

EVO™

Spray Application

Operator Manual



Thank you for your business!

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

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

Service Contact Information

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

System Purchased: _____

Dealer: _____

Contact: _____

Phone: _____

Address: _____

City,State/Province, Zip: _____

Factory Service/Repairs

CapstanAG

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

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

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

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

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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 Original Equipment Manufacturer (OEM) agricultural equipment manual(s).

Follow the instructions (in this manual) and in the OEM agricultural equipment 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 agricultural equipment manual(s) for chemical safety information.

Read, understand, and review the procedures in this manual and OEM agricultural equipment 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).

Pressurized Fluid Lines

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

Personal Protective Equipment

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

Battery Safety

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

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

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

Chemical Safety

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

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 or transportation and handling.

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

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

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

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

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

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

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

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 #, your name, customer's name, your address and phone number and description of problems or failure. Then ship to:

Capstan Ag Systems, Inc.

Attn: Warranty/Repair

4225 SW Kirklawn Ave.

Topeka, KS 66609

Phone: (785) 232-4477

Fax: (785) 232-7799

Hours: 8 a.m. - 4:30 pm CST

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: Installation

Before System Installation

Before assembly and installation, read the installation information carefully. Make sure that you have all of the parts in the kits. Read all of the instructions in this document, the system operator manual, and the machine manuals. The system operator manual includes information on operation, adjustments, troubleshooting, and maintenance.

For further assistance contact your CapstanAG representative.

Tip Selection and Capacities

Orifice Size	Flow US GPM	PSI		Speed Range					
		Gauge	Tip	3 GPA	5 GPA	8 GPA	10 GPA	15 GPA	20 GPA
05	0.336	20	18	3	5.0 to 20.0	3.1 to 12.5	2.0 to 10.0	1.3 to 6.7	1.0 to 5.0
	0.412	30	27		6.1 to 24.5	3.8 to 15.3	2.4 to 12.2	1.6 to 8.2	1.2 to 6.1
	0.476	40	36		7.1 to 28.3	4.4 to 17.7	2.8 to 14.1	1.9 to 9.4	1.4 to 7.1
	0.532	50	45	5	4.9 to 19.8	3.2 to 15.8	2.1 to 10.5	1.6 to 7.9	
	0.583	60	54		5.4 to 21.6	3.5 to 17.3	2.3 to 11.5	1.7 to 8.7	

Fig. 1:

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).

Nozzle Types and Component Identification

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

7-Watt—15 Series Coil Components

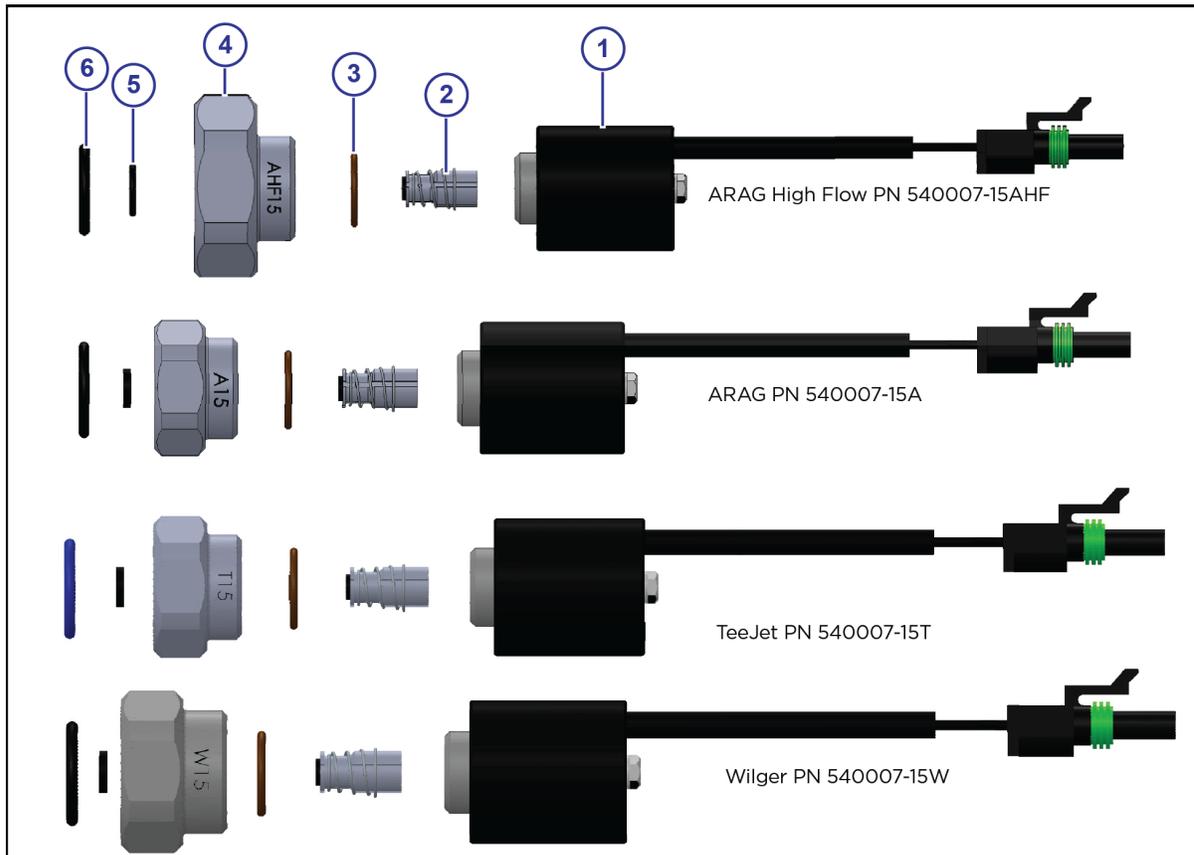


Fig. 2:

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 Components

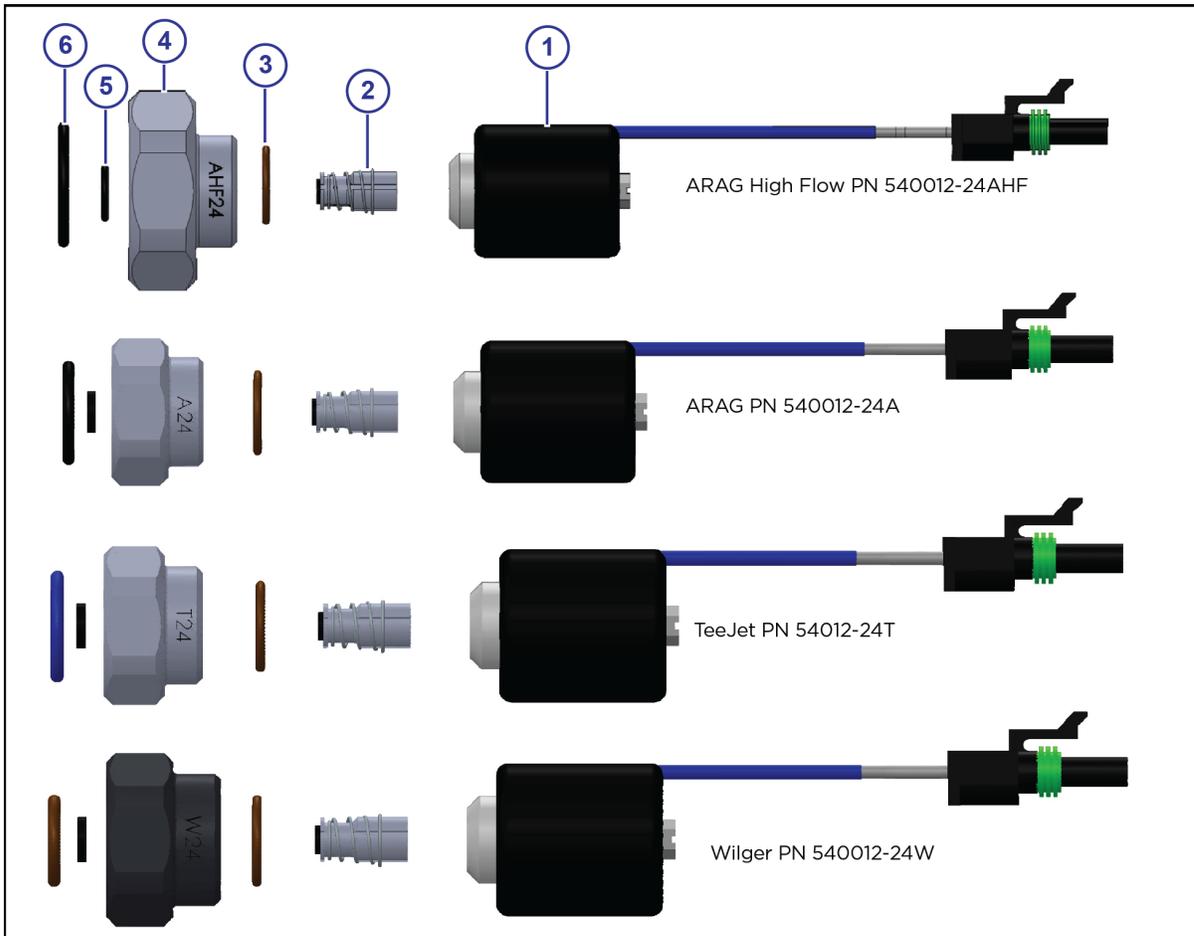


Fig. 3:

Item	Description	Arag High Flow Part Number	Arag Part Number	Tee Jet Part Number	Wilger Part Number
1	12-Watt Coil Assembly	116189-111	625147-011	625147-011	625147-011
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	116182-002	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.

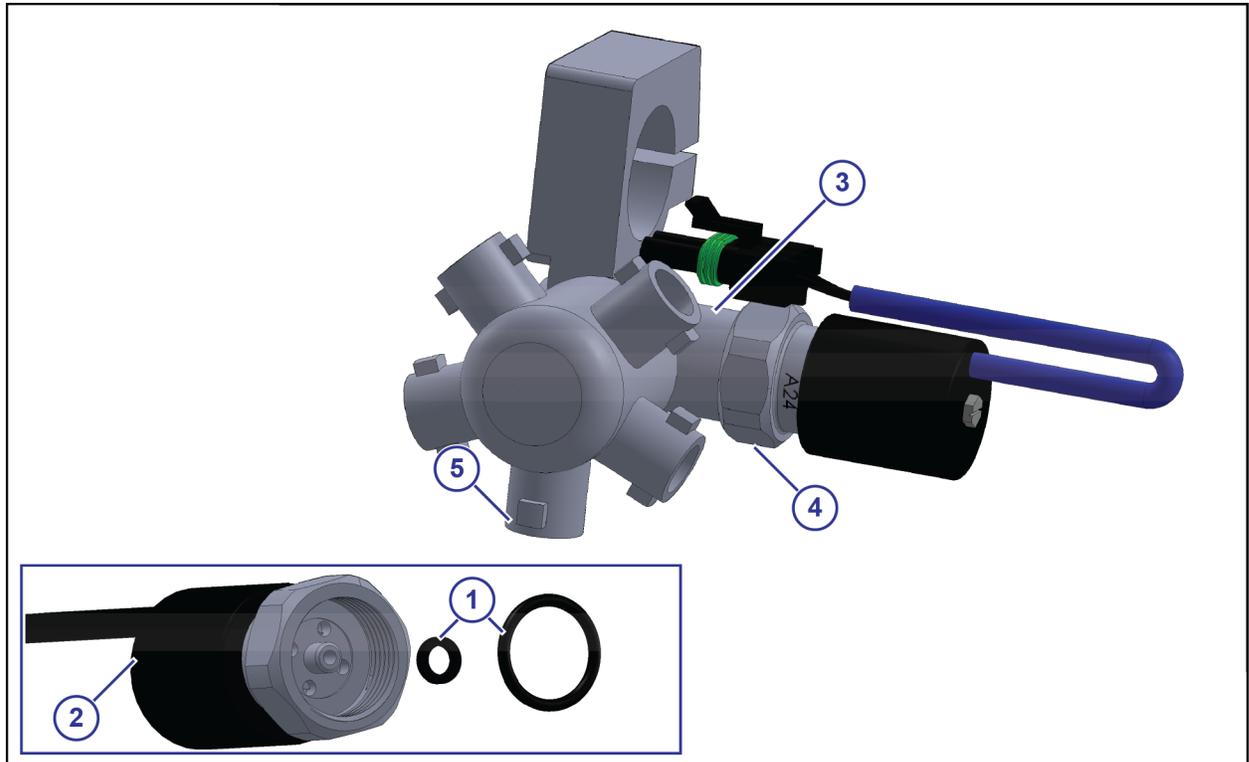


Fig. 4:

2. Install the O-rings (1) onto the flybody nozzle assembly (2).
3. Install the nozzle valve assembly onto the nozzle body (3).
4. Tighten the flybody (4) until the coil housing does not spin.
The nozzle valves only need to be snug to prevent leakage.
5. Install and tighten the spray tip to a port (5) on the nozzle body.
6. Repeat steps 1 to 5 for all nozzle valve assemblies.

Move the Spray Tube Mount (Nozzle Valve Interference)

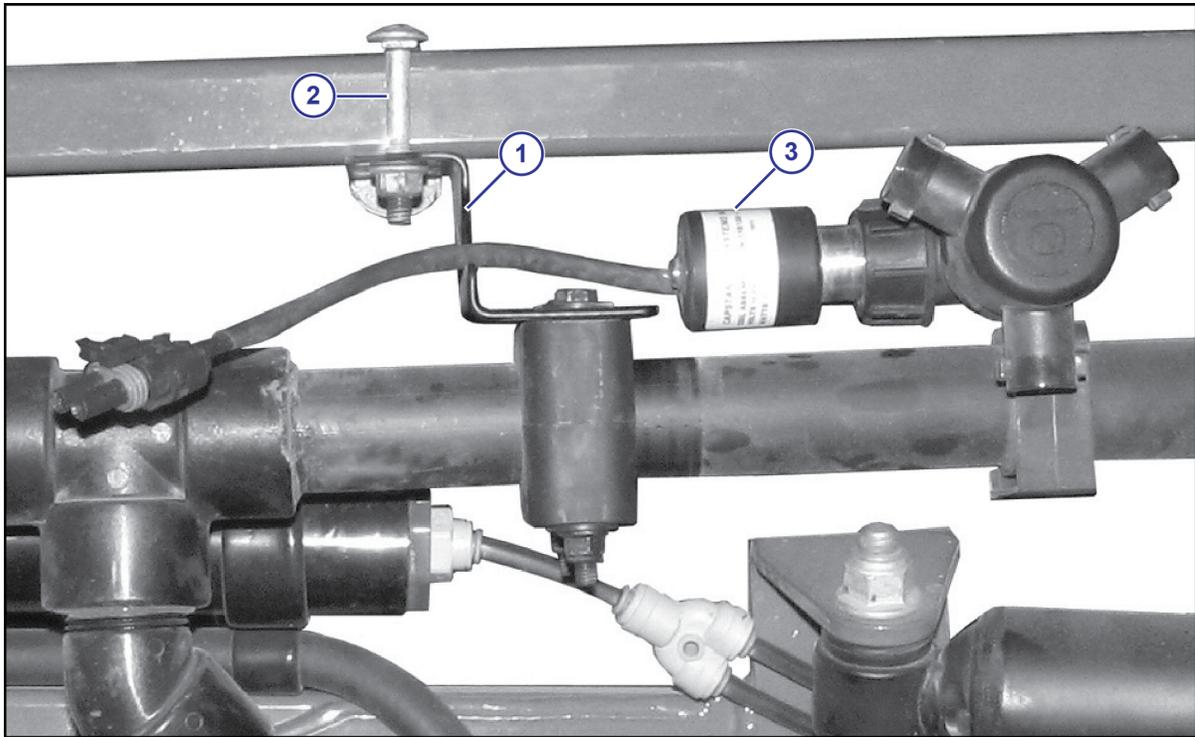


Fig. 5:

