

AgGPS® Autopilot™ Automated Steering System

Ordering Guide

**Version 2.00
Revision A
April 2005**



Agriculture BA

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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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The AgGPS Autopilot System – A Description

In this chapter:

- Introduction
- Selecting a Trimble Autopilot Guidance System
- Choosing an AgGPS Receiver and System
- AgGPS Autopilot System Type and Accuracy
- AgGPS Autopilot System Platform Kits
- AgGPS Autopilot System Receiver Types
- AgGPS Autopilot System Display Types
- AgGPS Autopilot System RTK Radios
- AgGPS Autopilot System Base Stations
- AgGPS Autopilot Conversion (Upgrade) and Transfer Kits
- AgGPS Autopilot Hydraulic and Bracket Kits
- AgGPS Autopilot System Uses

This chapter describes the AgGPS® Autopilot™ automated steering system to clear up some of the complexity surrounding the system. The section include descriptions of accuracy, receiver types, display types, correction sources, RTK radio types, and many others.

Introduction

This ordering guide is intended to help you correctly order an Autopilot system. There are several ways to configure the Autopilot system based on vehicle platform, receiver type, display type, and radio type (RTK Only). In addition, you can order manual guidance to automated steering conversion kits (formerly known as *upgrade kits*) and transfer kits.

Selecting a Trimble Autopilot Guidance System

The AgGPS Autopilot system connects to your tractor's hydraulic power steering system and automatically steers the tractor for perfectly straight rows. Because it is completely automated, operators can drive straight rows all day, ensure minimum overlaps, and have more time for infield applications such as listing, planting, and cultivating.

Choosing an AgGPS Receiver and System

Accuracy Versus Cost

One of the most important requirements you'll need to consider is accuracy required for the intended applications, which has the greatest impact on its cost. There are fundamental differences—both in cost and design—between a DGPS receiver that is typically accurate to +/- 8" to 12", a dual-frequency HP receiver that is typically accurate to +/- 2" to 4", and a Real-Time Kinematic (RTK) receiver that is typically accurate to +/- 1". Overall vehicle accuracies are dependent upon satellite communication, field location, terrain, tractor and implement setup and condition, system installation, and calibration. (The overall vehicle accuracy with an RTK may vary more than +/- 1" on an articulated 4WD tractor due to the articulated steering and sprayer due to the design, operating speeds, and soil conditions.)

Repeatability

If repeatability in travelling over the same path for a period of not more than 20 minutes is desired or if nudging to the original AB line as a reference is acceptable, DGPS or HP systems are sufficient. However, if the intended application requires repeatability in travelling accurately over the same path, whether the same day or year to year, an RTK system will provide highly accurate AB line repeatability.

Initial Investment

The cost of the system will increase with accuracy due to the cost of the correction signal from a base station (either commercial base station network for HP or local mobile or fixed base station) and RTK radio.

AgGPS Autopilot System Type and Accuracy

The following defines each AgGPS Autopilot system type and associated accuracy.

AgGPS Autopilot RTK - < 2.5 cm (1 inch) pass to pass, year to year

Utilizes GPS satellite signals collected at both the RTK base station and rover receiver to determine the rover's position to extremely high accuracy. Accuracy is typically less than +/- 1 inch (2.5 cm) depending on satellite geometry (PDOP), distance from base station, terrain, tractor & implement setup, field conditions and Autopilot system calibration.

Typically, no subscription is required but an RTK base station is required to compute the accuracy for guidance and positioning at the rover. The RTK base station is mobile and can be moved from field to field. In some cases, RTK Networks use fixed base stations to support many rover systems. Re-sellers establish RTK Networks and charge their customers a subscription fee.

AgGPS Autopilot HP (OmniSTAR HP) - +/- 5 cm (2 inches) pass to pass

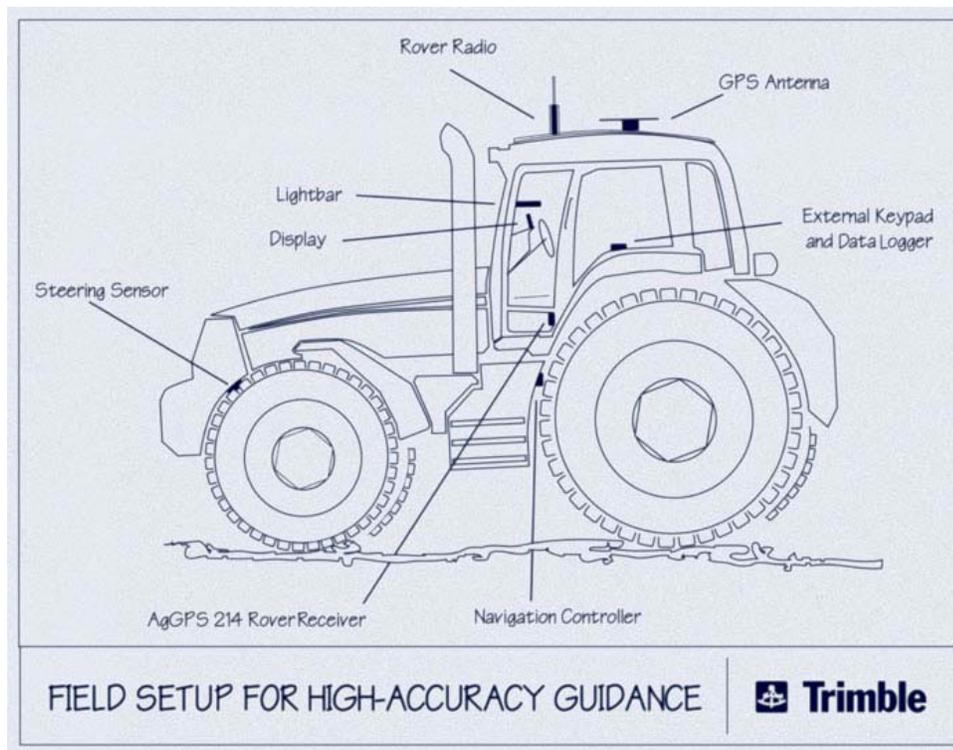
Utilizes GPS satellite signals for basic position information, along with a leased OmniSTAR HP correction signal subscription for each system (see subscription details below). The GPS receiver locks on to the OmniSTAR HP correction signal transmitted from separate satellite. The OmniSTAR HP service requires the position to converge for a period of 20-40 minutes before starting any Autopilot operations. Overall vehicle accuracy is typically +/- 4 inches (10-cm) depending on satellite geometry (PDOP), terrain, tractor & implement setup, field conditions and Autopilot system calibration.

AgGPS Autopilot DGPS - +/- 25 cm (10 inches) pass to pass

Utilizes GPS satellite signals for basic location information; it requires a leased OmniSTAR VBS Satellite correction signal subscription for each system (see subscription details below) or the free WAAS/EGNOS or beacon differential signal (beacon differential is not available with AgGPS 114). Accuracy is typically +/- 10 inches (25-cm) depending on satellite geometry (PDOP), terrain, tractor & implement setup, field condition, distance from Beacon transmitter (when Beacon is used) and Autopilot system calibration.

OmniSTAR subscription

To purchase an OmniSTAR HP or VBS satellite correction, contact OmniSTAR, Inc Customer Service, Houston, Texas at 1-800-338-9178 or 1-888-666-4782 or 888-883-8476 or e-mail: signal@omnistar.com. To complete the subscription process and setup the dealer or customer can call or e-mail OmniSTAR with the serial number of the GPS receiver (AgGPS 252/AgGPS 132/AgGPS 114) and payment is made via purchase order or valid credit card by the end user.



AgGPS Autopilot System Platform Kits

The basic component of an Autopilot system is the Platform kit. Each supported tractor, sprayer or combine has a specific platform kit design just for that platform or series of platforms. Currently there are more than 25 platform kits for the Autopilot system. The kits can be divided up into two categories based on the type of steering on the platform – Hydraulic or Electronic.

Platform kits for hydraulic steering systems

For platforms with hydraulic steering, the platform kits include all the hydraulic components - Manifold, valve pressure sensor - (excluding hoses) necessary to connect Autopilot into the platform steering system. These kits also include a steering angle sensor, which measure the steer angle of the wheels and transmit that data to the AgGPS NavController II. Most of the platform kits include all brackets needed to mount the hydraulics and steering sensor to the platform. Some platform kits include switches and/or jumper cables for reverse sense, speed sense, etc.

Platform kits for electronic steering systems

For platforms with Electronic steering, the platform kits a typically very simple. The kits include a steering control box that sends steering commands to the tractor from the AgGPS NavController II. With the electronic steering platforms, there is no need for a steering angle sensor.

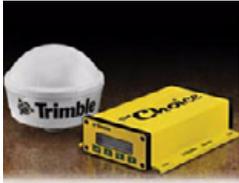
AgGPS Autopilot System Receiver Types

The following table defines the receiver type that can be used in each Autopilot system.

Receiver	Autopilot DGPS +/- 10"				Autopilot HP	Autopilot RTK
	WAAS	EGNOS	VBS	BEACON	+/- 4"	+/- 1"
AgGPS 252	✓	✓	✓		✓	✓
AgGPS 214*	✓					✓
AgGPS 150	✓					
AgGPS 132	✓	✓	✓	✓		
AgGPS 114*	✓	✓	✓			

**Note – The AgGPS 214 and AgGPS 114 GPS Receivers are only supported with Conversion Kits and Transfer Kits. The AgGPS 214 and AgGPS 114 GPS receivers are no longer sold on the Autopilot Price List.*

The following table describes the receivers:

Receiver	Description
<p data-bbox="386 348 506 375">AgGPS 252</p>  <p data-bbox="386 569 623 621">http://www.trimble.com/AgGps252.html</p>	<p data-bbox="657 348 1356 709">The AgGPS 252 is the all-in-one, low profile, smart receiver solution for Precision AG, Manual Guidance and Automated Steering. The AgGPS 252 covers all accuracy needs in a single receiver. A user can purchase the AgGPS 252 for use with WAAS or EGNOS free service, then later on activate an OmniSTAR VBS or HP subscription for higher accuracy. The receiver is RTK upgradeable via firmware when RTK accuracy is required. The integrated receiver and antenna mounts directly to the roof of the cab. The low-profile design keeps the receiver safe from low hanging branches and door openings. RTK requires the use of a base station and radios to transmit and receive the RTK corrections from the base to the rover. See the Base Station and RTK radio section for more information.</p>
<p data-bbox="386 722 506 749">AgGPS 132</p>  <p data-bbox="386 972 623 1024">http://www.trimble.com/AgGps132.html</p>	<p data-bbox="657 722 1356 1056">The AgGPS 132 is the highly reliable, field proven DGPS receiver for all Precision AG, Manual Steering and Automated Steering operations. The AgGPS 132 has several years of field operations behind it within many work environments. The AgGPS 132 receiver can use several different correction sources to obtain DGPS accuracy. The AgGPS 132 uses the free DGPS correction services, which include Beacon, WAAS and EGNOS. OmniSTAR and Thales L-Band corrections are available in the AgGPS 132 by activating a subscription with the provider. The receiver is typically mounted in the cab with the GPS antenna mounted on the cab roof. The receiver has a display for easy configuration, and diagnostics of the receiver.</p>
<p data-bbox="386 1068 506 1096">AgGPS 150</p>  <p data-bbox="386 1291 623 1371">http://trl.trimble.com/docushare/dsweb/Get/Document-153637</p>	<p data-bbox="657 1068 1356 1287">The AgGPS 150 is the newest DGPS receiver for Manual Steering and Automated Steering operations. The AgGPS 150 combines a DGPS receiver with a fully integrated LCD Display. The AgGPS 150 can use WAAS or EGNOS free DGPS correction sources. The AgGPS 150 includes an L1 Only antenna that is mounted on the cab roof. The Autopilot AgGPS 150 display also includes a slitter cable (52033) and Remote Keypad (50673-00). See section 1.6 for description of display functionality (AgGPS 50/150).</p>

