GRADEMETRIX™ LOADER
INSTALLATION GUIDE
Revision: A1

Additional information, documentation, and software can be found at:
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This device may not cause harmful interference, and
this device must accept any interference received, including interference that may cause undesired operation.

This product complies with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be consulted at HTTPS://HEMISPHEREGNSS.COM/ABOUT-US/QUALITY-COMMITMENT.

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6711501	7373231	7835832	8174437
6744404	7388539	7885745	8184050
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8307535	8311696	8334804	RE41358

Australia Patents	
2002244539	2002325645
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Continued on next page

Overview, Continued

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Contact your local dealer for technical assistance. To find the authorized dealer near you:

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Table of Contents

Chapter 1: Getting Started

Overview

Introduction

Chapter 1 provides you with the information and proper tooling needed to begin a GradeMetrix® Loader installation.

It is recommended for only an experienced service technician perform the installation and configuration of the Hemisphere GradeMetrix® system.

Contents

Getting Started

Introduction

This section lists the tools required, preparation, and power setup necessary to prepare your machine for the GradeMetrix® Loader system installation.

Tools List

Tools list

A variety of tools are needed to properly set up and install your GradeMetrix® Loader system.

Review the following list and locate these required tools prior to beginning installation:

- ☐ Slotted screwdriver
- ☐ Phillips screwdriver
- ☐ Adjustable wrench
- ☐ ½” & 3/8” ratchet set
- ☐ Inch sockets
- ☐ Metric sockets
- ☐ Cable tie cutters
- ☐ Allen wrench set (inch)
- ☐ Allen wrench set (metric)
- ☐ Torx wrench
- ☐ Wire stripper / Crimp tool
- ☐ GNSS base/rover
- ☐ Open wheel measuring tape
- ☐ Cable ties
- ☐ Split tube or other cable protection
- ☐ Electrical Tape
- ☐ Heat Shrink
- ☐ Electrical terminals i.e., spade, ring etc.
- ☐ Thread locker i.e., Loctite or similar
- ☐ Nickel anti-seize grease or similar
- ☐ Cold Gal and Machine-color paint if welding

Preparing for Installation

Prepare for installation

To prepare for a loader installation, place the loader on a flat surface.

Locate a clean source of power and a safe mounting location for the IronTwo control box. Check to ensure the control box and the GMS-1 sensors have power.

Important: The IronTwo must receive 7 – 36 VDC of input power from the machine (most machines should provide 24 V directly from the battery).

Note: The IronTwo must be installed so the operator can see the screen. Use care not to place the IronTwo in a location that might compromise visibility or block an exit from the cab.

Safety Information and Warnings

Safety information and warnings

Refer to the safety manual of each machine for proper operation and safety precautions. Store this guide and all related safety information with related machine manuals for future reference.

Prior to installing and operating GradeMetrix®, read and follow all safety precautions as outlined in this manual.

Review and adhere to the follow safety warnings:

- Before you begin working on the machine, use the machine's master switch to disconnect power to the machine.
- A human operator is required to manually maintain a safe operating speed.
- GradeMetrix® is a grade reference tool and is not designed to replace the machine's operator. **Do NOT allow a driver to operate without safety instructions. Avoid obstacles to prevent human, machine, and property injury.**

Important: The safety warnings contained in this manual are intended as guidelines and are not meant to be a complete list of potential hazards.

What's Included in Your Kit

Kit contents

Your GradeMetrix® kit contains the parts listed in Table 1-1, Installation Kit Contents.

Table 1-1: Installation Kit Contents

Level	Part Number	Description	Qty
1	051-0406-10	CBL, IO, VR500, 22-PIN to 5-PIN, 3.5M	1
1	051-0407-10	CBL,IO,IronX Bulkhead, 4m	1
1	150-0053-10	IronX BT_Wifi Antenna	1
1	150-0054-10	IronX Cellular Antenna	1
1	676-0036-0	ADAPTER,MINI-C,N2K,BULKHEAD	1
1	710-0148-10	IronX Flush Mount Kit	1
1	710-0149-10	IronX U-Mount Kit	1
1	710-0157-10	KIT, VR500 MACH. CTROL MOUNT	1
1	710-0159-10	KIT, VR500 MACH. CTROL MAGNETS	1
1	710-0186-20	KIT,CAN SENSOR,CABLES	1
2	051-0425-20	Cable, M12 CAN M/F Sensor, 3m	2
2	051-0425-30	Cable, M12 CAN M/F Sensor, 5m	3
1	710-0223-10	KIT, BT/WIFI ANTENNA WITH ADAPTER	1
1	710-0230-10	GradeMetrix Consumables Kit, VR500	1
1	710-0260-10	KIT, SENSORS, LOADER	1
2	710-0217-10	KIT, GMS-1 SENSOR MOUNT, WITH COVER	1
2	710-0218-10	KIT, GMS-1 SENSOR MOUNT, BASIC	2
1	750-5019-10	SENSOR,GMS-1,VER,M12-5PIN,M-F	2
1	750-5020-10	SENSOR,GMS-1,HOR,M12-5PIN,M-F	1
1	750-0245-10	CAN TERMINATION RESISTOR, M12(F)	1
1	752-0028-10	VR500 RECEIVER, HGNSS	1

Continued on next page

What's Included in Your Kit, Continued

Kit contents, continued

The kit also comes with an IronTwo terminal.

Table 1-1: Installation Kit Contents (continued)

Level	Part Number	Description	Qty
1	980-7008-10	IronTwo (Americas + EMEA)	1
2	752-0040-10	HGNSS IronTwo Display	1
2	051-0426-10	HGNSS IronTwo Bulkhead Cable	1
2	050-0046-20	CBL,ADO,PWR ADAPT, GRADEMETRIX	1
2	050-0022-01	CBL,ADO,POWER	1

OR

Level	Part Number	Description	Qty
1	980-7009-10	IronTwo (Americas + EMEA)	1
2	752-0040-20	HGNSS IronTwo Display	1
2	051-0426-10	HGNSS IronTwo Bulkhead Cable	1
2	050-0046-20	CBL,ADO,PWR ADAPT, GRADEMETRIX	1
2	050-0022-01	CBL,ADO,POWER	1

NOTE: Due to manufacturing processes outside of HGNSS purview, the installer may be required to adapt the GradeMetrix® kit to your individual system.

Continued on next page

What's Included in Your Kit, Continued

Kit contents, continued

If you have an articulating loader, an encoder must be ordered. You may order the encoder with, or without, a bracket (bracket referenced in this user manual).

Part Number	Description
980-5018-10	KIT, SENSOR, ROTARY ENCODER, HGNSS
710-0250-10	KIT, ROTARY ENCODER W/ MOUNTING BRACKETS

Machine Inspection Checklist

Machine Inspection Checklist

To ensure peak performance, GradeMetrix® should be installed only after a thorough machine inspection has been conducted.

To avoid bodily and machine injury, follow the machine inspection checklist below:

- Park the machine on a clean and level surface.
- Turn off the machine and remove +power from the batteries.
- Lower all implements to the ground.
- Apply the parking brake and chock wheels if necessary.
- Inspect any drilling and/or cutting sites to ensure no electrical wiring damage will be incurred.
- Periodically re-measure the bucket/blade width at the tips to adjust accuracy due to blade wear.

Chapter 2: Sensor Installation

Overview

Introduction

The loader uses a GMS-1 sensor on the chassis for machine pitch/roll, a GMS-1 for the boom angle and a GMS-1 sensor on the bucket for bucket angle. This chapter details the steps required for installing these sensors.

Contents

GMS-1 Sensor Installation

Sensors

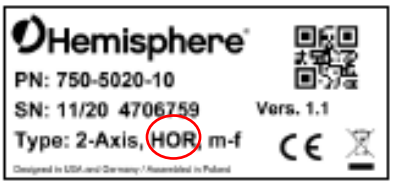
There are two types of GMS-1 sensors. There is a horizontal sensor (P/N: 750-5020-10) used on the chassis and a vertical sensor (P/N: 750-5019-10) used on the blade.

It is extremely important to ensure the horizontal and vertical sensors are mounted in the correct location.

Important: Take care and ensure the horizontal and vertical sensors are mounted in the correct position.

The labels on the GMS-1 sensors clearly indicate each sensor.

Below is a horizontal sensor label.



Below is a vertical sensor label.

The mounting bracket must be welded to the appropriate locations:

- **Body sensor** – The horizontal slope sensor used to measure the pitch and roll of machine.
- **Boom sensor** – The vertical tilt sensor used to measure the boom angle.
- **Bucket sensor** - The vertical tilt sensor used to measure the bucket/blade lift.

Important: It is important to choose safe welding locations for each sensor. Before doing any welding, make sure that the IronTwo is disconnected with the machine isolated. This may mean disconnecting a battery terminal lead.

Continued on next page

GMS-1 Sensor Installation, Continued

Brackets

The GMS-1 sensors include a base bracket (P/N: 602-1194-10) that can be welded to the machine. This bracket has two welding holes, so the bracket can be welded to the machine and hide the weld. Refer to Figure 2-1 bracket dimensions.

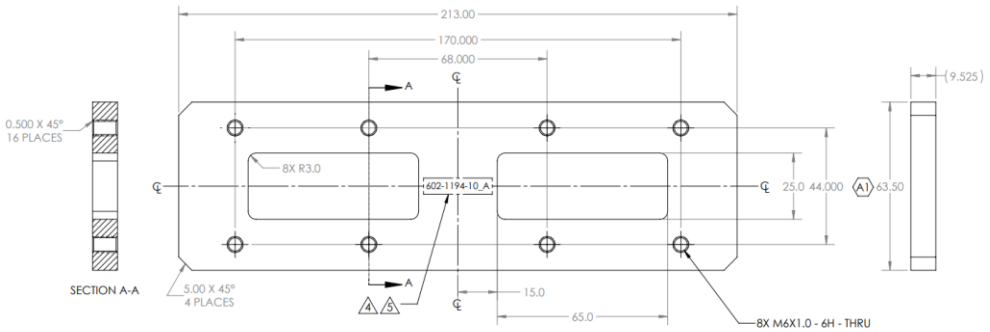


Figure 2-1: Bracket dimensions

Strain relief wings are also included. Screw the strain relief wing onto the bracket with the provided 14mm M6x1mm screws. The CAN cable can be zip-tied to the strain relief wing.

Figure 2-2 shows the drawing of P/N: 602-1196-10 strain relief wing.

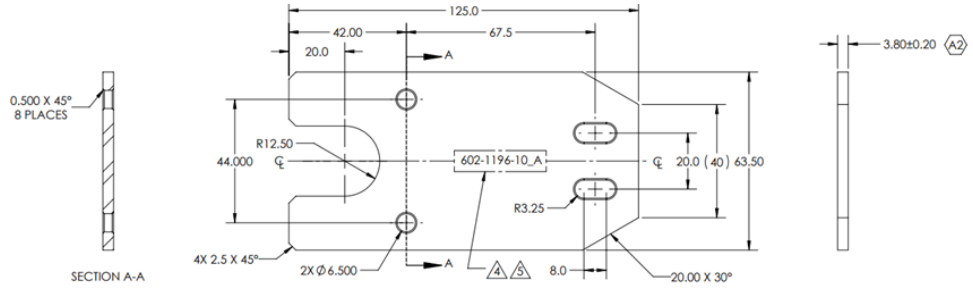


Figure 2-2: P/N 602-1196-10 strain relief wing

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GMS-1 Sensor Installation, Continued

Brackets, continued

After the base bracket has been welded onto the machine, the GMS-1 sensor can be bolted onto the bracket with the provided 20mm M6x1mm screws.

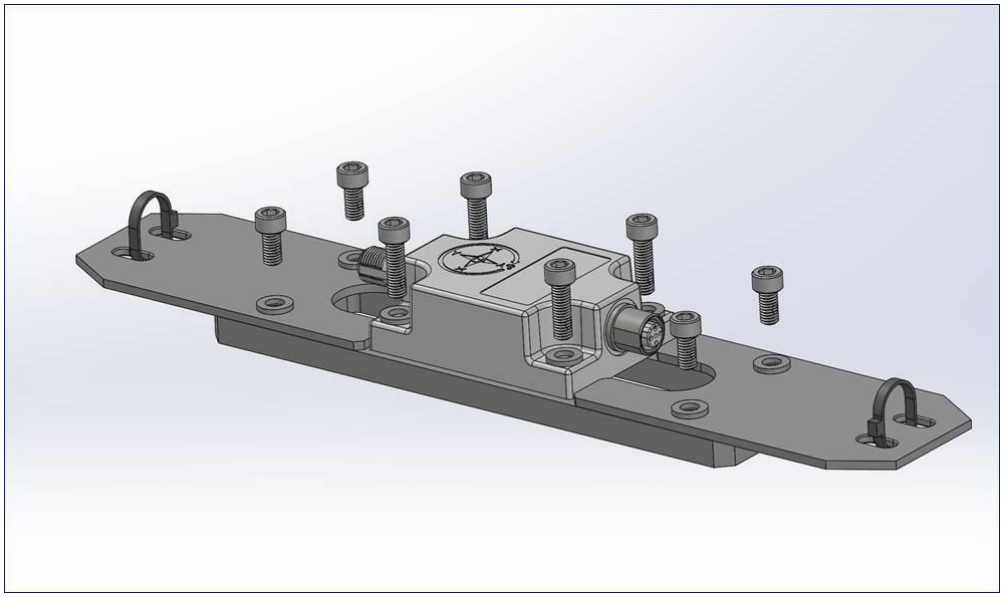

Figure 2-3: Base Bracket Screws

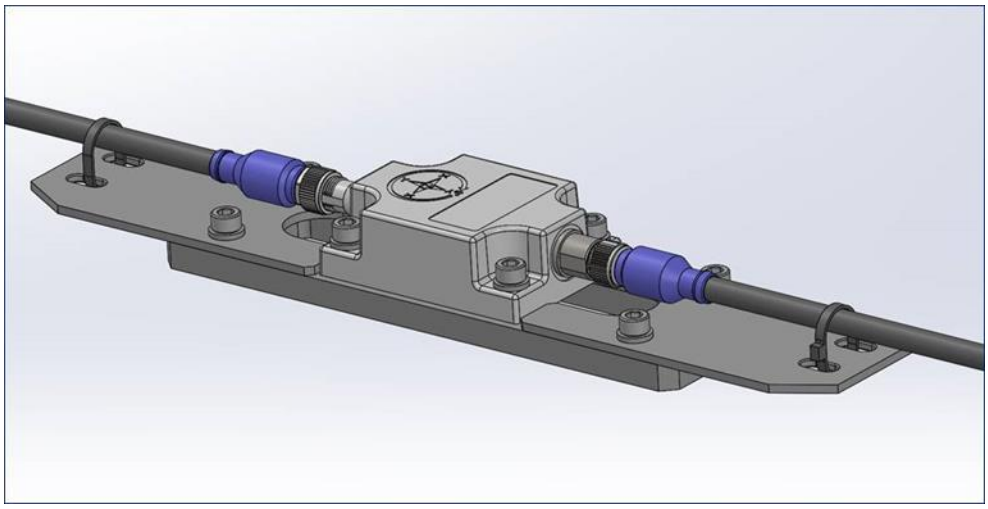

Figure: 2-4: Bracket

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GMS-1 Sensor Installation, Continued

Brackets, continued

One strain relief plate and one spacer (P/N: 602-1197-10) is included for the bucket. The spacer can be attached to the base bracket on the opposite side of the strain relief wing using the provided 14mm M6x1mm screws. See the following example.

