NAV-900

Guidance Controller

INSTALLATION GUIDE

Version 1.00
Revision C
March 2021
Part number 108993-00-ENG

Trimble

Legal Notices

Agriculture Business Area

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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.

FCC Caution: Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Contains FCC ID: Z64-2564N

Industry Canada statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radiation Exposure Statement:

The product comply with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Déclaration d'exposition aux radiations:

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé. Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

Contains IC: 451I-2564N

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Recycling in Europe: To recycle Trimble WEEE, Call +31 497 53 2430, and ask for the "WEEE Associate"

Or

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Trimble Europe BV
C/O XPO Logistics
De Schakel 39-41
5651 GM Eindhoven
The Netherlands

Aviso para México

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

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. Take care not to short-circuit the battery with tools and/or by the incorrect fitting of cables as fire, burns, and damage can occur.

⚠ **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.

Contents

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Introduction

- Basic system diagram
- Required components for mounting
- Optional accessories for mounting
- Ag-820 radio system
- Preparing the vehicle for installation
- Technical assistance

This manual describes how to install the Trimble® NAV-900 guidance controller.

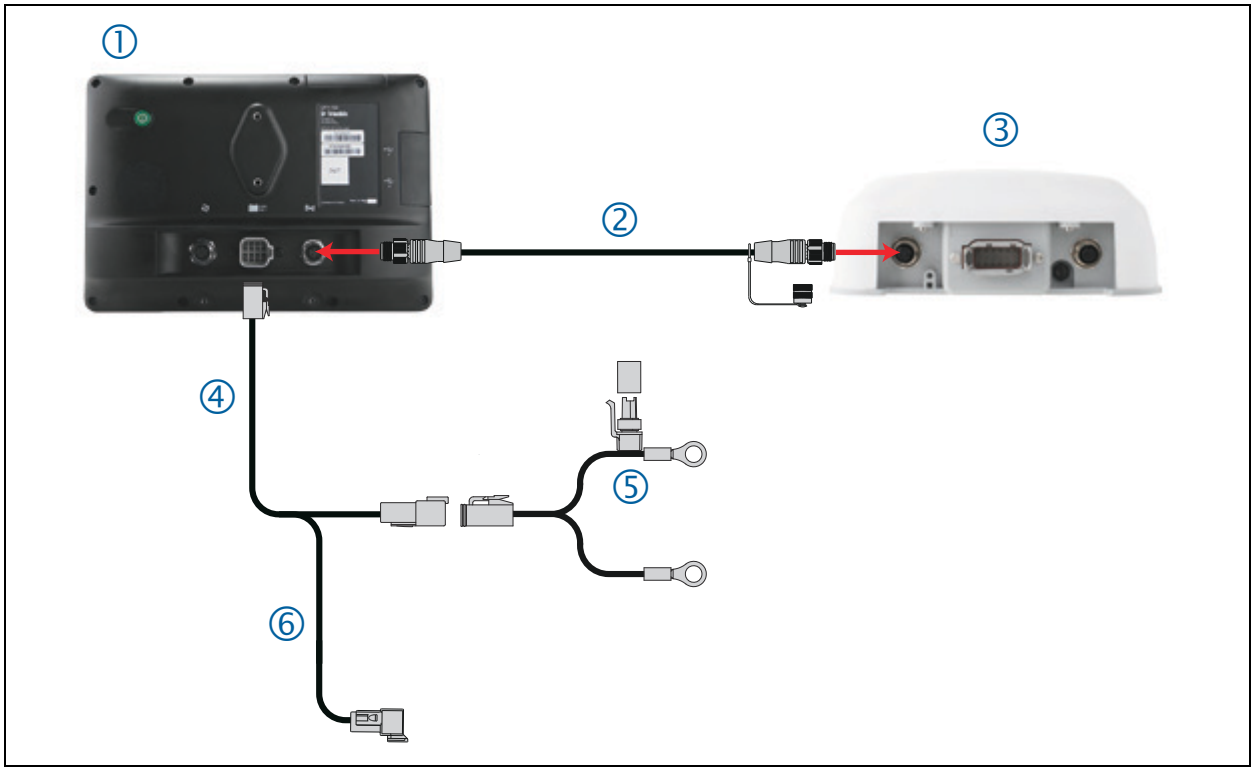
Even if you have used another GNSS (Global Navigation Satellite System), such as the United States' GPS (Global Positioning System), before, spend some time reading this manual to learn about the special features of this product. If you are not familiar with GNSS, go to the Trimble website (www.trimble.com)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

