INSTALLATION INSTRUCTIONS

Trimble® Autopilot™ Automated Steering System

Agrifac Sprayer ▪ Condor
(Trimble Ready machines)

Version 5.00
Revision A
March 2015
Part number 64425-77-E05

Trimble

Legal Notices

Agriculture Business Area

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This is the March 2015 release (Revision A) of the Autopilot Automated Steering System Installation Instructions, part number 64425-77-E05. It applies to version 5.00 of the Autopilot automated steering system.

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Notices

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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http://www.trimble.com/Corporate/Environmental_Compliance.aspx



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Or
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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.

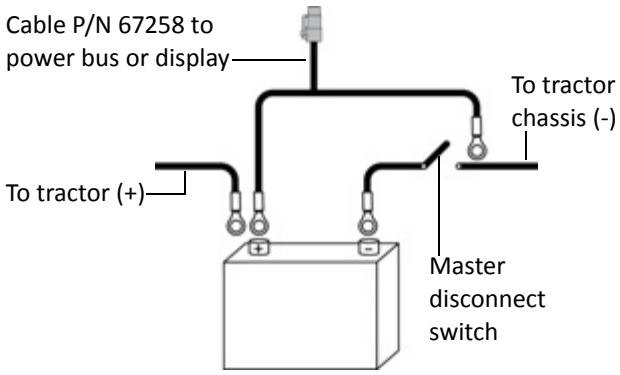
CAUTION – Do not direct pressurized water at:
- Electronic or electrical components or connectors
- Bearings
- Hydraulic seals
- Fuel injection pumps
- Any other sensitive parts or components



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 damaging the display.



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CHAPTER 1

Introduction

In this chapter:

- Technical assistance
- Manual system upgrade to the Autopilot system
- Required components
- Autopilot hardware organization: As shipped
- 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**.

Manual system upgrade to the Autopilot system

CFX-750 display and FmX integrated display

Retain
CFX-750™ display: P/N 94110-xx **FmX® integrated display: P/N 93100-xx** Antenna for display: P/N 60600-02 (DGPS) or 77038-00 (OmniSTAR®/RTK)

Required components

Kits required	Special tools
NavController kit P/N 64425-77	Imperial Allen key

Antenna mounting kits

Kits required
Agrifac factory bracket - see Chapter 2, GPS Antenna Installation.

Autopilot hardware organization: As shipped

Hardware	Component	See...
Agrifac Trimble Ready machines NavController kit P/N 64425-77	NavController	Chapter 4
GNSS receiver	GNSS receiver	Chapter 2
	GNSS antenna	
	GNSS receiver power/data cable	
	RTK radio, cable, and radio antenna	
Display	CFX-750 display	Chapter 3
	FmX integrated display	
	Display cable	
	Mounting bracket	

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.

CHAPTER 2

GPS Antenna Installation

In this chapter:

- Mounting the GPS antenna

This chapter describes how to install the GPS antenna.

To install the antenna for the CFX-750 or FmX display, see Chapter 3, Display Installation.

Mounting the GPS antenna

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 antenna mounting bracket on the top of the roof towards the front of the machine.

Clean the surface thoroughly.

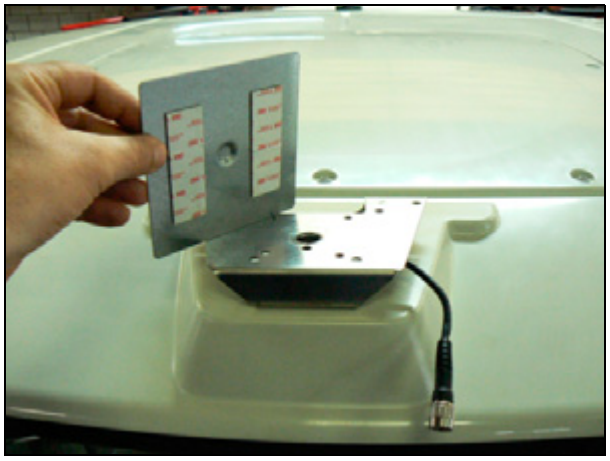
Use one of the following methods to attach the antenna:

- for a quick antenna removal, attach an antenna mounting plate, see steps 2-4.
- for a permanent installation, screw the antenna on the mounting plate, see Step 5.



Step 2

Locate the supplied VHB-backed antenna mounting plate.



Step 3

Secure the plate to the bracket using firm pressure.



Step 4

For RTK operations, a radio antenna mounting base is available at the back of the cab.

Screw the radio antenna securely.



Step 5

Alternatively, for a permanent installation, use the provided ⅝'' bolt and plate washer to secure the antenna to the mounting bracket.



Step 6

Install the antenna onto the bracket and then connect the factory installed antenna cable.



