



AgGPS EZ-Guide Plus System

What is the AgGPS EZ-Guide Plus system?

The Trimble® AgGPS® EZ-Guide® Plus system is a precision lightbar guidance product, designed for farmers, growers, and custom applicators that need a simple, affordable guidance solution for a variety of in-field operations.

Why would I use the EZ-Guide Plus system instead of foam markers?

Field trials comparing GPS and foam marker guidance show that in *ideal* foam marking conditions, experienced operators using GPS and foam marker guidance achieve similar swath overlap and skip results. On spinner spreaders and in less ideal foam conditions, such as low visibility, wind, low humidity, rough terrain, and canopy crops, GPS swathing is more reliable and accurate than foam markers, allowing operators to get more work done in less time.

This increase in productivity allows operators of EZ-Guide Plus to reduce farm expenses due to:

- Minimizing application overlap and skip, meaning less application material is required.
- No recurring foam marker expenses such as purchasing foam and maintaining foam marker systems.
- Drivers don't need to continually look to the side of the vehicle therefore they can drive faster and more precisely. This in turn reduces fuel consumption and decreases the overall time per field. Field trials comparing GPS and foam marker guidance show that in ideal foam marking conditions, operators using GPS drove 13-20% faster than when using foam—without sacrificing job quality.
- Because GPS works in all weather and lighting conditions, operators can avoid costly work stoppages and continue swathing in low visibility conditions such as dust, fog, and darkness.

What makes the EZ-Guide Plus system the best guidance system on the market today?

The EZ-Guide Plus system has several advantages that make it the most attractive guidance system for purchase.

- It is incredibly easy to install, learn, and use.
- A unique innovative lightbar design which combines guidance LEDs with a graphic LCD screen for the easiest to use guidance, especially during turns and curves.

Trimble Navigation Limited, Agriculture Division, 7401 Church Ranch Blvd, Westminster, CO 80021, USA.

- A small sized lightbar minimizes visual obstruction.
- The system uses a high-end GPS receiver for precise positioning that uses free Satellite-Based Augmentation System (SBAS), such as WAAS, or EGNOS corrections for precise DGPS positions. (See [What is WAAS?](#))
- The system is very competitively priced.
- The EZ-Guide Plus lightbar can save 99 AB Lines and display the vehicle path on the graphical LCD screen. Most competitive lightbars require a separate expensive field computer to provide similar functionality.
- Trimble has a number of add-on products that allow you to expand the capabilities of your system, without costly hardware replacements.
- You can upgrade an EZ-Guide Plus system to an AgGPS EZ-Steer™ assisted steering system or an AgGPS Autopilot™ DGPS automated steering system. There is no need to buy another display or GPS receiver to enable automated steering.
- The system's modular design means that the antenna is out of the way on the roof of the vehicle and the lightbar and optional remote control can be placed virtually anywhere inside the cab for optimal driver ergonomics and comfort. The lightbar can even be mounted upside-down from the cab ceiling if preferred!
- Extensive on-board GPS diagnostics make troubleshooting easy.
- Trimble has over 10 years of experience in the agriculture market, and has a comprehensive and mature product line. The EZ-Guide Plus system contains the distilled essence of this product line with years of iterative development behind it.

What is the standard EZ-Guide Plus system made up of?

The standard EZ-Guide Plus system is made up of the following items:

- One of the following lightbar options:
 - An AgGPS 150 lightbar with integrated GPS receiver and a high-performance GPS antenna, mount, and cable
 - An AgGPS 50 lightbar without integrated GPS
- Bracket and suction cup ready for mounting on the vehicle window
- Documentation – simple, clear documentation on a handy reference card and in a user manual
- Power cable – easily connected to a cigarette lighter power supply

In addition to the standard components, there is an optional six-button remote control, which moves complete control to your fingertips.

Alternatively, you could add a RAM mount option, which mounts the lightbar closer to the driver making the buttons on the lightbar easier to access.

What is the AgGPS 150 integrated GPS receiver?

