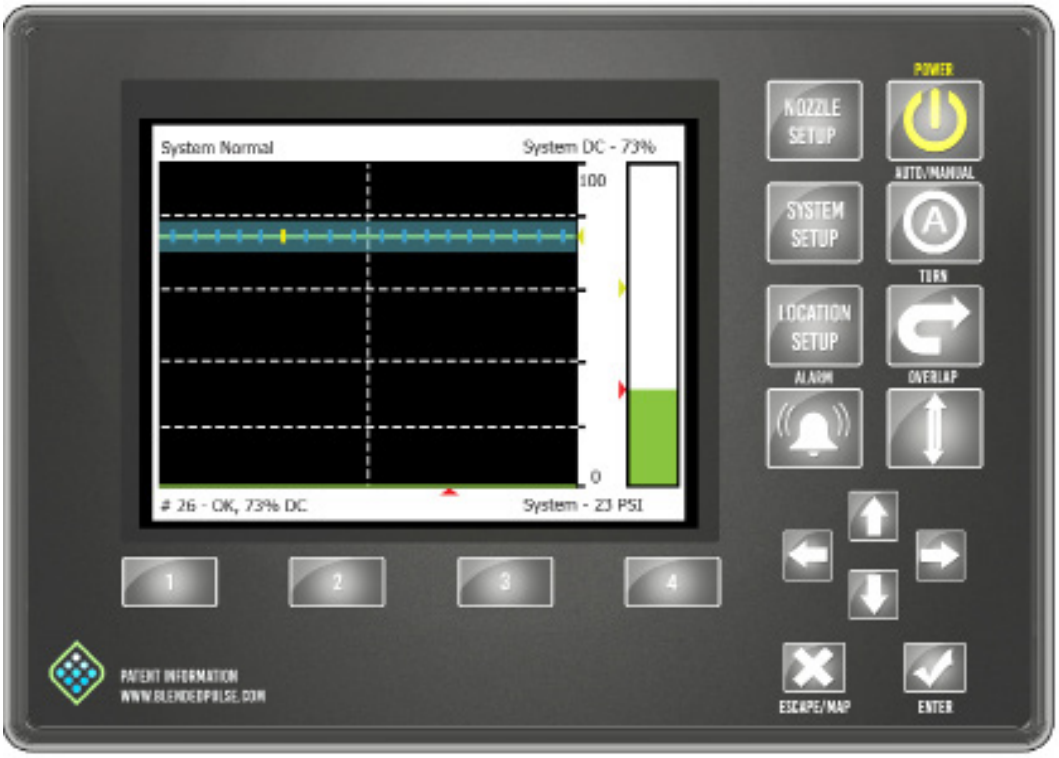
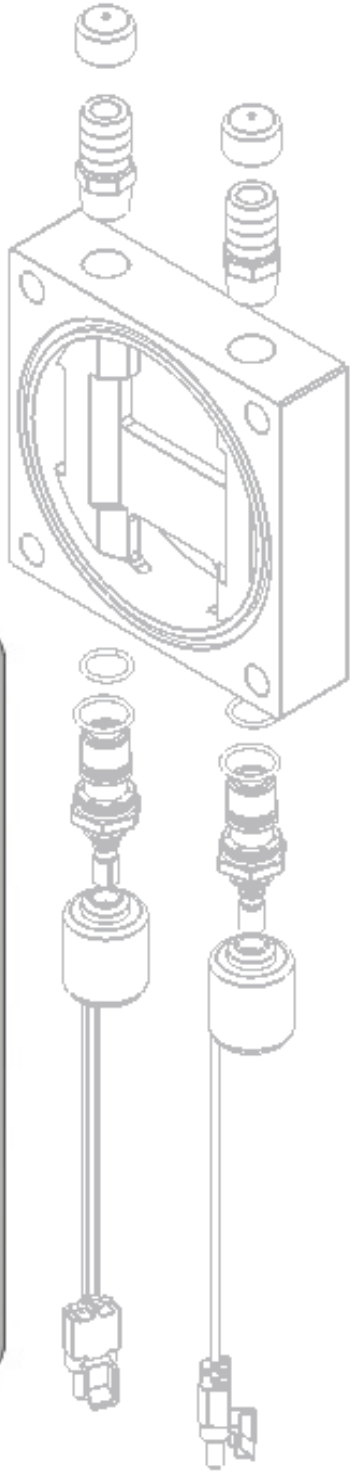
PinPoint™ II

For

N-Ject™ NH3





Operator and Maintenance Manual

APPLICATION SYSTEMS
FOR PROFESSIONALS™

www.capstanAG.com

CapstanAG

How Can We Help?
855-628-7722
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Thank you for your business!

At CapstanAG, our goal is to redefine the way people do their chemical application. Our PWM control systems have been setting the bar for maximum productivity for more than 20 years. Our focus on performance, support, and education have dramatically changed the landscape of agricultural chemical application.

CapstanAG specializes in creating proprietary systems for the agricultural industry, primarily focusing on chemical and fertilizer applications. Our inventive process involves research, engineering, design, and lab and field testing.

Service Contact Information

If a problem occurs with your system that cannot be corrected with the information in this manual, please contact your dealer for service and technical assistance. If further assistance is needed, contact CapstanAG.

System Purchased: _____

Dealer: _____

Contact: _____

Phone: _____

Address: _____

City,State/Province, Zip: _____

Factory Service/Repairs

CapstanAG
4225 S.W. Kirklawn Ave. | Topeka, KS 66609

Hours: 8:00 a.m. to 4:00 p.m. CST

Toll-free number: (855) 628-7722 | Fax: (785) 232-7799

E-mail: prodsupport@capstanag.com | Online: www.CapstanAG.com

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SAFETY

SIGNAL WORDS

FIGURE 1: Signal words designate a degree or level of hazard seriousness.

DANGER: indicates an imminent hazard which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.

WARNING: indicates a potential hazard which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION: indicates a potential hazard which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

FIGURE 1

FIGURE 2: Important and Note

IMPORTANT: *This is used to draw attention to specific information that is necessary for the operation, setup, or service of the system.*

NOTE: *This is used for additional information that can help understand or operate the system.*

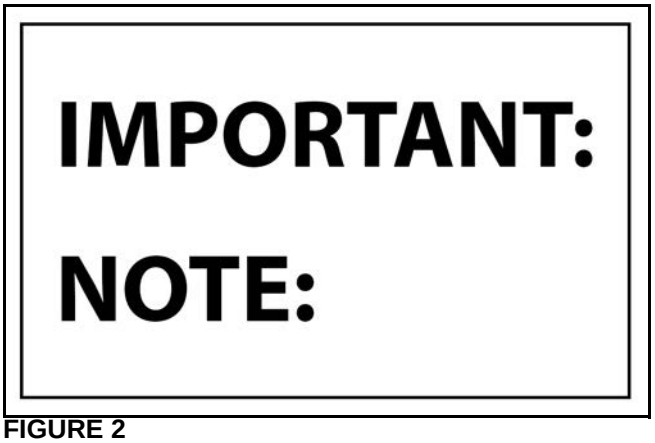

FIGURE 2

SAFETY SIGNS

FIGURE 3: The HCS aligned its provisions with the United Nations' Globally Harmonized System (GHS) Classification and Labeling of Chemicals in 2012. This is a GHS safety label example for a chemical hazard.

These labels and safety messages warn all personnel about hazardous chemicals or potentially unsafe chemical conditions that may exist while working around agricultural application equipment.

CapstanAG add-on application systems for OEM and retrofit agricultural application equipment (booms and toolbars) may contain HCS pictographs and GHS safety labels and safety signal word messages.

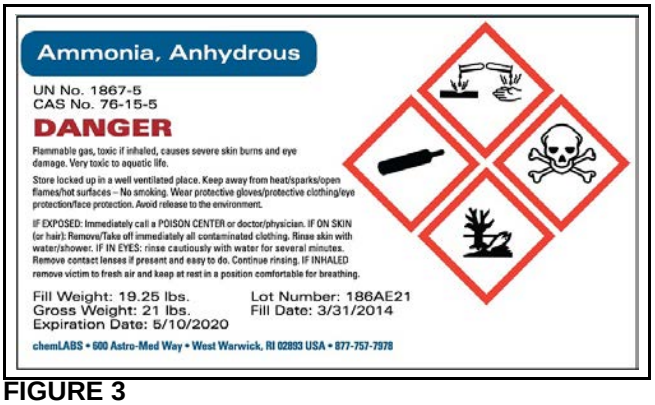

FIGURE 3

PRESSURIZED FLUID LINES

Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can accidentally burst when too much heat is present

PERSONAL PROTECTIVE EQUIPMENT

Wear close fitting clothing and the correct personal protective equipment (PPE) for the job. See the manufacturer's manual or other information for correct PPE.

BATTERY SAFETY

Use the procedure in the appropriate agricultural equipment manual for connecting, disconnecting, and jump-starting the machine's battery.

Keep sparks and flames away from the battery. Battery gas can explode and cause serious injury. Do not smoke in the battery charging area.

Remove jewelry, which might make electrical contact and create sparks.

CHEMICAL SAFETY

Chemicals used in agricultural applications can be harmful to your health and/or the environment if not used correctly. Always follow all label directions for effective, safe, and legal use of agricultural chemicals.

EMERGENCY SAFETY

Fire extinguishing systems must meet the applicable OSHA requirements, and all users of portable/fixed fire suppression equipment must know the types, limitations, and proper uses of this equipment; including hazards involved with incipient stage firefighting.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

Know the location of fire extinguishers and first aid kits and how to use them.

Inspect the fire extinguisher and service the fire extinguisher regularly.

Follow the recommendations on the instructions plate.

Very small fires can be put out (extinguished) with a fire extinguisher. Use an appropriate method to extinguish a fire (water for paper fires, and chemical extinguishers for electrical or chemical fires.

INTRODUCTION

THIS MANUAL

Make sure that all personnel has read this manual and thoroughly understand the safe and correct operation and maintenance procedure. Failure to do so could result in personal injury or equipment damage.

This manual should be considered a permanent part of your system and should remain with the system when you sell it.

Right and left sides are determined by facing in the direction of forward travel of the machine the system is on.

The information, screen shots, and other illustrations were correct at the time of publication. Changes can occur without notice.

This manual contains important information on how to safely and correctly install, operate, and maintain CapstanAG equipment. These instructions will help keep personnel safe, reduce downtime, and increase the reliability and life of the equipment, its components, and related systems.

Review the safety information in the Original Equipment Manufacturer (OEM) agricultural equipment manual(s).

Follow the instructions (in this manual) for each step to make sure that work conditions in and around the OEM equipment are safe.

It is important for all individuals working with chemicals to understand the potential risks, necessary safety precautions, and proper response in the event of accidental contact.

Review the OEM agricultural equipment manual(s) for chemical safety information.

Review, understand and read procedures and use Safety Data Sheets (SDS) and the required Personal Protective Equipment (PPE) for hazardous chemicals.

Please keep this manual and all enclosed documentation in an accessible location known to all operators, installation, and maintenance personnel.

If you do not understand the CapstanAG equipment after reading this manual, please obtain the proper training before working with equipment to make sure of your own safety and well as your co-workers' safety.

Do not attempt to operate any equipment or system until you completely understand why, when, and how it operates. If you are uncertain after studying this manual, please contact CapstanAG.

SYSTEM IDENTIFICATION

Write the system name, serial number, and other information down in the Service Contact Information on the inside cover of this manual. Your dealer will use these numbers when you order parts. File a copy of the identification numbers in a secure place off the machine.

If you are not the original owner of this machine, it is in your interest to contact your local CapstanAG dealer to inform them of this unit's serial number. Providing this information will help CapstanAG notify you of any issues or product improvements.

NOTES

OPERATION

CAPVIEW BUTTON DESCRIPTIONS

FIGURE 4:

(1) **POWER** button
Press to turn on or off the CapView and the Gateway hub.

(2) **AUTO/MANUAL** button
Press to change between Manual and Automatic operation mode

(3) **TURN** button
Press to engage or disengage turn compensation

(4) **OVERLAP** button
Press to engage or disengage overlap control

(5) Arrow buttons
Press these buttons to move through menus items

(6) **ENTER** button
Press to open the selected menu screen or to accept the selected value

(7) **ESCAPE/MAP** button
Press to exit the current screen or to not accept selected field. Also used to access map menu

(8) Presets buttons
Used to store and utilize boom, tip size, and flow profiles

(9) **ALARM** button
Press to stop an audible alarm

(10) **LOCATION SETUP** button
Press and hold for 10 sec to go to the **Location Setup Menu**

(11) **SYSTEM SETUP** button
Press to go to the **System Setup** menu

(12) **NOZZLE SETUP** button
Press to go to the **Nozzle Setup** menu

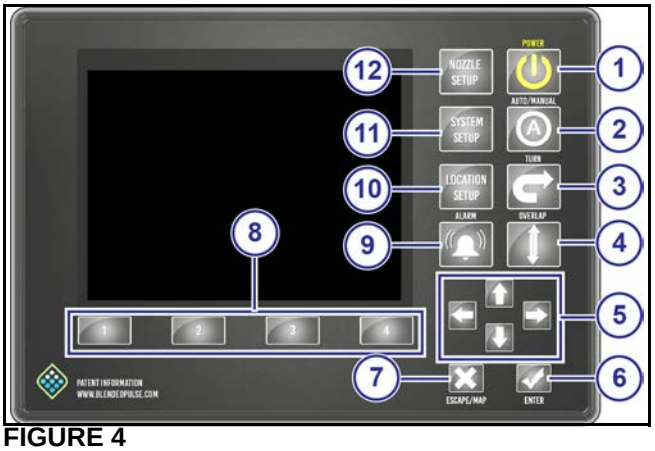

FIGURE 4

START UP PROCEDURE

FIGURE 5: Before starting the machine engine, always make sure that the CapView and rate controller are off.

1. Start the machine engine.
2. Press the **POWER** button (1) to start the CapView and the rate controller.
3. Make sure that the rate settings are correct.
4. Press the **AUTO/MANUAL** button (2) to let the rate controller control the duty cycles.
5. Press the **TURN** button (3) to activate the turn compensation feature.
6. Press the **OVERLAP** button (4) to activate the overlap feature.
7. Turn on the boom sections to spray.

FIGURE 5

SHUT DOWN PROCEDURE

FIGURE 6:

1. Turn off the sections.
2. Press the **POWER** button (1) to turn off the CapView and the rate controller.

FIGURE 6

OPERATE IN AUTOMATIC CONTROL (AUTO) MODE

FIGURE 7: The PinPoint™ II system default is manual control mode. In manual mode, press the up or down arrow buttons to change the nozzle duty cycle.

In Auto Mode, the rate controller changes the nozzle duty cycle.

To change to auto mode:

1. Start the machine engine.
2. Press the **POWER** button (1) to start the CapView and the rate controller.
3. Press the **AUTO/MANUAL** button (2) to let the rate controller control the duty cycles.

   The LED light (3) within the **AUTO/MANUAL** button indicates that the system is in automatic mode.

FIGURE 7

FIGURE 8: For the N-Ject™ operation mode, the pressure will not automatically change. On the main operation screen, the pressure is represented in three ways:

(1) Green bar graph

(2) Yellow arrow

(3) P In value

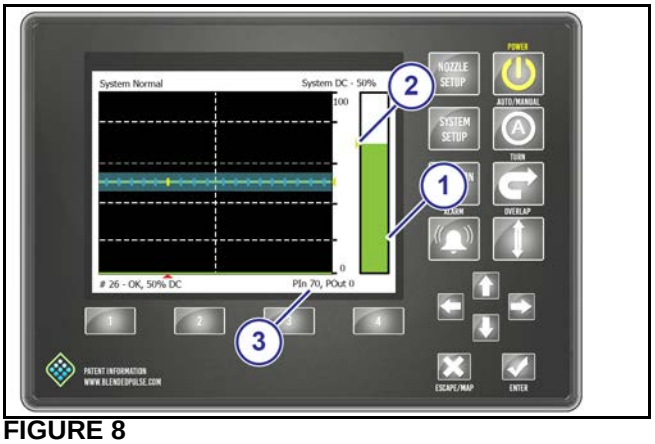

FIGURE 8

NOZZLE DISPLAY

FIGURE 9: The duty cycle of each nozzle on the boom is indicated with a blue tick mark (1) on the scale.

The bottom of the graphic is 0%, and the top is 100%. The grid lines (2) are in 20% increments. A vertical grid line (3) indicates the center of the boom.

The yellow arrow (4) indicates the average duty cycle of all the nozzles. The text block (5) in the upper right corner indicates the average system duty cycle.

The red arrow along (6) the bottom of the duty cycle graphic moves from nozzle to nozzle, and left to right two nozzles per second. The corresponding tick mark turns yellow (7) as the red arrow moves along.

The text box (8) at the lower left side shows the nozzle diagnostic information for the nozzle corresponding to the red arrow and yellow tick mark.

If a nozzle error is detected, that nozzle's tick mark will blink yellow, the alarm will sound, and the alarm and nozzle setup-# LEDs will blink.

The left and right arrows (9) will override the scrolling red arrow so that the red arrow can move to the detected nozzle. The text block at the lower left side may show one of the following notices:

- Coil Open
- Coil Shorted Closed
- Plunger Lodged Open
- Plunger Stuck Closed

After a few seconds, the red arrow will begin to scroll again.

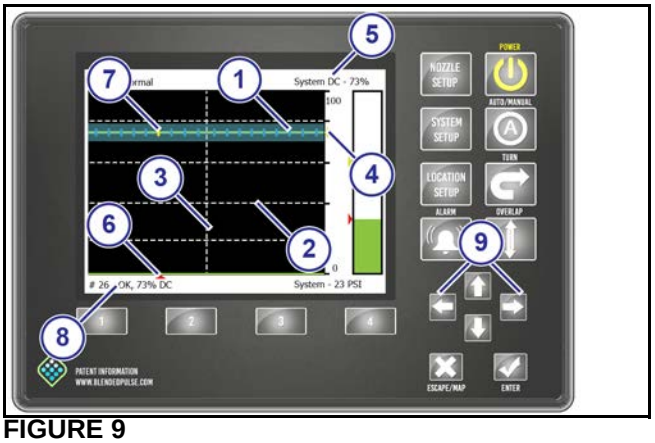

FIGURE 9

OVERLAP CONTROL

FIGURE 10: Press the **OVERLAP** button (1) to turn the overlap control on or off.

Overlap can be turned off for situations that can include:

- Spraying rinse water
- Troubleshooting
- No GPS signal
- Other

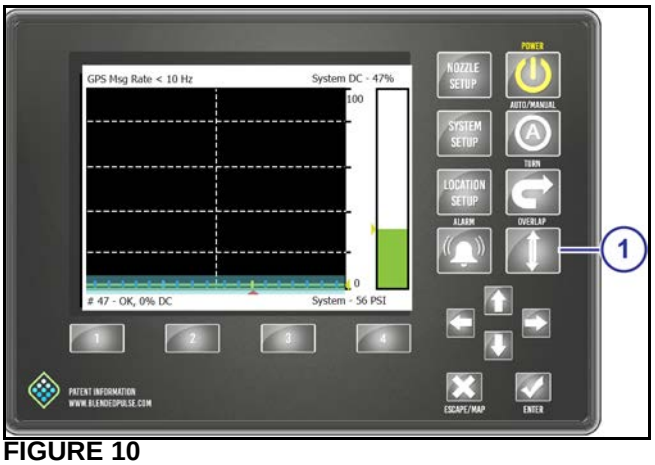

FIGURE 10

MAPPING

Maps can be deleted, moved, copied, etc.

Maps are stored in bitmap format and can be viewed with MS-Paint or a similar picture viewer program.

A new map is started when the CapView is turned on and the **OVERLAP** button is selected.

The system establishes a map origin and must stay within a 3-mile radius of the origin point.

If the map range is exceeded, an error message will show (Map out of bounds) and the alarm will sound.

