Autopilot

AUTOMATED STEERING SYSTEM

INSTALLATION INSTRUCTIONS

- Versatile Tractors
  - Nemesis MFWD AutoGuide Ready
- Kubota Tractors
  - M8 AutoGuide Ready

Version 8.00
Revision A
May 2019
P/N 54035-211-E08

Trimble

Legal Notices

Agriculture Business Area

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This is the May 2019 release (Revision A) of the *Autopilot Automated Steering System Installation Instructions*, part number 54035-211-E08. It applies to version 8.00 of the Autopilot automated steering system.

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For purposes of this warranty the following definitions shall apply: (1) "Fix Update" means an error correction or other update created to fix a previous software version that does not substantially conform to its published specifications; (2) "Minor Update" occurs when enhancements are made to current features in a software program; and (3) "Major Upgrade" occurs when significant new features are added to software, or when a new product containing new features replaces the further development of a current product line. Trimble reserves the right to determine, in its sole discretion, what constitutes a significant new feature and Major Upgrade.

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Class B Statement – Notice to Users. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

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Or

Mail a request for recycling instructions to:

Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL



Safety Information

Always follow the instructions that accompany a Warning or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to property. In particular, observe safety instructions that are presented in the following format:

⚠ **WARNING –** This alert warns of a potential hazard, which, if not avoided, can cause severe injury.

⚠ **CAUTION –** This alert warns of a hazard or unsafe practice which, if not avoided, can cause injury or damage.

NOTE – An absence of specific alerts does not mean that there are no safety risks involved.

Warnings

⚠ **WARNING –** When you are working on the vehicle's hydraulic systems, vehicle attachments that are suspended can drop. If you are working around the vehicle, you could suffer serious injury if an attachment dropped on you. To avoid this risk, lower all vehicle attachments to the ground before you begin work.

⚠ **WARNING –** If someone else attempts to drive the vehicle while you are working on or under it, you can suffer serious or fatal injuries. To avoid this possibility, install a lockout box on the battery terminal to prevent the battery from being reconnected, remove the key from the vehicle's ignition switch, and attach a "Do not operate" tag in the cab.

⚠ **WARNING –** Agricultural chemicals can pose serious health risks. If the vehicle has been used to apply agricultural chemicals, steam clean the vehicle to remove any chemical residue from the areas of the vehicle where you will be working.

⚠ **WARNING –** Vehicle cabs can be quite high in the air. To avoid potentially serious injury through falling from this height, always use the steps and handrails, and face the vehicle, when you enter or exit it.

Cautions

⚠ **CAUTION –** When the vehicle has been running, parts of the vehicle, including the engine and exhaust, can become extremely hot and can cause serious burns. To avoid burns, allow hot machine parts to cool before you begin working on them.

CAUTION – The system installation may bring you into contact with chemical substances, such as oil, which can cause poisoning. Wash your hands thoroughly after you finish working on the system.

CAUTION – Battery posts, terminals, and related accessories contain lead and lead compounds, which can cause serious illness. To avoid ingesting lead, wash your hands thoroughly after touching the battery.

CAUTION – Always wear protective equipment appropriate to the job conditions and the nature of the vehicle. This includes wearing protective glasses when you use pressurized air or water, and correct protective welder's clothing when welding. Avoid wearing loose clothing or jewelry that can catch on machine parts or tools.

CAUTION – Parts of the vehicle may be under pressure. To avoid injury from pressurized parts, relieve all pressure in oil, air, and water systems before you disconnect any lines, fittings, or related items. To avoid being sprayed by pressurized liquids, hold a rag over fill caps, breathers, or hose connections when you remove them. Do not use your bare hands to check for hydraulic leaks. Use a board or cardboard instead.

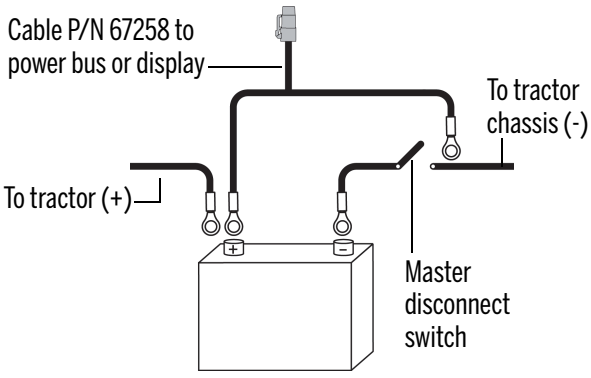
CAUTION – Do not direct pressurized water at:
- Electronic or electrical components or connectors
- Bearings
- Hydraulic seals
- Fuel injection pumps
- Any other sensitive parts or components



Set the hose pressure as low as practicable, and spray at a 45° to 90° angle. Keep the nozzle of the power washer away from the machine at the distance recommended by the manufacturer.

CAUTION – To prevent damage to the system, make sure that no wires or hoses interfere with or catch on any mechanical linkages, or contact any machine parts that get hot.

CAUTION – If the vehicle has a master electrical disconnect, make sure the basic power cable (P/N 67258) is not directly attached to the battery terminal that is disconnected by the master switch—the negative pole in this example.
Attach this terminal side just past the main disconnect so that it is as close as possible to the battery but still gets disconnected when the master disconnect is turned off. Failure to do so can result in damage to the display.



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1

Introduction

- Technical assistance
- Autopilot system hardware
- Preparing the vehicle for installation

This manual describes how to install the Trimble® Autopilot™ automated steering system.

Even if you have used another GNSS (Global Navigation Satellite System), such as the United States' GPS (Global Positioning System) before, spend some time reading this manual to learn about the special features of this product. If you are not familiar with GNSS, go to the Trimble website (www.trimble.com) for an interactive look at Trimble and GNSS.

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, contact Trimble technical support:

1. Log into http://agpartners.trimble.com.
2. Click the **Feedback** link at the right of the screen. A form appears.
3. Complete the form and then click **Submit Feedback**.