The AgGPS 150 lightbar contains a high-quality Satellite-Based Augmentation System (e.g. WAAS, EGNOS) Differential GPS receiver.

This GPS receiver uses Trimble's latest generation GPS chips used in our new survey receivers for significantly improved accuracy and position availability in both typical and harsh conditions.

How does the EZ-Guide Plus system work?

The AgGPS EZ-Guide Plus lightbar guidance system uses GPS positions to let you define an initial reference line or curve (AB Line) for parallel swathing or guidance. The system uses GPS positions to guide you along evenly spaced swaths at your specified implement width.

The row of 35 LEDs (light emitting diodes) along the lightbar give you guidance feedback on your current position left or right of the center of the desired swath (i.e., this indicates your cross-track error). The aim is to drive so that the LEDs remain centered within the lightbar; this indicates that you are driving directly down the center of the swath.

The graphic LCD screen provides perspective and plan views to assist with steering during turns and curved guidance, as well as status messages, and is used for configuration. This greatly improves your ability to orient yourself in the field, line up on the next swath after a turn, and makes it far easier to perform curve guidance.

What experience is needed to operate the EZ-Guide Plus system?

No special experience is required to operate an EZ-Guide Plus lightbar system. A concise, easy-to-read user guide and quick reference card gives simple step-by-step instructions on how to set up and use the system. Typically it takes no more than 15 minutes for new users to learn how to use and begin to reap the benefits of the EZ-Guide Plus lightbar system.

All functions and configuration of the EZ-Guide Plus system can be completed with just three buttons on the lightbar. The optional six-button keypad gives more flexibility and allows the lightbar to be mounted further from the operator and provides direct access to some functions.

What operations can the EZ-Guide Plus system be used for?

The EZ-Guide Plus system is ideal for agricultural guidance tasks such as application of crop protection chemicals, fertilizer, lime or manure and airseeding in broadacre operations. In broadacre row crops it can be used for tillage and stops drivers from having to count rows. If you want to use the EZ-Guide Plus system for high-accuracy operations (row crop planting, etc.), you may need to add an optional external high-accuracy receiver like the AgGPS 252 GPS receiver. Lastly, you may want to consider whether Trimble's AgGPS EZ-Steer assisted steering or AgGPS Autopilot DGPS or RTK automated steering technology is required for optimum performance for a given application.

EZ-Guide Plus Functionality

What patterns does the EZ-Guide Plus system support?

The EZ-Guide Plus lightbar provides guidance to the following patterns:

- straight-line A-B guidance
- straight-line A+ guidance
- curved guidance
- multiple headland guidance with straight line guidance inside the headlands
- center-pivot field guidance

What other functionality is provided in the EZ-Guide Plus system?

The EZ-Guide Plus system provides the following functions:

- automatic swath advance for straight, curve, and pivot patterns
- a pause and resume guidance feature; while paused, the lightbar provides navigation instructions to return to the pause location
- field acreage calculation for headland fields
- end-zone indication via a flashing on-screen warning message and audible alarm (audible alarm requires optional remote control or additional external alarm)
- on screen display of path traveled
- where-applied coverage area calculation when using a spray switch
- simulated speed pulse output which eliminates the need for radar guns
- an ability to save and restore up to 99 AB Lines and transfer the guidance lines between lightbars
- nudge to correct for GPS position drift
- OnPath™ advanced filtering technology to remove GPS position jumps

What is A-B Guidance?

A-B guidance is the basic guidance pattern, allowing you to set two points (A and B) that define a swath, usually the first swath, on your field. The EZ-Guide Plus system uses this, in conjunction with the width of your boom (known as the swath width) to guide you up and down parallel, evenly spaced swaths, across your entire field.

What is A+ Guidance?

A+ guidance lets you define a new A point but keep your previous A-B line heading. If you have two fields with the same orientation, set an A-B line on the first field and then just an A+ on the second field. Also, in the dark or in thick fog, define an A-B line along a parallel service road, then use A+ to set the start of the first swath. The lightbar will provide guidance parallel to the service road, but along the swath line.

