



## ArcMap

# Getting started with ArcMap GPS Support

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The global positioning system (GPS) is a set of satellites and ground stations. A GPS device calculates its location using signals received from the satellites. Funded and supported by the United States government, GPS has widespread use for both military and civilian applications.

## ► An overview of ArcMap GPS Support

ArcMap GPS Support takes as input a feed from a GPS receiver and displays the current location on the screen. You can also store locations from the GPS receiver in a log for archival or real-time digitizing purposes (see [Writing GPS locations to a log](#)). You can answer the question “Where am I?” by accessing ArcMap GPS Support through the GPS toolbar in ArcMap (see [Adding the GPS toolbar](#)) or by writing a custom application using ArcObjects.

The location is displayed as a user-defined marker symbol. You can have the angle of the marker symbol reflect the direction of motion (bearing), the size based upon the current speed of travel, and the color based upon the altitude. Previous locations can be displayed as a trail of markers or as a line that you can also customize. The trail of previous positions can reflect changes in bearing, speed, and altitude. See [Changing the display options](#) for more information.

You can keep the location visible on the screen by panning as needed or have the display pan automatically (see [Keeping the current location in the view](#)). For applications like in-car navigation and routing systems, you can snap the location to specified features, such as a street centerline. You can [store locations to a log file](#) either in streaming mode (at a specified rate or distance apart) or one at a time. When a log file is specified, you have the option of choosing which columns are added to the output feature class.

## ► Tasks you can perform with ArcMap GPS Support

You can perform the following tasks with ArcMap GPS Support.

### Show the location on the screen

You can connect a GPS receiver to a communication port on a computer running ArcMap and see the current location on the map display (see [Connecting to a GPS device](#)). You can also [open the GPS Position window](#), which shows updated information in real time.

### Digitize features

By [setting up a log file](#), you can create a new feature class in which to store GPS locations. Once the log is defined, you can use the Stamp Current Position to Log button on the GPS toolbar to record individual points. If you'd rather automatically record locations to the log, set up the filter options on the Log Setup dialog box and click the Start Streaming to Log button on the GPS toolbar.

### Snap positions to features

Consider the following scenario:

You want to have the current location snapped to the features in a feature class. In this example, you are [streaming features to a log file](#) as you drive down a road, and you want the locations to coincide with the street centerlines. You [set up the connection](#) and position display information. You then use the Snapping tab of the Display Options dialog box to choose the Roads layer (which contains street centerlines) from a list of features on a map. Next, you specify a snapping tolerance. All positions within the specified tolerance will now be snapped to the features in the Roads layer. [Learn more about snapping to existing features](#)

### Replay collected information later

You can use the [Simulate a GPS connection](#) option to review data that was collected earlier and saved to a log. First, set up the simulation by choosing the log you want and set a display interval. Then [open the connection](#) to display the locations from the log on the map. You can use any point or line feature class for the simulation data.



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### Adding the GPS toolbar

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#### ▶ About adding the GPS toolbar

Before working with GPS devices within ArcMap, you must first add the GPS toolbar.

#### ▼ How to add the GPS toolbar

1. Click the View menu in ArcMap.
2. Point to Toolbars.
3. Click GPS.

The toolbar is added.

#### Tip

- To hide the GPS toolbar, right-click on any toolbar and click GPS.



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### Connecting to a GPS device

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#### ▶ About connecting to a GPS device

A global positioning system (**GPS**) device allows you to quickly find your position to within several meters. To display and save positions reported by a GPS device in ArcMap using ArcMap GPS Support, the GPS device must have an input/output (I/O) interface and be National Marine and Electronics Association (**NMEA**) compliant. You also need a GPS compatible cable that connects to a computer. Refer to the GPS device documentation or contact the GPS manufacturer if you're uncertain whether your device meets these requirements.

#### ▼ How to connect to a GPS device


##### ▶ Setting up the connection

1. Click the GPS menu on the GPS toolbar and click GPS Connection Setup.
2. Click the Connect to GPS Receiver option.
3. Set the baud rate, parity, data bits, and stop bits.  
Refer to your GPS device's documentation for the correct values.
4. Click OK.

#### Tip

- If the GPS Connection Setup is unavailable, make sure that the GPS connection is closed.

