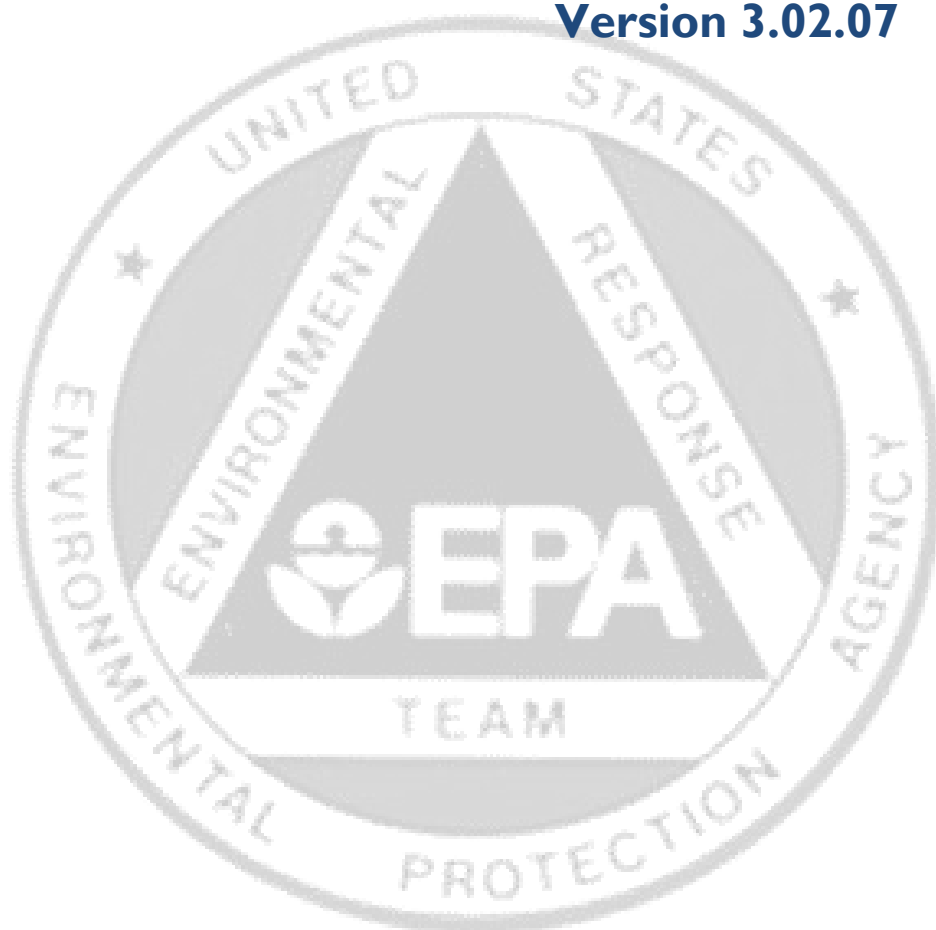




## USER GUIDE

### RAPID ASSESSMENT TOOL (RAT) Version 3.02.07



SOP NO. C-ERT-O-004  
REVISION NO. 0  
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## Acronyms

AC	Alternating Current
AEGL	Acute Exposure Guideline Level
.asc	ASCII file
Cl <sub>2</sub>	Chlorine
cm	Centimeter
CO	Carbon monoxide
.csv	Comma-Separated Value File
.dbf	Database File
DMS	Degrees minutes seconds
.dxf	AutoCAD Drawing Interchange Format file
ERPG	Emergency Response Protection Guideline
ERT	Environmental Response Team
ESRI	Environmental Systems Research Institute
F/S	Fast/Slow
FIELDS	Field Environmental Decision Support
GGA	GPS Fix Data
GIS	Geographic Information Systems
G-M	Geiger-Mueller
GPS	Global Positioning System
GSA	GPS Dilution of Precision and Active Satellites
HCl	Hydrogen chloride
HCN	Hydrogen cyanide
HF	Hydrogen fluoride
H <sub>2</sub> S	Hydrogen sulfide
IR	Infrared
.jpg	JPEG (Joint Photographic Experts Group) file
LCD	Liquid Crystal Display
m	Meters
.mdb	Microsoft Access file
NH <sub>3</sub>	Ammonia
NMEA	National Marine Electronics Association
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
PDA	Personal Digital Assistant
PDOP	Positional Dilution of Precision
PH <sub>3</sub>	Phosphine
PID	Photo Ionization Detector
PPE	Personal Protective Equipment
RAT	Rapid Assessment Tool
.shp	Shapefiles
SO <sub>2</sub>	Sulfur dioxide
SOP	Standard Operating Procedure
TEEL	Temporary Emergency Exposure Limit
.thr	Threshold File
.tif	Tagged Image File
.txt	Text File
USEPA	United States Environmental Protection Agency

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UTM	Universal Transverse Mercator
XRF	X-Ray Fluorescence

## SECTION

# I

## RAT SOFTWARE

### In this section:

- Chapter 1, Introduction
- Chapter 2, File Menu
- Chapter 3, Background Data Menu
- Chapter 4, Export Data Menu
- Chapter 5, Sample Design Menu
- Chapter 6, Contour Menu
- Chapter 7, Data Collection Menu
- Chapter 8, Display Options Menu
- Chapter 9, Statistics Menu
- Chapter 10, Help Menu

## CHAPTER

# 1

## Introduction

### In this chapter:

- Background
- Purpose
- Scope and Applicability
- Health and Safety
- Precautions and Limitations
- Software Overview



## Background

The United States Environmental Protection Agency (USEPA) Region 5 Field Environmental Decision Support (FIELDS) Team developed the Rapid Assessment Tool (RAT). RAT is currently under development and supported by EPA's Environmental Response Team (ERT).

RAT integrates real-time data from global positioning system (GPS) and environmental monitoring devices. RAT stores the sample data with its GPS location in a Microsoft Access database and plots these results in a dynamic, two-dimensional display in real-time. In the software, data can be overlaid with aerial photography, polygon boundaries, and sample designs to allow for immediate data availability, analysis, and use in the field. The collected data can also be exported using standard data formats such as Scribe and Environmental Standards Research Institute (ESRI) shapefiles.

For support with RAT, beyond what is supplied in this User Guide, please contact ERT's software support at (800) 999-6990 or [ERTSupport@epa.gov](mailto:ERTSupport@epa.gov).

## Purpose

This standard operating procedure (SOP) establishes requirements and procedures for setting up and operating RAT.

## Scope and Applicability

This guide establishes instruction in the setup and use of RAT version 3.02.07, although it may apply to other versions of the software. It applies to the use of RAT with Trimble GPS devices, MultiRAE PGM-50, DataRAM DR-4000, Ludlum 2221, 2241-2, 2350-I, Fluke Victoreen 450P, NITON XL 700 series x-ray fluorescence (XRF), and Innov-X 4000 series XRF.

## Health and Safety

You should follow general safe work procedures when using RAT. Follow your agency or company's health and safety plan, as well as the site-specific health and safety plan regarding personal protective equipment (PPE), respiratory protection, and action levels. You should also familiarize yourself with each of the instrument's operation and calibration procedures by reading each instrument's user manuals and quick start guides.

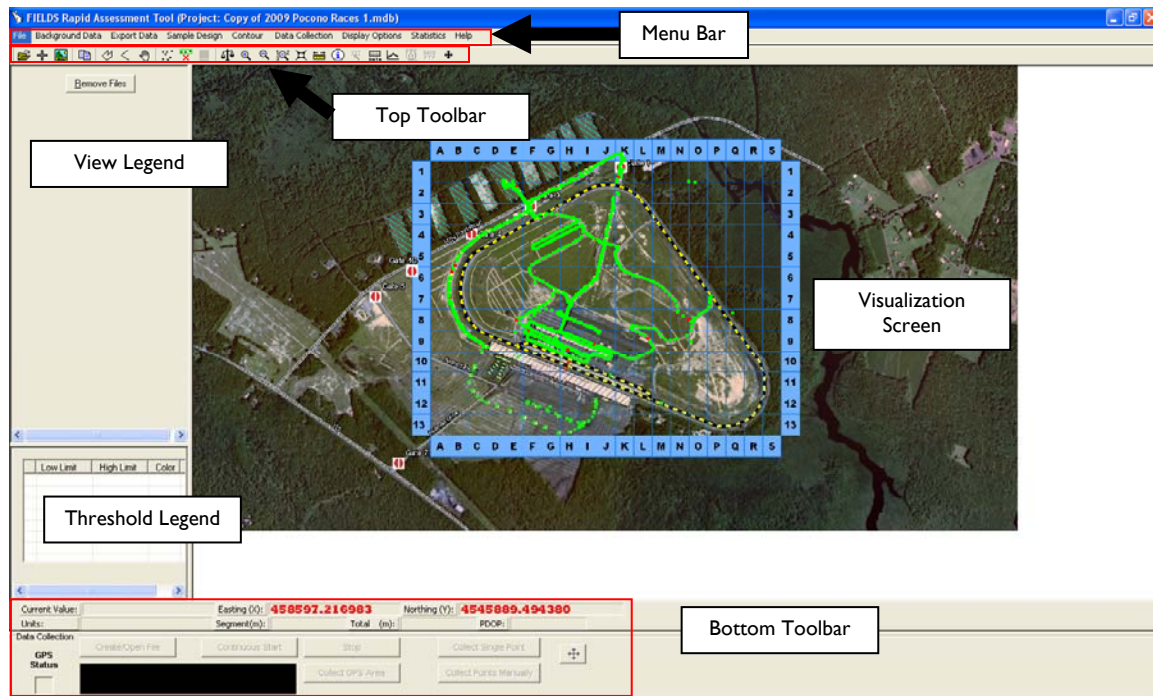
## Precautions and Limitations

The following are precautions and limitations of RAT:

- For RAT to operate correctly in most scenarios it must be connected to a functioning GPS. With the exception of single point collection, RAT will not work inside or if GPS signal is otherwise unavailable.
- External devices should be powered on, calibrated, and operating properly prior to connecting them to RAT.
- Monitor battery power levels for all instruments. Low battery in the GPS unit can cause loss of satellites and loss of data points in RAT.

## Software Overview

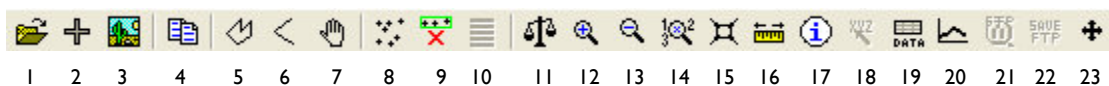
The RAT software combines geographic information system (GIS) visualization tools with data capture for monitoring devices. The software is comprised of a number of menus, two toolbars, a view legend, threshold legend, and visualization screen.



The **Menu Bar** includes the following menus, which are discussed in detail in Chapters 2-10.

- File menu
- Background Data menu
- Export Data menu
- Sample Design menu
- Contour menu
- Data Collection menu
- Display Options menu
- Statistics menu
- Help menu

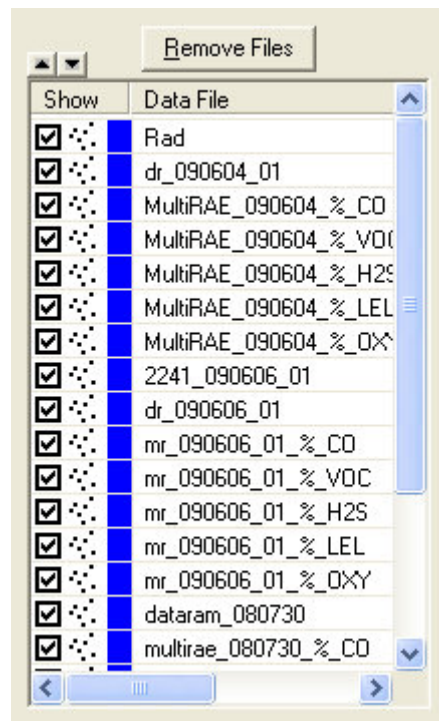
The **Top Toolbar** includes the following commands:



1. Open Project
2. Add Shapefiles or AutoCAD DXF file

3. Open Image File
4. Copy Data to Clipboard
5. Draw Polygon
6. Draw Polyline
7. Pan
8. Do Sample Design
9. Delete Points
10. Set Grid Color Legend
11. Set Point Thresholds
12. Zoom In
13. Zoom Out
14. Set Zoom Factor
15. Full Extent
16. Measure
17. Point/Line Info
18. Hyperlink
19. View Data File
20. Trend Window
21. FTP Data
22. Save FTP
23. Navigation Cursor Width and Color

The **View Legend** displays files currently available. Layers can be toggled on and off by checking and unchecking the boxes. The layer display order can be changed by using the up and down arrows at the top of the legend. Note: RAT displays files so that the bottom file displays on the top of the Visualization Screen.



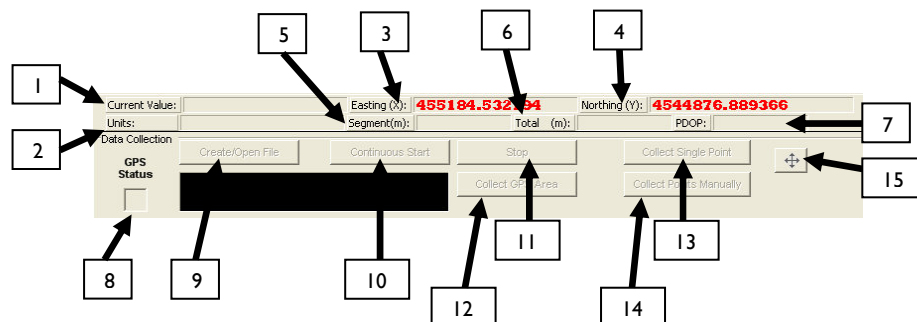
The **Threshold Legend** displays low and high limits and colors for selected concentrations for each monitoring file.

Low Limit	High Limit	Color
0.000000	35.000000	Green
330.000000	900.000000	Red

The **Visualization Screen** shows collected RAT data plotted on top of background imagery.



The **Bottom Toolbar** includes the following commands:



1. Current monitoring concentration for the selected file
2. Current monitoring units for the selected file
3. Easting (X) coordinates in UTM in meters (m)
4. Northing (Y) coordinates in UTM in m
5. Segment length in m
6. Total measured length in m
7. Positional Dilution of Precision (PDOP)
8. GPS Status where red represents improper GPS signal, blue represents uncorrected GPS signal, and green represents corrected GPS signal.
9. Create/Open File button
10. Continuous Start button
11. Stop button
12. Collect GPS Area button
13. Collect Single Point button
14. Collect Points Manually button
15. Navigation button

CHAPTER

2

## File Menu

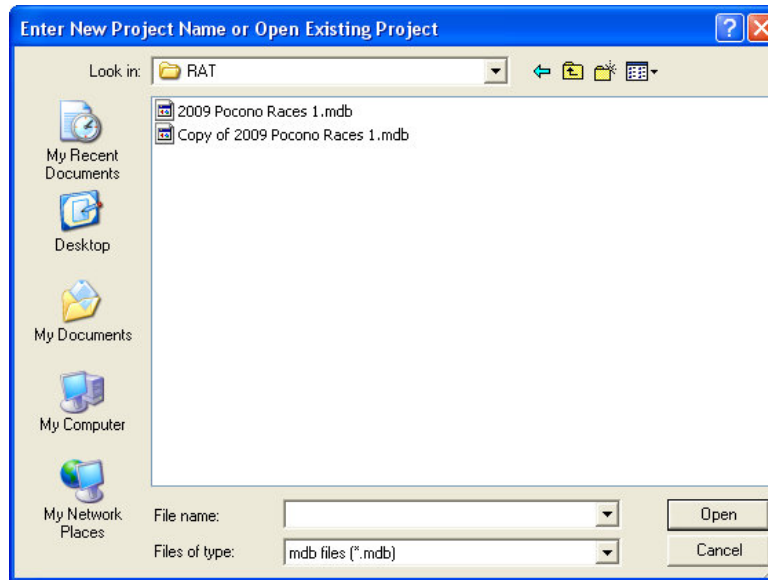
### In this chapter:

- Open Project
- Save Project
- Save Image
- Merge Device Data Files
- Merge GPS with Device Data
- Color List
- Project/Database Maintenance
- Exit

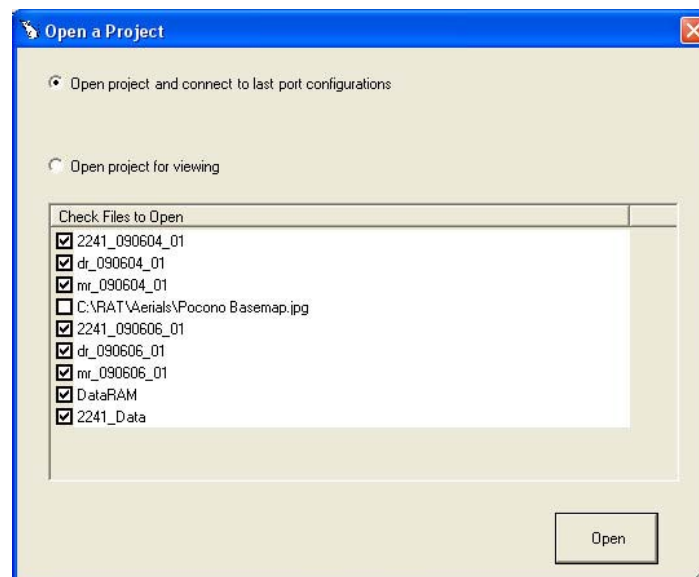
This chapter discusses the options available in the File menu of RAT.

