [1] is released. 2) To darken LCD contrast, hold key [2]. After one second, contrast will begin to darken until key [2] is released. 3) LCD contrast can also be adjusted from the Console Menu within the Data Menu. |
| 24) | CONSOLE DISPLAYS "CHECK CAN NODES OR CAN COMMUNICATION" | <ol style="list-style-type: none"> 1) If no CAN nodes are attached to the CAN bus, press [DATA MENU] key. CAN menu will appear and CAN node options will automatically be shut off. Operation can then be resumed as normal. 2) Verify that CAN nodes and console are connected to the CAN bus and that the cabling between them is connected and in tact. 3) Verify that terminators are placed at both ends of the CAN bus. 4) Verify that CAN nodes have logic power and ground are properly connected and energized and no fuses are blown on power leads. 5) Verify that CAN power adapter "T" cable is plugged in at the front of the CAN bus and 12V switched power is applied to the bus. 6) Reboot the console. 7) Contact service technician for CAN system repair. |
| 25) | CONSOLE DISPLAYS "CHECK CONTROL NODE x" (where x refers to 1, 2, or 3) | <ol style="list-style-type: none"> 1) If Product Control Node x is not connected to the CAN bus, press [DATA MENU] key. CAN menu will appear and CAN node options can be toggled ON and OFF using the [CE] key. Operation can then be resumed as normal. 2) Verify that Product Control Node x is connected to the CAN bus. 3) Verify that Product Control Node x has logic power and ground properly connected and energized and no fuses are blown on power leads. 4) Verify that CAN bus cabling from the console to the node is connected and in tact. |

- 5) Move the Product Control Node and Product Control Node cable to a known good CAN connection closer to the console (take off another cable if necessary). If message for the Product Control Node x goes away, replace CAN cabling going to the Product Control Node x. Otherwise, replace Product Control Node or Product Control Node cable.
- 26) CONSOLE DISPLAYS "CHECK BOOM CON NODE"
- 1) If Boom Control Node is not connected to the CAN bus, press [DATA MENU] key. CAN menu will appear and CAN node options can be toggled ON and OFF using the [CE] key. Operation can then be resumed as normal.
 - 2) Verify that Boom Control Node is connected to the CAN bus.
 - 3) Verify that Boom Control Node has logic power and ground properly connected and energized and no fuses are blown on power leads.
 - 4) Verify that CAN bus cabling from the console to the node is connected and in tact.
 - 5) Move the Boom Control Node and Boom Control Node cable to a known good CAN outlet closer to the console (take off another node or cable if necessary). If message for the Boom Control Node goes away, replace CAN Cabling going to the Boom Control Node. Otherwise, replace Boom Control Node or Boom Control Node cable.

APPENDIX 1

CASE IH A-POST DEFINITION

MAIN (23 PIN DEUTSCH CONNECTOR)

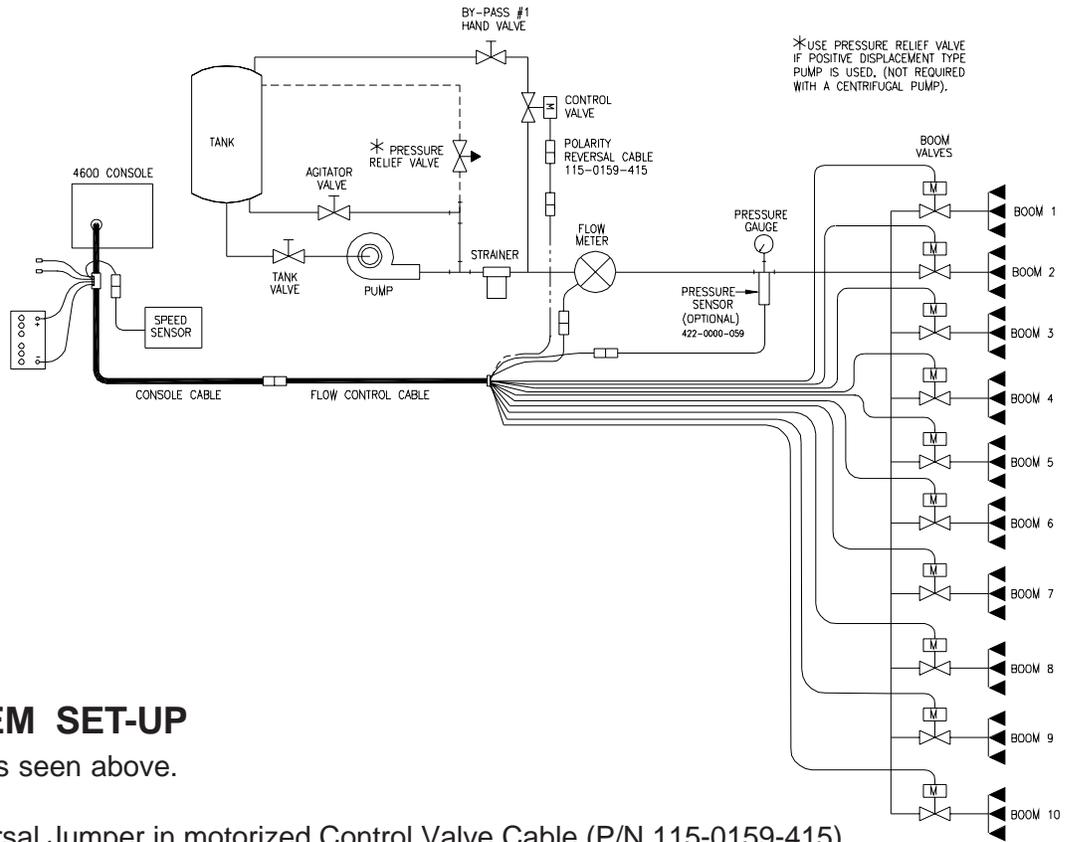
| POSITION | FUNCTION REFERENCE |
|----------|-----------------------|
| A | BATTERY + |
| B | BATTERY - |
| C | KEY SWITCHED POWER |
| D | CAN HIGH |
| E | BOOM SECTION #1 |
| F | BOOM SECTION #2 |
| G | BOOM SECTION #3 |
| H | BOOM SECTION #4 |
| J | BOOM SECTION #5 |
| K | BOOM SECTION #6 |
| L | BOOM SECTION #7 |
| M | BOOM SECTION #8 |
| N | BOOM SECTION #9 |
| O | +12 V SW FROM CONSOLE |
| P | SERVO + (BYPASS PLUM) |
| Q | SERVO - / PWM OUTPUT |
| R | CAN LOW |
| S | FLOWMETER POWER |
| T | FLOWMETER GROUND |
| U | FLOWMETER SIGNAL |
| V | RADAR PRESENT |
| W | RADAR SIGNAL |
| X | RADAR CLEAN GND |

