

**Crop Start II™**  
**Installation & Service Manual**

*P/N 016-0159-889 Rev A 12/15*

## ***Disclaimer***

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### **OPERATOR'S RESPONSIBILITIES**

1. User is responsible for proper system knowledge prior to use.
2. Apply chemicals according to proper environmental regulations.
3. Clean and flush at end of season.
4. Protect from freezing (winterize).

### **WARNING!**

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

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# INTRODUCTION/SYSTEM OPERATION

The Crop Start system is a computer controlled starter fertilizer delivery system based on flow, speed and width. The operator is responsible to select the correct orifice based on the desired application rate. A remote switch is supplied with the system. The remote switch will control the on/off function of the system when the planter is raised and lowered. The console OFF/HOLD/RUN switch will override the remote switch.

If the system is not going to be used for several days, the tank should be emptied and the system should be flushed with clean water. If freezing temperatures are expected, the system should be safeguarded with R.V. antifreeze. See Preventive Maintenance.

**IMPORTANT:** A 3-way valve must be installed on pump inlet to allow for clean water flush. Failure to flush system may allow fertilizer to clog flowmeter.

## SYSTEM OPERATING PARAMETERS

This system must be operated within its capabilities. Consider the following:

1. In order to get even distribution, 10 PSI back pressure is required.
2. Pump capacity will decrease as pump discharge pressure increases. Ref. Pump Performance Chart. The pump must be operated within its operating range.
3. Below is a formula to calculate gallons per minute for the complete system.

$$\text{GPM} = \frac{\text{Planter width (in inches)} \times \text{speed (in mph)} \times \text{rate (gallons per acre)}}{5940}$$

Planter width = Row spacing in inches x number of rows

example: 30" row spacing x 12 rows = 360

Planter width = 360 inches

$$\frac{360 \text{ inches} \times 5.5 \text{ mph} \times 5 \text{ gpa}}{5940} = 1.67 \text{ GPM}$$

4. To calculate operating pressure, calculate the GPM of one row and then use table 1 to find the operating pressure.

$$\text{GPM of 1 row} = \frac{\text{Row spacing in inches} \times \text{mph} \times \text{GPA}}{5940}$$

$$\text{example: } \frac{30 \text{ inches} \times 5.5 \text{ mph} \times 5.0 \text{ GPA}}{5940} = .14 \text{ GPM}$$

5. Based on the above calculation select an orifice or micro-tube that will provide at least 10 PSI at the lowest application rate.

Also, calculate the GPM for the highest application rate. The GPM and the pressure must be within the pumps operating range.

# SYSTEM SPECIFICATIONS

## CONSOLE:

4 Digit Display  
Keyboard Data Entry System  
Microprocessor Based  
PWM Motor Control  
Automatic Control relative to speed

## FLOWMETER:

Turbine  
.5 - 15 GPM

## CABLES:

15' Console Cable  
40' Control Cable

## PUMP:

See chart below

## PUMP P/N 063-0171-138

PUMP PERFORMANCE DATA		
DISCHARGE PRESSURE	FLOW	CURRENT
PSI	GPM	AMPS
70	3.00	18.00
60	3.20	16.30
50	3.55	14.60
40	3.80	13.00
30	4.10	11.00
20	4.50	9.00
10	4.90	7.00
OPEN	5.30	5.50

Performance measured with flooded inlet (0 PSI), 70°F (21°C) ambient and water temperature, and voltage controlled at 12 VDC. Positive inlet pressure will increase the discharge pressure by a similar amount, for a given flow. Maximum inlet pressure is 60 PSI.

**KIT P/N 117-0159-831**  
**BASIC KIT, CROP START II, 8 ROW**

Includes the following:

<b>ITEM #</b>	<b>DESCRIPTION</b>	<b>QTY</b>
063-0172-241	Console, Crop Start	1
115-0171-267	Cable, 15' Console	1
115-0171-268	Cable, 40' Product	1
063-0172-243	Stand Assembly, Crop Start	1
063-0172-037	Switch Assembly	1
063-0172-138	Pump Assembly	1

Includes Flow Monitors for 8 rows.  
(Each Flow Monitor monitors 2 rows)

**KIT P/N 117-0159-830**  
**KIT, FLOW MONITOR, 4 ROW ADD-ON**

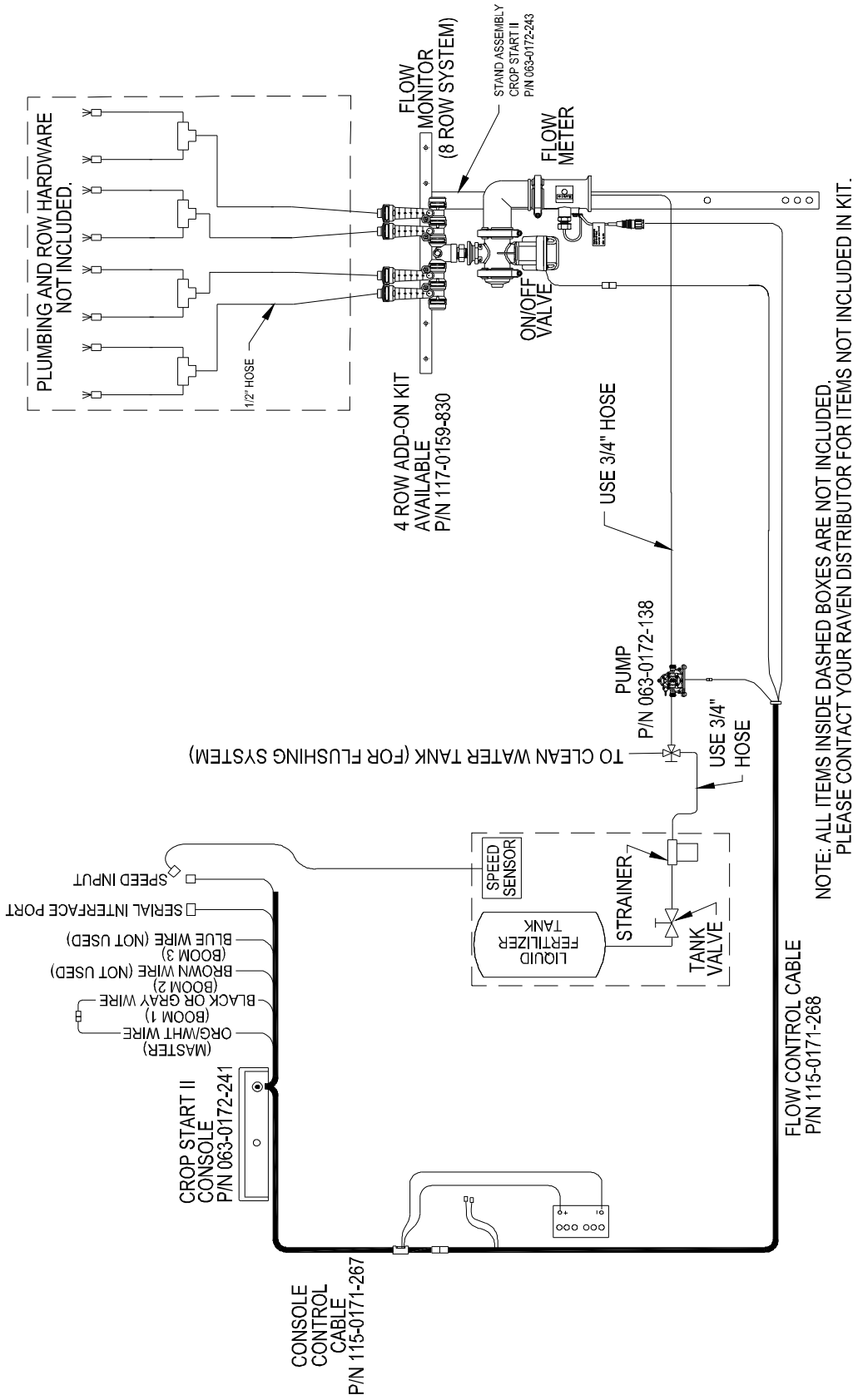
Includes Flow Monitors to add 4 rows to Kit 117-0159-831  
(Each Flow Monitor monitors 2 rows)

**KIT P/N 117-0159-832**  
**KIT, MANIFOLD VALVE ADD-ON, CROP START II**

Kit contains 1 Raven On/Off Valve, fittings and hardware to add 1 On/Off Valve to Kit 117-0159-831.  
Kit allows left or right shut off.

# SYSTEM DIAGRAM

Single Width, Single On/Off Valve



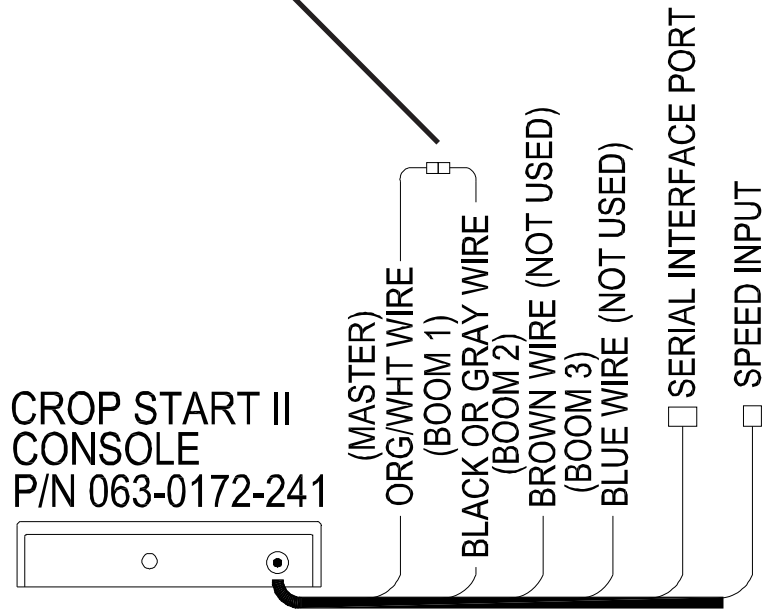


# SYSTEM DIAGRAM (continued)

Single Width / Single On/Off Valve

## WIRING OPTION 1

Connect the orange/white wire to the black wire.

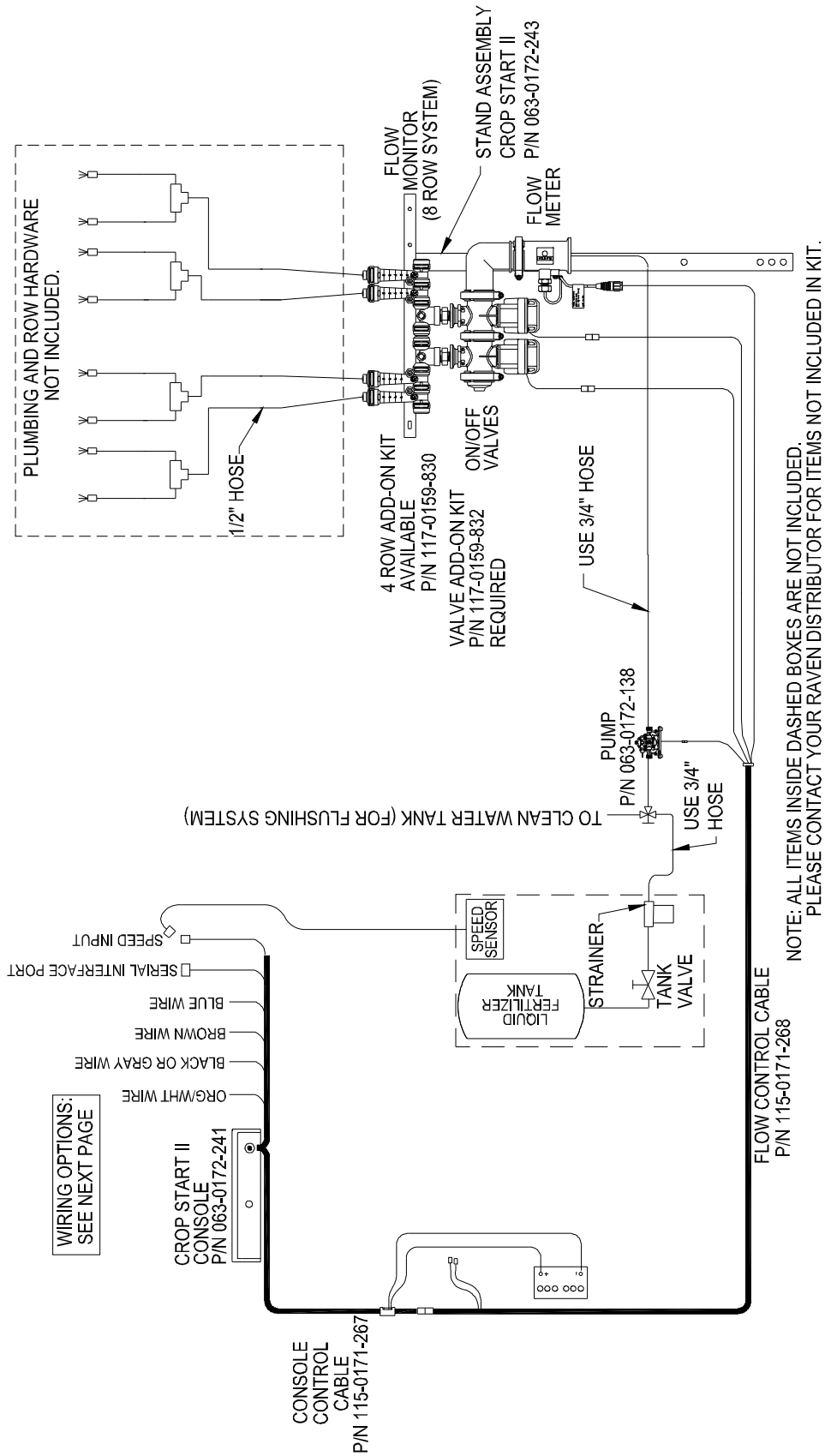


### OPERATION:

OFF/HOLD/RUN switch or remote switch acts as master switch.

