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Installation & Service Manual

SCS 550

N O T I C E

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.

016-0159-476

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REPLACEMENT PARTS LIST

APPENDIXES

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 CONVERSATIONS

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

FOR EXAMPLE:

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

$$\frac{\text{Original Meter Cal No.}}{3.785} = \text{Meter Cal No. for displays in Liters}$$

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

LIQUID CONVERSIONS

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

LENGTH

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

PRESSURE

1 psi = 6.89 kPa
1 kPa = 0.145 psi

AREA

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

INTRODUCTION

The Raven SCS 550 is a manual sprayer control system providing the operator with the ability to adjust flow rate at the touch of a finger to compensate for changes in speed, for changes in number of booms in operation, or for desired changes in application rates.

The RAVEN SCS 550 consists of a computer based control Console, Speed Sensor and cables. The Console mounts directly in the cab for easy operator use. The Speed Sensor is mounted on a non-driven wheel of the vehicle or implement (Radar and Speedometer Drive Speed Sensors are also available). Appropriate cabling is furnished for field installation.

The operator manually sets the application rate. Actual volume per area being applied is displayed at all times. The SCS 550 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 two magnets, a switch assembly with cable, and mounting hardware. (Installation instructions for the optional radar interface speed sensor is included in the shipping carton. See Appendix 1 for speedometer drive speed sensor Installation Instructions).

Sequence of mounting Speed Sensor:

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

2) Check for predrilled holes in rim. If not predrilled, drill two 1/2" (13 mm) holes directly opposite each other in the rim. Holes should be approximately 1" (25 mm) in from outside edge of rim. See figure 1.

3) Mount the two magnets to inside of rim and tighten (See Figures 1, 2, & 3). The red and black magnets must be mounted opposite each other.

4) Mount switch assembly to stationary column with hardware provided. (See Figure 2). The switch assembly need not pivot with the wheel.

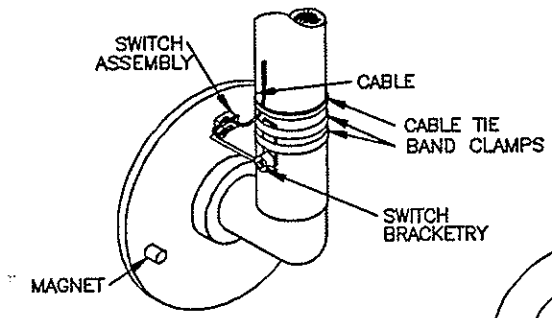


FIGURE 1

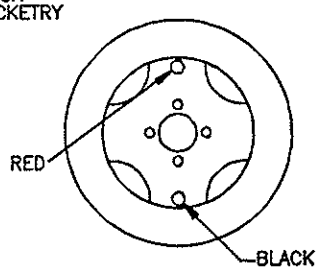


FIGURE 2

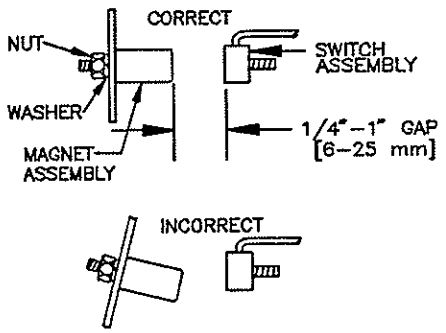


FIGURE 3

5) Position switch assembly so that as the wheel rotates the magnets pass across the center of the black, molded switch assembly. (See Figures 2 & 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 insure 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. Route cable into tractor cab as far as possible from the engine generator and voltage regulator.

2. MOUNTING THE FLOW METER

1) Mount Flow Meter in the area of the boom on/off valves per FIGURE 4. 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 (See FIGURE 4).

3) For best results, allow a minimum of 7 1/2 inches (20 cm) of straight hose on inlet
of RFM ff Flow Meter. Bend radius of hose on outlet of Flow Meter should be gradual, as shown in Figure 4.

4) Flow must be in direction of arrow on Flow Meter.

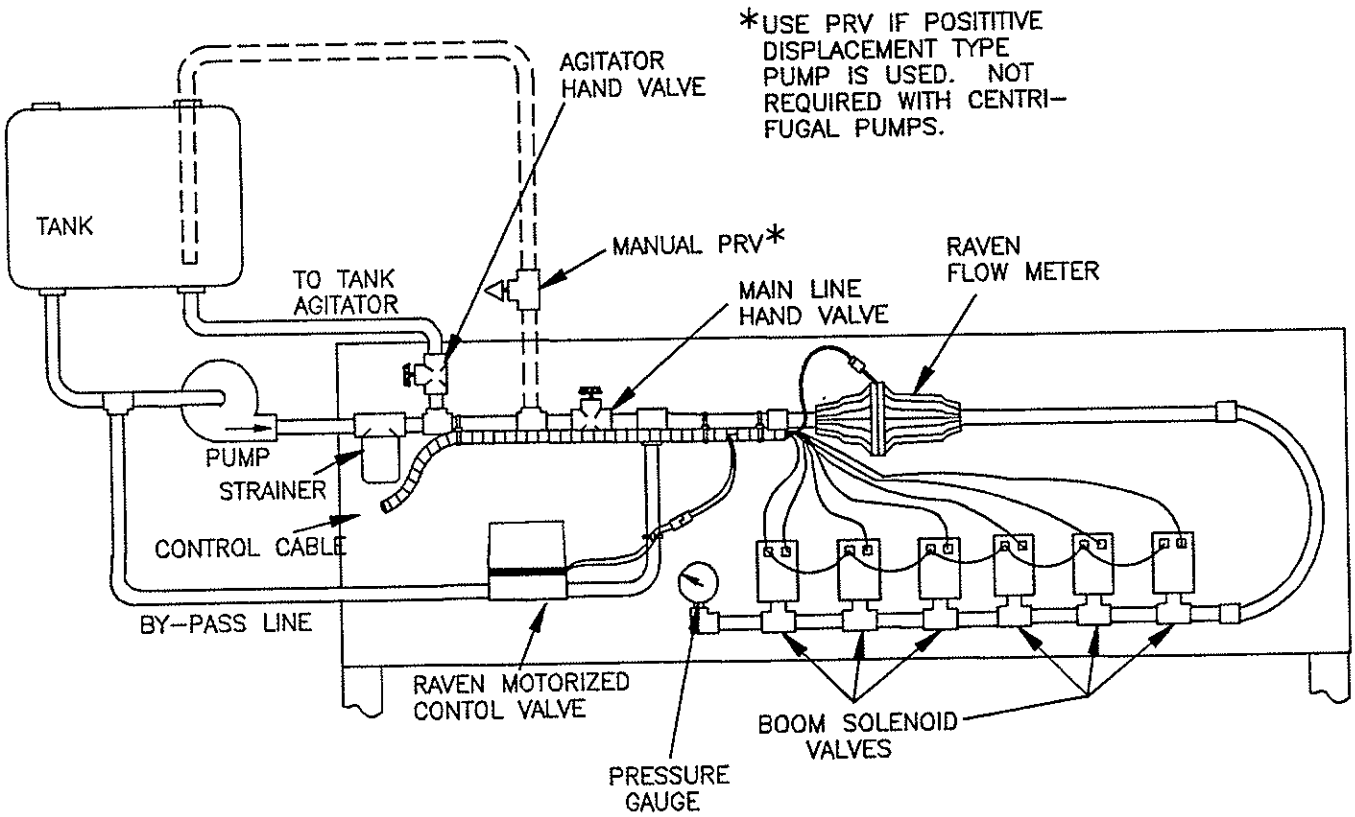


FIGURE 4

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

3. MOUNTING THE CONTROL VALVE

1) Mount the motorized Control Valve in the by-pass line with motor in the upright position. (See Figure 4).

2) Connect the 16-foot (4.9 meter) Control Cable to the Flow Meter, motorized Control Valve and Boom On/Off Valves. (See Figure 5). (Black wire to Boom Valve #1, Brown to Boom Valve #2. Blue to Boom Valve #3, White-Black wire to Boom Valve #4, White-Brown wire to Boom #5, White-Blue wire to Boom Valve #6). See Appendix 6 for optional wiring.

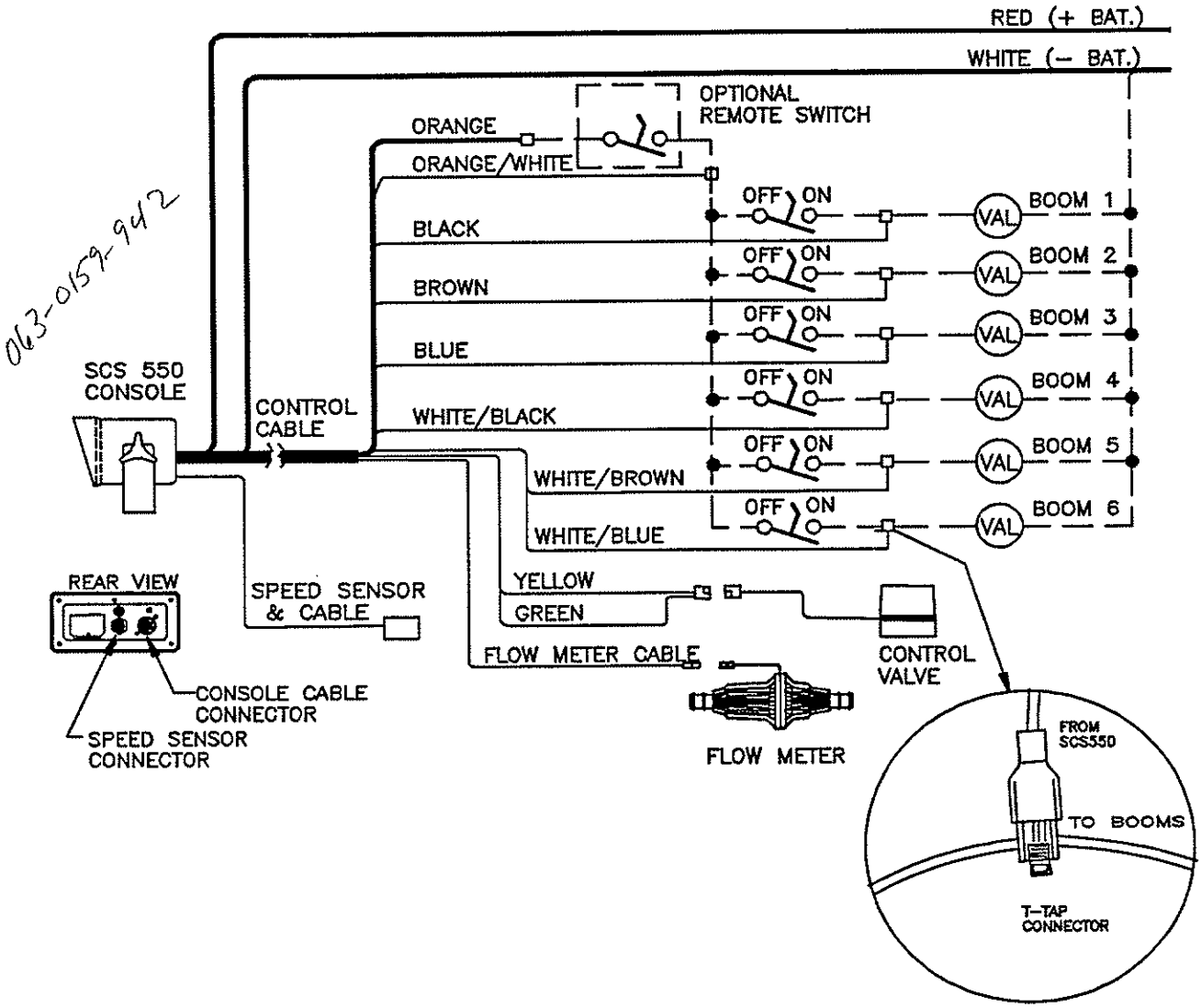


FIGURE 5

4. MOUNTING THE CONSOLE AND CABLING

1) Mount the console to a secure support inside the cab of the vehicle.

