

**RAVEN**

*Simply improving your position.<sup>SM</sup>*

# Installation Manual



**SmartSteer™**

## ***Disclaimer***

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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.

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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.

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<b>Chapter 1</b>	<b><i>Important Safety Information</i></b> .....	<b>1</b>
<b>Chapter 2</b>	<b><i>Introduction</i></b> .....	<b>3</b>
	Updates .....	3
	Recommendations .....	3
	Reviewing SmartSteer Kit Contents .....	4
<b>Chapter 3</b>	<b><i>Install the SmartSteer MDU Kit</i></b> .....	<b>7</b>
	Install the SmartSteer MDU Kit on the Steering Wheel .....	7
	Install Main Gear Around Steering Column .....	7
	Install the Spacer (If Needed) .....	9
	Install the Clamp Ring .....	9
	Install the Plastic Cover .....	11
	Install the MDU .....	11
	Install the Anti-rotation Pin .....	12
<b>Chapter 4</b>	<b><i>Install the Universal Bracket</i></b> .....	<b>15</b>
	Install the Universal Bracket .....	15
<b>Chapter 5</b>	<b><i>Installing the SmartSteer Foot Switch and Node</i></b> .....	<b>19</b>
	Install the SmartSteer Foot Switch .....	19
	Install the SmartSteer Node .....	19
<b>Chapter 6</b>	<b><i>System Drawings</i></b> .....	<b>21</b>
	CAN Node Wiring Diagram .....	22
	Envizio Pro/Viper Pro .....	23
	Envizio Pro .....	24
	Cruizer .....	25



## CHAPTER

# 1

# *Important Safety Information*

## NOTICE

Read this manual carefully before installing the SmartSteer 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 SmartSteer 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 SmartSteer, observe the following safety measures:

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

Please review the operation and safety instructions included with your implement and/or controller.

## **WARNING**

Read all safety requirements and precautions in the machine specific installation manual prior to operating a machine equipped with the SmartSteer feature. Failure to follow safety precautions may lead to damage to equipment, injury, or death.

To prevent the accidental engagement of steering and loss of vehicle control while driving on roads, turn the SmartSteer roading switch to the OFF position or remove the SmartSteer from the steering column. Never drive on roads or in public areas with the GPS steering system turned on.

 **CAUTION**

The GPS steering system does not detect obstacles in the vehicle's path. The operator must observe the path being driven in order to avoid obstacles.

When engaged, the GPS steering system controls only the steering of the vehicle. The operator must control the speed of the vehicle.

Do not reverse power leads. Doing so could cause severe damage to the equipment. Always make sure that the power leads are connected to the correct polarity as marked. Ensure that the power cable is the last cable to be connected.

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## CHAPTER

# 2

## *Introduction*

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Congratulations on your purchase of the Raven SmartSteer™ system!

SmartSteer assisted steering takes the stress out of driving and makes it quick and easy for you to improve your operating efficiency and performance. SmartSteer is compatible with Viper Pro, Envizio Pro, and Cruiser systems.

The following instructions are designed to assist with the proper installation of the SmartSteer system. Refer to the SmartSteer Calibration and Operation Manual (P/N 016-0171-277) for assistance with calibrating the software and using the SmartSteer system.

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### *Updates*

Updates for Raven manuals as well as software updates for Raven consoles are available at the Applied Technology Division web site:

<http://www.ravenprecision.com/Support/index2.jsp>

Sign up for e-mail alerts and we will notify you when updates for your Raven products are available on the Raven web site.

<http://www.ravenprecision.com>

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### *Recommendations*

Observe the following recommendations while installing the SmartSteer system:

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

## Reviewing SmartSteer Kit Contents

This section contains a list of the kit contents that you should have received in the SmartSteer kits. Before you begin assembling the kit, compare the items in your SmartSteer kit with this list. If you have questions about your kit, contact your Raven dealer.

### Viper Pro/ Envizio Pro Universal SmartSteer Kit (P/N 117-9001-029)

Component	Part Number	Quantity
Manual, SmartSteer, Hardware Installation	016-0171-280	1
Kit, SmartSteer, MDU	117-0196-003	1
Kit, Universal Bracket, SmartSteer	117-0181-024	1
Bracket, Quicktrax, L-bracket	107-0171-740	1
Bracket, Quicktrax, U-bracket	107-0171-741	1
Bracket, Quicktrax, U-bracket W/ flange	107-0171-742	1
Screw, Machine, 1/4-20 X 4", S.S. Pan Head, Ph.	311-0007-047	4
Bolt 5/16-18 X 3/4", Hex Head	311-0052-103	2
Bolt Carriage, Steel, Zinc Plated, 10-24 X 3/4 Unc	311-0069-082	2
Nut, 1/4-20 Zinc Plated Hex	312-1001-031	4
Nut, 5/16-18 Zinc Plated Hex	312-1001-034	2
Nut, Wing, 10-24	312-3000-013	2
Washer, 1/4" Lock, Split Zinc	313-1000-016	4
Washer, 5/16" Lock, Split, Zinc	313-1000-019	2
Washer, .281 Id X.625 Od X.065t	313-2300-010	8
Washer, .344 Id X.688 Od X.065t	313-2300-012	2
Bracket, Igubal Flange Bearing	320-0000-008	1
Tie, Cable, Black, Nylon 7.38"	435-1000-005	5
Kit, SmartSteer 3D, Viper Pro/ Envizio Pro	117-0197-015	1
Smartsteer Node Calibration Manual	016-0171-277	1
Switch Assembly	063-0172-470	1
Node, Can Control, SmartSteer 3D	063-0173-074	1
Cable, SmartSteer Node	115-4001-001	1
Cable, 6' CAN Bus with Tee	115-0171-326	1

**SmartSteer Cruiser Kit  
(P/N 117-9001-031)**

Component	Part Number	Quantity
Manual, SmartSteer, Hardware Installation	016-0171-280	1
Kit, SmartSteer, MDU	117-0196-003	1
Kit, Universal Bracket, SmartSteer	117-0181-024	1
Bracket, Quicktrax, L-bracket	107-0171-740	1
Bracket, Quicktrax, U-bracket	107-0171-741	1
Bracket, Quicktrax, U-bracket W/ flange	107-0171-742	1
Screw, Machine, 1/4-20 X 4", S.s. Pan Head, Ph.	311-0007-047	4
Bolt 5/16-18 X 3/4", Hex Head	311-0052-103	2
Bolt Carriage, Steel, Zinc Plated, 10-24 X 3/4 Unc	311-0069-082	2
Nut, 1/4-20 Zinc Plated Hex	312-1001-031	4
Nut, 5/16-18 Zinc Plated Hex	312-1001-034	2
Nut, Wing, 10-24	312-3000-013	2
Washer, 1/4" Lock, Split Zinc	313-1000-016	4
Washer, 5/16" Lock, Split, Zinc	313-1000-019	2
Washer, .281 Id X.625 Od X.065t	313-2300-010	8
Washer, .344 Id X.688 Od X.065t	313-2300-012	2
Bracket, Igubal Flange Bearing	320-0000-008	1
Tie, Cable, Black, Nylon 7.38"	435-1000-005	5
Kit, SmartSteer 3D, Viper Pro/ Envizio Pro	117-0197-017	1
Smartsteer Node Calibration Manual	016-0171-277	1
Switch Assembly	063-0172-470	1
Node, Can Control, Smartsteer 3D	063-0173-074	1
Cable, Cruiser	115-4001-010	1
Cable, Cruiser To Tm1/SmarTrax W/ boom Sense	115-0171-794	1



