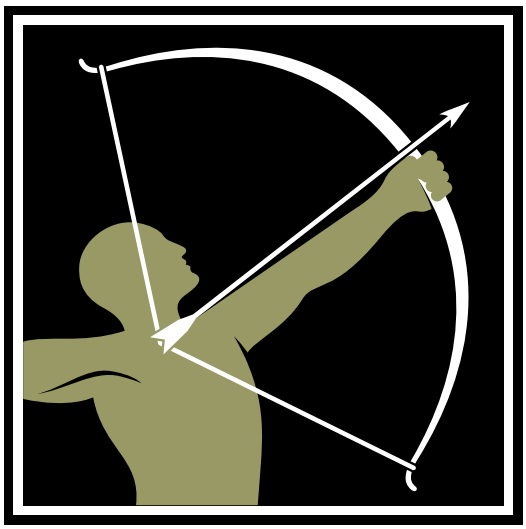

Apollo Project
Version 2.1

User Guide

Nanometrics INC.
SEISMOLOGICAL INSTRUMENTS
Kanata, Ontario • Canada

Apollo Project Version 2.1 User Guide

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About This Document

Document Conventions

Essential and Supplementary Information		
	 **Warning**	Explains a risk of irreversible damage to data, software, or equipment and provides recommendations for preventive action.
	 **Caution**	Explains a risk of damage to data, software, or equipment where recovery is likely to be troublesome and provides recommendations for preventive action.
	 **Note**	Provides additional information related to the current text.
	 **Tip**	Explains a best practice or provides helpful information related to the current text.
	 **Example**	Provides an example related to the current text.
Text Conventions		
	bold text	Identifies referenced elements in the graphical user interface (GUI) (for example, "click **Cancel** to discard the changes").
	italic text	Identifies variables such as parameter names and value placeholders (for example, "select Configuration > *Sensor Name*").
	`courier text`	Identifies commands that must be entered exactly as shown (for example, "type `mkdir $APOLLO_LOCATION/config`").

Changes Included in This Revision

Revision number 16106R7 includes the following changes:

- Added information about SOH channel groups.

Contents

Tables

Chapter 1
Getting Started

1.1 About Apollo Project

Apollo Project is a Web application that conveniently retrieves time series and state of health data from any Nanometrics Store, including those on Nanometrics instruments and those copied to network computers. Available through any Web browser, Apollo Project provides options for you to define complex, reusable data retrieval tasks called projects.

Apollo Project has five project types:

- Archive projects retrieve data from sources that are continually updated, such as a directory on a computer that has new data saved to it periodically, or a multicast group of Nanometrics instruments that has different instruments active at different times. You can schedule Archive projects to run automatically.
- One Time projects retrieve a single time segment of data.
- Controlled Source projects retrieve data specified as a set of shots.
- Triggers projects retrieve data specified by a trigger list in comma-separated value (CSV) format.
- Field Archive projects perform recurring data retrievals, storing the time of the current retrieval on the Nanometrics instrument. Using the time of the last retrieval, Field Archive projects only retrieve the data accumulated since the last time the project was run on the instrument.

Data for time series channel groups can be downloaded in MiniSEED, SAC (binary format), Seisan, or SEGY format, depending on the project type. Data for SOH channel groups is always downloaded in CSV format.

1.2 Hardware and Software Requirements

The configuration in Table 1-1 provides the hardware and software requirements for Apollo Project.

Table 1-1 System requirements

System component	Requirement
Operating system	◆ Microsoft Windows 7 (64-bit) ◆ Linux (any 64-bit distribution with Kernel version 2.6.27 or later for dongle licences) ◆ Mac OS X (10.6)
Memory	4 GB RAM
Disk space	1 GB
Java Runtime Environment (JRE)	Oracle® Java SE 6 Update 18 or later
Browser	Mozilla®Firefox® 3.6 or later **Note:** Firefox is used by Nanometrics for product verification, and while other modern browsers, such as Google Chrome™ and Apple® Safari®, should work, they are supported on a best-effort basis only.
Time synchronization	Synchronize the time of computers running Nanometrics applications with a Network Time Protocol (NTP) server to ensure that the time is accurate and matches the time of other computers running applications in your data acquisition system.

The following deployment scenarios are examples of the types of deployments that might require consultation with Nanometrics (see Contacting Nanometrics on page 39):

- Large scale deployments
- Deployments involving the installation of multiple Nanometrics applications on one computer
- Deployments involving 32-bit platforms with less than 2 GB RAM

1.3 Installing and Using Apollo Project

At a high level, you have to perform the following steps to use Apollo Project to retrieve data.

1. Install Apollo Project and start the Apollo Project Web server.

   If you plan to use Watchdog to watch and restart Apollo Project, Apollo Project should be installed using the "All users" option. For more information, see Section 1.3.1 "Using Watchdog with Apollo Project" on page 3.

2. Type **http://*IPaddress*:*port*** into a Web browser and configure Apollo Project (see Chapter 2 "Configuring Apollo Project Settings").

   The default port number is 8088.

3. Define data-retrieval projects (see Chapter 3 "Creating Projects").

   Installing a licence file after creating a project in Apollo Project will result in the loss of that project. For more information, see Section 1.3.2 "About Apollo Project Licences" on page 3.

4. Monitor the status of the projects (see Chapter 4 "Monitoring and Managing Projects").

1.3.1 Using Watchdog with Apollo Project

Watchdog is a Nanometrics service/daemon that runs automatically in the background and starts, watches, and restarts the Nanometrics applications it is configured to watch. Using Watchdog ensures that your vital Nanometrics server and data retrieval applications are always running, even when running on unattended systems.

If you plan to use Watchdog to watch and restart Apollo Project, Apollo Project should be installed using the "All users" option. Selecting this option will ensure that Watchdog has the necessary permissions to restart Apollo Project.

You can configure Watchdog to

- Automatically start when the computer starts and then start Apollo Project and any other applications it is configured to watch.
- Watch Apollo Project by checking its running status at specific intervals.
- Restart Apollo Project if it has stopped working for any reason, including a user-initiated shutdown.

See the Watchdog User Guide for full instructions on using the Watchdog service/daemon.