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 Nozzle Harnesses and Smart Drivers

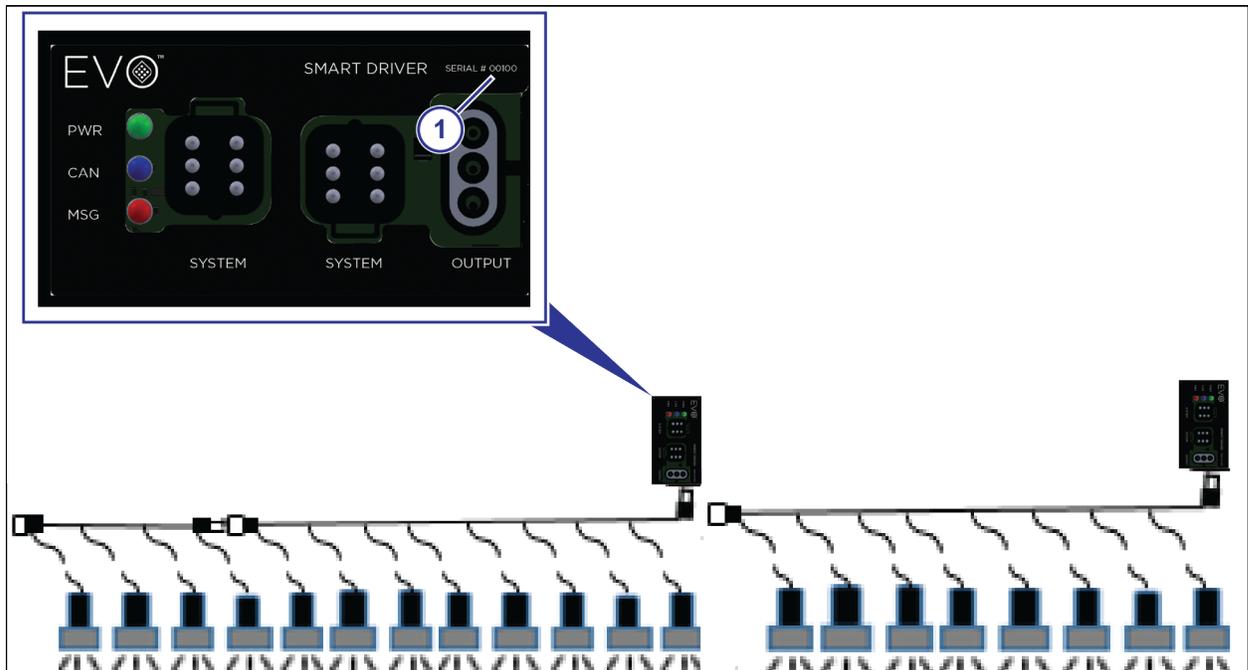


Fig. 6:

Each nozzle harness will have a smart driver already installed.

1. Put the smart drivers in serial number order with the lowest number to the left side of the machine.
The smart driver serial number (1) is shown on the front of the smart driver.
2. Route the nozzle harnesses along the boom with the smart driver toward the center of the machine.
Make sure that there is enough slack in the harnesses to raise and lower the booms and to avoid pinch points at the boom fold and pivot points.
3. Use cable ties to attach the smart driver and the nozzle harnesses to the machine.

Install the Power to CAN X Harness

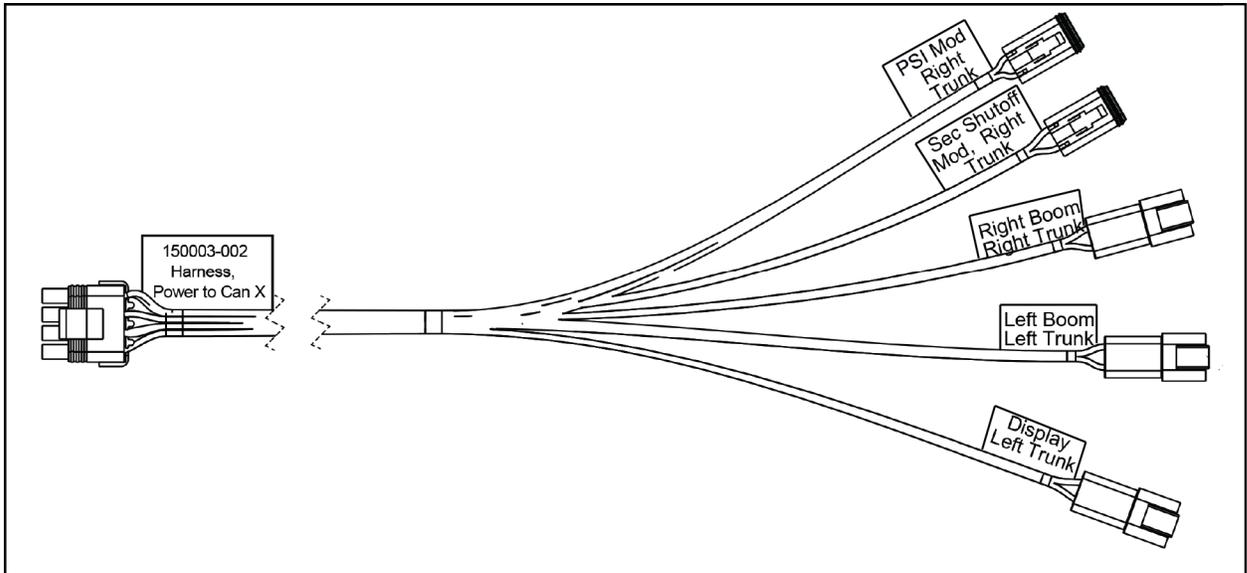


Fig. 7:

1. Install the power to CAN X harness at the center of the machine.
2. Use cable ties to attach the harness to the machine.

Install the Pressure Transmitter Module

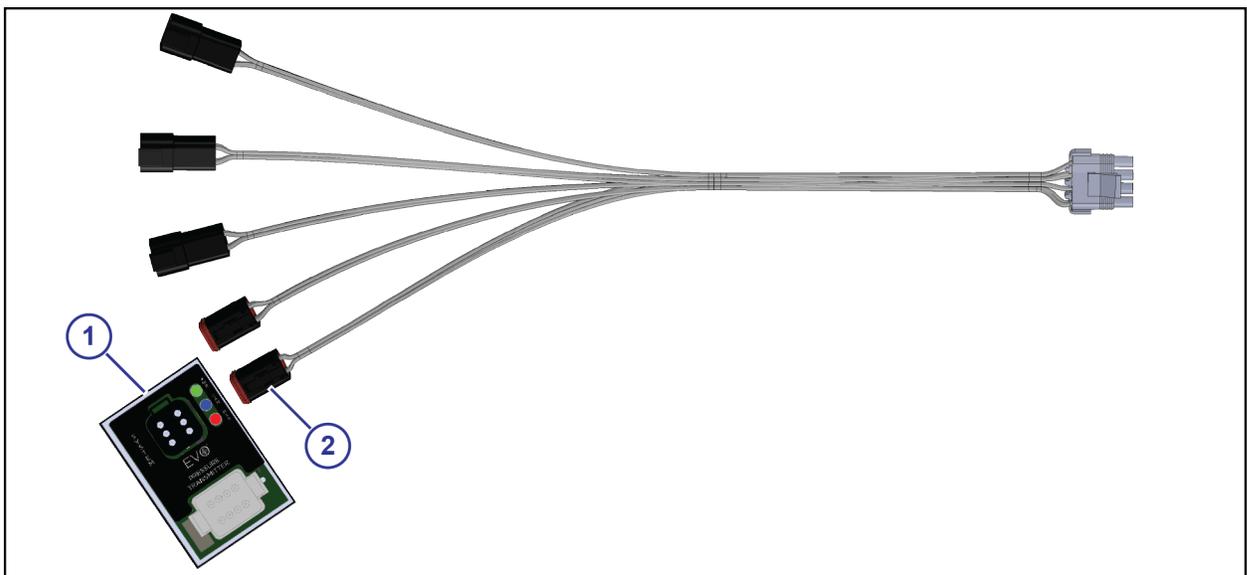


Fig. 8:

1. Install the pressure transmitter module (1) to the pressure connector (2) on the power to CAN X harness.
2. Use cable ties to attach the module to the machine.

Install the Pressure Sensor Adapter Harness

1. Connect one end of the pressure sensor adapter harness to the pressure transmitter module.
2. Route the harness to the pressure sensor.
3. Connect the other end of the harness to the pressure sensor.

Install the Boom Signal Transmitter Module

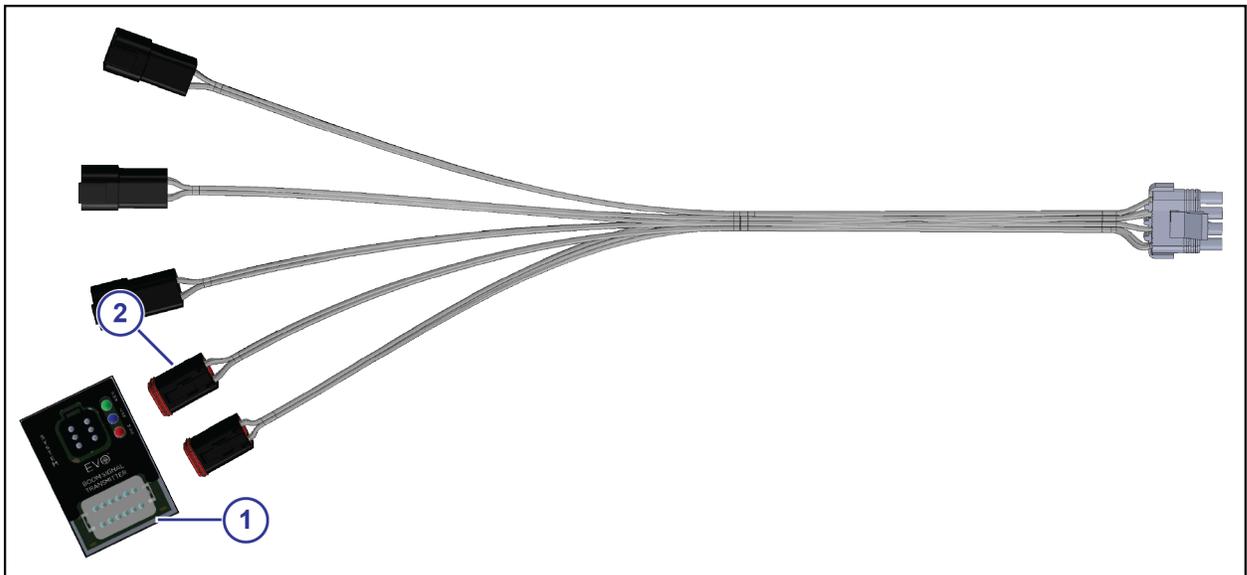


Fig. 9:

1. Install the boom signal transmitter module (1) to the shutoff connector (2) on the power to CAN X harness.
2. Use cable ties to attach the module to the machine.

Install the Shutoff Adapter

1. Install one end of the shutoff adapter into the boom signal transmitter module.
2. Route and connect the other ends of the shutoff adapter as necessary.

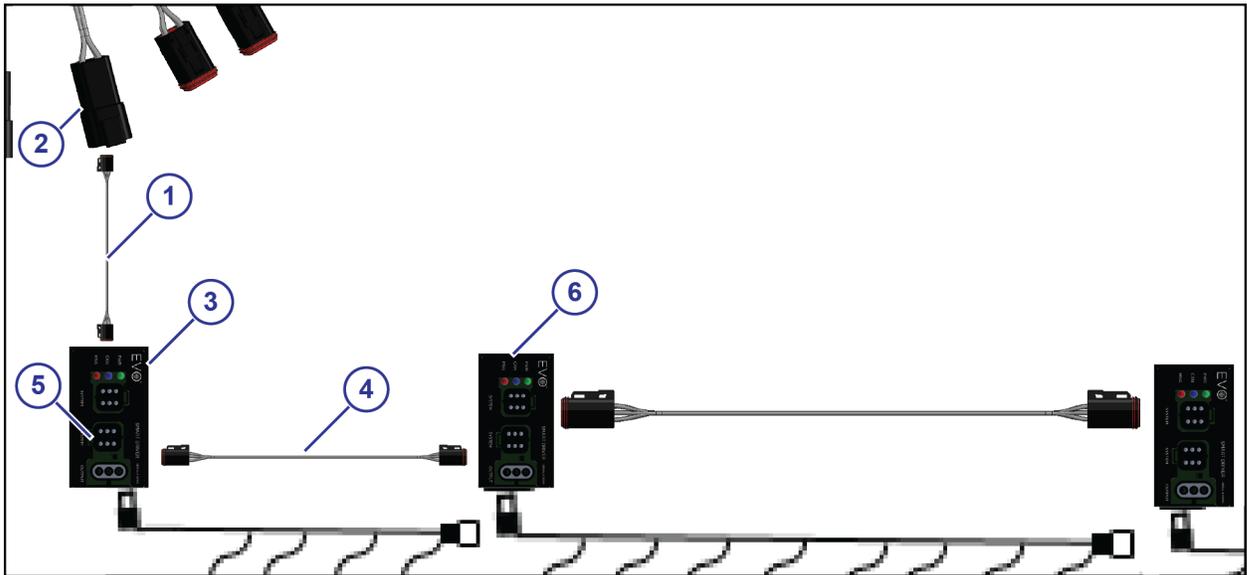


Fig. 11:

- 7.** Connect the CAN Bus extension harness (1), of the correct length, to the right boom/right truck connector (2) on the power to CAN X harness.
- 8.** Connect the other end of the CAN Bus harness to the smart driver module (3) closest to the center right side of the machine.
- 9.** Connect another CAN Bus harness (4), of the correct length, to the other port (5) on the smart driver at the center right side of the machine.
- 10.** Route the CAN Bus harness to the next smart driver (6) to the right.
- 11.** Connect the other end of the harness to the next smart driver.
- 12.** Continue installing CAN Bus harnesses, of the correct length, until you get to the last smart driver on the right of the machine.

