

OHIO VALLEY AG

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Ohio Valley Ag

***Liquid Ready System
T-Band / In-Furrow***

FMC

***Installation &
Service Manual***

IMPORTANT

If the Console Displays Code,
Contact the FMC Support Center
816.581.6872

For All Other Questions, Please Contact OVA
270.684.4202

Do not attempt to use the FMC Liquid Ready At Plant System for any chemical other than those approved by FMC.
To do so will void warranty.

OPERATORS 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.

PHONE NUMBERS:

For Chemical Issues Call : 888.59FMCAG

For Service Issues Call : 866.561.7772

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INTRODUCTION

SYSTEM OPERATION

The FMC Liquid Ready System is intended for FMC Insecticide products. The FMC Liquid Ready-Systems meets FMC's specifications for approved FMC products only. 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.

The FMC Liquid Ready system is intended to apply in volume per acre, relative to speed. A speed sensor is not supplied with the system. It is the user's responsibility to obtain the speed sensor. Speed sensors may be obtained through a Raven distributor. If you have a Radar Speed Sensor on your tractor already, chances are all you need is an adapter cable. Refer to Appendix 4 for choosing the correct radar adapter cable.

To calibrate the console, place the RUN/HOLD/OFF switch in the HOLD mode. Then, enter the required calibration data in the console. See console programming. Refer to Basic Console Calibration and Operation.

To operate the System, place the RUN/HOLD/OFF switch in the RUN mode. This starts the pump and opens on/off valve. To shut the pump and on/off valve off, place the RUN/HOLD/OFF switch to the HOLD position.

FMC LIQUID READY SYSTEM - STANDARD COMPONENTS

Base Kit

The base Liquid Ready system kit is available in 2 different versions.

LV Base Kit	For planter with up to 12 rows. If equipping a 24 row planter 2 of these kits will be necessary. These systems ship with 4.2 GPM Pump.
HV Base Kit	For planter with up to 16 rows. If equipping a 32 row planter 2 of these kits will be necessary. These systems ship with 5.3 GPM pump

Plumbing Kits

The Plumbing kits for the Liquid Ready System are available in 4 row increments. Each kit consist of :

FMC 4 Row Bag	Includes T-band & In-furrow fittings, flow indicators, spray nozzles, orifices & hardware.
Spray Arm Kit	Spray arm & universal mounting bracket
3/8" tubing	100' for each 8 planter rows.

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FMC LIQUID READY SYSTEM - OPTIONAL COMPONENTS

The following items are not included with the standard FMC LRS systems. Ohio Valley Ag offers these at additional expense. For pricing, details & availability contact Ohio Valley Ag @ 866-581-7772 for details.

Valve Add-on KIT

This kit can be added to the base FMC LRS system so that two sections can be controlled for each console. This kit provides the cabling, valve, switchbox & fittings necessary to control two boom sections.

In-Furrow

If in-furrow placement is desired, Ohio Valley Ag has several options available for purchase. These include Stainless Steel Row Tubes, Schaffert Manufacturing's Rebounder, and Keeton Seed Firmers.

Rebounder is a Trademark of Schaffert Mfg. & Sales
Keeton is a Trademark of Precision Planting Inc.

SYSTEM SPECIFICATIONS

CONSOLE:

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

CABLES:

- 15' Console Cable
- 40' Control Cable

PUMP:

- LV BASE KIT
- 4.2 GPM

- HV BASE KIT
- 5.3 GPM

FLOWMETER:

- Turbine
- .5 - 15 GPM

BASIC SYSTEM COMPONENTS

Base kit required is based upon number of rows and application rate.

Base LV Kit FMC LFR
For 12 row systems.
Includes the following:

QTY	DESCRIPTION
1	Assy,Stand, Incl:Flow Meter/Valve,Flow Tee, etc..
1	Cable, 40', Product
1	Console, FMC CAPTURE
1	Cable, Console 15'
1	Remote Switch
1	Pump, 4.25 GPM w/ Heat Sink
2	Clamp, 40", Worm Drive
7	Tie, Cable 14" Reg
1	Tefon Tape
1	Plumbing Fittings Kit
1	Spare Parts Bag
1	3/4"ID Braided Hose 25'
1	1"ID Braided Hose 10'
1	1/2"OD Tubing 100'

or

Base HV Kit FMC LFR
For 16 row systems
Includes the following:

QTY	DESCRIPTION
1	Assy,Stand, Incl:Flow Meter/Valve,Flow Tee, etc..
1	Cable, 40', Product
1	Console, FMC CAPTURE
1	Cable, Console 15'
1	Remote Switch
1	Pump, 5.3 GPM w/ Heat Sink
2	Clamp, 40", Worm Drive
7	Tie, Cable 14" Reg
1	Tefon Tape
1	Plumbing Fittings Kit
1	Spare Parts Bag
1	3/4"ID Braided Hose 25'
1	1"ID Braided Hose 10'
1	1/2"OD Tubing 100'

+

FMC 4 Row Bag (1 per each 4 planter rows)

QTY	DESCRIPTION
1	Kit, T-Band/In Furrow Fittings
1	Hardware Bag - Bolts,Washers,Nuts,Hose clamps, Fittings
24	Tie Cable 14" Reg
4	Tie Cable 34" HD
1	Fitting Bag - Fittings for Fertilizer
1	4 Row Fertilizer Flow Indicator Parts Kit
4	1/4"OD Tubing 10'

+

Spray Arm Kit (1 per 4 Row Kit)

QTY	DESCRIPTION
4	Spray Arm
4	Universal Mounting Bracket

+

3/8" OD Tubing (1 roll per 8 planter rows)

QTY	DESCRIPTION
1	3/8" OD TUBing 100'

OPTIONAL COMPONENTS

Kit, Valve Add On

QTY	DESCRIPTION
1	Valve, Manifold
1	Bracket
1	Fitting Tee, ORS
2	O-Ring #212
2	Fitting Cap, ORS
2	Lock, U-Clip
1	Fitting, Nipple, Reducing
2	Bolts 1/4-20 x 3" Lg
1	Switchbox
1	40' Valve Cable

In-Furrow Placement

Row Tubes	1 required per row
Rebounder	1 required per row
Keeton Seed Firmer	1 required per row
Contact Ohio Valley Ag @ 866-541-7772 for details	
Rebounder is a Trademark of Schaffert Mfg. & Sales	
Keeton is a Trademark of Precision Planting Inc.	

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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. This is also required for a spray pattern in the banded application.
2. The flow meter must be operated within its operating range, .5 GPM to 15 GPM.
3. The pump must be operated within its operating range, .5 to 2.2 GPM and at no more than 45 PSI.
4. 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

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

NOTE: 1.0 GPM is within the operating range of the pump and flow meter.

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

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

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

TABLE 1

Wilger Nozzle DRA50-01E

With Orange Pre-Orifice		With Yellow Pre-Orifice	
PSI	CAPACITY 1 NOZZLE IN GPM	PSI	CAPACITY 1 NOZZLE IN GPM
10	.05	10	.063
20	.07	20	.088
30	.09	30	.108
40	.10	40	.125

From the example calculation, it can be seen that at .083 GPM, the operating pressure is approximately 25 PSI. (Ref. nozzle chart using orange pre-orifice.)

6. Below are listed Basic Guidelines for planters with row spacing of 30". This will give operating speed range @ 3 gallons per acre.

	<u>With Orange Pre-Orifice</u>		<u>With Yellow Pre-Orifice</u>
6 ROW	30 inch spacing Speed Range 5 mph to 6.5 mph	6 ROW	30 inch spacing Speed Range 5 mph to 8.5 mph
8 ROW	30 inch spacing	8 ROW	30 inch spacing
12 ROW	Speed Range	12 ROW	Speed Range
16 ROW	4.0 mph to 6.0 mph	16 ROW	4.5 mph to 8.5 mph
24 ROW		*24 ROW	*24 ROW max speed 8 mph Optional pump # 063-0172-138 Required for 8.5 mph.

7. For Planters with row spacing other than 30 inch:

In order to work within the pressure range of the nozzle, an adjusted applied rate must be calculated. Only the water volume is changed. Follow label for chemical rates. To calculate the adjusted applied rate use the following calculation:

$$\frac{30}{\text{Row Spacing in inches}} \times 3.0 = \text{Adjusted Applied Rate}$$

example:

$$30 \times 3.0 = 4.5 \text{ gpa (Adjusted Applied Rate)}$$

$$20 \text{ (Row Spacing)}$$

SYSTEM DIAGRAM Single Width, Single On/Off Valve

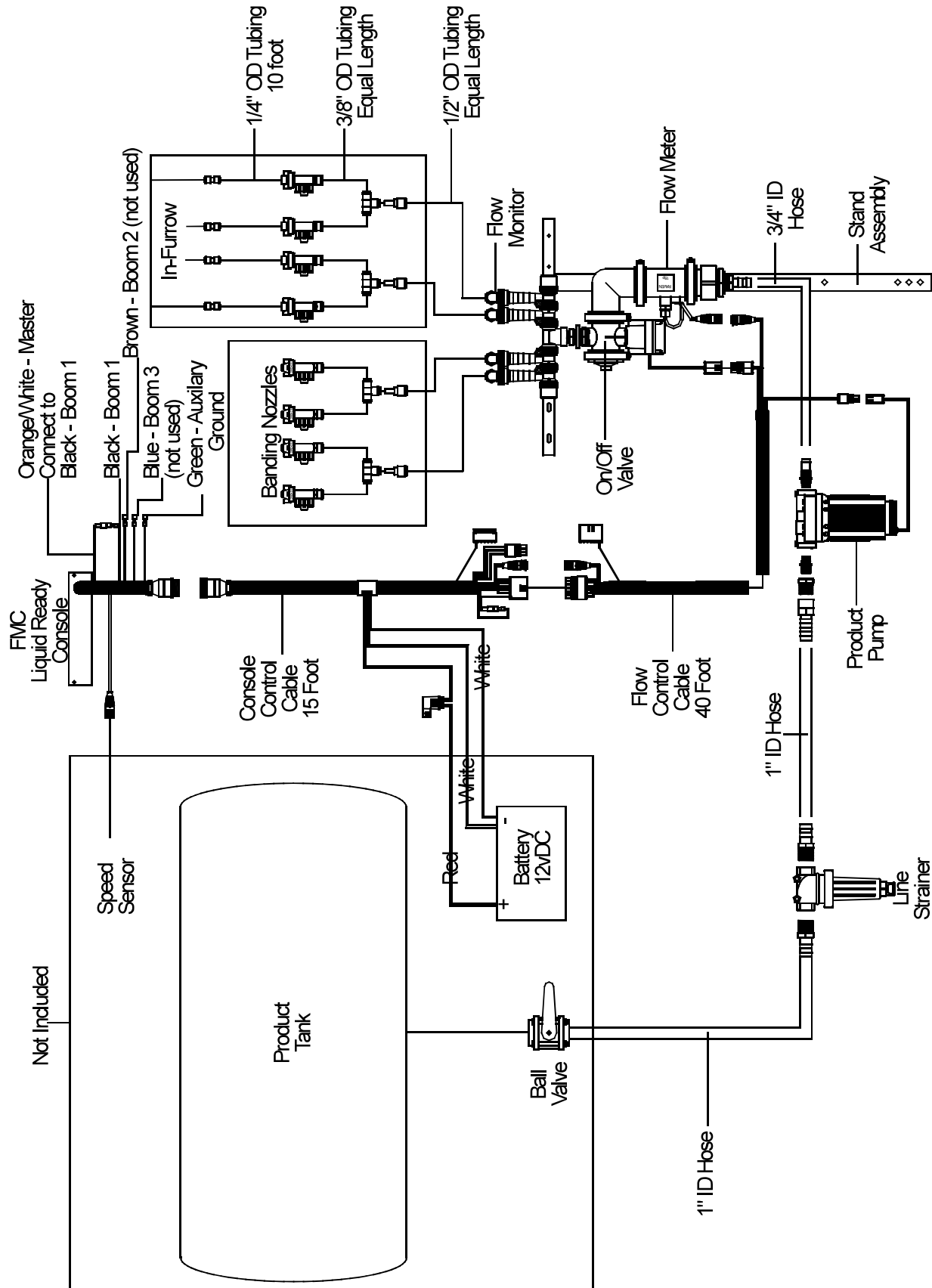


FIGURE 1

SYSTEM DIAGRAM Two Valves (Optional)

