PinPoint®

SharpShooter® Edition

Operator and Maintenance Manual

CAPSTAN
SINCE 1893 AG SYSTEMS, INC.
APPLICATION SYSTEMS FOR PROFESSIONALS

P/N 120156-002 | Revised 6-16 |

SERVICE CONTACT INFORMATION

If a problem arises with the PinPoint SharpShooter 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 Capstan Ag Systems, Inc.

Dealer: _____

Contact: _____

Phone: _____

Address: _____

City / State / Zip: _____

FACTORY SERVICE / REPAIRS

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FIGURES

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1.0 INTRODUCTION

Congratulations! You are now part of the Capstan Ag Systems, Inc. precision application team using Blended Pulse™!

PinPoint® SharpShooter® Mode with Blended Pulse™ is an innovative Capstan Ag patented process. We've coupled Pulse Width Modulation (PWM) with NOZZLE BY NOZZLE independent rate and pressure control to keep your spraying consistently on target, even in turns with our patented Turn Compensation feature. With our Blended Pulse™ technology, you can expand your spraying application rate range through a single spray tip to gain more spraying penetration over wider speed ranges and frequent speed changes.

You now have a spray system that can reduce drift potential, decrease chemical waste, and lessen your time spent in the field with the ability to control the pressure in the boom independent of the sprayer's chassis speed. This increases the speed range your sprayer can operate while maintaining (1) constant pressure, (2) constant droplet size, (3) instant ON/OFF, and (4) up to 8:1 speed range (versus 2:1 without Blended Pulse™).

The PinPoint® SharpShooter® Mode CapView displays visual and audible indicators of your spraying process. Audible alarms sound when your spraying variables are inconsistent with your predetermined settings. With a range of menu settings allowing customized changes in the field, you have the ability to better manage your spraying process.

The Capstan Ag team is excited to partner with you in your precision spraying operation. As an owner of your very own PinPoint® SharpShooter® Mode spray system with Blended Pulse™ technology, a network of experienced professionals are available in your region to provide informative technical support regarding your PinPoint® SharpShooter® Mode spray system. Please contact Capstan Ag Systems, Inc. to locate your nearest Capstan Ag Dealer, Capstan Ag Field Marketer or Field Technical Specialist.

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2.0 SAFETY

2.1 Hazard Communications

This manual contains important information on how to safely, efficiently and correctly install, operate and maintain Capstan Ag Systems, Inc. equipment. Following 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 OEM Sprayer equipment manual(s).
- Follow the instructions (in this manual) for each step thoroughly to ensure safe work conditions in and around OEM Sprayer equipment.
- 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 Sprayer equipment manual(s) for chemical safety information.
- Review and understand your employer's procedures for obtaining and using Safety Data Sheets (SDS) and the required PPE for hazardous chemicals.

Make certain that all personnel have read this manual, and thoroughly understand safe and correct installation, operation and maintenance procedures.

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 Capstan Ag Systems, Inc. equipment after reading this manual, please obtain the proper training before working with equipment to ensure your own safety and well as your co-worker's 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 Capstan Ag Systems, Inc.

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2.2 Signal Words

Signal Words used in product safety messages (found in this manual) are based upon these Standards:

- American National Standards Institute (ANSI) Z535.1-6
- American Society of Agricultural and Biological Engineers (ASABE) MS-23/14

2.3 Definitions

The **DANGER** symbol indicates a hazardous situation, which if not avoided, will result in death or serious injury. This signal word is limited to extreme situations.

The **WARNING** symbol indicates a hazardous situation, which if not avoided, could result in serious injury or equipment damage.

NOTE: DANGER or WARNING signal words are not used for property damage accidents unless personal injury risk is appropriate to a specific hazardous situation level.

The ***NOTICE*** symbol addresses practices not related to personal injury and safety practices.

The **SAFETY INSTRUCTION** symbol explains safety practices and hazardous situations in detail, above what the **DANGER** and **WARNING** symbols can provide.

2.4 Conformance

Safety Messages in this Capstan Ag manual conforms to the ANSI Z535 Standard:

- **Safety Color Code: (WARNING)**
- **Signal Word:** WARNING!
- **Hazard Statement:** Chemical Residues May Be Present In The OEM Equipment.
- **Instructions Statement:** Release Pressure on the Sprayer System Before Servicing. Rinse The System With Clean Water Prior To Installing Or Servicing Fittings, Hoses, Valves, Or Nozzles.
- **Consequences Statement:** Use Proper PPE At All Times To Avoid Personal Injury.

2.5 HCS Pictograms and GHS Safety Labels

OSHA's new Hazard Communication Standard (HCS) places pictograms on labels to alert users of chemical hazard exposure **[Figure 1]**. You many find these pictograms on OEM Sprayer equipment. Review the OEM Sprayer manuals for further explanations on these pictograms.

Figure 1: HCS Pictograms

The HCS aligned its provisions with the United Nations' Globally Harmonized System (GHS) Classification and Labeling of Chemicals in 2012. **[Figure 2]** displays a GHS Safety Label example for a chemical hazard.

Figure 2: GHS Safety Label Example

Capstan Ag Systems, Inc. add-on spraying systems for OEM and retrofit Sprayer equipment (Booms and Toolbars) may contain (where applicable) HCS pictograms and GHS safety labels (on our equipment) and safety "signal word" messages (in this manual) **[Figure 3]**.

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

Figure 3: GHS Safety Warning Example

2.6 Hazardous Energy

People working around OEM Sprayer Equipment may be exposed to hazardous energy in several forms and combinations during installation, operation or maintenance, of Capstan Ag equipment, such as:

- Kinetic (mechanical) - energy in the moving parts of mechanical systems (springs or spring-loaded).
- Potential (residual) - energy stored in pressure vessels, such as Sprayer booms and toolbars.
- Electrical energy - generated electrical power, static sources, or electrical storage devices (such as batteries or capacitors).
- Thermal (high or low temperature) - energy resulting from mechanical work, radiation, chemical reaction, or electrical resistance.

2.7 Chemical Safety

Following these common handling practices for working safely around hazardous chemicals:

- Always have an ample water supply nearby.
- Never smoke or eat while working around chemical spraying equipment.
- Have qualified technicians that are familiar with all local, State or Province, and Country-specific laws install and service the equipment.
- Operate the equipment according to the Product, Operation or Maintenance Manual.
- Avoid chemical exposure by using the proper PPE. Remove contaminated clothing immediately and wash skin (and clothing) thoroughly with soap and water. Wash contaminated clothing after every use.
- Bleed off pressurized Sprayer equipment and flush the chemical residue with clean water before servicing.
- If symptoms of illness occur during or shortly after working on or around spraying equipment, immediately call a physician or go to a hospital.

2.8 Unsafe Equipment Use

The use of the Capstan Ag equipment by non-qualified personnel.

- The use of unsuitable tools or replacing components or spare parts with ones other than those specified in this manual or by Capstan Ag personnel.
- Re-engineering Capstan's operating software so it changes the intended use of the Capstan Ag equipment without FIRST consulting Capstan Ag Systems, Inc.

2.9 Battery Safety

Use the procedure in the appropriate Sprayer 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 battery charging area.
- Remove jewelry, which might make electrical contact and create sparks.
-  Avoid chemical burns by not rubbing eyes or skin while working with the battery.
- Wash your hands immediately after completing the job.

2.10 Extinguishing Fires

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:

Know where fire extinguishers and first aid kits are located 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.

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3.0 PARTS IDENTIFICATION

3.1 CapView

[Figure 4] - The CapView is located in the sprayer's cab.

Figure 4: CapView

120010-001

3.2 Ball Mount, Ram Mount w/Install Kit, Clamp

[Figure 5] - The Ball Mount provides a clamp fixture on the backside of the CapView display. The 4 mounting screws are already located on the CapView.

The Ram Mount with Install Kit also provides a clamp fixture, and is mounted to a fixed post inside of the sprayer's cab.

The Clamp connects the CapView Ball Mount to the Ram Mount.

Figure 5: CapView Display Mounting Hardware

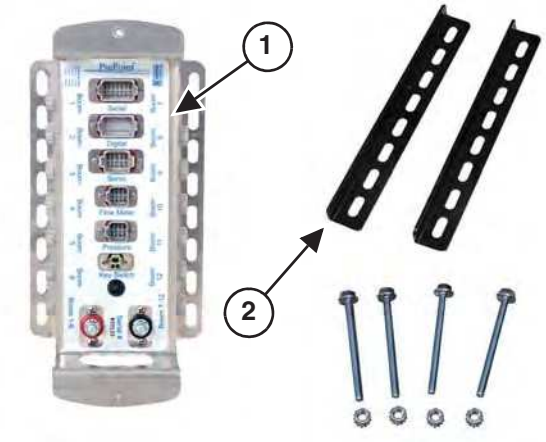
118603-111

3.3 Gateway Hub

[Figure 6] - The Gateway Hub is the junction where the battery power is routed to the VCMs. The Gateway Hub also routes the Pressure Sensor signals and VCMs signals to the CapView.

1. Gateway Hub (118640-025)
2. Bracket, Mounting, Gateway Hub (118640-033)

Figure 6: Gateway Hub and Mounting Hardware



3.4 Battery Harness

[Figure 7] - The PinPoint Battery Harness connects to the Gateway Hub and to the machine's batteries.

Figure 7: Battery Harness

118676-001

3.5 Pressure Sensor

[Figure 8] - The 100 PSI Pressure Sensor is installed in the product plumbing at the boom mast.

Additional fittings are supplied to adapt the Pressure Sensor to the machine. Teflon® tape is also supplied to seal the fittings and Pressure Sensor threads.

Figure 8: Pressure Sensor

116301-001

3.6 Pressure Sensor Harness

[Figure 9] - The Pressure Sensor Harness connects the Pressure Sensor to the Gateway Hub.

Figure 9: Pressure Sensor Harness

118657-001

3.7 VCM Kits

[Figure 10] - The VCMs (Valve Control Modules) are usually located adjacent to the nozzle closest to the center of the sprayer on the associated boom sections.

PART NO.	DESCRIPTION
118400-129	Module, VCM, PP 9 Nozzle x 20”
118250-020	Module, VCM (2) Kit, PP, Two 9 Nozzle x 20” harnesses, Y-adapter
118400-131	Module, VCM, PP 9 Nozzle x 15”
118250-015	Module, VCM (2) Kit, PP, Two 9 Nozzle x 15” harnesses, Y-adapter

NOTICE

If a boom section contains more than nine nozzles, an additional VCM is required. VCM Kits include two 9 nozzle harnesses, the additional VCM and a “Y” Adapter.

Figure 10: VCM Kits

118400-129

3.8 Y- Adapter Harness

[Figure 11] - The Y-adapter harness connects two VCMs together. The Y-adapter is also included in a VCM Kit with an additional VCM and two harnesses.

NOTICE

If a boom section contains more than nine nozzles, a Y-adapter is required to connect two VCMs together.

Figure 11: Y - Adapter Harness

118640-032

3.9 Circuit Breaker

[Figure 12] - The 80 AMP Circuit Breaker is installed in the battery box. The Circuit Breaker provides circuit protection for he PinPoint system.

Figure 12: Circuit Breaker

118604-006

3.10 Gateway Hub Cover

[Figure 13] - The Gateway Hub Cover protects the Gateway Hub.

Figure 13: Gateway Hub Cover

118639-010

3.11 Flowmeter Adapter Harness

[Figure 14] - The Flowmeter Adapter Harness connects to the Gateway Hub and to the machine's Flowmeter and the machine's Flowmeter Harness.

PART NO.	DESCRIPTION
118660-002	Harness, Flowmeter, PP, RoGator, 3 pin DT
118659-002	Harness, Flowmeter, PP, JD R-Series 27'
118652-001	Harness, Flowmeter, PP, 3 pin DTM
118659-001	Harness, Flowmeter, PP, JD, 10'
118660-001	Harness, Flowmeter, PP, Raven 3 pin DT Conxall

Figure 14: Flowmeter Adapter Harness

118659-001

3.12 Key FOB

[Figure 15] - The Key FOB allows the operator to turn ON/OFF 9 nozzle (or more) VCM-controlled boom sections.

Sprayer boom sections may contain one or more VCMs depending on the length of the boom.

- The Key FOB's ① left/right buttons turn ON/OFF individual nozzles, one at a time.
- The Key FOB's ② top/bottom buttons turn ON/OFF individual boom sections, one at a time.
- The Key FOB's ③ center button turns OFF all nozzles.

Figure 15: Key FOB

118640-040

3.13 Thumb Drive

[Figure 16] - The 2GB Thumb Drive provided with the PinPoint system can be used to download maps.

NOTICE Use the Capstan 2GB Thumb Drive or thumb drive no larger than 2GB in the CapView.

NOTICE Do not spray with the Thumb Drive inserted in the CapView.

Figure 16: Thumb Drive

120015-001

3.14 Serial Cable

[Figure 17] - The Serial Cable connects the CapView GPS port to the machine's GPS system.

Figure 17: Serial Cable

120140-016

3.15 Cable Tie kit

[Figure 18] - The Cable Tie Kit is supplied to secure PinPoint wiring and components.

Figure 18: Cable Tie Kit

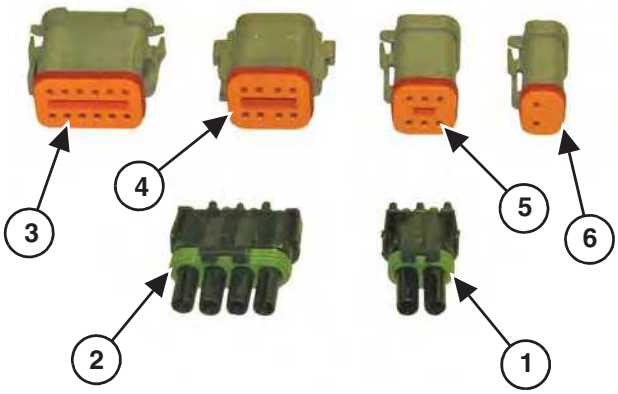
120100-010

3.16 Electrical Connector Types

[Figure 19] - These are the types of electrical connectors found on th PinPoint wire harnesses. The wire harness connectors will have weatherproof sealing plugs when not connected to another connector or component.

1. Plug 2-Pin Tower (116200-045)
2. Plug 4-Pin Tower (116200-078)
3. Plug 12-Pin Deutsch (706530-348)
4. Plug 8-Pin Deutsch (706530-349)
5. Plug 6-Pin Deutsch (706530-356)
6. Plug 2-Pin Deutsch (706530-347)

Figure 19: Electrical Connector Types



3.17 Power Disconnect (Optional)

[Figure 20] - The Power Disconnect Kit (optional) is available for sprayer applications or when unhooking battery power wires is desired.

Figure 20: Power Disconnect (Optional)

118605-001

3.18 CapView Display Pigtail Harness w/ Switched Power

[Figure 21] - The CapView Display Pigtail Harness w/ Switched Power connects from the CapView to the Gateway Hub Extension Harness. The switched power connector on the pigtail connects to the Key Switched Power Harness inside the sprayer Cab.

Figure 21: CapView Display Pigtail Harness w/ Switched Power

120139-001

3.19 Extension Harnesses

[Figure 22] - Extension Harnesses connect to the VCMs and route to the Gateway Hub. Also, an Extension Harness routes from the Gateway Hub, into the cab, and connects to the CapView Display Pigtail Harness w/Switched Power.

PART NO.	DESCRIPTION
118650-005	Extension, CAN/BUS, 6 cond x 5'
118650-010	Extension, CAN/BUS, 6 cond x 10'
118650-015	Extension, CAN/BUS, 6 cond x 15'
118650-020	Extension, CAN/BUS, 6 cond x 20'
118650-025	Extension, CAN/BUS, 6 cond x 25'
118650-030	Extension, CAN/BUS, 6 cond x 30'
118650-035	Extension, CAN/BUS, 6 cond x 35'
118650-040	Extension, CAN/BUS, 6 cond x 40'
118650-045	Extension, CAN/BUS, 6 cond x 45'
118650-050	Extension, CAN/BUS, 6 cond x 50'
118650-055	Extension, CAN/BUS, 6 cond x 55'
118650-060	Extension, CAN/BUS, 6 cond x 60'
118650-065	Extension, CAN/BUS, 6 cond x 65'
118650-070	Extension, CAN/BUS, 6 cond x 70'

Figure 22: Extension Harnesses

118650-040

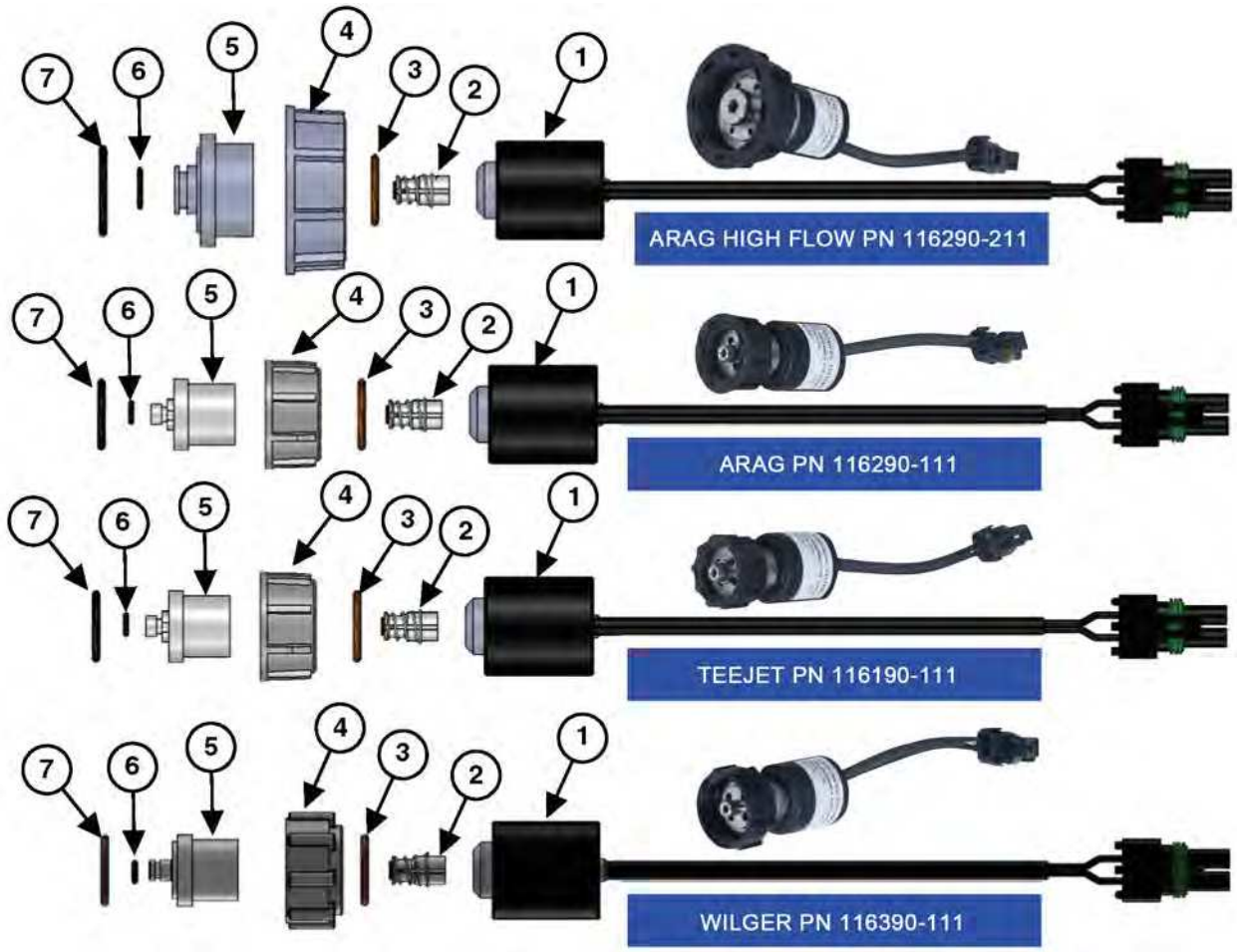
PART NO.	DESCRIPTION
118650-080	Extension, CAN/BUS, 6 cond x 80'
118650-090	Extension, CAN/BUS, 6 cond x 90'
118650-100	Extension, CAN/BUS, 6 cond x 100'
118650-110	Extension, CAN/BUS, 6 cond x 110'
118650-120	Extension, CAN/BUS, 6 cond x 120'

3.20 Nozzles - Types and Valve Component Identification

[Figure 23] - Capstan offers several types of nozzle valve assemblies to accommodate the variety of nozzle bodies used on sprayers.

It is important to have the correct individual nozzle valve components for the nozzle valve body.

Figure 23: Nozzles - Types and Valve Component Identification



*Parts shown above are for reference purposes only.

ITEM	DESCRIPTION	PART NO. WILGER	PART NO. TEE JET	PART NO. ARAG	PART NO. ARAG HIGH FLOW
1	Coil	116189-111	116189-111	116189-111	116189-111
2	Plunger	716009-111	716009-111	716009-111	716009-111
3	O-Ring	715022-204, Size-015	715022-204, Size-015	715022-204, Size-015	715022-204, Size-015
4	Flynut	717101-007	717101-004	717101-006	717101-206
5	Valve Body	116188-111	116186-111	116182-111	116182-211
6	O-Ring	715022-201, Size-008	715022-200, Size-2MM x 4MM	715022-201, Size-008	715022-211, Size-112
7	O-Ring	715022-206, Size-016	715022-202, Size-017	715022-205, Size-015	715022-215, Size-212

3.21 GPS Adapter Cable Application Guide

[Figure 24] - The optional GPS Adapter Cable splits GPS signal from the sprayer's normal GPS system and brings it into the CapView

Figure 24: GPS Adapter Cable

120046-001

120047-001

MACHINE MAKE	GPS RECEIVER TYPE	STEERING SYSTEM TYPE	GPS CONNECTION LOCATION	CONNECTION TYPE	OEM P/N	CAPSTAN P/N	CAPSTAN SERIAL CABLE NEEDED
Apache	Trimble	Trimble AutoPilot	NAV II Controller	DB9 Serial	N/A	N/A	Yes
Apache	Phoenix 200	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Apache	Phoenix 300	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Apache	Raven Viper 4	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Apache	Envisio Pro	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Case IH	AFS 372	AFS Accuguide	Nav II Controller	12 pin DTM Deutsch	380002424	120048-001	No
Case IH	AFS 372	Raven SmartTrax	Smart Trax Node /3D Node	DB9 Serial	115-0171-689	120049-001	Yes
Case IH	Phoenix 200	Raven Smart Trax	Smart Trax Node /3D Node	DB9 Serial	115-0171-689	120049-001	Yes
Case IH	Phoenix 300	Raven Smart Trax	Smart Trax Node /3D Node	DB9 Serial	115-0171-689	120049-001	Yes
Case IH	Raven Viper 4	Raven Smart Trax	Smart Trax Node /3D Node	DB9 Serial	115-0171-689	120049-001	Yes
Case IH	Envisio Pro	Raven Smart Trax	Smart Trax Node /3D Node	DB9 Serial	115-0171-689	120049-001	Yes
John Deere	StarFire 3000	John Deere	Receiver	12 pin DT Deutsch	PF90350, PF80722, PFP10470	120047-001	No
John Deere 4630/R4023	StarFire 3000 / StarFire ITC	John Deere	Receiver	12 pin DT Deutsch	PF90350, PF80722, PFP10470	120051-001	No
John Deere	StarFire ITC (5Hz only)	John Deere	Receiver	12 pin DT Deutsch	PF90350, PF80722, PFP10470	120047-001	No

MACHINE MAKE	GPS RECEIVER TYPE	STEERING SYSTEM TYPE	GPS CONNECTION LOCATION	CONNECTION TYPE	OEM P/N	CAPSTAN P/N	CAPSTAN SERIAL CABLE NEEDED
Miller	Trimble	Trimble AutoPilot	Nav II Controller	DB9 Serial	N/A	N/A	Yes
Miller	Phoenix 200	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	115-0171-689	120046-001	Yes
Miller	Phoenix 300	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	115-0171-689	120046-001	Yes
Miller	Raven Viper 4	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	115-0171-689	120046-001	Yes
Miller	Envisio Pro	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	115-0171-689	120046-001	Yes
New Holland	PLM 372	PLM Intellisteer	Nav II Controller	12 pin DTM Deutsch	380002422	120048-001	No
New Holland	Phoneix 200	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	N/A	120046-001	No
New Holland	Phoneix 300	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	N/A	120046-001	No
New Holland	Raven Viper 4	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	N/A	120046-001	No
New Holland	Envisio Pro	Raven Smart Trax	Smart Trax Node	3 pin DT Deutsch	N/A	120046-001	No
Rogator	Phoneix 200	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Rogator	Phoneix 300	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Rogator	Raven Viper 4	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Rogator	Envisio Pro	Raven Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Rogator MY2016 RG900B RG1100B RG1300B	Raven Viper 4	Raven Smart Trax	OEM Harnessing	6 Pin Deustch (C13)	N/A	120044-001	No

3.22 Retrofit GPS Systems

MACHINE MAKE	GPS RECEIVER TYPE	STEERING SYSTEM TYPE	GPS CONNECTION LOCATION	CONNECTION TYPE	OEM P/N	CAPSTAN P/N	CAPSTAN SERIAL CABLE NEEDED
Any	Ag Leader	ParaDyme	ParaDyme	DB9 Serial	4002226-15	N/A	Yes
Any	Ag Leader GPS 6500	Steer Command	Steer Command	DB9 Serial	4003263-6	N/A	Yes
Any	Ag Leader GPS 2500/ 1600	Geo Steer	Geo Steer	DB9 Serial	4003263-6	N/A	Yes
Any	Ag Leader GPS 2500/ 1600	None	Antenna Harness	DB9 Serial	4002304-18	N/A	Yes
Any	Phoenix 200	Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Any	Phoenix 300	Smart Trax	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Any	Viper 4/Hielix	None	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Any	Phoenix 200	None	Antenna Harness	DB9 Serial	115-0171-689	120049-001	Yes
Any	Phoenix 300	None	Antenna Harness	DB9 Serial	115-0171-272	N/A	Yes
Any	Envisio Pro	None	Smart Trax Node	DB9 Serial	115-0171-689	120049-001	Yes
Any	Trimble/AFS FM 750 CFX 750	None	GPS Receiver	12 pin DTM Deutsch	67091	120052-001	No
Any	Trimble/AFS FM 1000 FMX 1000	None	GPS Receiver	12 pin DTM Deutsch	67091	120052-001	No
Any	Trimble TMX 2050	None	GPS Receiver	12 pin DTM Deutsch	67091	120052-001	No
Any	Trimble 372	None	GPS Receiver	12 pin DTM Deutsch	380002422	120048-001	No
Any	Trimble	AutoPilot	Nav II Controller	DB9 Serial	N/A	N/A	Yes

3.23 PinPoint SS Parts

PART NO.	DESCRIPTION	QTY.
	Machine Specific Mounting Kits	
118703-006	Kit, Mounting, Gateway, Power Hub, JD, R4030, R4038, R4045	1
	NOT REQUIRED - ADDDITIONAL POWER SUPPLY OPTIONS	
118655-001	Harness, Power, PP, SSRS, 25’	As Req.
118676-001	Harness, Power, PP, SSRS, 40’	As Req.
118605-001	Power Disconnect Kit, 50A	1
	NOTE: Use power disconnect for front mount booms that need to be detached.	
	Nozzle Extension (Use if VCM pigtail does not reach valve)	
118673-001	Extension, 2 cond x 5’, WP	As Req.
	Display Extension (Distance from Cab to Gateway Hub)	
118650-010	Extension, CAN/BUS, 6 cond x 10’, 14/18ga, DT	
118650-015	Extension, CAN/BUS, 6 cond x 15’, 14/18ga, DT	
	NOTE: Use 2 extensions for front mount booms that need to be detached.	
118650-025	Extension, CAN/BUS, 6 cond x 25’, 14/18ga, DT	
118650-040	Extension, CAN/BUS, 6 cond x 40’, 14/18ga, DT	
	Valve Parts	
116182-011	Valve, Body, Arag w/ 1/8” port	As Req.
116188-011	Valve, Body, Wilger w/ 1/8” port	As Req.
116500-001	Valve Seal Kit, TeeJet	As Req.
116500-003	Valve Seal Kit, Arag	As Req.
116500-004	Valve Seal Kit, Wilger	As Req.
	Miscellaneous	
118640-049	Harness, Adapter, Field IQ AccuControl, N-Ject LF, PP	
118640-110	Mounting Plate, Gateway, Power Hub, JD, R4030, R4038, R4045	
705726-117	Elect, Breaker, Switchable, Manual Reset, 80A	
705726-118	Elect, Battery Boot, Black	
705726-119	Elect, Battery Boot, Red	
706500-003	Terminal Removal Tool, WP	
W10001-001	Extended Warranty	

4.0 INSTALLATION

4.1 Shipping Boxes

[Figure 25] - The PinPoint® SharpShooter® Mode System is boxed with a method called “Pizza boxing” to reduce the amount of shipping boxes and to group parts and assemblies together.