Autopilot system hardware

Display

Parts required
TMX-2050™ display: P/N 96700-xx
TM-200 Module: P/N 95060-00
TM-200 Module to display cable: P/N 93843
TM-200 Module power I/O cable: P/N 92676
TM-200 Module battery cable: P/N 92905
Antenna for display: P/N 60600-02 (DGPS) or 77038-00 (OmniSTAR®/RTK)

Autopilot components

Kits required	Special tools
Platform kit: P/N 54035-211	Standard hand tools
Trimble NavController III for Common Trimble Ready Installations, GEN III: P/N 64425-24	

Antenna mounting kits

Kits required
Antenna V plate mount and AG-372 receiver magnetic mount: P/N 62388-01 (includes magnets for quick release of the AG-372 receiver – see Chapter 3, Antenna / Receiver Installation).
AG-15 antenna mounting plate: P/N 62034

Accessory kits

Accessory options
Remote engage switch assembly – standard Euro: P/N 57227-10
Remote engage switch assembly – full Euro: P/N 57227-20
Remote engage foot pedal: P/N 57259
Remote engage push button: P/N 101250

Autopilot hardware organization: As shipped

Hardware	Component	See...
Platform kit: P/N 54035-211	In-cab controller/display cable set	Chapter 4
	External valve and sensor cable set	Chapter 2
Roof bracket kit: P/N 62388-02 - use only with a VHB plate P/N 62388-01 - use with magnets for removable mounting of the AG-372 receiver	Roof brackets	Chapter 3
	Bolt kit, roof bracket	
GNSS receiver	GNSS receiver	Chapter 3
	GNSS antenna	
	GNSS receiver power/data cable	
	RTK radio, cable, and radio antenna	
Display	TMX-2050 display	Chapter 4
	Display cable	
	Mounting bracket	
Common parts	Controller	Chapter 2
	In-cab controller/display cable set	
	Cable kit: In-cab controller/display cable set External valve and sensor cable set Sonalert alarm	

Notice to the installer

For serial number 508788 and later, this kit supports standard MFWD AutoGuidance Ready (AGR) platforms.

Preparing the vehicle for installation

NOTE – The left and right sides of the vehicle are referenced while standing behind the unit, facing the normal direction of travel.

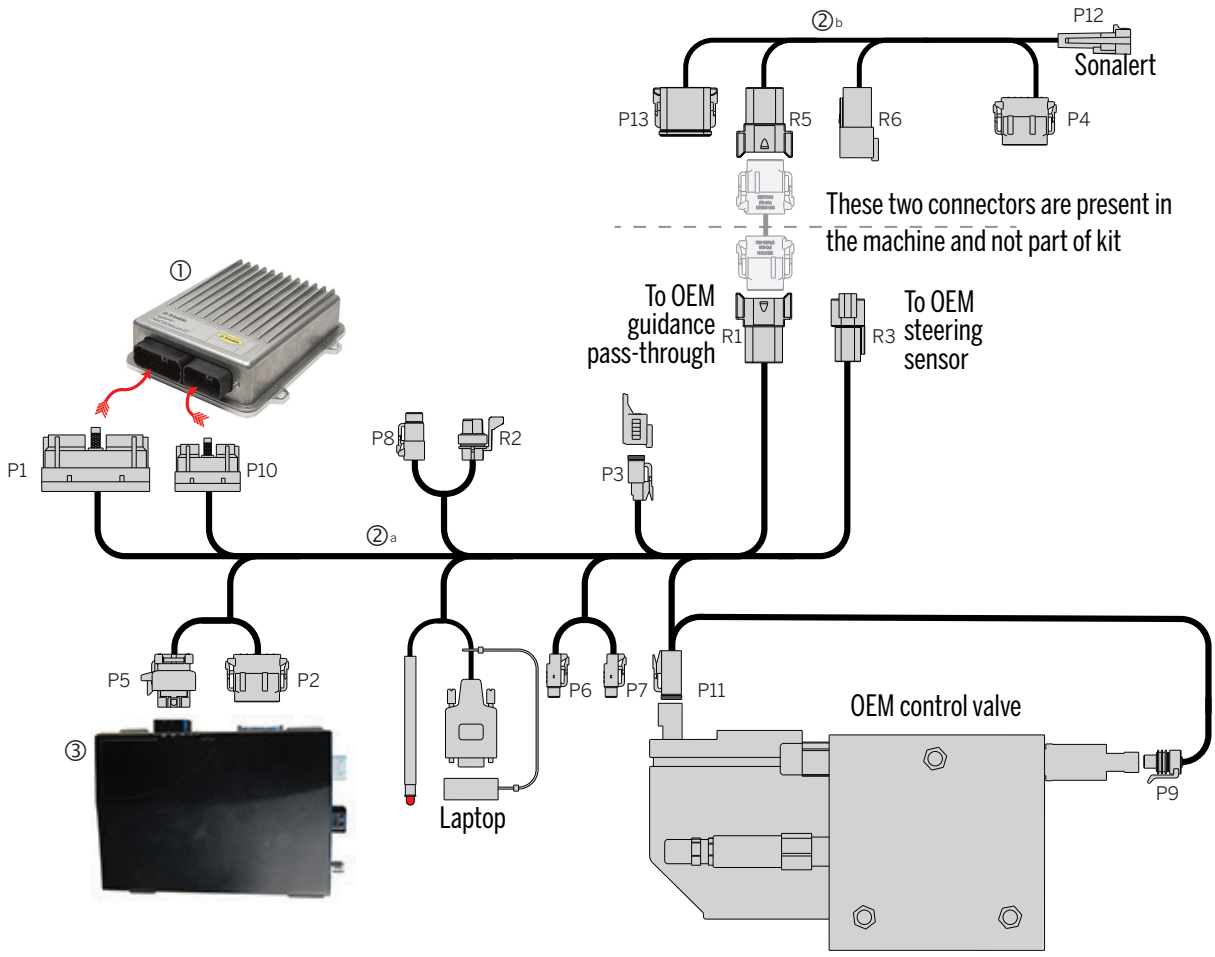
1. Park the vehicle on a hard, level surface. Block the front and rear wheels.
2. Align the steering straight ahead. On an articulated vehicle, install the articulation locks.
3. Remove all dirt and debris from the areas of the vehicle where the Autopilot system will be installed.
4. Open all kit boxes and check the contents of the box against the packing list/s. Lay all of the parts out on a clean workbench.