A cover is added to the sensor bracket for protection.

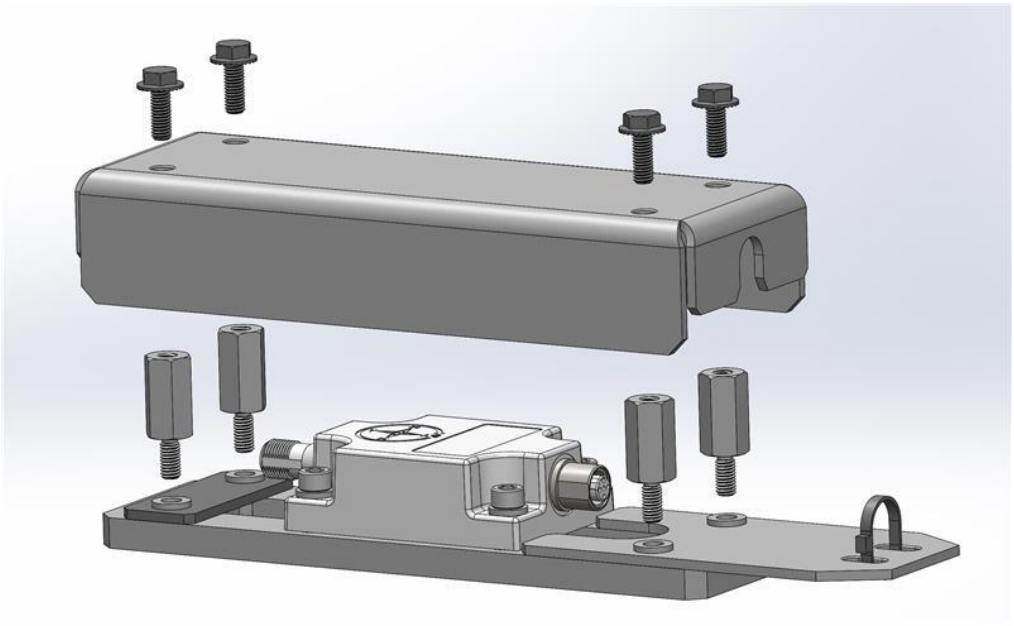

Figure 2-5: Strain Relief Plate and Spacer

Note: The standoffs in the installation are used only because a cover is placed (not bolted) over the installation.

For the chassis, use the M6 screws instead of the standoffs, and bolt (P/N: 602-1195-10) the cover onto the installation.

Continued on next page

GMS-1 Sensor Installation, Continued

Sensor Placement

Place the horizontal sensor on the chassis and level to the loader body. Place the label of the GMS-1 sensor either facing up or facing down.

The LED light can be placed facing left, right, forward, or backwards. Take care to square the sensor so the LED faces one of these locations.

The vertical sensor must be placed on the blade. Place the label facing forward (toward the front of the machine) or backward (toward the cab).

The LED light can be placed to face up, down, left, or right. The base bracket should be welded onto the blade and the cover placed over the sensor. The coil cable is connected to this sensor. It is best to place the LED where you can see it, since it can be used for diagnostics. The LED should remain green if everything is configured and working correctly. Red indicates an error.

Figure 2-6: Horizontal Sensor and Chassis

Continued on next page

GMS-1 Sensor Installation, Continued

Install sensors

To install the sensors, start at the bucket of the loader. Start at the bucket and work back towards the chassis because surplus cable is easier to protect at the chassis.

Weld the bucket sensor on the back of the bucket in a protected place to minimize material rollover damage. The bracket has two square holes in it to allow for welding.

Figure 2-7: Bucket Sensor Mount

Mount the sensor with the LED facing forward. The kit comes with two 3-meter (10 feet) CAN cables and three 5-meter (16 feet) CAN cables. Use the shortest cable that will allow you to safely route the cable to the boom. It is best to use the shortest cable near the bucket to avoid excess cable near the bucket. Add the strain relief plate and standoffs per Figure 2-5 and bolt the cover on.

Continued on next page

GMS-1 Sensor Installation, Continued

Install sensors, continued

The below photo shows a bucket sensor with the cover with the cable mounted with strain relief. The CAN cable is also run through hydraulic hose for additional protection.

Figure 2-8: Bucket Sensor

Continued on next page

GMS-1 Sensor Installation, Continued

Install sensors, continued

Next, mount the boom sensor. The boom sensor can be mounted on the inside of the boom to better protect it, as shown below. Cable loom can be added for better protection of the cables. The boom sensor is mounted where possible in a parallel alignment to a line between the boom and bucket pins. The LED is facing forward. The strain relief plates allow you to firmly attach the CAN cables to the brackets for protection.

Figure 2-9: Boom sensor installed on the inside of the boom

Continued on next page

GMS-1 Sensor Installation, Continued

Install sensors, continued

The chassis sensor needs to be installed horizontally on the chassis. The chassis articulates. **It is important to install the chassis sensor on the same side as the GNSS antennas.**

In the example below, the wheel loader articulates around the red line.

Continued on next page

GMS-1 Sensor Installation, Continued

Install sensors, continued

The GNSS antenna is on top of the cab, and so it's important that the chassis sensor be installed on that side of the red line (the cab side).

In the example below, the chassis sensor is shown installed on the cab side of the articulation point, on the same side as the VR500.

If you are installing this system onto an articulating loader, please see the section on installing the rotary encoder. Otherwise, the chassis sensor will connect to the IronTwo cable (see Figure 2-11).

Rotary Encoder Installation

Installing the encoder

For an articulating wheel loader, it is necessary to know the angle of the articulation point. To do this, install an encoder over the articulating point.

Figure 2-10: Articulation Point

It is important that the encoder is directly over the pivot point. If the encoder is not directly over the articulation point, there will be a horizontal shift on the encoder bracket when the machine articulates.

Continued on next page

Rotary Encoder Installation, Continued

Installing the encoder, continued**Installing the encoder**

Figure 2-11: Articulation Point

The encoder comes with a divot in the bracket to help you center it over the pivot point.

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Rotary Encoder Installation, Continued

Installing the encoder, continued

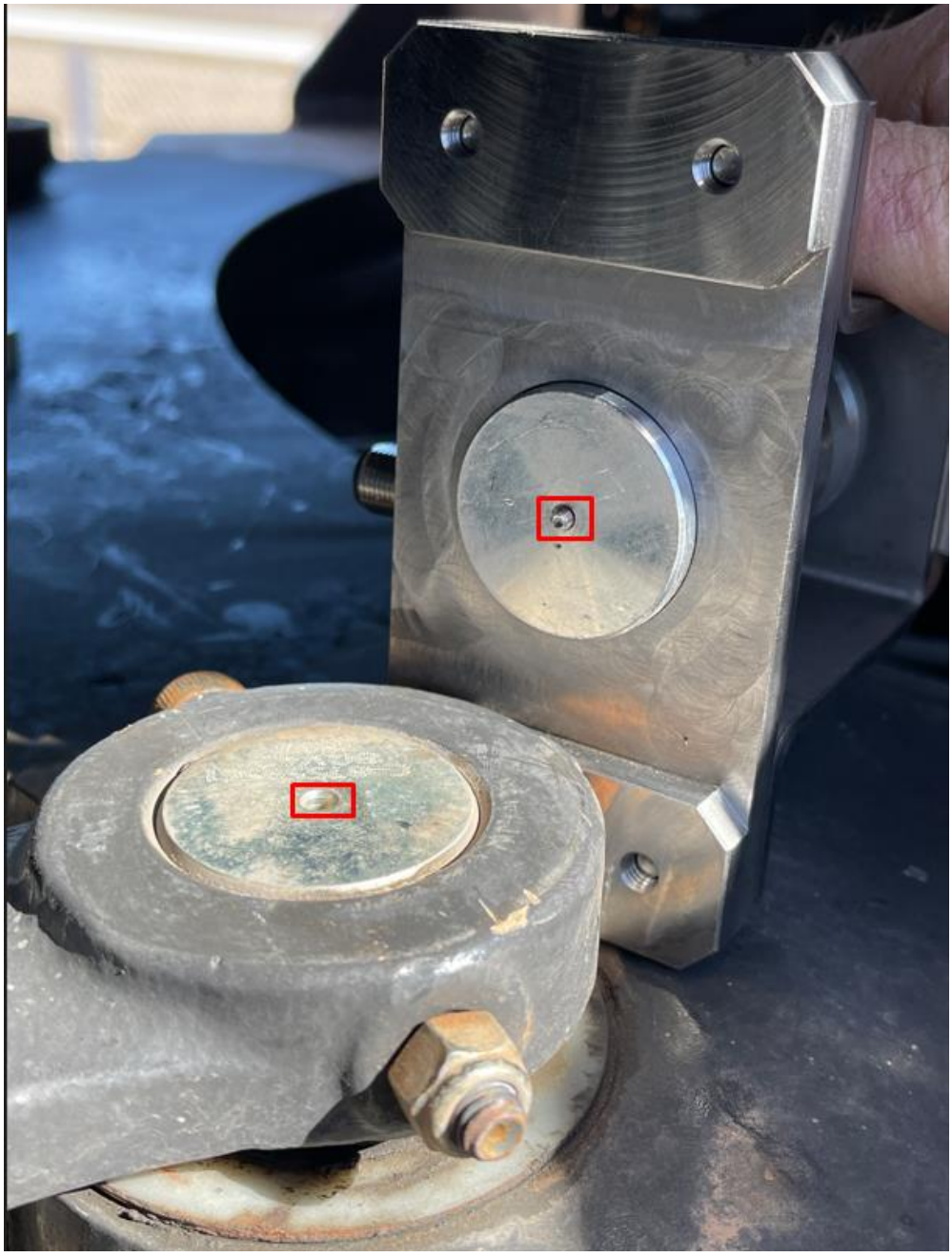

Figure 2-12: Pivot Point

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Rotary Encoder Installation, Continued

Installing the encoder, continued

The guide pin can be removed after welding the base.

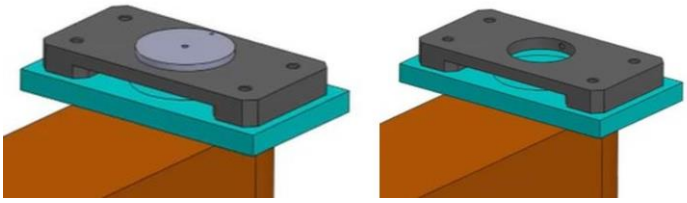

Figure 2-13: Guide Pin

Next, the bracket can be welded to the machine. It is possible that spacers may be needed to add depth to the base of the bracket.

Continued on next page

Rotary Encoder Installation, Continued

Installing the encoder, continued

Figure 2-14: Encoder with Bracket

A base is provided that can be welded to the machine. You can screw in the rod.

Continued on next page

Rotary Encoder Installation, Continued

Installing the encoder, continued

Figure 2-15: Encoder Shaft

Chapter 3: Installing the VR500 Antenna

Overview

Introduction

Chapter 3 contains the information you need to install the VR500 antenna to your GradeMetrix loader system.

Contents

Install the VR500 Antenna

Install the VR500 antenna

Install the VR500 on the roof of the cab.

The VR500 antenna may be installed parallel or perpendicular to the centerline of the machine.

If installing the VR500 perpendicular to the centerline of the machine, place the primary antenna on the left-hand side of the machine and secondary on the right-hand side.

If installing the VR500 parallel to the centerline, install the primary antenna in the back and install the secondary antenna in front.

Continued on next page

Install the VR500 Antenna, Continued

Install the VR500 antenna, continued

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Install the VR500 Antenna, Continued

Steps to install the VR500 antenna

To install the VR500 antenna, follow the steps as detailed in Table 3-1.

Table 3-1: Install VR500 Antenna

Step	Action
1	Install the VR500 antenna onto the mounting bracket.
2	If welding to a surface plate, (Weld Plate Kit P/N: 710-0158-10), square it center and close to the centerline of cab.
3	If using magnetic mounting (Mag Mount Kit P/N: 710-0157-10), remove the bottom plate and install the magnets directly on the cross bars. **IMPORTANT: If the antenna mount moves or the antenna location is changed, the calibration and measure-up must be repeated, or the machine accuracy will be inaccurate. We recommend permanently marking the exact location for future reference.**
4	Figure 3-1 shows the VR500 mounting brackets. If you are using a weld-on mount, use the bottom plate. Do not use the bottom plate if you are using the magnetic mount. **Table 3-1: Permanent mount (P/N: 710-0157-10)**

Part Number	Description
602-1186-10	BRACKET, VR500 MC MOUNT
602-1185-10	PLATE, WELDED, VR500 MC MOUNT
681-1076-10	PLUG, LDPE, FOR 23.4mm DIA HOLE
675-1342-10	SCR, BUTTON HEAD, HEX, M8X1.25, 20MM, SS
678-1146-10	WSHR, FLT, 0.344" ID, 0.75" OD, SS 18-8
678-1145-10	WSHR, LCK, 8.5mm ID, 14.8mm OD, SS.18-8

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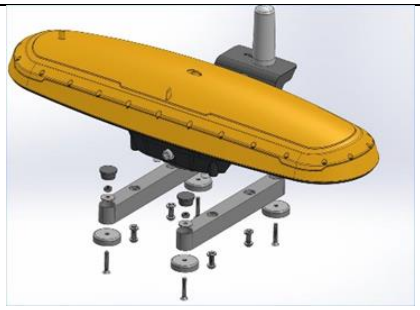
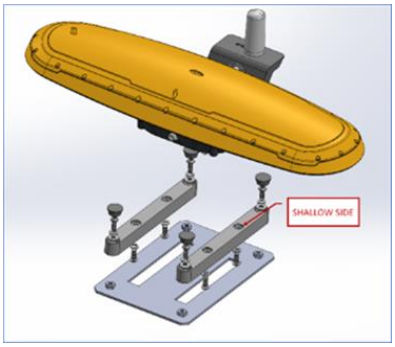
Install the VR500 Antenna, Continued

Steps to install the VR500 antenna, continued

Table 3-1: Install VR500 antenna (continued)

Step	Action
4 (cont.)	  **Figure 3-1: VR500 mounting brackets** **Table 3-2: Magnet Mount: (P/N: 710-0158-10)**

Part Number	Description
602-1186-10	BRACKET, VR500 MC MOUNT
681-1076-10	PLUG, LDPE, FOR 23.4mm DIA HOLE
675-1342-10	SCR, BUTTON HEAD, HEX, M8X1.25, 20MM, SS
678-1145-10	WSHR, LCK, 8.5mm ID, 14.8mm OD, SS.18-8
478-0020-10	MAGNET, BASE, ENCASED, NEODYMIUM, 1.75"OD, .375"THK

5	Apply cable wrap on the cable (cable P/N: 051-0406-10) where the cable may be exposed to chaffing, rubbing, or high heat to extend the cable life.

