

**Buhler Versatile 350/375/400/450/500/
550 Steering Ready, MY 2015 & Newer
SmarTrax™ Installation Manual**

P/N 016-5031-009 Rev. A

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CHAPTER

1

IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the SmarTrax™ system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the SmarTrax 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 your local Raven dealer.

When operating the machine after installing SmarTrax, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate SmarTrax or any 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 SmarTrax is engaged.
- Disable SmarTrax when exiting the operator's seat and machine.
- Do not drive the machine with SmarTrax enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling SmarTrax when the safe working distance has diminished.
- Ensure SmarTrax is disabled prior to starting any maintenance work on SmarTrax or the machine.

WARNING

- Do not use hands to check for leaks. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death.
- When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off during SmarTrax installation or maintenance.

CAUTION

INSTRUCTIONS FOR HOSE ROUTING

The word "hose" is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond 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

Routing should not allow hoses 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 hose components
- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses 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 hose 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 hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses 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

- High pressure wash

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

INTRODUCTION

2

Congratulations on your purchase of the Raven SmarTrax system! This system is designed to provide cutting-edge, hands-free steering of agricultural equipment via GPS (Global Positioning System) coordinates.

This manual applies to the following machines. For future reference, write your serial number in the space below.

MAKE: Buhler Versatile

MODEL: 4 WD and DeltaTrack 350/375/400/450/500/550

YEAR: 2015 & Newer

FIGURE 1. Buhler Versatile 4 WD



UPDATES

Software and manual updates are available on the Raven Applied Technology website.

<http://www.ravenhelp.com>

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

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

techwriting@ravenind.com

-Buhler Versatile 350/375/400/450/500/550 Steering Ready, MY 2015 & Newer SmarTrax™ Installation Manual

-P/N 016-5031-009 Rev. A

-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.

PREPARING FOR INSTALLATION

Before installing the SmarTrax system, park the machine where the ground is level, clean, and dry. Bleed pressure from the hydraulic system and leave the machine turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

RECOMMENDATIONS

Raven Industries recommends the following best practices when installing or operating the SmarTrax system for the first time, at the start of the season, or when moving the SmarTrax system to another machine:

- Install the GPS antenna in the recommended location. Refer to the following table for the machine-specific antenna mounting location.

NOTE: If your machine is not listed, install the antenna on the front-center of the cab.

Machine Preset	Antenna X Position (left to right)	Antenna Y Position (from the rear wheel axle to the antenna position on the cab)	Antenna Z Position (ground to top of antenna)
Versatile 350-400	Centered	128 inches	143 inches
Versatile 450-550	Centered	135 inches	143 inches

- Ensure the machine’s hydraulic filters have been recently changed and there are no issues with the machine’s hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).

- Ensure the machine's hydraulic system is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the SmarTrax system:

- Use part numbers to identify the parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

POINT OF REFERENCE

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

KIT CONTENTS

This section contains a list of the components that are included in the SmarTrax kit. Before beginning the SmarTrax installation, compare the items in the SmarTrax kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

FIGURE 2. SmarTrax Steer Ready, Buhler/Versatile 4WD; 2015, 350-400 Serial Number 307825 and Up; 450-550 Serial Number 705533 and Up (P/N 117-5031-009)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax Calibration & Operation	016-0171-532	1
Not Pictured	Manual - Buhler Versatile 350/375/400/450/500/550 Series, Model Year 2015 & Newer SmarTrax Installation	016-5031-009	1
	Node - SmarTrax Gen II, Buhler Versatile	063-0173-441	1
	Cable - CAN/Valve Tee, V-PAS, With W.A.S	115-4001-145	1
	Cable - PWR/CAN/NODE Chassis	115-4001-165	1

Picture	Item Description	Part Number	Qty.
	Terminator - CAN	063-0172-369	1
	Bolt - M8 x 1.25 x 25 mm Hex	311-0070-001	3

