



CatStim and Electrical Field Stimulator

SOF-152 & STIM-150I

PRODUCT MANUAL

DOC-281

Rev. 1.0

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NOTES

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CHAPTER 1 | INTRODUCTION

The STIM-150I Constant Current Stimulator packages for electric field stimulation include a series of PHM-152I Current Stimulator modules, PHM-152COM Control Network cards, SG-510 power supply cabinet, DIG-729USB interface and CatStim software. CatStim is a graphical user interface that will communicate stimulation parameters for up to eight stimulator modules.

Features

- Isolated output eliminates the need for an external stimulus isolation unit
- Perform completely independent stimulation protocols in each tissue bath or vessel chamber
- Constant current stimulus in a low impedance solution such as physiological saline solution
- Isolated monitor output allows the user to view the stimulus waveform using a separate oscilloscope
- Stimulator parameters are set in the user-friendly CatStim software
- Can be programmed to automatically deliver a sequence of stimulations using protocol files to encode the stimuli
- No confusing knobs or switches to set

CHAPTER 2 | HARDWARE

Hardware Guide

Figure 2.1 - PHM-152I Current Stimulator Module



Figure 2.2 - PHM-152COM Network Control Network Module



Figure 2.3 - Dig-729USB – USB Interface Module



Figure 2.4 - SG-510 – Power Supply Cabinet



Cable Guide

Figure 2.5 – SG-219ST – 25’ DB9 Control Cable



Figure 2.6 - SG-219G – 2’ DB9 Shock Cable

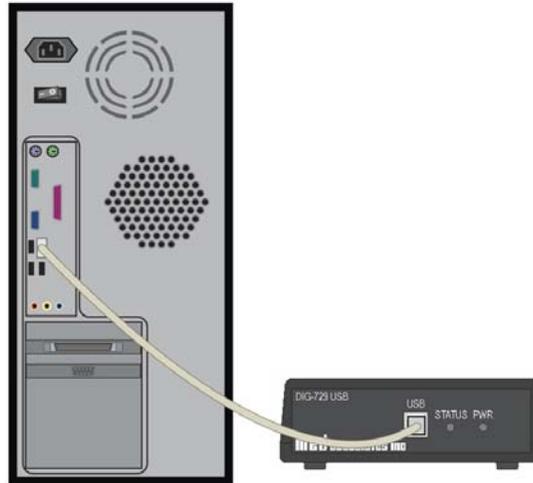


CHAPTER 3 | SETUP

NOTE: Install the CatStim software before connecting hardware to the computer, see Appendix A | Software Installation.

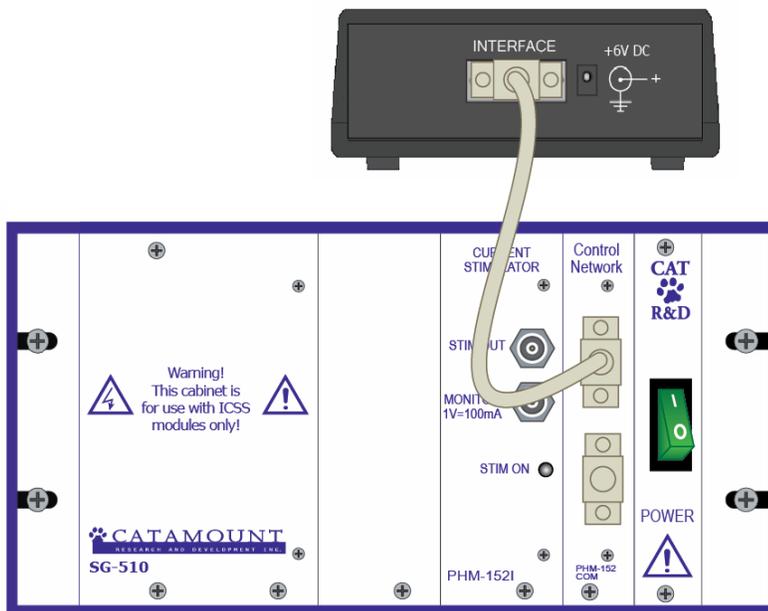
Connect the DIG-729USB Module to any available USB slot on a computer.