1.3.2 About Apollo Project Licences

Apollo Project is available as a fully-licensed version and as an unlicensed version. The licence determines

- The number of projects you can save.
- The number of time series channels you can select.
- The number of projects you can run concurrently.

The unlicensed version allows you to save one project definition at a time for up to three time series channels from any combination of Stores.

Click the About button  to view licence information.

You have the option to install a licence when you install Apollo Project or any time after installation by using the Nanometrics Licence Installer.

Installing a licence file after creating a project in Apollo Project will result in the loss of that project and any Apollo Project settings that you configured. It is recommended that you install your licence before creating your first project.

1.4 Viewing Log Files

You can view log files for Apollo Project in the logs folder. If requested, you can also zip the logs folder and send it to Nanometrics Technical Support.

The default location of the logs folder for each of the supported operating systems is shown in Table 1-2.

Table 1-2 Default log file locations

Operating System	Location
Windows	%APPDATA%\Nanometrics\ApolloProject\logs (%APPDATA% is an environment variable that provides the path to the application data directory for the user account.)
Linux	~/.nanometrics/apolloproject/logs
Mac OS X	If installed as a specific user: /Users/nmx/Library/Application Support/Nanometrics/ApolloProject/logs If installed as root: /Library/Application Support/Nanometrics/ApolloProject/logs

1.5 Upgrading Apollo Project

To upgrade to a newer version of Apollo Project, you have to uninstall the current version and then install the new version. All downloaded data will remain intact but you will have to re-create your projects and settings in the new version of Apollo Project. If you are using a licensed version of Apollo Project, you will need a new licence file when installing the upgrade. If you have not received a new licence file, contact Nanometrics (see Contacting Nanometrics on page 39).

For Windows and Linux installations, if you are upgrading from an earlier version of Apollo Project that used Apache Tomcat, it is strongly recommended that you uninstall Tomcat before installing the new version of Apollo Project.

Refer to the following user guide for instructions on uninstalling versions of Apollo Project prior to version 1.3:

- Apollo Project Version 1.2 User Guide, revision 16106R2, released on 2008-09-09

Chapter 2
Configuring Apollo Project Settings

2.1 About Configuring Settings

Before you begin creating and running projects in Apollo Project, you have to

- Review the behaviour and default settings of Apollo Project (see Section 2.2 "Configuring Behaviour and Default Settings" on page 5).
- Configure Apollo Project to use a Binder (see Section 2.3 "Configuring a Binder" on page 7).

2.2 Configuring Behaviour and Default Settings

Open Apollo Project and change the behaviour and default settings as required.

Table 2-1 Behaviour and defaults settings

Setting	Description
Log Verbosity	The level of detail that is logged by Apollo Project. Info – All errors, warnings, and minimal system status information Verbose – All error, warnings, and more detailed system status information Debug – All errors, warnings, and extensive system status information The default setting is Info. **Note:** You should only select Debug as the logging level if you were instructed to do so by Nanometrics Technical Support. This level of logging might impede the performance of Apollo Project and should only be used to diagnose a problem.
Log Location	The default name of the Apollo Project log folder.
Maximum Number of Retrieval Attempts	The maximum number of single retrieval attempt made for all missing time segments on all channel groups every time a project is run. Enter an integer from 0 through 1000. The default value is 8. **Notes**: If the Taurus is busy when a retrieval attempt is made, the number of remaining retrieval attempts is not decreased by one attempt. You can view the channel group details page to see if there are any remaining retrieval attempts for any channel groups (see Section 4.2 "Monitoring the Status of Projects" on page 18).

Table 2-1 Behaviour and defaults settings

Setting	Description
Number Of Retries	The number of times Apollo Project attempts to connect to a data source if there is a network connectivity problem. Enter an integer from 0 through 1000. The default value is 3. **Note:** Every time a project is run it starts with the maximum number of retries.
Retry Interval (secs)	The amount of time that Apollo Project waits before trying to connect to a data source again. Enter an integer from 0 to 1000. The default value is 15.
Status File Write Frequency (in minutes)	The frequency that information is written to the status file for each project. A status file is created for each project after the project is run for the first time. Status files are located in the status directory, which is created when the first status file is created. The default location of the status folder is: ◆ Windows — %APPDATA% ◆ Linux — $Home ◆ Mac OS X — App The default value is 5.
Base Directory	The folder name and location of the base directory for the processed data subfolders and files. Enter any valid folder name and location, including any additional characters that are valid for paths. The default base directory name is ApolloProject. **Notes:** The Base Directory is the root of all data retrieved for all projects and can be defined as a local or network accessible location. If you want to create or use a folder on a computer on the network, you have to enter the server and share name in a modified UNC format that is prefixed by an additional two backslashes. For example the usual `\\fileserver1\storefiles` must be written as `\\\\fileserver1\storefiles`. Large amounts of data can be stored in this location. You must ensure that adequate disk space is available. For deployments of Apollo Project where the user interface is not being accessed on the server, it is recommended that the file system containing the base directory on the server be shared or exported as a networked file system.
Subdirectories	The expression used to define path names for subfolders under the base directory. Enter tokens in any order, including any additional characters that are valid for paths. The default path name is as follows: /%project/%year/%month/%day/

Table 2-1 Behaviour and defaults settings

Setting	Description
Filename	The expression used to define file names for the processed data files that are stored in the subfolders under the base directory. Enter tokens in any order, including any additional characters that are valid for file names. The default file name is as follows: %network.%station.%location_%time
Sample Path	An example of a file name, generated using the values for the Base Directory, Subdirectories, and Filename settings.
File download extension	The extension added to the name of the downloaded file for each file type. s ◆ MiniSEED — The default extension is .seed. ◆ SegY — The default extension is .sgy. ◆ SAC — The default extension is .sac.

2.3 Configuring a Binder

Before creating projects, you have to configure Apollo Project to query a Binder to determine the SCNL information for instruments.

Binder is a shared network utility that allows Nanometrics applications to pair instrument data with seismic station metadata in the Binder source. This pairing allows each channel in the application to be uniquely identified with an SCNL code. The Binder source is typically an Athena Web site, which is referred to as a Web Binder in Nanometrics applications.