CHAPTER

3

CAB COMPONENT INSTALLATION

INSTALL THE SMARTRAX NODE

Mount the SmarTrax Node

FIGURE 1. SmarTrax Node Mounting Location



1. Remove the compartment cover located behind the operator's seat.

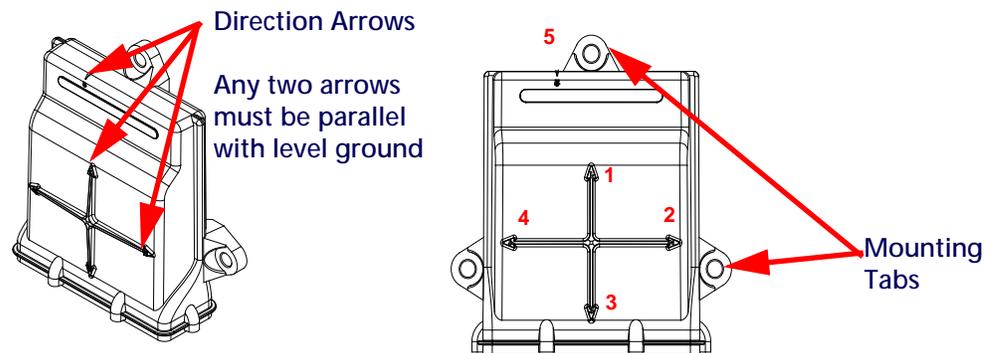
FIGURE 2. SmarTrax Node Installed



2. Secure the SmarTrax node (P/N 063-0173-441) to the existing node mounting bracket using three M8 x 1.25 x 25 mm hex bolts (P/N 311-0070-001).

Node Mounting Locations

FIGURE 3. Node Mounting



When choosing the location for the SmarTrax node, consider the following points:

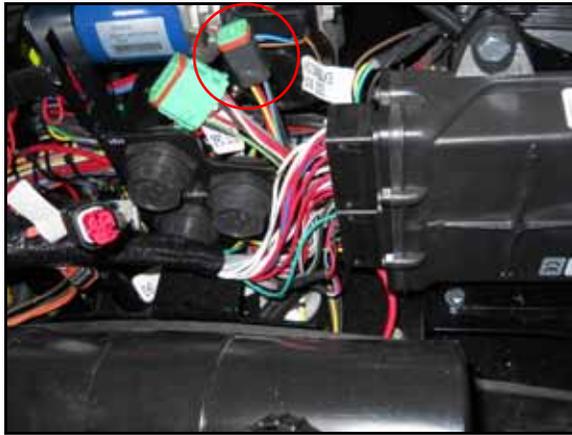
- Mount the SmarTrax node inside the machine's cab on a flat, level surface for proper performance and cable connection.
- One of the six numbered direction arrows on the node must be oriented in the direction of forward vehicle travel, one arrow pointing straight up, and two of the arrows parallel to the ground.

NOTE: *Make a note of the number of the arrow that is oriented in the direction of forward vehicle travel. This number will be needed during the SmarTrax calibration process.*

- The node mounting location must not create tripping hazards.
- Mount the node in a location where it will not be kicked or jarred during normal equipment operation.
- The location must allow cable routing to avoid crimping or damaging the cables or the node connections.
- Securely fasten the node using bolts or screws through at least two of the three mounting holes. When mounted properly, the node should not become loose or rotate.