Continued on next page

Install the VR500 Antenna, Continued

Running Cables

The IronTwo has a bulkhead cable that runs from the IronTwo to an M12 male CAN connector and 6-pin Deutsch connector (See Appendix D Cable Pin-Outs for more information).

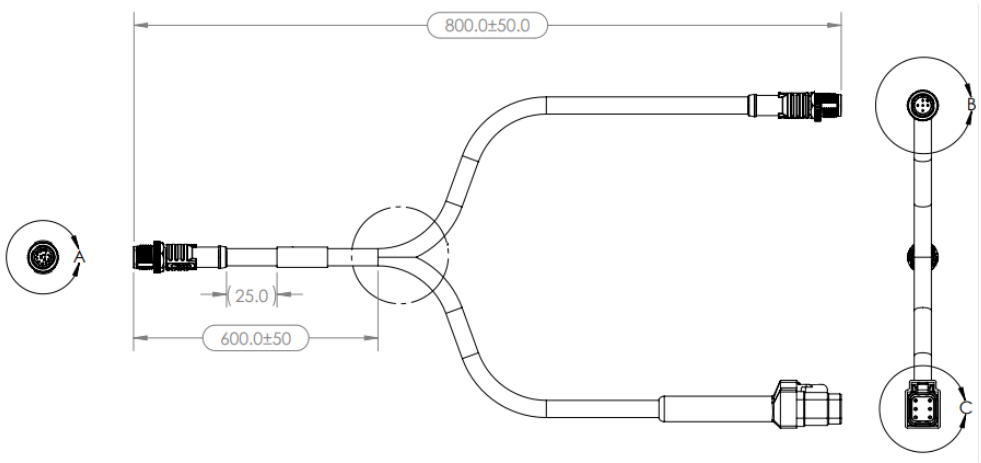


Figure 3-2: IronTwo J3 Connector

Continued on next page

Chapter 4: IronTwo

Overview

Introduction

Chapter 4 contains installation information for the IronTwo display.

Contents

IronTwo Display Installation

Install the IronTwo

The GradeMetrix® Loader Installation Kit comes with the following components:

1. IronTwo (P/N: 752-0040-10 or 752-0040-20)
2. IronTwo Power Cable (P/N:050-0022-01 + P/N: 050-0046-01)
3. IronTwo U-Mount Kit (P/N: 710-0149-10)

IronTwo Flush Mount Kit (P/N: 710-0148-10)

To install the components, you must have:

1. Philips Screwdriver
2. Nut driver

Continued on next page

IronTwo Display Installation, Continued

Install the IronTwo, continued

The IronTwo control panel console and mounting assembly (RAM mount included in the GradeMetrix® Loader Installation Kit) should be installed inside of the cab in a location the gives the operator a clear view.

There are several options for mounting the IronTwo control box. Regardless of which option is used, the first step is to screw the provided RAM ball (from either of the above kits) to the back of the IronTwo, as shown below:

Figure 4-1: IronTwo back view

Continued on next page

IronTwo Display Installation, Continued

Install the IronTwo, continued

Regardless of which mounting method is used, you can put the adjustable arm on the RAM ball.

Figure 4-2: Adjustable arm

IronTwo Display Installation, Continued

Install the IronTwo, continued

Follow these steps to install the IronTwo control box to your machine:

Table 4-1: Install IronTwo control box

Step	Action
1	Attach the 1.5” RAM ball to the rear of the IronTwo using the included bolts.
2	Install the 1.5” RAM base mount to an unobstructed location in the cab for console mounting. **Note:** The RAM swivel mount can be used to adjust the location and viewing angle of the console.
3	Using the IronTwo U-Mount Kit (P/N: 710-0149-10), mount the IronTwo to the window rails at the right-side of machine cab.
4	Ensure adequate cable slack is provided, so the IronTwo can swivel on the RAM mount without putting stress on the cables.

The IronTwo power cable runs power to the console.

IMPORTANT!
The main power cable (P/N: 050-0022-01, P/N: 050-0046-01 connected) leads should be installed to system power (9-36 +VDC and chassis ground).

Do NOT ground to the negative terminal of the battery; always ground to the machine chassis.

IronTwo Display Installation, Continued

IronTwo cable schematic

The IronTwo power cable comes with an ignition wire (orange wire) that can be connected to switch power. If connected to switch power, the IronTwo will automatically be turned on after receiving power. If you do not want to use switch power, connect the ignition to constant power.

The IronTwo bulkhead adapter cable harness (P/N: 051-0426-10) must be installed and routed along the interior side of the cab. Install harness cables away from sharp edges and other areas that could damage cables. The cable provides the following connections for the installation:

- **Serial (1)** – 6-pin Deutsch Connector -Connects to the GNSS receiver.
- **CAN (1**) – M12 Connector -Connects to CAN axial sensors for monitoring boom, stick, and bucket movement.

Note: When installing cables, ensure you leave enough slack behind the IronTwo so the display screen may be moved in any direction and will not place any stress on the cabling.

The diagrams below show the cable schematics for P/N: 051-0426-10. The J1 connector plugs into the IronTwo. The J2 connector connects a CAN cable. The J3 connector connects to the VR500 cable.

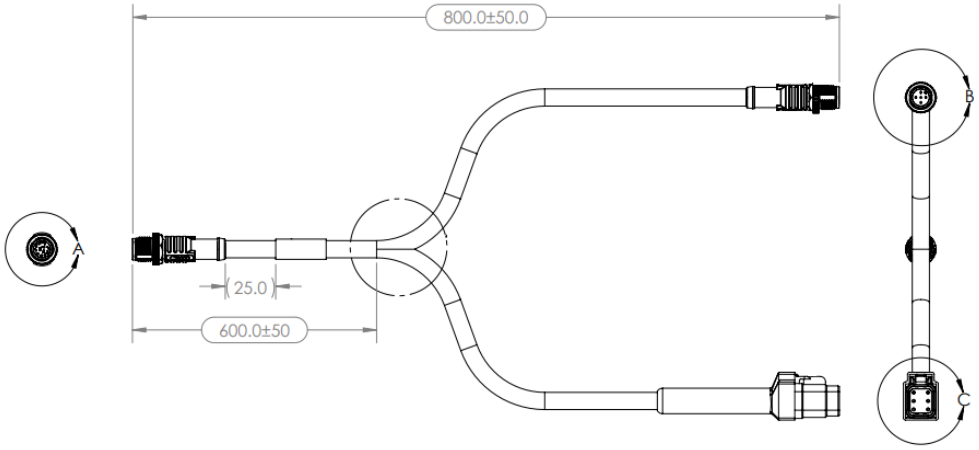


Figure 4-3: Cable schematic for P/N: 051-0426-10 (IronTwo)

Chapter 5: GradeMetrix® System

Overview

Introduction

This chapter provides information necessary to use the GradeMetrix® System to measure and setup your equipment.

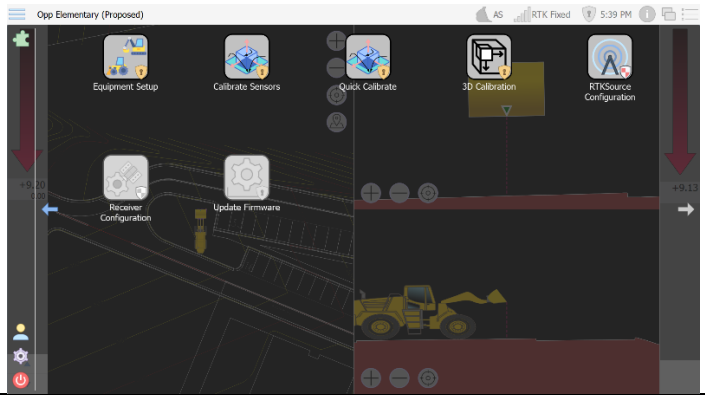
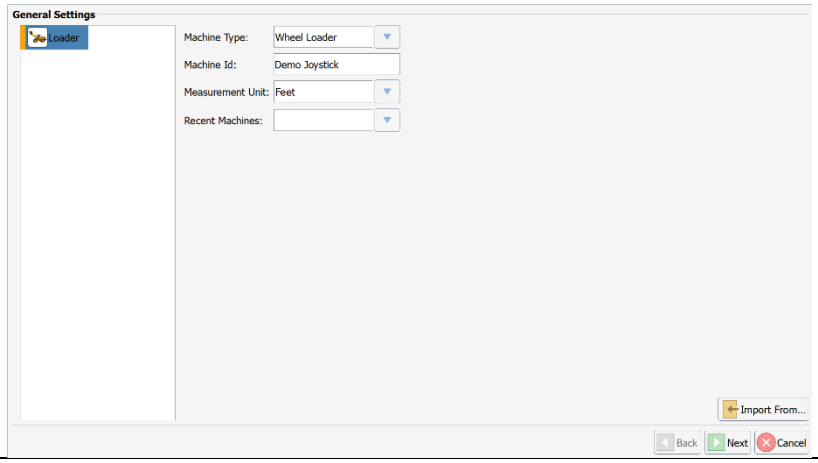
Contents

Measure and Set Up Equipment

Steps to measure and set up equipment

To measure and setup your equipment, follow the steps as detailed in Table 5-1: Measure and Set Up Equipment. Make sure that you're logged in as an **Administrator.**

Table 5-1: Measure and Set Up Equipment

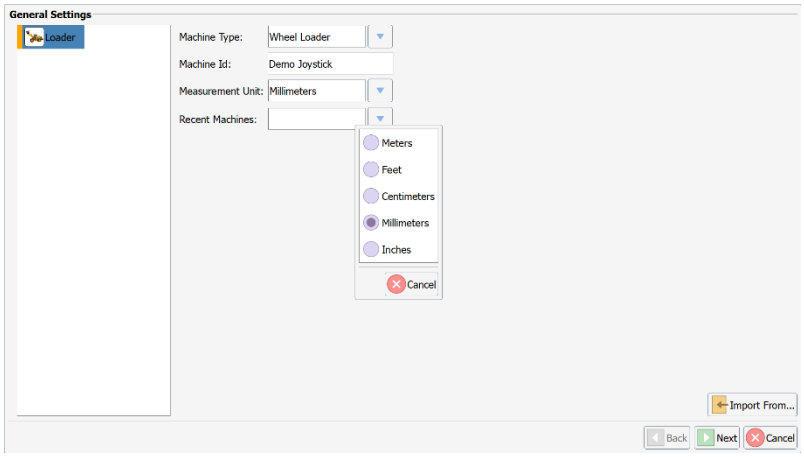
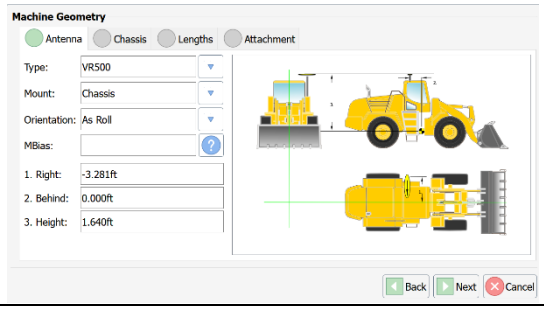
Step	Action
1	Select **Equipment Setup**. 
2	Select **Loader** in the **General Settings** screen. 

Continued on next page

Measure and Set Up Equipment, Continued

Steps to measure and set up equipment, continued

Table 5-1: Measure and Set Up Equipment (continued)

Step	Action
3	Assign a **Machine ID**. **Note:** Your Machine ID should be a unique identifier that will identify this specific machine to your company.
4	Select the unit of measure. Click **NEXT**. 
5	Follow the screen directions for measuring the machine. Locate the four tabs across the top below **Machine Geometry** for machine measure configuration. • **Antenna** - Antenna location • **Chassis** - Body size/graphical representation in run screen • **Lengths** – Boom dimensions & boom pin location • **Attachment** - Bucket configuration 

Configure Machine Measure

Configure Machine Measure

To configure your machine measure, follow the steps as detailed in Table 5-2.

Table 5-2: Configure machine measure

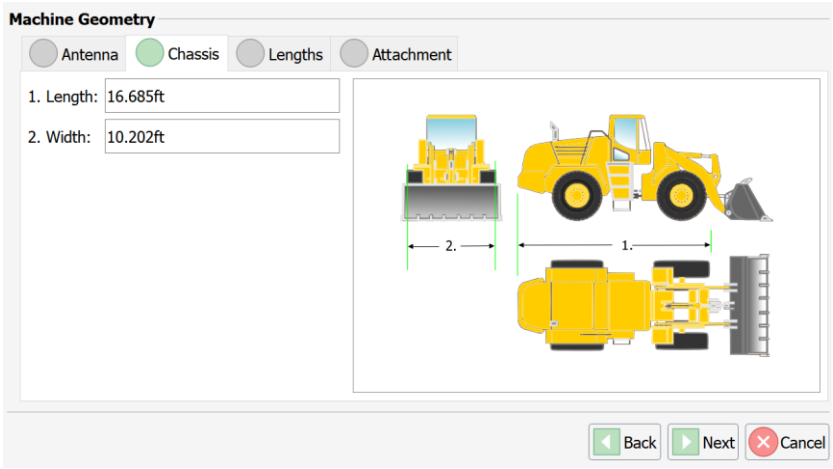
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>On the Antenna tab, select the type of antenna and receiver you are using. For loader installations, select the VR500 receiver.
<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Type</td><td>Select VR500.</td></tr>
<tr><td>Mount</td><td>Select Chassis.</td></tr>
<tr><td>Pitch orientation</td><td>The VR500 orientation is parallel with the machine’s tracks and the arrow points in the direction of forward travel.</td></tr>
<tr><td>Roll orientation</td><td>Roll orientation is perpendicular to the machine’s tracks with the arrow pointing to the right side of machine.</td></tr>
<tr><td>MBias</td><td>This value will automatically be calculated during the 3D calibration and does not need to be manually typed in. MBias is the angular offset between the VR500’s heading and the machine’s heading. If the machine is facing due north (0 degrees) and the VR500 reads 5 degrees, the MBias is 5 degrees.</td></tr>
<tr><td>Right</td><td>This value is the distance of the primary antenna from the centerline of the machine. If the primary antenna is to the left of the centerline, this value is negative. Note: You do not need to enter this value. It will be calculated automatically during the 3D calibration.</td></tr>
</table>
</td></tr>
</table>

Continued on next page

Configure Machine Measure, Continued

Configure Machine Measure, continued

Table 5-2: Configure machine measure (continued)

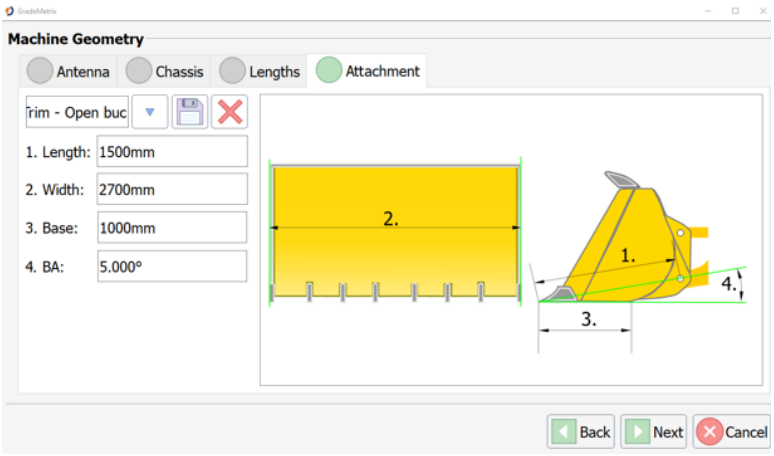
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1 (cont.)</td><td>
<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Behind</td><td>This value is the distance from the primary antenna to the blade. Note: You do not need to enter this value. It will be calculated automatically during the 3D calibration.</td></tr>
<tr><td>Height</td><td>This value is the height of the antenna above the tracks (measured to the lip of the VR500). Note: You do not need to enter this value. It will be calculated automatically during the 3D calibration.</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Click the Chassis tab. Type the body length and width per the diagram below. These values can be approximate, as they are only used for graphics.
 