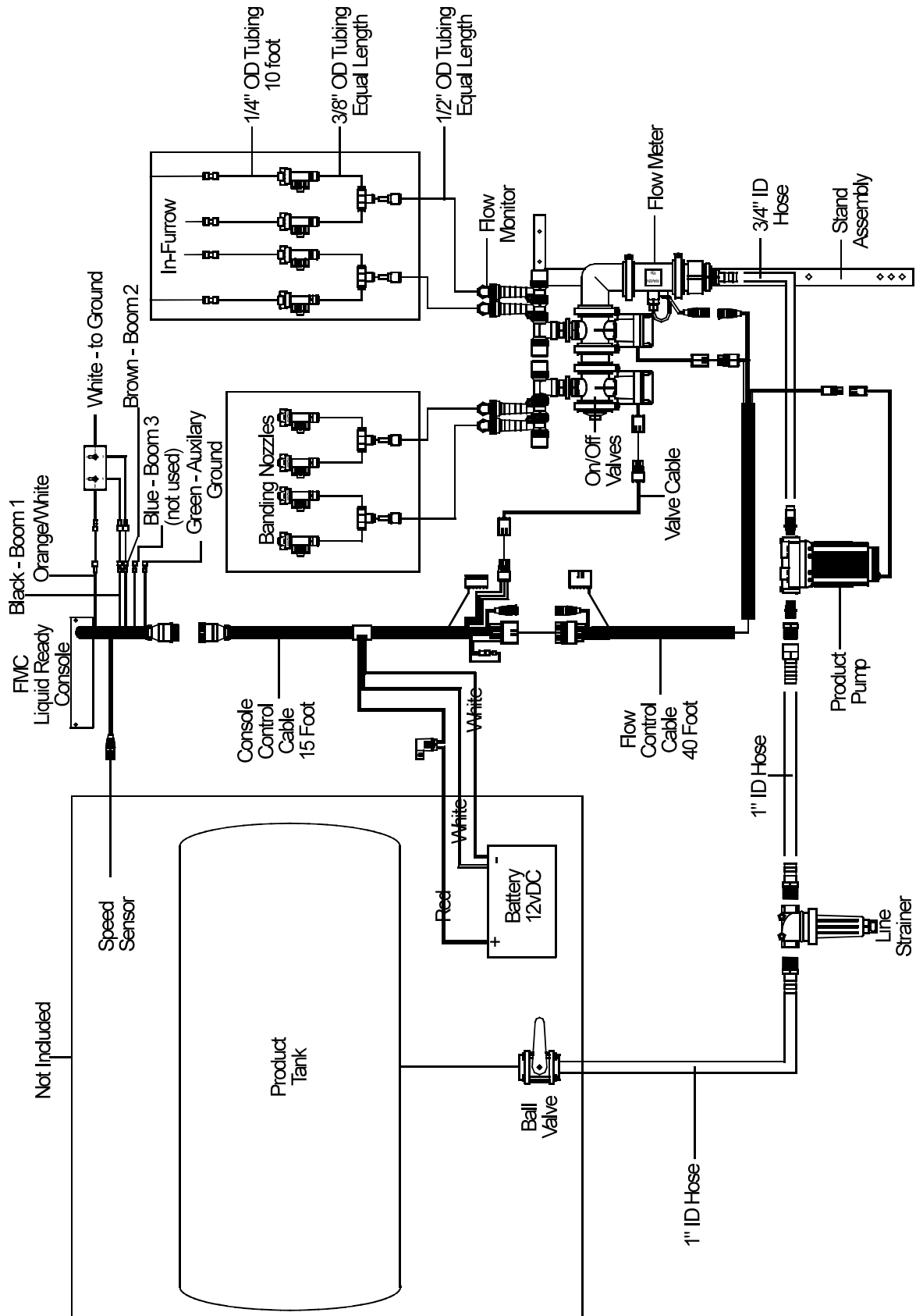


FIGURE 2

SYSTEM DIAGRAM

Single Width, Single On/Off Valve

WIRING STANDARD - Single Valve

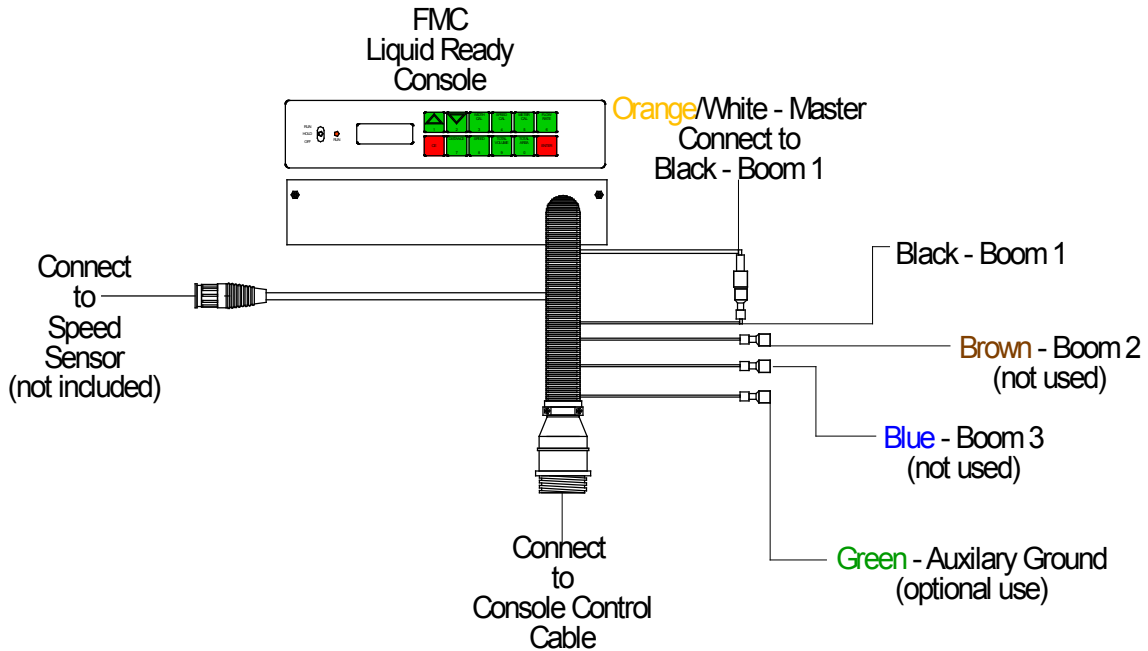


FIGURE 3

SYSTEM DIAGRAM

Two Width, Two On/Off Valves

WIRING OPTIONAL - Two Valve

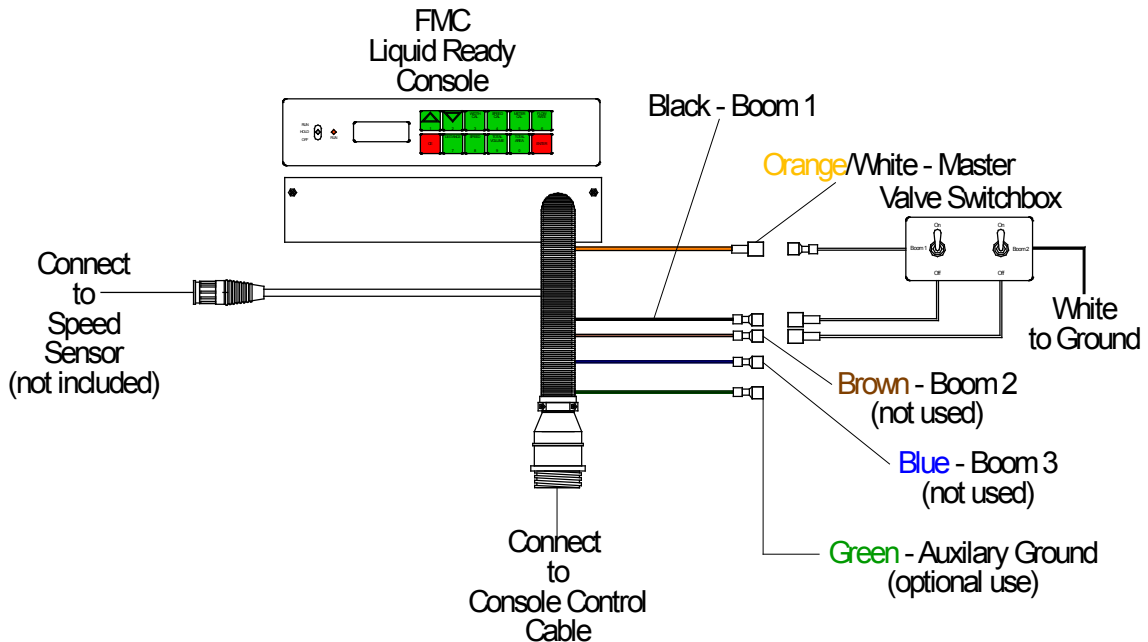


FIGURE 4

IN-FURROW APPLIANCES (Optional)

Several options are available for furrow conditioning. The Flexible Spray Arm allows you to deliver Capture insecticide in a T-Band and utilize products such as Rebounders™ or Keeton® Seed Firmers. This method provides a zone of protection to uniformly and precisely treat and protect the seed and soil prior to the closing of the furrow. The combination of a furrow conditioner device and Flexible Spray Arm will also allow the simultaneous use of multiple liquid planting time products to further promote plant health and vigor.

NOTE: Special precaution should be taken to not let any of the planter apparatus interfere with the T-Band spray pattern.

BANDED APPLICATION (TYPICAL)

NOTE: Not every planter may be capable of being fitted with the Banded Application.

NOTE: Not every planter may be capable of being fitted with the Banded Application.

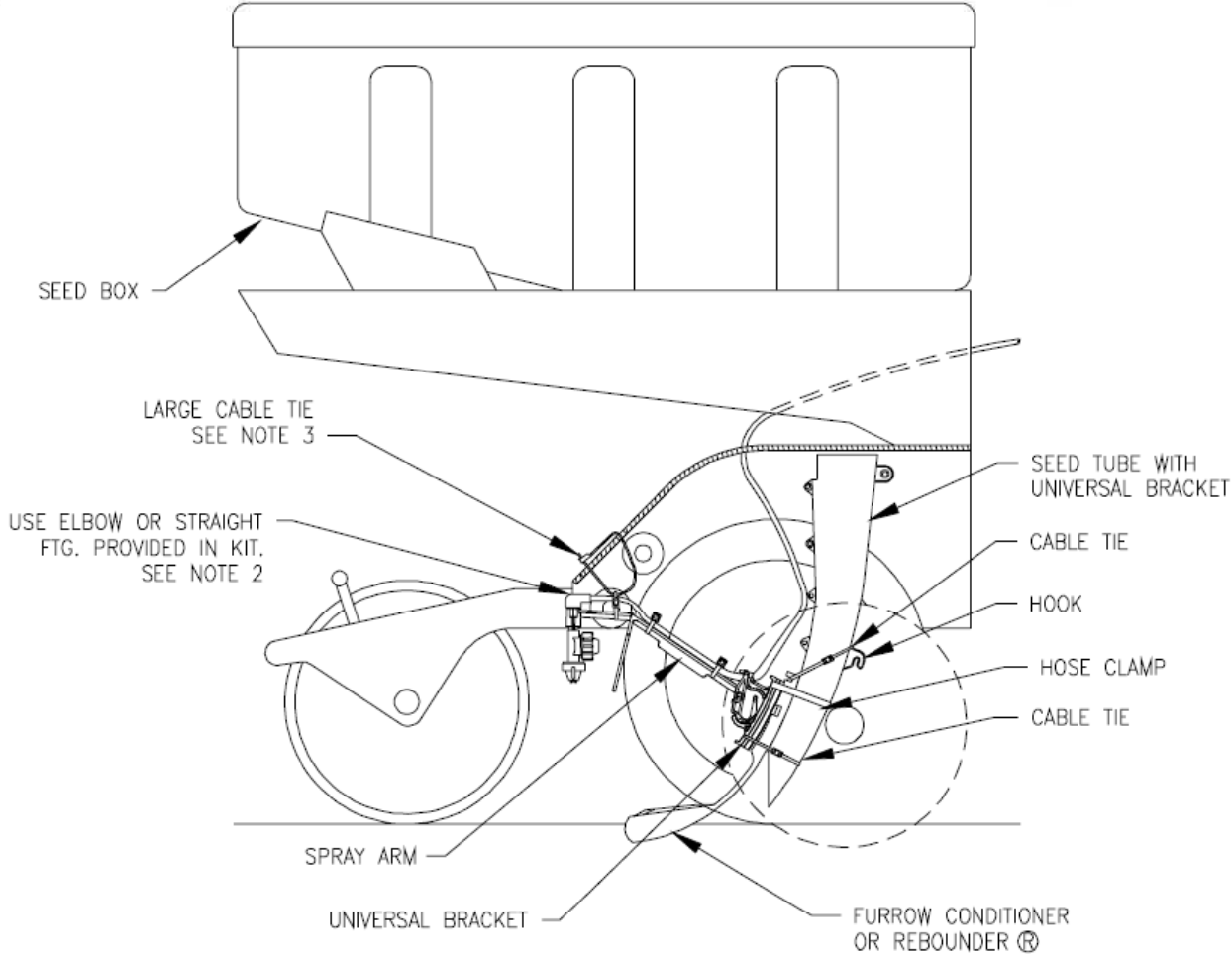


FIGURE 5

INSTALLATION

1. TANK INSTALLATION

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

2. STAND ASSEMBLY INSTALLATION

Assemble the flow monitors to the stand assembly. Mount stand assembly to center of planter toolbar with hardware provided. Flow indicators must face forward.

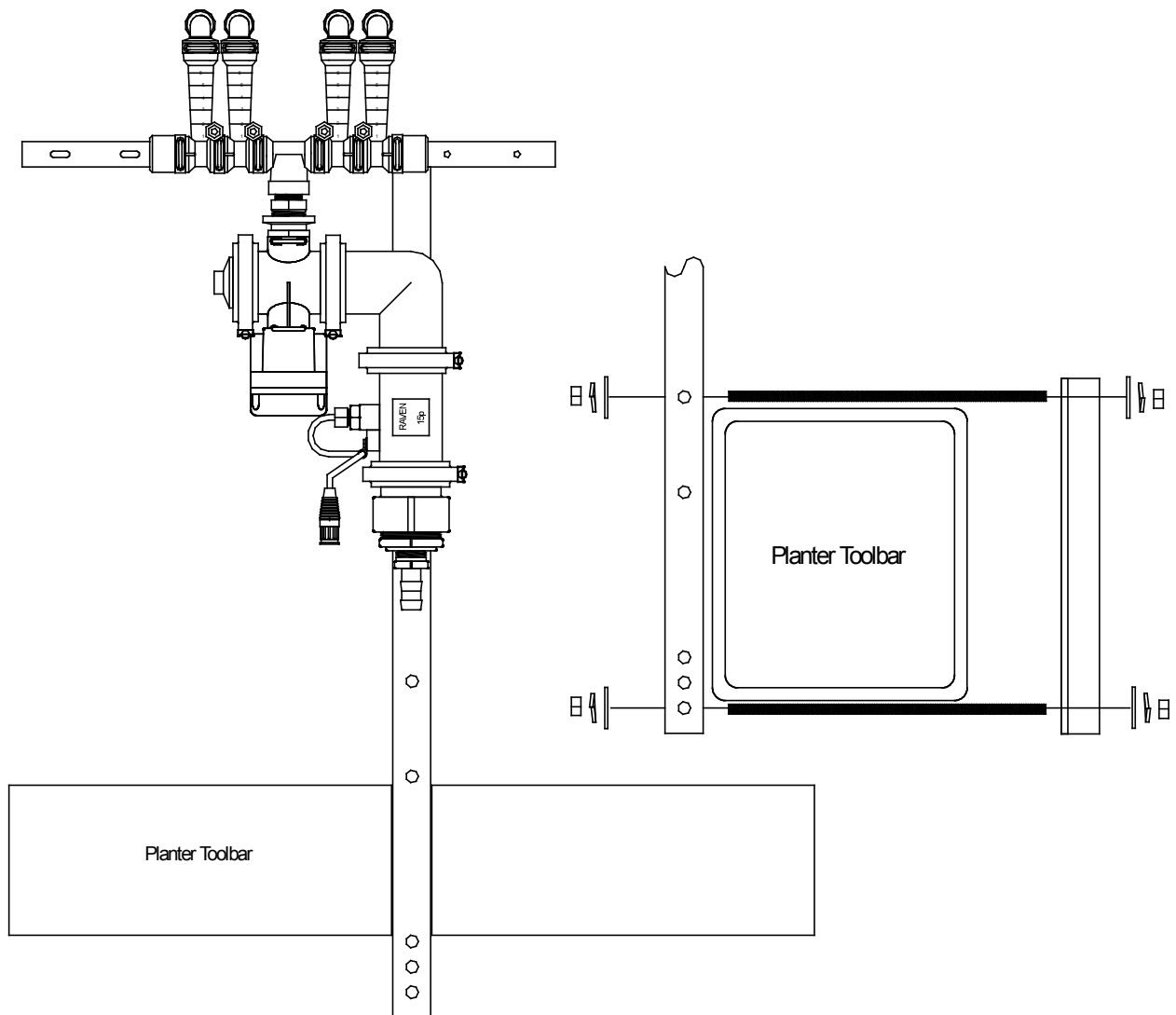


FIGURE 6

3. FLOW MONITOR INSTALLATION

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 16 for front view.

