INSTALLATION INSTRUCTIONS

Autopilot

automated steering system

Case IH AFS Connect

- Magnum 180/200/220/240/250/280/310/340/380/400
- Steiger 370/420/470/500/540/580/620

New Holland PLM Intelligence

- T8.320/T8.350/T8.380/T8.410/T8.435
- T8.410 SmartTrax
- T8.435 SmartTrax
- T9.435 Wheeled
- T9.480 Wheeled
- T9.530 Wheeled and SmartTrax
- T9.565 Wheeled and SmartTrax
- T9.600 Wheeled and SmartTrax
- T9.645 Wheeled and SmartTrax
- T9.970 Wheeled and SmartTrax

PTx Trimble

Version 10.00
Revision A
January 2024
P/N 54035-6197-E10

Legal Notices

Agriculture Business Area

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Release Notice

This is the January 2024 release (Revision A) of the *Autopilot Automated Steering System Installation Instructions*, part number 54035-6197-E10. It applies to Version 10.00 and later of the Autopilot automated steering system.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to:
trimble.com/en/our-commitment/responsible-business/corporate-compliance/environmental-compliance.



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:

DANGER! ALERTS YOU TO A SITUATION THAT IS LIKELY TO RESULT IN DEATH OR SERIOUS INJURY.

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

DANGER! 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 THE BOOM TO THE LOWEST POSITION BEFORE YOU BEGIN WORK.

DANGER! 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.

DANGER! 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.

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 – 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.

WARNING – 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.

Cautions

CAUTION – Damage will result to the cable if it is not routed correctly. When routing cables be sure to route them free from areas that may result in damage to the cables including pinching, stretching and rubbing.

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



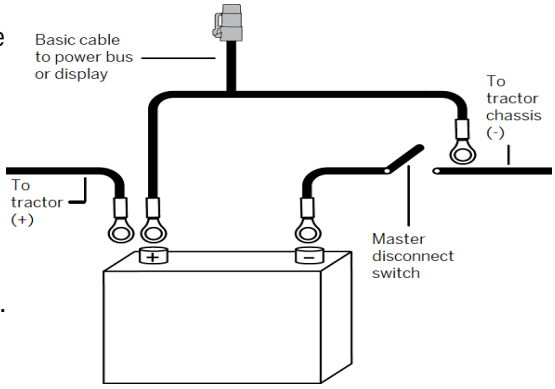
Set the hose pressure as low as practicable, and spray at a 45° to 90° angle. Keep the nozzle of the power washer away from the machine at the distance recommended by the manufacturer.

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

CAUTION – Before you drill any holes, check behind the drilling surface to ensure that you will not damage any hoses, wires, or other equipment. Failure to do so could result in damage to the vehicle.

CAUTION – If the vehicle has a master electrical disconnect, make sure the basic power cable (P/N 67258/92905) 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
- Manual system upgrade to the Autopilot system
- Preparing the vehicle for installation

This manual describes how to install the platform specific components of the Trimble® Autopilot™ automated steering system.

For installation of the GFX display and NAV-9xx guidance controller please review the separate display and NAV controller installation guide.

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 (trimble.com) for an interactive look at Trimble and GNSS.

Technical assistance

Go to the Ag Resource Center for the latest support information, including:

- support notes detailing support issues
- documentation
- the latest files available for download

If you still cannot find the information that you need, contact your Trimble reseller.

Manual system upgrade to the Autopilot system

Displays

Retain
GFX display: P/N 13x000-01
NAV-960™ guidance controller: P/N 131800-04
Power cable GFX display: P/N 110551
Base power cable: P/N 67258
GFX display to NAV-xxx comms cable: P/N 110540

Required components

Kits required	Special tools
Platform kit: P/N 54035-6197	Standard hand tools

Antenna mounting kits

Kits required
Mounting bracket, NAV-9xx to CNHi: P/N 132088
Optional spar mounts (must measure application for proper part number):
• P/N 64898: Bracket, GPS Spar 16.5"– 28.5"
• P/N 55349: Bracket, GPS Spar 27.5"– 37.5"
• P/N 53676: Bracket, GPS Spar 36.5"– 46.5"
• P/N 55348: Bracket, GPS Spar 45"– 55"
• P/N 66774: Bracket, GPS Spar 54"– 64"

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 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.

