RAVEN

Simply improving your position.[SM]

Installation & Service Manual

SCS 360

Manual Rev. B, SCS 360, 6-96
Order: 50, 6-20-96, #016-0159-543

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SYMBOL DEFINITION

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

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

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

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

LIQUID CONVERSIONS

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

LENGTH

1 millimeter (mm) = 0.039 inch
1 centimeter (cm) = 0.394 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

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

INTRODUCTION

The Raven SCS 360 (SPRAYER CONTROL SYSTEM) is designed to improve the uniformity of spray applications automatically. 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 360.

The SCS 360 consists of a computer based Control Console, a Speed Sensor, a turbine type Flow Meter, and a motorized Control Valve. The Console mounts directly in the cab of the vehicle for easy operator use. The Magnetic Speed Sensor is mounted on a non-drive wheel of the vehicle or on a wheel of the sprayer implement (Speedometer Drive Speed Sensors and Radar Speed Sensors are also available). The motorized Control Valve and Flow Meter mount directly to the framework of the sprayer. Appropriate cabling is furnished for field installation.

The operator sets the target rate (volume per area) to be sprayed and the SCS 360 automatically maintains the flow regardless of vehicle speed or gear selection (within range of selected spray nozzles). A manual override switch allows the operator to manually control flow for system check-out and spot spraying. The SCS 360 additionally functions as an area monitor, speed monitor, and volume totalizer.

INSTALLATION

1. MOUNTING WHEEL DRIVE SPEED SENSOR

The Wheel Drive Speed Sensor consists of **four magnets**, a switch assembly with cable, and mounting hardware. (Installation instructions for the optional Radar Interface Speed Sensor are included in their shipping carton. See Appendix 7 for the installation instructions for Wheel Drive Speed Sensor with **six magnets**).

Sequence of mounting Speed Sensor:

l) Select a non-driven wheel (left front tractor wheel or implement wheel).

2) Check for predrilled holes in rim. If not predrilled, see Appendix 1.

3) Mount the four magnets to inside of rim and tighten. (See Figures 1, 2, & 3). Magnets must be mounted in alternating red-black order.

4) Mount switch assembly to stationary column with the hardware provided. (See Figure 1). The switch assembly need not pivot with the wheel.

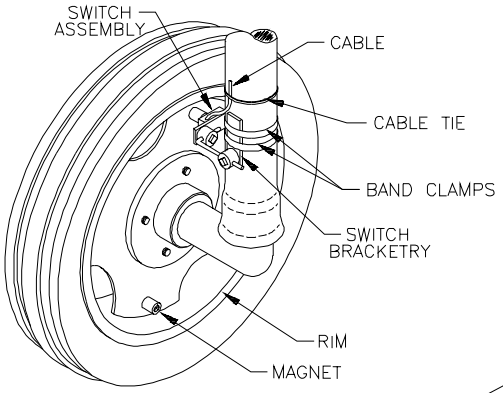


FIGURE 1

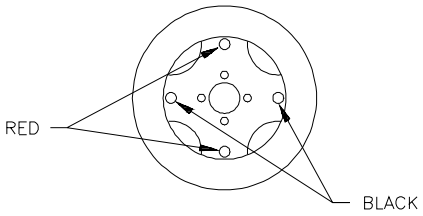


FIGURE 2

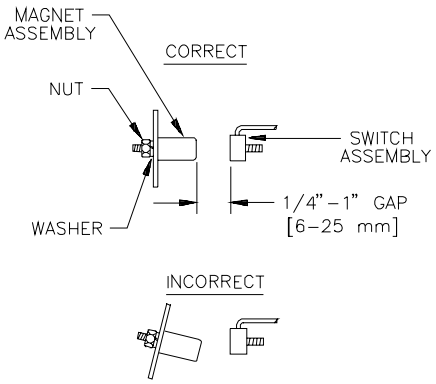


FIGURE 3

5) Position switch assembly so that as the wheel rotates the magnets pass across the center of the black, molded switch assembly. (See Figures 1 & 3).

6) Clearance gap between magnets and switch assembly must be between 1/4 inch [6 mm] and 1 inch [25 mm]. With wheels pointed straight ahead, rotate wheel to ensure gap is correct. Make sure vehicle wheels can be turned to their extremes in each direction without the magnets hitting the switch assembly.

7) Tighten switch assembly bracketry.

8) Secure cable to column with plastic cable ties.

2. MOUNTING THE CONSOLE AND CABLING

l) Mount the Console to a secure support inside the cab of the vehicle.

2) Remove the Jumper Plug on the SCS 212 Console Control Cable. Connect the 2' SCS 360 Console Control Cable to the SCS 212 Console Control Cable and the other end of the SCS 360 Console Control Cable to the back of the SCS 360 Console. (See Figure 4).

3) Run the 24' Flow Control Cable out of the vehicle cab and connect with the Flow Meters.

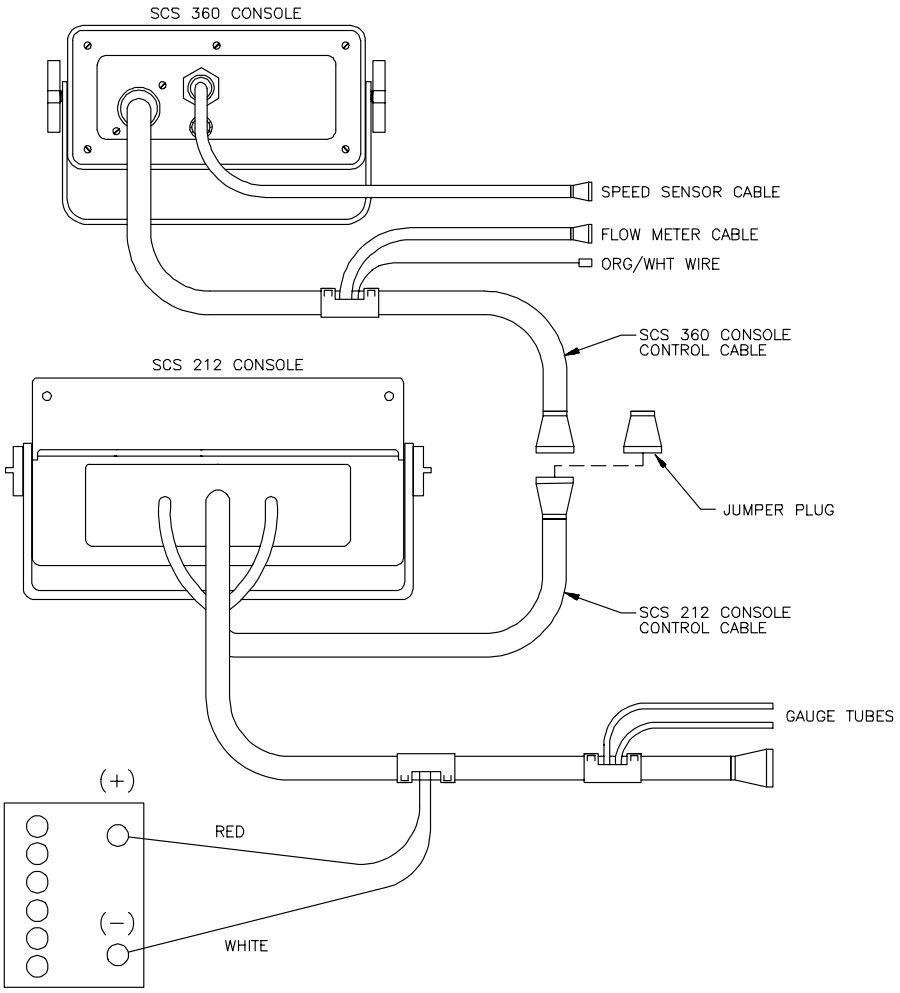


FIGURE 4

4) Turn MASTER ON/OFF switch OFF and route the Red and White battery wires to a 12-volt battery. Attach the White wire to the **NEGATIVE** (-) terminal and the Red wire to the **POSITIVE** (+) terminal. **(DO NOT CONNECT WIRES TO THE STARTER).** Secure the battery wires with plastic cable ties. **DO NOT** tie the battery wires close to the existing battery leads or other electrical wiring. (See Figure 5 on page 6).