The NAV-900 guidance controller is a GNSS receiver with an integrated Inertial Measuring Device (IMD) and auto-guidance controller:

It has three ports on the back:

- 4-pin, D code – Power/Communication (display) ①
- Deutsch, 12-pin DTM – Main interface port ②
- 5-pin, A code – RTK Radio connection ③

Basic system diagram



	Description	P/N
①	GFX-750 Display	121000-05
②	GFX-750 Display to NAV-900 Guidance Controller cable	110540
③	NAV-900 Guidance Controller	108993-05
④	GFX-750 System Power and CAN (1) Display cable	110551
⑤	GFX-750 System Power (Battery Cable)	67258
⑥	CAN Port. Uses adapters to connect to CAN implement devices (ISO and Field-IQ™ Basic)	1100551

Required components for mounting

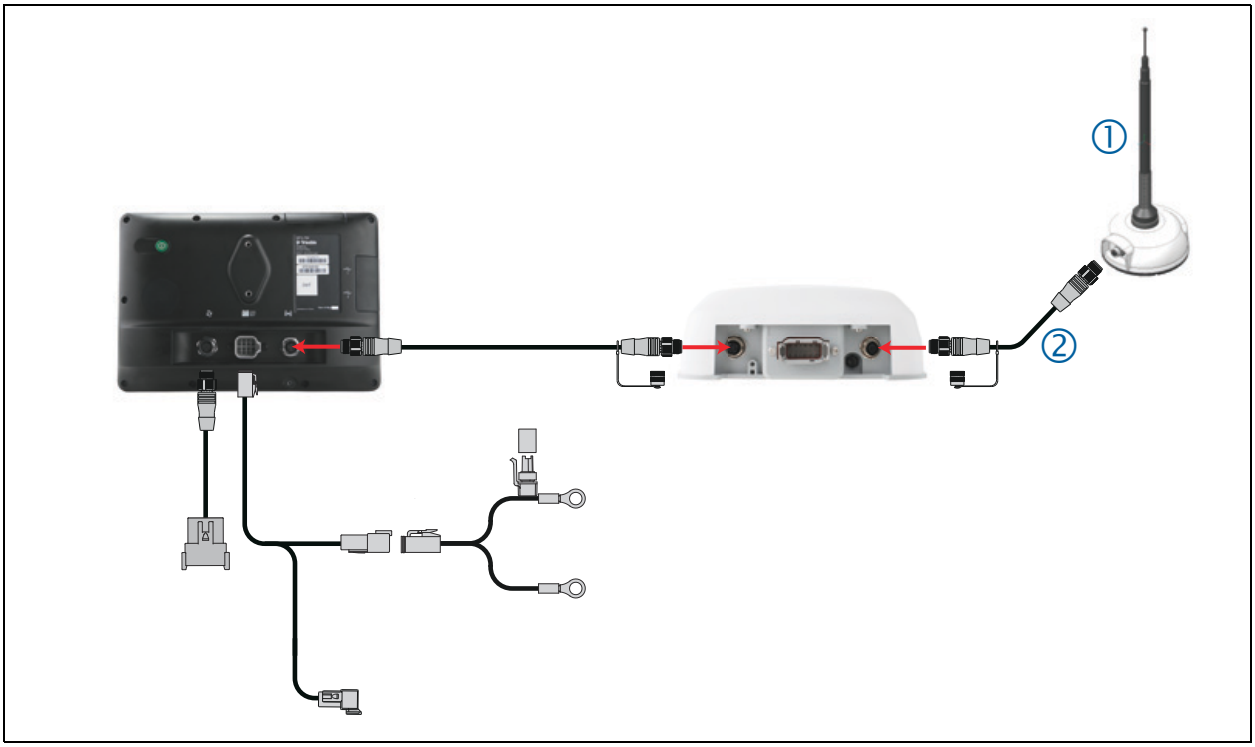
P/N	Description
108993-05	Guidance Controller, NAV-900, Trimble
109315	NAV-900 Base Mount Plate
109890	NAV-900 Base Mount Feet