PRESSURE / GAUGE PORT (LIQUID SYSTEM ONLY -- 9 PIN AMP)

| | |
|---|------------|
| 1 | PMU POWER |
| 2 | PSI GROUND |
| 3 | PSI POWER |
| 4 | BOOM PSI |
| 5 | SPARGE PSI |
| 6 | OPEN |
| 7 | OPEN |
| 8 | OPEN |
| 9 | OPEN |

APPENDIX 2

ALTERNATE BY-PASS LINE PLUMBING SYSTEM



INITIAL SYSTEM SET-UP

Plumb the system as seen above.

Adjust as follows:

Install Polarity Reversal Jumper in motorized Control Valve Cable (P/N 115-0159-415).

- 1) Fill tank with water only.
- 2) Place MASTER ON/OFF switch to ON and BOOM ON/OFF to OFF.
- 3) Turn console POWER ON. Place product control in MANUAL mode.
- 4) Verify that Boom Widths, SPEED CAL, METER CAL, VALVE CAL, and RATE CALs have been entered correctly into the Console. In SELF TEST mode enter the normal sprayer operating speed.
- 5) With pump not running, fully open main line hand valve, fully open by-pass #1 hand valve, and completely close agitator line hand valve. If positive displacement pump is used, fully open the pressure relief valve (PRV).
- 6) Run pump at normal operating RPM.
- 7) If centrifugal pump is used, proceed with Step 8. If positive displacement pump is used, proceed as follows:
 - a) Place MASTER ON/OFF switch to OFF.
 - b) Close by-pass #1 hand valve.
 - c) Set PRV to 65 psi [450 kPa].
 - d) Open by-pass #1 hand valve.
 - e) Place MASTER ON/OFF switch to ON.

- 8) Verify that each boom valve operates and that no nozzles are plugged by operating the BOOM ON/OFF switches.
- 9) Place all BOOM ON/OFF switches to ON.
- 10) Hold the FLOW CONTROL switch to INC position for approximately 12 seconds. This assures motorized Control Valve is fully closed. (Pressure gauge is not supplied).

| |
|---|
| NOTE: A pressure gauge MUST be installed to properly adjust the system. |
|---|

- 11) Adjust agitator line hand valve for desired agitation.
- 12) Close the main line hand valve, if necessary, to set the desired maximum operating pressure. Maximum pressure should be approximately 10 psi [70 kPa] above normal spraying pressure. **EXAMPLE:** If normal spraying pressure is 30 psi [210kPa], set maximum pressure at approximately 40 psi [280 kPa].
- 13) Hold the INC/DEC switch to DEC position for approximately 12 seconds. This assures motorized Control Valve is fully open.
- 14) Close by-pass #1 hand valve to set the desired minimum operating pressure. Minimum pressure should be approximately one half the normal spraying pressure. **EXAMPLE:** If normal spraying pressure is 30 psi [210 kPa], set minimum pressure at approximately 15 psi [105 kPa].
- 15) Verify maximum and minimum pressures and RATE by repeating Steps 11 and 14.

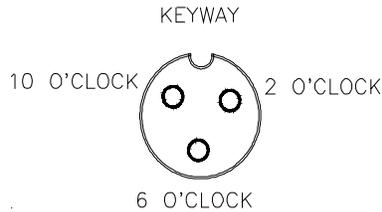
INITIAL SYSTEM FIELD TEST

- 1) Drive down field or road at target speed with sprayer booms OFF, to verify SPEED readout on Console.
- 2) Turn on sprayer and booms and place the product control in AUTO mode. Increase or decrease speed by one (1) MPH [2 km/h]. The system should automatically correct to the target application rate.
- 3) If for any reason, the system is unable to correct to the desired RATE, check for an empty tank, a plugged line, a malfunctioning pump, improper vehicle speed or a defect in the system.
- 4) If the system does not appear to be correcting properly, first review INITIAL SYSTEM SET-UP, then refer to TROUBLESHOOTING GUIDE.
- 5) At the end of each row, switch the MASTER ON/OFF to OFF to shut off flow. This also shuts off the area totalizer.
- 6) Verify area covered and volume used.

APPENDIX 3

PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES

Verify that the Console is in the SP1 Speed Sensor mode while testing the cable. Disconnect extension cable from Speed Sensor Assembly cable. Hold extension cable connector so that keyway is pointing in the 12 o'clock position.



PIN DESIGNATIONS

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

VOLTAGE READINGS

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

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

PROCEDURE TO CHECK CABLE:

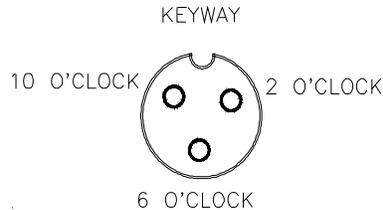
- 1) Enter SPEED CAL number of 1000 in key labelled  .
- 2) Depress key labelled  .
- 3) With small jumper wire (or paper clip), short between the 10 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the DISTANCE total should increase by increments of 1 or more counts.
- 4) If DISTANCE does not increase, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.
- 5) Perform above voltage checks.
- 6) If all cables test good, replace Speed Sensor.