When a Web Binder is configured in a Nanometrics application, such as Apollo Project, a connection is established to the Athena Web site and the connecting application queries Athena for the seismic station metadata. Athena returns the metadata to the application, which can then show channel names in the format NN.SSSSS.LL.CCC, where NN is the network code, SSSSS is the station code, LL is the location code, and CCC is the channel code. All editions of Athena (Enterprise, Express, and Binder) provide this binding functionality. For more information, see the Athena User Guide.

Before you configure Apollo Project to use a Web Binder, ensure that you know the following information:

- The URL for the Web Binder
- The API key for Web Binder

  Apollo Project uses this key to communicate with Athena. For more information, see the Athena User Guide or contact your Athena administrator.

For situations where you may need to disconnect your Nanometrics applications from the network for a period of time, you can change your Binder configuration so that the Binder source is a local file in comma-separated values (CSV) format. This file, channels.csv, is exported from Athena and includes all station and channel information in the Athena database. Refer to the Athena User Guide for information on exporting the channels.csv file. See Appendix C "Using a File Binder"for details on the format of this file.

Open Apollo Project and change the Binder settings as required.

Table 2-2 Binder settings

Setting	Description
Binder Type	The type of Binder queried by Apollo Project: a Web Binder (Athena Enterprise, Athena Express, or Athena Binder) or a .csv file. For more information on how to format a Binder file, see Appendix C "Using a File Binder."
Path	The path to the Binder file (.csv). For example: file:///C:/binderfile.csv
URL	The URL for the Web Binder. For example: http://localhost:8787
API Key	Enter the API key specified in the Athena Enterprise, Athena Express, or Athena Binder parameters. Apollo Project uses this key to communicate with the Web Binder. For more information, see the Athena User Guide or contact your Athena administrator.
Cache File	The location of the cache file for the Web Binder.

Chapter 3
Creating Projects

3.1 About Creating Projects

At a high level, you have to perform the following steps to create a project:

1. Select a project type.
2. Select data Stores.
3. Specify the time period of the data you want to download.
4. Select the channel groups you want to download data from.
5. Select the output format.
6. Specify the output location.

If you plan to install a licence file and have not done so yet, it is recommended that you install your licence before creating any projects in Apollo Project. Installing a licence file after creating a project in Apollo Project will result in the loss of that project.

3.2 Selecting a Project Type

You can create a new project using any one of the following project types:

Table 3-1 Project types

Project type	Description
Archive	Data is retrieved from sources that are continually updated, such as a directory on a computer that has new data saved to it periodically or a multicast group of Nanometrics instruments that has different instruments active at different times. You can schedule Archive projects to run automatically.
One Time	A single time segment of data is retrieved.
Controlled Source	Data specified as a set of shots is retrieved and outputted in SEGY format. For more information, see Section A.3 "Shot Files for Controlled Source Projects" on page 24.
Triggers	Data specified by a trigger list in comma-separated value (CSV) format is retrieved. For example, a trigger file that has been downloaded from a Taurus to the local computer.

Table 3-1 Project types

Project type	Description
Field Archive	Recurring data retrievals are performed and the time of the current retrieval is stored on the Nanometrics instrument. Using the time of the last retrieval, Field Archive projects only retrieve the data accumulated since the last time the project was run on the instrument. **Note**: You can only create and run Field Archive projects for Taurus version 3.0 or later.

3.3 Selecting Data Stores

Apollo Project provides you with four methods for accessing data Stores.

Each time a project is run, Apollo Project generates a list of available Stores based on the selected Store specifications. The actual Stores from which data is retrieved can vary on successive project runs. For example, a discovery Store specification might result in a different number of instruments being included, depending on current access to the instruments.

You cannot remove individual Stores from a specification but you can add a different specification and select a different group of Stores. Alternatively, you can use channel group attributes filtering to select the channel groups that data is retrieved from.

Table 3-2 Data Store selections

Selection method	Description and notes
File	A file Store specification defines the full path and file name of a particular Store that resides on a file system accessible by the server running Apollo Project. The file system can be a local or a networked file system (for example, accessible via SMB or NFS). When copying a Store from an instrument to your local computer, do not overwrite an existing Store. Instead, delete the existing Store or move it to a different folder on the computer. Stores are made up of multiple volumes and if the new Store has fewer volumes than the old Store, you could see some unpredictable results with Apollo Project.
Directory	A directory Store specification defines the set of Stores that reside in a particular directory hierarchy on a file system accessible by the server running Apollo Project. A recursive search from the specified directory identifies all of the available Stores. The file system can be a local or a networked file system (for example, accessible via SMB or NFS). If you specify a root directory such as C:\, it will take a long time for Apollo Project to find all of the Store files in that root directory.
IP Address	An IP Address Store specification defines the Store of a single instrument (or an instance of Apollo Server). The specified IP address must be an IP address bound to the Ethernet interface of an instrument. At the same time, the instrument must be running in communications mode and be accessible from the server running Apollo Project.

Table 3-2 Data Store selections

Selection method	Description and notes
Discovery	A discovery Store specification specifies the Stores of multiple instruments. In this case, a class D (multicast) IP address and port is specified. It is assumed that the Store of any instrument in communications mode is accessible from the LAN of the Apollo Project server. When Discovery is enabled for the specified IP address and port, these attributes are included upon running the project. Multicast addresses range from 224.0.0.0 through 239.255.255.255. When multiple multicast groups are used for discovery, the port number must differ from existing discovery port numbers by 2: for each discovery port number in use x, there must be no other discovery port configured for use with a value of x or x+1. For example, the default discovery multicast group used by Taurus is 224.199.71.138:6776. To add another multicast group, you have to specify a different port number (which cannot be 6776 or 6777.)
Recent Specifications	Apollo Project keeps the 16 most recently defined Store specifications and groups them by category on the Recent Specs page.

3.4 Specifying the Project Run Time

The options for scheduling and running a project vary greatly depending on the project type.

All times use the UTC time zone.