FIGURE 11: If the **Save Map #.bmp** (1) is selected, the map will be saved, and a new map will start.

Select **Save Map As...** (2) to give the map a specific name.

Select **Retrieve Map...** (3) to load a map that has already been made.

Select **Delete Map...** (4) to delete the current map.

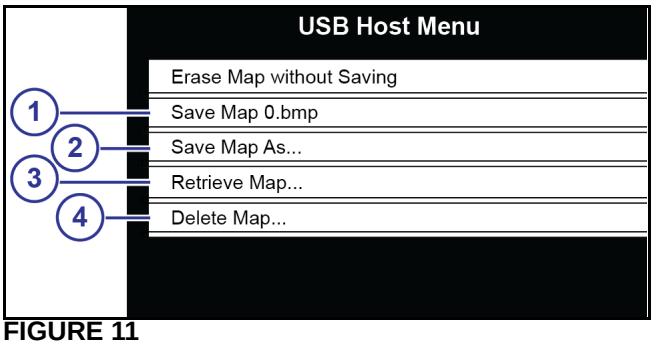

FIGURE 11

FIGURE 12: Press the **UP** or **DOWN** arrow buttons (1) to select the desired map setting.

Press the **ENTER** button (2) to save.

To shortcut to the **Save Map Menu**, press the **ESCAPE** button (3).

FIGURE 12

Download Maps

1. Insert a USB device into the back of the CapView.

NOTE: *Use a USB device no larger than 64GB in the CapView.*

FIGURE 13: The **USB Host Menu** will show.

2. Select **Download Maps** (1).
3. Press the **ESCAPE** button (2) to close the **USB Host Menu**.

You can now start spraying.

FIGURE 13

OVERLAP DISTANCE

The PinPoint™ II system uses 1-meter-squares to record where spraying has occurred. Any spraying nozzle that touches one of these squares will cause the system to consider this as an area that has been sprayed. As the machine travels along, each nozzle looks to see if the approaching square has been sprayed or not. If not, spraying continues. If so, the nozzle shuts off.

Change the Overlap Distance

FIGURE 14: Overlap Distance in the **System Setup** menu can be set to skip or overlap. The value is in inches. Positive numbers cause intentional overlap, and negative numbers cause intentional skips.

1. Press the **SYSTEM SETUP** button (1).
2. Use the **UP** or **DOWN** arrow buttons (2) to move to **Overlap Distance** (3).
3. Press the **ENTER** button (4).
4. Change the value of the overlap distance.
5. Press the **ENTER** button to save.
6. Press the **ESCAPE** button (5) to leave the **System Setup** menu.

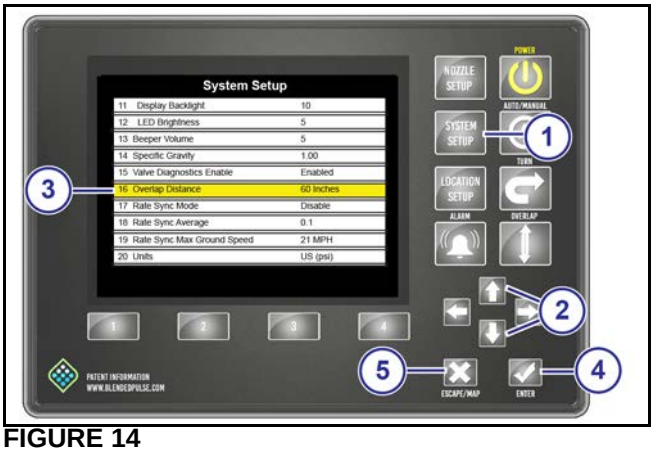

FIGURE 14

FLOW METER SIGNAL

When the operation mode is set to **N-Ject**, the system is always calculating the flow.

The rate controller is sent a signal for the whole section if the section is on.

The flow is calculated from the two pressure sensors (Inlet/Outlet).

Flow meter type must be set as NH3 calculation (default in N-Ject Mode). The system will not operate correctly if the type is changed from the default.

TURN COMPENSATION

With a standard spray boom, the flow rate is averaged over the entire boom and that flow rate is based on the speed of the machine chassis. This results in over application on the inner radius of the turn and under application on the outer radius of the turn because the nozzles are traveling at different speeds than the chassis is during a turn. A tighter turn radius results in a higher level of misapplication.

With the turn compensation feature engaged, each nozzle will apply the correct amount of product based on each nozzle's speed, calculated using GPS.

The amount of correction available to each nozzle during a turn compensation turn can be limited by the amount of available duty cycle during the turn. The ideal target duty cycle during a tight turn is 55%.

Nozzles determined to be moving backward will turn off. If only part of the boom is spraying, the flow meter signal is managed, so the correct rate is applied.

Turn compensation calculates a turn radius from a GPS signal and adjusts the flow per nozzle to maintain a constant rate.

If you need more information about turn compensation, contact your CapstanAG field representative or your servicing dealer.

FIGURE 15: Press the **TURN** button (1) to turn on and off the turn compensation feature.

Turn compensation can be turned off for situations like:

- Troubleshooting
- No GPS

Shown is the turn compensation active with no other features active

FIGURE 15

FIGURE 16: Turn Compensation with Overlap Control active.

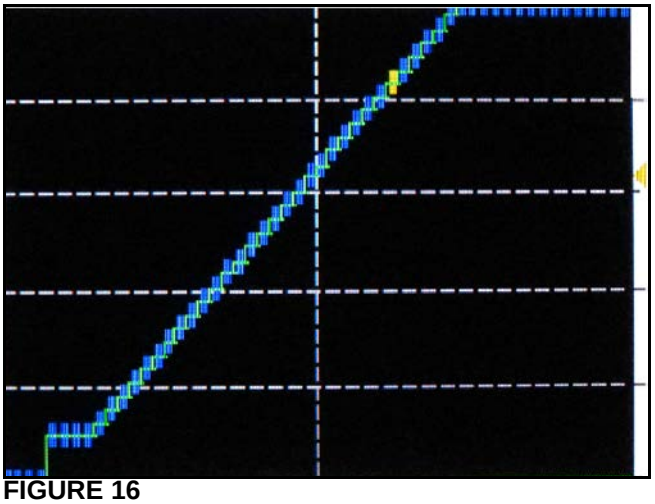

FIGURE 16

COUNTERS

FIGURE 17: The counters are shown on the **System Setup** screen.

System Setup

1	Operation Mode	XXXXX
2	Controller Gallon Counter	0 Gallons
3	Actual Gallon Counter	0 Gallons
4	Controller Acre Counter	0.0 Acre
5	Actual Acre Counter	0.0 Acre
6	Control Gallons Per Minute	0.0 GPM
7	Actual Gallons Per Minute	0.0 GPM
8	Nozzle Control (Key Fob)	12 V Active
9	Pressure 1	18 PSI
10	System Voltage	13.8 V

FIGURE 17

Gallon Counters

The PinPoint™ II system manages the flow meter signal to keep the rate controller accurate when the N-Ject™ system is turned off.

It is important to show the amount of manipulating that has occurred.

The **Controller Gallon Counter** on the CapView should match the values from the rate controller.

The **Actual Gallon Counter** values on the CapView should match the tank volume.

The difference between the controller counters and the actual counters is the amount of product saved by using the PinPoint™ II system.

Acre Counters

The **Controller Acre Counter** on the CapView should match the values from the rate controller.

Reset the Counters

1. Press the **SYSTEM SETUP** button.
2. Use the **UP** or **DOWN** arrow buttons to select the desired counter.
3. Press the **ENTER** button.
4. A menu will show, confirm your intention.

ALARM

If the alarm on the CapView sounds, press the **ALARM** button to silence the alarm. The LEDs will continue to blink. If the issue is not resolved after several minutes, the alarm will sound again.

IMPORTANT: *It is the responsibility of the operator to stop using the system if the spray application is not performing correctly.*

VENT AND DRAIN THE N-JECT™ SYSTEM

IMPORTANT: *This procedure must be done before any service or maintenance is performed on the N-Ject™ system.*

1. Close the tank manual shutoff valve.
2. Pull the application knifes through the soil.
3. Turn on the N-Ject™ system and the section and master switches to apply ammonia.

- Pressure will be relieved through the knifes and into the soil. When pressure is not shown on the inlet pressure gauge, turn off the N-Ject™ system.

4. Make sure that there is no pressure on the inlet pressure gauge.
5. Open the bleeder valve located on the inlet end plate on the N-Ject™ manifold(s).

- Any pressure remaining in the N-Ject™ system inlet hoses is released.

6. The machine/implement can be moved to a safe place for service.

NOTES

MAINTENANCE

SERVICE THE SYSTEM

⚠ CAUTION

Before operation or service to the system, read and understand the machine's operator manual and the PinPoint™ II for N-Ject™ NH3 operator and maintenance manual. Chemical residue may be present on/in the OEM equipment. Use the correct personal protective equipment.

CLEAN THE SYSTEM

Thoroughly clean the system after each use.

Avoid high-pressure spray when cleaning the spray system components, valves, and wiring connectors.

INSPECT THE SYSTEM

Inspect hoses for cuts, nicks, or abrasions before each use. Replace any damaged hoses immediately.

Make sure that the strainers are clean.

Make sure that all hoses and wiring are secure.

Check for loose hoses, mounting hardware, and other components. Tighten if necessary.

Check for damaged or missing decals. Replace if necessary.

JUMP START, WELD ON, OR CHARGE THE MACHINE

If jump starting the machine, make sure that you trip the 80 Amp circuit breaker to prevent damage to the PinPoint™ system.

If charging the machine's batteries or welding on the machine, trip the 80 Amp circuit breaker or the machine's battery disconnect to prevent damage to the PinPoint™ control system.

STORAGE OF THE SYSTEM

Thoroughly clean the implement and the system before any long storage.

IMPORTANT: *Use of N-Serve requires that the system is flushed with one or two tanks of ammonia without N-Serve at the end of the season before long storage.*

CLEAN THE Y-STRAINER

FIGURE 18: Remove the plug (1), magnet (2), and: screen (3).

Clean the debris from the magnet and screen by washing with a solution that will remove an oily residue.

Clean the strainers on a regular basis.

Install the screen, magnet, and plug before operation.

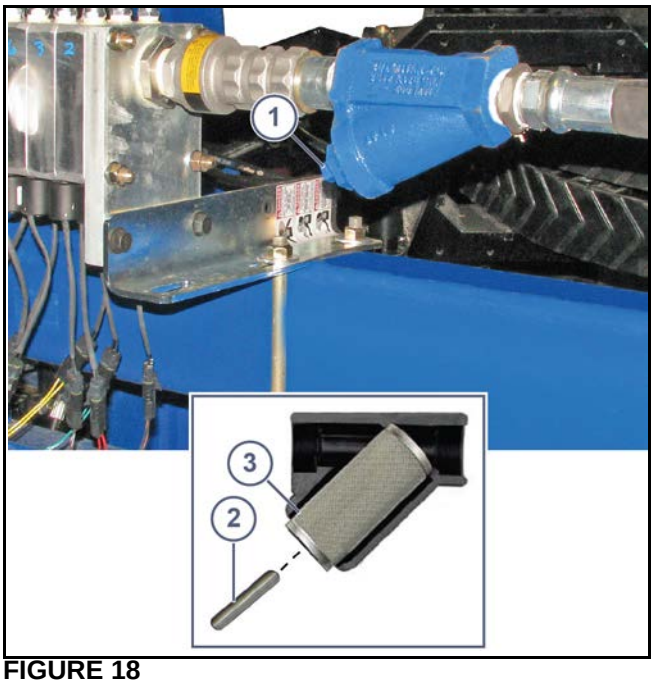

FIGURE 18

CLEAN THE INLET STRAINER

FIGURE 19: Disconnect the inlet plumbing (1) from the N-Ject™ manifold.

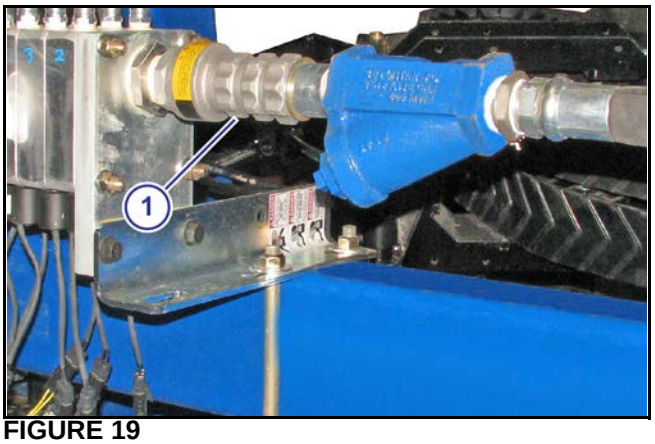

FIGURE 19

FIGURE 20: Remove the strainer (1) and magnet (2) from the manifold.

Clean the debris from the magnet and screen by washing with a solution that will remove an oily residue.

Clean the strainers on a regular basis.

Install the strainer and magnet into the manifold and connect the inlet plumbing before operation.

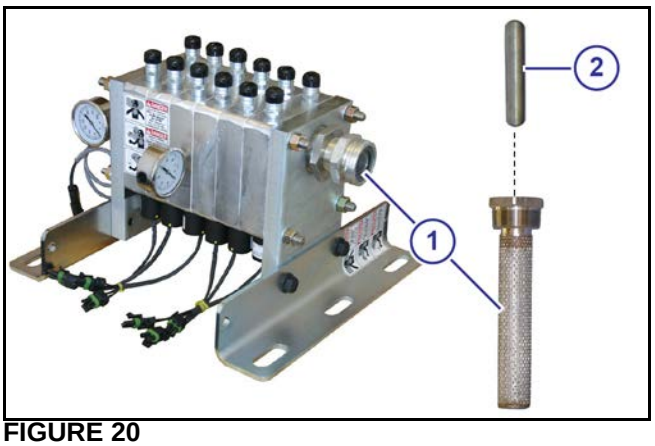

FIGURE 20

NOZZLE VALVES

The nozzle valves are on the N-Ject™ manifold(s).

Nozzle valve assemblies are offered with a 7-watt coil with either a 1/16 inch or 3/32 inch orifice or a 12-watt coil with a 5/32 inch orifice.

The 1/16 inch or 3/32 inch orifice for low flow applications or a 5/32 inch orifice for high flow applications.

Plugged nozzle valves can be classified into two categories:

- Plunger blockage
- Plunger stuck

Plunger blockage results when larger debris catches between the orifice and plunger seal. This is the smallest flow passage within the nozzle valve.

Stuck plungers result when smaller debris collects around the barrel of the plunger and binds the plunger in place. Symptoms of a blocked or stuck plunger are:

- Constant application
- Leaking when the nozzle is shut off
- No application

NOTE: *Pinched or split O-rings will also cause nozzles to drip when shut off.*

NOTE: *Operating a plugged nozzle valve for extended periods of time may result in a nozzle valve coil failure. Clean any plugged nozzle valves immediately.*

NOTE: *Before removal or installation of the nozzle valves, make sure that the pressure has been released from the N-Ject™ system.*

If plugged nozzles are a frequent problem in a particular N-Ject™ section, inspect the N-Ject™ system filter screens for plugged or damaged screens. A 100-mesh screen is recommended to prevent nozzles from plugging. Check the mesh size of the strainers and replace the strainers if they are too coarse.

Clean the Nozzle Valve(s)

FIGURE 21: Remove the nozzle valve assembly from the manifold.

1. Remove the coil (1) by rotating the coil counter-clockwise from the valve body (2).
2. Remove the plunger (3) and O-ring (4) from the coil.
3. Remove debris from the plunger, O-rings, and valve body by washing with a solution that will remove an oily residue.
4. Inspect the O-rings (5) and (6).
5. Inspect the valve body and make sure the orifice (7) is not plugged with debris, worn or damaged. If the orifice is worn or damaged, replace the valve body.
6. Inspect the plunger for wear or damage. Replace the plunger if it is worn or damaged.

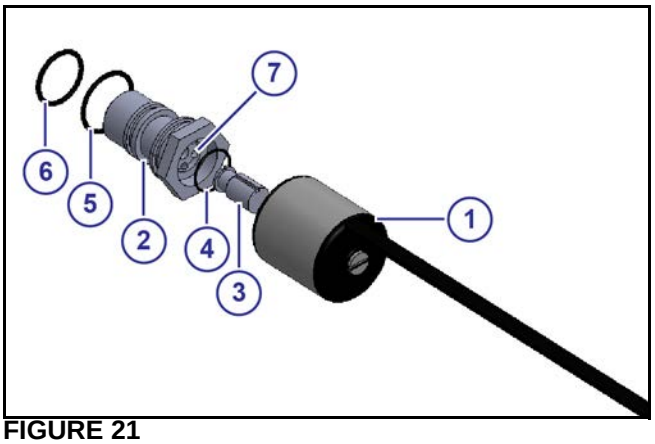

FIGURE 21

Inspect the Plunger Seal

FIGURE 22: After extended use, the Teflon plunger seal will wear a groove (1) where the seal impacts the hard orifice seat. Replace the plunger if worn or damaged.

As the groove deepens the pressure capacity of the valve will decrease until the pressure capacity interferes with the operating pressure of the N-Ject™ system.

The result is erratic pulsing, often described as “flickering.” The N-Ject™ system will operate normally at lower pressures until replacement parts can be installed. High operating pressures and abrasive chemicals will accelerate the wear of the plunger seal material.

- Clean the connector terminals
- Replace coil

FIGURE 22

FIGURE 23: When replacing the plunger, make sure that you have the correct plunger:

(1) High flow - 4 slots on the outside

(2) Standard flow - 2 slots on the outside

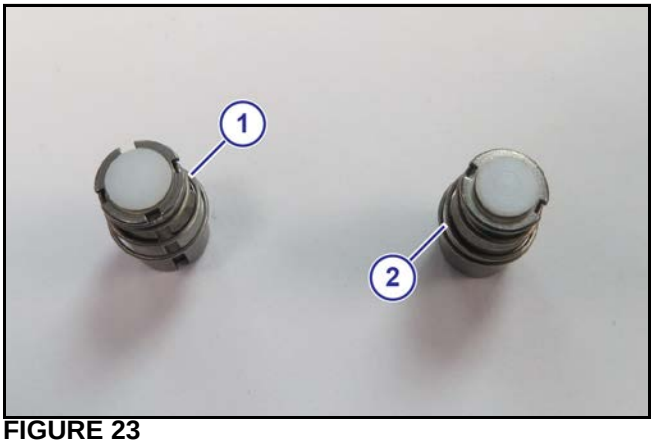

FIGURE 23

FIGURE 24: Make sure that the plunger seats are still smooth and not pitted.