</td></tr>
</table>

Continued on next page

Configure Machine Measure, Continued

Configure Machine Measure, continued

Table 5-2: Configure machine measure (continued)

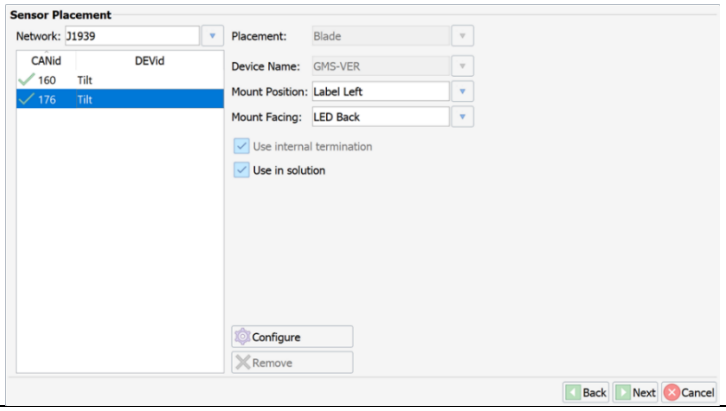
Step	Action
3	Click the **Attachment** tab. Type buckets length and width. The base is measured from the buckets deepest point to teeth/blade edge. The BA (base angle) will populate from the calibration menu. 

Configure Machine Measure

Configure Machine Measure

After clicking **Next** in the screen above, you will see the **Sensor Placement** screen.

Table 5-3: Set up sensor

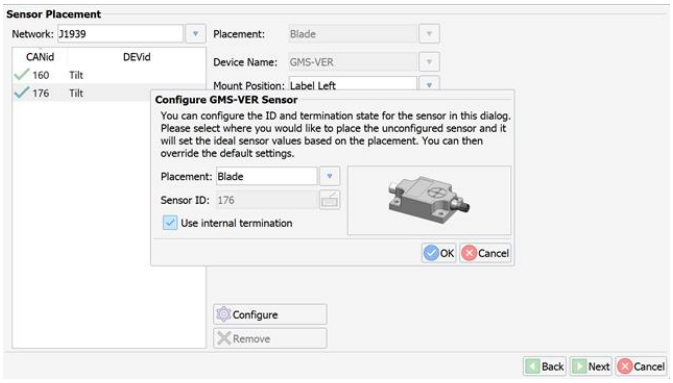
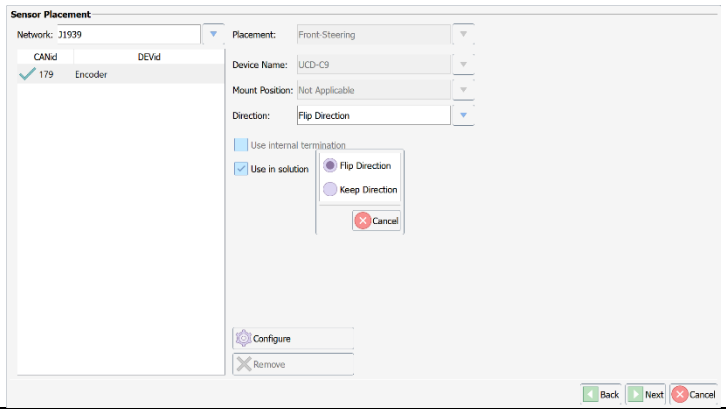
Step	Action
1	Click **Sensor Network**. Set **Network** to **J1939**. 

Continued on next page

Configure Machine Measure, Continued

Configure Machine Measure, continued

Table 5-3: Set up sensor (continued)

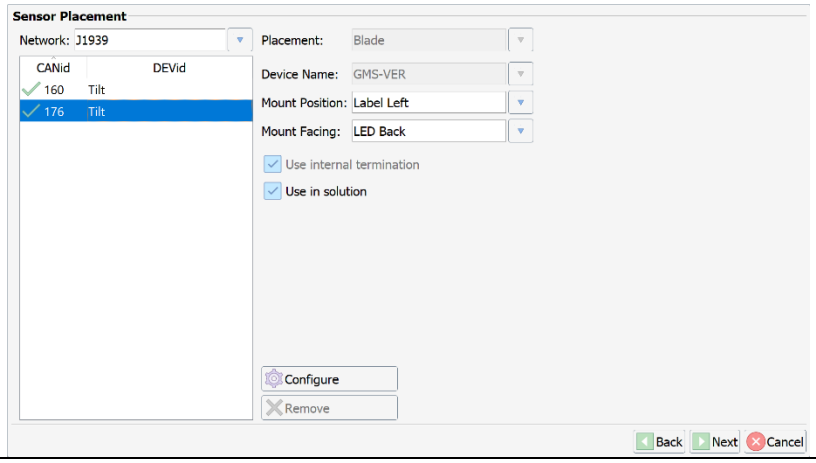
Step	Action
2	Each sensor is unconfigured. Click the sensor name and click **Configure**. A dialogue window displays. Click the dropdown box next to **Placement**. If the sensor is on the bucket, select **Bucket**. If the sensor is on the chassis, select **Chassis**. For the bucket sensor, check **Use internal termination**. Click **OK**.  You will need 4 sensors: chassis, front-steering, boom, and bucket. If a rotary encoder was installed, the rotary encoder sensor will be shown and you will need to set **Direction**. If you mount the encoder upside down, select **Flip Direction**. 

Continued on next page

Configure Machine Measure, Continued

Configure Machine Measure, continued

Table 5-3: Set up sensor (continued)

Step	Action
3	Set up the orientation of the sensor. **Mount Position** refers to the direction of the label. For the chassis sensor: **If ... / Then ...** the label is facing up → Set to **Label Up** the label is facing down → Set to **Label Down** For the blade sensor: **If ... / Then ...** the label is facing forward → Set to **Label Forward** The label is facing toward the cab → Set to **Label Back** 

Continued on next page

Configure Machine Measure, Continued

Configure Machine Measure, continued

Table 5-3: Set up sensor (continued)

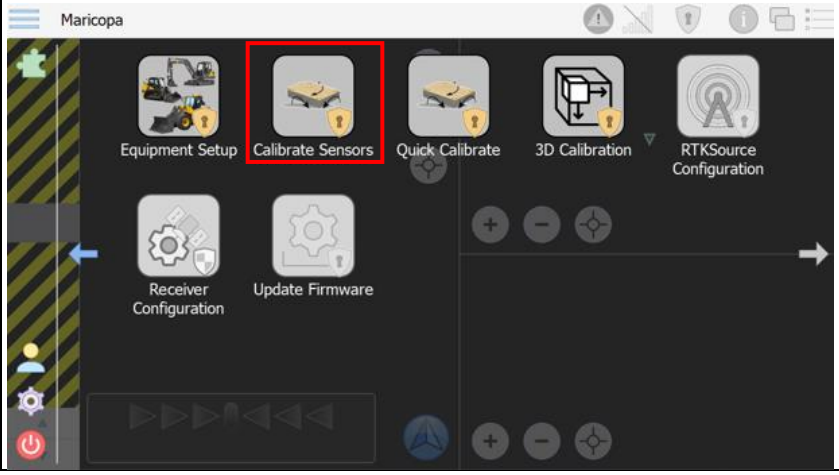
Step	Action
4	If **Mount Facing** is selected, a pull-down screen display. You can select from the listed options for the bucket sensor's arrow orientation.
5	Click **FINISH**.

Calibrate System

Calibrate system

To calibrate the system, follow the steps as detailed in Table 5-4: Calibrate System. The loader should be outside with a clear view of the sky and no obstructions. Use this method to calibrate all the sensors using GradeMetrix.

Table 5-4: Calibrate System

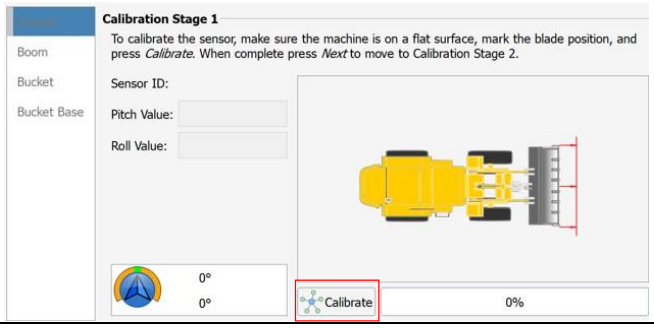
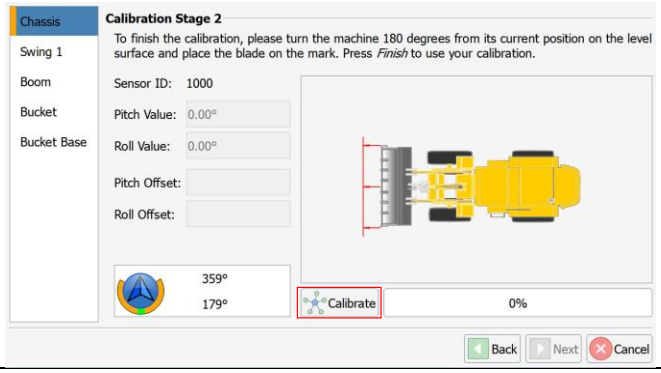
Step	Action
1	Click **Calibrate Sensors** and follow instructions. It is recommended to use a firm, flat surface during the calibration process. 

Continued on next page

Calibrate System, Continued

Calibrate system, continued

Table 5-4: Calibrate System (continued)

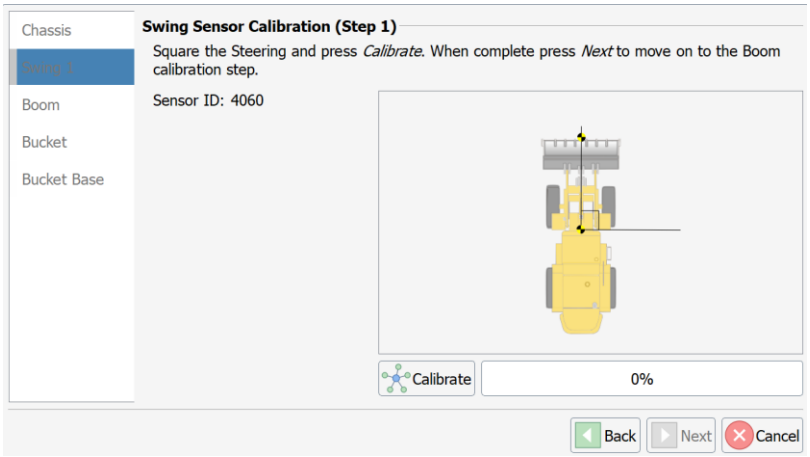
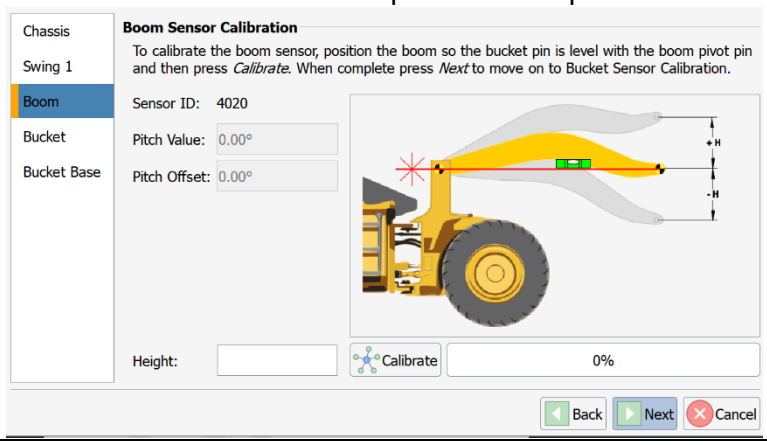
Step	Action
2	Follow the instructions on the screen. Locate a firm, flat level surface twice the length of the machine. Place the machine so the bucket sits in the middle as shown below. Place the bucket flat on the ground (with no weight on it or placed in 'float'). Mark both corners of the bucket. Select **Calibrate**. Click **Next**. 
3	Follow the instructions on the screen. Carefully lift the bucket so as to not damage the marks and track the machine to rotate 180 degrees and carefully place the bucket to align with the mark made at the last step Select **Calibrate**. Select **Finish**. 

