

Using the Trimble GeoXM GPS unit in the field

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Before using your GeoXM GPS unit, make sure you update all the software as described in “Updating GeoXM Software” and enter your settings as described in “GeoXM Settings.”

Starting

Launch ArcPad by tapping the Start button and choosing ArcPad 6 (this may be under Programs depending on your OS (Operating System) version).

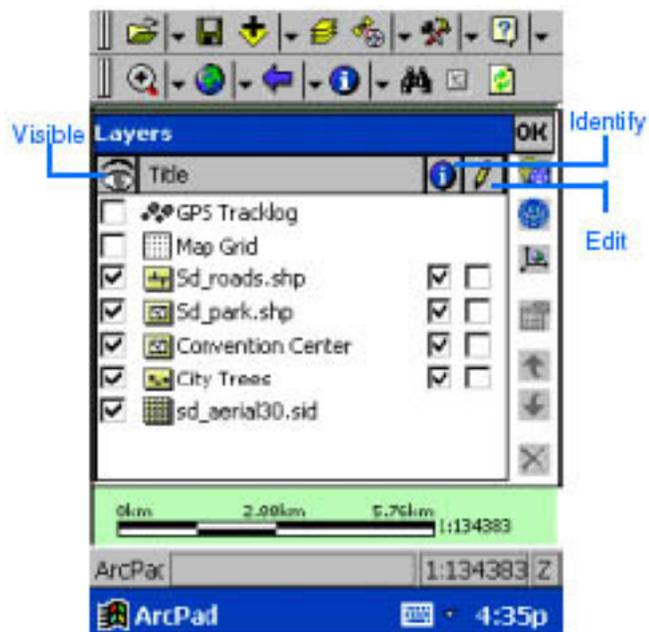
If you have a previously saved ArcPad project, you can open it by clicking the Open button in the top left hand corner (looks like a manila folder).

Now activate the GPS receiver, if it is not already activated, by tapping the dropdown arrow next to the satellite icon (between the layers button and the options button on the top toolbar) and choosing GPS Active (if there is a red box around the icon next to the words “GPS Active” then the GPS is already active and you should not tap GPS Active).

Tap the GPSCorrect button (which looks like the Trimble symbol and is by itself on the third or fourth toolbar) to launch GPSCorrect. This application shows you GPS satellite information. Return to the ArcPad application by either tapping the ArcPad icon in the Taskbar (at the bottom of the screen in some OS versions) or clicking Start (or the GPSCorrect button) and choosing ArcPad 6, depending on your OS. You can also just close GPSCorrect with the “x” button in the upper-right-hand corner; it will continue to run in the background. See the Troubleshooting section for more information about GPSCorrect.

Adding Data

You can add datalayers that you have uploaded from your office PC by tapping the Add Layer button, which looks like a black plus (+) symbol with a yellow background.  Then browse to your data and check their checkboxes to add them—all data should be stored in subfolders within \Disk\My Documents\. You can turn layers’ visibility on and off by tapping the Layers button, which looks like three yellow pieces of paper.  Check or uncheck the layers’ checkboxes (below the eye symbol)



to turn the layers' visibility on and off (you can also make them identifiable and editable with the other checkboxes, and change their draw order with the up and down arrow buttons). Add the layers that you think will be useful for the area you are working in. Turn off the visibility of any layers that are not currently useful or visible.

Moving around the map

ArcPad has fairly standard panning and zooming tools. They are on the second toolbar from the top. The first dropdown toolset has the Zoom In (magnifying glass with plus sign) , Zoom Out (magnifying glass with minus sign) , and Pan (hand) tools . To use these, select one by tapping it (it will now appear pressed-in, indicating that it is active) and then tap-and-drag on the map display. To select a tool that is not currently showing, tap the dropdown arrow to the immediate right of a tool, select the tool you want from the drop-down list, and then use it (by tapping-and-dragging on the map). The second and third dropdown buttonsets have some more self-explanatory zooming buttons. These just need to be tapped; you don't need to tap-and-drag on the map display. Bookmarks let you save a particular map extent so you can return to it later.