(1) A plunger seat on a new valve body

(2) Examples of a worn plunger seat on a valve body

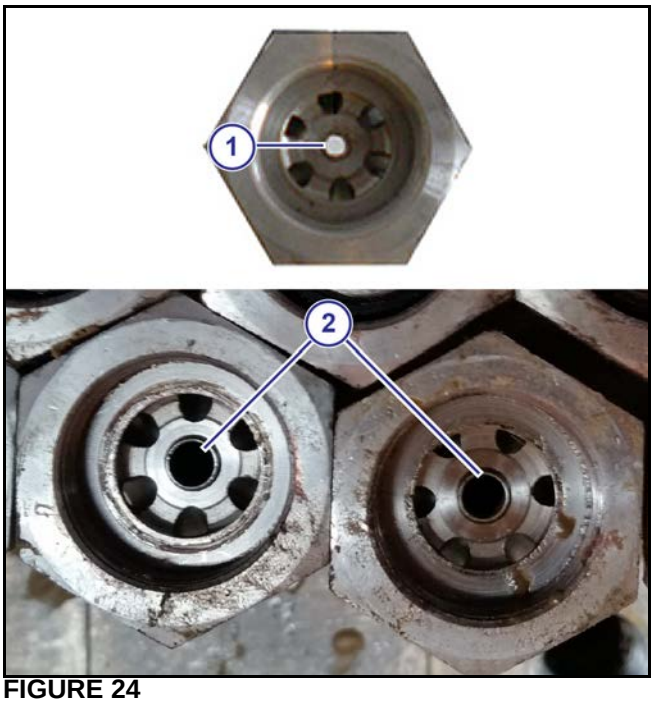

FIGURE 24

TROUBLESHOOTING

CAPVIEW SYSTEM ERROR CHART

SYSTEM ERROR	CAUSE	CORRECTION
System normal	This indicates that the system is operating correctly	
Missing Gateway hub	Communication to the Gateway hub has been lost	Check the connections (key switch power, ignition, and battery power) and then cycle power to the system
Missing VCM	Communication to the VCMs has been lost	Check the connections and fuses (key switch power, ignition, and battery power) and then cycle power to the system
GPS not attached	No GPS messages are being received	Cycle the GPS power
		Check the GPS antenna connections and fuses
No GPS signal	GPS messages are being received but are empty.	Wait for the GPS antenna to acquire satellites
		Cycle the GPS Power
	Faulty GPS antenna	Replace GPS antenna
	Faulty GPS receiver	Replace the GPS receiver
	Incorrect GPS settings • VTG < 10 Hz • GGA < 10 Hz	Wait 10 seconds while the GPS verifies itself. Change GPS receiver settings to: • Baud Rate - 19200 to 115200 • GGA - 10 Hz or more • VTG - 10 Hz or more • ZDA - 1 Hz or more
Valves not found	At machine/system start, the system does not find all of the valves	Identify the missing valve(s). Use the Location Setup Menu. Repair or replace the valve(s) to resume operation.
Compass error	Internal compass on the Gateway hub is faulty	Replace the Gateway hub or change the backup detection method to: • off = fwd to continue without compass
Overlap out of bounds	Distance traveled has exceeded three miles from the point of origin (start of map)	Save or erase the map. Refer to mapping in the operation section
Valve lodged open	Debris in the valve	Clean the valve

CAPVIEW SYSTEM ERROR CHART

SYSTEM ERROR	CAUSE	CORRECTION
Valve lodges closed	Debris in the valve	Clean the valve
Coil circuit open	Coil wire is pinched, cut, or broke. Coil is disconnected	Check the coil connection and resistance (7-watt coils - 21 ohms to 23.5 ohms/12-watt coils - 10 ohms to 11.5 ohms)
Coil circuit closed	Coil wire is pinched, cur, or broke. Internal coil short	Check the coil connection and resistance (7-watt coils - 21 ohms to 23.5 ohms/12-watt coils - 10 ohms to 11.5 ohms)
Gateway hub reset	PinPoint™ II lock/missing VCM error	An alarm will sound until the **ALARM** button is pressed. The error will continue to show for a few seconds after the button is pressed. Operation will continue normally.
System pressure sensor	Pressure sensor is below the minimum voltage	Make sure that the pressure sensor is connected and is not damaged. Replace if necessary.
Outlet pressure sensor	Pressure sensor is below the minimum voltage	Make sure that the pressure sensor is connected and is not damaged. Replace if necessary.

OVER AND UNDER APPLICATION

PROBLEM	CAUSE	CORRECTION
Under application	Plugged filter(s)	Clean or replace the filter(s)
	Incorrect rate settings	Check and adjust the rate settings
	Incorrect calibration settings	Refer to the rate controller and/or PinPoint™ II manuals for instructions
	Flow meter calibration number is incorrect	Check the flow meter calibration
Over application	Speed too slow	Increase speed
	Incorrect rate settings	Check and adjust the rate settings
	Incorrect calibration settings	Refer to the rate controller and/or PinPoint™ II manuals for instructions
	Servo valve not working correctly	Check the Servo valve and replace as necessary

OVER AND UNDER APPLICATION

PROBLEM	CAUSE	CORRECTION
Rate instability	Low voltage to the rate controller	Test the voltage and repair as needed
	Faulty speed sensor reading	Check the radar and replace as needed
	Collapsed suction hose	Replace the suction hose
	Inlet plugged	Check and clean the inlet
	Incorrect valve calibration settings	Check and adjust the settings. Refer to the rate controller manual
	Faulty rate controller	Replace the rate controller
Pressure instability	Faulty rate controller	Replace the rate controller
	Worn or sticky poppet(s)	Check and replace the poppet(s) as needed
	Faulty pressure sensor	Replace the pressure sensor
Single nozzle valve drips when shut off	Plunger is lodged with debris	Clean the nozzle valve
	Plunger is worn	Replace the plunger
	O-ring is pinched or broken	Replace the O-ring
Single nozzle valve will not shut off	Plunger is lodged with debris	Clean the nozzle valve
	O-ring is pinched or broken	Replace the O-ring
Section will not spray	Blown fuse on VCM extension harness	Replace the fuse on the VCM harness
	Faulty VCM	Repair or replace the VCM
	Damaged VCM extension harness	Repair or replace the VCM extension harness
	Rate controller is not activating the section	Make sure that the section signal on Gateway hub. Refer to the CapView pinout identification in the schematics section. Repair or replace the rate controller components.

OVER AND UNDER APPLICATION

PROBLEM	CAUSE	CORRECTION
Skips at the edges of a field	Overlap distance is set too low	Increase the overlap distance to at least 40 in
	Incorrect GPS antenna location	Check the measurements to the GPS antenna location
	CapView overlap settings are incorrect	Set the look ahead time and overlap distance to prevent skips

Rate Controller - Under Application

CAUSE	CORRECTION
Plugged filters	Check the filters and replace as needed
	Make sure that the filters are installed correctly
Plugged lines	Make sure that the lines are clean and do not have any kinks
Shutoff valve is partially closed	Make sure that each shutoff valve is fully open

RATE CONTROLLER - OVER APPLICATION

CAUSE	CORRECTION
Incorrect speed calibration number	Adjust the speed calibration setting

RATE CONTROLLER - RATE INSTABILITY

CAUSE	CORRECTION
Check the rate controller calibration numbers	Check the valve type: • Standard • Fast • PWM • PWM Close • Etc.
	Check the valve calibration. Refer to the rate controller information for the cal number for the valve type

RATE CONTROLLER - RATE INSTABILITY

CAUSE	CORRECTION
Plugged, kinked, or collapsed hoses	Check all hoses and replace as needed

LIQUID LEVEL SENSOR ALARM

CAUSE	CORRECTION
Tank is empty	Fill the tank
Slow ground speed	Strainers are plugged, bad tank, or blockage in hose plumbing

RECOMMENDED GUIDELINES

When servicing a system, CapstanAG recommends doing this three step troubleshooting process:

1. Perform baseline service checks and m the original system setup values in this manual.
2. Identify individual performance problems. Evaluate possible causes and corrections for performance issues.
3. Troubleshoot individual components and replace if needed.

IMPORTANT: *The primary service tool will be a simple multimeter that can measure voltage and resistance (ohms).*

BASELINE EVALUATION PROCESS

1. Verify voltage readings.
2. Visually check all wire connections, harnesses, and connectors for loose, broken, or damaged wires.
3. Visually check all hoses for wear or damage.
4. Make sure that the correct nozzle size is being used for the application rate and mode of action.
5. Compare current settings with those recorded in this manual at setup.
6. Do a “like component swap” to see if the failure follows the component.
7. Do the system tests. Refer to the system testing in the operation section.
8. Make sure that the strainer(s) are clean.
9. Repair or replace any damaged components.

INTERCHANGE THE COMPONENTS

The PinPoint™ II system includes a number of multiple parts:

- Nozzle valves
- Extension harnesses
- VCMs

When troubleshooting failed components, it can be helpful to replace the failed part with a working part at another location. If the problem follows the failed part to the new location, repair or replace the failed part.

If the problem does not follow the failed part, then the problem is likely elsewhere in the system and other

troubleshooting means may be followed.

NOTE: *Use caution when interchanging failed components as in rare cases that the failed component may cause other components to fail at the new location.*

FUSES

Blown fuses are indicators of a short or overload condition. Do not replace a blown fuse with a larger fuse. Larger fuses may result in component failures.

FUSE LOCATION	RATING	TYPE	COLOR
Key Switched Power Harness	5 A	ATO/ATC (in-line)	Tan
PinPoint™ II display (CapView) extension harness	15 A	ATO/ATC	Blue
VCM Extension Harness	15A	ATO/ATC	Blue

COIL TEST

Coil failures are often the result of two factors:

Extended valve use with a plugged nozzle.

Extended use in corrosive environments.

NOTE: *CapstanAG recommends cleaning any plugged nozzle valves immediately.*

Use a voltmeter to measure the ohms of resistance across pins A and B on the nozzle valve connector.

- 7-watt coil resistance of 21 ohms to 23.5 ohms
- 12-watt coil resistance of 11 ohms to 13.5 ohms

If proper resistance is not found:

- Clean the connector terminals and retest
- Replace the coil

CIRCUIT BREAKER

FIGURE 25: A circuit breaker is located near the battery or in the battery box. The 80 A circuit breaker has an automatic/manual trip button (1) and a manual reset lever (2).

A tripped circuit breaker (3) is an indicator of a short or overload condition.

Do not reset (4) the circuit breaker without looking into the cause of the tripped circuit breaker.

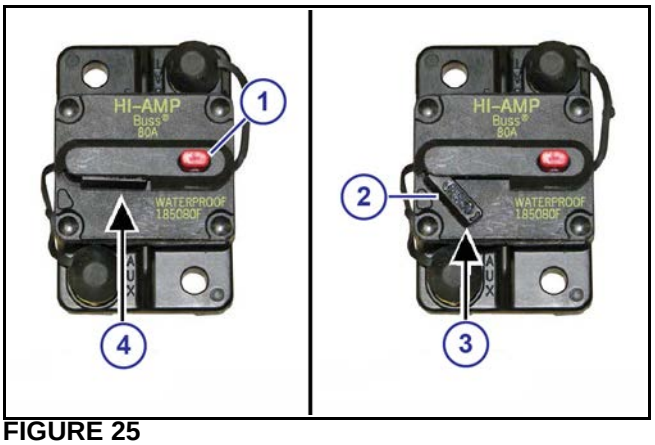

FIGURE 25

CHECK THE BATTERY VOLTAGE

FIGURE 26: Disconnect the CapView harness (8-pin Deutsch connector) on the back of the CapView.

- With the engine of the machine running, use a voltmeter to observe that there is a 13.5 VDC between pin 1 and pin 2.
- With the engine of the machine off, there is a 12.0 VDC between pin 1 and pin 2.

Make sure that the polarity is accurate by looking at the positive voltage when the red (positive) probe is connected to pin 1 and the black (negative) probe is connected to pin 2.

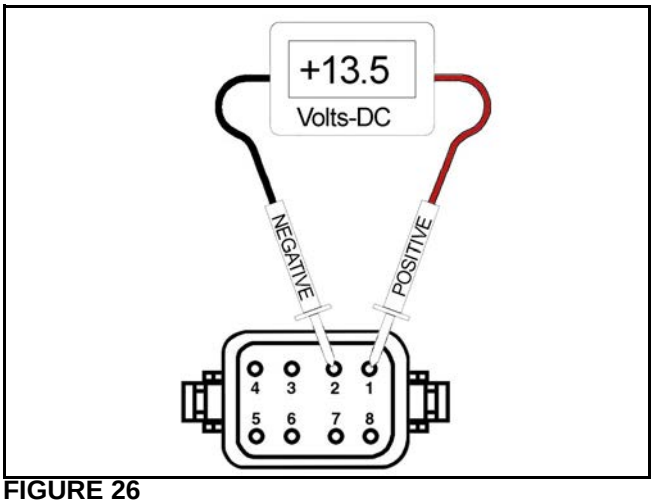

FIGURE 26

FIGURE 27: If there is no voltage present between pin 2 (GND) and pin 6 (SWPWR):

- Check the 5 A in-line fuse (1) on the key switched power harness.
  - If the fuse is good, check the connector pins of the key switched power harness connector that connects to the CapView harness.

Check the 15 A fuse on the CapView extension harness at the Gateway hub.

Check the 80 A circuit breaker at the machine battery.

Check the PinPoint™ II battery harness connections

Check the condition of the battery and the alternator.

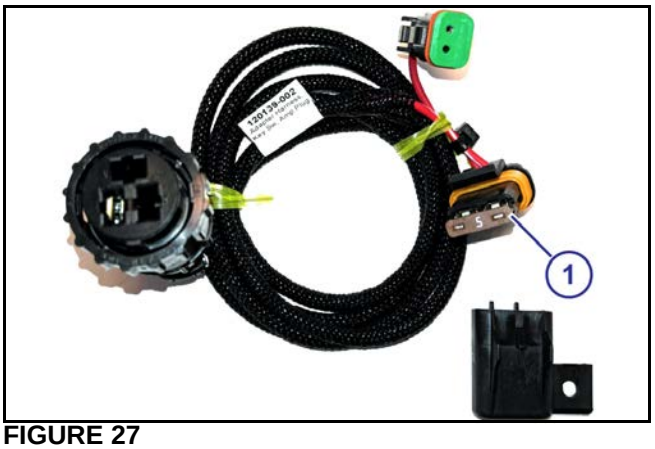

FIGURE 27

CHECK THE SYSTEM LOAD CAPACITY

1. Start the engine of the machine.
2. Turn on the CapView and all of the boom sections.
3. Turn on all of the electrical loads, including the air conditioning, foam marker monitors, etc.
4. See what the voltage readout on the CapView is:

   Go to: System Setup > System Voltage.

PinPoint™ II nozzle valves operate best at 12 VDC or higher. Using less than 12 VDC will result in reduced pressure capacity. This will often result in erratic nozzle pulsing, sometimes described as “flickering.” Also, check the nozzle valves for worn plunger seals.

If low voltage is observed:

- Check and clean the battery terminals.
- Check the battery condition.
- Check the alternator condition.
- Check the condition of the connections and retest.

CONNECTOR PIN IDENTIFICATION

FIGURE 28: CapView

PIN NUMBER	DESCRIPTION	WIRE COLOR
1	Power	Red
2	Ground	Black
3	Boom Switch Signal	Blue
4	CAN High	Yellow
5	CAN Low	Green
6	Key Switched Power	Brown
7	Empty	
8	Empty	

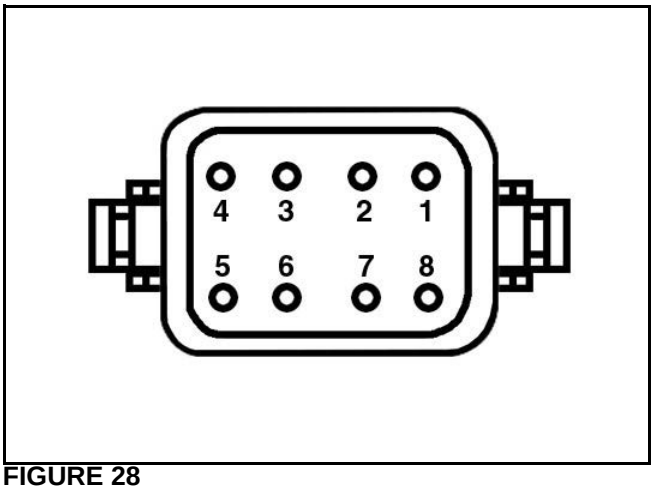

FIGURE 28

FIGURE 29: VCM

PIN NUMBER	DESCRIPTION	WIRE COLOR
1	Power	Red
2	Ground	Black
3	Boom Switch Signal	Blue
4	CAN High	Yellow
5	CAN Low	Green
6	Key Switched Power	Brown

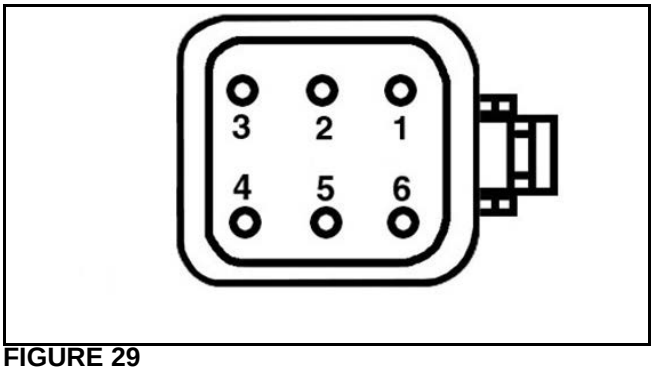

FIGURE 29

FIGURE 30: Gateway Hub

SERIAL	
PIN NUMBER	**DESCRIPTION**
1	RS232 Tx1
2	RS232 Rx1
3	GRD
4	Program DTR
5	Program RTS
6	Speed 1
7	Speed 2
8	GND
9	12 V Key Switched
10	GND
11	Rx2
12	Tx2

DIGITAL	
PIN NUMBER	**DESCRIPTION**
1	ISO CAN High
2	ISO CAN Low
3	12 V Key Switched
4	Float Switch IN
5	GND
6	Backup Alarm IN
7	Digital OUT
8	GND
9	Digital IN
10	12 V Key Switched
11	Implement Switch OUT
12	Implement Switch IN

SERVO		
PIN NUMBER	**DESCRIPTION**	**WIRE COLOR**
1	Servo Power 12 V	Red
2	Servo Input INC	Green
3	Servo Input DEC	Yellow

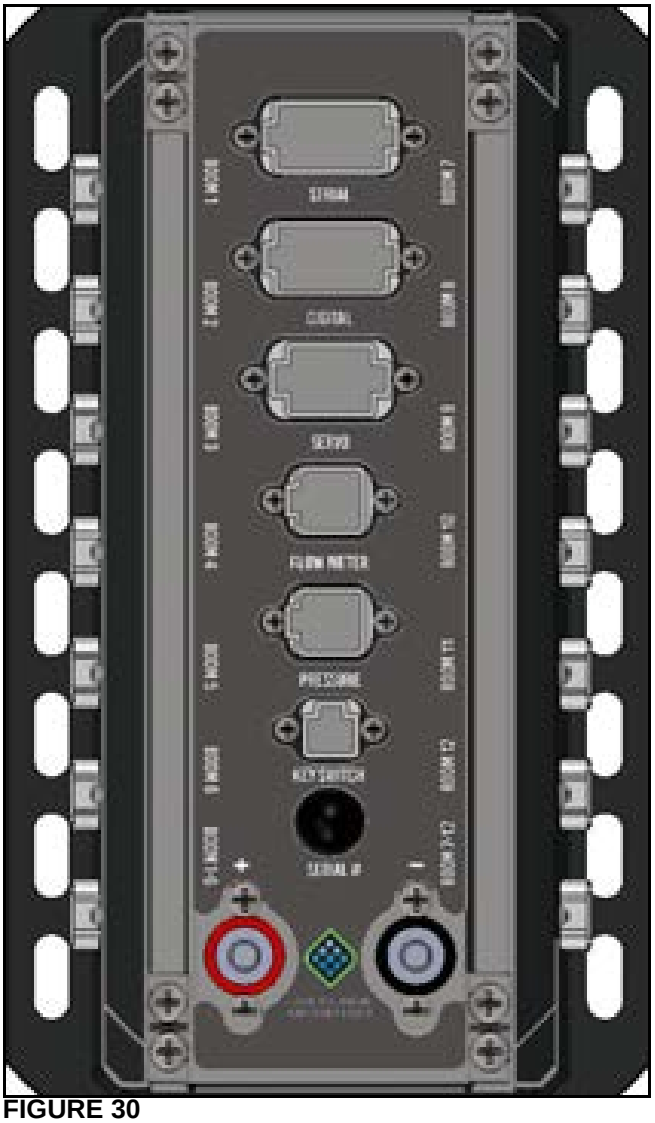

FIGURE 30

SERVO		
PIN NUMBER	DESCRIPTION	WIRE COLOR
4	GND	Black
5	GND	Black
6	Servo Output DEC	Yellow
7	Servo Output INC	Green
8	Valve Power 12 V	Red

FLOW METER	
PIN NUMBER	DESCRIPTION
1	Power from Controller
2	Signal Output to Controller
3	GND from Controller
4	GND from Flow Meter
5	Signal from Flow Meter
6	Power to Flow Meter

PRESSURE	
PIN NUMBER	DESCRIPTION
1	12 V Key Switched
2	Pressure Output 1
3	GND
4	GND
5	Pressure Output 2
6	12 V Key Switched Power

KEY SWITCH	
PIN NUMBER	DESCRIPTION
1	12 V Key Switched Power (Auto/Off/Man)
2	GND

BOOM SECTION 1 TO 6	
PIN NUMBER	DESCRIPTION
1	Boom Section 1 (12 V On/0 V Off)
2	Boom Section 2 (12 V On/0 V Off)
3	Boom Section 3 (12 V On/0 V Off)
4	Boom Section 4 (12 V On/0 V Off)
5	Boom Section 5 (12 V On/0 V Off)
6	Boom Section 6 (12 V On/0 V Off)

BOOM SECTION 7 TO 12	
PIN NUMBER	DESCRIPTION
1	Boom Section 7 (12 V On/0 V Off)
2	Boom Section 8 (12 V On/0 V Off)
3	Boom Section 9 (12 V On/0 V Off)
4	Boom Section 10 (12 V On/0 V Off)
5	Boom Section 11 (12 V On/0 V Off)
6	Boom Section 12 (12 V On/0 V Off)

BOOMS 1 TO 12		
PIN NUMBER	DESCRIPTION	WIRE COLOR
1	12 V Battery	Red
2	GND Battery	Black
3	Boom Section Signal (12 V On/0 V Off)	Blue
4	CAN High	Yellow
5	CAN Low	Green
6	12 V Key Switched Power	Brown

CHECK THE VCM VOLTAGE

FIGURE 31: Disconnect the VCM extension harness (6-pin Deutsch connector) at each boom section VCM.

