Hawkeye® Installation Manual for ET Apache AS 720, 730, 1020, 1025, 1030, 1220, and 1230 Series

Manual No. 016-0171-587 Rev. C 04/17 *E29377*

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CHAPTER 1 IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and all operation and safety instructions included with the implement and/or controller carefully before installing the Hawkeye system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of Raven equipment, contact a local Raven dealer for support.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact a local Raven dealer.

When operating the machine, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position in the machine at all times when equipment is engaged. Disable system functions or features when exiting from the operator's seat and machine.
- Do not drive the machine with equipment enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling the Hawkeye system when the safe working distance has been diminished.
- Ensure Hawkeye is disabled prior to starting any maintenance work on the system or the implement.

⚠ DANGER

AGRICULTURAL CHEMICAL SAFETY

- Thoroughly bleed pressure from chemical lines and rinse the system with clean water prior to installing or servicing fittings, hoses, valves, or nozzles in the application system.
- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer.
- Fill, flush, calibrate, and decontaminate chemical application systems in an area where runoff will not reach ponds, lakes, streams, livestock areas, gardens, or populated areas.
- Avoid inhaling chemical dust or spray particulate and avoid direct contact with any agricultural chemicals. Seek immediate medical attention if symptoms of illness occur during, or soon after, use of agricultural chemicals, products, or equipment.
- After handling or applying agricultural chemicals:

  - Thoroughly wash hands and face after using agricultural chemicals and before eating, drinking, or using the rest room.
  - Thoroughly flush or rinse equipment used to mix, transfer, or apply chemicals with water after use or before servicing any component of the application system.
- Follow all federal, state, and local regulations regarding the handling, use, and disposal of agricultural chemicals, products, and containers. Triple-rinse and puncture or crush empty containers before disposing of them properly. Contact a local environmental agency or recycling center for additional information.

⚠ CAUTION

INSTRUCTIONS FOR WIRE ROUTING

The word "harness" is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets

- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

IMPORTANT: Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:

- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.
- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.

CHAPTER 2 INTRODUCTION

The Hawkeye® nozzle control system is a pressure based product control system designed for precise sprayer application in a variety of conditions. Pressure based application control provides accurate control of droplet size which reduces spray drift during field operations.

Hawkeye® is compatible with the ISOBUS communication platform which allows the system to work with most ISO Virtual Terminals (VTs) and Task Controllers on the market. This manual is intended to provide installation instructions on the following equipment:

TABLE 1. Apache Make and Model Information

Make	Model	Model Years	Boom Configuration
Apache	AS 720/730/1020/1025/1030/ 1220/1230	2012 through 2017	132′ Boom (Pommier) 20″ Spacing
			120′ Boom (Pommier) 15″ and 20″ Spacing
			100′ Boom 15″ and 20″ Spacing
			100′ Boom (Pommier) 15″ and 20″ Spacing
			90′ Boom 15″ and 20″ Spacing
			60′/90′ Boom 15″ and 20″ Spacing

FIGURE 1. Apache AS1020

REQUIRED COMPONENTS

The following components must be installed with the Hawkeye nozzle control system:

- Updated software on field computers or control monitors
- PWM pump control valve
- 80 mesh (or finer) strainer

NOTE: Air induction style spray tips should not be used with the Hawkeye nozzle control system. A fan or cone style spray tip is required for the Hawkeye system to operate properly.

TOOLS AND MATERIALS NEEDED

The following tools are recommended for completing the installation:

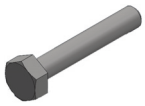
- SAE and metric sized wrenches and tools
- Drill bit set and drill
- Cable ties
- Hammer
- Punch

POINT OF REFERENCE

The instructions provided in this manual assume the installer is standing behind the machine, looking toward the machine cabin.

KIT CONTENTS

TABLE 2. Components Included with Every Kit

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - Hawkeye® Calibration and Operation	016-0171-584	1
Not Pictured	Manual - Apache Hawkeye Installation	016-0171-587	1
	Cable - ISO Adapter	115-7303-138	1
	Cable - ECU	115-7303-143	1
	Cable - Power Cable	115-7303-144	1
	ECU - Product Controller II	063-0173-704	1
	Bolt, 1/4-20 x 1.5" LG Hex Head	311-0050-107	4
	Nut, Flanged Lock 1/4 - 20 Zinc	312-1001-0168	4
	Washer - 1/4"	313-2300-120	4
	Valve, Hydraulic, PWM, Flow Control	334-0003-096	1

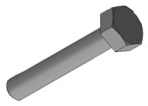
Picture	Item Description	Part Number	Qty.
Not Pictured	Bracket, PWM Pump Valve Mount, Apache	107-0172-362	1
	5/16" x 3-1/2"" Bolt	311-0052-115	2
	Nut: Flanged Lock, 5/16"-18 Zinc	312-1001-169	2
	Washer - 5/16", Split, Zinc	311-1000-019	2
Not Pictured	Terminator	063-0172-964	2
	Fitting, Adapter, Straight 3/4" SAE O-Ring to 3/4" JIC	333-0012-093	2
	Fitting, Adapter, Straight 3/4" SAE O-Ring (M) to 7/8" JIC (M)	333-0012-110	2
	Hose: End 1: 10JF; SIZE 10; Overall Length: 18"; END 2: 10JF	214-1001-072	1
	Hose: END1: 8JF45; SIZE: 8; Overall Length: 18; END 2: 8JF	214-1001-068	1
	Grommet,.3/4" ID x 1-5/8" OD	315-1001-006	1

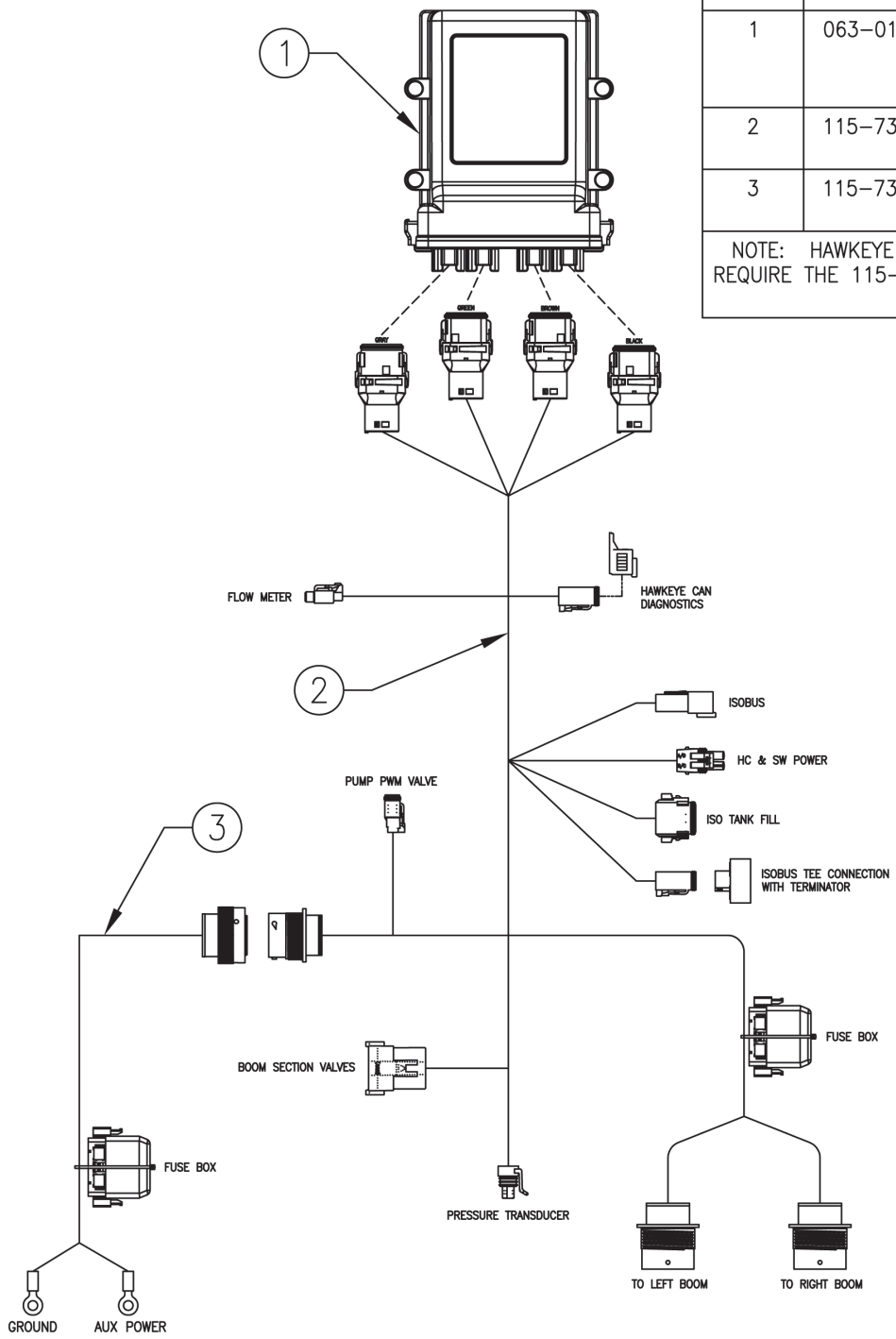
TABLE 3. Boom Specific Cable Numbers

Boom Configuration	Cable		
	Left Primary (Qty 1)	Right Primary (Qty 1)	Secondary (Qty 2)
60′/90′ Combo Boom 15″ Spacing	115-7303-056	115-7303-056	115-7303-059
60′/90′ Combo Boom 20″ Spacing	115-7303-056	115-7303-057	115-7303-059
90′ Boom 15″ Spacing	115-7303-037	115-7303-037	115-7303-038
90′ Boom 20″ Spacing	115-7303-060	115-7303-061	115-7303-063
100′ Boom 15″ Spacing	115-7303-064	115-7303-065	115-7303-066
100′ Boom 15″ Spacing (Pommier Boom)	115-7303-349	115-7303-350	115-7303-351
100′ Boom 20′ Spacing	115-7303-035	115-7303-035	115-7303-036
100′ Boom 20′ Spacing (Pommier Boom)	115-7303-317	115-7303-317	115-7303-318
120′ Boom 20″ Spacing (Pommier Boom)	115-7303-054	115-7303-054	115-7303-055
132′ Boom 20″ Spacing (Pommier Boom)	115-7303-079	115-7303-079	115-7303-080

SYSTEM DIAGRAMS

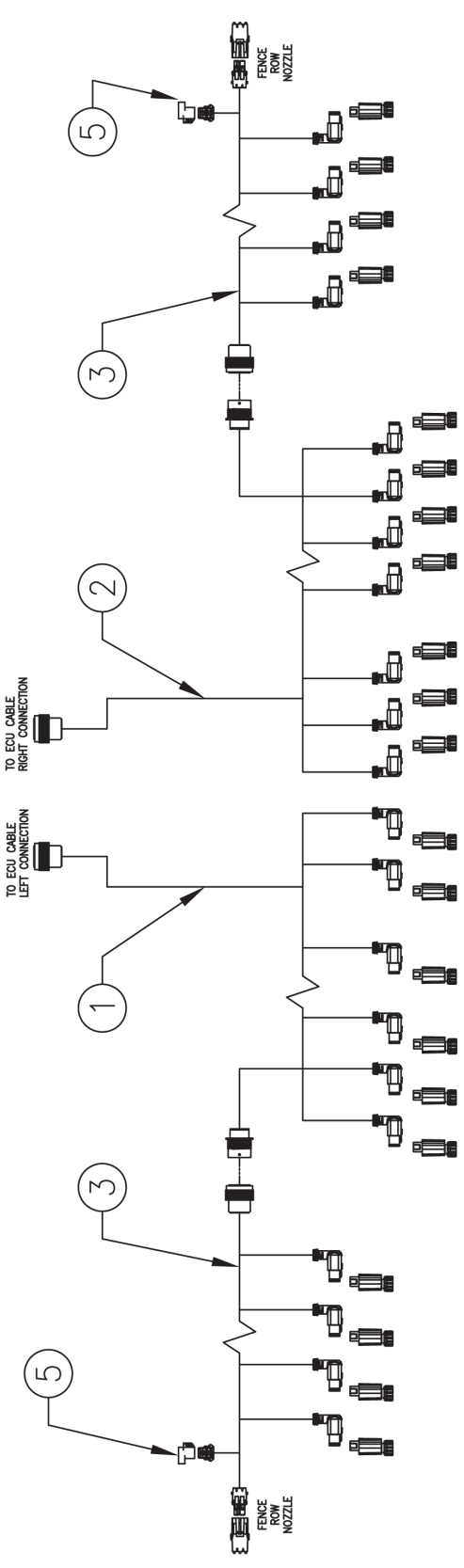
Review the three system diagrams below before starting an installation.