Some parts are packaged with protective foam, bubble wrap and white boxes. Identification labels are placed on the bottom left hand corner of all inner pizza boxes and box assemblies for quick identification.

Figure 25: PinPoint® SharpShooter® Mode System

[Figure 26] - Each system has a valves box, harnesses box, power hub/gateway hub, cab/CapView box and boom sections boxes. Depending on the system, box sizes and contents might vary.

Pizza boxes are labeled as such:

- Box 1 – Cover Assembly & Install Kit
- Box 2 – Cab, Power Hub & Pressure Sensor, Harnesses, SSRS
- Box 3 – Boom Sections 1– number ordered

Figure 26: PinPoint Packing Example for Box 1

[Figure 27] - Box 3 - Boom section boxes are sequentially numbered inside of a shipping box and contain the number of harnesses ordered and Nozzle Valves.

Use the shipping manifest to make sure the parts match the order submitted to Capstan Ag.

NOTICE

Your PinPoint SharpShooter system is assembled, tested and shipped according to your machine’s boom configurations. Make sure the VCMs/ harnesses are installed on the correct boom sections (1 through 12) when unpacking the sequentially numbered shipping boxes.

Figure 27: Shipping and Boom Section Boxes

4.1.1 PinPoint SS Base Kit

Verify all parts arrived as shipped

Check the list of parts for your machine from the shipping materials. It should look something like this list; only specific to your machine.

12010-011 PinPoint SS Base Kit - One of each Core Component		
PART NO.	**DESCRIPTION**	**QTY.**
120139-004	Harness, Key Switched Power, Power Strip Connector	1
120139-003	Harness, Key Switched Power, Ring Terminal	1
120139-002	Harness, Key Switched Power, Amp Power Port	1
118606-051	Harness, Shutoff Adapter, SSRS-PP, DT	As Req.
706530-347	Harness, Dust Plug, 2 Pin, Deutsch DT	As Req.
706530-349	Harness, Dust Plug, 8 Pin, Deutsch DT	As Req.
706530-356	Harness, Dust Plug, 12- Pin, Deutsch DT	As Req.
706530-348	Harness, Dust Plug, 6 Pin, Deutsch DT	As Req.
116200-078	Harness, Dust Plug, 4 Pin Tower, WP	As Req.
116200-045	Harness, Dust Plug, 2 Pin Tower, WP	As Req.
118640-040	Key FOB, PinPoint, with Key Chain	1
120015-001	Thumb Drive, PP	1
120156-002	PinPoint SS Owner's Manual	1
118639-010	Enclosure, PinPoint, Gateway Cover	1
120139-001	Harness, Display Pigtail, PP, CapView w/Switch Power, 10’	1
118676-001	Harness, Power, PP, SSRS, 40’	1
118703-002	Kit, Installation, PP, SSRS	1
118657-001	Harness, Pressure Sensor, PP	1
120140-016	Cable, Serial, DB9, M to F, 15’	1
116301-001	Pressure Sensor Assembly, 100 PSI, 0.5-5V, 1/4” MNPT, WP	1
118640-025	Gateway, Hub, PinPoint, 12 Section	1
120010-001	Display, CapView, PP	1

4.1.2 Shipping Box Layout

1. In **[Figure 28]** open and place each sequentially numbered shipping box on the ground along the boom length; beginning with boom #1.

NOTICE

Boom Sections with more than 9 nozzles will use VCM Kit P/N 118250-015 or P/N 118250-020 connected together with the included ② Y-adapter **[Figure 33]**. (Boom section lengths dictate nozzle valve quantities and VCM harness lengths and quantities in each section.)

WARNING

CHEMICAL RESIDUES MAY BE PRESENT IN THE OEM EQUIPMENT. RELEASE PRESSURE ON THE SPRAYER SYSTEM BEFORE SERVICING. RINSE THE SYSTEM WITH CLEAN WATER PRIOR TO INSTALLING OR SERVICING FITTINGS, HOSES, VALVES, OR NOZZLES. USE PROPER PPE AT ALL TIMES TO AVOID PERSONAL INJURY.

NOTICE

DO NOT secure harnesses with cable ties until a Dry Test of the PinPoint System is completed.

Figure 28: Shipping Box Layout

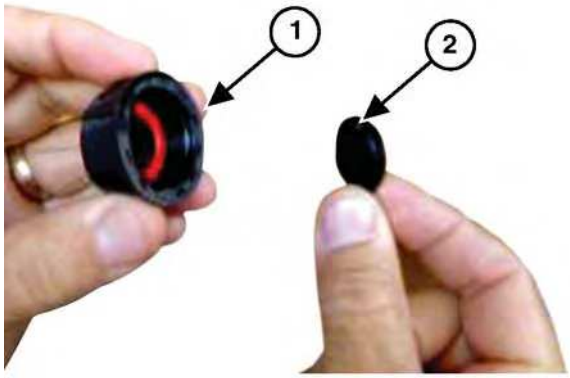
NOTICE

- Make sure the sprayer's boom is unfolded and lowered.
- Review the PinPoint System General Layout located at the back of manual.

4.2 Nozzle Valve Assembly

1. In **[Figure 29]** remove the ② drip "check valve" and ① diaphragm cap from each nozzle body.

Figure 29: Drip "check valve" and diaphragm cap



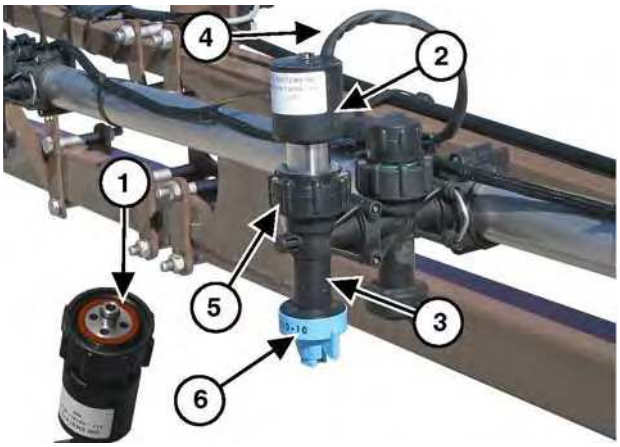
2. **[Figure 30]** - Install the ① O-ring, then install the ② nozzle valve assembly onto the ③ nozzle body.

3. Rotate the nozzle valve assembly so the ④ electrical wire faces the boom. Tighten the ⑤ flynut. If desired, tie-strap the electrical wire to the nozzle valve to relieve strain.

NOTICE Tighten the flynut until the coil housing does not spin. The nozzle valves only need to be snug to prevent leakage.

4. Install and tighten the ⑥ spray tip. Repeat Steps 2-4 for all nozzle valve assemblies.

Figure 30: Nozzle Valve Installation

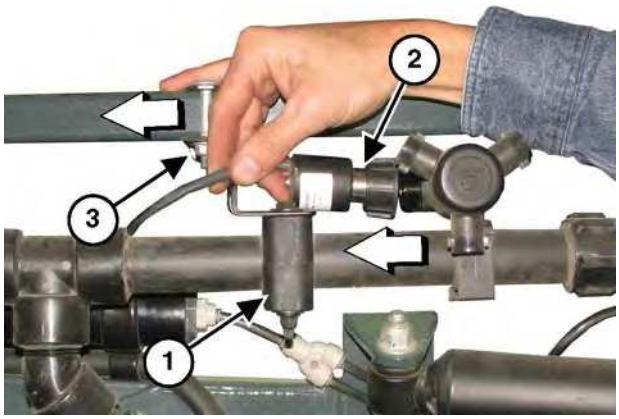


4.2.1 Nozzle Valve Assembly Interference

NOTICE Perform these instructions when other components interfere with nozzle valve installation.

1. **[Figure 31]** - If a ① spray tube mount prevents nozzle valve installation, loosen the spray tube mount ③ bolts, slide the spray tube mount back until the ② nozzle valve can be properly installed. Re-tighten the spray tube mount bolts.

Figure 31: Interference with Nozzle Valve



4.3 Boom Harnesses

1. **[Figure 32]** - Route each boom harness along each boom section (1-12, etc.).

NOTICE Allow enough slack in the wiring harnesses to raise and lower the booms and to operate the boom fold and pivot points.

Figure 32: Boom Harness Routing

4.4 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 through 12, etc.) in VCM serial number order.

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

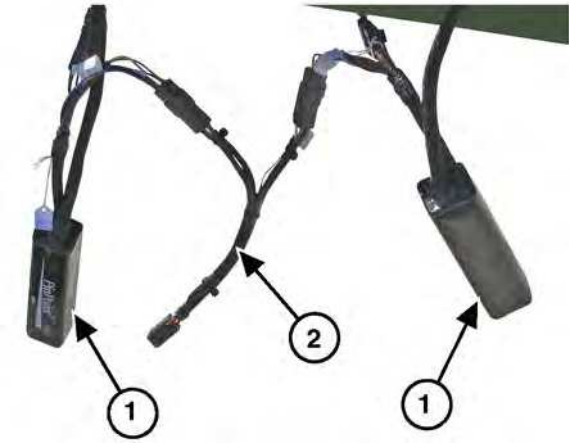
NOTICE

Make sure each tagged VCM is installed on the correct boom section (1-12 etc.) in VCM serial number order.

3. **[Figure 33]** - Additional VCMs and Y-adapter(s) are required on boom sections that contain more than 9 nozzles. Mount additional ① VCMs and ② Y-adapters at a central location in the boom section.

4. Install dust caps on any unused connectors.

Figure 33: VCMs

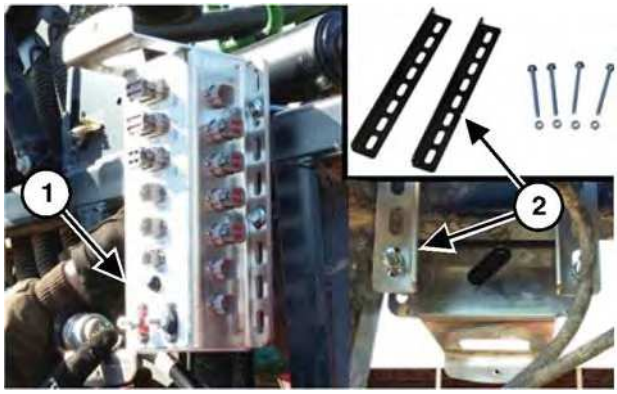


4.5 Gateway Hub

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

2. **[Figure 34]** - Install the ① Gateway Hub onto the boom mast with the ② mounting brackets.

Figure 34: Gateway Hub Installation



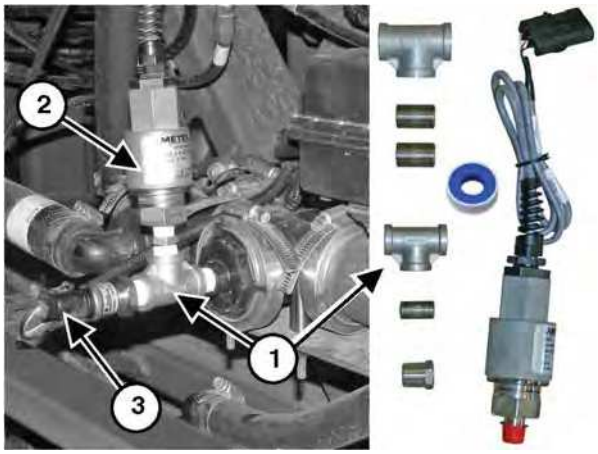
4.6 Pressure Sensor

1. **[Figure 35]** - Remove the machine's existing ③ Pressure Sensor from the boom manifold.
2. Install the ① fitting tee, nipples, bends and bushings (as needed) using Teflon® sealant tape.
3. Install the PinPoint ② Pressure Sensor into the fitting tee using Teflon® sealant tape.
4. Install the machine's existing ③ Pressure Sensor into the fitting tee using Teflon® sealant tape.

NOTICE

- When installing the Pressure Sensor into plastic fittings, be cautious not to overtighten.

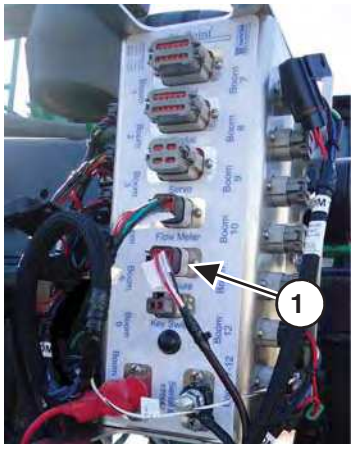
Figure 35: Pressure Sensor Installation



4.7 Pressure Harness Connection

1. **[Figure 36]** - Route the Pressure Sensor ① Adapter Harness through the lower Gateway Hub slot. Install the harness connector on the Gateway Hub.

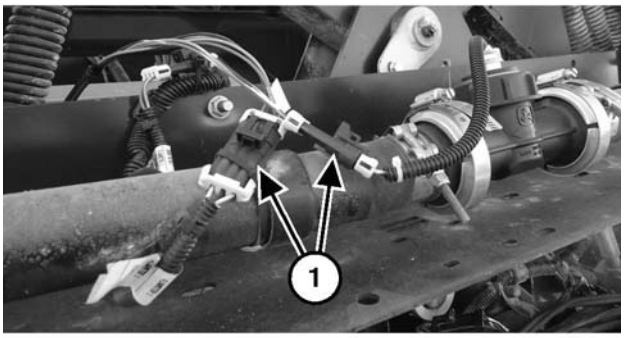
Figure 36: Gateway Hub - Pressure Sensor



4.8 Flowmeter Harness

1. **[Figure 37]** - Disconnect the machine's Flowmeter harness. Install the ① PinPoint Flowmeter Harness between the Flowmeter and machine's existing harness.

Figure 37: Flowmeter Harness Installation

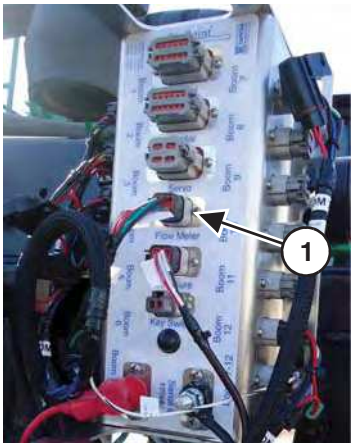


4.9 Gateway Hub - Flowmeter Harness Connection

1. **[Figure 38]** - Route the PinPoint Flowmeter Harness through the lower Gateway Hub slot. Install the ① harness connector on the Gateway Hub.

NOTICE Allow enough slack in the extension harness for the boom mast to be raised / lowered.

Figure 38: Gateway Hub - Flowmeter Harness



4.10 Gateway Hub - CapView Extension Harness

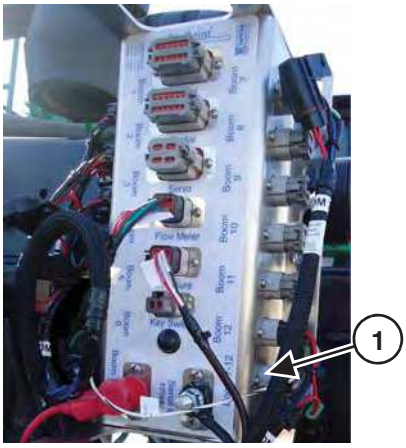
1. **[Figure 39]** - Route the Extension Harness through the lower Gateway Hub slot. Install the ① harness connector into “Boom 12” on the Gateway Hub.

2. Follow existing wiring/plumbing and route the Extension Harness into the right rear side of the cab.

NOTICE To prevent damage, allow enough slack in the wiring harnesses to raise and lower the booms and to operate the boom folds.

3. Install, route and connect each VCM Extension Harness to the appropriate Gateway Hub connector (boom 1, boom 2, etc.).

Figure 39: Gateway Hub - Extension Harness



4.11 CapView Display Mounting

Ball Mount and Clamp

1. **[Figure 40]** - Remove the ② four screws from the back of the CapView display.

2. Use the screws to install the ① Ball Mount.

3. Install the ③ Clamp.

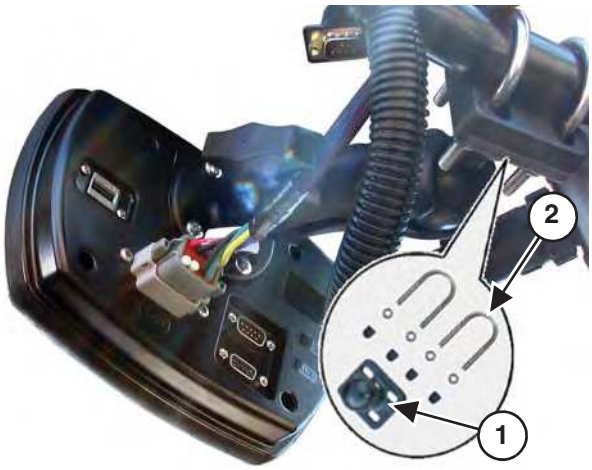
Figure 40: Ball Mount and Clamp Installation

Ram Mount

4. **[Figure 41]** - Install the CapView display inside the cab with the ① Ram Mount and ② Hardware Kit.

NOTICE Choose a mounting location in the cab within reach and view of the operator.

Figure 41: Ram Mount Installation



Harness Connections

5. **[Figure 42]** - Connect the ① CapView Display Pigtail Harness with Switched Power and the ② GPS Cable to the back of the CapView Display.

Figure 42: CapView Harness Connections

Screen Protector Removal

6. **[Figure 43]** - Peel off the plastic screen protector from the CapView display.

Figure 43: Screen Protector Removal

4.12 Key Switched Power Harness

1. Route the Extension Harness from the Gateway Hub into the cab. Connect it to the CapView Display Pigtail Harness with Switched Power.

2. **[Figure 44]** - Connect the Key Switched Power Harness from the CapView Display Pigtail Harness with Switched Power to the in-cab power supply.

NOTICE The Key Switched Power Harness contains a 5-AMP fuse**.**

1. RoGator RG900, RG1100, RG1300: Beside right hand console.
2. RoGator RG700: Right front floorboard kick panel.
3. 2014 Apache: Underneath armrest on fuse panel board.
4. Miller/New Holland: Front right hand cab post.
5. John Deere “R” series: Right front kick panel underneath right hand console.

Figure 44: Key Switched Power Harness

KEY SWITCHED POWER HARNESS GUIDE					
Machine Info			**Capstan Cable PN’s**		
Make	Model	Years	120139-004	120139-002	120139-003
John Deere	4XXX, R4XXX	ANY	X		
RoGator	RG4XXXX	ANY	X		
RoGator	RG900B, RG1100B, RG1300B	ANY	X		
New Holland	Guardian	ANY		X	
Miller	Condor, Nitro	ANY		X	
Apache	AS Series	2014			X
Hagie*	STS	2007-2015			X

NOTE: All CASE IH platforms supply Key Switched Power in the chassis harness to the Gateway Hub.

* In addition to the Capstan cables listed above, 2010-2013 Hagie sprayers will require Hagie P/N 293942 Installation ① under the arm rest or ② in the access panel in the right-front corner of the Cab on 2014 too current Hagie sprayers.

120139-004 Key Switched Power Harness, Power Strip Connector

120139-002 Key Switched Power Harness, Amp Power Connector

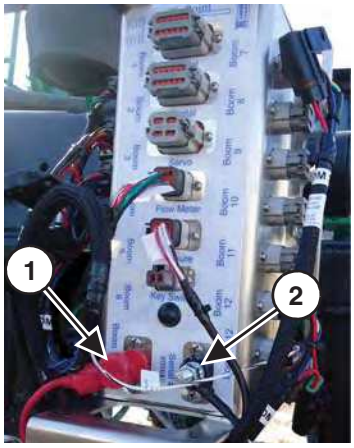
120139-003 Key Switched Power Harness, Ring Terminal

4.13 Battery Harness

1. Route the battery harness connectors through the slot in the Gateway Hub.
2. **[Figure 45]** - Connect the ① positive (+) Red cable to the Red power terminal on the Gateway Hub.
3. Connect the ② Black ground cable to the negative (-) Black terminal.
4. Tighten the nuts and install the rubber caps onto the terminals. Route the harness from the Gateway Hub, over the boom mast and under the sprayer, to the batteries.

NOTICE Allow enough slack in the extension harness to raise and lower the boom mast.

Figure 45: Battery Harness Install

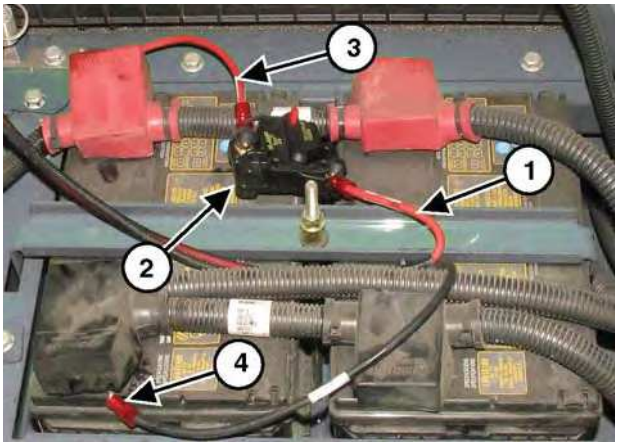


4.14 Circuit Breaker

NOTICE Complete all PinPoint component wiring and harness connections before installing the Circuit Breaker and battery connections.

5. Disconnect the battery negative (-) Black cable.
6. Cut a length of wire from the battery harness positive (+) Red cable. The length needs to reach from the circuit breaker to the battery positive (+) terminal. Strip the insulation from each cut. Crimp the provided ring terminals to each cable end.
7. **[Figure 46]** - Connect the battery harness ① positive (+) Red cable to the ② circuit breaker. From the battery positive (+) terminal, connect the ③ positive (+) Red cable to the circuit breaker.
8. Connect the battery harness ④ negative (-) Black cable to the battery ground terminal.

Figure 46: Circuit Breaker Install



NOTICE If the machine is so equipped, PinPoint must be wired to the main power disconnect.

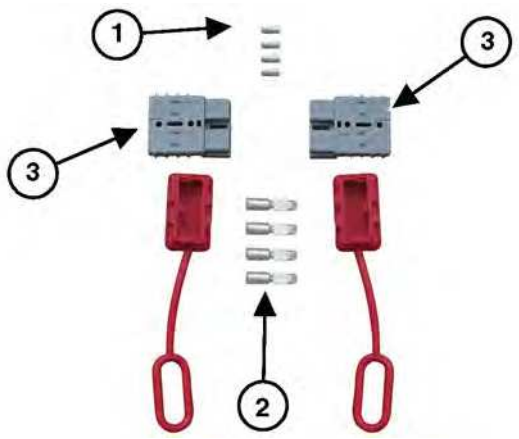
4.15 Power Disconnect Breaker Kit (Optional)

A power disconnect kit is available for applications when unhooking battery power wires is not desired.

9. With the battery harness power cables disconnected, cut and strip the cables at the desired disconnect location.

10. **[Figure 47]** - Crimp the ① spacer bushings and ② terminals onto each cable. Insert the terminals into the ③ housing. Be sure that the positive (+) Red cable and negative (-) Black cable are in the correct housing location.

Figure 47: Power Disconnect Kit (Optional)



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5.0 SETUP

5.1 CapView General Navigation

Power Button: Press to power on and power off the CapView display and the Gateway Hub.

Enter Button: Press to access a selected field and to accept selected values.

Escape Button: Press to exit or escape selected field without change. Also used to access map menu.

Right / Left Arrow Button: Press to select values if required and scroll.

Up / Down Arrow Button: Press to select values if required and scroll.

Alarm Button: Press to silence an audio alarm.

Auto / Manual Button: Press to switch operation between Manual and Automatic.

System Setup Button: Press to access System Setup Menu.

Location Setup Button: Press to access Location Setup Menu.

Nozzle Setup Button: Press to access Nozzle Setup Menu.

Turn Button: Press to engage or disengage Turn Compensation.

Overlap Button: Press to engage or disengage Overlap Control; starts or continues overlap map.

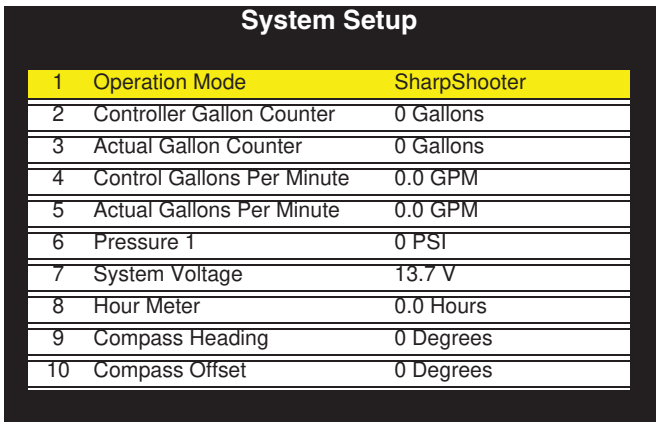
Preset Buttons: Used to store and utilize boom, tip size and flow profiles.

Figure 48: CapView

There are eight major steps in correctly setting up a PinPoint System after it has been properly installed.

1. Perform Factory Reset
2. Perform Location Setup
3. Perform System Setup
4. Perform Nozzle Setup
5. Perform Dry Test
6. Perform Wet Test
7. Perform Overlap Test
8. Perform Final Tuning

Figure 49: CapView Display



5.2 Factory Reset (Line-56)

A **Factory Reset** should be performed after initial installation, updating software or changing major components.

Performing a factory reset step by step:

1. With the keyswitch power on, press the **Power** button to power up the CapView display.

2. Press the **System Setup** button to display the System Setup menu.

3. **[Figure 49]** - Press the **Arrow** button UP or DOWN to highlight **Line 1 Operation Mode**.

4. Press the **Enter** button (Green Check).

5. Press the **Arrow** button UP or DOWN to select **Sharpshooter** mode.

6. Press the **Enter** button (Green Check) to accept changes.

7. **[Figure 50]** - Press the **Arrow** button UP or DOWN to highlight **Line 56 Factory Reset**.

8. Press the **Enter** button (Green Check).

Figure 50: Factory Reset (Line-56)

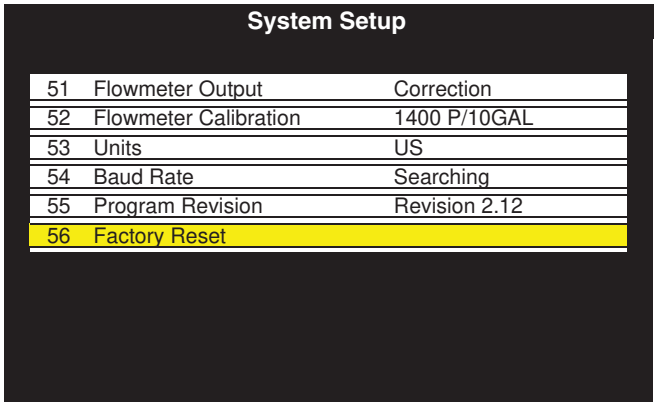
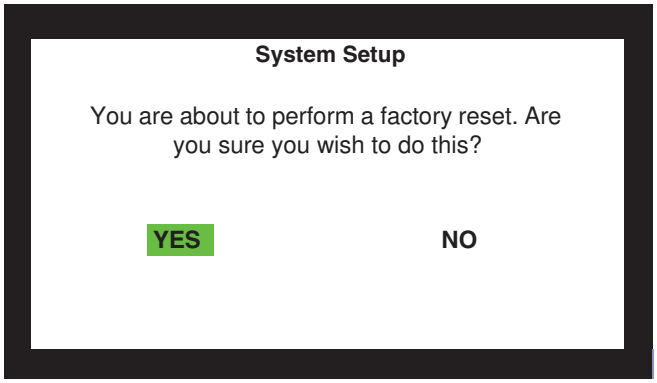


Figure 51: Warning



9. **[Figure 51]** - Press the **Arrow** button RIGHT or LEFT to select Yes.