Install the CAN Terminator

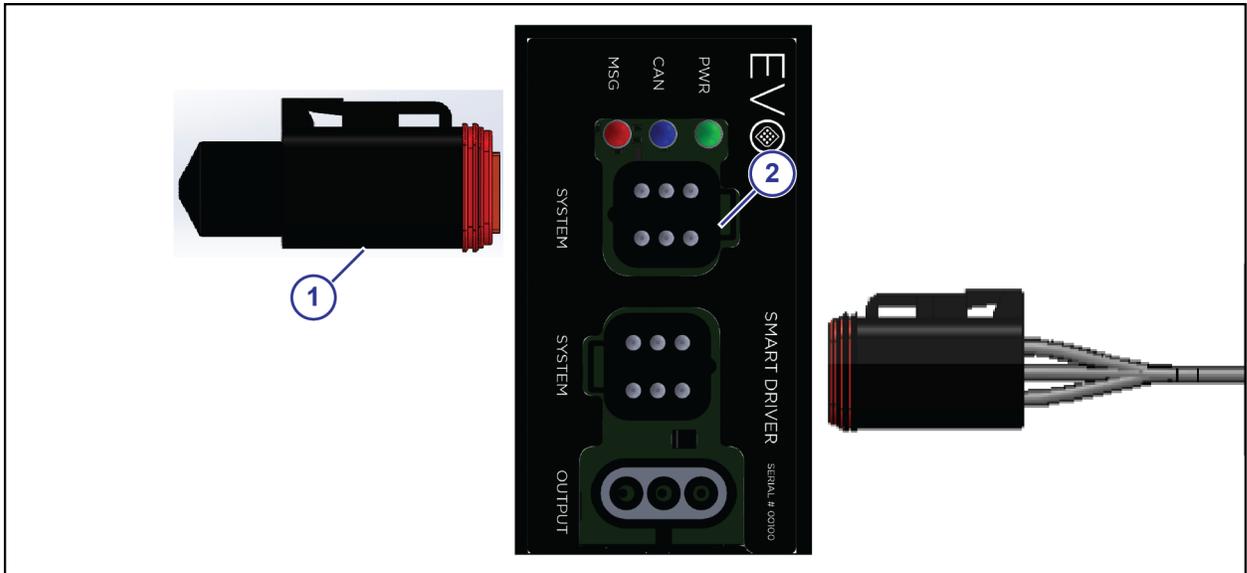


Fig. 12:

1. On the left most smart driver, install a CAN terminator (1) into the open CAN port (2).
2. On the right most smart driver, install a CAN terminator into the open CAN port.

Install the Pressure Sensor (Optional)

The use of a CapstanAG pressure sensor is optional. The EVO Spray system is designed to integrate with the existing boom pressure sensor on the machine.

1. If you want to use the Capstan AG pressure sensor, remove the existing machine pressure sensor from the boom manifold.
2. Install the tee fitting and other hardware with sealant tape.
3. Vertically install the new pressure sensor with sealant tape.

Note: If you must install the pressure sensor horizontally make sure that there is an angle to it to keep liquid from settling inside the pressure sensor.

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 Cab Display

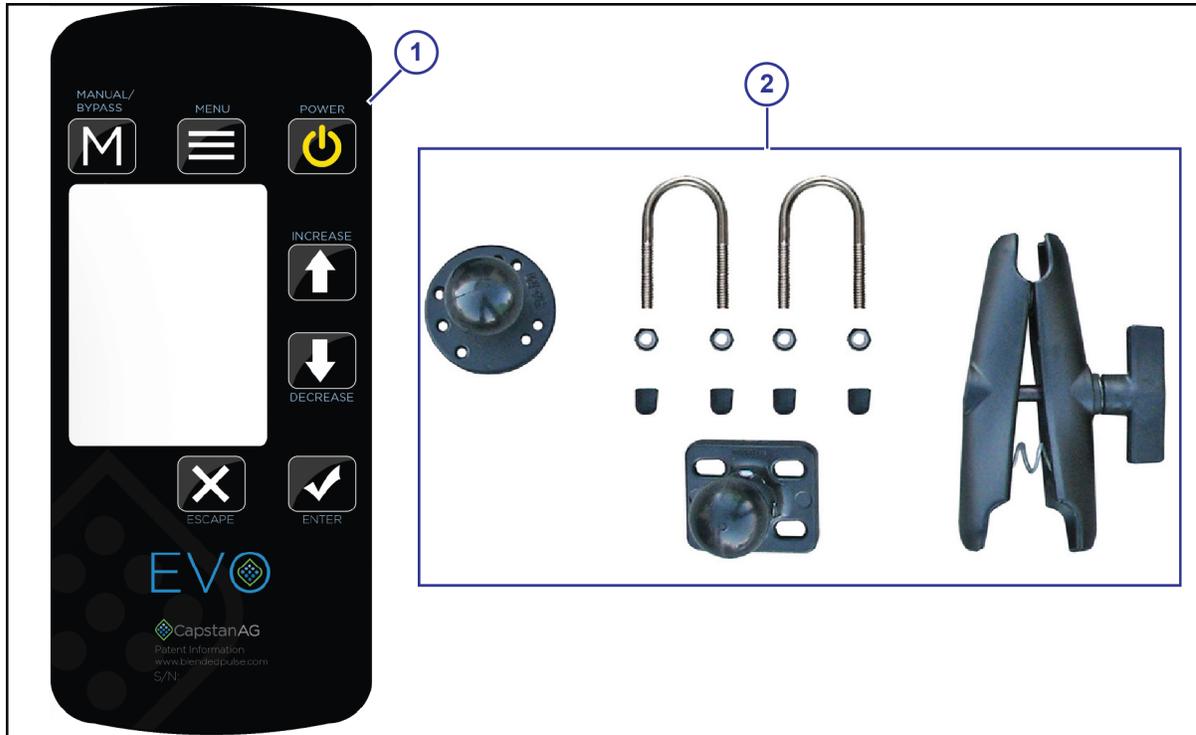


Fig. 13:

Mount the cab display (1) in the cab of the machine with the hardware (2) supplied with the kit. Make sure that the cab display is within view and reach of the operator.

Install the Display Harness and CAN Bus Extension Harness

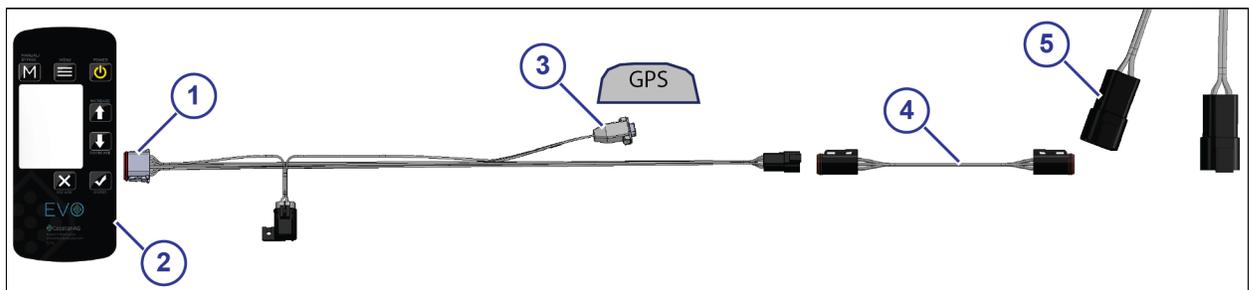


Fig. 14:

1. Install one end of the display harness (1) into the connector at the back of the cab display (2).
2. Route the display harness to the back of the cab of the machine.
3. Connect the GPS connector (3) to the GPS source.

4. At the back of the cab, connect the display harness to the CAN Bus extension harness (4).
5. Route the CAN Bus extension harness to the power to CAN X harness at the back of the machine.
6. Connect the other end of the CAN Bus extension harness to the display connector (5) on the power to CAN X harness.

Install the Power Harness

1. Connect one end of the power harness to the power to CAN X harness.
2. Route the power harness to the battery.
3. Connect the battery harness positive (+) red cable to the positive terminal of the battery.
4. Connect the battery harness negative (-) black cable to the battery ground terminal.

Chapter 5: Setup

Cab Display

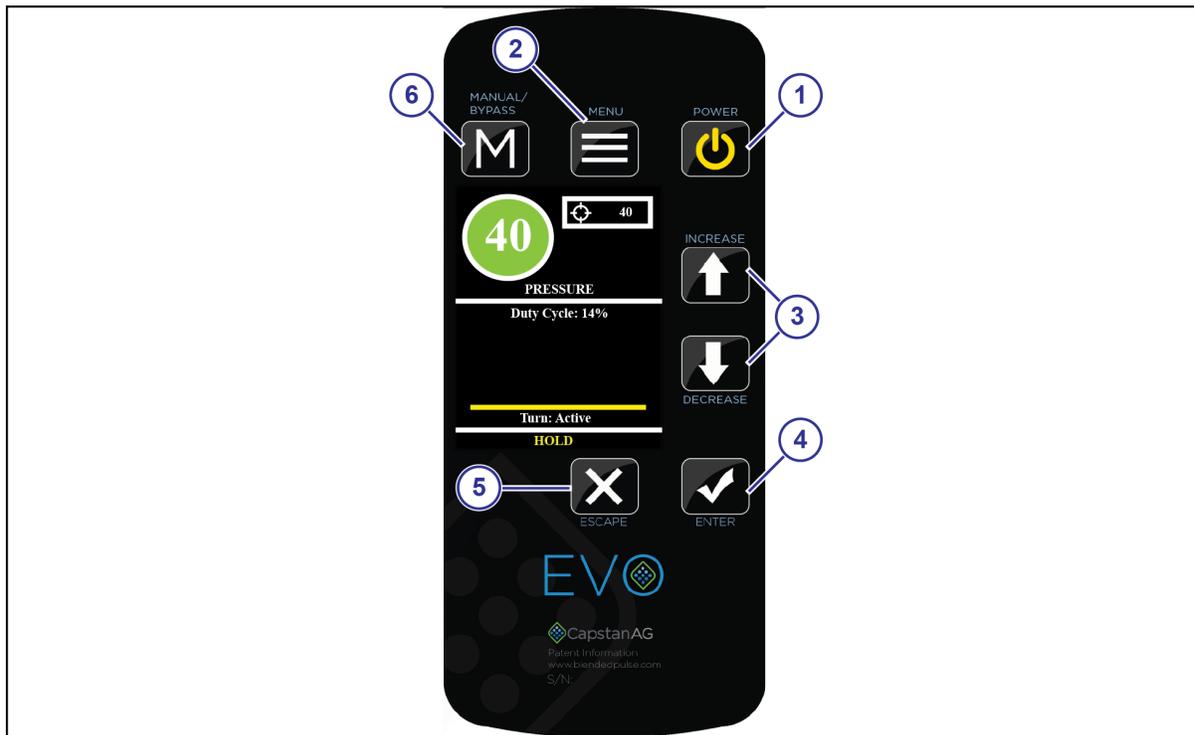


Fig. 15:

The cab display has seven buttons to navigate and control the system. A screen on the cab display shows immediate information and gives access to the menu items.

- (1) **POWER** Button—Press to turn on or off the display
- (2) **MENU** Button—Press to see the *Main Menu* screen
- (3) **INCREASE** and **DECREASE** Buttons—Press to move through the menu items
- (4) **ENTER** Button—Press to accept changes or go to the next screen
- (5) **ESCAPE** Button—Press to cancel or go back to the previous screen.
- (6) **MANUAL/BYPASS** Button—Press to use the manual operation or bypass mode.

Screen Descriptions

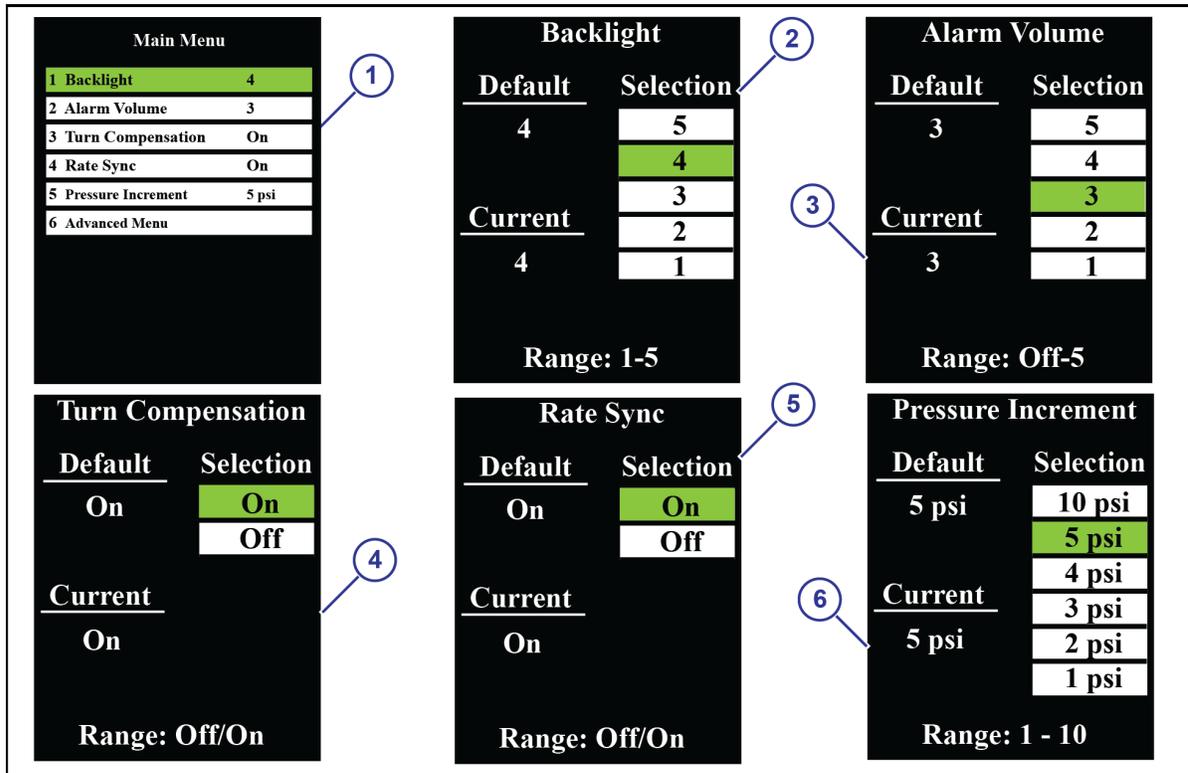


Fig. 16:

Main Menu

The *Main Menu* screen (1) includes this information:

1. Backlight
2. Alarm Volume
3. Turn Compensation
4. Rate Sync
5. Pressure Increment
6. Advanced Menu

Backlight

The *Change Backlight* screen (2) gives choices of the brightness of the LCD screen and light behind the keypad for low light conditions.

Range: 1 to 5 (Dimmest to Brightest)

When selections 1 or 2 are active (low ambient light conditions) the keypad buttons become back-lit.

Alarm Volume

The *Change Alarm Volume* screen (3) let you change the volume level of the alarm.

To silence the alarm, select Off.

Range: Off to 5 (Quiet to Loudest)

Turn Compensation

The *Turn Compensation* screen (4) lets you turn the feature on or off.

Range: Enabled or Disabled

Rate Sync

The *Rate Sync* screen (5) lets you turn the feature on or off.

Range: On or Off

When the feature is on the range is 5 Hz to 10 Hz.

Rate Sync™ uses real time speed change to determine the proper duty cycle for the appropriate boom section. It is used to make the system react faster to speed changes.

Note: A 5 Hz GPS connection is required for Rate Sync™ to operate properly. If a 5 Hz GPS signal is not available, the Rate Sync™ feature should be set to **Off**.

Rate Sync™ turned off disables speed change corrections. GPS connection is not needed with the Rate Sync™ feature set to **Off**.

Pressure Increment

The *Pressure Increment* screen (7) lets you change pressure increment per toggle of the **INCREASE** or **DECREASE** button.