Receiver	Description
<p data-bbox="386 289 506 315">AgGPS 114</p>  <p data-bbox="386 550 625 604">http://www.trimble.com/AgGps114.html</p>	<p data-bbox="657 289 1356 676">The AgGPS 114 is the highly reliable, field proven DGPS smart antenna for all Precision AG, Manual Steering and Automated Steering operations. The AgGPS 114 has several years of field operations behind it within many work environments. The AgGPS 114 receiver can use several different correction sources to obtain DGPS accuracy. The AgGPS 114 uses the free DGPS correction services, which include WAAS and EGNOS. OmniSTAR and Thales L-Band corrections are available in the AgGPS 114 by activating a subscription with the provider. The receiver is typically mounted on the cab roof. The AgGPS 114 GPS Receivers is only supported with Conversion Kits (Upgrade of an AgGPS 114 Manual Guidance system) and Transfer Kits (Existing Autopilot RTK AgGPS 214 system). The AgGPS 114 GPS receiver is no longer sold on the Autopilot Price List.</p>
<p data-bbox="386 693 506 718">AgGPS 214</p>  <p data-bbox="386 949 625 1003">http://www.trimble.com/AgGps214.html</p>	<p data-bbox="657 693 1356 1159">The AgGPS 214 is the highly reliable, field proven RTK receiver for all Precision AG and Automated Steering operations. The AgGPS 214 has several years of field operations behind it within many work environments. The AgGPS 214 is used for RTK level accuracy and also has the capability to be used in WAAS mode when outside the RTK range limits (Base Station to Rover). The AgGPS 214 consist of two components, a receiver and GPS Antenna. The receiver is typically mounted in the cab with the GPS antenna mounted on the cab roof. The receiver has a display for easy configuration, and diagnostics of the receiver. RTK requires the use of a base station and radios to transmit and receive the RTK corrections from the base to the rover. See the Base Station and RTK radio section for more information. The AgGPS 214 GPS Receivers is only supported with Conversion Kits (Upgrade of an AgGPS 214 Topomapping system) and Transfer Kits (Existing Autopilot RTK AgGPS 214 system). The AgGPS 214 GPS receiver is no longer sold on the Autopilot Price List.</p>

Correction sources

There are several correction sources for increasing the GPS accuracy of the *AgGPS* Autopilot system. Below is a brief description of each correction source:

Receiver	Description
<p>WAAS (Wide Area Augmentation System)</p>  <p>http://gps.faa.gov/FAQ/index.html</p>	<p>WAAS is a free Differential GPS (DGPS) correction source provided by US Government via two geo-stationary satellites and a network ground stations that provide North America with a correction source. The GPS antenna receives the L-band (satellite frequency band) correction signals in the same way as the GPS satellite signal. The corrections are applied to the GPS position to improve the positional errors to >1 meter (>3 feet). It is recommended that WAAS is only used in North American operations. Trimble <i>AgGPS</i> Autopilot system using WAAS corrections can attain approximately 20-25 cm (8-10") accuracy, pass to pass.</p>
<p>EGNOS</p>  <p>http://www.esa.int/esaNA/GGG63950NDC_index_0.html</p>	<p>EGNOS (European Geostationary Navigation Overlay System) is a free Differential GPS (DGPS) correction source provided by European Space Agency (ESA), the European Commission (EC) and Eurocontrol, the European Organization for the Safety of Air Navigation via three geo-stationary satellites and a network ground stations that provide the European community with a correction source. The GPS antenna receives the L-band (satellite frequency band) correction signals in the same way as the GPS satellite signal. The corrections are applied to the GPS position to improve the positional errors to >1 meter (>3 feet). Trimble <i>AgGPS</i> Autopilot system using EGNOS corrections can attain approximately 20-25 cm (8-10") accuracy, pass to pass.</p>
<p>Beacon</p>  <p>http://www.navcen.uscg.gov/ADO/DgpsSelectStatus.asp</p>	<p>BEACON is a free Differential GPS (DGPS) correction source provided by the United States Coast Guard Navigation Center (NAVCEN), many other government agencies around the world and several civilian companies. The BEACON systems broadcast GPS "correction" information to users on the medium frequency radio beacon band. BEACON allows users with BEACON band equipped GPS receivers to determine their position to an accuracy better than ten meters, and typically better than three meters depending on distance from the DGPS station. BEACON systems are generally located in coastal area and around major waterways due to its primary purpose of supporting maritime operations. The corrections are applied to the GPS position to improve the positional errors to >1 meter (>3 feet). Trimble <i>AgGPS</i> Autopilot system using BEACON corrections can attain approximately 20-25 cm (8-10") accuracy, pass to pass.</p>

Receiver	Description
OmniSTAR VBS (Virtual Base Station)  http://www.omnistar.com	OmniSTAR VBS is a fee (subscription) based Differential GPS (DGPS) correction source provided by OmniSTAR. The system uses a network of ground stations, along with geo-stationary satellites to improve the GPS position of the receiver. The OmniSTAR VBS uses the network of stations to calculate a correction for your area and transmit the correction to your receiver on L-band (satellite frequency band). The corrections are applied to the GPS position to improve the positional errors to +/-0.5 meter (1.5 feet). OmniSTAR VBS is a worldwide DGPS system. Trimble AgGPS Autopilot system using OmniSTAR VBS corrections can attain approximately 20-25 cm (8-10") accuracy, pass to pass.
OmniSTAR HP (High Performance)  http://www.omnistar.com	OmniSTAR VBS is a fee (subscription) based Differential GPS (DGPS) correction source provided by OmniSTAR. The system uses a network of ground stations, along with geo-stationary satellites to improve the GPS position of the receiver. The OmniSTAR HP uses the network of stations to calculate a correction for your area and transmit the correction to your receiver on L-band (satellite frequency band). OmniSTAR HP used both L1 and L2 GPS L-band frequencies to determine the local correction, thus making the position much more accurate. The OmniSTAR HP service requires the position to converge for a period of 20-40 minutes before starting any Autopilot operations requiring 5 cm (2") accuracy. The corrections are applied to the GPS position to improve the positional errors to +/-10 cm (4 inches). OmniSTAR HP is a worldwide dual-frequency DGPS system. Trimble AgGPS Autopilot system using OmniSTAR HP corrections can attain approximately 5 cm (2") accuracy, pass to pass.
RTK (Local or Network Base Station) 	RTK requires the use of an RTK base station and radios to provide the necessary "corrections" for +/- 1 inch (2.5 cm) accuracy with GPS. There are two options with the RTK base station, local or network. A local base station is defined as being controlled by the user. The user has either a mobile or fixed base station and he/she decides when and where the base station used. An RTK network is a series of base stations controlled by a provider (Trimble Dealer, local COOP, etc.). The user pays the provider a fee to use the RTK network base stations in his area. Either way, local or network, the RTK system works the same way. The base station collects data from the GPS satellites simultaneously with the rover (Autopilot). The base station then uses the radio to transmits its collected data to the rover and the rover uses its data with the base station data to determine (calculate) a very accuracy position of the rover. An RTK receiver collects and uses much more data from the satellites to determine a position. Most Autopilot RTK users are using a local base station as the idea of RTK networks is just catching momentum in the market place.

AgGPS Autopilot System Display Types

There are several display options available for the Autopilot system, ranging from the simple Lightbar Only display to the full-featured AgGPS 170 Field Computer. The following is a brief description of each display option:

Display Option	Description
<p data-bbox="386 491 505 518">AgGPS 170</p>  <p data-bbox="386 760 634 842">http://trl.trimble.com/docushare/dsweb/Get/Document-153637/</p>	<p data-bbox="662 491 1354 850">The AgGPS 170 is a full-featured, rugged, Field Computer with removable data storage for use in Precision AG and Automated Steering. The AgGPS 170 includes Field Manager Software (FMS) allowing the user to perform variable rate application, tree planting, topographic mapping and many other field management operations, all while controlling the Autopilot system. The AgGPS 170 display option supports all Autopilot field patterns, which include straight line, center pivots and contour farming (curves). The AgGPS 170 also supports Land levelling with FieldLevel add on software and components. The AgGPS 170 virtually allows unlimited job (field) storage with the removable compact flash card. The AgGPS 170 can be purchased separately or bundled with an AgGPS 21A lightbar.</p>
<p data-bbox="386 863 537 890">AgGPS 50/150</p>  <p data-bbox="386 1100 634 1171">http://www.midtech.com/MS/MidTech/product_Detail.asp?ID=129</p>	<p data-bbox="662 863 1354 1115">The AgGPS 50/150 is a full-featured, rugged, display for use in Manual Steering and Automated Steering operations. The AgGPS 50/150 display option supports all Autopilot field patterns, which include straight line, center pivots and contour farming (curves). The AgGPS 50/150 uses the same intuitive and simple interface as the AgGPS EZ-Guide® Plus product line. Data storage is accomplished by using a PDA and the AgGPS EZ-Map software connected to the AgGPS NavController. The AgGPS 150 version includes an integrated DGPS receiver.</p>
<p data-bbox="386 1184 623 1211">Mid-Tech Legacy 6000</p>  <p data-bbox="386 1505 639 1598">http://www.midtech.com/MS/MidTech/product_Detail.asp?ID=129</p>	<p data-bbox="662 1184 1354 1520">The Mid-tech Legacy 6000 is a robust and flexible Field Computer for Fixed-rate or variable-rate application—liquid, dry or anhydrous products, complete field mapping with hazard marking, and interfaces with AgGPS Autopilot system. There are four application modules for the Legacy 6000. The console in the cab is one of these modules and the one with which people are most familiar. The other modules manage product control, the switches in the system like those that regulate boom sections on a sprayer or seed bins in an air seeder, and other network functions. Optional office software uses application data to create detailed job reports. The Mid-tech Legacy 6000 can be purchased separately or bundled with an AgGPS 21A lightbar.</p>

