INSTALLATION INSTRUCTIONS

Autopilot™ Automated Steering System

McCormick
- MTX 120
- MTX 135
- MTX 150
- XTX 145
- XTX 165

Case IH (1997-2002)
- MX 100
- MX 110
- MX 120
- MX 135
- MX 150
- MX 170

Version 5.00
Revision A
January 2013
Part number 54035-195-E05

Trimble

Legal Notices

Agriculture Business Area

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This is the January 2013 release (Revision A) of the Autopilot Automated Steering System Installation Instructions, part number 54035-195-E05. It applies to version 5.00 of the Autopilot automated steering system.

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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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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.

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CHAPTER 1

Introduction

In this chapter:

- Technical assistance
- Manual system upgrade to Autopilot
- 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 Autopilot

CFX-750 display and FmX integrated display

Retain	Remove
CFX-750™ display: P/N 94000-xx Power cable CFX-750 display: P/N 77282 **FmX® integrated display: P/N 93700-xx** Power cable FmX display: P/N 66694 Antenna for display: P/N 60600-02 (DGPS) or 77038-00 (OmniStar/RTK) Antenna to receiver cable: P/N 50449 Basic cable (both displays): P/N 67258	

Required components

Kits required	Special tools
Platform kit: P/N 54035-195 Hydraulic hose kit: P/N 90733	Drill 5/16'' drill bit 3/8-16 tap 2" hole saw

Antenna mounting kits

Kits required
Spar mount P/N 53676 or Magnetic mount P/N 62388-01.

Autopilot hardware organization: As shipped

Hardware	Component	See...
Platform kit: P/N 54035-195	Hydraulic valve	Chapter 2
	Hydraulic manifold	
	Transducer flow switch	
	Manual override cable	
	Hydraulic brackets and bolt kits	
	Hydraulic valve cable	
	Autosense™ steering device and cabling	Chapter 3
	Autosense mounting bracket and hardware	
	Power switch	Chapter 6
	Bolt kit controller	Chapter 8
Hydraulic hose kit: P/N 90733	Hydraulic hoses	Chapter 2
	Hydraulic adaptors	
Roof bracket kit: Spar mount P/N 53676 or Magnetic mount P/N 62388-01	Roof brackets	Chapter 4
	Bolt kit, roof bracket	
GNSS receiver	GNSS receiver	Chapter 4
	GNSS antenna	
	GNSS receiver power/data cable	
	RTK radio, cable, and radio antenna	
Display	CFX-750 display	Chapter 5
	FmX integrated display	
	Display cable	
	Mounting bracket	
Common parts	Controller	Chapter 8
	Controller mounting bracket	
	Cable kit: Main wiring harness Power bus auxiliary wiring harness Sonalert alarm	

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

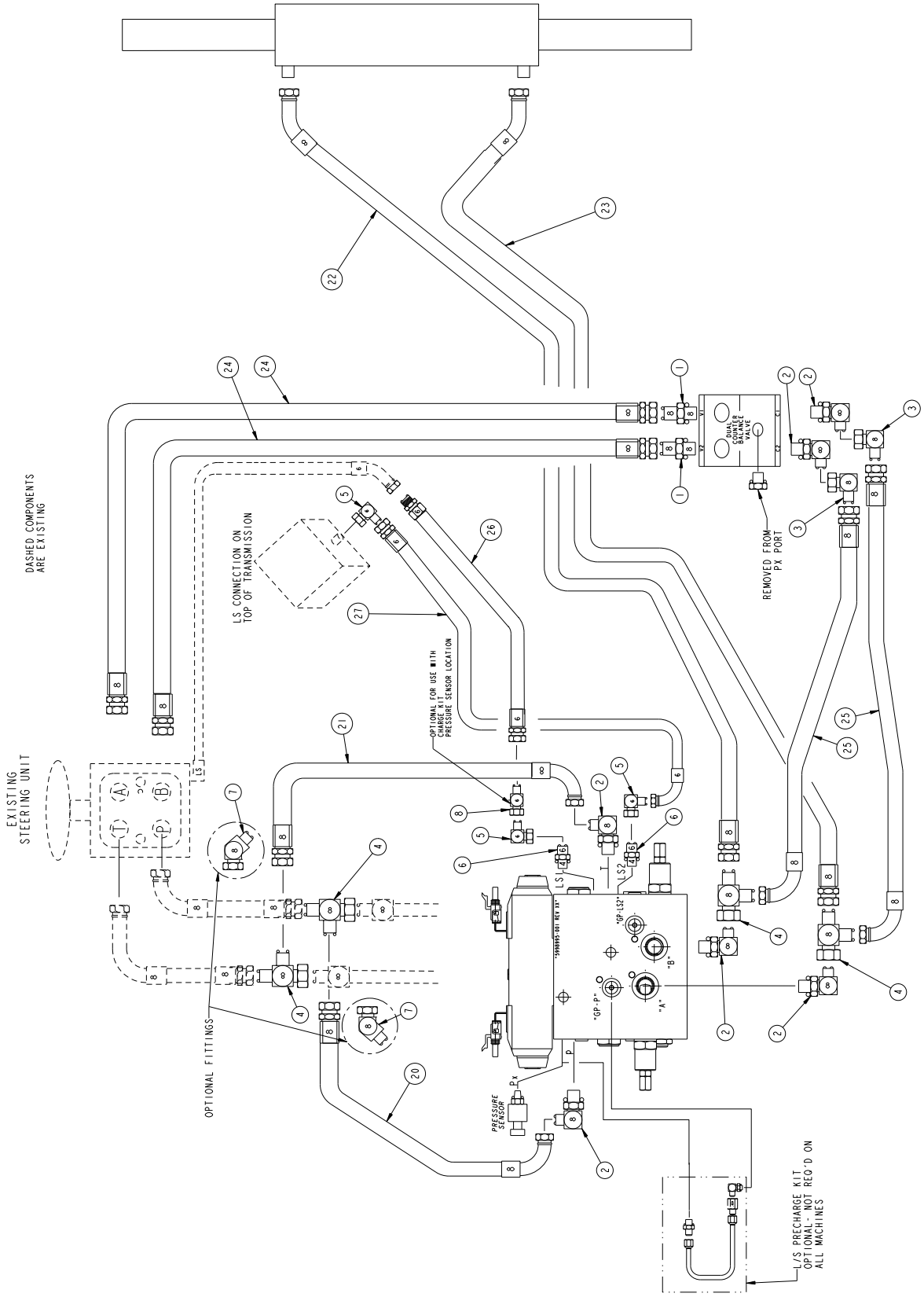
Hydraulic Control Valve Installation

In this chapter:

- Hydraulic control valve components
- Determining if your vehicle requires the LS charge kit
- Prepare the Autopilot manifold and DCBV
- Mounting the Autopilot manifold and the DCBV
- Hydraulic connections
- Load sense line connections: Type one
- Checking the hydraulics

This chapter describes how to install the hydraulic control valve and hoses.

Hydraulic control valve components



Fitting	Part number	Quantity
1	8 F50L0	2
2	8 C50L0	6
3	8 C6L0	2
4	8 R6L0	4
5	6 C6L0	3
6	6-4 F50L0	2
7	8 V6L0	2
8	6-4 L0HL6G5TP	1

Hose	Hose size	Part number	Quantity
20	90”	451TCJSJ9-08-08-08-90”	1
21	90”	451TCJSJ9-08-08-08-90”	1
22	128”	451TCJSJ7-08-08-08-127”	1
23	105”	451TCJSJ7-08-08-08-105	1
24	105”	451TCJSJS-08-08-08-105	2
25	20”	451TCJSJ9-08-08-08-20	2
26	40”	451TCJSJO-06-06-04-40	1
27	40”	451TCJSJ9-06-06-04-40	1

Determining if your vehicle requires the LS charge kit

In order to determine if the machine requires a LS charge kit, do either or both of the following:

- Confirm that a Sauer Danfoss hand pump is installed
- Remove the LS line from the hand pump, place the end of the line in a bucket. momentarily start the machine but do not steer the machine at all.

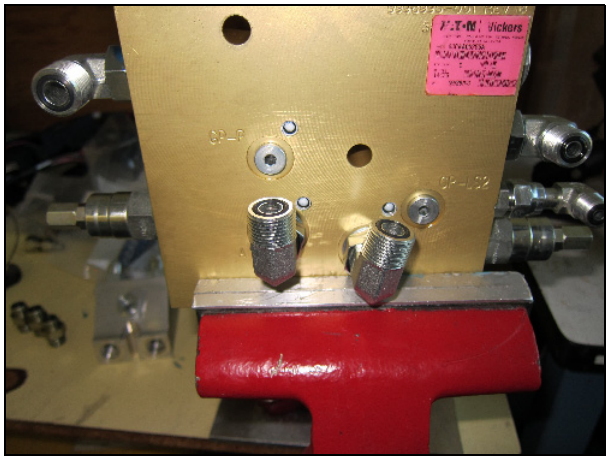
For a machine that requires an LS charge kit, a steady stream of oil flow will come out of the LS line that you removed from the hand pump. If very little flow is seen the LS charge kit is not needed.

Prepare the Autopilot manifold and DCBV

Step 1

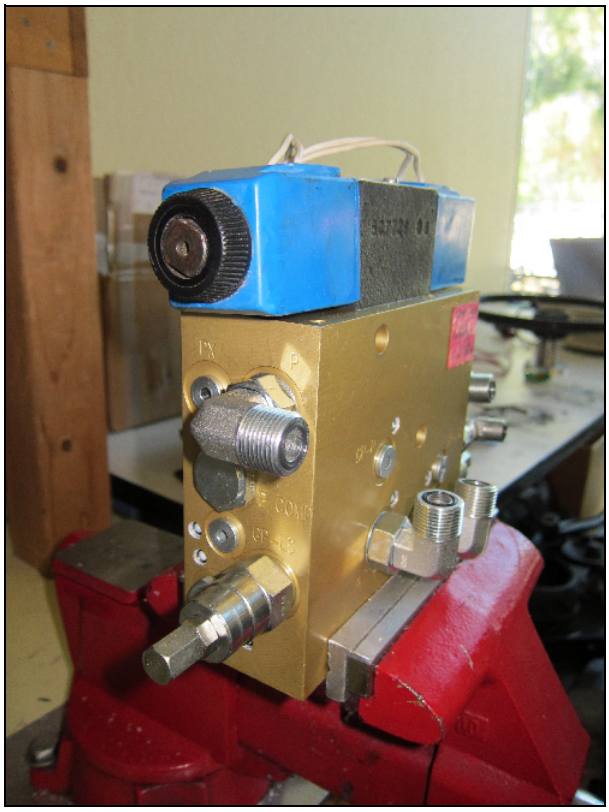
Locate the Autopilot manifold and the fittings and place them on a clean work surface.

Install the two provided -8 ORS-ORB 90° fittings into the A and B ports of the Autopilot manifold. Orient the fitting approximately as shown.



Step 2

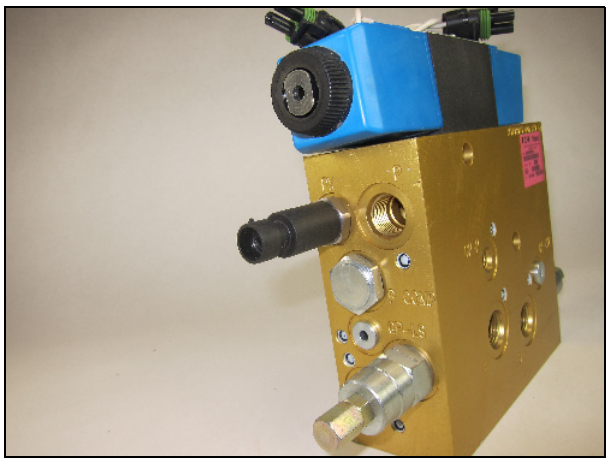
Install the provided -8 ORS-ORB 90° fitting into the P port of the manifold. Orient the fitting approximately as shown.



Step 3

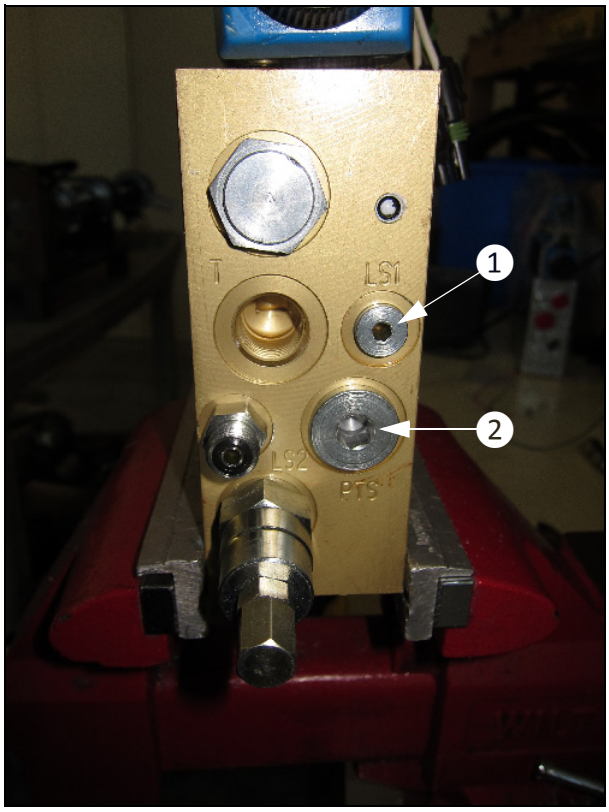
Remove the plug from the PX port on the manifold.

For vehicles that do not require the LS charge kit: Fit the pressure transducer into the port.



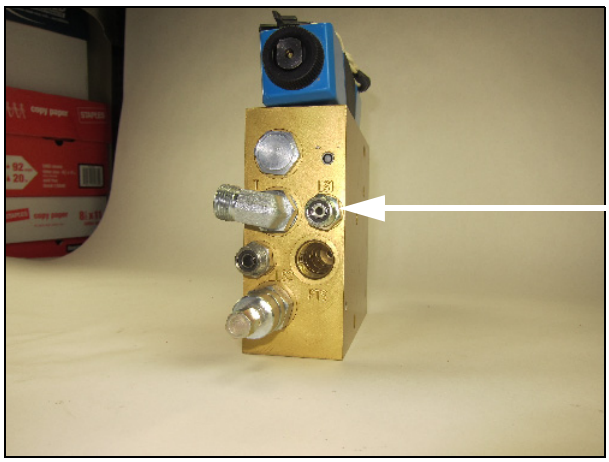
Step 4

Remove the plugs from the LS1 ❶ and PTS ❷ ports of the manifold.



Step 5

Install the provided straight fitting into the LS1 port.



Step 6

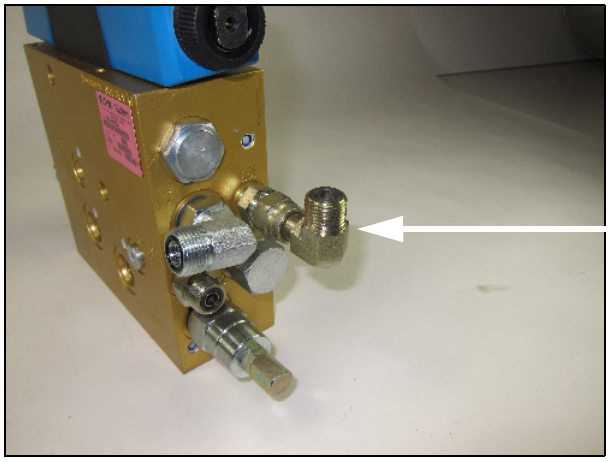
For all vehicles with the LS charge kit: Install the provided -4 diagnostic Tee fitting. Assemble the pressure transducer into the branch of the diagnostic tee fitting.



Step 7

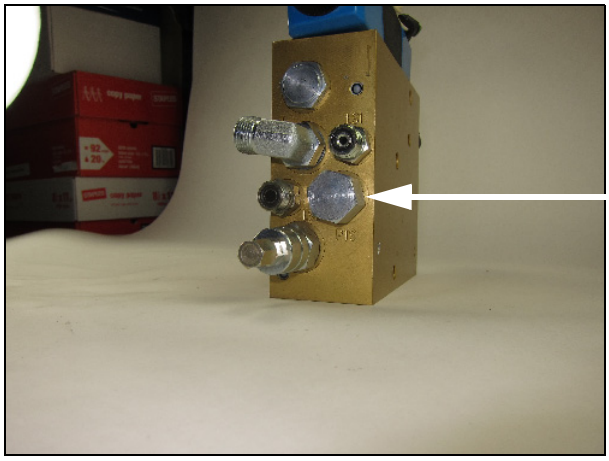
Fit the provided swivel 90° fitting onto the straight fitting in the LS1 port.

The diagnostic tee and pressure transducer may also be installed to the swivel 90° fitting.



Step 8

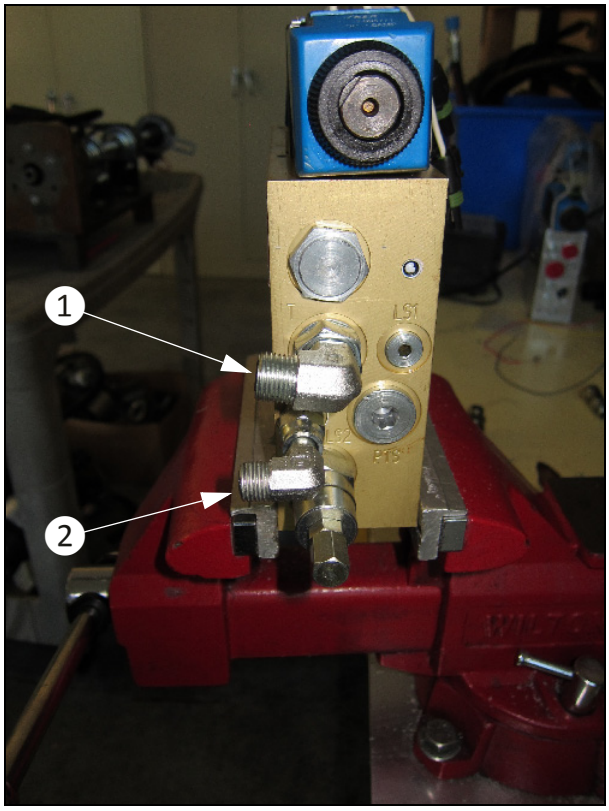
Make sure that the plug is removed from the PTS port of the manifold, and then fit the provided PTS cartridge into the port.



Step 9

Install the provided -8 ORS-ORB fitting into the T port of the manifold ❶. Orient the fitting approximately as shown.

Install the straight fitting into the LS2 port, and then fit the swivel 90° fitting to the straight fitting ❷. Orient the fitting approximately as shown.

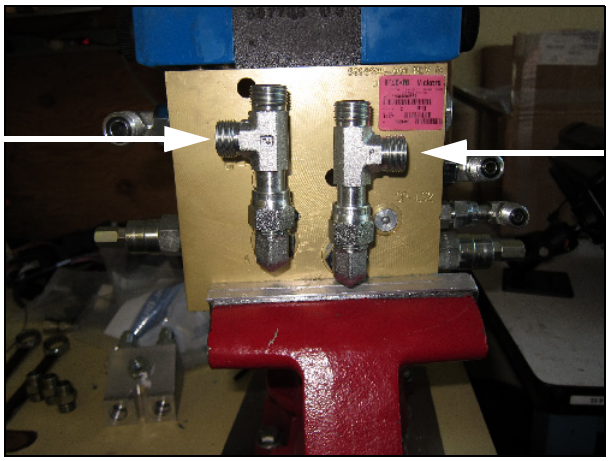


Step 10

Install the provided -8 ORS-ORB Tee fittings into the manifold A and B ports, as shown.

Orient the fittings later when the hoses are connected.

If the LS charge kit is used the orientation of the fittings may need to be adjusted to fit.



Step 11

For vehicles with the LS charge kit:
In the GP-P port of the manifold, use a $^{3}/_{16}$'' Allen wrench to remove the plug and then install the provided -4-4 JIC 90° fitting into that port.

Install the provided straight -4-4 ORB JIC fitting into the PX port of the Autopilot manifold that port.



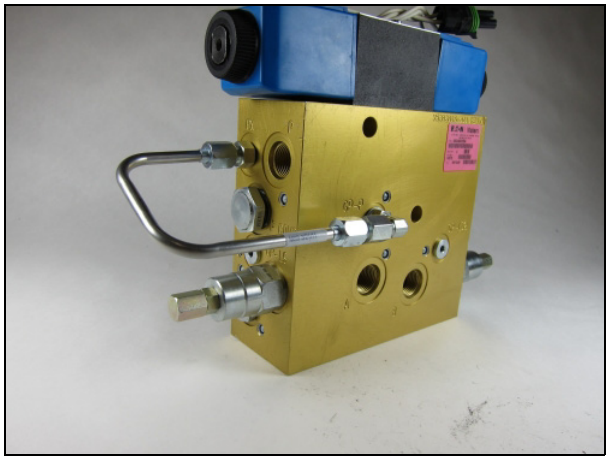
Step 12

For vehicles with the LS charge kit:
Install the provided .031 orifice straight connector to the 90° fitting as shown.