## Open Project

The Open Project command allows you to open RAT projects collected in a previous RAT session. RAT stores the projects in an Access database (.mdb) format.



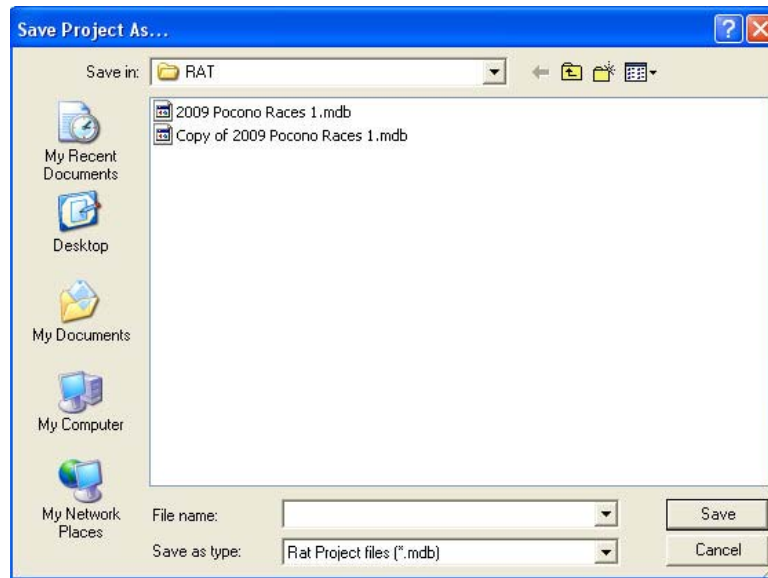
When a project is selected, you have the option to open the project and connect to last port configurations or open the project for viewing. Opening and connecting to the last port configurations will allow you to collect additional data without having to re-setup instruments. Opening the project for viewing will allow you to view and export data previously collected.





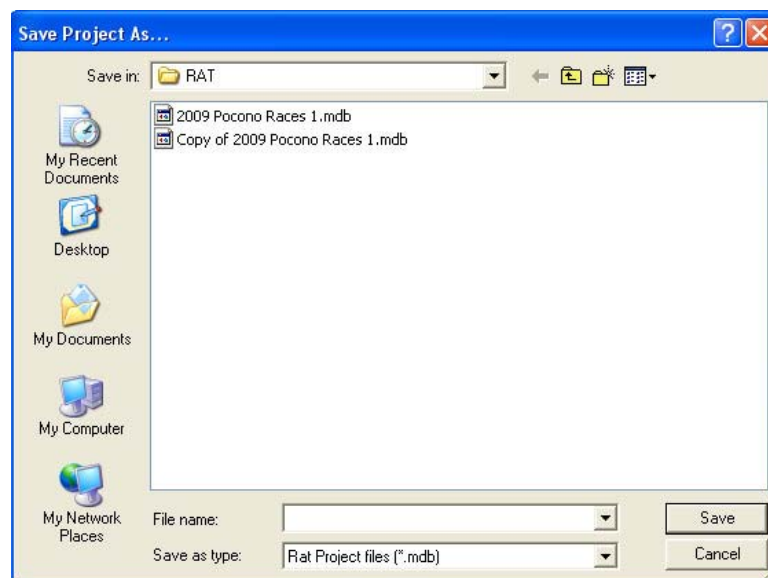
## Save Project

The Save Project command will save the RAT project in an Access database (.mdb) format.



## Save Image

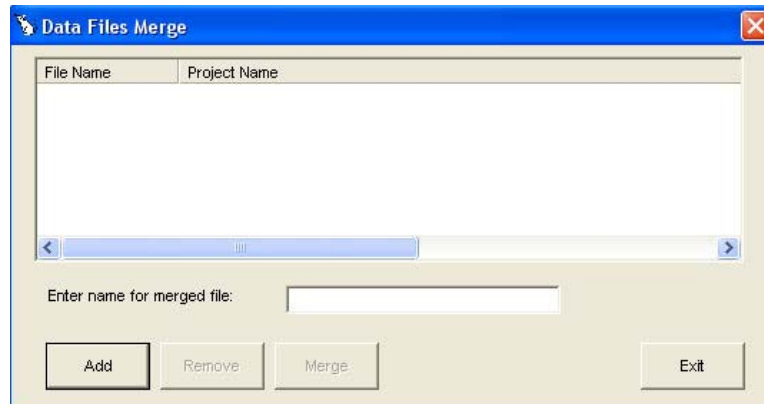
The Save Image command will save the RAT screenshot as a JPEG (.jpg) file for export to other users or for making quick maps. The copy button in the top toolbar copies the view to the clipboard of your computer so that it can be pasted into any application.





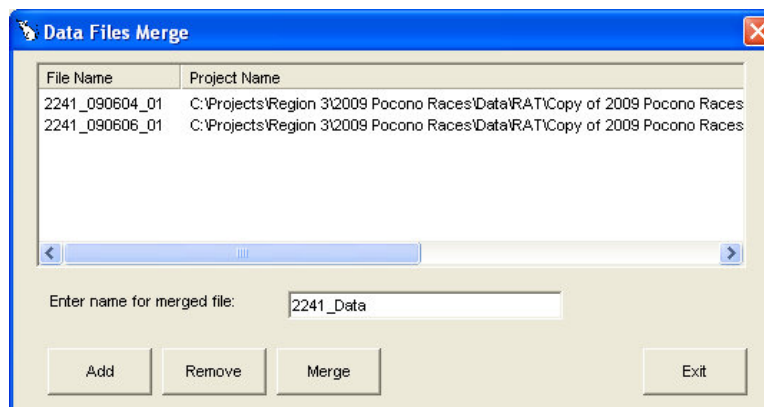
## Merge Device Data Files

To facilitate data collection by multiple teams or over separate collection events, RAT has two built-in merge options. One option allows you to merge multiple files created while using the National Marine Electronics Association (NEMA) 84 (default) GPS settings. These tables contain both GPS and Device data. The second option allows you to merge GPS-only file(s) with device-only (No GPS-Soil) file(s). This command allows you to merge collection files from the same device. *Note: the program will not merge files from different devices.*



To merge files:

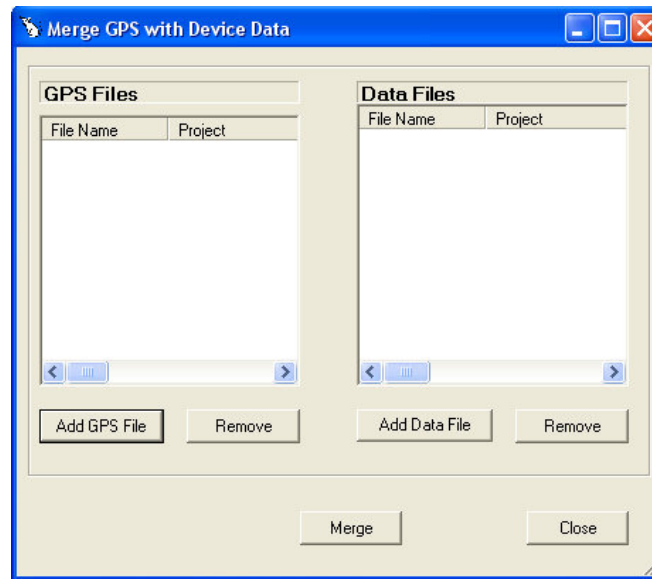
1. Click the Add button.
2. Select a file from the current project or select a file from another project database. Pressing the Select button adds the file to the merge menu box.
3. Enter a name for the merged file, and then click the Merge button.



4. When finished, press Exit.

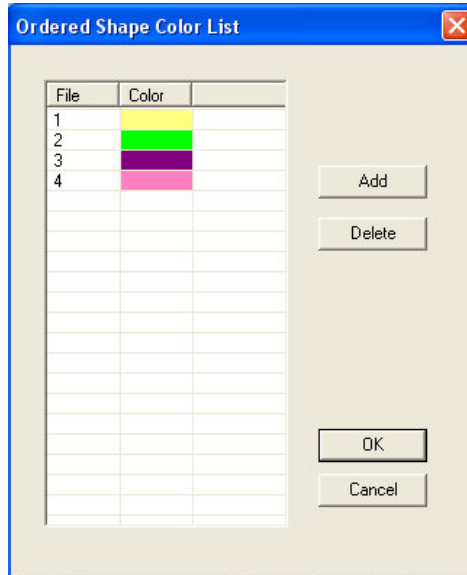
## Merge GPS with Device Data

This selection will allow you to merge GPS data with data gathered from monitoring devices. RAT will only allow merged data to be obtained from RAT Access databases.



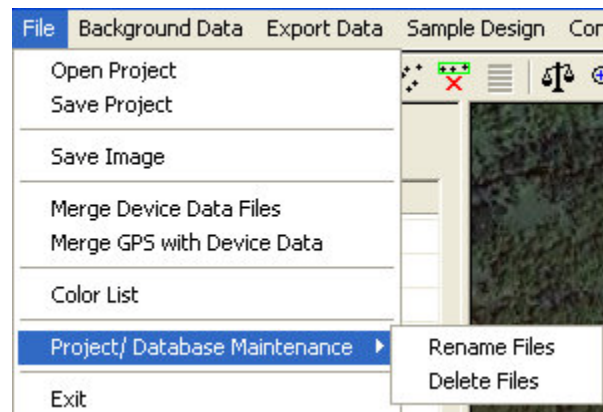
## Color List

You may set up a list of colors using the Color List command. These colors will be applied to shapefiles as they are added to the data file list. RAT will rotate through this list as each subsequent file is added to the file list, displaying each file with a different color.



## Project/Database Maintenance

You can rename and delete database files using this option. These utility functions are intended for use after data collection is complete allowing you to re-identify files or permanently remove a data collection file from the database.



## Exit

This command closes the RAT software.

CHAPTER

3

## Background Data Menu

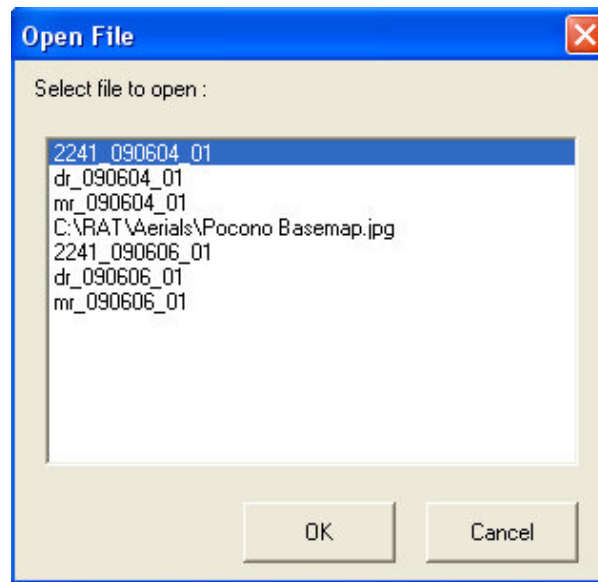
### In this chapter:

- Open Project Files
- Import Files from Other Projects
- Point Locations, Line Boundaries, Area Boundaries
- Aerial Images
- Contours
- Spatial Query
- Import Scribe Text File (points)
- Import Polygons/Lines from Scribe
- Import Threshold

This chapter discusses the options available in the Background Data menu of RAT.

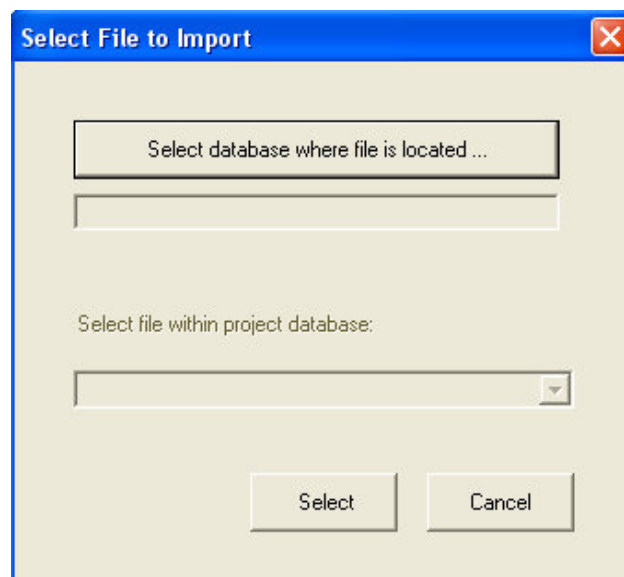
## Open Project Files

You can open project files using this command. This command selects files to open from the current database only.



## Import Files from Other Projects

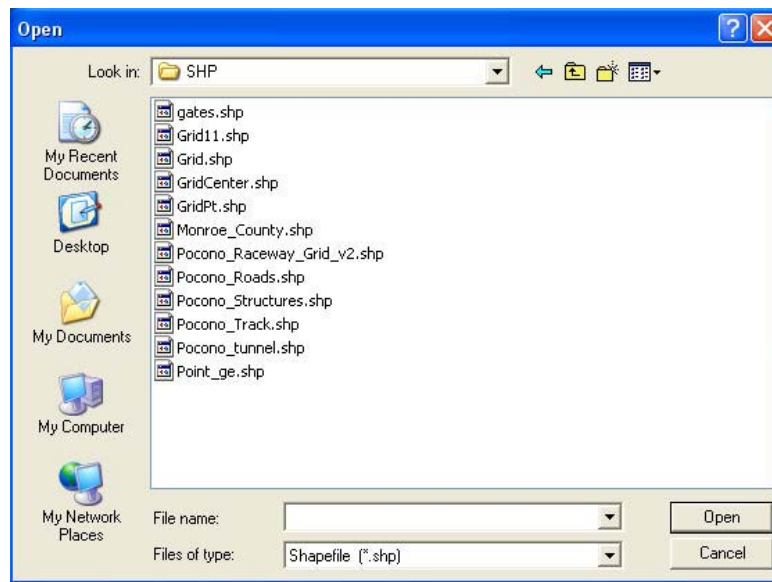
This option allows you to import files from other RAT projects. Once the project is selected, you have the option to select all collected files or specify the files to be imported.



## Point Locations, Line Boundaries, Area Boundaries

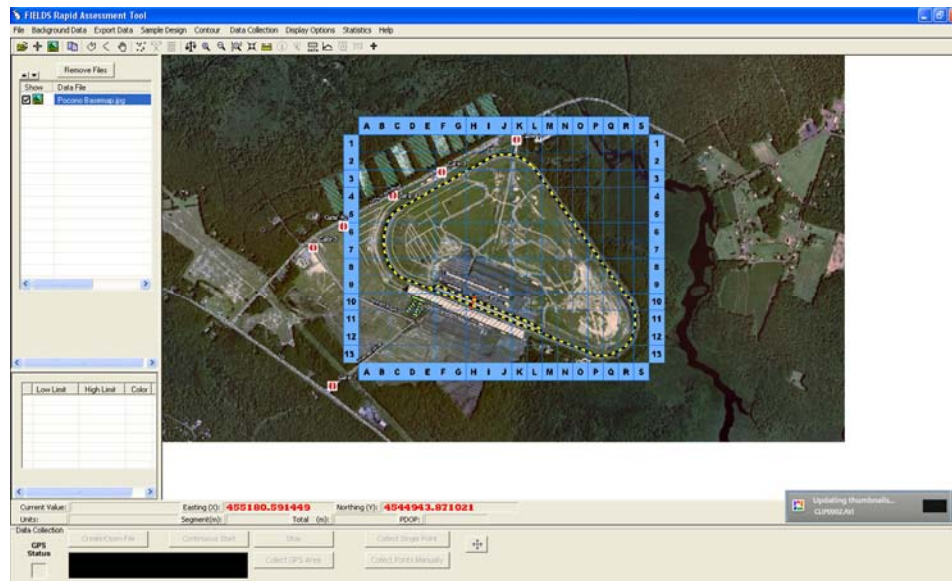
Vector files are points, lines, and polygons. Users can import vector files with the following extensions:

- .shp (shapefiles)
- .dbf (database files)
- .asc (ASCII files)
- .dxf (AutoCAD files)



## Aerial Images

You can add background raster images to RAT, including aerial photographs and topographic maps. Images must be in .jpg or .tif format, georeferenced, and in Universal Transverse Mercator (UTM) coordinates. Currently, only one image can be open in RAT. You can create a mosaic to combine multiple images before viewing in RAT. Images cannot be turned off in RAT but must be removed.