APACHE 720/730/1020/1025/1030/1220/1230		
ITEM	PART NUMBER	DESCRIPTION
1	063–0173–704	PRODUCT NODE II (MAIN ECU)
2	115–7303–143	ECU CABLE
3	115–7303–144	POWER CABLE
NOTE: HAWKEYE READY MACHINES ONLY REQUIRE THE 115–7303–144 POWER CABLE		

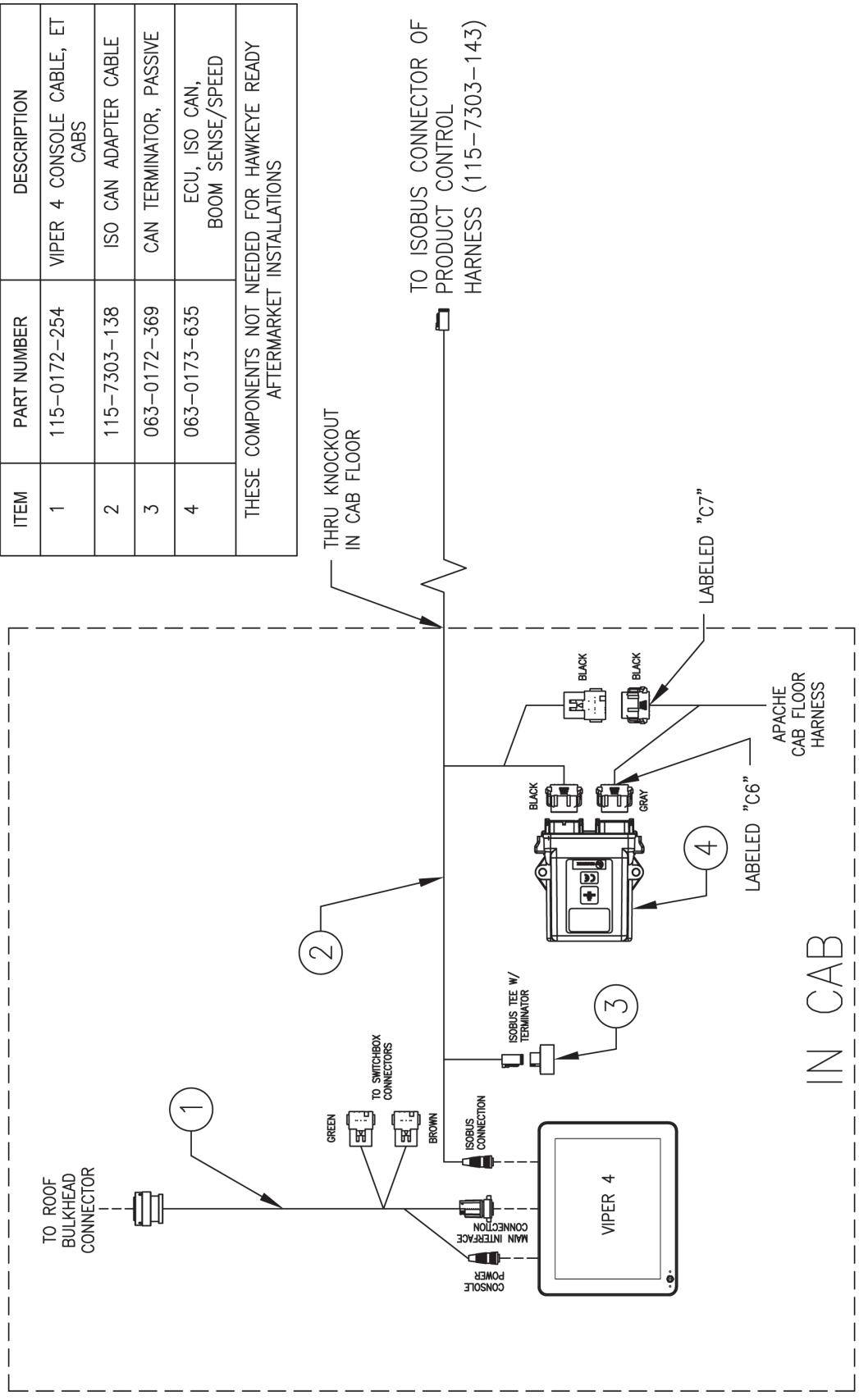


APACHE AS 720/730/1020/10125/1030/1220/1230

ITEM NO.	DESCRIPTION	60'/90' BOOM 15" SPACING	60'/90' BOOM 20" SPACING	90' BOOM 15" SPACING	90' BOOM 20" SPACING	100' BOOM 15" SPACING	100' BOOM 20" SPACING	100' BOOM 15" SPACING (POMMIER BOOM)	100' BOOM 20" SPACING (POMMIER BOOM)	120' BOOM 15" SPACING (POMMIER BOOM)	120' BOOM 20" SPACING (POMMIER BOOM)	132' BOOM 15" SPACING (POMMIER BOOM)	132' BOOM 20" SPACING (POMMIER BOOM)
1	CABLE, LEFT PRIMARY	115-7303-056	115-7303-037	115-7303-060	115-7303-010	115-7303-064	115-7303-035	115-7303-349	115-7303-317	CONTACTT RAVEN FOR AVAILABILITY	115-7303-054	CONTACTT RAVEN FOR AVAILABILITY	115-7303-079
2	CABLE, RIGHT PRIMARY	115-7303-057	115-7303-037	115-7303-061	115-7303-010	115-7303-065	115-7303-035	115-7303-350	115-7303-317		115-7303-054		115-7303-079
3	CABLE, SECONDARY	115-7303-059	115-7303-038	115-7303-063	115-7303-011	115-7303-066	115-7303-036	115-7303-351	115-7303-318		115-7303-055		115-7303-080
4	TEEJET NCV ARAG/HYPRO NCV WILGER NCV	063-0173-672 063-0173-673 063-0173-674 (QTY: 72)	063-0173-672 063-0173-673 063-0173-674 (QTY: 54)	063-0173-672 063-0173-673 063-0173-674 (QTY: 72)	063-0173-672 063-0173-673 063-0173-674 (QTY: 54)	063-0173-672 063-0173-673 063-0173-674 (QTY: 80)	063-0173-672 063-0173-673 063-0173-674 (QTY: 60)	063-0173-672 063-0173-673 063-0173-674 (QTY: 80)	063-0173-672 063-0173-673 063-0173-674 (QTY: 60)		063-0173-672 063-0173-673 063-0173-674 (QTY: 72)		063-0173-672 063-0173-673 063-0173-674 (QTY: 80)
5	TERMINATOR	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964	063-0172-964



APACHE 720/730/1020/1025/1030/1220/1230		
ITEM	PART NUMBER	DESCRIPTION
1	115-0172-254	VIPER 4 CONSOLE CABLE, ET CABS
2	115-7303-138	ISO CAN ADAPTER CABLE
3	063-0172-369	CAN TERMINATOR, PASSIVE
4	063-0173-635	ECU, ISO CAN, BOOM SENSE/SPEED
THESE COMPONENTS NOT NEEDED FOR HAWKEYE READY AFTERMARKET INSTALLATIONS		



UPDATES

Raven software and documentation updates may be made available periodically on the Raven Applied Technology web site:

www.ravenhelp.com

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To serve you best, please send an email with the following information to

techwriting@ravenind.com

-Hawkeye® Installation Manual for ET Apache AS 720, 730, 1020, 1025, 1030, 1220, and 1230 Series
-Manual No. 016-0171-587 Rev. C
-Any comments or feedback (include chapter or page numbers if applicable).
-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

CHAPTER 3 INSTALLATION PREPARATION

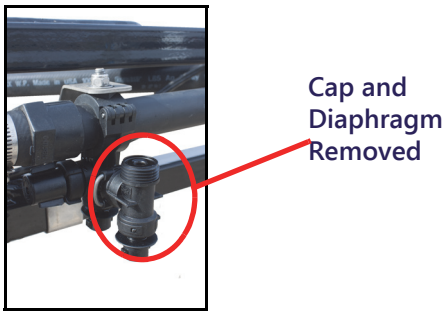
Perform the following procedure to prepare the implement for installation of the Hawkeye nozzle control system.

⚠ CAUTION

Chemical residues may be present. Thoroughly bleed pressure from chemical lines and rinse the system with clean water prior to installing or servicing fittings, hoses, valves, or nozzles in the application system.

1. Rinse and fill the tank with clean water.
2. Move the equipment to an open area suitable for testing application system operation and rinsing the boom plumbing.
3. Unfold the boom and enable the application control system. Verify that all control hardware (e.g. control valves, section valves, etc.) and spray tips function as expected.
4. Operate the system until any chemicals are rinsed from the boom supply lines.
5. Disable the application control system and de-pressurize the boom.
6. Replace existing carrier line strainer(s) with an 80 mesh strainer. An 80 mesh or finer strainer is required for use with the Hawkeye nozzle control system.
7. If turret style nozzle bodies are installed on the implement, rotate the turret to an open spray position, if available. If an open spray position is not available, or for nozzle bodies without a turret, remove the spray tips from the boom and set aside for later use.
8. Enable the application control system and run clean water for at least 20 seconds to rinse any remaining debris from the boom plumbing and nozzle bodies.
9. Remove the cap and diaphragm from the nozzle bodies.