CHAPTER 3

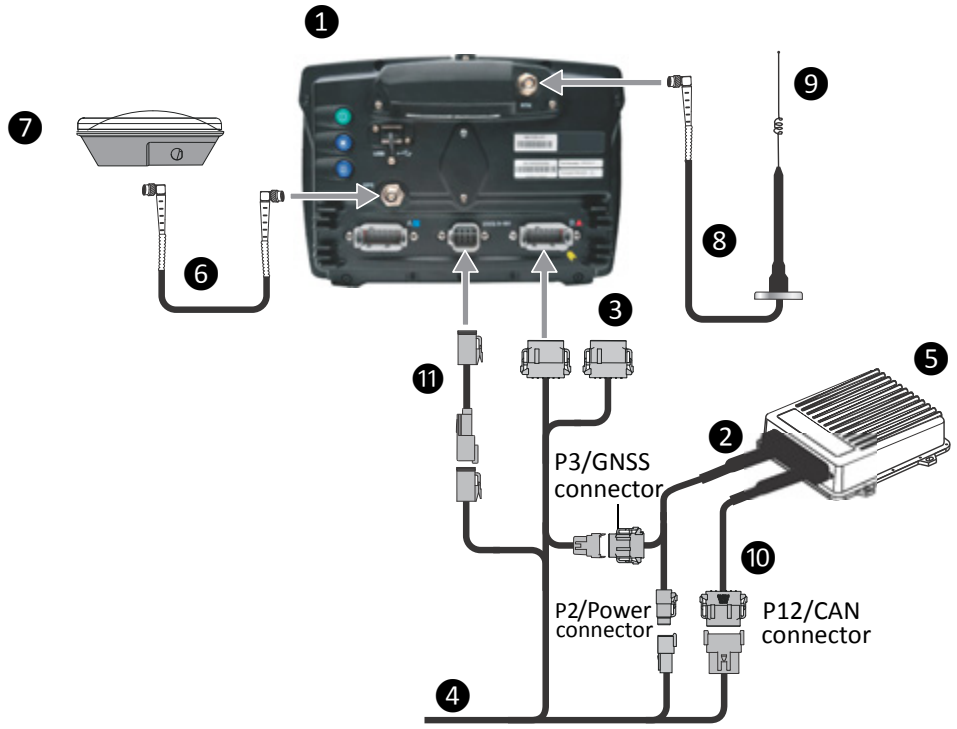
Display Installation

In this chapter:

- CFX-750 display components
- Preparing the CFX-750 display
- Installing the CFX-750 display
- FmX integrated display components
- Preparing the FmX integrated display
- Installing the FmX integrated display
- CFX-750 display and FmX integrated display: Connecting accessory options
- Installing the DCM-300 modem

This chapter describes how to install and connect the CFX-750 display or the FmX integrated display in the vehicle.

CFX-750 display components



Item	Description	Trimble part number
❶	CFX-750 display ***Note –*** *RTK password required.*	94110-xx
❷	Auxiliary NavController cable	54602
❸	Optional GreenSeeker connector	Factory installed Not connected
❹	FmX/CFX-750 OEM harness	Factory installed
❺	NavController II / NavController III	55563-00 / 55566-00
❻	Antenna cable	Factory installed
❼	AG-25 GNSS antenna	77038-00
❽	NMO-to-TNC 20 ft antenna cable and base - Factory installed	72122
❾	900 / 450 MHz radio kit / DCM-300 radio kit	22882-10 / 24253-xx / 51227
❿	Main NavController cable	54601
⓫	FmX to CFX-750 power adaptor cable	Factory installed

Preparing the CFX-750 display

Step 1

Locate the CFX-750 display, the RAM mount, and the RAM mount clamp.



Step 2

Use the provided metric hardware to attach the RAM mount to the rear of the display.



Step 3

Attach the RAM mount to the rear of the display.



Installing the CFX-750 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

The display bracket is located on the front right pilar.

Use the screws provided with the vehicle bracket to install the RAM mont ball. Tighten the screws securely.

Attach the RAM mount arm to the ball and then tighten the clamp on the RAM mount so that the display is secure.