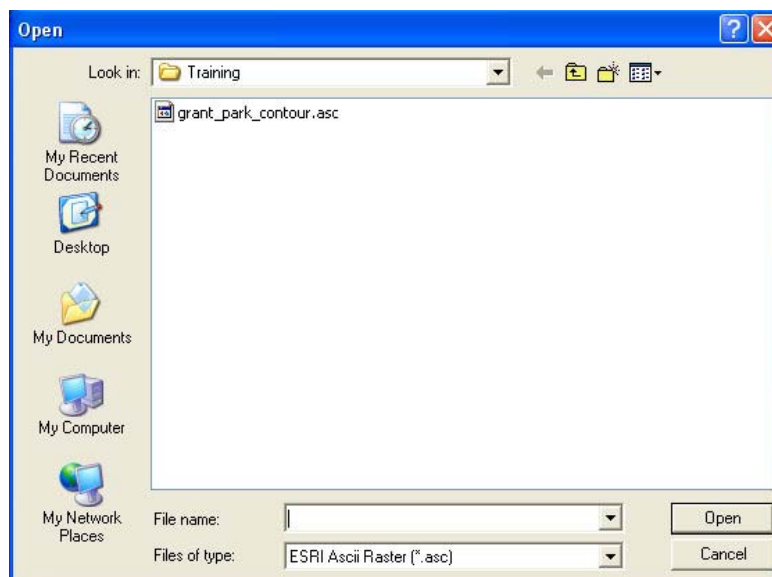


There are numerous sources for georeferenced aerial imagery in UTM coordinates. A few sources include:

- USGS Seamless: [seamless.usgs.gov](http://seamless.usgs.gov)
- TerraServer USA: [terraserver-usa.com](http://terraserver-usa.com)
- LandVoyage: [www.landvoyage.com](http://www.landvoyage.com)
- ArcGIS Online Services (requires ESRI's ArcGIS software)

## Contours

You can use this command to add contours to the map created through the Contour menu.

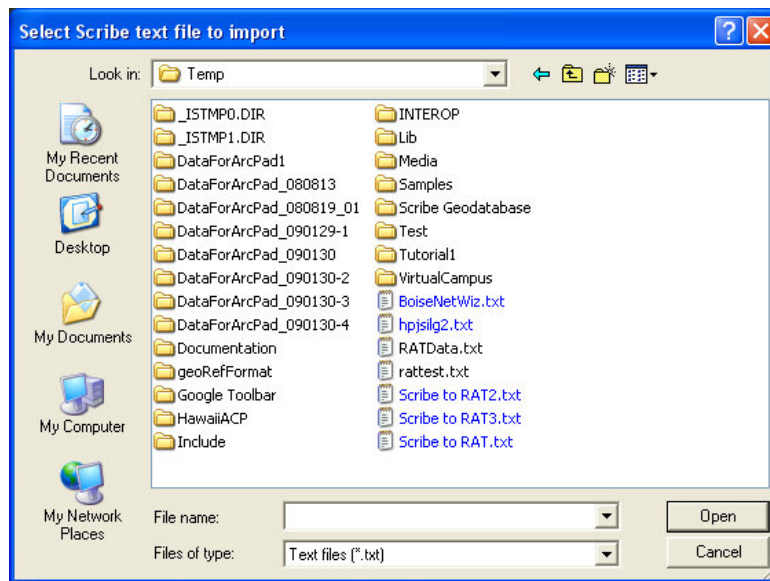


## Spatial Query

This command is not currently active.

## Import Scribe Text Files (points)

Scribe is environmental data management software created by ERT. Scribe manages sampling, monitoring, and analytical data. RAT can import RAT point data from Scribe using this command. A file must first be exported from Scribe, using the Export/Text File command.



To export data from Scribe:

1. Select Monitoring Data.
2. Filter for RAT data. If RAT has been entered as the Event ID, you can filter by the EventID field.
3. Select the Export button and Text File (\*.txt, \*.csv).
4. Save the file.
5. In RAT, select Import Scribe Text Files (points) from the Background Data menu.

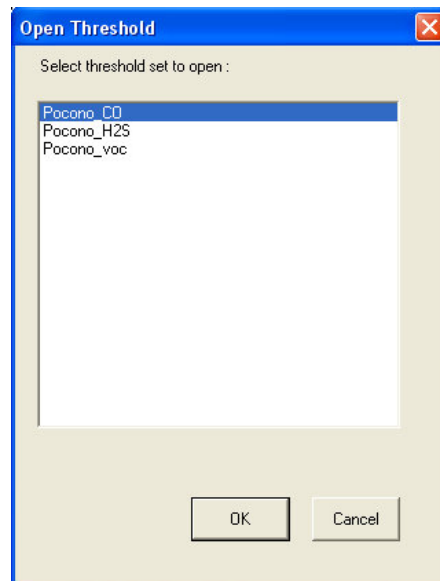
## Import Polygon/Lines From Scribe

Scribe does not store polygon or line data. Therefore, this command will not work.

## Import Threshold

Thresholds can be imported from another RAT project or from threshold (.thr) files.





## CHAPTER

# 4

## Export Data Menu

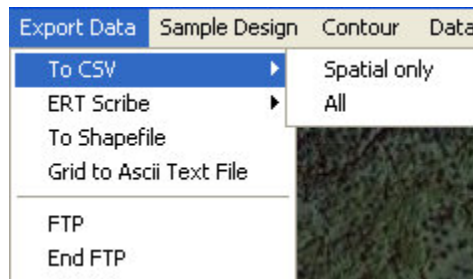
### In this chapter:

- To CSV
- ERT Scribe
- To Shapefiles
- Grid to Ascii Text File
- FTP
- End FTP

This chapter discusses the options available in the Export Data menu of RAT.

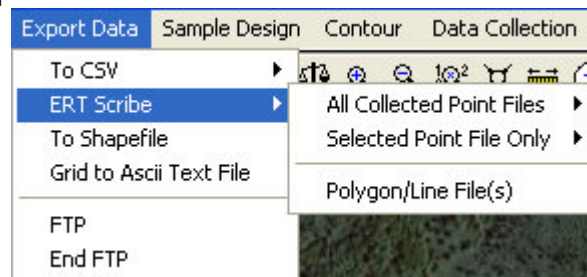
## To CSV

RAT data can be exported to a comma space delimited (.csv) file. The options are to export spatial only (data with coordinates) or all data. *Note that all RAT files are exported to one .csv and this .csv is not compatible with Scribe.* To export a Scribe-compatible .csv, refer to the following section.



## ERT Scribe

This export option creates a .csv file that is compatible with Scribe. All RAT files are exported to one .csv. **Note: After exporting, it is currently necessary to open the .csv file in Excel and update the Location field to make each number unique.** Excel's auto fill feature is useful for creating unique numbers.



You have the option of exporting all collected point files or selected point files only. If the All Collected Point Files option is selected, **you must create unique Location numbers for each and every .csv file per Scribe project.** You also have the option of exporting all points or spatial points only, i.e. points with coordinates.

There is also an option to export polygon/line files to Scribe. However, Scribe is not capable of storing line or polygon data. Selecting this option will give you an error.

## To Shapefile

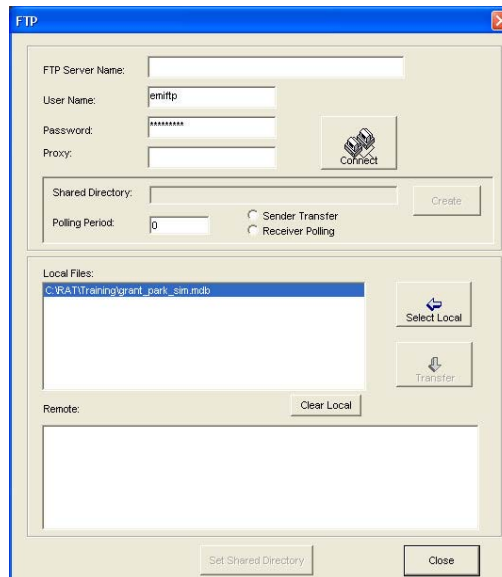
The selected file will be exported to ESRI shapefiles, excluding the non-spatial data. RAT will create files with \*.dbf, \*.shp, and \*.shx extensions. You can add these shapefiles to ESRI's ArcGIS software to create a map.

## Grid to Ascii Text File

The selected file will be exported to a text file (\*.asc). You can import this text file in other GIS applications.

## FTP

RAT can export data directly to an FTP site using the integrated FTP function. Files from the field computer can be uploaded by simply connecting to the server and selecting the files to upload using the following interface. *Note that this may not work with every FTP server.*



To load files to a FTP site:

1. Open the files in RAT that you want to transfer. RAT automatically selects all files in the view legend and any associated files and places them in the Load Files window.
2. Enter the FTP site name, user name, password and proxy (if needed) for the FTP server. Click Connect and RAT will attempt to connect to the FTP site.
3. After connection, select a folder in the FTP directory in which to place the files and click Transfer to upload the files.

## End FTP

This command ends sending data to a FTP site.

CHAPTER

5

## Sample Design Menu

### In this chapter:

- Judgmental
- Random
- Aligned Grid (Hotspot)
- Unaligned Grid

RAT offers four choices for sample design, including judgmental, random, aligned grid, and unaligned grid. Each of these options is discussed below.

## Judgmental


Judgmental sampling is sampling without statistical measurement. Judgmental sampling allows you to review an identified percentage (coverage) of a specific population. This sample design is used when you are selecting specific sampling locations for their unique value and interest. For example, you may want to measure the contamination in a waterway directly downstream of an outfall and compare to results upstream of the outfall. The tool will create sampling points in the designated locations and return point shapefiles with X,Y, and ID in the attribute table. Results from a judgmental survey cannot be used to make inferences to a wider population (i.e. calculating averages).

To create judgmental sample locations, the UTM zone must be set correctly. After setting the UTM zone, RAT will ask you to assign the first point ID, after which you will be prompted to enter a file name. After entering the file name, click on the map to add the sample locations.

When finished, click the  button.

## Random

This type of sample design is appropriate for estimating average values if the population does not contain major trends or patterns of contamination; otherwise bias may be introduced. Simple random does not guarantee good spatial distribution throughout your sample area and may miss spatially discrete contamination in relatively large sample areas. The tool will select "n" random sampling locations in the delineated sampling area and return point shapefiles with X, Y, and ID in the attributes. If you want random locations that have good spatial distribution, then use the Unaligned Grid sample design.

Random samples must be created within a polygon. You can create a polygon in RAT by clicking the  button and drawing a polygon on the map. Once the polygon is created, you will be prompted to enter a file name. To create a random sample distribution, select Random from the Sample Design menu. Ensure that the UTM zone is set correctly. Enter the total number of random sample (n) to be created and enter the starting sample ID. RAT will prompt you for a file name in which to save the sample design.

## Aligned Grid (Hotspot)

The Aligned Grid sampling design helps you create a statistically-based gridded sampling design to locate areas of high contamination (hot spots) in soil or sediment. The tools calculate a sample design when you:

- Know the size of the hot spot you want to detect
- Know the maximum number of samples you can take
- Have a pre-determined distance between samples

The aligned grid sample design is a non-random systematic design that can introduce bias based upon design decisions, but provides good spatial coverage.

The following assumptions are required:

- The target (hot spot) is circular or elliptical. For subsurface targets this applies to the projection of the target to the surface.
- Samples or measurements are taken on a square, triangular, or rectangular grid.
- The distance between grid points is much larger than the area sampled, measured, or cored at grid points; that is, a very small proportion of the area being studied can actually be measured.
- The definition of "hot spot" is clear and unambiguous. This definition implies that the types of measurement and the levels of contamination that constitute a hot spot are clearly defined.
- There are no measurement misclassification errors— i.e., no errors are made in deciding when a hot spot has been hit.

The required inputs for creating a Sample Design are:

1. Choose a polygon theme that delineates the boundaries of the Sampling Area.
2. Choose the Hot Spot Shape. The hot spot is assumed to be circular or elliptical. The number shown after "Ellipse" is the ratio of the short axis of the ellipse to the long axis. If there is strong directional movement in the media (i.e. sediment in river), you should choose a "skinnier" ellipse for the hot spot shape- Ellipse 0.5 or Ellipse 0.7. If there is not strong directional movement (i.e. sediment in a harbor), you should choose a "fatter" ellipse for the hot spot shape-- Circle or Ellipse 0.9.
3. Beta is the acceptable chance of not hitting the hot spot of the specified size (also known as false negative or failure rate). A beta of 10% means your sampling design will have no more than a 10% chance of missing a hot spot of the specified size.
4. The sampling Grid Shape determines the relative orientation of your sampling points. On a square grid, the sampling locations are taken from the centers of the squares; therefore, they are aligned horizontally and vertically. On a triangular grid, the sampling locations fall on the vertices of the triangles; therefore the locations will be staggered along the vertical axis. For a rectangular grid, the points are spaced twice as far horizontally as they are vertically.
5. Choose whether you want to have a Random Start for the sample design. With random start, the location of the point in the first grid cell is chosen randomly within the grid cell. With no random start, the location of the point in the first grid cell is taken as the center (centroid) of the grid cell.
6. Designate Key Variable: Since the following three variables are related, you will enter a value for only one of them-- the remaining two are then calculated based on all of your inputs.
7. Hot spot size of interest: half the total length of the hot spot. For example, if you want to detect a hot spot that is 100 distance units across, enter "50."
8. Number of sampling locations: The number of sampling locations.
9. Distance between samples: Distance between samples in distance units.
10. Then, calculate the other two variables. The other two variables will be calculated based on your inputs. In addition, a statistical interpretation of the sampling design is displayed

- in the lower box. If you are not satisfied with the design, simply change any of the variables and single-click the "Calculate Other 2 Variables" button again.
11. If your sampling area does not have an east-west orientation, you may want to apply an angle of rotation to the sampling design. Click on the Rotate button, and draw a line on the view to indicate the angle that you want the sample design to be oriented. To clear the angle of rotation, click on the Clear Rotation button.
  12. Click on Apply to create the sampling design themes on your view. If you have chosen Random Start, you can click Apply again to re-apply your design with a different start point.
  13. To save the design as shapefiles, click on Save. Enter the names and locations where you want the sampling points shapefiles and statistical summary table to be saved.

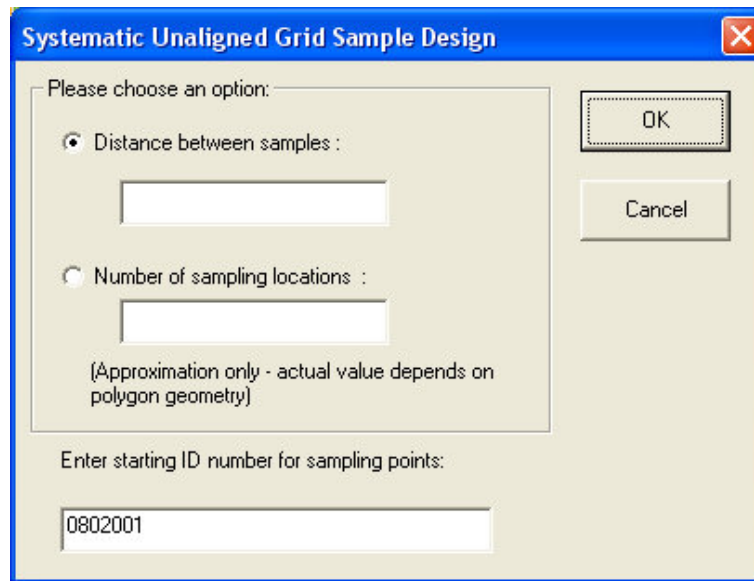
## Unaligned Grid

This sample design combines systematic and random sampling, allowing for a more uniform coverage than simple random does. In addition, this design guards against bias in the estimated mean due to unsuspected periodicities over space, as may occur with the hot spot. The tool drops a grid of user-specified size on the sampling area and takes a random point within each grid cell.

Random points are selected for the first row and first column of cells. The remaining cells derive their coordinates from the first cell in its row and the first cell in its column (y from first cell in its row, x from first cell in its column).

1. Select a polygon to bound the desired sampling area either from a file or create one on screen.
2. From the Sample Design menu, select "unaligned grid" and the following screen should appear.





**Systematic Unaligned Grid Sample Design**

Please choose an option:

☒ Distance between samples :

☐ Number of sampling locations :  
  
(Approximation only - actual value depends on polygon geometry)

Enter starting ID number for sampling points:

OK  
Cancel

3. For the unaligned grid design, enter the distance between samples or the number of sampling locations. RAT defaults to the units of the aerial image or bounding polygon, which is in meters. RAT will prompt you to save the file. You will then see the unaligned grid of points appear on the screen (the grid lines shown above were added to clarify the grid nature and will not appear in the RAT program).

**CHAPTER**

**6**

## Contour Menu

RAT allows you to contour monitoring data. The contour function in RAT uses natural neighbor interpolation to create contours. Natural neighbor interpolation finds the closest subset of input samples to a query point and applies weights to them based on proportionate areas in order to interpolate a value.

