



GEOMATICS, INC.



Version 1.31

User Guide



GEOMATICS, INC

Information in this document is subject to change without notice. No part of this document may be reproduced, modified or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of Aphelion Geomatics, Inc.

© 2001 APHELION GEOMATICS, Inc. All rights reserved.

Earth Tracer is a registered trademark of Aphelion Geomatics, Inc.
Windows is a registered trademark of Microsoft Corporation.
Microsoft is a registered trademark of Microsoft Corporation.
Windows 95 is a registered trademark of Microsoft Corporation.
Windows 98 is a registered trademark of Microsoft Corporation.
Windows NT is a registered trademark of Microsoft Corporation.
AutoCAD is a registered trademark of Autodesk, Inc.
ESRI and ArcView are registered trademarks of Environmental Systems Research Institute, Inc.



Table of Contents

INTRODUCTION	1
About this Manual	1
List of Symbols Used In this Manual	2
Hardware Recommendations	3
Terminology	3
Help Us Help You	4
Getting Help	4
 CHAPTER ONE	 5
Loading Earth Tracer	5
Starting Earth Tracer	5
Understanding the Earth Tracer Opening Display	6
Setting your GPS Receiver Communications	8
Setting Up Your Map Projection	9
Setting up your Map Window	11
Exiting Earth Tracer	12
 CHAPTER TWO	 13
Starting GPS receiver communication	13
Stopping GPS receiver communication	14
Setting your stream distance	14
Creating a new Earth Tracer line entity	14
Saving a new Earth Tracer line entity	15
Completing a line entity	15
Creating a new Earth Tracer point entity	16
Saving a new Earth Tracer point entity	16
Completing a point entity	17
Creating a new Earth Tracer polygon entity	17
Saving a new Earth Tracer polygon entity	18
Removing a point during data collection	18
Adding a point during data collection	19
Clearing an Earth Tracer entity	19
Saving an Earth Tracer entity to a file	19
Using the Right Mouse Button	20
Zoom/Pan Functions	20
Zoom In	20
Zoom Out	20
Zoom Reset	20
Zoom To First	20
Zoom To Last	21
Panning	21
AutoPan	21
Data Recovery	22
The Help Menu	22
About Earth Tracer	22



GEOMATICS, INC

CHAPTER 3	23
Load your Back Entity	23
The Grid Sampling Dialog Box	25
INDEX	29
APPENDIX A - UTM MAP ZONES	A-1
APPENDIX B - LICENSE AGREEMENT	B-1
1. Grant of License	B-1
2. Restrictions:	B-2
3. Copyright	B-2
4. Limited Warranties	B-2
5. Disclaimer	B-3
6. Limitation of Liability	B-4
APPENDIX C - PROGRAM DATA CAPTURE PROCESS	C-1



GEOMATICS, INC



GEOMATICS, INC

Introduction

Welcome to the Earth Tracer™ program. Several functions and features are built into this program to assist with mapping land features using your GPS receiver and a laptop. This release offers an all in one position detection and tracking package that will help you:

- 1) Collect ground positions and elevations on land features such as roads, field boundaries, and water boundaries
- 2) Save your work to file.

About this Manual

The following *User Manual* is intended for those people who already have some introductory experience with Microsoft Windows 95/98/NT™ programs. You should know how to use a mouse, select programs, choose commands, and resize windows. You will also need a familiarity with desktop/laptop computer hardware, such as disk drives and a mouse. You will also need an understanding of your GPS receiver. Therefore, no instructions or visuals are included for using or operating your computer or GPS receiver.

Each chapter contains an overview of the topics that are to follow. The user is urged to read as much of this manual as possible. Reading this manual will save you time in the long run. This manual is filled with illustrations and steps that will show you through each task and command.

List of Symbols Used In this Manual

As stated, our intention is to provide you with a manual that will be simple to use and easy to understand. We have included a number of symbols that can make learning Earth Tracer™ an easier task.



Quick Reference: Refers you to information on a previously discussed task. Beside or below the quick reference icon, the task and page location will be provided.



Closer Look: Allows you to take an in depth examination of the current command under discussion.



Note: Highlights an important point that can further assist you with your task.



Reminder: Helps you recall a step that must be performed before and/or after the current task.



Quick Tip: Identifies areas where you can save time performing tasks.



Hardware Recommendations

The minimum recommended computer hardware requirements for Earth Tracer™ are as follows:

- 1) Pentium® 266 MHz processor with 32 MB RAM (PCI or local bus)
- 2) Accelerated video card with 2 MB DRAM (PCI or local bus)
- 3) 5 Megabyte hard drive space
- 4) VGA Screen (Transflective color or greyscale optimal)
- 5) Windows NT®, Windows 98® or Windows 95® operating system
- 6) Mouse device
- 7) GPS Receiver (differential correction preferred) using NMEA 0183 interface standard and a serial out port.

Terminology

Throughout this manual, we use a number of terms and concepts that you may not be familiar with. The following definitions of terms and concepts may be of some help to you.

Digitizing: The act of tracing topographic sites or geographic features into a digital computer file. Digitizing is most often performed with GPS receivers, from maps, tablets, or display screens.

Entity: a graphical piece of data that represents a land feature. Entities are points, lines, or polygons. For example a road feature would be represented by a line entity, a farm field feature by a polygon entity, and a fire hydrant feature by a point entity. Note that an entity can contain only one of the following types of features: lines, points, or polygons,. Furthermore, only one type of feature can be in a layer. For example a layer cannot contain both points and lines.

GPS: Global Positioning System (GPS), refers to a constellation of spaceborne satellites orbiting the earth. A GPS receiver picks up and triangulates the satellite signals to provide you with a location on the ground in the form of map coordinates. GPS is capable of providing highly accurate navigation signals worldwide.

GIS: A Geographic Information System (GIS), refers to a computer program used by land resource managers such as farmers, foresters, and geologists. Unlike spreadsheets or database software, a GIS also integrates geographic and/or cartographic spatial data to provide and create additional information.



GEOMATICS, INC

Line: A line is commonly referred to as a vector and consists of two or more points joined together. As a layer, a line can be given a name based on some attribute, such as: a road, power line, or irrigation ditch.

Points: A point is essentially a feature that is not associated with distance. Points can include items such as: water wells, lamp posts, or houses.

Polygon: A polygon is an area and consists of three or more vectors. The beginning and ending point connect to close the feature. A field boundary is a polygon.

Stream Distance: The distance (in meters) between collected locations in a line, point or polygon entity. It can be set by the user.

Help Us Help You

We're interested in your comments or suggestions and want our relationship with you to grow. Your input will help us build a better product for you and your colleagues.

If you should need further assistance or would like to offer a suggestion, we've established a customer email service.