Step 13

Install the provided hard line as shown.



Step 14

Install the two provided -8 ORS-ORB fittings into the V1 and V2 ports of the DCBV manifold, as shown.



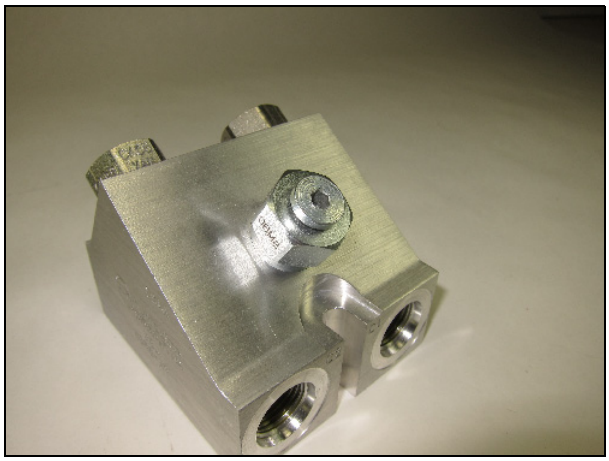
Step 15

Install the two provided 90° -8 ORS-ORB fittings into the C1 and C2 ports of the DCBV manifold. Orient the fitting approximately as shown.



Step 16

Install the plug removed from the PX port of the manifold in Step 3 into the port the DCBV as shown.



Determining the mounting plate configuration

There are two different mounting plate configurations for these machines:

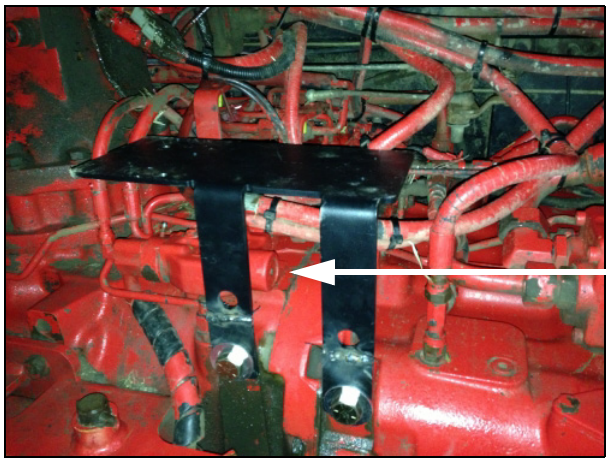
- Machines with the brake valve
- Machines without the brake valve

To determine which mounting plate configuration is required, verify if your machine is fitted with a brake valve in the location of the Autopilot manifold.

Machines with the brake valve

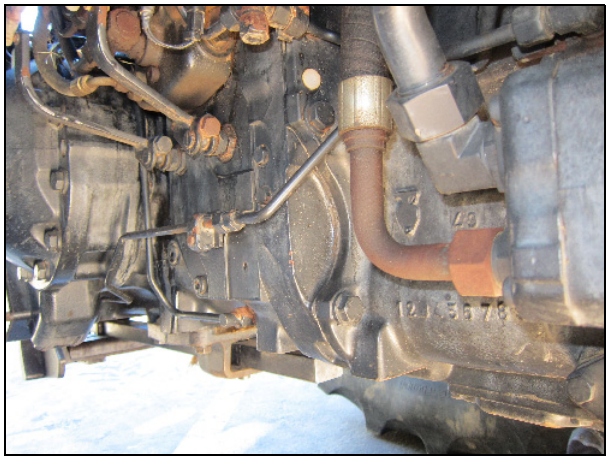
For machines that have a brake valve, it is behind the bracket.





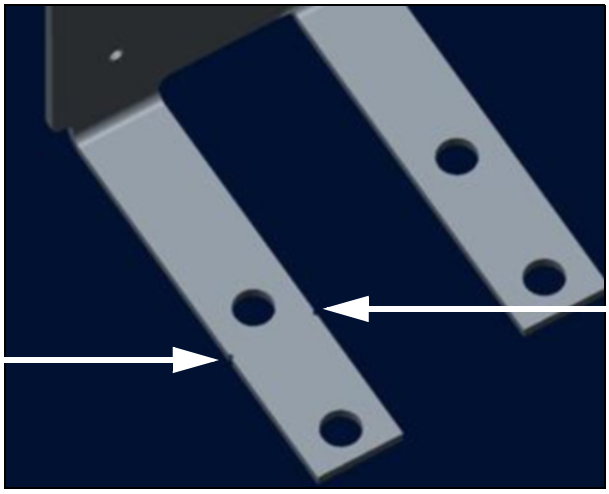
Machines without the brake valve

The image to the right shows a machine without the brake valve.



For machines without the brake valve, shorten the lower tab of the mounting plate at the notch shown here.

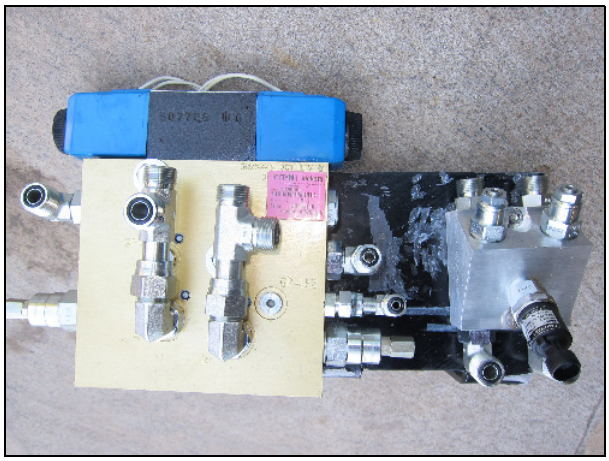
Cut from the notch on one side of the tab to the notch on the other side of the tab

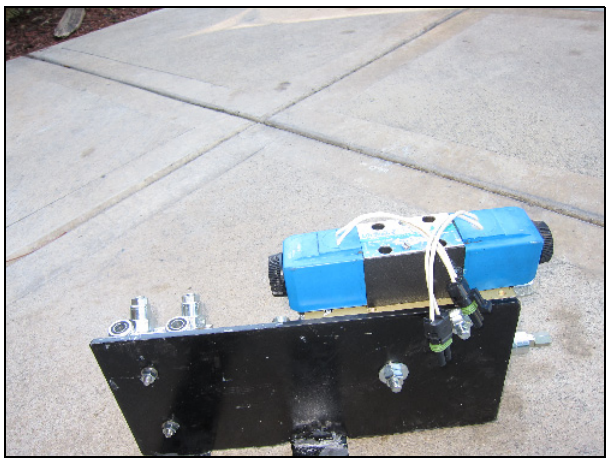


Mounting the Autopilot manifold and the DCBV

Step 1

Use the provided mounting hardware to attach the Autopilot manifold and DCBV manifold to the manifold mounting plate, as shown.





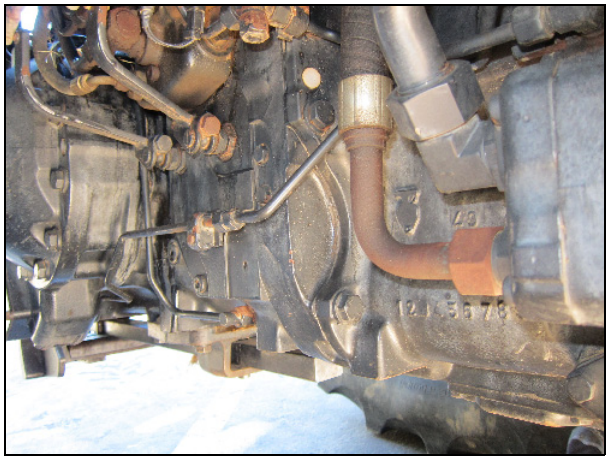
Step 2

Locate the manifold installation area on the right side of the machine under the cab.



Step 3

Install the Autopilot manifold in the location shown.



Step 4

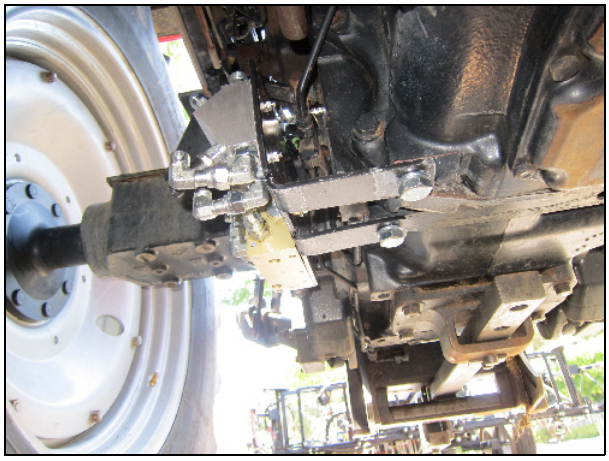
Locate the bolt holes shown and install the manifold mounting bracket to the machine using the provided ¾" bolts.

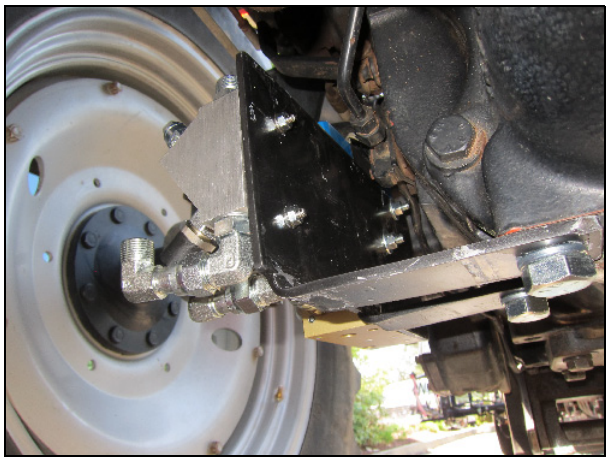


Place the Autopilot manifold next to the transmission, as shown on the right.



These images show the manifold and DCBV installed on the machine.





The following images show the manifold and DCBV installed on a machine with a brake valve.



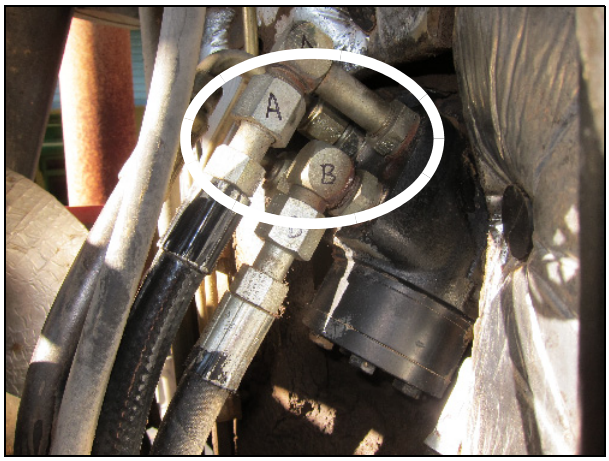


Hydraulic connections

Step 1

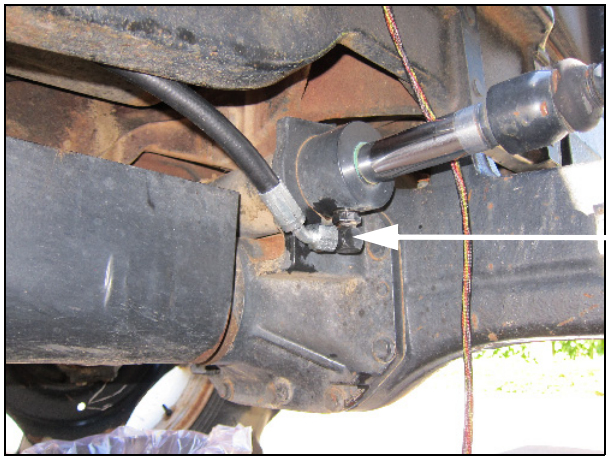
Locate the machine's hand-pump , and then the two hoses on the left side of the hand pump. These are the cylinder hoses.

Label the hoses (as shown) and then remove the hoses from the fitting on the hand-pump.



Step 2

Trace the lines to the cylinder and label the ends, then, to remove both of the steering hoses, disconnect the other ends of the hoses from the cylinder at the front of the machine.



Step 3

Connect the 45° end of the new A and B hoses to the machine's steering cylinder.

Label the hoses and then route the hoses the same as the removed hoses up near the steering hand-pump, then under the cab of the machine to the A and B ports of the manifold.



Step 4

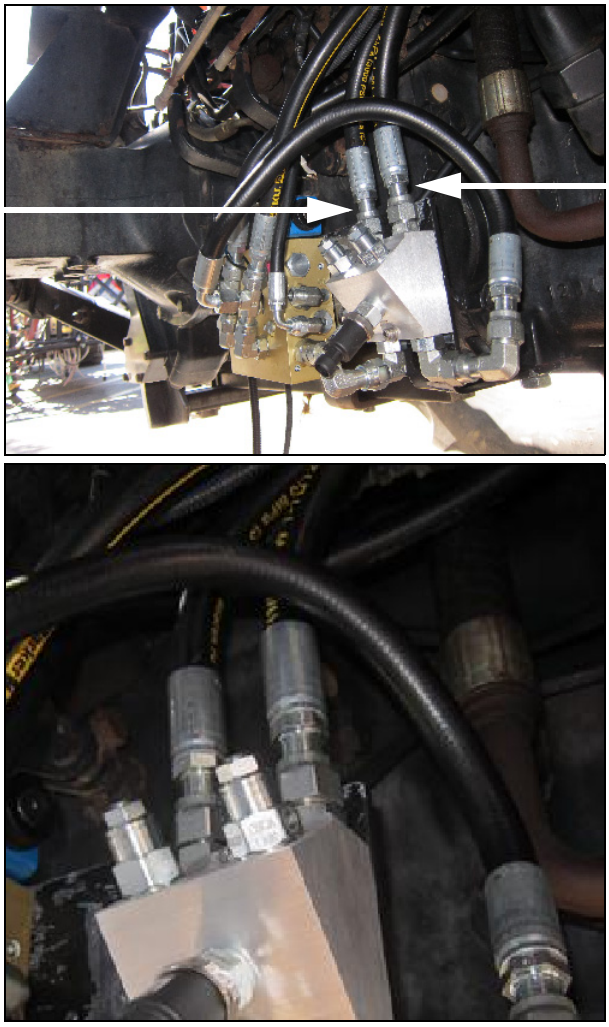
Connect the V1 and V2 hoses to the A and B ports of the hand-pump.

Route the hoses under the machine's cab to the V1 and V2 ports on the DCBV.



Step 5

Connect the V1 and V2 hoses to the V1 and V2 ports of the DCBV in the location shown.



Step 6

Connect the A and B hoses routed from the machines steering cylinder to the ends of the run tee fittings on the A and B ports of the manifold

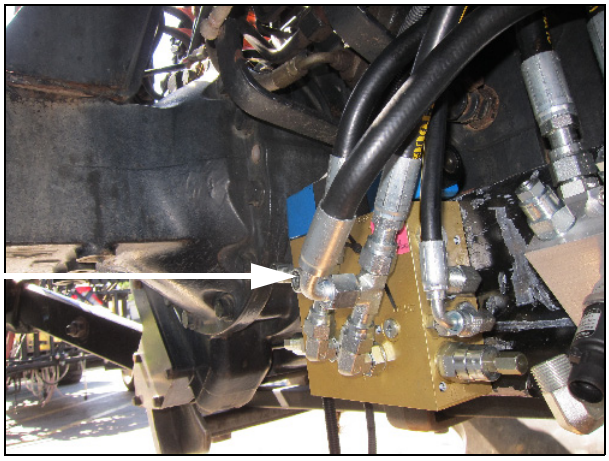


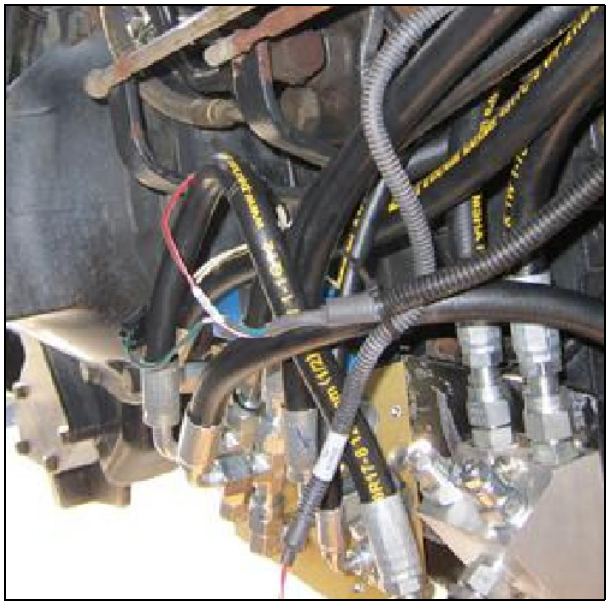


Step 7

Connect the 90° end of the C1 and C2 hoses to the branches of the run tee fittings on the A and B ports of the manifold, as shown.

Route the hoses to the C1 and C2 ports of the DCBV.



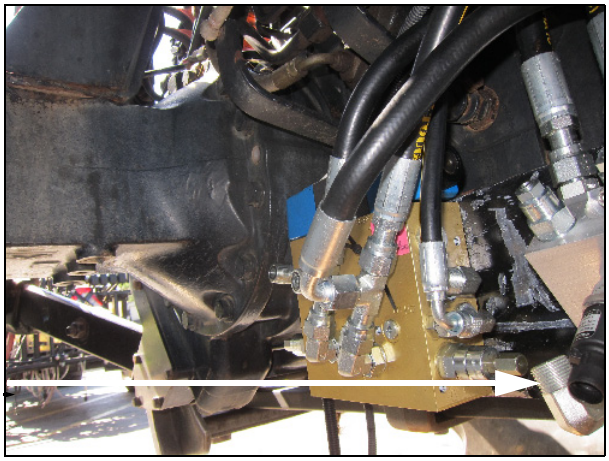


Step 8

Connect the:

- provided swivel 90° fittings to the end of the 90° fittings on the C1 and C2 ports of the DCBV.
- straight ends of the C1 and C2 hoses to the swivel 90° fittings.

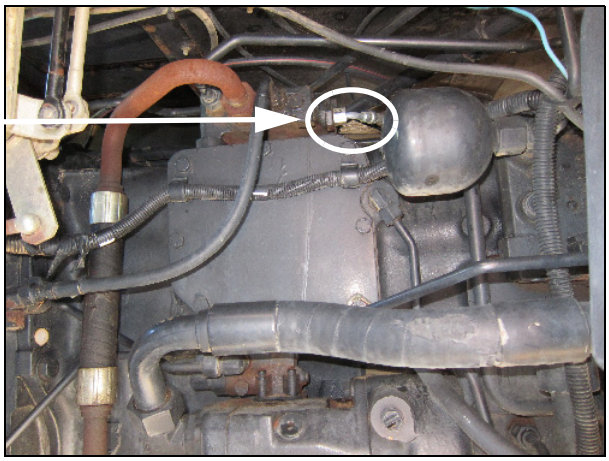
Orient the fittings with the lines routed tight against the machine's transmission.



Load sense line connections: Type one

Step 1

Identify the load sense line, on the top of the transmission, above where the Autopilot manifold was mounted.



Step 2

Disconnect the load sense hose and then connect the LS1 hose to the end of the disconnected LS hose.

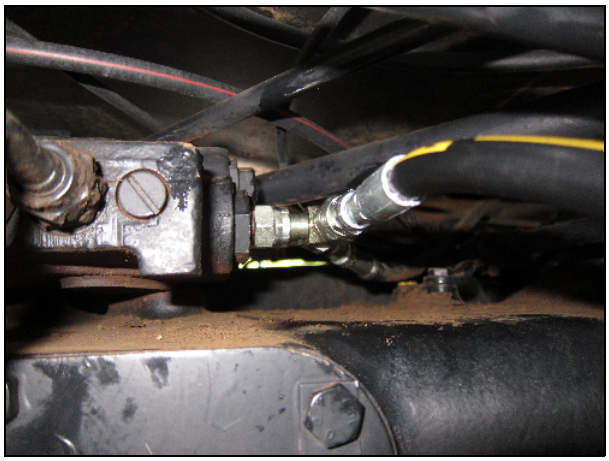
Route the line to the LS1 port on the manifold



Step 3

Attach the provided swivel 90° fitting to the machine's LS port, then connect the LS2 hose to the end of that fitting.

Route the line to the LS2 port on the manifold.



Alternate LS configuration: Type two

Step 1

Identify the load sense line, on the top of the transmission, above where the Autopilot manifold was mounted.



