

**CropStart™ Manual Control
System Installation and
Service Manual**

P/N 016-0159-887 Rev A 04/16

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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.

TABLE OF CONTENTS

| | |
|---|----|
| INTRODUCTION/SYSTEM OPERATION | 2 |
| SYSTEM OPERATING PARAMETERS | 2 |
| SYSTEM SPECIFICATIONS | 3 |
| SYSTEM DIAGRAM | 5 |
| BASIC SYSTEM OVERVIEW | 6 |
| ROW DETAIL, IN-FURROW APPLICATION | 6 |
| INSTALLATION | 7 |
| 1. TANK INSTALLATION | 7 |
| 2. STAND ASSEMBLY INSTALLATION | 7 |
| 3. FLOW MONITOR INSTALLATION INSTRUCTIONS | 8 |
| 4. PLUMBING ASSEMBLY, INLET INSTALLATION | 10 |
| 5. PLUMBING FROM STAND ASSEMBLY TO ROWS | 11 |
| 6. CONSOLE AND CABLE MOUNTING | 12 |
| 7. INSTALLING THE PRESSURE SENSOR | 12 |
| BATTERY CONNECTIONS | 13 |
| PREVENTIVE MAINTENANCE | 16 |

APPENDIX

| | |
|--|----|
| 1. PUMP INSTALLATION WITH TRACTOR MOUNTED SADDLE TANKS | 17 |
| 2. CROP START REPLACEMENT PARTS | 18 |
| 3. FLOW MONITOR REPLACEMENT PARTS | 19 |
| 4. STAND REPLACEMENT PARTS | 20 |
| 5. PUMP ASSEMBLY, AQUATEC, REPLACEMENT PART | 21 |
| 6. CONTROL VALVE REPLACEMENT PART | 22 |

INTRODUCTION/SYSTEM OPERATION

The Crop Start system is a manually controlled starter fertilizer delivery system based on pressure. 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 pump on/off 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.

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

$$\frac{360 \text{ inches} \times 5.5 \text{ mph} \times 3 \text{ gpa}}{5940} = 1.0 \text{ GPM}$$

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

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

$$\text{example: } \frac{30 \text{ inches} \times 5.5 \text{ mph} \times 3.0 \text{ GPA}}{5940} = .083 \text{ GPM}$$

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:

- Mechanical stainless steel gauge
- System on/off switch
- Manual pressure adjust switch

CABLES:

- 15' Console Cable
- 40' Control Cable

PUMP:

See Chart Below

PUMP P/N 063-0171-138

| PUMP PERFORMANCE DATA | | |
|-----------------------|---------------|-------------------|
| DISCHARGE PRESSURE | | |
| PSI | FLOW (GPM) | CURRENT (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 117-0159-826

BASIC KIT, CROP START, 8 ROW

Includes the following:

| PART # | DESCRIPTION | QTY |
|---------------|----------------------|------------|
| 063-0172-222 | Console, Crop Start | 1 |
| 115-0171-261 | Cable, 40' Product | 1 |
| 116-0159-482 | Weldment, Stand | 1 |
| 063-0172-037 | Switch Assembly | 1 |
| 063-0172-138 | Pump Assembly | 1 |
| 063-0172-221 | Valve, Control, 3/4" | 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 117-0159-826
(Each Flow Monitor monitors 2 rows)

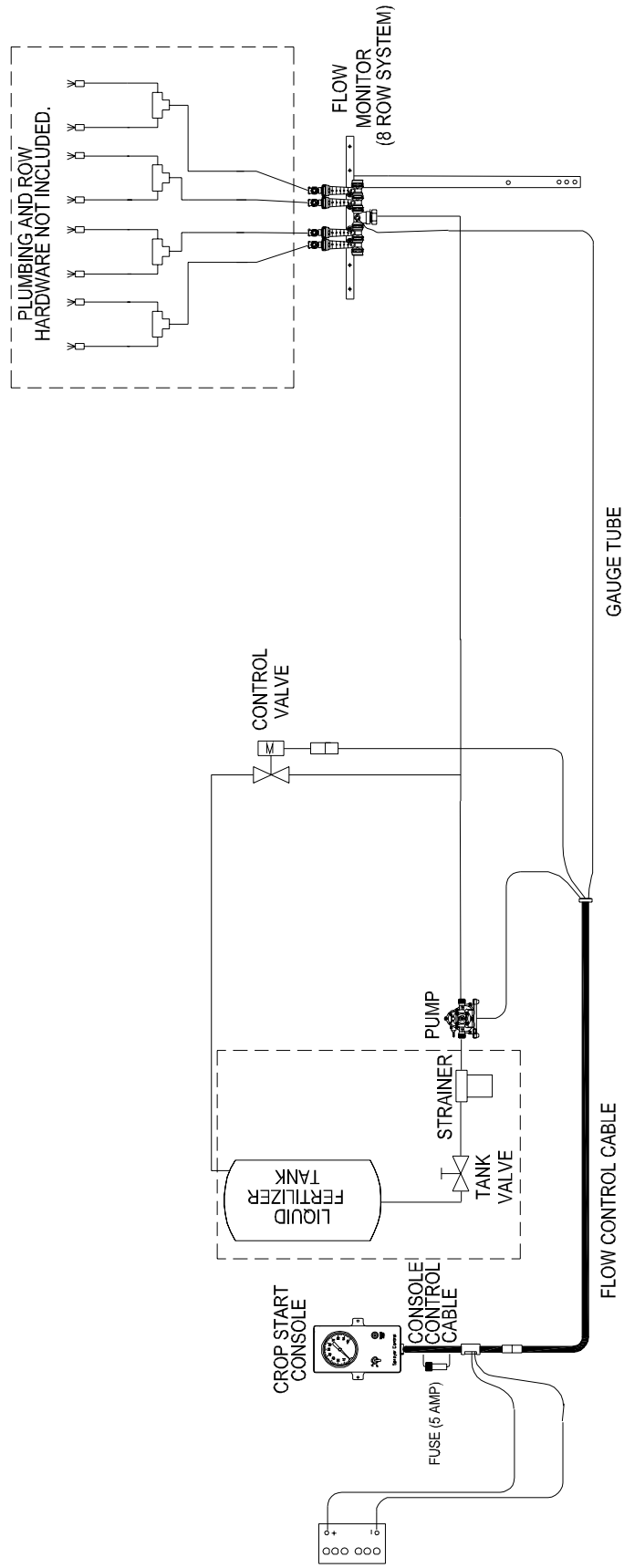
KIT P/N 117-0159-834

KIT LEFT/RIGHT VALVE ADD-ON

Allows for left and right side shut off.

Contains 2 Raven On/Off valves, fittings and hardware to mount to stand contained in Kit P/N 117-0159-826. User must provide wiring and switches to operate valves.

SYSTEM DIAGRAM



NOTE: ALL ITEMS INSIDE DASHED BOXES ARE NOT INCLUDED.
PLEASE CONTACT YOUR RAVEN DISTRIBUTOR FOR ITEMS NOT INCLUDED IN KIT.

BASIC SYSTEM OVERVIEW

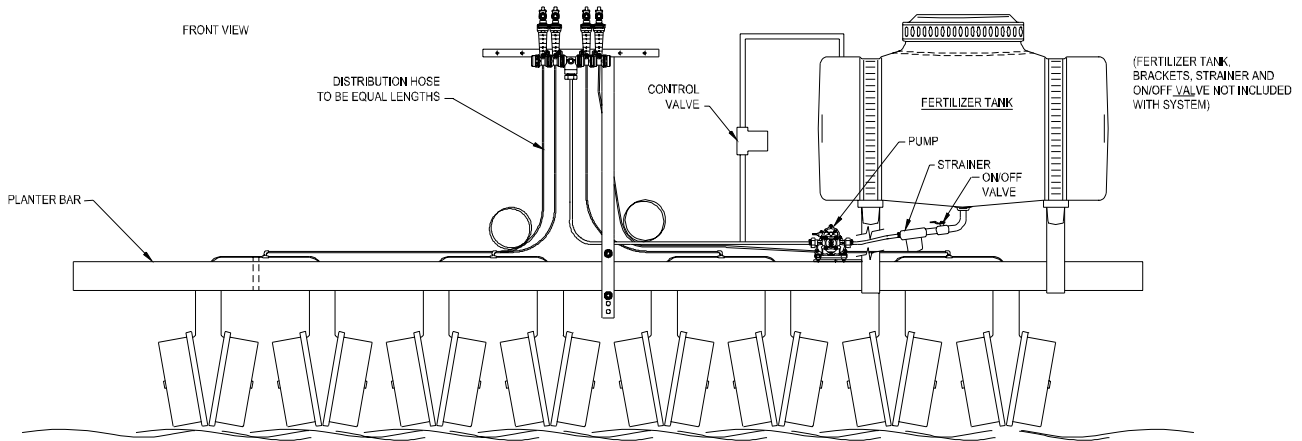


FIGURE 1

ROW DETAIL IN-FURROW APPLICATION (TYPICAL)