Optional accessories for mounting

P/N	Description
109314	NAV-900, Mount, Quick Release Kit
110308	NAV-900, Mount, Spar Quick Release Adapter
111339	NAV-900, Mount, CNH Quick Release Adapter
111340	NAV-900, Mount, Agco Adapter
111342	NAV-900, Mount, JD Adapter
64898	Spar mount: 16.5" – 28.5"
55349	Spar mount: 27.5" – 37.5"
53676	Spar mount: 36.5" – 46.5"
55348	Spar mount: 45" - 55"
66774	Spar mount: 54" – 64"

NOTE – The standard multi-purpose mount plate and feet are supplied in your basic kit. Optional vehicle specific mounts are also available including the ones shown in the above table.

Ag-820 radio system



	Description	P/N
①	Ag-820 Radio Kit, 430-450 MHz	123500-44
	Ag-820 Radio Kit, 450-470 MHz	123500-46
	Ag-820 Radio Kit, 900 MHz	123500-90
②	NAV-900 to Ag-820 cable	113295

Preparing the vehicle for installation

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 guidance controller 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.

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

Technical assistance

For additional cable guides and information on connecting Auto Guidance Systems or if you have a problem and cannot find the information you need in the product documentation, go to https://agriculture.trimble.com/precision-ag/products/displays/ or contact Trimble technical support.

2

LED Indicators

- LED color: None
- LED color: Red
- LED color: Red/Orange
- LED color: Red/Green
- LED color: Orange
- LED color: Green
- Fatal error

Below the M12 4-pin display connector is the status LED indicator with three colors: Red, Orange, and Green. Different modes indicate different status conditions for the receiver varying between hardware issues, firmware issues, and the GNSS fix status (varies by selected correction type).

LED color: None

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Off	No Power	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LED color: Red

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Solid	Unit has failed. Send in for service	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flashing 1 HZ	Unit is in Monitor mode. FL200 must be used to load valid main firmware	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rapid red then solid orange	Boot Monitor Activity with Main Firmware loading while unit is initializing	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alternating red and green	Firmware is uploading or Flash File system is being formatted	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LED color: Red/Orange

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Rapid red then solid orange	Boot Monitor Activity with main firmware loading while unit is initializing	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LED color: Red/Green

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Alternating red and green	Firmware is uploading or Flash File system is being formatted	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LED color: Orange

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Rapid red then solid orange	Boot Monitor Activity with Main Firmware loading while unit is initializing	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fast flash	N/A	No position	No position	No position	No position	No position	No position	No position
Slow Flash	N/A	N/A	Autonomous. No SBAS signal	Autonomous /DGPS. No RTX signal	Autonomous /DGPS. No OmniSTAR signal	Autonomous /DGPS. No RTX signal	Autonomous /DGPS. Not connected to RTX server	Autonomous /DGPS. No CMR or RTCM3 corrections
Solid	N/A	N/A	Autonomous. Have SBAS signal	Autonomous /DGPS. Have RTX signal	Autonomous /DGPS. Have OmniSTAR signal	Autonomous /DGPS, have RTX signal	Autonomous /DGPS. Connected to RTX server	Autonomous /DGPS, CMR or RTCM3 corrections arriving

LED color: Green

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Alternating red and green	Firmware is uploading or Flash File system is being formatted	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fast flash	N/A	N/A	DGPS, no SBAS signal. Using old corrections	Converged/ Unconverged. Using old corrections	Subscription expired or other error	Converged/ Unconverged. Using old corrections	Converged/ Unconverged. Using old corrections	Fixed/Float. Using old corrections

LED State	Hardware/ Firmware indication	Autonomous	SBAS	Rangepoint RTX	OmniSTAR HP/XP/G2	CenterPoint RTX (FS/SS)	CenterPoint RTX (Cell)	CenterPoint RTK/VRS
Slow flash	N/A	N/A	DGPS, no SBAS signal. Using recent corrections	Unconverged	Unconverged	Unconverged	Unconverged	Float
Solid	N/A	Autonomous position	DGPS, have SBAS signal	Converged	Converged	Converged	Converged	Fixed

Fatal error

A fatal error will be indicated by the following repeating cycle:

- Rapidly flashing Red > Solid Orange
- Possible flashing Orange > Rapidly flashing Red

3

Mounting the NAV-900 Guidance Controller

This chapter describes how to mount the guidance controller onto a vehicle.

