



# Instructions for Continued Airworthiness

# SwathPRO™

For AirTractor

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# Change Log

Revision	Date	Description
A	11/15/2021	Initial Release of the Instructions for Continued Airworthiness of the SwathPRO™ system
B	6/21/2022	Clarification and additions to Section 6: System Operation in accordance with FAA STC direction
C	7/22/2022	Clarifications and addition of Wiring Schematics into Section 8: Schematics. Fixed part number error in Power and Sensors Schematic
D	10/22/2022	Addition of Ag-Nav Servo/Control Valve Harness
E	11/18/2022	Removed part number 320015-096 and fix shutoff kit schematic
F	12/28/2022	Added procedure for inputting number of nozzles into CapView. Updated Wiring Schematic
G	3/3/2023	Updated Wiring Schematic Corrected verbiage in Table 9
H	8/22/2023	Main power note added Updated wiring schematic Removed Nav Spray Map information
J	11/12/2024	Hardware part numbers revised to Mil Spec throughout SwathPRO Main “circuit breaker switch” and “main power disconnect” terminology revised to “SwathPRO Main toggle switch” throughout 50 Amp Circuit Breaker revised to 60 Amp throughout Verbiage for 7.5A fuse in Contactor to Main Power Relay Harness added throughout Note: Crimp all ring terminals in accordance with AC 43.13-1B Chapter 11, Section 14. text added as needed throughout References to Table 2: AN Part Numbers and Torque Specifications added throughout Figure 8 revised Figure 9 revised CapView Will Not Turn On table and text revised Install Conventional (OEM) Booms text revised Jump Start, Weld On, or Charge the Machine text revised Install a VCM Harness Assembly text revised Clean the Nozzle Valve(s) text and Figure 23 callouts revised Replacing the Power Supply text revised Examine the Main Power Contactor section added Replace the Main Power Contactor section added Location Setup Procedure text revised System Summary figure removed Power and Sensors Schematic revised to two separate schematics Power Schematic added Boom Shutoff Kit Schematic and table revised Table 9 revised Table 11 revised Table 12 revised Table 19 revised Figure 51 parts table revised cont'd next page

Revision	Date	Description
J	11/12/2024	SwathPRO Main Circuit Breaker heading, figure, and text revised Power Contactor section added Shut-off Harness Assembly text revised

## Revisions and Amendments

All ICA changes will be submitted to the FAA for review and acceptance by the Aircraft Certification Office and the Aircraft Evaluation Group prior to issuance to the field. Revisions to this ICA may not be distributed without prior FAA acceptance. Once an ICA revision is accepted by the FAA, it shall be distributed to all registered owners by either U.S. mail, internet, or email at the election of the STC holder. For questions or assistance regarding these Instructions for Continued Airworthiness, contact:

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# References

Table 1: Reference List

Title	Part Number	Description
Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for SwathPRO™	320700-001	System operation information
SwathPRO™ Installation Manual	320700-007	System installation information
ProMaker User Guide	320700-002	Computer software manual to make profiles
Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair	AC 43.13-1B	Aircraft inspection and repair information

**Table 2: AN Part Numbers and Torque Specifications**

Part Number	Description	Torque Specification
AN960-416L	Washer, Mil-Spec, 1/4, Cad Plated	
AN960-516L	Washer, Mil-Spec, 5/16, Cad Plated	
AN365-524A	Nut, Hex, Nylok, 5/16-24, Cad Plated	100-140 in/lbs
AN364-632A	Nut, Stop, Hex, Thin, 6-32, Cad Plated	11-13 in/lbs
AN364-428A	Nut, Stop, Hex, Thin, 1/4-28, Cad Plated	30-40 in/lbs
AN5-7A	Bolt, Mil-Spec 5/16-24 x 31/32, Cad Plated	
AN3-5A	Bolt, Hex 10-32 x 21/32 Cad Plated	
AN365-1032A	Nut, Hex Elastic Stop, 10-32 Cad Plated	20-25 in/lbs
AN960-10	Washer, Flat, #10 Cad Plated	
AN3-4A	Bolt, Hex, 10-32 x 17/32, Cad Plated	
AN6-7A	Bolt, Hex 3/8-24 x 31/32 Cad Plated	
AN365-624A	Nut, Hex Elastic Stop, 3/8-24 Cad Plated	160-190 in/lbs
AN960-616L	Washer, Flat, 3/8 Cad Plated	
MS35206-219	Screw, 4-40 x 3/4" Cad Plated	
AN364-440A	Nut, 4-40, thin, Cad Plated	3-4 in/lbs
AN960-4L	Washer, 4-40, Cad Plated	
MS35207-280	Screw, 1/4-28 x 5/8" Cad Plated	
MS35207-264	Machine screw, 10-32 x 5/8", Cad Plated	
MS35207-271	Screw, 10-32 x 2", Cad Plated	
MS21045L3	Nut, Self locking, 10-32, Cad Plated	20-25 in/lbs
MS35206-230	Screw, Pan Head Philips, 6-32 x 1/2, Cad Plated	
MS24693-S298	Screw, Mach, Flt Hd, 100 deg, 1/4-28 x 1, Cad Plated	
The published torque values do not include the rotational drag of the elastic stop nuts. Standard maintenance practice dictates that mechanics add this value to the specified torque. A random sample of new and used size -4, and -5 nuts shows that the torque required to turn the (1/4") nuts varied between 15-19 in/lbs. The torque required on the (5/16") nuts varied between 18-22 in/lbs. This value must be added to the torque value.		

## Acronym List

Acronym	Description
FAA	Federal Aviation Administration
OEM	Original Equipment Manufacturer
VCM	Valve Control Module
SDS	Safety Data Sheet
PPE	Personal Protective Equipment
DTM	Deutsch Mini
DT	Deutsch
RMA	Return Merchandise Authorization
PWM	Pulse Width Modulation
LED	Light Emitting Diode
CAN	Controller Area Network
CB	Circuit Breaker

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# Section 1: Introduction

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## Topics:

- [This Manual](#)
- [Applicable Aircraft Models](#)
- [Modification for SwathPRO](#)
- [Required and Special Tools](#)

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## This Manual

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Important: This document must be placed into the aircraft operator's Aircraft Maintenance Manual and incorporated into the aircraft's scheduled maintenance program.

For any case in which the instructions in this document and the Aircraft Maintenance Manual are in conflict, the most restrictive instructions take precedence.

This manual includes maintenance and re-installation information for the SwathPRO™ system you purchased.

Make sure that all personnel has read this manual other referenced manual(s) and thoroughly understand the safe and correct operation, maintenance, and re-installation procedures.

The right and left sides of the system are determined by facing the direction of forward travel of the aircraft on which the system is installed.

This manual contains important information on how to safely and correctly reinstall, operate, and maintain the SwathPRO™ system. These instructions 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) listed in the reference section of this manual. For more information, go to References.

Follow the instructions (in this manual) and in the other referenced manual(s) for each step to make sure that work conditions in and around the aircraft 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. Reference the specific chemical manuals for safety information.

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

If you do not understand the SwathPRO™ system after reading this manual and referenced documentation, please obtain the proper training before operating, servicing, or reinstalling the system. Proper training is important for your own safety, as well as your co-workers' safety, is maintained.

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## Applicable Aircraft Models

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Refer to the STC AML for applicable aircraft models.

## Modification for SwathPRO™

- The SwathPRO™ system removes and replaces the factory spray booms.
- The system added electronically controlled spray valves to control spray patterns.
- The CapView display in the aircraft cockpit lets the pilot upload custom spray patterns and save preset pattern profiles for selection in-flight.
- Spray on/off is controlled by the use of the existing spray handle (with no changes) or rate controller, as applicable.
- The SwathPRO™ system is compatible with aftermarket rate controllers and spray nozzles.

## Required and Special Tools

Tool Description	Where Used
Torque wrench	Install the SwathPRO™ Booms
5 psi water line and a camlock fitting on the end of each boom	Key Fob Boom Wet Test Flush the System
Voltmeter	Coil Assembly Test CapView Battery Voltage Test System Load Capacity Test VCM Voltage Test Pressure Sensor Signal Test

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## Section 2: Safety

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### Topics:

- [Signal Words](#)
- [Emergency Safety](#)
- [Personal Protective Equipment](#)
- [Pressurized Fluid Lines](#)
- [Chemical Safety](#)

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## Signal Words

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**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.

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## Emergency Safety

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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).

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## Personal Protective Equipment

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Wear close-fitting clothing and the correct personal protective equipment (PPE) for the job. Refer to the specific chemical manufacturer documentation or other information for correct PPE.

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## Pressurized Fluid Lines

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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.

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## Chemical Safety

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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.

## Section 3: Warranty

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### Topics:

- [Limited Warranty](#)

## Limited Warranty

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### What does the Limited Warranty cover?

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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.



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## 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.

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## 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. If the component(s) are not returned to the shipping address below within the thirty (30) day period, no credit will be issued for the part. 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

Once the package is received by us, we have thirty (30) days to process the warranty claim. If the warranty claim is still open after thirty (30) days, the warranty will be accepted, and credit issued to.

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## 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.<sup>1</sup>

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<sup>1</sup> Rev. Date 06/21/2022

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## Section 4: Airworthiness Limitations

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The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

There are no new (or additional) airworthiness limitations associated with this equipment and/or installation.

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## Section 5: Installation

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### Topics:

- [Before Installation of the CapstanAG™ System](#)
- [Install the SwathPRO™ Booms](#)
- [Post-install Checklist](#)
- [System Dry Tests](#)
- [System Wet Test](#)
- [Remove the SwathPRO Booms](#)
- [Install Conventional \(OEM\) Booms](#)

## Before Installation of the CapstanAG™ System

Make sure to remove the existing system from the aircraft.

If the SwathPRO™ system has not been installed on your aircraft before, refer to the SwathPRO™ installation manual for correct installation procedures.

If the SwathPRO™ booms have been removed and you are installing the booms again, continue to use this manual.

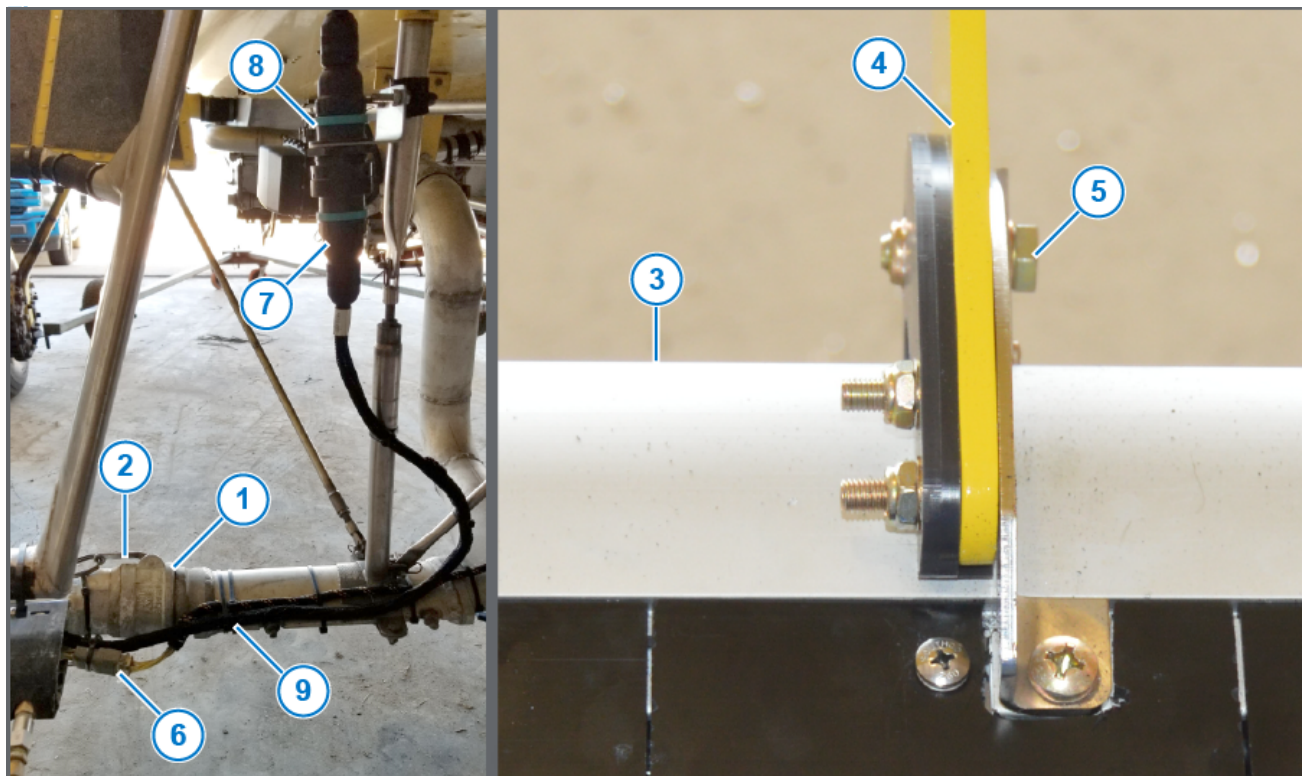


**CAUTION:** Before installation, operation, or service to the system, read and understand the system manuals and other referenced and required documentation. Chemical residue may be present on/in the equipment. Use the correct personal protective equipment.

1. Make sure that the hopper is empty.
2. Make sure that the aircraft key power is off.
3. Chock the wheels of the aircraft.

## Install the SwathPRO™ Booms

1. Before starting this procedure, make sure that you have completed the procedures in [Before Installation of the CapstanAG™ System](#).
2. Connect the camlock fittings ([Figure 1, Item 1](#)) and close the camlock handles ([Figure 1, Item 2](#)).



**Figure 1: SwathPRO™ Boom Installation**

3. Put the booms ([Figure 1, Item 3](#)) into the plastic centering plates on each boom hanger ([Figure 1, Item 4](#)).
4. Install a 5/16 bolt ([Figure 1, Item 5](#)), washers, and lock nut to attach the booms to the boom hangers.

**Table 3: SwathPRO™ Boom Installation**

Item	Part Number	Description	Qty
5	AN5-7A	Bolt, Mil-Spec 5/16-24 x 31/32, Cad Plated	6
	MS21044N5	Nut, Hex, Nylok, 5/16-24	6
	AN960-516L	Washer, Mil-Spec, 5/16, Cad Plated	12

Refer to [Table 2: AN Part Numbers and Torque Specifications](#) for correct torque specifications.<sup>1</sup>

5. If installed, connect the 6-pin DTM connector ([Figure 1](#), Item 6) by the camlock fittings on the left and right sides of the aircraft.
6. Remove the dust caps from the 31-pin connectors ([Figure 1](#), Item 7) on the left and right side of the fuselage by the steps.
7. Connect the 31-pin connector to the connector ([Figure 1](#), Item 8) mounted to each side of the aircraft.
8. Attach cable ties ([Figure 1](#), Item 9) to the harnesses, where necessary.

## Post-Install Checklist

- Make sure that the quarter-turn fasteners on the top and boom of each shell are installed and tightened.
  - Make sure that the harnesses are connected and fastened in place with cable ties.
- IMPORTANT:** Do not attach the harnesses to the aircraft or components with cable ties until the dry test of the system is complete.

## System Dry Tests

Perform the following procedures to make sure that the nozzle valves are operating correctly:

- Boom Dry Test
- Key Fob Boom Dry Test

### Boom Dry Test

9. Make sure that the engine is off and the aircraft key switch is on.
10. Make sure that the toggle switch labeled **SWATHPRO MAIN** is on.
11. Turn on the CapView display.
12. If using the fan brake relay, put the fan brake switch in the SPRAY ON position.
13. Push the spray handle down.  
All nozzle valves on the boom should start clicking.
14. Pull the spray handle up.  
All nozzle valves should turn off and stop clicking.

<sup>1</sup> In accordance with the Advisory Circular 43.13b Chapter 7 Section 4f, do not reuse a fiber or nylon locknut, if the nut cannot meet the minimum prevailing torque values.

## Key Fob Boom Dry Test

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



**Figure 2: System Setup — Nozzle Control**

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

When the key fob mode is activated, all the nozzles are turned off. The CapView shows that the Key Fob Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs.

2. Press the top/bottom buttons on the key fob to turn on or off each boom section.  
Make sure that each boom section is operating (clicking) in the correct order.  
**Note:** If the nozzles do not turn on in sequential order, it indicates the VCMs are not set up correctly.
3. Press the right/left buttons on the key fob to turn on or off each individual nozzle.  
Make sure that each nozzle is operating (clicking) in the correct order.
4. Press the center button on the key fob to turn off the whole boom.
5. Activate Nozzle Control (Key Fob) in the **SYSTEM SETUP** and change the setting back to 12V Active or the previous setting.



## System Wet Test

Perform this procedure to make sure that the nozzle valves are operating correctly.

### Key Fob Boom Wet Test

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

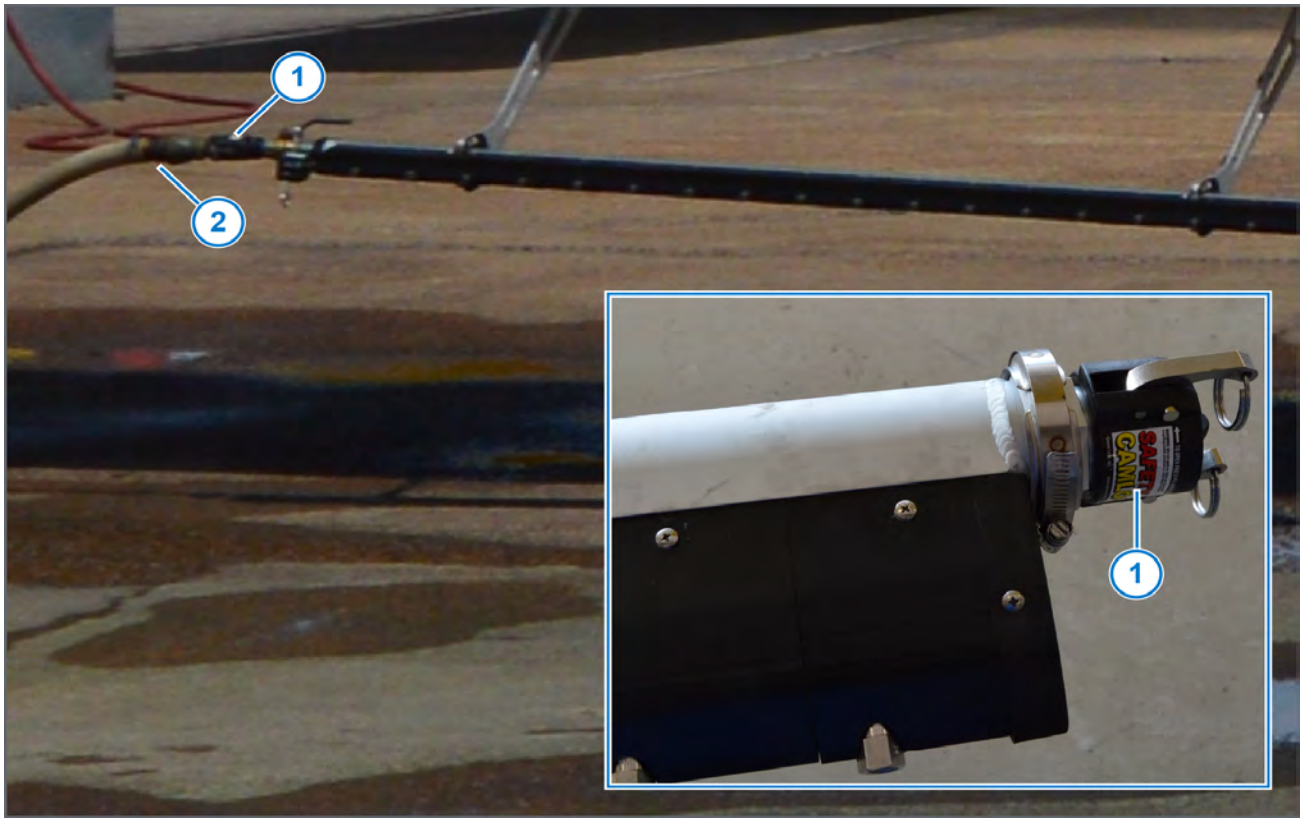
The key fob works well when checking for plugged tips without wasting a significant amount of product.



**Figure 3: System Setup — Nozzle Control**

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

When the key fob mode is activated, all the nozzles are turned off. The CapView shows that the Key Fob Mode is active. This is indicated by the text block in the upper left corner and the blinking LEDs.

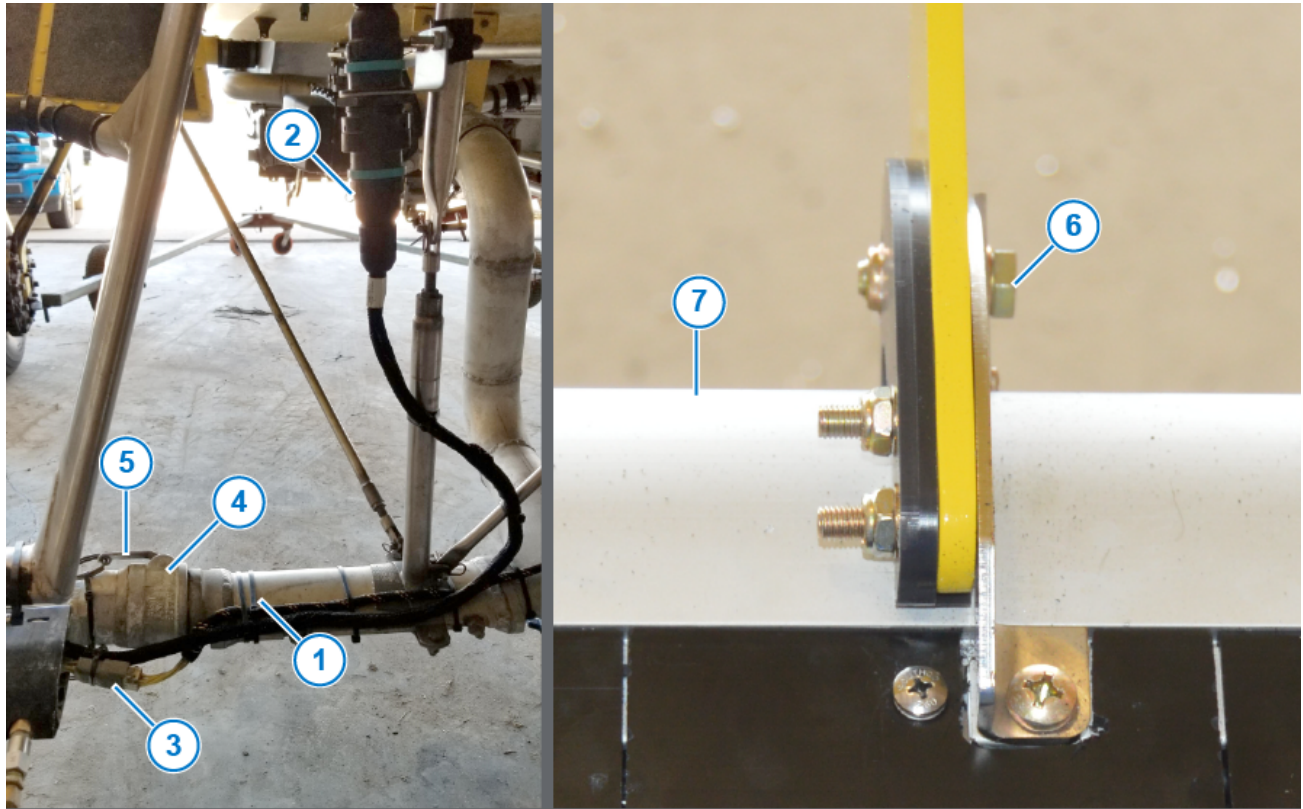


**Figure 4: Connect Water Line**

2. Use one of the camlock fittings (Figure 4, Item 1), located at the end of each boom, to attach a water line. (Figure 4, Item 2) that can build more than 5 psi inside of the boom.
3. Press the top/bottom buttons on the key fob to turn on or off each boom section.  
Make sure that each boom section is operating (clicking) in the correct order.  
**Note:** If the nozzles do not turn on in sequential order, it indicates the VCMs are not set up correctly.
4. Press the right/left buttons on the key fob to turn on or off each individual nozzle.  
Make sure that each nozzle is operating (clicking) in the correct order.  
**Note:** If a nozzle valve is leaking or dripping, use a marker to mark the nozzle valve. Continue to check all nozzle valves.
5. Press the center button on the key fob to turn off the whole boom.
6. Activate Nozzle Control (Key Fob) in the **SYSTEM SETUP** and change the setting back to **12V Active** or the previous setting.