In the view legend, select the file to be contoured. Select the Grid Cell Size and check the box if you would like to enable the Gradient option. Gradient options include Tautness 1 and 2. Tautness 1 affects the minima and maxima of the interpolated values, which can create estimates beyond the range of the underlying data. Tautness 2 affects the width of the slope, i.e. varying the size of the contamination area.

The 'Natural Neighbor' dialog box is shown with the following values and settings:

Field	X	Y
Minimum	443277.4690044	448014.0076999
Maximum	6260300.639330	7563726.225704
Number of Cells	5817024	7115713

Cell Size: Grid Cell Size = 1

Options: ☒ Extrapolation, ☐ Set Negatives to Zero, ☐ Allow Nulls

Type of Data: ☒ Functional, ☐ Choropleth, ☐ Density

Other Options: ☐ Enable Gradient, Tautness 1 (Range 1 - 3) = 1.5, Tautness 2 (Range 3 - 9) = 7

Under Options there are the following choices.

- Extrapolation – Allows estimation of values beyond the spatial extent of the original data to the spatial extent of the selected polygon
- Set Negatives to Zero – Changes all negative interpolated values to 0
- Allow Nulls – Allows missing values in the calculated grid

After you have selected the options, the type of data needs to be chosen. Data types include:

- Functional Data – Returns coordinate values (X, Y) and results, such as contaminant concentration
- Choropleth Data - Sum or aggregate values associated with a region not an X, Y location
- Density Data – Ration of a functional value as related to area

Click Grid when finished. A dialog box will appear stating that RAT has finished estimating the grid. Click OK and enter a filename for the contour grid file (.asc).

## CHAPTER

# 7

## Data Collection Menu

### In this chapter:

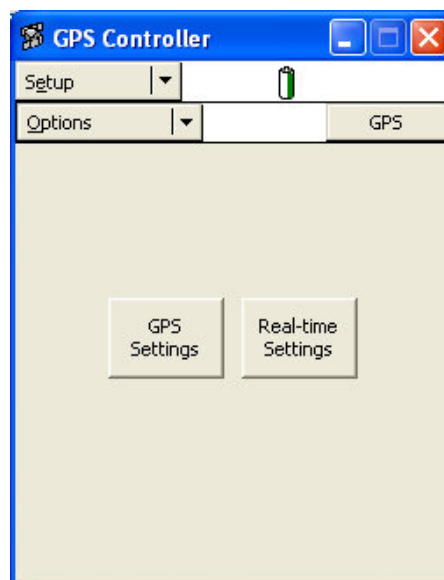
- [GPS Settings](#)
- [External Device Settings](#)
- [Timer Interval](#)
- [Status Window](#)
- [Trend Window](#)
- [Setup Alarms](#)
- [Show Alarms](#)

This chapter discusses the options available in the Data Collection menu of RAT.

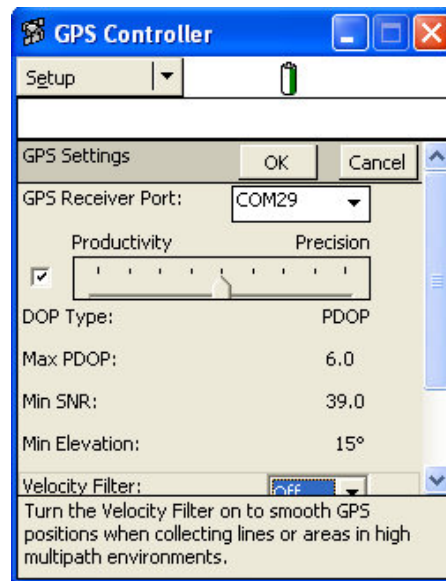
## GPS Settings

RAT supports GPS devices that can output a NMEA string containing spatial data from the GPS receiver. Prior to connecting the GPS device in RAT, it is necessary to configure the device using Trimble's GPS Controller or TerraSync software using the instructions below. Information on setting up individual GPS units can be found in Chapter 11.

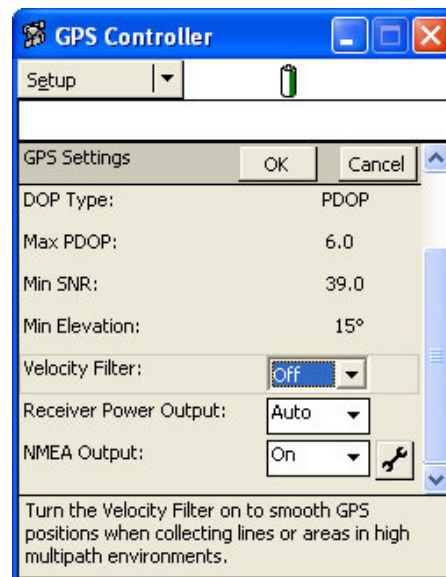
1. Open GPS Controller or TerraSync on the field device.
2. Ensure that GPS is *not* connected. If necessary, go to Setup and click the GPS button to disconnect GPS.



3. In Setup, click the GPS Settings button.
4. Select the correct com port under GPS Receiver Port. You may need to check Device Manager (Chapter 10) to find out the com port number assigned by your computer.



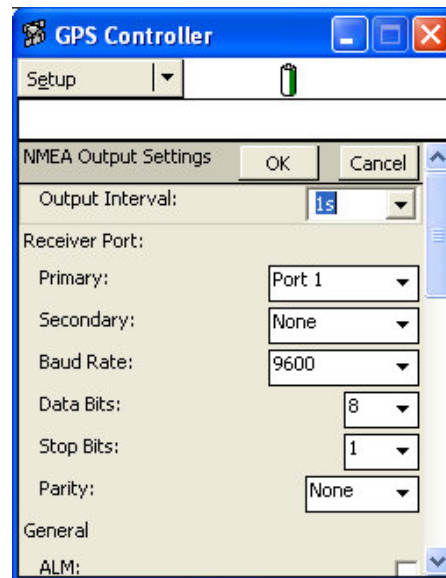
5. Ensure that NMEA output is on.



6. Select the NMEA Settings button (wrench tool) and setting the following parameters:

- Output interval: 1 s
- Primary Receiver Port: Port I
- Secondary Receiver Port: None
- Baud Rate: 9600
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- GGA: Checked

- GSA: Checked



7. Select OK to return to GPS Settings menu.
8. Select OK to return to Setup menu.
9. Click the GPS button to connect to GPS.
10. If the instrument fails to connect, change the com port and attempt to connect again. Once connected, allow several minutes for satellite and beacon acquisition. This can be checked in the Skyplot menu.

*Note: Trimble GeoExplorer series (GeoXH, GeoXT, GeoXM) require additional setup, as outlined below.*

- I. Connect the option serial clip to the GeoExplorer and plug a null modem cable into the serial clip.



2. On the GPS device, go to Start/Settings/Connections.
3. Open GPS Connector.
4. Click the Setup button.
5. Choose External – COM 1 for NMEA Output.
6. Click the wrench tool and set the following:
  - Port Configuration: Custom
  - Baud Rate: 9600
  - Data Bits: 8
  - Stop Bits: 1
  - Parity: None
7. Click OK when finished.
8. Click OK to return to the main menu. The screen should indicate:

Connecting . .  
COM1 opened at 9600-8-1-N  
COM2 connected to COM1  
NMEA output on COM1 at 9600-8-1-N

To connect the GPS device to RAT, open GPS Settings from the Data Collection Menu.

**Select GPS Device**

**GPS Device Settings**

Device Name: NMEA 0183

Communication Port: Detect Automatically

☒ Use Only Corrected

Accuracy (PDOP): 6

More [Slider] Less

GPS Date: [Field]

GPS Time: [Field]

Detect Port

**Local Settings**

Time Zone: Eastern Standard Time

Local Computer Date: 8/2/2009

Local Computer Time: 3:23:18 PM

☐ Computer Clock Is Correct

OK Cancel



Using the Device Name drop down menu, select one of the GPS devices in the list.

- NMEA 0183 is the default selection in RAT for collecting both GPS and Device data.
- No GPS –Trend for Trend Analysis. Use this option when viewing continuous incoming data from stationary air monitoring device(s) (e.g. MultiRAE).
- No GPS –Soil. Use this option for soil testing with XRF device. These results can be merged with GPS data at a later time. (see File Menu/Merge)
- GPS Only. This option allows you to collect a GPS point (Single Point Collection), line, or polygon area features. For point features, you are required to enter a Sample ID value. This Sample ID can be used to merge the GPS points with data recorded in No GPS – Soil mode.

The Use Only Corrected checkbox option only accepts GPS data that is being corrected in real-time. This enhances the quality of the location data from your GPS receiver. However, not all GPS receivers support real-time corrections. *Note that checking this option will exclude data that has not been corrected but that may be valid data.* On the main screen, the GPS Status Window displays various colors - green represents corrected GPS data, blue uncorrected, and red improper GPS signal.

The Accuracy (PDOP) slider option allows you to adjust the PDOP. The PDOP describes the geometric strength of satellite configuration on GPS accuracy. The default value is set to 6, which is the USEPA and industry standard; greater than six decreases the accuracy of your GPS coordinates.

Click the Detect Port button to find the port connected to the GPS device. RAT finds the correct port by analyzing the incoming data from all ports and finding the data with the correct GPS format. You should see the message that "NMEA detected on Comm Port: X" appear when RAT has located the correct port for the device. If RAT is unsuccessful in detecting the GPS, the following message appears: "Could not detect GPS device. Make sure the device is turned on, connected, and try again."

Finally, click on the check mark box stating the Computer Clock is Correct. Be sure to verify that your computer clock is indeed set to the correct time. If a change is necessary, double click on the time in the system tray of Windows and update the date, time, and time-zone.

## External Device Settings

You can setup monitoring devices through the External Device Settings option. External devices include the following:

### Radiation Equipment

- Ludlum 222I
- Ludlum 224I
- Ludlum 2350-I
- Fluke Victoreen 451P

### Air Monitoring Equipment

- DataRAM DR-4000

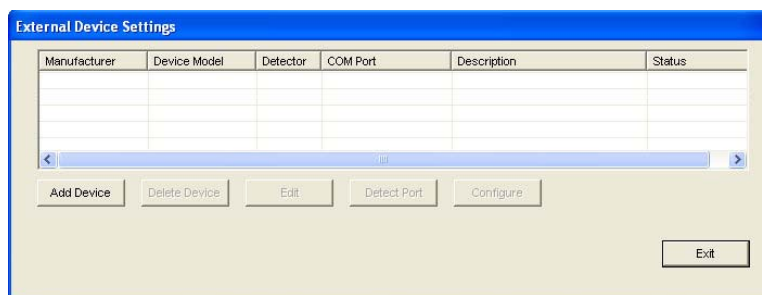
- MultiRAE
- Multiwarn

### Soil Monitoring

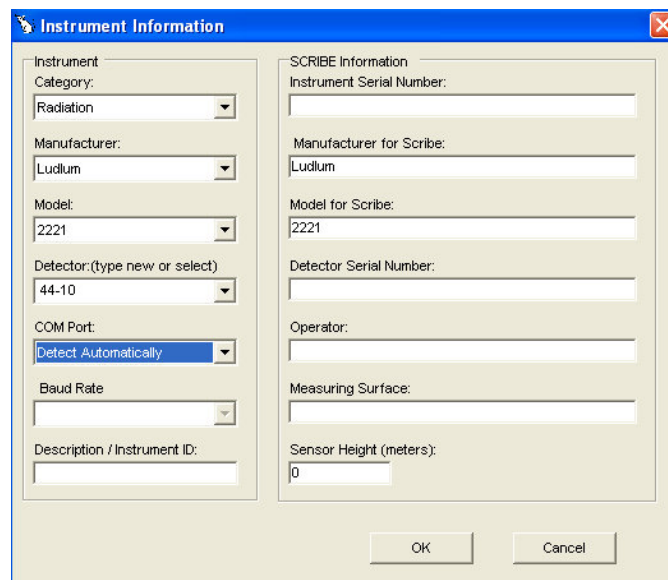
- Niton XL-700 series XRF
- Innov-X 4000 series XRF

To connect an instrument to RAT, follow the instructions below. Instrument-specific information is provided in Section II.

1. Select External Device Settings from the Data Collection menu.
2. Click the Add Device button.



3. Select the Instrument Category.

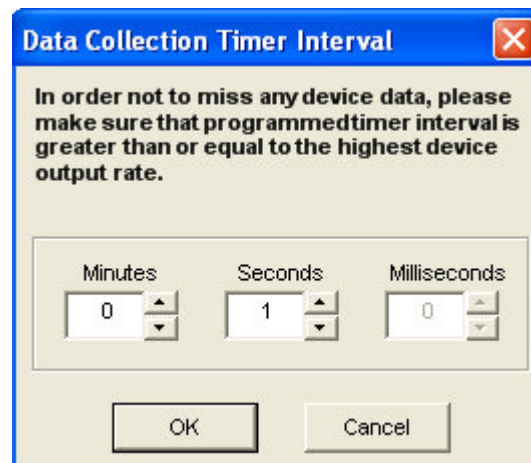


4. Select the Manufacturer.
5. Select the Model.
6. If the instrument is a radiation detection device and has an external detector, select the correct detector.
7. Allow the COM Port to detect automatically.

8. Leave the Baud Rate as null, except for NITON XLp XRF instruments. For these instruments, you must know the baud rate and select it accordingly. The baud rate can usually be determined by looking at the instrument's settings.
9. Enter a unique Description/Instrument ID (Required).
10. Enter information for Scribe as needed, including the Instrument Serial Number, Detector Serial Number, Operator, etc.
11. RAT will scan available com ports to detect the instrument. When the instrument is connected, the Status on the External Device Settings dialog box will read "Connected."

## Timer Interval

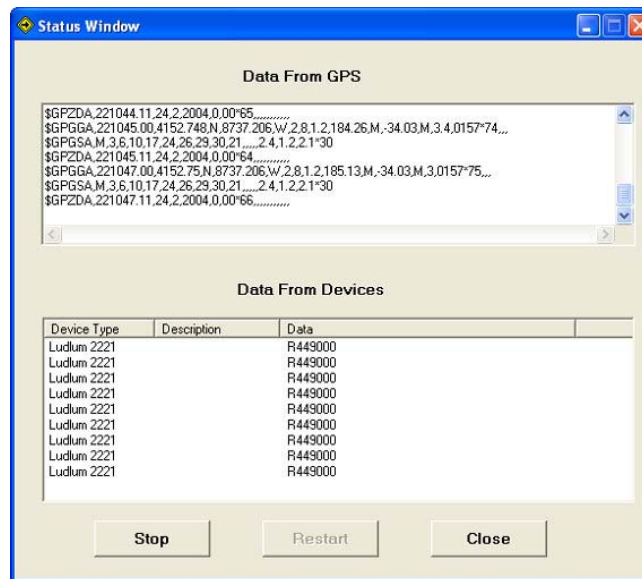
RAT allows you to set the frequency at which it acquires a reading from the monitoring and GPS devices. The default setting is for 1 second to maximize data collection.



You should be careful about changing the default setting. You may miss readings from the monitoring devices and incorrectly record a reading at the wrong location.

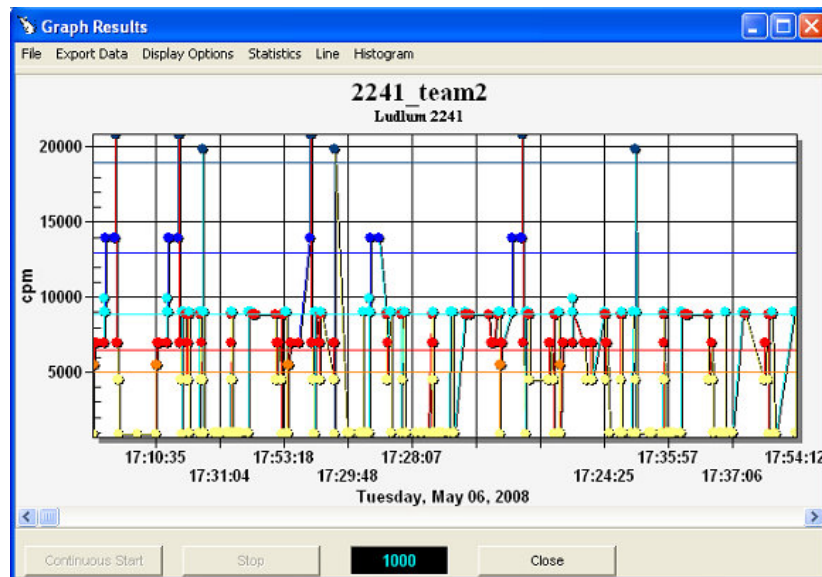
## Status Window

The Status Window shows you current data streaming from the devices. The GPS window shows two lines of data including the GGA (GPS time, position, and fix-related data) and GSA (GPS receiver operating mode, satellites used for navigation, and DOP values). The data from device window shows values from the instruments.