Finding your current GPS position

Before trying to collect data, make sure that you are receiving GPS positions. You can tell this two ways: in ArcPad, there will be a red circle with a pointy end  that should be moving around slightly as it receives positions from the satellites. If this circle isn't visible or if it has a red slash through it , or if the pointy end is not moving around, you are not receiving positions. Or, you can look at GPSCorrect's Skyplot screen; this will show you which satellites are in the sky and which you are receiving signals from, as well as whether you are receiving WAAS (real-time differential correction) signals. If you are receiving enough signals, it will also tell you your location's coordinates. See the troubleshooting section if you are not receiving position data.

Creating a new layer

ArcPad works by allowing you to edit and add GPS data to shapefiles (a GIS data format that stores map (location) and attribute (database) information). You can add data by drawing and manipulating it on the map, but you are more likely to add data from your physical position on the earth's surface, taken from GPS readings. If you have worked with the Trimble GeoExplorer I, II, or 3, or the ProXR units, you will notice that ArcPad works much differently. Instead of logging GPS data to a rover file, you will be directly editing shapefiles—you're essentially doing GIS work in the field.

If the layer you want to edit does not already exist, you'll need to create a new layer (shapefile) to store your GPS data. Tap the dropdown arrow next to the Open button and choose New Layer. Choose Point, Polyline (line), or Polygon (closed shape) from the dropdown menu depending on what type of data you want to collect. For instance, if you want to create a layer for trails, choose Polyline. If you want to create a layer to store property boundary markers or soil sample sites, choose Point.

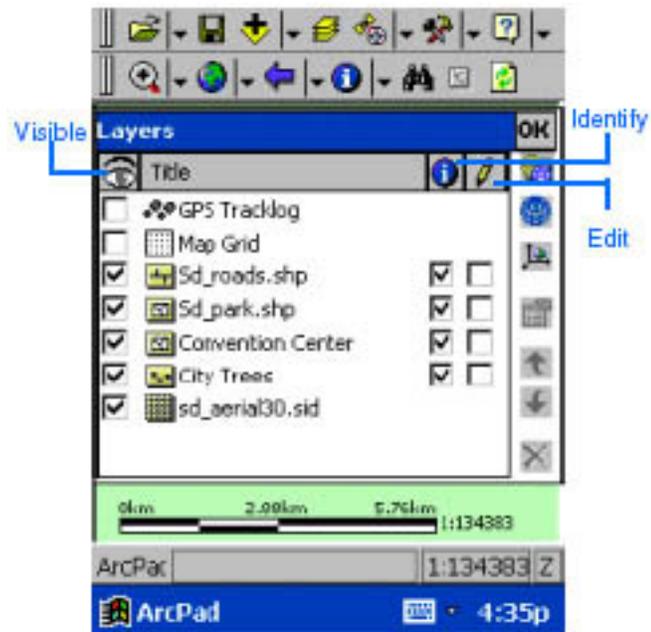
You'll want to add columns to the data table that is associated with your shapefile. If you have a similar shapefile on the GPS unit, you can import its fields (database table columns) by tapping Import... Otherwise you can manually add fields with the plus (+) button. Tap +, give your field a name*, choose the type of data the field will store (text, number, date, or T/F), and choose a length for the field (and a precision, or number of decimal places, if it is a number field). Add as many fields as you need, using the + button. Examples of fields would be Comments, Trail_Type, Name, Date, Took_Photo, Num_smpls, etc. It is a good idea to use a standardized set of fields wherever possible. If you have used a GeoExplorer or ProXR in the past, the fields essentially take the place of the Data Dictionary concept—they enable you to store information about each point or line or polygon you capture using GPS. You should always have at least one field, even if it's just a Comment field.

* To enter text into any text box, you need to use the Windows CE keyboard, which appears on screen. If the keyboard doesn't appear automatically, you can bring it up by tapping the keyboard icon at the bottom of the screen. Just make sure the blinking cursor is in the correct input area. Close the keyboard when you are done by tapping on the keyboard icon again.

Click OK and choose a name for your new shapefile. Now you have a new empty layer that you can add GPS location information to! When you create a new layer, it automatically becomes editable. You can change layers' edit status using the Layers button. You can simultaneously have a point, line, and polygon shapefile editable.