CHAPTER

3

*Install the SmartSteer  
MDU Kit*

*Install the SmartSteer MDU Kit on the  
Steering Wheel*

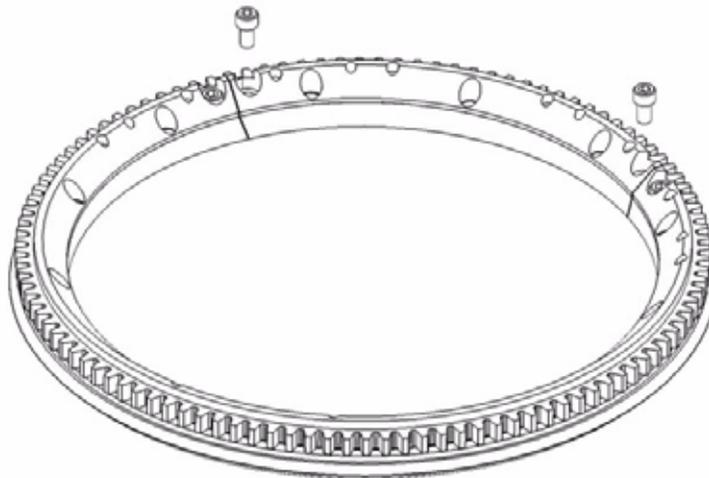
Install Main Gear Around Steering Column

**Note:** *The installation of the main gear on the steering wheel does NOT require removing the steering wheel.*

1. Remove the two hex screws from the smaller section of the Main Gear as shown in Figure 1, "Main Gear Hex Screws," . Do not remove the two hex screws on the larger section.

**Note:** *The Main Gear is part of the MDU Assembly.*

FIGURE 1. Main Gear Hex Screws



2. Remove the smaller section by pulling upward.

**Note:** *Tolerances are tight; pull directly upward on section as shown in Figure 2, "Main Gear Exploded View," .*

FIGURE 2. Main Gear Exploded View

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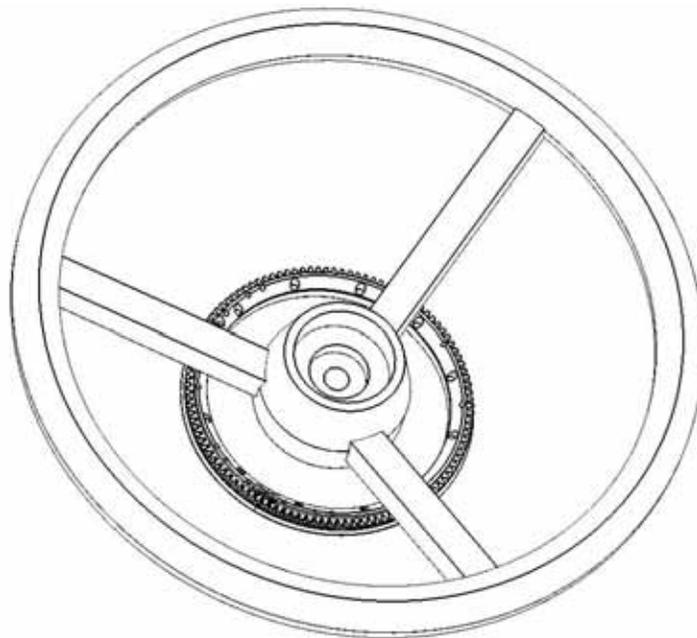
3. Install the larger section under the steering wheel around the steering column. Install with the gear teeth on the top, closest to the steering wheel. See Figure 3, “Installed Main Gear,” .

**Note:** Weave the gear around the steering wheel spokes if needed; certain steering columns may be too thick for the gear opening.

4. Reinstall the smaller section by pushing directly downward into the larger section.
5. Reinstall and secure the two hex screws. At this point the main gear is assembled around the steering column below the steering wheel as shown in Figure 3, “Installed Main Gear,” . Make sure the gear is free to move around.

FIGURE 3. Installed Main Gear

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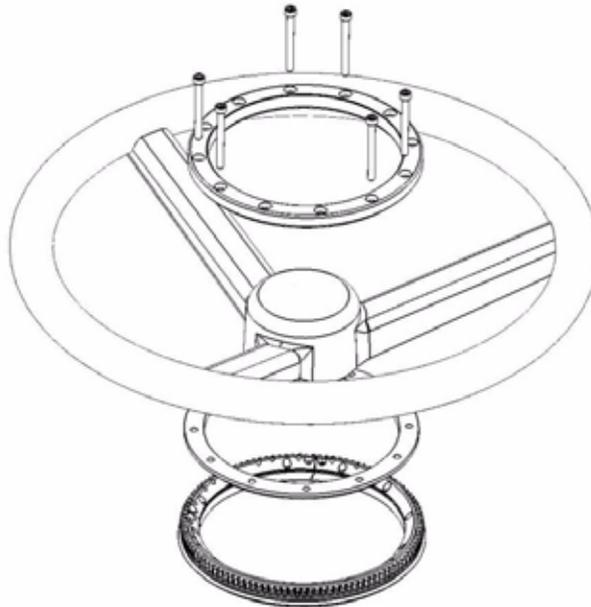


## Install the Spacer (If Needed)

1. Examine the steering wheel underside to determine if a spacer is necessary. A steering wheel with a soft covering material usually requires installation of a spacer to avoid interference with the MDU housing.
2. Install the spacer around the steering column between the steering wheel and the main gear. Flex the plastic spacer as needed to clear the steering wheel spokes. The large chamfer on the outside diameter of the spacer ring should be facing the main gear.

