Cheetah Reference Guide

1. About This Guide

About the Cheetah Reference Guide

The purpose of this guide is to provide a complete reference for everything related to the Cheetah Data Acquisition software. For help getting started with Cheetah, see the Cheetah Quickstart. The quickstart is located in the Neuralynx\Cheetah5 folder of your Start menu. This reference guide has been compiled into a help file for easier searching of all of the information. For those unfamiliar with the terms used throughout Cheetah (i.e. Acquisition Entities); start with reading through the Definition of Terms section of this guide. There are two tabs to the left. The Contents tab allows one to browse all of the topics contained in this guide. The Search tab gives a full text search of this entire guide.

2. Definition of Terms

Definition of Terms

Throughout this guide and all Neuralynx software, you will run into certain terms time after time. Here is a listing of some of the terms that will help you navigate and understand this guide.

Acquisition	Data is processed and viewed in Cheetah, but nothing is saved to a file.
Acquisition Entity (AE)	An object that is responsible for manipulating, saving and distributing data throughout the Cheetah software. Acquisition Entities (AE for short) are the most important objects in Cheetah. There are multiple types of AEs in Cheetah. They are: • Spike • Continuously Sampled Channels (CSC) • Events • Video Tracker (VT) Each of the different AEs have different properties and purposes, and will each generate their own output file.
AD Channels	An Analog to Digital channel. Each analog signal is referred to as an AD channel. This can be an electrode in the brain or an external signal such as an eye tracker. For instance, a 32 channel Cheetah system has 32 possible AD channels.
AD Counts	When an analog signal is digitized, it is sampled using a certain number of bits. The number of bits determines the precision of the digital representation. Since the voltage range can be adjusted, the hardware does not store the sample as a voltage, but as an AD count. Cheetah normalizes all AD counts to a 32 bit value before it converts the counts to actual voltage levels (based on the input range setting).
Continuously	Usually referred to as CSC. These AE will continuously process the incoming signal and save

Sampled Channels (CSC)	that signal to a record. These channels can be used for EEG.
Framegrabber	Sometimes referred to as a capture card or capture device. This device is responsible for converting video images to digital images that Cheetah processes. These cards can also have built in video encoders to save video to a compressed file.
Hardware System	This general term refers to all of the hardware that is controlled by Cheetah that is connected to your computer..
Recording	Data is processed and saved to data files.
Spike	Spike acquisition entities will detect specific signals from the incoming neurological data. If these specific signals are found on any of the electrodes related to this spike acquisition entity, the signal found will be extracted from the incoming signal on all electrodes related to this spike acquisition entity , and saved to a spike record. Spike acquisition entities can be created as: • Single Electrodes (SE) • Stereotrodes (ST, two electrodes) • Tetrodes (TT, four electrodes)
TTL	Acronym for Transistor to Transistor Logic. These signals are input to generate events or output to control an experiment. TTL inputs are DC inputs that can accept a maximum voltage of 5.0V.

3. Configuration Files

Configuration Files

Configuration files are files that contains a series of commands that are run sequentially to setup how Cheetah runs and monitors your experiment. When Cheetah is installed, the installer will ask you a few questions about your hardware and modify the appropriate configuration files for use with your hardware. After the installation, you will have a Configuration directory (C:\Program Files\Neuralynx\Cheetah\Configuration) containing many pre-written and tested configuration files for use with Cheetah. You can process other configuration files from a configuration file by using the -ProcessConfigurationFile command (see the General Cheetah Commands for more information).

One of the first things you need to do after installing Cheetah is to select the electrode configuration you wish to use with Cheetah. See Editing Configuration Files for more information.

Configuration File Topics:

3.1 Variable Substitution

Variable Substitution

Overview

Neuralynx provides a very basic set of functionality for using variables within its configuration files. Variables are mainly used to allow for easily making global changes to a specific configuration file. All variables are represented as strings, however, arithmetic operations can be performed using variables and when that occurs, the variable is check to see if it contains a numeric value and if it does, the operation is carried out. Variables are not maintained between configuration files. A variables scope is strictly limited to a single configuration file. The same variable may be used in different configuration files.

Creation

A variable is not explicitly created. A variable must be assigned a value before it can be used, therefore, the first time a variable has an assignment made to it is when it is created.

Usage

The % sign is what denotes a variable. The % sign comes immediately before the variables name. A variable can be used at any time for any command except within a set of double quotes. If we were to use a variable called inputRange, then in order to use this variable it must appear as %inputRange.

Operations

There are only a handful of operations that may be used for variables. They are as follows:

Assignment(=) - Assign a value or another variable to a new or existing variable.

Example: %newWindowName = "Time Window 3"
Example: %newWindowName = %oldWindowName

Plus Equal(+=) - adds a new value or the value of a variable and set it equal to the existing variable. All variables used must contain numeric values.

Example: %adChannelNumber += 1
Example: %adChannelNumber += %numChannels

Minus Equal(-=) - subtracts a new value or the value of a variable and set it equal to the existing variable. All variables used must contain numeric values.

Example: %adChannelNumber -= 1
Example: %adChannelNumber -= %numChannels

Multiply Equal(*=) - multiply a new value or the value of a variable and set it equal to the existing variable. All variables used must contain numeric values.

Example: %inputRange *= 2
Example: %inputRange *= %inputRangeMultiplier

Divide Equal(/=) - divide by a new value or the value of a variable and set it equal to the existing variable. All variables used must contain numeric values.

Example: %inputRange /= 2
Example: %inputRange /= %inputRangeMultiplier

String concatenation(:=) - concatenates a new value or the value of a variable and set it equal to the existing variable.

Example: %acqEntName := ".ncs"
Example: %acqEntName := %fileExtension

3.2 Editing Configuration Files

Editing Configuration Files

Sometimes it is necessary to actually get into the configuration files and make changes. Maybe you need a customized electrode configuration or just simply want to change your electrode configuration. Familiarize yourself with the Cheetah commands before you start editing files, or it could lead to an afternoon of debugging configuration files, which is not fun.

Configuration File Rules

All of the rules listed for Cheetah commands are applicable, with these additional rules for configuration files:

1. There can only be one command per line.
2. All objects must be created before they are used.
    1. *-CreateSpikeAcqEnt Sc1 DL 1* must be called after *-CreateHardwareSubSystem DL DigitalLynx* because DL needs to be created to be used in the spike acquisition entity creation.
3. Objects can only be created once.
    1. If you create a window named TimeWindow, you cannot issue another create command for a window named TimeWindow.
4. Any text in a configuration file that follows a pound sign (#) is ignored.
    1. *#-Break* will ignore the break command. *-Break # this text is ignored* will process the break command, and ignore the rest of the line.
5. Configuration files are in ASCII format. Do not edit them in any program (i.e. Word) that saves formatting information to the file. Notepad is a safe program to use for editing.

Changing Your Electrode Configuration using Cheetah.cfg

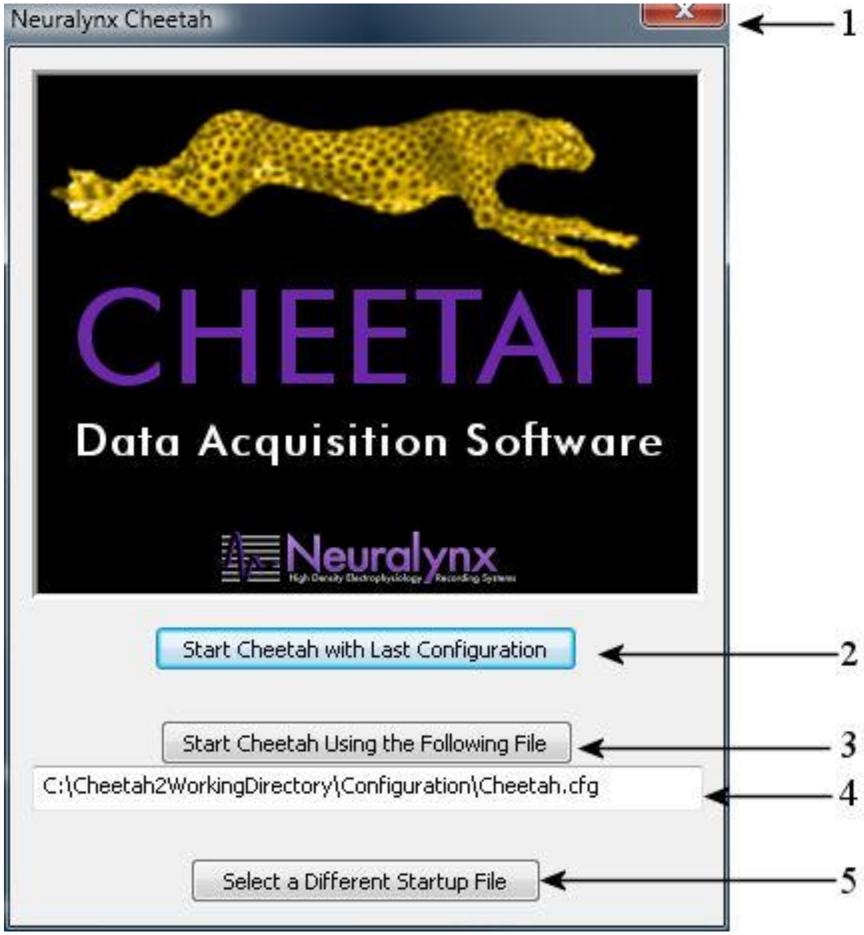
Cheetah.cfg is the starting point for Cheetah configuration. This file is responsible for setting up all hardware, display and electrode configurations after Cheetah is installed. Changing your electrode configuration is the most common reason for editing this file, so that is what will be covered here.

1. Open Cheetah.cfg from your Configuration directory using Notepad.
2. Find the section of the file titled "“######### ELECTRODE CONFIGURATIONS"
3. Put a comment (#) in front of the only uncommented line in this section. After your first Cheetah installation, this line usually is *-ProcessConfigurationFile 8se8csc.cfg*
4. Remove the comment (#) in front of one and only one of the other -ProcessConfigurationFile lines. The generic configuration files are named using the number and type of spike channels and the number of CSC channels.
5. Save the file and close Notepad.
6. The next time you start Cheetah, click the Use the Following File button on the Startup Configuration Selection.

3.3 Startup Configuration Selection

Startup Configuration Selection

Since Cheetah is a completely configurable program, it needs to know what system to create when it starts. The startup configuration can be specified one of two ways. If you will always be using the same configuration file (and want it to start in the same initial state every time), you can specify a configuration file either as a command line argument either through a shortcut or from the command window. The other option is to use the startup configuration selection. If Cheetah is started without a command line argument, you will see the startup configuration selection window.



C:\Cheetah2WorkingDirectory\Configuration\Cheetah.cfg

1. Close Button	This button will immediately exit Cheetah.
2. Use Last Configuration	Every time Cheetah is closed, it will save the current configuration. If you click this button, Cheetah will start exactly as it looked the last time it was exited. If Cheetah cannot find the last configuration, this button will be grayed out.
3. Use Following File	Cheetah will start using the file listed in the startup file entry box.
4. Startup File Entry Box	You can type any file you want into this box. It starts out using the Cheetah.cfg file that is installed on every Cheetah system.
5. Browse for a File	Cheetah will open a window where you can browse for the startup file you wish to use. Once a file is selected, Cheetah will automatically launch the selected file.

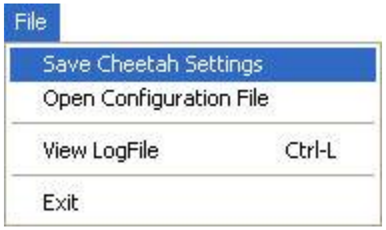
3.4 Saving System State

Saving the System State

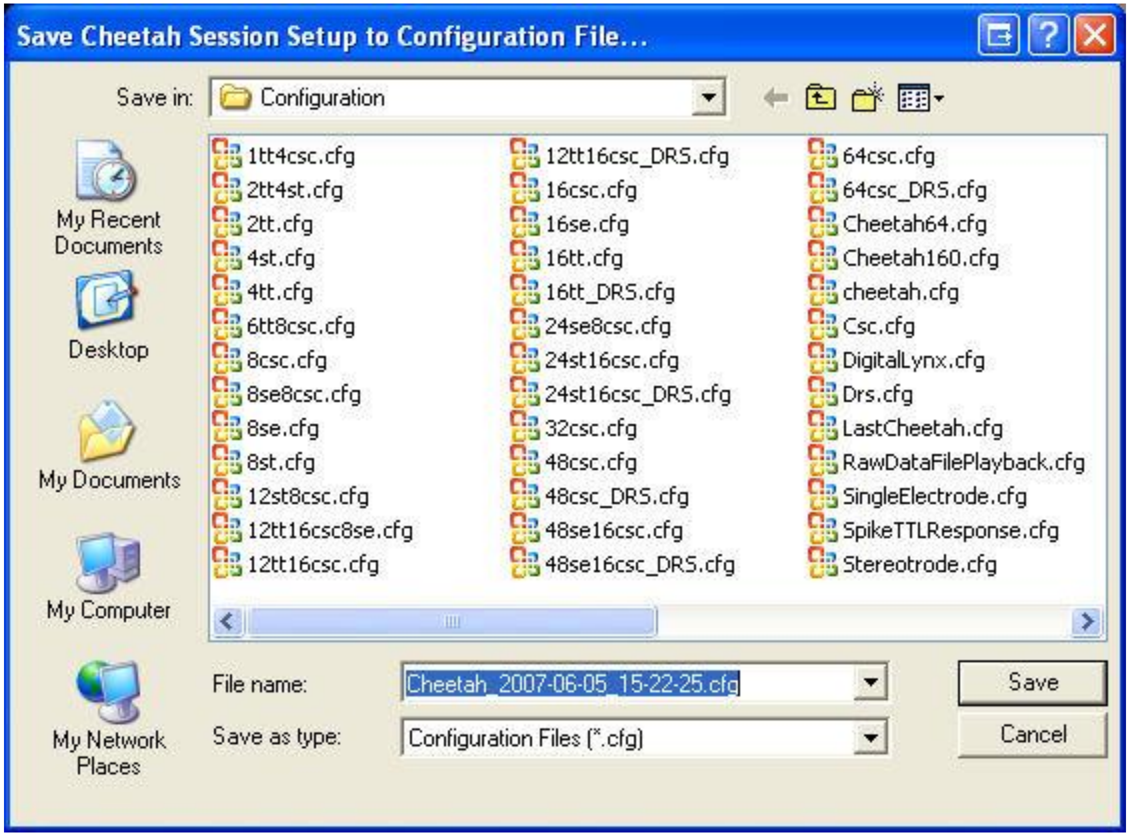
One of the downsides to using configuration files to setup Cheetah is that every time you want to change values that are used when Cheetah starts, you need to edit the entries in the configuration files. Cheetah allows for you to save the complete system state out to a configuration file that you can use at startup to put Cheetah in the exact state it was when you saved the file. Additionally, every time you close Cheetah, the system state is automatically saved in the background; allowing you to load the last used Cheetah state the next time you start Cheetah. Cheetah will never modify a configuration file, it only saves new files. So you will never have to worry about messing up one of your configuration files while using Cheetah. This can be a huge time saver if you have multiple experiment setups that use similar electrode configurations, but have different display and acquisition entity setups for each experiment.