2

NavController III and External Cable Installation

- External sensor harness
- NavController III installation
- External cable installation

External sensor harness



Item	Description	Trimble P/N
1	NavController III	55566-00
2 a,b	Cbl Assy, Main Autopilot, NavIII / TMX, Versatile Nemesis/Kubota M8	118896
3	TM-200 Module	95060-00

Connectors on cable P/N 118896	Description
P1	Connects to NavController III ①
P2	Connects to TM-200 module ③
P5	Connects to TM-200 module ③
R1	Connects to 8-pin DT OEM guidance sensor pass through
R3	Connects to OEM steering sensor
P9	Connects to Manual Override Sensor
P10	Connects to NavController III ①
P11	Connects to OEM control valve

NavController III installation

Step 1

Mount the NavController III as shown on the mounting bracket using the provided M6 x 1 x 12 mm.



Step 2

Connect the NavController III connectors on the cable P/N 118896 to the NavController III.



Step 3

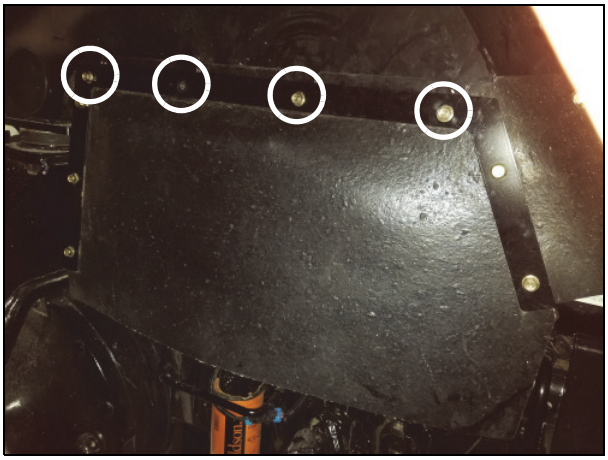
Locate the rubber shield in front of the right rear axle.

NOTE – You may need to slide out the right rear tire for easier access.



Step 4

Remove the top four screws from the rubber shield and then swing the shield towards the front of the tractor.



Step 5

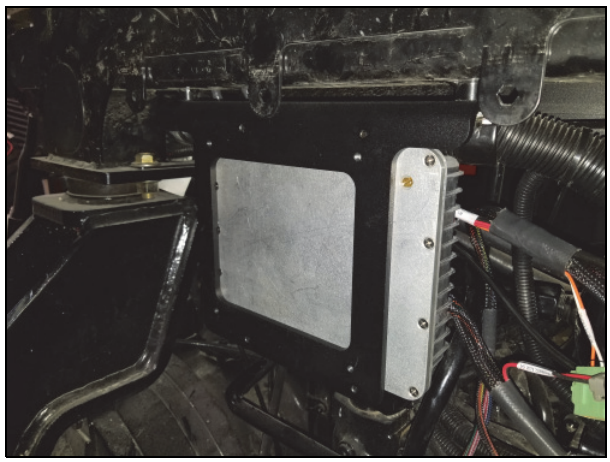
Remove the two screws from the clamp holding the tractor harness in place below the cab.



Step 6

Reuse the screws removed in the previous step to attach the NavController plate and harness clamps to the tractor.

Make sure the NavController is installed so the label faces the left side of the tractor and the connectors are facing the back of the tractor.

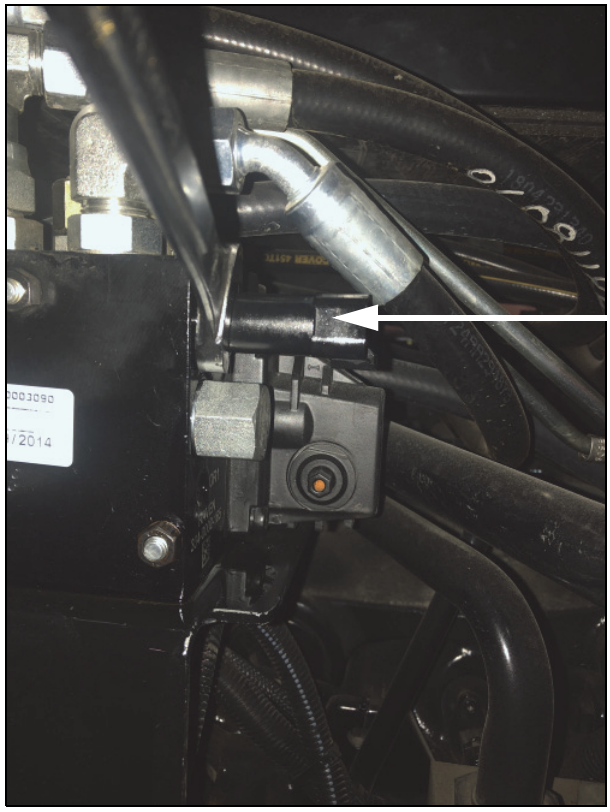


External cable installation

⚠ **WARNING –** To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

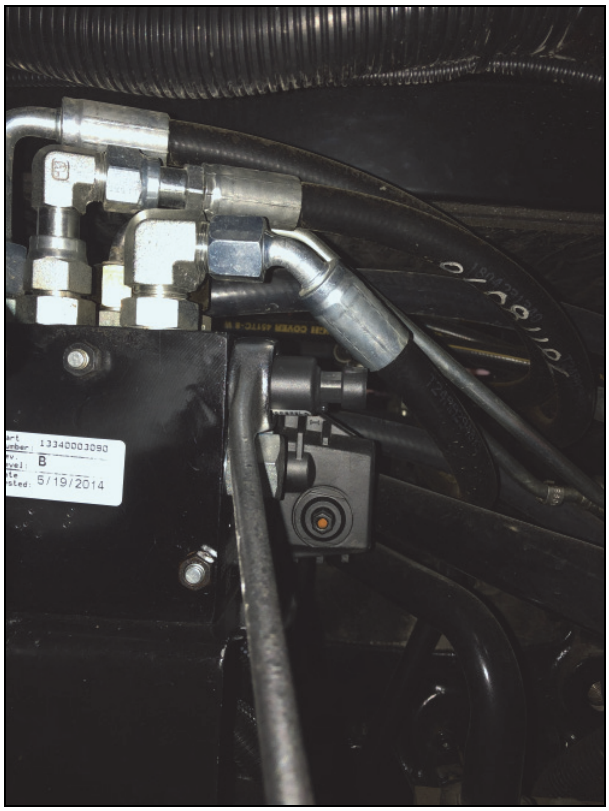
Step 1

Locate the tractor guidance valve in front of the NavController III mounting location and then remove the existing pressure transducer from the front of the valve.