10. Press **Enter** button (Green Check) to accept the warning.

Wait at least 5 minutes after the CapView powers down.

11. Press the **Power** button to power up the CapView display.

NOTICE

The CapView display will power down after a factory reset.

IMPORTANT: Leave the key switch in the ON position to maintain power to the Gateway Hub.

Leave the CapView OFF for at least 5 minutes. Critical setup communications between the VCMs and Gateway Hub occur while the CapView sleeps.

The Factory Reset procedure MUST be repeated when the system is not OFF for at least 5 minutes.

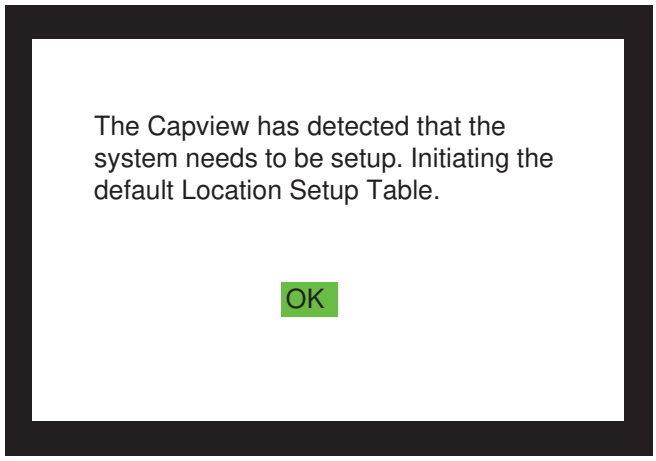
5.2.1 Warning Screen

[Figure 52] - The warning screen appears after a factory reset or when no data is present in the VCMs. This indicates that the system needs to be setup.

1. Press the **Enter** button (Green Check) to continue.

[Figure 53] - The Location Setup Table appears after the warning screen, or whenever the LOCATION SETUP button is pressed.

Figure 52: Warning Screen



5.2.2 Location Setup Table

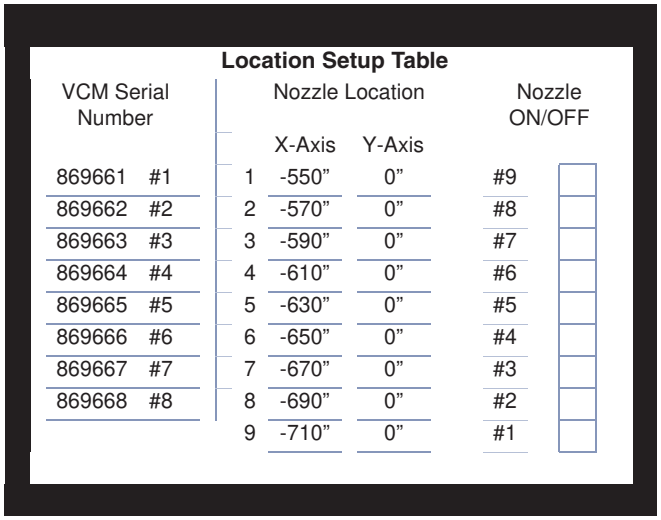
[Figure 53] - Any selected VCM in the Location Setup Table is highlighted in Yellow. Press the **Arrow** button UP or DOWN to highlight a different VCM.

The *left-hand column* lists all VCM serial numbers in numeric order. Press the **Arrow** button UP or DOWN to navigate to the second screen when the first screen is full.

The *center column* displays the location data of the highlighted VCM on the sprayer boom. Press the RIGHT **Arrow** button to highlight this data in Yellow.

The *right-hand column* is where a nozzle valve can be turned ON or OFF. Press the RIGHT **Arrow** button to highlight the Nozzle ON/OFF box. Press the **Enter** button to select ON or OFF.

Figure 53: Location Setup Table



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 54] - *Column one* - 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).

Column two - is the X-Axis 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 2 inch increments until a location setup has been done.

Column three - is Y-Axis. This is 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 toolbars where there may be a front gang and rear gang of knives.

Column four - is the "Element Number," or nozzle number from left to right along the entire boom. The left-most nozzle on the boom is #1, and the right-most nozzle would be #72 if you have 72 nozzles.

Column five - is made up of test boxes. When you move the highlighter to a test box and press **Enter** (Green Check), that nozzle will begin to pulse. This feature is used to identify which nozzle you are working on. To unmark the test box and stop the nozzle from pulsing, press **Enter**.

Figure 54: Location Setup Table

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	

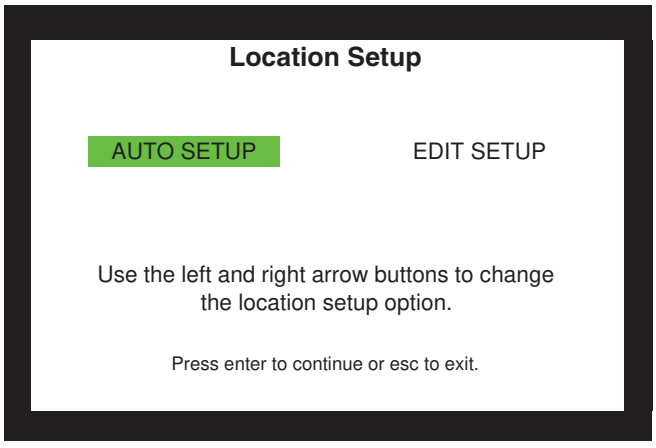
2. Press and hold the **Location Setup** button for 10 seconds to open the screen.

It is normal for the screen to flash back and forth as you press and hold the Location Setup button.

3. **[Figure 55]** - Use **Left / Right** button key RIGHT or LEFT to select Auto Setup.

4. Press the **Enter** button (Green Check) to begin the process.

Figure 55: Auto Setup

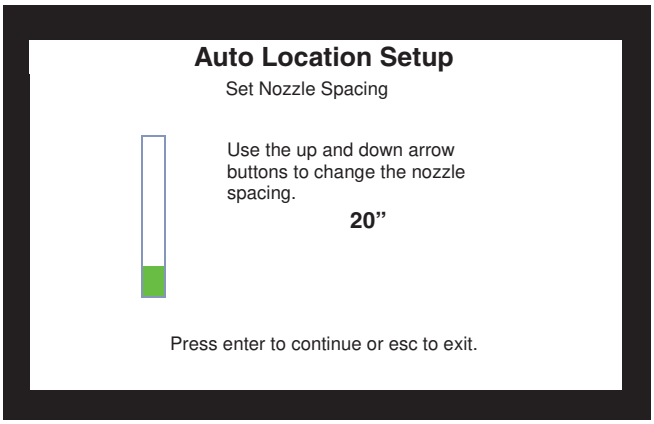


5.2.3 Nozzle Spacing

1. **[Figure 56]** - On the first screen, use the **Up/Down Arrow** button to set the desired nozzle spacing. The default setting in 20 inches.

2. Press the **Enter** button (Green Check).

Figure 56: Nozzle Spacing



[Figure 57] - The second screen displays 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.

It is recommended to work from left to right.

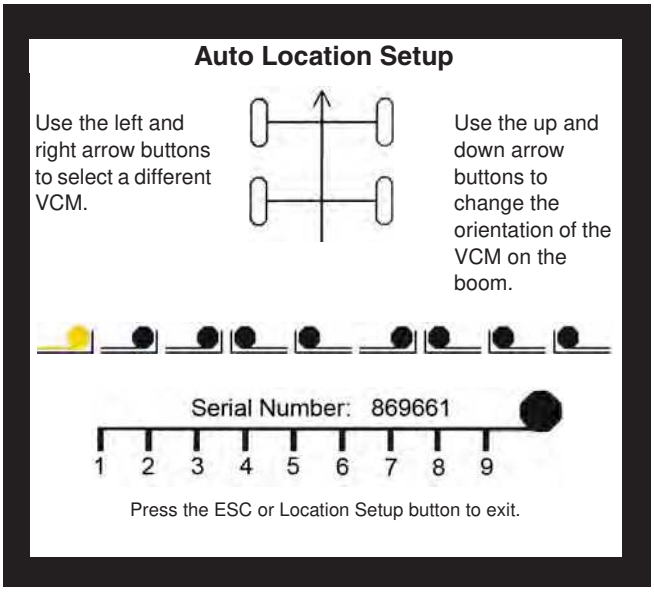
3. Begin with the VCM that is located on the far left section of the left boom. Press the **Arrow** button RIGHT or LEFT to move the Yellow highlighter from left to right.

4. Press the **Enter** button (Green Check) on each VCM. The highlighter will turn Red and will cause the nozzles to pulse on that VCM.

5. When the machine’s left most VCM’s nozzles pulse, press the LEFT **Arrow** button to move the highlighted VCM to the left most position on the graphic.

6. Pressing the **Enter** button (Green Check) again stops the pulsing.

Figure 57: VCM Arrangement



[Figure 58] - The graphic along the bottom of the display looks like a VCM with a 9 nozzle wire harness. The Black dot 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.

7. Press the **Arrow** button UP or DOWN to flip the VCM graphic so the potted tube orientation displayed on the graphic matches the potted tube orientation found on the boom. Serial numbers for all VCMs can be found on this screen as well, their locations should match up with serial number tags on each VCM on the boom.

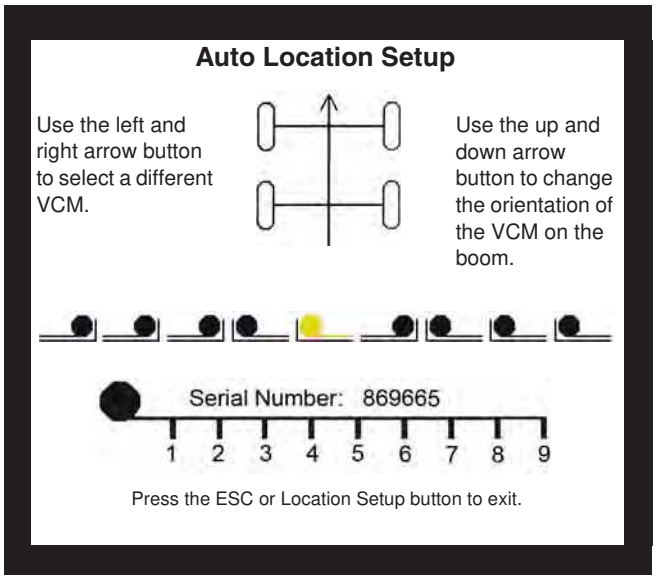
8. Repeat the process from left to right, until all the VCMs are moved to their proper location and flipped to their proper orientation. When finished, press **Escape** button (Red X) to go to the next step.

9. Pressing **Enter** button (Green Check) again stops the pulsing.

NOTICE If the left to right method is not used, setting the VCMs locations can be difficult.

NOTICE Before going to the next step be sure the Master Switch is engaged and the Boom Section switches are turned off.

Figure 58: VCM Orientation



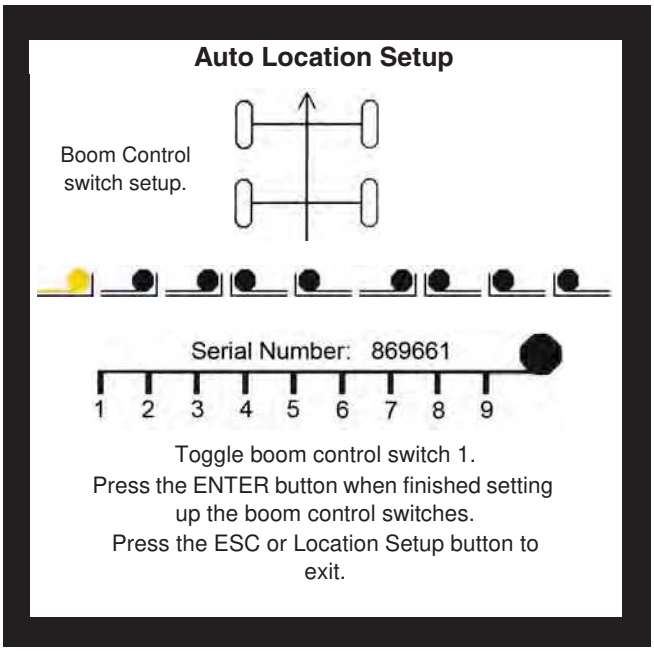
You will need to engage each boom section control switch to correlate the boom valves to the VCMs. Engage switch #1, then #2, then #3, etc., from left to right so that #1 is the left most boom.

[Figure 59] - Notice that the highlighter lights up the VCM that the switch is physically associated with.

It is possible to have 9 boom switches and only 1 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 sprayer's rate controller so that the boom valves can physically be turned on and off.

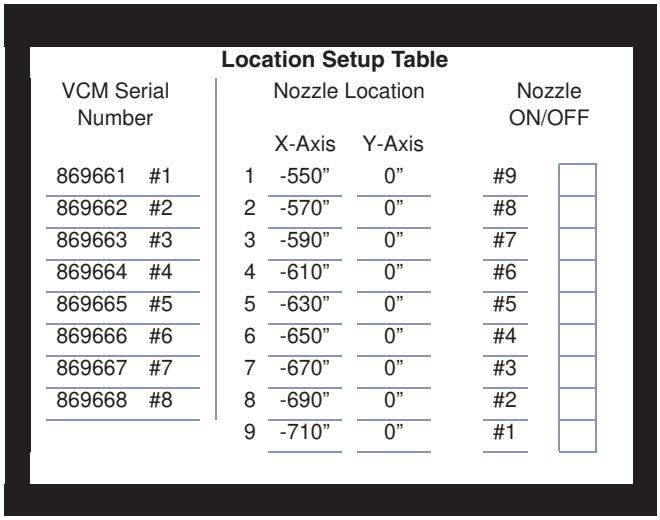
10. When the boom control switch setup is complete, press the **Enter** button (Green Check) to return to the Location Setup Table.

Figure 59: VCM Boom Switch Correlation



[Figure 60] - *The data on the Location Setup Table X-Axis should now match your machine. Verify 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 inches because of bracket interference at the nozzle's exact location.

Figure 60: Location Setup Table



Location Setup Table

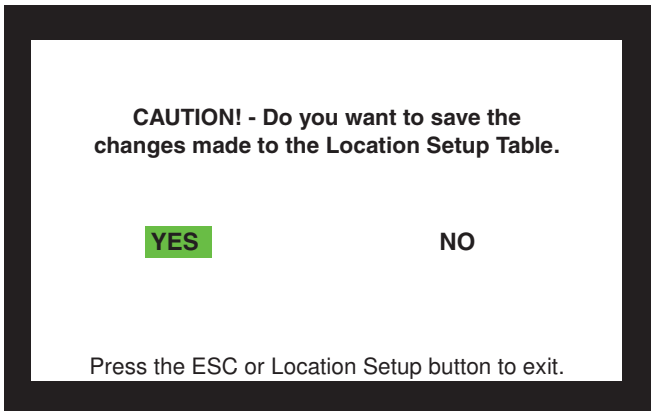
VCM Serial Number		Nozzle Location			Nozzle ON/OFF	
			X-Axis	Y-Axis		
869661	#1	1	-550”	0”	#9	
869662	#2	2	-570”	0”	#8	
869663	#3	3	-590”	0”	#7	
869664	#4	4	-610”	0”	#6	
869665	#5	5	-630”	0”	#5	
869666	#6	6	-650”	0”	#4	
869667	#7	7	-670”	0”	#3	
869668	#8	8	-690”	0”	#2	
		9	-710”	0”	#1	

11. **[Figure 61]** - Press **Escape** button (Red X). The screen will give the option YES (to save) or NO (not to save) the entered data.

12. If the data entered is correct, press the **Arrow** button RIGHT or LEFT to select YES.

13. Press the **Enter** button (Green Check). A Blue save bar will appear and crawl across the screen. CapView is now saving all the data inside the VCMs. This process may take a couple of minutes to complete.

Figure 61: Warning



5.3 System Setup

1. Press the **Power** button to power on the CapView display if needed.

2. **[Figure 62]** - Press the **System Setup** button to display the System Setup menu.

3. Press the **Arrow** button UP or DOWN to scroll the system setup list to the appropriate menu item. Menu Items are numbered and color coded for easy identification.

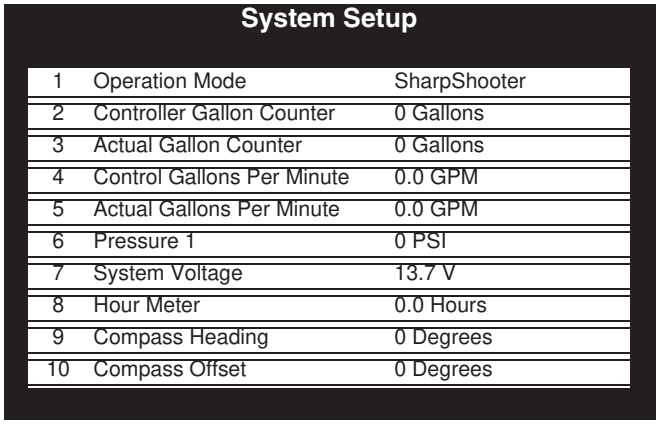
4. The Yellow highlighter indicates which line is selected. Press **Enter button** (Green Check) to change the highlighter to Red.

5. With the red field accessed, press the **Arrow** button UP or DOWN to change the value. Some items require confirmation before saving. To confirm, press the **Arrow** button RIGHT or LEFT to select the OK box.

6. Press **Enter** button (Green Check) to change the highlighter from Red back to Yellow.

7. Press the **System Setup** button or the **Escape** button (Red X) to exit the system setup menu.

Figure 62: System Setup



5.3.1 System Setup Chart (Line 1-14)

PINPOINT SYSTEM SETUP			
Line Number	Line Title Description	Default	Action
1	**Operation Mode**	**SharpShooter**	**Press ENTER to change.**
	The PinPoint System can operate in two modes: SharpShooter or N-Ject. It is quite possible that, when troubleshooting, a mode can be temporarily changed.		
2	**Controller Gallon Counter**	**0 Gallons**	**Press ENTER and YES to reset.**
	The Controller Gallons Counter value should match the values from the rate controller. Resetting Line-2 also resets Line-3. Make sure to reset the Rate Controller at the same time.		
3	**Actual Gallons Counter**	**0 Gallons**	**Press ENTER and YES to reset.**
	The Actual Gallons Counter value should match the tank volume. The difference between Line-2 and Line-3 is the product saved using PinPoint overlap control.		
4	**Control Gallons Per Minute**	**0 GPM**	
	This Control Gallons GPM value is the flow in gallons-per-minute. It should match the rate controller flow display.		
5	**Actual Gallons Per Minute**	**0 GPM**	
	The Actual Gallons Per Minute value is the flow in gallons-per-minute that is actually being sprayed. It should match the turbine flowmeter (unless correction mode is active at a very low flow rate or calculation mode is active).		
6	**Pressure 1**	**0 PSI**	
	The Pressure 1 value is the boom spray pressure. This value is represented by the Green bar on the operate screen.		
7	**System Voltage**	**13.7V**	
	The System Voltage is the voltage at the Gateway Hub. This can be an indicator of system health.		
8	**Hour Meter**	**0.0 Hours**	
	The Hour Meter displays accumulated hours. The hour meter starts when at least one nozzle is on.		
9	**Compass Heading**	**0 Degrees**	**Press ENTER and YES to Calibrate.**
	The 3-Dimensional compass is generally not used. It could be used for backup detection or low speed turn compensation stability.		
10	**Compass Offset**	**0 Degrees**	**Enter Offset to Calibrate.**
	This value is used after calibrating the 3-Dimensional compass to correlate the chassis with the Gateway Hub.		
11	**USB Mode**		
	Thumb drive or computer. Thumb drive must be chosen to utilize a USB drive for different purposes.		
12	**Display Backlight**	**5**	**Press ENTER to change.**
	Larger numbers make the display brighter for daytime use. Smaller numbers make the display dimmer for night-time use. Range: 1-10, if 5 or less the keypad backlight 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 night-time 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.		

5.3.2 System Setup Chart (Line 15-21)

PINPOINT SYSTEM SETUP			
Line Number	Line Title / Description	Default	Action
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	**Deadband PSI**	**0.0**	**Press ENTER to change.**
	Deadband is used to tune out instability by providing a pressure zone that is considered satisfactory, thus requiring no action by the control system. The higher the number, the less sensitive the control system. To stabilize an oscillating system, use a higher number. To speed up a sluggish system use a lower number. Range 0-100		
17	**Gain - Proportional**	**5.0**	**Press ENTER to change.**
	Proportional gain causes the control system to respond faster when the errors are greater. The higher the number the more sensitive the control system. To stabilize an oscillating system use a lower number. To speed up a sluggish system use a higher number. (See page 52).		
18	**Gain - Integral**	**0.5**	**Press ENTER to change.**
	Integral gain causes the control system to accelerate faster when the errors are greater. The higher the number, the more sensitive the control system. To stabilize an oscillating system use a lower number. To speed up a sluggish system use a higher number. Integral gain is generally set at 1/10th of the proportional gain. (See page 52).		
19	**Gain - Differential**	**0.0**	**Press ENTER to change.**
	Differential gain causes the control system to accumulate errors faster when errors are small. The higher the number the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number. Differential gain is rarely used and is generally set at 1/10th of the integral gain or zero. (See page 52).		
20	**Gain - System**	**3.0**	**Press ENTER to change.**
	System gain changes the total gain of the system according to the same ratios of Proportional/Integral/Differential gain established in Lines-17/18/19. This gain number is the one most often used to tune sluggish or oscillating systems. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number. (See page 52).		
21	**Total Number Valve Expected**	**72**	**Press ENTER to change.**
	This number is the number of valves on the sprayer. Upon power-up, the system counts the number of valves reported by the VCMs. If the number matches Line-21, then all is OK and the system continues. If an error is detected, an alarm is sounded and diagnostic readouts are shown. PinPoint cannot detect valve issues that may have occurred when the system wasn't running. If the valve was damaged, or corrosion sets in over the winter, this is the error you will get. PinPoint also 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."		

5.3.3 System Setup Chart (Line 22-30)

PINPOINT SYSTEM SETUP			
Line Number	Line Title Description	Default	Action
22	**Scrolling Enable/Disable**	**Enabled**	**Press ENTER to change.**
	In the nozzle diagnostics on the operate screen, scroll from nozzle to nozzle. To focus on a single nozzle without the scrolling taking place, select DISABLED here.		
23	**Valve Diagnostics Enable**	**Enabled**	**Press ENTER to change.**
	If PinPoint isn't using nozzles where Capstan's nozzle diagnostics works properly, the nozzle diagnostics can be disabled here. We often use this feature on demonstration units and development units where lights are substituted for valves or reset to coil only. Coil only disables plunger movement detection without disabling short or open data.		
24	**Boom Switch Activation**	**12V 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 turn on the Key FOB, select "Key FOB Active."** In Key FOB mode, all the nozzles will be turned off, and a message will appear in the operate screen that the Key FOB mode is active. To return to operation mode, turn the boom switch activation value back to the previous value (typically 12V Active).		
25	**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 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 implement.		
26	**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.		
27	**GPS Antenna Above Ground**	**0 Inches**	**Press ENTER to change.**
	Enter the number of inches that the GPS antenna is above ground.		
28	**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.		
29	**Backup Detection Method**	**Off=Fwd (GPS Turn)**	**Press ENTER to change.**
	In most cases where the compass is not used, then a backup switch (beeper) can be used. It can be setup for "Off=Fwd (GPS Turn)" or "On=Fwd (GPS Turn)". If no backup "beeper" switch is present set it to "Off-Fwd (GPS Turn)" forego backup detection altogether. The setting "Off=Fwd(GPS Turn) disables the compass.		
30	**Overlap Distance**	**60 Inches**	**Press ENTER to change.**
	Capstan 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. PinPoint's map resolution is 1-meter-squares, so it is advised to set this at a minimum of 40 inches (1- meter).		

5.3.4 System Setup Chart (Line 31-44)

PINPOINT SYSTEM SETUP			
Line Number	Line Title / Description	Default	Action
31	**Look Ahead Time**	**0.5 Seconds**	**Press ENTER to change.**
	Look Ahead Time is based on the fastest field speed, the value is an indicator of how much time the GPS and the PinPoint System take 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 at the fastest travel speed expected.		
32	**Look Ahead Distance**	**0.0 Meter**	**Press ENTER to change.**
	Look Ahead Distance is based on the slowest field speed, the value is an indicator of how much distance is covered while the GPS and the PinPoint system are reacting 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 Distance at the slowest travel speed expected.		
33	**Zero Rate Shutoff**	**Shutoff**	**Press ENTER to change.**
	When set to “Shutoff” the low pressure shutoff is enabled. If you want to disable the low pressure shutoff, set to “Minimum PWM%.”		
34	**Pressure Shutoff Limit**	**8.0 PSI**	**Press ENTER to change.**
	When used, it causes the solenoid valves to shut off, like diaphragm drip checks at this PSI.		
35	**Pressure Turn-On Limit**	**10.0 PSI**	**Press ENTER to change.**
	When used, it causes the solenoid valves to turn on after a low pressure shutoff, like diaphragm drip checks.		
36	**Pressure Control Hold**	**3 Sec**	**Press ENTER to change.**
	This setting causes a pressure control delay after a boom shutoff. Values for this setting are commonly between 1 and 4 seconds. However, the allowable range is between 1-10.		
37	**PSI Sensor 1 Min. Voltage**	**0.5 Volts**	**Press ENTER to change.**
38	**PSI Sensor 1 Max. Voltage**	**5.0 Volts**	**Press ENTER to change.**
39	**PSI Sensor 1 Min. Pressure**	**0 PSI**	**Press ENTER to change.**
40	**PSI Sensor 1 Max. Pressure**	**100 PSI**	**Press ENTER to change.**
41	**PSI Sensor 1 Offset**	**0.0 PSI**	**Press ENTER to change.**
	Lines-37 thru Line-41 are used to setup pressure sensor #1, which is the PinPoint spray pressure sensor. It is common to have 1-5 VDC sensors and 0.5-5 VDC sensors. Line-41, PSI Sensor Offset, is used when the sensor doesn’t match a gauge. Entering offset will scale the sensor up or down. Sensor Offset allowable range is ±1-9.		
42	**Rate Sync Mode**	**Speed**	**Press ENTER to change.**
	Rate Sync changes nozzle duty cycle based on vehicle speed obtained from the GPS receiver.		
43	**Rate Sync Average**	**0.1**	**Press ENTER to change.**
	Rate Sync Average is used for Rate Sync calculations. Higher settings cause the system to react slower.		
44	**Rate Sync Max Ground Speed**	**25**	**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. This value should change when tip sizes or flow rates change, consult the spray tip chart in this manual for values.		

