RAVEN

SmarTrax™ Installation Manual

John Deere 50/60/70 Series Steering Ready Combines

Disclaimer

While every effort has been made to ensure the accuracy of this document, Raven Industries assumes no responsibility for omissions and errors. Nor is any liability assumed for damages resulting from the use of information contained herein.

Raven Industries shall not be responsible or liable for incidental or consequential damages or a loss of anticipated benefits or profits, work stoppage or loss, or impairment of data arising out of the use, or inability to use, this system or any of its components. Raven Industries shall not be held responsible for any modifications or repairs made outside our facilities, nor damages resulting from inadequate maintenance of this system.

As with all wireless and satellite signals, several factors may affect the availability and accuracy of wireless and satellite navigation and correction services (e.g. GPS, GNSS, SBAS, etc.). Therefore, Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of these services and cannot guarantee the ability to use Raven systems, or products used as components of systems, which rely upon the reception of these signals or availability of these services. Raven Industries accepts no responsibility for the use of any of these signals or services for other than the stated purpose.

©Raven Industries, Inc. 2012

Chapter 1 *Important Safety Information*..... 1

Hydraulic Safety **2**
Electrical Safety **2**

Chapter 2 *Introduction*..... 3

Preparing for Installation **4**
Recommendations **4**
Point of Reference **5**
Updates **5**
Kit Contents **5**

Chapter 3 *Cab Component Installation*..... 9

Install the SmarTrax Node **9**
Mount the SmarTrax Node **9**
Node Mounting Locations **11**
Install the Foot Switch **12**
Install the Road Switch **12**
Open Switch Port Installation **12**
Alternate Switch Port Installation **13**
Install the Valve Harness **13**
Install the Chassis Cable - SmarTrax-Only Systems (If Applicable) **16**
Connect SmarTrax to an Existing Chassis Cable (If Applicable) **16**
Calibrate the SmarTrax System **16**
System Diagrams **17**

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

- 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

Hydraulic Safety

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing SmarTrax hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly damage the SmarTrax valve.

Electrical Safety

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

CHAPTER 2

Introduction

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

This manual applies to the following machines:

MAKE: John Deere
MODEL: 9X50 STS Series - Steering-Ready: 9450, 9550, 9650, and 9750
YEAR: 2009 & Older

MODEL: 9X60 STS Series - Steering-Ready: 9560, 9660, 9760, and 9860
YEAR: 2009 & Older

MODEL: 9X70 STS Series - Steering-Ready with Digital Encoder: 9570, 9670, 9770, and 9870
YEAR: 2011 & Older

FIGURE 1. **John Deere 9660 STS**

Preparing for Installation

Before installing the SmarTrax system, park the machine where the ground is level, clean, and dry. Turn off the machine and leave it 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.*

Note: *The units in the table below are measured in inches. To convert the values to centimeters, multiply the listed value by 2.54.*

Note: *The values in the table below must be converted into feet or meters before being entered into the field computer.*

  - *To convert the values to feet, divide the listed value by 12.*
  - *To convert the values to meters, multiply the listed value by 0.0254.*

Machine Preset	Antenna X Position (left to right)	Antenna Y Position (from the rear wheel axle to the antenna position on the cab in inches)	Antenna Z Position (ground to top of antenna in inches)
John Deere 9750 STS	Centered	192	132.25
John Deere 9x70STS	Centered	176.5	171.5

- 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.

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

-John Deere 50/60/70 Series Combines - Steering Ready SmarTrax™ Installation Manual
-Manual No. 016-5034-014 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.

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 kit with the components on this list. If you have questions about the kit, contact your local Raven dealer. .