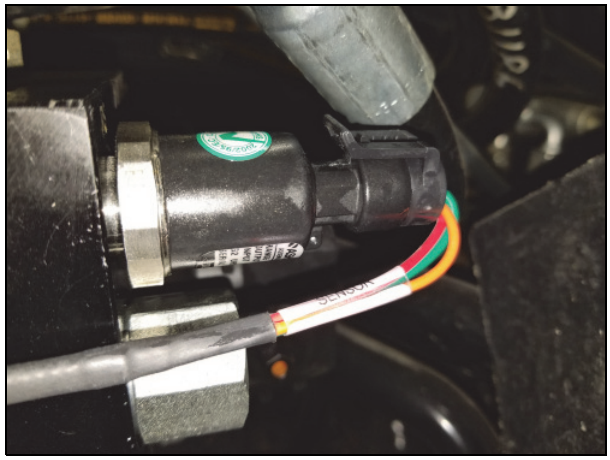
Step 2

Install the provided Trimble pressure transducer P/N 49669 in the port where the transducer was removed in the previous step.



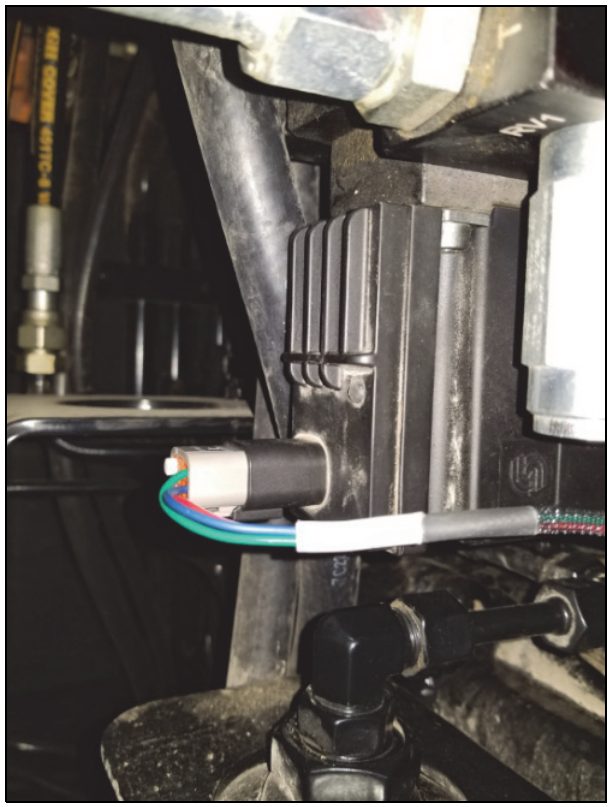
Step 3

Connect the P9 connector on cable P/N 118896 to the pressure transducer.



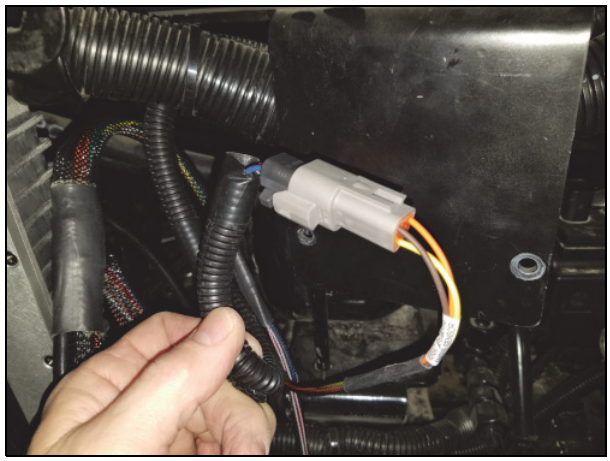
Step 4

Connect the P11 connector on cable P/N 118896 to the steering control valve.



Step 5

Connect R3 on cable P/N 118896 to the steering sensor connector located on the tractor harness near the NavController III mounting location.



Step 6

Connect R1 on cable P/N 118896 to the sensor pass-thru connector. The connector is an 8-pin Deutsch DT, located behind the NavController III.



Step 7

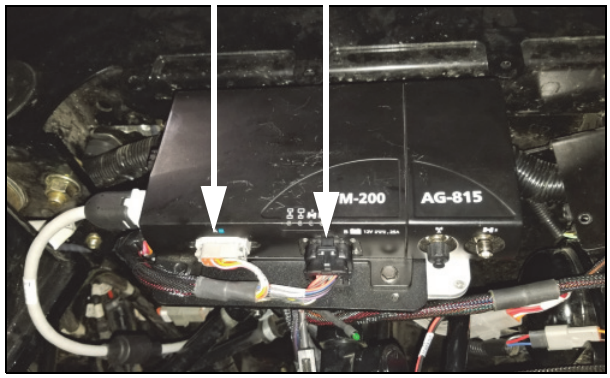
Attach the TM-200 module to the NavController III bracket using the provided M6 x 1 x 10 mm hardware (four screws, shown).

NOTE – The AG-815 module is used when RTK corrections are used and is shown for reference.



Step 8

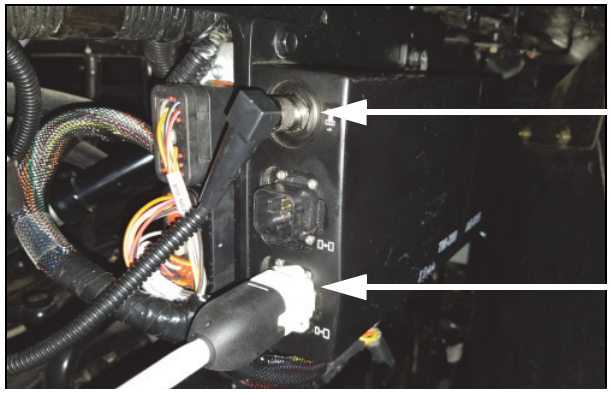
Connect P2 and P5 on cable P/N 118896 to the TM-200 module.



Step 9

Connect the TM-200 module to display cable P/N 93843 to the TM-200 module.