5.3.5 System Setup Chart (Line 45-56)

PINPOINT SYSTEM SETUP			
Line Number	Line Title Description	Default	Action
45	**Servo Minimum DC%**	**23%**	**Press ENTER to change.**
	This value is not used in Sharpshooter mode.		
46	**Servo Maximum DC%**	**78%**	**Press ENTER to change.**
	This value is not used in Sharpshooter mode.		
47	**Nozzle Pulse Frequency**	**10.0 Pulse/Sec.**	**Press ENTER to change.**
	All Capstan sprayer systems run at 10 pulses per second pulse frequency. If you wish to run a faster pulse frequency, you may enter a larger number. Capstan does not recommend pulse frequencies slower than 10Hz in sprayer applications.		
48	**Nozzle PWM Minimum**	**10%**	**Press ENTER to change.**
	This is the minimum pulse duty cycle for the nozzle valves. You may not change this value any less than the Nozzle Pulse Frequency on Line-47. If Line-47 is set to 10 pulses then 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.		
49	**Nozzle PWM Maximum**	**100%**	**Press ENTER to change.**
	It is unlikely that you would set this lower than 100%, this is where the limit to the maximum duty cycle would be set.		
50	**Flowmeter Minimum GPM**	**3 GPM**	**Press ENTER to change.**
	This is the minimum flow at which the turbine flowmeter is no longer accurate. When in Correction Flowmeter Type Line-51, the PinPoint will automatically calculate the flow below this value. This is especially important when the PinPoint is operating with only a few nozzles, like point rows, filling gaps, etc. PinPoint's calculation accurately measures flow through a single nozzle.		
51	**Flowmeter Output Type**	**Correction**	**Press ENTER to change.**
	In correction mode, the flow reported to the rate controller automatically switches from the turbine flowmeter to a calculation whenever the flow falls below Line-50 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.		
52	**Flowmeter Calibration**	**1400 P/10 GAL**	**Press ENTER to change.**
	It is important for this value to match the tag on the turbine flowmeter so that the gallon counters will match the rate controller. PinPoint uses "pulses per 10-gallons." If the flowmeter 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 GPM display in System Setup and comparing it to the rate controller.		
53	**Units**	**US**	**Press ENTER to change.**
	Select the desired units of choice, US or SI units.		
54	**Baud Rate**	**Searching**	**Press ENTER to change.**
	This displays the GPS Baud Rate detected by the system. 19,200 - 115,200.		
55	**Program Revision**		**Press ENTER and YES to change.**
	This displays the current version of CapView Software.		
56	**Factory Reset**		**Press ENTER and YES to change.**
	The Factory Reset will require all setups in the entire system to be reset to DEFAULT. **The Factory Reset is necessary when repairing the system. Make sure you have written down 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.		

5.4 Compass Calibration

5.4.1 Compass Heading (Line-9)

NOTICE Compass calibration is not required if the Gateway Hub is installed in standard vertical orientation.

The 3-Dimensional compass is used primarily for backup detection, but can also be used for low speed turn compensation stability. Upon installation of the Gateway Hub, the compass needs to be calibrated so that the machine knows the “plane of the earth”.

[Figure 63] - To calibrate the Compass Heading Line-9, face the machine north.

1. Press the **Enter** button (Green Check) and YES. Drive in a slow, smooth right-hand circle until the machine is facing north again (about 30 seconds).

2. Press the **Enter** button (Green Check). A heading will appear. If “6502,” is present, an error has occurred and calibration must be repeated. If calibration fails twice, cycle the power OFF/ON and retry. When completed, proceed to Line-10.

NOTICE In ordinary installations the compass is disabled; however by selecting Compass (*w/Turn*) as a Backup Detection Method in Line-29 **[Figure 66]**, the 3-Dimensional compass can be used for backup 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”.

Figure 63: Compass Heading (Line-9)

System Setup

1	Operation Mode	SharpShooter
2	Controller Gallon Counter	0 Gallons
3	Actual Gallon Counter	0 Gallons
4	Control Gallons Per Minute	0.0 GPM
5	Actual Gallons Per Minute	0.0 GPM
6	Pressure 1	0 PSI
7	System Voltage	13.7 V
8	Hour Meter	0.0 Hours
9	Compass Heading	0 Degrees
10	Compass Offset	0 Degrees

5.4.2 Compass Offset (Line-10)

[Figure 64] - With the machine still facing north, enter the Compass Heading value displayed on Line-9 onto Compass Offset Line-10. This calibrates where “North” is in the plane of the earth.

After a couple of seconds, the Compass Heading, Line-9, 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 properly.

Figure 64: Compass Offset (Line-10)

System Setup

1	Operation Mode	SharpShooter
2	Controller Gallon Counter	0 Gallons
3	Actual Gallon Counter	0 Gallons
4	Control Gallons Per Minute	0.0 GPM
5	Actual Gallons Per Minute	0.0 GPM
6	Pressure 1	0 PSI
7	System Voltage	13.7 V
8	Hour Meter	0.0 Hours
9	Compass Heading	0 Degrees
10	Compass Offset	0 Degrees

5.5 Gain Settings (Line 17-20)

5.5.1 Gain - Proportional (Line-17)

[Figure 65] - Proportional gain Line-17 causes the control system to respond faster when the errors are greater. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number.

5.5.2 Gain - Integral (Line-18)

Integral gain Line-18 causes the control system to accelerate faster when the errors are greater. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number. Integral gain is generally set at 1/10th of the proportional gain.

5.5.3 Gain - Differential (Line-19)

Differential gain Line-19 causes the control system to accumulate errors faster when errors are small. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number. Differential gain is rarely used and is generally set at 1/10th of the integral gain or zero.

Figure 65: Gain Settings (Line 17-20)

System Setup

11	USB Mode	Thumb Drive
12	Display Backlight	10
13	LED Brightness	5
14	Beeper Volume	5
15	Specific Gravity	1.00
16	Deadband PSI	0.0
17	Gain - Proportional	5.0
18	Gain - Integral	0.5
19	Gain - Differential	0.0
20	Gain System	3.0

5.5.4 Gain - System (Line-20)

System gain Line-20 changes the total gain of the system according to the same ratios of Proportional/ Integral/Differential gain established in Lines-17/18/19. This gain number is the one most often used to tune sluggish or oscillating systems. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number.

5.6 Total Number of Valves Expected (Line-21)

[Figure 66] - Upon power-up, the system counts the number of valves reported by the VCMs. If the number of valves displayed on Line-21 matches the number of valves installed on the sprayer, then all is okay and the system continues. If an error is detected, an alarm is sounded and “Valves Not Found” is displayed.

Figure 66: Total Number of Valves Expected (Line-21)

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

5.7 GPS Settings (Line 25-28)

5.7.1 GPS - Antenna Ahead of Rear Axle (Line-25)

[Figure 67] - On Line-25, enter the number of inches ③ from the rear axle centerline ① to the GPS antenna centerline ② . 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 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.

5.7.2 GPS - Antenna Right of Center (Line-26)

[Figure 67] - On Line-26, 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.

5.7.3 GPS - Antenna Above Ground (Line-27)

[Figure 68] - On Line-27, enter the number of inches that the GPS antenna ④ is above ground.

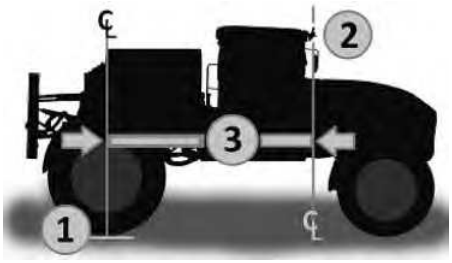
5.7.4 GPS - Boom Ahead of Rear Axle (Line-28)

[Figure 69] - On Line-28, enter the number of inches ⑥ measured from the boom centerline ⑦ to the rear axle centerline ⑤ .

NOTICE

If the GPS signal is taken from a navigation controller, the virtual position may be electronically repositioned over the rear axle causing the values in lines 25, 26, and 27 to vary from the measured values on the sprayer. Line-28 will always be the actual measured distance from the GPS antenna centerline to the rear axle centerline at ground level.

Figure 67: GPS Settings (Line 25)



System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

Figure 68: GPS Settings (Line 27)

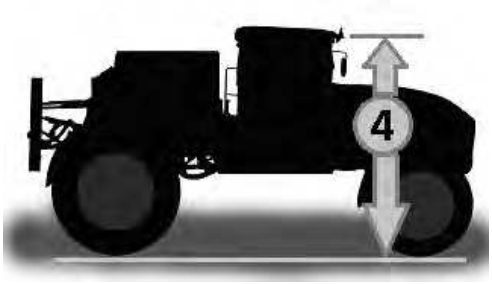
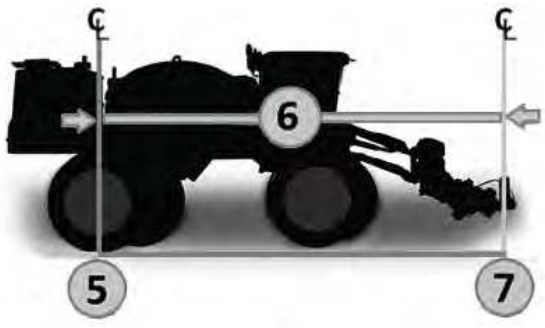


Figure 69: GPS Settings (Line 28)



Line	With Nav Controller	Without Nav Controller
25	Set to “0”	Enter Physically Measured Distance
26	Set to “0”	Enter Physically Measured Distance
27	Set to “0”	Enter Physically Measured Distance
28	Enter Physically Measured Distance	Enter Physically Measured Distance

5.8 Backup Detection Method (Line-29)

[Figure 70] - In most installations in which the compass is not used, then a backup switch (beeper) could be used. Set it up for “Off=Fwd (GPS Turn)” or “On=Fwd (GPS Turn).” If no backup “beeper” switch is present set Line-29 to “Off=Fwd (GPS Turn)” and forego backup detection altogether.

Figure 70: Backup Detection Method (Line-29)

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

5.9 Overlap Distance (Line 30)

[Figure 71] - Overlap Distance Line-30 can be set to intentionally skip or overlap. The data is in inches. Positive numbers cause intentional overlap, and negative numbers cause intentional skips.

Capstan 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. Whiskers are located on the 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 or on at an unapplied area. The “Overlap Distance” refers to the distance these four whiskers are from the center whisker. A positive value indicates that an overlap will always occur, and the nozzle will not shut off until the rear whisker touches the already sprayed area. A negative value indicates a skip will always occur, and the nozzle will shut off when the front whisker touches the already sprayed area. This feature works forwards, backwards, right and left. PinPoint’s map resolution is 1-meter-squares. It is advised to set this no less than 40 inches (1-meter). Setting the value to zero is okay, but slight skips will occur.

Figure 71: Overlap Distance (Line-30)

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

5.10 Look Ahead Time / Look Ahead Distance (Line 31-32)

NOTICE

Before performing the following test for Look Ahead Time / Look Ahead Distance, first complete a system wet test. See PINPOINT SYSTEM WET TEST later in this manual.

NOTICE

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

1. Place a person at point (A) and a person at point (B) **[Figure 87 on Page 69]**.
2. Travel forward and start spraying.
3. Continue to drive straight approximately 150 feet.
4. Turn left while continuing to spray. Travel a short distance, and then turn around and travel towards the previously sprayed area, (point A).
5. When the booms reach point (A) (the previously sprayed area) the nozzle valves should shutoff.
6. When the booms reach point (B) (the area not sprayed), the sprayer nozzle valves should start spraying.

NOTICE

The helpers can see if the nozzle valves shutoff time is early or late at point (A), or if the spray-on time is early or late at point (B). Adjust Line-31 & Line-32 accordingly.

Look Ahead Time: PinPoint GPS accuracy can be tuned using System Setup Line-31 and Line-32.

- **[Figure 72]** - Adjust Line-31 Look Ahead Time at the fastest travel speeds expected.

  If the shutoff is too early, decrease the value. If the shutoff is too late, increase the value.

  If turn-on is too early, decrease the value. If turn-on is too late, increase the value.

- **[Figure 73]** - Adjust Line-32 Look Ahead Distance at the slowest travel speeds expected.

  If the shutoff is too early, decrease the value. If the shutoff is too late, increase the value.

  If turn-on is too early, decrease the value. If turn-on is too late, increase the value.

.

Figure 72: Look Ahead Time (Line-31)

System Setup

31	Look Ahead Time	0.5 s
32	Look Ahead Distance	0.0 m
33	Zero Rate Shutoff	Minimum PWM %
34	Pressure Shutoff Limit	8.0 PSI
35	Pressure Turn-On Limit	010.0 PSI
36	Pressure Control Hold	Disable
37	PSI Sensor 1 Min. Voltage	0.5 V
38	PSI Sensor 1 Max. Voltage	5.0 V
39	PSI Sensor 1 Min. Pressure	0 PSI
40	PSI Sensor 1 Min. Pressure	100 PSI

Figure 73: Look Ahead Distance (Line-32)

System Setup

31	Look Ahead Time	0.5 s
32	Look Ahead Distance	0.0 m
33	Zero Rate Shutoff	Minimum PWM %
34	Pressure Shutoff Limit	8.0 PSI
35	Pressure Turn-On Limit	010.0 PSI
36	Pressure Control Hold	Disable
37	PSI Sensor 1 Min. Voltage	0.5 V
38	PSI Sensor 1 Max. Voltage	5.0 V
39	PSI Sensor 1 Min. Pressure	0 PSI
40	PSI Sensor 1 Min. Pressure	100 PSI

5.11 Pressure Control Hold (Line-36)

[Figure 74] - The Pressure Control Hold Line-36 should be set to 3 seconds.

NOTICE Pressure Control Hold prevents pressure control with the booms off and causes pressure control delay after the boom is turned on.

Figure 74: Pressure Control Hold (Line-36)

System Setup

31	Look Ahead Time	0.5 s
32	Look Ahead Distance	0.0 m
33	Zero Rate Shutoff	Minimum PWM %
34	Pressure Shutoff Limit	8.0 PSI
35	Pressure Turn-On Limit	010.0 PSI
36	Pressure Control Hold	Disable
37	PSI Sensor 1 Min. Voltage	0.5 V
38	PSI Sensor 1 Max. Voltage	5.0 V
39	PSI Sensor 1 Min. Pressure	0 PSI
40	PSI Sensor 1 Min. Pressure	100 PSI

5.12 System Setup (Line 42-46)

5.12.1 Rate Sync Mode (Line-42)

[Figure 75] - Rate Sync Mode Line-42 when set to speed changes the nozzle duty cycle based on vehicle speed. Rate Sync is used to help the rate controller achieve the target rate faster.

5.12.2 Rate Sync Average (Line-43)

Rate Sync Average Line-43 setting is the average time between rate sync calculations. Typically set to the same speed as the VTG string coming into the display. Higher values cause the system to react more slowly. If the system operates too quickly, increase this value. If the system operates too slowly, decrease this value.

5.12.3 Rate Sync Max Ground Speed (Line-44)

Rate Sync Max Ground Speed Line-44, enter the approximate speed that will cause the system to reach 100% duty cycle based on the current target rate, target pressure and spray tip being used.

Servo Minimum DC% (Line-45)

The Servo Minimum DC% Line-45 is not used in SharpShooter mode.

Servo Maximum DC% (Line-46)

The Servo Maximum DC% Line-46 is not used in SharpShooter mode.

Figure 75: System Setup (Line 42-46)

System Setup

41	PSI Sensor Offset	0.0 PSI
42	Rate Sync Mode	Speed
43	Rate Sync Average	0.1
44	Rate Sync Max Ground Speed	18
45	Servo Minimum DC%	23 %
46	Servo Maximum DC%	78 %
47	Nozzle Pulse Frequency	10.0 Pulse/s
48	Nozzle PWM Minimum	10 %
49	Nozzle PWM Maximum	100 %
50	Flowmeter Minimum GPM	10 GPM

5.12 System Setup (Line 47-50)

5.12.1 Nozzle Pulse Frequency (Line-47).

[Figure 76] - Nozzle Pulse Frequency Line-47 setting determines how many times per second the nozzles will pulse. This is ordinarily left at the default setting of “10” pulses/sec.

5.12.2 Nozzle PWM Minimum (Line-48).

[Figure 76] - Nozzle PWM Minimum Line-48 is the minimum duty cycle for the nozzle valves. You may not change this value any less than the Nozzle Pulse Frequency on Line-47. If Line-47 is set to 10 pulses then Nozzle PWM Minimum must be set to 10 or higher. If you are uncomfortable about running low duty cycles, then this value can be set to a higher value.

5.12.3 Nozzle PWM Maximum (Line-49).

[Figure 76] - Nozzle PWM Maximum Line-49 is the maximum duty cycle for the nozzle valves and is usually left at the default setting of 100.

5.12.4 Flowmeter Minimum GPM (Line-50).

[Figure 76] - Flowmeter Minimum GPM Line-50 is the minimum flow at which the turbine flowmeter is no longer accurate. In Correction Flowmeter Type, the PinPoint will automatically calculate the flow below this value. This is especially important when PinPoint is operating with only a few nozzles like point rows, filling gaps, etc. PinPoint’s calculation accurately measures the flow through a single nozzle.

Figure 76: System Setup (Line 47-50)

System Setup

41	PSI Sensor Offset	0.0 PSI
42	Rate Sync Mode	Speed
43	Rate Sync Average	0.1
44	Rate Sync Max Ground Speed	18
45	Servo Minimum DC%	23 %
46	Servo Maximum DC%	78 %
47	Nozzle Pulse Frequency	10.0 Pulse/s
48	Nozzle PWM Minimum	10 %
49	Nozzle PWM Maximum	100 %
50	Flowmeter Minimum GPM	10 GPM

5.13 System Setup (Line 51-56)

5.13.1 Flowmeter Output Type (Line-51).

[Figure 77] - Flowmeter Output Type Line-51 in correction mode, the flow reported to the rate controller automatically switches from the turbine flowmeter's signal to a calculated flowmeter signal whenever the flow falls below Line-50. Additionally, when any one boom section does not have all valves on that boom section on, then a calculated flow is reported to the flowmeter as well. Transparent mode prohibits this switch, and only uses the turbine value regardless of accuracy. Calculate mode uses only the calculation.

5.13.2 Flowmeter Calibration (Line-52).

[Figure 77] - On Flowmeter Calibration Line-52 it is important for this value to match the tag on the turbine flowmeter so that the gallon counters will match the rate controller. PinPoint uses "pulses per 10-gallons" nomenclature. If the flowmeter tag is in "pulses per gallon," multiply by 10. If the rate controller requires "pulses per gallon," divide by 10. This can be checked by monitoring the GPM display in System Setup and comparing it to the rate controller.

5.13.3 Units (Line-53).

[Figure 77] - On Units Line-53 either US or SI units can be specified with this menu option.

5.13.4 Baud Rate (Line-54).

[Figure 77] - Baud Rate Line-54 will automatically sense the baud rate of the GPS signal. 19,200 - 115,200.

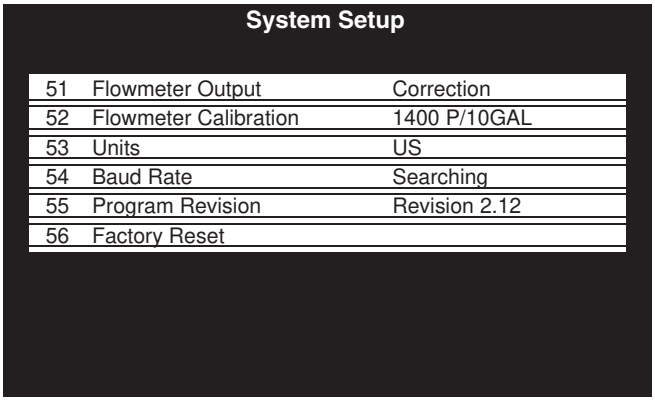
5.13.6 Program Revision (Line-55).

[Figure 77] - Program Revision Line-55 will show the current software version of the CapView display.

5.13.7 Factory Reset (Line-56).

[Figure 77] - Factory Reset Line-56 option will perform a factory reset on the system. Prior to performing this operation it is a good idea to have written down prior values from Location Setup, Menu Setup and Nozzle Setup.

Figure 77: System Setup (Line 51-56)



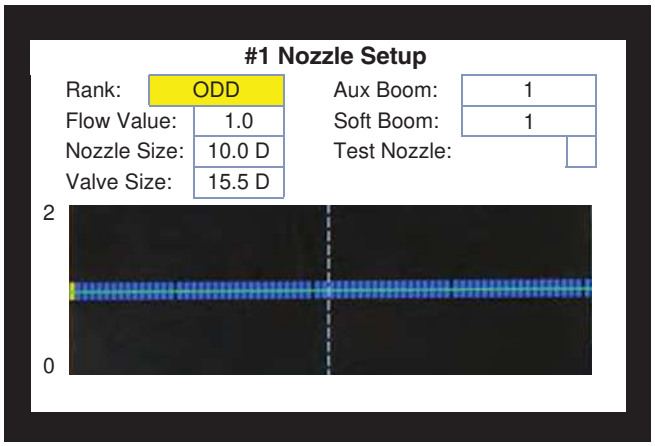
5.14 Nozzle Setup

[Figure 78] - *Nozzle Setup:* Pressing the **Nozzle Setup** button brings up the Nozzle Setup Screen. Nozzle Setup allows individual nozzles to be set up for: Rank, Flow Value, Nozzle Size, Valve Size, Auxiliary Boom Attachment and Soft Boom Attachment. This allows individual nozzles to be tested or for their identity to be confirmed.

[Figure 78] - The Nozzle Setup Screen feature allows the setup of fence rows, wheel track and dust control nozzles. This is also where soft booms are set up on non-conventional nozzle groupings.

[Figure 78] - Individual nozzle tip sizes may be changed in Nozzle Setup. Default nozzles are indicated with a “D”. Always check the tip size in nozzle setup after changing default.

Figure 78: Nozzle Setup Screen



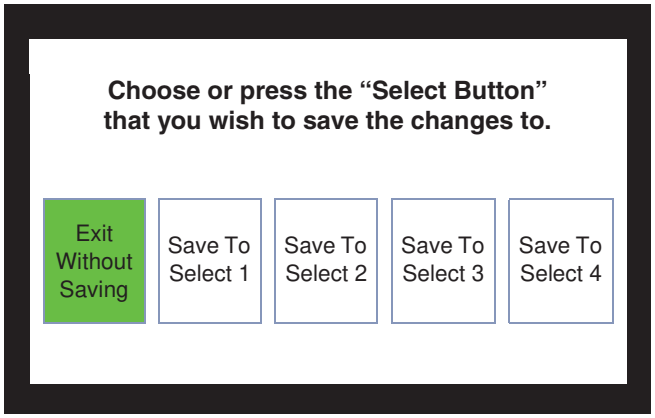
Four different default nozzle sizes may be setup, one for each **Preset** button. You can save the profile to a number by simply pressing the number buttons #1, #2, #3 or #4, or

[Figure 79] - by pressing the **Arrow** button RIGHT/LEFT to highlight the appropriate selection. Select 1, 2, 3, or 4.

Press **Enter** button (Green Check).

From the operate screen, any of the four preset nozzle setups can be selected using **Preset** buttons #1 thru #4 along the bottom of the CapView. Pressing the **Preset** button initially displays a graphic of the nozzle setup saved to that button. Releasing the **Preset** button quickly will avoid changing the nozzle setup. Pressing and holding the button for approximately five seconds will cause the nozzle setup to change.

Figure 79: Select Button Screen



5.14.1 Wheel Track Setup

[Figure 80] - *Wheel Track Setup:* To set up a wheel track control function, press the **Nozzle Setup** button. Note that this screen is for Preset #1, and that nozzle #1 is highlighted Yellow (left of Blue tick marks on the screen).

[Figure 80] - Press the **Arrow** button RIGHT/LEFT to arrive at the nozzle that you wish to set up.

For each nozzle, press the **Arrow** button UP/DOWN to highlight the field that you wish to change.

Press the **Enter** button (Green Check) to select the field.

Then, press the **Arrow** button UP/DOWN to change the value.

Press the **Enter** button (Green Check) again to save the value.

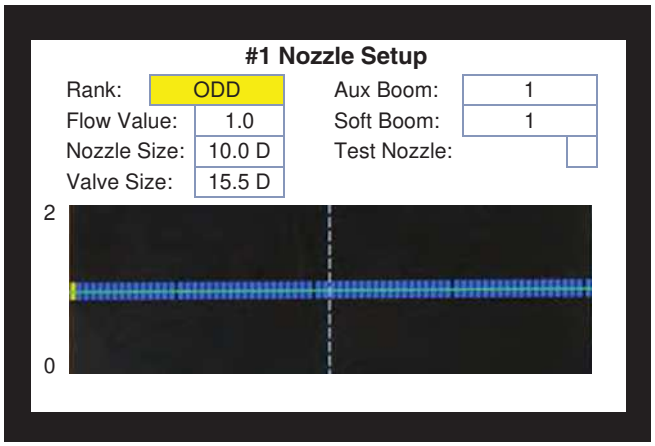
A shortcut is available to speed up this process.

After pressing the **Nozzle Setup** button,

you may press any of the four Nozzle **Preset** buttons #1, #2, #3 or #4 to begin with an existing setup.

Once all of the nozzles are setup, press the **Escape** button (Red X) to save the profile to one of the four numbered buttons.

Figure 80: Wheel Track Setup



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6.0 SYSTEM TESTING AND FINAL TUNING

6.1 Pinpoint System Dry Test

Perform the following steps, to confirm that the soft boom and nozzle valves are operating correctly.

6.1.1 Boom Shutoff Dry Test

1. Engine OFF and key ON.
2. CapView power ON.
3. Turn ON all boom switches.
4. Rate Controller setup so that section control valves are able to be engaged.

NOTICE All nozzle valves on the boom should start clicking.

5. Turn OFF all boom sections.
6. Turn ON boom section 1.
7. Repeat steps 5 & 6 for each individual boom section. Verify that each boom section is firing in the correct order.

NOTICE If the clicking nozzle valves are not on the selected boom section, a VCM is not connected to the appropriate boom section on the Gateway Hub. This can be fixed electronically. See Location Setup on page 41.

6.1. 3 Boom Shutoff Dry Test with Key FOB

NOTICE Using the Key FOB to turn ON/OFF boom sections allows the operator to closely view the operation of the nozzle valves. Using the Key FOB also allows each individual nozzle to be turned ON/OFF.

1. **[Figure 81]** - Activate Line-24 in system setup to “Key FOB Active”.

NOTICE When the Key FOB mode is activated, all the nozzles are turned off. The CapView display indicates that the Key FOB Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs.

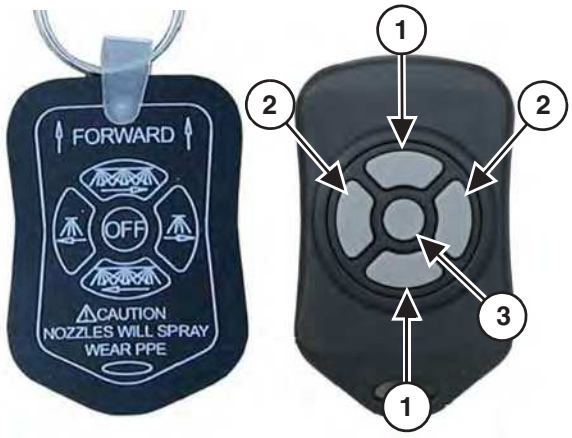
Figure 81: Boom Switch Activation

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

2. **[Figure 82]** - Press the ① top/bottom buttons on the Key FOB to turn ON/OFF each boom section (1 thru 12). Verify that each boom section is operating (clicking) in the correct order.
3. Press the ② right/left buttons on the Key FOB to turn ON/OFF each individual nozzle valve. Verify that each nozzle valve is operating (clicking) in correct order.
4. Press the ③ center button on the Key FOB to turn OFF the whole boom.
5. **[Figure 81]** - Activate Line-24 in system setup and change setting back to 12V Active or previous setting.

Figure 82: Key FOB



6.2 Pinpoint System Wet Test

NOTICE Fill the sprayer with approximately 400 gallons of water.

Perform the following steps, to confirm that the soft boom and nozzle valves are operating correctly.

Boom Shutoff Wet Test

1. CapView and Rate Controller OFF.
2. Start the engine and set engine at idle speed.
3. Turn ON the CapView and the Rate Controller.
4. With the engine at idle speed, use the Rate Controller to start the pump.
5. Increase the engine speed to half throttle.
6. Set the CapView to the desired pressure.
7. Turn ON all boom switches.

NOTICE All nozzle valves on the boom should start spraying.

8. Turn OFF all boom sections.
9. Turn ON boom section 1.

NOTICE The nozzle valves on boom section 1 should start spraying.

10. Repeat step 9 for each boom section to verify boom sections operate in the correct order.

NOTICE

If the nozzle valves that are clicking are not on the selected boom section, a VCM is not connected to the appropriate boom section on the Gateway Hub. This can be fixed electronically. See Location Setup on page 41.

6.2.1 Boom Shutoff Wet Test with Key FOB

1. **[Figure 83]** - Activate Line-24 in system setup, to "Key FOB Active".

NOTICE

Using the Key FOB to turn ON/OFF boom sections allows the operator to closely view the operation of the nozzle valves. Using the Key FOB also allows each individual nozzle to be turned ON/OFF.

2. Turn ON all boom section switches and the master switch to allow water to all boom sections.

NOTICE

With Line-24 activated and all nozzles turned off, the CapView display will indicate that the Key FOB Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs on the CapView.