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

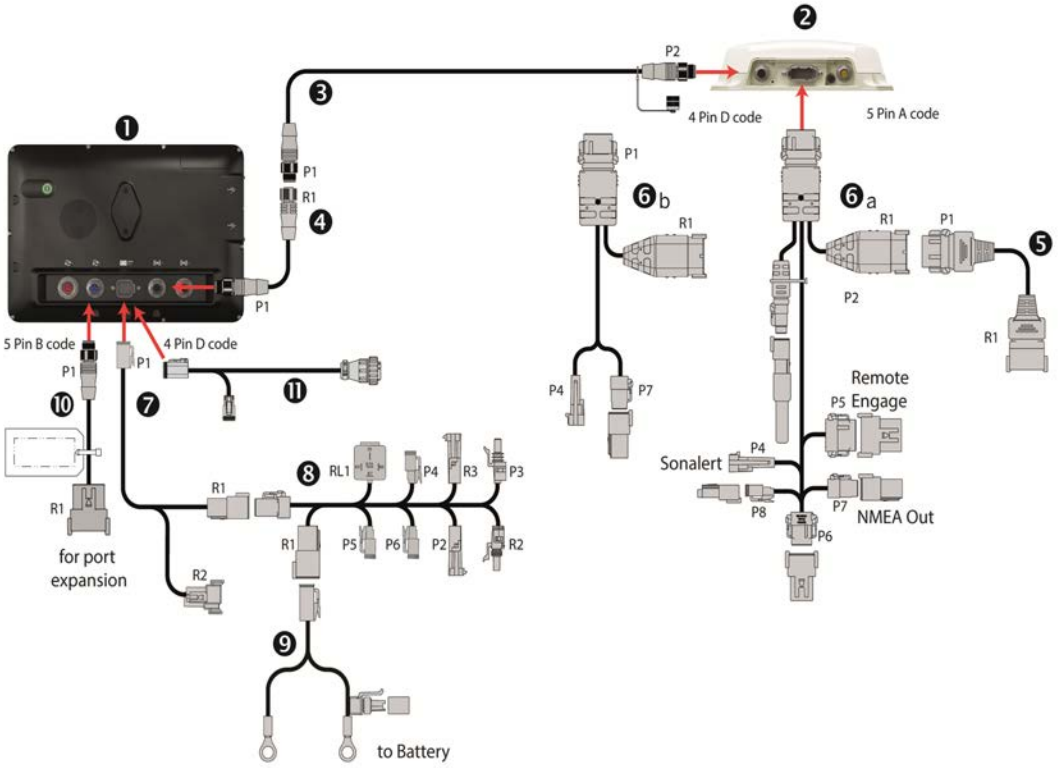
TIP – Read through the steps and make certain you have all the hand tools needed before starting installation.

2

Connecting the NAV-960 controller

- GFX series display: Components
- GFX series display: Installation
- GFX series display: Installing the power harness
- Connecting the cables

GFX series display: Components



Item	Description	P/N
1	GFX display, with PIQ App	13x000-01
2	NAV-960 guidance controller	131800-04
3	Cable Assy, GFX to NAV, Power/Ethernet (BRR), 5 m	110540
4	Cable Assy, GFX to NAV, Power/Ethernet (BRR) Extension, 2.5 m (optional extension for large vehicles	112082
5	Cable Assy, Roof CAN AFSC	130133
6a	Cable Assy, NAV, Roof CAN, Sonalert, NMEA, R.E., IMU Extension (optional)	122387
6b	Cable Assy, NAV, Roof CAN, Sonalert, NMEA	130738
7	Cable Assy, GFX, Power to display, CAN, 2.5 m	110551
8	Cable Assy, GFX, Power with Relay and Switch (Acc)	67259
9	Cable Assy, GFX, Basic Power, 4 m	67258
10	Cable Assy, Display, Expansion Port, RS232, Dig I/O, 2.5 m	110545
11	Cable Assy, Display Power, 16-pin, 2nd Display Connector, CNH	122452

NOTE – This cable can be used instead of items 7, 8, and 9.