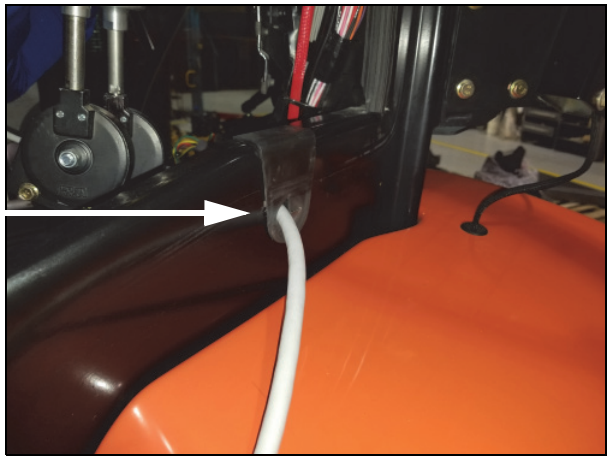
Connect the coax cable P/N 50449 to the TM-200 module.



Step 10

Route the cable P/N 93843 to the rear of the cab and through the cable pass-thru and into the cab.

Route the antenna cable to the cab roof.



3

Antenna / Receiver Installation

- Installing the GNSS antenna and plate using the VHB adhesive method on the display
- Installing the RTK radio antenna on the display

Installing the GNSS antenna and plate using the VHB adhesive method on the display

⚠ **WARNING –** To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

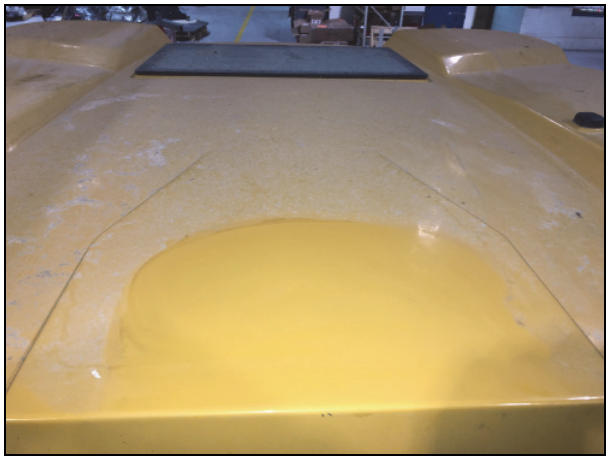
NOTE – The V plate antenna bracket is available on the Autopilot price list. See Antenna mounting kits, page 8.

Standard P/N 62034 plates are provided in most display kits. You can use Very High Bond (VHB) tape to attach either a P/N 62034 plate or a V plate.

- GLONASS, RTK, OmniSTAR, DGPS applications – To use this method for high accuracy, the surface must be rigid and free of "oil canning". For RTK or OmniSTAR HP corrections, the spar method is recommended. The V plate provides repeatable positioning of the antenna.
- WAAS, EGNOS, OmniSTAR VBS, Beacon applications – Use a P/N 62034 plate for simplified installation in applications where high accuracy is not critical.

Step 1

Clean the antenna location on the roof of the cab with a light solvent to remove oil and dust.

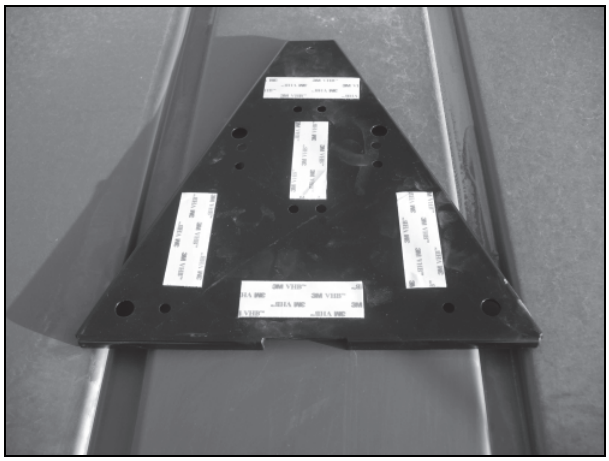


Step 2

V plate only

Remove the backing from one side of the VHB strips provided and then apply the strips to the plate.

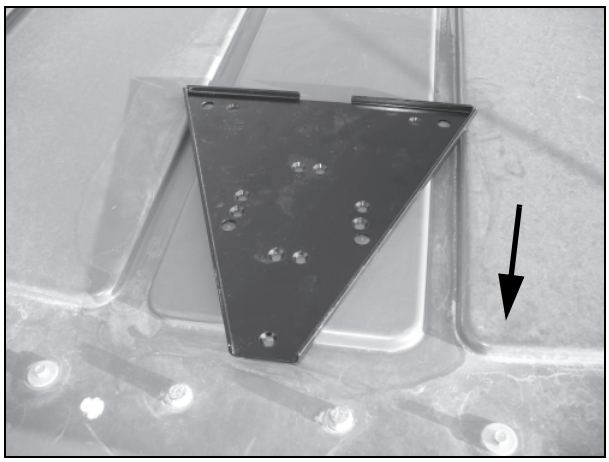
NOTE – The VHB strips are pre-applied to the 4" x 6" plate.



Step 3

Remove the backing from the other side of the VHB strips and then apply the plate to the cab roof. The narrow end points forward. Ensure that the VHB strips make even contact with the surface. Apply pressure and then leave for approximately 30 minutes to adhere.

NOTE – The arrow in this figure points to the front of the vehicle.



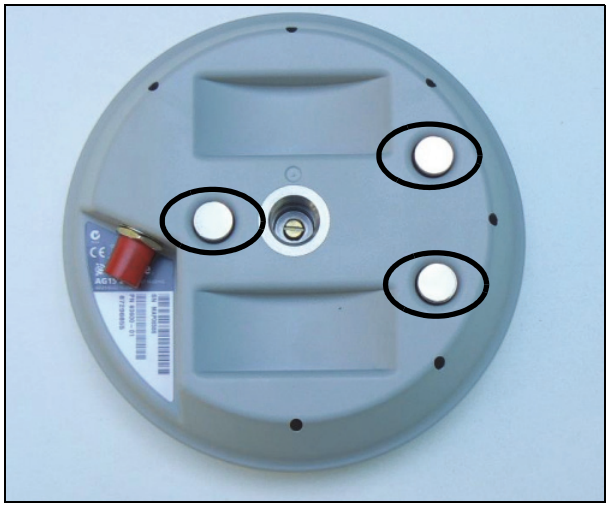
V plate



P/N 62034 plate

Step 4

If the antenna has magnets built in, omit this step.



