CapstanAG™

PinPoint™ II

Spray Application

Configurations:
Synchro™ Mode
SharpShooter™ Mode

Operator Manual

122200-210 Rev. D | Revised 02/2020 |

Thank you for your business!

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

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

Service Contact Information

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

System Purchased: _____

Dealer: _____

Contact: _____

Phone: _____

Address: _____

City,State/Province, Zip: _____

Factory Service/Repairs

CapstanAG
4225 S.W. Kirklawn Ave. | Topeka, KS 66609
Hours: 8:00 a.m. to 4:00 p.m. CST
Toll-free number: (855) 628-7722 | Fax: (785) 232-7799
CapstanAG.com | CapstanAG.ca
prodsupport@capstanag.com

Contents

Chapter 1: Introduction

This Manual

This manual includes operation, maintenance, and installation information for the system you purchased.

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

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

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

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

This manual contains important information on how to safely and correctly install, operate, and maintain CapstanAG products. 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 manual(s) from the Original Equipment Manufacturer (OEM).

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

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

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

Read, understand, and review the procedures in this manual and OEM manual(s). Use the Safety Data Sheets (SDS) and the required Personal Protective Equipment (PPE) for hazardous chemicals.

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

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

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

System Identification

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

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

Chapter 2: Safety

Signal Words

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

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

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

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

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

Emergency Safety

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

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

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

Inspect the fire extinguisher and service the fire extinguisher regularly.

Follow the recommendations on the instructions plate.

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

Personal Protective Equipment

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

Safety Signs

Fig. 1:

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

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

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

Pressurized Fluid Lines

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

Chemical Safety

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

Battery Safety

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

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

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

Chapter 3: Warranty

Limited Warranty

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, 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 CapstanAG product can be performed by any company, we recommend that you use only authorized CapstanAG 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.

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.

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 #, 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 am to 4:30 pm CST

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.[1]

[1] Rev. Date 7/15/2014

Chapter 4: System Installation

Prepare for Installation and Setup

CAUTION: Before installation, operation, or service to the system, read and understand the machine's operator manual and the system operator manual. Chemical residue may be present on/in the OEM equipment. Use the correct personal protective equipment.

Important: Before installation, make sure that all parts are included in the shipping boxes using the list of parts included in the order.

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

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

The VCMs are tagged and marked for the appropriate boom sections (1 to 11, etc.). Make sure that the VCMs are installed on the appropriate boom sections. Boom section 1 is the leftmost boom when at the back of the machine facing the front of the machine.

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

- Never use Air Induction (AI) spray tips.
- When routing nozzle harnesses and other wiring through the boom fold and swing joints, allow for boom joints to operate without damaging harnesses.
- Use the correct tip choices.
- If a boom section has more than one VCM, the VCM with the lowest serial number should be placed on the left.

Tip Selection and Capacities

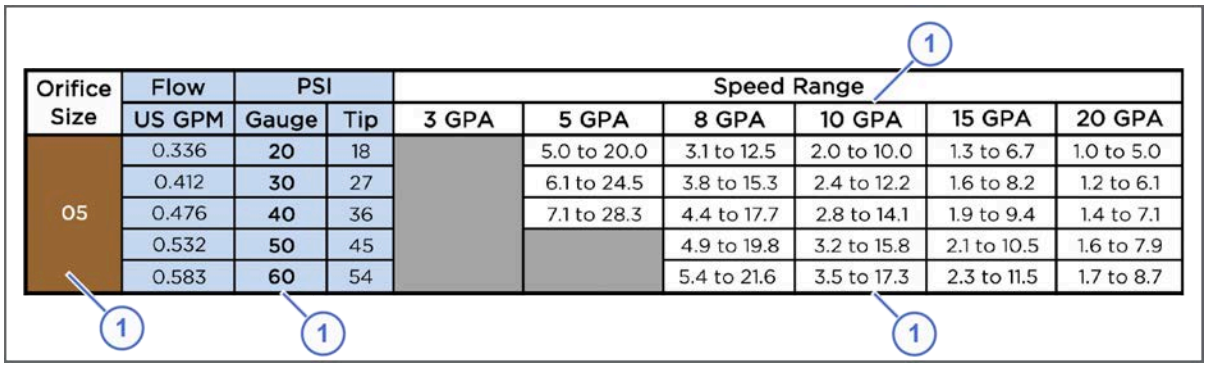


Fig. 2:

When selecting the correct tips:

- Always use 110° spray angle tips and maintain the boom height of at least 24 in (61 cm). If 80° spray angle tips are used, maintain the boom height of at least 36 in (91 cm).
- The tip selection chart, in the operation section of this manual, describes the speed ranges that can be expected when operating with a rate controller at various rates and pressures.
- To use the chart, select the application rate *(1)*.
- Move down the column to the desired speed range *(2)*.
- Select a tip *(3)* that provides the boom pressure you wish to spray *(4)*.

Valve Assembly Types and Component Identification

Important: Make sure that you have the correct valves and components for your system.

7-Watt Coil Components

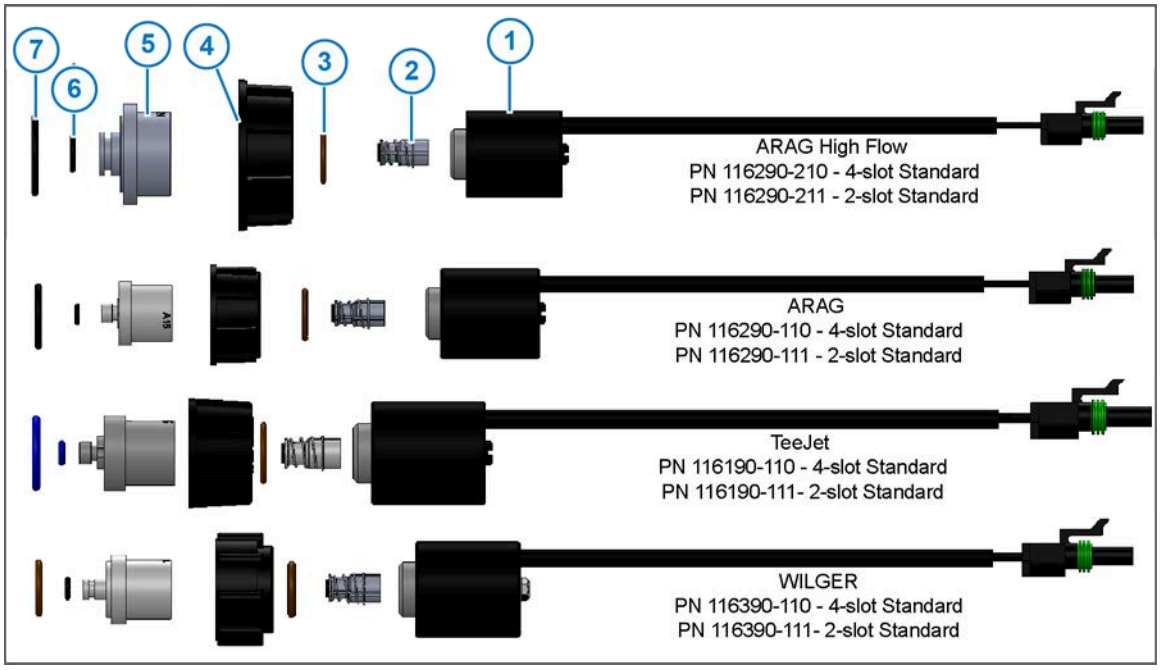


Fig. 3:

Item	Description	Arag High Flow Part Number	Arag Part Number	Tee Jet Part Number	Wilger Part Number
1	Coil	116189-111	116189-111	116189-111	116189-111
2	Plunger—2-Slot Standard	716009-111	716009-111	716009-111	716009-111
	Plunger—4-Slot Standard	716009-114	716009-114	716009-114	716009-114
3	O-ring	715022-204 Size: 0-15	715022-204 Size: 0-15	715022-204 Size: 0-15	715022-204 Size: 0-15
4	Fly Nut	717101-306	717101-006	717101-105	717101-007
5	Valve Body	116182-211	116182-111	116186-111	116188-111
6	O-ring	715022-211 Size: 112	715022-201 Size: 008	715022-200 Size: 2 mm x 4 mm	715022-201 Size: 008
7	O-ring	715022-215 Size: 212	715022-205 Size: 015	715022-202 Size: 017	715022-206 Size: 016

12-Watt Coil Components

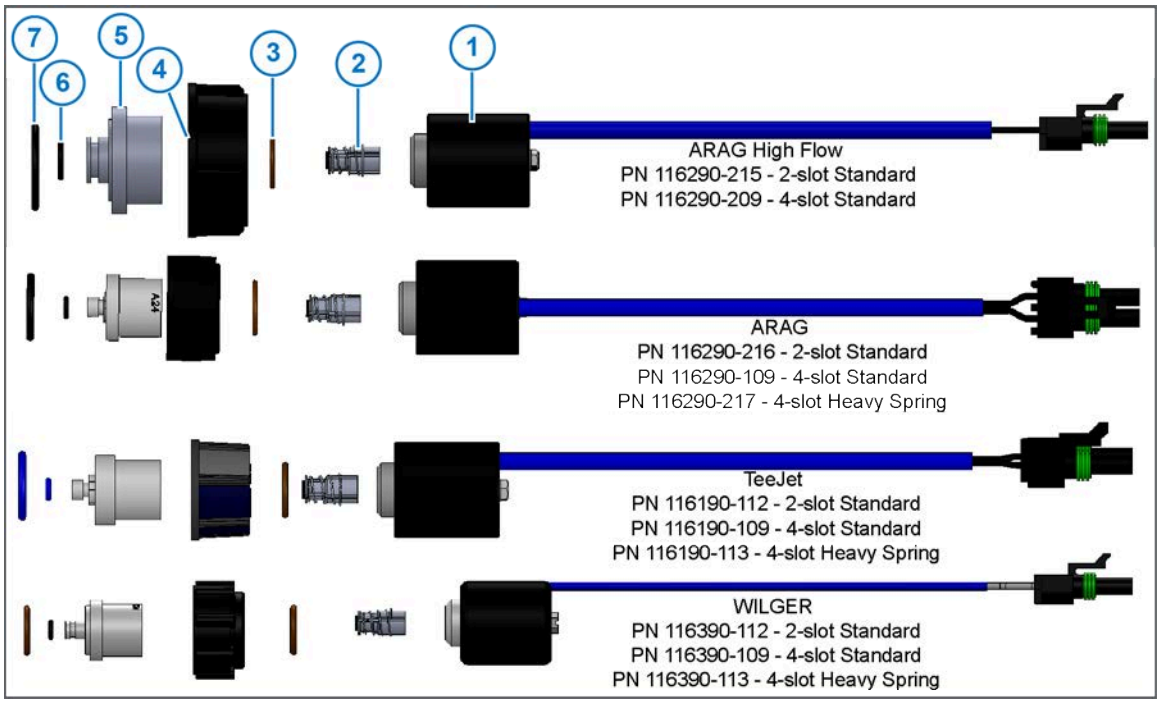


Fig. 4:

Item	Description	Arag High Flow Part Number	Arag Part Number	Tee Jet Part Number	Wilger Part Number
1	Coil	625147-011	625147-011	625147-011	625147-011
2	Plunger—2-Slot Standard	716009-111	716009-111	716009-111	716009-111
	Plunger—4-Slot Standard	716009-114	716009-114	716009-114	716009-114
	Plunger—4-Slot Heavy Spring		716009-113	716009-113	716009-113
3	O-ring	715022-204 Size: 0-15	715022-204 Size: 0-15	715022-204 Size: 0-15	715022-204 Size: 0-15
4	Fly Nut	717101-306	717101-006	717101-105	717101-007
5	Valve Body	116182-215	116182-150	116186-112	116188-112
6	O-ring	715022-211 Size: 112	715022-201 Size: 008	715022-200 Size: 2 mm x 4 mm	715022-201 Size: 008
7	O-ring	715022-215 Size: 212	715022-205 Size: 015	715022-202 Size: 017	715022-206 Size: 016

7-Watt—15 Series Coil Assembly Components

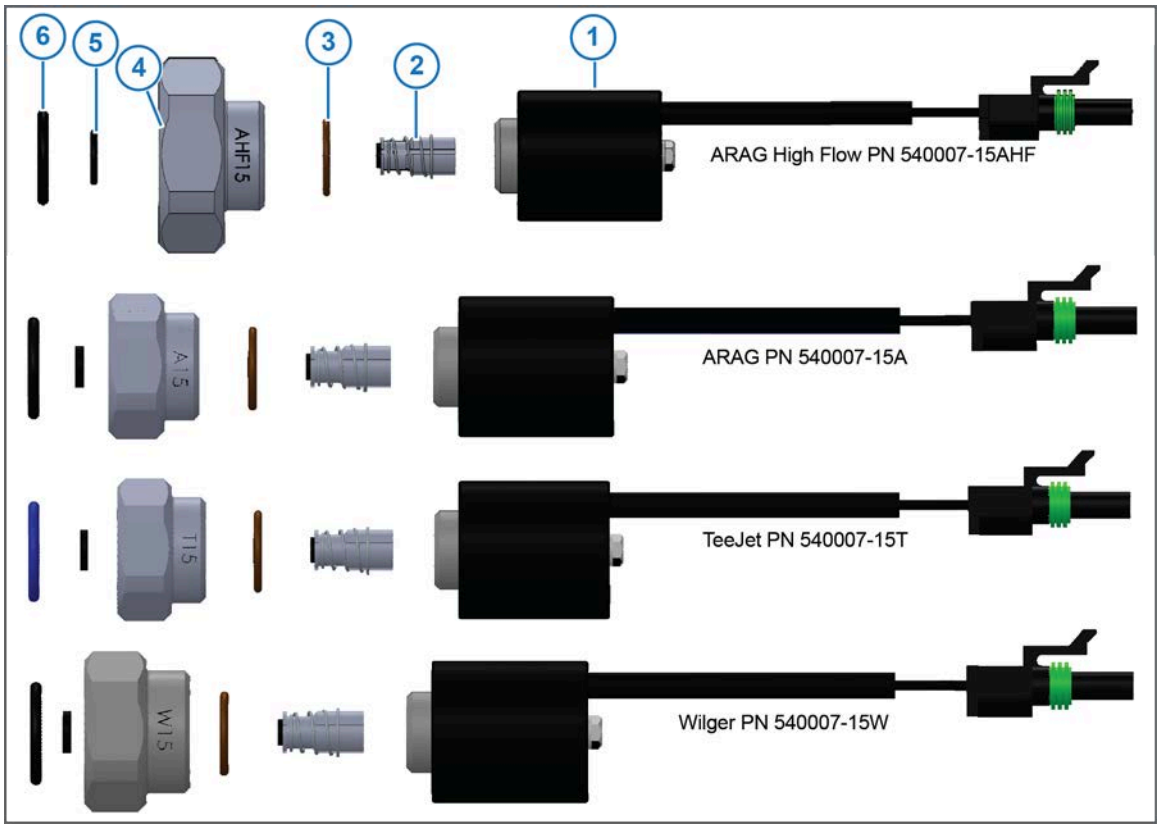


Fig. 5:

Item	Description	Arag High Flow Part Number	Arag Part Number	Tee Jet Part Number	Wilger Part Number
1	7-Watt Coil Assembly	116189-111	116189-111	116189-111	116189-111
2	Plunger Assembly	716009-114	716009-114	716009-114	716009-114
3	Inner-valve O-ring	715022-204	715022-204	715022-204	715022-204
4	Flybody	116182-201	116182-001	116186-001	116188-001
5	FlyBody Stem (Tip) O-ring	715022-211	715022-210	715022-210	715022-210
6	Nozzle Body FlyBody O-ring	715022-212	715022-205	715022-202	715022-206

12-Watt—24 Series Coil Assembly Components

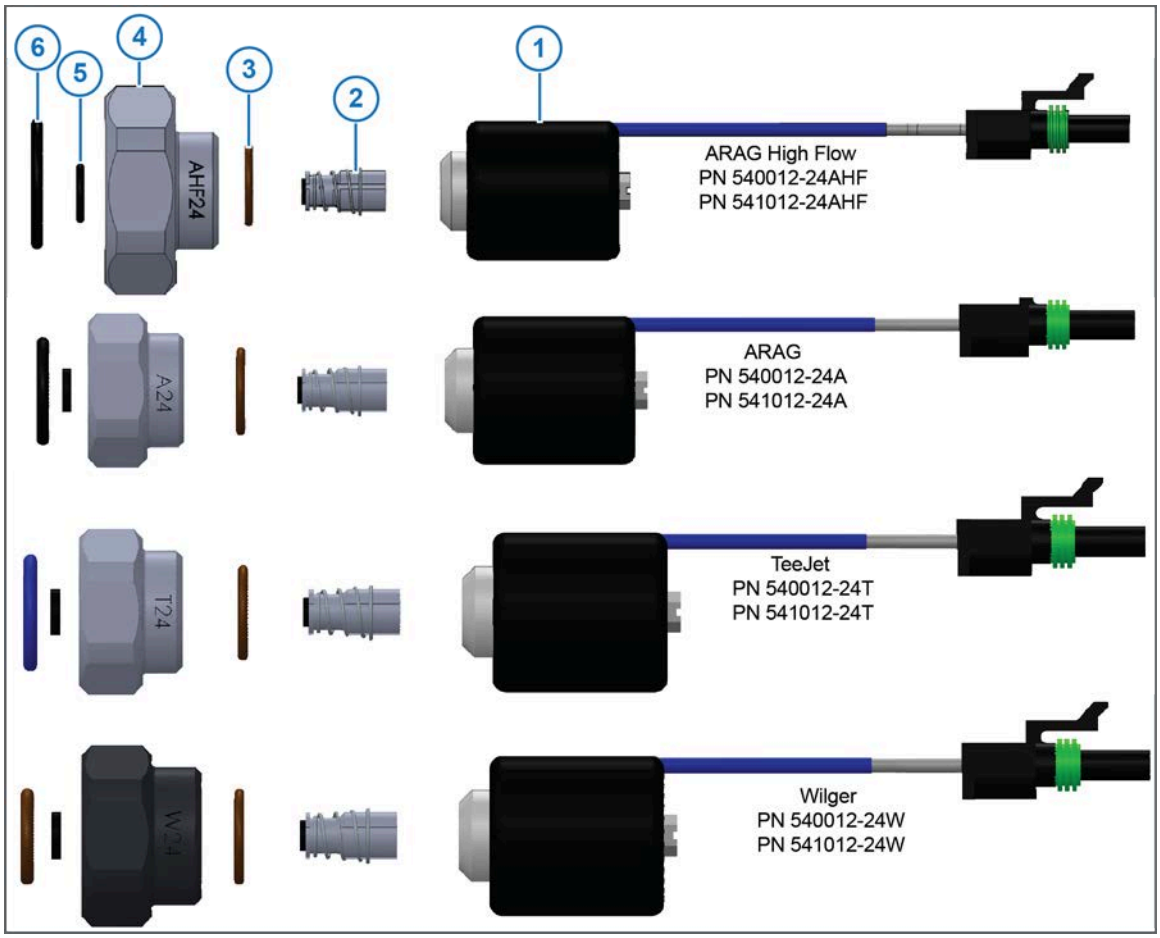


Fig. 6:

Item	Description	Arag High Flow Part Number	Arag Part Number	Tee Jet Part Number	Wilger Part Number
1	12-Watt Coil Assembly	625147-011	625147-011	625147-011	625147-011
2	Plunger Assembly—Standard Spring	716009-114	716009-114	716009-114	716009-114
	Plunger Assembly—Heavy Spring	716009-113	716009-113	716009-113	716009-113
3	Inner-valve O-Ring	715022-204	715022-204	715022-204	715022-204
4	Flybody	116182-202	116182-002	116186-002	116188-002
5	FlyBody Stem (Tip) O-ring	715022-211	715022-210	715022-210	715022-210
6	Nozzle Body FlyBody O-ring	715022-212	715022-205	715022-202	715022-206

Assemble the Nozzle Valves

1. Remove the drip check valve and diaphragm cap from each nozzle body.

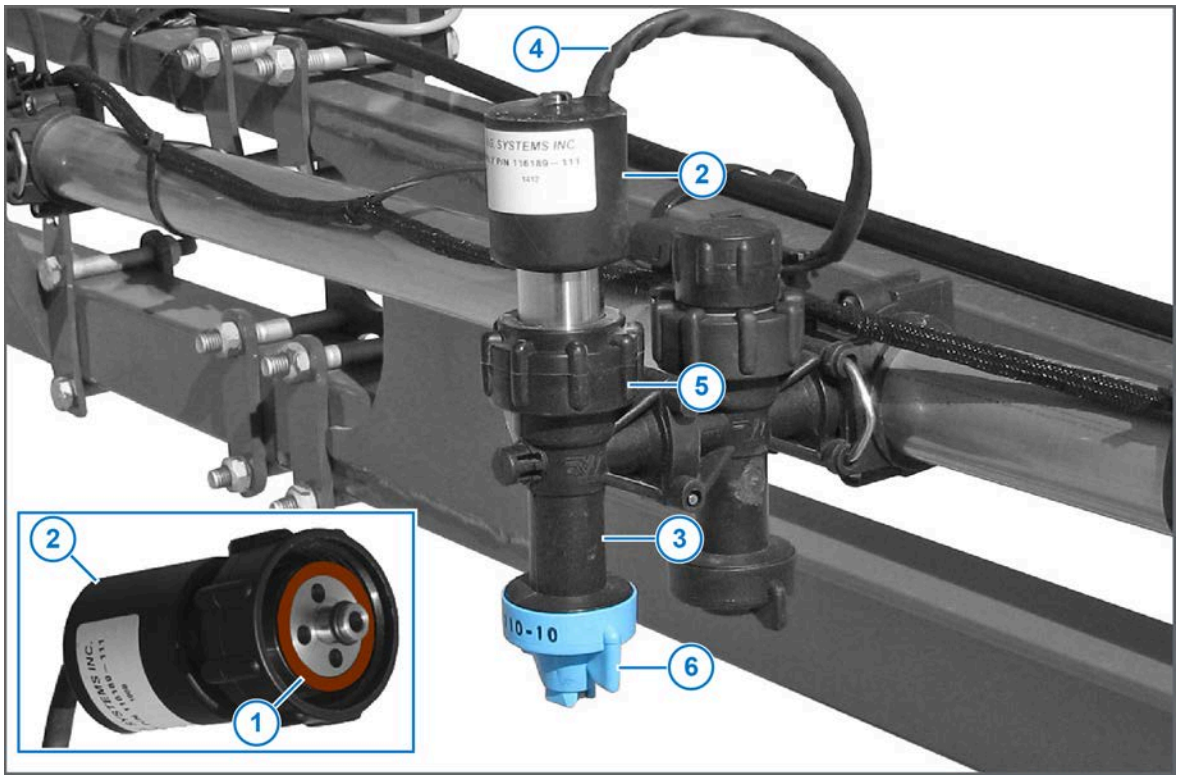


Fig. 7:

2. Install the O-ring *(1)* onto the nozzle valve assembly *(2)*.
3. Install the nozzle valve assembly onto the nozzle body *(3)*.
4. Rotate the nozzle valve body so that the electrical wire *(4)* faces the boom.
5. Tighten the fly nut *(5)* until the coil housing does not spin.
   The nozzle valves only need to be snug to prevent leakage.
6. Install and tighten the spray tip *(6)*.
7. Repeat steps 1 to 5 for all nozzle valve assemblies.

Move the Spray Tube Mount (Nozzle Valve Interference)

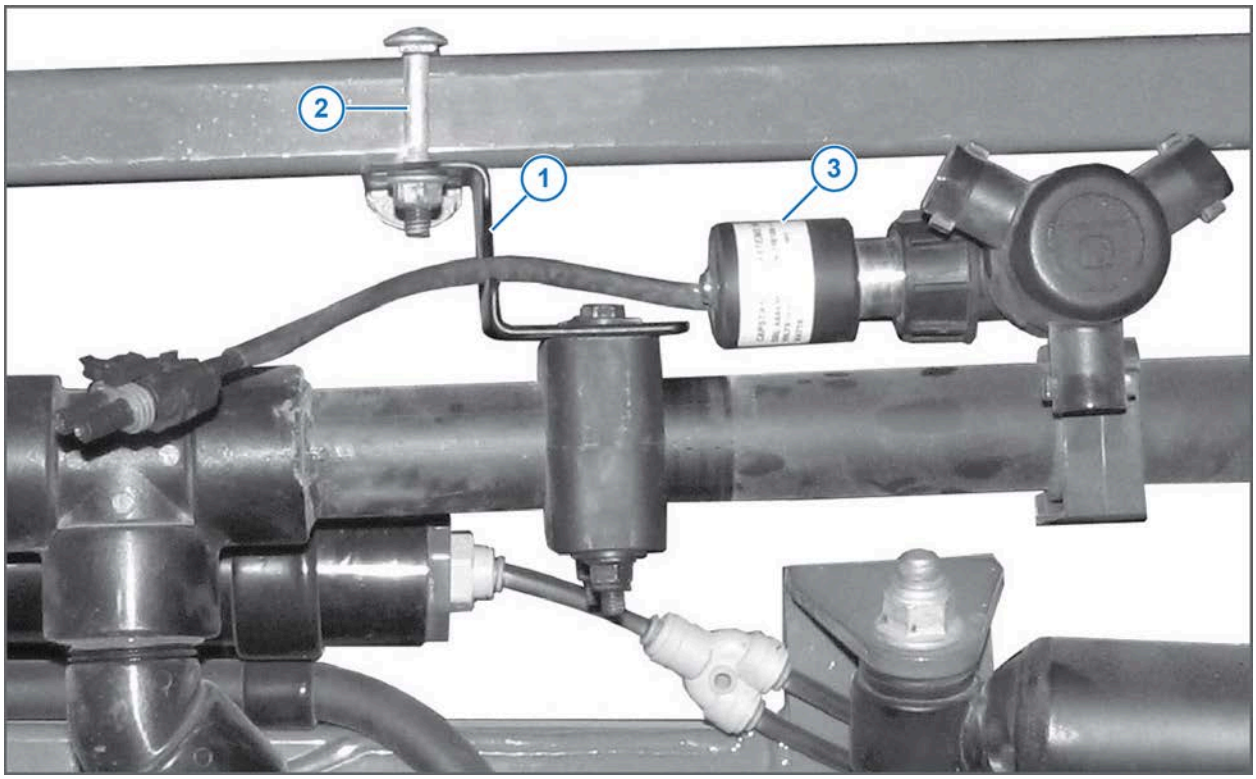


Fig. 8:

If a spray tube mount *(1)* prevents nozzle valve installation:

1. Loosen the spray tube mount bolts *(2)*.
2. Slide the spray tube mount away from the nozzle valve assembly *(3)* until the nozzle valve assembly can be properly installed.
3. Tighten the spray tube mount bolts.

Install the Gateway Hub

1. Locate an accessible location near the center of the boom mast.
2. Install the Gateway hub onto the boom mast with the supplied mounting bracket.

Gateway Hub Identification

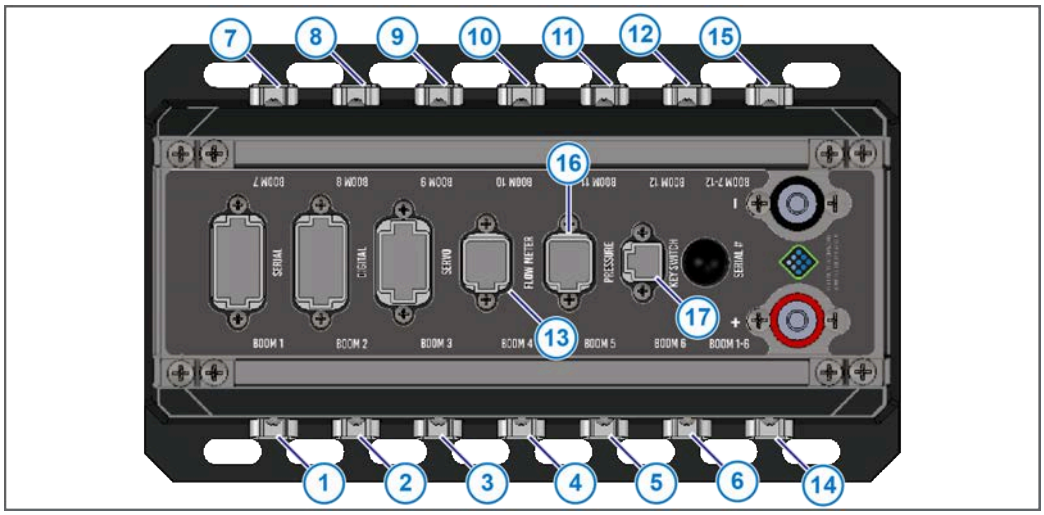


Fig. 9:

(1) Boom 1—Connector for boom 1 extension harness

(2) Boom 2—Connector for boom 2 extension harness

(3) Boom 3—Connector for boom 3 extension harness

(4) Boom 4—Connector for boom 4 extension harness

(5) Boom 5—Connector for boom 5 extension harness

(6) Boom 6—Connector for boom 6 extension harness

(7) Boom 7—Connector for boom 7 extension harness

(8) Boom 8—Connector for boom 8 extension harness

(9) Boom 9—Connector for boom 9 extension harness

(10) Boom 10—Connector for boom 10 extension harness

(11) Boom 11—Connector for boom 11 extension harness

(12) Boom 12—Connector for the CapView extension harness or boom 12 extension harness when needed

(13) Flowmeter—Connector for the flowmeter harness

(14) Boom 1-6—Connector for the boom 1-6 shutoff adapter

(15) Boom 7-12—Connector for the boom 7-12 shutoff adapter

(16) Pressure—Connector for the pressure sensor adapter harness

(17) Key Switch—Connector for the CapView switched power harness

Install the PSI NAV Commander Module

Note: For detailed information on the installation of the PSI NAV Commander module, see the installation instruction sheet that may be supplied.

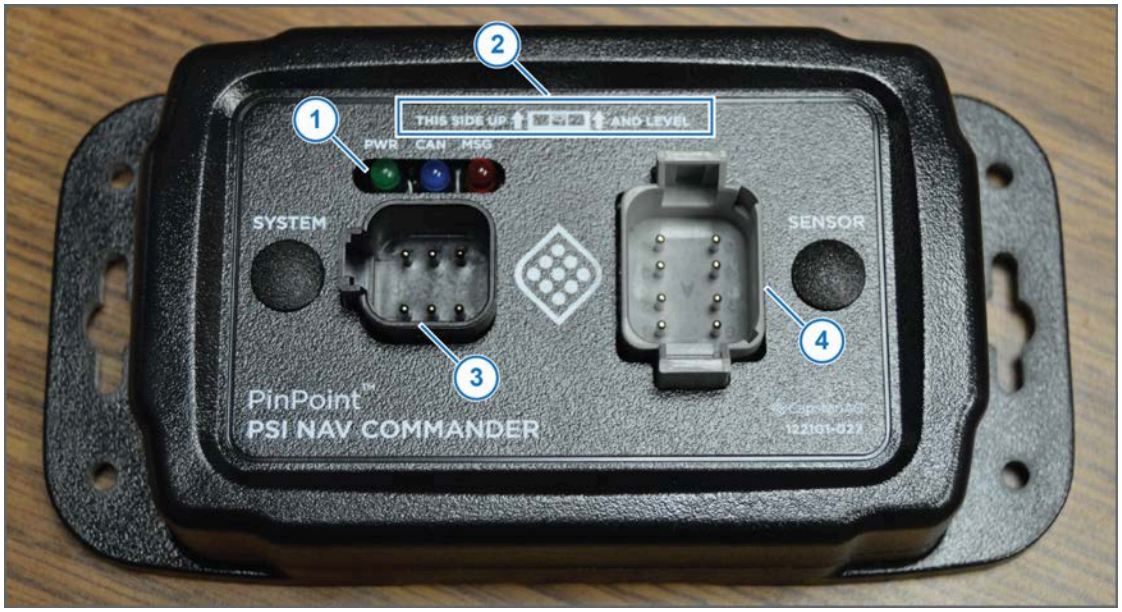


Fig. 10:

1. Mount the PSI NAV Commander Module.

   The module must be oriented correctly when mounting, with the LEDs *(1)* and the note *(2)* at the top of the module.

   The mounting location can be anywhere the module will fit, as long it is oriented correctly. The LEDs can face toward the machine, away from the machine, or to the left or right side of the machine.
2. Install the end of the pressure commander extension harness with a 6-pin connector and fuse to any open **Boom** port on the Gateway hub.
3. Route the harness to the PSI NAV Commander Module.
4. Install the other end to the **SYSTEM** port *(3)* on the module.
5. If the machine has a Raven PC2 Node:
   a) Install the end of the pressure commander harness with two 3-pin DT connectors between the Raven pressure sensor and the existing harness.
   b) Route the pressure commander harness to the PSI NAV Commander.
   c) Install the other end of the harness to the **SENSOR** port *(4)* on the module.
6. If the machine does not have a Raven PC2 Node, install the plug into the **SENSOR** port on the module.