Step 2

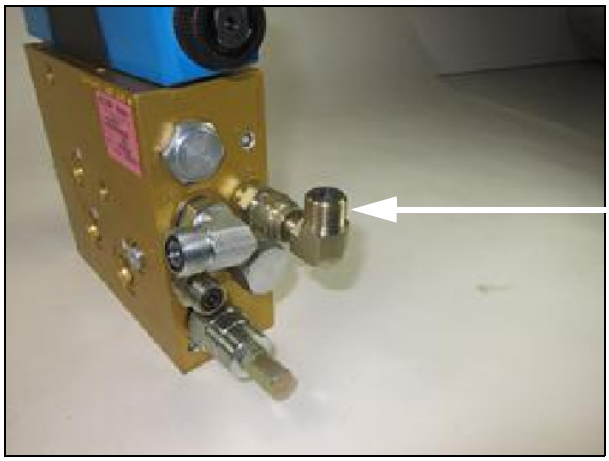
Disconnect the load sense hose and then connect the LS1 hose to the end of the disconnected LS hose.

Route the line to the LS1 port on the manifold



Step 3

Attach the LS1 hose to the LS1 port on the manifold in the location shown.



Step 4

Attach the 90° end of the LS2 hose to the swivel 90° fitting on the LS2 port of the manifold.

Route the hoses near the transmission; ***make sure*** that the hoses do not contact any moving components and are not rubbed by the machine's tire.



Step 5

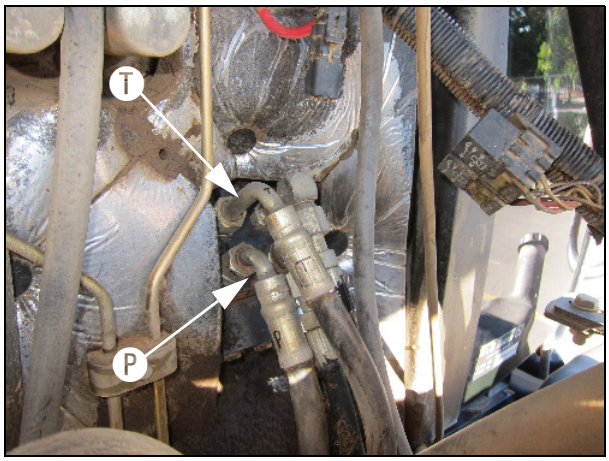
Locate the P and T lines on the machine's hand-pump.



Step 6

Label the two lines T and P as shown.

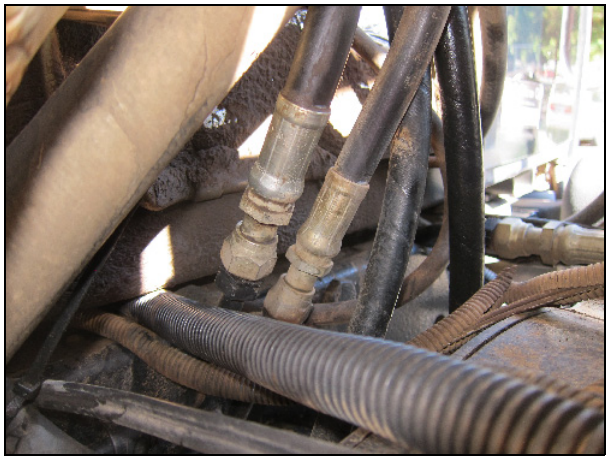
In some machines the run tee fittings can be installed at this location, on other machines, install the run tee in a lower position as shown in Step 8 and Step 9.



Step 7

Follow the T and P lines to the connections with the hard lines just below the hand pump.

Label the lines again.



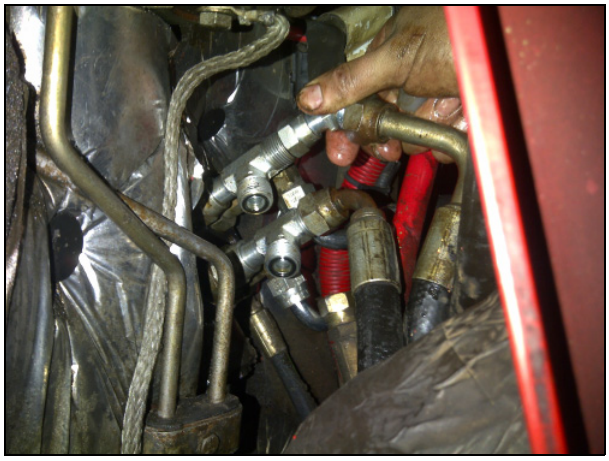
Step 8

Install the provided run tee fittings onto the P and T hard lines.

Reconnect the existing soft lines to the end of the run tee fittings.



If you make the connections at the hand pump then use the provided run tee fittings and then reconnect the existing lines to the ends of the run tee fittings. You can use the provided swivel 45° fittings to more easily connect the tractors P and T lines.





Step 9

Connect the provided T and P hoses to the branches of the run tee fittings, route the hoses under the cab to the manifold.

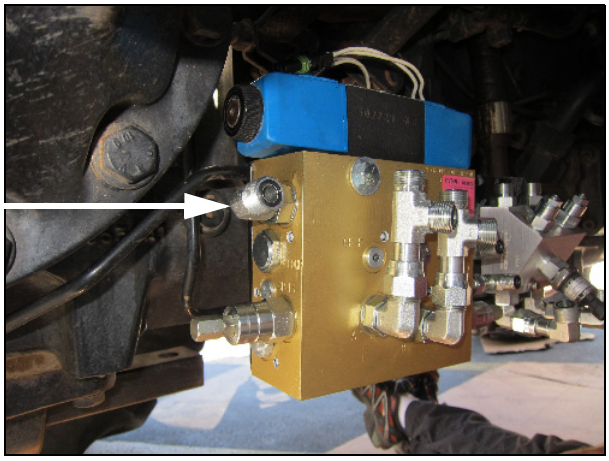




Step 10

Route the P hose from the connection near the hand-pump under the cab to the P port on the manifold.

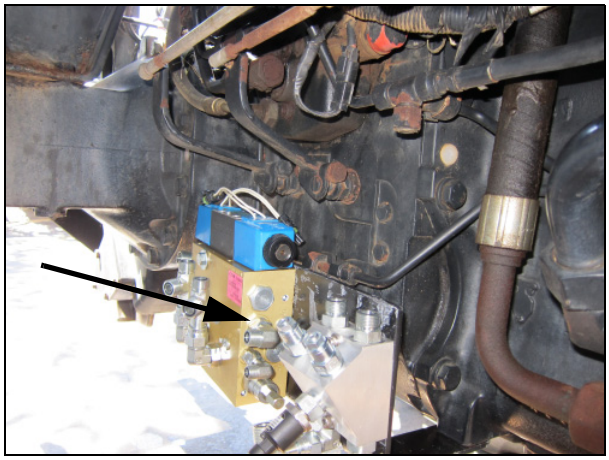
Connect the 90° end of the P hose to the P port on the manifold.

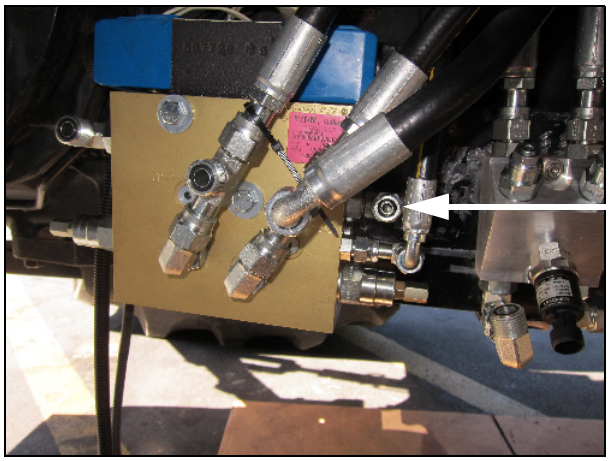


Step 11

Route the T hose from the connection near the hand pump under the cab to the T port on the Autopilot manifold.

Connect the 90° end of the T hose to the manifold T port.





Checking the hydraulics

1. Make sure that all the hydraulic connections are tight.
2. Check the oil level in the hydraulic tank. If necessary, top it up.
3. Check for hydraulic leaks. Connect the battery and then start the machine. Once you complete the leak check, disconnect the battery.

CHAPTER 3

Autosense Steering Device Installation

In this chapter:

- Autosense steering device components
- Installing the Autosense steering device
- Preparing the harness: P/N 54602 Rev C

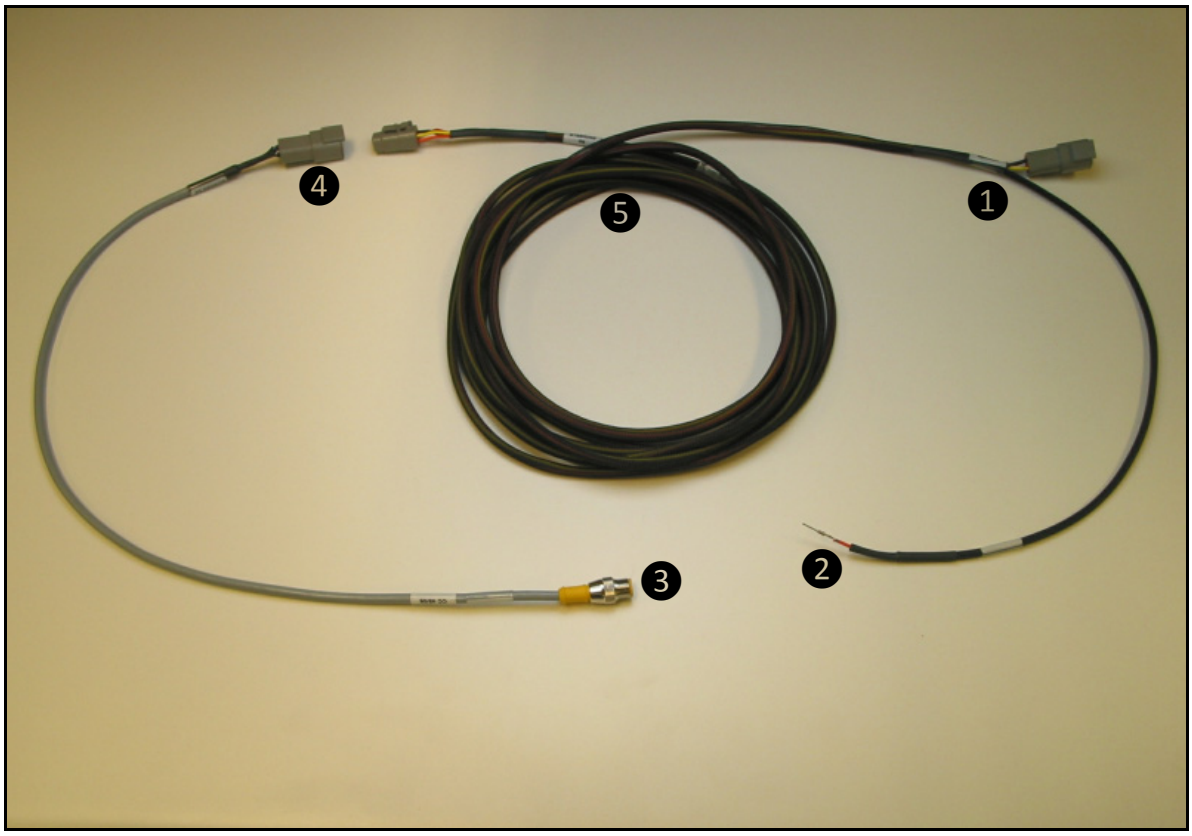
This chapter describes how to install the Autosense™ steering device. If the required mounting location is not accessible, chose a different place. To ensure proper function, the Autosense device must be located where it is free of obstructions and can rotate with the wheels when they turn.

On articulated vehicles, mount the Autosense device on the opposite side of the pivot point to the Autopilot controller.

Mount the device base down or base up so that it maintains a level orientation. Do not mount it on its side. An angle of up to 10° in any direction is acceptable.

To avoid stretching the cable, leave adequate length on the service loop.

Autosense steering device components



Item	Description	P/N
❶	P-6 connector	
❷	Power connector	
❸	Autosense connector	
❹	Jumper cable	57560
❺	Autosense steering cable	57885

Installing the Autosense steering device

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 Autosense device at the right front wheel of the machine, in the location shown here.



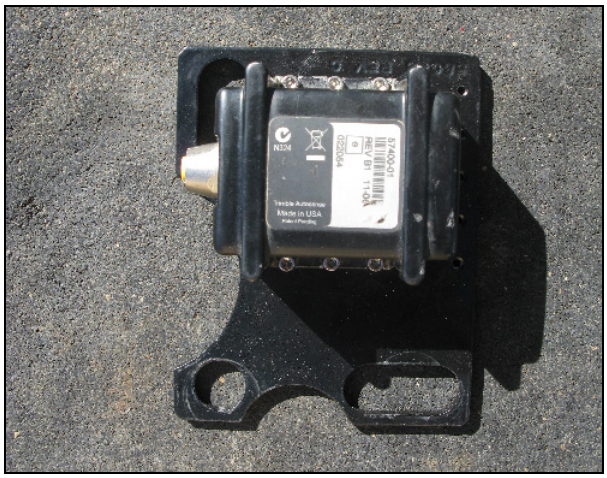
Step 2

To install the device sensor bracket, remove two of the bearing cap bolts, as shown.



Step 3

Use the provided socket head cap screws to assemble the device to the mounting bracket.



Step 4

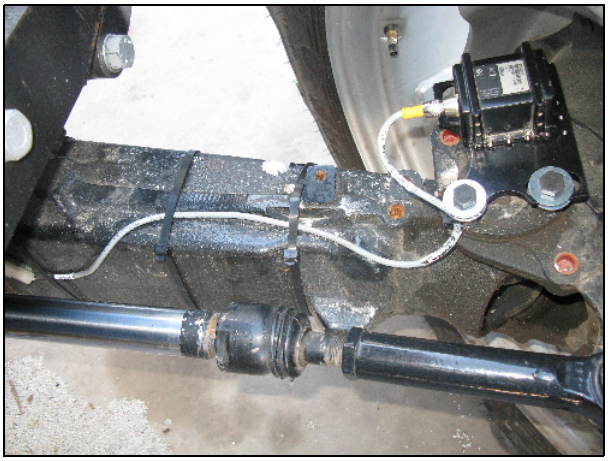
Use the washers and existing bolts to fix the device to the machine.



Step 5

Connect the cabling to the device, and then route the cabling to the NavController II.

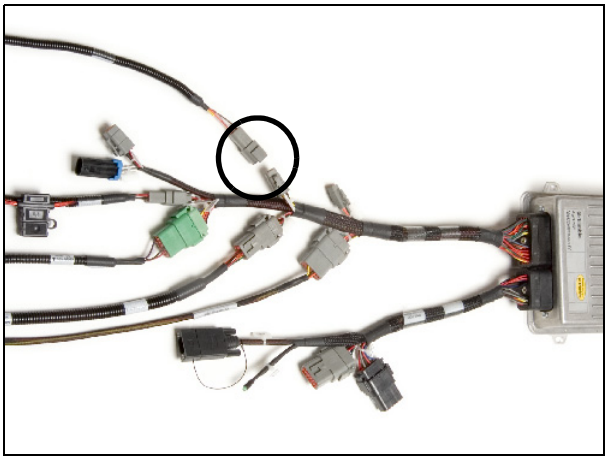
While routing the cable, make sure that is not pinched or pulled when the wheels are steered full right and full left. Also, check that the cable does not hit, brush or otherwise contact any moving components.



Step 6

Plug the steering sensor cable to P-6 on the Autopilot controller main wiring harness.

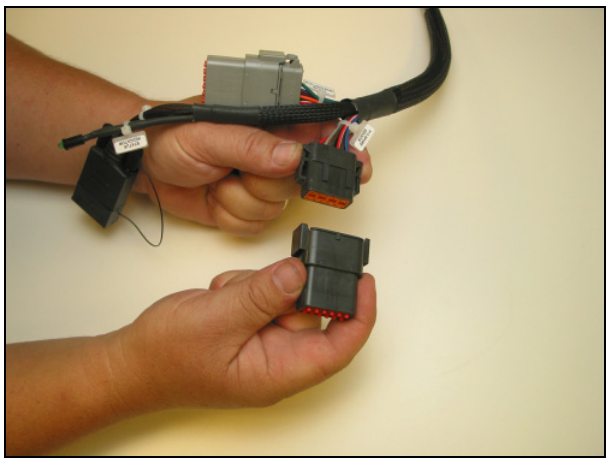
The P6 connector is labeled **Steering Sensor**.



Preparing the harness: P/N 54602 Rev C

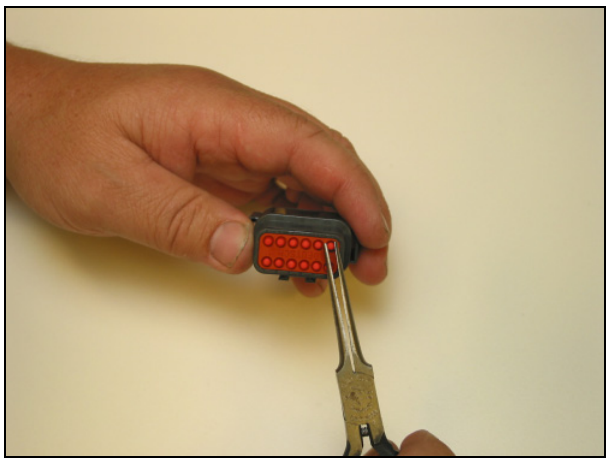
Step 1

Remove the black Deutsch DTM receptacle from the P-13 sensors leg of the auxiliary harness. See Chapter 8, Controller Installation.



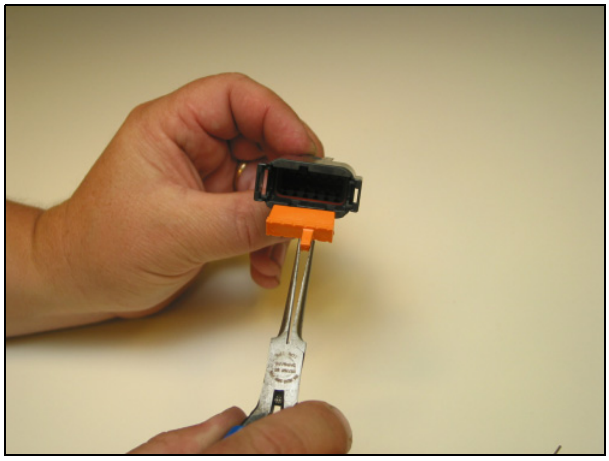
Step 2

Remove the plug from cavity number 1.



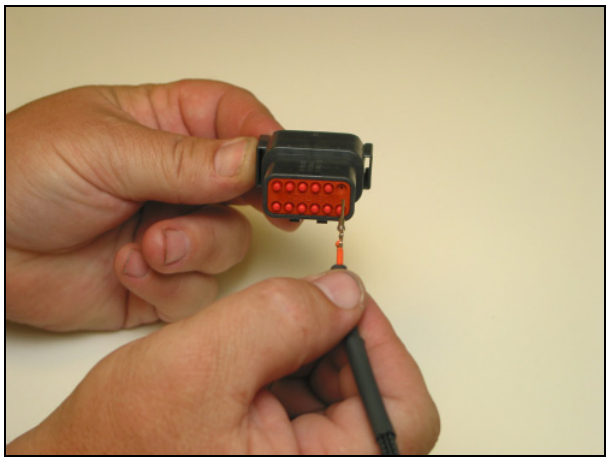
Step 3

Remove the wedge from the connector.



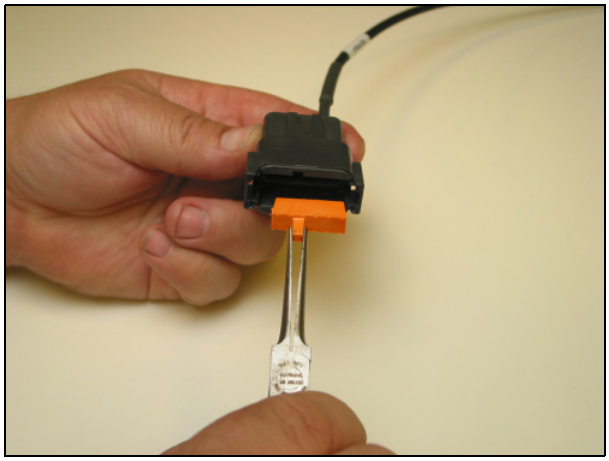
Step 4

Insert the DTM pin labeled “Cavity 1” into the connector.



Step 5

Pull back on the wire to seat the pin. Replace the wedge in the connector.



Step 6

Plug the assembled Deutsch receptacle into the P-13 sensors leg of the Autopilot controller auxiliary harness. See Chapter 8, Controller Installation.

CHAPTER 4

Antenna/Receiver Installation

In this chapter:

- Antenna and receiver installation options
- Mounting an adjustable spar to roof bolts
- AG-372 receiver with AgGPS 450/900 radio module (if equipped) components
- Installing the AG-372 GPS receiver with AgGPS 450/900 radio module (if equipped)
- Installing an AG-372 receiver with magnetic feet
- AgGPS 542 receiver components
- Installing the AgGPS 542 receiver

This chapter describes how to install the required receiver and antenna, and radio module (if used).

To install the antenna for CFX-750 or FmX display, see Chapter 5, Display Installation.