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

APPENDIX 4

PROCEDURE TO TEST FLOW METER CABLES

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



PIN DESIGNATIONS

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

VOLTAGE READINGS

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

If a +5 VDC voltage reading is not present, disconnect the Speed Sensor cable. If the voltage reading is restored, test the Speed Sensor cable per Appendix 4, "PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES".

PROCEDURE TO CHECK CABLE:

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

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

APPENDIX 5

FLOW METER MAINTENANCE AND ADJUSTMENT PROCEDURE

- 1) Remove Flow Meter from sprayer and flush with clean water to remove any chemicals.

| |
|---|
| <p>NH₃ WARNING: Thoroughly bleed nurse tank hose and all other system lines prior to disassembling the Flow Meter, fittings, and hoses.</p> |
|---|

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

APPENDIX 6

PROCEDURE TO RE-CALIBRATE FLOW METER

- 1) Enter a METER CAL number of 10 [38] in the key labelled  .
- 2) Enter a TOTAL VOLUME of 0 in the key labelled  .
- 3) Switch OFF all booms.
- 4) Remove a boom hose and place it into a calibrated 5 gallon [19 liter] container.
- 5) Switch ON appropriate boom switch (for the hose that was just placed into the 5 gallon container) and the MASTER switch. Pump exactly 10 gallons [38 liters].
- 6) Readout in TOTAL VOLUME is the new METER CAL number. This number should be within +/- 3% of the calibration number stamped on the tag of the Flow Meter.
- 7) Repeat this procedure several times to confirm accuracy. (Always "zero out" the TOTAL VOLUME display *before* retesting).

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

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

EXAMPLE:

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

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

ENGLISH UNITS:

$$= \frac{720 \times 260}{250} = 749$$

METRIC UNITS:

$$= \frac{[190] \times [984]}{[946]} = [198]$$

Corrected METER CAL = 749 [198]

- 9) Enter corrected METER CAL before resuming application.

APPENDIX 7

VERIFICATION OF SPREADER CONSTANT

To verify and refine the Spreader Constant, perform the following procedure (after completing INITIAL CONSOLE PROGRAMMING):

- 1) Weigh loaded truck and note weight.
- 2) Enter the Product Density in lbs/cu.ft. [grams/liter] into key labelled .
- 3) Enter a "0" into the key labelled .
- 4) With the rate switch in the MAN position, unload a portion of the load by positioning the boom switch to ON.
- 5) Determine the actual weight unloaded by re-weighing the truck.
- 6) Compare to the TOTAL VOLUME displayed by the Console.
- 7) Perform the following calculation to correct the Spreader Constant if desired:

$$\text{Corrected Spreader Constant} = \frac{\text{old Spreader Constant} \times \text{TOTAL VOLUME}}{\text{actual weight unloaded}}$$

EXAMPLE:

| | | |
|------------------------|---|--------------------|
| old Spreader Constant | = | 228 [797] |
| TOTAL VOLUME amount | = | 2000 lbs [4400 kg] |
| actual weight unloaded | = | 1950 lbs [4290 kg] |

English (US):

$$\text{Corrected Spreader Constant (1 lb)} = \frac{228 \times 2000}{1950} = 234$$

Metric (SI):

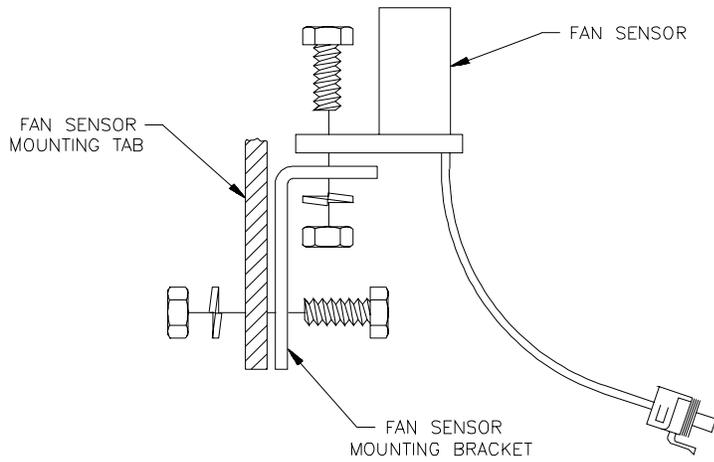
$$\text{Corrected Spreader Constant (1 kg)} = \frac{[797] \times [4400]}{[4290]} = [817]$$

This is the new Spreader Constant. Repeat this procedure until the weight of the metered material equals the TOTAL VOLUME value.