**Note:** Two spacers with different thickness are included in the kit.

FIGURE 4. Wheel with Spacer



## Install the Clamp Ring

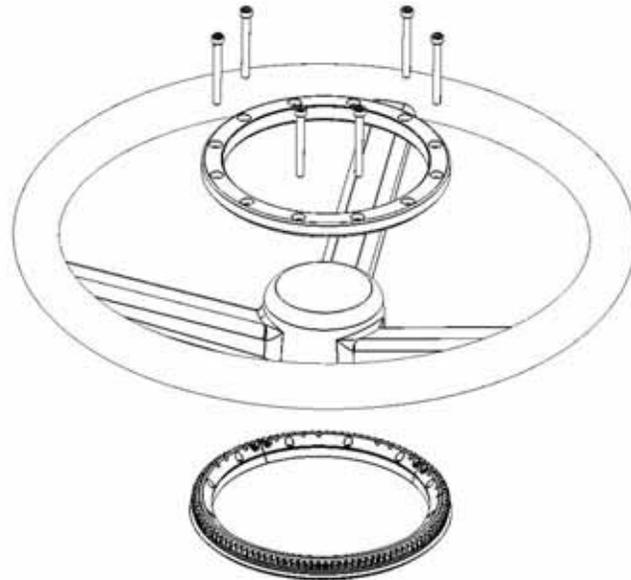
This procedure installs and centers the ring gear for typical three spoked steering wheels.

1. Place the clamp ring on top of the steering wheel and install a minimum of 6 screws.
2. Install a screw on each side of every spoke keeping the screws as close to the spokes as possible. At this stage, keep the screws fairly loose to allow for centering. See Figure 5, "Clamp Ring," .

**Note:** Multiple sets of different length screws are included in the kit in order to ensure proper installation. Make sure to use the appropriate length of screws for your machine when installing the clamp ring.

FIGURE 5. Clamp Ring

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3. With main gear clamped loosely, rotate and move the gear until 3 screws touch the spokes evenly. Figure 6, "Main Gear Centered," shows the main gear rotated counter-clockwise until three of the mounting screws touch the steering wheel spokes evenly. Also, press the top ring down evenly on the spokes of the steering wheel to make sure it is centered.

FIGURE 6. Main Gear Centered

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4. Tighten screws with a hex key until the main gear and ring fit snugly to the steering wheel. Tighten the screws in a cross-pattern (as opposed to tightening each screw in a clockwise or counter-clockwise order).

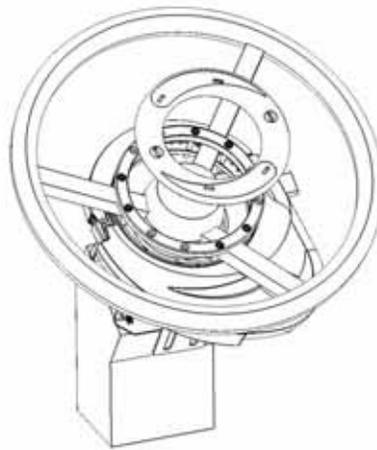
**Note:** Do not over-tighten the hex screws. The hex bolts may be tightened later if the steering wheel slips during operation.

5. Check the installation by rotating the steering wheel and watching for off-center movement of the main gear. Repeat the centering process as necessary.

## Install the Plastic Cover

Snap the plastic cover over the top aluminum clamp ring as shown in Figure 7, “Plastic Cover Ring,” .

**FIGURE 7. Plastic Cover Ring**

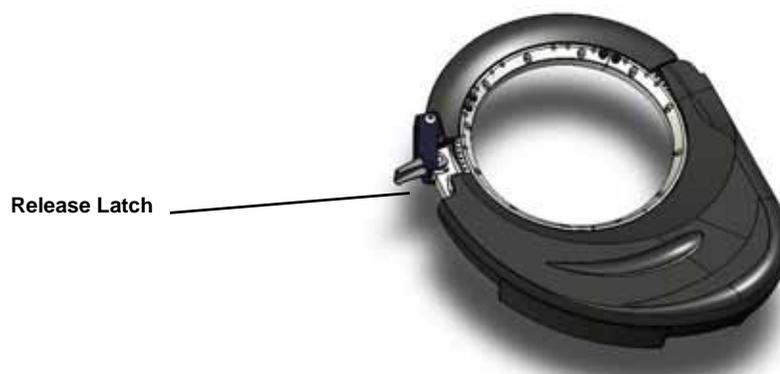


## Install the MDU

This procedure describes the installation and alignment of the MDU to the Main Gear.

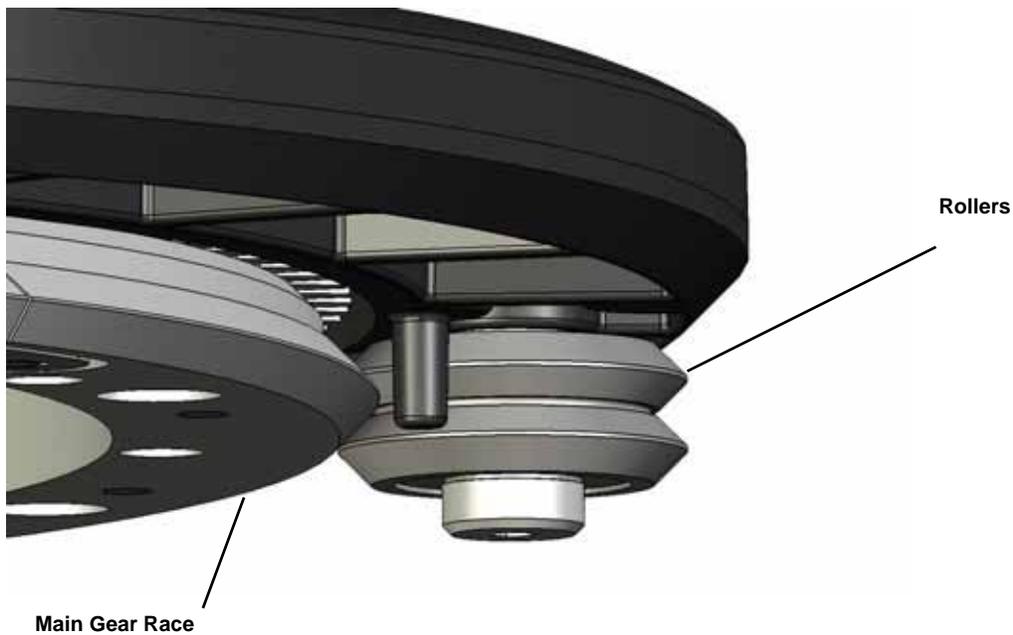
1. Open the MDU release latch as shown in Figure 8, “MDU Release Latch,” .

**FIGURE 8. MDU Release Latch**



2. Fit the MDU around the Main Gear so that the MDU rollers align on the Main Gear race as shown in Figure 9, “MDU Alignment,” .

