

GENIE™ IV

EEG Analysis Software for the Thymatron® System IV

Table of Contents

1. Introduction.....	1
2. Installation.....	1
Program Files.....	1
Connecting the Serial Cable.....	1
3. User Interface.....	2
4. Collecting Data.....	2
Auto Upload.....	3
Automatic Operation.....	3
5. Report Window.....	4
6. Analysis Screens.....	5
7. Loading and Saving Data to Disk.....	6
Batch Conversion.....	6
Exporting as Text.....	6
Exporting as Images.....	7
Import/Export Patient Info.....	7
8. Sending and Receiving Data from the Thymatron.....	7
9. Monitoring and Playback Controls.....	8
Control Panel.....	8
Settings Panel.....	8
Keyboard Shortcuts.....	10

1. Introduction

The Genie IV program allows you to collect, analyze, and display EEG, EMG, and ECG data from the Thymatron System IV in real-time. It also has functions to save and playback treatment sessions, and edit the patient information associated with a set of data. If desired, Genie IV can automatically collect the data of multiple treatment sessions, eliminating the need for any operator intervention in between patients.

2. Installation

Program Files

Genie IV works with MS Windows XP, Vista, 7, and 8. If you don't already have the Genie IV software, you can download it from

http://thymatron.com/sub_downloads.asp

The program is self-contained, and does not require you to run an installer. Just create a folder on your computer called "Genie" and drag the *Genie[xxx].exe*¹, *DevIL.dll*, and *Sample.dat* files from your download into that folder. Any data files you save will be kept in that directory, as well as a *Genie.cfg* file that stores your settings when you quit the program. To run Genie IV, double-click the *Genie[xxx]* file.

Connecting the Serial Cable

The Genie IV software communicates with the Thymatron System IV using a 9-pin serial cable. Connect one end to the serial port, labeled RS232, on the rear panel of the Thymatron, and the other end to a 9-pin port on your computer. If your computer does not have a built-in serial port, you can use a USB-to-Serial converter: we have tested the Genie with Keyspan's USA-19QW and USA-19HS adapters, and adapters based on the PL2303 chipset; these can also be purchased through Somatics, if you wish. If you use a USB-to-Serial adapter, you will need Genie version 6.61 or higher.

You will need to know the "COM Number" of your serial port, the first time you run Genie. Though this number varies from computer to computer, there are some guidelines that might help you:

- If you have a built-in serial port, try COM1.
- If you are using a USB-to-Serial converter, and also have a modem on your computer, try

¹ The [xxx] represents the version number of the particular Genie you are using; for instance, *Genie641.exe*. Also, depending on how your Windows installation is configured, the .exe extension may be hidden.

COM5.

- If you are using a USB-to-Serial converter, but do not have a modem, try COM1 or COM2.
- You can also find the COM ports available on your computer by using the Device Manager function of Windows²

To set the COM port, open the Connect menu once you have run the program, and choose the Set Port item to display a list of COM ports from which you can select one. Note that if you select an invalid COM port, the Genie software will give you a warning, and you can try another. There is no harm in trying different COM ports until you find the correct one.

3. User Interface

The first time you run Genie IV, it will attempt to detect your COM port, and then you will see a gray screen with a menu bar at the top. The menus are:

- File** Used to load and save data to disk, print, and exit the program.
- Connect** For sending to and receiving data from the Thymatron.
- PatientInfo** Allows you to set patient information, such as the name, age, and sex, stored with the data.
- Tools** This menu is available only when a window is open. It contains commands for recording and playing back data.
- Format** Shown only when the Report window is active, this menu allows you to configure the types of information displayed, and the formatting of the graph.
- Window** Used to open various types of windows (Graph, FFT, etc.) for viewing the collected data, and for selecting among the windows you have open. These are discussed individually in section 6 on page 5.
- About** Shows the version number of the Genie IV.

In the Tools menu there are two items, Play Control and Channel Settings, that open floating “control panels” that allow you to more easily activate recording and playback functions. These controls are discussed in section 9 on page 8.