Figure 3.1 – DIG-729USB to Computer



Connect the DIG-729USB to the PHM-152COM Control Network Module using the SG-219ST Cable.

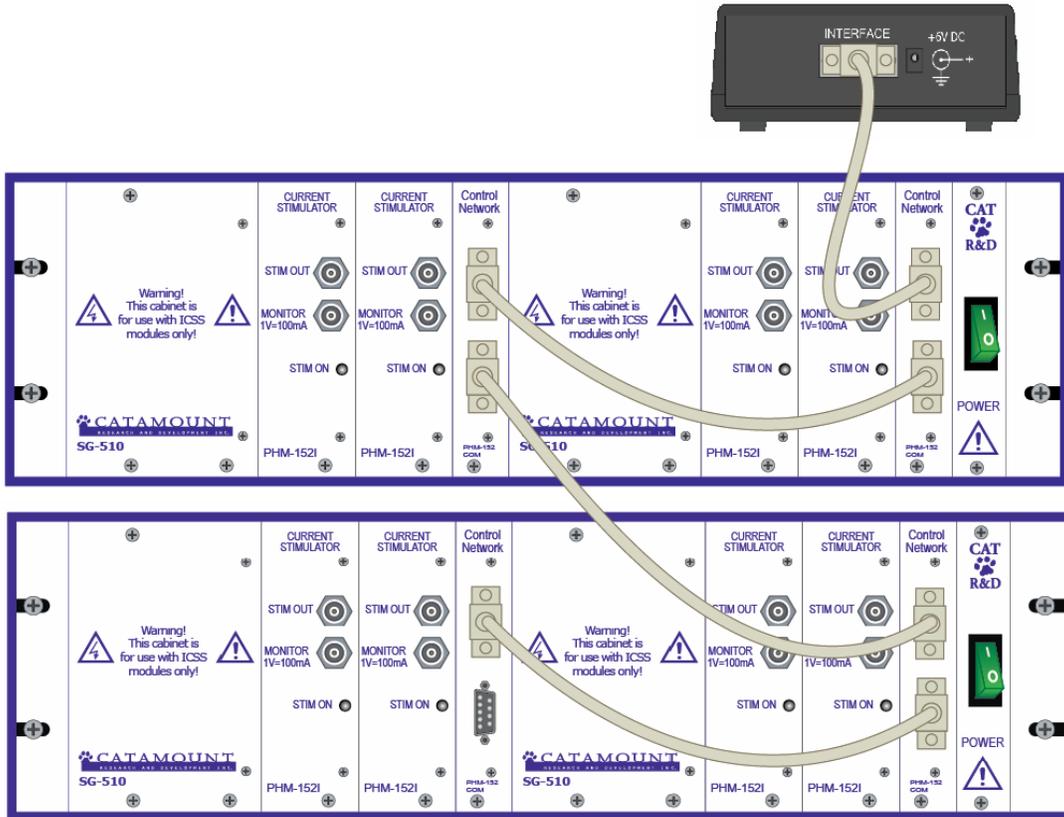
Figure 3.2 – DIG-729USB to PHM-152COM



If using more than two PHM-152I Current Stimulators ‘Daisy Chain’ them together using SG-219G Cables as seen in Figure below, there should be one PHM-152COM Control Network Module per two PHM-152I Current Stimulators.

NOTE: CatStim will communicate stimulation parameters for up to 8 stimulator modules.