You can contact us by email: aphelion@prairie.ca Our fax number is: (204) 488 0132.

You can also write us at:

Aphelion Geomatics™, 199 Centennial St., Winnipeg, Manitoba, Canada R3N 1P4

Getting Help

We've outlined this manual to introduce you to the concepts, commands, and methods of Earth Tracer™ software. Once you've learned all this manual has to offer, you'll be a fairly confident user.

Chapter One

Basics

In this first chapter we show you how to load Earth Tracer onto your hard drive. You'll also be introduced to some of the basic skills used in the program, such as starting Earth Tracer, setting up your map display, setting your map projection and GPS serial communications.

Loading Earth Tracer

To install Earth Tracer under Windows 95/98 or Windows NT 4.0

- 1) Start Windows 95/98/NT.
- 2) DOUBLE-CLICK the **setup** icon in the folder where you downloaded Earth Tracer.
- 3) CLICK **Finish**. Earth Tracer will begin the installation procedure.
- 4) In the Earth Tracer setup screen, CLICK **Next**.
- 5) Accept the default directory or enter your own destination, CLICK **Next**.

Depending on your installation options, you may be prompted to restart your computer.

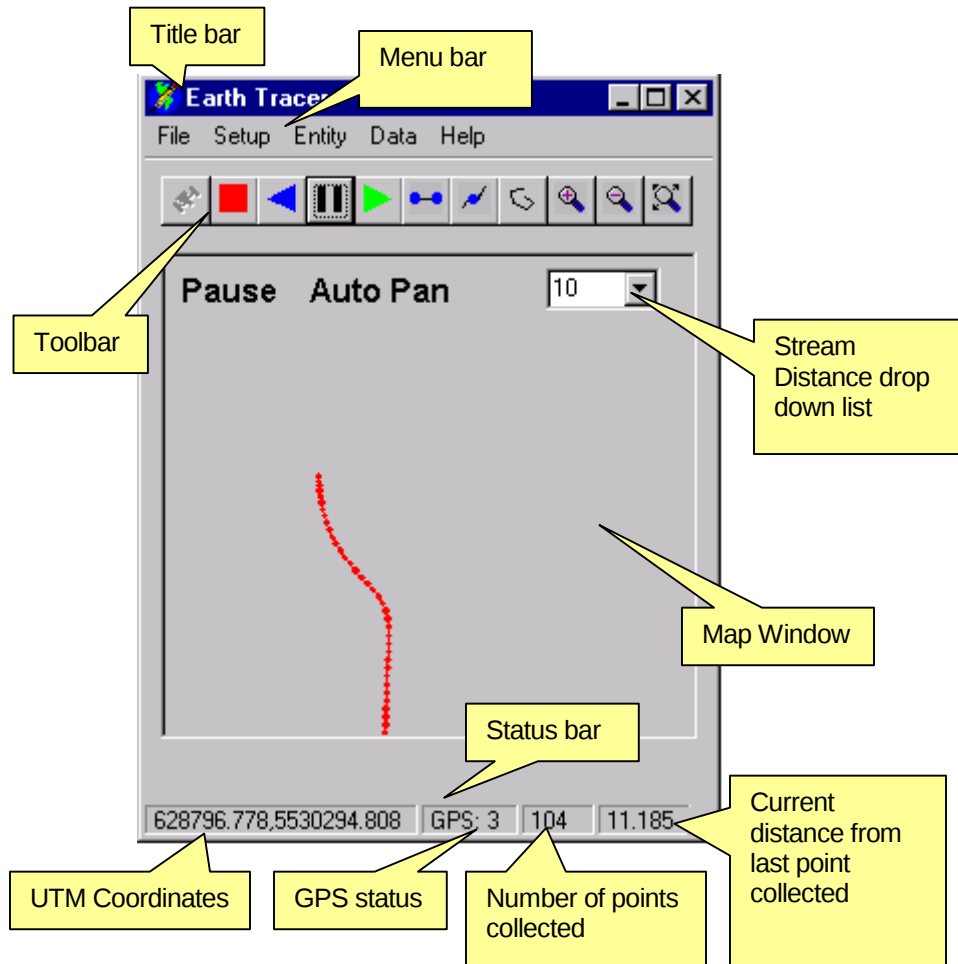
Starting Earth Tracer

To start Earth Tracer in Windows 95/98/NT:

- 1) CHOOSE **Start/Programs/Earth Tracer**.

Understanding the Earth Tracer Opening Display

As shown below, the opening display is made up of several components.



Title Bar: Identifies the program, the name of the field currently being worked on, and can be used to reposition the window on your screen.

Menu Bar: Displays the tasks you select to access the commands contained beneath the menu.

Toolbar: Provides quick access to commonly used commands. Some commands shown on the Toolbar can also be accessed from the tasks on the Menu bar.



GPS setup: set serial port communications and UTM map zone



Reset Entity: clear your current entity selected and erase the screen.



Remove Last: remove the last point collected



Pause: temporarily hold data collection



Start GPS: connect the gps receiver with the software on your laptop



Stream Distance: shows the stream distance drop down list in the map window. You can then selected a predefined distance or enter your own.



Add point: click this button to add a new point in your entity at your current location.



Close polygon: visible only when the polygon entity is checked. Click this button to close and end your polygon entity.



Zoom In: click this button to magnify the map window.



Zoom out: click this button to reduce the map window.



Zoom Reset: resets the map window to the full extents of the entity.

Stream Distance Drop down list: Appears when the stream distance button is hit. It determines when a new position will be collected based on the distance from the last point collected.

Map Window: Illustrates you current position and results of your data capture.

Status Bar: Specifically identifies the map location of your current position, the status of GPS reception, the number of points collected, and the distance from your current position to last point collected.



GEOMATICS, INC

Setting your GPS Receiver Communications

Before you can begin to collect entities, you need to setup your GPS receiver with Earth Tracer. Earth Tracer communicates with your GPS receiver through your computers serial port. For your GPS receiver, you'll need to set its baud rate and communications protocol. Be sure your GPS receiver is set to send in the National Marine Electronics Association (NMEA) 0183 communications standard. You also need to set the baud rate of your GPS receiver. Earth Tracer can receive baud rates of 2400, 4800, 9600, 19200, 38400, and 57600. *The parity, databits, and stop bits must be set to N,8,1 respectively.* Thus if you want to send at 9600, your GPS receiver must be set as: 9600,N,8,1 Refer to your GPS receiver manual to set the communications.



Make a note of your GPS receiver settings to help you set up Earth Tracer.



Your GPS Receiver and Earth Tracer serial communications must match exactly, otherwise it won't work.