Display Option	Description
<p>AgLeader Insight</p>  <p>http://www.agleader.com/insight.htm</p>	<p>The AgLeader Insight is a rugged, full featured, field computer featuring a 10.4-inch color touch screen display. The Insight records all of your field activities ñ from planting to harvest, commands most popular planter, sprayer, anhydrous or injection rate controllers and records applied rates throughout the season and monitors yield and moisture at harvest while seeing your maps being generated in realtime.</p>
<p>AgGPS 21A Lightbar</p>  <p>http://trl.trimble.com/docushare/dsweb/Get/Document-7021/</p>	<p>The AgGPS 21A is a simple, entry level display option know as the Lightbar Only (LBO option). The AgGPS 21A provide the user with an easy to learn inexpensive display that interfaces with the Autopilot System. The AgGPS 21A only supports straight-line operations and is limited in job storage capabilities (10 fields). The AgGPS 21A uses the Autopilot Remote Keypad to control the automated steering functionality. A separate remote data storage device (AgGPS 70 RDL) is required for logging functions. The AgGPS 21A LBO display option is only supported with Conversion Kits (Upgrade of a PSO Manual Guidance system) and Transfer Kits (Existing Autopilot DGPS LBO system). The AgGPS 21A LBO Display option is no longer sold on the Autopilot Price List.</p>
<p>NT300AG with AgGPS 70 RDL</p> 	<p>The NT300AG display is the original Autopilot display, which provides a simple monochrome display and remote data storage device (AgGPS 70 RDL). The NT300AG field patterns are limited to straightline operations. The NT300AG virtually allows unlimited job (field) storage with the RDL's removable compact flash card. The NT300AG also allows logging operations via the RDL storage. This display option includes an AgGPS 21A lightbar. The NT300AG display option is only supported with Transfer Kits (Existing Autopilot DGPS/RTK system with NT300AG display option). The NT300AG Display option is no longer sold on the Autopilot Price List.</p>

Display conversion kits

Display conversion kits are available for current NT300AG owners who wish to convert to a new display option, AgGPS 170 or Legacy 6000. The kits include the new display and the cabling required for connecting the display to your existing cables. These conversion kits are only applicable to system using the NT300AG and the original Navigation Controller (Bigfoot).

Conversion Kit	Description
<p>NT300AG to AgGPS 170</p>  <p>http://www.trimble.com/AgGps170.html</p>	<p>The conversion kit includes an AgGPS 170 and cable 49282. The 49282 cable plugs into the existing 43175 cable, which connects the Autopilot Navigation Controller I to the NT300AG. The 49282 connector then connects to the D-Sub 9-pin connector on the AgGPS 170 cable or junction box.</p>
<p>NT300AG to Mid-Tech Legacy 6000</p>  <p>http://www.mid-tech.com/MS/MidTech/product_Detail.asp?ID=129</p>	<p>The conversion kit includes a Mid-Tech Legacy 6000 display and cable 49282. The 49282 cable plugs into the existing 43175 cable, which connects the Autopilot Navigation Controller I to the NT300AG. The 49282 connector then connects to the D-Sub 9-pin connector on the Legacy 6000 wiring harness.</p>

AgGPS Autopilot System RTK Radios

There are four radio types available for the Autopilot system. The four types are AgGPS 900 (rover radio only), Trimble® SiteNet™ 900 (base radio only), SiteNet 450 (Rover or base radio), and TRIMMARK™ 3 (base radio only). The radios are configured to two different radio frequencies, 900 MHz and 450 MHz. The SiteNet 900 is the 900 MHz solution, while the SiteNet 450 and TRIMMARK 3 are the 450 MHz solution. The TRIMMARK 3 radio is equipped with a 25-watt power amplifier for increased range.

The following table contains a brief description of each RTK radio option:

Radio Option	Description
<p>AgGPS 900 (mounted under the AgGPS 252)</p> 	<p>AgGPS 900 (mounted AgGPS 900 is license free, rugged, multi-network, 900 MHz radio modem designed specifically for Precision Ag operations in harsh environments. The AgGPS 900 mounts directly under the AgGPS 252 GPS receiver creating a single form on the tractor cab roof. The AgGPS 900 is license free in the U.S.A., Canada and Australia/New Zealand, which makes it extremely portable; you can move it from project to project without licensing hassles and restrictions. The AgGPS 900 operates in the frequency range of 902-928 MHz receiving (Rover) real-time data used by the AgGPS 252 receiver. Under optimal conditions, the AgGPS 900 radio receives data up to 10 km (6.2 miles) line-of-sight.</p>
<p>SiteNet 900</p>  <p>http://www.trimble.com/sitesnet900.html</p>	<p>Trimble's SiteNet 900 is a license free, rugged, multi-network, 900 MHz radio modem designed specifically for machine control in harsh environments. The SiteNet 900 is license free in the U.S.A., Canada and Australia/New Zealand, which makes it extremely portable; you can move it from project to project without licensing hassles and restrictions. The SiteNet 900 operates in the frequency range of 902-928 MHz, broadcasting (base), repeating (repeater), and receiving (Rover) real-time data used by the AgGPS 214, AgGPS 252, and MS750 GPS receivers. Under optimal conditions, the SiteNet 900 radio broadcasts data up to 10 km (6.2 miles) line-of-sight and coverage can be enhanced by using a network of multi-repeaters. Typically range is 3-5 km. The SiteNet 900 is no longer sold as a rover radio option (replaced by AgGPS 900, see above). The SiteNet 900 is currently sold as a Base radio or Repeater only.</p>
<p>SiteNet 450</p>  <p>http://www.trimble.com/sitesnet450.html</p>	<p>Trimble's SiteNet 450 is a rugged, multi-channel UHF radio modem that meets European licensing requirements. This versatile Trimble radio operates in four different 10 MHz wide frequency bands, from 430 to 470 MHz. It is designed to meet the licensing and approval requirements (ETSI 300-113) in Europe as well as many other countries around the world (US, Australia). The SiteNet 450 radio can be used for broadcasting (Base), repeating (Repeater), and receiving (Rover) real-time data used by AgGPS 214, AgGPS 252, and MS750 GPS receivers. Under optimal conditions, using a network of repeaters can enhance the SiteNet 450 radio broadcasts data up to 10 km line-of-sight. Typically range is 3-5 km.</p>
<p>TRIMMARK 3</p>  <p>http://www.trimble.com/trimmark3.html</p>	<p>The TRIMMARK 3 is a rugged, compact unit used for broadcasting (Base), repeating (Repeater), and receiving (Rover) real-time data used by AgGPS 214, AgGPS 252, and MS750 GPS receivers. Selectable power outputs of 2, 10, or 25-Watts support short- and long-range operations. Operating ranges can extend from 5 to 8 km (3 to 5 miles) for a 2W repeater (typical), to Up to 15 km (8 miles) line-of-sight under optimal conditions for a 25W base station. You can configure each broadcast network to operate on one of up to 20 programmed channels. Channel spacing of either 12.5 or 25 kHz is programmable at the factory. The TRIMMARK 3 radio modem is available in three frequency bands 410-420 MHz, 430-450 MHz, 450-470 MHz based on your local frequency range (per country).</p>

RTK radio repeater kits

While working in the field with SiteNet 900 or SiteNet 450 radios, there may be a need for repeaters to extend the range of the radios or it traverse around a tree line.

When there is an area on the farm that is just outside the range of base station radio, the repeater is set at the edge of the base station radio range and repeats the corrections from the base to the rover.

A more common use of a repeater is to traverse the signal around or over an obstruction. Since all radios are line of sight, any obstruction will block the signal from the base. In heavily wooded areas it is good practice to carry a repeater with the tractor to repeat the signal around trees, thus making the Autopilot system operational throughout the entire farm. In areas with rolling hills, there may be a need to place a repeater at the top of a hill adjacent to the field that is in a hollow (small valley). The repeater on the hill repeats the signal from the base to the rover in the field.

There are two radio repeater kits available for the Autopilot system: Tripod Mount and High Mobility. Both types of kits support the SiteNet 900, while the SiteNet 450 is only available as a Tripod Mount kit:

Radio Repeater Kit	Description
<p data-bbox="386 1010 537 1035">Tripod Mount</p> 	<p data-bbox="695 1010 1360 1144">The kit includes one radio (SiteNet 900 or 450), cabling and all the parts required for mounting the radio on a tripod or any other structure with a 5/8 - 11 thread. The radio can be mounted permanently to a structure or carried from site to site as needed. The kit does not include a tripod.</p>
<p data-bbox="386 1430 537 1455">High Mobility</p> 	<p data-bbox="695 1430 1360 1539">The kit includes one radio (SiteNet 900 only), magnetic mount and cabling for easy mounting on the roof of a vehicle or any other metal surface. The cabling includes a cigarette lighter plug to easily plug the repeater into a power source.</p>

RTK radio whip antennas

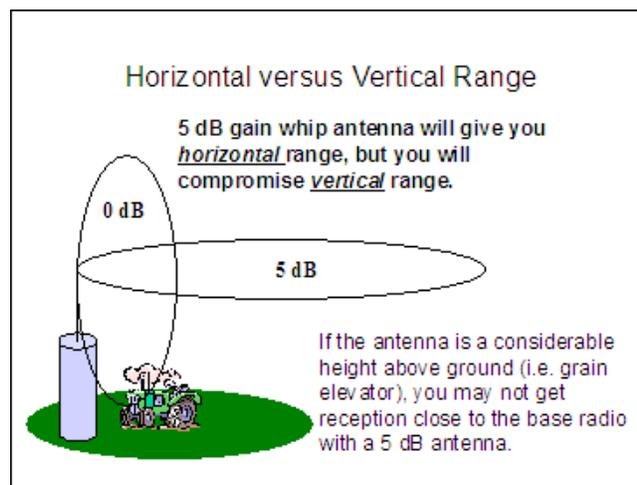
The RTK Radio kits come with whip or low-profile antennas manufactured to a specific dB (decibel) gain. This section describes what type of antenna comes with each radio and how they should be used.

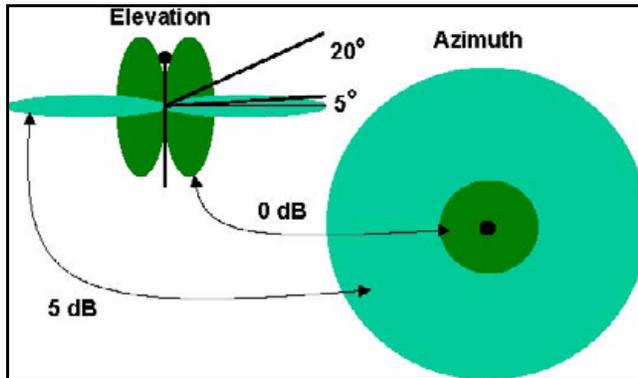
SiteNet 450 antennas

The **SiteNet 450** ships with a 0 dB gain low-profile antenna. The SiteNet 450 (Base and Rover) has only one antenna and attaching any other antenna is not allowed by regulation (US or host country).

SiteNet 900 antennas

The **SiteNet 900 rover radio** ships with a 0 dB gain low-profile antenna and should only be outfitted with this antenna. The **SiteNet 900 base radio** ships with a 0 dB, 3 dB, and 5 dB gain whip antennas and an antenna base. The base radio can be outfitted with any of these whip antennas. Each whip antenna creates a different gain pattern based on the dB gain. The dB gain does not increase the energy radiated from the antenna (radio), however it does concentrate the energy from the antenna into a particular pattern. The higher the dB the more concentrated the energy. The easiest way to understand this is using the figures below. The antennas are omni-directional, which means radiated energy is equal in all directions from the antenna. The circles in the second figure demonstrate this.