Antenna and receiver installation options

There are several options for mounting components (the antenna, radio module, or GNSS receiver) on the cab roof depending on the accuracy required and the antenna type:

- **Spar mount** – This bracket mounts directly to the roof bolts and is required for all high accuracy applications such as RTK and OmniSTAR. Trimble recommends this method for mounting an AG-372 receiver. Bolt a metal spar to the roof or to a light bracket and then attach either a V plate for magnetic mounting or an AG-372 receiver plate for permanent mounting.
  You can also bolt the AG15/AG25/Zephyr antenna to the spar mount.
- **VHB mount** – Attach a P/N 62034 plate or a V plate directly to the roof with VHB (Very High Bond) adhesive for magnetic mounting. See page 52.
- **Magnetic mounting** – Magnetic mounting for quick release is available for both VHB and spar type mounting.

Possible mounting methods

GNSS receiver	VHB mounted plate	VHB V mounted plate	AG15/AG25/Zephyr/ AG-372 bolted to spar mount
CFX-750 display; FmX integrated display	✓	✓	✓
AG-372 receiver	✗	✓	✓
*Ag*GPS 542 receiver	✓	✓	✓

Notes:

- *For quick release magnetic mounting with an AG-372 receiver, order the kit listed in Antenna mounting kits, page 8 and bolt the V plate to the spar.*
- *With all other antennas, bolt the V plate to the spar for high accuracy and repeatability.*
- *For WAAS, EGNOS, OmniSTAR VBS, Beacon, and DGPS applications, place either of the plates in a firm location using the VHB.*

Mounting an adjustable spar to roof bolts

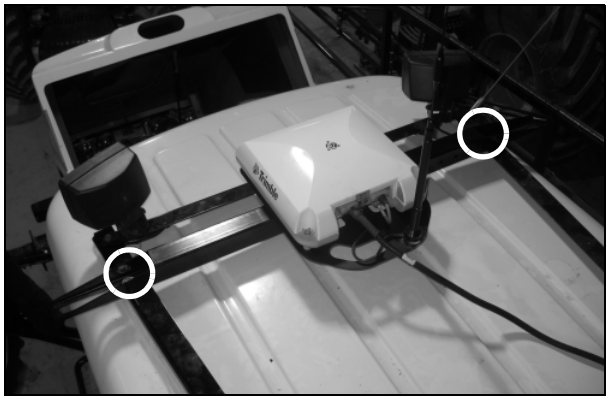
WARNING – To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

Step 1

Position the cab bolts on the roof of the vehicle.

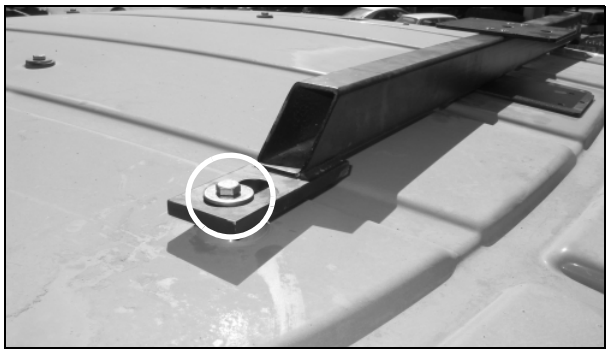


If a light bracket already occupies the roof studs, mount the spar directly onto the light bracket.



Step 2

If required, replace the existing bolts with longer bolts.



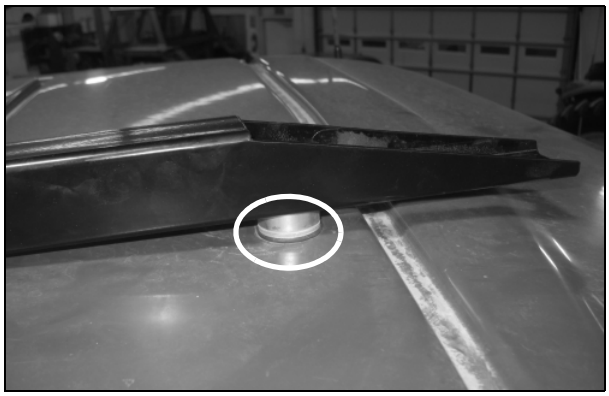
If you use the light bracket, drill two holes to match the spar width.



Step 3

Use the slotted holes to center the spar and then tighten the bolts. If required, use the spacers and flat washers provided to secure the spar.

Note – *If the receiver is offset to the left or the right of the vehicle, Autopilot system performance may be affected. Before you tighten the cab bolts, make sure that the GNSS antenna is aligned with the center of the vehicle.*



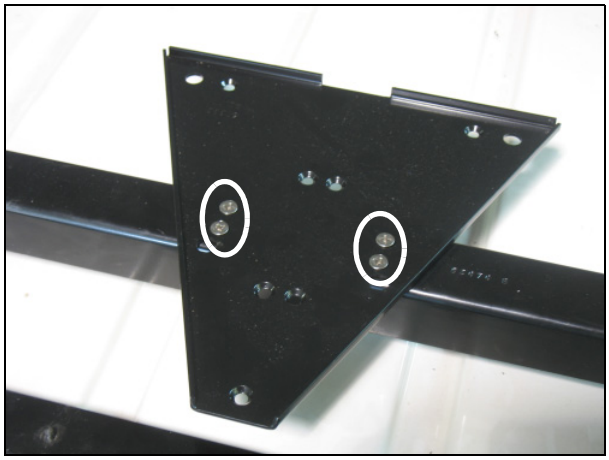
Step 4

For either of the following applications:

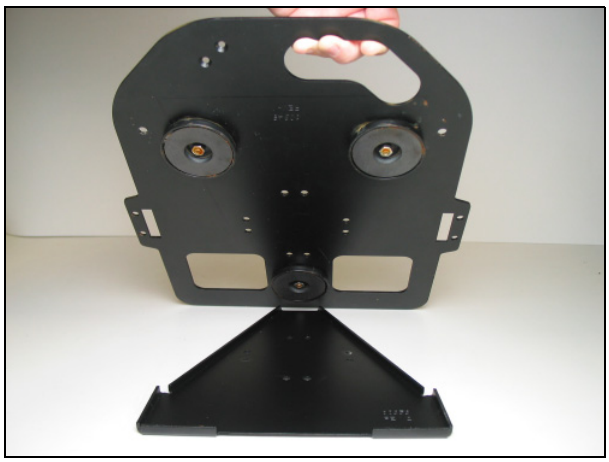
- A single magnet antenna mount
- An AG-372 receiver with magnetic option for quick removal

Attach a V plate with four ¼" flathead screws.

The narrow end points to the front of the vehicle.



V plate on the spar



Magnetic mount on the V plate

If you use a standard AG-372 plate for permanent mounting, install the radio antenna first. Use four ¼" flathead screws to attach the plate, with the handle toward the back of the vehicle.

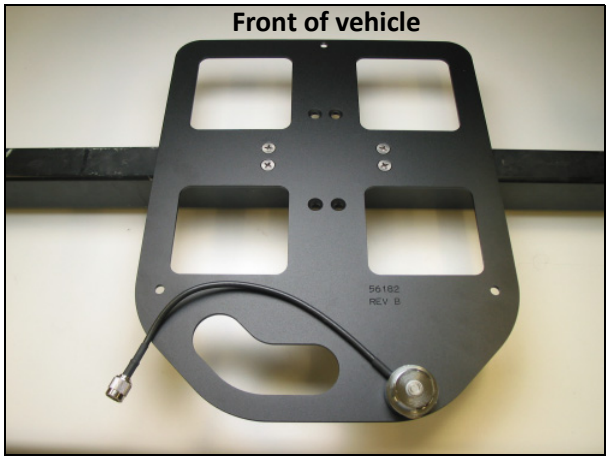


Plate on the spar

AG15/AG25/Zephyr mounted to spar

Use a $^{5}/_{8}$" bolt to mount the antenna to the spar.



AG-25 bolted to spar

Attaching the plate with VHB adhesive

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.

Standard P/N 62034 plates are provided in display kits. You can use the VHB mounting method to attach either a P/N 62034 plate or a V plate.

- **RTK, OmniSTAR, DGPS, GLONASS applications** – To use this method for high accuracy, the surface must be rigid and free of "oil panning". 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. Apply force to the roof to find a firm location.

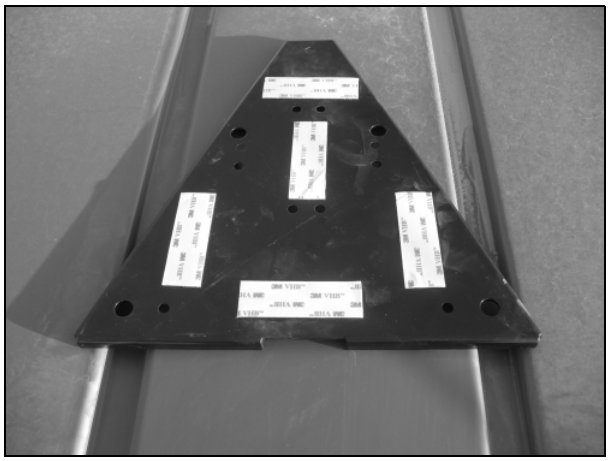


Step 2

V plate only

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

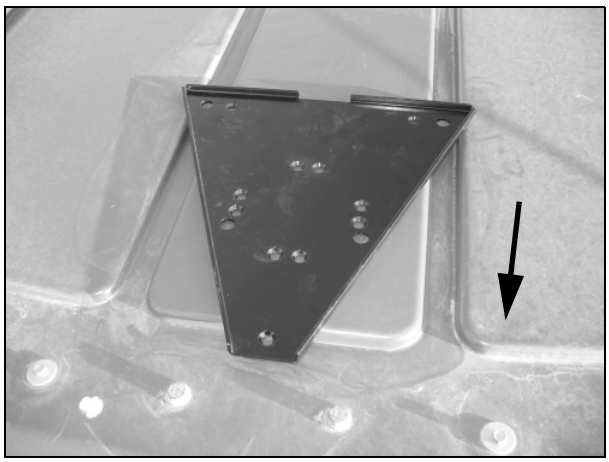
Note – *The VHB strips are pre-applied to the P/N 62034 plate.*



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 of the plate 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 points to the front of the vehicle.*

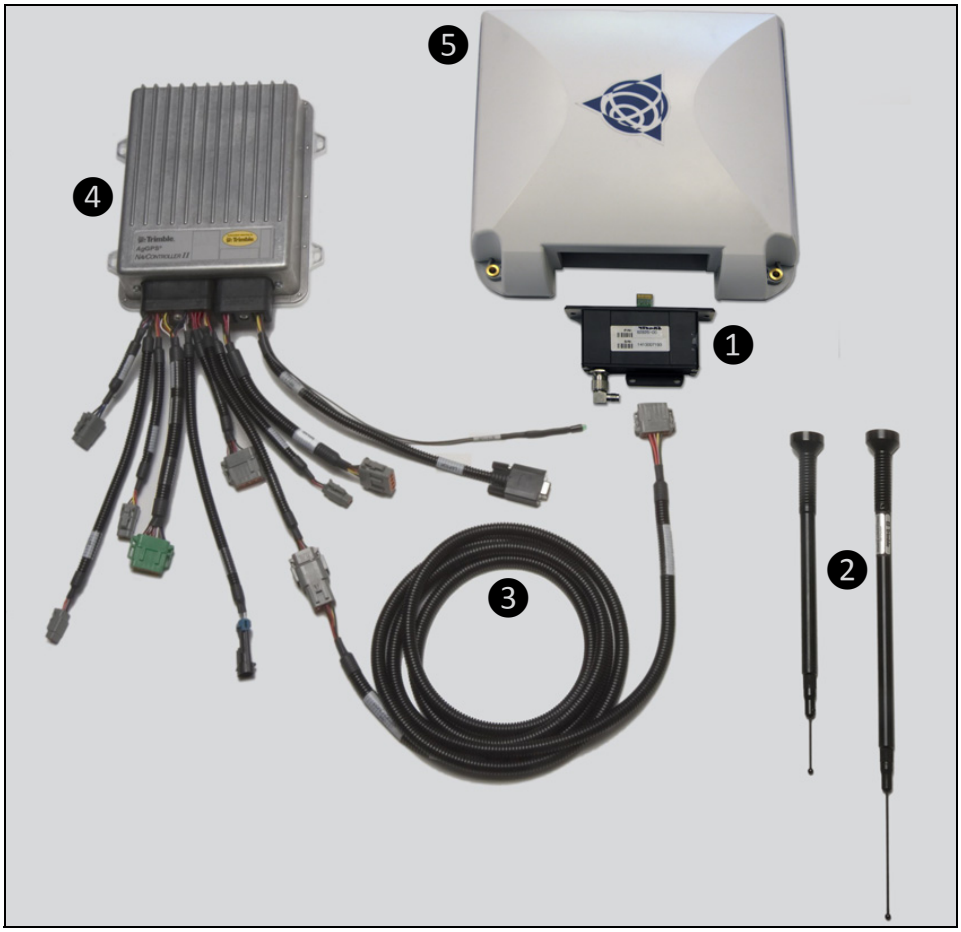


V plate



P/N 62034 plate

AG-372 receiver with *Ag*GPS 450/900 radio module (if equipped) components



Item	Description	Trimble part number
❶	*Ag*GPS 450 or 900 radio (if equipped)	
❷	Radio antenna cable and magnetic mount	
❸	*Ag*GPS 450 or 900 radio antenna	
❹	Antenna/receiver cable	54608
❺	Autopilot controller	

Installing the AG-372 GPS receiver with *Ag*GPS 450/900 radio module (if equipped)

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.

Installing the optional RTK radio

Step 1

Remove the blanking plate and set it aside.



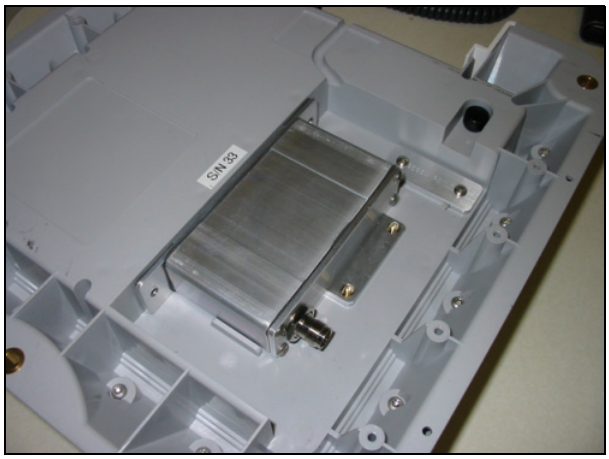
Step 2

Place the integrated radio inside the AG-372 receiver. Ensure that the circuit board is aligned with the slot in the vertical wall of the receiver.



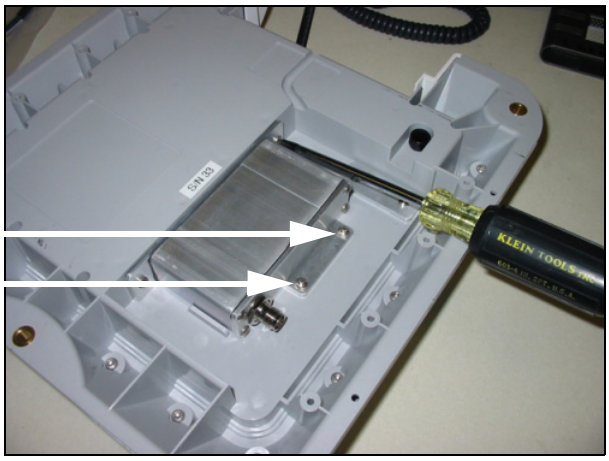
Step 3

Slide the integrated radio back so that it is flush with the vertical wall of the receiver.



Step 4

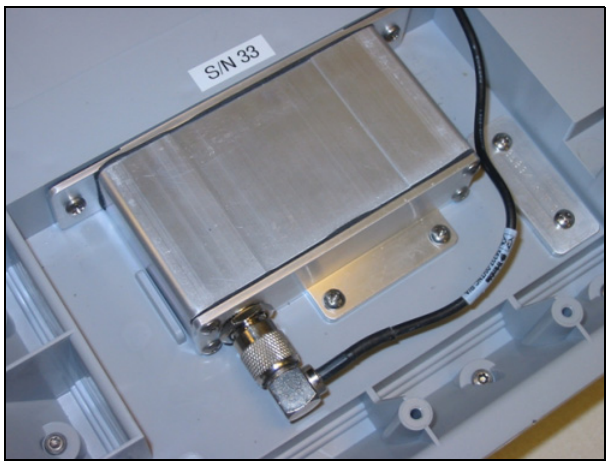
Use a #1 or #2 Phillips screwdriver and the supplied screws to install the integrated radio. First insert and tighten the two screws on the horizontal wall (arrowed), and then insert the remaining screws.



Step 5

Install the supplied antenna cable.

Notes: *The housing can accommodate a cable diameter of up to ¼".*

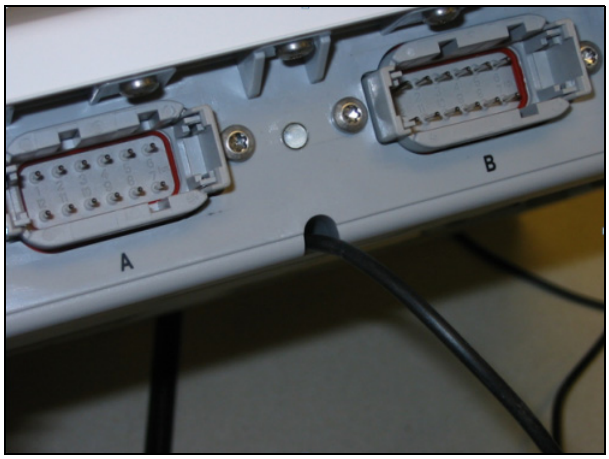


Step 6

Route the cable through the cable channel and then insert the cable cover.

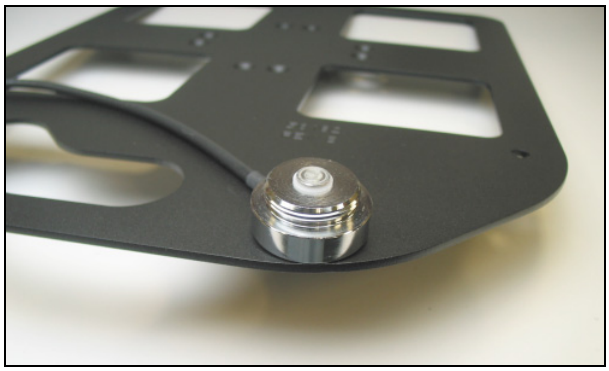


This image shows the unit with the cable routed through the channel.



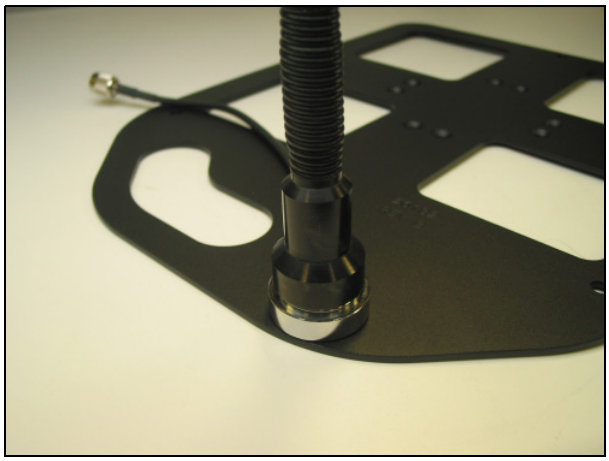
Step 7

Attach the antenna base to the rear of the plate with the two flathead screws provided.



Step 8

Attach the radio antenna to the antenna base.



Step 9

Position the AG-372 receiver and radio on the mounting plate with the connector ports facing the radio antenna. Align the three bolt holes with the receiver, radio, and mounting plate.

To attach the AG-372 receiver plate to the cab roof, do one of the following:

- For a removable installation, attach a V plate to a spar and then stick the receiver plate to the V plate with magnets.
- For a permanent installation, bolt the receiver plate to a spar.

