



Introduction

CONGRATULATIONS! By purchasing the SmartBox[®] system, you have obtained the world's first variable-rate, speed-compensated and totally enclosed system for the application of low-rate granular insecticides. The SmartBox[®] system was created to allow granular insecticides to be applied accurately, efficiently and safely to your crops

The information presented in this Parts & Operator's Manual will introduce you to the components of the SmartBox[®] system; provide step-by-step instructions on how to install the system on your planter, and lead you through the programming and operation steps required to obtain the most accurate application and record keeping possible. Please read all of the information in Section A before proceeding to Sections B, C, D and E. Section A will tell you the tools needed for installation and operation, as well as give you helpful hints to make installing the system as effortless as possible.

From all of the employees at AMVAC Chemical Corporation who have worked to offer you the SmartBox[®] system, we are confident that you will enjoy the many benefits of our product. Should you have any questions or comments, please feel free to contact your local AMVAC sales representative or call our Customer Service Center at 1-888-SMARTBOX (1-888-762-7826). You may also write to us at the following address:

AMVAC Chemical Corporation
Attn: SmartBox[®] Customer Service
2110 Davie Avenue
Commerce, CA 90040
www.amvac-chemical.com or www.amvacSmartBox.com

SmartBox[®] is a registered trademark of AMVAC Chemical Corp.

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CHEMICAL CORPORATION

SmartBox® System Operator's Manual

NOTICE — SAFETY PRECAUTIONS

Persons using a SmartBox® system to apply granular insecticides are responsible for obtaining, reading, and following all safety recommendations as stated on the manufacturer's product label. Read and follow all use directions and precautions specified on the product label(s), including, but not limited to, the following sections:

- Emergency Response Telephone Numbers
- Personal Protective Equipment (PPE)
- User Safety Requirements
- User Safety Recommendations
- Environmental Hazards
- Directions for Use
- Agricultural Use Requirements
- Storage and Disposal

In addition, all SmartBox® system maintenance must be performed in compliance with product safety precautions as stated on the product label. If you have questions regarding any of the use directions and precautions specified on the product label, or require additional information, contact your local AMVAC sales representative or call 1-888-462-6822. You may also visit the AMVAC Chemical Corporation website at www.amvac-chemical.com for access to product labels and other information.

NOTICE — WARRANTY

All parts and assemblies supplied with the SmartBox® application system are intended for use only with this system and only with the insecticide products licensed for application using this system. Any usage of the SmartBox® system which is inconsistent with the intended usage will result in the following actions:

- The entire warranty for the SmartBox® system will be voided immediately.
- User will be in violation of U.S. Patent laws and will be prosecuted to the fullest extent of the law.

System Overview

System Description:

The SmartBox® System is a closed transfer and application system which uses electronically controlled metering technology to accurately and safely apply low-rate granular insecticides. The system features a controller which can store and record the necessary information required by the Environmental Protection Agency (EPA) for record keeping.

The controller can easily download the stored information to a personal computer at the user's convenience. Information can be transferred to a Windows based personal computer using a USB flash drive. A Windows based record keeping software program is also included with the system.

An added feature of the SmartBox® System is the ability to enter controller information and function into the supplied AMVAC SmartBox® system manager software and transfer to the controller using a USB flash drive for easier set up.

The SmartBox® System provides the operator with on-the-go flexibility to monitor and change various operation parameters or set the system and allow it to run automatically. The controller, which mounts inside the tractor cab, enables the user to quickly change the chemical application rate or shut off flow to one, all, or any combination of planter rows.

Input from a lift switch mounted on the planter will shut the system off when the planter is raised. Audio and visual alarms on the controller alert the user of a possible plugged row tube, non-flowing meter, or an empty chemical box.

The accuracy of the SmartBox® system is elevated if true ground speed is measured using radar, GPS, or another true wheel speed measurement device. With accurate speed input and proper calibration, the meters will automatically compensate for variations in planter speed to keep the chemical application rate accurate. If true ground speed is not available, a fixed planting speed can be entered, but application accuracy will depend on how close the actual ground speed matches the fixed speed entered in the controller.

The SmartBox® System requires an activation code for use. Users are required to register and activate their SmartBox® System annually. Upon registration the user will

receive any updated software that has been released. Updates can be easily installed on your SmartBox[®] controller using a USB flash drive.

The SmartBox[®] System can be registered by going to www.AMVACsmartbox.com.

AMVAC SmartBox[®] Home Web Page



What's Included:

The AMVAC SmartBox® System consists of the components listed below. All components will be received in the quantities required for your planter according to the manufacturer, row count, planter fold type, and row mounting bracket style (if required).

Controller: The controller is the central control of the SmartBox® System. It is installed in the tractor cab and connects to the 12-volt power port located in the tractor cab. A mounting bracket and hardware is included.

Power Distribution Box: The power distribution box controls the communication and regulates the power supply to each meter. It is mounted at the center of the main planter bar near the row units.



Controller



Power Distribution Box

SmartBox® System Manager:

The SmartBox® System Manager software can be used for setting up your controller and storing application information.

The SmartBox System Manager software is a Windows based PC program that is compatible with Windows XP – Service Pack 3, Windows Vista, Windows 7 and Windows 8.



AMVAC SmartBox® Home Web Page

Meter: The meter is attached to the base container and includes both the metering device and a flow sensor. Once the meters are configured, the controller is able to identify the exact meter and row number if a problem occurs. A 30" vinyl braided tube, hose clamp, gasket, and meter screen is also provided with each meter.

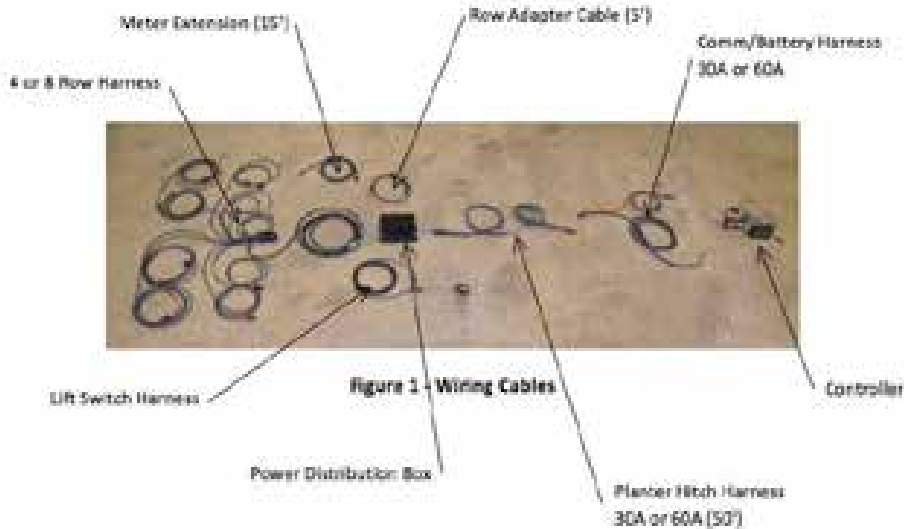


Meter

Wiring Cables: Cables included with the system include: tractor harness, (30 or 60 Amp) planter harness, (30 or 60 Amp), console pigtail harness, row adapter cables, 4-row harness and 8-row harness, and meter extension cable. These cables make electrical and communication connections between the controller and meters.

30 Amp tractor and 30 Amp planter cables are for use on system 23 rows and less.

60 Amp tractor and 60 Amp planter cables are for use on systems 24 rows and greater.



Lift Switch: The mechanical lift switch with cable is used to signal the controller that the planter is either in the raised or lowered position. This input tells the controller when to start and stop the meters to avoid discharge of chemical when the planter is in the up position. The lift switch is connected directly to the power distribution box.



Lift Switch

Base Container: The base container will hold a range of 10 to 12 pounds of chemical. Each base container comes with a rain cover for use when a transfer container is not installed.



Base Container

Universal Mounting Cradle: The universal mounting cradle is designed to fit onto most major planter manufacturers' existing insecticide brackets to hold the base container and meter securely on the row frame. Mounting hardware is included.

If insecticide brackets are not available for your planter model, they can be purchased along with your SmartBox[®] System.



Universal Mounting Cradle

In-furrow tube kits: In-furrow tubes that match your particular planter are included with your SmartBox[®] System.

Attention should be given to planters using seed firmers to verify that the discharge tube does not hit the firmer while the planter is in the down position.

Recommendations on product application, either in-furrow or T-band, must come from your chemical dealer or AMVAC sales representative. Be sure to follow all label requirements for application of insecticide.



In-furrow Tube (John Deere Rear Mt)

What's Not Included:

The following items are not included with the AMVAC SmartBox® System. If any of these items are required for installation and operation of the SmartBox® System, please contact your equipment dealer or the appropriate source shown below to purchase the item(s) separately. These items will not be part of the SmartBox® System shipped to you from AMVAC.

Transfer Container: The transfer containers are available only through a chemical dealer. The transfer containers will be delivered with product loaded and ready for use. With a transfer container locked in place on the base container and the valves opened, product will flow from the transfer container to fill the base container for discharge through the meter. A loaded transfer container can be dispersed into many base containers, so a new transfer container may not be needed every time a base container empties. This feature is handy when finishing a field or at the end of the planting season.

After planting, all empty transfer containers are to be returned to your chemical dealer to be re-filled for next season.

Radar or true wheel speed sensor: Input to the controller from radar or a true wheel sensor is required to get the most accurate chemical application rate. The system is operable in a fixed speed mode, but automatic speed compensation is not available in this mode.

Note: If you are using the automatic speed option (GPS or radar) you must travel faster than 2.2 miles per hour. After you have lowered the planter and the lift switch is activated you will have 5 seconds to reach 2.2 miles per hour. If you do not reach this speed in five seconds your SmartBox® System will shut off. It is suggested if you are traveling slower than two miles per hour that you set the controller to fixed speed and make sure you have the meters calibrated to the appropriate speed.

The SmartBox® controller has a 4-pin radar connector compatible with the connector of many leading radar brands. Other radar and true-wheel sensors (some true wheel speed sensors are not compatible) may be used; if your sensor has a different connector arrangement an adapter will be required and must be purchased separately. Radar signals routed through tractor wiring must match the pin assignments of the controller; some systems have been found to feed voltage to the controller through a signal pin resulting in a “buzzing” of the controller when the controller is shut off. While this arrangement does not damage the controller, the radar signal may not be read correctly. There is a cable available to filter out this voltage feed. Contact your local AMVAC sales representative for further information.

Radar or true wheel speed sensor Y-cable or signal booster: When using radar for more than one monitor (planter monitor and SmartBox®), a Y-cable will be required. If the sensor’s signal is split to several monitors a signal booster may be required. For help with the requirements of your setup, including compatibility of specific true wheel sensors and radar wiring arrangements please contact us at 1-888-SMARTBOX. For technical assistance, we also suggest these sources:

AG-EXPRESS Electronics: Three Locations:

Des Moines, IA = 515-289-2746

Sulphur Springs, IN = 765-533-4809

Grand Island, NE = 308-381-2905

White planter series 6000 & 8000 seal lid kits or seed hopper extension rings: When installing the SmartBox® System on a White series 6000 planter, seal lid kits or hopper extension rings may be required. These planters use seed boxes with lids designed to slide backward over the insecticide hopper for filling. The SmartBox® transfer containers will extend approximately two inches above the seed box lids, preventing the lids from sliding backward. If liquid fertilizer tanks are installed in front of the seed boxes, the tanks may prevent the seed box lids from sliding forward. In this situation, either the seed box lids need to be replaced with hinged lids (White’s seal lid kit), or the seed boxes must be lifted with spacer rings. Contact your local White Equipment Dealer representative for recommendations.



Discharging T-Band kits: If your AMVAC or chemical dealer is recommending T-banding your chemical, contact your local equipment dealer or call:

Banders & Insecticide Systems: Walker, IA = 319-224-3339

Brackets are not provided: When installing the SmartBox® System on a planter which has not previously used insecticide boxes, additional brackets may be required. Bracket options are available on the SmartBox® website (<http://www.AMVACsmartbox.com>) or by calling Willmar Fabrication for bracket details.

Willmar Fabrication, LLC: Willmar, MN = 877-332-2551 (opt. 2).

Willmar Fabrication currently supplies brackets for John Deere, Case IH, and AGCO brand planters. For other manufactures such as Kinze, Great Plains or Monoson planters please contact your equipment dealer for bracket options.

If you have any questions concerning compatibility of the SmartBox® System with your particular planter configuration, you may contact your local AMVAC sales representative or call 1-888-SMARTBOX.

How to Get Started

Tools Required:

The following tools will be required to install your SmartBox® System:

3/8" torque wrenches	3/8" socket set
Small 3/8" sockets set	3/8" ratchet
Pliers	Small combination wrench set
Drill (some cases)	Drill index (some cases)

Additional tools may be required for bracket, lift switch, and controller mounting.

Time Required:

The amount of time required to install your system will depend on your planter design, fold type, and number of rows along with the amount of information you choose to enter into the controller. The following chart presents estimated time requirements.

Number of planter rows:	Hours required
4	4 - 6
8	6 - 8
12	8 - 10
16	10 - 12
24	12 - 14

Planter Wiring Harness Instructions:

Note: See Appendix A in this Section for detailed wiring diagrams on your particular planter.

1. Lay out all 4 and/or 8 Row Wiring Harness to each row starting at one end of the planter and ending at the other end. (see Row Planter Arrangement Diagrams)
2. The row numbers on the 4 or 8 Row Wiring Harness are for manufacturing purposes only and do not reference to a particular row. **Note: Do not connect meters to the 4 or 8 Row Wiring Harness at this time.** You will be prompted to do so during the row configuration process.
3. Start from one side of the planter and connect the adjacent 4 or 8 Row Wiring Harness to each other. Up to 16 individual rows can be connected to one row adaptor cable.
4. Attach the Row Adapter Cable to the 4 or 8 Row Wiring Harness closest to the center of the planter.
5. The Row Adapter Cable will then be plugged into a port on the Power Distribution Box.

Each row adaptor cable can be connected to up to 16 individual rows.

6. Repeat steps 2 - 4 with the remainder of the rows. Do not add the cable ties at this point.
7. In some cases you may need a Meter Cable Extension or a 4 or 8 Row Harness Extension to connect all the Meters to your Harnesses as well as reaching the Power Distribution Box.
8. Stop at this point and start wiring from the tractor back to the Power Distribution Box. Note: You may need to move the Power Distribution Box to accommodate the length of the wiring coming from the tractor.

Tractor and Planter Hitch Wiring Harness Instructions:

1. Start at the tractor-planter hitch point. Lay out the Communication / Battery Harness Assembly and run the battery side of the harness to the battery (see Figure 13 and instructions on page 13) and the communication side of the harness to the cab of the tractor.
2. Connect the battery side of the Wiring Harness directly to the 12-volt or 24 volt battery on the tractor. Do not remove the fuse from the battery cable (see Figure 13). Connect the communication side of the Wiring Harness to the Controller Console Pigtail which will then plug into the controller (see Figure 11).

3. Connect the radar unit (if used) to the round 4-pin connector (see Figure 11 and 12).
4. From the tractor-planter hitch point attach the Planter Hitch Harness to the Communication/Battery Harness. Run the cable to the power distribution box located at the rear of the planter. It is recommended that you follow existing cabling on the planter.
5. Mount the Power Distribution Box to the planter.
6. Mount the Lift Switch as shown in Figure 30 and 31 and connect to the power distribution box.

Installation Suggestions:

1. Place the planter in the planting position.
2. Layout the wiring harness without tying down the cables.
3. Locate ideal places for securing the wire harnesses to the planter. Do not tie down the cables at pinch points; this allows the cable to flex during folding. It is recommended to follow existing electrical and hydraulic lines.
4. When attaching the meter cables to the planter, remember that it may be more advantageous to connect a longer cable to a closer row and a shorter cable to a meter extension cable and then to a row that is further away.
5. It is usually more convenient to lay out the hitch harness along the left side of the planter hitch. This is due to the massive number of hydraulic and electrical cables threaded through the right side of the planter hitch or tongue.
6. Secure the harnesses to the planter using the wire ties included with the system.
7. Carefully fold and unfold the planter and check all pinch points to be sure that the wires stay in place and the connections remain intact.

Installation

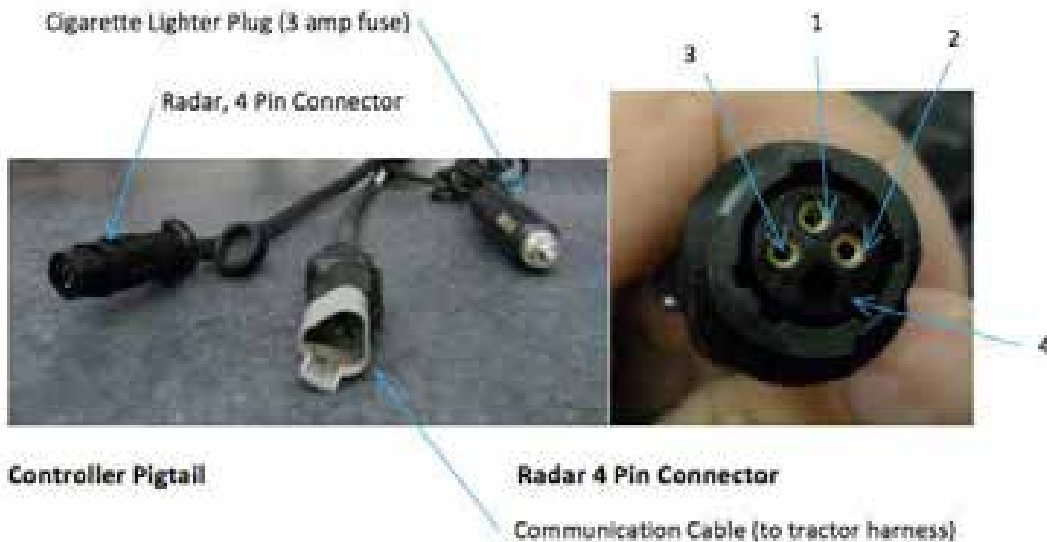
This section will include instructions on installation of the SmartBox® controller system, row units, and wiring cables. Suggested cable routings and lift switch mounting locations will be shown at the end of this section in Appendix A. The order in which you install your system components may vary from the order shown in this manual. These instructions are grouped by system. A general installation sequence is as follows:

1. Remove existing insecticide boxes and chains (if necessary).
2. Install planter brackets (if necessary).
3. Install cradles.
4. Install meters onto base containers.
5. Install base containers in cradles.
6. Install controller in tractor.
7. Install battery cable.
8. Loosely route all wiring and harnesses (do not use cable ties at this point).
9. Install power distribution box and lift switch.
10. Adjust wiring and use ties to secure.

Due to the vast number of planter configurations and continuous introductions of new planter designs, your planter may differ slightly from the figures shown here. If you have questions concerning installation of the SmartBox® System on your planter, please contact your AMVAC representative or call 1-888-SMARTBOX.