Install the VCMs

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

   The VCMs are tagged and marked for the appropriate boom sections (1 to 11, etc.).
2. Make sure that each tagged VCM is installed on the correct boom section (1 to 11, etc.).

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

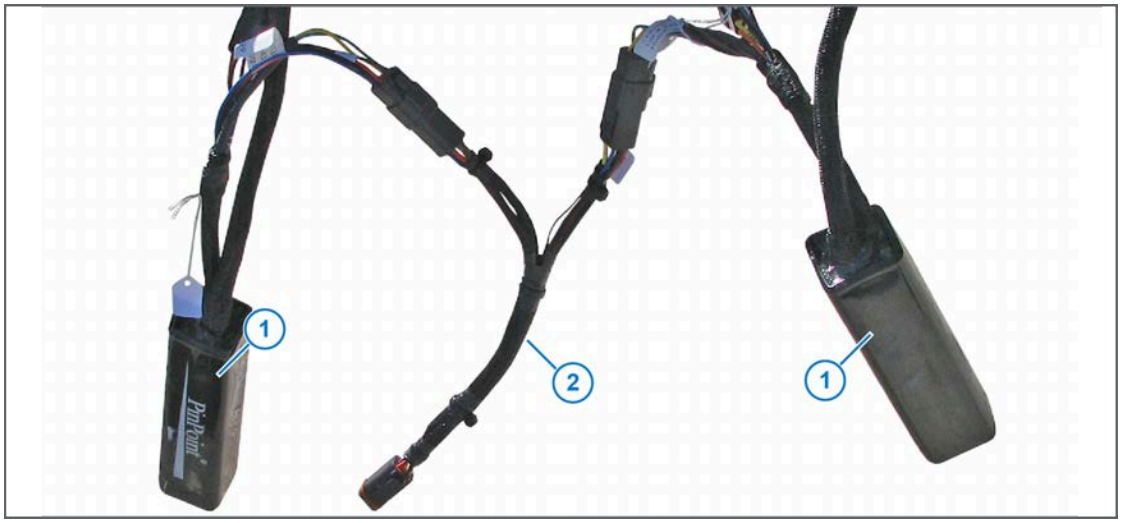


Fig. 11:

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

4. Mount additional VCMs *(1)* and Y-adapters *(2)* at a central location in the boom section.
5. Install dust caps on any unused connectors.

Table: VCM Part Numbers

Part Number		Description	Qty
118400-138		4-nozzle x 5-nozzle VCM Assembly with 15 Channel Board	
118400-136		9-nozzle x 10-in Spacing VCM Assembly	
118400-131		9-nozzle x 15-in Spacing VCM Assembly	
118400-135		9-nozzle x 15-in Spacing VCM Assembly with 15 Noz Brd	
118400-129		9-nozzle x 20-in Spacing VCM Assembly	
118400-134		9-nozzle x 20-in Spacing VCM Assembly with 15 Noz Brd	
118400-137		15-nozzle x 10-in Spacing VCM Assembly	
118400-125		15-nozzle x 15-in Spacing VCM Assembly	
118400-126		15-nozzle x 20-in Spacing VCM Assembly	
118250-015		18-nozzle x 15-in Spacing VCM Kit	
	118400-131	9-nozzle x 15-in Spacing VCM Assembly	2
	118640-032	Y-adapter Harness	1
118250-020		18-nozzle x 20-in Spacing VCM Kit	
	118400-129	9-nozzle x 20-in Spacing VCM Assembly	2
	118640-032	Y-adapter Harness	1

Install the VCM Extension Harnesses

1. Connect each extension harness to the VCM.
2. Route the extension harnesses along the boom to the Gateway hub.

   Make sure that there is enough slack in the extension harnesses to raise and lower the booms and to avoid pinch points at the boom fold and pivot points.
3. Connect each extension harness to the correct connector on the Gateway hub (Boom 1, Boom, 2, etc.)

Install the Pressure Sensor

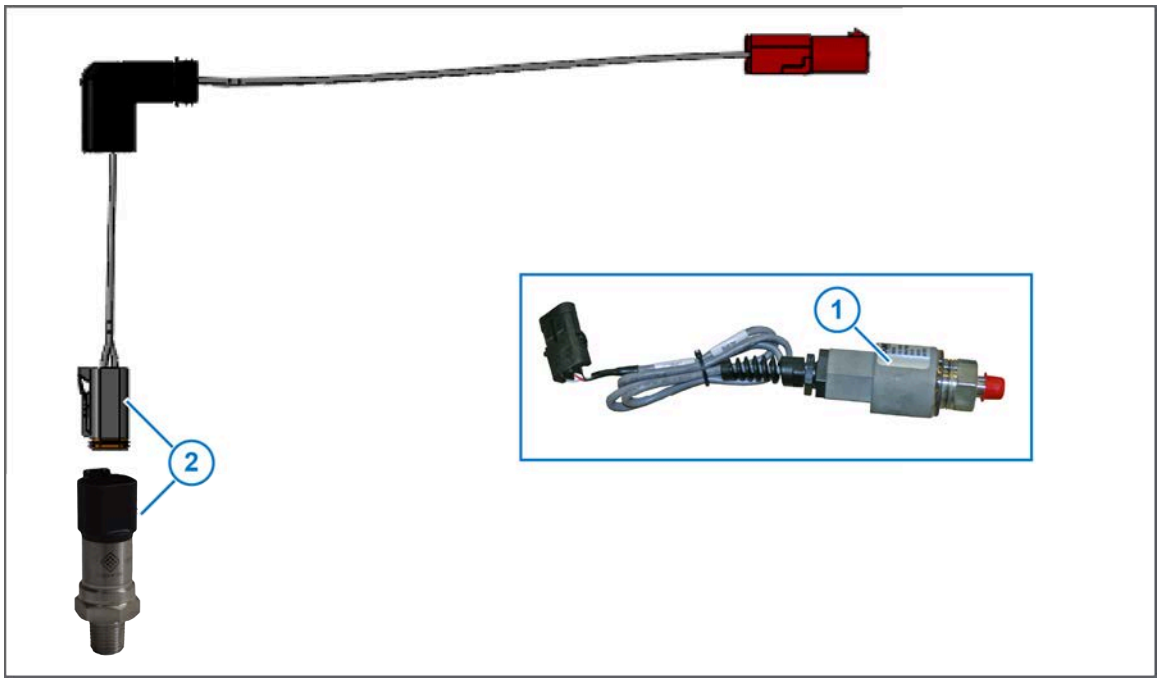


Fig. 12:

There are two pressure sensors that can be used on the system:

(1) Pressure sensor used 2017 and before—P/N 116301-001

(2) Pressure sensor kit used late 2017 and after—P/N 116301-011

Note: To replace the pressure sensor use in 2017 and before with a new pressure sensor, you will need to order this kit (P/N 116301-011), which includes additional harnesses and not just a pressure sensor.

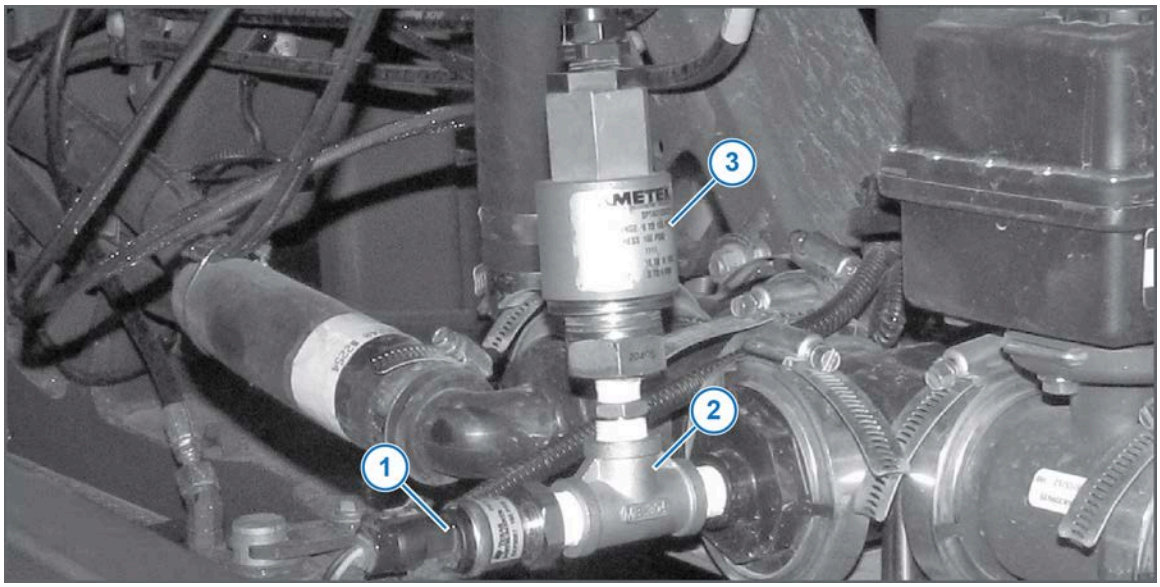


Fig. 13:

1. Remove the existing machine pressure sensor *(1)* from the boom manifold.
2. Install the tee fitting *(2)* and other hardware with sealant tape.
3. Install the new pressure sensor *(3)* with sealant tape.

   Important: Do not over-tighten the pressure sensor when installing into plastic tee fittings.
4. Install the existing machine pressure sensor with sealant tape.

Install the Pressure Sensor Adapter Harness

1. Route the pressure sensor adapter harness to the Gateway hub.
   Adapter Harness PN—118657-001
2. Install the harness connector to the **PRESSURE** port on the Gateway hub.

Install the Flowmeter Harness

1. Record flowmeter tag g/min information.
   The information will be used during the CapView setup.

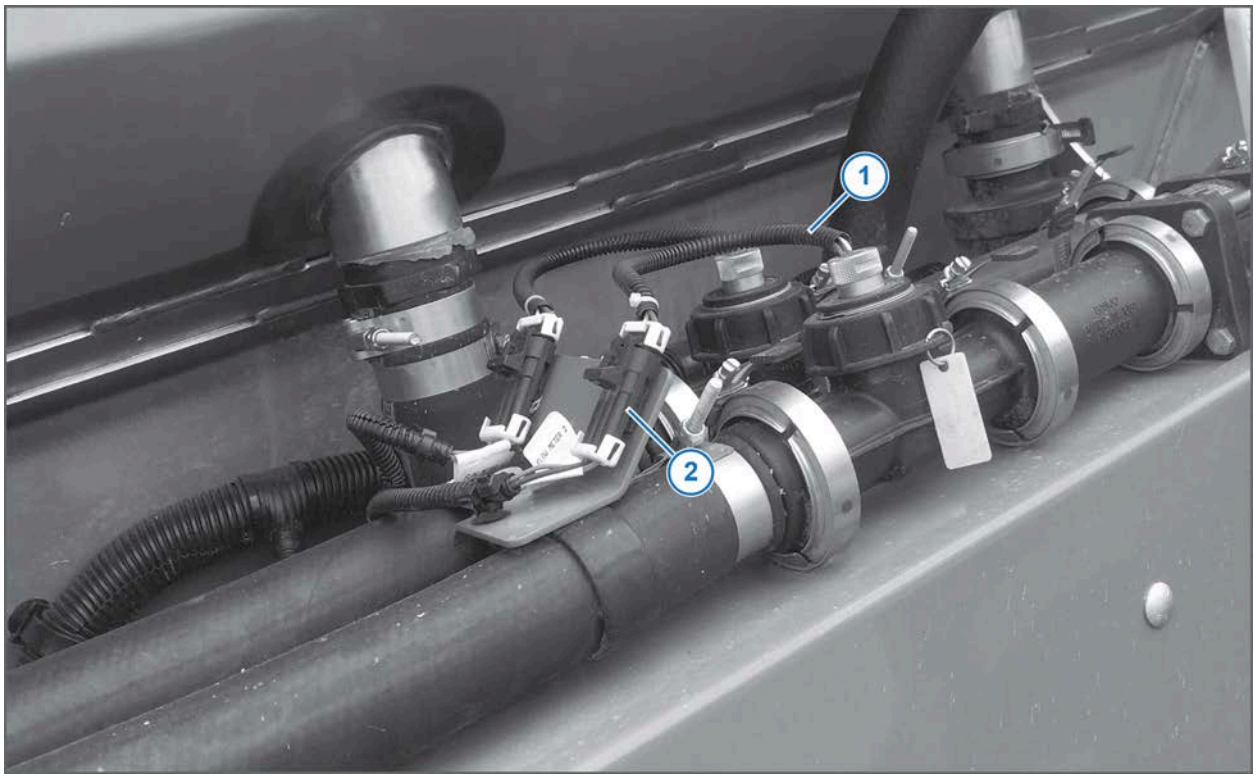


Fig. 14:

2. Disconnect the machine flowmeter harness *(1)*.
3. Install the flowmeter harness *(2)* between the flowmeter and the existing harness.
4. Route the flowmeter harness to the Gateway hub.
5. Install the harness connector to the **FLOWMETER** port on the Gateway hub.

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

Install the Boom Shutoff Adapter

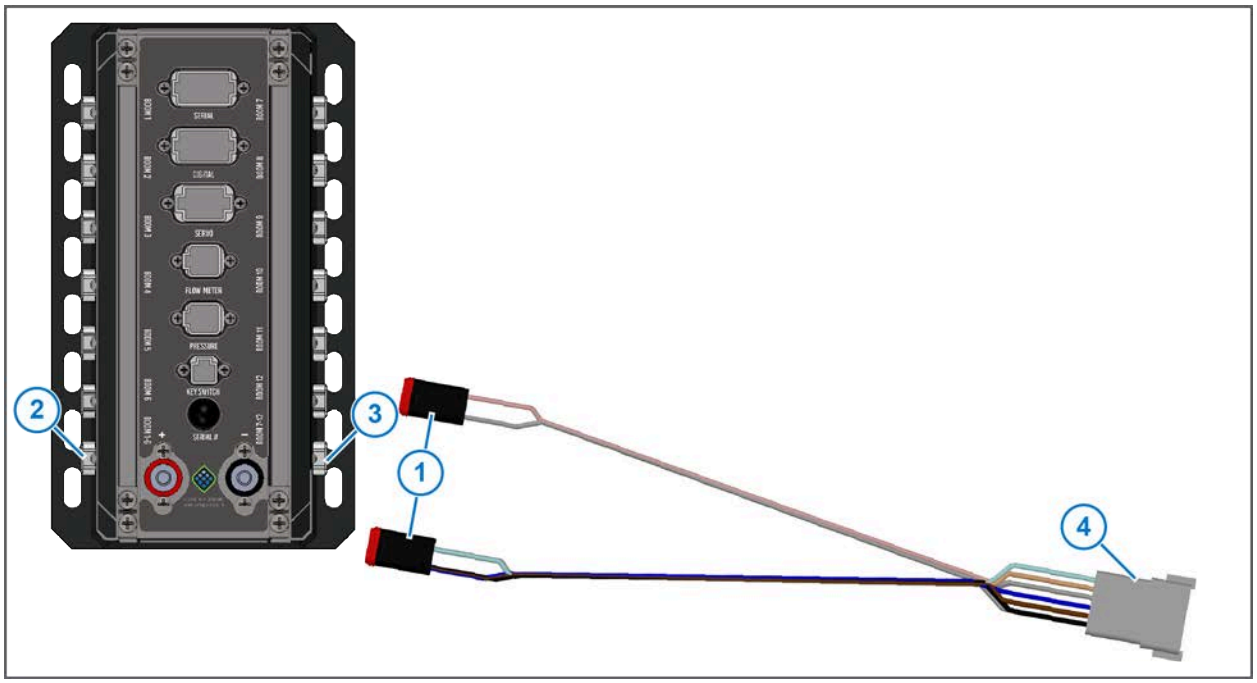


Fig. 15:

1. Connect a connector *(1)* for the boom shutoff adapter to the **BOOM 1-6** port *(2)* and **BOOM 7-12** port *(3)* on the Gateway hub.

   Boom shutoff adapter PN—118606-051

2. Connect the 12-pin connector *(4)* into the shutoff harness.

   The shutoff harness is different depending on your machine.

Install the CapView

Fig. 16:

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

   Note: Make sure that the CapView can be seen and reached from the operator seat.
2. Remove the four screws from the back of the CapView *(2)*.
3. Install the ball mount *(3)* to the back of the CapView with the screws.
4. Install the clamp *(4)* onto the ball mount.
5. Install the clamp onto the RAM mount.
6. Install the display harness to the connectors to the back of the CapView.
7. Remove the screen protector from the CapView screen.

Install the CapView Extension Harness

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

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

Install the Key Switched Power Cable

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

   Important: Refer to installation instructions for machine-specific power supply locations.

Install the Battery Harness

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

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

Install the Circuit Breaker

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

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

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

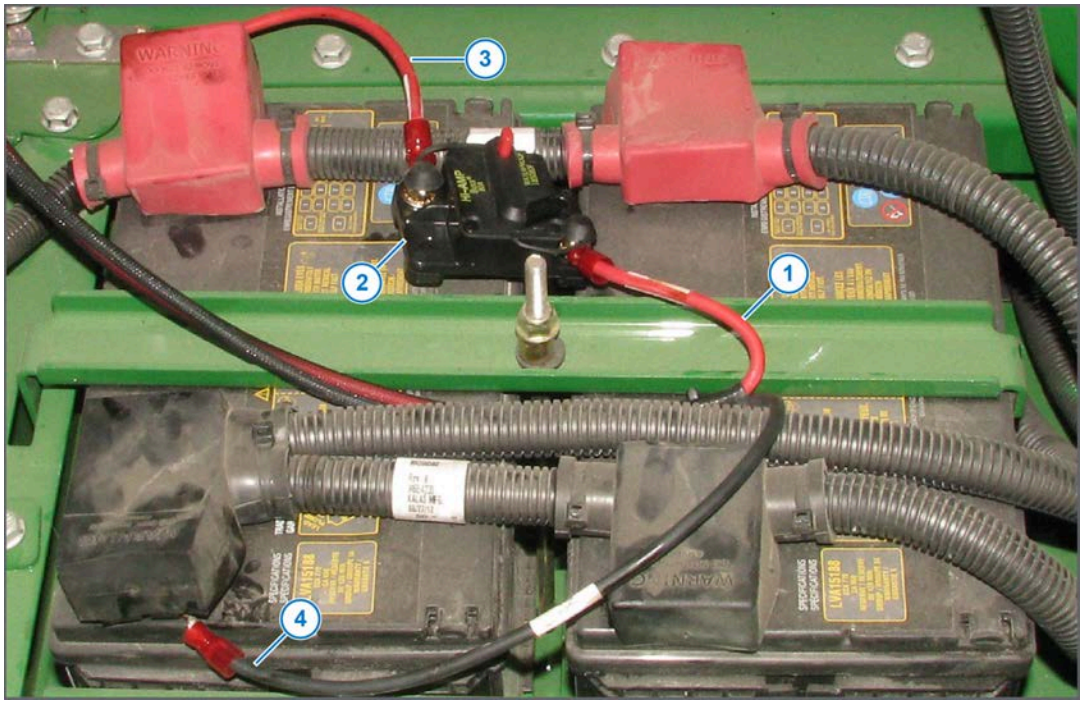


Fig. 17:

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

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

Install the Power Disconnect Breaker Kit (Optional)

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

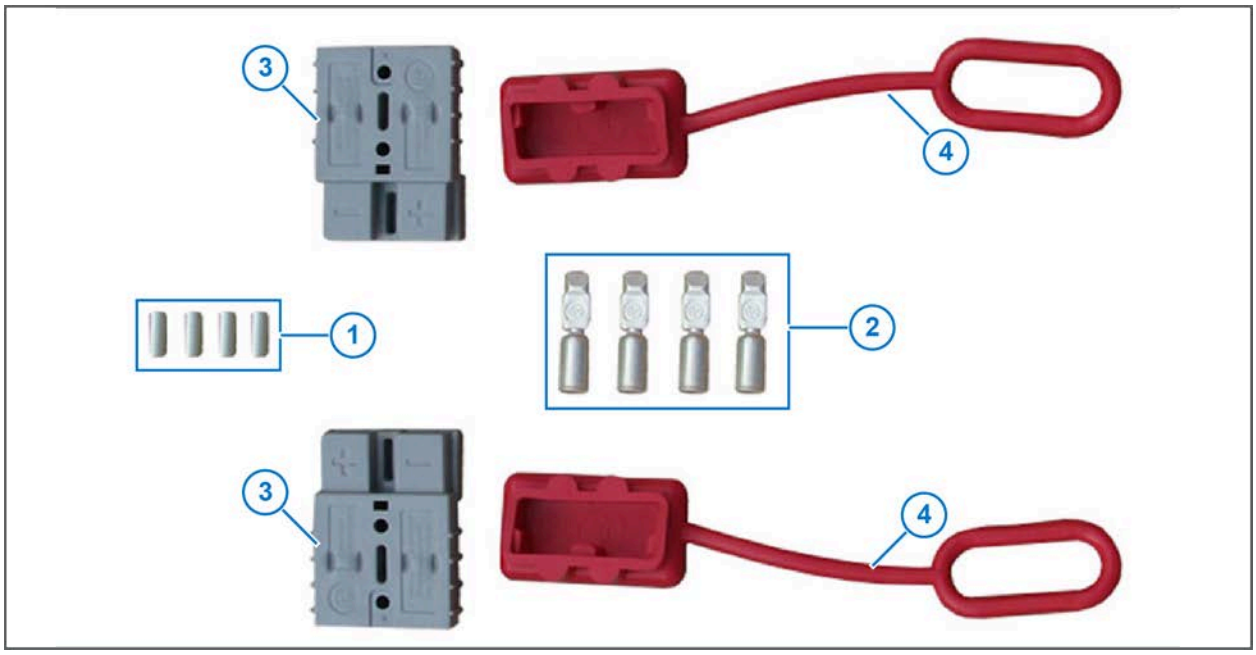


Fig. 18:

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

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

5. Install the covers *(4)*.

Chapter 5: System Setup

CapView Button Descriptions

Icon	Name	Description
	**POWER**	Press the button to start or shut down the CapView display and the rate controller The LED light illuminates to show what is active
	**AUTO/ MANUAL**	Press the button to change between Manual or Automatic operation mode
	**TURN**	Press the button to engage or disengage turn compensation
	**OVERLAP**	Press the button to engage or disengage overlap control
	Navigation Arrows	Press the buttons to move through the menu items
	**ENTER**	Press the button to open the selected menu screen or to accept the selected value
	**ESCAPE/ MAP**	Press the button to exit the current screen, to not accept the selected field, and to access the map menu
	Presets	Use the four buttons to store and use boom, tip size, and flow profiles Press a button and hold for 10 seconds to change to that preset Only one of the four buttons is shown
	**ALARM**	Press the button to stop an audible alarm
	**LOCATION SETUP**	Press the button to go to the ***Location Setup Menu*** Press the button and hold for 10 seconds to go to the ***Auto Location Setup***. The screen will flash while holding the button.
	**SYSTEM SETUP**	Press the button to go to the ***System Setup Menu***
	**NOZZLE SETUP**	Press the button to go to the ***Nozzle Setup Menu***

Start the CapView

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

Fig. 19:

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

Shutdown the CapView

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

System Setup

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

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

Factory Reset

Important: Always save your profile settings and/or record all settings and location setup information before doing a factory reset.

A factory reset should be performed after:

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

Do the Factory Reset Procedure

Fig. 20:

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

Fig. 21:

12. Use the **LEFT** or **RIGHT** arrows *(1)* to select **YES** *(2)*.

13. Press the **ENTER** button *(3)*.

The CapView will turn off.

Leave the key switch on to keep power to the hub.

14. Press the **POWER** button *(4)*.

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

15. Press the **ENTER** button.

Restore System Configuration or Select Settings

Contact your local CapstanAG representative for initial system configuration or select settings files if this is the initial setup for your system.

Fig. 22:

1. Insert the USB thumb drive *(1)* into the back of the CapView *(2)*.
   The ***USB Host Menu*** screen will show.
2. Go the **Restore Configuration** or **Restore Select Settings** line *(3)*.

   If you are restoring the information for the same sprayer and have not made significant system changes, like replacing the VCMs or changing the number of VCMs, use **Restore Configuration**.

   For software released October 2018 and after, if you are restoring information that was used on a different system or have made significant changes, like replacing the VCMs or changing the number of VCMs, use **Restore Select Settings**.
3. Press the **ENTER** button *(4)*.
   A message will show.
4. Use the left or right arrow button *(5)* to select **YES**.
5. Press the **ENTER** button.
   The display will power down.
6. Remove the USB thumb drive from the back of the CapView display.
7. Press the **POWER** button *(6)*.
8. Make sure that the settings shown on the CapView display are correct.

Change the Units of Measure

Fig. 23:

1. Press the **SYSTEM SETUP** button *(1)*.
2. Use the **UP** or **DOWN** arrow buttons *(2)* to select **Units** *(3)* from the ***System Setup*** menu.
3. Press the **ENTER** button *(4)*.
4. Use the **UP** or **DOWN** arrow buttons to select the desired units of measure.
5. Press the **ENTER** button.
6. Press the **ESCAPE/MAP** *(5)* button to go to the main operating screen.

Do the Location Setup Procedure

Fig. 24:

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

   Note: It is normal for the screen to change as you press and hold the button.
2. Use the **LEFT** or **RIGHT** arrow buttons *(2)* to select **AUTO SETUP** *(3)*.
3. Press the **ENTER** button *(4)*.

Do the Nozzle Spacing Setup Procedure

1. Use the **UP** or **DOWN** arrow buttons to set the desired nozzle spacing.
   The default setting is 20 in.
2. Press the **ENTER** button.

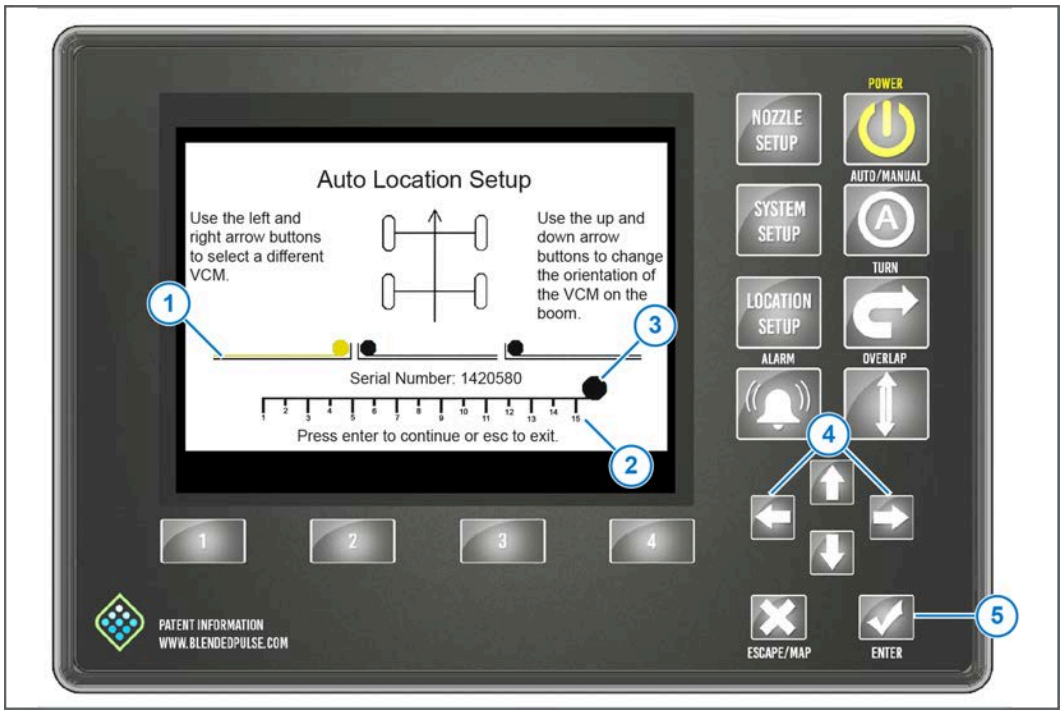


Fig. 25:

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

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

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

3. Use the left or right arrow buttons *(4)* to highlight the desired VCM.
4. Press the **ENTER** button *(5)* for each VCM.
   The highlight color changes to red. The nozzles on that VCM pulse.
5. When the leftmost VCM nozzles pulse, press the left arrow button to move the highlighted VCM to the leftmost position on the CapView screen.
6. Press **ENTER** to stop the pulsing.
7. Press the up or down arrow buttons to flip the VCM graphic, so the potted tube orientation show on the CapView screen is the same as the potted tube orientation found on the boom.
   Serial numbers for all VCMs are 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 of the VCMs are in to the proper location and orientation.
9. When finished, press the **ESCAPE** button.
10. Make sure that the master switch is engaged and the boom section switches are off.
11. Engage and disengage each boom section control switch to correlate the boom valves to the VCMs.

    Engage switch #1, disengage switch #1, then engage/disengage #2, then engage/disengage #3, etc., from left to right so that #1 is the leftmost boom.

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

    Having 12 boom switches and only one VCM is possible. Later, you can assign soft booms so that the nozzles are turned on/off individually by the rate controller. You may need to start a job in the rate controller for the sprayer so that the boom valves can be physically turned on and off.
12. Press the **ENTER** button to return to the ***Location Setup Table*** screen.

Fig. 26:

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

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

    Any selected VCM in the **Location Setup Table** is highlighted in yellow. Press the **UP** or **DOWN** arrow button to highlight a different VCM.

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

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

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

The **X-Axis** column shows the location of the nozzle. Zero is the center of the machine. Use a negative value to show the nozzle location is left of center. Use a positive value to show the nozzle location is right of center. Column two data is in 20-in increments until a location setup has been done.

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

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

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

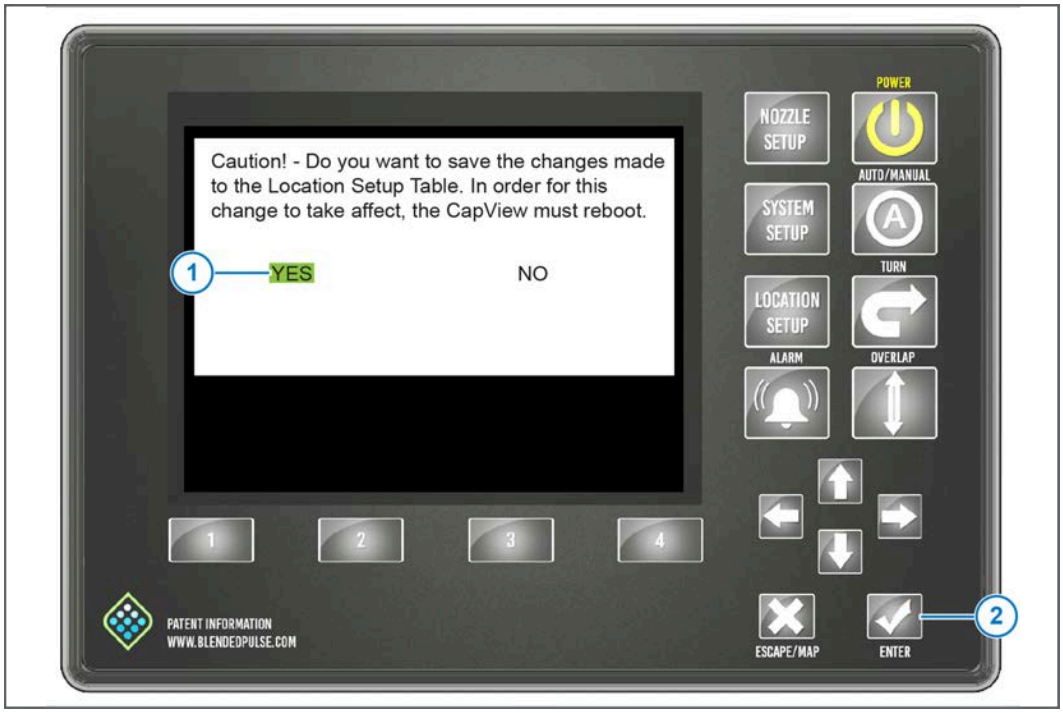


Fig. 27:

The screen shows the option **YES** (to save) or **NO** (not to save) the entered data.

15. If the data is correct, use the right or left arrow buttons to select **YES** *(1)*.

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

A blue save bar shows and moves across the screen while the CapView saves all the data to the VCMs. This process may take a few minutes to complete.

Important: The CapView will shutdown to reboot shortly after selecting **YES** and pressing the **ENTER** button.

