CapstanAG™

EVO™

Upgrade Kit

Compatible with:
Synchro™
AIM* Command

Operator Manual

150300-011 Rev. D | Revised 04/2021 |

Thank you for your business!

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

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

Service Contact Information

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

System Purchased: _____

Dealer: _____

Contact: _____

Phone: _____

Address: _____

City,State/Province, Zip: _____

Factory Service/Repairs

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

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

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

CapstanAG.com | CapstanAG.ca

prodsupport@capstanag.com

Contents

Chapter 1: Introduction

This Manual

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

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

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

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

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

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

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

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

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

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

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

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

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

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

System Identification

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

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

Chapter 2: Safety

Signal Words

DANGER: Indicates an imminent hazard which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for aircraft 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.

Examine 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 specific chemical manufacturer documentation 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 of use of any products shall in no case exceed the purchase price allocable to the components.

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

What is the period of coverage?

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

How do you get service?

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

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

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

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

Capstan Ag Systems, Inc.

Attn: Warranty/Repair

4225 SW Kirklawn Ave.

Topeka, KS 66609

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

Hours: 8 am to 4:30 pm CST

How does state law relate to this Limited Warranty?

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

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

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

[1] Rev. Date 7/15/2014

Chapter 4: Setup

Cab Display

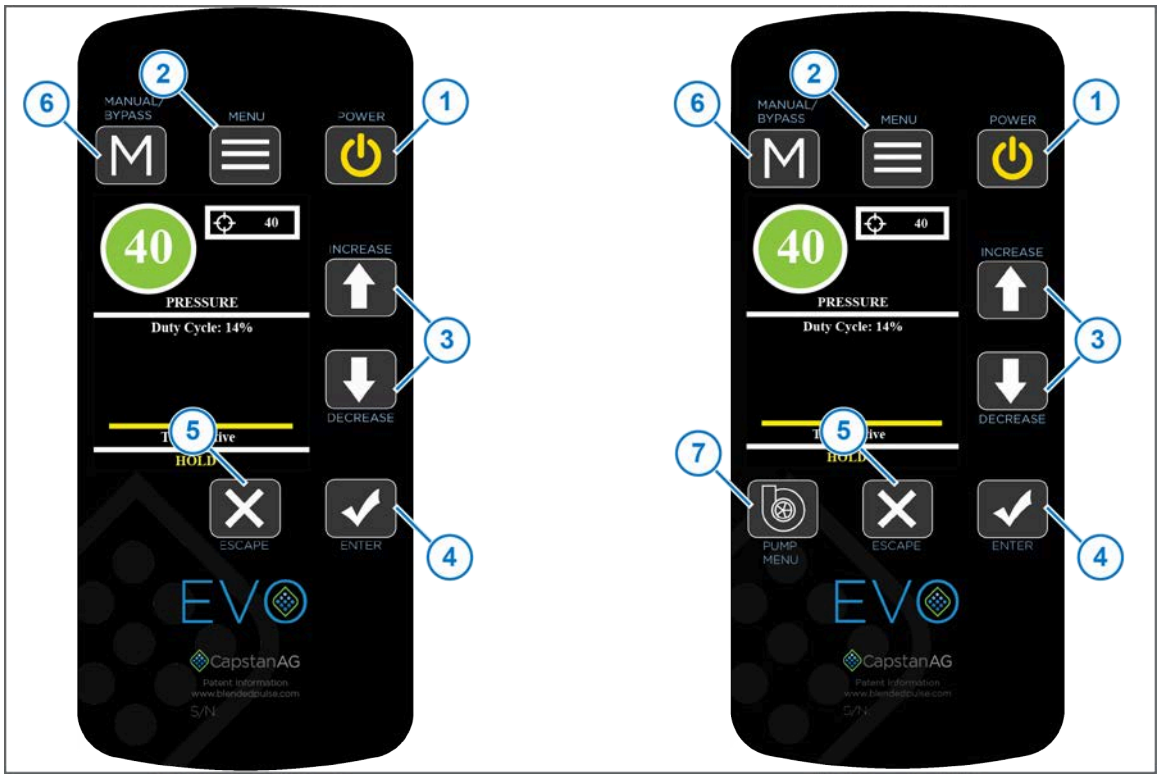

Figure 1:

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—Push to turn on or off the display

(2) **MENU** Button—Push to see the ***Main Menu*** screen

(3) **INCREASE** and **DECREASE** Buttons—Push to move through the menu items

(4) **ENTER** Button—Push to accept changes or go to the next screen

(5) **ESCAPE** Button—Push to cancel or go back to the previous screen.

(6) **MANUAL/BYPASS** Button—Push to use the manual operation or bypass mode or change back to automatic mode.

(7) **PUMP MENU** Button—Push to see the pump menu information.

System Setup

Before setting up the EVO upgrade system, make sure that you know how the sections are configured on the machine.

Common system configurations with 20-in spacing include:

Boom Width in ft	Number of Sections	Nozzles Per Section	Total Nozzles	Section Number						
				1	2	3	4	5	6	7
80	6	6-9-9-9-9-6	48	6	9	9	9	9	6	
90	5	9-15-6-15-9	54	9	15	6	15	9		
90	6	9-9-9-9-9-9	54	9	9	9	9	9	9	
100	6	12-9-9-9-9-12	60	12	9	9	9	9	12	
120	7	9-9-14-8-14-9-9	72	9	9	14	8	14	9	9

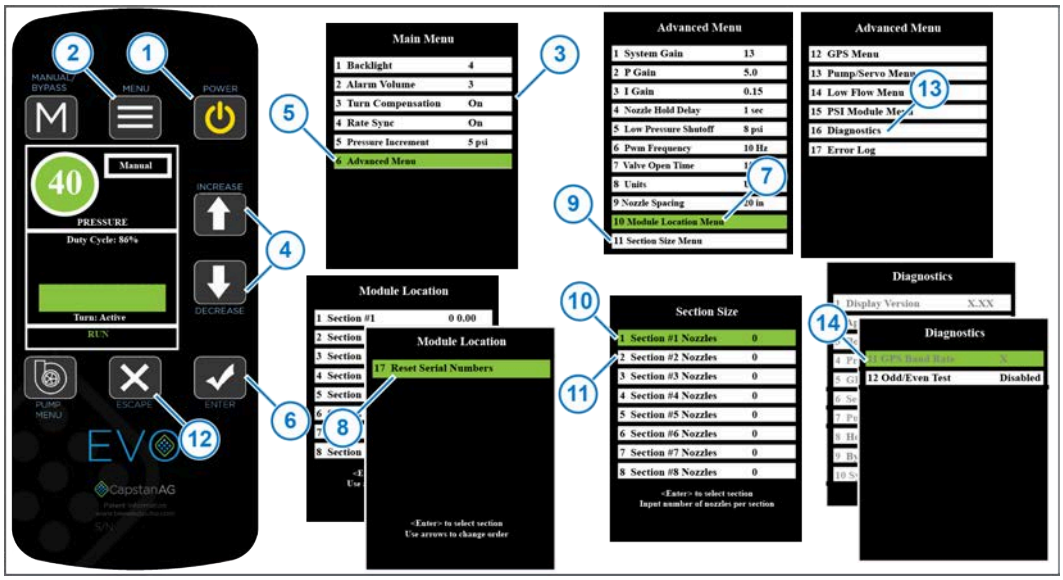

Figure 2:

1. Press the **POWER** button *(1)* on the cab box display to turn on the display.
2. Press the **MENU** button *(2)* to go to the ***Main Menu*** screen *(3)*.
3. Use the arrow buttons *(4)* to go to the **Advanced Menu** line *(5)*.
4. Press the **ENTER** button *(6)*.
5. Use the arrow buttons to go to the **Module Location Menu** line *(7)*.
6. Press the **ENTER** button.
7. Use the arrow buttons to scroll to the **Reset Serial Numbers** line *(8)* on the ***Module Location*** screen.
8. Make sure that the order of the smart drivers on the ***Module Location*** screen matches the physical boom layout. Change the order if necessary.

   The smart drivers should be in serial number order from left to right (lowest to highest number).

9. Use the arrow buttons to scroll to **Section #1** line.
10. Press the **ENTER** button.

    The nozzles on the selected section must pulse. If the nozzles do not pulse, the smart driver is in the wrong location.

    a) To change the location, press the **ENTER** button until the line is highlighted yellow.
    b) Use the arrow buttons to move the smart driver to the correct location.
    c) Press the **ENTER** button.
11. Use the arrow buttons to scroll to the next Section line.
12. Repeat Steps 11 and 12 to test the rest of the system sections.
13. Use the arrow buttons to go to the **Section Size** line *(9)* on the ***Advanced Menu*** screen.
14. Press the **ENTER** button.
15. On the Section Size screen, Section #1 Nozzles is selected *(10)*, press the **ENTER** button.
16. Enter the correct number of nozzles for that section.
17. Press the **ENTER** button.
18. Use the arrow buttons to go to the line for the next section *(11)*.
19. Press the **ENTER** button.
20. Enter the correct number of nozzles for that section.
21. Press the **ENTER** button.
22. Repeat steps 10 to 13 for each additional section of your machine.
23. When the correct number of nozzles for each section has been entered, press the **ESCAPE** button *(12)* to go to the ***Advanced Menu*** screen.
24. Press the **ESCAPE** button three times to go to the main operating screen on the display.
25. Power cycle the display.
26. Make sure that you have a GPS connection.

    A GPS error will show at the bottom of the main operating screen if the system is not receiving the correct GPS signal.

    Go to the ***Diagnostics*** line *(13)* that shows the GPS baud rate.

    If the baud rate is showing on the **Diagnostics** screen *(14)*, you have good a good GPS connection. Then verify that the correct NMEA information is being sent from the exported information from you GPS. The EVO™ system requires VTG and GGA with a minimum of 5 Hz and 10 Hz recommended.

    The EVO™ system requires a baud rate between 19200 to 115200.

    If no baud rate is present, do a check of all the GPS connection points.

Module LED Identification

Smart Driver Modules

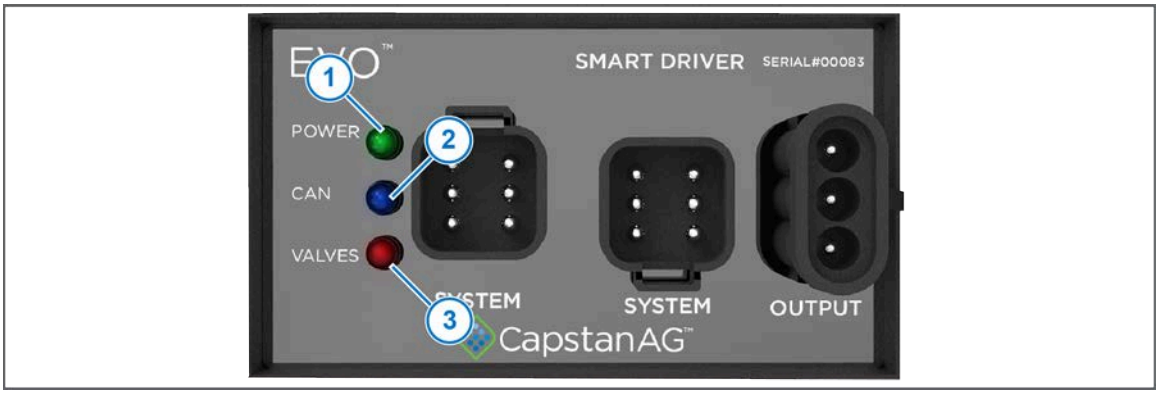

Figure 3:

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

Figure 4:

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

Figure 5:

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

Servo Transmitter Module

Figure 6:

The system will have one servo transmitter module. The module has 5 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	INC—Increase in duty cycle—Switch is pressed, and the duty cycle is increasing
(5)	Green	DEC—Decrease in duty cycle—Solid Illumination—Switch is pressed, and the duty cycle is decreasing

GPS Transmitter Module

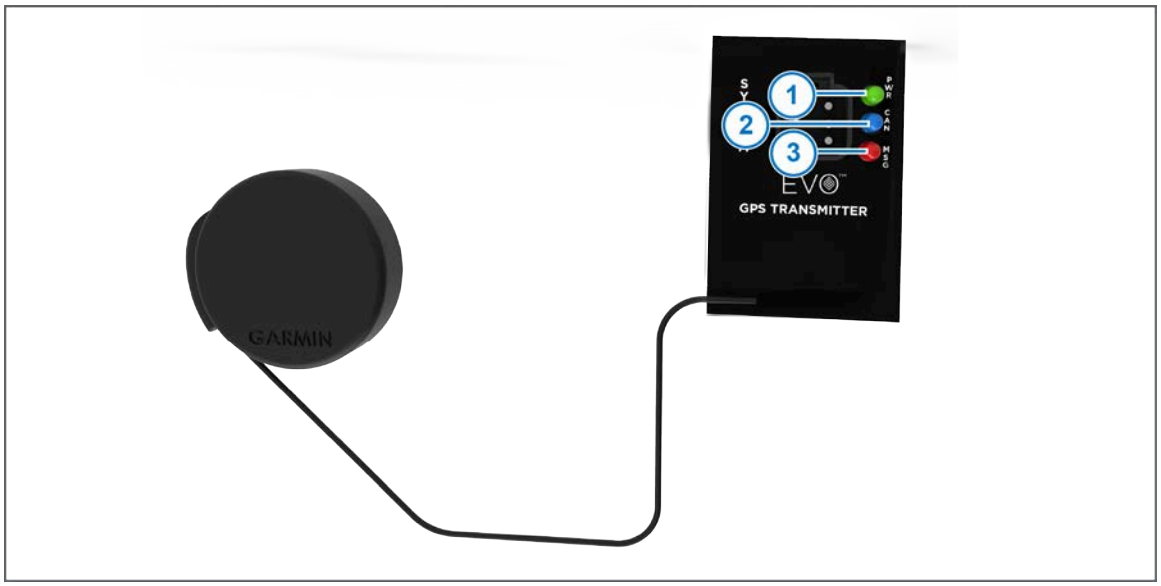

Figure 7:

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

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

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

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

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	17	23	5	9	14	18

Nozzle Spacing—20 in

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

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

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

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

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

Tip Size	Gauge (PSI)	Nozzle (PSI)	10 GPA Min 25%	10 GPA - 50%	10 GPA - 75%	10 GPA Max 100%	15 GPA Min 25%	15 GPA - 50%	15 GPA - 75%	15 GPA Max 100%	20 GPA Min 25%	20 GPA - 50%	20 GPA - 75%	20 GPA Max 100%	25 GPA Min 25%	25 GPA - 50%	25 GPA - 75%	25 GPA Max 100%	30 GPA Min 25%	30 GPA - 50%	30 GPA - 75%	30 GPA Max 100%	40 GPA Min 25%	40 GPA - 50%	40 GPA - 75%	40 GPA Max 100%	50 GPA Min 25%	50 GPA - 50%	50 GPA - 75%	50 GPA Max 100%
0.5 GPM #5	20	19	3	5	8	10	2	3	5	7	1	3	4	5	1	2	3	4	1	2	3	3	1	1	2	3	1	1	2	2
	30	29	3	6	9	13	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3	1	1	2	3
	40	38	4	7	11	15	2	5	7	10	2	4	5	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	50	48	4	8	12	16	3	5	8	11	2	4	6	8	2	3	5	7	1	3	4	5	1	2	3	4	1	2	2	3
	60	58	4	9	13	18	3	6	9	12	2	4	7	9	2	4	5	7	1	3	4	6	1	2	3	4	1	2	3	4
	70	67	5	10	14	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
0.6 GPM #6	20	19	3	6	9	12	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4	1	2	2	3	1	1	2	2
	30	28	4	7	11	15	2	5	7	10	2	4	6	7	1	3	4	6	1	2	4	5	1	2	3	4	1	1	2	3
	40	38	4	9	13	17	3	6	9	12	2	4	6	9	2	3	5	7	1	3	4	6	1	2	3	4	1	2	3	3
	50	47	5	10	14	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
	60	56	5	11	16	21	4	7	11	14	3	5	8	11	2	4	6	8	2	4	5	7	1	3	4	5	1	2	3	4
	70	66	6	11	17	23	4	8	11	15	3	6	9	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
0.8 GPM #8	20	18	4	8	12	16	3	5	8	11	2	4	6	8	2	3	5	6	1	3	4	5	1	2	3	4	1	2	2	3
	30	27	5	10	15	20	3	7	10	13	2	5	7	10	2	4	6	8	2	3	5	7	1	2	4	5	1	2	3	4
	40	36	6	11	17	23	4	8	11	15	3	6	8	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	50	45	6	13	19	25	4	8	13	17	3	6	9	13	3	5	8	10	2	4	6	8	2	3	5	6	1	3	4	5
	60	54	7	14	21	28	5	9	14	18	3	7	10	14	3	6	8	11	2	5	7	9	2	3	5	7	1	3	4	6
	70	63	7	15	22	30	5	10	15	20	4	7	11	15	3	6	9	12	2	5	7	10	2	4	6	7	1	3	4	6
1.0 GPM #10	20	17	5	10	15	19	3	6	10	13	2	5	7	10	2	4	6	8	2	3	5	6	1	2	4	5	1	2	3	4
	30	26	6	12	18	24	4	8	12	16	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	4	5
	40	34	7	14	21	27	5	9	14	18	3	7	10	14	3	5	8	11	2	5	7	9	2	3	5	7	1	3	4	5
	50	43	8	15	23	31	5	10	15	20	4	8	11	15	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	6
	60	51	8	17	25	34	6	11	17	22	4	8	13	17	3	7	10	13	3	6	8	11	2	4	6	8	2	3	5	7
	70	60	9	18	27	36	6	12	18	24	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	5	7
1.2 GPM #12	20	16	6	11	17	23	4	8	11	15	3	6	8	11	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	30	24	7	14	21	28	5	9	14	18	3	7	10	14	3	6	8	11	2	5	7	9	2	3	5	7	1	3	4	6
	40	32	8	16	24	32	5	11	16	21	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	8	2	3	5	6
	50	40	9	18	27	36	6	12	18	24	4	9	13	18	4	7	11	14	3	6	9	12	2	4	7	9	2	4	5	7
	60	48	10	20	29	39	7	13	20	26	5	10	15	20	4	8	12	16	3	7	10	13	2	5	7	10	2	4	6	8
	70	56	11	21	32	42	7	14	21	28	5	11	16	21	4	8	13	17	4	7	11	14	3	5	8	11	2	4	6	8
1.25 GPM #12.5	20	16	6	12	17	23	4	8	12	16	3	6	9	12	2	5	7	9	2	4	6	8	1	3	4	6	1	2	3	5
	30	24	7	14	21	29	5	10	14	19	4	7	11	14	3	6	9	11	2	5	7	10	2	4	5	7	1	3	4	6
	40	31	8	16	25	33	5	11	16	22	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8	2	3	5	7
	50	39	9	18	28	37	6	12	18	25	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	6	7
	60	47	10	20	30	40	7	13	20	27	5	10	15	20	4	8	12	16	3	7	10	13	3	5	8	10	2	4	6	8
	70	55	11	22	33	44	7	15	22	29	5	11	16	22	4	9	13	17	4	7	11	15	3	5	8	11	2	4	7	9
1.5 GPM #15	20	14	7	13	20	27	4	9	13	18	3	7	10	13	3	5	8	11	2	4	7	9	2	3	5	7	1	3	4	5
	30	22	8	16	25	33	5	11	16	22	4	8	12	16	3	7	10	13	3	5	8	11	2	4	6	8	2	3	5	7
	40	29	9	19	28	38	6	13	19	25	5	9	14	19	4	8	11	15	3	6	9	13	2	5	7	9	2	4	6	8
	50	36	11	21	32	42	7	14	21	28	5	11	16	21	4	8	13	17	4	7	11	14	3	5	8	11	2	4	6	8
	60	43	12	23	35	46	8	15	23	31	6	12	17	23	5	9	14	19	4	8	12	15	3	6	9	12	2	5	7	9
	70	50	12	25	37	50	8	17	25	33	6	12	19	25	5	10	15	20	4	8	12	17	3	6	9	12	2	5	7	10
2.0 GPM #20	20	12	8	16	24	32	5	11	16	22	4	8	12	16	3	6	10	13	3	5	8	11	2	4	6	8	2	3	5	6
	30	18	10	20	30	40	7	13	20	26	5	10	15	20	4	8	12	16	3	7	10	13	2	5	7	10	2	4	6	8
	40	24	11	23	34	46	8	15	23	30	6	11	17	23	5	9	14	18	4	8	11	15	3	6	9	11	2	5	7	9
	50	30	13	26	38	51	9	17	26	34	6	13	19	26	5	10	15	20	4	9	13	17	3	6	10	13	3	5	8	10
	60	35	14	28	42	56	9	19	28	37	7	14	21	28	6	11	17	22	5	9	14	19	3	7	10	14	3	6	8	11
	70	41	15	30	45	60	10	20	30	40	8	15	23	30	6	12	18	24	5	10	15	20	4	8	11	15	3	6	9	12
2.5 GPM #25	20	10	9	18	27	36	6	12	18	24	5	9	14	18	4	7	11	15	3	6	9	12	2	5	7	9	2	4	5	7
	30	14	11	22	33	45	7	15	22	30	6	11	17	22	4	9	13	18	4	7	11	15	3	6	8	11	2	4	7	9
	40	19	13	26	39	51	9	17	26	34	6	13	19	26	5	10	15	21	4	9	13	17	3	6	10	13	3	5	8	10
	50	24	14	29	43	58	10	19	29	38	7	14	22	29	6	12	17	23	5	10	14	19	4	7	11	14	3	6	9	12
	60	29	16	32	47	63	11	21	32	42	8	16	24	32	6	13	19	25	5	11	16	21	4	8	12	16	3	6	9	13
	70	34	17	34	51	68	11	23	34	45	9	17	26	34	7	14	20	27	6	11	17	23	4	9	13	17	3	7	10	14

Blended Pulse™ Droplet Classification Table—US Measurements

Droplet Classification Table ASABE S-572.1

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

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

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

Tip Size	Gauge PSI	Nozzle PSI	Wilger				Hypro						TeeJet							
			ER (110°)	SR (110°)	MR (110°)	DR (110°)	HF (140°)	GRD (120°)	LD (110°)	VP (110°)	TR (110°)	F (110°)	TTJ60 (110°)	XR (110°)	XRC (110°)	DG (110°)	TJ60 (110°)	DGTJ60 (110°)	TT (110°)	TP (110°)
0.1 GPM #1	20	20	F											F					C	
	30	30	F									F		F					M	F
	40	40	VF									F		F					M	F
	50	50	VF									F		F					M	F
	60	60	VF									VF		VF					F	VF
	70	70	VF																F	
0.15 GPM #1.5	20	20	F											F					C	
	30	30	F	M	C	VC						F		F		M		F	M	F
	40	40	F	M	C	C						F		F		F		F	M	F
	50	50	VF	M	C	C						F		F		F		F	M	F
	60	59	VF	M	C	C						F		F		F		F	F	F
	70	69	VF	F	M	C													F	
0.2 GPM #2	20	20	F					M	M	F	M		C	M	F				VC	
	30	30	F	C	C	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	40	39	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	M	M	F
	50	49	F	M	C	VC		M	M	F	F	F	M	F	F	M	VF	F	M	F
	60	59	F	M	C	C		M	M	F	F	F	M	F	F	M	VF	F	M	F
	70	69	VF	M	C	C		F	M	F	F		M						F	
0.25 GPM #2.5	20	19	M					M	M	M			VC	M	M				VC	
	30	29	M	C	VC	XC		M	M	F			C	M	F				C	
	40	39	M	C	C	VC		M	M	F			C	F	F				M	
	50	49	F	M	C	VC		M	M	F			M	F	F				M	
	60	58	F	M	C	VC		M	M	F			M	F	F				M	
	70	68	F	M	C	C		F	M	F			M						F	
0.3 GPM #3	20	19	M					M	C	M	M		VC	M	M				VC	
	30	29	M	C	VC	XC		M	C	F	M	F	C	M	F	C	F	M	C	F
	40	39	F	C	VC	XC		M	M	F	F	F	C	F	F	M	F	M	C	F
	50	48	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	60	58	F	C	C	VC		M	M	F	F	F	M	F	F	M	F	F	M	F
	70	67	F	C	C	VC		M	M	F	F		M						M	
0.4 GPM #4	20	19	C					C	C	M	M		VC	M	M				VC	
	30	28	C	C	VC	XC		C	C	M	M	M	C	M	M	C	F	C	C	M
	40	38	M	C	VC	XC		C	M	F	F	F	C	M	M	M	F	C	C	M
	50	47	M	C	VC	XC		M	M	F	F	F	M	F	F	M	F	C	M	F
	60	56	M	C	C	VC		M	M	F	F	F	M	F	F	M	F	M	M	F
	70	66	M	C	C	VC		M	M	F	F		M						M	
0.5 GPM #5	20	18	C					C	C	M	C		VC	M	M				VC	
	30	27	C	VC	XC	XC		C	C	M	M	M	C	M	M	C	M		VC	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																		
	30	18																	UC	
	40	24																	UC	
	50	30																	XC	
	60	36																	VC	
	70	42																	VC	
1.25 GPM #12.5	20	12	XC																	
	30	18	XC																	
	40	24	VC	XC	UC															
	50	30	VC	XC	UC	UC														
	60	36	VC	XC	XC	UC														
	70	42	C	VC	XC	XC														
1.5 GPM #15	20	10	XC																	
	30	15	XC				UC			VC	VC				VC					
	40	21	XC				UC			VC	VC				VC					
	50	26	VC	XC	UC		UC			VC	VC	C			VC					
	60	31	VC	XC	XC	UC	UC			VC	VC	C			VC					
	70	36	VC	XC	XC	UC	UC			C	C									