TABLE 1. SmarTrax Installation Kit (P/N 117-5034-014)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277	1
Not Pictured	Manual - John Deere 50/60/70 STS - Steering Ready Series SmarTrax Installation Manual	016-5034-014	1
	Node - SmarTrax RTK	063-0173-228	1

TABLE 1. SmarTrax Installation Kit (P/N 117-5034-014)

Picture	Item Description	Part Number	Qty.
	Bracket - Node Mounting	107-0172-055	1
	Cable - SmarTrax Node Harness	115-4001-161	1
	Cable - Valve Harness	115-4001-162	1
	Cable - 3’ Power Strip	115-4001-164	1
	Assembly - Enable Foot Switch	063-0172-470	1
	Housing - Rocker Switch Base	118-0159-056	1
	Housing - Rocker Switch Cover	118-0159-057	1
	Switch - Master	412-2011-104	1
	Terminator - Low Encoder	063-4001-003	2
	Terminator - Flow Meter	063-4001-007	1
	Tape - 3.5” Double-Sided	332-0000-019	6

TABLE 1. SmarTrax Installation Kit (P/N 117-5034-014)

Picture	Item Description	Part Number	Qty.
	Screw - #4-40 Phillips Pan-Head Machine	311-0008-027	4
	Nut - 3/8”-16 Lock	312-4001-109	3

CHAPTER 3

Cab Component Installation

Install the SmarTrax Node

Mount the SmarTrax Node

FIGURE 1. Node Mounting Location

1. Clean the notch in the molding to the right of the operator's seat.

FIGURE 2. SmarTrax Node Installed

2. Mount the SmarTrax node (P/N 063-0173-228) on the node mounting plate (P/N 107-0172-055) using three 3/8”-16 lock nuts (P/N 312-4001-109).
3. Place five double-sided tape strips (P/N 332-0000-019) on the bottom of the node mounting plate.
4. Remove the backing from the double-sided tape and adhere the node mounting plate to the notch in the molding.

Note: *The node connectors should point to the front of the machine.*

FIGURE 3. Node Harness Installed

5. Install the two large, rectangular connectors of the node harness (P/N 115-4001-161) into the correct ports of the node, tightening the bolts on the connectors to secure the connections.
6. Route the round 19-pin connector through the access hole in the rear-right corner of the cab.
7. Locate the electrical panel on the exterior of the machine, in the right-rear corner of the cab.

FIGURE 4. Electrical Panel Access Hole

Ideal Cable Routing Location

Alternate Cable Routing Location

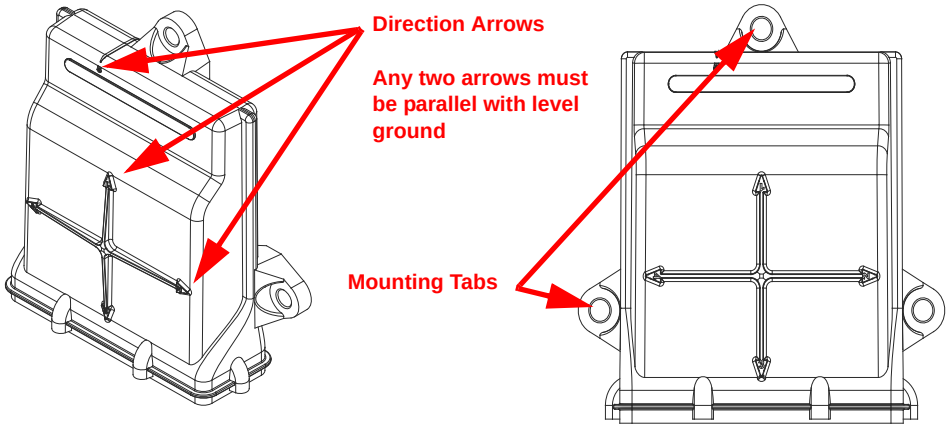
8. Determine the appropriate cable routing location in the electrical access panel.
   - If the perforated knockout port in the access panel cover is not being used, use a hammer and punch to remove it.
   - If the hole is already occupied by another cable, drill a 1-3/4” diameter hole centered between the top four connection ports.
9. Remove the screws securing the electrical panel cover and pull the access panel away from the cab.

FIGURE 5. **Node Harness Installed in Electrical Access Panel**

10. Reach behind the access panel cover and locate the 19-pin connector of the node harness.
11. Insert the cable into the hole in the panel and secure it with the supplied lock washer and nut.
12. Route the node harness cable connectors back into the cab.
13. Reinstall the electrical panel cover.