Range: 1 to 10

Advanced Menu

The *Advanced Menu* screens include this information:

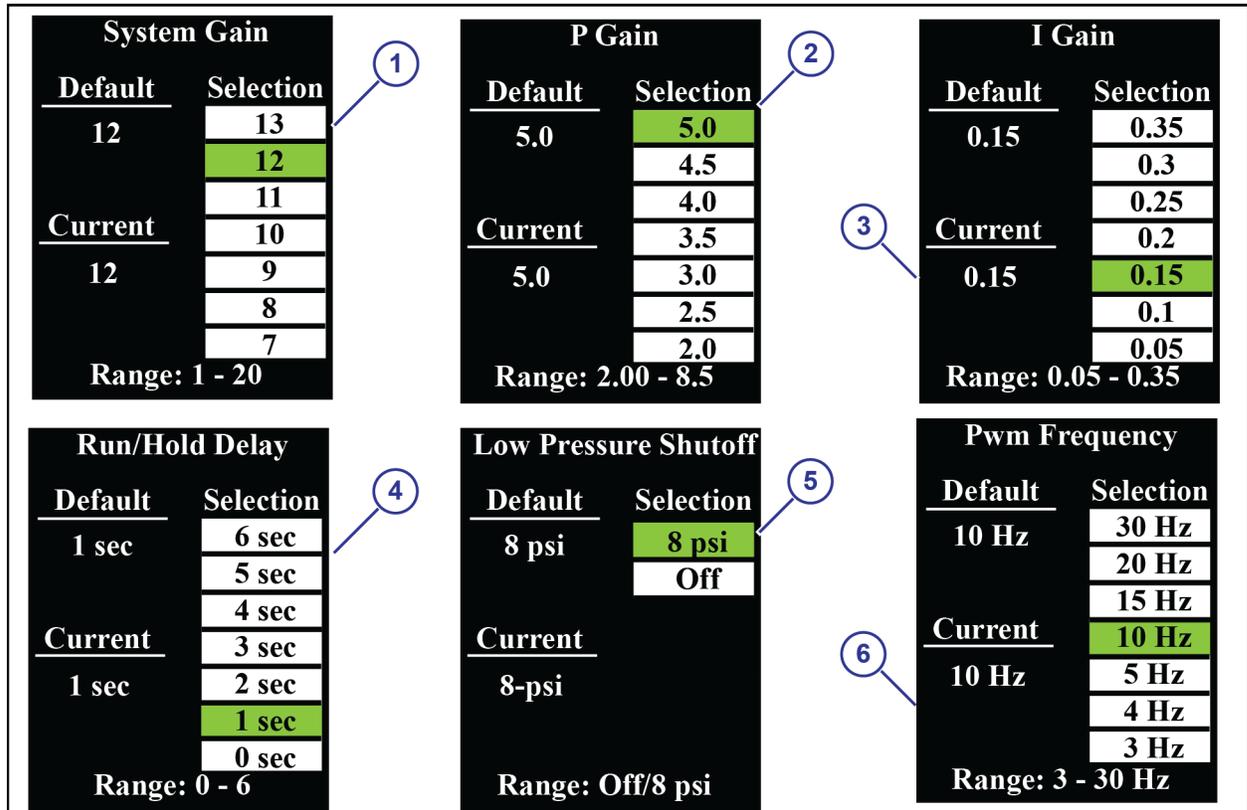


Fig. 17:

System Gain

The *System Gain* screen (1) lets you make changes to the system pressure control.

Range: 1 to 20

System Gain is the first pressure control parameter in the display menu system. System Gain changes the total response of system according to the same ratio between the individual P Gain and I Gain values. It is the first menu item to utilize when tuning the pressure control.

Increasing the System Gain makes the system react faster to pressure changes.

Decreasing the System Gain makes system react slower to pressure changes.

P Gain

The *P Gain* screen (2) lets you change the value.

Range: 2.00 to 8.5

P (Proportional) gain is the second pressure tuning parameter in the display menu. Proportional gain determines the initial speed at which display drives the duty cycle toward the target value. Stabilize an oscillating system by selecting a lower number. Speed up a sluggish system by selecting a higher number.

I Gain

The **I Gain** screen (3) lets you change the value.

Range: 0.05 to 0.35

I (Integral) Gain, the third pressure tuning parameter in the display, determines the acceleration driving duty cycle to the target value. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number.

Run/Hold Delay

The **Run/Hold Delay** screen (4) lets you change the delay when the display starts at a preset value (50% or the last known duty cycle) allowing the rate controller to stabilize before making larger pressure control changes.

Range: 0 to 6

When the boom is turned on and the run/hold signal is returned, the display will begin to control pressure by first resuming the pulsing at the previous duty cycle before the boom was shutoff.

The **Hold** will show in the Diagnostics area on the main operating screen, to alert the operator that the initialization delay has been activated.

The start-up delay time is equal to the run/hold delay time. This allows the flow control system to resume control and attain rate stability. Once the delay period has elapsed, the display will resume pressure control.

The diagnostic readout area will read **Hold** and count down the seconds to alert the operator that the **Run/Hold Delay** has been activated. When the hold count down is finished, the display will read **Run** in diagnostics area. At this point, the display is controlling pressure once again.

Low Pressure Shutoff

The **Low Pressure Shutoff** screen (5) lets you change when the system turns off the nozzle valves when the pressure decreases.

Range: Off or 8 psi

This feature is intended to duplicate the effect of the nozzle drip checks found on sprayers. To alert the operator that the low pressure shutoff feature has been activated, low PSI shutoff will appear in the diagnostic readout area.

When the pressure rises above 12 PSI again, the display will pulse at 50% duty cycle for the start-up delay period and then will resume pressure control.

When set to **Off**, the display will maintain a minimum duty cycle percentage, equal to the pulse frequency, regardless of either low or zero pressure.

Pwm Frequency

The **Pwm Frequency** screen (6) lets you change the value.

Range: 3 to 30 Hz

CapstanAG does not recommend pulse frequencies slower than 10 Hz in sprayer applications.

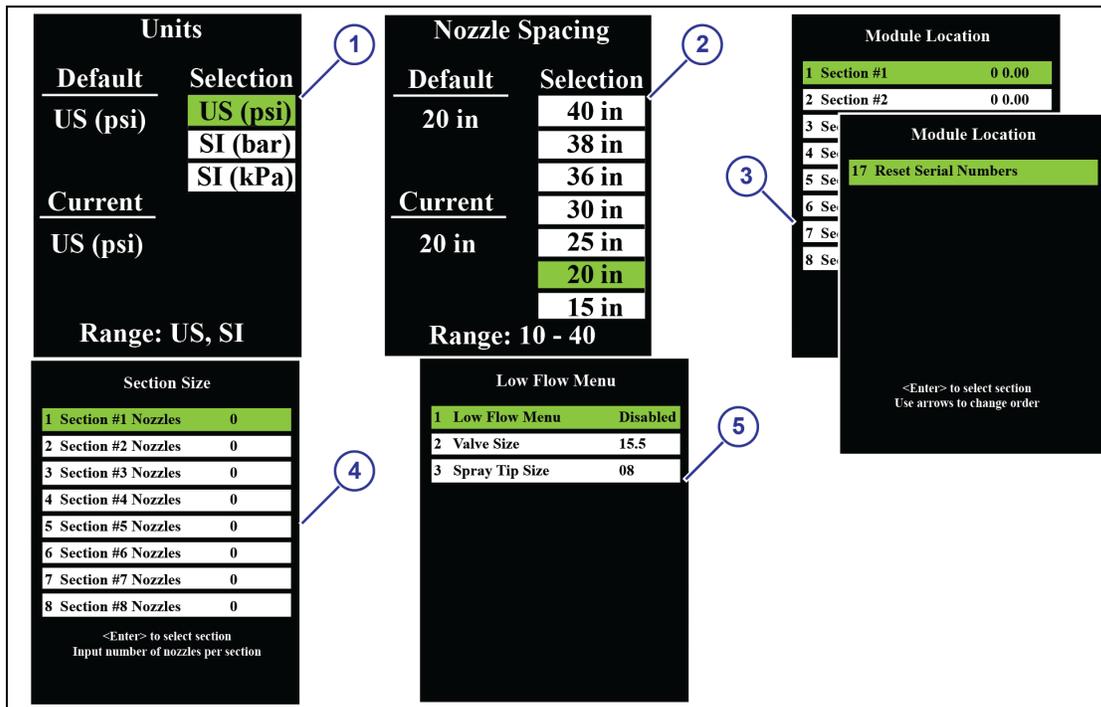


Fig. 18:

Units

The *Units* screen (1) lets you change the units of measure.

Range: US, SI

Nozzle Spacing

The *Nozzle Spacing* screen (2) lets you change the system nozzle spacing.

Range: 10 to 40

Module Location

The *Module Location* screen (3) lets you see smart driver module location and information and change the order if necessary.

To change the order follow the prompts on the display.

Note: The smart driver module location must be correct for the sections to operate in the correct order.

Section Size

The *Section Size* screen (4) lets you change the number of nozzles per section.

The correct number of nozzles for each section must be entered manually for the system to operate correctly.

This feature lets the nozzles on a specific section turn on, and for accurate turn compensation.

Note: The section size programming must be done after doing the module location setup.

Low Flow Menu

The Low Flow Menu (5) is for use with the John Deere R Series Sprayers only. See a CapstanAG representative for more information.

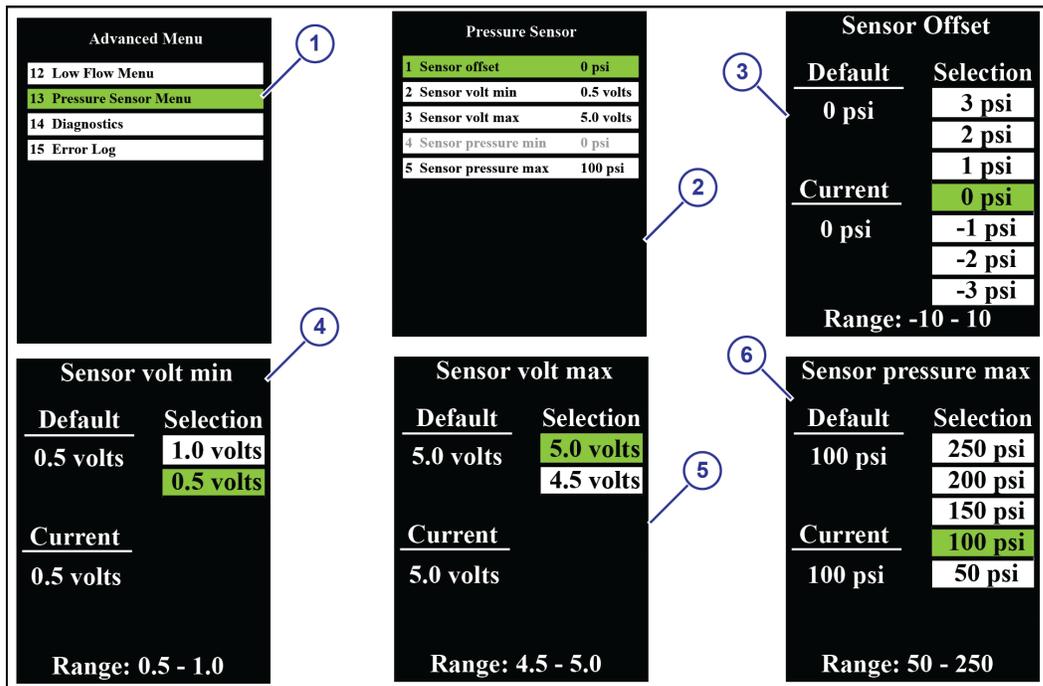


Fig. 19:

Pressure Sensor Menu

Select the **Pressure Sensor Menu** (1) to see the *Pressure Sensor* screen (2).

Sensor Offset

The *Sensor Offset* screen (3) lets you manipulate this setting if a difference in the pressure is noticed across separate pressure sensors, such as between the display pressure reading and the rate controller pressure display from a secondary pressure sensor.

Range: -10 to 10

Note: The system requires a greater quality pressure sensor relative to pressure sensors which only report a screen value. In most cases, the adjustment will be correcting the value to the least accurate sensor.

Sensor volt min

The *Sensor volt min* screen (4) lets you change the minimum voltage of the pressure sensor.

Range: 0.5 to 1.0

If you are using a CapstanAG™ pressure sensor leave the default value of 0.5. Change the value as needed if you are using another type of pressure sensor.

Sensor volt max

The *Sensor volt max* screen (5) lets you change the maximum voltage of the pressure sensor.

Range: 4.5 to 5.0

Sensor pressure max

The *Sensor pressure max* screen (6) lets you change the maximum pressure of the pressure sensor.

Range: 50 to 250

The system will have one pressure transmitter module (5) and one boom signal transmitter module (6). Each module has 3 LEDs:

- (7) Green—Power
Solid Illumination—12 V
- (8) Blue—CAN
Blinking Illumination—5 Hz
- (9) Red—Feedback Information
Blinking Illumination—5 Hz

Start the Cab Display



Fig. 22:

1. Start the machine.
2. Press the **POWER** button (1) on the cab display.
3. Set the desired pressure on the cab display.
4. Start the rate controller, if necessary.
5. Make sure that the rate settings are correct on the rate controller.
6. Turn on the boom sections to spray.

Shutdown the Cab Display

1. Turn off the boom sections.
2. Press the **POWER** button on the cab display.
3. Turn off the machine.

Change the Units of Measure

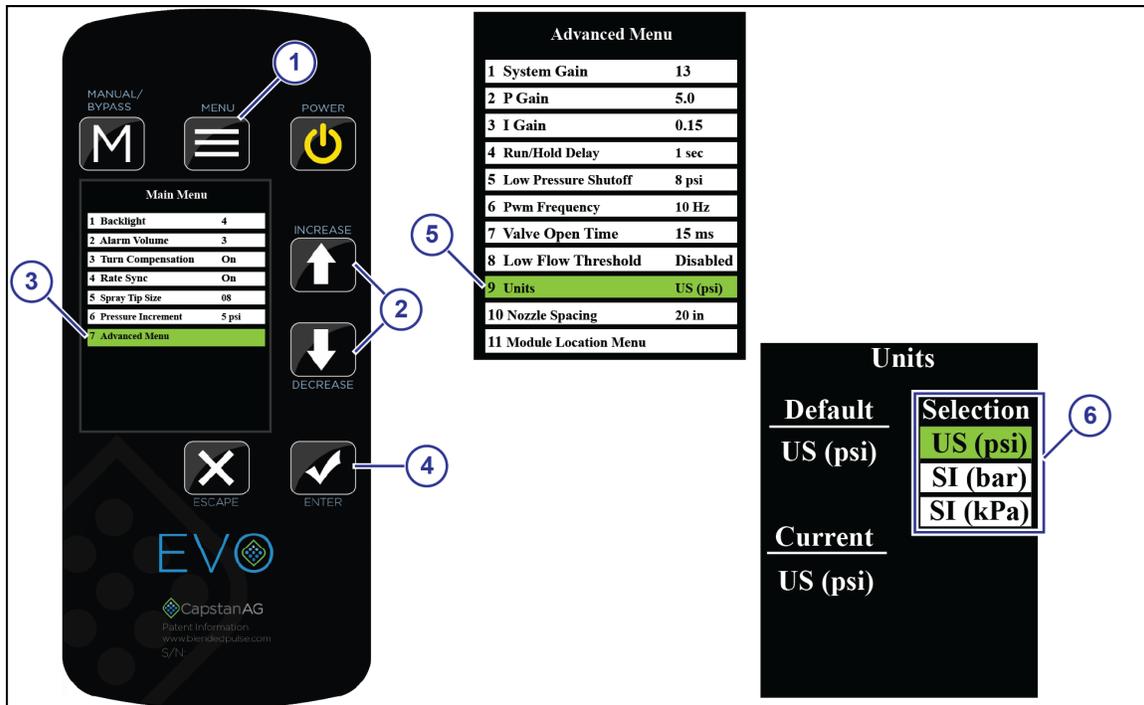


Fig. 23:

1. Press the **MENU** button (1).
2. Use the **UP** or **DOWN** arrow buttons (2) to select **Advanced Menu** (3) from the *Main Menu*.
3. Press the **ENTER** button (4).
4. Use the **UP** or **DOWN** arrow buttons to select **Units** (5) from the *Advanced Menu*.
5. Press the **ENTER** button.
6. Use the **UP** or **DOWN** arrow buttons to select the desired units of measure (6) on the *Units* screen.
7. When the desired unit of measure is highlighted, press the **ENTER** button.