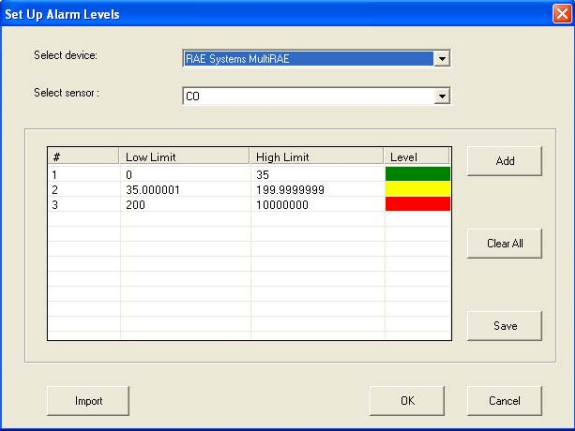
## Trend Window

The Trend Windows allows you to view a graph of monitoring data plotted versus time. The Continuous Start and Stop button allow you to control starting and stopping data collection. You can use the menus at the top to save the graph to a file or export the data to Scribe.



## Setup Alarms

You can set up alarms levels for each instrument. The resulting alarm box is a floating box that can be viewed during data collection.



The 'Set Up Alarm Levels' dialog box features a title bar with a close button. It contains two dropdown menus: 'Select device:' set to 'RAE Systems MultiRAE' and 'Select sensor:' set to 'CO'. Below these is a table with four columns: '#', 'Low Limit', 'High Limit', and 'Level'. The table has three rows of data. To the right of the table are 'Add', 'Clear All', and 'Save' buttons. At the bottom are 'Import', 'OK', and 'Cancel' buttons.

#	Low Limit	High Limit	Level
1	0	35	Green
2	35.0000001	199.9999999	Yellow
3	200	10000000	Red

## Show Alarms

The alarm box will show instrument and sensor-specific low and high alarms during data collection.

## CHAPTER

# 8

## Display Options Menu

### In this chapter:

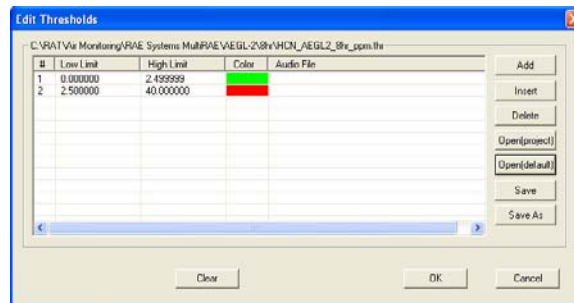
- [Edit Thresholds](#)
- [Set Thresholds](#)
- [View Threshold Legend](#)
- [View/Edit Data File](#)
- [Query Data File](#)
- [View FTP](#)
- [Tile Trend Windows](#)

This chapter discusses the options available in the Display Options menu of RAT.

## Edit Thresholds

RAT allows you to apply custom or default thresholds to your data. Thresholds are the concentrations at which the RAT point data will change colors, usually indicative of an alarm condition or health-based screening levels. Default threshold values include Acute Exposure Guideline Level (AEGL), Emergency Response Protection Guidelines (ERPG), and Temporary Emergency Exposure Limits (TEEL).

You can create and edit custom thresholds in the Display Options menu under Edit Thresholds. You can choose to create a new file using the Add button. You can also modify existing thresholds using the Open buttons. You can either open thresholds from the existing project using the Open (project) button or from the default threshold files using the Open (default) button.



Default thresholds, including the AEGLs, ERPGs, and TEELs, are stored on your hard drive in the RAT folder. Files are located inside the Air Monitoring, Radiation, and Soil Monitoring folders and are organized by instrument.

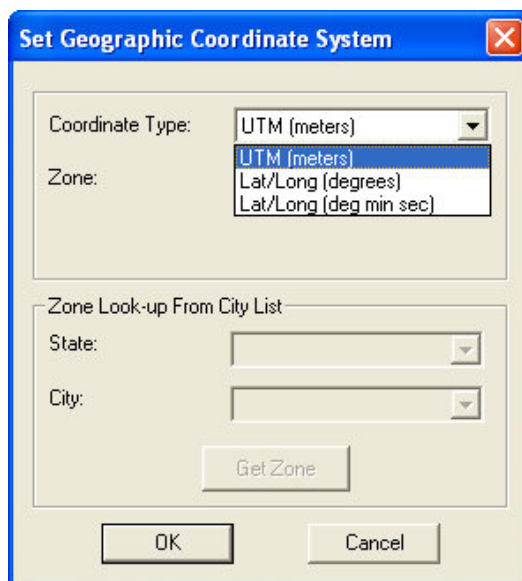


After you have created or edited the threshold file, you can save the file. RAT will prompt you to assign the threshold to the contaminant-specific monitoring file. Another way to associate the threshold with the file is to double click on the file name in the directory, which will initiate the Threshold Setup box. From this box, you can browse the default directory or browse within your project for threshold files. A third alternative is to import thresholds from another project, as discussed in Chapter 3, Background Data Menu.

## Set Coordinates

RAT allows you to change the display coordinate system from the default of UTM. Other coordinate projections include Latitude/Longitude in decimal degrees and degrees, minutes, seconds (DMS). In order to re-project the UTM coordinates correctly, you must know the

UTM zone where you are collecting data. There is a city look-up list in RAT that can provide you with that information.



The dialog box titled "Set Geographic Coordinate System" has a blue title bar with a close button. It contains two main sections. The first section has a "Coordinate Type:" label and a dropdown menu currently showing "UTM (meters)". Below it is a "Zone:" label and a list box showing "UTM (meters)", "Lat/Long (degrees)", and "Lat/Long (deg min sec)". The second section is titled "Zone Look-up From City List" and contains a "State:" label with a dropdown menu, a "City:" label with a dropdown menu, and a "Get Zone" button. At the bottom are "OK" and "Cancel" buttons.

## View Threshold Legend

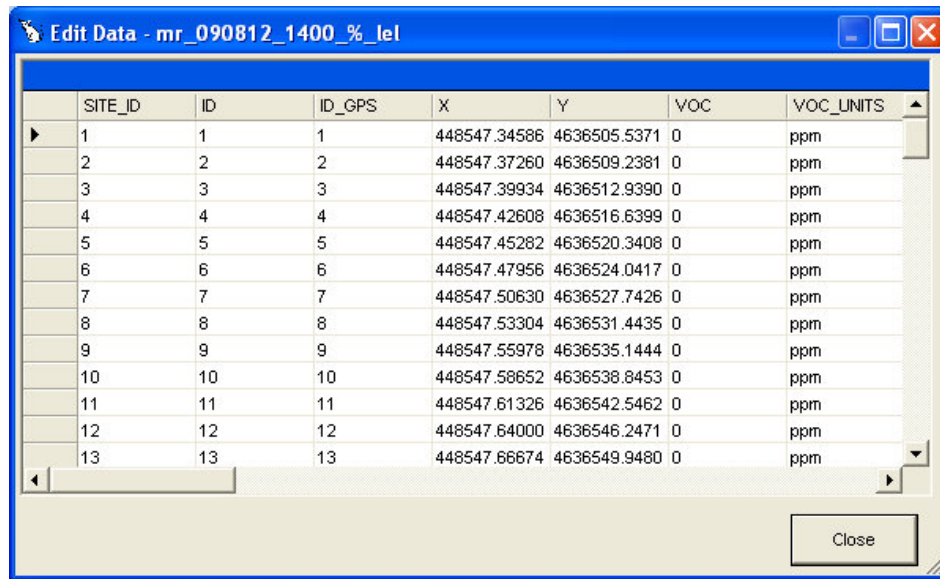
You can use this option to turn the threshold legend on and off. The threshold legend appears under the view legend and shows the threshold values for the highlighted file in the view legend.

	Low Limit	High Limit	Color
1	0.000000	10.000000	Green
2	10.000001	100.000000	Red

## View/Edit Data File

You can view the data collected in your RAT project by selecting the View/Edit Data File. The only editable field in this table is the Notes field.



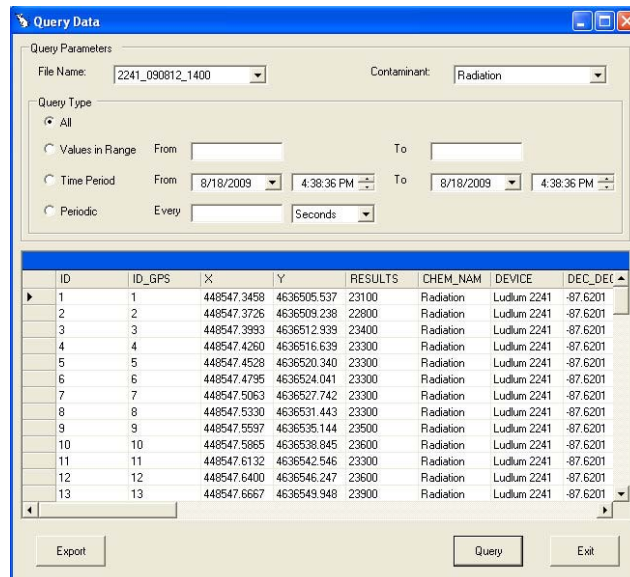


The screenshot shows a window titled "Edit Data - mr\_090812\_1400\_%\_lel". It contains a table with the following columns: SITE\_ID, ID, ID\_GPS, X, Y, VOC, and VOC\_UNITS. The table lists 13 data points, each with a unique SITE\_ID and ID, and corresponding GPS coordinates and VOC readings in ppm.

SITE_ID	ID	ID_GPS	X	Y	VOC	VOC_UNITS
1	1	1	448547.34586	4636505.5371	0	ppm
2	2	2	448547.37260	4636509.2381	0	ppm
3	3	3	448547.39934	4636512.9390	0	ppm
4	4	4	448547.42608	4636516.6399	0	ppm
5	5	5	448547.45282	4636520.3408	0	ppm
6	6	6	448547.47956	4636524.0417	0	ppm
7	7	7	448547.50630	4636527.7426	0	ppm
8	8	8	448547.53304	4636531.4435	0	ppm
9	9	9	448547.55978	4636535.1444	0	ppm
10	10	10	448547.58652	4636538.8453	0	ppm
11	11	11	448547.61326	4636542.5462	0	ppm
12	12	12	448547.64000	4636546.2471	0	ppm
13	13	13	448547.66674	4636549.9480	0	ppm

## Query Data File

You can query data in your RAT project by a value range, time period, or periodic interval. You must select the file name to query from the File Name dropdown box. You can also select the contaminant.



The screenshot shows a window titled "Query Data". It has a "Query Parameters" section with a "File Name" dropdown set to "2241\_090812\_1400" and a "Contaminant" dropdown set to "Radiation". Below this, there are three radio buttons for "Query Type": "All" (selected), "Values in Range" (with "From" and "To" fields), and "Time Period" (with "From" and "To" date/time fields). There is also a "Periodic" option with an "Every" field and a "Seconds" dropdown. At the bottom, there is a table with columns: ID, ID\_GPS, X, Y, RESULTS, CHEM\_NAM, DEVICE, and DEC\_DEI. The table lists 13 data points, each with a unique ID and corresponding GPS coordinates, radiation results, and device information.

ID	ID_GPS	X	Y	RESULTS	CHEM_NAM	DEVICE	DEC_DEI
1	1	448547.3458	4636505.537	23100	Radiation	Ludlum 2241	-87.6201
2	2	448547.3726	4636509.238	22800	Radiation	Ludlum 2241	-87.6201
3	3	448547.3993	4636512.939	23400	Radiation	Ludlum 2241	-87.6201
4	4	448547.4260	4636516.639	23300	Radiation	Ludlum 2241	-87.6201
5	5	448547.4528	4636520.340	23300	Radiation	Ludlum 2241	-87.6201
6	6	448547.4795	4636524.041	23300	Radiation	Ludlum 2241	-87.6201
7	7	448547.5063	4636527.742	23300	Radiation	Ludlum 2241	-87.6201
8	8	448547.5330	4636531.443	23300	Radiation	Ludlum 2241	-87.6201
9	9	448547.5597	4636535.144	23500	Radiation	Ludlum 2241	-87.6201
10	10	448547.5865	4636538.845	23600	Radiation	Ludlum 2241	-87.6201
11	11	448547.6132	4636542.546	23300	Radiation	Ludlum 2241	-87.6201
12	12	448547.6400	4636546.247	23600	Radiation	Ludlum 2241	-87.6201
13	13	448547.6667	4636549.948	23900	Radiation	Ludlum 2241	-87.6201

## View FTP

You can view the FTP configuration using this option. To send your files to a FTP site, instructions are provided in Chapter 4, Export Data Menu.

**Ftp Configuration**

FTP Server Name: regionalftp.ert.org

User Name: R05FTPuser

Password: \*\*\*\*\*

Proxy:

Shared Directory:

Polling Period: 0

☒ Sender Transfer  
☐ Receiver Polling

Close

## Tile Trend Windows

You can use this menu option to automatically distribute trend windows evenly on your display. To view trend windows, refer to Chapter 7, Data Collection.

## CHAPTER

# 9

## Statistics Menu

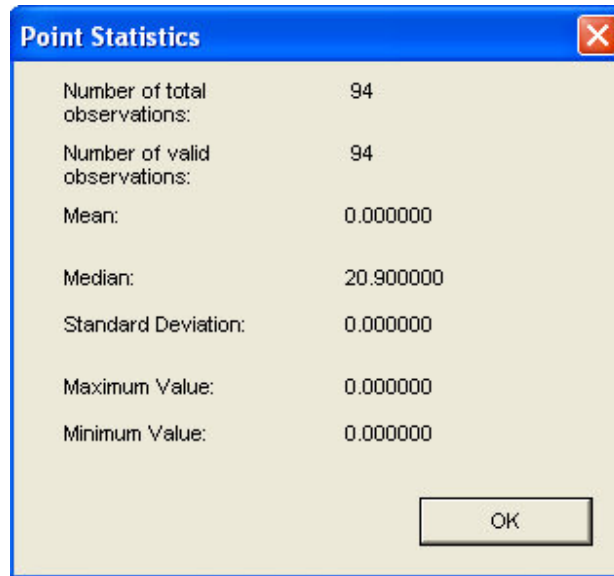
### In this chapter:

- [Point Statistics](#)
- [Grid Statistics](#)

Within RAT you can obtain basic statistical information on the data you collected. This includes point and grid statistics.

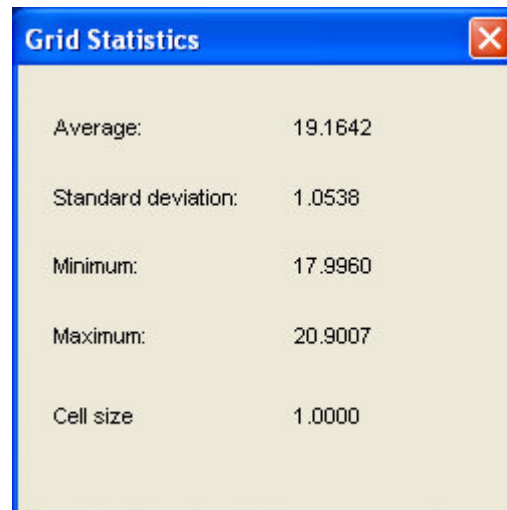
## Point Statistics

You can obtain statistical information on point files in your RAT project. Click on Point Statistics in the Statistics menu. RAT provides you with the information shown below.



## Grid Statistics

Grid Statistics provide you information on grid files, including;



## CHAPTER

# 10

## Help Menu

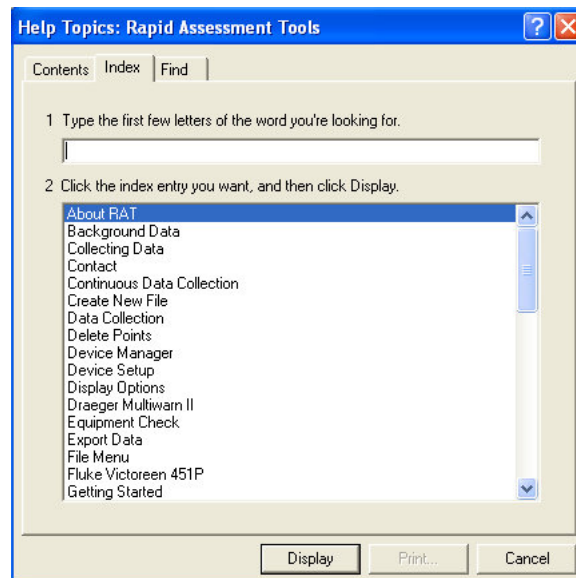
### In this chapter:

- [Help Topics](#)
- [Device Manager](#)
- [Link to HyperTerminal](#)
- [About FIELDS Rapid Assessment Tool](#)

The Help Menu provides you with several options including Help Topics, shortcuts to Device Manager and HyperTerminal, and information about the RAT software.