TRIMMARK 3 antennas

The **TRIMMARK 3 mobile base radio** is shipped with a 0 dB and 5 dB whip antennas. The **TRIMMARK 3 fixed base radio** is shipped with a 0 dB antennas. These antennas have the same characteristics as the antennas described above.

AgGPS Autopilot System Base Stations

There are two types of Base Station available for the Autopilot system. The following table describes each one:

Base Station	Description
<p data-bbox="386 457 467 483">Mobile</p> 	<p data-bbox="686 457 1360 678">The Mobile Base Station is the best solution when a user has fields spread out over several areas and would need to change the base location to accommodate each area. The areas are too far apart to be covered by one fixed base station and there are no RTK Networks in the areas. The system fits inside a carrying case. All part except for the GPS and Radio antenna stay inside the case. This system requires a mobile power supply, such as a deep cycle marine battery or the battery in a vehicle.</p>
<p data-bbox="386 850 451 875">Fixed</p> 	<p data-bbox="686 850 1360 1234">The Fixed Base Station is the best solution when a user has several fields in close proximity to each other and can be covered by one base station. All fields are close enough to each other and the radio signal covers the entire area. The base station is permanently located (fixed) in a single location. Typically the user will place the radio or whip antenna remotely on a tall tower. If the whip antenna is mounted remotely then the radio and GPS antenna are placed at ground level. If the entire radio is mounted remotely, then just the GPS receiver is at ground level. Some user prefer mounting the radio on the tower to minimize signal loss in a cable going to a remotely mount whip antenna. The fixed base the equipped with AC power supplies for the GPS antenna and radio. The fixed site must have a source of AC power.</p> <p data-bbox="686 1266 1360 1402">In some cases a series of fixed base stations are erected to create an RTK Network of base stations. These stations cover a large area by overlapping the radio signals are a fixed range. This allows the user to switch from one radio network to another as he/she moves into a new base station range (cell).</p>

AgGPS Autopilot Conversion (Upgrade) and Transfer Kits

Conversion kits and/or Transfer kits is very similar to a full Autopilot kit. You must first select the Platform kit for your customers vehicle (same platform kits as described above), select a conversion kit or transfer kit, then order a hydraulic and/or bracket kit. In both cases, there is no need for a receiver kit or radio kit, because the receiver, radio and display is already owned by the conversion kit customer and the receiver, radio, AgGPS NavController II and display will be the transferred parts by the transfer kit customer.

Conversion (upgrade) kits

A conversion kit is for the customer who currently owns a manual guidance or topomapping system and is looking to convert (upgrade) to full autosteer. The customer owns a receiver (DGPS, HP or RTK) and radio (RTK only) with a display - lightbar, AgGPS 170 or third party - and only needs the AgGPS NavController II, Autopilot system cabling, and documentation, plus platform kit. The platform kit is the same one as described above.

The following is a list of items in the conversion kit:

- AgGPS NavController II
- Autopilot Cable kit
- AgGPS 50/150 Remote keypad (as needed)
- Display to Controller cable (specific to each conversion kit type)
- Receiver to Controller cable (specific to each conversion kit type)
- Documentation

In some cases, a customer may want to purchase a field computer to upgrade their display from a lightbar.

Transfer kits

A transfer kit is for a customer who own more than one vehicle platform and would like to transfer the high dollar Autopilot components (GPS receiver/radio, AgGPS NavController II, display) between the two or more vehicle to avoid the cost of multiple complete Autopilot systems. The transfer kits include all the required cabling and other components needed to easily transfer the high dollar parts. A platform kit is purchased with the transfer kit to install all required hydraulics or electrical interface.

Currently the transfer kits support the new Autopilot system using the AgGPS NavController II and the old Autopilot system using the Navigation Controller (Bigfoot). Support for the old Autopilot system transfer kits will continue through 2005. The old Autopilot system transfer kits will no longer be available after that date.

The following is a list of items in the transfer kit:

- Autopilot Common Cable kit
- LB/RDL/Remote Keypad to Controller cable
- Documentation
- Receiver to Controller cable (specific to each transfer kit type)
- Display to Controller cable (specific to each transfer kit type)

- GPS antenna cable (specific to each transfer kit type)

AgGPS Autopilot Hydraulic and Bracket Kits

Hydraulic and bracket kits are optional accessories that can be critical to accomplishing successful and consistent installations of each Autopilot system. Trimble recommends that you use the factory hydraulic and bracket kits if you do not have access to a high quality metal machine shop.

Hydraulic kits

Hydraulic kits contain all the hydraulic hoses and fittings required to completely and efficiently install the Autopilot system hydraulics on the platform. All hoses are cut to the correct lengths for routing shown in installation documentation. Using a factory hydraulic kit can save considerable installation time.

Bracket kits

Bracket kits contain all the brackets needed to correctly and securely install the GPS antenna or smart antenna and RTK rover radio. All brackets are built to fit securely on the cab of the tractor and provide a stable base for the GPS antenna. When mounting the GPS antenna, you do not want any movement or shaking of the antenna. The factory-supplied brackets are specially designed to hold the GPS antenna in place with no movement. The bracket kits include an L-shaped bracket for installation of the RTK radio on the bracket.

A bracket kit is not required for most installations of an Autopilot DGPS (*AgGPS 132, AgGPS 124, AgGPS 114, AgGPS 110*) system. A metal plate with adhesive material is supplied with each receiver type along with a magnetic mount with 5/8-11 thread. The only DGPS installations currently requiring a bracket kit are the 4WD articulated tractor platforms. This is due to the necessity to have the GPS antenna centered over the front axle.

AgGPS Autopilot System Uses

The following table defines the possible uses for each AgGPS Autopilot system type (RTK, HP, or DGPS). The number of uses for each system is not limited to this listing and only limited to yours and your customer's imagination. This list will at least get you started.

Uses	Autopilot DGPS	Autopilot HP	Autopilot RTK
Spraying	✓	✓	✓
Spreading	✓	✓	✓
Broad-acre air seeding	✓	✓	✓
Tillage, Discing	✓	✓	✓
Harvesting	✓	✓	✓
Planting		✓	✓
Row cultivating		✓	✓
Strip tilling			✓
Drip tape placement			✓
Listing, Bedding, Ridging			✓

The AgGPS Autopilot System – Putting it all Together

In this chapter:

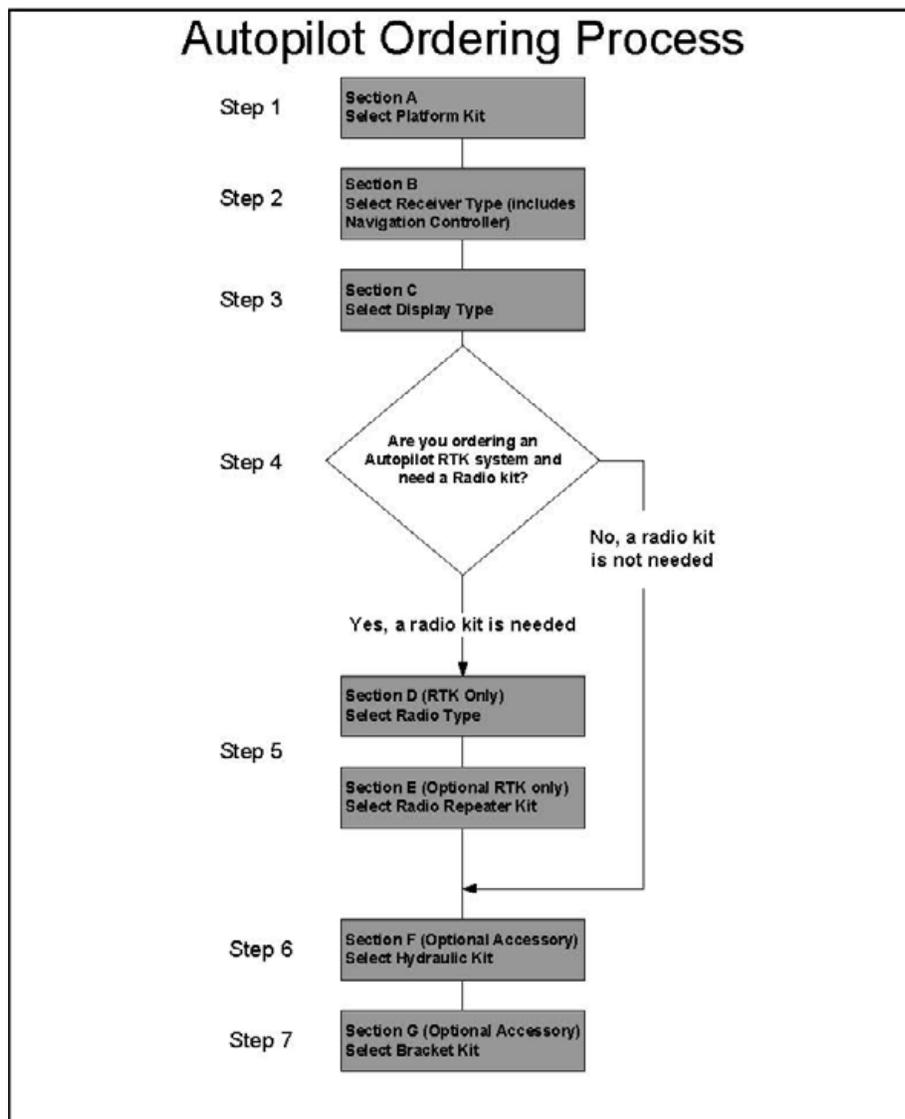
- AgGPS Autopilot - Putting it all Together
- Step 1 – Selecting a Platform Kit
- Step 2 – Selecting a Receiver Kit With AgGPS NavController II
- Step 3 – Selecting a Display Kit
- Step 4 – Deciding Whether or Not a Radio Kit is Required
- Step 5 - Selecting a Radio Kit
- Step 6 – Selecting a Hydraulic Kit (Optional Accessory)
- Step 7 – Selecting a Bracket Kit (Optional Accessory)
- Micro View of the Ordering Process
- Ordering Conversion Kits and Transfer Kits

This chapter describes how to select the AgGPS Autopilot automated steering system components that are best suited to your customer.

AgGPS Autopilot - Putting it all Together

The following figure shows a "macro" view of how to order an Autopilot system. The flow chart shows you what sections each Autopilot component belongs to in the pricebook. The flowchart shows that there is a decision to be made after selecting a display option.

