



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

CapstanAG.com | CapstanAG.ca

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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 manual(s) from the Original Equipment Manufacturer (OEM).

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

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

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

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

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

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

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

System Identification

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

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

Chapter 2: Safety

Signal Words



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



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



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

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

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

Emergency Safety

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

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

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

Inspect the fire extinguisher and service the fire extinguisher regularly.

Follow the recommendations on the instructions plate.

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

Personal Protective Equipment

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

Pressurized Fluid Lines

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

Chemical Safety

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

Battery Safety

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

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

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

Chapter 3: Warranty

Limited Warranty

What does the Limited Warranty cover?

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

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

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

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

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

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

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

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

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

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

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

What is the period of coverage?

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

How do you get service?

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

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

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

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

Capstan Ag Systems, Inc.

Attn: Warranty/Repair

4225 SW Kirklawn Ave.

Topeka, KS 66609

Phone: (785) 232-4477 | Fax: (785) 232-7799

Hours: 8 am to 4:30 pm CST

How does state law relate to this Limited Warranty?

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

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

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.¹

¹ Rev. Date 7/15/2014

Chapter 4: 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	PSI		Speed Range					
	US GPM	Gauge	Tip	3 GPA	5 GPA	8 GPA	10 GPA	15 GPA	20 GPA
05	0.336	20	18		5.0 to 20.0	3.1 to 12.5	2.0 to 10.0	1.3 to 6.7	1.0 to 5.0
	0.412	30	27		6.1 to 24.5	3.8 to 15.3	2.4 to 12.2	1.6 to 8.2	1.2 to 6.1
	0.476	40	36		7.1 to 28.3	4.4 to 17.7	2.8 to 14.1	1.9 to 9.4	1.4 to 7.1
	0.532	50	45			4.9 to 19.8	3.2 to 15.8	2.1 to 10.5	1.6 to 7.9
	0.583	60	54			5.4 to 21.6	3.5 to 17.3	2.3 to 11.5	1.7 to 8.7

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).

Valve Assembly Types and Component Identification

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

7-Watt—15 Series Coil Assembly Components

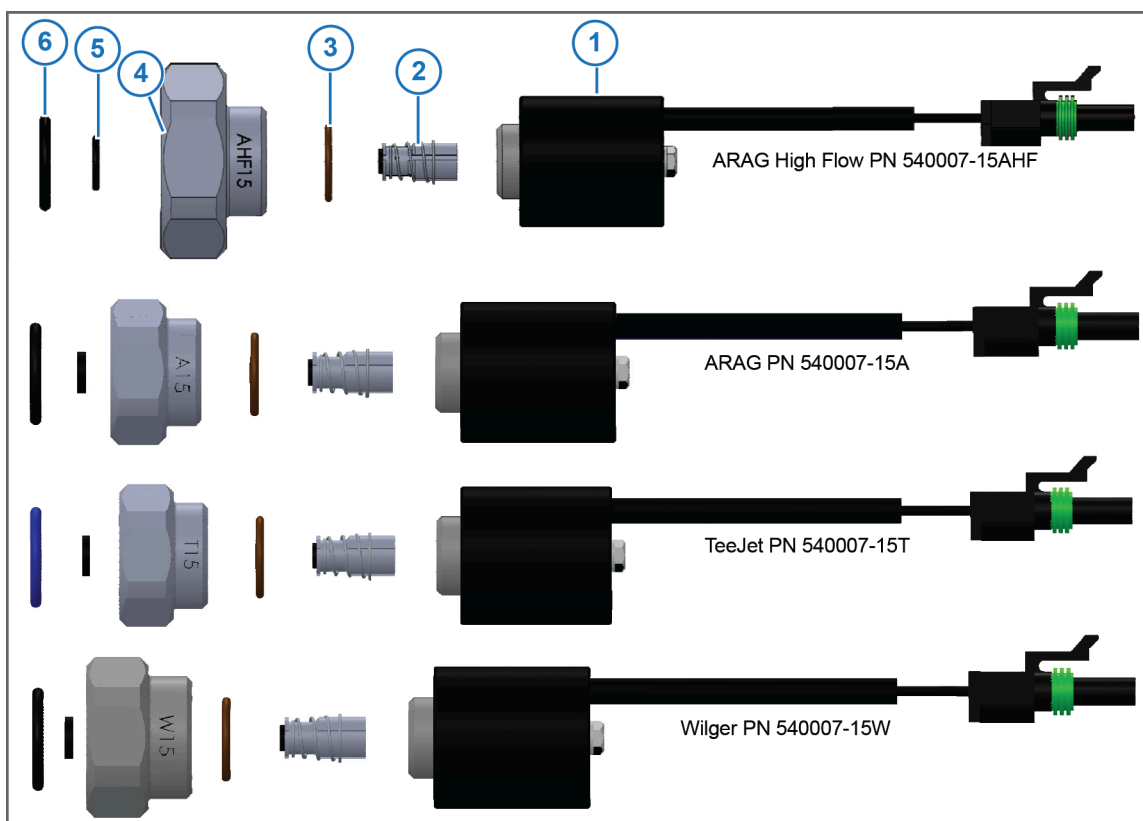


Fig. 2:

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 Assembly Components

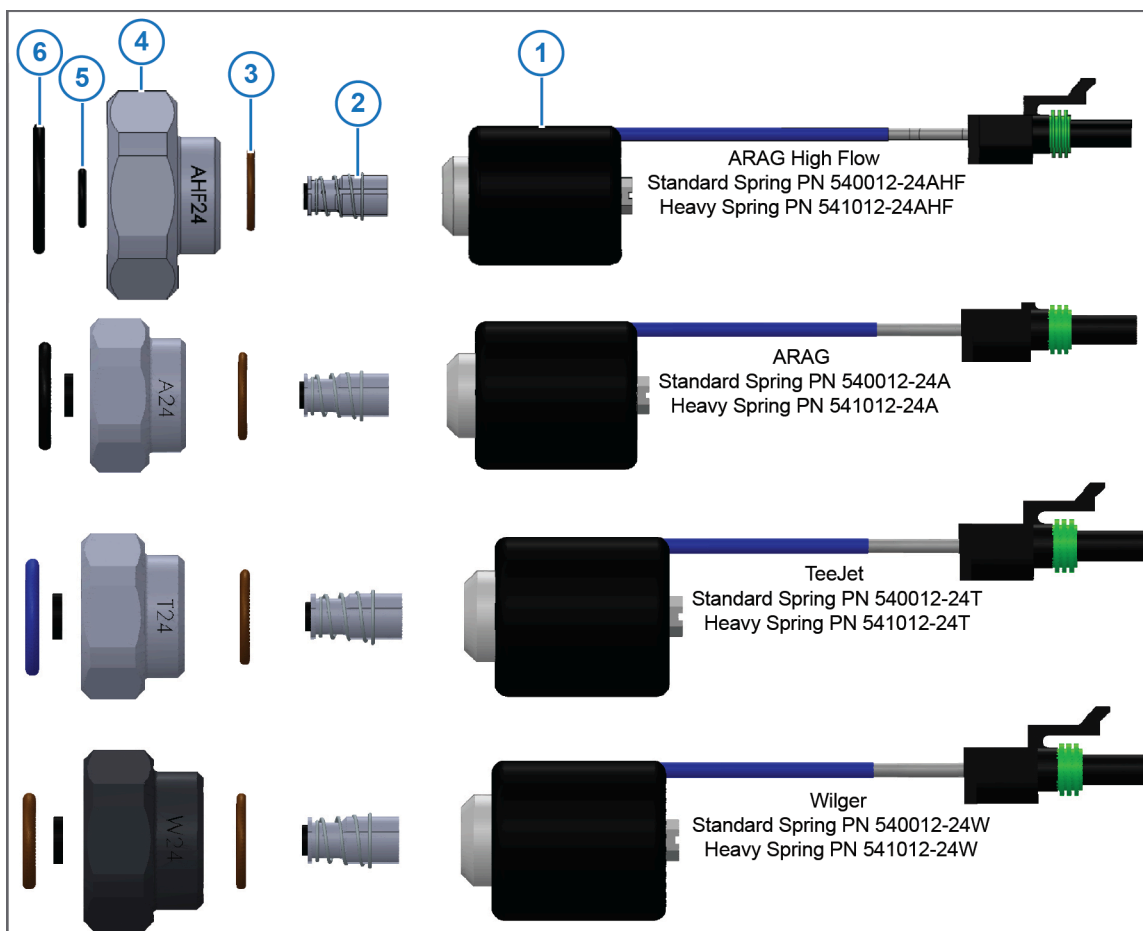


Fig. 3:

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

Assemble the Nozzle Valves

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

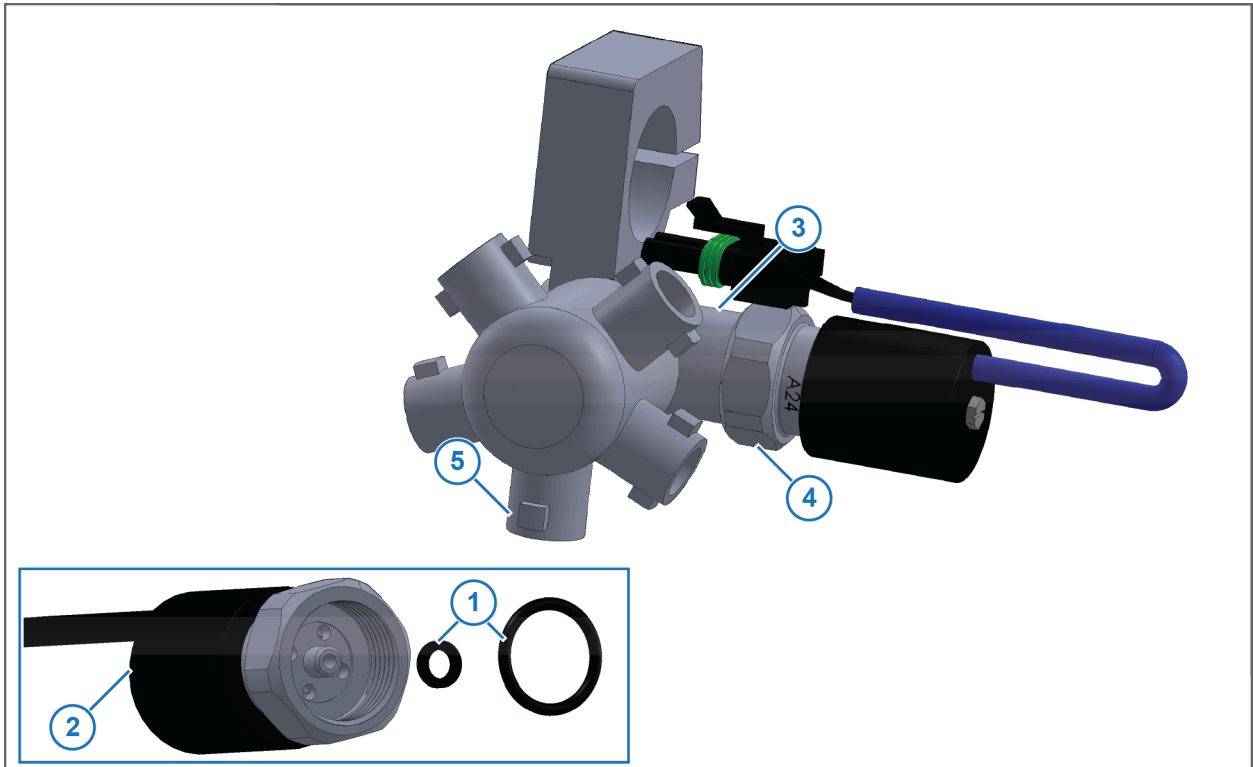


Fig. 4:

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)

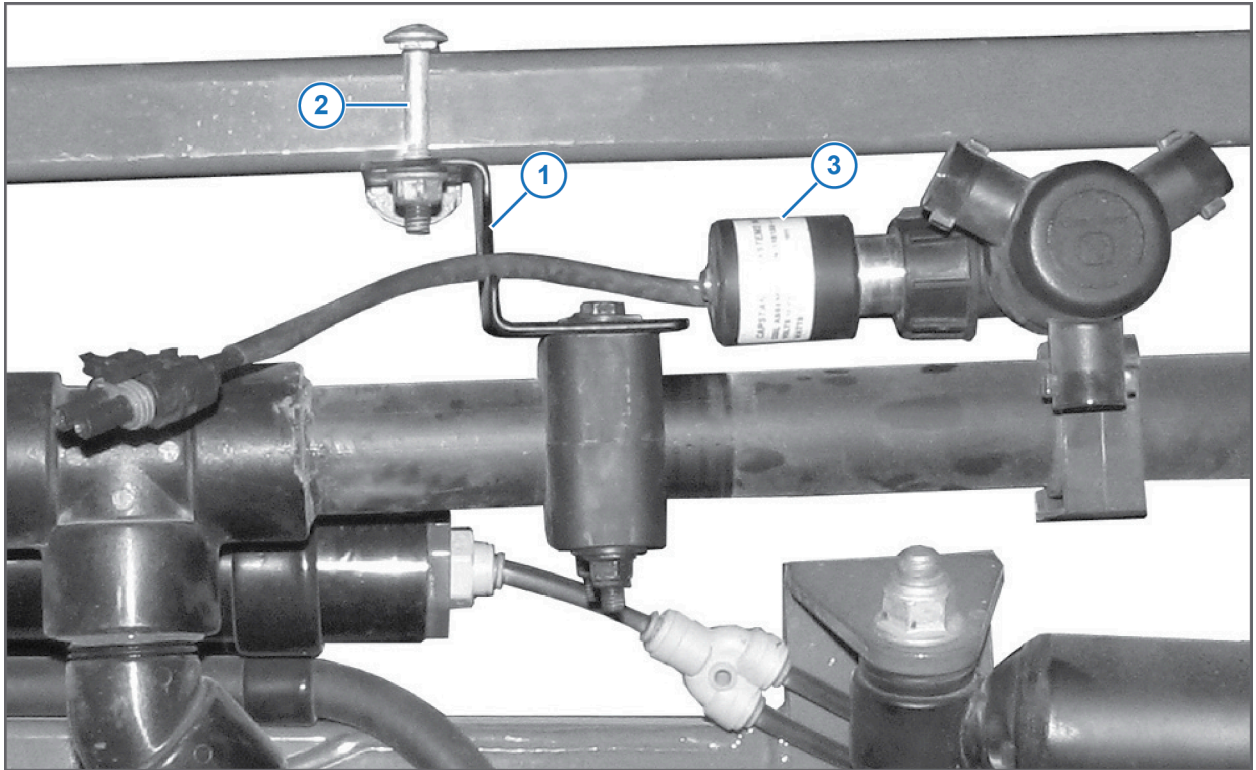


Fig. 5:

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.

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	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5
	70					5	10	16	21	3	6	10	13	3	5	8	10	2	4	6	9	2	3	5	7	1	3	4	5
0.25 GPM #2.5	20	6	12	17	23	3	7	10	14	2	4	6	9	2	3	5	7	1	3	4	6	1	2	3	5	1	2	3	3
	30	7	14	21	28	4	8	13	17	3	5	8	11	2	4	6	8	2	4	5	7	1	3	4	6	1	2	3	4
	40					5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5
	50					5	11	16	22	3	7	10	14	3	5	8	11	2	5	7	9	2	4	5	7	1	3	4	5
	60					6	12	18	24	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	70					6	13	19	26	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	9	2	3	5	6
0.3 GPM #3	20	7	14	21	27	4	8	12	16	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4
	30					5	10	15	20	3	6	9	13	3	5	8	10	2	4	6	8	2	3	5	7	1	3	4	5
	40					6	12	17	23	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	8	1	3	4	6
	50					7	13	20	26	4	8	12	16	3	7	10	13	3	5	8	11	2	4	7	9	2	3	5	7
	60					7	14	21	29	4	9	13	18	4	7	11	14	3	6	9	12	2	5	7	10	2	4	5	7
	70					5	10	14	19	4	8	12	15	4	8	12	15	3	6	10	13	3	5	8	10	2	4	6	8
0.4 GPM #4	20					5	11	16	22	3	7	10	14	3	5	8	11	2	5	7	9	2	4	5	7	1	3	4	5
	30					7	13	20	27	4	8	12	17	3	7	10	13	3	6	8	11	2	4	7	9	2	3	5	7
	40									5	10	14	19	4	8	12	15	3	6	10	13	3	5	8	10	2	4	6	8
	50									5	11	16	21	4	9	13	17	4	7	11	14	3	6	9	11	2	4	6	9
	60									6	12	18	23	5	9	14	19	4	8	12	16	3	6	9	13	2	5	7	9
	70									6	13	19	25	5	10	15	20	4	8	13	17	3	7	10	14	3	5	8	10
0.5 GPM #5	20					7	13	20	27	4	8	12	17	3	7	10	13	3	6	8	11	2	4	7	9	2	3	5	7
	30									5	10	15	20	4	8	12	16	3	7	10	14	3	5	8	11	2	4	6	8
	40									6	12	18	24	5	9	14	19	4	8	12	16	3	6	9	13	2	5	7	9
	50									7	13	20	26	5	11	16	21	4	9	13	18	4	7	11	14	3	5	8	11
	60									7	14	22	29	6	12	17	23	5	10	14	19	4	8	12	15	3	6	9	12
	70									6	12	19	25	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	3	7	10	14
	70													7	15	22	29	6	12	18	24	5	10	15	20	4	7	11	15
0.8 GPM #8	20									6	12	19	25	5	10	15	20	4	8	12	17	3	7	10	13	2	5	7	10
	30									8	15	23	30	6	12	18	24	5	10	15	20	4	8	12	16	3	6	9	12
	40													7	14	21	28	6	12	18	23	5	9	14	19	4	7	11	14
	50																	7	13	20	26	5	10	16	21	4	8	12	16
	60																	7	14	22	29	6	11	17	23	4	9	13	17
	70																					6	12	19	25	5	9	14	19
1.0 GPM #10	20									7	15	22	29	6	12	18	24	5	10	15	20	4	8	12	16	3	6	9	12
	30													7	14	22	29	6	12	18	24	5	10	14	19	4	7	11	14
	40																	7	14	21	28	6	11	17	22	4	8	12	17
	50																					6	12	19	25	5	9	14	19
	60																					7	14	20	27	5	10	15	20
	70																					7	15	22	29	6	11	17	22
1.2 GPM #12	20																	6	11	17	22	4	9	13	18	3	7	10	13
	30																	7	14	20	27	5	11	16	22	4	8	12	16
	40																					6	13	19	25	5	9	14	19
	50																					7	14	21	28	5	11	16	21
	60																									6	12	17	23
	70																									6	12	19	25
1.25 GPM #12.5	20																												
	30																	7	14	21	28	6	11	17	22	4	8	13	17
	40																					6	13	19	26	5	10	14	19
	50																					7	14	22	29	5	11	16	22
	60																									6	12	18	24
	70																									6	13	19	25
1.5 GPM #15	20																												
	30																												
	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	22	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							

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	
0.1 GPM #1	20	2	3	5	7	1	2	3	4	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1	0	1	1	1
	30	2	4	6	9	1	3	4	5	1	2	2	3	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1
	40	2	5	7	10	1	3	4	6	1	2	3	4	1	1	2	3	1	1	2	2	0	1	1	2	0	1	1	1
	50	3	6	8	11	2	3	5	7	1	2	3	4	1	2	2	3	1	1	2	3	1	1	2	2	0	1	1	2
	60	3	6	9	12	2	4	5	7	1	2	3	5	1	2	3	4	1	2	2	3	1	1	2	2	0	1	1	2
0.15 GPM #1.5	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
	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
0.2 GPM #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
	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
0.25 GPM #2.5	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
	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
0.3 GPM #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	5	10	15	19	3	6	9	12	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5
	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
0.4 GPM #4	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
0.5 GPM #5	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
0.5 GPM #5	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
	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	5	10	15	20	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8
0.5 GPM #5	60					5	11	16	22	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	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
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
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
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
1.25 GPM #12.5	20																												
	30																												
	40									8	16	23	31	6	13	19	25	5	10	16	21	4	8	13	17	3	6	9	13
	50													7	14	22	29	6	12	18	24	5	10	14	19	4	7	11	14
	60																	7	13	20	27	5	11	16	22	4	8	12	16
1.5 GPM #15	20																												
	30																												
	40																												
	50																												
	60																												

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	13

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	F
	40	40	F	M	C	C								F	F		F		F	M
	50	50	VF	M	C	C								F	F		F		M	F
	60	59	VF	M	C	C								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		C	F
	40	39	F	M	C	VC		M	M	F	F	F		M	F	F	M	VF	M	F
	50	49	F	M	C	VC		M	M	F	F	F		M	F	F	M	VF	F	M
	60	59	F	M	C	C		M	M	F	F	F		M	F	F	M	VF	F	M
	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
	40	39	F	C	VC	XC		M	M	F	F	F		C	F	F	M	F	M	C
	50	48	F	C	C	VC		M	M	F	F	F		M	F	F	M	F	F	M
	60	58	F	C	C	VC		M	M	F	F	F		M	F	F	M	F	F	M
	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
	40	38	M	C	VC	XC		C	M	F	F	F		C	M	M	M	F	C	C
	50	47	M	C	VC	XC		M	M	F	F	F		M	F	F	M	F	C	M
	60	56	M	C	C	VC		M	M	F	F	F		M	F	F	M	F	M	M
	70	66	M	C	C	VC		M	M	F	F			M					M	
0.5 GPM #5	20	18	C					C	C	M	C			VC	M	M			VC	
	30	27	C	VC	XC	XC		C	C	M	M	M		C	M	M	C	M	VC	M
	40	36	M	C	XC	XC		C	C	F	F	F		C	M	M	C	M	C	M
	50	45	M	C	XC	XC		M	M	F	F	F		C	M	M	M	F	C	F
	60	54	M	C	VC	XC		M	M	F	F	F		C	F	F	M	F	C	F
	70	63	M	C	VC	XC		M	M	F	F			M					M	

Droplet Classification Table ASABE S-572.1

Extremely Fine (EF)	Very Fine (VF)	Fine (F)	Medium (M)	Coarse (C)	Very Coarse (VC)	Extremely Coarse (EC)	Ultra Coarse (UC)
<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	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
	207	4	9	13	17	3	5	8	10	2	4	6	9	2	4	6	7	2	3	5	6	1	3	4	5	1	2	3	4
	276	5	10	15	20	3	6	9	12	2	5	7	10	2	4	6	9	2	4	6	7	1	3	4	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
	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
0.15 GPM #1.5	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
	138	5	11	16	21	3	6	9	13	3	5	8	11	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	5
	207	6	13	19	26	4	8	12	15	3	6	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	6
	276	7	15	22	30	4	9	13	18	4	7	11	15	3	6	10	13	3	6	8	11	2	4	7	9	2	4	6	7
	345	8	17	25	33	5	10	15	20	4	8	12	17	4	7	11	14	3	6	9	12	2	5	7	10	2	4	6	8
0.2 GPM #2	414	9	18	27	36	5	11	16	22	5	9	14	18	4	8	12	16	3	7	10	14	3	5	8	11	2	5	7	9
	483	10	20	30	39	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
	138	7	14	21	28	4	8	13	17	3	7	10	14	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	7
	207	9	17	26	34	5	10	15	21	4	9	13	17	4	7	11	15	3	6	10	13	3	5	8	10	2	4	6	9
	276	10	20	30	40	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
0.25 GPM #2.5	345	11	22	33	44	7	13	20	27	6	11	17	22	5	9	14	19	4	8	12	17	3	7	10	13	3	6	8	11
	414	12	24	36	48	7	15	22	29	6	12	18	24	5	10	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	483					8	16	24	31	7	13	20	26	6	11	17	22	5	10	15	20	4	8	12	16	3	7	10	13
	138	9	17	26	35	5	10	16	21	4	9	13	17	4	7	11	15	3	7	10	13	3	5	8	10	2	4	7	9
	207	11	21	32	43	6	13	19	26	5	11	16	21	5	9	14	18	4	8	12	16	3	6	10	13	3	5	8	11
0.3 GPM #3	276					7	15	22	30	6	12	18	25	5	11	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	345					8	16	25	33	7	14	21	27	6	12	18	24	5	10	15	21	4	8	12	16	3	7	10	14
	414					9	18	27	36	8	15	23	30	6	13	19	26	5	11	17	23	4	9	14	18	3	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
	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
0.4 GPM #4	207					8	15	23	30	6	13	19	25	5	11	16	22	5	10	14	19	4	8	11	15	3	6	10	13
	276					9	18	26	35	7	15	22	29	6	13	19	25	6	11	17	22	4	9	13	18	4	7	11	15
	345					10	20	30	39	8	16	25	33	7	14	21	28	6	12	18	25	5	10	15	20	4	8	12	16
	414					11	22	32	43	9	18	27	36	8	15	23	31	7	13	20	27	5	11	16	22	4	9	13	18
	483					12	23	35	47	10	19	29	39	8	17	25	33	7	15	22	29	6	12	17	23	5	10	15	19
0.5 GPM #5	138					8	16	25	33	7	14	20	27	6	12	18	23	5	10	15	20	4	8	12	16	3	7	10	14
	207					10	20	30	40	8	17	25	33	7	14	21	29	6	13	19	25	5	10	15	20	4	8	13	17
	276					12	23	35	46	10	19	29	39	8	17	25	33	7	14	22	29	6	12	17	23	5	10	14	19
	345									11	22	32	43	9	18	28	37	8	16	24	32	6	13	19	26	5	11	16	22
	414									12	24	35	47	10	20	30	41	9	18	27	35	7	14	21	28	6	12	18	24
0.5 GPM #5	483									11	22	33	44	10	19	29	38	8	15	23	31	6	13	19	26	5	11	16	22
	138					10	20	30	40	8	17	25	34	7	14	22	29	6	13	19	25	5	10	15	20	4	8	13	17
	207									10	21	31	41	9	18	26	35	8	15	23	31	6	12	18	25	5	10	15	21
	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26
0.5 GPM #5	414																	11	22	33	44	9	17	26	35	7	15	22	29
	483																	12	24	35	47	9	19	28	38	8	16	24	31
	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26
	414																	11	22	33	44	9	17	26	35	7	15	22	29
	483																	12	24	35	47	9	19	28	38	8	16	24	31