# SYSTEM DIAGRAM

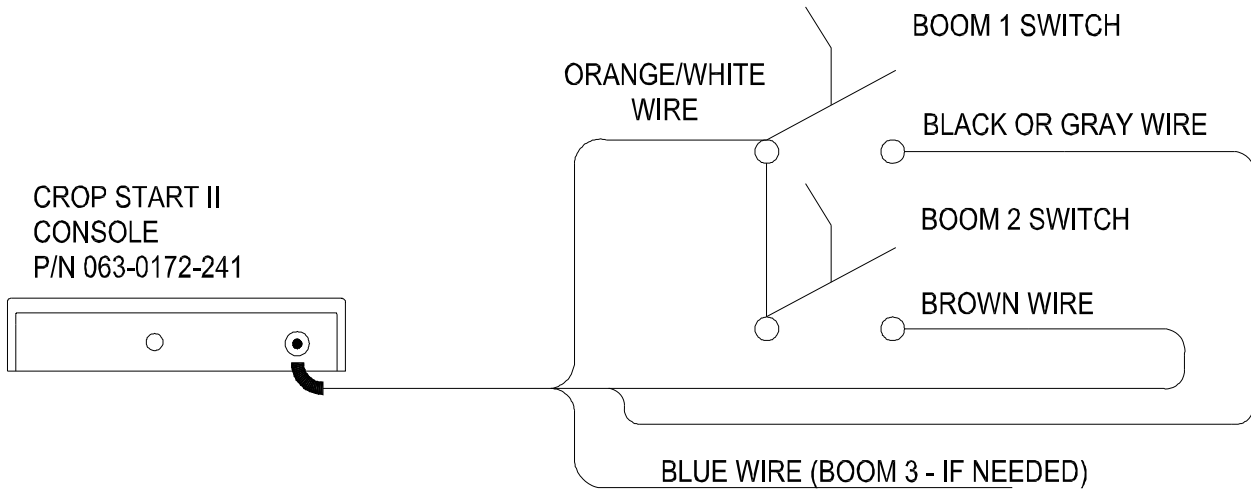
## Two Width, Two On/Off Valves



# SYSTEM DIAGRAM (continued)

Two Width / Two On/Off Valves

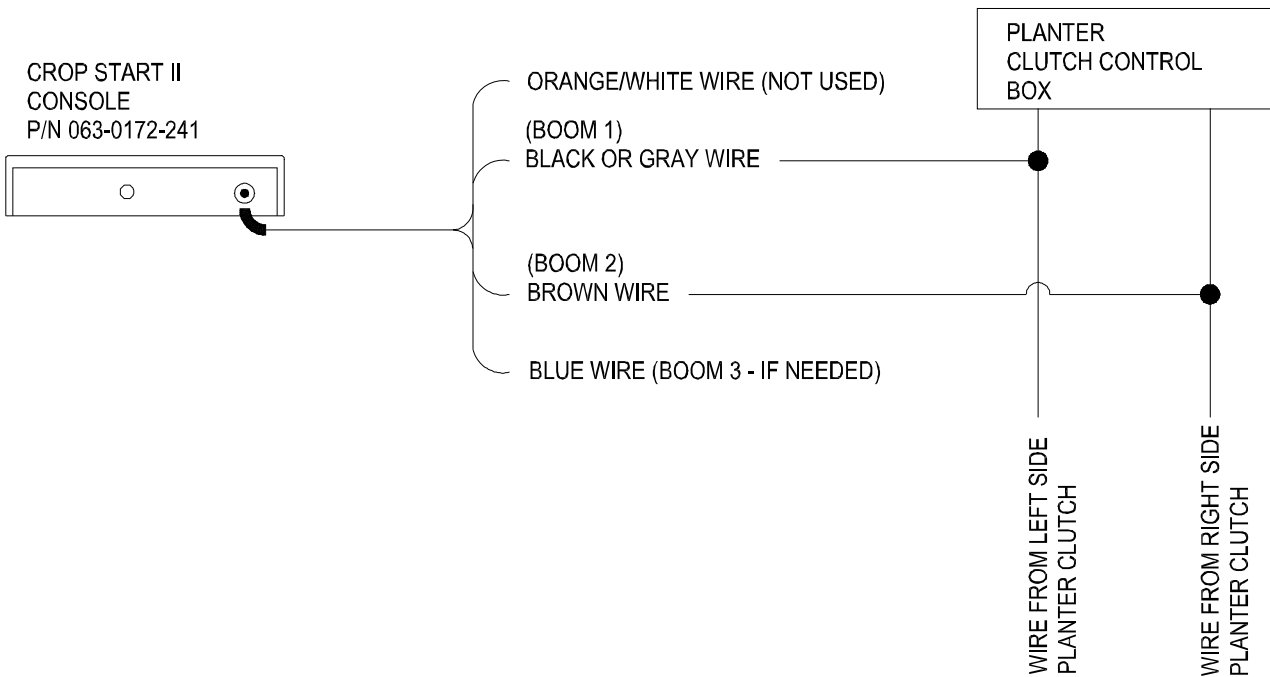
## WIRING OPTION 2



### OPERATION:

1. OFF/HOLD/RUN switch or Remote switch acts as master switch.
2. Use Boom 1 and Boom 2 switches to control left and right booms.

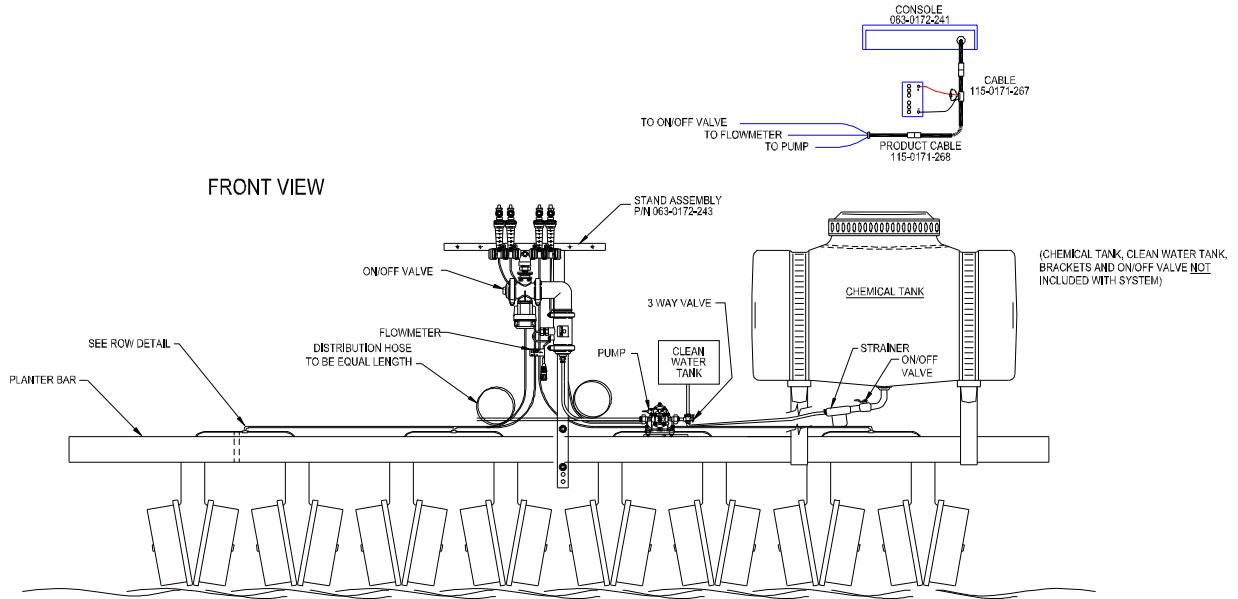
## WIRING OPTION 3



### OPERATION:

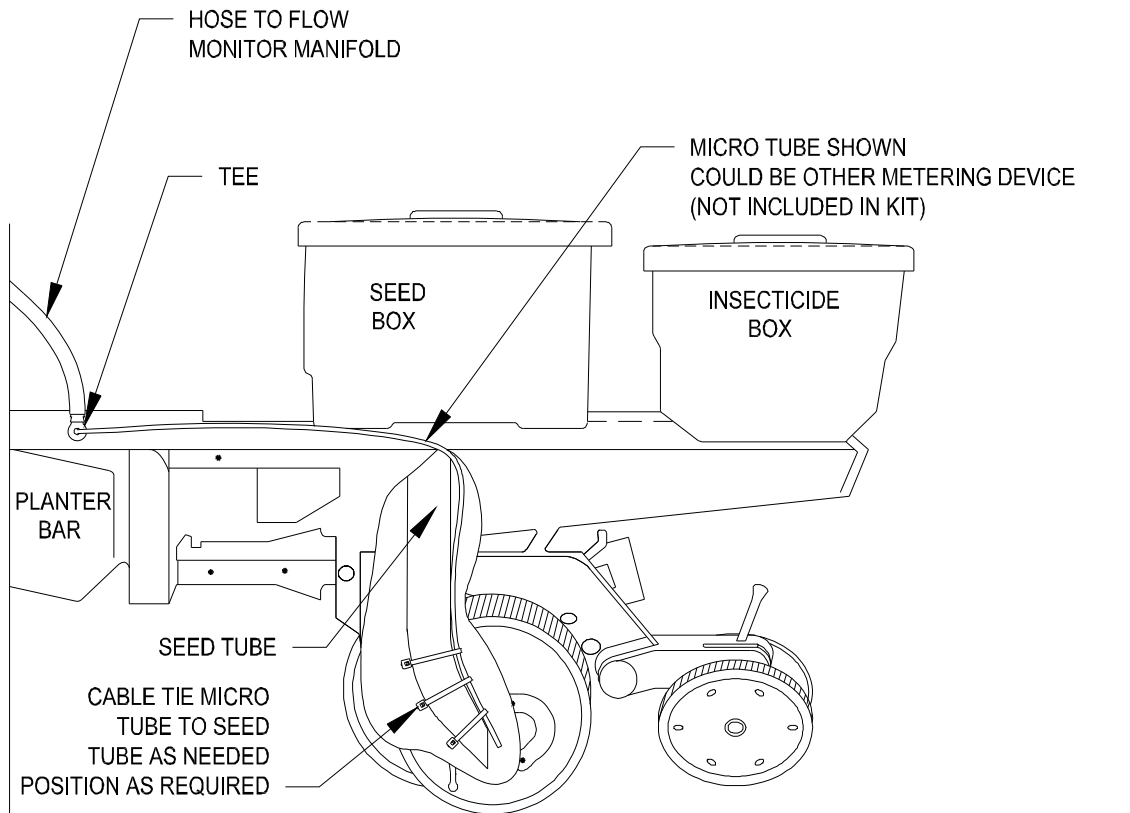
1. OFF/HOLD/RUN switch or Remote switch acts as master switch.
2. Use left or right clutch switch to control left or right booms.

# BASIC SYSTEM OVERVIEW



**FIGURE 1**

## ROW DETAIL IN-FURROW APPLICATION (TYPICAL)



GROUND

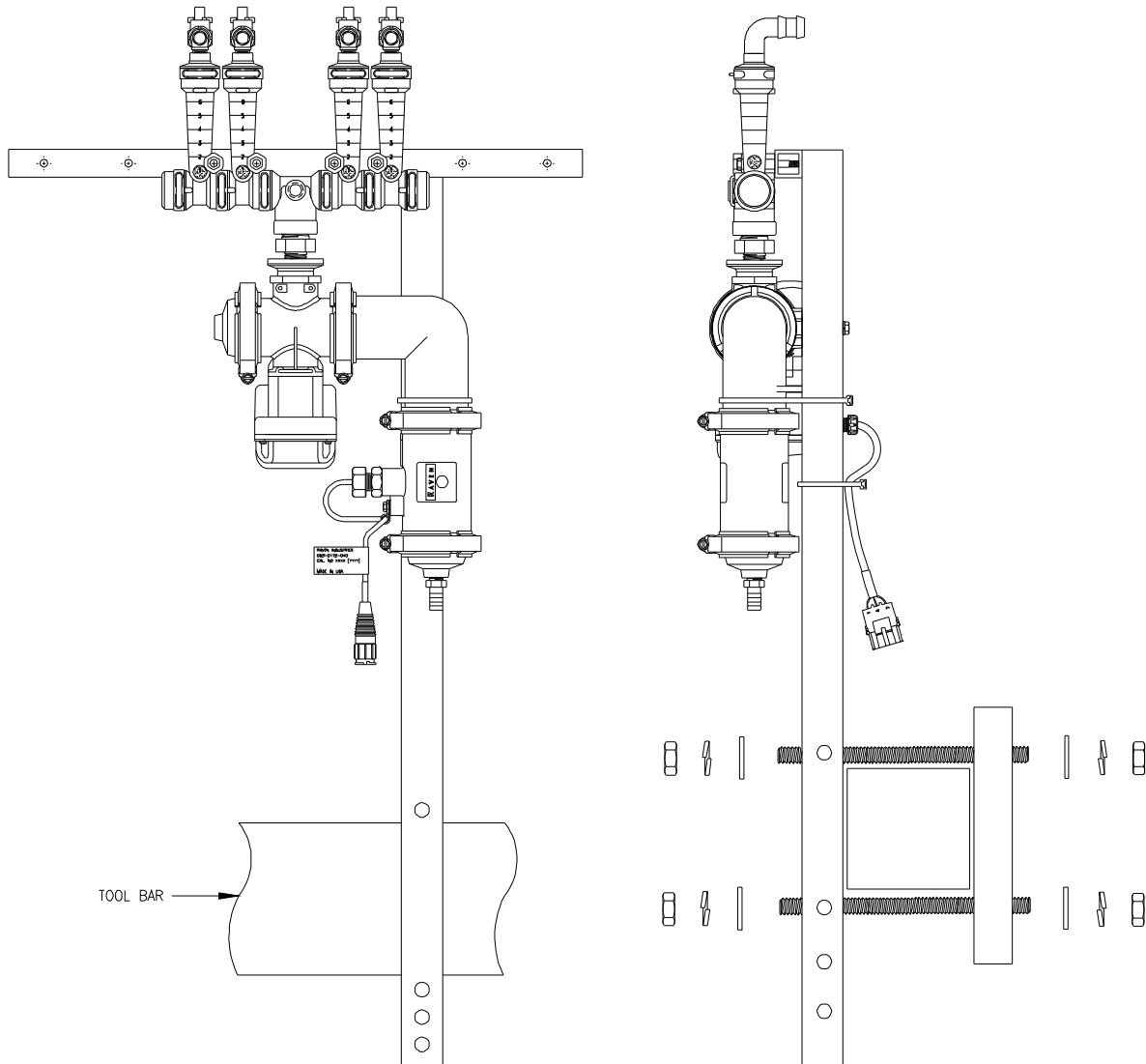
**FIGURE 2**

# INSTALLATION

## 1. TANK INSTALLATION

The tank is not provided with this unit. The tank and mounting brackets should be obtained from your planter dealer for your planter make and model. Locate the tank on the planter in an area that will balance the weight of the tank and fertilizer.