Otherwise, attach the large magnet with a ⅝" stud to the GNSS antenna.



Step 5

GLONASS, RTK, OmniSTAR, DGPS, applications

For repeatable positioning, place the antenna against the lip at the narrow end of the V plate.



WAAS, EGNOS, VBS, Beacon applications

Attach the antenna to the center of the existing steel plate or P/N 62034 plate.



Installing the RTK radio antenna on the display

⚠ **WARNING –** To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

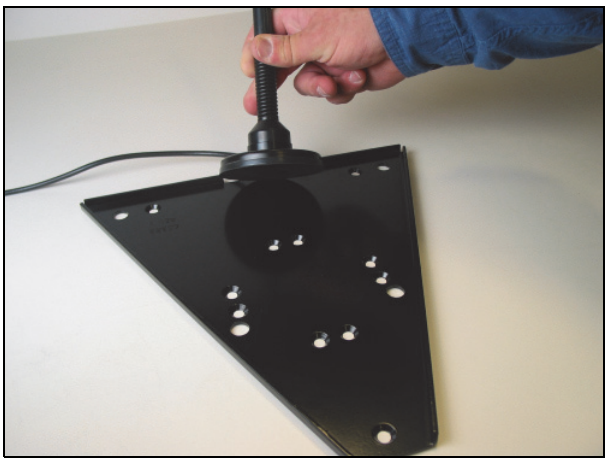
Step 1

Connect the radio antenna to the magnetic antenna base.



Step 2

Attach the magnetic radio antenna base to the rear of the V plate on the roof. If the cable does not reach the V plate, use the P/N 62034 plate with the VHB provided to relocate the antenna.



Step 3

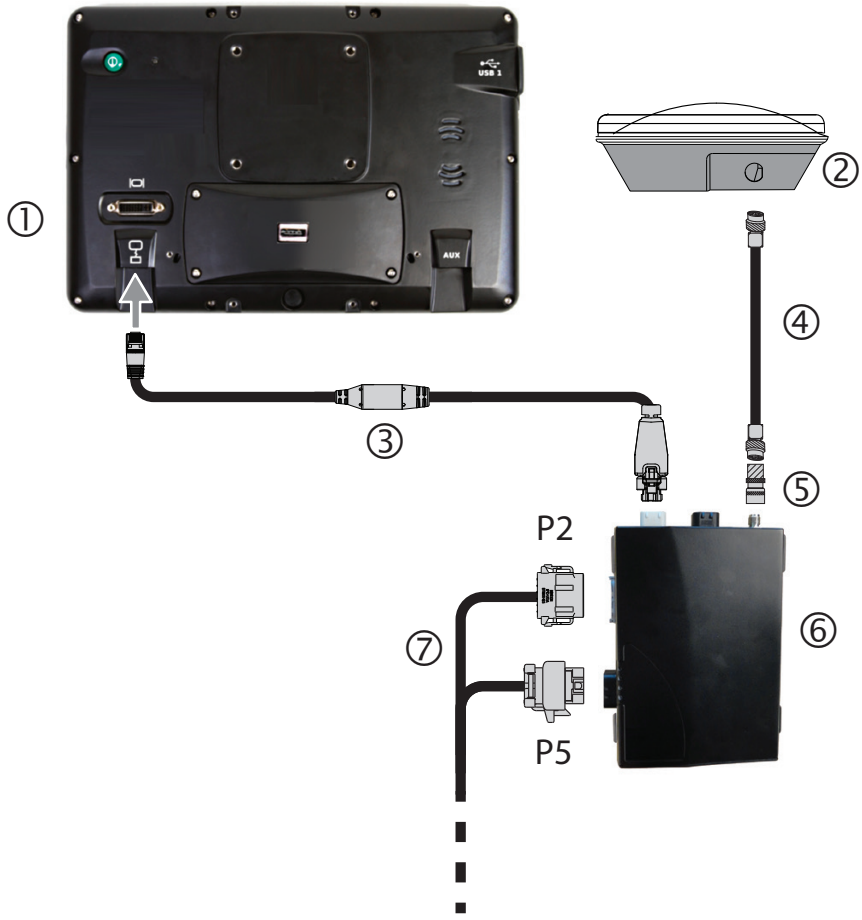
Route cable from the vehicle roof into the cab, and connect the radio cable to the display.

4

Installation of the TMX-2050 display and in-cab cables

- TMX-2050 display: Components
- TMX-2050 display: Installation
- In-cab harness installation

TMX-2050 display: Components



Item	Description	Trimble P/N
1	TMX-2050 display	96550-XX
2	AG-25 GNSS antenna	77038-00
3	Display to TM-200 cable	93843
4	OEM-provided GPS antenna cable	83666
5	TNC-to-BNC adapter	118242
6	TM-200 Module	95060-00
7	Main NavController to TM-200 Module	118896

TMX-2050 display: Installation

⚠ **WARNING –** To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

Step 1

Decide where you will mount the display in the vehicle cab and then use the provided bolts to attach the bar mount to the rail. Attach the free end of the RAM mount to the bar mount and then tighten the clamp on the RAM mount so that the display is secure.



Step 2

Connect the power and data cable to the TMX-2050 display.



In-cab harness installation

Step 1

Locate the right rear window lift cylinder and use a screw drive to loosen the clip as shown.

NOTE – Keep the clip safe for later use.



With the clip loosened, pull the end of the cylinder off the end of the rod.

NOTE – Make sure to hold the rear window open while doing this step to prevent possible damage to the window.



Step 2

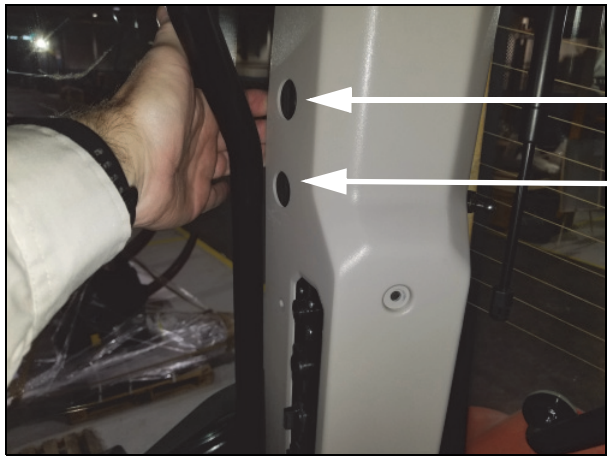
Using a Torx T-30 bit, remove the three screws holding the B post cover in place.