Figure 3.3 - 8 Stimulator Connection Setup



CHAPTER 4 | SOFTWARE

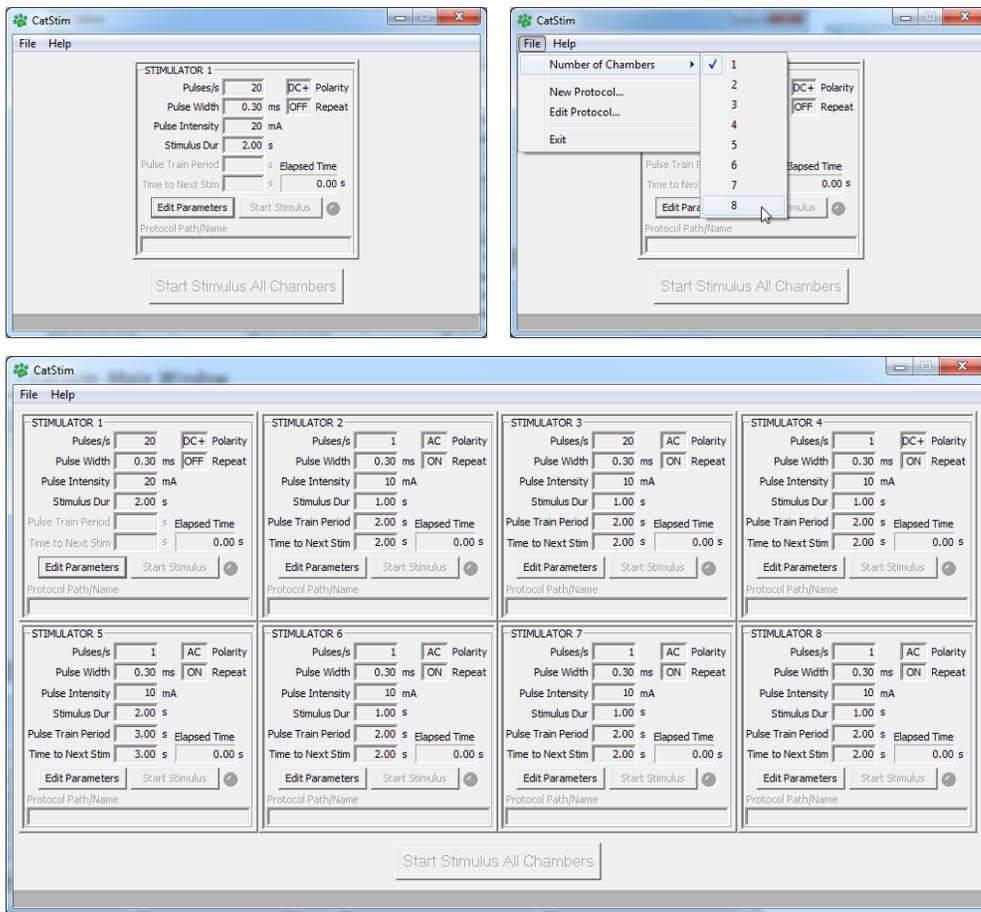
The software communicates parameters for two types of stimuli.

1. Stimulus – A single stimulus event where output current from a stimulator rises to a defined amplitude for a defined duration (pulse width) and then returns to zero.
2. Stimulus Pulse – A series of stimulation pulses that recur at a defined frequency and take place for a defined duration, also called a Pulse Train.

CatStim Main Window

The CatStim main window (Figure 4.1) shows all parameters being communicated to the stimulator module/s. CatStim can communicate these parameters to up to 8 stimulators. The CatStim software defaults to one stimulator but can be changed by clicking **File** then **Number of Chambers** and selecting the number of stimulators (see Figure 4.1). All stimulators can run independent of each other running the same or different parameters.