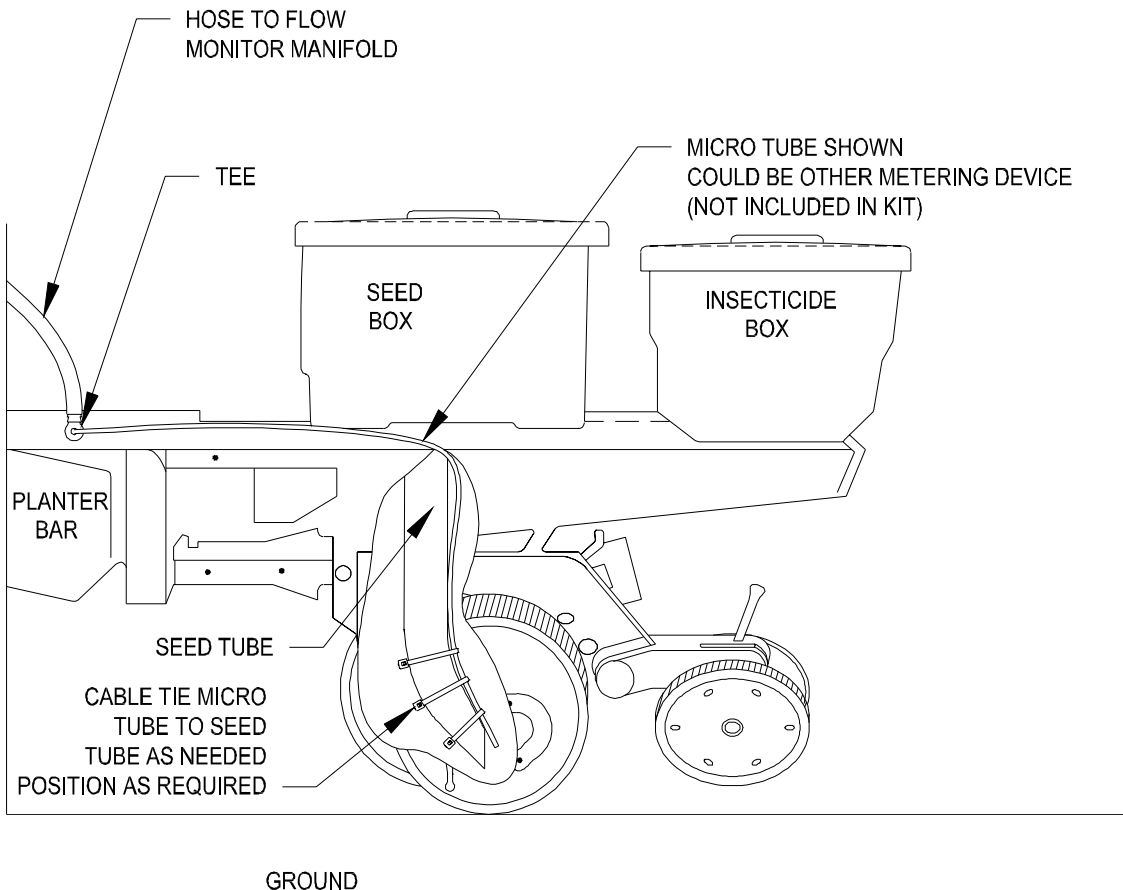


FIGURE 2

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

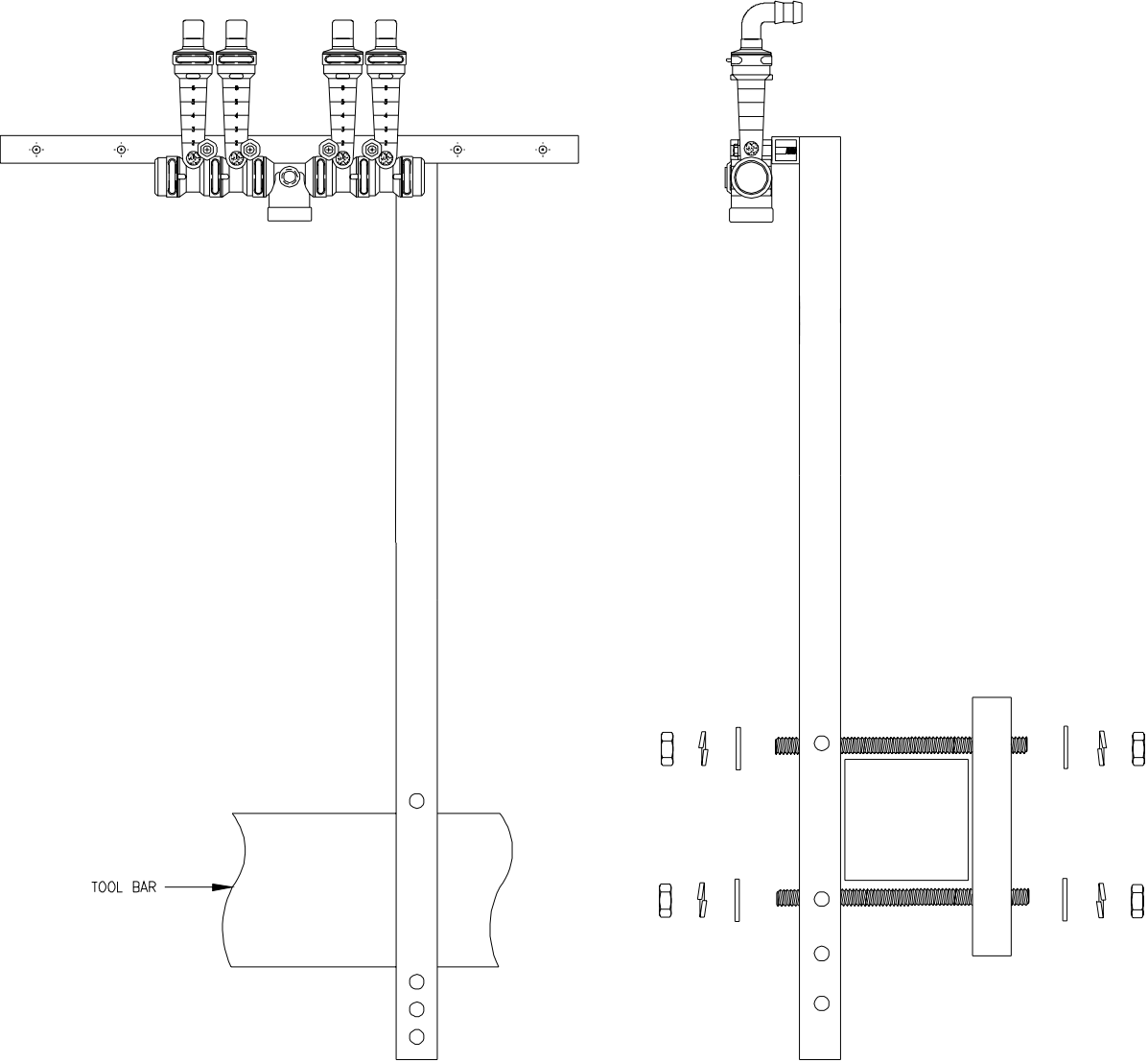


FIGURE 3

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.

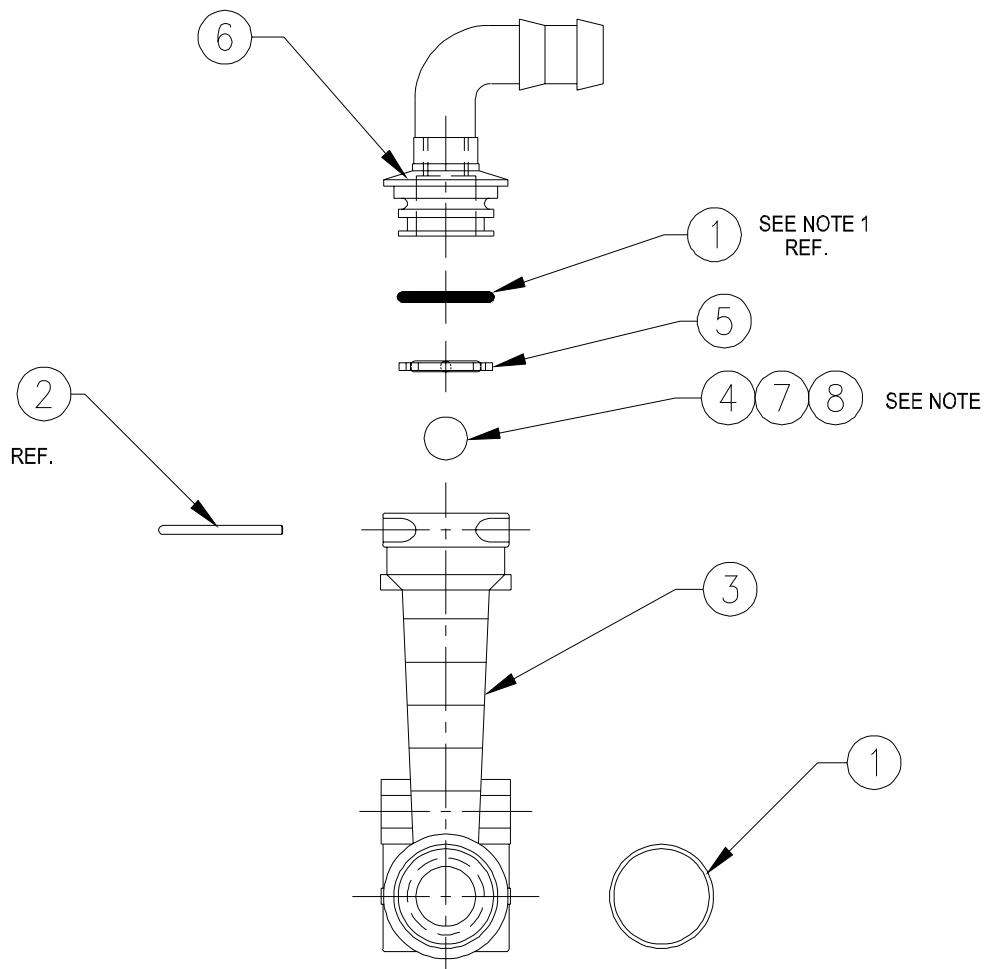


FIGURE 4

| 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).
5. Drill a 1/4" hole in tee to open gauge port. Tube from console pressure gauge is to connect here.

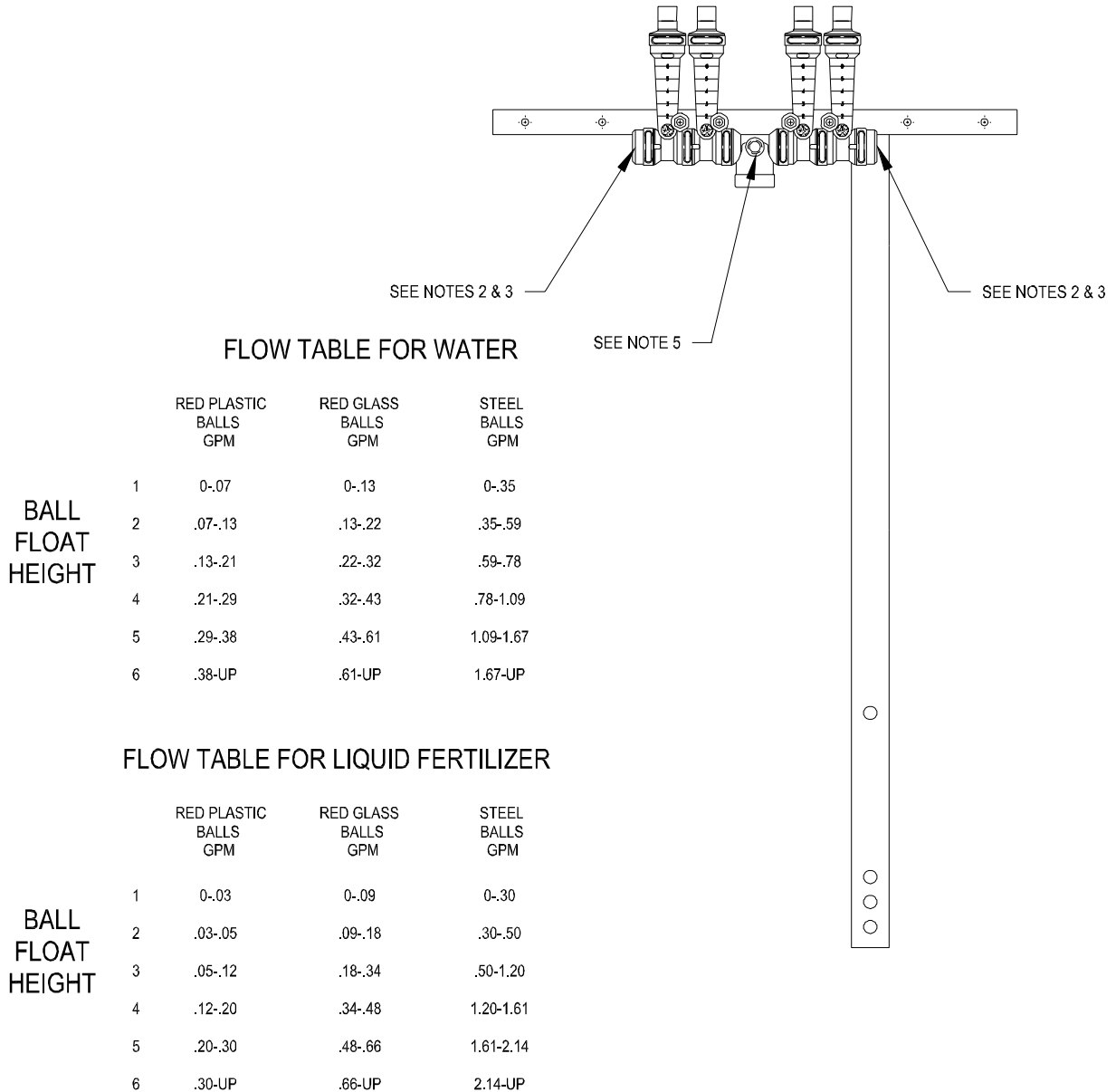


FIGURE 5

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

NOTE: Flow Monitors are monitoring 2 rows. Select ball based on flow rate for 2 rows.