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	
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
0.15 GPM #1.5	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
	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
0.2 GPM #2	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
	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
0.25 GPM #2.5	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
	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
0.3 GPM #3	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	6	12	19	25	5	11	16	21	5	9	14	19	4	7	11	15	3	6	9	12
	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
0.4 GPM #4	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
0.5 GPM #5	138					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
0.5 GPM #5	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
	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
0.5 GPM #5	414					11	22	33	44	9	19	28	38	8	17	25	33	7	13	20	26	6	11	17	22	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	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	
0.6 GPM #6	138					9	18	27	36	7	15	22	30	6	13	19	26	6	11	17	22	4	9	13	18	4	7	11	15
	207					11	22	33	44	9	18	28	37	8	16	24	31	7	14	21	28	6	11	17	22	5	9	14	18
	276									11	21	32	42	9	18	27	36	8	16	24	32	6	13	19	25	5	11	16	21
	345									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	414													11	22	33	44	10	19	29	39	8	16	23	31	6	13	19	26
	483													12	24	36	48	11	21	32	42	8	17	25	34	7	14	21	28
0.8 GPM #8	138					11	23	34	46	10	19	29	38	8	16	24	33	7	14	21	29	6	11	17	23	5	10	14	19
	207									12	23	35	47	10	20	30	40	9	17	26	35	7	14	21	28	6	12	17	23
	276													12	23	35	46	10	20	30	40	8	16	24	32	7	13	20	27
	345																	11	23	34	45	9	18	27	36	8	15	23	30
	414																					10	20	30	40	8	16	25	33
	483																					11	21	32	43	9	18	27	36
1.0 GPM #10	138									11	22	34	45	10	19	29	39	8	17	25	34	7	13	20	27	6	11	17	22
	207													12	24	35	47	10	21	31	41	8	17	25	33	7	14	21	28
	276																	12	24	36	48	10	19	29	38	8	16	24	32
	345																					11	21	32	43	9	18	27	36
	414																					12	23	35	47	10	19	29	39
	483																									11	21	32	42
1.2 GPM #12	138													11	22	33	44	10	19	29	38	8	15	23	30	6	13	19	25
	207																	12	23	35	47	9	19	28	37	8	16	23	31
	276																					11	22	32	43	9	18	27	36
	345																					12	24	36	48	10	20	30	40
	414																									11	22	33	44
	483																									12	24	36	48
1.25 GPM #12.5	138																					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

Hypro and TeeJet Orpjet classifications below may not match manufacturers spec sheets. The chart below adjusts the Orpjet classification to be representative of the Actual Nozzle Pressure																				
Tip Size	Gauge (kPa)	Nozzle (kPa)	Wilger				Hypro							TeeJet						
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.1 GPM #1	138	137	F												F				C	
	207	206	F											F	F				M	F
	276	275	VF											F	F				M	F
	345	343	VF											F	F				M	F
	414	412	VF											VF	VF				F	VF
	483	481	VF																F	
0.15 GPM #1.5	138	137	F											F					C	
	207	205	F	M	C	VC							F	F		M		F	M	F
	276	273	F	M	C	C							F	F		F		F	M	F
	345	342	VF	M	C	C							F	F		F		F	M	F
	414	410	VF	M	C	C							F	F		F		F	F	F
	483	478	VF	F	M	C													F	
0.2 GPM #2	138	136	F					M	M	F	M		C	M	F				VC	
	207	203	F	C	C	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	276	271	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	M	M	F
	345	339	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	F	M	F
	414	407	F	M	C	C		M	M	F	F	F	M	F	F	M	VF	F	M	F
	483	475	VF	M	C	C		F	M	F	F		M						F	
0.25 GPM #2.5	138	134	M					M	M	M			VC	M	M				VC	
	207	202	M	C	VC	XC		M	M	F			C	M	F				C	
	276	269	M	C	C	VC		M	M	F			C	F	F				M	
	345	336	F	M	C	VC		M	M	F			M	F	F				M	
	414	403	F	M	C	VC		M	M	F			M	F	F				M	
	483	470	F	M	C	C		F	M	F			M						F	
0.3 GPM #3	138	133	M					M	C	M	M		VC	M	M				VC	
	207	199	M	C	VC	XC		M	C	F	M	F	C	M	F	C	F	M	C	F
	276	266	F	C	VC	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	345	332	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	414	399	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	483	465	F	C	C	VC		M	M	F	F		M						M	
0.4 GPM #4	138	129	C					C	C	M	M		VC	M	M				VC	
	207	194	C	C	VC	XC		C	C	M	M	M	C	M	M	C	F	C	C	M
	276	259	M	C	VC	XC		C	M	F	F	F	C	M	M	M	F	C	C	M
	345	323	M	C	C	VC	XC		M	M	F	F	F	M	F	F	M	F	C	F
	414	388	M	C	C	VC		M	M	F	F	F	M	F	F	M	F	M	M	F
	483	452	M	C	C	VC		M	M	F	F		M						M	
0.5 GPM #5	138	125	C					C	C	M	C		VC	M	M				VC	
	207	187	C	VC	XC	XC		C	C	M	M	M	C	M	M	C	M		VC	M
	276	250	M	C	XC	XC		C	C	F	F	F	C	M	M	C	M		C	M
	345	312	M	C	C	XC	XC		M	M	F	F	F	C	M	M	M	F	C	F
	414	375	M	C	C	VC	XC		M	M	F	F	F	C	F	F	M	F	C	F
	483	437	M	C	C	VC	XC		M	M	F	F		M					M	

Droplet Classification Table ASABE S-572.1

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

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

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

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

Install the Nozzle Harnesses and Smart Drivers

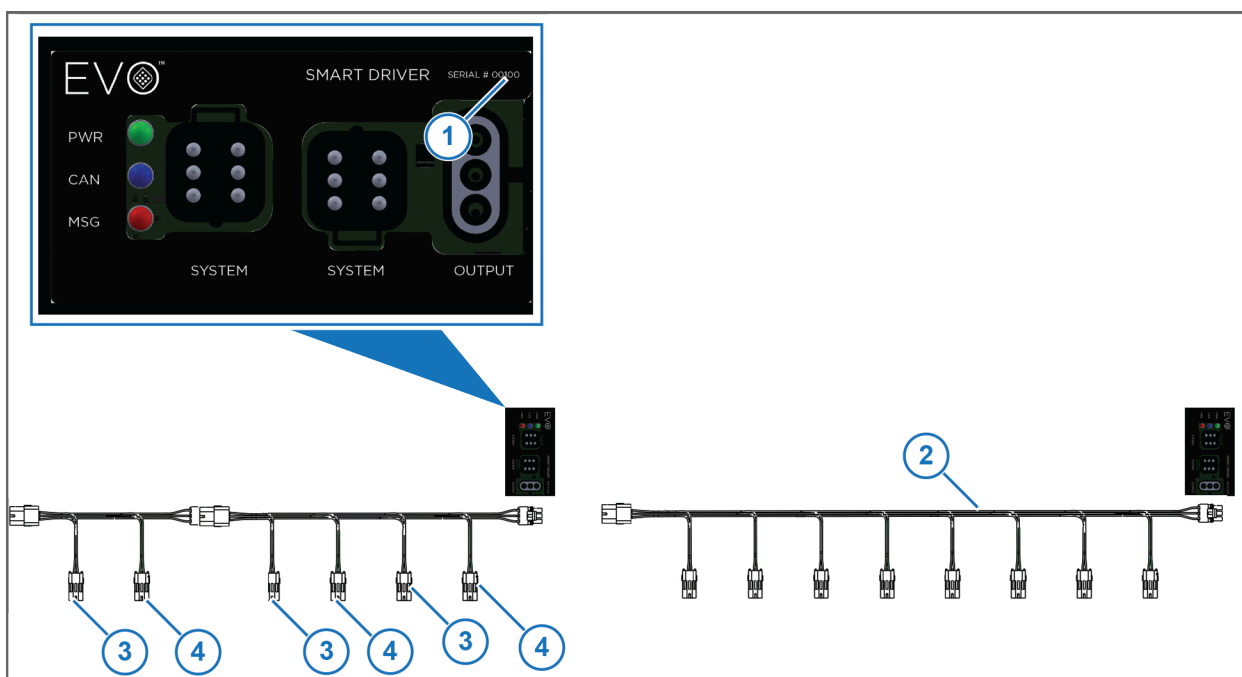


Fig. 6:

Each section box has a smart driver module with a nozzle harness and a CAN bus extension harness already connected.

1. Make sure that the smart driver modules are 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. Disconnect the CAN bus extension harness from the smart driver module.

You will route and install this harness later in the installation.

3. Route the nozzle harnesses (2) 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.

4. Connect the 2-pin connectors on the nozzle harness to the nozzles along the boom.

The nozzle harness connectors must alternate in a pattern of white/red (3), green/red (4), white/red, green/red, etc. from the left-most nozzle to the right-most nozzle.

Note: The use of a nozzle alternator harness (PN 116200-013) may be necessary to keep the alternating nozzle pattern.

If a nozzle alternator harness is necessary, install between the smart driver and the nozzle harness.

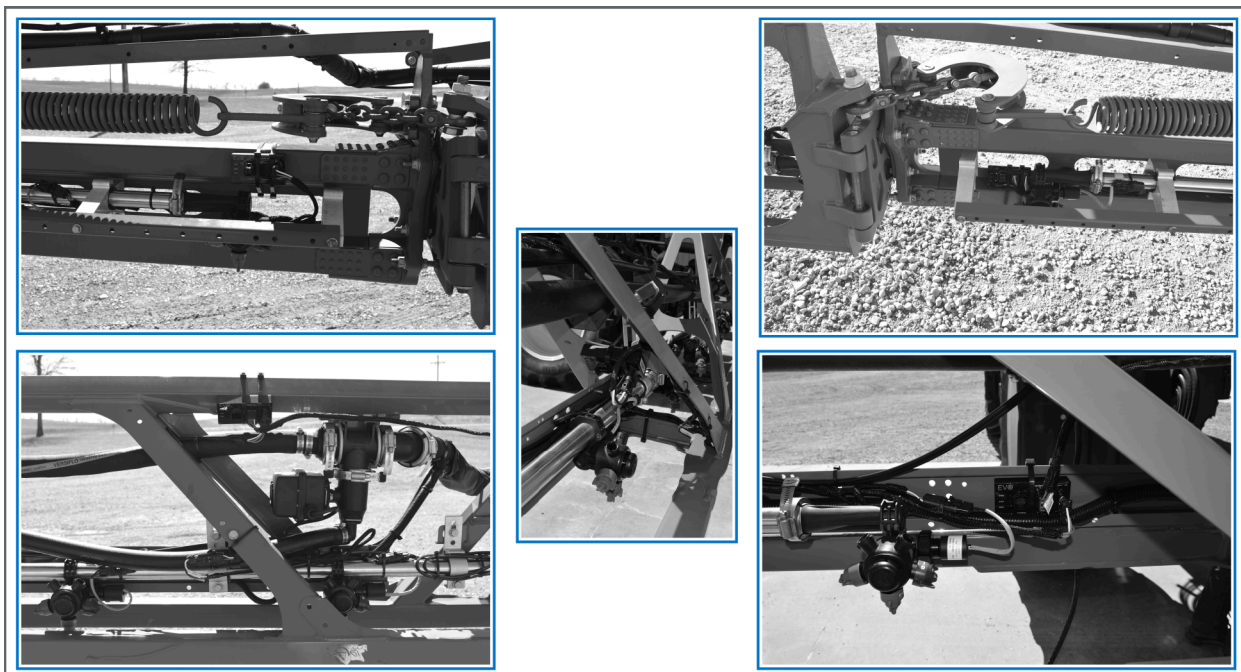


Fig. 7:

- 5.** Use cable ties to attach the smart driver and the nozzle harnesses to the machine.
Make sure that you can easily see the LEDs on the smart driver when you attach the smart driver modules to the machine. Shown are a few options for mounting the smart driver modules.

Install the CAN bus Extension Harness

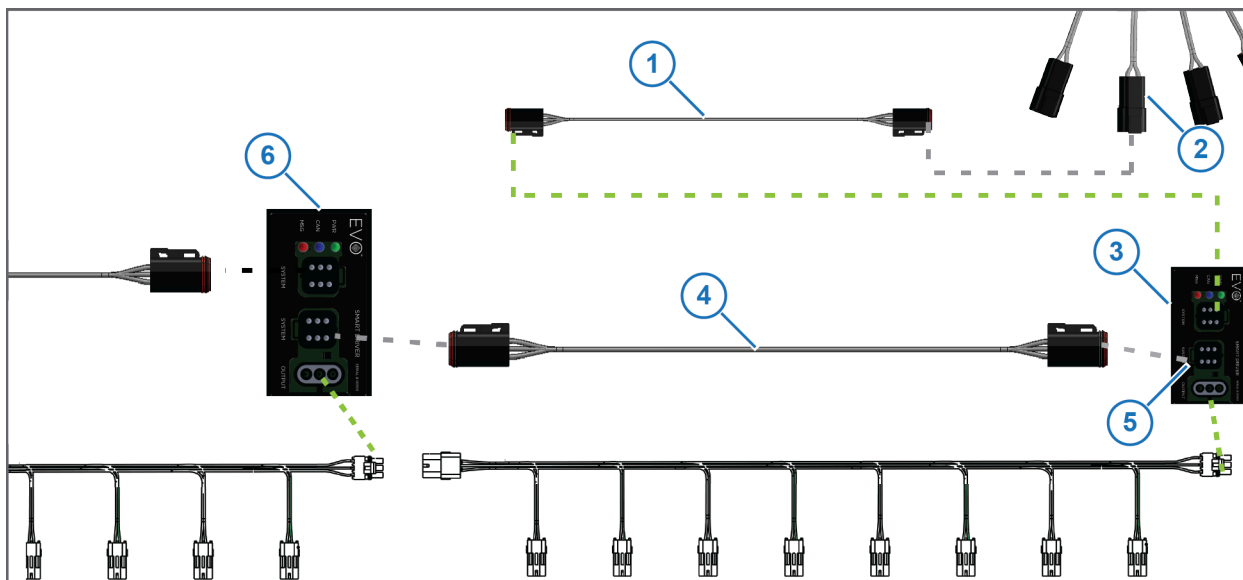


Fig. 8:

1. Connect the CAN bus extension harness (1), of the correct length, to the left boom/left truck connector (2) on the power to CAN harness.
2. Connect the other end of the CAN bus harness to the smart driver module (3) that is just left of the center of the machine.
3. Connect another CAN bus harness (4), of the correct length, to the other port (5) on the smart driver that is just left of the center of the machine.
4. Route the CAN bus harness to the next smart driver (6) to the left.
5. Connect the other end of the harness to the next smart driver.
6. Continue installing CAN bus harnesses, of the correct length, until you get to the last smart driver on the left of the machine.

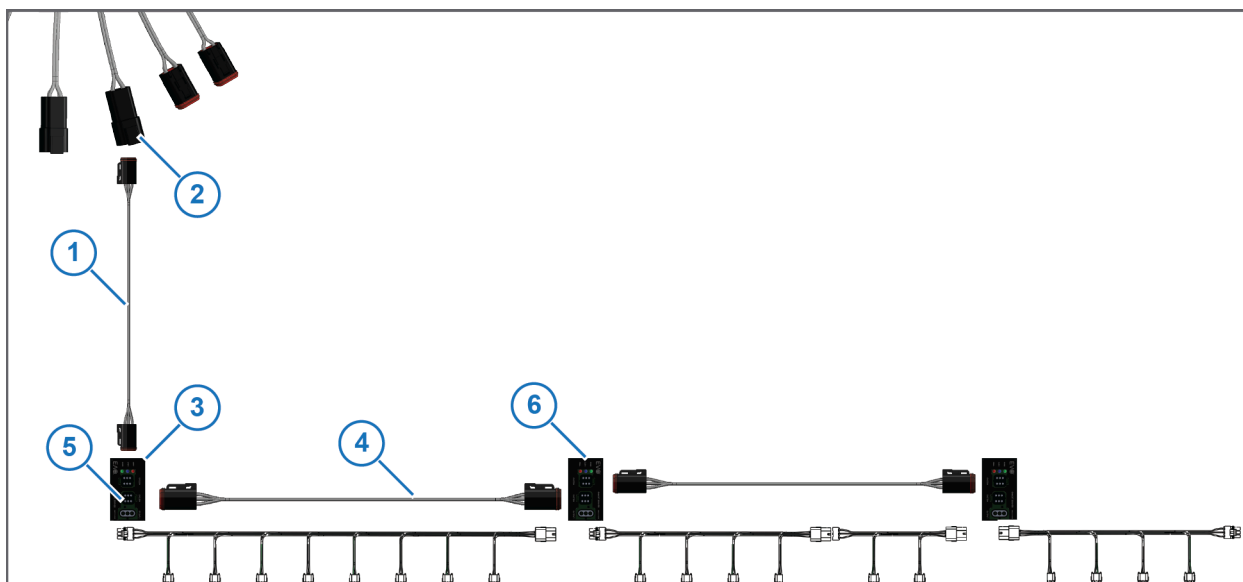


Fig. 9:

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 harness.
8. Connect the other end of the CAN bus harness to the smart driver module (3) that is just right of the center of the machine.
9. Connect another CAN bus harness (4), of the correct length, to the other port (5) on the smart driver that is just right of the center 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 Power Harness

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

Install the Power to CAN Harness

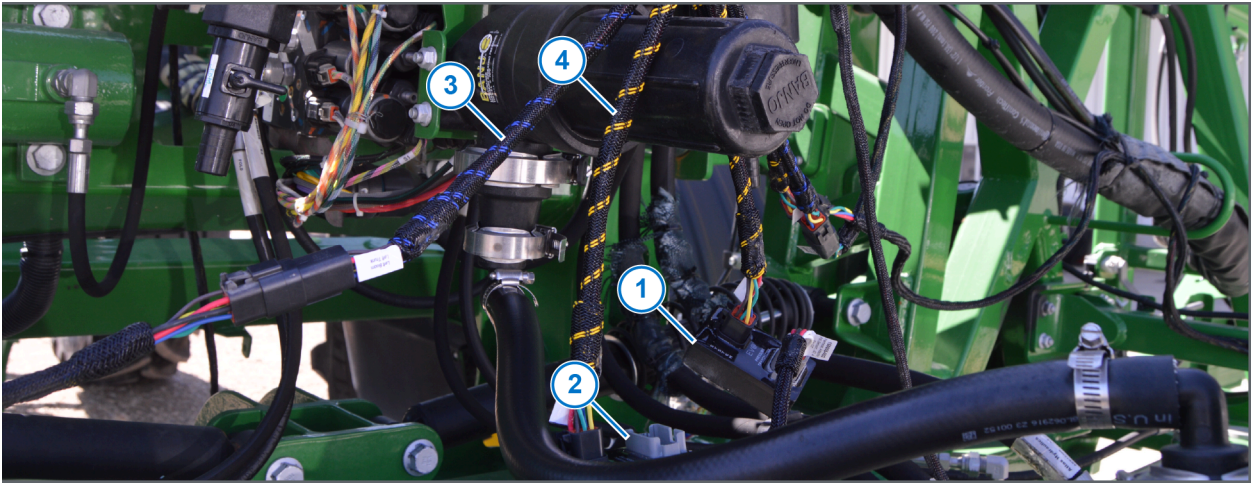


Fig. 10:

The 2-trunk power to CAN harness has these modules attached:

- (1) Pressure Transmitter Module
- (2) Boom Signal Module

The 3-trunk power to CAN harness has these modules attached:

- Pressure Transmitter Module or PSI NAV Commander Module
- Boom Signal Module
- Pump Control Module
- GPS Transmitter Module

The connectors for the left side of the machine have a blue strip (3) in the braiding. The connectors for the right side of the machine have a yellow strip (4) in the braiding. If using the 3-trunk power to CAN harness, the center section of the harness is all black braiding.

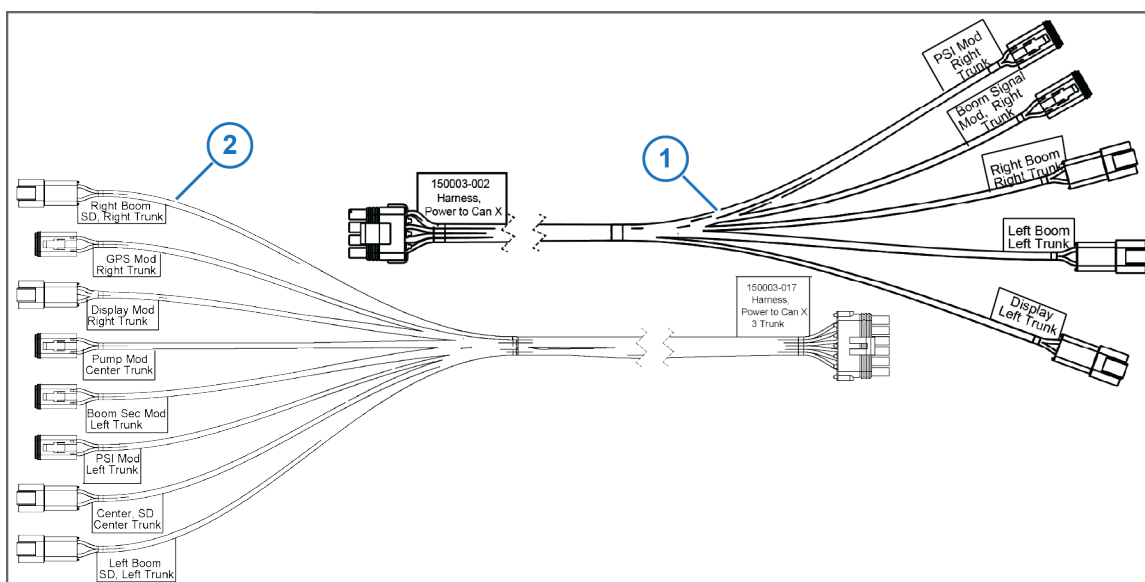


Fig. 11:

1. Install the power to CAN harness at the center of the machine.

- (1) Power to CAN Harness, 2 Trunk
- (2) Power to CAN Harness, 3 Trunk

The power to CAN harness provides power to the system by connecting to the system modules, depending on which harness the modules may be different:

- Smart Drivers for left, right, and center booms
- GPS Transmitter Module
- Cab Box Display
- Pump Module
- PSI NAV Commander Module
- Boom Signal Transmitter Module
- Pressure Transmitter Module

2. Use cable ties to attach the harness to the machine.

Install the Pump Control Module

If your system has a pump control module, you must have a three-trunk power to CAN harness and the correct power cable. Along with the pump module, you need:

With the pump control module, you can also use the PSI NAV commander module, if necessary. See your CapstanAG representative for more information.