FIGURE 9. MDU Alignment



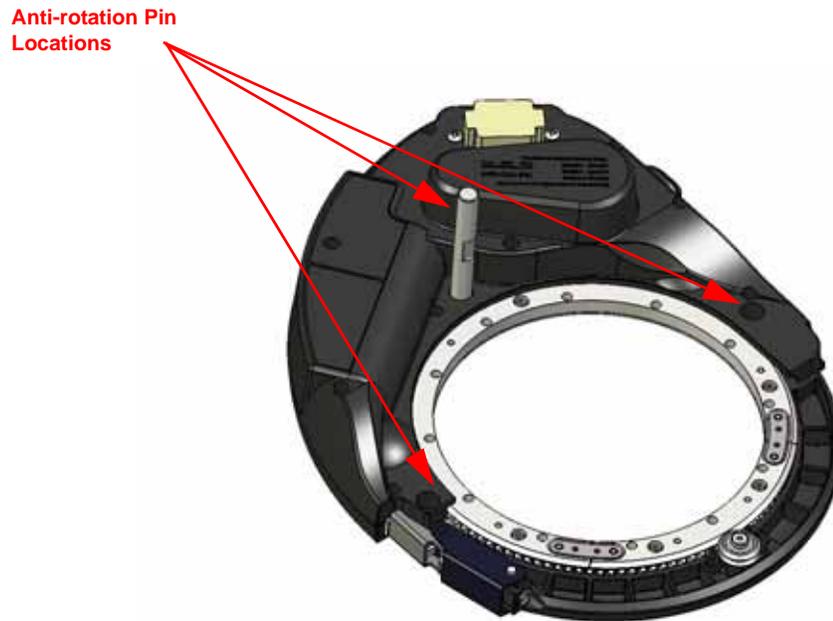
3. Check that the main gear race has properly engaged the top roller before closing latch. See Figure 9, “MDU Alignment,” .
4. Rotate the MDU manually to ensure the unit rolls smoothly without any resistance.

**Note:** Any resistance can wear out the MDU prematurely or decrease effectiveness of the steering capabilities.

### Install the Anti-rotation Pin

1. Choose the desired MDU orientation. The MDU can be mounted in any orientation the user chooses. Consider the following when choosing an orientation:
  - Ease of installing Anti-rotation bracketry
  - Access to 'Roding Switch'
  - Avoid locations where a knee could accidentally press the roading switch
  - Avoid blocking the vehicle's steering column controls and indicators
  - Routing of cable for minimal obstruction in the cab
2. Based on your preferred orientation, choose one of three locations for the Anti-rotation pin as shown in Figure 10, “Anti-rotation Pin Locations,” .

FIGURE 10. Anti-rotation Pin Locations



3. Raven recommends the use of Loctite 242 on the Anti-rotation pin threads.

**Note:** *Loctite 242 not supplied by Raven.*

4. Install the Anti-rotation pin and tighten.



## CHAPTER

# 4

## *Install the Universal Bracket*

### *Install the Universal Bracket*

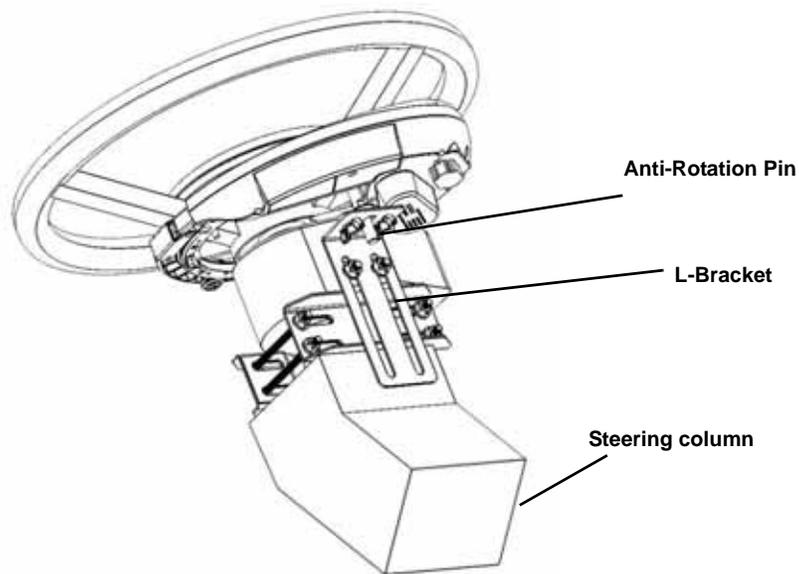
The bracket kit is designed to prevent the MDU from rotating around the steering column when your system is operating.

**Note:** *The SmartSteer MDU is attached to the steering wheel prior to installation of the bracket kit.*

1. Attach the L-Bracket to the front bracket using the two bolts (slider attaching bolts). Tighten finger tight. See Figure 1, "L-Bracket Attachment," .

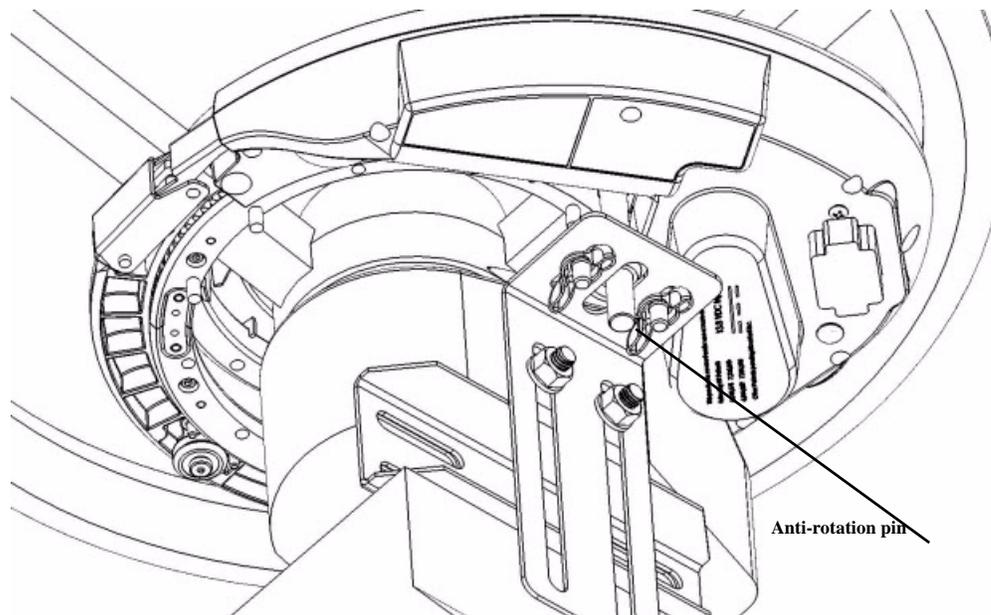
**Note:** *The L-Bracket will require adjustment once installed on the steering column.*