Similarly, if you have a break midway down your field area (such as a service road), use A+ to set a new A point on the other side of the break. The system will retain the previous heading so that you can keep the same swath heading on both sides of the break.

What is curved guidance?

Curved guidance provides guidance to the previous curved swath at the swath-width distance apart. This pattern is useful when working in an irregularly shaped or terraced field and ensures evenly spaced swaths across the entire field.

What is multiple headlands guidance?

Headland guidance lets you drive multiple curved headland circuits around the outside of the field as a turning area, then map an A-B Line for straight parallel guidance inside the headlands to complete the field. You can also use the Headland pattern to spiral right into the middle of the field without doing any straight swaths.

What is center-pivot guidance?

Center-pivot guidance is used for guidance in a field using a center-pivot. It guides you in concentric circles around the center-pivot.

How does the EZ-Guide Plus system calculate field acreage?

The field area is calculated automatically as you drive the field using the *Headland* pattern. The area calculation on the EZ-Guide Plus system always takes into account the width of the boom by expanding the total area out by half of a swath width from the outer headland.

How does the EZ-Guide Plus system calculate the where-applied coverage area?

The EZ-Guide Plus system uses input from a spray switch to determine when material is being applied. The coverage area is calculated as the distance traveled while applying material multiplied by the swath width.

What are end zones?

Also known as headlands, end zones are “no spray” zones around your field. When you set an A-B line, the EZ-Guide Plus system automatically computes two end-zones at each end of the field, perpendicular to the A-B line; one runs through the A point and the other runs through the B point.

Alternatively, if you use the *Headlands* pattern, EZ-Guide Plus uses the edge of the inner headland as the end zone while you are parallel swathing. This is useful for non-rectangular fields.

How does the EZ-Guide Plus system tell me when I cross an end zone?

You can configure a headland warning distance so that the warning message will give you advanced warning on leaving or entering the headlands.

In addition, if the remote control or an external alarm is connected, an alarm will sound while the warning message is displayed.

What is the alarm used for?

The alarm in the optional remote control is used to alert the driver of significant events while using the EZ-Guide Plus system. If the remote control is connected, the alarm will sound on the following events:

- outside spray zone
- too far offline
- reduced GPS accuracy

What configuration items are available with the EZ-Guide Plus system?

The system has a number of configurable items to fine-tune its operation:

- swath width
- the information displayed on the graphic display can be customized to suit your needs
- contrast and brightness, so that the graphic display and guidance lights (LEDs) are suitable for daytime or nighttime operation
- the guidance LED mode, so you can choose whether to chase the lights or pull them to the center of the lightbar
- lightbar LED spacing, so that you can define the resolution of the lightbar guidance feedback
- the headland warning distance and the distance off-swath at which the warning is displayed
- the forward or backward offset of the boom from the antenna
- look ahead time (in seconds), used to predict the future guidance path and prevent overshooting the target swath when exiting corners.

- the mounting orientation (to invert the display if lightbar is mounted upside-down)
- status text display options to provide detailed feedback while driving
- data port settings, so you can configure GPS input, GPS output, RTCM correction input etc.
- the low accuracy warning, so you can choose whether or not to work with low accuracy GPS positions
- audible warning so you can choose to turn off the audible alarm
- the units of measure (US or metric)
- the language to operate the system
- a factory default option to restore default settings

Does the EZ-Guide Plus system support WAAS and EGNOS for differential GPS?

Yes, the EZ-Guide Plus system with an integrated GPS receiver supports free WAAS and EGNOS corrections, and is configured by default to use the WAAS or EGNOS signal. This means that on first use, the receiver will track and begin to generate WAAS- or EGNOS-corrected DGPS positions when used in North America or Europe respectively, depending on where the unit is currently located, without any configuration by the user.

Does the EZ-Guide Plus system support other differential GPS sources?