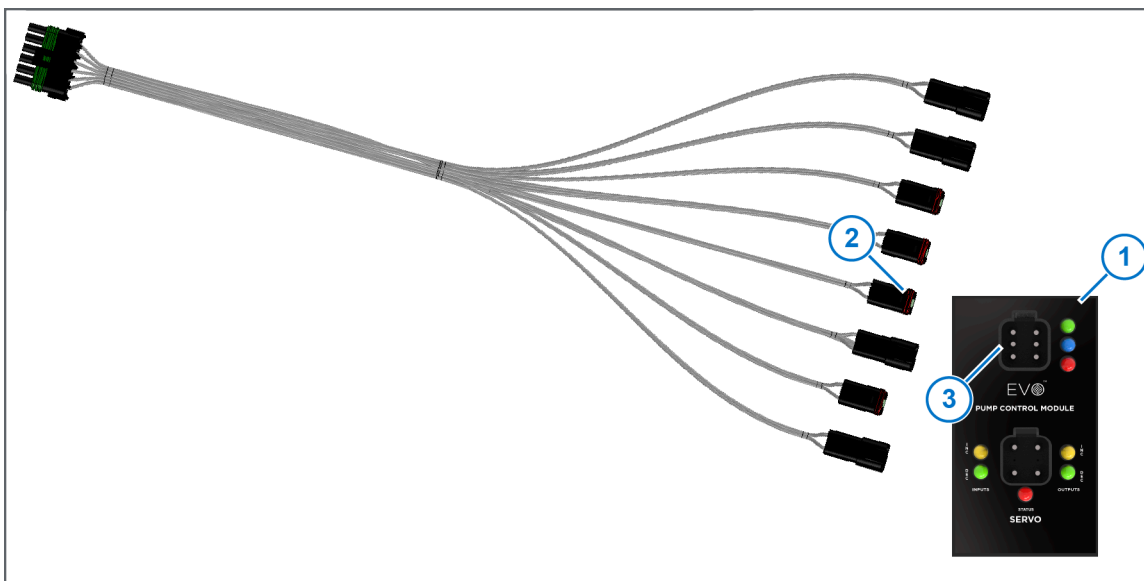


Fig. 12:

1. Install the pump control module (1) to the center of the machine.
Use cable ties to attach the module to the machine.
2. Connect the pump mod connector (2) on the power to CAN harness to the port (3) on the pump control module.

Install the Pump Control Harness

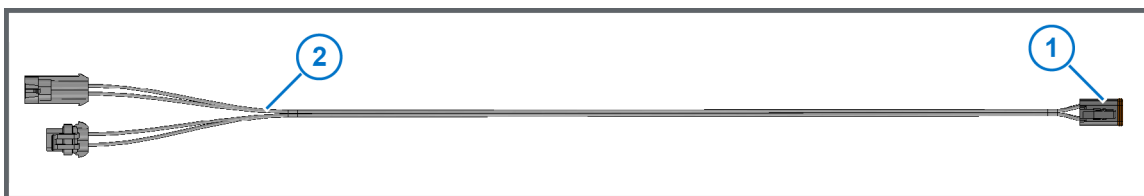


Fig. 13:

1. Install one end (1) of the pump control harness to the pump control module.
2. Route the harness to the machine control valve.
3. Connect the other end (2) of the pump control harness between the machine control valve and the existing harness.

Install the Pressure Transmitter Module

Note: If your system has a Pump Control Module and PSI NAV Commander Module, the pressure transmitter module is not used.

If your system does not have a pressure transmitter, go to install the PSI NAV Commander Module.

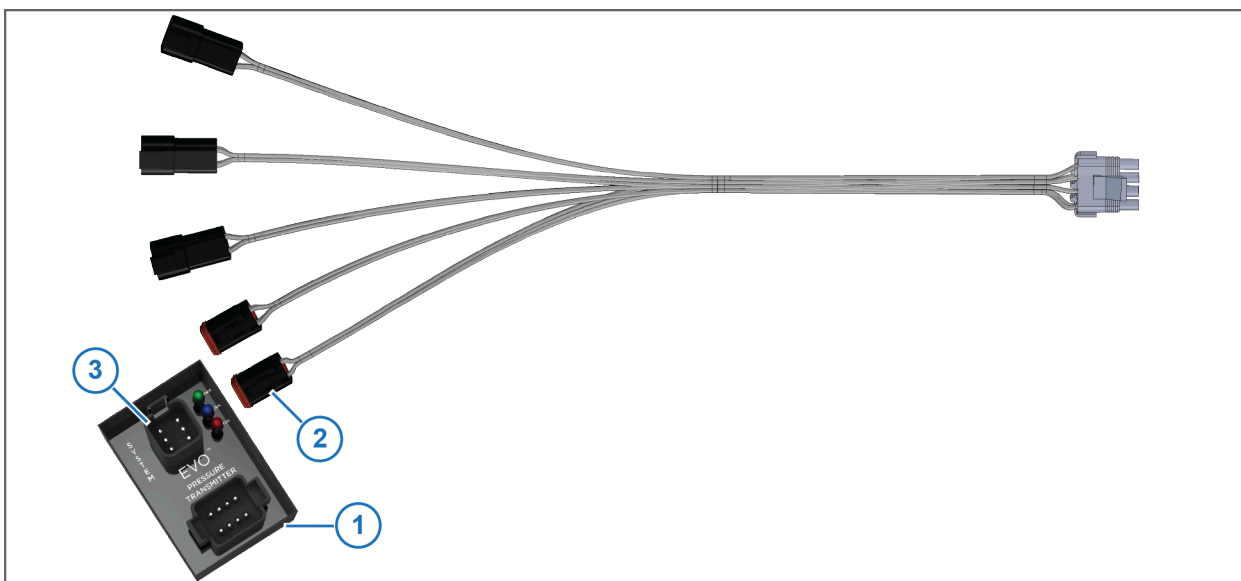


Fig. 14:

1. Install the pressure transmitter module (1) to the center of the machine.
Use cable ties to attach the module to the machine.
2. Connect the pressure connector (2) on the power to CAN harness to the port (3) on the pressure transmitter module.

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.

Important: If a PSI NAV Commander module is used, you must use the existing system pressure sensor. Do not use a CapstanAG pressure sensor.

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 Pressure Sensor Adapter Harness

1. Connect one end of the pressure sensor adapter harness to the pressure transmitter module or PSI NAV Commander module.
2. Route the harness to the pressure sensor.
3. Disconnect any existing harness from the pressure sensor.
4. Connect the other end of the harness to the pressure sensor.
5. If using the existing pressure sensor, connect the other end of the harness to the existing pressure sensor harness.

Install PSI NAV Commander Module

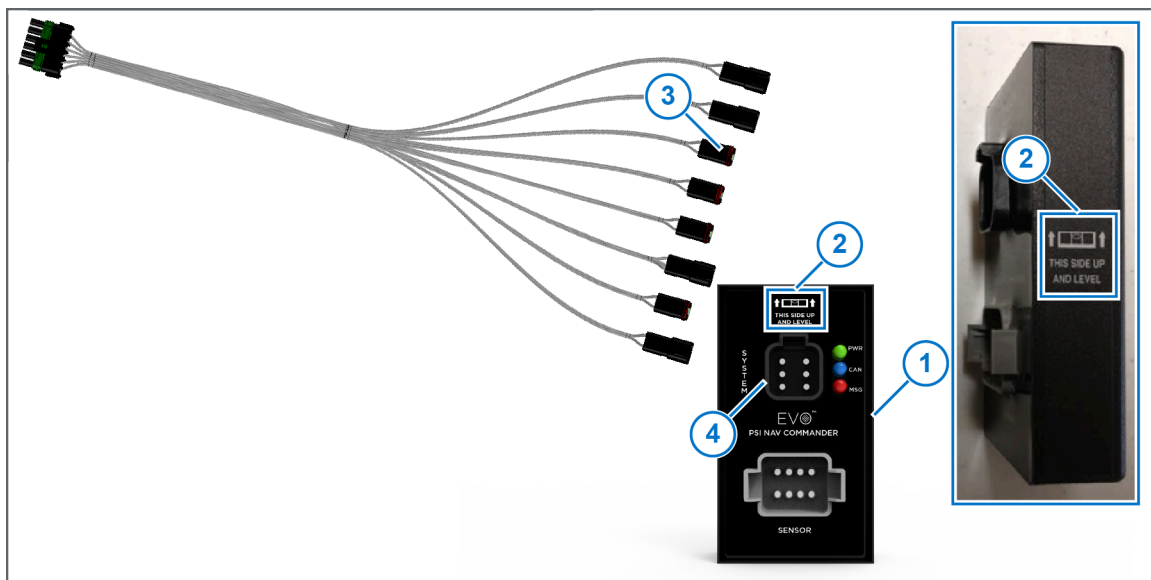


Fig. 15:

1. Install the PSI NAV Commander module (1) to the center of the machine.

The module must be oriented correctly when mounting, with the notes (2) at the top and side of the module. The mounting location can be anywhere the module will fit, as long as it is oriented correctly.

Use cable ties to attach the module to the machine.

2. Connect the PSI Mod connector (3) on the power to CAN harness to the port (4) on the PSI NAV Commander module.

Install the PSI Commander Harness

1. Connect one end of the PSI commander harness to the PSI NAV commander module.
2. Route the PSI commander harness to the pressure sensor.
3. Install the other end of the PSI commander harness between the pressure sensor and existing harness.

Install the Boom Signal Transmitter Module

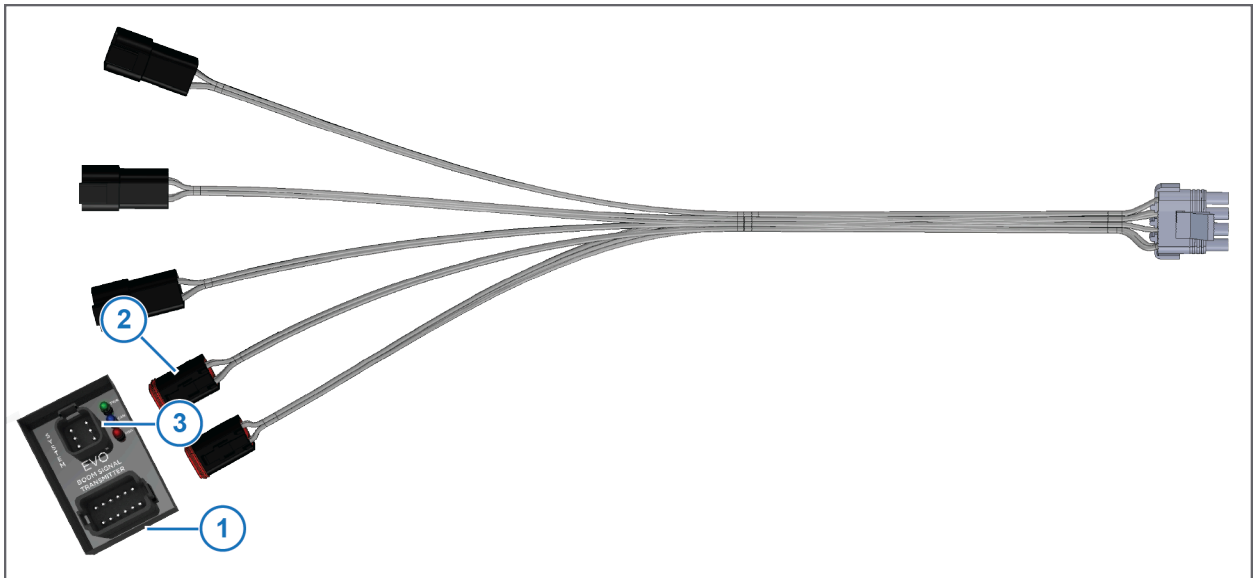


Fig. 16:

1. Mount the boom signal transmitter module (1) at the center of the machine.
Use cable ties to attach the module to the machine.
2. Connect the boom sec module connector (2) on the power to CAN harness to the port (3) on the boom signal transmitter module.

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.

Install the GPS Transmitter Module

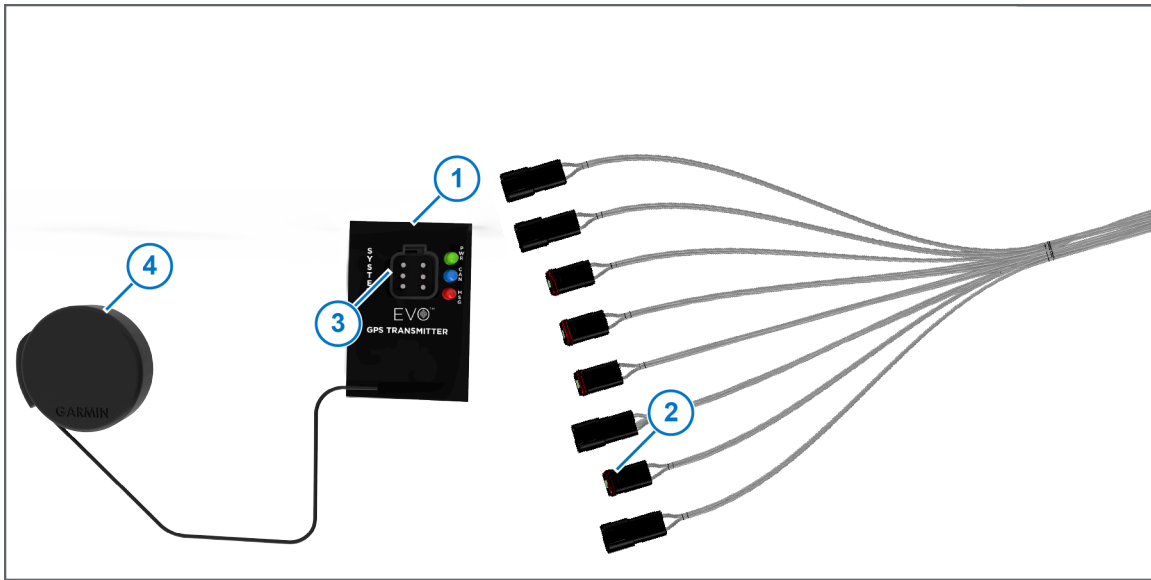


Fig. 17:

1. Install the GPS module (1) to the center of the machine.
Use cable ties to attach the module to the machine.
2. Connect the GPS Mod connector (2) on the power to CAN harness to the port (3) on the GPS module.
3. Route the cable attached to the GPS receiver (4) to where the receiver will have a clear line of sight to the sky and that nothing is above the receiver.

Install the CAN Terminator—Two-trunk Power to CAN Harness

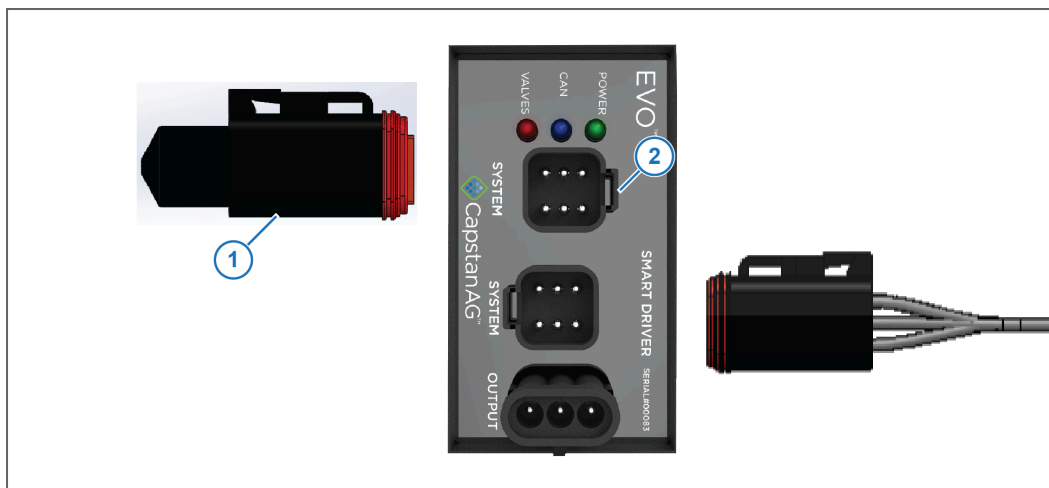


Fig. 18:

1. On the leftmost smart driver, install a CAN terminator (1) into the open CAN port (2).
2. On the rightmost smart driver, install a CAN terminator into the open CAN port.

Install the CAN Terminator—Three-trunk Power to CAN Harness

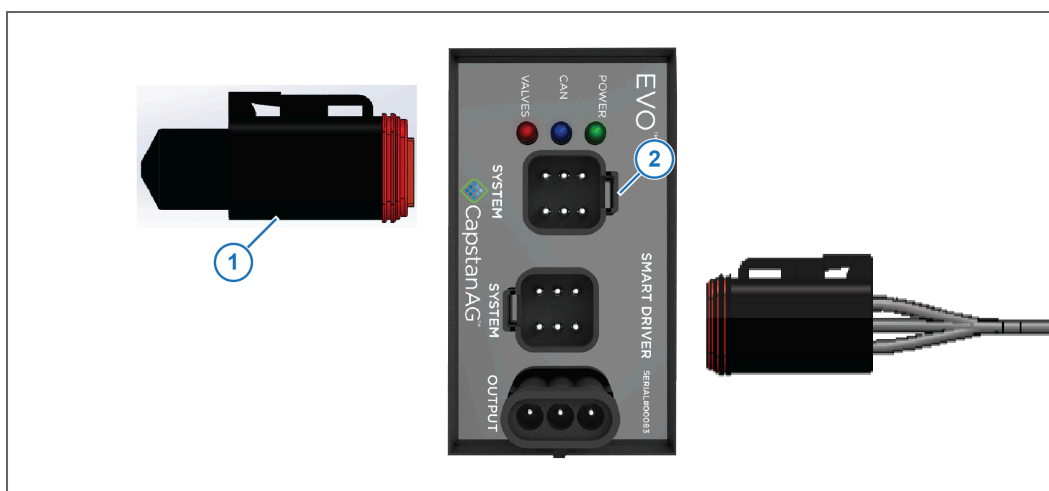


Fig. 19:

1. On the leftmost smart driver, install a CAN terminator (1) into the open CAN port (2).
2. On the rightmost smart driver, install a CAN terminator into the open CAN port.
3. On the center trunk smart driver, install a CAN terminator into the open CAN port

Install the Cab Display

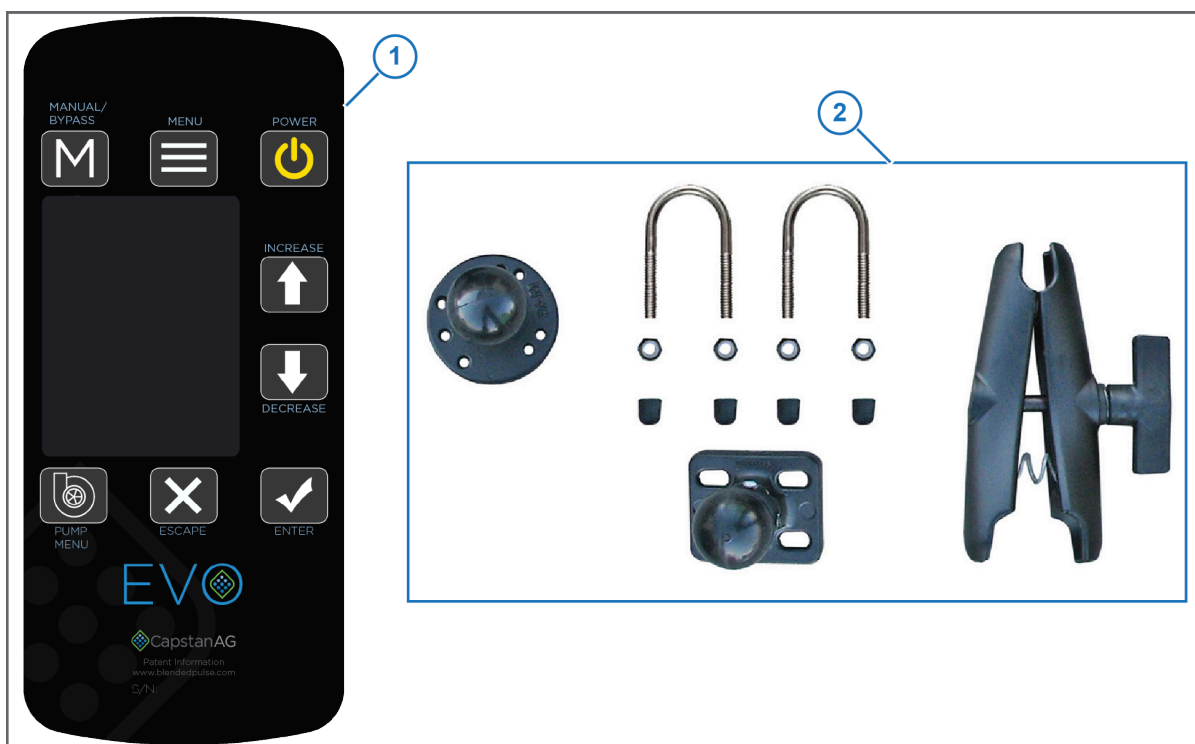


Fig. 20:

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

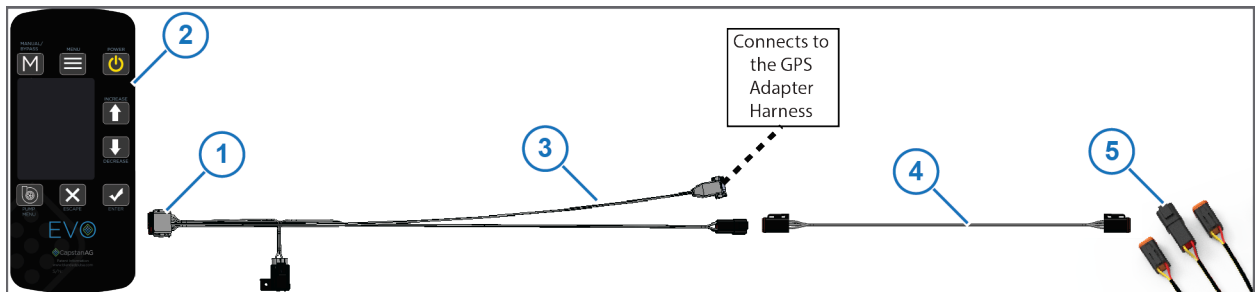


Fig. 21:

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.
If the GPS source is a CapstanAG GPS transmitter module, see install the GPS transmitter module for more information.
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 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 harness.

Chapter 5: Setup

Cab Display

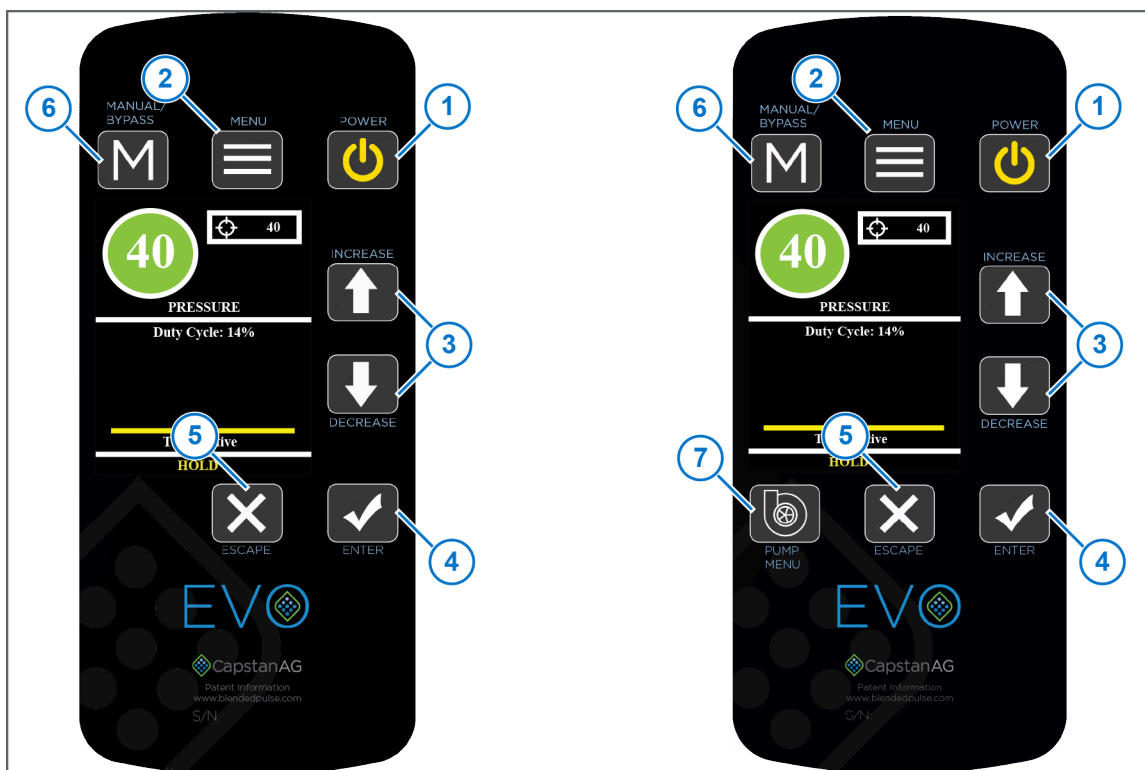


Fig. 22:

The original cab display has seven buttons to navigate and control the system. The updated cab display has eight 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 or change back to automatic mode.
- (7) **PUMP MENU** Button—Press to see the pump menu information.