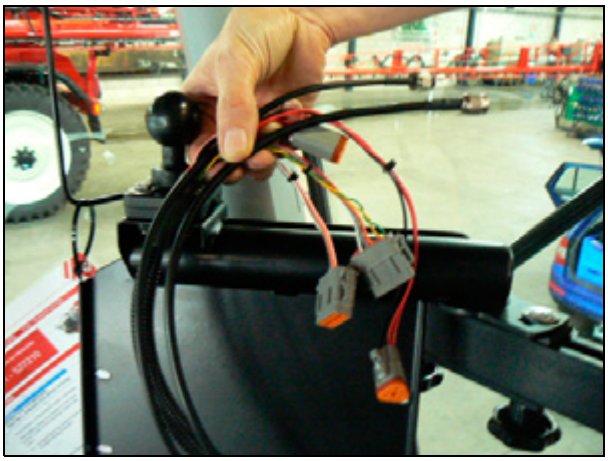


Step 2

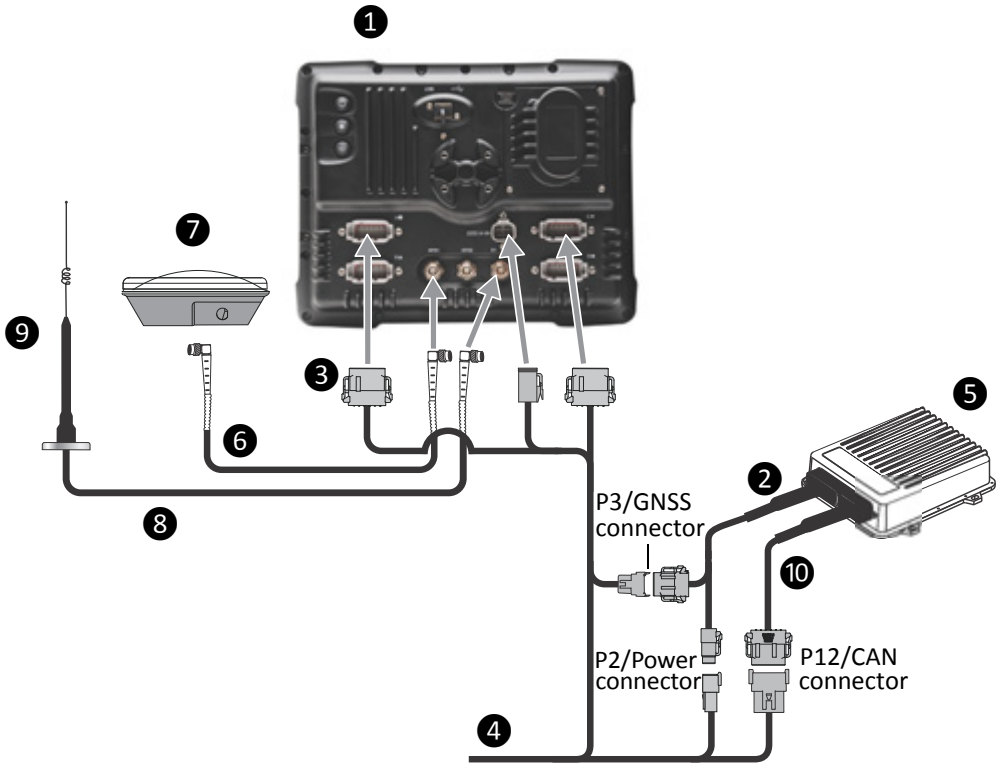
Locate the connectors on the vehicle harness and connect the 12-pin DTM Autopilot connector on the harness to the B port of the CFX-750 display.

To connect power to the CFX-750 display, use the FMX-to-CFX-750 power adaptor cable, provided with the vehicle.

Connect the GPS antenna cable and the optional radio cable to the corresponding TNC sockets at the back of the display.



FmX integrated display components



Item	Description	Trimble part number
❶	FmX integrated display ***Note –*** *RTK password required.*	93100-xx
❷	Auxiliary NavController cable	54602
❸	Optional GreenSeeker connector	Factory installed
❹	FmX/CFX-750 OEM harness	Factory installed
❺	NavController II / NavController III	55563-00 / 55566-00
❻	Antenna cable	Factory installed
❼	AG-25 GNSS antenna	77038-00
❽	NMO-to-TNC 20 ft antenna cable and base - Factory installed	72122
❾	900 / 450 MHz radio kit / DCM-300 radio kit	22882-10 / 24253-xx / 51227
❿	Main NavController cable	54601

Preparing the FmX integrated display

Step 1

Locate the FmX integrated display, the RAM mount, and the RAM mount clamp.



Step 2

Use the provided metric hardware to attach the RAM mount to the rear of the display.



Step 3

Attach the RAM mount to the rear of the display.



Installing the FmX integrated 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

The display bracket is located on the front right pilar.

Use the screws provided with the vehicle bracket to install the RAM mont ball. Tighten the screws securely.

Attach the RAM mount arm to the ball and then tighten the clamp on the RAM mount so that the display is secure.

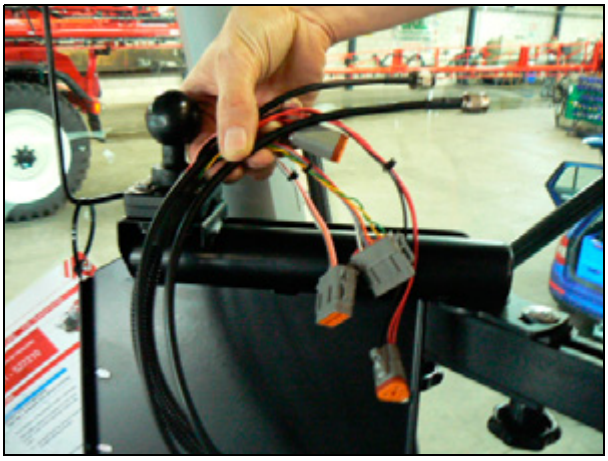


Step 2

Locate the existing connectors on the vehicle harness, at the display bracket level.