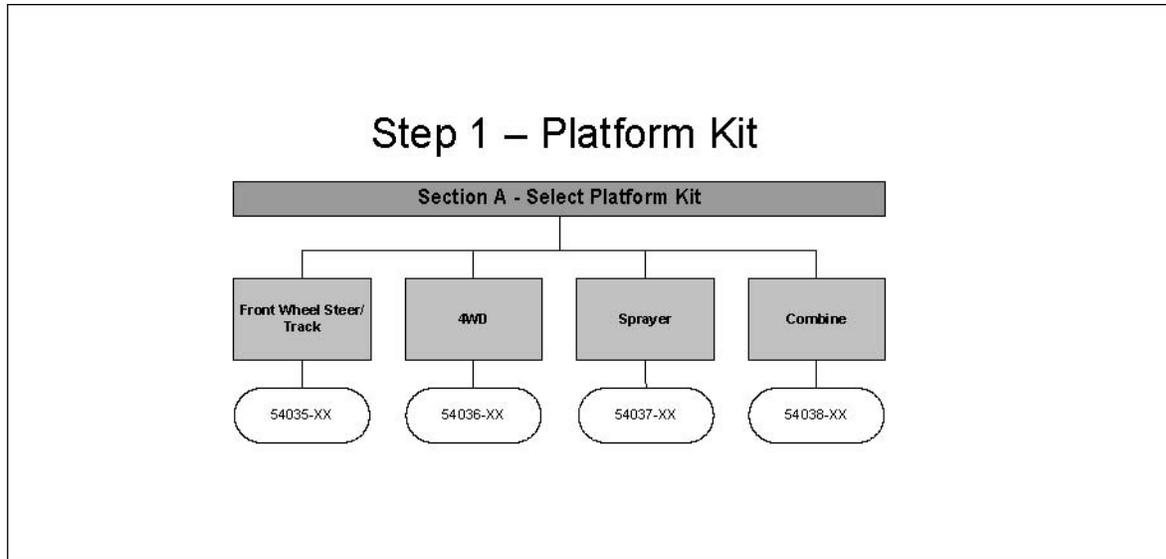
- If you are ordering an Autopilot RTK system, you must select a Radio Kit from Section D and if a repeater is required, a Radio Repeater Kit from Section E.
- If you are ordering an Autopilot DGPS system, you must skip to the selection of a Radio Kit and move right to the choice of Hydraulic Kit and Bracket Kit, which are optional.



The remainder of this chapter explains each step to the ordering process in more detail.

Step 1 – Selecting a Platform Kit

Selecting the Platform kit is the first step in ordering an Autopilot system and in most cases the most critical. Each platform kit is designed specifically for each vehicle (or platform). It contains all the required hydraulic parts (minus hoses and fittings) or electrical interface parts (drive by wire), cables, switches, steering angle sensor, and mounting brackets (minus GPS antenna and radio bracket). Each vehicle is different in some way, hence the need for different platform kits.



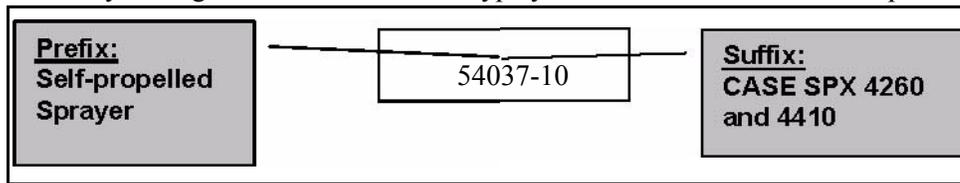
The platform kits are divided into four main platform types:

- Front-wheel steer and track tractors
- 4WD Articulated tractors
- Self propelled sprayers
- Combines

From the figure below, you can see that each of the main platform types has a Trimble part number series assigned to it. Each part number has a prefix (5403X), which designates the platform type and a suffix (XX), which designates the tractor model. Here are the prefix designations for each platform type:

- 54035 = Front-wheel steer and track tractors
- 54036 = 4WD Articulated tractors
- 54037 = Self propelled sprayers
- 54038 = Combines

By adding the suffix for a model type you will have the full Trimble part number:



See Chapter 3 for typical Platform Kit Bill of Materials (BOM).

Step 2 – Selecting a Receiver Kit With AgGPS NavController II

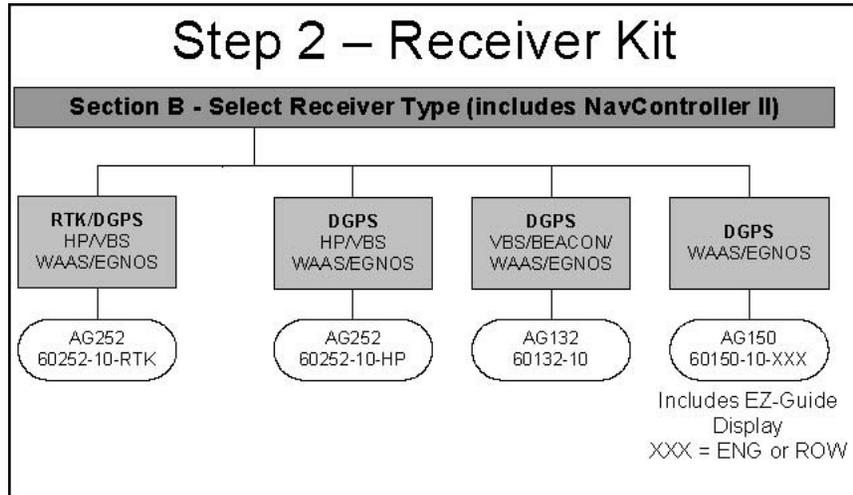
The next step is to select a receiver type. Determining a receiver type is related directly to the following question you will ask the customer:

- “What applications is Autopilot used for?”
- “At what accuracy do they want to perform autosteer?”

These two questions are somewhat interchangeable, but both are important so the customer understands how applications relate to accuracy. The chart in *AgGPS Autopilot System Uses* (page 20) shows how applications relate to accuracy. From *AgGPS Autopilot System Receiver Types* (page 5), here are the correction sources available and levels of accuracy for each receiver:

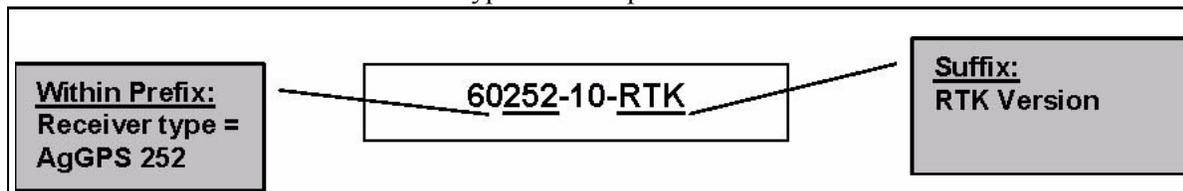
Receiver	Autopilot DGPS +/- 10"				Autopilot HP	Autopilot RTK
	WAAS	EGNOS	VBS	BEACON	+/- 4"	+/- 1"
AgGPS 252	✓	✓	✓		✓	✓
AgGPS 214*	✓					✓
AgGPS 150	✓					
AgGPS 132	✓	✓	✓	✓		
AgGPS 114*	✓	✓	✓			

**Note – The AgGPS 214 and AgGPS 114 GPS Receivers are only supported with Conversion Kits and Transfer Kits. The AgGPS 214 and AgGPS 114 GPS receivers are no longer sold on the Autopilot Price List.*



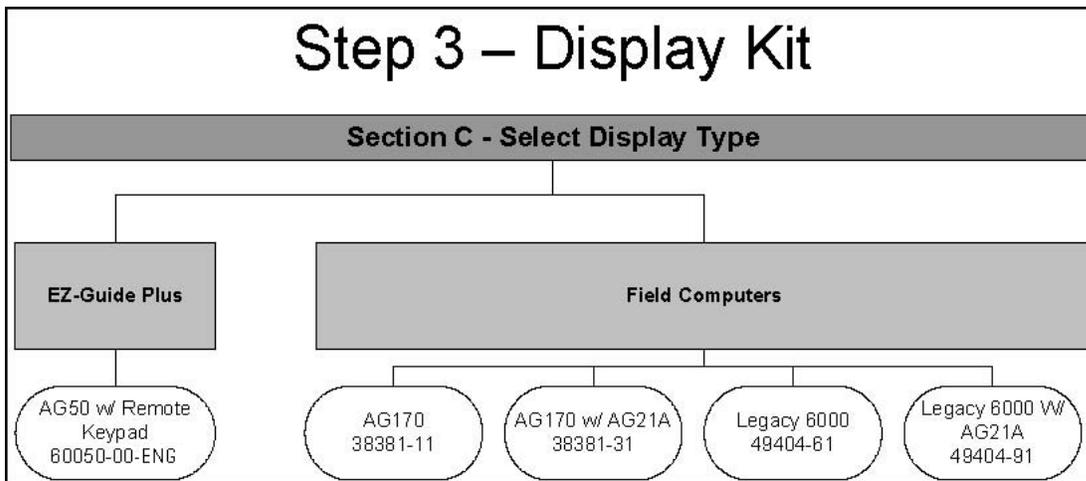
Price is also a key point in selecting a receiver type. The DGPS receiver are the most affordable when purchasing an Autopilot system, but they are the least accurate. The AgGPS 252 HP receiver is a level high in cost, but not as high as an RTK system, especially when adding the cost of a base station for the RTK system. Even though the DGPS and HP receivers do not have a base station, there is definitely a correction source subscription fee with the OmniSTAR HP receiver and possibly one for the DGPS receiver when using an L-band correction source other than WAAS and/or EGNOS. The table above shows each Receiver kit part number and the associated correction sources. Each receiver kit also includes an AgGPS NavController II, an Autopilot Cable kit, and a Sonalert, along with the Autopilot system documentation. See Chapter 3 for each receiver kit BOM.

The part numbers are set up very similar to the platform kits in the fact that you can determine the receiver type from the part number:



Step 3 – Selecting a Display Kit

During Step 3 a display kit or option is selected. The section entitled *AgGPS Autopilot System Display Types* (page 10) describes each display option and describes the functionality available in each display. All the displays will give you basic straight line guidance, with the *AgGPS 170* and *AgGPS 50/150* displays allowing for pivot patterns and contour farming (curves). With the Field computers, you have multiple field management functions available and each field computer differs in the types of functions.

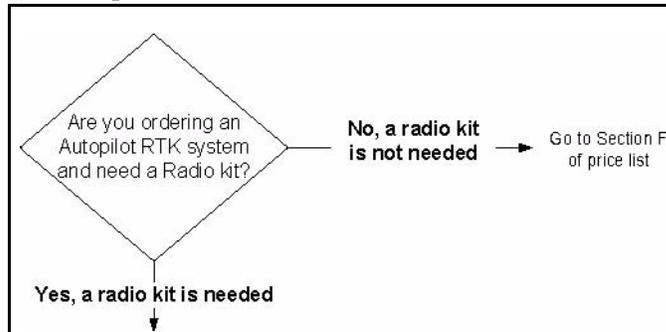


Each kit comes with the required cabling needed to connect the display to the Autopilot system, along with a remote keypad, when required.

The AgLeader Insight field computer is not listed in the figure below, due to the fact that the display is purchased from an AgLeader dealer and does not currently have a Trimble part number assigned to it.