## 2. STAND ASSEMBLY INSTALLATION



**FIGURE 3**

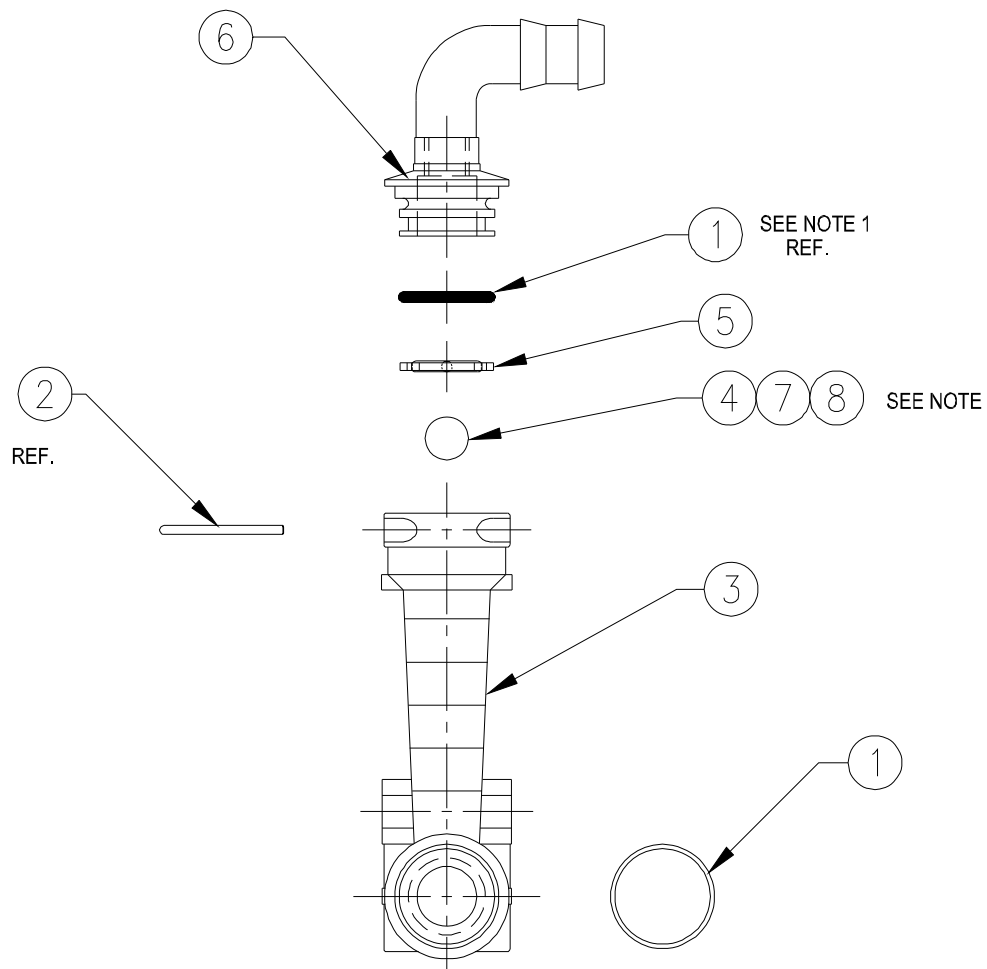
Assemble the flow monitors to the stand assembly. Mount stand assembly to center of planter tool bar with hardware provided. Flow indicators must face forward. If planter folds check for clearance so stand assembly is not damaged.

### 3. FLOW MONITOR INSTALLATION INSTRUCTIONS

1. Assemble one of the Flow Monitor assemblies for every 2 rows on the planter.

**NOTES:**

1. Apply lubricant to all o-rings (item 1) before assembling.
2. Apply pipe thread tape to all threaded connections before assembly.
3. All u-clips (item 2) should face front of assembly, see page 10 for front view.
4. Select a ball that floats midway in monitor during normal applications.



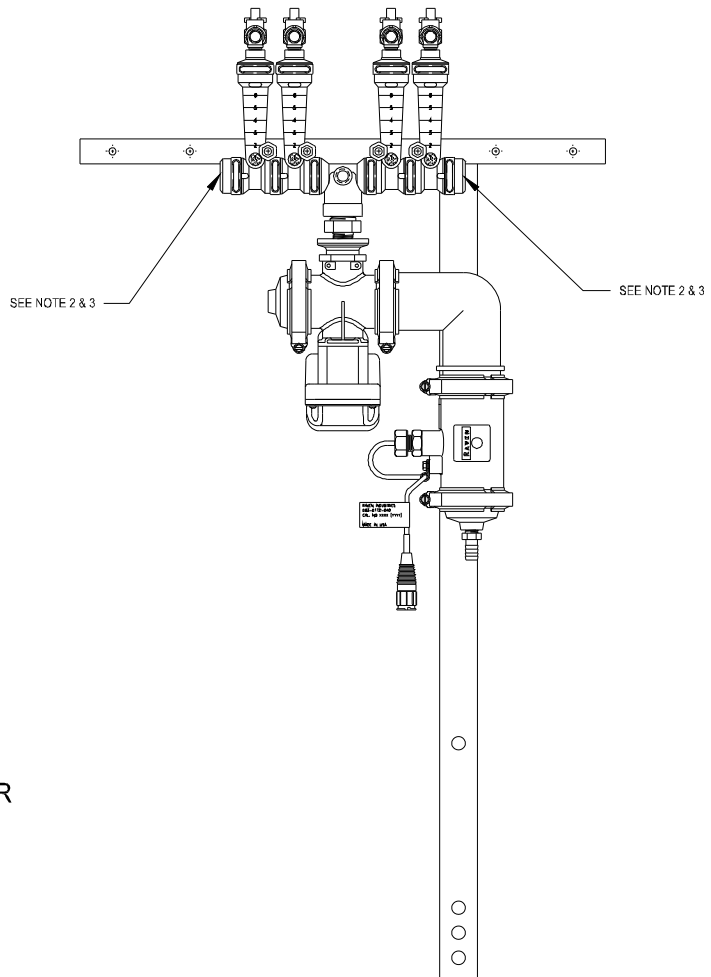
**FIGURE 4**

QTY	DESCRIPTION	PART #	ITEM #
4	O-Ring	219-0002-212	1
4	Lock, U-Clip	333-0002-147	2
2	Body, Flow Indicator	333-0002-151	3
2	Ball, Flow Indicator Red Celon	333-0002-150	4
2	Retainer, Ball	333-0002-146	5
2	Fitting, ORS Male x 1/2" Hose Barb	333-0002-180	6
2	Ball Flow Indicator	333-0002-178	7
2	Ball Flow Indicator	333-0002-179	8

**Kit, Flow Monitor 4 Row Add-on**

**117-0159-830**

2. Remove the end caps by first pulling the stainless steel u-clip.
3. Slide the one flow monitor assembly (assembled in step 1) on to each end of the existing monitor assembly.
4. Secure the newly added flow monitors with the 1/4 x 2 3/4" long bolts, lock washers and nuts included in this kit (only required where holes in stand align with Flow Monitor assembly).



**FLOW TABLE FOR WATER**

BALL FLOAT HEIGHT	RED PLASTIC BALLS GPM	RED GLASS BALLS GPM	STEEL BALLS GPM
1	0-.07	0-.13	0-.35
2	.07-.13	.13-.22	.35-.59
3	.13-.21	.22-.32	.59-.78
4	.21-.29	.32-.43	.78-1.09
5	.29-.38	.43-.61	1.09-1.67
6	.38-UP	.61-UP	1.67-UP

**FLOW TABLE FOR LIQUID FERTILIZER**

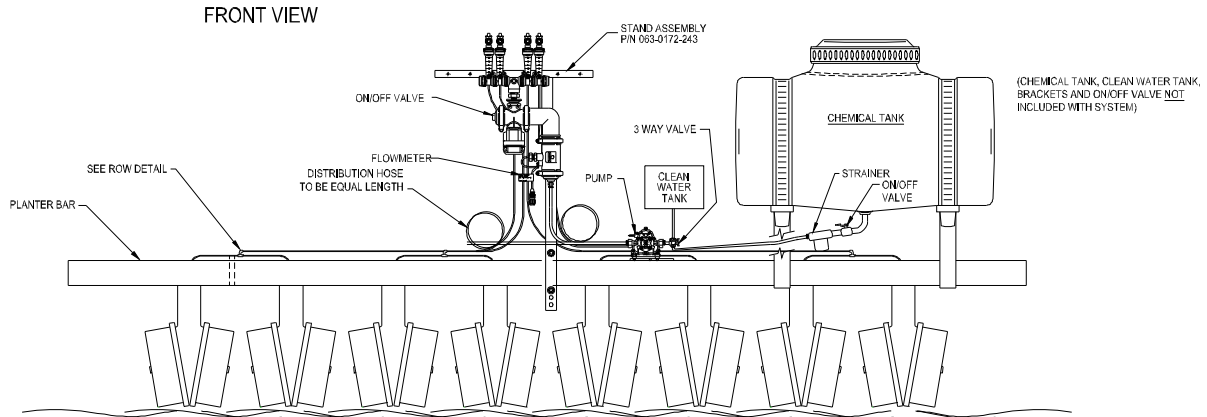
BALL FLOAT HEIGHT	RED PLASTIC BALLS GPM	RED GLASS BALLS GPM	STEEL BALLS GPM
1	0-.03	0-.09	0-.30
2	.03-.05	.09-.18	.30-.50
3	.05-.12	.18-.34	.50-1.20
4	.12-.20	.34-.48	1.20-1.61
5	.20-.30	.48-.66	1.61-2.14
6	.30-UP	.66-UP	2.14-UP

**FIGURE 5**

For best results, select a ball that floats midway in flow monitor.

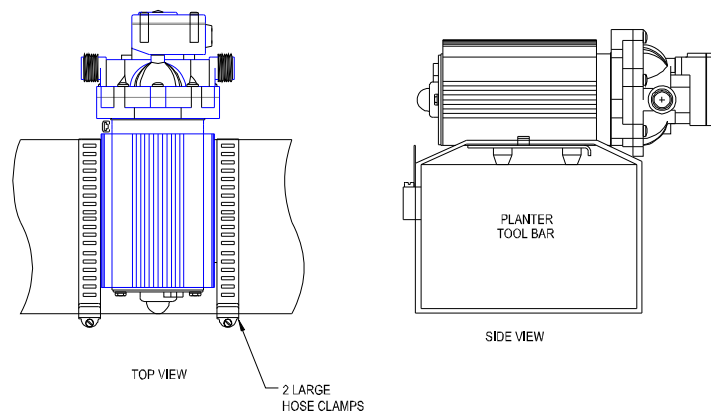
**NOTE:** Flow Monitor is monitoring 2 rows. Select ball based on flow rate for 2 rows.

## 4. PLUMBING ASSEMBLY, INLET INSTALLATION



**FIGURE 6**

1. Mount the pump on the tool bar and close to the chemical tank. Use the large hose clamps provided. Note: Inlet and Outlet of pump.



**FIGURE 7**

2. Install 3way valve on pump inlet. One side goes to fertilizer tank, the other side goes to clean water tank.
3. Install the strainer between the 3 way valve on inlet of pump and the on/off hand valve. Ref. Figure 6.
4. Connect the other side of the pump to the stand assembly. Use 3/4" hose. There must be a minimum of 5 ft. of hose between pump and flowmeter.

**NOTE:** For Tractor Mounted Saddle Tanks, see Appendix 1.

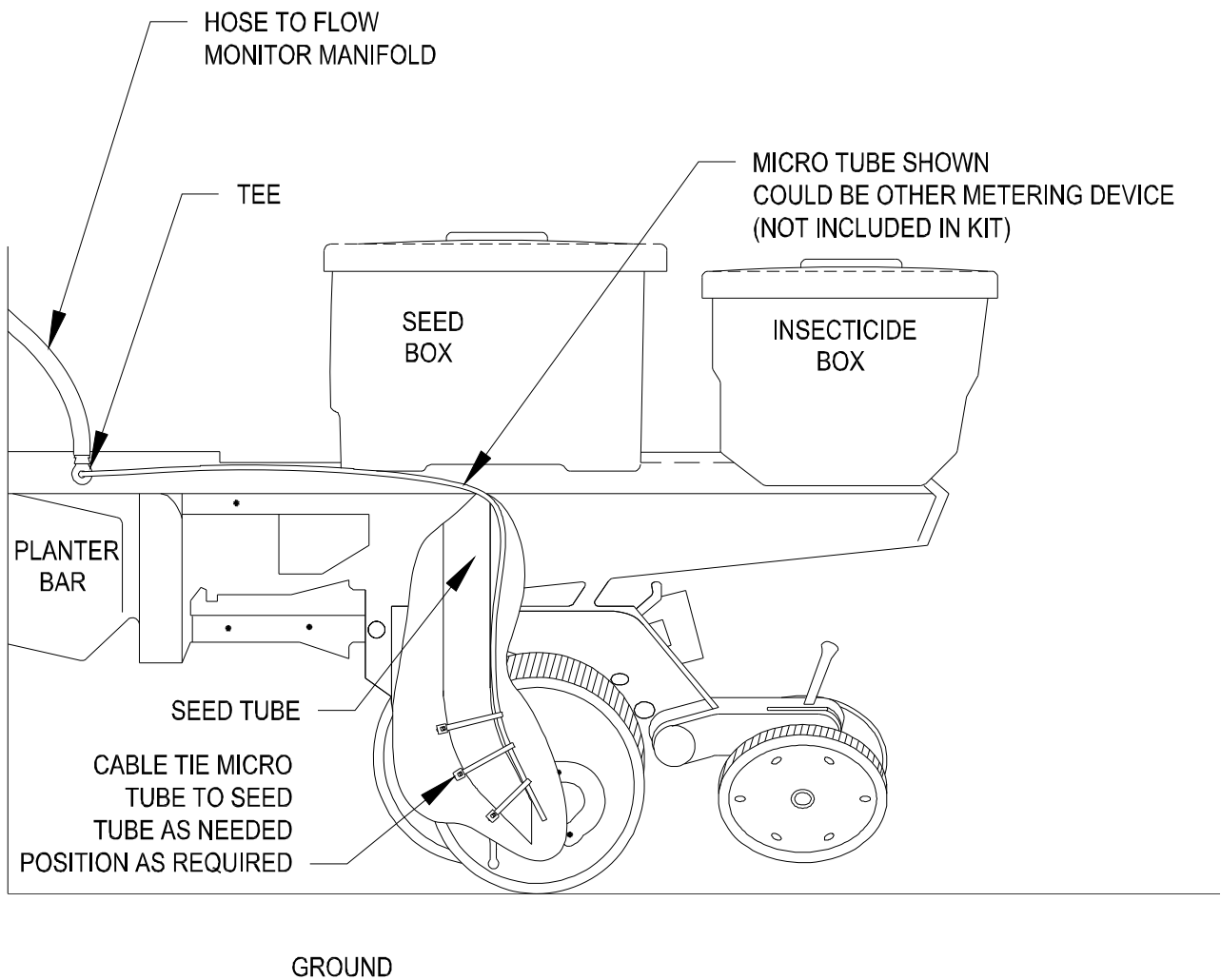


## 5. PLUMBING FROM STAND ASSEMBLY TO ROWS

Use 1/2" hose to feed a tee positioned between each 2 rows. Plumb from tees to individual row.