Start the Cab Display



Fig. 23:

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.

Change the Units of Measure

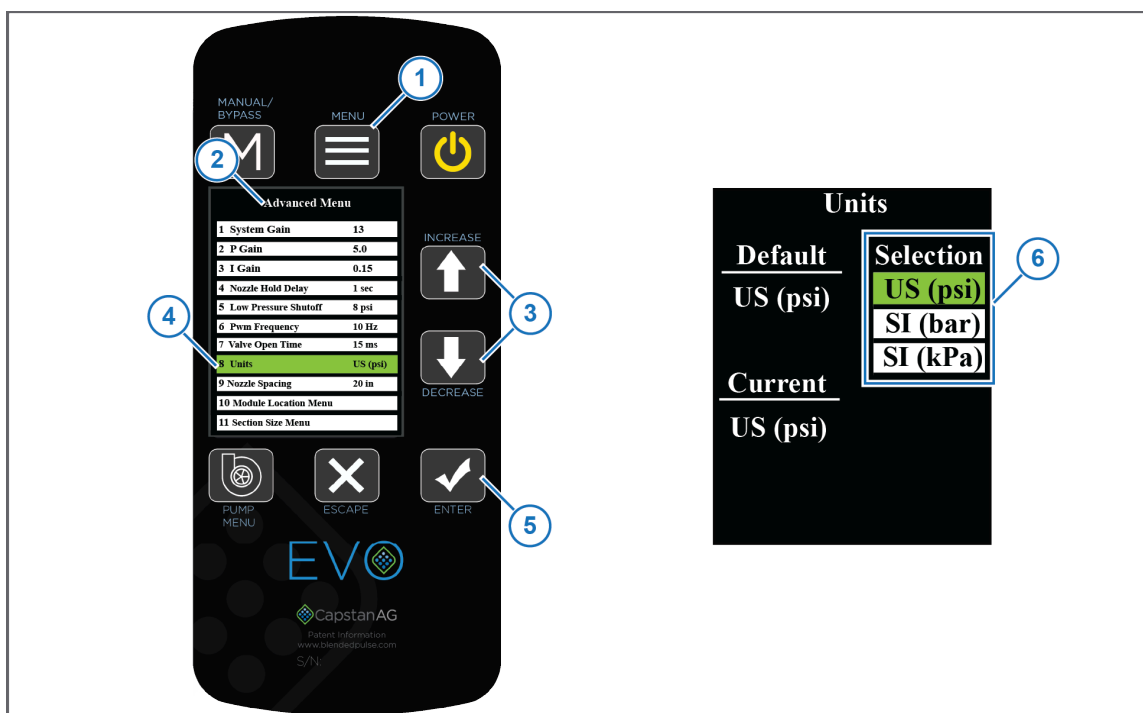


Fig. 24:

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

Module LED Identification

Smart Driver Modules

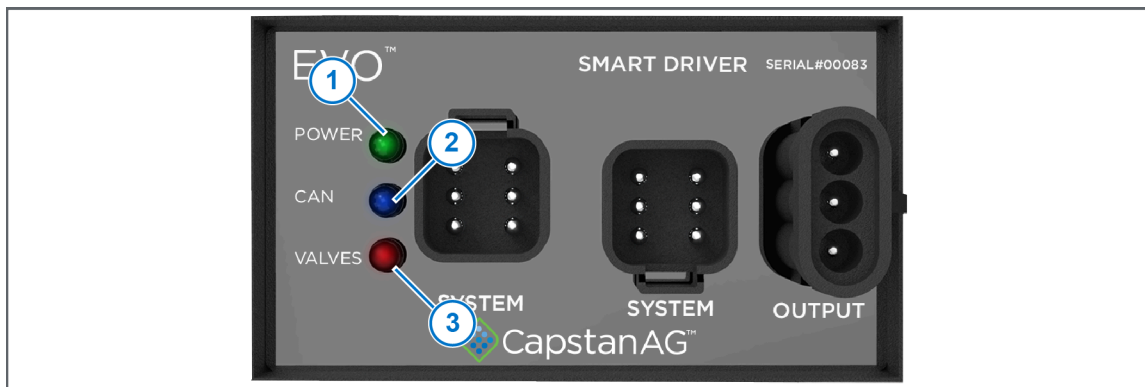


Fig. 25:

The system will have several smart driver modules. Each module has 3 LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present Blinking or Solid Illumination—5 Hz—The smart drivers are driving the valves (constant=100%)

Pressure Transmitter Module

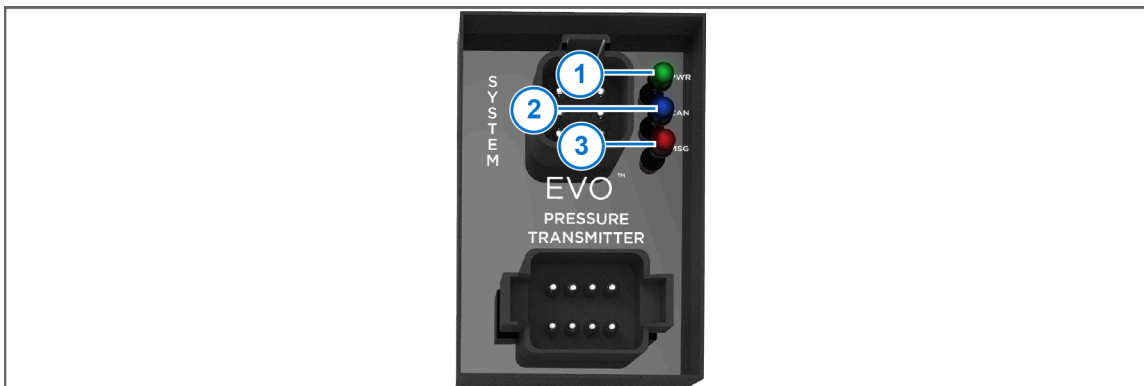


Fig. 26:

If the system does not have a PSI NAV Commander module, then the system will have one pressure transmitter module. Each module has 3 LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present

Boom Signal Transmitter Module

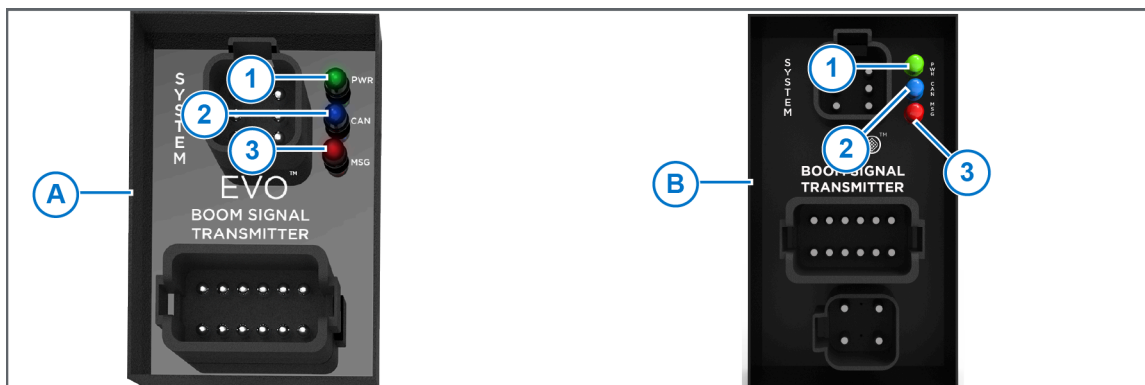


Fig. 27:

The system will have one boom signal transmitter module. There are two module options:

- (A) Boom Transmitter Module A—12-section capability
- (B) Boom Transmitter Module B—16-section capability

Both modules have the same 3 LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present

Pump Control Module

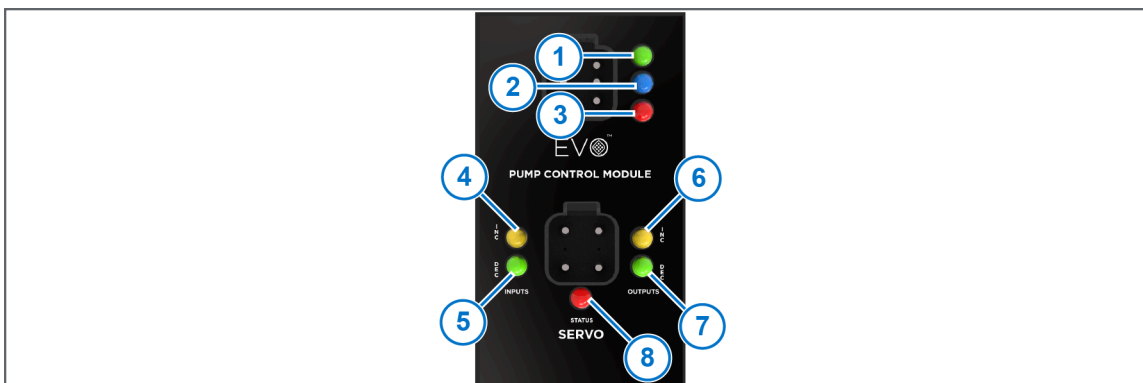


Fig. 28:

The system may have one pump control module if the system is not operating with reactive pressure control. Each module has these LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present
(4)	Yellow	INPUTS—INC—Increase in duty cycle—Switch is pressed, and the duty cycle is increasing/the intensity of illumination will change based on duty cycle—0=dim illumination/100=bright illumination.
(5)	Green	INPUTS—DEC—Decrease in duty cycle—Solid Illumination—Switch is pressed, and the duty cycle is decreasing/the intensity of illumination will change based on duty cycle—0=dim illumination/100=bright illumination.
(6)	Yellow	OUTPUTS—INC—Increase in duty cycle—Switch is pressed, and the duty cycle is increasing/the intensity of illumination will change based on duty cycle—0=dim illumination/100=bright illumination.
(7)	Green	OUTPUTS—DEC—Decrease in duty cycle—Solid Illumination—Switch is pressed, and the duty cycle is decreasing/the intensity of illumination will change based on duty cycle—0=dim illumination/100=bright illumination.
(8)	Multiple Color LED	STATUS— <ul style="list-style-type: none"> Green (constant)—Normal Operation Green (flashing)—Emergency Stop. Module stopped receiving valid messages Solution: Disable the pump control or use the CAN bypass mode. <ul style="list-style-type: none"> Red (constant)—Bypass Mode Red (flashing)—Pump module has not received a valid message

GPS Transmitter Module

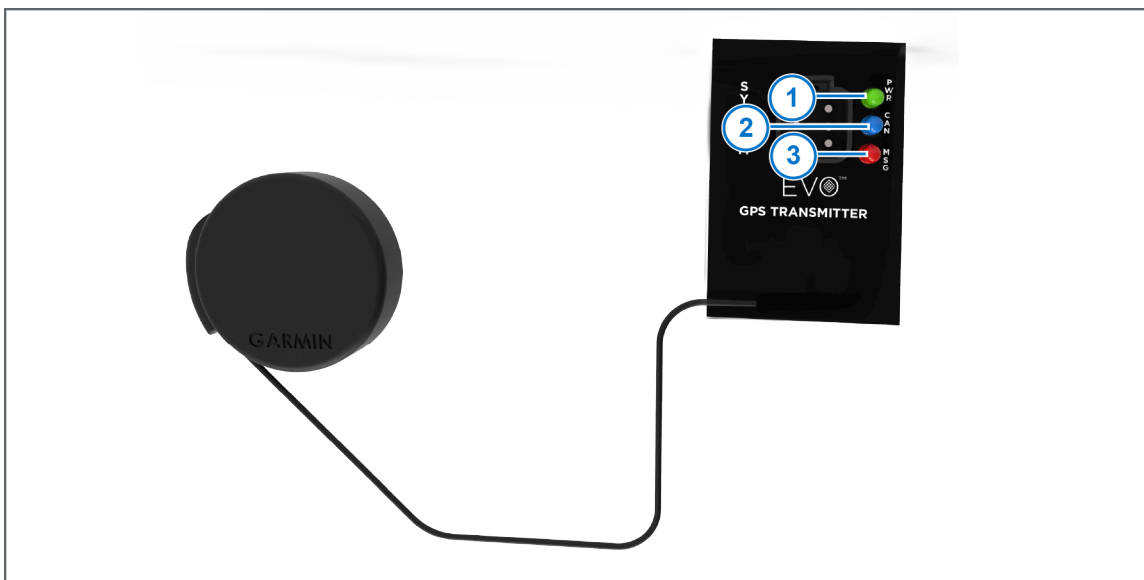


Fig. 29:

The system may have one GPS module. The GPS module is not used if the system uses a GPS y-adapter harness to pull in NMEA GPS information.

Each GPS module has 3 LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present

PSI NAV Commander Module

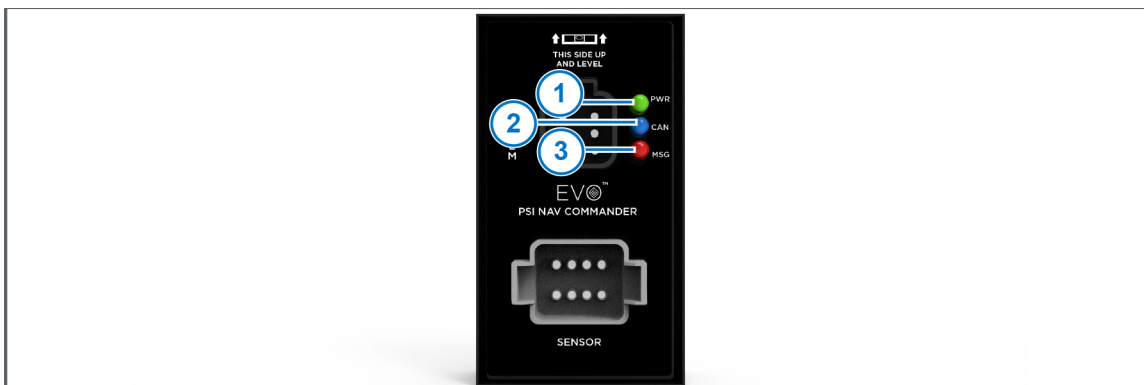


Fig. 30:

If the system does not have a pressure transmitter module, then the system will have one PSI NAV Commander module. Each module has 3 LEDs:

Callout	Color	Description
(1)	Green	PWR—Power—Solid Illumination—Correct Operation at 12 V
(2)	Blue	CAN—CAN Communication—Blinking Illumination—5 Hz Good CAN Communication
(3)	Red	MSG—Feedback Information—5 Hz Feedback Information is Present

Do the Odd/Even Test

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

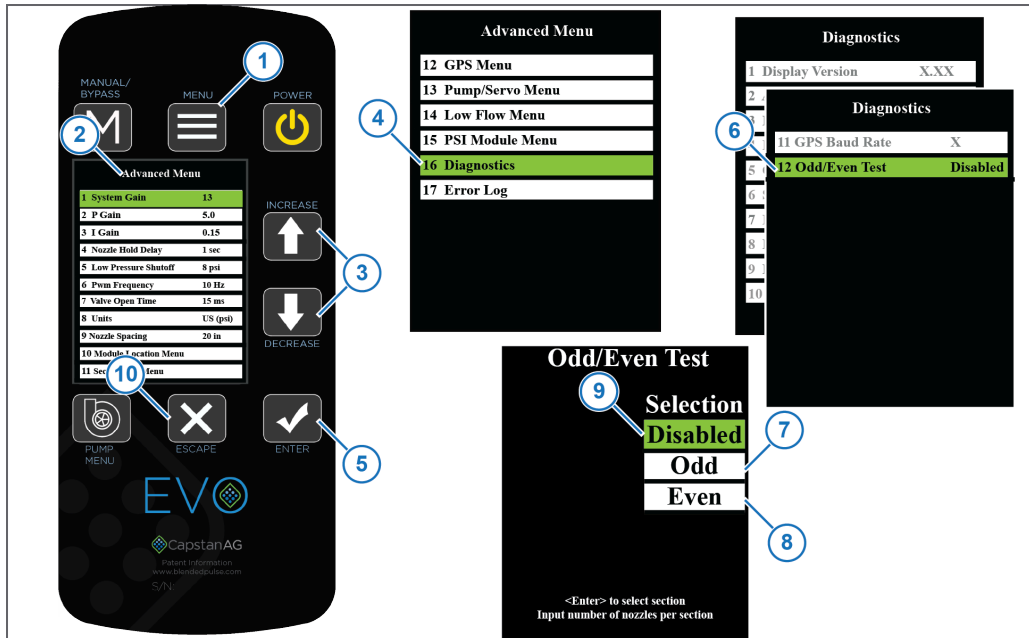


Fig. 31:

1. Press the **MENU** button (1) twice to go to the **Advanced Menu** (2).
2. Use the **UP** or **DOWN** arrow buttons (3) to select **Diagnostics** (4) from the **Advanced Menu**.
3. Press the **ENTER** button (5).
4. Use the **UP** or **DOWN** arrow buttons to select **Odd/Even Test** (6) from the **Diagnostics** screen.
5. Press the **ENTER** button.
6. Use the **UP** or **DOWN** arrow buttons to select **Odd** (7) from the Selection list on the **Odd/Even Test** screen.
7. Press the **ENTER** button.
8. Make sure that all of the odd nozzles are operating.
Note: If two adjacent nozzles are pulsing, make sure that a nozzle alternator harness is not necessary.
9. Use the **UP** or **DOWN** arrow buttons to select **Even** (8) from the Selection list on the **Odd/Even Test** screen.
10. Press the **ENTER** button.
11. Make sure that all of the even nozzles are operating.
Note: If two adjacent nozzles are pulsing, make sure that a nozzle alternator harness is not necessary.
12. Use the **UP** or **DOWN** arrow buttons to select **Disabled** (9) from the Selection list on the **Odd/Even Test** screen.
13. Press the **ESCAPE** button (10) to exit the **Odd/Even Test** screen.

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 6: Operation

Navigate to the Main System Menu



Fig. 32:

Press the **Menu** button (1) to enter the **Main Menu**.

The **Main Menu** screen (2) includes this information:

- Backlight
- Alarm Volume
- Turn Compensation
- Rate Sync
- Pressure Increment
- Advanced Menu

Main Menu

Backlight

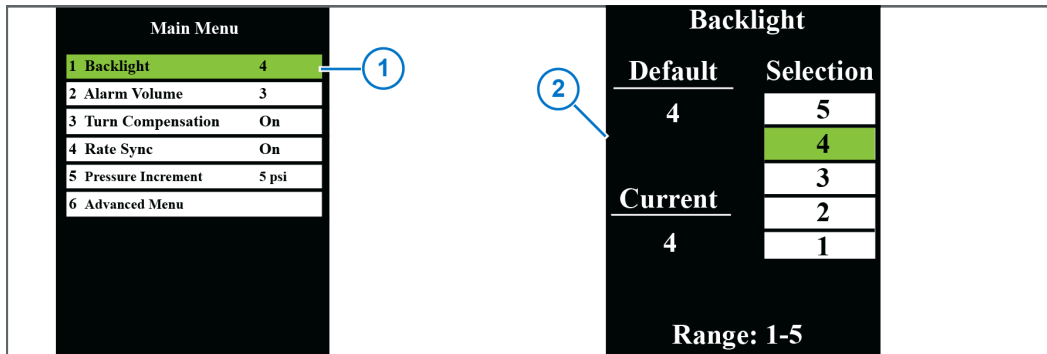


Fig. 33:

1. Use the arrow buttons to select the **Backlight** line (1).
2. Press the **ENTER** button to open the **Backlight** screen (2).

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

Larger numbers make the cab box display screen brighter for daytime use. Smaller numbers make the cab box display screen dimmer for night-time use. When selections 1 or 2 are active (low ambient light conditions), the keypad buttons become back-lit.

Range: 1 to 5 (Dimmest to Brightest)

Alarm Volume

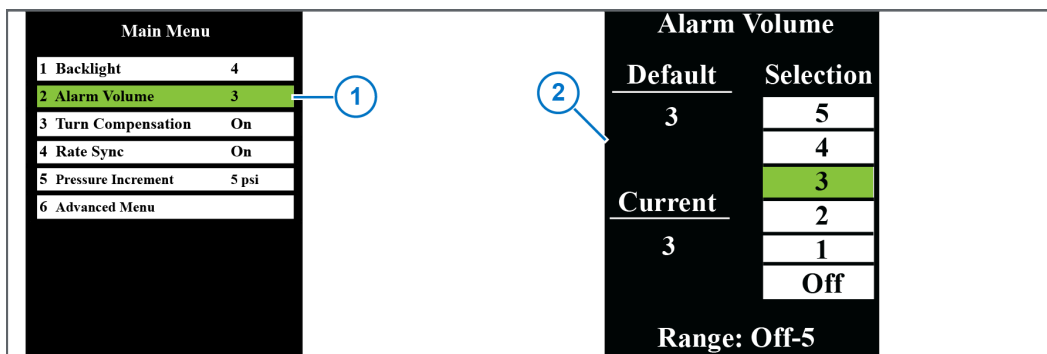


Fig. 34:

1. Use the arrow buttons to select the **Alarm Volume** line (1).
2. Press the **ENTER** button to open the **Alarm Volume** screen (2).

The **Alarm Volume** screen lets you change the volume level of the alarm. Larger numbers make the alarm louder for outdoor use. Smaller numbers soften the alarm for indoor use. To silence the alarm, select Off.

Range: Off to 5 (Quiet to Loudest)

Turn Compensation

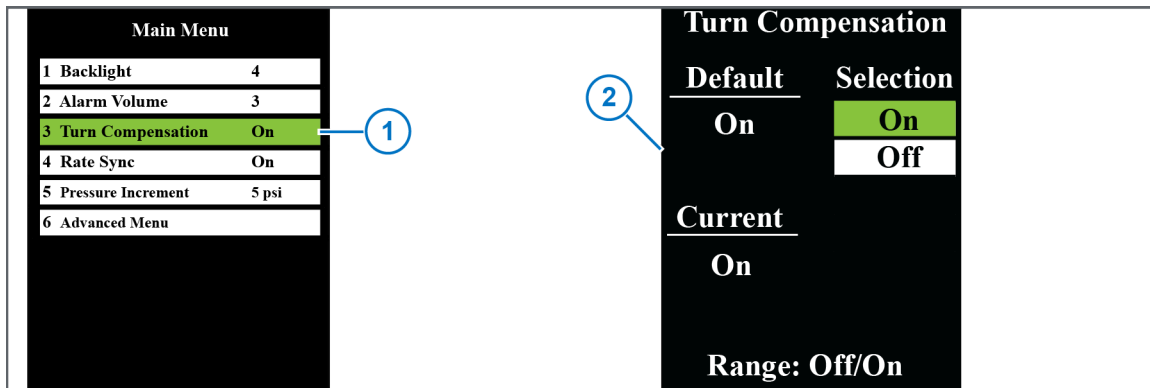


Fig. 35:

1. Use the arrow buttons to select the **Turn Compensation** line (1).
2. Press the **ENTER** button to open the **Turn Compensation** screen (2).

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

Range: Off/On

Rate Sync

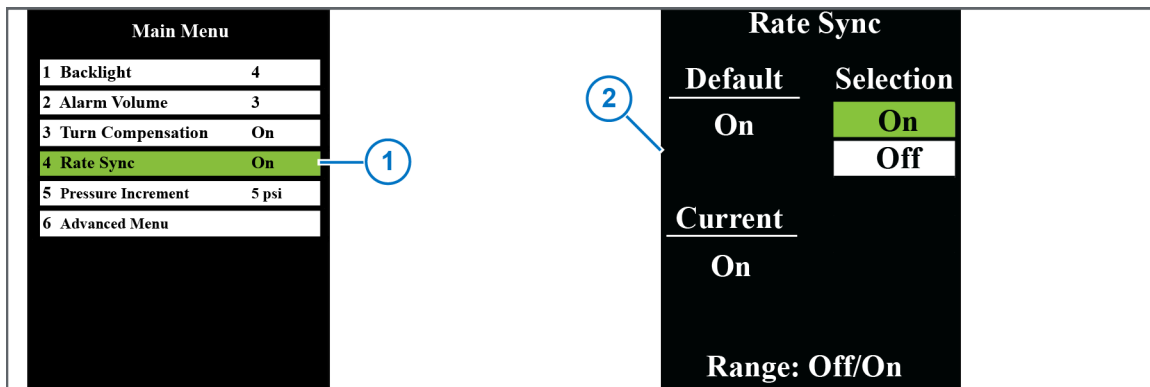


Fig. 36:

1. Use the arrow buttons to select the **Rate Sync** line (1).
2. Press the **ENTER** button to open the **Rate Sync** screen (2).