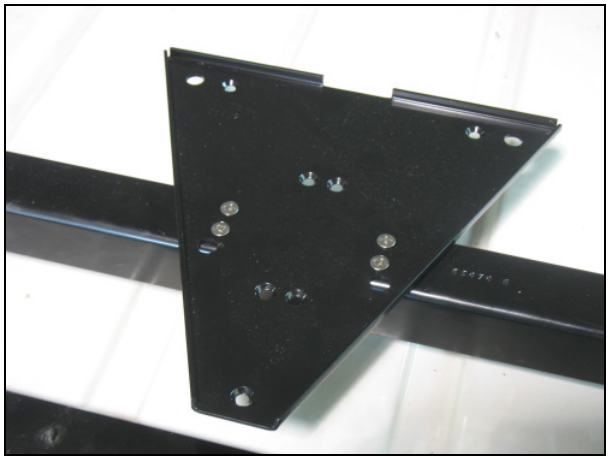


Removable installation

V plate

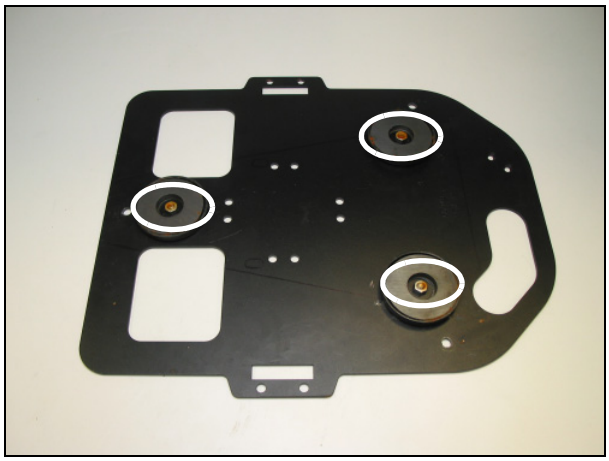
Attach the V plate to the spar using the ¼" flathead screws provided in the V plate bolt kit. Ensure that the narrow end points forward.

For spar mounting instructions, see page 48.



Mounting plate

Attach the three provided magnets to the plate with the ¼" flathead screws and hardware provided.



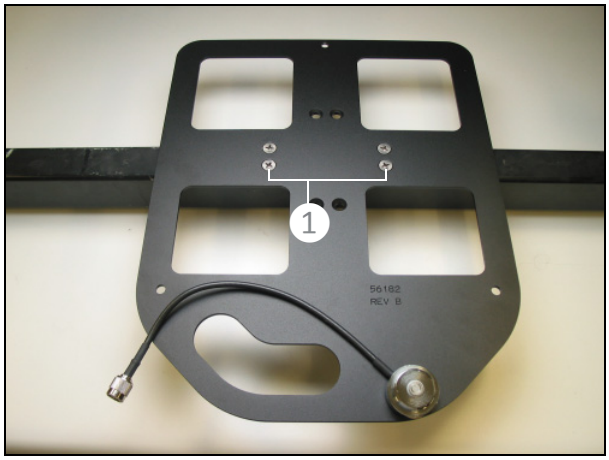
Underside of plate

Permanent installation

Step 1

Use the four provided ¼" flathead screws ❶ to attach the receiver mounting bracket to the spar.

For spar mounting instructions, see page 48.



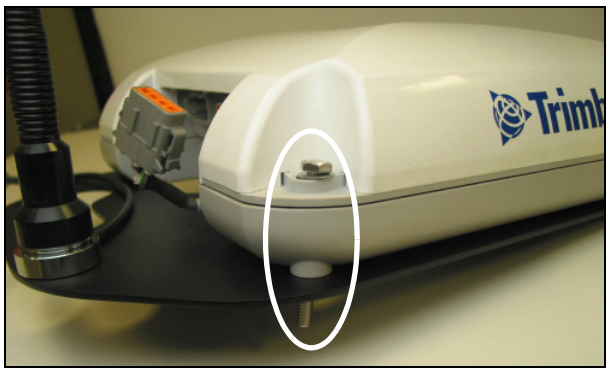
Step 2

Insert the nylon bushings provided.



Step 3

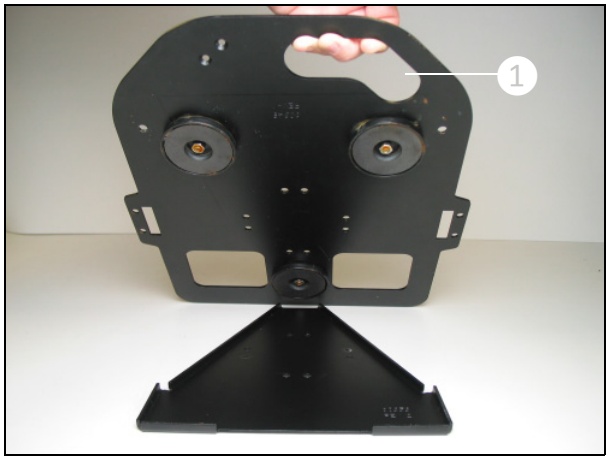
Insert the bolts through the receiver, radio, and mounting bracket. Place nuts on the bolt ends and then tighten them.



Step 4

Magnet method

Place the receiver on the roof by aligning the magnets with the V plate. Ensure that the handle ❶ is toward the back of the vehicle.

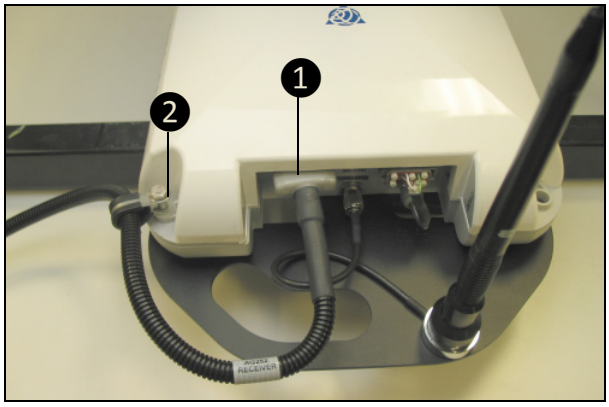


Step 5

Both methods

Connect the cable from the cab controller into port A ❶ of the AG-372 receiver. Bolt the cable clamp ❷ to the left side of the receiver.

Route the cable into the cab and into the controller.



Installing an AG-372 receiver with magnetic feet

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.

Use this option only when all other options are unavailable. It requires a firm surface for mounting to avoid vertical vibration and is not an easily repeatable location when moving receivers. Many cabs do not offer roof bolts; you may need to drill or to construct a firm location.

Step 1

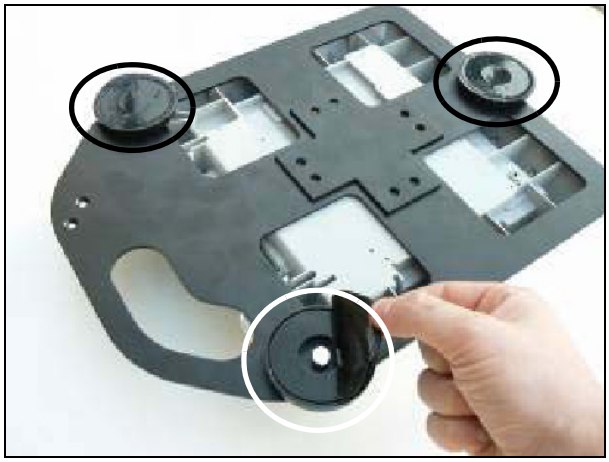
Attach the magnets to the receiver mounting plate. Use the three ¼" bolts to mount the AG-372 receiver.

Place the nuts on the receiver side.



Step 2

Turn the mounting plate upside down. Stick the covers onto the magnets as shown.

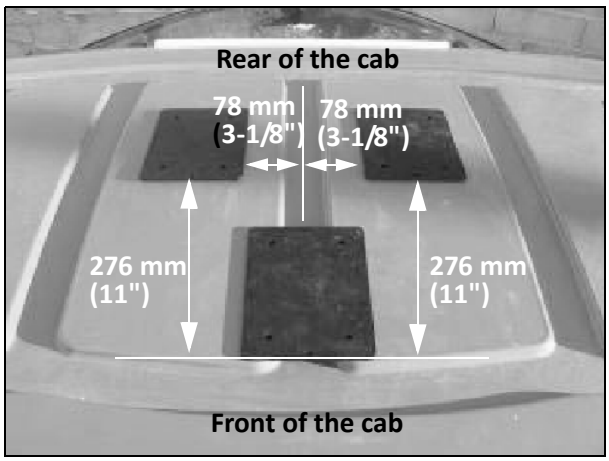


Step 3

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

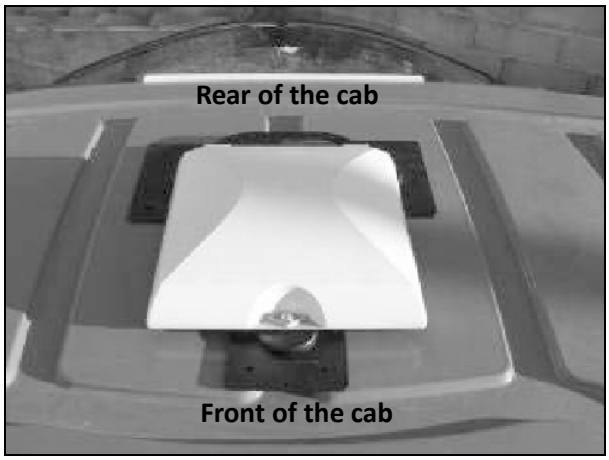
Remove the backing from the VHB strips and then apply the plates to the cab roof.

Attach the three mounting plates so that the receiver is as firm as possible.



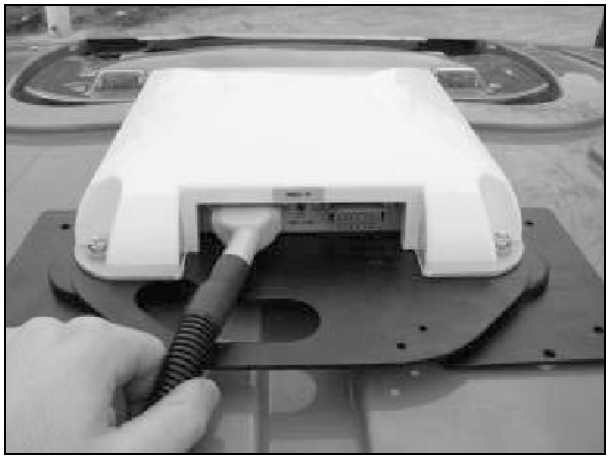
Step 4

Stick the antenna magnetic mounts at the center of the mounting plates.

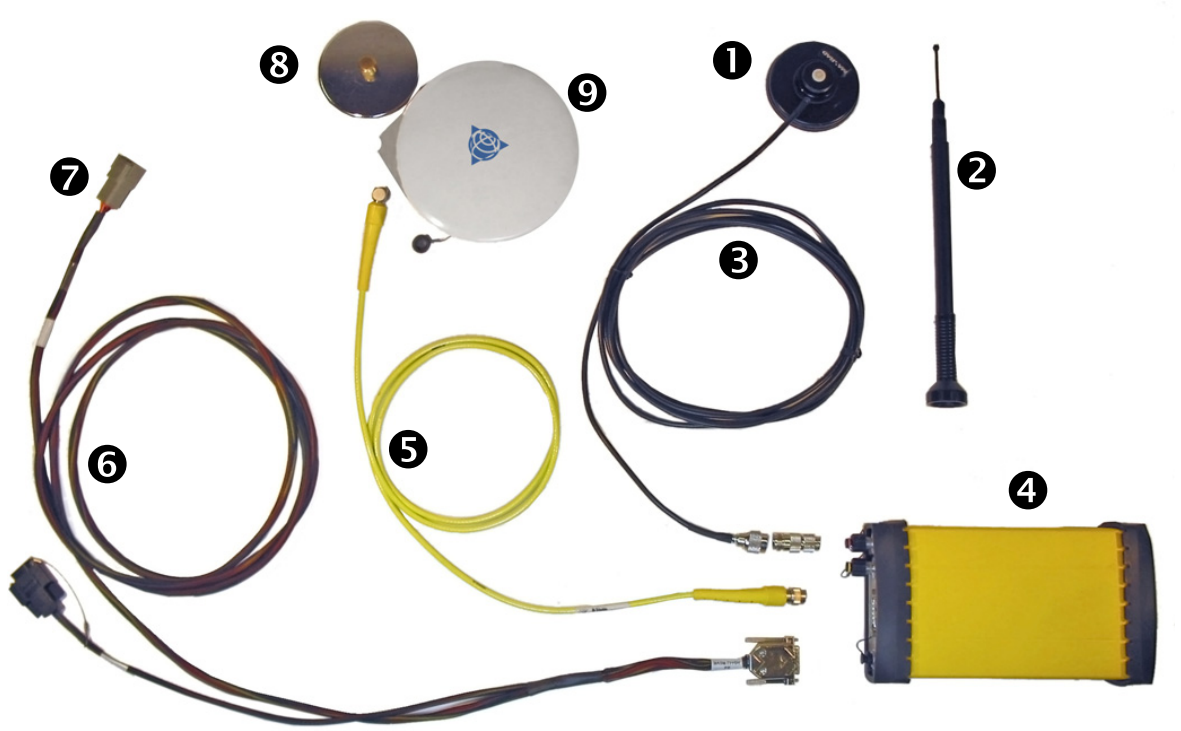


Step 5

Connect the antenna cable to port A of the AG-372 GPS receiver and then route the cable toward the NavController II harness.



*Ag*GPS 542 receiver components



Item	Description	Trimble part number
❶	Radio antenna magnetic base	
❷	Radio antenna	
❸	Radio antenna cable	
❹	*Ag*GPS 542 GPS receiver	
❺	Antenna cable	
❻	Receiver cable	62037
❼	To controller “P3 GPS”	
❽	Antenna magnetic mount	
❾	*Ag*GPS 542 GPS receiver	

Installing the *Ag*GPS 542 receiver

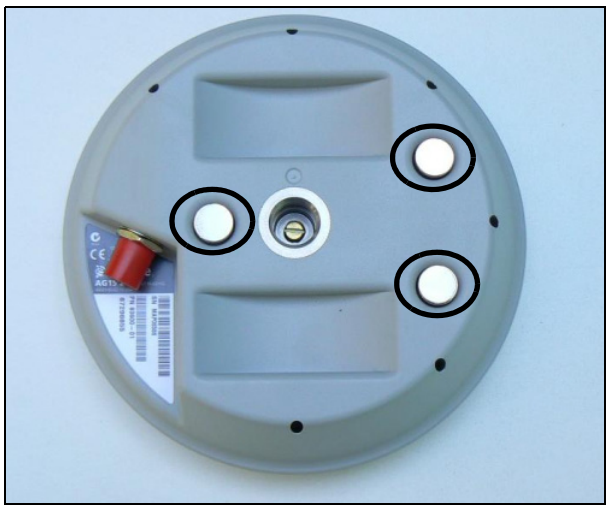
WARNING – To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information chapter.

Step 1

Attach the large magnet with a $^{5}/_{8}$" stud to the GPS antenna.



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



Step 2

GLONASS,RTK, OmniSTAR, DGPS applications

For repeatable positioning, place the antenna against the lip at the narrow end of the V plate, or on the raised dimple on the P/N 62034 plate.



Photo for AG-25 on P/N 62034?

AG-25 on P/N 62034

Step 3

Attach the antenna/receiver cable to the antenna and then route the cable into the cab through the rubber grommet at the base of the rear window. Secure the cable along the way.



Step 4

Mount the receiver in a convenient location in the cab. Route the antenna cable to the receiver and then connect it.

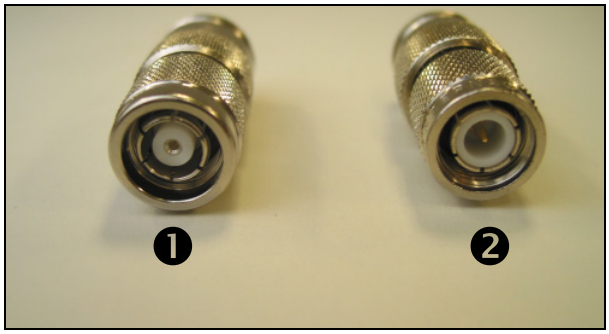


Step 5

Identify the correct adaptor for the radio connection:

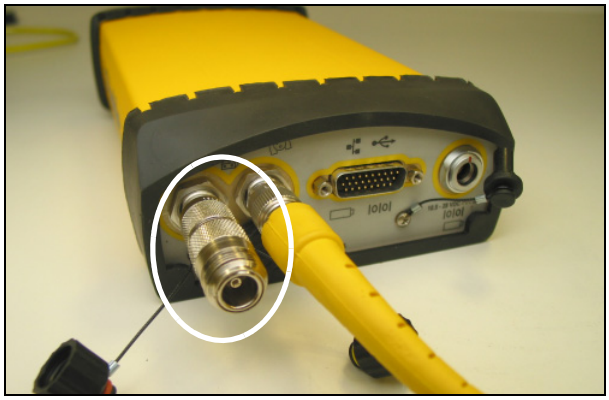
❶ Reverse polarity TNC-to-N for 900 MHz radios

❷ Normal polarity TNC-to-N for 400 MHz radios



Step 6

Attach the adaptor to the radio port.



Step 7

Connect the radio antenna cable to the radio port adaptor.



Step 8

Connect the controller cable to the 26-pin connector of the receiver. Controller cable connections will be completed in Chapter 8, Controller Installation.



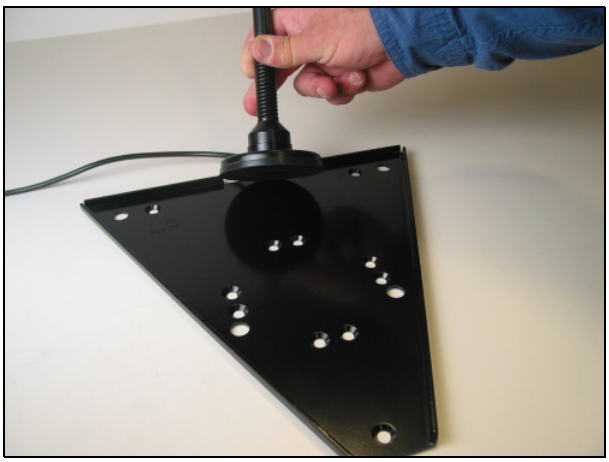
Step 9

Connect the radio antenna to the magnetic antenna base.



Step 10

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.





A RTK antenna on a P/N 62034 plate

CHAPTER 5

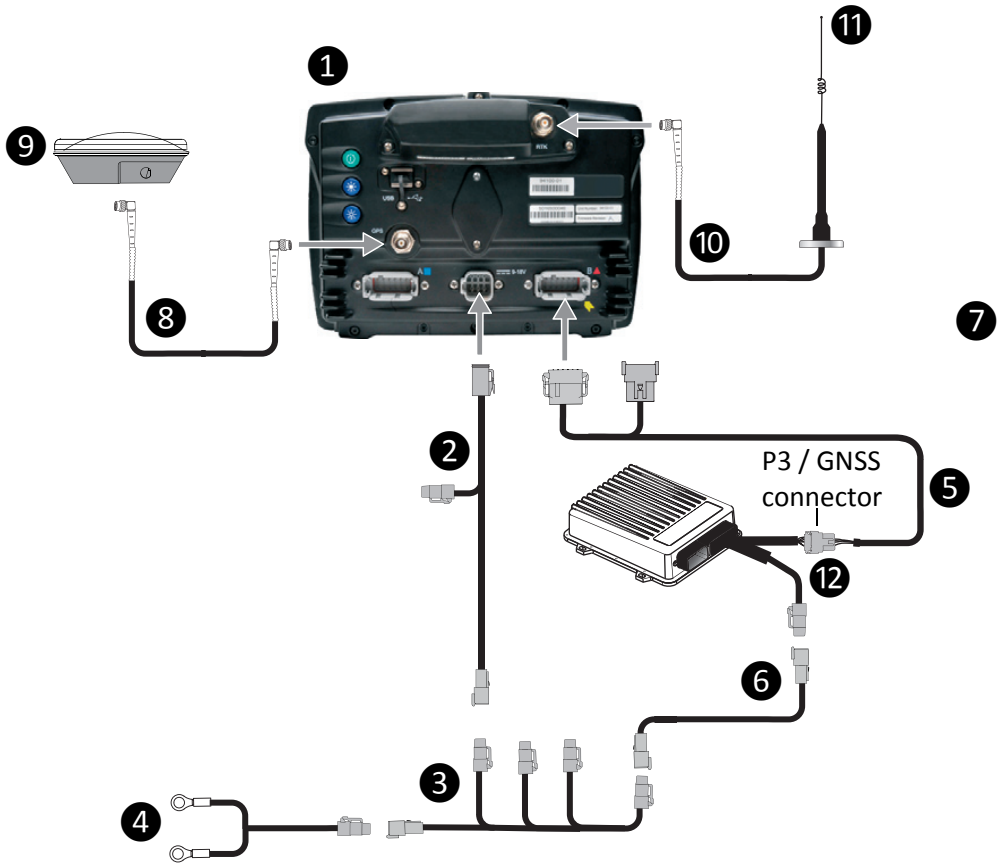
Display Installation

In this chapter:

- CFX-750 display components
- FmX integrated display components
- Preparing the CFX-750 display
- Installing the CFX-750 display
- CFX-750 display: Installing the wiring harness
- Preparing the FmX integrated display
- Installing the FmX integrated display
- FmX integrated display: Installing the wiring harness
- CFX-750 display and FmX integrated display: Connecting accessory options
- CFX-750 and FmX displays: Installing the GNSS antenna and plate
- CFX-750 and FmX displays: Installing the RTK radio antenna

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

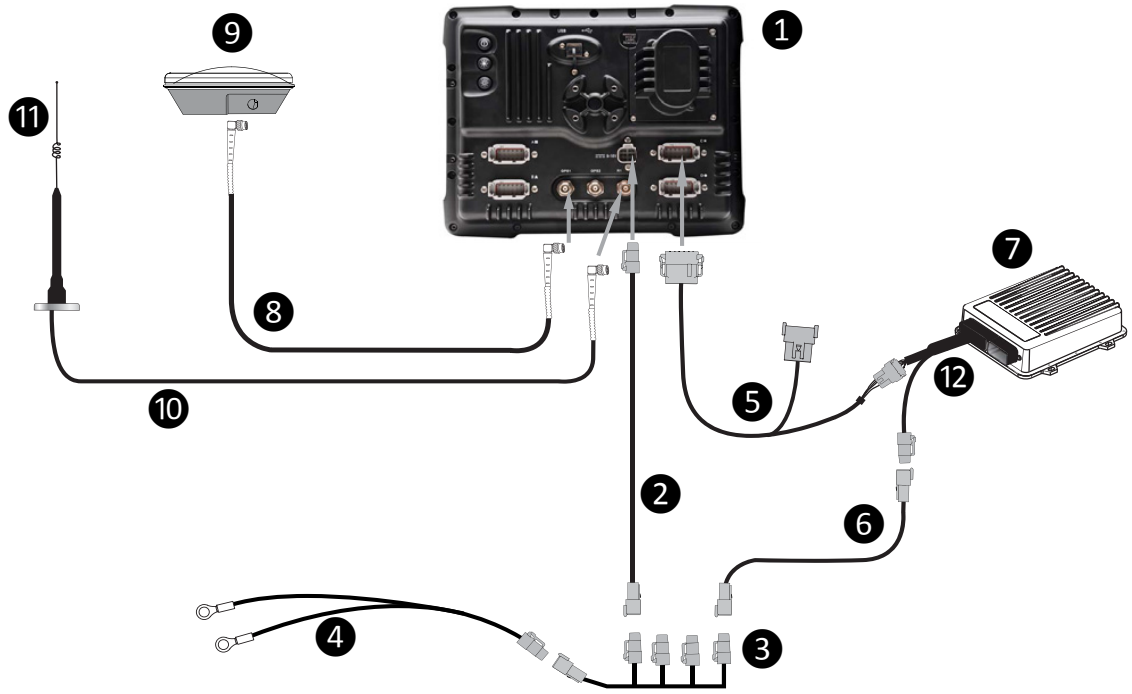
CFX-750 display components



CAUTION – Connecting the Port Replicator on the FmX to NavController II cable ❺ to the P4 or P12 connector of the NavController II harness ⓬ will result in damage to the FmX / FM-1000 integrated display, and will void the warranty.