**NOTE:** To provide equal distribution, it may be necessary to have equal length hose between Stand assembly and row tees.

### TYPICAL ROW DETAIL



**FIGURE 8**

## 6. CONSOLE AND CABLE MOUNTING

1. Mount the console P/N 063-0172-241 to a secure support inside the cab of the vehicle.
2. Route the 15' Console Control Cable P/N 115-0171-267 out of the cab and toward the draw bar.
3. Turn RUN/HOLD/OFF switch to OFF and route the Red and White battery wires to the 12-volt vehicle battery. Attach the two White battery wires to the NEGATIVE (-) terminal and the Red battery wire to the POSITIVE (+) battery terminal. (See Figure 5.) (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. Route the 40' Flow Control Cable P/N 115-0171-268 from the draw bar to the Stand Assembly. Always follow hydraulic lines. Use cable ties to secure cable. Be sure cable does not pinch or stretch when planter is opened or closed.

### CONSOLE MOUNTING

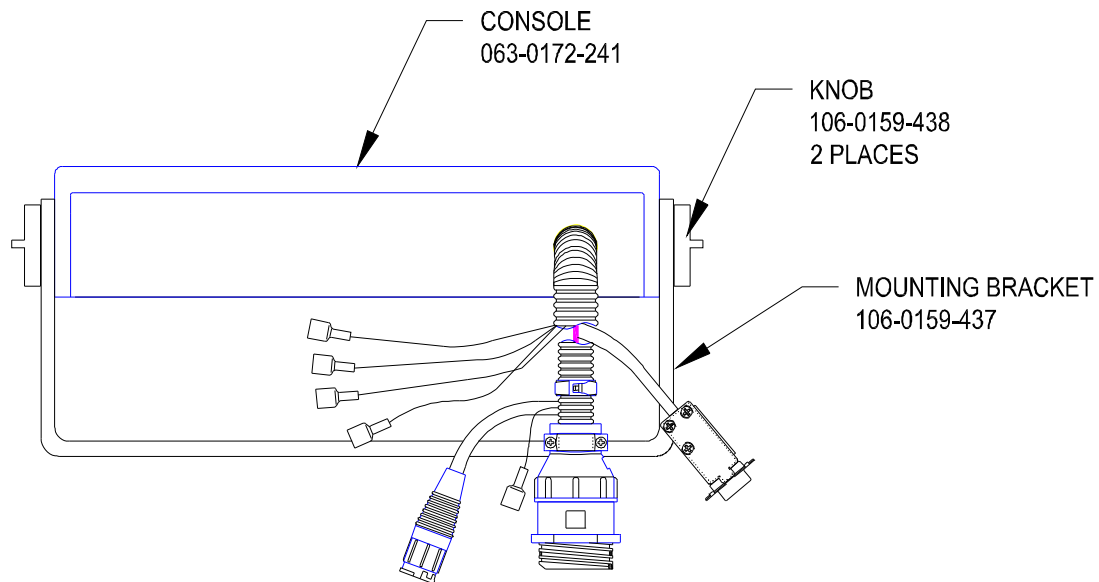


FIGURE 9

# BATTERY CONNECTIONS

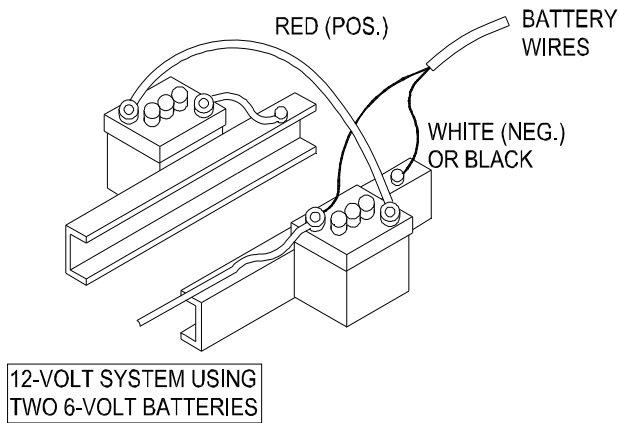
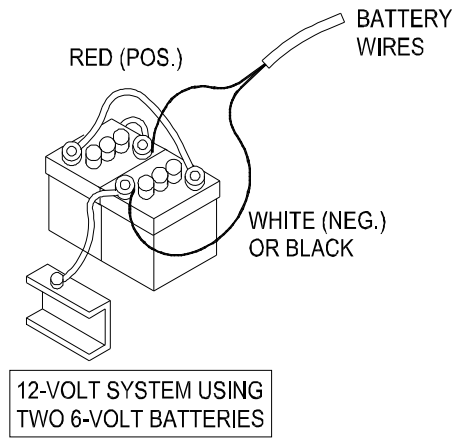
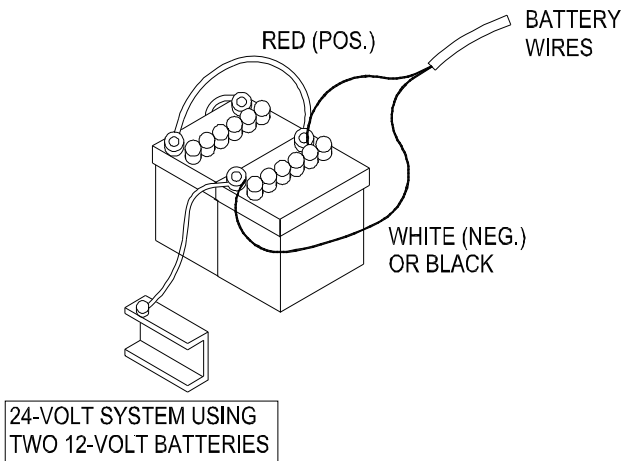
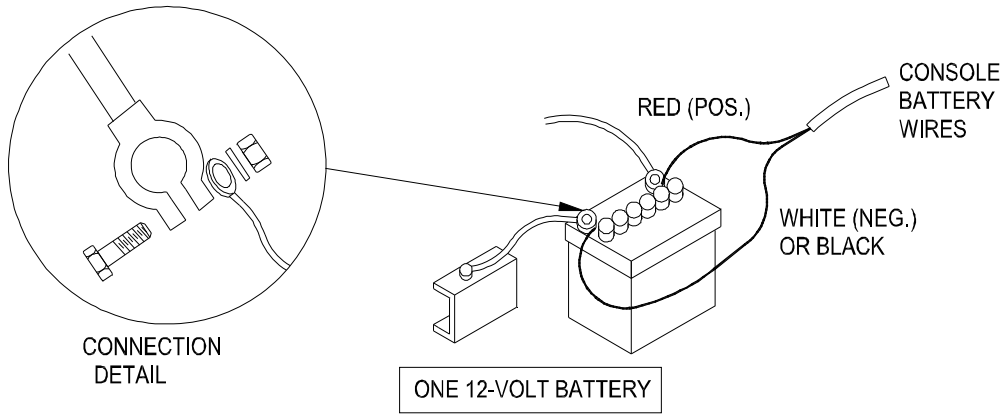
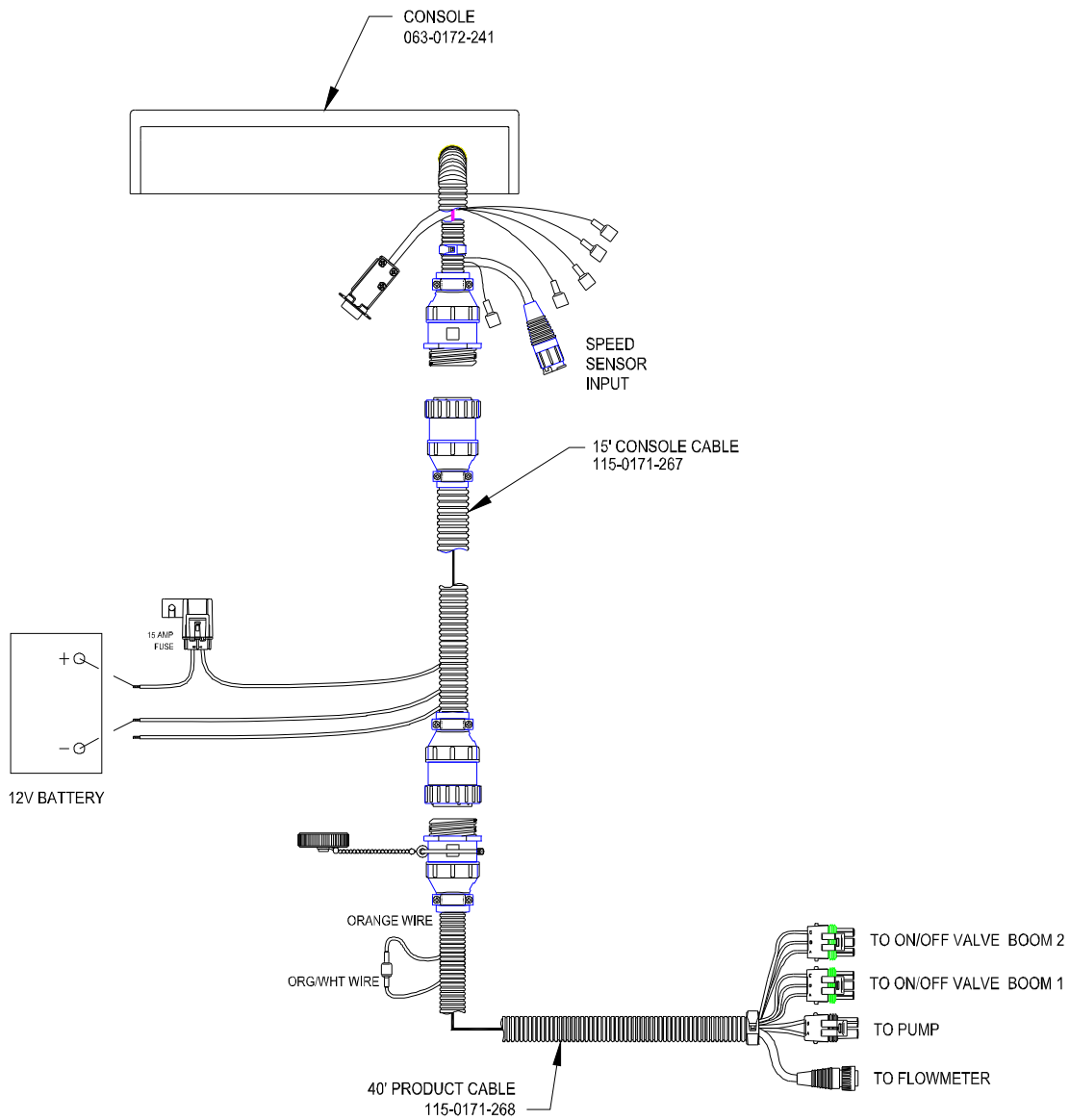


FIGURE 10

# WIRING OPTION 1



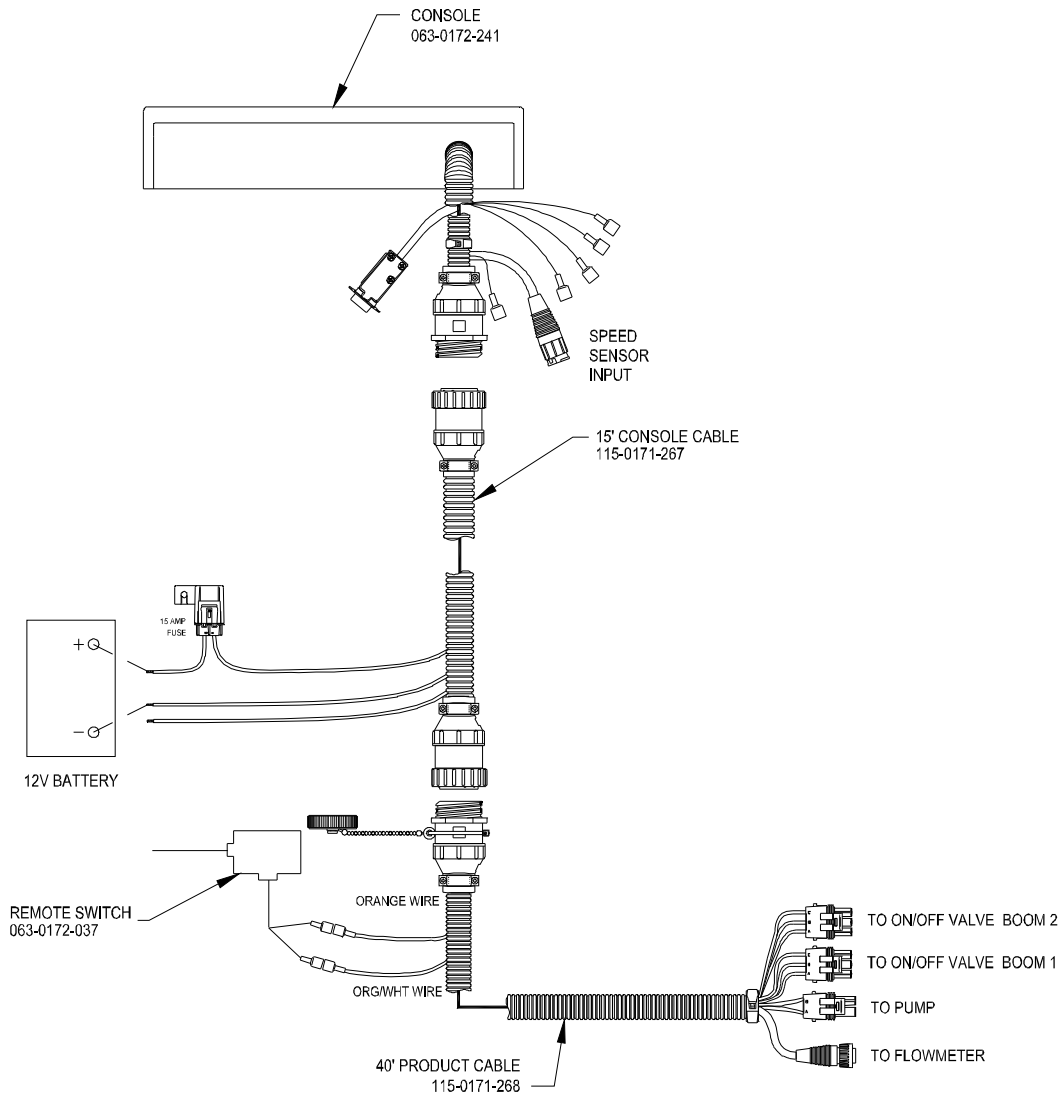
**FIGURE 11**

## OPERATION:

Plug the orange and orange/white wires together. When wired this way, the pump will run and the On/Off valve will open when the RUN/HOLD/OFF switch is placed in the RUN position. The run indicator on the console will be illuminated. Place the RUN/HOLD/OFF switch to HOLD. This will shut the pump and the On/Off valve to OFF. The run indicator will now be off.