## Remove the SwathPRO Booms

1. Flush the system with clean water.
2. Make sure that the hopper is empty.
3. Make sure that the toggle switch labeled **SWATHPRO MAIN** is off.
4. Chock the wheels of the aircraft.
5. Remove necessary cable ties ([Figure 5](#), Item 1 ).

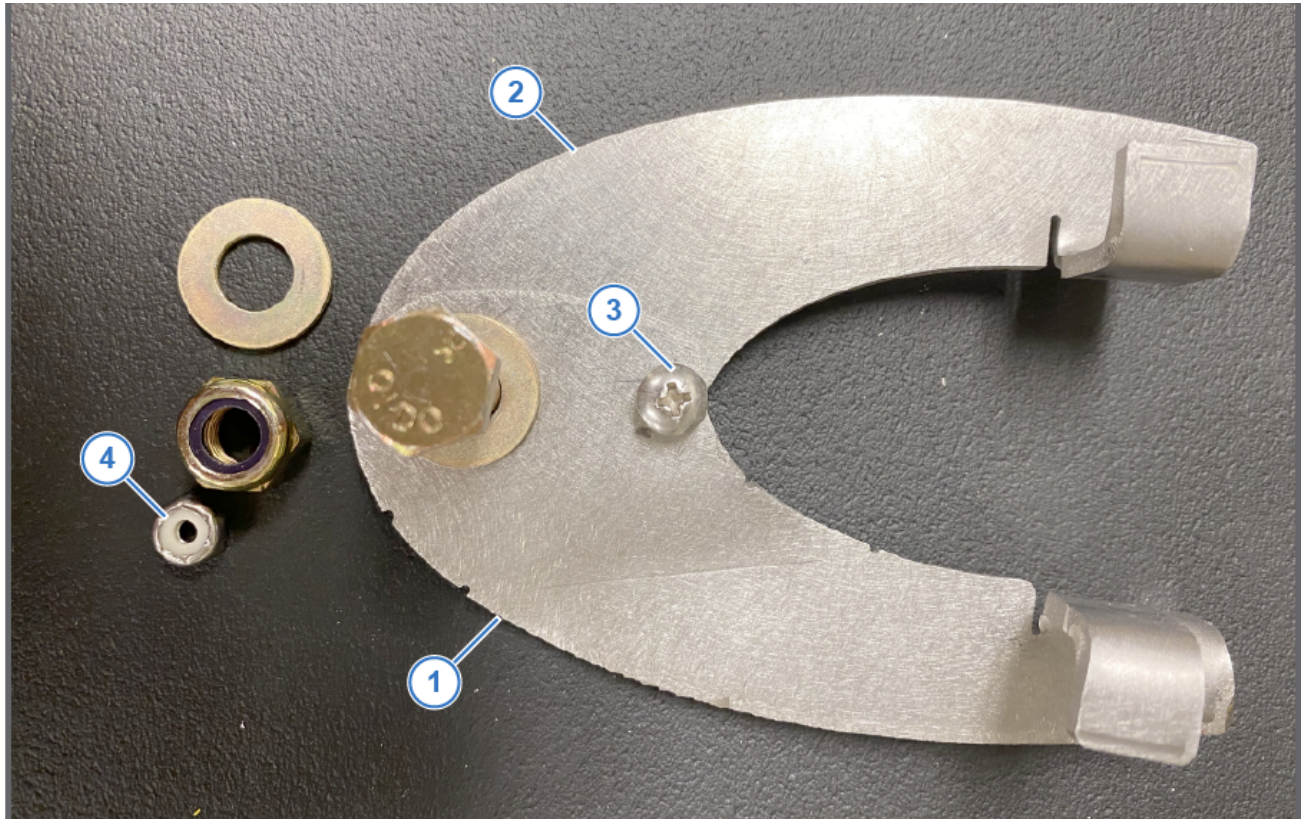


**Figure 5: SwathPRO™ Boom Removal**

6. Disconnect the 31-pin connector ([Figure 5](#), Item 2) mounted on the left and right side of the fuselage by the steps.
7. Cover the 31-pin connectors with the supplied dust caps.
8. If installed, disconnect the 6-pin DTM connector ([Figure 5](#), Item 3) by the camlock fittings ([Figure 5](#), Item 4) on the left and right side of the plane.
9. Open the camlock handles ([Figure 5](#), Item 5) on each boom.
10. Remove the single 5/16 bolt ([Figure 5](#), Item 6) and nut from each boom hanger (six total).
11. Pull the booms ([Figure 5](#), Item 7) from the plastic centering plates.



## Install Conventional (OEM) Booms



**Figure 6: Conventional Boom Hanger Tab Parts**

1. Place the two boom hanger tab pieces (Figure 6, Item 1) and (Figure 6, Item 2) together with the holes lining up.

**Table 4: Boom Hanger Tab Installation Parts**

Parts from the Boom Hanger Kit

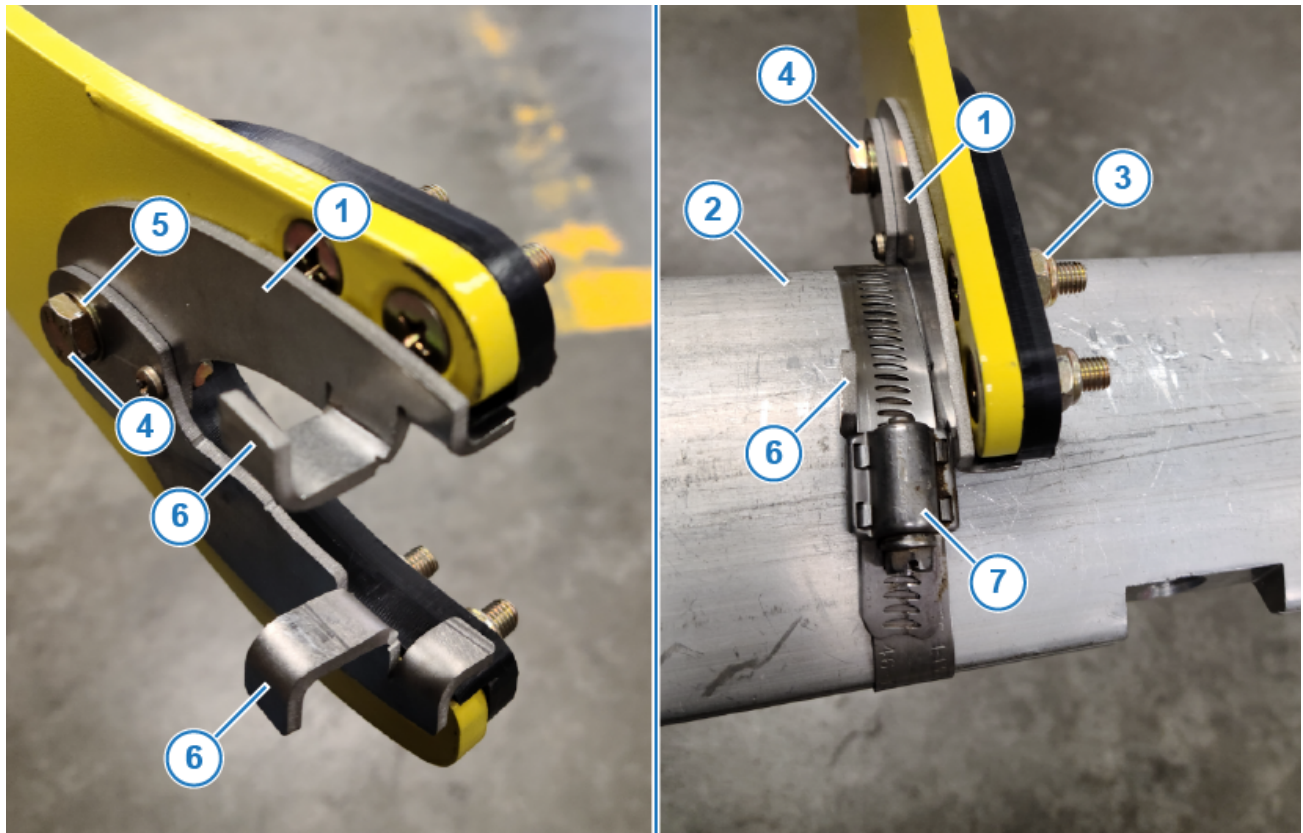
Item	Part Number	Description	Qty
1	320100-005	Boom Hanger Tab, Conv. Boom, Jog Bracket	6
2	320100-006	Boom Hanger Tab, Conv. Boom, Straight Bracket	6

2. Install the 6-32 x 1/2 screw (Figure 6, Item 3) and nut (Figure 6, Item 4) into the boom hanger tab so the nut will be against the boom hanger.

**Table 5: Boom Hanger Tab Installation Parts**

Parts from the Boom Hanger Kit

Item	Part Number	Description	Qty
3	MS35206-230	Screw, PH Philips, 6-32 x 1/2, Cad Plated	6
4	AN364-632A	Nut, Stop, Hex, Thin, 6-32 Cad Plated	6



**Figure 7: Installing the Boom Hanger Tabs**

3. Mount the boom hanger tab assembly (Figure 7, Item 1) from the side of the boom hanger opposite of the plastic centering bracket nuts (Figure 7, Item 3), with the bent tabs pointing away from the hanger. Verify the straight tabs fit tight in the mouth of the boom hanger.

**Note:** Install a piece of rubber, if needed, between the boom and bracket for cushion.

4. Insert a 5/16 bolt (Figure 7, Item 4) through the boom hanger tab assembly. Install the nut and ensure washers (Figure 7, Item 5) are installed on each side of the bracket.

**Table 6: Boom Hanger Tab Installation Parts**

Parts from the Boom Hanger Kit

Item	Part Number	Description	Qty
4	AN5-7A	Bolt, Mil-Spec 5/16-24 x 31/32 Cad Plated	6
5	AN960-516L	Washer, Mil-Spec, 5/16, Cad Plated	12
6	AN365-524A	Nut, Hex, Nylok, 5/16-24, Cad Plated	6

5. Install the OEM booms into the boom hangers and camlock fitting.
6. Close the camlock fitting.
7. Attach the boom to the hanger tab (Figure 7, Item 6) assembly with a worm-gear clamp (Figure 7, Item 7) around the tabs.
8. Tighten the worm-gear clamp.

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## Section 6: Operation

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**Topics:**

- [Start the CapView](#)
- [Main Operation Screen](#)
- [Upload a Profile to the CapView](#)
- [Update Software](#)
- [Shut down the CapView](#)
- [Forced Shutdown—  
Unresponsive CapView](#)
- [CapView Will Not Turn On](#)
- [Missing VCM Error on CapView  
Display](#)
- [Valves Not Operating Correctly](#)

Complete system operation procedures can be found in the Pilot's Operating Handbook for SwathPRO™.



## Start the CapView

Before starting the aircraft engine, ensure that the toggle switch labeled **SWATHPRO MAIN** is in the **OFF** position.



**Figure 8: Power On the CapView**

1. Start the aircraft engine and generator.
2. Allow amperage draw to normalize.
3. Place the toggle switch labeled **SWATHPRO MAIN** in the **ON** position.
4. Press the **POWER** button (Figure 8, Item 1) to turn on the CapView display.
5. Read the message (Figure 8, Item 2) on the CapView.
6. Press the **ENTER** button (Figure 8, Item 3) when the guidance controller is ready to operate.
7. Take off and fly the aircraft to the desired application location.
8. Operate the SwathPRO™ system.

Refer to the information on how to operate in auto or manual mode.

- [Operate in Auto Mode](#)
- [Operate in Manual Mode](#)



## Main Operation Screen



**Figure 9: Main Operation Screen**

The selected profile name (Figure 9, Item 1) shows at the top of the main operating screen.

The actual boom pressure (Figure 9, Item 2) shows inside the circle at the top center of the screen.

The target air speed and pressure set point (Figure 9, Item 3) shows on the top right side of the screen.

The actual air speed (Figure 9, Item 4) shows below the targeted information.

On the top left side of the screen, the circle with lines and an aircraft (Figure 9, Item 5) depicts the wind direction.

When the system is in auto mode, the circle around the boom pressure and the pressure set point change to green. When in auto mode, the **UP** and **DOWN** arrow buttons (Figure 9, Item 6) can change the pressure set point. In manual mode, the icon will be in white, and the **UP** and **DOWN** arrow buttons can change the duty cycle.

To change between auto and manual mode, press the **ENTER** button (Figure 9, Item 7).

The tip pressure (Figure 9, Item 8) is shown for both booms.

The graph (Figure 9, Item 9) on the bottom portion of the screen represents each nozzle and actual duty cycle.

Each nozzle is represented by a blue mark (Figure 9, Item 10).

The text box on the lower right side (Figure 9, Item 11) on the screen shows the nozzle diagnostic information for the nozzle with the yellow mark (Figure 9, Item 12) on the nozzle line.

The text box on the lower left side (Figure 9, Item 13) shows system diagnostic information.

## Upload a Profile to the CapView

You must first make a profile using ProMaker. Refer to the ProMaker User Manual for more information.



**Figure 10: Upload a Profile**

1. Save the desired profile(s) from your computer to a USB thumb drive.
2. Insert the USB memory device into the port on the back of the CapView display. The USB Host Menu will show on the display screen.
3. Use the **UP** or **DOWN** arrow buttons (Figure 10, Item 1) to go to Upload Profile (Figure 10, Item 2).
4. Press the **ENTER** button (Figure 10, Item 3).
5. If at least one profile is on the USB memory device, an Upload Profile Menu screen will show.
  - a. To upload a profile, use the up or down arrow buttons to select the desired profile name.
  - b. Press the **ENTER** button.
  - c. Select the profile number to save the profile.

Choose from:

- Press any one of the preset buttons (Figure 10, Item 4) to select where to save the profile.

OR

- Use the arrow buttons to select the desired preset number and then press the **ENTER** button.

**Note:** If profiles will not load, the Total Number Valves Expected line in the Advanced Settings menu may not match the total number of valves used on the system. These values must match for profiles to load. For more information refer to [Input Total Number of Valves](#).

- d. Repeat steps a—c to save profiles to all seven preset buttons.

- When the uploads are complete, remove the USB thumb drive from the CapView.

## Update Software



**Figure 11: Update Software**

- Insert the USB thumb drive into the back of the CapView display (Figure 11, Item 1).
- The USB Host Menu screen (Figure 11, Item 2) will show on the screen.
- Use the Up or Down arrow buttons (Figure 11, Item 3) to go to the Upload CapView SW: line (Figure 11, Item 4).

**IMPORTANT:** CapView software must be updated first.

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

- Press the **ENTER** button (Figure 11, Item 5).

The lights on the display will flash for a few moments, and the CapView display will automatically power down.

- Wait five seconds, and then press the **POWER** button (Figure 11, Item 6).

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

You do not have to wait until the progress bar disappears before continuing with the procedure.

6. Use the **UP** or **DOWN** arrow to go to the Upload PowerHub SW: line ([Figure 11](#), Item 7).
7. Press the **ENTER** button.
8. Upload Gateway Code and a progress bar will show on the screen.
9. When the update process is complete, the USB Host Menu will show.
10. Go to the Upload Software to All VCMs: line ([Figure 11](#), Item 8).
11. Press the **ENTER** button.
12. Upload VCM Code and a progress bar will show.
13. When the update process is complete, the USB Host Menu will show.
14. Remove the USB thumb drive from the back of the CapView display.
15. Press the **SYSTEM SETUP** button ([Figure 11](#), Item 9).
16. Use the **UP** or **DOWN** arrow to go to the Advanced Settings line.
17. Press the **ENTER** button.
18. Use the up or down arrow to go to the Factory Reset line.
19. Press the **ENTER** button.  
A message screen will show on the display.
20. Use the left or right arrow button to select **YES**.
21. Press the **ENTER** button.  
The display will power off.
22. Wait five seconds and then press the **POWER** button.  
A message will show on the CapView display.
23. Press the **ENTER** button.
24. Perform the Location Setup Procedure.  
For more information, refer to [Location Setup Procedure](#).
25. Set the Total Number of Valves Expected.  
For more information, refer to [Input Total Number of Valves](#).

## Shut down the CapView



**Figure 12: CapView**

1. Press the **POWER** button (Figure 12, Item 1) to turn off the CapView.
2. Place the toggle switch labeled **SWATHPRO MAIN** in the **OFF** position.

**IMPORTANT:** Shutting main power off before the Capview has been powered down, can cause the Capview to lose software.

## Forced Shutdown—Unresponsive CapView

If the CapView is unresponsive to button presses, do a forced shutdown of the CapView.



**Figure 13: CapView Power Button**

1. Press and hold the **POWER** button (Figure 13, Item 1) for 10 seconds.  
The CapView will turn off.



## CapView Will Not Turn On

1. If the CapView will not turn on when the pilot is starting the system, there are several possible causes. Examine these first:

Cause	Correction
7.5A fuse next to the contactor is blown	Replace the 7.5A fuse located in harness 320124-030, near the contactor
Toggle switch labeled <b>SWATHPRO MAIN</b> is not in the operating position	Toggle the switch to the on position
CapView fuse is blown	Replace the fuse located on the CapView display harness near the Gateway hub
60A circuit breaker labeled <b>SWATHPRO MAIN CB</b> in the engine bay is tripped	Reset the circuit breaker in the engine bay

2. In the cockpit, push the spray handle down. If the valves open:
  - a. Verify that the 10A fuse on the CapView harness located at the Boom 12 port on the Gateway hub is in good working condition.
  - b. Disconnect the harness from the back of the CapView.
    - i. Using a voltmeter, is there 24VDC between pin 1 and pin 2 at the connector behind the CapView?
    - ii. Using a voltmeter, is there 24-28VDC at the power lugs at the Gateway hub?  
If you have 24-28VDC at the Gateway hub, then you have a broken wire between the hub and the CapView. For more information, refer to [CapView Battery Voltage Test](#) in the Troubleshooting Section.
    - iii. Using a voltmeter, is there 12 to 24VDC between pin 2 and pin 6 at the connector behind the CapView?  
If the fuse in the harness is good, then you have a broken key switch wire between the hub and the CapView.
3. In the cockpit, push the spray handle down and if the valves do not open:
  - a. Verify that the aircraft main key switch power is on.
  - b. Verify that the toggle switch labeled **SWATHPRO MAIN** is in the on position.
  - c. Verify that the 7.5A fuse located in harness 320124-030 near the contactor is not blown.
  - d. Verify that the circuit breaker in the engine bay labeled **SWATHPRO MAIN CB** is not tripped.
  - e. Verify that the fan brake switch is toggled to the Spray On position.
  - f. Verify that there is 24-28VDC at the power lugs on the Gateway hub
  - g. Verify that there is 24-28VDC on the inlet side, lug 2 (88A) (coming from the 60A circuit breaker) of the Main Power contactor, located on the right side of the plane, underneath the cockpit.
  - h. Verify that there is 24-28VDC on the load side, lug 1 (88) (going to the Gateway hub), of the Main Power contactor, located on the right side of the plane, underneath the cockpit.
4. In the cockpit, if the CapView screen is black, but there are LEDs that are illuminated:
  - a. Install the CapView application code software onto a 2GB or smaller external memory device (USB drive).  
If you do not have a USB drive with the software on it, contact your CapstanAG representative.
  - b. Hold the **POWER** button for 10 seconds or move the toggle switch labeled **SWATHPRO MAIN** to the

off position until the CapView turns off.

- c. Insert the thumb drive into the back of the CapView.
- d. Turn on the CapView.

The CapView LEDs should blink. If the LEDs come on and are solid, the USB drive is larger than 2GB.

- e. Once the LEDs stop blinking and the display turns off, press the **POWER** button to turn on the CapView.

**Note:** You will have to perform a Location Setup and upload profiles after the CapView turns on.

## Missing VCM Error on the CapView Display

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If there is a missing VCM error message shown on the CapView:

1. Press the **POWER** button on the CapView to turn off the display.
2. Press the **POWER** button on the CapView to turn on the display.
3. Push down on the spray handle:
4. If the valves on the VCM are still open and will pulse:
  - a. Verify that the 31-pin connector is fully engaged under the fuselage.  
For more information, refer to [Install the SwathPRO™ Booms](#).
  - b. Verify that the 31-pin connector does not have corroded pins inside the connector.
  - c. Verify that the 6-pin DTM power connector at the VCM is fully engaged and does not have corroded pins inside the connector.
  - d. Verify that the gray/white twisted wires are not worn, broken, or pinched at the VCM.
  - e. Unplug the 6-pin DTM plug at the VCM. Using a voltmeter, set the reading to Ohms, and check the resistance between pin 4 and pin 5. You should see about 120 Ohms.
  - f. If you have a spare VCM, plug the spare VCM into the missing VCM power connector and power on the system.
  - g. Navigate to the Location Setup screen, verify that it shows 8 VCMs.  
**Note:** If it is found that the VCM is bad, refer to [Remove a VCM Harness Assembly](#) and [Install a VCM Harness Assembly](#).
5. If the valves on the VCM will not pulse:
  - a. Verify that the 15A fuse, located at the Gateway hub, for the missing VCM is still good and in working condition.
  - b. Verify that the 31-pin connector is fully engaged under the fuselage.  
For more information, refer to [Install the SwathPRO™ Booms](#).
  - c. Verify that the 31-pin connector does not have corroded pins inside the connector.
  - d. Verify that the 6-pin DTM power connector at the VCM is fully engaged and does not have corroded pins inside the connector.  
**Note:** If you check connections by unplugging the connectors, make sure the system is powered off, then power back on to see if it fixed the issue.  
For more information, refer to [VCM Voltage Test](#).



## Valves Not Operating Correctly

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

If valves are not operating properly, land the aircraft and find the source of the problem.

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

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

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

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

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

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## Section 7: Maintenance

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### Topics:

- [Service the System](#)
- [Jump Start, Weld On, or Charge the Machine](#)
- [Winterize the SwathPRO System](#)
- [Recommended Guidelines for Maintenance/Service](#)
- [Access the SwathPRO System Components](#)
- [Maintenance Service Intervals](#)
- [Flush the System](#)
- [Baseline Evaluation Process](#)
- [Examine the System](#)
- [Examine Specific System Components](#)
- [How to Replace the GPS Receiver](#)
- [Strainers and Screens](#)
- [How to Replace the Pressure Sensor](#)
- [Factory Reset Procedure](#)
- [Location Setup Procedure](#)
- [Input Total Number of Valves](#)

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## Service the System

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CAUTION: Before operation or service to the system, read and understand the operator manual and other referenced and required documentation. Chemical residue may be present on/in the 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.

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## Jump Start, Weld On, or Charge the Machine

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If jump starting the aircraft, make sure that you place the 60A circuit breaker in the engine bay labeled **SWATHPRO MAIN CB** into the **OFF** position by pulling out on the breaker, to prevent damage to the system.

If charging the aircraft's batteries or welding on the aircraft, place the 60A circuit breaker in the engine bay labeled **SWATHPRO MAIN CB** into the **OFF** position by pulling out on the breaker.

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## Winterize the SwathPRO™ System

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Proper winterizing of the SwathPRO™ system is essential in climates with freezing temperatures.

Thoroughly clean the system before winter storage:

1. Attach a water line that builds more than 5 psi of water pressure to the end of a boom.
2. Start the SwathPRO™ system.
3. Start the CapView.
4. Select a profile that will have all valves pulsing.
5. Disengage the fan brake.
6. Push the spray handle down to let all the valves pulse until only clean water comes out of the nozzle valves.

There are two options for winterizing the SwathPRO™ system.

- Antifreeze in the booms
- Dry-out the booms

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### Antifreeze in the Booms

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Winterize the system with RV antifreeze for winter storage. Make sure that the lines are completely full of RV antifreeze at 100% strength.

1. Start the aircraft.
2. Start the SwathPRO™ system.
3. Start the CapView.
4. Select a profile that will have all valves pulsing.
5. Disengage the fan brake.
6. Push the spray handle down to let all the valves pulse.
7. Throttle up until you build enough pressure in the booms where you see liquid coming out of all of the tips.
8. Continue to pulse the valves until only RV antifreeze is seen coming out of all of the valves.
9. Do the correct shutdown procedures.

## Dry out the Booms

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1. Attach an air hose to the end of one of the booms.
2. Make sure that the other end of the boom is closed.
3. Turn the SwathPRO™ system on.
4. Put the system in key fob mode. For more information refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for SwathPRO™.
5. Make sure that air is flowing into the booms.
6. Work your way down the boom, pulsing each section or valve, until there is no liquid coming out of the nozzles when they are pulsed.
7. Do the correct shutdown procedures.

**Note:** Improper winterizing will result in damage to the internal components of the nozzle valves.

## Recommended Guidelines for Maintenance/Service

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When servicing a system, the following items are recommended:

- Perform 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).

## Access the SwathPRO System Components



**Figure 14: Access Panels Removed**

To access the components, remove the panels below the cockpit and around the luggage compartment, as shown in [Figure 14](#).