System Setup Menus

System Setup Menu Descriptions

Line Number	Line Title / Description	Action
1	Operation Mode	Press **ENTER** to change
	The PinPoint™ II system can operate in three modes: **SharpShooter™**, **Synchro™**, or **N-Ject™**. In **SharpShooter™** mode, the rate controller ties into the pump for flow control, and the PinPoint™ II changes the nozzle duty cycle to maintain constant pressure. In **Synchro™** mode, the PinPoint™ II controls the pump for active pressure control, and the rate controller ties into the Gateway Hub to control flow by changing the nozzle duty cycle. The **N-Ject™** mode, is used for anhydrous ammonia or liquid fertilizer application.	
2	Controller Gallon Counter	Press **ENTER** and then **YES** to reset.
	The controller gallons counter value should match the values from the rate controller. Resetting the controller gallons counter also resets the actual gallons counter. Make sure to reset the rate controller at the same time. The controller gallon counter shows the flow value per section.	
3	Actual Gallons Counter	Press **ENTER** and then **YES** to reset.
	The actual gallons counter value should match the tank volume. The difference between the controller gallon counter and actual gallon counter is the product saved using PinPoint™ II overlap control. The actual gallon counter shows the flow value per nozzle. The controller gallon counter minus the actual gallon counter is the total savings in product applied from the individual nozzle control.	
4	Controller Acre Counter	Press **ENTER** and then **YES** to reset.
	The controller acre counter counts the acres applied per section.	
5	Actual Acre Counter	Press **ENTER** and then **YES** to reset.
	The actual acre counter counts the acres applied per nozzle. The controller acre counter minus the actual acre counter is the additional acres an operator can apply per tank load from the individual nozzle control.	
6	Controller Gallons per Minute	
	The controller gallons per minute should match the rate controller flow display. The gallons per minute value is per section.	
7	Actual Gallons per Minute	
	The actual gallons per minute value is the flow that is actually being sprayed. It should match the turbine flowmeter (unless the correction mode is active at a very low flow rate or calculation mode is active). The gallons per minute value is per individual nozzle control. The control gallons per minute and the actual gallons per minute values should always be equal unless the PinPoint™ II is shutting off individual nozzles. When individual nozzles are being turned off, the actual gallons per minute will be lower than the controller gallons per minute.	

Line Number	Line Title / Description	Action
8	Nozzle Control (Key FOB)	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 show on the operate screen that the Key FOB mode is active. To return to operation mode, turn the nozzle control activation value back to the previous value (typically 12V Active). Some systems will use the **12V GND** switch signal.	
9	Pressure 1	
	The pressure 1 value is the boom spray pressure. This value is shown as the green bar on the main operating screen.	
10	System Voltage	
	The system voltage is the voltage at the Gateway hub. This can be an indicator of system health.	
11	Display Backlight	Press **ENTER** to change
	Larger numbers make the CapView screen brighter for daytime use. Smaller numbers make the CapView screen dimmer for night-time use. Range: 1-10, if 5 or less, the keypad backlight will turn on.	
12	LED Brightness	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.	
13	Beeper Volume	Press **ENTER** to change
	Larger numbers make the alarm louder for outdoor use. Smaller numbers soften the alarm for indoor use. Range: 0-5, 0 turns off the beeper completely.	
14	Specific Gravity	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.	
15	Valve Diagnostics Enable	Press **ENTER** to change
	If the PinPoint™ II system is not using nozzles that use the CapstanAG nozzle diagnostics properly, the nozzle diagnostics can be disabled here. CapstanAG uses this feature on demonstration units and development units where lights are substituted for valves or reset to coil only. **Coil only** disables the plunger movement detection without disabling short or open data.	

Line Number	Line Title / Description	Action
16	Overlap Distance	Press **ENTER** to change
	CapstanAG has coined the term “Cat Whiskers” to describe this feature. Each nozzle has five imaginary cat whiskers by which it checks and marks the overlap map. There is a whisker in front, behind, right, left, and center. The center whisker marks the map as being sprayed. The other four whiskers are for checking if the nozzle needs to be turned off at an already sprayed area. The overlap distance refers to the distance that these four whiskers are from the center whisker. The PinPoint™ II map is in one-meter-squares, so it is advised to set this at a minimum of 40 in (1 meter).	
17	Rate Sync Mode	Press **ENTER** to change
	Rate Sync™ changes the nozzle duty cycle based on the vehicle speed obtained from the GPS receiver.	
18	Rate Sync Average	Press **ENTER** to change
	The Rate Sync™ average represents how often the rate sync samples the speed from GPS. PinPoint™ II has a 10hz GPS requirement, so the speed is sampled 10 times per second or once every 0.1 seconds. Higher values cause the system to react slower.	
19	Rate Sync Max Ground Speed	Press **ENTER** to change
	Enter the approximate speed that will allow the system to reach a 100% duty cycle based on the current spray tip size being used.	
20	Units	Press **ENTER** to change
	Select the desired units of choice: US or SI units.	
21	Baud Rate	
	This shows the GPS baud rate that is detected by the system. 19,200 to 115,200.	
22	Revision Information	Press **ENTER** to change and then **YES**
	The revision information stores all hardware items by CAN address and shows the current version of all hardware and software items on the system. This includes the CapView, Gateway hub, and VCM software versions.	
23	Language	Press **ENTER** to change
	Select the desired language: **English** or **Portuguese**	
24	Previous Error List	Press **ENTER** to change
	This displays the 50 most recent errors.	
25	Advanced Settings	Press **ENTER** to see the menu
	Additional settings menu	

Advanced Settings—Synchro™ Mode Operation

Line Number	Line Title / Description	Action
1	Hour Meter	
	The hour meter shows the accumulated hours. The hour meter starts when at least one nozzle is on.	
2	Compass Heading	Press **ENTER** to and then **YES** to calibrate.
	The 3-dimensional compass is generally not used. It could be used for backup detection or low-speed turn compensation stability.	
3	Compass Offset	Enter the offset to calibrate
	This value is used after calibrating the 3-dimensional compass to correlate the chassis with the Gateway Hub.	
4	USB Mode	
	Thumb drive or **computer**. **Thumb drive** must be chosen to utilize a USB drive for different purposes.	
5	Deadband Pressure	Press **ENTER** to change.
	The deadband pressure 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 to100.	
6	Gain - System	Press **ENTER** to change.
	The system gain is used to tune pressure control. The system gain changes the total gain of the system according to the same ratios of proportional/integral/differential gain established in those settings. The system 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.	
7	Gain - Proportional	Press **ENTER** to change.
	The 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.	
8	Gain - Integral	Press **ENTER** to change.
	The 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.	

Line Number	Line Title / Description	Action
9	Gain - Differential	Press **ENTER** to change.
	The 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.	
10	Total Number Valve Expected	Press **ENTER** to change.
	The total number of valve expected value is the number of valves on the sprayer. At system power on, the system counts the number of valves reported by the VCMs. If the reported number matches the manually entered number for the value, then all is OK, and the system continues. If an error is detected, then an alarm is sounded and diagnostic readouts show. The system cannot detect valve issues that may have occurred when the system was not running. If the valve was damaged, or corrosion sets in over the winter, this is the error you will get. The system cannot determine which nozzle is affected if the problem occurred when the system was powered off, so use the CapView location setup screen and look for a nozzle that is not connected.	
11	Scrolling Enable/Disable	Press **ENTER** to change.
	In the nozzle diagnostics on the operation screen, scroll from nozzle to nozzle. To focus on a single nozzle without the scrolling taking place, select disabled here.	
12	GPS - Ant. Ahead of Rear Axle	Press **ENTER** to change.
	Enter the number of inches from the rear axle to the GPS antenna. A positive number indicates that the antenna is ahead of the axle. A negative number indicates that the antenna is behind the axle. This value is used for the GPS overlap control to shut off the nozzles in the proper place. The GPS antenna must be located on the vehicle on which the boom is mounted. For pull-behind units, mount the GPS antenna on the implement.	
13	GPS - Ant. Right of Center	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.	
14	GPS Antenna Above Ground	Press **ENTER** to change.
	Enter the number of inches that the GPS antenna is above ground.	
15	GPS Boom Ahead of Rear Axle	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.	

Line Number	Line Title / Description	Action
16	Forward/Reverse Detection	Press **ENTER** to change.
	For individual nozzle control to correctly perform, the system must know if the sprayer is moving in forward or reverse. When the forward/reverse detection is set to **OFF=Fwd Rev Switch**, the system is looking for a 12V (reverse beeper) input to tell it the sprayer is reversing. If the system does not see the 12V signal, it assumes the sprayer is traveling in the forward direction. If this setting is changed to **Compass w/Turn**, then a 3-D compass is used to detect forward/reverse, and the compass calibration is required. For operators who do not spray in reverse, the best option is to leave this setting at **OFF=Fwd Rev Switch**.	
17	Look Ahead Time	Press **ENTER** to change.
	The look ahead time is based on the fastest field speed. The value is an indicator of how much time the GPS and the 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 value at the fastest travel speed expected. **Note:** When setting the overlap distance, set the Look Ahead Time value to 0.	
18	Zero Rate Shutoff	Press **ENTER** to change.
	When set to **Shutoff** the low pressure shutoff is enabled. To disable the low pressure shutoff, set to **Minimum PWM%**. When set to shutoff, the system will allow the duty cycle to drive to 0% or off. This is useful when applying VRT grids with a 0 application rate. The recommended setting is **Minimum PWM%**, where it will only allow the system to go to the low limit nozzle PWM set on the **Nozzle PWM Minimum** line.	
19	Pressure Control Hold	Press **ENTER** to change.
	Synchro™ mode operation pressure control hold must be set to **Disable** or 0.	
20	Pressure Sensor 1 Min. Voltage	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
21	Pressure Sensor 1 Max. Voltage	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
22	Pressure Sensor 1 Min. Pressure	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
23	Pressure Sensor 1 Max. Pressure	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
24	Pressure Sensor 1 Offset	Press **ENTER** to change.
	It is common to have 1 to 5 VDC sensors and 0.5 to 5 VDC sensors. The PSI sensor offset is used when the sensor does not match a gauge. Entering an offset value will scale the sensor up or down. The sensor offset allowable range is ±1-9.	

Line Number	Line Title / Description	Action
25	Servo Type	Press **ENTER** to change.
	Case Sprayers 2017 and before will use **PWM 12 Volt**. Case sprayers 2017 and after will use **PWM Ground**. The RoGator factory controller uses **PWM Ground**. The Apache factory controller uses **PWM Ground** or **Bypass Servo** depending upon plumbing. The AgLeader rate controllers use **PWM 12 Volt**. Trimble rate controllers use **PWM Ground**. Raven ISO controller 2 uses **PWM Ground**.	
26	Manual Mode Servo Speed	Press **ENTER** to change.
	The manual mode servo speed controls how fast the pressure changes in manual mode. If the valve operates too slowly in manual mode, increase this value. If the valve operates too quickly in manual mode, decrease this value.	
27	Servo Minimum DC%	Press **ENTER** to change.
	The servo minimum value is the minimum duty cycle that the pump will be driven. It is important that this value corresponds with the minimum duty cycle used by the rate controller. This value also scales the minimum duty cycle of the pulsing boom nozzles. Raven uses Bit Integers 0 to 256 to set this minimum. Use math to determine this percentage. If the controller value is “150,” then the duty cycle percent is 150/256*100 = 59%.	
28	Servo Maximum DC%	Press **ENTER** to change.
	The servo maximum value is the maximum duty cycle that the pump will be driven. It is important that this value corresponds with the maximum duty cycle used by the rate controller. This value also scales the maximum duty cycle of the pulsing boom nozzles. Raven uses Bit Integers 0 to 256 to set this maximum. Use math to determine this percentage. If the controller value is “250,” then the duty cycle percent is 250/256*100 = 98%.	
29	Pump Speed Limit	Press **ENTER** to change.
	The pump speed limit is used on sprayers that are equipped with a pump speed sensor. When the pump speed limit is enabled, it will limit the maximum pump speed to the selected RPM.	
30	Pump Seal Shutdown	Press **ENTER** to change.
	When the sensor falls below the pump seal shutdown value, the pump shuts off to prevent the pump from operating dry and causing pump seal failure. This feature only works in Synchro™ mode with a PWM pump in Automatic mode.	
31	Nozzle PWM% Cycle Time	Press **ENTER** to change.
	The nozzle PWM% cycle time value only affects in-line or bypass valve servo types. The PWM% cycle time (4.0 seconds) is the time it takes for the pulsing nozzles to modulate from minimum to maximum duty cycle. To speed up a sluggish system reaction time, enter a lower number. To slow down the reaction time of an oscillating system, enter a higher number.	

Line Number	Line Title / Description	Action
32	Nozzle Pulse Frequency	Press **ENTER** to change.
	All CapstanAG sprayer systems run at 10 pulses per second pulse frequency. To run a faster pulse frequency, enter a larger number. CapstanAG does not recommend pulse frequencies slower than 10Hz in sprayer applications.	
33	Nozzle PWM Minimum	Press **ENTER** to change.
	The nozzle PWM minimum value is the minimum pulse duty cycle for the nozzle valves. You may not change this value any less than the Nozzle Pulse Frequency value. If the Nozzle Pulse Frequency is set to 10 pulses, then the nozzle PWM minimum must be set to 10 or higher. If you are is uncomfortable about running low duty cycles, then this value can be set higher.	
34	Nozzle PWM Maximum	Press **ENTER** to change.
	It is unlikely that you would set the nozzle PWM maximum lower than 100%. This is where the limit to the maximum duty cycle would be set.	
35	Flowmeter Minimum GPM	Press **ENTER** to change.
	The flowmeter minimum gallons per minute value is the minimum flow at which the turbine flowmeter is no longer accurate. When in correction mode, the PinPoint™ II will automatically calculate the flow below this value. This is especially important when the system is operating with only a few nozzles, like point rows, filling gaps, etc. The system calculation accurately measures flow through a single nozzle.	
36	Flowmeter Output Type	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 Flowmeter Minimum GPM and also when a partial boom section is pulsing. **Transparent** mode prohibits this switch and only uses the turbine value regardless of accuracy. **Calculate** mode uses only the calculation.	
37	Flowmeter Calibration	Press **ENTER** to change.
	It is important for the flow meter calibration value to match the tag on the turbine flowmeter so that the gallon counters will match the rate controller. The system 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 gallons per minute shown in ***System Setup*** and comparing it to the rate controller.	
38	Flowmeter Error Limit	Press **ENTER** to change.
	The flowmeter error limit ranges from Disabled to 50%. Flow % higher than the chosen % will cause a fault message and an alarm.	
39	Flowmeter Error	Press **ENTER** to change.
	The flowmeter error shows the real-time % difference between the flowmeter and the calculated flow.	

Line Number	Line Title Description	Action
40	Minimum Valves ON	Press **ENTER** to change.
	The minimum valves on defaults to 1. Reduces the over application of chemical product with chemical injection. Used for chemical injection systems (not N-Ject™).	
41	Navigation IMU	Press **ENTER** to change.
	This feature must be enabled to allow quicker response time to the headings. **Note:** The PSI NAV Commander Module must be mounted correctly for this feature to function correctly.	
42	Pressure Command	Press **ENTER** to change.
	Enable this feature if the system is using a Raven PC2 Node to get the correct rate control for the system.	
43	GPS Lag Time	Press **ENTER** to change.
	This is used to correct the delayed GPS signal from the antenna.	
44	Factory Reset	Press **ENTER** and then **YES** to change.
	The factory reset will require all setups in the entire system to be reset to default. The factory reset is required when repairing the system. Make sure that you have recorded the setups you prefer before resetting. With a properly prepared “cheat sheet,” a factory reset only takes a few minutes. If major components are changed, a factory reset may need to be performed.	
45	Contact Information	
	Selecting this line will open up a page with the CapstanAG toll-free phone number, website, and a QRC code that will direct you to the website.	

Advanced Settings—SharpShooter™ Mode Operation

Line Number	Line Title Description	Action
1	Hour Meter	
	The hour meter shows the accumulated hours. The hour meter starts when at least one nozzle is on.	
2	Compass Heading	Press **ENTER** to and then **YES** to calibrate.
	The 3-dimensional compass is generally not used. It could be used for backup detection or low-speed turn compensation stability.	
3	Compass Offset	Enter the offset to calibrate
	This value is used after calibrating the 3-dimensional compass to correlate the chassis with the Gateway Hub.	
4	USB Mode	
	Thumb drive or **computer**. **Thumb drive** must be chosen to utilize a USB drive for different purposes.	
5	Deadband Pressure	Press **ENTER** to change.
	The deadband pressure 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 to100.	
6	Gain - System	Press **ENTER** to change.
	The system gain is used to tune pressure control. The system gain changes the total gain of the system according to the same ratios of proportional/integral/differential gain established in those settings. The system 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.	
7	Gain - Proportional	Press **ENTER** to change.
	The 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.	
8	Gain - Integral	Press **ENTER** to change.
	The 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.	

Line Number	Line Title / Description	Action
9	Gain - Differential	Press **ENTER** to change.
	The 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.	
10	Total Number Valve Expected	Press **ENTER** to change.
	The total number of valve expected value is the number of valves on the sprayer. Upon system power on, the system counts the number of valves reported by the VCMs. If the reported number matches the manually entered number for the value, then all is OK, and the system continues. If an error is detected, then an alarm is sounded and diagnostic readouts show. The system cannot detect valve issues that may have occurred when the system was not running. If the valve was damaged, or corrosion sets in over the winter, this is the error you will get. The system cannot determine which nozzle is affected if the problem occurred when the system was powered off, so use the CapView location setup screen and look for a nozzle that is not connected.	
11	Scrolling Enable/Disable	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.	
12	GPS - Ant. Ahead of Rear Axle	Press **ENTER** to change.
	Enter the number of inches from the rear axle to the GPS antenna. A positive number indicates that the antenna is ahead of the axle. A negative number indicates that the antenna is behind the axle. This value is used for the GPS overlap control to shut off the nozzles in the proper place. The GPS antenna must be located on the vehicle on which the boom is mounted. For pull-behind units, mount the GPS antenna on the implement.	
13	GPS - Ant. Right of Center	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.	
14	GPS Antenna Above Ground	Press **ENTER** to change.
	Enter the number of inches that the GPS antenna is above ground.	
15	GPS Boom Ahead of Rear Axle	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.	

Line Number	Line Title / Description	Action
16	Forward/Reverse Detection	Press **ENTER** to change.
	For individual nozzle control to correctly perform, the system must know if the sprayer is moving in forward or reverse. When the forward/reverse detection is set to **OFF=Fwd Rev Switch**, the system is looking for a 12V (reverse beeper) input to tell it the sprayer is reversing. If the system does not see the 12V signal, it assumes the sprayer is traveling in the forward direction. If this setting is changed to **Compass w/Turn**, then a 3-D compass is used to detect forward/reverse, and the compass calibration is required. For operators who do not spray in reverse, the best option is to leave this setting at **OFF=Fwd Rev Switch**.	
17	Look Ahead Time	Press **ENTER** to change.
	The look ahead time is based on the fastest field speed. The value is an indicator of how much time the GPS and the 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 value at the fastest travel speed expected. **Note:** When setting the overlap distance, set the Look Ahead Time value to 0.	
18	Zero Rate Shutoff	Press **ENTER** to change.
	When set to **Shutoff**, the low pressure shutoff is enabled. To disable the low pressure shutoff, set to **Minimum PWM%**. When set to shutoff, the system will allow the duty cycle to drive to 0% or off. This is useful when applying VRT grids with a 0 application rate. The recommended setting is **Minimum PWM%**, where it will only allow the system to go to the low limit nozzle PWM set on the **Nozzle PWM Minimum** line.	
19	Low Pressure Shutoff	Press **ENTER** to change.
	When used, the low pressure shutoff causes the solenoid valves to shut off, like diaphragm drip checks at this value. When the low pressure shutoff value is 8 PSI, a readout will show when PSI drops below 8 PSI. At this point, nozzle valves will close. Nozzle valves will open, and the readout will clear when the PSI increases to at least 12 PSI.	
20	Low Pressure Turn-On	
	When used, the low pressure turn-on causes the solenoid valves to turn on after a low pressure shutoff, like diaphragm drip checks.	
21	Pressure Control Hold	Press **ENTER** to change.
	SharpShooter™ mode operation pressure control hold must be set to **disable** or 0.	
22	Pressure Sensor 1 Min. Voltage	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
23	Pressure Sensor 1 Max. Voltage	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
24	Pressure Sensor 1 Min. Pressure	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	

Line Number	Line Title / Description	Action
25	Pressure Sensor 1 Max. Pressure	Press **ENTER** to change.
	Used to set up pressure sensor 1, which is the PinPoint™ II spray pressure sensor.	
26	Pressure Sensor 1 Offset	Press **ENTER** to change.
	It is common to have 1 to 5 VDC sensors and 0.5 to 5 VDC sensors. The PSI sensor offset is used when the sensor does not match a gauge. Entering an offset value will scale the sensor up or down. The sensor offset allowable range is ±1-9.	
27	Nozzle Pulse Frequency	Press **ENTER** to change.
	All CapstanAG sprayer systems run at 10 pulses per second pulse frequency. To run a faster pulse frequency, enter a larger number. CapstanAG does not recommend pulse frequencies slower than 10Hz in sprayer applications.	
28	Nozzle PWM Minimum	Press **ENTER** to change.
	The nozzle PWM minimum value is the minimum pulse duty cycle for the nozzle valves. You may not change this value any less than the Nozzle Pulse Frequency value. If the Nozzle Pulse Frequency is set to 10 pulses, then the nozzle PWM minimum must be set to 10 or higher. If you are is uncomfortable about running low duty cycles, then this value can be set higher.	
29	Nozzle PWM Maximum	Press **ENTER** to change.
	It is unlikely that you would set the nozzle PWM maximum lower than 100%, this is where to set the limit to the maximum duty cycle.	
30	Flowmeter Minimum GPM	Press **ENTER** to change.
	The flowmeter minimum gallons per minute value is the minimum flow at which the turbine flowmeter is no longer accurate. When in correction mode, the system will automatically calculate the flow below this value. This is important when the system is operating with only a few nozzles, like point rows, filling gaps, etc. The system calculation accurately measures flow through a single nozzle.	
31	Flowmeter Output Type	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 Flowmeter Minimum GPM and also when a partial boom section is pulsing. **Transparent** mode prohibits this switch and only uses the turbine value. **Calculate** mode uses only the calculation.	
32	Flowmeter Calibration	Press **ENTER** to change.
	It is important for the flow meter calibration value to match the tag on the turbine flowmeter so the gallon counters will match the rate controller. The system 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. Monitor the gallons per minute shown in ***System Setup*** and comparing it to the rate controller.	

Line Number	Line Title / Description	Action
33	Flowmeter Error Limit	Press **ENTER** to change.
	The flowmeter error limit ranges from Disabled to 50%. Flow % higher than the chosen % will cause a fault message and an alarm.	
34	Flowmeter Error	Press **ENTER** to change.
	The flowmeter error shows the real-time % difference between the flowmeter and the calculated flow.	
35	Low Flow Hold Flow Rate	
	The low flow hold flow rate is set to **Disabled** except on John Deere R Series sprayers; this must be set to 10 GPM.	
36	Rate Sync Test Speed	Press **ENTER** to change.
	The Rate Sync™ test speed is not used at this time.	
37	Minimum Valves ON	Press **ENTER** to change.
	The minimum valves on defaults to 1. Reduces the over application of chemical product with chemical injection. Used for chemical injection systems (not N-Ject™).	
38	Navigation IMU	Press **ENTER** to change.
	This feature must be enabled to allow quicker response time to the headings. **Note:** The PSI NAV Commander Module must be mounted correctly for this feature to function correctly.	
39	Pressure Command	Press **ENTER** to change.
	Enable this feature if the system is using a Raven PC2 Node to get the correct rate control for the system.	
40	GPS Lag Time	Press **ENTER** to change.
	This is used to correct the delayed GPS signal from the antenna.	
41	Factory Reset	Press **ENTER** and then **YES** to change.
	The factory reset will reset all setups in the entire system to the default settings. The factory reset is required when repairing or replacing parts of the system. Make sure that you have recorded the setups you prefer before resetting. With a properly prepared “cheat sheet,” a factory reset only takes a few minutes.	
42	Contact Information	
	Selecting this line will open up a page with the CapstanAG toll-free phone number, website, and a QRC code that will direct you to the website.	

Do the Nozzle Setup Procedure

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

   Nozzle Setup is to set up each individual nozzle for:

   - Rank
   - Flow Value—Used to adjust nozzle flow for fence row and wheel track
   - Nozzle Size—Used to adjust to match tip size
   - Valve Size—15.5 for standard valve assemblies and 24.0 for high flow valve assemblies
   - Auxiliary and Soft Boom Attachment

   Each individual nozzles can be tested, or the identity confirmed.

   The ***Nozzle Setup*** screen includes set up for:

   - Fence Rows
   - Wheel Track
   - Dust Control Nozzles
   - Soft Booms for Non-conventional Nozzle Groupings

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

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

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

   The nozzle setup should change.
2. Use the arrow buttons to highlight the desired information to change.
3. Press the **ENTER** button.
4. Change the information.
5. Press the **ENTER** button.

Set the Preset Buttons

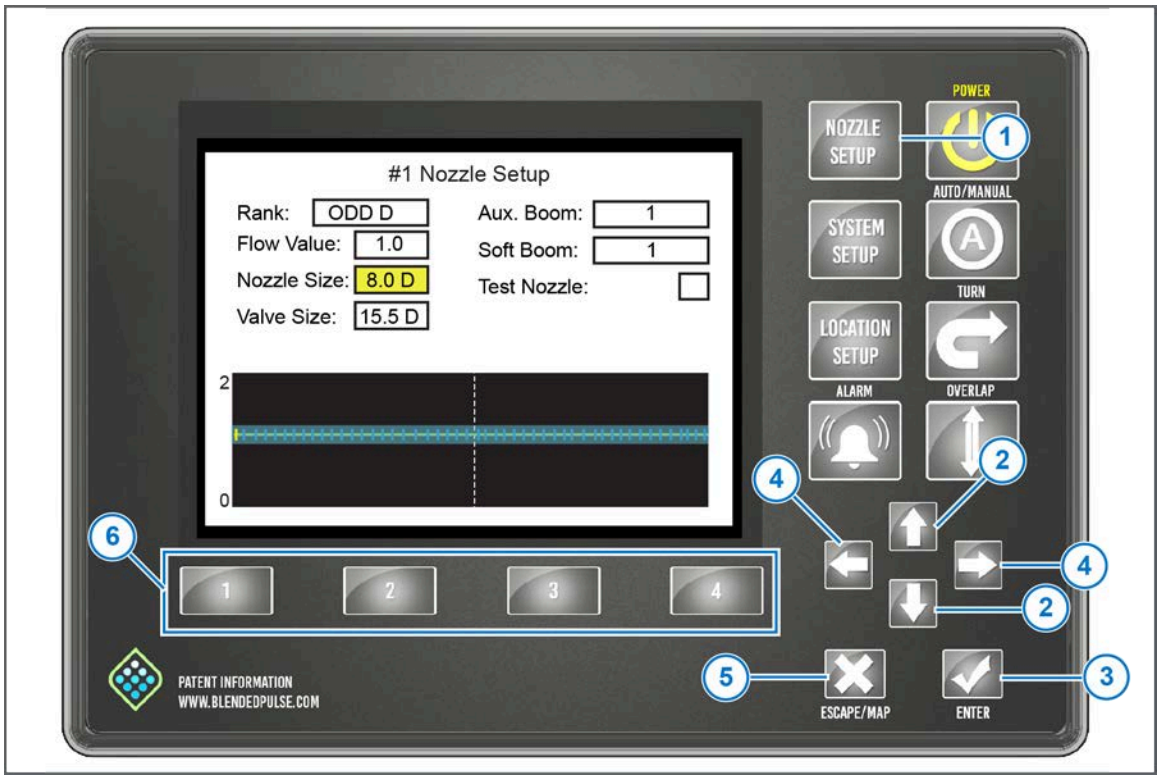


Fig. 28:

1. Press the **NOZZLE SETUP** button *(1)*.
2. Use the **UP** or **DOWN** arrow buttons *(2)* to go to the **Nozzle Size**.
3. Press the **ENTER** button *(3)*.
4. Use the **UP** or **DOWN** arrow buttons to change the value to match the desired tip size.
5. Press the **ENTER** button.

   A message screen will show... **You are about to change the default tip size for all nozzles. Are you sure you wish to do this?**
6. Use the **LEFT** or **RIGHT** arrow buttons *(4)* to go to **Save**.
7. Press the **ENTER** button.
8. Press the **ESCAPE/MAP** button *(5)* to show the ***Save Menu***.
9. Use the **LEFT** or **RIGHT** arrow buttons to select the preset number to which you would like to save this profile.
10. Press the desired preset button *(6)*.

    Note: When you change the nozzles, you must select the corresponding preset. Press and hold the correct Preset button until the light turns on.

System Dry Tests

Do these procedures to make sure that the soft boom and nozzle valves are operating correctly.

Do the Boom Shutoff Dry Test

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

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

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

Do the Key Fob Boom Shutoff Dry Test

Using the key fob to operate the boom sections lets the operator see the operation of the nozzle valves. Use the key fob to operate each nozzle.

Fig. 29:

1. Activate the Nozzle Control (Key Fob) on the CapView.
   a) Press the **SYSTEM SETUP** button *(1)*.
   b) Use the **UP** or **DOWN** arrow buttons *(2)* to select **Nozzle Control (Key Fob)** *(3)*.
   c) Press the **ENTER** button *(4)*.
   d) Use the **UP** or **DOWN** arrow buttons to select **Key Fob Active** *(5)*.
   e) Press the **ENTER** button.

   When the key fob mode is activated, all the nozzles are turned off. The CapView shows that the Key FOB Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs.
2. Turn on all of the boom section switches and the master switch to let water flow to all of the boom sections.
3. Press the top/bottom buttons on the Key FOB to turn ON/OFF each boom section (1 thru 12).

   Make sure that each boom section is operating (clicking) in the correct order.

   Note: If the nozzles do not turn on in sequential order, it indicates the VCMs are not setup correctly.
4. Press the right/left buttons on the Key FOB to turn ON/OFF each individual nozzle valve.

   Make sure that each nozzle valve is operating (clicking) in the correct order.

Note: 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 center button on the Key FOB to turn OFF the whole boom.
6. Activate Nozzle Control (Key FOB) in the ***SYSTEM SETUP*** and change setting back to **12V Active** or the previous setting.

System Wet Tests

Do these procedures to make sure that the soft boom and nozzle valves are operating correctly.

Do the Boom Shutoff Wet Test

1. Fill the sprayer with approximately 400 gallons of water.
2. Make sure that the CapView and rate controller are off.
3. Start the machine engine and set to idle speed.
4. Turn on the CapView and rate controller.
5. Use the rate controller to start the pump.
6. Increase the engine speed to half throttle.
7. Set the CapView to the desired pressure.
8. Turn on all of the boom switches.

   All of the nozzle valves on the boom should start to spray.
9. Turn off all of the boom sections.
10. Turn of boom section 1.

    The nozzle valves on boom section 1 should start to spray.
11. Repeat steps 9 and 10 for each boom section.
12. Make sure that each boom section operates in the correct order.

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

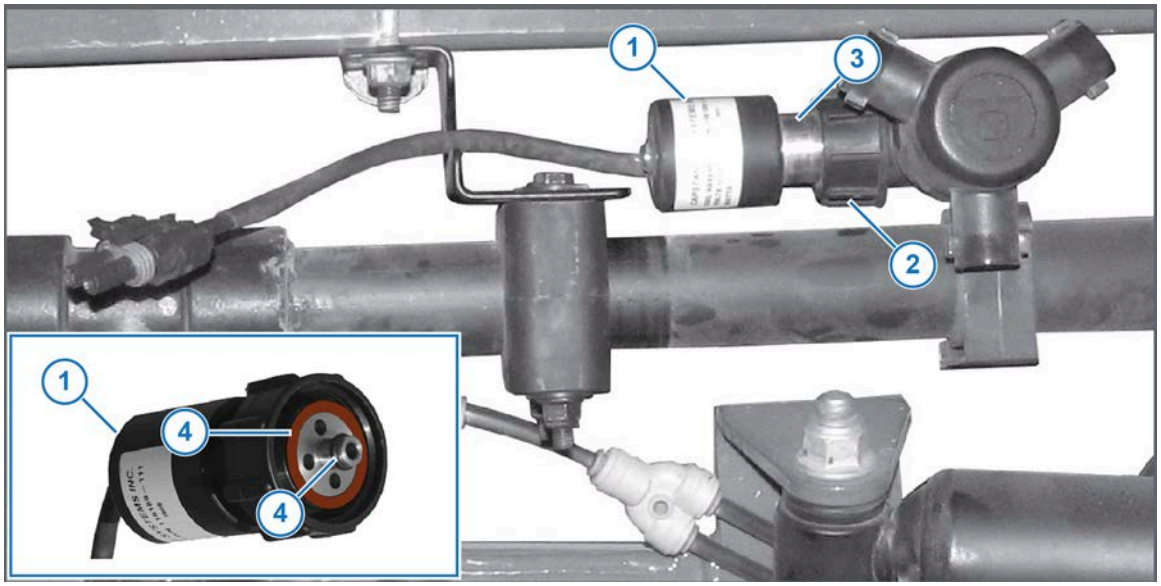


Fig. 30:

13. If the coil housing *(1)* spins, tighten the fly nut *(2)* until the coil housing does not spin.
14. If the coil housing does not spin, remove the nozzle valve *(3)*.
15. Inspect the O-rings *(4)*. If an O-ring is damaged, replace the O-ring.