5) Connect the Speed Sensor Cable to the plug in the back of the Console.

6) Installation of the system is now complete.

BATTERY CONNECTIONS

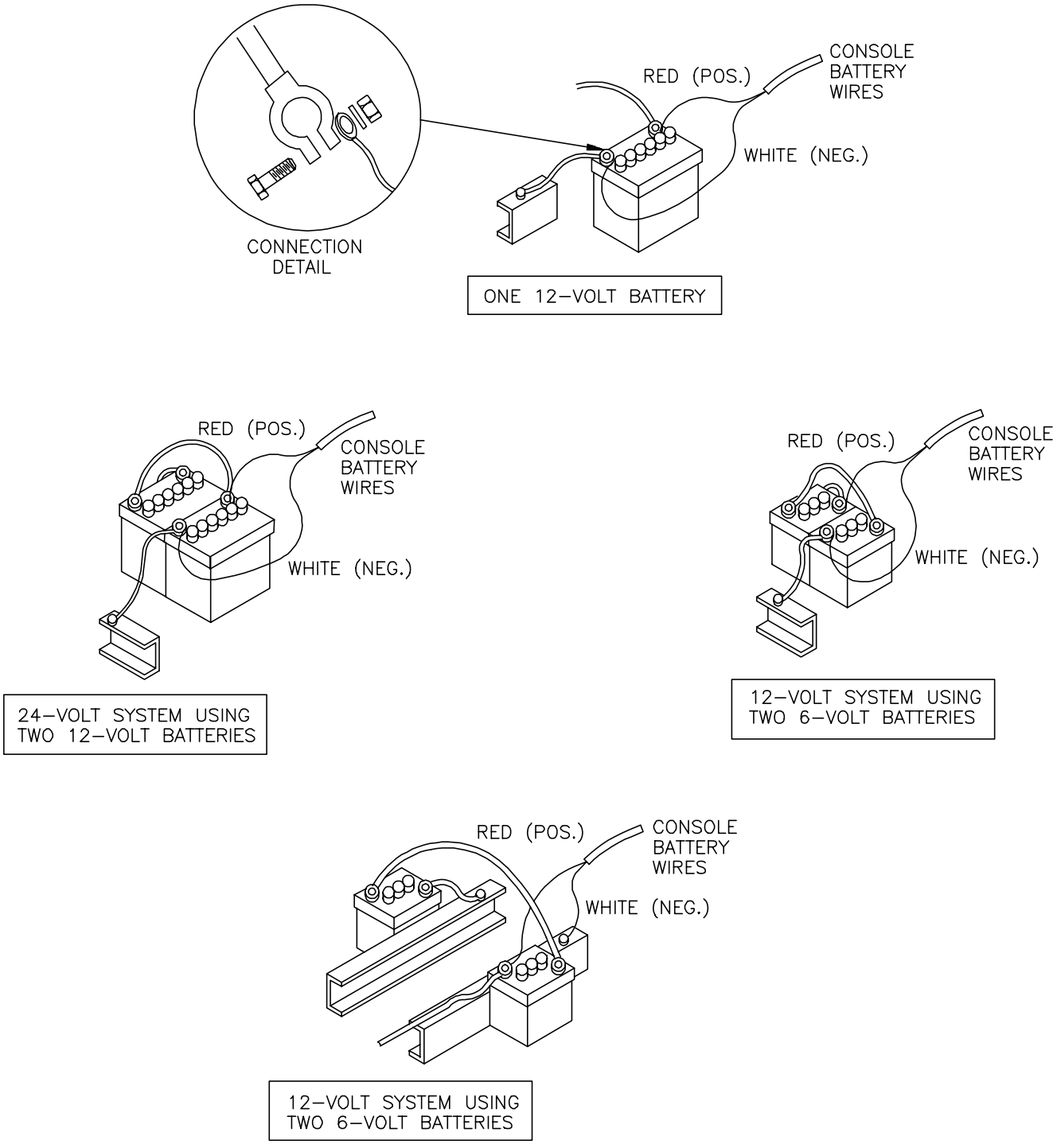
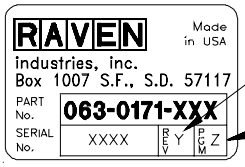


FIGURE 5

CONSOLE FEATURES

IMPORTANT: This Console requires selection of **US** (acres), **SI** [hectares], or **TU** {1,000 sq. ft.} area; **SP1** (wheel drive, etc.) or **SP2** (radar) speed sensor; and **C-Sd** (Standard Valve) or **C-FC** (Fast Close Valve).

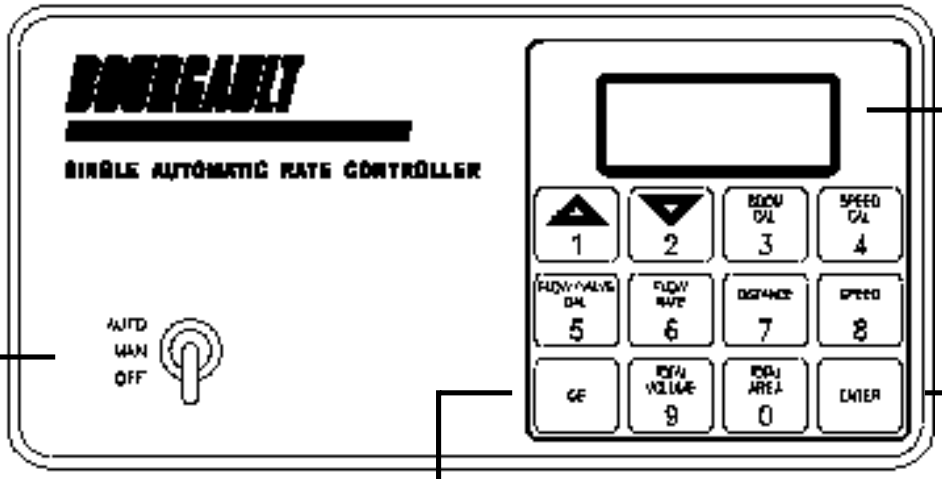


Console Revision can be determined by the letter stamped in REV box on label.

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

Selects Off (Power Off), manual, or fully automatic control.

Displays actual rate of application, calibration, and function data.



CE - Use like you do the CE key on a calculator.

ENTER - Used only to enter data into the Console.