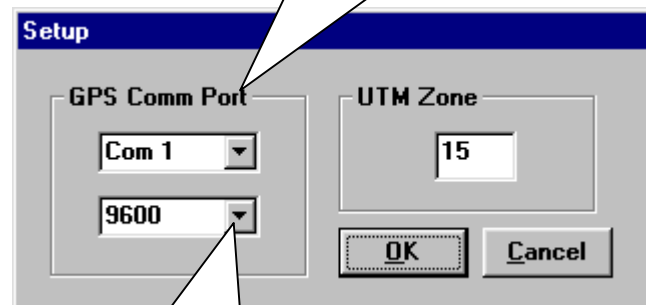


Be sure the NMEA string for your GPS receiver is sending the GPGSA and GPRMC sentences. To view speed and direction you must also have either GPRMC or GPVTG sentences enabled on your GPS receiver.

To set you GPS receiver serial port settings in Earth Tracer:

1) CHOOSE Setup/GPS

2) SELECT the Serial port you've connected your laptop to your GPS receiver with.



3) SELECT the baud rate you set your GPS receiver at.

4) CLICK the OK button.



Earth Tracer™ remembers your last com port settings. Unless you change your GPS receiver com port settings, there's no need to enter them each time you use the program.

Setting Up Your Map Projection

In order for entities to relate with one-another, a common map projection is required. A map projection is a mathematical means of translating the Earth's curvature to a two-dimensional flat medium such as paper or a computer display.

Latitude and longitude coordinates collected by GPS systems for example, don't enable accurate area and distance calculations. Earth Tracer uses the UTM (Universal Transverse Mercator) map projection to permit area and distance calculations. UTM is a commonly used projection around the world.

To determine your UTM zone, connect your GPS receiver to your laptop/computer's serial port.

After starting your GPS receiver:

- 1) CLICK the Start GPS button.  Wait until either a "2" or "3" appears on the GPS status bar widow
- 2) RIGHT-CLICK on the Map Window. The GPS Status dialog box appears.

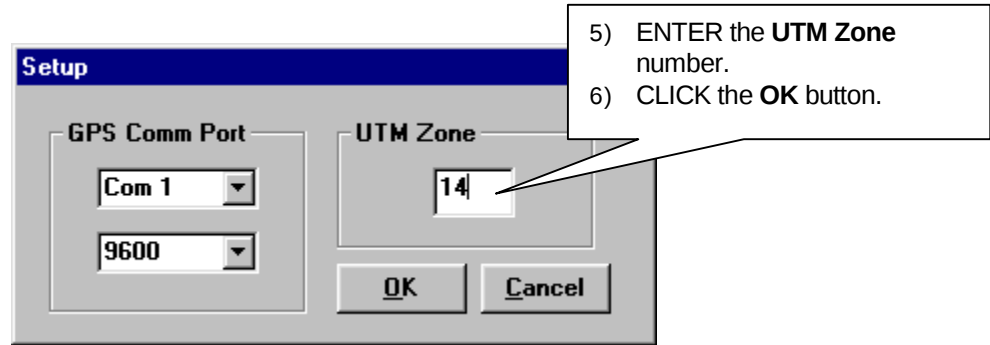
Compare the Longitude position with the "Longitude Range" column found in the UTM Zone table located in Appendix A . In the example shown above, the Lon of 97.173533W would fall under UTM Zone 14.



Make sure you set the UTM zone before you start collecting entities for the first time.

To setup your UTM zone:

- 3) CLICK the **Start GPS** button to turn off reception and the enable the Setup button.
- 4) CHOOSE **Setup/GPS**.



Important! Most GPS units collect coordinates using the **WGS 84 datum**.



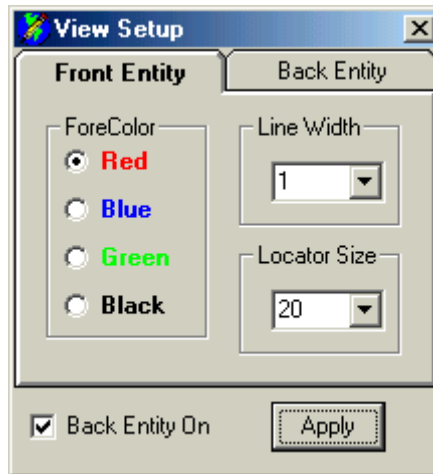
Earth Tracer will store your UTM Zone number and load it each time you use the program.

Setting up your Map Window

In Earth Tracer, you can setup the color of your entities, the size of your locator, and the width of the lines you're collecting. These features are strictly for display purposes and do not affect how your entity will be saved.

To setup your Map window:

- 1) CHOOSE Setup/View. The View Set Up dialog box appears.



The Front Entity Tab is used for view properties of active GPS tracing. The Back Entity Tab is used to set the view properties of your back ground entity.

The **ForeColor** (BackColor under Back Entity Tab) selections determine the color of both your points and lines on the display. To select a color simply click the color of choice.

The **Locator Size** (Point Size under Back Entity Tab) drop down list sets the size of your locator (current position) and the size of the captured points. The Locator size is set in meters. Thus a Locator size of 20 sets the locator to a scaled size of 20 meters on the ground.

The **Line Width** drop down list sets the thickness of a line or polygon perimeter. You can set the thickness from 1 thinnest to 5 thickest.

The **Apply** button sets your View properties and stores them to the program.

The **Back Entity On** Checkbox toggles the entity on or off the view window.

Exiting Earth Tracer

To Exit EARTH TRACER:

- 1) CHOOSE **File** from the Menu bar.
- 2) MOVE down to **Exit**.
- 3) CLICK your left primary **mouse** button.

Chapter Two

Collecting point, line, and polygon entities

In this chapter we'll show you how to start collecting data. Editing features will also be introduced that will make field collection easier to perform. Finally, we'll show you how to save your work to a file for use in other software packages.

In Earth Tracer you create one entity at a time. This means that if you want to create a boundary around several parcels of land such as farm fields, you would capture and save each field separately as polygon entities.

Starting GPS receiver communication

Before you can start an entity, be sure your GPS receiver is turn on and connected correctly to your laptop/computer. Be sure that Earth Tracer is also set to the right serial port, baud rate and UTM map zone before you begin.



Refer to Chapter one to setup your Earth Tracer GPS software.

- 1) CLICK the **Start GPS** button to start collecting information from your GPS receiver to Earth Tracer.

Once you've started you're GPS, there should be no need to stop the GPS reception.



You may want to check your stream distance before you start a new entity.



After you start GPS communications, notice how the GPS Setup button becomes disabled. You can't setup your GPS or map projection once GPS communications have been started. Stop GPS communications if you want to enter the setup dialog.