To save the current system state:

1. Go to the File menu of the main window and click on Save Cheetah Settings.



2. Cheetah will open a save file dialog in the Configuration directory, and set the file name to the current date and time. You can change the file name and location if you wish. Click Save when you are finished.



File name: Cheetah_2007-06-05_15-22-25.cfg

Save as type: Configuration Files (*.cfg)

The next time you start Cheetah, you can click the Select a Different Startup File button on the Startup Configuration Selection to load the file you just saved.

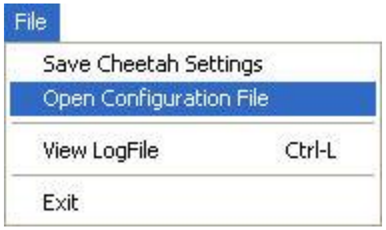
3.5 Loading Configuration Files

Dynamically Loading Configuration files

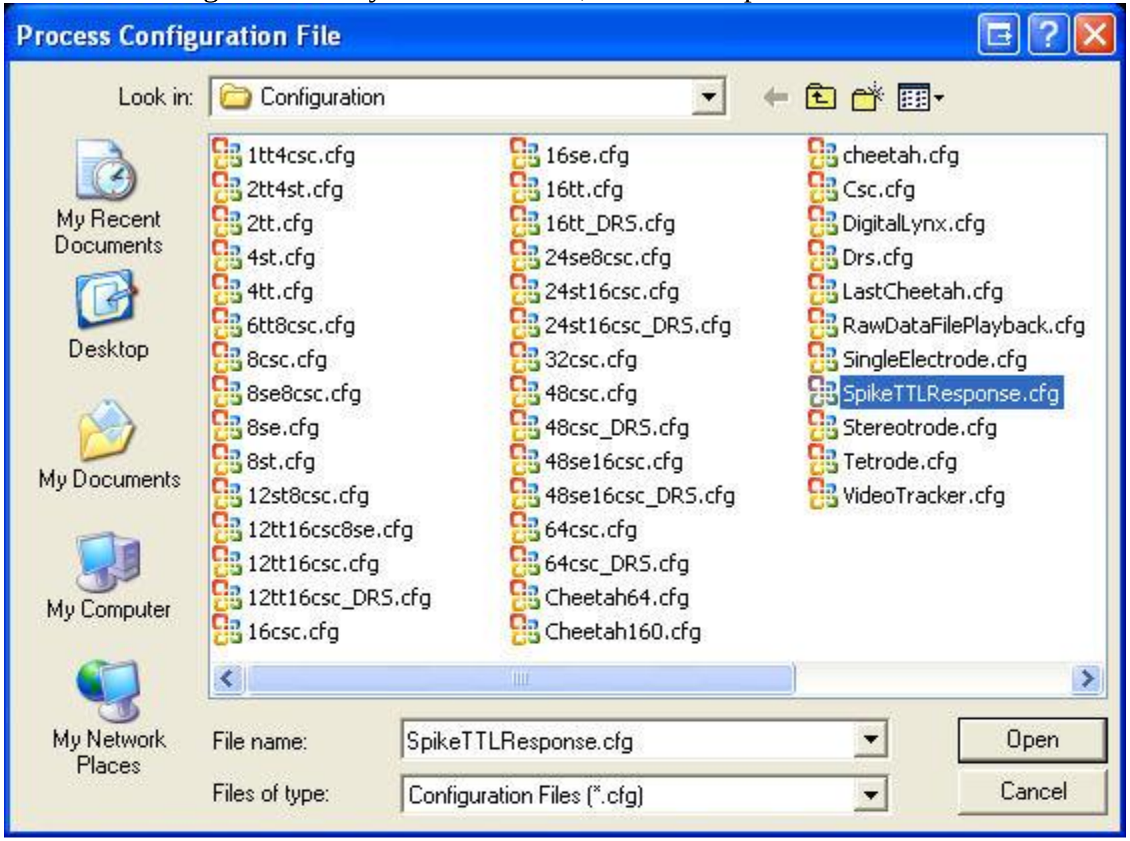
Cheetah mainly uses configuration files at startup only. Once the system is up and running, you will be able to create and modify displays without having to load new configuration files, and you will be able to control Cheetah using NetCom applications. If you need to have different settings for different experiments, you will want to look into saving the system state. Sometimes it may be useful to save out the configuration of a particular display setup that you saved from a plot window and only want to use occasionally, or some other similar situation. In these instances, you can load configuration files dynamically while Cheetah is running. Cheetah will process dynamically loaded files using the same rules as if you were loading the file at startup, so you need to make sure that the objects created in the file don't already exist, and that any objects modified have already been created.

To dynamically load a configuration file:

1. Go to the File menu of the main window and click on Open Configuration File.



2. Select the configuration file you wish to load, and click Open.



Look in: Configuration

File name: SpikeTTLResponse.cfg

Files of type: Configuration Files (*.cfg)

3. As Cheetah is processing the file, the mouse cursor will change to an hourglass and Cheetah will not respond to any clicking or typing until the processing is done. When processing is completed, the mouse cursor will turn back into an arrow and Cheetah will be responsive. You can view the log file or see the system status message history to see if there were any problems processing your configuration file.

4. Hardware Systems

HARDWARE SYSTEMS

One of the purposes of Cheetah is to allow you to easily control Neuralynx hardware. Each Neuralynx acquisition system will come with multiple pieces of hardware that need to be setup to work with each other properly. This guide will not attempt to explain everything about your hardware; just how your hardware is controlled and viewed in Cheetah. For setup instructions, or questions about the capabilities of your hardware, see the manual for your specific hardware setup.

Neuralynx hardware systems are designed to take physical electrical signals from the outside world, be it neurons or from a signal generator; digitize those signals and save them to a file on your computer for later analysis. There are two different categories of hardware systems controlled by Cheetah: Analog and Digital.

All real world signals are analog. Neuralynx Analog systems keep the signal in the analog domain until it reaches the computer, where it is then converted to a digital signal and processed by Cheetah. Most of our analog systems also ship with the Lynx8 amplifier/filter. The Lynx8 will amplify and apply high and low cut analog filters to the electrical signal before it reaches the computer. This means that the signal that reaches the computer is physically changed, and Cheetah will not be able to remove the filtering or amplification that was applied by the Lynx8. Cheetah will only allow each AD channel of an analog system to be used by one acquisition entity, since it is not physically possible to apply two distinct sets of amplification and filter values to the same signal.

The newer Neuralynx systems use digital signal processing (DSP) to do the filtering and amplification of electrical signals. These systems will immediately digitize the analog signal and send the digitized signal to the computer for processing. All of the filtering and amplification is done by Cheetah. Since the original, unprocessed signal is sent to the computer, this allows the flexibility to process the same signal using many different amplification, high and low cut filter combinations, as well as allowing an AD channel to be used by multiple acquisition entities.

Hardware Systems Topics:

4.1 Digital Lynx SX

Digital Lynx SX

Hardware Overview

The Digital Lynx SX system is a stand alone acquisition system. The Digital Lynx SX consists of a chassis that contains input boards and DRS boards. The chassis can hold any combination of input boards and DRS boards. The total max number of boards it can hold is 16. Each board has 32 AD channels associated with it. Channel numbers increment starting from the left side of the chassis. A signal is input into each input board via a DRS board if applicable. The signal is digitized and then formatted and sent over the fiber optic cable to the fiber optic Ethernet card located in the PC.

Hardware Sub System Interface

In order to retrieve data from the fiber optic Ethernet card, a hardware sub system must be created. A hardware sub system is an object in Cheetah that controls the acquisition of data from a specified piece of hardware, in this case the Digital Lynx SX. The hardware sub system has a set of properties that control how data is retrieved and processed.   The creation and properties for a sub system can only be accessed using configuration file commands.
The -CreateHardwareSubSystem command is used to create a new hardware sub system. As part of the creation command, a name must be given to the sub system. The name must be unique and is used to report errors or to set the properties of the sub system.

Once a sub system is set up, its first responsibility is to retrieve data from the hardware and store it in a buffer. The number of buffers used and their size may be set using a configuration command. The number of buffers and their size can effect the performance of the overall system. If there are too few buffers specified, or the buffer size is too small, the buffers may fill up faster than the data in them can be processed by the rest of the system. If this occurs, we have whats called a buffer overrun error and some data will be lost. If the buffer size is set too large, the latency in which data is processed will increase.

The user has the option to save these buffers immediately to a raw data file. This file must be specified by the user, cheetah will only save data to this file if it has been requested to. The data being saved is completely unprocessed. It has come straight from the hardware, store in a buffer and then output to disk.

The next step is to process the data that resides in our buffers. When data is acquired by the Digital Lynx SX hardware, it is packed into a record and then sent to the fiber optic Ethernet interface. The data now has to be unpacked and its validity checked. The first step is to find a valid record, this is called hunting. A couple things are checked during the hunting process to determine if a record is valid. The first thing is to check to see if the id associated with the record is valid. The next thing is to see if the record size is valid. The record size is determined by the number of boards in the Digital Lynx SX chassis. The last thing that is done is a check to make sure the data has not been corrupted .   If any of these checks fail, then a hunt error is reported to the System Status Dialog. Now that we know we have a valid record, the timestamp is checked to make sure it is incrementing. If it is not incrementing an error is generated.

The record has now been validated. The last step is to unpack the data from the record and store it into a buffer that will be sent to have DSP filters run on it. The hardware sub system will continue to process records until acquisition is turned off.

TTL Input and Output

The Digital Lynx SX has built in support for a single TTL input port. The direction of this port cannot be changed. The Cheetah Board Number is the value used when Cheetah assigns the device name used to reference the TTL device. For more information, see the Digital I/O Overview.

Port Label	Cheetah Board Number	Total TTL Bits	Number of Ports	Number of Bits per Port	Port Direction
Parallel Input Port	0	32	4	8	Bidirectional

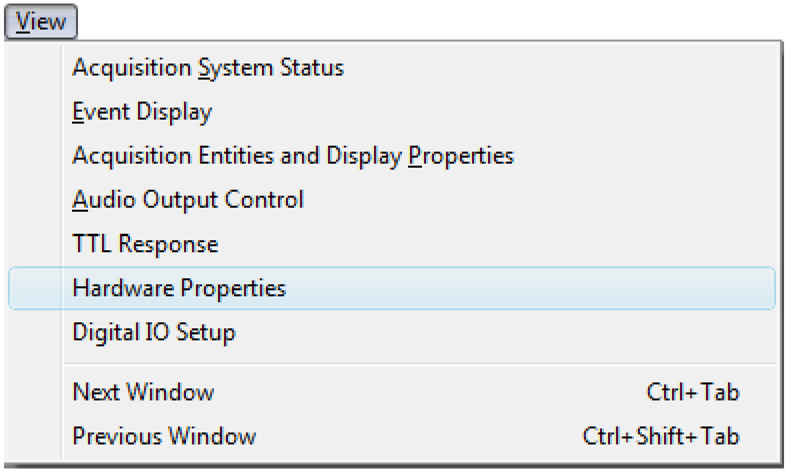
Digital Lynx SX System Topics:

Digital Lynx SX Properties Dialog
Digital Lynx SX Commands

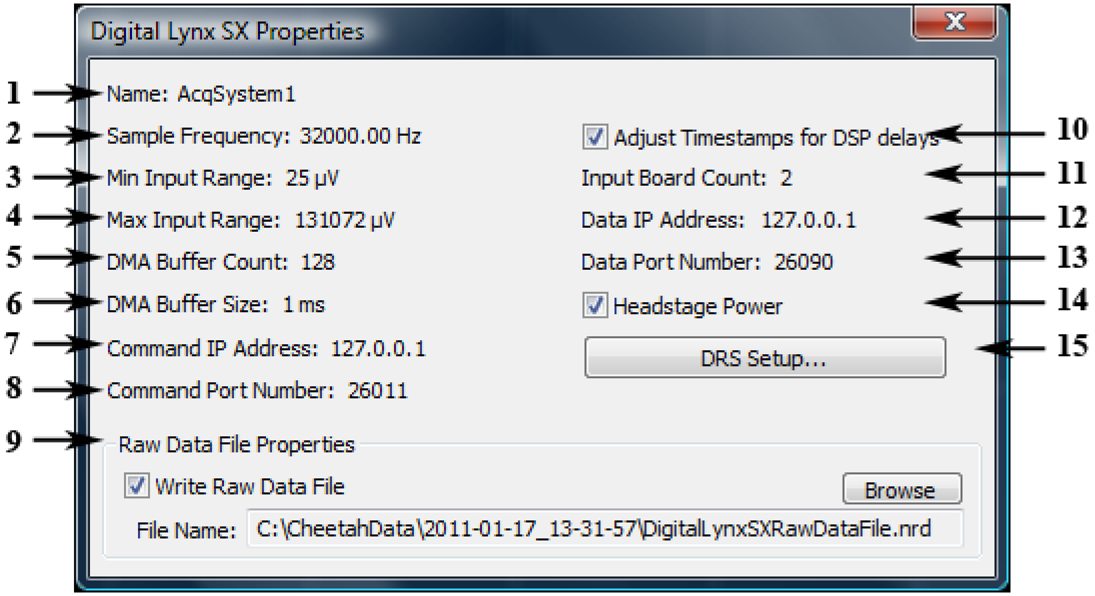
4.1.1 Digital Lynx SX Hardware Properties

Digital Lynx SX Hardware System Properties

These settings are used to control how the Digital Lynx SX acquisition system hardware is setup and how it process AD data before passing the data to the acquisition entities. The hardware system properties are shown via the View menu in Cheetah.