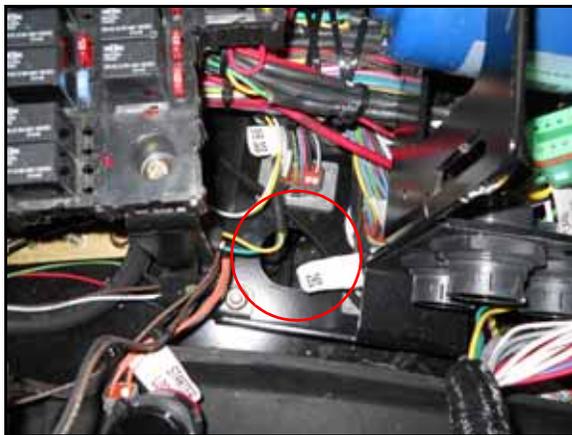
INSTALL THE NODE HARNESS

FIGURE 4. 6-Pin Deutsch Connector on Node Harness



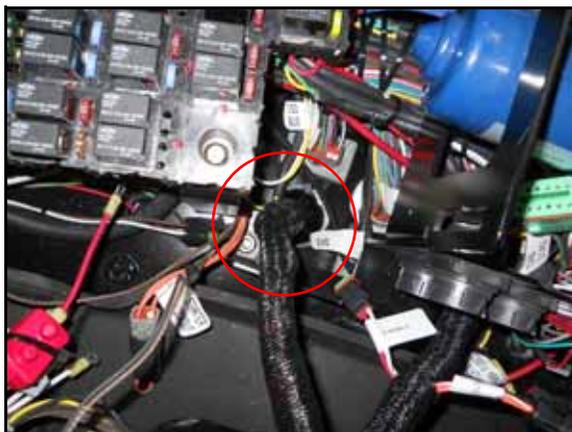
1. Connect the unlabeled 6-pin Deutsch connector to the mating connector on the machine's harness.

FIGURE 5. Grommet in Bottom of Compartment



2. Remove the rubber grommet in the bottom of the compartment.

FIGURE 6. Node Harness Routed to Machine's Bulkhead



3. Route the 21-pin bulkhead connector on the node harness into the hole in the bottom of the compartment.

FIGURE 7. Node Harness Secured to Bulkhead



4. From outside the cab, secure the bulkhead connector to the machine using the lock nut on the connector.

FIGURE 8. Machine's Ground Bar



5. Locate the machine's ground bar on the right side of the compartment.
6. Install the two ground wires on the grounding bar.
7. Locate the fuse panel on the right side of the compartment.
8. Remove the bolt from the machine's power cable.
9. Install the two power wires from the node cable on the bolt.

NOTE: It may be necessary to cut the ring terminals from the power wires and crimp new ring terminals (P/N 405-0200-052 or 405-0200-053) on the end.

10. Reinstall the machine's power cable on the bolt.
11. Reinstall the bolt in the fuse panel.
12. Loop and tie-off the REMOTE SWITCH cable connection, securing it with plastic cable ties as necessary.

NOTE: The ENABLE and REMOTE SWITCH connectors are not used in the SmarTrax system. Ensure the cables are secured away from moving parts and heat sources.

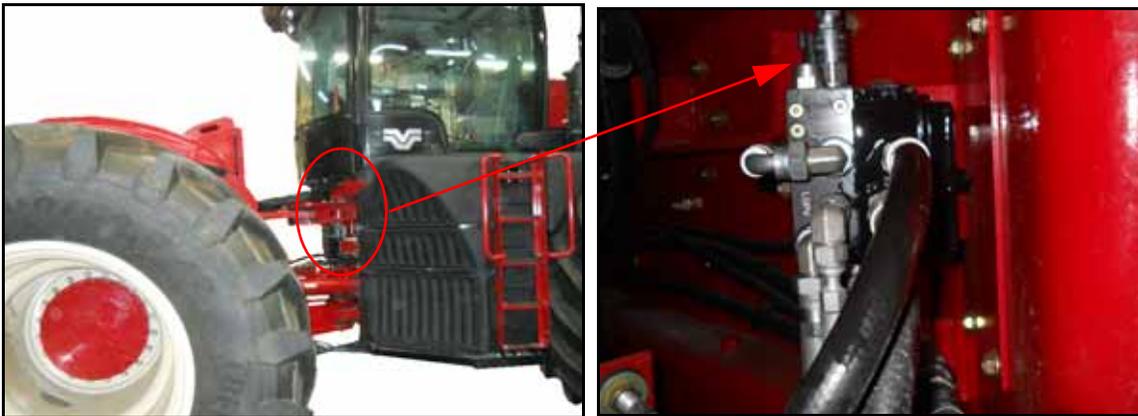
INSTALL THE VALVE HARNESS

FIGURE 9. Valve Harness Secured to Bulkhead



1. Connect the round 21-pin connector on the valve harness (P/N 115-4001-145) to the mating bulkhead connector under the machine's cab.
2. Route the valve harness toward the existing SmarTrax valve located under the cab on the right side of the articulation joint.

FIGURE 10. TRANSDUCER and VALVE Connections



3. Connect the TRANSDUCER connector to the pressure transducer installed in Port PS of the SmarTrax valve.

FIGURE 11. Transducer Connection



4. Connect the VALVE connector to the open 4-pin Deutsch port on the PVES valve.

FIGURE 12. Valve Connection



5. Disconnect the machine's existing WAS connection location adjacent to the bulkhead in Figure 9 on page 13.
6. Install the WAS connectors of the valve harness between the machine's WAS connectors.