FIGURE 1. Nozzle Body Cap and Diaphragm Removed



CHAPTER 4 BOOM INSTALLATION

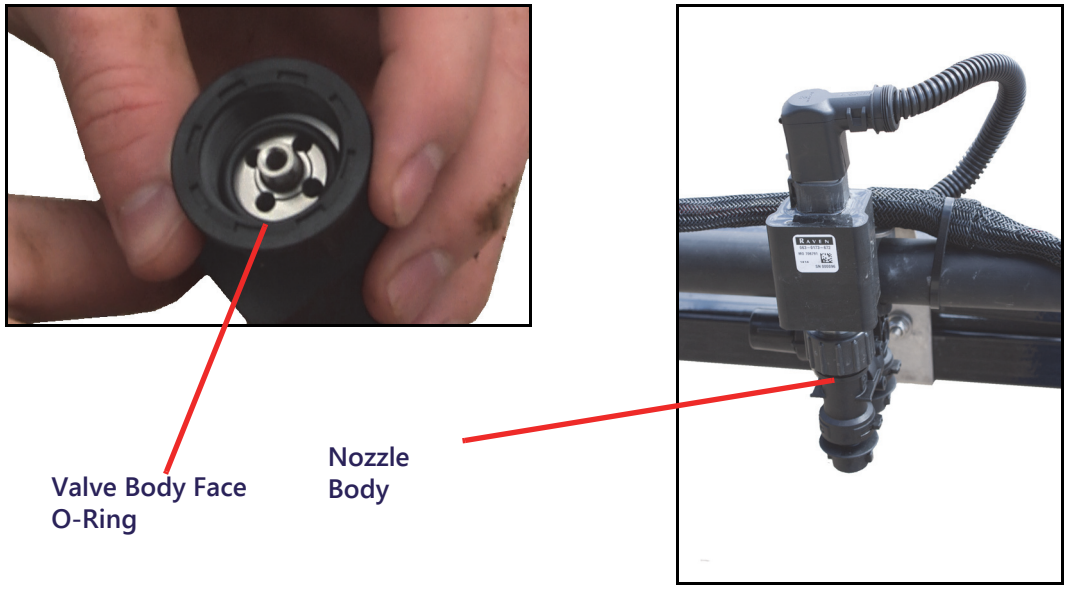
HAWKEYE NOZZLE CONTROL VALVE INSTALLATION

BEST PRACTICES AND RECOMMENDATIONS

- Do not connect battery leads until all cables are installed and connected.
- If a dual channel turret nozzle body is installed on the implement, always mount the Hawkeye nozzle control valve to the straight nozzle port to avoid excessive pressure drop across the nozzle.

GENERAL VALVE INSTALLATION

FIGURE 1. Valve Face O-Ring and Nozzle Control Valve



1. Place a supplied o-ring on the inside of the fly nut flush with the valve body face.
2. Thread the fly nut onto the nozzle body.
3. Orient the nozzle control valve so that the label is easily readable.
4. Hand tighten the swivel nut to secure the nozzle control valve to the nozzle body. Do not over tighten.

NOTE: Frequently check the nozzle control valve nuts to ensure they are secure.

5. Repeat the previous steps to mount a nozzle control valve to each nozzle body on the spray boom.

VALVE MOUNTING INTERFERENCE AND OBSTRUCTIONS

In some locations on the spray boom, boom equipment or hardware may interfere with mounting the Hawkeye nozzle control valves. In these locations, it may be necessary to rotate the nozzle control valve or to relocate existing hardware to provide additional clearance.

NOTE: Avoid removing of any existing boom hardware or support brackets where applicable during installation of the Hawkeye nozzle control valves.

See Figure 2 on page 18 for an example of modified installations of the nozzle control valve.

FIGURE 2. Modified Nozzle Control Valve Installation

BOOM CABLE ROUTING AND CONNECTION

BEST PRACTICES AND RECOMMENDATIONS

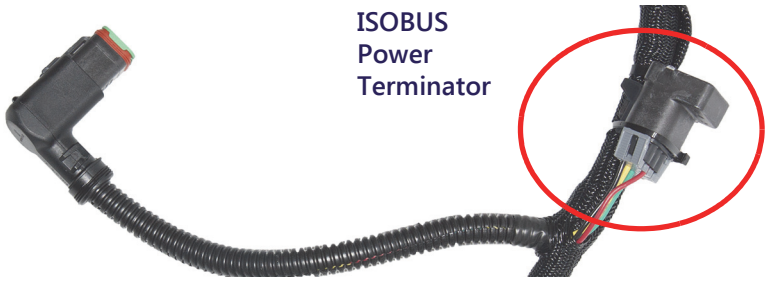
- Route the Hawkeye® primary and secondary boom cables along existing cables or plumbing to help avoid damage to the cable.
- Route cables to avoid pinch points and to avoid stretching the cable during folding and unfolding operations. Pay special attention to cable routing near folding or break-away points.
- Route cables through existing cable retention devices as appropriate.
- When securing the primary and secondary boom cables on the implement, begin at the outer boom tips. Adjust the cable position to provide sufficient slack between valve tee branches while working toward the center of the implement.
- Route the boom cables on the inside of the boom frame work.
- Secure cables using a zip tie at each nozzle control valve tee branch, and one between each tee branch along the cable length.

SECONDARY BOOM CABLE ROUTING AND CONNECTIONS

NOTE: Please review the Best Practices and Recommendations section on page 18 before routing or securing the boom cables on the implement. Do not to connect or secure the cables until instructed to do so in the procedure.

1. Locate the terminator on each of the secondary boom cables (refer to the Kit Contents section on page 7).

FIGURE 3. Secondary Cable ISOBUS Powell Terminator



2. Route the secondary boom cables so they are located at the outer tips of the left and right boom.
3. Starting from the mid-boom fold point, feed the terminator end of the secondary boom cable through the boom framework along existing cable or plumbing runs and through any existing cable retention devices as appropriate.

NOTE: If there is interference between the connector and boom components, remove the connector back shell. Refer to Figure 5 on page 20.

4. If not already applied, apply a single short burst of corrosion inhibitor (Corrosion X HD (Raven P/N 222-0000-020 or available from http://www.corrosionx.com/corrosionx-heavy-duty.html)) into the NCV connection. Be sure the corrosion inhibitor has coated the NCV contacts and recessed portions of the connector.

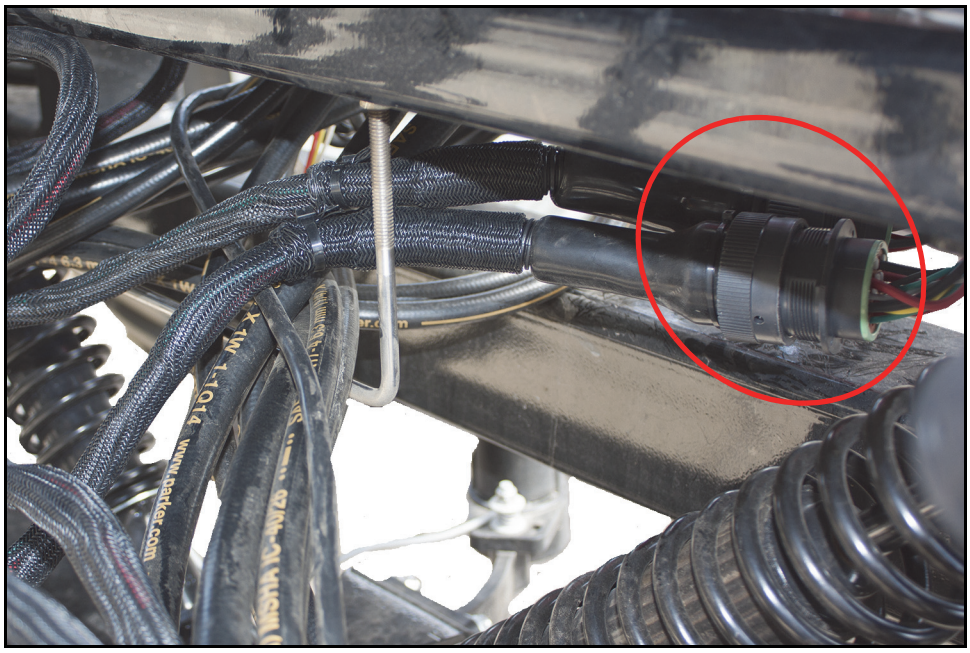
NOTE: To determine is corrosion inhibitor has been applied, inspect for a thick liquid in the bottom of the connector.

5. Once the secondary boom cable is routed appropriately, begin connecting the valve tee branches to the nozzle control valves, starting with the nozzle control valve at the outer end of the boom.

FIGURE 4. Securing Valve Branches

6. At each valve branch, adjust the cable as necessary to provide slack between nozzle control valve connections. The large round connector on the secondary boom cable should reach to the mid-boom fold point after all nozzle control valves are connected.

FIGURE 5. Primary and Secondary Boom Cable Connection at Mid-Boom Fold Point



7. Repeat this procedure to route and connect the secondary boom cable on the opposite boom.

NOTE: Route and connect the primary and secondary cables before securing the cable with the supplied zip ties.

PRIMARY BOOM CABLE ROUTING AND CONNECTIONS

NOTE: Review the Best Practices and Recommendations section on page 18 before routing or securing the boom cables on the implement. It is recommended not to connect or secure the cable until instructed to do so in the procedure.

1. Locate the large, round connectors on the primary boom cables (refer to the Kit Contents section on page 7). The primary boom cables must be routed such that the connector with female pins is located at the mid-boom fold point of the left or right boom and will connect to the secondary boom cable.

FIGURE 6. Primary Cable Ends

Male Connector
To Center Rack/Chassis Connector

Female Receptacle
To Secondary Boom Cable/Mid-Boom Fold Point

2. Starting at the center of the implement, feed the female receptacle end of the primary boom cable through the boom framework along existing cable or plumbing runs and through any existing cable retention devices as appropriate.
3. Connect the large, round connectors on the primary and secondary boom cables.
4. Adjust the primary and secondary boom cables to ensure sufficient slack around the mid-boom fold point and allow each cable to reach nozzle control valves near the folding point.
5. Secure the primary and secondary connection using the supplied zip ties as necessary to protect the connector from damage during folding and unfolding operations.
6. Once the primary and secondary boom cables are connected, begin connecting the valve tee branches to the nozzle control valves, starting with the valve on the primary boom segment furthest from the center of the implement.
7. At each valve branch, adjust the cable as necessary to provide slack between nozzle control valve connections and use the supplied zip ties to secure the cable at each valve branch. Refer to Figure 4 on page 19. The large, round connector with male pins on the primary boom cable should reach to the center of the implement after all nozzle control valves are connected.
8. Repeat this procedure to route the primary boom cable on the opposite boom.

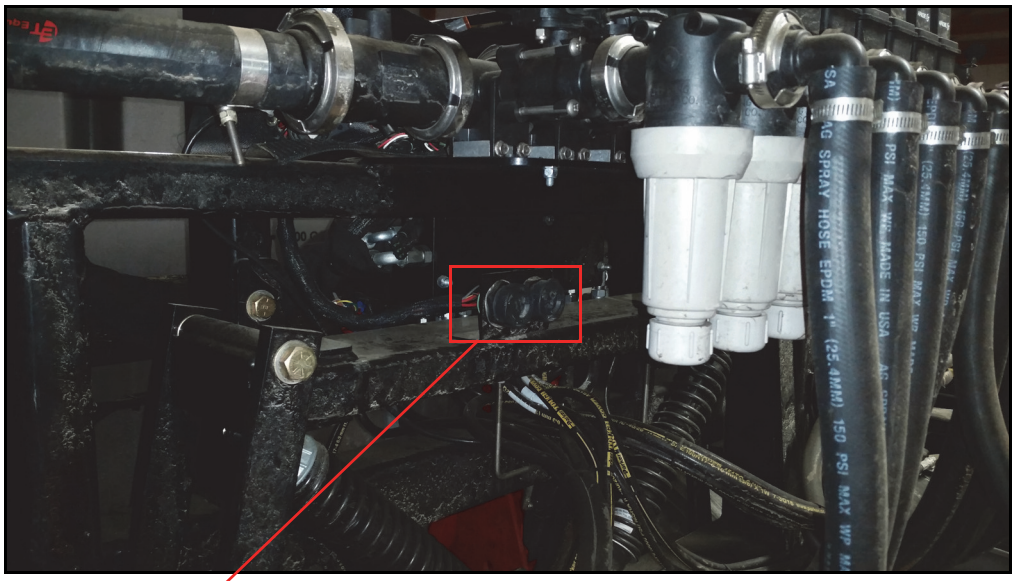
CHAPTER 5 COMPLETING HAWKEYE READY MACHINE INSTALLATION

If the machine is Hawkeye ready, complete the steps in this chapter to complete the installation. If the machine is not Hawkeye ready, skip to "Cab Preparation and Wiring" on page 25. Hawkeye ready is a factory option for 2017+ model years. These Hawkeye ready units came with a Viper 4 field computer and ISO Product Controller II.