3. **[Figure 84]** - Press the ① top/bottom buttons on the Key FOB to turn ON/OFF each boom section (1 thru 12). Verify that each boom section is operating (spraying) in the correct order.

4. Press the ② right/left buttons on the Key FOB to turn ON/OFF each individual nozzle valve. Verify that each nozzle valve is operating (spraying) in the correct order. Check that no valves are leaking or dripping when the nozzle valve is shutoff.

NOTICE

If a nozzle valve is leaking or dripping, use a marker to mark the nozzle valve. Continue to check all nozzle valves.

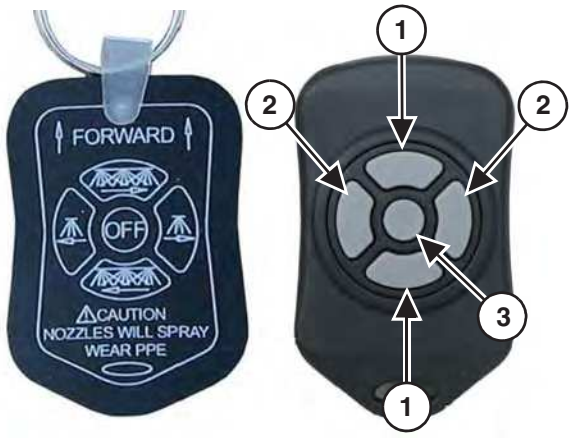
5. Press the ③ center button on the Key FOB to turn OFF the whole boom.

Figure 83: Boom Switch Activation

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

Figure 84: Key FOB



6. When all nozzle valves have been tested, turn OFF the Rate Controller and CapView, disengage the product pump, turn OFF the engine, and then release the pressure from the sprayer lines.

NOTICE

Make necessary repairs to any leaking or dripping nozzle valves. Dripping can be caused by debris on the plunger, preventing sealing when not pulsing.

7. **[Figure 85]** - If the ① coil housing spins, tighten the ② flynut until the coil housing does not spin.

8. If the coil housing does not spin, remove the ③ nozzle valve and inspect the ④ O-rings. If an O-ring is damaged, replace the O-ring. If the O-rings appear to be okay, reinstall the nozzle valve.

NOTICE

Use the Key FOB to check the repaired nozzle valves.

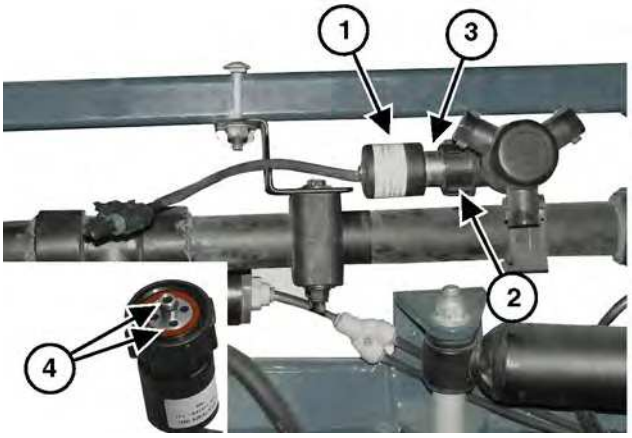
NOTICE

The Key FOB works well when checking for plugged tips without wasting a significant amount of product.

WARNING

CHEMICAL RESIDUES MAY BE PRESENT IN THE OEM EQUIPMENT. RELEASE PRESSURE ON THE SPRAYER SYSTEM BEFORE SERVICING. RINSE THE SYSTEM WITH CLEAN WATER PRIOR TO INSTALLING OR SERVICING FITTINGS, HOSES, VALVES, OR NOZZLES. USE PROPER PPE AT ALL TIMES TO AVOID PERSONAL INJURY.

Figure 85: Nozzle Valve O-ring Inspection



9. **[Figure 86]** - Go to **Boom Switch Activation** Line-24 in system setup and change setting back to 12V Active or previous setting.

Figure 86: Boom Switch Activation

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

6.3 Pressure Control Test

NOTICE Make sure the tank has adequate water supply to perform the following tests.

1. CapView and Rate Controller OFF.
2. Start the engine and set engine at idle speed.

3. Turn ON the CapView and Rate Controller.
4. With the engine at idle speed, use the Rate Controller to start the pump.

5. Press the CapView Auto button to place PinPoint in Auto mode.
6. Place the Rate Controller in manual mode, or set a test speed and place the Rate Controller in auto mode.
7. Turn on all boom sections (system will spray).
8. Slowly increase the engine to full speed.

9. Press ENTER (Green Check) to switch between set points.
10. If the pressure is stable on a set point and moves between set points at a reasonable rate, the system has passed the test.

NOTICE If the pressure is unstable, decrease the system gain value.

NOTICE If the pressure moves too slowly between set points, increase the system gain.

6.4 Flow Control Test

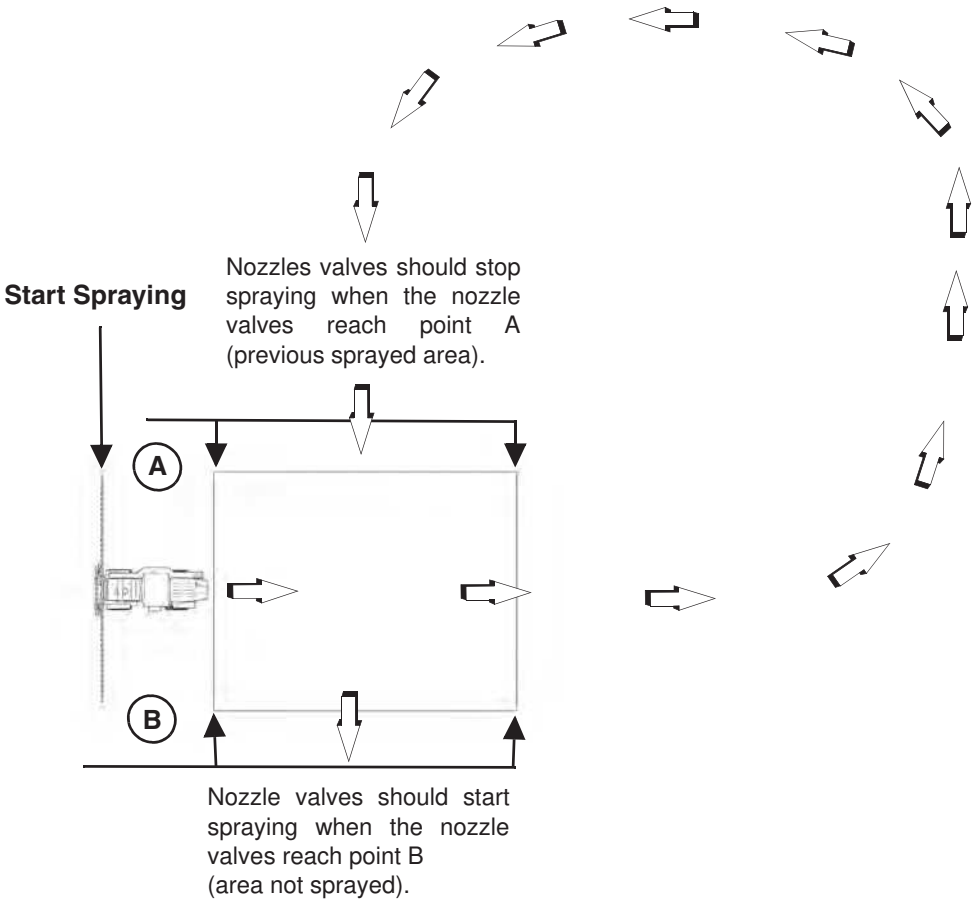
NOTICE Make sure the tank has adequate water supply to perform the following tests.

1. While stationary, set a test speed in the Rate Controller.
2. Set the Rate Controller to AUTO.
3. Set the Rate Controller for an appropriate rate for the tips on the machine.
4. Turn ON the master and boom section switches.
5. The actual rate should match the target rate.
6. If you change the target rate, the actual rate should change to match the new target rate.

NOTICE If the rate change is unstable or too slow, the gain values in the Rate Controller should be changed.

NOTICE If any of these installation tests fail, see PINPOINT TROUBLESHOOTING.

Figure 87: Look Ahead Time / Look ahead Distance



NOTICE Look Ahead Time and Look Ahead Distance is how PinPoint 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. These times can be set with the help of two people to watch the nozzle valves at a known overlap point.

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

[Figure 87] - With the aid of two people to watch the operation of the nozzle valves, perform the following steps:

1. Place a person at point (A) and a person at point (B).
2. Travel forward and start spraying.
3. Continue to drive straight approximately 150 feet.
4. Turn left while continuing to spray. Travel a short distance, and then turn around and travel towards the previously sprayed area, (point A).
5. When the booms reach point (A) (the previously sprayed area) the nozzle valves should shutoff.
6. When the booms reach point (B) (the area not sprayed) the sprayer nozzle valves should start spraying.

NOTICE The helpers can see if the nozzle valves shutoff time is early or late at point (A), or if the spray-on time is early or late at point (B). Adjust Line-31 & Line-32 accordingly.

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7.0 OPERATION AND TUNING

7.1 Basic Operation

NOTICE Before starting the engine, always make sure that the CapView and rate controller are turned off.

Start Up:

1. Start the engine.
2. 

Press the **Power** button to power up the CapView and power up the rate controller.
3. Verify that the rate settings are correct.
4. 

Press the CapView **Auto/Manual** button to activate automatic pressure control.
5. Set the CapView to the desired pressure.
6. 

Press the **Turn** button to activate the Turn Compensation feature.
7. 

Press the **Overlap** button to activate the overlap feature.
8. Turn ON the boom sections to spray.

NOTICE Gallon counters must be reset for each field.

Shut Down:

1. Turn OFF all boom sections.
2. 

Press the **Power** button to power OFF the CapView and turn the power off on the rate controller.

7.2 Spraying without the PinPoint System

NOTICE To spray without the PinPoint system, use the following procedures.

A. Spraying Through Capstan Nozzle Valves

1. CapView OFF the nozzle valves will open and close with the boom signal (no pulsing).

NOTICE The rate controller controls the rate.

B. Spraying Through Alternate Valve Body

[Figure 88] - With Wilger nozzles bodies, disconnect the ① Key Switched Power Harness connector from the CapView Display Pigtail Harness with Switched Power connector. Use a cap and plug to seal the connectors.

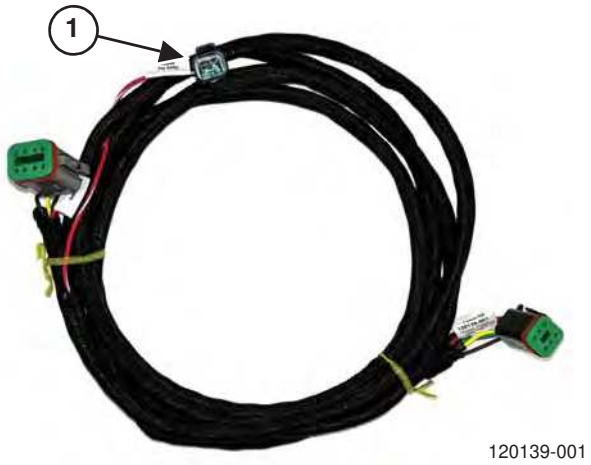
1. CapView OFF

2. Manually open the drip checks.

NOTICE The rate controller controls the rate.

NOTICE This is recommended for high flow applications (30 gallons or more per acre).

Figure 88: Key Switched Power Harness



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7.3 Auto Mode

[Figure 89] - The CapView screen most often encountered is the “Operate” screen. Spraying is usually done in “Auto” mode.

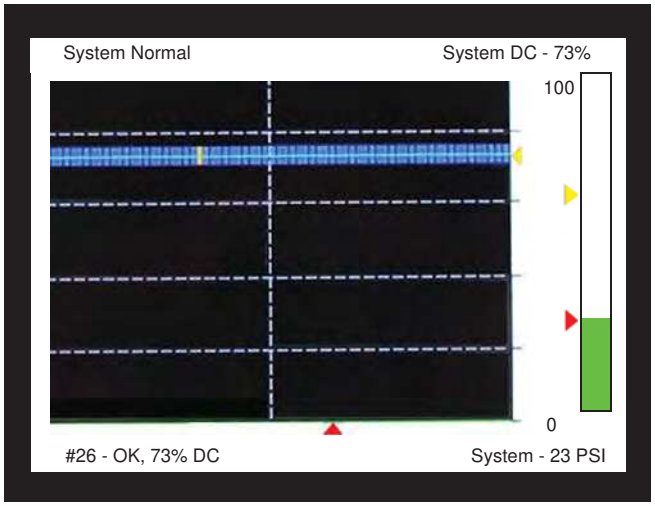
NOTICE Auto means Automatic Pressure Control.

1. Press the CapView **Power** button to power-up the PinPoint system.

NOTICE The PinPoint system defaults to the Manual mode upon power-up.

2. Press the **Auto/Manual** button once. The LED light within the Auto/Manual button indicates that the PinPoint system is in Automatic mode.

Figure 89: Operate Screen - Auto Mode



[Figure 90] - The Green Pressure Bar (lower right corner) indicates pressure.

The Red Arrow (along the pressure bar) indicates target pressure.

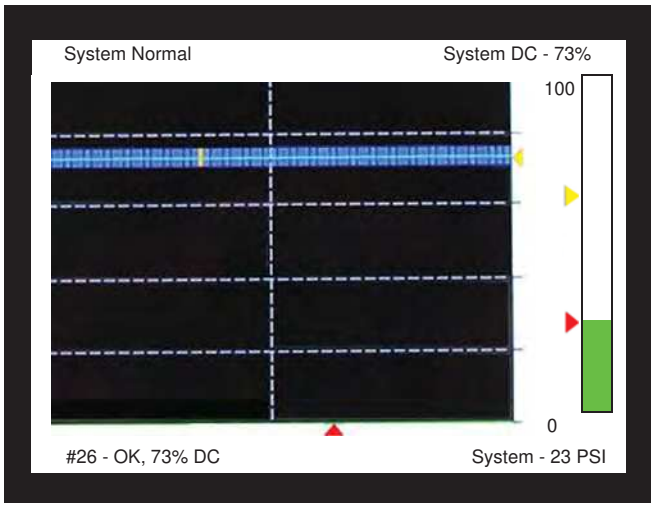
The text block (bottom right corner) indicates target pressure.

Press the **Arrow** button UP or DOWN to move the Red arrow to a new target pressure.

The Yellow arrow (along the pressure bar) indicates an alternate target pressure.

To change to the alternate target pressure, press the **Enter** button (Green Check).

Figure 90: Operate Screen - Auto mode



7.4 Manual Mode

NOTICE

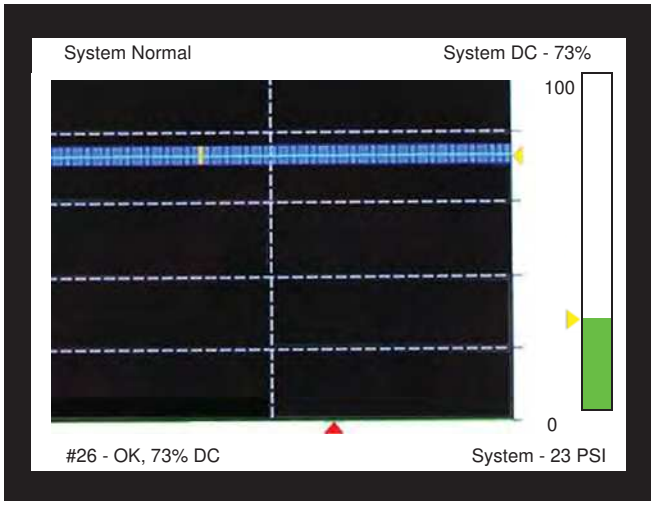
Manual mode is usually used for troubleshooting purposes, should the operator encounter rate or pressure instability issues while spraying. Switching to Manual Mode could allow the operator to finish a field or job before contacting the dealer to solve the problem.

[Figure 91] - In the Manual mode, the Yellow arrow (along the pressure bar) coincides with the top of the Green pressure bar and indicates the actual pressure.

In Manual mode, the text block (bottom right corner) indicates actual pressure.

In the Manual mode, pressing the **Arrow** button UP or DOWN will control the nozzle duty cycle, regardless of the pressure sensor reading or target pressure set point.

Figure 91: Operate Screen - Manual Mode



7.5 Nozzle Display

[Figure 92] - The heart of the CapView display is the nozzle duty cycle graphic.

Each nozzle on the boom's duty cycle is indicated with a Blue tick mark that corresponds with the scale on the right hand side of the graphic.

The bottom of the graphic is 0% and the top is 100%. The grid lines are in 20% increments. A vertical grid line indicates the center of the boom. A Green line connects the Blue tick marks.

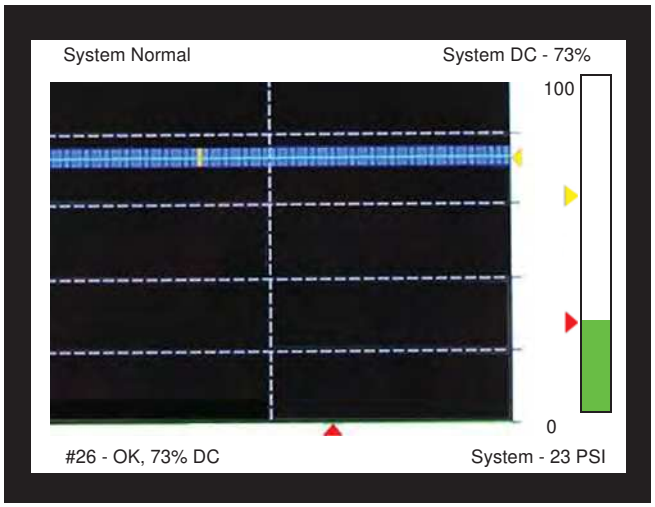
Average Duty Cycle: The Yellow arrow (right of Blue tick marks) indicates the average duty cycle of all the nozzles. The text block (upper right) indicates the average duty cycle value (System DC).

Nozzle Diagnostics: The Red arrow along the bottom of the duty cycle graphic moves from nozzle to nozzle, and left to right two nozzles per second. The corresponding Blue tick mark turns Yellow as the Red arrow moves along.

The text box (lower left) displays the nozzle diagnostic information for the nozzle corresponding to the Red arrow and Yellow tick mark. In this example, nozzle #45 is okay and is at 73% duty cycle.

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 will override the scrolling Red arrow so that the Red arrow may be moved to the detected nozzle. The text block may show one of the following notices: Coil Open, Coil Shorted Closed, Plunger Stuck Open, Plunger Stuck Closed. After a few seconds, the Red arrow will begin to scroll again.

Figure 92: Operate Screen - Nozzle Duty Cycle



7.6 Overlap Control

[Figure 93] and **[Figure 94]** - PinPoint's overlap control feature is turned on and off using the **Overlap** button.

NOTICE

Overlap control may be turned off for various situations including: spraying rinse water, troubleshooting, no GPS signal, etc.

Figure 93: Overlap Control while in a Turn

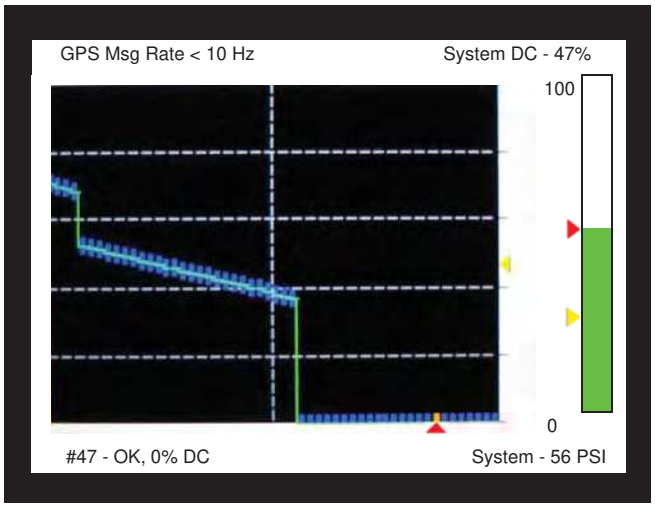
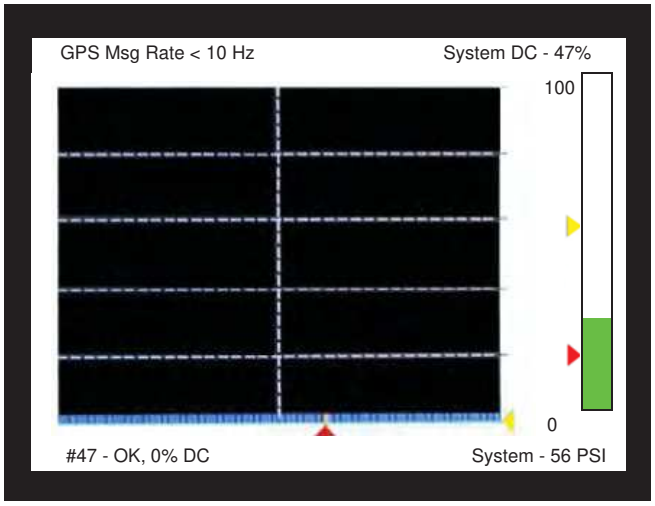


Figure 94: Overlap Control - While driving over a previously sprayed area.



7.7 Mapping

A new map is started when the CapView is powered up and the **Overlap** button is selected.

PinPoint establishes a map origin and must stay within 3 miles x 3 miles of that origin point.

NOTICE

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

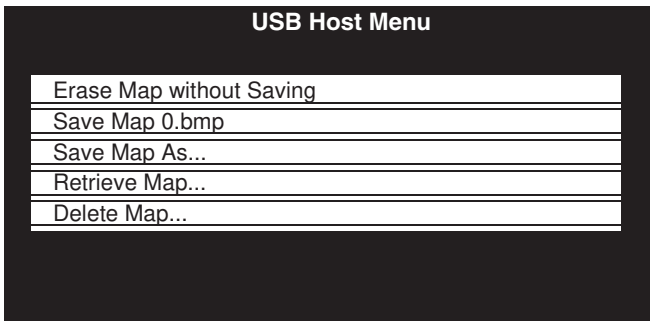
[Figure 95] - If the “Save Map #” choice is selected the map will be saved and a new map started. You may also choose “Save Map As” and give the map a name, or choose “Retrieve Map” or choose “Delete Map.”

Press the **Arrow** button UP or DOWN to select the appropriate map setting.

Press the **Enter** button (Green Check) to save.

To shortcut to the Save Map Menu, press the **Escape** button (Red x).

Figure 95: Mapping



7.8 Map Downloading

NOTICE

Use the Capstan 2GB thumb drive or thumb drive no larger than 2GB in the CapView.

[Figure 96] and **[Figure 97]** - To access maps, use a USB drive inserted into the back of the CapView. Maps may be deleted, moved, copied, etc. Maps are stored in bitmap format and can be viewed with MS-Paint or a similar picture viewer type program.

NOTICE

Remove USB drive from CapView when not in use. Never attempt to spray with the USB in the CapView.

Figure 96: USB Host Menu

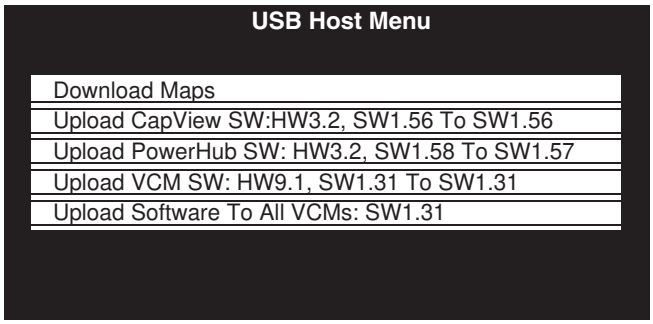
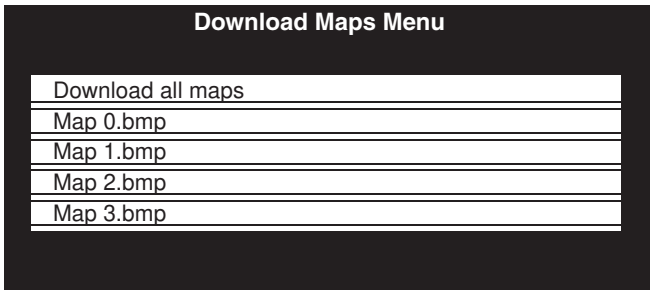


Figure 97: Download Maps Menu



7.9 Overlap Distance (Line-30)

PinPoint uses 1-meter-squares to record where spraying has occurred. Any spraying nozzle that touches one of these squares will cause the PinPoint 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. Each nozzle looks forward, backward, right, and left to determine if spraying needs to occur.

[Figure 98] - Overlap Distance Line-30 can be set to intentionally skip or overlap. The data is in inches. Positive numbers cause intentional overlap, and negative numbers cause intentional skips.

[Figure 99] - *Look Ahead:* PinPoint GPS accuracy can be tuned using System Setup Line-31 and Line-32.

- Adjust Line-31, Look Ahead Time, at the fastest travel speeds expected.
- Adjust Line-32, Look Ahead Distance, at the slowest speeds expected.

Figure 98: Overlap Distance (Line-30)

System Setup

21	Total Number Valve Expected	0 Valves
22	Scrolling Enable/Disable	Enabled
23	Valve Diagnostics	Enabled
24	Boom Switch Activation	12V Active
25	GPS-Ant. Ahead Of Rear Axle	0 Inches
26	GPS-Ant. Right Of Center	0 Inches
27	GPS Antenna Above Ground	0 Inches
28	GPS Boom Ahead Of Rear Axle	0 Inches
29	Backup Detection Method	OFF=Fwd (GPS Turn)
30	Overlap Distance	60 Inches

Figure 99: Look Ahead Time / Look Ahead Distance (Line 31-32)

System Setup

31	Look Ahead Time	0.5 s
32	Look Ahead Distance	0.0 m
33	Zero Rate Shutoff	Minimum PWM %
34	Pressure Shutoff Limit	8.0 PSI
35	Pressure Turn-On Limit	010.0 PSI
36	Pressure Control Hold	Disable
37	PSI Sensor 1 Min. Voltage	0.5 V
38	PSI Sensor 1 Max. Voltage	5.0 V
39	PSI Sensor 1 Min. Pressure	0 PSI
40	PSI Sensor 1 Min. Pressure	100 PSI

7.10 Flowmeter Signal

Since the rate controller doesn't know that PinPoint is shutting off nozzles, the PinPoint "manipulates" the flowmeter signal to cause the rate controller to apply the proper rate. At low flow rates, PinPoint replaces the turbine flowmeter signal with a calculated value that is accurate down to a single nozzle.

[Figure 100] - Flowmeter Minimum GPM Line-50 is the minimum flow at which the turbine flowmeter is no longer accurate.

[Figure 101] - Correction Flowmeter Output Type, Line-51, the PinPoint will automatically calculate the flow below the minimum flow value. This is especially important when PinPoint is operating with only a few nozzles, like point rows, filling gaps, etc. PinPoint's calculation accurately measures flow through a single nozzle.

In correction mode, the flow reported to the rate controller automatically switches from the turbine flowmeter to calculation whenever the flow falls below Line-50. Transparent mode prohibits this switch, and only uses the turbine value regardless of its accuracy. Calculate mode uses only the calculation.

Figure 100: Flowmeter Minimum GPM (Line-50)

System Setup

41	PSI Sensor Offset	0.0 PSI
42	Rate Sync Mode	Speed
43	Rate Sync Average	0.1
44	Rate Sync Max Ground Speed	18
45	Servo Minimum DC%	23 %
46	Servo Maximum DC%	78 %
47	Nozzle Pulse Frequency	10.0 Pulse/s
48	Nozzle PWM Minimum	10 %
49	Nozzle PWM Maximum	100 %
50	Flowmeter Minimum GPM	10 GPM

Figure 101: Flowmeter Output (Line-51)

System Setup

51	Flowmeter Output	Correction
52	Flowmeter Calibration	1400 P/10GAL
53	Units	US
54	Baud Rate	Searching
55	Program Revision	Revision 2.12
56	Factory Reset	

7.11 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 sprayer 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.

[Figure 102] - With PinPoint's Turn compensation feature engaged each nozzle will apply the proper 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%.