Continued on next page

Calibrate System, Continued

Calibrate system, continued

Table 5-4: Calibrate System (continued)

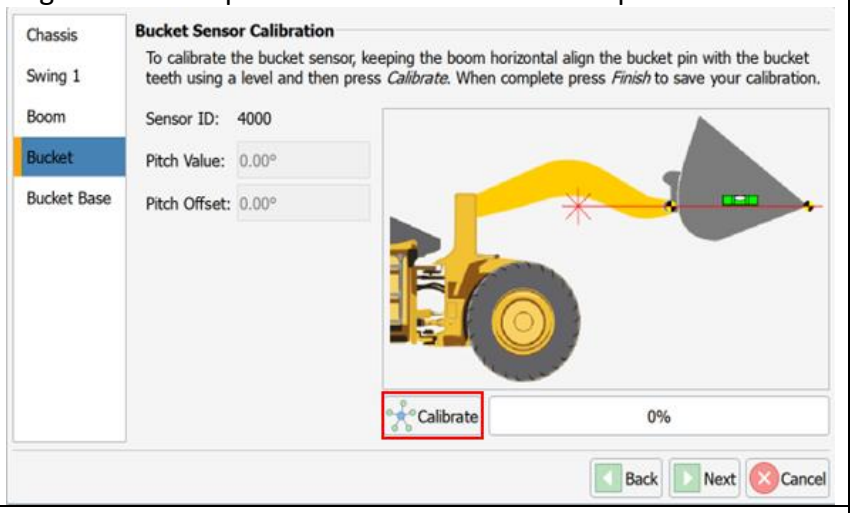
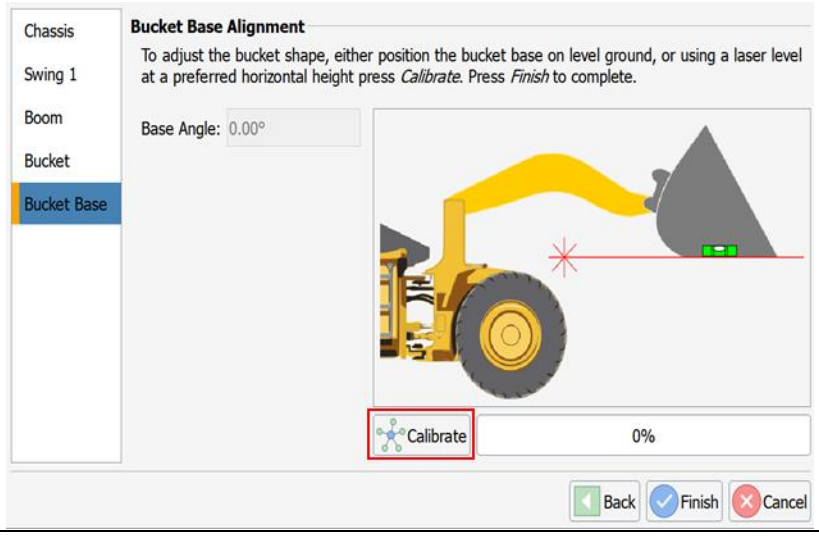
Step	Action
4	The follow the instructions on the screen. Square the articulation point. The azimuth of the bucket should be the same as the azimuth of the chassis. There should be no rotation of the boom or bucket. This determines the zero point of the rotary encoder. **Note:** if you do not have a rotary encoder installed, this step will not be shown. 
5	Use a string line, laser, total station, or any other available tool to level the boom. The boom pin to bucket pin must be level. 

Continued on next page

Calibrate System, Continued

Calibrate system, continued

Table 5-4: Calibrate System (continued)

Step	Action
6	Align the bucket pin with the bucket teeth and press **Calibrate**. 
7	Using a level, position the bottom of the bucket into a level plane and press **Calibrate**. Press **Finish** to complete. 

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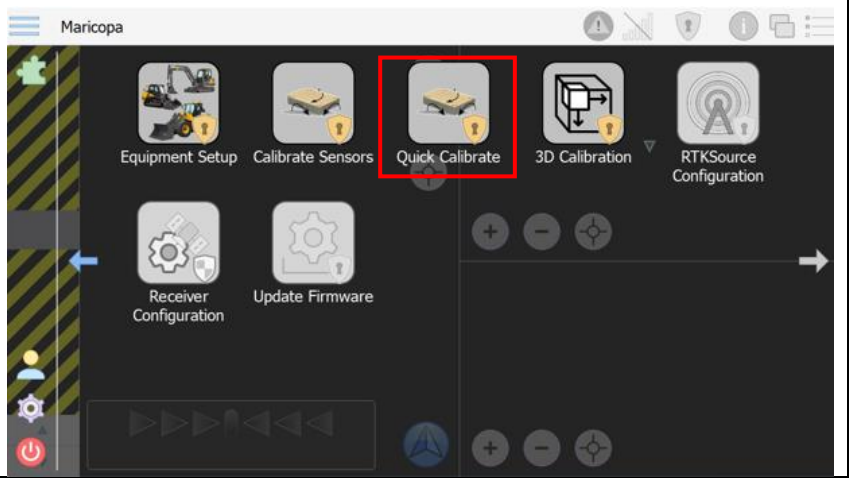
Quick Calibrate

Steps to quick calibrate

To quick calibrate the system, follow the steps as detailed in Table 5-5: Quick Calibrate.

Table 5-5: Quick Calibrate

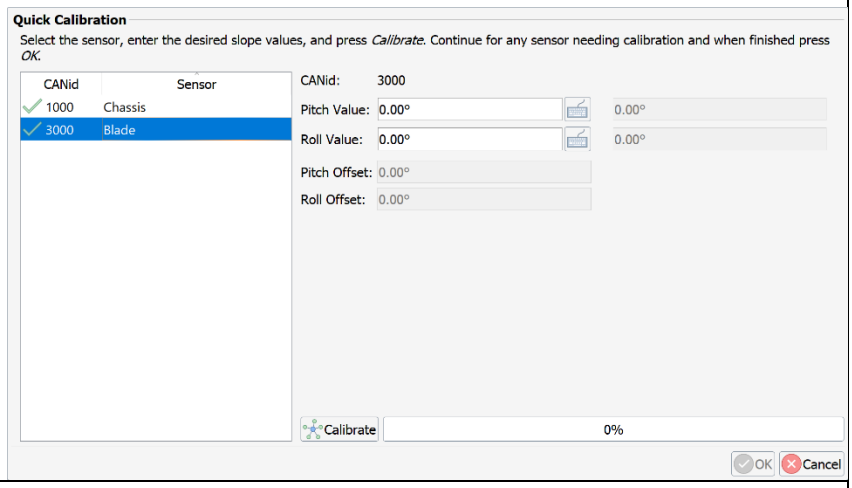
Step	Action
1	Click **Quick Calibrate**. This method is a direct setting of a single sensor and works well with a calibrated 'Smart Level' tool. 

Continued on next page

Quick Calibrate, Continued

Steps to quick calibrate, continued

Table 5-5: Quick Calibrate (continued)

Step	Action
2	Select the sensor to be calibrated. **Pitch/Roll** Place the Smart Level on a flat part of the machine running rear of the machine to the bucket. Enter the 'Smart Level' readings of the pitch. Place the Smart Level on a flat surface running across the machine i.e. door to door. Enter the roll values for the sensor. **Boom** Bring the boom to level from boom pin to bucket pin. (Use string line/laser/total station). Press **Calibrate**. **Bucket** Bring the bucket level from the bucket pin to the tip/teeth. . (Use string line/laser/total station). Press **Calibrate**. It's good idea is to complete this with the boom in its level calibrated position. 
3	Click **OK** when you are finished calibrating all the sensors.

3D Calibration

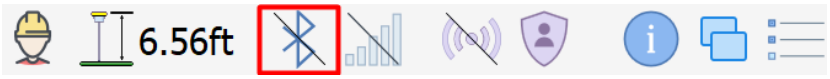
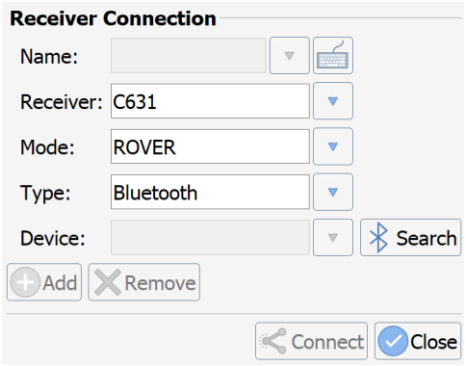
3D Calibration

Before proceeding with the 3D calibration, ensure the chassis and bucket sensors are calibrated. Face the machine **North**.

The VR500 on the loader and the C631 rover must be RTK Fixed. Make sure the C631, connected to SiteMetrix™ Grade, is running the same projection as GradeMetrix. To check if the C631 is in the same datum, set it next to the primary antenna of the VR500. Verify the readings are close between the two. If the projection is incorrect, the northing and easting will show obvious errors.

To calibrate a GradeMetrix® Loader, use SiteMetrix Grade.

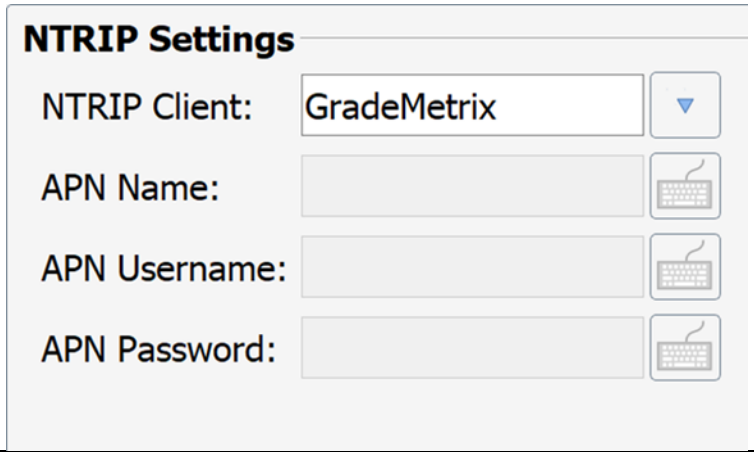
Table 5-6: SiteMetrix Grade Points

Step	Action
1	Click the **Bluetooth** icon on the top-right of the screen.  A dialogue window displays. Click **Search** to search for Bluetooth devices. 

Continued on next page

3D Calibration, continued

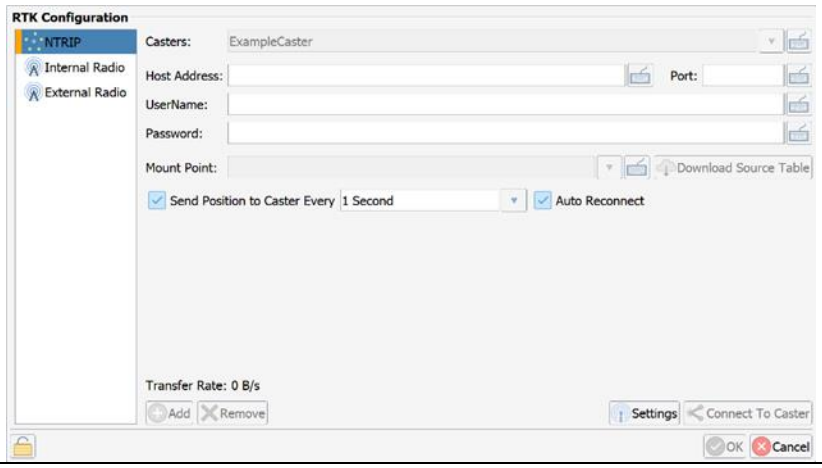
Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
2	Click **Search** to search for the receiver. The Bluetooth ID is the serial number. There is no Bluetooth pin. Set **Mode** to either **Rover**, **Base**, or **Static**. Under **Name**, use the option to name the C631 as “base” or “rover”, rather than using the serial number. Click **Connect**. After connecting to the rover, configure the RTK. Go to the menu, scroll to the right, and click **RTKSource**. SiteMetrix Grade can receive RTK over NTRIP and use the internal UHF radio or an external UHF radio.
3	If using NTRIP, you can use the data collector’s internet (if internal cellular modem or WiFi) or the C631’s internal GSM modem. To setup click **Settings**. 

Continued on next page

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
4	If the NTRIP Client is set to **GradeMetrix**, the data collector's internet will be used to access the NTRIP caster and the RTK messages will transfer back to the C631 via Bluetooth. If the NTRIP Client is set to **Receiver**, the C631's internal modem will be used. Type the **APN Name**, **Username**, and **Password**. Type a **Caster** name. You can add multiple NTRIP casters to SiteMetrix Grade (all saved in a database). Type the **IP address/DNS**, **Port**, **Username**, and **Password**. Click **Download Source Table**. 

Continued on next page

3D Calibration, Continued

3D Calibration, continued

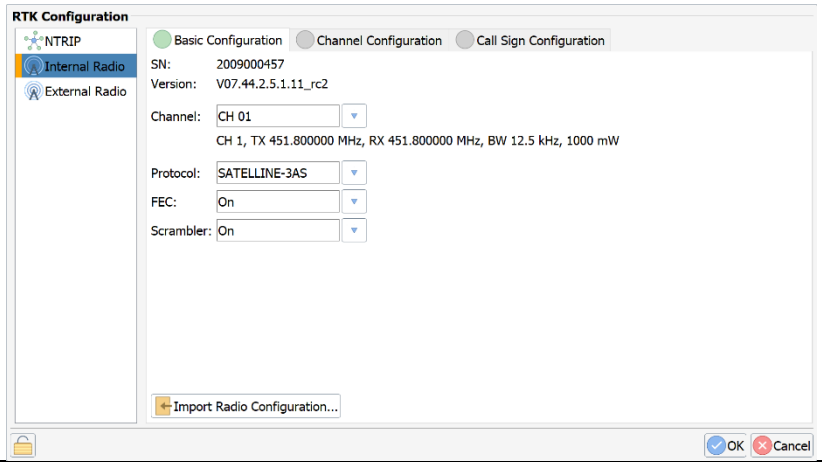
Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
5	Select the correct mount point. If using a VRS network (or the nearest base station), click **Send Position To Caster Every** and select an interval for your position to send to the caster. Click **Auto Reconnect** to ensure that the software reconnects to the NTRIP caster every time it opens or if internet is lost and re-gained. Click **OK**. **Note**: After clicking **OK**, the NTRIP client is the only source of RTK (even if the internal UHF radio is configured). If you wish to switch to a configured internal UHF radio, go to **RTKSource Configure**, click **Internal Radio**, and click **OK**.

Continued on next page

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

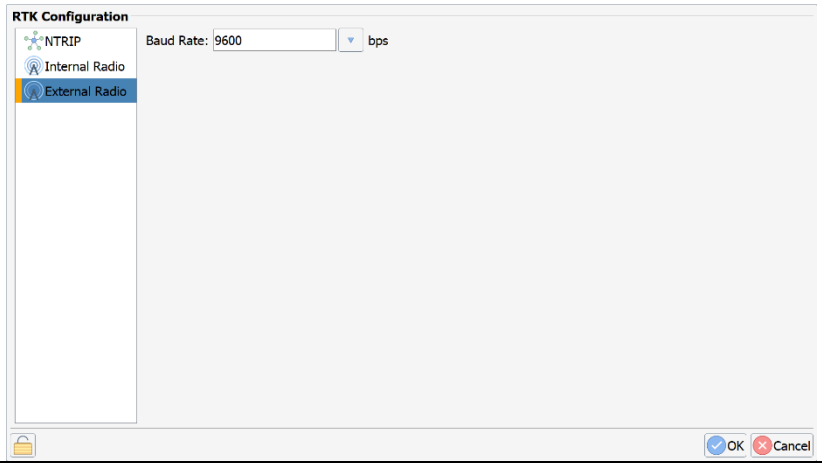
Step	Action
6	Alternatively, you can use the **Internal Radio**. Click the **Internal Radio** tab. If you have the correct administrative settings, you can enter channels using **Channel Configuration**. **Warning: You are responsible for verifying which frequencies and bandwidths can be set up for your region.** Select the **channel**, **protocol**, **FEC** (if applicable), and scrambling (if applicable). Click **OK**. **Note:** After you click **OK**, the internal UHF radio is the primary source of RTK (even if the NTRIP client is configured) the receiver will use the radio. If you wish to switch to a configured the NTRIP client, go to **RTKSource Configure**, click **NTRIP**, and click **OK**. 