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

BOOM CAL -- Length of Boom. Select Boom number by using the UP/DOWN arrow keys.
SPEED CAL -- Determined by Speed Sensor
METER (FLOW) CAL -- Meter Calibration Number
VALVE CAL -- Valve Response Time
FLOW RATE -- Target Application Rate

FUNCTION KEYS -- Used to Display Data

DISTANCE -- Distance Traveled
SPEED -- Speed of Vehicle
TOTAL VOLUME -- Total Volume Applied
TOTAL AREA -- Total Area Applied

CONSOLE CALIBRATION

1. CALCULATING "BOOM CAL"

Calculate the width of each boom in inches [cm] by multiplying the number of tips times the spacing. End boom width needs to be determined by measuring spray pattern width. Only one end boom can be used at a time. Console assumes end boom widths are equal. Write these boom widths down for future reference when programming the Console.

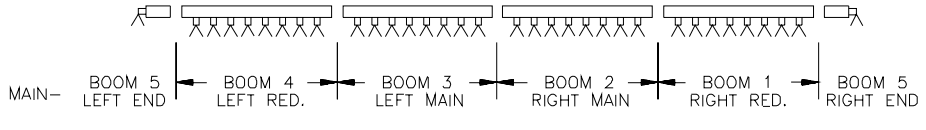


FIGURE 6

2. CALCULATING "SPEED CAL"

This section applies only to the Wheel Drive Speed Sensor. (Instructions for Speedometer or Radar Speed Sensors are included in their packing carton).

1) Place chalk mark or tape on vehicle tire on which Speed Sensor is mounted, as shown in Figure 7.

2) Mark initial spot on the ground.

3) Drive vehicle straight ahead counting 10 revolutions of the wheel, with the mark stopping at the same position as starting.

4) Measure distance from start mark to stop mark in inches [dm]. (Round off to the nearest whole number). Divide this number by 2. If **six magnets** are used, see Appendix 7.

5) Write down this SPEED CAL calibration number for future reference when programming the Console.

NOTE: This measurement is critical to the performance of the SCS 360. **MEASURE CAREFULLY**. Make sure tire is properly inflated before measuring. Measure tire in type of soil in which you will be spraying. Circumference of tire will vary when measured in soft soil versus hard packed soil. For best results, measure several times and average the results.

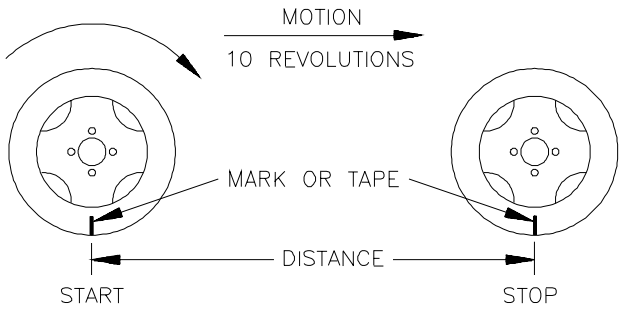


FIGURE 7

3. CALCULATING "METER CAL"

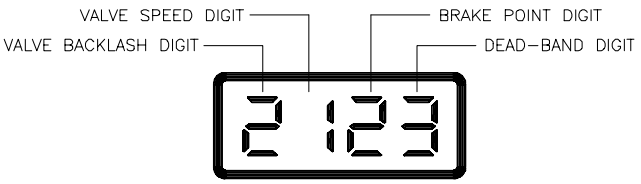
The Flow Meter calibration number is stamped on the label attached to each Flow Meter. This number is to be used for gallons [liters] per area application.

To convert original Flow Meter calibration number from gallons to desired units of measure (oz. or lbs per area) see METER CAL CONVERSIONS on page 2. Write down this number for future reference when programming the Console.

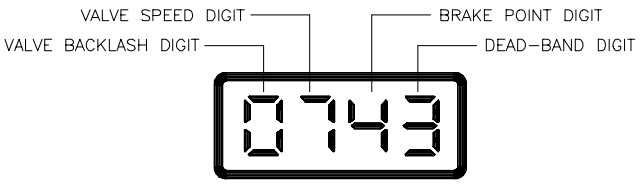
4. CALCULATING "VALVE CAL"

1) The Control Valve calibration number is pre-programmed (2123 for C-Sd, 743 for C-FC). No entry needs to be made for this value. However, if the response time of the Control Valve needs to be changed, a new calibration number can be entered by depressing the FLOW/VALVE CAL key for 5 seconds. See definitions below:

For **STANDARD VALVE** (C-Sd):



For **FAST VALVE** (C-FC):



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.

C-Sd Valve Control Range: 1 to 9 1-Slow, 9-Fast
C-FC Valve Control Range: 0 to 9 9-Slow, 0-Fast

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

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

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

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

5. CALCULATING "RATE CAL"

Determine the application rate at which your chemical should be sprayed. Consult with your Dealer to ensure your spray nozzles are capable of applying at this rate. In determining which spray nozzles to use with your sprayer, you must know:

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 you would select tip number XR8004 from the chart below, since it comes closest to providing the desired output.

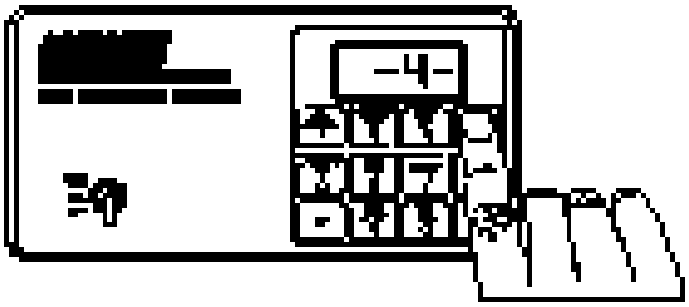
TIP COLOR	TIP NO. 80 DEG.	TIP NO. 110 DEG.	LIQUID PRESSURE IN PSI	CAPACITY 1 NOZZLE IN GPM	CAPACITY 1 NOZZLE IN OZ./MIN.	GALLONS PER ACRE 20" SPACING 5 MPH	6 MPH	7 MPH	8 MPH
YELLOW	XR8002	XR11002	15	.12	15	7.3	6.1	5.2	4.5
			20	.14	18	8.4	7.0	6.0	5.3
			30	.17	22	10.3	8.6	7.4	6.4
			40	.20	26	11.9	9.9	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.