4. PLUMBING ASSEMBLY, INLET INSTALLATION

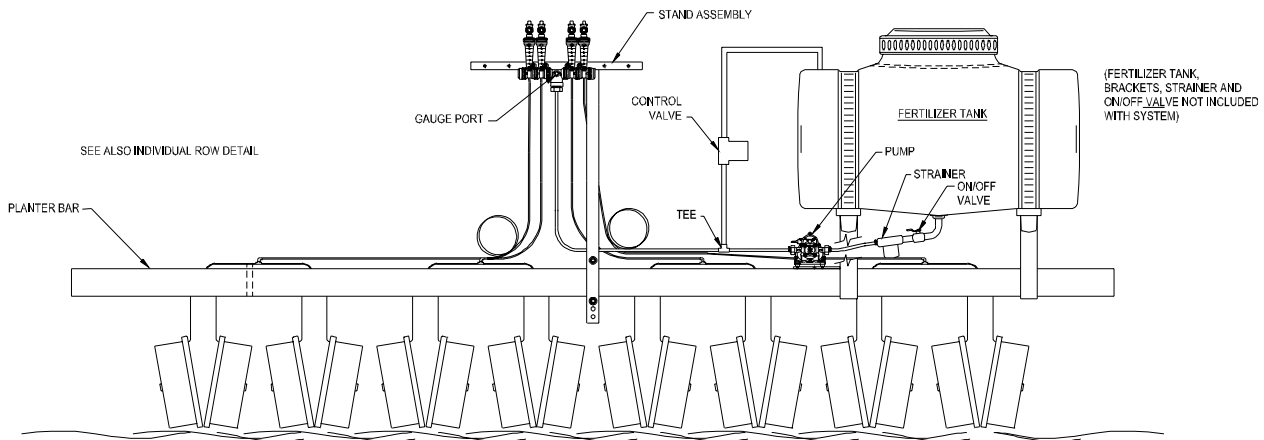


FIGURE 6

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.

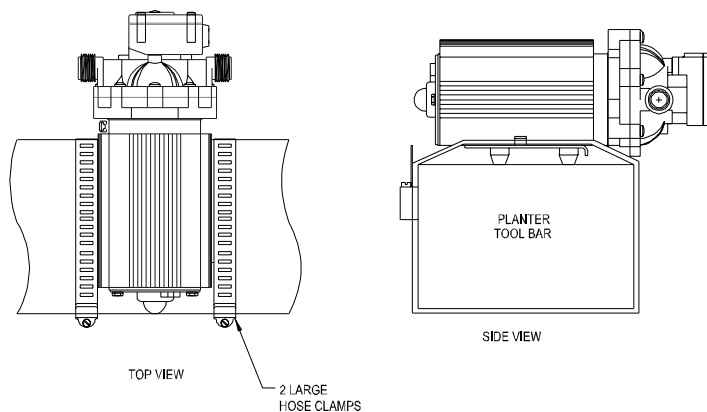


FIGURE 7

2. Install the strainer between the inlet of the pump and the on/off hand valve. Ref. figure 6.
3. Install a tee after the pump and plumb the control valve in a bypass hose to return to the fertilizer tank.
4. Connect the other side of the tee to the stand assembly.

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

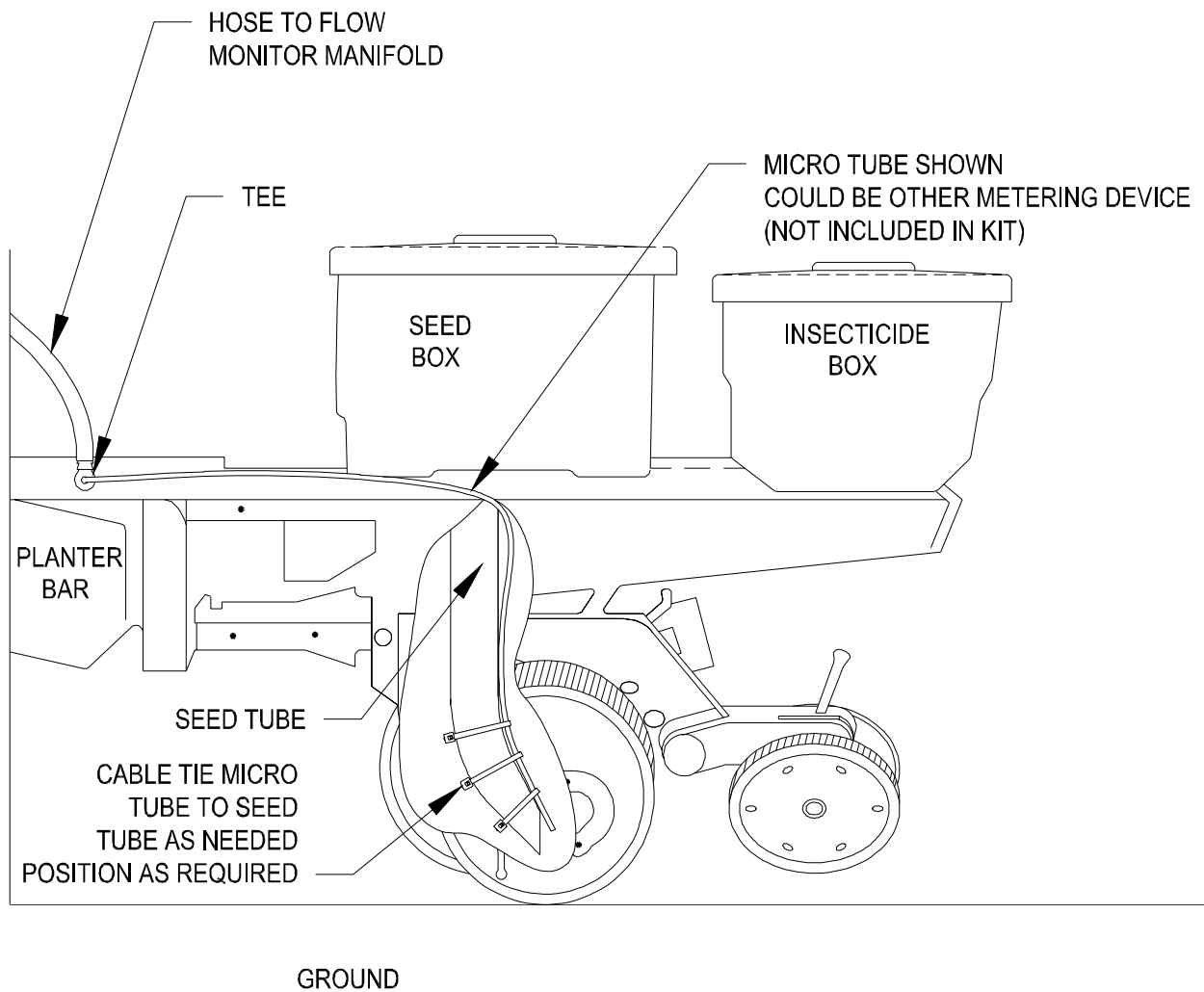


FIGURE 8

6. CONSOLE AND CABLE MOUNTING

1. Select a mounting location for the console in the tractor cab where the pressure gauge is clearly visible and switches are within easy reach.
2. Use a console bracket as a pattern to drill the mounting holes. Drill one 1/4" hole and bolt the bracket in the position desired. Now drill the second hole and install the second mounting bolt.

CROP START CONSOLE BRACKET

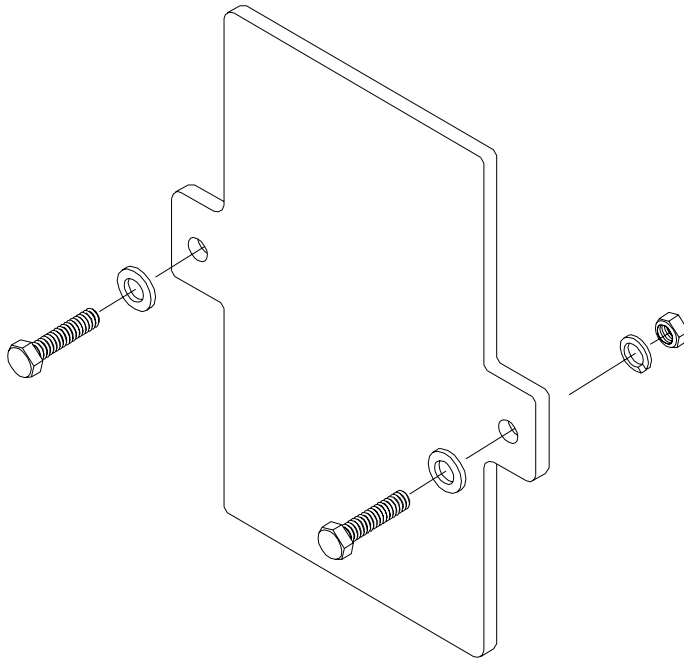


FIGURE 9

3. Route the two power wires (red & white) from the console to a 12 volt source. Connect the white wire to ground. Connect the red wire to a +12 VDC "hot" wire (battery, ignition solenoid, or fuse block).

CAUTION: Some ignition solenoids are 24 VDC.

4. Route the Crop Start console control cable (P/N 115-0171-261) 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.

7. INSTALLING THE PRESSURE SENSOR

The Crop Start Fertilizer Control System senses pressure by means of a black plastic tube which is tapped into stand assembly and connected to the pressure tube provided with the system.