Orientation of the guidance controller

The presence of the Inertial Measurement Device (IMD) requires that the device is installed rigidly with the orientation of the guidance controller being specified in reference to the top/front of the vehicle.

A neutral 0°, 0°, 0° (Roll, Pitch, Yaw) orientation is required, with the dome up and the connectors facing backwards toward the rear of the tractor.

Mounting options

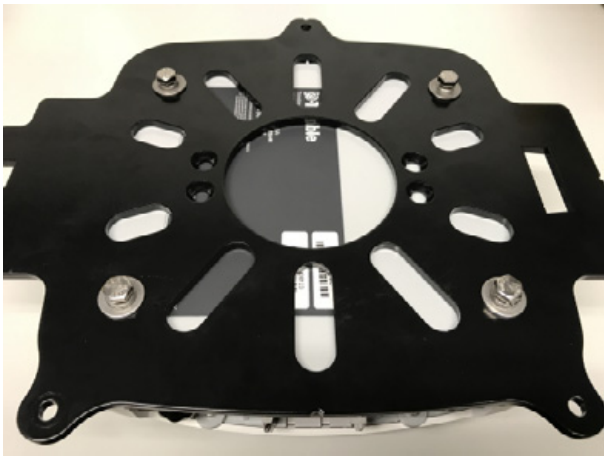
1. VHB double-sided tape mounting (see page 19).

   NOTE – VHB mounting is not recommended for high-precision auto guidance installations and should be used as the last option; a more rigid fixed mount option is recommended as some cabs can have flexibility in their structure. For high performance, choose from one of our more rigid factory mount adapters or spar mount options. See Optional accessories for mounting, page 9.

2. Factory-fitted mounts:
   - AGCO factory roof mounts (see page 22)
     - Challenger
     - Massey Ferguson
     - Valtra
   - Case IH factory roof mounts (see page 24)
   - Fendt Internal factory roof mounts (see page 25)
   - John Deere factory mounts (see page 27)
     - Current Starfire
   - New Holland factory roof mounts (see page 29)
3. Spar mounting (see page 30).

Attaching the base mounting plate

The guidance controller has a base mounting plate (P/N 109315) for adapting to other mounting fixtures. It is attached using four M6 x 14 mm bolts with flat washers and lock washers into the 4 bolts in the base of the housing. Tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.



VHB (double-sided tape) style mounting

The VHB tape option is standard with some display system kits and can be used if no factory-fitted mount or Spar mount option is available.

VHB tape – 3M application guidelines

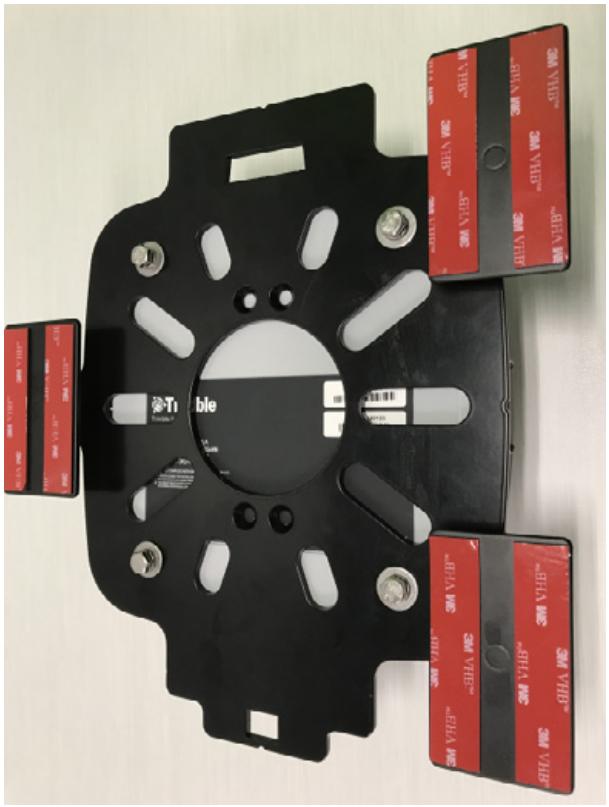
- **Mating surfaces**: (tractor roof) are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol (IPA) and water prior to applying 3M™ VHB™ tapes.
- **Heavy Oils**: A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Temperature**: Ideal application temperature range is 70°F to 100°F (21°C to 38°C). Pressure sensitive adhesives use viscous flow to achieve substrate contact area. Minimum suggested application temperatures: 50°F (10°C).
- **Pressure**: Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Typically, good surface contact can be attained by applying enough pressure to insure that the tape experiences approximately 15 psi (100 kPa) pressure.
- **Time**: After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours.
- **Disassembly and removal of residue**: To remove: If the assembled area can cope with an elevated temperature, a hand-held heat gun can soften the tape for ease of removal. Additionally, cutting through the adhesive bond-line is an effective method of removal. Use an appropriate saw or tool. A soapy water solution can be effective to help ease of cutting. Remove adhesive residue using a 3M citrus-based cleaner, Automotive Bug and Tar remover, or other commercial adhesive removers. (Follow manufacturers instructions and safety precautions).