Figure 4.1 – CatStim Main Window

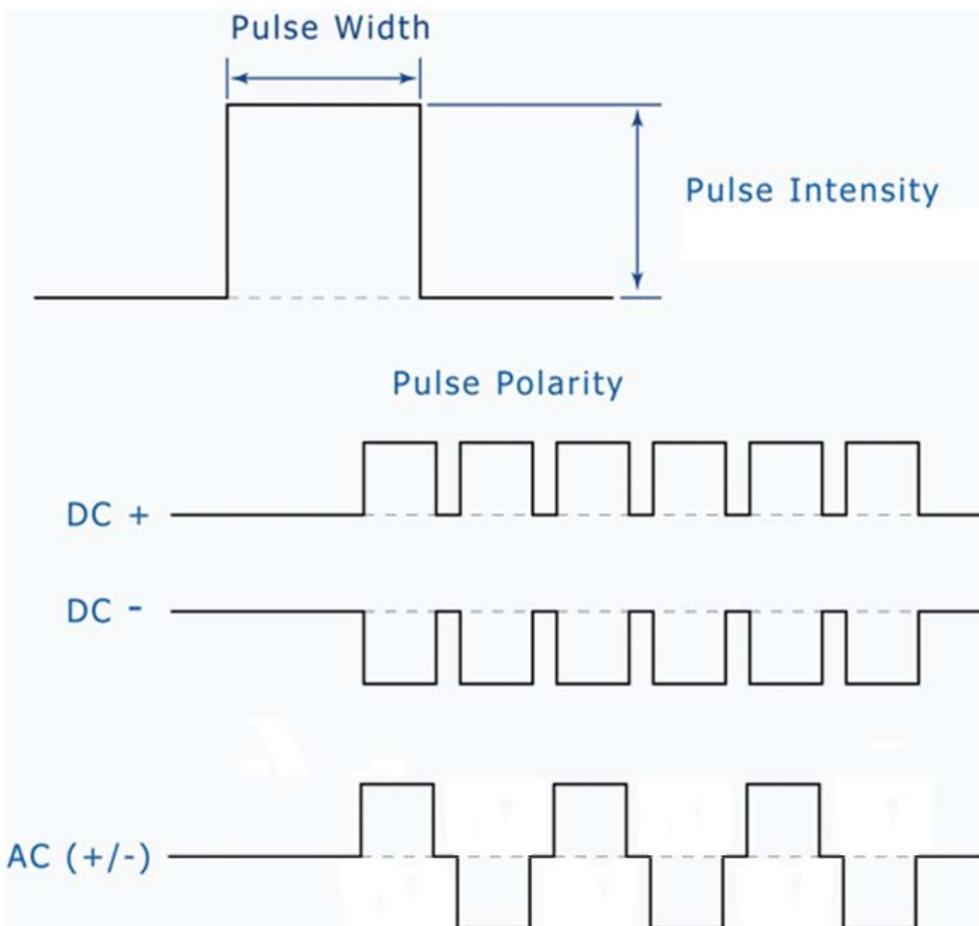


Pulse Parameters Defined

Individual Pulse Parameters

- **Pulse Width** defines the duration of a single stimulus pulse. Units for the pulse width are milliseconds, and typical values are in tenths of a millisecond range. The range of the pulse width is 0.1 to 32 ms, depending on the frequency.
- **Pulse Intensity** defines the amplitude of a single stimulus pulse. Pulse amplitudes are given in milliamps. The range of the pulse intensity is 0 to 400 milliamps.
- **Polarity** defines the polarity of an individual stimulus pulse. As shown in Figure 4.2, pulses can be positive, negative, or alternating polarity, referred to as DC+, DC-, or AC (+/-) for convenience. When trains of pulses are to be used, setting the pulse polarity to alternate (AC+/-) minimizes electrode polarization. This helps avoid stimulus artifacts due to electrode polarization.