Digital Lynx SX Hardware System Properties Dialog



Name: AcqSystem1

Sample Frequency: 32000.00 Hz

Min Input Range: 25 µV

Max Input Range: 131072 µV

DMA Buffer Count: 128

DMA Buffer Size: 1 ms

Command IP Address: 127.0.0.1

Command Port Number: 26011

☑ Adjust Timestamps for DSP delays

Input Board Count: 2

Data IP Address: 127.0.0.1

Data Port Number: 26090

☑ Headstage Power

Raw Data File Properties

☑ Write Raw Data File

File Name: C:\CheetahData\2011-01-17_13-31-57\DigitalLynxSXRawDataFile.nrd

1. System Name	This is the unique name that is used to identify this system in Cheetah. It is the name you chose when you created the hardware system.
2. Sample Frequency	The current sample frequency for this system. This value is based on the hardware but can be set using the -CreateHardwareSubSystem command. All AD channels on this system will be sampled at this frequency. However, the sampling rate of individual acquisition entities can be changed. See the help section for the type of acquisition entity whose sampling rate you wish to change for more information.
3. Min Input Range	This is the smallest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
4. Max Input Range	This is the largest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
5. DMA Buffer Count	This is the number of DMA buffers used when acquiring data from the hardware.
6. DMA Buffer Size	This is the buffer size for each buffer used when acquiring data from the hardware. This is in milliseconds.
7. Command IP Address	The IP address of the Digital Lynx SX hardware. The IP address is used for creating a TCP\IP connection that will be used to send and receive commands.

8. Command Port Number	The port number of the Digital Lynx SX hardware used for creating a TCP\IP connection that will send and receive commands between Cheetah and the Digital Lynx SX hardware.
9. Raw Data File Properties	This section will enable output of a raw data file to the file name shown in the box when the check box is checked. You can change the file that is being written to by clicking on the browse button.
10. DSP Delay Adjustment	When DSP delay adjustment is enabled (box is checked), the timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. For more information see the -SetDSPDelayCompensationEnabled command.
11. Input Board Count	The number of input boards that exist in the Digital Lynx SX cabinet. This value will be between 1 and 16 and exactly match the hardware and firmware configuration.
12. Data IP Address	The IP Address that Cheetah expects the Digital Lynx SX will send AD Records to. This should be the IP Address of theFiber Optic Ethernet Card that is connected to the Digital Lynx SX hardware.
13. Data Port Number	The port number that Cheetah expects the Digital Lynx SX hardware will send AD Records to.
14. Headstage Power	Allows you to manually turn the headstage power on (checked) or off (unchecked) for all DRS boards installed in the Digital Lynx cabinet. This option is only available if your system supports software control of headstage power. If the headstage power control is not available, see your acquisition system hardware manual to determine how to manually control headstage power. **Note:** The headstage power will automatically be turned on when acquisition is started and automatically be turned off when acquisition is stopped, overriding whatever manual changes were made prior to acquisition stopping or starting.
15. DRS Setup	Launches the DRS Properties which allows for manual control of the DRS global and local reference selections. Only use this option if you need to manually adjust DRS settings. Normal reference selection can be done on either the CSC or Spike Acquisition Entity Properties. This setting is only available if you have a DRS installed in your system.

4.2 Digital Lynx

Digital Lynx

Hardware Overview

The Digital Lynx system is a stand alone acquisition system. The digital lynx consists of a chassis that contains input boards and DRS boards. The chassis can hold any combination of input boards and DRS boards. The total max number of boards it can hold is 10. Each board has 32 AD channels associated with it. Channel numbers increment starting from the left side of the chassis. A signal is input into each input board via a DRS board if applicable. The signal is digitized and then formatted and sent over a fiber optic cable to the EDT acquisition card located in the PC.

Hardware Sub System Interface

In order to retrieve data from the EDT acquisition card, a hardware sub system must be created. A hardware sub system is an object in Cheetah that controls the acquisition of data from a specified piece of hardware, in this case the digital lynx. The hardware sub system has a set of properties that control how data is retrieved and processed. The creation and properties for a sub system can only be accessed using configuration file commands. The -CreateHardwareSubSystem command is used to create a new hardware sub system. As part of the creation command, a name must be given to the sub system. The name must be unique and is used to report errors or to set the properties of the sub system.

Once a sub system is set up, its first responsibility is to retrieve data from the hardware and store it in a buffer. The number of buffers used and their size may be set using a configuration command. The number of buffers and their size can effect the performance of the overall system. If there are too few buffers specified, or the buffer size is too small, the buffers may fill up faster than the data in them can be processed by the rest of the system. If this occurs, we have whats called a buffer overrun error and some data will be lost. If the buffer size is set too large, the latency in which data is processed will increase.

The user has the option to save these buffers immediately to a raw data file. This file must be specified by the user, cheetah will only save data to this file if it has been requested to. The data being saved is completely unprocessed. It has come straight from the hardware, store in a buffer and then output to disk.

The next step is to process the data that resides in our buffers. When data is acquired by the digital lynx hardware, it is packed into a record and then sent to the EDT interface. The data now has to be unpacked and its validity checked. The first step is to find a valid record, this is called hunting. A couple things are checked during the hunting process to determine if a record is valid. The first thing is to check to see if the id associated with the record is valid. The next thing is to see if the record size is valid. The record size is determined by the number of boards in the digital lynx chassis. Cheetah must be aware of the number of boards in the system so that it can determine if the record size is valid. This is accomplished by setting the input board count in the hardware sub system by using the -SetNumberInputBoards. The last thing that is done is a check to make sure the data has not been corrupted . If any of these checks fail, then a hunt error is reported to the System Status Dialog. Now that we know we have a valid record, the timestamp is checked to make sure it is incrementing. If it is not incrementing an error is generated.

The record has now been validated. The last step is to unpack the data from the record and store it into a buffer that will be sent to have DSP filters run on it. The hardware sub system will continue to process records until acquisition is turned off.

TTL Input and Output

The Digital Lynx has built in support for a single TTL input port. The direction of this port cannot be changed. The Cheetah Board Number is the value used when Cheetah assigns the device name used to reference the TTL device. For more information, see the Digital I/O Overview.

Port Label	Cheetah Board Number	Total TTL Bits	Number of Ports	Number of Bits per Port	Port Direction
Parallel Input Port	0	16	1	16	Input

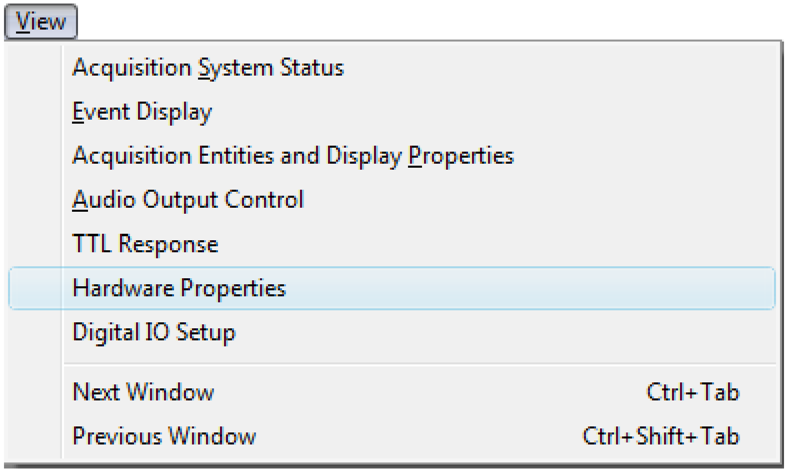
Digital Lynx System Topics:

Digital Lynx Properties Dialog
Digital Lynx Commands

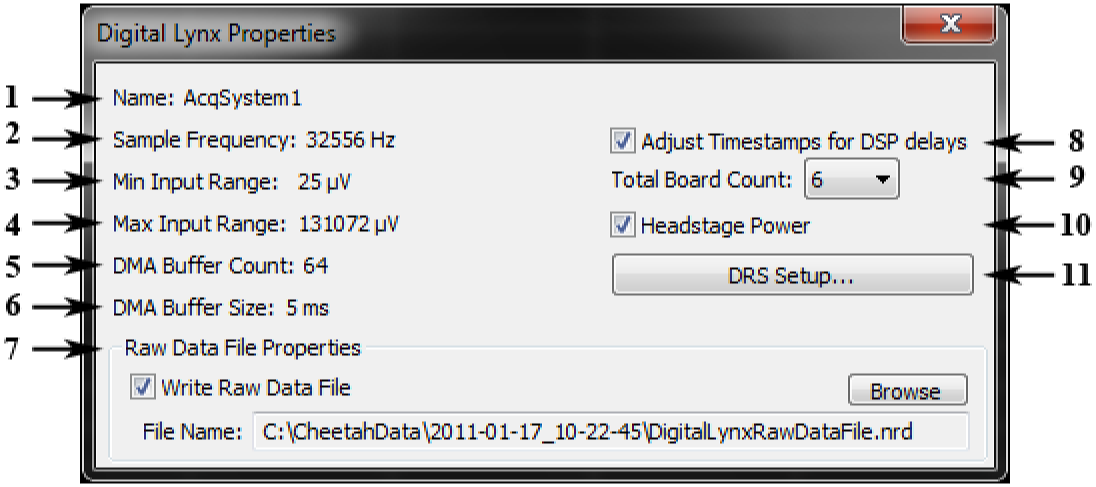
4.2.1 Digital Lynx Hardware Properties

Digital Lynx Hardware System Properties

These settings are used to control how the Digital Lynx acquisition system hardware is setup and how it process AD data before passing the data to the acquisition entities. The hardware system properties are shown via the View menu in Cheetah.



Digital Lynx Hardware System Properties Dialog



Digital Lynx Properties

Name: AcqSystem1
Sample Frequency: 32556 Hz
Min Input Range: 25 µV
Max Input Range: 131072 µV
DMA Buffer Count: 64
DMA Buffer Size: 5 ms
☑ Adjust Timestamps for DSP delays
Total Board Count: 6
☑ Headstage Power

Raw Data File Properties
☑ Write Raw Data File
File Name: C:\CheetahData\2011-01-17_10-22-45\DigitalLynxRawDataFile.nrd

1. System Name	This is the unique name that is used to identify this system in Cheetah. It is the name you chose when you created the hardware system.
2. Sample Frequency	The sample frequency for this system is 32556 Hz. This value is based on the hardware being used and cannot be changed. All AD channels on this system will be sampled at this frequency. However, the sampling rate of individual acquisition entities can be changed. See the help section for the type of acquisition entity whose sampling rate you wish to change for more information.
3. Min Input Range	This is the smallest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
4. Max Input Range	This is the largest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
5. DMA Buffer Count	This is the number of DMA buffers used when acquiring data from the hardware.
6. DMA Buffer Size	This is the buffer size for each buffer used when acquiring data from the hardware. This is in milliseconds.
7. Raw Data File Properties	This section will enable output of a raw data file to the file name shown in the box when the checkbox is checked. You can change the file that is being written to by clicking on the browse button.
8. DSP Delay Adjustment	When DSP delay adjustment is enabled (box is checked), the timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. For more information see the -SetDSPDelayCompensationEnabled command.
9. Total Board	The number of boards that exist in the Digital Lynx cabinet. This value must be between 1 and 10 and exactly match

Count	the hardware and firmware configuration.
10. Headstage Power	Allows you to manually turn the headstage power on (checked) or off (unchecked) for all DRS boards installed in the Digital Lynx cabinet. This option is only available if your system supports software control of headstage power. If the headstage power control is not available, see your acquisition system hardware manual to determine how to manually control headstage power. **Note:** The headstage power will automatically be turned on when acquisition is started and automatically be turned off when acquisition is stopped, overriding whatever manual changes were made prior to acquisition stopping or starting.
11. DRS Setup	Launches the DRS Properties which allows for manual control of the DRS global and local reference selections. Only use this option if you need to manually adjust DRS settings. Normal reference selection can be done on either the CSC or Spike Acquisition Entity Properties. This setting is only available if you have a DRS installed in your system.

4.3 Cheetah 64

Cheetah 64

Hardware Overview

The Cheetah 64 system is an analog acquisition system. The system is made up of several parts. The Lynx 8 amplifiers are used with this system to provide high and low cut filtering as well as gain control. A Digital Interface box is used to control timestamp synchronization as well as port control. The acquisition card that is used for this system is the DT3010. Each DT3010 board allows for 32 AD channels. The Cheetah 64 system may have a max of 2 DT3010 boards, thus allowing for a maximum of 64 channels.

Hardware Sub System Interface

In order to retrieve data from the DT3010 acquisition card, a hardware sub system must be created. A hardware sub system is an object in Cheetah that controls the acquisition of data from a specified piece of hardware, in this case the DT3010 boards. The hardware sub system has a set of properties that control how data is retrieved and processed. The creation and properties for a sub system can only be accessed using configuration file commands. The -CreateHardwareSubSystem command is used to create a new hardware sub system. As part of the creation command, a name must be given to the sub system. The name must be unique and is used to report errors or to set the properties of the sub system. With a Cheetah 64 system, the number of DT3010 boards is automatically detected.