Stopping GPS receiver communication

- 1) CLICK the **Start GPS** button to stop serial port communications. The GPS Setup button becomes enabled.

Setting your stream distance

The stream distance is the distance between collected locations. If the stream distance is set to 20, for example, then the next coordinate will be collected when you reach a distance of greater than or equal to 20 meters from the last point. You may find that this distance can be much greater due to your rate of speed. Setting the stream distance to zero will stream points continuously. You may find that low stream distances will also continuously stream points, depending on the positional accuracy of your GPS receiver and/or differential correction. You can see how far you are from your last point collected in the lower right status bar box.

- 1) CLICK the **stream distance** button. The stream distance drop down list appears in the upper right corner of the map window.
- 2) SELECT an existing **stream distance** factor or enter your own from the drop down list. Earth Tracer only accepts integer values.
- 3) CLICK the **stream distance** button to hide it.

Creating a new Earth Tracer line entity

Line entities include land features such as roads, power lines, pipelines, etc. Before you start a line, be sure you are at the exact position where you want to begin.

To create an Earth Tracer line entity:

- 1) CHOOSE **Entity/Line**. Your first point is now collected.

With your first location logged, you'll notice the point indicator change from 0 to 1. As you travel along your land feature, new locations will be added based on your stream distance.

When you have reached the end of your line you can save it as either a comma delimited text file or as an AutoCAD® dxf line file.

Saving a new Earth Tracer line entity

You can save a line entity as an AutoCAD® dxf or comma delimited text file at anytime during the data collection process. Saving often will help save data in the interim of the data collection process and guard against total data loss due to some hardware/software failure.

To save your line entity as a dxf file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT **Autocad files (*.dxf)** files from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your line entity as a comma delimited file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT Text files (*.txt) from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your line entity as a shape file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) ENTER a file **name**.
- 3) SELECT ***.shp** from the save as drop down list.
- 4) CLICK the **Save** button.

Completing a line entity

To complete a line entity:

- 1) CHOOSE **File/Save** and make your final file save for the line entity and format(s) of your choosing.
- 2) CHOOSE **Entity/Line**. This will uncheck Entity/Line, and clear the both the map and coordinate windows. It will also enable all entity types for making a new selection.



To finish your line entity, be sure to make your last file save. Once you Uncheck the line entity under the Entity/Line menu, all data will be lost!



GEOMATICS, INC

Creating a new Earth Tracer point entity

Point entities include land features such as fire hydrants, transmission towers, light standards, etc. Before you start taking points, be sure you are at the exact position where you want to begin.

To create an Earth Tracer point entity:

- 1) CHOOSE **Entity/Point**. Your first point is now collected.
- 2) CLICK the **Add point** button whenever you want to log more locations.

With your first location logged, you'll notice the point indicator change from 0 to 1. As you collect more points, the point indicator will change.

Saving a new Earth Tracer point entity

You can save a point entity as an comma delimited text file, AutoCAD® dxf file or ESR® shape file at anytime during the data collection process. Saving often will help save data in the interim of the data collection process and guard against total data loss due to some hardware/software failure.

To save your point entity as a dxf file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT **Autocad files (*.dxf)** files from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your point entity as a comma delimited file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT **Text files (*.txt)** files from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your point entity as a shape file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) ENTER a file **name**.
- 3) SELECT ***.shp** from the save as drop down list.
- 4) CLICK the **Save** button.

Completing a point entity

- 1) CHOOSE **File/Save** and make your final file save for the point entity and format(s) of your choosing.
- 2) CHOOSE **Entity/Point**. This will uncheck Entity/Point, and clear the both the map and coordinate windows. It will also enable all entity types for making a new selection.



To finish your point entity, be sure to make your last file save. Once you Uncheck the point entity under the Entity/Point menu, all data will be lost!

Creating a new Earth Tracer polygon entity

Line entities include land features such as roads, power lines, pipelines, etc. Before you start a line, be sure you are at the exact position where you want to begin.

To create an Earth Tracer polygon entity:

- 1) CHOOSE **Entity/Polygon**. Your first point is now collected. The Close polygon button appears on the toolbar.

With your first location logged, you'll notice the point indicator change from 0 to 1. As you travel along your land feature, new locations will be added based on your stream distance.

- 2) CLICK the **Close Polygon** button to snap back to the origin and close the polygon. This completes the polygon entity.

After you have closed your polygon you can save it as either a comma delimited text file, a AutoCAD® dxf polygon file, or ESRI® shape file.



GEOMATICS, INC

Saving a new Earth Tracer polygon entity

You can save a point entity as an AutoCAD® dxf or comma delimited text file at anytime during the data collection process. Saving often will help save data in the interim of the data collection process and guard against total data loss due to some hardware/software failure.

To save your polygon entity as a dxf file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT **Autocad files (*.dxf)** files from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your polygon entity as a comma delimited file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) SELECT **Text files (*.txt)** files from the Save as type drop down list
- 3) ENTER a file **name**.
- 4) CLICK the **Save** button.

To save your polygon entity as a shape file:

- 1) CHOOSE **File/Save**. The file save dialog box appears.
- 2) ENTER a file **name**.
- 3) SELECT ***.shp** from the drop down list.
- 4) CLICK the **Save** button.

Removing a point during data collection

At anytime during your data collection process you can remove the last coordinate.

- 1) CLICK the **Remove last** button to erase the last point collected. The point indicator will be reduced by one each time you press the remove last button.

This automatically puts Earth Tracer in Pause mode since it would otherwise add a new location if your current position exceeded the stream distance from the last point in memory. This pause gives you an opportunity to go back to another location before proceeding with data logging. To exit from pause mode, CLICK the Pause button.

Adding a point during data collection

You can add a point at anytime during your data collection process, regardless of where your stream distance is set at. This gives you the chance to log important changes in the shape of the feature you're collecting.

To add a point:

- 1) CLICK the **Add Point** button.

Clearing an Earth Tracer entity

To clear an Earth Tracer entity:

- 1) CLICK the **Reset Entity** button.

Saving an Earth Tracer entity to a file

You have three options when saving an Earth Tracer entity. You can save it as either a comma delimited text file for import into software such as Microsoft® Excel , a AutoCAD® dxf file or ESRI® shape file. You can save out your data at any time during the collection process.

When saving a dxf file, the type of dxf file created will depend on the entity type collected. If you made a line entity, then only the dxf line save will be active, when making a point entity, only the dxf point line will be active, and when making a polygon entity, only the dxf polygon save will be active.



After saving your Earth Tracer dxf file into AutoCAD®, use zoom-extents to see your data. Earth Tracer dxf export files were tested with AutoCAD® 2000



We recommend that you name your file something after the entity you created for easier recall.