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	6	1	2	4	5
	345	6	11	17	22	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7	1	3	4	6
	414	6	12	18	24	4	7	11	15	3	6	9	12	3	5	8	10	2	5	7	9	2	4	5	7	2	3	5	6
	483	7	13	20	26	4	8	12	16	3	7	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	7
0.15 GPM #1.5	138	5	11	16	21	3	6	9	13	3	5	8	11	2	5	7	9	2	4	6	8	2	3	5	6	1	3	4	5
	207	6	13	19	26	4	8	12	15	3	6	10	13	3	6	8	11	2	5	7	10	2	4	6	8	2	3	5	6
	276	7	15	22	30	4	9	13	18	4	7	11	15	3	6	10	13	3	6	8	11	2	4	7	9	2	4	6	7
	345	8	17	25	33	5	10	15	20	4	8	12	17	4	7	11	14	3	6	9	12	2	5	7	10	2	4	6	8
	414	9	18	27	36	5	11	16	22	5	9	14	18	4	8	12	16	3	7	10	14	3	5	8	11	2	5	7	9
	483	10	20	30	39	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
0.2 GPM #2	138	7	14	21	28	4	8	13	17	3	7	10	14	3	6	9	12	3	5	8	10	2	4	6	8	2	3	5	7
	207	9	17	26	34	5	10	15	21	4	9	13	17	4	7	11	15	3	6	10	13	3	5	8	10	2	4	6	9
	276	10	20	30	40	6	12	18	24	5	10	15	20	4	8	13	17	4	7	11	15	3	6	9	12	2	5	7	10
	345	11	22	33	44	7	13	20	27	6	11	17	22	5	9	14	19	4	8	12	17	3	7	10	13	3	6	8	11
	414	12	24	36	48	7	15	22	29	6	12	18	24	5	10	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	483					8	16	24	31	7	13	20	26	6	11	17	22	5	10	15	20	4	8	12	16	3	7	10	13
0.25 GPM #2.5	138	9	17	26	35	5	10	16	21	4	9	13	17	4	7	11	15	3	7	10	13	3	5	8	10	2	4	7	9
	207	11	21	32	43	6	13	19	26	5	11	16	21	5	9	14	18	4	8	12	16	3	6	10	13	3	5	8	11
	276					7	15	22	30	6	12	18	25	5	11	16	21	5	9	14	18	4	7	11	15	3	6	9	12
	345					8	16	25	33	7	14	21	27	6	12	18	24	5	10	15	21	4	8	12	16	3	7	10	14
	414					9	18	27	36	8	15	23	30	6	13	19	26	6	11	17	23	5	9	14	18	4	8	11	15
	483					10	20	29	39	8	16	24	33	7	14	21	28	6	12	18	24	5	10	15	20	4	8	12	16
0.3 GPM #3	138	10	21	31	41	6	12	19	25	5	10	16	21	4	9	13	18	4	8	12	16	3	6	9	12	3	5	8	10
	207					8	15	23	30	6	13	19	25	5	11	16	22	5	10	14	19	4	8	11	15	3	6	10	13
	276					9	18	26	35	7	15	22	29	6	13	19	25	6	11	17	22	4	9	13	18	4	7	11	15
	345					10	20	30	39	8	16	25	33	7	14	21	28	6	12	18	25	5	10	15	20	4	8	12	16
	414					11	22	32	43	9	18	27	36	8	15	23	31	7	13	20	27	5	11	16	22	4	9	13	18
	483					12	23	35	47	10	19	29	39	8	17	25	33	7	15	22	29	6	12	17	23	5	10	15	19
0.4 GPM #4	138					8	16	25	33	7	14	20	27	6	12	18	23	5	10	15	20	4	8	12	16	3	7	10	14
	207					10	20	30	40	8	17	25	33	7	14	21	29	6	13	19	25	5	10	15	20	4	8	13	17
	276					12	23	35	46	10	19	29	39	8	17	25	33	7	14	22	29	6	12	17	23	5	10	14	19
	345									11	22	32	43	9	18	28	37	8	16	24	32	6	13	19	26	5	11	16	22
	414									12	24	35	47	10	20	30	41	9	18	27	35	7	14	21	28	6	12	18	24
	483													11	22	33	44	10	19	29	38	8	15	23	31	6	13	19	26
0.5 GPM #5	138					10	20	30	40	8	17	25	34	7	14	22	29	6	13	19	25	5	10	15	20	4	8	13	17
	207									10	21	31	41	9	18	26	35	8	15	23	31	6	12	18	25	5	10	15	21
	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	345													11	23	34	45	10	20	30	40	8	16	24	32	7	13	20	26
	414																	11	22	33	44	9	17	26	35	7	15	22	29
	483																	12	24	35	47	9	19	28	38	8	16	24	31
0.5 GPM #5	276									12	24	36	47	10	20	30	41	9	18	27	36	7	14	21	28	6	12	18	24
	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 Min - Max 25%	30 l/ha 50%	30 l/ha 75%	30 l/ha 100%	50 l/ha Min - Max 25%	50 l/ha 50%	50 l/ha 75%	50 l/ha 100%	60 l/ha Min - Max 25%	60 l/ha 50%	60 l/ha 75%	60 l/ha 100%	70 l/ha Min - Max 25%	70 l/ha 50%	70 l/ha 75%	70 l/ha 100%	80 l/ha Min - Max 25%	80 l/ha 50%	80 l/ha 75%	80 l/ha 100%	100 l/ha Min - Max 25%	100 l/ha 50%	100 l/ha 75%	100 l/ha 100%	120 l/ha Min - Max 25%	120 l/ha 50%	120 l/ha 75%	120 l/ha 100%
0.6 GPM #6	138									10	20	30	39	8	17	25	34	7	15	22	30	6	12	18	24	5	10	15	20
	207									12	24	36	48	10	21	31	41	9	18	27	36	7	14	22	29	6	12	18	24
	276													12	24	36	48	10	21	31	42	8	17	25	33	7	14	21	28
	345																	12	23	35	47	9	19	28	37	8	16	23	31
	414																					10	20	31	41	9	17	26	34
	483																					11	22	33	44	9	18	28	37
0.8 GPM #8	138													11	21	32	43	9	19	28	38	8	15	23	30	6	13	19	25
	207																	11	23	34	46	9	18	28	37	8	15	23	31
	276																					11	21	32	42	9	18	27	35
	345																					12	24	36	48	10	20	30	40
	414																									11	22	33	43
	483																									12	23	35	47
1.0 GPM #10	138																	11	22	33	44	9	18	27	36	7	15	22	30
	207																					11	22	33	43	9	18	27	36
	276																									10	21	31	42
	345																									12	23	35	47
	414																												
	483																												
1.2 GPM #12	138																					10	20	30	40	8	17	25	33
	207																									10	20	31	41
	276																									12	24	35	47
	345																												
	414																												
	483																												
1.25 GPM #12.5	138																												
	207																									10	21	31	42
	276																									12	24	36	48
	345																												
	414																												
	483																												
1.5 GPM #15	138																												
	207																									12	23	35	46
	276																												
	345																												
	414																												
	483																												

Nozzle Spacing—50 cm

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

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

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

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

Blended Pulse™ Droplet Classification Table—Metric

Droplet Classification Table ASABE S-572.1

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

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

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

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

Droplet Classification Table ASABE S-572.1

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

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

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

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

Chapter 5: Operation

Navigate to the Main System Menu

Figure 8:

Push 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

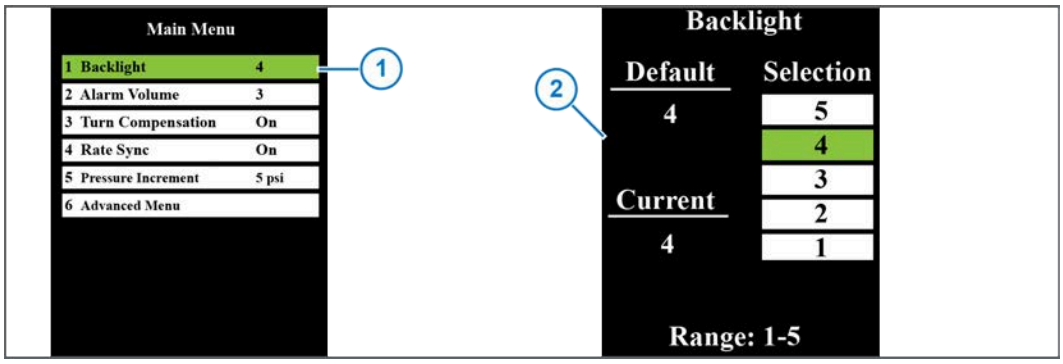

Figure 9:

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

The ***Backlight*** screen gives choices for the brightness of both the LCD screen and the 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 backlit.

Range: 1 to 5 (Dimmest to Brightest)

Alarm Volume

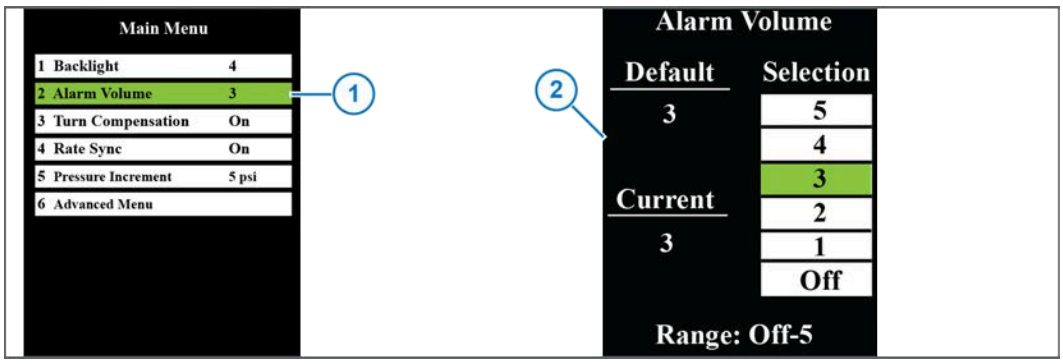

Figure 10:

1. Use the arrow buttons to select the **Alarm Volume** line *(1)*.
2. Push 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

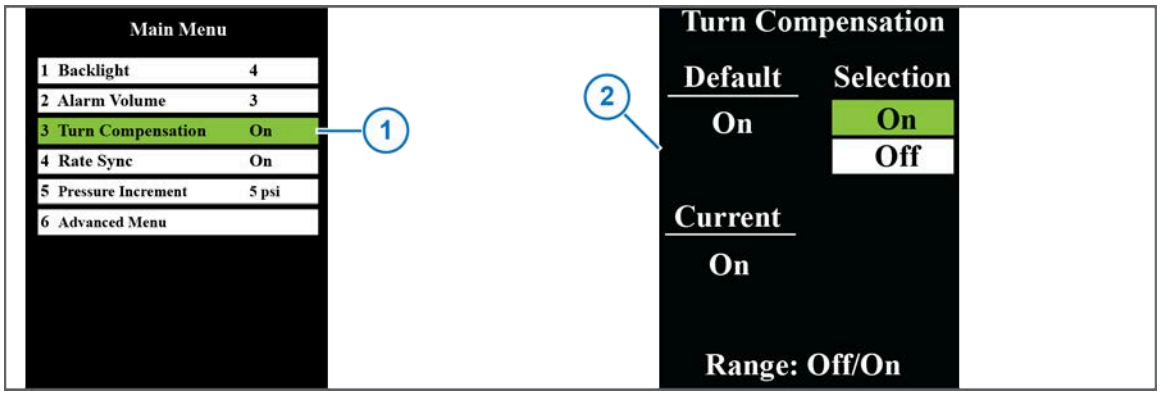

Figure 11:

1. Use the arrow buttons to select the **Turn Compensation** line *(1)*.
2. Push 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

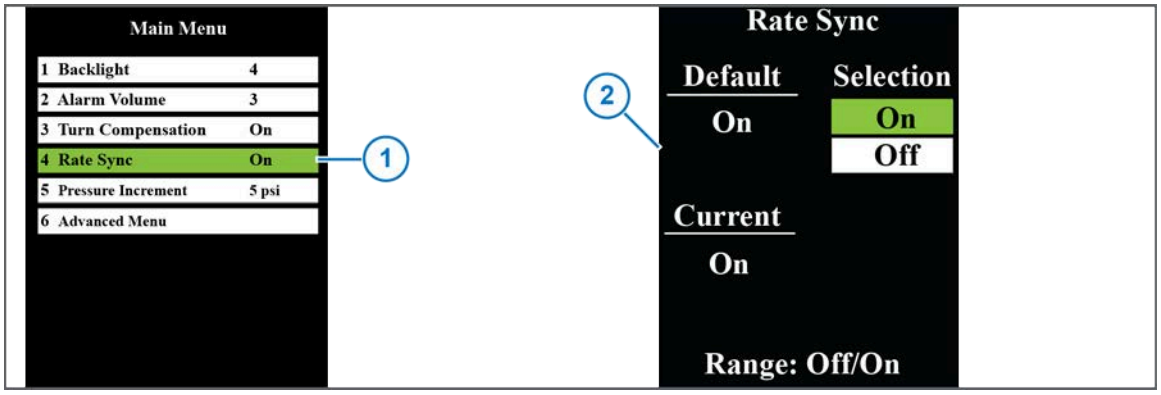

Figure 12:

1. Use the arrow buttons to select the **Rate Sync** line *(1)*.
2. Push 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

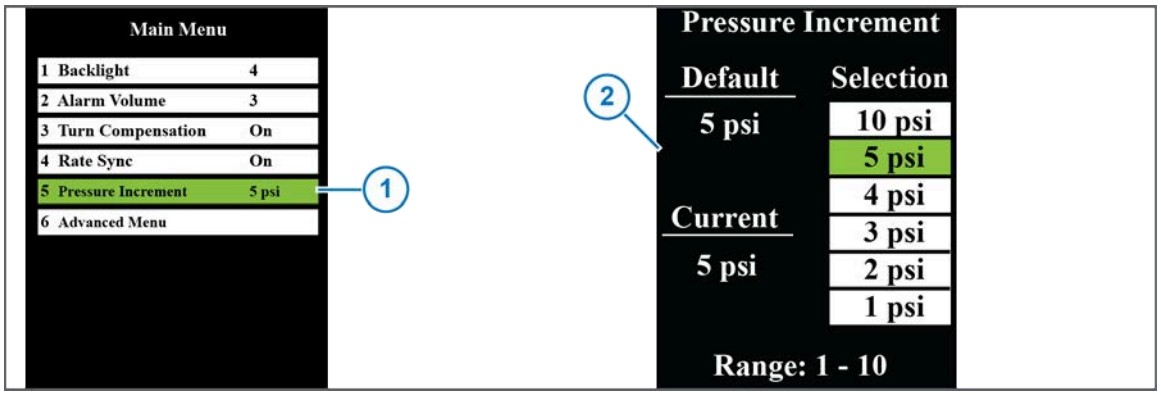

Figure 13:

1. Use the arrow buttons to select the **Pressure Increment** line *(1)*.
2. Push 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

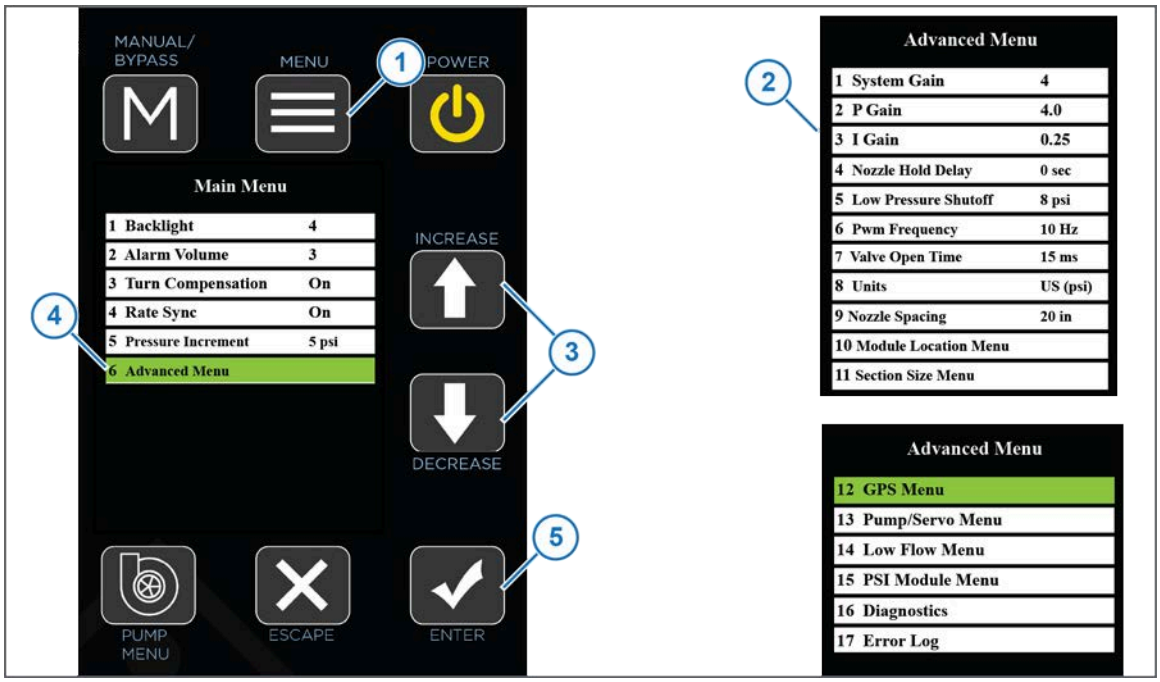

Figure 14:

To open the ***Advanced Menu*** list:

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

OR

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

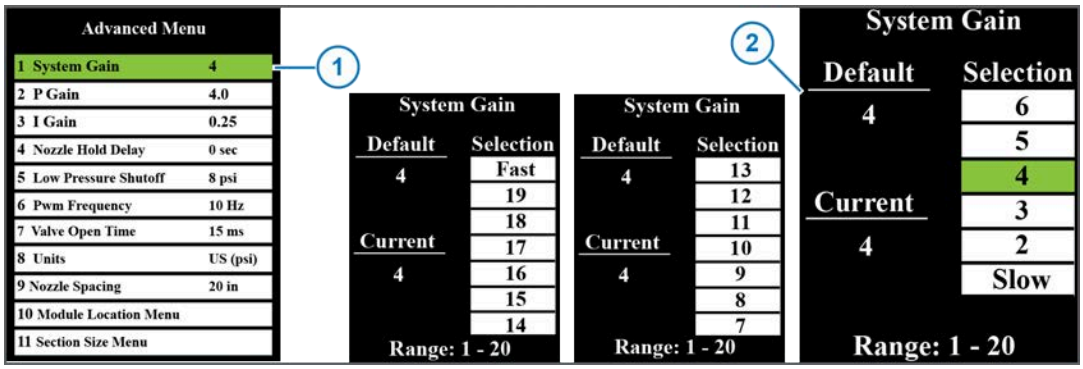

Figure 15:

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

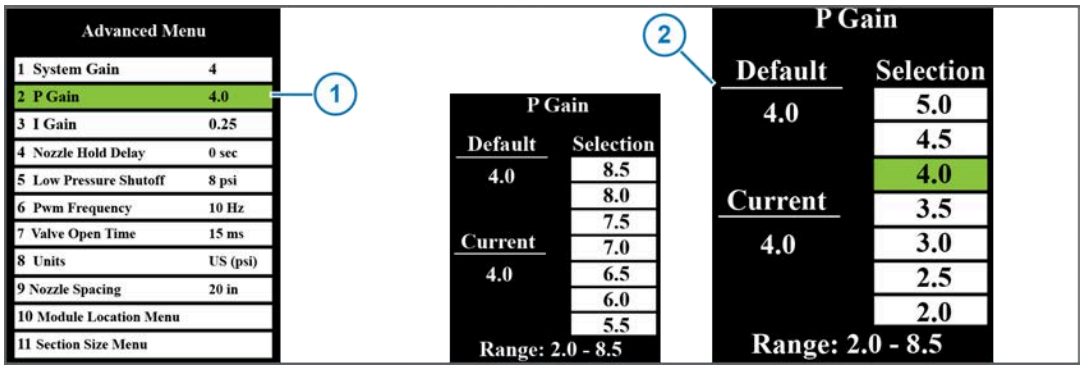

Figure 16:

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

Figure 17:

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

Figure 18:

1. On the ***Advanced Menu*** screen, use the arrow buttons to select the **Nozzle Hold Delay** line *(1)*.
2. Push 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 nozzle 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

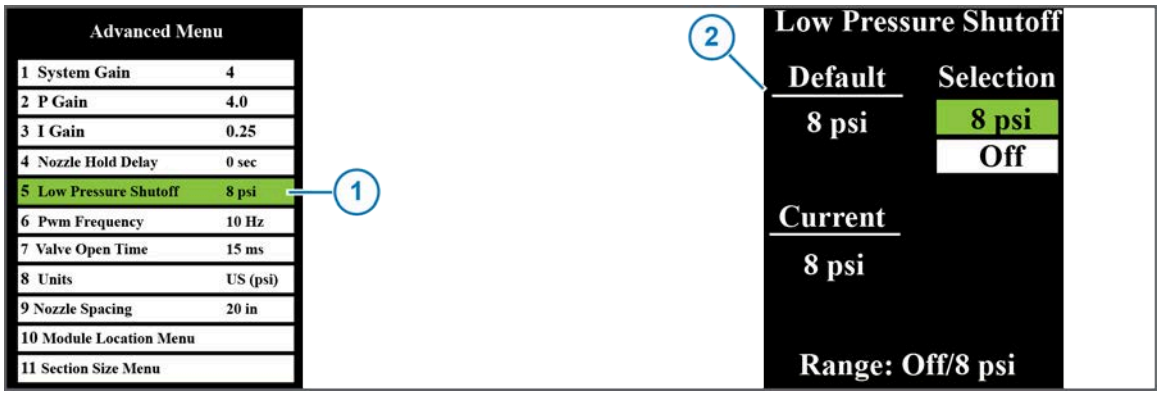

Figure 19:

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

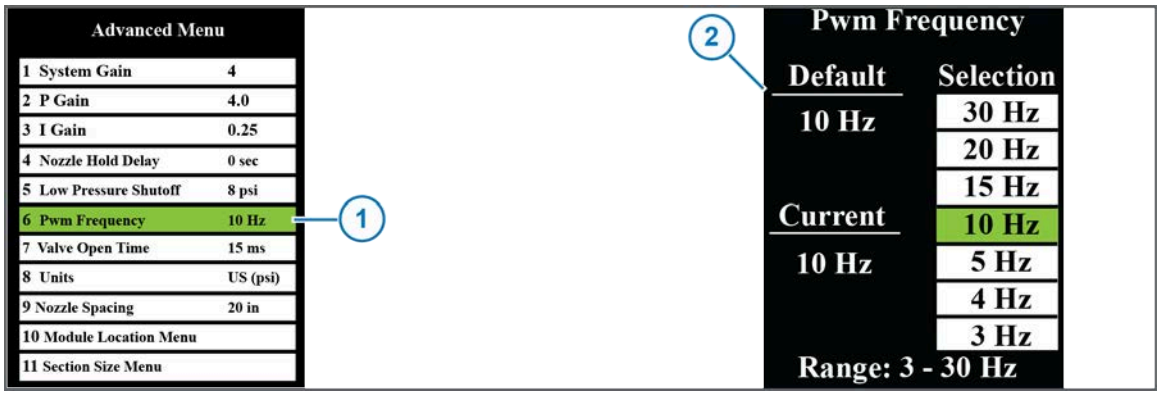

Figure 20:

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

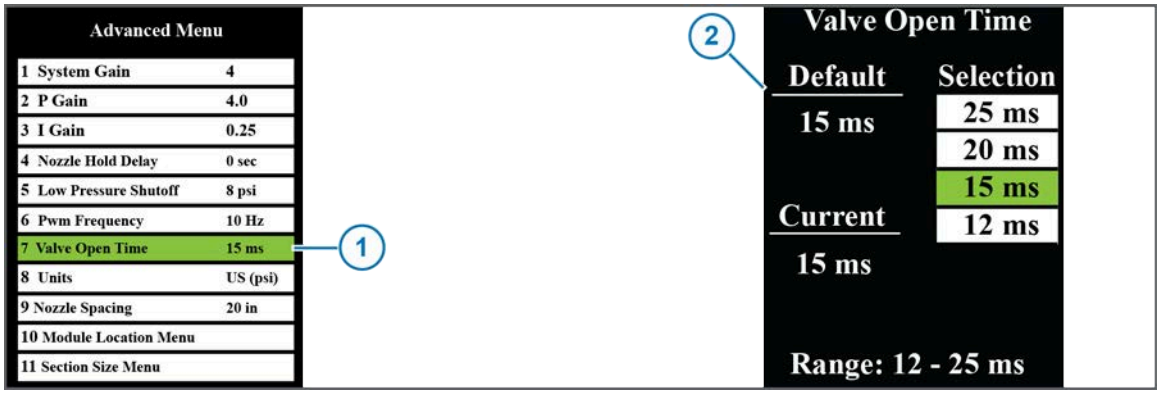

Figure 21:

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

If the EVO Upgrade system has 24-series valves, make sure that the **Valve Open Time** is set to 20 ms.

Units

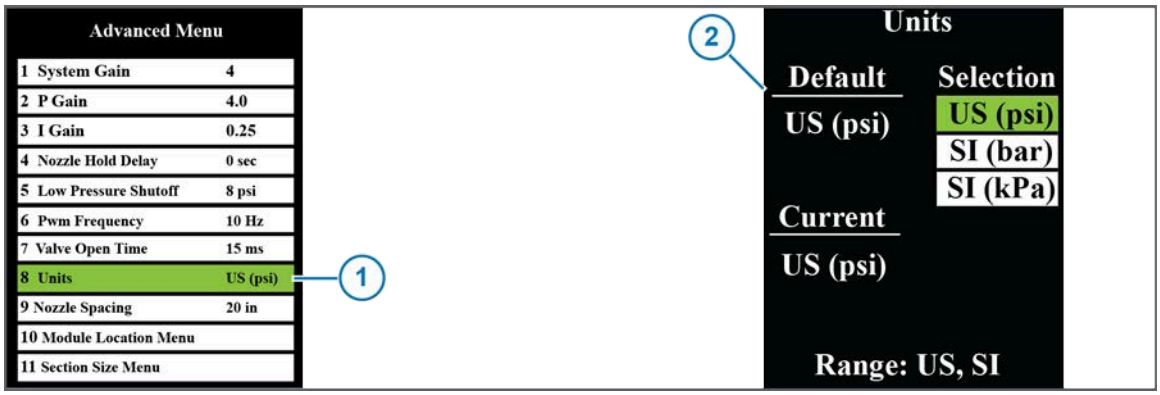

Figure 22:

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

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

Range: US, SI

Nozzle Spacing

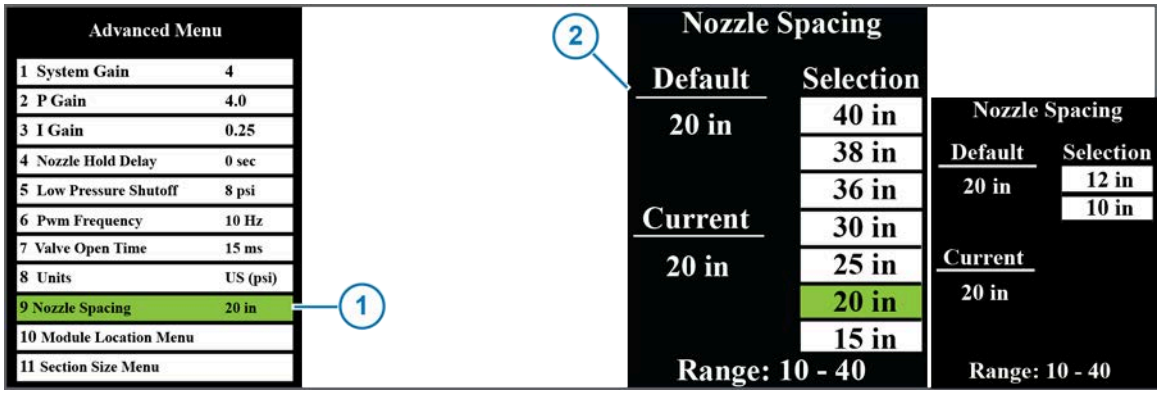

Figure 23:

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

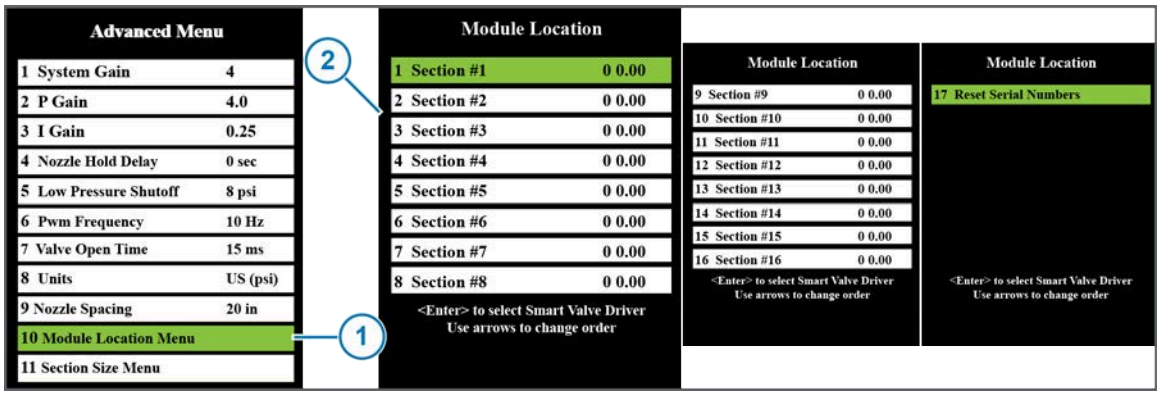

Figure 24:

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

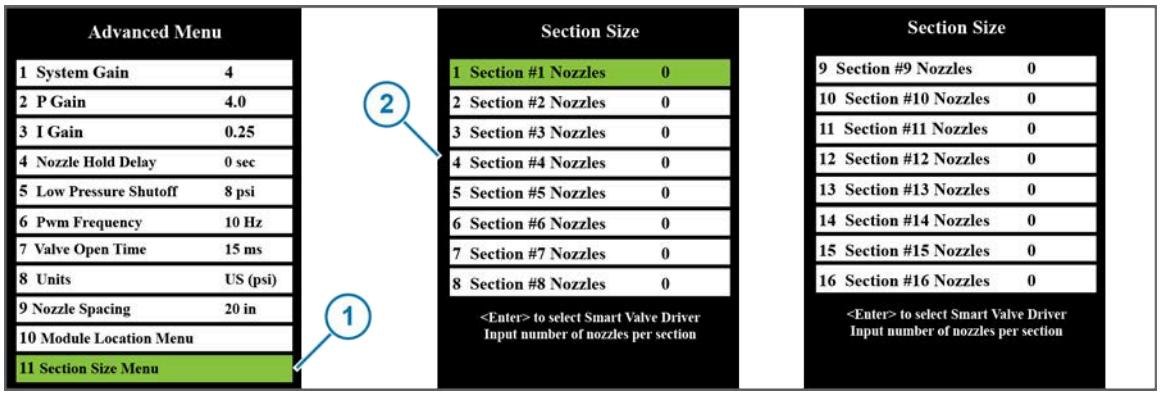

Figure 25:

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

Common system configurations for an EVO Upgrade system with 20-in spacing include:

Boom Width in ft	Number of Sections	Nozzles Per Section	Total Nozzles	Section Number						
				1	2	3	4	5	6	7
80	6	6-9-9-9-9-6	48	6	9	9	9	9	6	
90	5	9-15-6-15-9	54	9	15	6	15	9		
90	6	9-9-9-9-9-9	54	9	9	9	9	9	9	
100	6	12-9-9-9-9-12	60	12	9	9	9	9	12	
120	7	9-9-14-8-14-9-9	72	9	9	14	8	14	9	9

GPS Menu

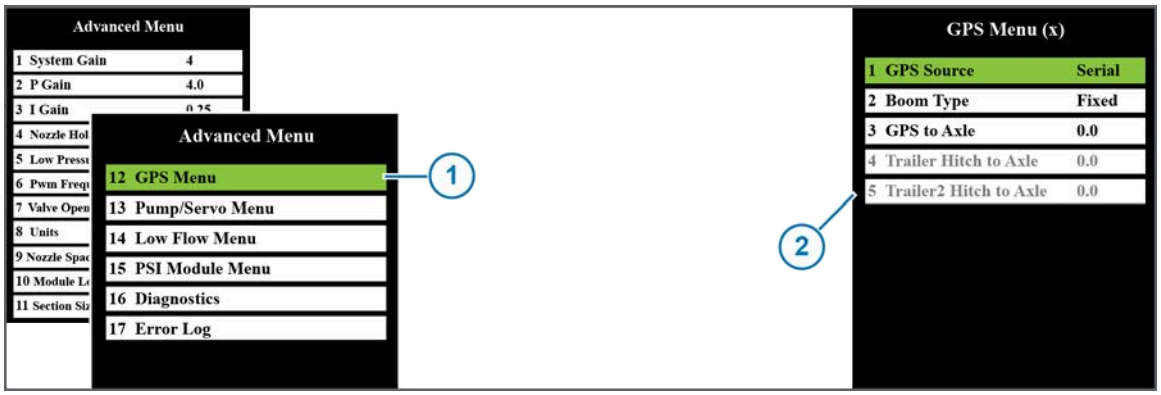

Figure 26:

1. On the ***Advanced Menu*** screen, use the arrow buttons to select the **GPS Menu** line *(1)*.
2. Push 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

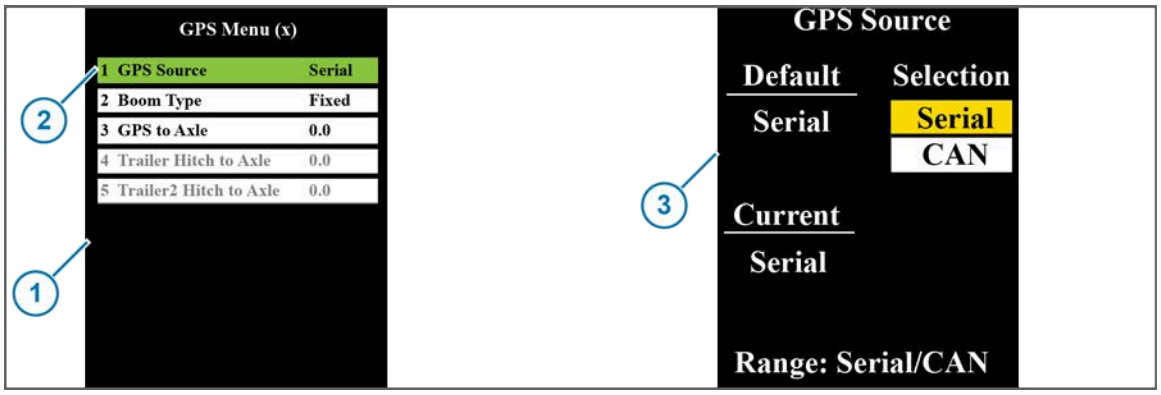

Figure 27:

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. Push 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.

The GPS source settings:

- **Baud Rate:** 19200 to 115200
- **GGA:** 5 Hz minimum requirement
- **VTG:** 5 Hz minimum requirement

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

Figure 28:

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

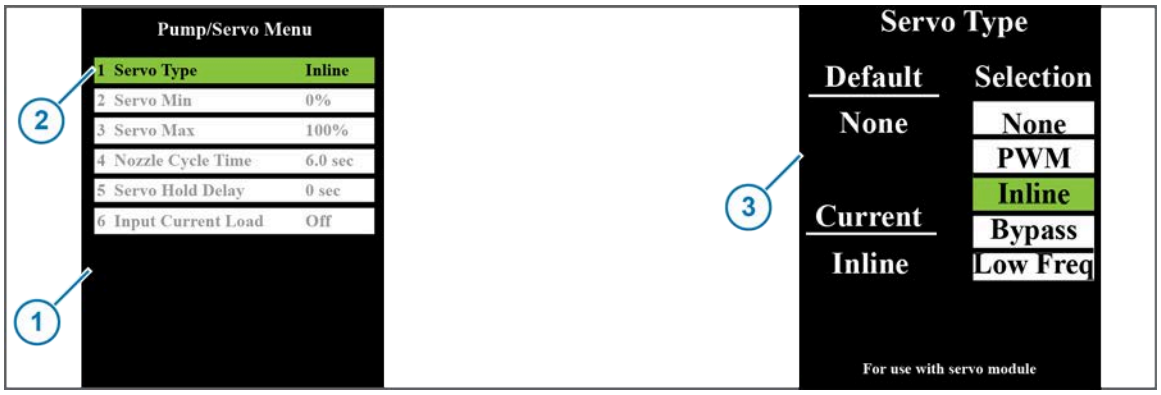

Figure 29:

1. From the ***Pump/Servo Menu*** screen *(1)*, select the **Servo Type** line *(2)*.
2. Push 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

For EVO Upgrade systems, make sure that the servo information is set to:

- **Servo Type**—Inline
- **Servo Min**—0%
- **Servo Max**—100%
- **Nozzle Cycle Time**—6.0 sec

Servo Min

For the EVO™ Upgrade Kit, set the value to 0%

Servo Max

For the EVO™ Upgrade Kit, set this value to 100%.

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.

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 in turned on.

Low Flow Menu

See a CapstanAG representative for more information.

PSI Module Menu

Figure 30:

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

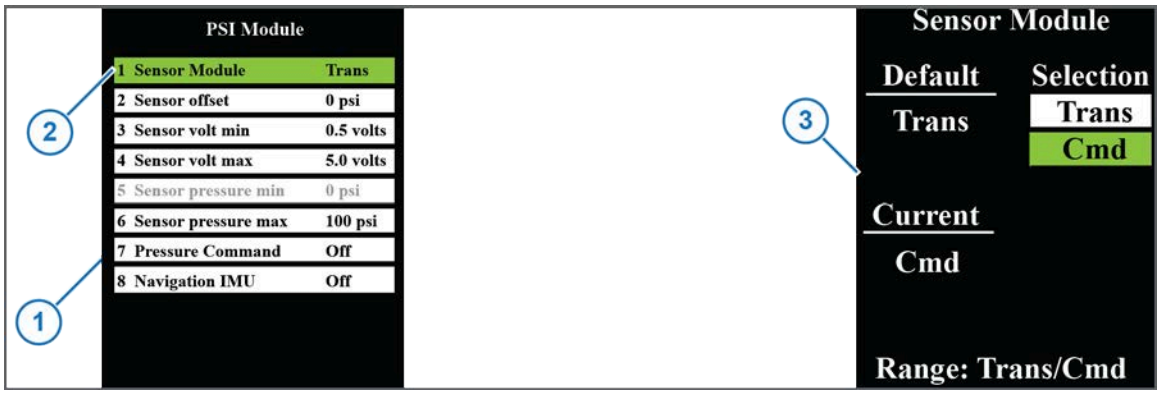

Figure 31:

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

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

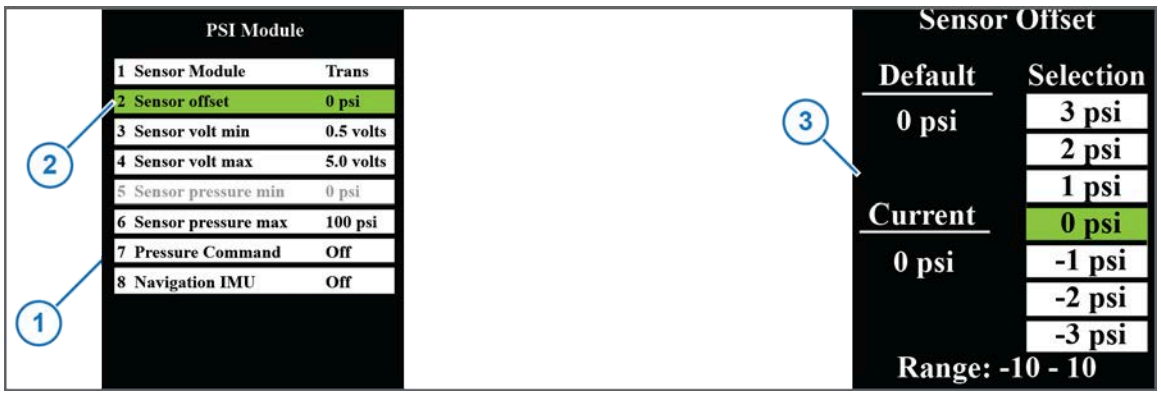

Figure 32:

1. From the ***PSI Module*** screen *(1)*, select the **Sensor offset** line *(2)*.
2. Push 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