Making layers editable

Before you can record GPS data, you'll need an editable datalayer (shapefile). If you just created a new layer, it will automatically become editable. Otherwise, tap the Layers button (looks like three yellow sheets of paper ) to see the list of layers that are currently part of the map. In the column below the pencil icon there are checkboxes—tap the checkbox for the layer(s) you want to edit. If the layer you want is already checked, you should uncheck and then re-check it. You can only have one of each type of layer editable at once (one point, one line, and one polygon layer). Tap OK and you will see a new toolbar, which contains your editing tools.



Adding a point from GPS

To record a point at the place where you are standing, stand still and tap the GPS Point button, on the third toolbar; it has a satellite and a dot  (if you do not see the third toolbar, you'll need to return to the Layers dialog to set a point layer editable). This will start recording your position – if you set up your GPS unit as recommended in “GeoXM Settings,” it will take 30 readings and average them. While it is doing this, it will display a screen with two tabs, Attributes and Geography. **IF YOU ARE USING DCR CUSTOMIZED DATALAYERS, LIKE TRAILS, YOU WILL HAVE MORE TABS; SEE THE “CUSTOM DATA” SECTION BELOW!** Geography lets you know how far along the 30 readings are (and shows you the coordinates of your point) and Attributes lets you enter data about the point into your data table fields. Click on a Property name (like Trail_Type for example) and use the keyboard to enter data. **IMPORTANT:** Make sure you tap the Enter key on the keyboard (or just tap somewhere on the data entry area) when you are done with each piece of data entry! If you tap OK or tap the Geography tab while the cursor is still blinking at the end of your newly entered data, the data won't get saved!

Once you have finished entering your attributes and the 30 points have been taken, tap the OK button to enter the point into your editable point shapefile. Don't walk away from the point on the ground until the unit has finished taking the 30 readings or the point location will not be accurate.

It is also possible to add points and other shapes manually (not from GPS) by drawing them on the screen, but this is not generally as useful, unless you are unable to physically access an area but can see it on your background layers. You can do this by using the Point tool, available from the shape dropdown menu on the third toolbar.

Adding a Line or Polygon from GPS

Adding a line is similar, except that you walk along the linear feature while collecting GPS readings, and the number of readings you take depends on the length of time that you walk. Generally you take one reading for each vertex (corner) of the line instead of 30 readings for a point, but if you wish to be more accurate you can explicitly take a more accurate vertex. When recording line features, you enter the attributes after the line is done.

To record a line (such as a boundary, trail, or road) to your editable line shapefile, choose the Polyline button from the shape dropdown menu  (which is to the left of the GPS Point button). It will appear pressed-in. This starts the process of adding a polyline, but does not start adding vertices. There are two buttons that allow you to add GPS vertices: the Add GPS Vertex button  (looks like a satellite, a dot, and an x) and the Add GPS Vertices Continually button  (looks like a satellite, three connected dots, and an x). You can use any combination of these two buttons to create a single line. For instance, you can tap the Add GPS Vertex button at the start of your line (we have it set up to take 5 GPS readings and average them to create a single, more accurate vertex) while standing still, then when it is done with those 5 readings, tap the Add GPS Vertices Continually

button and start walking. We typically have it set up to take a reading every 3 or 4 or 5 seconds, which is a reasonable interval. If you are driving a car or riding a bike, you may wish to decrease the interval (see “GeoXM Settings”). If you get to a sharp corner and want to make sure that you record a vertex there, you could tap the Add GPS Vertices Continually button to stop recording continually, then tap the Add GPS Vertex button to take a 5-reading vertex while standing still at the corner, then tap the Add GPS Vertices Continually button again and start walking again. When you come to the end of the line, tap the Add GPS Vertices Continually button to stop recording continually, then tap the Add GPS Vertex button to record the final vertex with a 5-reading, more accurate vertex. Now you are done with the line, so tap the Polyline button again to end it. This will bring up the Attributes/Geography screen, where you can enter attributes just like with a point. Tap OK and your line is done!

You can also record your entire line using the Add GPS Vertices Continually button; just make sure you pause for a few seconds at the beginning and end of your line and at any sharp corners to make sure you get a reading there.

Recording a polygon is just like recording a line, except that the software automatically joins the last point to the first point to create a closed shape.