#### ▶ Opening the connection

1. Click the Open Connection button .

#### ▶ Closing the connection

1. Click the Close Connection button .

#### Tip

- The Close Connection button is unavailable unless a connection is open.

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### Simulating a connection to a GPS device

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#### ▶ About simulating a connection to a GPS device

You can use an existing dataset in place of a connection to a GPS device. A simulated connection is useful if you're giving a demonstration or are working with previously collected data. The shapefile or feature class must have point or line features; you can't use point or line coverages for the simulation.

#### ▶ How to simulate a connection to a GPS device

##### ▶ Setting up the simulation

1. Click the GPS menu on the GPS toolbar and click GPS Connection Setup.
2. Click the Simulate GPS connection option.
3. Click the Layer dropdown arrow and click the layer you want.
4. Type the interval in the Interval text box.  
The time interval is always in seconds.
5. Click OK.

##### ▶ Starting the simulation


1. Click the Open Connection button .

##### ▶ Stopping the simulation

1. Click the Close Connection button .

#### Tip

- When the last feature in the simulation dataset is displayed, the connection will close.

To restart the simulation, click the Open Connection button .



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### Using the GPS Position window

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#### ▶ About using the GPS Position window

The GPS Position window displays information about the GPS connection and the current position. The window has two modes: simple and advanced. The simple mode shows the latitude and longitude values, altitude, speed, and heading for the current position. It also shows the connection status. The advanced mode adds the time, date, and magnetic variance. The horizontal, vertical, and positional dilutions of precision values are on the right side of the window. The dilution of precision values reflects the current satellite distribution. At the bottom left of the window is the number of satellites and the average signal-to-noise ratio. The ID of the differential GPS unit and the time since the last contact are displayed (if applicable) at the bottom right of the window.

If the connection is closed or some information is not available, N/A (not applicable) is displayed in the GPS Position window.

#### ▼ How to use the GPS Position window



##### ▶ Displaying the GPS Position window

1. Click the GPS menu on the GPS toolbar.
2. Click GPS Position Window.

##### Tip

- You can also type "w" after opening the GPS menu to display the GPS Position window.

##### ▶ Changing between the simple and advanced modes

1. Click the Simple button  and the Advanced button  to switch between the two displays.

##### ▶ Closing the GPS Position window

1. Click the Close button  on the GPS Position window.



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### Changing the display options

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#### ▶ About changing the display options

The Display Options dialog box allows you to customize the look of the GPS positions. You can decide whether to show estimated positions if the GPS signal is lost, or change how often a new position is displayed. You can add a point-based or linear trail to show previous positions and better see the path of the GPS device. The positions can be snapped to features. You can also vary the current position or trail symbols by the direction, speed, or altitude of the position.

## ▼ How to change the display options

### ► Changing the position symbol

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the General tab.
3. Check the first check box under Current Position if you want to show the current position in the view. Click the symbol button to change the symbol properties.
4. Check the second check box under Current Position if you want to display estimated positions if the signal is lost. Click the symbol button to change the symbol properties (you may want to have a different symbol to make it obvious if the signal is lost).

A GPS signal can be lost if not enough satellites are visible to the receiver. This can occur under trees and in tunnels.

5. Check Minimum Display Rate and type a number in the text box to change how often a new position is displayed.
6. Click OK.

### ► Setting the display units

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the General tab.
3. Choose the units of measure from the dropdown lists under Units.

These units of measure are used on the Advanced tab of the Display Options dialog box if you choose to modify the symbol representing the current position by either its speed or altitude. All three units of measure are used on the GPS Position window. The Latitude/Longitude Format displays the current position's coordinate values on the GPS Position window.

4. Click OK.

### ► Showing a trail with points

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the Trails tab.
3. Check the Show trail as points check box.
4. Click the symbol button if you want to change the symbology.
5. Type the number of points you want in the trail.
6. Type the distance between points.
7. Click the small button to the right of the Color ramp dropdown list and click Properties to set the color ramp to a single color. In the Colors section, click Color 1. Change its color if necessary.

To change back to a color ramp, click Color 2 and update the two colors.