4. Collecting Data

To monitor in real-time the channels of the Thymatron,

1. Run the Genie program as described above
2. Open the Window menu and select the Graph item. A four-channel graph screen will appear, as well as the Control and Setting floating panels.
3. Acquire an impedance reading by holding the Impedance button on the Thymatron until a

² When using Windows 7 or 8, you can open the Start menu and simply type "Device Manager" to open it.

value is shown on the LED display. Note that the patient does not have to be hooked up to the stimulus electrodes—you can continue monitoring with a 3000Ω reading.

4. On the Control panel, click the Monitor button. The Genie will begin to display data, organized into 1.28 second epochs, or segments.
5. When you wish to stop monitoring, click on the Stop Mon button in the Control panel.

To upload the collected data from the Thymatron to Genie,

1. Press the FlexDial™ on the Thymatron, and rotate the dial until “DATA OUT” is displayed on the 8-character LED.
2. Press the FlexDial, and then rotate it until “RAW DATA” is shown.
3. In the Genie program, open the Connect menu and click Receive Data.
4. Press the FlexDial to begin the data upload process.
5. When the transfer finishes, press the Impedance Test button on the Thymatron to exit the FlexDial menu.
6. If you wish, you can use the PatientInfo menu to store information such as the name, sex, age, etc. of the patient before saving the data.

See section 9 on page 8 for detailed information on how to review the collected data, alter the playback speed and channel gain, and mark any artifacts found; and see section 7 on page 6 for instructions on saving and loading data to files on your computer.

Auto Upload

Auto Upload is the feature that provides for operator-free data collection from multiple patients. To use it,

1. From the Connect menu, select Auto Upload.
2. Your files will be named according to the date, time, and a sequence number. You can choose the directory in which you want to store the files.
3. When you have chosen the directory, click Upload.
4. Ensure that auto-upload mode is active on the Thymatron.³

At this point, the Genie IV is ready: it will begin collecting data when treatment is initiated, and will end when the Start/Stop button on the Thymatron is pressed after treatment. It then saves the data to a file, and is ready for the next patient.

Automatic Operation

Using the monitoring and automatic upload features together provides a convenient method of operating the Genie IV when treating several patients in a row. To set up the software,

³ Refer to the Thymatron System IV instruction manual for full directions on how to do this; this is only a brief summary: use the FlexDial → Upload → Load Raw

1. Turn on Auto Upload as described in section .
2. Begin monitoring the patient according to the directions in section 4.
3. The graph screen will show real-time traces of selected channels.
4. While the stimulus is being delivered, the graph will pause.
5. After the Start/Stop button on the printer is pressed, Genie will automatically upload data from the Thymatron, save it, and then wait for the next patient to be treated.
6. When the impedance has been acquired on the next patient, the Genie will automatically begin monitoring again.

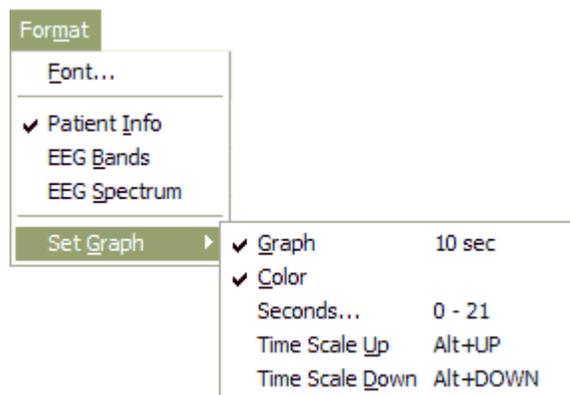
If you would like to perform post-treatment monitoring on a patient, obtain another impedance reading and the Genie will resume monitoring.

At the end of the day, you will have a number of files saved by Genie in a folder on your computer. It is often a good idea to go through these files and rename them to more descriptive names; also, you can open the saved data files in Genie and use the PatientInfo menu to enter more detailed characteristics (name, age, etc.).

5. Report Window

The Report Window (Window menu→Report) allows you to view and print a treatment report with similar information to the paper printout from the Thymatron itself. When you open the Report window, you'll see a Format menu that allows you to choose which types of information appear, and, if you choose to display a graph, the time, scale, and formatting of that graph.