    If the O-rings appear to be okay, install the existing nozzle valve.

Do the Key Fob Boom Shutoff Wet Test

Fig. 31:

Use the key fob to operate the boom sections while not in the cab near the CapView display. The key fob lets the operator see the operation of the nozzle valves. The Key Fob works to check for plugged tips without wasting a significant amount of product.

1. Activate the Nozzle Control (Key Fob) on the CapView.
   a) Press the **SYSTEM SETUP** button *(1)*.
   b) Use the **UP** or **DOWN** arrow buttons *(2)* to select **Nozzle Control (Key Fob)** *(3)*.
   c) Press the **ENTER** button *(4)*.
   d) Use the **UP** or **DOWN** arrow buttons to select **Key Fob Active** *(5)*.
   e) Press the **ENTER** button.

   When the key fob mode is activated, all the nozzles are turned off. The CapView shows that the Key Fob Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs.
2. Turn on all of the boom section switches and the master switch to let water flow to all of the boom sections.
3. Press the top/bottom buttons on the Key FOB to turn ON/OFF each boom section (1 thru 12).

   Make sure that each boom section is operating (clicking) in the correct order.
4. Press the right/left buttons on the Key FOB to turn ON/OFF each individual nozzle valve.

   Make sure that each nozzle valve is operating (clicking) in the correct order.

   Note: If a nozzle valve is leaking, use a marker to mark it and continue to check the nozzle valves.
5. Press the center button on the Key FOB to turn OFF the whole boom.
6. Activate Nozzle Control (Key FOB) in the ***SYSTEM SETUP*** and change to **12V Active** or the previous setting.

Do the Pressure Control Test

1. Make sure that the tank has enough water to do the procedure.
2. Make sure that the CapView and the rate controller are off.
3. Start the machine engine and set the engine to idle speed.
4. Turn on the CapView and rate controller.
5. Use the rate controller to start the pump.
6. Press the **AUTO** button on the CapView to put the system in automatic mode.
7. Put the rate controller in manual mode, or set a test speed and put the rate controller in automatic mode.
8. Turn on all of the boom sections.
   The system will spray.
9. Slowly increase the engine to full speed.
10. Press the **ENTER** button of the CapView to change between set points.

    If the pressure is stable at each of the set points and changes between the set points at a reasonable rate, the system has passed the pressure control test.

    If the pressure is unstable at any of the set points, decrease the system gain value in the ***ADVANCED SETTINGS*** menu.

    If the pressure changes too slowly between the set points, increase the system gain value in the ***ADVANCED SETTINGS*** menu.

Do the Flow Control Test

1. Make sure that the tank has enough water to do the procedure.
2. While stationary, set the test speed in the rate controller.
3. On the rate controller, set an appropriate application rate for the nozzles on the machine.
4. Turn on the boom section switches and the master switch.
5. Make sure that the actual rate is the same as the target rate.

   If the target rate changes, the actual rate should change to the same value.

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

Do the Look Ahead Time and Overlap Test

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

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

It is important to do this procedure without the **Overlap** turned on to make sure that all of the valves are turning on early enough and turning off late enough.

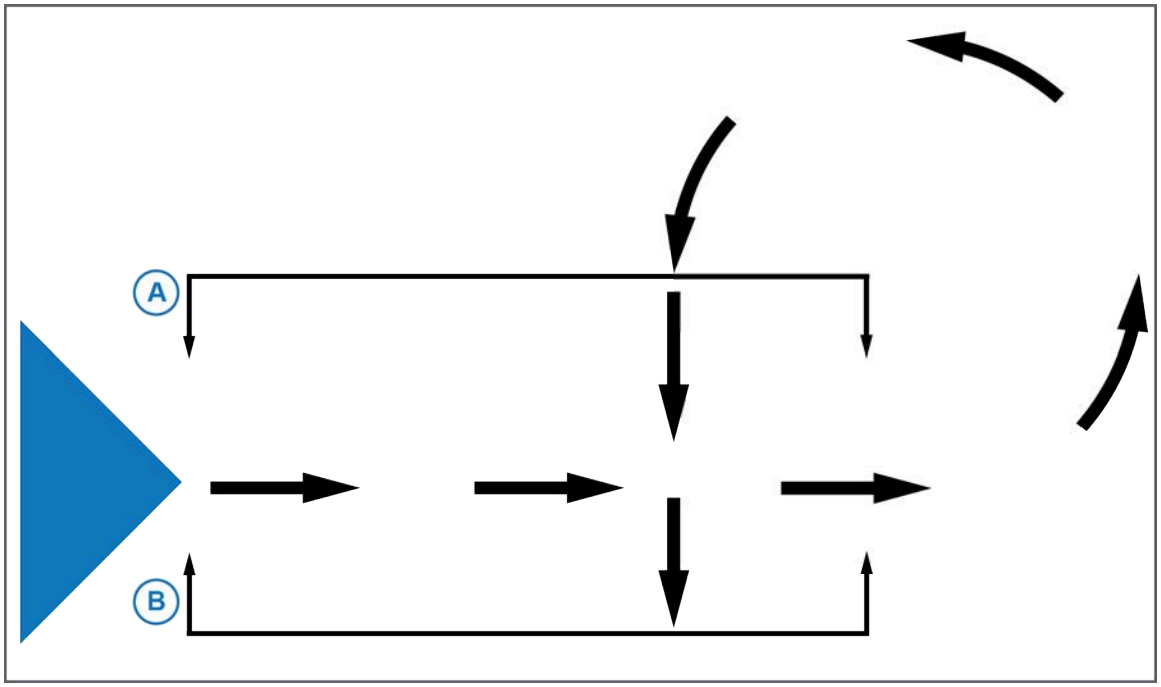


Fig. 32:

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

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

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

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

   If the people notice that the nozzle valve shutoff time or the spray on time is early or late, adjust the **Look Ahead Time** in the ***SYSTEM SETUP*** menu. If the shutoff is too late, increase the value. If the shutoff is too early, decrease the value.

Do the Compass Calibration Procedure

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

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

1. Make sure that the machine is facing north.

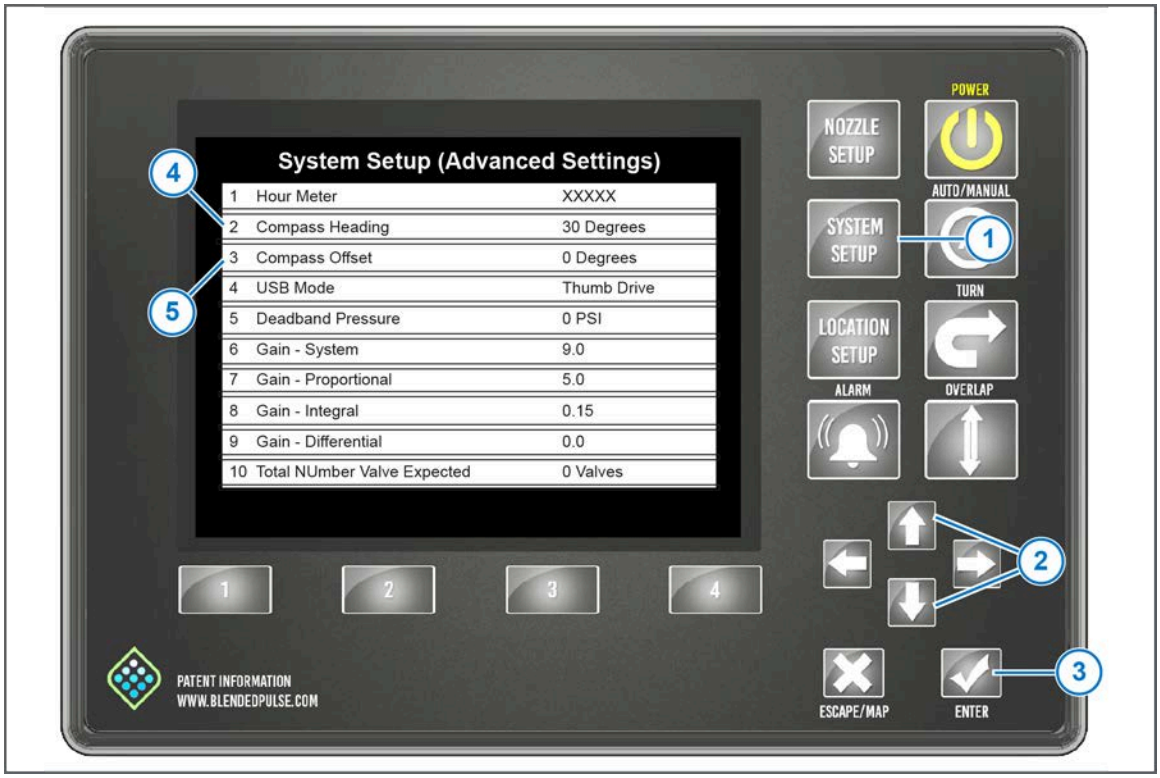


Fig. 33:

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

    A heading value will show on the CapView.

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

    Note: If the calibration fails twice, cycle the power and do the procedure again.
11. Use the **UP** or **DOWN** arrows to select **Compass Offset** *(5)*.
12. Press the **ENTER** button.
13. Enter the value into the Compass Offset value.

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

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

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

Setting the GPS Settings

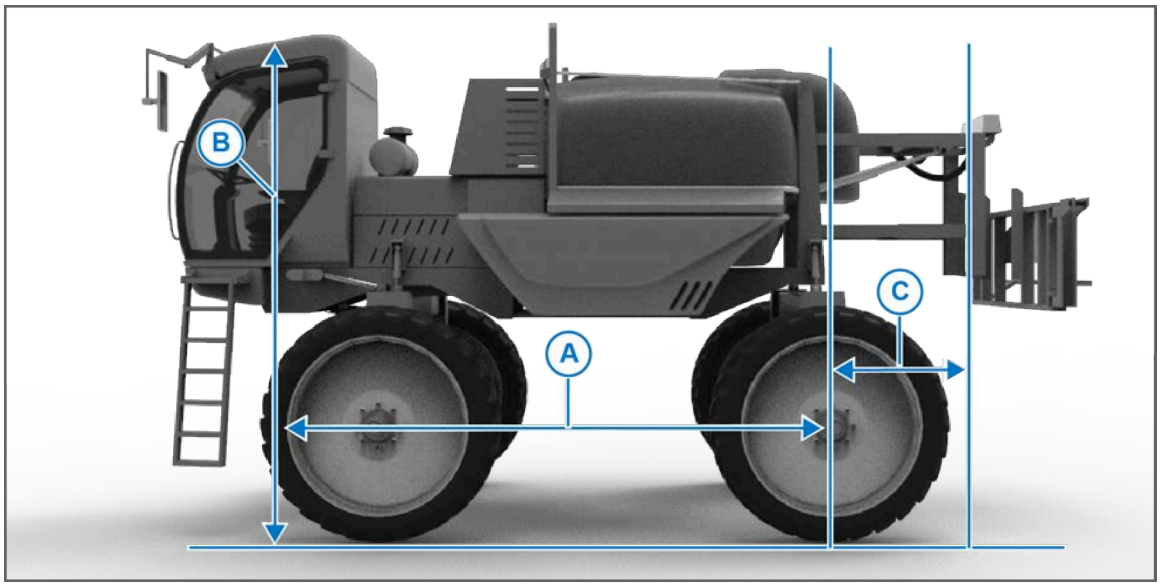


Fig. 34:

Before operation, make sure that the GPS setting values are correct.

Measure and record the values for:

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

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

(B) Antenna Above Ground—Inches that the GPS antenna is above the ground.

(C) Boom Ahead of Rear Axle—Inches from the boom centerline to the rear axle centerline.

- A positive number indicates the boom is ahead of the rear axle.
- A negative number indicates the boom is behind the rear axle.

Not Shown Antenna Right of Center—Inches that the GPS antenna is off-center

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

Note: If the GPS signal is taken from a navigation controller, the virtual position may be electronically repositioned over the rear axle, causing the GPS setting values to vary from the measured values on the sprayer. The GPS Boom Ahead of Rear Axle value will always be the actual measured distance from the GPS antenna centerline to the boom centerline at ground level, while A, B, and C can be 0.

Fig. 35:

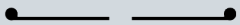
1. Press the **SYSTEM SETUP** button *(1)*.
2. Use the **UP** or **DOWN** arrow buttons *(2)* to select **GPS-Ant. Ahead of Rear Axle** *(3)*.
3. Enter the number of inches from the rear axle centerline to the GPS antenna centerline.

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

Machine Specific Information

Location Setup Information

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

Machine Type			VCM Orientation	
			Left	Right
				
Boom Section #8	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Boom #7:			
	Move these nozzles to Boom #9:			
Boom Section #9	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Boom #8:			
	Move these nozzles to Boom #10:			
Boom Section #10	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Boom #9:			
	Move these nozzles to Boom #11:			
Boom Section #11	Left VCM SN:	Nozzle Qty.		
	Right VCM SN:	Nozzle Qty.		
	Move these nozzles to Boom #10:			
	Move these nozzles to Boom #12:			

System Setup Information

Line Number	Line Name	Actual Setting
1	Operation Mode	
2	Controller Gallon Counter	
3	Actual Gallon Counter	
4	Controller Acre Counter	
5	Actual Acre Counter	
6	Controller Gallons Per Minute	
7	Actual Gallons Per Minute	
8	Nozzle Control (Key FOB)	
9	Pressure 1	
10	System Voltage	
11	Display Backlight	
12	LED Brightness	
13	Beeper Volume	
14	Specific Gravity	
15	Valve Diagnostics Enable	
16	Overlap Distance	
17	Rate Sync Mode	
18	Rate Sync Average	
19	Rate Max Ground Speed	
20	Units	
21	Baud Rate	
22	Revision Information	
23	Language	
24	Previous Error Lists	
25	Advanced Settings	

Advanced Settings—Synchro™ Setup Information

Line Number	Line Name	Actual Setting
1	Hour Meter	
2	Compass Heading	
3	Compass Offset	
4	USB Mode	
5	Deadband Pressure	
6	Gain - System	
7	Gain - Proportional	
8	Gain - Integral	
9	Gain - Differential	
10	Total Number Valve Expected	
11	Scrolling Enable/Disable	
12	GPS - Antenna Ahead Of Rear Axle	
13	GPS - Antenna Right Of Center	
14	GPS - Antenna Above Ground	
15	GPS - Boom Head Of Rear Axle	
16	Forward/Reverse Detection	
17	Look Ahead Time	
18	Zero Rate Shutoff	
19	Pressure Control Hold	
20	Pressure Sensor 1 Min. Volt	
21	Pressure Sensor 1 Max. Volt	
22	Pressure Sensor 1 Min. PSI	
23	Pressure Sensor 1 Max. PSI	
24	Pressure Sensor 1 Offset	
25	Servo Type	
26	Manual Mode Servo Speed	
27	Servo Minimum DC%	
28	Servo Maximum DC%	
29	Pump Speed Limit	
30	Pump Seal Shutdown	
31	Nozzle PWM% Cycle Time	

Line Number	Line Name	Actual Setting
32	Nozzle Pulse Frequency	
33	Nozzle PWM Minimum	
34	Nozzle PWM Maximum	
35	Flowmeter Minimum GPM	
36	Flowmeter Output Type	
37	Flowmeter Calibration	
38	Flowmeter Error Limit	
39	Flowmeter Error	
40	Minimum Valves On	
41	Navigation IMU	
42	Pressure Command	
43	GPS Lag Time	
44	Factory Reset	
45	Contact Information	

Advanced Settings—SharpShooter™ Setup Information

Line Number	Line Name	Actual Setting
1	Hour Meter	
2	Compass Heading	
3	Compass Offset	
4	USB Mode	
5	Deadband Pressure	
6	Gain - System	
7	Gain - Proportional	
8	Gain - Integral	
9	Gain - Differential	
10	Total Number Valve Expected	
11	Scrolling Enable/Disable	
12	GPS - Antenna Ahead Of Rear Axle	
13	GPS - Antenna Right Of Center	
14	GPS - Antenna Above Ground	
15	GPS - Boom Head Of Rear Axle	
16	Forward/Reverse Detection	
17	Look Ahead Time	
18	Zero Rate Shutoff	
19	Low Pressure Shutoff	
20	Low Pressure Turn-ON	
21	Pressure Control Hold	
22	Pressure Sensor 1 Min. Volt	
23	Pressure Sensor 1 Max. Volt	
24	Pressure Sensor 1 Min. PSI	
25	Pressure Sensor 1 Max. PSI	
26	Pressure Sensor 1 Offset	
27	Nozzle Pulse Frequency	
28	Nozzle PWM Minimum	
29	Nozzle PWM Maximum	
30	Flowmeter Minimum GPM	

Line Number	Line Name	Actual Setting
31	Flowmeter Output Type	
32	Flowmeter Calibration	
33	Flowmeter Error Limit	
34	Flowmeter Error	
35	Low Flow Hold Flow Rate	
36	Rate Sync Test Speed	
37	Minimum Valves On	
38	Navigation IMU	
39	Pressure Command	
40	GPS Lag Time	
41	Factory Reset	
42	Contact Information	

Chapter 6: Operation

Operate in Automatic Pressure Control (AUTO) Mode

Spraying is usually done in AUTO mode.

The PinPoint™ II system default is manual mode, to change to AUTO mode:

1. Start the machine engine.
2. Press the **POWER** button to start the CapView and the rate controller.
3. Press the **AUTO/MANUAL** button to activate the automatic pressure control.

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

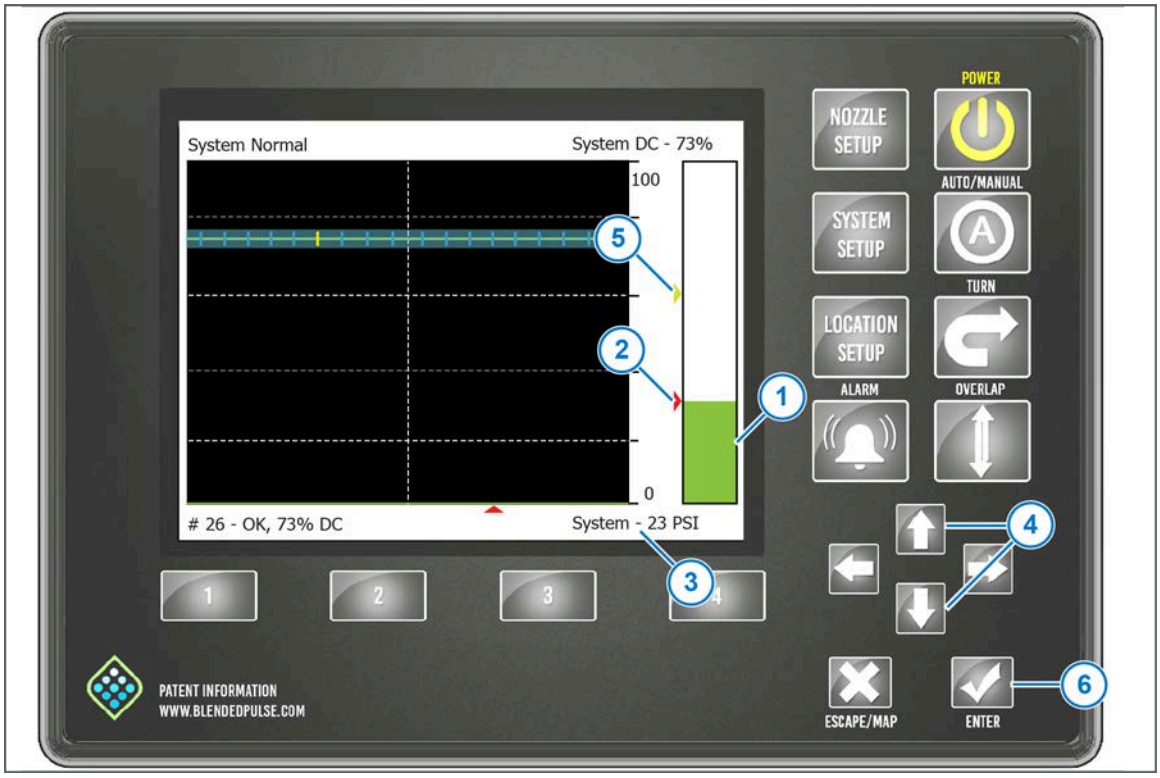


Fig. 36:

The green pressure bar *(1)* represents the pressure.

The red arrow *(2)* and the text on the bottom right corner *(3)* indicates the target pressure.

Use the **UP** or **DOWN** arrow buttons *(4)* to change the target pressure.

The yellow arrow *(5)* indicates the alternate target pressure. To change the alternate target pressure, press the **ENTER** button *(6)*.

Manual Mode Operation

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.

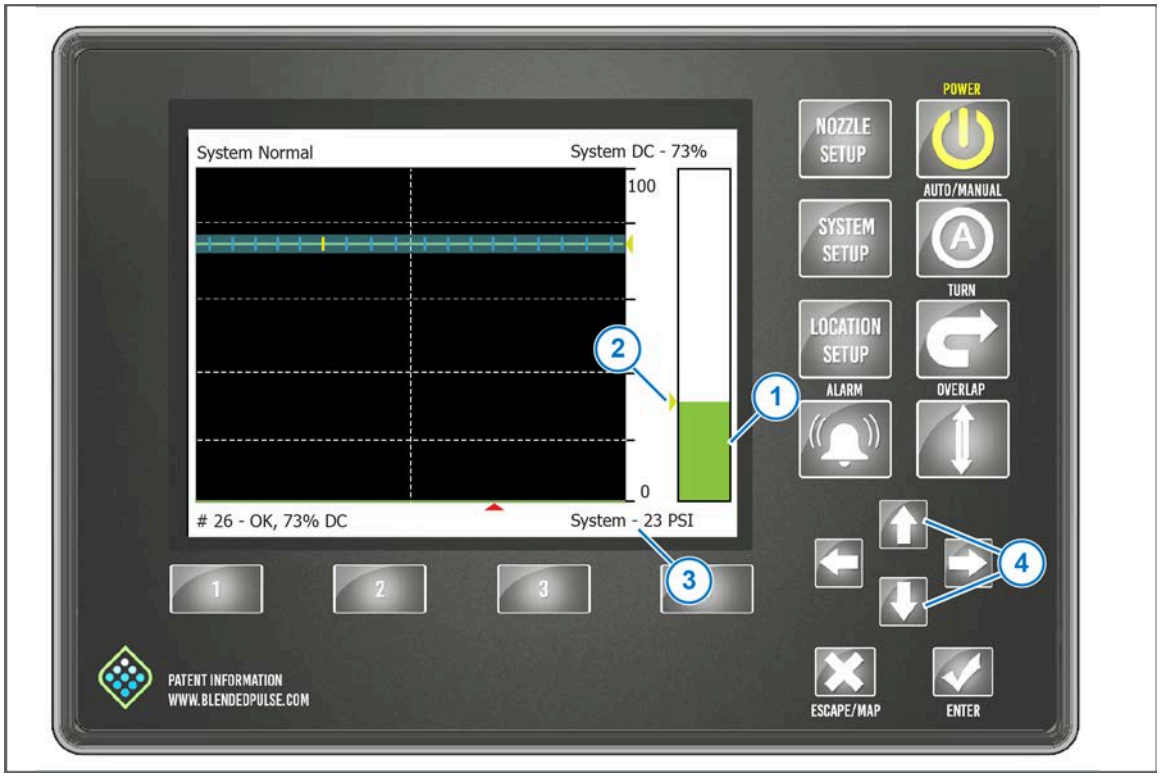


Fig. 37:

In manual mode, the actual pressure is shown in three different ways:

(1) Green Pressure Bar

(2) Yellow Error

(3) Text on the bottom right corner

In Sharpshooter mode, use the **UP** or **DOWN** arrows *(4)* to control the nozzle duty cycle, regardless of the pressure sensor reading or target pressure set point.

In Synchro™ mode, use the **UP** and **DOWN** arrows control the pump.

Spray Without the PinPoint™ II System

To spray without the PinPoint™ system, use one of these:

- CapstanAG nozzle valves
- Alternate valve bodies

Spray Through the CapstanAG Nozzle Valves

- The display must be off.
- The rate controller will control the rate.
- The nozzle valves will open and close with the boom signal (without pulsing).

Spray Through Alternate Valve Bodies

Note: Use of alternate valve bodies is recommended for high flow applications (30 gal or more per acre) if you do not have CapstanAG high-flow valve assemblies.

If using WILGER nozzle bodies:

- Disconnect the key switched power harness connector from the CapView harness.
- Install a cap onto the connectors.

The CapView must be off.

The rate controller will control the rate.

Manually open the drip checks.

Nozzle Display

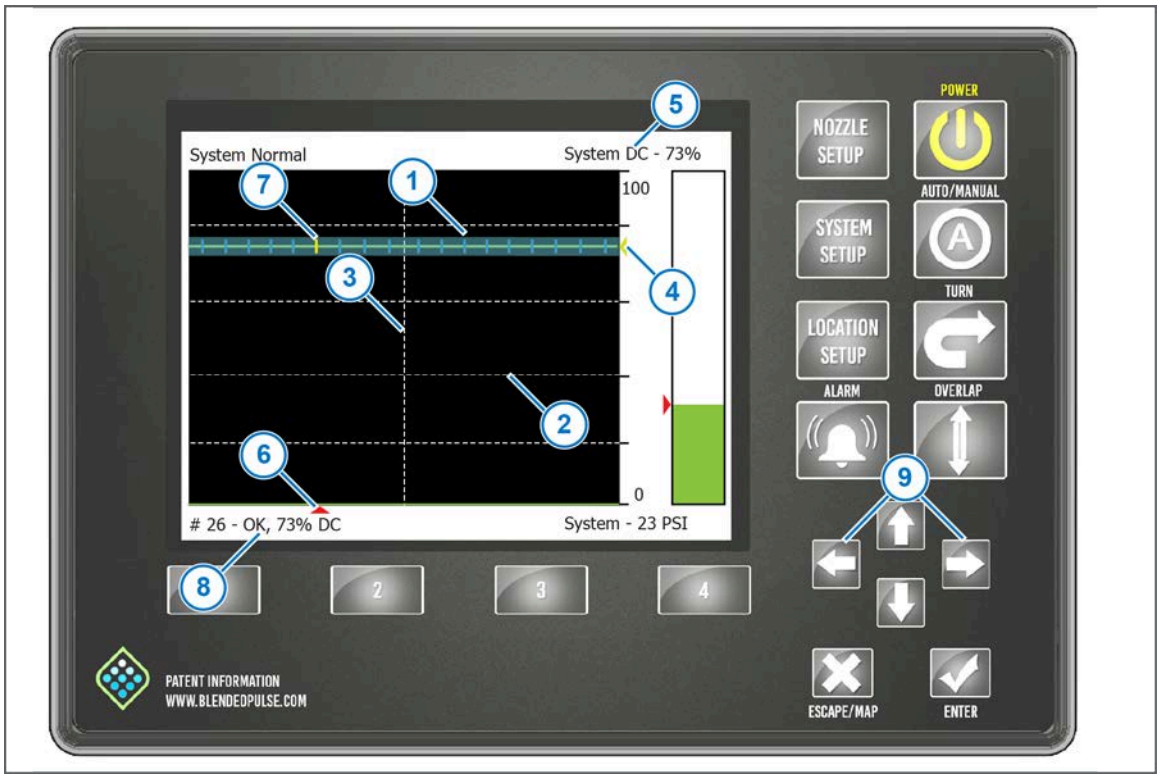


Fig. 38:

Each nozzle on the boom's duty cycle is indicated with a blue tick mark *(1)* on the scale.

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

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

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

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

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

The **LEFT** and **RIGHT** arrows *(9)* will override the scrolling red arrow so that the red arrow may be moved to the detected nozzle. The text block at the lower left side may show one of the following notices:

- Coil Circuit Open
- Coil Circuit Shorted Closed
- Valve Lodged Open
- Valve Lodged Closed

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

Overlap Control

Press the **OVERLAP** button to turn the overlap control on or off.

Overlap can be turned off for situations that include:

- Spraying Rinse Water
- Troubleshooting
- No GPS Signal
- Other

Mapping

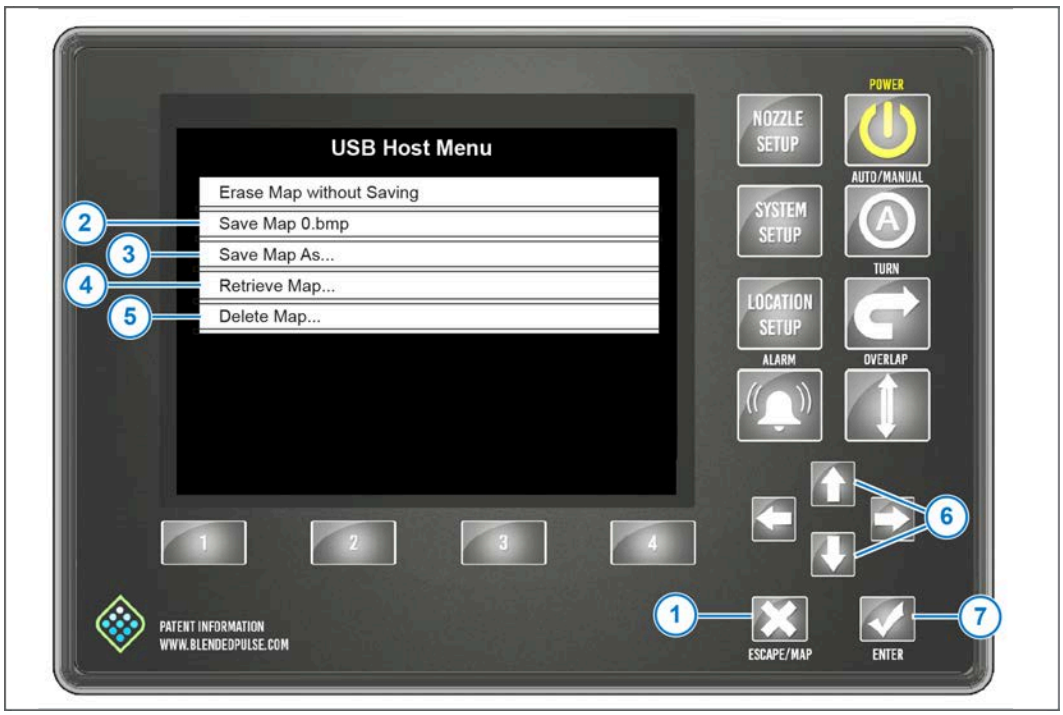


Fig. 39:

Make sure that the **OVERLAP** is off before you enter the **MAP** menu.

Press the **ESCAPE/MAP** button *(1)* to go to the ***Save Map Menu***.

From the ***Save Map Menu***, maps can be viewed, saved, deleted, moved, copied, etc.

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

Maps can also be made on CapMaps™ Software on your computer and uploaded to the CapView display. For more information, see CapMaps™—Boundary Mapping.

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

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

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

If the **Save Map #.bmp** *(2)* is selected, the map will be saved, and a new map will start.

Select **Save Map As...** *(3)* to give the map a specific name.

Select **Retrieve Map...** *(4)* to load a map that has already been made.

Select **Delete Map...** *(5)* to delete the current map.

RECOMMENDATION: If you are done spraying the field, select **Delete Map...**.

Press the **UP** or **DOWN** arrow buttons *(6)* to select the desired map setting.

Press the **ENTER** button to save.

To shortcut to the Save Map Menu, press the **ESCAPE** button *(7)*.