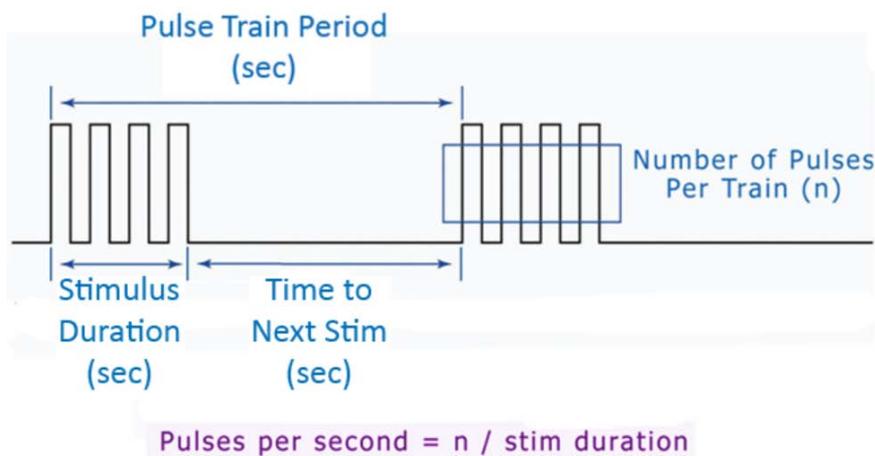
Figure 4.2 - Individual Pulse Parameters



Pulse Train Parameters

- **Pulses/s** is the number of stimulus pulses per second. The range of the pulse frequency is 1 to 2000 pulses per second, depending on the pulse width.
- **Stimulus Duration** is the length of time, in seconds that a train of pulses is applied. The minimum stimulus duration is 0.01 seconds and the maximum is the time it takes to generate 65,500 pulses.
- **Repeat** determines whether or not a pulse train will be repeated. The options are ON, OFF and FILE. Refer to the Repeat Mode section of this manual on page 10 for more detailed information.
- **Pulse Train Period** defines the amount of time (in seconds) from the start of one pulse train to the start of the next pulse train.

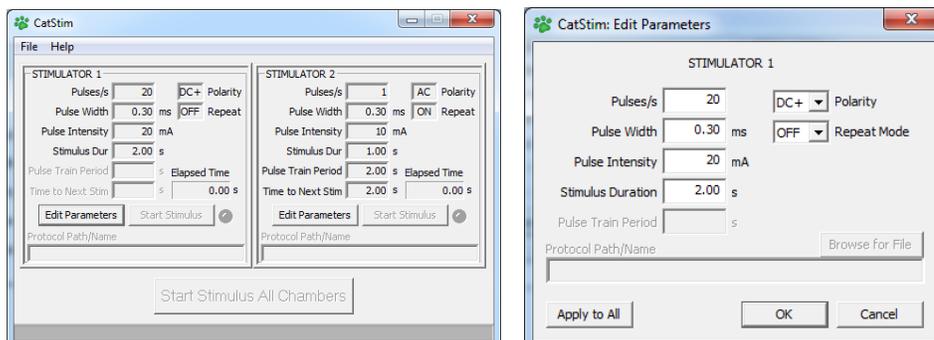
Figure 4.3 - Pulse Train Parameters



Editing Parameters

To make changes to the stimulator parameters, click the **Edit Parameters** button on the corresponding stimulator and the Edit Parameters window will appear as seen in Figure 4.4.

Figure 4.4 – Edit Parameters



Pulse Polarity is chosen from a drop down selector containing the available choices: DC+, DC-, AC+/- . Pulses/s, Pulse Width, Pulse Intensity, Stimulus Duration, and Pulse Train Period are all set by manually typing in the desired setting in the corresponding selection box. The Repeat Mode is chosen from a drop down selector containing the available choices: ON, OFF, or FILE. Settings for Pulse Train Period and Time to Next Stim are only active if the Repeat Mode is set to ON.

When the changes to the stimulator parameters are complete, click the **OK** button. Exit the Edit Stimulator window without making any changes by clicking the **Cancel** button. Press **Apply to All** to change parameters for all stimulators.