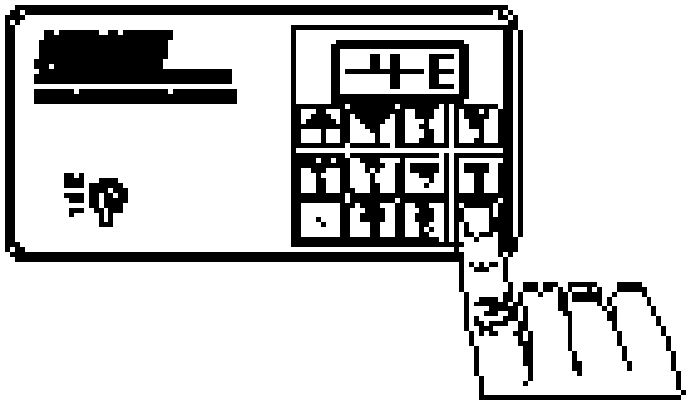
FLOW METER MODEL	FLOW RANGE
RFM 5	0.05-5 GPM [0.2-18.9 lit/min]
RFM 15	0.3-15 GPM [1.1-56.8 lit/min]
RFM 55/55A	1-55 GPM [3.8-208 lit/min]
RFM 100	3-100 GPM [11.4-379 lit/min]
RFM 200/200 Poly	15-200 GPM [56.8-757 lit/min]
RFM 400	25-400 GPM [94.6-1514 lit/min]

CONSOLE PROGRAMMING

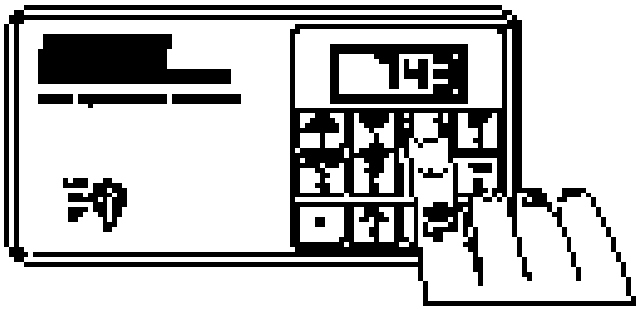
When entering data into the Console, the entry sequence is always the same. (NOTE: DATA MUST BE ENTERED INTO THE FIRST SIX KEYS).



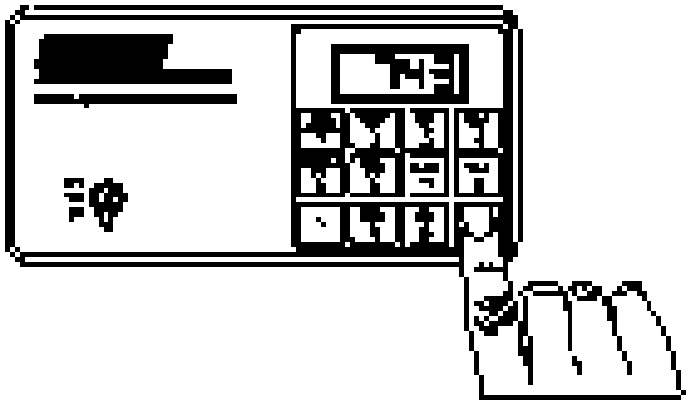
Depress the key in which you wish to enter data.



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



Depress the keys corresponding to the number you wish to enter (i.e. "7","4","3"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

1. INITIAL CONSOLE PROGRAMMING

If an entry selection error is made during steps 1-6, place the AUTO/MAN/OFF switch to the OFF position. Depress [CE] key and hold while placing the AUTO/MAN/OFF switch to MAN or AUTO. This will "reset" the Console. The DATA display will now show "US".

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

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

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

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

2) Selecting US, SI, or TU.

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

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

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

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

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

4) Selecting SP1 or SP2.

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

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

5) Selecting C-Sd or C-FC.

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

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

6) Procedure for entering BOOM CAL:
Definition of keys:

[BOOM CAL 3] Depressing this key displays the selected boom number.
EXAMPLE: Boom 1 will display as b-01.

[▲ 1] Depressing this key after selecting BOOM CAL increments the boom number.
EXAMPLE: b-01 will increment to b-02.

[▼ 2] Depressing this key after selecting BOOM CAL decrements the boom number.
EXAMPLE: b-02 will decrement to b-01.

Entering Boom Data.

1. Select desired boom number.
2. Enter boom length as detailed on page 8.
3. If a boom is not needed, enter a "0" for a length.

7) Enter SPEED CAL in key labelled: SPEED CAL 4

8) Enter METER CAL calibration number in key labelled: FLOW/VALVE CAL 5

9) Enter FLOW RATE gal/acre [lit/ha] target application rate in key labelled: FLOW RATE 6

NOTE: A decimal point is displayed automatically. Therefore, twenty gallons per acre is entered as 20.0, not 2.0.

YOU HAVE NOW COMPLETED PROGRAMMING THE CONSOLE
The flashing "CAL" will now extinguish. If not, repeat procedure starting at Step 6.

10) To change VALVE CAL calibration number depress key labelled: FLOW/VALVE CAL 5

for 5 seconds. Display will flash. Enter VALVE CAL number. (See page 9 for default VALVE CAL settings).

NOTE: To display operating mode (US, SI, TU), speed sensor type (SP1, SP2), and valve control (C-Sd, C-FC) depress TOTAL AREA 0 for 5 seconds and continue holding.

2. OTHER DISPLAYS

1) To display TOTAL AREA covered, momentarily depress key labelled: TOTAL AREA 0
To "zero out" this total at any time, enter a "0" in this key.

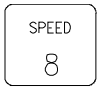
2) To display TOTAL VOLUME sprayed, momentarily depress key labelled: TOTAL VOLUME 9
To "zero out" this total at any time, enter a "0" in this key.

3) To display DISTANCE (feet) [m] traveled, momentarily depress key labelled: DISTANCE 7
To "zero out" this total at any time, enter a "0" in this key.

4) To display MPH [km/h], momentarily depress key labelled: SPEED 8

3. SELF TEST FEATURE

SELF TEST allows speed simulation for testing the system while the vehicle is not moving. Enter the simulated operating speed by depressing key labelled: SPEED 8 for 5 seconds (display will flash). If 6 MPH [9.6 km/h] is desired, enter 6.0 [9.6]. (See CONSOLE PROGRAMMING on page 11).

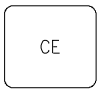
Verify SPEED by depressing key labelled: 

6.0 [9.6] will appear in the 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.

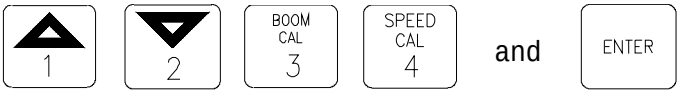
NOTE: To prevent nuisance clearing of self-test speed, disconnect speed connector on back of the Console when Radar Speed Sensors are used.

4. SEQUENCE TO ACTIVATE DATA-LOCK

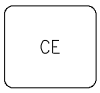
1) Depress 

for 5 seconds, NEW CODE message will appear.

2) Enter 4 digit code within 15 seconds.

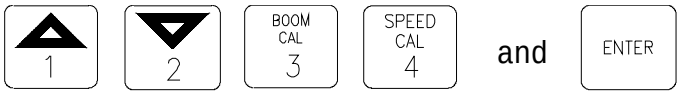
EXAMPLE: For 1234, depress: 

5. SEQUENCE TO CHANGE DATA-LOCK

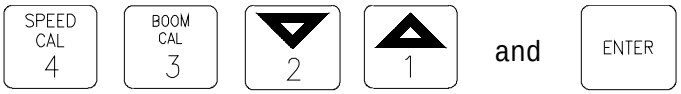
1) Depress 

for 5 seconds, OLD CODE message will appear.

2) Enter 4 digit code within 15 seconds:



NEW CODE message will appear. Enter 4 digit code within 15 seconds.

EXAMPLE: For 4321, depress: 

6. ENTER MODE SEQUENCE WITH ACTIVATED DATA-LOCK

1) Depress the key into which you wish to enter data.

2) Depress 

CODE message will appear. Enter your DATA-LOCK CODE. If code is correct, "E" will appear. Now enter data normally.