Step 3

Remove the display mounting bar if present

Place your hand behind the right side of the cover and gentle pull to allow the cover to move past the bracket mounts and power outlets.



Remove the cover from the B post.

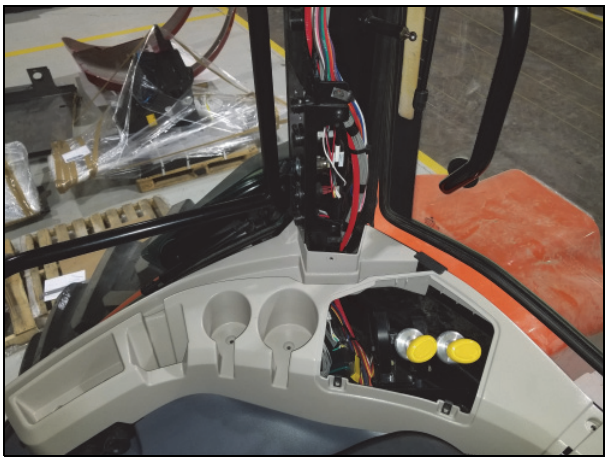


Step 4

Place both of the PTO handles in the center position. Remove the two Torx screws from the front of the PTO handle cover.



Remove the cover from around the PTO handles.



Step 5

Remove the Torx screws from the remainder of the cover. There is a screw in each cup holder, one on the B post and one on the rear wall.

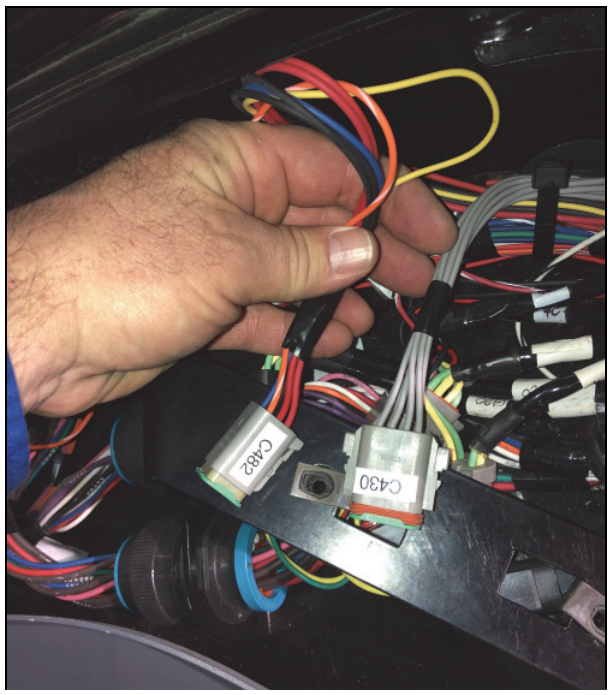


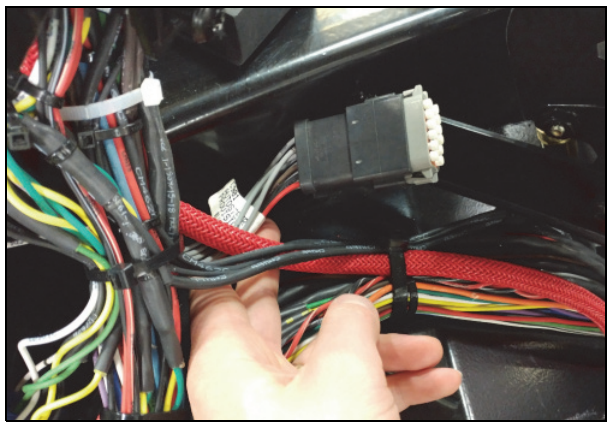
To access the rear wall screw, the middle cover behind the seat will need to be temporarily removed.



Step 6

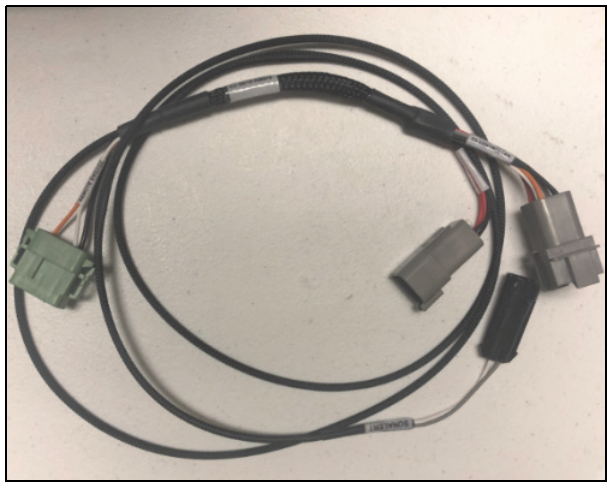
Locate the 6-pin Deutsch DT connector labeled **C482,** the 8-pin Deutsch DT pass-thru connector labeled **C430**, and the 12-pin Deutsch DT connector labeled **C901**.



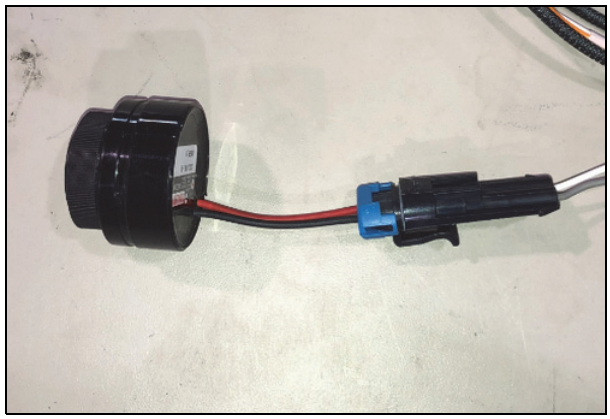


Step 7

Locate the in-cab portion of cable P/N 118896.



Attach the sonalert to the P12 sonalert connector.