Controller System:

The front and back of the SmartBox[®] controller are shown in the figures below. The controller should be installed inside the tractor cab (or mounted on the tractor if there is no cab) in a position where the user can easily see the screen during operation and where there is no possibility of the controller being damaged. Sufficient room must be provided behind the controller to connect the necessary cables.



Radar Pin Assignments

1 - Ground 2 - Signal 3 - + 12 Volt 4 - Empty

WARNING!

- The power cable (cigarette lighter) plug going to the controller contains a 3 Amp fuse. Removing the fuse may damage the controller and void warranty.
- Secure tractor and all machinery from sudden or unwanted movement when working on or near it. Remove key from the tractor ignition to prevent unwanted starting.

Suggestion:

Before mounting the controller, estimate the length of cable required to run between the controller and the connecting wiring harness. Each SmartBox® System includes a Controller Pigtail Harness and either a 30 or 60 Amp Tractor/Battery Harness. Plan your controller and Communication/Battery wiring harness locations; this will help eliminate the need to purchase extra battery extensions. If extra battery extensions are needed, they can be purchased through your local equipment dealer.

1. Secure the controller mounting bracket to the tractor using the three screws provided.
2. Use the two controller knobs to secure the controller to the mounting bracket.
3. Connect the controller's cigarette lighter to cigarette plug.
4. Connect the Communication Cable to the Communication/Battery harness.

You must connect the battery cable terminals directly to a 12-volt or 24-volt battery with the red wire to the positive and black wire to the negative. Do not connect the battery cable to a cab power strip.

If the tractor is powered by two 6-volt batteries instead of one 12-volt battery, the terminals must be connected at a location where a 12-volt supply is available. A minimum of 12 volts is required for the system to operate properly.

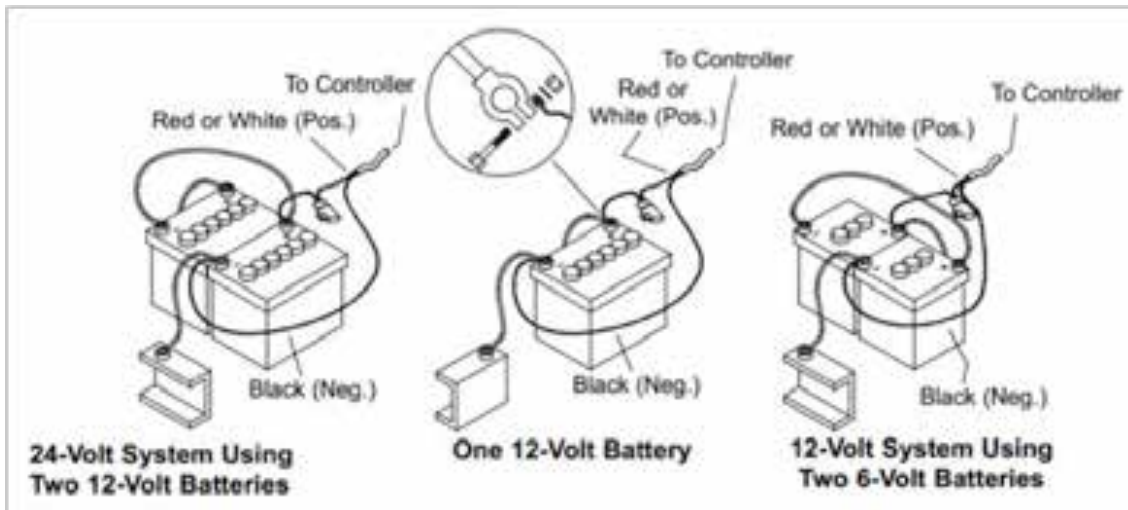


Figure 2 - Battery Examples

Your SmartBox® System is fused in two different places.

1. Controller Console Pigtail (cigarette lighter) = 3 Amp fuse
2. Communication / Battery Harness (battery cable)
 - a. 23 Rows or Meters and below 30A = 25 Amp fuse
 - b. 24 Rows or Meters and above 60A = 60 Amp fuse

Attach the power cable directly to the battery. Connect the fused side of the power cable to the positive post of the battery. Warning: Do not remove the fuse while connecting to the battery.

Once the cables are routed and a speed sensor (if used) has been installed, connect the Communication/Battery and speed sensor cable to the controller. If the speed sensor's connector is not compatible with the controller's 4-pin radar connector, then an adapter must be obtained by the user.

The USB port on the controller will not be used during planting.

This port is provided for:

1. Registering your System and transferring your access code.
2. Updating your controller with chemical and software updates.
3. Transferring data from the controller to a personal computer.

Row Units:

The SmartBox[®] row unit is made up of a **cradle, base container with rain cover, meter with discharge tube, and transfer container**. Note: The transfer container is shipped from your insecticide supplier and is not part of the SmartBox[®] System shipped to mount to your planter.

Cradle installation will differ according to the make and model of the planter. Existing insecticide hoppers and drive chains should be removed prior to installation of the SmartBox[®] cradles.

Cradle Installation Overview:

General precautions for all major planter makes and models are as follows:

1. Use hardened steel for mounting pins.
2. Do not over-tighten. Doing so will cause the cradle sides to bend inward.
3. Check for clearance between hoppers on interplant, vertical, and stack fold planters. Insecticide transfer containers may need to be removed to fold these planters.
4. For additional cradle installation instructions: refer to installation videos at www.AMVACsmartbox.com.

Cradle Installation: John Deere Planter Series 7000 and 7100 (Max-Emerge®)

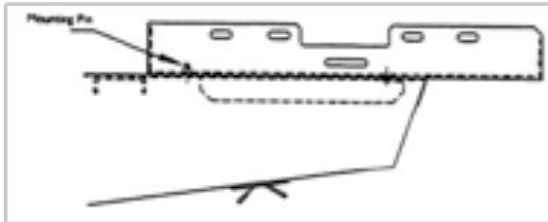


Figure 3a

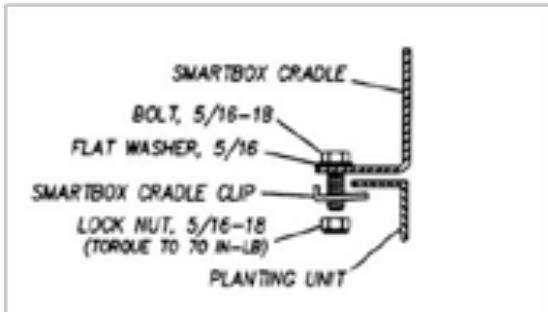


Figure 3b

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient the SmartBox® cradle (see figure 3a).
3. Position cradle so that legs of cradle slide back into rear cross brace of row unit frame.
4. Position cradle so that vertical posts on row unit frame comes through slots in cradle.
5. Place existing cotter pins through hole in frame posts to lock cradle in place.
6. If cotter pins do not hold cradle securely in place, use SmartBox® cradle clips as a spacer between the frame and pins; or secure the cradle to the frame using the SmartBox® cradle clips and fasteners (see figure 3b).

Cradle Installation: John Deere Planter Series 1700, 7200, and 7300 (Max-Emerge[®] 2, Plus, Pro, XP, XP Pro)

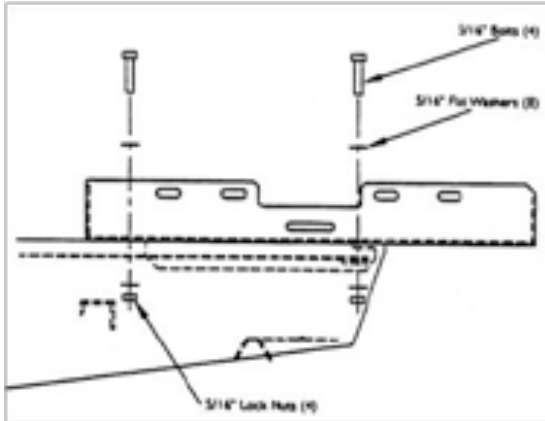


Figure 4a

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient SmartBox[®] cradle as shown (see figure 4a, b, and c).
3. Place the 5/16" x 1-1/2" bolt with washer through the rear hole in the cradle in line with the rear hole in the row unit frame (as shown), lightly secure with washer and nut.
4. Place the 5/16" x 1-1/2" bolt with washer through the cross frame (as shown) and lightly secure with washer and lock nut.
5. Center cradle in relation to planter frame and tighten all bolts securely.



Figure 4b and 4c

Cradle Installation: Kinze and Buffalo Planters

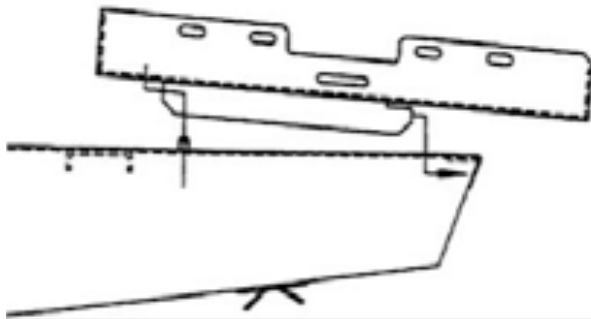


Figure 5a



Figure 5b

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient SmartBox[®] cradle as shown (see figure 5a).
3. Position cradle so that legs of cradle slide back into rear cross brace of row unit frame.
4. Position cradle so that vertical posts on row unit frame come through slots in cradle.
5. Place existing cotter pins through hole in frame posts to lock cradle in place.
6. If cotter pins do not hold cradle securely in place, use SmartBox[®] cradle clips as a spacer between the frame and pins; or secure the cradle to the frame and pins; or secure the cradle to the frame using the SmartBox[®] cradle clips and fasteners as shown (see figure 5b).

Cradle Installation: Great Plains Planters

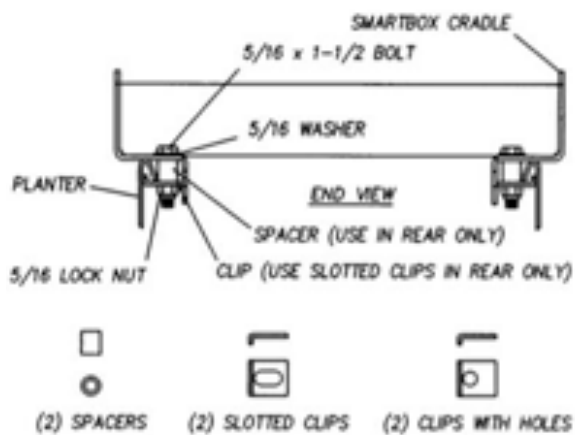


Figure 6

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient SmartBox[®] cradle as shown (see Figure 6).
3. Place 5/16" x 1-1/2" bolt with washer through rear hole of the cradle down through spacer and slotted mounting clip (oriented as shown to catch underside of planter frame) and secure with lock nut.
4. Place 5/16" x 1-1/2" bolt with washer through slotted hole of the cradle mounting clip (oriented as shown to catch underside of planter frame) and secure with lock nut.

Cradle Installation: Case IH Planter Models 800 – 950 and White Series 5000

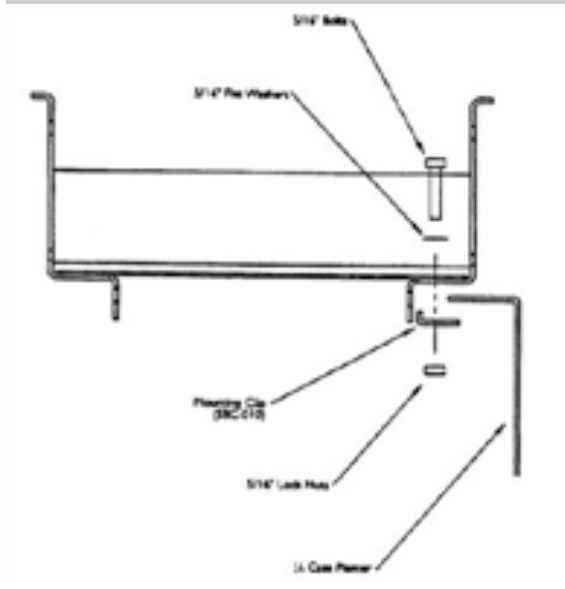


Figure 7

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient SmartBox[®] cradle as shown (see Figure 7).
3. Place 5/16" x 3/4" bolt with washer through cross slot in cradle, through hole in row unit frame and secure with lock nut.
4. Using SmartBox[®] cradle mounting clips to secure rear of cradle, orient clips underneath planter row unit frame so short bend is facing toward center and upward (as shown).
5. Place 5/16" x 3/4" bolt with washer through rear hole of cradle down through planter row unit frame and SmartBox[®] cradle mounting clip and secure with lock nut.

Cradle Installation: Case IH Planter Model 1200

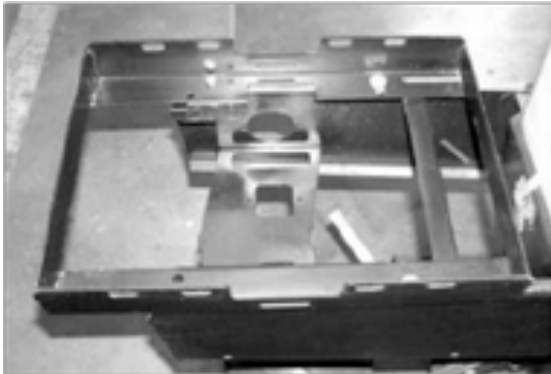


Figure 8

1. Remove existing insecticide hoppers and drive mechanisms.
2. Orient SmartBox[®] cradle as shown (see Figure 8).
3. Place 5/16" x 3/4" bolt with washer through cross slot in cradle, through hole in row unit frame and secure with lock nut.
4. Using SmartBox[®] cradle mounting clips to secure rear of cradle, orient clips underneath planter row unit frame so short bend is facing toward center and upward (as shown).
5. Place 5/16" x 3/4" bolt with washer through rear hole of cradle down through planter row unit frame and SmartBox[®] cradle mounting clip and secure with lock nut.

Cradle Installation: White Planter Series 6000

For White Planter Series 8000 planters contact 1-888-SMARTBOX for instructions.

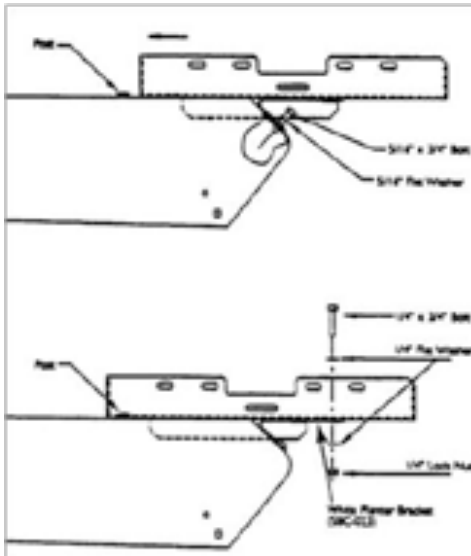


Figure 9

1. Position seed hoppers so that lids slide toward front of planter (SmartBox[®] transfer containers will interfere with lids sliding toward rear of planter).
2. Remove existing insecticide hoppers and drive mechanisms.
3. Orient SmartBox[®] cradle as shown (see Figure 9).
4. Attach White planter brackets to rear of row unit frame (as shown) using 5/16" x 3/4" bolt with washer.
5. Position cradle so that open-ended slot of cradle slides forward underneath head of row unit frame post.
6. Secure cradle to White planter bracket using double holes on both sides at rear of cradle using 1/4" x 3/4" bolt and washer with lock nuts.

Meter, Base Container, and Cradle Installation: For easier installation, mount the meter to the base container before installing the base container in the cradle. **Note:** These instructions are for initial meter installation. For meter replacement, see instructions in Section D of this manual. Always use a new meter gasket when installing or replacing the SmartBox® meter.

Meter to Base Container:

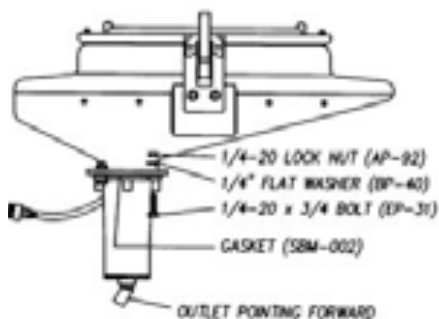


Figure 10

1. Position the meter with the 45° meter discharge opening facing toward the planter row in which the chemical will flow to. (Rear mounted systems will have the meter facing forward toward the tractor.) See your bracket information for the orientation of the meter for front mount systems and ladder mount rows.
2. Ensure the gasket and meter screen are properly installed on the meter. **NOTE: Always use a new gasket when replacing a meter.**
3. Place the 1/4" x 1" bolts up through the meter, base container flange, and washer. Lightly secure with the lock nuts (see Figure 10).
4. Tighten all bolts securely. Torque all bolts to 25 – 30 in-lbs. **NOTE: Do not over-tighten or under-tighten bolts; meter-to-base gasket must be compressed 60% -75% for proper sealing. Over-tightening can cause the meter-to-base gasket to tear.**
5. Once the meter has been secured to the base container apply a thin layer of silicone caulk to the outside edge of the gasket seal.

Base Container to Cradle:

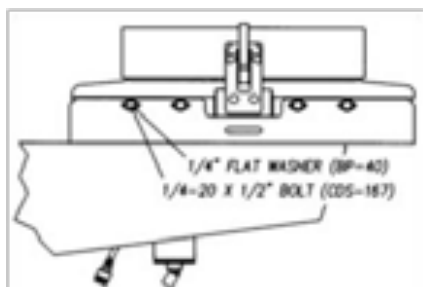
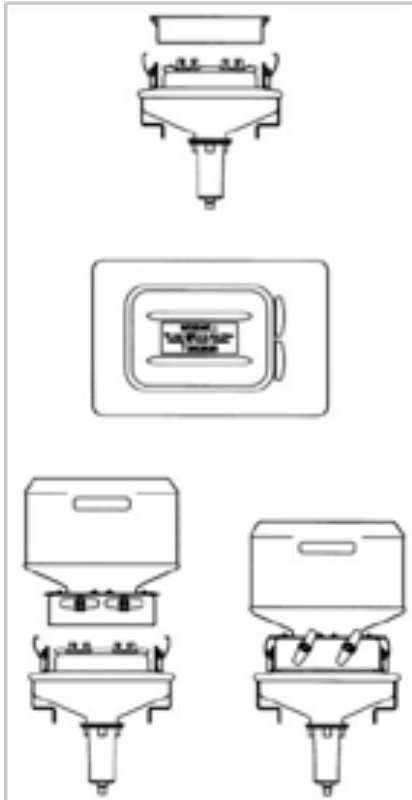


Figure 11

1. For rear mounting orient the base container into the cradle (see Figure 11). (The base container can be mounted in the cradle facing forward or backward. See your bracket information when additional brackets are used.)
2. Loosely secure the base container to the cradle using the 1/4" x 1/2" bolts with washers. Tighten all bolts securely. **Note: Do not over-tighten or under-tighten bolts: Torque all bolts to 25-30 in-lbs.**

Installation of Transfer Container to Base Container:



1. Remove rain cover from base container (see Figure 12). Store rain cover for use when transfer container is not installed on base container.
2. **Apply a light dusting of baby powder/talc on the base container seal prior to seating transfer container. This step is necessary to avoid damage to the seals during removal of transfer container. Do not use a petroleum based silicon spray or graphite to lubricate the seals.**
3. Remove the transfer container valve cover. Store cover for use when returning transfer container back to chemical dealer.
4. Orient the transfer container so that the valve handles face away from the planter seed hopper.
5. Lower the transfer container so each valve is fully inserted into the mating base container valve. If valves are not fully seated, they will not open to release product to the base container.
6. Clamp transfer container to base container. You may need to rock the container from side to side to make sure that clamps are secure. If the transfer container is not clamped securely, the clamps may be made more secure by increasing the bend in the clamp arm which hooks onto the transfer container. Insert the locking clips through the clamps to further secure the transfer containers.
7. Turn valves counter-clockwise 60° to open transfer container. If valve does not open smoothly, then the valve is not seated properly; unclamp container and repeat steps 4 -6 above.