Here you can see the options available in the Format menu:



To save a treatment Report to a file, print (File→Print) the report window to a PDF writer (ex. Acrobat or PDFCreator), which will yield a high-quality vector PDF version of the information and graph.

6. Analysis Screens

In addition to the Graph window, you can view real-time analyses of the data in the FFT, Bands, and Spectrum windows; and a summary of the treatment, similar to the one printed out by the Thymatron, in the Report window. To open any of these displays, use the Window menu. When you are looking at the FFT, Bands, or Spectrum display, an additional Spectrum menu will be available. It allows you to choose between an analysis of the accumulated spectrum data thus far (Accumulated Spectrum), or just the current segment (Current Segment). Depending on the type of window you have open, the Spectrum or Format menus may have additional functions, as described below.

Graph The Graph window displays traces from EEG channels 1 & 2, and up to two more EEG channels, or EMG and ECG channels. See section on page 8 for instructions on how to configure the graph display.

FFT The FFT window shows a 32-bar display of the FFT analysis of the EEG channels.

Bands The Bands window displays the numeric values of the absolute EEG power, relative EEG power, % interhemispheric coherence, and % interhemispheric asymmetry, for each of the four standard frequency bands (delta, theta, alpha, beta) plus 2 additional user-assignable bandwidths. These variables are used to assess the relative interhemispheric symmetry in EEG amplitude and phase.

When you are collecting in four-channel mode, you can use the Spectrum menu to select any pair of EEG channels to analyze. Also the Spectrum menu will contain a Set Bands item that lets you choose the range (in Hz) for each of the frequency bands.

Any number of separate Bands windows may be opened simultaneously by using the Window menu and selecting the Bands item.

Spectrum The Spectrum displays numeric values for absolute power, relative power, asymmetry, and coherence, for each of 32 frequency points, in steps of 0.78 Hz.

When you are collecting in four-channel EEG mode, you can use the Spectrum menu to select any pair of EEG channels to analyze.

Any number of separate Spectrum windows may be opened simultaneously by using the Window menu and selecting the Spectrum item.

7. Loading and Saving Data to Disk

The File menu has items that relate to loading and saving data to your computer.

<i>Menu Item</i>	<i>Function</i>
New	Clears any data you have collected so far, and readies the Genie IV to accept new data.
Open	Allows you to choose a file from which to load saved data.
Save	Writes your current data to disk.
Save As	Allows you to choose a file name under which to save.
Batch Convert	Convert multiple data files to text (see the next section)
Save As Text	Exports data as text (see below).
Print	Lets you choose among the various windows, and sends your selection to a printer.
Exit	Closes the software.

Batch Conversion

Genie version 6.81 and newer can convert multiple .DAT files to text in one batch operation. Select the File→Batch Convert... menu item, and you'll be presented with a file dialog in which you can select multiple .DAT files at once: hold down Ctrl or Shift, and select all the files you wish to convert. You will then be shown another file dialog, to choose the directory in which to save the resulting text files. Each .DAT file will result in two text files: one will have a "-info.txt" suffix, and the other a "-raw.txt" suffix. These contain the patient and treatment information reports, and the raw monitoring data, respectively.

Exporting as Text

Normally, Genie IV saves data in a binary format in files with a .DAT or .EDT extension, which are readable only by the Genie software. It may be useful to export the raw data, analysis windows, or summary report as a text file, so that it can be read by other software, for instance MS Excel.

To export a specific window as a text file⁴,

1. Open the appropriate display (Graph, FFT, etc.) using the Window menu.
2. Choose Save As Text... from the File menu.
3. You will be asked if you would like to include the patient information with the text output, and also for a file name.

⁴ Specifically, these will be in Comma-Separated Value (CSV) format, which is a standard for text files that is interoperable among many programs.

If you want to import this text file into Excel

1. Choose Open from Excel’s file menu, select the appropriate file name, and then use Excel’s data import wizard to continue the process.
2. On the first page, choose the “Delimited” data type.
3. On the next page, ensure that only “Comma” is selected as the delimiter—by default Tab will be selected, so uncheck it
4. On the third page you may accept the default of “General” column types.