Do the Odd/Even Test

Testing with Odd/Even test will actuate only the odd valves then only the even valves.

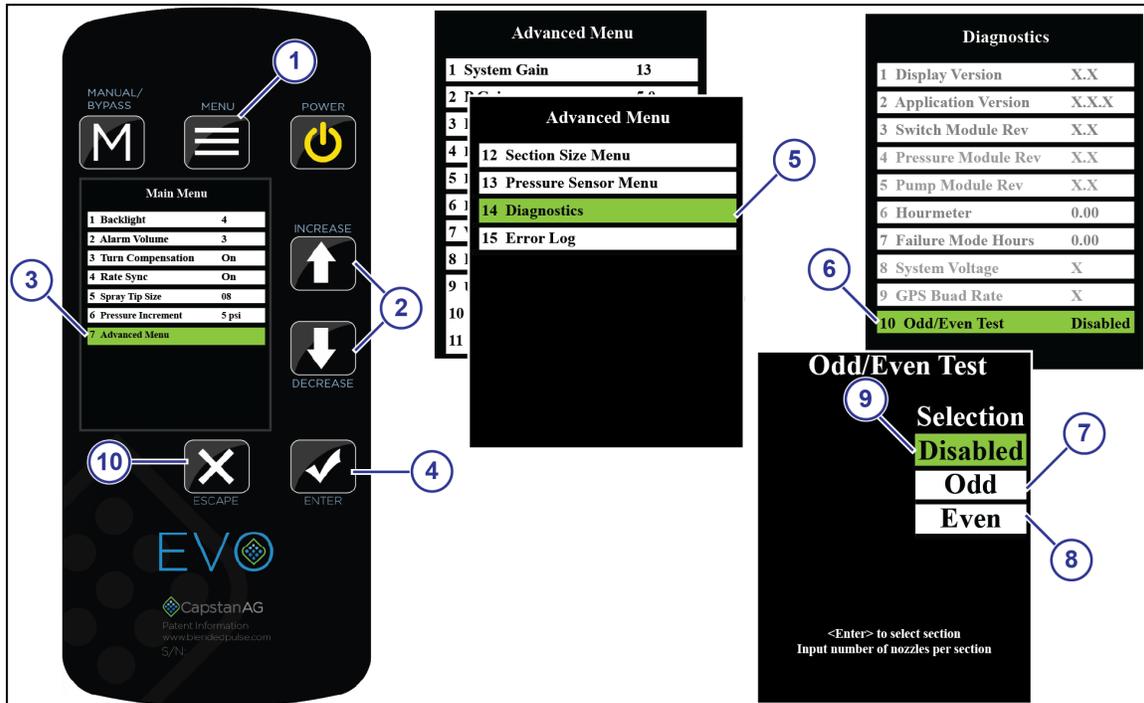


Fig. 24:

1. Press the **MENU** button (1).
2. Use the **UP** or **DOWN** arrow buttons (2) to select **Advanced Menu** (3) from the *Main Menu*.
3. Press the **ENTER** button (4).
4. Use the **UP** or **DOWN** arrow buttons to select **Diagnostics** (5) from the *Advanced Menu*.
5. Press the **ENTER** button.
6. Use the **UP** or **DOWN** arrow buttons to select **Odd/Even Test** (6) from the *Diagnostics* screen.
7. Press the **ENTER** button.
8. Use the **UP** or **DOWN** arrow buttons to select **Odd** (7) from the Selection list on the *Odd/Even Test* screen.
9. Press the **ENTER** button.
10. Make sure that all of the odd nozzles are operating.

Note: If two adjacent nozzles are pulsing, one nozzle must be moved to skip a connector on the harness.
11. Use the **UP** or **DOWN** arrow buttons to select **Even** (8) from the Selection list on the *Odd/Even Test* screen.
12. Press the **ENTER** button.
13. Make sure that all of the even nozzles are operating.

Note: If two adjacent nozzles are pulsing, one nozzle must be moved to skip a connector on the harness.
14. Use the **UP** or **DOWN** arrow buttons to select **Disabled** (9) from the Selection list on the *Odd/Even Test* screen.
15. Press the **ESCAPE** button (10) to exit the *Odd/Even Test* screen.

Nozzle Speed Ranges

US Measurements Nozzle Speed Ranges

Nozzle Spacing—15 in

15 Series Valve 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%
0.1 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	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	14	19	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	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	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	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	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	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	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	4	7	10	13	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	4	7	11	14	3	6	9	12	2	5	7	10	2	4	5	7
70	5	10	14	19	5	10	14	19	4	8	12	15	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	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	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	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	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	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	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	7	13	20	26	5	11	16	21	4	9	13	18	4	7	11	14	3	5	8	11				
	60	7	14	21	29	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	6	12	19	25	6	12	19	25	5	10	16	21	4	8	12	17	3	6	9	12					

15 Series Valve Speed Range (MPH) - 15" Nozzle Spacing Continued

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	4	7	10	14	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																												
	40																												
	50																												
	60																												
70																													
1.5 GPM #15	20																												
	30																												
	40																												
	50																												
	60																												
70																													

24 Series Valves Speed Range (MPH) - 15" Nozzle Spacing

Tip Size	Gauge (PSI)	Nozzle (PSI)	10 GPA				15 GPA				20 GPA				25 GPA				30 GPA				40 GPA				50 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%
0.5 GPM #5	20	19	3	7	10	14	2	5	7	9	2	3	5	7	1	3	4	5	1	2	3	5	1	2	3	3	1	1	2	3
	30	29	4	8	13	17	3	6	8	11	2	4	6	8	2	3	5	7	1	3	4	6	1	2	3	4	1	2	3	3
	40	38	5	10	15	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
	50	48	5	11	16	22	4	7	11	14	3	5	8	11	2	4	7	9	2	4	5	7	1	3	4	5	1	2	3	4
	60	58	6	12	18	24	4	8	12	16	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	4	5
70	67	6	13	19	26	4	9	13	17	3	6	10	13	3	5	8	10	2	4	6	9	2	3	5	6	1	3	4	5	
0.6 GPM #6	20	19	4	8	12	16	3	5	8	11	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4	1	2	2	3
	30	28	5	10	15	20	3	7	10	13	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5	1	2	3	4
	40	38	6	12	17	23	4	8	12	15	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	50	47	6	13	19	26	4	9	13	17	3	6	10	13	3	5	8	10	2	4	6	9	2	3	5	6	1	3	4	5
	60	56	7	14	21	28	5	9	14	19	4	7	11	14	3	6	8	11	2	5	7	9	2	4	5	7	1	3	4	6
70	66	8	15	23	30	5	10	15	20	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6	
0.8 GPM #8	20	18	5	11	16	21	4	7	11	14	3	5	8	11	2	4	6	9	2	4	5	7	1	3	4	5	1	2	3	4
	30	27	7	13	20	26	4	9	13	17	3	7	10	13	3	5	8	10	2	4	7	9	2	3	5	7	1	3	4	5
	40	36	8	15	23	30	5	10	15	20	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	50	45	8	17	25	34	6	11	17	22	4	8	13	17	3	7	10	13	3	6	8	11	2	4	6	8	2	3	5	7
	60	54	9	18	28	37	6	12	18	25	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	6	7
70	63	10	20	30	40	7	13	20	27	5	10	15	20	4	8	12	16	3	7	10	13	2	5	7	10	2	4	6	8	
1.0 GPM #10	20	17	6	13	19	26	4	9	13	17	3	6	10	13	3	5	8	10	2	4	6	9	2	3	5	6	1	3	4	5
	30	26	8	16	24	32	5	11	16	21	4	8	12	16	3	6	9	13	3	5	8	11	2	4	6	8	2	3	5	6
	40	34	9	18	27	37	6	12	18	24	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	5	7
	50	43	10	20	31	41	7	14	20	27	5	10	15	20	4	8	12	16	3	7	10	14	3	5	8	10	2	4	6	8
	60	51	11	22	34	45	7	15	22	30	6	11	17	22	4	9	13	18	4	7	11	15	3	6	8	11	2	4	7	9
70	60	12	24	36	48	8	16	24	32	6	12	18	24	5	10	15	19	4	8	12	16	3	6	9	12	2	5	7	10	
1.2 GPM #12	20	16	8	15	23	30	5	10	15	20	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	30	24	9	18	28	37	6	12	18	25	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	6	7
	40	32	11	21	32	43	7	14	21	28	5	11	16	21	4	9	13	17	4	7	11	14	3	5	8	11	2	4	6	9
	50	40	12	24	36	48	8	16	24	32	6	12	18	24	5	10	14	19	4	8	12	16	3	6	9	12	2	5	7	10
	60	48	13	26	39	52	9	17	26	35	7	13	20	26	5	10	16	21	4	9	13	17	3	7	10	13	3	5	8	10
70	56	14	28	42	56	9	19	28	37	7	14	21	28	6	11	17	22	5	9	14	19	4	7	11	14	3	6	8	11	
1.25 GPM #12.5	20	16	8	16	23	31	5	10	16	21	4	8	12	16	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	30	24	10	19	29	38	6	13	19	25	5	10	14	19	4	8	11	15	3	6	10	13	2	5	7	10	2	4	6	8
	40	31	11	22	33	44	7	15	22	29	5	11	16	21	4	9	13	18	4	7	11	15	3	5	8	11	2	4	7	9
	50	39	12	25	37	49	8	16	25	33	6	12	18	25	5	10	15	20	4	8	12	16	3	6	9	12	2	5	7	10
	60	47	13	27	40	54	9	18	27	36	7	13	20	27	5	11	16	22	4	9	13	18	3	7	10	13	3	5	8	11
70	55	15	29	44	58	10	19	29	39	7	15	22	29	6	12	17	23	5	10	15	19	4	7	11	15	3	6	9	12	
1.5 GPM #15	20	14	9	18	27	36	6	12	18	24	4	9	13	18	4	7	11	14	3	6	9	12	2	4	7	9	2	4	5	7
	30	22	11	22	33	44	7	15	22	29	5	11	16	22	4	9	13	17	4	7	11	15	3	5	8	11	2	4	7	9
	40	29	13	25	38	50	8	17	25	34	6	13	19	25	5	10	15	20	4	8	13	17	3	6	9	13	3	5	8	10
	50	36	14	28	42	56	9	19	28	38	7	14	21	28	6	11	17	23	5	9	14	19	4	7	11	14	3	6	8	11
	60	43	15	31	46	62	10	21	31	41	8	15	23	31	6	12	19	25	5	10	15	21	4	8	12	15	3	6	9	12
70	50	17	33	50	67	11	22	33	44	8	17	25	33	7	13	20	27	6	11	17	22	4	8	12	17	3	7	10	13	
2.0 GPM #20	20	12	11	22	32	43	7	14	22	29	5	11	16	22	4	9	13	17	4	7	11	14	3	5	8	11	2	4	6	9
	30	18	13	26	40	53	9	18	26	35	7	13	20	26	5	11	16	21	4	9	13	18	3	7	10	13	3	5	8	11
	40	24	15	30	46	61	10	20	30	41	8	15	23	30	6	12	18	24	5	10	15	20	4	8	11	15	3	6	9	12
	50	30	17	34	51	68	11	23	34	45	9	17	26	34	7	14	20	27	6	11	17	23	4	9	13	17	3	7	10	14
	60	35	19	37	56	75	12	25	37	50	9	19	28	37	7	15	22	30	6	12	19	25	5	9	14	19	4	7	11	15
70	41	20	40	60	81	13	27	40	54	10	20	30	40	8	16	24	32	7	13	20	27	5	10	15	20	4	8	12	16	
2.5 GPM #25	20	10	12	24	36	49	8	16	24	32	6	12	18	24	5	10	15	19	4	8	12	16	3	6	9	12	2	5	7	10
	30	14	15	30	45	59	10	20	30	40	7	15	22	30	6	12	18	24	5	10	15	20	4	7	11	15	3	6	9	12
	40	19	17	34	51	69	11	23	34	46	9	17	26	34	7	14	21	27	6	11	17	23	4	9	13	17	3	7	10	14
	50	24	19	38	58	77	13	26	38	51	10	19	29	38	8	15	23	31	6	13	19	26	5	10	14	19	4	8	12	15
	60	29	21	42	63	84	14	28	42	56	11	21	32	42	8	17	25	34	7	14	21	28	5	11	16	21	4	8	13	17
70	34	23	45	68	91	15	30	45	61	11	23	34	45	9	18	27	36	8	15	23	30	6	11	17	23	5	9	14	18	

Nozzle Spacing—20 in

15 Series Valve 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%				
0.1 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	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	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					

15 Series Valve Speed Range (MPH) - 20" Nozzle Spacing Continued

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									8	16	23	31	6	13	19	25	5	10	16	21	4	8	13	17	3	6	9	13
	30													7	14	22	29	6	12	18	24	5	10	14	19	4	7	11	14
	40																	7	13	20	27	5	11	16	22	4	8	12	16
	50																	7	15	22	29	6	12	18	24	4	9	13	18
	60																					6	13	19	25	5	10	14	19
70																					6	13	19	25	5	10	14	19	
1.5 GPM #15	20													7	14	21	28	6	12	17	23	5	9	14	18	3	7	10	14
	30																	7	13	20	27	5	11	16	21	4	8	12	16
	40																	7	15	22	30	6	12	18	24	4	9	13	18
	50																					7	13	20	26	5	10	15	20
	60																					7	14	21	28	5	11	16	21
70																					7	14	21	28	5	11	16	21	