BOOM CABLE CONNECTIONS

Connect the primary Hawkeye boom cables installed in the "Boom Cable Routing and Connection" section on page 18 to the boom cable connections. These are located on the center rack, just below the section control valves.

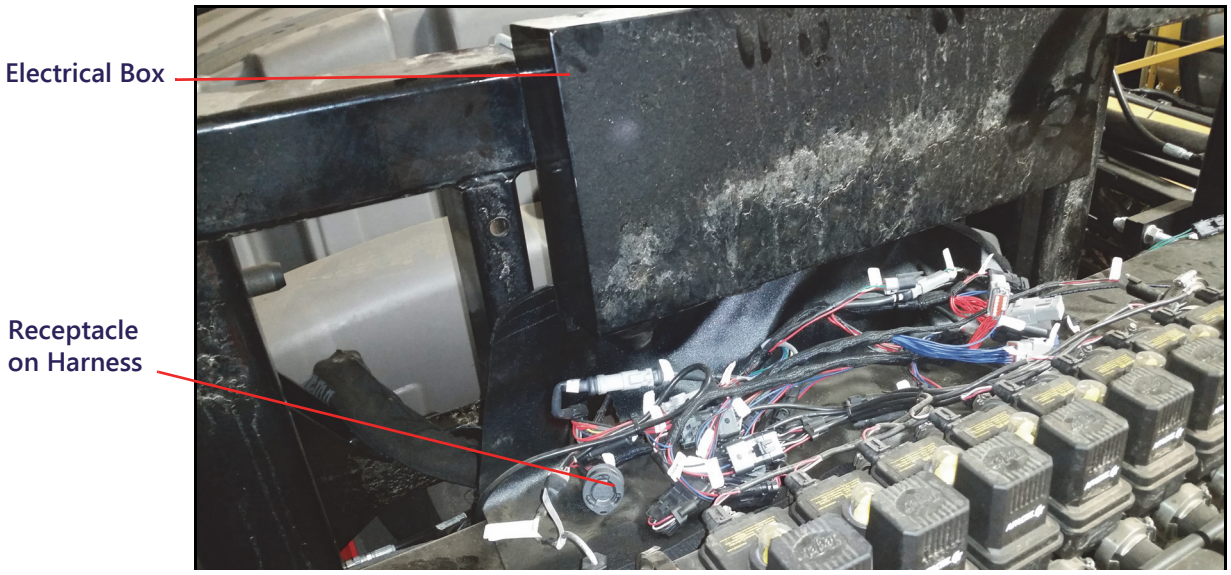
FIGURE 1. Boom Cable Connections



ELECTRICAL CONNECTION

1. Connect the round power plug on the power cable (P/N 115-7303-144) to the receptacle on the OEM harness located on the center rack beneath the electrical box.

FIGURE 2. Harness Under Electrical Box



2. Route the Hawkeye power cable towards the sprayer battery compartment.

NOTE: Follow the right frame rail towards the front of the machine.

3. Open the hood of the sprayer to access the power connections.
4. Locate the Ground Aux. terminals on the power connection.
5. Connect the ground cable from the Hawkeye power cable (115-7303-144) to the ground aux terminal.
6. Connect the power ring to the Aux. Power terminal.
7. Secure all cables with zip ties.

CHAPTER 6 CAB PREPARATION AND WIRING

CHASSIS CABLE ROUTING AND CONNECTION

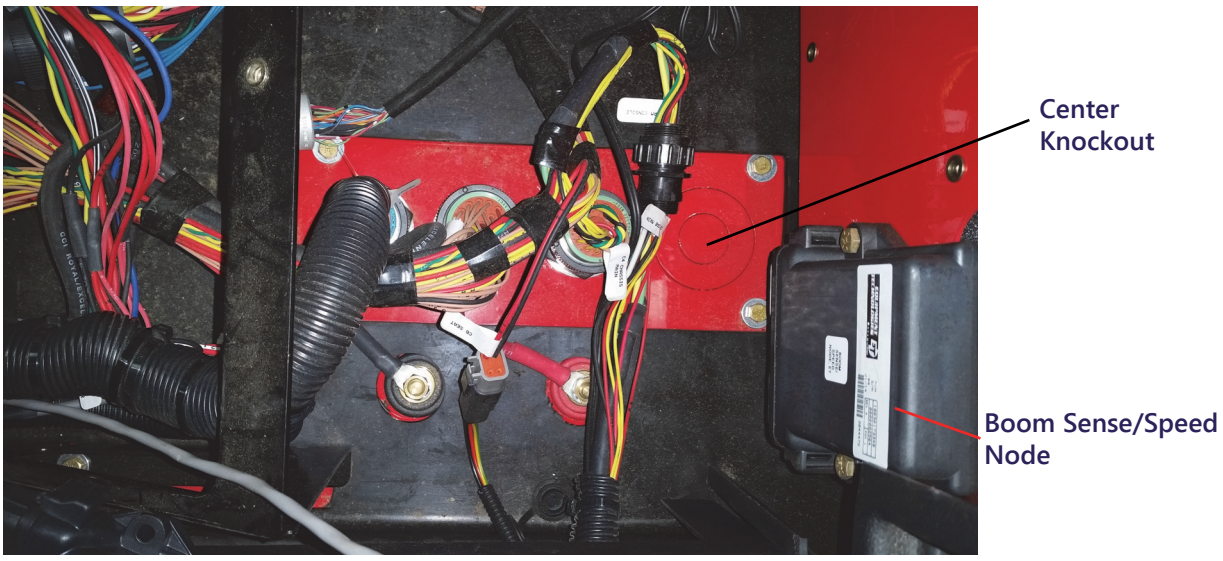
BEST PRACTICES AND RECOMMENDATIONS

- Do not connect battery leads until all cables are installed and connected.
- Route chassis cabling along existing cabling or plumbing to help avoid pinch points or stretching the cable during normal equipment operation.

ISOBUS CABLE CAB PREPARATION

1. While sitting in the drivers seat, look towards the floor on the lower right rear corner of the cab and locate the covers over the electrical box.
2. Remove the plastic cover from the electrical box.
3. Remove the fastener from the electrical panel and fold the panel down.
4. Locate the existing boom sense/speed node mounted to the back wall inside the electrical box.
5. Remove the existing boom sense/speed node connections from the node by squeezing the clips on the sides of the connection and pulling down.
6. Remove the two bolts securing the boom sense/speed node. Keep the hardware for later use.
7. Locate an available knockout in the cab floor.

FIGURE 1. Knockouts in Cab

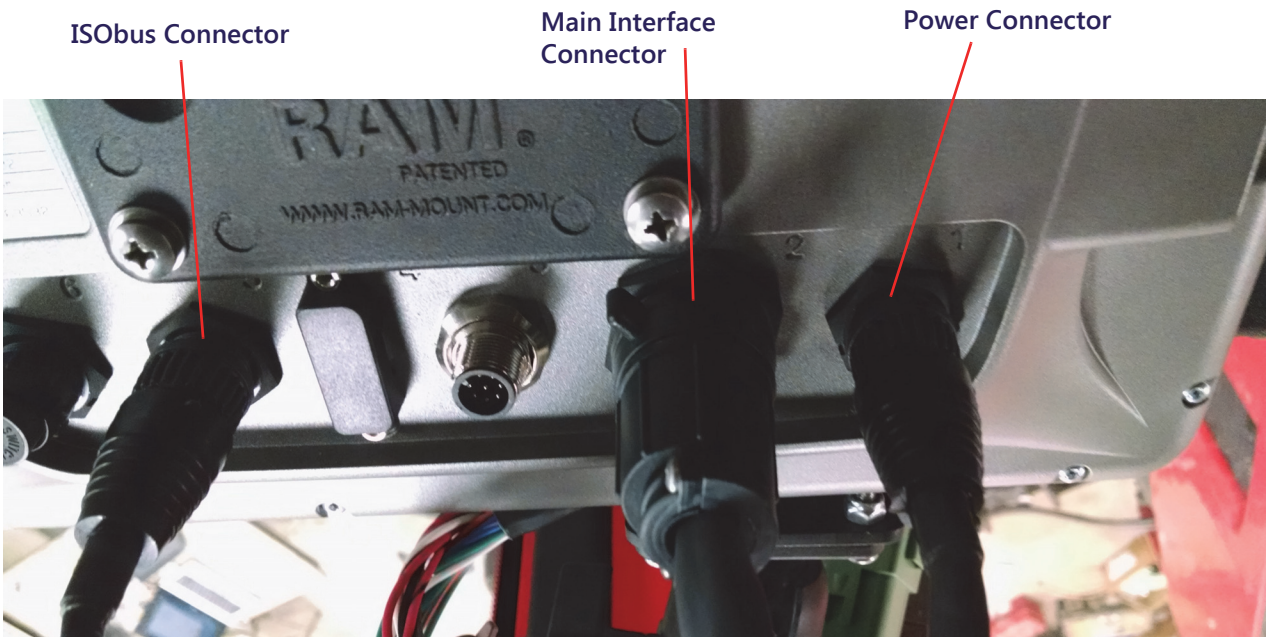


8. Use a hammer and punch to carefully remove the center of one of the available knockouts.
9. Locate the provided grommet (P/N 315-1001-006) and install it in the pass through hole.

CAB CONNECTIONS

1. Locate the ISO/CAN adapter cable (P/N 115-7303-138) included in the kit.
2. Connect the round 7-pin connex-all connector to the terminal on the back of the Viper 4.

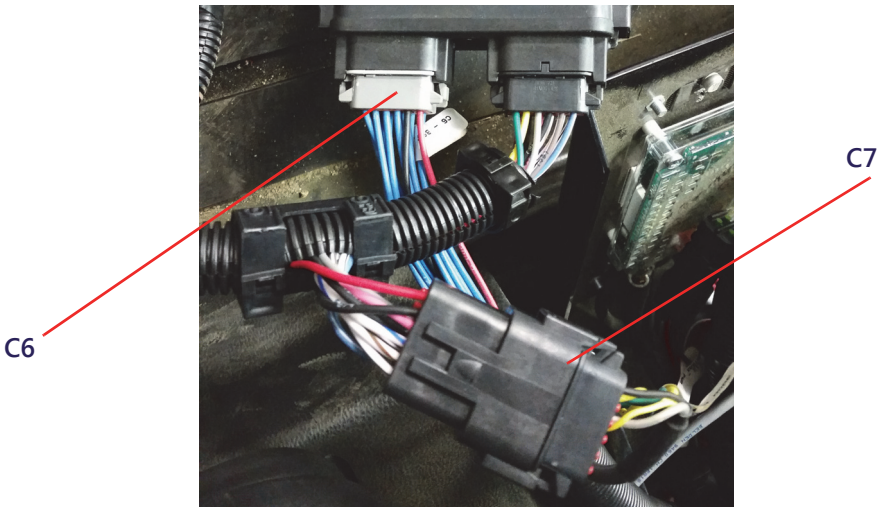
FIGURE 2. Connections on the Back of the Viper



NOTE: If a virtual Terminal (VT) other than Viper 4 is being used, an adapter cable may be required (if available) to connect the ISO Product Controller II ECU to the machine's ISObus. Raven Industries, Inc. does not support third party or custom adapter cables.