Once back to the CatStim main window, the parameters entered will be displayed in the corresponding stimulators. If operating the stimulator in manual mode (i.e. Repeat is set to OFF), the stimulator status indicator will have a bright red color (Table 4.1). To activate the stimulator, click the **Start Stimulus** or **Start Stimulus All Chambers** button. The stimulator status indicator will flash bright green while the stimulus is being delivered. As soon as the stimulus is completed, the stimulator status indicator will return to a bright red color, indicating the stimulator is OFF. The color of the stimulator status indicator defines important information about the status of the stimulator. Table 4.1 shows the various stimulator status indicator colors and defines their meanings.

Table 4.1 – Stimulator Status Indicator Definitions

Stimulator Status Indicator	Description	Definition
	Grayed-Out	Stimulator not found when program started. Communication error between computer and stimulator. Check connections and power.
	Bright Red	Stimulator is OFF. Repeat is set to OFF. Stimulator is in "Manual Mode".
	Bright Green (Flashing)	Stimulation in progress using the current settings.
	Dark Green	Stimulator is set to Repeat ON or FILE but is not activated.
	Bright Green	Stimulator is set to Repeat ON or FILE and has been activated. Stimulator is in between stimulations.
	Black	Stimulator not found after program started. Communication error between computer and stimulator. Check connections and power.

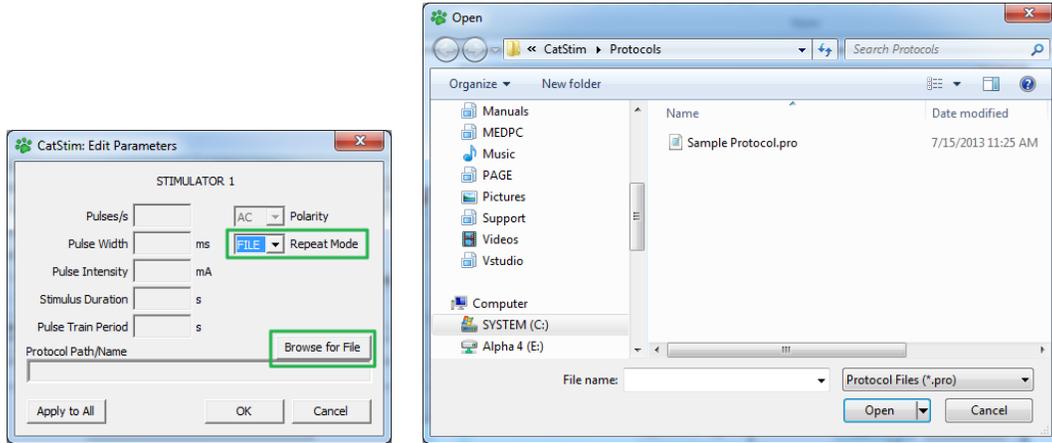
Using Repeat Mode

If desired to stimulate using the same parameters at set intervals, set **Repeat** to **ON**. Enter the desired **Pulse Train Period** in the Edit Parameters window. The **Pulse Train Period** is the amount of time from the start of one stimulus to the start of the subsequent stimulus, refer to Figure 4.3. For example, if **Repeat** is **ON** and the **Pulse Train Period** is set to 90s, the selected stimulus parameters will be repeated every minute and a half. Click the **Start Stimulus** or **Start Stimulus All Chambers** button to deliver the first stimulus, the stimulator status indicator will flash bright green (Table 4.1). When the stimulus is finished, the stimulator status indicator will stay bright green, indicating that the stimulator is in standby waiting for the **Time to Next Stim** to elapse. When the time set as the **Pulse Train Period** has elapsed, the stimulator will automatically deliver the stimulus using the same settings. The repeating will continue until the **Stop Stimulus** or **Stop Stimulus All Chambers** button is clicked. The stimulator status indicator will change to dark green indicating that the stimulator is OFF.