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
7	Finally, you can select an **External Radio**. Click **External Radio**. SiteMetrix Grade does not support the configuration of an external radio, but you can set the baud rate of the serial port of the C631. On the bottom of the C631 are two Lemo connectors. One connector has 5 pins for an external radio, and the other has 7 pins. 
8	Verify the antenna height is correct. 

Continued on next page

3D Calibration, continued

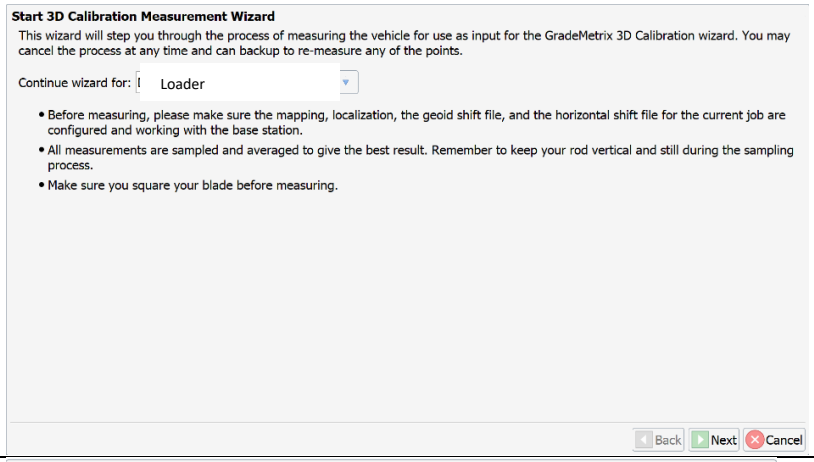
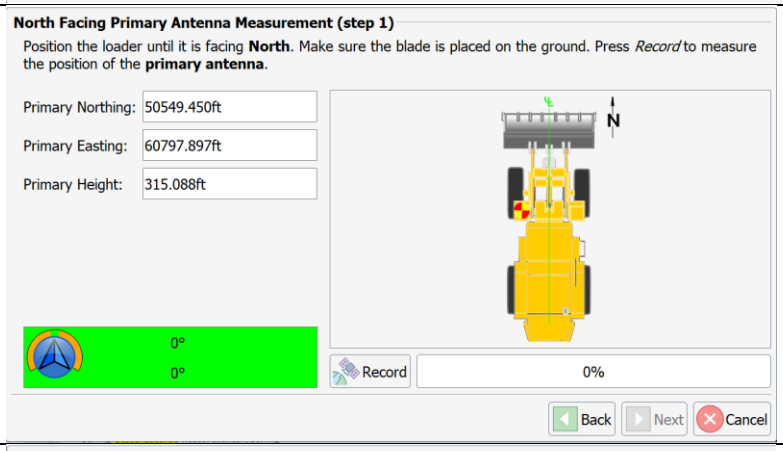
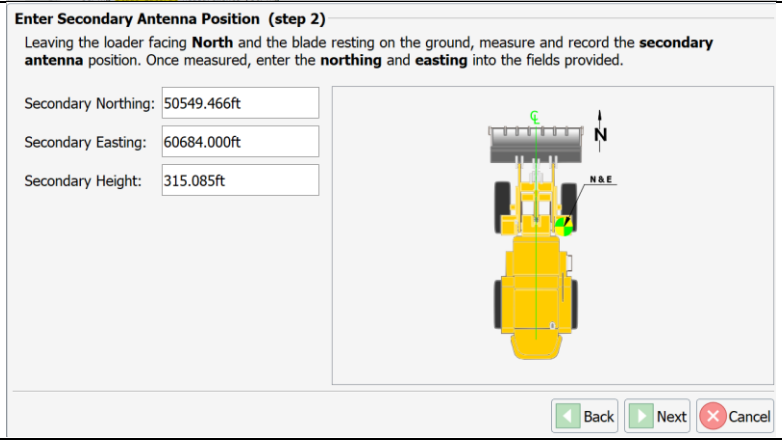
Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
9	Go to the main menu. Click **Calculations**. 
10	Click **Vehicle Calibration Wizard**. 

Continued on next page

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

Step	Action
11	Select **Loader**. 
12	
13	

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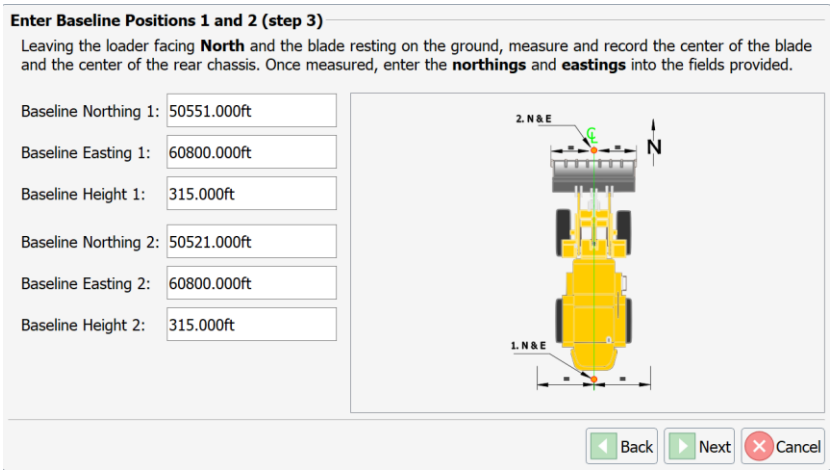
3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

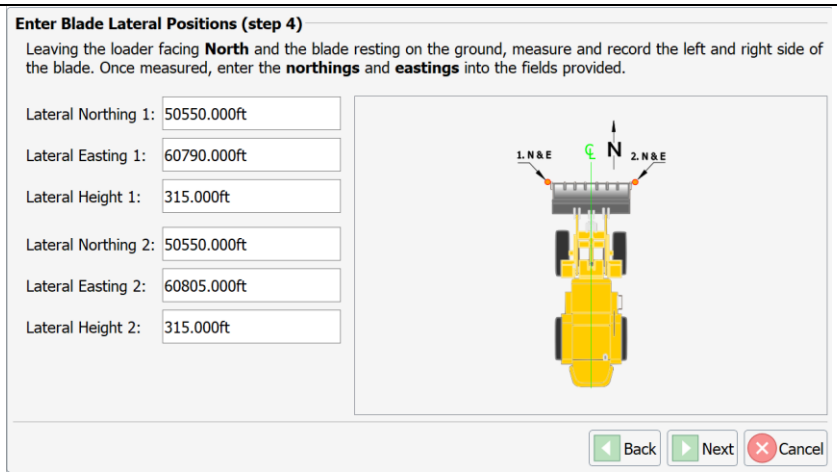
Step	Action
14	  

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

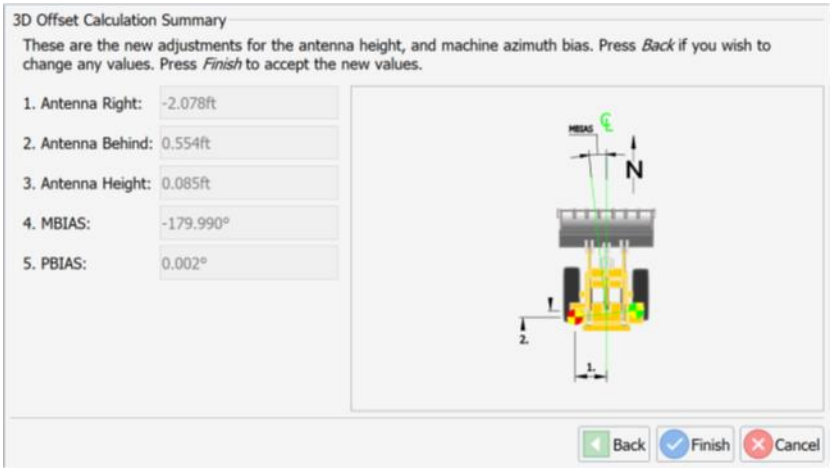
Step	Action
15	 The 3D Calibration Summary displays all of your primary antenna offsets. Click **Finish**.

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

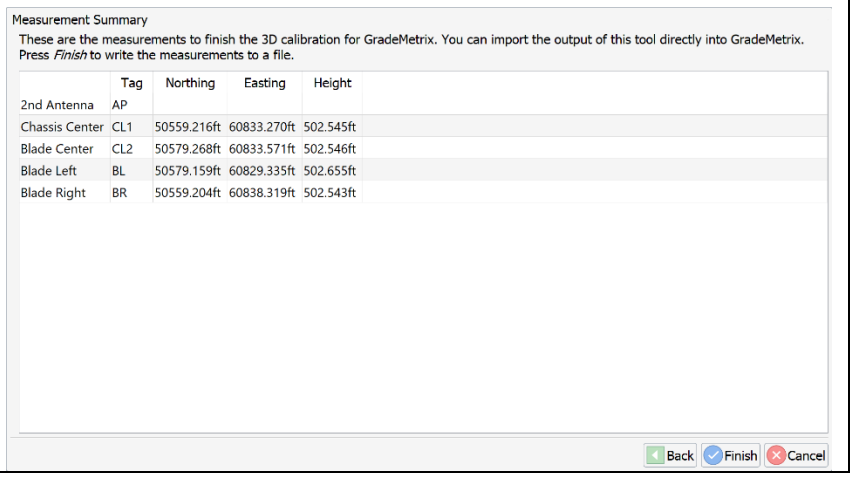
Step	Action
16	 

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

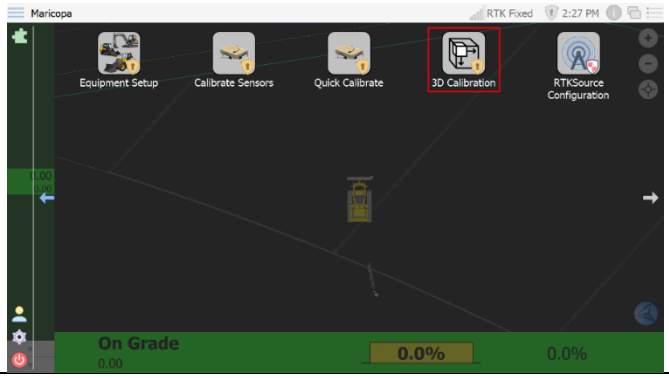
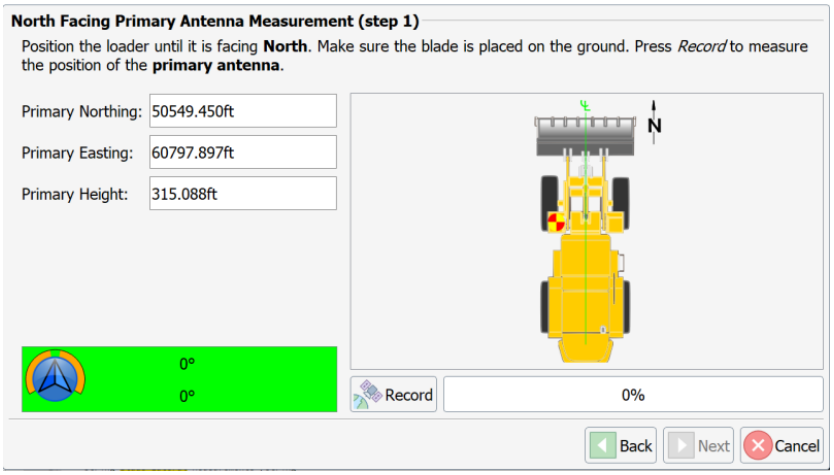
Step	Action
16	To save the file, insert a USB thumb drive to your HT20 tablet and save the file. 

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

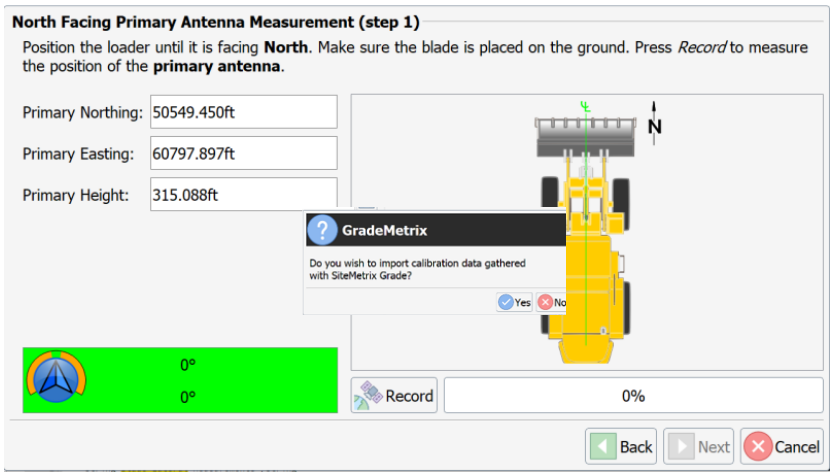
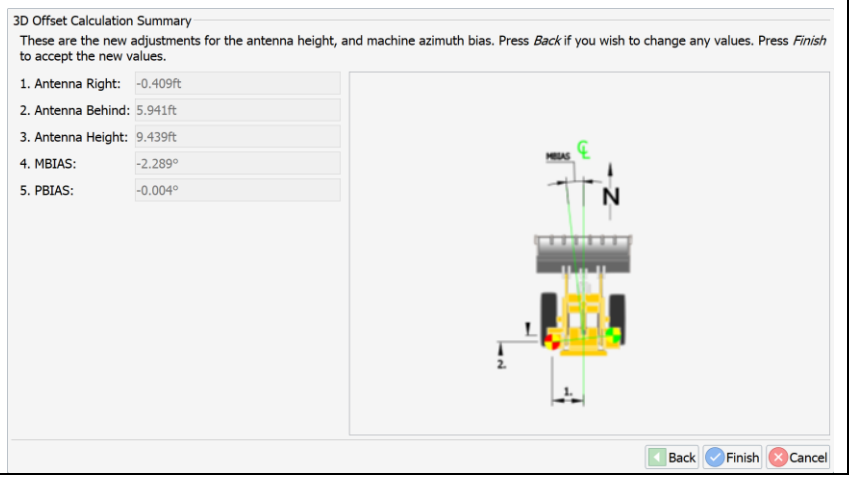
Step	Action
17	Return to the GradeMetrix® loader. Click the **3D Calibration** icon in GradeMetrix® Loader. 
18	Position the machine facing North and click **Record**. 

