

AgNavigator™

Fully Integrated Real-Time Navigation and Mapping for Site-Specific Agriculture



The Ag-Navigator is a portable and rugged field navigation, guidance, mapping and data collection system. It contains a 486/66 computer, an Ashtech SCA-12S™ Super C/A GPS Receiver, a “map stick” device for entering attribute data, and a light bar for guidance. The screen provides text and graphic information on current status and operation of the unit, and a well designed user interface provides single keystroke access to many user functions. The Ag-Navigator accepts GPS differential corrections from a local base station to provide real time positions at half second intervals, accurate to <1.0 meter under average field conditions. In regions where alternative sources of GPS differential corrections are available in RTCM-104 format, the Ag-Navigator can use these sources. Accuracy will vary with the correction source.

The GPS receiver uses the “all-in-view” dedicated 12 channel Super C/A code tracking where the carrier phase measurements are used to smooth the low noise code measurements. This allows greater accuracy than other GPS receivers that have no carrier smoothing or low noise code measuring techniques. Twelve independent channels allow the Ag-Navigator to simultaneously track all of the GPS satellites which will be available at any time.

The optional base station is configured with a two (2) watt radio which will provide differential corrections at a range of up to five (5) miles. Radio reception will vary with terrain and height of transmitter antenna above ground. Amplifiers are available for longer range or difficult RF conditions.

Field Mapping

One of the first operations in site-specific farming is to locate the boundaries of fields or management units. The basic Ag-Navigator can be mounted on a four-wheeler, pickup, or other vehicle and as it is driven over the boundaries a map is created in real time.

Soil Survey

The soil survey option will divide a field into a square grid pattern with the cell dimension selected by the user. The center of each grid cell is shown on the Ag-Navigator screen. The screen can zoom in as the drill rig approaches the point helping to navigate precisely to the selected location.

Yield Mapping

To generate a yield map, the Ag-Navigator is mounted on a harvester equipped with a yield monitor. The yield monitor communicates with the Ag-Navigator through one of 2 RS-232 serial ports. As the monitor collects yield data and moisture data when available during harvest at 1, 2, 3, or 5 second intervals, each data point is tagged with a GPS position, and a file of yield and position data is stored within the Ag-Navigator. This file can be viewed graphically on the screen of the Ag-Navigator, or downloaded into an office computer for further processing.

During harvest the “map stick” is used to log the location of objects in the field. The three buttons on the stick are associated with three user defined attributes to be logged such as weeds, insects, and

rock. As the operator encounters each object, a single button stroke will record the position of that object. When the harvest of a field is completed, a geo-referenced file of all objects mapped has been generated along with the yield map file.

Variable Rate Application

The Variable Rate Application module provides communication with available spray, fertilizer, and seed rate controllers, and automatically adjusts the rate of application of a material. In this mode, a field is divided into regions on a map stored in the Ag Navigator. Each region is associated with a rate. As a machine with the Ag Navigator moves from one region to another, a message is sent to the controller to adjust the rate. Data collected from the controller is used to compile an application map which shows precisely how much material was placed where.

Sub-Meter Guidance

In guidance mode, the Ag-Navigator will direct a machine operator over a set of parallel swath lines separated by an interval selected by the user. The machine position relative to the desired track is shown on the screen and the operator is aided in staying on the track by a light bar. The light bar indicates deviation from the path to the right or left by illuminating lights to the right or left of center. A center light only indicates that the machine is on course. The guidance module will provide navigation accurate to <1.0 meter when used with the optional base station.



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AgNavigator™ System Specifications

Ag Navigator

- Cast Aluminum Housing
- GPS Receiver
- 486DX-2 66MHz Microprocessor
- Math Co-processor
- QUERTY Membrane Keyboard
- 6" x 4.5" LCD Display (monochrome)
- 540 Mbyte hard drive
- 4 MB Memory
- 2 serial ports, 1 parallel port
- ROM-DOS v 6.22 Operating System
- Receive Only Radio Modem (optional)
- Light Bar (optional)
- Map Stick (optional)
- Mounting Hardware (optional)
- 1 year warranty

Measurement Features

- Single Point Position:* 25 m (rms)
- DGPS Position: <1 m (rms, PDOP<4)
- Time to first fix: Typically < 1 minute
- Tracks 12 satellites simultaneously
- Carrier-smoothed pseudo range
- Half Second update rate
- Real-Time Differential (RTCM 104)
- Base Station Mode RTCM 104
- 10, 30 or 60 ft Antenna cable
- GPS Antenna

* *With SA off*

Internal Radio Modem

- Frequency ranges 450 - 470 MHz
- Channel Spacing 12.5 KHz
- Receive Rate 9600 bps
- Antenna Whip
- All necessary cables and connections

Environmental

Meets MIL-STD-810D, MIL-STD-810E standards for moisture, dust, sand, shock and altitude.

- Temperature Range Operation: 0 to +55°C

Light Bar

The light bar is housed in an extruded aluminum housing with Plexiglas face. It communicates with Ag Navigator via parallel port. The light bar is a sealed, waterproof unit intended for outside use.

Light Bar Dimensions

- length 14"
- height 2.5"
- depth 1.25"

Map Stick

The map stick is a molded plastic device approximately 6 inches long and 1.5 inches in diameter with three switches. It shares the Ag Navigator parallel port with the light bar. Switches on the map stick are used to tag features to be mapped.

Base Station

Required hardware to establish an autonomous base-station for broadcasting differential corrections to the mobile unit.

- Super C/A GPS Receiver
- GPS Antenna
- Radio Modem
- OMNI Directional Antenna
- Antenna cables *
- Power supply *
- RF Amplifier **
- Tower (optional)

* *Options will vary based on the location of the base station.*

** *Standard 2W optional 15W or 35W for wider area coverage. 1W spread spectrum also available for use where appropriate.*

Alternative DGPS Sources

- Coast Guard Beacon Receiver
- DCI Receiver
- Spread Spectrum One Watt system
- Any external source delivering RTCM-104 DGPS corrections through a serial connection