- With the engine of the machine running, use a voltmeter to observe that there is a 13.5 VDC between pin 1 and pin 2.
- With the engine of the machine off, there is a 12.0 VDC between pin 1 and pin 2.

Make sure that the polarity is accurate by looking at the positive voltage when the red (positive) probe is connected to pin 1 and the black (negative) probe is connected to pin 2.

If there is no voltage present between pin 2 and pin 6:

Turn on the key and cab switch.

Check the 15 A fuse on the VCM extension harness at the Gateway hub. Check the voltage at the hub.

Check the 80 A circuit breaker at the machine battery.

Check the PinPoint™ II battery harness connections.

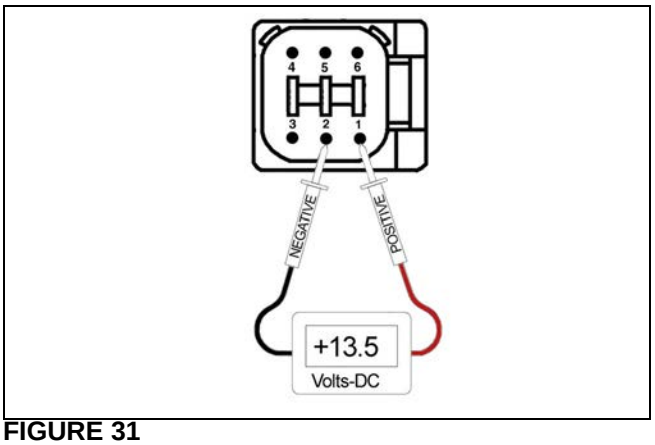

FIGURE 31

CHECK THE BOOM SHUTOFF SIGNAL

FIGURE 32: Disconnect the VCM extension harness (6-pin Deutsch connector) from the VCM.

Turn on the boom section shutoff switch for the VCM being tested.

- With the engine of the machine running, use a voltmeter to observe that there is a 13.5 VDC between pin 2 and pin 3.
- With the engine of the machine off, there is a 12.0 VDC between pin 2 and pin 3.

Make sure that the polarity is accurate by looking at the positive voltage when the red (positive) probe is connected to pin 3 and the black (negative) probe is connected to pin 2.

If there is no voltage present:

- Check the 80 A circuit breaker at the machine battery.
- Check the 15 A fuse on the VCM extension harness at the Gateway hub. Check the voltage at the hub.
- Check the PinPoint™ II battery harness connections.
- Check the boom shutoff switches

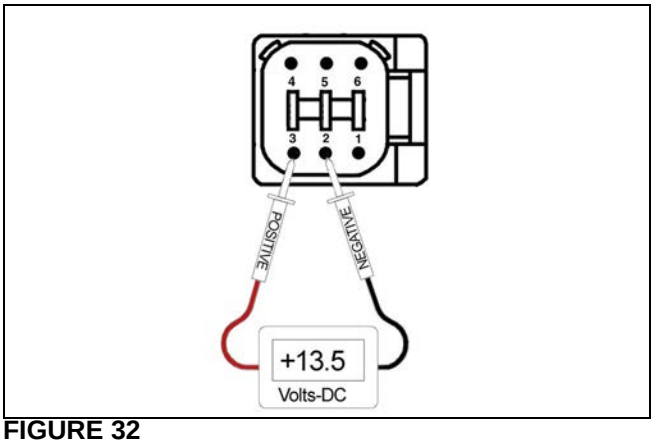

FIGURE 32

TEST THE PRESSURE SENSOR SIGNAL

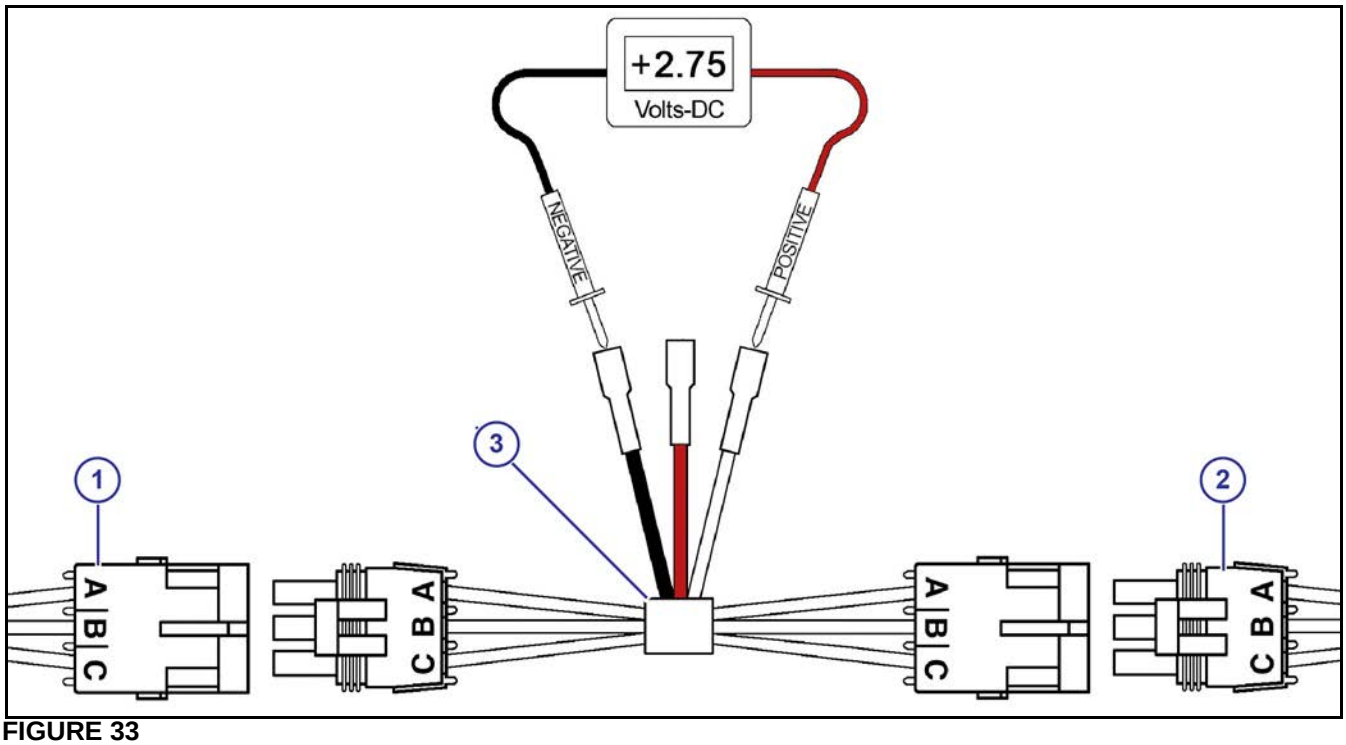

FIGURE 33

FIGURE 33:

Disconnect the pressure sensor (1) from the pressure sensor harness (2). Connect one end of the pressure sensor breakout harness diagnostic tool (3) into the pressure sensor shroud connector. Connect the other end to the connector for the pressure sensor harness tower.

With the engine running and the N-Ject™ system turned on, use the rate controller to establish 50 psi on the pressure gauge.

Use a voltmeter to observe that there is 2.75 VDC between the black and white wire on the pressure sensor breakout harness.

Using the rate controller, adjust the pressure to 100 psi. The voltmeter should read 5.0 VDC.

If accurate voltage is not present:

- Verify the accuracy of the pressure gauge on the machine.
- Check for power to the pressure sensor.
- Use the serial diagnostics to check the pressure sensor calibration.
- Replace the pressure sensor.

CHECK THE POWER TO THE PRESSURE SENSOR INPUT

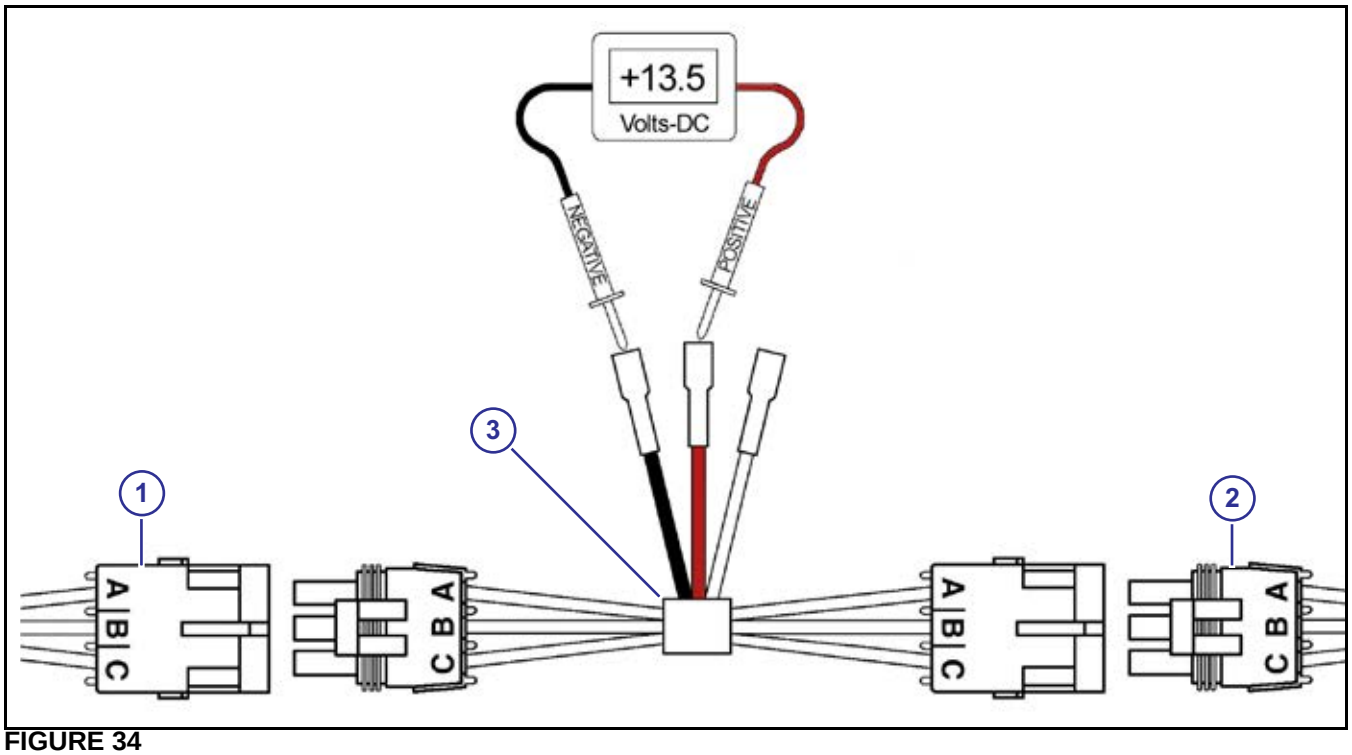

FIGURE 34

FIGURE 34:

Disconnect the pressure sensor (1) from the pressure sensor harness (2). Connect one end of the pressure sensor breakout harness diagnostic tool (3) into the pressure sensor shroud connector. Connect the other end to the connector for the pressure sensor harness tower.

Use a voltmeter to observe that there is13.5 VDC between the red and black wire on the pressure sensor breakout harness with the engine running, or 12.0 VDC without the engine running.

Be sure the polarity is accurate by observing that there is positive voltage when the red (positive) probe is connected to the red wire on the pressure sensor breakout harness and the black (negative) probe is connected to the black wire on the pressure sensor breakout harness.

If no voltage is present:

- Check the fuse located at the battery.
- Check the battery connections.
- Check the condition of the battery.
- Check the condition of the alternator.

LIQUID LEVEL SENSOR

FIGURE 35: The liquid level sensor has three LED lights:

(1) Green - Power (12 V)

(2) Purple - Liquid Level Sensor 1

(3) Orange - Liquid Level Sensor 2

When the green LED illuminates, there is power to the system.

If the purple or orange LED illuminates, the sensor is not seeing liquid.

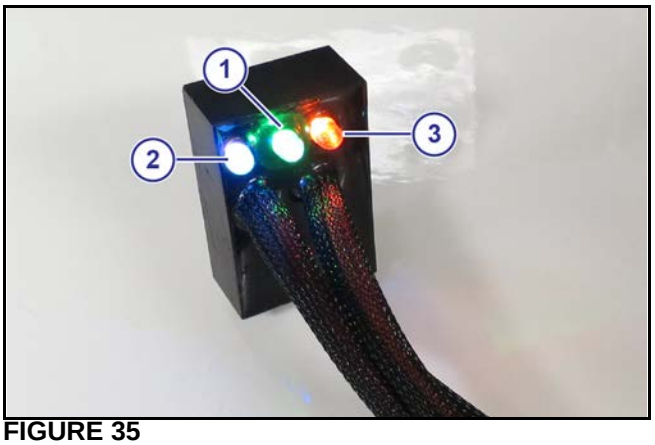

FIGURE 35

Test the Sensor Voltages

If there is liquid in the system, but the LEDs stay illuminated, test the sensor voltages.

To test the sensor voltages, drain the system, and remove the sensor(s) from the manifold. Put the sensor(s) in water to test the operation of the sensor.

NOTE: *When you quickly insert the sensor into water, there can be an air bubble inside the cavity of the sensor and the LED will stay illuminated. Move the sensor side-to-side to remove air bubble and the LED should go off.*

NOTES

WARRANTY

LIMITED WARRANTY

Rev Date: 7/15/2014

A. What does the Limited Warranty cover?

The ultimate purchaser/user (“you”), by acceptance of seller Capstan Ag Systems, Inc.’s, (“our,” “we,” or “us”) product, assume all risk and liability of the consequences of any use or misuse by you, your employees, or others.

All replacement components furnished under this warranty, but shipped before the failed component is returned for evaluation, will be invoiced in the usual manner and warranty adjustments will be made after the component claimed to be defective has been returned to and inspected and deemed defective by us at our factory.

Upon determining that a component has failed under warranty, the repaired component or replacement component, furnished under this warranty, will be shipped at our expense, to your location. We will credit you an amount equal to the incoming freight you paid. We shall not be responsible for installation costs. (You shall be responsible for all customs and brokerage fees for all international transactions.)

If the component does not prove to be defective, you shall be liable for all freight, inspection and handling costs. In no event will any claim for labor or incidental or consequential damages be allowed for removing or replacing a defective product. Warranty will be denied on any component which has been subject to misuse, abuse, accidents, or alterations, or to improper or negligent use, maintenance, storage or transportation and handling.

Our liability under this warranty, or for any loss or damage to the components whether the claim is based on contract or negligence, shall not, in any case, exceed the purchase price of the components and upon the expiration of the warranty period all such liability shall terminate. The foregoing shall constitute your exclusive remedy and our exclusive liability.

The terms of this warranty do not in any way extend to any product which was not manufactured by us or one of our affiliates.

While necessary maintenance or repairs on your Capstan Ag Systems, Inc. product can be performed by any company, we recommend that you use only authorized Capstan Ag Systems, Inc. dealers. Improper or incorrectly performed maintenance or repair voids this warranty.

The foregoing warranty is exclusive and is in lieu of all other warranties expressed or implied. We shall not be liable for any incidental or consequential damages resulting from any breach of warranty.

Your exclusive remedy for breach of warranty shall be repair or replacement of defective component(s): Provided, if the component(s) are incapable of being repaired or replaced, your exclusive remedy shall be credit issued, but such credit shall not exceed the purchase price of the components.

On any claim of any kind, including negligence, our liability for any loss or damage arising out of, or from the design, manufacture, sale, delivery, resale, installation, technical direction of installation, inspection, repair, operation of use of any products shall in no case exceed the purchase price allocable to the components.

In no event, whether as a result of breach of contract or warranty or alleged negligence, shall we be liable for incidental or consequential damages, including, but not limited to: personal injury, loss of profits or revenue, loss of use of equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, environmental damage, crop losses, or claims of customers of you for such damages.

B. What is the period of coverage?

We warrant to you, that our products are free from defects in material and workmanship in normal use and service for a period of one year from date of purchase.

C. How do you get service?

Our obligation under this warranty shall be limited to the repairing or replacing at our option, the component which our inspection discloses to be defective, free of charge, return freight paid by us, provided you: (i) Notify us of defect within thirty (30) days of failure; (ii) Return the defective component to us, freight prepaid; (iii) Complete the Owner Registration Form and returned it to us; and (iv) Establish that the product has been properly installed, maintained and operated in accordance with our instructions or instructions contained in our operations or maintenance manuals and within the limits of normal usage.

Any claim for breach of our warranty must be in writing addressed to us and must set forth the alleged defect in sufficient detail to permit its easy identification by us. All breach of warranty claims must be made within thirty (30) days after expiration of the warranty period which is applicable to the defective product. Any breach of warranty claim not timely made will not be honored by us and will be of no force and effect.Any component that needs to be repaired or evaluated for warranty has to be authorized before return. Contact the factory (785-232-4477) to get a Return Materials Authorization (RMA #). This helps to track the part coming into the factory for repair or replacement.

Before returning any component to the factory, clean the component as well as possible to remove any dirt or chemical residue. Components received at the factory that are not clean, will be returned and warranty denied.