BATTERY CONNECTIONS

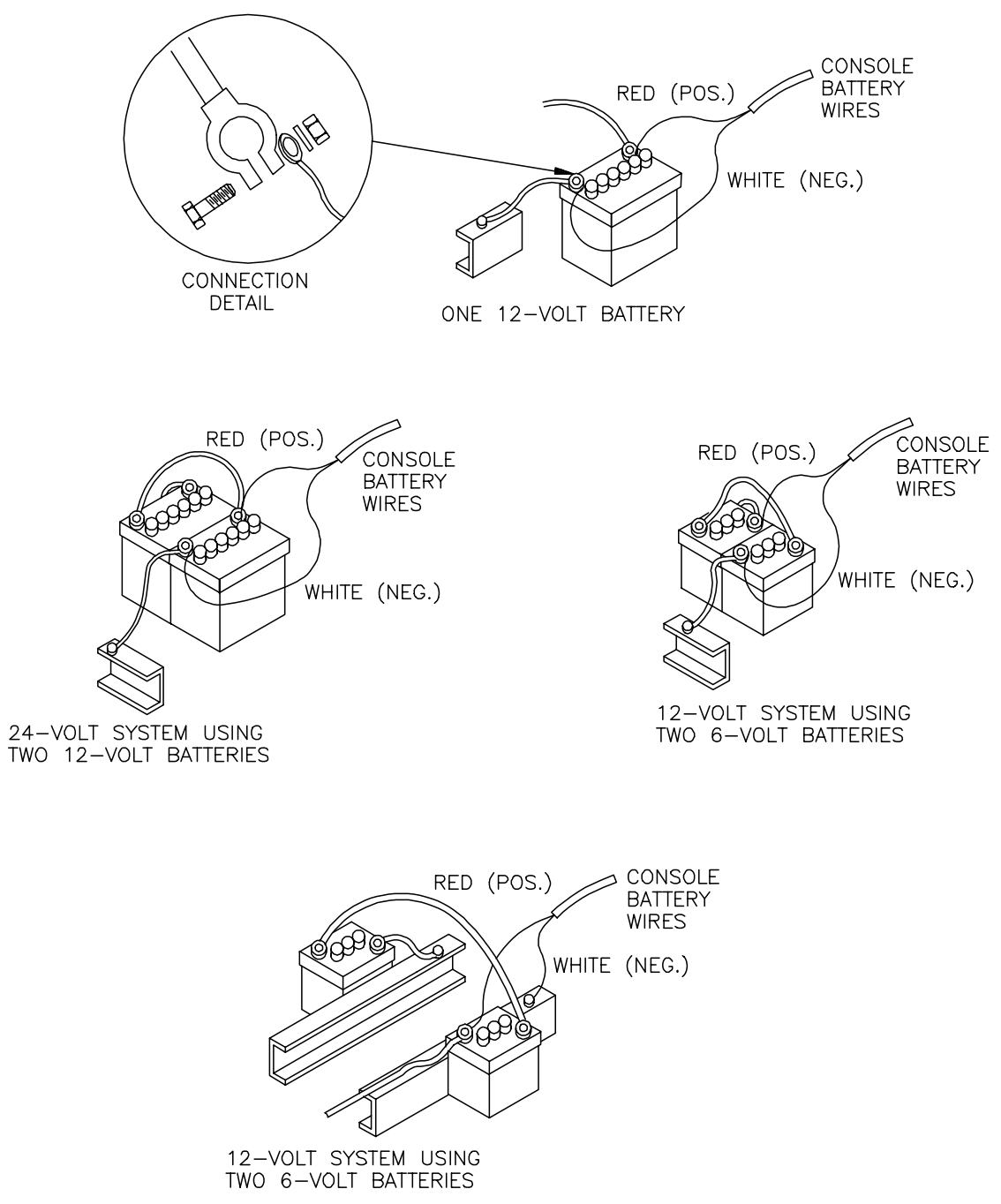


FIGURE 10

WIRING OPTION 1

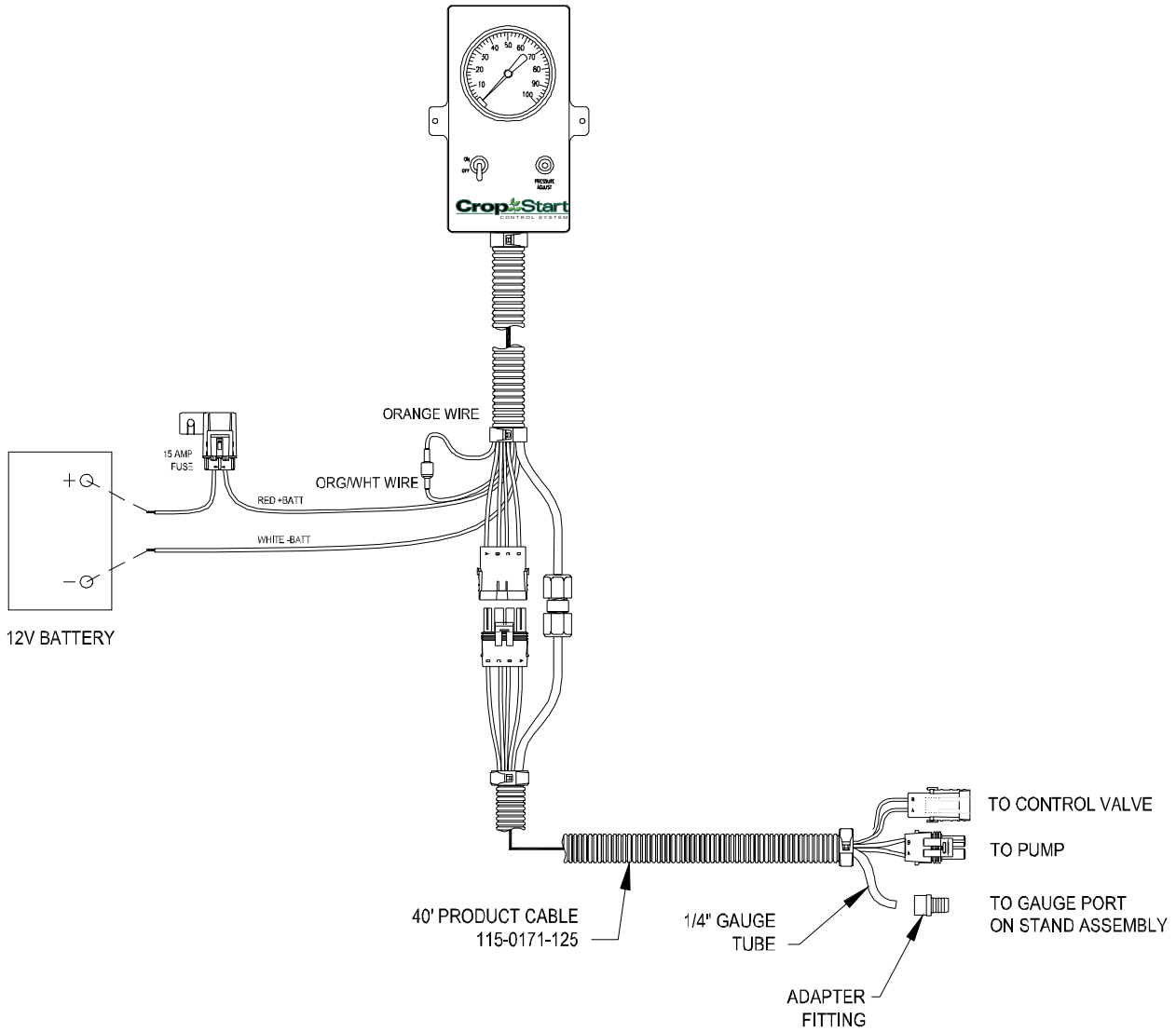


FIGURE 11

OPERATION:

Plug the orange and orange/white wires together. When wired this way, the pump will run when the pump switch is in the ON position. Use the pressure adjust switch to control the system pressure.

WIRING OPTION 2

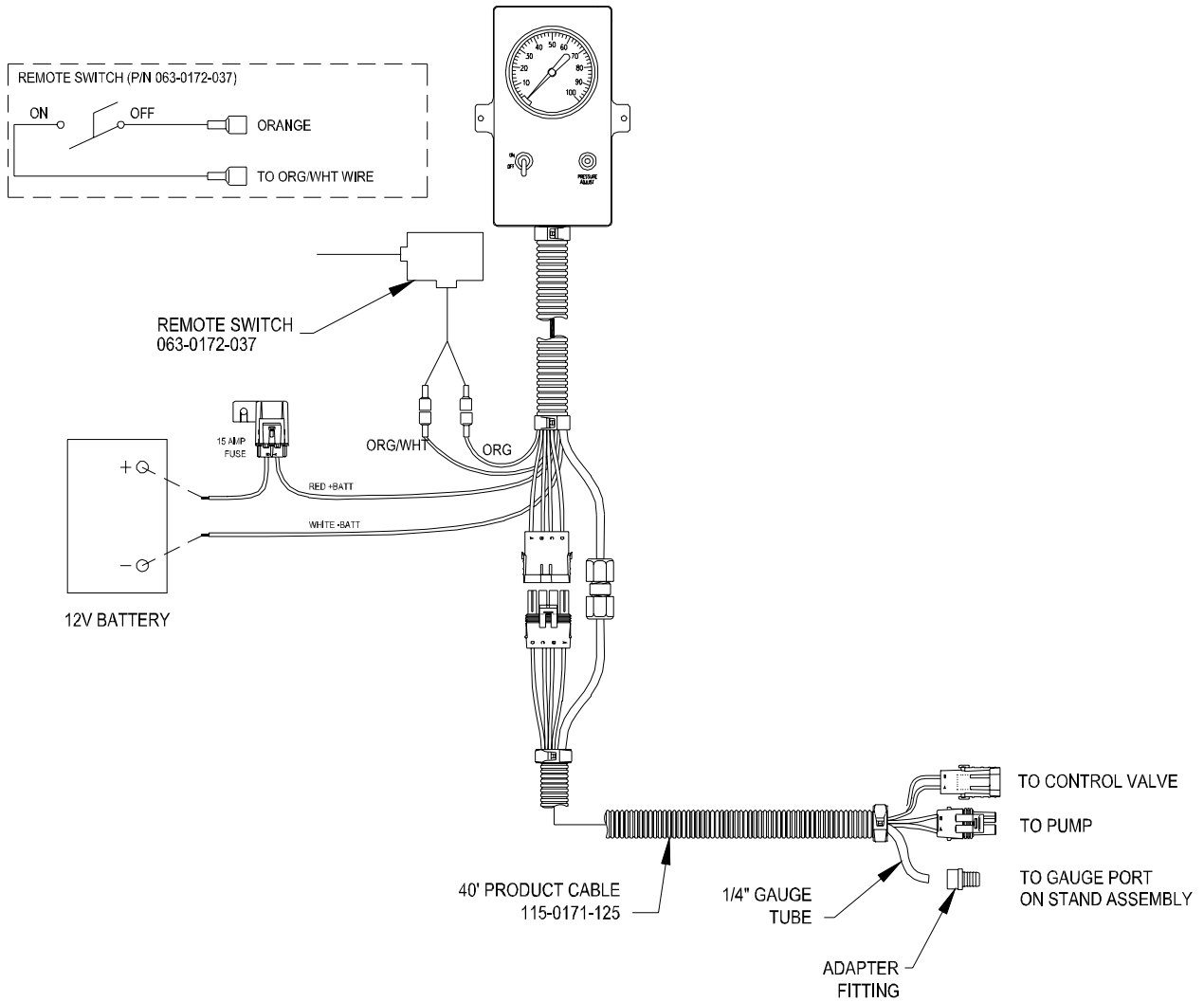


FIGURE 12

OPERATION:

Place the pump on/off switch to ON. Now the Remote Switch must also be on to run the system. To disable the system, raise the planter or place the pump on/off switch to OFF.