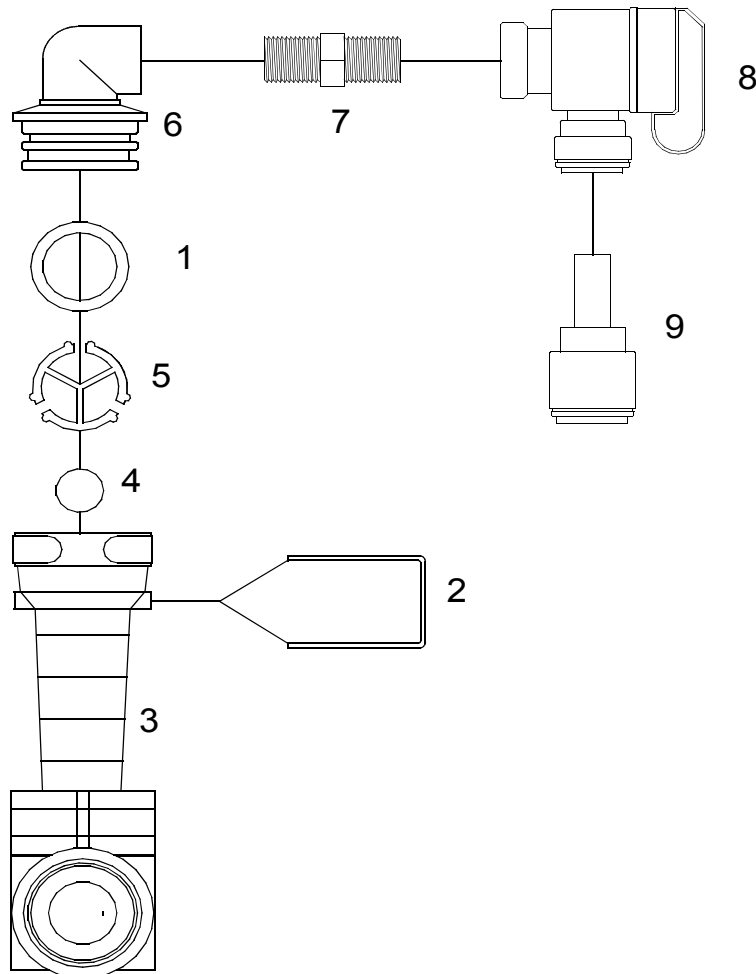
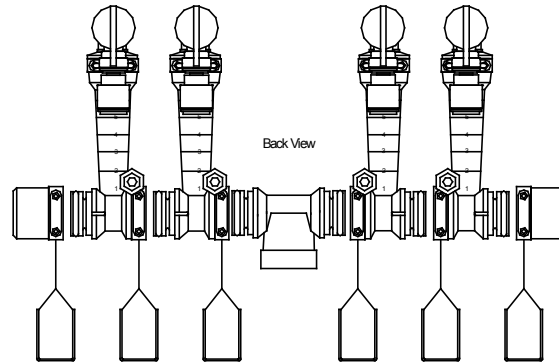


FIGURE 7

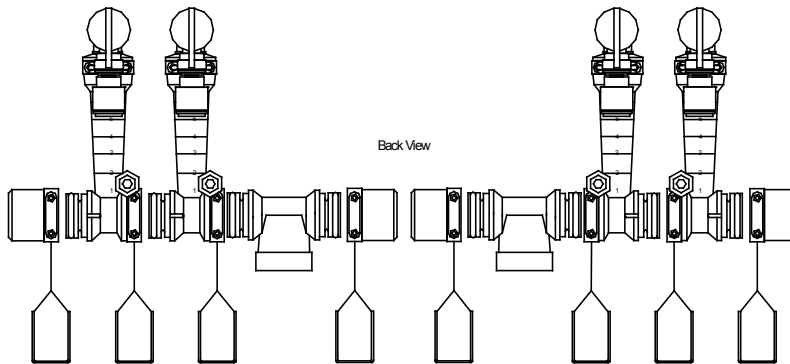
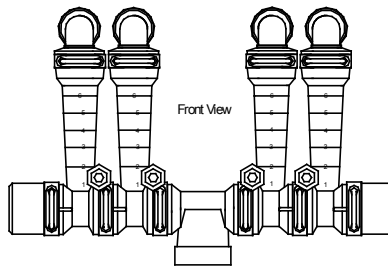
4 Row Flow Indicator

QTY	DESCRIPTION	PART #	ITEM #
4	O-Ring- Viton	CJ2046015	1
4	Lock, U-Clip	CJ2046004	2
2	Body, Flow Indicator	CJ2046000	3
2	Ball, Flow Indicator Red Celcon (Water)	CJ2046007	4
2	Ball, Flow Indicator Red Glass (Fertilizer)		4
2	Retainer, Ball	CJ2046002	5
2	Fitting, ORS Male x 1/4" Female NPT	CJ20518VO	6
2	Close Nipple 1/4mpt x 1/4mpt	M1414	7
2	90 Degree Ball Valve, 1/4" x 1/4" MNPT	6JV380140EFG	8
2	Stem Connector 3/8 stem x 1/2 tube	8JENL380120	9

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).



Single Valve
Flow Monitor Assembly



Dual Valve
Flow Monitor Assembly

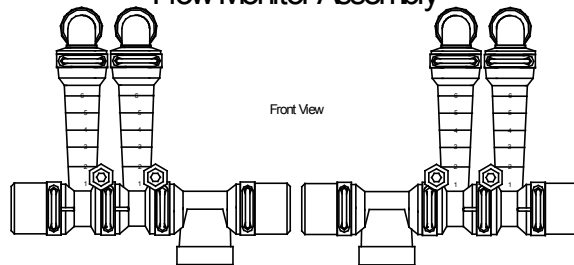


FIGURE 8

4. PLUMBING ASSEMBLY, INLET

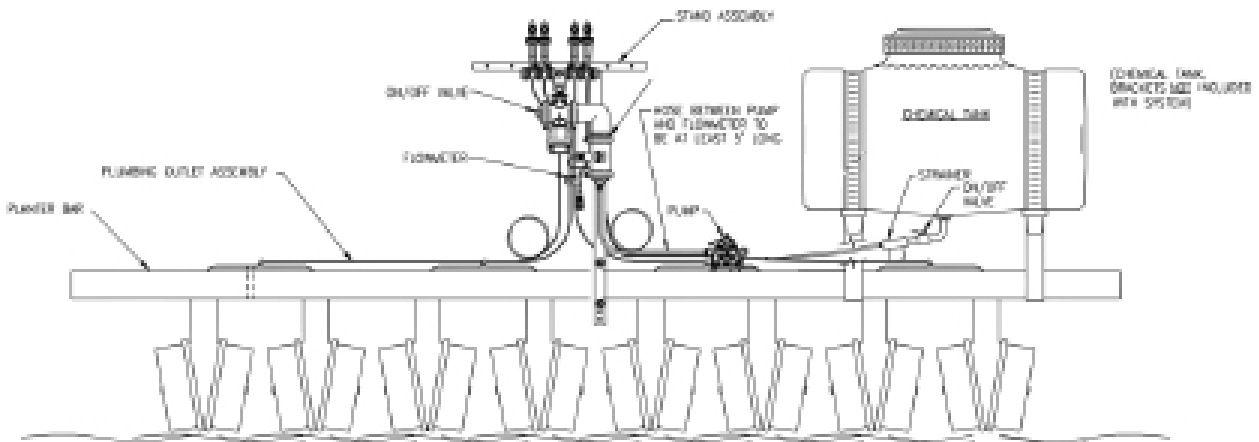


FIGURE 9

1. Mount the pump on the tool bar and close to the chemical tank. Use the large hose clamps provided. Ref. figure 9 & 10.

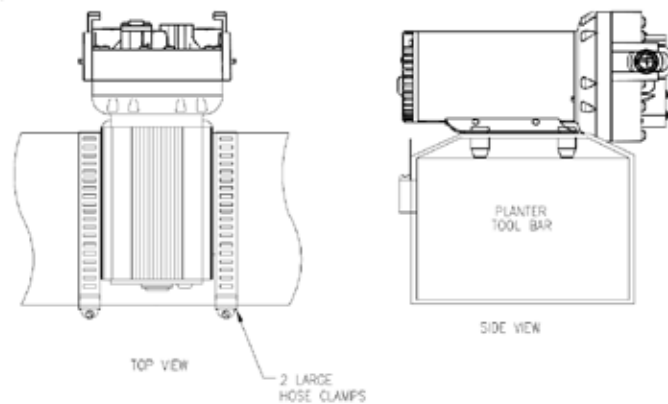


FIGURE 10

2. Install the strainer between product tank and pump inlet. Use green strainer screen (100 Mesh) when water is the carrier, use red screen (50 mesh) when fertilizer is used as carrier.
3. Install the swivel elbows on the inlet and outlet of the pump. Use teflon tape or pipe sealant on all threaded fittings.
4. Remove Clamp and inlet fitting installed on flowmeter.
5. Connect 3/4" ID braided hose between pump outlet & inlet to flow meter on the 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 7.

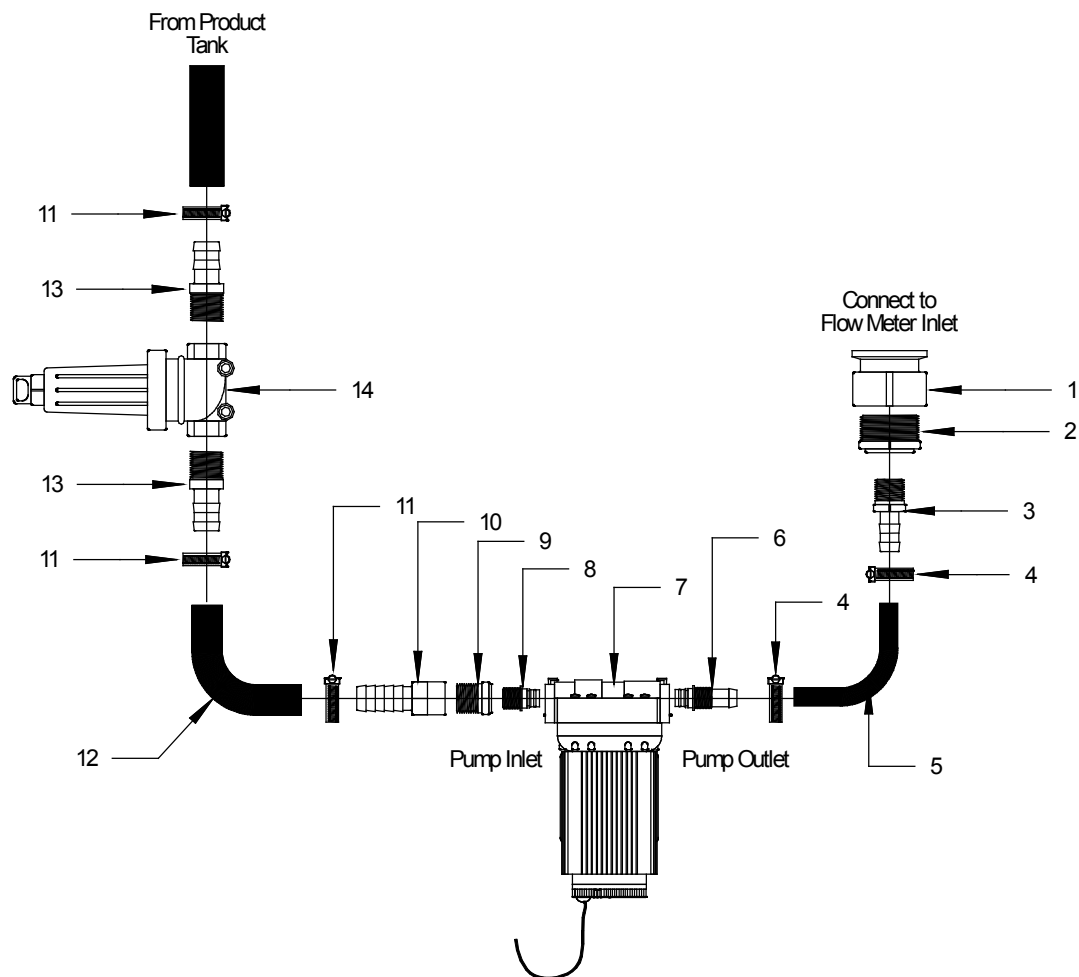


FIGURE 11

QTY	DESCRIPTION	PART #	ITEM #
1	2"FPT x 2" Flange Manifold Fitting	BANM200FPT	1
1	Reducing Bushing 2"mpt x 3/4"fpt	BANRB200075	2
1	3/4mpt x 3/4hb	BANHB075	3
2	#12 Hose Clamp	HC12	4
25	3/4" Braided Braided Hose	HT034BR	5
1	3/4" Hose Barb x Quad Port Fitting	DELSDF34	6
1	Pump 12vdc 5 GPM (Liquid Fertilizer Systems)	DEL5950111E	7
1	Pump 12vdc 4.2 GPM (Standard Delivery Kit)	RV0630172279	7
1	Heat Sink	DEL50075	
1	Quad Port x 1/2"mpt Straight Fitting	FJ20381039	8
1	Reducer Bushing 3/4"mpt x 1/2"fpt	BANRB075050	9
1	Hose Barb 3/4"fpt x 1"hb	BANHBF075100	10
3	#16 Hose Clamp	HC16	11
10	1" Braided Hose	HT100BR	12
2	Hose Barb 1"mpt x 1"hb	BANHB100	13
1	In-Line Strainer 1"fpt - 50 Mesh Screen - 100 Mesh Green	BANLST10050 BANLST1100	14 n/s

5. OUTLET ASSEMBLY INSTALLATION FOR BANDED & IN-FURROW APPLICATION

- Flow from the Flow Monitor Manifold will be distributed as shown.

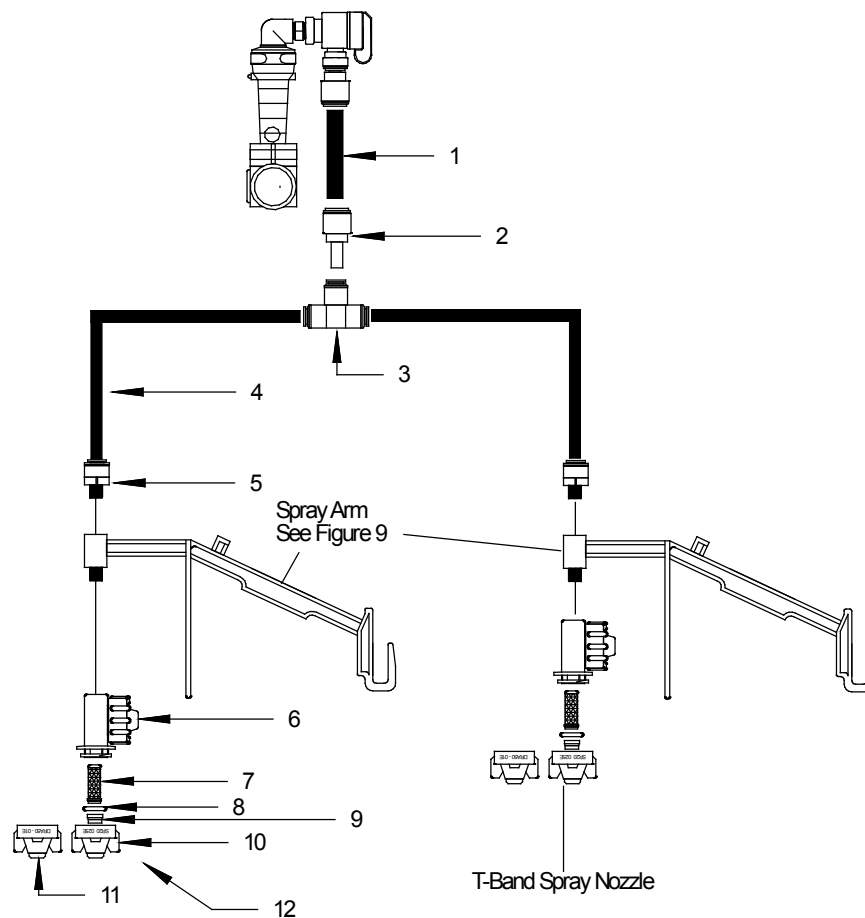


FIGURE 12

QTY	DESCRIPTION	PART #	ITEM #
1	1/2" OD Tubing - 100'/Roll	2T200806BK100	1
4	Enlarger 3/8' Stem x 1/2"tube	8JENL380120	2
2	3/8"tube Union Tee	8JUTC380	3
1	3/8" OD Tubing - 100'/Roll	2T200604BK100	4
4	3/8"tube x 1/8"mpt Connector	8JMC38018	5
4	Nozzle Body	CJ4050000	6
4	Strainer 50 mesh Combo-jet	CJ40250	7
4	Nozzle Seal - Viton	CJ40260VO	8
4	Pre-Orifice - Brown	CJ4028505	9
4	Pre-Orifice - Red	CJ4028504	9
4	Pre-Orifice - Yellow	CJ4028502	9
4	Pre-Orifice - Orange	CJ4029566	9
4	Tip/Cap Combo-jet SR220025E (Black - Fertilizer as Carrier)	CJ7007125E	10
4	Tip/Cap Combo-jet DRA5001E (Orange - Water as Carrier)	CJDRA5001E	11
4	Nozzle Assy w/ Tip	CJ50500VO	12