Node Mounting Locations

FIGURE 6. **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 Foot Switch

FIGURE 7. Foot Switch Installed

1. Select a suitable location for the foot switch (P/N 063-0172-470) to be installed.

Note: *The foot switch should be installed in a location where the operator has easy access to it and is able to fully press the pedal.*

2. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
3. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.
4. Locate the ENABLE connector on the node harness (P/N 115-4001-161) and connect it to the foot switch cable connector.

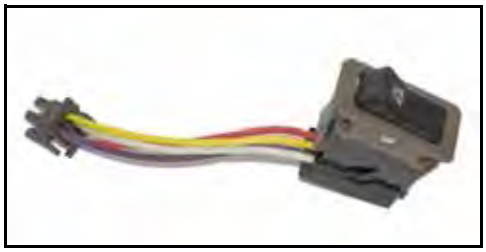
Install the Road Switch

The ideal road switch installation location is in an open switch port in the machine's console. If an open switch port it not available, identify an alternate mounting location which is easily accessible to the operator.

Open Switch Port Installation

1. Locate an unused switch port on the armrest console.
2. Use a flat-head screwdriver to gently remove the cover of the unused switch port.
3. Route the ROAD SWITCH connector of the node harness (P/N 115-4001-161) into the machine's console and through the open port.

FIGURE 8. Road Switch



4. Connect the ROAD SWITCH connector to the road switch (P/N 412-2011-104).
5. Feed the wires back into the console.
6. Press on the switch casing to ensure the switch is securely installed.

Alternate Switch Port Installation

Note: *An alternate mounting location must be easily accessible to the operator.*

FIGURE 9. Road Switch Assembly

1. Insert the road switch (P/N 412-2011-104) into the road switch base (P/N 118-0159-056) and cover (P/N 118-0159-057) housing.
2. Secure the housing with four #4-40 Phillips pan-head machine screws (P/N 311-0008-027).
3. Route the ROAD SWITCH connector of the node harness (P/N 115-4001-161) to the chosen switch mounting location.
4. Connect the ROAD SWITCH connector to the road switch.
5. Use one double-sided tape strip (P/N 332-0000-019) or two self-tapping screws (not provided) to mount the road switch to the selected mounting location.

Install the Valve Harness

1. Connect the round 19-pin connector of the valve harness (P/N 115-4001-162) into the port on the electrical access panel in which the node harness was installed.
2. Route the valve harness under the cab.

3. Locate and disconnect the existing cable on the machine's steering valve.

Note: *The machine's existing steering valve cable is not used in the SmarTrax system. Ensure the cable is secured away from moving parts and heat sources.*

FIGURE 10. **VALVE and FLOW METER Connections**

4. Plug the VALVE connector of the valve harness into the open port of the steering valve.
5. Locate and disconnect the existing cable from the machine's flow meter.
6. Plug the FLOW METER connector of the valve harness into the open port of the flow meter.
7. Install the flow meter terminator (P/N 063-4001-007) on the end of the machine's flow meter cable connection.