2) Connect the 16 foot (4.9 meter) Console Control Cable to the plug in the back of the Console. (Reference Figure 5). Route the Console Control Cable out of the vehicle cab and terminate. (Flow Meter extension cables are available from your Dealer).

3) Turn RUN/HOLD/OFF switch OFF and route the Red and White battery wires to a 12-volt battery. Attach the White battery wires to the NEGATIVE (-) terminal and the Red battery wire directly to the POSITIVE (+) battery terminal. (See Figure 5a). (DO NOT CONNECT RED AND WHITE 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 any other electrical wiring.

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

5) Secure and tie the Speed Sensor Cable and the Console Control Cable with plastic cable ties.

6) Initial installation of the system is now complete.

*When using optional Remote Switch, place OFF/HOLD/RUN switch to HOLD.

BATTERY CONNECTIONS

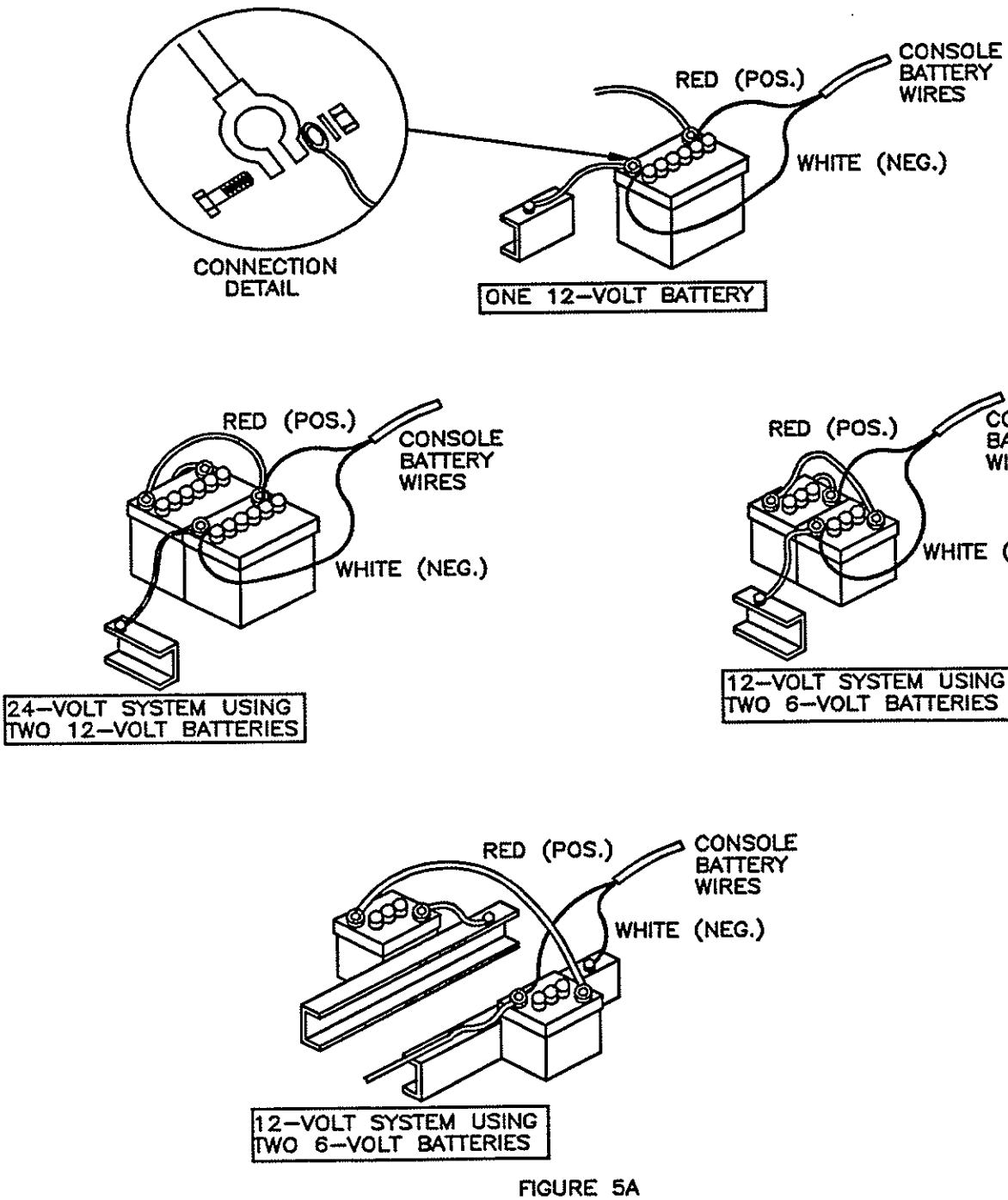


FIGURE 5A

NOTE: Disconnect SCS 550 battery wires if the system is not used for an extended period, (i.e. two weeks). With the POWER switch to OFF, the system draws .25 milliamps of current to maintain information stored in Console computer. Whenever battery wires are disconnected, remove the optional 9-volt back-up battery from the Console.

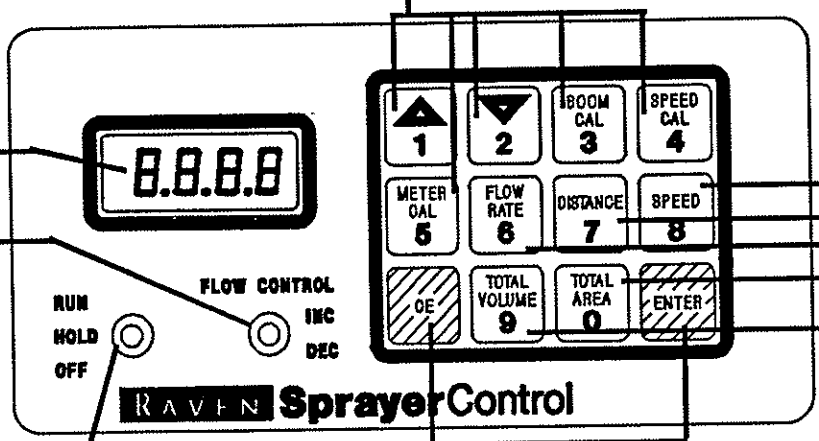
CONSOLE FEATURES

FLOW CONTROL - Manually increase or decrease flow rate.

LCD DIGITAL READOUT - 4-digit read-out of all functions. When "CAL" appears in the display, it indicates that the system needs to be calibrated, or that the Console has been without power and needs to be re-calibrated.

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

BOOM CAL - Lenght of Boom 1-6, select Boom number by using UP-DOWN keys.
SPEED CAL - Determined by wheel size
METER CAL - Flow Meter calibration number



ENTER - Used only to enter data into the computer

RUN/HOLD/OFF - Place switch in RUN position when you are spraying. Place switch in HOLD position when you want to shut off spraying (i.e., on end rows) This also stops area accumulation. To turn off all power to the Console, place switch in OFF position. Turning Console OFF does not affect data stored in the computer.

CE - Use like the CE key on a calculator.

FUNCTION KEYS - Used to display data

FLOW RATE - Actual Rate being applied
TOTAL AREA - Total Area Sprayed
TOTAL VOLUME - Total Volume Applied
DISTANCE - Distance Traveled
SPEED - Speed of Vehicle

CONSOLE CALIBRATION

1. CALCULATING "BOOM CAL" (BOOM 1,BOOM 2,BOOM 3,BOOM 4,BOOM 5, BOOM 6)

1) BROADCAST SPRAYING

Calculate the width of each boom in inches (centimeters) by multiplying the number of tips times the spacing. Write these boom widths down for future reference when programming the Console computer. The Console is capable of monitoring up to six (6) booms.

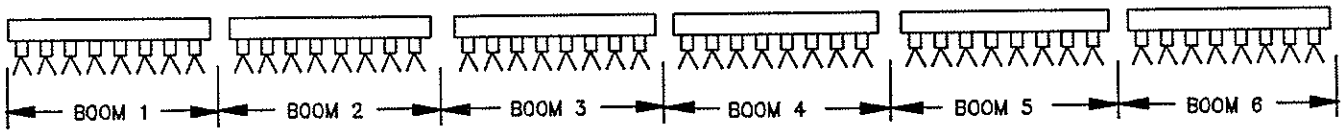


FIGURE 6
BOOM TYPE SPRAYER

2) BAND SPRAYING

Calculate the width of each boom in inches (centimeters) by multiplying the number of Tips times the spacing. Calculate the Adjusted Applied Rate by multiplying the Broadcast Rate times Band Width in inches (centimeters) divided by spacing in inches (centimeters).

Example: Broadcast Rate = 20 GPA (200 lit/ha)
Spacing = 40 inches (100 cm)
Band Width = 14 inches (40 cm)

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

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

$$= (200 \times \frac{40}{100} = 80 \text{ lit/ha})$$

2. CALCULATING "SPEED CAL"

This section applies only to the Magnet-Type Wheel Drive Speed Sensors. (Instructions for Speedometer Drive Speed Sensor are described in Appendix 1).

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 to stop mark in inches (decimeter). (Round off fractions of an inch (decimeter)).

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 550. MEASURE CAREFULLY.** Be 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. Re-measure periodically.

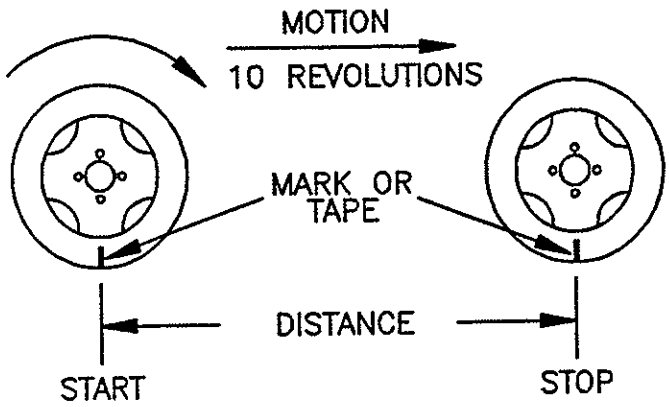


FIGURE 7

3. CALCULATING "METER CAL"

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

4. SELECTING SPRAY NOZZLES

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

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

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

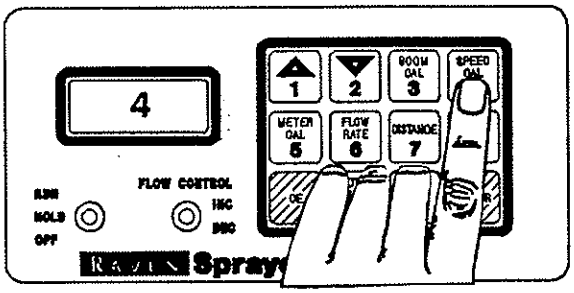
VERIFYING FLOW RATE LIMITS:
The flow rate of spraying must be within the range of that specified for the Flow Meter included.