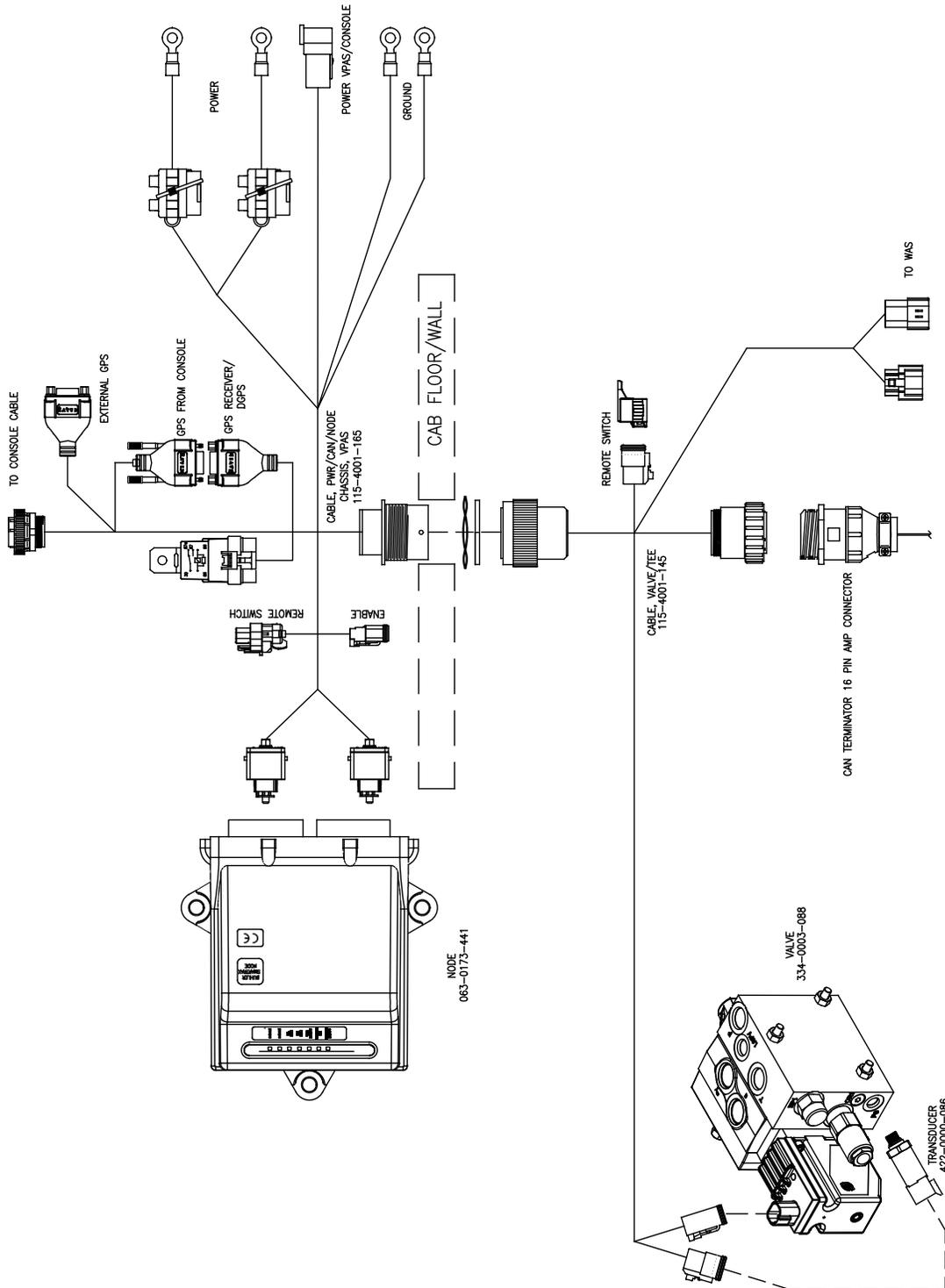
FIGURE 13. WAS Tee Connector



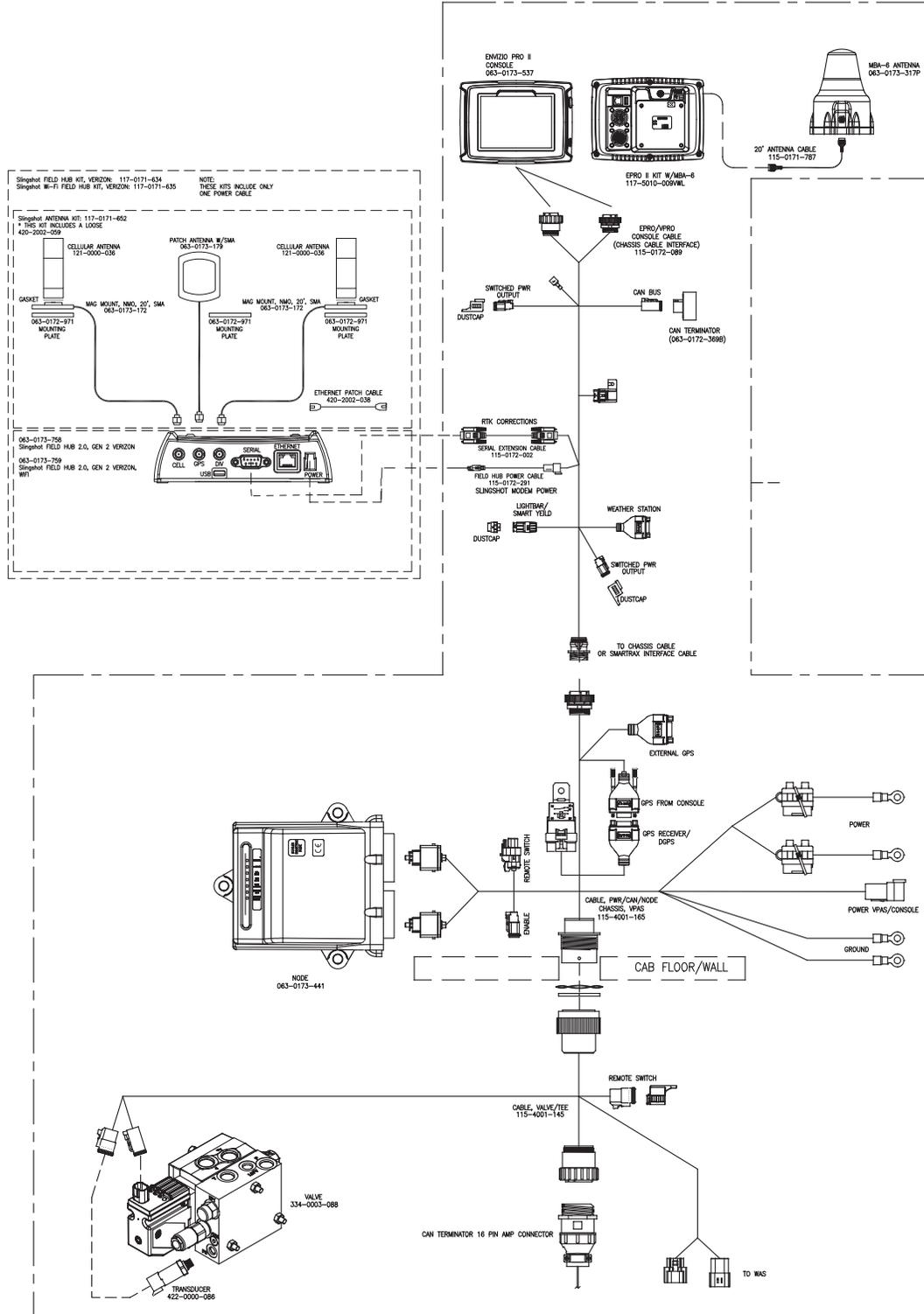
Connect
Tee
Here

7. Use cable ties to secure any excess cable away from moving parts and heat sources.

FIGURE 14. Valve and Node Harness Wiring Diagram



SYSTEM DIAGRAMS



C

Cab Component Installation

- Installing the Node Harness 11
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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.



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.