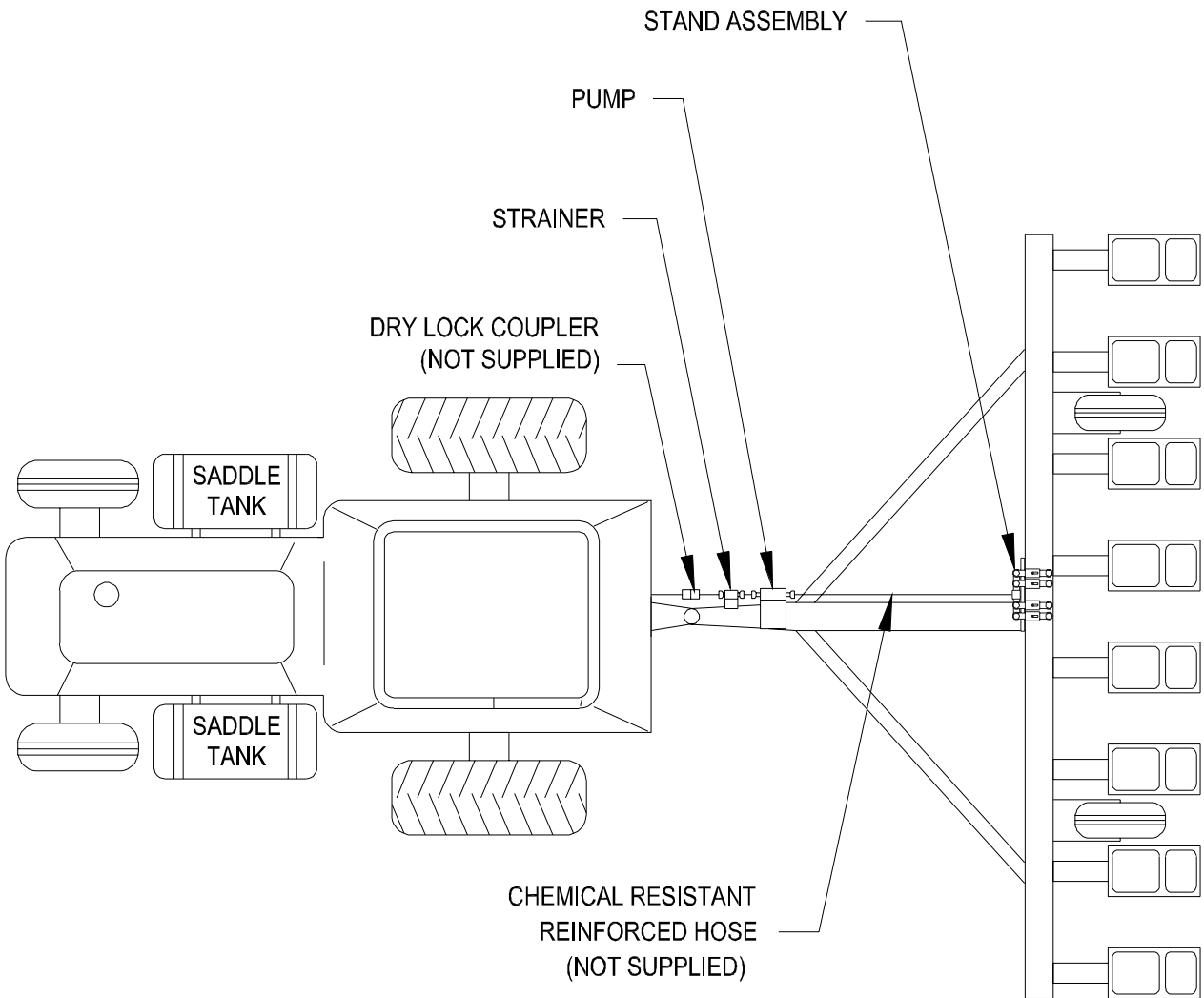
PREVENTIVE MAINTENANCE

Preventive maintenance is most important to assure long life of the Crop Start 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 to 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. **HOSED 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.

APPENDIX 1

PUMP INSTALLATION WITH TRACTOR MOUNTED SADDLE TANKS

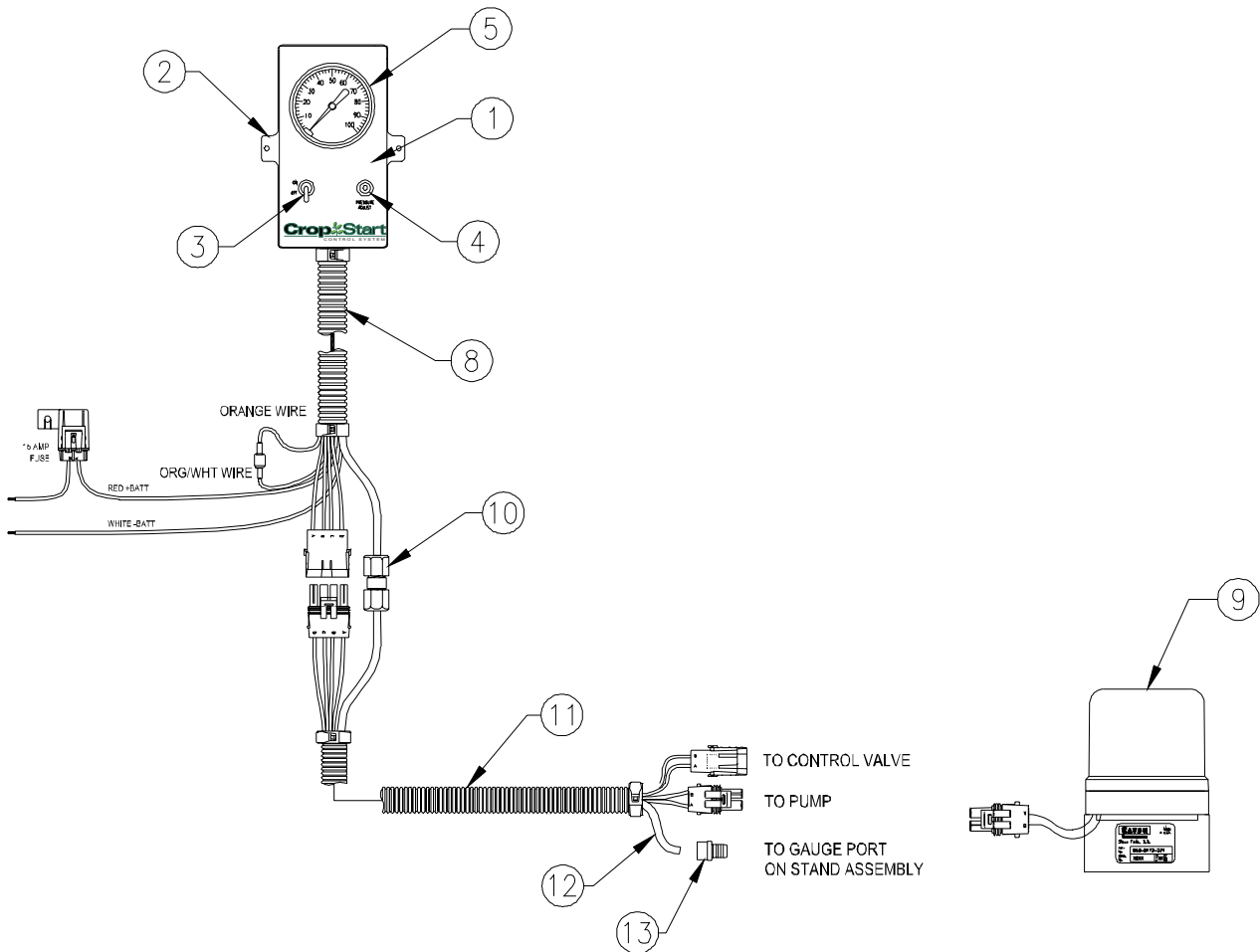


NOTES:

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.

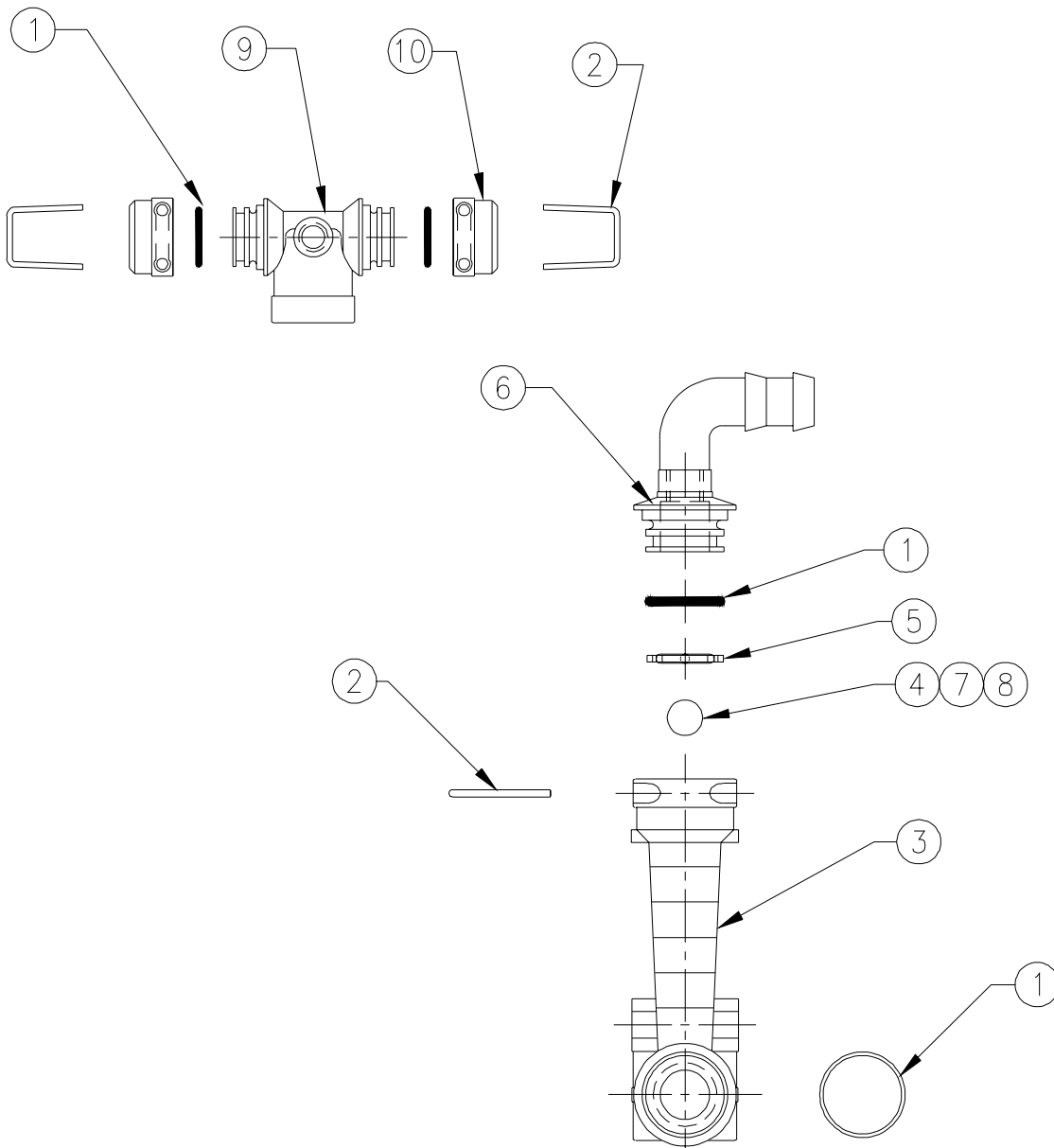
APPENDIX 2 CROP START REPLACEMENT PARTS

| ITEM | DESCRIPTION | RAVEN PART # |
|------|------------------------------------|--------------|
| 1 | Printed Overlay | 040-0159-574 |
| 2 | Back Cover Bracket | 106-0159-001 |
| 3 | On/Off Switch | 412-2011-038 |
| 4 | Pressure Adjust Switch | 412-2011-041 |
| 5 | English PSI Gauge, Stainless Steel | 417-0001-026 |
| 6 | Relay | 415-1001-009 |
| 7 | Fuse, 15 AMP | 510-1003-025 |
| 8 | Console Control Cable | 115-0171-260 |
| 9 | 3/4" Valve Assembly (Crop Start) | 063-0172-221 |
| 10 | Fitting, Union | 333-0001-008 |
| 11 | Product Cable, 40' | 115-0171-261 |
| 12 | Tubing (Length as required) | 214-0001-001 |
| 13 | Ftg Male 1/4" | 333-0001-007 |