* The DATA-LOCK feature prohibits the entry of data without first entering the DATA-LOCK CODE. If DATA-LOCK is not desired, omit Steps 4, 5, and 6. The DATA-LOCK CODE may be cleared by entering a code of "0" or by resetting Console.

INITIAL SYSTEM FIELD TEST

1) Drive down field or road at target speed with sprayer booms off, to verify SPEED readout on Console.

2) With water in tank, turn on sprayer and booms and place the AUTO/MAN/OFF switch to AUTO. 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, review INITIAL SYSTEM SET-UP in SCS 212 INSTALLATION AND SERVICE MANUAL.

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

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.**

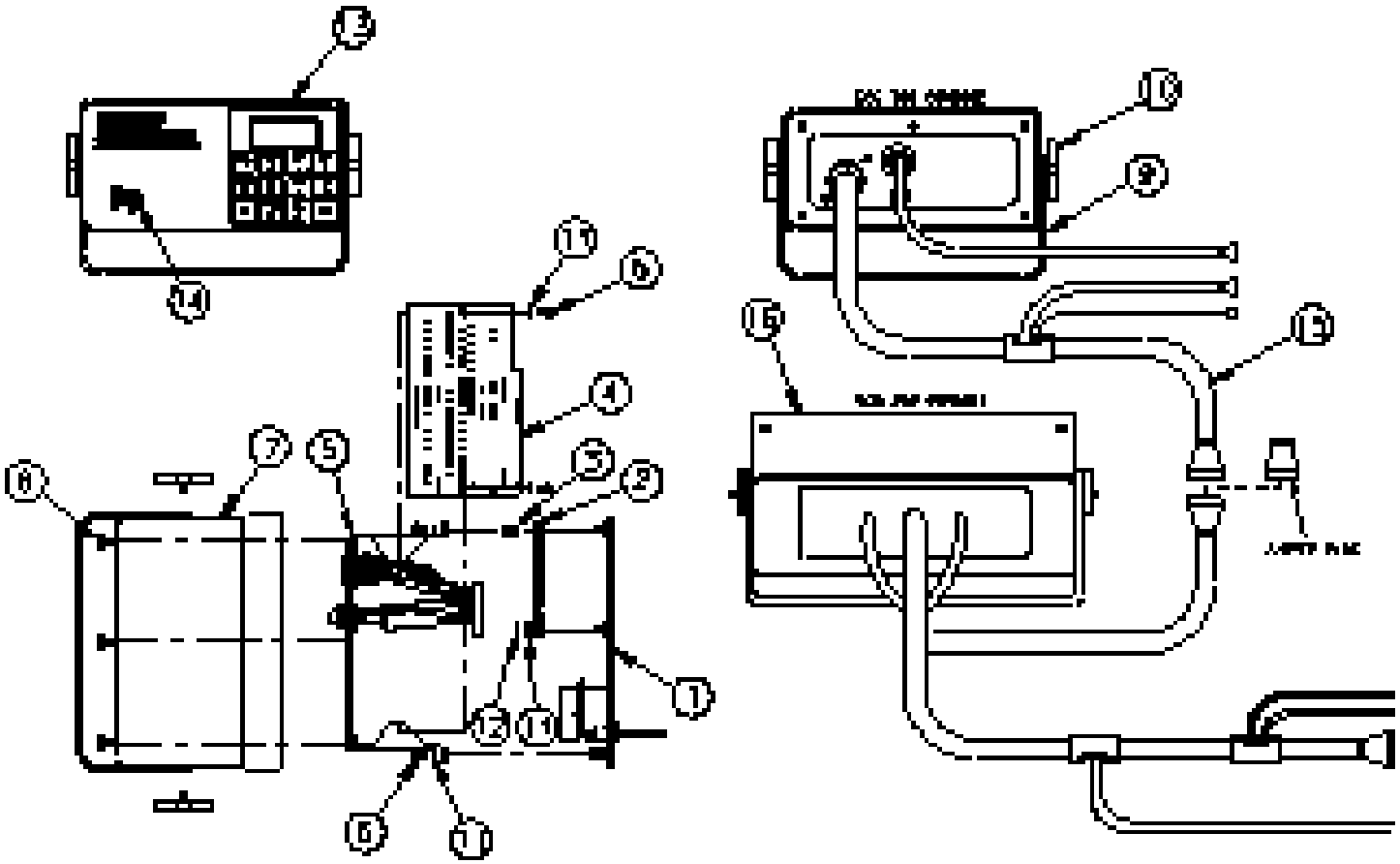
3) Remove Flow Meter at the end of each spraying season. Clean Flow Meter turbine and inlet hub. Clean off all metal filings and wettable powders which have hardened on the plastic and metal parts. Check the inlet hub and turbine assembly for worn or damaged turbine blades and bearings. Flush Flow Meter with clear water and drain.

KEEP FROM FREEZING

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

SCS 360 REPLACEMENT PARTS

ITEM	DESCRIPTION	RAVEN PART #
1	Faceplate Assembly	063-0171-165
2	Display P.C. Assembly	064-0159-535
3	Spacer, Threaded	305-2540-625
4	Processor P.C. Assembly	064-0159-544
5	Connector Plate Assembly	063-0171-167
6	Screw, 6-32 UNC x 5/16 in.	311-0004-008
7	Enclosure w/ Inserts	063-0171-135
8	Screw, 6-32 UNC	321-0000-085
9	Mounting Bracket	107-0159-007
10	Knob	309-1000-006
11	Internal Lock Washer	313-3000-007
12	Hex Nut	312-1001-014
13	SCS 360 Console	063-0171-164
14	Off/Man/Auto Switch	412-2011-052
15	Console Control Cable (2 ft.)	115-0159-737
16	SCS 212 Console	063-0171-169

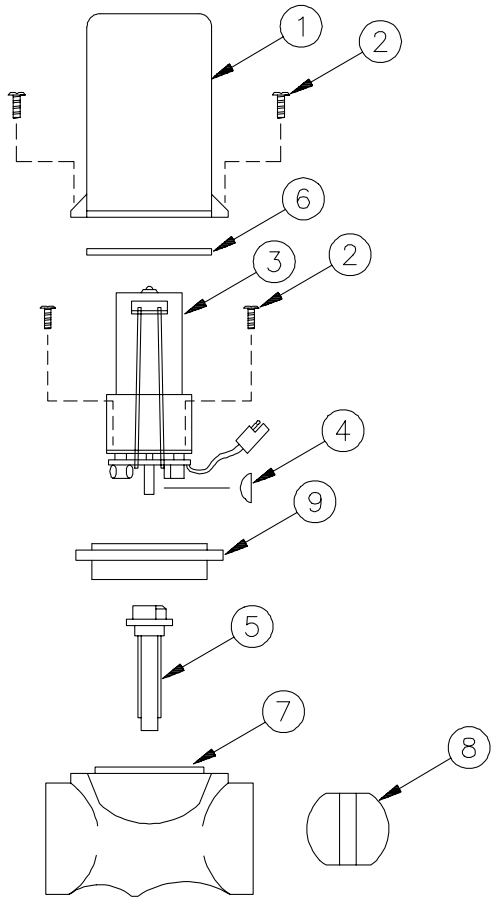


1" AND 1 1/2" POLY CONTROL VALVE REPLACEMENT PARTS

063-0159-445 - 1" VALVE
063-0159-446 - 1 1/2" VALVE

ITEM	DESCRIPTION	RAVEN PART #
1	Valve Cover	106-0159-407
2	#6-32 x 3/4" Lg. Screw	321-0000-256
3	Motor Assembly	063-0159-409
4	Woodruff Key	321-0000-062
5	Coupler Shaft (1" Valve)	019-0159-016
	Coupler Shaft (1 1/2" Valve)	019-0159-015
6	Seal Tetraseal	219-0000-020
7	Valve Body Mod. (1" Valve)	019-0159-005
	Valve Body Mod. (1 1/2" Valve)	019-0159-006
8	Butterfly (1" Valve)	106-0159-411
	Butterfly (1 1/2" Valve)	106-0159-414
9	Isolation Flange Assembly	063-0159-457
10	Iso-Body Kit (1" Valve) (Not Shown)	117-0159-009
	Iso-Body Kit (1 1/2" Valve) (Not Shown)	117-0159-010
11	*Polarity Reversal Jumper (Not Shown)	115-0159-415