24 Series Valve Speed Range (MPH) - 20" Nozzle Spacing

Tip Size	Gauge (PSI)	Nozzle (PSI)	10 GPA				15 GPA				20 GPA				25 GPA				30 GPA				40 GPA				50 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%
0.5 GPM #5	20	19	3	5	8	10	2	3	5	7	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3	1	1	2	2
	30	29	3	6	9	13	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3	1	1	2	3
	40	38	4	7	11	15	2	5	7	10	2	4	5	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	50	48	4	8	12	16	3	5	8	11	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4	1	2	2	3
	60	58	4	9	13	18	3	6	9	12	2	4	7	9	2	4	5	7	1	3	4	6	1	2	3	4	1	2	3	4
70	67	5	10	14	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4	
0.6 GPM #6	20	19	3	6	9	12	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	2
	30	28	4	7	11	15	2	5	7	10	2	4	6	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	40	38	4	9	13	17	3	6	9	12	2	4	6	9	2	3	5	7	1	3	4	6	1	2	3	4	1	2	3	3
	50	47	5	10	14	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
	60	56	5	11	16	21	4	7	11	14	3	5	8	11	2	4	6	8	2	4	5	7	1	3	4	5	1	2	3	4
70	66	6	11	17	23	4	8	11	15	3	6	9	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5	
0.8 GPM #8	20	18	4	8	12	16	3	5	8	11	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3
	30	27	5	10	15	20	3	7	10	13	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5	1	2	3	4
	40	36	6	11	17	23	4	8	11	15	3	6	8	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	50	45	6	13	19	25	4	8	13	17	3	6	9	13	3	5	8	10	2	4	6	8	2	3	5	6	1	3	4	5
	60	54	7	14	21	28	5	9	14	18	3	7	10	14	3	6	8	11	2	5	7	9	2	3	5	7	1	3	4	6
70	63	7	15	22	30	5	10	15	20	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	7	1	3	4	6	
1.0 GPM #10	20	17	5	10	15	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
	30	26	6	12	18	24	4	8	12	16	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	4	5
	40	34	7	14	21	27	5	9	14	18	3	7	10	14	3	5	8	11	2	5	7	9	2	3	5	7	1	3	4	5
	50	43	8	15	23	31	5	10	15	20	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	60	51	8	17	25	34	6	11	17	22	4	8	13	17	3	7	10	13	3	6	8	11	2	4	6	8	2	3	5	7
70	60	9	18	27	36	6	12	18	24	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	5	7	
1.2 GPM #12	20	16	6	11	17	23	4	8	11	15	3	6	8	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	30	24	7	14	21	28	5	9	14	18	3	7	10	14	3	6	8	11	2	5	7	9	2	3	5	7	1	3	4	6
	40	32	8	16	24	32	5	11	16	21	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	8	2	3	5	6
	50	40	9	18	27	36	6	12	18	24	4	9	13	18	4	7	11	14	3	6	9	12	2	4	7	9	2	4	5	7
	60	48	10	20	29	39	7	13	20	26	5	10	15	20	4	8	12	16	3	7	10	13	2	5	7	10	2	4	6	8
70	56	11	21	32	42	7	14	21	28	5	11	16	21	4	8	13	17	4	7	11	14	3	5	8	11	2	4	6	8	
1.25 GPM #12.5	20	16	6	12	17	23	4	8	12	16	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	30	24	7	14	21	29	5	10	14	19	4	7	11	14	3	6	9	11	2	5	7	10	2	4	5	7	1	3	4	6
	40	31	8	16	25	33	5	11	16	22	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8	2	3	5	7
	50	39	9	18	28	37	6	12	18	25	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	6	7
	60	47	10	20	30	40	7	13	20	27	5	10	15	20	4	8	12	16	3	7	10	13	3	5	8	10	2	4	6	8
70	55	11	22	33	44	7	15	22	29	5	11	16	22	4	9	13	17	4	7	11	15	3	5	8	11	2	4	7	9	
1.5 GPM #15	20	14	7	13	20	27	4	9	13	18	3	7	10	13	3	5	8	11	2	4	7	9	2	3	5	7	1	3	4	5
	30	22	8	16	25	33	5	11	16	22	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8	2	3	5	7
	40	29	9	19	28	38	6	13	19	25	5	9	14	19	4	8	11	15	3	6	9	13	2	5	7	9	2	4	6	8
	50	36	11	21	32	42	7	14	21	28	5	11	16	21	4	8	13	17	4	7	11	14	3	5	8	11	2	4	6	8
	60	43	12	23	35	46	8	15	23	31	6	12	17	23	5	9	14	19	4	8	12	15	3	6	9	12	2	5	7	9
70	50	12	25	37	50	8	17	25	33	6	12	19	25	5	10	15	20	4	8	12	17	3	6	9	12	2	5	7	10	
2.0 GPM #20	20	12	8	16	24	32	5	11	16	22	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	8	2	3	5	6
	30	18	10	20	30	40	7	13	20	26	5	10	15	20	4	8	12	16	3	7	10	13	2	5	7	10	2	4	6	8
	40	24	11	23	34	46	8	15	23	30	6	11	17	23	5	9	14	18	4	8	11	15	3	6	9	11	2	5	7	9
	50	30	13	26	38	51	9	17	26	34	6	13	19	26	5	10	15	20	4	9	13	17	3	6	10	13	3	5	8	10
	60	35	14	28	42	56	9	19	28	37	7	14	21	28	6	11	17	22	5	9	14	19	3	7	10	14	3	6	8	11
70	41	15	30	45	60	10	20	30	40	8	15	23	30	6	12	18	24	5	10	15	20	4	8	11	15	3	6	9	12	
2.5 GPM #25	20	10	9	18	27	36	6	12	18	24	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	5	7
	30	14	11	22	33	45	7	15	22	30	6	11	17	22	4	9	13	18	4	7	11	15	3	6	8	11	2	4	7	9
	40	19	13	26	39	51	9	17	26	34	6	13	19	26	5	10	15	21	4	9	13	17	3	6	10	13	3	5	8	10
	50	24	14	29	43	58	10	19	29	38	7	14	22	29	6	12	17	23	5	10	14	19	4	7	11	14	3	6	9	12
	60	29	16	32	47	63	11	21	32	42	8	16	24	32	6	13	19	25	5	11	16	21	4	8	12	16	3	6	9	13
70	34	17	34	51	68	11	23	34	45	9	17	26	34	7	14	20	27	6	11	17	23	4	9	13	17	3	7	10	14	

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	
	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)
<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°)
0.6 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	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																	UC	
	30	18																	UC	
	40	24																	XC	
	50	30																	VC	
	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									

Metric Nozzle Speed Ranges

Nozzle Spacing—38 cm

15 Series Valve 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%				
0.1 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	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	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	5	1	2	4	5	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	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	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	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	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	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	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	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	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	3	5	8	11	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	6	12	18	24
483													11	22	33	44	10	19	29	38	8	15	23	31	7	14	21	28	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	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	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	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26	7	13	20	26
	414																	11	22	33	44	9	17	26	35	8	16	24	32	7	15	22	29
483																	12	24	35	47	10	19	28	38	9	17	26	35	8	16	24	31	
0.5 GPM #5	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26	7	13	20	26
	414																	11	22	33	44	9	17	26	35	8	15	22	29	8	15	22	29
	483																	12	24	35	47	10	19	28	38	9	17	26	35	8	16	24	31

15 Series Valve Speed Range (KPH) - 38 cm Nozzle Spacing Continued

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																									10	21	31	42
	207																									12	24	36	48
	276																												
	345																												
	414																												
483																													
1.5 GPM #15	138																									12	23	35	46
	207																												
	276																												
	345																												
	414																												
483																													

Nozzle Spacing—50 cm

15 Series Valve 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	

15 Series Valve Speed Range (KPH) - 50 cm Nozzle Spacing Continued

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	10	20	30	40	8	16	25	33
483																	11	21	32	43	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																					10	19	29	38	8	16	24	32
	207																					11	22	33	44	9	18	28	37
	276																									10	21	31	41
	345																									11	23	34	45
	414																												
483																													
1.5 GPM #15	138																					11	21	32	42	9	18	26	35
	207																									10	20	31	41
	276																									11	23	34	46
	345																												
	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°)	TJ60 (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		C	F	F				M	C	F
	276	271	F	M	C	VC		M	M	F	F		M	F	F	M	VF		M	M	F
	345	339	F	M	C	VC		M	M	F	F		M	F	F	M	VF		F	M	F
	414	407	F	M	C	C		M	M	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		C	M	F	C	F	M	C	C	F
	276	266	F	C	VC	XC		M	M	F	F	F	C	F	F	M	F	M	C	C	F
	345	332	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	M	F
	414	399	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	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		C	M	M	C	F	C	C	C	M
	276	259	M	C	VC	XC		C	M	F	F	F	C	M	M	M	F	C	C	C	M
	345	323	M	C	VC	XC		M	M	F	F	F	M	F	F	M	F	C	M	M	F
	414	388	M	C	C	VC		M	M	F	F	F	M	F	F	M	F	M	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		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	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	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							C	VC		XC	C	C		M		UC		
	207	146	VC					UC		C	C	M	XC	C	C		M		XC		
	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																	UC		
	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									

Chapter 6: Operation

Start the Cab Display



Fig. 25:

1. Start the machine.
2. Press the **POWER** button (1) on the cab display.
3. Set the desired pressure on the cab display.
4. Start the rate controller, if necessary.
5. Make sure that the rate settings are correct on the rate controller.
6. Turn on the boom sections to spray.

Shutdown the Cab Display

1. Turn off the boom sections.
2. Press the **POWER** button on the cab display.
3. Turn off the machine.

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.

Manual mode will keep the nozzle valves at a constant duty cycle, which is useful when optimizing rate controller tuning.



Fig. 26:

Press the **MANUAL/BYPASS** button (1) to enter manual mode operation.

Use the **UP** or **DOWN** arrows (2) to control the nozzle duty cycle, regardless of the pressure sensor reading or target pressure set point.

ByPass Mode



Fig. 27:

To enter into bypass mode, press and hold the **MANUAL/BYPASS** (1).

Press the **ENTER** button (2) to turn the booms on and off.

ByPass Mode provides a way to continue operation without CAN Communication.

Shutdown the Cab Display

1. Turn off the boom sections.
2. Press the **POWER** button on the cab display.
3. Turn off the machine.

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. Make sure that the liquid product plumbing and the strainer(s) are clean.
5. Do a like component swap test to see if the failure follows the component.
6. Repair or replace any damaged components.
7. Do the system tests.

See the system testing information in this manual.

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.

Clean the Nozzle Valve(s)



Warning: Chemical residues may be present in the agricultural equipment. Always use the 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.

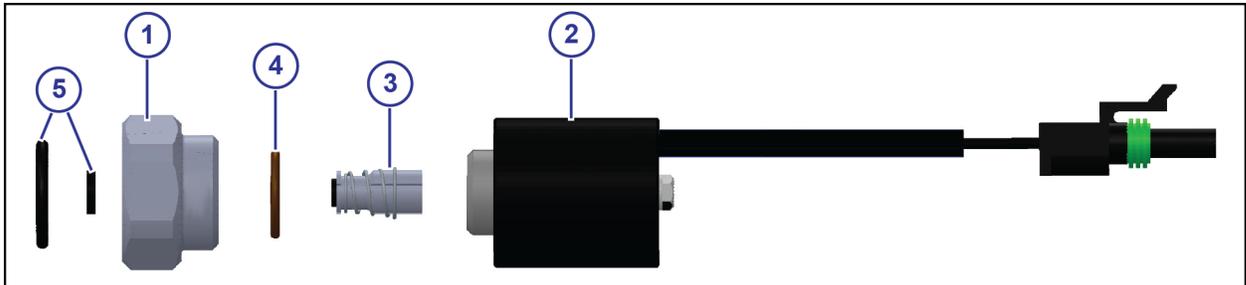


Fig. 28:

3. Use pliers around the flybody (1) to hold the assembly with the coil harness facing the ground.
4. Rotate the coil (2) counter-clockwise to remove the coil from the valve body.
5. Remove the plunger (3) from the coil.
6. Inspect the O-ring (4) on the coil.
7. Inspect the O-rings (5) on the flybody.
8. Wash the nozzle valve components to remove any debris.
9. Inspect the plunger for wear or damage.
10. If there is wear or damage to the plunger, replace the plunger.
11. Inspect the flybody.
Make sure that the orifice is not plugged with debris, worn, or damaged.
12. If there is wear or damage to the orifice, replace the flybody.
13. 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. 29:

After extended use, the plunger seal will wear a groove (*1*) where the seal impacts the hard orifice seat. Replace 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.

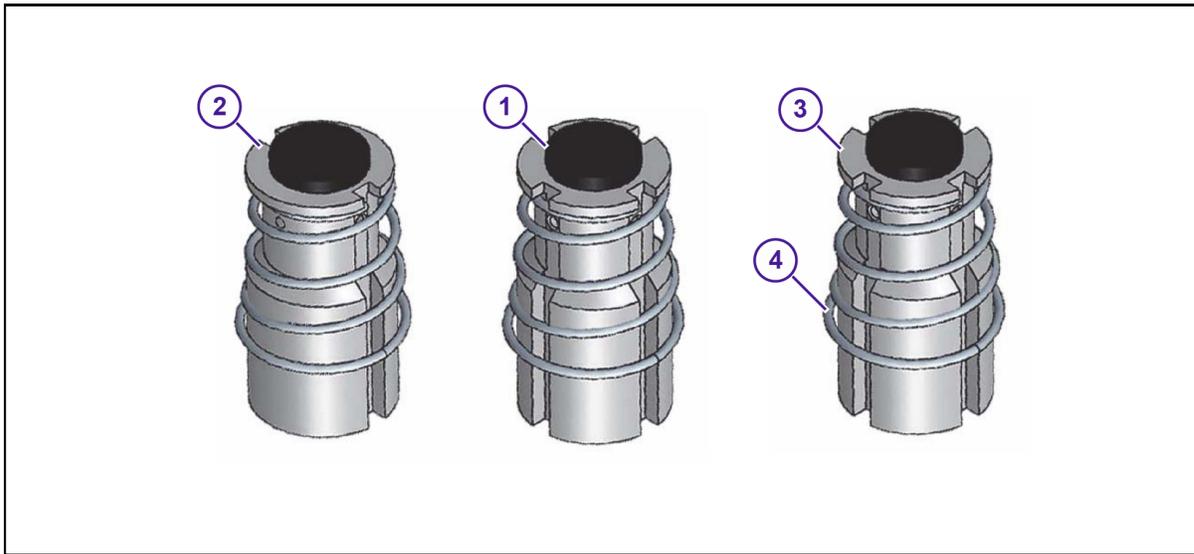


Fig. 30:

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

- (1) Standard Flow—4 slots on the outside
- (2) Standard Flow—2 slots on the outside
- (3) Heavy Flow—The spring (4) on the plunger has a larger diameter than the spring on the standard valve plunger.