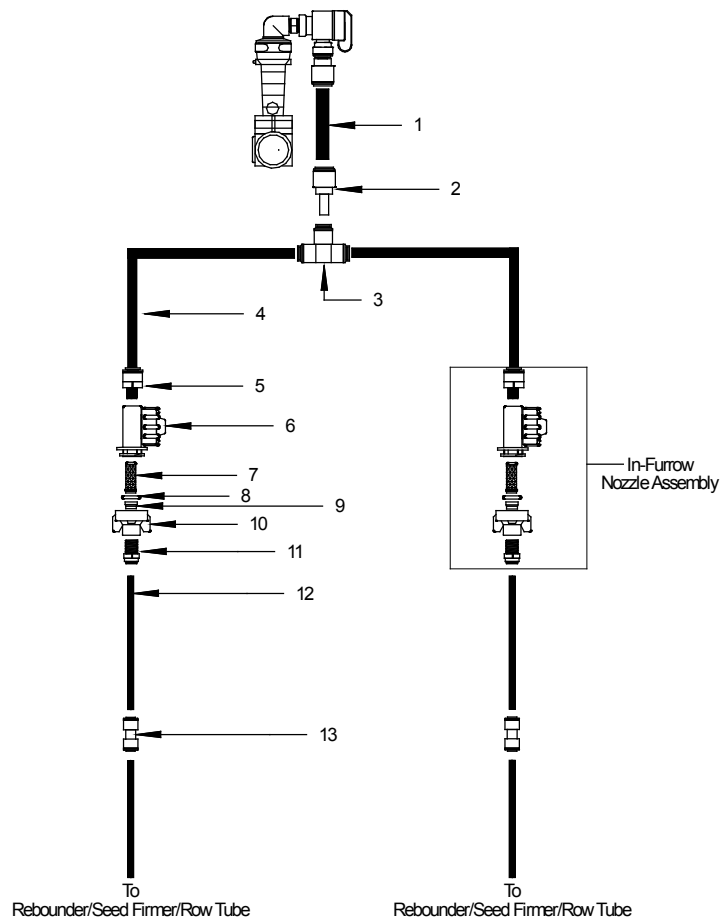


FIGURE 13

QTY	DESCRIPTION	PART #	ITEM #
1	1/2" OD Tubing - 100'/Roll	2T200806BK100	1
4	Enlarger 3/8' Stem x 1/2"tube	8JENL380120	2
2	3/8"tube Union Tee	8JUTC380	3
1	3/8" OD Tubing - 100'/Roll	2T200604BK100	4
4	3/8"tube x 1/8"mpt Connector	8JMC38018	5
4	Nozzle Body	CJ4050000	6
4	Strainer 50 mesh Combo-jet	CJ40250	7
4	Nozzle Seal - Viton	CJ40260VO	8
4	Pre-Orifice - Brown	CJ4028505	9
4	Pre-Orifice - Red	CJ4028504	9
4	Pre-Orifice - Yellow	CJ4028502	9
4	Pre-Orifice - Orange	CJ4029566	9
4	Cap 1/4" fpt	CJ4027305	10
4	1/4" tube Union	8JMC14014	11
4	1/4" OD Tubing	BHE46428	12

2. Attach Spray arm (and optional In-Furrow appliance) to seed tube.
 - a. Remove the seed box.
 - b. Disconnect the seed monitor sensor cable.
 - c. Remove the seed tube.
 - d. Assemble the 1/8" NPT elbow or straight fitting to the top of the spray arm. See note.
 - e. Attach furrow conditioner and the universal bracket to the seed tube using the hose clamp and cable ties as shown.
 - f. Attach the spray arm to the universal bracket after the seed tube has been re-installed.

NOTE: In some cases it may be easier to install seed tube if elbow is installed later. In all cases, prevent dirt from entering fittings during installation. Cover fittings with tape to avoid plugged nozzles.

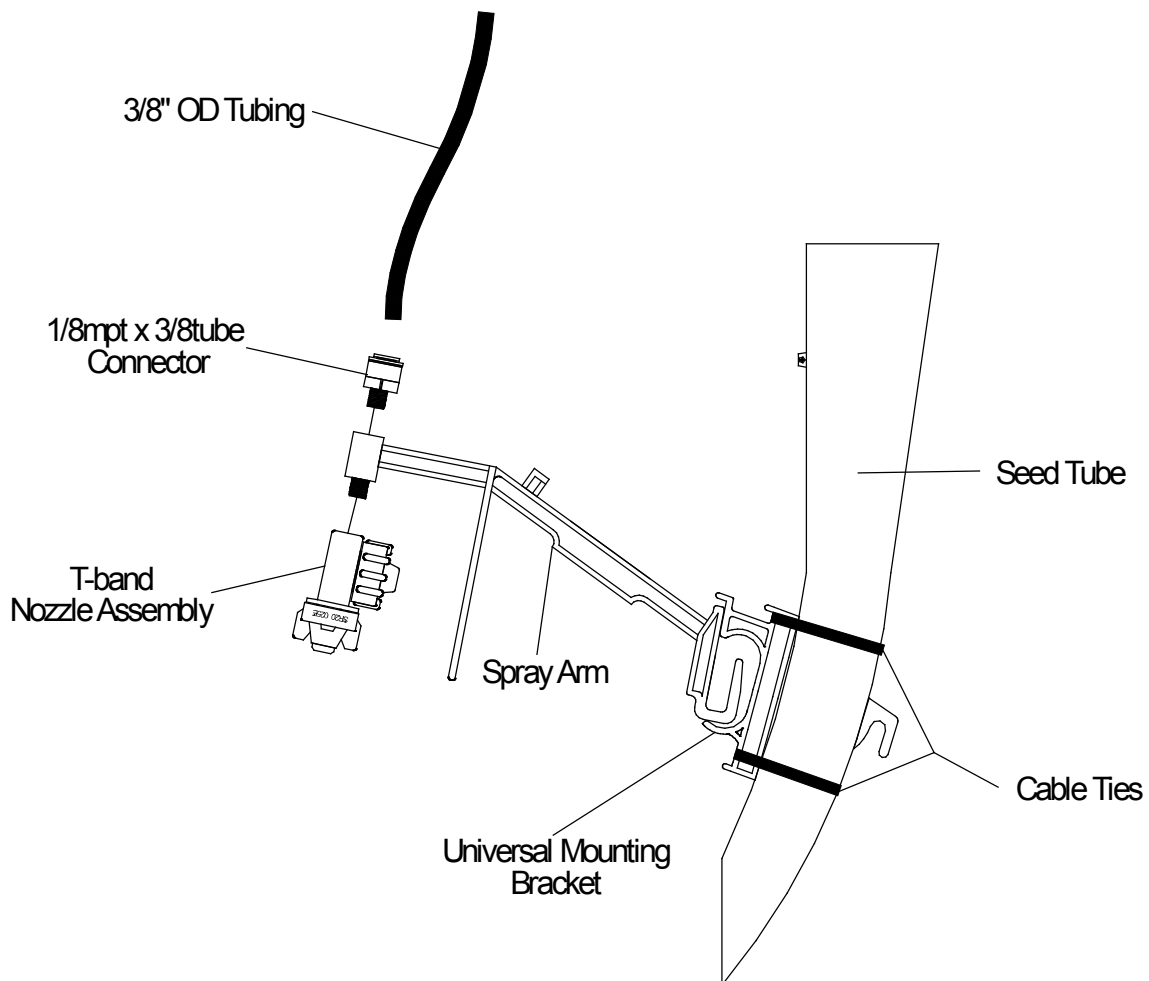


FIGURE 14

3. Position the flow divider shown in step 1 on the planter tool bar (Ref Fig 15). One flow divider feeds 2 rows. Point the flow divider fitting toward the center of the planter. Secure the flow divider with two cable ties.
4. Locate the large coil of 1/2" tubing supplied with the system. This will be used to connect the compression fitting on the stand assembly to the compression tee fitting on the flow divider. All tubing must be equal length. Coil surplus tubing.

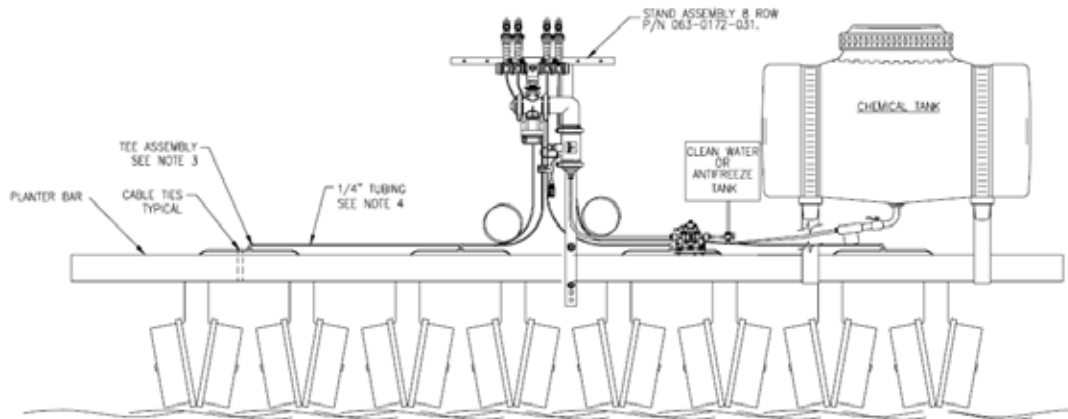


FIGURE 15

NOTE: Larger planters may fold, leaving 3 or 5 rows on a section of planter tool bar. When this occurs, the 1/2" flow divider tubing will have to feed the two rows at the fold point. Care must be taken to ensure 1/2" tubing movement is not restricted or damaged when folding planter.

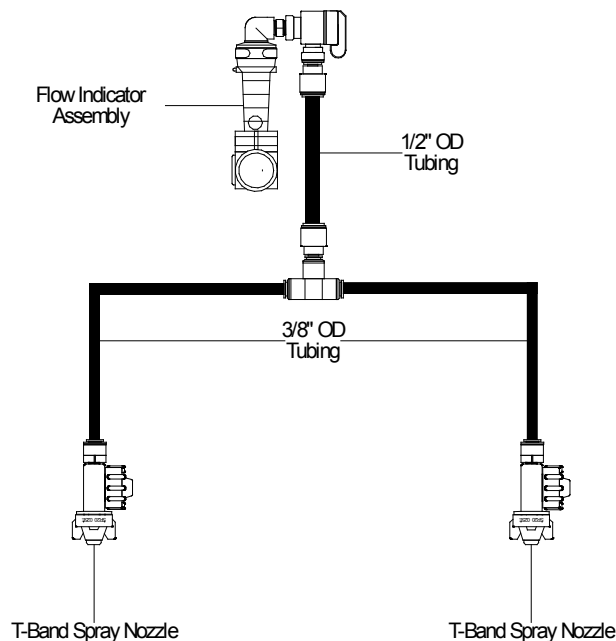


FIGURE 16

5. The Spray Arm (assembled in step 2) is intended to mount on the planter seed tube. The spray arm nozzle should be positioned in place of the insecticide drop tube. (Ref. Figure 17) If this tube is present, it will not be used and must be removed.
6. Install the Spray Arm on the planter as shown in the manual for the user's planter make and model.
7. Connect the flow divider to the row-tube assembly by using a 10' long piece of 3/8" tube. To make this connection, just push the tube into the push-in fittings. (To release the tube, hold the ring in on the push-in fitting and pull lightly on the tube.) Secure the tube with cable ties. Do NOT pinch the tube.
8. Use the large cable tie to adjust the nozzle height to obtain a 5" to 7" band. The large cable tie has a release mechanism to allow adjustment.

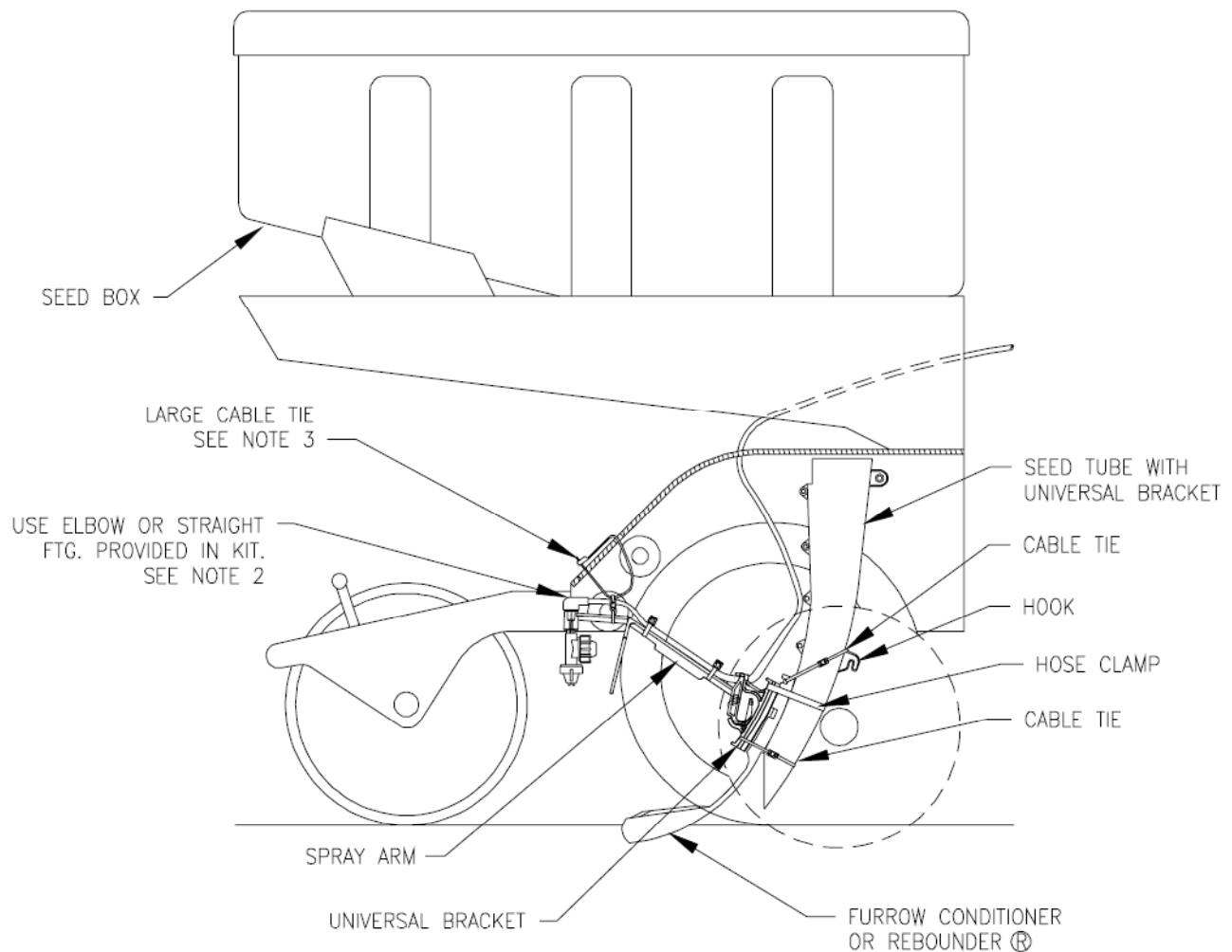


FIGURE 17

6. CONSOLE AND CABLING

1. Mount the console P/N 063-0171-913 to a secure support inside the cab of the vehicle.
2. Route the 15' Console Control Cable P/N 115-0171-124 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 wire to the NEGATIVE (-) terminal and the Red battery wire directly 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 115-0171-125 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