## WIRING OPTION 2

The Crop Start II System can be wired with a remote switch. The part number for this switch is 063-0172-037. To do this, connect a remote switch between the orange and orange/white wires.

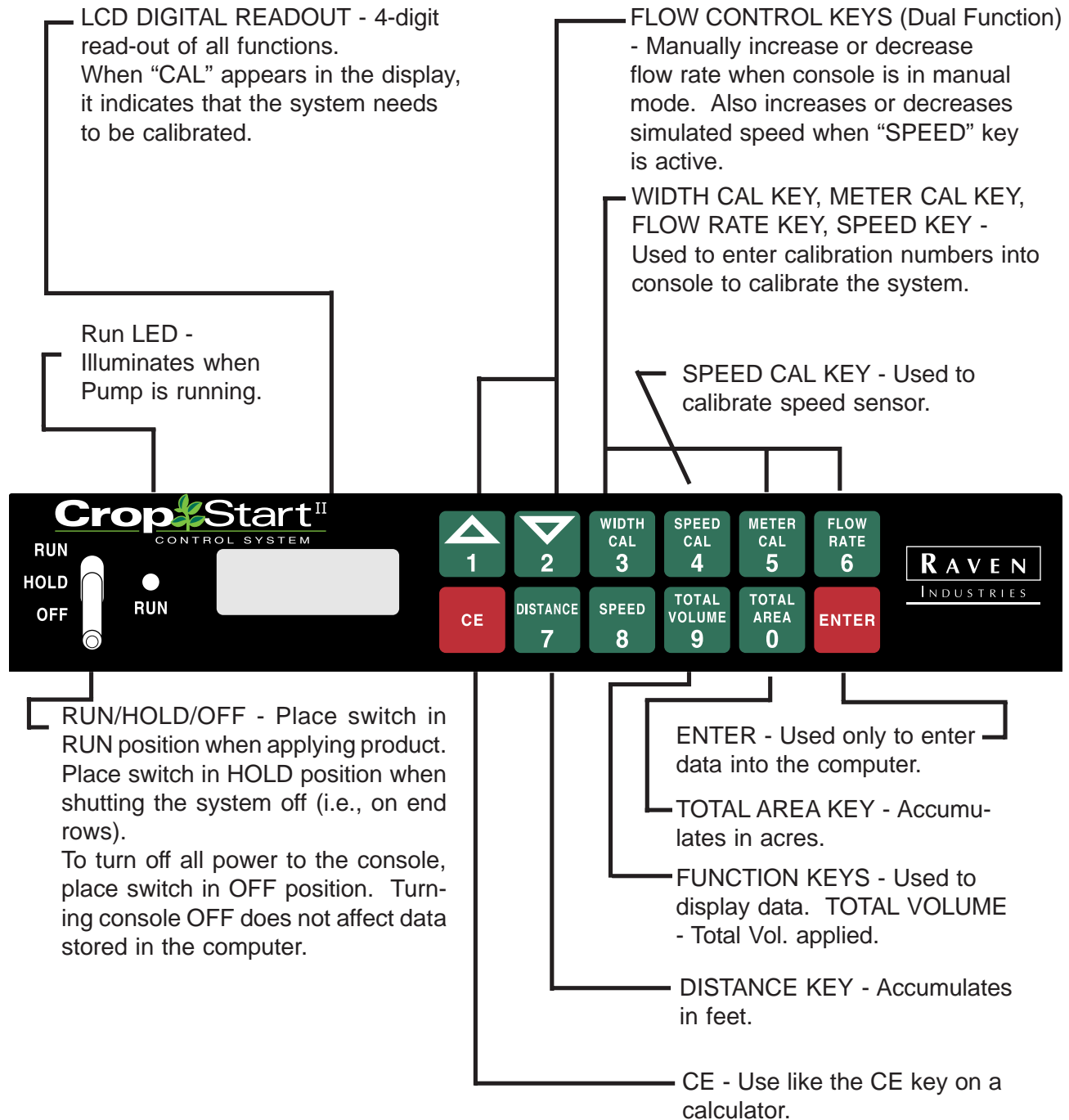


**FIGURE 12**

## OPERATION:

Place the RUN/HOLD/OFF switch to RUN. Now the Remote Switch must also be on to enable the system. The run indicator will also illuminate. To disable the system, place the Remote Switch to OFF or place the RUN/HOLD/OFF switch to HOLD.

# CONSOLE FEATURES



# CONSOLE CALIBRATION

## 1. CALCULATING WIDTH CAL



Calculate the width of each boom by multiplying the row spacing in inches by number of rows on boom.

Width Cal = Row spacing in inches x number of rows  
example: 30 inch row spacing x 16 rows = 480 inches

## 2. CALCULATING METER CAL

**NOTE:** Fertilizer viscosity will affect this number.



The meter calibration number is on the tag attached to the flow meter.

This number may need to be adjusted slightly. If you find you are over applying, adjust the number down. If you are under applying, adjust the number upward. Typical adjustment is about 5%. Write down this calibration number for future reference when programming the console computer.

## 3. SPEED CAL



The initial speed CAL is 598. This number is used to calibrate speed reading. After the Initial Console Calibration, this number must be refined. See “Calculating Speed Cal”.

## 4. FLOW RATE CAL

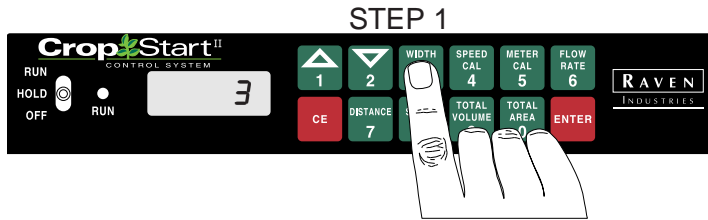


This number is the gallons per acre you wish to apply.  
example: 3.0=3.0 gallons per acre.

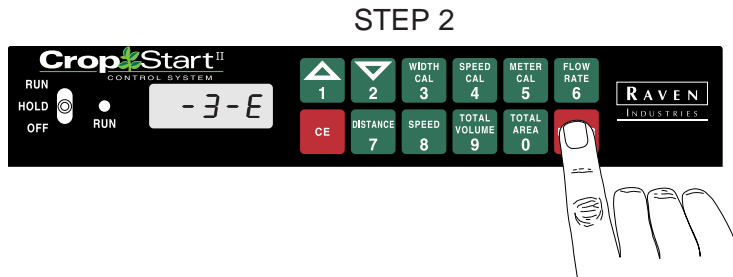
<b>NOTE:</b> Data must be entered into these keys before system will operate.
-------------------------------------------------------------------------------

# CONSOLE PROGRAMMING

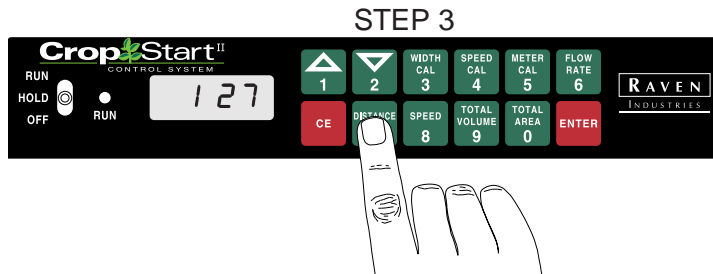
When entering data into the Console computer, the entry sequence is always the same.



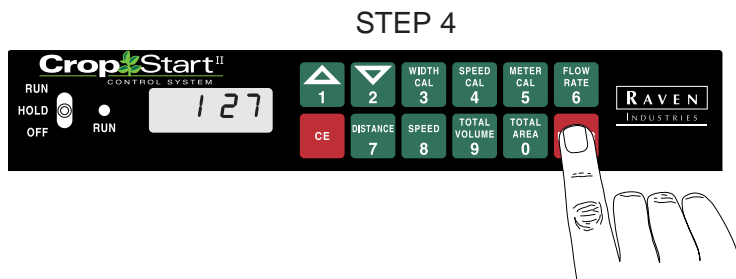
Depress the key in which you wish to enter data. The number of the key will be displayed.



Depress the "Enter" key. A -3-E will now flash in the digital display.



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.



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



# 1. INITIAL PROGRAMMING OF CONSOLE COMPUTER




When first turning on console power, after all installation procedures have been completed, the Console will display "SP1" in the digital display. This means the user must "CALIBRATE" or program the Console before it can be operated.


(This is a one-time operation, which does not have to be repeated. Turning OFF the RUN/HOLD/OFF switch does not affect the console memory. All data is retained.) The following steps must now be followed: (Refer to Console Programming.)

## 2. BASIC CONSOLE CALIBRATION AND OPERATION

### a) INITIAL PROGRAMMING


- 1) Place RUN/HOLD/OFF switch in HOLD position. Console will display "SP1". SP1 is for ALL speed sensors except radar. SP2 is for Radar Speed Sensor.

To change the display to SP2, press the  key. To step between SP1 and SP2, press  key. Press  to lock in your choice. The console will now display "CAL".


- 2) Console is ready to be calibrated. Press . Console will display "B1".



Press .



Press XXX. (This is from the following calculation:

Width = Row spacing in inches x number of rows) Press .

**NOTE:** If planter has clutches to enable shut off of portion of planter and kit P/N 117-0159-832 has been installed, Enter width of left

side as B1 width. Press  key. Display will now show "B2". Enter width of right side as B2 width.


- 3) Press . Press . The initial Speed Cal number is 598. This number must be refined later. See Calculating Speed Cal.

- 4) Press . Press . Press the numbers on Flow Meter Calibration tag.



Press .

- 5) Press . Press . Enter desired rate per acre. Press .


- 6) If a simulated speed is desired, refer to Selft Test Feature.

**NOTE:** To clear out program and return to SP1, place RUN/HOLD/OFF switch to OFF. Press and Hold  and at the same time, place the RUN/HOLD/OFF switch to HOLD.

### 3A. CALCULATING "SPEED CAL" FOR RADAR SPEED SENSORS

- 1) Complete "INITIAL CONSOLE PROGRAMMING" before doing this procedure.
- 2) Enter "0" in key labelled  .
- 3) Enter a SPEED CAL of 598 in key  .
- 4) Drive 1 mile.

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

- 5) Read DISTANCE by depressing key labelled  .
  - a) DISTANCE should read a value of approximately 5280. If it reads between 52200-5350, the SPEED CAL for your vehicle is 598.
  - b) If the DISTANCE display reads any other value, perform the following calculation:

Multiply the SPEED CAL by the actual distance, then divide the sum by the value in DISTANCE display. This will give you the corrected value to enter for SPEED CAL. ***You must round off to the nearest 3 digit whole number.***

**EXAMPLE:** SPEED CAL = 598  
Actual distance = 5280  
Assume the DISTANCE display reads 5000

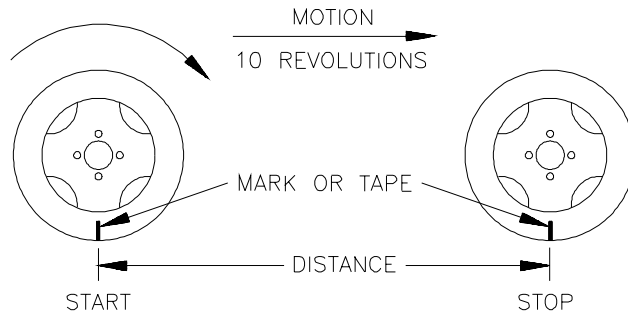
$$= \frac{598 \times 5280}{5000} = 631.4$$

The corrected number to enter for SPEED CAL is 631.

- 6) Enter the number calculated for SPEED CAL.
- 7) Verify the corrected SPEED CAL number calculated in Step 5:
  - a) Zero out the DISTANCE display as in Step 2.
  - b) Enter the corrected SPEED CAL number as in Step 3.
  - c) Repeat Steps 4 and 5b. If DISTANCE value does not read correctly, repeat Steps 5b, 5, and 7.

### 3b. CALCULATING "SPEED CAL" FOR WHEEL DRIVE SPEED SENSORS

- 1) Place a chalk mark or tape onto the vehicle tire that has the Speed Sensor mounted to it as shown below.
- 2) Mark the initial spot on the ground.
- 3) Drive vehicle straight ahead counting 10 full revolutions of the wheel. The mark must stop at the same position it was in when the vehicle started.
- 4) Measure the distance from the ground starting mark to stopping mark in inches (round off fractions).
- 5) Write down this distance as the SPEED CAL number; keep it for future reference when programming the console.



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

Large tires and very low speed applications may require additional magnets to insure accurate speed readings. Any even number of magnets may be used as long as they are of alternating color and equally spaced. After calculating "SPEED CAL", this number must be adjusted according to the number of magnets used.


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


**Example:**  $\frac{4}{6} \times 1200 = 800$



## 6. SELF TEST FEATURE

SELF TEST allows speed simulation for testing the system while the vehicle is not moving.

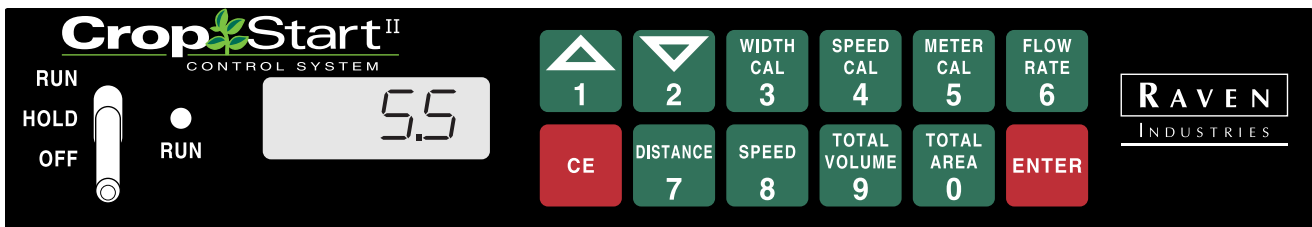
Enter the simulated operating speed by depressing the key labelled  for 5 seconds. Display will show “-tEst-”. If 6 MPH is desired, enter 6.0 (See CONSOLE PROGRAMMING).

Verify SPEED by depressing key labelled . The display will show 6.0. The SELF TEST speed will clear itself when motion of vehicle is detected by the Speed Sensor. A SPEED CAL value of 900 or greater is recommended when operating in this mode.

**NOTE:** To prevent nuisance clearing of self-test speed, disconnect speed connector when radar speed sensors are used.


## 7. SIMULATED SPEED ADJUSTMENT FEATURE


A simulated speed must first be entered (see self test feature).