For specifics on saving line, point, or polygon entities refer to: "Completing a line entity", "Completing a point entity", or "Completing a polygon entity" respectively.



GEOMATICS, INC

Using the Right Mouse Button

- 1) CLICK the **right mouse** button. The GPS Status dialog box appears.

Zoom/Pan Functions

Zoom consists of a number of features that enable you to navigate within your region. You can magnify or reduce your view, as well as move around in your area. All of these functions are found on the toolbar.

Zoom In

Zoom In allows you to focus in on an area in your region.

To use Zoom In:

- 1) CLICK the **Zoom In** button. Your region will magnify up in 20 percent increments of the currently displayed area.

Zoom Out

Zoom Out enables you to reduce the current magnification by 20 percent of your focused area.

To use Zoom Out:

- 1) CLICK the **Zoom Out** button

Zoom Reset

Zoom Reset sets your view to the entire file region.

To reset your view:

- 1) CLICK the **Zoom Reset** button. Your display will zoom out to view your entire region.

Zoom To First

Zooms and displays the first point collected, regardless of what's currently displayed.

To use Zoom To First:

- 1) CLICK the **right mouse** button.
- 2) CHOOSE **Zoom To First**.

Zoom To Last

Zooms and displays the last point collected, regardless of what's currently displayed.

To use Zoom To Last:

- 1) CLICK the **right mouse** button.
- 2) CHOOSE **Zoom To Last**.

Panning

To Pan:

You can pan around the view window at any time by simply clicking the left mouse button on the map window. The screen will center on this position at your current magnification.

AutoPan

AutoPan will “follow” the last point collected. When the last point collected reaches the edge of the map window, autopan will “jump” to the last point to enable viewing of the data collection. AutoPan sets the window size to a 2 km by 2 km area as it pans.

To enable AutoPan:

- 1) CHOOSE **Setup/AutoPan**. The AutoPan indicator appears in the top center of the map window.



If you click either the zoom in, zoom out, or zoom reset button, AutoPan will disable.

To disable AutoPan:

- 1) CHOOSE **Setup/AutoPan**. The AutoPan indicator disappears.



GEOMATICS, INC

Data Recovery

Earth Tracer GPS records each coordinate to a subfile during the data collection process for a chosen entity type. This important feature allows you to recover data lost due to some unforeseen event such as a power failure on your computer or some other software/hardware problem. This subfile will remain intact until you reset and clear the current entity, exit the program, or start a new entity.

To recover your entity:

- 1) CHOOSE Data/Recovery. The subfile will be loaded and the entity type will be reactivated. You'll need an active GPS receiver before you can recover your data.



Remember that you can save your entity at anytime during the data collection process! If the Data\Recovery option is "grayed out" then no data was recoverable.

The Help Menu

About Earth Tracer

Opens a window that describes the current version of Earth Tracer on your system. About Earth Tracer also provides copy write notification.

To view About Earth Tracer

- 1) CHOOSE **Help/About Earth Tracer**

Chapter 3

Grid Sampling

In this chapter we'll show you how to perform a systematic grid sample scheme. Grid sampling is a common form of collecting data on a study area such as a farm field. Primarily we'll take a look at the Grid Sampling dialog that will aid you in setting up your systematic sample design. This chapter makes no attempt to assist with determining the number of samples you need to collect for your application or any statistical analysis required prior to sampling.

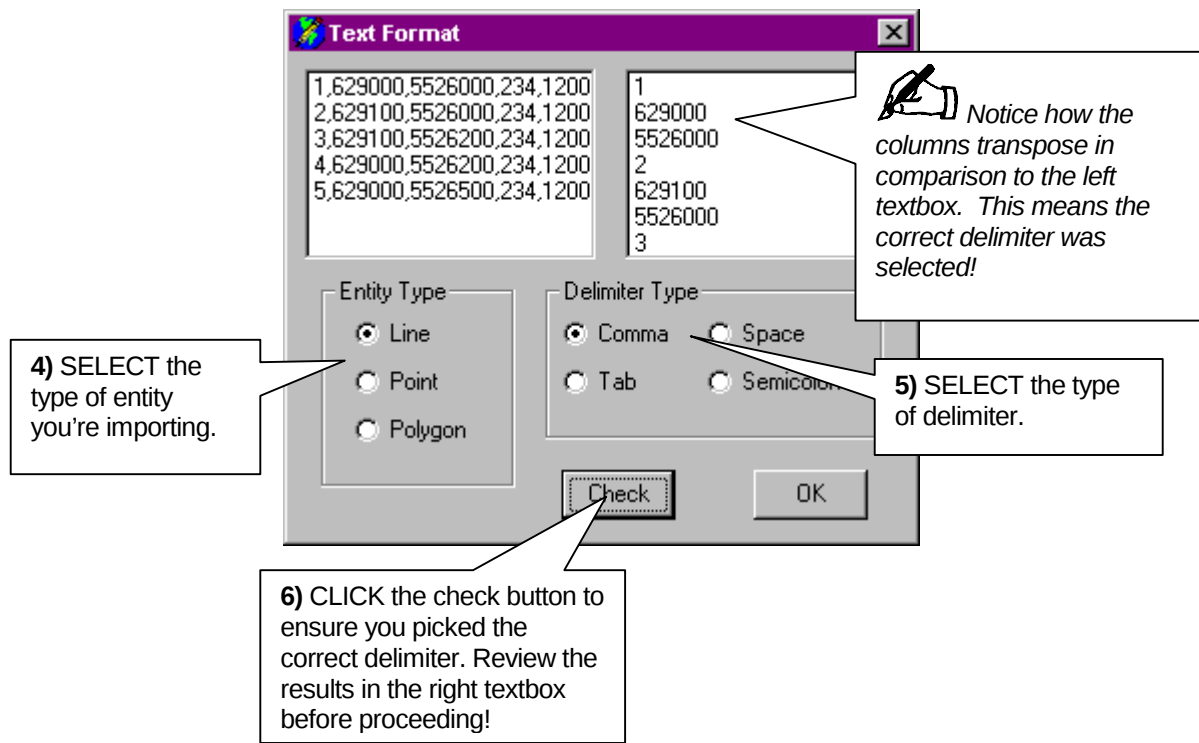
The core steps involved in grid sampling are to first collect a polygon boundary of the study area. This boundary is later used as a border for your interpolation software to stop interpolation. Most importantly its used by you in the field to set up the grid. Once the grid is set up, you simply locate yourself over the grid intersections that fall in the boundary and log your point. Depending on the sampling, as in the case of precision farming, you would then collect your soil samples. The surveyor would continue until all intersections found within the boundary (loaded as a backdrop in Earth Tracer) are sampled.