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

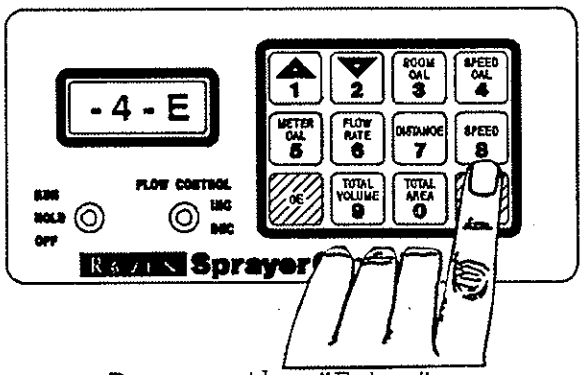
When entering data into the Console computer, the entry sequence is always the same. (NOTE: DATA MUST BE ENTERED IN ALL 6 BOOMS. ENTER A "0" IF BOOM IS NOT USED. DATA MUST BE ENTERED FOR SPEED CAL AND METER CAL.)

STEP 1



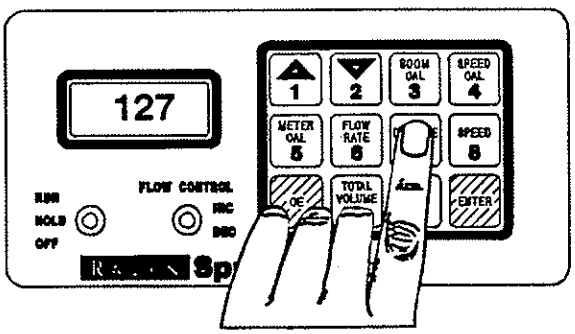
Depress the key in which you wish to enter data. The number of the key will be displayed.

STEP 2



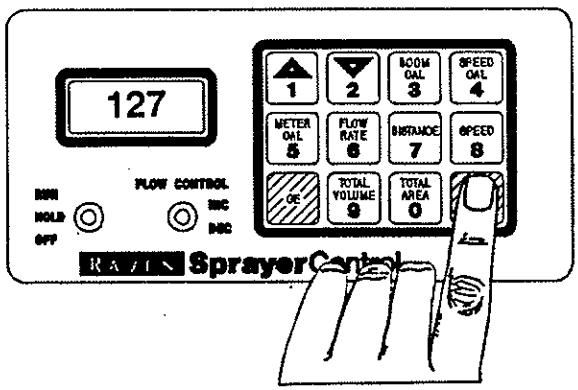
Depress the "Enter" key. An -4-E will now flash in the digital display.

STEP 3



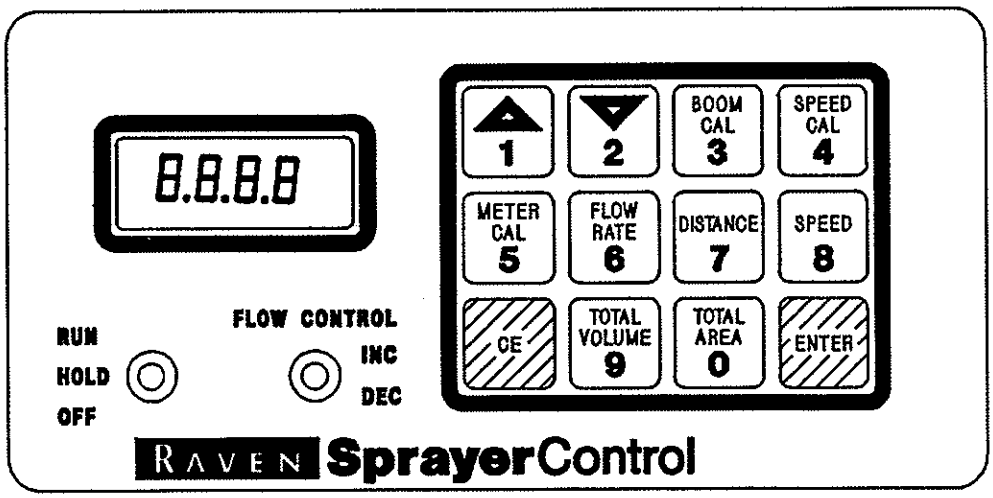
Depress the keys corresponding to the number you wish to enter (i.e. "1", "2", "7"). The numbers will flash in the digital display as they are entered.

STEP 4



Complete the entry by again depressing the "Enter" key. Diplay stops flashing.

BOOM SELECTION SEQUENCE



DEFINITION OF KEYS

Depressing this key displays selected boom number in display. Example: Boom 1 will be diplayed as -b1-.

Depressing this key after selecting BOOM CAL increases the boom number. Example: -b1- will increase to -b2-.

Depressing this key after selecting BOOM CAL decreases the boom number Example: -b2- will decrease to -b1-.

ENTERING DATA

1. Select desired boom number.
2. Enter boom lenght as calculated on page 11.

1. INITIAL PROGRAMMING OF CONSOLE COMPUTER

When you first turn on console power, after all installation procedures have been completed, the Console will display "US" in the digital display. This means you must "CALIBRATE" or program the Console before it can be operated.

(This is a one-time operation which does not have to be repeated unless you disconnect your battery wires. Turning OFF the RUN/HOLD/OFF switch does not affect the console memory. All data in retained). The following steps must now be followed: (refer to page 14 for entry sequence.)

NOTE: If a mistake is made during programming steps 1 through 4, place the RUN/HOLD/OFF switch to the OFF position. Press the 

key and hold while placing the RUN/HOLD/OFF switch to HOLD. This will "reset" the console. This display should now be "US." Repeat steps 1 through 4 to select desired operating mode.

1) Displaying US, SI or TU

a. Depressing momentarily 

steps the display from US (acres) to SI.

b. Depressing momentarily 

steps the display from SI (Hectares) to TU.

c. Depressing momentarily 

steps the display from TU (1000 sq.ft.) to US.

2) Selecting US, SI or TU

a. To select US,SI or TU, step 

until the desired code is displayed in the display.

b. Momentarily depress 

. The display will now display SP1.

3) Displaying SP1 or SP2

a. Depressing momentarily 

steps the display from SP1 (wheel drives, etc.) to SP2.

b. Depressing momentarily 

steps the display from SP2 (Radar Sensor) to SP1.

INITIAL PROGRAMMING CONT.

4) Selecting SP1 or SP2

a. To select SP1 or SP2, step with 

until desired code is displayed in the display.

b. Momentarily depress 

the display will now diplay CAL.

5) After completing steps 1-4, press 

key.

Display shall now be -b1-. Press the 

key.

Display shall flash b1-E. Enter the width in inches (centimeters) for Boom 1.

Press the 

key to complete the entry.

6) Press the 

key to select Boom 2. Press the 

key. The display shall flash b2-E. Enter the width in inches (centimeters) for Boom 2. Press 

key to complete the entry.

7) Program Booms 3-6 by following the same procedure as Booms 1 and 2. Press the 

key after pressing BOOM CAL will increase the boom selection. Pressing the 

key after pressing BOOM CAL will decrease the boom selection. If not all 6 booms are used, enter a "0" for any unused boom.

8) Enter SPEED CAL in key labelled: 

See page 6 CALCULATING "SPEED CAL" to determine the correct SPEED CAL number.

9) Enter the METER CAL calibration number in the key labelled: 

See FLOW METER tag for "CAL" number.

YOU HAVE NOW COMPLETED PROGRAMMING THE CONSOLE.

The display will stop displaying "CAL". If not, repeat procedure starting at step 1.

NOTE: To display operating mode (US,SI,TU) and type speed sensor selected (SP1 or SP2) press 

key for 5 seconds and continue holding.

2. OTHER DISPLAY FEATURES

1) When all calibration data has been entered, the display will alternately show the key number that was depressed and the data entered for that key. Example: "-8-" will alternate with the vehicle speed. The only exception is the FLOW RATE key which, when depressed, constantly displays the actual flow rate.

2) The display will display the key number while a key is depressed to show that the Console is responding to the operator's input.

3) To display FLOW RATE, depress key marked: this will display the actual rate of flow being sprayed. The flow rate changes as speed changes.

4) To display DISTANCE traveled in feet(meters), depress key marked:

To "zero out" this total at any time, enter "0" for distance (refer to page 14 for Entry sequence).

5) To display SPEED, depress the key marked:

6) To display TOTAL VOLUME, depress the key marked: To "zero out" this total at any time, enter "0" for TOTAL VOLUME. (Refer to page 14 for Entry sequence).

7) To display TOTAL AREA, depress the key marked: To "zero out" this total at any time, enter "0" for TOTAL AREA (Refer to page 14 for Entry sequence).

3. SPECIAL MESSAGES

When viewing key marked: 

The following error messages may be displayed.

boon eror: Displayed when a boom is on with no BOOM CAL.

SPEd Eror: Spraying material with no SPEED CAL or speed input.

FLO Eror: Spraying material with no METER CAL or meter input.

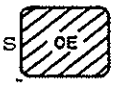
4. SEQUENCE TO ACTIVATE DATA-LOCK*

1) Depress 

for 5 seconds, NEW CODE message will appear.

2) Enter 4-digit code within 15 seconds.
EXAMPLE: For 1085, depress:

5. SEQUENCE TO CHANGE DATA-LOCK

1) Depress 

for 5 seconds, OLd CODE message will appear.

2) Enter 4-digit OLD CODE within 15 seconds.

NEW CODE message will appear.
Enter 4-digit code within 15 seconds. EXAMPLE: For 1285, depress:

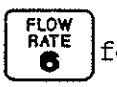
6. ENTER MODE SEQUENCE WITH ACTIVATED DATA-LOCK

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, a flashing key number followed by an "E" will appear. EXAMPLE: For key 9, a flashing -9-E will appear. Now enter data normally.

7. SEQUENCE TO DISPLAY FLOW PER TIME

1) Depress 

for 5 seconds. FPT message will appear.

2) Flow Per Time will be displayed with a flashing FPT.

*The DATA-LOCK feature prohibits the entry of data without first entering the DATA-LOCK Code. The DATA-LOCK Code may be cleared by entering a code of "0" or by removing Console power.

SELF TEST FEATURE

SELF-TEST allows speed simulation for testing systems while the vehicle is not moving. To activate SELF-TEST, press [SPEED 8] key and hold for 5 seconds.