### DEFINITION OF KEYS


Press , then:

Depressing  will cause the Simulated Speed to INCREASE by 0.1.

Depressing  will cause the Simulated Speed to DECREASE by 0.1.

**NOTE:** For these keys to be functional, the SPEED key must be pressed first.

## 8. LOW LIMIT FEATURE


To activate this feature, press and hold  key for 5 seconds. A low limit flow may now be entered. Enter this rate as a volume per minute. When slowing down, the console will not adjust the rate below this limit. “LL” will be displayed, indicating this limit has been reached.

To determine vol/min, use the following formula:

$$\text{vol/min} = \frac{\text{RATE (Vol/Acre)} \times \text{Width (Row spacing in inches)} \times \text{SPEED (mph)}}{5940 \times \text{\# of rows}}$$

## 9. ALARM MENU



To display ALARM MENU, depress key labelled  for 5 seconds. "A on" will show in the display.

- a) Momentarily depressing  toggles the display between "A on" and "A off". "A on" means alarm is enabled, "A off" means alarm is disabled.







## 10. OFF TARGET ALARM

Alarm sounds when the actual rate is off from the target rate by a specified percentage. The Off Target value is preset to 30%, but may be changed to a different number.

- 1) Adjusting Off Target value.

- a) Depress  for 5 seconds. Display will show "or". Enter desired new number for OFF TARGET ALARM.
- b) Depress  to store selection.

## 11. MANUAL OPERATION FEATURE

- a) Press and hold  for 5 seconds and "C on" displays. Press  to alternate between "C on" (automatic control) and "C off" (manual control). Press  to select desired control mode.
- b) To adjust Flow Rate in manual mode, press . Target Flow Rate will flash on display. To increase Flow Rate, press . To decrease Flow Rate, press .

<b>NOTE:</b> Console defaults to automatic mode. Switching RUN/HOLD/OFF switch to OFF, then HOLD returns the console to automatic control.
--------------------------------------------------------------------------------------------------------------------------------------------

## 12. DATA MENU

The following are brief descriptions of features available under the TOTAL VOLUME key.

<u>DISPLAY</u>		<u>DESCRIPTION</u>
<i>P r n</i>	<i>b E 9 n</i>	Sends data through serial port to attached optional printer to print field begin and field end pages.
<i>r R t E</i>	<i>o n</i>	Turns rate change alarm ON or OFF. When rate change alarm is selected ON; alarm sounds 4 long beeps when the Rate 1 calibration number is changed via the serial port using a valid change request data string.
<i>F I L E</i>	<i>1</i>	Used only with Raven Application Management System. See Application Management System manual for more details.
<i>9 P S</i>	<i>1 n R C</i>	Used only with Raven Application Management System. See Application Management System manual for more details.
<i>F r E F</i>	<i>0</i>	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.
<i>b A U d</i>	<i>9 6 0 0</i>	Used in GPS mode and data logging mode. Selectable between 1200 or 9600 baud.
<i>t r I 9</i>	<i>0</i>	Used in data logging mode. The trigger determines how often actual rate data string (See Appendix 10 for Data Communication String Formats) is sent to the serial port. The trigger may be either feet [meters] or seconds.
<i>U n I t</i>	<i>F t</i>	Used in data logging mode. The trigger unit is selectable between feet [meters] or seconds.
<i>d L o g</i>	<i>o F F</i>	Turns data logger ON or OFF.
<i>t I n E</i>		Sets time.
<i>0 n t h</i>		Sets month.
<i>d A Y</i>		Sets day.
<i>Y E A r</i>		Sets year.

1) **Definition of Data Menu Options:**



Depressing this key for 5 seconds displays selected Data Menu features.



Depressing this key after selecting DATA MENU increments through desired features. EXAMPLE: "Prn" "bEgn", "rAtE" "on", "FILE" "1", etc....

2) **CONSOLE DATA PRINTOUT**

a) Display will alternate between *Prn* and *bEgn* (Print Field Begin).

1) To Print Field Begin, depress key labelled

b) Display will now alternate between *Prn* and *End* (Print Field End).

1) To Print Field End, Depress key labelled

2) While End is displayed, if Field Begin is required, depress key labelled to toggle display to *bEgn*.

c) Momentarily depress to advance to RATE CHANGE ALARM ON/OFF.

3) **RATE CHANGE ALARM ON/OFF**

a) Display will alternate between *rAtE* and *on* (Rate Change Alarm On).

b) Depressing momentarily changes the display between *on* and *oFF*. A value of *on* means alarm is enabled; a value of *oFF* means alarm is disabled.

c) Momentarily depress to advance to GPS FILE REFERENCE.

4) **GPS FILE REFERENCE**

a) Display will alternate between *FILE* and *1* (GPS File Reference 1).

b) Enter the GPS file number.

c) Momentarily depress to advance to GPS OPTIONS.

5) **GPS OPTIONS**

a) GPS is inactive when the display alternates between GPS and InAC. The GPS features are explained further in the GRID APPLICATION SYSTEM MANUAL.

b) Momentarily depress to advance to FIELD REFERENCE.

6) **FIELD REFERENCE**



a) Display will alternate between *FEF* and *0* (Field Reference 0).

b) Enter the field number.

c) Momentarily depress to advance to BAUD RATE.




7) **BAUD RATE**



- a) Display will alternate between *bAUD* and *9600* (Baud Rate 9600).
- b) Depressing  momentarily changes the display between 9600 and 1200.
- c) Momentarily depress  to advance to DATA LOGGER TRIGGER VALUE.

**NOTE:** The TRIGGER VALUE default is "zero". This value must be changed to a desired number ranging from 1-9999. The DATA LOGGER features will not work if this number is not changed.

8) **DATA LOGGER TRIGGER VALUE**

- a) Display will alternate between *trig* and 0 (Data Log Trigger Value 0).
- b) Enter the TRIGGER VALUE.
- c) Momentarily depress  to advance to DATA LOGGER TRIGGER UNITS.

9) **DATA LOGGER TRIGGER UNITS**

- a) Display will alternate between *Unit* and *Fe* (Data Log Trigger Units Feet).
- b) Depressing  momentarily changes the display between *Fe [meter]* and *SEC*. A value that has been chosen as the unit of measurement for the TRIGGER VALUE programmed previously. (*SEC* means seconds has been chosen as the unit of measure.)
- c) Momentarily depress  to advance to DATA LOGGER.

10) **DATA LOGGER ON/OFF**



- a) The DATA LOGGER uses the communications strings listed in Appendix 10 to pass data out through the serial port. The data is sent at a set time interval or a set distance traveled, as determined by the values entered in the DATA LOGGER TRIGGER VALUE and DATA LOGGER TRIGGER UNITS. Upon each trigger, the Actual Rate string, Data Strings 1, 2, and 3, and the Time/Date string are sent, in that order. When a Console Calibration value is changed, the Console will automatically send out the Cal 1, 2, and 3 strings. When a Console switch is changed, the Data 1, 2, 3, Time/Date, and Cal 1, 2, 3 strings will be sent by the Console. The Data (with Time/Date string included) and Cal strings can also be requested by the data logger using the request strings shown in Appendix 10.

**NOTE:** Some options within the DATA MENU LISTINGS may be unavailable if certain features are on or active. The option affected are:


CONSOLE DATA PRINTOUT: Console Data Printout will not be available when DATA LOGGER is ON or when GPS functions are active.

GPS OPTIONS: GPS options will not be available when DATA LOGGER is ON.


DATA LOGGER: DATA LOGGER will not be available when GPS functions are active.

- b) Display will alternate between *dL o9* and *oFF* (Data Log Off).
- c) Depressing  momentarily changes the display between *oFF* and *oN*. A value of *oFF* means DATA LOGGER is disabled; a value of *oN* means DATA LOGGER is enabled.
- d) Momentarily depress  to advance to TIME.


**11) ENTER TIME**

- a) Select TIME.
- b) Enter TIME when display flashes *tI nE*.
- c) Momentarily depress  to advance to MONTH.


**12) ENTER MONTH**

- a) Select MONTH.
- b) Enter MONTH when display flashes *MoNtH*.
- c) Momentarily depress  to advance to DAY.



**13) ENTER DAY**

- a) Select DAY.
- b) Enter DAY when display flashes *dAY*.
- c) Momentarily depress  to advance to YEAR.

**14) ENTER YEAR**

- a) Select YEAR.
- b) Enter YEAR when display flashes *YEAr*.
- c) Momentarily depress  to advance to PRINT FIELD BEGIN.

# INITIAL SYSTEM SET-UP AND SYSTEM CHECK OUT

1. Fill tank with water.
2. Place RUN/HOLD/OFF to HOLD.
3. Verify calibration data has been entered in console.
4. Press the key labelled  . Enter the desired Rate Per Acre.
5. Press the key labelled  . Enter the desired simulated speed. This number should match the “while planting” tractor speed.
6. If the system has been wired to run when the Remote switch is on, place the RUN/HOLD/OFF switch to RUN. Place the Remote switch to ON. Red LED shall be on. Verify the pump is running and has primed.
7.
  - A. Place RUN/HOLD/OFF switch to HOLD. Verify pump has stopped. Run LED shall be off.
  - B. Place RUN/HOLD/OFF switch to ON. Run LED shall be on. Verify pump is running.
  - C. Place RUN/HOLD/OFF switch to HOLD. Console should display programmed rate. Run LED shall be off. Verify pump is not running.
8. System Check Out.
  - A. Verify spray pattern for each row. Check for plugged nozzles.
  - B. Verify Flow Indicator balls are at the same height.
  - C. Check system for leaks.
  - D. Verify system can achieve rate at desired speed. See System Operating Parameters.
9. After initial system check out, drain water from tank.

# PREVENTIVE MAINTENANCE

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

1. **PUMP:** Drain tank of fertilizer and flush pump with water if system will not be used for extended periods of time. Keep system clean. Protect from freezing. Use RV anti-freeze.
2. **FLOW INDICATOR ASSEMBLY:** When system is to be put away, flush out with clean water. After flushing, protect system from freezing with RV anti-freeze. Cover Flow Indicator to protect from sun light. Direct sun light and prolonged contact with fertilizer will degrade the clear plastic in the Flow Indicator.
3. **HOSES AND FITTINGS:** Inspect on a regular basis for wear and abrasion, softening, swelling and leaks. Replace as needed.
4. **CABLES:** Inspect regularly for wear and abrasion. Protect connections with di-electric grease. Clean any corrosion that may develop. Always tie up cables to keep them away from hot surfaces and from being caught or stepped on.
5. **FLOWMETER:** Inspect flowmeter periodically for obstructions. Flush with clean water if system will not be used for extended periods of time. Keep system clean. **DO NOT LET SYSTEM FREEZE.**

Do NOT let fertilizer set in flowmeter. Use 3 way valve to select clean water and flush system.

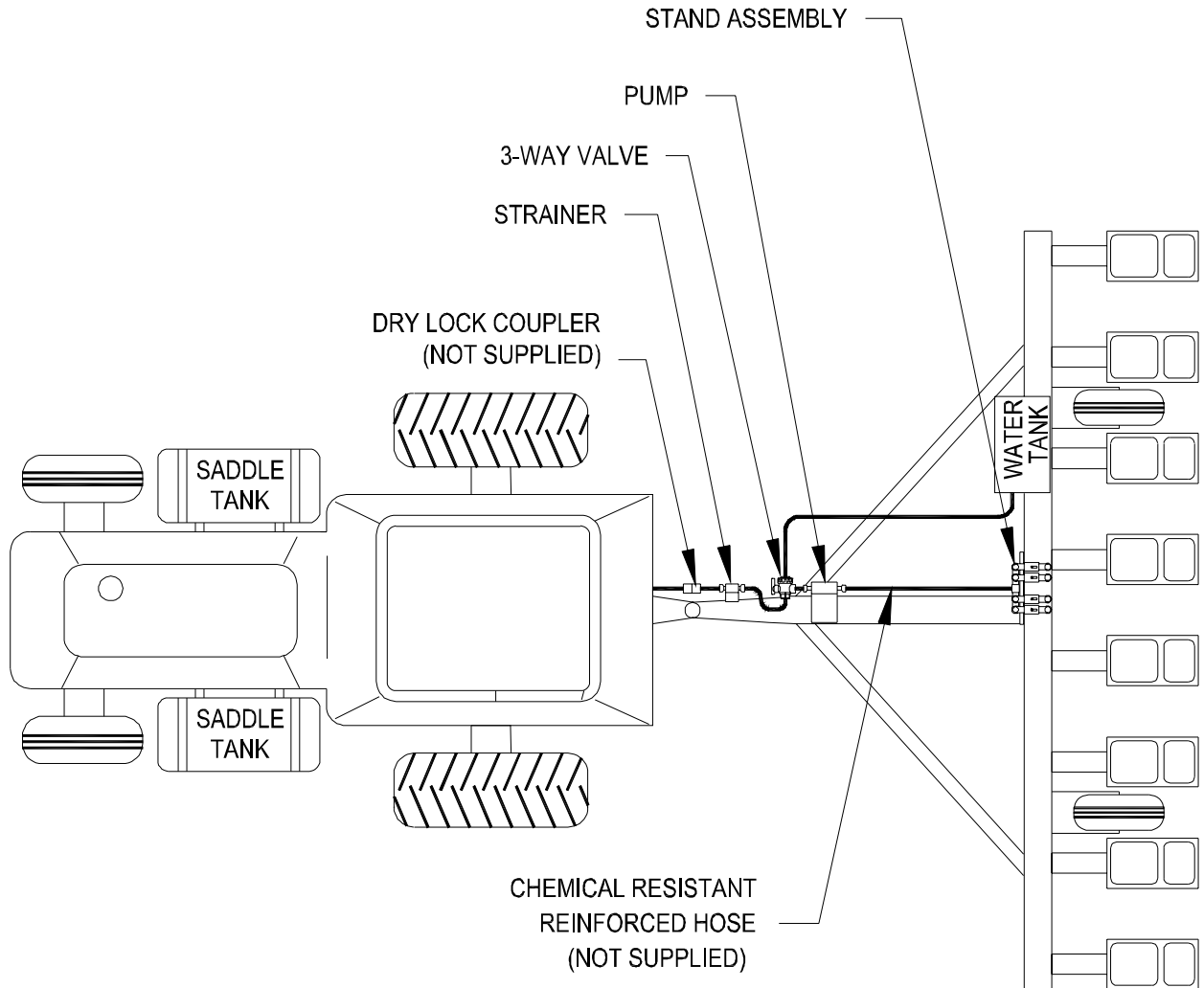
Fertilizer may crystalize in flowmeter and bind turbine shaft which may result in expensive repairs if not flushed.