Yes. The EZ-Guide Plus system with internal GPS supports external RTCM corrections. There are some low cost beacon correction receivers, or in Canada you can buy a CDGPS receiver which is ideal for this application.

The integrated receiver does not directly receive L-band (OmniSTAR or Thales) or radio-beacon corrections as sources of differential correction. If you want to use beacon or L-band corrections, Trimble recommend that you purchase the EZ-Guide Plus lightbar without integrated GPS and connect an AgGPS 132 or AgGPS 252 receiver.

Where should the operator mount the lightbar?

The EZ-Guide Plus lightbar should be placed in the operator's peripheral vision. When turning, or changing swaths, the operator relies on the lightbar to get on line. Once on line, the operator may pick a distant visual target and drive toward it. The operator periodically references the lightbar to correct off-track errors. The compact size of the EZ-Guide Plus system makes it easy to position within all cabs.

Can an operator leave the field in mid-swath and return to the same point to continue swathing while using the EZ-Guide Plus system?

Yes. A pause/resume guidance function allows the operator to leave the swath row, reload, and then navigate back to the exact pause location and recommence swathing where they left off. While paused, the lightbar provides navigation information back to the pause-point.

Can the integrated receiver be used for yield monitoring?

Yes, the integrated receiver is pre-configured to be able to output positions to yield monitors using the industry-standard NMEA format for GPS receivers. Because the EZ-Guide Plus lightbar has a serial port, it is possible to use EZ-Guide Plus for parallel guidance and simultaneously output positions to a yield monitor, planter, or other NMEA compatible device.

How can I configure my integrated receiver?

The settings of the lightbar integrated GPS receiver will in most circumstances, already be good for guidance. However, if for any reason you need to change the GPS settings, you can change many from the EZ-Guide Plus lightbar menu or you can use the free Trimble AgRemote setup utility software.

For more information or to obtain a copy of the AgRemote software, contact your nearest Trimble Reseller.

How can I view the GPS status of the integrated receiver?

The EZ-Guide Plus system has a *GPS Diagnostics* menu option which displays several screens of information from the integrated receiver, including the time, latitude, longitude, height, speed, number of satellites, HDOP, correction age, WAAS or EGNOS station ID, differential SNR, receiver settings, receiver serial number, firmware version, and update rate.

Can I use another receiver with my EZ-Guide Plus system?

Yes. You can use any other GPS receiver that outputs NMEA GGA and VTG messages, including the John Deere StarFire receiver. For best guidance, Trimble recommends that you ensure the receiver outputs NMEA messages at 5 Hz.

What are the available upgrades for the EZ-Guide Plus system?

Four upgrades are available for the EZ-Guide Plus system to extend its functionality to more than just a guidance system.

Upgrade #1: AgGPS EZ-Steer assisted steering system

The AgGPS EZ-Steer assisted steering system turns your EZ-Guide Plus system into an affordable and easy to use assisted steering product.

The EZ-Steer system uses a friction wheel and GPS guidance from the EZ-Guide Plus lightbar and turns the steering wheel automatically, greatly reducing driver fatigue and allowing you to better oversee the implement or spray booms to improve the job quality.

The EZ-Steer system is easy to install, setup and use. Installation can be completed in less than 30 minutes with 1 wrench. No need for complex hydraulic interfaces. You can remove the system from a vehicle in a few minutes and never know it was fitted.

The EZ-Steer system provides 6-12 inch pass-to-pass accuracy.

Upgrade #2 AgGPS Autopilot automated steering system

The AgGPS Autopilot DGPS or RTK system turns your EZ-Guide Plus system into the ultimate automated steering system.

Adding the AgGPS Autopilot system to the EZ-Guide Plus system provides these additional features:

- Support of AB Line, A+, Pivot, Identical Curved, Adaptive Curved and Headland patterns for automated guidance.
- Ability to save and restore up to one hundred AB Lines.
- Ability to save and restore three Autopilot vehicle configurations on the EZ-Guide Plus system.
- Ability to set up the Autopilot Navigation Controller to output roll corrected NMEA data for the use with EZ-Map software, yield monitors etc.
- Ability to use the internal EZ-Guide Plus GPS receiver as the GPS source for the Autopilot system .
- Dedicated *Auto-steer* button on the EZ-Guide Plus system's remote keypad
- Autopilot provides up to 1 inch accuracy.