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

Range: On or Off

When the feature is used the minimum connection frequency is 5 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**.

Pressure Increment

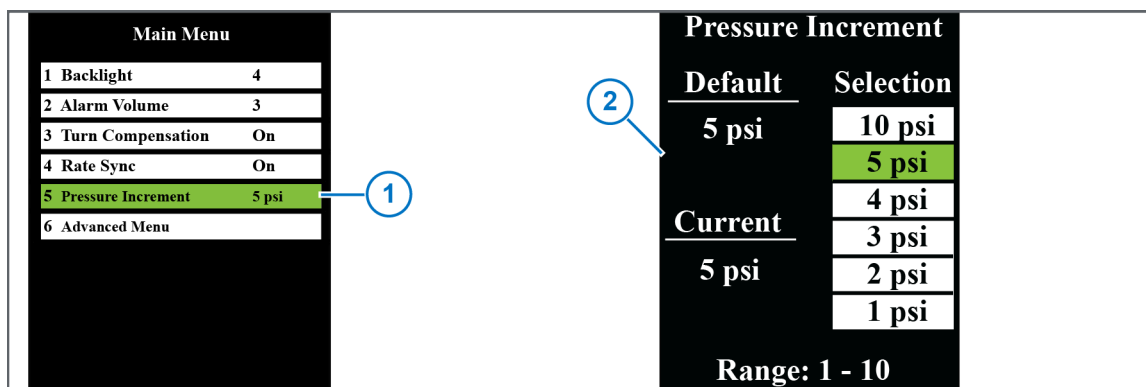


Fig. 37:

1. Use the arrow buttons to select the **Pressure Increment** line (1).
2. Press the **ENTER** button to open the **Pressure Increment** screen (2).

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

Range: 1 to 10

Navigate to the Advanced Menu

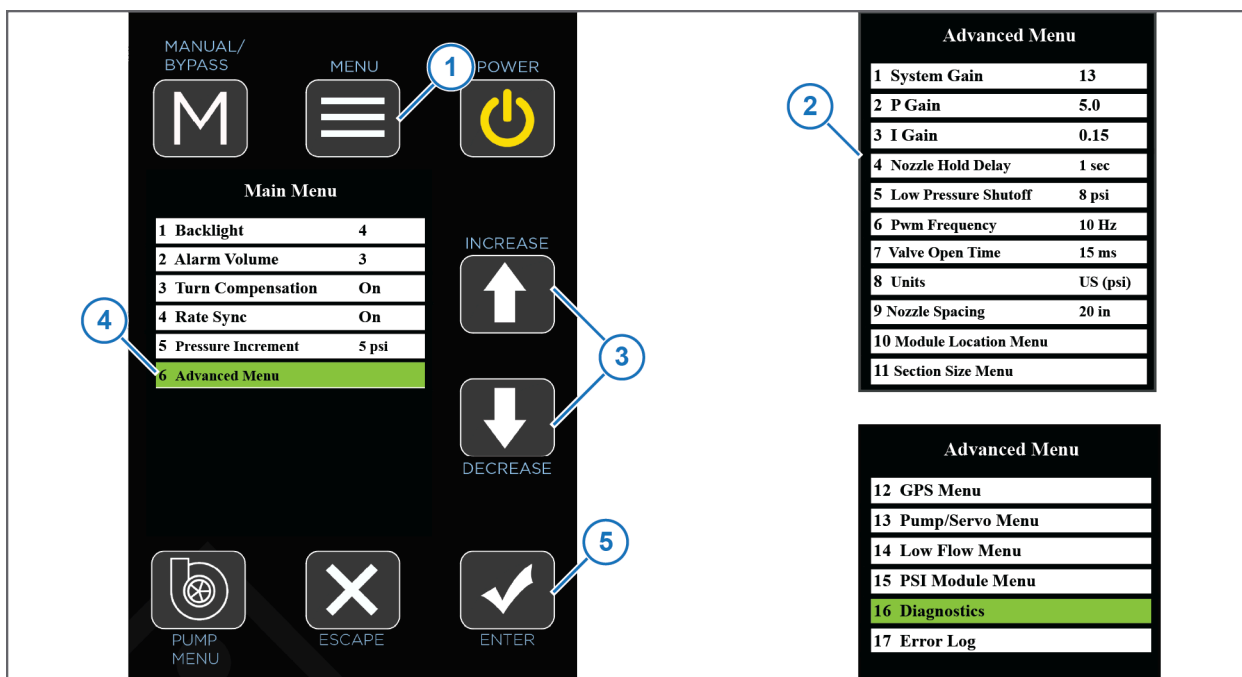


Fig. 38:

To open the **Advanced Menu** list:

1. Press the **MENU** button (1) twice to open the **Advanced Menu** (2).

OR

1. Press the **MENU** button (1)
2. Use the **INCREASE** or **DECREASE** buttons (3) to go to the **Advanced Menu** line (4).
3. Press the **ENTER** button (5).

The **Advanced Menu** (2) will show.

The **Advanced Menu** includes:

- System Gain
- P Gain
- I Gain
- Nozzle Hold Delay
- Low Pressure Shutoff
- Pwm Frequency
- Valve Open Time
- Units
- Nozzle Spacing
- Module Location Menu
- Section Size Menu
- GPS Menu
- Pump/Servo Menu
- Low Flow Menu
- PSI Module Menu
- Diagnostics
- Error Log

Advanced Menu

System Gain

Advanced Menu		System Gain		System Gain		System Gain	
1	System Gain	13		Default	Selection	Default	Selection
2	P Gain	5.0		12	13	12	6
3	I Gain	0.15			12		5
4	Run/Hold Delay	1 sec			11		4
5	Low Pressure Shutoff	8 psi		Current	10		3
6	Pwm Frequency	10 Hz		12	9	12	2
7	Valve Open Time	15 ms			8		Slow
8	Units	US (psi)			7		
9	Nozzle Spacing	20 in					
10	Module Location Menu						
11	Section Size Menu						
		Range: 1 - 20		Range: 1 - 20		Range: 1 - 20	

Fig. 39:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **System Gain** line (1).
2. Press the **ENTER** button to open the **System Gain** screen (2).

The **System Gain** screen 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 the 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.

The system gain number is the one most often used to tune sluggish or oscillating systems. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number.

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

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

P Gain

Advanced Menu		P Gain	
1 System Gain	13	Default	5.0
2 P Gain	5.0		
3 I Gain	0.15	Current	5.0
4 Nozzle Hold Delay	1 sec		
5 Low Pressure Shutoff	8 psi	Range: 2.0 - 8.5	Range: 2.0 - 8.5
6 Pwm Frequency	10 Hz		
7 Valve Open Time	15 ms	Range: 2.0 - 8.5	Range: 2.0 - 8.5
8 Units	US (psi)		
9 Nozzle Spacing	20 in	Range: 2.0 - 8.5	Range: 2.0 - 8.5
10 Module Location Menu			
11 Section Size Menu		Range: 2.0 - 8.5	Range: 2.0 - 8.5

Fig. 40:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **P Gain** line (1).
2. Press the **ENTER** button to open the **P Gain** screen (2).

The **P Gain** screen lets you change the value.

Range: 2.0 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.

The proportional gain causes the control system to respond faster when the errors are greater. The higher the number, the more sensitive the control system. To stabilize an oscillating system, use a lower number. To speed up a sluggish system, use a higher number.

I Gain

Advanced Menu		I Gain	
1 System Gain	13	Default	Selection
2 P Gain	5.0	0.15	0.35
3 I Gain	0.15		0.3
4 Nozzle Hold Delay	1 sec		0.25
5 Low Pressure Shutoff	8 psi	Current	0.2
6 Pwm Frequency	10 Hz	0.15	0.15
7 Valve Open Time	15 ms		0.1
8 Units	US (psi)		0.05
9 Nozzle Spacing	20 in	Range: 0.05 - 0.35	
10 Module Location Menu			
11 Section Size Menu			

Fig. 41:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **I Gain** line (1).
2. Press the **ENTER** button to open the **I Gain** screen (2).

The **I Gain** screen 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.

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

Nozzle Hold Delay



Fig. 42:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Nozzle Hold Delay** line (1).
2. Press the **ENTER** button to open the **Nozzle Hold Delay** screen (2).

The **Nozzle Hold Delay** screen 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 nozzle valve control changes.

Range: 0 to 6

When the boom is turned on, and the nozzle 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 nozzle valve control.

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

Low Pressure Shutoff

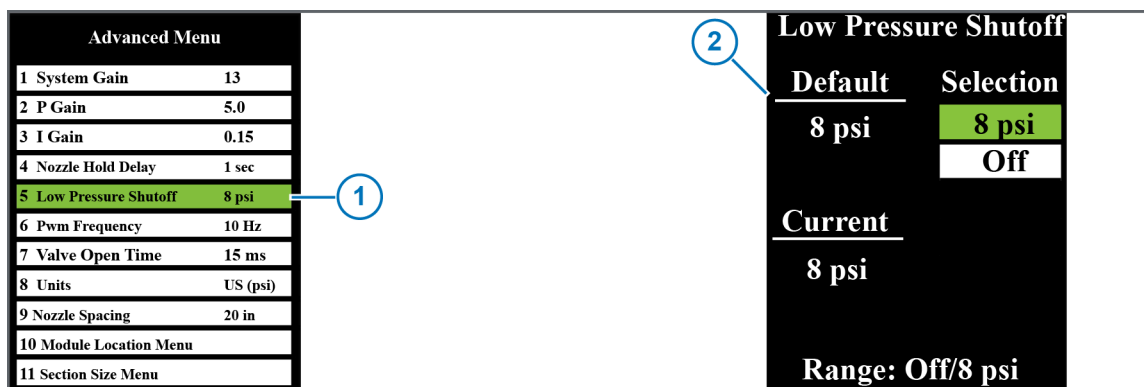


Fig. 43:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Low Pressure Shutoff** line (1).
2. Press the **ENTER** button to open the **Low Pressure Shutoff** screen (2).

The **Low Pressure Shutoff** screen 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 a 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

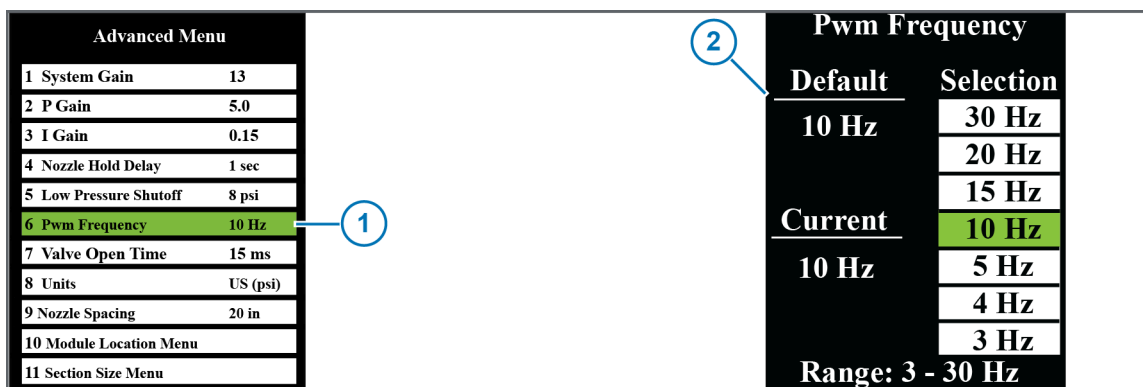


Fig. 44:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **PWM Frequency** line (1).
2. Press the **ENTER** button to open the **PWM Frequency** screen (2).

The **Pwm Frequency** screen lets you change the value.

Range: 3 to 30 Hz

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

Valve Open Time



Fig. 45:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Valve Open Time** line (1).
2. Press the **ENTER** button to open the **Valve Open Time** screen (2).

The **Valve Open Time** screen lets you change the value.

Range: 12 or 25 milliseconds

Select 15 ms when using 7-watt valves.

Select 20 ms when using 12-watt valves.

Units

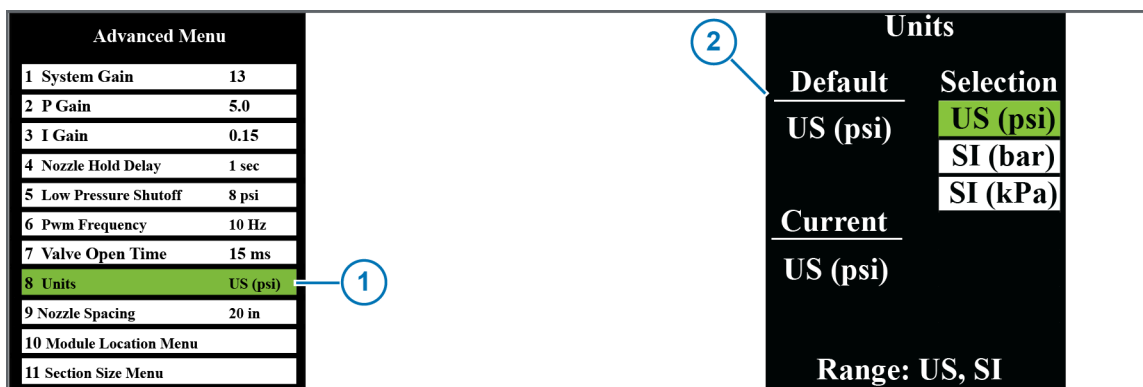


Fig. 46:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Units** line (1).
2. Press the **ENTER** button to open the **Units** screen (2).

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

Range: US, SI

Nozzle Spacing

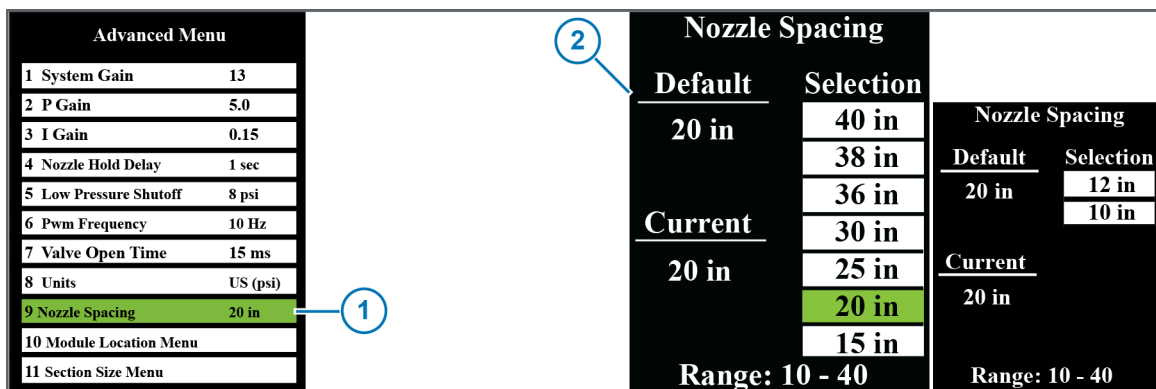


Fig. 47:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Nozzle Spacing** line (1).
2. Press the **ENTER** button to open the **Nozzle Spacing** screen (2).

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

Range: 10 to 40

Module Location

Advanced Menu		Module Location		Module Location		Module Location	
1 System Gain	13	1 Section #1	0 0.00	9 Section #9	0 0.00	17 Reset Serial Numbers	
2 P Gain	5.0	2 Section #2	0 0.00	10 Section #10	0 0.00		
3 I Gain	0.15	3 Section #3	0 0.00	11 Section #11	0 0.00		
4 Nozzle Hold Delay	1 sec	4 Section #4	0 0.00	12 Section #12	0 0.00		
5 Low Pressure Shutoff	8 psi	5 Section #5	0 0.00	13 Section #13	0 0.00		
6 Pwm Frequency	10 Hz	6 Section #6	0 0.00	14 Section #14	0 0.00		
7 Valve Open Time	15 ms	7 Section #7	0 0.00	15 Section #15	0 0.00		
8 Units	US (psi)	8 Section #8	0 0.00	16 Section #16	0 0.00		
9 Nozzle Spacing	20 in	<Enter> to select section Use arrows to change order		<Enter> to select section Use arrows to change order		<Enter> to select section Use arrows to change order	
10 Module Location Menu							
11 Section Size Menu							

Fig. 48:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Module Location Menu** line (1).
2. Press the **ENTER** button to open the **Module Location** screen (2).

The **Module Location** screen lets you see the smart driver module location and information, and change the order of the modules, 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

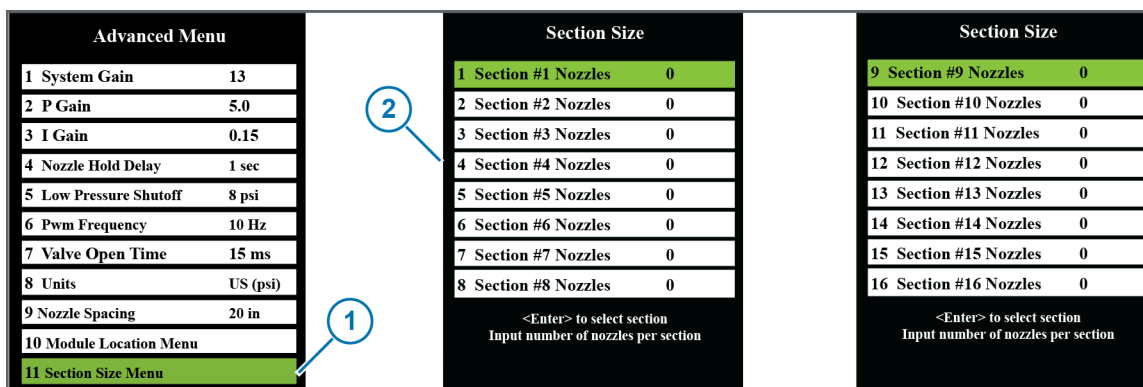


Fig. 49:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Section Size Menu** line (1).
2. Press the **ENTER** button to open the **Section Size** screen (2).

The **Section Size** screen 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.

The section size programming must be performed for each section (smart driver) to pulse valves. If the section size is left at 0, that section will not drive valves.

GPS Menu

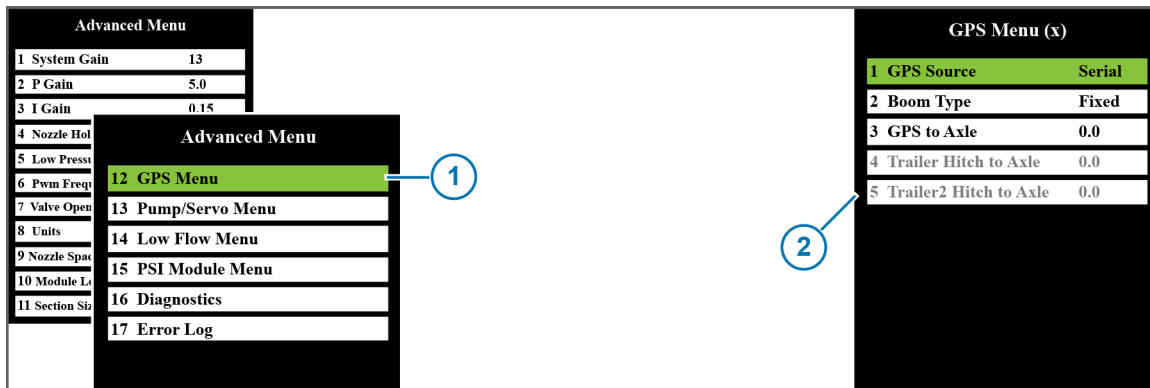


Fig. 50:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **GPS Menu** line (1).
2. Press the **ENTER** button to open the **GPS Menu** screen (2).

From the **GPS Menu** screen, you can change or see (If the information is in gray it cannot be changed.):

- GPS Source
- Boom Type
- GPS To Axle
- Trailer Hitch to Axle
- Trailer2 Hitch to Axle

GPS Source

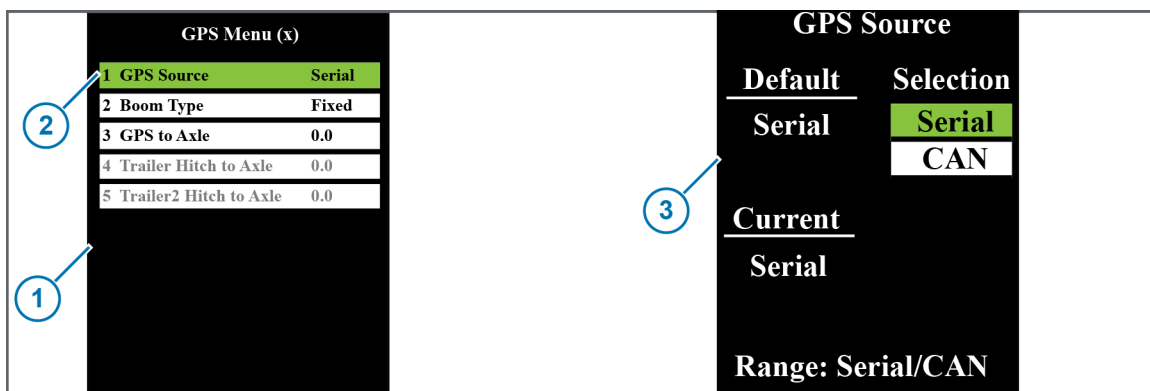


Fig. 51:

To change the GPS source type:

1. From the **GPS Menu** screen (1), use the arrow buttons to select the **GPS Source** line (2).
2. Press the **ENTER** button to open the **GPS Source** screen (3).

Range: Serial or CAN

If you are using a CapstanAG GPS module, make sure that the GPS source is set to CAN.

If you are using another GPS source, make sure that the GPS source is set to Serial.

Boom Type

Boom Type is only accessible if the GPS source is set to Serial.

This feature allows the operator to change the type of implement the GPS source is installed on:

- Fixed
- Trailed—Pull Type Sprayer
- Trailed2—Second hitch point on the train.

GPS to Axle

GPS To Axle—Enter the distance the GPS antenna is from the rear axle.

Enter 0 if the GPS source is directly above the axle.

A positive number indicated the GPS antenna is in front of the rear axle. A negative number indicated the GPS antenna is behind the rear axle.

Trailer Hitch to Axle

- Trailer Hitch to Axle—Only used when the GPS source is installed on a pull-type system—Enter the distance the hitch is from the machine axle
- Trailer2 Hitch to Axle—Only used when the GPS source is installed on a pull-type system—Enter the distance the hitch is from the machine axle

Pump/Servo Menu

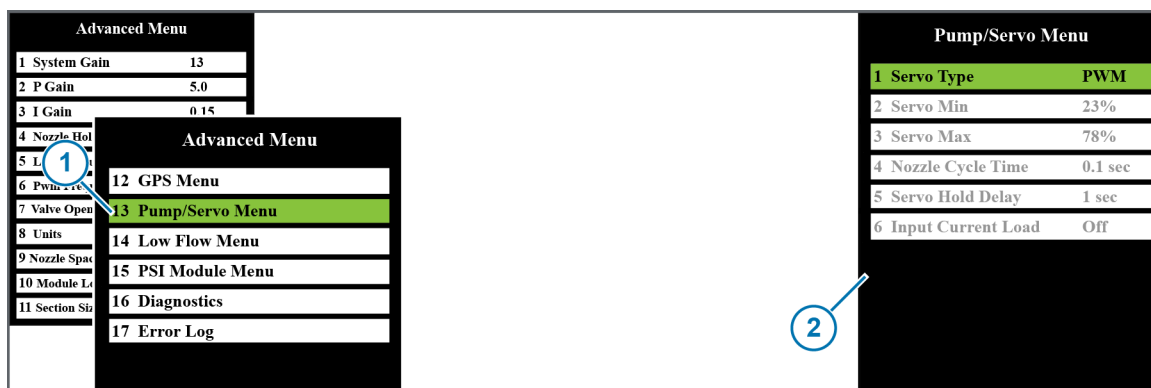


Fig. 52:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Pump/Servo Menu** line (1).
2. Press the **ENTER** button to open the **Pump/Servo Menu** screen (2).