FIGURE 1. L-Bracket Attachment



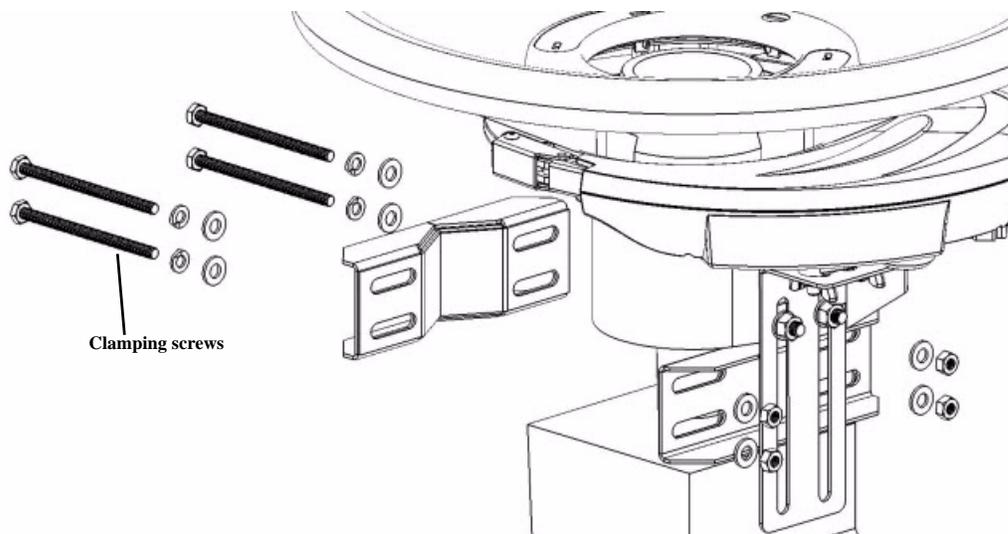
2. Slide flange bearing over Anti-rotation pin as shown in Figure 2, "Slide Flange Bearing," .

FIGURE 2. Slide Flange Bearing



3. Attach the back bracket to the front bracket using the four machine screws, clamping the steering column between the front and back brackets. See Figure 3, "Brackets Attachment," .

FIGURE 3. Brackets Attachment

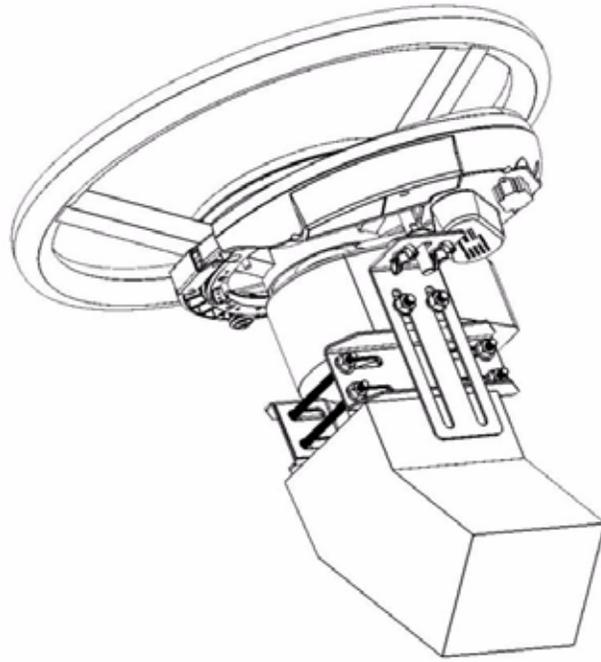


4. Tighten clamping assembly.
5. Make sure the assembly does not interfere with any of the vehicle control levers on the steering column.
6. Adjust the L-Bracket so it slides onto the Anti-rotation pin while making sure the L- Bracket sits squarely on the steering column front bracket. See Figure 4, "L-Bracket Adjustment," .
7. Finally, check to make sure the unit operates smoothly with no resistance.

**Note:** Any resistance can wear out the MDU prematurely or decrease effectiveness of the steering capabilities.

The installation is complete.

FIGURE 4. L-Bracket Adjustment





## CHAPTER

# 5

## *Installing the SmartSteer Foot Switch and Node*

### *Install the SmartSteer Foot Switch*

1. Select a location for the foot switch (P/N 063-0172-470) within easy reach of the operator to fully press the front of the pedal.
2. Use the foot switch as a template and pre-drill holes in the floor.
3. Secure the foot switch to the floor with four screws or bolts through each of the mounting holes.
4. Locate the connector labeled 'ENABLE' on the console cable harness (P/N 115-0171-326/794) and connect it to the foot switch cable.

**FIGURE 1. Foot Switch Mounting Example**



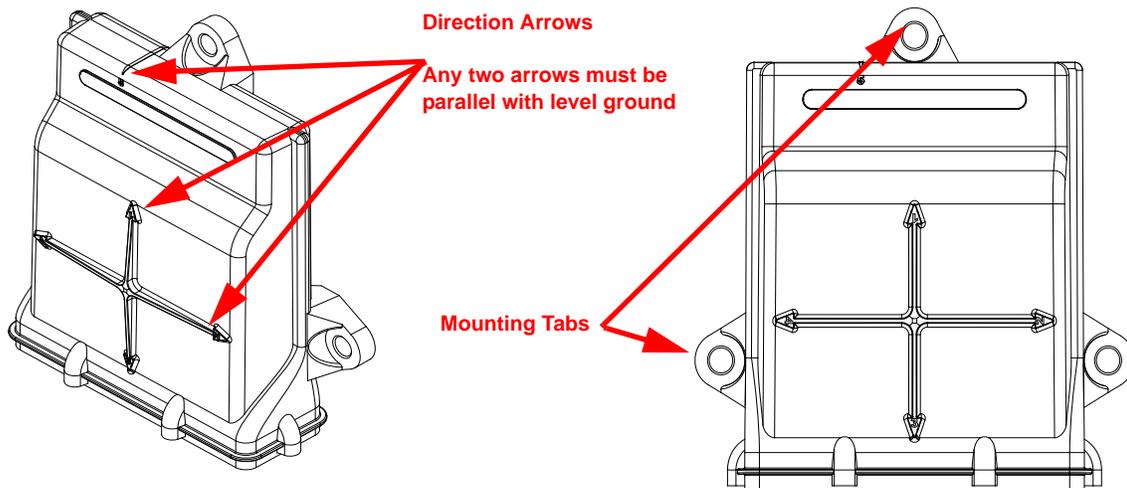
### *Install the SmartSteer Node*

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

- The node is not weatherproof. Mount the node inside the machine's cab or driver's compartment.
- The node mounting location must not create tripping hazards and allow cable routing to avoid crimping or damaging the cables or the node connections.
- Mount the node to a flat surface with two of the arrows on the node parallel to the ground and in a location where it will not be kicked or jarred during normal equipment operation. The floor of the cab is generally ideal.

- One of the six numbered direction arrows on the node must be oriented in the direction of forward vehicle travel. Note the number of the arrow corresponding to forward travel for SmartSteer calibration. One arrow must also point straight up.
- 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.