Connect the cable to the C port of the FmX integrated display.

Connect the power cable to the power port of the FMX.



Connect the GPS antenna cable and the optional radio cable to the corresponding TNC sockets at the back of the display.

Connect the GreenSeeker 12-pin DTM connector to port A for optional GreenSeeker operations.



CFX-750 display and FmX integrated display: Connecting accessory options

Note – *Unless otherwise stated, "the display" applies to the CFX-750 display or the FmX integrated display.*

AgCam

The AgCam and AgCam cable are accessory items that you can purchase separately from the display. The CFX-750 display allows up to two video inputs; the FmX integrated display allows up to four.

Step 1

Locate the AgCam and AgCam cable.

Step 2

Mount the AgCam in a secure location and then route the cable towards the display.



CFX-750 display



FmX display

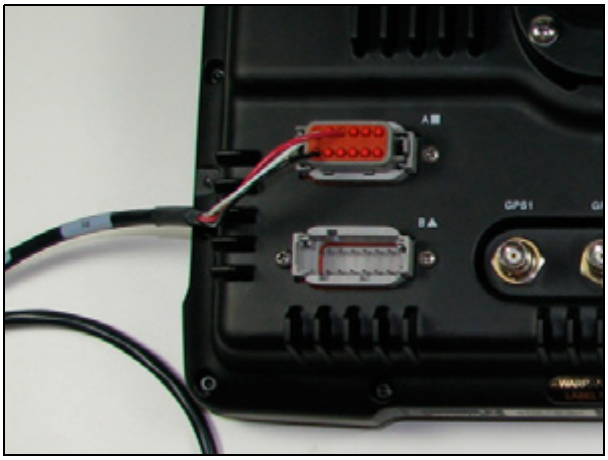
Step 3

Connect the AgCam cable to the display adaptor cable.



Step 4

Connect the display to AgCam adaptor cable to one of the open 12-pin connectors on the back of the display.



Installing the DCM-300 modem

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 existing DCM-300 bracket below the display bracket.

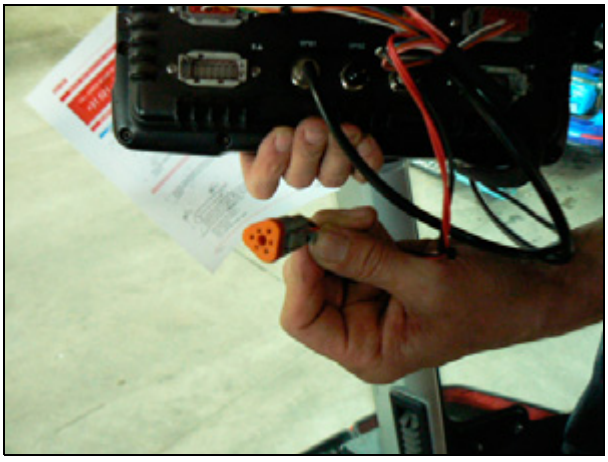


Step 2

Install the DCM-300 modem using the provided mounting hardware.

Step 3

Locate the DCM-300 power cable on the OEM harness.



Step 4

Connect the DCM-300 power adaptor cable (delivered with the DCM module).

Connect the TNC radio connector. The TNC radio connector is located on the OEM harness.



CHAPTER 4

Controller Installation

In this chapter:

- Installing the controller
- Controller connections

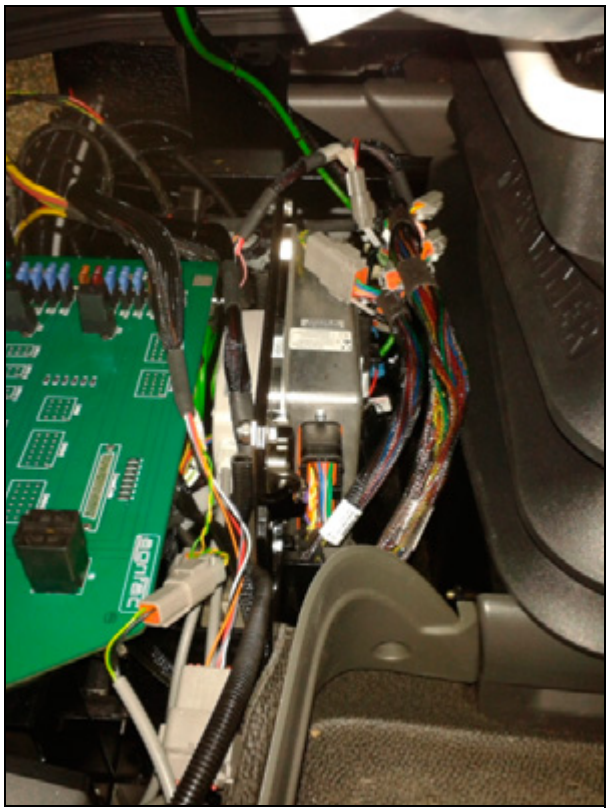
This chapter describes how to install the controller unit.