Item	Description	Trimble part number
❶	CFX-750 display ***Note –*** *RTK password required.*	93100-02
❷	CFX-750 power cable	66694
❸	CFX-750 power cable with relay and switch (power bus)	67259
❹	Basic power cable	67258
❺	CFX-750 to NavController II cable with port replicator	75741
❻	2 pin DTM to 2 pin DT power adaptor	67095
❼	NavController II	55563-00
❽	8 m GNSS TNC/TNC RT angle cable	50449
❾	AG25 GNSS antenna	77038-00
❿	NMO to TNC 20ft antenna cable and base	72122
⓫	900 MHz radio antenna kit	22882-10
⓬	Main NavController II cable	54601

FmX integrated display components



⚠ **CAUTION –** Connecting the Port Replicator on the FmX to NavController II cable ❺ to the P4 or P12 connector of the NavController II harness ⓬ will result in damage to the FmX / FM-1000 integrated display, and will void the warranty.

Item	Description	Trimble part number
❶	FmX integrated display	93100-02
❷	FmX power cable	66694
❸	FmX power cable with relay and switch (power bus)	67259
❹	Basic power cable	67258
❺	FmX to NavController II cable with port replicator	75741
❻	2 pin DTM to 2 pin DT power adaptor	67095
❼	NavController II	55563-00
❽	8 m GNSS TNC/TNC RT angle cable	50449
❾	AG25 GNSS antenna	77038-00
❿	NMO to TNC 20ft antenna cable and base	72122
⓫	900 MHz radio antenna kit	22882-10
⓬	Main NavController II cable	54601

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

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 cable to the B port of the CFX-750 display.

To connect power to the CFX-750 display, see Chapter 8, Controller Installation.



CFX-750 display: Installing the wiring harness

Step 1

Locate the cable that connects the CFX-750 display to the NavController II.

Step 2

Connect the cable to the P3 connector on the NavController II main harness and then route the cable from the NavController II to the mounting location on the CFX-750 display.



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.

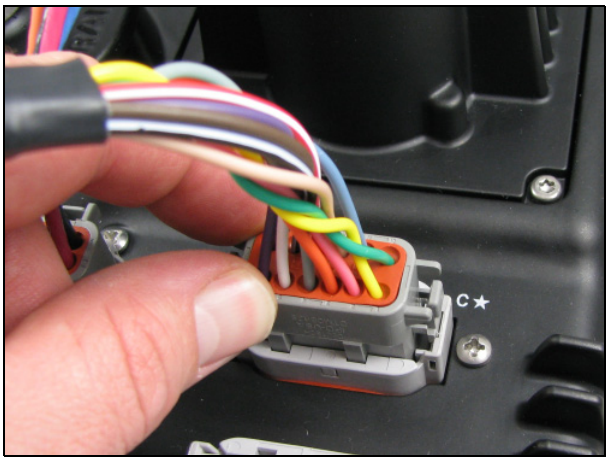
Step 1

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 cable to the C port of the FmX integrated display.

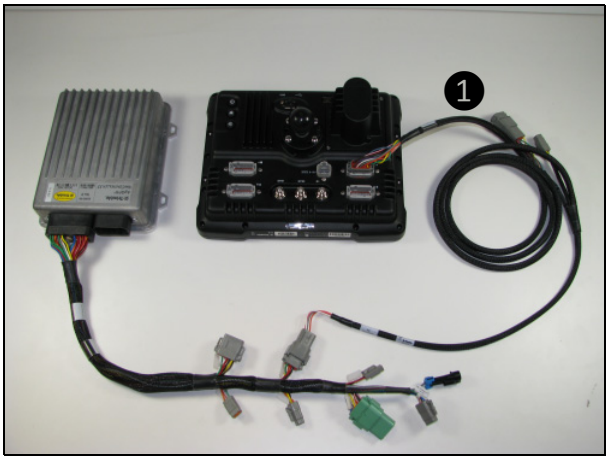
To connect power to the FmX integrated display, see Chapter 8, Controller Installation.



FmX integrated display: Installing the wiring harness

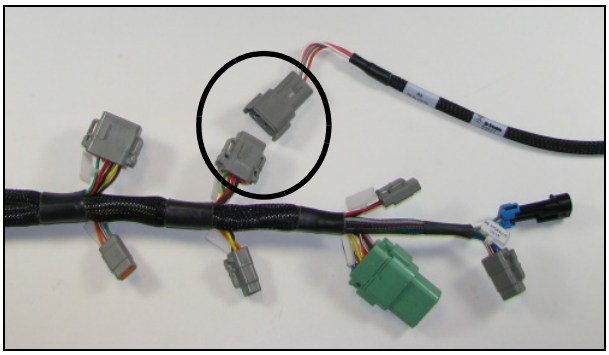
Step 1

Locate the cable that connects the FmX integrated display to the NavController II ❶.



Step 2

Connect the cable to the P3 connector on the NavController II main harness, and then route the cable from the NavController II to the mounting location on the FmX integrated display.



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

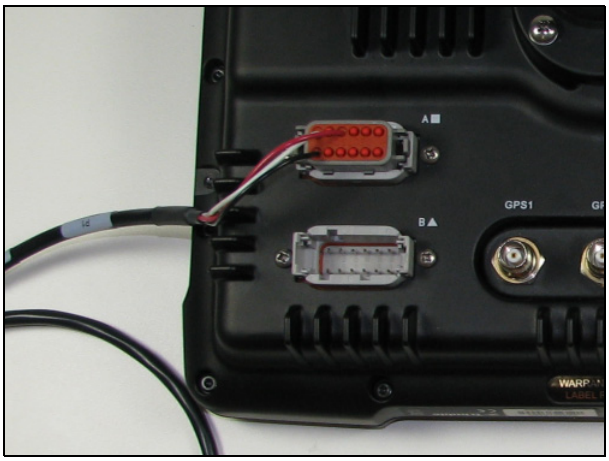
Step 3

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.



CFX-750 and FmX displays: Installing the GNSS antenna and plate

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**.*

Use one of the following methods:

- Spar mount
- VHB adhesive

Spar mount method

Trimble recommends that you use this method for RTK and OmniSTAR operations. For more information, see Antenna and receiver installation options, page 21.

Use a $^{5}/_{8}$" bolt to attach the AG-25 antenna to the spar, as shown.



VHB adhesive method

Standard 4" x 6" plates are provided in most kits. You can use Very High Bond (VHB) to attach either a 4" x 6" 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 panning”. 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 4" x 6" 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.

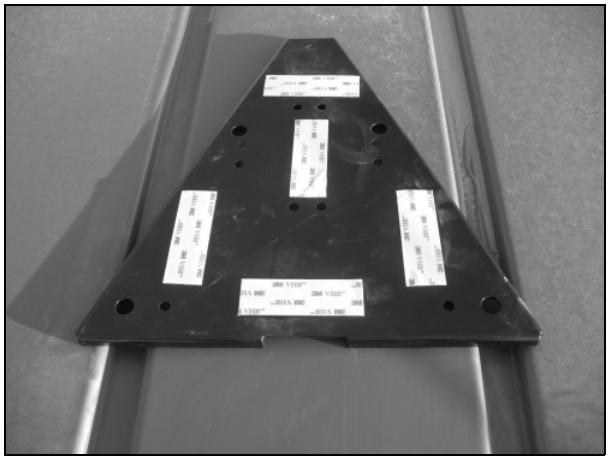


Step 2

V plate only

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

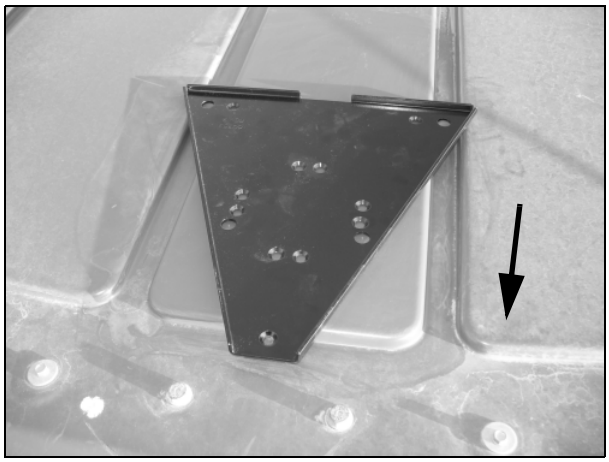
Note – *The VHB strips are pre-applied to the P/N 62034 plate.*



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.*



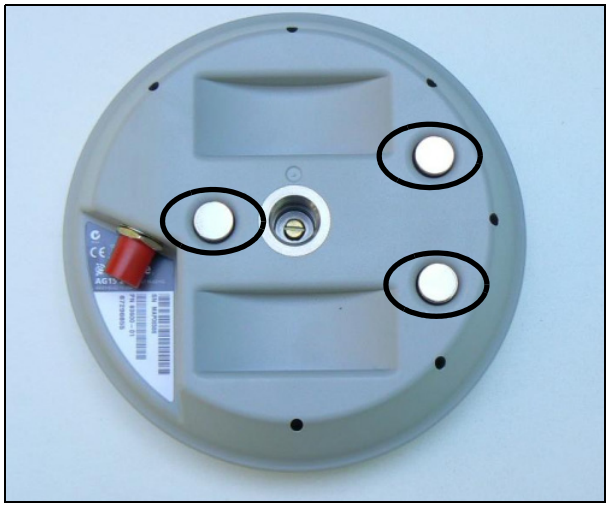
V plate



P/N 62034 plate

Step 4

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



Otherwise, attach the large magnet with a $^{5}/_{8}$" 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 P/N 62034 plate.



A RTK antenna on a P/N 62034 plate

Step 6

Both models

Attach the antenna/receiver cable to the antenna and then route the cable into the cab through the rubber grommet at the base of the rear window. Secure the cable along the way.



CFX-750 and FmX displays: Installing the RTK radio 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.

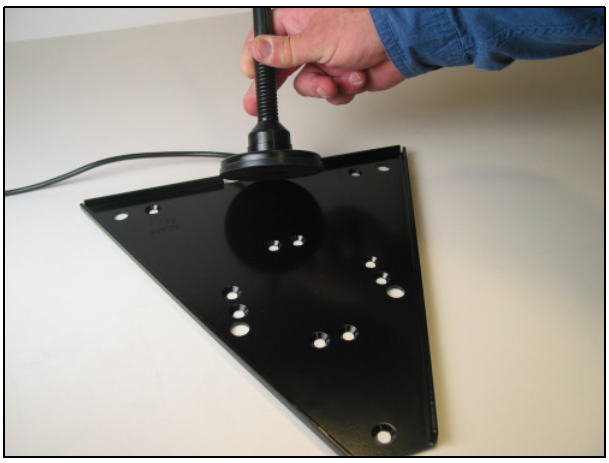
Step 1

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.



A RTK antenna on a P/N 62034 plate

CHAPTER 6

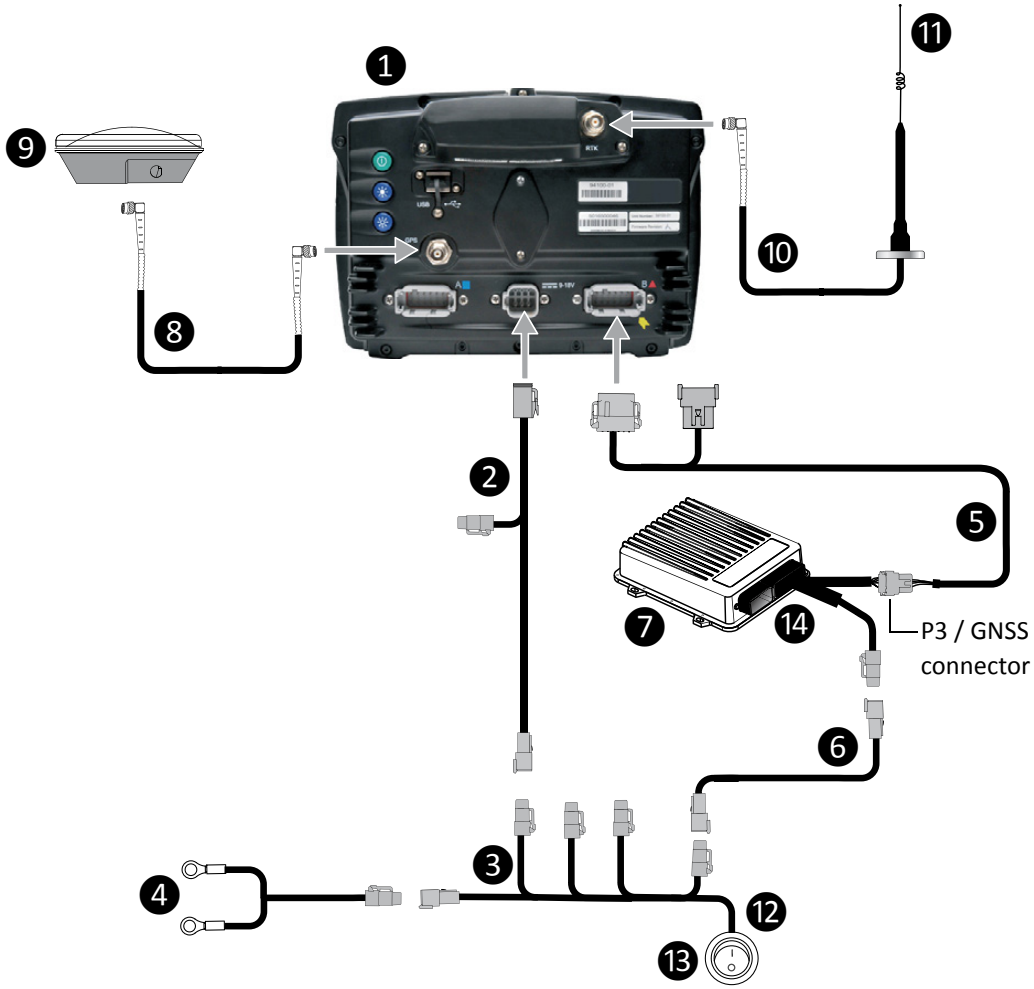
Power Harness Installation

In this chapter:

- CFX-750 display components
- FmX integrated display components
- Installing the power harness for the display
- Configuring the power bus options for the display

This chapter describes how to install the power harness in the vehicle.

CFX-750 display components

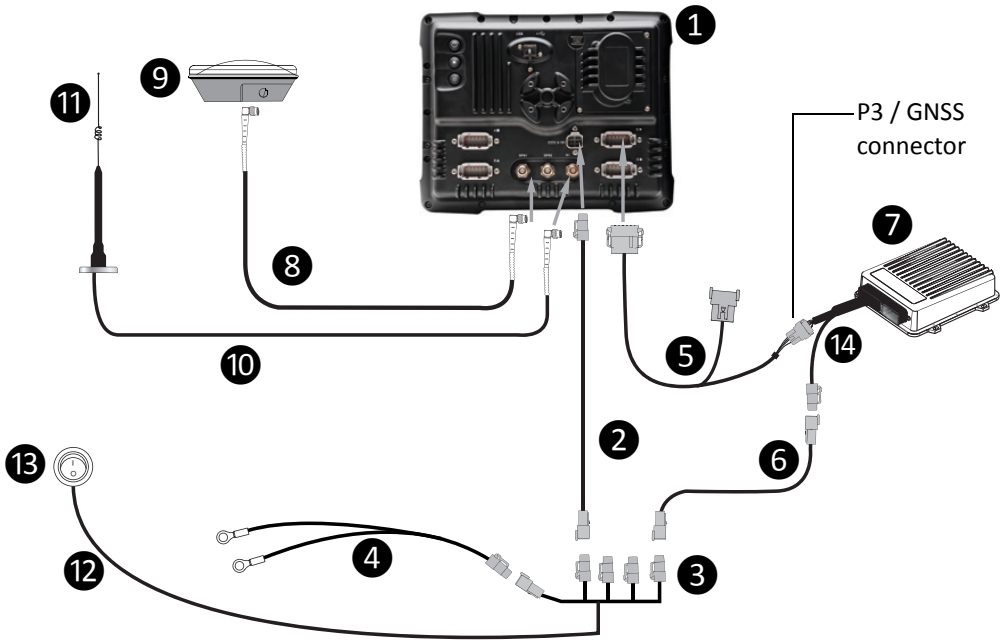


⚠ **CAUTION –** Connecting the Port Replicator on the FmX to NavController II cable ❺ to the P4 or P12 connector of the NavController II harness ⓬ will result in damage to the FmX / FM-1000 integrated display, and will void the warranty.

Item	Description	Trimble part number
❶	CFX-750 display ***Note –*** *RTK password required.*	93100-02
❷	CFX-750 power cable	66694
❸	CFX-750 power cable with relay and switch (power bus)	67259
❹	Basic power cable	67258
❺	FmX to NavController II cable with port replicator	75741
❻	2 pin DTM to 2 pin DT power adaptor	67095
❼	NavController II	55563-00
❽	8 m GNSS TNC/TNC RT angle cable	50449
❾	AG25 GNSS antenna	77038-00

Item	Description	Trimble part number
⑩	NMO to TNC 20ft antenna cable and base	72122
⑪	900 MHz radio antenna kit	22882-10
⑫	External switch cable included with kit	Part of P/N 67259
⑬	External switch included with kit	Part of P/N 67259
⑭	Main NavController II cable	54601

FmX integrated display components



⚠ **CAUTION –** Connecting the Port Replicator on the FmX to NavController II cable ❺ to the P4 or P12 connector of the NavController II harness ⓬ will result in damage to the FmX / FM-1000 integrated display, and will void the warranty.

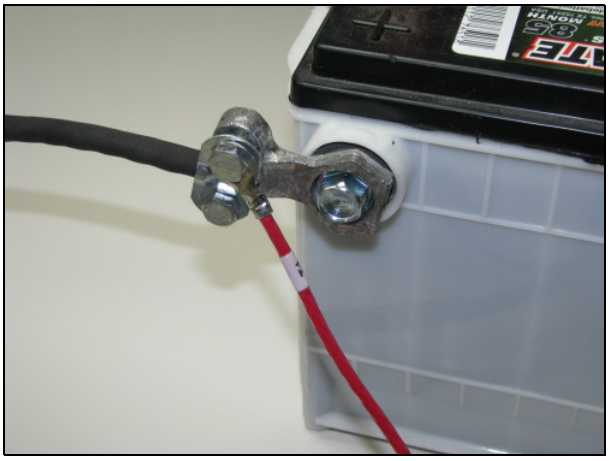
Item	Description	Trimble part number
❶	FmX integrated display	93100-02
❷	FmX power cable	66694
❸	FmX power cable with relay and switch (power bus)	67259
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❽	8 m GNSS TNC/TNC RT angle cable	50449
❾	AG25 GNSS antenna	77038-00
❿	NMO to TNC 20ft antenna cable and base	72122
⓫	900 MHz radio antenna kit	22882-10
⓬	External switch cable included with kit	Part of P/N 67259
⓭	Switch	67095
⓮	NavController II harness	54601

Installing the power harness for 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.