**FIGURE 2. Node Mounting**

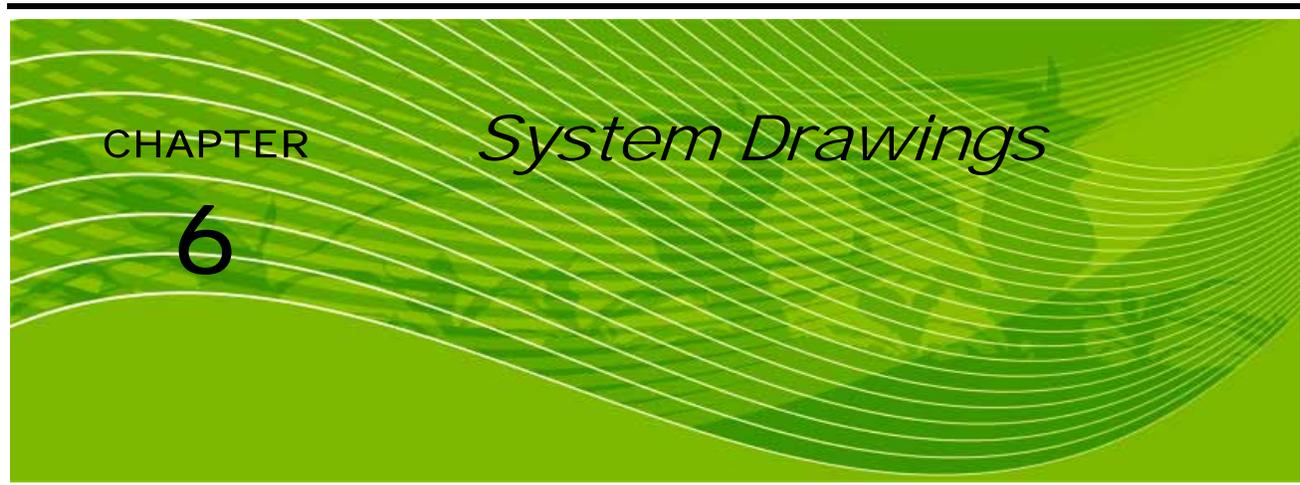


1. Select the preferred location for the node. See the recommendations for choosing a mounting location above.
2. Using the mounting tabs on the node as a template, mark and pre-drill holes. Using bolts or screws (not supplied), secure the node in position.

**Note:** Refer to Chapter 6, System Drawings on page 21 for additional assistance with the wiring installation.

3. Connect the large, round connectors on the node adapter cable (P/N 115-4001-001/010) and SmarTrax console cable harness (P/N 115-0171-326/374).
4. Connect the large, rectangular connectors to the node.
5. Connect your receiver or source of DGPS to the connector labeled 'DGPS' on the node adapter cable.
6. Connect the console providing machine guidance to the remaining small, round connector.
7. Connect the 4-pin deutsch plug to the vehicle's CANbus system (Viper Pro/ Envizio Pro) or the DB-9 display cable (Cruizer).
8. Electrical hookup is recommended as shown in the *CAN Node Wiring Diagram* section on page 22.

**Note:** High Current Power, which is used to run steering operations, should be connected to a separate power source than Logic Power, which is used to run processing and communication between the node and the guidance console.



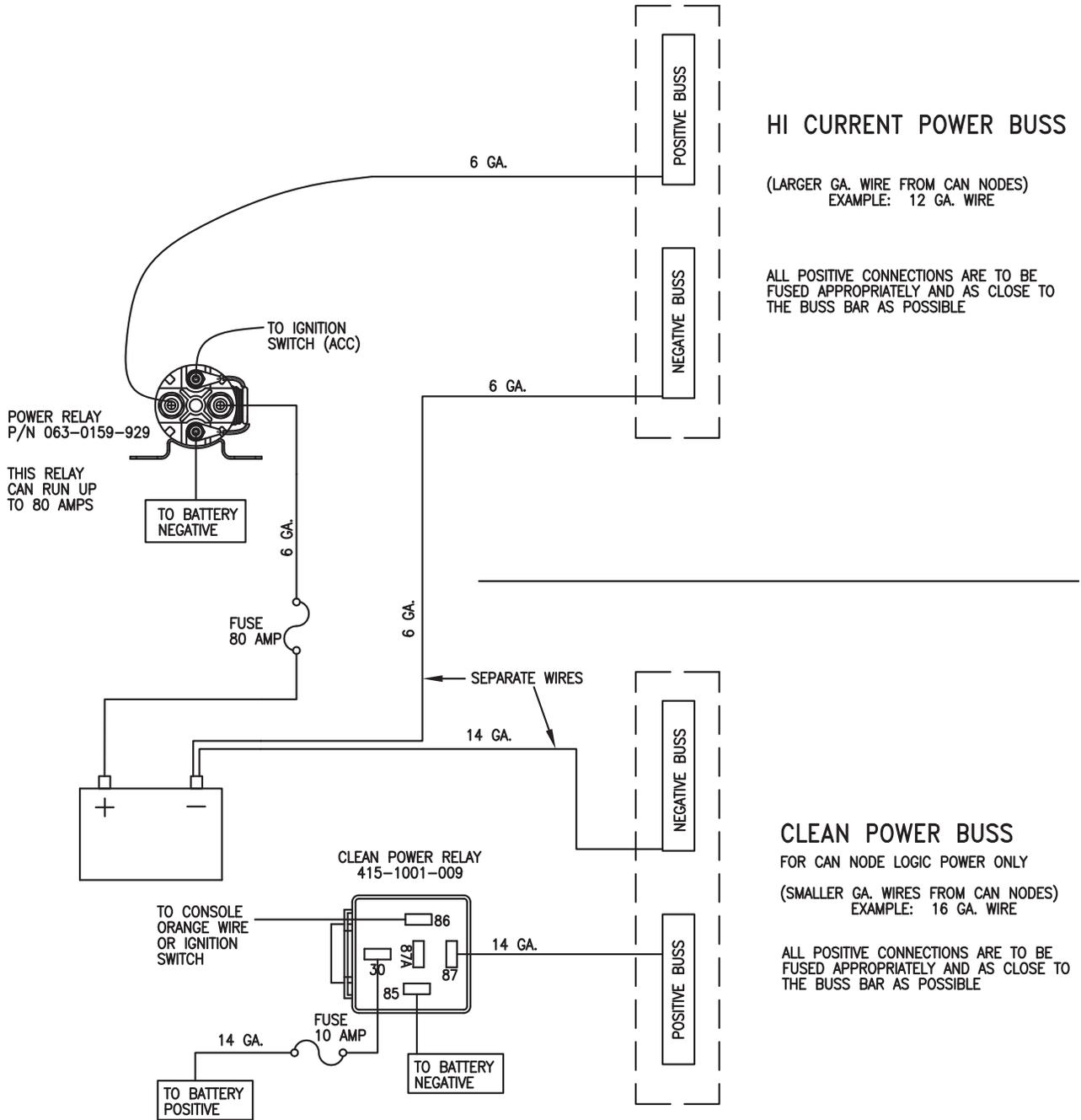
The following diagrams may be helpful for installing or troubleshooting the SmartSteer system. The following diagrams may show optional features or components not required for operation and will not apply to your system if the required hardware has not been installed.