Upload a Boundary File to the CapView

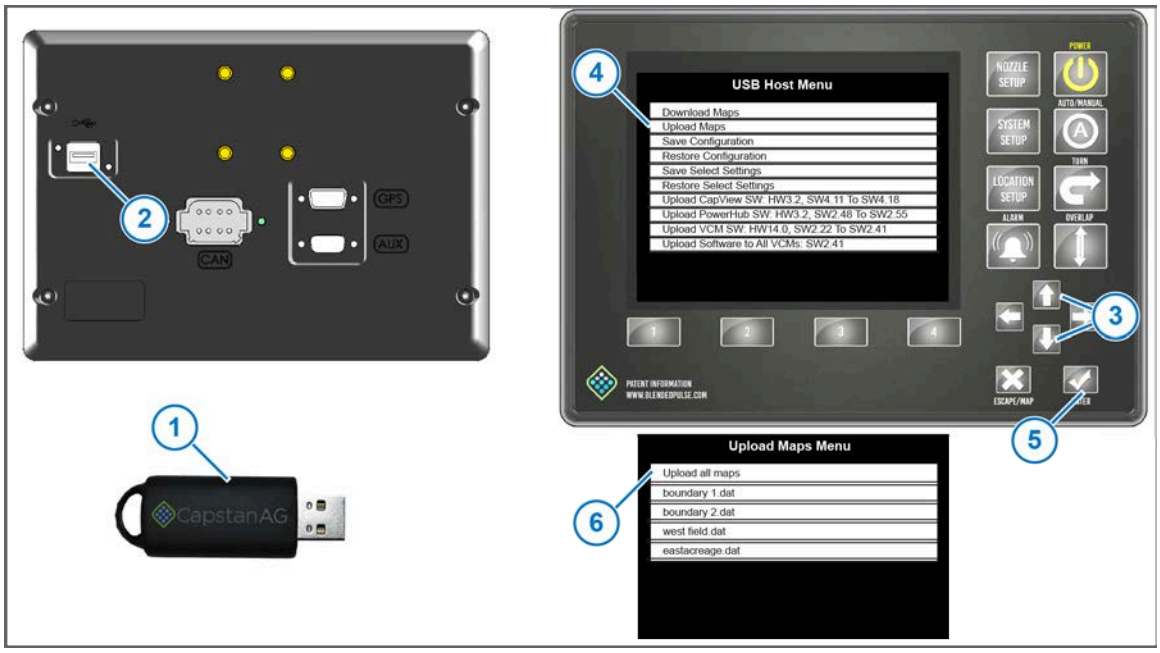


Fig. 40:

1. Insert the thumb drive *(1)* into the back of the CapView display *(2)*.
   The ***USB Host Menu*** will show on the display screen.
2. Use the up or down arrow button *(3)* to select **Upload Maps** *(4)*.
3. Press the **ENTER** button *(5)*.
   The ***Upload Maps Menu*** will show.
4. Select the desired map(s) or select **Upload all maps** *(6)*.
5. Press the **ENTER** button.
   The upload is complete when the blue scroll bar at the bottom of the screen disappears.
6. Remove the thumb drive from the CapView.

Use a Map on the CapView

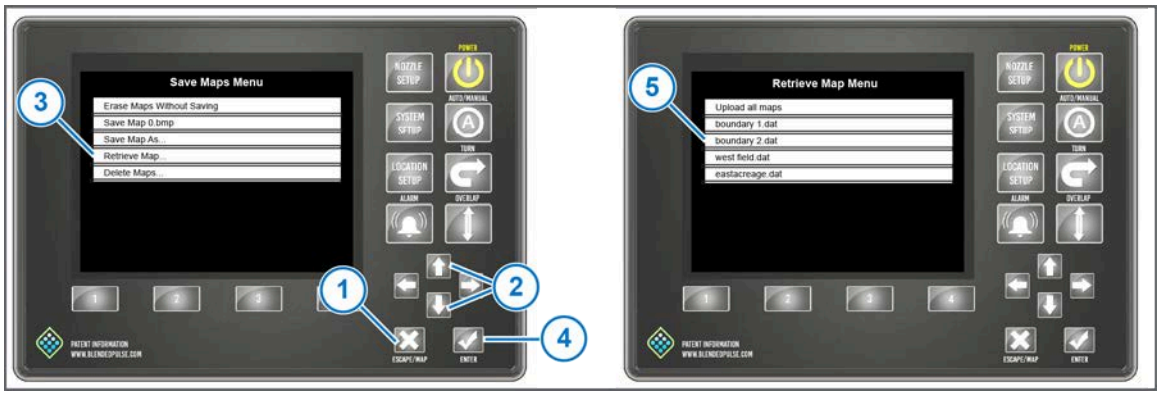


Fig. 41:

1. Press the **ESCAPE/MAP** button *(1)*.
2. Use the up or down arrow button *(2)* to select **Retrieve Map** *(3)*.
3. Press the **ENTER** button *(4)*.
4. Use the up or down arrow button to select the desired boundary map *(5)*.
5. Press the **ENTER** button.

   The upload is complete when the blue scroll bar at the bottom of the screen disappears.
6. Press the **ESCAPE/MAP** button twice to go to the main operating screen.
   You are now ready to spray.

Download Maps

Fig. 42:

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

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

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

CapMaps™—Boundary Mapping

Install the CapMaps™ Software

If you have a previous version of the CapMaps™ software on your computer, you must uninstall that version before installing a new version of the software.

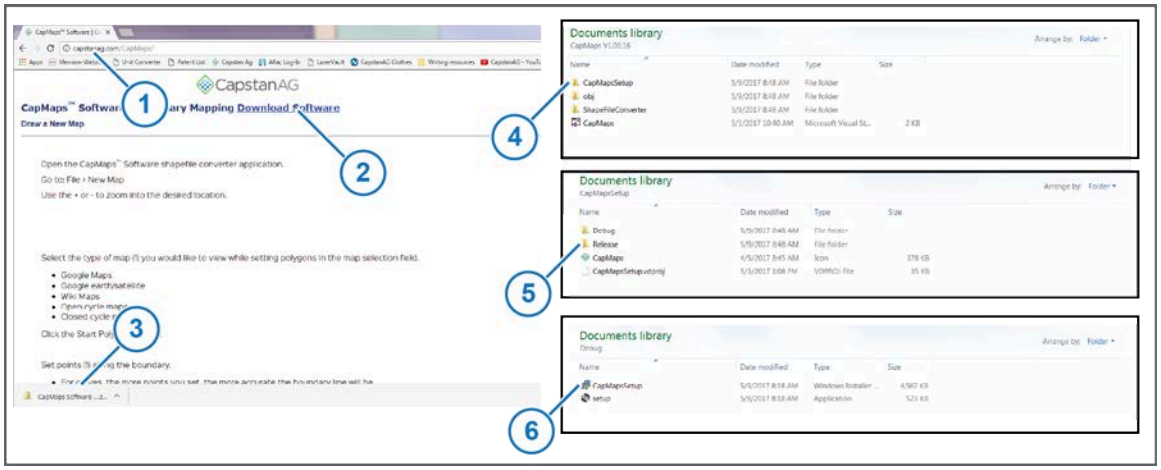


Fig. 43:

1. On your computer, open a web browser and go to capstanag.com/CapMaps *(1)*.

   Important: Capital letters must be used for the C and M in CapMaps when typing in the web address.
2. Click on **Download Software** *(2)*.

   The software will automatically begin downloading to your computer.
3. When the software download is complete, open the download folder *(3)* on your computer.
4. Extract all the files from the zipped folder.
5. Open the extracted folder.
6. Double click **CapMapsSetup** folder *(4)* to open the folder.
7. Double click the **Release** folder *(5)* to open the folder.
8. Double click the **setup** icon *(6)*.
   The setup wizard will start.

Fig. 44:

9. Click **Next >** *(1)*.

10. Make sure that the program will be installed in the desired location *(2)*.

11. Click **Next >** *(3)*.

12. Click **Next >** *(4)*.

You can watch the progress of the software installation *(5)*.

13. When the installation is complete, click **Close** *(6)*.

A **CapMaps™ Software** icon *(7)* will show on the computer desktop.

14. Double click the icon to start the program.

Draw a Map

1. Open the CapMaps™ Software shapefile converter application.

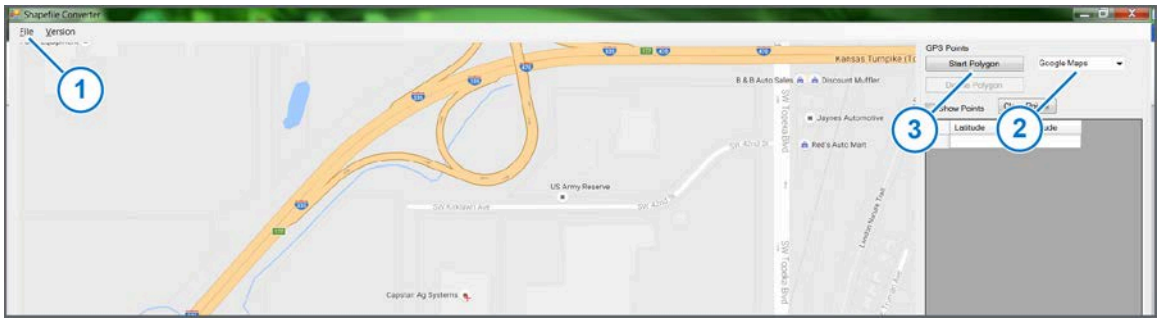


Fig. 45:

2. Go to: **File** > **New Map** *(1)*.
3. Use the + or - to zoom to the desired location.
4. Select the type of map *(2)* you would like to view while setting polygons in the map selection field:
   - Google Maps
   - Google Earth/Satellite
   - Wiki Maps
   - Open cycle maps
   - Closed cycle maps
5. Click the **Start Polygon** icon *(3)*.

Fig. 46:

6. Set points *(1)* along the boundary.

   For curves, the more points you set, the more accurate the boundary line will be.

   You can manually enter latitude and longitude coordinates.
7. When you have set all of the points desired along the boundary, click the **Stop Polygon** icon *(2)*.

Fig. 47:

8. Enter the name *(1)* of the field in the window that shows on the screen.

9. Click **OK** *(2)*.

10. To add another field to the same map, repeat steps 5, 6, and 7.

Fig. 48:

11. To add a no spray area within an existing field, repeat steps 5, 6, and 7 with the boundary of an existing field.

The no spray area *(1)* must be completely within the spray area of the existing field.

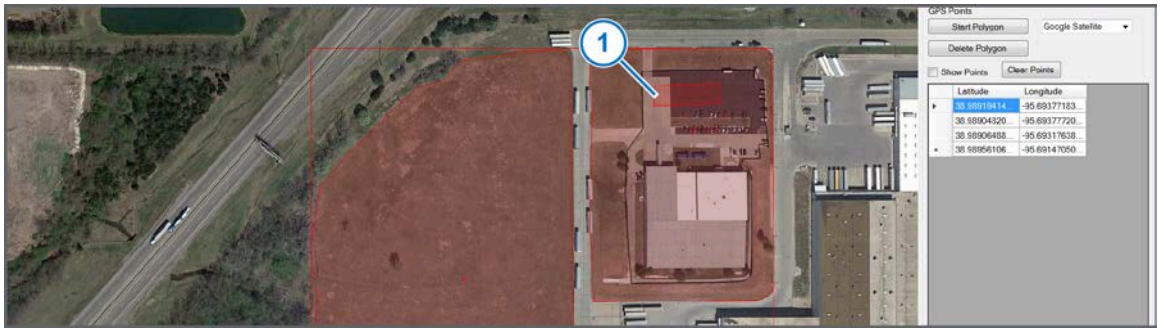


Fig. 49:

12. If points are added within a no spray area, that area *(1)* will become a spray area.

13. When all of the spray/no spray areas are on the map, select: **File** > **Save As PinPoint II Map**.

Important: Make sure that you save the map to an external memory device, like a thumb drive.

Convert a Shapefile into a PinPoint™ II Map

Fig. 50:

1. Open the CapMaps™ Software shapefile converter application.
2. Go to: **File** > **Open Shapefile** *(1)*.
3. Select the desired shapefile to open.

   The shapefile will show in red *(2)* on the Google map.
4. If desired, change the type of map *(3)* that you would like to view.
   - Google Maps
   - Google Earth/Satellite
   - Wiki Maps
   - Open cycle maps
   - Closed cycle maps
5. To save a shapefile as a PinPoint II boundary files, select **File** > **Save As PinPoint II Map**.

   Important: Make sure that you save the map to an external memory device, like a thumb drive.

Convert a Batch of Shapefiles to PinPoint™ II Maps

1. Open the CapMaps™ software shapefile converter application.
2. Go to: **File** > **Batch PinPoint 1 Map Conversion**.
3. Select the desire shapefiles to convert.

   All converted shapefiles will save as PinPoint II Maps to the external memory device with the same name as the original files.
4. To view the converted shapefiles, select: **File** > **Open Shapefile** and select the desired file.

Uninstall the CapMaps™ Software

If you have a previous version of the CapMaps™ Software on your computer, you must uninstall that version before installing a new version of the software.

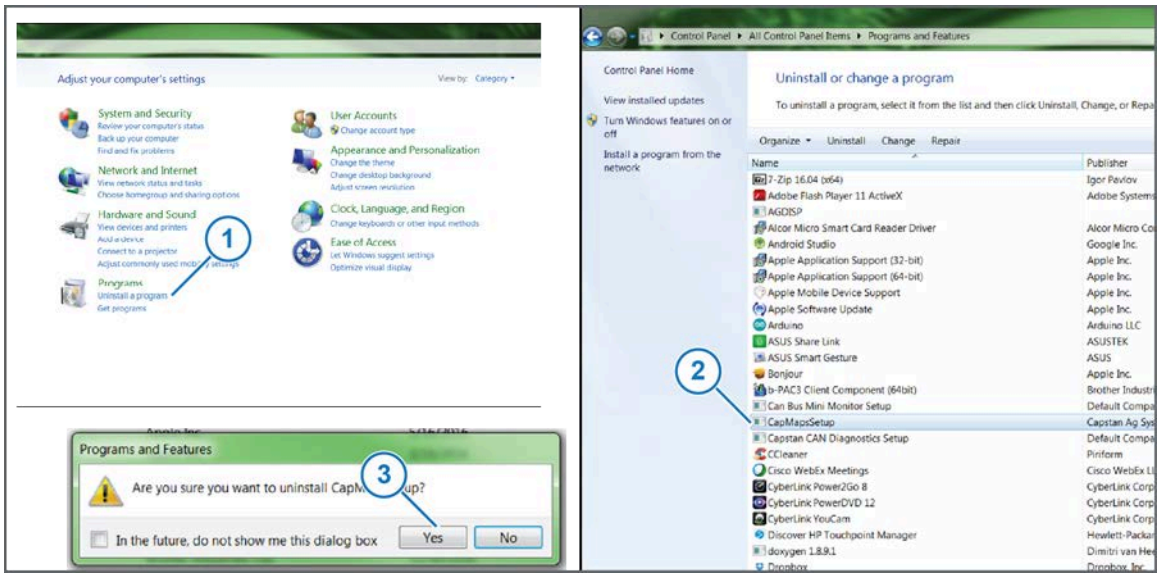


Fig. 51:

1. Open the **Control Panel** on your computer.
2. Click on **Uninstall a Program** *(1)*.
3. Double click **CapMapsSetup** *(2)* from the list of installed programs.
4. Click **Yes** *(3)* to confirm the uninstall of the program.
5. When the uninstall is complete, close the list of installed programs.

Overlap Distance

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

Note: The overlap distance is set to zero when calibrating the look ahead on times for overlap control.

Change the Overlap Distance

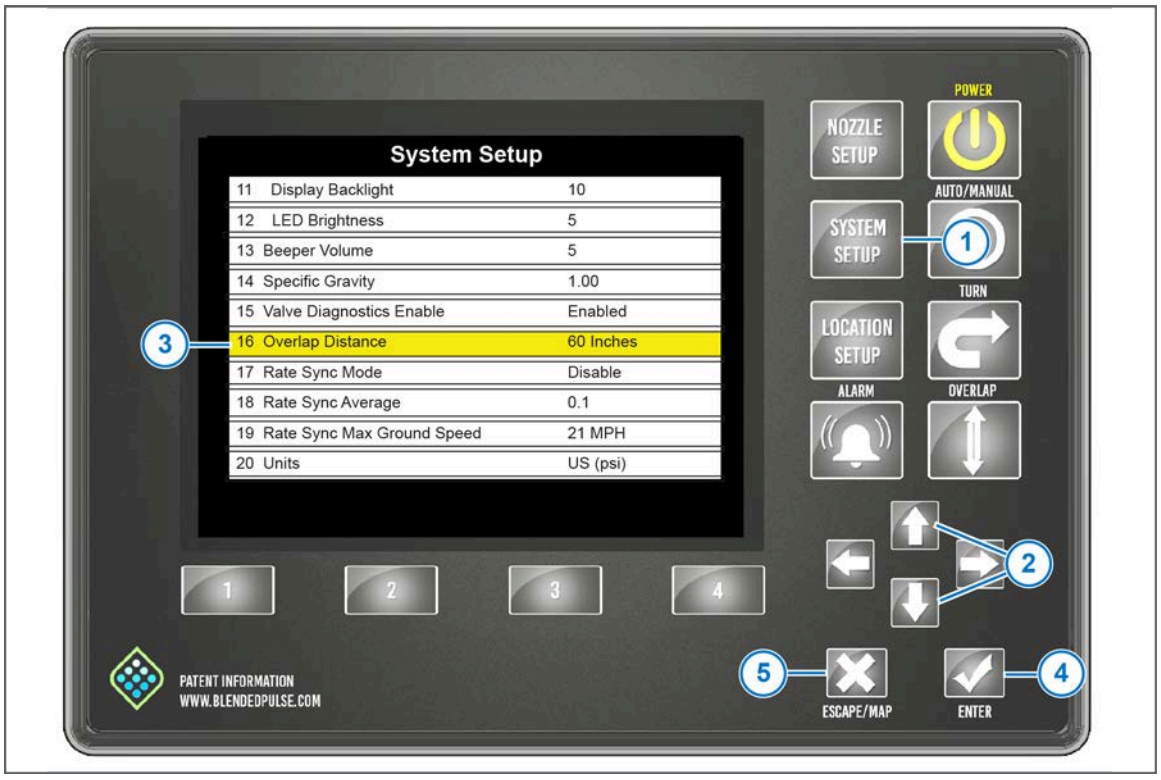


Fig. 52:

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

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

Flowmeter Signal

Since the rate controller does not know the PinPoint™ II system is shutting off nozzles, the system manipulates the flowmeter signal to cause the rate controller to apply the proper rate. At low flow rates, the system replaces the turbine flowmeter signal with a calculated value that is accurate down to a single nozzle. The flowmeter minimum GPM is the minimum flow at which the turbine flowmeter is no longer accurate.

In **Correction** mode, the flow reported to the rate controller automatically changes from the turbine flowmeter to calculation whenever the flow falls below the flowmeter minimum GPM value. The flowmeter output type, set as **Correction**, the system will automatically calculate the flow below the minimum flow value. This is especially important when the system is operating with only a few nozzles, like point rows, filling gaps, etc. The system calculation accurately measures flow through a single nozzle.

Transparent mode does not allow this change, and only uses the turbine value regardless of its accuracy.

Calculate mode uses only the calculation.

Change the Flowmeter Settings—Synchro™ Mode

1. Press the **SYSTEM SETUP** button.
2. Use the **UP** or **DOWN** arrow buttons to move to the **Advanced Settings**.
3. Press the **ENTER** button.
4. Use the **UP** or **DOWN** arrow buttons to move to the **Flowmeter Minimum**.
5. Press the **ENTER** button.
6. Change the value.
7. Press the **ENTER** button.
8. Use the **UP** or **DOWN** arrow buttons to move to the **Flowmeter Output Type**.
9. Press the **ENTER** button.
10. Change the output type.
11. Press the **ENTER** button.

Change the Flowmeter Settings—SharpShooter Mode™

1. Press the **SYSTEM SETUP** button.
2. Use the **UP** or **DOWN** arrow buttons to move to the **Advanced Settings**.
3. Press the **ENTER** button.
4. Use the **UP** or **DOWN** arrow buttons to move to the **Flowmeter Minimum**.
5. Press the **ENTER** button.
6. Change the value.
7. Press the **ENTER** button.
8. Use the **UP** or **DOWN** arrow buttons to move to the **Flowmeter Output Type**.
9. Press the **ENTER** button.
10. Change the output type.
11. Press the **ENTER** button.

Turn Compensation

With a standard spray boom, the flow rate is averaged over the entire boom, and the 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.

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

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

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

Turn compensation calculates a turn radius from a GPS signal and adjusts the flow per nozzle to maintain a constant rate. Turn compensation can be turned off for situations that include troubleshooting and no GPS.

Press the **TURN** button on the CapView display to turn on and off the turn compensation feature.

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

Counters

Fig. 53:

The counters *(1)* are shown on the ***System Setup*** screen.

Gallon Counters

The PinPoint™ system manages the flow meter signal to keep the rate controller accurate when the nozzles are turned off.

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

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

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

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

Acre Counters

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

The **Actual Acre Counter** counts the acres applied per nozzle. The controller acre counter minus the actual acre counter is the additional acres an operator can apply per tank load from the individual nozzle control.

Reset the Counters

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

Alarm

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

Important: It is the responsibility of the operator to stop using the system if the system is not applying product or operating correctly.

Nozzle Speed Ranges

Metric Nozzle Speed Ranges

Nozzle Spacing - 38 cm

Speed Range (KPH) - 38 cm Nozzle Spacing

Tip Size	Gauge (kPa)	30 l/ha Min 25%	30 l/ha Min 50%	30 l/ha Min 75%	30 l/ha - Max 100%	50 l/ha Min 25%	50 l/ha Min 50%	50 l/ha Min 75%	50 l/ha - Max 100%	60 l/ha Min 25%	60 l/ha Min 50%	60 l/ha Min 75%	60 l/ha - Max 100%	70 l/ha Min 25%	70 l/ha Min 50%	70 l/ha Min 75%	70 l/ha - Max 100%	80 l/ha Min 25%	80 l/ha Min 50%	80 l/ha Min 75%	80 l/ha - Max 100%	100 l/ha Min 25%	100 l/ha Min 50%	100 l/ha Min 75%	100 l/ha - Max 100%	120 l/ha Min 25%	120 l/ha Min 50%	120 l/ha Min 75%	120 l/ha - Max 100%
0.1 GPM #1	138	4	7	11	14	2	4	6	8	2	4	5	7	2	3	5	6	1	3	4	5	1	2	3	4	1	2	3	4
	207	4	9	13	17	3	5	8	10	2	4	6	9	2	4	6	7	2	3	5	6	1	3	4	5	1	2	3	4
	276	5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	9	2	4	6	7	1	3	4	6	1	2	4	5
	345	6	11	17	22	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	6
	414	6	12	18	24	4	7	11	15	3	6	9	12	3	5	8	10	2	5	7	9	2	4	5	7	2	3	5	6
	483	7	13	20	26	4	8	12	16	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7
0.15 GPM #1.5	138	5	11	16	21	3	6	9	13	3	5	8	11	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	5
	207	6	13	19	26	4	8	12	15	3	6	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	6
	276	7	15	22	30	4	9	13	18	4	7	11	15	3	6	10	13	3	6	8	11	2	4	7	9	2	4	6	7
	345	8	17	25	33	5	10	15	20	4	8	12	17	4	7	11	14	3	6	9	12	2	5	7	10	2	4	6	8
	414	9	18	27	36	5	11	16	22	5	9	14	18	4	8	12	16	3	7	10	14	3	5	8	11	2	5	7	9
	483	10	20	30	39	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
0.2 GPM #2	138	7	14	21	28	4	8	13	17	3	7	10	14	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	7
	207	9	17	26	34	5	10	15	21	4	9	13	17	4	7	11	15	3	6	10	13	3	5	8	10	2	4	6	9
	276	10	20	30	40	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
	345	11	22	33	44	7	13	20	27	6	11	17	22	5	9	14	19	4	8	12	17	3	7	10	13	3	6	8	11
	414	12	24	36	48	7	15	22	29	6	12	18	24	5	10	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	483					8	16	24	31	7	13	20	26	6	11	17	22	5	10	15	20	4	8	12	16	3	7	10	13
0.25 GPM #2.5	138	9	17	26	35	5	10	16	21	4	9	13	17	4	7	11	15	3	7	10	13	3	5	8	10	2	4	7	9
	207	11	21	32	43	6	13	19	26	5	11	16	21	5	9	14	18	4	8	12	16	3	6	10	13	3	5	8	11
	276					7	15	22	30	6	12	18	25	5	11	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	345					8	16	25	33	7	14	21	27	6	12	18	24	5	10	15	21	4	8	12	16	3	7	10	14
	414					9	18	27	36	8	15	23	30	6	13	19	26	6	11	17	23	5	9	14	18	4	8	11	15
	483					10	20	29	39	8	16	24	33	7	14	21	28	6	12	18	24	5	10	15	20	4	8	12	16
0.3 GPM #3	138	10	21	31	41	6	12	19	25	5	10	16	21	4	9	13	18	4	8	12	16	3	6	9	12	3	5	8	10
	207					8	15	23	30	6	13	19	25	5	11	16	22	5	10	14	19	4	8	11	15	3	6	10	13
	276					9	18	26	35	7	15	22	29	6	13	19	25	6	11	17	22	4	9	13	18	4	7	11	15
	345					10	20	30	39	8	16	25	33	7	14	21	28	6	12	18	25	5	10	15	20	4	8	12	16
	414					11	22	32	43	9	18	27	36	8	15	23	31	7	13	20	27	5	11	16	22	4	9	13	18
	483					12	23	35	47	10	19	29	39	8	17	25	33	7	15	22	29	6	12	17	23	5	10	15	19
0.4 GPM #4	138					8	16	25	33	7	14	20	27	6	12	18	23	5	10	15	20	4	8	12	16	3	7	10	14
	207					10	20	30	40	8	17	25	33	7	14	21	29	6	13	19	25	5	10	15	20	4	8	13	17
	276					12	23	35	46	10	19	29	39	8	17	25	33	7	14	22	29	6	12	17	23	5	10	14	19
	345									11	22	32	43	9	18	28	37	8	16	24	32	6	13	19	26	5	11	16	22
	414									12	24	35	47	10	20	30	41	9	18	27	35	7	14	21	28	6	12	18	24
	483													11	22	33	44	10	19	29	38	8	15	23	31	6	13	19	26
0.5 GPM #5	138					10	20	30	40	8	17	25	34	7	14	22	29	6	13	19	25	5	10	15	20	4	8	13	17
	207									10	21	31	41	9	18	26	35	8	15	23	31	6	12	18	25	5	10	15	21
	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26
	414																	11	22	33	44	9	17	26	35	7	15	22	29
	483																	12	24	35	47	9	19	28	38	8	16	24	31

Speed Range (KPH) - 38 cm Nozzle Spacing

Tip Size	Gauge (kPa)	30 l/ha				50 l/ha				60 l/ha				70 l/ha				80 l/ha				100 l/ha				120 l/ha			
		Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max
		25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
0.6 GPM #6	138									10	20	30	39	8	17	25	34	7	15	22	30	6	12	18	24	5	10	15	20
	207									12	24	36	48	10	21	31	41	9	18	27	36	7	14	22	29	6	12	18	24
	276													12	24	36	48	10	21	31	42	8	17	25	33	7	14	21	28
	345																	12	23	35	47	9	19	28	37	8	16	23	31
	414																					10	20	31	41	9	17	26	34
	483																					11	22	33	44	9	18	28	37
0.8 GPM #8	138													11	21	32	43	9	19	28	38	8	15	23	30	6	13	19	25
	207																	11	23	34	46	9	18	28	37	8	15	23	31
	276																					11	21	32	42	9	18	27	35
	345																					12	24	36	48	10	20	30	40
	414																									11	22	33	43
	483																									12	23	35	47
1.0 GPM #10	138																	11	22	33	44	9	18	27	36	7	15	22	30
	207																					11	22	33	43	9	18	27	36
	276																									10	21	31	42
	345																									12	23	35	47
	414																												
	483																												
1.2 GPM #12	138																					10	20	30	40	8	17	25	33
	207																									10	20	31	41
	276																									12	24	35	47
	345																												
	414																												
	483																												
1.25 GPM #12.5	138																												
	207																									10	21	31	42
	276																									12	24	36	48
	345																												
	414																												
	483																												
1.5 GPM #15	138																												
	207																									12	23	35	46
	276																												
	345																												
	414																												
	483																												

Nozzle Spacing - 50 cm

Speed Range (KPH) - 50 cm Nozzle Spacing

Tip Size	Gauge (kPa)	30 l/ha				50 l/ha				60 l/ha				70 l/ha				80 l/ha				100 l/ha				120 l/ha			
		Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max
		25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
0.1 GPM #1	138	3	5	8	11	2	3	5	6	1	3	4	5	1	2	3	5	1	2	3	4	1	2	2	3	1	1	2	3
	207	3	7	10	13	2	4	6	8	2	3	5	7	1	3	4	6	1	2	4	5	1	2	3	4	1	2	2	3
	276	4	8	11	15	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	6	1	2	3	5	1	2	3	4
	345	4	8	13	17	3	5	8	10	2	4	6	8	2	4	5	7	2	3	5	6	1	3	4	5	1	2	3	4
	414	5	9	14	19	3	6	8	11	2	5	7	9	2	4	6	8	2	3	5	7	1	3	4	6	1	2	3	5
	483	5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	9	2	4	6	7	1	3	4	6	1	2	4	5
0.15 GPM #1.5	138	4	8	12	16	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	6	1	2	4	5	1	2	3	4
	207	5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	4	6	7	1	3	4	6	1	2	4	5
	276	6	11	17	23	3	7	10	14	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	6
	345	6	13	19	25	4	8	11	15	3	6	9	13	3	5	8	11	2	5	7	9	2	4	6	8	2	3	5	6
	414	7	14	21	28	4	8	12	17	3	7	10	14	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	7
	483	7	15	22	30	4	9	13	18	4	7	11	15	3	6	10	13	3	6	8	11	2	4	7	9	2	4	6	7
0.2 GPM #2	138	5	11	16	21	3	6	10	13	3	5	8	11	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	5
	207	7	13	20	26	4	8	12	16	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7
	276	8	15	23	30	5	9	14	18	4	8	11	15	3	6	10	13	3	6	8	11	2	5	7	9	2	4	6	8
	345	8	17	25	34	5	10	15	20	4	8	13	17	4	7	11	14	3	6	9	13	3	5	8	10	2	4	6	8
	414	9	18	28	37	6	11	17	22	5	9	14	18	4	8	12	16	3	7	10	14	3	6	8	11	2	5	7	9
	483	10	20	30	40	6	12	18	24	5	10	15	20	4	9	13	17	4	7	11	15	3	6	9	12	2	5	7	10
0.25 GPM #2.5	138	7	13	20	26	4	8	12	16	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7
	207	8	16	24	32	5	10	15	19	4	8	12	16	3	7	10	14	3	6	9	12	2	5	7	10	2	4	6	8
	276	9	19	28	37	6	11	17	22	5	9	14	19	4	8	12	16	4	7	11	14	3	6	8	11	2	5	7	9
	345	10	21	31	42	6	13	19	25	5	10	16	21	4	9	13	18	4	8	12	16	3	6	9	13	3	5	8	10
	414	11	23	34	46	7	14	21	27	6	11	17	23	5	10	15	20	4	9	13	17	3	7	10	14	3	6	9	11
	483					7	15	22	30	6	12	19	25	5	11	16	21	5	9	14	19	4	7	11	15	3	6	9	12
0.3 GPM #3	138	8	16	24	32	5	9	14	19	4	8	12	16	3	7	10	14	3	6	9	12	2	5	7	9	2	4	6	8
	207	10	19	29	39	6	12	17	23	5	10	14	19	4	8	12	17	4	7	11	14	3	6	9	12	2	5	7	10
	276	11	22	33	45	7	13	20	27	6	11	17	22	5	10	14	19	4	8	13	17	3	7	10	13	3	6	8	11
	345					7	15	22	30	6	12	19	25	5	11	16	21	5	9	14	19	4	7	11	15	3	6	9	12
	414					8	16	25	33	7	14	20	27	6	12	18	23	5	10	15	20	4	8	12	16	3	7	10	14
	483					9	18	27	35	7	15	22	29	6	13	19	25	6	11	17	22	4	9	13	18	4	7	11	15
0.4 GPM #4	138	10	21	31	41	6	12	19	25	5	10	16	21	4	9	13	18	4	8	12	16	3	6	9	12	3	5	8	10
	207					8	15	23	30	6	13	19	25	5	11	16	22	5	10	14	19	4	8	11	15	3	6	10	13
	276					9	18	26	35	7	15	22	29	6	13	19	25	5	11	16	22	4	9	13	18	4	7	11	15
	345					10	20	30	39	8	16	25	33	7	14	21	28	6	12	18	25	5	10	15	20	4	8	12	16
	414					11	22	32	43	9	18	27	36	8	15	23	31	7	13	20	27	5	11	16	22	4	9	13	18
	483					12	23	35	47	10	19	29	39	8	17	25	33	7	15	22	29	6	12	17	23	5	10	15	19
0.5 GPM #5	138					8	15	23	31	6	13	19	25	5	11	16	22	5	10	14	19	4	8	11	15	3	6	10	13
	207					9	19	28	37	8	16	23	31	7	13	20	27	6	12	18	23	5	9	14	19	4	8	12	16
	276					11	22	32	43	9	18	27	36	8	15	23	31	7	14	20	27	5	11	16	22	5	9	14	18
	345					12	24	36	48	10	20	30	40	9	17	26	35	8	15	23	30	6	12	18	24	5	10	15	20
	414									11	22	33	44	9	19	28	38	8	17	25	33	7	13	20	26	6	11	17	22
	483									12	24	36	48	10	20	31	41	9	18	27	36	7	14	21	29	6	12	18	24