1. Start by putting the height adjustment nuts on the VBH plate stud.

2. Insert the stud through one of the three outer mounting holes on the main mounting plate.

3. Place the flat washer and lock washer on the stud. Loosely thread the remaining nut onto the stud.

4. Repeat for the other two stud mounts.
5. Attach the guidance controller to the main mounting plate.
6. Verify the vehicle is sitting in a level location.
7. Find a suitable location on the top of the tractor cab with minimal flex and height variation.



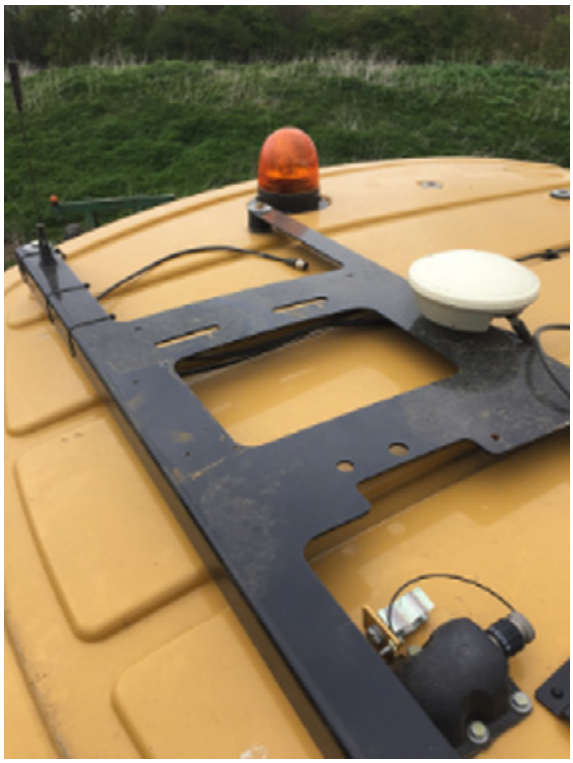
8. Before removing the VHB protective covers, place and mark the location on the cab ensuring it is on the center-line of the vehicle. Mark each VHB foot.
9. Peel the covers from the VHB tape and place the feet in the marked locations.
10. Adjust the height of the nuts on the studs to level the guidance controller.

Factory-fitted specific mounting options

AGCO factory roof mounts (five different types)

Type 1 – AGCO Challenger MT 765E Tracked Tractor

1. Fit the two tabs on the NAV-900 guidance controller mount plate into the slots on the existing roof bracket.



2. Insert, twist, and latch the opposite side of the plate.

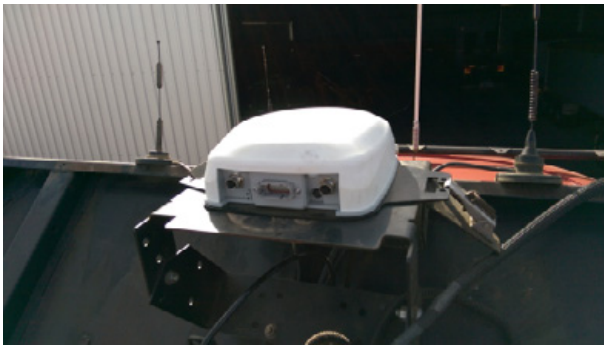
NOTE – When fixing the NAV-900 unit at the NAV-900's AGCO mounting plate, tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.