## Maintenance Service Intervals

Type of Service	Initial System Setup	Before Each Use	After Each Use	Bi-yearly
Baseline Evaluation	X		X	
Examine the System		X		
Flush the System			X	
Clean the Nozzle Valves and Plunger Seal Inspection				X
Examine Specific System Components: <ul style="list-style-type: none"> <li>Gateway Hub</li> <li>Boom Hanger</li> <li>Boom Assembly</li> <li>CapView</li> <li>System Wiring</li> </ul>				X

Details for each of these procedures are following in this section of the manual.

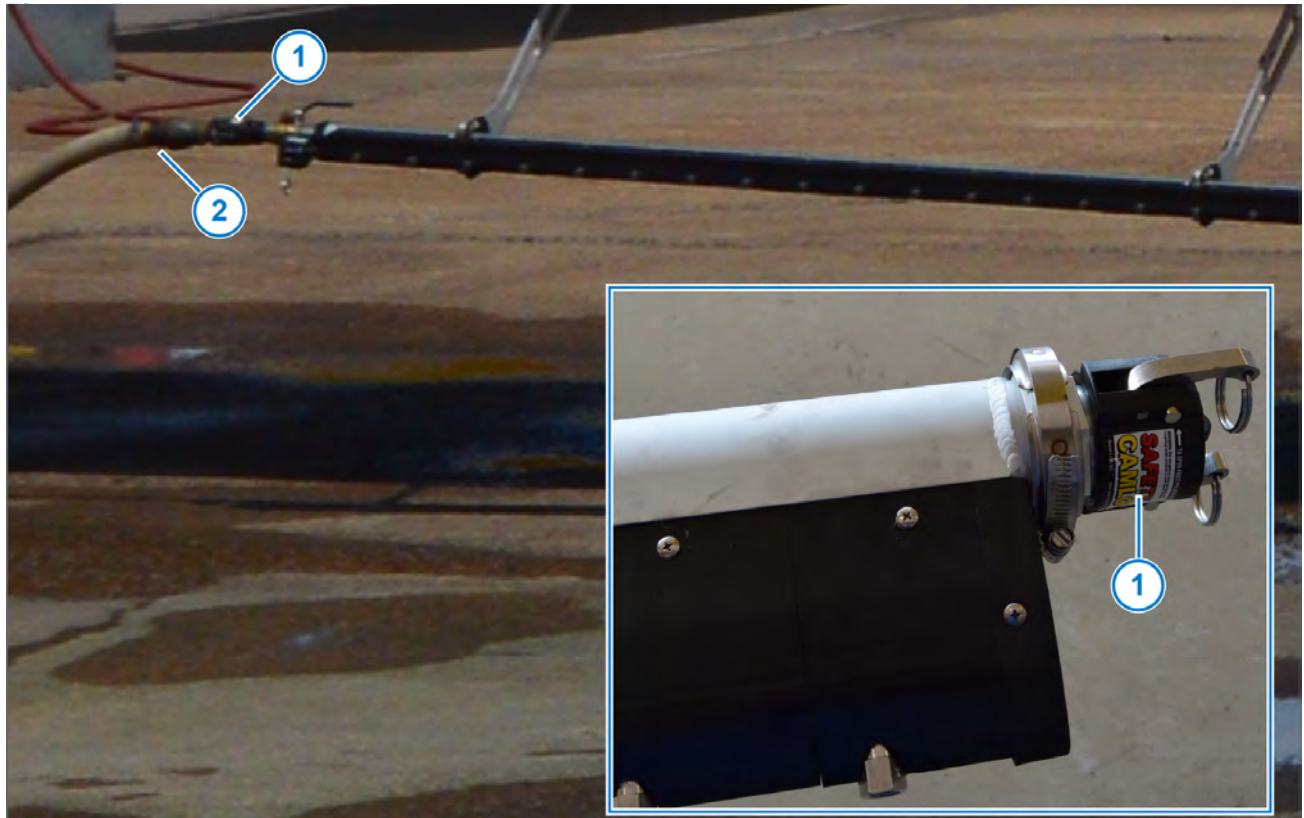
When the specified inspections in this section are accomplished, a general visual inspection of the adjacent areas must also be accomplished while access is available. These general visual inspections may reveal conditions that require additional maintenance activity.

Inspection items are provided for specified components and systems. The inspection program must incorporate professionalism and good judgment by all inspection personnel. The technician must ensure all components and systems are in good condition and maintained to the highest standards of safety.



## Flush the System

1. In the cockpit, turn the key on.
2. Make sure that the toggle switch labeled **SWATHPRO MAIN** is on.
3. Set the Bypass Switch in the **ON** position.



**Figure 15: Connect Water Line**

4. Use one of the camlock fittings (Figure 15, Item 1), located at the end of each boom, to attach a water line (Figure 15, Item 2) that can build more than 5 psi inside of the boom.
5. Run water through the booms until clean.



## Baseline Evaluation Process

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1. Make sure that the voltage readings are correct.

For more information, refer to:

- [CapView Battery Voltage Test](#)
- [System Load Capacity Test](#)
- [VCM Voltage Test](#)
- [Pressure Sensor Signal Test](#)

2. Perform a visual check of all wire connections, harnesses, and connectors. Make sure that there are no loose, broken, or damaged parts.
3. Compare the current settings with those recorded in the manual during setup.
4. Repair or replace any damaged components.
5. Perform the system tests.

For more information, refer to:

- [System Dry Tests](#)
- [System Wet Test](#)

## Examine the System

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Before each use, visually examine the SwathPRO™ system for issues.

- Remove the access panels to get access to the system components.
- Visually examine the harnesses for cuts, nicks, or abrasions before each use. Replace any damaged parts immediately.
- Make sure that all harnesses are secure.
- Check for loose mounting hardware and other components. Tighten if necessary.
- Check the nozzles. Find and fix any leakage problems.
- Check all the boom shells. Tighten any 1/4 turn screws that have become loose, and replace any shells that are broken or damaged.

## Examine Specific System Components

### Examine the Harnesses

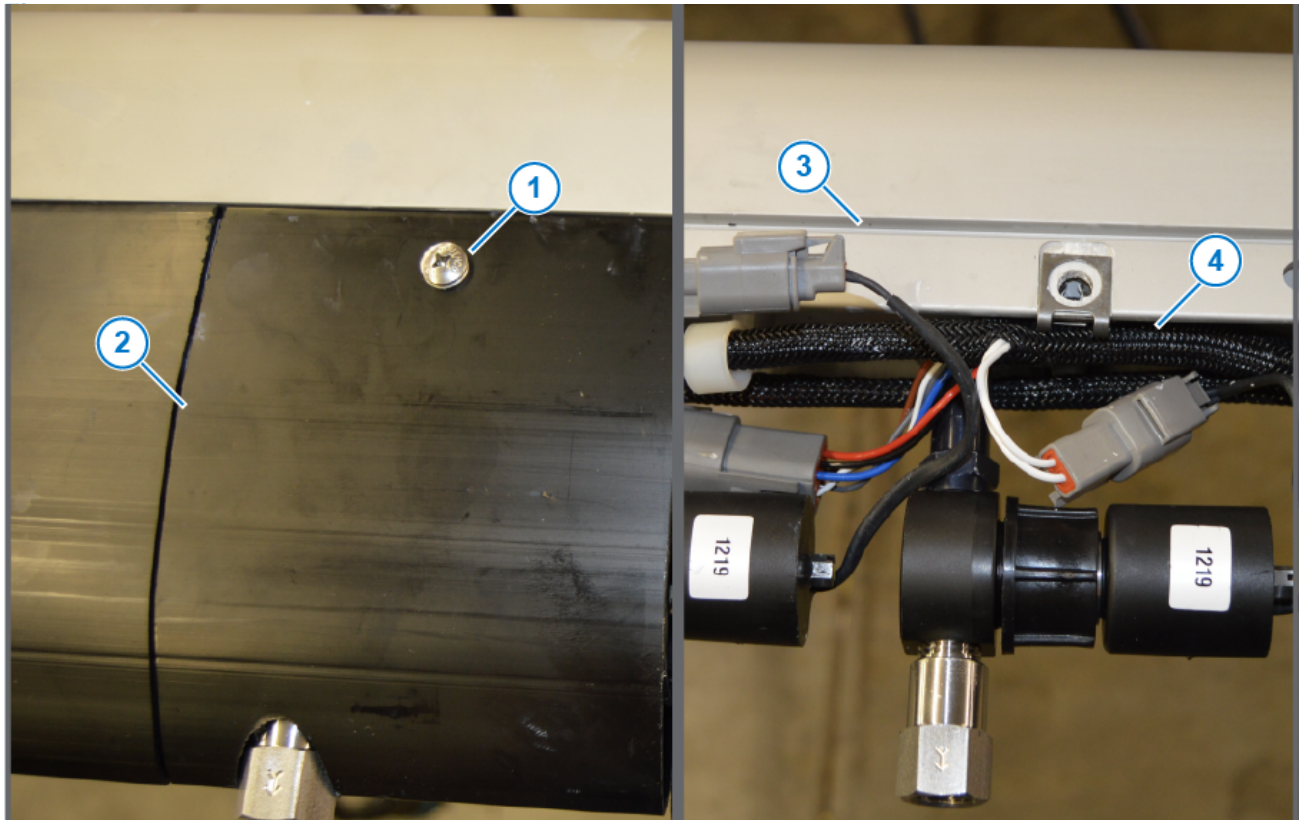
While inspecting the VCM harness assembly, also check attaching structure for damage or corrosion and hardware for looseness, damage, and security.

1. In the cockpit, power off the SwathPRO™ system.
2. Make sure that the toggle switch labeled **SWATHPRO MAIN** is off.



**Figure 16: Boom Control Extension Harness Connector**

3. On each side of the aircraft, examine the Gateway boom control extension harness (Figure 16, Item 1), boom control harness (Figure 16, Item 2), and connectors for damage or corrosion.
4. Replace as necessary.
5. Examine the attaching structure for damage or corrosion and hardware for looseness, damage, and security.



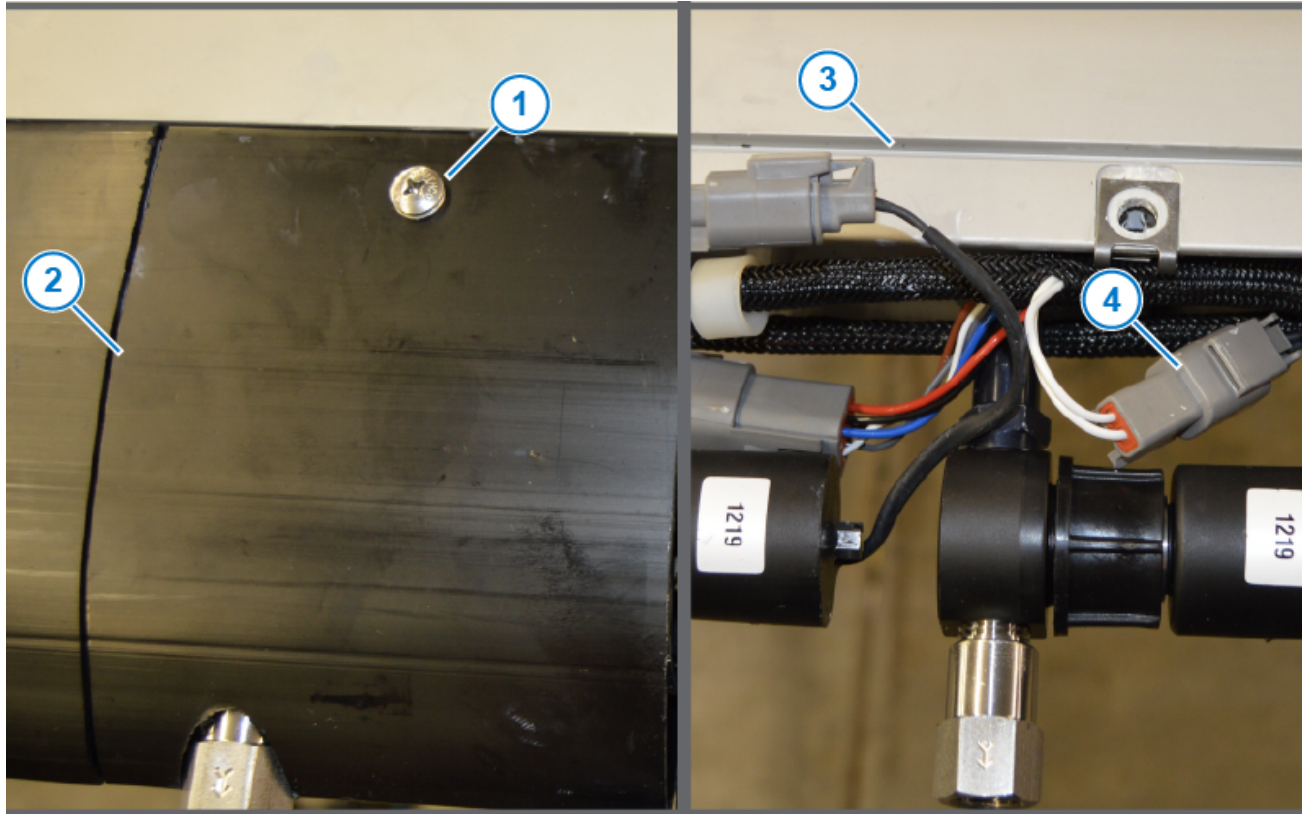
**Figure 17: Shell Removal and Examination of Harnesses**

6. On the SwathPRO™ booms, loosen the 1/4 turn screws (Figure 17, Item 1) on the top and bottom of each shell (Figure 17, Item 2) that you want to remove.
7. Remove any tips that will not allow the shell to slide off of the tip.  
Example: deflection adapters, CP nozzles, etc.
8. Remove the shells by holding both of the 1/4 turn screws and pulling them away from the boom to get the edges of the shell out of the groove (Figure 17, Item 3) and over the coil assembly.
9. Examine the harnesses (Figure 17, Item 4) for damage or wear.
10. Replace any harnesses, as necessary.
11. Examine the attaching structure for damage or corrosion and hardware for looseness, damage, and security.



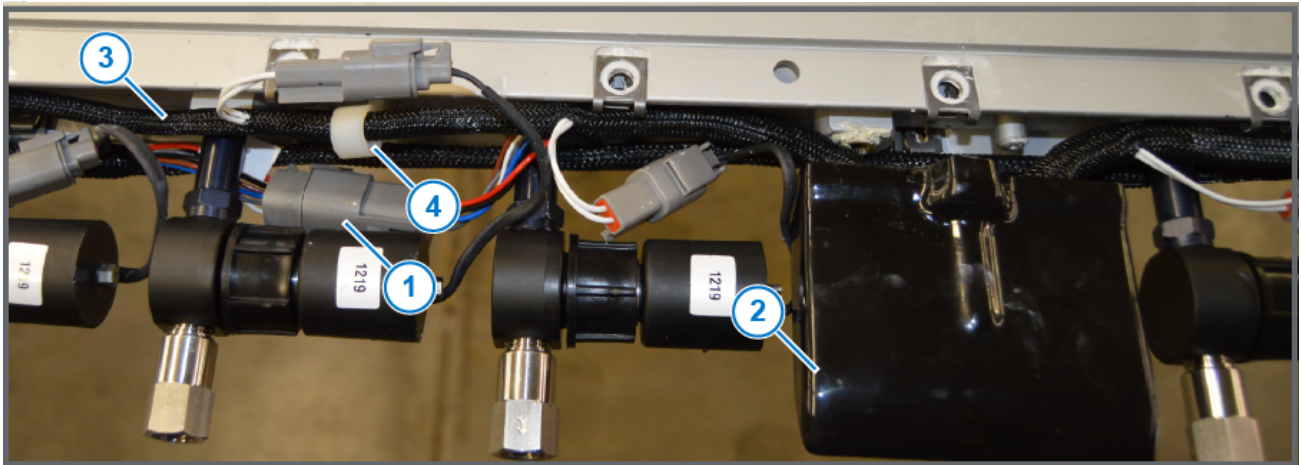
## Remove a VCM Harness Assembly

1. In the cockpit, power the SwathPRO™ system down
2. Make sure that the toggle switch labeled **SWATHPRO MAIN** is off.



**Figure 18: Shell Removal and Valve Disconnect**

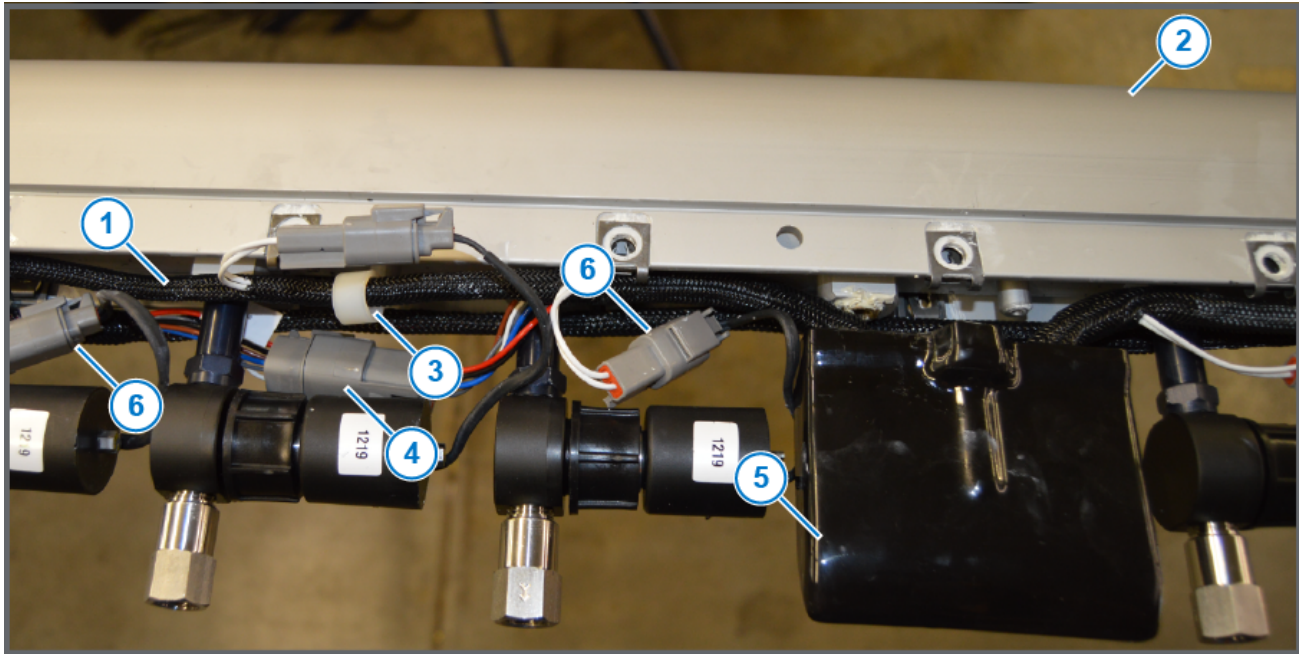
3. On the SwathPRO™ booms, loosen the 1/4 turn screws (Figure 18, Item 1) on the top and bottom of each shell (Figure 18, Item 2) that is on the VCM assembly that needs to be replaced.  
Depending on the system configuration, there can be up to nine shells outboard of the VCM, six shells inboard of the VCM, and the VCM shell to remove.
4. Remove any tips that will not allow the shell to slide off of the tip.  
**Example:** deflection adapters, CP nozzles, etc.
5. Remove the shells by holding both of the 1/4 turn screws and pulling them away from the boom to get the edges of the shell out of the groove (Figure 18, Item 3) and over the coil assembly.
6. Disconnect all 2-pin DTM connectors (Figure 18, Item 4) at each valve on the harness being replaced.



**Figure 19: VCM Harness Assembly Removal**

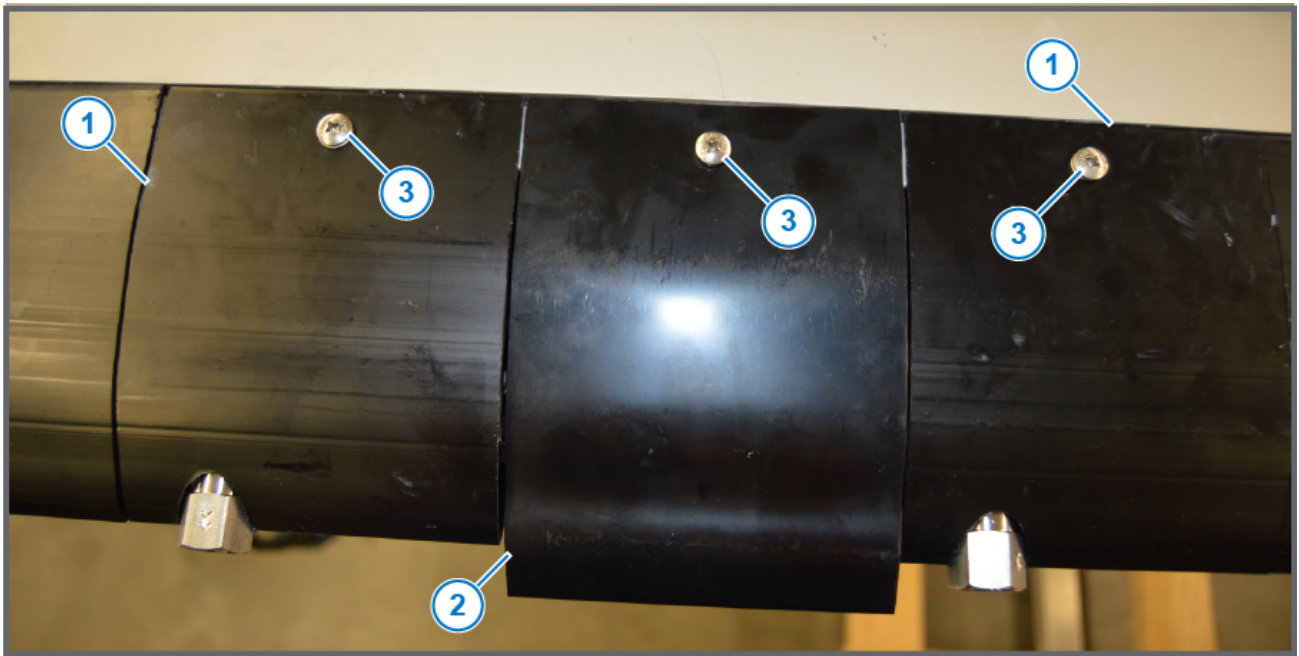
7. Disconnect the 6-pin power connector (Figure 19, Item 1), located near the VCM (Figure 19, Item 2).
8. Remove the harness (Figure 19, Item 3) from under the guides (Figure 19, Item 4) on the boom.
9. Remove the VCM harness assembly from the boom.

## Install a VCM Harness Assembly



**Figure 20: VCM Harness Assembly Installation**

1. Lay the new VCM harness assembly (Figure 20, Item 1) along the boom (Figure 20, Item 2) like the old harness was positioned.
2. Hook the harness into the clamps (Figure 20, Item 3) on the boom.
3. Connect the 6-pin power connector (Figure 20, Item 4) located near the VCM (Figure 20, Item 5).
4. Connect all of the 2-pin DTM connectors (Figure 20, Item 6) at each valve.
  - Install 2-pin dust plugs in the same locations as the harness being replaced. .



**Figure 21: Shell Installation**

5. Install all of the shells ([Figure 21](#), Item 1) that go over the valve assemblies.
6. Install the VCM shell ([Figure 21](#), Item 2) over the new VCM.
7. Tighten all of the ¼ turn fasteners on each shell ([Figure 21](#), Item 3) on the top and bottom of the booms.
8. Install any tips and deflectors that were removed.
9. Power the SwathPRO™ system up.
10. Take pictures of your setting screens.
11. Perform the factory reset procedure.  
For more information, refer to [Factory Reset Procedure](#).
12. Perform the Location Setup Procedure.  
For more information, refer to [Location Setup Procedure](#).
13. Install the desired profiles.  
For more information, refer to [Upload a Profile to the CapView](#).