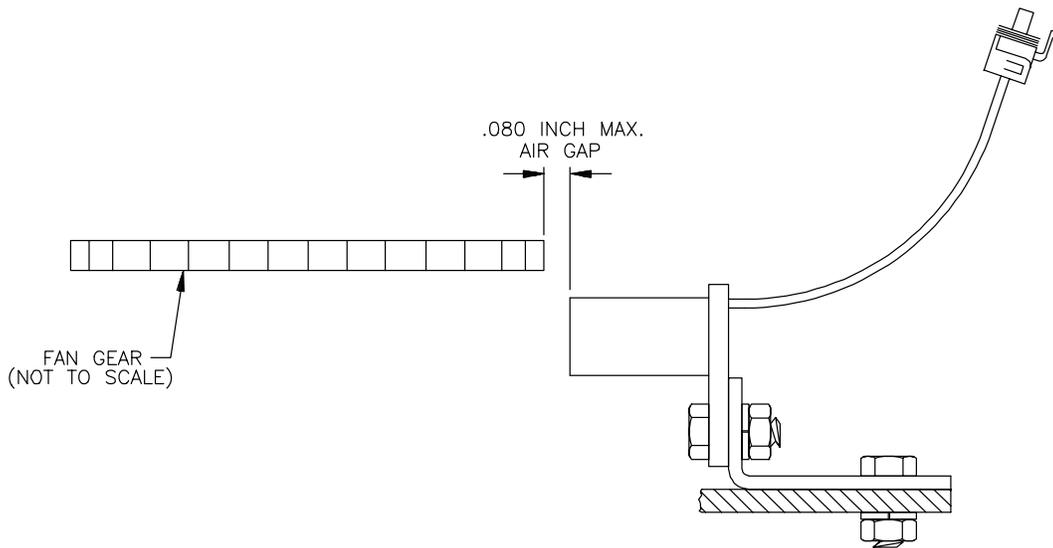
APPENDIX 8

FAN RPM SENSOR INSTALLATION

RAVEN P/N 117-0159-575



Assemble Fan Sensor to fan sensor bracket with stainless steel bolt, lock washer, and nut. Assemble fan sensor bracket to fan sensor mounting tab on box with stainless steel bolt, lock washer, and nut. (See Figure above).

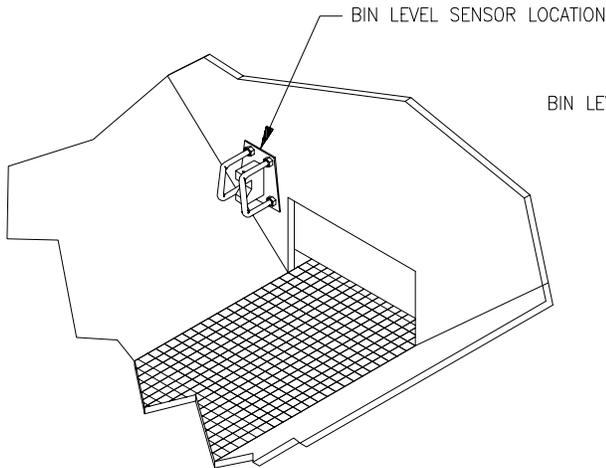


Adjust fan sensor air gap between .040 and .080 inch (.080 inch max.)

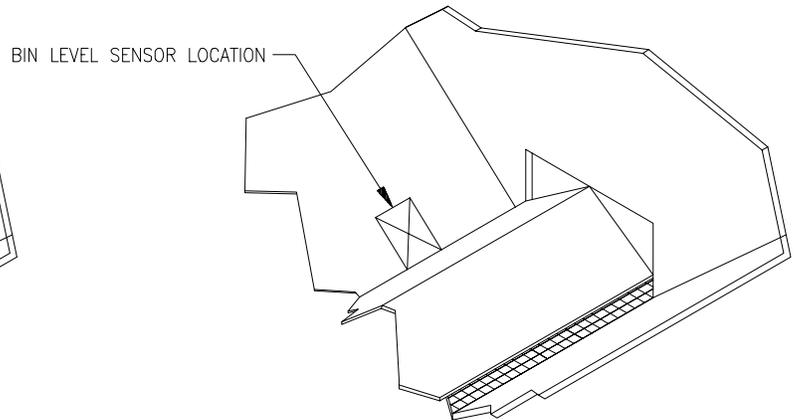
APPENDIX 9 BIN LEVEL SENSOR INSTALLATION

RAVEN P/N 063-0171-252

Install Bin Level Sensor in spreader bin at location illustrated. Select location in accordance to bin construction.

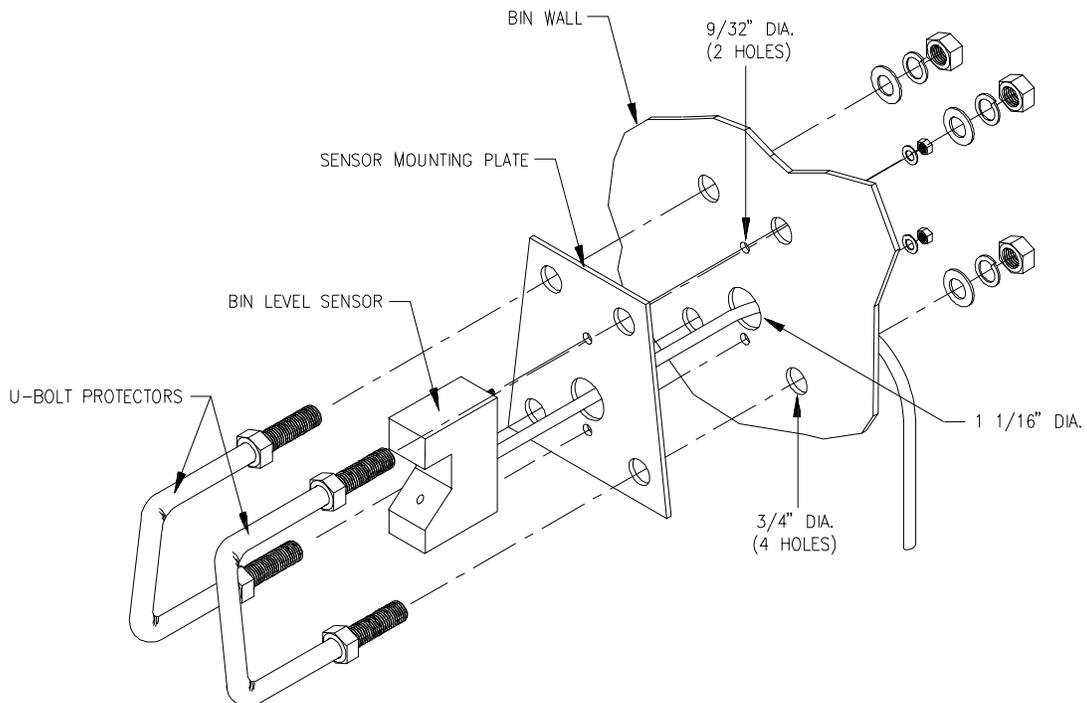


V-BOX WITHOUT DEFLECTOR SHIELD



V-BOX WITH DEFLECTOR SHIELD

Use the mounting plate as a template to mark the location for the holes. Drill and deburr all holes. Route the sensor cable and secure the mounting plate to the bin wall using U-bolt protectors. Route and connect the sensor cable connector to the flow cable connector. Secure all cables with plastic cable ties.