8. Click OK to close this dialog box and apply the changes.
9. Click OK.

#### Tip

- The unit of measure is set by the display unit of measure in the data frame. To change the unit of measure for the data frame, right-click Layers in the ArcMap table of contents and click Properties. Click the General tab. Set the Map units, if it is set to Unknown Units, and update the Display unit of measure. Click OK when finished.

### ► Showing a trail with a line

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the Trails tab.

3. Check the Show trail as a line check box.
4. Click the symbol button if you want to change the line symbology and click OK.
5. Type a new value for the length of the trail, if necessary.
6. Click OK.

**Tip**

- The unit of measure is set by the display unit of measure in the data frame. To change the unit of measure for the data frame, right-click Layers in the ArcMap table of contents and click Properties. Click the General tab. Set the Map units, if it is set to Unknown Units, and update the Display unit of measure. Click OK when finished.

**▶ Snapping to existing features**

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the Snapping tab. All layers listed in the table of contents are listed on this tab.
3. Click the layers to which you want to snap the GPS locations.
4. Type a new snap tolerance value, if necessary.
5. Click OK.

**Tip**

- The unit of measure is set by the display unit of measure in the data frame. To change the unit of measure for the data frame, right-click Layers in the ArcMap table of contents and click Properties. Click the General tab. Set the Map units, if it is set to Unknown Units, and update the Display unit of measure. Click OK when finished.

**▶ Varying the position symbology by its properties**

1. Click the GPS menu on the GPS toolbar and click Display Options.
2. Click the Advanced tab.
3. To set the bearing:  
Check Current position symbol if you want to show the direction of the GPS locations by rotating the symbol.  
Check Marker trail symbols if you want the point trail symbols to rotate based on the direction of the GPS locations. You may want to change the current position or the marker trail symbol to one that will make it obvious when the direction changes.
4. To set the speed:  
Check Current position symbol if you want to show the speed of the GPS locations by changing the symbol color.  
Check Marker trail symbols if you want the point trail symbols to change color based on the speed of the GPS locations.  
Change the color ramp if desired. To create a custom color ramp, click the small button to the right of the dropdown list and click Properties. Change the end colors, the algorithm that generates the colors, and the brightness, as desired. Click OK to apply the changes and close the Edit Color Ramp dialog box.  
To save the new color ramp, click the small button to the right of the dropdown list and click Save to style. Type a name for the color ramp and click OK.  
Change the minimum and maximum speed values. The units are set on the General tab. The symbol colors are set by the extreme values of the color ramp. You can change these using the dropdown lists.  
To set the color ramp to a single color, click the small button to the right of the Color ramp dropdown list and click Properties. In the Colors section, click Color 1 to change its color.  
To change back to a color ramp, click Color 2 and update the two colors. Click OK to close this dialog box and apply the changes.

5. To set the altitude:

Check Current position symbol if you want to show the altitude of the GPS locations by changing the size of the symbol.

Check Marker trail symbols if you want the point trail symbols to change size based on the altitude of the GPS locations.

Change the minimum and maximum altitude values. The units are set on the General tab.

Change the symbol sizes that will correspond to the minimum and maximum altitude values. The symbol size is scaled depending on the position's altitude value.

6. Click OK.

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### Keeping the current location in the view

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#### ▶ About keeping the current location in the view



ArcMap GPS Support has several tools that allow you to keep the current GPS location in the view.

#### ▼ How to keep the current location in the view

##### ▶ Turning on automatic panning

1. Click the GPS menu on the GPS toolbar.
2. Click Auto Pan.

##### ▶ Panning or zooming to the current location

1. Click the Pan To GPS Position button  on the GPS toolbar to pan to the current location.
2. Click the Zoom To GPS Position button  on the GPS toolbar to zoom to the current location.

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### Adding a destination

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#### ▶ About adding a destination

You can interactively add a destination, or target, to ArcMap. You can change the symbology of the destination point and enable a symbol at the current location that will point to the destination.

#### ▼ How to add a destination

##### ▶ Modifying the destination's symbology

1. Click the GPS menu on the GPS toolbar and click Destination Properties.
2. Click the Symbol button to open the Symbol Selector. You can change the symbol or its color, size, or

angle. Click OK when finished.