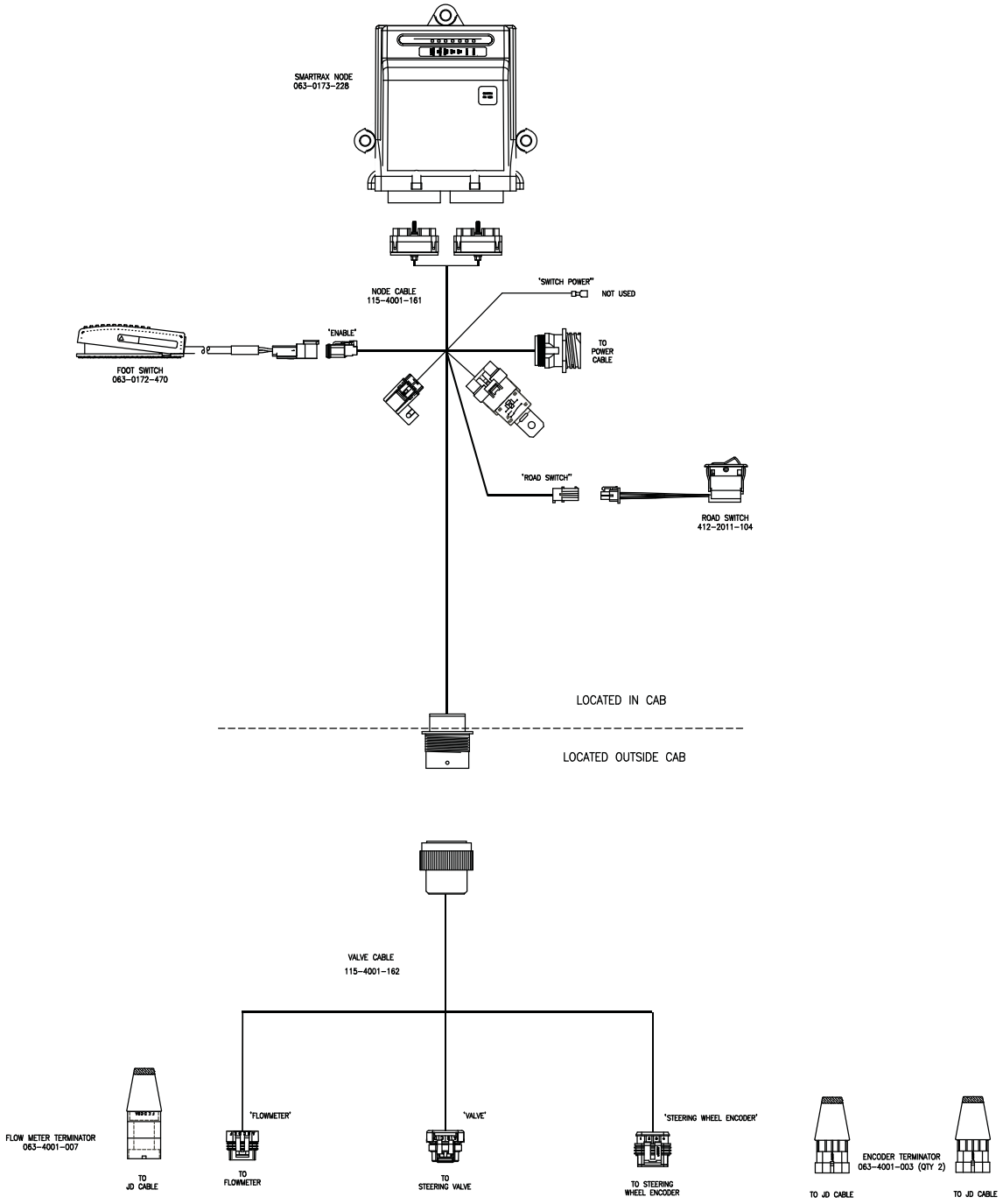
FIGURE 11. **Steering Wheel Encoder Connections**

8. Locate and disconnect the machine's two steering wheel encoder connections near the steering valve.
9. Connect the ENCODER connector of the valve harness into either of the machine's mating steering wheel encoder connectors.

Note: *The other steering wheel encoder connector is not used in the SmarTrax system. Ensure the cable is secured away from moving parts and heat sources.*

10. Install the two low encoder terminators (P/N 063-4001-003) on the remaining steering wheel encoder connectors.
11. Loop and tie-off any excess cable, securing with plastic cable ties as necessary.

FIGURE 12. Valve Harness Wiring Diagram



Install the Chassis Cable - SmarTrax-Only Systems (If Applicable)

If the machine does not contain an existing chassis power system (such as AutoBoom, product control, etc.), it is necessary to install the chassis power cable to operate the SmarTrax system. If a CAN system already exists on the machine, refer to Connect SmarTrax to an Existing Chassis Cable (If Applicable) below to connect power to the SmarTrax system.