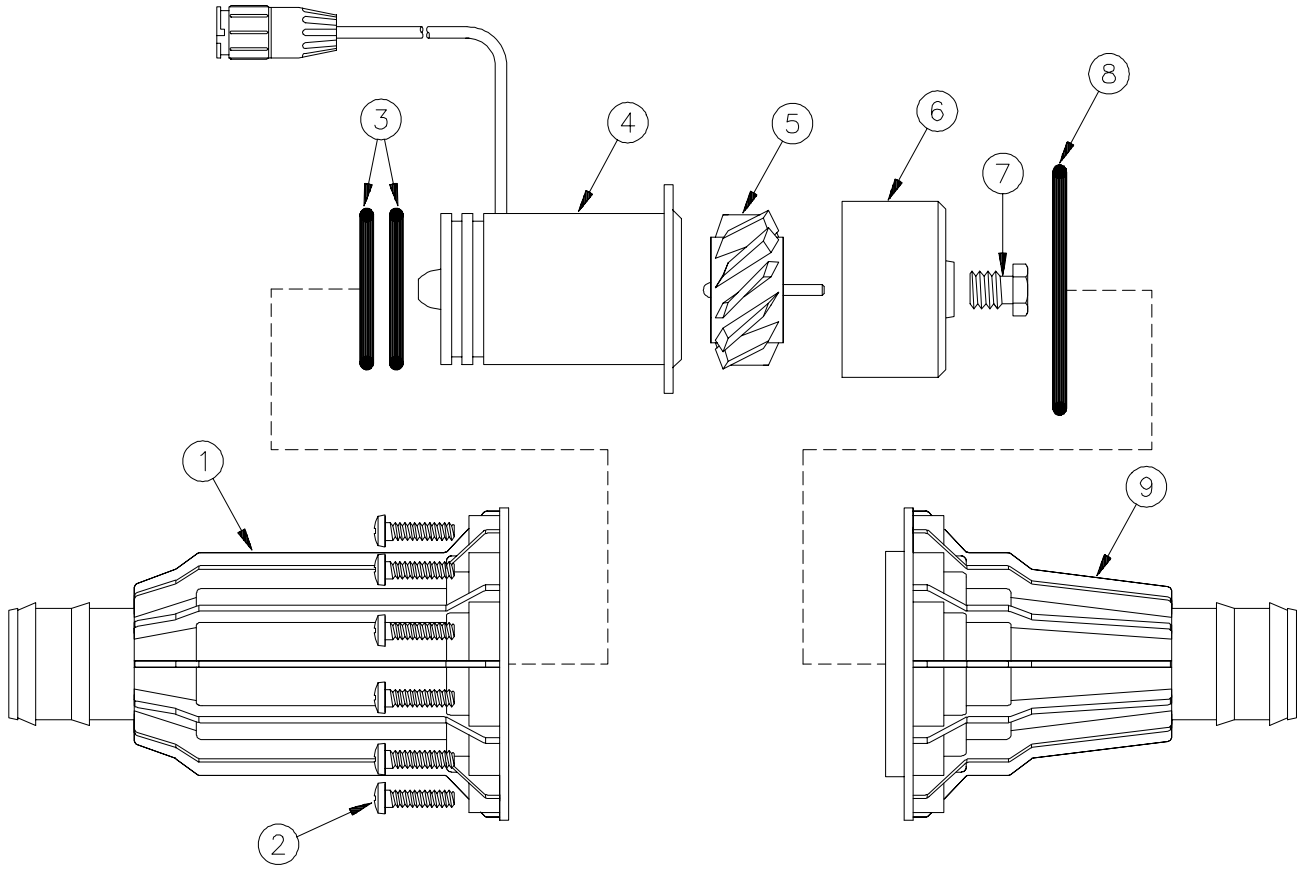
*NOT SUPPLIED WITH STANDARD UNIT



RFM 55 FLOW METER REPLACEMENT PARTS

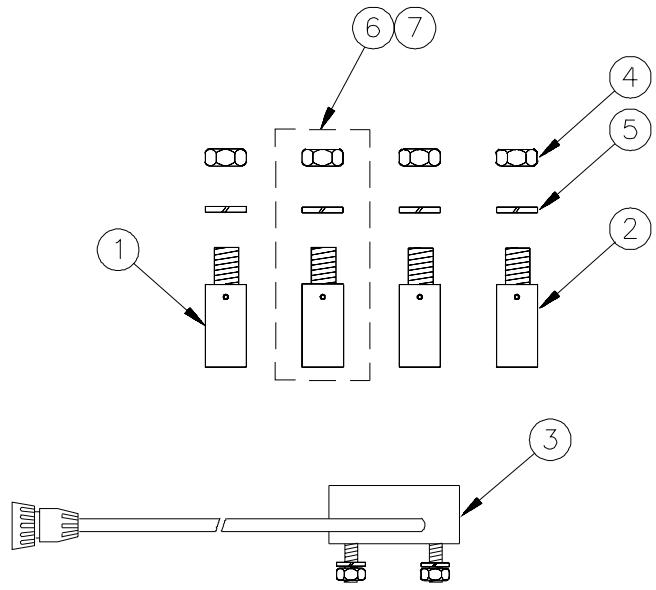
063-0159-571

ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing	019-0159-085
2	#10-32 x 3/4" S.S. Screw	311-0007-037
3	O-Ring, Viton	219-0002-030
4	RFM 55 Dual O-Ring XDCR Assembly	063-0159-749
5	RFM 55 Turbine	117-0159-020
6	Turbine Hub/Bearing Assembly	063-0359-563
7	Turbine Stud Assembly	063-0159-570
8	O-Ring, Viton	219-0000-042
9	Hub Housing w/Inserts	063-0159-776
10	Mounting Bracket, RFM 55 (Not Shown)	107-0159-507
**	Dual O-Ring Transducer Kit (Includes Items #3 & 4)	117-0159-569



WHEEL DRIVE SPEED SENSOR REPLACEMENT PARTS

ITEM	DESCRIPTION	RAVEN PART #
1	Red Magnet Assembly, North	063-0159-402
2	Black Magnet Assembly, South	063-0159-403
3	Sensor Ass'y (24 ft.) Standard	063-0171-295
	Sensor Ass'y (10 ft.) Turf	063-0159-770
	Sensor Ass'y (7 1/2 ft.)	063-0171-149
4	1/2-13 Hex Nut	312-1001-043
5	1/2" Lock Washer	313-1000-028
6	Red Magnet Wheel Kit, North	115-0159-622
7	Black Magnet Wheel Kit, South	115-0159-623
8	24 ft. Speed Sensor Ext. Cable (Optional)(Not Shown)	115-0159-018
9	12 ft. Speed Sensor Ext. Cable (Optional)(Not Shown)	115-0159-032



APPENDIX 1
RIM DRILLING INSTRUCTIONS FOR WHEEL DRIVE SPEED SENSOR MAGNETS

On wheels which do not have pre-punched mounting holes, proceed as follows:

RIMS WITH FOUR OR EIGHT HOLE STUD PATTERN:

Choose stud holes that are opposite each other as shown in Figure 8. Using the center of opposite holes, scribe two lines on the rim web to divide the circumference into four equal parts. Measure in one inch from the outer edge of the web on each of the lines drawn. Mark this point as the center. Drill four 1/2" holes for mounting the magnets.