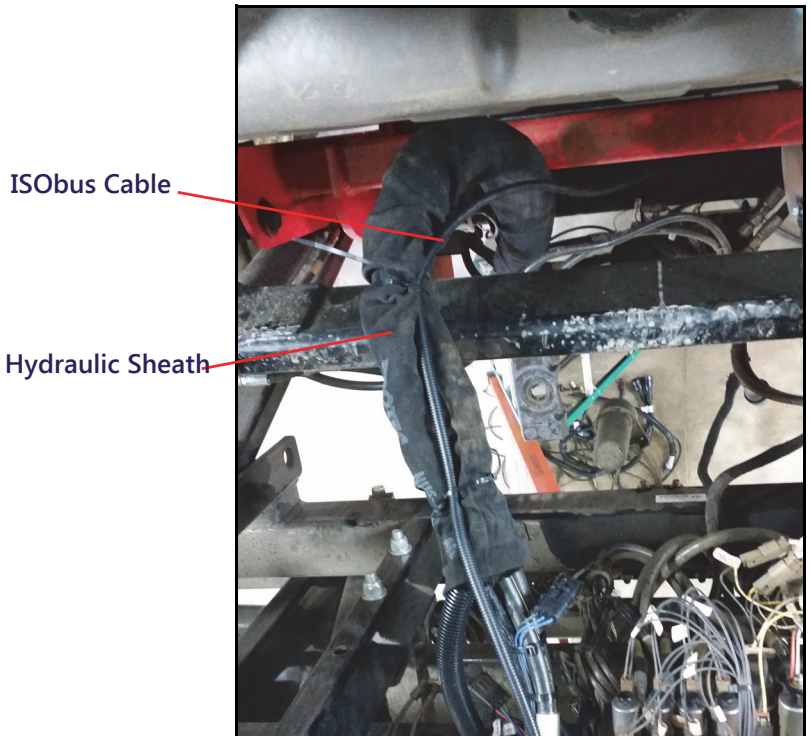
3. Route the ISO/CAN adapter from the ISO VT down the machine's A-post and across the floor towards the electrical box in the rear RH floor of the cabin.
4. Run the three remaining connectors into the side opening of the electrical box while ensuring that the cable will not get pinched when closing the electrical box.
5. Locate the ISO Boom Sense/Speed ECU (P/N 063-0173-635) provided in the kit.
6. Locate the gray connector (labeled C6) removed from the Boom Sense/Speed Node in the Cab Connections section on page 26 and connect it to the gray receptacle of the ISO Boom Sense/Speed ECU.
7. Locate the black connector (labeled C7) removed from the Boom Sense/Speed Node in the Cab Connections section on page 26 and connect it to the black receptacle on the ISO/CAN adapter cable (P/N 115-7303-138).
8. Locate the black 12-pin plug on the ISO/CAN adapter cable (P/N 115-7303-138) and connect it to the black receptacle of the ISO Boom Sense/Speed ECU.

FIGURE 3. ISO Boom Sense/Speed ECU Connections



9. Use the hardware retained from removing the CAN Boom Sense/Speed Node to Mount the new ISO Boom Sense/Speed ECU in the previous location.
10. Route the 4-pin ISObus plug connection through the knockout hole and grommet in the floor while ensuring the connector is dropping to a clean, dry, safe spot under the cab. Feed the excess cable through the floor of the cab.
11. From under the machine, locate the ISObus plug from the previous step.
12. Route the plug along the right frame rail, over the rear axle, and over the center-rack support linkage. Either route through, or along, the hydraulic hose protective sheath while leaving plenty of slack for full center rack motion without stretching the cable.

FIGURE 4. ISObus Plug Routing along Hydraulic Sheath



13. Leave the connection near the boom plumbing on top of the center rack.

CHAPTER 7 ISOBUS ECU MOUNTING AND CONNECTION

PRODUCT CONTROLLER II ECU INSTALLATION

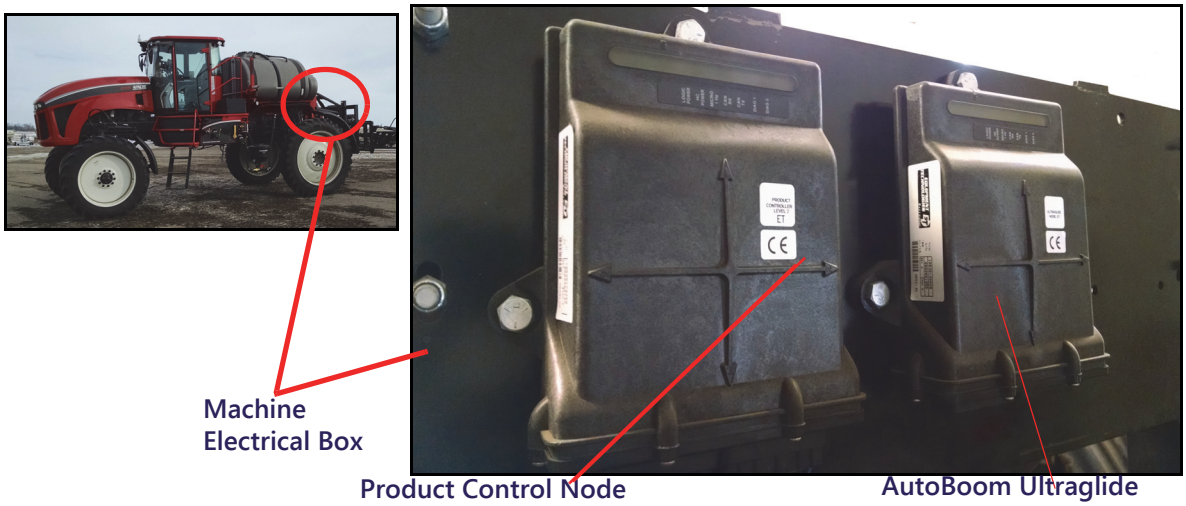
BEST PRACTICES AND RECOMMENDATIONS

- Do not connect battery leads until all cables are installed and connected.
- If a protected mounting location is not available on the equipment, mount the Hawkeye product controller II ECU with the connectors facing down toward the ground to help keep moisture from accumulating in the ECU.

ELECTRICAL BOX PREPARATION

1. Locate the electrical box on top of the center rack on the back of the machine.
2. Loosen the two bolts that secure the electrical box hood in place.
3. Lift the cover off of the electrical box.

FIGURE 1. Apache Electrical Box and Controller Location

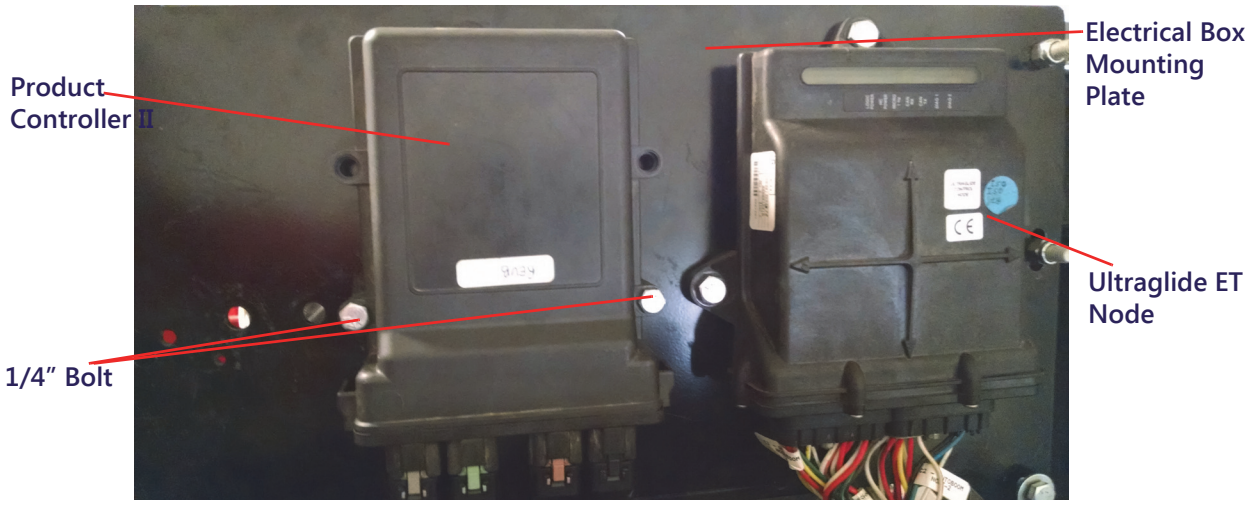


4. Locate the existing product controller node.
5. Remove the three bolts that secure the existing product controller to the electrical box mounting plate.
6. Remove the existing product control node and harness from sprayer by disconnecting all connections.
7. If applicable, remove the three bolts that secure the Ultraglide node to the electrical box mounting plate.
8. Mount the Ultraglide node to the available mounting location on the right side of the electrical box mounting plate.
9. Locate the product controller II ECU (P/N 063-0173-704) in the Hawkeye kit.

10. Use a 1/4" bolt, nut, and washer to secure one side of the product controller II ECU to one of the lower mounting holes in the middle position (original Ultraglide mounting position). Ensure that the top edge of the product controller II ECU is parallel with the top edge of the electrical mounting plate.
11. Mark the opposite lower hole location on the product controller II ECU.
12. Rotate the product controller II ECU to out of the way.
13. Drill a 5/16" hole at the location marked in step 11.
14. Reorient the product controller II ECU and mount it to the electrical box mounting plate using a provided 1/4" bolt.

NOTE: Verify that the node is still parallel with the top of the plate.

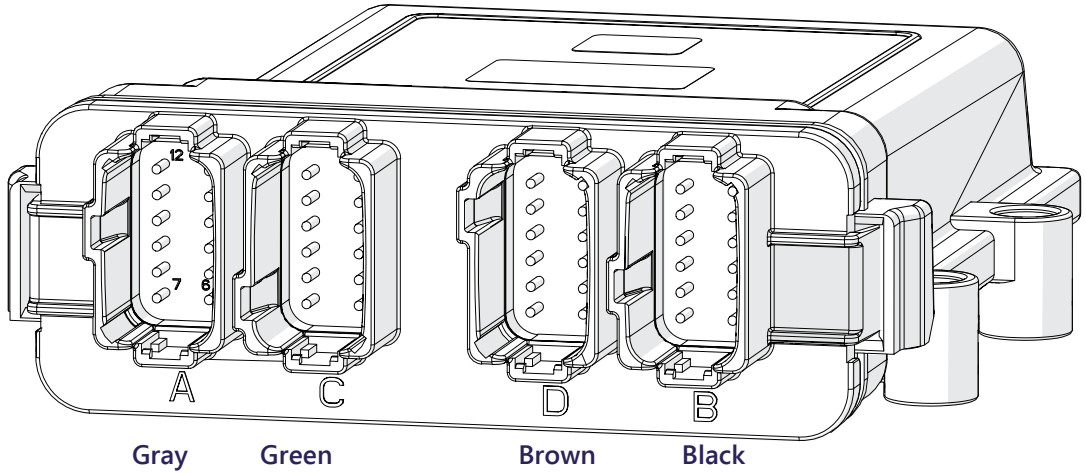
FIGURE 2. Electrical Box Assembly.