Load your Back Entity

Before you can start collecting sample points, you need to have a boundary of the study area. You can collect your field boundary directly with Earth Tracer GPS (recommended) or import one. It's best to collect your study area boundary just prior to sampling to ensure the most current boundary is available.

To load your back entity:

- 1) CHOOSE File/Open.
- 2) SELECT your file in delimited text format.
- 3) CLICK the Open button.



7) CLICK the OK button to accept and view the background entity.

Assuming you're currently located over the study area with active GPS, the file will appear in the view window.



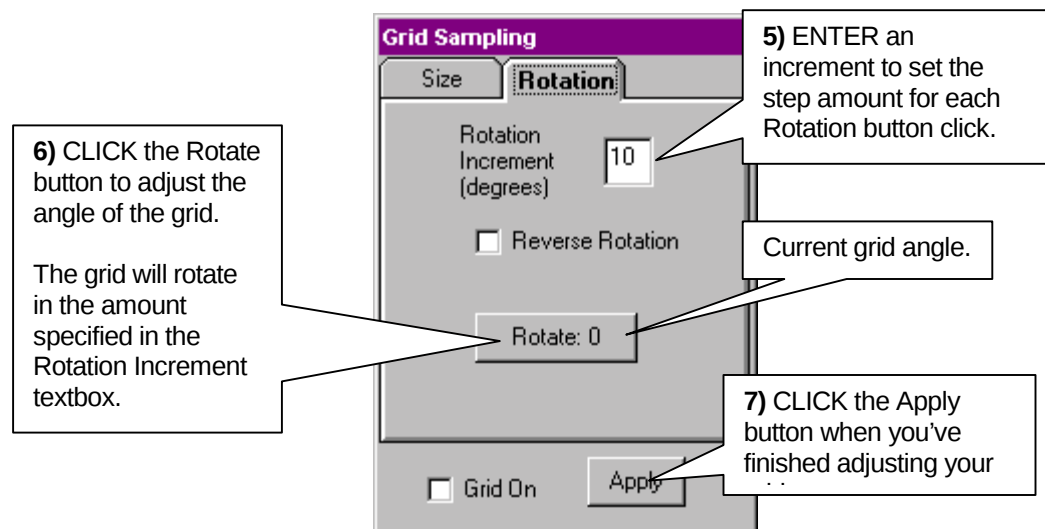
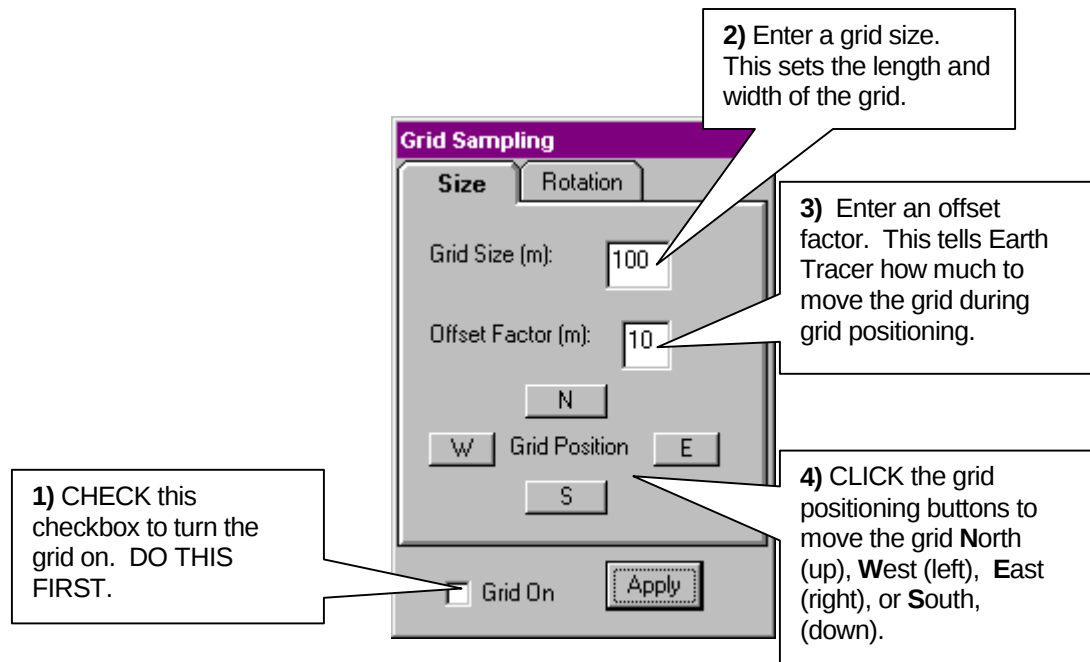
Your GPS receiver must be active and able to collect data before you can load your background file.



To turn off your current background entity, CHOOSE Setup/View and UNCHECK the Back Entity On checkbox.

The Grid Sampling Dialog Box

Once you have your boundary loaded as a backdrop, the next step is to lay a grid over it. The grid sampling menu offers you a variety of controls to adjust the size, location and angle of the grid over the background boundary. In general, you want to position the grid so that the first line of gridded intersections falls midway along a boundary.

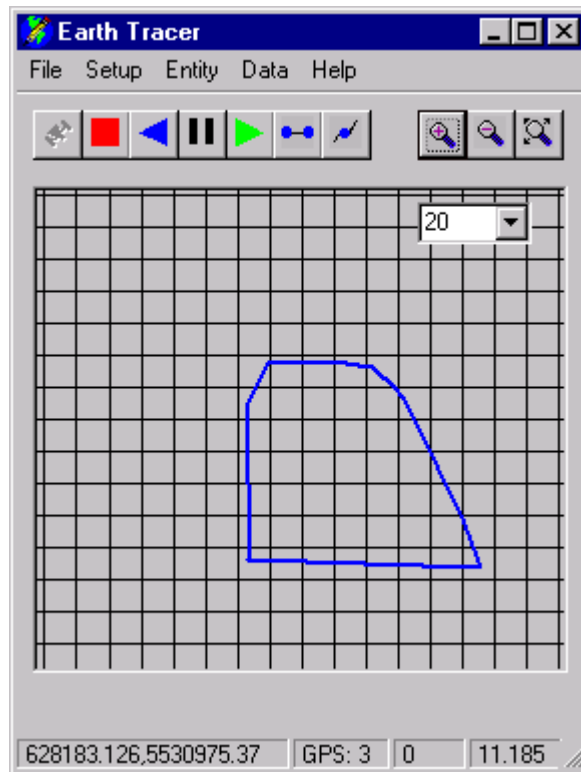




GEOMATICS, INC



Your GPS receiver must be active and able to collect data before you can load the grid sampling dialog box.