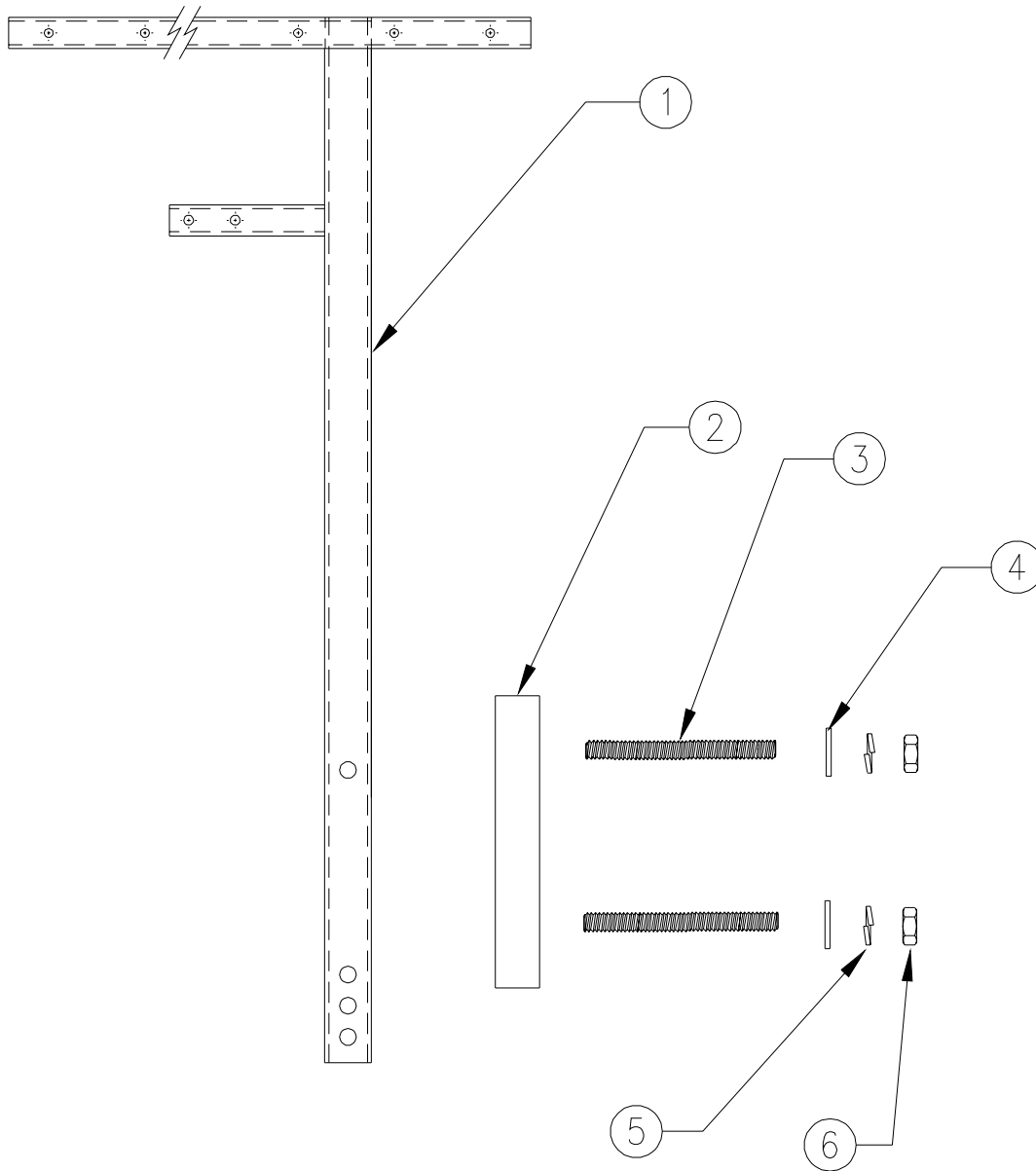
APPENDIX 3 FLOW MONITOR REPLACEMENT PARTS

| ITEM | DESCRIPTION | RAVEN PART # |
|------|---------------------------------------|--------------|
| 1 | O-Ring | 219-0002-212 |
| 2 | Lock, U-Clip | 333-0002-147 |
| 3 | Body, Flow Indicator | 333-0002-151 |
| 4 | Ball, Flow Indicator, Red Celon | 333-0002-150 |
| 5 | Retainer, Ball | 333-0002-146 |
| 6 | Fitting, ORS Male x 1/2" Hose Barb | 333-0002-180 |
| 7 | Ball, Flow Indicator, Stainless Steel | 333-0002-178 |
| 8 | Ball, Flow Indicator, Red Glass | 333-0002-179 |
| 9 | Fitting, Tee, Female, ORS | 333-0002-152 |
| 10 | Fitting, Cap, ORS | 333-0002-149 |



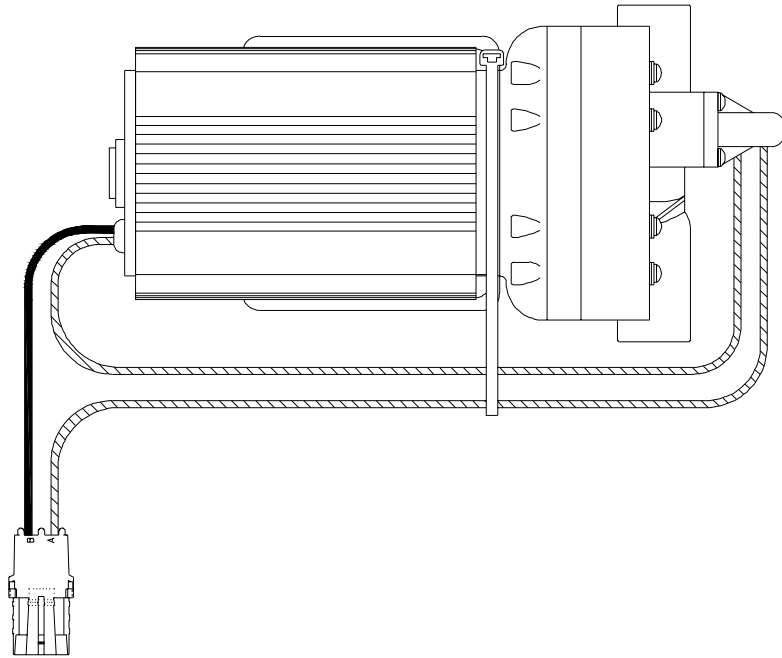
APPENDIX 4 STAND REPLACEMENT PARTS

| ITEM | DESCRIPTION | RAVEN PART # |
|------|----------------------------------|--------------|
| 1 | Weldment, Stand | 116-0159-482 |
| 2 | Bracket, Angle | 107-0171-355 |
| 3 | Rod, Threaded, 1/2"-13 unc x 12" | 311-8000-013 |
| 4 | Washer, Flat, 1/2" | 313-2300-019 |
| 5 | Washer, Split 1/2" | 313-1000-028 |
| 6 | Nut, Hex, 1/2"-13 unc | 312-1001-043 |