RETROFIT CABLE INSTALLATION

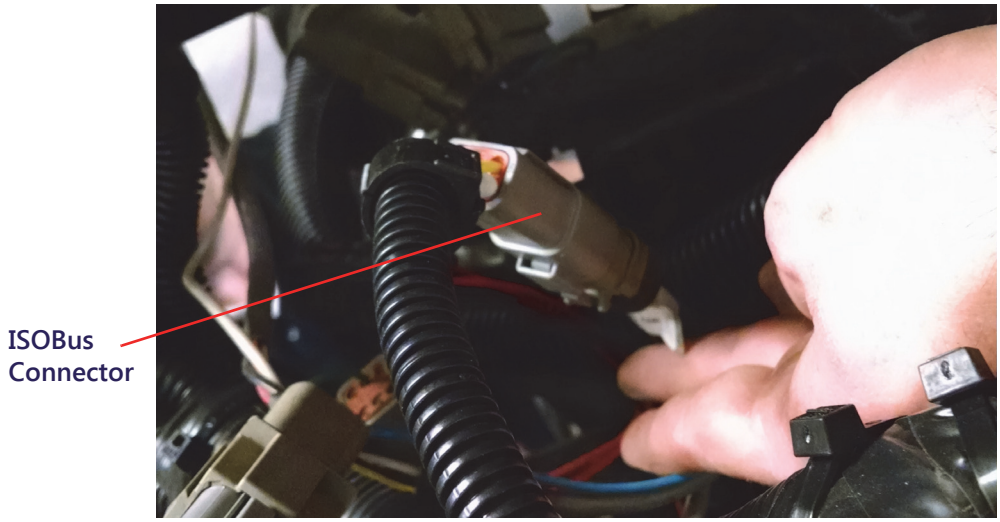
1. Locate the Hawkeye ECU cable harness (P/N 115-7303-143) shipped with the kit.
2. Connect the ECU cable harness to the product controller II ECU using the four 12-pin connectors. Connectors are keyed. Refer to Figure 3, "Product Controller II ECU Connections," for the connector orientation.

FIGURE 3. Product Controller II ECU Connections



3. Connect the four pin ISObus plug from the cab (P/N 115-7303-138) to the four pin receptacle ISObus connector on the Hawkeye ECU harness (P/N 115-7303-143).

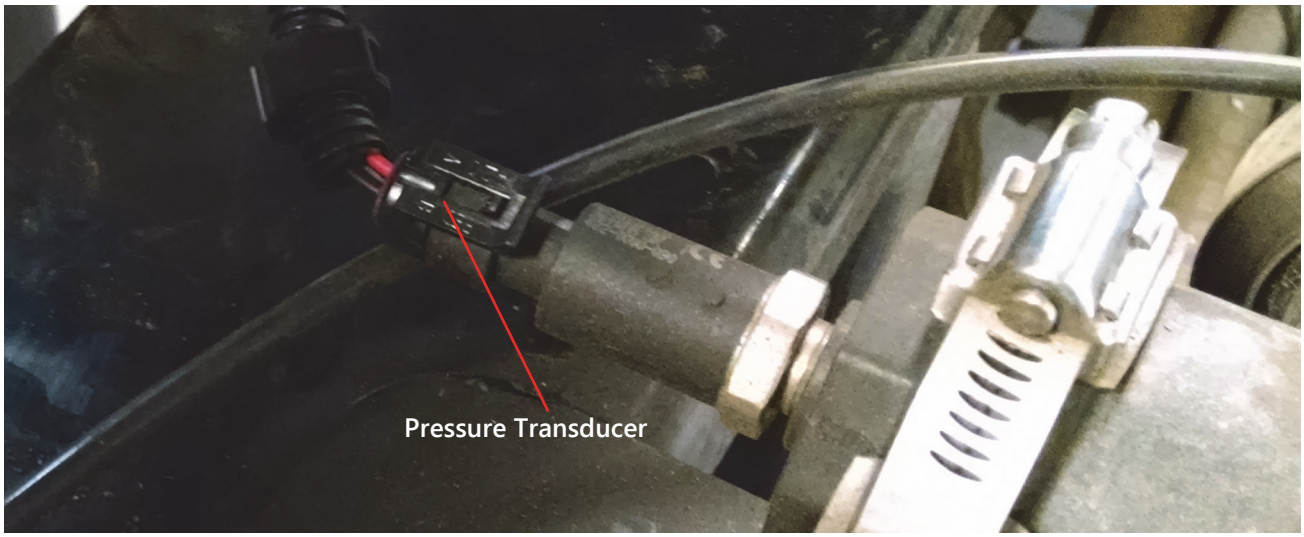
FIGURE 4. ISOBus Connector



NOTE: If there is an existing ISObus controller, it is necessary to remove the terminator from the ECU Harness (-143) and connect it to the machine cabling and the Hawkeye harness using tee connections. Place the terminator at the end of the ISObus.

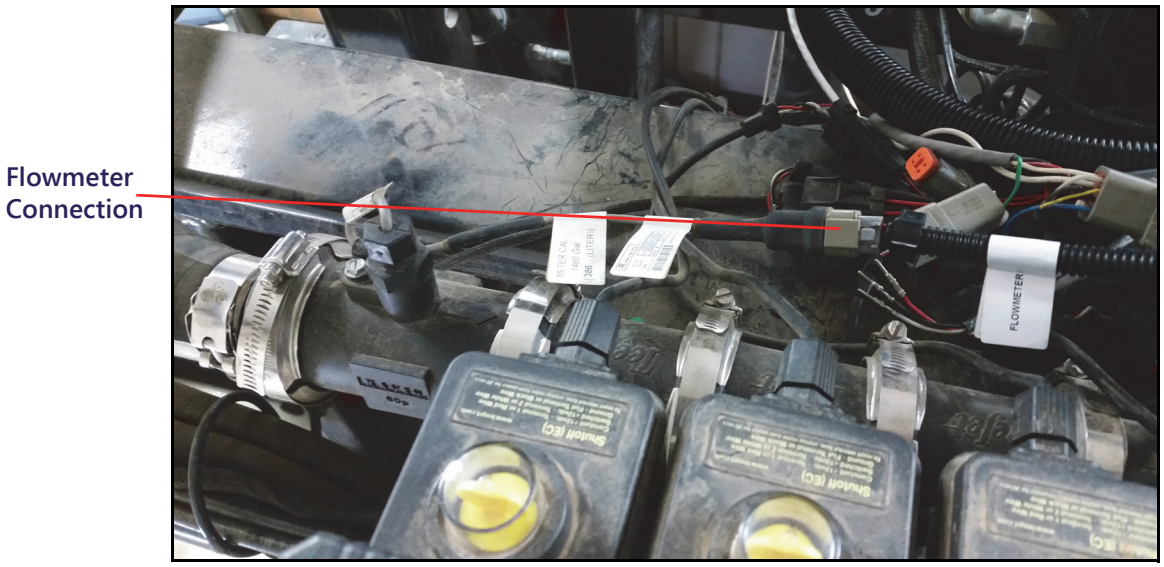
4. Connect the three pin plug to existing pressure transducer in the boom plumbing.

FIGURE 5. Pressure Transducer.



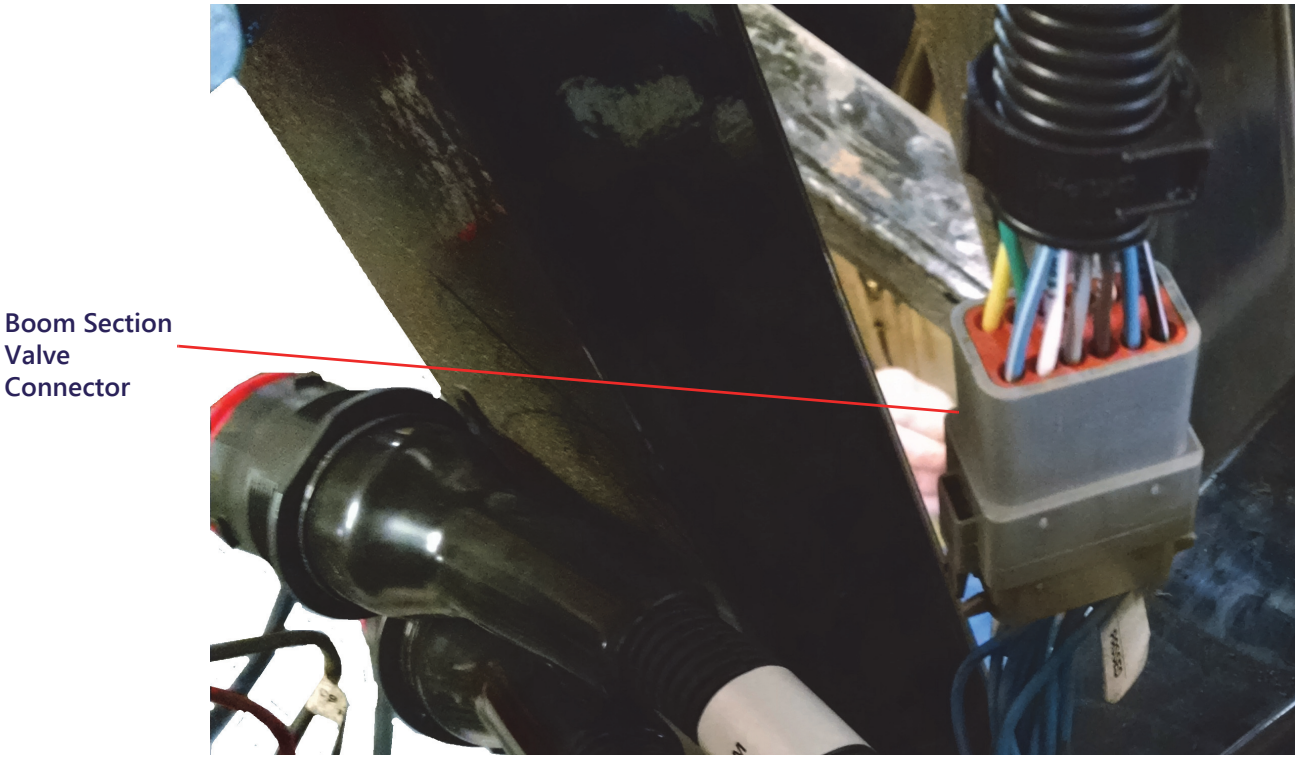
5. Connect the three pin jack to the flowmeter.

FIGURE 6. Flowmeter Connection



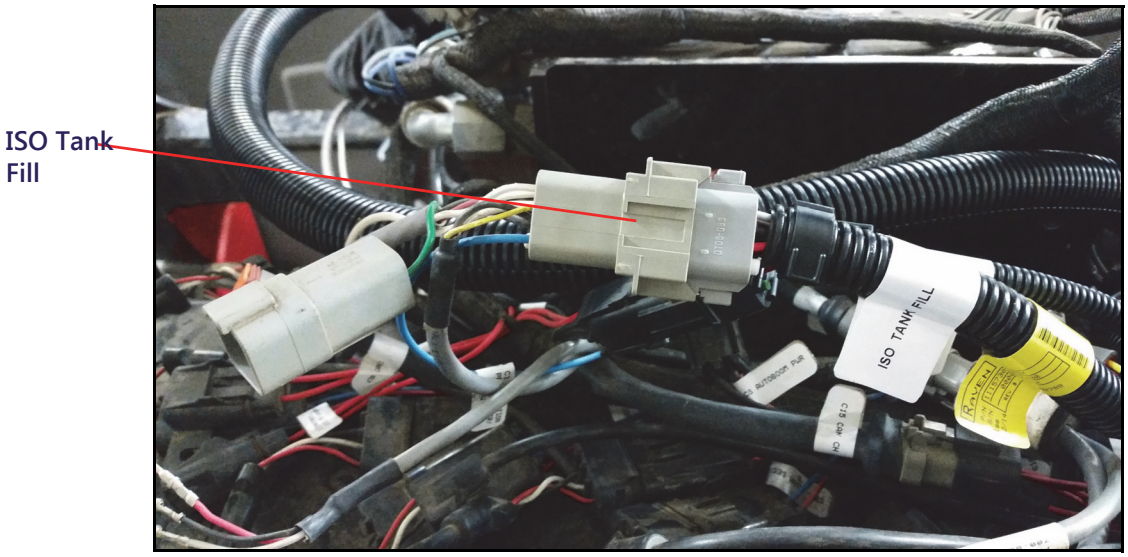
6. Connect the 12 pin receptacle on the Hawkeye ECU harness (P/N 115-7303-143) to the 12 boom section valve plug on the machine harness.