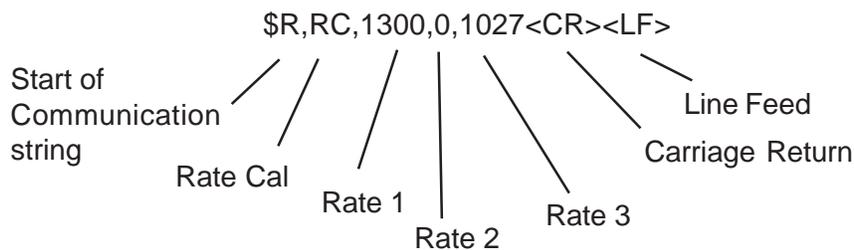
APPENDIX 10 SERIAL INTERFACE

- 1) Changing RATE CAL by remote computer.
 a) Configuration of RS-232C serial port:

9600 Baud Rate
 NO Parity
 8 Data Bits
 2 Stop Bits

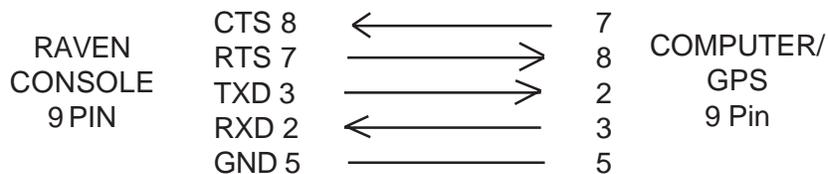
- b) Setup Raven Console to pass data through comport. See DATALOG options under DATA MENU section.
 c) Data stream to Raven Console.

EXAMPLE: Change Product 1 rate to 130.0
 Change Product 2 rate to 0.0
 Change Product 3 rate to 102.7



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

- 2) Optional 9 pin to 9 pin cable pinout (P/N 115-0171-395).



APPENDIX 11

CASE IH SCS 4600 COMMUNICATION STRINGS

REMOTE COMPUTER TO CASE IH SCS 4600 CONSOLE

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

Rate 1 Change Request:

To set Rate Cal values for all three products:

\$R,RC,<rate_1_cal>,<rate_2_cal>,<rate_3_cal><CR><LF>

To set Rate Cal values for products 1 and 3 only:

\$R,RC,<rate_1_cal>,,<rate_3_cal><CR><LF>

Calibration String Values Request:

\$R,CR<CR><LF>

Data String Request:

\$R,DR<CR><LF>

CASE IH SCS 4600 CONSOLE TO REMOTE COMPUTER

All console output strings begin with \$R171-, the \$R indicates a Raven communication string, the 171 is the last three digits of the CASE IH SCS 4600 program number and "-" denotes the software revision letter.

Calibration Strings:

\$R171-,C1,<switch_byte_1>,<switch_byte_2>,<boom_1_cal>,
<boom_2_cal>,<boom_3_cal>,<boom_4_cal>,<boom_5_cal>,
<boom_6_cal>,<boom_7_cal>,<boom_8_cal>,<boom_9_cal>,
<boom_10_cal>,<speed_cal><CR><LF>

\$R171-,C2,<meter_1_cal>,<meter_2_cal>,<meter_3_cal>,0,0,<spreader_constant_1>,
<spreader_constant_2>,<spreader_constant_3>,0,0<CR><LF>

\$R171-,C3,<valve_cal>,<valve_2_cal>,<valve_3_cal>,0,0,<rate_1_cal>,
<rate_2_cal>,<rate_3_cal>,0,0,0.0<CR><LF>

| <u>Bit</u> | <u>Switch Byte 1</u> | <u>Switch Byte 2</u> | <u>Switch Byte 3</u> |
|------------|----------------------|----------------------|----------------------|
| 0 | boom 1 | boom 8 | prod 3 auto |
| 1 | boom 2 | boom 9 | prod 3 manual |
| 2 | boom 3 | boom 10 | 0 |
| 3 | boom 4 | prod 1 auto | 0 |
| 4 | boom 5 | prod 1 manual | 0 |
| 5 | boom 6 | prod 2 auto | 0 |
| 6 | boom 7 | prod 2 manual | 0 |
| 7 | 1 | 1 | 1 |

NOTE: If prod auto and manual are both zero, the product is in Off.
For switch Byte Bits: 0 = Off and 1 = On.