GFX series display: Installation

Step 1

The display should be mounted on the top right side of the cab using the RAM mount ball provided in the tractor for mounting a second display.



GFX series display: Installing the power harness

The GFX series display requires a nominal 12 volt power source. The P/N 67259 cable has ring terminal leads for connecting to a battery or other cable mount point.

WARNING – If the machine has a master electrical disconnect, ensure that the display/receiver is disconnected from the battery when the master disconnect is used. Failure to do so may result in hardware damage and void warranty. Additionally, it is recommended to use power terminals located within the cab of the vehicle that ground in the same location as the cab components to avoid ground shifts between the display and any vehicle ECUs.

Step 1

Locate the display power adapter cable P/N 122452.



Step 2

Connect the 6-pin DT power/CAN cable P/N 122452 to the middle port of the display.



Step 3

Connect the 4-pin M12 connector to the 4-pin receiver connector. Note the keying and number of pins.





Step 4

Attach the round P1 connector on P/N 122452 to the second display connector in the cab.



Connecting the cables

Step 1

Locate the P/N 118226 adapter cable.

Plug the P1 connector on cable P/N 118226 into the R1 on cable P/N 122387 or P/N 130738.



Step 2

Connect the other end of the interface cable into the 12-pin DT connector on the vehicle's roof.

NOTE – NAV-900 controller shown as reference.



Step 3

Connect P2 of the P/N 110540 cable to the 4-pin M12 connector on the left side of the NAV-9xx controller.

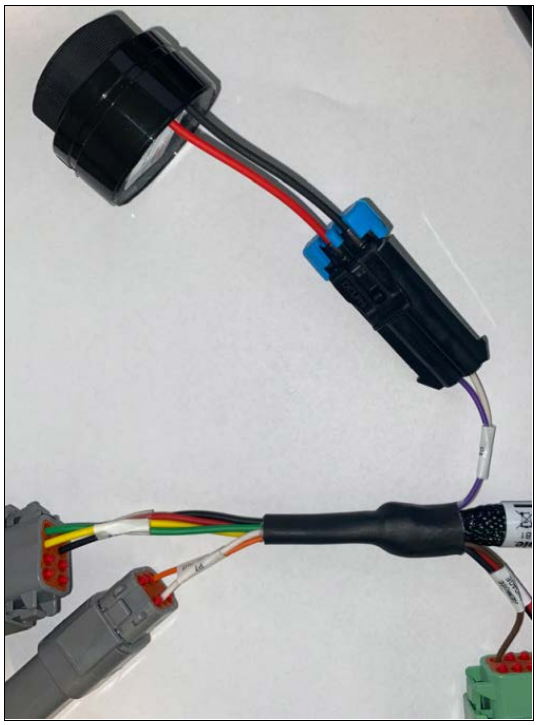
Connect P1 on cable P/N 122387 or P/N 130738 to the 12-pin DTM connector on the NAV-9xx.



Step 4

Route the remainder of cable P/N 122387 or P/N 130738 into the cab.

Connect the sonalert to the P4 connector.



3

Final Machine Check

- Checking the system
- Setting up 3rd party guidance
- Disabling the TIM
- Enabling the steering

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 chapter.

Checking the system

1. Connect the battery.
2. Update the Trimble display and the NAV-9xx controller to the latest firmware from Ag Resource Center.
3. Configure the vehicle using the Trimble display and selecting the correct configuration for the vehicle model being used.
4. Calibrate the Autopilot system using the Trimble display. Depending on your machine type, the following items must be calibrated before you can use the Autopilot system:
   - NAV-9xx mounting orientation
   - Antenna height/Antenna axle offset, and Roll offset
   - Make sure the machine steering has been calibrated by the CNHi dealer for the best performance.
5. Set up the guidance. See Setting up 3rd party guidance.
6. Disable the Tractor Implement Management (TIM). See Disabling the TIM.
7. Enable the steering. See Enabling the steering.