Upgrade #3: AgGPS EZ-Map software

The AgGPS EZ-Map software, which runs on a Pocket PC* or Trimble's rugged Recon Pocket PC handheld enhances your EZ-Guide Plus system by providing coverage logging, mapping, and sampling functionality.

Adding AgGPS EZ-Map software to the EZ-Guide Plus system lets you:

- Map field boundaries, subtracting non-productive areas if necessary, for accurate billing purposes.
- Collect and display application coverage so you can remedy skips before leaving the field to reduce crop damage, improve crop yields, and avoid costly callbacks.
- Connect a spray switch to control coverage logging automatically.
- Collect points, lines, and areas with attributes for mapping and scouting.
- Prepare sampling grids and navigate to the sample targets.
- Import sampling zone maps, field boundaries or background layers from a variety of software packages, such as SMS Basic, SSToolbox, ArcView, MapInfo, AGIS, ViewPoint, AgLink, AgInfo, Agvance, Farm Site, Farm Site Pro, and Patchwork Office.
- Import background images in .jpg or .bmp format to locate fields and management zones.
- Record event attributes such as product, equipment, and soil and weather conditions.

- Create, view, and print maps using a range of GIS packages, including ESRI's ArcExplorer software (included).
- Use high-accuracy RTK GPS to record topographic data. This data is suitable for display and analysis in GIS software packages.

**Requires user-supplied Pocket PC.*

Upgrade #4: AgGPS 170 Field Computer

The AgGPS 170 Field Computer turns your EZ-Guide Plus system into the ultimate field information management solution, with enhanced guidance and powerful record-keeping, field mapping, flow control, flow monitoring, variable rate management, and soil sampling capabilities.

Adding the AgGPS 170 Field Computer to the EZ-Guide Plus system provides the following additional features:

- All the features of AgGPS EZ-Map software, as described above.
- Enhanced guidance options such as racetracks.
- Guidance to line and area features to form rice field levees, lay subsurface drainage, or perform land leveling.
- The ability to use high-accuracy RTK GPS to record topographic data. This data is suitable for display and analysis in GIS software packages and for land leveling and drainage design software such as AgGPS MultiPlane.
- Support for variable rate controllers, including multiple models from MidTech, Raven, Rawson, New Leader, DICKEY-john, TeeJet, GVM Transpread, Flex-Air, LH Agro as well as Krone and DGH flow meters. Record as-applied rate information to verify applications.
- The ability to import application prescription maps, field boundaries or background layers from a variety of software packages, such as SMS Basic, SSToolbox, ArcView, AGIS, AgLink, AgInfo, Agvance, and Patchwork Office.
- Work orders which save time and allow operators to easily select predefined jobs.
- Full-color graphic display with scratch-resistant low-glare glass for viewing in direct sunlight.
- Color differentiation of sprayed vs. unsprayed areas, prescription rates, and background layers.
- Fully sealed cast-aluminum, shock-resistant, waterproof housing suitable for vehicle mounting.
- Multiple ports to interface to multiple sensors and equipment.

GPS and DGPS Questions

What is GPS?

The Global Positioning System (GPS) is a worldwide radio-navigation system formed from a constellation of 24 orbiting satellites and their ground stations. By using a process of triangulation from several GPS satellites, it is possible to determine your position on the ground very accurately.

GPS works everywhere on earth, 24 hours a day, making it an ideal technology for use in agriculture.

How accurate is GPS?

Depending on the exact time of day and the number of GPS satellites available, a position generated from an uncorrected GPS receiver may be 40 feet from truth, although most positions are within 15 feet. There are several reasons for this range of values, mostly stemming from GPS signal delays in the ionosphere.