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

- (1) A plunger seat on a new valve body
- (2) Examples of a worn plunger seat on a valve body

Chapter 8: Schematics

System Layout

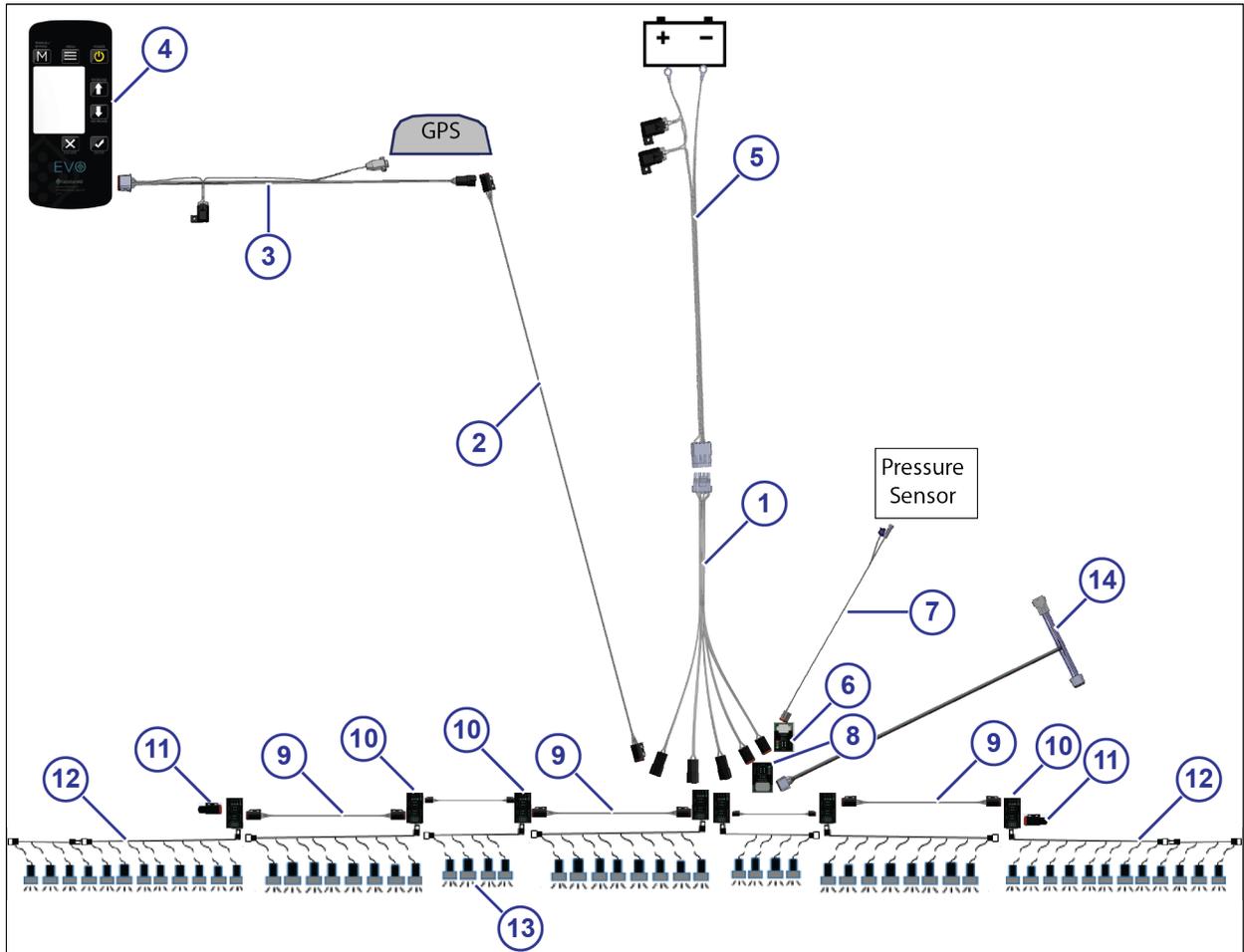


Fig. 31:

Callout	Description	Callout	Description
(1)	Power to CAN X Harness	(8)	Boom Signal Transmitter Module
(2)	CAN Bus Extension Harness	(9)	CAN Bus Extension Harness (Plug to Plug)
(3)	Display Harness	(10)	Smart Driver Module
(4)	Cab Display	(11)	CAN Terminator
(5)	Power Harness	(12)	Nozzle Harness
(6)	Pressure Transmitter Module	(13)	Nozzle Valve Assembly
(7)	Pressure Sensor Adapter Harness	(14)	Boom Shutoff Adapter

Display Harness

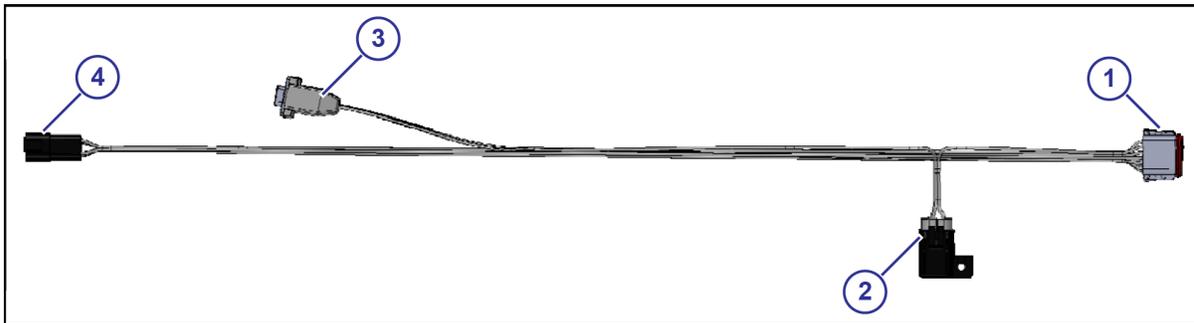


Fig. 32:

Table: Display Connector (1) Pinout—12-pin DT Plug

Pin	Description	Color	Pin	Description	Color
1	Power with Fuse	Red	7	GPS Rx	Black/White
2	Ground	Black	8	Plug	
3	Synch	Blue	9	GPS Ground	Blue/White
4	CAN Hi	Yellow	10	Plug	
5	CAN Lo	Green	11	Plug	
6	AI Ground	Brown	12	Plug	

5 A Fuse (2).

Table: GPS Connector (3) Pinout—DB9 Male Connector

Pin	Description	Color	Pin	Description	Color
1			6		
2	GPS Rx	Black/White	7		
3			8		
4			9		
5	GPS Ground	Blue/White			

Table: CAN Extension Harness Connector (4) Pinout—6-pin DT Receptacle

Pin	Description	Color	Pin	Description	Color
1	Power	Red	4	CAN Hi	Yellow
2	Ground	Black	5	CAN Lo	Green
3	Synch	Blue	6	AI Ground	Brown

Power Harness

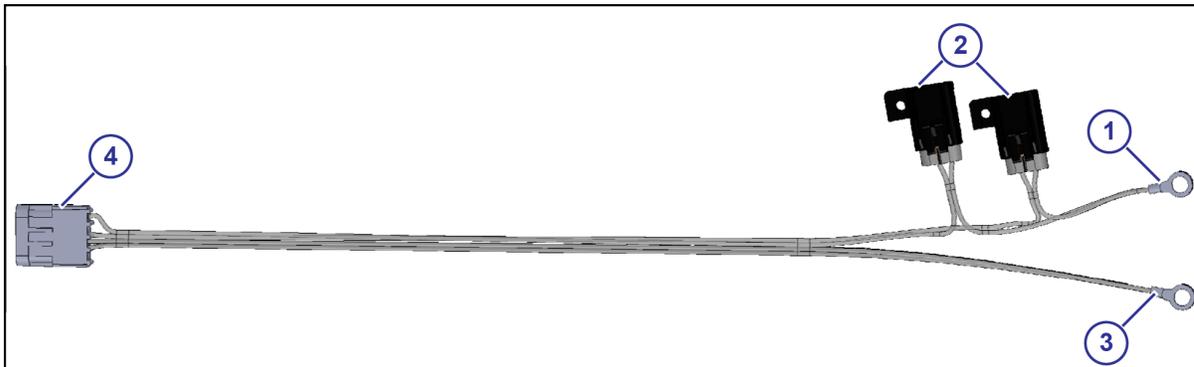


Fig. 33:

- (1) Battery Power Positive (+) Ring Terminal
- (2) 20 A Fuse
- (3) Battery Ground Negative (-) Ring Terminal

Table: Power Harness Connector (4) Pinout—4-pin WP Shroud

Pin	Description	Color	Pin	Description	Color
A	Power	Red	C	Ground	Black
B	Power	Red	D	Ground	Black

Power Extension Harness

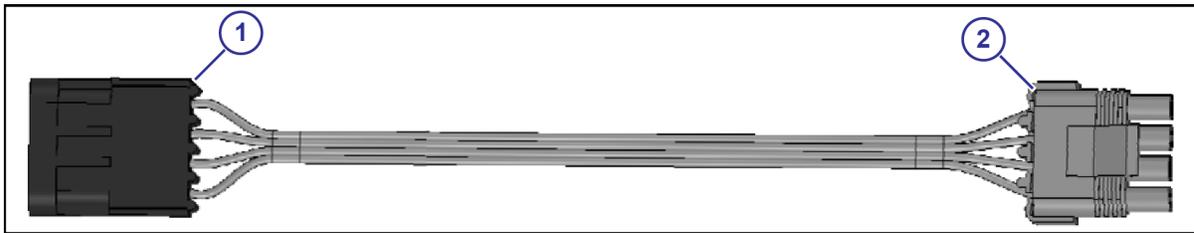


Fig. 34:

Table: Power Harness Connector (1) Pinout—4-pin WP Tower

Pin	Description	Color		Pin	Description	Color
A	Power	Red		C	Ground	Black
B	Power	Red		D	Ground	Black

Table: Power to CAN Extension Harness Connector (2) Pinout—4-pin WP Shroud

Pin	Description	Color		Pin	Description	Color
A	Power	Red		C	Ground	Black
B	Power	Red		D	Ground	Black

CAN Bus Extension Harness

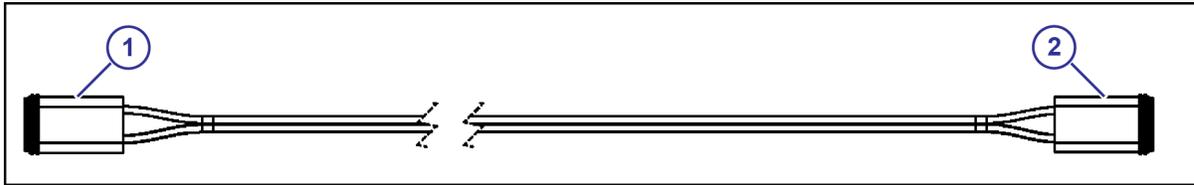


Fig. 35:

Table: Extension Connector (1) Pinout—6-pin DT Receptacle

Pin	Description	Color		Pin	Description	Color
1	Power	Red		4	CAN Hi	Yellow
2	Ground	Black		5	CAN Lo	Green
3	Synch	Blue		6	AI Ground	Brown

Table: Extension Connector (1) Pinout—6-pin DT Receptacle

Pin	Description	Color		Pin	Description	Color
1	Power	Red		4	CAN Hi	Yellow
2	Ground	Black		5	CAN Lo	Green
3	Synch	Blue		6	AI Ground	Brown

Power to CAN X Harness

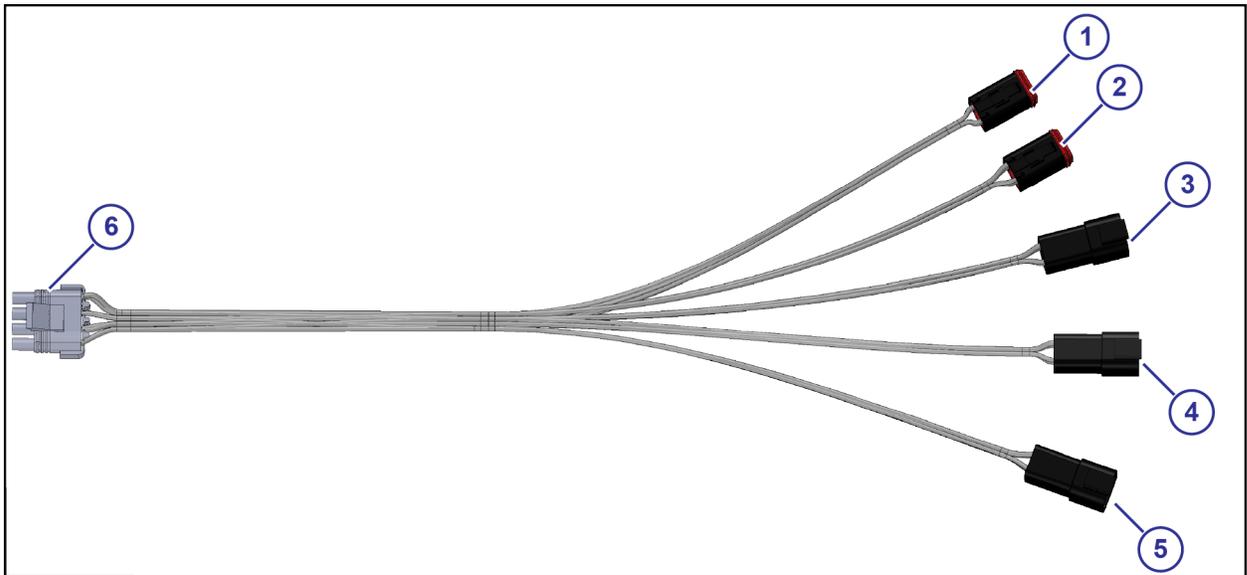


Fig. 36:

Table: PSI Module/Right Trunk Connector (1)—6-pin DT Plug

Pin	Description	Color	Pin	Description	Color
1	Power (Right)	Red	4	CAN Hi	Yellow
2	Ground (Right)	Black	5	CAN Lo	Green
3	Synch	Blue	6	AI Ground	Brown

Table: Section Shutoff Module/Right Trunk Connector (2)—6-pin DT Plug

Pin	Description	Color	Pin	Description	Color
1	Power (Right)	Red	4	CAN Hi	Yellow
2	Ground (Right)	Black	5	CAN Lo	Green
3	Synch	Blue	6	AI Ground	Brown

Table: Right Boom/Right Trunk Connector (3)—6-pin DT Receptacle

Pin	Description	Color	Pin	Description	Color
1	Power (Right)	Red	4	CAN Hi	Yellow
2	Ground (Right)	Black	5	CAN Lo	Green
3	Synch	Blue	6	AI Ground	Brown

Table: Left Boom/Left Trunk Connector (4)—6-pin DT Receptacle

Pin	Description	Color		Pin	Description	Color
1	Power (Left)	Red		4	CAN Hi	Yellow
2	Ground (Left)	Black		5	CAN Lo	Green
3	Synch	Blue		6	AI Ground	Brown

Table: Display/Left Trunk Connector (5)—6-pin DT Receptacle

Pin	Description	Color		Pin	Description	Color
1	Power (Left)	Red		4	CAN Hi	Yellow
2	Ground (Left)	Black		5	CAN Lo	Green
3	Synch	Blue		6	AI Ground	Brown

Table: Power Harness Connector (6) Pinout—4-pin WP Tower

Pin	Description	Color		Pin	Description	Color
A	Power (Left)	Red		C	Ground (Left)	Black
B	Power (Right)	Red		D	Ground (Right)	Black

Nozzle Harness

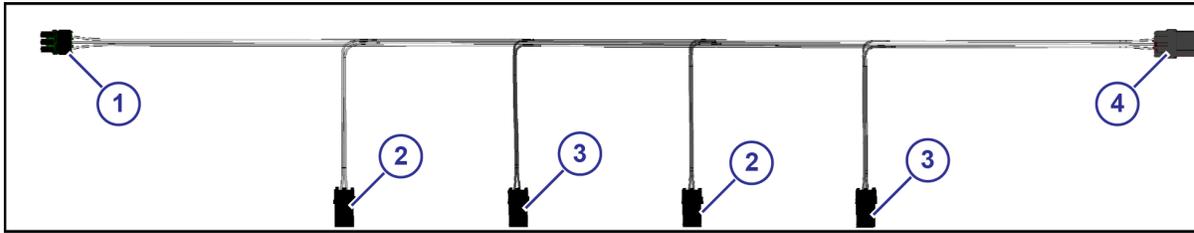


Fig. 37:

The nozzle harnesses can have two, four, or eight connectors for the nozzles.

Note: A four nozzle harness is shown.

Table: Smart Valve Driver Connector (1) Pinout—3-pin WP Tower

Pin	Description	Color	Pin	Description	Color
A	Power	Red	C	Odd	White
B	Even	Green			

Table: Nozzle Valve Connector (2) Pinout—2-pin WP Shroud

Pin	Description	Color	Pin	Description	Color
A	Power	Red	B	Odd	White

Table: Nozzle Valve Connector (3) Pinout—2-pin WP Shroud

Pin	Description	Color	Pin	Description	Color
A	Power	Red	B	Even	Green

Table: Nozzle Harness Connector (4) Pinout—3-pin WP Shroud

Pin	Description	Color	Pin	Description	Color
A	Power	Red	C	Odd	White
B	Even	Green			



Fig. 38:

When necessary there is a 1x20 nozzle harness available that can be connected to the end of the other nozzle harnesses.