Speed Range (KPH) - 50 cm Nozzle Spacing

Tip Size	Gauge (kPa)	30 l/ha				50 l/ha				60 l/ha				70 l/ha				80 l/ha				100 l/ha				120 l/ha			
		Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max	Min	-		Max
		25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
0.6 GPM #6	138					9	18	27	36	7	15	22	30	6	13	19	26	6	11	17	22	4	9	13	18	4	7	11	15
	207					11	22	33	44	9	18	28	37	8	16	24	31	7	14	21	28	6	11	17	22	5	9	14	18
	276									11	21	32	42	9	18	27	36	8	16	24	32	6	13	19	25	5	11	16	21
	345									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	414													11	22	33	44	10	19	29	39	8	16	23	31	6	13	19	26
	483													12	24	36	48	11	21	32	42	8	17	25	34	7	14	21	28
0.8 GPM #8	138					11	23	34	46	10	19	29	38	8	16	24	33	7	14	21	29	6	11	17	23	5	10	14	19
	207									12	23	35	47	10	20	30	40	9	17	26	35	7	14	21	28	6	12	17	23
	276													12	23	35	46	10	20	30	40	8	16	24	32	7	13	20	27
	345																	11	23	34	45	9	18	27	36	8	15	23	30
	414																					10	20	30	40	8	16	25	33
	483																					11	21	32	43	9	18	27	36
1.0 GPM #10	138									11	22	34	45	10	19	29	39	8	17	25	34	7	13	20	27	6	11	17	22
	207													12	24	35	47	10	21	31	41	8	17	25	33	7	14	21	28
	276																	12	24	36	48	10	19	29	38	8	16	24	32
	345																					11	21	32	43	9	18	27	36
	414																					12	23	35	47	10	19	29	39
	483																									11	21	32	42
1.2 GPM #12	138													11	22	33	44	10	19	29	38	8	15	23	30	6	13	19	25
	207																	12	23	35	47	9	19	28	37	8	16	23	31
	276																					11	22	32	43	9	18	27	36
	345																					12	24	36	48	10	20	30	40
	414																									11	22	33	44
	483																									12	24	36	48
1.25 GPM #12.5	138																												
	207																					10	19	29	38	8	16	24	32
	276																					11	22	33	44	9	18	28	37
	345																									10	21	31	41
	414																									11	23	34	45
	483																												
1.5 GPM #15	138																												
	207																					11	21	32	42	9	18	26	35
	276																									10	20	31	41
	345																									11	23	34	46
	414																												
	483																												

Blended Pulse™ Droplet Classification Table-Metric

Droplet Classification Table ASABE S-572.1

Extremely Fine (EF)	Very Fine (VF)	Fine (F)	Medium (M)	Coarse (C)	Very Coarse (VC)	Extremely Coarse (EC)	Ultra Coarse (UC)
<50	50 - 136	137-177	178-218	219-349	350-428	429-622	>622

*** Blanks cells represent nozzles either not available or below the manufacturers operating specifications*

*** Hypro and TeeJet droplet classifications below may not match manufacturers spec sheets. The chart below adjusts the droplet classification to be representative of the Actual Nozzle Pressure*

Tip Size	Gauge (kPa)	Nozzle (kPa)	Wilger				Hypro						TeeJet							
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.1 GPM #1	138	137	F											F					C	
	207	206	F									F		F					M	F
	276	275	VF									F		F					M	F
	345	343	VF									F		F					M	F
	414	412	VF									VF		VF					F	VF
	483	481	VF																F	
0.15 GPM #1.5	138	137	F											F					C	
	207	205	F	M	C	VC						F		F		M		F	M	F
	276	273	F	M	C	C						F		F		F		F	M	F
	345	342	VF	M	C	C						F		F		F		F	M	F
	414	410	VF	M	C	C						F		F		F		F	F	F
	483	478	VF	F	M	C													F	
0.2 GPM #2	138	136	F					M	M	F	M		C	M	F				VC	
	207	203	F	C	C	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	276	271	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	M	M	F
	345	339	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	F	M	F
	414	407	F	M	C	C		M	M	F	F	F	M	F	F	M	VF	F	M	F
	483	475	VF	M	C	C		F	M	F	F		M						F	
0.25 GPM #2.5	138	134	M					M	M	M			VC	M	M				VC	
	207	202	M	C	VC	XC		M	M	F			C	M	F				C	
	276	269	M	C	C	VC		M	M	F			C	F	F				M	
	345	336	F	M	C	VC		M	M	F			M	F	F				M	
	414	403	F	M	C	VC		M	M	F			M	F	F				M	
	483	470	F	M	C	C		F	M	F			M						F	
0.3 GPM #3	138	133	M					M	C	M	M		VC	M	M				VC	
	207	199	M	C	VC	XC		M	C	F	M	F	C	M	F	C	F	M	C	F
	276	266	F	C	VC	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	345	332	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	414	399	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	483	465	F	C	C	VC		M	M	F	F		M						M	
0.4 GPM #4	138	129	C					C	C	M	M		VC	M	M				VC	
	207	194	C	C	VC	XC		C	C	M	M	M	C	M	M	C	F	C	C	M
	276	259	M	C	VC	XC		C	M	F	F	F	C	M	M	M	F	C	C	M
	345	323	M	C	VC	XC		M	M	F	F	F	M	F	F	M	F	C	M	F
	414	388	M	C	C	VC		M	M	F	F	F	M	F	F	M	F	M	M	F
	483	452	M	C	C	VC		M	M	F	F		M						M	
0.5 GPM #5	138	125	C					C	C	M	C		VC	M	M				VC	
	207	187	C	VC	XC	XC		C	C	M	M	M	C	M	M	C	M		VC	M
	276	250	M	C	XC	XC		C	C	F	F	F	C	M	M	C	M		C	M
	345	312	M	C	XC	XC		M	M	F	F	F	C	M	M	M	F		C	F
	414	375	M	C	VC	XC		M	M	F	F	F	C	F	F	M	F		C	F
	483	437	M	C	VC	XC		M	M	F	F		M						M	

Droplet Classification Table ASABE S-572.1

Extremely Fine (EF)	Very Fine (VF)	Fine (F)	Medium (M)	Coarse (C)	Very Coarse (VC)	Extremely Coarse (EC)	Ultra Coarse (UC)
<50	50 - 136	137-177	178-218	219-349	350-428	429-622	>622

*** Blanks cells represent nozzles either not available or below the manufacturers operating specifications*

*** Hypro and TeeJet droplet classifications below may not match manufacturers spec sheets. The chart below adjusts the droplet classification to be representative of the Actual Nozzle Pressure*

Tip Size	Gauge (kPa)	Nozzle (kPa)	Wilger				Hypro						TeeJet							
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.6 GPM #6	138	120	C					VC	VC	M	C		VC	M	C				VC	
	207	180	C	XC	XC			C	C	M	C	M	C	M	M		M	C	VC	M
	276	240	C	VC	XC	XC		C	C	M	M	M	C	M	M		M	C	VC	M
	345	300	C	VC	XC	XC		C	C	M	M	M	C	M	M		F	C	VC	M
	414	360	C	C	XC	XC		C	C	F	M	F	C	M	M		F	C	C	M
	483	420	C	C	VC	XC		C	C	F	M		M						C	
0.8 GPM #8	138	109	C					VC	VC	C	C		VC	C	C				VC	
	207	163	C	XC	XC		VC	VC	VC	C	C		VC	C	C		M	C	VC	C
	276	218	C	XC	XC	XC	UC	C	C	M	C	M	VC	M	C		M	C	VC	C
	345	272	C	VC	XC	XC	UC	C	C	M	M	M	C	M	M		M	C	C	M
	414	327	C	VC	XC	XC	UC	C	C	M	M	M	C	M	M		M	C	C	M
	483	381	C	VC	XC	XC	XC	C	C	M	M		C						C	
1.0 GPM #10	138	97	VC																	
	207	146	VC				UC			C	VC		XC	C	C		M		UC	
	276	195	C	XC	XC	UC	UC			C	C	M	XC	C	C		M		XC	
	345	243	C	XC	XC	UC	UC			M	M	M	VC	C	C		M		XC	
	414	292	C	VC	XC	UC	UC			M	M	M	VC	M	M		M		VC	
	483	341	C	VC	XC	XC	UC			M	M		VC						VC	
1.2 GPM #12	138	83																		
	207	124																	UC	
	276	135																	UC	
	345	207																	XC	
	414	248																	VC	
	483	290																	VC	
1.25 GPM #12.5	138	84	XC																	
	207	125	XC																	
	276	167	VC	XC	UC															
	345	209	VC	XC	UC	UC														
	414	251	VC	XC	XC	UC														
	483	292	C	VC	XC	XC														
1.5 GPM #15	138	71	XC																	
	207	107	XC				UC			VC	VC				VC					
	276	142	XC				UC			VC	VC				VC					
	345	178	VC	XC	UC		UC			VC	VC	C			VC					
	414	214	VC	XC	XC	UC	UC			VC	VC	C			VC					
	483	249	VC	XC	XC	UC	UC			C	C									

US Measurements Nozzle Speed Ranges

Nozzle Spacing - 15 in

Speed Range (MPH) - 15" Nozzle Spacing

Tip Size	Gauge (PSI)	3 GPA Min 25%	3 GPA Min 50%	3 GPA Min 75%	3 GPA Max 100%	5 GPA Min 25%	5 GPA Min 50%	5 GPA Min 75%	5 GPA Max 100%	8 GPA Min 25%	8 GPA Min 50%	8 GPA Min 75%	8 GPA Max 100%	10 GPA Min 25%	10 GPA Min 50%	10 GPA Min 75%	10 GPA Max 100%	12 GPA Min 25%	12 GPA Min 50%	12 GPA Min 75%	12 GPA Max 100%	15 GPA Min 25%	15 GPA Min 50%	15 GPA Min 75%	15 GPA Max 100%	20 GPA Min 25%	20 GPA Min 50%	20 GPA Min 75%	20 GPA Max 100%
0.1 GPM #1	20	2	5	7	9	1	3	4	6	1	2	3	3	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1
	30	3	6	9	11	2	3	5	7	1	2	3	4	1	2	3	3	1	1	2	3	1	1	2	2	0	1	1	2
	40	3	7	10	13	2	4	6	8	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	3	0	1	1	2
	50	4	7	11	15	2	4	7	9	1	3	4	6	1	2	3	4	1	2	3	4	1	1	2	3	1	1	2	2
	60	4	8	12	16	2	5	7	10	2	3	5	6	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	2
	70	4	9	13	17	3	5	8	10	2	3	5	7	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3
0.15 GPM #1.5	20	3	7	10	14	2	4	6	8	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3	1	1	2	2
	30	4	9	13	17	3	5	8	10	2	3	5	6	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3
	40	5	10	15	20	3	6	9	12	2	4	6	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	50	6	11	17	22	3	7	10	13	2	4	6	8	2	3	5	7	1	3	4	6	1	2	3	4	1	2	2	3
	60	6	12	18	24	4	7	11	14	2	5	7	9	2	4	5	7	2	3	5	6	1	2	4	5	1	2	3	4
	70	7	13	20	26	4	8	12	16	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
0.2 GPM #2	20	5	9	14	19	3	6	8	11	2	3	5	7	1	3	4	6	1	2	3	5	1	2	3	4	1	1	2	3
	30	6	11	17	23	3	7	10	14	2	4	6	9	2	3	5	7	1	3	4	6	1	2	3	5	1	2	3	3
	40	7	13	20	26	4	8	12	16	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
	50	7	15	22	29	4	9	13	18	3	5	8	11	2	4	7	9	2	4	5	7	1	3	4	6	1	2	3	4
	60					5	10	14	19	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5
	70					5	10	16	21	3	6	10	13	3	5	8	10	2	4	6	9	2	3	5	7	1	3	4	5
0.25 GPM #2.5	20	6	12	17	23	3	7	10	14	2	4	6	9	2	3	5	7	1	3	4	6	1	2	3	5	1	2	3	3
	30	7	14	21	28	4	8	13	17	3	5	8	11	2	4	6	8	2	4	5	7	1	3	4	6	1	2	3	4
	40					5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5
	50					5	11	16	22	3	7	10	14	3	5	8	11	2	5	7	9	2	4	5	7	1	3	4	5
	60					6	12	18	24	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	70					6	13	19	26	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	9	2	3	5	6
0.3 GPM #3	20	7	14	21	27	4	8	12	16	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
	30					5	10	15	20	3	6	9	13	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5
	40					6	12	17	23	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	50					7	13	20	26	4	8	12	16	3	7	10	13	3	5	8	11	2	4	7	9	2	3	5	7
	60					7	14	21	29	4	9	13	18	4	7	11	14	3	6	9	12	2	5	7	10	2	4	5	7
	70									5	10	14	19	4	8	12	15	3	6	10	13	3	5	8	10	2	4	6	8
0.4 GPM #4	20					5	11	16	22	3	7	10	14	3	5	8	11	2	5	7	9	2	4	5	7	1	3	4	5
	30					7	13	20	27	4	8	12	17	3	7	10	13	3	6	8	11	2	4	7	9	2	3	5	7
	40									5	10	14	19	4	8	12	15	3	6	10	13	3	5	8	10	2	4	6	8
	50									5	11	16	21	4	9	13	17	4	7	11	14	3	6	9	11	2	4	6	9
	60									6	12	18	23	5	9	14	19	4	8	12	16	3	6	9	13	2	5	7	9
	70									6	13	19	25	5	10	15	20	4	8	13	17	3	7	10	14	3	5	8	10
0.5 GPM #5	20					7	13	20	27	4	8	12	17	3	7	10	13	3	6	8	11	2	4	7	9	2	3	5	7
	30									5	10	15	20	4	8	12	16	3	7	10	14	3	5	8	11	2	4	6	8
	40									6	12	18	24	5	9	14	19	4	8	12	16	3	6	9	13	2	5	7	9
	50									7	13	20	26	5	11	16	21	4	9	13	18	4	7	11	14	3	5	8	11
	60									7	14	22	29	6	12	17	23	5	10	14	19	4	8	12	15	3	6	9	12
	70													6	12	19	25	5	10	16	21	4	8	12	17	3	6	9	12

Speed Range (MPH) - 15" Nozzle Spacing

Tip Size	Gauge (PSI)	3 GPA					5 GPA					8 GPA					10 GPA					12 GPA					15 GPA					20 GPA				
		Min	-			Max	Min	-			Max	Min	-			Max	Min	-			Max	Min	-			Max	Min	-			Max	Min	-			Max
		25%	50%	75%	100%		25%	50%	75%	100%		25%	50%	75%	100%		25%	50%	75%	100%		25%	50%	75%	100%		25%	50%	75%	100%		25%	50%	75%	100%	
0.6 GPM #6	20											5	10	15	20		4	8	12	16		3	7	10	13		3	5	8	10		2	4	6	8	
	30											6	12	18	24		5	10	14	19		4	8	12	16		3	6	10	13		2	5	7	10	
	40											7	14	21	28		6	11	17	22		5	9	14	18		4	7	11	15		3	6	8	11	
	50																6	12	19	25		5	10	15	21		4	8	12	17		3	6	9	12	
	60																7	14	20	27		6	11	17	23		5	9	14	18		3	7	10	14	
	70																7	15	22	29		6	12	18	24		5	10	15	20		4	7	11	15	
0.8 GPM #8	20											6	12	19	25		5	10	15	20		4	8	12	17		3	7	10	13		2	5	7	10	
	30											8	15	23	30		6	12	18	24		5	10	15	20		4	8	12	16		3	6	9	12	
	40																7	14	21	28		6	12	18	23		5	9	14	19		4	7	11	14	
	50																					7	13	20	26		5	10	16	21		4	8	12	16	
	60																					7	14	22	29		6	11	17	23		4	9	13	17	
	70																										6	12	19	25		5	9	14	19	
1.0 GPM #10	20											7	15	22	29		6	12	18	24		5	10	15	20		4	8	12	16		3	6	9	12	
	30																7	14	22	29		6	12	18	24		5	10	14	19		4	7	11	14	
	40																					7	14	21	28		6	11	17	22		4	8	12	17	
	50																										6	12	19	25		5	9	14	19	
	60																										7	14	20	27		5	10	15	20	
	70																										7	15	22	29		6	11	17	22	
1.2 GPM #12	20																					6	11	17	22		4	9	13	18		3	7	10	13	
	30																					7	14	20	27		5	11	16	22		4	8	12	16	
	40																										6	13	19	25		5	9	14	19	
	50																										7	14	21	28		5	11	16	21	
	60																															6	12	17	23	
	70																															6	12	19	25	
1.25 GPM #12.5	20																																		
	30																					7	14	21	28		6	11	17	22		4	8	13	17	
	40																										6	13	19	26		5	10	14	19	
	50																										7	14	22	29		5	11	16	22	
	60																															6	12	18	24	
	70																															6	13	19	25	
1.5 GPM #15	20																																		
	30																										6	12	18	25		5	9	14	18	
	40																										7	14	21	28		5	11	16	21	
	50																															6	12	18	24	
	60																															7	13	20	26	
	70																															7	14	21	28	

Nozzle Spacing - 20 in

Speed Range (MPH) - 20" Nozzle Spacing

Tip Size	Gauge (PSI)	3 GPA Min 25%	3 GPA 50%	3 GPA 75%	3 GPA Max 100%	5 GPA Min 25%	5 GPA 50%	5 GPA 75%	5 GPA Max 100%	8 GPA Min 25%	8 GPA 50%	8 GPA 75%	8 GPA Max 100%	10 GPA Min 25%	10 GPA 50%	10 GPA 75%	10 GPA Max 100%	12 GPA Min 25%	12 GPA 50%	12 GPA 75%	12 GPA Max 100%	15 GPA Min 25%	15 GPA 50%	15 GPA 75%	15 GPA Max 100%	20 GPA Min 25%	20 GPA 50%	20 GPA 75%	20 GPA Max 100%
0.1 GPM #1	20	2	3	5	7	1	2	3	4	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1	0	1	1	1
	30	2	4	6	9	1	3	4	5	1	2	2	3	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1
	40	2	5	7	10	1	3	4	6	1	2	3	4	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1
	50	3	6	8	11	2	3	5	7	1	2	3	4	1	2	2	3	1	1	2	3	1	1	2	2	0	1	1	2
	60	3	6	9	12	2	4	5	7	1	2	3	5	1	2	3	4	1	2	2	3	1	1	2	2	0	1	1	2
	70	3	7	10	13	2	4	6	8	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	3	0	1	1	2
0.15 GPM #1.5	20	3	5	8	10	2	3	5	6	1	2	3	4	1	2	2	3	1	1	2	3	1	1	2	2	0	1	1	2
	30	3	6	10	13	2	4	6	8	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	3	0	1	1	2
	40	4	7	11	15	2	4	7	9	1	3	4	6	1	2	3	4	1	2	3	4	1	1	2	3	1	1	2	2
	50	4	8	12	17	2	5	7	10	2	3	5	6	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	2
	60	5	9	14	18	3	5	8	11	2	3	5	7	1	3	4	5	1	2	3	5	1	2	3	4	1	1	2	3
	70	5	10	15	20	3	6	9	12	2	4	5	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
0.2 GPM #2	20	3	7	10	14	2	4	6	8	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3	1	1	2	2
	30	4	9	13	17	3	5	8	10	2	3	5	6	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3
	40	5	10	15	20	3	6	9	12	2	4	6	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	50	5	11	16	22	3	7	10	13	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4	1	2	2	3
	60	6	12	18	24	4	7	11	14	2	5	7	9	2	4	5	7	2	3	5	6	1	2	4	5	1	2	3	4
	70	6	13	19	26	4	8	12	16	2	5	7	10	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4
0.25 GPM #2.5	20	4	9	13	17	3	5	8	10	2	3	5	6	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3
	30	5	11	16	21	3	6	10	13	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3
	40	6	12	18	24	4	7	11	15	2	5	7	9	2	4	5	7	2	3	5	6	1	2	4	5	1	2	3	4
	50	7	14	20	27	4	8	12	16	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
	60	7	15	22	30	4	9	13	18	3	6	8	11	2	4	7	9	2	4	6	7	1	3	4	6	1	2	3	4
	70					5	10	15	19	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5
0.3 GPM #3	20	5	10	15	21	3	6	9	12	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3
	30	6	13	19	25	4	8	11	15	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4
	40	7	15	22	29	4	9	13	17	3	5	8	11	2	4	7	9	2	4	5	7	1	3	4	6	1	2	3	4
	50					5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5
	60					5	11	16	21	3	7	10	13	3	5	8	11	2	4	7	9	2	4	5	7	1	3	4	5
	70					6	12	17	23	4	7	11	14	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
0.4 GPM #4	20	7	14	20	27	4	8	12	16	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
	30					5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5
	40					6	12	17	23	4	7	11	14	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	50					6	13	19	26	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	9	2	3	5	6
	60					7	14	21	28	4	9	13	18	4	7	11	14	3	6	9	12	2	5	7	9	2	4	5	7
	70					8	15	23	30	5	10	14	19	4	8	11	15	3	6	10	13	3	5	8	10	2	4	6	8
0.5 GPM #5	20					5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5
	30					6	12	18	24	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	40					7	14	21	28	4	9	13	18	4	7	11	14	3	6	9	12	2	5	7	9	2	4	5	7
	50									5	10	15	20	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8
	60									5	11	16	22	4	9	13	17	4	7	11	14	3	6	9	12	2	4	6	9
	70									6	12	18	23	5	9	14	19	4	8	12	16	3	6	9	12	2	5	7	9

Speed Range (MPH) - 20" Nozzle Spacing

Tip Size	Gauge (PSI)	3 GPA				5 GPA				8 GPA				10 GPA				12 GPA				15 GPA				20 GPA			
		Min		-	Max	Min		-	Max	Min		-	Max	Min		-	Max	Min		-	Max	Min		-	Max	Min		-	Max
		25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
0.6 GPM #6	20					6	12	18	24	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	30					7	14	22	29	4	9	13	18	4	7	11	14	3	6	9	12	2	5	7	10	2	4	5	7
	40									5	10	16	21	4	8	12	17	3	7	10	14	3	6	8	11	2	4	6	8
	50									6	12	17	23	5	9	14	19	4	8	12	15	3	6	9	12	2	5	7	9
	60									6	13	19	25	5	10	15	20	4	8	13	17	3	7	10	14	3	5	8	10
	70									7	14	21	27	5	11	16	22	5	9	14	18	4	7	11	15	3	5	8	11
0.8 GPM #8	20					7	15	22	30	5	9	14	19	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	7
	30									6	11	17	23	5	9	14	18	4	8	11	15	3	6	9	12	2	5	7	9
	40									7	13	20	26	5	11	16	21	4	9	13	18	4	7	11	14	3	5	8	11
	50									7	15	22	30	6	12	18	24	5	10	15	20	4	8	12	16	3	6	9	12
	60													6	13	19	26	5	11	16	22	4	9	13	17	3	6	10	13
	70													7	14	21	28	6	12	17	23	5	9	14	19	3	7	10	14
1.0 GPM #10	20									6	11	17	22	4	9	13	18	4	7	11	15	3	6	9	12	2	4	7	9
	30									7	14	20	27	5	11	16	22	5	9	14	18	4	7	11	14	3	5	8	11
	40													6	12	19	25	5	10	16	21	4	8	12	17	3	6	9	12
	50													7	14	21	28	6	12	17	23	5	9	14	19	3	7	10	14
	60																	6	13	19	25	5	10	15	20	4	8	11	15
	70																	7	14	21	28	6	11	17	22	4	8	12	17
1.2 GPM #12	20									6	12	19	25	5	10	15	20	4	8	12	17	3	7	10	13	2	5	7	10
	30													6	12	18	24	5	10	15	20	4	8	12	16	3	6	9	12
	40													7	14	21	28	6	12	18	23	5	9	14	19	4	7	11	14
	50																	7	13	20	26	5	11	16	21	4	8	12	16
	60																	7	14	22	29	6	12	17	23	4	9	13	17
	70																					6	12	19	25	5	9	14	19
1.25 GPM #12.5	20																												
	30									8	16	23	31	6	13	19	25	5	10	16	21	4	8	13	17	3	6	9	13
	40													7	14	22	29	6	12	18	24	5	10	14	19	4	7	11	14
	50																	7	13	20	27	5	11	16	22	4	8	12	16
	60																	7	15	22	29	6	12	18	24	4	9	13	18
	70																					6	13	19	25	5	10	14	19
1.5 GPM #15	20																												
	30													7	14	21	28	6	12	17	23	5	9	14	18	3	7	10	14
	40																	7	13	20	27	5	11	16	21	4	8	12	16
	50																	7	15	22	30	6	12	18	24	4	9	13	18
	60																					7	13	20	26	5	10	15	20
	70																					7	14	21	28	5	11	16	21

Blended Pulse™ Droplet Classification Table-US Measurements

Droplet Classification Table ASABE S-572.1

Extremely Fine (EF)	Very Fine (VF)	Fine (F)	Medium (M)	Coarse (C)	Very Coarse (VC)	Extremely Coarse (EC)	Ultra Coarse (UC)
<50	50 - 136	137-177	178-218	219-349	350-428	429-622	>622

*** Blanks cells represent nozzles either not available or below the manufacturers operating specifications*

*** Hypro and TeeJet droplet classifications below may not match manufacturers spec sheets. The chart below adjusts the droplet classification to be representative of the Actual Nozzle Pressure*

Tip Size	Gauge PSI	Nozzle PSI	Wilger				Hypro						TeeJet							
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.1 GPM #1	20	20	F											F					C	
	30	30	F									F		F					M	F
	40	40	VF									F		F					M	F
	50	50	VF									F		F					M	F
	60	60	VF									VF		VF					F	VF
	70	70	VF																F	
0.15 GPM #1.5	20	20	F											F					C	
	30	30	F	M	C	VC						F		F		M		F	M	F
	40	40	F	M	C	C						F		F		F		F	M	F
	50	50	VF	M	C	C						F		F		F		F	M	F
	60	59	VF	M	C	C						F		F		F		F	F	F
	70	69	VF	F	M	C													F	
0.2 GPM #2	20	20	F					M	M	F	M		C	M	F				VC	
	30	30	F	C	C	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	40	39	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	M	M	F
	50	49	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	F	M	F
	60	59	F	M	C	C		M	M	F	F	F	M	F	F	M	VF	F	M	F
	70	69	VF	M	C	C		F	M	F	F		M						F	
0.25 GPM #2.5	20	19	M					M	M	M			VC	M	M				VC	
	30	29	M	C	VC	XC		M	M	F			C	M	F				C	
	40	39	M	C	C	VC		M	M	F			C	F	F				M	
	50	49	F	M	C	VC		M	M	F			M	F	F				M	
	60	58	F	M	C	VC		M	M	F			M	F	F				M	
	70	68	F	M	C	C		F	M	F			M						F	
0.3 GPM #3	20	19	M					M	C	M	M		VC	M	M				VC	
	30	29	M	C	VC	XC		M	C	F	M	F	C	M	F	C	F	M	C	F
	40	39	F	C	VC	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	50	48	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	60	58	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	70	67	F	C	C	VC		M	M	F	F		M						M	
0.4 GPM #4	20	19	C					C	C	M	M		VC	M	M				VC	
	30	28	C	C	VC	XC		C	C	M	M	M	C	M	M	C	F	C	C	M
	40	38	M	C	VC	XC		C	M	F	F	F	C	M	M	M	F	C	C	M
	50	47	M	C	VC	XC		M	M	F	F	F	M	F	F	M	F	C	M	F
	60	56	M	C	C	VC		M	M	F	F	F	M	F	F	M	F	M	M	F
	70	66	M	C	C	VC		M	M	F	F		M						M	
0.5 GPM #5	20	18	C					C	C	M	C		VC	M	M				VC	
	30	27	C	VC	XC	XC		C	C	M	M	M	C	M	M	C	M		VC	M
	40	36	M	C	XC	XC		C	C	F	F	F	C	M	M	C	M		C	M
	50	45	M	C	XC	XC		M	M	F	F	F	C	M	M	M	F		C	F
	60	54	M	C	VC	XC		M	M	F	F	F	C	F	F	M	F		C	F
	70	63	M	C	VC	XC		M	M	F	F		M						M	

Droplet Classification Table ASABE S-572.1

Extremely Fine (EF)	Very Fine (VF)	Fine (F)	Medium (M)	Coarse (C)	Very Coarse (VC)	Extremely Coarse (EC)	Ultra Coarse (UC)
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*** Blanks cells represent nozzles either not available or below the manufacturers operating specifications*

*** Hypro and TeeJet droplet classifications below may not match manufacturers spec sheets. The chart below adjusts the droplet classification to be representative of the Actual Nozzle Pressure*

Tip Size	Gauge PSI	Nozzle PSI	Wilger				Hypro						TeeJet							
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.6 GPM #6	20	17	C					VC	VC	M	C		VC	M	C				VC	
	30	26	C	XC	XC			C	C	M	C	M	C	M	M		M	C	VC	M
	40	35	C	VC	XC	XC		C	C	M	M	M	C	M	M		M	C	VC	M
	50	43	C	VC	XC	XC		C	C	M	M	M	C	M	M		F	C	VC	M
	60	52	C	C	XC	XC		C	C	F	M	F	C	M	M		F	C	C	M
	70	61	C	C	VC	XC		C	C	F	M		M						C	
0.8 GPM #8	20	16	C					VC	VC	C	C		VC	C	C				VC	
	30	24	C	XC	XC		VC	VC	VC	C	C		VC	C	C		M	C	VC	C
	40	32	C	XC	XC	XC	UC	C	C	M	C	M	VC	M	C		M	C	VC	C
	50	39	C	VC	XC	XC	UC	C	C	M	M	M	C	M	M		M	C	C	M
	60	47	C	VC	XC	XC	UC	C	C	M	M	M	C	M	M		M	C	C	M
	70	55	C	VC	XC	XC	XC	C	C	M	M		C						C	
1.0 GPM #10	20	14	VC																	
	30	21	VC				UC			C	VC		XC	C	C		M		UC	
	40	28	C	XC	XC	UC	UC			C	C	M	XC	C	C		M		XC	
	50	35	C	XC	XC	UC	UC			M	M	M	VC	C	C		M		XC	
	60	42	C	VC	XC	UC	UC			M	M	M	VC	M	M		M		VC	
	70	49	C	VC	XC	XC	UC			M	M		VC						VC	
1.2 GPM #12	20	12																		
	30	18																	UC	
	40	24																	UC	
	50	30																	XC	
	60	36																	VC	
	70	42																	VC	
1.25 GPM #12.5	20	12	XC																	
	30	18	XC																	
	40	24	VC	XC	UC															
	50	30	VC	XC	UC	UC														
	60	36	VC	XC	XC	UC														
	70	42	C	VC	XC	XC														
1.5 GPM #15	20	10	XC																	
	30	15	XC				UC			VC	VC				VC					
	40	21	XC				UC			VC	VC				VC					
	50	26	VC	XC	UC		UC			VC	VC	C			VC					
	60	31	VC	XC	XC	UC	UC			VC	VC	C			VC					
	70	36	VC	XC	XC	UC	UC			C	C									

Chapter 7: Maintenance

Service the System

CAUTION: Before operation or service to the system, read and understand the machine's operator manual and the system operator manual. Chemical residue may be present on/in the OEM equipment. Use the correct personal protective equipment.

Before servicing the system or plumbing components, release the pressure and empty any product from the system and liquid delivery lines.

Jump Start, Weld On, or Charge the Machine

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

If charging the machine's batteries or welding on the machine, trip the circuit breaker.

Inspect the System

- Inspect the hoses for cuts, nicks, or abrasions before each use. Replace any damaged hoses immediately.
- Make sure that the strainers are clean.
- Make sure that all hoses and wiring are secure.
- Do a check for loose hoses, mounting hardware, and other components. Tighten if necessary.
- Do a check for damaged or missing decals. Replace if necessary.

Clean the System

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

Storage of the System

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

Winterize for Storage

Do not use fertilizer to winterize! The use of fertilizer to winterize will cause internal damage to the nozzle valves.