Display will change to -T-. Press [ENTER] key. Depress the keys corresponding to the speed you wish to simulate. To complete the entry, press the "ENTER" key again.

Press [FLOW RATE 6] key to display flow rate at simulated speed.

The SELF-TEST speed will clear itself when motion of the vehicle is detected by the Speed Sensor.

NOTE: To prevent nuisance clearing of SELF-TEST speed, disconnect speed connector on the back of console when Radar Speed Sensors are used.

PREVENTIVE MAINTENANCE

Preventive maintenance is most important to assure long life of the SCS 550. 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 crystalization of chemicals which may plug 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. Flush Flow Meter with clean water and drain.

KEEP FROM FREEZING

4) Remove Console from tractor cab and back up battery from Console when not in use for extended periods to prevent batteries from discharging.

INITIAL SYSTEM SET-UP

1) Fill tank with water.

2) Place RUN/HOLD/OFF to HOLD.

3) Verify correct boom widths, Speed calibration, and Meter calibration have been entered in Console.

4) With pump not running, fully open main line hand valve and totally close agitator line hand valve. (If positive displacement type pump is used, fully open pressure relief valve. PRV.)

5) Run pump at normal operating RPM.

6) If centrifugal pump is used, proceed with step 7. If positive displacement pump is used, proceed as follows:

A) Place RUN/HOLD/OFF switch to RUN.
B) With Flow Control Switch, position the Control Valve for maximum pressure.
C) Place RUN/HOLD/OFF switch to HOLD.
D) Set PRV to 65 PSI (450 kpa).

7) Verify that boom On/Off valves operate and that no nozzles are plugged by placing RUN/HOLD/OFF switch to RUN.

8) Hold the FLOW CONTROL switch in INCR. position until pressure is at its maximum. This assures motorized Control Valve is fully closed. (Pressure gauge is not supplied with SCS 550).

9) Adjust agitator line hand valve for desired agitator.

10) Close the main line hand valve, if necessary, to set the maximum desired operating pressure. (The maximum pressure should be approximately 10 PSI (69 kpa) above the nominal spraying pressure.) For example, if nominal spraying pressure is 30 PSI (208 kpa); set maximum pressure at approximately 40 PSI (276 kpa).

11) Hold the FLOW CONTROL switch to DECR. position until pressure is at its minimum. This assures motorized Control Valve is fully open. Verify minimum pressure.

12) Verify the desired maximum and minimum pressures in Sprayer System by repeating Steps 8 and 11.

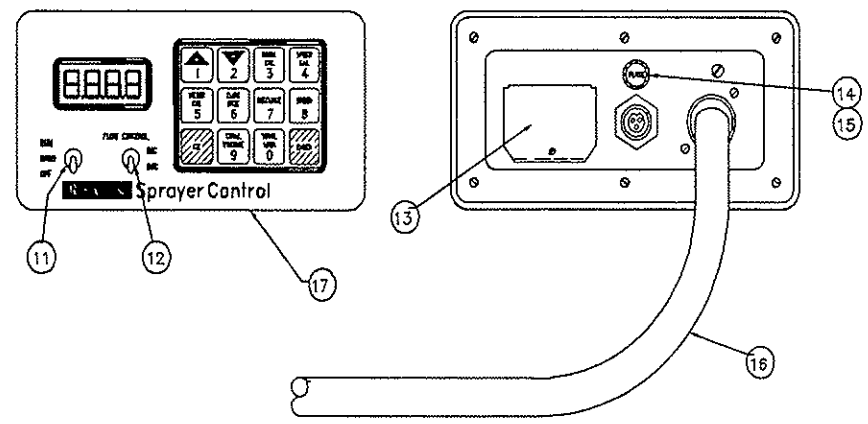
TROUBLESHOOTING GUIDE

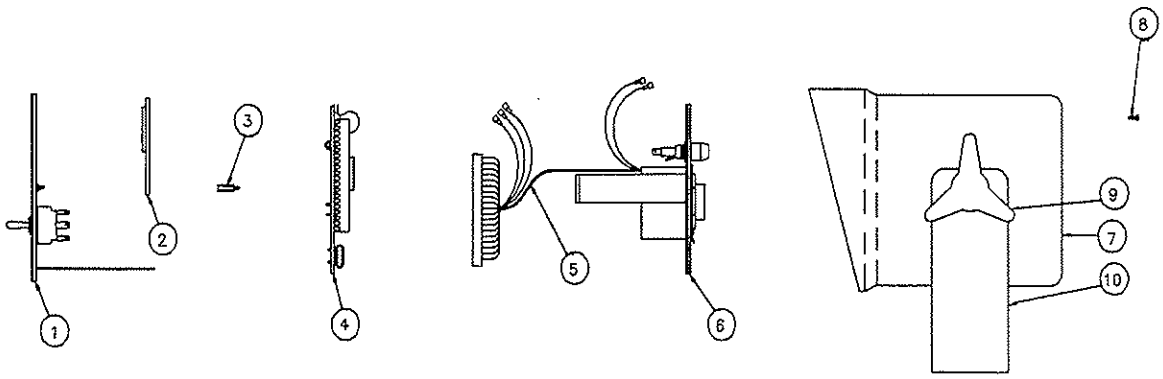
PROBLEM	CORRECTIVE ACTION
1) NO DISPLAY LIGHTS WITH POWER ON.	1) Check fuse on back of Console 2) Check battery connections. 3) Check operation of RUN/HOLD/OFF switch. 4) Return Console to your Dealer to replace Processor Board Assembly.
2) A DIGIT CANNOT BE ENTERED VIA KEYBOARD.	1) Return Console to your Dealer to replace Face Plate Sub-assembly.
3) CONSOLE DISPLAYS FLASHING "CAL" WHENEVER VEHICLE ENGINE IS STARTED.	1) Check battery voltage and battery connections. 2) Install stand-by 9-volt "alkaline" battery in battery box at rear of Console. (Duracell MN 1640 or Everready 522). 3) Install CB Radio suppressor kit on vehicles ignition system.
4) CONSOLE DISPLAYS FLASHING "CAL" WHENEVER RUN/HOLD/OFF SWITCH IS TURNED ON OR OFF.	1) Check battery voltage and battery connections. 2) Obtain electrical noise supprressors from Cb radio shop and install on boom On/Off Valves.
5) ONE DISPLAY DIGIT HAS ONE OR MORE MISSING SEGMENTS	1) Return Console to Dealer to replace LCD Display Board Assembly.
6) SPEED DISPLAY "0"	1) Check Speed Sensor cable connector and plug on back on Console for loose pins. 2) Clean pins and sockets on connectors. 3) If no extension cable is used, replace Speed Sensor Switch Assembly. 4) If 24' Speed Sensor Extension Cable is used, see Appendix 2.
7) SPEED INACCURATE OR UNSTABLE (WHEEL DRIVE SPEED SENSOR)	1) Run speed check on hard surface road. If SPEED is accurate, investigate mounting Speed Sensor on a different wheel.

8) 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 a bend. 4) Check for bad spark plug wires with engine analysis computer. 5) Obtain electrical noise suppressors from CB radio shop and install on spark plugs and generator. Install grounding strap from engine hood to chassis. 6) Replace Speedometer Transducer Assembly.
9) CANNOT VARY FLOW RATE WITH INC./DEC. SWITCH	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.
10) SPRAYER PRESSURE IS CORRECT BUT RATE IS LOW.	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 13 of Installation Manual.
11) TOTAL VOLUME DOES NOT REGISTER.	1) Check Flow Meter cable for breaks and shorts. See Appendix 3 for test procedures. 2) Check internals of Flow Meter; clean and adjust. See Appendix 6 for Flow Meter cleaning and adjustment.
12) TOTAL VOLUME REGISTERS INACCURATELY.	1) Verify that arrow on Flow Meter is pointing in direction of flow. See Appendixes 4 and 5.
13) ERROR MESSAGE	1) See Page 18 Special Messages.

SCS 550 REPLACEMENT PARTS

ITEM	DESCRIPTION	RAVEN PART #
1	Face Plate Assembly	063-0159-941
2	Display P.C. Assembly	064-0159-435
3	Spacer, Aluminum	305-2540-625
4	Processor P.C. Assembly	064-0159-511
5	Internal Cable Harness	115-0159-582
6	Connector Plate Assembly	063-0159-943
7	COnsole Enclosure	063-0159-542
8	6-32 UNC Screws	321-0000-085
9	Mounting Knob	309-1000-006
10	Mounting Bracket	107-0159-007
11	Switch & Ring Nut	412-2011-052
12	Switch & Ring Nut	412-2011-053
13	Battery Box Cover	063-0159-451
14	Fuse, 15 Amp.	510-1003-003
15	Fuse Holder	510-2001-018
16	Console Control Cable	115-0159-581
17	Console Only	063-0159-942



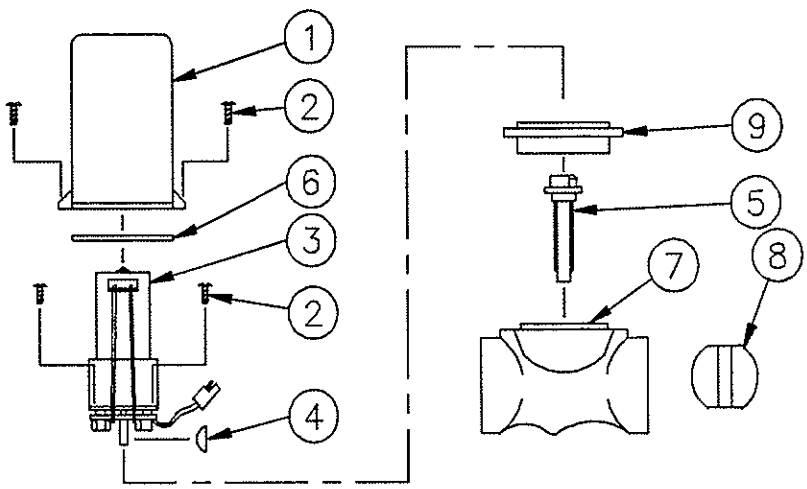


1" and 1 1/2" POLY CONTROL VALVE REPLACEMENT PARTS

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	219-0000-062
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)	117-0159-009
	Iso-Body Kit (1 1/2" Valve)	117-0159-010
11	Polarity Reversal Jumper*	115-0159-415