Once a sub system is set up, its first responsibility is to retrieve data from the hardware and store it in a buffer. The number of buffers used and their size may be set using a configuration command. The number of buffers and their size can effect the performance of the overall system. If there are too few buffers specified, or the buffer size is too small, the buffers may fill up faster than the data in them can be processed by the rest of the system. If this occurs, we have whats called a buffer overrun error and some data will be lost. If the buffer size is set too large, the latency in which data is processed will increase.

The next step is to process the data that resides in our buffers. Also the data can be formatted and written to a raw data file. This file must be specified by the user, cheetah will only save data to this file if it has been requested to. The final check that is performed is to see if there was any activity on the Input Port. If activity was detected an event is created.

TTL Input and Output

The Cheetah 64 has built in support for up to two bidirectional TTL ports. Systems with a maximum of 32 channels only have a single bidirectional TTL port. The Cheetah Board Number is the value used when Cheetah assigns the device name used to reference the TTL device. For more information, see the Digital I/O Overview.

Port Label	Cheetah Board Number	Total TTL Bits	Number of Ports	Number of Bits per Port	Port Direction
Digital I/O Port #1	0	16	1	16	Bidirectional
Digital I/O Port #2	1	16	1	16	Bidirectional

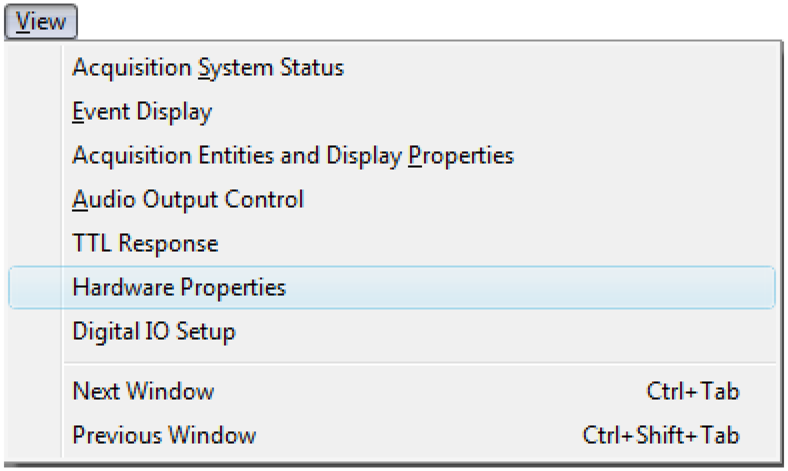
Cheetah 64 System Topics:

Cheetah 64 Properties Dialog
Cheetah 64 DA Port Control
Cheetah 64 Commands

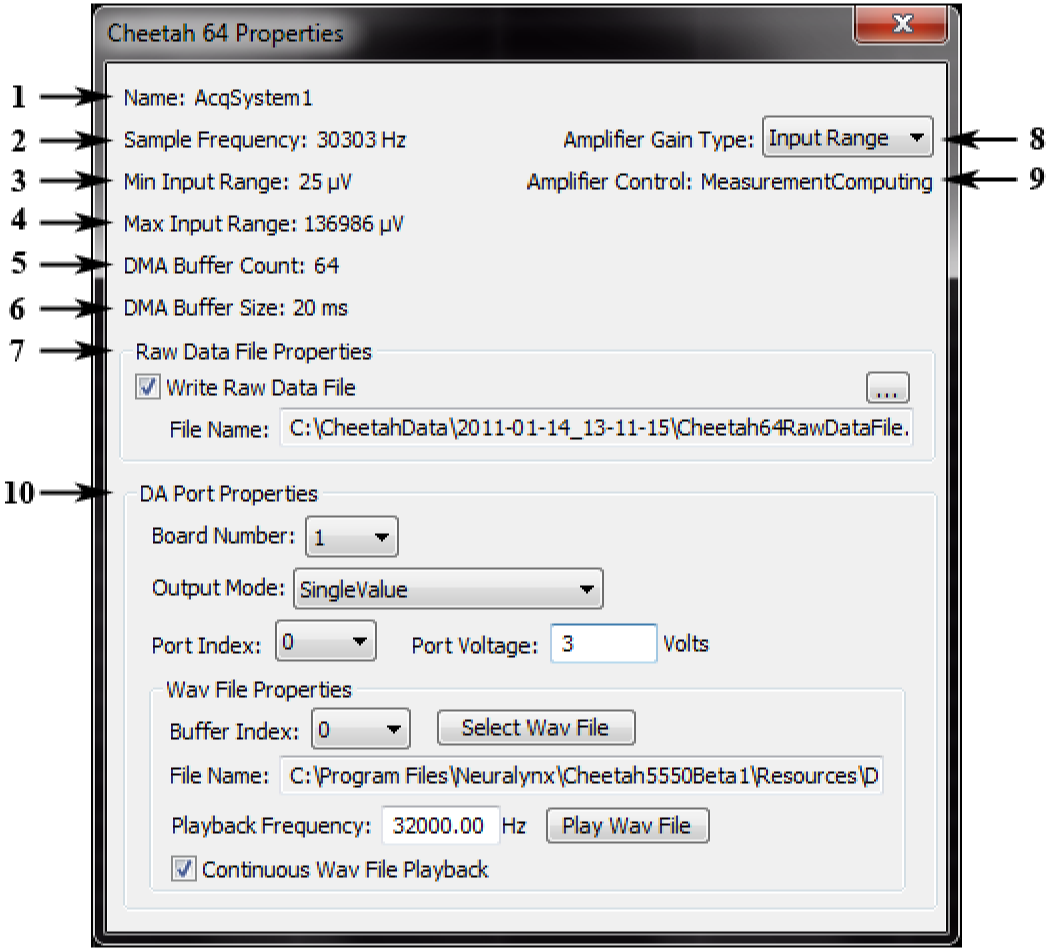
4.3.1 Cheetah 64 Hardware Properties

Cheetah 64 Hardware System Properties

These settings are used to control how the Cheetah 64 acquisition system hardware is setup and how it process AD data before passing the data to the acquisition entities. This also includes control over the DAC output of wave files. The hardware system properties are shown via the View menu in Cheetah.



Cheetah 64 Hardware System Properties Dialog



Cheetah 64 Properties

Name: AcqSystem1

Sample Frequency: 30303 Hz

Amplifier Gain Type: Input Range

Min Input Range: 25 µV

Amplifier Control: MeasurementComputing

Max Input Range: 136986 µV

DMA Buffer Count: 64

DMA Buffer Size: 20 ms

Raw Data File Properties

☑ Write Raw Data File

File Name: C:\CheetahData\2011-01-14_13-11-15\Cheetah64RawDataFile.

DA Port Properties

Board Number: 1

Output Mode: SingleValue

Port Index: 0

Port Voltage: 3 Volts

Wav File Properties

Buffer Index: 0

File Name: C:\Program Files\Neuralynx\Cheetah5550Beta1\Resources\D

Playback Frequency: 32000.00 Hz

☑ Continuous Wav File Playback

1. Acquisition Entity Name	This is the unique name that is used to identify this spike acquisition entity. It is the name you chose when you created the acquisition entity.
2. Sample Frequency	The sample frequency for this system is 30303 Hz. This value is based on the hardware being used and cannot be changed. All AD channels on this system will be sampled at this frequency. However, the sampling rate of individual acquisition entities can be changed. See the help section for the type of acquisition entity whose sampling rate you wish to change for more information.
3. Min Input Range	This is the smallest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
4. Max Input Range	This is the largest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.

5. DMA Buffer Count	This is the number of DMA buffers used when acquiring data from the hardware.
6. DMA Buffer Size	This is the buffer size for each buffer used when acquiring data from the hardware. This is in milliseconds.
7. Raw Data File Properties	This section will enable output of a raw data file to the file name shown in the box when the checkbox is checked. You can change the file that is being written to by clicking on the browse button.
8. Amplifier Gain Type	Selects the type of gain control to use for controlling signal amplification. 1. **Input Range:** Adjusts the system to use optimal gain settings for both amplifiers and AD conversion in order to acquire a signal inside of the specified input range value. 2. **Amp Gain:** Allows individual control of both AD and amplifier gain settings. Input Range then becomes a calculated value and can only be changed through adjusting either of the gain values.
9. Amplifier Control	The curent amplifier control being used with the hardware sub system.
10. Digital to Analog Port Control Section	See Cheetah 64 DA Port Control for a more detailed description.

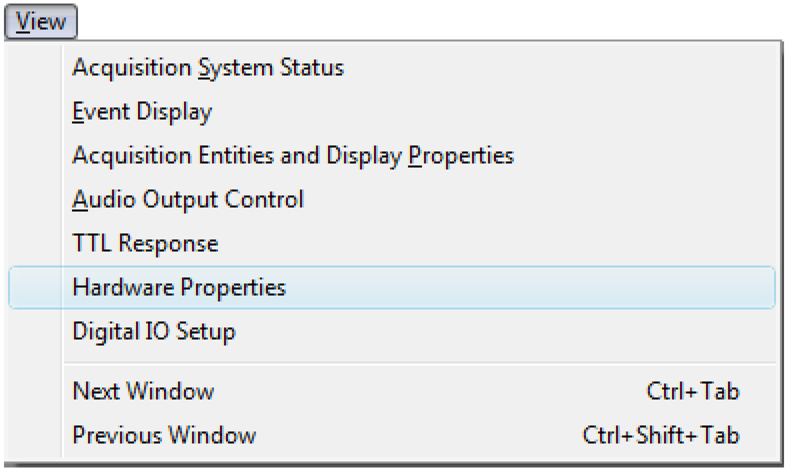
4.3.2 Cheetah 64 DA Port Control

Cheetah 64 Digital to Analog (DA) Port Control

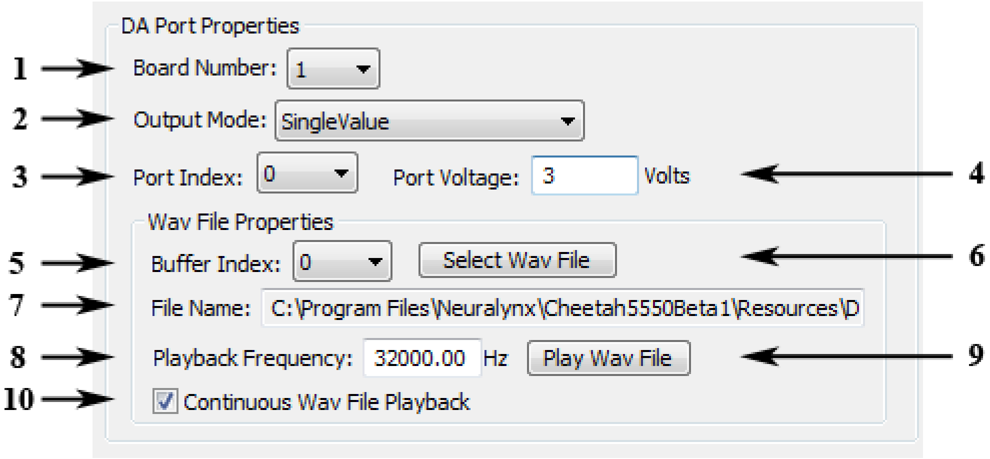
The Cheetah 64 system also offers a DA port control interface through the use of 2 BNC connectors that are part of the amplifier control cable. The DA port can be controlled only through the use of configuration commands. The DA port has 4 different modes. They are as follows:

1. Single Value - The user may set a port to a specified value to stay constant.
2. Buffered Output - Buffered data may be stored and played at any time on the port. This is generally used for wav file playback.
3. Buffered Output Synced Start - Buffered data may be stored and played at the start of acquisition This is generally used for wav file playback..
4. Continuous Audio - This is used only for wav file playback. The wav file that is currently selected with continuously repeat playback until acquisition is turned off.

The DA port control for the Cheetah 64 is found on the Cheetah 64 Hardware Properties page. It can be launched from the View menu in Cheetah:



DA Port Control



Board Number: 1

Output Mode: SingleValue

Port Index: 0

Port Voltage: 3 Volts

Buffer Index: 0

File Name: C:\Program Files\Neuralynx\Cheetah5550Beta1\Resources\D

Playback Frequency: 32000.00 Hz

☑ Continuous Wav File Playback

1. Board Number	This is the currently selected board number for which DA Port Properties will be display. This refers to the number of DT3010 boards that are installed in the PC. There may be at most 2 DT3010 boards used within a Cheetah setup.
2. Output Mode	The DA output mode can be one of the following: 1. **SingleValue:** The user may set a port to a specified value to stay constant. 2. **BufferedOutput:** Buffered data may be stored and played at any time on the port. This is generally used for wav file playback.

	3. **BufferedOutputSynxStart:** Buffered data may be stored and played at the start of acquisition This is generally used for wav file playback.. 4. **ContinuousAudio:** This is used only for wav file playback. The wav file that is currently selected with continuously repeat playback until acquisition is turned off.
3. Port Index	This is the port in which a voltage may be set.
4. Port Voltage	This is the voltage that will be set to the specified port.
5. Buffer Index	This is the currently selected buffer that will be used for wav file playback. Different wav files may be set to different buffers.
6. Wav File Selection	This will bring up the standard windows file selection dialog in order to select a wav file to be stored in the current buffer.
7. **Wave File Name**	This is the name of the Wav file stored within the currently selected buffer index.
8. Playback Frequency	The playback frequency that will be used when playing the wav file. Each wav file has a sample frequency stored in the file, however, that value may be modified for output to the DA port.
9. Play Wav File	This will start playback of the currently selected wav file.
10. Continuous Playback Mode	This will cause the wav file to repeat playback.

4.4 Cheetah 160

Cheetah 160

Hardware Overview

The Cheetah 160 system is an analog acquisition system. The system consists of the acquisition box and Lynx 8 amplifiers. The Lynx 8 amplifiers are used with this system to provide high and low cut filtering as well as gain control. The system also uses 2 EDT acquisition cards. One of the EDT cards provides a command interface to the acquisition box. The other EDT card is responsible for steaming data into the PC.