# TROUBLESHOOTING GUIDE

<u>PROBLEM</u>	<u>CORRECTIVE ACTION</u>
1) NO DISPLAY LIGHTS WITH POWER ON.	1) Check Fuse. 2) Check battery connections. 3) Check operation of OFF/HOLD/RUN switch.
2) A DIGIT CANNOT BE ENTERED VIA KEYBOARD.	1) Return Console to your dealer for service.
3) CONSOLE DISPLAYS "SP1" WHENEVER VEHICLE ENGINE IS STARTED.	1) Check battery voltage and battery connections.
4) CONSOLE DISPLAYS "SP1" WHENEVER MASTER SWITCH IS TURNED ON OR OFF.	1) Check battery voltage and battery connections.
5) ONE DISPLAY DIGIT HAS ONE OR MORE MISSING SEGMENTS.	1) Return Console to Dealer for service.
6) SPEED DISPLAY "0".	1) Perform cable test. See Appendix 3.
7) RATE READS "0".	1) Verify speed value is entered. 2) Perform flowmeter cable test. See Appendix 2. 3) Verify pump is running. 4) Verify flowmeter turbine spins freely. 5) Replace flowmeter sensor.
8) RATE IS ERRATIC.	1) Verify console is programmed correctly. 2) Verify system pressure does not exceed 45 psi.
9) PUMP WILL NOT PRIME.	1) Verify On/Off valve is open. 2) Verify strainer is not plugged.
10) PUMP WILL NOT RUN.	1) Verify console is programmed correctly. 2) Verify cable connections. 3) Apply 12 VDC to pump leads. Verify pump runs. If not, replace pump.
11) SYSTEM NOT ACCURATE.	1) Verify correct calibration data entered in console.

# APPENDIX 1

## PUMP INSTALLATION WITH TRACTOR MOUNTED SADDLE TANKS



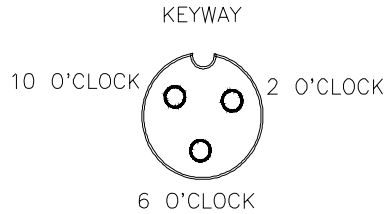
### NOTES:

1. Mount pump and strainer on draw bar near hitch.
2. Connect pump to flowmeter on stand assembly with chemical resistant reinforced hose.
3. Pump power wires will need to be separated from main harness and routed to pump.

## APPENDIX 2

# 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:



### 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 Flow reading is restored, Test the Speed Sensor cable per Appendix "PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLES".

### PROCEDURE TO CHECK CABLE:

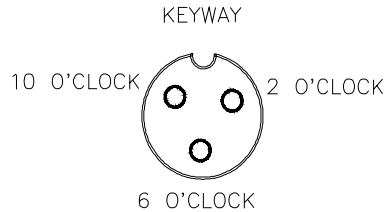
- 1) Enter a METER CAL number of one (1) in key labelled 
- 2) Depress key labelled 
- 3) Place OFF/HOLD/RUN switch to RUN.
- 4) With small jumper wire (or paper clip), short between the 2 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the TOTAL VOLUME should 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 Sensor.

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

# 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 Sensor cable. If the Speed reading is restored, Test the Flow Sensor cable per Appendix "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 RADAR ADAPTER CABLE SELECTION GUIDE

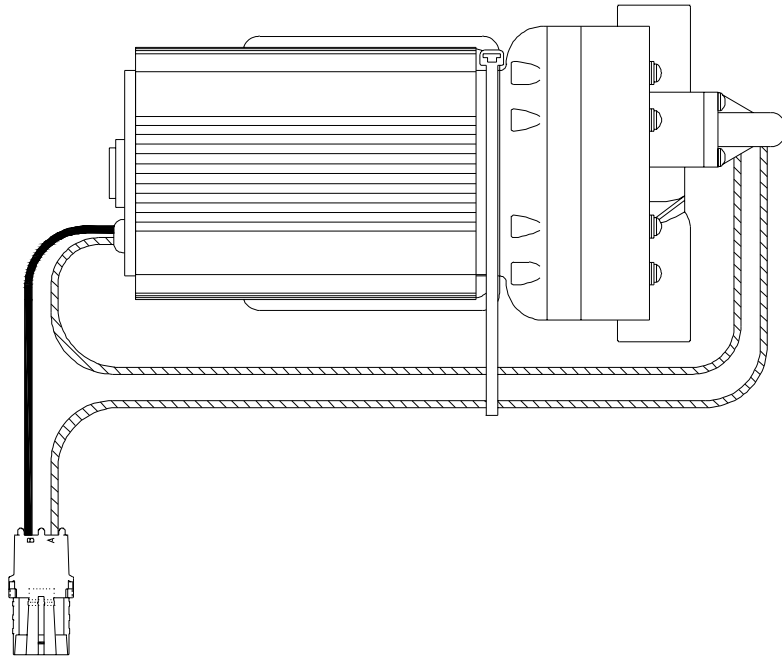
RADAR TYPE	TRACTOR TYPE	ADAPTER CABLE PART NUMBER
DICKEY JOHN	CASE IH	115-0159-517
	AGCO-ALLISON 94/95/96 FORD *** WHITE *	115-0159-529
	JOHN DEERE **	115-0159-519
	CHALLENGER *	115-0159-518
	CAT C-MOD, D-MOD ROW CROP 35,45,55 CHALLENGER	115-0159-627
	JOHN DEERE 7000/8000/9000 SERIES	115-0159-700
	FORD GENESIS/VERSATILE NEW HOLLAND 1996	115-0159-709
	OTHER	115-0159-526
	MAGNAVOX	JOHN DEERE **
JOHN DEERE 7000/8000/9000 SERIES		115-0159-700
OTHER		117-0159-462
TRW	CASE	115-0159-432
	OTHER	115-0159-463

**TABLE 1**

- \* 1990 model year or later with factory installed performance monitor.
- \*\* 1990 model year or later with factory installed performance monitor.  
Not used for 7000/8000/9000 series tractors.
- \*\*\* 1990 model year or later with factory installed performance monitor.  
Not used for Genesis/Versatile tractors.

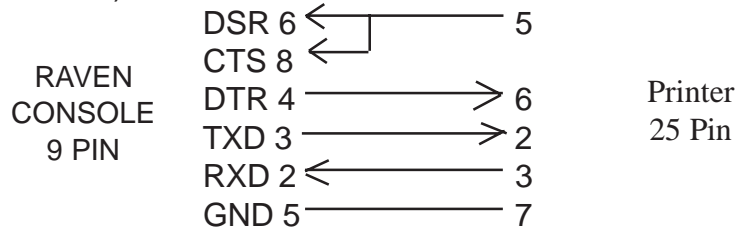
APPENDIX 5  
PUMP ASSEMBLY, AQUATEC  
REPLACEMENT PART

P/N 063-0172-138



# APPENDIX 6 SERIAL INTERFACE

- 1) Cable pinout (P/N 115-0159-994), supplied with Thermal Printer Kit (P/N 117-0159-529).

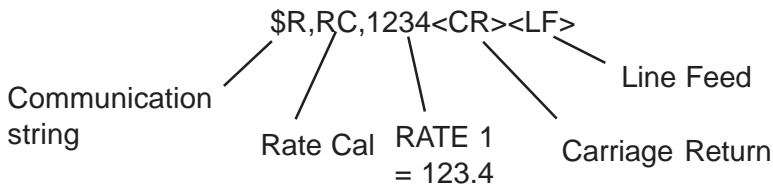


- 2) Changing RATE 1 CAL by remote computer.  
a) Configuration of RS-232C serial port:

1200 or 9600 Baud Rate  
NO Parity  
8 Data Bits  
2 Stop Bits

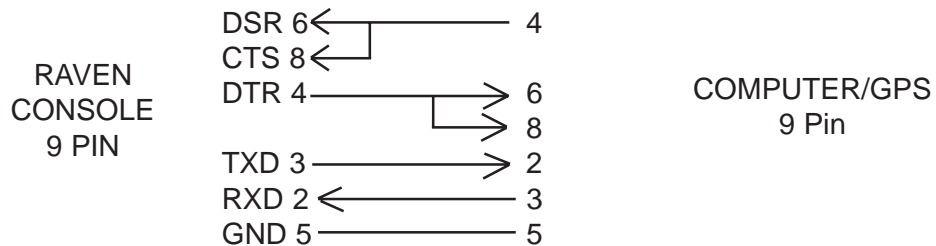
- b) Data stream to Raven Console.

**EXAMPLE:** Change RATE 1 to 123.4



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

- 3) Optional 9 pin to 9 pin cable pinout (P/N 115-0159-822).



# APPENDIX 7

## CROP START II COMMUNICATION STRINGS

### REMOTE COMPUTER TO CROP START II CONSOLE

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

**Rate 1 Change Request:**

\$R,RC,<rate\_1\_cal><CR><LF>

**Calibration String Values Request:**

\$R,CR<CR><LF>

**Data String Request:**

\$R,DR<CR><LF>

**Time Request:**

\$R,TR<CR><LF>

**Time Acknowledge Request:**

\$R,TA<CR><LF>

### CROP START II CONSOLE TO REMOTE COMPUTER

All console output strings begin with \$R141-, the \$R indicates a Raven communication string, the 141 is the last three digits of the current CROP START II programmed chip part number and - is the software revision number.

**Calibration Strings:**

\$R141-,C1,<switch\_byte>,<boom\_1\_cal>,  
<boom\_2\_cal>,<boom\_3\_cal>,<speed\_cal><CR><LF>

\$R141-,C2,<meter\_cal>,<CR><LF>

\$R141-,C3,<valve\_cal>,<rate\_1\_cal><CR><LF>

<u>Bit</u>	<u>Switch Byte</u>
0	boom 1
1	boom 2
2	boom 3
3	rate 1
4	1
5	1
6	1
7	1

**NOTE:** If rate 1 is zero, the console is in Manual. For switch Byte Bits; 0 = off and 1 = on.

**Data Strings:**

\$R141-,D1,<total\_area><CR><LF>

\$R141-,D2,<total\_volume><CR><LF>

\$R141-,D3,<distance><CR><LF>

**Actual Rate:**

\$R141-,AR,<actual\_rate><CR><LF>

**Time/Date:**

\$R141-,TD,<hr:min>,<month/day/year>,<field\_reference><CR><LF>

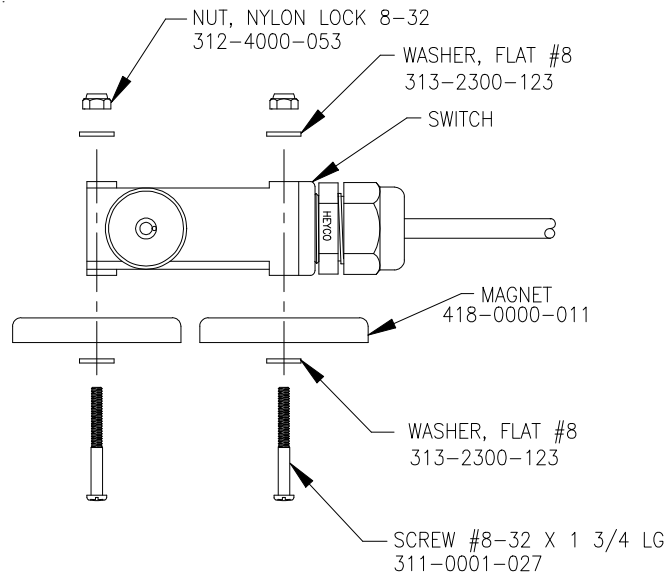
# REMOTE IMPLEMENT SWITCH INSTALLATION INSTRUCTIONS

P/N 063-0172-037

1. The Remote Implement switch can be mounted with 2 methods.

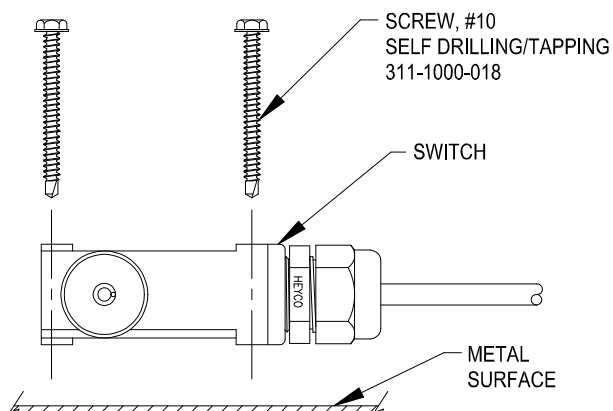
## Method 1 - Magnetic Mount

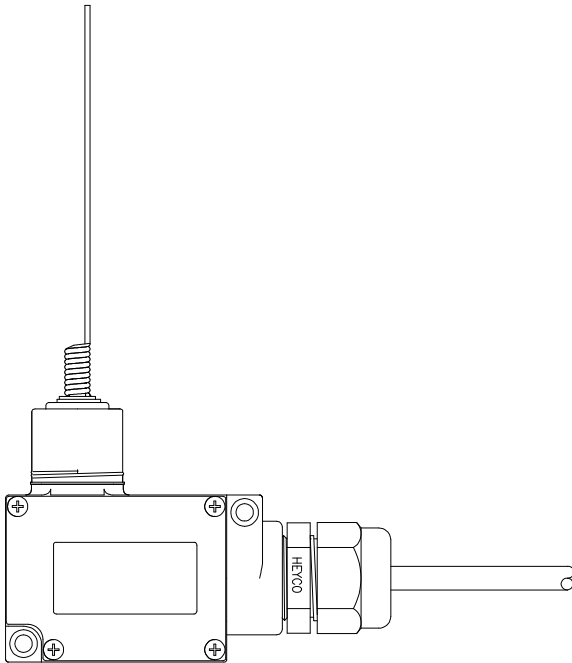
Assemble magnets to switch using hardware as shown. Switch must be mounted to a clean, flat, and smooth surface.



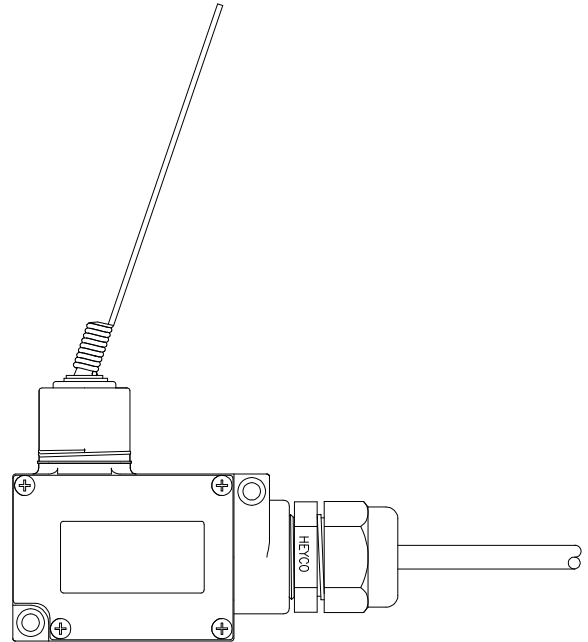
## Method 2

Fasten to metal surface using self drilling/tapping screws.