Installing the controller

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

Install the NavController in the cab on the right side of the seat base, inside the electronics compartment.



Step 2

To gain access to the mounting location, remove the plastic fuse panel cover located on the right hand side of the cab.



Step 3

Locate the controller harnesses, P/N 54601 and 54602, tucked beside the large green circuit board which holds fuses and relays.

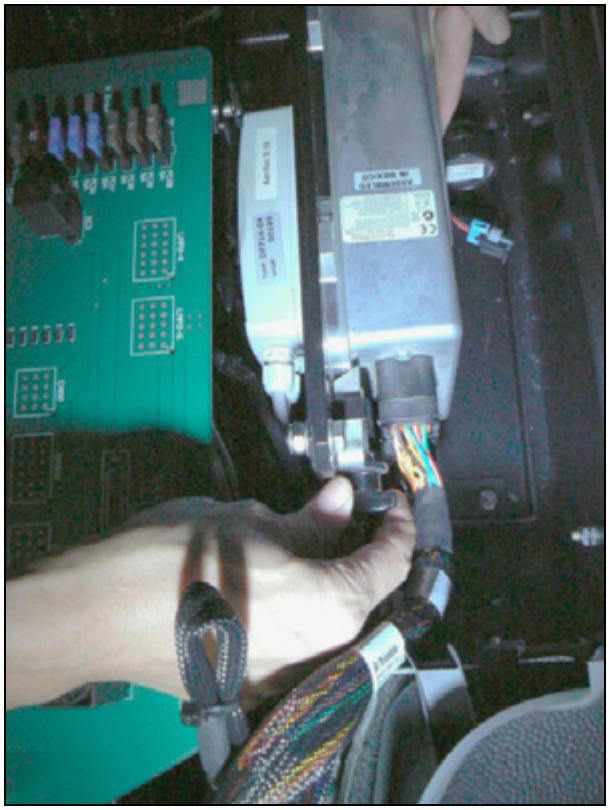
Use an Allen wrench to secure the harnesses to the controller.



Step 4

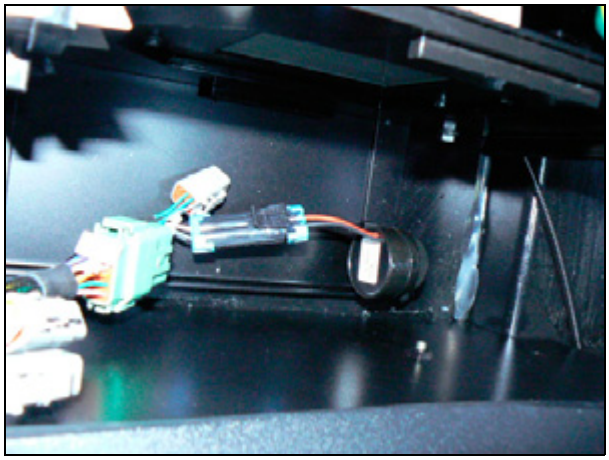
Use the existing quick-release mount to secure the controller to the machine.

No additional hardware is required for installation.



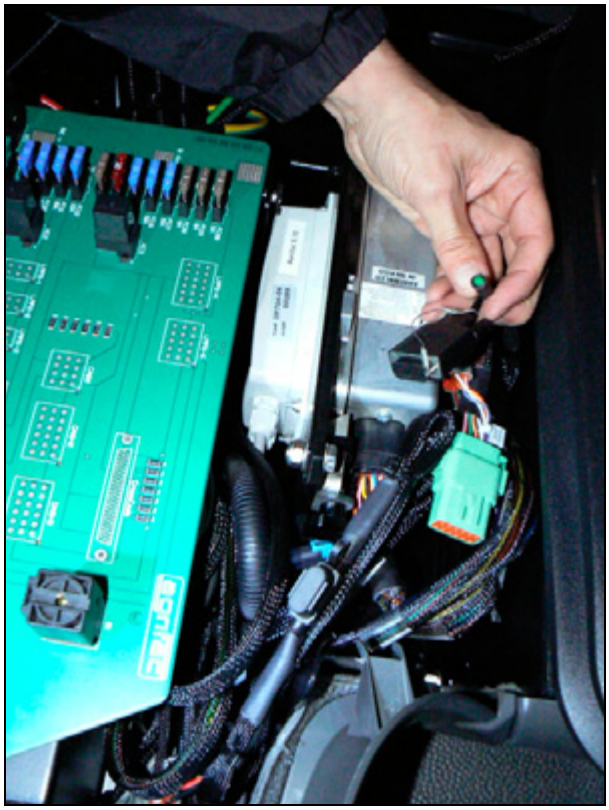
Step 5

Check that the Sonalert is connected correctly.