Step 4 – Deciding Whether or Not a Radio Kit is Required

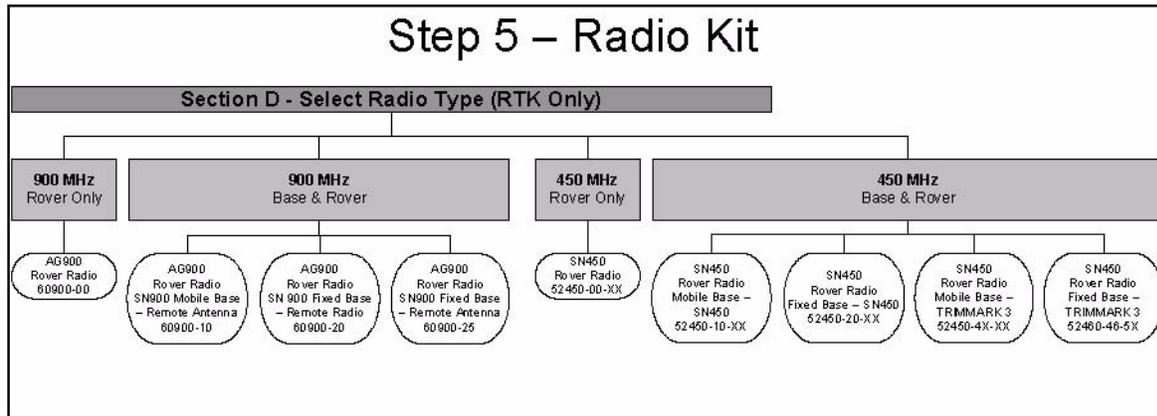
After selecting a Display kit, you will need to decide whether the Autopilot system requires a radio kit. The decision is very simple because the only system that needs radios is the Autopilot RTK systems. If you are ordering the 60252-00-RTK receiver above, then you will need to order a radio kit from Section D (Step 5) of the price list. Any other receiver type does not require a radio, so you can move onto Section F (Step 6) of the price list.



**Note – Section E of the price list contains Radio repeater kits, which are optional with the RTK kits.*

Step 5 - Selecting a Radio Kit

Step 5 has two sub-step involved. Typically you will only need to do the first sub-step (select a radio kit for the Autopilot system), but on some orders you will order a Repeater radio kit in support of the Autopilot radio kit.



Autopilot radio kit

After deciding that a Radio is required for an Autopilot RTK system, the next step is deciding which radio kit you will need. Two separate radio frequency ranges – 900 MHz (SiteNet 900) and 450 MHz (SiteNet 450 or TRIMMARK 3), support the Autopilot product. Most North American customers use the 900 MHz frequency range because it is license free. The same is true with Australia and New Zealand. While in Europe, the 900 MHz radio frequency is not allowed and the customer must use a 450 MHz frequency range. Within the 450 MHz frequency range there is a high power (amplified) solution available using the TRIMMARK 3 product. The TRIMMARK 3 is available for the US and Australian customers, but cannot be used in Europe. The TRIMMARK 3 can get you better range, but requires a license.

Now that a frequency range is selected, you must select either a Rover Only kit or a Rover & Base Radio Kit.

A rover only radio kit is selected when the customer already has access to a base station from a previous purchase or is using an RTK network or a local community base station (shared with other growers). There will be times when a rover only radio kit is selected for a system when there is another system on the sales order that has a rover and base station kit.

A rover and base station radio kit is selected when the customer is purchasing their first Autopilot system and want to maintain their own base station. As explained in *AgGPS Autopilot System Base Stations* (page 17), there are two main types of base stations – mobile or fixed. The customer must decide if the base station needs to be moved throughout the area there are working in or if the base station is fixed in a permanent location on the farm.

When selecting a fixed base station, the customer has two choices for the 900 MHz fixed base station radio kits. The choices are:

- Fixed Base Station with remotely mounted radio
- Fixed Base Station with remotely mounted whip antenna

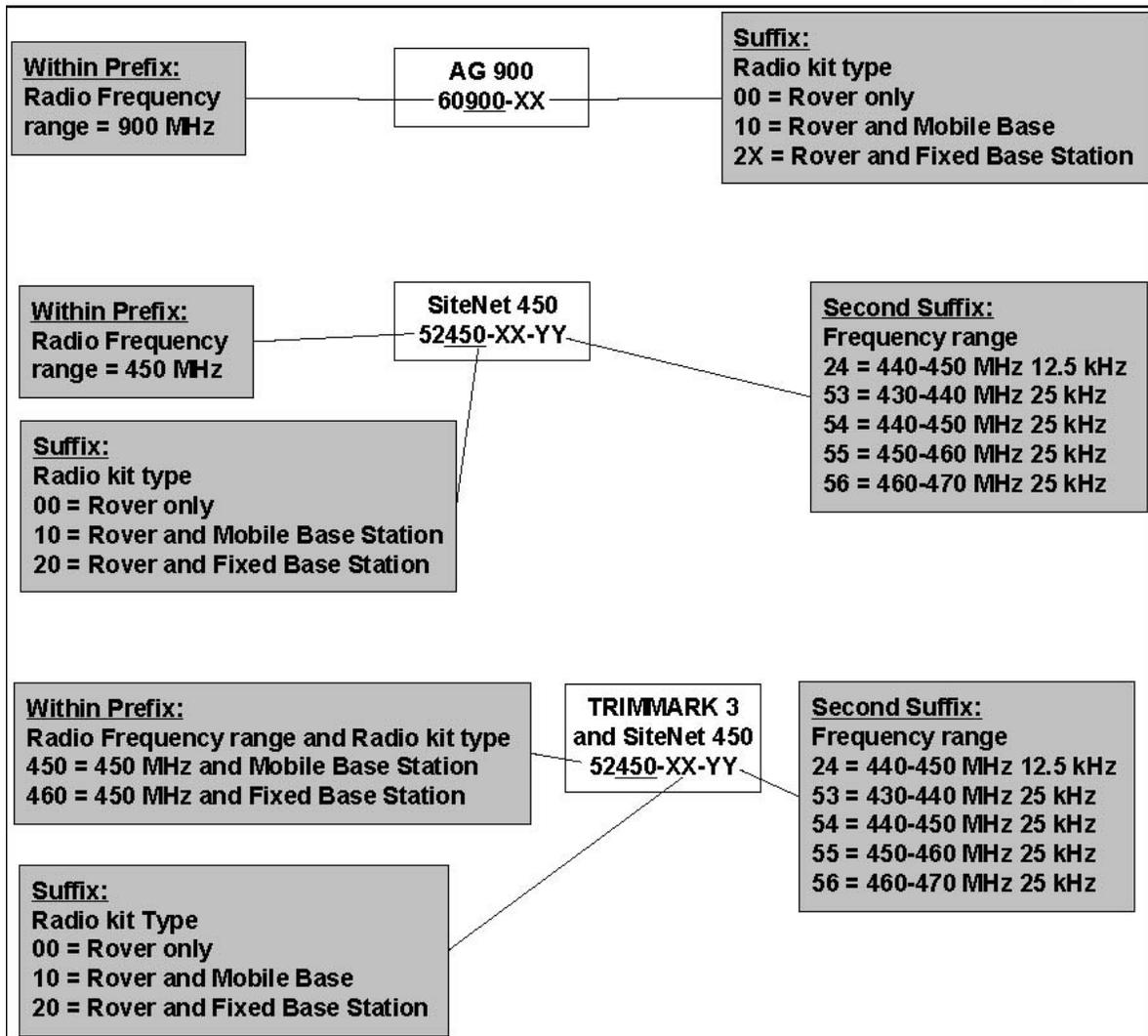
The difference is whether the customer wants to mount the radio at the top of the tower or keep the radio with the GPS receiver on the ground. There are some advantages and disadvantages to both:

Fixed Base Station with remotely mounted radio:

- Advantage – no loss of radio Db gain with whip antenna directly connected to the radio.
- Disadvantages – cannot see the radio status lights for troubleshooting. Radio is highly susceptible to lightning strikes.

Fixed Base Station with remotely mounted whip antenna:

- Advantages – radio is at ground for viewing of the status lights during troubleshooting. Radio can be protected from lightning strikes with lightning protection kit (purchased separately).
- Disadvantage – reseller must purchase separately a cable from radio to remote whip antenna. Chance of Db loss in cable from radio to whip antenna (suggest using high quality, low loss cable LMR 400 or better).



**Note – The SiteNet 900 radios for Australia and New Zealand include an additional suffix of -ANZ. This is to identify them as being configured to the 900 MHz frequency range used in those countries.*

See Chapter 3 for complete BOM listings for each radio kit.

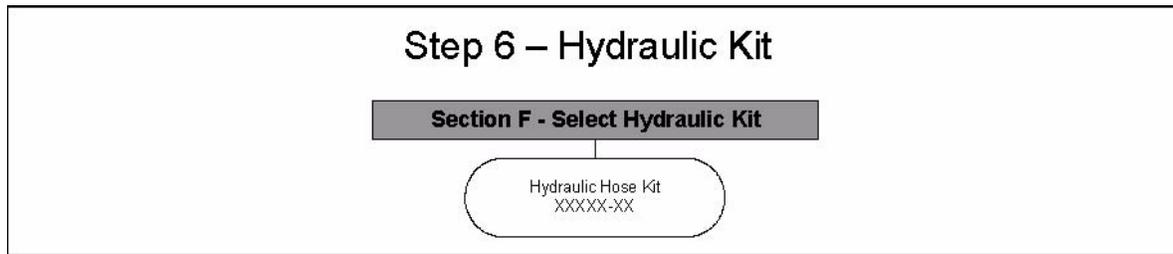
Repeater radio kit

A repeater radio kit is purchased for two reasons:

- To extend the range of the base station radio to distances of up to 20 kilometers (12.4 miles).
- To repeat the base station transmission around an obstruction such as a hill, trees, or building.

With the repeater kits you have two choices with the 900 MHz radios (SiteNet 900) and only one with the 450 MHz radios (SiteNet 450). Both radio types are available in kits package for mounting on a tripod or some other stable post. The SiteNet 900 also has a High-Mobility repeater available for attaching to a magnetic surface, such as a vehicle. The High-Mobility kit includes the magnetic bracket (Rover radio kit) and a cable for plugging the radio into a cigarette lighter. See *AgGPS Autopilot System RTK Radios* (page 12) for more details.

Step 6 – Selecting a Hydraulic Kit (Optional Accessory)



Next is the selection of a Hydraulic kit for the Autopilot system. This is optional to each Autopilot purchase, but it is recommended by Trimble to purchase and use factory Autopilot hydraulic kits for high quality and consistent installations. The hydraulic kits are associated with each platform kit and contain all the hydraulic hoses and fittings needed to complete an installation on that specific platform.

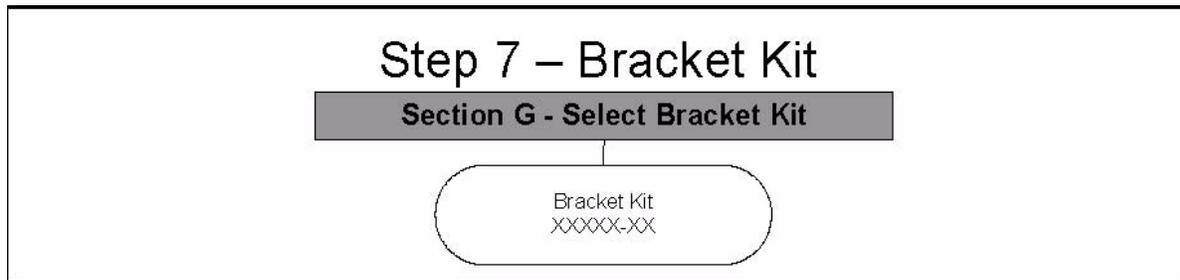
Note – Refer to the AgGPS NavController II Price Book for availability and the latest part numbers.