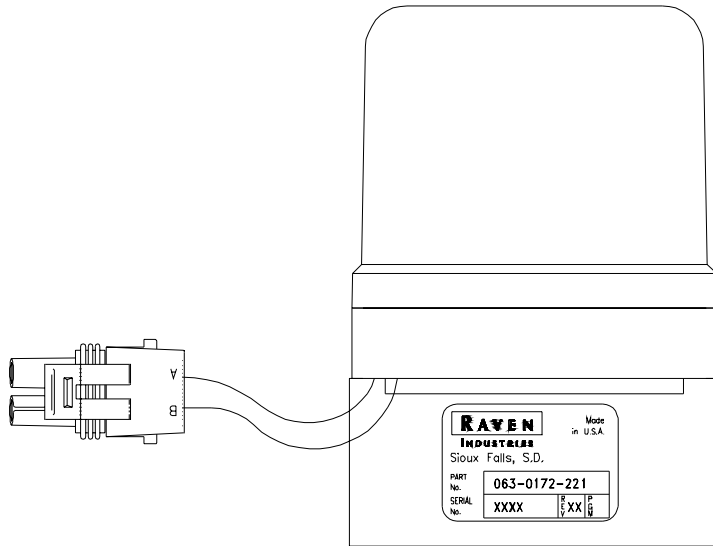
APPENDIX 5
PUMP ASSEMBLY, AQUATEC
REPLACEMENT PART

P/N 063-0172-138



APPENDIX 6 CONTROL VALVE REPLACEMENT PART

P/N 063-0172-221



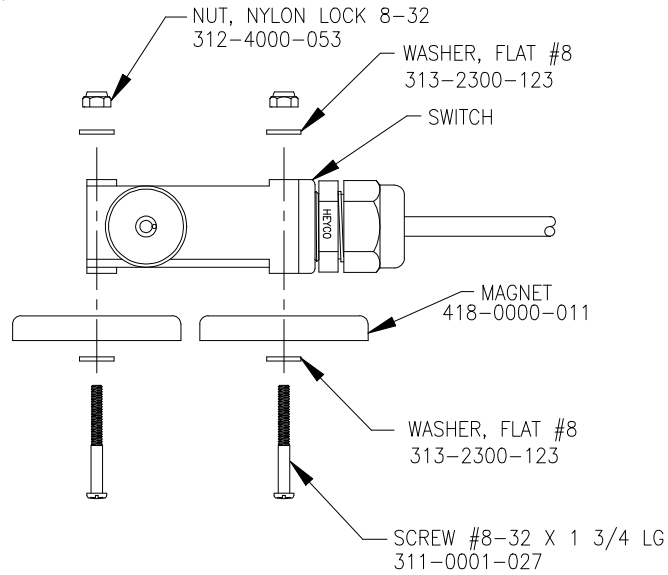
REMOTE IMPLEMENT SWITCH INSTALLATION INSTRUCTIONS

P/N 063-0172-037

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

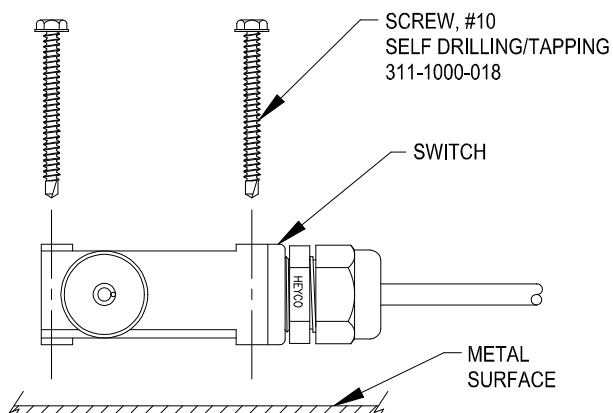
Method 1 - Magnetic Mount

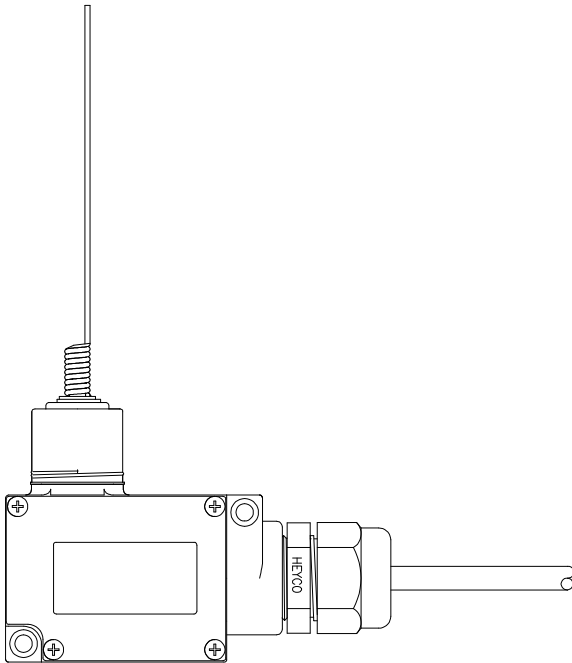
Assemble magnets to switch using hardware as shown. Switch must be mounted to a clean, flat, and smooth surface.



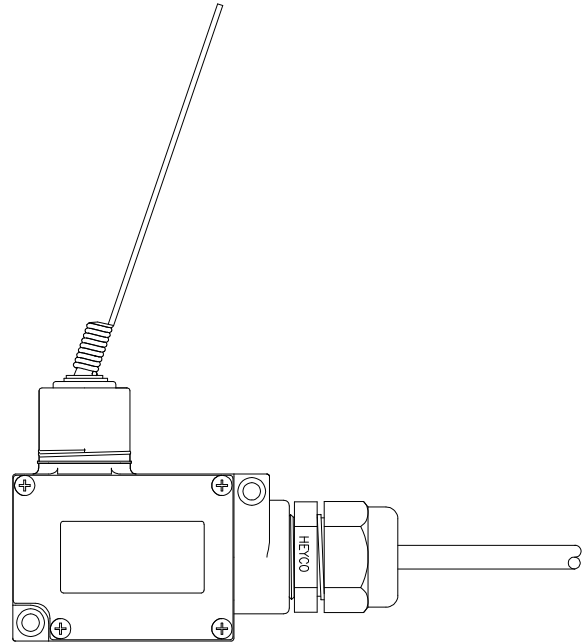
Method 2

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.

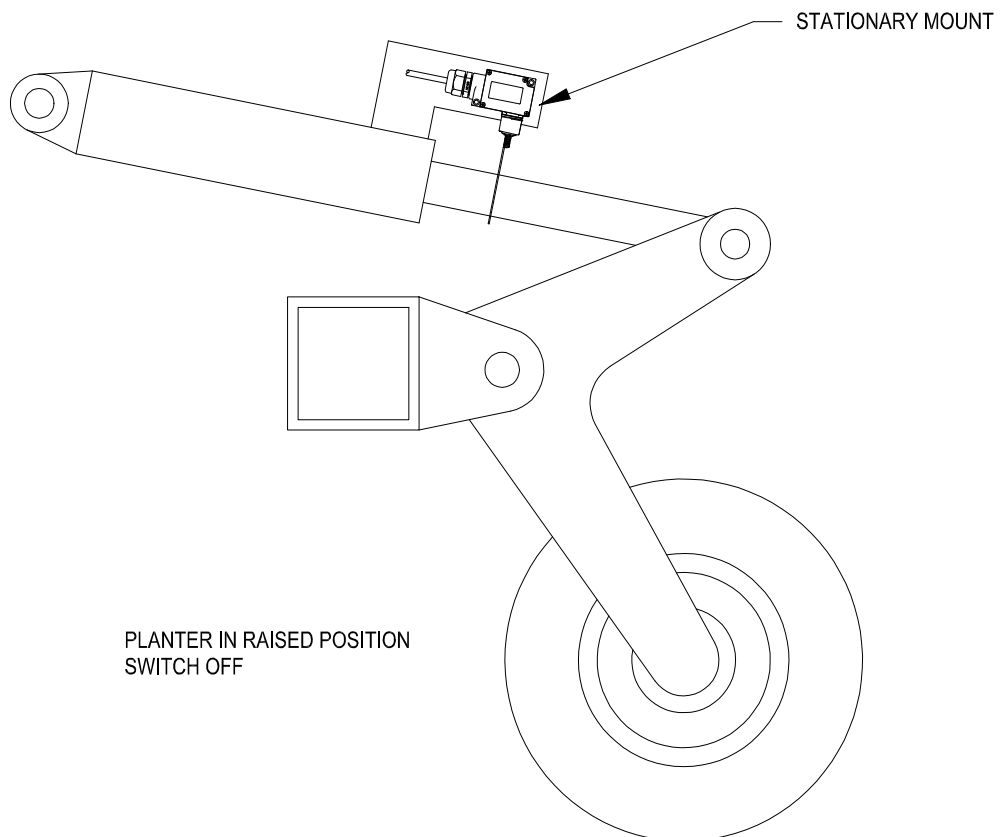
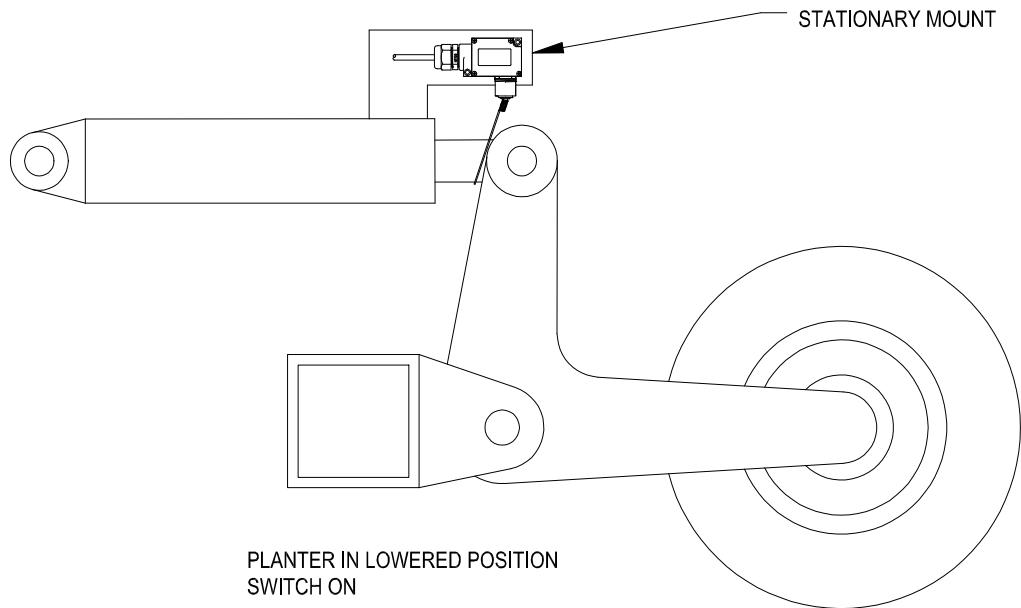
After installation, verify operation is reliable and consistent.

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

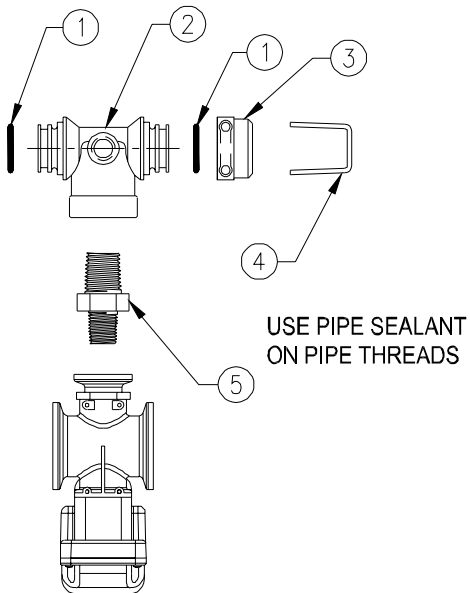
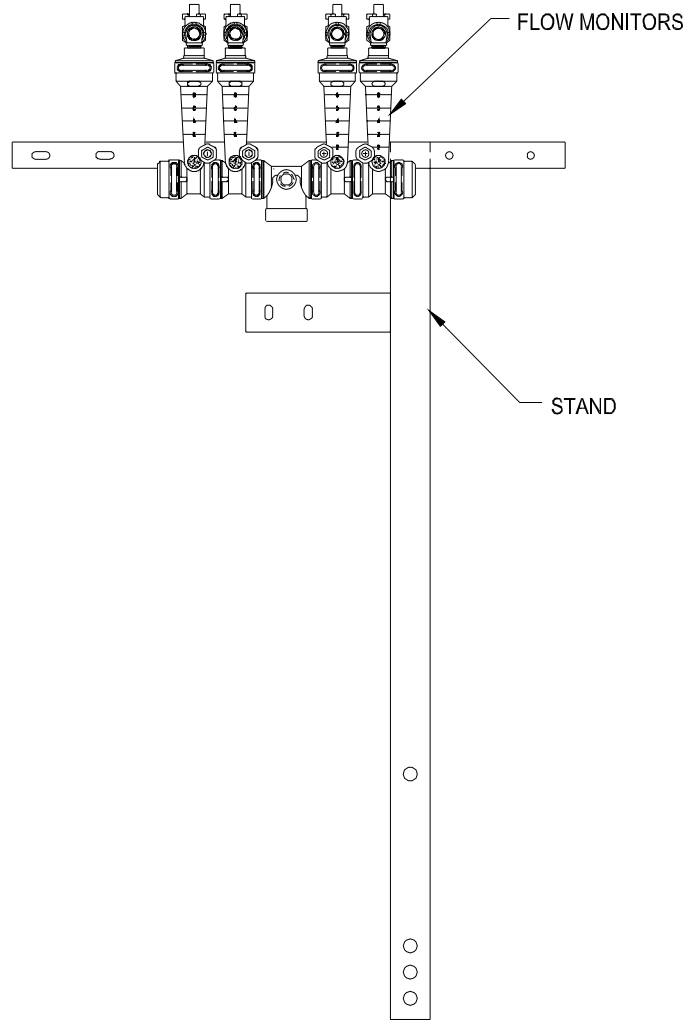
KIT, LEFT/RIGHT VALVE ADD-ON

P/N 117-0159-834

STEP 1

Remove Flow Monitors from Stand.