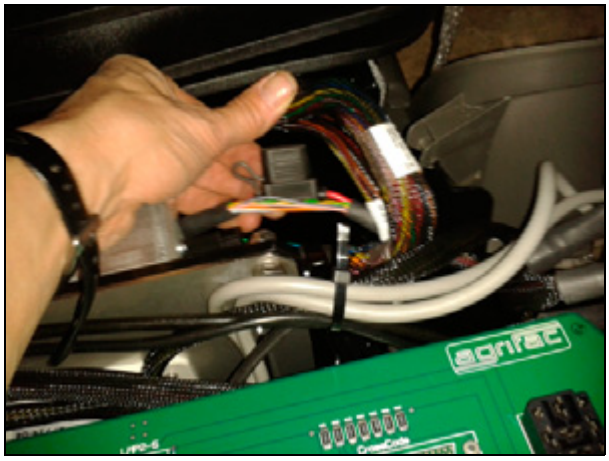
Step 6

Route the cables around the NavController so that the Status LED and Diagnostic connector are easily accessible.



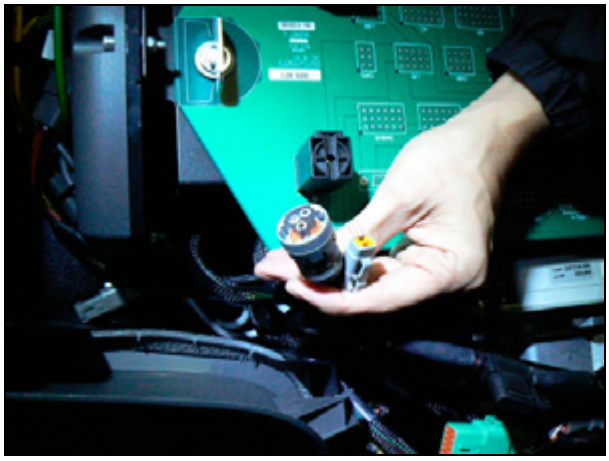
Step 7

Locate the existing main fuse that protects the Autopilot OEM harness.



Step 8

Locate the existing GreenSeeker cable for optional GreenSeeker operations.

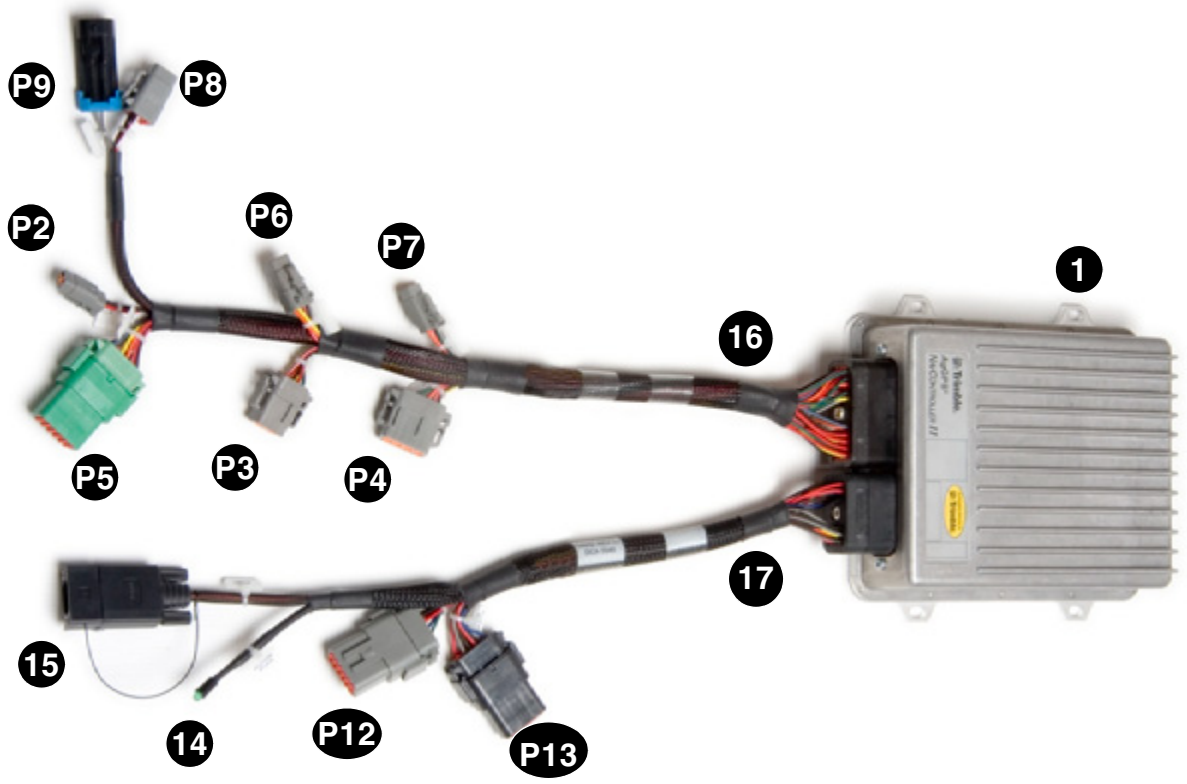


Step 9

Reinstall the plastic cover back into its original position.