Note: *The chassis cable is sold separately. Contact your local Raven dealer for ordering information.*

1. Locate the SmarTrax chassis cable (P/N 115-4001-085 or 115-4001-131).
2. Connect the TO SMARTRAX NODE connector from the chassis cable to the round 16-pin connector on the node harness (P/N 115-4001-161).
3. Connect the TO CONSOLE CABLE connector to the Raven console cable.
4. Install a terminator (P/N 063-0172-369) on the CAN cable connector.
5. Loop and tie-off the REMOTE SWITCH cable connection, securing it with plastic cable ties as necessary.

Note: *The REMOTE SWITCH connector is not used in the SmarTrax system. Ensure the cable is secured away from moving parts and heat sources.*

6. Connect the ring terminals to the battery.

Note: The positive connectors are fused.

Note: *The chassis power cable can be connected to the cab's power strip using the supplied 3' power strip cable (P/N 115-4001-164). The red wire is direct battery power, the orange wire is switched power, and the black wire is ground.*

Connect SmarTrax to an Existing Chassis Cable (If Applicable)

Note: *The SmarTrax interface tee is sold separately. Contact your local Raven dealer for ordering information.*

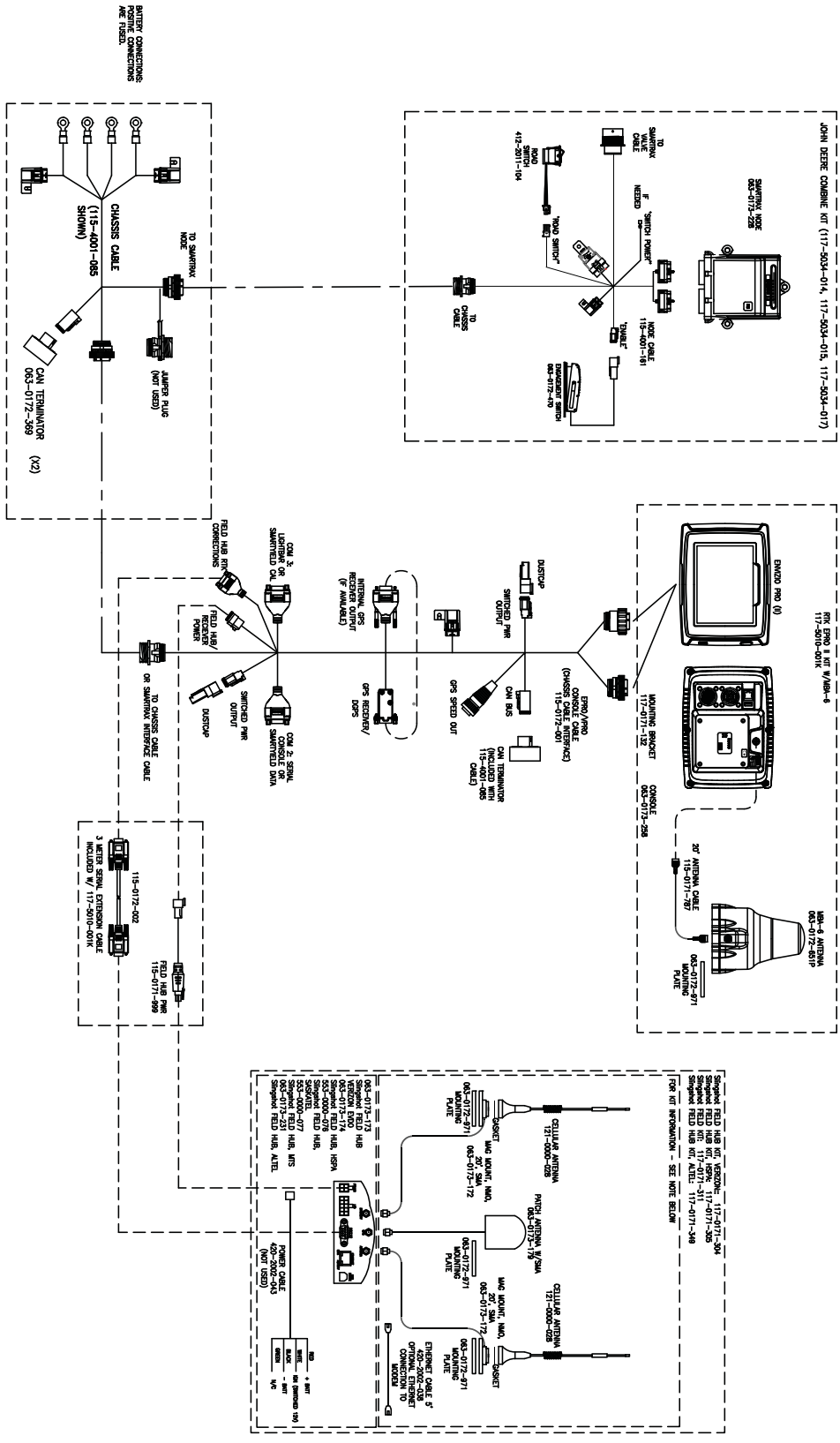
1. Locate and disconnect the connection between the Raven console cable and chassis cable on the machine's existing CAN system.
2. Install the SmarTrax interface tee cable (P/N 115-4001-070 or 115-4001-071) between the chassis and Raven console harness.
3. Connect the SmarTrax node cable (P/N 115-4001-161) to the remaining SmarTrax interface tee.