From the **Pump/Servo Menu** screen, you can change information (If the line is gray, the information cannot be changed.):

- Servo Type
- Servo Min
- Servo Max
- Nozzle Cycle Time
- Servo Hold Delay

Servo Type

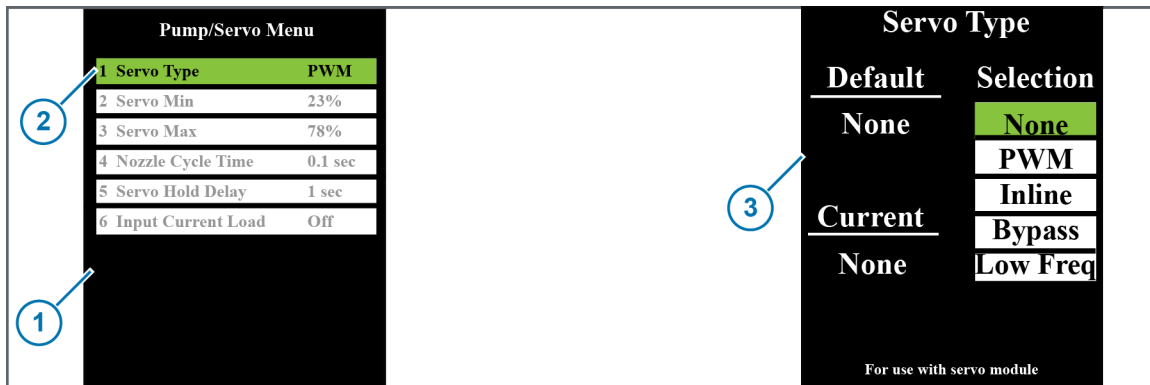


Fig. 53:

1. From the **Pump/Servo Menu** screen (1), select the **Servo Type** line (2).
2. Press the **ENTER** button to go to the **Servo Type** screen (3).

Range: None, PWM, Inline, Bypass, and Low Freq

Select the correct control valve type on your system:

- None
- PWM
- Inline
- Bypass
- Low Freq

Servo Min

Set to match the minimum pump PWM value in the rate controller.

The servo minimum value is the minimum duty cycle that the pump will be driven. It is important that this value corresponds with the minimum duty cycle used by the rate controller.

Servo Max

Set to match the maximum pump PWM value in the rate controller.

The servo maximum value is the maximum duty cycle that the pump will be driven. It is important that this value corresponds with the maximum duty cycle used by the rate controller.

Nozzle Cycle Time

The cycle time is the amount of time it takes for the pulsing nozzles to modulate from minimum to maximum duty cycle.

Leave this feature at the default setting for PWM servo type systems.

For Inline or Bypass servo type systems, it is recommended to run at a 4 or 6 second choice.

Servo Hold Delay

The **Servo Hold Delay** screen lets you change the delay when the display starts at a preset value (50% or the last known duty cycle), allowing the system to stabilize before making larger control changes.

Range: 0 to 6

Select 0 to allow the servo to stay at the last known value for a set amount of time when the system is turned on.

Low Flow Menu

See a CapstanAG representative for more information.

PSI Module Menu



Fig. 54:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **PSI Module Menu** line (1).
2. Press the **ENTER** button to open the **PSI Module** screen (2).

From the **PSI Module** screen you can see information for:

- Sensor module
- Sensor offset
- Sensor volt min
- Sensor volt max
- Pressure Command
- Navigation IMU
- Sensor pressure min
- Sensor pressure max

Sensor Module

PSI Module		Sensor Module	
1	1 Sensor Module	Trans	
	2 Sensor offset	0 psi	
	3 Sensor volt min	0.5 volts	
	4 Sensor volt max	5.0 volts	
	5 Sensor pressure min	0 psi	
	6 Sensor pressure max	100 psi	
	7 Pressure Command	Off	
	8 Navigation IMU	Off	
		Default	Selection
		Trans	Trans
			Cmd
		Current	
		Cmd	
		Range: Trans/Cmd	

Fig. 55:

1. From the **PSI Module** screen (1), select the **Sensor Module** line (2).
2. Press the **ENTER** button to go to the **Sensor Module**.

The **Sensor Module** screen lets you change the sensor module type.

- Trans—Select if the system has a pressure transmitter module
- Cmd—Select if the system has a PSI NAV Commander module

Sensor Offset

PSI Module		Sensor Offset	
1	1 Sensor Module	Trans	
	2 Sensor offset	0 psi	
	3 Sensor volt min	0.5 volts	
	4 Sensor volt max	5.0 volts	
	5 Sensor pressure min	0 psi	
	6 Sensor pressure max	100 psi	
	7 Pressure Command	Off	
	8 Navigation IMU	Off	
		Default	Selection
		0 psi	3 psi
			2 psi
			1 psi
		Current	0 psi
		0 psi	-1 psi
			-2 psi
			-3 psi
		Range: -10 - 10	

Fig. 56:

1. From the **PSI Module** screen (1), select the **Sensor offset** line (2).
2. Press the **ENTER** button to go to the **Sensor Offset** screen (3).

The **Sensor Offset** screen lets you change 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

The PSI sensor offset is used when the sensor does not match a gauge. Entering an offset value will scale the sensor up or down. The sensor offset allowable range is ± 1 to 9.

Sensor Volt Min



Fig. 57:

1. From the **PSI Module** screen (1), select the **Sensor volt min** line (2).
2. Press the **ENTER** button to go to the **Sensor volt min** screen (3).

The **Sensor volt min** screen lets you change the minimum voltage to match the settings of the pressure sensor installed on your system.

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.

Range: 0.5 to 1.0

Sensor Volt Max



Fig. 58:

1. From the **PSI Module** screen (1), select the **Sensor volt max** line (2).
2. Press the **ENTER** button to go to the **Sensor volt max** screen (3).

The **Sensor volt max** screen lets you change the maximum voltage to match the settings of the pressure sensor installed on your system.

Range: 4.5 to 5.0

Sensor Pressure Min and Max

The **Sensor pressure min** line is grayed out and cannot be changed.

The **Sensor pressure max** line can be changed.



Fig. 59:

1. From the **PSI Module** screen (1), select the **Sensor pressure max** line (2).
2. Press the **ENTER** button to go to the **Sensor pressure max** screen (3).

The **Sensor pressure max** screen lets you change the maximum pressure to match the settings of the pressure sensor installed on your system.

Range: 50 to 250

Pressure Command

The **Pressure Command** screen lets you turn the feature on or off.

Enable this feature if the system is using a Raven PC2 Node to get the correct rate control for the system.

Range: Off/On

Navigation IMU

The **Navigation IMU** screen lets you turn the feature on or off.

This feature must be enabled to allow quicker response time to the headings.

Range: Off/On

Note: The PSI NAV Commander Module must be mounted correctly for this feature to function correctly.

For correct installation, see [Install PSI NAV Commander Module](#) on page 40.

Diagnostics

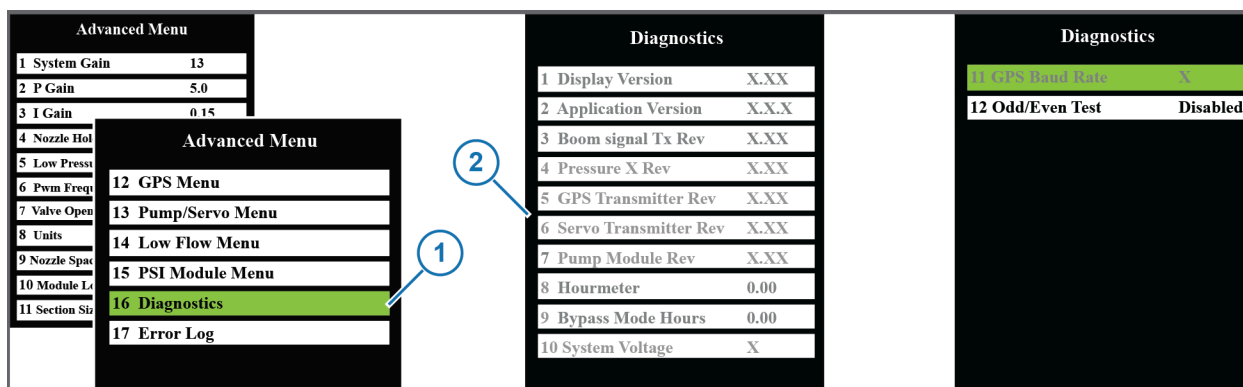


Fig. 60:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Diagnostics** line (1).
2. Press the **ENTER** button to open the **Diagnostics** screen (2).

The **Diagnostics** screens show system information that is useful for troubleshooting and/or diagnostics.

Odd/Even test is the one menu line a person can enter and utilize in this Diagnostic page. Do the Odd/Even Test for setup and troubleshooting. See the information to [Do the Odd/Even Test](#).

Software Version/Rev numbers may be useful for troubleshooting and when adding features to an existing system.

The **Hourmeter** line shows the cumulative time system display is on, while the valves are spraying.

The **Failure Mode Hours** line shows the amount of time system has operated in one of the bypass modes. This can be useful when troubleshooting.

The **System Voltage** line shows system voltage experienced at the display.

The **Baud Rate** line shows the NMEA GPS baud rate being received or shows if a CAN GPS module is being used.

Error Log

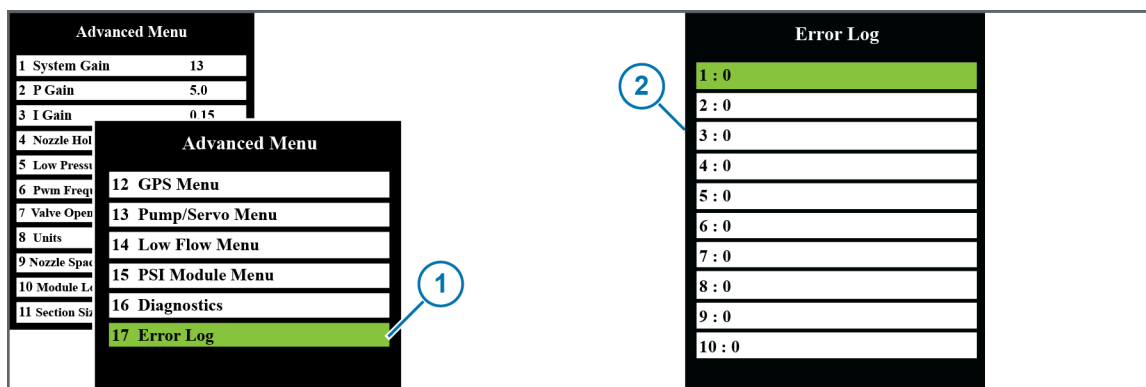


Fig. 61:

1. On the **Advanced Menu** screen, use the arrow buttons to select the **Error Log** line (1).
2. Press the **ENTER** button to open the **Error Log** screen (2).

The **Error Log** screen shows the last 50 system errors. The first error will be the most recent error found.

Use the arrow buttons to move through the list of errors.

Manual Mode—with Reactive Pressure Control

Note: Reactive pressure control is the system operating without a pump control module.

The reactive pressure control 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. Manual mode may be used when you want to spray at a fixed duty cycle; including the option of 100% duty cycle, fully on spraying with no pulsing.



Fig. 62:

1. Press the **MANUAL/BYPASS** button (1) to enter manual mode operation.
2. 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

Bypass Mode provides a way to continue operation without CAN Communication. The system can automatically enter bypass mode if specific module/CAN issues are experienced. This is a way that the system can continue operation without CAN communication.



Fig. 63:

To manually enter into bypass mode:

1. Press and hold the **MANUAL/BYPASS** (1) for five seconds.
2. Press the **ENTER** button (2) to turn the booms on and off.

Manual Mode—Nozzle Valve Duty Cycle

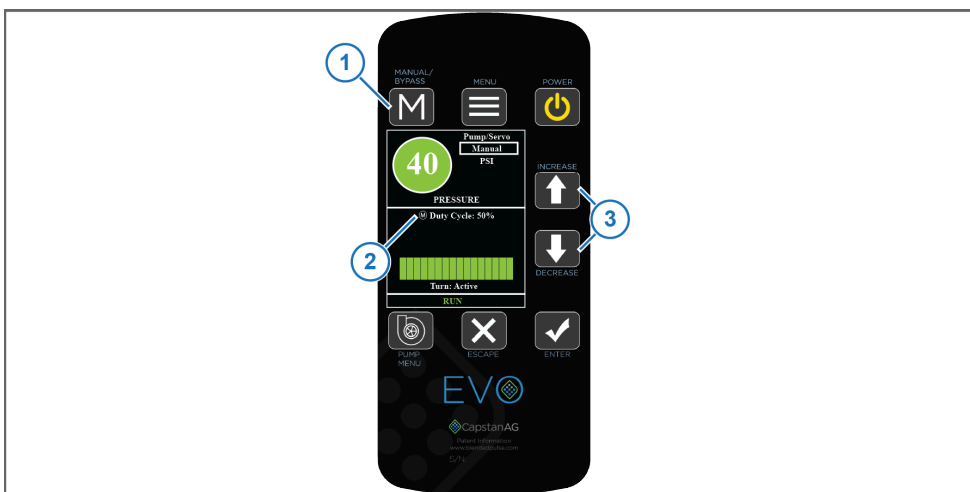


Fig. 64:

1. Press the **MANUAL/BYPASS** button (1).
A **M** (2) will show on the screen. The **M** indicates that the nozzle valve duty cycle is now in manual mode.
2. Use the **INCREASE** or **DECREASE** buttons (3) to change the nozzle valve duty cycle.

Manual Operation Mode with Pump Control

The manual mode with pump control 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 can also help the operator adjust parameters to optimize the system operation.

In manual mode with pump control, the operator can change between keeping the servo/pump at a constant duty cycle or the nozzle valves at a constant duty cycle. Manual mode may be used when you want to spray at a fixed duty cycle. Including the option of 100% duty cycle, fully on spraying with no pulsing

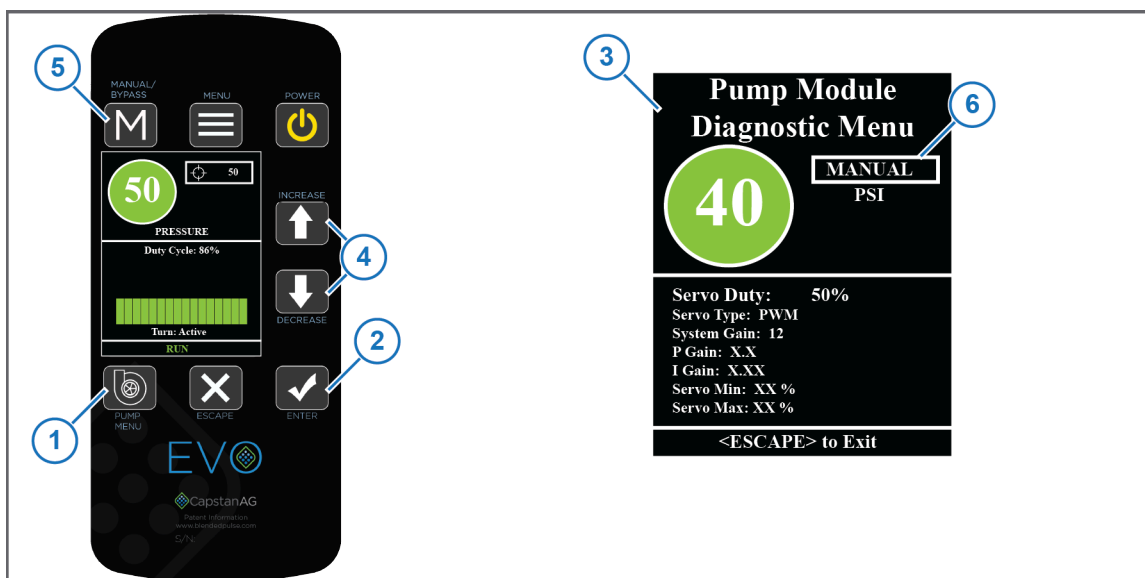


Fig. 65:

To get to **Pump Module Diagnostics Menu** screen:

- If your cab display has the **PUMP MENU** button:
 1. Press the **PUMP MENU** button (1)
- If your cab display does not have the **PUMP MENU** button:
 1. Press and hold the **ENTER** button (2) for two seconds.

On the **Pump Module Diagnostics Menu** screen (3):

1. Use the **INCREASE** or **DECREASE** buttons (4) to change the target pressure.

The servo duty cycle will automatically change in response to the increase or decrease of the target pressure.

2. Press the **MANUAL/BYPASS** button (5).

Manual (6) will show on the screen.

3. Use the **INCREASE** or **DECREASE** buttons to change the servo duty cycle.

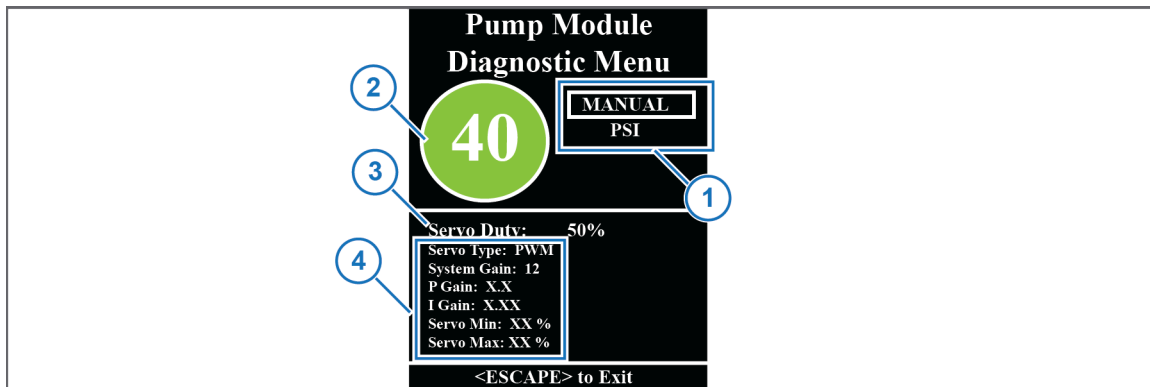


Fig. 66:

The **Pump Module Diagnostics Menu** screen shows:

- (1) Mode selected
- (2) Actual Pressure Readout
- (3) Servo Duty Cycle
- (4) Pump Module/Pressure Control Tuning Parameters

To change the pump module/pressure control tuning parameters, go to the desired system advanced menu line items.

Exit Manual Mode—with Pump Control

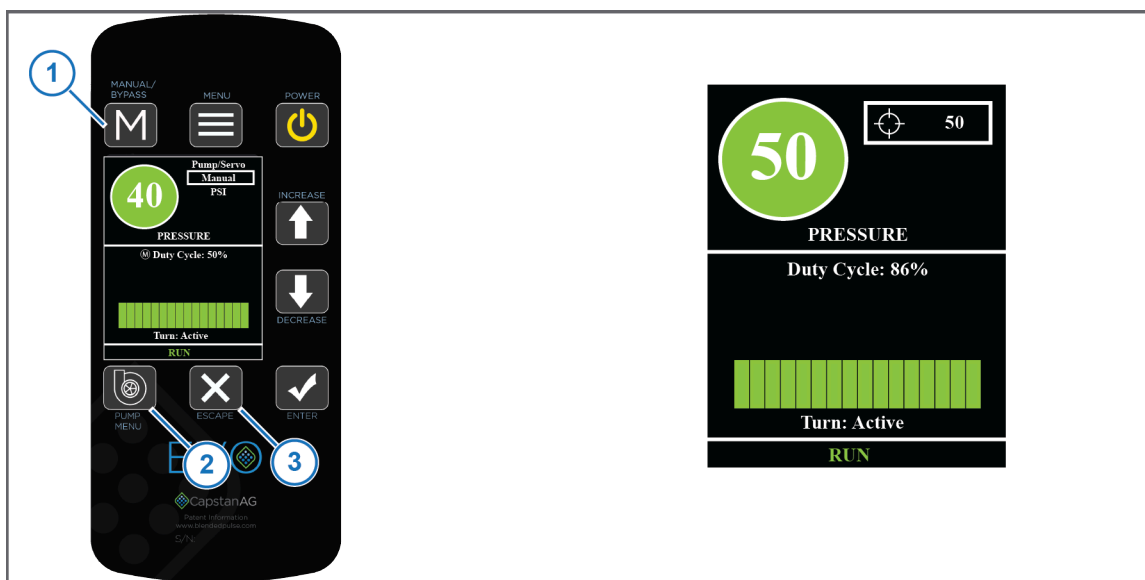


Fig. 67:

With the **M** showing on the main operating screen, do this procedure to go to automatic operation mode.

1. Press the **MANUAL/BYPASS** button (1).

The **M** will disappear from the screen.

2. Press the **PUMP MENU** button (2).
3. Press the **MANUAL/BYPASS** button.

MANUAL will disappear from the screen.

4. Press the **ESCAPE** button (3).

The main operating screen will show, and the system will return to the automatic operation mode.

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 remove the fuses from the holders at the battery to prevent damage to the system.

If charging the machine's batteries or welding on the machine, remove the fuses from the holders at the battery.

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.

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

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

Clean the Nozzle Valve(s)



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

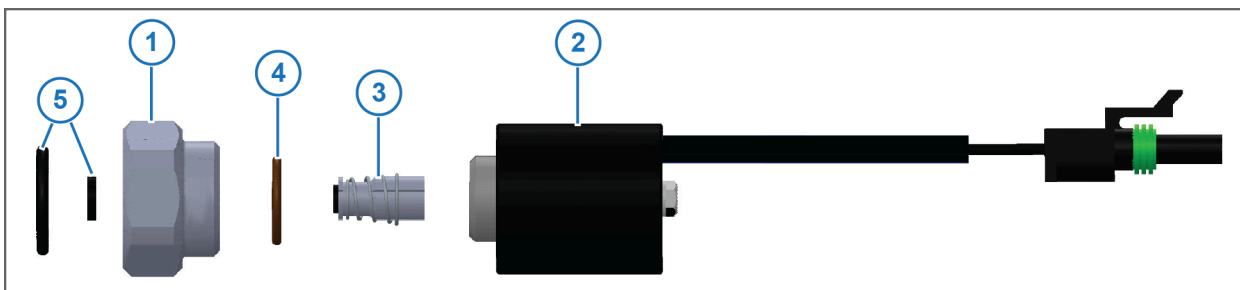


Fig. 68:

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

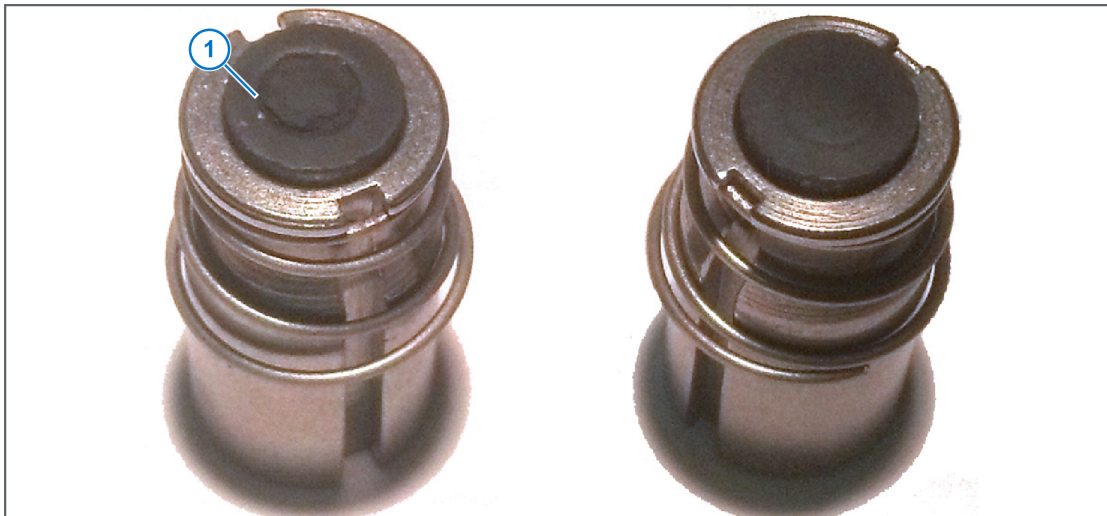


Fig. 69:

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

As the groove deepens, the pressure capacity of the valve will decrease until the pressure capacity interferes with the operating pressure of the system.

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

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

Update Application Code

Contact your dealer or local CapstanAG representative to install the correct software version on the cab display.