After receiving your RMA #, package the part, making sure to include the RMA #, your name, customer's name, your address and phone number and description of problems or failure. Then ship to:

Capstan Ag Systems, Inc.
Attn: Warranty/Repair
4225 SW Kirklawn Ave.
Topeka, KS 66609

Phone: (785) 232-4477
Fax: (785) 232-7799
Hours: 8 a.m. - 4:30 pm CST

D. How does state law relate to this Limited Warranty?

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

SCHEMATICS

MANIFOLD SCHEMATICS

N-JECT™ MANIFOLD			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	620100-001	Inlet Flange	1
2	620101-001	End Flange	1
3	620104-002	Master Slice	1
4	620106-001	Mounting Bracket	2
5	620110-001	1/2-20 Grade 8 Nut	8
6	620111-001	M12 Flat Washer	8
7	620186-001	1/2-13 x 1-1/4 in Grade 8 Bolt	4
8	620118-001	Strainer - 100-Mesh	1
9	620136-001	2-1/4 in ACME Fitting	1
10	620123-001	Bleeder Valve	1
11	620122-001	Relief Valve - 312 PSI	1
	620154-001	N-Ject™ Safety Decal (Not Shown)	3

N-JECT™ MANIFOLD			713	715	813	815	913	915	1013	1015	1113	1115	1215	1313	1413	1415	1515	1613	1615	1715	1813	1815	1913	1915	2013	2015
ITEM	PART NUMBER	DESCRIPTION	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY
12	620103-002	Dual Port Slice	2	2	3	5	3	5	5	5	5	5	5	5	6	6	7	7	7	8	8	8	8	8	9	9
13	620112-001	O-Ring, 4mm x 136mm, Buna-N	7	7	7	7	7	7	7	7	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	11
14	620109-004	Threaded Rod 1/2-20 x 13 in	4	4	4	4	4	4	4	4	4	4	4													
	620109-006	Threaded Rod 1/2-20 x 16 in															4	4	4							
	620109-007	Threaded Rod 1/2-20 x 17.5 in																		4	4	4				
	620109-008	Threaded Rod 1/2-20 x 19 in																					4	4	4	4
	620109-005	Threaded Rod 1/2-20 x 14.5 in												4	4	4										
15	620117-002	1/2 in HB x 1/2 in MNPT Fitting	7		8		9							13	14			16			18		19			
	620117-004	1/2 in HB x 3/4 in MNPT Fitting		7		8		9	10	10	11	11	12			14	15		16	17		18		19	20	20
16	620124-001	Pressure Gauge - 60 PSI				1	1	1	1	1	1	1	1				1		1	1					1	
17	620125-001	Pressure Gauge - 400 PSI				1		1	1	1	1	1	1				1		1	1					1	
18	620126-001	Valve Plug with O-Ring				4		3	2	2	1	1														
19	620143-001	1/4 in MNPT Plug	5	5	5	1	5	1	1	1	1	1	1	5	5	5	1	5	1	1	5	5	5	5	1	5
20	620144-001	1/2 in MNPT Plug				4		3	2	2	1	1														
21	116189-111	Coil Assembly - 7 W	7		8		9		10		11			13	14			16			18		19		20	
	625147-011	Coil Assembly - 12 W		7		8		9		10		11	12			14	15		16	17		18		19		20
22	716190-001	Plunger Assembly - Teflon	7	7	8	8	9	9	10	10	11	11	12	13	14	14	15	16	16	17	18	18	19	19	20	20
23	621022-204	O-Ring - 015 Buna	7	7	8	8	9	9	10	10	11	11	12	13	14	14	15	16	16	17	18	18	19	19	20	20
24	620208-001	Valve Body - 3/32 Orifice	7		8		9		10		11			13	14			16			18		19		20	
	620108-001	Valve Body - 5/32 Orifice		7		8		9		10		11	12			14	15		16	17		18		19		20
25	620115-001	O-Ring - 019 Buna	7	7	8	8	9	9	10	10	11	11	12	13	14	14	15	16	16	17	18	18	19	19	20	20
26	620116-001	O-Ring - 017 Buna	7	7	8	8	9	9	10	10	11	11	12	13	14	14	15	16	16	17	18	18	19	19	20	20
27	620199-001	Strainer Magnet				1		1	1	1	1	1	1				1		1	1					1	
28	706530-272	Vinyl End Cap				1		1	1	1	1	1	1				15	16	16	1	18	18	19	19	1	20
29	620178-001	1/2 Vinyl Push On Cap				8		9	10	10	11	11	12				1			17					20	
30	715040-178	Cable Tie - 12 in				1		1	1	1	1	1	1				1		1	1					1	
	620140-001	Single Port Slice (Not Shown)	1	1			1							1									1	1		
	620139-001	Spacer Slice (Not Shown)	1	2	2		1																			
	620179-001	3/4 in Push-on Cap (Not Shown)	7	7	8		9							13	14	14		16			18	18		19		20

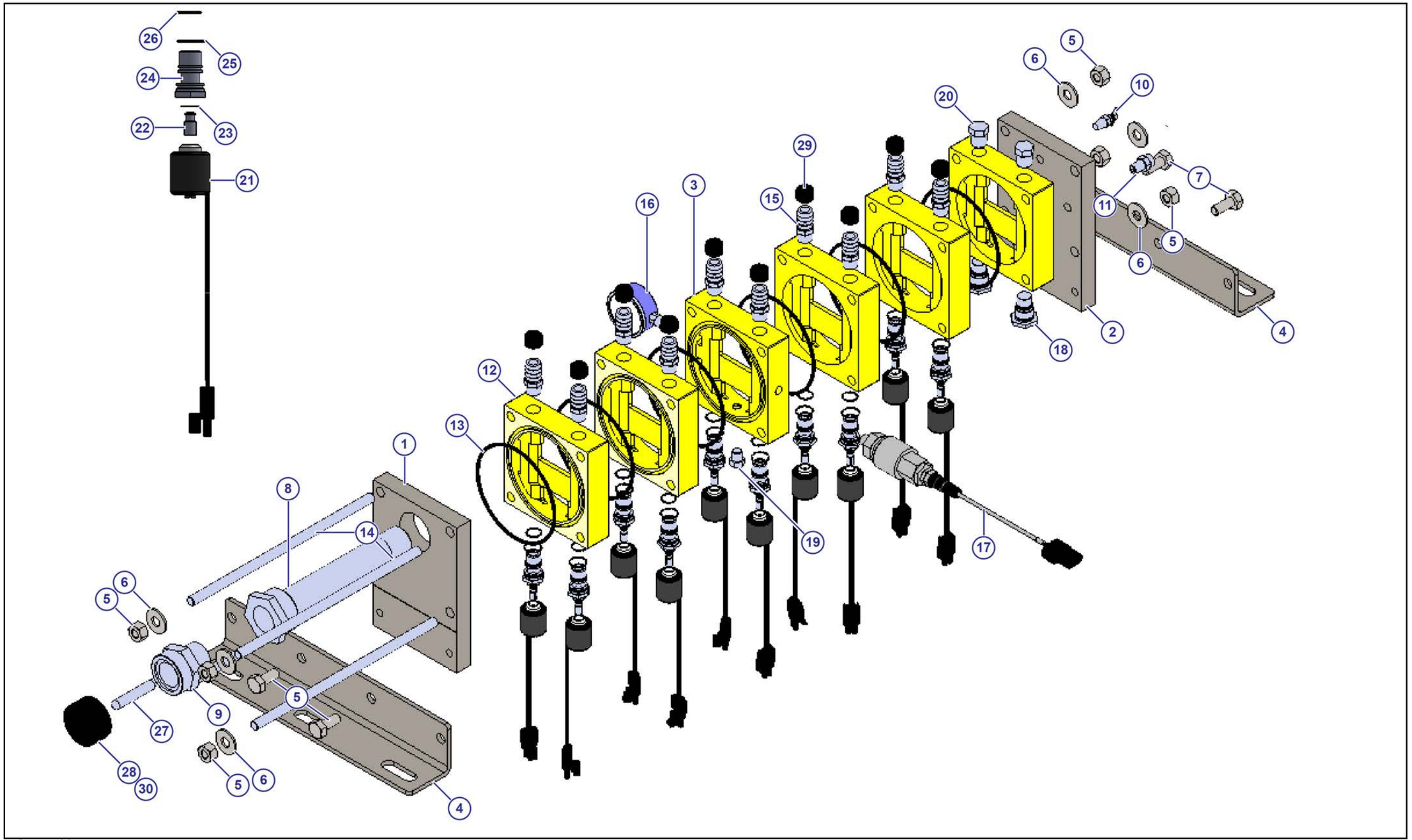

FIGURE 36
FIGURE 36: Manifold

NOTES

INSTALLATION AND SETUP

⚠ CAUTION Before operation or service to the system, read and understand the machine's operator manual and the PinPoint™ II N-Ject™ NH3 operator and maintenance manual. Chemical residue may be present on/in the OEM equipment. Use the correct personal protective equipment.

IMPORTANT: *Before installation make sure that all parts are included in the shipping boxes. Check the list of parts for your machine included in the shipping boxes.*

IMPORTANT: *Do not attach the harnesses with cable ties until the dry test of the system is complete.*

NOTE: *Do a check of the general system layout at the back of this manual.*

The VCMs are tagged and marked for the appropriate boom sections (1 to 7, etc.). Make sure that the VCMs are installed on the appropriate boom sections (1 to 7, etc.).

Although the installation is usually straightforward, the following are common installation oversights:

- When routing harnesses and hoses make sure to allow enough slack to avoid damage at fold joints.
- Use the correct valve and plunger choices.
- If a boom section has more than one VCM, the VCM with the lowest serial number should be placed on the left.

INSTALL THE N-JECT™ MANIFOLD(S)

Mount the N-Ject™ manifold(s) so that the valve assemblies are offset from the implement attachment location. This makes the valve assemblies easy to access for service and makes more room for installation of the boom section harnesses.

IMPORTANT: *If mounting a single N-Ject™ manifold, a central mounting location on the implement is ideal, this minimizes the length of hose needed for routing to each row. When installing a dual N-Ject™ manifold system, locate one N-Ject™ manifold to the left of center and the other N-Ject™ manifold to the right of center on the implement. Centering the N-Ject™ manifolds on the rows will minimize the length of hose needed for routing to each row.*

The inlet flange should be located in a direction so that a nurse tank hose can be attached.

Use the mounting brackets and U-bolts (not supplied with the kit) to install the manifold on the implement.

Install The Pressure Sensor

FIGURE 37:

1. Install the inlet pressure sensor (1) as shown.

   The inlet pressure sensor is 0 psi to 250 psi.

2. Install the outlet pressure sensor (2) as shown.

   The outlet pressure sensor is 0 psi to 50 psi.

IMPORTANT: *Do not over-tighten the pressure sensor during installation.*

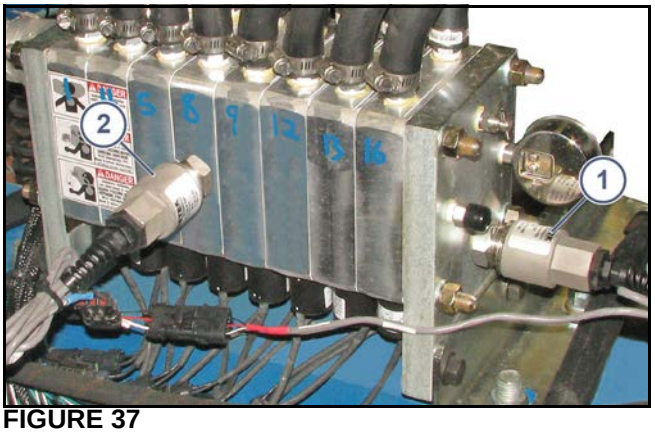

FIGURE 37

Install the Pressure Sensor Adapter Harness

FIGURE 38:

1. Route the pressure sensor adapter harness to the Gateway hub.
2. Install the harness connector to the **PRESSURE** port (1) on the Gateway hub.

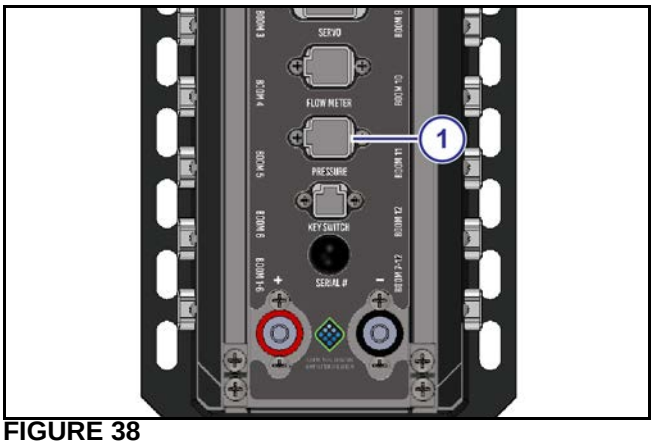

FIGURE 38

Install the N-Ject™ Manifold/Implement Plumbing

FIGURE 39: Use a marker to label each manifold valve (1) to identify the implement row that connects to the manifold valve.

Attach hoses (2) to the top of the N-Ject™ manifold and route to each row. On a typical implement one hose routes to one row. If a splitter is used, see Splitter Installation (Optional).

With a dual N-Ject™ manifold system the numbering on the secondary manifold should start where the numbering ended on the primary manifold. Install the hoses to the connections with hose clamps. Then install cable ties to keep the hoses in place.

IMPORTANT: *The hoses must route from the N-Ject™ manifold to the implement rows. Every other implement row must alternate, just like the nozzle valves, (white/green wire alternation).*

When the implement is folded/unfolded, make sure that there is no interference that could pinch or damage the hoses.

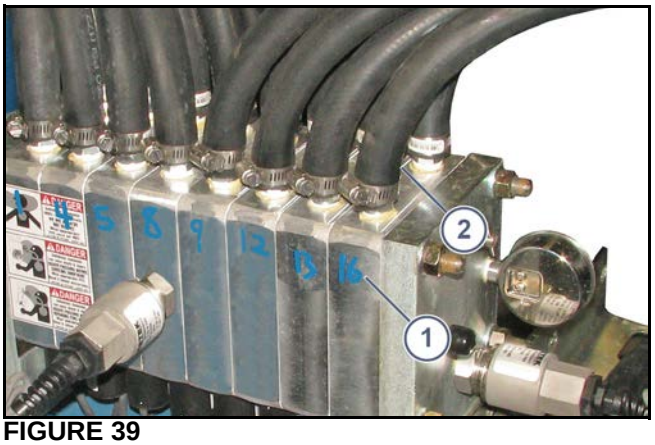

FIGURE 39

Splitter Installation (Optional)

FIGURE 40: If desired, a splitter can be installed to connect two rows to one manifold port.

In this scenario, label the splitter by the row number rather than the N-Ject™ manifold. Row location 1 would be referenced as 1A and 1B or as 1 and 2.

On a dual N-Ject™ manifold system, the numbering on the secondary manifold should begin where the numbering ended on the primary manifold.

EXAMPLE: If row 15 ends on the primary manifold, then row 16 would start on the secondary manifold.

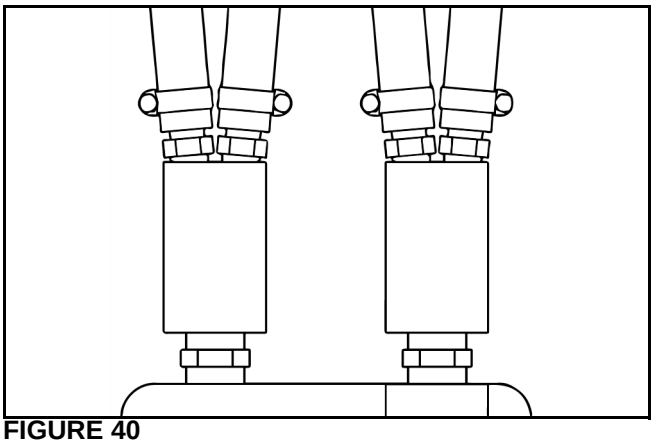

FIGURE 40

INSTALL THE GATEWAY HUB

1. Locate an accessible location near the center of the boom mast.

FIGURE 41:

2. Install the Gateway hub onto the boom mast with the supplied mounting bracket.

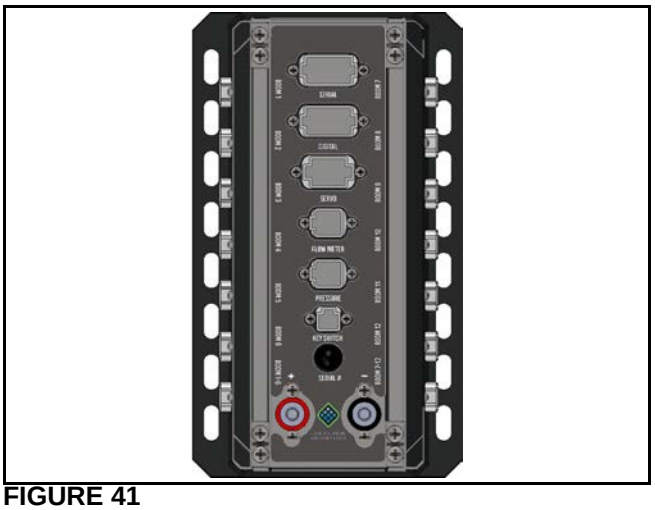

FIGURE 41

INSTALL THE VCMS

1. Locate the VCMs adjacent to the first nozzle on the associated boom section.

   The VCMs are tagged and marked for the appropriate boom sections (1 to 12, etc.) in VCM serial number order.

2. Make sure that each tagged VCM is installed on the correct boom section in VCM serial number order.

3. Connect the harness plugs at the VCMs and the nozzle valves.

FIGURE 42: Additional VCMs and Y-adapters are required on boom sections that have more than nine nozzles.

4. Mount additional VCMs (1) and Y-adapters (2) at a central location in the boom section.

5. Install dust caps on any unused connectors.

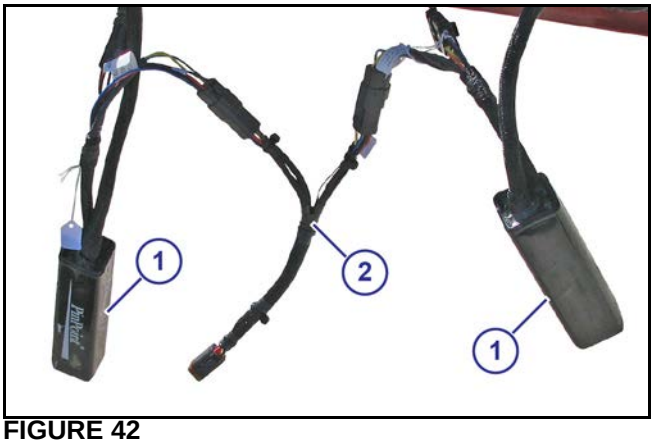

FIGURE 42

Install the Extension Harnesses

FIGURE 43:

1. Connect each extension harness to the VCM.

2. Route the extension harnesses along the boom to the Gateway hub.

   Make sure that there is enough slack in the extension harnesses to raise and lower the booms and to avoid pinch points at the boom fold and pivot points.

3. Connect each extension harness to the correct connector (1) on the Gateway hub (boom 1, boom, 2, boom 3, etc.)

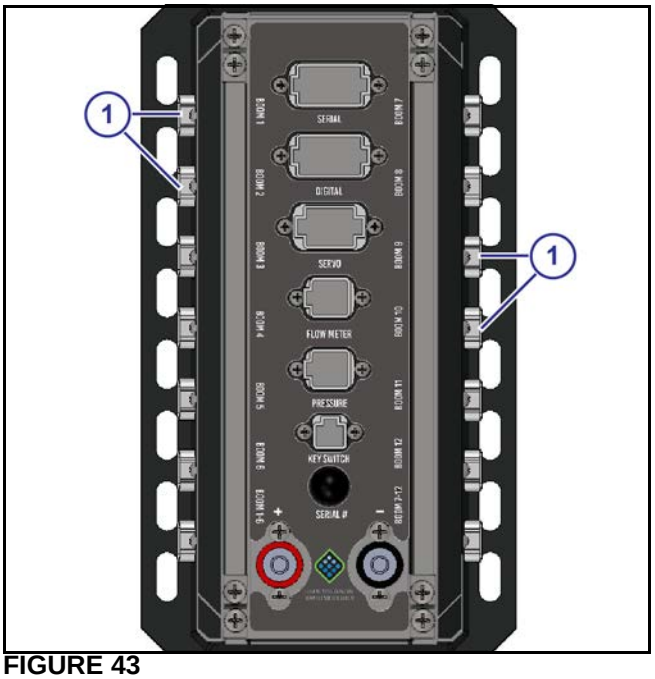

FIGURE 43

INSTALL THE BOOM SHUTOFF ADAPTER

FIGURE 44: Connect a boom shutoff adapter to the **BOOM 1-6** port (1) and **BOOM 7-12** port (2) on the Gateway hub.