Contact your local dealer for purchasing or more information on components shown in the following diagrams.

Additional system diagrams are available from the Raven Industries web site:

<http://www.ravenprecision.com/Support/ApplicationDrawings/index2.jsp>

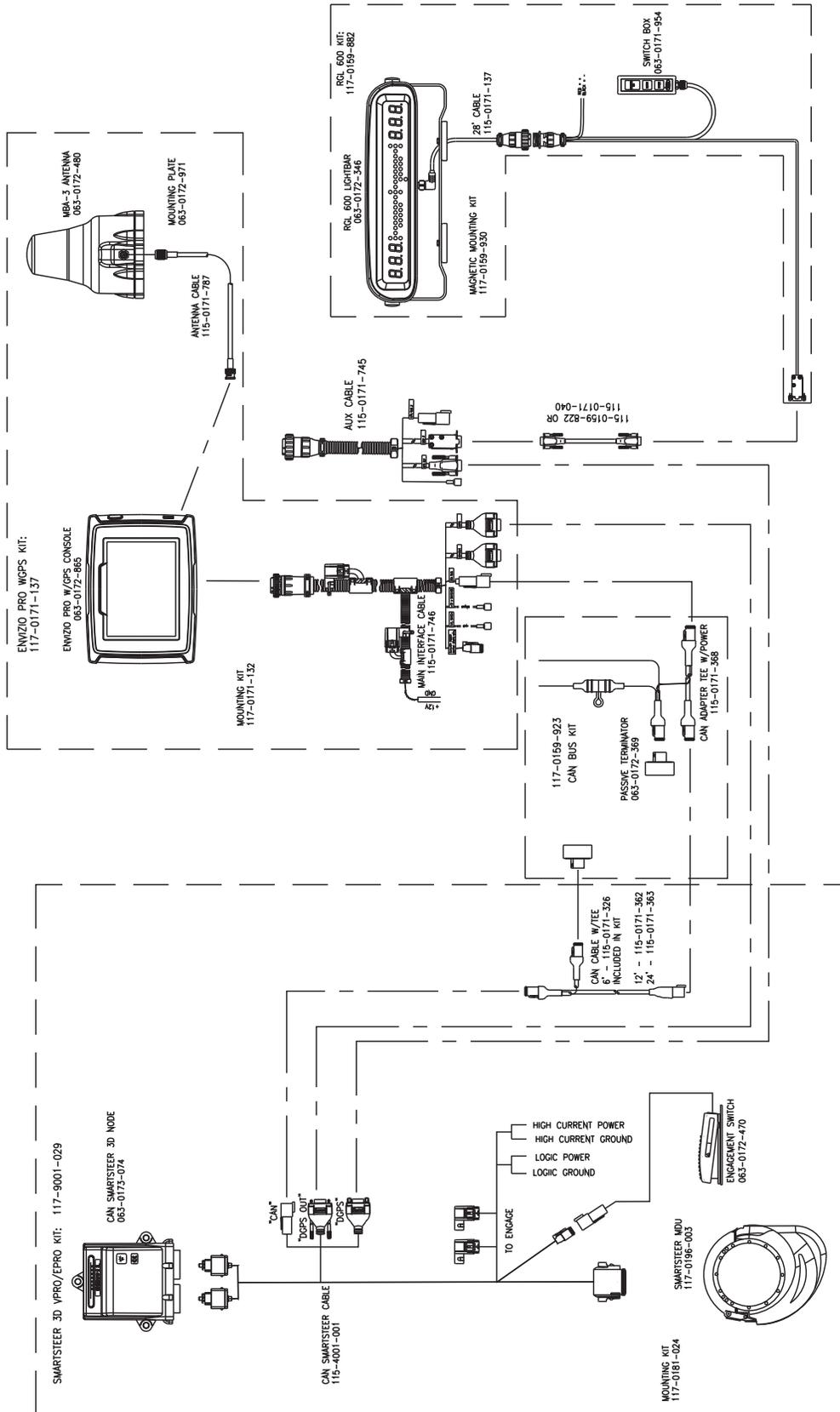
# CAN Node Wiring Diagram





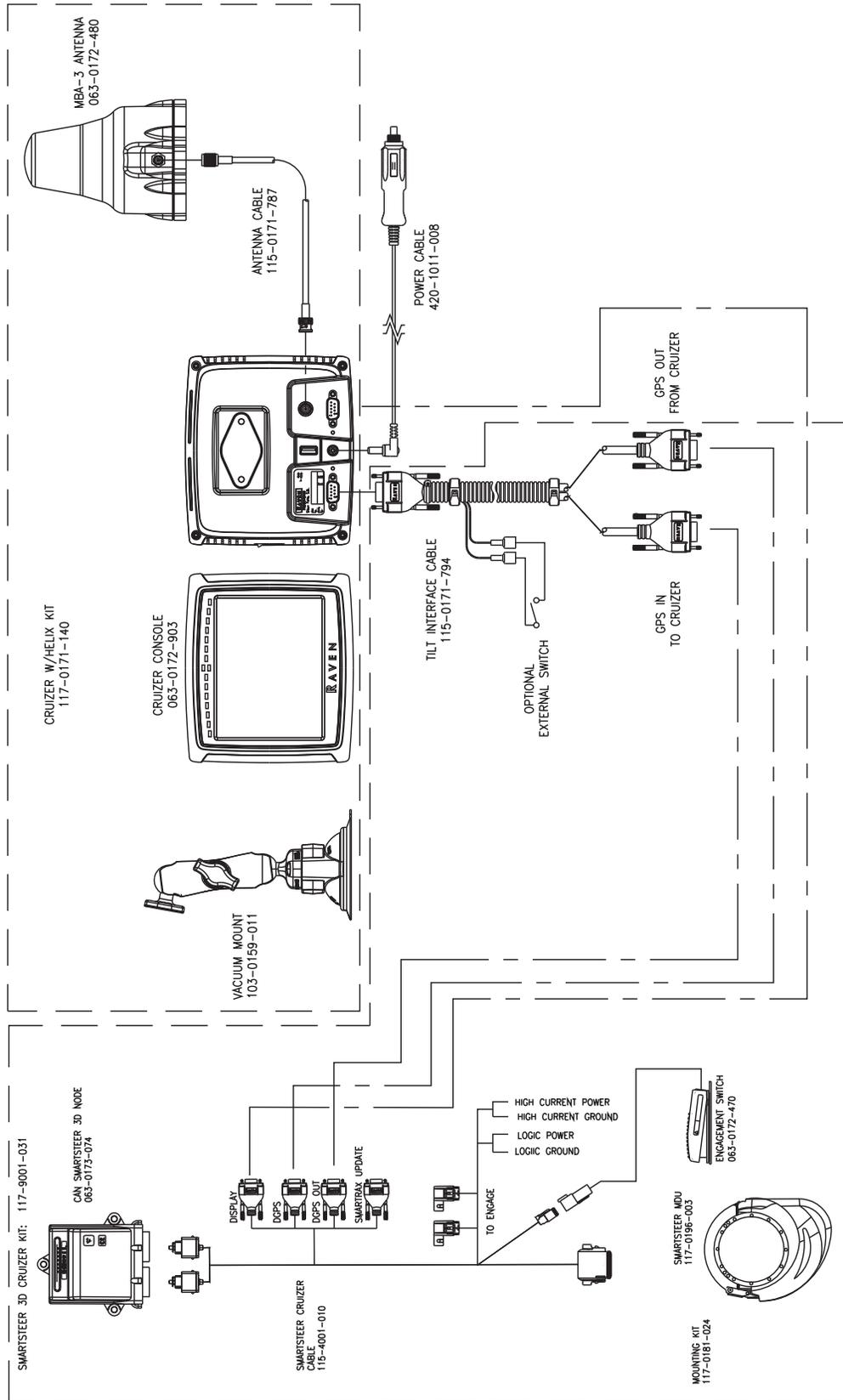
Envizio Pro

ENVIZIO PRO/RGL 600/SMARTSTEER 3D

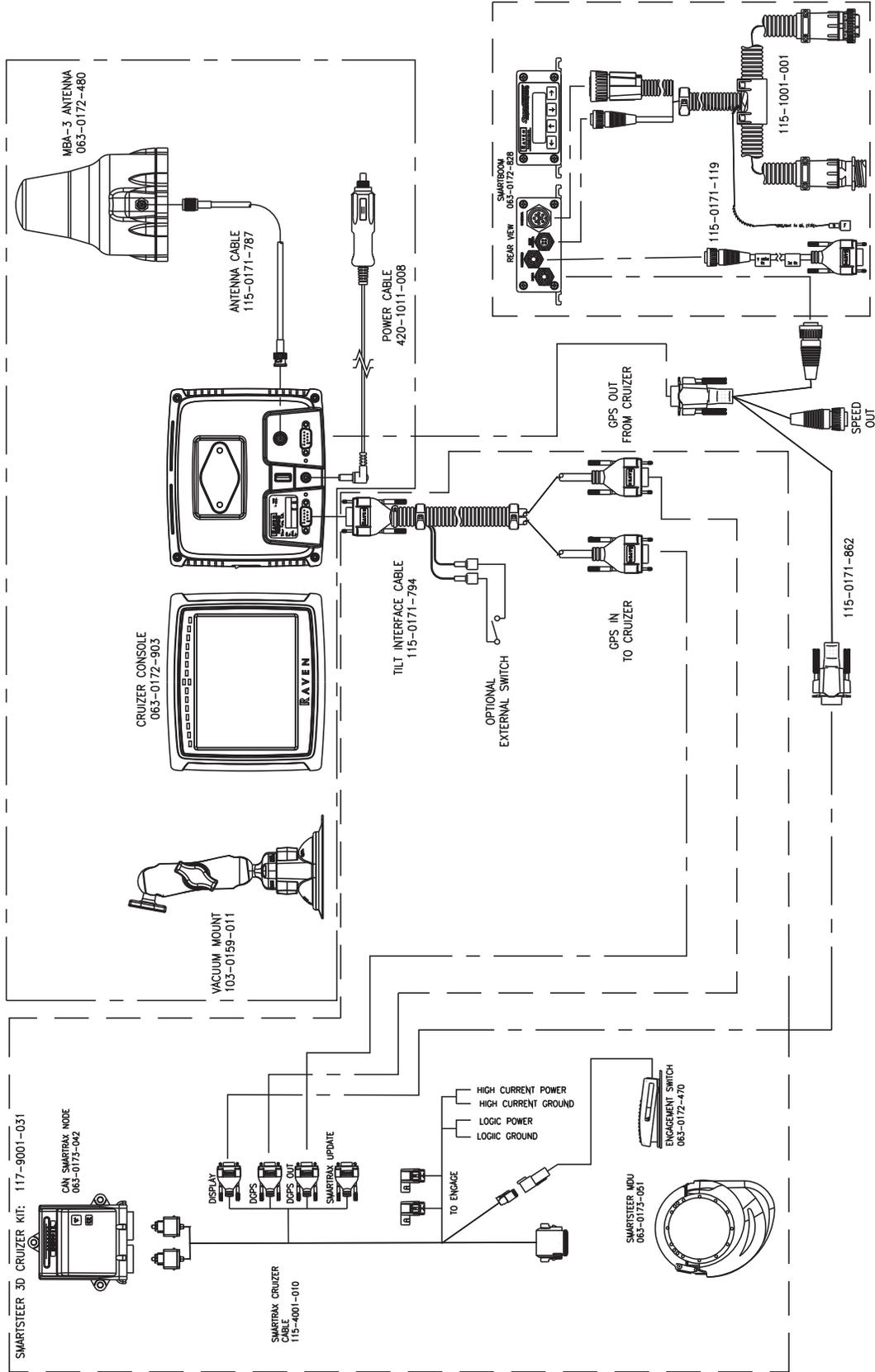


Cruizer

CRUIZER WITH HELIX ANTENNA/SMARTSTEER 3D



CRUIZER WITH HELIX ANTENNA, SMARTSTEER AND SMARTBOOM



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**A**

**Anti-rotation Pin, Installation** 12

**C**

**Clamp Ring, Installation** 9

**F**

**Foot Switch, Installation** 19

**I**

**Important Safety Information** 1

**Introduction** 3

**K**

**Kit Contents** 4

**M**

**Main Gear Around Steering Column,  
Installation** 7

**MDU, Installation** 11

**N**

**Node, Installation** 19

**Notice** 1

**P**

**Plastic Cover, Installation** 11

**R**

**Recommendations** 3

**S**

**SmartSteer MDU Kit on the Steering Wheel,  
Installation** 7

**Spacer, Installation** 9

**U**

**Universal Bracket, Installation** 15

**Updates** 3



**RAVEN**

# **RAVEN INDUSTRIES**

## **Limited Warranty**

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### ***What Does this Warranty Cover?***

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Product under normal use, maintenance, and service.

### ***How Long is the Coverage Period?***

Raven Applied Technology 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.

**R A V E N**

SmartSteer™  
Installation Manual  
(P/N 016-0171-280 Rev C 10/09)

*Simply improving your position.™*



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