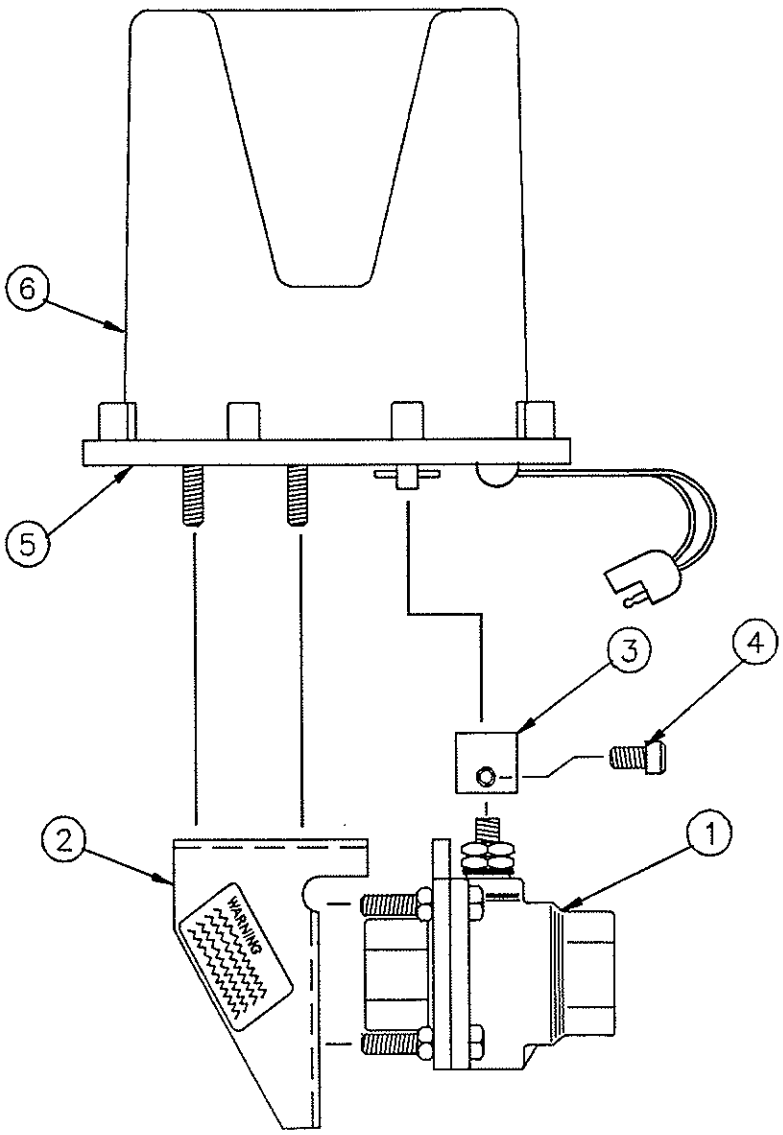
*NOT SUPPLIED WITH STANDARD UNIT



1" (NH3) THROTTLING VALVE REPLACEMENT PARTS

063-0159-557

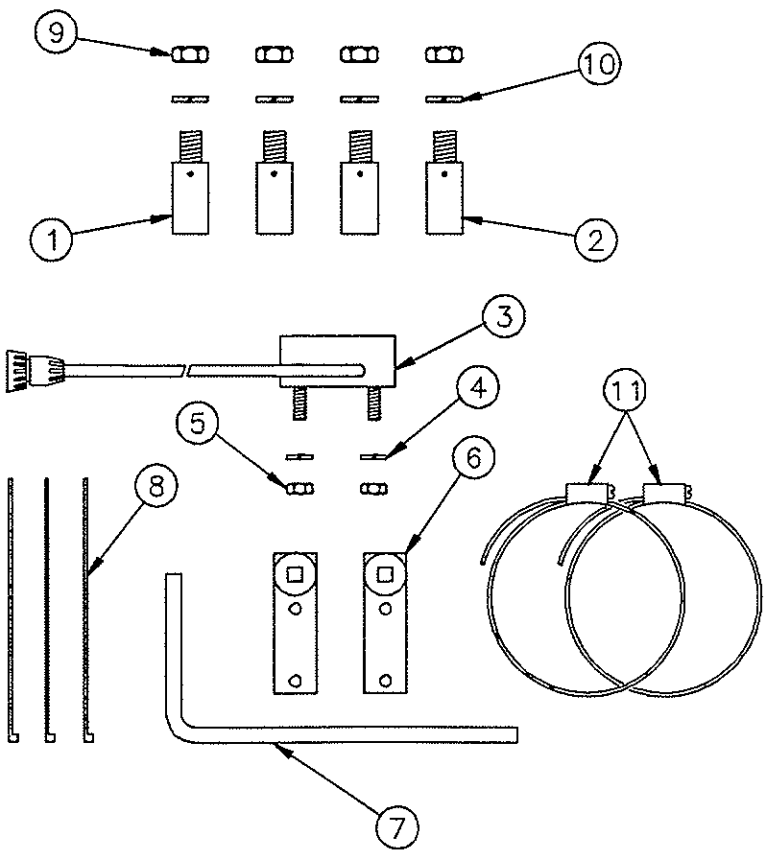
ITEM	DESCRIPTION	RAVEN PART#
1	1" Ball Valve	334-0001-010
2	Valve Bracket	107-0159-474
3	Coupler	107-0159-608
4	1/4-20 x 1/2" Cap Screw	311-0068-064
5	Motor Control Assembly (includes cover)	063-0159-619
6	Cover (Blue)	106-0159-444
7	Seal/Packing Kit	117-0159-410
8	Polarity Reversal Jumper (Not Shown)	115-0159-415



WHEEL DRIVE SPEED SENSOR REPLACEMENT PARTS

063-0159-484 (Standard)
063-0159-781 (Turf)

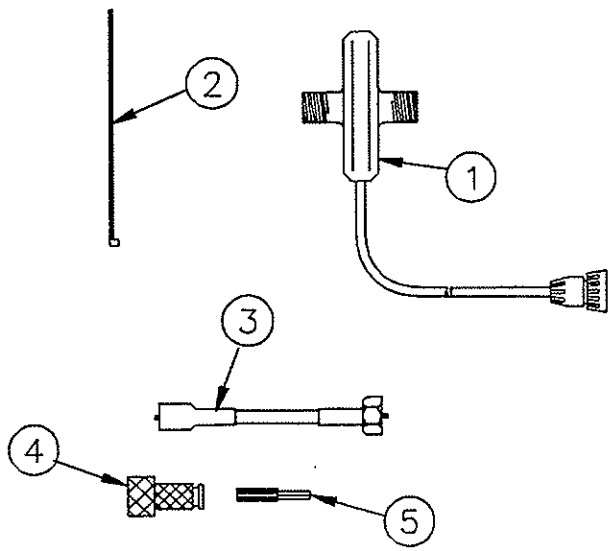
ITEM	DESCRIPTION	RAVEN PART#
1	Red Magnet Ass'y, North	063-0159-402
2	Black Magnet Ass'y, South	063-0159-403
3	Sensor Ass'y (21 ft.) Standard	063-0159-438
	Sensor Ass'y (10 ft.) Turf	063-0159-770
4	1/4" Lock Washer	313-1000-016
5	1/4-20 Hex Nut	312-1001-031
6	Turret Assembly	063-0159-483
7	Speed Sensor Rod	107-0159-472
8	Cable Ties	435-1000-003
9	1/2-13 Hex Nut	312-1001-043
10	1/2" Lock Washer	313-1000-028
11	Band Clamp	435-3003-009
12	24 ft. Speed Sensor Ext. Cable (Optional)	115-0159-018
13	12 ft. Speed Sensor Ext. Cable (Optional)	115-0159-032



SPEEDOMETER DRIVE SPEED SENSOR REPLACEMENT PARTS

063-0159-450	Ford (Prior to '75)
063-0159-426	Ford ('75 and After)
063-0159-436	GM (10" Ext. Cable)
063-0159-841	GM (14" Ext. Cable)
063-0159-450	I.H., Jeep
063-0159-437	Dodge
063-0159-634	5/8" M/F Cushman/Mertz

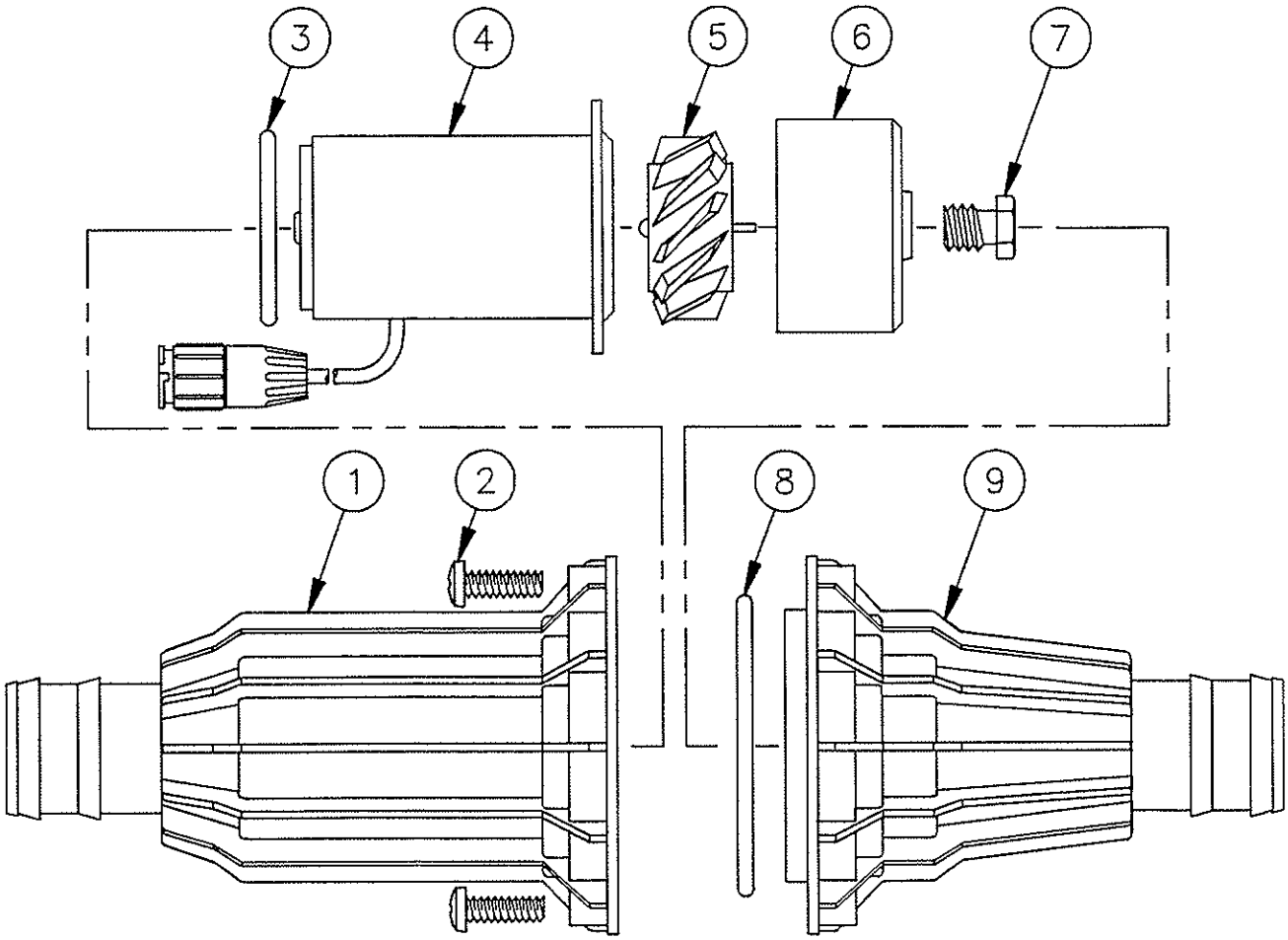
ITEM	DESCRIPTION	RAVEN PART#
1	Speedometer Transducer Ass'y	063-0159-456
2	Cable Ties	435-1000-003
3	Extension Cable	
	Ford - Prior to '75 (14")	321-0000-106
	Ford - '75 & After (14")	321-0000-097
	GM - (10")	321-0000-100
	GM - (14")	321-0000-107
	I.H., Jeep	321-0000-106
	Dodge - (14")	321-0000-103
4	Adapter	
	Ford	321-0000-098
	GM	321-0000-101
	I.H, Jeep	NOT REQUIRED
	Dodge	321-0000-104
5	Key	
	Ford	321-0000-099
	GM	321-0000-099
	I.H, Jeep	NOT REQUIRED
	Dodge	321-0000-099
6	24 ft. Speed Sensor Ext. Cable (Optional)	115-0159-018
7	12 ft. Speed Sensor Ext. Cable (Optional)	115-0159-032