3.4.1 Project Scheduling Tips

- Archive
  - Archive projects attempt to retrieve data up to the current time. The time ranges for which output files will be produced are driven by the file interval and are aligned to the project start time. It is unlikely that the "most recent" file interval will align with the current time. Therefore, the most recent range for which data retrieval is attempted will have a portion of its data retrieved and the remainder (for future retrieval) will be declared unavailable. However, when the project is run later (after the end of the particular time range) the unavailable data will normally be retrieved and the situation will likely repeat itself with the "new" last range to retrieve.
  - An Archive project will run according to the interval you specified after you start the schedule. For example, if you click **Start Schedule** on a Wednesday and you specified every 2 days as the interval, then the project will run for the first time on Friday and every two days after that.
  - If the computer has been rebooted and the Apollo Project Web server has been restarted, an Archive project will run according to the interval you specified after the computer has rebooted. For example, if the computer reboots on a Wednesday and you specified every 2 days as the interval, then the project will run for the next time on Friday and every two days after that.

- Be careful when specifying the file interval. For example, retrieving many hours or days of data and specifying a file interval of seconds or minutes could result in the generation of many files. This is not only very resource intensive but could result in a data management problem as well.

When running Apollo Project with Taurus version 2.x, the schedule for Archive projects must be greater than 5 minutes in duration. Schedules that are less than 5 minutes can result in data that is missing or not downloaded.

◆ Field Archive

- The date and time the last data was retrieved through a Field Archive project is stored in the Taurus as the Retrieval Mark. Apollo Project uses this mark as the starting point for the next Field Archive project if an earlier start time is configured. You can delete the date and time in the Taurus if you want Apollo Project to download all of the data from the start of the project the next time you run a Field Archive project. You can also change the date and time in the Taurus if you only want data downloaded from a specific point in time. For more information, see the Data Retrieval section of the Taurus Portable Seismograph User Guide.
- You should only select the **Include last interval, even if incomplete** check box for Field Archive projects if the retrieval of partial files is more important than retrieving the data for the current interval during a future project run.
- Be careful when specifying the file interval. For example, retrieving many hours or days of data and specifying a file interval of seconds or minutes could result in the generation of many files. This is not only very resource intensive but could result in a data management problem as well.

3.5 Selecting Channel Groups

If the text "Selected Time Series Channels: x of x" is red, you have either selected more time series channels than your licence permits or you have not selected any channels. You must select a valid number of time series channels (for the unlicenced version of Apollo Project there is a maximum of three time series channels) before you can create your project.

Click the About button  to view licence information.

3.5.1 Filtering Channels

If you do not want Apollo Project to download all data from all available Stores, you can select specific channels by creating a filter based on one or more SCNL codes and/or an Instrument ID.

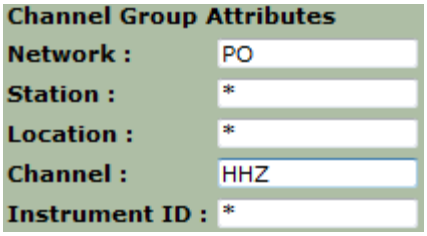
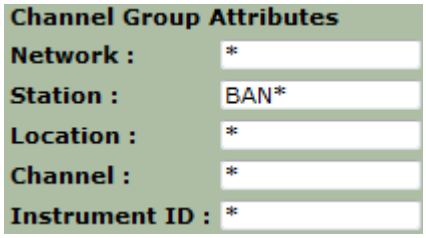
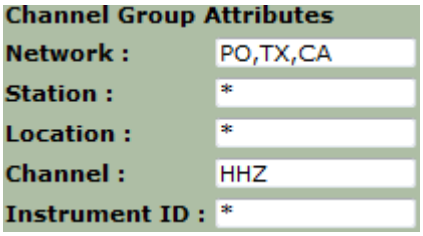
To create a filter, you can use

- a comma to separate multiple elements;
- an asterisk (*) to represent one or more characters in a channel name.

Table 3-3 Channel filter elements

Filter element	Description	Example
Network	A one to two character alphanumeric SCNL network code.	PO
Station	A one to five character alphanumeric SCNL station code.	BANO2
Location	A one to two character alphanumeric SCNL location code.	06
Channel	A one to three character alphanumeric SCNL channel code.	HHZ
Instrument ID	The name and serial number of the instrument in the following format: InstrumentName_SerialNumber	taurus_1234

Table 3-4 Filter examples

Filter	Result
	Data from all HHZ channels is retrieved from the PO network.
	Data is retrieved from all stations that start with BAN, such as BAN01, BAN02, and BAN03.
	Data from all HHZ channels is retrieved from the PO and TX and CA networks.

3.5.2 Selecting SOH Channel Groups

Select the state of health (SOH) channel groups you want to download data from. Each group has a predefined dataset as shown in Table 3-5 "SOH channel groups" on page 14.

To view the SOH data retrieved from a Taurus version 2.x, see Appendix B "Retrieving SOH Data from a Taurus Version 2.x."

Table 3-5 SOH channel groups

Predefined SOH group	SOH data
GPS Time	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) ◆ DAC Count ◆ GPS Engine Status ◆ GPS Last Update Time(s) ◆ GPS PDOP ◆ GPS Satellites Used (number of satellites used) ◆ GPS TDOP ◆ Lat (deg) (latitude in degrees) ◆ Long (deg) (longitude in degrees) ◆ Timing Error (ns) ◆ Timing Phase Lock (system clock phase lock) ◆ Timing Uncertainty (ns) **Note:** The values for Number of satellites used, PDOP, and TDOP are provided by the GPS receiver at the Last update time. In order to see what time these values correspond to, look at the Last update time. When GPS is off, these three parameters and the Last update time are not updated. The last value displays until the next update arrives (after the GPS is turned on again).
GPS Satellites	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) For each satellite: ◆ GPS Satellite Acquisition Flag ◆ GPS Satellite Azimuth (µ°) ◆ GPS Satellite Elevation (µ°) ◆ GPS Satellite Last Update Time (ms) ◆ GPS Satellite PRN ◆ GPS Satellite Signal Level (AMU)
Environment	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) ◆ External SOH Voltage 1 (V) (12-bit, voltage input) ◆ External SOH Voltage 2 (V) (12-bit, voltage input) ◆ External SOH Voltage 3 (V) (12-bit, voltage input) ◆ External SOH Voltage 4 (V) (12-bit, voltage input) ◆ Sensor SOH Voltage 1 (V) ◆ Sensor SOH Voltage 2 (V) ◆ Sensor SOH Voltage 3 (V)