Note the location of the intersections that start approximately halfway inside the field boundary.

Sample grid positioned on a field boundary.

In summary, use the decision tree on the following page to help you use Earthtracer's grid control.





GEOMATICS, INC.

Index

A

Adding a point during data collection, 19
AutoPan, 21

B

Back Entity On, 12
Back Entity Tab. *See* View Setup

C

Completing
 line entity, 15
 point entity, 17
Creating a new Earth Tracer line entity, 14
Creating a new Earth Tracer point entity, 16
Creating a new Earth Tracer polygon entity, 17

D

Data/Recovery, 22
Definition
 Digitizing, 3
 Entity, 3
 GIS, 3
 GPS, 3
 Graphics Display Area, 7
 Line, 4
 Map Coordinates, 7
 Menu Bar, 6
 Points, 4
 Polygon, 4
 Stream Distance, 4
 Stream Distance Drop down list, 7
 Titlebar, 6
 Tool Bar, 6

Delete, Point. *See* Removing a point during data collection

E

Entity
 Recover. *See* Data Recovery
Entity, Line. *See* Creating a new Earth Tracer line entity
Entity, Point. *See* Creating a new Earth Tracer point entity
Entity, Polygon. *See* Creating a new Earth Tracer polygon entity
Entity/Line, 14, 15
Exiting Earth Tracer, 12

F

File
 close, 19
 create a new polygon, 17
 create, new line, 14
 create, new point, 16
 Recover. *See* Data Recovery
 save, update, 19
ForeColor, 12
Front Entity Tab. *See* View Setup

G

GPS Status, 10, 20
Grid Rotation, 25
grid sampling, 23
Grid Sampling
 dialog box, 25
Grid Size, 25



GEOMATICS, INC

H

Hardware Recommendation, 3

Help

About Earth Tracer, 22

I

Installing Earth Tracer, 5

L

Line

Completing, 15

Save as dxf entity, 15, 16

Save as shape entity, 15

Save as text entity, 15

Line Width, 12

Locator Size, 12

Lost Data. *See* Data Recovery

P

Panning, 21

Point

Save as dxf entity, 16

Save as shape entity, 16

Save as text entity, 16

Point Entity

Completing, 17

Point, Add. *See* Adding a point during data collection

Polygon

Save as dxf entity, 18

Save as shape entity, 18

Save as text entity, 18

R

Recover. *See* Data Recovery

Removing a point during data collection, 18

Right Mouse Button, 20

S

Save

line entity, 15, 16

point entity, 16

polygon entity, 18

Saving to a file, 19

Serial Communications. *See* Setting your GPS Receiver Communications

Serial Port. *See* Stopping GPS receiver communication

Setting up your Map Projection, 9

Setting up your Map Window, 11

Setting your GPS Receiver Communications, 8

Starting Earth Tracer, 5

Starting GPS receiver communication, 13

Stopping GPS receiver communication, 14

stream distance, 7, 14, 17, 18, 19

U

Understanding the Earth Tracer Opening Display, 6

V

View Setup

Back Entity Tab, 12

Z

Zoom In, 20

Zoom Out, 20

Zoom Reset, 20

Zoom To First, 20

Zoom To Last, 21

Zoom/Pan Functions, 20



Appendix A

UTM Map Zones

The following table lists the Universal Transverse Mercator map zones used in Earth Tracer. UTM splits the World into 60 zones based on Latitude and Longitude. Use this table to determine your UTM map zone. In order to find your UTM zone, you'll need to know your location by latitude and longitude. You can find your latitude and longitude using a common road atlas.

UTM Zone	Central Meridian	Longitude Range
1	177W	180W-174W
2	171W	174W-168W
3	165W	168W-162W
4	159W	162W-156W
5	153W	156W-150W
6	147W	150W-144W
7	141W	144W-138W
8	135W	138W-132W
9	129W	132W-126W
10	123W	126W-120W
11	117W	120W-114W
12	111W	114W-108W
13	105W	108W-102W
14	99W	102W-96W
15	93W	96W-90W
16	87W	90W-84W
17	81W	84W-78W
18	75W	78W-72W
19	69W	72W-66W
20	63W	66W-60W
21	57W	60W-54W
22	51W	54W-48W
23	45W	48W-42W
24	39W	42W-36W



GEOMATICS, INC

25	33W	36W-30W
26	27W	30W-24W
27	21W	24W-18W
28	15W	18W-12W
29	9W	12W-6W
30	3W	6W-0
31	3E	0-6E
32	9E	6E-12E
33	15E	12E-18E
34	21E	18E-24E
35	27E	24E-30E
36	33E	30E-36E
37	39E	36E-42E
38	45E	42E-48E
39	51E	48E-54E
40	57E	54E-60E
41	63E	60E-66E
42	69E	66E-72E
43	75E	72E-78E
44	81E	78E-84E
45	87E	84E-90E
46	93E	90E-96E
47	99E	96E-102E
48	105E	102E-108E
49	111E	108E-114E
50	117E	114E-120E
51	123E	120E-126E
52	129E	126E-132E
53	135E	132E-138E
54	141E	138E-144E
55	147E	144E-150E
56	153E	150E-156E
57	159E	156E-162E
58	165E	162E-168E
59	171E	168E-174E
60	177E	174E-180E



GEOMATICS, INC

Appendix B

License Agreement

IMPORTANT, PLEASE READ THIS FIRST. THIS IS A LICENSE AGREEMENT.

Aphelion Geomatics Inc is willing to license the accompanying software to you only upon the condition that you accept all of the terms contained in this license agreement and any supplementary or unique license terms included herewith ("Agreement").

READ THE TERMS AND CONDITIONS OF THIS AGREEMENT CAREFULLY BEFORE USING THIS PRODUCT. BY USING THIS PRODUCT, YOU ARE CONSENTING TO BE BOUND BY ALL THE TERMS OF THE LICENSE AGREEMENT.

COPYING OF THIS COMPUTER PROGRAM OR ITS DOCUMENTATION EXCEPT AS PERMITTED BY THIS LICENSE IS COPYRIGHT INFRINGEMENT UNDER THE LAWS OF YOUR COUNTRY. IF YOU COPY THIS COMPUTER PROGRAM WITHOUT PERMISSION OF APHELION GEOMATICS INC, YOU ARE VIOLATING THE LAW. YOU MAY BE LIABLE TO APHELION GEOMATICS INC FOR DAMAGES, AND YOU MAY BE SUBJECT TO CRIMINAL PENALTIES.

1. Grant of License

Aphelion Geomatics Inc. grants you a nonexclusive, nontransferable license to use the enclosed program (the "Software") and its printed manual and other accompanying material ("Documentation") with equipment owned by you or under your control, according to the terms and conditions of this License Agreement. This License Agreement permits a single user to install and use the Software on only one computer at one location at any one time.