SWITCH POSITION  
SYSTEM OFF



SWITCH POSITION  
SYSTEM ON

2. The details above show the switch position required to turn the system off and on.

It is critical that during operation, the switch be mounted so the ON position be positive and that the switch must NOT move. Respectively, when the system is required to be OFF, the switch must be mounted securely and must NOT move. Avoid mounting switch in areas that have excessive vibration or in areas where trash may dislodge switch mounting.

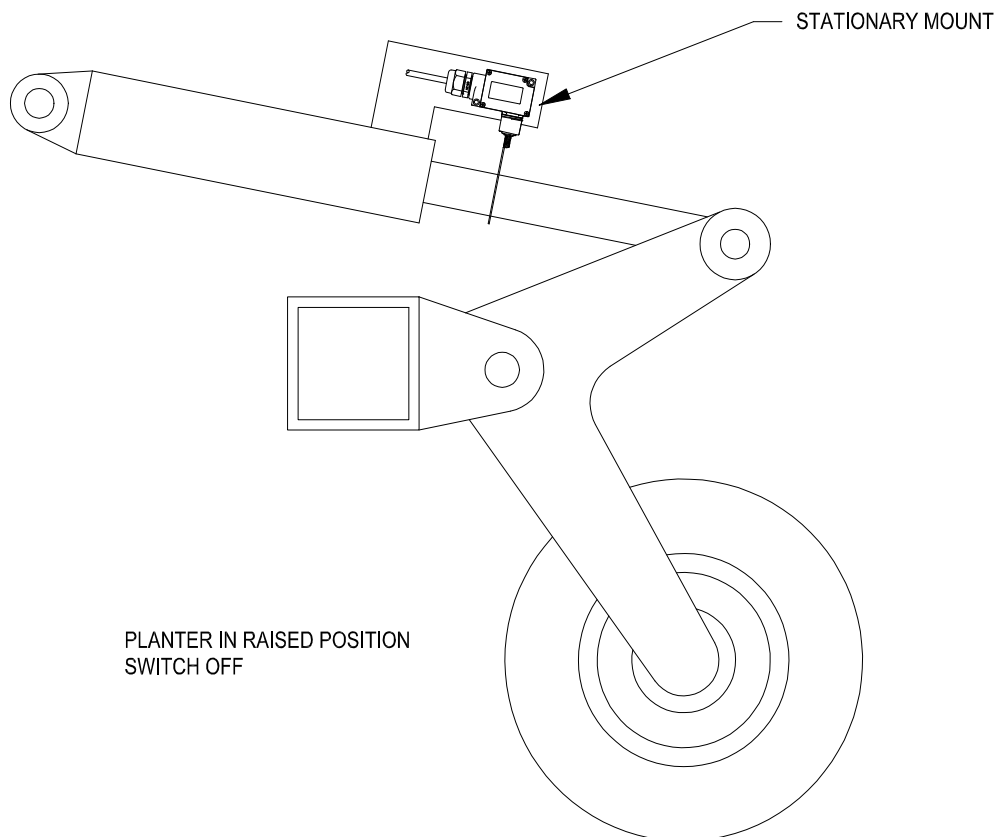
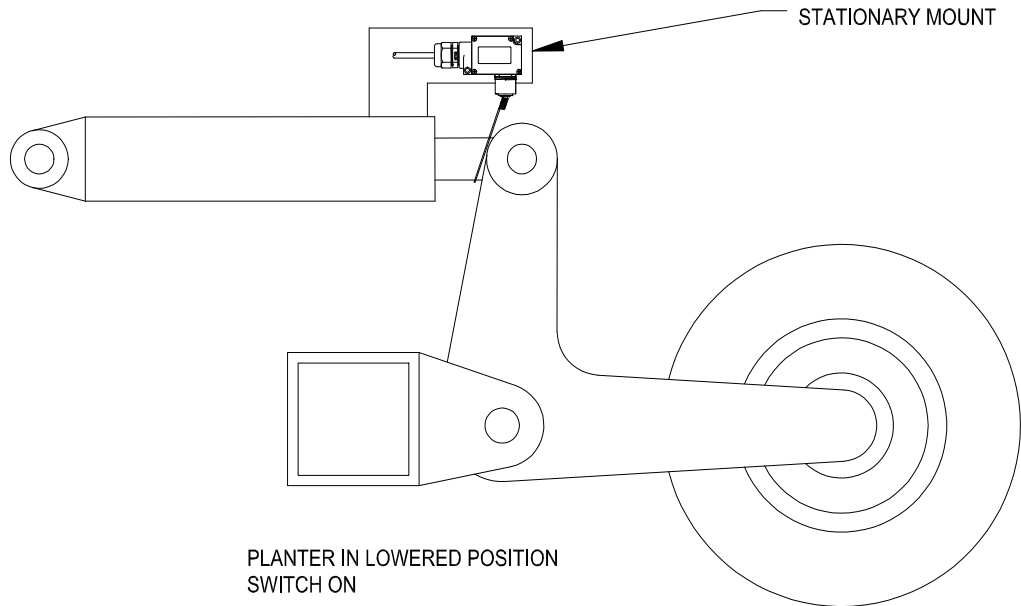
After installation, verify operation is reliable and consistent.

3. Connect the switch to the orange and orange/white wires of the console cable. Reference Installation/Service Manual, Console and Cable Mounting, wiring option 2.

## TYPICAL INSTALLATION:

### NOTE:

1. It may be necessary to fabricate a bracket.
2. In example shown, hydraulic cylinder must not float.



# INSTALLATION SHEET

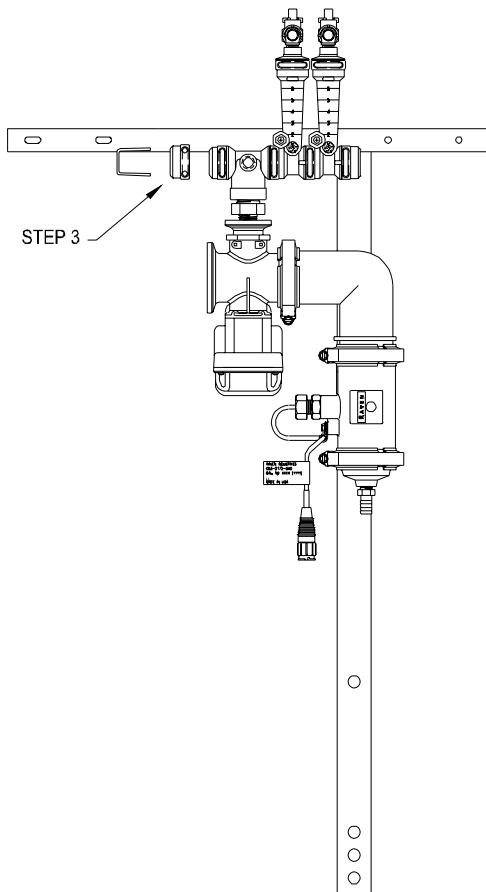
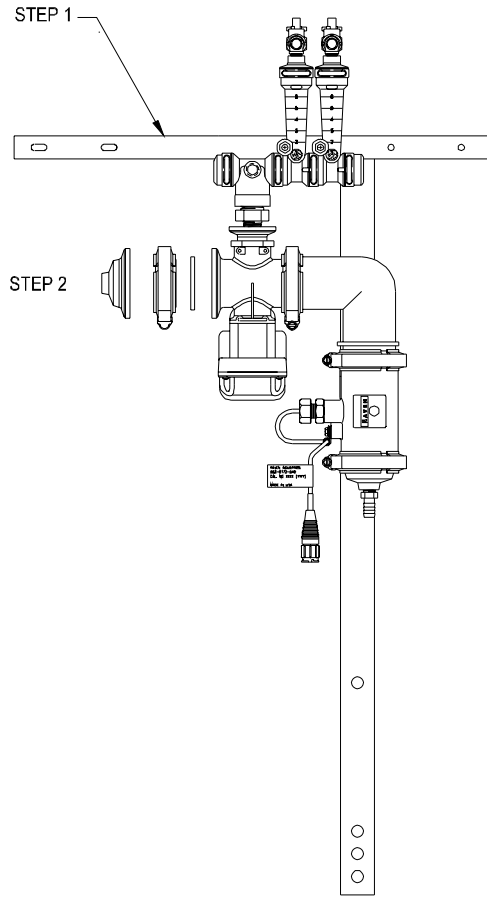
## MANIFOLD VALVE ADD-ON KIT

### STEP 1

Remove Flow Monitors from left side of Stand Assembly.

### STEP 2

Remove clamp, gasket and end plate from On/Off valve. Retain for later use.



### STEP 3

Add cap (P/N 333-0002-149).

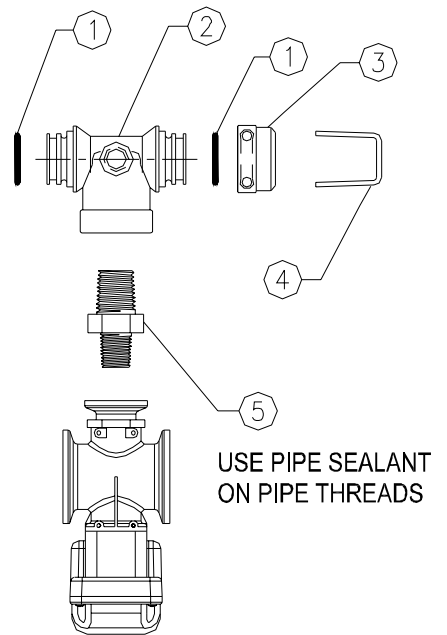
Add lock u-clip (P/N 333-0002-147) to tee.



#### STEP 4

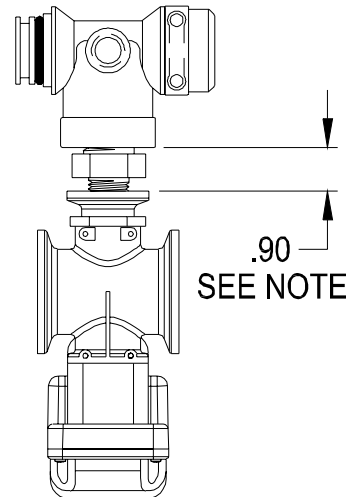
Assemble parts to valve as shown.

ITEM	DESCRIPTION	PART #
1	O-Ring	219-0002-212
2	Tee	333-0002-152
3	Cap	333-0002-149
4	Lock U-Clip	333-0002-147
5	Nipple, Reducing 1" x 3/4"	333-0008-476



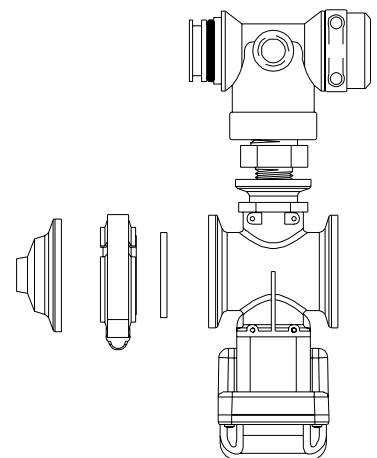
#### STEP 5

Tighten fitting to obtain .90" between tee and valve.



#### STEP 6

Assemble clamp, gasket and end plate to left side of valve.

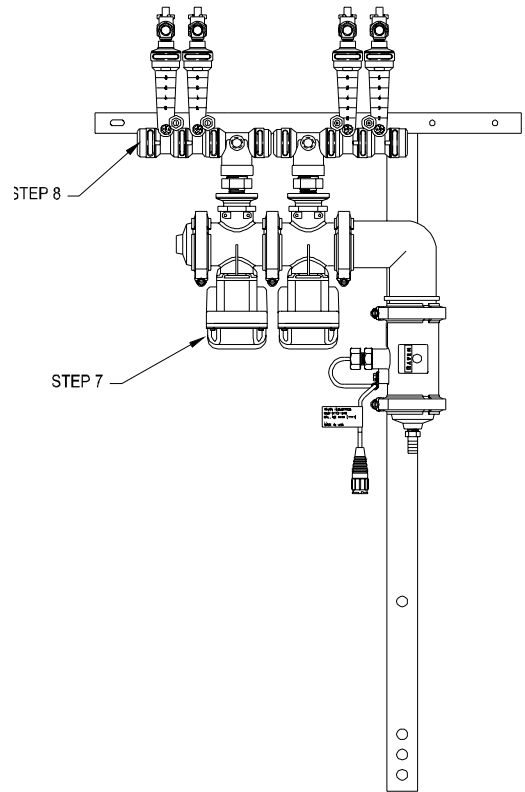


**STEP 7**

Assemble valve assembled in steps 4, 5, & 6 to stand assembly.

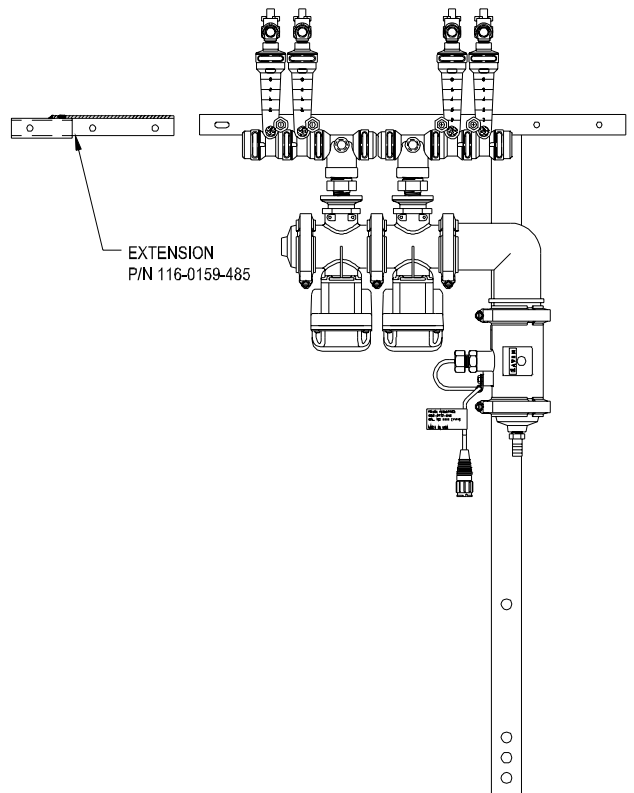
**STEP 8**

Assemble Flow Monitors removed in step 1.



**STEP 9**

Bolt on extension if additional Flow Monitors are to be added.



**RAVEN**

# **RAVEN INDUSTRIES**

## **Limited Warranty**

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### ***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 Division 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 non-transferrable.

### ***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.