Table 3-5 SOH channel groups

Predefined SOH group	SOH data
Instrument	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) ◆ Controller Current (mA) ◆ Digitizer Current (mA) ◆ NMX Bus Current (mA) (external connector) ◆ Sensor Current (mA) ◆ Serial Port Current (mA) ◆ Supply Voltage (mV) ◆ Temperature (°C)
PowerPC	◆ Time in longsecs format (the number of UTC seconds since 1970-01-01) ◆ UTC time in yyyy-mm-dd hh:mm:ss:ms format ◆ Ethernet status ◆ Packets
Acquisition	The Acquisition group provides SOH information about the acquisition rates and telemetry of the transmitted data. This group includes information such as the following: • The number of packets received, missed, requested, or re-requested. • The number of gaps in the data. • The maximum and minimum latency of packets. • The amount of missed time.

3.6 Specifying the Output Format

SOH channel group data is always outputted in comma-separated values (.csv) format.

You can select one of four different file types for the output:

Table 3-6 Output formats

Output types	Description and notes
MiniSEED	The MiniSEED format is a subformat of the SEED data format. MiniSEED data only contains waveform data, no station or channel metadata is included. The number of output files is determined by the file interval that you set on the Time Selection page and by the file grouping you select on the Output Format page: one file per channel, one file per station, or one file for all instruments. The **Per channel** grouping produces many small files, the **All Instruments** grouping produces one large file, and the **Per station** grouping is in between these two. You can see the number of files that will be produced at the bottom of the Time Selection page. Data is put in a Store in the order received and this order might not always be chronological. To ensure that the data in the resulting SEED file is chronological, select the **Sort** check box. The default record size is 512 B. However, not all SEED file readers will support this file size. Determine what your SEED reader supports and select an appropriate value. Note that a smaller record size will result in quicker SEED file output.

Table 3-6 Output formats

Output types	Description and notes
SAC	The SAC format is a waveform file that is used by the SAC software (see http://www.iris.edu/software/sac/). There are two types of SAC files, binary and ASCII. Apollo Project only outputs binary SAC files. One output file per channel group is generated.
SEG Y	The SEG Y file format is a standard format developed by the Society of Exploration Geophysicists for storing geophysical data. The number of output files is determined by the file interval that you set on the Time Selection page and by the file grouping you select on the Output Format page: one file per channel, one file per station, or one file for all instruments. The **Per channel** grouping produces many small files, the **All Instruments** grouping produces one large file, and the **Per station** grouping is in between these two. You can see the number of files that will be produced at the bottom of the Time Selection page. Data is put in a Store in the order received and this order might not always be chronological. To ensure that the data in the resulting SEG Y file is chronological, select the **Sort** check box. All stations must have the same sample rate. The maximum number of samples per trace is 32767. SEGY trace headers from discovered instruments will not have station location information
Seisan	The Seisan file format is a waveform file that can be used with the SEISAN earthquake analysis software. You must have Seisan installed on your computer with a WAVEFORM_BASE and CONT_BASE line included for each station in the DAT/SEISAN.DEF file. You must define a SEISAN_TOP environment variable. One output file per channel group is generated.

3.7 Specifying the Output Location

The location, path names, and file names defined in the configuration settings of Apollo Project will be used for the output from all projects unless you specify a different location and expressions on the Output Location tab of a project.

It is not recommended that you use the %channel token in the subdirectories or filename expression if the project includes more than one channel group per instrument (selected on the Channel Group Selection tab).

Chapter 4
Monitoring and Managing Projects

4.1 Overview of Running Projects

When a project runs, Apollo Project identifies the

- requested time ranges;
- channel groups for which data is to be retrieved;
- actual Stores specified by the Store specifications of the project.

For each identified Store, the following steps are performed:

1. A data availability analysis for the outstanding time ranges is performed.

   This is performed for the ranges for which data has not already been retrieved. The availability of the data is recorded for reference. It is possible that a given Store was not present at the time the project was last run. If this is the case, then an attempt is made to retrieve all of the required time ranges of the project from the Store.

2. If any data exists in the Store for any of the requested time ranges, then a retrieval of this data is performed and the retrieved data is stored to local temporary files.

3. If the number of retrieval attempts for a given time range exceeds a configurable threshold, then the retrieval of data within the stated range is not attempted again.

If any data was retrieved during the run of the project, then the corresponding output files are generated in the desired output format and stored in the output location specified for the project.

It is possible that the requested data for a given channel group exists across multiple Stores. If all of these Stores are included by the Store specifications for the project, then Apollo Project assembles the requested data.

Launching a desktop shortcut to a project automatically runs that project. It is important to note that once a project is run its settings can no longer be edited. It is recommended that desktop shortcuts only be created for Field Archive projects.

4.2 Monitoring the Status of Projects

The status of a project is displayed on three pages: the Existing Projects page, the Summary page, and the Retrieval Status page.

- The Existing Projects page shows the status of all projects. You see this page when you first open Apollo Project or when you click **Projects** in the projects bar. The Data Retrieval bars on the Existing Projects page show the overall status of the data retrieval (see Table 4-1).
- The Summary page shows the status of an individual project. You can view this page by opening a project.
- The Retrieval Status page shows the data retrieval status of a project while it is running. This page is displayed automatically when you click Run Now to run a project. You can also view this page by opening a project and clicking the Retrieval Status tab. The status for each channel group is expressed in the form of two numbers (for example, 60/100) and two bar graphs. The first number is the percentage available of the total time requested (for example, 60%) and the second number is the percentage retrieved of the time available (for example, 100%). For more information on the bar graphs, see Table 4-1.

The information that is displayed on the Retrieval Status page is updated continuously while a project is running.

The data retrieval status bars use the following status colours:

Table 4-1 Status colours

Colour	Status
Green	Apollo Project has retrieved the data. 
Yellow	Apollo Project is attempting to retrieve available data from the Store. 
Red	Data is available in the Store but Apollo Project has failed to retrieve it on this attempt. Apollo Project will make additional attempts to retrieve the data, up to the configured Maximum Number of Retrieval Attempts. 
White	Data for some portion of the requested time segment is not available in the Store. For example, there are gaps in the data or the retrieval request is for a future time segment. 