RFM 55 FLOW METER REPLACEMENT PARTS

063-0159-571

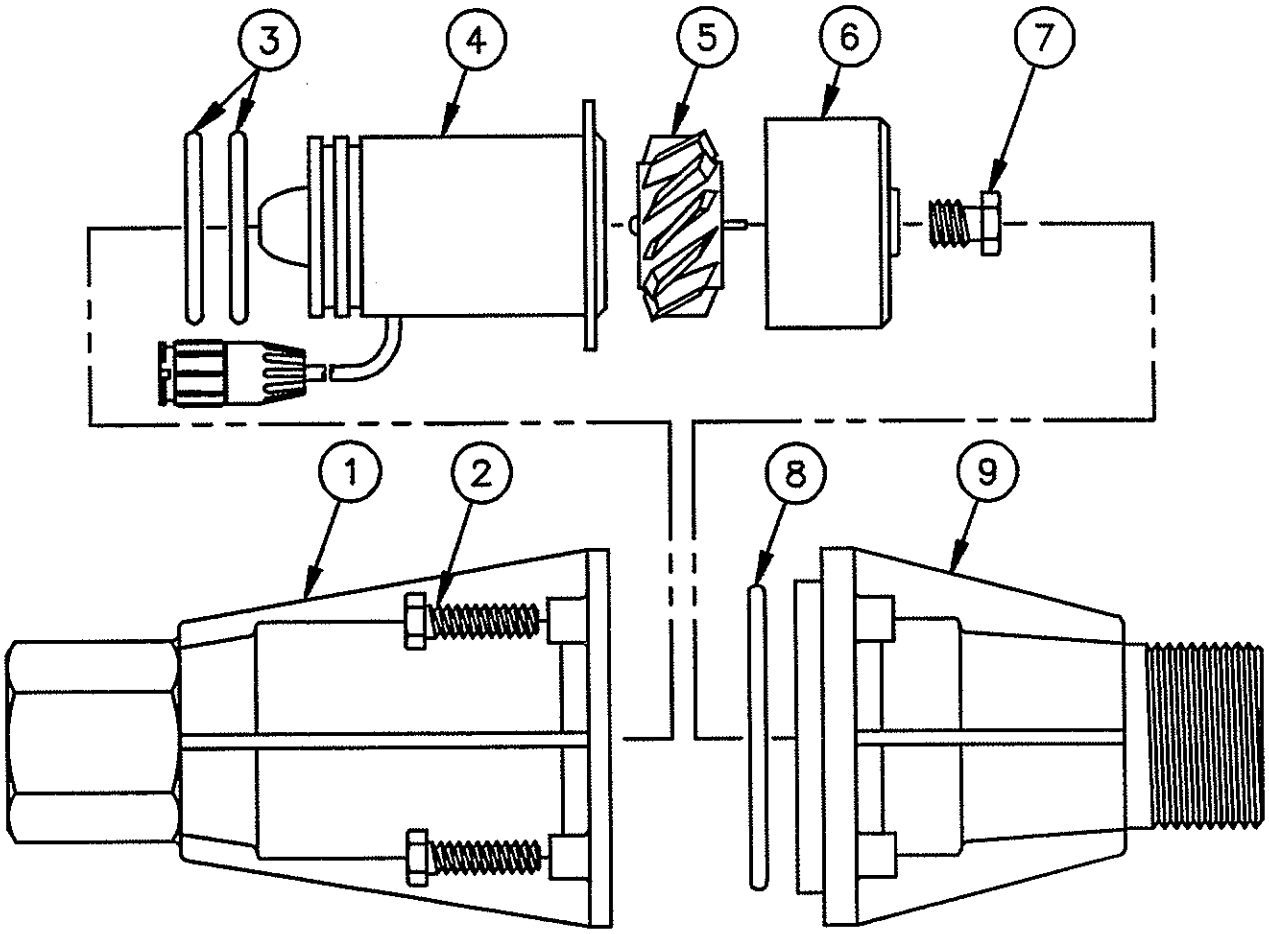
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing	019-0159-085
2	#10-32 x 3/4" S.S. Screw	311-0007-037
3	O-ring, Viton	219-0000-040
4	RFM55 XDCR Assembly	063-0159-593
5	RFM55 Turbine	117-0159-020
6	Turbine Hub/Bearing Ass'y	063-0159-563
7	Turbine Stud Assembly	063-0159-570
8	O-ring, Viton	219-0000-042
9	Hub Housing W/Inserts	063-0159-776
10	Mounting Bracket, RFM 55 (Not Shown)	107-0159-507



RFM 55A DUAL O-RING FLOW METER REPLACEMENT PARTS

063-0159-572

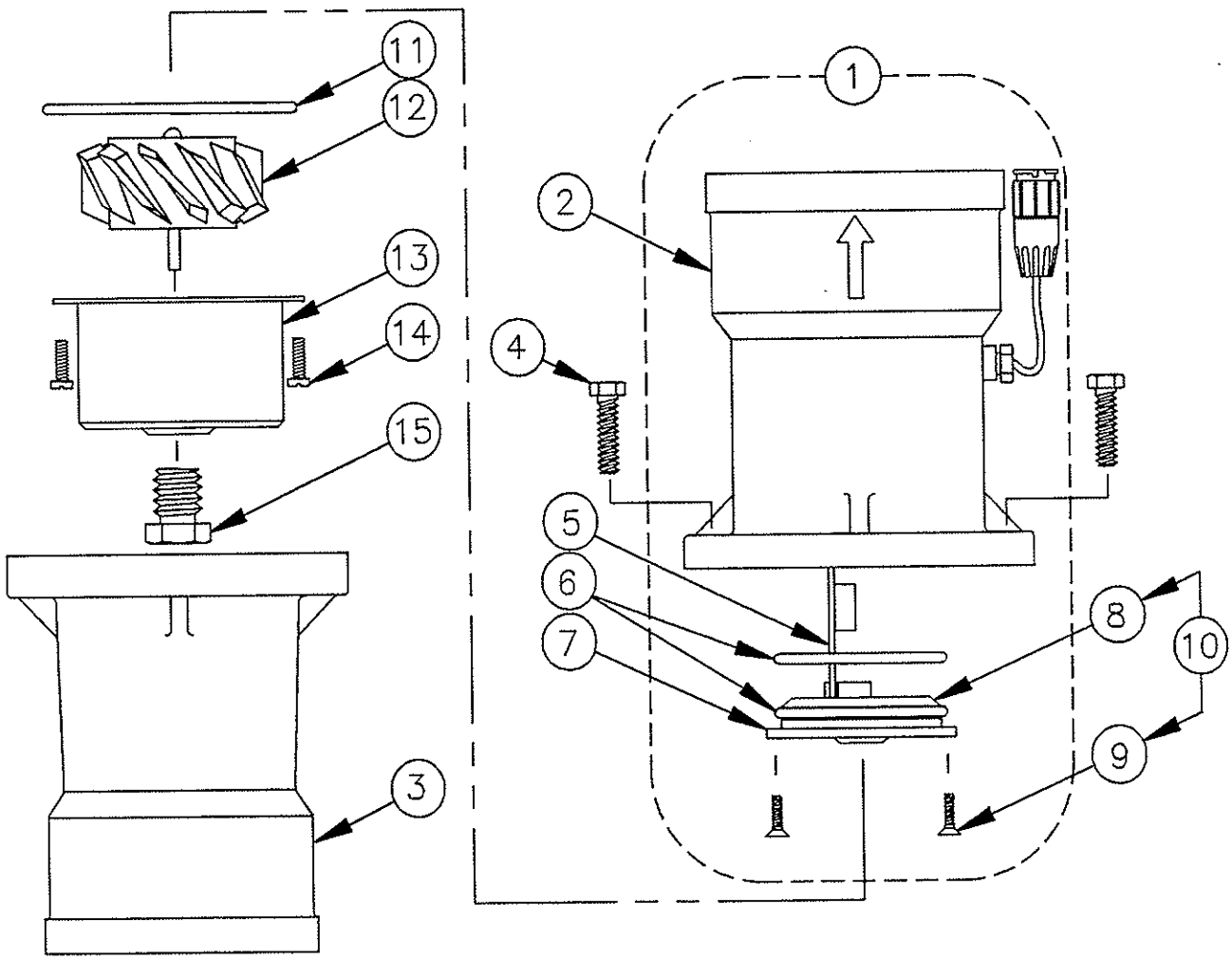
ITEM	DESCRIPTION	RAVEN PART#
1	Sensor Housing	105-0159-002
2	1/4-20 x 1/4" Bolt	311-0050-231
3	O-Ring, Viton(For Chemicals)	219-0002-030
	O-Ring, Butyl(For NH3)	219-0006-030
4	RFM 55 XDCR Ass'y	063-0159-749
5	RFM 55 Turbine	117-0159-020
6	Turbine Hub/Bearing Ass'y	063-0159-563
7	Turbine Stud Ass'y	063-0159-570
8	O-Ring, Viton(For Chemicals)	219-0000-042
	O-Ring, Butyl(For NH3)	219-0000-041
9	Hub Housing	105-0159-001
10	Mounting Bracket(Not Shown)	107-0159-507
11	Turbine Hub Shim(Not Shown)	107-0159-520
12	Thread Sealer(Not Shown)	222-1001-016
**	NH3 Transducer Kit (Includes Item # 3 & 4)	117-0159-545