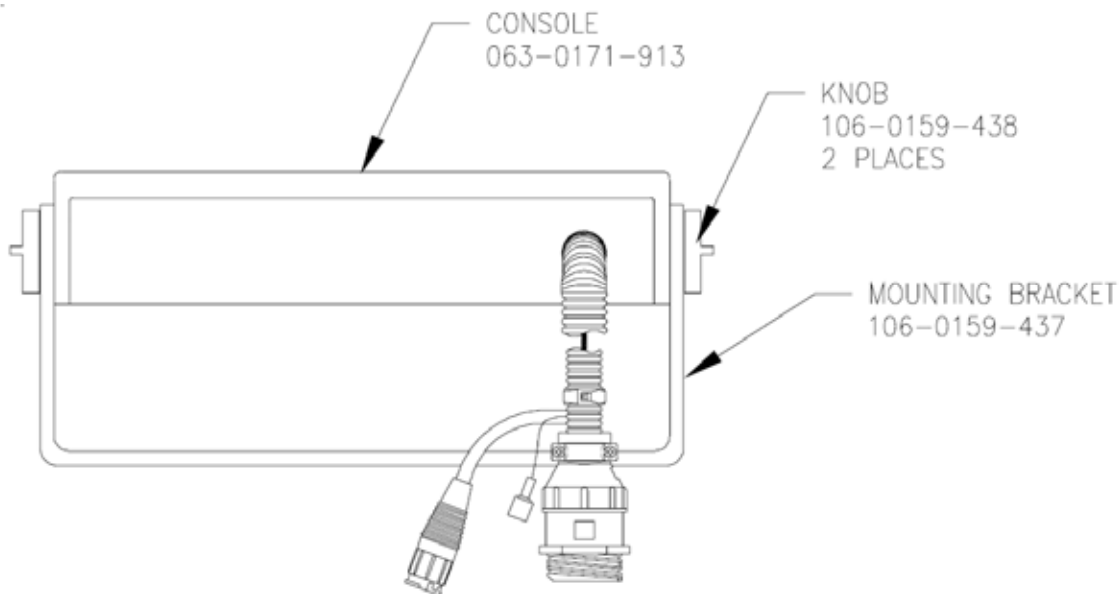


FIGURE 18

BATTERY CONNECTIONS

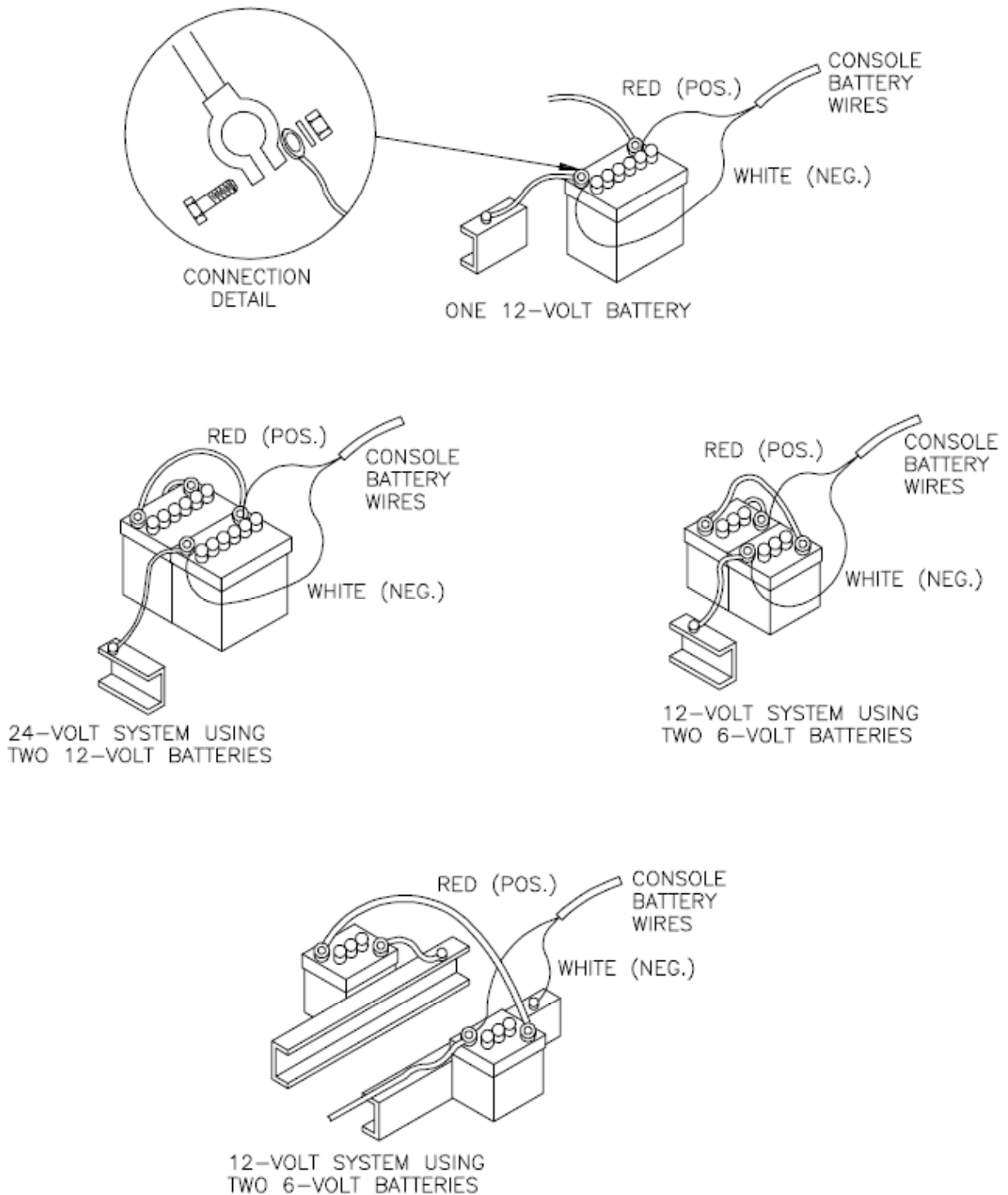


FIGURE 19

WIRING OPTION 1

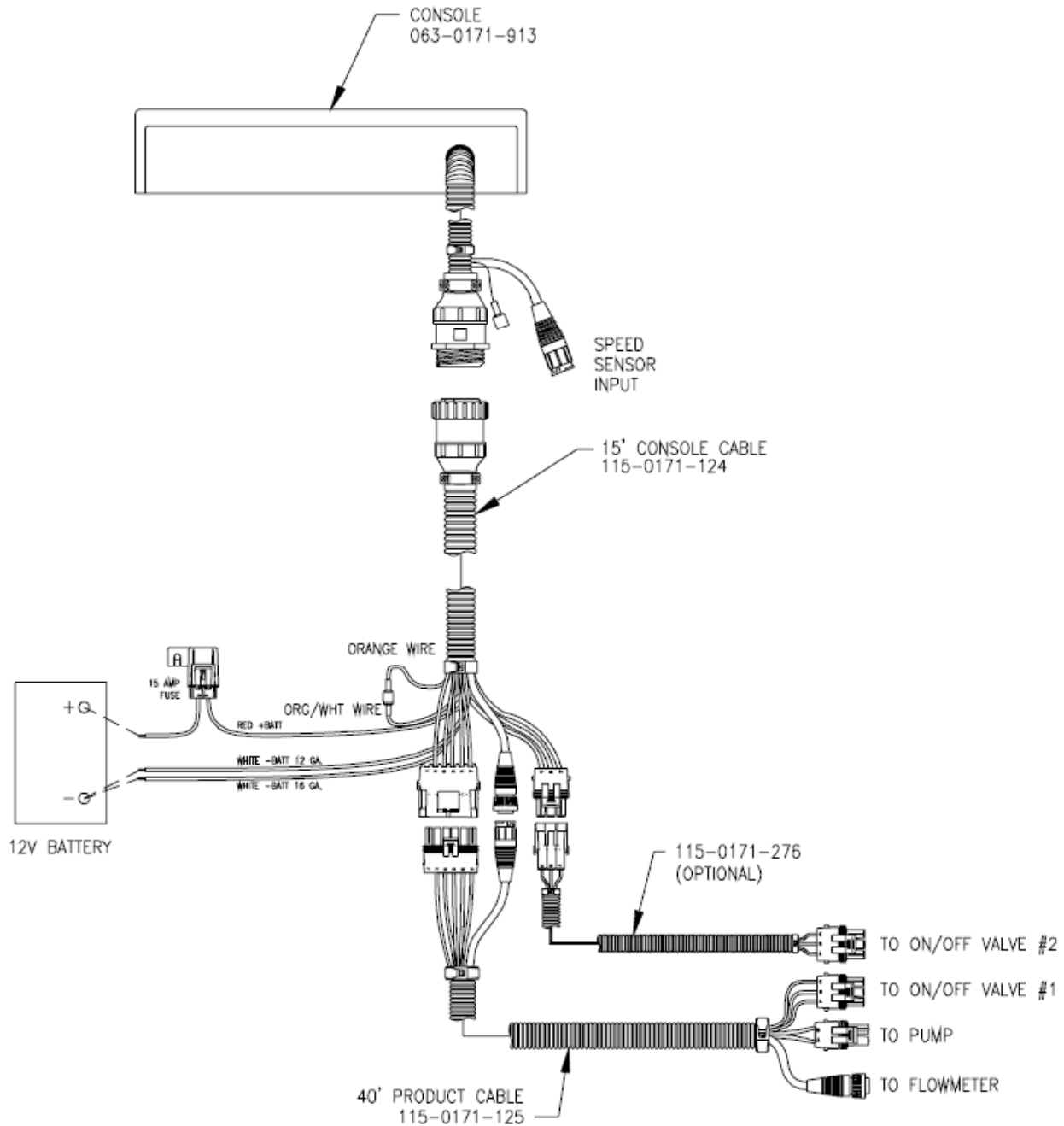


FIGURE 20

OPERATION

Plug the orange and orange/white wires together. When wired in 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 off. The run indicator will now be off.

WIRING OPTION 2

The FMC Liquid Ready 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.

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.

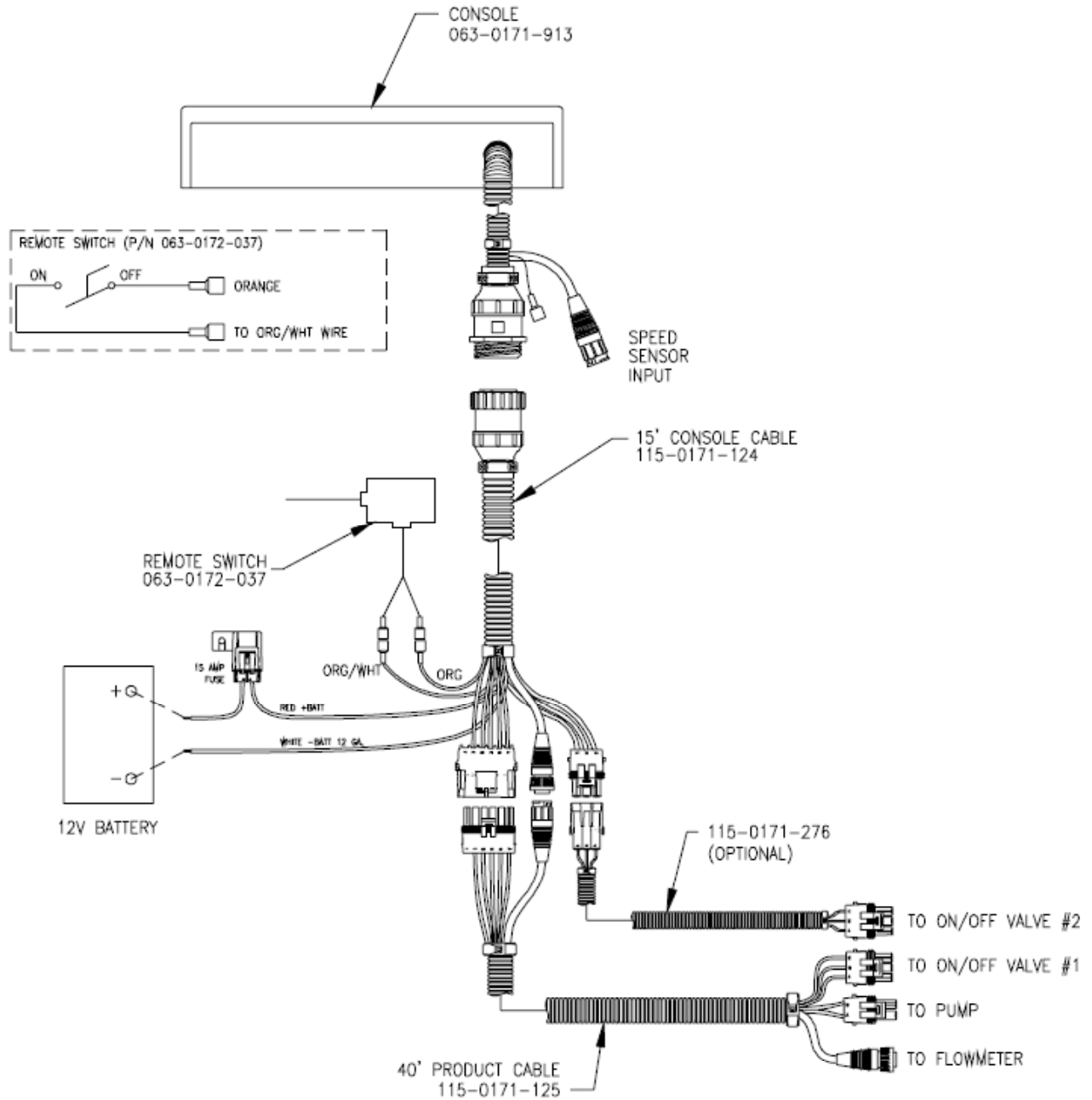


FIGURE 21

CONSOLE FEATURES

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.

Run LED - Illuminates when Pump is running.

FLOW CONTROL KEYS (DualFunction) - Manually increase or decrease flow rate when console is in manual mode. Also increases or decreases simulated speed when "SPEED" key is active.

WIDTH CAL KEY, METER CAL KEY, FLOW RATE KEY, SPEED KEY - Used to enter calibration numbers into console to calibrate the system.

SPEED CAL KEY - Used to calibrate speed sensor.



RUN/HOLD/OFF - Place switch in RUN position when applying product. Place switch in HOLD position when shutting the system off (i.e., on end rows). To turn off all power to the console, place switch in OFF position. Turning console OFF does not affect data stored in the computer.

ENTER - Used only to enter data into the computer.

TOTAL AREA KEY - Accumulates in acres.

FUNCTION KEYS - Used to display data. TOTAL VOLUME - Total Vol. applied.

DISTANCE KEY - Accumulates in feet.

CE - Use like the CE key on a calculator.

CONSOLE CALIBRATION

1. CALCULATING WIDTH CAL



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

2. CALCULATING METER CAL



The meter calibration number is on the tag attached to the flow meter.
This number may need to be adjusted slightly. If over application occurs, adjust the number down. If under application occurs, adjust the number upward. Typical adjustment is about 5%. Write down the calibration number for future reference when programming the console computer.

3. FLOW RATE



This number is the gallons per acre to be applied.
example: 30 = 3.0 gallons per acre.

4. SPEED

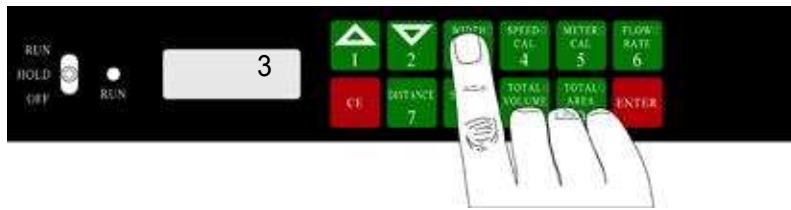


This console applies relative to speed. This key calibrates the speed sensor to the console. Refer to Calculating "Speed Cal".

CONSOLE PROGRAMMING

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

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. A -3-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. 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. Press  to lock in your choice. Console will now display “SoFF”. Press . It is recommended that zero speed shut off not be used with this system.



Explanation of Zero Speed Shut off Feature: This feature is for zero speed shut off. If “SoFF” is selected, when speed reaches 0, the pump will continue to run until the RUN/HOLD/OFF switch is placed in HOLD. If S ON is selected, the pump will shut off when speed drops to .7 mph or less.

When a zero speed shut-off has occurred, the RUN/HOLD/OFF switch must be turned to HOLD and then to RUN to restart the system. If a constant speed greater than .7 mph is not attained within 10 seconds, the zero speed shut-off will be enacted again. If a remote implement switch is used, raising and lowering the planter will re-start the system. To step between S off and S


ON, press the  key. Press  to lock in your choice.



The console will now display “CAL”.







- 2) Console is ready to be calibrated. Press  Console will display “b-01”


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 117-0159-851 has been installed, enter width of left side as “b-01”



width. Press  key. Display will now show “b-02”. Enter width of right side as “b-02” width.

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


- 4) Press  Press  Enter in the Meter Cal number found on the Flow Meter Calibration tag. Press 
- 5) Press  Press  Enter in 3.0 for 3.0 gal/acre. Press 
- 6) If a simulated speed is desired, refer to Self 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. To achieve the most accurate calibration, accelerate and decelerate slowly.