Viewing and Changing Your Attributes

You can view and even change the attributes you have entered in your new points, lines, and polygons.

To view the attributes of a point, tap the ID button (looks like the letter "i" in a blue circle, on the 2nd toolbar) so it looks pressed-in, then tap the point (or line or polygon) on the map window that you want to see (it helps to be zoomed in enough so that several features aren't on top of each other). This will bring up a form that is like the attribute entry form but is not editable. It shows the attributes that you entered for that point (you can also click on background layers to see their attributes). If you have trouble getting the attributes for the right layer to pop up, you may not be tapping accurately enough, the layers may be in the wrong order, or IDing may be turned off for the layer you are interested in. If you open the Layers dialog  you can reorder the layers so the one you are interested in IDing is on top, and check to see if the checkbox under the Identify column for that layer is checked.

To edit the attributes of a point, you can select it by tapping the Pointer tool (a black arrow, leftmost tool on the 3rd toolbar) so it looks pressed-in, then tap on the point you want. A dotted line will appear around the point to show that it is selected. Now you can tap the Feature Properties button (rightmost button on the 3rd toolbar, looks like a hand pointing to a piece of paper) and the attribute form for that point will pop up, showing all the attributes previously entered for that point, and they will be editable. When you are done editing them, tap OK to save them, or tap "X" to keep the original attributes.

Custom Data Layers

DCR GIS staff have created some custom datalayers that make data entry easier, more consistent, and more similar to the old Data Dictionaries that were used on the GeoExplorer and ProXR GPS units. These datalayers, such as Catchbasins and DCR Trails And Roads, have an extra file or two that go along with them that contain special data entry forms. The data adding process is identical to that described above, except that when it comes time to enter attributes, there are one or more new pages (tabs) that replace the Attributes tab (which is still there, but which you don't need to use). These pages have drop-down menus and other input spaces that will make it easier for you to enter data in the correct format. For instance, you will be presented with a choice between "Catchbasin," "Outfall," and "Manhole/Cleanout" instead of a blank space to type in. Or you may be presented with a checkbox or a blank field for typing. Tap the keyboard icon at the bottom of the screen to make the keyboard appear and disappear.

Navigating to a point

If you wish to navigate to a point using the GPS unit, you can do so using the Go To tool (There are several other ways to navigate—see the ArcPad manual for details).

Tap the dropdown arrow next to the Identify tool (to the left of the binoculars) and tap Go To. Now tap the map at the location you wish to navigate to—a label saying MARK will appear where you tapped. Open the GPS Position Window (tap the button to the right of the Layers button on the top toolbar) to open ArcPad's little GPS position window. This window shows the direction (BRG) and distance (DST) to your destination. Tap twice (not a double-tap, but two separate taps) on the circle in this window to get to the compass window. Here you will see a red line and dot that indicate the direction you want to go, and a black compass arrow that indicate the direction that you *are* traveling (this only works if you are in motion, because it calculates your direction of motion based on the change in your GPS position). It's a little confusing, but the idea is to get the black arrow to line up with the red. It may help to turn the GPS unit so that the red dot is pointing straight ahead. While you are walking you should see the DST (distance to your destination) decrease gradually until you reach your target.

To stop navigating, tap the Clear Selected button, which is to the right of the binoculars.

We have found that sometimes it is easier and more intuitive to just watch yourself (the red position icon) move across the map towards the intended destination rather than using the navigation tools.

Stopping your edit session

When you are done collecting data, you should close ArcPad.

To close ArcPad (and GPScorrect) tap the dropdown arrow next to the Open button (the first button on the top toolbar) and tap Exit. If you want, you can save the ArcPad project from the same menu first. This way you can load everything up just as you left it next

time you run ArcPad. Whether or not you save the project, the points, lines, and polygons you created were saved when you collected them, so you don't need to worry about saving them at the end.

To turn the GPS unit off, press the power button (the larger of the two gray buttons at the front bottom of the unit) briefly. This actually puts the unit into Suspend (sleep) mode. Do not hold the power button down – this will reset the unit, which can cause serious problems if done unintentionally. If you are not planning to use the unit again for three months or more, you should turn the unit off completely. See the Getting Started Guide that came with the unit for instructions on long-term Storage.