Exporting as Images

Genie version 6.61 and above can export the graph as a series of PNG image files, which you can assemble into a PDF (using third-party software such as Adobe Acrobat or the free PDFCreator), embed in other documents, print, and so forth. To use this feature,

1. Ensure the Graph window is showing (*Window* menu→Graph).
2. Select the *File* menu→Save as Image. This will open a dialog prompting for the base filename and directory where you want to store the PNG files. Each screenful of graph data will be saved in files consecutively named *basename-1.png*, *basename-2.png*, [...]. You can choose to export all pages of the graph, a subset, or just the current view on the screen.

Import/Export Patient Info

Genie version 6.8 and above provides a method to set the patient information of one or multiple files to be the same as another file. There are two scenarios in which this is convenient:

Import - When you have a file open, and want to fill in the Patient Info with the fields from another treatment file, click Import and choose the filename you wish to import from.

Export - You can save the current treatment's patient information to multiple files at once. This is useful if, for example, you have many treatments saved from the same patient, but the Patient Info is blank for those files. Open one treatment file, fill in the Patient Info appropriately, and then click Export. By holding the Ctrl key, you can select multiple target files; once you click Export, the current Patient Info will be saved into all of those files.

8. Sending and Receiving Data from the Thymatron

In the Connect menu are a number of functions related to transferring data between the computer and the Thymatron.

<i>Menu Item</i>	<i>Function</i>
Send Data	Transmits data from Genie to the Thymatron (see below).
Receive Data	Uploads data from the Thymatron to Genie, as described above.

Send Name	Sets the name printed on the Thymatron summary report.
Auto Upload	Toggles auto-upload mode, as described above.
Set Port	Specifies to which COM port the Thymatron is connected.

To use the Send Data and Send Name functions, you must prepare the Thymatron to receive data:

1. Press the FlexDial on the Thymatron, and rotate the dial until “DATA IN” is displayed on the 8-character LED.
2. Press the FlexDial; DATA IN will flash on the display.
3. Press the FlexDial again to make the Thymatron ready to receive data.
4. In the Genie program, open the Connect menu and click Send Data or Send Name.
5. When the transfer finishes, press the Impedance Test button on the Thymatron to exit the FlexDial menu.

To use the Receive Data function, follow the steps given previously in the discussion of Collecting Data.

9. Monitoring and Playback Controls

Control Panel

Once you have uploaded data from the Thymatron or loaded a file from disk, you can playback that data at a variety of speeds and mark any segments that contain artifacts.

On the Control panel, available from the Tools menu, you can select a subset of the data to review and change the speed at which it is played back. To view only a specific time range, type in the desired value into the Time Set field. From the Speed drop-down box, you can choose the playback speed from 25%—500% of real time.

There are also certain controls available while you are playing back data:

- PlayBack/StopBack** Starts and stops playback, respectively.
- Monitor/StopMon** Begins and ends monitoring of the Thymatron, respectively.
- Reset** Jumps to the beginning of the collected data.
- Reject** Marks the segment currently being viewed as an artifact, so that it won't factor in to the statistical analyses performed on the data set.

Settings Panel

From the Settings panel, available through the Tools menu, you can customize the behavior and display of the input channels. To enable a channel, ensure that there is a checkmark next to its On

label. For channels 3 & 4, you can select among EEG, EMG, and ECG inputs. The Scale dropdown box lets you change the display scale of each channel, in μV . The Artifact field contains a value in μV above which a segment will be automatically flagged as an artifact.

Keyboard Shortcuts

Most common operations have equivalent keyboard shortcuts, which can make using the Genie software much more efficient; a table of these shortcuts is given.

<i>Function</i>	<i>Shortcut</i>
New	Ctrl+N
Open	Ctrl+O
Save	Ctrl+S
Print	Ctrl+P
Send Data	Ctrl+F2
Receive Data	Ctrl+F3
Auto Upload	Ctrl+U
PlayBack/Stop Playback	Ctrl+B
Monitor/Stop Monitoring	Ctrl+T
Reset	Ctrl+R
Reject	Ctrl+J