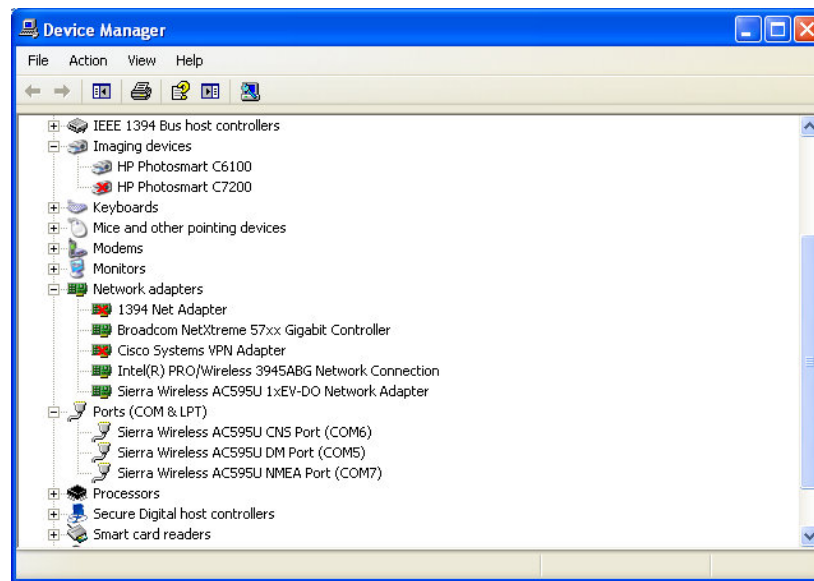
## Help Topics

The Help menu provides basic information on RAT. Most information is organized by menu topics, e.g. look in Background Data for information on aerial images.



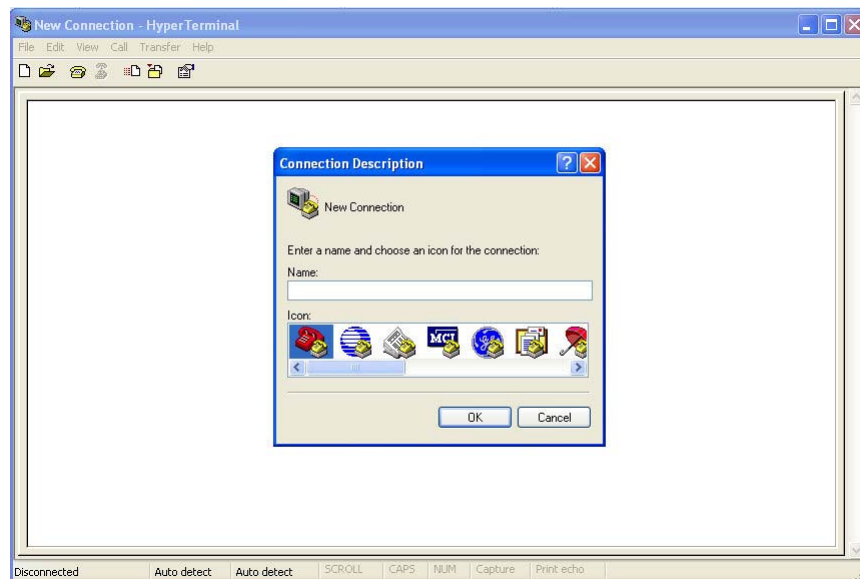
## Device Manager

RAT provides you a shortcut to Windows Device Manager. Device Manager provides you with information about how the hardware on your computer is installed and configured, and how the hardware interacts with your computer's programs. With Device Manager, you can update the device drivers for hardware installed on your computer, modify hardware settings, and troubleshoot problems. Device Manager is useful for understanding how your computer assigns com port numbers to USB-serial adapters.



## Link to HyperTerminal

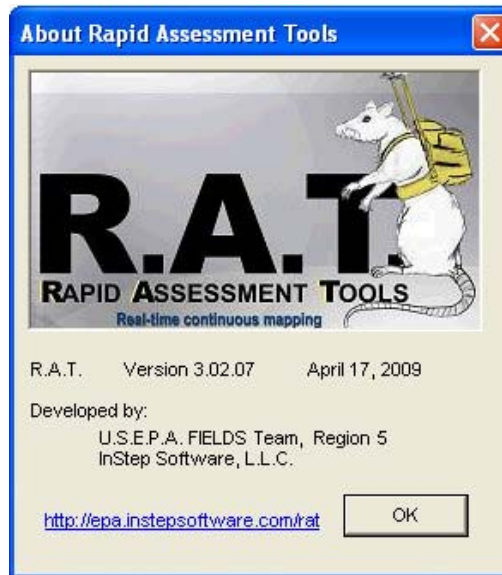
HyperTerminal lets you connect to other computers, Internet telnet sites, bulletin board services, online services, and host computers, using either your modem or a null modem cable. You can use HyperTerminal to connect to monitor instruments to find out if they are configured correctly for computer communications.



When connecting instruments to HyperTerminal, be sure to select the correct com port under the Connect Using option. Also set the baud rate, data bits, stop bits, and parity to the correct settings for your instrument. It may be necessary to enter special characters for certain instruments. Refer to the Troubleshooting section for more information.

## About FIELDS Rapid Assessment Tool

This menu option provides you information on the current version of RAT including the version number and release date.





**SECTION**

**II**

## **EQUIPMENT**

**In this section:**

- Chapter 11, Global Positioning Systems
- Chapter 12, Radiation Monitoring Equipment
- Chapter 13, Air Monitoring Equipment
- Chapter 14, Soil Monitoring Equipment

CHAPTER

11

## Global Positioning Systems

### In this chapter:

- Trimble Pro XR and Pro XRS
- Trimble ProXT and ProXH
- Trimble GeoExplorer Series

RAT supports GPS devices that can output a NMEA string containing spatial data from the GPS receiver. However, only the setup and use of certain Trimble GPS units is discussed in this user guide.

## Trimble Pro XR and Pro XRS

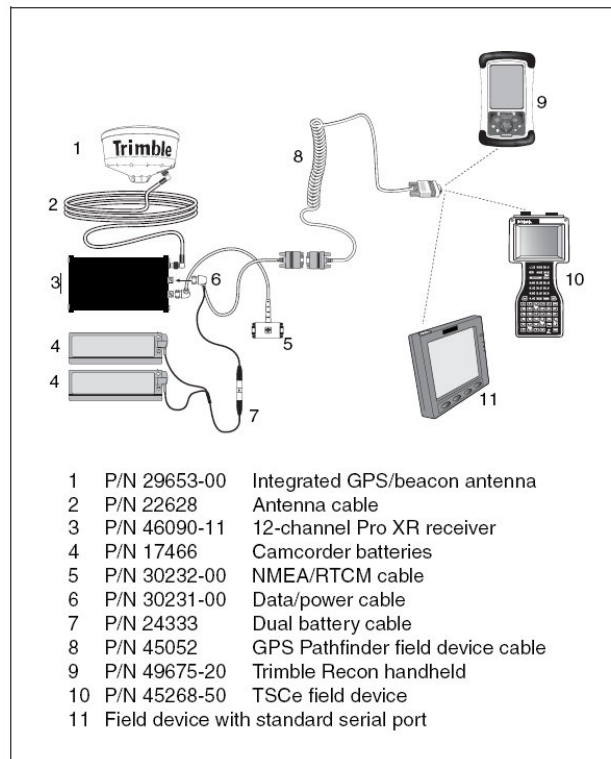
GPS Pathfinder Pro XR and Pro XRS receivers are high-end receivers that are capable of sub-meter accuracy. They are capable of utilizing a range of accurate real-time correction sources and the rugged design ensures that they function effectively in all GPS conditions and all environments. GPS Pathfinder Pro XR and Pro XRS receivers can easily be fitted into the custom-designed ergonomic backpack or onto your vehicle with a magnet mount.

The following parts and accessories are needed to connect the Trimble Pro XR and Pro XRS to RAT.

- Backpack
- Controller, such as the TSCe or a laptop
- Controller alternating current (AC) adapter
- Receiver
- Antenna
- Male/female serial cable
- Batteries
- Battery charger
- GPS Controller or TerraSync software



To setup a Trimble Pro XR or Pro XRS GPS unit with a TSCe controller, or a laptop computer, connect the system as shown below and complete the following steps.



1. Place the Pathfinder Pro XR or Pro XRS receiver in the center of the backpack, between the battery pockets. Position it with the back panel face up and clip the receiver in place with the retaining straps.
2. Attach the data/power cable (P/N 30231-00) to receiver Port B.
3. Place two (or four, if needed) fully charged batteries in the backpack. One battery goes in each of the battery pockets, with the connector clips facing up, towards the front.
4. Clip the battery cable (P/N 24333) to two batteries and connect the 3-pin connector to the data/power cable. The other two batteries act as spares if required.
5. Screw the antenna pole(s) onto one of the antenna mounts. The poles need to be high enough for the Pathfinder Pro XR or Pro XRS antenna to be above your head.
6. Install the Pathfinder Pro XR or Pro XRS antenna on top of the antenna pole.
7. Attach the antenna cable (P/N 22628) to the port labeled "Ant" on the receiver.
8. Thread the other end of the antenna cable through the antenna cable outlets and attach it to the antenna.
9. Place the excess antenna cable in the device pocket.
10. From the outside of the backpack, insert the DE9 connector of the field device data cable through the data cable outlet.
11. Connect the DE9 connector on the receiver data/power cable (P/N 30231-00) to the DE9 connector on the field device data cable.
12. Pull the data cable through the cable retainer loops on the side of the backpack.
13. Connect the field device cable to the field device or into a USB serial adapter.
14. Close all compartments.
15. Open GPS Controller or TerraSync on the field device.

16. Ensure that GPS is *not* connected. If necessary, go to Setup>Options to disconnect GPS.
17. In Setup, click the GPS Settings button.
18. Select the correct com port.
19. Ensure that NMEA output is on.
20. Select the NMEA Settings button (wrench tool) and setting the following parameters:
  - Output interval: 1 s
  - Receiver port: Port 1
  - Baud rate: 9600
  - GGA: Yes
  - GSA: Yes
21. Select OK to return to GPS Settings menu.
22. Select OK to return to Setup menu.
23. Under Options, connect to GPS.
24. If the instrument fails to connect, change the com port and attempt to connect again. Once connected, allow several minutes for satellite and beacon acquisition.
25. Once connected, open the RAT software program. In the Data Collection menu, click on GPS Settings.
26. Using the dropdown menu, select NMEA 84 for the Device Name.
27. For Communication Port, select Detect Automatically.
28. Set Accuracy (PDOP) at 6.
29. Check box that “Computer clock is correct.”
30. Click Detect Port. If the GPS is correctly detected, the message “NMEA 84 detected on Com Port X” will display, where X represents the com port number.
31. Click OK to accept the settings and close the window.

## Trimble Pathfinder ProXT and ProXH

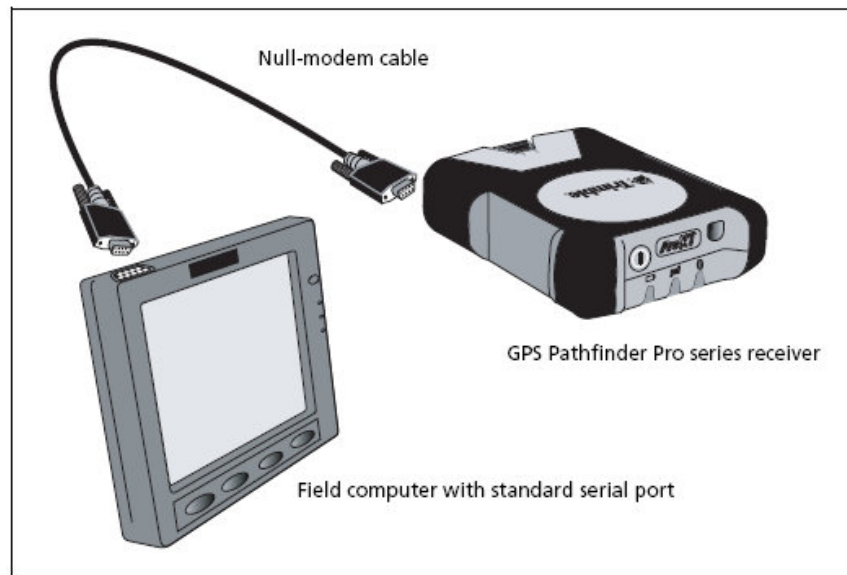
Purpose-built for GIS data collection, the GPS Pathfinder ProXT and ProXH receivers are designed for ease of use. A sub-meter GPS receiver, antenna, and all-day battery in one, the ProXT and ProXH receivers make data collection more straightforward. GPS Pathfinder ProXT and ProXH receivers can be fitted onto your vehicle with a magnet mount.



The following parts and accessories are needed to connect the Trimble Pathfinder Pro Series (Pro XT or Pro XH) to RAT.

- AC adapter
- Female/female null modem cable
- GPS Controller or TerraSync software
- Recon Handheld (optional)

To setup a Trimble Pro XT or Pro XH, connect the system as shown below and complete the following steps.



1. Turn on the Pro XT/Pro XH using the button on the front panel.
2. Ensure that the Bluetooth radio is off (Blue LED on the front panel will not flash). It may be necessary to deactivate the Bluetooth radio using the Trimble Bluetooth Activation Manager.
3. Connect the null modem cable into the ProXT/ProXH unit. Plug the other end into the serial port on the laptop. If there is no serial port available on the laptop, the cable can be plugged into a USB-serial adapter.
4. Connect the USB serial adapter to the laptop using the USB cable.
5. Open GPS Controller or TerraSync software on the laptop.
6. Ensure that GPS is *not* connected. If necessary, go to Setup and deselect the GPS button. Press Yes to disconnect.
7. In Setup, click the GPS Settings button.
8. Select the correct GPS receiver port. Select the correct com port as the receiver port (see Device Manager in Chapter 10).
9. Ensure that NMEA output is on.
10. Select the NMEA Settings button (wrench tool) and setting the following parameters:
  - Output interval: 1 s
  - Primary receiver: Port 1
  - Secondary receiver: None
  - Baud rate: 9600
  - GGA: Yes
  - GSA: Yes
11. Select OK to return to GPS Settings menu.
12. Select OK to return to Setup menu.
13. Press the GPS button to connect to GPS.
14. Once connected, allow several minutes for satellite and beacon acquisition.

15. Once connected, open the RAT software program. In the Data Collection menu, click on GPS Settings.
16. Using the dropdown menu, select NMEA 84 for the Device Name.
17. For Communication Port, select Detect Automatically.
18. Set Accuracy (PDOP) at 6.
19. Check "Computer clock is correct" box.
20. Click Detect Port. If the GPS is correctly detected, the message "NMEA 84 detected on Com Port X" will display, where X represents the com port number.
21. Click OK to accept the settings and close the window.

## Trimble GeoExplorer Series

The Trimble GeoExplorer series includes the GeoXM, GeoXT, or GeoXH units. These are high performance GPS receivers in a rugged handheld computer. The GeoXM collects reliable 1 to 3 meter GPS data. The GeoXT collects sub-meter GPS receiver with post-processing. The GeoXH provides real-time sub-foot (<30 centimeter [cm]) accuracy with the internal antenna, and decimeter (10 cm) accuracy with an optional Zephyr external antenna.



The Trimble GeoExplorer series 2005 and 2008 series can be connected to RAT using a serial clip. *Note - The 2003 series of the GeoExplorer cannot be connected to RAT.*

The serial clip attaches to the communication swipes on the back of the handheld. When the serial clip is attached, it adds a serial port (COM1) to the GeoExplorer series handheld. The serial clip is used to connect to a computer to supply GPS data. To attach the serial clip to the handheld, follow the procedures below. *Note – When connecting to an office computer using the serial clip, you cannot use ActiveSync technology to establish the connection or synchronize data.*

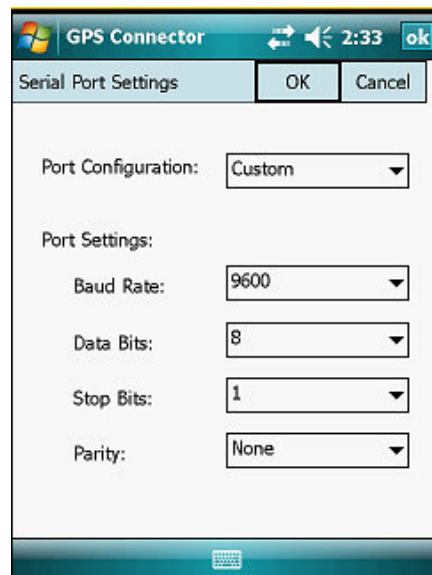


1. Line up the communication swipes on the handheld with the pins on the serial clip.
2. Lower the handheld onto the serial clip.
3. Use the screws supplied with the serial clip to secure it to the handheld.

4. Plug the null modem cable into the serial port on the serial clip.
5. Connect the other end of the cable to the serial port on the external device. To connect to a serial device that does not have a standard 9-pin serial port, use a USB-serial adapter.



6. On the GeoExplorer handheld, go to Start/Settings/Connections and open GPS Connector.
7. Click Setup.
8. Set the NMEA Output to External – COM1 and press the NMEA Settings button (wrench tool).
9. In the Serial Port Settings, set the Port Configuration to Custom and set the Baud Rate to 9600.