If you need more information about Capstan Ag's Turn Compensation, contact your Capstan Ag Field Representative or your servicing dealer.

Turn Compensation: PinPoint's turn compensation feature is turned ON and OFF using the **TURN** button. Turn compensation may be turned off for various situations including: troubleshooting, no GPS signal, etc.

NOTICE

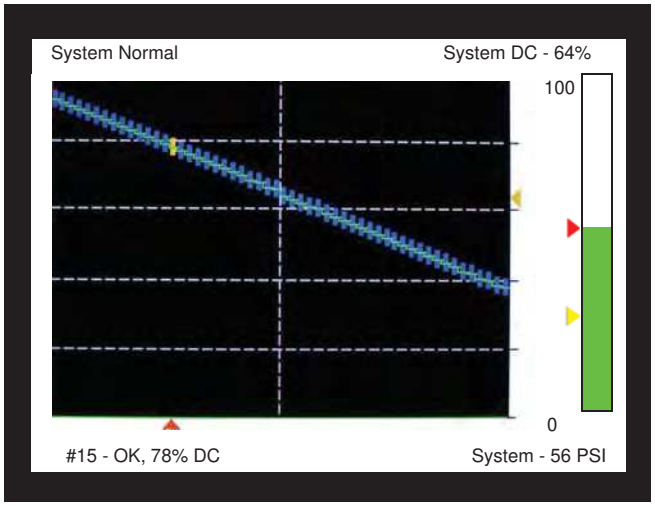
Nozzles determined to be moving backwards will turn off. If only part of the boom is spraying, the flowmeter signal is "managed" so the correct rate is applied.

NOTICE

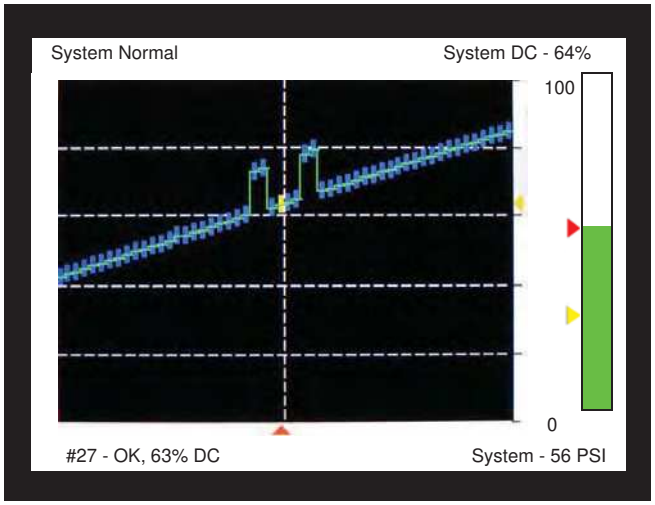
Turn compensation calculates a turn radius from a GPS signal and adjusts the flow per nozzle to maintain a constant rate.

Figure 102: Turn Compensation Examples

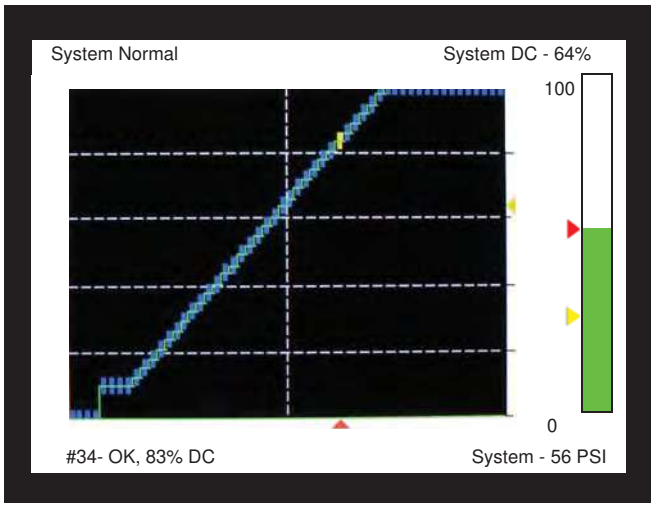
Turn Compensation with no other features shown active.



Turn Compensation with Wheel Track active. See 5.14.1 Wheel Track Setup on page 61 for more information.



Turn Compensation with Overlap Control active.



7.12 Gallon Counters

[Figure 103] - Line-2 thru Line-5 of the System Setup Screen are:

2. Controller Gallon Counter
3. Actual Gallon Counter
4. Control Gallons Per Minute
5. Actual Gallons Per Minute

PinPoint “manages” the flowmeter signal to keep the rate controller accurate when the nozzles are turned off.

It is important to display the amount of “manipulating” that has occurred. Gallon counters can be cleared by selecting and then pressing the **Enter** button (Green Check).

A menu will confirm your intentions. The CapView Controller Gallons Counter should match the values from the rate controller. The CapView Actual Gallons Counter values should match the tank volume.

The difference in these two values is the amount of product saved by using the PinPoint system.

Figure 103: Gallon Counters (Line 2-5)

System Setup

1	Operation Mode	SharpShooter
2	Controller Gallon Counter	0 Gallons
3	Actual Gallon Counter	0 Gallons
4	Control Gallons Per Minute	0.0 GPM
5	Actual Gallons Per Minute	0.0 GPM
6	Pressure 1	0 PSI
7	System Voltage	13.7 V
8	Hour Meter	0.0 Hours
9	Compass Heading	0 Degrees
10	Compass Offset	0 Degrees

7.13 Alarm

If the PinPoints alarm sounds, the **Alarm** button may be pressed to silence the alarm. LEDs will continue to blink. If the issue is not resolved after several minutes, the alarm will sound again.

NOTICE

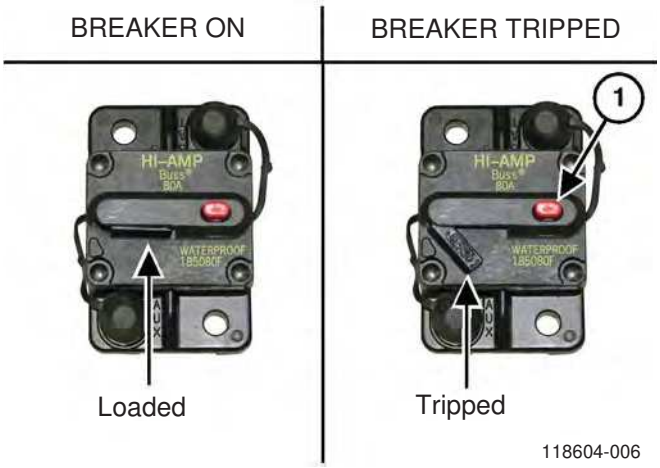
It is the operator's responsibility to stop using the PinPoint system if the spray application is not performing adequately.

8.0 MAINTENANCE

8.1 Jump Starting/Welding/Charging

- **[Figure 104]** - If jump starting the machine, trip the PinPoint's 80 AMP circuit breaker to prevent damage to the PinPoint system.
- If charging the machine's batteries or welding on the machine, trip the PinPoint's 80 AMP circuit breaker or the machine's battery disconnect to prevent damage to the PinPoint system.

Figure 104: Circuit Breaker



NOTICE

[Figure 104] - The circuit breaker is usually located near the batteries or in the battery compartment. The 80A Circuit Breaker is equipped with automatic and manual trip features as well as a ① manual reset button.

8.2 Servicing the Spray System

- Before servicing the spray system or spray components, the spray tank and system should be emptied of chemical mixture and flushed with clean water. Clean the machine of all chemical residue.

8.3 Inspecting the Spray System

- Inspect spray system hoses for cuts, nicks or abrasions before each use. Replace any damaged hoses immediately.
- Check for loose hoses, mounting hardware and components. Tighten if necessary.
- Make sure all hoses and wiring are secure.
- Make sure boom strainers are clean.
- Check for damaged or missing decals. Replace decals if damaged or missing.

8.4 Cleaning the Spray System

- Flush the spray system with clean water after each use.
- Avoid high pressure spray when cleaning the spray system components, valves and wiring connectors.

8.5 Winterizing for Storage

- Thoroughly clean the spray system before winter storage.
- Flush the spray system with clean water.
- Winterize the spray system with RV antifreeze for winter storage. Proper winterizing of the sprayer with a Capstan system installed on it is essential. Make sure the booms are completely full of antifreeze at 100% strength and that the solenoids are pulsed (sprayed) for a few minutes to ensure the antifreeze remaining in the solenoids is at full strength.

NOTE: Improper winterizing procedure could result in damage to the internal components of the solenoids.

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9.0 TROUBLESHOOTING

9.1 Recommended Guidelines

When servicing a PinPoint System, Capstan recommends the following three step troubleshooting process:

1. Perform baseline service checks and verify the original PinPoint 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.

NOTICE The primary service tool will be a simple multi-meter that can measure voltage and resistance (ohms).

9.2 PinPoint Baseline Evaluation Protocol

1. Verify voltage readings. See pages 94 thru 98 for individual component testing.
2. Visually check all wire connections, harnesses, and connectors for loose, broken, or damaged wires.
3. Make sure the correct nozzle size is being used for the application rate and mode of action.
4. Compare current CapView settings with those recorded in this manual at setup. See PinPoint setup sheets on page 109.
5. Do a “Like Component Swap” to see if the failure follows the component.
6. For Wet Tests, see 6.0 SYSTEM TESTING AND FINAL TUNING.

⚠ WARNING

Before operating or servicing system: Read and understand the machine's Operator Manual and the PinPoint SharpShooter Mode Manual. Follow the warnings and instructions in the manuals when making repairs, adjustments, or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

9.3 CapView System Errors Chart

SYSTEM ERRORS (Displayed in Upper Left Text Block)	CAUSE	CORRECTION
System normal.	This indicates that everything is normal.	
Missing gateway.	Communication to the gateway has been lost.	Check connections, including: keyswitch power, ignition, and battery power; cycle power.
Missing VCM.	Communication to the VCMs has been lost.	Check connections and fuses, including: keyswitch power, ignition, and battery power; cycle power.
GPS not attached.	No GPS messages are being received.	Cycle GPS Power.
		Check GPS Antenna Connections and Fuse.
No GPS signal.	GPS messages are being received but are empty.	Wait for the GPS Antenna to acquire satellites. Cycle GPS Power.
	Faulty GPS antenna.	Replace GPS antenna.
	Faulty GPS receiver.	Repair or replace receiver.
	Incorrect GPS settings. VTG<10 Hz. GGA<10 Hz.	Change GPS receiver settings to: Baud rate 19,200 - 115,200 GGA 10 Hz or greater. VTG 10 Hz or greater. ZDA 1 Hz or greater.
Key FOB mode active.	The Key FOB Mode is Active. (Alarm light comes on, but the alarm does not sound).	System Setup Line-24: Return Valve Type to 12V Active to resume operation.
Valves not found.	Upon power up, the system did not find all valves.	Identify missing valve(s) using Location Setup Menu or Key FOB. Repair or Replace Valve to Resume Operation.
Compass error.	Internal compass on Gateway Hub is faulty.	Replace the Gateway Hub or change 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. See 7.7 Mapping on page 76.
Valve lodged open.	Debris in valve.	Clean debris from affected valve.
Valve lodged close.	Debris in valve.	Clean debris from affected valve.
Coil circuit open.	Coil wire pinched, cut or broke. Coil disconnected.	Check coil connection and resistance (21-23.5 ohm).

SYSTEM ERRORS (Displayed in Upper Left Text Block)	CAUSE	CORRECTION
Coil circuit closed.	Coil wire pinched, cut or broke. Internal coil short.	Check coil connection and resistance (21-23.5 ohm).
Gateway reset.	Gateway lock / missing VCM error.	Alarms sounds until alarm button is pressed. Error will continue to show for a few seconds afterward. Operation will continue normally.

NOTICE When a system error occurs, an alarm will sound, and an error message will appear on the CapView lower left screen.

9.4 Over and Under Application Troubleshooting Chart

PROBLEM	CAUSE	CORRECTION
Under application.	Tips too small.	Check for proper tip size.
	Plugged tips.	Clean or replace tips.
	Plugged filter(s).	Clean or replace filter(s).
	Filter(s) not installed correctly.	Check all filters for correct installation.
	Plugged, kinked or collapsed hoses.	Check all hoses and replace as needed.
	Pump not turned on.	Consult sprayer manual for instructions for starting pump.
	Outrunning sprayer liquid system capability.	Slow down.
		Run at optimum pressure (not too low, not too high).
	Incorrect rate settings.	Check and adjust rate settings.
	Incorrect calibration settings.	Consult rate controller and/or PinPoint manual for instructions.
	Faulty radar.	Replace radar.
	Poor GPS satellite signal.	Verify that the GPS is working correctly.
	Faulty rate controller switch.	Locate bad switch(s) and replace switch.
	Servo valve not working correctly.	Check servo valve and replace if needed.
	Flowmeter cal # incorrect.	Check flowmeter calibration.
	Faulty flowmeter.	Repair or replace the flowmeter.
Over application.	Tips too large.	Check for proper tip size.
	Worn tips.	Replace tips.
	Speed too slow.	Increase speed.
	Incorrect rate settings.	Check and adjust rate settings.
	Incorrect calibration settings.	Consult sprayer or rate controller manual for instructions.
	Servo valve not working correctly.	Check servo valve, and replace if needed.
	Flowmeter cal # incorrect.	Check flowmeter calibration.
	Faulty flowmeter.	Repair or replace flowmeter.

PROBLEM	CAUSE	CORRECTION
Rate instability.	Low voltage to rate controller.	Test voltage and repair as needed.
	Faulty flowmeter.	Repair or replace flowmeter.
	Faulty speed sensor reading.	Check radar and replace if needed.
	Collapsed suction hose.	Replace suction hose.
	Inlet plugged.	Check and clean inlet if needed.
	Incorrect valve calibration settings.	Check and adjust settings. See the rate controller's manual.
	Incorrect PinPoint system gain.	Check PinPoint system gain, and adjust as needed.
	PinPoint Run / Hold Parameter too short.	Adjust PinPoint Run / Hold Parameter up incrementally to decrease instability.
	Air in the spray boom.	Bleed air from system.
	Faulty rate controller.	Replace rate controller.
Pressure instability.	Faulty rate controller.	Replace rate controller.
	Worn or sticky poppets.	Check and replace poppets as needed.
	Incorrect PinPoint system gain.	Check PinPoint system gain and adjust as needed.
	Faulty pressure sensor.	Replace pressure sensor.
Single nozzle valve drips when shutoff.	Plunger is lodged with debris.	Clean nozzle valve. See 9.8.1 Nozzle Valve Cleaning on page 90.
	Plunger is worn.	Replace plunger. See 9.8.2 Plunger Seal Inspection on page 90.
	O-ring pinched or broken.	Replace O-ring.
Single nozzle valve sprays erratically.	Plunger is worn.	Replace plunger. See 9.8.2 Plunger Seal Inspection on page 90.
Single nozzle valve will not shut off.	Plunger is lodged with debris.	Clean nozzle valve. See 9.8.1 Nozzle Valve Cleaning on page 90.
	O-ring pinched or broken.	Replace O-ring.
Section will not spray.	Blown fuse on VCM extension cable.	Replace fuse on VCM extension cable.
	Faulty VCM or damaged extension cable.	Repair or replace VCM or extension cable.
	Rate controller not activating section.	Verify boom section signal on Gateway Hub. See "9.11 Gateway Hub Pinout Identification" on page 93. Repair or replace rate controller components.
Skips at edges of field.	Overlap distance set too low.	Increase overlap distance to at least 40".
	Incorrect GPS antenna location.	Verify measurements to GPS antenna location.
	CapView overlap settings incorrect.	Set look ahead and overlap distances to prevent skips.

9.5 Swapping Components

PinPoint Systems are comprised of a number of components. Some of these components are used in multiples. Components with multiple uses are:

- Nozzle Valves
- Extension Harnesses
- VCMs

When troubleshooting failed components, it can be helpful to swap the failed part with a part that works from 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.

NOTICE Use caution when swapping failed components, as in rare cases, the failed component may cause other components to fail at the new location.

9.6 Fuses

Fuses are located in three places within the PinPoint System.

FUSE LOCATION	RATING	TYPE	COLOR
Key Switched Power Harness	5	ATO/ ATC (inline)	Tan
CapView Extension Harness	15	ATO/ ATC	Blue
VCM Extension Harness	15	ATO/ ATC	Blue

Blown fuses are indicators of a short or overload condition. Never replace a fuse with a larger fuse. Larger fuses may result in costly component failures.

9.7 Circuit Breaker

A circuit breaker is located near the battery in the Gateway Hub power cable.

CIRCUIT BREAKER LOCATION	RATING	TYPE
Battery	80 AMP	Auto or Manual Trip, Manual Reset

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

9.8 Nozzle Valves

NOTICE Plugged nozzle valves will cause error messages on the CapView.

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:

- No spray.
- Constant spray.
- Dripping when the nozzle is shut off.

NOTICE Pinched or split O-rings will also cause nozzles to drip when shutoff.

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

NOTICE If plugged nozzles are a frequent problem in a particular boom section, inspect the machine's boom filter screens for plugged or damaged screens. An 80 mesh screen is recommended to prevent nozzles from plugging. Check the mesh size of the strainers and replace strainers if they are too coarse.

9.8.1 Nozzle Valve Cleaning

[Figure 105] - Remove the ⑦ O-ring, ⑥ O-ring, ⑤ valve body, ④ flynut, ② plunger and ③ O-ring from the ① coil.

Inspect the plunger for wear or damage. Replace the plunger if it is worn or damaged.

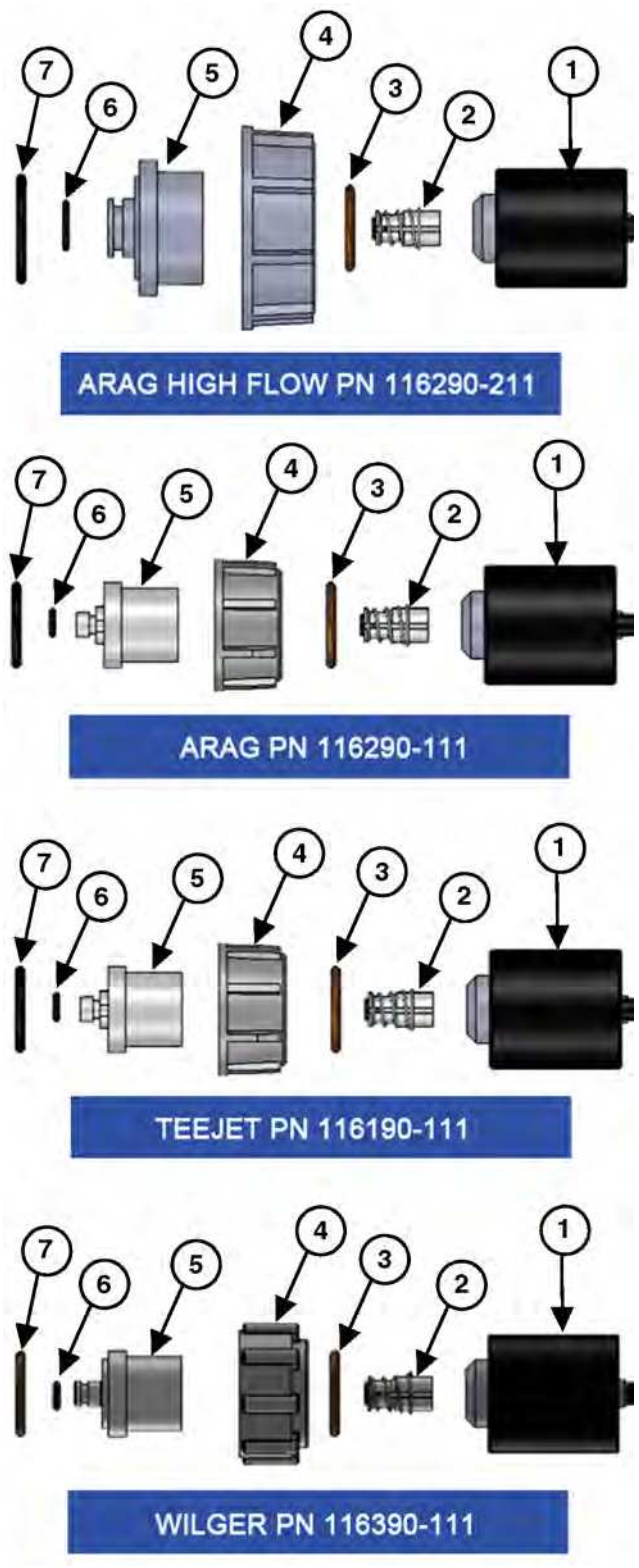
Inspect the O-rings for wear or damage. Replace any worn or damaged O-rings. For correct O-ring sizes for your nozzle valve, see 3.20 Nozzles - Types and Valve Component Identification on page 22.

NOTICE Remove debris from the nozzle components item 2-7 by washing with clean water.

WARNING

CHEMICAL RESIDUES MAY BE PRESENT IN THE OEM EQUIPMENT. RELEASE PRESSURE ON THE SPRAYER SYSTEM BEFORE SERVICING. RINSE THE SYSTEM WITH CLEAN WATER PRIOR TO INSTALLING OR SERVICING FITTINGS, HOSES, VALVES, OR NOZZLES. USE PROPER PPE AT ALL TIMES TO AVOID PERSONAL INJURY.

Figure 105: Nozzle Valve Cleaning



9.8.2 Plunger Seal Inspection

[Figure 106] - After extended use, the ① soft plunger seal will wear a groove where the seal impacts the hard orifice seat. Replace the plunger if it is 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 sprayer. The result is erratic pulsing, often described as “flickering”.

PinPoint will operate normally at lower pressures until replacement parts can be acquired. High operating pressures and abrasive spray solutions will accelerate the wear of the plunger seal material.

Figure 106: Plunger Seal Inspection

9.8.3 Coil Failure

Coil failures are often the result of:

- Extended valve use with a plugged nozzle.
- Extended use in liquid fertilizer overspray environments.

NOTICE

Capstan recommends cleaning any plugged nozzle valves immediately. Capstan also recommends rinsing the inside of the boom with clean water and washing the outside of the coils with clean water as often as practical.

[Figure 107] - Use a voltmeter to measure 21 to 23.5 ohms of resistance across pins A and B on the nozzle valve connector.

If proper resistance is not found:

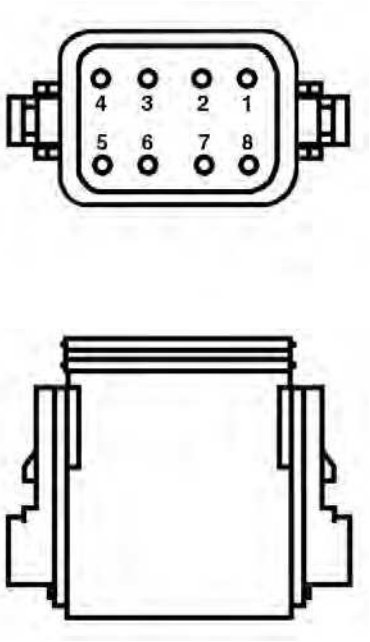
- Clean the connector terminals.
- Replace the coil.

Figure 107: Voltmeter Coil Check

9.9 CapView Pinout Identification

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

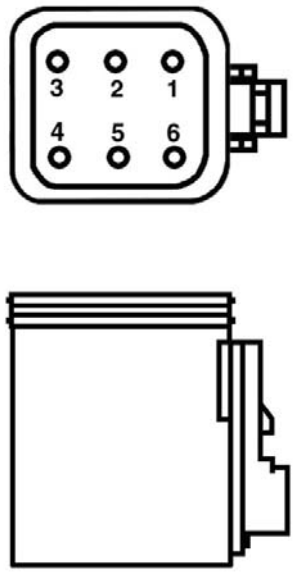
Figure 108: CapView Pinout



9.10 VCM Pinout Identification

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 109: VCM Pinout



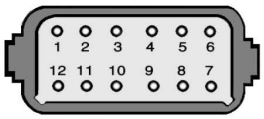
Service Bulletin - Gateway Hub Pinout Correction

9.11 Gateway Hub Pinout Identification

As of June 01, 2016

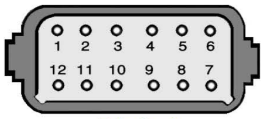
Servo Pinout 7 Corrected

NOTE: Do not connect boom harnesses or the adapter into the Serial and Digital ports.



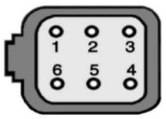
Serial

1 - RS232 Tx1
2 - RS232 Rx1
3 - GND
4 - Program DTR
5 - Program RTS
6 - Speed 1
7 - Speed 2
8 - GND
9 - 12V-Key Switched
10 - GND
11 - Rx2
12 - Tx2



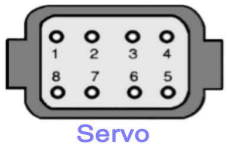
Digital

1 - ISO CAN HI
2 - ISO CAN LO
3 - 12V-Key Switched
4 - Float Switch IN
5 - GND
6 - Backup Alarm IN
7 - Digital OUT
8 - GND
9 - Digital IN
10 - 12V-Key Switched
11 - Implement Switch OUT
12 - Implement Switch IN



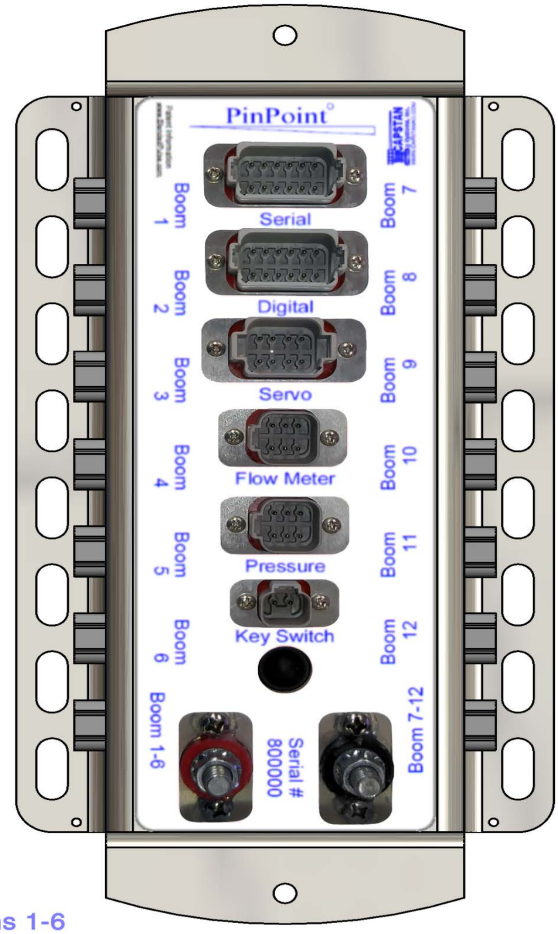
Booms 1 thru 12

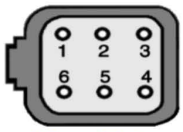
1 - 12V-Battery (Red)
2 - GND Battery (Black)
3 - Boom Section Signal (12V ON, 0V OFF)
4 - CAN HI (Yellow)
5 - CAN LO (Green)
6 - Key Switched 12V (Brown)



Servo

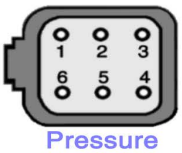
1 - Servo Power 12V (Red)
2 - Servo Input INC (Green)
3 - Servo Input DEC (Yellow)
4 - GND (Black)
5 - GND (Black)
6 - Servo Output DEC (Yellow)
7 - Servo Output INC (Green)
8 - Valve Power 12V (Red)





Flow Meter

1 - Power from Controller
2 - Signal Output to Controller
3 - GND from Controller
4 - Ground to Flow Meter
5 - Signal from Flow Meter
6 - Power to Flow Meter



Pressure

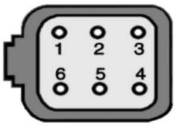
1 - 12V-Key Switched
2 - Pressure Output 1
3 - GND
4 - GND
5 - Pressure Output 2
6 - 12V-Key Switched

Key Switch

1 - 12V-Key Switched
2 - GND

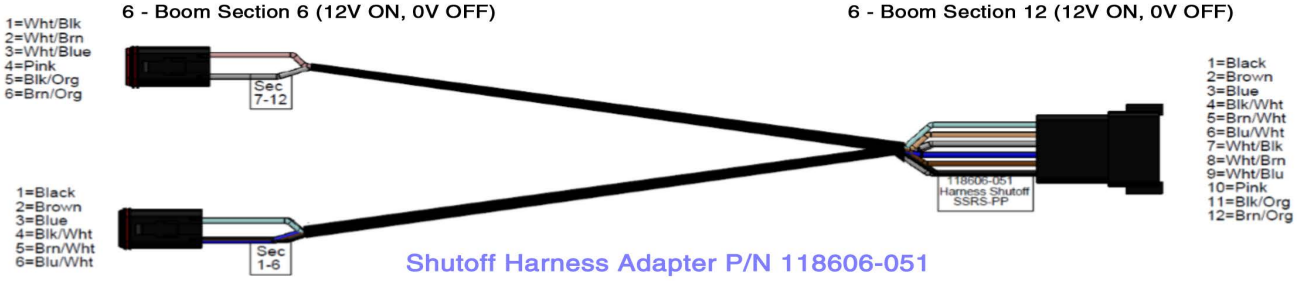
Boom Sections 1-6

1 - Boom Section 1 (12V ON, 0V OFF)
2 - Boom Section 2 (12V ON, 0V OFF)
3 - Boom Section 3 (12V ON, 0V OFF)
4 - Boom Section 4 (12V ON, 0V OFF)
5 - Boom Section 5 (12V ON, 0V OFF)
6 - Boom Section 6 (12V ON, 0V OFF)



Boom Section 7-12

1 - Boom Section 7 (12V ON, 0V OFF)
2 - Boom Section 8 (12V ON, 0V OFF)
3 - Boom Section 9 (12V ON, 0V OFF)
4 - Boom Section 10 (12V ON, 0V OFF)
5 - Boom Section 11 (12V ON, 0V OFF)
6 - Boom Section 12 (12V ON, 0V OFF)



Shutoff Harness Adapter P/N 118606-051

9.12 Battery Voltage Check

Disconnect the CapView Pigtail Harness (8-Pin Deutsch connector) located on the back of the CapView.