NOTE: Distance (D) between each set of drilled holes must be equal within 1/8" [3 mm] to ensure accuracy of system.

RIMS WITH SIX HOLE STUD PATTERN:

Locate the center of the holes to be drilled by using the rim webbing as a guide. (See Figure 9). Obtain a small piece of wood and cut to fit exactly over the web as shown in Figure 9. Measure the length of the piece of wood and mark the center on one edge. Using the center mark on the piece of wood, mark each of the four webs. Measure in one inch from the outer edge of the web on each of the lines drawn. Mark this point as center and drill four 1/2" holes for mounting the magnets.

NOTE: Distance (D) between each set of drilled holes must be equal within l/8" [3 mm] to ensure accuracy of system.

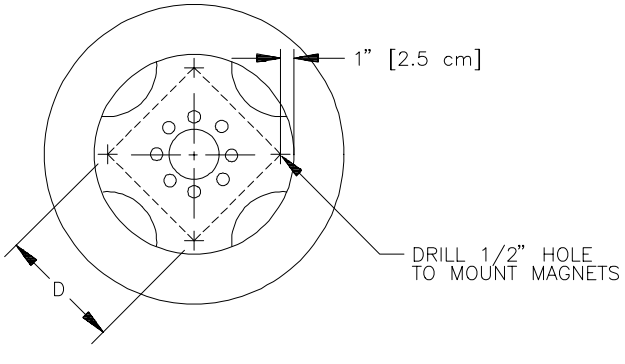


FIGURE 8
EIGHT HOLE STUD PATTERN

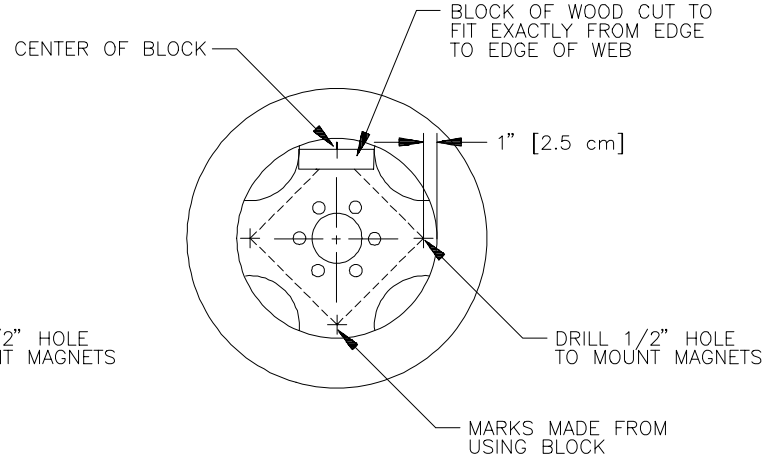
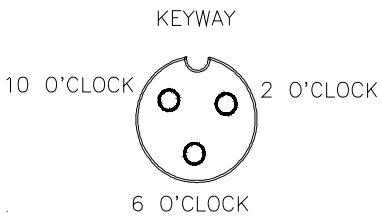


FIGURE 9
SIX HOLE STUD PATTERN

APPENDIX 2
PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES

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



1) 2 o'clock socket is power.
2) 10 o'clock socket is ground.
3) 6 o'clock socket is signal.

VOLTAGE READINGS

1) 10 o'clock to 6 o'clock (+5 VDC).
2) 10 o'clock to 2 o'clock (+5 VDC).

Procedure to check cable:

l) Enter SPEED CAL number of 1000 in key labelled: SPEED CAL 4

2) Depress key labelled: SPEED 8

3) With small jumper wire (or paper clip), short between 10 o'clock and 6 o'clock sockets with a "short-no short" motion. This should cause a speed reading to be displayed in the Console. Each time a contact is made, the DISTANCE total should increment up 1 or more counts.

4) If DISTANCE does not count up, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.

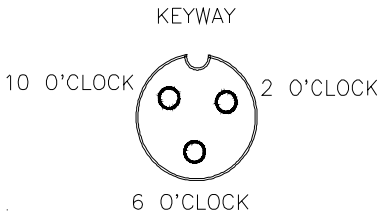
5) Perform above voltage checks.

6) If all cables test good, replace speed sensor.

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

APPENDIX 3
PROCEDURE TO TEST FLOW METER CABLES

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



1) 2 o'clock socket is ground.
2) 10 o'clock socket is power.
3) 6 o'clock socket is signal.

VOLTAGE READINGS

1) 2 o'clock to 6 o'clock (+5 VDC).
2) 2 o'clock to 10 o'clock (+5 VDC).

Procedure to check cable:

1) Enter a METER CAL number of one (1) in key labelled: FLOW/VALVE CAL 5

2) Depress key labelled: TOTAL VOLUME 9

3) Place BOOM switches ON.

4) With small jumper wire (or paper clip), short between 2 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the TOTAL VOLUME should increment up 1 or more counts.

5) If TOTAL VOLUME does not count up, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.

6) Perform above voltage checks.

7) If all cables test good, replace Flow Sensor.

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

APPENDIX 4
FLOW METER MAINTENANCE AND ADJUSTMENT PROCEDURE

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

2) Remove flange bolts or clamp from the Flow Meter.

3) Remove the turbine hub and turbine from inside Flow Meter.

4) Clean turbine and turbine hub of metal filings and 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. It should spin freely with very little drag.

5) If transducer (XDCR) assembly is replaced or if turbine stud is adjusted or replaced, verify the turbine fit before reassembling. Hold turbine hub with turbine on transducer. Spin turbine by blowing on it. Tighten turbine stub until turbine stalls. Loosen turbine stud 1/3 turn. The turbine should spin freely.

6) Re-assemble Flow Meter.

7) Using a low pressure (5 psi) [34.5 kPa] jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/16 turn until the turbine spins freely.

APPENDIX 5
PROCEDURE TO RE-CALIBRATE FLOW METER

1) Enter a FLOW/VALVE 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 in calibrated 5 gallon [19 liter] container.

5) Switch ON appropriate boom switch and MASTER switch. Pump exactly 10 gallons [38 liters].

6) Readout in TOTAL VOLUME is the new FLOW/VALVE CAL number. This number should be within +/- 3% of the number stamped on the tag on Flow Meter.