4.3 Merging Project Data Files

You have the option to merge all of the downloaded data for the stations and instruments into one file per interval for each project.

When project data is merge, a single file is generated for each time period. The time period is determined by the file interval you specified on the Time Selection page when you created the project.

The original data files are not modified when you select the option to merge project data files.

You cannot merge data from Archive projects and you cannot merge data in the Seisan format.

4.4 Editing and Viewing Project Settings

You can only edit the settings of a project before it has run for the first time or been scheduled (Archive project). After it has run, you can only view the settings but you can no longer edit them. If you want to edit the settings of a project after it has already run once or been scheduled, you can copy the project and then edit the settings for the copy.

If you want to make a copy of a scheduled Archive Project and the schedule has already started, you have to cancel the schedule before you can make a copy of it.

4.5 Deleting Projects

When you delete a project, only files in the temporary folder are deleted. All processed data files are not deleted.

Apollo Project stores intermediate files in a temporary subdirectory of the Base Directory specified for the output location of a project. These intermediate files correspond to the actual channel group data retrieved from the Stores referenced by the project. If a project is deleted from Apollo Project, these temporary files will be removed automatically.

Disk space can also be reclaimed by removing these temporary files manually without deleting the project. However, if the project is run again, the output files produced might be incomplete if previously retrieved data from these temporary files is required.

Appendix A
Examples

A.1 Example Project Settings

A.1.1 Example 1: One Time Project

Project Name: Project1

Project Type: One Time

Channel groups selected for retrieval: CA.STN1.OT.BHZ (on taurus_1234)

Requested Time Range: January 30, 2008 14:00 – 15:00 UTC

File Interval: 20 minutes

Output Location Base Directory: /disk2/ApolloProjectOutputData

Output Location Subdirectories: /%project/%year/%month/%day/

Output Location Filename:%station%network_%time

When the project is run successfully, the following output files will be created on the server running Apollo Project:

- /disk2/ApolloProjectOutputData/Project1/2008/01/30/STN1CA_20080130_140000.seed
- /disk2/ApolloProjectOutputData/Project1/2008/01/30/STN1CA_20080130_142000.seed
- /disk2/ApolloProjectOutputData/Project1/2008/01/30/STN1CA_20080130_144000.seed

A.1.2 Example 2: Controlled Source Project

Project Name: Project2

Project Type: Controlled Source

Channel groups selected for retrieval: CA.STN1.OT.BHZ (on taurus_1234), CA.STN1.OT.BHN (on taurus_1234)

Requested Shot Times: January 30, 200814:00 UTC, January 30, 2008 14:30 UTC

Pre Time: 30 seconds

Post Time: 30 seconds

Output Location Base Directory: /disk2/ApolloProjectOutputData

Output Location Subdirectories: /%project/%year/%month/%day/

Output Location Filename: %time.%format

When the project is run successfully, the following output files will be created on the server running Apollo Project:

- /disk2/ApolloProjectOutputData/Project2/2008/01/30/20080130_135930.segy.sgy
- /disk2/ApolloProjectOutputData/Project2/2008/01/30/20080130_142930.segy.sgy

A.2 Example Deployment Scenarios

A.2.1 One Time

You want to download three days of data from multiple instruments on the network, save the data in MiniSEED format, and create a file for every hour of data.

A One Time project is the recommended solution. The Store of each instrument can be made available to Apollo Project by creating a corresponding IP Address Store specification with the IP address of the instrument. The requested time range can be specified along with a file interval of one hour. Ensure that the instruments are configured to run in Communications mode.

A.2.2 Scheduled Archive

You want seismic data to be retrieved automatically from a group of instruments on the network every six hours. The instruments are always accessible via an Ethernet connection.

A scheduled Archive project is the recommended solution. Use the Regular Interval scheduling option and set the interval to six hours.

You can also run a scheduled Archive project at any time. For example, if the scheduled retrieval interval of a project is six hours and between intervals you want to retrieve the data three hours early, you can run the project and approximately three additional hours of data would be accumulated. About three hours later, the project will run automatically and accumulate the remaining three hours of data.

A.2.3 Manual Archive

You want to retrieve seismic data from a group of instruments but their respective Stores are only available for retrieval on occasion (no regular, dependable schedule for retrieval from these Stores is possible).

A manually run Archive project is the recommended solution. You can create the project and run it whenever any of the instruments are available for retrieval.

A.2.4 Field Archive

You want to collect data from a set of isolated instruments in the field at recurring intervals (for example, twice per month) and the same laptop will not be used each time.

A Field Archive project is the recommended solution. You can create a Field Archive project and either add all instrument IP addresses to the list or use a Discovery specification. The time for the last retrieval is stored on the instrument and all data is recovered from the last recovery time.

You can only create and run Field Archive projects for Taurus version 3.0 or later.

A.2.5 Media Harvesting

You want to collect the media from a set of instruments in the field at a regular interval (for example, once per week). You also have to retrieve all of the seismic data on the media for subsequent analysis.

An Archive project is the recommended solution. Initially, a directory is created on the file system of the server running Apollo Project. A directory Store specification is created with this directory as the parent directory from which to search for Stores. The content of each media instance in the week's collection is copied from a media reader to a subdirectory of the directory. When the project is run, all of the copied Stores are automatically available and the project accumulates data for each instrument.

Due to the nature of media harvesting and the replacement procedure for this example, data is always missing for the last period of output files for the current week. This period corresponds to the time that the media was taken from the instrument and replaced with a new one. The following week when the media is harvested again from the instruments in the field, Apollo Project fills in the missing time for these files with the new Store data, regardless of the media instance on which the data currently resides.

A.2.6 Downloading Triggers

You have set up a network of five Tauruses around a hydro dam. Each Taurus is accessible over an Ethernet connection and each is set to record data over the weekend. You have set the period for data retrieval at 30 seconds before and five minutes after any seismic activity but the following procedure shows you why it is not necessary to view all of the data accumulated over the whole weekend.