## Nozzle Valves

Plugged nozzle valves can be classified into two categories:

- Plunger blockage
- Plunger stuck

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

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

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

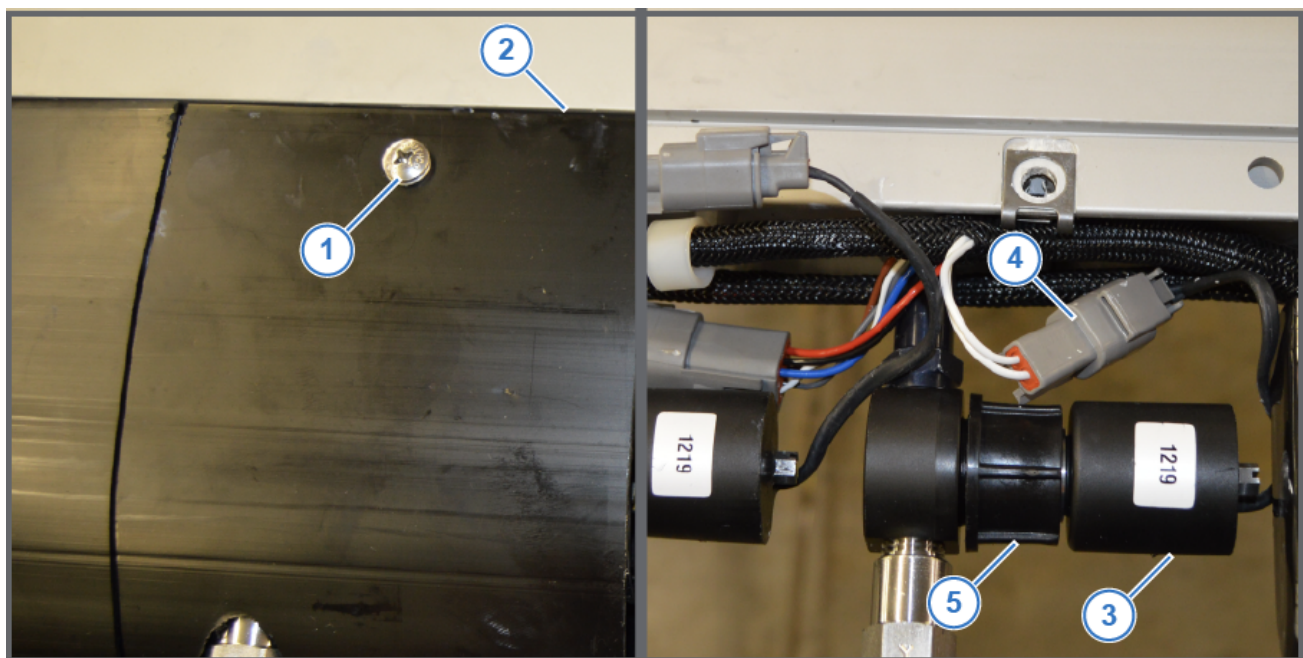
**Note:** Pinched or split O-rings will also cause nozzles to drip when shutoff.

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

## Clean the Nozzle Valve(s)



Warning: Chemical residue may be present. Always use proper personal equipment to avoid personal injury.

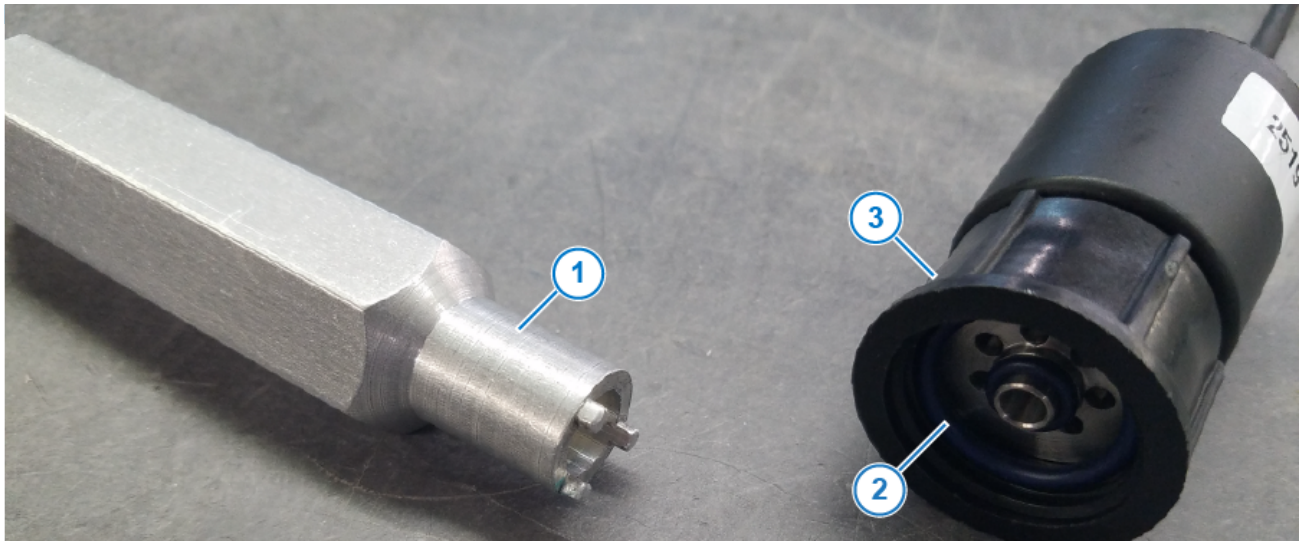


**Figure 22: Valve Assembly Removal**

1. Release pressure from the system before servicing.
2. Clean the system before installation or service of the fittings, hoses, valves, or nozzles.
3. Loosen the quarter-turn fasteners (Figure 22, Item 1) on the top and bottom of each shell.
4. Remove the shell (Figure 22, Item 2).

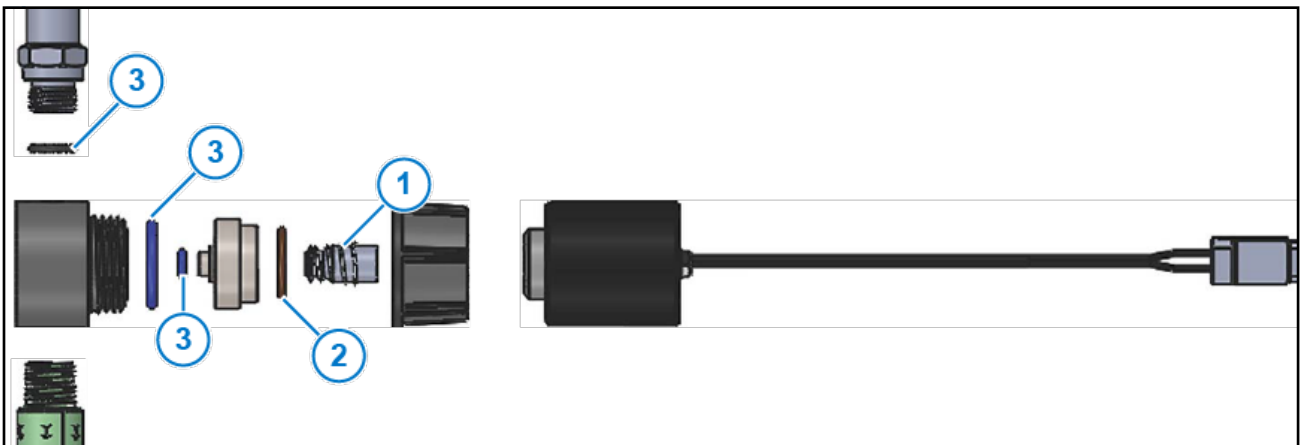


5. Disconnect the coil (Figure 22, Item 3) from the harness (Figure 22, Item 4).
6. Unscrew the flynut (Figure 22, Item 5) to remove the valve assembly from the adapter.



**Figure 23: Valve Body Removal Tool**

7. Use the removal tool (Figure 23, Item 1) to remove the valve body (Figure 23, Item 2) from the flynut (Figure 23, Item 3) by inserting the tool into the small holes in the middle of the valve body, and twisting counter-clockwise.



**Figure 24: Valve Assembly Parts**

8. Remove the plunger (Figure 24, Item 1) from the coil.
9. Examine the O-rings (Figure 24, Item 2) on the coil.
10. Examine the O-rings (Figure 24, Item 3) on the valve body.
11. Wash the nozzle valve components to remove any debris.
12. Examine the plunger for wear or damage.
13. If there is wear or damage to the plunger, replace the plunger.
14. Examine the valve body.  
Make sure that the orifice is not plugged with debris, worn, or damaged.
15. If there is wear or damage to the orifice, replace the valve body.

16. Wash the nozzle body components to remove any debris.

**IMPORTANT:** Do not use brake cleaner, or the seal will be damaged.

**IMPORTANT:** During installation, apply 40 inch-lbs of torque to the coil when it threads into the valve body to properly seat the O-ring.

### Plunger Seal Inspection

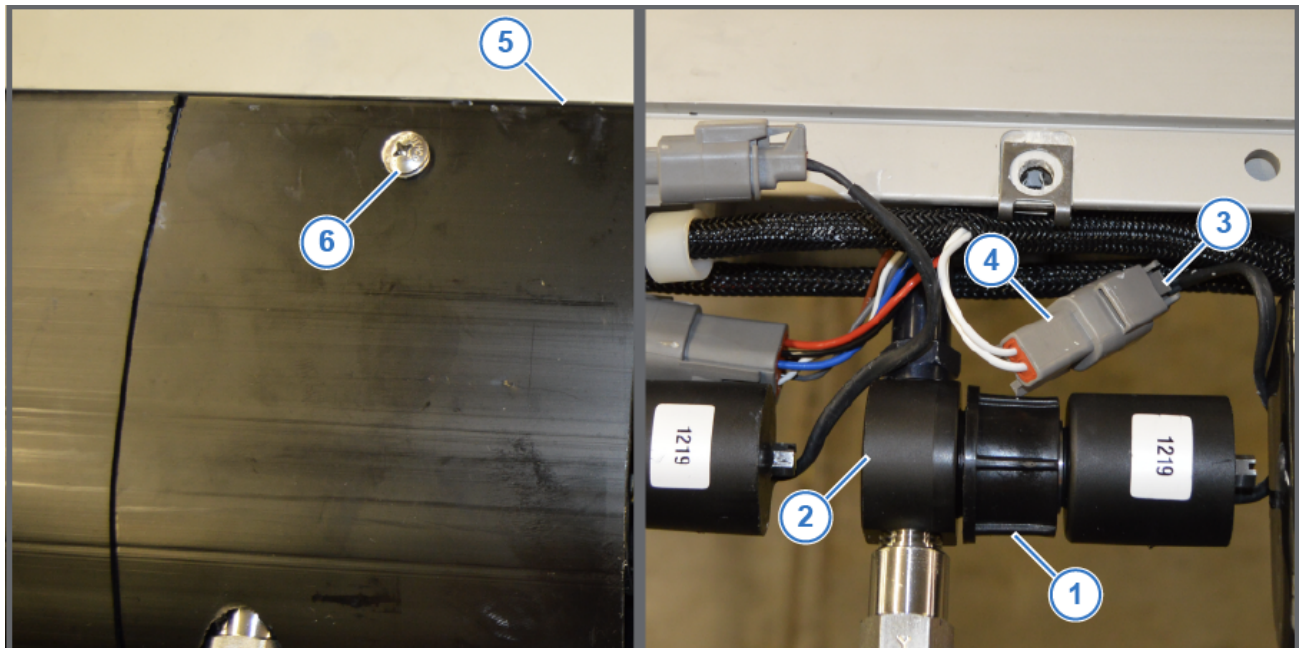


**Figure 25: Plunger Seals**

After extended use, the plunger seal will wear a groove (Figure 25, Item 1), where the seal impacts the hard orifice seat. Replace the plunger if worn or damaged. As the groove deepens, the pressure capacity of the valve will decrease until the pressure capacity interferes with the operating pressure of the system. The result is erratic pulsing, often described as “flickering.” The system will operate normally at lower pressures until replacement parts can be installed. High operating pressures and abrasive chemicals will accelerate the wear of the plunger seal material.

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

## Install a Nozzle Valve



**Figure 26: Nozzle Valve Installation**

1. Screw the valve assembly flynut (Figure 26, Item 1) onto the adapter (Figure 26, Item 2).  
Hand tighten only, do not use tools to tighten.
2. Make sure that the valve assembly lies in-line correctly.
3. Connect the coil connector (Figure 26, Item 3) to the harness (Figure 26, Item 4).
4. Install the shell (Figure 26, Item 5).
5. Tighten the quarter-turn fasteners (Figure 26, Item 6) on the top and bottom of each shell.

## Examine the CapView and Harnesses

1. In the cockpit, examine the CapView and the harnesses for damage or wear.
2. Check the attaching structure for damage or corrosion and hardware for looseness, damage, and security.
3. Replace as necessary.

## Replacing the CapView



**Figure 27: Remove the CapView**

1. Remove the existing CapView:
  - a. Loosen the clamp (Figure 27, Item 1) on the back of the CapView (Figure 27, Item 2).
  - b. Remove the ball mount (Figure 27, Item 3) on the back of CapView from the clamp.
  - c. Disconnect the CapView harness (Figure 27, Item 4) from the back of the CapView.





**Figure 28: Back of CapView**

2. Remove and keep the four screws (Figure 28, Item 1) from the back of the CapView (Figure 28, Item 2).
3. Use the four screws to install a ball mount (Figure 28, Item 3) to the back of the CapView.



**Figure 29: CapView Installation**

4. Connect the CapView harness into the receptacle (Figure 29, Item 1) in the back of the CapView (Figure 29, Item 2).
5. Install one end of the clamp (Figure 29, Item 3) onto the ball mount (Figure 29, Item 4) on the back of the CapView, and the other onto the ball mount attached to the aircraft.
6. Remove the screen protector from the CapView screen.
7. Tighten the clamp when the CapView is in the desired position.

---

## Examine the Gateway Hub

---

1. Find the mounting location for the Gateway Hub.  
Refer to the installation manual for mounting location options.
2. Examine all of the connectors and harnesses connected to the Gateway hub.
3. Check the attaching structure for damage or corrosion and hardware for looseness, damage, and security.
4. Replace any parts as necessary.

---

## Replacing the Gateway Hub

---

1. Find the mounting location for the Gateway Hub.  
Refer to the installation manual for mounting location options.
2. Disconnect all of the harnesses from the Gateway Hub.
3. Remove the existing Gateway Hub.
4. Install the new Gateway Hub in the exact position as the previous Gateway Hub.
5. Make sure all hardware is tightened to the correct specification.  
Refer to [Table 2: AN Part Numbers and Torque Specifications](#) for correct torque specifications.<sup>1</sup>
6. Connect all of the harnesses to the connectors on the Gateway Hub.  
For more information, refer to [Gateway Hub Identification](#).

---

## Examine the Power Supply

---

1. Find the mounting location of the power supply near the Gateway hub.
2. Examine the wires and connectors coming from the power supply.
3. Check the attaching structure for damage or corrosion and hardware for looseness, damage, and security.
4. Replace parts as necessary.

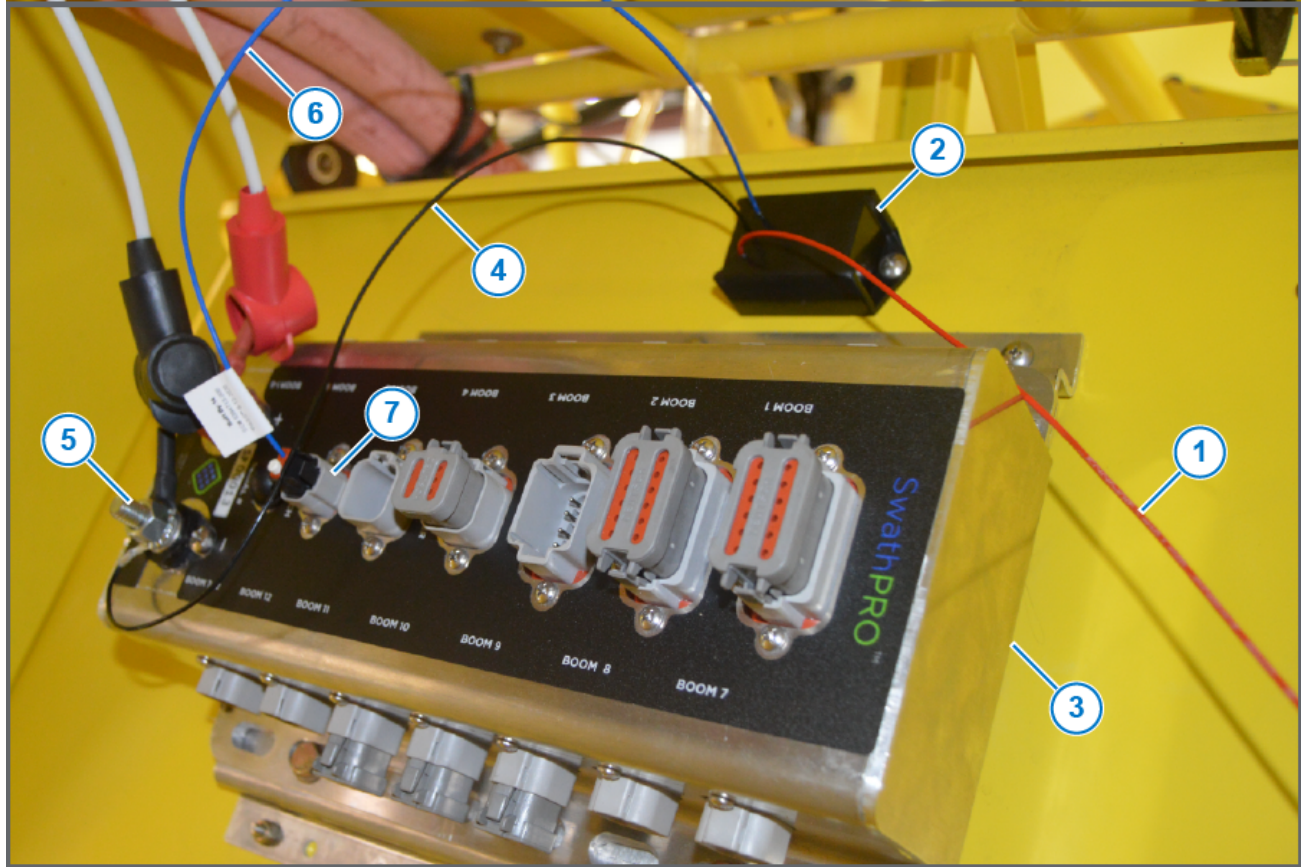
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<sup>1</sup> In accordance with the Advisory Circular 43.13b Chapter 7 Section 4f, do not reuse a fiber or nylon locknut, if the nut cannot meet the minimum prevailing torque values.



## Replacing the Power Supply

1. Locate the Main Power relay on the left side of the cockpit.
2. Disconnect the spade terminal on the end of the red wire a couple inches from terminal 87 on the relay.



**Figure 30: Remove the Existing CapstanAG™ Power Supply**

3. Remove the red wire (Figure 30, Item 1) from the relay to the existing power supply (Figure 30, Item 2) near the Gateway Hub (Figure 30, Item 3).
4. Disconnect the black wire (Figure 30, Item 4) with the ring terminal from the black ground lug (Figure 30, Item 5) on the Gateway hub.
5. Disconnect the 2-pin DT connector, on the blue wire (Figure 30, Item 6), from the Key Switch port (Figure 30, Item 7) on the Gateway hub.



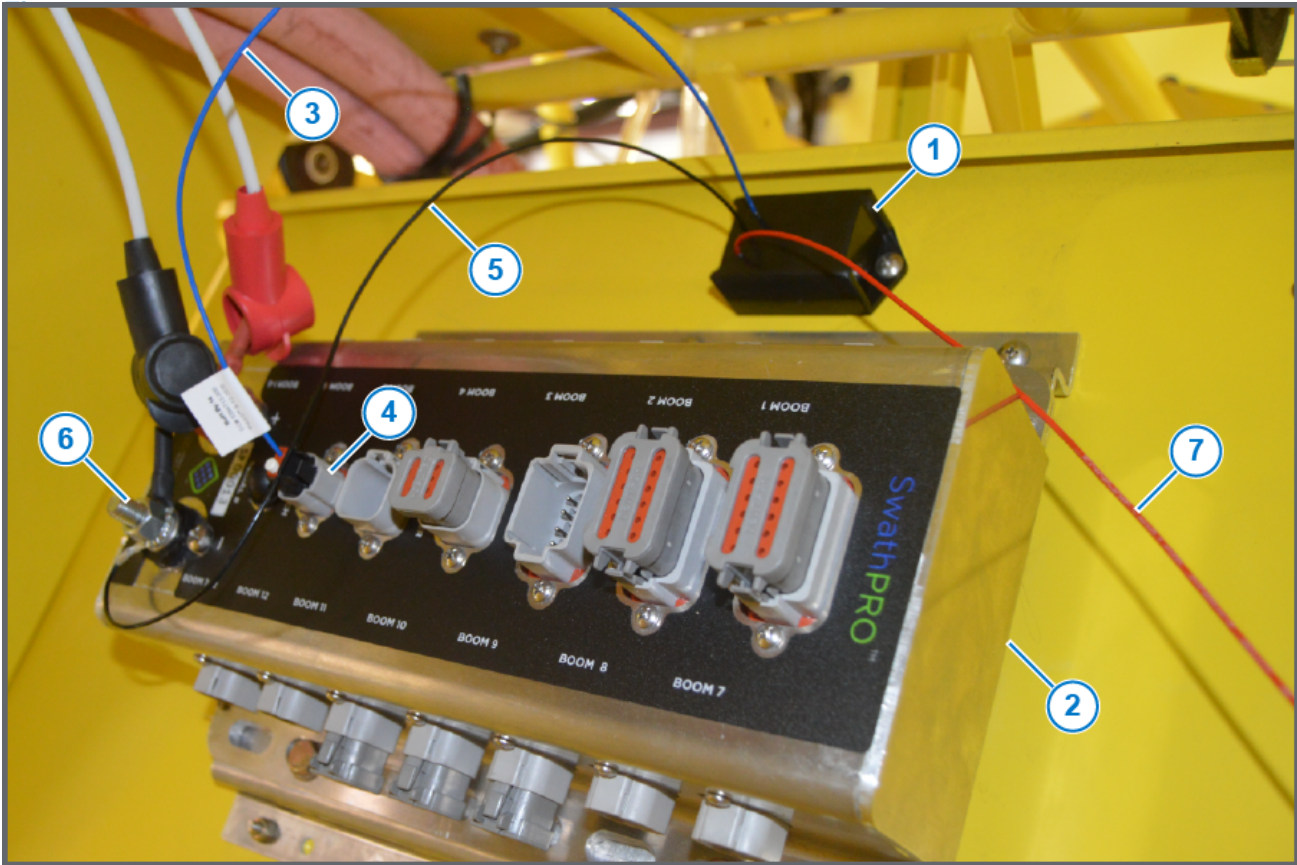


Figure 31: CapstanAG™ Power Supply

- 6. Mount the new power supply (Figure 31, Item 1) near the Gateway Hub (Figure 31, Item 2).
- 7. Connect the 2-pin DT connector (Figure 31, Item 3), on the blue wire, to the Key Switch port (Figure 31, Item 4) on the Gateway hub.
- 8. Install the black wire (Figure 31, Item 5) with the ring terminal onto the black ground lug (Figure 31, Item 6) on the Gateway hub.
- 9. Route the red wire (Figure 31, Item 7) to the Main Power relay on the left side of the cockpit.  
**Note:** Route the wiring in accordance with AC 43.13-1B Chapter 11, Section 8, paragraph 11-96 and secure per Chapter 11, Section 11.
- 10. Cut off and discard any extra harness length that is not needed to reach the main power relay.
- 11. Crimp a spade terminal onto the end of the red wire.  
**Note:** Crimp all ring terminals in accordance with AC 43.13-1B Chapter 11, Section 14.