Table: Nozzle Harness Connector (1) Pinout—3-pin WP Tower

Pin	Description	Color		Pin	Description	Color
A	Power	Red		C	Odd	White

Table: Nozzle Valve Connector (2) Pinout—2-pin WP Shroud

Pin	Description	Color		Pin	Description	Color
A	Power	Red		B	Odd	White

Chapter 9: Troubleshooting

Troubleshooting Charts

When troubleshooting the EVO™ system start with these:

1. Use the battery harness fuses to isolate half of the system. This will help focus on the half of the system that has the issue. The fuse located on the left trunk corresponds to the power to CAN X harness left trunk connections.
2. When there is a CAN issue, isolate half of the system to start looking for the issue by disconnecting the left or right trunk connection.
3. Once the side of the system has been determined (left or right trunk), use the daisy chain of CAN extension harnesses to finish isolating the issue. Disconnect the connections except for the center module and harness. Start connecting the modules back together one at a time until the error shows again. When the error shows again, you have found the section with the problem.

Problem	Cause	Correction
CAN Bypass Mode	The CAN Bus is experiencing issues. This is an alternative control mode that allows the operator to use manual PWM spray mode to complete the current job before locating and solving the issue.	Use the LEDs on the system modules to locate the area of the issue.
		Find and repair the CAN issue.
CAN Bus Off	The CAN Bus is experiencing issues. Follow the on-screen prompts to utilize an alternate PWM spray mode to complete the current job before locating and solving the issue.	Use the LEDs on the system modules to locate the area of the issue.
		Find and repair the CAN issue.
No CAN Modules	Modules are not on the CAN Bus.	Connect the modules and set up system.
		Use the LEDs on the system modules to locate the area of the issue.
No CAN: Alt Control	The CAN Bus is experiencing issues. This is an alternative control mode that allows the operator to use manual PWM spray mode to complete the current job before locating and solving the issue.	Use the LEDs on the system modules to locate the area of the issue.
		Find and repair the CAN issue.
No Bm Sig Module	The boom signal transmitter module is not on the CAN Bus.	Connect the boom signal transmitter module.
		Find and repair wiring issue.
No Bm Sig: Alt Control	The boom signal transmitter module is not on the CAN Bus. This is an alternative control mode that allows the operator to use manual PWM spray mode to complete the current job before locating and solving the issue.	Connect the boom signal transmitter module.
		Find and repair wiring issue.

Problem	Cause	Correction
No Psi Trans Module	The pressure transmitter module is not on the CAN Bus.	Connect the pressure transmitter module.
		Find and repair wiring issue. Use the LEDs on the system modules to locate the area of the issue.
No Pump Module	Pump Module is not on the CAN Bus.	The pressure transmitter module is plugged. Find and repair the CAN issue. Use the LEDs on the system modules to locate the area of the issue.
Missing Sm Driver Mod	One of the smart driver modules is not on the CAN Bus.	Connect the smart driver module.
		Go to the system setup screen and make sure the information is correct.
		Use the LEDs on the system modules to locate the area of the issue.
		Find and repair the CAN issue.
CAN Bus Error	The CAN Bus is experiencing issues. Follow the on-screen prompts to use an alternate PWM spray mode to complete the current job before locating and solving the issue.	Find and repair the CAN issue.
New Sm Driver Mod	A new smart driver module has been connected to the system.	Do the module location and section size setup procedures.
Sm Driver Init	Smart Driver Module initialization	Do the module location and section size setup procedures.
Pressure Sensor Fail	The pressure sensor is experiencing issues.	Find the pressure sensor error and repair or replace as needed
Pressure Sensor 2 Fail	The pressure sensor is experiencing issues.	Find the pressure sensor error and repair or replace as needed
Low Pressure	The tank is empty.	Fill the tank
	The nozzle valves are closed to keep pump from running dry.	Increase the pressure above 12 psi and error will clear
Maximum Duty	Shows when the maximum duty cycle value is experienced	
Minimum Duty	Shows when the minimum duty cycle value is experienced.	
Low Flow Control	Incorrect low flow threshold	Do a check of the low flow threshold and adjust as needed

Problem	Cause	Correction
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	Wait 10 seconds while the GPS verifies itself. Change GPS receiver baud rate setting 19200 to 115200
No GPS VTG	Incorrect GPS settings	Change the VTG message rate to at least 10 Hz on the GPS receiver Note: 5 Hz will work for this system if your antenna cannot export 10 Hz.
No GPS GGA	Incorrect GPS settings	Change the GGA message rate to at least 10 Hz on the GPS receiver Note: 5 Hz will work for this system if your antenna cannot export 10 Hz.
Sync Line Fail	An issue has occurred with the Sync line (pin 3 in your 6p DT connection points).	Find the Sync Line failure by separating left and right trunk issue(s). Then disconnecting the daisy chained CAN extension harness connections until the issue is found.
Sm Driver Mod Error	The smart driver module is experiencing issues.	Find the smart driver module error by separating the left and right trunk issue(s). Then disconnecting the daisy chained CAN extension harness connections until the issue is found.

Problem	Cause	Correction
Under application of product.	Plugged nozzle valves.	Clean or replace the nozzle valves.
	Plugged filter(s).	Clean or replace the filter(s).
	Filter(s) not installed correctly.	Check all filters for correct installation.
	Plugged, kinked, or collapsed hoses.	Do a check of all the hoses and replace as needed.
	Product supply valve not fully open.	Open the supply valve fully.
	Outrunning system capability.	Slow down.
	Incorrect rate settings.	Do a check of the rate settings and adjust as necessary.
	Incorrect calibration settings.	Do a check of the calibration settings and adjust as necessary.
	Faulty radar.	Replace the radar.
	Poor GPS satellite signal.	Verify that the GPS is working correctly.
	Flow meter cal # incorrect.	Do a check of the flow meter calibration.
	Faulty module.	Replace the module.
Over application	Worn nozzle valves.	Replace the nozzle valves.
	Speed too slow.	Increase the speed.
	Incorrect rate settings.	Do a check of the rate settings and adjust as necessary.
	Incorrect calibration settings.	Do a check of the calibration settings and adjust as necessary.
	Flow meter cal # incorrect.	Do a check of the flow meter calibration.
	Faulty flow meter module.	Repair or replace the flow meter module.
Rate instability	Faulty rate controller.	Replace the rate controller.
	Faulty module.	Do a check of the module and replace if needed.
	Faulty speed sensor reading.	Do a check of the radar and replace if needed.
Rate instability continued	Collapsed supply hose.	Replace the supply hose.
	Strainer(s) plugged.	Do a check of the strainer(s) and clean if needed.
	Incorrect valve calibration settings.	Do a check of the valve calibration settings, and adjust as necessary (See the rate controller's manual).
	Faulty rate controller.	Replace the rate controller.
	Low voltage to rate controller.	Do a test of the voltage and repair as needed.

Problem	Cause	Correction
Single nozzle leaks when shutoff.	Orifice is lodged with debris.	Clean the nozzle valve.
	O-ring pinched or broken.	Replace the O-ring.
	Orifice is worn or damaged.	Replace the valve body.
	Plunger is lodged with debris.	Clean the nozzle valve.
	Plunger is worn or damaged.	Replace the plunger.
Single nozzle valve operates erratically.	Nozzle valve is faulty.	Service the nozzle valve.

Interchangeable Components

The system includes a number of multiple parts:

- Nozzle valves
- Boom and extension harnesses
- Electronic control modules

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

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

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

Coil Test

Coil failures are often the result of two factors:

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

Recommendation: Clean any plugged nozzle valves immediately.

Recommendation: Rinse the inside of the booms, and wash the outside of the coils 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

Battery Voltage Test

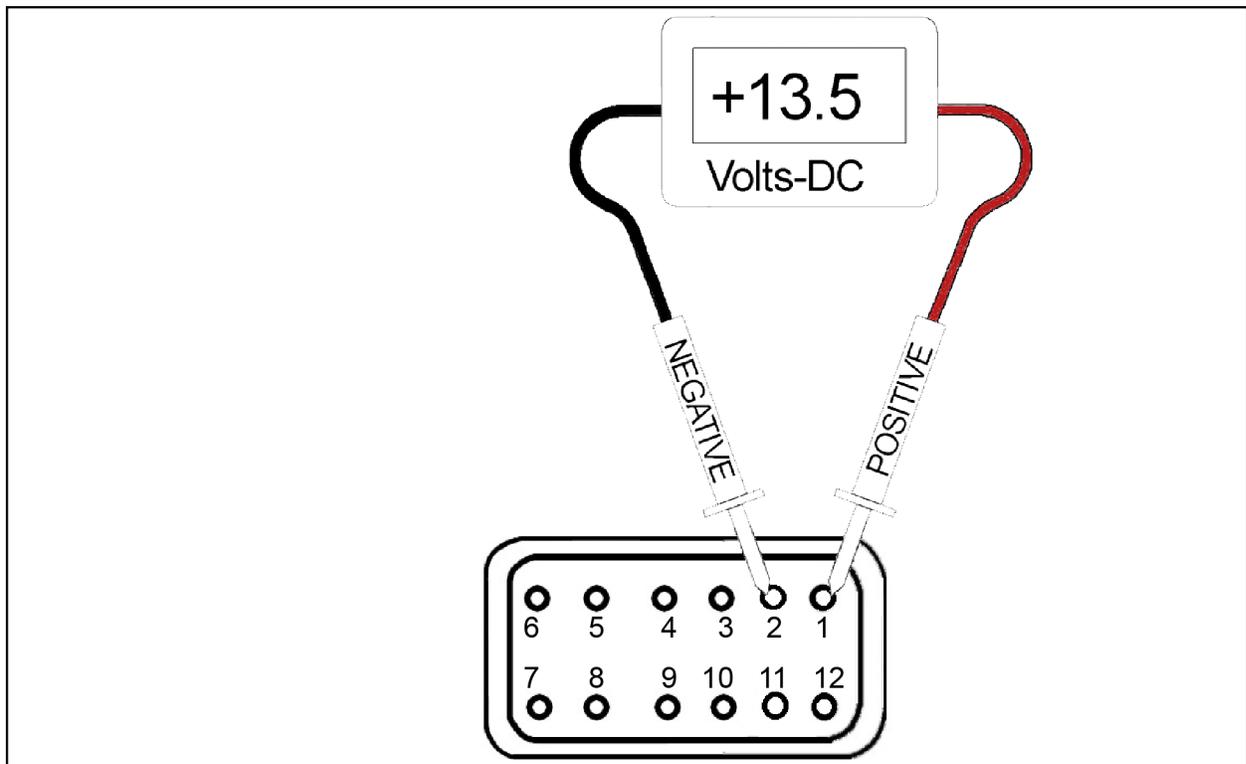


Fig. 39:

Disconnect the display harness (12-pin connector) on the back of the cab display.

- 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 1 and pin 2, do a check of:

- The 5 A in-line Fuse on the pin 1 battery wire.
- The 2 (20 A fuses) located next to the battery connection point.
- The system 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 cab display 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 cab display is on the *Diagnostics* screen.

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

Pressure Sensor Signal Test

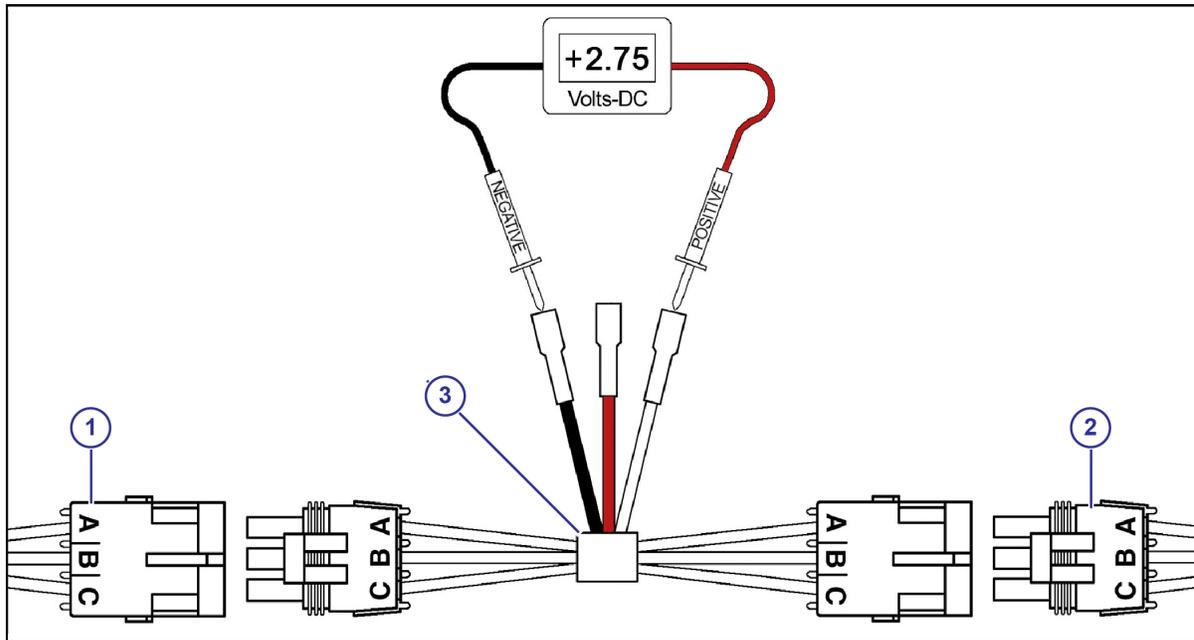


Fig. 40:

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.

Power to the Pressure Sensor Input Test

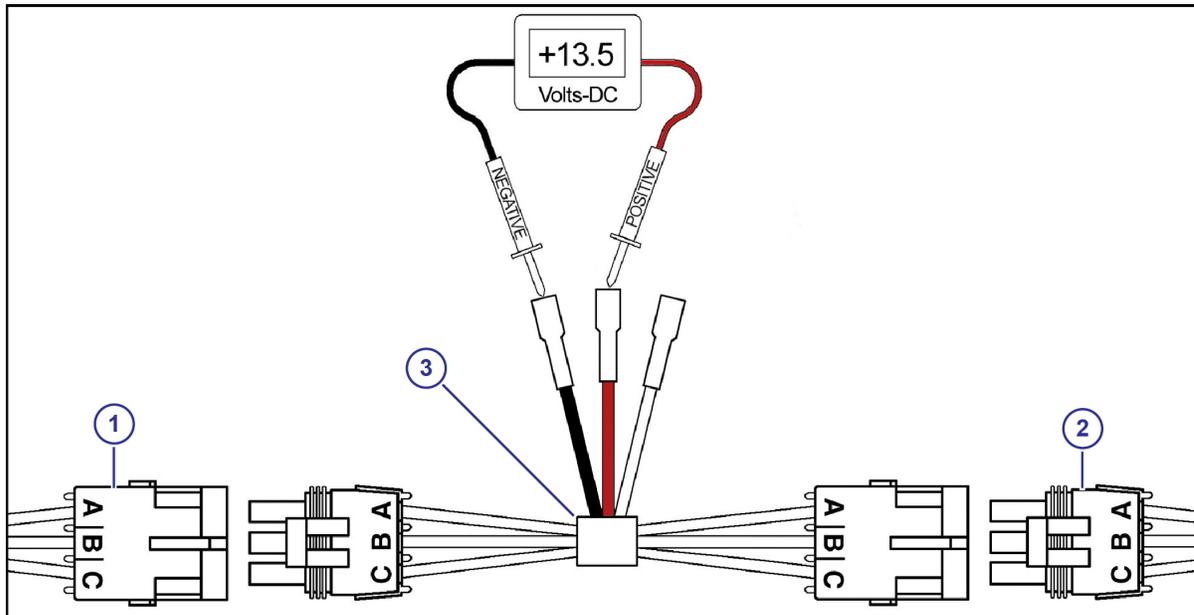


Fig. 41:

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

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