Cheetah 5 no longer supports the Cheetah 160's built in video trackers. Please contact Neuralynx to obtain a new Video Tracker.

Hardware Sub System Interface

In order to retrieve data from the EDT acquisition card, a hardware sub system must be created. A hardware sub system is an object in Cheetah that controls the acquisition of data from a specified piece of hardware, in this case the Cheetah 160 chassis. The hardware sub system has a set of properties that control how data is retrieved and processed. The creation of a sub system can only be accessed using configuration file commands. The -CreateHardwareSubSystem command is used to create a new hardware sub system. As part of the creation command, a name must be given to the sub system. The name must be unique and is used to report errors or to set the properties of the sub system.

Once a sub system is set up, its first responsibility is to retrieve data from the hardware and store it in a buffer. The number of buffers used and their size may be set using a configuration command. The number of buffers and their size can effect the performance of the overall system. If there are too few buffers specified, or the buffer size is too small, the buffers may fill up faster than the data in them can be processed by the rest of the system. If this occurs, we have whats called a buffer overrun error and some data will be lost. If the buffer size is set too large, the latency in which data is processed will increase.

The next step is to process the data that resides in our buffers. When data is acquired by the Cheetah160 hardware, it is packed into a record and then sent to the EDT interface. The data now has to be unpacked and its validity checked. The first step is to find a valid record, this is called hunting. A couple things are checked during the hunting process to determine if a record is valid. The first thing is to check to see if the id associated with the record is valid. The next thing is to see if the packet size is valid. The last thing that is done is a check to make sure the data has not been corrupted . If any of these checks fail, then a hunt error is reported to the System Status Dialog. Now that we know we have a valid record, the timestamp is checked to make sure it is incrementing. If it is not incrementing an error is generated.

The user also has the option to save the data to a raw data file. This file must be specified by the user, cheetah will only save data to this file if it has been specifically requested. The data being saved is completely unprocessed. It has come straight from the hardware, store in a buffer and then output to disk. The final check that is performed is to see if there was any activity on the Input Port. If activity was detected an event is created.

The record has now been validated and processed. The hardware sub system will continue to process records until acquisition is turned off.

TTL Input and Output

The Cheetah 160 has built in support for one TTL input port and three TTL output ports. The direction of these ports is not configurable. The Cheetah Board Number is the value used when Cheetah assigns the device name used to reference the TTL device. For more information, see the Digital I/O Overview.

Port Label	Cheetah Board Number	Total TTL Bits	Number of Ports	Number of Bits per Port	Port Direction
J500	0	16	1	16	Output
J501	0	16*	1	16	Input
J604	1	16	1	16	Output
J605	1	16	1	16	Output

* The J501 port will only read in TTL bits when the 16th bit is strobed from low to high. See the -SetDigitalIOUseStrobeBit command for more information on how this works.

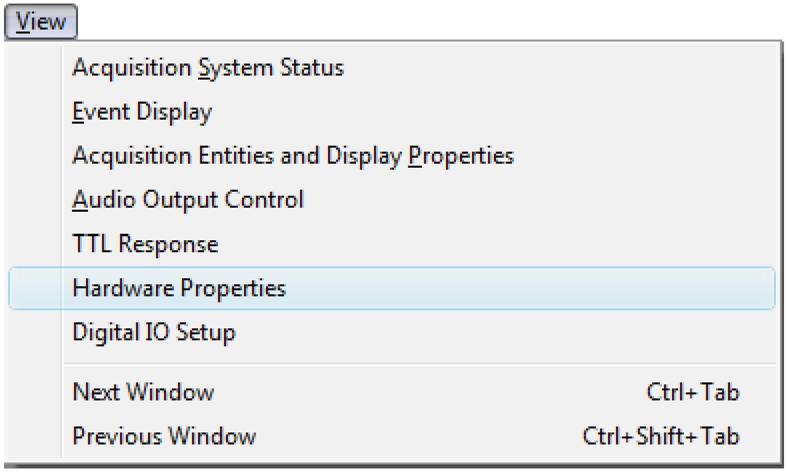
Cheetah 160 System Topics:

Cheetah 160 Properties Dialog
Cheetah 160 Commands

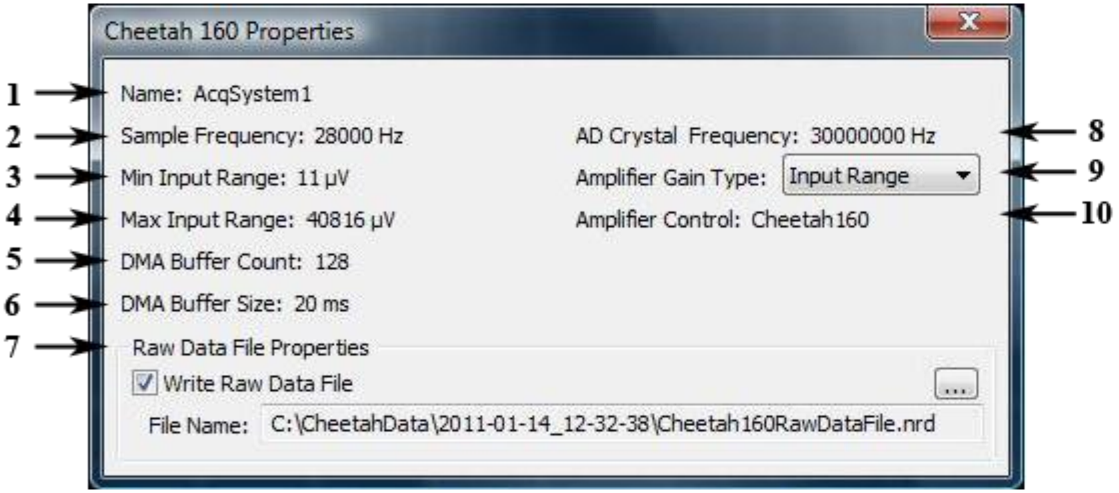
4.4.1 Cheetah 160 Hardware Properties

Cheetah 160 Hardware System Properties

These settings are used to control how the Cheetah 160 acquisition system hardware is setup and how it process AD data before passing the data to the acquisition entities. The hardware system properties are shown via the View menu in Cheetah.



Cheetah 160 Hardware System Properties Dialog

 Cheetah 160 Properties Name: AcqSystem1 Sample Frequency: 28000 Hz Min Input Range: 11 µV Max Input Range: 40816 µV DMA Buffer Count: 128 DMA Buffer Size: 20 ms AD Crystal Frequency: 30000000 Hz Amplifier Gain Type: Input Range Amplifier Control: Cheetah160 Raw Data File Properties ☑ Write Raw Data File File Name: C:\CheetahData\2011-01-14_12-32-38\Cheetah160RawDataFile.nrd	
1. Acquisition Entity Name	This is the unique name that is used to identify this spike acquisition entity. It is the name you chose when you created the acquisition entity.
2. Sample Frequency	The sample frequency for this system is 28000 Hz. This value is based on the hardware being used and cannot be changed. All AD channels on this system will be sampled at this frequency. However, the sampling rate of individual acquisition entities can be changed. See the help section for the type of acquisition entity whose sampling rate you wish to change for more information.
3. Min Input Range	This is the smallest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
4. Max Input Range	This is the largest input range that this system is capable of recording. This value is based on the hardware being used and cannot be changed.
5. DMA Buffer Count	This is the number of DMA buffers used when acquiring data from the hardware.
6. DMA Buffer Size	This is the buffer size for each buffer used when acquiring data from the hardware. This is in milliseconds.
7. Raw Data File Properties	This section will enable output of a raw data file to the file name shown in the box when the checkbox is checked. You can change the file that is being written to by clicking on the browse button.
8. AD Crystal Frequency	This value is six times the A/D sampling rate. This frequency is determined by the electronic device (5 volt oscillator IC) that is installed on the A/D board in the Cheetah160 box. The nominal values that have been used are 25000000 (25 MHz) and 30000000 (30MHz). This oscillator crystal frequency clocks the logic on the A/D board and it takes 6 clock cycles to perform each A/D conversion.
9. Amplifier Gain Type	Selects the type of gain control to use for controlling signal amplification. 1. **Input Range:** Adjusts the system to use optimal gain settings for both amplifiers and AD conversion in order

	to acquire a signal inside of the specified input range value. 2. **Amp Gain:** Allows individual control of both AD and amplifier gain settings. Input Range then becomes a calculated value and can only be changed through adjusting either of the gain values.
10. Amplifier Control	This is the type of amplifier control that is being used with the sub system.

4.5 Lynx 8 Amplifier Control

Lynx 8 Amplifier Control

All analog acquisition systems are designed to use the Lynx 8 amplifiers. The interfaces for controlling these amplifiers are described below.

ACP

This form of amplifier control is done through the Measurement Computing DIO24 card.

Cheetah 160

This form of amplifier control is done through the Cheetah 160 box and is only available for use with a Cheetah 160 sub system.

4.6 Digital Reference Selector (DRS)

Digital Reference Selector (DRS) Control

DRS Overview

The DRS board is used by Digital Lynx and Digital Lynx SX systems to allow software controlled reference selection for all AD channels. When setting up a system to use a DRS, Cheetah requires the following:

1. Each DRS is paired with a single Input Board in the slot immediately to its left (e.g. DRS in slot 1 controls references for all AD channels on the Input Board in slot 0).

2. DRS boards must be in odd numbered slots (e.g. 1,3,5,etc.).
3. All unpaired input boards must be after all paired input boards (e.g. IIIDID is not correct, IDIDII is correct).

When using the Digital Lynx, DRS boards must be added to the system via the -AddDRSBoard command, and cannot be added through the DRS properties dialog once Cheetah has started. Digital Lynx SX systems report their board layout to Cheetah and do not require the -AddDRSBoard command.

Each DRS board can select from the 32 AD channels or four headstage references on the paired Input Board or the Animal and Panel ground connectors as references. An individual DRS is limited to eight unique references at a time (Local0 - Local7).

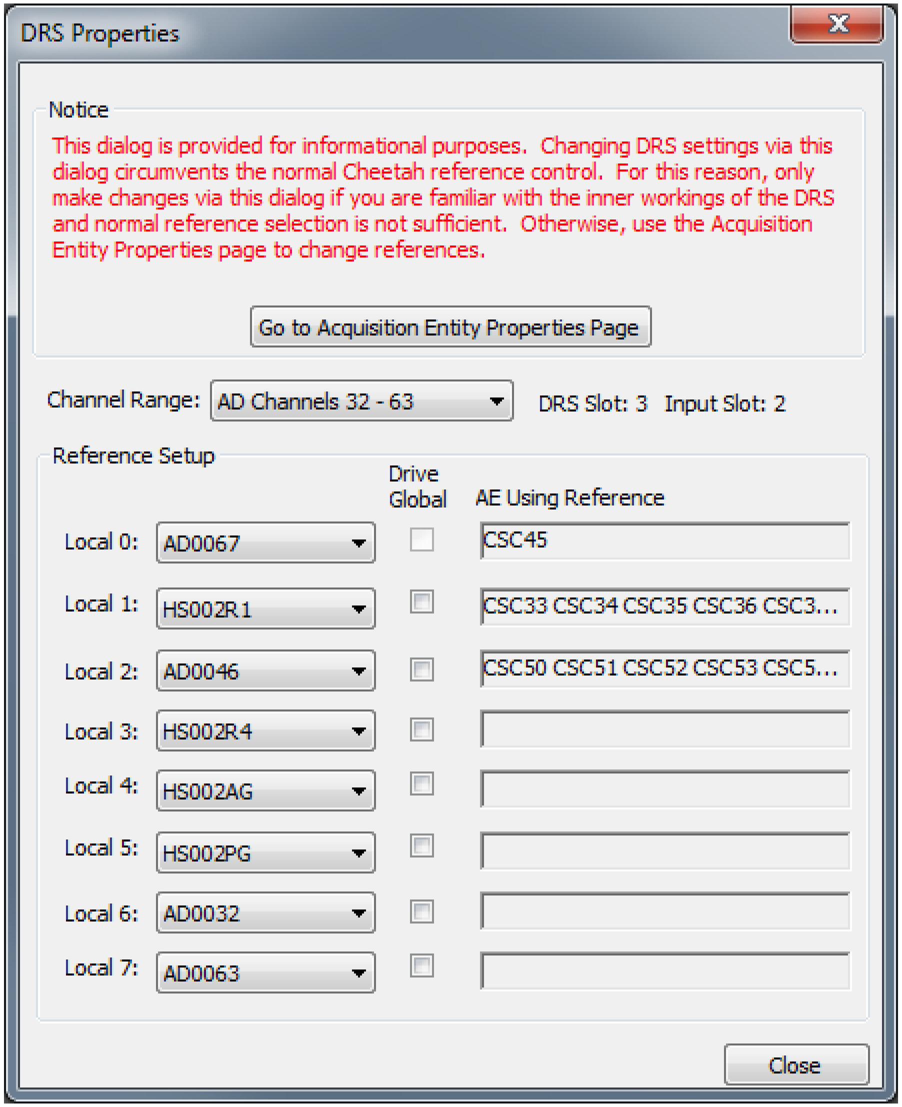
It is also possible to share references between DRS boards via the global bus. Cheetah assumes that all DRS boards are connected via the global bus cable that was supplied with your hardware system. There can be a total of eight global references for the entire system, regardless of the number of DRS boards. When using a reference from the global bus on a DRS, it will use up one of the eight local references on that board. Global references must be matched to their corresponding local reference (i.e. if AD channel 33 is set to local 0 on DRS board 3, and the DRS at board 1 wants to use AD channel 33 as a reference, it must set its local 0 to use AD channel 33).

Cheetah will take care of managing all locals and globals via the -SetAcqEntReference command and the CSC or Spike Acquisition entity properties, so there is no need to manually make these changes.

DRS Properties Dialog

The DRS Properties Dialog can be launched either from the Digital Lynx Hardware Properties or from either the CSC or Spike Acquisition Entity properties.