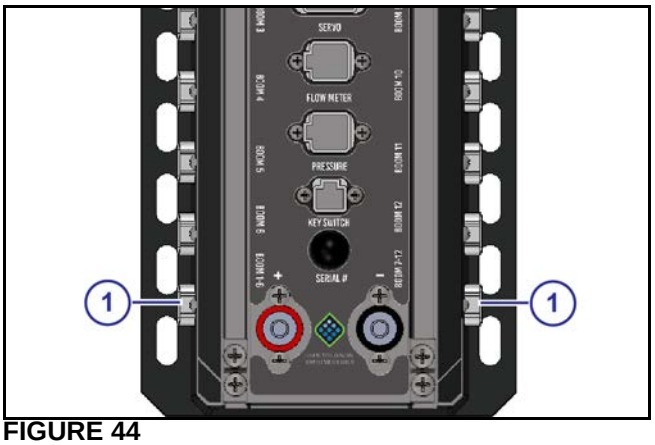

FIGURE 44

INSTALL THE LIQUID LEVEL SENSOR (OPTIONAL)

FIGURE 45: Install the liquid level sensor into the manifold.

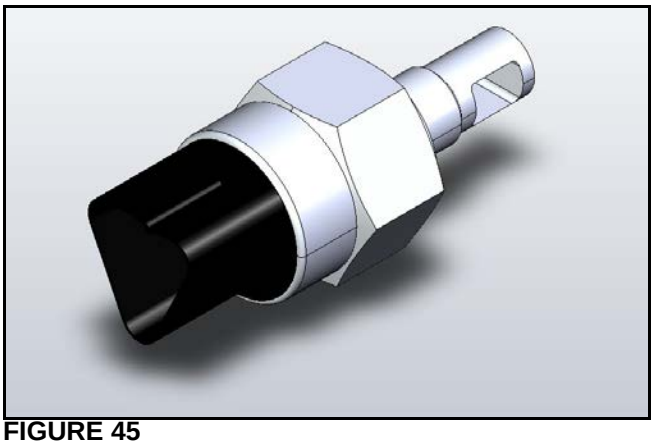

FIGURE 45

Install the Liquid Level Sensor Harness

FIGURE 46: Install the liquid level sensor harness.

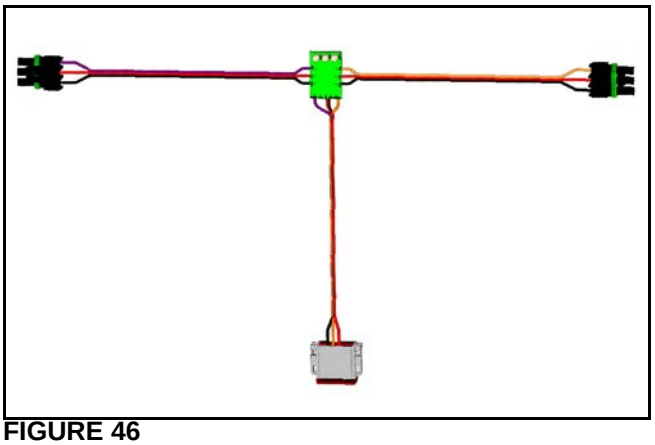

FIGURE 46

Install the Extension Harness

FIGURE 47: Install the extension harness.

PART NUMBER	DESCRIPTION
620202-016	Extension Harness - 15 ft
620202-017	Extension Harness - 25 ft

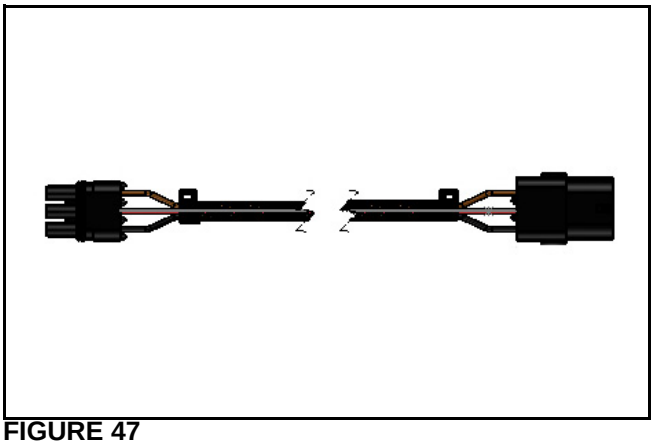

FIGURE 47

Install the Liquid Level Sensor Adapter

FIGURE 48: Install the liquid level sensor adapter.

For a single manifold system, one adapter is necessary.

For a dual manifold system, two adapters are necessary.

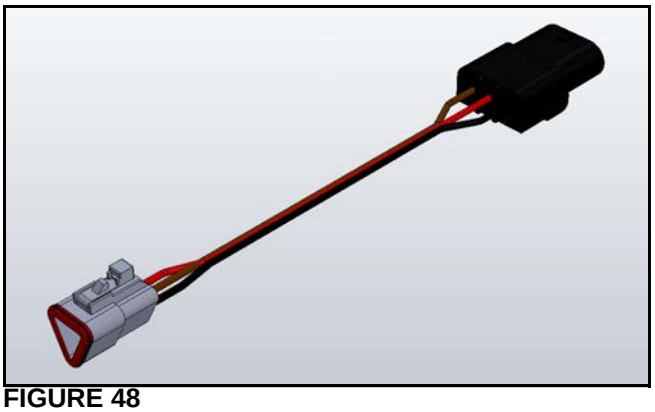

FIGURE 48

INSTALL THE CAPVIEW

FIGURE 49:

1. Install the RAM mount (1) and hardware inside the machine cab.

NOTE: *Make sure that the CapView can be seen and reached from the operator seat.*

2. Remove the four screws from the back of the CapView (2).
3. Install the ball mount (3) to the back of the CapView with the screws.
4. Install the clamp (4) onto the ball mount.
5. Install the clamp onto the RAM mount.

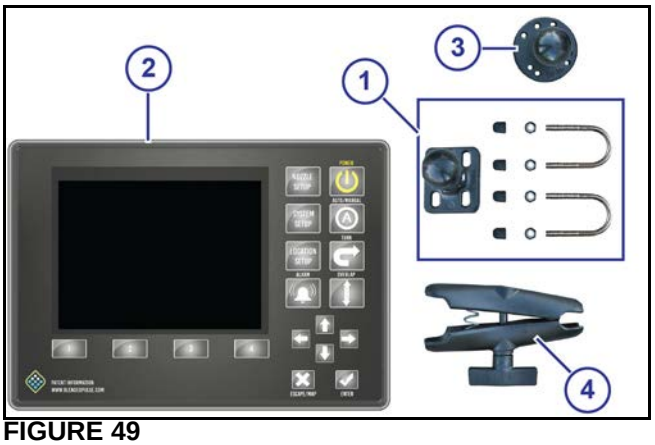

FIGURE 49

FIGURE 50:

6. Connect the switched power connector (1) and the GPS connector (2) to the back of the CapView.
7. Remove the screen protector from the CapView screen.

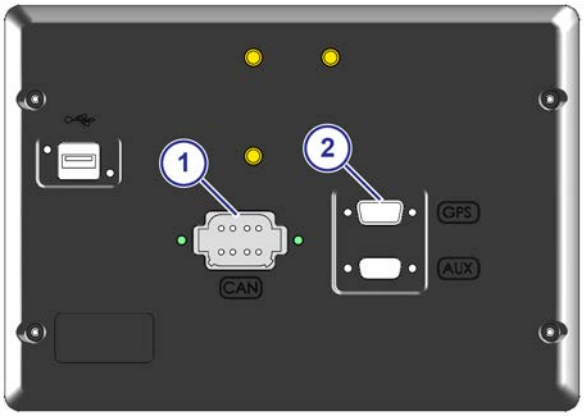

FIGURE 50

Install the CapView Extension Harness

FIGURE 51:

1. Route the CapView extension harness through the lower slot in the Gateway hub.
2. Install the harness connector into the **BOOM 12** port (1) on the Gateway hub.
3. Follow existing wiring/plumbing to route the extension harness into the right rear side of the cab.

IMPORTANT: *Make sure that there is enough slack in the harness to raise and lower the boom mast.*

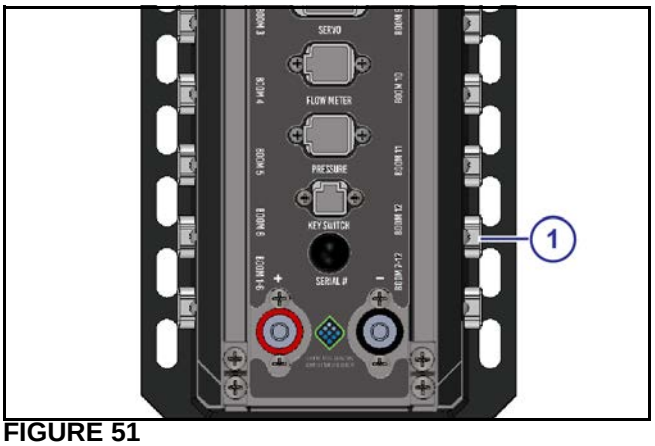

FIGURE 51

INSTALL THE BATTERY HARNESS

FIGURE 52:

1. Route the battery harness connectors to the Gateway hub.
2. Connect the positive (+) red cable to the red power terminal (1) on the Gateway hub.
3. Connect the negative (-) black cable to the black terminal (2) on the Gateway hub.
4. Tighten the nuts on the power cables.
5. Install the rubber caps onto the terminals.
6. Route the battery harness from the Gateway hub over the boom mast and under the machine to the batteries.

IMPORTANT: *Make sure that there is enough slack in the harness to raise and lower the boom mast.*

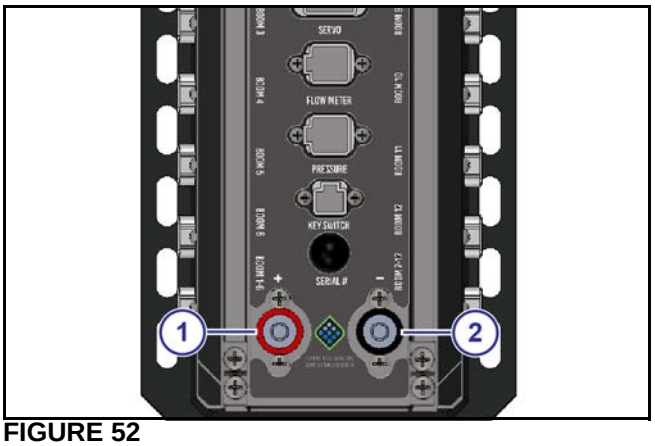

FIGURE 52

INSTALL THE POWER DISCONNECT BREAKER KIT

FIGURE 53: A power disconnect breaker kit is available for applications when unhooking the battery power cable is not desired.

1. Disconnect the battery cables.
2. Cut and strip the cables at the desired disconnect location.
3. Crimp the spacer bushings (1) and terminals (2) onto each cable.
4. Install the terminals into the housing (3).

   Make sure that the positive (+) red cable and the negative (-) black cable are in the correct location.

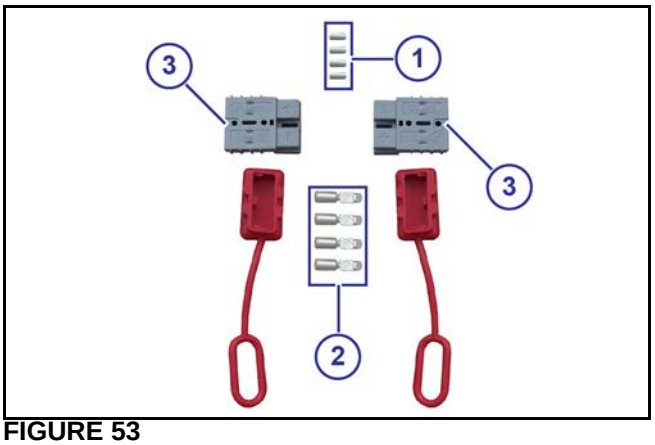

FIGURE 53

INSTALL THE KEY SWITCHED POWER CABLE

1. Route the extension harness from the Gateway hub into the cab.
2. Connect to the CapView switched power harness.
3. Connect the other end of the key switched power cable to the in-cab power supply.

NOTE: *Refer to installation instructions for machine specific power supply locations.*

INSTALL THE CIRCUIT BREAKER

FIGURE 54: Complete the installation of all other system components before installing the circuit breaker and battery connections.

1. Disconnect the battery power cables.
2. Cut a length of wire from the battery harness positive (+) red cable.

   The length of wire must reach from the circuit breaker to the battery positive (+) terminal.
3. Strip the insulation from each cut end of the wire.
4. Crimp the provided ring terminals to the end of each cable.

NOTE: *If the machine is so equipped, the PinPoint™ II must be wired to the main power disconnect.*

5. Connect the battery harness positive (+) red cable (1) to the circuit breaker (2).

   From the battery positive (+) terminal, connect the positive (+) red cable (3) to the circuit breaker.
6. Connect the battery harness negative (-) black cable (4) to the battery ground terminal.

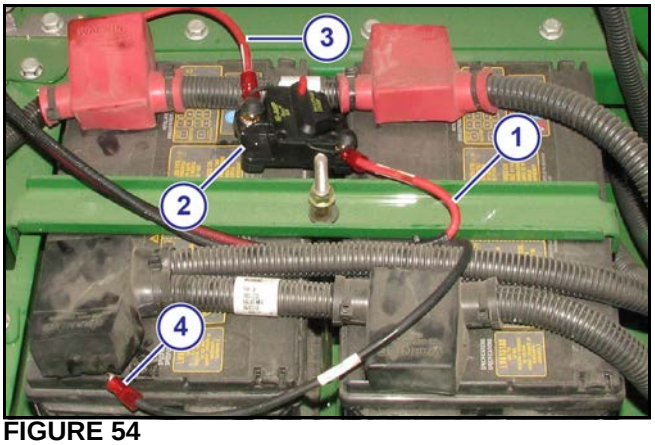

FIGURE 54

SYSTEM SETUP

The system is set up at the factory. These steps are only required when modifications have been made during installation or if changes were made to the machine after the PinPoint™ II order was placed.

1. Factory Reset
2. Location Setup Procedure
3. System Setup Procedure
4. Nozzle Setup Procedure
5. System Dry Test
6. System Wet Test
7. Look Ahead Time and Overlap Test

FACTORY RESET

A factory reset should be performed after:

- Initial installation
- Software update
- Major component change
- Operation mode change

1. Make sure that the key switch power is on.

FIGURE 55:

2. Press the **POWER** button (1) on the CapView.
3. Press the **SYSTEM SETUP** button (2) on the CapView
4. Use the up or down arrows (3) to select **Operation Mode** (4).
5. Press the **ENTER** button (5).
6. Use the up or down arrows to show the correct operation mode (6).
7. Press the **ENTER** button.
8. Use the up or down arrows to select **Advanced Settings**
9. Press the **ENTER** button.
10. Use the up or down arrows to select **Factory Reset**
11. Press the **ENTER** button.

FIGURE 55

FIGURE 56:

12. Use the left or right arrows (1) to select **Yes** (2).
13. Press the **ENTER** button (3).

    The CapView will turn off.

    Leave the key switch on to keep power to the hub.
14. Press the **POWER** button (4).

    A warning screen will show after a factory reset or when no data is present in the VCMs. This indicated that the system must be set up.
15. Press the **ENTER** button.

FIGURE 56

LOCATION SETUP PROCEDURE

FIGURE 57:

1. Press and hold the **LOCATION SETUP** button for 10 seconds.

NOTE: *It is normal for the screen to change as you press and hold the button.*

2. Use the left or right arrow buttons (2) to select **AUTO SETUP** (3).
3. Press the **ENTER** button (4).

FIGURE 57

FIGURE 58: The data on the **Location Setup Table** X-Axis should now match your machine.

4. Make sure that the data is correct, and if not, manually fix the location numbers. An example of this might be a nozzle that is offset a couple of inches because of bracket interference at the nozzle's exact location.
5. Press the **ESCAPE** button.

Location Setup Table

VCM Serial Number	Nozzle Location	X-Axis	Y-Axis	Nozzle ON/OFF	
869661 #1	1	-550”	0”	#9	
869662 #2	2	-570”	0”	#8	
869663 #3	3	-590”	0”	#7	
869664 #4	4	-610”	0”	#6	
869665 #5	5	-630”	0”	#5	
869666 #6	6	-650”	0”	#4	
869667 #7	7	-670”	0”	#3	
869668 #8	8	-690”	0”	#2	
	9	-710”	0”	#1	

FIGURE 58

FIGURE 59: The screen will give the option **YES** (to save) or **NO** (not to save) the entered data.

6. If the data is correct, use the right or left arrow buttons to select **YES** (1).
7. Press the **ENTER** button (2).

   A blue save bar will show and move across the screen. The CapView is saving all the data inside the VCMs. This process may take a few of minutes to complete.

IMPORTANT: *The CapView will shut down to reboot shortly after selecting* ***YES****.*

FIGURE 59

Location Setup Table

FIGURE 60: Any selected VCM in the **Location Setup Table** is highlighted in yellow. Press the up or down arrow button to highlight a different VCM.

The left columns, **VCM Serial Number**, shows all of the VCMs in numeric order. Press the up or down arrow button to go to the second screen when the first screen is full.

Numbers 1 to 9 represent the physical location of the nine nozzles on the highlighted VCM. Number 1 is the nozzle closest to the VCM (potted tube) and number 9 is the farthest from the VCM (potted tube).

The center columns, under **Nozzle Location**, shows the location data of the highlighted VCM on the sprayer boom. Press the right arrow button to highlight this data in yellow.

The **X-Axis** column shows location of the nozzle. Zero is the center of the machine. Negative inches to the left and positive inches to the right. Column two data will be in 20-inch increments until a location setup has been done.

The **Y-Axis** column shows the distance in front or behind the centerline of the spray boom. On most spray booms, this value will be zero. This distance is more commonly used on tool bars where there may be a front gang and rear gang of knives.

The right columns under **Nozzle ON/OFF** are where a nozzle valve can be turned on or off. Press the arrow buttons to highlight the desired box. Press the **ENTER** button to select on or off.

The nozzle number from left to right along the entire boom. The leftmost nozzle on the boom is #1, and the right-most nozzle would be #72 if you have 72 nozzles.

Location Setup Table

VCM Serial Number	Nozzle Location			Nozzle ON/OFF	
		X-Axis	Y-Axis		
869661 #1	1	-550”	0”	#9	
869662 #2	2	-570”	0”	#8	
869663 #3	3	-590”	0”	#7	
869664 #4	4	-610”	0”	#6	
869665 #5	5	-630”	0”	#5	
869666 #6	6	-650”	0”	#4	
869667 #7	7	-670”	0”	#3	
869668 #8	8	-690”	0”	#2	
	9	-710”	0”	#1	

FIGURE 60

AUTO LOCATION SETUP

FIGURE 61:

1. Use the up or down arrow buttons (1) to set the desired nozzle spacing.

   The default setting is 20 inches.

2. Press the **ENTER** button (2).

FIGURE 61

FIGURE 62: This screen shows a picture of the sprayer with the VCMs located on the boom. The VCMs are arranged on the boom from left to right according to the VCM serial number order and oriented according to the position of the potted tube relative to the center mast (1).

The graphic along the bottom shows a VCM with a 15-nozzle wire harness (2). The black dot (3) is the potted tube, and the nozzles are indicated with numbers. This graphic changes as you move the yellow highlighter from VCM to VCM. This can be an indicator of which VCM is which, based on the number and location of the valves on the VCM.

Start with the VCM that is located on the far left section of the left boom.