Setting up 3rd party guidance

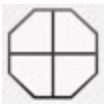
The machine must have a CNHi ISOBUS Class III Steering unlock (CNHi P/N 47645764) installed on the system. This must be done by a CNHi dealer.

1. Set up the Pro1200 for guidance in **Pro 1200 Menu** / **GNSS & Guidance** / **Guidance**:

   Set **Guidance** to **OFF**.



2. CNHi ISOBUS Class III uses a 4 quadrant status symbol to display the status of that ISOBUS Class III function, including 3rd Party CAN Guidance. It is important to understand these symbols and know what they mean.

Icon	Description
	ISOBus Class III is off. This means the tractor controller has not been initialized or the system has been canceled.
	Tractor controller is performing self-checks/not ready to accept commands
	An activation condition on the tractor controller for accepting steering commands is not met. Example: moving steering wheel, Field mode switch is in on-road mode, or the operator is out of the seat.
	Tractor controller has passed internal self-checks and is ready. It is in standby mode, waiting for the external guidance system to be ready.
	The tractor controller is ready to accept guidance commands and the external guidance system is ready to send guidance commands. The machine and the external guidance system are waiting for the operator to acknowledge and engage the steering. **NOTE –** The following actions must be done for the status octagon to go to the 3/4 green ready state: • 3rd party Guidance Unlock installed (Step 1) • Machine configured for 3rd Party Guidance with ISOBUS Class III (Step 2) • Field mode switch is in the off-road position (Step 4) • ISOBUS Class III is enabled (Step 5) • Be in a field on the Trimble display • Have a guidance pattern created in the field on the Trimble display • Be within an engageable distance to the guidance pattern • No Manual override is active (operator is not manually moving the steeringwheel)
	Operator has engaged the steering, and the external guidance system is steering the machine.
	Internal error in the tractor function. The external guidance system will not engage.

The symbol for the external guidance system will appear in the upper-left corner of the Pro1200 display. This area is viewable on all screens.



3. Push the field mode switch to the Up position. This setting can be confirmed in **Pro1200 Menu** / **Tractor** / **Steering**.

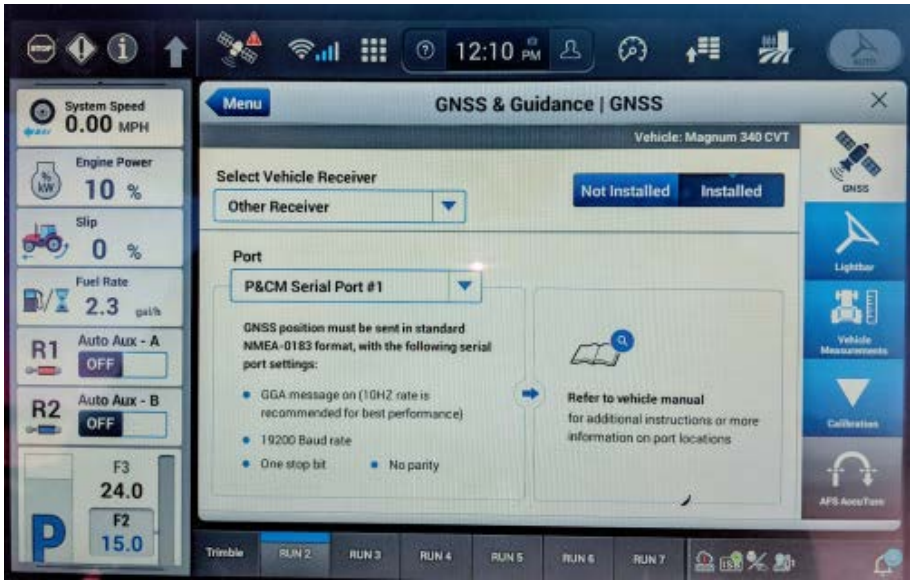




4. Enable CNHi ISOBUS Class III Steering by fully pressing the switch labeled Auto up for 3 seconds.



5. To set up NMEA into the Pro1200, navigate to Pro1200 **Menu** / **GNSS & Guidance** / **GNSS**.



a. Select **Installed**.