[Figure 110] - With the engine running, use a voltmeter to observe that there is 13.5 VDC between pins 1 and 2. Without the engine running there should only be 12.0 VDC.

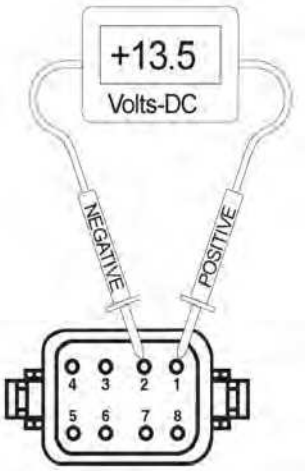
Be sure that the polarity is accurate by observing positive voltage when the Red (positive) probe is connected to pin 1 and the Black (negative) probe is connected to pin 2.

If no voltage is present between pins 2 (GND) and 6 (SWPWR):

[Figure 111] - Check the ① 5 AMP fuse located inline on the Key Switched Power Harness. If the fuse is good, remove the Key Switched Power Harness connector from the CapView Display Pigtail Harness with Switched Power connector. Check the condition of the connector pins.

- Check the 15 AMP fuse located on the CapView Extension Harness at the Gateway Hub.
- Check the 80 AMP Circuit Breaker located at the battery.
- Check the PinPoint battery harness connections.
- Check the condition of the battery and alternator.

Figure 110: Voltage Check



CapView pigtail w/switched power harness end located on back of CapView display (Male Deutsch Connector)

Figure 111: Key Switched Power Harness Fuse

120139-002 Key Switched Power Harness, Amp Plug Connector

9.13 System Load Capacity Check

1. Start the engine and turn on the CapView and all boom sections.
2. Turn on all electrical loads, including air conditioning, foam markers monitors, etc.
3. Observe the voltage readout on the Capview, system setup Line-7.
4. PinPoint 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.

9.14 VCM Voltage Check

1. Disconnect the VCM extension harness (6-Pin Deutsch connector) located at each boom section VCM.

[Figure 112] - With the engine running, use a voltmeter to observe that there is 13.5 VDC between pins 1 and 2. Without the engine running there should only be 12.0 VDC.

2. Be sure that the polarity is accurate by observing positive voltage when the Red (positive) probe is connected to pin 1, and the Black (negative) probe is connected to pin 2.

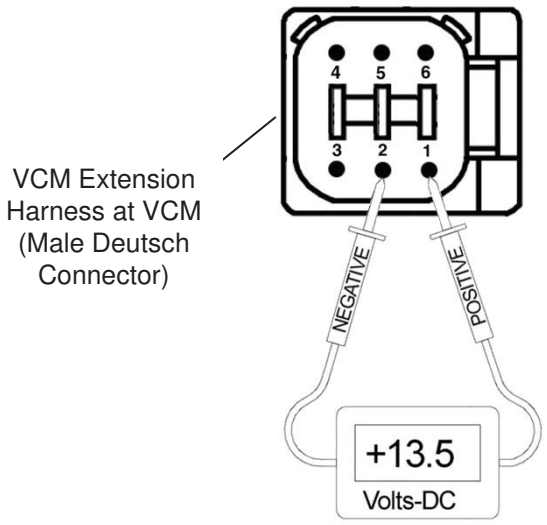
If no voltage is present:

- Check the 15 AMP fuse located on the VCM extension harness near the Gateway Hub.
- Disconnect the VCM extension harness on the Gateway Hub and check the voltage at the Gateway Hub.
- Check the 80 AMP circuit breaker located at the battery.
- Check PinPoint battery harness connections.

Check voltage between pins 2 and 6. If no voltage is present:

- Turn ON key and cab switch.

Figure 112: VCM Voltage Check



9.15 Pressure Sensor Signal Test

[Figure 113] - Disconnect the pressure sensor 3-pin connector from the Power Hub harness and then insert the Capstan pressure breakout harness diagnostic tool.

With the engine running and the pump turned on, use the spray rate controller to establish 50 PSI on the pressure gauge.

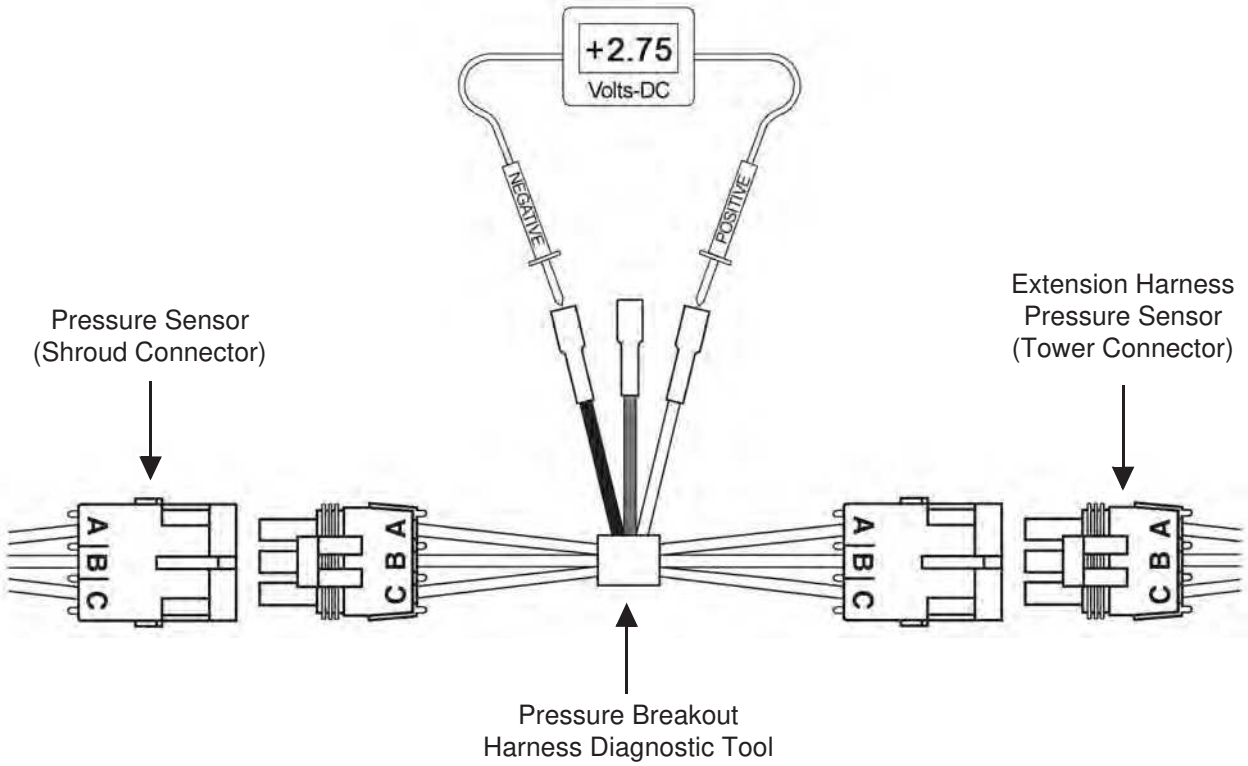
Use a voltmeter to observe that there is 2.75 VDC between the Black and white wires on the pressure breakout harness.

Using the spray rate controller, adjust the pressure to 100 PSI and observe 5.0 VDC on the voltmeter.

If accurate voltage is not present:

- Verify the accuracy of the sprayers pressure gauge.
- Check for power to the pressure sensor. See 9.15.1 Pressure Sensor Input Power Check on page 97.
- Check the pressure sensor calibration using the serial diagnostics.
- Replace the pressure sensor.

Figure 113: Pressure Sensor Signal Test



9.15.1 Pressure Sensor Input Power Check

[Figure 114] - Disconnect the pressure sensor 3-pin connector from the Power Hub harness, and then insert the Capstan pressure breakout harness diagnostic tool.

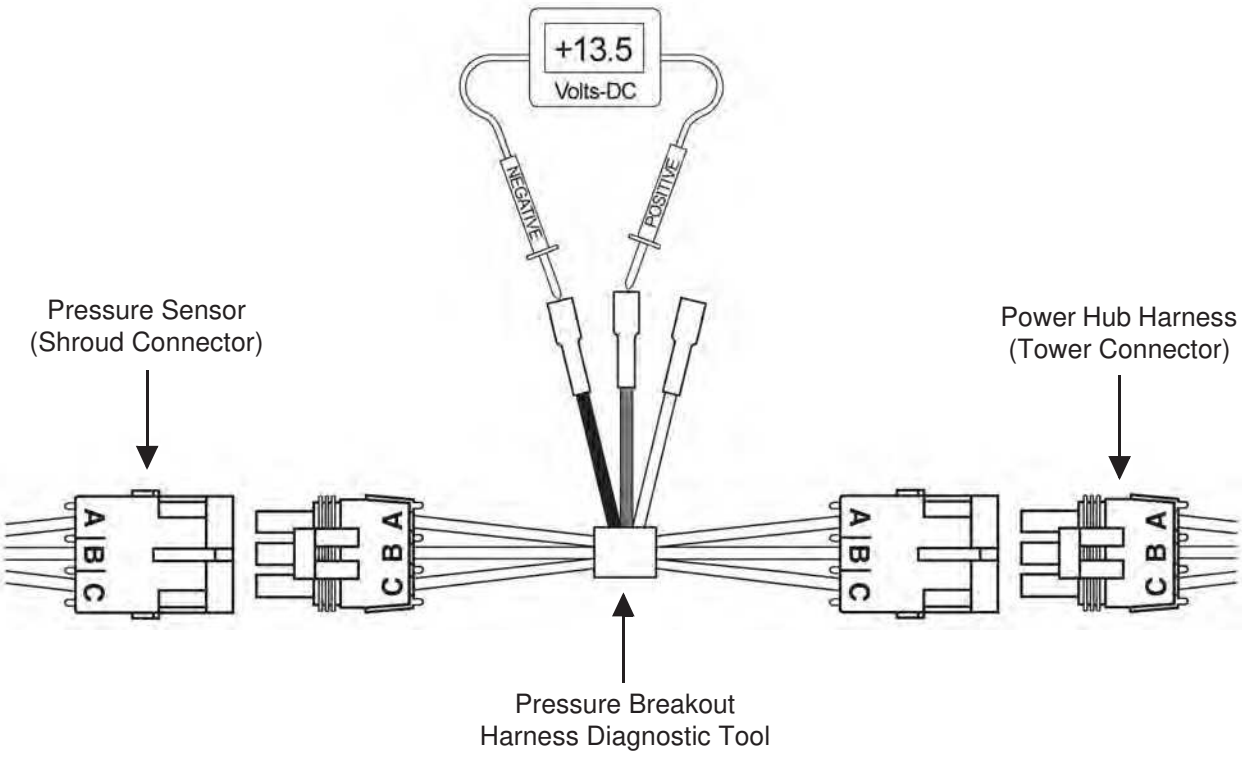
Use a voltmeter to observe that there is 13.5 VDC between the Red and Black wires on the pressure breakout harness with the engine running, or 12.0 VDC without the engine running.

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

If no voltage is present:

- Check the 80A circuit breaker located at the battery.
- Check the Power Hub battery connections.
- Check the condition of the battery.
- Check the condition of the alternator.

Figure 114: Pressure Sensor Input Power Check



9.16 Boom Shutoff Signal Check

9.16.1 VCM Shutoff Signal

1. Disconnect the VCM extension harness (6-Pin Deutsch connector) from the VCM.
2. Turn ON the boom section shutoff switch that corresponds to the VCM tested.

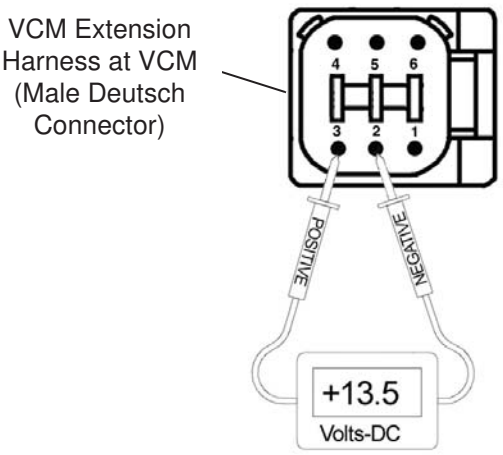
[Figure 115] - With the engine running, use a voltmeter to observe that there is 13.5 VDC between pins 2 and 3 on the extension harness. Without the engine running there should only be 12.0 VDC.

3. Be sure that the polarity is accurate by observing positive voltage when the Red (positive) probe is connected to pin 3, and the Black (negative) probe is connected to pin 2.
4. Turn OFF the boom section shutoff switch and observe the voltage disappear.

If no voltage is present:

- Check the 80 AMP circuit breaker located at the battery.
- Disconnect the VCM extension harness on the Gateway Hub and check the voltage at the Gateway Hub.
- Check PinPoint battery harness connections.
- Check the boom shutoff switches

Figure 115: VCM Voltage Signal Check



9.17 Rate Controller Troubleshooting

Symptom: Under Application

1. Tips too small

   - Verify that all nozzle valves have correct tips, and are the correct size.

   - Verify the low rates with a Wilger Quick Calibrator or with a catch / time test at each nozzle.

   Oz / min per nozzle = GPA x Test Speed in MPH x Nozzle Spacing in inches / (5940 x 128).

   Oz / min per nozzle = G/1000 ft² x Test Speed in MPH x Nozzle Spacing in inches / (136 x 128).

2. Plugged filters

   - Check the filters and replace any plugged or restricted filters.

   - Verify that each filter is correctly installed.

3. Plugged lines

   - Verify that each line is clear and free of kinks.

4. Shut-off valves partially closed

   - Verify that each shut-off valve is fully open.

5. Control Valve Type. Use A, B, C or D as it applies to your machine:

   A. Pressure set too low on flow by-pass lines

   - Verify settings on each pressure-controlled by-pass valve.

   B. In-line servo flow control valve stuck

   - Verify that the servo flow control valve is operating correctly.

   C. Servo signal wire polarity switched

   - Verify that the valve opens with a rate increase.

   - Verify that the valve closes with a rate decrease.

   D. Top PWM value set too low.

   - Adjust the rate controller PWM valve to the desired setting.

6. Electric servo valve pump control stuck

   - Verify that the electric servo pump control is operating correctly.

7. PWM spool stuck

   - Change the rate to observe whether the rate change is slow, limited or doesn't change at all. Replace as needed.

8. Worn flow meter

   - Remove the rate smoothing feature.

   - Place the rate controller in manual mode at a test speed.

   NOTICE Placing the rate controller in manual mode will lock the servo valve position (unless manually changed).

   If the rate becomes stable, then it is either a worn servo valve or PWM valve.

   If the rate continues to be unstable, it is likely flow meter signal instability.

   - Manually increase the rate.

   The rate and pressure should increase.

   If the rate does not increase, then it is either a worn servo valve or PWM valve.

   - Manually decrease the rate.

   The rate and pressure should decrease.

   If the rate does not decrease, then it is either a worn servo valve or PWM valve.

9. Worn pump

   - Speed data error.

   Incorrect speed calibration number.

   Poor GPS satellite reception / number of satellites.

   - Spraying too fast which outruns the liquid system capability.

Symptom: Over Application

1. Worn tips or tips too large

   - Verify that all nozzle valves have correct tips, and are the correct size.

   - Verify the low rates with a Wilger Quick Calibrator or with a catch / time test at each nozzle.

   Oz / min per nozzle = GPA x Test Speed in MPH x Nozzle Spacing in inches / (5940 x 128).

   Oz / min per nozzle = G/1000 ft² x Test Speed in MPH x Nozzle Spacing in inches / (136 x 128).

   - Incorrect speed calibration number.

   Adjust the speed calibration setting.

Symptom: Rate Instability

1. Check the rate controller calibration numbers

   Valve Type - Standard, Fast, PWM, PWM Close, etc.

   Valve Calibration - Refer to rate controller information to check the cal number for valve type.

2. Worn or sticking servo valve

   - Check the servo valve and replace if needed.

3. Worn or sticking PWM valve

   - Check the PWM valve and replace if needed.

4. Flow meter signal instability

   - Verify the flow meter signal.

5. Hose integrity

   - Check for plugged, kinked, or collapsed hoses. Replace as needed.

6. Controller Pressure Instability

   - To isolate the CapView Display from rate controller, put the CapView Display in Manual mode at 50%.

   Faulty controller pressure sensor

   Check the rate controller calibration numbers.

9.18 Technical Bulletin - July 11, 2001 (Revised April 12, 2006)

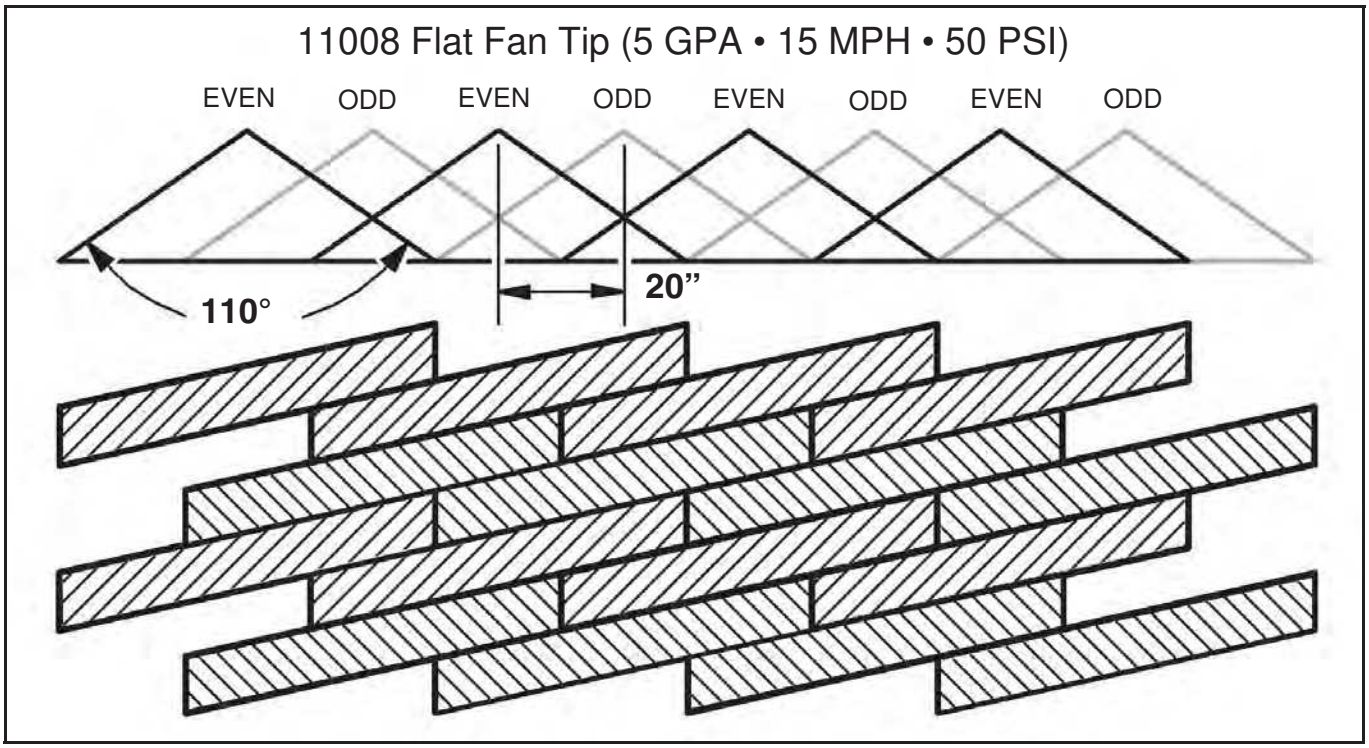
Spray Skips from Poor Pulse Blending

NOTE: For: PinPoint®, SharpShooter® Blended Pulse Spray Systems. (For additional information contact your Capstan Ag dealer.

Over the years, Capstan's field engineers have received many questions about blended pulse spraying and its potential for causing skips in the field. In rare instances, skipping has been documented in the field. This technical bulletin is intended to explain pulse blending, and the techniques used to provide optimum spray coverage in order to prevent skipping.

What is blended pulse spraying? Each nozzle in a blended pulse spray system emits 10 spray pulses per second. Adjacent nozzles have alternate timing. The alternating pulses, the overlapping spray patterns, and the natural dispersing of droplets blend together to provide consistent coverage of the target.

What makes the pulses blend? Below is an illustration of what a blended pulse spray pattern might look like if it were sprayed upon a flat surface. This spray pattern is similar to a #8 size flat fan spray tip (with a 110 degree fan angle) that is spraying 5 GPA at 15 MPH with a 50 PSI boom pressure. The nozzles are 20” apart. Each tip is rotated 12.5 degrees to prevent pattern interference between the nozzles. The minimum boom height is 21” above the spray target.

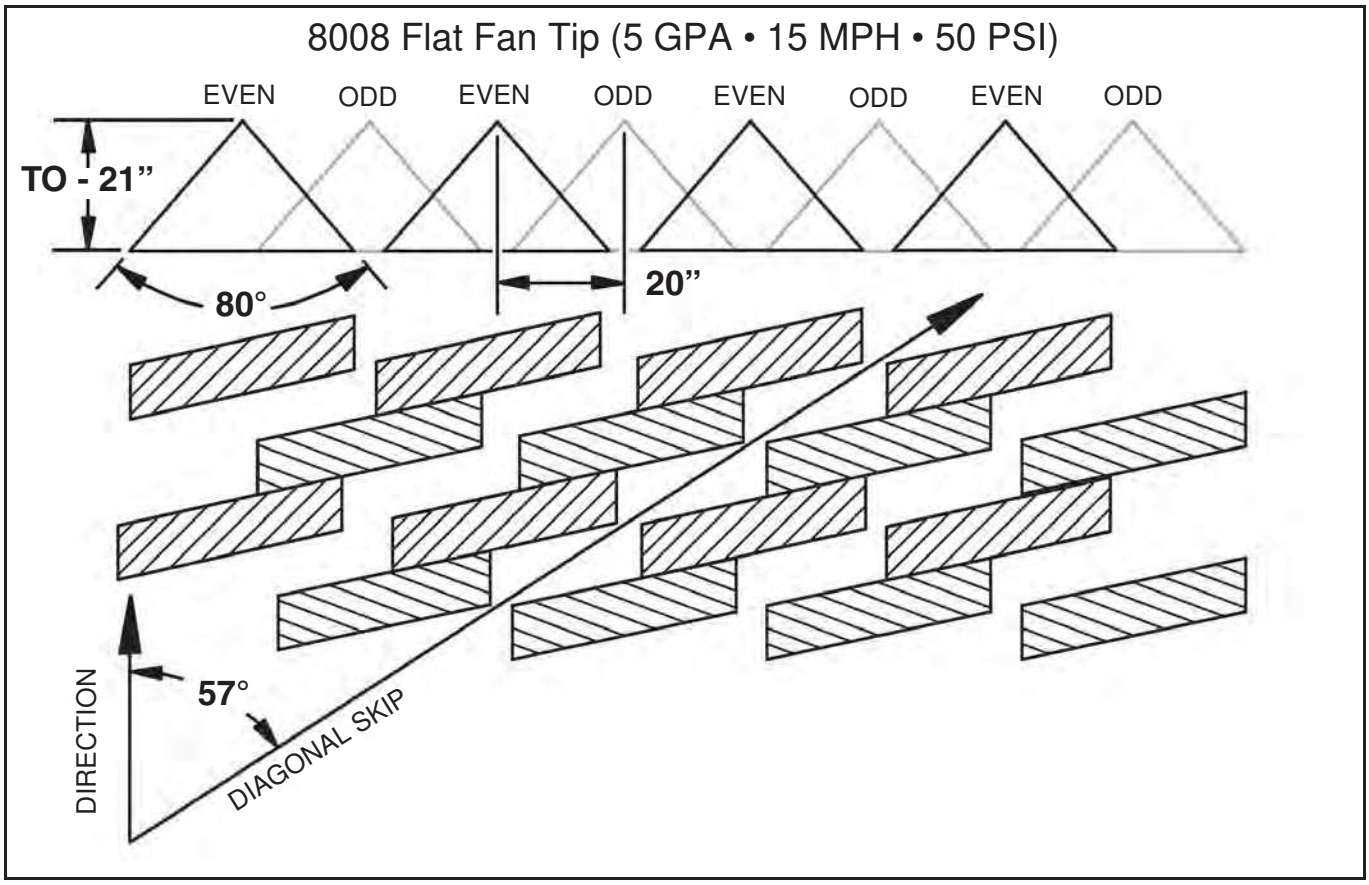


In this example, each nozzle sprays 1/3 of the time, but the adjacent nozzles alternate and overlap to fill in the areas between the nozzles. As the sprayer increases speed, rate, or boom height, the pulses become wider. This provides additional overlap, better pulse blending, and increased spray coverage.

As the sprayer decreases speed or rate, skips may begin to appear. For this example, a smaller tip size would be recommended if slower speeds are desired.

Pattern width and natural droplet dispersion are not shown in the diagram. These factors help to smooth out the pulses and fill in the skips. The amount of droplet dispersion depends on the style of tip being used. For example, low-drift tips typically emit large droplets and provide minimal droplet dispersion.

What causes skipping? On the following page is the same illustration from the this page, except that 80 degree fan angle tips are used rather than 110 degree tips. In this case, the 21” boom height doesn’t provide adequate nozzle overlap and skips can be seen. Tips emitting small droplets, with plenty of droplet dispersion, will fill in large skips. Large droplet tips may not fill in the skips, and this may result in poor coverage. The skips appear as diagonal lines in the direction of travel. The angle of the diagonal depends upon the speed of the sprayer.



To Prevent Skipping:

1. Use wide-angle spray tips and appropriate boom heights to provide 150% nozzle overlap.
   - For 80 degree tips, use 36" or greater boom height.
   - For 110 degree tips, use 21" or greater boom height.
   - Use pressures which fully develop the intended fan angle.
2. Avoid pulse duty cycles below 33%.
   - Use appropriately sized spray tips for the desired speed, rate, and pressure ranges.
   - Avoid speeds in the lower 1/3 of the speed range.
   - Avoid rates in the lower 1/3 of the rate range.
3. Use additional caution when using drift control tips or drift control additives which increase droplet size and reduce droplet dispersion. Carefully observe the boom height, duty cycle, and tip selection recommendations to ensure adequate spray coverage.
4. **Always read and follow chemical label instructions!** Agronomic and environmental factors significantly affect the efficiency of the chemicals, and will magnify the adverse effects of poor coverage. Carefully observe boom height, duty cycle, and tip selection recommendations for hot and dry field conditions, large / mature weed pressures, etc.
5. Always apply blended pulse broadcast sprays using a 10Hz or greater pulse frequency! When uniform coverage is not required, Capstan's “Commander” module, SharpShooter Pulse Generator and CapView allow the pulse frequency to be reduced for non-sprayer applications.