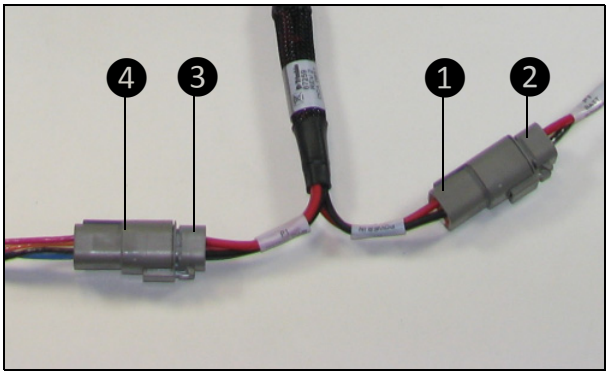
Step 1

Connect the basic power cable to the vehicle battery and then route the cable into the cab.



Step 2

Locate and connect the 4-pin Deutsch DTP receptacle on the power bus ❶ to the 4-pin Deutsch DTP plug ❷ on the basic power cable and then remove the protective cap from the 4-pin Deutsch DTP plug ❸ on the power bus and connect the plug to the 4-pin Deutsch DTP receptacle ❹ on the display power adaptor.

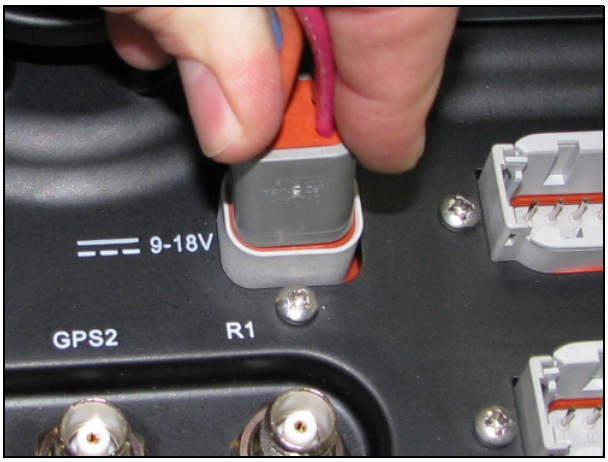


Step 3

Route the display power adaptor to the display mounting location and then connect it to the display.



CFX-750 display



FmX display

Configuring the power bus options for the display

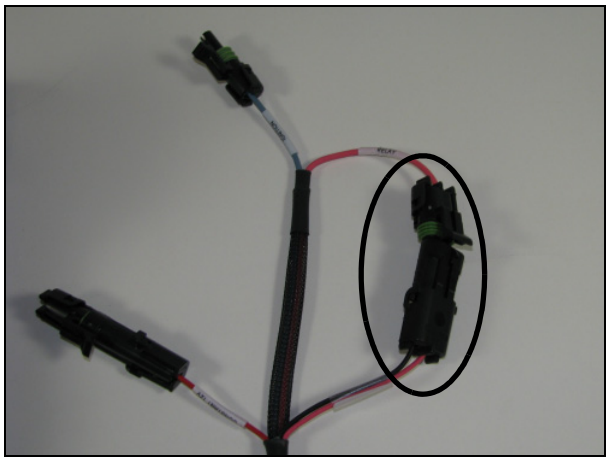
WARNING – To avoid potentially serious personal injury or illness, and to prevent damage to equipment, make sure that you read and understand the Safety Information.

When you use the power bus cable, use one of the following configuration methods to turn on the Autopilot system:

- Display power button is used to turn on the Autopilot system
- External switch is used to turn on the Autopilot system
- Ignition is used to turn on the Autopilot system

Display power button is used to turn on the Autopilot system

Connect the 2 pin connectors labeled R2 and P2 on the power bus.

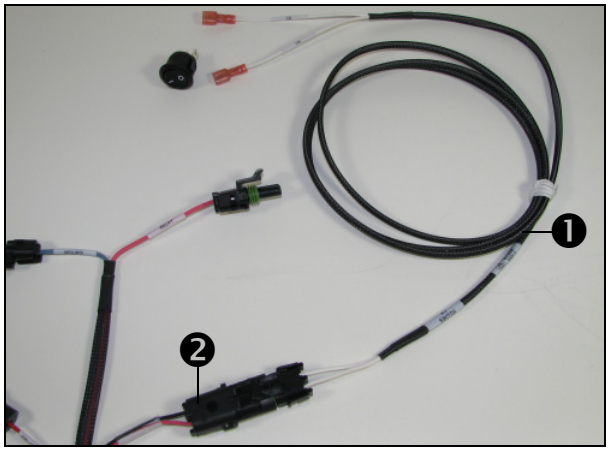


External switch is used to turn on the Autopilot system

Step 1

Connect the cable labeled R7 switch ❶ (included with the power bus) to connector labeled P2 on the power bus ❷ and then route the cable labeled R7 to a switch location.

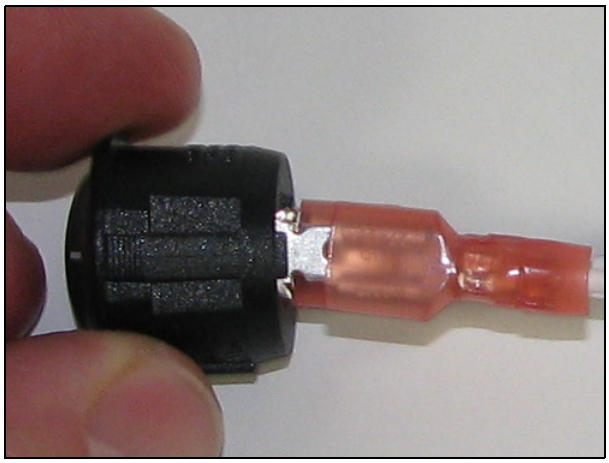
Note – *To install the switch provided, drill a ¾" hole.*



Step 2

Connect the cable labeled R7 to the switch pins.

Note – *Polarity is not important.*

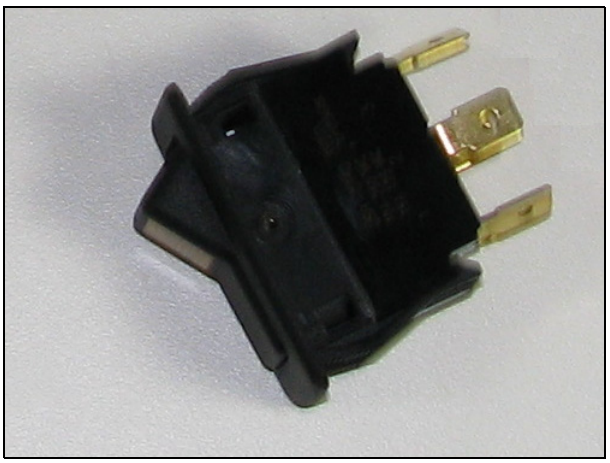


Installing the optional illuminated full or standard Euro switch

Step 1

Find an available knockout location on the vehicle console.

Note – *An alternative location is required for the switch provided.*

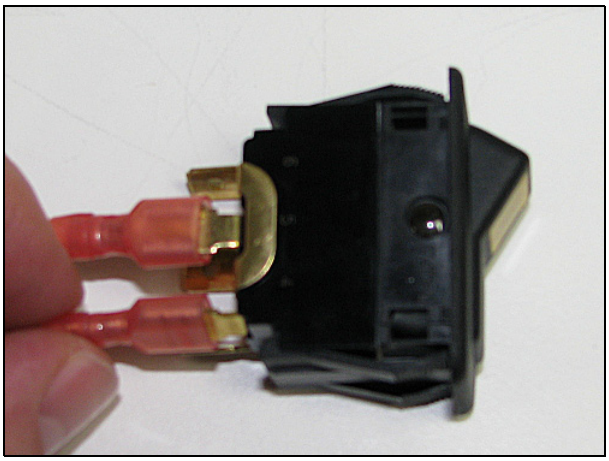


Step 2

Route the cable labeled R7 to the switch location and then connect the cable to the illuminated switch.

Connect the wire labelled S1 to pin 5 on the switch and then connect the wire labelled S2 to pin 4 on the switch.

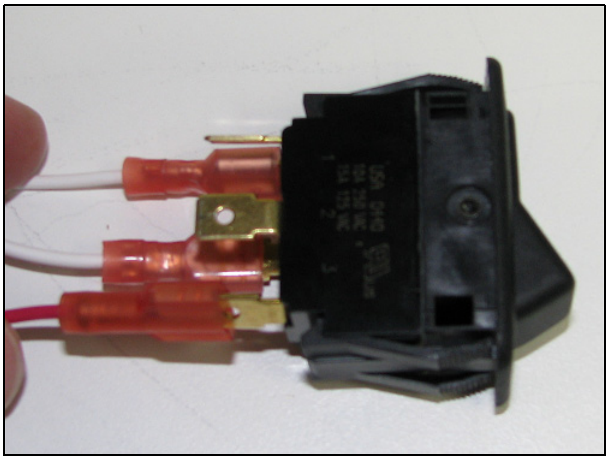
Note – *Polarity **is** important.*



Step 3

Connect a separate wire to pin 3 on the switch using a spade connector. Route the wire and then connect it to the vehicle switched power.

Note – *This additional wire is required to allow the switch to illuminate.*

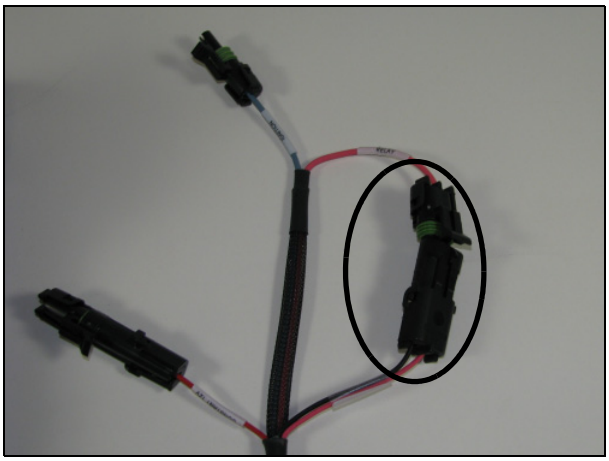


Ignition is used to turn on the Autopilot system

Note – *For more information on how to use the ignition sensing option, see the FmX Integrated Display User Guide.*

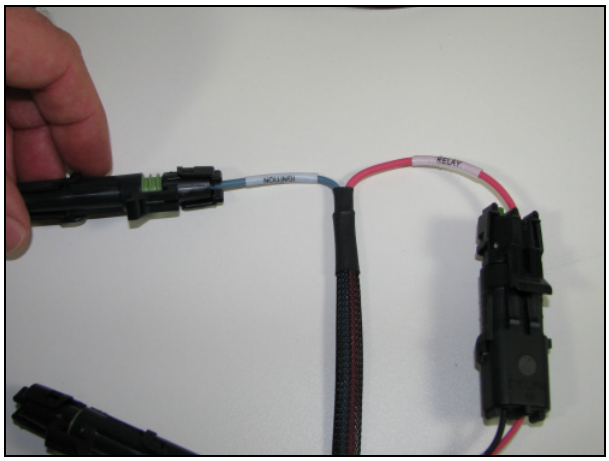
Step 1

Connect the 2-pin connectors labeled R2 and P2 on the power bus.



Step 2

Connect the cable labeled R8 Ignition (included with the power bus) to connector P3 Ignition on the power bus.

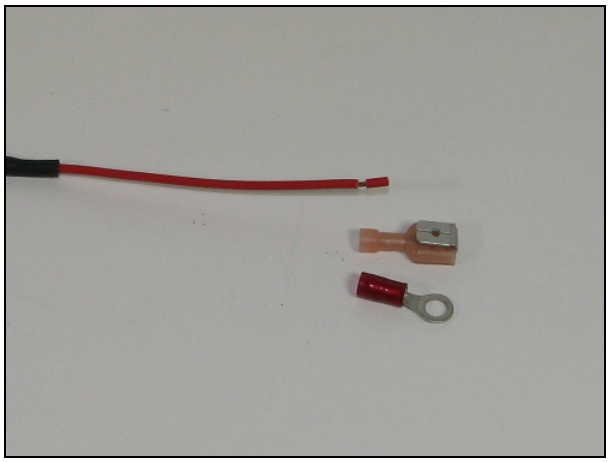


Step 3

Route the cable to the vehicles ignition.

Step 4

Connect the red ignition sense wire to the vehicle ignition using the spade or ring terminal provided.



CHAPTER 7

Remote Engage Switch Installation

In this chapter:

- Remote engage switch components: Rocker switch
- Remote engage switch components: Foot switch
- Preparing the remote engage cable
- Using the remote engage switch

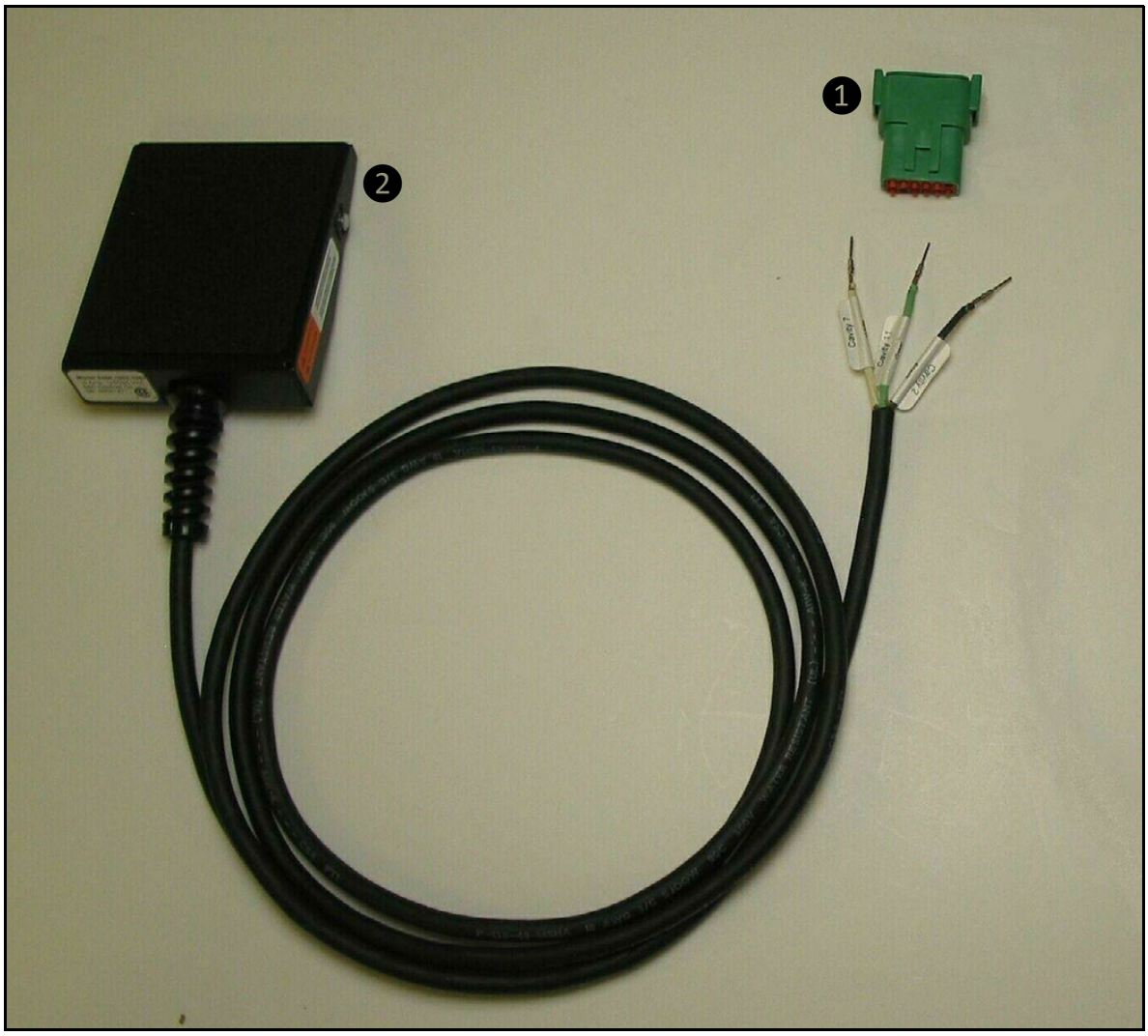
This chapter describes how to install the remote engage switch.

Remote engage switch components: Rocker switch



Item	Description
❶	DTM receptacle
❷	Remote engage rocker switch

Remote engage switch components: Foot switch

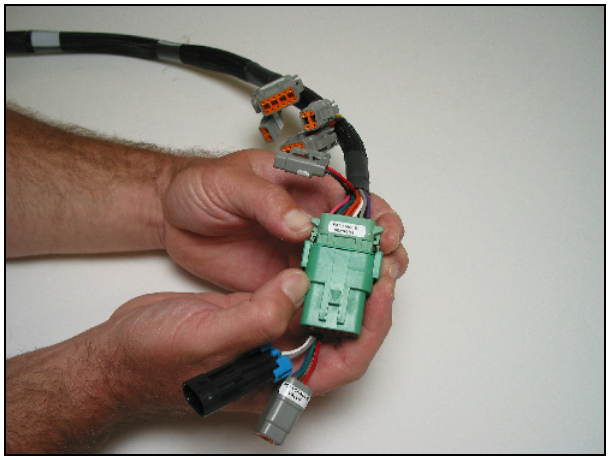


Item	Description
❶	DTM receptacle
❷	Remote engage rocker switch

Preparing the remote engage cable

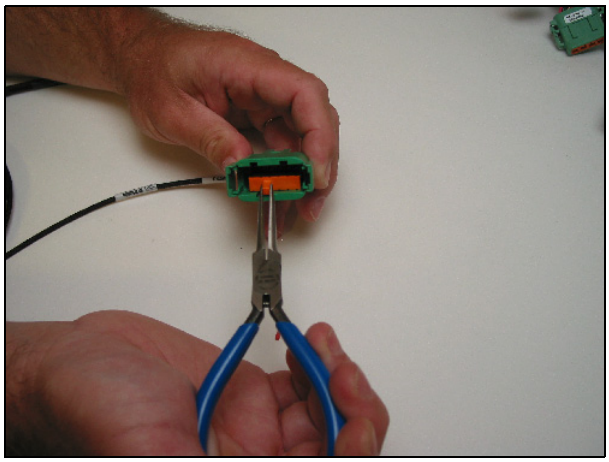
Step 1

Locate the green 12-pin Deutsch receptacle on the P-5 leg of the main controller harness. For more information, see Chapter 8, Controller Installation.



Step 2

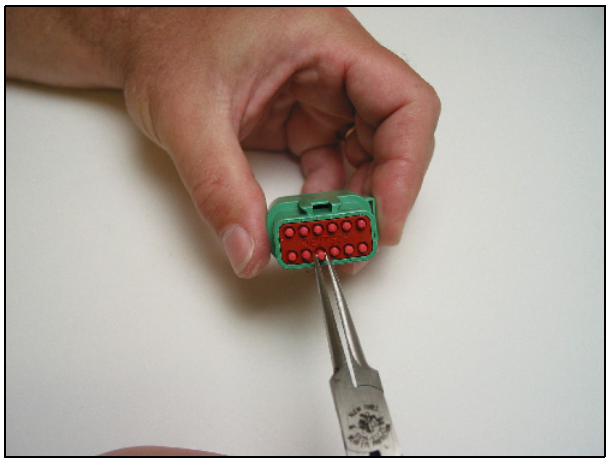
Remove the wedge from the connector.



Step 3

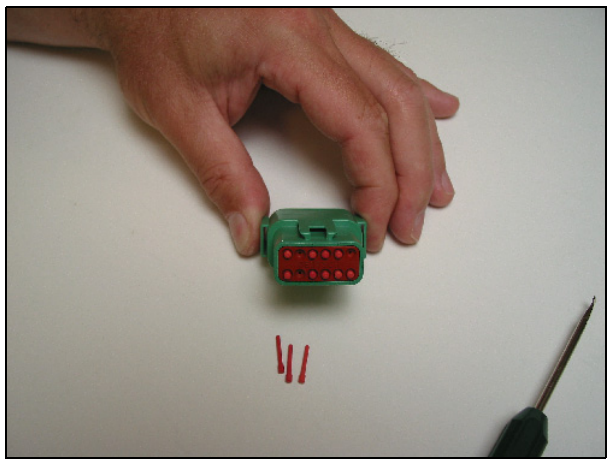
Rocker switch only

Remove the plugs from cavity 2 and cavity 7.