Data Strings:

\$R171-,D1,<total_area_1>,<total_area_2>,<total_area_3>,0,0,0.0,<field_area_1>,
<field_area_2>,<field_area_3>,0,0,0.0<CR><LF>

\$R171-,D2,<total_volume_1>,<total_volume_2>,<total_volume_3>,0,0,
<field_volume_1>,<field_volume_2>,<field_volume_3>,0,0<CR><LF>

\$R171-,D3,<tank_1_volume>,<tank_2_volume>,<tank_3_volume>,0,0,<miles/km>,
<feet/meters><CR><LF>

\$R171-,D4,<speed>,<pressure1_1>,<pressure1_2>,<pressure1_3>,0,0,
<pressure2_1>,<pressure2_2>,<pressure2_3>,0,0<CR><LF>

Actual Rate:

\$R171-,AR,<actual_rate_1>,<actual_rate_2>,<actual_rate_3>,0,0,0.0<CR><LF>

Time/Date:

\$R171-,TD,<hr:min>,<month/day/year>,<field_reference><CR><LF>

APPENDIX 12

SCS 4600 PROGRAM UPDATE PROCEDURE

1. Using console cable, connect red wire to +12V and white wire to GND. (NOTE: Pin 1 on console connector is GND, Pin 37 on console connector is +12V). Connect RS232 serial connector from console cable to open DB9 serial communications port on personal computer/laptop with a null modem serial cable (Raven P/N 115-0171-395).
2. Power up console. From Data Menu, select Update Console PGM and press ENTER. Console will reboot and the LCD will read "LOOKING FOR DATA TO FLASH IC WITH."
3. From Windows 95 or above start button, select Programs → Accessories → Communications → Hyperterminal (folder). (If Hyperterminal folder does not exist, go to Settings → Control Panel → Add/Remove Programs to add it. Select Windows Setup tab, Communications option, and check Hyperterminal. Click OK and wait for installation.)
4. From within Hyperterminal folder, select Hypertrm.exe. Enter in a file name (ex. SCS4600 Update) when asked for Connection Description. From the Connect to dialog, change the Connect Using option from Standard 9600 bps Modem to Direct to COMx, where x represents the serial port connected to the console and select OK.
5. From the COMx Properties dialog, configure the port settings as follows:

| | |
|-----------------|----------|
| Bits per second | 9600 |
| Data bits | 8 |
| Parity | None |
| Stop bits | 2 |
| Flow control | Hardware |

Click OK to advance to Hyperterminal.

6. From the File menu, select Properties. Click on the Settings tab. Click on the ASCII Setup button. Select (check) "Send line ends with line feeds" and "Echo typed characters locally." Select OK twice to back out to the main screen.
7. From the Call menu, Select Disconnect, and then Call for the new settings to take effect.
8. From the Transfer menu, select Send Text File. Select the text file containing the program update (ex. SCS 4600-CASE IH-Rev 1_20.txt) from the folder it is saved in and select Open.
9. Program update will start sending from computer to console and take approximately 5 minutes to complete. Update status can be monitored on the console LCD. Upon completion of the program update, the console will automatically shutdown.
10. Hyperterminal session can be saved for future use.

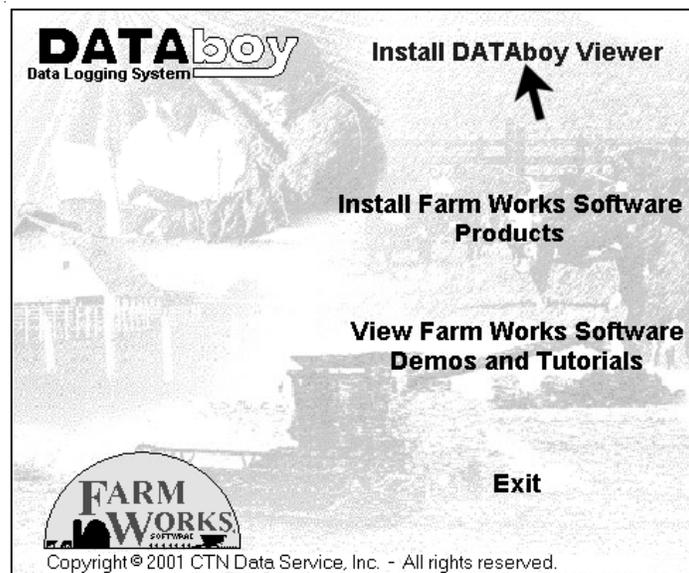
APPENDIX 13

DATAboy Viewer Installation

The DATAboy Viewer software is an optional software program (P/N 077-0171-138) that the user can install on a desktop or laptop computer to view the maps created with DATAboy.

SOFTWARE INSTALLATION

1. Insert the Farm Works CD into the appropriate CD ROM drive. Windows will automatically start the installation process for you. (If it does not start automatically, choose RUN from the START menu if you are using Windows 95 or higher. Type D:\SETUP in the box (where "D" is your CD ROM drive) and choose OK.)
2. Select Install DATAboy Viewer from the installation screen.
3. Follow the instructions on the screen to complete the installation process.



REGISTRATION

1. The registration screen will appear on the initial startup of DATAboy Viewer program.
2. There are three ways to register your software:
 - * Call 800-225-2848 and provide the Install ID number shown on the screen.
 - * Go to the website online listed
<http://www.farmworks.com/databoy/register.cgi> and fill out the registration screen.
 - * Send e-mail to databoy@ctndata.com with your name, address, phone number, and Install ID.
3. When you receive the registration number, enter in the Registration Number box and choose OK.