Table 7: Ring Terminal Specifications

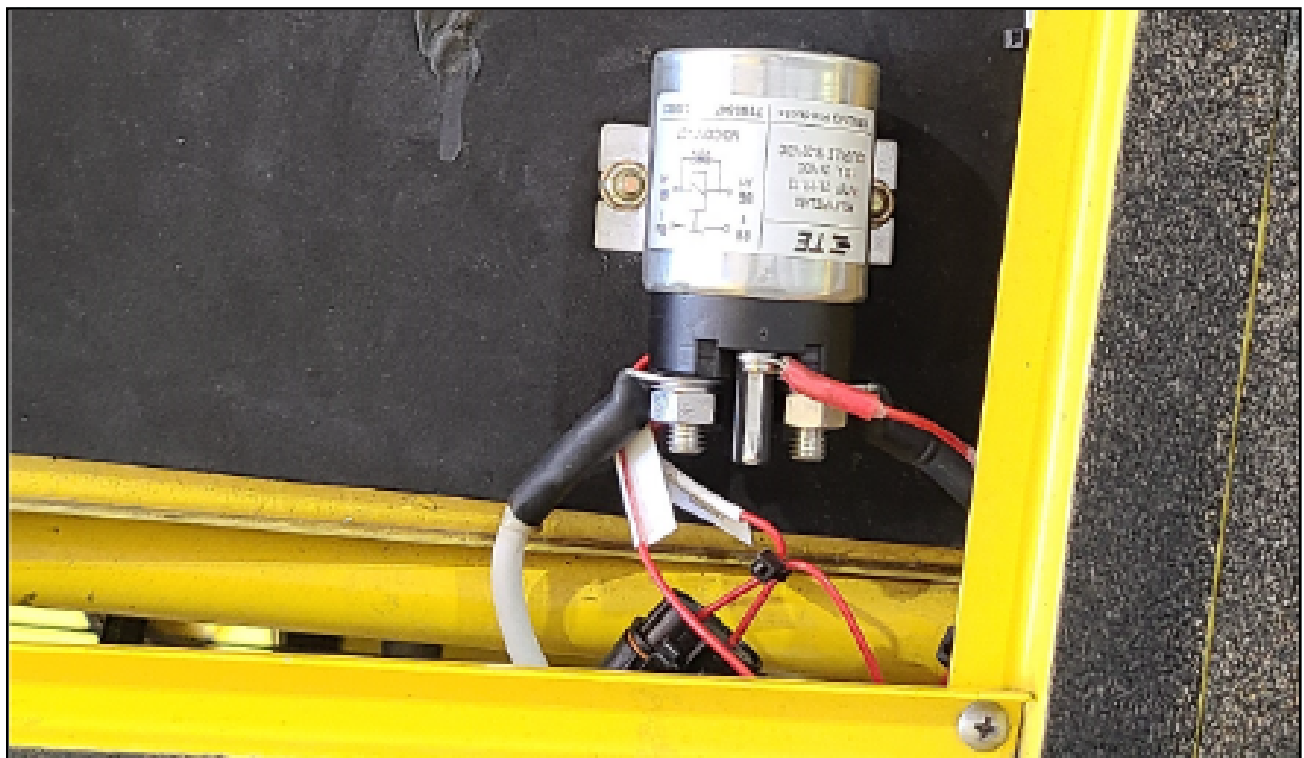
Part Number	Description	Qty
715005-161	Terminal, Spade 1/4 Female	1

- 12. Install the spade terminal to the male spade terminal located on the wire that is a couple inches from terminal 87 of the main power relay.

## Examine the Main Power Contactor



**Figure 32: Main Power Contactor**



**Figure 33: Main Power Contactor**

1. Find the mounting location for the Main Power Contactor.
2. Examine all of the connectors and harnesses connected to and going from the contactor.
3. Check the attaching structure for damage or corrosion and hardware for looseness, damage, and security.
4. Replace any parts as necessary.

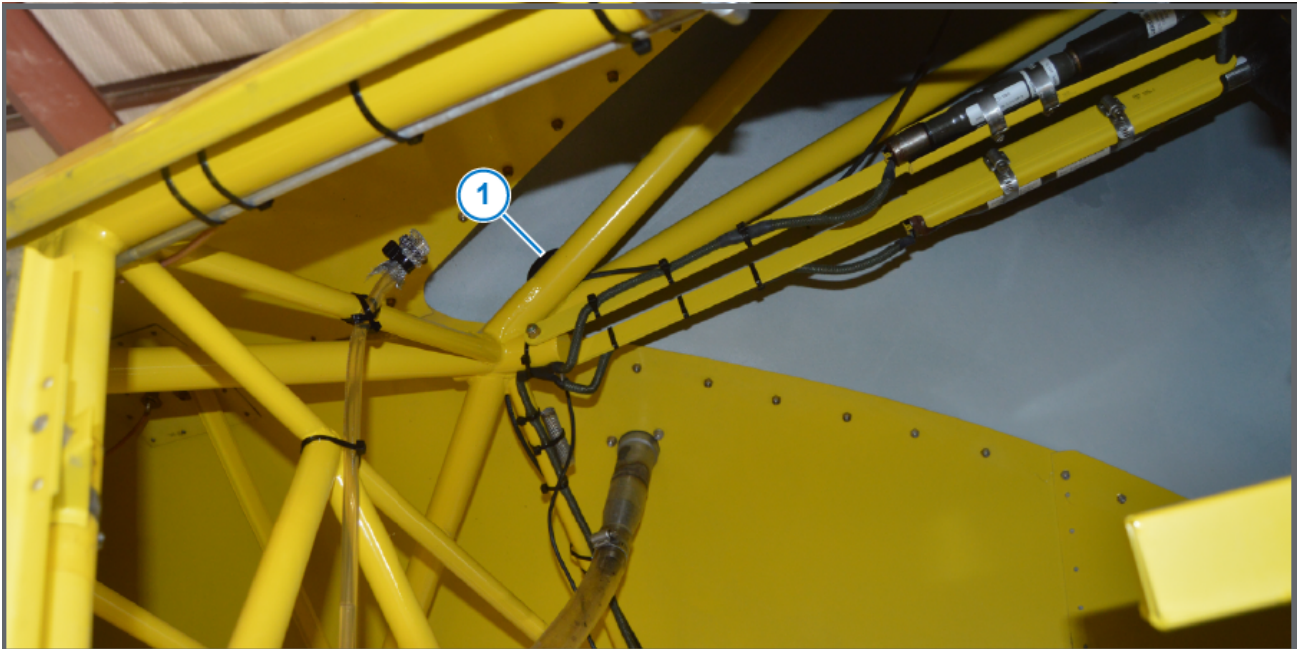
## Replace the Main Power Contactor

1. Find the mounting location for the Main Power Contactor.
2. Remove the existing contactor by loosening and removing the mounting hardware.
3. Disconnect all of the harnesses from the contactor.
4. Connect all of the harnesses to the terminal lugs on the new contactor.
5. Install the new contactor in the exact position as the previous contactor.
6. Make sure all hardware is tightened to the correct specification.

Refer to [Table 2: AN Part Numbers and Torque Specifications](#) for correct torque specifications.<sup>1</sup>

## Replacing the GPS Receiver

1. Disconnect the end of the GPS harness to the GPS-hub adapter harness.



**Figure 34: Remove Existing GPS Receiver**

2. Remove the existing GPS receiver ([Figure 34](#), Item 1).

<sup>1</sup> In accordance with the Advisory Circular 43.13b Chapter 7 Section 4f, do not reuse a fiber or nylon locknut, if the nut cannot meet the minimum prevailing torque values.





**Figure 35: GPS Receiver Location**

3. Install the new GPS receiver (Figure 35, Item 1) on top of the tubing, located under the canopy, behind the cockpit, at the highest point in the fuselage.
4. Use a cable tie to attach the GPS receiver to the tubing.
5. Route the harness toward the Gateway hub.
6. Connect the end of the GPS harness to the GPS-hub adapter harness.

**Note:** Route the wiring in accordance with AC 43.13-1B Chapter 11, Section 8, paragraph 11-96 and secure per Chapter 11, Section 11.

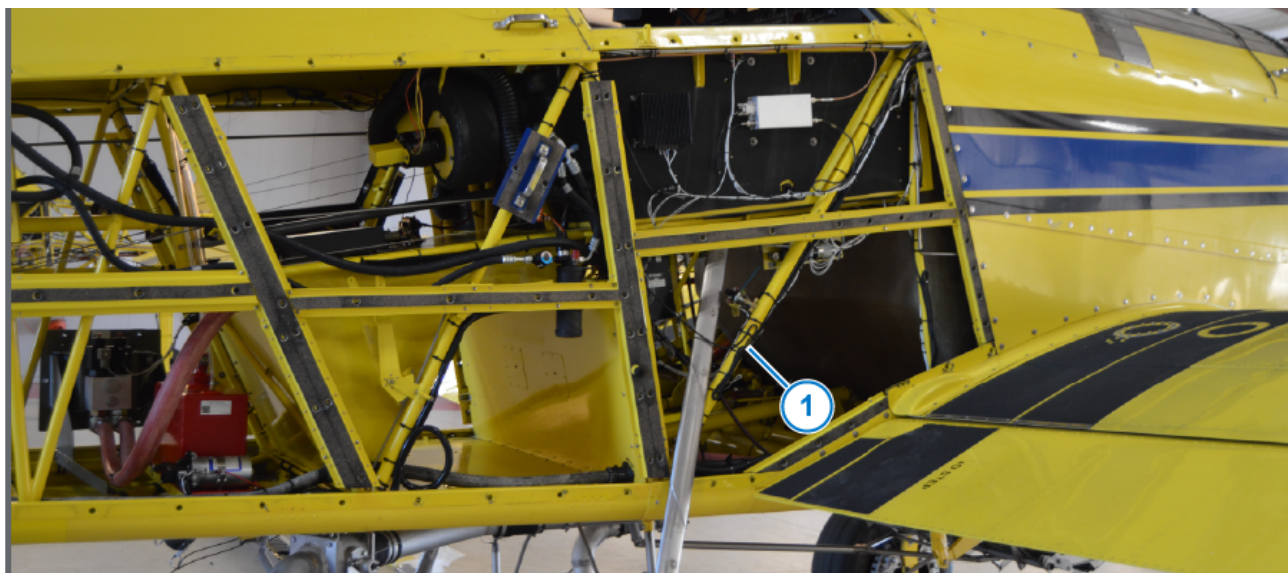
## Strainers and Screens

**Important:** Clean the strainers on a regular basis.

Check the mesh size of the strainers and replace the screens if they are too coarse. Use 50-mesh or finer strainer screens. A 50-mesh screen is required to prevent nozzles from plugging, and to reduce debris from damaging the plunger seats. Check with the strainer manufacturer to select a 50-mesh strainer or finer.

Plugged strainers will cause a reduction in system operating pressure.

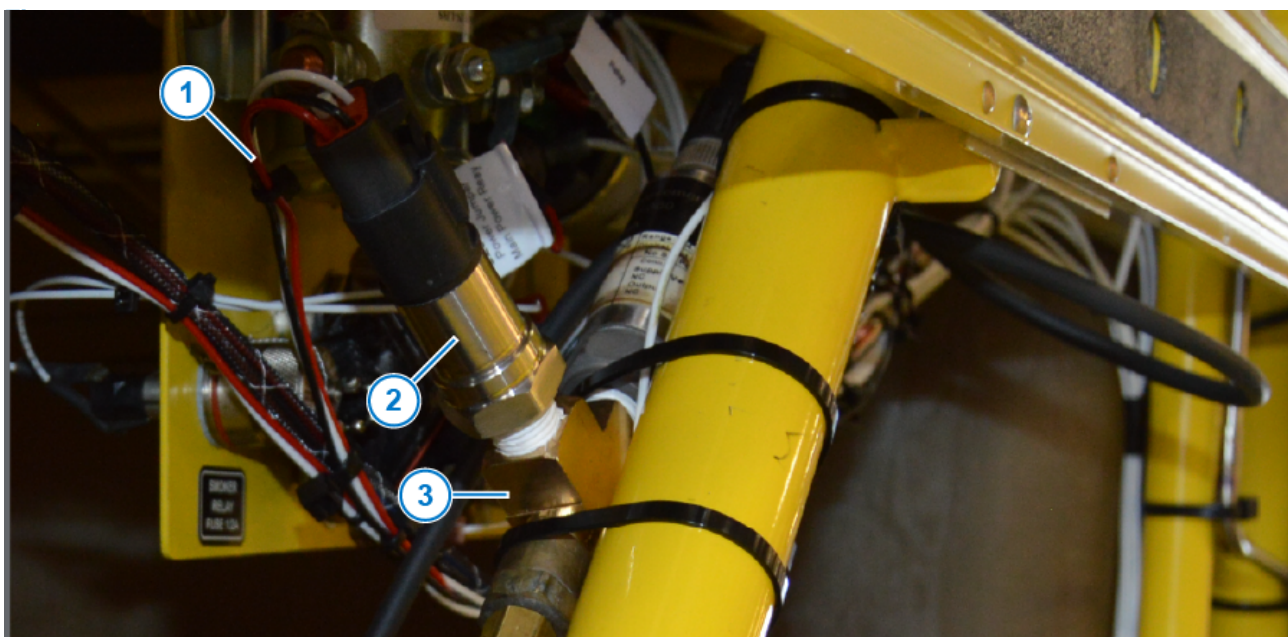
## Replacing the Pressure Sensor



**Figure 36: Existing Pressure Sensor Location**

1. Locate the existing pressure sensor on the aircraft.

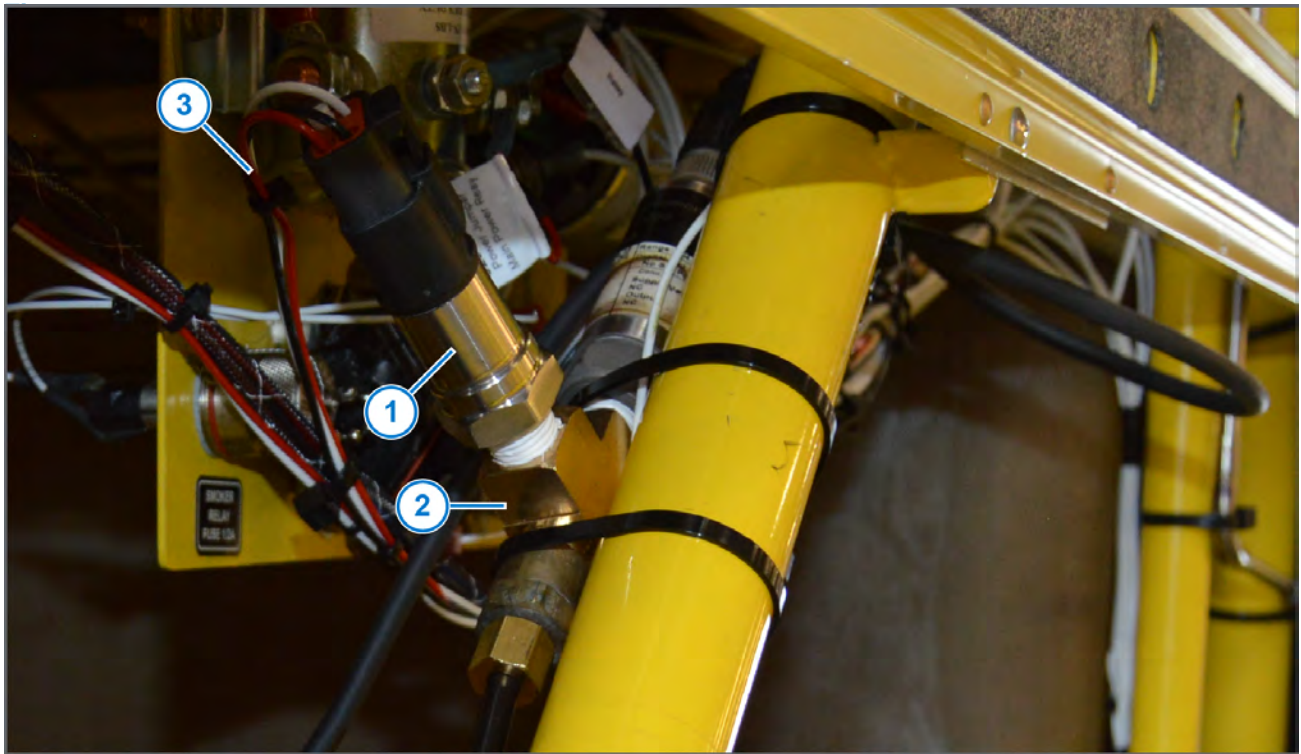
The usual location is on the right side of the cockpit (Figure 36, Item 1) inside the aircraft frame.



**Figure 37: Pressure Sensor Removal**

2. Disconnect the pressure sensor extension harness (Figure 37, Item 1) from the existing pressure sensor (Figure 37, Item 2)
3. Remove the existing pressure sensor from the 1/4 NPT tee street fitting (Figure 37, Item 3).





**Figure 38: Pressure Sensor Installation**

4. Put thread sealant tape on the threads of the new CapstanAG pressure sensor ([Figure 38](#), Item 1).
5. Install the new CapstanAG pressure sensor to the tee fitting ([Figure 38](#), Item 2).

Mount the CapstanAG pressure sensor so that it is leaning back at approximately a 20-degree angle, or at least vertically.

6. Connect the pressure sensor extension harness ([Figure 38](#), Item 3) to the pressure sensor.

## Factory Reset Procedure

A factory reset must be performed during the initial system setup and if the CapView or a VCM is replaced.

**Important:** Leave both the aircraft key switch power and the **SWATHPRO MAIN** toggle switch on to maintain power to the Gateway Hub during this procedure.



**Figure 39: Advanced Settings—Factory Reset**

1. Make sure that the aircraft key switch power is **ON**.
2. Press the **POWER** button (Figure 39, Item 1) on the display.
3. Take pictures of all the settings, or record all the settings in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual Supplement for SwathPRO™.
4. Press the **SYSTEM SETUP** button (Figure 39, Item 2) on the display.
5. Use the **UP** or **DOWN** arrow buttons (Figure 39, Item 3) to go to Advanced Settings.
6. Press the **ENTER** button (Figure 39, Item 4) on the display.
7. Use the **UP** or **DOWN** arrows buttons to go to Factory Reset (Figure 39, Item 5).
8. Press the **ENTER** button on the display.
9. A message shows on the screen, use the **LEFT** or **RIGHT** arrow buttons (Figure 39, Item 6) to select Yes.
10. Press the **ENTER** button on the display.  
The display will turn off when this procedure is complete.
11. Perform the Location Setup Procedure after completing a factory reset.  
For more information, refer to [Location Setup Procedure](#).

## Location Setup Procedure

If you are not prompted to do this procedure, it is not necessary to complete.



**Figure 40: Location Setup**

1. Make sure that the aircraft key switch power is **ON**.
2. If the CapView is not on, press the **POWER** button (Figure 40, Item 1) on the display.
3. If a location setup is needed, the system prompts you when the CapView is powered on. Press the **ENTER** button (Figure 40, Item 3) on the display to select **OK**.
4. Press and hold the **LOCATION SETUP** button (Figure 40, Item 4) on the display for 10 seconds.  
**Note:** It is normal for the screen to change as you press and hold the button.
5. Use the left or right arrow buttons to go to **AUTO SETUP** (Figure 40, Item 5).
6. Press the **ENTER** button on the display.
7. Press the **ENTER** button on the display to accept the default 4-inch nozzle spacing.
14. Repeat the process from left to right until all of the VCMs are moved to their proper location and flipped to





**Figure 41: Auto Location Setup**

This screen shows a picture with the VCMs (Figure 41, Item 1) located on the booms.

The graphic along the bottom shows a VCM with a 15-nozzle wire harness (Figure 41, Item 2). The black dot (Figure 41, Item 3) represents the direction of the harness, and the nozzles are indicated with numbers. This graphic changes as you move the yellow highlighter from VCM to VCM. This can be an indicator of which VCM is which, based on the number and location of the valves on the VCM.

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

8. Use the **LEFT** or **RIGHT** arrow buttons (Figure 41, Item 4) to highlight the desired VCM.

9. Press the **ENTER** button (Figure 41, Item 5) on the display.

The highlight color will change from yellow to red and the nozzles on that VCM will pulse.

10. With the help of another person, find the correct VCM that pulses the valves on VCM #1 (far left).

**Note:** It may be necessary to scroll through multiple VCM's to find the one that pulses the valves on VCM #1. Press the **ENTER** button to change the color back to yellow to go to the next VCM.

11. Once VCM #1 is found, move the red-highlighted VCM using the **LEFT** or **RIGHT** arrow buttons to the physical location on the boom.

**Example:** Selected far right VCM (VCM #8), but it pulses at physical location #1.

12. Press the **ENTER** button on the display to stop the pulsing.

13. Press the **UP** or **DOWN** arrow buttons to flip the VCM graphic, so the VCMs on the left side must show the black dot on the left side (Figure 41, Item 1). The VCMs on the right side must show the black dot on the right side.

their proper orientation.

**Note:** It is easiest to go from VCM #1 to VCM #8 and place them in order.

15. When finished, press the **ESCAPE** (Figure 41, Item 6) button three times.

16. This screen will give the option **YES** (to save) or **NO** (not to save) the entered data. If the data is correct, use the **LEFT** or **RIGHT** arrow buttons to go to **YES**.

17. Press the **ENTER** button.

A blue save bar will show and move across the screen. The CapView is saving all the data inside the VCMs. This process may take a few minutes to complete.

**Important:** The CapView will shutdown to reboot shortly after selecting **YES**.

## Input Total Number of Valves

After a factory reset, input the total number of valves used on the system back into the Capview.

1. Press the **SYSTEM SETUP** button.

2. Using the **UP** or **DOWN** arrows, scroll to the Advanced Settings line (Line 29).

3. Press the **ENTER** button.

4. Using the **DOWN** arrow, scroll to the Total Number Valves Expected line (Line 10).

5. Press the **ENTER** button.

The line will turn red.

6. Using the **UP** or **DOWN** arrows, select the desired number of nozzles.

Once the total number of valves has been reached, the alarm light will turn off.

7. Press the **ENTER** button.

The line will turn yellow.

8. Press the **ESCAPE** button or the **SYSTEM SETUP** button to return to the main screen.

**Note:** Profiles cannot be uploaded until the Total Number Valves Expected line matches the total number of valves used on the SwathPRO system.

## Section 8: Schematics

---

### Topics:

- [Power Schematic](#)
- [Sensors Schematic](#)
- [Controls Schematic](#)
- [Boom Shut-off Kit Schematic](#)
- [Nozzle Type and Component Identification](#)
- [Gateway Hub Identification](#)
- [Pressure Sensor Harness](#)
- [Gateway Boom Control Extension Harness](#)
- [CapView Display Harness](#)
- [Boom Control Harness](#)
- [SwathPRO Main Circuit Breaker](#)
- [VCM Assemblies](#)
- [Shutoff Harness Assembly](#)
- [GPS-Hub Adapter Harness](#)
- [GPS Receiver](#)