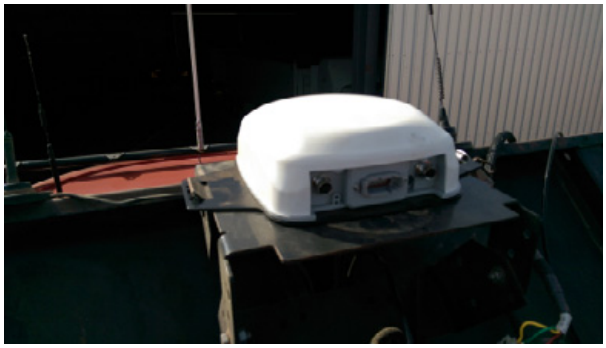
Case IH factory roof mounts

Case IH machines that come factory ready are fitted with a quick release mount for the 252/262/372 receivers. There is a specific NAV-900 guidance controller mount plate for these vehicles (P/N 111339).

1. Slip the open slot on the mount plate over the raised tab on the CNH receiver mount plate and then use the over-center latch to secure the guidance controller.

Case IH Flagship combine install: (Case IH 9120 pictured)





Case IH Tractor install: (CIH Magnum 340 pictured)

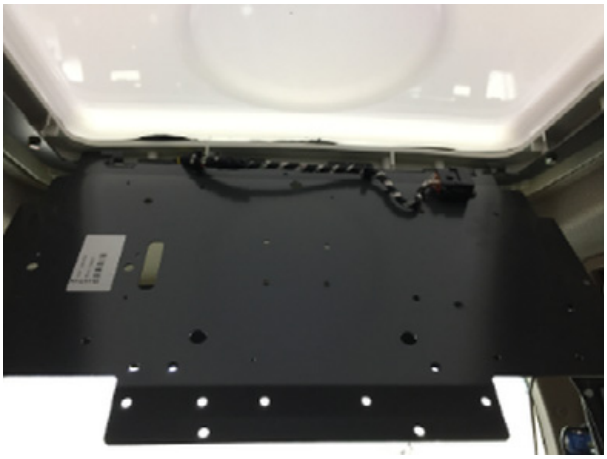
NOTE – When fixing the NAV-900 unit at the NAV-900's CNH mounting plate, tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.

Fendt internal roof factory mounts

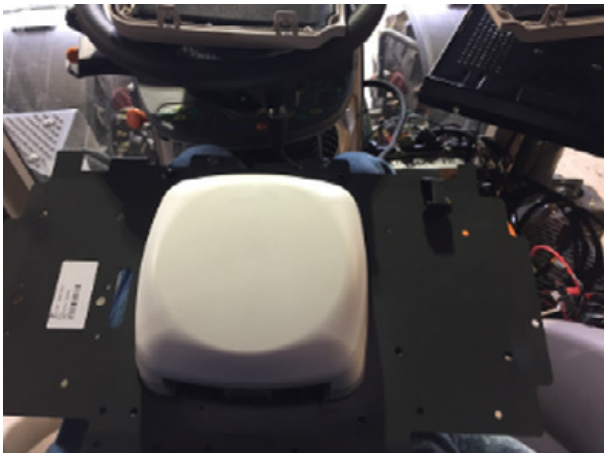
Guidance Ready Fendt (MY 2016 and later) and Challenger 1000 series machines have a cavity within the roof for GNSS antennas.

For these machines: (Fendt 716 Vario Profi MY2016 shown)