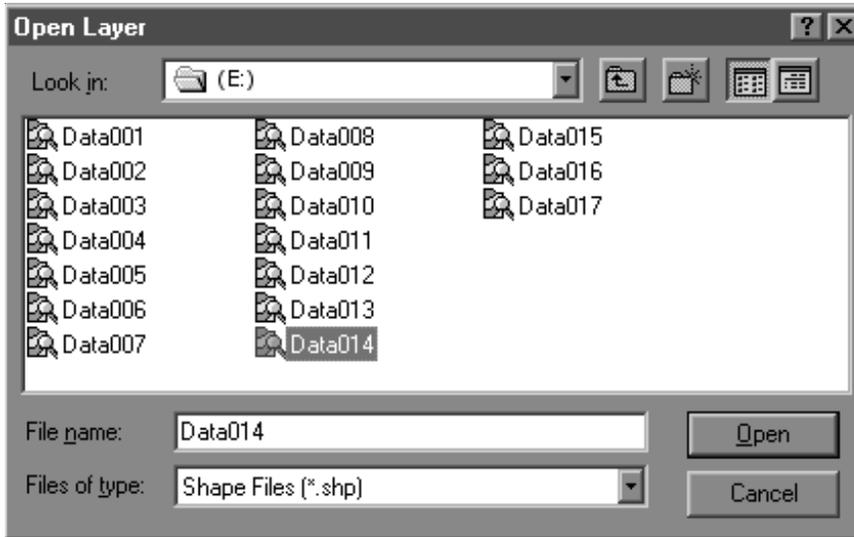
TO START

- Select Programs from the Start Menu
- Select Raven Industries
- Then select DATAboy Viewer

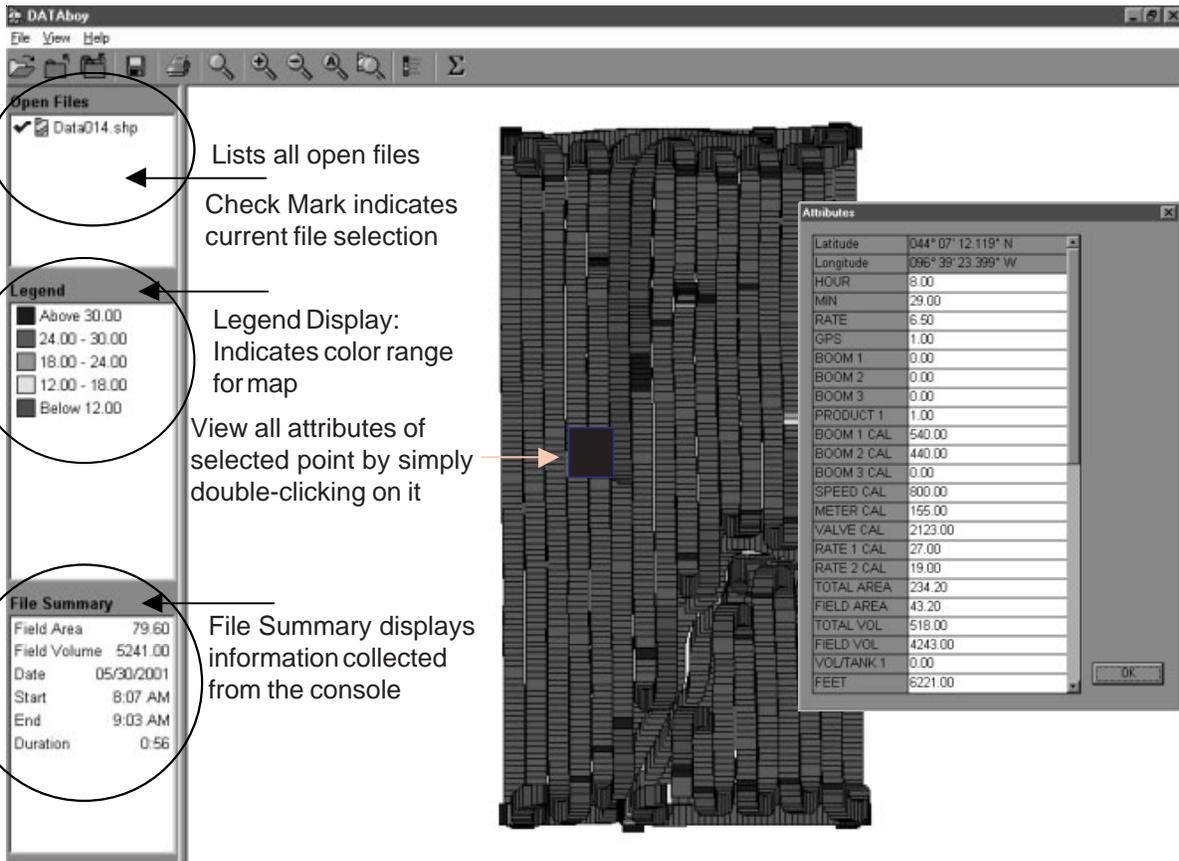
OPEN FILE



Select desired file from list, then select Open.