3. Type a label for the destination.
4. Click the Label Symbol button to change the appearance of the label.
5. Click OK when you have finished changing the label symbology.
6. Click OK to close the Destination Properties dialog box.

#### ► Showing the direction to the destination

1. Click the GPS menu on the GPS toolbar and click Destination Properties.
2. Check Show bearing to destination from current location.
3. Click the Bearing Symbol button if you want to change its appearance. Click OK when you have finished changing the bearing symbol.
4. Click OK to close the Destination Properties dialog box.

## ArcMap

### Writing GPS locations to a log

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#### ► About writing GPS locations to a log

You can save the information from a GPS device to a shapefile or personal geodatabase feature class. You can write individual points to the log or stream data. When streaming data, you can also filter the data by properties such as time or distance. To write data to a log, you must first either create a new log or open an existing log and append locations to it.

The log has the same spatial reference as the GPS device. Besides the actual coordinate values, you can save related information to the log's attribute table.

The following are descriptions of the fields you can save to the log.


Field	Description
Latitude	The latitude value of the position.
Longitude	The longitude value of the position.
Altitude	The altitude of the position. The unit of measure is set by the Display Properties.
Date_time	The date and time of day of the position.
Date	The date of the position.
Time	The time of day of the position. If the log file is a shapefile, this field is written out as a string type field using the time format specified in the Windows Control Panel.
Speed_KPH	The speed in kilometers per hour of the position. This is calculated using the coordinates and the date_time information of the current and previous positions.
Heading	The direction in degrees as measured east of north of the current position. This is calculated using the previous position's coordinate.
HDOP	The horizontal dilution of precision of the position. Reflects the effect of the current geometric satellite distribution.
VDOP	The vertical dilution of precision of the position. Reflects the effect of the current

geometric satellite distribution.

PDOP	The positional dilution of precision of the position. This is a combination of the HDOP and VDOP. Reflects the effect of the current geometric satellite distribution.
DGPS_ID	The identification of the differential GPS unit.
DGPS_age	The length of time since the last contact with the DGPS base station.
Magnet_var	The magnetic variation of the position in degrees.
Numof_sats	The number of satellites used to calculate the position.
AvgSAT_SNR	The average satellite signal-to-noise ratio.
Sats_inuse	The number of satellites in use for the position.
Quality	Quality indicator of the position.

## How to write GPS locations to a log

### Creating a new log

1. Click the GPS menu on the GPS toolbar and click Log Setup.
2. Click New.
3. Click Points if you want the log to contain points.  
Click Lines if you want the log to contain lines.
4. Type the location and name for the log or click the Browse button  and navigate to it.
5. Check the fields you want to store in the log. Use the Select All and Clear All buttons to quickly change the selection set.
6. Click OK.


### Opening an existing log

1. Click the GPS menu on the GPS toolbar and click Log Setup.
2. Click Open.
3. Choose a log and click Add.
4. Click OK.

### Closing a log

1. Click the GPS menu on the GPS toolbar and click Log Setup.
2. Click Close.
3. Click OK.

### Writing the current position to a log

1. Click the Stamp Current Position To Log button  on the GPS toolbar.  
If the button is unavailable, you may not have defined a log, or there might not be an open connection. Make sure you have an open connection (see [Connecting to a GPS device](#)), and either open an existing log (see 'Opening an existing log' above) or create a new one (see 'Creating a new log' above).

### Filtering data when streaming


1. Click the GPS menu on the GPS toolbar and click Log Setup.
2. Click the filters you want to use and update their values under Streaming options.  
The sampling rate is time based. The default is to log a position every second.

The units of the minimum sampling distance between points are set in the Display Options dialog box.

The minimum deflection angle is the absolute difference between the direction of the new position and the direction of the previous position. The direction is the azimuth from north as calculated between two positions. A new position is stored if the change in direction is greater than the minimum deflection angle.

3. Click OK.

#### ▶ Starting data streaming

1. Click the Start Streaming To Log button  on the GPS toolbar.

#### Tip

- If the button is unavailable, click the GPS menu and click Log Setup, then follow the steps above to create a new log or open an existing one.

#### ▶ Stopping data streaming

1. Click the Stop Streaming To Log button  on the GPS toolbar.