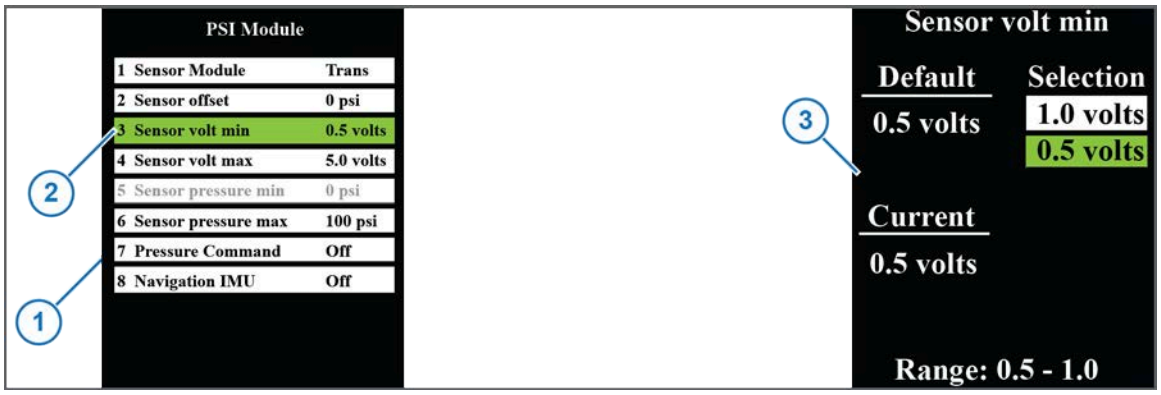

Figure 33:

1. From the ***PSI Module*** screen *(1)*, select the **Sensor volt min** line *(2)*.
2. Push 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

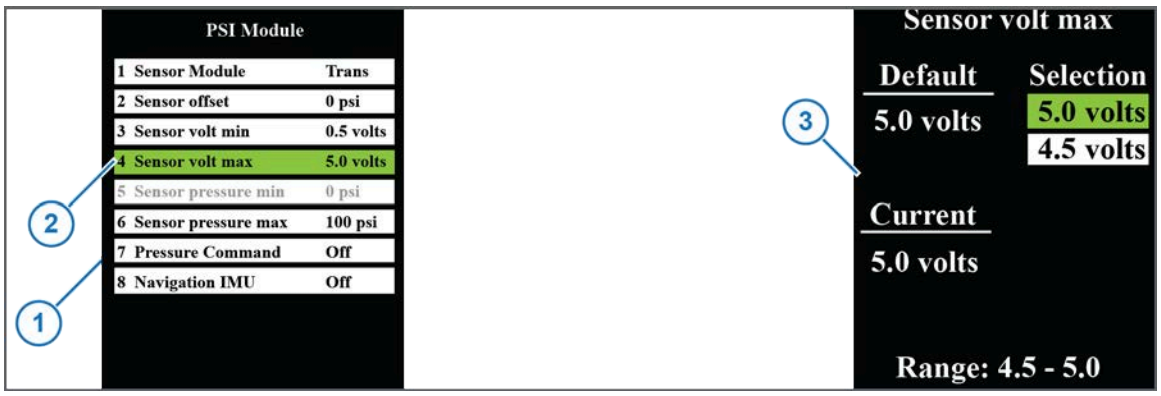

Figure 34:

1. From the ***PSI Module*** screen *(1)*, select the **Sensor volt max** line *(2)*.
2. Push 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.

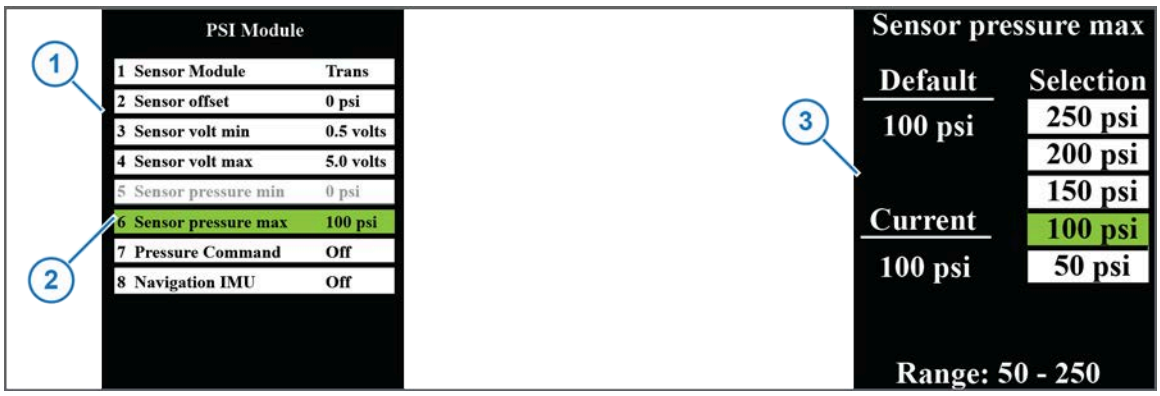

Figure 35:

1. From the ***PSI Module*** screen *(1)*, select the **Sensor pressure max** line *(2)*.
2. Push 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.

Diagnostics

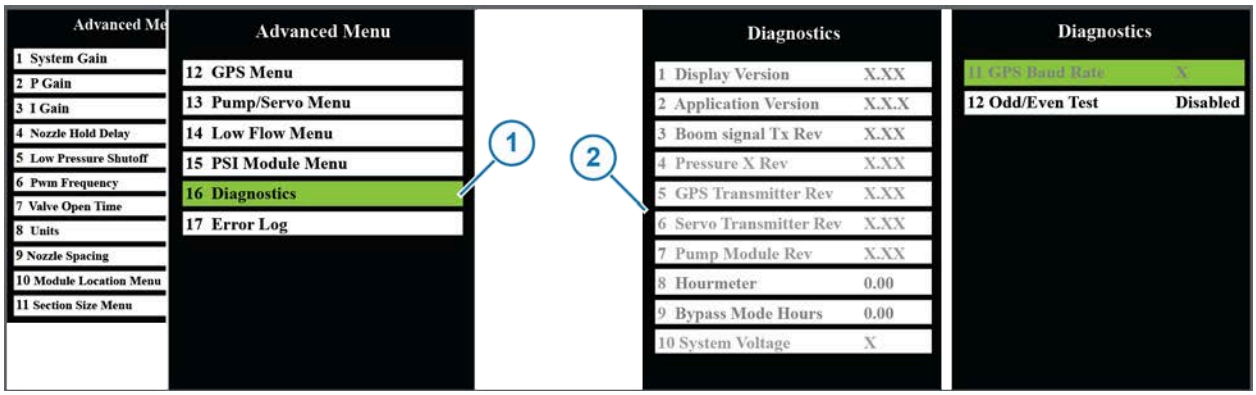

Figure 36:

1. On the ***Advanced Menu*** screen, use the arrow buttons to select the **Diagnostics** line *(1)*.
2. Push 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

Figure 37:

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

Start the Cab Display

Figure 38:

1. Start the machine.
2. Push 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

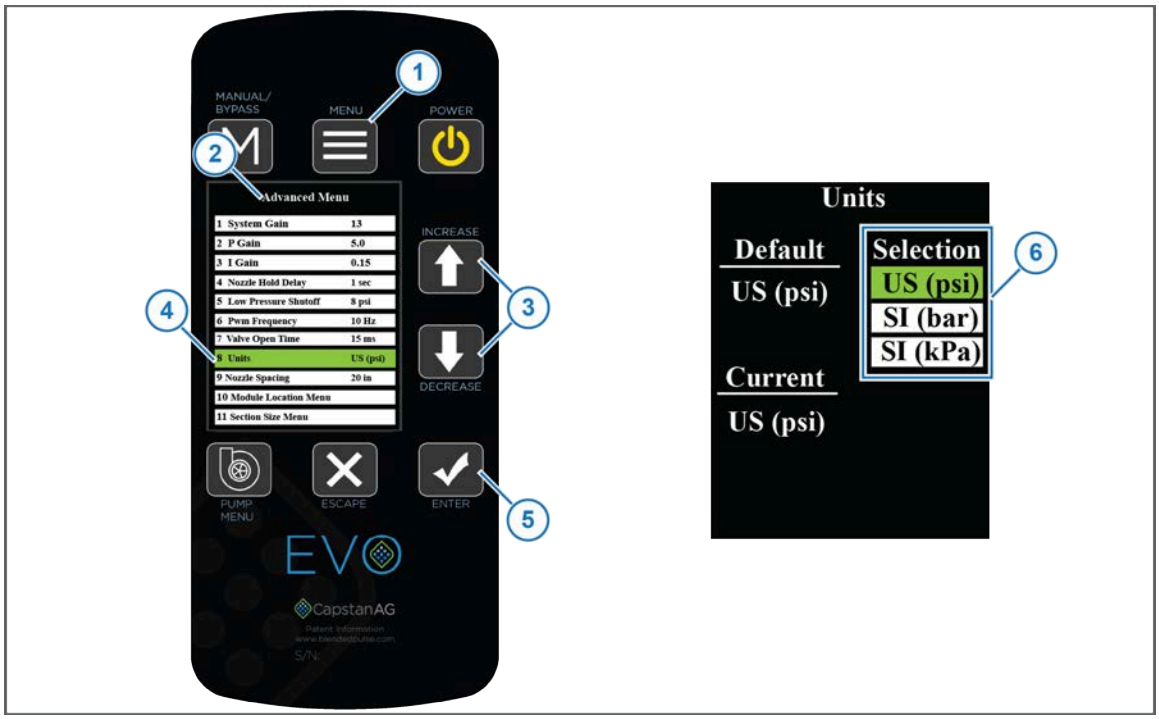

Figure 39:

1. Push 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. Push 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, push the **ENTER** button.

Manual Mode Operation

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

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

Figure 40:

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.

Figure 41:

To manually enter into bypass mode:

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

Shutdown the Cab Display

Figure 42:

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

Chapter 6: 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, it is recommended to do 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 voltmeter 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.

Chapter 7: Schematics

System Layout

Seven-section Schematic

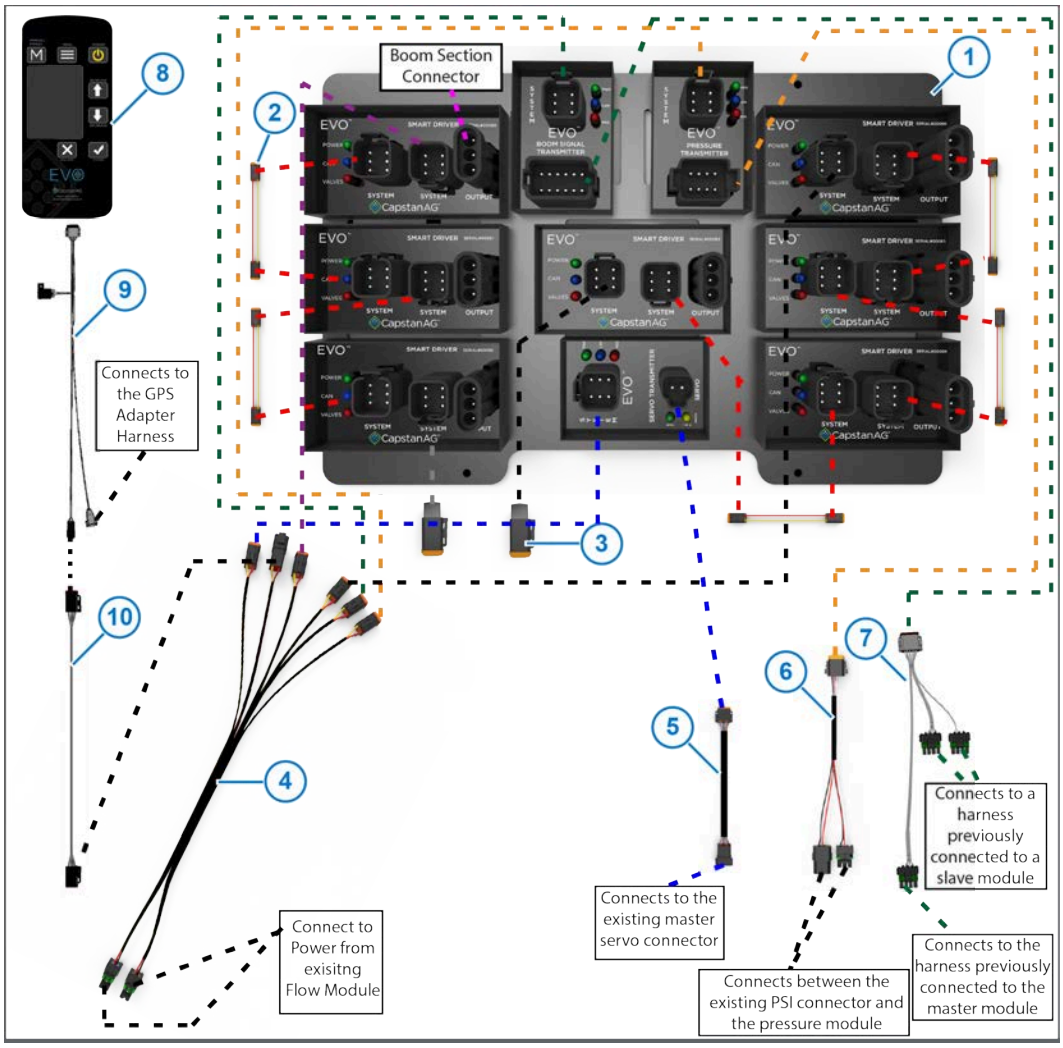

Figure 43:

Callout	Description		Callout	Description
(1)	Mounting Plate		*(6)*	PSI Adapter Harness
(2)	Plug-to-Plug Adapter Harness-6 in		*(7)*	Shutoff Harness
(3)	CAN Terminator		*(8)*	Cab Box Display
(4)	Power to CAN X Harness		*(9)*	Display Harness with GPS Drop
(5)	Servo Adapter Harness		*(10)*	CAN-Bus Extension Harness-40 ft