Controller connections



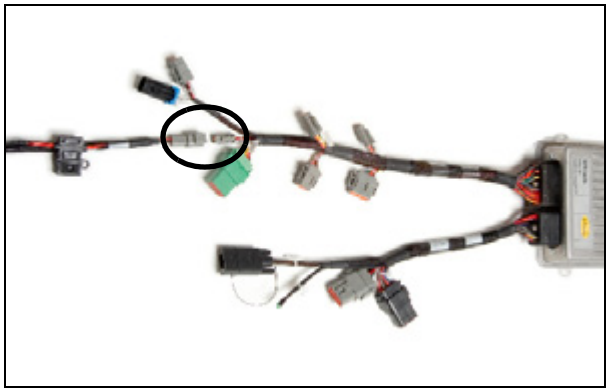
Item	Description
1	NavController II
P2	Power connector
P3	GNSS connector
P4	Display connector
P5	Vehicle sensors connector
P6	Steering sensor connector
P7	Manual override connector
P8	Hydraulic valve connector

Item	Description
P9	Sonalert connector
P12	Lightbar/spare connector
P13	Spare sensors connector
14	Status indicator
15	Laptop connector
16	Main harness
17	Auxiliary harness

Step 1

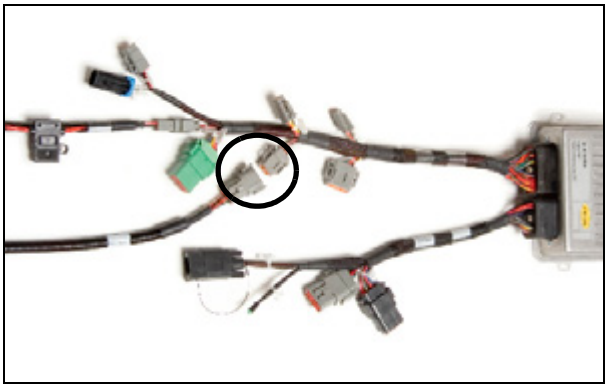
Connect the power cable connection to P2, which is labeled **Power**. P2 is located on the main wiring harness.

Note – *The power connection supplies power through the controller to all connected devices, including GNSS and displays.*



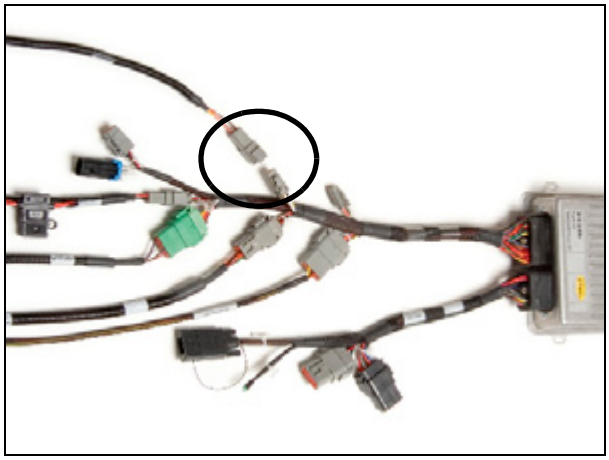
Step 2

Connect the CFX-750 display or FmX integrated display to P3, which is labeled **GPS**. P3 is located on the main wiring harness.



Step 3

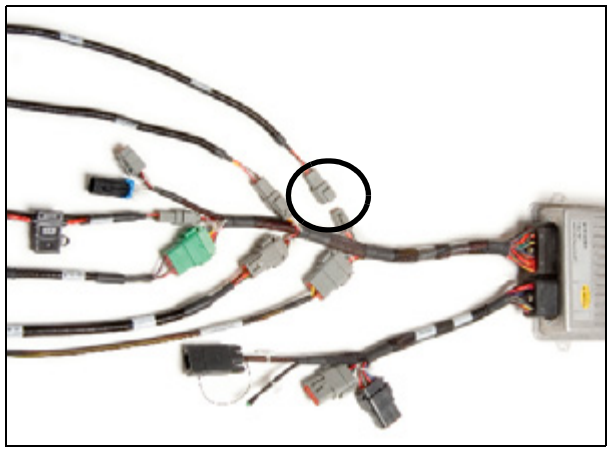
Connect the steering sensor cable connection to P6, which is labeled **Steering Sensor**. P6 is located on the main wiring harness.