FIGURE 7. Boom Section Valve Connection.



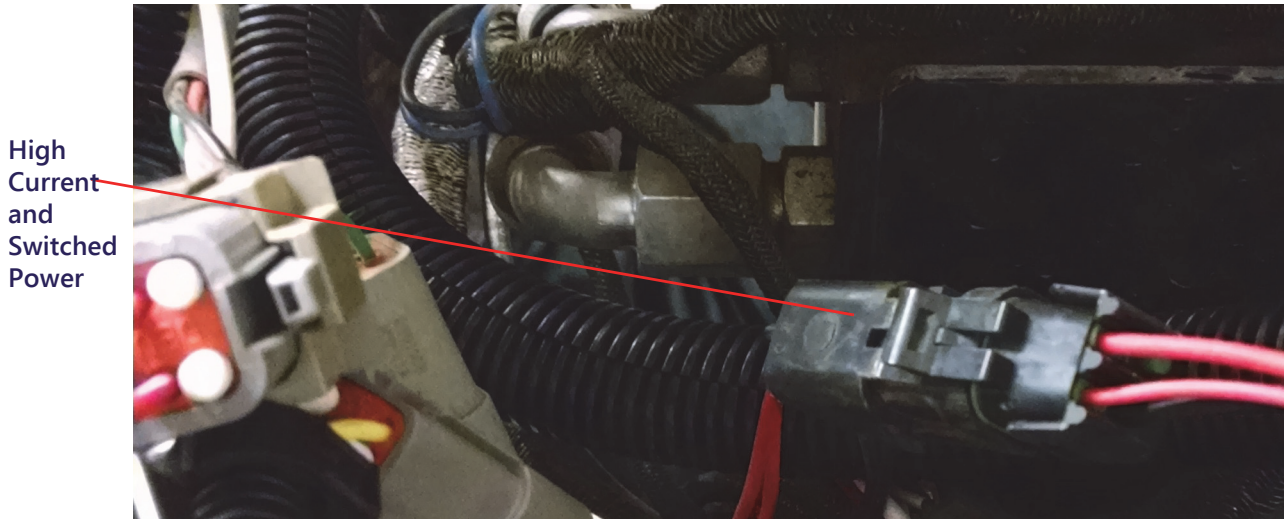
7. Connect the ISO tank fill plug on the Hawkeye ECU harness (P/N 115-7303-143) to the tank fill receptacle on the machine cable harness (if applicable).

FIGURE 8. ISO Tank Fill



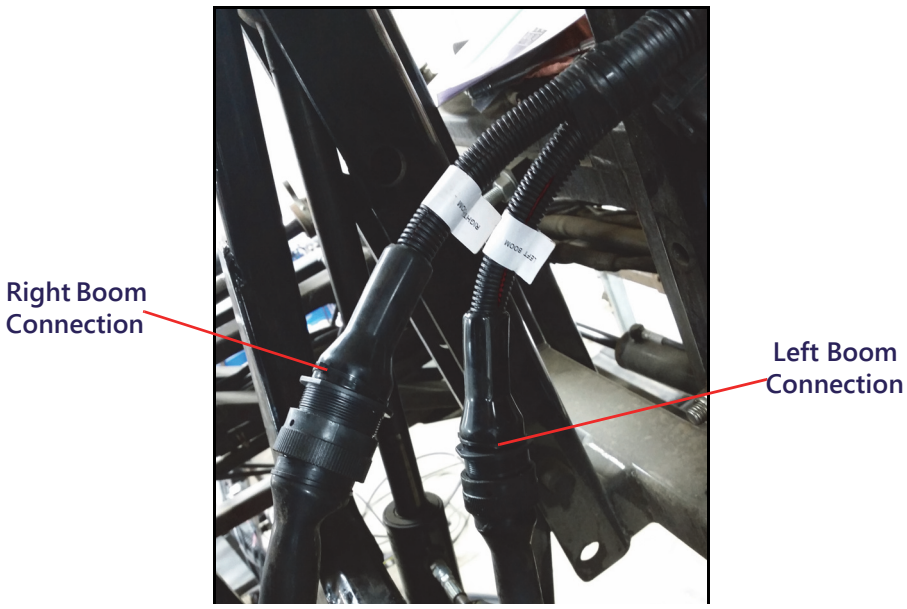
8. Connect the four-pin high current and switched power plug on the Hawkeye ECU harness (P/N 115-7303-143) to the receptacle on the machine cable harness.

FIGURE 9. High Current and Switched Power Connection



9. Connect the right boom 19-pin plug of the Hawkeye ECU harness (P/N 115-7303-143) to the right primary boom cable receptacle installed in Chapter 4, Nozzle Control Valve Installation.

FIGURE 10. Boom Cable Connections

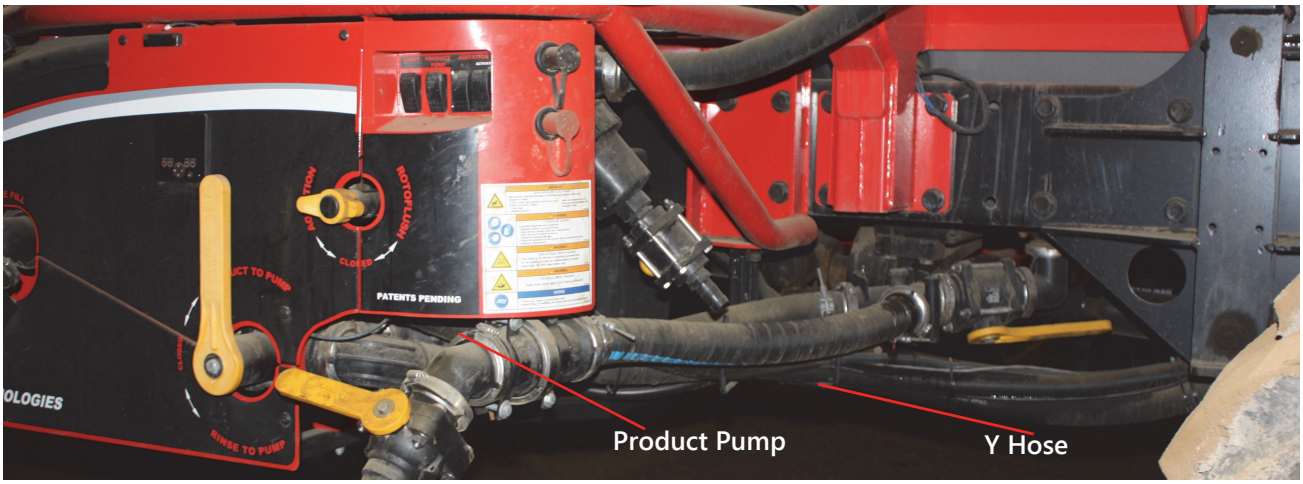


10. Connect the left 19-pin plug of the Hawkeye ECU harness (P/N 115-7303-143) to the left primary boom cable receptacle installed in Chapter 4, Nozzle Control Valve Installation.

PWM VALVE INSTALLATION AND WIRING

1. Locate the product pump.

FIGURE 11. Product Pump Location

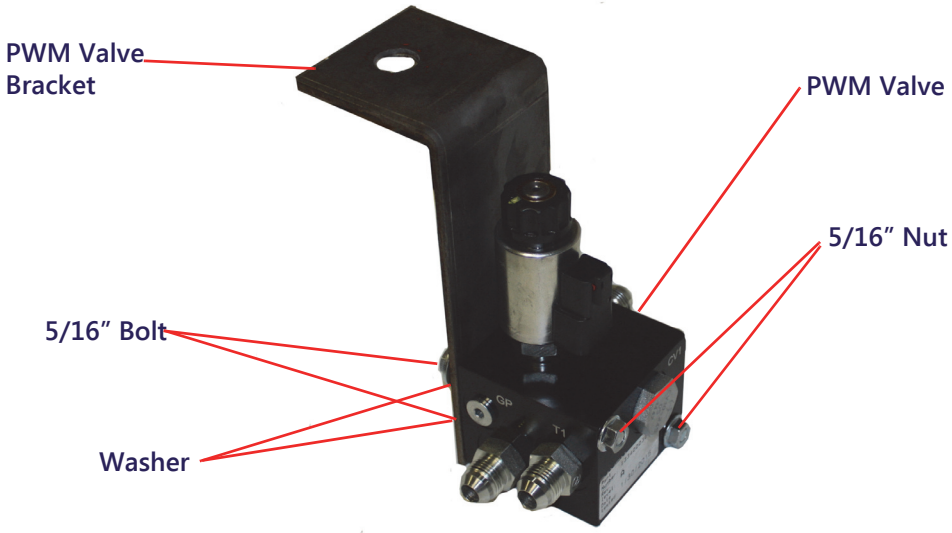


2. Follow the hydraulic hoses under the machine chassis to locate the Y hose support bracket.
3. Use an impact wrench and a 15/16" socket to remove the Y hose support.

NOTE: Keep the hardware because it is used to reinstall the Y hose support bracket in a later step.

4. Locate the PWM valve (P/N 334-0003-096), PWM valve mounting bracket (P/N 107-0172-362), and 5/16" PWM valve mounting hardware that was shipped with the Hawkeye kit.
5. Use the two provided 5/16" bolts, nuts, and washers to mount the PWM valve to the mounting bracket as shown in Figure 12 on page 35.

FIGURE 12. PWM Valve on Bracket



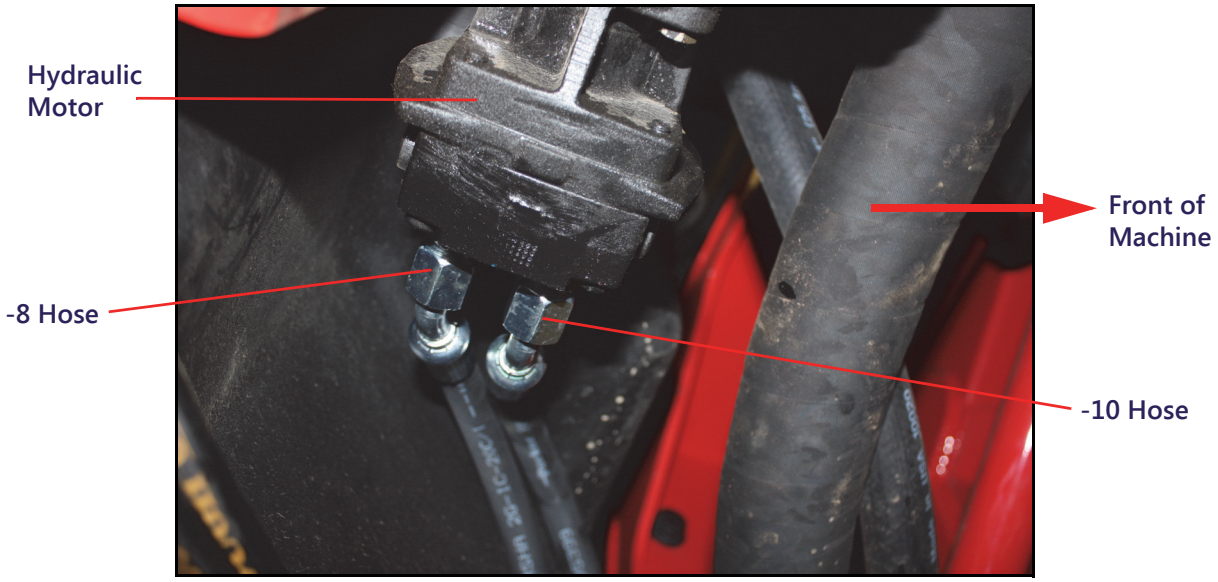
6. Remove the four plastic plugs installed in the T1, T2, P, and M ports of the PWM valve.
7. Install a -8 SAE o-ring to -10 JIC fitting (P/N 333-0012-110) into the T1 and T2 ports on the PWM valve.
8. Install a -8 SAE o-ring to -8 JIC fitting adapter (P/N 333-0012-093) into the P and M ports on the PWM valve.
9. Mount the PWM valve assembly and the Y hose support to the chassis using the hardware removed in Figure 3 on page 34 as shown in Figure 13 on page 35.