Below is a table that associates the Hydraulic kits with each Platform kit:

Description	Hydraulic Kit	Platform Kit
AgChem Ro-Gator 854 Sprayer	51698	54037-50
AgChem Terra-Gator 8103 Floater	51175	54037-40
Case IH MX 120–135	No kit	54035-21
Case IH MXM 120–190	52365	54035-22
Case IH MX 180–285	53289	54035-25
Case IH 9x0 4WD Small Frame	50537	54036-30
Case IH 9x0 4WD Large Frame	50713	54036-33
Case IH STX 275–325 Small Frame	49771	54036-15
Case IH STX 375–500 Large Frame	49917	54036-15
Case IH SPX 4260C/4410	49916	54037-10
Case IH 2377/2388 Combine	52801	54038-20
Challenger 35–55	No kit	54035-10
Challenger 65–95	No kit	54035-11
Challenger MT600	51263	54035-40
Challenger MT700/MT800	No kit required	54035-17
John Deere 6000	0795-0100	54035-60
John Deere 7x00, 7x10	0795-0800	54035-70 or 54035-74
John Deere 8x20 ILS	51504	54035-34
John Deere 8x20	51570	54035-30
John Deere 8000T	No kit required	54035-80
John Deere 9000 4WD	50530	54036-20
John Deere 9000T	No kit required	54035-85
John Deere 47x0 Sprayer	50148	54037-20

Description	Hydraulic Kit	Platform Kit
John Deere 9050, 9060 STS	52520	54038-10
Massey Ferguson 8000	51263	54035-40
New Holland TM 120–190	52365	54035-22
New Holland 8670	No kit	54035-90
New Holland TG 210–285	53290	54035-27
New Holland TJ 275–325 Small Frame	49771	54036-15
New Holland TJ 375–500 Large Frame	49917	54036-15

Step 7 – Selecting a Bracket Kit (Optional Accessory)



Next is the selection of a Bracket kit for the Autopilot system. This is optional to each Autopilot purchase, but it is recommended by Trimble to purchase and use factory Autopilot bracket kits for high quality and consistent installations. The bracket kits are associated with each platform kit and contain all the brackets needed to complete an installation of the GPS antenna and radio on that specific platform. There is a Generic Bracket available for quite a few front wheel steer tractor platforms.

Note – Refer to the AgGPS NavController II Price Book for availability and the latest part numbers.

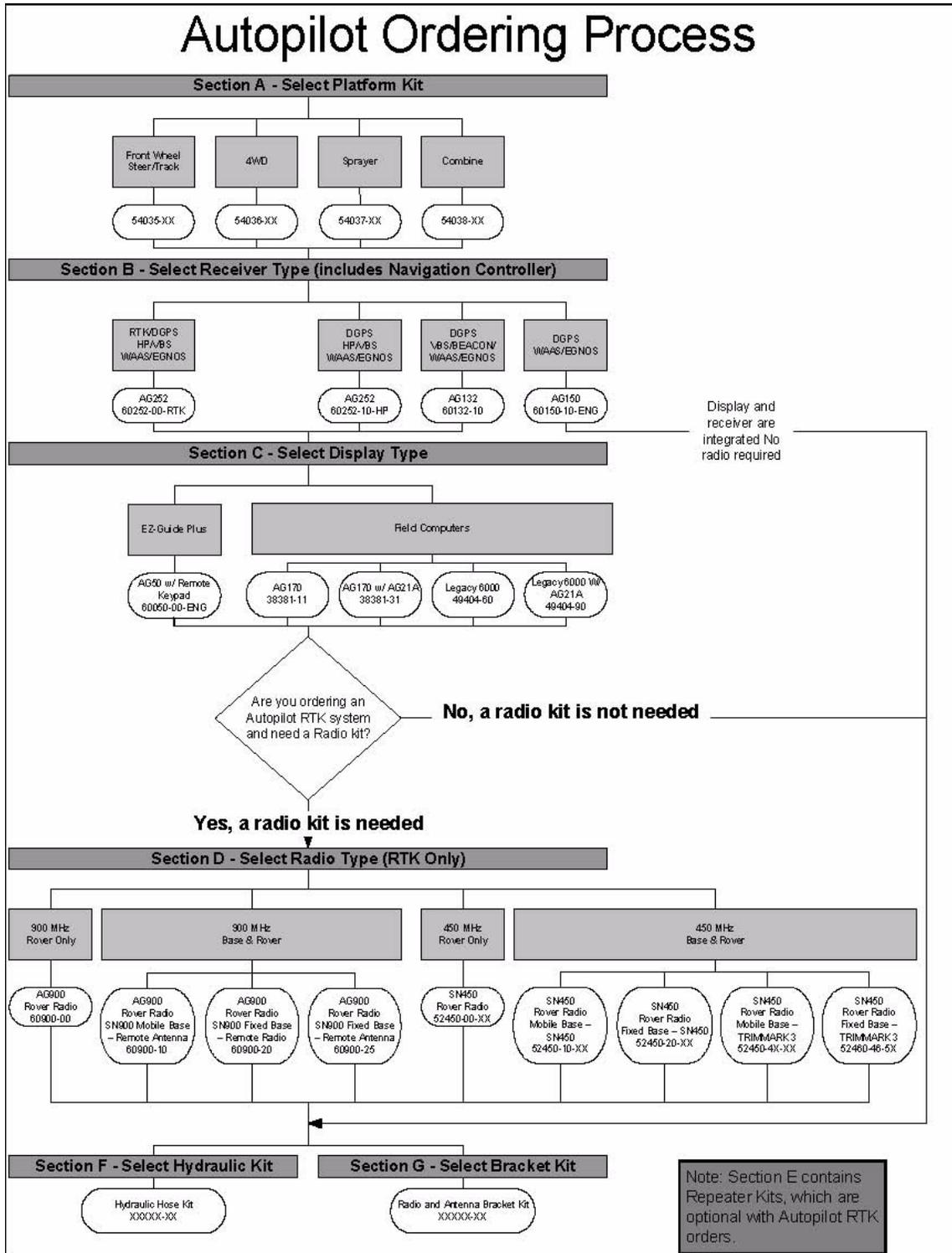
The table below associates the Bracket kits with each Platform kit:

Bracket Kit	Platform Kit	Description
4WD Vehicles		
49307	54036-15	Case IH STX & NH TJ 4WD 275–325 Sm or Lg Frame
50541	54036-30	Case IH 9200 and 9300 4WD Series
50526	54036-20	John Deere 9000 4WD
Front Wheel Steer Vehicles		
50128	54035-30	John Deere 8x00 and 8x10, 8x20
	54035-34	John Deere 8x20 ILS John Deere 47x0 Sprayer
51437	54037-50	AgChem Ro-Gator 854 Sprayer
	54038-10	John Deere 9050 STS & 9060 STS
53767	54035-70	John Deere 7x00, 7x10 without power Quad
	54035-74	John Deere 7x00, 7x10 with power Quad
	54035-25	Case IH MX 180–270 and MX 210–285
	54035-27	New Holland TG 210–285
	54035-10	Case IH SPX 4260C, 4410 Sprayer
	54036-50	AgChem Ro-Gator 854 Sprayer
	54038-10	John Deere 9000 STS
52323	54035-22	Case IH MXM and New Holland TM
51124	54034-40	Massey Ferguson 8000 and Challenger MT600
51178	54037-40	AgChem Terra-Gator 8103 Floater

Bracket Kit	Platform Kit	Description
55685		Universal Magnetic Cab mounting kit for AgGPS 252
	54038-20	Case IH 2377/2388 combine (without aftermarket grain extensions)
52423-00		Universal Mounting bracket kit. For use with front wheel steer vehicles.
	54423-60	John Deere 6000
	54035-21	Case IH MX 120–135
	54035-90	New Holland 8x70
Tracked Vehicles		
0795-0260	54035-80	John Deere 8x00T, 8x10T, 8x20T Track Series
	54035-85	John Deere 9x00T, 9x10T, 9x20T Track Series
0795-0290	40394-10	Challenger 35–55 Series
	40394-11	Challenger 65–95C, D, E Series
	40394-17	Challenger MT700/800 Series

Micro View of the Ordering Process

The figure below shows the entire Autopilot full system ordering process in detail:



Ordering Conversion Kits and Transfer Kits

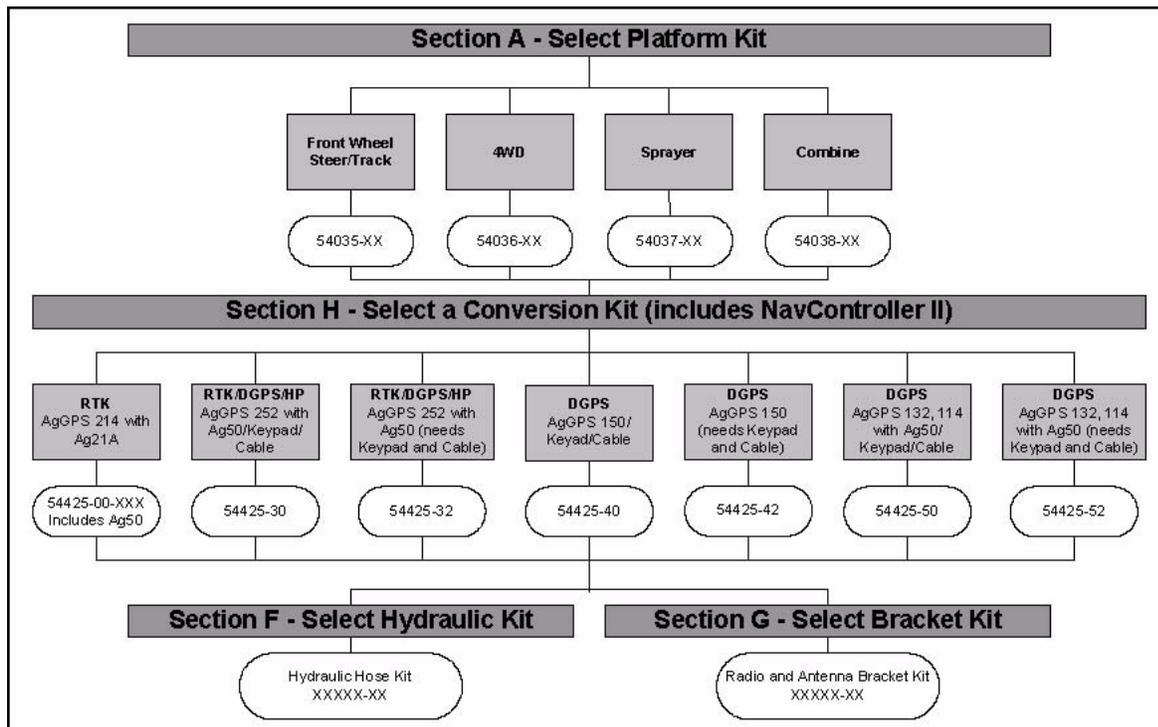
Ordering Conversion kits and/or Transfer kits is very similar to ordering a full Autopilot kit. You must first select the Platform kit for your customer's vehicle (same platform kits as described above), select a conversion kit or transfer kit, then order a hydraulic and/or bracket kit. In both cases, there is no need to order a receiver kit or radio kit, because the receiver, radio and possibly the display is already owned by the conversion kit customer and the receiver, radio, AgGPS NavController II and display will be the transferred parts by the transfer kit customer.