1. Open the roof cavity.

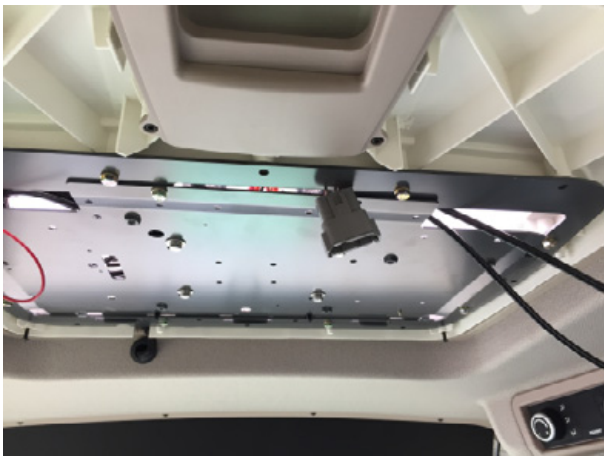


2. Remove the antenna mounting tray. Center the guidance controller on the tray.



3. Utilize the base mounting plate as a template to mark and drill ¼" holes for mounting the guidance controller.

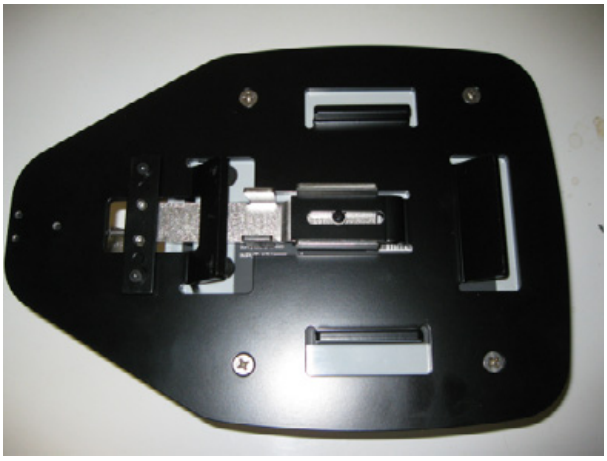
4. Re-insert the mounting tray in the roof, and use the M6 bolts. Tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.



John Deere Starfire factory mounts

Current versions

1. Secure the guidance controller to the John Deere factory adapter (P/N 111342) using the four supplied countersunk M6 bolts. The connectors should be located opposite of the latch. Tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.



The adapter will secure to the John Deere factory Mounting Square:

1. Lay the back side of the mount onto the square.

2. Lay the front side down and secure with the latch.
3. Connect the Interface Cable to the Starfire connector under the front of the roof.

New Holland factory roof mounts

New Holland machines that come factory ready are fitted with a quick release mount for the 252/262/372 receivers. The NAV-900 guidance controller CNH adapter plate (P/N 111339) will fit into these mounts.

See also Case IH factory roof mounts, page 24.

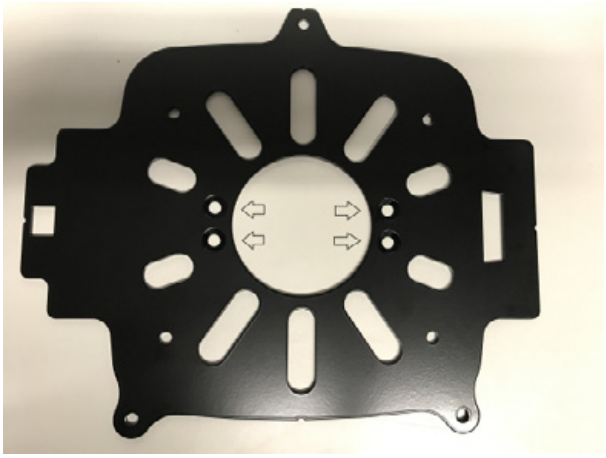
Spar mounting method

For vehicles that do not have factory mounting methods or the factory mounting method is already in use, Spar mounts are available to span between rigid bolts on the roof.

Lengths available are:

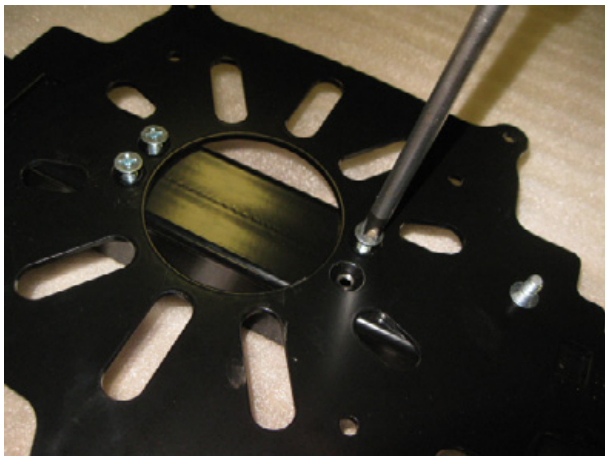
- P/N 64898: 16.5" – 28.5"
- P/N 55349: 27.5" – 37.5"
- P/N 53676: 36.5" – 46.5"
- P/N 55348: 45" - 55"
- P/N 66774: 54" – 64"