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 machine with a CapstanAG system installed on it is essential. Make sure that the booms are completely full of antifreeze at 100% strength and that the solenoids are pulsed (sprayed) for a few minutes to make sure that the antifreeze remaining in the solenoids is at full strength.

Recommended Guidelines for Maintenance/Service

When servicing a system, CapstanAG recommends doing these:

- Do the baseline service checks and verify the original setup values in this manual.
- Identify individual performance problems. Evaluate possible causes and corrections for performance issues.
- Troubleshoot individual components and replace, if needed.

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

Baseline Evaluation Process

1. Make sure that the voltage readings are correct.
2. Do a visual check of all wire connections, harnesses, and connectors. Make sure that there are no loose, broken, or damaged parts.
3. Make sure that the correct tip size is used for the application.
4. Compare the current settings with those recorded in the manual during setup.
5. Make sure that the liquid product plumbing and the strainer(s) are clean.
6. Do a like component swap test to see if the failure follows the component.
7. Repair or replace any damaged components.
8. Do the system tests.

   See the system testing information in this manual.

Strainers and Screens

Important: Clean the strainers on a regular basis.

Check the mesh size of the strainers and replace the screens if they are too coarse. Use 80-mesh or finer strainer screens. The filter manufacturer is specified only on the strainer housing. Only a color code identifies the strainer mesh size, which is not consistent between filter suppliers. An 80-mesh screen is required to prevent nozzles from plugging. When selecting a strainer, do not rely on the color coding. Check with the strainer manufacturer to be sure and select the 80-mesh strainer.

Plugged strainers will cause a reduction in system operating pressure.

When replacing the mesh screen on a Tee-jet Strainers:

1. Install and set the mesh screen in the strainer head.
2. Install the strainer cap.

   Important: Failure to do this will likely result in a damaged mesh screen and overall strainer failure.

Nozzle Valves

Plugged nozzle valves can be classified into two categories:

- Plunger blockage
- Plunger stuck

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

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

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

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

Note: Operating a plugged nozzle valve for extended periods of time may result in a nozzle valve coil failure. Immediately clean any plugged nozzle valves.

Note: Before removing the nozzle valves, make sure that the pressure has been released from the boom tubes.

If plugged nozzles are a frequent problem in a particular boom section, inspect the boom filter screens for plugged or damaged screens.

Recommendation: Use an 80-mesh screen to prevent the nozzles from plugging.

Do a check of the mesh size of the strainers and replace strainers if they are too coarse.

Clean the Nozzle Valve(s)

Warning: Chemical residues may be present in the agricultural equipment. Always use proper personal equipment to avoid personal injury.

1. Release pressure from the system before servicing.
2. Clean the system before installation or service of the fittings, hoses, valves, or nozzles.

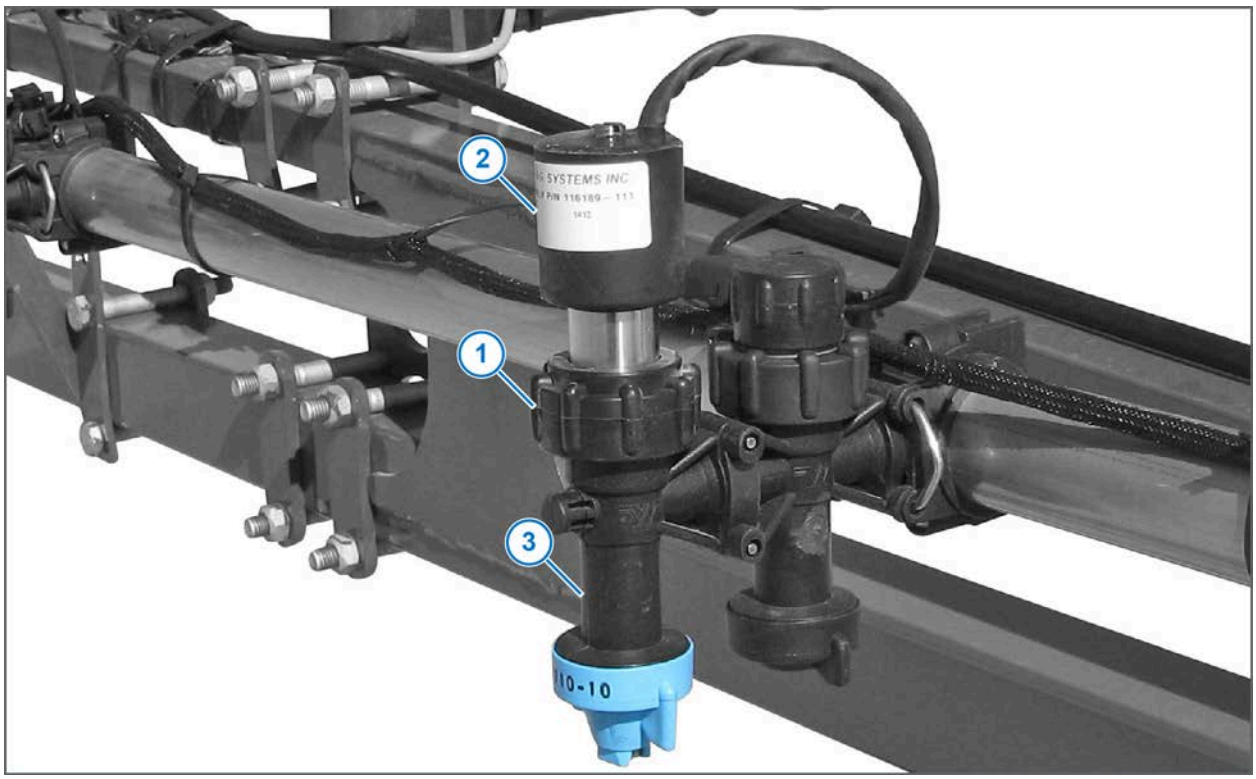

Fig. 54:

3. Unscrew the fly nut *(1)* counter-clockwise to remove the nozzle valve assembly *(2)* from the nozzle body *(3)*.

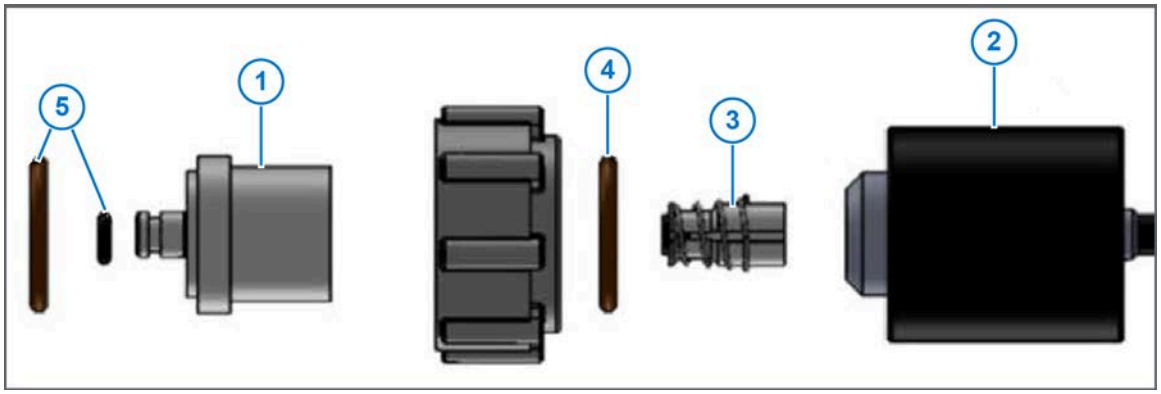

Fig. 55:

4. Use pliers around the valve body *(1)* to hold the assembly with the coil harness facing the ground.
5. Rotate the coil *(2)* counter-clockwise to remove the coil from the valve body.
6. Remove the plunger *(3)* from the coil.
7. Inspect the O-ring *(4)* on the coil.
8. Inspect the O-rings *(5)* on the valve body.
9. Wash the nozzle valve components to remove any debris.
10. Inspect the plunger for wear or damage.
11. If there is wear or damage to the plunger, replace the plunger.
12. Inspect the valve body.

    Make sure that the orifice is not plugged with debris, worn, or damaged.
13. If there is wear or damage to the orifice, replace the valve body.
14. Wash the nozzle body components to remove any debris.

    Important: Do not use brake cleaner. Brake cleaner can damage the seal.

    Important: During installation, apply 40 lbf in of torque to the coil when it threads into the valve body to properly seat the O-ring.

Plunger Seal Inspection

Fig. 56:

After extended use, the plunger seal will wear a groove *(1)* where the seal impacts the hard orifice seat. Replace the plunger if worn or damaged. As the groove deepens, the pressure capacity of the valve will decrease until the pressure capacity interferes with the operating pressure of the system. The result is erratic pulsing, often described as “flickering.” The system will operate normally at lower pressures until replacement parts can be installed. High operating pressures and abrasive chemicals will accelerate the wear of the plunger seal material.

- Clean the connector terminals
- Replace the coil

When replacement of the plunger is necessary, make sure that you have the correct plunger.

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

Update PinPoint™ II Software

This procedure is for updating PinPoint™ II and CapView II display.

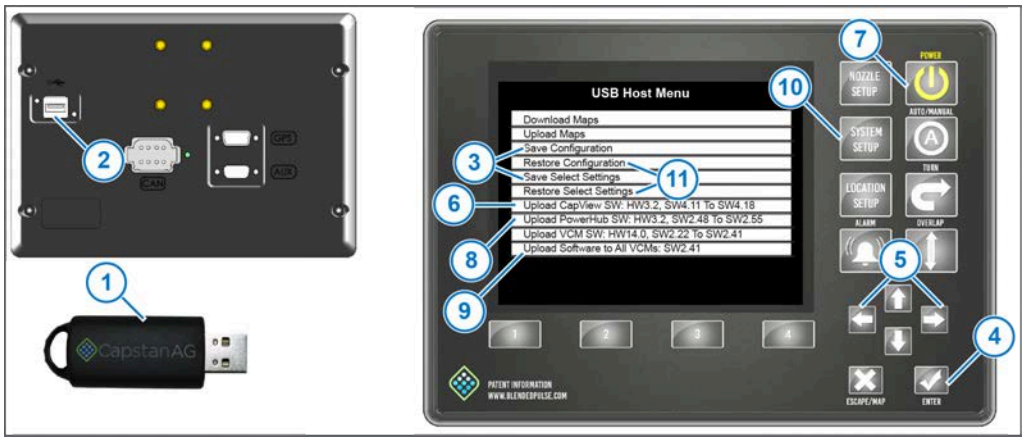

Fig. 57:

1. Insert the USB thumb drive *(1)* into the back of the CapView display *(2)*.
2. The ***USB Host Menu*** will show on the screen.
3. Use the up or down arrow to go to the **Save Configuration** or **Save Select Settings** line *(3)*.

   Use **Save Configuration** if you are saving the information for the same sprayer and have not made significant system changes, like changing the number of VCMs.

   For software released in October 2018 and after, use **Save Select Settings** if you are saving information to use on a different sprayer or have made significant system changes, like changing the number of VCMs.
4. Press the **ENTER** button *(4)*.
   A message screen will show on the display.
5. Use the left or right arrow button *(5)* to select **YES**.
6. Press the **ENTER** button.
   The CapView display will show the ***USB Host Menu***.
7. Go to the **Upload CapView SW:** line *(6)*.

   Important: CapView software must be updated first.

   On the list, on the upload software lines, there are two software versions that show. The software version on the left is the version that is currently on your hardware. The software on the right is the version available on the USB thumb drive. Do not upload the same version of software unless advised to do so by a CapstanAG representative.
8. Press the **ENTER** button.

   The lights on the display will flash for a few moments, and the CapView display will automatically power down.
9. Wait five seconds, and then press the **POWER** button *(7)*.

   The CapView display will turn on, and a splash screen will show a progress bar advancing across the screen.

   You do not have to wait until the progress bar disappears before continuing with the procedure.
10. Use the up or down arrow to go to the **Upload PowerHub SW:** line *(8)*.
11. Press the **ENTER** button.

12. ***Upload Gateway Code*** and a progress bar will show on the screen.
13. When the update process is complete, the ***USB Host Menu*** will show.
14. Go to the **Upload Software to All VCMs:** line *(9)*.

    Note: If your system has both 9-channel and 15-channel VCMs, you must select **Upload Software for All VCMs** for each version of hardware that is on your system.
15. Press the **ENTER** button.
16. ***Upload VCM Code*** and a progress bar will show.
17. When the update process is complete, the ***USB Host Menu*** will show.
18. Remove the USB thumb drive from the back of the CapView display.
19. Press the **SYSTEM SETUP** button *(10)*.

    The first line of the ***System Setup*** menu is the **Operation Mode** line.
20. Make sure that the operation mode is correct:

    - Synchro
    - SharpShooter
    - N-Ject
21. Use the up or down arrow to go to the **Advanced Settings** line.
22. Press the **ENTER** button.
23. Use the up or down arrow to go to the **Factory Reset** line.

    Note: Make sure that you have saved your configuration before continuing. Do steps 3 to 6 if you did not previously save the configuration.
24. Press the **ENTER** button.
    A message screen will show on the display.
25. Use the left or right arrow button to select **YES**.
26. Press the **ENTER** button.
    The display will power off.
27. Wait five seconds and then press the **POWER** button.
    A message will show on the CapView display.
28. Press the **ENTER** button.
29. Insert the USB thumb drive into the back of the CapView.
    The ***USB Host Menu*** screen will show.
30. Use the up or down arrow to go the **Restore Configuration** line *(11)*.
31. Use the up or down arrow to go the **Restore Configuration** or **Restore Select Settings** line *(11)*.

    If you saved configurations, use the **Restore Configuration**.

    For software released in October 2018 and after, if you saved select files, use the **Restore Select Settings**.
32. Press the **ENTER** button.
    A message will show.
33. Use the left or right arrow button to select **YES**.
34. Press the **ENTER** button.
    The display will power down.
35. Remove the USB thumb drive from the back of the CapView display.
36. Press the **POWER** button.
37. Press the **SYSTEM SETUP** button.
38. Make sure that the system shows the correct **Operation Mode** and that other settings are correct.

Chapter 8: Troubleshooting

Troubleshooting Charts

Table: CapView System Errors

Error Message	Cause	Correction
System Normal	This indicates that the system is operating correctly	
Missing Gateway	Communication to the Gateway hub has been lost	Do a check of the connections (key switched power, ignition, and battery power) and then cycle power to the system
Missing VCM	Communication to the VCMs has been lost	Do a check of the connections (key switched power, ignition, and battery power) and then cycle power to the system
No GPS Attached	No GPS messages are being received	Cycle the GPS power
		Do a check of the GPS antenna connections and fuses
No GPS Signal	GPS messages are being received but are empty	Wait for the GPS antenna to acquire satellites
	Faulty GPS antenna	Replace the GPS antenna
	Faulty GPS receiver	Replace the GPS receiver
	Incorrect GPS settings • VTG is less than 10 Hz • GGA is less than 10 Hz	Wait 10 seconds while the GPS verifies itself. Change GPS receiver settings to: • Baud Rate: 19200 to 115200 • GGA: 10 Hz or more • VTG: 10 Hz or more • ZDA: 1 Hz or more
Key Fob Mode Active	The key fob mode is active. The alarm light illuminates, but the alarm does not sound	System Setup Nozzle Control (Key FOB): Change to 12V Active to resume operation.
Valves Not Found	The system uses the number of valves expected line to determine how many it should find, and at machine/system start, the system does not find all of the valves	Identify the missing valve(s). Use the Location Setup Menu or the key fob. Repair or replace the valve(s) to resume operation. After correcting the problem, turn the system off and back on to clear the error after fixing the problem.

Error Message	Cause	Correction
Compass Failure	Internal compass on the PinPoint™ II hub is faulty	Replace the PinPoint™ II hub or change the backup detection method to: • off = fwd to continue without compass
Overlap Out Of Bounds	Distance traveled has exceeded three miles from the point of origin (start of map)	Save or erase the map. Refer to mapping in the operation section
Valve Lodged Open	Debris in the valve	Clean the valve
Valve Lodged Closed	Debris in the valve	Clean the valve
Coil Circuit Open	Coil wire is pinched, cut, or broke. Coil is disconnected	Do a check of the coil connection and resistance (21 to 23.5 ohm)
Coil Circuit Short	Coil wire is pinched, cut, or broke. Internal coil short	Do a check of the coil connection and resistance (21 to 23.5 ohm)
Gateway Reset	PinPoint™ II lock/missing VCM error	Alarm will sound until the **ALARM** button is pressed. The error will continue to show for a few seconds after the button is pressed. Operation will continue normally, and the alarm will clear itself.
No Rate Control Signal	No communication with the rate controller	Do a check of the connections for the rate controller and CapView Make sure that the baud rate on the CapView and the rate controller are the same
GGA Msg Rate < 10 Hz	Incorrect GPS settings	Change the GGA message rate to at least 10 Hz on the GPS receiver
VTG Msg Rate < 10 Hz	Incorrect GPS settings	Change the VTG message rate to at least 10 Hz on the GPS receiver
Pump Seal Shutdown	The system is below the value set in the ***System Setup*** menu for more than 2 seconds	Fill the tank and then restart the pump. To restart the pump, press the **UP** arrow or the **AUTO/MAN** button twice
System Pressure Sensor	The system pressure is outside of the range of the inlet pressure sensor	Do a check of the ***System Setup*** menu and adjust the pressure with the correct operating range.
		Do a check of the pressure sensor, replace if necessary
		Do a check of the wiring, repair as necessary.

Error Message	Cause	Correction
Flow Error	Flowmeter calibration number is incorrect	Do a check of the flowmeter calibration
	Damaged flowmeter	Do a check of the flowmeter and replace as necessary
	Wrong tip size on CapView	Change the value on the CapView
	Wrong valve size of CapView	Change the value on the CapView
	Boom leak	Do a check of the booms and repair any damage
Flow Error	Section valve not operating	Do a check of the section valves and repair/replace as necessary
	Plugged strainers	Clean or replace the strainers
	Lodged plungers	Clean or replace the plungers
Conventional Flow	This is used only is SharpShooter™ mode and information only. Conventional Flow is used to spray without the CapstanAG valves.	
Low Flow Alt. Control	This is used only for John Deere and is information only.	
Slow Min Flow Error	Tips are too large	Find and install tips that are the correct size
	Speed too slow	Increase speed
	Pressure is set to high	Make sure that the settings on each pressure controlled by-pass valve are correct
Fast Max Flow Error	Tips are too small	Find and install tips that are the correct size
	Speed too fast	Decrease speed
	Pressure is set to low	Make sure that the settings on each pressure controlled by-pass valve are correct
Undefined Valve Error	Shows along with the Missing VCM error because the system does not have information on all of the valves, which are causing a CAN communication error.	
IMU Invalid	NAV IMU is enabled with a faulty module	Disable the Navigation IMU or replace the module
Missing PSI NAV Commander Module	NAV IMU or Pressure Command is enabled but has not received any communication from the module	Do a check of the connections or disable the feature(s).
	NAV IMU or Pressure Command is enabled but has not received any communication from the module which is faulty	Replace the module or disable the feature(s).

Table: System Operation Errors

Problem	Cause	Correction
Under application	Tips are too small	Find and install tips that are the correct size
	Plugged tips	Clean or replace the tips
	Plugged filter(s)	Clean or replace the filter(s)
	Filter(s) not correctly installed	Correctly install filter(s)
	Plugged, kinked, or collapsed hoses	Check all hoses and replace as needed
	Pump is not turned on	Refer to the sprayer manual for instructions to start the pump
	Outrunning sprayer liquid system capability	Slow down
		Run at optimum pressure (not too low, not too high)
	Incorrect rate settings	Check and adjust the rate settings
	Incorrect calibration settings	Refer to the rate controller and/or PinPoint™ II manuals for instructions
Under application	Faulty radar	Replace the radar
	Poor GPS satellite signal	Make sure that the GPS is working correctly
	Faulty rate controller switch(es)	Locate and replace the faulty switch(es)
	Servo valve not working correctly	Do a check of the Servo valve and replace as necessary
	Flowmeter calibration number is incorrect	Do a check of the flowmeter calibration
	Faulty flowmeter	Repair or replace the flowmeter
Over application	Tips are too large	Find and install tips that are the correct size
	Worn tips	Replace the tips
	Speed too slow	Increase speed
	Incorrect rate settings	Do a check of the rate settings and adjust as necessary
	Incorrect calibration settings	Refer to the rate controller and/or PinPoint™ II manuals for instructions
	Servo valve not working correctly	Do a check of the Servo valve and replace as necessary
	Flowmeter calibration number is incorrect	Do a check of the flowmeter calibration
	Faulty flowmeter	Repair or replace the flowmeter

Problem	Cause	Correction
Rate instability	Low voltage to the rate controller	Test the voltage and repair as needed
	Faulty flowmeter	Repair or replace the flowmeter
	Faulty speed sensor reading	Do a check of the radar and replace as needed
	Collapsed suction hose	Replace the suction hose
	Inlet plugged	Do a check of the inlet and clean as necessary
	Incorrect valve calibration settings	Do a check of the valve calibration settings and adjust as necessary. Refer to the rate controller manual
	Incorrect PinPoint™ II system gain	Do a check of the PinPoint™ II system gain and adjust as needed
	PinPoint™ II run/hold parameter is too short	Incrementally adjust up the PinPoint™ II run/hold parameter to decrease the instability
	Air in the spray boom	Bleed air from the system
	Faulty rate controller	Replace the rate controller
Pressure instability	Faulty rate controller	Replace the rate controller
	Worn or sticky poppet(s)	Do a check of the poppet(s) and replace as needed
	Incorrect PinPoint™ II system gain	Do a check of the PinPoint™ II system gain and adjust as needed
	Faulty pressure sensor	Replace the pressure sensor
Single nozzle valve drips when shut off	Plunger is lodged with debris	Clean the nozzle valve
	Plunger is worn	Replace the plunger
	O-ring is pinched or broken	Replace the O-ring
Single nozzle valve sprays erratically	Plunger is worn	Replace the plunger
Single nozzle valve will not shut off	Plunger is lodged with debris	Clean the nozzle valve
	O-ring is pinched or broken	Replace the O-ring
Section will not spray	Blown fuse on VCM extension harness	Replace the fuse on the VCM harness
	Faulty VCM	Repair or replace the VCM
	Damaged VCM extension harness	Repair or replace the VCM extension harness
	Rate controller is not activating the section	Make sure that the section signal on Gateway hub. Refer to the CapView display pinout identification in the schematics section. Repair or replace the rate controller components.

Problem	Cause	Correction
Skips at the edges of a field	Overlap distance is set too low	Increase the overlap distance to at least 40 inches
	Incorrect GPS antenna location	Do a check of the measurements to the GPS antenna location
	PinPoint™ II display overlap settings are incorrect	Set the look ahead time and overlap distance to prevent skips
	Incorrect ball valve settings	Make sure that the ball valves are turning on soon enough or turning off late enough

Table: Rate Controller Errors

Problem	Cause	Error
Under application	Tips are too small	Find and install tips that are the correct size
		Do a check of the low rates with a Wilder Quick Calibrator or with a catch time test at each nozzle: • Oz/min per nozzle = GPA x Test Speed (mph) x Nozzle Spacing (inches) / (5940 x 128) • Oz/min per nozzle = G/1000 ft2 x Test Speed (mph) x Nozzle Spacing (inches) / (136 x 128)
	Plugged filters	Do a check of the filters and replace as needed
		Make sure that the filters are installed correctly
Under application	Plugged lines	Make sure that the lines are clean and do not have any kinks
	Shutoff valve is partially closed	Make sure that each shutoff valve is fully open
	Control Valve Type: • Use A, B, C, or D as it applies to your Machine	A. Pressure set too low on the flow by-pass lines • Make sure that the settings on each pressure controlled by-pass valve are correct B. In-line Servo flow control valve is stuck • Make sure that the Servo flow control valve is operating correctly C. Servo signal wire polarity is switched • Make sure that the valve opens with a rate increase • Make sure that the valve closes with a rate decrease D. Top PWM valve is set too low • Adjust the rate controller PWM valve to the desired setting

Problem	Cause	Error
Under Application Continued	Electric Servo Valve pump control is stuck	Make sure that the electric Servo pump control is operating correctly
	PWM spool is stuck	Change the rate to observe whether the rate change is slow, limited, or does not change at all. Replace as needed
	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
	Worn flowmeter	Remove the rate smoothing feature
	Worn flowmeter	Put the rate controller in manual mode at a test speed **Note:** Putting the rate controller in manual mode will lock the Servo valve position unless the valve position is changed manually. If the rate becomes stable, then it is one of these: • Worn Servo Valve • Worn PWM Valve If the rate remains unstable, it is usually the flowmeter signal instability. Manual increase the rate. The rate and pressure should increase. If the rate does not increase, then it is one of these: • Worn Servo Valve • Worn PWM Valve Manually decrease the rate. The rate and pressure should decrease. If the rate does not decrease, then it is one of these: • Worn Servo Valve • Worn PWM Valve

Problem	Cause	Error
Over Application	Worn tips or tips that are too big	Find and install tips that are the correct size Do a check of the low rates with a Wilder Quick Calibrator or with a catch time test at each nozzle: • Oz/min per nozzle=GPA x Test Speed (mph) x Nozzle Spacing (inches) / (5940 x 128) • Oz/min per nozzle=G/1000 ft2 x Test Speed (mph) x Nozzle Spacing (inches) / (136 x 128)
	Incorrect speed calibration number	Adjust the speed calibration setting
Rate Instability	Check the rate controller calibration numbers	Do a check of the valve type: • Standard • Fast • PWM • PWM Close • Etc.
		Do a check of the valve calibration. Refer to the rate controller information for the cal number for the specific valve type
	Worn or sticking Servo valve	Do a check of the Servo valve and replace as needed
Rate Instability	Worn of sticking PWM valve	Do a check of the PWM valve and replace as needed
	Flowmeter signal instability	Make sure that the flowmeter signal is correct
	Plugged, kinked, or collapsed hoses	Do a check of all hoses and replace as needed
	Controller pressure instability	Isolate the CapView from the rate controller and then put the system in manual mode at 50%
		Do a check of the rate controller pressure sensor and replace as needed
		Make sure that the rate controller calibration numbers are correct

Interchange the Components

The system includes a number of multiple parts:

- Nozzle Valves
- Extension Harnesses
- VCMs

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

When troubleshooting a failed VCM, a location setup procedure is necessary to show the VCM in the correct location.

If the problem does not follow the failed part, then the problem is likely elsewhere in the system, and other troubleshooting means may be followed.

Note: Use caution when failed parts are interchanged with a part that is operating correctly; in rare cases, the failed component may cause other components to fail at the new location.

Fuses

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

Fuse Location	Rating	Type	Color
Key Switched Power Harness	5 A	ATO/ATC	Tan
PinPoint™ II display (CapView) extension harness	15 A	ATO/ATC	Blue
VCM Extension Harness	15 A	ATO/ATC	Blue

Coil Assembly Test

Coil assembly failures are often the result of two factors:

- Extended valve use with a plugged nozzle
- Extended use in corrosive environments

Recommendation: Clean any plugged valve assemblies immediately.

Recommendation: Rinse the inside of the booms, and wash the outside of the coil assemblies with clean water as often as practical.

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

Notice: Correct resistance is:

- **7-watt coils resistance—21 ohms to 23.5 ohms**
- **12-watt coils resistance—10 ohms to 11.5 ohms**

If correct resistance is not found:

- Clean the connector terminals and retest
- Replace the coil assembly

Circuit Breaker

Fig. 58:

The circuit breaker has a manual trip button *(1)* and a manual reset lever *(2)*.

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

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

Note: The circuit breaker is usually located near the battery or in the battery compartment. The 60A or 80A circuit breaker is equipped with a manual trip. To reset the breaker, rotate the tripped lever back into the reset position.

Important: When disconnecting the battery terminals, remove the negative (-) cable first, then remove the positive (+) cable. When connecting cables, connect the positive (+) cable first, then connect the negative (-) cable.

Battery Voltage Test

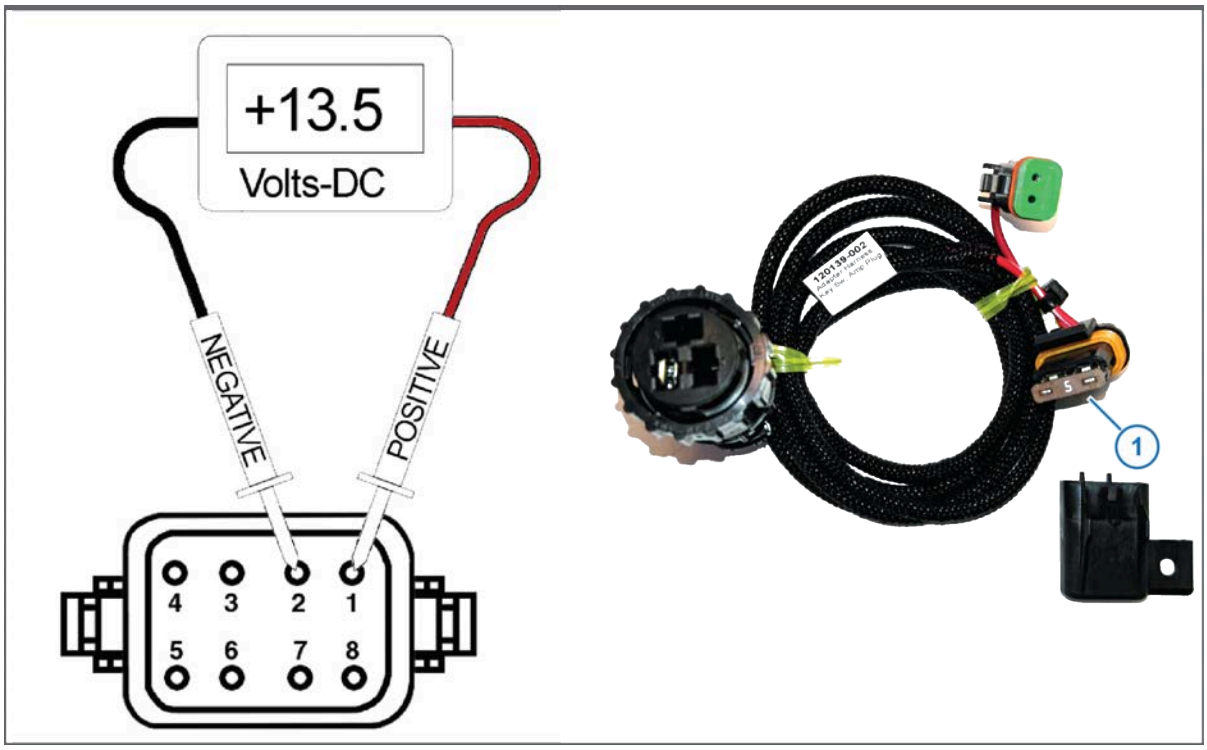

Fig. 59:

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

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

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

If the polarity is accurate, but there is still a problem, check the voltage between pin 2 (GND) and pin 6 (SWPWR).

If there is no voltage present between pin 2 (GND) and pin 6 (SWPWR), do a check of:

- The 5 A in-line fuse *(1)* on the key switched power harness.

  If the fuse is good, do a check of the pins on the key switched power harness connector that connects to the display harness.

  Do a check of the fuse on the machine side of the key switched power.
- The 15 A fuse on the CapView extension harness at the Gateway hub.
- The 80 A circuit breaker at the machine battery.
- The PinPoint™ II battery harness connections.
- The condition of the battery and the alternator.

Do a Check of the System Load Capacity

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

The 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, do a check of the nozzle valves for worn plunger seals.