> **NOTE –** If a GNSS signal is not needed by the Pro1200, select **Not Installed** and skip the rest of the steps.

b. Set **Select Vehicle Receiver** field to **Other Receiver**.

c. Set **Port** to **ISO CAN BUS**.

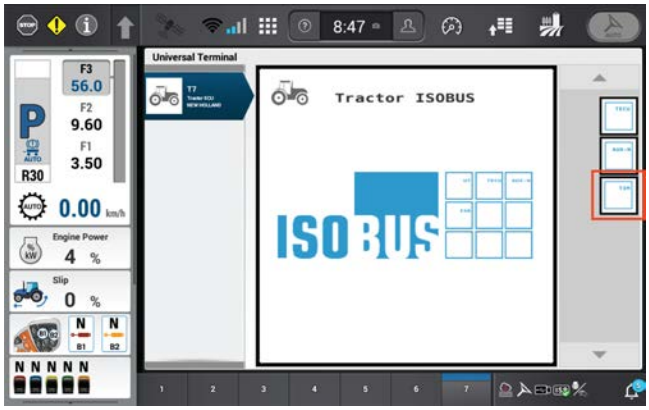
d. The following PGNs must be set in the **Trimble Receiver configuration** settings for CAN Port B:

- PGN 129029 @ 10 Hz
- PGN 65267 @ 10 Hz
- PGN 65256 @ 10 Hz

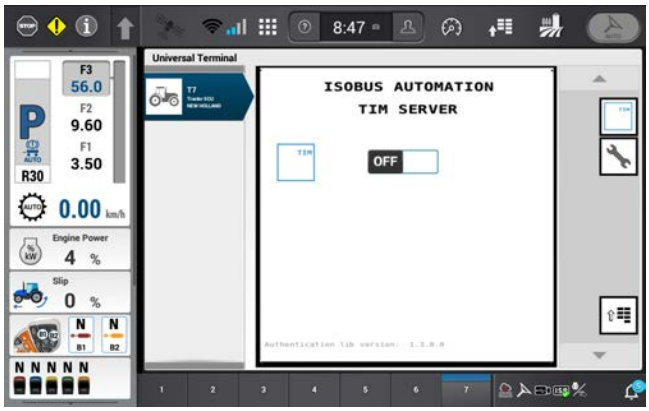
Disabling the TIM

In order for the third-party guidance to work, the TIM setting must be set to **OFF**.

1. Enter the **Universal Terminal** screen on the Pro1200 display. Select the **TIM** button on the right side of the screen.



2. Set the **ISOBUS Automation TIM Server** setting to **OFF**.



Enabling the steering

Complete the following steps with each power cycle of the machine:

1. It is important that the Pro1200 system is powered up before the Trimble system. If the Trimble system is powered up prior to the Pro1200, the ISOBUS Class III authentication process will not complete properly and the systems will not communicate with each other.

   Normally powering the Trimble system through key switched power is sufficient to facilitate this timing, but in some instances the Trimble display may need to be manually powered up after the Pro1200 system is fully loaded.
2. Cycle the field mode switch from the field (**Off-Road**) position to the **On-Road** position, and back to the field position. (see page 18 , in Setting up 3rd party guidance).
3. Press for 3 seconds the Class III ISO switch to enable ISOBUS Class III steering (see page 19 , in Setting up 3rd party guidance).

The Trimble steering system can be engaged either through the engage button on the Trimble display, or through the engage button on the machine's joystick.

NOTE – The CNHi ISOBUS Class III status octagon will only go to the 3/4 green ready state when the Trimble display's engage button steering wheel goes to green. If the Trimble display's engage button is yellow, the Class III status octagon will be 2/4 orange mode.

Case IH Engage button



New Holland Engage button




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