Continued on next page

3D Calibration, Continued

3D Calibration, continued

Table 5-6: SiteMetrix Grade Points (continued)

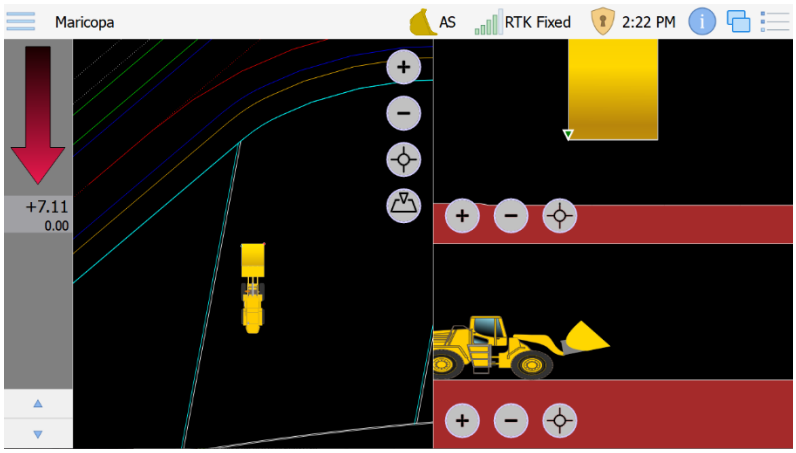
Step	Action
19	A prompt displays to load your file from SiteMetrix Grade. Click **Yes**. 
20	The 3D Calibration Summary displays all of your primary antenna offsets. Click **Finish**. 

Verify Machine Accuracy

Verify machine accuracy

To verify the accuracy of the machine, follow the steps as detailed in Table 5-7: Verify Machine Accuracy.

Table 5-7: Verify Machine Accuracy

Step	Action
1	From the main operational screen, select the “folder” icon in the upper-right corner of the screen. 

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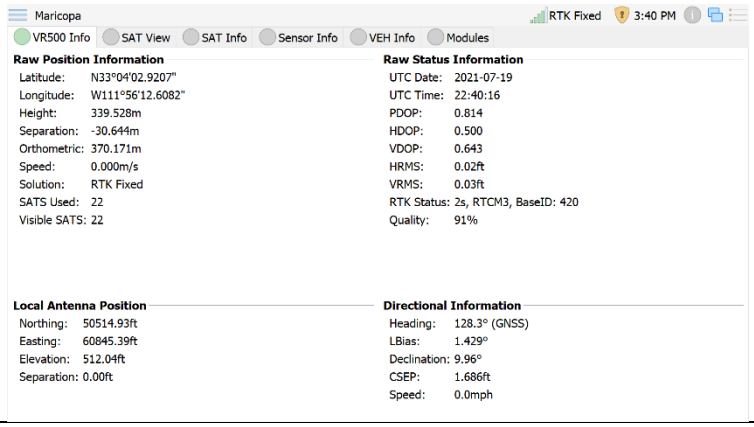
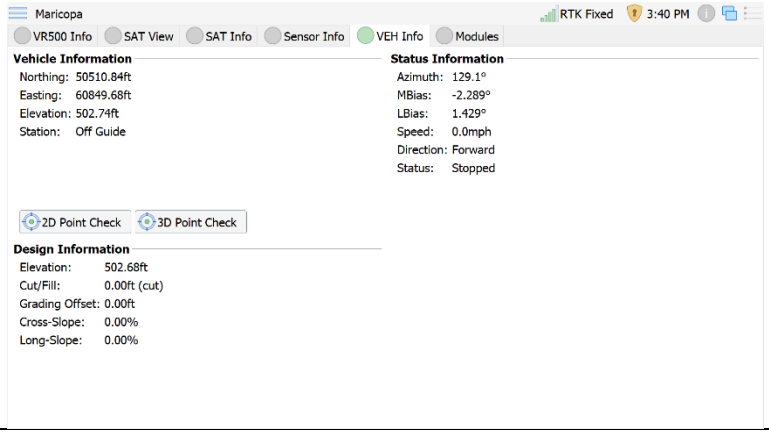
Verify Machine Accuracy, Continued

Verify machine accuracy, continued

Table 5-7: Verify Machine Accuracy (continued)

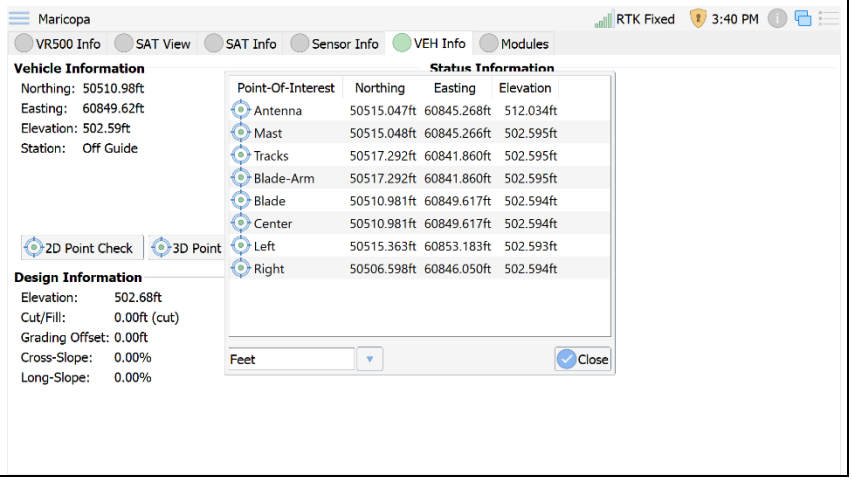
Step	Action
2	Verify you have an RTK Fixed solution before proceeding. 
3	Select the VEH (Vehicle) tab to verify the blade accuracy. 

Continued on next page

Verify Machine Accuracy, Continued

Verify machine accuracy, continued

Table 5-7: Verify Machine Accuracy (continued)

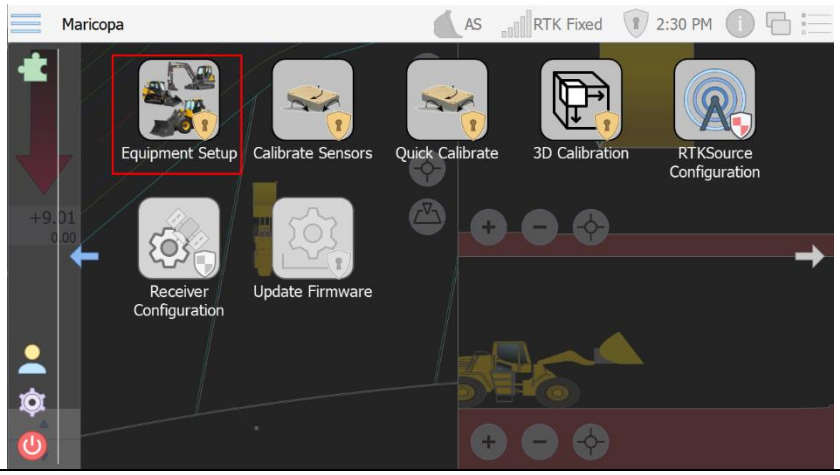
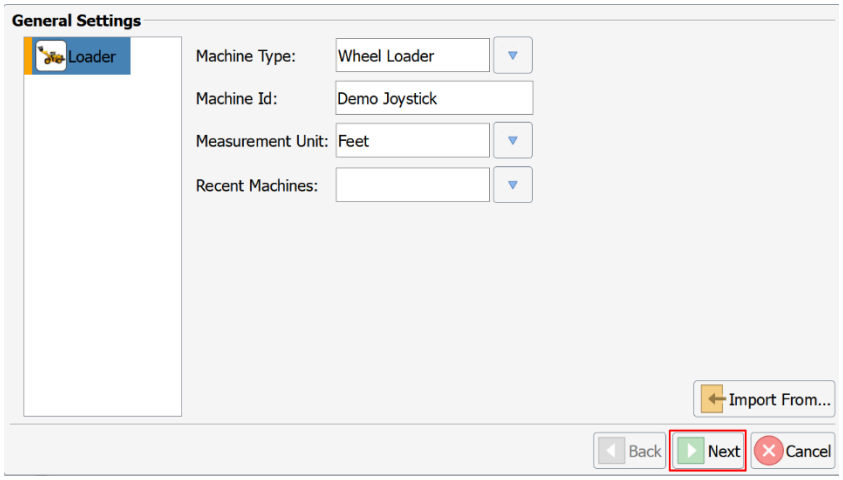
Step	Action
4	Select **3D Point Check** to check the accuracy at multiple locations. Use a rover to verify accuracy at left blade tip, right blade tip, and center blade. 

Save Machine Settings

Save Machine Settings

To save the settings for your machine, use the following steps.

Table 5-8: Save Machine Settings

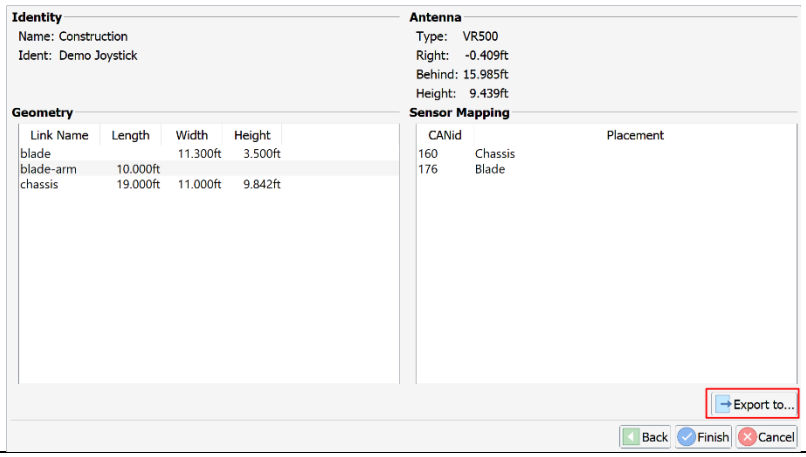
Step	Action
1	To save your machine settings, go to **Equipment Setup**: 
2	Click **Next**. 

Continued on next page

Save Machine Settings, Continued

Save Machine Settings, continued

Table 5-8: Save Machine Settings (continued)

Step	Action
3	Click **Next** until the final screen displays. Click **Export to…** and save the machine settings to a USB thumb drive. 

Appendix A: Troubleshooting

Overview

Introduction

Appendix A provides troubleshooting for the dozer installation.

> **Note:** It is important to review each category in detail to eliminate it as a problem.

Contents

Troubleshooting

Troubleshooting

Table A-1: Troubleshooting

Issue	Possible Solution
Incorrect Position	First, check a control point with the machine and the survey rover. If the horizontal or vertical position is off, first consider if it is off by a consistent amount throughout the jobsite, or if the position bust varies throughout the job. If it is consistent, consider the following: • Check your machine measurements/offsets. If any of these are incorrect, your projected position will be off. • Bad localization. Make sure that all points in your localization file have low residuals and/or that the correct coordinate system is selected (this can make a significant difference). If there is an inconsistent position bust, check: • Sensor mounting was incorrectly selected and/or the sensor was not calibrated. This is evident if your position is correct when flat, but not if you are on a slope. • If the position at the GPS antenna is correct, but the position bust worsens as you approach the cutting edge, it may be a heading offset error.
No GPS Position	First, check to see if the VR500 is powered on. There are LED lights underneath the receiver. If the receiver is not powered, disconnect the cable and use a multimeter to verify it is receiving power and ground. Check the monitor screen and sky plots to see if there is any data from the receiver. If there is no data, but the receiver is powered, there could be a bad serial connection / mismatched baud rate.

Continued on next page

Troubleshooting, continued

Table A-1: Troubleshooting (continued)

Issue	Possible Solution
No RTK	1. If using a base station onsite (versus an NTRIP service), first check to verify the base station is turned on. 2. If the base station is turned on and sending RTK out over UHF, check to see if the Tx (or TD on some radios) light is flashing once per second. 3. Verify that the other rovers on the job site are receiving RTK corrections, if available. 4. If it is flashing once per second, check to verify the settings (frequency, bandwidth, forward error corrections, modulation, and protocol) at the base match that of the rover. 5. Check to see if the UHF light at the rover is blinking once per second. If it is, refer to #3. 6. The receiver may be out of UHF range. Consider installing the external UHF antenna (if using a VR500). You may need to install repeaters. See if the RTK corrections work when the machine is closer to the base station. 7. If using NTRIP, check cellular connectivity. One option is to exit GradeMetrix® and verify you can go to a website via the browser.
IronTwo Will Not Power On	1. Check to verify the power cable is connected to machine power. The positive should go to a reliable, clean power source and ground to the chassis of the machine. 2. Disconnect the cable and refer to the pinout to see if 12V or 24V (depending on machine) is going into the IronTwo by using a multi-meter. If the multimeter reads 12V or 24V, then power is confirmed, and the IronTwo may need to be serviced. If you do not have any power, then check your power source, ground, and all fuses.

Appendix B: Technical Specifications

Overview

Introduction

Appendix B contains the technical specifications for the VR500 GNSS receiver, the IronTwo control box, and the GMS-1 sensor.