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

- 5) Read DISTANCE by depressing key labelled 
 - a) DISTANCE should read a value of approximately 5280. If it reads between 5260-5300, 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 the corrected value to enter for SPEED CAL. **Round off to the nearest 3 digit whole number.**

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

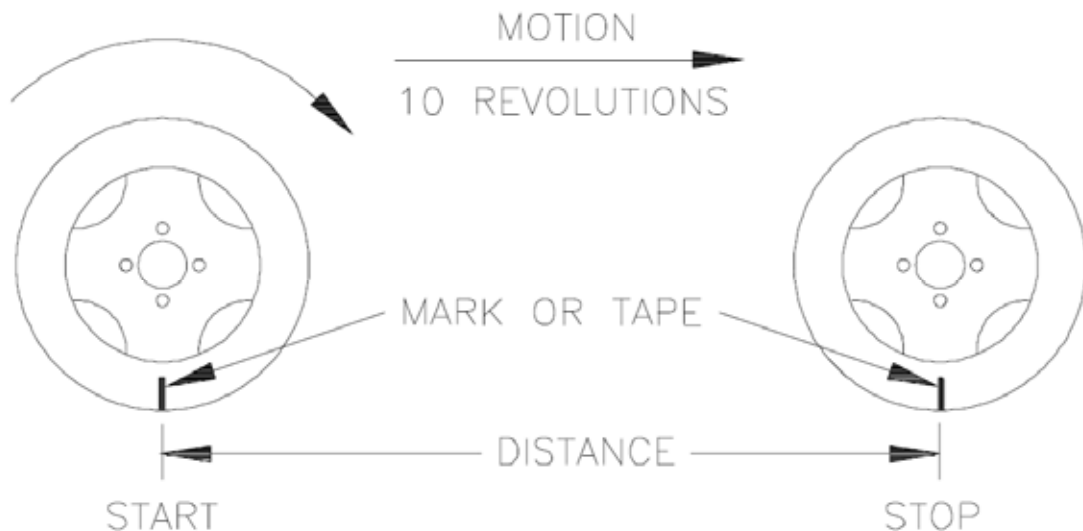
$$= \frac{598 \times 5280}{5000} = 631.4$$

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 5a. If DISTANCE value does not read correctly, repeat Steps 5b, 6, 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.

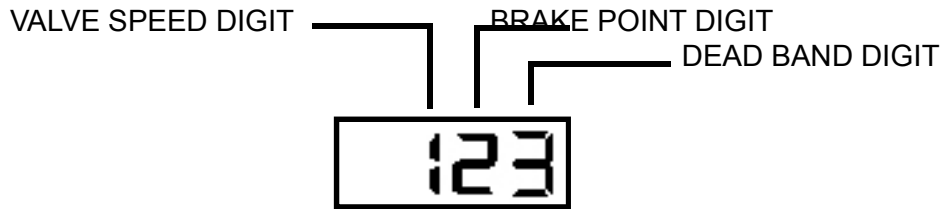
$$\frac{\text{Normal Number of Magnets}}{\text{Actual Number of Magnets}} \times \text{Speed Cal} = \text{Adjusted Speed Cal}$$


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

4. VALVE CAL FEATURE

VALVE CAL

- 1) The initial Control Valve calibration number is 123. After operating the system, this number may be refined. See definition below:



To change the Valve Cal setting, depress the key labelled  for 5 seconds.

The display will show the current valve calibration number. Enter a new valve calibration number if desired.

Valve Speed Digit: Controls response time of pump motor.

CAUTION: Adjusting response time too fast will cause the system to oscillate.

Range: 1 to 9
1-Slow
9-Fast


Brake Point Digit: Sets the percent away from target rate at which the control begins braking, so as not to over-shoot the desired rate.

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

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

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

5. SP1 OR SP2 AND ZERO SPEED SHUT-OFF

Press and hold  key. After 5 seconds, the display will show either SP1 or SP2, then alternate to S off or S ON.

SP1 is for all speed sensors except radar.
SP2 is for radar and GPS speed sensors.
S off zero speed shut off has not been selected.
S ON zero speed shut off has been selected.

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). 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 MPH.


Depressing  will cause the Simulated Speed to DECREASE by 0.1 MPH.

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

8. ZERO SPEED SHUT-OFF FEATURE

During initial programming, a choice must be made to use or not to use this feature.


If you desire not to use Zero Speed Shut-Off, press the  key when display is S off.

To step the display to S ON, press the  key. If you desire to use Zero Speed Shut-Off, press  when the display is S ON.

If S ON has been selected, the console will shut the injection pump off when speed drops below .7 mph. When a zero speed shut-off has occurred, the RUN/HOLD/OFF switch must be placed to HOLD and then to RUN to re-start the system. If a constant speed greater than .7 is not attained within 10 seconds, the zero speed shut-off will be enacted again. If a speed

greater than .7 is detected after this 10 second period and the console RUN/HOLD/OFF switch is in RUN, the alarm will sound to alert operator that product is not being applied. Restart the system or place the RUN/HOLD/OFF switch to HOLD.

9. 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 in gallons per minute. When slowing down, the console will not ad just the rate below this limit. "LL" will be displayed, indicating this limit has been reached. To determine gal/min, use the following formula:

$$\text{gal/min} = \left[\begin{array}{ccc} \text{RATE} & \times & \text{Width} & \times & \text{SPEED} \\ \text{(Gal/Acre)} & & \text{(Row spacing in inches} & & \text{(mph)} \\ & & \text{x \# of Rows)} & & \end{array} \right] \div 5940$$




10. PROCEDURE TO ACCESS CONSOLE

After purchase of FMC Insecticide, an 8 digit code is available from your FMC Representative. This code will allow access the console for 1 year from December 1 thru November 30th. He will require the serial number from the console.

STEP 1

When the console displays the message CODE, press the  key. The display will show "C1". Press the  key. Press the numbers of the first 4 digits in the code. Verify they are correct, then press .






STEP 2

Press the  key. The display will show C2. Press the  key. Press the numbers of the last 4 digits in the code. Verify they are correct, then press .

If the console has been successfully unlocked, the display will no longer show CODE. If SP1 message appears, refer to CONSOLE CALIBRATION. If no message appears, console retains calibration as previously programmed.


NOTE: If CODE message is displayed repeat process starting with Step 1.


11. MANUAL OPERATION FEATURE

- Press and hold  for 5 seconds and "C on" displays. Press  to alternate between "C on" (automatic control) and "C off" (manual control).
- 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 .

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

12. AUDIBLE ALARM MENU


To display the AUDIBLE 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 audible alarm is enabled. “A off” means audible alarm is disabled. The display will still indicate an alarm condition.

13. 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.

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 Application System. The following maintenance procedures should be followed on a regular basis:

1. PUMP:
Pump check valves may need to be changed after prolonged exposure to Insecticide. Replace check valve assembly with part 219-0000-103.
2. TANK(S):
Drain tank of chemical and flush pump with water if system will not be used for extended periods of time. Keep system clean.
3. 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 chemical will degrade the clear plastic in the Flow Indicator.
4. HOSES AND FITTINGS:
Inspect on a regular basis for wear and abrasion, softening, swelling and leaks. Replace as needed.
5. 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.
6. 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.

NOTE: Parts damaged due to freezing will not be covered under warranty.
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

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.
5) CONSOLE DISPLAYS "SP1" WHENEVER MASTER SWITCH IS TURNED ON OR OFF.	1) Check battery voltage and battery connections.
6) ONE DISPLAY DIGIT HAS ONE OR MORE MISSING SEGMENTS.	1) Return Console to Dealer for service
7) SPEED DISPLAY "0".	1) Perform cable test. See Appendix 3.
8) 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.
9) RATE IS ERRATIC.	1) Verify console is programmed correctly. 2) Verify system pressure does not exceed 45 psi.
10) PUMP WILL NOT PRIME.	1) Verify On/Off valve is open. 2) Verify strainer is not plugged. 3) Replace check valve assembly. See Appendix 5.
11) 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.
12) SYSTEM NOT ACCURATE	1) Verify correct calibration data entered in console. 2) See Appendix 1, Procedure to Re-Calibrate Flowmeter

APPENDIX 1

PROCEDURE TO RE-CALIBRATE FLOW METER

IMPORTANT: Prior to this procedure, flush system and perform test using water.

- 1) Enter a METER CAL number of 10 [38] in the key labelled 
- 2) Enter a TOTAL VOLUME of 0 in the key labelled 
- 3) Place all On/Off valves on stand assembly to OFF.
- 4) Remove a tube from stand assembly and place it into a calibrated 5 gallon [19 liter] container.
- 5) Place at appropriate On/Off valve for the tube that was just placed into the 5 gallon container. Place RUN/HOLD/OFF switch to RUN. Pump exactly 10 gallons [38 liters].
- 6) Readout in TOTAL VOLUME is the new METER CAL number. This number should be within +/- 3% of the calibration number stamped on the tag of the Flow Meter.
- 7) Repeat this procedure several times to confirm accuracy. (Always “zero out” the TOTAL VOLUME display *before* retesting).
- 8) To verify Flow Meter calibration, fill applicator tank with a predetermined amount of measured liquid (i.e. 250 gallons). **DO NOT RELY ON GRADUATION NUMBERS MOLDED INTO APPLICATOR TANK.** Empty the applicator tank under normal operating conditions. If the number displayed under TOTAL VOLUME is different from the predetermined amount of measured liquid by more than +/- 3%, complete the following calculation:

EXAMPLE:

METER CAL	= 1600 [422]
TOTAL VOLUME	= 260 [984]
Predetermined amount of measured liquid	= 250 [946]

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

ENGLISH UNITS:	METRIC UNITS:
$= \frac{1600 \times 260}{250} = 1664$	$= \frac{[422] \times [984]}{[946]} = [439]$

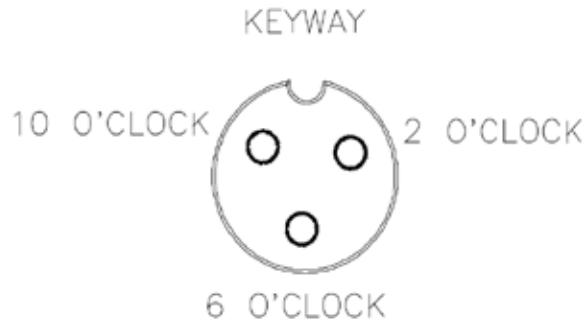
Corrected METER CAL = 1664 [439]

- 9) Enter corrected METER CAL before resuming application.

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.

PROCEDURE TO CHECK CABLE:

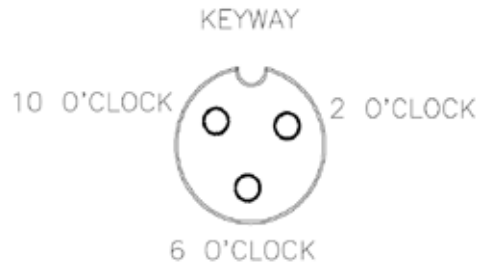
- 1) Enter a METER CAL number of one (1) in key labelled 
- 2) Depress key labelled 
- 3) Disconnect the pump power connector. Place RUN/HOLD/OFF switch to RUN.
- 4) With small jumper wire (or paper clip), short between the 2 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact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

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	Cable Part #
Dickey john	Case IH	RV1150159517
	Agco-Allison 94/95/96 Ford *** White *	RV1150159529
	John Deere **	RV1150159519
	Challenger *	RV1150159518
	Cat C-Mod, D-Mod Row Crop 35,45,55 Challenger	RV1150159627
	John Deere 7000/8000/9000 Series	RV1150159700
	Ford Genesis/Versatile New Holland 1996	RV1150159709
	Other	RV1150159526
	Magnavox/Phillips	John Deere **
John Deere 7000/8000/9000 Series		RV1150159700
Other		RV1170159462
TRW	Case	RV1150159432
	Other	RV1150159463

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 Gensesis/Versatile tractors.

APPENDIX 5
INSTALLATION INSTRUCTIONS FOR
SEED SHIELD SPRAY ARM® WITH SEED SHIELD FUR-
ROW CONDITIONER®
SEED SHIELD SPRAY ARM® WITH REBOUNDER®
SEED COVER
SEED SHIELD SPRAY ARM® WITH KEETON® COM-
PACT LOW PROFILE SEED FIRMER
FOR JOHN DEERE, KINZE AND PLANTERS IN GENERAL

INSTALLATION OF UNIVERSAL BRACKET

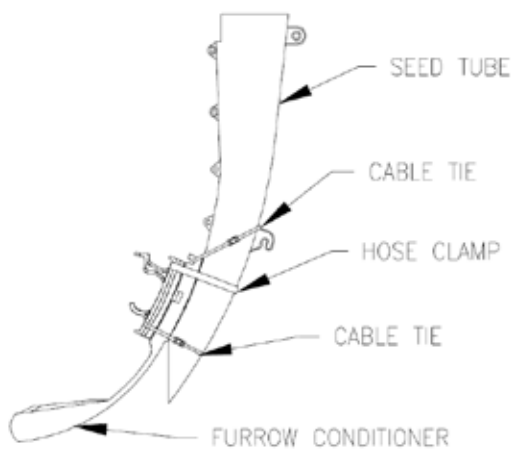


FIGURE 1A

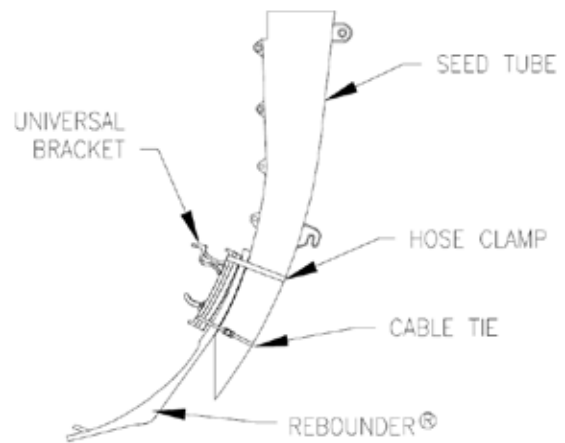


FIGURE 1B

The Universal Bracket may be used with the Furrow Conditioner® or Rebounder®.

1. Remove the seed box.
2. Disconnect the seed monitor sensor cable.
3. Remove the seed tube.
4. Install the Universal Bracket on Furrow Conditioner® or Rebounder® and on the seed tube using hose clamp and cable ties where shown. Install the Rebounder® according to its instructions.
5. Re-assemble the seed tube in the planter.

NOTE: Install the Universal Bracket directly to the seed tube if the Furrow Conditioner® or Rebounder® are not used.