Conversion kits

There are two types of conversion kits - converting manual guidance to Automated steering or converting a Autopilot DGPS system to an Autopilot HP/RTK system. Both types are discussed below.

Manual guidance to automated steering conversion kits

A conversion kit is required for the customer who currently owns a manual guidance or topomapping system and is looking to convert (upgrade) to full autosteer. The customer owns a receiver (DGPS, HP or RTK) and radio (RTK only) with a display - AgGPS 50/150, AgGPS 170 or third party - and only needs the AgGPS NavController II, Autopilot cabling, and documentation, plus platform kit. These items (minus the platform kit) are included in the conversion kits.



As shown above, once a platform kit is selected, you select a conversion kit based on the type of receiver the customer currently has, then select a hydraulic and bracket kit associated with the platform kit. In some cases the customer may want to purchase a display kit to also upgrade from a lightbar to field computer or virtual terminal.

The current conversion kits are set up for use with the AgGPS 50/150 Display options. As you can see from the figure above the 54425-00-XXX kit comes with an AgGPS 50 display within the kit. In this case, the customer is converting their AgGPS 214 with the Lightbar Only (LBO) system to a fully functional, fully featured Autopilot AgGPS 150 system.

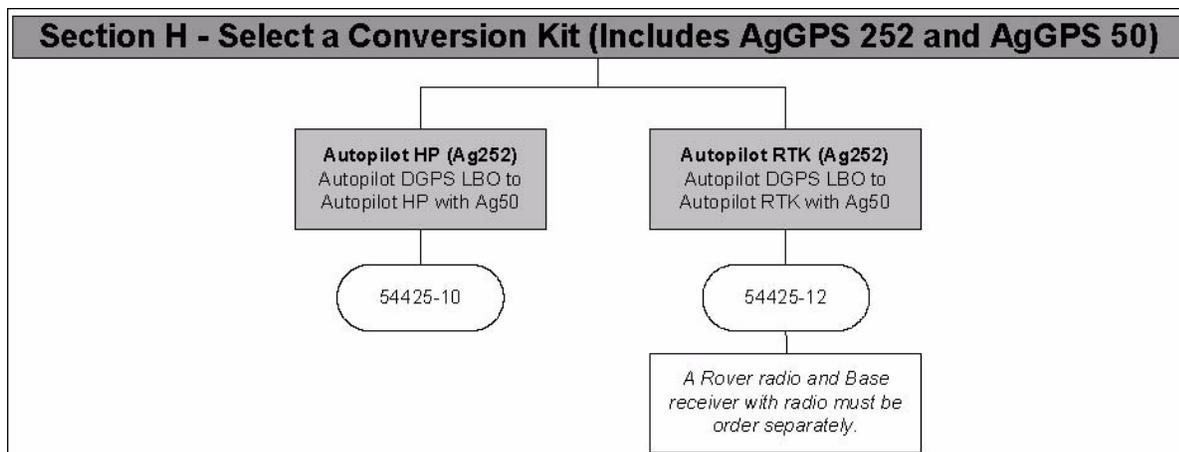
Autopilot DGPS to Autopilot HP or RTK conversion kits

There are two kits available for converting an Autopilot DGPS using the Lightbar Only (LBO) display to an Autopilot HP or RTK system using the AgGPS 50 display. If a customer has a simple DGPS LBO system and wants to upgrade to a fully featured Display system and move up to a more flexible GPS receiver with higher accuracy, they can purchase the kits listed below. The two kits vary by what GPS system (accuracy) the customer needs. One kit will take them to the OmniSTAR HP level of accuracy and the other to RTK accuracy.

With these conversion kits there is no requirement to purchase a platform kit and/or hydraulic/bracket kit. Since the customer is converting an existing Autopilot system to a higher accuracy Autopilot system, all platform specific parts are already on the vehicle.

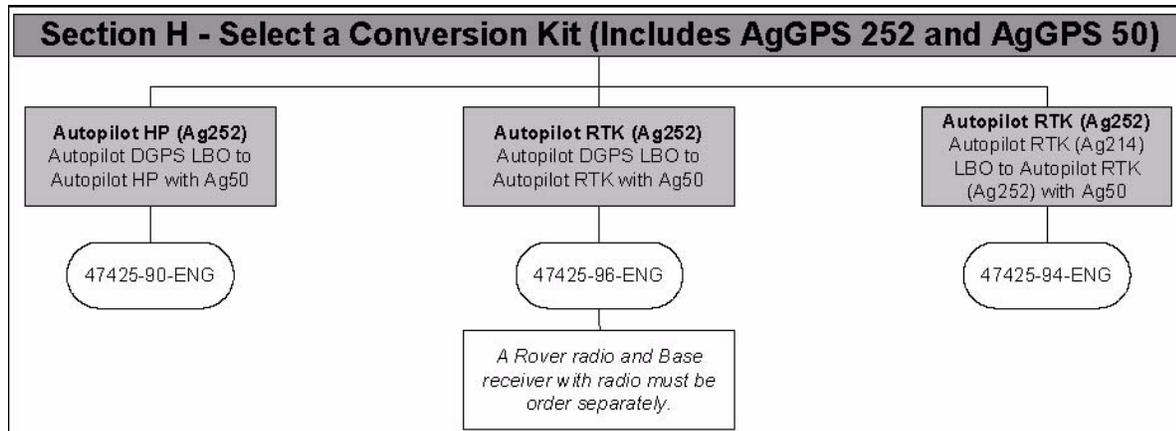
Autopilot to Autopilot conversion kits using the AgGPS NavController II

The first figure shows the kits that support the **new** Autopilot system using AgGPS **NavController II**. These kits will **not** work with the old Autopilot system using the Navigation Controller (Bigfoot).



Autopilot to Autopilot conversion kits using the Navigation Controller (Bigfoot)

The figure below shows the kits that support the **old** Autopilot system using the **Navigation Controller (Bigfoot)**. These kits will not work with the new Autopilot system using the AgGPS NavController II. The listing below includes a conversion from the Autopilot RTK LBO system using the AgGPS 214 to an Autopilot RTK system using the AgGPS 252 and AgGPS 50.

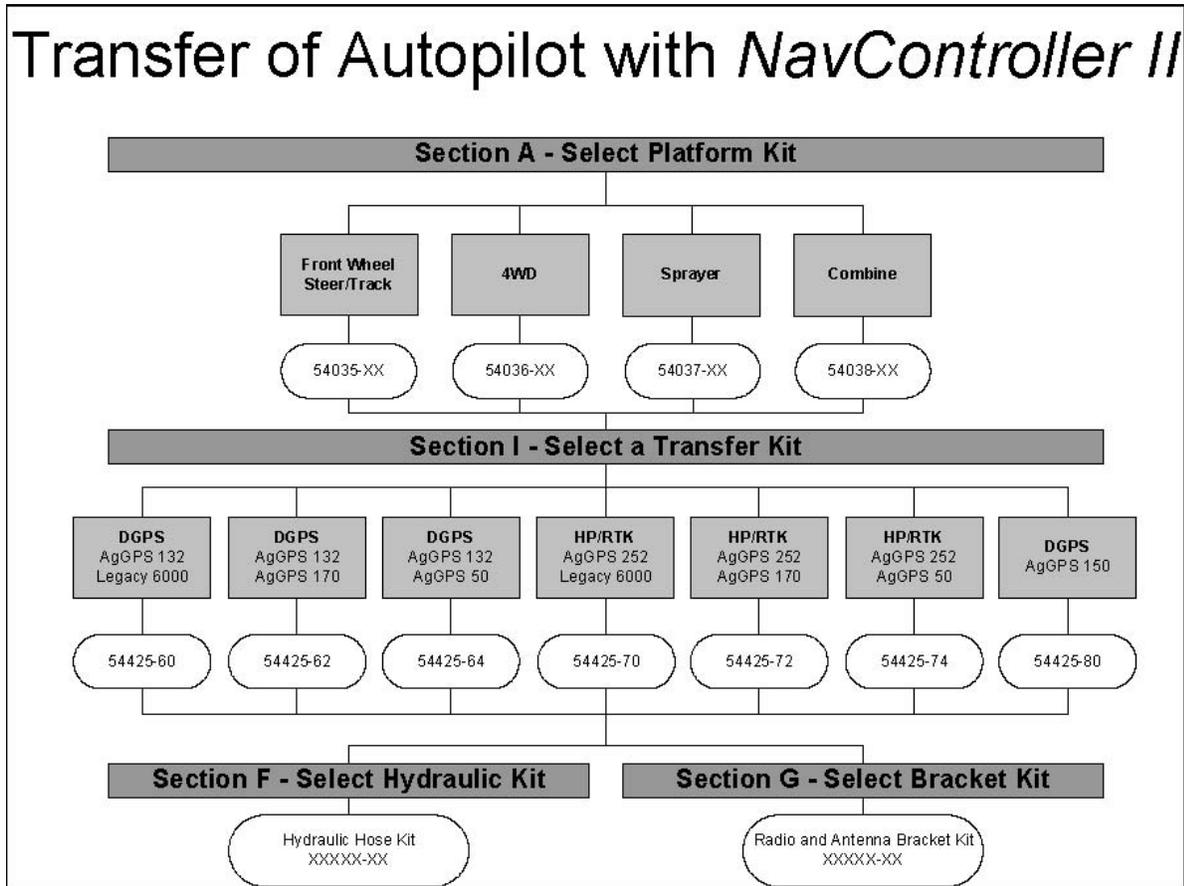


Transfer kits

A transfer kit is available for customers who own more than one vehicle platform and would like to transfer the high dollar Autopilot components (GPS receiver/radio, Navigation Controller or AgGPS NavController II, and display) between the two or more vehicle to avoid the cost of multiple complete Autopilot systems. The transfer kits include all the required cabling and other components needed to easily transfer the high dollar parts. A platform kit is purchased with the transfer kit to install all required hydraulics or electrical interface.

Transfer of Autopilot system using the new AgGPS NavController II

As shown below, once a platform kit is selected, you select a transfer kit based on the type of receiver and display the customer currently has, then select a hydraulic and bracket kit associated with the platform kit. The kits shown in this figure are for the new Autopilot system using the AgGPS NavController II.



Transfer of Autopilot system using the old Navigation Controller (Bigfoot)

As in *Manual guidance to automated steering conversion kits* (page 37), once a platform kit is selected, you select a transfer kit based on the type of receiver and display the customer currently has and then select a hydraulic and bracket kit associated with the platform kit. The kits listed below are for the old Autopilot system using the Navigation Controller commonly known as "Bigfoot".