Back at the office...

If you have arranged to return the GPS unit to the GIS staff, we will download your data and map it or add it to the database. If you need to download data onto your office computer by yourself, you'll need a program call Microsoft ActiveSync and a special cradle that comes with the GPS unit. You'll create a Guest connection with the GPS unit and copy the necessary files using Windows Explorer. Then they can be emailed to GIS staff or you can process them yourself if you know how. Data should be downloaded and refreshed at least once a week.

If you are keeping the GPS unit overnight, it is essential to keep it on its charger cradle. The unit should be on the cradle whenever not in use to avoid running down the battery.

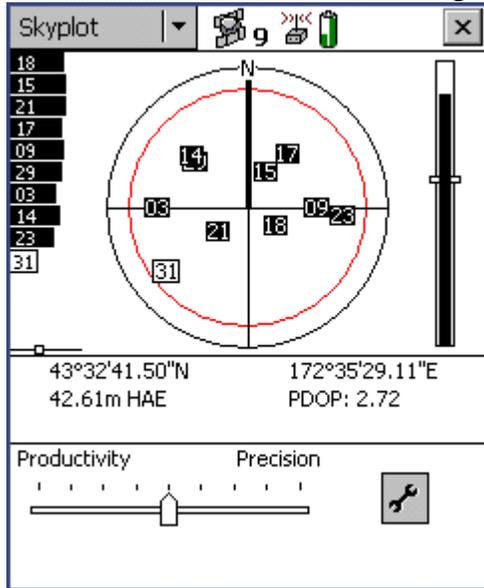
Troubleshooting

If you are having trouble receiving GPS positions, go through the following checklist in order, trying each option until one works. In ArcPad, if you are receiving valid GPS locations you will see a red circle with a pointy end  that keeps moving around slightly. If you don't see this or it has a slash through it, you are not receiving positions.

If you are receiving GPS data (the red circle on the map seems OK) but you can't seem to get vertices added to your line feature, make sure that the Polyline tool is pressed-in and that the streaming vertices button is also pressed-in.

- 1) Make sure the GPS is active: tap the dropdown arrow to the right of the satellite icon  on the top toolbar. There should be a red square around the icon next to "GPS Active". If not, tap on "GPS Active".
- 2) Open GPScorrect and see if it is receiving GPS information. Tap on the GPScorrect icon (on the toolbar that has just one icon on it—it looks like a globe with a triangle superimposed on it). In GPScorrect, make sure you are on the Skyplot screen (available from the upper left dropdown). You should see several solid black satellites in the circular skyplot. This screen will also show you the PDOP, your GPS position (if receiving data) and some other graphics that

indicate various reception conditions. If you see a message that says “Attempting to connect to GPS receiver” you may need to adjust your settings in ArcPad and GPSCorrect; see the GeoXM Settings document.



- 3) If the GPSCorrect Skyplot screen says “Too few satellites,” you will need to either reposition yourself or wait for several minutes (if you just turned on the unit it may need to initialize itself for a few minutes—longer if it hasn’t been used in a while). If you think that the satellite signals are blocked by trees, hills, buildings, etc., try holding the unit up higher or moving around slightly. If absolutely necessary you can take a point nearby and make a note that the actual point is (for example) 10 meters north of the GPS point.
- 4) If you are getting enough satellites but your PDOP is too high (it is shown on the Skyplot screen - . PDOP (Percentage Dilution of Precision) is a numerical measurement of the accuracy of the data you are getting, based on the “constellation,” or arrangement of satellites in the sky), you may need to wait a few minutes for the satellite constellation to change, move your location slightly to try to pick up some new satellites, or, if that doesn’t work, raise your PDOP mask. The default PDOP mask setting is 6 (any PDOP value below 6 will be accepted) but you can raise the mask to 7 or 8 (never above 10!) if the values you are getting are just slightly above 6. If the values are very high (above 10) you should not raise the PDOP mask to attempt to include them; you will sacrifice too much quality. Make sure you move the PDOP down to 6 or 7 again later to make sure you are getting high accuracy data. The easiest way to adjust the PDOP is by using the Productivity-Precision slider.
- 5) Call GIS staff if you still can’t figure out how to get data!

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