1. Select the Taurus at the site with the least environmental noise or determine the best site for generating triggers and designate this Taurus "Taurus A" for reference.

   You need to perform this task in advance. More information about triggers can be found in the Taurus Portable Seismograph User Guide.

2. Download the trigger file from "Taurus A" and review the file to verify the correct number of triggers.

3. Create a new Triggers project in Apollo Project.

4. Add the IP addresses of all five of the Tauruses on the Store Selection tab.

5. Select the trigger file that you downloaded in step 2 on the Time Selection tab and enter a Pre Time of 30 seconds and a Post Time of 5 minutes.

6. Click the **Run Now** button on the Summary page.

   When the project has finished running, the output folder you specified will contain ten files. Each output file will contain 5 minutes and 30 seconds of data from the five Tauruses.

A.3 Shot Files for Controlled Source Projects

You have two options for defining shots for a Controlled Source project: manually defining shots or importing shots from a shot file in the Microsoft Office Excel (.xls) format:

A template for a shot file is located in the doc/ShotFileImport folder on the Apollo Project CD.

Only the decimal separator is supported for shot files. Separators that denote the 3rd power of 10 (thousand) are not supported (for example, 4,500).

The .csv shot file template is not compatible with Microsoft Office Excel. Make sure that you do not double-click it and open it in Microsoft Office Excel.

Appendix B
Retrieving SOH Data from a Taurus Version 2.x

B.1 Taurus Version 2.x SOH Data Retrieved by Apollo Project

This section presents the predefined datasets of SOH data Apollo Project will retrieve from a Taurus version 2.x, either through a direct connection or a stream to Apollo Server. For instruction on retrieving streaming Taurus version 2.x data from Apollo Server, see Section B.2 "Retrieving SOH Data from a Taurus Version 2.x Streaming to Apollo Server" on page 26.

The order of the columns presented in the table below will differ when streaming Taurus version 2.x SOH data from Apollo Server.

Predefined SOH group	SOH data
GPS Time	• Time (longsecs) (the number of seconds since 1970-01-01) • Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) • Altitude (m) • DAC Count • Error (ns) (time error) • GPS Engine Status • Last Update Time(s) • Lat (deg) (latitude in degrees) • Long (deg) (longitude in degrees) • NumSatellites (number of satellites used) • PDOP • PhaseLock (system clock phase lock) • TDOP • Uncertainty (ns) (time uncertainty) **Note:** The values for Number of satellites used, PDOP, and TDOP are provided by the GPS receiver at the Last update time. In order to see what time these values correspond to, look at the Last update time. When GPS is off, these three parameters and the Last update time are not updated. The last value displays until the next update arrives (after the GPS is turned on again).

Predefined SOH group	SOH data
GPS Satellites	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) For each satellite ◆ Acquisition Flag ◆ Last Update Time (ms) ◆ PRN ◆ Satellite Azimuth (µ°) ◆ Satellite Elevation (µ°) ◆ Signal Level (AMU)
Environment	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) ◆ External SOH Voltage 1 (V) (12-bit, voltage input) ◆ External SOH Voltage 2 (V) (12-bit, voltage input) ◆ External SOH Voltage 3 (V) (12-bit, voltage input) ◆ External SOH Voltage 4 (V) (12-bit, voltage input) ◆ Sensor SOH Voltage 1 (V) ◆ Sensor SOH Voltage 2 (V) ◆ Sensor SOH Voltage 3 (V)
Instrument	◆ Time (longsecs) (the number of seconds since 1970-01-01) ◆ Time (UTC) (time in yyyy-mm-dd hh:mm:ss.ms format) ◆ Controller Current (mA) ◆ Digitizer Current (mA) ◆ NMX Bus Current (mA) (external connector) ◆ Sensor Current (mA) ◆ Serial Port Current (mA) ◆ Supply Voltage (mV) ◆ Temperature (°C)

B.2 Retrieving SOH Data from a Taurus Version 2.x Streaming to Apollo Server

This section provides instruction on configuring your Taurus version 2.x to stream data to Apollo Server and instructions on how to use Apollo Project to retrieve this data from Apollo Server.

B.2.1 Streaming Data from a Taurus Version 2.x to Apollo Server

Use the Taurus graphical user interface on either the Taurus display screen or through a Web browser to set up an NP stream from a Taurus version 2.x to Apollo Server.

1. Log on to the Taurus version 2.x with either the tech or central user account.
2. Select **Advanced Configuration** > **Communications** > **NP Data Streaming**.

3. To have the Taurus stream both time series and SOH data to Apollo Server, select both **Stream Time Series** and **Stream SOH**.

   -OR-

   Select only **Stream SOH** if you only want to retrieve the SOH data from Apollo Server.

4. Type the IP address for Apollo Server in the **IP Address** box.
5. Type the port number Apollo Server uses to receive data in the **Port #** box. By default this is port number 32008.
6. The **Second IP Address** and **Second Port #** boxes are not necessary; however cannot be left blank. Type 127.0.0.1 in the **Second IP Address** box and 32004 in the **Second Port #** box.
7. Type a value in the **Maximum Throughput [bps]** box if a limited data link is present between the Taurus and Apollo Server. For instance, if at some point the data link is limited to 9600 bps, then this is the maximum throughput the link can allow. If there are no throughput limitations, set the value in this box to zero to disable the throughput limitation.
8. Click **Apply**.
9. Click **Commit**.

B.2.2 Retrieving Taurus Version 2.x Data from Apollo Server

Create a new project or use an existing project in Apollo Project to retrieve the Taurus version 2.x data from Apollo Server. For more information on creating or editing projects, refer to Chapter 3 "Creating Projects" and Section 4.4 "Editing and Viewing Project Settings" on page 19.

When creating or editing the project,

a) Add an IP address Store specification on the **Store Selection** tab for Apollo Server, including the port number:

   Apollo Server IP Address:*Port Number*

b) Apply the appropriate filters on the **Channel Group Selection** tab to retrieve the desired channel groups from the Taurus version 2.x.