Calibrate the SmarTrax System

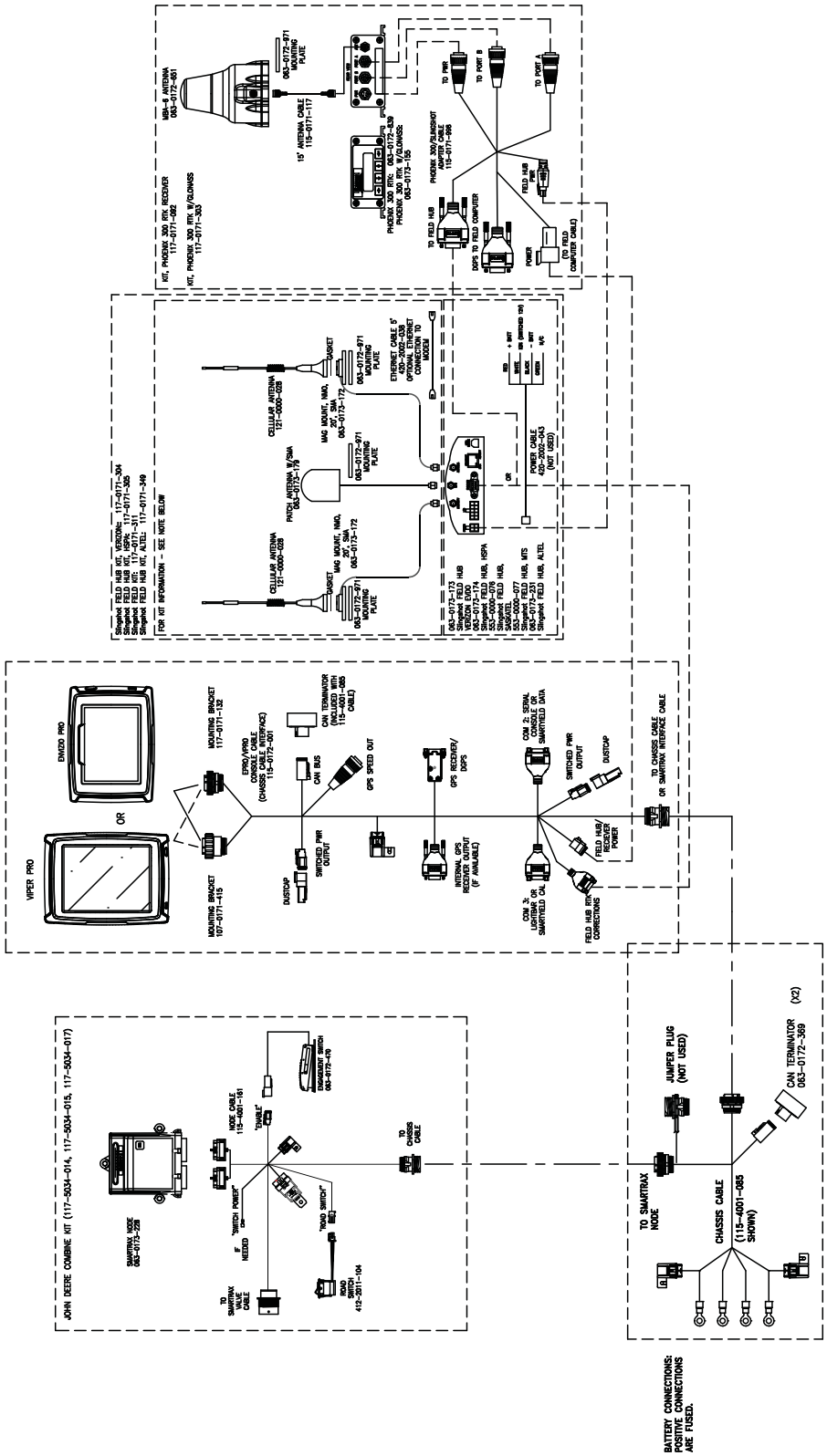
Refer to the SmarTrax & SmartSteer Calibration & Operation Manual (P/N 016-0171-277) for instructions on calibrating the SmarTrax system, adjusting system settings, and system operation.