The guidance controller plate has a four-bolt pattern that directly attaches to the spar mounts:

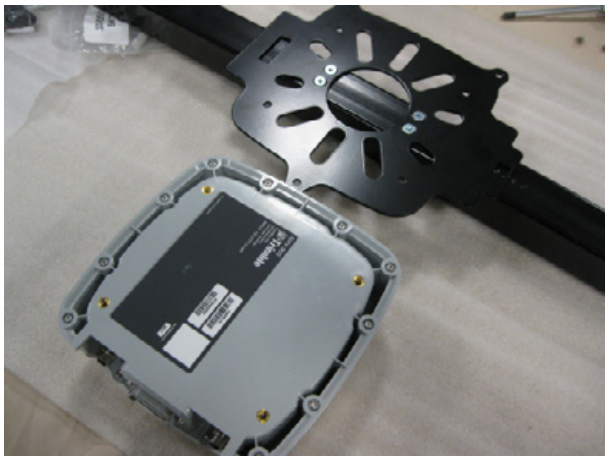


1. Remove the spar from the box and lay out the hardware:

2. Align the four holes on the base mounting plate with the four holes in the spar. Install the supplied ¼-20 × ½" countersunk bolts and tighten appropriately.



3. Lay the guidance controller on its top.



4. Lay the mounting plate with spar attached over on top. Attach the plate to the guidance controller with the qty 4 - 6 mm bolts and lock washers. Tighten the four M6 fasteners to 7.0 ± 0.4ft-lbs (10.0 ± 0.5 N-m). Take care not to over-tighten the bolts as damage may result.

5. Loosen and remove the large bolts on the cab that are to be used to fasten down the spar.

6. Place the supplied spacer on the cab mounting point. The thickness of the spacer will vary by kit.

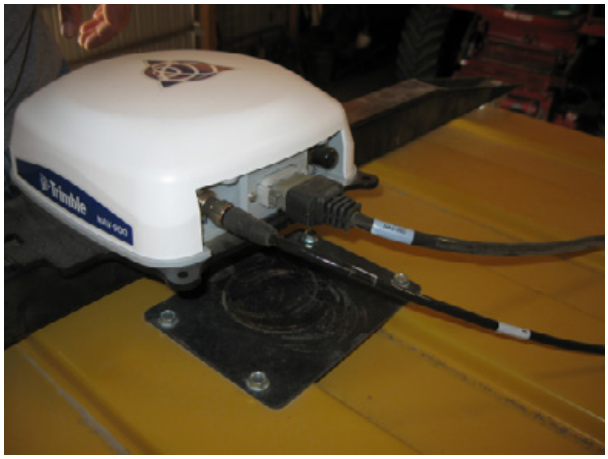
7. Locate the provided longer bolts to be use for securing the spar. Put both the original washer and the larger provided washer on the bolt.

8. Place the spar on the space and insert the bolt.

9. Insert the bolt on the other side of the cab. Center the spar on the cab using a measuring tape. Then tighten the bolts.

All mounting types – Connecting the cables

1. Connect the display cable to the 4-pin M12 connector on the left of the NAV-900 guidance controller.
2. Make sure that you align the keying and then tighten the connector.
3. Insert the install specific interface cable into the 12-pin Deutsch connector.
4. If a radio is being installed, remove the plastic cap on the radio connector (right side 5-pin M12 connector) and carefully align the keying. Tighten the connector.
5. If no radio is being installed, leave the cap on for weather protection.



4

Firmware

The NAV-900 firmware automatically updates to match the version running on the Trimble GFX-750 display.

You can get updates manually via USB drive or via the Internet using Wi-Fi.

To automatically download the latest software updates:

1. Tap **Settings** and select **WiFi Settings**.
2. Tap **Connect** to connect your tablet to the network of your choice.
3. On the **Android App** screen, tap **App Central** to open the App Central market place. From here, you can initialize any software notification and update.

For more information, go to http://agpartners.trimble.com/agsupport/FirmwareMatrix/ or https://agriculture.trimble.com/precision-ag/products/.