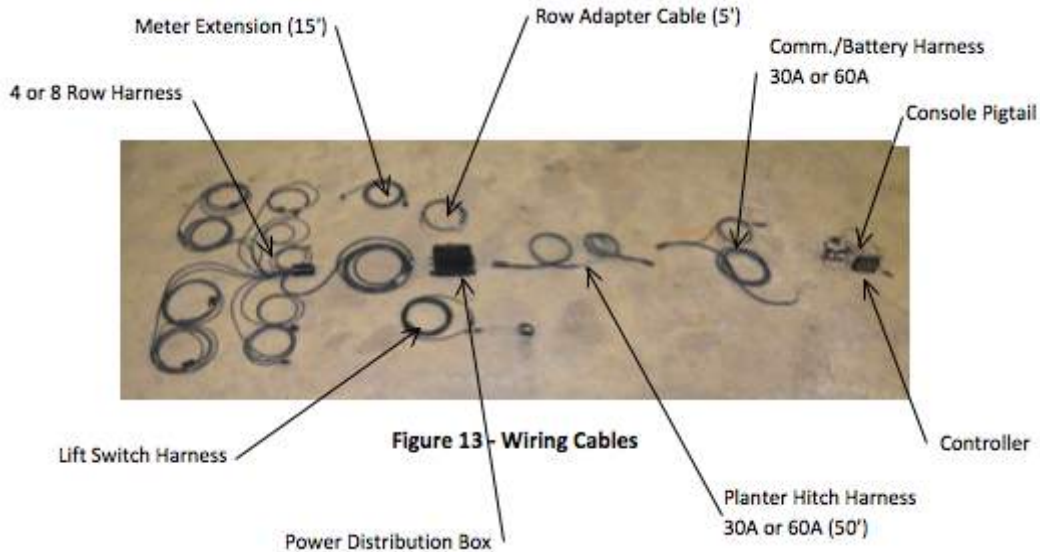


Transfer Container
and Base



Wiring Cables and Harnesses:

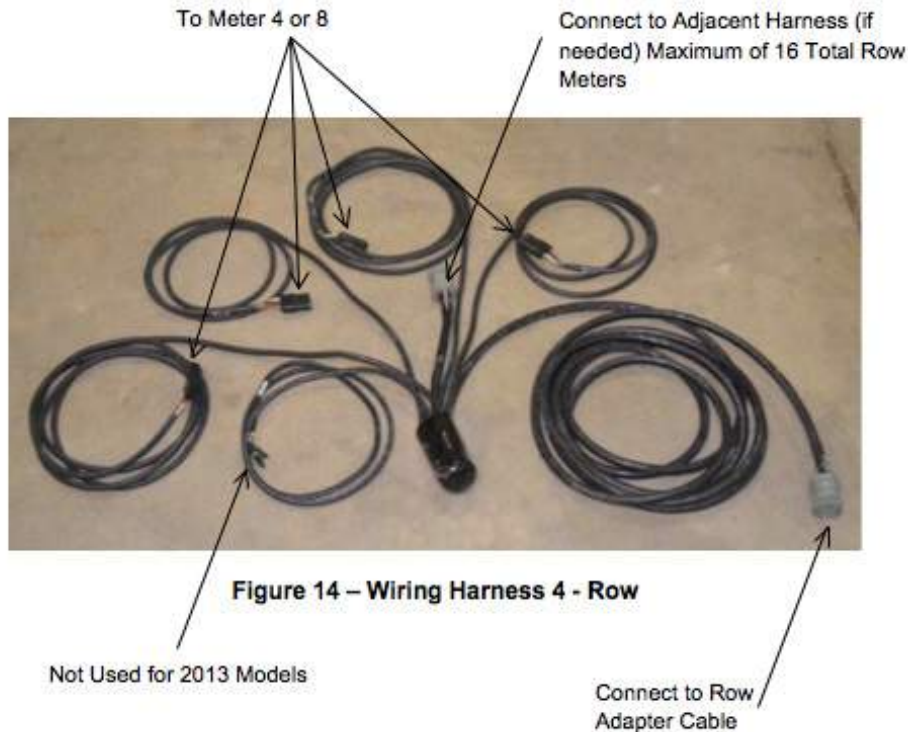
Cable routings and extensions requirements vary depending on planter manufacturer, fold style, and number of planter rows. All cables must be routed and secured to the planter in such a way to eliminate damage during folding or planting. Damage resulting from improper installation will not be covered by the AMVAC Chemical Corporation warranty.



The SmartBox® System includes the following cables (quantities supplied depend on the planter design):

- Lift Switch Kit with cable**
- Harness; Wiring, 8 – Row**
- Harness; Wiring, 4 – Row**
- Cable; Meter, 15' Ext.**
- Harness; Controller Console Pigtail**
- Harness; Comm./ Battery (30 or 60 Amp)**
- Harness; Planter Hitch (50') (30 or 60 Amp)**
- Harness; Row Adapter Cable (5')**

Wiring harness connections are as shown in the next figures and diagrams. Suggested routings of wiring harnesses are shown in the specific planter arrangement drawings.



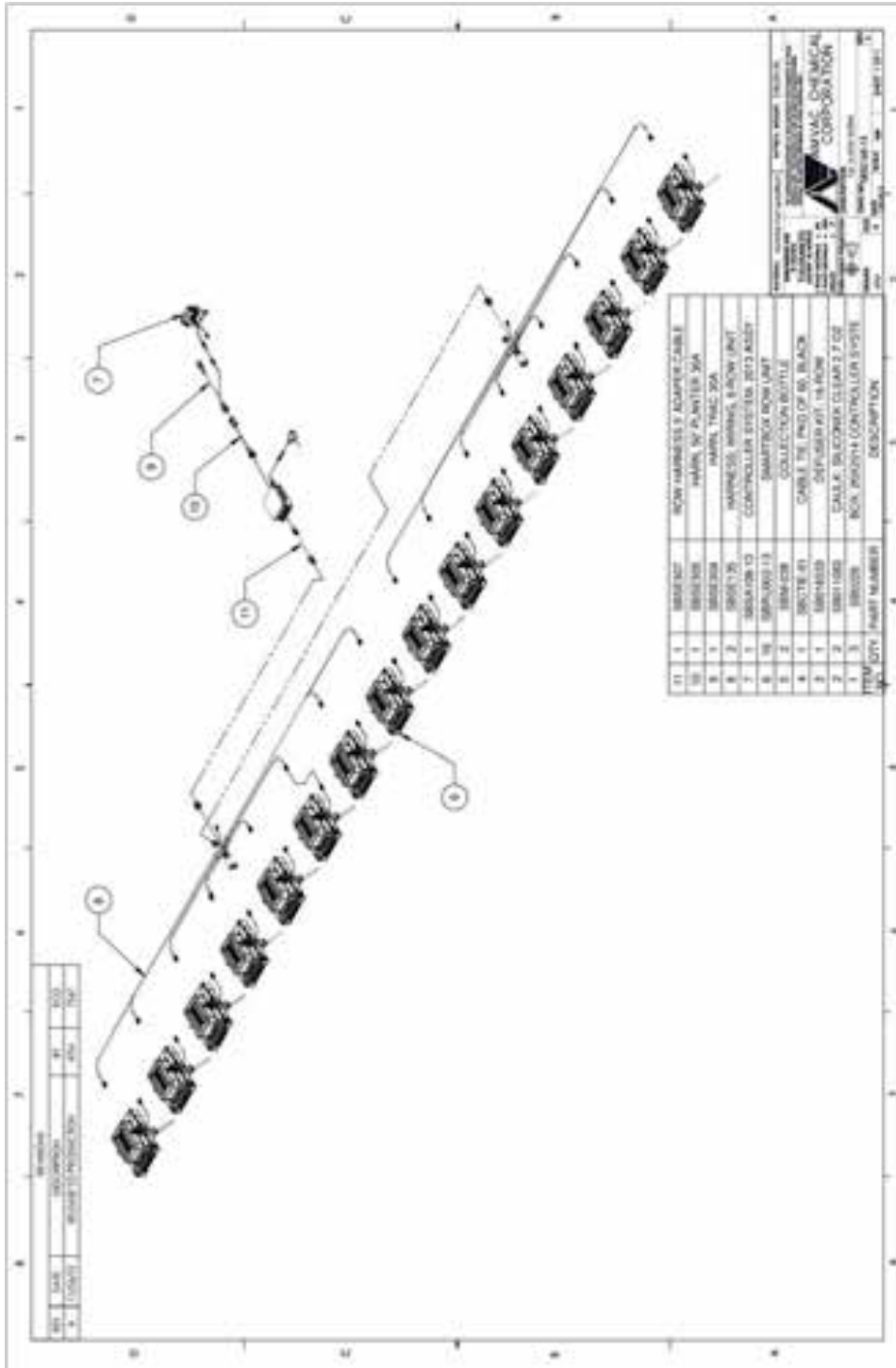
- When mounting your Wiring Harnesses and Cables make sure you follow the planters existing wiring and hydraulics hoses. Slack should be left in cables when wiring around hinge points. This is to prevent wiring harnesses from being pinched or cut when the planter flexes during planting, or when folding the planter for transport.
- When connecting all your wiring harnesses together make sure that you have a little slack at each wiring harness connection, as shown (see Figure 15). This is to prevent the connection from pulling apart when the planter flexes during planting.

Figure 15 - Wiring Harness Connection

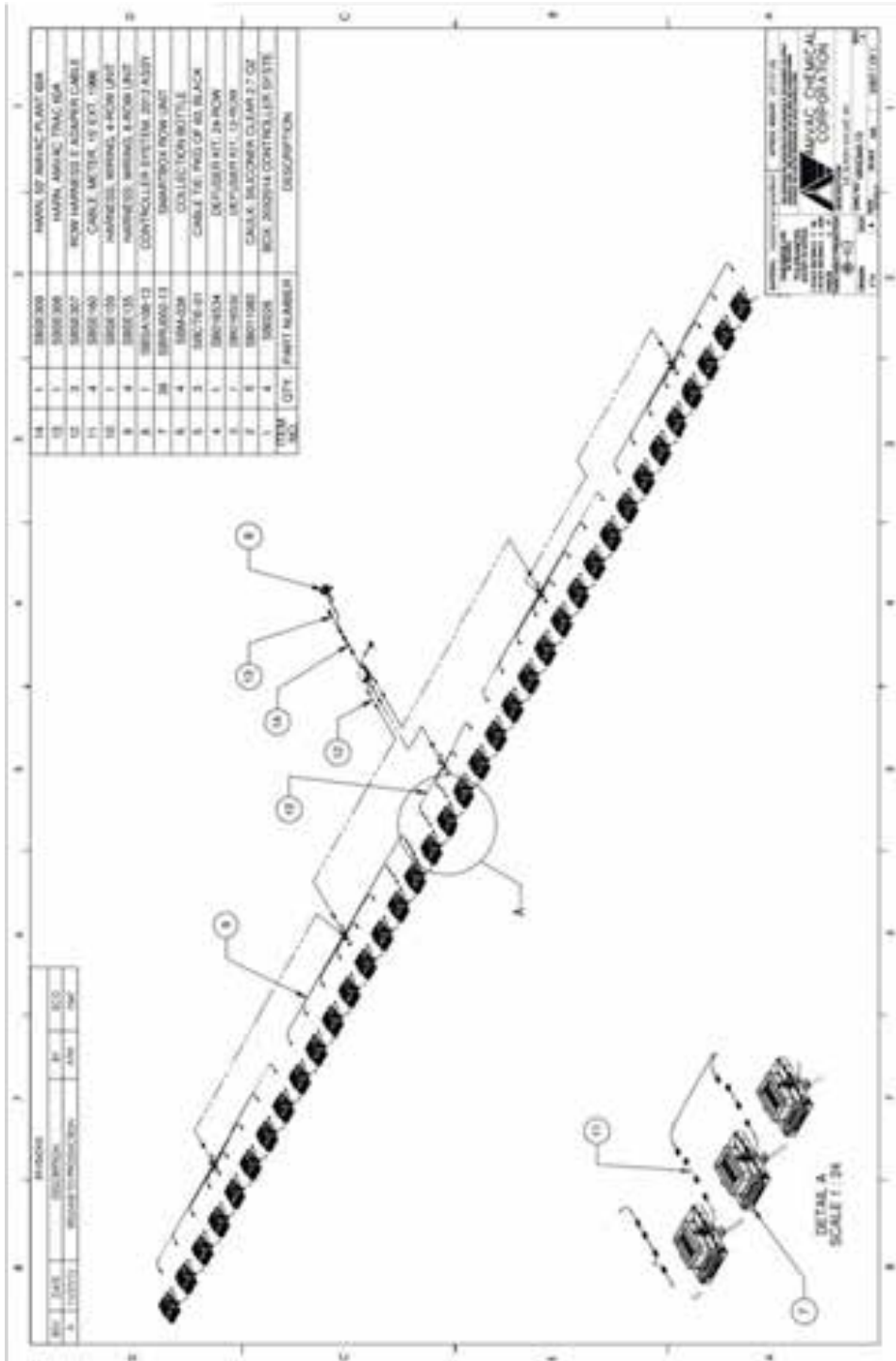


When laying out the 4 and 8 Row Wiring Harness configurations, as shown by the diagrams on the next page, do not attach each row meter harness to the meters at this time. This will be done when you configure the rows using your controller/monitor in Section B.

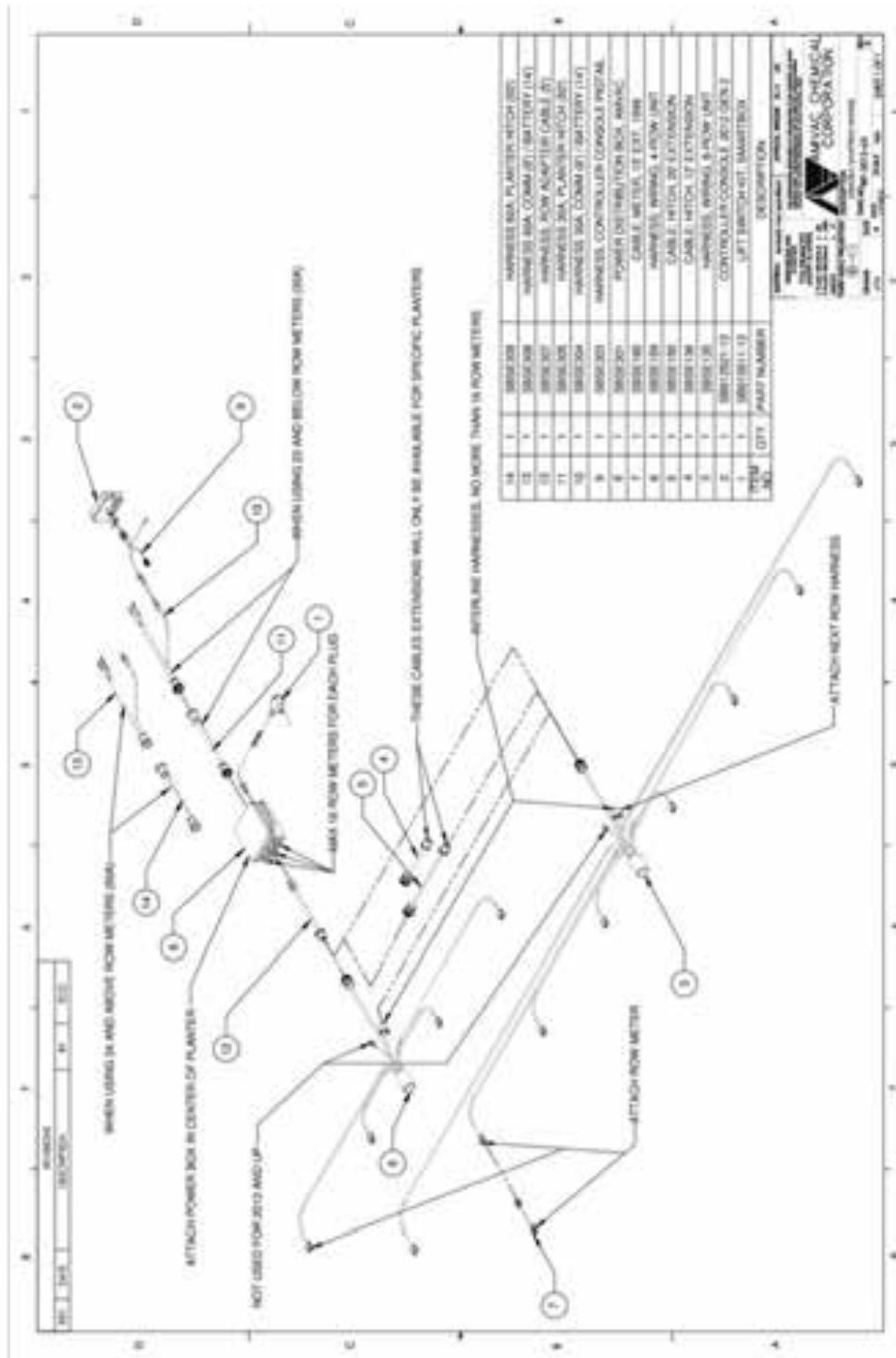
Suggested 16 Row Planter Arrangement Diagram:



Suggested 36 Row Planter Arrangement Diagram:



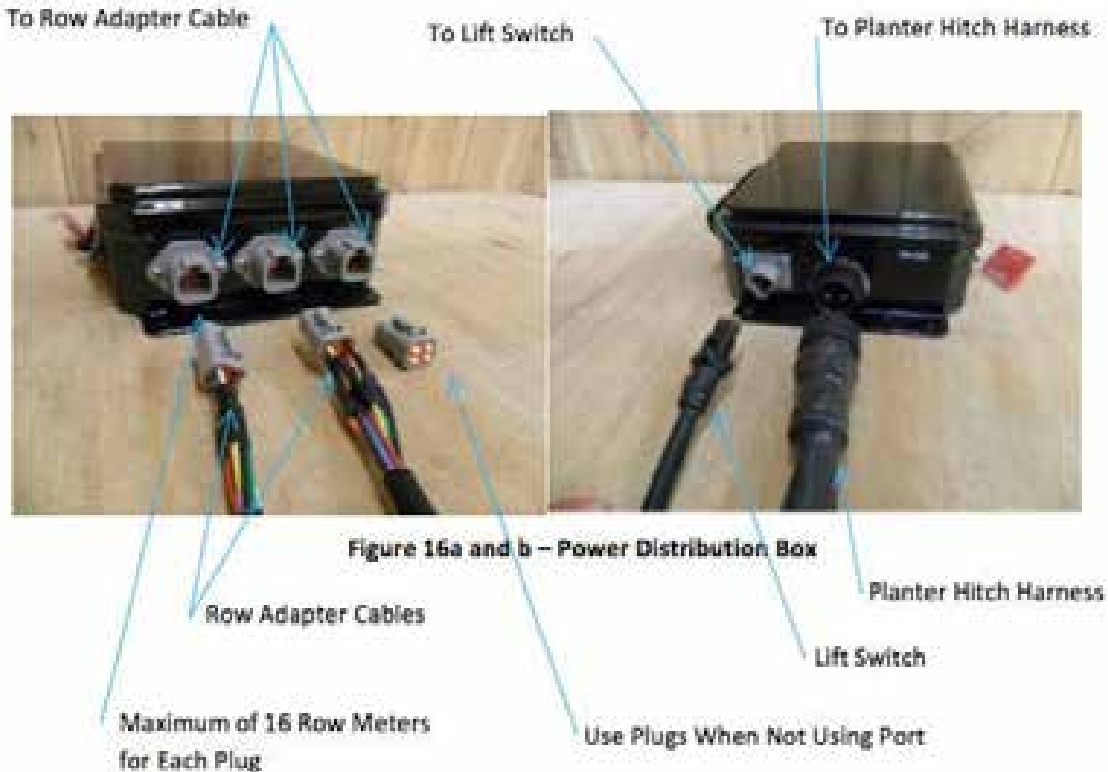
Wiring Diagram Parts:



Wiring and Mounting the Power Distribution Box:

Mount the Power Distribution Box as close to the center of the planter as possible.