If low voltage is observed, do a check of:

- The battery terminals and clean as necessary
- The condition of the battery
- The condition of the alternator
- The condition of the connections

VCM Voltage Test

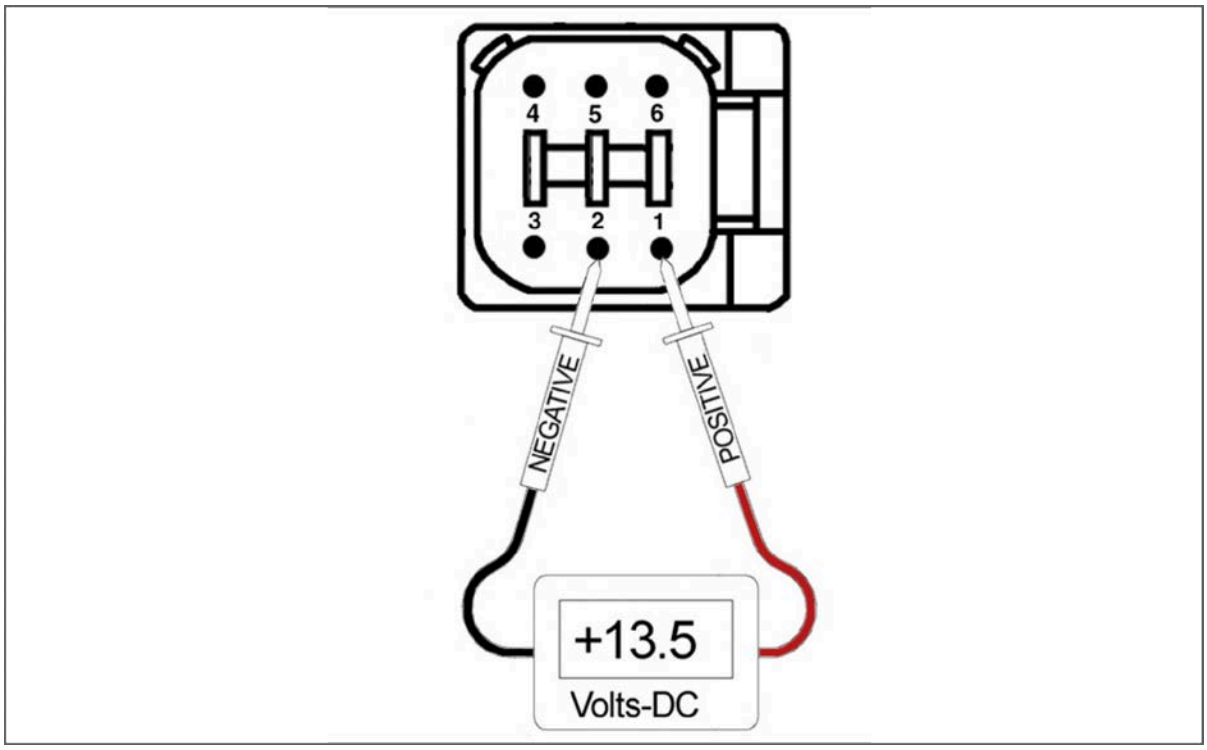

Fig. 60:

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

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

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

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

- Turn on the key and cab switch.
- Do a check of the 15 A fuse on the VCM extension harness at the Gateway hub.
- Do a check of the voltage at the hub.
- Do a check of the 80 A circuit breaker at the machine battery.
- Do a check of the PinPoint™ II battery harness connections.

VCMs require constant power on pin 1 and key switched power on pin 6.

Boom Shutoff Signal Test

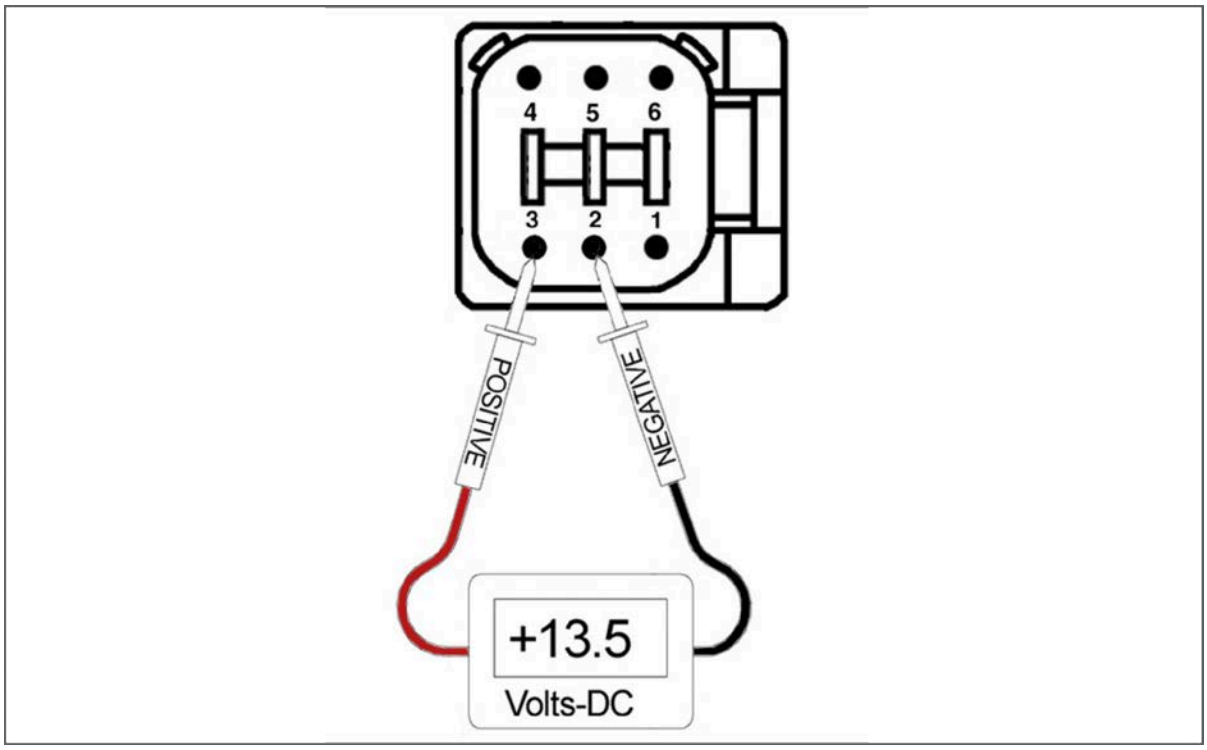

Fig. 61:

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

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

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

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

If there is no voltage present, do a check of:

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

For a VCM to spray, there must be 12 V on pin 1 (constant power), pin 3 (boom signal), and pin 6 (key switched power).

Power to the Pressure Sensor Input Test

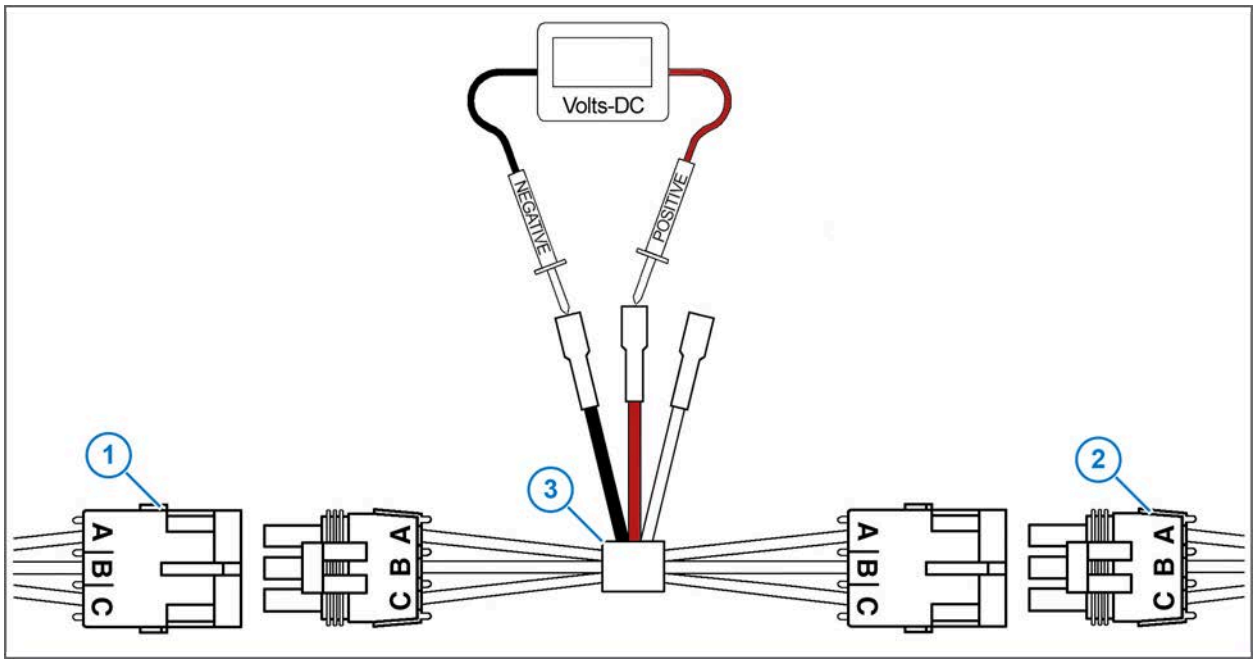

Fig. 62:

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

Use a voltmeter to observe that there is 13.5 VDC between the red and black wire on the pressure sensor breakout harness with the engine running or 12.0 VDC without the engine running.

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

If no voltage is present, do a check of:

- The fuse located at the battery
- The battery connections
- The condition of the battery
- The condition of the alternator

Pressure Sensor Signal Test

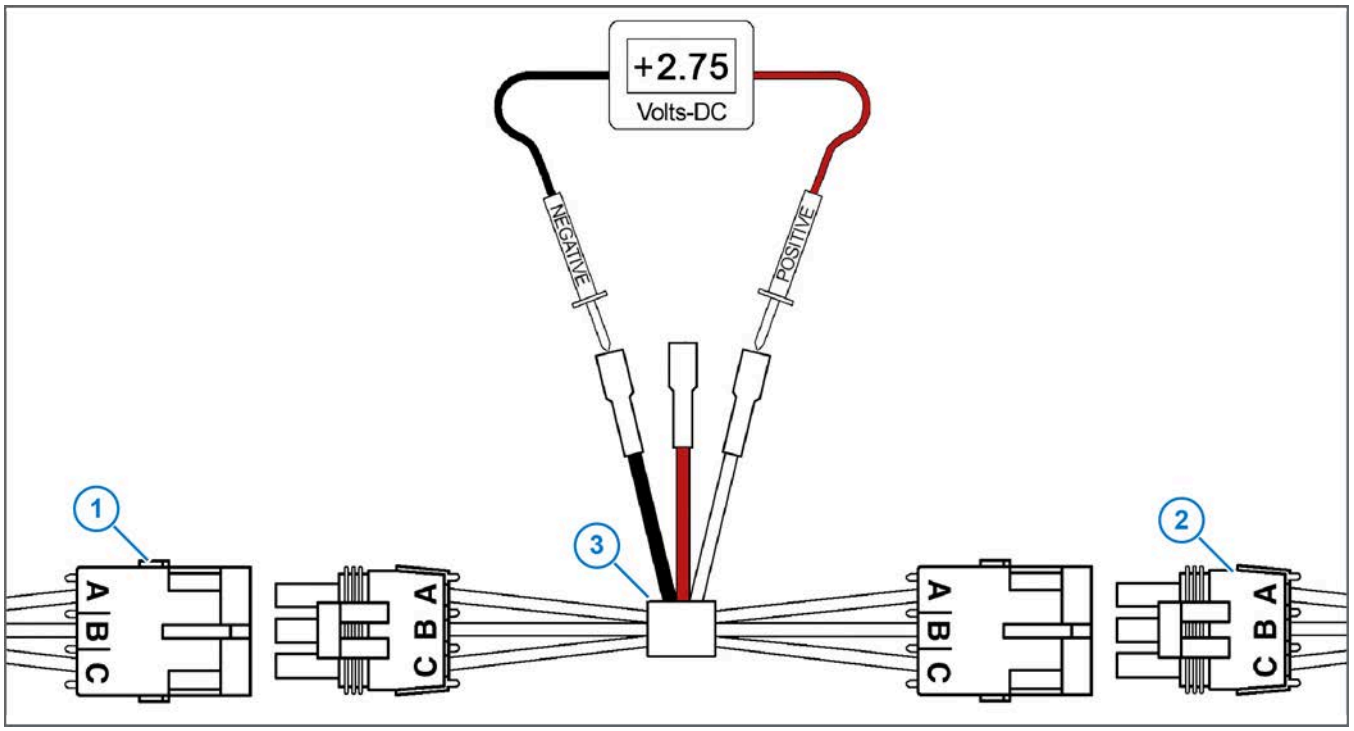

Fig. 63:

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

With the engine running and the system is turned on, use the rate controller to establish 50 psi on the pressure gauge.

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

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

If accurate voltage is not present:

- Verify the accuracy of the pressure gauge on the sprayer.
- Do a check of the power to the pressure sensor.
- Use the serial diagnostics to check the pressure sensor calibration.
- Replace the pressure sensor.

Technical Bulletin

This technical bulletin was originally produced July 11, 2001. The latest revision to this bulletin was made November 1, 2017.

Spray Skips from Poor Pulse Blending

Over the years, CapstanAG 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 and to prevent skipping.

What is Blended Pulse™ spraying? Each nozzle in a Blended Pulse™ spray system emits 19 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° fan angle) that is spraying 5 GPA at 15 mph with a 50 psi boom pressure. The nozzles are 20 in apart. Each tip is rotated 12.5° to prevent pattern interference between nozzles. The minimum boom height is 21 in above the spray target.

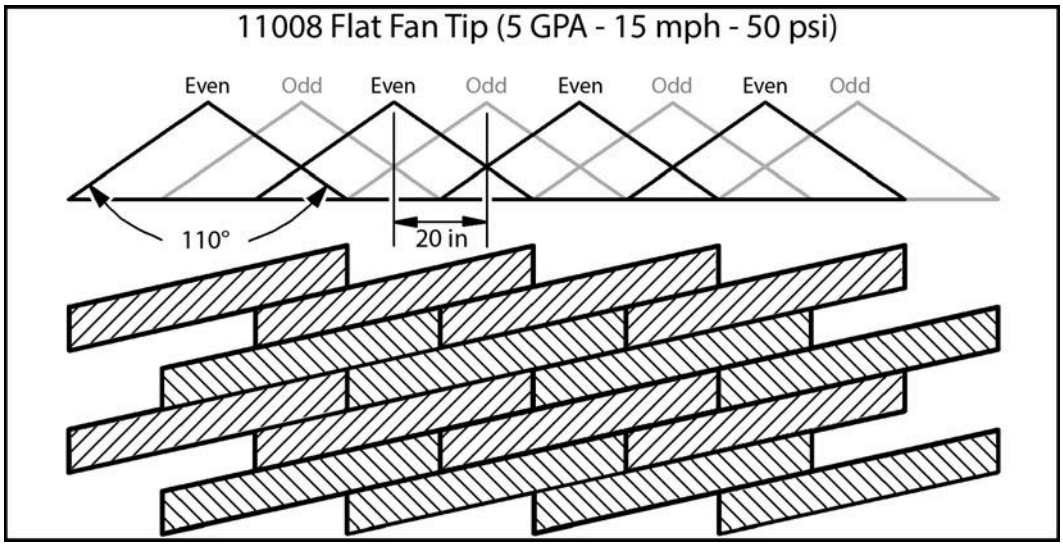

Fig. 64: 11008 Flat Fan Tip

In this example, each nozzle sprays 1/3 of the time, but adjacent nozzles alternate and overlap to fill in 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 skips. The amount of droplet dispersion depends upon the style of tip being used. For example, low-drift tips typically emit large droplets and provide minimal droplet dispersion.

What causes skipping? Below is the same illustration from the previous page except that 80° fan angle tips are used rather than 110° tips. In this case, the 21 in boom height does not 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.

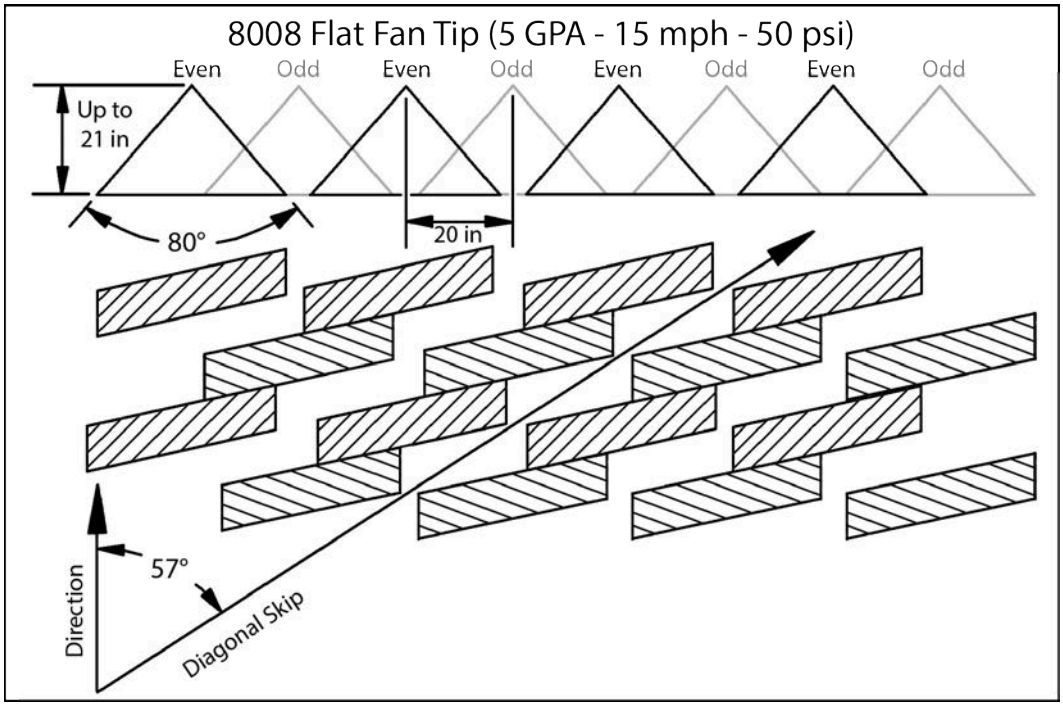

Fig. 65: 8008 Flat Fan Tip

To Prevent Skipping

1. Use wide-angle spray tips and appropriate boom heights to provide 150% nozzle overlap.
    - For 80° tips, use 36 in or greater boom height.
    - For 110° tips, use 24 in 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. Follow the boom height, duty cycle, and tip selection recommendations to make sure that there is adequate spray coverage.
4. Always read and follow chemical label instructions. Agronomic and environmental factors significantly affect efficiency of the chemicals, and will magnify the adverse effects of poor coverage. Follow 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 19 Hz or greater pulse frequency. The CapstanAG master module and display allow the pulse frequency to be reduced for non-sprayer applications, when uniform coverage is not required.

Chapter 9: Schematics

Connector Pin Identification

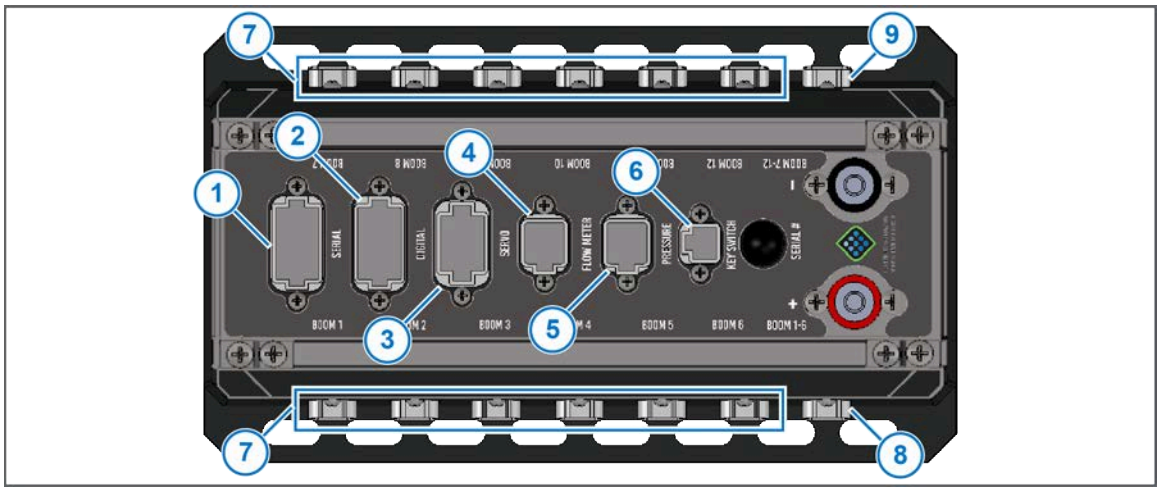

Fig. 66:

Table: Serial Connector Port *(1)*

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

Table: Digital Connector Port *(2)*

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

Table: Servo Connector Port *(3)*

Pin Number	Description		Pin Number	Description
1	12 V Servo Power		5	Ground
2	Servo Input INC		6	Servo Output DEC
3	Servo Input DEC		7	Servo Output INC
4	Ground		8	12 V Valve Power

Table: Flowmeter Connector Port *(4)*

Pin Number	Description		Pin Number	Description
1	Power from Controller		4	Ground to Flowmeter
2	Signal Output to Controller		5	Signal from Flowmeter
3	Ground from Controller		6	Power to Flowmeter

Table: Pressure Connector Port *(5)*

Pin Number	Description		Pin Number	Description
1	12 V Key Switched Power		4	Ground
2	Pressure Input 1		5	Pressure Input 2
3	Ground		6	12 V Key Switched Power

Table: Key Switch Connector Port *(6)*

Pin Number	Description		Pin Number	Description
1	12 V Key Switched Power		2	Ground

Table: Booms 1 to 12 Connector Ports *(7)*

Pin Number	Description		Pin Number	Description
1	12 V Battery		4	CAN High
2	Ground Battery		5	CAN Low
3	Boom Section Signal (12 V On/0 V Off)		6	Key Switched Power

Table: Boom Section 1 to 6 Connector Port *(8)*

Pin Number	Description		Pin Number	Description
1	Boom Section 1 (12 V On/0 V Off)		4	Boom Section 4 (12 V On/0 V Off)
2	Boom Section 2 (12 V On/0 V Off)		5	Boom Section 5 (12 V On/0 V Off)
3	Boom Section 3 (12 V On/0 V Off)		6	Boom Section 6 (12 V On/0 V Off)

Table: Boom Section 7 to 12 Connector Port *(9)*

Pin Number	Description		Pin Number	Description
1	Boom Section 7 (12 V On/0 V Off)		4	Boom Section 10 (12 V On/0 V Off)
2	Boom Section 8 (12 V On/0 V Off)		5	Boom Section 11 (12 V On/0 V Off)
3	Boom Section 9 (12 V On/0 V Off)		6	Boom Section 12 (12 V On/0 Ve Off)

CapView Connector Pinout

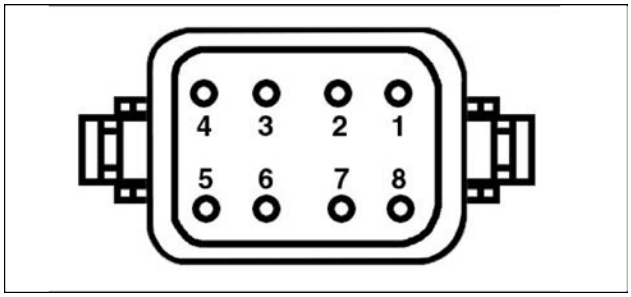

Fig. 67:

Pin Number	Description	Wire Color		Pin Number	Description	Wire Color
1	Power	Red		5	CAN Low	Green
2	Ground	Black		6	Key Switched Power	Brown
3	Boom Switch Signal	Blue		7	Empty	
4	CAN High	Yellow		8	Empty	

VCM Connector Pinout

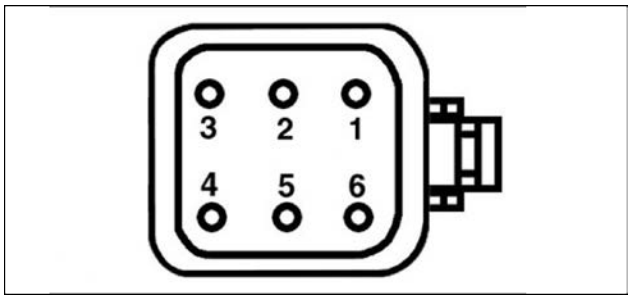

Fig. 68:

Pin Number	Description	Wire Color		Pin Number	Description	Wire Color
1	Power	Red		4	CAN High	Yellow
2	Ground	Black		5	CAN Low	Green
3	Boom Switch Signal	Blue		6	Key Switched Power	Brown

General System Layout—Synchro™ Mode

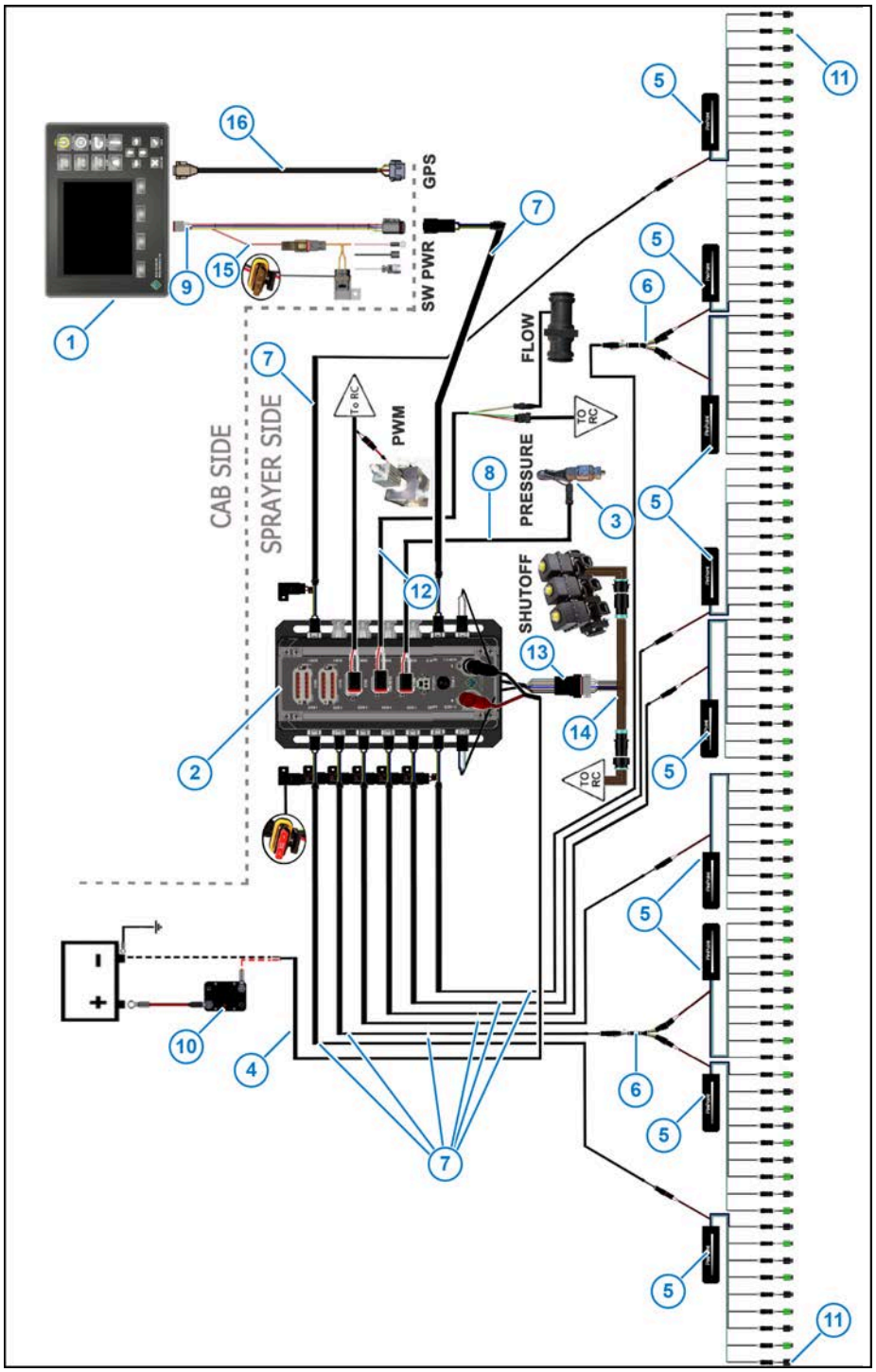

Fig. 69:

Callout	Description	Qty
1	CapView	1
2	Gateway Hub	1
3	Pressure Sensor	1
4	Power Harness	As Required
5	VCM Kit	As Required
6	Y-adapter	2
7	Extension Harness	As Required
8	PSI Adapter Harness	1
9	CapView Harness with Switched Power	1
10	Circuit Breaker Kit	1
11	Valve Assembly	As Required
12	Flowmeter Harness	As Required
13	Boom Shutoff Adapter	1
14	Shutoff Harness DT	As Required
15	Key Switched Power Harness[2]	1
16	GPS Adapter Cable	As Required

Note: Hagie sprayers will require Hagie part number 293942. Hagie sprayers from 2010 to 2013 will require installation under the armrest. Hagie sprayers from 2014 and after, install in the access panel in the right-front corner of the cab.

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

[2] All CASE IH platforms supply key switch power in the chassis harness to the Gateway hub.

General System Layout—SharpShooter™ Mode

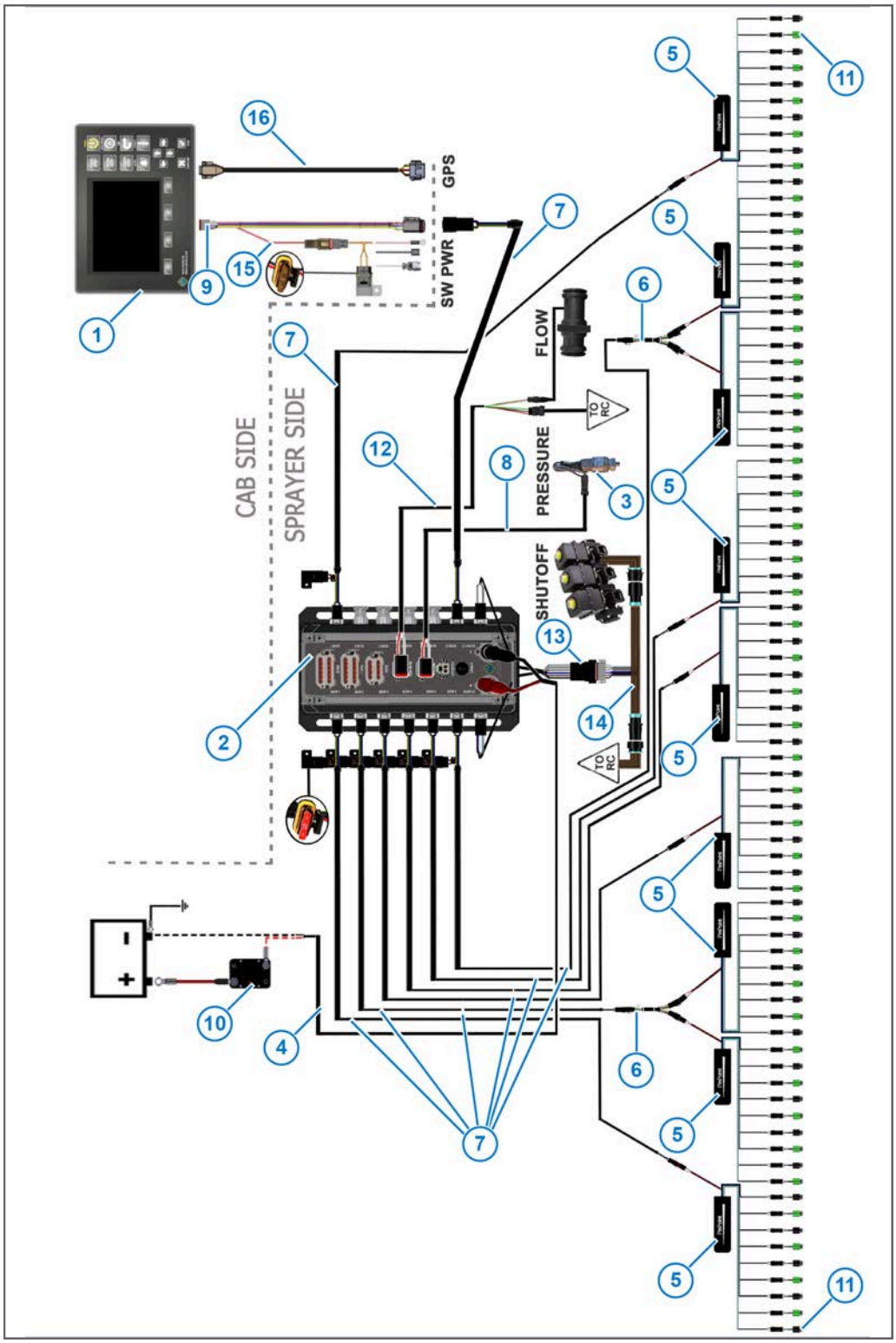

Fig. 70:

Callout	Description	Qty
1	CapView	1
2	Gateway Hub	1
3	Pressure Sensor	1
4	Power Harness	As Required
5	VCM Kit	As Required
6	Y-adapter	2
7	Extension Harness	As Required
8	PSI Adapter Harness	1
9	CapView Harness with Switched Power	1
10	Circuit Breaker Kit	1
11	Valve Assembly	As Required
12	Flowmeter Harness	As Required
13	Boom Shutoff Adapter	1
14	Shutoff Harness DT	As Required
15	Key Switched Power Harness[3]	1
16	GPS Adapter Cable	As Required

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[3] All CASE IH platforms supply key switch power in the chassis harness to the Gateway hub.

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