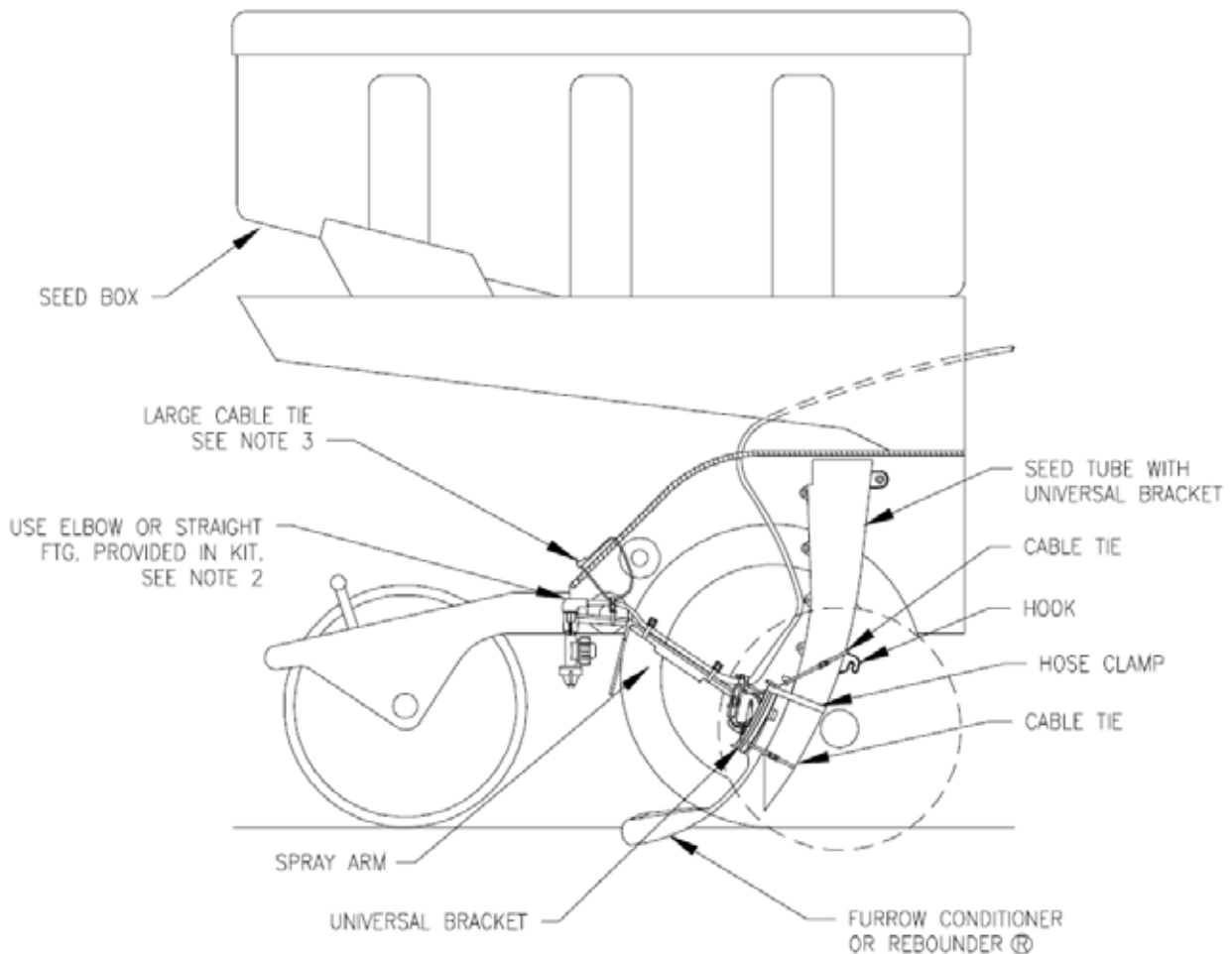


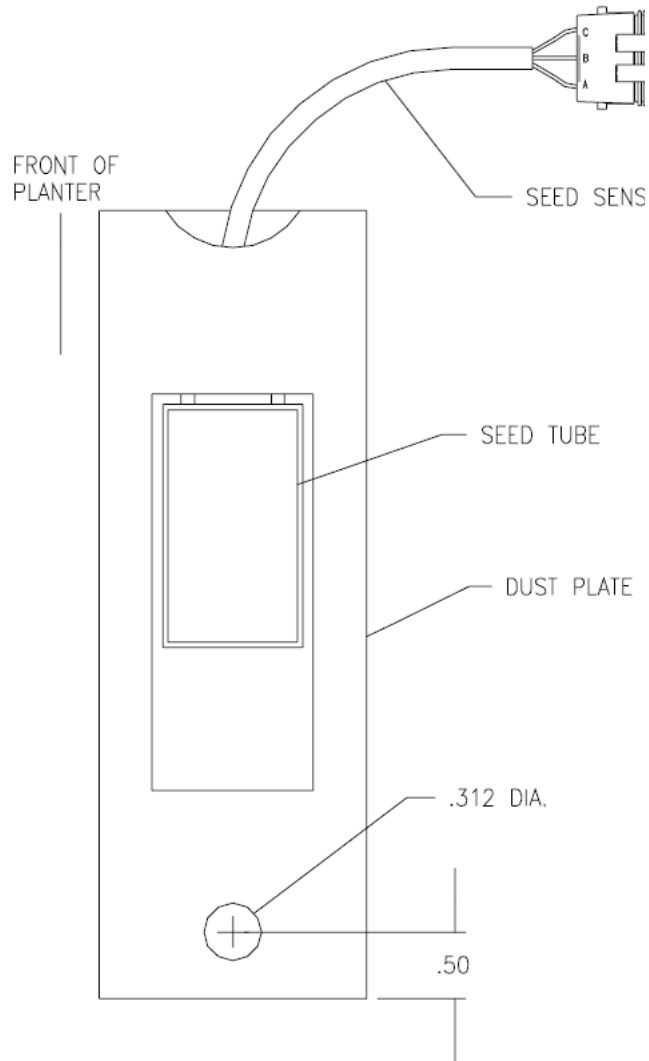
FIGURE 2

INSTALLATION OF THE SPRAY ARM TO THE UNIVERSAL BRACKET

1. Assemble the spray arm to the universal bracket by inserting the spray arm into the lower part of the universal bracket. Push up on the spray arm until the assembly snaps and locks into place.
2. Assemble nozzle and fittings as shown. An elbow and a straight fitting are provided to connect the 1/4" tubing to the spray arm.
3. Secure 1/4" tubing with cable ties.
4. The large cable tie may be used to further secure the spray arm and to adjust nozzle height.

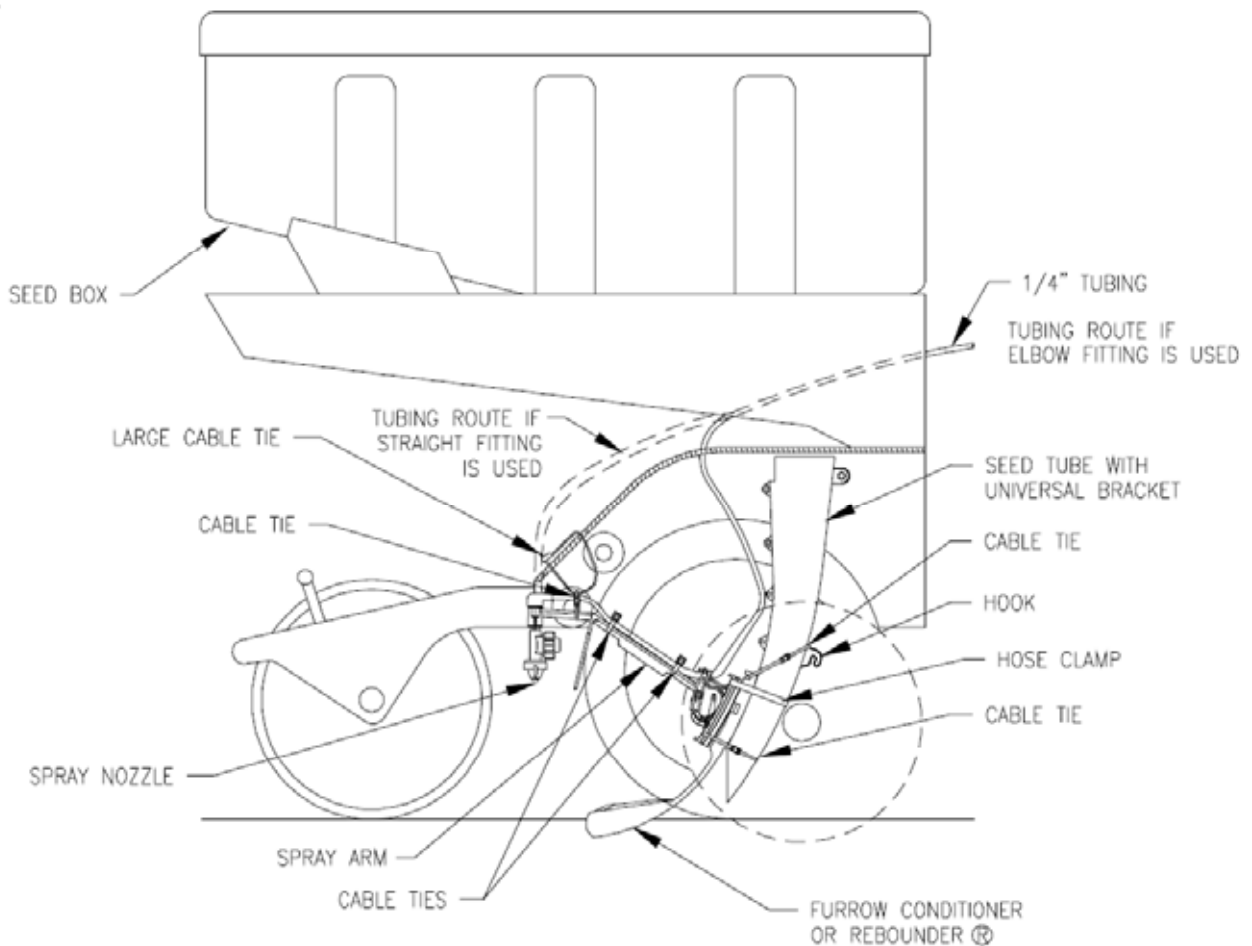
IMPORTANT REMINDER:

VERIFY SPRAY ARM AND UNIVERSAL BRACKET ARE SECURELY ENGAGED.



CABLE ROUTING:

It may be desirable to drill a .312 dia. hole in the area where the seed meter and seed tube meet. See diagram. This hole will be used to route the 1/4" tube from the nozzle to the flow divider on the planter bar. The exact location may differ depending on planter make and model.



INSTALLATION OF NOZZLE

1. Assemble the nozzle to the spray arm. Use pipe sealant or teflon tape to seal threads.
2. Connect the 1/4" x 10' long tube to the elbow above the nozzle. Secure tube to spray arm.
3. Use a small cable tie to make a loop around the spray arm and just ahead of the nozzle.
4. Thread a large cable tie in from the rear of the planter. This cable tie will go through the hole provided for dry insecticide.
5. Next, run the large cable tie through the cable tie looped around the spray arm, then back up and around the back side of the hole.
6. The large cable tie may be used to set the nozzle height.
7. Route the 1/4" tube as shown (Ref. Figures 3 and 4). Secure tube with cable ties. Be careful so tube does not rub on rotating parts or get damaged when planter is folded or unfolded.

INSTALLATION OF SPRAY ARM WITH KEETON LOW PROFILE FIRMER

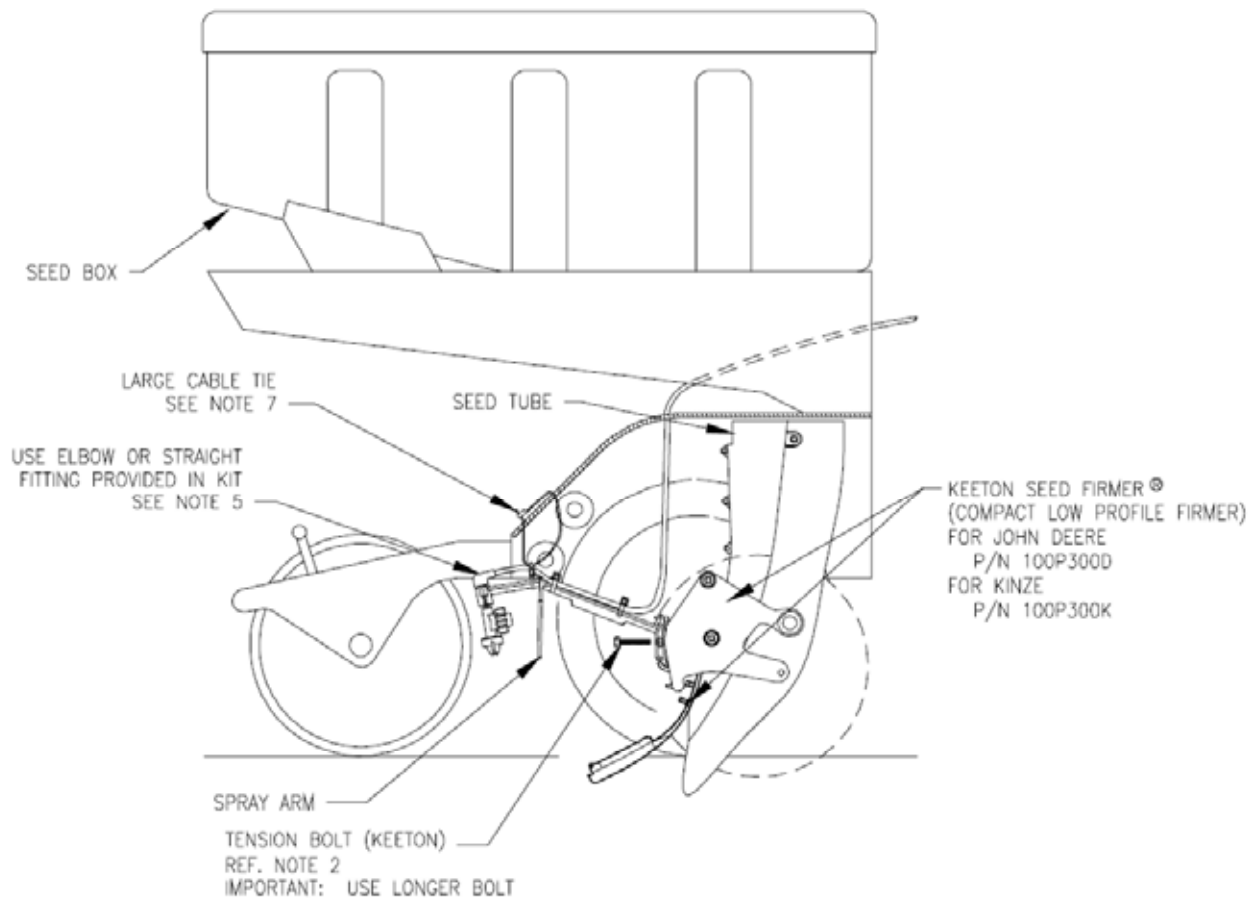


FIGURE 5

1. **IMPORTANT:** The spray arm is intended for use with Keeton® Compact Low Profile Firmers. Reference above for Keeton part numbers.
2. Install the Keeton Firmer® according to Keeton instructions.
3. To attach the spray arm, remove the tension bolt. Slide the spray arm on to the Keeton bracket as shown. (universal bracket will not be used)
4. Re-install the tension bolt to secure the spray arm to the Keeton bracket.
5. Assemble the nozzle and fittings as shown. An elbow and a straight fitting are provided to connect the 1/4" tubing to the spray arm.
6. Secure the 1/4" tubing with cable ties.
7. The large cable tie may be used to further secure the spray arm and to adjust nozzle height.