WARNING! Removal of the security tab will void warranty!



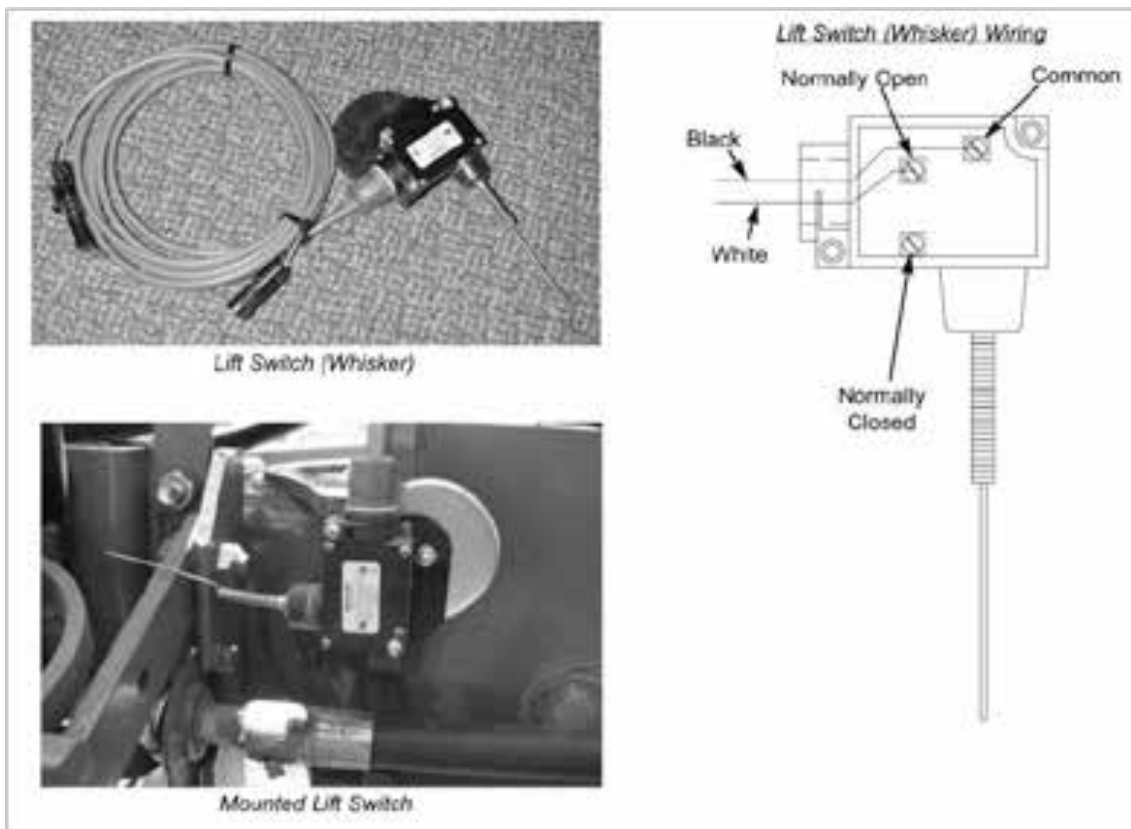
Lift Switch (Whisker) Installation:

Mount the Lift Switch in a protected location in the “neutral” (off) position when the implement is in the raised position. As the planter is lowered to plant, the lift switch contact arm should be deflected, turning “on” the SmartBox® System.

A magnetic mounting bracket is provided, depending on the mounting location and planter configuration an additional bracket may be required. The lift switch mount should permit for adjustment of the lift switch to allow for switch activation at different planter heights.

To obtain maximum magnetic holding force, it is critical that the mounting surface be smooth and free of dirt, weld splatter, paint runs, etc. It is also important that any debris be removed from the magnet prior to mounting.

Connect the lift switch cable to the Power Distribution Box. On 2013 and newer models do not connect your Lift Switch to the 4 or 8 Row Wiring Harness. The system will not function properly if the lift switch is plugged into a 4 or 8 Row Wiring Harness.



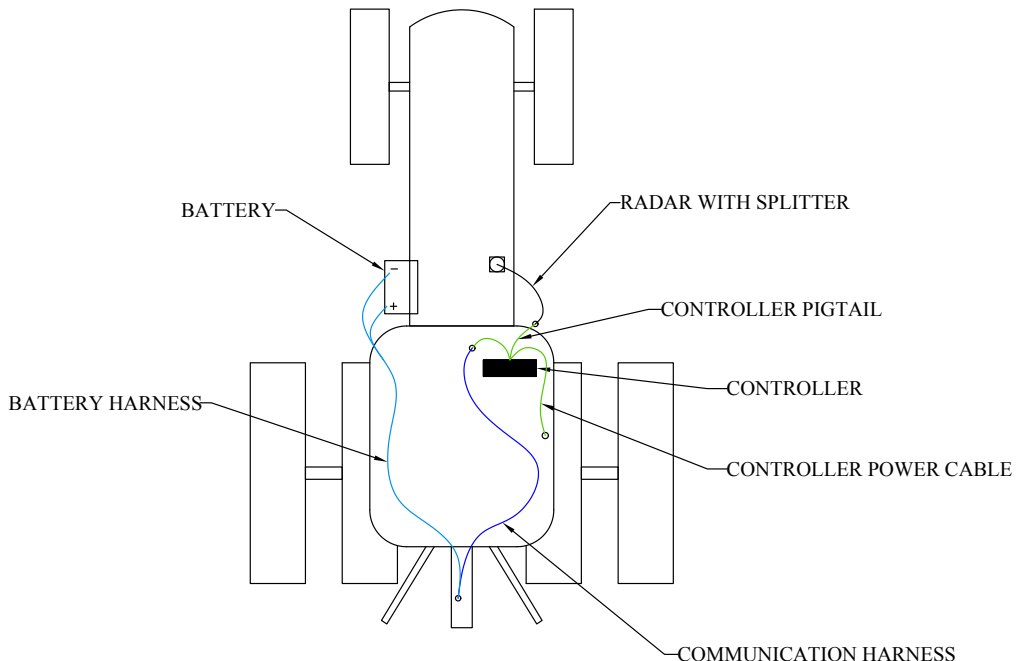
Appendix A

Suggested Wiring Configuration by Planter Folding Style:

The following figures show suggested routings for the SmartBox® System Wiring configurations for various planters. Please see the suggested tractor wiring diagram then find your planters folding style and number of rows by using the table provided. These arrangements are presented as suggestions only. Routing of cables and lift switch placement are left to the discretion of the installer. Due to the large number of planter arrangements available, some planters will not be included in this section. For further information concerning planters not included in this section, please contact your local AMVAC Representative.

Tractor Wiring Diagram; Drawing 1:

- BATTERY HARNESS =
- COMMUNICATION HARNESS =
- CONTROLLER PIGTAIL =
- WIRING HARNESS CONNECTION =



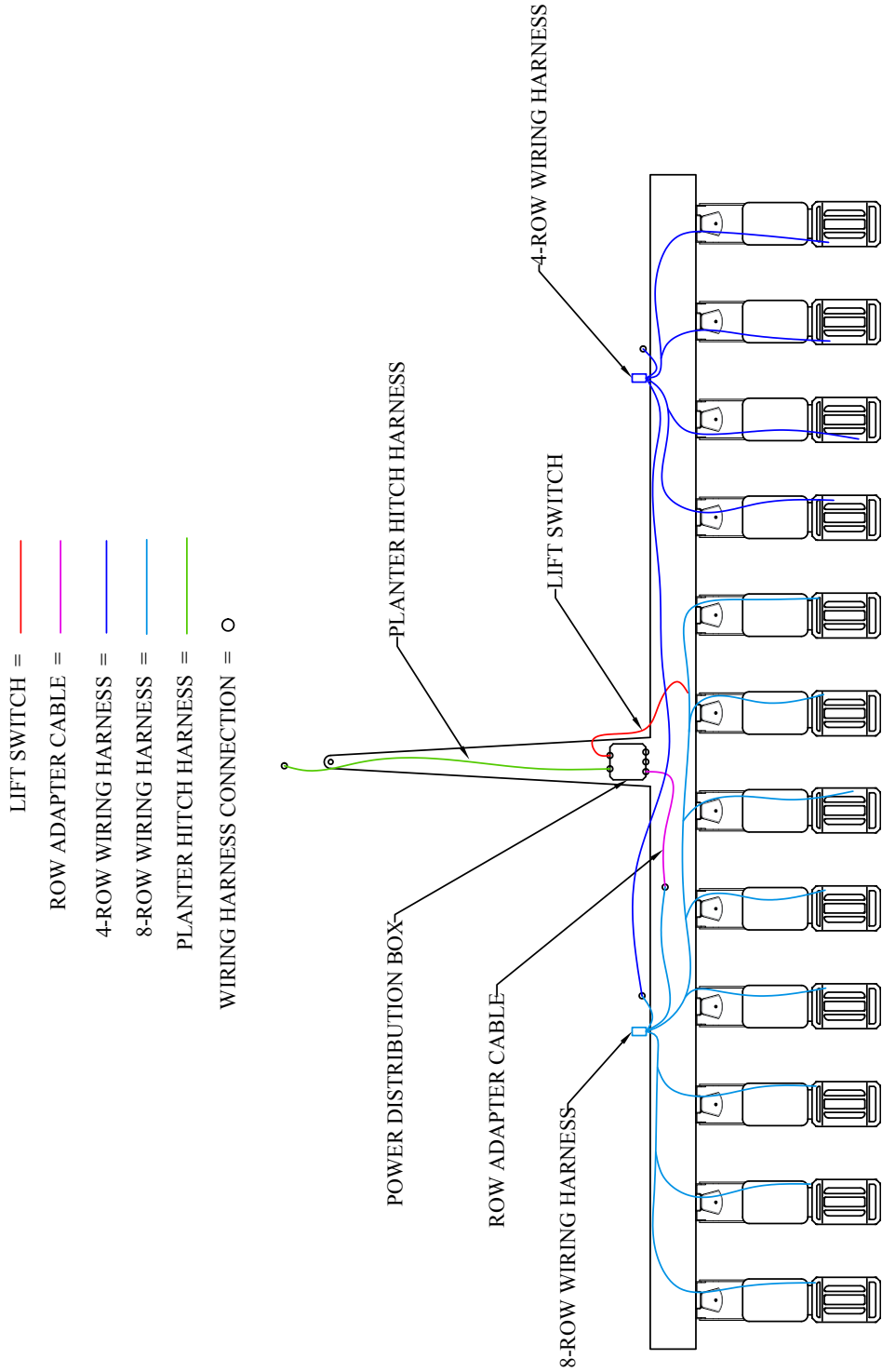
Planter Folding Styles:

Rigid Drawbar (no fold)	Planter Drawing 2
Rigid Three Point Hitch (no fold)	Planter Drawing 3
Vertical-Fold	Planter Drawing 4
Stack-Fold	Planter Drawing 5
Wing-Fold (wings fold 180° forward)	Planter Drawing 6
Stack-Fold and Wing-Fold (wing 180°)	Planter Drawing 7

Front-Fold (wings fold 90° forward)

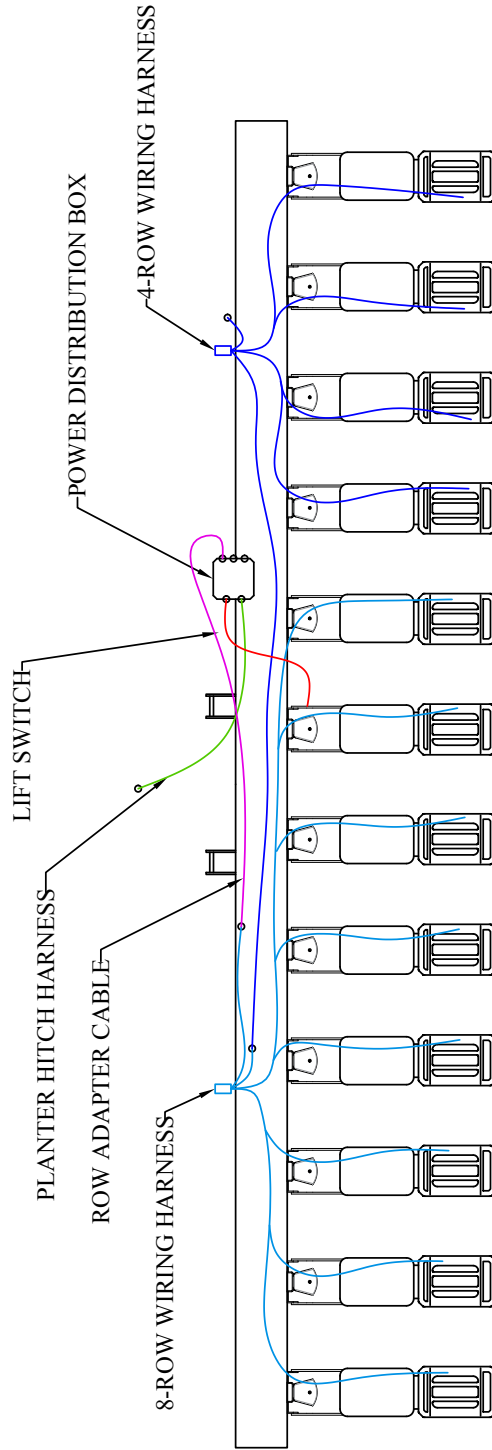
12 Row Planters	Planter Drawing 8
16 Row Planters	Planter Drawing 9
18 Row Planters	Planter Drawing 10
24 Row Planters	Planter Drawing 11
32 Row Planters	Planter Drawing 12
36 Row Planters	Planter Drawing 13
48 Row Planters	Planter Drawing 14

Rigid Drawbar (no fold); Planter Drawing 2:

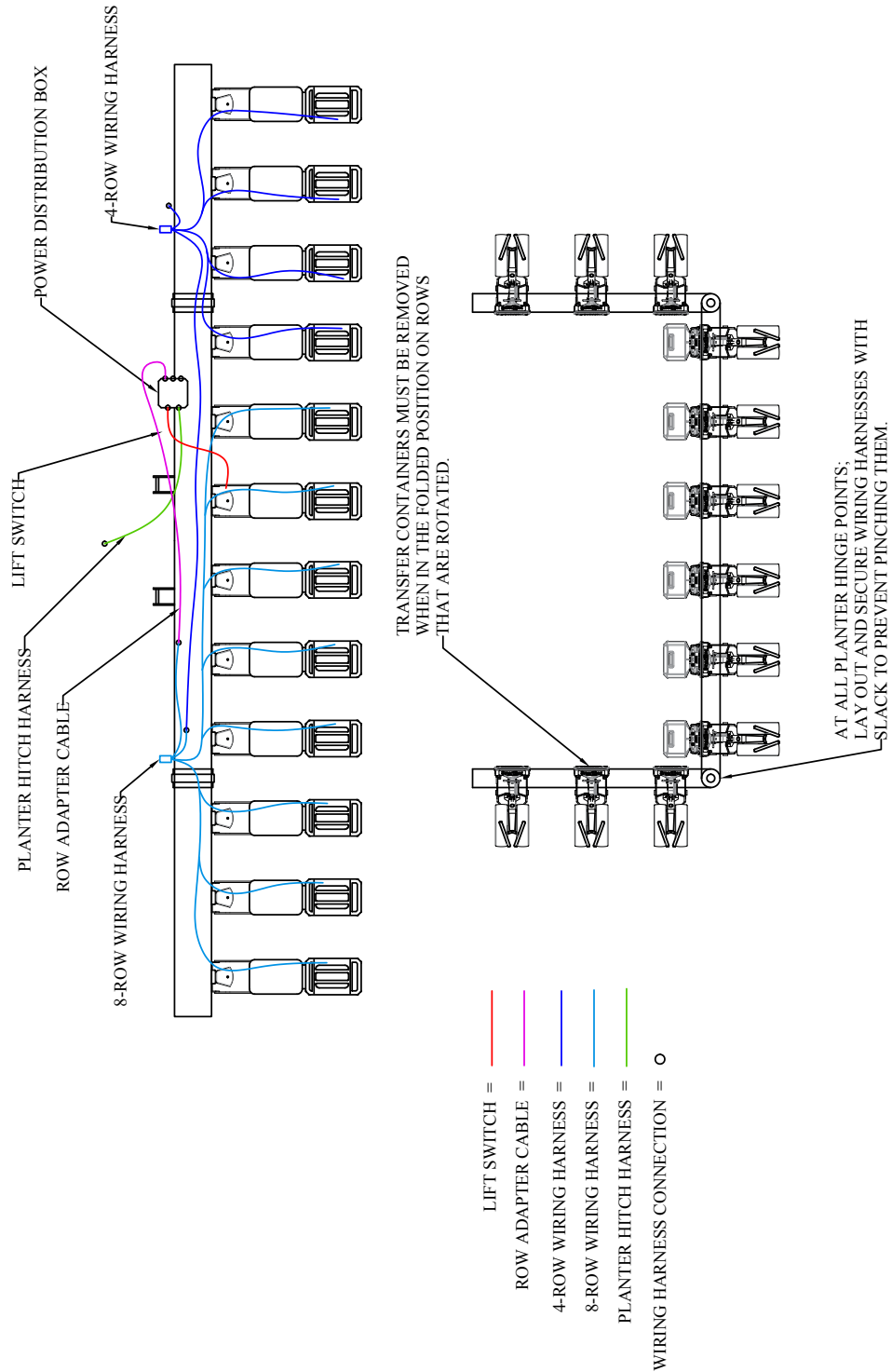


Rigid Three Point Hitch (no fold); Planter Drawing 3:

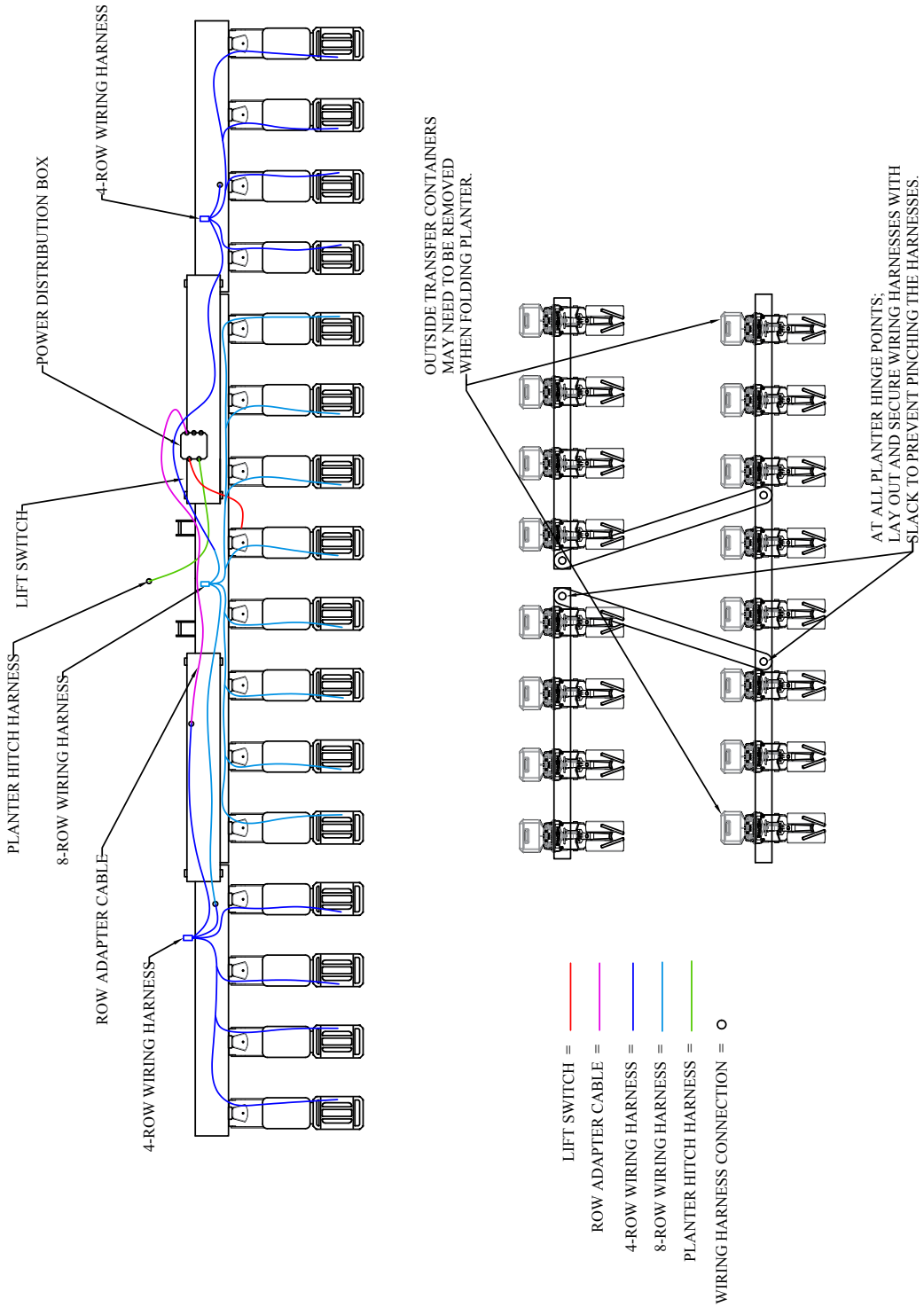
- LIFT SWITCH = —
- ROW ADAPTER CABLE = —
- 4-ROW WIRING HARNESS = —
- 8-ROW WIRING HARNESS = —
- PLANTER HITCH HARNESS = —
- WIRING HARNESS CONNECTION = ○



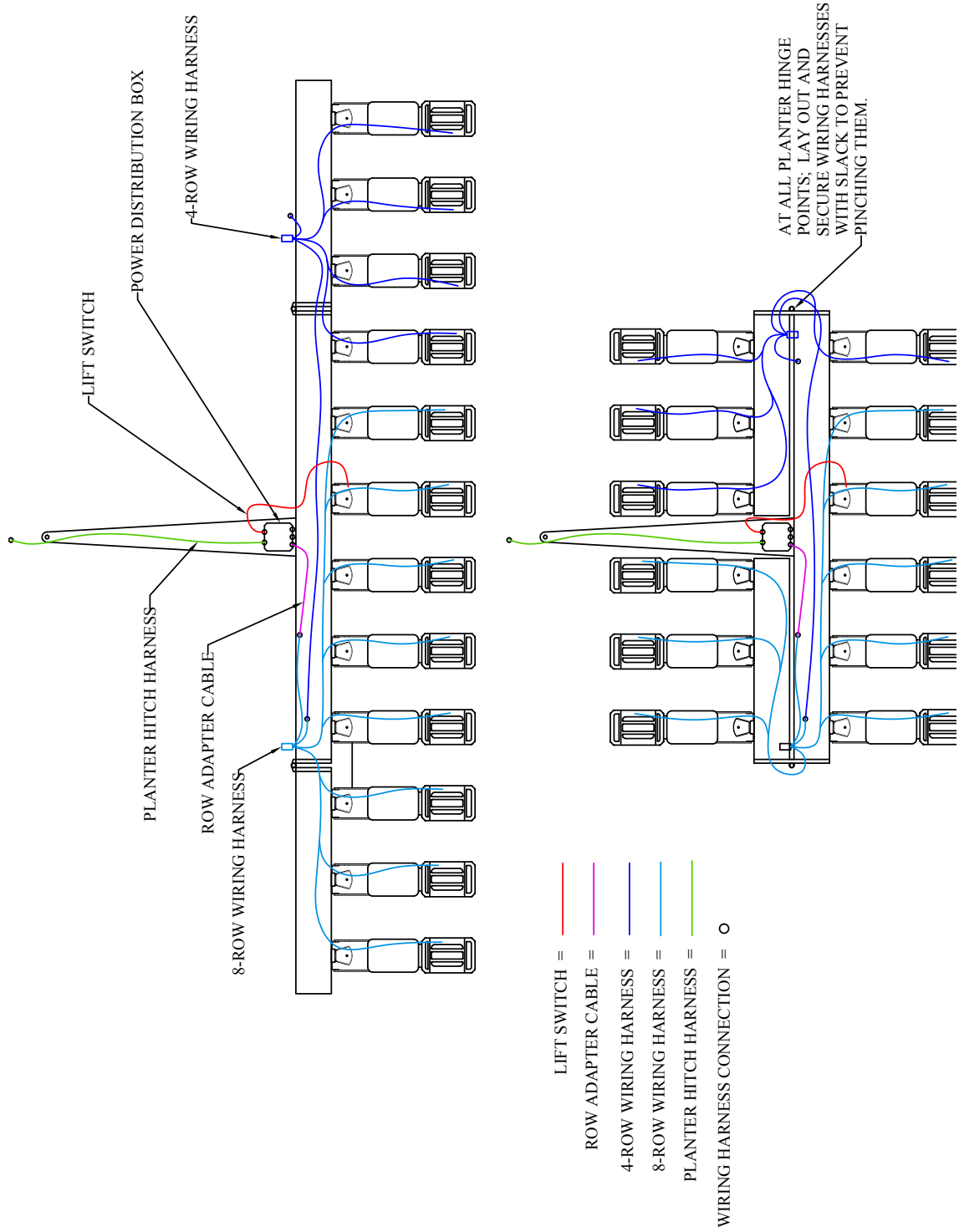
Vertical-Fold; Planter Drawing 4:



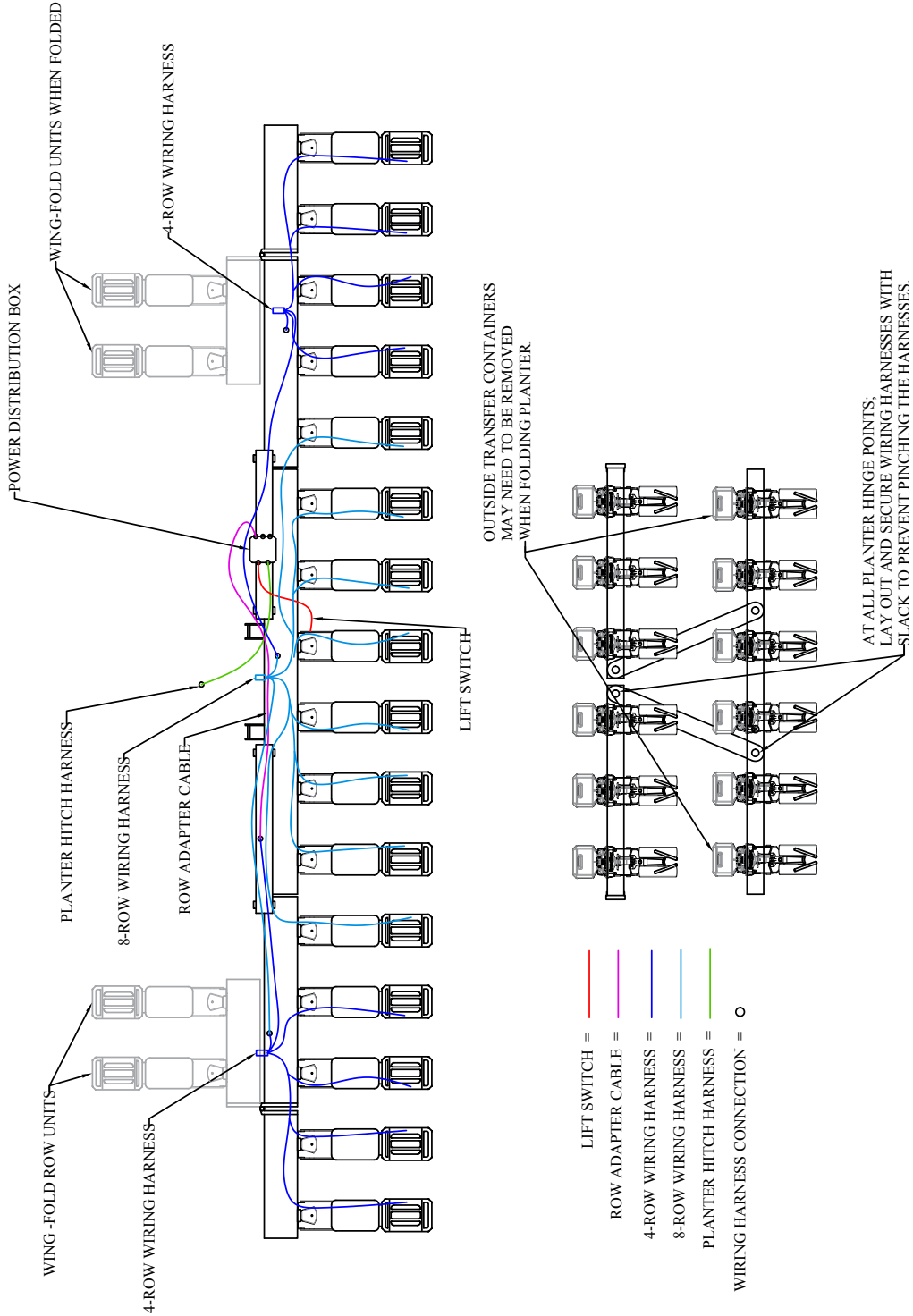
Stack-Fold; Planter Drawing 5:



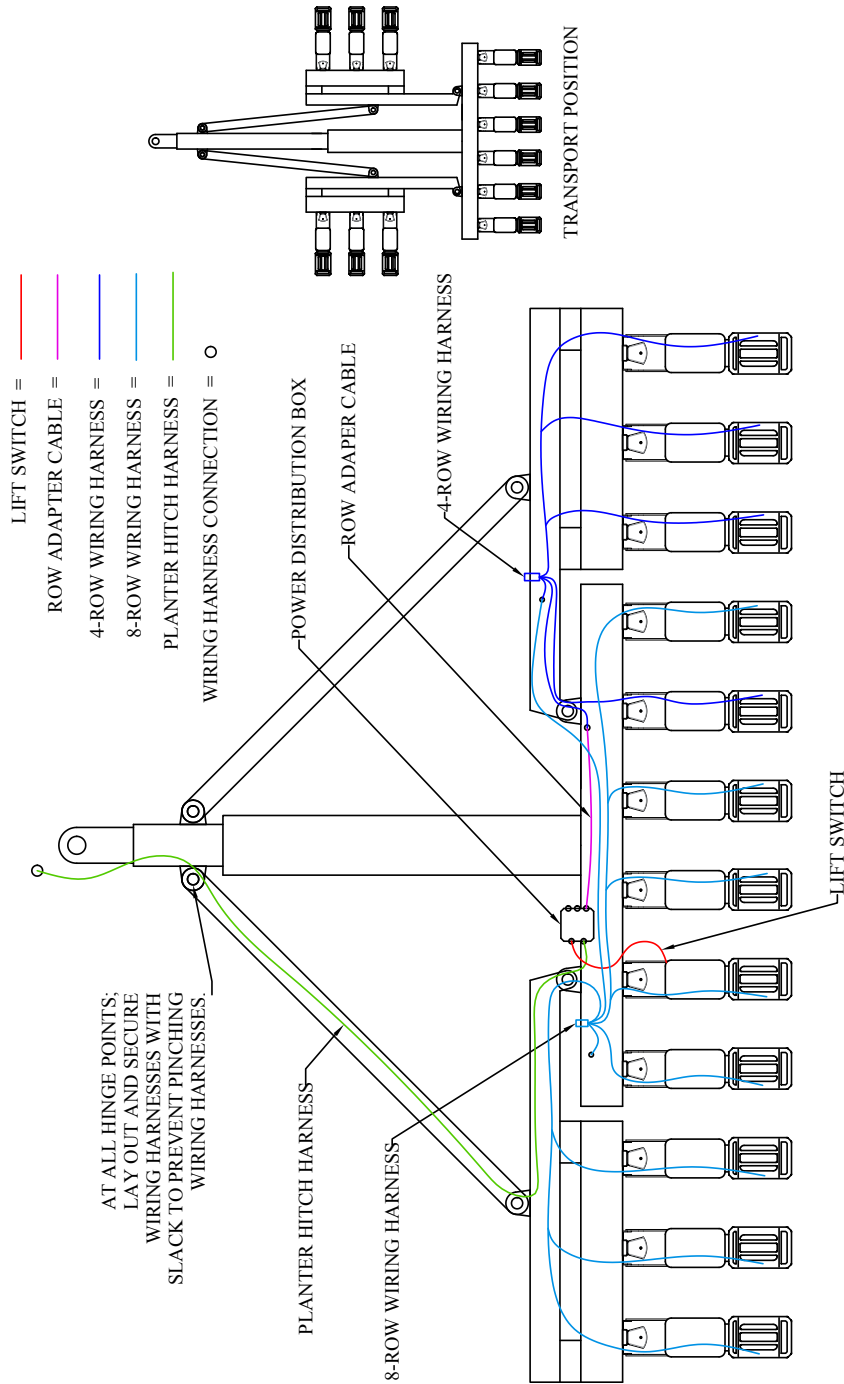
Wing-Fold (wings fold 180° forward); Planter Drawing 6:



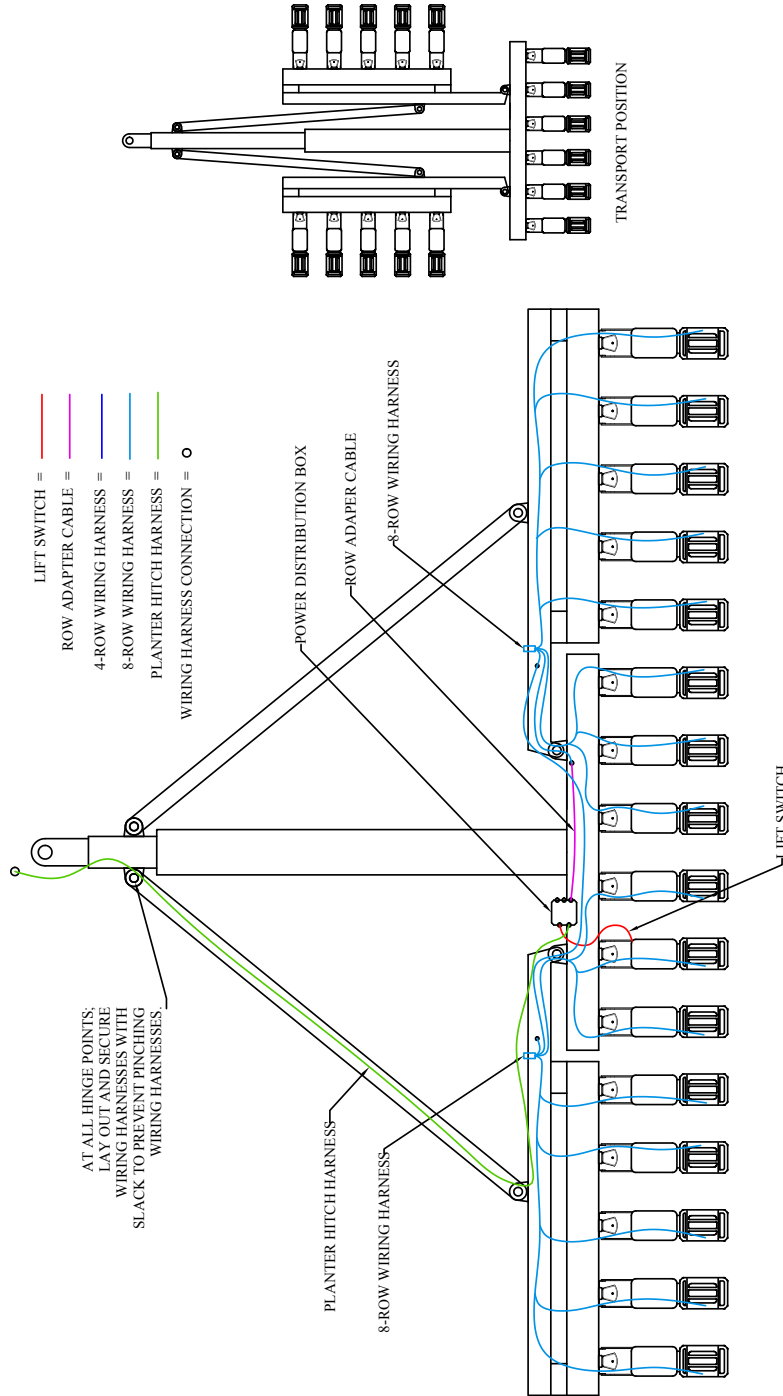
Stack-Fold and Wing-Fold (wing 180°) Planter Drawing 7:



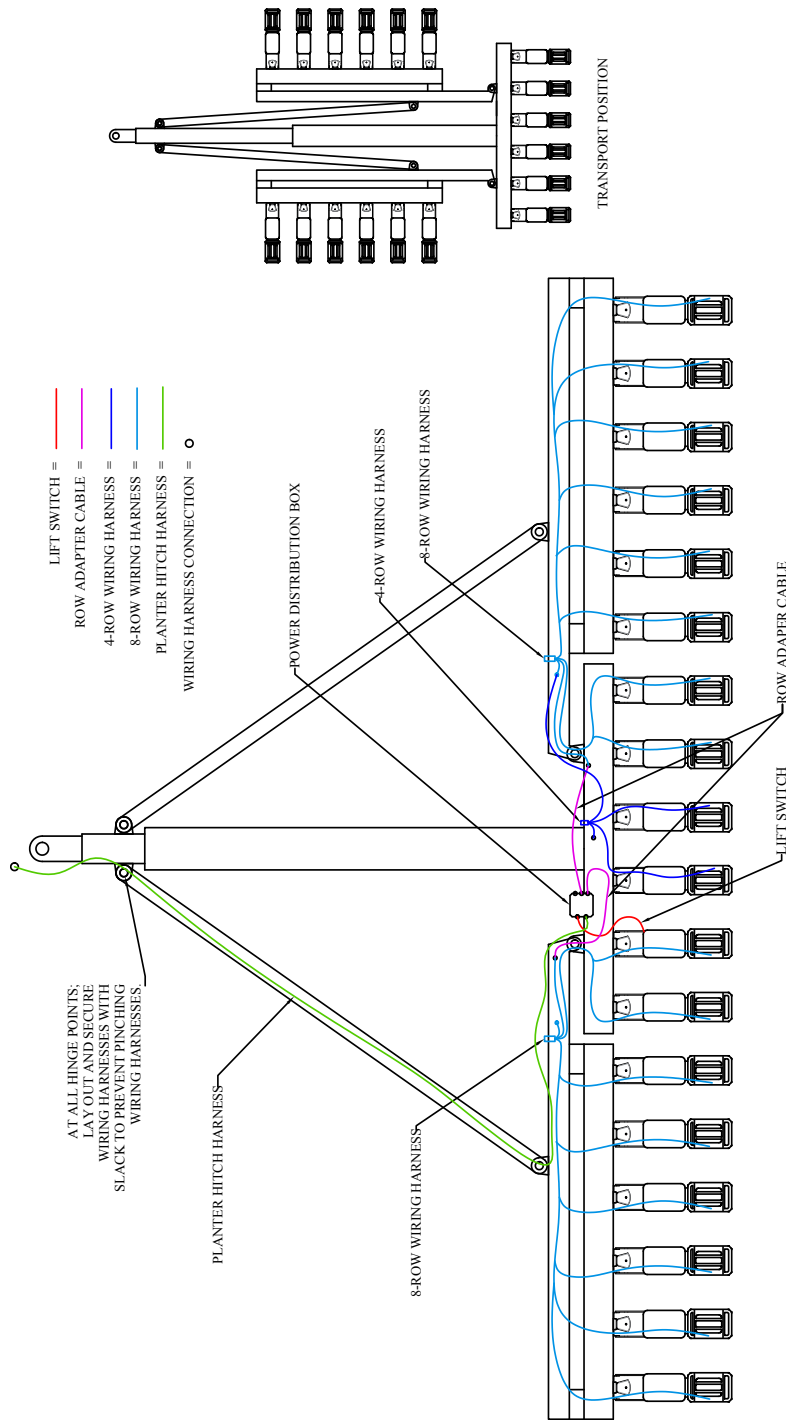
Front-Fold (wings fold 90° forward); 12 Row Planters - Planter Drawing 8:



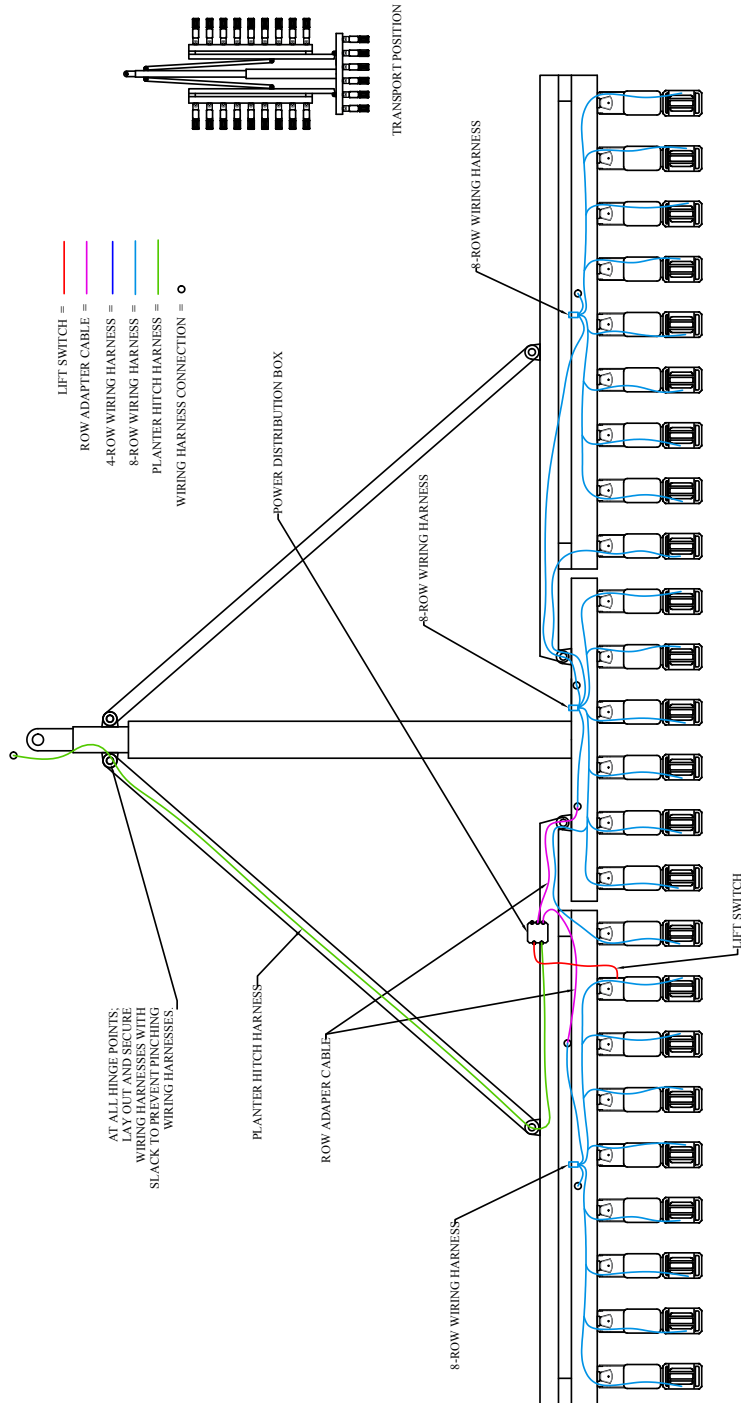
Front-Fold (wings fold 90° forward); 16 Row Planters - Planter Drawing 9:



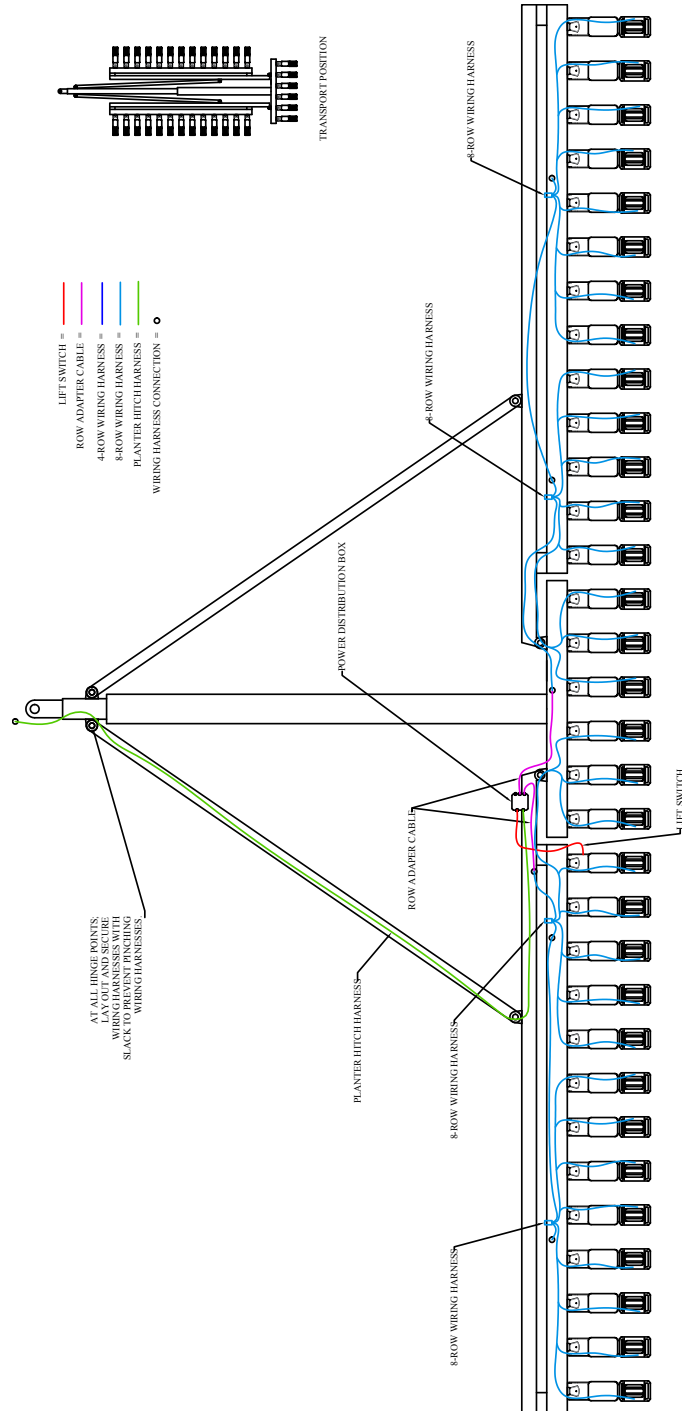
Front-Fold (wings fold 90° forward); 18 Row Planters - Planter Drawing 10:



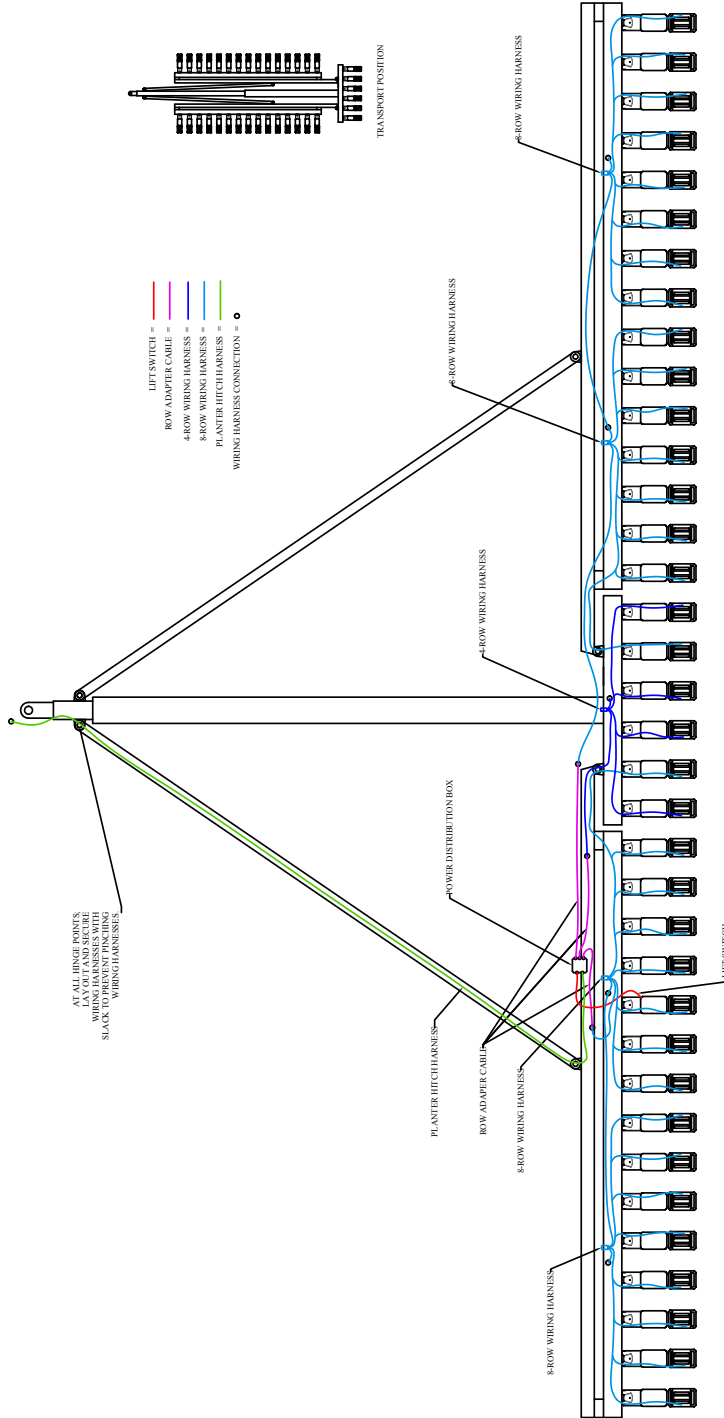
Front-Fold (wings fold 90° forward); 24 Row Planters - Planter Drawing 11:



Front-Fold (wings fold 90° forward); 32 Row Planters - Planter Drawing 12:



Front-Fold (wings fold 90° forward); 36 Row Planters - Planter Drawing 13:



Controller Setup

The SmartBox® controller requires several setup steps to produce accurate chemical application. This section of the Operator's Manual will show those steps required, as well as additional steps which may be followed to increase the benefits of the SmartBox® system.

One added feature of the SmartBox® system is the ability to upload field and user information from a personal computer to the controller. Instructions for the additional features are located in Section C. Instructions provided in this section are for programming directly into the controller.

- The controller screen will show only four menu choices at a time. To view all of the selections available in a menu, press the down arrow button to scroll through the selections.
- To make a selection from the menu, push the up or down arrow button until your selection shows on the screen, then push to the right that matches with your selection.
- The "Return" arrow will appear as the "Enter" button on most screens, allowing you to return to previous screen.
- To return to the original menu during operation, press the button sequenced with "Main Menu".

A list and description of the controller menus is presented throughout this section. Those steps required for accurate insecticide application are shaded. Other steps are optional but will greatly enhance operation and record keeping capabilities of the system. Instructions for particular functions (such as inputting user information, programming "Groups", and recording weather conditions) are shown following the controller function map. The instructions are given in an order of probable use, but programming sequence and use of optional functions are at the discretion of the user.



Controller Functions

Row Configuration

Row Configuration is used to assign row numbers to each of the meters. This routine is needed at initial system setup or whenever more than one new meter is attached.

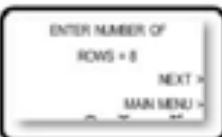
Note: If you have previously configured all rows and are replacing only one meter, see applicable instructions in Section D.



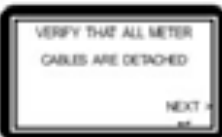
Step 1:
From the Main Menu, select **SYSTEM CALIBRATION**.



Step 2:
Select **ROW CONFIGURATION**.



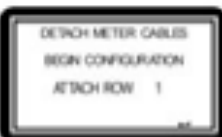
Step 3:
Using the arrow keys, select the number of rows and press **NEXT** or **ENTER**.



Step 4:
Disconnect the 4-pin connector from each meter and press **NEXT**, then press **ENTER** to begin configuration.



Step 5:
Attach the 4-pin connector for the row which is to be designated as Row 1 and wait for the three "beeps". The screen will automatically sequence to the next row.



Step 6:
Repeat Step 5 until all rows have been configured.



End:
After all rows have been configured, the system will automatically advance to the **MAIN MENU** screen.

Planter Setup

REQUIRED

OPTIONAL

Planter Setup is used to record or change the number of planter rows and row spacing. This information is required for calculation of acreage values.

	<p>Step 1: From the Main Menu, select PLANTER SETUP.</p>
	<p>Step 2: Select PLANTER SELECTION.</p>
	<p>Step 3: Using the arrow keys, scroll to select planter type/model. Press ENTER.</p>
	<p>Step 4: Using the arrow keys, scroll to and select PLANTER ROW SPACING.</p>
	<p>Step 5: Using the arrow keys to increase or decrease the value shown, until it equals the number of row spacing (.01 - 130.0 Inches). Press ENTER.</p>
	<p>Step 6: Using the arrow keys, scroll to and select NUMBER OF ROWS.</p>
	<p>Step 7: Using the arrow keys to increase or decrease the value shown, until it equals the number of planter rows (1 to 48). Press NEXT.</p>
	<p>Step 8: Select ORIFICE COLOR MENU.</p>
	<p>Step 9: Use the arrow keys to select the orifice color and select enter. NOTE: For standard operations orifice color should be set to black.</p>
	<p>End: Press ENTER to return to the Main Menu.</p>

REQUIRED

 OPTIONAL






Speed Input Setup

Speed Input Setup is used to accomplish two objectives: to choose either true or fixed speed and to calibrate the true speed device if used. "True" speed here indicates use of either radar or a true wheel speed sensor; a wheel sensor is considered true speed, however no compensation is made for wheel slippage.