Appendix C
Using a File Binder

C.1 About File Binder

For situations where you may need to disconnect your Nanometrics applications from the network for a period of time, you can change your Binder configuration so that the Binder source is a local file in comma-separated values (CSV) format. This file, channels.csv, is exported from Athena and includes all station and channel information in the Athena database. Refer to the Athena User Guide for information on exporting the channels.csv file.

Before you configure Apollo Project to use a file Binder, ensure that

- The file Binder (.csv) is saved locally.
- You know the location of the file Binder.

C.2 File Binder Format

The file Binder is a comma-separated values (CSV) file with the following columns:

(1) You do not have to create a header row with the column names: only the body rows are required.

(2) To use a special character in a value, enclose the entire value in quotation marks (“ ”).

For example: “Ottawa, Ontario”

To specify a null, blank, or empty value, leave the value empty.

Table C-1 File Binder format

Column	Description	Example
Network code	A one to two character alphanumeric SCNL network code.	PO
Station code	A one to five character alphanumeric SCNL station code.	BANO2
Location code (optional)	A one to two character alphanumeric SCNL location code.	06
Channel code	A one to three character alphanumeric SCNL channel code.	HHZ
Channel index	Zero to ten numeric characters. **Note:** A channel code must be present if the channel is associated with an instrument.	1
Network name	The name of the network.	Polaris
Station name	The name of the station.	Station B
Latitude	The latitude of the station (+/- for North/South).	45.0198
Longitude	The longitude of the station (+/- for East/West).	-77.928
Elevation	The elevation in metres of the station.	360
Azimuth	The azimuth in degrees of the station.	123.2

Table C-1 File Binder format

Column	Description	Example
Dip	The dip in degrees of the station (between -90 and +90).	89.1
Instrument model (optional)	The exact name of the instrument model.	Taurus
Instrument serial no. (optional)	The exact serial number of the instrument.	0678
Instrument name (optional)	The name of the instrument within a station.	Foo
Sensor name	The name of the sensor.	Trillium 40
Sample rate	The samples per second.	100.0
Valid start time	Start of the valid period in ISO8601 format.	2010-09-06T12:34:56.987Z
Valid end time	End of the valid period in ISO8601 format. **Note:** An empty value means that the valid time has not ended.	2010-09-07T12:34:56.987Z
Response file URL	This column is not applicable to Apollo Project. This column is used by Nanometrics applications that can retrieve response information.	

In the following example line from a file Binder; a location code, a valid end time, and a response file URL are not specified (the double comma is the empty location code field and the final comma indicates that the valid end time field is empty):

PO,BANO2,,HHZ,1,Polaris,Station B,45.0198,-77.928,360,123.2,89.1,Taurus,0678,Trillium 40,100.0,2010-09-06T12:34:56.987Z,,,

Appendix D
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Appendix E
Glossary

E.1 Glossary of Abbreviations and Terms

A

ASCII

American Standard Code for Information Interchange

B

BHE

Broad Band, High Gain Seismometer, East-West Orientation

Channel name based on the Global Seismological Network (GSN) standard.

BHN

Broad Band, High Gain Seismometer, North-South Orientation

Channel name based on the Global Seismological Network (GSN) standard.

BHZ

Broad Band, High Gain Seismometer, Vertical Orientation

Channel name based on the Global Seismological Network (GSN) standard.

C

CSV

Comma-Separated Values

D

DAC

Digital to Analog Converter

G

GPS

Global Positioning System

J

JRE

Java Runtime Environment

JVM

Java Virtual Machine

N

NFS

Network File System

P

PDOP

Position Dilution of Precision

PRN

Pseudo-random Number

S

SAC

Seismic Analysis Code

An Apollo Project output file format that generates files that can be used by the SAC software (see http: www.iris.edu/software/sac/).

SEED

Standard for the Exchange of Earthquake Data

SMB

Server Message Block

SOH

State of Health

T

TCP/IP

Transmission Control Protocol/Internet Protocol

TDOP

Time Dilution of Precision

U

UNC

Uniform Naming Convention or Universal Naming Convention

URL

Uniform Resource Locator

UTC

Coordinated Universal Time

E.2 List of Unit Abbreviations and Symbols

Table E-1 provides a list of unit abbreviations and symbols commonly used in Nanometrics documentation.

Table E-1 Unit abbreviations and symbols

Abbreviation or Symbol	Definition	Abbreviation or Symbol	Definition
°	degree	lb	pound
Ø	diameter	m	metre
µ	micro	m/s	metre per second
Ω	ohm	m/s^2	metre per second, squared
A	ampere	mA	milliampere
AC	alternating current	MB	megabyte
b	bit	MΩ	megaohm
B	byte	MHz	megahertz
bps	bits per second	mi.	mile
C	Celsius	mL	millilitre
cm	centimetre	mm	millimetre
dB	decibel	ms	millisecond
DC	direct current	MTU	maximum transmission unit
F	farad	mV	millivolt
ft.	foot	mW	milliwatt
g	gram	N	Newton
g	gravity	nF	nanofarad
GB	gigabyte	ns	nanosecond
GHz	gigahertz	rad	radian
Hz	hertz	rad/s	radian per second
in.	inch	s	second
KB	kilobyte	sps	samples per second
kg	kilogram	U	rack unit
kHz	kilohertz	V	volt
kΩ	kiloohm	Vpp	Volts peak-to-peak
kW	kilowatt	W	watt
L	litre		

About Nanometrics

Nanometrics Inc. is a world-class provider of precision instrumentation, network technology and software applications for seismological and environmental research. Nanometrics products are employed for the study and monitoring of regional, national and global seismicity; natural resource exploration; environmental data communications; and other scientific applications. Deployed in over 100 countries, and on every continent, Nanometrics real-time and portable systems are utilized by the world's leading scientific institutions, universities, corporations and test ban treaty monitoring organizations. With state-of-the-art manufacturing facilities in Ottawa, Ontario; Nanometrics is an award-winning Canadian exporter located in the heart of Canada's technology sector.

Contacting Nanometrics

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Contacting Technical Support

If you need technical support please submit a request on the Nanometrics technical support site or by email or fax. Include a full explanation of the problem and related information such as log files.

Support site: http://support.nanometrics.ca
Email: techsupport@nanometrics.ca