Using Protocols

A more advanced and powerful way to change stimulus parameters between successive stimulations is to use the “**FILE**” feature of **Repeat Mode**. Setting **Repeat Mode** to **FILE** will allow you to load a pre-programmed stimulus protocol into memory and execute stimulations based on parameters set in the file. To use a pre-programmed protocol, click the **Edit Parameters** button for the desired stimulator(s). From the **Repeat Mode** selector, choose **FILE**. This will activate the Browse for File button, click to browse the directory where the protocol files are stored. It will have a “pro” extension. There is a sample protocol file called **Sample Protocol.pro** that is installed in the **C:\ProgramData\Catamount Research\CatStim\Protocols** directory. Double click or highlight the protocol file and click **Open**, refer to Figure 4.5. Click **Apply to All** to apply protocol to all stimulators and/or **OK** from the **Edit Parameters** window to load the protocol and return to the main CatStim window. The Stimulator parameters will show **FILE** listed for all the stimulus parameters fields. The stimulator status indicator should be dark green, indicating the stimulator is off. During an experiment, when the **Start Stimulus** button is clicked for a stimulator that has a protocol file loaded, the stimulator will deliver the first stimulus and then go into standby while waiting for the **Pulse Train Period** to elapse before delivering the next stimulus if any. After a stimulus is delivered, the Stimulator Parameters will be updated automatically to reflect the settings that will be used in the next stimulus. As soon as all the stimulations programmed in the protocol file have been delivered, the stimulator will automatically turn off, the stimulator status indicator will change to Dark green to indicate the stimulator is off, and the Stimulator Parameters will be updated with the parameters for the first stimulation settings in the file. If the **Start Stimulus** button is clicked again, the stimulator will execute the stimulations in the protocol file once again.

Figure 4.5 – Loading a Protocol File

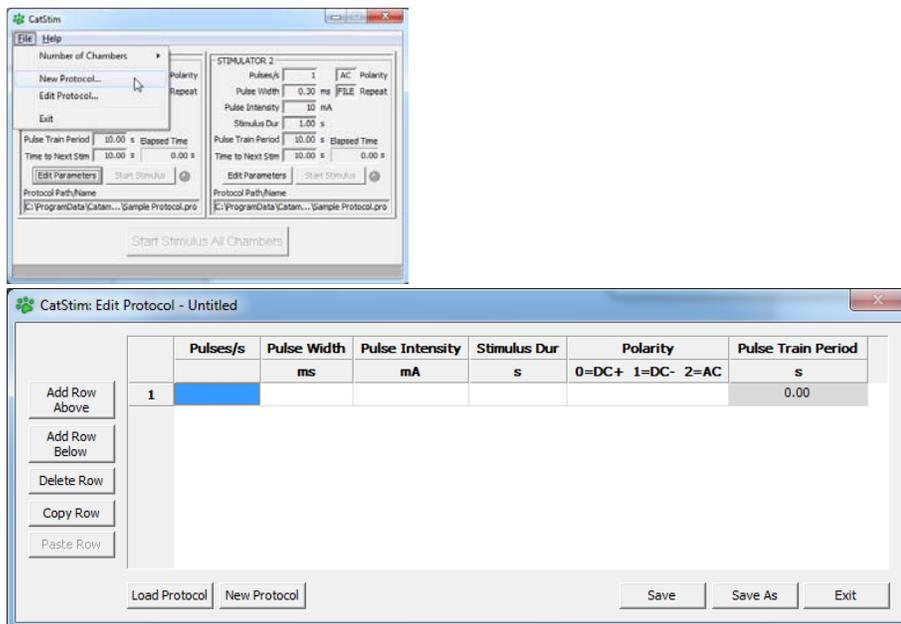


Editing Protocols

To create protocols or edit existing protocols, Click **File** from the main CatStim window, then select **New Protocol...** or **Edit Protocol...**, both will bring forward the **Edit Protocol** window as seen in Figure 4.6. New Protocol... will provide a blank table to enter in stimulator parameters as desired. Edit Protocol... will open the **C:\ProgramData\Catamount Research\CatStim\Protocols** directory and prompt you to load an already programmed protocol to edit, this is helpful if a protocol is already created and only minor changes or additions need to be made. The file can then be overwritten or saved as a new .pro.