Six-section Schematic

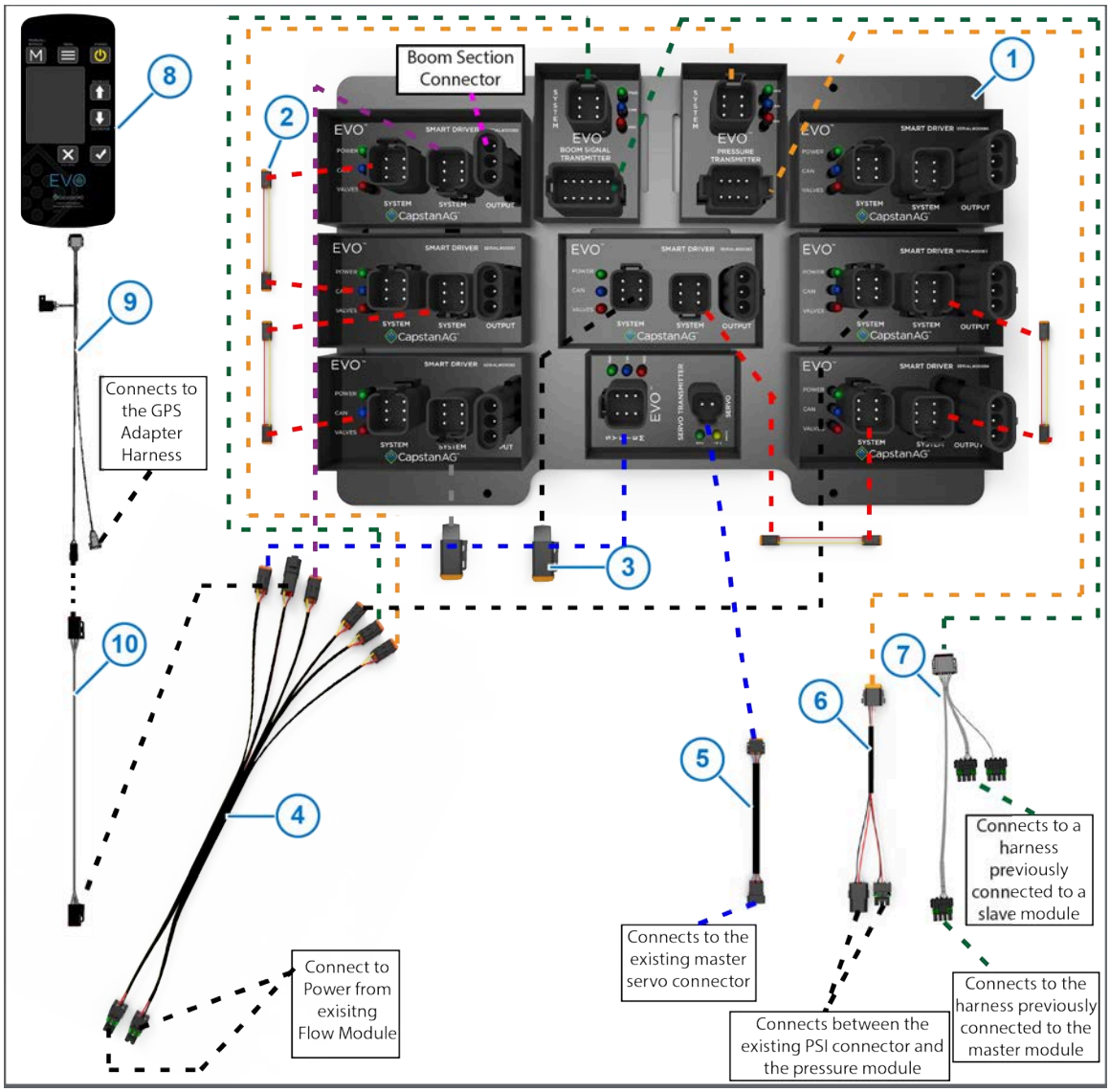

Figure 44:

Callout	Description		Callout	Description
(1)	Mounting Plate		*(6)*	PSI Adapter Harness
(2)	Plug-to-Plug Adapter Harness-6 in		*(7)*	Shutoff Harness
(3)	CAN Terminator		*(8)*	Cab Box Display
(4)	Power to CAN X Harness		*(9)*	Display Harness with GPS Drop
(5)	Servo Adapter Harness		*(10)*	CAN-Bus Extension Harness-40 ft

Five-section Schematic

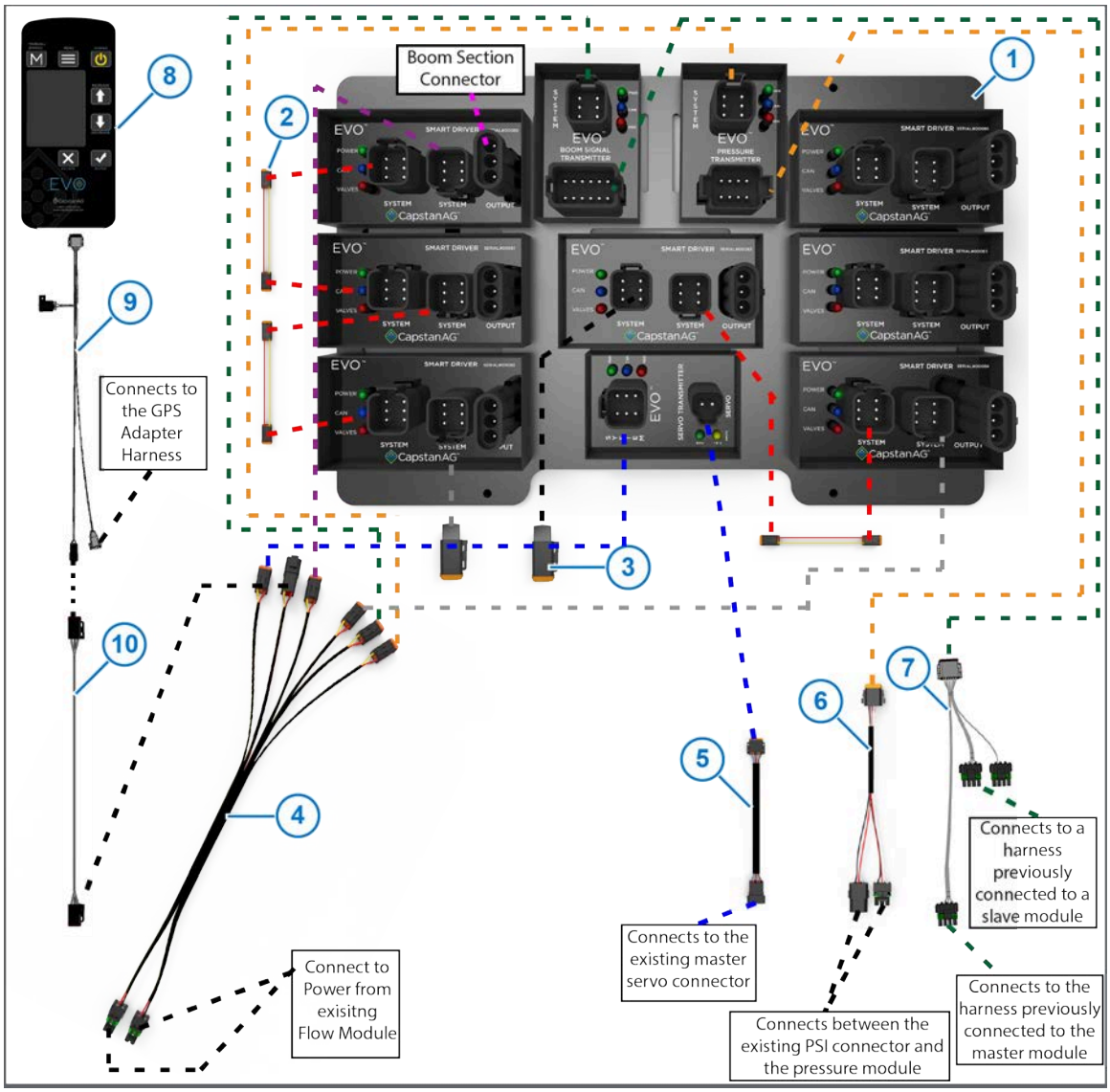

Figure 45:

Callout	Description		Callout	Description
(1)	Mounting Plate		*(6)*	PSI Adapter Harness
(2)	Plug-to-Plug Adapter Harness-6 in		*(7)*	Shutoff Harness
(3)	CAN Terminator		*(8)*	Cab Box Display
(4)	Power to CAN X Harness		*(9)*	Display Harness with GPS Drop
(5)	Servo Adapter Harness		*(10)*	CAN-Bus Extension Harness-40 ft

Kit Parts List

Part Number	Description	Parts Description	Qty
116200-014	3-pin Extension Harness-4 ft	Extension 3-Conductor x 4ft, 14 ga	4
116200-045	2-Pin Tower Dust Plug	HN Dust Plug 2 Pin Tower WP	4
116200-046	3-Pin Tower Dust Plug	HN Dust Plug 3 Pin Tower WP	2
116200-048	3-Pin Shroud Dust Plug	HN Dust Cap 3 Pin Shroud WP	7
116200-051	2-Pin Shroud Dust Plug	Dust Plug, 2 Pin WP Shroud	2
116200-078	4-Pin Tower Dust Plug	HN Dust Plug 4 Pin Tower WP	4
120140-016	DB9 Serial Cable	Cable Serial DB9 MTOF 15'	1
120140-028	8-32 Male/Female Hex Standoff	Hex Standoff, M/F 8-32 SS	4
150003-005	CAN Terminator	CAN Terminator	2
150006-010	Cab Box Display	Cab Box Display Assy EVO	1
150150-010	Pressure Transmitter Module	Assembly, Pressure Transmitter, EVO	1
150200-010	Boom Transmitter Module	Assembly, Boom Transmitter A, EVO	1
709031-505	8-32 x 5/16 Screw	Screw #8-32 X 5/16" SSPAN SS	4
713501-508	Split Lock Washer	Washer #8 Split Lock, SS	4
715040-178	Cable Ties	Tie Cable 12" Black	68
150005-008	PSI Adapter Harness	Harness, Adapter PSI EVO-AC Upgrade	1
150300-001	Mounting Plate	Module Mount Plate, EVO AC Retro	1
150100-010	Smart Driver Module	Assembly, Controller, Smart Driver, EVO	7
150003-006	Power to CAN X Harness	Power to Can X for AC Retro	1
118606-601	Shutoff Harness	Harness, Shutoff, Aim-Evo at Aim Module	1
150004-040	CAN-Bus Extension Harness-40 ft	Harness, Ext, CAN-BUS, 40FT Plug to Plug	1
150003-004	Display Harness with GPS Drop	Harness, Display w/GPS Drop	1
116200-077	4-Pin Tower Square Dust Plug	HN Dust Plug 4 Pin Tower SQWP	1
118603-111	RAM Mount	RAM Mount 2 7/16" Rnd Base 1"UBolt base w/1.5" Ball	1
620303-023	Plug-to-Plug Adapter Harness	Harn, Adapter, Plg-Plg 6"	5
150005-010	Servo Adapter Harness	Harness, Adapter, Servo, for AC	1
150250-050	Servo Transmitter Module	Assembly, Controller Servo, EVO	1
705725-141	20 A Fuse	Fuse 20 Amp Type ATO/ATC YL	3
705725-150	20 A Mini Fuse	Fuse, 20 Amp, Mini ATC	3

Part Number	Description	Parts Description	Qty
706530-356	12-pin D Dust Plug	HN Dust Plug 12-Pin Deutsch DT A Key	1
Machine Specific	GPS Adapter Cable	See Technical Bulletin TB19-04 for more information about which cable is needed for your system.	1

Display Harness

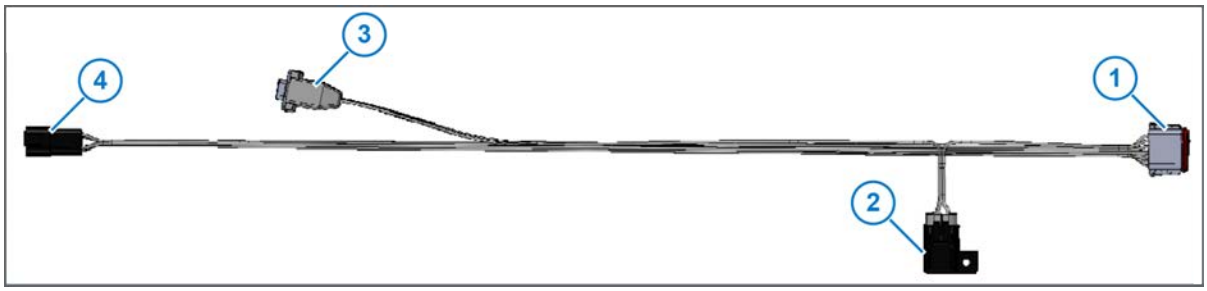

Figure 46:

Table 1: 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 2: 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 3: 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

CAN bus Extension Harness

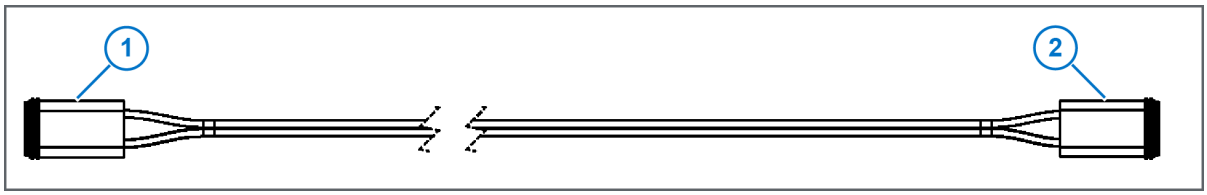

Figure 47:

Table 4: 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 5: Extension Connector *(1)* Pinout—6-pin DT Receptacle

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

Power to CAN X Harness

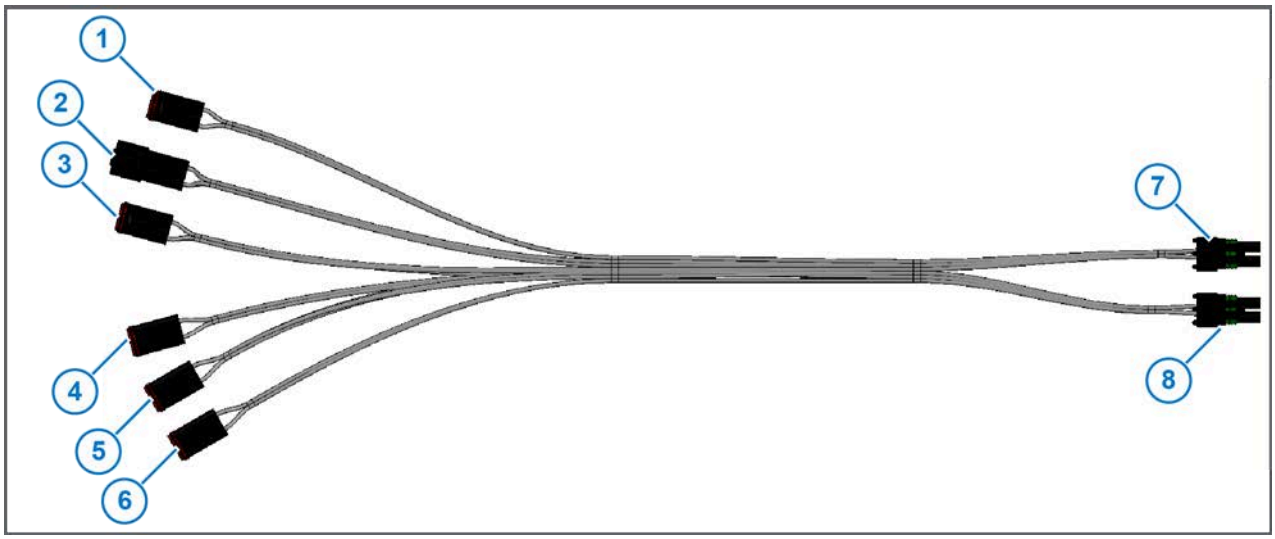

Figure 48:

Table 6: Servo Signal/Left Trunk Connector *(1)*—6-pin DT Plug

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 7: Display/Left Trunk Connector *(2)*—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 8: Left Boom/Left Trunk Connector *(3)*—6-pin DT Plug

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 9: Right Boom/Right Trunk Connector *(4)*—6-pin DT Plug

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

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 11: PSI Module/Right Trunk Connector *(6)*—6-pin DT Plug

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 12: Left Trunk Connector *(7)*—4-pin Tower

Pin	Description	Color		Pin	Description	Color
1	Power	Red		3	Power	Red
2	Ground	Black		4	Ground	Black

Table 13: Right Trunk Connector *(8)*—4-pin Tower

Pin	Description	Color		Pin	Description	Color
1	Power	Red		3	Power	Red
2	Ground	Black		4	Ground	Black

Shutoff Harness

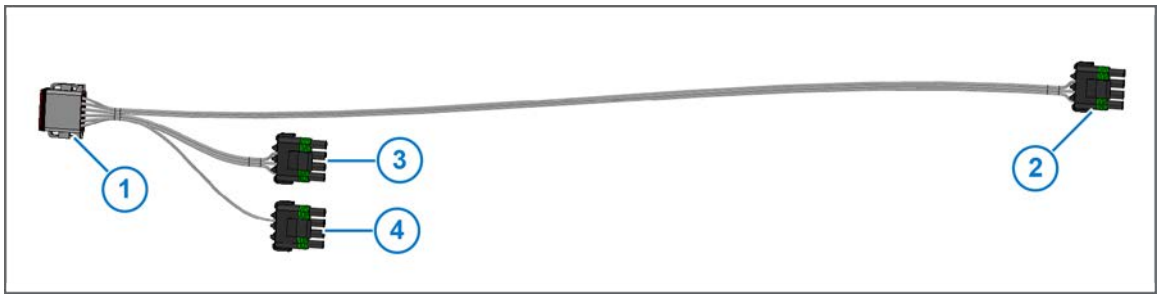

Figure 49:

Table 14: Boom Signal Transmitter Module Connector *(1)*—12-Pin DT Connector

Pin	Color		Pin	Color
1	Black		7	White/Black
2	Brown		8	Plug
3	Blue		9	Plug
4	Black/White		10	Plug
5	Brown/White		11	Plug
6	Blue/White		12	Plug

Table 15: Master Module Connector *(2)* (Boom Sections 1, 2, and 3)—4-Pin WP Tower Connector

Pin	Color		Pin	Color
A	Black		C	Blue
B	Brown		D	Plug

Table 16: Slave Module Connector *(3)* (Boom Sections 4, 5 and 6)—4-Pin WP Tower Connector

Pin	Color		Pin	Color
A	Blue/White		C	Black/White
B	Brown/White		D	Plug

Table 17: Slave Module Connector *(4)* (Boom Sections 7)—4-Pin WP Tower Connector

Pin	Color		Pin	Color
A	Plug		C	White\Black
B	Plug		D	Plug

Chapter 8: 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. 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 or right), 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.
		Find and repair the wiring issue.

Message	Description	Action
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

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

Notice: Correct resistance is:

If correct resistance is not found:

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

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.

Battery Voltage Test

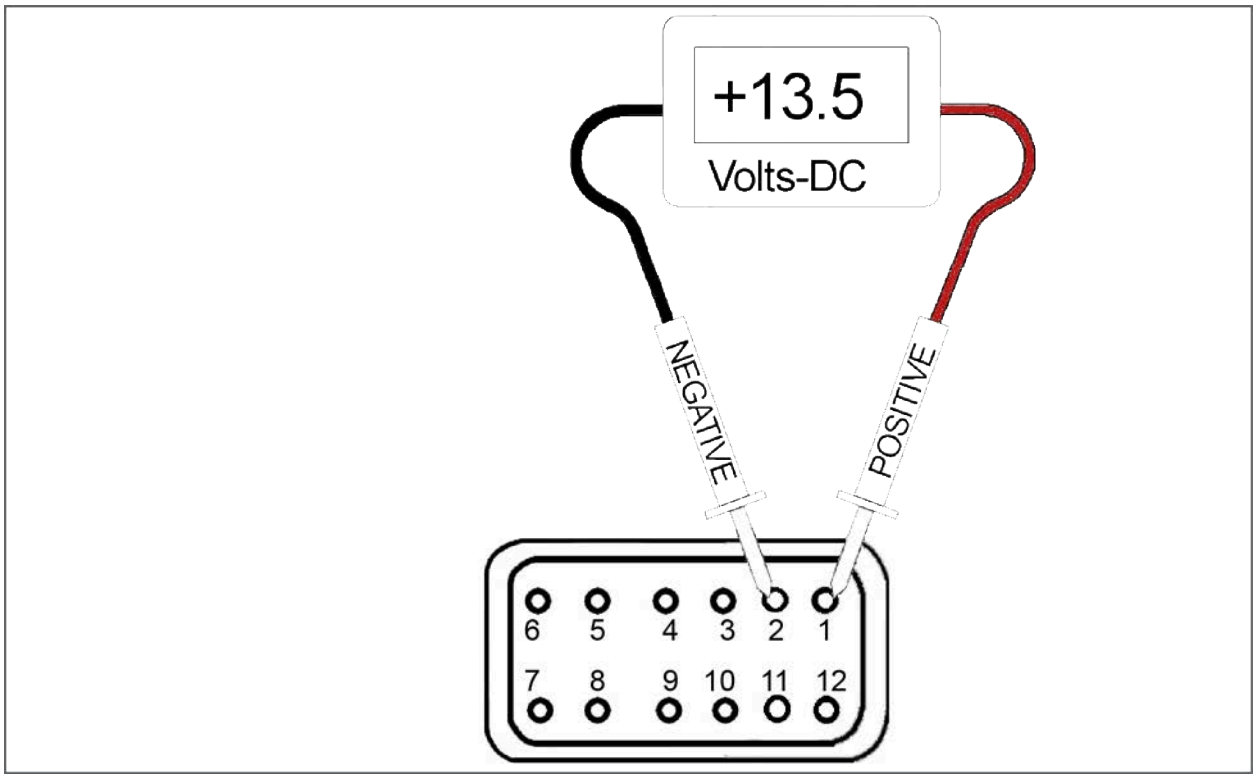

Figure 50:

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.

Power to the Pressure Sensor Input Test

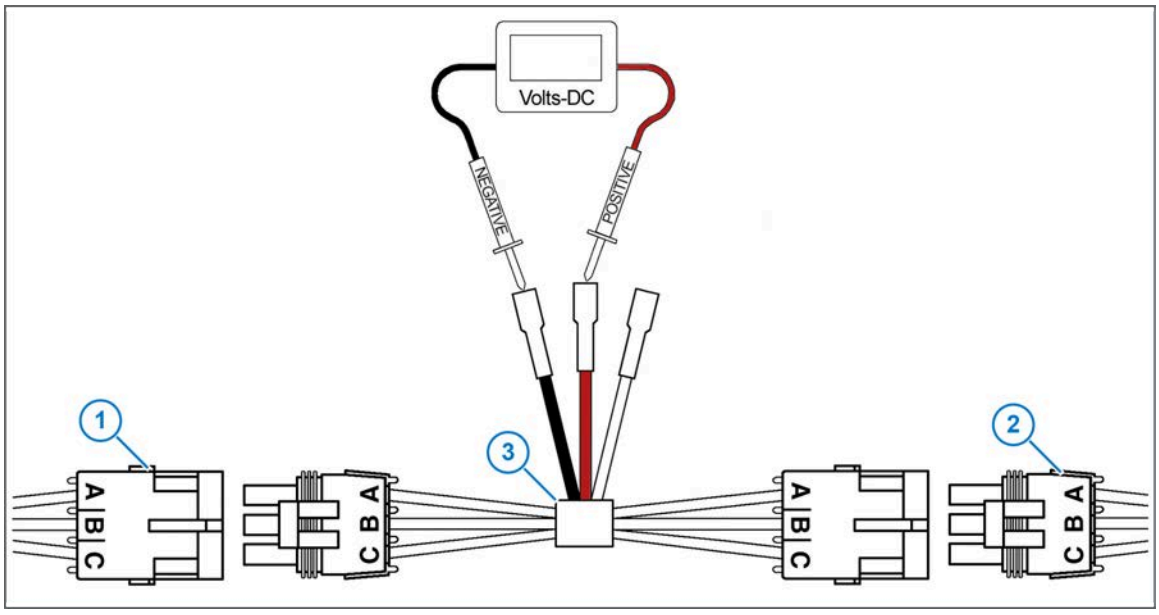

Figure 51:

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

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

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

If no voltage is present, do a check of:

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

Pressure Sensor Signal Test

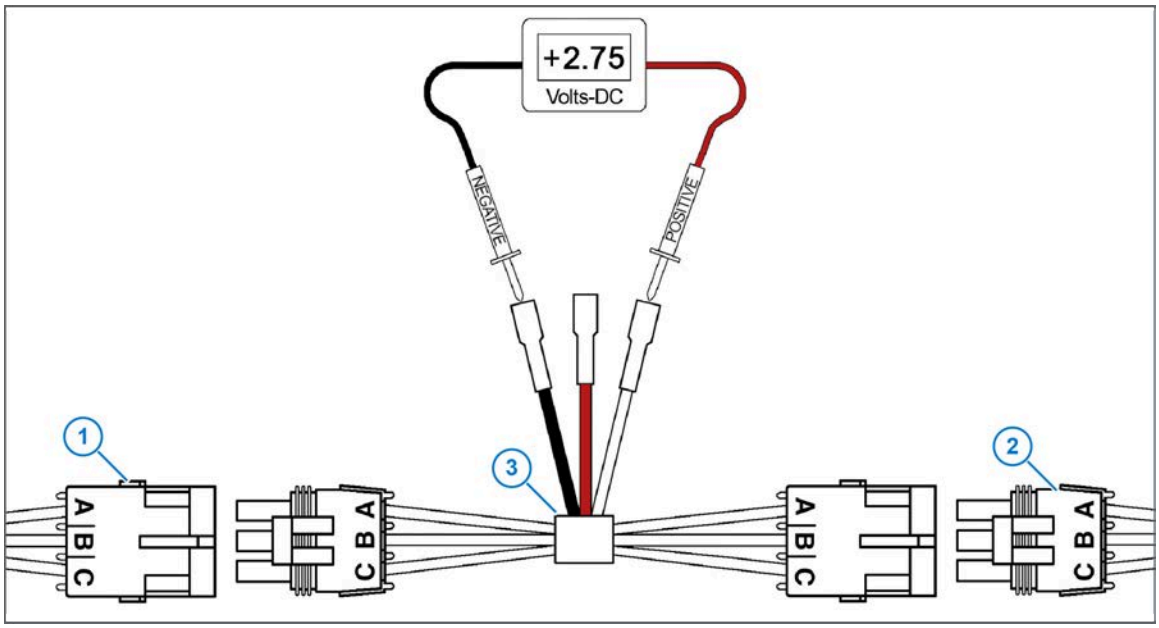

Figure 52:

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

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

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

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

If accurate voltage is not present:

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

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