NOTE: The PWM valve should be on the opposite side of Y hose support bracket arms.

FIGURE 13. PWM Assembly on Back of Y Hose Support

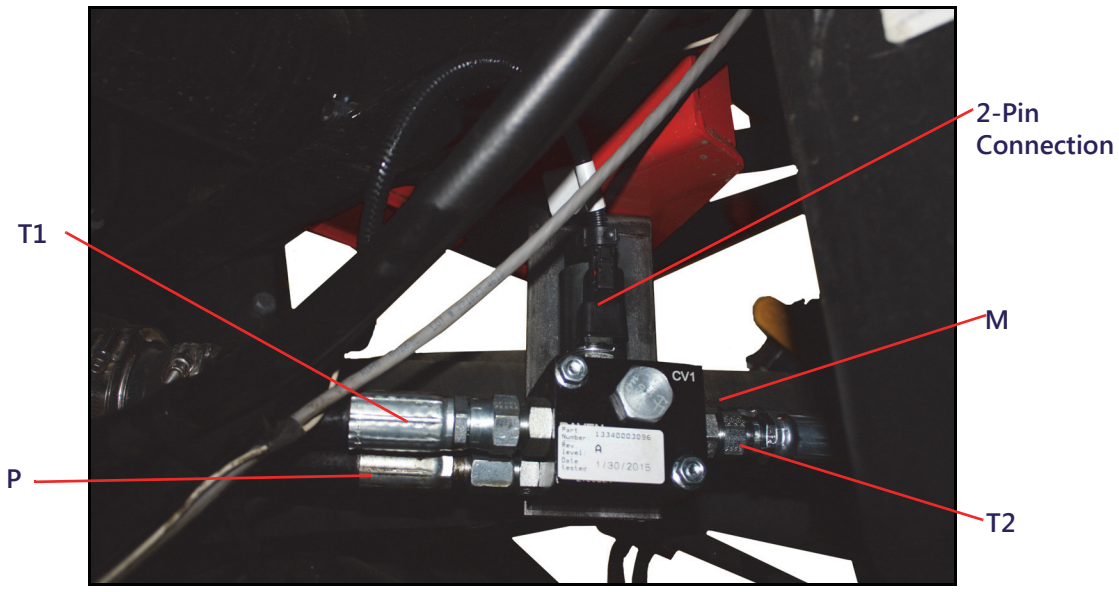
10. Disconnect the -10 return hose (-10) from the hydraulic motor of the product pump and connect it to the -10 fitting at T1 on the PWM valve.

FIGURE 14. Connections on Hydraulic Motor



11. Connect the -10 hose supplied with the kit (P/N 214-1001-072) to T2 on the PWM valve and to the -10 45° hydraulic motor connection disconnected in step 10.
12. Disconnect the -8 hose from the inlet port on the motor pump and connect it to the -8 fitting on the P port of the PWM valve.
13. Connect the -8 hose supplied with the kit (P/N 214-1001-068) to the -8 M port on the PWM valve and to the -8 45° hydraulic motor port disconnected in step 12.
14. Connect the 2-pin plug from the Hawkeye harness (routed in Section 5, Cab Preparation and Wiring to the receptacle located towards the top of the PWM valve. Refer to Figure 15 on page 36 for a completed PWM valve assembly.

FIGURE 15. Installed PWM Valve (Looking Towards Back of Machine)



15. Use cable ties to secure any excess hose to the existing hoses to ensure they remain away from the chassis drive line.

ELECTRICAL CONNECTION

1. Connect the round power plug on the power cable (P/N 115-7303-144) to the receptacle on the ECU cable (P/N 115-7303-143).
2. Route the Hawkeye power cable towards the sprayer battery compartment.

NOTE: Follow the right frame rail towards the front of the machine.

3. Open the hood of the sprayer to access the power connections.
4. Locate the Ground Aux. terminals on the power connection plate.
5. Connect the black ground cable from the Hawkeye power cable (P/N 115-7303-144) to the ground aux terminal.

FIGURE 16. Electrical Connections

6. Connect the red power ring to the Aux. Power terminal.
7. Secure all cables with zip ties.

APPENDIX

A

CABLE AND CONNECTOR MAINTENANCE

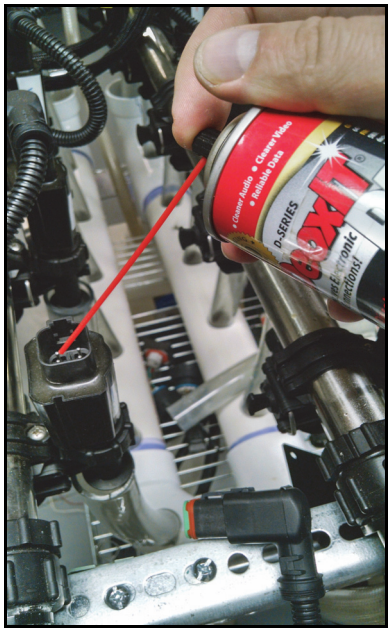
POWER AND ECU HARNESS MAINTENANCE

1. Disconnect the ECU harness connector and inspect for signs of moisture or corrosion.
2. If moisture of corrosion is detected, use Deoxit D5, brushes, and compressed air to clean and dry the connector.
3. When clean, apply a coating of Corrosion X HD to the connector mating surfaces and contacts.
4. Reattach the connectors.

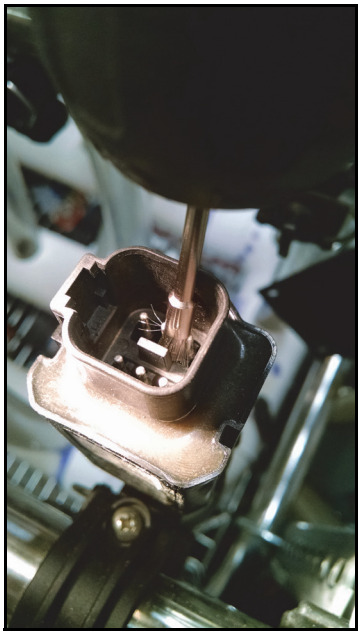
HAWKEYE BOOM HARNESS CONNECTOR MAINTENANCE

Prior to connecting the Hawkeye boom cable to the Hawkeye Nozzle Control Valves (NCV), perform the following steps to all 6-pin NCV connectors and 19-pin circular connectors between the boom cables and ECU cable connections to ensure high quality connections:

1. Verify the NCV connectors and the accompanying boom cable connectors are free of moisture, contamination, or oxidation. Oxidation will appear as a dry, white coating on the contacts. If any connectors show signs of moisture, contamination, or oxidation, perform Step 2 - Step 6. If this is a new installation, skip to Step 7. All components listed below can be ordered in the Hawkeye NCV Connection Maintenance Kit (P/N 117-0171-692).
2. Spray the connection with a deoxidizing agent (DeoxIT D5 is recommended (P/N 222-4001-006)).



3. Clean contacts with a small wire brush (P/N 321-0000-477).

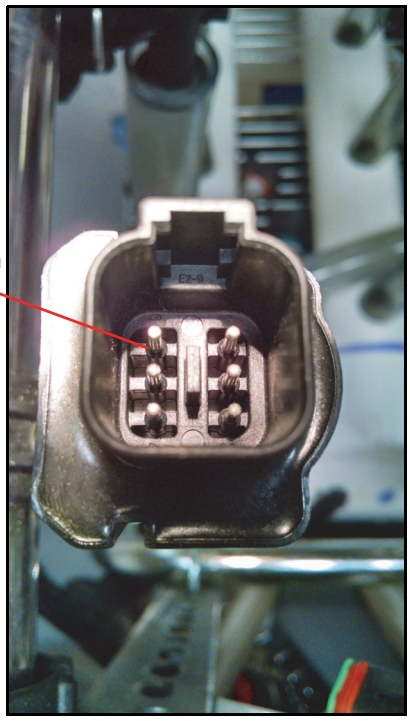


4. Spray the contacts again with the deoxidizing agent. This will rinse out debris.
5. Remove all residue of deoxidizing agent from the connection. Not removing deoxidizing agent can damage the connector seal.
6. Dry out the connection with dry, compressed air. Dust Off Electronics Duster (P/N 222-4001-007) is recommended however, if unavailable, alternate compressed air sources can be used. If using compressed air from a large volume air compressor, be sure the lines are free of moisture.

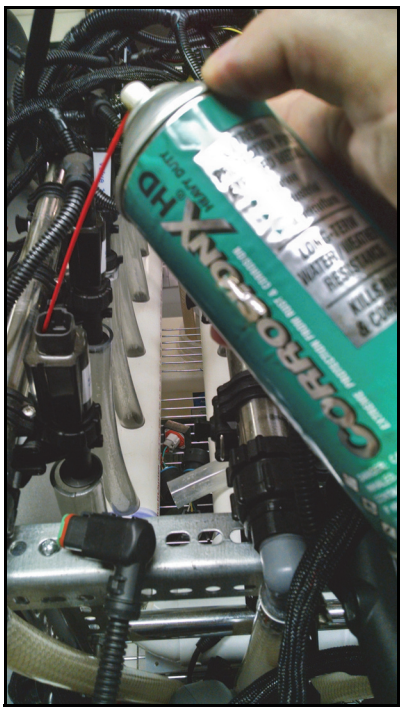
7. If not already applied, apply a single short burst of corrosion inhibitor (Corrosion X HD (Raven P/N 222-0000-020 or available from http://www.corrosionx.com/corrosionx-heavy-duty.html)) into the NCV connection. Be sure the corrosion inhibitor has coated the NCV contacts and recessed portions of the connector.

NOTE: To determine is corrosion inhibitor has been applied, inspect for a thick liquid in the bottom of the connector (as shown in the Corrosion Inhibitor Applied image below).

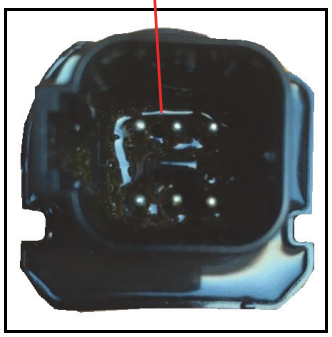
NCV Connector



Applying Corrosion Inhibitor



Corrosion Inhibitor Applied



RAVEN

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

How Long is the Coverage Period?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

016-0171-537 Rev. A, E19889

RAVEN

Extended Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

Do I Need to Register My Product to Qualify for the Extended Warranty?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

Where Can I Register My Product for the Extended Warranty?

To register, go online to www.ravenhelp.com and select Product Registration.

How Long is the Extended Warranty Coverage Period?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

What Will Raven Industries Do?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is Not Covered by the Extended Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.