To update application code, these are needed:

Part Number	Description
	CapstanAG™ CAN Commander Program
120050-002	Translator Box and USB Cable
150002-001	EVO Diagnostics Breakout Harness

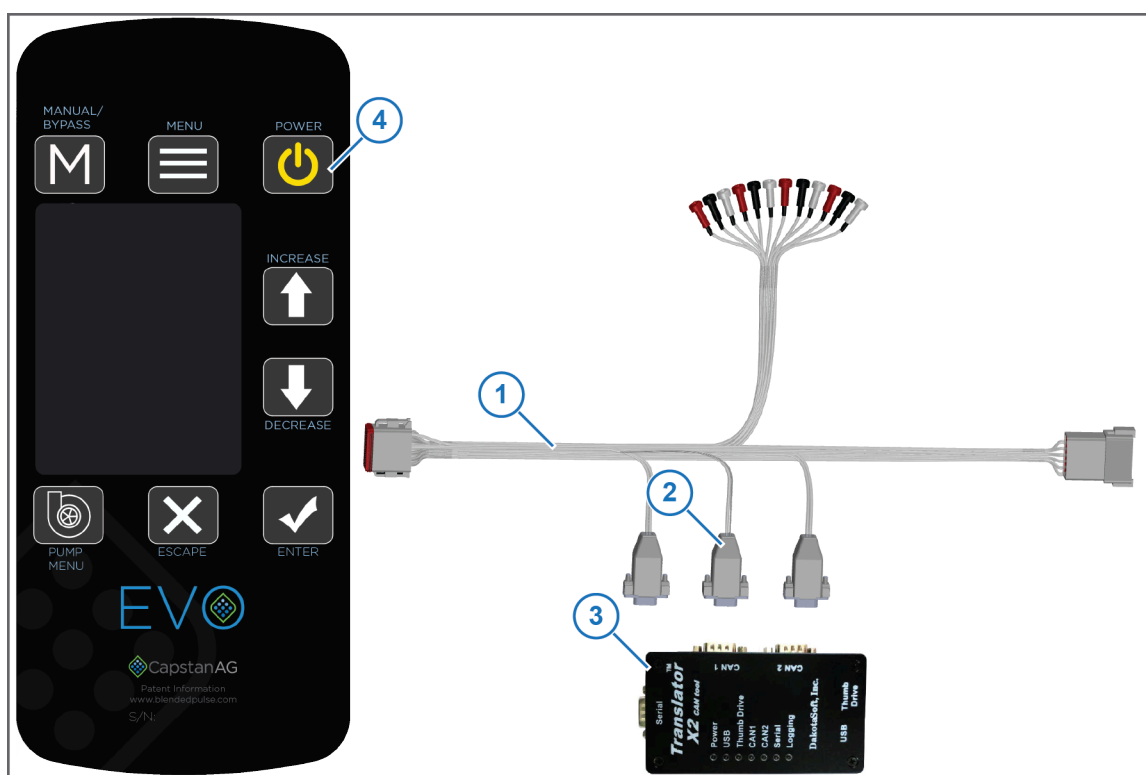


Fig. 70:

1. Connect the EVO diagnostics breakout harness (1) between the cab box display and the existing display harness.
2. Connect the diagnostic harness connector labeled **CAN Terminator** (2) to the CAN 1 port (3) on the translator box.
3. Connect the USB cable that is connected to the CAN Translator to a computer.
4. Press the **POWER** button (4) on the cab box display.
5. On the computer, open the CAN Commander program.

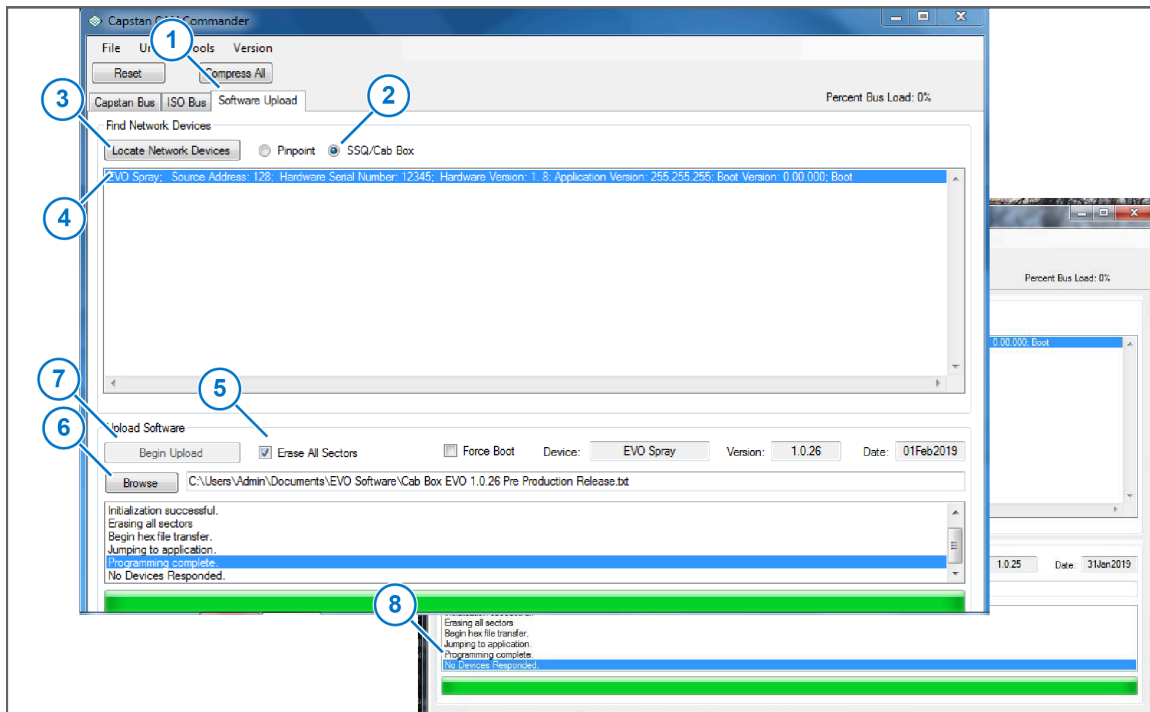


Fig. 71:

6. Select the **Software Upload** tab (1).
7. Select **SSQ/Cab Box** (2).
8. Click **Locate Network Devices** (3).
9. Hardware information (4) will show.
10. Make sure that the hardware information selected.
The line will be highlighted if it is selected.
11. Make sure there is a checkmark (5) in the box next to **Erase All Sectors**.
12. Click **Browse** (6) and select the correct code to upload.
13. Click **Begin Upload** (7).
- The status bar will show progress across the bottom of the screen.
14. When the programming is complete, it will show **Programming complete** (8) near the bottom of the screen.
15. Disconnect the programming cables.
16. Press the **POWER** button on the cab box display.

Chapter 8: Schematics

System Layout

System with Two-trunk Power to CAN Harness

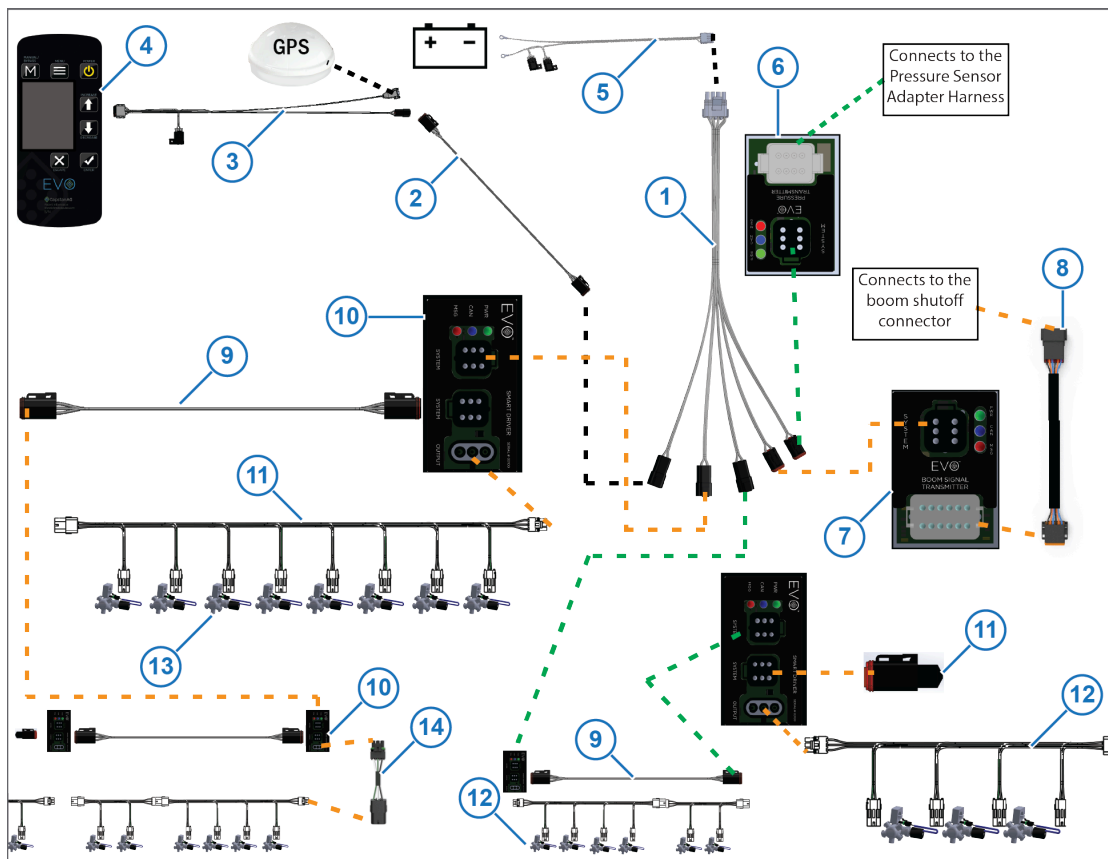


Fig. 72:

Callout	Description	Callout	Description
(1)	Power to CAN Harness	(8)	Boom Signal Shutoff Adapter
(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)	Valve Assembly
(7)	Boom Signal Transmitter Module	(14)	Nozzle Alternator Harness

System with Three-trunk Power to CAN Harness

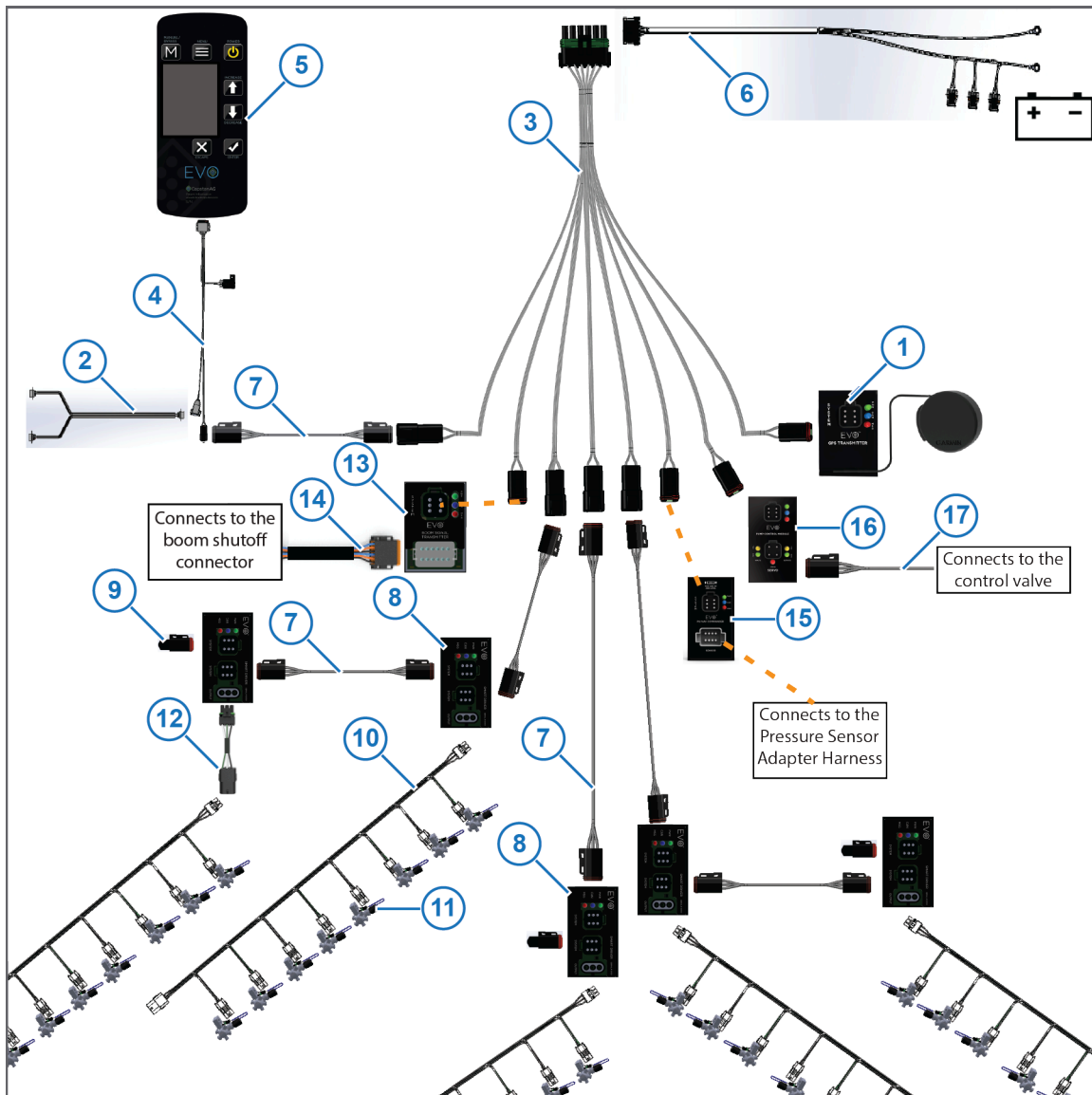


Fig. 73:

Note: If the system has a CapstanAG GPS transmitter module (1) connect the module to the correct connector on the power to CAN harness (2). If the system has an existing GPS Source, connect the correct GPS y-adaptor harness (3) to the display harness (4).

Callout	Description	Callout	Description
(1)	GPS Transmitter Module	(10)	Nozzle Harness
(2)	Power to CAN Harness	(11)	Valve Assembly
(3)	GPS Y-adapter Harness	(12)	Nozzle Alternator Harness
(4)	Display Harness	(13)	Boom Signal Transmitter Module Note: There are two options for this module—12-section or 16-section capability.
(5)	Cab Display	(14)	Boom Signal Shutoff Adapter
(6)	Power Harness	(15)	PSI NAV Commander Module or Pressure Transmitter Module
(7)	CAN bus Extension Harness (Plug to Plug)	(16)	Pump Control Module
(8)	Smart Driver Module	(17)	Pump Control Harness
(9)	CAN Terminator		

EVO™ System Parts List

Description	Part Number	Parts Drawing Description	QTY
Power to CAN X Harness	150003-002	HARNESS, POWER TO CAN X PWR HARNS EVO	1
	150003-017	HARN, POWER TO CAN X 3 TRUNK	
Display Harness	150003-004	HARNESS, DISPLAY W/GPS DROP PWR DSPLY EVO	1
Cab Display	150006-011	ASSY, CAB BOX DISPLAY EVO 8 BUTTON	1
Power Harness	150003-003	HARNESS, POWER, 40FT, EVO	1
	150003-009	POWER HARNESS, 40FT 12 GA EVO	
	150003-010	POWER HARNESS 15 FT 12 GA	
	150003-011	POWER HARNESS 25FT 12 GA. EVO	
	150003-015	HARNESS, POWER, 15FT, EVO	
	150003-020	HARNESS, POWER, 25FT, EVO, , 10GA	
	150003-053	POWER HARNESS, 40FT, EVO 10GA	
	150003-054	POWER HARNESS, 15FT, EVO, 10GA	
	150003-055	POWER HARNESS, 25FT, EVO, 10GA	
	150003-016	POWER HARNESS, 3 TRUNK 40FT, 12 GA.	
	150003-018	POWER HARNESS, 3 TRUNK 40FT, 12 GA.	
	150003-019	POWER HARNESS, 3 TRUNK 40FT, 10 GA	
	150003-021	POWER HARNESS, 3 TRUNK, 25 FT, 10GA	
	150003-022	POWER HARNESS, 15FT 3 TRUNK, 10GA.	
Power Extension Harness	150003-007	EXTENSION POWER HARN 25FT, 12 GA. EVO	As Needed
	150003-008	EXTENSION, POWER HARNESS 50 FT 12 GA. EVO	
	150003-025	EXTENSION, POWER HARNESS, 25FT, 14Ga.	
	150003-050	EXTENSION, POWER HARNESS, 50FT, 14Ga.	
	150003-051	EXTENSION, POWER HARNESS 25FT, 10GA.	
	150003-052	EXTENSION, POWER HARNESS 50 FT, 10 GA.	
	150003-056	EXTENSION, POWER HARNESS 25FT 10GA, 3 TRUNK	
	150003-057	EXTENSION, POWER HARNESS 50FT 10 GA, 3 TRUNK	
	150003-058	EXT, POWER HARNESS 40FT 10 GA, 3 Trunk	

Description	Part Number	Parts Drawing Description	QTY
Pressure Transmitter Module	150150-010	ASSY, PRESSURE TRANSMITTER EVO	1
Pressure Sensor Adapter Harness	150005-001	HARNESS, ADAPTER, PSI, RAVEN	1
	150005-002	HARNESS, ADAPTER, PSI, JD R SERIES, 4 PIN DT	
	150005-003	HARNESS, ADAPTER, PSI, CAPSTAN 3 PIN WP	
	150005-004	HARNESS, ADAPTER, PSI, JD PRE R SERIES, 3 PIN MP	
	150005-006	HARNESS, ADAPT PSI SENS HAGIE	
	150005-007	HARNESS ADAP, PRESS SENS, CNH	
PSI NAV Commander Module	150285-100	ASSY, CONTROLLER PSI NAV COMMANDER EVO	1
Pressure Commander Harness	150005-009	PRESSURE COMMANDER HARNESS RAVEN PSI SENSOR	1
Boom Signal Transmitter Module	150200-010	ASSY, BOOM TRANSMITTER A, EVO	1
	150200-011	ASSY, BOOM TRANSMITTER B, EVO	
CAN bus Extension Harness (Plug to Plug)	150004-005	HARNESS, EXT, CAN-BUS, 5FT PLUG TO PLUG	As Needed
	150004-010	HARNESS, EXT, CAN-BUS, 10FT PLUG TO PLUG	
	150004-015	HARNESS, EXT, CAN-BUS, 15FT PLUG TO PLUG	
	150004-025	HARNESS, EXT, CAN-BUS, 20FT PLUG TO PLUG	
	150004-030	HARNESS, EXT, CAN-BUS, 25FT PLUG TO PLUG	
	150004-020	HARNESS, EXT, CAN-BUS, 30FT PLUG TO PLUG	
	150004-035	HARNESS, EXT, CAN-BUS, 35FT PLUG TO PLUG	
	150004-040	HARNESS, EXT, CAN-BUS, 40FT PLUG TO PLUG	
Smart Driver Module	150100-010	ASSY, CONTROLLER, SMART DRIVER EVO	As Needed
CAN Terminator	150003-005	CAN TERMINATOR EVO	2
Pump Control Module	150275-010	ASSY, PUMP CONTROL MOD, EVO	1

Description	Part Number	Parts Drawing Description	QTY
Pump Control Harness	150005-011	HARNESS, PUMP CONTROL, EVO JOHN DEERE, 20FT	1
	150005-012	HARNESS, PUMP CONTROL, EVO, APACHE 6FT	
	150005-015	HARNESS, PUMP CONTROL EVO 35FT	
RAM Mount	118603-111	RAM MOUNT 2 7/16"RND BASE 1"UBOLTBASEW/1.5"BALL	1
Cable Ties	120100-010	KIT CABLE TIES 12" X 150 PCS 15.5" X 50PCS	65
CAN Y-harness	118640-047	HARNESS, CAN, Y, MMF	1
Pressure Sensor Kit	116301-011	KIT PRESSURE SENSOR 100 PSI	1
GPS Transmitter	150290-010	ASSY, CONTROLLER GPS, EVO	1
GPS Cable	Note: See Technical Bulletin TB19-04 for more information on the correct GPS cable for your machine.		1
Nozzle Harness	150001-001	HARNESS, NOZZLE, 8 X 20", EVO	As Needed
	150001-002	HARNESS, NOZZLE, 8 X 15", EVO	
	150001-003	HARNESS, NOZZLE, 4 X 20", EVO	
	150001-004	HARNESS, NOZZLE, 4 X 15", EVO	
	150001-005	HARNESS, NOZZLE, 2 X 20", EVO	
	150001-006	HARNESS, NOZZLE, 2 X 15", EVO	
	150001-007	HARNESS, NOZZLE, 1 X 20", EVO	
Nozzle Alternator Harness	116200-013	HN NOZ ALTERNATOR	As Needed
Valve Assembly	540007-15A	VA FLYBODY ARAG A15 7W 4-SLOT BLK STD SPRING	As Needed
	540007-15AHF	VA FLYBODY ARAG HF AHF15 7W 4-SLOT BLK STD SPRING	
	540007-15T	VA FLYBODY TEEJET T15 7W 4-SLOT BLK STD SPRING	
	540007-15W	VA FLYBODY WILGER W15 7W 4-SLOT BLK STD SPRING	
	540012-24A	VA FLYBODY ARAG A24 12W 4-SLOT BLK STD SPRING	
	540012-24AHF	VA FLYBODY ARAG HF AHF24 12W 4-SLOT BLK STD SPRING	
	540012-24T	VA FLYBODY TEEJET T24 12W 4-SLOT BLK STD SPRING	
	540012-24W	VA FLYBODY WILGER W24 12W 4-SLOT BLK STD SPRING	

Description	Part Number	Parts Drawing Description	QTY
Valve Assembly Continued	541012-24A	VA FLYBODY ARAG A24 12W 4-SLOT BLK HEAVY SPRING	As Needed
	541012-24AHF	VA FLYBODY ARAG HF AHF24 12W 4-SLOT BLK HEAVY SPRING	
	541012-24T	VA FLYBODY TEEJET T24 12W 4-SLOT BLK HEAVY SPRING	
	541012-24W	VA FLYBODY WILGER W24 12W 4-SLOT BLK HEAVY SPRING	
Boom Shutoff Adapter	118606-001	HN SHUTOFF PIGTAIL SSRS 6 P in Shroud DT	1
	118606-002	HN SHUTOFF PP SSRS CASE SP X DT	
	118606-003	HN SO PIGTAIL SSRS 12PINPLUG DT 5Wires 10ft Brazil	
	118606-051	HN SHUTOFF ADAPTER SSRS-PP DT	
	118606-052	HN SHUTOFF CASE 3185	
	118606-101	HN SHUTOFF PP SSRS APACHE P re2011 1-10Sec DT	
	118606-102	HN SHUTOFF PP SSRS APACHE 11 -17 1-10Sec DT	
	118606-103	HARNESS, SHUTOFF, 12 SEC RAVEN PC2 NODE	
	118606-104	HARNESS, SHUTOFF, EVO- RAVEN PC MODE, 16 SECTION	
	118606-200	HN SHUTOFF PP SSRS ROGATOR 90 &100ft 5Sec DT	
	118606-201	HN SHUTOFF PP SSRS ROGATOR 120ft 7Sec DT	
	118606-203	HN SHUTOFF PP SSRS ROGATOR RG700Series DT	
	118606-204	HN SHUTOFF PP SSRS ROGATOR RG 900 RG1100&RG1300Series DT	
	118606-205	HN SHUTOFF PP SSRS MASSEY 90 ft 7Sec.Brazil	
	118606-300	HN SHUTOFF PP SSRS JD4730&JD 4830 7Sec DT	
	118606-301	HN SHUTOFF PP SSRS JD4940 1 1Sec DT	
	118606-302	HN SHUTOFF PP SSRS JD4930 Ground Switched DT	
	118606-303	HN SHUTOFF PP SSRS JOHN DE ere 4720 DT	