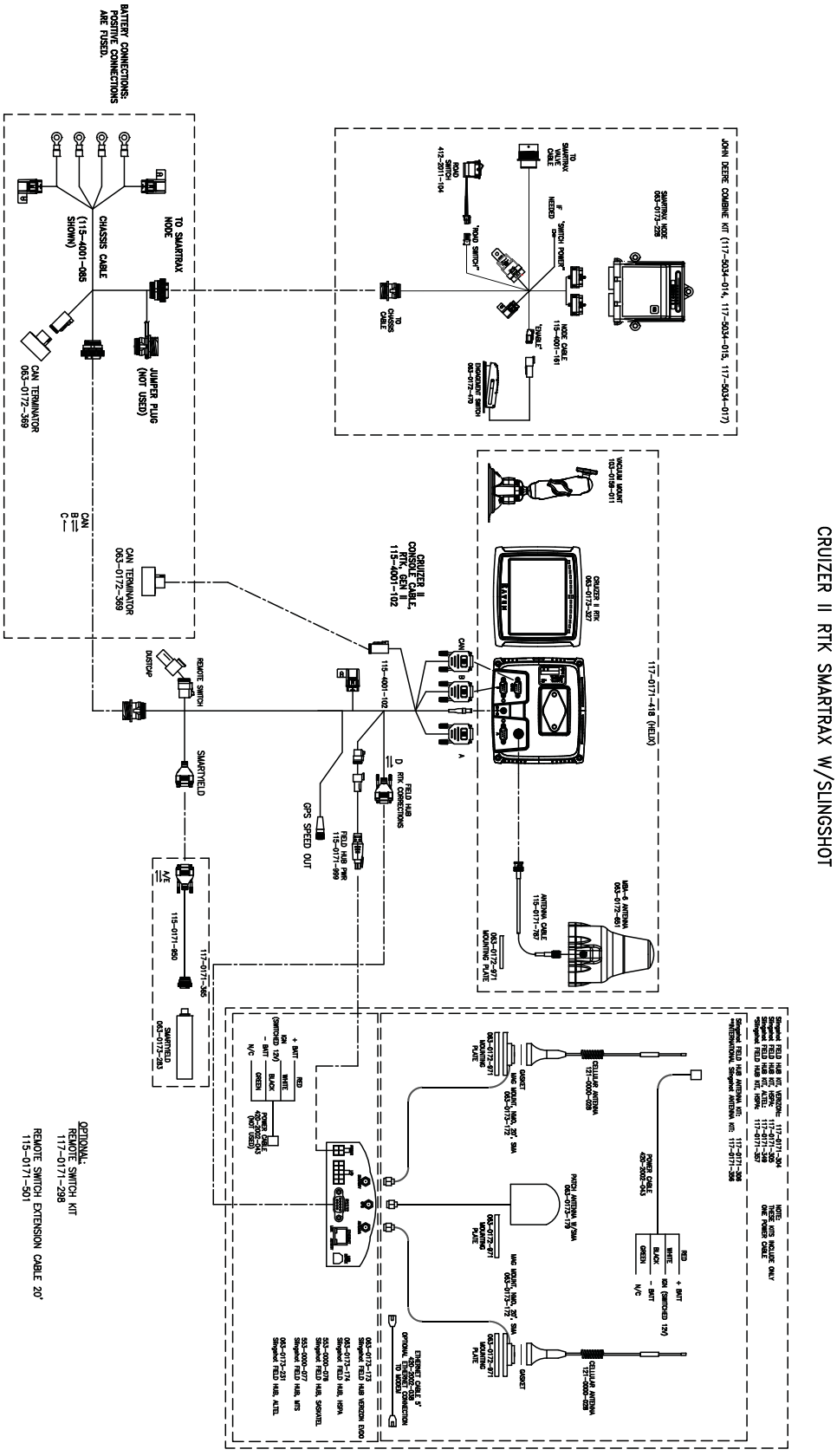
Important: *When transporting the vehicle, press down on the side of the road switch that contains the icon. To use SmarTrax in the field, toggle the road switch in the opposite direction.*