## Power Schematic

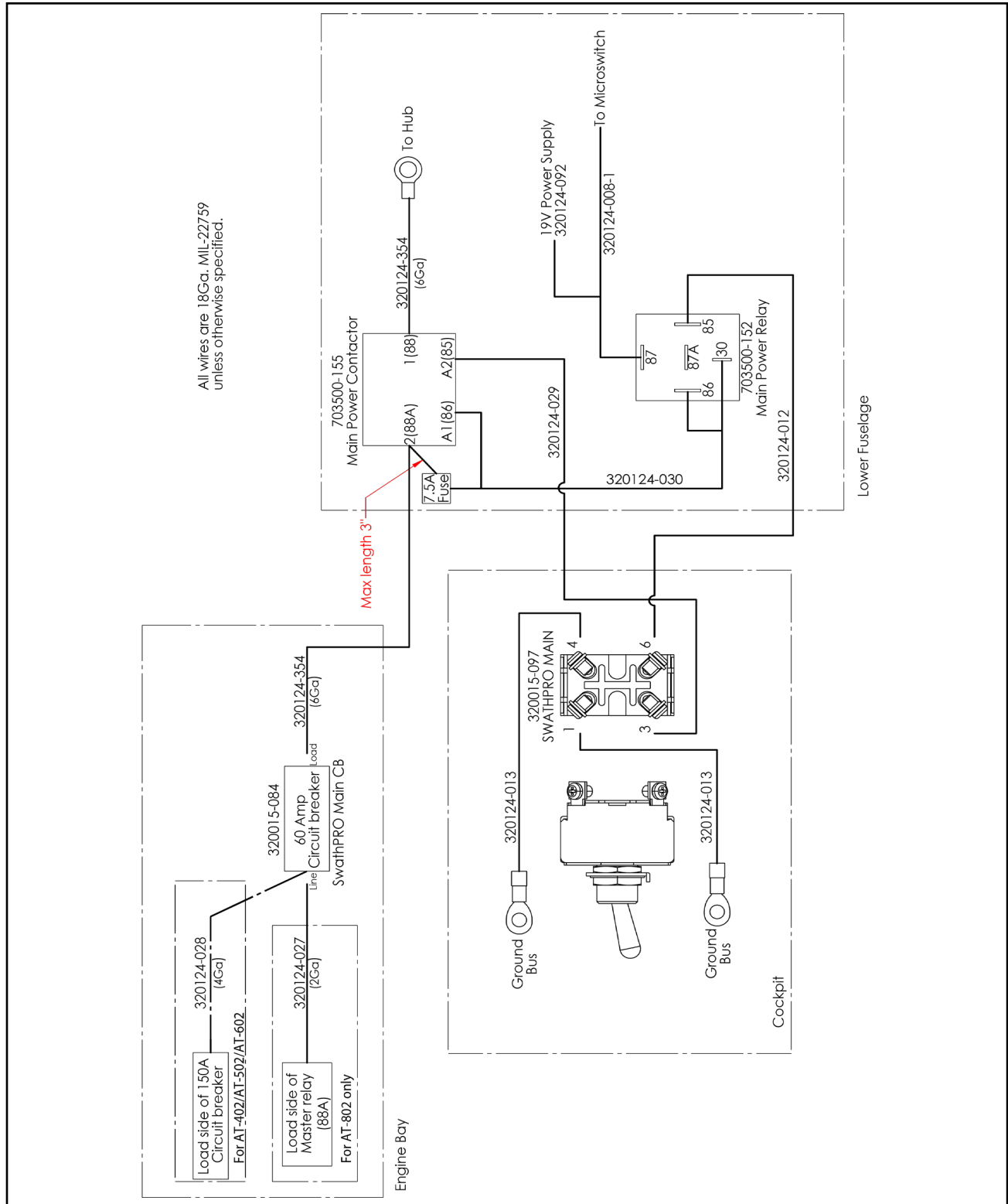
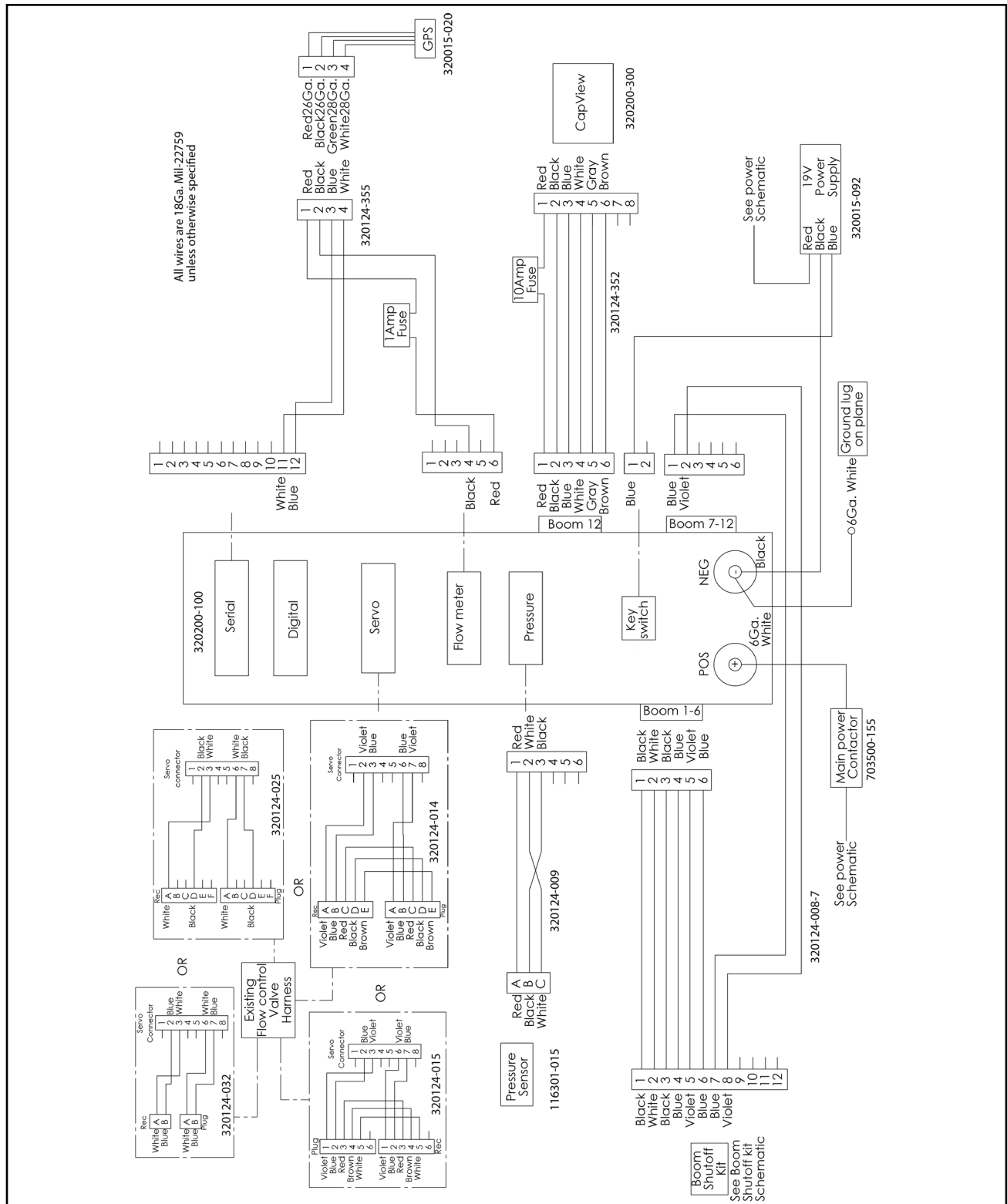


Figure 42: Power Schematic

## Sensors Schematic



### Figure 43: Sensors Schematic

## Controls Schematic

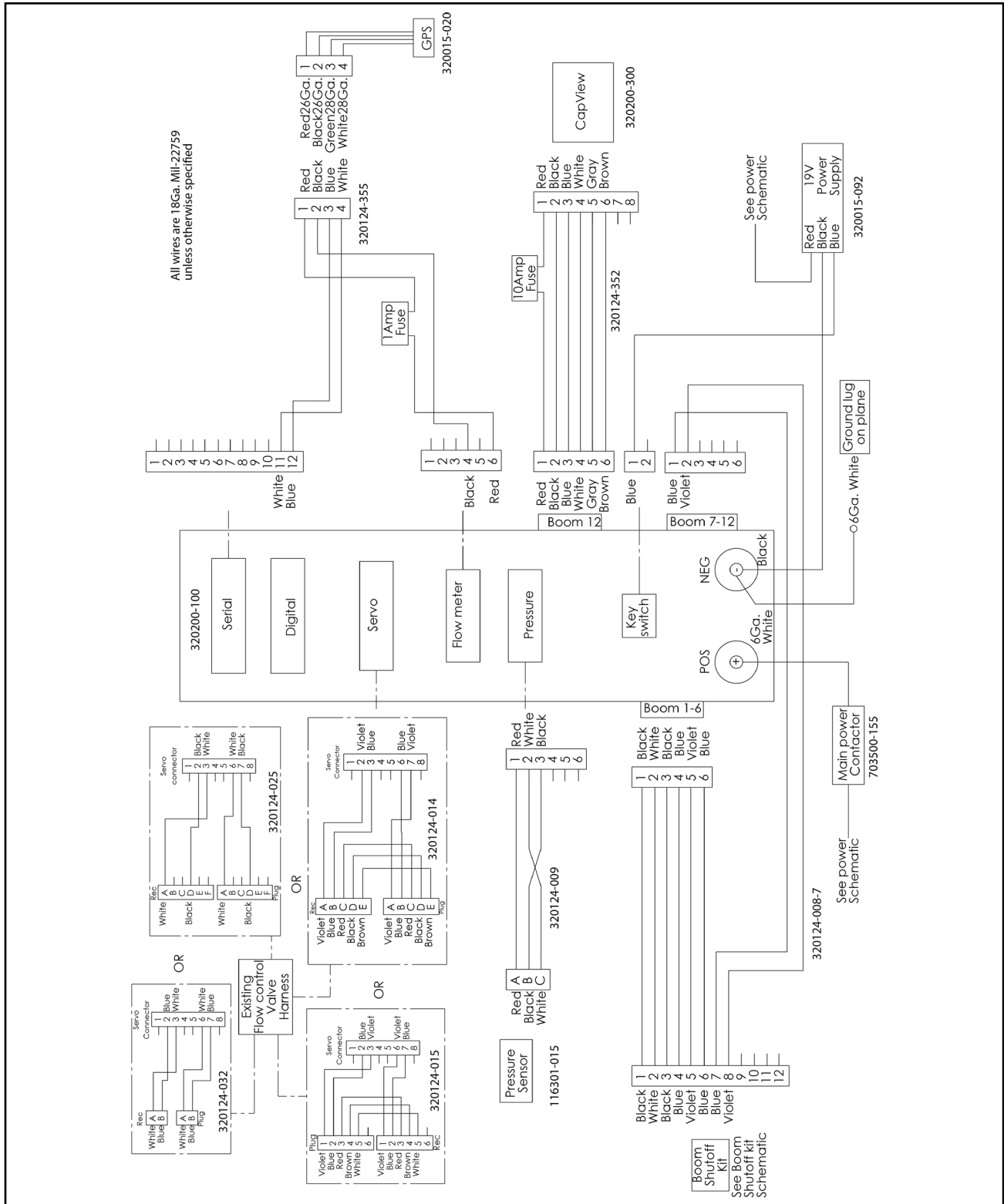


Figure 44: Controls Schematic

## Boom Shut-off Kit Schematic

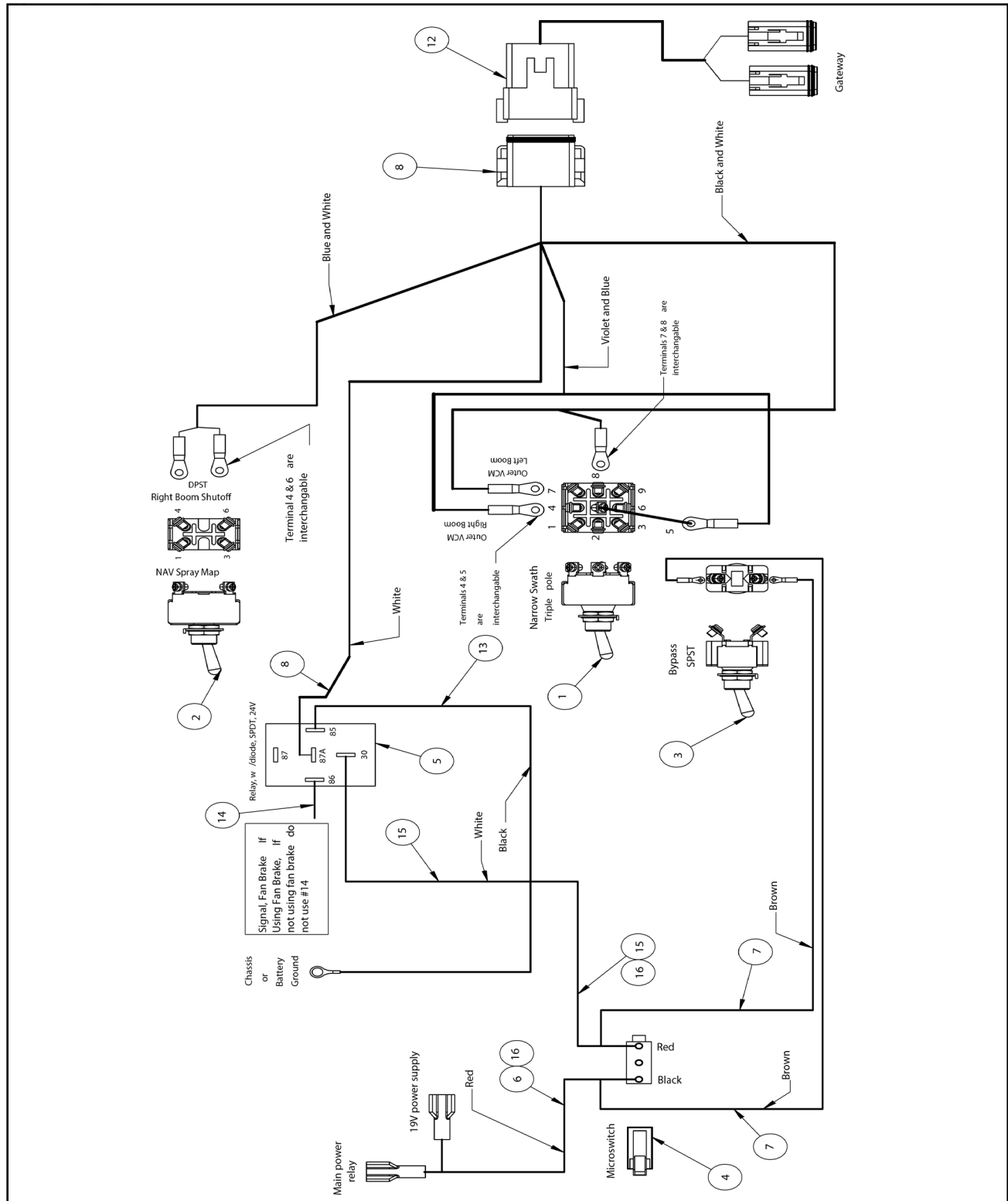


Figure 45: Boom Shut-off Kit Schematic

**Table 8: Boom Shut-off Kit Schematic Parts List**

Item	Part Number	Description	Qty
1	320015-096	Toggle Switch, Triple Pole	1
2	320015-097	Toggle Switch, DPST	1
3	320015-098	Toggle Switch, SPST	1
4	320015-099	Microswitch	1
5	703500-152	Relay, w/ diode, SPDT, 24V	1
6	320124-008-1	Harness, Shutoff, Power, MicroSW	1
7	320124-008-2	Harness, SPST Switch	2
8	320124-008-3	Harness, Shutoff, Gateway, Pigtail	1
12	320124-008-7	Harness, Shutoff, 12 Pin Gateway	1
13	320124-008-8	Harness, Fan Brake Relay, Ground	1
14	320124-008-9	Harness, Fan Brake Relay, Signal (Optional)	1
15	320124-008-10	Harness, Microswitch to Relay	1
16	715005-156	Sleeve, Solder 14-16 Ga.	3



## Nozzle Type and Component Identification

### Valve Assembly Components

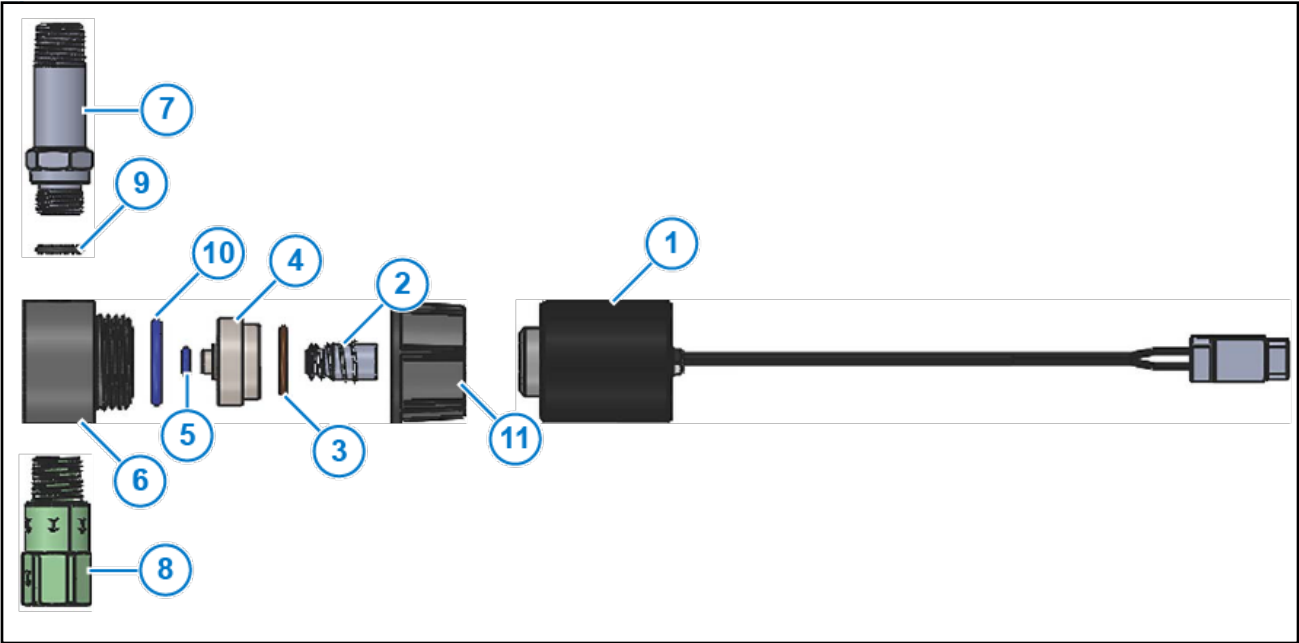


Figure 46: Valve Assembly Components

Table 9: Valve Assembly Component Part Numbers

Item	Part Number	Description
1	320015-100	Coil Assembly
2	116500-199	Plunger Assembly
3	715022-204	O-ring (Brown)
4	320015-008	Valve Body
5	715022-200	O-ring (Blue)
6	320015-190	FlyBody Adapter
7	320015-007	Transfer Tube
8	320015-009	Check Valve
9	715022-012	O-ring (Brown)
10	715022-202	O-ring (Blue)
11	717101-105	Flynut

## Center Valve Assembly Components

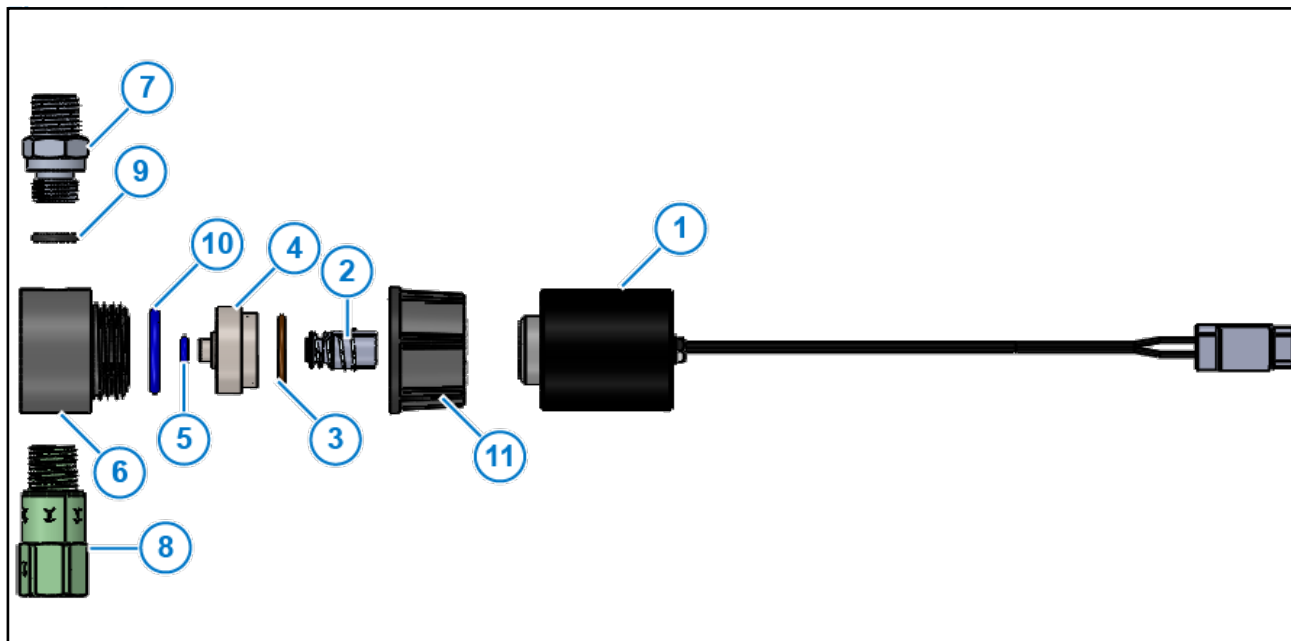


Figure 47: Center Valve Assembly Components

Table 10: Center Valve Assembly Component Part Numbers

Item	Part Number	Description
1	320015-100	Coil Assembly
2	116500-199	Plunger Assembly
3	715022-204	O-ring (Brown)
4	320015-008	Valve Body
5	715022-200	O-ring (Blue)
6	320015-190	FlyBody Adapter
7	320015-002	SAE-05 to 1/4 NPT Adapter
8	320015-009	Check Valve
9	715022-012	O-ring (Brown)
10	715022-202	O-ring (Blue)
11	717101-105	Flynut

Gateway Hub Identification

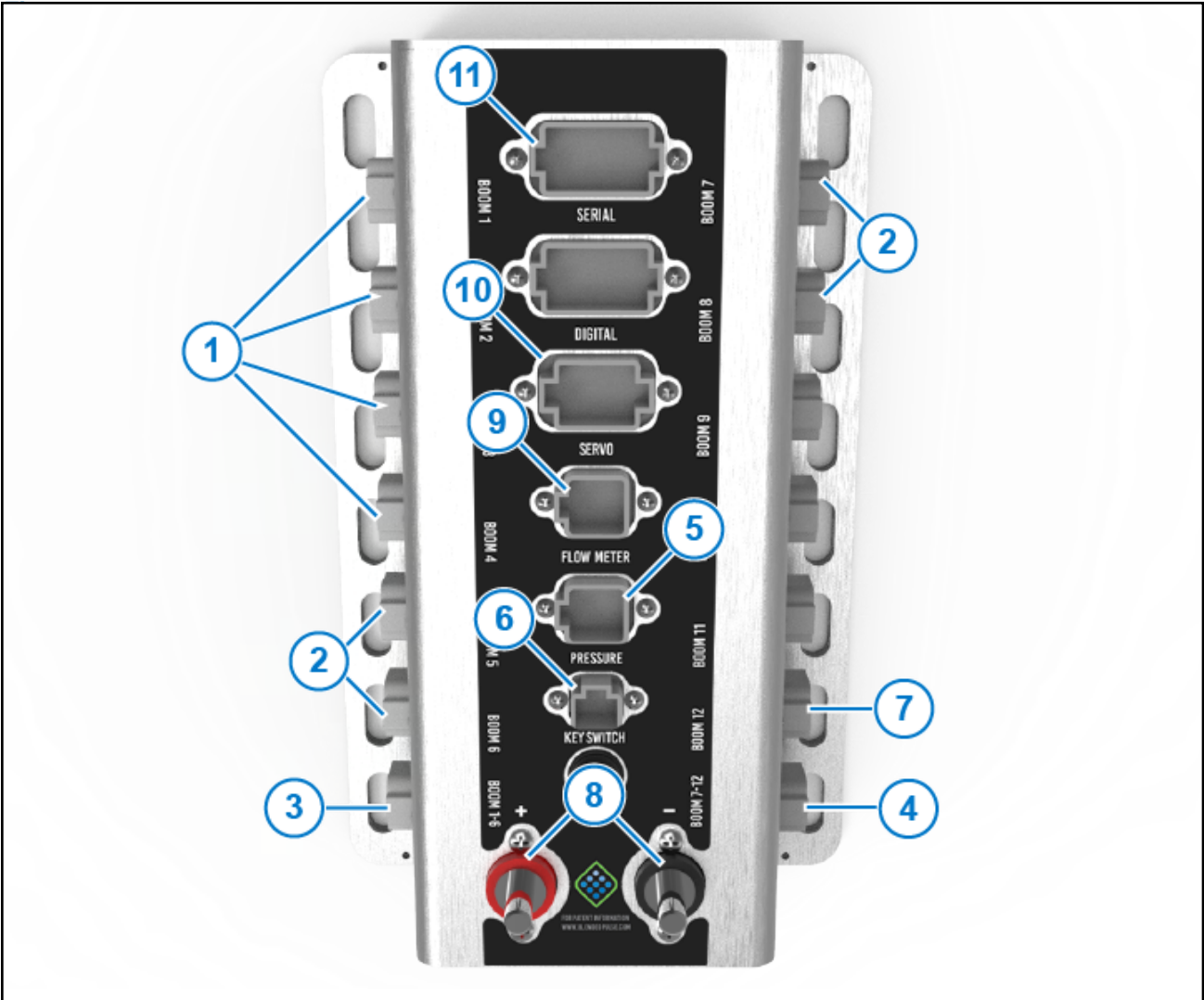
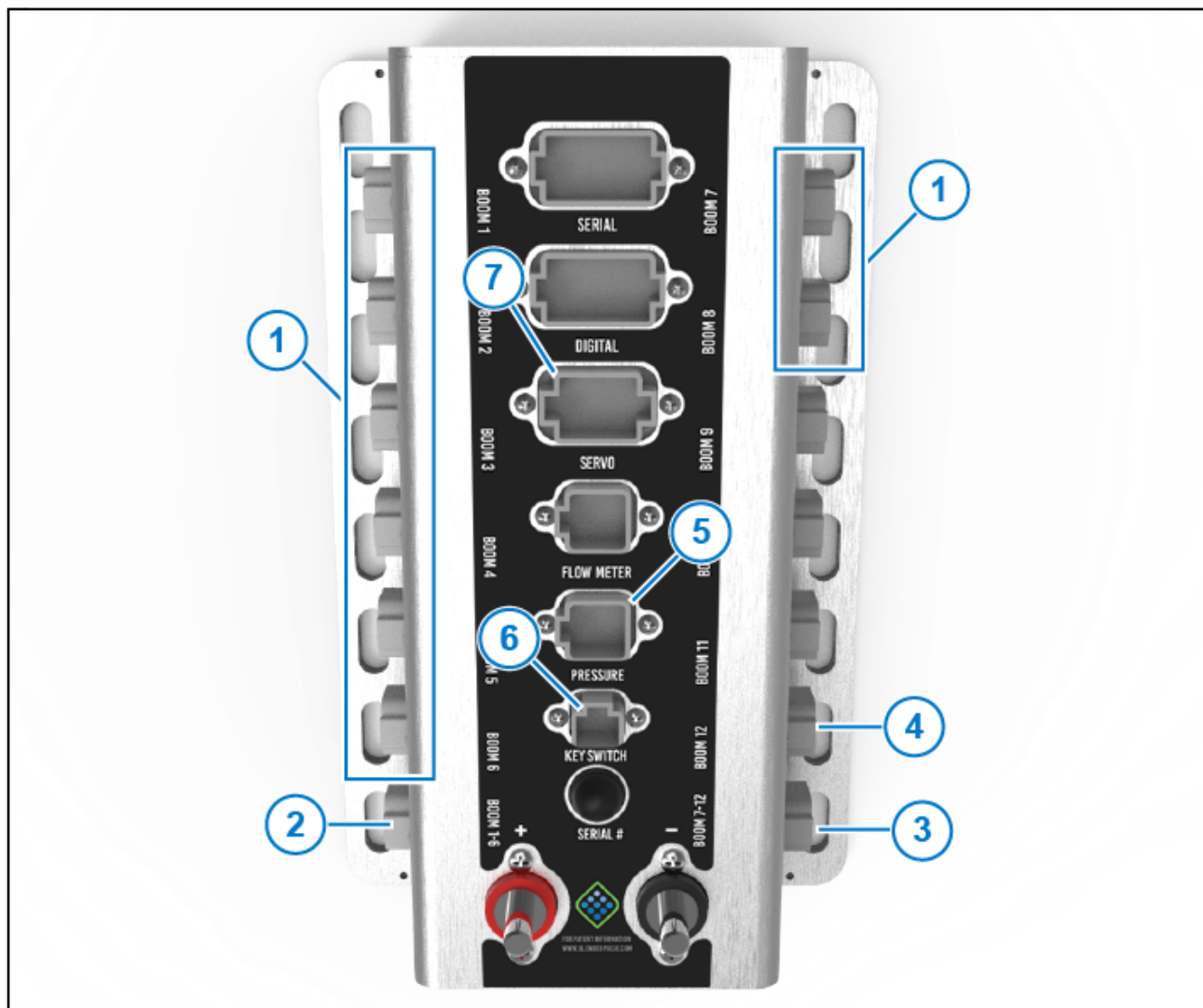