The SmartBox[®] system will work in either fixed or true speed mode. The meters will compensate for changes in planter speed only when the system is set in the true speed mode.

The in-field calibration described below is critical for accurate speed measurement and insecticide application. This calibration is separate from calibrations of the radar itself; you must calibrate the speed device with the SmartBox[®] controller by performing the 200' in-field calibration steps stated below. Do not enter the radar calibration number used for the other monitors. If speed calibration is not performed correctly, then the values recorded for planter speed will produce errors in calculations of acreage treated, pounds of chemical applied, and pounds of chemical applied per acre. Inaccuracies resulting from failure to properly calibrate are the responsibility of the user.

The in-field calibration routine should be used at the start of each new season or whenever a modification is made which could affect the output of the speed sensor. For greater accuracy, the 200' in-field test should be run at the expected planting speed. Also, the test should be repeated two or three times and the average count value entered into the controller.

	<p>Step 1: From the Main Menu, select SYSTEM CALIBRATION.</p>
	<p>Step 2: Using the arrow keys, scroll down and select SPEED INPUT SETUP.</p>
	<p>Fixed Speed Step 3: To set a FIXED speed select FIXED, then using the arrow keys, increase or decrease to desired speed and press ENTER. OPTIONS: 3.0 - 16.0 MPH</p>
	<p>Radar Input Step 4: Select RADAR to set speed using pulse from RADAR or GPS.</p>
	<p>Step 5: For this feature an in-field calibration will need to be completed. Measure and mark a linear course of 200 feet.</p>

Speed Input Setup (continued)


	<p>Step 6: Using the arrow keys, scroll down and select RADAR CALIBRATION.</p>
	<p>Step 7: Using the arrow keys, increase or decrease number of calibration runs, then press ENTER. OPTIONS: 1 - 5 RUNS, recommend minimum of 3 runs</p>
	<p>Step 8: Press the START button as you enter the course. The controller will then measure the counts of the radar. If your controller fails to count pulses as you move through the course, re-start controller and repeat above steps. If pulses still do not register, you may need a signal booster for the radar system. See recommended contacts in Section A.</p>
	<p>Step 9: Press the STOP button as you exit the course. The controller will then calibrate according to the counts of the radar. Press ENTER to accept.</p>
	<p>Step 10: To change radar counts per 200 feet (6096 counts is preset), select RADAR COUNT.</p>
	<p>Step 11: Use the arrow keys to change the radar count value. Press ENTER to accept. This step may be done to move the radar reading slightly to agree with a monitor already calibrated and correct. Do not use the value provided in the radar system owner's manual or obtained from calibration with a different monitor without confirming calibration with an in-field test.</p>
	<p>GPS Input Step 12: The GPS speed source is used only if the GPS plugs into the DB9 pin connector on the back of the SmartBox console. If the GPS emits a Radar pulse, you will need to make the radar pulse available and use the "RADAR" selection in the SPEED INPUT screen. Note: Not all GPS systems are compatible with the SmartBox system, contact 1-888-SMARTBOX for additional information.</p>
	<p>End: Press ENTER to return to the Main Menu.</p>

REQUIRED


 OPTIONAL

Grouping


The Grouping feature is used to select certain meters to be run under a specific group number or name. This function is beneficial when planting point rows or planting along the edge of a field. Those rows which are not needed can be shut off simply by pre-assigning those rows to a group number and indicating which rows will be active and which rows will not be active. During normal operation, the “GROUP” tab can be pressed and a group chosen, this will then activate that group, shutting off the rows chosen. Group activation is also available by pressing “START GROUPING” in the Operate screen.




Step 1:
From the Main Menu, select **SET ROW GROUPS**.




Step 2:
Select **GROUPING INDIVIDUAL ROWS** to assign the chemical being used for each row.




Step 3:
Using the arrow keys, select the chemical for Row 1. To select the same chemical for all rows being used in the group, select **SAME FOR REMAINDER**. To assign a different chemical for each row individually, select **NEXT ROW**, then using the arrow keys select the chemical for the selected row.



Step 4:
To create a group name, select **EDIT**. If groups have already been setup, using the arrow keys, you can change and select a group name to **EDIT** or **ERASE**.



Step 5:
Using the arrow keys, select letters or numbers to create the name of the group. Press **ENTER**.



Step 6:
Using the arrow keys, select the individual rows that will be added to the group, then press **ADD**. To select all active rows at once, press **ALL** then **ADD**. Press **NEXT** to proceed.

Grouping (continued)


Step 8:

Using the arrow keys, increase or decrease chemical rate per ounce. (Rate suggested for chemical selected is default.)

Changes can be made for each individual row or **SAME FOR REMAINDER** can be selected. Select **SAVE/MAIN MENU** once complete.


End:

Press **ENTER** to return to the Main Menu.

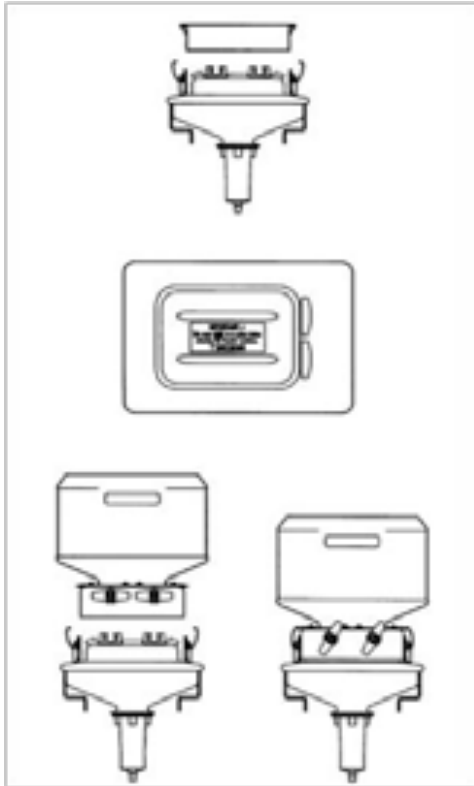
OPERATION

Once the controller has been setup by inputting the row and the planter configuration, both meters and speed input have been calibrated, and any additional optional information has been input for record keeping, then the system is ready to do its job.

The **OPERATE** mode must be used during application of insecticide. In this mode, the user can select the field in which to store information, change the insecticide application rate on the move, and either monitor true planter speed or change the fixed speed setting. The user is able to see the accumulated acres covered in the field. Also, information concerning functioning or failure of the system will be displayed on the controller and accompanied by auditory signals while in the **OPERATE** mode.

The **WEATHER INFO** mode is available to identify weather conditions experienced during planting. The information entered in this mode is stored for record keeping. Use of the **WEATHER INFO** mode is optional.

Transfer Container



1. Remove rain cover from base container. Store rain cover for use whenever transfer container is not attached to the base container.

NOTE: Apply a light dusting of baby powder/talc on the base container seal prior to seating transfer container. This step is necessary to avoid damage to the seals during removal of transfer container. Do not use a petroleum based silicon spray to lubricate the seals. Do not use graphite.

2. Remove the transfer container valve cover. Store cover for return of used container to chemical dealer.

3. Orient the transfer container so that the valve handles face away from the planter seed hopper.

4. Lower the transfer container so each valve is fully inserted into the mating base container valve. If valves are not fully seated, they will not open to release product to the base container.

5. Clamp the transfer container to the base container. **Rock each transfer container from side to side to make sure that clamps are secure.** If the transfer container is not clamped securely, the clamps may be made more secure by increasing the bend in the clamp which hooks on the transfer container. If the base containers are supplied with locking pins, insert the pins through the clamps to further secure the transfer container.

6. Rotate the valves toward the off position before trying to open. Turn valves counter-clockwise 60° to open. If valve does not open smoothly, the valve may not be seated properly; unclasp container and repeat steps 4 through 6 above. Both valves must be closed before the transfer container can be removed.

Meter Calibration

Meter calibration is performed to adjust each meter to release an accurate insecticide rate. The meter calibration routine must be performed on all meters at the beginning of each season. In addition, any time a replacement meter is installed, that row must be re-configured and its new meter calibrated. **For best results, growers should recalibrate after planting 150 acres and/or when application rates are not accurate.**

Pre-calibration Instructions:

Person conducting meter calibrations must insure that proper safety equipment is used during calibrations; see product label for details.

1. Prior to meter calibration, run each meter in the Operate mode for a minimum of fifteen (15) minutes with the tractor running. Meters may be run without chemical during the war-up period.
 - a. To do this in the shop set the speed mode to fixed, (refer to section D). Select operate on the main screen of the controller and set the controller to run.
 - b. Trip the lift switch to allow the meters to run.
 - c. This will also test the flow sensors on each meter.
2. Confirm that each base container is a minimum of 2/3 full of chemical. To fill, place a loaded transfer container on each base container and open valves.

Preliminary Steps

1. Number calibration bottles to correspond with the number of planter rows.
2. Confirm that the scale used for weighing the catches is set to weigh grams and placed on a flat surface located out of the wind for proper measuring.
3. Measure and record the tare (empty) weight of the empty catch bottle or apply tape to the calibration bottles to make the weight of each bottle match the weight of the heaviest one.
 - a. Record the tare weight.
4. Install a catch bottle under each meter discharge opening, matching the bottle number with the corresponding row number as configured in the controller. Position bottles so that bottle cap hinges are not damaged during installation. On John Deere planters with row mount brackets you will need to remove the bottle caps to allow them to fit over the meter discharge opening.

**Step 1:**

From the Main Menu select **SYSTEM CALIBRATION**.

**Step 2:**

Select **METER CALIBRATION**.

**Step 3:**

Using the arrow keys, scroll to select chemical being used during operation. The options are: **AZTEC 4.67G; COUNTER 20G; FORCE 3G; SMART CHOICE 5G; THIMET 20G**.

Press **ENTER**.

**Step 4:**

Choose the desired calibration distance. Options are **500'** or **1000'**.

Recommend **500'**

**Step 5:**

Using the arrow keys, enter the target catch amount corresponding to the desired application rate. The controller will be preset at 42.5 grams / 500 ft. and will allow values between 5.0 to 300.0 grams / 500 ft. See chart below. Press **ENTER** to continue.

SmartBox® Application Rate Table

Used	Product	Rate	Target Catch (500')	Passing Catch Range (500' cal. Distance)	Target Catch (1,000')	Passing Catch Range (1,000' cal. Distance)
	Counter® 20G	6 oz/1000 ft	85	80.7 - 85 grams	170	161.5 - 170 grams
	Aztec® 4.67G	3.0 oz/1000 ft	42.6	40.5 - 42.6 grams	85.2	80.9 - 85.2 grams
	Force® 3G	4.0 oz/1000 ft	56.8	53.9 - 56.8 grams	113.6	107.8 - 113.6 grams
	SmartChoice 5G	5 oz/1000 ft	69.1	67.4 - 70.9 grams	138.2	134.8 - 141.8 grams
	Thimet 20G	6 oz/1000 ft	85	80.7 - 85 grams	170	161.5 - 170 grams


Step 6:

Using the arrow keys, enter the test speed equal to the expected planting speed. For example, if the expected average planting speed is 5.5 mph, then scroll until the test speed is set at 5.5 mph. The controller will be preset at 6.0 mph, but will allow a value between 1.0 to 14.0 mph. Press **ENTER** to continue.


Step 7:

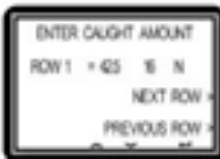
Press **START** to start catch test.


Step 8:

The **TIME REMAINING** value that first appears indicates the seconds required to plant 500 or 1000 feet of a row at the selected ground speed. The catch test will end automatically once the **TIME REMAINING** value has counted down to zero.


Step 9:

Catch test completed. Press **ENTER AMOUNT** to enter catch amounts (or press **START** to start another catch test).


Step 10:

Weigh the caught amount for each row (not including the tare weight). A sample form to record the catch weights and the N and P number is included at the end of this section. Using the arrows, enter the caught amount for each row. Press **NEXT ROW** to move to the next row. Once a catch amount has been entered for each row, the controller will automatically advance to the next screen.


End:

If all catch amounts were within 5% of the target weight, then press **MAIN MENU** to **SYSTEM CALIBRATION SET** screen. If any catch weight was outside of the 5% calibration variance, press **YES** and conduct another catch test. To complete another test catch return to Step 7 and repeat.

*AMVAC Chemical provides calibration assistance and in-field calibration programs to allow you to monitor your application rate. The correct insecticide application rate is the responsibility of the farmer/ operator.

SmartBox® Calibration Record

Operator: _____ Date: _____
 Address: _____ City: _____
 Retail Dealer: _____ Calibrated By: _____
 Brand and Model of Planter: _____

_____ MPH - Calibration Speed _____ oz/500 ft - Calibration Rate

Important: If application speed and application rate differ from the calibrated speed and calibrated rate more than +/-10%, then the system should be recalibrated at desired application speed and application rates.

Product	Rate	Target Catch (500')	Passing Catch Range (500' cal. Distance)	Target Catch (1,000')	Passing Catch Range (1,000' cal. Distance)
Counter® 20G	6 oz/1000 ft	85	80.7 - 85 grams	170	161.5 - 170 grams
Aztec® 4.67G	3.0 oz/1000 ft	42.6	40.5 - 42.6 grams	85.2	80.9 - 85.2 grams
Force® 3G	4.0 oz/1000 ft	56.8	53.9 - 56.8 grams	113.6	107.8 - 113.6 grams
SmartChoice 5G	5 oz/1000 ft	69.1	67.4 - 70.9 grams	138.2	134.8 - 141.8 grams
Thimet 20G	6 oz/1000 ft	85	80.7 - 85 grams	170	161.5 - 170 grams

Catch Test 1		Catch Test 2		Catch Test 3		Row	Catch Test 1		Catch Test 2		Catch Test 3
Grams	N/P Num	Grams	N/P Num	Grams	N/P Num		Grams	N/P Num	Grams	N/P Num	Grams
						25					
						26					
						27					
						28					
						29					
						30					
						31					
						32					
						33					
						34					
						35					
						36					
						37					
						38					
						39					
						40					
						41					
						42					
						43					
						44					
						45					
						46					
						47					
						48					



Smartbox Application Rate Table

**Note: Always start tractor and idle between 1000-1500 rpm during calibration
Meters must be run prior to calibration to warm them up**

Controller @ planting /1000 ft.)	=	Calibration Target Rate (grams/500 ft.)	=	Lbs/ac 20" rows	=	Lbs/ac 22" rows	=	Lbs/ac 24" rows	=	Lbs/ac 30" rows	Calibration Variance (grams)		
											-5%	Tolerance	
2.0		27.8		3.3		3.0		2.7		2.2		27.4	2
2.2		30.4		3.6		3.25		2.9		2.4		29.8	3
2.4		33.2		3.9		3.5		3.2		2.6		32.5	3
2.6		35.9		4.2		3.9		3.5		2.8		35.1	3
2.8		39.0		4.6		4.2		3.8		3.0		38.0	4
3.0		41.5		4.9		4.5		4.1		3.3 ⁵		40.4	4
3.0	Aztec	41.5		4.9		4.5		4.1		3.3 ³		40.4	4
3.2		44.4		5.2		4.8		4.4		3.5		43.1	4
3.5	SmartChoice	48.6		5.7		5.2		4.8		3.8 ⁶		47.1	4
3.7		51.4		6.0		5.5		5.0		4.0		49.8	5
4.0		55.7		6.5		6.0		5.4		4.4 ⁵		53.9	5
4.0	Force	55.7		6.5		6.0		5.4		4.4 ⁴		53.9	5
4.1		57.1		6.7		6.1		5.6		4.5		55.2	5
4.5	Counter 20G	62.8		7.3		6.7		6.1		4.9 ²		60.6	6
4.9		68.5		8.0		7.3		6.7		5.3		66.0	6
5.0	SmartChoice	69.9		8.2		7.4		6.8		5.4 ⁶		67.3	7
5.4		75.5		8.8		8.0		7.4		5.9		72.7	7
5.5		77.0		9.0		8.2		7.5		6.0		74.1	7
6.0	Counter 20G	84.1		9.8		8.9		8.2		6.5 ²		80.8	8
6.0		84.1		9.8		8.9		8.2		6.5 ¹		80.8	8
6.1		85.5		9.9		9.1		8.3		6.6		82.1	8
6.5		91.1		10.6		9.7		8.8		7.1		87.5	9
6.7		94.0		10.9		10.0		9.1		7.3		90.2	9
6.8		95.4		11.1		10.1		9.3		7.4		91.6	9
6.9		96.8		11.2		10.3		9.4		7.5		92.9	9
7.0		98.2		11.4		10.4		9.5		7.6		94.3	9
7.4		103.9		12.1		11.0		10.1		8.1		99.7	10
7.5		105.3		12.2		11.2		10.2		8.2		101.0	10
8.0		112.4		13.0		11.9		10.9		8.7 ¹		107.7	11
8.1		113.8		13.2		12.1		11.0		8.8		109.1	11

Maximum rates/ac per product on 30" Row Spacings

Counter 20G	Standard rate is 6 oz/1000 ft row - 6.5 lbs/ac; Trait Rate is 4.5 oz/1000 ft row
Aztec 4.67G	Standard rate is 3 oz/1000 ft row - 3.3 lbs/ac
Force 3G	Standard rate is 5.1 oz/1000 ft row - 5.5 lbs/ac
	Standard rate is 4 oz/1000 ft row - 4.4 lbs/ac
SmartChoice 5G	Standard rate is 5 oz/1000 ft row - 5.4 lbs/ac

eed to interpolate oz/1000' rate to achieve target rate on lbs/ac

10" row spacing, when a higher rate for CRW control (i.e. for refuge) is desired, Fortress and (to a lesser extent) Force have variable rates to achieve higher rates on a per plant. This will have to be balanced with >\$\$/ac for more lbs product on per acre basis vs. the expected control at less than labeled rates.






Speed Input Setup

The Speed Input Setup routine is used to accomplish two objectives: to choose either true or fixed speed and to calibrate the true speed device if used. “True” speed here indicates use of either radar or a true wheel speed sensor; a wheel sensor is considered true speed, however no compensation is made for wheel slippage.

The SmartBox[®] system will work in either fixed or true speed mode. The meters will compensate for changes in planter speed only when the system is set in the true speed mode.