Step 4

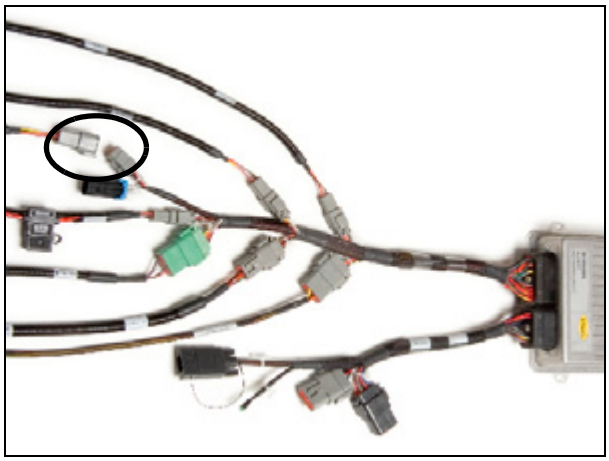
Connect the manual override cable connection to P7, which is labeled **Manual Override**. P7 is located on the main wiring harness.

Note – *When you install the remote engage harness, add the pins to the existing connector.*



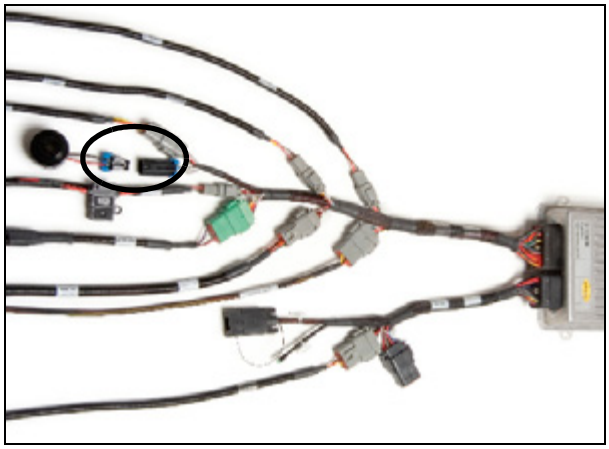
Step 5

Connect the hydraulic steering valve cable connection to P8, which is labeled **Hydraulic Valve**. P8 is located on the main wiring harness.



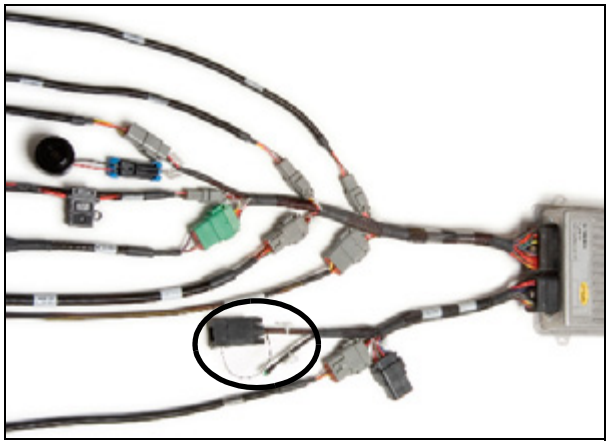
Step 6

Connect the Sonalert P9 to the 2-pin Delphi connector on the main wiring harness. Route the cable so the Sonalert warning device is in a position that is audible to the operator.



Step 7

Route the LED and laptop lead, which is located on the auxiliary wiring harness, to a location that allows the operator to determine the controller status. See controller LED status for status determination. Six flashes per second indicates a correctly functioning controller.



Step 8

Use the provided sleeving to secure the harness cables with tie wraps. Cover and route the cable bundle to avoid damage to connectors and strain on wire connections.

CHAPTER 5

Final Machine Check

In this chapter:

- Calibration
- Vehicle calibration values

This chapter describes how to perform a final check of the vehicle.

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.

Calibration

The Autopilot system has limited calibrations that can be done on a vehicle steered over the CAN bus.

Steering angle sensor calibrations are done at the factory, and can be re-calibrated only by an authorized Agrifac dealer. However, valve dead zones may be adjusted using the steps below. Symptoms of mis-calibrated dead zones include:

- aggressively abrupt steering corrections (dead zones set too high)
- slow oscillations across an AB-line (deadzones set too low).

To perform the final machine check:

1. Press the **Menu** button, press the spanner icon, and enter the code **456**. Select the button with the steering wheel.
2. Select the *Actuator* tab. Scroll down to find the values *37A8* and *37AC*.
   These values are the left and right dead zone settings of the valve, respectively.
   To calibrate them:
   a. Decrease both the *Minimum* and *Maximum* settings (for example to 10%) and press the **Save** button.
   b. Turn the wheel all the way to left and activate the Auto steering. There should be no steering movement initially.
   c. Increase the *Right maximum* in small steps until the wheels start turning in that direction. The default value is 14%. The wheel angle sensor is displayed on the right side of the screen. Use this as an aid to determine when the wheels begin to move.
   d. Once the wheels begin to move, set this value as your *Minimum*, and change the *Maximum* back to 100%.
   e. Repeat this procedure for the left side.
3. Press the **Save** button to store these values.

Vehicle calibration values

ID	Description	Default Value	Unit
37A8	Front PWM L Min.	14	%
37A9	Front PWM L Max.	100	%
37AA	Front PWM L Hysteresis	5	%
37AC	Front PWM R Min.	14	%
37AD	Front PWM R Max.	100	%
37AE	Front PWM R Hysteresis	5	%