Figure 48: Gateway Hub Identification

Table 11: Gateway Hub Identification

Item	Description	Item	Description
1	Left Boom Extension Harness Ports	7	Display Harness Connector Port
2	Right Boom Extension Harness Ports	8	Battery Power Harness Terminals
3	L Boom Connector Port	9	Flowmeter Connector Port
4	R Boom Connector Port	10	Servo Port
5	Pressure Connector Port	11	Serial Port
6	Key Switched Power Connector Port		

## Gateway Hub Connector Pin Identification



**Figure 49: Gateway Hub Connector Identification**

The Gateway Hub assembly (P/N: 320200-100)

**Table 12: Gateway Hub Connector Identification**

Item	Description	Item	Description
1	Booms 1 to 8 Connector Ports	5	Pressure Connector Port
2	L Boom Connector Port	6	Key Switch Connector Port
3	R Boom Connector Port	7	Servo Connector Port
4	CapView Connector Port		

**Table 13: Boom 1 to 8 Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	24 V Battery		4	CAN High
2	Ground Battery		5	CAN Low
3	Boom Section Signal (24 V On/0 V Off)		6	Key Switched Power

**Table 14: Section 1 to 6 Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	Section 1 (24 V On/0 V Off)		4	Section 4 (24 V On/0 V Off)
2	Section 2 (24 V On/0 V Off)		5	Section 5 (24 V On/0 V Off)
3	Section 3 (24 V On/0 V Off)		6	Section 6 (24 V On/0 V Off)

**Table 15: Section 7 to 8 Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	Section 7 (24 V On/0 V Off)		3 to 6	
2	Section 8 (24 V On/0 V Off)			

**Table 16: CapView Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	Power		4	CAN High
2	Ground		5	CAN Low
3	Boom Switch Signal		6	Key Switched Power

**Table 17: Pressure Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	12-24 V Key Switched Power		4	Ground
2	Pressure Input 1		5	Pressure Input 2
3	Ground		6	12-24 V Key Switched Power

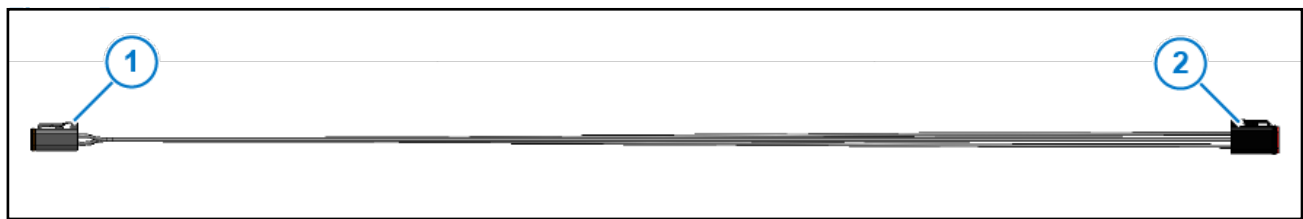
**Table 18: Key Switch Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	12-24 V Key Switched Power		2	Ground

**Table 19: Servo Connector Port Pinouts**

Pin Number	Description		Pin Number	Description
1	12-24 V Servo Power		5	Ground
2	Servo Input INC		6	Servo Output DEC
3	Servo Input DEC		7	Servo Output INC
4	Ground		8	12-24 V Valve Power

## Pressure Sensor Harness


**Figure 50: Pressure Sensor Harness**

The 3-pin DT connector (Figure 50, Item 1) of the pressure sensor harness (P/N: 320124-009) connects to the pressure sensor. The 6-pin DT connector (Figure 50, Item 2) connects to the pressure port on top of the Gateway hub.

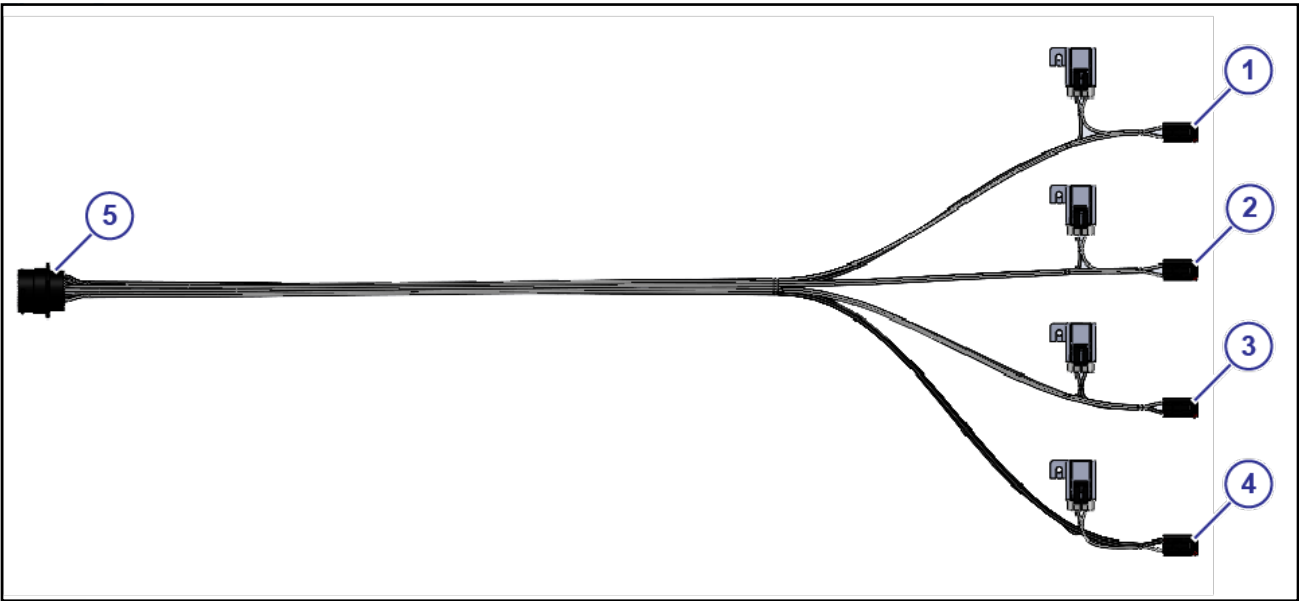
**Table 20: 3-Pin DT Connector Pinouts**

Pin Number	Description		Pin Number	Description
A	Red, 18Ga., MIL-22759		C	White, 18Ga., MIL-22759
B	Black, 18Ga., MIL-22759			

**Table 21: 6-Pin DT Connector Pinouts**

Pin Number	Description		Pin Number	Description
1	Red, 18Ga., MIL-22759		4	Plug
2	White, 18Ga., MIL-22759		5	
3	Black, 18Ga., MIL-22759		6	

## Gateway Boom Control Extension Harness



**Figure 51: Gateway Boom Control Extension Harness**

The 6-pin DT plugs (Figure 51, Items 1 to 4) on the Gateway boom control extension harness (P/N: 320124-347) connect to the Gateway hub. Each connector harness is equipped with a 10A fuse.

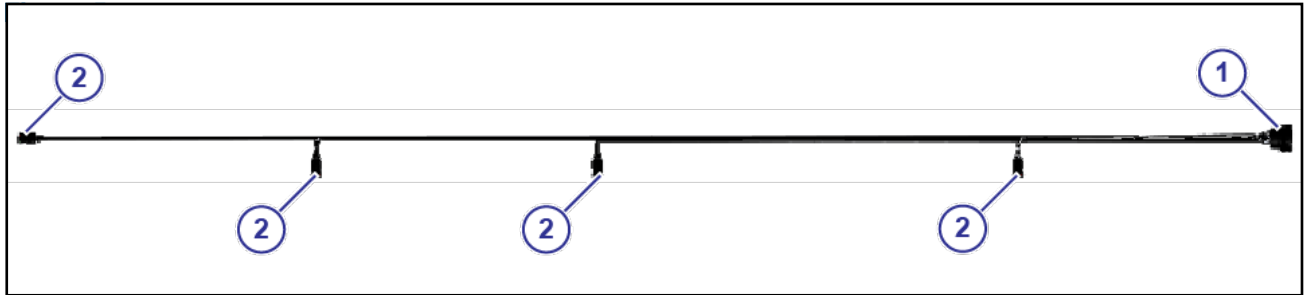
**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

Left Boom Extension Harness		Right Boom Extension Harness	
Item	Description	Item	Description
1	Connector 1/8 to Boom 1 Port	1	Connector 4/5 to Boom 5 Port
2	Connector 2/7 to Boom 2 Port	2	Connector 3/6 to Boom 6 Port
3	Connector 3/6 to Boom 3 Port	3	Connector 2/7 to Boom 7 Port
4	Connector 4/5 to Boom 4 Port	4	Connector 1/8 to Boom 8 Port

The 31-pin DT receptacle (Figure 51, Item 5) connects to the boom control harness.



## Boom Control Harness



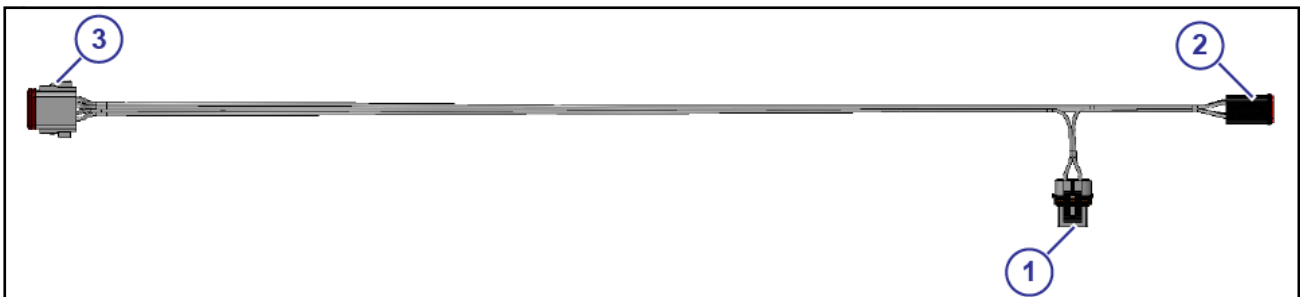
**Figure 52: Boom Control Harness**

**Note:** The length of harnesses will differ based on boom length.

**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

The 31-pin DT plug (Figure 52, Item 1) connects to the boom control extension harness. The 6-pin DTM plugs (Figure 52, Item 2) connect to the VCM power harnesses.

## CapView Display Harness



**Figure 53: CapView Display Harness**

The CapView display harness (P/N: 320124-352) has a 10 A fuse (Figure 53, Item 1).

The 6-pin plug (Figure 53, Item 2) connects to the Gateway hub. The 8-pin plug (Figure 53, Item 3) connects to the back of the CapView display.

**Table 22: 6-Pin DT Connector Pinouts**

Pin Number	Description	Pin Number	Description
1	Red, 18Ga., MIL-22759	4	White, 18 Ga. Twisted pair, MIL-22759/32
2	White, 18Ga., MIL-22759	5	Gray, 18 Ga. Twisted pair, MIL-22759/32
3	Black, 18Ga., MIL-22759	6	Brown, 18 Ga., MIL-22759

Table 23: 8-Pin DT Connector Pinouts

Pin Number	Description		Pin Number	Description
1	Red, 18Ga., MIL-22759		5	Gray, 18 Ga. Twisted pair, MIL-22759/32
2	Black, 18 Ga., MIL-22759		6	Brown, 18 Ga., MIL-22759
3	Blue, 18 Ga., MIL-22759		7	Plug
4	White, 18 Ga. Twisted pair, MIL-22759/32		8	Plug

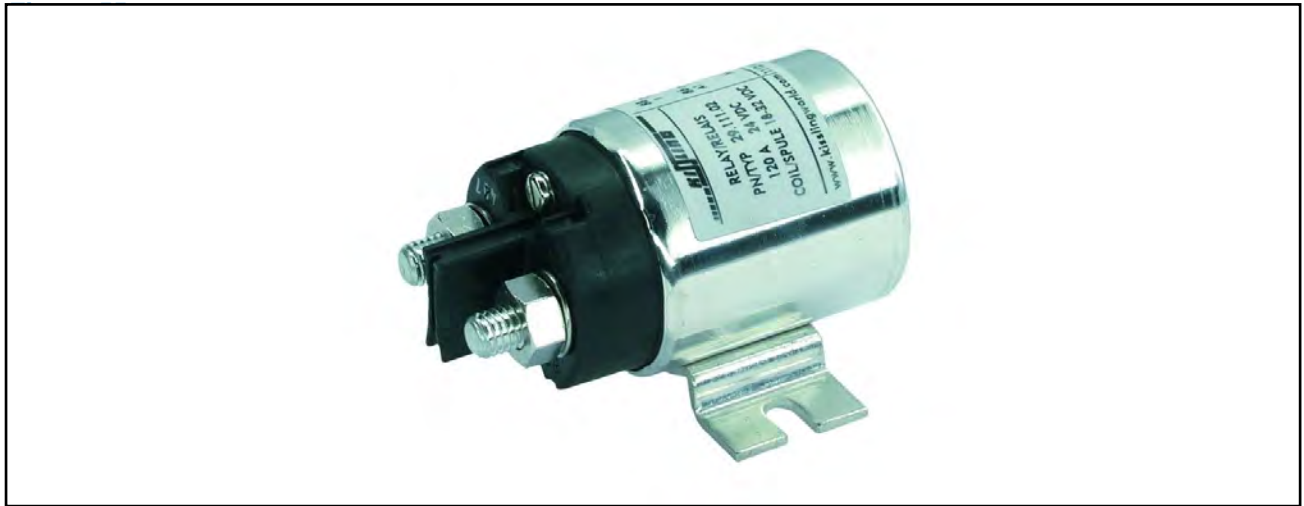
SwathPRO Main Circuit Breaker



Figure 54: Main Circuit Breaker

The circuit breaker labeled **SWATHPRO MAIN CB** is shown in the correct operating position. This circuit breaker controls the primary power to the system. When the circuit breaker is in the tripped position, the system is fully disabled.

## Main Power Contactor

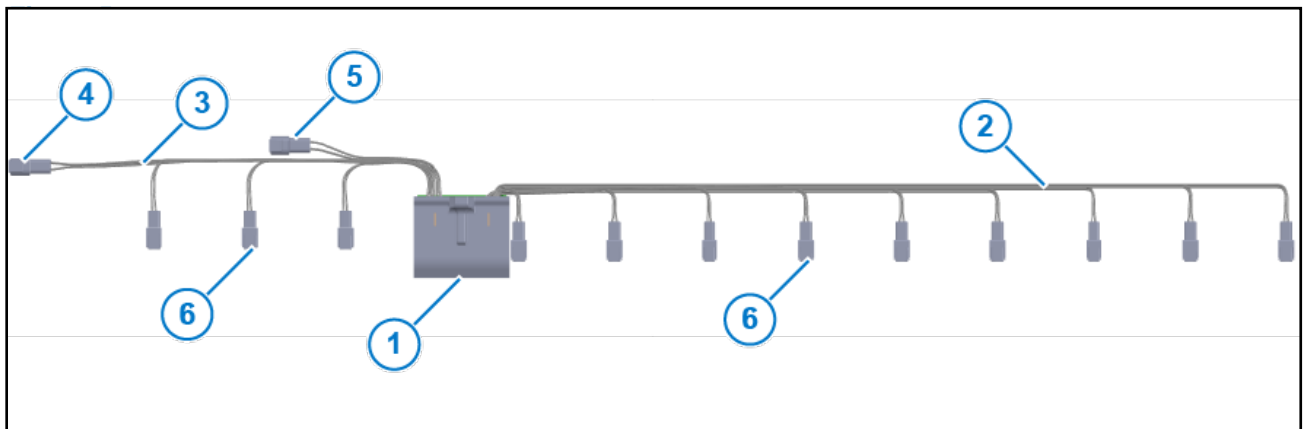


**Figure 55: Main Power Contactor**

The Main Power Contactor (P/N: 703500-155) is used to energized and de-energize the SwathPRO system through the use of the **SWATHPRO MAIN** switch, located in the cockpit.

## VCM Assemblies

### Center VCM Harness Assembly



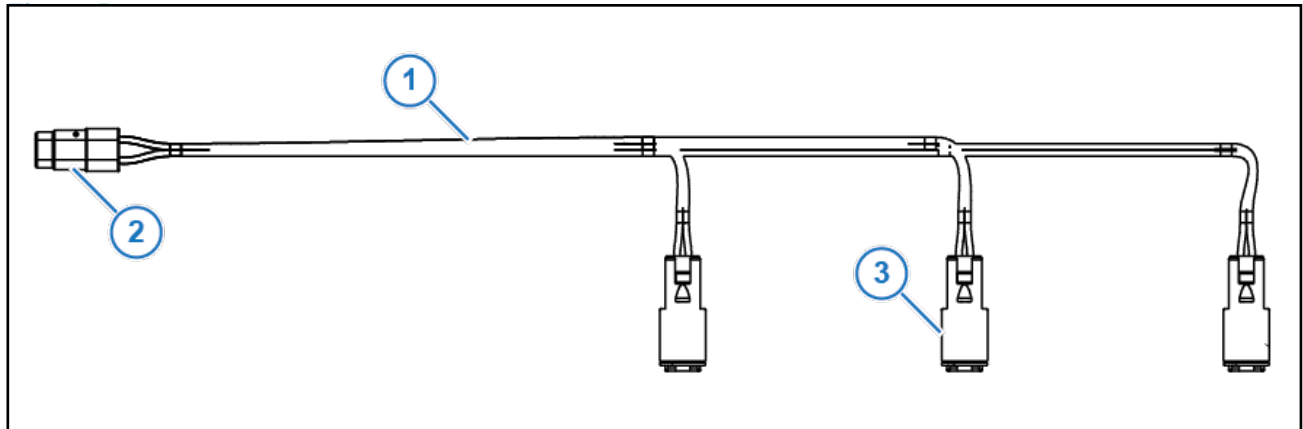
**Figure 56: Center VCM Harness Assembly**

The VCM assembly includes the potted VCM (Figure 56, Item 1), the VCM harness (Figure 56, Item 2), and the VCM power harness (Figure 56, Item 3). The connector (Figure 56, Item 4) on the end of the VCM power harness will connect to the center boom harness (if installed).

The 6-pin DTM receptacle (Figure 56, Item 5) connects to the boom control harness. The 2-Pin DTM Receptacles (Figure 56, Item 6) connect to the valves.

Any unused connectors will have dust plugs.

**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

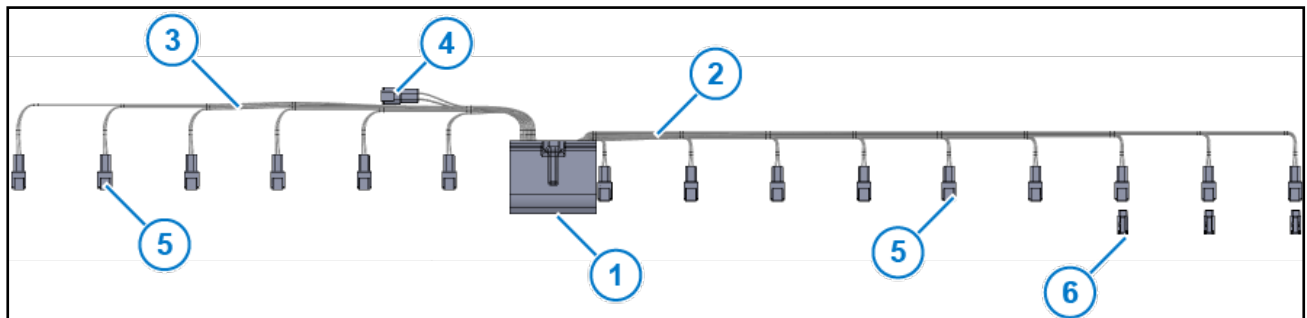


**Figure 57: Center Boom Harness**

If the system will have valves on the center boom, there can be two center boom harnesses (Figure 57, Item 1). One harness will connect to each of the center VCM harness assemblies using a 6-pin DTM connector (Figure 57, Item 2). The 2-Pin DTM Receptacles (Figure 57, Item 3) connect to the valves.

**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

## VCM Harness Assembly

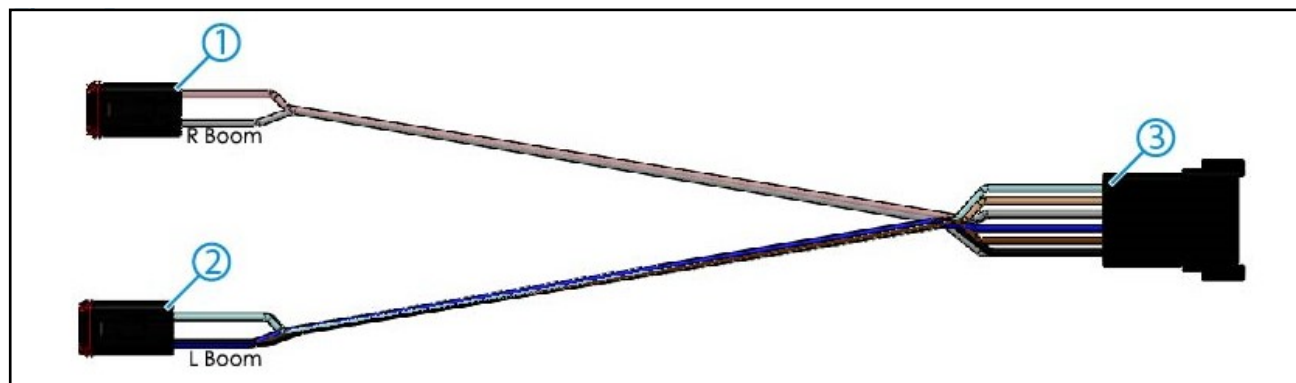


**Figure 58: VCM Harness Assembly**

The VCM assembly includes the potted VCM (Figure 58, Item 1), the VCM harness (Figure 58, Item 2), and the VCM power harness (Figure 58, Item 3). The 6-pin DTM receptacle (Figure 58, Item 4) connects to the boom control harness. The 2-Pin DTM Receptacles (Figure 58, Item 5) connect to the valves. Any unused connectors will have dust plugs (Figure 58, Item 6).