The in-field calibration described below is critical for accurate speed measurement and insecticide application. This calibration is separate from calibrations of the radar itself; you must calibrate the speed device with the SmartBox[®] controller by performing the 200’ in-field calibration steps stated below. Do not enter the radar calibration number used for the other monitors. If speed calibration is not performed correctly, then the values recorded for planter speed will produce errors in calculations of acreage treated, pounds of chemical applied, and pounds of chemical applied per acre. Inaccuracies resulting from failure to properly calibrate are the responsibility of the user.

The in-field calibration routine should be used at the start of each new season or whenever a modification is made which could affect the output of the speed sensor. For greater accuracy, the 200’ in-field test should be run at the expected planting speed. Also, the test should be repeated two or three times and the average count value entered into the controller.

	Step 1: From the Main Menu, select SYSTEM CALIBRATION .
	Step 2: Using the arrow keys, scroll down and select SPEED INPUT SETUP .
	Fixed Speed Step 3: To set a FIXED speed select FIXED , then using the arrow keys, increase or decrease to desired speed and press ENTER . OPTIONS: 3.0 - 16.0 MPH
	Radar Input Step 4: Select RADAR to set speed using pulse from RADAR or GPS .
	Step 5: For this feature an in-field calibration will need to be completed. Measure and mark a linear course of 200 feet.



Step 6:
Using the arrow keys, scroll down and select **RADAR CALIBRATION**.



Step 7:
Using the arrow keys, increase or decrease number of calibration runs, then press **ENTER**.
OPTIONS: 1 - 5 RUNS, recommend minimum of 3 runs



Step 8:
Press the **START** button as you enter the course. The controller will then measure the counts of the radar. If your controller fails to count pulses as you move through the course, re-start controller and repeat above steps. If pulses still do not register, you may need a signal booster for the radar system. See recommended contacts in Section A.



Step 9:
Press the **STOP** button as you exit the course. The controller will then calibrate according to the counts of the radar.
Press **ENTER** to accept.



Step 10:
To change radar counts per 200 feet (6096 counts is preset), select **RADAR COUNT**.



Step 11:
Use the arrow keys to change the radar count value. Press **ENTER** to accept. This step may be done to move the radar reading slightly to agree with a monitor already calibrated and correct. **Do not use the value provided in the radar system owner's manual or obtained from calibration with a different monitor without confirming calibration with an in-field test.**



GPS Input
Step 12:
The GPS speed source is used only if the GPS plugs into the DB9 pin connector on the back of the SmartBox console. If the GPS emits a Radar pulse, you will need to make the radar pulse available and use the "RADAR" selection in the **SPEED INPUT** screen. Note: Not all GPS systems are compatible with the SmartBox system, contact 1-888-SMARTBOX for additional information.



End:
Press **ENTER** to return to the Main Menu.

Start Normal

The **OPERATE** mode is used during application of insecticide. When ready to apply insecticide, follow the steps in this **START NORMAL** routine. Make sure that the controller is showing the field number in which you want to collect and store data. If not, scroll to find the correct field number, then push the **ENTER** button to begin dispensing chemical. Verify rate in oz / 1000' is set correctly. If the system does not dispense, refer to the Troubleshooting Guide located in Section D.

To return to the main menu during operation, press the **MAIN MENU** button.

Step 1: From the Main Menu, select **OPERATE**.

Step 2: Select **START NORMAL**.

Step 3: Using the arrow keys, highlight the field name and press **ENTER**.

Step 4: Using the arrow keys, change the current application rate. Press **ENTER** to continue.

Step 5: The screen shown on the left is the planting screen displayed when using radar or true wheel speed. When Fixed speed is used, "Fixed" will be displayed next to mph. The arrow keys can be used to adjust the application rate during operation.

Step 6: The screen shown on the left is the planting screen displayed when a row failure occurs. Row failures will display when something has gone wrong with one or more of the meters. Yellow bars mean that the system is no longer detecting chemical flow. Red bars (not shown) mean the console can't communicate with one of the meters. Black bars indicated the meters are turned off. Pressing the **ROW FAILURES** button will display additional details on the type of failure.

Step 7: The screen shown indicates which meters are not responding. Press **EXIT** or **ENTER** to return to the Main Menu.

Important: If application speed and application rate differ from calibrated speed and calibrated rate more than +/- 10%, then the system should be recalibrated at desired application speed and application rates.

Replacing a Meter:

!!!! NOTICE !!!!

This meter assembly is intended for use only on the SmartBox® Insecticide Application System and only with products licensed for application using the SmartBox® system. Any other usage of this meter will result in the following actions:

1. All warranty for this meter and any other SmartBox® system component will be voided immediately.
2. User will be in violation of U.S. Patent laws and will be prosecuted to the fullest extent of the law.

!!!! Always replace the meter gasket !!!!

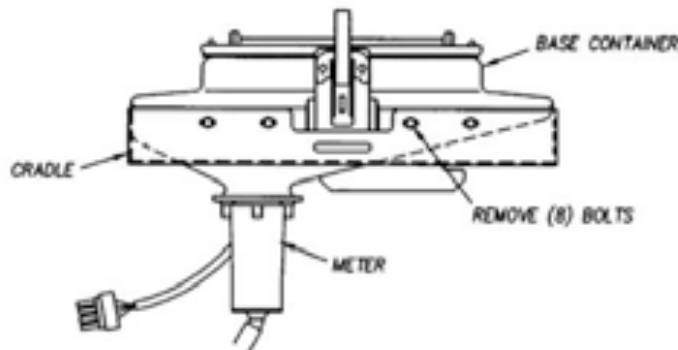
These instructions must be followed when removing or replacing a used meter:

A. **Safety precautions:** All SmartBox® system maintenance must be performed in strict compliance with all applicable product safety restrictions and recommendations as stated on the product label. Persons working with a SmartBox® system either containing or having contained a product are responsible for obtaining, reading, and following the product manufacturer's safety instructions. The following instructions are included in, but are not a complete statement of, the requirements for use of AMVAC's Aztec 4.67G, a restricted use pesticide. These steps may or may not be applicable to the use of other products which may be available for use in a SmartBox® system. For detailed information concerning the safety requirements of any product, contact the applicable chemical dealer or manufacturer's representative.

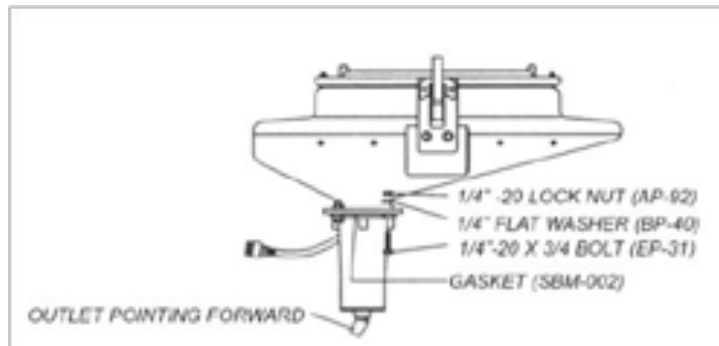
1. Comply with the following personal protective equipment requirements:
 - a. long-sleeved shirt
 - b. long-legged pants
 - c. shoes plus socks
 - d. coveralls
 - e. waterproof gloves
 - f. protective eyewear
 - g. organic vapor respirator
2. Comply with the following user safety recommendations: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
3. Comply with all applicable storage and disposal regulations.

B. Removal of existing meter and / or meter gasket:

1. Turn off controller.
2. Unplug meter from wiring harness.
3. Close transfer container valves and remove transfer container.
4. Secure rain cover on base container.
5. Remove the eight bolts attaching the base container to the cradle as shown in figure 1.



6. Invert the base container and remove the four $\frac{1}{4}$ " -20 x $\frac{3}{4}$ " bolts attaching the meter to the base container as show in figure 2. The $\frac{1}{4}$ " flat washer shown in figure 2 may have been installed on the meter side of the joint as shown in the original SmartBox® Operator's Manual.



7. Remove the meter from the base container.
8. Clear any wet product or obstruction from the meter screen and base container. If meter is to be re-installed, examine and clear any wet product or obstruction from the meter.
9. Properly dispose of the used meter gasket. If meter is being replaced, place the non-functional meter in a sealed plastic bag for return to AMVAC at a later date. Your AMVAC representative will provide instructions on the return procedures.

C. Installation of new meter and / or meter gasket:

1. Install the meter assembly as stated below and in the SmartBox® Operator's Manual under "Installation: Meter to Base Container".
 - a. Position the meter with the 45° meter discharge opening facing forward (pointing toward the short side of the base container and pointing toward the planter tool bar).
 - b. Ensure the gasket (always use a new meter gasket) and meter screen are properly installed on the meter.
 - c. Place the ¼" x 1" bolts up through the meter, base container flange, and ¼" flat washer as show in figure 2 above. Lightly secure with the lock nuts.
 - d. Examine meter gasket to make sure it is centered to provide a good seal.
 - e. Tighten all bolts securely. Torque bolts to 25-30 in-lbs. Do not over-tighten or under-tighten bolts. **NOTE: A 60% to 75% compression ratio is required for the gasket to properly seal.**
 - f. Apply a thin layer of silicon to the outside of the gasket after it has been installed on the base container.
2. Place the base container back on the cradle and replace the eight bolts holding it into position as stated in the SmartBox® Operator's Manual under: "Installation: Base Container to Cradle".
3. Replace the transfer container.
4. Turn on controller. Follow directions on controller screen to configure meter.
5. Plug meter into wiring harness. Configure and calibrate if a new meter has been installed. Used meters returned to their original rows do not require reconfiguration or re-calibration.

Rows On/Off

The Rows On/Off routine is performed to turn individual meters on or off as needed. This function can be used to shut off individual rows during re-calibration, during troubleshooting of the system, or whenever a row will not be used.

This function may be used in place of the Grouping function. Once a meter has been turned off, it can only be turned back on by using this routine again.



Step 1:
From the Main Menu select **ROW ON/OFF**.

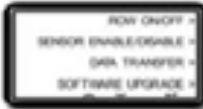


Step 2:
Using the arrow keys, select the desired row number. Press **OFF** to turn the row off, or press **ON** to turn meter on. By pressing **ALL**, then **OFF**, all rows will show as being turned off. By pressing **ALL**, then **ON**, all rows will show as on.



End:
Press **ENTER** or **EXIT** to return to the Main Menu.

Sensor Enable/Disable



Step 1:

From the Main Menu select **SENSOR ENABLE/DISABLE**.



Step 2:

Using the arrow keys, select the desired sensor number. Press **DISABLE** to turn the sensor off, or press **ENABLE** to turn sensors on. By pressing **ALL**, then **DISABLE**, all sensors will show as being turned off. By pressing **ALL**, then **ENABLE**, all sensors will show as on.



End:

Press **ENTER** or **EXIT** to return to the Main Menu.

Weather Info

OPERATE >
SYSTEM CALIBRATION >
SET ROW GROUPS >
CHEMICAL INFO >

Step 1:
From the Main Menu, select **OPERATE**.

SMART NORMAL >
SMART GROUPING >
WEATHER INFO >
AREA INFORMATION >

Step 2:
Select **WEATHER INFO**.

WEATHER INFO
SELECT CLOUD COVER >
SELECT WIND DIRECTION >
SET WIND SPEED >

Step 3:
Press **SELECT CLOUD COVER**.

CLOUD COVER
0 - CLEAR >
1 - VERY LIGHT CLOUDS >
2 - PARTLY CLOUDY >

Step 4:
Using the arrow keys, choose the option that best fits the current weather conditions and returns to the **WEATHER INFO** menu. The condition selected will be stored for record keeping.

OPTIONS:
0-CLEAR
1-VERY LIGHT CLOUDS
2-PARTLY CLOUDY
3-CLOUDY
4-LIGHT RAIN

WEATHER INFO
SET TEMPERATURE >

Step 5:
Repeat steps 3 and 4 for **WIND DIRECTION**, **WIND SPEED** and **TEMPERATURE**.

WEATHER INFO
SELECT CLOUD COVER >
SELECT WIND DIRECTION >
SET WIND SPEED >

End:
Press **ENTER** to return to the Main Menu.

Start Grouping

The **OPERATE** mode is used during application of insecticide. **When ready to apply insecticide, follow the steps in this START GROUPING routine. Make sure the controller is showing the field number and group in which you want to collect and store data. If not, scroll to find the correct field number and or group then push the ENTER button to begin dispensing chemical. Verify rate is oz / 1000' is set correctly, if more than one rate is assigned within a group oz/1000' feet will not display.**

To return to the main menu during operation, press the **MAIN MENU** button.



Step 1:

From the Main Menu, select **OPERATE**.



Step 2:

Select **START GROUPING**.



Step 3:

Using the arrow keys, change to the desired field. Press **ENTER**.



Step 4:

Using the up and down arrow keys, change to the desired group, then press **ENTER** to select the group desired. Press **GROUPING OFF** to operate in normal operation.



Step 5:

The screen shown on the left is the planting screen displayed when using radar or true wheel speed. Use the arrow keys to change the application rate.



Step 6:

The screen shown on the left is the planting screen displayed when a row failure occurs. Row failures will display when something has gone wrong with one or more of the meters. Yellow bars mean that the system is no longer detecting chemical flow. Red bars (not shown) mean the console can't communicate with one of the meters. Black bars indicated the meters are turned off. Pressing the **ROW FAILURES** button will display additional details on the type of failure.



Step 7:

The screen shown indicates which meters are not responding. Press **EXIT** or **ENTER** to return to the Main Menu.

Area Information

Step 1:

From the Main Menu, select **OPERATE**.

Step 2:

Select **AREA INFORMATION**.

Step 3:

Using the arrow keys to scroll through the fields to view areas accumulated in each.

Step 4:

To reset the acres to 0.0, press **CLEAR**. Press **ENTER** to return to **OPERATE** menu.

Step 5:

Press **TOTAL AREA COUNTERS** to view all recorded area totals. Press **CLEAR** next to **TOTAL AREA** to reset the acres to 0.0.

End:

Press **ENTER** to return to **AREA INFORMATION** screen, then **ENTER** again to return to **OPERATE** menu.

2013 SmartBox® System Troubleshooting

Problem	Possible Cause	Controller Message	Possible Solution
No communication	Power to distribution box	No communication with distribution box	Check all cable connections
No communication	No power	No communication with distribution box	Connect to battery or replace fuse
No response from meters	System not configured yet	No response from meters	Complete Row Configuration
No response	5 ft. adapter cable not attached	No response from meters	Connect adapter cable
No response from meters	Row harness not attached	No response from meters	Attach row harness
Unable to configure full system	Not all row harnesses attached	Attach next row	Connect row harness(es)
Unable to configure full system	Incorrect number of rows entered	Operate	Reset row number and reconfigure
Individual rows not responding	Meters not attached	No response from row number	Attach the row
Individual rows not responding	Cut row cable	Meter not responding	Fix or replace row cable
Individual meter not responding	Bad meter	Meter # not responding	Replace and configure new meter

Troubleshooting Speed Calibration

Main Menu > System Calibration > Speed Input

Problem	Possible Cause	Controller Message	Possible Solution
Counts do not show in calibration mode	Not connected to radar input	N/A	Connect to active speed input
Counts do not show in calibration mode	Speed input set on GPS	N/A	GPS not compatible or set to radar
Counts do not show in calibration mode	Speed signal too weak	N/A	Switch speed input or amplify signal

Troubleshooting Meter Calibration

Problem	Possible Cause	Controller Message	Possible Solution
Individual rows not dispensing	Rows shut off	N/A	Turn meters back on
Individual rows not dispensing	Bad meter or meter plugged	N/A	Clean meters or replace meter
Individual rows not dispensing	Empty base unit	N/A	Fill base unit
Individual rows not dispensing	Meter not connected	N/A	Connect meter
Individual rows not dispensing	Row shutoffs activated	N/A	Deactivate row shutoffs
Individual rows not dispensing	Negative 84 setting	N/A	Reset to zero by pushing up and down arrow at the same time

Meter Catch Test

Problem	Possible Cause	Results	Possible Solution
Meter catch weight incorrect	Partially plugged meter	Catch amount light	Clean meter
Heavy catch weight	Meter wear	Catch grams above target weight	Re-calibrate
Meter will not increase out-put when adjusted	Meter partially plugged	Catch amount light	Clean meter
Meter out-put will not increase when adjusted	Bad meter	Catch amount increase very little	Replace meter

Troubleshooting Guide for Operation

When system is not dispensing in the operate mode, use the following checks to determine the cause:

- ▶ Do we have product in base units?
 - If yes, go to next question.
 - If no, add chemical to base units.

- ▶ Has lift switch been activated
 - If yes, go to next question or lift switch may be bad (replace lift switch) if system will function in calibrate mode.
 - If no, activate lift switch.

- ▶ Is the on/off switch on?
 - If yes, go to next question.
 - If no, activate the on key (switch).

- ▶ Are meters turned on
 - If yes, go to next question.
 - If no, go to main menu to on/off and turn all meters on.

- ▶ Are rows shutoffs activated? (if so equipped)
 - If yes, deactivate row shutoffs.
 - If no, go to next question.

- ▶ Are we on fixed speed or is ground speed above 2.2 mph
 - If yes, connect or repair or replace wiring as needed.
 - If no, increase planting speed above 2.2 mph or set on fixed speed. Does controller indicate speed input above 2.2 mph. If no, possible speed input failure if on radar mode.

System Application Issues Troubleshooting

System over or under application/ acre

- ▶ Does controller speed match tractor and planter monitor speed?
 - If yes, go to next question
 - If no, go to system calibration then to speed input and then to radar counts and adjust to match speed of SmartBox[®] controller to planter monitor speed.

- ▶ Is application rate correct for chosen product?
 - If yes, go to next question.
 - If no, set application rate to the correct rate per 1000/ft. of row. Note controller applies in oz. / 1000ft of row not pounds per acre.

- ▶ Does the system stop applying product when planter is raised at end rows and water ways?
 - If yes, go to next question.
 - If no, adjust lift switch or check for pinched or a shorted wire (cut wire).
If lift switch has been locked on, turn off this feature in controller section of main menu.

- ▶ System may need to be recalibrated for correct application rate for chosen product. Very definitely recalibrate if certain meters are over or under applying product.

- ▶ If SmartBox[®] system is equipped with row shutoffs, acres applied and amount of product applied will not match due to SmartBox[®] controller calculation of acres applied does not account for row shutoffs.

Acres applied does not match planter monitor.

- ▶ Is the correct row spacing set in the SmartBox[®] controller for your row width? Go to main menu and down to planter set up. Enter on row spacing and adjust as needed. Note application rate is based on oz./1000ft of row not by acreage(row spacing)
 - If yes, go to next question.
 - If no, adjust row spacing as needed.

- ▶ Does the SmartBox[®] controller apply product when planter is lifted and speed is above 2.2 mph?
 - If yes, adjust lift switch.
 - If no, go to next question.

- ▶ Does planter have seed clutches and SmartBox[®] controller have row shutoffs, if yes on planter and no to SmartBox[®] then acres applied will not match.