7) Repeat this procedure several times to confirm accuracy. (Always "zero out" the TOTAL VOLUME display before retesting).

NOTE: For greatest precision, set FLOW/VALVE 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: FLOW/VALVE CAL = 720 [190]
TOTAL VOLUME = 260 [984]
Predetermined amount of measured liquid = 250 [946]

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

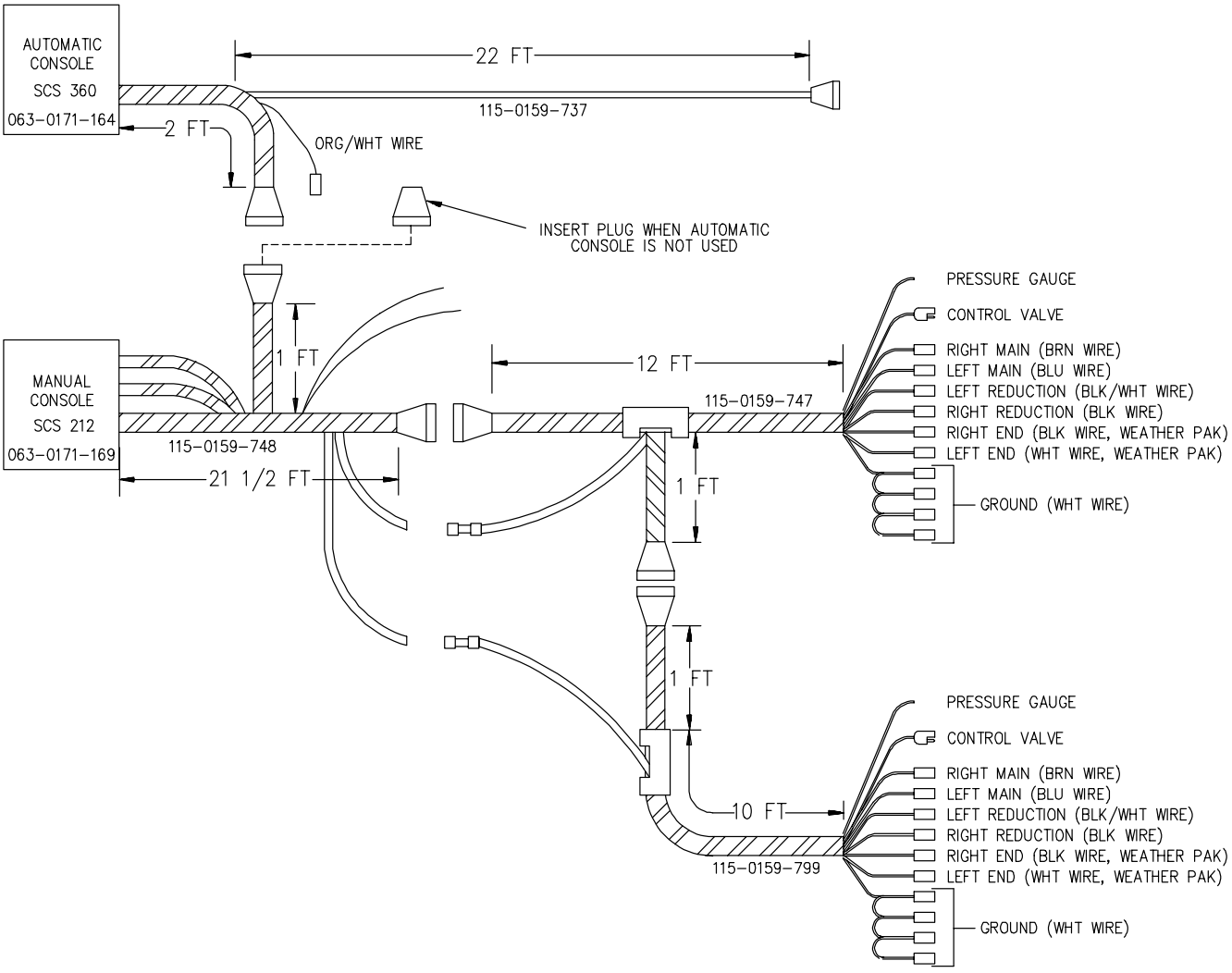
ENGLISH UNITS:
$= \frac{720 \times 260}{250} = 749$

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

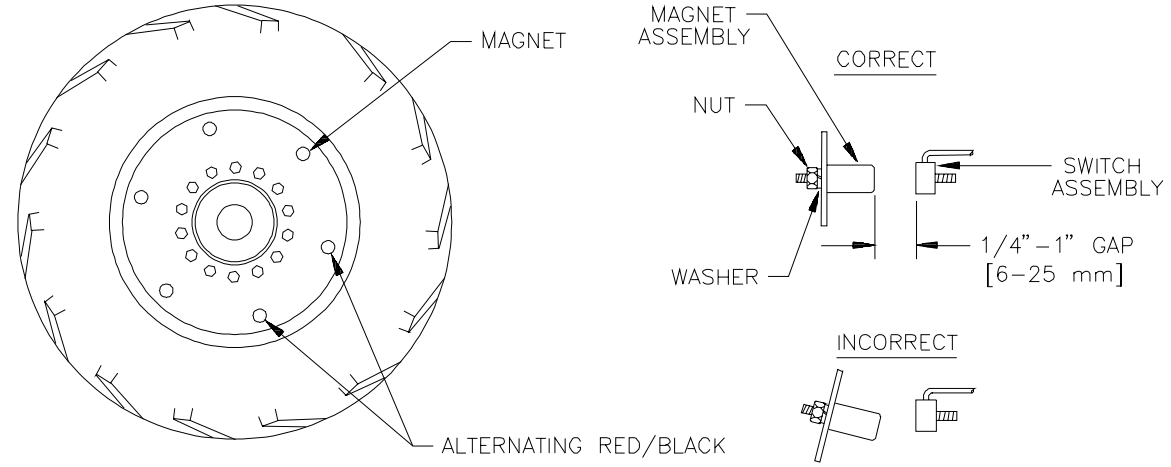
Corrected FLOW/VALVE CAL = 749 [198]

9) Enter corrected FLOW/VALVE CAL before resuming application.

APPENDIX 6
SYSTEM CABLING



APPENDIX 7
SIX MAGNET WHEEL DRIVE SPEED SENSOR



Position the six magnets symetrically on the rim of the tire, alternating the magnets in red-black order.

To find the new SPEED CAL number, take number found in CALCULATING "SPEED CAL" on page 8 and divide by 3. This is the new SPEED CAL number.

RAVEN

RAVEN INDUSTRIES

Limited Warranty

What Does this Warranty Cover?

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

How Long is the Coverage Period?

Raven Applied Technology Products are covered by this warranty for 12 months after the date of purchase. This warranty coverage applies only to the original owner and is nontransferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven Dealer. If your Dealer agrees with the warranty claim, the Dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products 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 or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

SCS 360
Installation & Service Manual
(P/N 016-0159-543 Rev B 2/09)

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Raven Industries
Applied Technology Division
P.O. Box 5107
Sioux Falls, SD 57117-5107

Toll Free (U.S. and Canada): (800)-243-5435
or Outside the U.S. :1 605-575-0722
Fax: 605-331-0426
www.ravenprecision.com
atdinfo@ravenind.com