Remove Flow Monitors from tee.



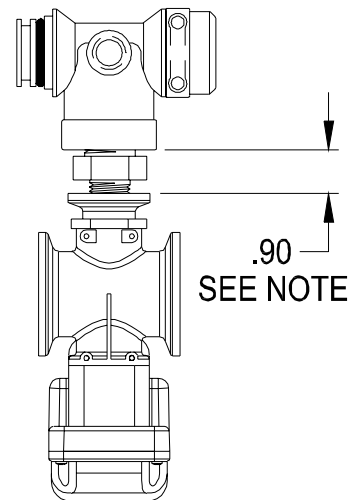
STEP 2

Assemble parts to both valves as shown.

| ITEM # | DESCRIPTION | P/N |
|--------|-----------------------------|--------------|
| 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 |

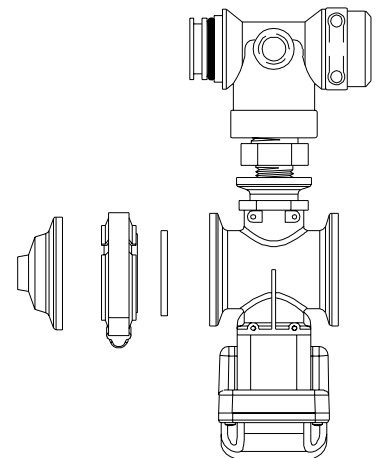
STEP 3

1. Tighten Fitting to obtain .90" between tee and valve (both valves).
2. On one valve, rotate tee 90 degrees (For use on right side of stand).



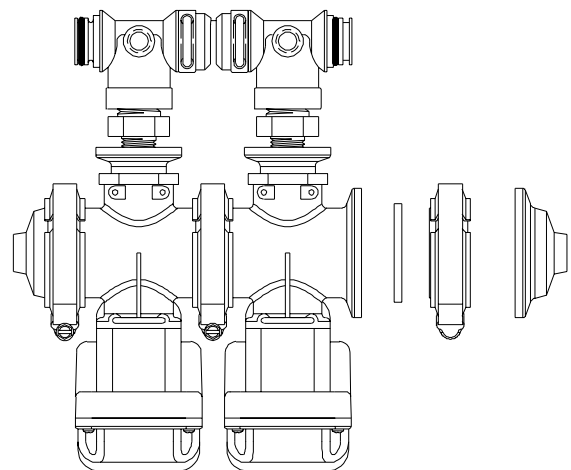
STEP 4

Assemble clamp, gasket and end plate to left side of one valve (for use on left side of stand).



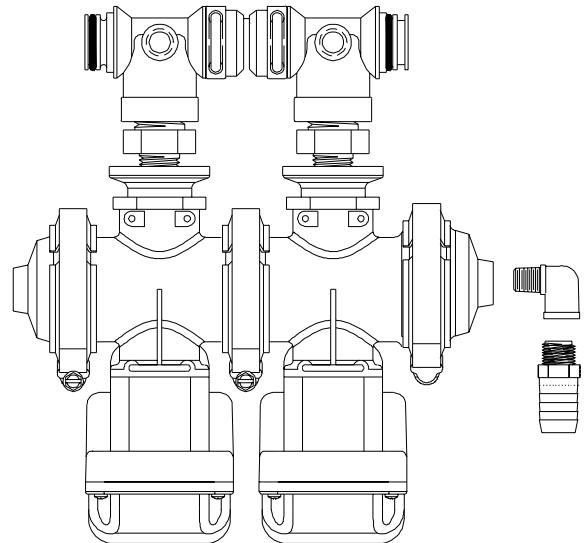
STEP 5

1. Assemble valves together.
2. Assemble right side inlet, (end cap with 3/8 NPT) clamp and gasket.



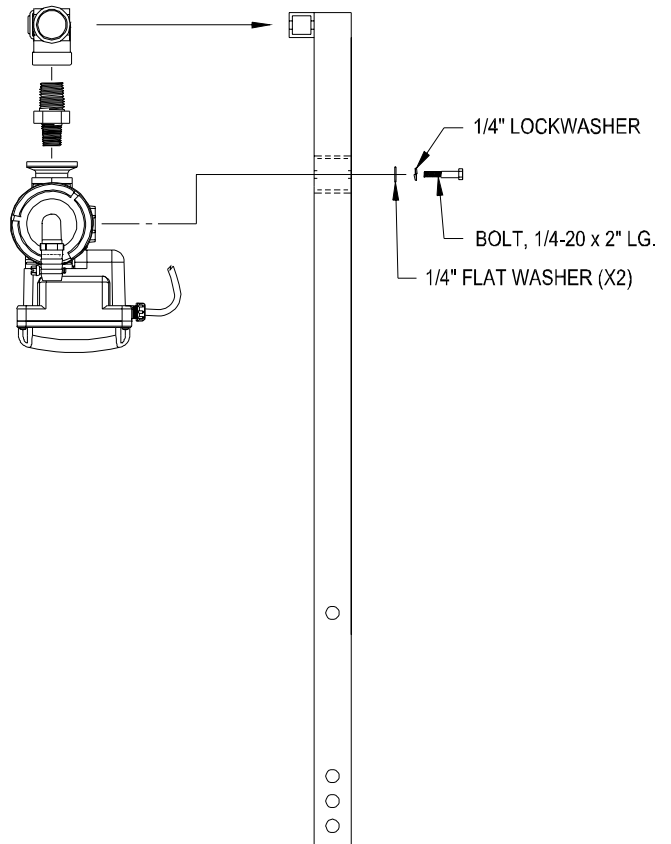
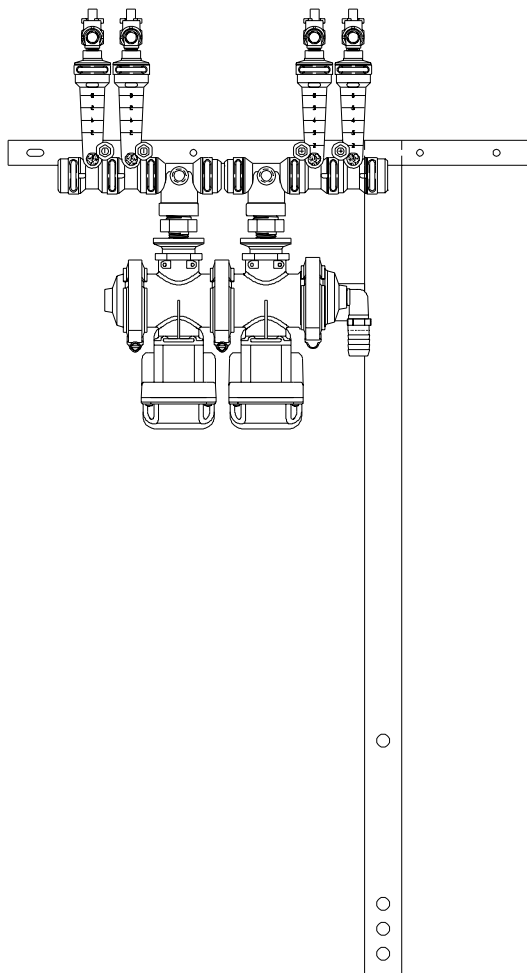
STEP 6

Assemble street elbow P/N 333-0002-170 and 3/8 NPT x 3/4" hose barb P/N 333-0002-181 to inlet of valve assembly.



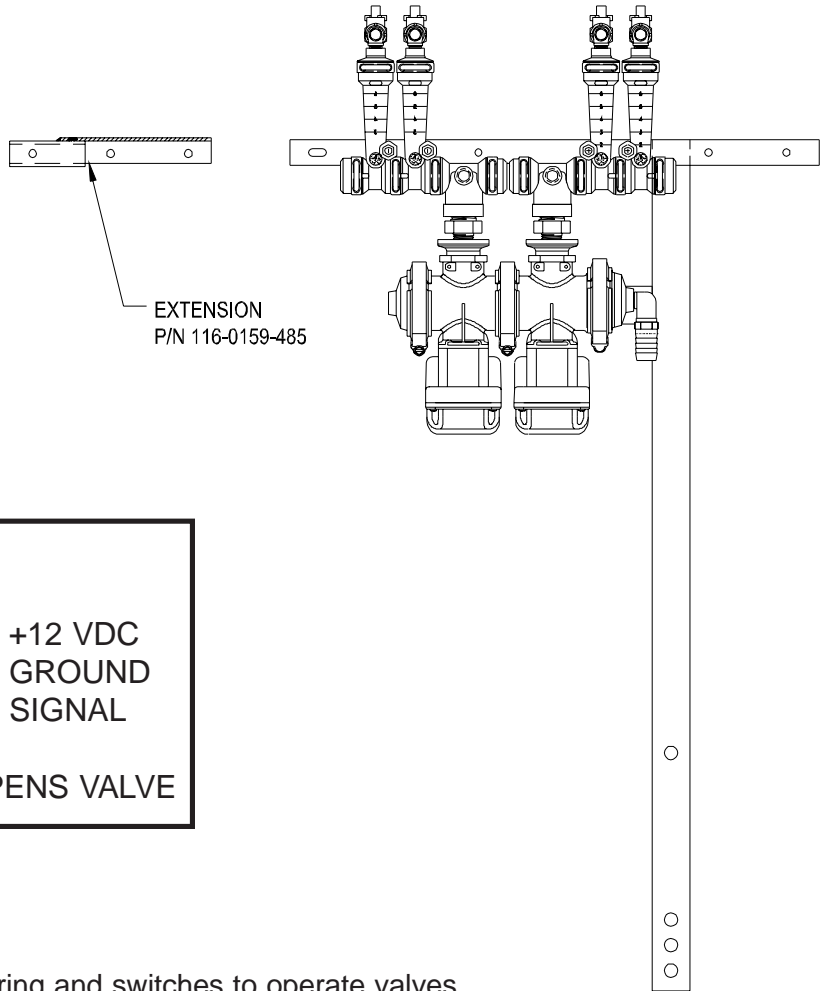
STEP 7

Assemble Flow Monitors to valves, then bolt assembly to stand.



STEP 8

Bolt on extension if additional Flow Monitors are to be added. Use 3" bolts included in this kit.



WIRING SPECIFICATION

| | |
|-----------------|---------|
| RED (PIN A) = | +12 VDC |
| WHITE (PIN B) = | GROUND |
| BLACK (PIN C) = | SIGNAL |

+12 VDC ON SIGNAL OPENS VALVE

NOTE: User must provide wiring and switches to operate valves.

RAVEN

RAVEN INDUSTRIES

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division 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 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.