10.0 WARRANTY POLICY

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.

10.1 EXTENDED WARRANTY POLICY

CAPSTAN EXTENDED WARRANTY PROGRAM

W10001-001

Capstan is pleased to announce an extended warranty offering for our retrofit sprayer systems. The program will be contingent upon the submission of a warranty form and will add an additional 3 years of coverage on top of Capstan's current warranty for a total of 4 years of coverage.

[1]**Items covered** under the extended warranty are the electric components of the system such as modules, nodes, cab interfaces, circuit boards, sensors, coils, and remotes. The covered item part numbers and descriptions are shown below for reference. [2]**Items not covered** under the warranty are harnesses, connectors, plungers, o-rings, valve bodies, or whole valve assemblies unless it can be shown that any damage is not a result of normal wear and tear or negligence but are a direct result of manufacturing or assembly issues.

The extended warranty may be purchased any time within 6 months of purchasing the system and must be purchased through the system-selling dealer. The price for the warranty will be $2,250.00 USD and will include a $200.00 USD deductible per warranty claim to be managed and collected by the servicing dealer which will go into effect during the first year of the extended warranty period. The warranty will also be transferable in the event that the system or machine with the system is sold. The transferable coverage is contingent on the new owner submitting a new warranty registration with the machine and system details for tracking purposes.

As a bonus for purchasing the extended warranty, Capstan will provide a full set of Wilger spray nozzles, including adapters if needed, for the covered sprayer as well as provide a personal tip selection session to ensure the tips align with chemical label and performance expectations.

CAPSTAN PART NO.	WARRANTY COVERED PART DESCRIPTION*
116149-012	Module, Slave, Commander
116150-011	Module, Master, Commander
116175-011	Module, Pressure, Commander
116189-111	Valve, Coil Assy, 7W, OM
116301-001	Pressure Sensor Assy, 100 PSI, 0.5-5V, 1/4" MNPT, WP
118400-004	Module, Valve Driver, SSRS, 6 Pin DT, Sq, Logo
118400-129	Module, VCM, PinPoint 9 Nozzle x 20"
118400-131	Module, VCM, PinPoint 9 Nozzle x 15"
118550-002	Display, SharpShooter w/RS, Assembly
118600-012	Power Hub, SSRS. 12 Section, DT
118640-025	Gateway, Hub, PinPoint, 12 Section
118640-040	Key FOB, PinPoint, with Key Chain
119101-001	Module, Control Bypass
120010-001	Display, CapView, PP
625147-011	Coil Assy, 12W, OM

*Disclaimer- Credits or replacements will only be given for the components listed above. The parts listed may undergo design changes and new parts or part numbers may be added to the list with updated hardware configurations without notification to the warranty holder. Warranty holders are entitled to have defective components repaired or replaced with compatible parts for their system. If any part number on this list is discontinued and unavailable, Capstan will replace the component with the equivalent, upgraded, or current version of that component and any associated software required for operation. [1]If warranted parts are shown through testing to not be failed, the warranty holder may decide to have the questioned component shipped back and reinstalled. If a replacement part has been shipped and installed already, a bill for the replacement parts will be sent to the servicing dealer for the full list price of the component less any dealer discounts applicable until Capstan receives back the replacement component in good working order. If the component sent in for warranty is shown to have failed because of abuse through negligence or damaged for any reason other than normal wear and tear or manufacturing defect, a bill for the full list price of the component less any applicable dealer discount plus any applicable shipping cost will be sent to the dealer for a replacement part. [2]If unwarranted parts are sent in with the warranted components in the form of an assembly, those components will be returned to the servicing dealer and the dealer will be billed for any associated freight or shipping charges.

10.2 CAPSTAN AG SYSTEMS EXTENDED WARRANTY FORM

12 Month Warranty	☐	
36 Month Extended Warranty	☐	Contact dealer for pricing

Owner Information	
First Name or Company Name	
Last Name	
Address	
Address	
City	
State/Province	
Zip	
Phone Number	
Email Address	

Machine Information	
Machine Brand and Model Number	
Machine Serial Number	
Machine Boom Length	
Machine Number of Boom Sections	
Boom Nozzle Spacing	

Servicing Dealer Information	
Dealership Name	
City	
State/Province	
Dealer Contact Name	

Capstan System Information	
System Purchase Date	
System Type (PinPoint, SharpShooter w/Rate Sync, Commander, etc.)	
Extended Warranty Coverage Begin Date (12 months after system purchase date)	
Extended Warranty Coverage End Date (Expires 48 months after system purchase date)	

Serial Number Information

Part Name/Description	Serial Number (Fill in all that apply)	Part Name/Description	Serial Number (Fill in all that apply)
Gateway Hub		Valve Control Module (VCM) #3	
Power Hub		Valve Control Module (VCM) #4	
CapView Display		Valve Control Module (VCM) #5	
SharpShooter w/Rate Sync Display		Valve Control Module (VCM) #6	
Commander Master Module		Valve Control Module (VCM) #7	
Commander Slave Module		Valve Control Module (VCM) #8	
Commander Slave Module		Valve Control Module (VCM) #9	
Commander Pressure Module		Valve Control Module (VCM) #10	
Pressure Sensor		Valve Control Module (VCM) #11	
Valve Control Module (VCM) #1		Valve Control Module (VCM) #12	
Valve Control Module (VCM) #2		Valve Control Module (VCM) #13	

Dealership Representative Signature		Customer Signature	
Date		Date	

For Capstan Internal use only*

Invoice/SO#		Customer PO#	

11.0 TIP SELECTION CHARTS

BLENDED PULSE TIP SELECTION GUIDE: SPEED RANGE (ENGLISH)

CAPSTAN AG SYSTEMS, INC.
SINCE 1893
APPLICATION SYSTEMS FOR PROFESSIONALS

Always verify actual spray rates before applying chemicals on the field.

Use wide-angle tips (110 degrees) and appropriate boom heights to provide 100% nozzle overlap.

Stay within the recommended speed ranges to prevent skips and inconsistent spray patterns.

Actual speed range depends on machine design and limitations.

Chart data is based on tip manufacturer's published data. Capstan Ag does not guarantee the accuracy of the tip manufacturer data nor the droplet classification. DO NOT USE AI TIPS

Operator is responsible for the understanding and proper use of this chart.

Operator is responsible to follow chemical labels, tip manufacturer and governmental requirements.

Orifice Size	Flow US gpm	PSI Range	PSI Tip	Speed Range, mph 3 GPA	5 GPA	8 GPA	10 GPA	15 GPA	20 GPA
03	0.208	20	19	5.2 to 20.6	3.1 to 12.4	1.9 to 7.7	1.2 to 6.2	0.8 to 4.1	0.6 to 3.1
	0.255	30	29	6.3 to 25.3	3.8 to 15.2	2.4 to 9.5	1.5 to 7.6	1.0 to 5.1	0.8 to 3.8
	0.295	40	39	7.3 to 29.2	4.4 to 17.5	2.7 to 10.9	1.7 to 8.7	1.2 to 5.8	0.9 to 4.4
	0.329	50	48		4.9 to 19.6	3.1 to 12.2	2.0 to 9.8	1.3 to 6.5	1.0 to 4.9
	0.361	60	58		5.4 to 21.4	3.3 to 13.4	2.1 to 10.7	1.4 to 7.1	1.1 to 5.4
04	0.274	20	19	6.8 to 27.1	4.1 to 16.3	2.5 to 10.2	1.6 to 8.1	1.1 to 5.4	0.8 to 4.1
	0.335	30	28		5.0 to 19.9	3.1 to 12.5	2.0 to 10.0	1.3 to 6.6	1.0 to 5.0
	0.387	40	38		5.8 to 23.0	3.6 to 14.4	2.3 to 11.5	1.5 to 7.7	1.2 to 5.8
	0.433	50	47		6.4 to 25.7	4.0 to 16.1	2.6 to 12.9	1.7 to 8.6	1.3 to 6.4
	0.474	60	56		7.0 to 28.2	4.4 to 17.6	2.8 to 14.1	1.9 to 9.4	1.4 to 7.0
05	0.336	20	18		5.0 to 20.0	3.1 to 12.5	2.0 to 10.0	1.3 to 6.7	1.0 to 5.0
	0.412	30	27		6.1 to 24.5	3.8 to 15.3	2.4 to 12.2	1.6 to 8.2	1.2 to 6.1
	0.476	40	36		7.1 to 28.3	4.4 to 17.7	2.8 to 14.1	1.9 to 9.4	1.4 to 7.1
	0.532	50	45			4.9 to 19.8	3.2 to 15.8	2.1 to 10.5	1.6 to 7.9
	0.583	60	54			5.4 to 21.6	3.5 to 17.3	2.3 to 11.5	1.7 to 8.7
06	0.396	20	17		5.9 to 23.5	3.7 to 14.7	2.4 to 11.8	1.6 to 7.8	1.2 to 5.9
	0.485	30	26		7.2 to 28.8	4.5 to 18.0	2.9 to 14.4	1.9 to 9.6	1.4 to 7.2
	0.560	40	35			5.2 to 20.8	3.3 to 16.6	2.2 to 11.1	1.7 to 8.3
	0.626	50	43			5.8 to 23.2	3.7 to 18.6	2.5 to 12.4	1.9 to 9.3
	0.685	60	52			6.4 to 25.4	4.1 to 20.4	2.7 to 13.6	2.0 to 10.2
08	0.503	20	16			4.7 to 18.7	3.0 to 14.9	2.0 to 10.0	1.5 to 7.5
	0.616	30	24			5.7 to 22.9	3.7 to 18.3	2.4 to 12.2	1.8 to 9.1
	0.711	40	32			6.6 to 26.4	4.2 to 21.1	2.8 to 14.1	2.1 to 10.6
	0.795	50	39			7.4 to 29.5	4.7 to 23.6	3.1 to 15.7	2.4 to 11.8
	0.871	60	47				5.2 to 25.9	3.4 to 17.2	2.6 to 12.9
10	0.728	30	21			6.8 to 27.0	4.3 to 21.6	2.9 to 14.4	2.2 to 10.8
	0.840	40	28				5.0 to 25.0	3.3 to 16.6	2.5 to 12.5
	0.939	50	35				5.6 to 27.9	3.7 to 18.6	2.8 to 14.0
	1.029	60	42				6.1 to 30.6	4.1 to 20.4	3.1 to 15.3
12.5	0.843	30	18				5.0 to 25.0	3.3 to 16.7	2.5 to 12.5
	0.973	40	24				5.8 to 28.9	3.9 to 19.3	2.9 to 14.4
	1.088	50	30					4.3 to 21.5	3.2 to 16.2
	1.192	60	36					4.7 to 23.6	3.5 to 17.7
15	0.933	30	15				5.5 to 27.7	3.7 to 18.5	2.8 to 13.9
	1.078	40	21					4.3 to 21.3	3.2 to 16.0
	1.205	50	26					4.8 to 23.9	3.6 to 17.9
	1.320	60	31					5.2 to 26.1	3.9 to 19.6

**Based on 20-inch Tip Spacing

BLENDED PULSE TIP CHART (ENGLISH)

Droplet Classification	F 135-235	M 235-340	C 340-400	VC 400-500	XC >500
Mode of Action	Fungicide	Insecticide	Contact Herbicide	Systematic Herbicide	Fertilizer

Tip Info			Wilger www.wilger.net				TeeJet www.teejet.com				Hypro www.hypropumps.com					
Orifice Size	PSI Gage	PSI Tip	ER 110	SR 110	MR 110	DR 110	XR/XRC 110	TJ 110	TT/2XTT 110	TTJ60 110	TR 110	F 110	VP 110	ADI 110	GRD 120	LD 110
03	20	19	F	C			M		VC	VC	M		M	C	C	C
	30	29	F	M	C	VC	M	F	C	C	M	M	M	M	C	C
	40	38	F	M	C	VC	M	F	C	C	F	F	F	M	C	M
	50	47	F	M	MR	VC	F	F	M	C	F	F	F	M	C	M
	60	56	F	M	MR	C	F	F	M	C	F	F	F	M	M	M
04	20	19	M	C			M		VC	VC	M		M		C	C
	30	28	F	M	VC	XC	M	F	C	C	M	M	M	VC	C	C
	40	38	F	M	C	VC	M	F	C	C	F	M	M	C	C	M
	50	47	F	M	C	VC	M	F	C	C	F	M	M	C	C	M
	60	56	F	M	MR	VC	M	F	C	C	F	F	F	C	C	M
05	20	18	M	VC			M		VC	VC	C		C		C	C
	30	27	F	C	XC	XC	M		VC	C	M	M	M		C	C
	40	36	F	M	VC	XC	M		C	C	F	M	M		C	C
	50	45	F	M	VC	XC	M		C	C	F	M	M		C	C
	60	54	F	M	C	VC	M		C	C	F	M	M		C	M
06	20	17	M	XC			C	M	XC	XC	C		C		VC	C
	30	26	M	VC	XC	XC	M	M	VC	VC	C	M	C		C	C
	40	35	M	C	VC	XC	M	M	C	C	M	M	M		C	C
	50	44	M	C	VC	XC	M	M	C	C	M	M	M		C	C
	60	52	F	M	VC	VC	M	M	C	C	M	M	M		C	C
08	20	16	C	XC			C	M	XC		C		C		XC	VC
	30	24	M	VC	XC	XC	C	M	VC		C	C	C		VC	C
	40	32	M	VC	XC	XC	C	M	VC		M	C	M		C	C
	50	39	M	C	VC	XC	M	M	C		M	C	M		C	C
	60	47	M	C	VC	XC	M	M	C		M	C	M		C	C
10	30	21	C	XC	XC	XC		C			C	C	C			
	40	28	M	VC	XC	XC		M			M	C	C			
	50	35	M	VC	VC	XC		M			M	C	M			
	60	42	M	VC	VC	XC		M			M	C	M			
12.5	40	24	VC	XC	XC	XC										
	50	30	VC	VC	XC	XC										
	60	36	VC	VC	XC	XC										
15	40	21	VC	XC	XC	XC					C	C	C			
	50	26	VC	XC	XC	XC					C	C	C			
	60	31	VC	XC	XC	XC					M	C	M			

CAPSTAN AG SYSTEMS, INC. SINCE 1893
APPLICATION SYSTEMS FOR PROFESSIONALS

www.CapstanAg.com
Marketing@CapstanAg.com
4225 SW Kirklawn Ave
Topeka, KS 66609
Toll-Free (855) 628-7722

11.1 PinPoint Setup Sheet

NO.	DESCRIPTION	DEFAULT	ACTUAL	NO.	DESCRIPTION	DEFAULT	ACTUAL
1	Operation Mode	SharpShooter		29	Backup Detection Method	OFF=FWD GPS Turn	
2	Controller Gallon Counter	-		30	Overlap Distance	60	
3	Actual Gallon Counter	-		31	Look Ahead Time	0.5 sec	
4	Control Gallons Per Minute	-		32	Look Ahead Distance	0.0 m	
5	Actual Gallons Per Minute	-		33	Zero Rate	Shutoff	
6	Pressure 1	-		34	Pressure Shutoff Limit	8.0 PSI	
7	System Voltage	-		35	Pressure Turn-On Limit	10.0 PSI	
8	Hour Meter	-		36	Pressure Control Hold	3 sec	
9	Compass Heading	-		37	PSI Sensor 1 Min. Volt	0.5 VDC	
10	Compass Offset	-		38	PSI Sensor 1 Max. Volt	5.0 VDC	
11	USB Mode	Thumb Drive		39	PSI Sensor 1 Min. Pressure	0 PSI	
12	Display Backlight	10		40	PSI Sensor 1 Max. Pressure	100 PSI	
13	LED Brightness	5		41	PSI Sensor 1 Offset	0.0 PSI	
14	Beeper Volume	5		42	Rate Sync® Mode	Speed	
15	Specific Gravity	1.00		43	Rate Sync® Average	0.1	
16	Deadband PSI	0		44	Rate Sync® Max Ground Speed	25	
17	Gain - Proportional	5.0		45	Servo Minimum DC%	23%	
18	Gain - Integral	0.5		46	Servo Maximum DC%	78%	
19	Gain - Differential	0.0		47	Nozzle Pulse Frequency	10.0 Pulse/s	
20	Gain System	3.0		48	Nozzle PWM Minimum	10%	
21	Total Number Valves Expected	-		49	Nozzle PWM Maximum	100%	
22	Scrolling Enable/ Disable	Enabled		50	Flowmeter Minimum GPM	10 GPM	
23	Valve Diagnostics Enable	Enabled		51	Flowmeter Output Type	Correction	
24	Boom Switch Activation	12 V Active		52	Flowmeter Calibration	1400 P/ 10 GAL	
25	GPS-Antenna Ahead Axle	See Page 54.		53	Units	US	
26	GPS-Antenna Right of Center	See Page 54.		54	Baud Rate	-	
27	GPS Antenna Above Ground	See Page 54.		55	Program Revision	-	
28	GPS Boom Ahead of Rear Axle	See Page 54.		56	Factory Reset	-	

Record your Location Setup information for later use performing a Factory Reset or troubleshooting the system.

Machine Type: _____

VCM ORIENTATION

Boom Section #1

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Boom #2 _____

Boom Section #2

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #1 _____

Move these nozzles to Soft Boom #3 _____

Boom Section #3

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #2 _____

Move these nozzles to Soft Boom #4 _____

Boom Section #4

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #3 _____

Move these nozzles to Soft Boom #5 _____

Boom Section #5

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #4 _____

Move these nozzles to Soft Boom #6 _____

Boom Section #6

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #5 _____

Move these nozzles to Soft Boom #7 _____

Boom Section #7

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #6 _____

Move these nozzles to Soft Boom #8 _____

Record your Location Setup information for later use performing a Factory Reset or troubleshooting the system.

Boom Section #8 VCM ORIENTATION

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Boom #7 _____

Move these nozzles to Boom #9 _____

Boom Section #9

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #8 _____

Move these nozzles to Soft Boom #10 _____

Boom Section #10

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #9 _____

Move these nozzles to Soft Boom #11 _____

Boom Section #11

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #10 _____

Move these nozzles to Soft Boom #12 _____

Boom Section #12

LH VCM SN: _____ Nozzle Qty. _____

RH VCM SN: _____ Nozzle Qty. _____

Move these nozzles to Soft Boom #11 _____

12.0 GENERAL SYSTEM LAYOUT PART NUMBERS

PINPOINT SHARPSHOOTER MODE SYSTEM

Item	PN	Description	Qty.
1	120010-001	CapView Display, PP	1
2	118640-025	Gateway Hub, PP	1
3	116301-001	Sensor Assy., Pressure, 100 PSI, 0.5-5V	1
4	118676-001	Harness, Battery 40’	1

VCM KITS

Item	PN	Description	Qty.
5	118400-129	Module, VCM, PP 9 Nozzle x 20”	As Req.
	118250-020	Module, VCM, PP 18 Nozzle x 20”	
	118400-131	Module, VCM, PP 9 Nozzle x 15”	
	118250-015	Module, VCM, PP 18 Nozzle x 15”	
Item	**PN**	**Description**	**Qty.**
6	118640-032	Y-Adapter	2
7	118650-005	Harness, Ext 6 cond x 5’	As Req.
	118650-010	Harness, Ext 6 cond x 10’	As Req.
	118650-020	Harness, Ext 6 cond x 20’	As Req.
	118650-030	Harness, Ext 6 cond x 30’	As Req.
	118650-040	Harness, Ext 6 cond x 40’	As Req.
	118650-050	Harness, Ext 6 cond x 50’	As Req.
	118650-060	Harness, Ext 6 cond x 60’	As Req.
	118650-070	Harness, Ext 6 cond x 70’	As Req.
	118650-080	Harness, Ext 6 cond x 80’	As Req.
	118650-090	Harness, Ext 6 cond x 90’	As Req.
	118650-100	Harness, Ext 6 cond x 100’	As Req.
	118650-110	Harness, Ext 6 cond x 110’	As Req.
	118650-120	Harness, Ext 6 cond x120’	As Req.
8	118657-001	Harness, PSI Adapter	1
9	120139-001	Harness, CapView Display Pigtail w/Switch Power, 10’	1
10	118604-006	Kit, Circuit Breaker 80 A	1
11	116190-111	Valve Assy (Tee Jet)	As Req.
	116290-111	Valve Assy (Arag)	As Req.
	116390-111	Valve Assy (Wilger)	As Req.
	116290-211	Valve Assy (Arag High Flow)	As Req.
12	116200-045	Plug, 2-Pin Tower	As Req.

FLOWMETER HARNESS

Item	PN	Description	Qty.
13	118660-002	Harness, FM PP, RoGator 3 pin DT	As Req.
	118652-001	Harness, FM PP, 3 pin DTM	
	118659-002	Harness, FM PP, JD R-Seies 27’	
	118659-001	Harness, PP, JD, 10’	
	118660-001	Harness, FM, PP, Raven 3 pin DT Conxall	

SHUTOFF HARNESS, DT

Item	PN	Description	Qty.
14	118606-001	Pigtail, SSRS, 6 Pin Shroud	As Req.
	118606-002	Case SPX	
	118606-101	Apache, Pre 2011, 1-10 Section	
	118606-102	Apache, 2011-2017, 1-10 Section	
	118606-200	RoGator, 90' & 100', 5 Section	
	118606-201	RoGator, 120', 7 Section	
	118606-203	RoGator, RG700 Series	
	118606-204	RoGator, RG900, RG1100, RG1300	
	118606-308	JD 4630 5 Section	
	118606-300	JD 4730 & JD 4830, 7 Section	
	118606-301	JD 4940 11Section	
	118606-302	JD 4930 Ground Switched	
	118606-303	JD 4720	
	118606-304	JD, R Series, 7 Section	
	118606-305	JD, R Series, 9 Section	
	118606-306	JD, R Series, 11 Series	
	118606-400	New Holland/Miller, Pre 2013, 1-10 Section	
	118606-401	New Holland/Miller, 2013+, 1-10 Section	
	118606-500	Harness, Shutoff, Hagie, 120’, 9 Section	
	118606-501	Harness, Shutoff, Hagie, 90’-100’, 9 Section	

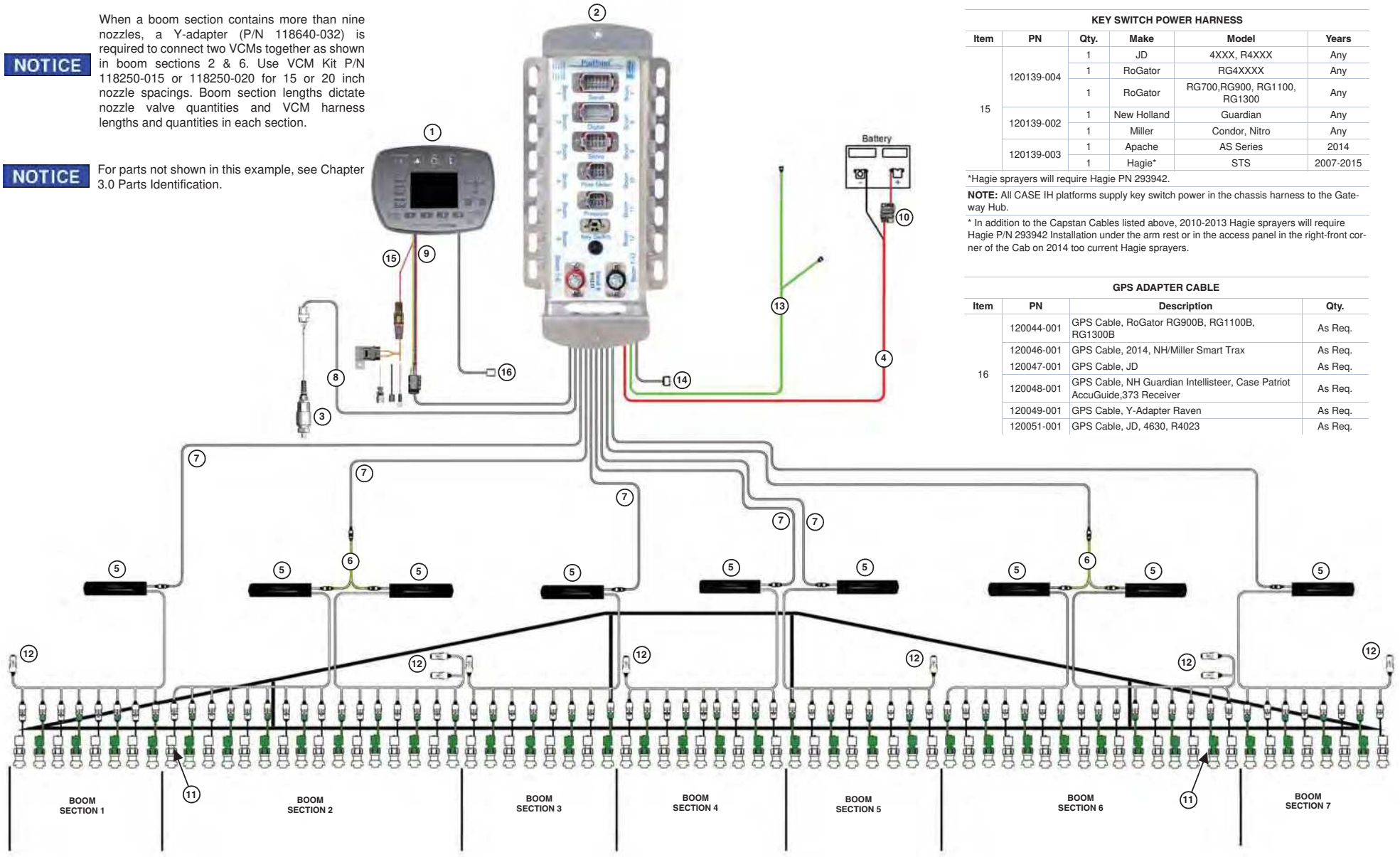
12.1 PINPOINT® SHARPSHOOTER® MODE GENERAL SYSTEM LAYOUT

NOTICE

When a boom section contains more than nine nozzles, a Y-adapter (P/N 118640-032) is required to connect two VCMs together as shown in boom sections 2 & 6. Use VCM Kit P/N 118250-015 or 118250-020 for 15 or 20 inch nozzle spacings. Boom section lengths dictate nozzle valve quantities and VCM harness lengths and quantities in each section.

NOTICE

For parts not shown in this example, see Chapter 3.0 Parts Identification.



KEY SWITCH POWER HARNESS

Item	PN	Qty.	Make	Model	Years
15	120139-004	1	JD	4XXX, R4XXX	Any
		1	RoGator	RG4XXXX	Any
		1	RoGator	RG700,RG900, RG1100, RG1300	Any
	120139-002	1	New Holland	Guardian	Any
		1	Miller	Condor, Nitro	Any
	120139-003	1	Apache	AS Series	2014
		1	Hagie*	STS	2007-2015

*Hagie sprayers will require Hagie PN 293942.

NOTE: All CASE IH platforms supply key switch power in the chassis harness to the Gateway Hub.

* In addition to the Capstan Cables listed above, 2010-2013 Hagie sprayers will require Hagie P/N 293942 Installation under the arm rest or in the access panel in the right-front corner of the Cab on 2014 too current Hagie sprayers.

GPS ADAPTER CABLE

Item	PN	Description	Qty.
16	120044-001	GPS Cable, RoGator RG900B, RG1100B, RG1300B	As Req.
	120046-001	GPS Cable, 2014, NH/Miller Smart Trax	As Req.
	120047-001	GPS Cable, JD	As Req.
	120048-001	GPS Cable, NH Guardian Intellisteer, Case Patriot AccuGuide,373 Receiver	As Req.
	120049-001	GPS Cable, Y-Adapter Raven	As Req.
	120051-001	GPS Cable, JD, 4630, R4023	As Req.

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APPLICATION SYSTEMS FOR PROFESSIONALS

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