System Diagrams



ENVIZIO PRO/VIPER PRO SMARTRAX W/SLINGSHOT




CRUIZER II RTK SMARTRAX W/SLINGSHOT
JOHN DEERE COMBINE KIT (117-5034-014, 117-5034-015, 117-5034-017)
BATTERY CONNECTIONS: POSITIVE CONNECTIONS ARE FUSED.
TO SMARTRAX NODE
CHASSIS CABLE (115-4001-085 SHOWN)
JUMPER PLUG (NOT USED)
CAN TERMINATOR 063-0172-369
CRUIZER II CONSOLE CABLE, RTK, GEN II 115-4001-102
117-0171-418 (HELIX)
REMOTE SWITCH
DUSTCAP
SMARTYIELD
GPS SPEED OUT
OPTIONAL: REMOTE SWITCH KIT 117-0171-298
REMOTE SWITCH EXTENSION CABLE 20' 115-0171-501

C

Cab Component Installation 9
Calibrating the SmarTrax System 16
Connecting the SmarTrax to Existing Chassis Cable 16
Installing the Chassis Cable - SmarTrax-Only Systems 16
Installing the Foot Switch 12
Installing the Road Switch 12
Alternate Switch Port Installation 13
Open Switch Port Installation 12
Installing the SmarTrax Node 9
Node Mounting Locations 11
Installing the Valve Harness 13
Model Year 2010 & Newer 16
Mounting the SmarTrax Node 9

I

Important Safety Information
Electrical Safety 2
Hydraulic Safety 2
Introduction
Kit Contents 5
Preparing for Installation 4
Point of Reference 5
Recommendations 4
Updates 5

K

Kit Contents 5

RAVEN

RAVEN INDUSTRIES

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.

How Long is the Coverage Period?

Raven Applied Technology Division products are covered by this warranty for 12 months after the date of purchase. This warranty coverage applies only to the original owner and is nontransferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If your dealer agrees with the warranty claim, the dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

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 or other special 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.

John Deere 50/60/70 Series Combines-Steering Ready
SmarTrax™ Installation Manual
(P/N 016-5034-014 Rev A 06/12 E19759)

Raven Industries
Applied Technology Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
www.ravenprecision.com

Toll Free (U.S. and Canada): (800)-243-5435
or Outside the U.S. :1 605-575-0722
Fax: 605-331-0426
www.ravenhelp.com

Notice: This document and the information provided are the property of Raven Industries, Inc. and may only be used as authorized by Raven Industries, Inc. All rights reserved under copyright laws.

©Raven Industries, Inc. 2012