RFM 200 FLOW METER REPLACEMENT PARTS

063-0159-574

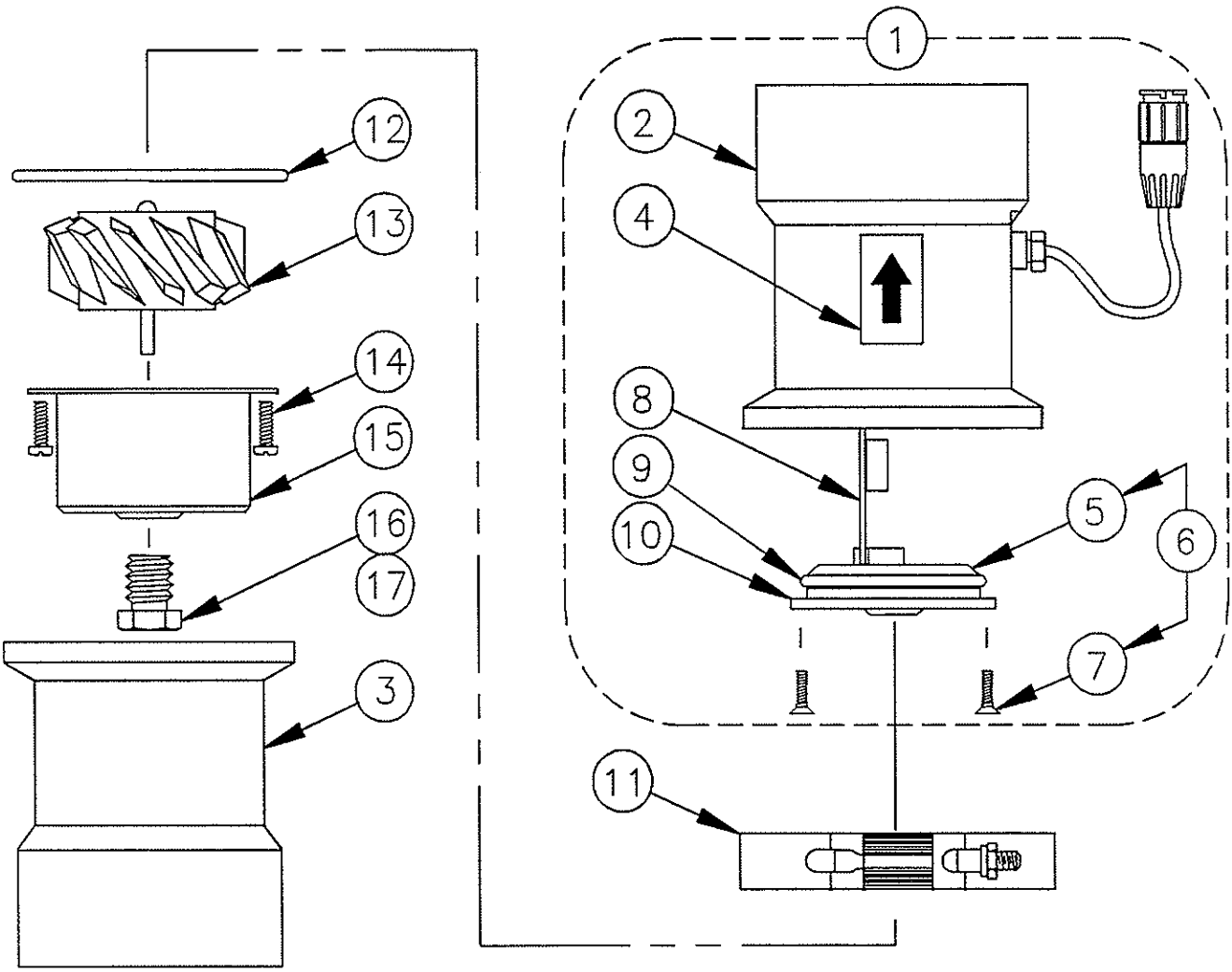
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing Assembly	063-0159-573
2	Sensor Housing	105-0159-004
3	Hub Housing	105-0159-003
4	1/4-20 x 1 1/4 Bolt	311-0050-230
5	P.C. Assembly	064-0159-447
6	O-ring, Viton	219-0000-040
7	End Bearing Assembly	063-0159-591
8	End Bearing/P.C. Assembly	063-0159-646
9	2-56 x 5/16" Stainless Steel Screw	311-0011-030
10	End Bearing/P.C. Assembly Kit	117-0159-428
11	O-ring, Viton	219-0000-052
	O-ring, Butyl	219-0000-051
12	RFM 200 Turbine	117-0159-017
13	Turbine Hub/Bearing Assembly	063-0159-564
15	Stud W/Bearing	063-0159-575
16	Cable Kit (Not Shown)	117-0159-441
17	Thread Sealer (Not Shown)	222-1001-016
18	Mounting Bracket, RFM 200 (Not Shown)	107-0159-509
19	Hose Clamp (Not Shown)	435-3003-009



RFM 200 POLY FLOW METER REPLACEMENT PARTS

063-0159-751

ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing Assembly	063-0159-750
2	Sensor Housing	107-0159-617
3	Hub Housing	107-0159-618
4	Label, Yellow W/black Arrow	039-0159-023
5	End Bearing/P.C. Assembly	063-0159-646
6	End Bearing/P.C. Assembly Kit	117-0159-428
7	2-56 x 1/2" Flat Hd. Screw	311-0013-390
8	P.C. Assembly	064-0159-447
9	O-Ring, Viton	219-0000-040
10	End Bearing Assembly	063-0159-591
11	Retainer Clamp	435-3003-031
12	O-Ring, Viton	219-0000-052
13	RFM 200 Turbine	117-0159-017
14	4-20 x 1/2" Pan Hd. Screw	311-0008-027
15	Turbine Hub/Bearing Assembly	063-0159-564
16	Turbine Stud Assembly w/bearing	063-0159-575
17	Thread Sealer (Not Shown)	222-1001-016
18	Mounting Bracket, RFM 200(Not Shown)	107-0159-509
19	Hose Clamp (Not Shown)	435-3003-009
20	Cable Kit (Not Shown)	117-0159-441



APPENDIX 1
SPEEDOMETER DRIVE SPEED SENSOR INSTALLATION AND CALIBRATION

1) Remove the existing speedometer cable from the back of the vehicle speedometer. Pull cable through fire wall into engine compartment.

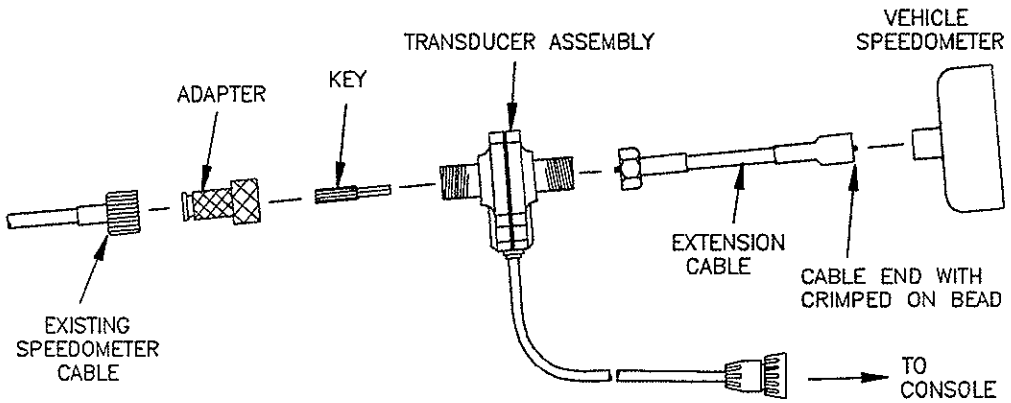
2) Install adapter and key on speedometer cable and connect to Transducer Assembly. (Some units do not use adapter and key).

3) Connect Extension cable to Transducer Assembly.

4) Push Extension Cable through fire wall and re-install on speedometer.

5) Connect the cable on the Transducer Assembly to the SCS 550 Console.

6) Secure all Cables with plastic cable ties. The unit is now ready for calibration with your vehicle.



7) Complete Initial Programming of console before doing this procedure.

8) Enter "0" in key labeled: DISTANCE

9) Enter 612 [1550] in key labeled: SPEED CAL 4

10) Drive 1 mile [1 km]. (**CAUTION:** Do not use vehicle odometer to determine distance. Use section lines or Highway markers).

11) Read DISTANCE by depressing key labeled: DISTANCE

12) It should read a value of approximately 5,280 [1000]. If it Reads between 5,200 - 5350 [990 - 1010], the SPEED CAL for your vehicle is 612 [1,550]. Entering [1,550]. in step 1 permits driving 1 kilometer instead of 10 kilometers.

If the DISTANCE, display reads any other value, divide SPEED CAL by the value observed in DISTANCE, then multiply by 5,280 [1,100]. This will give you the correct value to enter for SPEED CAL. You must round off to the nearest 3 digit number. FOR **EXAMPLE:** Assume Distance read 5,000 [980].

FOR ENGLISH UNITS

Then, $612 \times \frac{5{,}280}{5{,}000} = 646.3$

FOR METRIC UNITS

Then $[1{,}550] \times \frac{1{,}100}{980} = 1{,}582$

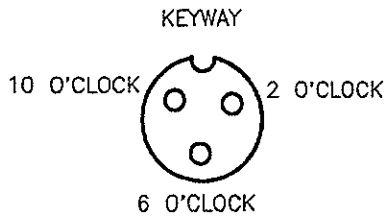
13) The number to enter for SPEED CAL is 646 [158].

14) Recheck the new SPEED CAL derived in Step 3.

a) Zero out DISTANCE display as in Step 3.
b) Enter the new SPEED CAL number as in Step 1. (**NOTE:** To drive 1 kilo meter instead of 10, enter [1,580] for SPEED CAL instead of 158).
c) Repeat steps 10, 11, and 12.

APPENDIX 2
PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLE

Disconnect extension cable from Speed Sensor Assembly cable. Hold extension cable connector so that key way 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:

1) 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. If speed reading is displayed, cable is good.

4) If no speed is displayed, replace defective cable as required.

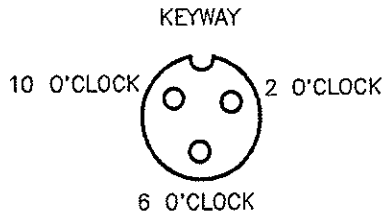
5) Perform above voltage checks.

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

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

APPENDIX 3
PROCEDURE TO TEST FLOW METER CABLES

Disconnect cable from Flow Sensor. Hold Flow Sensor cable so that the key way 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: METER CAL 6

2) Depress key labelled: TOTAL VOLUME 9

3) Place RUN/HOLD/OFF switch to RUN.

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 VOLUME total should increment up 1 or more counts.

5) If 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 cables all test good, refer to Appendix 4 to test Flow Meter.

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

APPENDIX 4
PROCEDURE FOR FLOW METER MAINTENANCE AND ADJUSTMENTS

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

NH3 WARNING

Thoroughly bleed nurse tank hose and all other system lines prior to disassembling the flow meter, fittings and hoses.

2) Remove flange bolts 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 turbine blades are not worn. Hold turbine hub and turbine 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 stud until turbine stalls. Loosen turbine stud 1/3 turn, the turbine should spin freely.

6) Reassemble flow meter.

7) Using a low presure (5 PSI) jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/3 turn until the turbine spins freely.

8) If turbine spins freely and if cables have checked out per Appendix 3, but flow meter still is not totalizing properly, replace flow meter transducer.