Contents

VR500 Receiver

VR500 Receiver

Table B-1: VR500 Receiver

Item	Specification
Receiver type	GPS, GLONASS, BeiDou, Galileo and RTK with carrier phase and L-band dual antenna
Channels	744
Satellites	12 L1CA GPS 12 L1P GPS 12 L2P GPS 12 L2C GPS 15 L5 GPS 12 G1 GLONASS 12 G2 GLONASS 12 G3 GLONASS 22 B1 BeiDou 22 B2 BeiDou 14 B3 BeiDou 12 Galileo E1 12 Galileo E5a 12 Galileo E5b 3 SBAS or 3 additional L1CA GPS 2 L-band
Primary antenna	GPS L1,L1P,L2C,L2P,L5 GLONASS G1,G2,Pcode BeiDou B1,B2,B3 Galileo E1,E5a,E5b L-band
Secondary antenna	GPS L1,L1P,L2C,L2P GLONASS G1,G2 BeiDou B1,B2 Galileo E1,E5b L-band
GPS sensitivity	-142 dBm

Continued on next page

VR500 Receiver, continued

Table B-1: VR500 Receiver (continued)

Item	Specification
SBAS tracking	3-channel, parallel tracking
Update rate	10 Hz standard, and 20 Hz available
Horizontal accuracy	<table><tr><th></th><th>RMS (67%)</th><th>2DMRS (95%)</th></tr><tr><td>RTK[1,2]</td><td>8 mm + 1 ppm</td><td>15 mm +2 ppm</td></tr><tr><td>Atlas</td><td>0.04 m</td><td>0.08 m</td></tr><tr><td>SBAS (WAAS)[1]</td><td>0.3 m</td><td>0.6 m</td></tr><tr><td>Autonomous, no SA[1]</td><td>1.2 m</td><td>2.4 m</td></tr></table>
Heading accuracy	0.27° RMS
Pitch/roll accuracy	< 1° RMS
ROT	145°/s maximum
Timing (1PPS) accuracy	20 ns
Cold start time	< 60 s typical (no almanac or RTC)
Warm start time	< 30 s typical (almanac and RTC)
Hot start time	< 10 s (almanac, RTC, and position)
Maximum speed	1,850 km/h (999 kts)
Maximum altitude	18,288 m (60,000 ft)
Differential options	SBAS, Autonomous, External RTCM v2.3, RTK v3, L-band (Atlas), and DGPS
Antenna LNA gain input	10 to 40 dB

Continued on next page

VR500 Receiver, Continued

VR500 Receiver, continued

Table B-2: VR500 Communication

Item	Specification
Serial ports	3x full-duplex UART's 2x 3.3V CMOS 1x RS-232
CAN	2 CAN ports NMEA2000, ISO-11783
Baud rates	4800 - 115200
Data I/O protocol	NMEA 0183, CAN, Hemisphere GNSS binary
Correction I/O protocol	Hemisphere GNSS' ROX, RTCM v2.3 (DGPS), RTCM v3 (RTK), CMR, CMR+3, and Atlas
Timing output	1 PPS CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event marker input	CMOS, active low, falling edge sync, 10 kΩ 10 pF load
Ethernet	1x 10/100 base-T

Table B-3: VR500 Power

Item	Specification
Input voltage	9-32 VDC
Power consumption	10.8W Maximum (All signals and L-band)
Current consumption	1.2A Maximum

Continued on next page

VR500 Receiver, Continued

VR500 Receiver, continued

Table B-5:VR500 Environment

Item	Specification
Operating temperature	-40°C to +70°C (-40°F to +158°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)
Humidity	95% non-condensing (when installed in an enclosure)
Shock and vibration	50Gs, 11ms half sine pulse, 10 shocks in each direction and axis, total 60 shocks Operational IEC 60068-2-29 MIL-STD-810G Vibration Sine: 30.6Grms MIL-STD-810G SAE J1211 ISO 16750-3:2007 Vibration Random: 5.96Grms IEC 60068-2-64 MIL-STD-202F
EMC[4]	CE (ISO 14982 Emissions and Immunity) FCC Part 15, Subpart B CISPR22

Continued on next page

VR500 Receiver, Continued

VR500 Receiver, continued

Table B-6: VR500 Mechanical

Item	Specification
Dimensions	68.6 L x 22 W x 12.3 H cm
Weight	3.9 kg
Status indication	Power, GNSS, Heading, Radio
Power/Data connector	22-Pin environmentally sealed

Table B-7: VR500 L-band sensor

Item	Specification
Receiver type	Single Channel
Channels	1525 to 1560 MHz
Sensitivity	140 dBm
Channel spacing	5.0 kHz
Satellite selection	Manual and Automatic
Reacquisition time	15 seconds (typical)

Table B-8: VR500 Aiding Devices

Device	Description
Gyro	Provides smooth heading, fast heading reacquisition, and reliable < 3° heading for periods up to 3 minutes when loss of GPS has occurred.[4]
Tilt sensor	Provide pitch and roll data and assist in fast startup and reacquisition of heading solution.

IronTwo

IronTwo system

Table B-9: System

Item	Specification
Processor	Intel® Celeron N3350
Storage	SSD 64GB, RAM 4GB
Operating System	Windows 10

IronTwo mechanical

Table B-10: Mechanical

Item	Specification
Dimensions	263.28 W x 171 H x 35.7 D (mm) 10.4 W x 6.7 H x 1.4 D (in)
Weight	1.38 kg (3.04 lbs)
Mount	Adjustable 1.5” RAM ball mount

IronTwo environmental

Table B-11: Environmental

Item	Specification
Operating Temperature	-20°C to +60°C (-4°F to 140°F)
Operating Humidity	30% ~ 90% (non-condensing)
Enclosure	IP65

Continued on next page

IronTwo, Continued

IronTwo power

Table B-12: Power

Item	Specification
Input Voltage	9 - 36 VDC

IronTwo screen

Table B-13: Screen

Item	Specification
Display Type	10.1” TFT edge-to-edge projective capacitive multi-touch screen
Size	192.8 mm × 116.9 mm (7.59” × 4.6”)
Resolution	1920 × 1200, 800:1
Luminance	700 cd/m

IronTwo communication

Table B-14: Communication

Item	Specification
Serial Port	2 x RS232
CANBUS	2 × CANBUS
USB	2 × USB 2.0
Ethernet	2x 10/100 LAN
Wi-Fi	IEEE 802.11a/b/g/n/ac
Cellular	4G LTE
Bluetooth	Bluetooth 4.1

GMS-1 Sensor

GMS-1 sensor measurement range

Table B-15: Measurement range

Item	Specification
Pitch	± 180°
Roll	± 85°

GMS-1 sensor accuracy

Table B-16: Sensor accuracy

Item	Specification
Absolute Accuracy	±0.30°
Resolution	±0.01°
Repeatability	±0.05°
Refresh Rate	20 Hz
Base Sensor Cycle	5ms
Hysteresis	±0.05°

GMS-1 sensor electrical

Table B-17: Electrical

Item	Specification
Supply Voltage	9 – 30 VDC
Current	≤ 65mA @ 10 VDC
EMC Emittance	DIN EN 61000-6-4
EMC Immunity	DIN EN 61000-6-2

Continued on next page

GMS-1 Sensor, Continued

GMS-1 sensor pin-outs

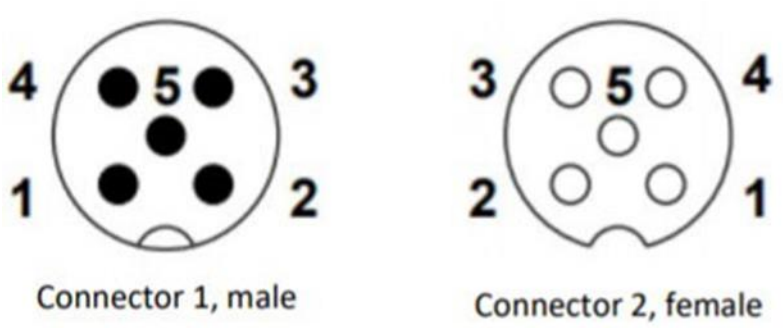


Figure B-1: GMS-1 Sensor pin-out

Table B-18: GMS-1 Sensor pin-out

Signal	Connector	Pin Number
Power Supply	Connector 1	2
GND	Connector 1	3
CAN High	Connector 1	4
CAN Low	Connector 1	5
CAN GND	Connector 1	1
Power Supply	Connector 2	2
GND	Connector 2	3
CAN High	Connector 2	4
CAN Low	Connector 2	5
CAN GND	Connector 2	1

Appendix C: Cable Pin-Outs

Overview

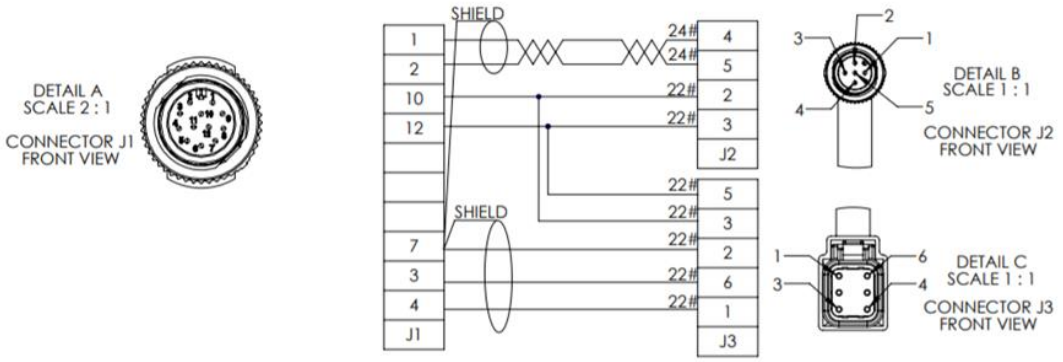
Introduction

Appendix C contains the cable pin-outs used for installation of the VR500 and IronTwo.

Contents

Part Number 051-0426-10

P/N: 051-0426-10



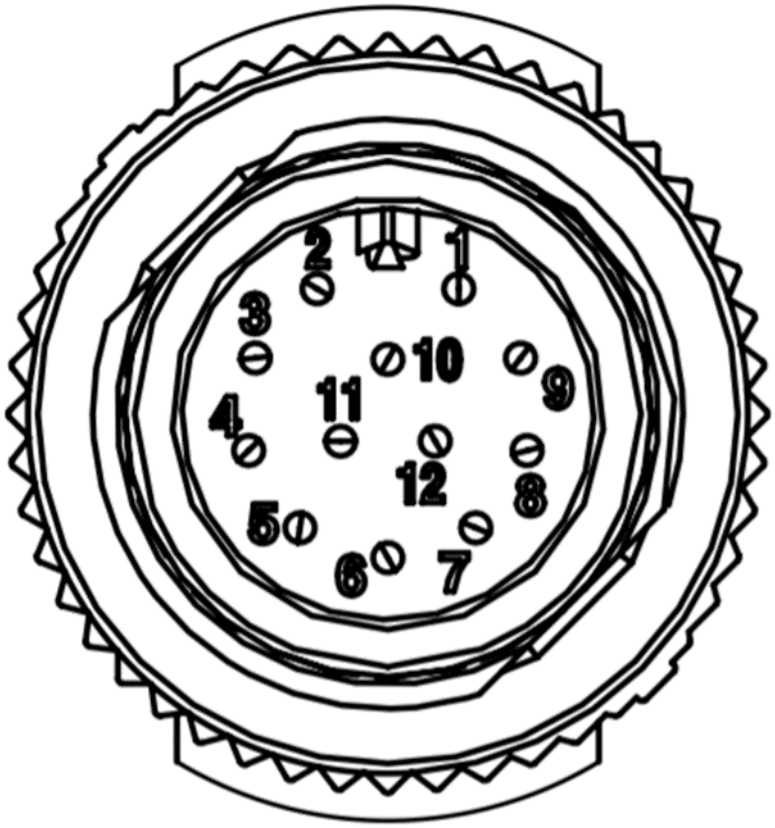


Figure C-1: Part Number: 051-0426-10

Continued on next page

Part Number 051-0426-10, Continued

P/N: 051-0426-10, continued

Table C-1: Part Number 051-0426-10 Pin-Outs

J1	J2	J3	Signal
1	4		CAN High
2	5		CAN Low
3		6	IronTwo RS232 Rx
4		1	IronTwo RS232 Tx
5		2	
6			
7		2	Signal Ground
8			
9			
10	2	3	12V+ Out
11			
12	3	5	Power Ground

Part Number 051-0406-10

P/N: 051-0406-10

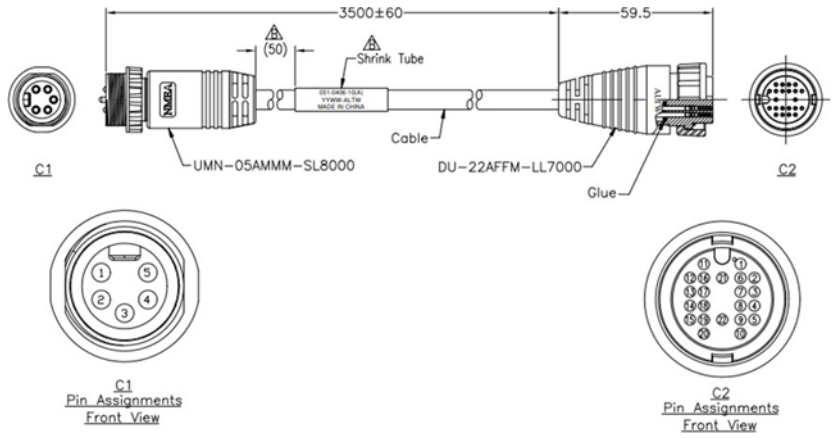


Figure C-2: Part Number: 051-0406-10

Table C-2: Part Number: 051-0406-10 Pin-Outs

C1	C2	Signal
1	21	Power+
2	12	VR500 Port A RS232 Tx
3	11	VR500 Port A RS232 Rx
4	22	Power-
5	13	Signal Ground

Part Number 051-0407-10

P/N: 051-0407-10

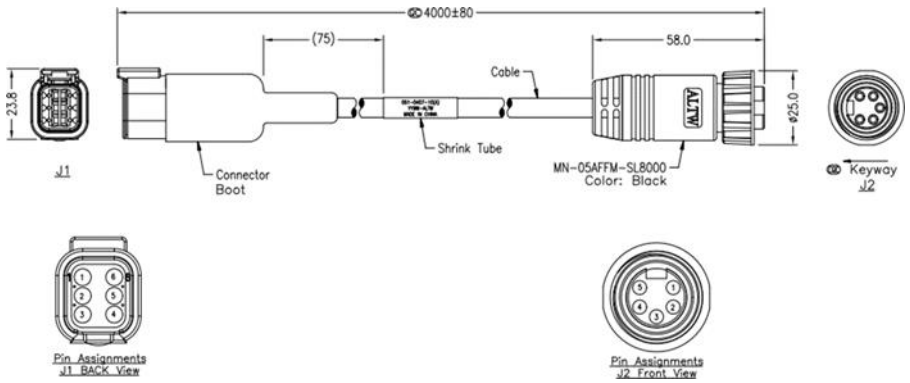


Figure C-3: Part Number: 051-0407-10

Table C-3: Part Number: 051-0407-10 Pin-Outs

J1	J2	Signal
1	3	VR500 Port A RS232 Rx
2	5	Signal Ground
3	1	Power-
4		
5	4	Power+
6	2	VR500 Port A RS232 Tx

VR500 Installation Schematic

VR500 Installation Schematic

Table C-4: Loader Schematic, IronTwo – VR500

051-0426-10 J1	051-0426-10 J3	051-0407-10 J1	051-0407-10 J2	051-0406-10 J2	Signal
1					CAN High
2					CAN Low
3	6	6	2	12	IronTwo RS232 Rx/VR500 Tx
4	1	1	3	11	IronTwo RS232 Tx/V500 Rx
5					
6					
7	2	2	5	13	Signal Ground
8					
9					
10	3	3	1	21	12V+ Out
11					
12	3	5	4	22	Power Ground

Index

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VR500 Installation Schematic, continued

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