10. Once connected, open the RAT software program. In the Data Collection menu, click on GPS Settings.
11. Using the dropdown menu, select NMEA 84 for the Device Name.
12. For Communication Port, select Detect Automatically.
13. Set Accuracy (PDOP) at 6.
14. Check "Computer clock is correct" box.
15. Click Detect Port. If the GPS is correctly detected, the message "NMEA 84 detected on Com Port X" will display, where X represents the com port number.
16. Check button that Computer Clock is Correct.
17. Click OK to accept the settings and close the window.

CHAPTER

12

## Radiation Monitoring Equipment

### In this chapter:

- Ludlum 222 I
- Ludlum 224 I
- Ludlum 2350-I
- Fluke Victoreen 45 IP

This section includes setup of radiation monitoring equipment including the Ludlum 222I, Ludlum 224I, Ludlum 2350-I, and Fluke Victoreen 451P.

## Ludlum 222I Scaler/Ratemeter

The Ludlum Model 222I portable Scaler/Ratemeter is a self-contained counting instrument designed for operation with scintillation, proportional, or G-M detectors. A single channel analyzer is also featured for use in gamma spectrum analysis.

The 222I can be connected to RAT with several detectors, including 43-37, 43-68, 44-7, 44-10, and 44-20 probes. The 222I is automatically set to output a digital feed every 2 seconds. This is a factory setting and cannot be changed by the user. **NOTE: In selecting the detector setting on the instrument, you should refer to the instrument's calibration certificate. Failure to do so can result in instrument malfunction.**



The following parts and accessories are needed to connect the Ludlum 222I to RAT.

- Ludlum 222I Datalogger
- Serial Cable (9-pin male to female null modem cable)
- Probe
- Coaxial Cable
- D-Cell Batteries

The following procedures should be used to setup the Ludlum 222I:

1. Securely fasten the data cable from the instrument to the USB serial adapter.
2. From the Data Collection menu in RAT, select External Device Settings.
3. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for SCRIBE.
4. Select the Radiation as the category of instrument using the dropdown menu.
5. Select Ludlum as the manufacturer of the instrument using the dropdown menu.
6. Select the 222I as the model using the dropdown menu.
7. Select the correct detector.
8. Set Com Port to Detect Automatically.
9. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
10. On the right side of the screen, information can be entered for downloading to SCRIBE. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height

11. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
12. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
13. If RAT fails to detect the instrument after several connection attempts, delete the instrument by selecting Delete Device in the External Device Settings dialog box. Attempt to reconnect the instrument.
14. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. 2221\_090819\_1400.
15. When reading, click the Continuous Start button to begin collecting data.

## Ludlum 2241-2 Scaler/Ratemeter

The Model 2241-2 is a portable microprocessor-based digital Scaler/Ratemeter designed for use with scintillation, Geiger-Mueller (G-M), and proportional type detectors for measurement of ionizing radiation. The data is presented on a 4-digit (6 digits in the Scaler mode) Liquid Crystal Display (LCD) with moving decimal point. A 3-position switch labeled selects the desired operating mode for the instrument.

The Ludlum 2241-2 can be configured in RAT with a number of detectors, including the 43-37, 43-68, 44-7, 44-10, 44-20, 133-4, and 133-6 probes.

**NOTE: In selecting the detector setting on the instrument, you should refer to the instrument's calibration certificate. Failure to do so can result in instrument malfunction.**



The following parts and accessories are needed to connect the Ludlum 2241 to RAT.

- Ludlum 2241 Datalogger
- Serial Cable (9-pin male to female null modem cable)
- Probe
- Coaxial Cable
- D-Cell Batteries

The following procedures should be used to setup the Ludlum 2241:

1. Connect the detector to the 2241 instrument using a coaxial cable.
2. Set Fast/Slow (F/S) switch to S.
3. Open the instrument case and unplug the speaker and serial port.
4. On the rotary knob, select position F and verify a baud rate of 9600.
5. Move knob to Position D for data dumping.
6. Reconnect the speaker and serial port and close the instrument case.
7. Operate the instrument in ratemeter mode.
8. Connect a serial cable to the 2241-2, and then connect the other end into the 4-port USB serial adapter.
9. From the Data Collection menu in RAT, select External Device Settings.
10. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for Scribe.

11. Select the Radiation as the category of instrument using the dropdown menu.
12. Select Ludlum the manufacturer of the instrument using the dropdown menu.
13. Select the 2241 as the model using the dropdown menu.
14. Select the correct detector using the dropdown menu.
15. Set Com Port to Detect Automatically.
16. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
17. On the right side of the screen, information can be entered for downloading to SCRIBE. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
18. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
19. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
20. If RAT fails to detect the instrument after several connection attempts, delete the instrument by selecting Delete Device in the External Device Settings dialog box. Attempt to reconnect the instrument.
21. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. 2241\_090819\_1400.
22. When reading, click the Continuous Start button to begin collecting data.

## Ludlum 2350-I Data Logger

The 2350-I is a general purpose Ratemeter/Scaler datalogger. It has a digital display and stores up to 16 detector setups. Optional accessories include a programmable terminal, optical wand bar code reader, and bar code scanner.

The Ludlum 2350-I can be configured in RAT with a number of detectors, including the 43-37, 43-68, 44-7, 44-10, and 44-20 probes.

**NOTE: In selecting the detector setting on the instrument, you should refer to the instrument's calibration certificate. Failure to do so can result in instrument malfunction.**

The following parts and accessories are needed to connect the Ludlum 2350-I to RAT.

- Ludlum 2350-I Datalogger
- Serial Cable (9-pin male to female null modem cable)
- Probe
- Coaxial Cable



- D-Cell Batteries
- Programmable terminal, optical wand bar code reader, or bar code scanner

Configuring the 2350-I for RAT will depend on the programming option available, whether the programmable terminal, optical wand bar code reader, or bar code scanner. The directions below are general instructions for connecting the 2350-I to RAT. You should familiarize yourself with the instrument's user manual prior to use.

1. Plug the programming option into the wand port.
2. Turn on the instrument.
3. Set the detector setting for your probe.
4. Connect the probe to the instrument using the coaxial cable.
23. Plug a null modem cable into the 2350-I and connect the other end into the USB serial adapter.
5. From the Data Collection menu in RAT, select External Device Settings.
6. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for SCRIBE.
7. Select the Radiation as the category of instrument using the dropdown menu.
8. Select Ludlum as the manufacturer of the instrument using the dropdown menu.
9. Select the 2350-I as the model using the dropdown menu.
10. Set Com Port to Detect Automatically.
11. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
12. On the right side of the screen, information can be entered for downloading to SCRIBE. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
13. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
14. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
15. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. 2350\_090819\_1400.
16. When reading, click the Continuous Start button to begin collecting data.

## Fluke Victoreen 451P Ion Chamber

The Model 451P ion chamber survey meter is a hand-held battery operated unit designed for use in both rugged and normal environments. The Model 451P features a pressurized ionization chamber, providing enhanced sensitivity and improving energy response to measure gamma and X-ray radiation. No special setup is required for this instrument. However, a Victoreen-specific serial cable is required.



The following parts and accessories are needed to connect the 451P to RAT.

- Fluke Victoreen 451B/P
- Serial Cable
- 6-volt Battery

Follow the instructions below to connect the instrument to RAT:

1. Securely fasten the data cable from the instrument to the USB serial adapter.
2. From the Data Collection menu in RAT, select External Device Settings.
3. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for Scribe.
4. Select Radiation as the category of instrument using the dropdown menu.
5. Select Fluke Victoreen as the manufacturer of the instrument using the dropdown menu.
6. Select the 451P as the model using the dropdown menu.
7. Set Com Port to Detect Automatically.
8. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
9. On the right side of the screen, information can be entered for downloading to SCRIBE. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
10. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
11. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
12. If RAT fails to detect the instrument after several connection attempts, delete the instrument by selecting Delete Device in the External Device Settings dialog box. Attempt to reconnect the instrument.
13. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. 451\_090819\_1400.
14. When reading, click the Continuous Start button to begin collecting data.

CHAPTER

13

## Air Monitoring Equipment

### In this chapter:

- DataRAM DR-4000
- MultiRAE
- Multiwarn



This section includes setup of air monitoring equipment including the DataRAM 4, MultiRAE, and Multiwarn.

## DataRAM DR-4000

The DataRAM DR-4000 is a portable continuous particle sizing monitor. It continuously monitors and logs the real-time concentration and median particle size of airborne dust, smoke, mist, and fumes. With appropriate particle discriminators, it provides measurements correlated with PM10, PM2.5, PM1.0, and respirable fractions.



The following parts and accessories are needed to connect the DataRAM to RAT.

- DataRAM DR-4000
- Serial Cable (9-pin female to female null modem cable)

Use the following procedures to setup the DataRAM for use:

1. Turn on the DataRAM using the On/Off button.
2. Initialize the unit by selecting Zero/Initialize, then Enter. The unit will zero/initialize for 299 seconds.
3. When complete, press Exit to return to the main menu.
4. Select Start Run.
5. Connect a serial cable to the DataRAM, and then connect the other end into the USB serial adapter.
6. From the Data Collection menu in RAT, select External Device Settings.
7. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for SCRIBE.
8. Select the Air Monitoring as category of instrument using the dropdown menu.
9. Thermo Anderson and DR-4000 are the defaults.
10. Set Com Port to Detect Automatically.
11. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
12. On the right side of the screen, information can be entered for downloading to SCRIBE. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
13. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
14. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.

15. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. DataRAM\_090819\_1400.
16. When reading, click the Continuous Start button to begin collecting data.

## MultiRAE

The MultiRAE Plus combines a photo ionization detector (PID) with four interchangeable gas sensors in a compact monitor with sampling pump. The MultiRAE can be configured with toxic sensors, including

- Ammonia (NH<sub>3</sub>)
- Carbon monoxide (CO)
- Chlorine (Cl<sub>2</sub>)
- Hydrogen chloride (HCl)
- Hydrogen cyanide (HCN)
- Hydrogen fluoride (HF)
- Hydrogen sulfide (H<sub>2</sub>S)
- Nitric oxide (NO)
- Nitrogen dioxide (NO<sub>2</sub>)
- Phosphine (PH<sub>3</sub>)
- Sulfur dioxide (SO<sub>2</sub>)



The following parts and accessories are needed to connect the MultiRAE to RAT.

- MultiRAE
- MultiRAE computer interface cable

The following procedures are used to set up the MultiRAE.

1. Turn on the MultiRAE by pressing the Mode button. The unit will warm up for 60-90 seconds.
2. If not prompted for a fresh air calibration, perform a fresh air calibration in a clean environment by holding the N/- and Mode buttons for 3 seconds to enter calibration mode. Press Y/+ at Fresh air calibration?. Press the Mode button when complete.
3. Connect the MultiRAE to the USB adapter using a computer interface cable.
4. From the Data Collection menu in RAT, select External Device Settings.
5. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for SCRIBE.
6. Select the Air Monitoring category.
7. Select RAE Systems as the manufacturer.
8. Select MultiRAE as the model.
9. Set Com Port to Detect Automatically.
10. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
11. On the right side of the screen, information can be entered for downloading to Scribe. This includes:

- a. Instrument Serial Number

- b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
12. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
13. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
14. If RAT fails to detect the MultiRAE, check the computer's connection to the instrument by performing the following:
  - a. Connect serial cable directly between the PC and unit.
  - b. Set unit in PC communication mode.
  - c. Double click on EnableP2PComm.exe in C:\RAT\. If enable is successful, program will display a message that communication is enabled.
  - d. Re-cable the MultiRAE to RAT by connecting the serial cable to the USB serial adapter.
  - e. Attempt to reconnect the instrument.
15. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. MultiRAE\_090819\_1400.
16. When reading, click the Continuous Start button to begin collecting data.

## Multiwarn

Dräger Safety's Multiwarn is a multi-gas instrument that combines infrared (IR) sensing technology with a PID. The Multiwarn can be used with a selection of over 20 Dräger electrochemical sensors.

The following parts and accessories are needed to connect the Multiwarn to RAT.

- Multiwarn
- Dräger-specific RS-232 interface cable

The following procedures are used to set up the Multiwarn.

1. Turn on the Multiwarn by pressing the power button on the right.
2. Begin taking measurements by pressing enter (power button).
3. Connect the Multiwarn to the USB adapter using a RS-232 interface cable. You may also need a 25-pin to 9-pin adapter.
4. From the Data Collection menu in RAT, select External Device Settings.
5. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for Scribe.
6. Select the Air Monitoring category.
7. Select Draeger as the manufacturer.
8. Select Multiwarn as the model.



9. Set Com Port to Detect Automatically.
10. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
11. On the right side of the screen, information can be entered for downloading to Scribe. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
12. Click OK to accept the settings and RAT will attempt to locate the device on available com ports.
13. If the device is not detected, click on the device to highlight the row. Click the Detect Port button to attempt a second connection.
14. After setting up instruments, click Create/Open file to set up data collection files. You should give each file a unique and distinctive name, e.g. Multiwarn\_090819\_1400.
15. When reading, click the Continuous Start button to begin collecting data.

CHAPTER

14

## Soil Monitoring Equipment

### In this chapter:

- NITON XL-700 Series XRF
- Innov-X 4000 Series XRF

RAT is configured to work with the NITON XL-700 series and Innov-X 4000 series XRFs. Both types of units are discussed in detail below.

## NITON XL-700 Series XRF

The Niton XLt 700 Series XRF analyzer is a small, field-portable instrument designed for chemical characterization of soils, sediment, and other thick, homogeneous samples (plastics and metals). Included in this series are the XL-700, XLi-700, and XLp-700 series.



The following parts and accessories are needed to connect the NITON XRF to RAT.

- NITON XRF
- Serial communications cable

The following procedures are used to set up the NITON XRF:

1. Turn on the NITON using the power button. Hold down the power button for at least 3 seconds to turn on the analyzer.
2. Press the screen to log in.
3. Enter the password followed by the E key.
4. Calibrate monitor by selected Calibrate from the Utilities menu.
5. Use the arrow to return to the main menu.
6. Enter the Common Setup menu.
7. Press Serial Output. Ensure that the serial output is not crossed out. Return to the main menu.
8. For the XLp model, check the instrument baud rate. It should be 9600 or 115200.
9. Connect the serial communications cable from the instrument to the USB-serial adapter.
10. In RAT, open the GPS Settings menu from the Data Collection menu.

11. Select NMEA 0183 as the device if a GPS is connected or select No GPS – Soil if the GPS will not be connected.
12. For Communication Port, select Detect Automatically.
13. Set Accuracy (PDOP) at 6.
14. Check “Computer clock is correct” box.
15. Click Detect Port if GPS is connected. If the GPS is correctly detected, the message “NMEA 84 detected on Com Port X” will display, where X represents the com port number.
16. Click OK to accept the settings and close the window.
17. Open the External Device Settings from the Data Collection menu.
17. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for Scribe.

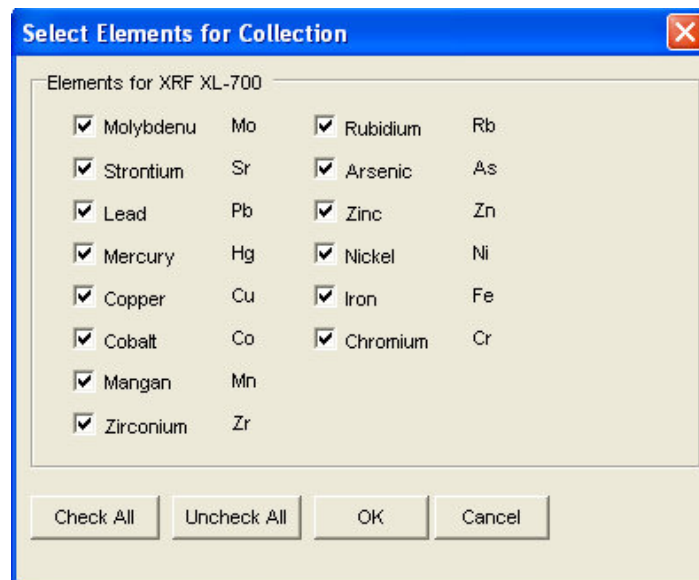
The screenshot shows the 'Instrument Information' dialog box. On the left, under 'Instrument', the 'Category' is 'Soil Monitoring', 'Manufacturer' is 'Niton', and 'Model' is 'XL-700 Series'. The 'COM Port' is set to 'Detect Automatically'. The 'Description / Instrument ID' is 'ERT-668'. On the right, under 'SCRIBE Information', the 'Instrument Serial Number' is '37358', 'Manufacturer for Scribe' is 'Niton', and 'Model for Scribe' is 'XL-700 Series'. The 'Sensor Height (meters)' is '0'. The 'OK' and 'Cancel' buttons are at the bottom.

18. Select Soil Monitoring as the category.
19. Select NITON as the manufacturer.
20. Select the correct model.
21. Set Com Port to Detect Automatically.
22. For the XLp, set the baud rate to 9600 or 115,200 as per the instrument’s settings.
23. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument’s serial number or equipment ID.
24. On the right side of the screen, information can be entered for downloading to Scribe. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height

25. Click OK to accept the settings. RAT will ask you to close the dialog box and initiate a reading within 60 seconds.



26. On the XRF, enter the Mode menu to select the sample mode.  
27. Press the trigger to begin taking readings.  
28. RAT will show that the status is connected when it has connected to the instrument.  
29. You can click the Configure button to select metals for data logging.