NOTE: Only use this dialog when you wish to manually change the DRS settings. Changing acquisition entity references from either the CSC or Spike Acquisition Entity properties will automatically adjust all settings on a DRS. These automatic adjustments take much of the complexity out of using the DRS.



This dialog is provided for informational purposes. Changing DRS settings via this dialog circumvents the normal Cheetah reference control. For this reason, only make changes via this dialog if you are familiar with the inner workings of the DRS and normal reference selection is not sufficient. Otherwise, use the Acquisition Entity Properties page to change references.

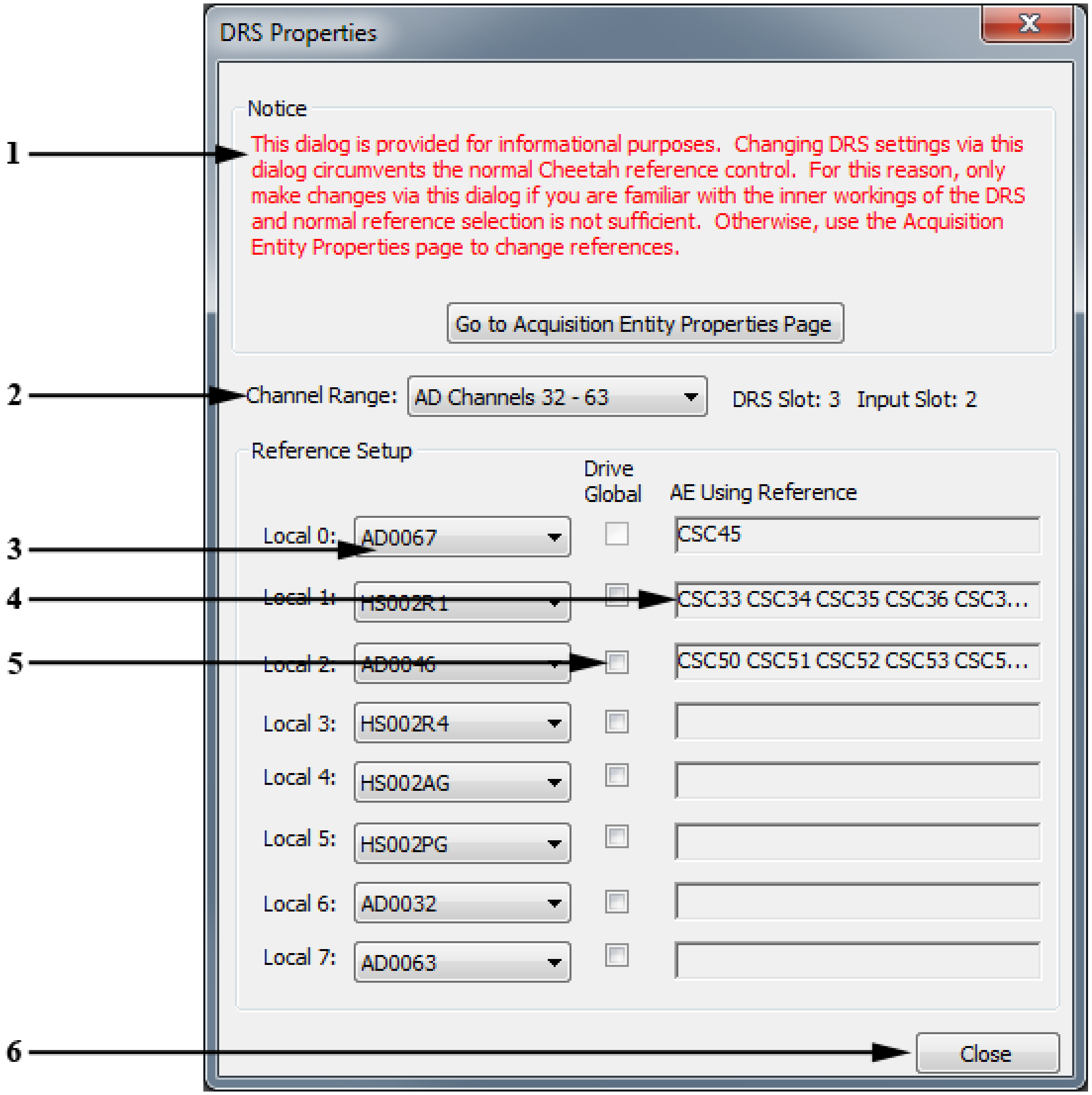
Channel Range: AD Channels 32 - 63

DRS Slot: 3 Input Slot: 2

Reference Setup

		Drive Global	AE Using Reference
Local 0:	AD0067	☐	CSC45
Local 1:	HS002R1	☐	CSC33 CSC34 CSC35 CSC36 CSC3...
Local 2:	AD0046	☐	CSC50 CSC51 CSC52 CSC53 CSC5...
Local 3:	HS002R4	☐	
Local 4:	HS002AG	☐	
Local 5:	HS002PG	☐	
Local 6:	AD0032	☐	
Local 7:	AD0063	☐	

DRS Properties Settings



This dialog is provided for informational purposes. Changing DRS settings via this dialog circumvents the normal Cheetah reference control. For this reason, only make changes via this dialog if you are familiar with the inner workings of the DRS and normal reference selection is not sufficient. Otherwise, use the Acquisition Entity Properties page to change references.

Channel Range: AD Channels 32 - 63 DRS Slot: 3 Input Slot: 2

		Drive Global	AE Using Reference
Local 0:	AD0067	☐	CSC45
Local 1:	HS002R1	☐	CSC33 CSC34 CSC35 CSC36 CSC3...
Local 2:	AD0046	☐	CSC50 CSC51 CSC52 CSC53 CSC5...
Local 3:	HS002R4	☐	
Local 4:	HS002AG	☐	
Local 5:	HS002PG	☐	
Local 6:	AD0032	☐	
Local 7:	AD0063	☐	

1. Usage Notice	This notice is to inform you about the purpose of this dialog. **We do NOT recommend usage of this dialog for normal reference setup. Use the CSC or Spike Acquisition Entity Properties for reference selection.** Clicking on the button will switch you to the Acquisition Entity Properties window.
2. Channel Range	This selects the range of channels whose reference settings you wish to change. The DRS and input board slot number that corresponds to the selected channel range is also shown.
3. Local Selection	Each DRS allows for eight different references to be active at one time. Use the box to select which reference should be used in each slot. Slots that are currently blank are unused.

4. AE Using Reference	This is a list of all of the acquisition entities that are currently using the selected reference.
5. Set to Golobal	This will drive (checked) or release (unchecked) the current reference selection to the global bus. This allows for other DRS boards to use the selected reference on their channels. There can only be one global per reference slot at a time. If a different board is currently driving globally, the set to global checkbox will be disabled. You will need to release the global bus from the board that is currently driving global to allow you to change the reference driving globally. To eliminate much of the complication of global settings, it is recommended that you use either the CSC or Spike Acquisition Entity properties to change references.
6. Close Button	Closes this window.

4.7 Digital I/O Overview

Digital I/O (TTL Input and Output) Overview

The Cheetah Data Acquisition Software (DAS) is capable of reading transistor to transistor logic (TTL) input values and outputting TTL values via both dedicated add-on Digital I/O boards and through Neuralynx acquisition systems. TTLs can either be on (voltage applied) or off (grounded). The actual voltage value can vary from device to device but is usually either 3.3V or 5V. Each TTL device has a specific number of physical TTL pins, otherwise known as bits, associated with it. To allow for more flexibility in configuring how Cheetah utilizes your available TTL bits, each TTL device has their total number of bits divided into ports (groups of TTL bits). You can then configure and use the bits on each port independently of the bits on other ports. TTL values are timestamped along with all other data recorded by Cheetah DAS so they can be used during both offline and online analysis. To add additional TTL devices (available with 24, 48 or 96 TTL bits) to supplement the capabilities of your acquisition system, contact sales@neuralynx.com.

Supported Add-on Hardware

The following add-on Digital I/O boards are compatible with Cheetah. For information on Digital I/O that is built into Neuralynx hardware, see the entry for your particular acquisition system in the Hardware Systems section of this guide. The Cheetah Device Type is the value used when Cheetah assigns the device name used to reference the TTL device.

Device	Cheetah Device Type	Total TTL Bits	Number of Ports	Number of Bits per Port	Max Sampling Rate
Measurement Computing DIO-24	PCI-DIO24	24	3	8	1KHz*

Measurement Computing PCIe DIO-24	PCIe-DIO24	24	3	8	1KHz*
Measurement Computing DIO-48	PCI-DIO48H	48	6	8	1KHz*
Measurement Computing DIO-96	PCI-DIO96	96	12	8	1KHz*

*The maximum sampling rate is approximate, see the -SetDigitalIOInputScanDelay command for more information.

Hardware Installation

Upon receiving the DIO card, follow all of the included manufacturer’s installation and setup instructions before attempting to use it with Cheetah DAS.

Adding the TTL Board to Cheetah

After installation and setup is complete, Cheetah DAS will automatically detect your newly installed hardware and allow you to take advantage of your new TTL capabilities.

NOTE: If Cheetah does not detect your hardware, it means one of the following has occurred:

1. **The hardware is not supported by Cheetah**
2. **The hardware's driver is not correctly installed or configured**
3. **There is a physical problem with the hardware.**

Configuring the TTL Board

Before the new TTL card can be of much use, you will need to define how the TTL bits will be used. Use the Digital IO Setup dialog in order to configure the board.

After the card has been added to the system, all TTL inputs will be recorded to event data files (NEV) just as those of your acquisition system’s built in TTL port.

Controlling the TTL Board

Cheetah has no user interface to directly control the output capabilities of Digital I/O devices, including those built into Neuralynx acquisition systems. You will need to create a NetCom program that sends commands or manually load a configuration file each time you want a sequence of commands to execute. The NetCom approach is much preferred for controlling an experiment as it will not interfere with Cheetah DAS’s normal operation. Many of our experiment control programs have the ability to send any command to Cheetah DAS. The NetComExampleCommands example project that is included in the NetCom Development package (available at www.neuralynx.com/Software) can be used to simply send commands to Cheetah DAS on demand. For explanations of all control and status commands, see the Digital IO Commands section of this guide.

Add-on Digital I/O Board Limitations

There are a couple of limitations that the add-on Digital I/O boards have that the digital I/O built into the acquisition systems do not. First of all, the TTL values are not saved to a raw data file (RDF) during recording. So when the RDF is played back, you will not have any of the TTLs from the extra board show up. Second, the sampling rate of the add-on boards is set separately from the sampling rate of the acquisition hardware. Not all add-on boards will be able to have the same sampling rate as the acquisition hardware. See the Supported Add-on Hardware section of this page for more information.

Additional TTL Input and Output Topics:

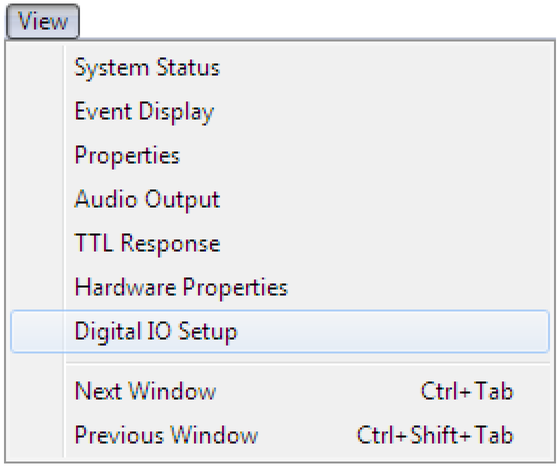
Digital I/O Setup
Digital IO Commands

4.8 Digital I/O Setup

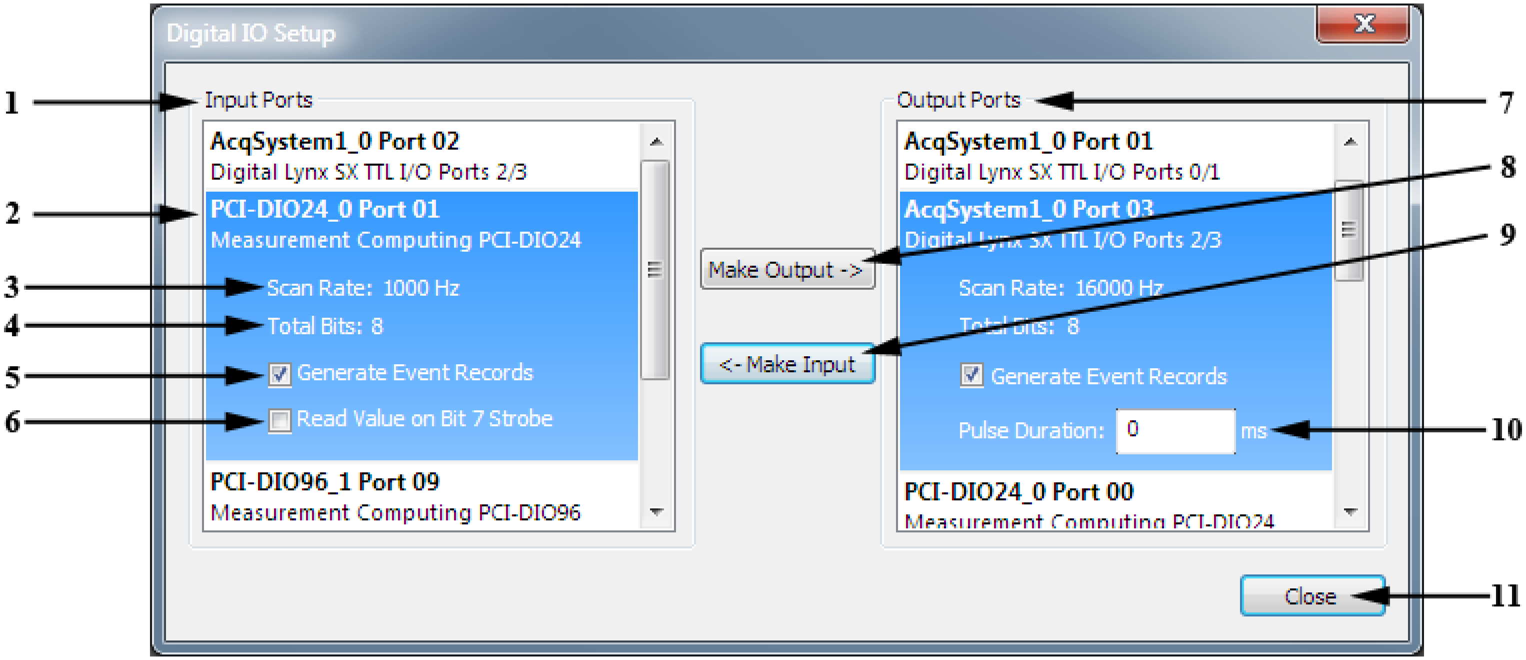
Digital I/O Setup

For an overview of Cheetah Digital I/O as well as definitions of Digital I/O specific terms, see the Digital I/O Overview page.