**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

## Shut-off Harness Assembly



**Figure 59: Shut-off Harness Assembly**

The 12-Pin Shutoff harness (P/N: 320124-008-7) includes a 12-pin connector (Figure 59, Item 3) that plugs into the Pigtail Gateway Shutoff Harness in the Shut-off Kit. The 6-pin plug labeled **L Boom** (Figure 59, Item 2) connects to the Gateway hub into the Boom 1-6 port. The 6-pin plug labeled **R Boom** (Figure 59, Item 1) connects to the Gateway hub into the Boom 7-12 port.

**Table 24: 12-Pin DT Connector Pinouts**

Pin Number	Description	Pin Number	Description
1	Black, 18Ga., MIL-22759	7	Blue, 18 Ga., MIL-22759
2	White, 18 Ga., MIL-22759	8	Violet, 18 Ga., MIL-22759
3	Black, 18 Ga., MIL-22759	9	Plug
4	Blue, 18 Ga., MIL-22759	10	Plug
5	Violet, 18 Ga., MIL-22759	11	Plug
6	Blue, 18 Ga., MIL-22759	12	Plug

**Table 25: 6-Pin DT Connector Pinouts**

Pin Number	Description	Pin Number	Description
1	Black, 18Ga., MIL-22759	4	Blue, 18 Ga., MIL-22759
2	White, 18 Ga., MIL-22759	5	Violet, 18 Ga., MIL-22759
3	Black, 18 Ga., MIL-22759	6	Blue, 18 Ga., MIL-22759

**Table 26: 6-Pin DT Connector Pinouts**

Pin Number	Description	Pin Number	Description
1	Blue, 18Ga., MIL-22759	4	Plug
2	Violet, 18 Ga., MIL-22759	5	Plug
3	Plug	6	Plug

GPS-Hub Adapter Harness

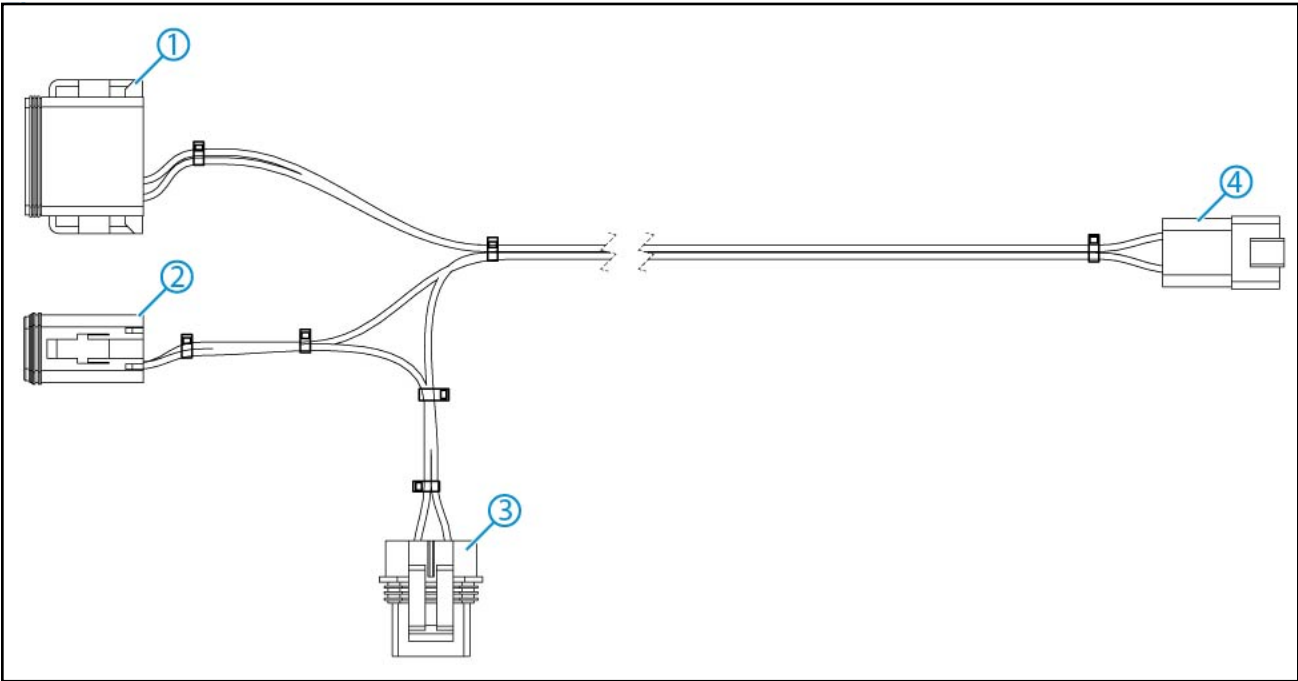


Figure 60: GPS-Hub Adapter Harness

The GPS-Hub adapter harness (P/N: 320124-355) has a 1 A fuse (Figure 60, Item 3). The 12-pin plug (Figure 60, Item 1) connects to the Gateway hub into the Serial Port. The 6-pin plug (Figure 60, Item 2) connects to the Gateway hub into the Flowmeter Port. The 4-pin receptacle (Figure 60, Item 4) connects to the GPS Receiver.

Table 27: 4-Pin DT Connector Pinouts

Pin Number	Description	Pin Number	Description
1	Red, 18 Ga., MIL-22759	4	White, 18 Ga., MIL-22759
2	Black, 18 Ga., MIL-22759		
3	Blue, 18 Ga., MIL-22759		

Table 28: 6-Pin DT Connector Pinouts

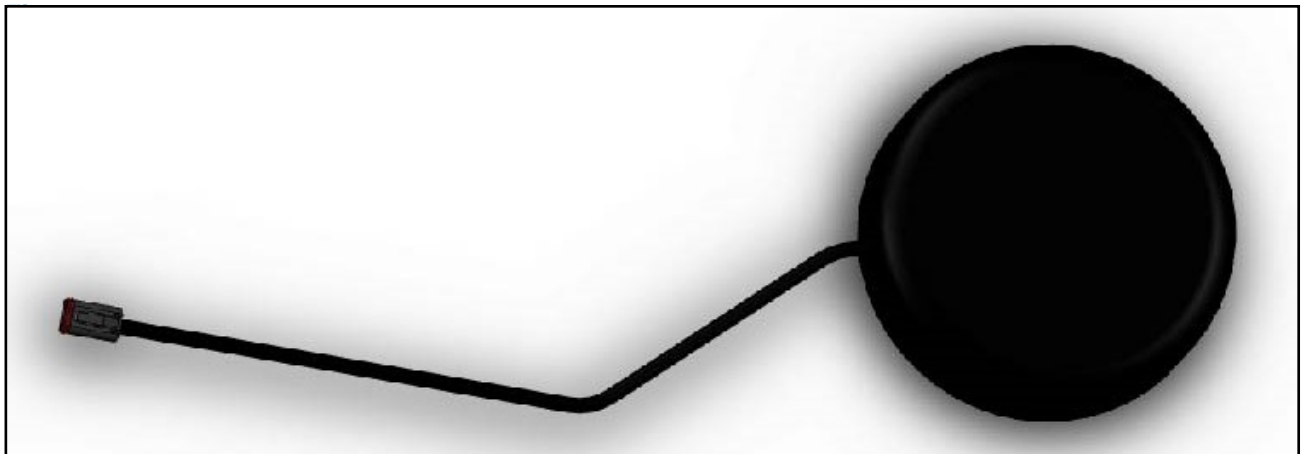
Pin Number	Description	Pin Number	Description
1	Plug	4	Black, 18 Ga., MIL-22759
2	Plug	5	Plug
3	Plug	6	Red, 18 Ga., MIL-22759



**Table 29: 12-Pin DT Connector Pinouts**

Pin Number	Description		Pin Number	Description
1	Plug		7	Plug
2	Plug		8	Plug
3	Plug		9	Plug
4	Plug		10	Plug
5	Plug		11	White, 18 Ga., MIL-22759
6	Plug		12	Blue, 18 Ga., MIL-22759

## GPS Receiver


**Figure 61: GPS Receiver**

The 4-pin connector of the GPS receiver (P/N: 320015-020) connects to the GPS-Hub adapter harness.

**Note:** These wiring harnesses are not field repairable and must be replaced if damaged.

**Table 30: 4-Pin DT Connector Pinouts**

Pin Number	Description		Pin Number	Description
1	Red (VIn)		4	White (Transmit Data)
2	Black (Ground)			
3	Green (Receive Data)			

## Section 9: Troubleshooting

---

### Topics:

- [Troubleshooting Charts](#)
- [Interchange the Components](#)
- [Fuses](#)
- [Coil Assembly Test](#)
- [CapView Battery Voltage Test](#)
- [System Load Capacity Test](#)
- [VCM Voltage Test](#)
- [Pressure Sensor Signal Test](#)

## Troubleshooting Charts

These tables are additional error messages and operation errors that may occur. Reference the correction column for recommended actions.

**Table 32: CapView System Errors**

Error Message	Cause	Correction
Profile Name	This indicates that the system is operating correctly	
Missing Hub	Communication to the Gateway hub has been lost	Check the connections (key switched power, ignition, and battery power) and then cycle power to the system
Missing VCM	Communication to a VCM has been lost	Check the connections (key switched power, ignition, and battery power) and then cycle power to the system
Key fob mode active	The key fob mode is active. The alarm light illuminates, but the alarm does not sound	System Setup Nozzle Control (Key FOB): Change to 12V Active to resume operation
Valves not found	The system uses the number of valves expected line to determine how many it should find, and at aircraft/system start, the system does not find all of the valves	Identify the missing valve(s). Use the Location Setup Menu or the key fob. Repair or replace the valve(s) to resume operation. After correcting the problem, turn the system off and back on to clear the error
Valve lodged	Debris in the valve	Clean the valve
Coil circuit open	Coil wire is pinched, cut, or broke. Coil is disconnected	Check the coil connection and resistance (21 to 23.5 ohm)
Coil circuit short	Coil wire is pinched, cut, or broke. Internal coil short	Check the coil connection and resistance (21 to 23.5 ohm)
Hub reset	System lock/missing VCM error	Alarm will sound until the <b>ALARM</b> button is pressed. The error will continue to show for a few seconds after the button is pressed. Operation will continue normally

**Table 33: System Operation Errors**

Problem	Cause	Correction
Single nozzle valve drips when shut off	Plunger is lodged with debris	Clean the nozzle valve
	Plunger is worn	Replace the plunger
	O-ring is pinched or broken	Replace the O-ring
Single nozzle valve sprays erratically	Plunger is worn	Replace the plunger
Single nozzle valve will not shut off	Plunger is lodged with debris	Clean the nozzle valve
	O-ring is pinched or broken	Replace the O-ring
Group of nozzles will only spray constant stream out of all valves even if a profile has some nozzles turned off	Faulty VCM (CAN wires)	Repair or replace the VCM harness
	Damaged boom control harness (CAN wires)	Repair or replace the boom control harness
	Damaged boom control extension harness (CAN wires)	Repair or replace the boom control extension harness
System pressure cannot reach the desired pressure	Pitch on the fan is not set correctly	Adjust the pitch on the fan to increase the system pressure
	Servo/flow control valve is not opening to the desired position	Do a test of the servo/flow control valve
System pressure is oscillating while spraying	Pitch on the fan is set for too high of pressure	Adjust the pitch on the fan to decrease the pressure
	Nozzle PWM % Cycle Time is set too low	Adjust the Nozzle PWM % Cycle Time to a higher number (Advanced System Setup page, line 31)
	System Gain is set too high	Adjust the System Gain to a lower number (Advanced System Setup page, line 6)
Duty cycle/rate is oscillating while spraying	Pitch on the fan is set for too high of pressure	Adjust the pitch on the fan to decrease the pressure
	Nozzle PWM % Cycle Time is set too low	Adjust the Nozzle PWM % Cycle Time to a higher number (Advanced System Setup page, line 31)
Pressure drops or has light flow out of the tips when entering again into a field	Pressure Control Hold setting is set to Disable	Change the Pressure Control Hold to 1 sec (Advanced System Setup page, line 19)
	Check valve is lodged open/ plunger lodged open (suckback caused air to get in booms)	Clean or replace the check valve and/or the plunger

Problem	Cause	Correction
Valves will not shut off while the spray handle is up or down	<b>SWATHPRO BYPASS</b> switch is on	Turn the <b>SWATHPRO BYPASS</b> switch to off
Under application	System pressure on the CapView too low	Increase the system pressure on the CapView
	Incorrect rate settings	Check and adjust the rate settings
Key fob is not working	Battery is dead	Replace the battery
	Key fob mode not enabled	Enable the Key fob Mode (System Setup, line 8)

## Interchange Components

The system includes a number of multiple parts:

- Nozzle Valves
- Extension Harnesses
- VCMs

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

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

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

## Fuses

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

1A ATO/ATC Black

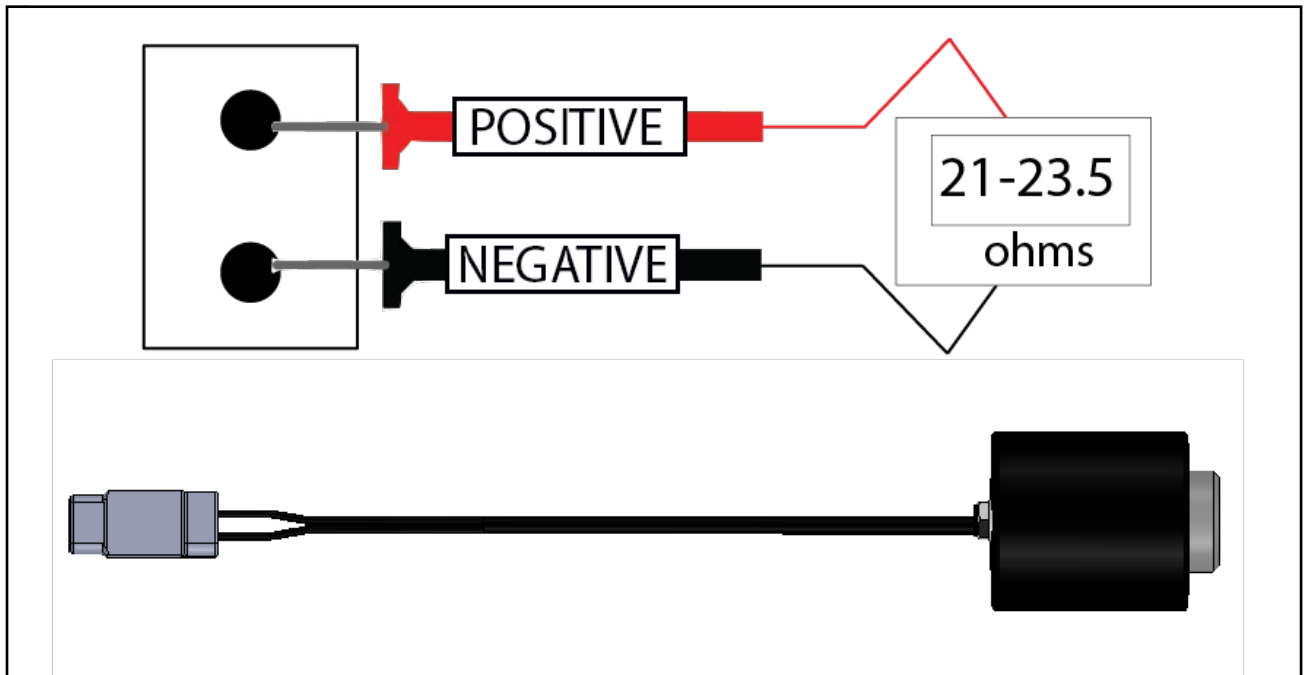
7.5A ATO/ATC Brown

10A ATO/ATC Red

15A ATO/ATC Blue

Fuse Location	Rating	Type	Color
GPS Adapter Harness (P/N: 320124-355)	1A	ATO/ATC	Black
Contactor to Main Power Relay Harness (P/N: 320124-030)	7.5A	ATO/ATC	Brown
SwathPRO Display (CapView) Extension Harness (P/N: 320124-352)	10A	ATO/ATC	Red
Boom Control Extension Harness (P/N: 320124-347)	15A	ATO/ATC	Blue

## Coil Assembly Test



**Figure 62: Coil Assembly Test**

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

**Note:** Correct resistance is:

- 7-watt coils resistance—21 ohms to 23.5 ohms

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:

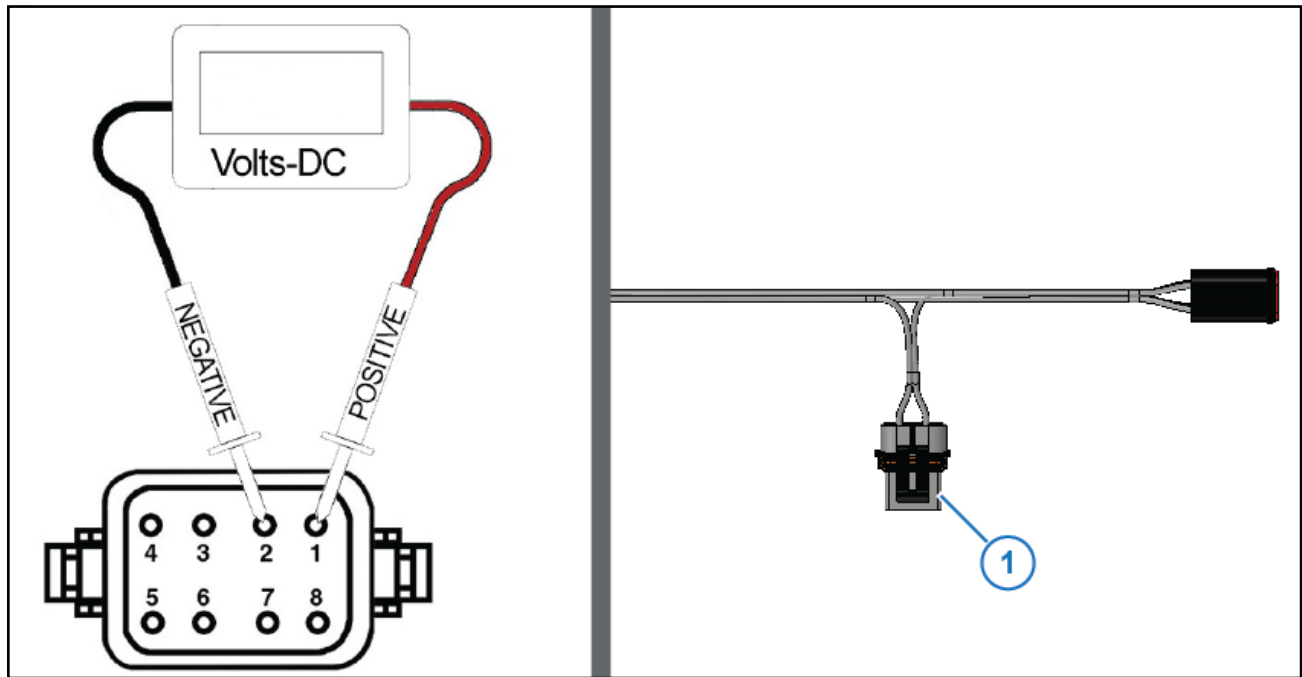
- Extended valve use with a plugged nozzle
- Extended use in corrosive environments

**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.



## CapView Battery Voltage Test



**Figure 63: CapView Battery Voltage Test**

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

- With the engine of the aircraft off, use a voltmeter to observe that there is 24-28 VDC between pin 1 and pin 2.

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

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

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

- Make sure that the aircraft main key switch power is on.
- Make sure that the toggle switch labeled **SWATHPRO MAIN** is in the on position.
- Make sure that the 7.5A fuse located in harness 320124-030 near the contactor is not blown.
- Make sure that the 10A fuse (Figure 63, Item 1) on the CapView harness, located at the Boom 12 port of Gateway hub, is in good working condition.

## System Load Capacity Test

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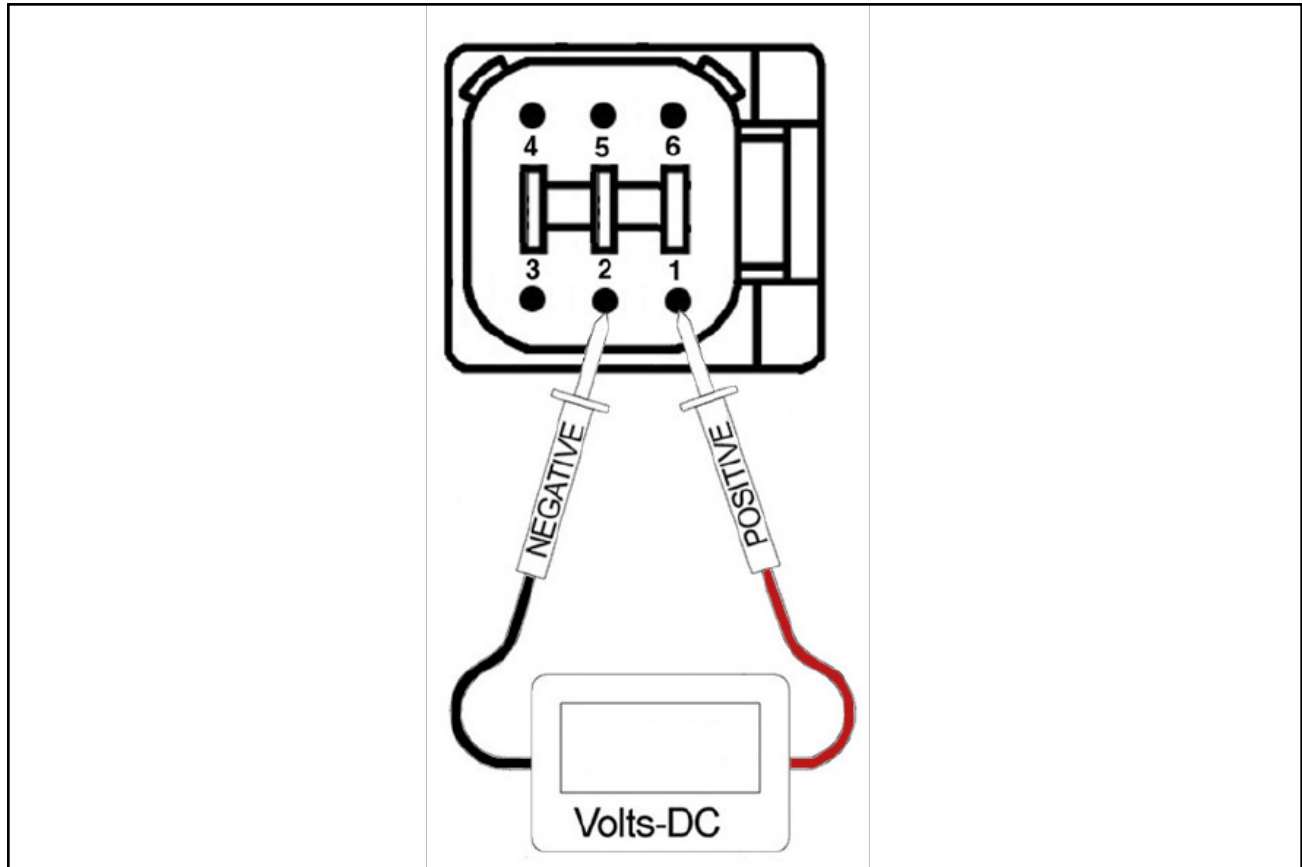
1. Start the aircraft engine.
2. Turn on the CapView and all of the boom sections.
3. Turn on all electrical loads, including the air conditioning, etc.
4. Observe the voltage readout on the CapView in the System Setup Menu screen.

The system valves assemblies operate best at 24 VDC or higher. Using less than 24 VDC will result in reduced pressure capacity. This will often result in erratic nozzle pulsing, sometimes described as flickering. Also, inspect the valve assemblies for worn plunger seals.

If low voltage is observed, inspect:

- Battery terminals, clean as necessary
- Battery condition
- Alternator condition
- Electrical connections

## VCM Voltage Test



**Figure 64: VCM Voltage Test**

Disconnect the power harness 6-pin DTM connector at each VCM.

- With the engine of the aircraft off, use a voltmeter to check that there is 24-28 VDC between pin 1 and pin 2.

Make sure that the polarity is correct by confirming the red (positive) probe is connected to pin 1, and the black (negative) probe is connected to pin 2.

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

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

- Check the 15A in-line fuses on each boom control extension harness located at the Gateway hub.
- If the fuse is good, check the pins on the power harness connector that connects to the boom control harness.

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

To test the CAN wires, use a voltmeter, set the reading to Ohms, and check the resistance between pin 4 and pin 5. The reading should be approximately 120 Ohms.

## Pressure Sensor Signal Test

---

Disconnect the pressure sensor from the pressure sensor harness.

If accurate voltage is not present:

- Verify the accuracy of the pressure gauge on the aircraft.
- Check the power to the pressure sensor and repair or replace as necessary.
- Replace the pressure sensor.

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