Foot Switch Only

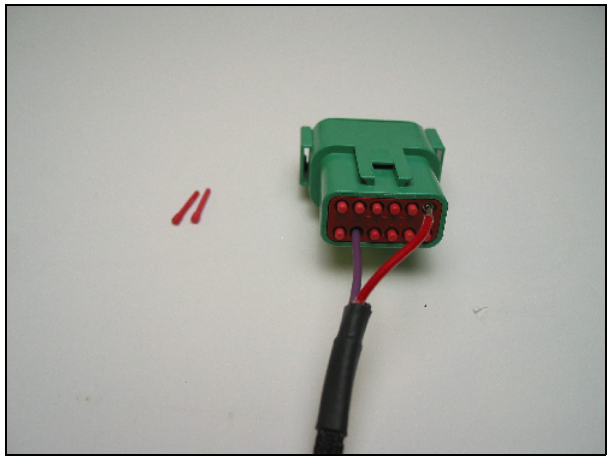
Remove the plugs from cavity 2, cavity 7, and cavity 11.



Step 4

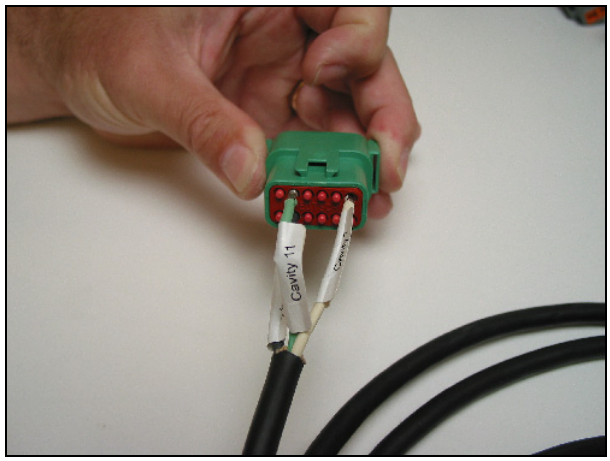
Rocker switch only

Insert the DTM pins into cavity 2 and cavity 7, according to the labels on the wires.



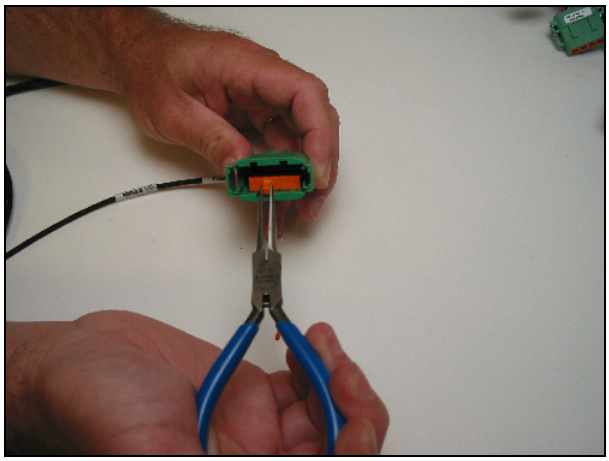
Foot switch only

Insert the DTM pins into cavity 2, cavity 7, and cavity 11, according to the labels on the wires.



Step 5

Pull on the wires to seat them in place and then replace the wedge in the connector.



Step 6

Replace the receptacle on the P5 plug of the NavController II harness.

Step 7

Rocker switch only

Run the spade ends of the cable to a knockout location in the operator console.



Foot switch only

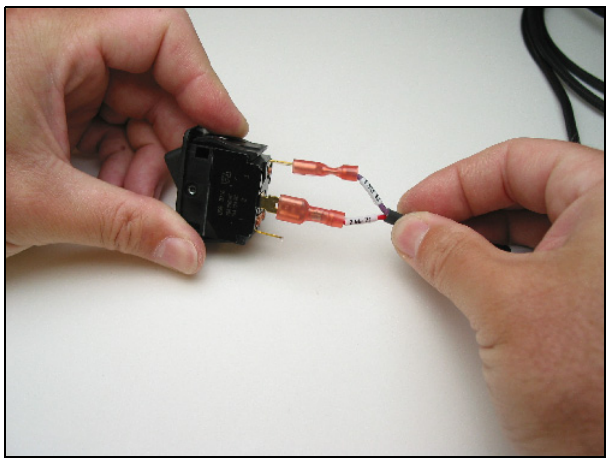
Run the cable to a clear location on the floor board. Use double-sided tape to secure the pedal. Route the cable under the floor mat.



Step 8

Rocker Switch Only

Connect the wires to the switch. Match the print on the switch body with the labels on the wires.



Step 9

Rocker Switch Only

Place the switch in the console.



Using the remote engage switch

To use NavController II to engage the system:

- For firmware versions 5.20 and earlier: Hold down the remote engage switch for longer than **0.5** seconds and less than **4** seconds.
- For firmware 5.21 and later: Hold the switch down for longer than **0.15** seconds and less than **4** seconds.

The system engages when you release the switch.

CHAPTER 8

Controller Installation

In this chapter:

- Installing the controller
- Controller connections
- Connecting the cables to the controller

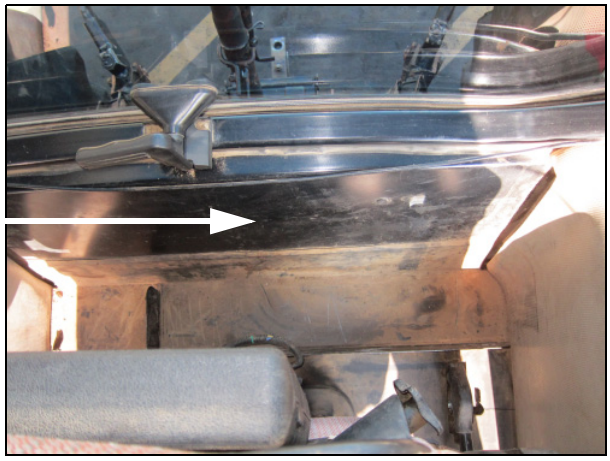
This chapter describes how to install the controller unit.

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 II in the area behind the seat of the machine on the flat wall under the window, as shown.



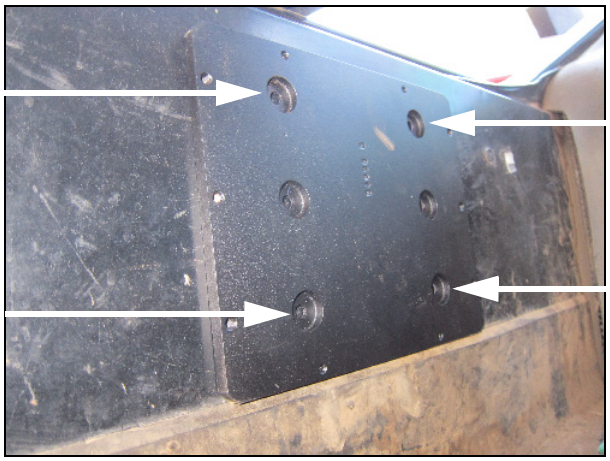
Step 2

Position the controller mounting plate in the place where the NavController II will be mounted.



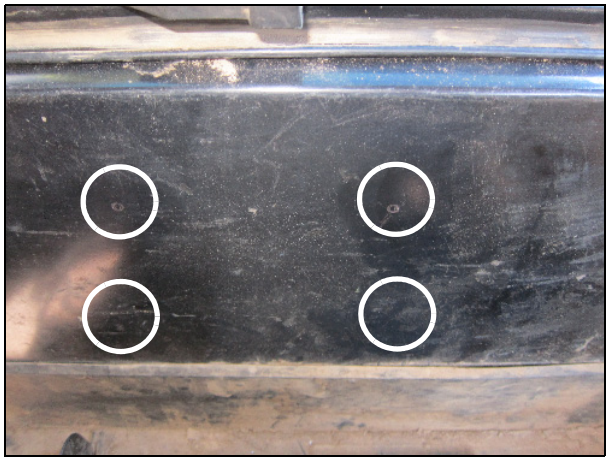
Step 3

Use the controller mounting plate as a template to the mark the centre of 4 holes for mounting the controller mounting plate.



Step 4

Where the 4 holes were marked, drill 4 holes $^{5}/_{16}$" in diameter.



Step 5

Use the provided ¼ mounting hardware to attach the controller mounting plate to the machine.

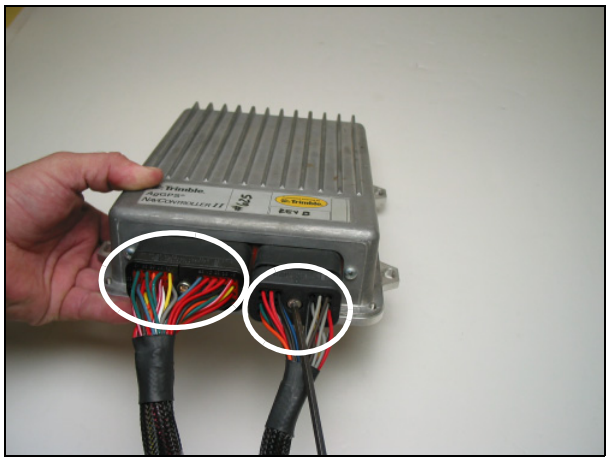
The slow moving vehicle sign may need to be temporarily removed to provide access for installing the controller mounting plate.





Step 6

Before you install the controller, attach the main and auxiliary cable harnesses. Use an Allen wrench to secure the connectors to the controller.

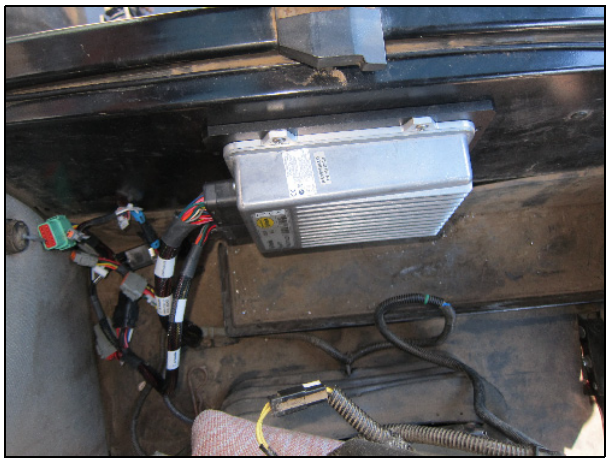


Step 7

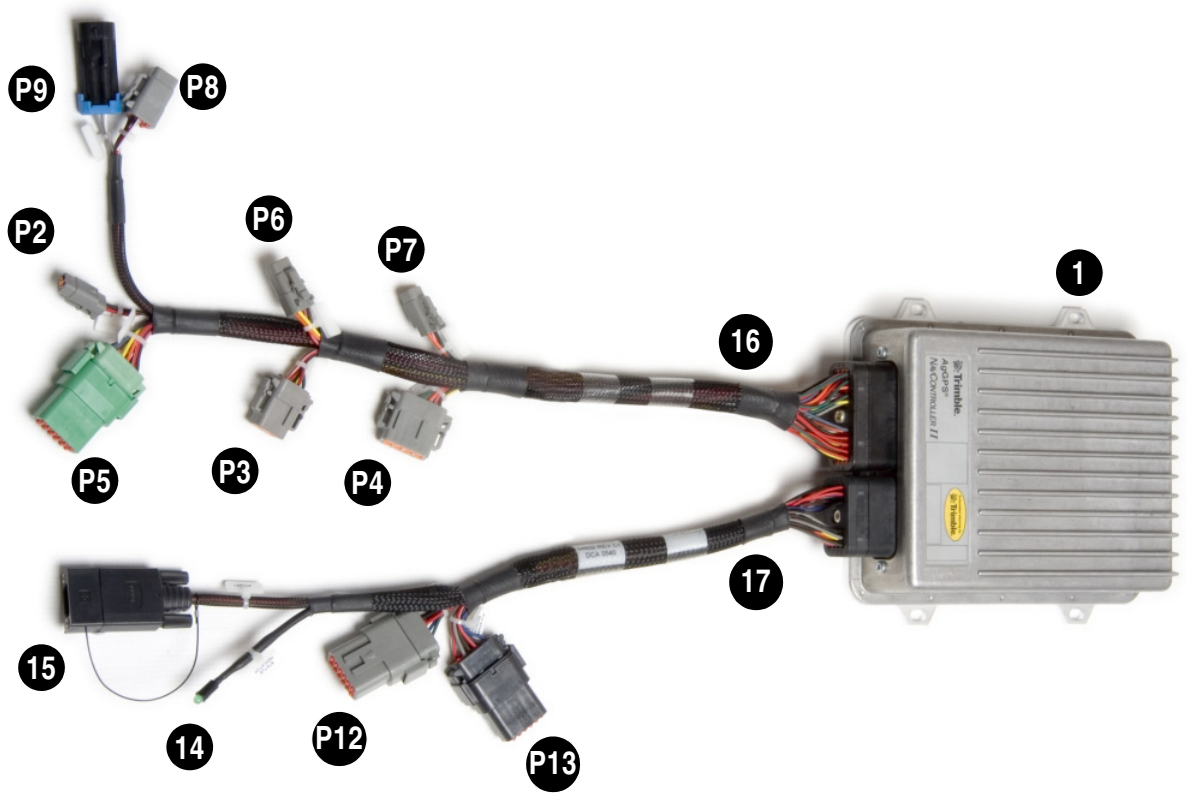
Position the NavController II so that it faces the right side of the machine.

Use the provided 10-32 screws to attach the NavController II to the controller mounting plate.





Controller connections



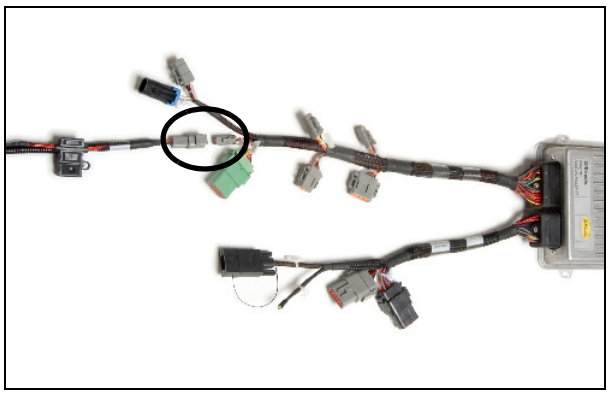
Item	Description
1	NavController II controller
P2	Power connector
P3	GNSS connector
P4	Display connector
P5	Vehicle sensors connector
P6	Steering sensor connector
P7	Manual override connector
P8	Hydraulic valve connector

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

Connecting the cables to the controller

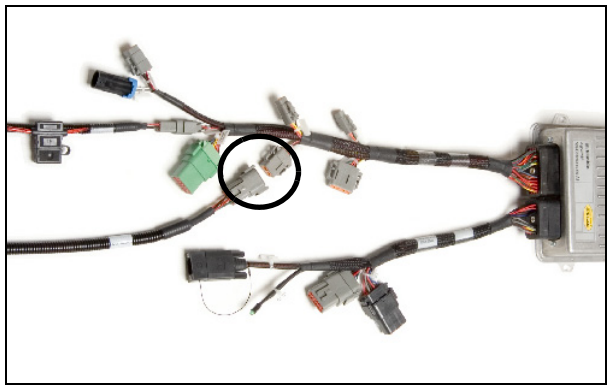
Step 1

Connect the power cable connection to P-2, which is labeled “Power”. P-2 is located on the main wiring harness.



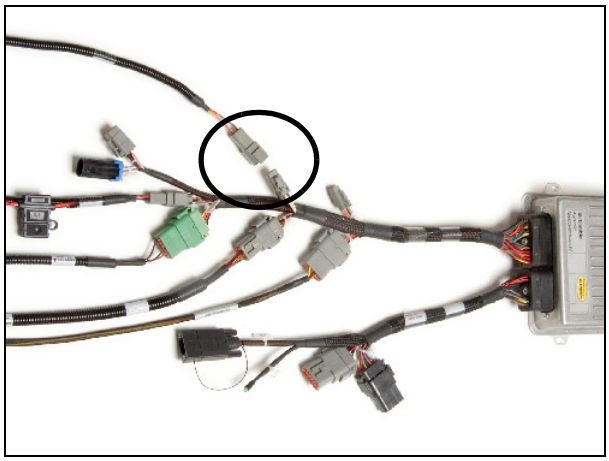
Step 2

Connect the CFX-750 display or FmX integrated display to P-3, which is labeled “GPS”. P-3 is located on the main wiring harness.



Step 3

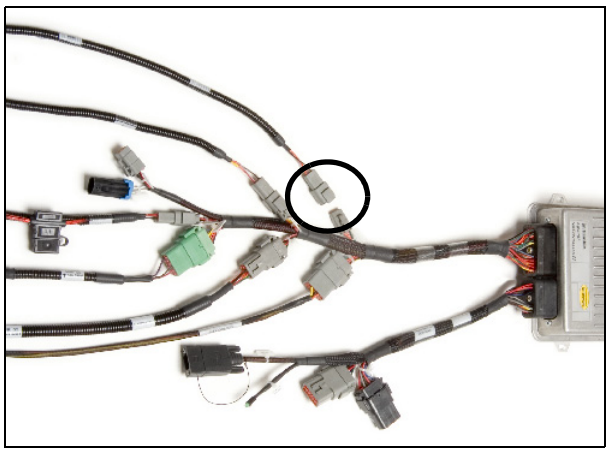
Connect the steering sensor cable connection to P-6, which is labeled “Steering Sensor”. P-6 is located on the main wiring harness.



Step 4

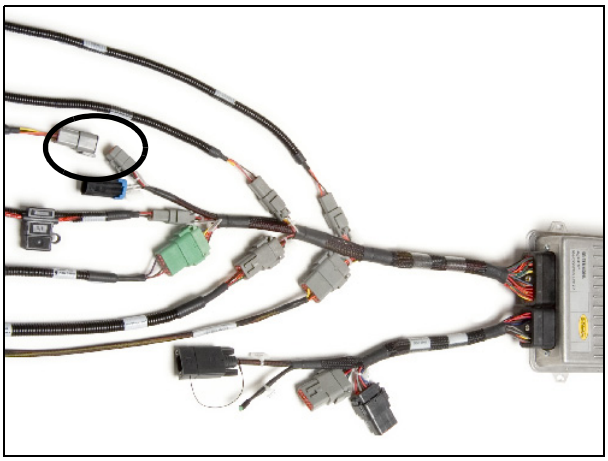
Connect the manual override cable connection to P-7, which is labeled “Manual Override”. P-7 is located on the main wiring harness.

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



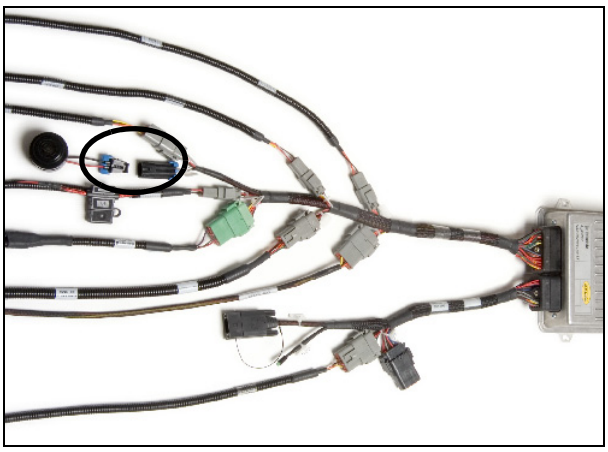
Step 5

Connect the hydraulic steering valve cable connection to P-8, which is labeled “Hydraulic Valve”. P-8 is located on the main wiring harness.



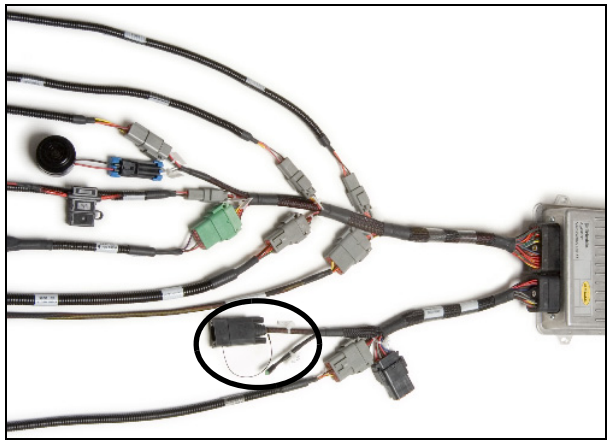
Step 6

Connect the Sonalert P-9 to the two 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 9

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 II to the latest firmware from http://agpartners.trimble.com.

   You can use FlashLoader 200 software version 3.19 to update the Autopilot controller: Download it from http://agpartners.trimble.com.
4. Load the correct configuration file into the Autopilot NavController II 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 2.92 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. Calibrate the Autopilot system using the Trimble display or Autopilot Toolbox II software version 2.92 or later. Depending on your machine type, the following items must be calibrated before you can use the Autopilot system:
   - NavController II mounting orientation
   - Manual override
   - Autosense mounting orientation
   - Valve deadzone
   - Autopilot P-gain
   - Antenna height/Antenna axle offset, and Roll offset