These settings are used to control how the Digital I/O ports are setup and how Cheetah DAS process the TTL values before passing the data to the acquisition entities or outputting the values to the TTL output port. The Digital I/O setup is shown via the View menu in Cheetah. All changes made in this dialog are applied immediately.



Digital I/O Setup Dialog



Input Ports:

AcqSystem1_0 Port 02
Digital Lynx SX TTL I/O Ports 2/3

PCI-DIO24_0 Port 01
Measurement Computing PCI-DIO24
Scan Rate: 1000 Hz
Total Bits: 8
☑ Generate Event Records
☐ Read Value on Bit 7 Strobe

PCI-DIO96_1 Port 09
Measurement Computing PCI-DIO96

Output Ports:

AcqSystem1_0 Port 01
Digital Lynx SX TTL I/O Ports 0/1

AcqSystem1_0 Port 03
Digital Lynx SX TTL I/O Ports 2/3
Scan Rate: 16000 Hz
Total Bits: 8
☑ Generate Event Records
Pulse Duration: 0 ms

PCI-DIO24_0 Port 00
Measurement Computing PCI-DIO24

1. Input Port List	A list of all of the ports that are currently set for TTL input. Clicking on one of the items in this list will allow you to adjust parameters of the port as well as see more details.
2. Board Description	The description shown consists of three parts: the device name, the port number and the detailed port description. The device name and port number will be used to identify this particular item when using Digital I/O

	commands. **Example:** The highlighted item in the import list above has a device name of PCI-DIO24_0, the port represented by this item is port 1, and the detailed description informs us that this device is a Measurement Computing PCI-DIO24.
3. Scan Rate	Also known as the sampling frequency, this is the rate at which values will be written to or read from the selected port. The sampling frequency for all Digital I/O devices that are part of an acquisition system is set by the acquisition system and cannot be changed independently. Add-on Digital I/O devices may have their sampling rate changed depending on the capabilities of the hardware. See the Digital I/O Overview section for more information.
4. Total Bits	The total number of bits available for this port.
5. Event Record Generation	If this box is checked, event records will be generated whenever a change is made to the value of the port.* *See the Strobe Selection item for exceptions to this rule.
6. Strobe Selection	Digital I/O ports that are set to input have the option of selectively capturing the value currently on that port by strobing (a low to high TTL transition) the most significant bit (MSB) of the port (i.e. bit 7 of an 8 bit port). If this option is checked, whenever Cheetah detects a low to high transition on the MSB, the entire value of the input port will be read and an event record generated (if enabled, see the Event Record Generation item on this page). Any bit changes that occur between strobes of the MSB will not generate event records. If you desire to have an event record generated for every bit change on the input port, disable (uncheck) this option. **NOTE:** The MSB will always be part of the TTL value. This means that the MSB will always be set to 1 when the TTL value is saved to the event record. For more detailed information as well as examples, see the -SetDigitalIOUseStrobeBit command. The checked state indicates a TRUE value for the -SetDigitalIOUseStrobeBit command and the unchecked state is a value of FALSE.
7. Output Port List	A list of all the ports that are currently set for TTL output. Clicking on one of the items in this list will allow you to adjust parameters of the port as well as see more details.
8. Make Output	Changes the direction of the item selected in the Input Ports list from input to output. If the item cannot be changed, a message will be shown explaining why the change could not take place at that time.
9. Make Input	Changes the direction of the item selected in the Output Ports list from output to input. If the item cannot be changed, a message will be shown explaining why the change could not take place at that time.
10. Pulse Duration	The amount of time that a pulsed bit will remain in the pulsed direction when a TTL pulse is generated on one of the bits in this port. See the -SetDigitalIOPulseDuration and -DigitalIOTtlPulse commands for more detailed information as well as examples.
11. Close	Closes this window.

5. Acquisition, Recording and Status

Acquisition Recording and Status Overview

The Cheetah software's primary purpose is to acquire and record data. Cheetah starts out in idle mode. When Cheetah is not acquiring any valid operation may be executed within the Cheetah software. This is usually when the hardware sub systems, acquisition entities and plots are being setup. Once Cheetah has been successfully configured, acquisition may be turned on. When acquisition is turned on, data will begin to move through the Cheetah software. Data will be acquired from the appropriate interface, filtered, put into records, displayed and sent over NetCom if requested. While acquisition is on, additional hardware sub systems and acquisition entities may not be added to the Cheetah system. Plots and windows however may be added or removed at any time. When acquisition is on, data is moving through Cheetah, but none of the data is being saved. Turning on recording then saves all data to disk.

The current system status can be monitored using the system status dialog. This dialog can be moved around and hidden if you want it out of the way.

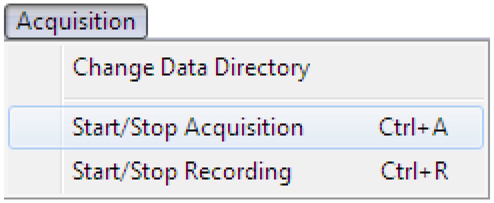
Acquisition, Recording and Status Topics:

Acquiring With Cheetah
Recording With Cheetah
System Status Dialog
Acquisition and Recording Commands
System Status Dialog Commands
Generic Dialog Commands

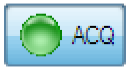
5.1 Acquiring Data

Starting and Stopping Acquisition

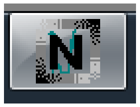
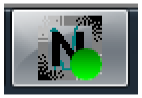
Starting and stopping acquisition can be done in a variety of ways. The first way is to use the main menu. Under the Acquisition menu, the user may select Start/Stop Acquisition to toggle acquisition on and off.



Another way to toggle acquisition is to use the mouse to press the ACQ button location on the upper left portion of the System Status dialog. If the ACQ button is green, then acquisition is currently on, otherwise, acquisition is currently off. Regardless of how acquisition is being turned on or off, the ACQ button will always display the current state of acquisition.

		
Acquisition is off. Cheetah is idle.	Cheetah is acquiring data, but not recording data.	Cheetah is recording data. Recording must be stopped in order to turn off acquisition.

In Windows 7, Cheetah's taskbar icon will also have an overlay indicator to indicate the current acquisition state:

	
Both Recording and Acquisition are off	Cheetah is acquiring data.

Acquisition can also be toggled by using hot keys. The hot key combination of CTRL+A will toggle acquisition based on the current state.

The final way that acquisition can be turned on or off is by using a Cheetah command. There are two commands that can be used. One to turn on acquisition and one to turn off acquisition. These commands are as follows:

```
-StartAcquisition
-StopAcquisition
```

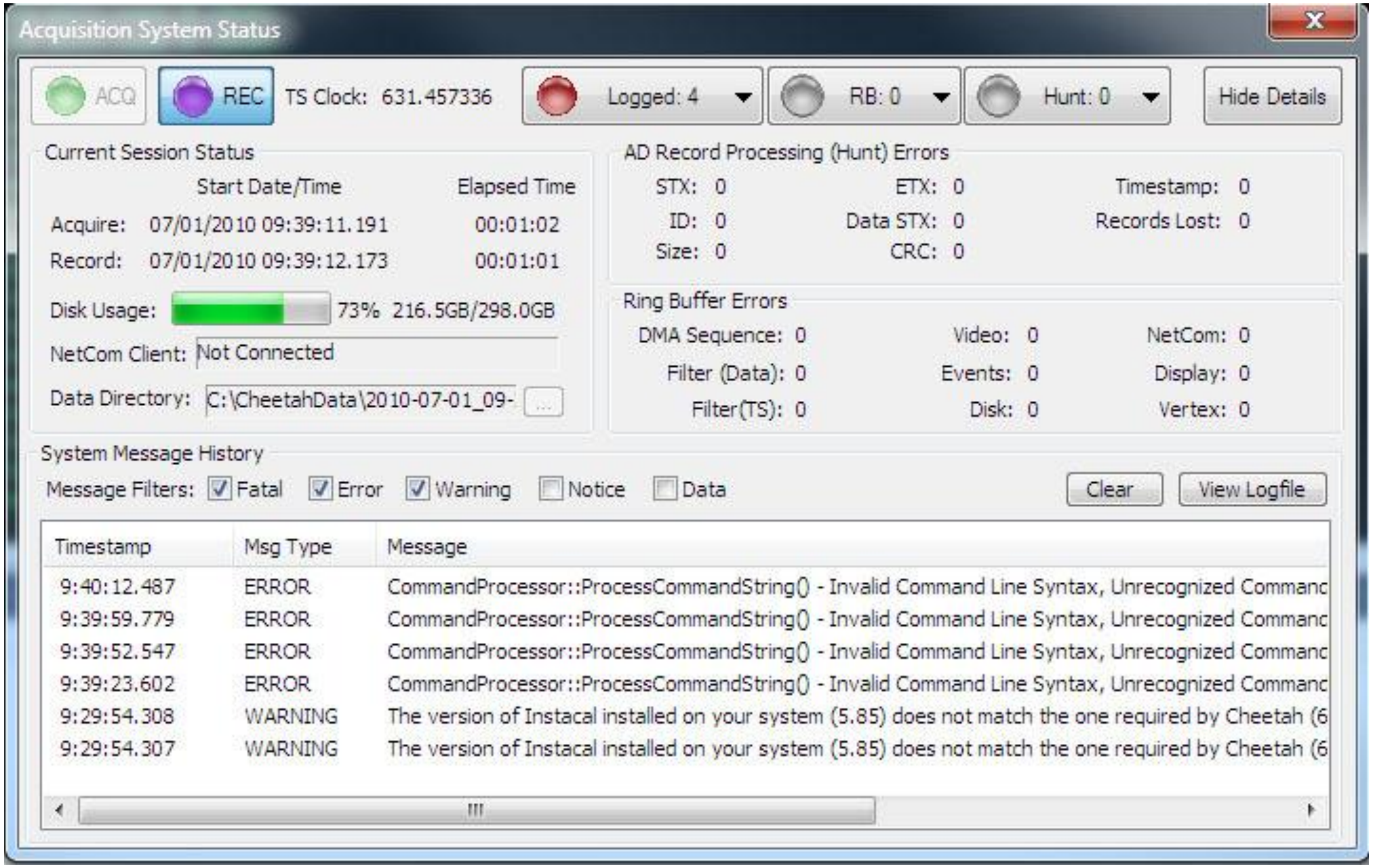
See the Cheetah Control Commands section for more information.

These commands may be part of a configuration file that is being processed or they may be sent to Cheetah via the NetCom interface from an experiment control program. As a general practice, these commands are sent via NetCom, since configuration files are mainly used for setup purposes.

Note: If acquisition is not currently turned on, it will be turned on automatically when recording is started. Recording must be stopped before acquisition can be turned off.

5.2 System Status

System Status Dialog



TS Clock: 631.457336

	Start Date/Time	Elapsed Time
Acquire:	07/01/2010 09:39:11.191	00:01:02
Record:	07/01/2010 09:39:12.173	00:01:01

Disk Usage: 73% 216.5GB/298.0GB

NetCom Client: Not Connected

Data Directory: C:\CheetahData\2010-07-01_09-

STX:	0	ETX:	0	Timestamp:	0
ID:	0	Data STX:	0	Records Lost:	0
Size:	0	CRC:	0		

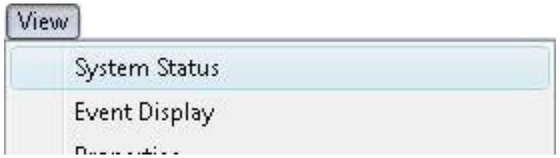
DMA Sequence:	0	Video:	0	NetCom:	0
Filter (Data):	0	Events:	0	Display:	0
Filter(TS):	0	Disk:	0	Vertex:	0

Message Filters: ☑ Fatal ☑ Error ☑ Warning ☐ Notice ☐ Data

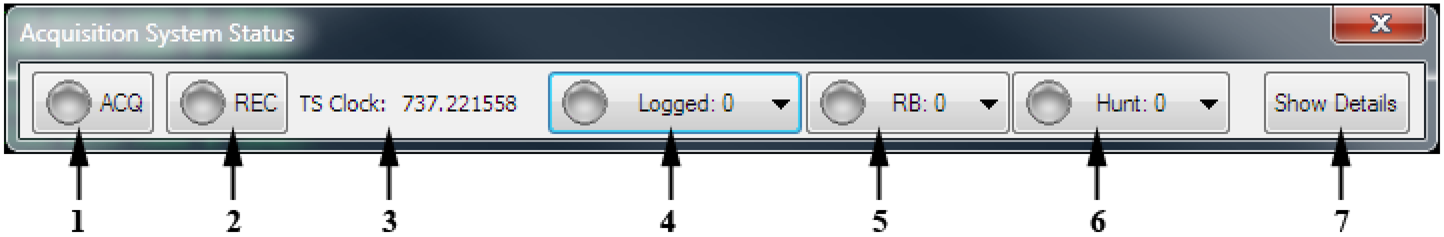
```
Timestamp      Msg Type    Message
9:40:12.487    ERROR       CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:59.779    ERROR       CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:52.547    ERROR       CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:23.602    ERROR       CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:29:54.308    WARNING     The version of Instacal installed on your system (5.85) does not match the one required by Cheetah (6
9:29:54.307    WARNING     The version of Instacal installed on your system (5.85) does not match the one required by Cheetah (6
```