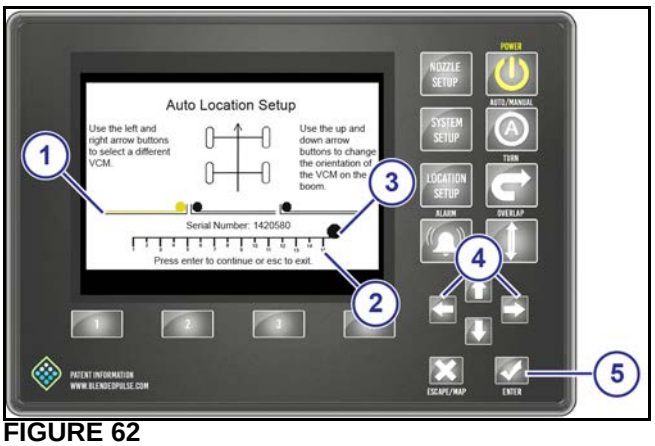

FIGURE 62

3. Use the left or right arrow buttons (4) to highlight the desired VCM.
4. Press the **ENTER** button (5) for each VCM.

   The highlight color will change to red. The nozzles on that VCM will pulse.

5. When the left most VCM nozzles pulse, press the left arrow button to move the highlighted VCM to the left most position on the CapView screen.
6. Press **ENTER** to stop the pulsing.
7. Press the up or down arrow buttons to flip the VCM graphic, so the potted tube orientation show on the CapView screen is the same as the potted tube orientation found on the boom.

   Serial numbers for all VCMs can be found on this screen. The location of each VCM should match up with serial number tags on each VCM on the boom.

8. Repeat the process from left to right, until all of the VCMs are moved to their proper location and flipped to their proper orientation.
9. When finished, press the **ESCAPE** button.
10. Make sure that the master switch is engaged and the boom section switches are off.

11. Engage each boom section control switch to correlate the boom valves to the VCMs.

    Engage switch #1, then #2, then #3, etc., from left to right so that #1 is the left most boom.

    The highlighter shows the VCM that is physically associated with that boom section switch.

    It is possible to have 12 boom switches and only one VCM. Later, you can assign soft booms so that the nozzles are turned on/off individually by the rate controller. You may need to start a job in the rate controller for the sprayer so that the boom valves can physically be turned on and off.

12. Press the **ENTER** button to go to the **Location Setup Table** screen.

SYSTEM SETUP

System Setup Chart

SYSTEM SETUP			
LINE NUMBER	**LINE TITLE** / **DESCRIPTION**	**DEFAULT SETTING**	**ACTION**
1	Operation Mode	N-Ject™	Press **ENTER** to change.
	The PinPoint™ II system can operate in three modes: SharpShooter™, Synchro™, or N-Ject™. In SharpShooter™ mode the rate controller ties into the pump for flow control and the PinPoint™ II changes the nozzle duty cycle to maintain constant pressure. In Synchro™ mode the PinPoint™ II controls the pump for active pressure control and the rate controller ties into the Gateway hub to control flow by changing nozzle duty cycle. The N-Ject™ mode is used for anhydrous ammonia or liquid fertilizer application.		
2	Controller Gallon Counter	0 Gallons	Press **ENTER** and then **yes** to reset.
	The controller gallons counter value should match the values from the rate controller. Resetting the controller gallons counter also resets the actual gallons counter. Make sure to reset the rate controller at the same time. The controller gallon counter shows the flow value per section.		
3	Actual Gallons Counter	0 Gallons	Press **ENTER** and then **yes** to reset.
	The actual gallons counter value should match the tank volume. The difference between the controller gallon counter and actual gallon counter is the product saved using PinPoint™ II overlap control. The actual gallon counter shows the flow value per nozzle. The controller gallon counter minus the actual gallon counter is the total savings in product applied from the individual nozzle control.		
4	Controller Acre Counter	0.0 Acre	
	The controller acre counter counts the acres applied per section.		
5	Actual Acre Counter	0.0 Acre	
	The actual acre counter counts the acres applied per nozzle. The controller acre counter minus the actual acre counter is the additional acres an operator can apply per tank load from the individual nozzle control.		
6	Controller Gallons per Minute	0.0 GPM	
	The control gallons per minute should match the rate controller flow display. The gallons per minute value is per section.		

SYSTEM SETUP			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
7	Actual Gallons per Minute	0.0 GPM	
	The actual gallons per minute value is the flow that is actually being sprayed. It should match the turbine flow meter (unless the correction mode is active at a very low flow rate or calculation mode is active). The gallons per minute value is per individual nozzle control. The control gallons per minute and the actual gallons per minute values should always be equal unless the PinPoint™ II system is shutting off individual nozzles. When individual nozzles are being turned off the actual gallons per minute will be lower than the controller gallons per minute.		
8	Nozzle Control (Key FOB)	12 V Active	Press **ENTER** to change.
	Most systems will have **12V Active** boom switches. This means the boom switch wires get positive 12 VDC when turned on. To return to operation mode, turn the nozzle control activation value back to the previous value (typically 12V Active).		
9	Pressure 1	0 PSI	Press **ENTER** to change.
	The pressure 1 value is the N-Ject™ manifold inlet pressure. This value is shown as the green bar on the main screen and the PIn value on the bottom of the main screen.		
10	Pressure 2	0 PSI	Press **ENTER** to change.
	The pressure 2 value is the N-Ject™ manifold outlet pressure. This value is shown as the POut value on the bottom of the main screen.		
11	System Voltage	13.7 V	
	The system voltage is the voltage at the Gateway hub. This can be an indicator of system health.		
12	Display Back light	5	Press **ENTER** to change.
	Larger numbers make the CapView screen brighter for daytime use. Smaller numbers make the CapView screen dimmer for night-time use. Range: 1-10, if 5 or less the keypad back light will turn on.		
13	LED Brightness	5	Press **ENTER** to change.
	Larger numbers make the LED lights brighter for daytime use. Smaller numbers dim the LED lights for nighttime use. Range: 1-10.		
14	Beeper Volume	5	Press **ENTER** to change.
	Larger numbers make the alarm louder for outdoor use. Smaller numbers softens the alarm for indoor use. Range: 0-5, 0 turns off the beeper completely.		
15	Specific Gravity	1.00	Press **ENTER** to change.
	Specific gravity refers to the density or weight per gallon as compared to water (Water = 8.35 lb./gal.). For water based products use 1.00. For liquid fertilizer use 1.2 for 10 lb./gal. product, etc. Specific gravity is used to calculate flow.		
16	Valve Diagnostics Enable	Enabled	Press **ENTER** to change.
	If the PinPoint™ II system is not using nozzles that use the CapstanAG nozzle diagnostics properly, the nozzle diagnostics can be disabled here. CapstanAG uses this feature on demonstration units and development units where lights are substituted for valves or reset to coil only. Coil only disables the plunger movement detection without disabling short or open data.		

SYSTEM SETUP			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
17	Overlap Distance	60 Inches	Press **Enter** to change.
	CapstanAG has coined the term “Cat Whiskers” to describe this feature. Each nozzle has five imaginary cat whiskers by which it checks and marks the overlap map. There is a whisker in front, behind, right, left, and center. The center whisker marks the map as being sprayed. The other four whiskers are for checking if the nozzle needs to be turned off at an already sprayed area. The overlap distance refers to the distance that these four whiskers are from the center whisker. The PinPoint™ II map is in one-meter-squares, so it is advised to set this at a minimum of 40 in (1 meter).		
18	Liquid Sensor 1 Sensitivity	0.0 s	Press **Enter** to change.
	If the system has a liquid level sensor, the recommendation is to set this value to 5 seconds.		
19	Liquid Sensor 2 Sensitivity	0.0 s	Press **Enter** to change.
	If the system has a second liquid level sensor, the recommendation is to set this value to 5 seconds.		
20	Strainer Pressure Drop	50%	
	This value is comparing the static inlet pressure to operating inlet pressure and if the pressure drops too much. Using the default value of 50% if the pressure drops by more than half a Plugged Strainer Alarm will show.		
21	Min. Outlet Pressure	0%	Press **Enter** to change.
	0= disabled Must be disabled for systems that include a liquid level sensor. ***IMPORTANT:*** *The outlet pressure sensor must be centered for this feature to work correctly.* If the outlet pressure is below this percentage of the Inlet Pressure Alarm will show.		
22	Rate Sync Mode	Disable	Press **Enter** to change.
	Rate Sync™ changes the nozzle duty cycle based on the vehicle speed obtained from the GPS receiver.		
23	Rate Sync Average	0.1 seconds	Press **Enter** to change.
	The Rate Sync™ average represents how often the rate sync samples the speed from GPS. The PinPoint™ II system has a 10hz GPS requirement, so the speed is sampled 10 times per second or once every 0.1 seconds. Higher values cause the system to react slower.		
24	Rate Sync Max Ground Speed	21 MPH	Press **Enter** to change.
	Enter the approximate speed that will allow the system to reach 100% duty cycle based on the current spray tip size being used.		
25	Units	US (psi)	Press **Enter** to change.
	Select the desired units of choice: US or SI units.		
26	Baud Rate	Searching	Press **Enter** to change.
	This shows the GPS baud rate that is detected by the system. 19,200 - 115,200.		
27	Revision Information	XXXX	Press **Enter** to change and then **Yes**.
	The revision information stores all hardware items by CAN address and shows the current version of all hardware and software items on the system.		

SYSTEM SETUP			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
28	Language	English	Press **ENTER** to change.
	Select the desired language: English or Portuguese		
29	Previous Error List		Press **ENTER** to see.
	This displays the 50 most recent errors.		
30	Advanced Settings		Press **ENTER** to change.
	Additional settings menu.		

Advanced Settings - N-Ject™ Operation Mode

ADVANCED SETTINGS			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
1	Hour Meter	0.0 Hours	
	The hour meter shows the accumulated hours. The hour meter starts when at least one nozzle is on.		
2	Compass Heading	0 Degrees	Press **ENTER** to and then **YES** to calibrate.
	The 3-dimensional compass is generally not used. It could be used for backup detection or low-speed turn compensation stability.		
3	Compass Offset	0 Degrees	Enter the offset to calibrate
	This value is used after calibrating the 3-dimensional compass to correlate the chassis with the Gateway hub.		
4	USB Mode	Thumb Drive	
	Thumb drive or computer. Thumb drive must be chosen to utilize a USB drive for different purposes.		
5	Total Number Valve Expected	0 Valves	Press **Enter** to change.
	The total number of valve expected value is the number of valves on the sprayer. Upon system power on, the system counts the number of valves reported by the VCMs. If the reported number matches the manually entered number for the value, then all is OK, and the system continues. If an error is detected, an alarm is sounded and diagnostic readouts are shown. The PinPoint™ II system cannot detect valve issues that may have occurred when the system was not running. If the valve was damaged, or corrosion sets in over the winter, this is the error you will get. The PinPoint™ II system cannot determine which nozzle is affected if the problem occurred when the system was powered off, so use the CapView location setup screen and look for a nozzle that is not connected.		
6	Scrolling Enable/Disable	Enabled	Press **ENTER** to change.
	In the nozzle diagnostics on the operation screen, scroll from nozzle to nozzle. To focus on a single nozzle without the scrolling taking place, select disabled here.		
7	GPS - Ant. Ahead of Rear Axle	0 Inches	Press **ENTER** to change.
	Enter the number of inches from the rear axle to the GPS antenna. A positive number indicates that the antenna is ahead of the axle. A negative number indicates that the antenna is behind the axle. This value is used for the GPS overlap control to shut off the nozzles in the proper place. The GPS antenna must be located on the vehicle on which the boom is mounted. For pull-behind units, mount the GPS antenna on the implement.		

ADVANCED SETTINGS			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
8	GPS - Ant. Right of Center	0 Inches	Press **ENTER** to change.
	Enter the number of inches that the GPS antenna is off-center. A positive number indicates that the antenna is right of center. A negative number indicates that the antenna is left of center.		
9	GPS Antenna Above Ground	0 Inches	Press **ENTER** to change.
	Enter the number of inches that the GPS antenna is above ground.		
10	GPS Boom Ahead of Rear Axle	0 Inches	Press **ENTER** to change.
	Enter the number of inches that the boom is from the rear axle. A positive number indicates that the boom is ahead of the rear axle. A negative number indicates that the boom is behind the rear axle.		
11	Forward/Reverse Detection	Off=Fwd Rev Switch	Press **ENTER** to change.
	For individual nozzle control to correctly perform the PinPoint™ II system has to know if the sprayer is moving in forward or reverse. When the forward/reverse detection is set to **OFF=Fwd Rev Switch**, the system is looking for a 12V (reverse beeper) input to tell it the sprayer is reversing. If the system does not see the 12V signal, it assumes the sprayer is traveling in the forward direction. If this setting is changed to **Compass w/Turn** then a 3-D compass is used to detect forward/reverse and the compass calibration is required. For operators who do not spray in reverse, the best option is to leave this setting at **OFF = Fwd Rev Switch**.		
12	Look Ahead Time	0.3 Seconds	Press **ENTER** to change.
	The look ahead time is based on the fastest field speed, the value is an indicator of how much time the GPS and the PinPoint™ II system takes to react to coverage inputs. If the shutoff is too early, decrease the value. If the shutoff is too late, increase the value. Set the look ahead time value at the fastest travel speed expected.		
13	Zero Rate Shutoff	Minimum PWM%	Press **ENTER** to change.
	When set to **Shutoff** the low pressure shutoff is enabled. To disable the low pressure shutoff, set to **Minimum PWM%**. When set to shutoff the PinPoint™ II will allow the duty cycle to drive to 0% or off. This is useful when applying VRT grids with a 0 application rate. Recommended setting is **Minimum PWM%** where it will only allow the system to go to the low limit nozzle PWM set at the Nozzle PWM Minimum value.		
14	Pressure Sensor 1 Min. Volt	1.0 V	Press **ENTER** to change.
	Used to setup pressure sensor 1.		
15	Pressure Sensor 1 Max. Volt	5.0 V	Press **ENTER** to change.
	Used to setup pressure sensor 1.		
16	Pressure Sensor 1 Min. PSI	0 PSI	
	Used to setup pressure sensor 1.		
17	Pressure Sensor 1 Max. PSI	250 PSI	
	Used to setup pressure sensor 1.		
18	Pressure Sensor 1 Offset		
	It is common to have 1 to 5 VDC sensors and 0.5 to 5 VDC sensors. The PSI sensor offset is used when the sensor does not match a gauge. Entering an offset value will scale the sensor up or down. The sensor offset allowable range is ±1-9.		
19	Pressure Sensor 2 Min. Volt	1.0 V	Press **ENTER** to change.
	Used to setup pressure sensor 2.		

ADVANCED SETTINGS			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
20	Pressure Sensor 2 Max. Volt	5.0 V	Press **ENTER** to change.
	Used to setup pressure sensor 2.		
21	Pressure Sensor 2 Min. PSI	0 PSI	
	Used to setup pressure sensor 2.		
22	Pressure Sensor 2 Max. PSI	250 PSI	
	Used to setup pressure sensor 2.		
23	Pressure Sensor 2 Offset		
	It is common to have 1 to 5 VDC sensors and 0.5 to 5 VDC sensors. The PSI sensor offset is used when the sensor does not match a gauge. Entering an offset value will scale the sensor up or down. The sensor offset allowable range is ±1-9.		
24	Servo Type	In-line Valve	Press **ENTER** to change.
	If a servo valve was used, then **in-line valve** or **bypass valve** might be used.		
25	Manual Mode Servo Speed	50%	Press **ENTER** to change.
	The manual mode servo speed controls how fast the pressure changes in manual mode. If the valve operates too slowly in manual mode, increase this value. If the valve operates too quickly in manual mode, decrease this value.		
26	Servo Minimum DC%	20%	Press **ENTER** to change.
	The servo minimum value is the minimum duty cycle that the pump will be driven. It is important that this value corresponds with the minimum duty cycle used by the rate controller. This value also scales the minimum duty cycle of the pulsing boom nozzles. Raven uses Bit Integers 0 to 256 to set this minimum. Use math to determine this percentage. If the controller value is “150,” then the duty cycle percent is 150/256*100 = 59%.		
27	Servo Maximum DC%	100%	Press **ENTER** to change.
	The servo maximum value is the maximum duty cycle that the pump will be driven. It is important that this value corresponds with the maximum duty cycle used by the rate controller. This value also scales the maximum duty cycle of the pulsing boom nozzles. Raven uses Bit Integers 0 to 256 to set this maximum. Use math to determine this percentage. If the controller value is “250,” then the duty cycle percent is 250/256*100 = 98%.		
28	Nozzle PWM% Cycle Time	6.0 Seconds	Press **ENTER** to change.
	The nozzle PWM% cycle time value only affects in-line or bypass valve servo types. The PWM% cycle time (4.0 seconds) is the time it takes for the pulsing nozzles to modulate from minimum to maximum duty cycle. To speed up a sluggish system reaction time, enter a lower number. To slow down the reaction time of an oscillating system, enter a higher number, up to 31 Hz.		
29	Nozzle Pulse Frequency	3.0 Pulse/Sec.	Press **ENTER** to change.
	All CapstanAG systems run at 10 pulses per second pulse frequency. To run a faster pulse frequency, enter a larger number. CapstanAG does not recommend pulse frequencies slower than 10Hz in sprayer applications.		
30	Nozzle PWM Minimum	3%	Press **ENTER** to change.
	The nozzle PWM minimum value is the minimum pulse duty cycle for the nozzle valves. You may not change this value any less than the Nozzle Pulse Frequency value. If the Nozzle Pulse Frequency is set to 10 pulses then the nozzle PWM minimum must be set to 10 or higher. If you are is uncomfortable about running low duty cycles, then this value can be set higher.		

ADVANCED SETTINGS			
LINE NUMBER	LINE TITLE DESCRIPTION	DEFAULT SETTING	ACTION
31	Nozzle PWM Maximum	100%	Press **ENTER** to change.
	It is unlikely that you would set the nozzle PWM maximum lower than 100%, this is where the limit to the maximum duty cycle would be set.		
32	Flow meter Minimum GPM	10 GPM	Press **ENTER** to change.
	The flow meter minimum gallons per minute value is the minimum flow at which the turbine flow meter is no longer accurate. When in correction mode, the PinPoint™ II will automatically calculate the flow below this value. This is especially important when the PinPoint™ II is operating with only a few nozzles, like point rows, filling gaps, etc. The PinPoint™ II calculation accurately measures flow through a single nozzle.		
33	Flow meter Output Type	NH3 Calculation	Press **ENTER** to change.
	In **Correction** mode, the flow reported to the rate controller automatically switches from the turbine flow meter to a calculation whenever the flow falls below Flow meter Minimum GPM and also when a partial boom section is pulsing. **Transparent** mode prohibits this switch and only uses the turbine value regardless of accuracy. **Calculate** mode uses only the calculation.		
34	Flow meter Calibration	1400 P/10 GAL	Press **ENTER** to change.
	It is important for the flow meter calibration value to match the tag on the turbine flow meter so that the gallon counters will match the rate controller. PinPoint™ II uses “pulses per 10-gallons.” If the flow meter tag is in “pulses per gallon,” multiply by 10. If the rate controller requires “pulses per gallon,” divide by 10. You can check this by monitoring the gallons per minute shown in **System Setup** and comparing it to the rate controller.		
35	Flow meter Error Limit	Disabled	Press **ENTER** to change.
	The flow meter error limit, range Disabled to 50%. Flow% higher than the chosen% will cause a fault message and an alarm.		
36	Flow meter Error	0%	Press **ENTER** to change.
	The flow meter error shows the real-time% difference between the flow meter and the calculated flow.		
37	Factory Reset		Press **ENTER** and then **YES** to change.
	The factory reset will require all setups in the entire system to be reset to default. The factory reset is required when repairing the system. Make sure that you have recorded the setups you prefer before resetting. With a properly prepared “cheat sheet,” a factory reset only takes a few minutes. If major components are changed, a factory reset may need to be performed.		
38	Contact Information		
	Selecting this line will open up a page with the CapstanAG toll-free phone number, website, and a QRC code that will direct you to the website.		