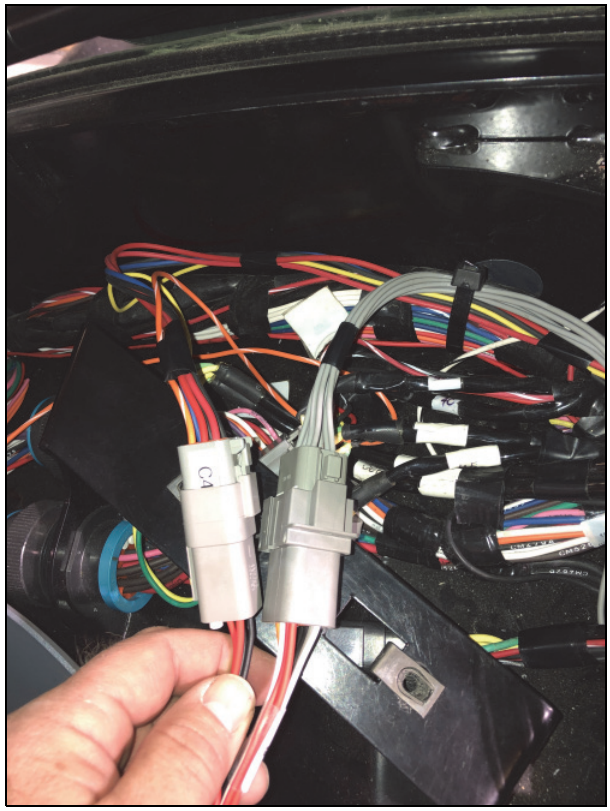


Step 8

Connect the R5 connector on cable P/N 118896 to the C430 connector.

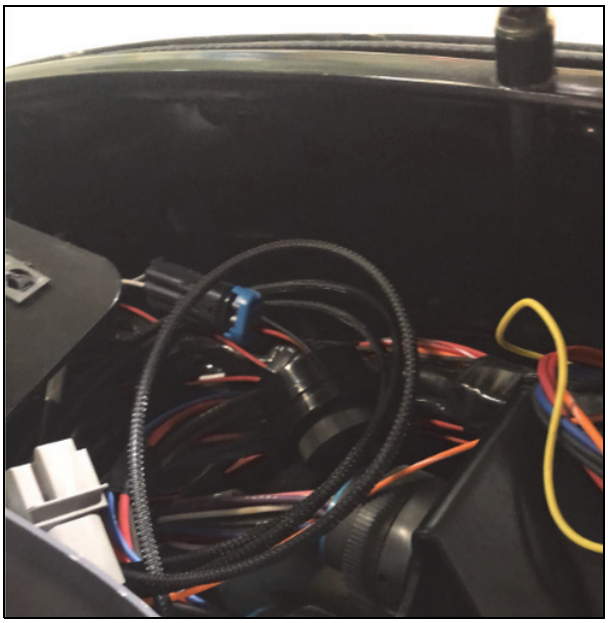
Connect the R6 connector on cable P/N 118896 to the C482 connector.

Connect the P13 connector on cable P/N 118896 to the C901 connector.



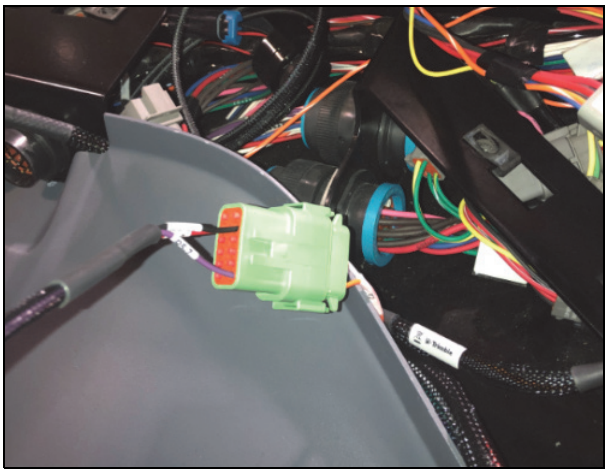
Step 9

Coil the excess cable including the sonalert in the area below the cup holder cover.



Step 10

Connect the remote engage connector if a remote switch is used.



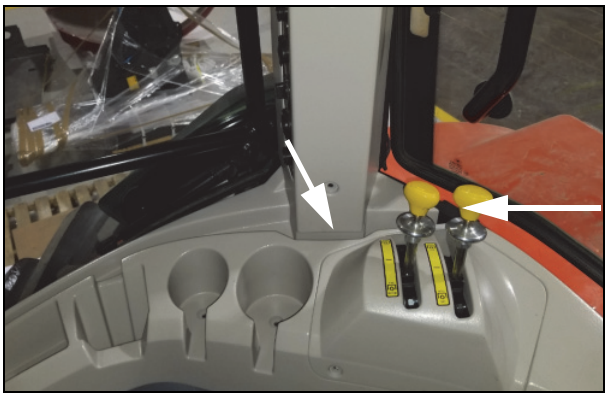
Step 11

Replace the covers in the reverse order as described in the previous steps.



Step 12

Route the TM-200 to TMX-2050 display cable through the cable pass-thru on the back of the cab, and through the cable tray to the display mounting location.



5

Final Machine Check

⚠ **WARNING –** To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

To perform the final machine check:

1. Connect the battery.
2. Start the machine and check for hydraulic leaks. Correct as needed.
3. Update the Trimble display and the Autopilot NavController/III to the latest firmware from http://agpartners.trimble.com.

   You can use FlashLoader 200 software version 4.03 to update the Autopilot controller: Download it from http://agpartners.trimble.com.
4. Load the correct configuration file into the Autopilot NavController for the vehicle model being used.

   Download the latest set of configuration files from http://agpartners.trimble.com.

   You can use Autopilot Toolbox II software version 4.01 or later to load the configuration file into the Autopilot controller. You can download the Autopilot Toolbox II software from http://agpartners.trimble.com.
5. The Autosteer enable switch must be switched to **Auto** prior to calibration or operation. The switch is located near the upper right side of the headliner.



6. Calibrate the Autopilot system using the Trimble display or Autopilot Toolbox II software. Depending on your machine type, the following items must be calibrated before you can use the Autopilot system:
   - NavController III mounting orientation
   - Manual override
   - Valve deadzone
   - Autopilot P-gain
   - Antenna height/Antenna axle offset, and Roll offset