APPENDIX 6

INSTALLATION INSTRUCTIONS SPRAY ARM - FURROW CONDITIONER WHITE PLANTERS (REF. FIGURES 6 THRU 10)

INSTALLATION OF UNIVERSAL BRACKET

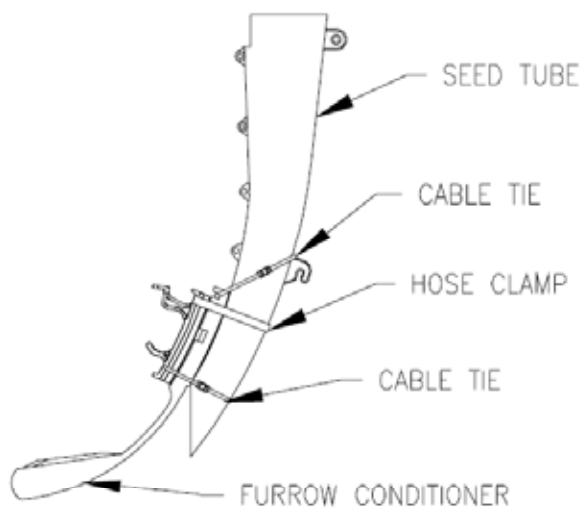


FIGURE 6A

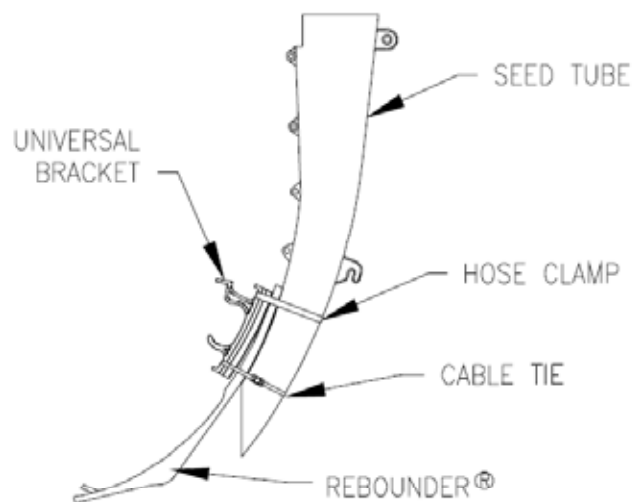
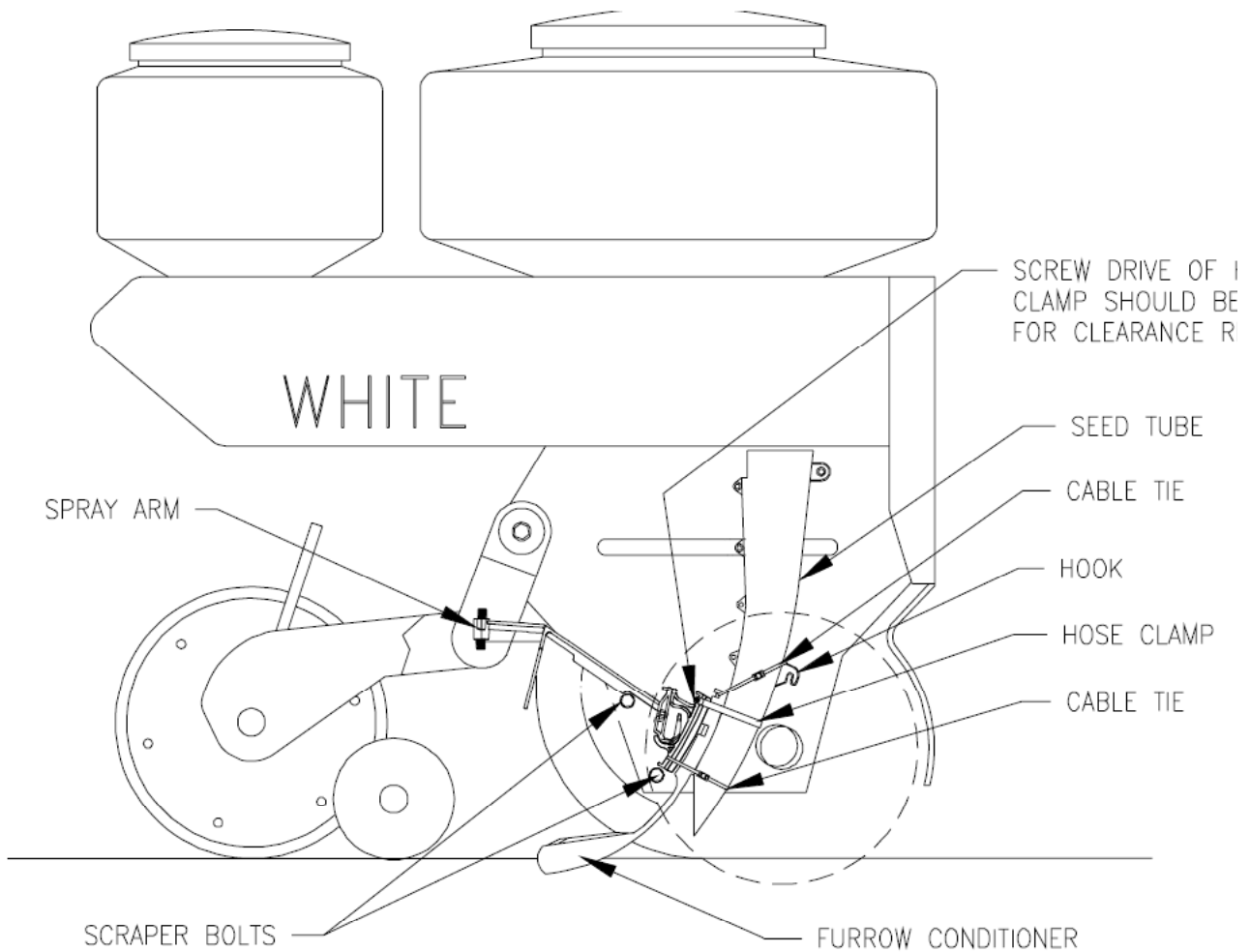


FIGURE 6B

The Universal Bracket may be used with the Furrow Conditioner® or Rebounder®.

1. Remove the seed box.
2. Disconnect the seed monitor sensor cable.
3. Remove the seed tube.
4. Install the Universal Bracket on Furrow Conditioner® or Rebounder® and on the seed tube using hose clamp and cable ties where shown. Install the Rebounder® according to its instructions.
5. Re-assemble the seed tube in the planter.

NOTE: Install the Universal Bracket directly to the seed tube if the Furrow Conditioner® or Rebounder® are not used.



INSTALLATION OF SPRAY ARM AND FURROW CONDITIONER TO THE SEED TUBE

If desired, the spray arm may be used with out the furrow conditioner.

1. Remove the seed box.
2. Disconnect the seed monitor sensor cable.
3. Remove the seed tube.
4. Remove any dirt in the area where the seed tube normally rests to avoid problems when seed tube is reinstalled.
5. Cut Stop of Furrow Conditioner off so spray arm can slide higher on conditioner. This is required to clear scraper bolts.



6. Attach the furrow conditioner and spray arm to the seed tube using the hose clamp. Note the position of the screw drive of the hose clamp.
7. Secure the spray arm with a small cable tie over the "hook" on the seed tube. Secure the bottom of the spray arm with another small cable tie.
IMPORTANT! Prevent dirt from entering fittings during installation. Cover fittings with tape to avoid plugged nozzles.

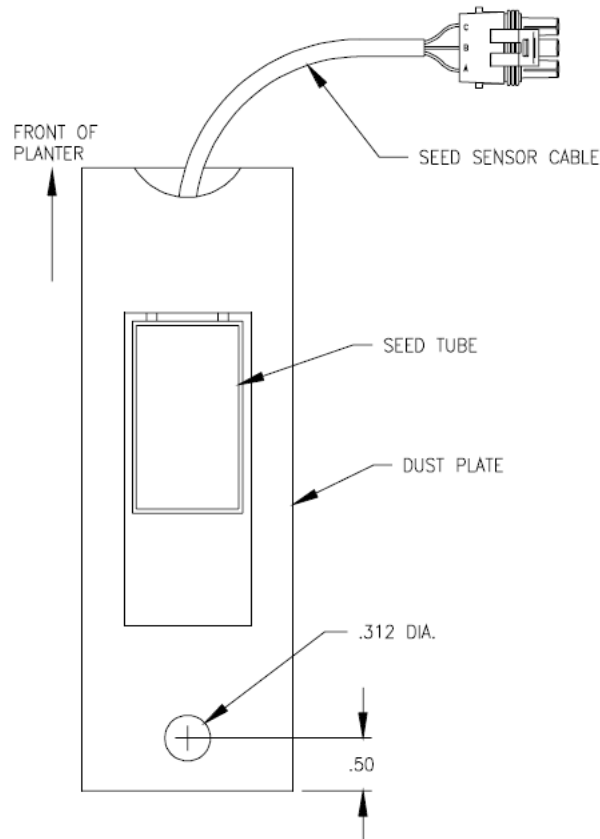
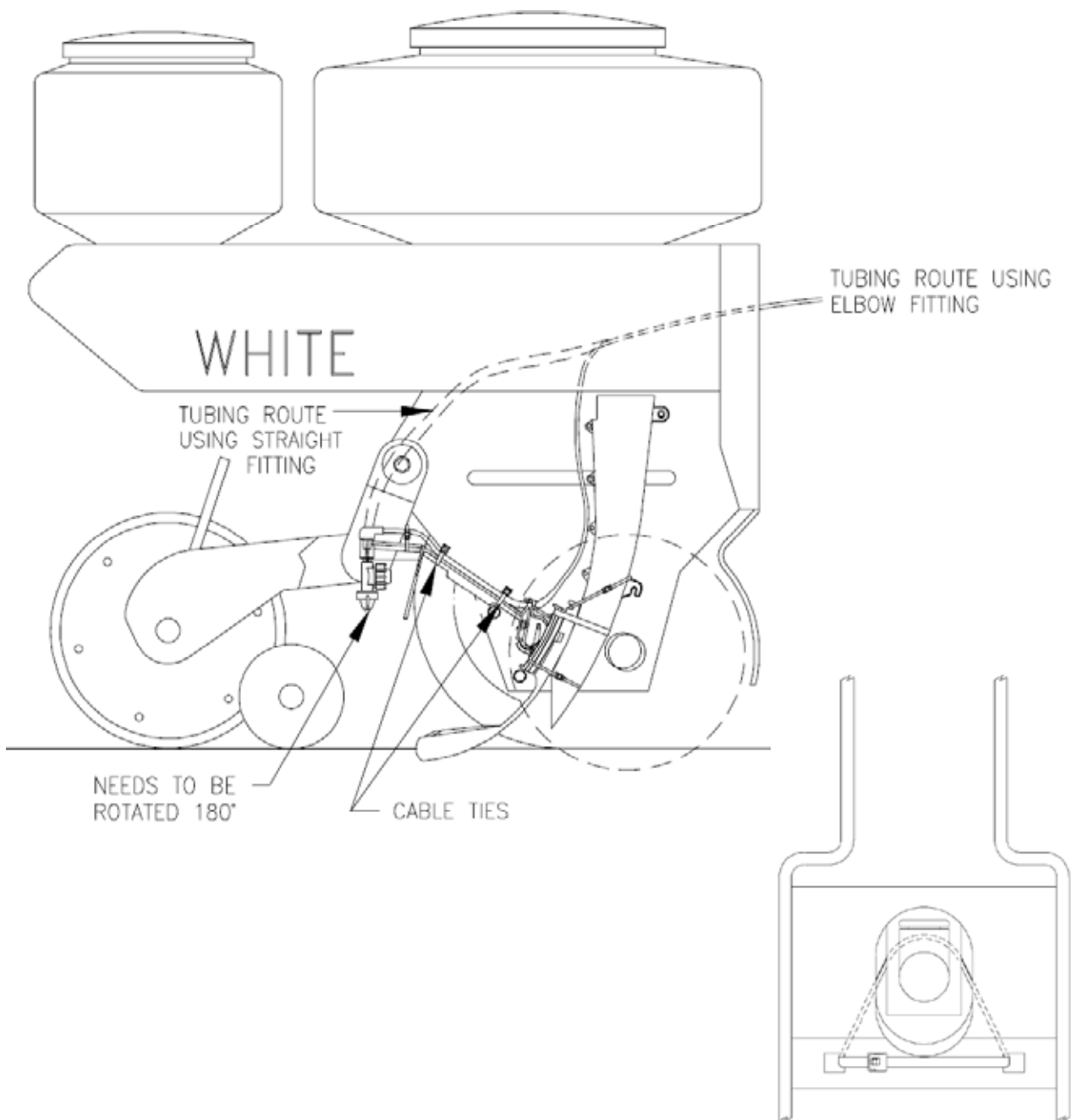


FIGURE 9

TOP VIEW
 PLANTER ROW UNIT W/ SEED BOX
 AND SEED METER REMOVED.

CABLE ROUTING:

It may be desirable to drill a .312 dia. hole in the area where the seed meter and seed tube meet. See diagram. This hole will be used to route the 1/4" tube from the nozzle to the flow divider on the planter bar. The exact location may differ depending on planter make and model.

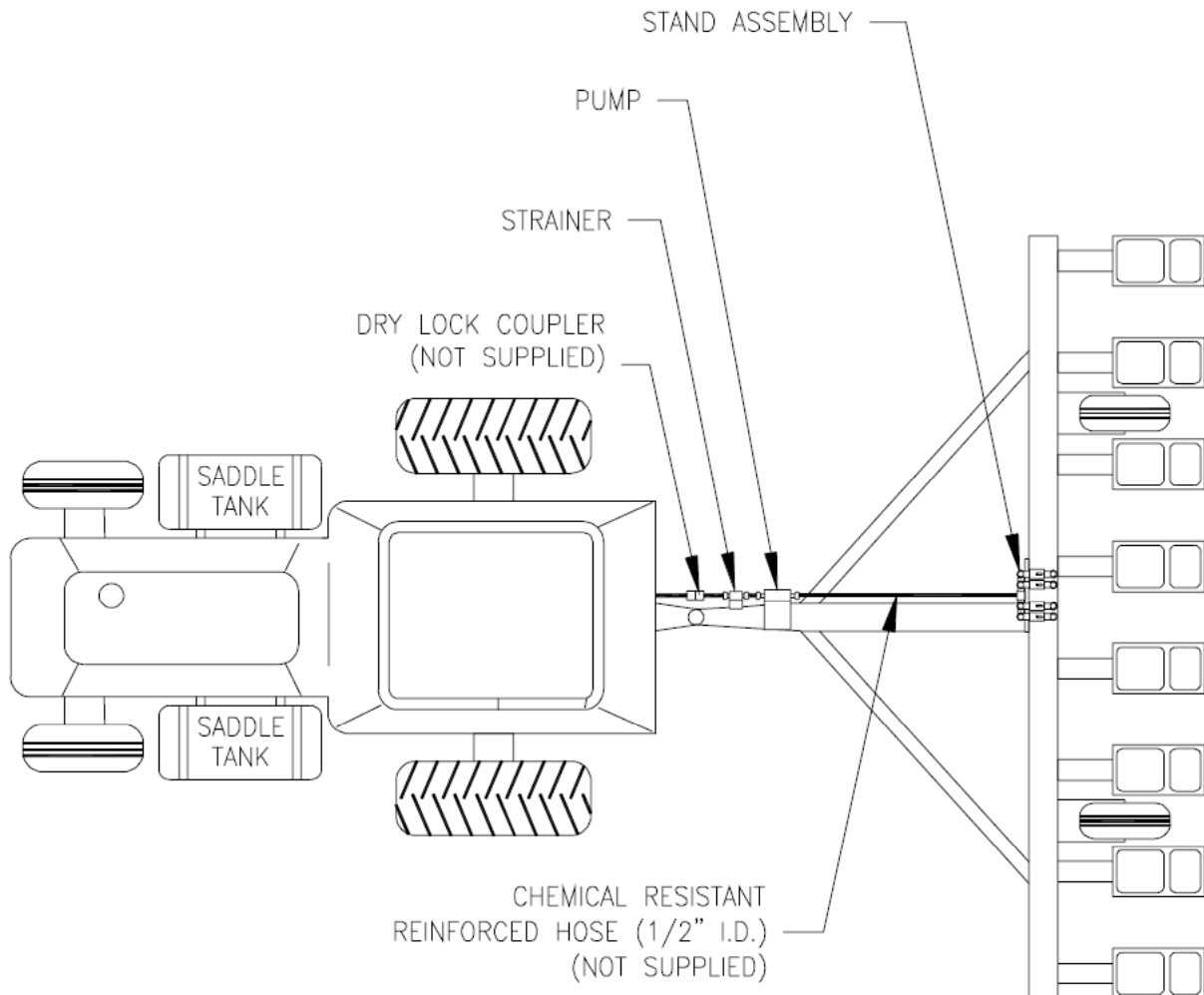


INSTALLATION OF NOZZLE

1. Assemble a 90 degree elbow or straight fitting (1/8 NPT x 1/4" push-in) to the top of the spray arm. Use teflon tape or pipe sealant on threads. Assemble the nozzle to the spray arm. Use teflon tape or pipe sealant on threads.
2. Connect the 1/4" x 10' long tube to the elbow installed in step 1. Secure the tube to the spray arm.
3. Use a small cable tie to pull the spray arm up and secure to planter frame. Ref. Figure 9B. The nozzle should be just under the hole provided for the dry insecticide tube.
4. Route the 1/4" tube as shown. Ref. Figure 9 & 10. Secure tube with cable ties. Be careful so tube does not rub on rotating parts or get damaged when planter is folded or unfolded.

APPENDIX 7

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.