GEOMATICS, INC

Authorization Code: If this Software requires an authorization code, you must register your purchase of this Software product with Aphelion Geomatics, Inc before an authorization code shall be issued to you.

2. Restrictions:

You May Not:

1. copy the Software or Documentation except as permitted by this license.
2. reverse engineer, decompile or disassemble the Software except to the extent permitted by law where this is indispensable to obtain the information necessary to achieve interoperability of an independently created program with the Software or with another program and such information is not readily available from Aphelion Geomatics Inc or elsewhere. You may not decompile the Software if such information is available.
3. distribute, rent, loan, lease, sell, sublicense or otherwise transfer all or part of the Software, Documentation or any rights granted hereunder to any other person without the prior written consent of Aphelion Geomatics Inc.
4. remove, alter or obscure any proprietary notices, labels or marks from the Software or Documentation.
5. modify, translate, adapt, arrange or create derivative works based on the Software or Documentation for any purpose.
6. utilize any equipment, device, software or other means designed to circumvent or remove any form of copy protection used by Aphelion Geomatics Inc in connection with the Software, or use the Software together with any hardware lock, authorization code, serial number, or other copy protection device not supplied by Aphelion Geomatics Inc directly or through an Authorized Aphelion Geomatics Inc Reseller.
7. use the Software or Documentation outside of the country in which it was purchased.
8. export the Software or Documentation in violation of applicable export control laws.

3. Copyright

Title and copyrights to the Software, Documentation and accompanying materials and any copies made by you remain with Aphelion Geomatics Inc. Unauthorized copying of the Software or Documentation, or failure to comply with the above restrictions, will result in automatic termination of this license.

4. Limited Warranties

Aphelion Geomatics Inc warrants that: (1) for a 20 day period beginning on the date of delivery of the Software to you as evidenced by your receipt, the Software will provide the facilities and functions generally described in the Documentation and that the media on which the Software is furnished, the Documentation accompanying the Software, and any hardware lock or other copy protection device accompanying the Software will be free from defects in materials and workmanship under normal use.



GEOMATICS, INC

EXCEPT FOR THE ABOVE EXPRESS LIMITED WARRANTIES, APHELION GEOMATICS INC MAKES AND YOU RECEIVE NO WARRANTIES, EXPRESS, IMPLIED, STATUTORY OR IN ANY COMMUNICATION WITH YOU, AND APHELION GEOMATICS INC SPECIFICALLY DISCLAIMS ANY OTHER WARRANTY INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. APHELION GEOMATICS INC DOES NOT WARRANT THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR-FREE. The above exclusions may not apply to you as some jurisdictions do not allow the exclusion of implied warranties. In addition to the above warranty rights, you may also have other rights, which vary from jurisdiction to jurisdiction.

Aphelion Geomatics Inc's entire liability and your exclusive remedy under the warranties made in this License Agreement will be, at Aphelion Geomatics Inc's option, to attempt to correct or work around errors, to replace the defective media; documentation or copy protection device, or to refund the license fee and terminate this license. This remedy is subject to the return of the defective media, documentation or copy protection device with a copy of your receipt to your local Aphelion Geomatics Inc office or the Authorized Aphelion Geomatics Inc Reseller from whom it was obtained within the ten day trial period of its delivery to you. Following expiration of this ten day free trial period, Aphelion Geomatics Inc will replace any defective or damaged copy protection device in return for payment of an amount which covers the cost of a replacement device plus a fee for handling and shipment.

5. Disclaimer

THIS SOFTWARE IS INTENDED TO BE USED BY TRAINED PROFESSIONALS ONLY. DUE TO THE LARGE VARIETY OF POTENTIAL APPLICATIONS FOR THE SOFTWARE, THE SOFTWARE HAS NOT BEEN TESTED IN ALL SITUATIONS UNDER WHICH IT MAY BE USED. APHELION GEOMATICS INC SHALL NOT BE LIABLE IN ANY MANNER WHATSOEVER FOR THE RESULTS OBTAINED THROUGH THE USE OF THE SOFTWARE. PERSONS USING THE SOFTWARE ARE RESPONSIBLE FOR THE SUPERVISION, MANAGEMENT AND CONTROL OF THE SOFTWARE. THIS RESPONSIBILITY INCLUDES, BUT IS NOT LIMITED TO, THE DETERMINATION OF APPROPRIATE USES FOR THE SOFTWARE AND THE SELECTION OF THE: SOFTWARE, OTHER PROGRAMS, GPS EQUIPMENT AND OTHER RELATED HARDWARE DEVICES TO ACHIEVE INTENDED RESULTS.

PERSONS USING THE SOFTWARE ARE ALSO RESPONSIBLE FOR ESTABLISHING THE ADEQUACY OF INDEPENDENT PROCEDURES FOR TESTING THE RELIABILITY AND ACCURACY OF ANY PROGRAM OUTPUT, INCLUDING ALL ITEMS DESIGNED BY USING THE SOFTWARE.



GEOMATICS, INC

6. Limitation of Liability

IN NO EVENT WILL APHELION GEOMATICS INC BE LIABLE FOR ANY LOSS OR DAMAGES OF ANY KIND, INCLUDING LOSS OF DATA, LOST PROFITS, COST OF COVER OR OTHER SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE SOFTWARE OR DOCUMENTATION, HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY. THIS LIMITATION WILL APPLY EVEN IF APHELION GEOMATICS INC OR ANY APHELION GEOMATICS INC RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSS OR DAMAGE. YOU ACKNOWLEDGE THAT THE LICENSE FEE REFLECTS THIS ALLOCATION OF RISK.

Aphelion Geomatics Inc shall have no responsibility or liability whatsoever arising from loss or theft of the Software or of any copy protection device with which the Software is supplied. Specifically, Aphelion Geomatics Inc shall not be obligated to replace any lost or stolen software or copy protection device. You are solely responsible for safeguarding the Software and any copy protection device from loss or theft and protecting your investment through insurance or otherwise. The above limitation may not apply to you because some jurisdictions do not allow the limitation or exclusion of liability for incidental or consequential damages.

Any disputes made in regards to the use of this product or license agreement shall be resolved under the laws of Manitoba, Canada.

If you have any questions please send written inquiries to: Aphelion Geomatics Inc, Inc., Customer Service, 199 Centennial St., Winnipeg, Manitoba, Canada R3N 1P4

Appendix C

Program Data Capturing Process

Use the following flow chart to help gain a better understanding of how Earth Tracer GPS works and what steps to follow in capturing your GPS data.