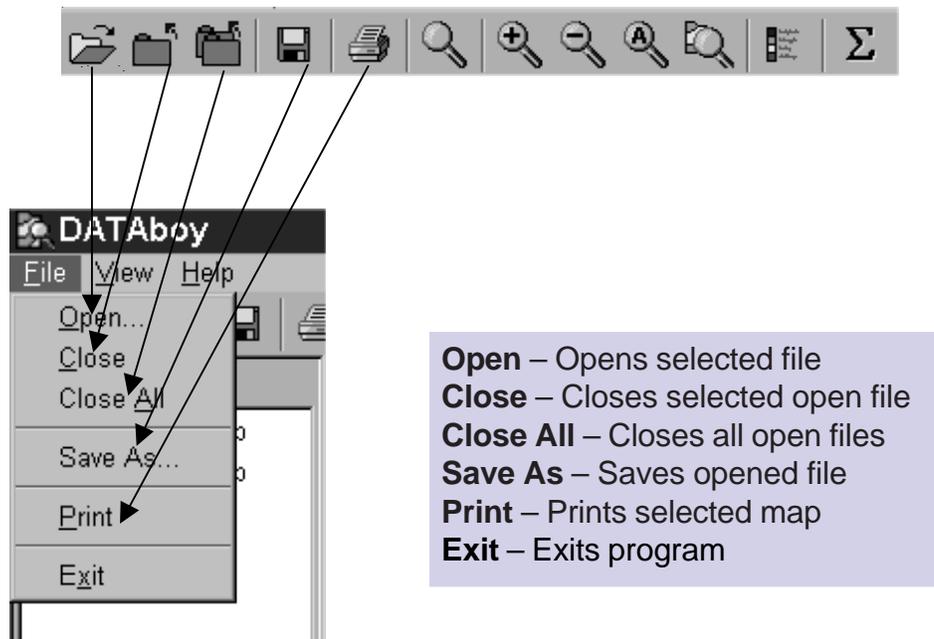
MAP VIEW



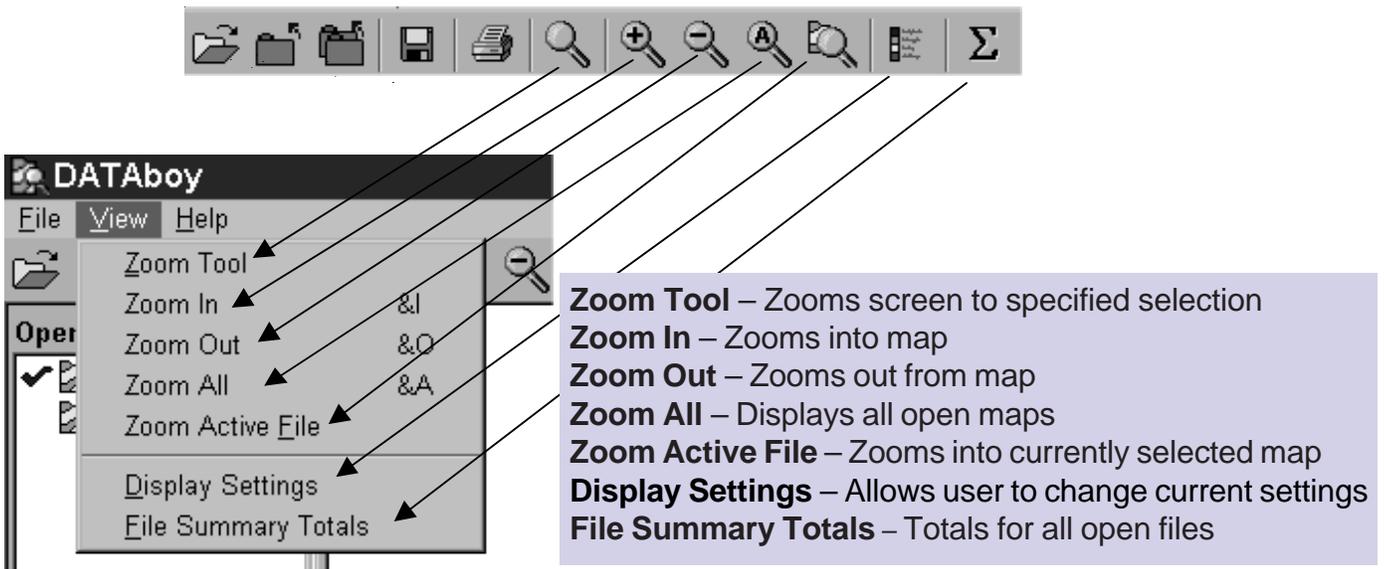
The screenshot shows the DATAboy software interface with several panels and annotations:

- Open Files:** Lists all open files. A check mark indicates the current file selection (Data014.shp).
- Legend:** Legend Display: Indicates color range for map. The legend shows five categories: Above 30.00, 24.00 - 30.00, 18.00 - 24.00, 12.00 - 18.00, and Below 12.00.
- File Summary:** File Summary displays information collected from the console. The summary includes: Field Area: 79.60, Field Volume: 5241.00, Date: 05/30/2001, Start: 8:07 AM, End: 9:03 AM, Duration: 0.56.
- Attributes:** View all attributes of selected point by simply double-clicking on it. The attributes table includes: Latitude: 044° 07' 12.119" N, Longitude: 096° 39' 23.399" W, HOUR: 8.00, MIN: 29.00, RATE: 6.50, GPS: 1.00, BOOM 1: 0.00, BOOM 2: 0.00, BOOM 3: 0.00, PRODUCT 1: 1.00, BOOM 1 CAL: 540.00, BOOM 2 CAL: 440.00, BOOM 3 CAL: 0.00, SPEED CAL: 800.00, METER CAL: 155.00, VALVE CAL: 2123.00, RATE 1 CAL: 27.00, RATE 2 CAL: 19.00, TOTAL AREA: 234.20, FIELD AREA: 43.20, TOTAL VOL: 518.00, FIELD VOL: 4243.00, VOL/TANK 1: 0.00, FEET: 6221.00.

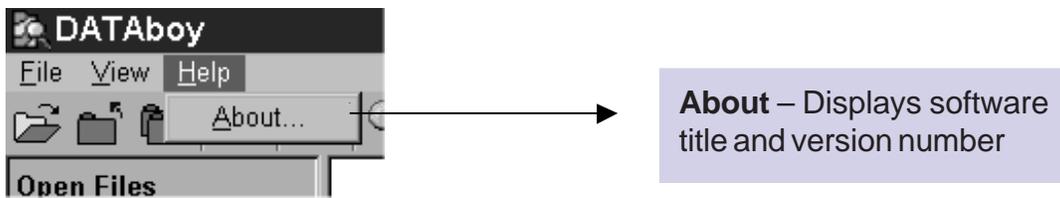
MENU AND TOOLBAR DESCRIPTIONS



Open – Opens selected file
Close – Closes selected open file
Close All – Closes all open files
Save As – Saves opened file
Print – Prints selected map
Exit – Exits program



Zoom Tool – Zooms screen to specified selection
Zoom In – Zooms into map
Zoom Out – Zooms out from map
Zoom All – Displays all open maps
Zoom Active File – Zooms into currently selected map
Display Settings – Allows user to change current settings
File Summary Totals – Totals for all open files



About – Displays software title and version number