A process known as differential correction with DGPS receivers can correct for many of these errors. Differential GPS (DGPS) positions are much more accurate than regular GPS positions—DGPS accuracy is usually less than three feet.

What is differential GPS (DGPS)?

Differential GPS positions are regular GPS positions that have been corrected for ionospheric and other errors using a process known as differential correction. Differential correction uses a GPS reference station—a GPS base station at a known location—to provide corrections for other GPS receivers that are at unknown locations (such as on a spray truck).

Differential corrections may be applied second-by-second in real time; these are known as real-time differential corrections. Differential corrections may also be stored in computer files and accessed later. For agricultural purposes, only real-time differential corrections are required.

There are many sources of differential corrections, such as:

- via a short-range radio link from a local GPS reference station
- via a medium-range radio link from maritime or land-based beacons
- via geo-stationary satellites

Geo-stationary satellites use multiple land-based reference stations to create a differential correction map over very large areas of the earth. Two of these systems, known as WAAS and EGNOS are free of charge and supported by the AgGPS EZ-Guide Plus lightbar guidance system.

What is WAAS?

WAAS is the Wide Area Augmentation System, a source of differential corrections designed primarily for commercial aeronautical applications within the United States. However, because this system broadcasts signals from geo-stationary satellites, farmers can take advantage of this system for parallel swathing and other purposes.

WAAS is currently a fully functional signal, commissioned by the FAA on July 10, 2003.

Information Regarding Satellite Based Augmentation Systems

Please note that some Satellite Based Augmentation Systems (SBAS) are currently (and independently) under various stages of development. They may not be considered fully operational yet. When the systems are considered operational, they will provide positioning to commercial and private aircraft to within several meters. The AgGPS receivers can provide general positions derived from WAAS during testing periods. Positions created from these messages may occasionally be erroneous due to tests being performed; therefore under no circumstances must they be used for safety critical operations. Users should use caution when operating GPS receivers in SBAS mode.

How do I know if WAAS is available in my area?

The WAAS signal is available in the continental USA and southern Canada. Because the WAAS satellites are in equatorial orbits, reception improves the closer you are to the equator. The further north you are located, the more chance that obstructions to the south of your field may block the WAAS signal, such as buildings or lines of trees.

What do I do if WAAS or EGNOS is not available in my area?

The EZ-Guide Plus system allows for guidance without DGPS corrections. Even without corrections the EZ-Guide Plus system will normally give sub-meter pass-to-pass accuracy due to the high performance GPS receiver design and antenna and the new OnPath advanced filtering technology. However, guidance without corrections will not be as accurate as DGPS.

If you want to use DGPS corrections in an area without WAAS or EGNOS corrections, you can purchase the EZ-Guide Plus 50 lightbar without integrated GPS and use another AgGPS receiver, such as the AgGPS 132 or AgGPS 252 for positions.

What is the OnPath advanced filtering technology?

OnPath advanced filtering technology is new patent pending technology that detects position jumps and decays their effect over time. It gives superior accuracy to other receivers when no corrections are available, and automatically works all the time—there's no extra initialization down time required.

By default, position jumps are decayed in over 120 minutes, which means that position jumps are not noticeable to the user. However, if you have a lot of trees, you may need to reduce the decay time to 5 minutes to prevent accumulated errors.

When using autonomous GPS (without DGPS corrections) OnPath advanced filtering technology provides 6-18 inch pass-to-pass accuracy.

When using WAAS or EGNOS corrections, OnPath advanced filtering technology can improve pass-to-pass accuracy to be less than 6-12 inches.

OnPath advanced filtering technology is a feature automatically included in the GPS receiver integrated within the AgGPS EZ-Guide Plus 150 lightbar. No additional fees required.

What other agricultural applications use GPS?

GPS is fast becoming a standard utility in the agricultural world. Some examples of other agricultural uses of GPS are:

- yield monitoring
- field mapping and scouting
- soil sampling
- aerial guidance
- high-accuracy automated steering
- variable-rate application and as-applied mapping