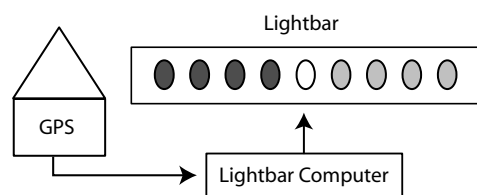


Lightbar guidance aids are GPS-based systems that help agricultural machine operators steer along uniformly parallel passes across a field. Lightbars can provide many advantages to farm operations including reduced input usage, enhanced record keeping, and improved operator environment [see the companion factsheet *Lightbar Guidance Aids* (PA-3) for information on different lightbar configurations]. There are many different types and configurations of lightbar systems available. This publication provides information that should help potential buyers choose the proper lightbar for their operation.



Lightbar System Components

## Primary Considerations in Purchasing a Lightbar

There are two primary issues to consider when purchasing a lightbar:

1. Is the lightbar error indication accurate?
2. How well is the driver able to interpret the guidance indicators and appropriately steer the vehicle?

### Lightbar Accuracy

Several researchers and organizations have tested various lightbars and the user response to these devices. These studies have indicated that, in general, there is no significant difference in accuracy between lightbars. In other words, the offset error indicated by the lightbar is accurate based on the position indication that the DGPS receiver provided to the lightbar computer. The data accuracy of the lightbar is almost totally dependent on the accuracy of the DGPS receiver. Therefore, the first key to getting an accurate lightbar is making sure the DGPS receiver that drives the lightbar is accurate.

In lightbar applications, one of the primary considerations of GPS accuracy is the long-term stability of the receiver. Most DGPS receivers have very good short-term relative accuracy, but they may tend to drift with time. In practical terms, this means that the system would perform very well if all passes across the field occurred within several minutes of the previous path; however, if you take extended breaks for meals, refilling, or repairs, the position could drift by several feet or more. When comparing GPS lightbar systems, be certain to check whether the accuracy specifications are based on pass-to-pass testing or longer term absolute accuracy tests.

### Guidance Accuracy

The overall swath accuracy of the lightbar system depends on the operator's ability to interpret the guidance indicator and



# Choosing the Right Lightbar

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make appropriate steering adjustments. Because of the wide variety of lightbar configurations that exist, the buyer must shop around to determine which system they prefer and find easier to use. Two primary factors to consider when purchasing a lightbar are display configuration and system features.

### Display Configurations

Many different display configuration options are available from different manufacturers. The buyer must choose a display that is easy for the driver to use and compatible with the machine(s) in which it will be installed. Some key factors to consider are mounting location, display visibility, display information, display update rate, look-ahead capability, and indicator sensitivity.

**Mounting Location.** Some displays are mounted inside the cab, while others are mounted outside on the hood. Consider your machine configuration and cab size to determine which would work better for you.

**Display Visibility.** Consider the brightness, size, and contrast of the different displays to determine which would be easier to see. Be especially considerate of drivers who use bifocal or other vision correction when considering options and mounting locations within the cab.

**Display Information.** The simplest lightbars contain one horizontal row of lights that indicate the error from the path. Others add a second indicator for vehicle heading toward or away from the path. The indicators can be simple horizontal rows of lights, other arrangements of lights, LCD screens showing the desired path and vehicle, or even audible tones indicating steering direction.

**Display Update Rate.** Most displays update at about 5Hz, which means that the display will indicate your new position five times a second. If the display is too slow, it will be difficult to steer accurately. Be careful when considering systems with update rates of 2Hz or less. This update rate becomes more of a factor at higher ground speeds (e.g., above 10 mph).

**Look-Ahead Capability.** Lightbars should have the capability to "look ahead" or predict where the vehicle will be in a short time. This look-ahead feature makes it much easier to follow the guidance indicators. Some lightbars actually allow the user to set the look-ahead distance to compensate for different machine speeds.

*Indicator Sensitivity.* The amount of error that causes the display indicator to change is the sensitivity. Does the first light come on when you are 6 inches from the desired path or not until you are 4 feet away? If the display is too sensitive, the “flickering” lights will become annoying to the driver. If the display is not sensitive enough, the driver will not be as accurate. Many lightbars allow the user to change the indicator sensitivity.

### System Features

Each lightbar system will have a variety of standard or optional features available. Obviously, the cost increases as the number of options increases. A few of the features that may be available include data logging, graphical displays, programmability, headland indicator, return to point, snap to path, contour following, tilt sensors, and compatibility with other GPS and PA equipment. Consider which ones are pertinent to your operation.

*Data Logging.* A data logging option will allow you to record a history of your position as you were operating. Some lightbars will even allow you to tie in to the application switch on the machine to record where you applied product and where you were just driving. If you purchase the logging option, verify what software and/or hardware will be needed to get the data from the lightbar to your farm computer. Is this software included with the lightbar, or do you have to purchase it separately?

*Graphical Displays.* Some higher-end lightbars have real-time graphical displays that show what parts of the field have been covered. This display can be extremely useful in odd-shaped fields to make sure no areas are missed or in operations where the swaths are not taken sequentially.

*Programmability.* How easy is the lightbar to program? The programming interfaces for various lightbars could range from two or three switches or buttons that control all functions to nearly full-sized computer keyboards. Displays can vary from a few crude LED digits at the edge of the lightbar to a full graphical display with pull-out menus. Try different lightbars to see which are easier to program. Remember that time spent establishing the A-B line reduces field capacity of the machine.

*Headland Indicator.* Some lightbars will remember any headland passes that are made in a field and give an indication to the driver when to turn off the application at the end of a swath. This feature could be extremely helpful in point rows to know when to turn off boom sections.

*Return to Point.* When the tank runs empty in the middle of a swath, it is often difficult to return to the exact point where you ran out to continue application. Some lightbars have a marker option that lets the driver mark a particular point in the field and even helps navigate back to that point.

*Snap to Path.* On many early lightbars, the operator had to manually increment the path number at each headland turn. Most new lightbars now automatically find the closest path to the vehicle and guide the driver to that path.

*Contour Following.* Several manufacturers offer contour or curve following features that could be quite helpful in irregularly shaped fields. These algorithms are becoming more



Example Display Configurations

reliable. Check each system carefully to make sure it will create the field patterns that you have in your operation (contour strips, irrigation spirals, irregular fields, etc.)

*Tilt Sensors.* GPS receiver antennas must be located on the top of the machine to assure a good view of satellites. As the machine tilts from side to side, the antenna could move several feet. Some manufacturers are now incorporating tilt sensors into their lightbar systems to compensate for machine tilt. These sensors could help improve guidance accuracy when operating on uneven terrain with features such as ditches or terraces. On gently rolling terrain, however, swath accuracy is generally good despite machine tilt.

*Compatibility with other GPS and PA Equipment.* A single DGPS receiver can often be used with a variety of precision agriculture equipment. The key compatibility issue with lightbars is the position update rate, or the frequency at which the receiver outputs a new position. Most yield monitors and variable rate application equipment require only a 1Hz position update (one update per second), yet most lightbars require at least a 5Hz update rate. Some lightbar systems will allow you to use your current receiver as long as it has a sufficient update rate. If you are purchasing a new receiver with the lightbar, make sure it has adequate output ports to connect with yield monitors, variable rate controllers, and other PA equipment.

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