NOZZLE SETUP PROCEDURE

1. Press the **NOZZLE SETUP** button (1).

FIGURE 63: Nozzle Setup is to set up each individual nozzle for:

- Rank
- Flow value
- Nozzle size
- Valve size
- Auxiliary boom attachment
- Soft boom attachment

Each individual nozzles can be tested or the identity confirmed.

The Nozzle Setup Screen includes set up for:

- Fence rows
- Wheel track
- Dust control nozzles
- Soft booms for non-conventional nozzle groupings

Individual nozzle tip sizes can be changed in the Nozzle Setup. Default nozzles are indicated with a “D.” Always make sure that the tip size in nozzle setup is correct.

A valve size change may be necessary to achieve the correct rate. For example, at 60 to 70 psi tank pressure:

- For standard plungers - a valve size of 12.5 is a good starting point
- For high flow plungers - a valve size of 19 is a good starting point.

FIGURE 63

FIGURE 64: Use this equation to calculate the correct valve size needed.

IMPORTANT: *The Units value must be set to lbs. NH3.*

$$\text{New Valve Size} = \frac{\text{Scale Weight}}{\text{Actual Weight from PinPoint}} \times \text{Current Valve Size}$$

FIGURE 64

Four different default nozzle sizes can be setup, one for each **PRESET** button (2). You can save the profile to a number by simply pressing the number buttons #1, #2, #3 or #4.

From the operation screen, any of the four preset nozzle setups can be selected by pressing and holding the desired **PRESET** button for approximately five seconds. The nozzle setup should change.

1. Use the arrow buttons to highlight the desired information to change.
2. Press the **ENTER** button.
3. Change the information.
4. Press the **ENTER** button.

SYSTEM DRY TEST

Do this procedure to make sure that the soft boom and nozzle valves are operating correctly.

Boom Shutoff Dry Test

1. Make sure that the engine is off and the key is on.
2. Turn on the CapView display and the rate controller.
3. Turn on all of the boom switches.
4. Go to the rate controller setup so that the section control valves can be engaged.

All nozzle valves on the boom should start clicking

5. Turn off all of the boom sections
6. Turn on boom section 1.
7. Repeat steps 5 and 6 for each boom section.
8. Make sure that the boom sections are operating in the correct order.

NOTE: *If the clicking nozzle valves are not on the selected boom section, a VCM is not connected to the correct boom section on the Gateway hub. This can be fixed electronically.*

LOOK AHEAD TIME AND OVERLAP TEST

The look ahead time and the overlap test show how the system is tuned to the speed of the GPS sensor and the time that it takes for overlap messages to make it to the nozzle valves. The look ahead time can be set with the help of two people to watch the nozzle valves at a known overlap point.

When setting the look ahead time and overlap distance, the overlap distance must be set to ZERO. Reset the distance to 40 plus after setting the look ahead time.

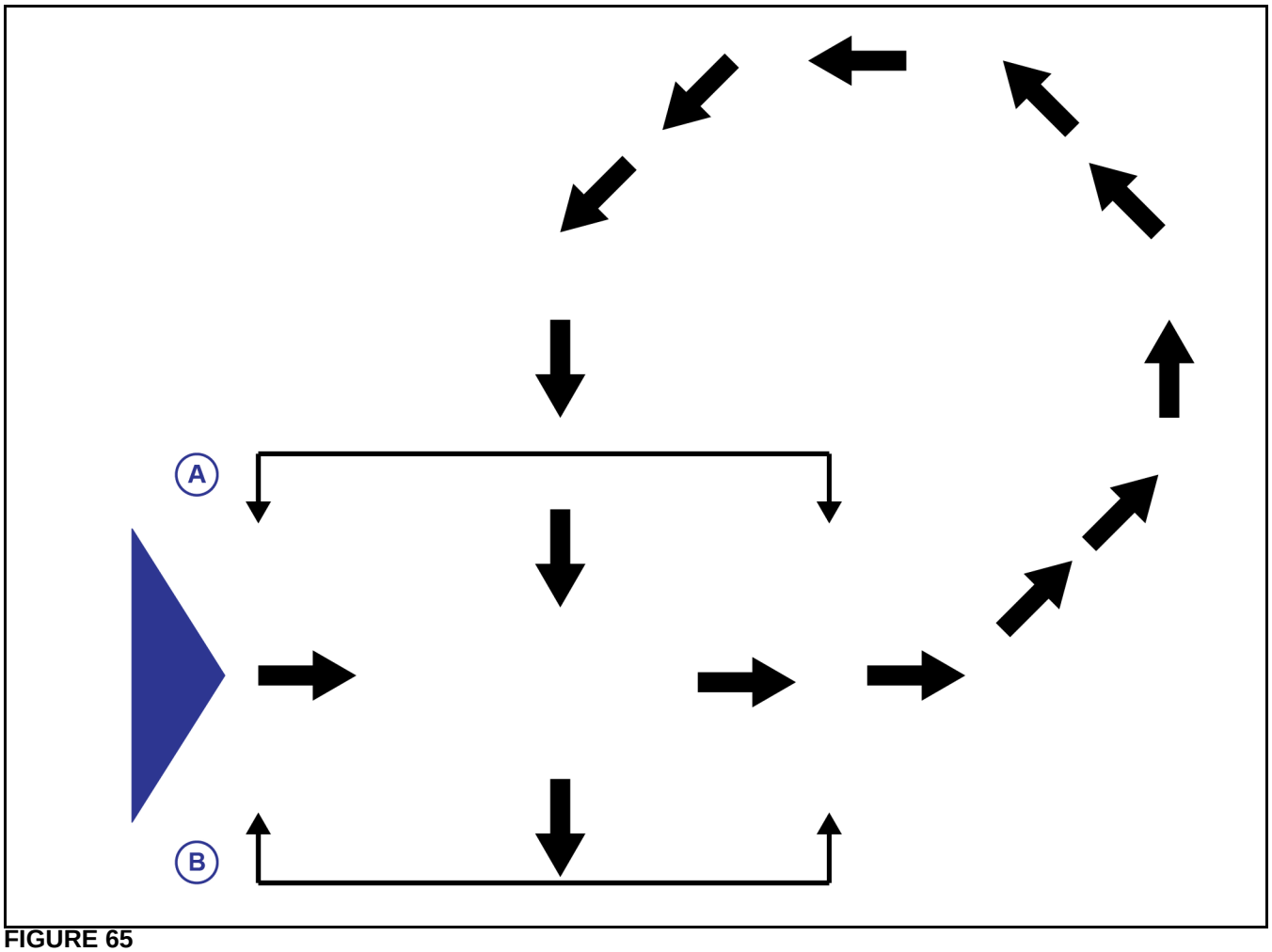

FIGURE 65

FIGURE 65:

1. Put a person at point A and another at the point B.

   The people should be on either side of the machine at the starting point.
2. Start spraying and move the machine forward.
3. Continue to move straight forward for approximately 150 ft (45 m).
4. Then while continuing to spray, turn left.
5. Move a short distance and then turn around to go to the previously sprayed area (point A).

When the boom reaches point B, the nozzle valves should start spraying.

When the boom reaches point A, the nozzle valves should stop spraying.

If the people notice that the nozzle valve shutoff time or the spray on time is early or late, adjust the look ahead time in the **SYSTEM SETUP** menu.

COMPASS CALIBRATION

The compass calibration is not required if the Gateway hub is installed in standard vertical orientation.

In typical installations the compass is disabled; however, by selecting **Compass (w/Turn)** as a F**orward/Reverse Detection Method** in the **SYSTEM SETUP**, the 3-Dimensional compass can be used for forward/reverse detection and for low-speed turn compensation stability. If this option is selected the compass needs to be calibrated so that the machine knows the plane of the earth.

1. Make sure that the machine is facing north.

FIGURE 66:

2. Press the **SYSTEM SETUP** (1) button.
3. Use the up or down arrows (2) to select **Advanced Settings**.
4. Press the **ENTER** button (3).
5. Use the up or down arrows to select to **Compass Heading** (4).
6. Press the **ENTER** button.
7. Use the left or right arrow button to select **YES**.
8. Drive the machine in a slow, smooth, right-hand circle until the machine is again facing north.
9. Stop the machine when it is facing north and do not move the machine.
10. Press the **ENTER** button.

    A heading value will show on the CapView.

IMPORTANT: *If 6502 shows on the CapView, an error has occurred. Do the compass calibration procedure again.*

NOTE: *If the calibration fails twice, cycle the power and do the procedure again.*

11. Use the up or down arrows to select to the **Compass Offset** (5).
12. Press the **ENTER** button.
13. Enter the Compass Heading value into the Compass Offset value.

    This calibrates where North is in the plane of the earth.

    After a couple of seconds, the **Compass Heading** should read **0 Degrees** when facing north.

    This may be off a few degrees. The compass only needs to be within 90 degrees to make backup detection work correctly.

FIGURE 66

SETTING THE GPS SETTINGS

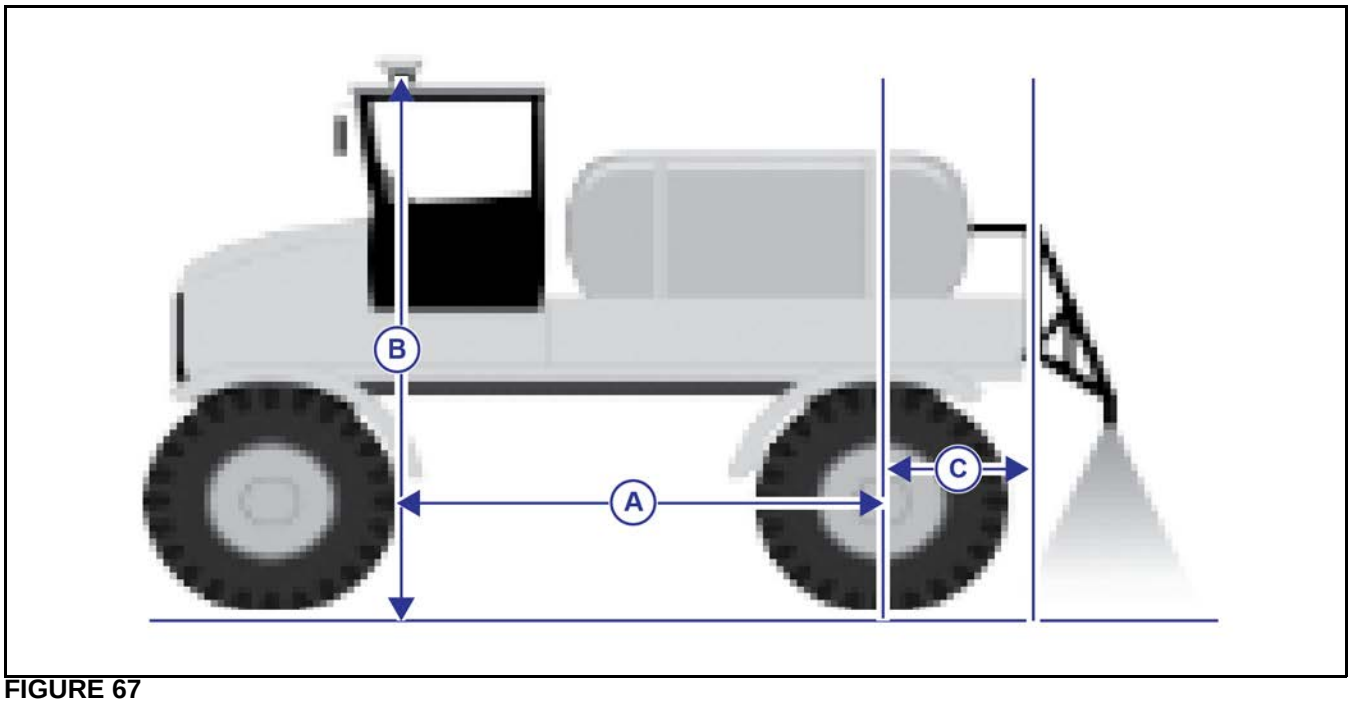

FIGURE 67

FIGURE 67: Before operation make sure that the GPS setting values are correct.

Measure and record the values for:

- Antenna Ahead of the Rear Axle (A)
  - Inches from the rear axle centerline to the GPS antenna centerline.

    A positive number indicates the antenna is ahead of the rear axle.

    A negative number indicates the antenna is behind the rear axle.
- Antenna Right of Center
  - Inches that the GPS antenna is off-center.

    A positive number indicates that the antenna is right of center.

    A negative number indicates that the antenna is left of center.
- Antenna Above Ground (B)
  - Inches that the GPS antenna is above the ground.
- Boom Ahead of Rear Axle (C)
  - Inches from the boom centerline to the rear axle centerline.

NOTE: *If the GPS signal is taken from a navigation controller, the virtual position may be electronically repositioned over the rear axle causing the GPS setting values to vary from the measured values on the sprayer. The GPS boom Ahead of Rear Axle value will always be the actual measured distance from the GPS antenna centerline to the rear axle centerline at ground level.*

FIGURE 68:

1. Press the **SYSTEM SETUP** button (1).
2. Use the up or down arrow buttons (2) to select **GPS-Ant. Ahead of Rear Axle** (3).
3. Enter the number of inches from the rear axle centerline to the GPS antenna centerline.

   This value is used for GPS overlap control to shut off nozzles in the proper place. The GPS antenna must be located on the vehicle on which the boom is mounted. For pull-behind units, mount the GPS antenna on the trailed unit.
4. Press the **ENTER** button (4).
5. Use the up or down arrow buttons to select **GPS-Ant. Right of Center** (5).
6. Enter the number of inches that the GPS antenna is off-center.
7. Press the **ENTER** button.
8. Use the up or down arrow buttons to select **GPS Antenna Above Ground** (6).
9. Enter the number of inches that the GPS antenna is above the ground.
10. Press the **ENTER** button.
11. Use the up or down arrow buttons to select **GPS Boom Head of Rear Axle** (7).
12. Enter the number of inches from the boom centerline to the rear axle centerline.
13. Press the **ENTER** button.

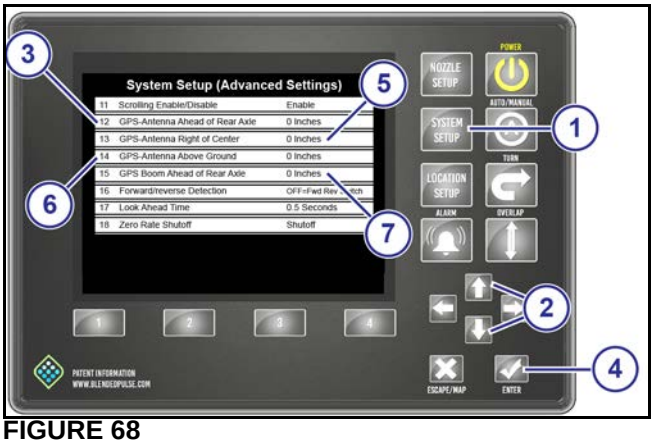

FIGURE 68

MACHINE SPECIFIC INFORMATION

Location Setup Information

Machine Type:			**VCM Orientation**	
			Left	**Right**
Boom Section #1	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Boom #2:			
Boom Section #2	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #1:			
	Move these nozzles to Soft Boom #3:			
Boom Section #3	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #2:			
	Move these nozzles to Soft Boom #4:			
Boom Section #4	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #3			
	Move these nozzles to Soft Boom #5:			
Boom Section #5	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #4:			
	Move these nozzles to Soft Boom #6:			
Boom Section #6	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #5:			
	Move these nozzles to Soft Boom #7:			
Boom Section #7	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #6:			
	Move these nozzles to Soft Boom #8:			
Boom Section #8	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #7:			
	Move these nozzles to Soft Boom #9:			

Machine Type:			**VCM Orientation**	
			Left	**Right**
Boom Section #9	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #8:			
	Move these nozzles to Soft Boom #10:			
Boom Section #10	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #9:			
	Move these nozzles to Soft Boom #11:			
Boom Section #11	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #10:			
	Move these nozzles to Soft Boom #12:			
Boom Section #12	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Soft Boom #1			

System Setup Information

Line Number	Line Name	Default Setting	Actual Setting
1	Operation Mode	N-Ject™	
2	Controller Gallon Counter	0 Gallons	
3	Actual Gallon Counter	0 Gallons	
4	Controller Acre Counter	0 Acres	
5	Actual Acre Counter	0 Acres	
6	Controller Gallons Per Minute	0.0 GPM	
7	Actual Gallons Per Minute	0.0 GPM	
8	Nozzle Control (Key FOB)	12V Active	
9	Pressure 1	0 PSI	
10	Pressure 2	0 PSI	
11	System Voltage	13.8V	
12	Display Back light	5	
13	LED Brightness	5	
14	Beeper Volume	5	
15	Specific Gravity	1.00	Not Used for N-Ject™ Operation Mode
16	Valve Diagnostics Enable	Enabled	
17	Overlap Distance	60 Inches	
18	Liquid Sensor 1 Sensitivity	5.0 s	
19	Liquid Sensor 2 Sensitivity	0.0 s	
20	Strainer Pressure Drop	50%	
21	Min. Outlet Pressure	0%	
22	Rate Sync Mode	Disable	
23	Rate Sync Average	0.1	
24	Rate Max Ground Speed	21 MPH	
25	Units	US-GAL	
26	Baud Rate	Searching	
27	Revision Information	Revision X.XX	
28	Language	English	
29	Previous Error Lists		
30	Advanced Settings		

Advanced System Setup Information - N-Ject™ Operation Mode

Line Number	Line Name	Default Setting	Actual Setting
1	Hour Meter	0.0 Hours	
2	Compass Heading	0 Degrees	
3	Compass Offset	0 Degrees	
4	USB Mode	Thumb Drive	
5	Total Number Valve Expected	0 Valves	
6	Scrolling Enable/Disable	Enabled	
7	GPS - Antenna Ahead Of Rear Axle	0 inches	
8	GPS - Antenna Right Of Center	0 inches	
9	GPS - Antenna Above Ground	0 inches	
10	GPS - Boom Head Of Rear Axle	0 inches	
11	Forward/Reverse Detection	OFF=Fwd Rev Switch	
12	Look Ahead Time	0.3 Seconds	
13	Zero Rate Shutoff	Minimum PWM%	
14	Pressure Sensor 1 Min. Volt	1.0 V	
15	Pressure Sensor 1 Max. Volt	5.0 V	
16	Pressure Sensor 1 Min. PSI	0 PSI	
17	Pressure Sensor 1 Max. PSI	250 PSI	
18	Pressure Sensor 1 Offset	0.0 PSI	
19	Pressure Sensor 2 Min. Volt	1.0 V	
20	Pressure Sensor 2 Max. Volt	5.0 V	
21	Pressure Sensor 2 Min. PSI	0 PSI	
22	Pressure Sensor 2 Max. PSI	250 PSI	
23	Pressure Sensor 2 Offset	0.0 PSI	
24	Servo Type	In-line Valve	
25	Manual Mode Servo Speed	50%	
26	Servo Minimum DC%	20%	
27	Servo Maximum DC%	100%	
28	Nozzle PWM% Cycle Time	6.0 s	
29	Nozzle Pulse Frequency	3.0 Pulse/Sec.	
30	Nozzle PWM Minimum	3%	
31	Nozzle PWM Maximum	100%	
32	Flow Meter Minimum GPM	10 GPM	Not Used for N-Ject™ Operation Mode
33	Flow Meter Output Type	NH3 Calculation	
34	Flow Meter Calibration	1400 P/ 10 GAL	
35	Flow Meter Error Limit	Disabled	Not Used for N-Ject™ Operation Mode
36	Flow Meter Error	0%	Not Used for N-Ject™ Operation Mode
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