Description	Part Number	Parts Drawing Description	QTY
Boom Shutoff Adapter Continued	118606-304	HN SHUTOFF PP SSRS JD R4030 R 4038 R4045 7Sec DT	1
	118606-305	HN SHUTOFF PP SSRS JD R4030 R 4038 R4045 9Sec DT	
	118606-306	HN SHUTOFF PP SSRS JDR4030 R4 038 R4045 11Series DT	
	118606-309	HN SHUTOFF PP SSRS JOHNDEERE 4630 R4023Series	
	118606-310	HN SHUTOFF PP SSRS JOHNDEERE4 630 R4023 7Sec 90Ft	
	118606-311	HN SHUTOFF 90FT 7 SEC JD R 4023 2018	
	118606-312	HN SHUTOFF 80FT 5 SEC JD R 4023 2018	
	118606-315	HN SHUTOFF PP SSRS JD 4730 9 Sec	
	118606-316	HARNESS SHUTOFF EVO - JD R SERIES 13 SECTION	
	118606-400	HN SHUTOFF PP SSRS NEW HOLL Guardian Pre2013 10Sec	
	118606-401	HN SHUTOFF PP SSRS NEWHOLL/MI LLER 2013 OR NEWER 1-10SEC DT	
	118606-403	HN SHUTOFF PP/SSRS JACTO 8 S ec	
	118606-500	HN SHUTOFF HAGIE 120' 9 SE c	
	118606-501	HN SHUTOFF HAGIE 90'-100' 9 Sec	
	118606-505	ADAPTER HN SHUTOFF PP-SSRS Hagie 120ft 9 Sec	
	118606-506	HN SHUTOFF HAGIE 9 SEC 120F t Modelyear2018	
	118606-600	HN SHUTOFF PCI SSRS CASE I H 2017+	
	118606-650	KIT SHUTOFF HN SSRS CASE Sprayers 2017+	

Display Harness

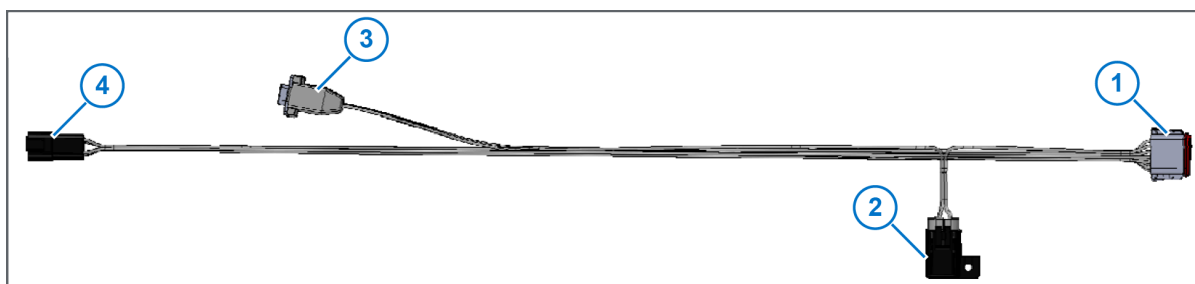


Fig. 74:

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 to CAN Harness

Two-Trunk Power to CAN Harness

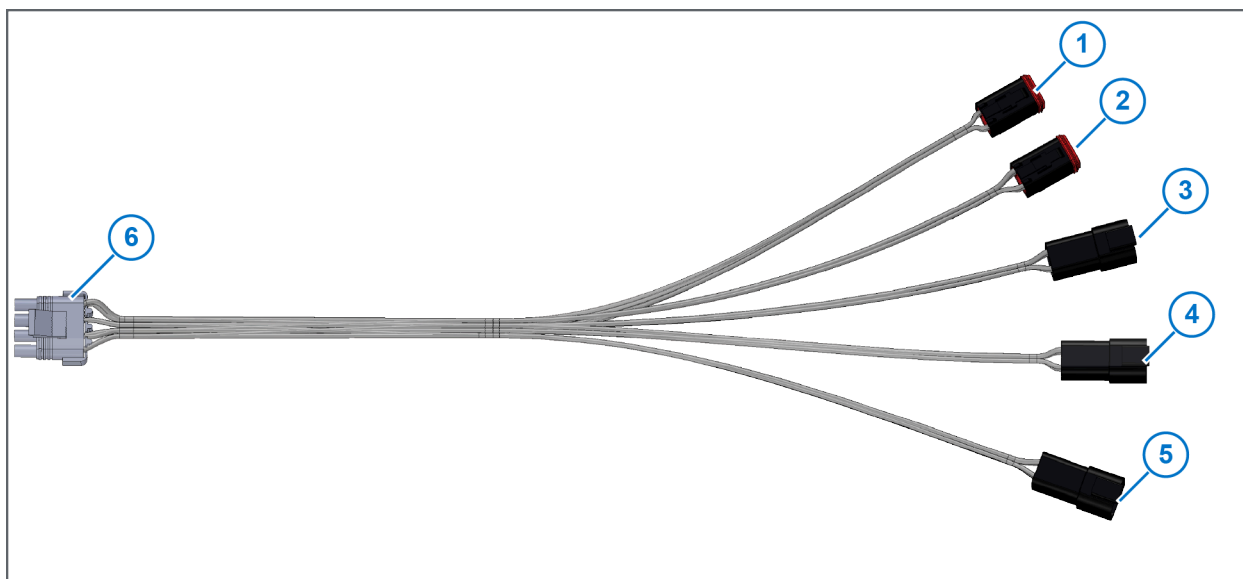


Fig. 75:

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

Pin	Description	Color	Pin	Description	Color
1	Power—Right Trunk	Red	4	CAN Hi	Yellow
2	Ground	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 Trunk	Red	4	CAN Hi	Yellow
2	Ground	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 Trunk	Red	4	CAN Hi	Yellow
2	Ground	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 Trunk	Red		4	CAN Hi	Yellow
2	Ground	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 Trunk	Red		4	CAN Hi	Yellow
2	Ground	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 Trunk	Red		C	Ground	Black
B	Power—Right Trunk	Red		D	Ground	Black

Three-Trunk Power to CAN Harness

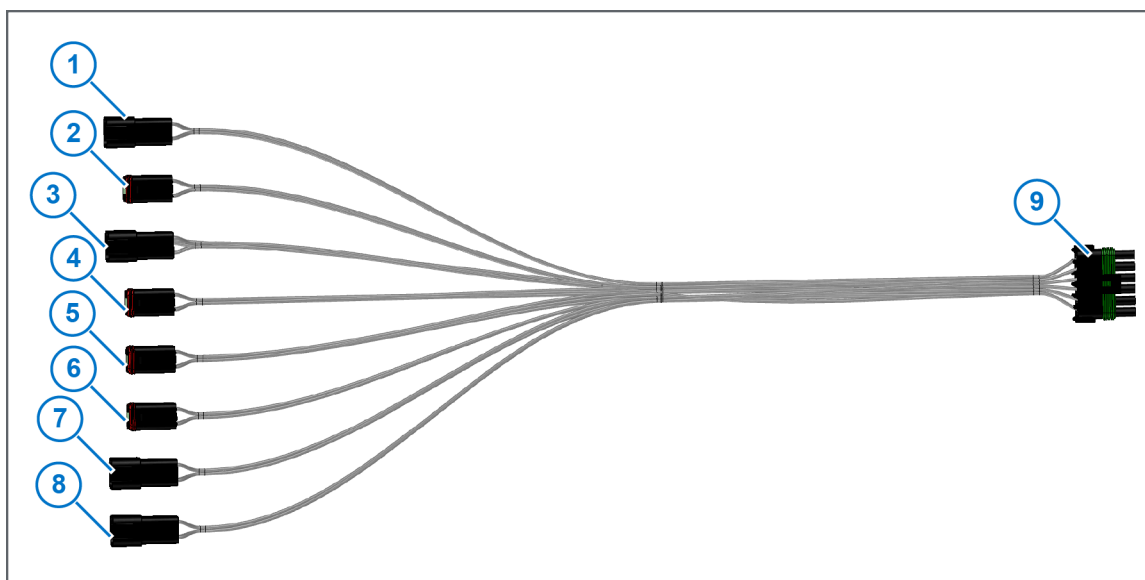


Fig. 76:

Table: Right Boom SD/Right Trunk Connector (1)—6-pin DT Receptacle

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

Table: GPS Mod/Right Trunk Connector (2)—6-pin DT Plug

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

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

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

Table: Pump Mod/Center Trunk Connector (4)—6-pin DT Plug

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

Table: Boom Sec Mod/Left Trunk Connector (5)—6-pin DT Plug

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

Table: PSI Mod/Left Trunk Connector (6)—6-pin DT Plug

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

Table: Center SD/Center Trunk Connector (7)—6-pin DT Receptacle

Pin	Description	Color		Pin	Description	Color
1	Power1Center Trunk	Red		4	CAN Hi	Yellow
2	Ground	Black		5	CAN Lo	Green
3	Synch	Blue		6	AI Ground	Brown

Table: Left Boom SD/Left Trunk Connector (8)—6-pin DT Receptacle

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

Table: Power Harness Connector (9)—6-pin WP Tower

Pin	Description	Color		Pin	Description	Color
A	Power—Left Trunk	Red		D	Ground	Black
B	Power—Center Trunk	Red		E	Ground	Black
C	Power—Right Trunk	Red		F	Ground	Black

Power Harness

Two-Trunk Power Harness

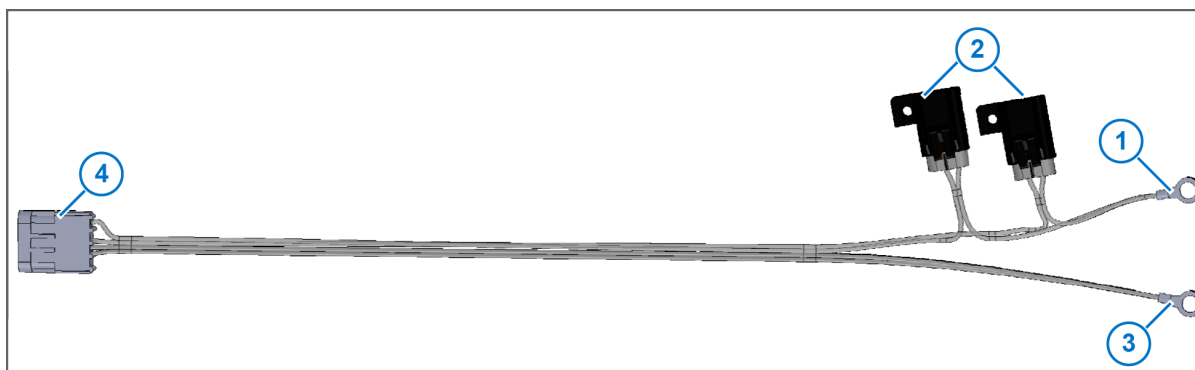


Fig. 77:

- (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

Three-Trunk Power Harness

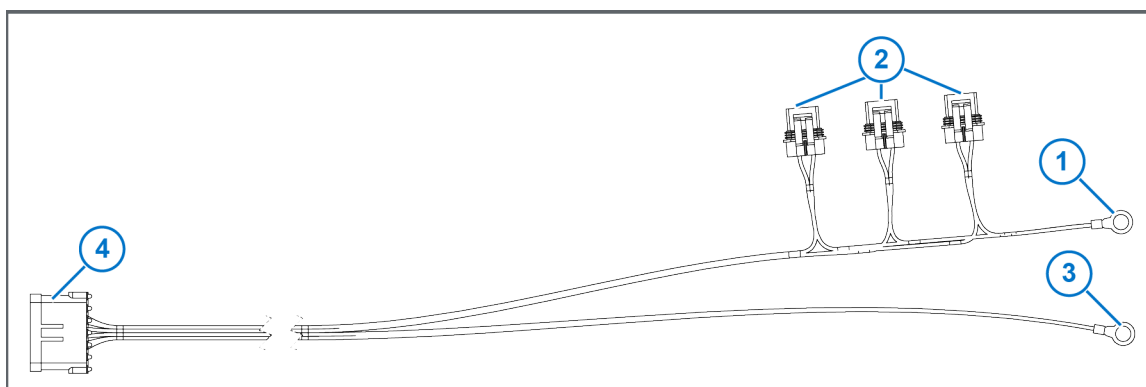


Fig. 78:

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

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

Pin	Description	Color	Pin	Description	Color
A	Power—Left Trunk	Red	D	Ground	Black
B	Power—Center Trunk	Red	E	Ground	Black
C	Power—Right Trunk	Red	F	Ground	Black

CAN bus Extension Harness

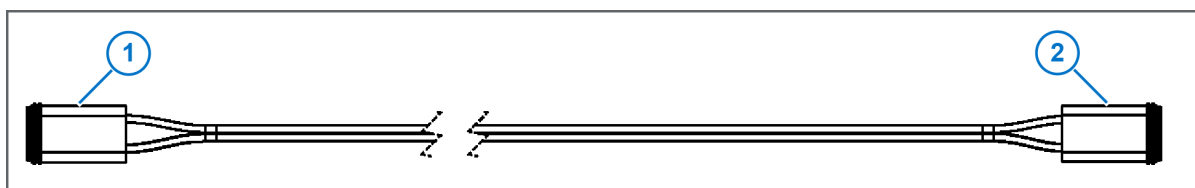


Fig. 79:

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 Extension Harness

Two-Trunk Power Extension Harness

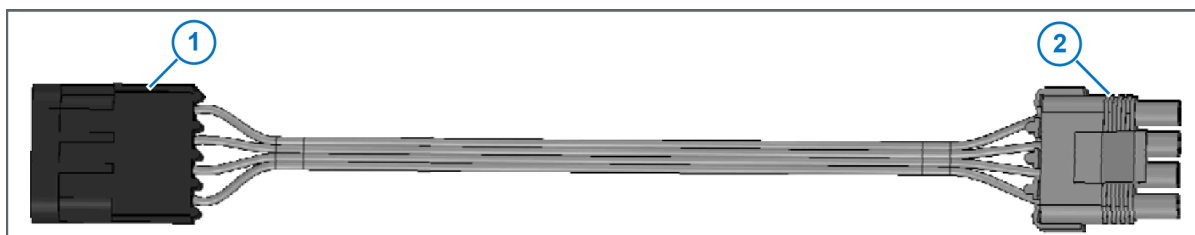


Fig. 80:

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

Pin	Description	Color		Pin	Description	Color
A	Power—Left Trunk	Red		C	Ground	Black
B	Power—Right Trunk	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

Three-Trunk Power Extension Harness



Fig. 81:

Table: Power Harness Connector (1) Pinout—6-pin WP Tower

Pin	Description	Color		Pin	Description	Color
A	Power—Left Trunk	Red		D	Ground	Black
B	Power—Center Trunk	Red		E	Ground	Black
C	Power—Right Trunk	Red		F	Ground	Black

Table: Power to CAN Extension Harness Connector (2) Pinout—6-pin WP Shroud

Pin	Description	Color		Pin	Description	Color
A	Power—Left Trunk	Red		D	Ground	Black
B	Power—Center Trunk	Red		E	Ground	Black
C	Power—Right Trunk	Red		F	Ground	Black

Nozzle Harness

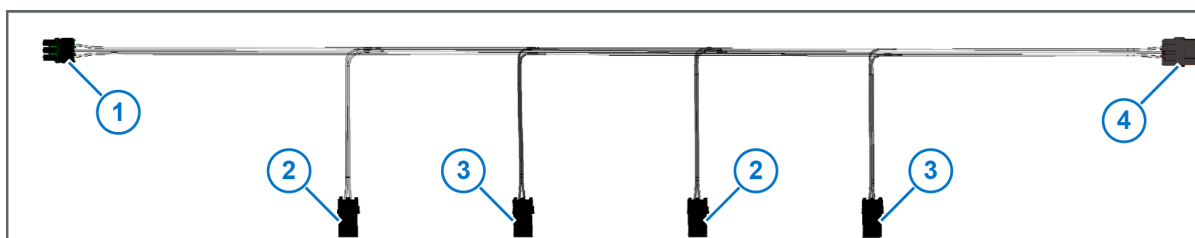


Fig. 82:

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				

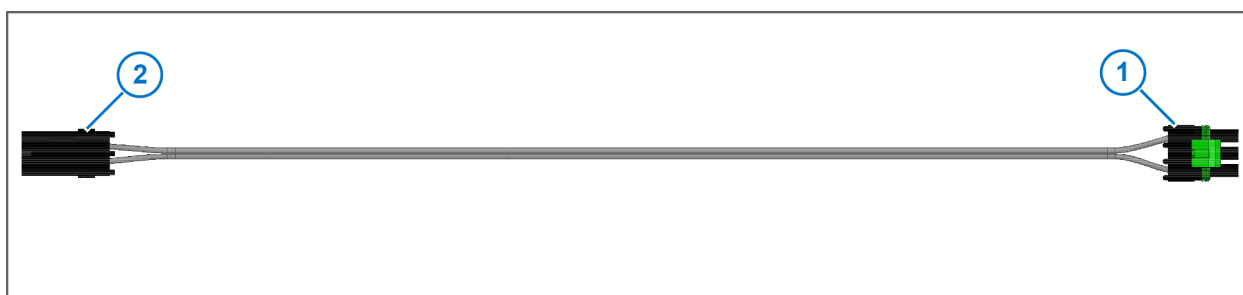


Fig. 83:

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 information shown on the main operation screen on the display, error list, and diagnostic information to begin your diagnosis. Also, use the LEDs on the modules to verify the situation and details experienced.
2. Use the battery harness fuses to isolate half of the system on a two-trunk system. Use power harness fuses to isolate a 1/3 of the system for a three-trunk system. This will help focus on the part of the system that has the issue. The fuse located on the left trunk corresponds to the power to CAN harness left trunk connections and so on.
3. 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.
4. Once the part of the system has been determined (left, right, or center 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.

Display Messages

Message	Description	Action
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 the 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.

Message	Description	Action
		Find and repair the 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 the wiring issue.
No Psi Trans Module	The pressure transmitter module is not on the CAN Bus.	Connect the pressure transmitter module.
		Find and repair the 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.
	This message will show when the EVO Pump/Servo menu is programmed to an option other than none, and the Pump Module is not installed	Change the Pump/Servo menu option to none or do a check of the pump module connections and repair or replace as necessary.
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

Message	Description	Action
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 the pump from running dry.	Increase the pressure above 12 psi and error will clear
		Change the Low PSI Shutoff from 8 psi to Off. This will allow psi to spool below 8 psi. Important: Turning off the low PSI shutoff will allow the pump to run dry if the tank is empty.
Maximum Duty	Shows when the nozzle valve(s) maximum duty cycle value is experienced.	
Minimum Duty	Shows when the nozzle valve(s) minimum duty cycle value is experienced.	
Low Flow Control	Alerts that low flow control is enabled and operational	
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
	GPS NMEA (5hz minimum) signal is not being received	Do a check of the GPS connections, repair or replace, as necessary.
		Move the GPS receiver to an unobstructed view of the sky. Restart the EVO system to reconfigure the GPS module.
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.
	NMEA VTG message is not being received (5hz minimum).	Enable 10 Hz recommended VTG messages (5 Hz minimum requirement).
No GPS GGA	NMEA GGA message is not being received (5hz minimum).	Enable 10 Hz recommended GGA messages (5 Hz minimum requirement).

Message	Description	Action
No GPS GGA Continued	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.
Acquiring GPS Fix	EVO GPS module will show this message at startup.	Once a fix is acquired, this message will disappear. If the message does not disappear, a moment or two after startup, troubleshooting is recommended. Move the GPS receiver to an unobstructed view of the sky. Restart the EVO system to reconfigure the GPS module.
No GPS Module	Occurs when the EVO GPS menu is programmed to CAN GPS source, and the EVO GPS module is not plugged in.	If using an EVO GPS module, do a check of the connections from the GPS Module to the power to CAN harness. If not using an EVO GPS Module, do the system menu and change the GPS source to Serial
GPS HDOP	Signifies poor horizontal GPS precision with the CAN GPS transmitter module.	Move the GPS receiver to an unobstructed view of the sky. Restart the EVO system to reconfigure the GPS module.
GPS Sats	Less than desirable geometric GPS precision with the CAN GPS transmitter module.	Move the GPS receiver to an unobstructed view of the sky. Restart the EVO system to reconfigure the GPS module.
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 the trunk issue(s). Then disconnect 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 trunk issue(s). Then disconnect the daisy-chained CAN extension harness connections until the issue is found.
PSI Module Mismatch	Mismatch between the PSI module plugged into EVO CAN and PSI module chosen in the system menu	Go to the system setup menu and make sure that the information is correct
New Pump Module	Pump module has been connected to the system and needs set up.	Setup the Pump Module.

Message	Description	Action
Pump Seal Shutdown	When the sensor falls below 3.0 psi, the pump shuts off to prevent from operating dry and causing pump seal failure. This feature only works in conjunction with a Pump Module and a PWM pump in Automatic mode.	
IMU Invalid	IMU in the PSI NAV Commander Module is malfunctioning.	Troubleshoot issue, restart the EVO system, or replace the module.
Controller Duty Zero	Rate controller pump duty cycle is zero.	Activate the pump and do a check of the connections.

Operation Troubleshooting

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.
	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 manual for the rate controller).

Problem	Cause	Correction
Rate instability continued	Faulty rate controller.	Replace the rate controller.
	Low voltage to rate controller.	Do a test of the voltage and repair as needed.
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 Assembly Test

Coil assembly failures are often the result of two factors:

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

Recommendation: Clean any plugged valve assemblies immediately.

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

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

Notice: Correct resistance is:

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

If correct resistance is not found:

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

Battery Voltage Test

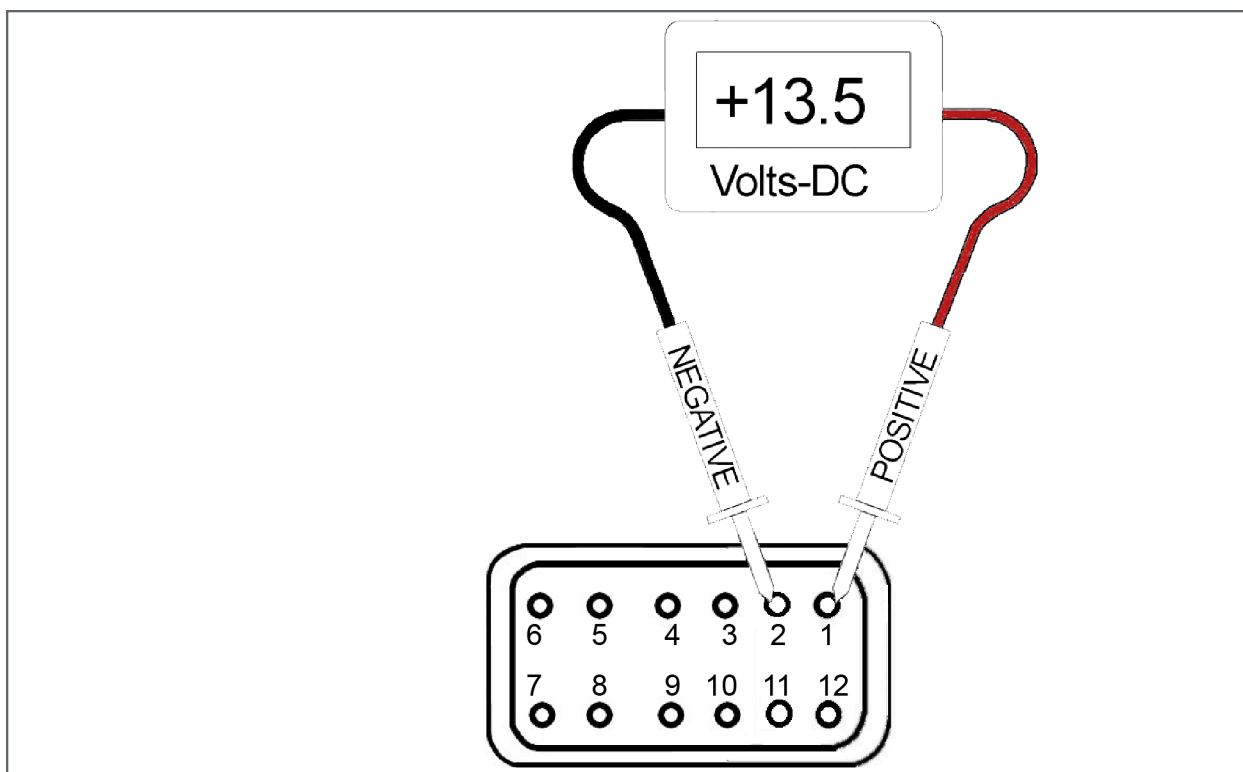


Fig. 84:

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 and between pin 1 and pin 6.
- With the engine of the machine off, there is a 12.0 VDC between pin 1 and pin 2 and between pin 1 and pin 6.

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 3 (20 A fuses) located in the F6, F7, and F8 locations.
- 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.

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