30. Click Create/Open File to create a file for data collection. Enter a unique and distinct filename, e.g. Niton\_090819\_1400.  
31. Click the Collect Single Point button.



Element	Longitude	Latitude	Concentration	Error
Mo	-87.6201	41.8789	2.6	10.3
Sr	-87.6201	41.8789	19.1	6.7
Pb	-87.6201	41.8789	20.4	24.5
Hg	-87.6201	41.8789	-1.3	11.8
Cu	-87.6201	41.8789	8.5	62.8
Co	-87.6201	41.8789	-41.2	160
Mn	-87.6201	41.8789	-26.9	300
Zr	-87.6201	41.8789	-19.2	6.2
Rb	-87.6201	41.8789	-6.8	15.3
As	-87.6201	41.8789	3	22.9

32. Enter a unique Sample ID.
33. To capture a reading, click the Display Data button and pull the XRF trigger.
34. When the reading is complete, click the Write Data to File button.
35. You can continue collecting sample readings by changing the Sample ID, clicking the Display Data button, initiating a reading on the XRF, and writing the data to file.

## Innov-X 4000 Series XRF

The Innov-X 4000 Series XRF analyzer is a small, field-portable instrument with three testing modes – soil, industrial paint, and lead paint. You have the option of using the XRF in auto or Personal Digital Assistant (PDA) non-auto mode. If you use the non-auto mode, you should install the Innov-X software on the RAT laptop. Refer to the Innov-X software manual prior to setting up RAT.



The following parts and accessories are needed to connect the Innov-X 4000 XRF to RAT.

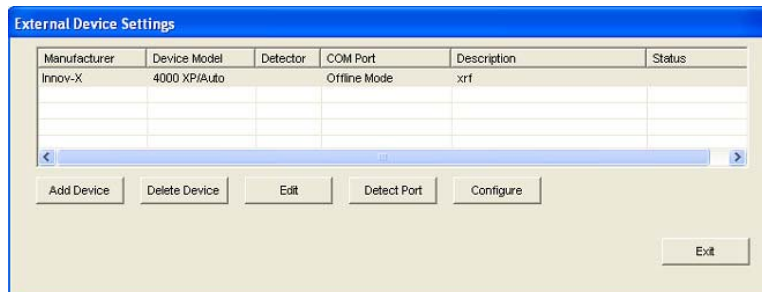
- Innov-X 4000 XRF
- Serial communications cable
- Innov-X software

The following procedures are used to set up the Innov-X 4000 XRF:

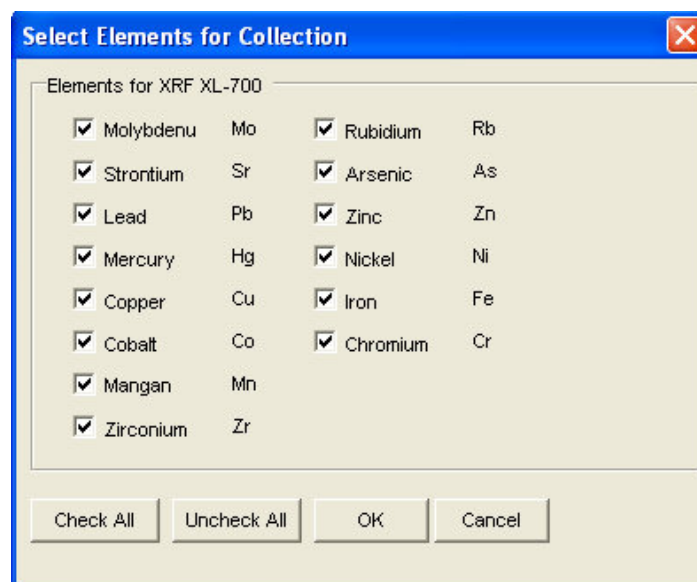
1. Turn on the XRF using the power button. Hold down the power button for at least 3 seconds to turn on the analyzer.
2. Calibrate monitor.
3. Connect the serial communications cable from the instrument to the USB-serial adapter.
4. In RAT, open the GPS Settings menu from the Data Collection menu.

5. Select NMEA 0183 as the device if a GPS is connected or select No GPS – Soil if the GPS will not be connected.
6. For Communication Port, select Detect Automatically.
7. Set Accuracy (PDOP) at 6.
8. Check “Computer clock is correct” box.
9. Click Detect Port if GPS is connected. If the GPS is correctly detected, the message “NMEA 84 detected on Com Port X” will display, where X represents the com port number.
10. Click OK to accept the settings and close the window.
11. Open the External Device Settings from the Data Collection menu.
36. Click the Add Device button. This window allows you to select the monitoring instrument and enter information necessary for Scribe.

37. Select Soil Monitoring as the category.
38. Select Innov-X as the manufacturer.
39. Select the correct model, PDA or non-PDA option.
40. Set Com Port to Offline Mode.
41. Under Description/Instrument ID enter a unique identifier for the instrument. It is recommended to use the instrument's serial number or equipment ID.
42. On the right side of the screen, information can be entered for downloading to Scribe. This includes:
  - a. Instrument Serial Number
  - b. Manufacturer
  - c. Model
  - d. Operator
  - e. Measuring Surface
  - f. Sensor Height
43. Click OK to accept the settings. The Innov-X will not auto-detect and will state it is in an offline mode due to using the Innov-X's software controlling the device.



44. You can click the Configure button to select metals for data logging.



45. Click Create/Open File to create a file for data collection. Enter a unique and distinct filename, e.g. InnovX\_090819\_1400.
46. Click the Collect Single Point button.

The screenshot shows the 'XRF Data Collection' window. At the top, there are input fields for 'Sample ID' (containing '2454\_A\_F') and 'Notes'. Below these, a message states 'XRF Reading Complete. Add it to the file now.' There are three buttons: 'Display Data', 'Write Data To File', and 'Clear'. Below the buttons is a table with the following data:

Element	Longitude	Latitude	Concentration	Error
Mo	-87.6201	41.8789	2.6	10.3
Sr	-87.6201	41.8789	19.1	6.7
Pb	-87.6201	41.8789	20.4	24.5
Hg	-87.6201	41.8789	-1.3	11.8
Cu	-87.6201	41.8789	8.5	62.8
Co	-87.6201	41.8789	-41.2	160
Mn	-87.6201	41.8789	-26.9	300
Zr	-87.6201	41.8789	-19.2	6.2
Rb	-87.6201	41.8789	-6.8	15.3
As	-87.6201	41.8789	3	22.9

At the bottom right of the window is a 'Close' button.

47. Enter a unique Sample ID.
48. To capture a reading, click the Display Data button and pull the XRF trigger.
49. When the reading is complete, click the Write Data to File button.
50. You can continue collecting sample readings by changing the Sample ID, clicking the Display Data button, initiating a reading on the XRF, and writing the data to file.

## SECTION



# APPENDICES

## In this section:

- [Appendix A, Quick Start Procedures](#)
- [Appendix B, Troubleshooting](#)
- [Appendix C, References](#)

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**APPENDIX**

**A**

## **Quick Start Procedures**

The following procedures give step by step instructions on setting up RAT. These procedures are not intended to be comprehensive. You should be familiar with this User Guide and each instrument's instruction manual.

1. Connect GPS (Refer to Chapters 7 and 11). Plug a null modem cable from the GPS into the computer or USB-serial adapter.
  - a. Open GPS Controller or TerraSync.
  - b. Ensure that GPS is *not* connected. If necessary, go to Setup>Options to disconnect GPS.
  - c. In Setup, click the GPS Settings button.
  - d. Select the correct com port. Refer to the Device Manager (Chapter 10).
  - e. Ensure that NMEA output is on.
  - f. Select the NMEA Settings button (wrench tool) and setting the following parameters:
    - Output interval: 1 s
    - Receiver port: Port 1
    - Baud rate: 9600
    - GGA: Yes
    - GSA: Yes
  - g. Select OK to return to GPS Settings menu.
  - h. Select OK to return to Setup menu.
  - i. Under Options, connect to GPS.
  - j. If the instrument fails to connect, change the com port and attempt to connect again. Once connected, allow several minutes for satellite and beacon acquisition.
  - k. Once connected, open the RAT software program. In the Data Collection menu, click on GPS Settings.
  - l. Using the dropdown menu, select NMEA 84 for the Device Name.
  - m. For Communication Port, select Detect Automatically.
  - n. Set Accuracy (PDOP) at 6.
  - o. Check box that "Computer clock is correct."
  - p. Click Detect Port. If the GPS is correctly detected, the message "NMEA 84 detected on Com Port X" will display, where X represents the com port number.
  - q. Click OK to accept the settings and close the window.
2. Setup and connect monitoring instruments (Refer to Chapters 12-14).
3. Import aerial image. From the Background Data menu, select Aerial Images. Aerial images must be georeferenced .tif or .jpg files. Images should have an associated world file and must be in UTM coordinates.
4. Select Create/Open File. Give each instrument a unique and distinct filename, e.g. MultiRAE\_090817\_1400.
5. Save project. From the File menu, select Save Project.
6. Import or edit thresholds (Refer to Chapters 3 and 8).
7. Setup alarms. From the Data Collection menu, select Setup Alarms and then Show Alarms (Refer to Chapter 7).
8. Click Continuous Start to begin data collection.
9. When finished, click Stop.
10. Export data to Scribe. From the Export Data menu, select ERT Scribe/All Collected Point Files/All Points (Refer to Chapter 4).

**APPENDIX**

**B**

## Troubleshooting



The following chapter lists common troubleshooting problems along with solutions. For instrument-specific issues, refer to the instrument's instruction manual.

Instrument	Problem and Solution
<b>Global Positioning Systems (GPS)</b>	
<b>Trimble Pro XR and Pro XRS</b>	<b>Cannot connect instrument to RAT</b> Check NMEA settings. NMEA should be turned on, baud rate should be set to 9600, and only GGA and GSA should be checked. Check that the Primary Receiver Port is correct (Port 1). Ensure that instrument cables are connected correctly. Refer to Chapter 11. Replace null modem cable.
	<b>Instrument will not turn on</b> Change the camcorder batteries in the backpack. If the controller will not turn on, charge the internal battery on the controller.
	<b>No GPS Position</b> Ensure that enough satellites are available and PDOP is below 6. Move to a location where you have a clear view of the sky and ensure that the antenna is not obstructed. Alternatively, adjust the PDOP settings to increase productivity.
<b>Trimble ProXT and ProXH</b>	<b>Cannot connect instrument to RAT</b> Ensure that the instrument's Bluetooth is turned off. On the instrument panel, the blue LED will not be blinking. If this does not solve the problem, connect the GPS directly to the computer's serial port using a null modem cable. Run Trimble's Radio Activation Manager software. Check NMEA settings. NMEA should be turned on, baud rate should be set to 9600, and only GGA and GSA should be checked. Check that the Primary Receiver Port is correct (Port 1). Replace null modem cable.
	<b>Instrument will not turn on</b> Recharge the internal battery.
	<b>No GPS Position</b> Ensure that enough satellites are available and PDOP is below 6. Move to a location where you have a clear view of the sky and ensure that the antenna is not obstructed. Alternatively, adjust the PDOP settings to increase productivity.
	<b>Receiver will not turn off</b> Unplug the null modem cable from the field computer or the GPS receiver. Press the power button to turn off the receiver.

<b>Trimble GeoExplorer (GeoXM, GeoXT, GeoXH)</b>	<p><b>Cannot connect instrument to RAT</b> Check NMEA settings. NMEA should be turned on, baud rate should be set to 9600, and only GGA and GSA should be checked. Check that the Primary Receiver Port is correct (Port 1). Check the serial clip. Refer to the steps in Chapter 11 to ensure that the serial clip is connected correctly through GPS Connector. Replace null modem cable.</p> <p><b>Instrument will not turn on</b> Recharge the internal battery.</p> <p><b>No GPS Position</b> Ensure that enough satellites are available and PDOP is below 6. Move to a location where you have a clear view of the sky and ensure that the antenna is not obstructed. Alternatively, adjust the PDOP settings to increase productivity.</p>
<b>Radiation Monitoring Equipment</b>	
<b>Ludlum 222I</b>	<p><b>Cannot connect instrument to RAT</b> Replace the cable and try reconnecting. Verify that the 222I is connected to an available com port using Device Manager. Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: None</li> </ul>
	<p><b>Instrument will not turn on</b> Replace the batteries.</p>
<b>Ludlum 224I</b>	<p><b>Cannot connect instrument to RAT</b> Replace the cable and try reconnecting. Make sure that the instrument is in Dump mode. The screen should flash "DUP." If it is not flashing DUP, open the instrument case and move knob to Position D for data dumping. Verify that the 224I is connected to an available com port using Device Manager. Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: None</li> </ul>
	<p><b>Instrument will not turn on</b> Replace the batteries.</p>

<b>Ludlum 2350-I</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the 2350-I is connected to an available com port using Device Manager.            Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: SADIII</li> </ul>
	<p><b>Instrument will not turn on</b>            Replace the batteries.</p>
<b>Fluke Victoreen 451P</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the 2350-I is connected to an available com port using Device Manager.            Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 1200</li> <li>• Data Bits: 7</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: Spacebar then T</li> </ul>
	<p><b>Instrument will not turn on</b>            Replace the batteries.</p>
<b>Air Monitoring Equipment</b>	
<b>DataRAM DR-4000</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the DataRAM is connected to an available com port using Device Manager.            Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600 or 38400</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: Xon/Xoff</li> <li>• Special Characters: O (the letter)</li> </ul>
	<p><b>Instrument will not turn on</b>            Charge the internal battery.</p>
	<p><b>Instrument screen shows “jjjjj”</b>            The instrument is malfunctioning and should be sent to the manufacturer for repair.</p>

<b>MultiRAE</b>	<p><b>Cannot connect instrument to RAT</b>            Enable communication mode on the MultiRAE. Using the computer interface cable, connect the instrument directly to the serial port of the computer. Run the EnableP2PComm.exe program located in C:\RAT.            Replace the cable and try reconnecting.            Verify that the MultiRAE is connected to an available com port using Device Manager.            Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: R</li> </ul>
	<p><b>Instrument will not turn on</b>            Charge the internal battery.</p>
<b>Multiwarn</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the DataRAM is connected to an available com port using Device Manager. Note: This device only works on com ports 1-9.</p>
	<p><b>Instrument will not turn on</b>            Charge the internal battery.</p>
<b>Soil Monitoring Equipment</b>	
<b>NITON XL-700 Series XRF</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the NITON is connected to an available com port using Device Manager.            Connect to HyperTerminal and establish the following settings:</p> <ul style="list-style-type: none"> <li>• Bits per second: 9600 or 115200</li> <li>• Data Bits: 8</li> <li>• Parity: None</li> <li>• Stop Bits: 1</li> <li>• Flow Control: None</li> <li>• Special Characters: None</li> </ul>
	<p><b>Instrument will not turn on</b>            Charge or change the internal battery.</p>
<b>Innov-X 4000 Series XRF</b>	<p><b>Cannot connect instrument to RAT</b>            Replace the cable and try reconnecting.            Verify that the Innov-X is connected to an available com port using Device Manager.</p>
	<p><b>Instrument will not turn on</b>            Charge the internal battery.</p>

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<b>Miscellaneous Equipment</b>	
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<b>USB-Serial Adapter</b>	
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	<b>Computer will not recognize adapter</b>
--	--

	Install adapter drivers. For the Digi Edgeport adapter, use version 3.70 drivers.
--	---

	<b>USB port cannot power for the adapter</b>
--	--

	Plug in the adapter to external power or change to a different USB port.
--	--

For additional support, contact ERT's software support at (800) 999-6990 or [ERTSupport@epa.gov](mailto:ERTSupport@epa.gov).

## APPENDIX

# C

## References

Ludlum Measurements, Inc. 1998. Ludlum Model 2350-I Data Logger. December.

Ludlum Measurements, Inc. 2002. Ludlum Model 2221 Portable Scalar Ratemeter. January.

Ludlum Measurements, Inc. 2006. Ludlum Model 2241-2 Survey Meter. June.

RAE Systems. 2003. MultiRAE Plus User's Manual. November.

Thermo Electron Corporation. 2003. Model DR-4000 DataRAM 4 Instruction Manual.  
December.

Trimble. 2004. GeoExplorer Series Getting Started Guide. Version 3.00. Revision B. Part  
Number 46506-30-ENG. February.

Trimble. 2004. GPS Pathfinder Systems User Guide. Version 2.00. Revision A. Part Number  
40889-10-ENG. April.

Trimble. 2005. User Guide, GPS Pathfinder Pro Series. Version 1.00. Revision A. May.

Trimble. 2008. User Guide, GeoExplorer 2008 series. Version 1.00. Revision B. May.

U.S. Environmental Protection Agency. 2005. R.A.T. Training Manual. Field Environmental  
Decision Support Team. Chicago, IL.