Note: Load Protocol and New Protocol from within the Edit Protocol window serve the same function as selecting Edit Protocol... or New Protocol... from the File menu on the main CatStim window.

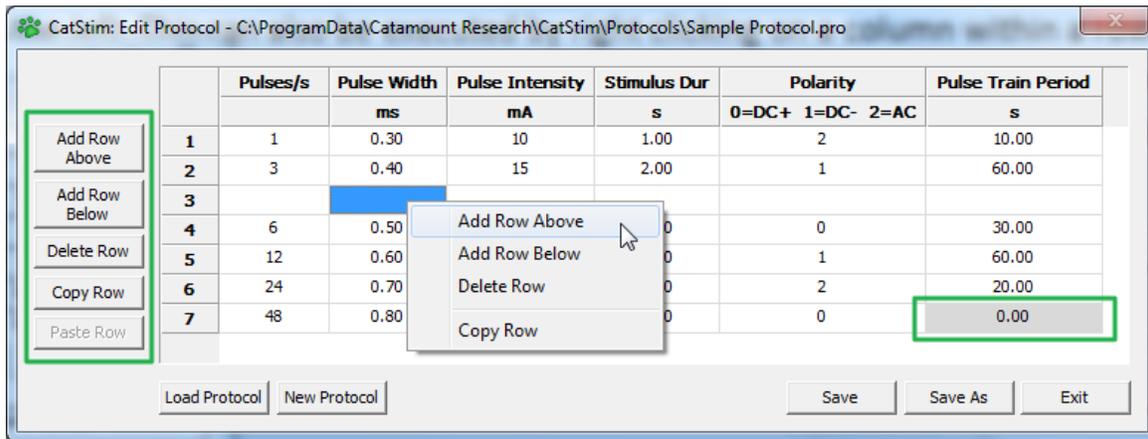
Figure 4.6 – Edit Protocol



The protocol table can be edited by inserting, deleting, copying, and pasting rows of parameters as needed. To use a function on a row, click on one of the columns within a row and then select the function on the left. This can also be executed by right clicking on a column within a row and selecting the function from the floating window as seen in Figure 4.7. The Paste Row button will stay grayed-out and missing from the floating window until a Copy Row selection has been made.

Note: The Time to Next Stim on the last row of the protocol is Zero and Grayed-Out, this represents the end of the protocol.

Figure 4.7 – Edit Row Functions



APPENDIX A | SOFTWARE INSTALLATION

If the computer being used with the CatStim Software was purchased as part of a package from Catamount Research and Development, the driver and software installation was completed at the factory. If the computer was not purchased from Catamount Research and Development, follow the instructions to install the hardware drivers and software programs.

Before beginning the installation, fax or e-mail Catamount Research and Development with the registration information in order to receive the software installation password. This password will be necessary during the installation process.

Insert the CatStim CD into the CD-ROM drive and the screen shown in Figure A.1 will appear. Click **Install CatStim**.

Figure A.1 – Installation Screens



Continue installing the drivers and software by clicking **Install**. Complete the steps to install the drivers and software, entering the desired User Name and Company as well as the password when prompted.

Successful installation of each item will be indicated by a green check mark as shown in Figure A.2, and a red X will indicate an unsuccessful installation.

Figure A.2 – Successful Installation



Driver and software installation has been successfully completed. Click **Finish** to close this screen.

APPENDIX B | CONTACT INFORMATION

Please contact Catamount Research and Development, Inc. for information regarding any of our products.

Visit our website at www.catamountresearch.com for contact information.

For technical questions, email preclinical@catamountresearch.com.