APPENDIX 5
PROCEDURE TO RE-CALIBRATE FLOW METER

1) Enter a METER CAL number of 10 [38] in the key labeled: 

2) Enter a TOTAL VOLUME of 0 in the key labeled: 

3) Position MASTER, BOOM 2, BOOM 3 switch OFF and BOOM 1 switch ON.

4) Remove Boom 1 hose at boom connection and place in a 5 gallon [19 liter] container.

5) Switch on Boom 1 and pump exactly two (2) containers (10 gallons) [38 liters]. Position MASTER switch to OFF each time the container is filled.

6) The readout in TOTAL VOLUME is your new METER CAL number. Under normal circumstances, this number should be within +/- 3% of the number stamped on the tag on the Flow Meter.

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

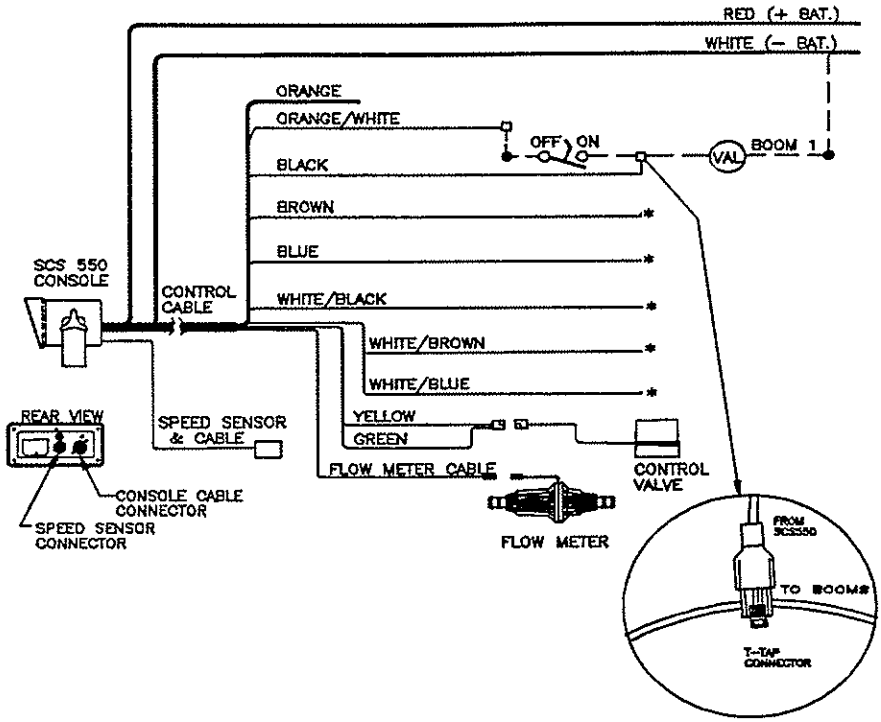
NOTE:	For greatest precision, set METER CAL to 100 [378] and pump 100 gallons [378 liters] of water.

8) Enter correct METER CAL number before resuming chemical spraying.

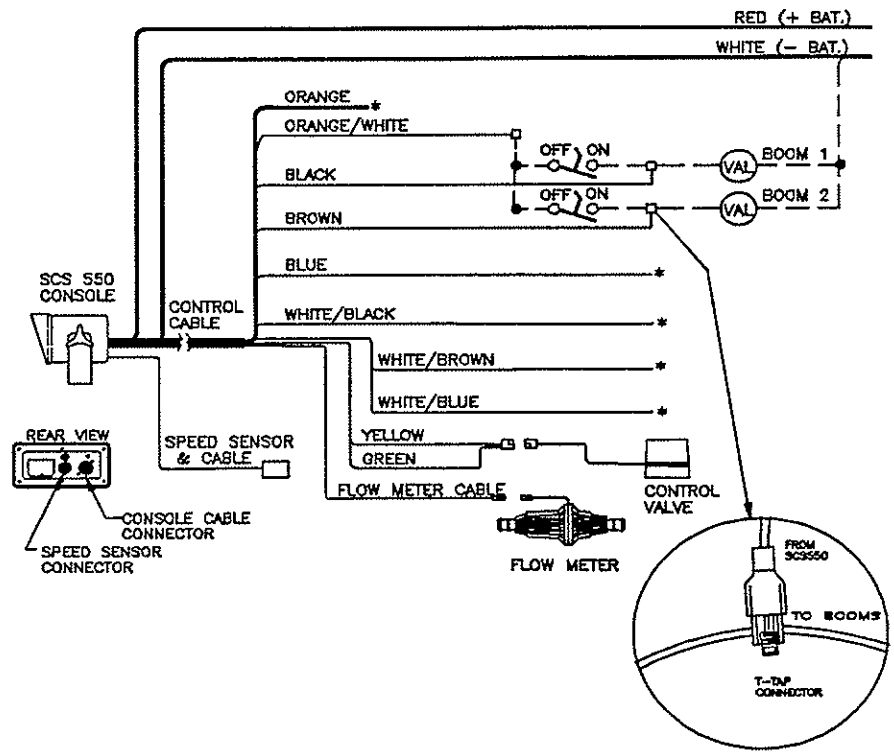
9) An alternate method of calibrating your Flow Meter is to fill your applicator tank with a predetermined amount of liquid (i.e. 250 gallons). **DO NOT RELY ON GRADUATION NUMBERS MOLDED INTO APPLICATOR TANK.** Set your METER CAL to the number on the tag attached to the Flow Meter. Empty the applicator tank under normal operating conditions. The number in the TOTAL VOLUME display should be the same as the amount you put in the tank. If not, increase or decrease the METER CAL by the percentage difference.

APPENDIX 6
OPTIONAL BOOM VALVE CABLING

1. OPTIONAL SINGLE BOOM VALVE CABLING

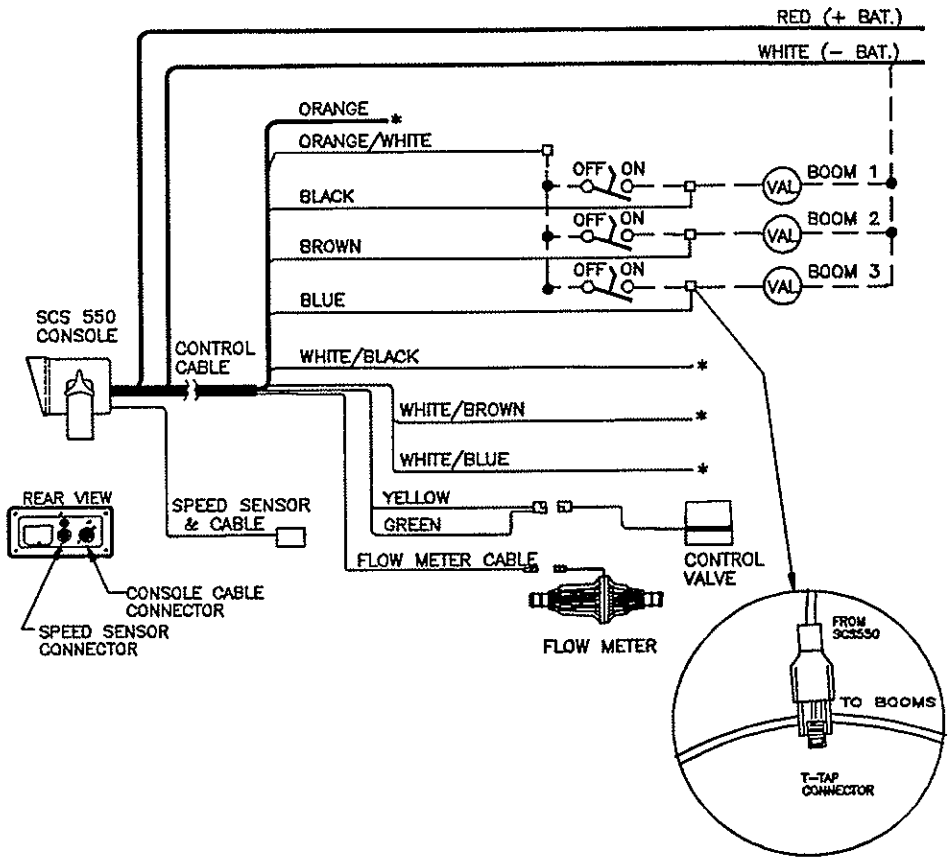


2. OPTIONAL DOUBLE BOOM VALVE CABLING

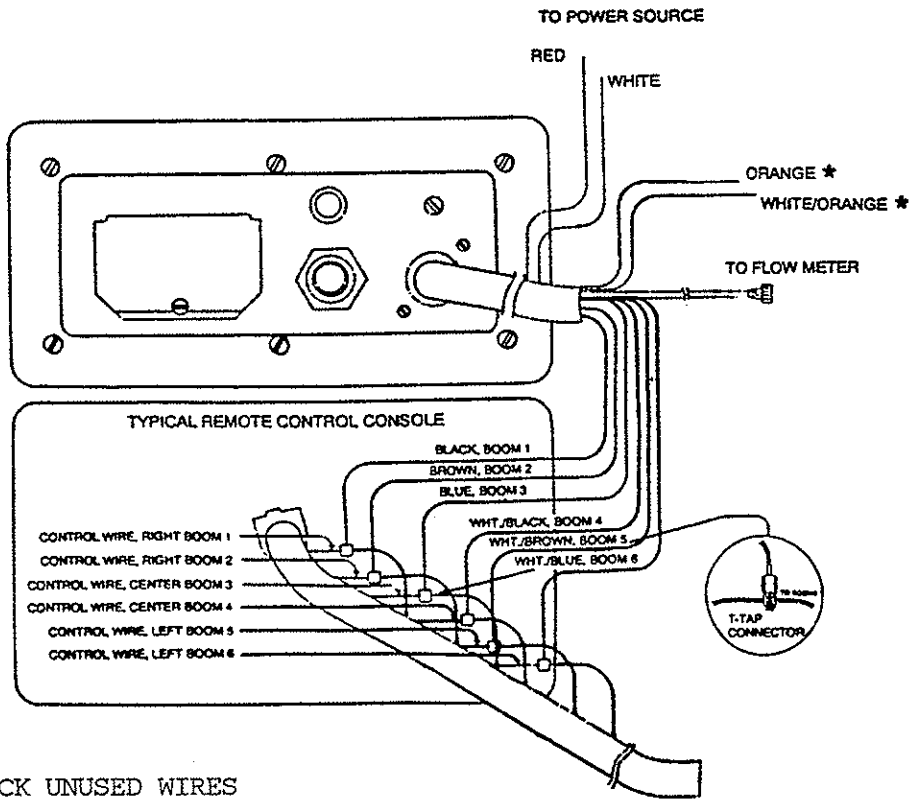


* TAPE BACK UNUSED WIRES

3. OPTIONAL TRIPLE BOOM VALVE CABLING



4. OPTIONAL RAVEN SCS CONSOLE INTERCABLING



* TAPE BACK UNUSED WIRES

RAVEN

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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 550
Installation & Service Manual
(P/N 016-0159-476 Rev C 2/09)

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Simply improving your position.[SM]

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