The system status dialog will allow you to see the status of Cheetah while recording or acquiring. The system status dialog can be launched from the

View menu of Cheetah:



Single Line Information

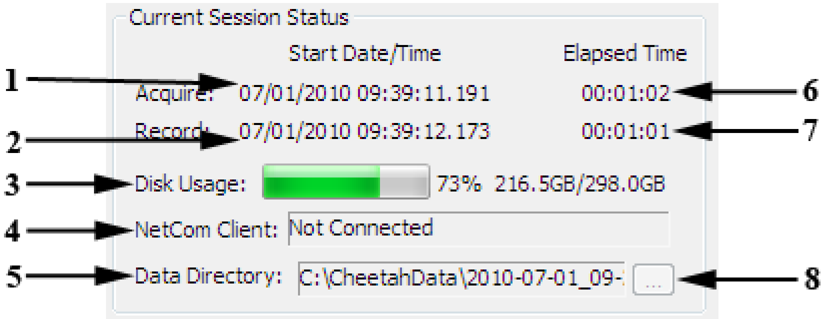


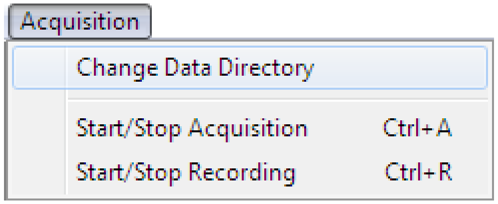
1. Acquisition Toggle and Status	When this indicator is grey, Cheetah is not acquiring any data. Clicking on the acquisition toggle when the indicator is grey will start acquiring data. When Cheetah is acquiring, the indicator will turn green. Clicking on the acquisition toggle when the indicator is green will turn off acquisition.
2. Recording Toggle and Status	When this indicator is grey, Cheetah is not recording data to a file. Clicking on the recording toggle when the indicator is grey will start recording data to a file. When Cheetah is recording, the indicator will turn purple. Clicking on the recording toggle when the indicator is purple will turn off recording. **No data will be saved if Cheetah is not in recording mode.**
3. Timestamp Clock	This is the current Cheetah timestamp displayed in seconds. This is obtained from the hardware system and does not have a consistently defined start time. Use the current session status section of this window to determine how long Cheetah has been acquiring or recording.
4. Logged Errors	Displays the number of errors that have been logged to the logfile since the last time the counter was reset. The logfile provides details on the errors that have occurred. To view the logfile, click on the logged errors button and select "View Logfile". To reset the error count back to zero, click the logged errors button and select "Reset Logged Error Count".
5. Ring Buffer Error Status	This indicator will turn red every time a ring buffer error occurs. A ring buffer error occurs when a part of the acquisition system is overloaded and can't get the required resources to handle all the data that needs to be processed. To reset the ring buffer error count, click the button and select "Reset RB Error Count". For more details on the ring buffer errors that have occurred, see the Error Counts section of this window.
6. Hunt Error Status	This indicator will turn red every time a hunt error occurs. A hunt error occurs when cheetah is receiving data packets from a hardware interface and has found data in the packet that is corrupt. When this occurs, the data

	packet is discarded. To reset the hunt error count, click the button and select "Reset Hunt Error Count". For more details on the hunt errors that have occurred, see the Error Counts section of this window.
7. Show/Hide Details Button	Clicking on this button when it says "Show Details" will expand the acquisition system status window to show a more detailed view of the current system status. Clicking on the button when it says "Hide Details" will change the window to single line mode.

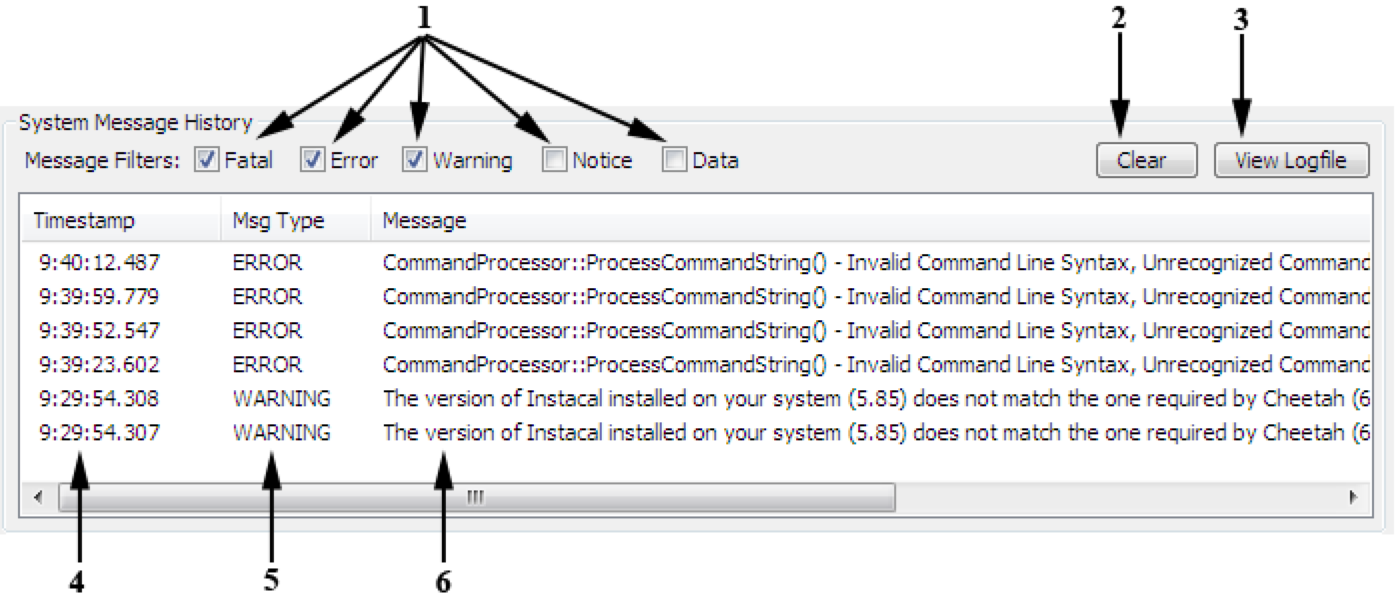
Detailed View

Current Session Status

 Current Session Status Start Date/Time Elapsed Time Acquire: 07/01/2010 09:39:11.191 00:01:02 Record: 07/01/2010 09:39:12.173 00:01:01 Disk Usage: 73% 216.5GB/298.0GB NetCom Client: Not Connected Data Directory: C:\CheetahData\2010-07-01_09-	
1. Start Date and Time of Acquisition	This is the exact time and date of the last time Cheetah began acquiring.
2. Start Date and Time of Recording	This is the exact time and date of the last time Cheetah began recording.
3. Hard Disk Usage	The disk usage is shown as a percentage of used space on the hard drive where the data directory is located. In the above image, it shows that 216.5 gigabytes(GB) out of a total of 298GB are used. The higher this number, the less space you have left on your system. If this percentage is ever over 90%, you should change the data directory to a different hard drive, delete old data and unused programs, or get more storage space for your computer.
4. Connected NetCom Client	This is the name of the NetCom client program that is connected to Cheetah. If no program is connected, this will show "Not Connected" (as seen above).
5. Current Data Directory	This shows the current directory for all active data files. Any time you start recording in Cheetah, the data will be written to files in this directory. The only exception is if you specify a specific path for an individual file (i.e. C:\csc1.ncs).
6. Elapsed Time	This is the elapsed time in hours, minutes and seconds since the last time Cheetah began acquiring. If Cheetah is not

of Acquisition	acquiring, this will show the duration of the last recording session.
7. Elapsed Time of Recording	This is the elapsed time in hours, minutes and seconds since the last time Cheetah began recording. If Cheetah is not recording, this will show the duration of the last recording session.
8. Change Data Directory Button	Clicking on this button will bring up a window where you select the base data directory for Cheetah. Selecting a directory in this window and pressing OK will close all open files in the old data directory; make a directory inside of the one you just selected based on the current time, and finally open a new version of all files that were in the old data directory. If a file was open that was not in this directory, that file will continue to be recorded to at the same location. This can only be changed while Cheetah is idle. **Example:** Your current data directory is C:\CheetahData2\2007-02-21_10-58-27, and you have the file CSC1.ncs open in that directory. You also specified that CSC2 will write to a file called C:\CSC2.ncs. You then click on the change data directory button and select C:\NewDataDirectory and click OK. Cheetah will create a directory called C:\NewDataDirectory\YYYY-MM-DD_HH-MM-SS (the hours will be in a 24 hour format) where the date and time will be filled in by the current date and time. Cheetah will then create a file called CSC1.ncs in this new directory with no data in it. Your logfile will be copied to the new directory. The next time you record, all data will go to the new directory. However, no change will be made to the C:\CSC2.ncs file, as it was not located in the old data directory. The data directory can also be changed from the Acquisition menu of Cheetah's main window. 

System Message History

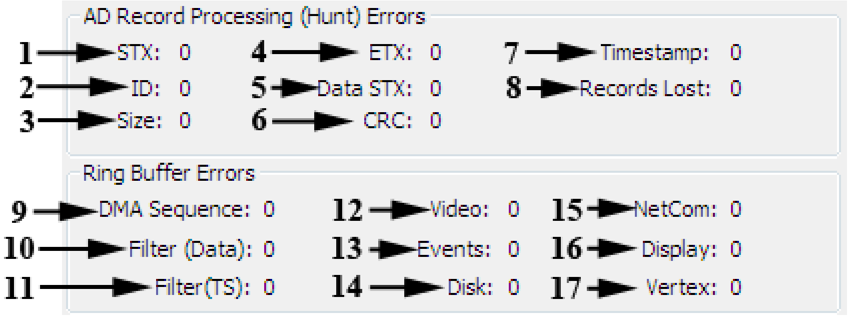


Timestamp	Msg Type	Message
9:40:12.487	ERROR	CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:59.779	ERROR	CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:52.547	ERROR	CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:39:23.602	ERROR	CommandProcessor::ProcessCommandString() - Invalid Command Line Syntax, Unrecognized Commanc
9:29:54.308	WARNING	The version of Instacal installed on your system (5.85) does not match the one required by Cheetah (6
9:29:54.307	WARNING	The version of Instacal installed on your system (5.85) does not match the one required by Cheetah (6

1. Message Filters	Only messages whose type has a check mark (filter is On) by it in the message filters list will be shown in the history list. All messages are passed through the message filters before being sent to the message history. If the message makes it through the filters, it will be displayed in the message history. Changes in the filter settings will have no effect on messages that have already been through the filtering process. Cheetah allows you to filter the following messages: 1. **Fatal:** All messages tagged as FATAL will be affected. Fatal messages are unrecoverable, and Cheetah should be restarted. 2. **Error:** All messages tagged as ERROR will be affected. Error messages are for errors in commands, incorrect keywords or values, or intermittent problems with a portion of the system 3. **Warning:** All messages tagged as WARNING will be affected. Warning messages indicate that something happened out of the ordinary, but was handled by Cheetah. 4. **Notice:** All messages tagged as NOTICE will be affected. Notices provide status information about Cheetah. These messages are purely informational. 5. **Data:** All messages tagged as DATA will be affected. Data messages are not generated by Cheetah. These message types can be used to log information to the log file. However, if you will use these messages for analysis, you would be better off posting an event with the message as the event string.
2.Clear Button	Clicking this button will clear all messages in the message history list. All of these messages are present in the log file, so you will not be clearing all records of these messages.

3.View Logfile Button	The message history will not show all messages that have occurred since Cheetah was started. It will only show the last 50 messages that were allowed by the filter selections. Clicking on the view logfile button will allow you to see a complete list of messages generated by Cheetah, regardless of the message filter settings. Remember, a new logfile is started when you change data directories.
4. Timestamp	Every message displayed in the message history list will have the Cheetah timestamp for when the message was generated displayed in this column.
5. Message Type	This will be one of the types listed in the message filters section.
6. Message	The complete message text that was generated by Cheetah.

Error Counts

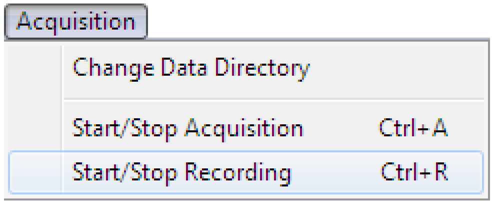
 AD Record Processing (Hunt) Errors STX: 0 ID: 0 Size: 0 ETX: 0 Data STX: 0 CRC: 0 Timestamp: 0 Records Lost: 0 Ring Buffer Errors DMA Sequence: 0 Filter (Data): 0 Filter(TS): 0 Video: 0 Events: 0 Disk: 0 NetCom: 0 Display: 0 Vertex: 0 	
1. STX	STX is a value used to identify the start of an AD Record. STX values are used when transmitting data in order to help detect and recover from corrupt data. If this error occurs, then at least 1 AD Record has been lost.
2. ID	The ID is a value used to identify the AD Record type when processing data. It also helps detect when data has been corrupted. If this error occurs, then at least 1 AD Record has been lost.
3. Size	The size represents the AD data portion of an AD Record. The size is validated by comparing it to the expected size that is calculated in cheetah. This error is generally caused by the number of input boards being set incorrectly. An invalid size value may also indicate that the AD Record has become corrupt. If this error occurs, then at least 1 AD Record has been lost.
4. ETX	The ETX is a value used to identify the end of an AD Record. ETX values are used when transmitting data in order to help detect and recover from corrupt data. If this error occurs, then at least 1 AD Record has been lost.
5. Data STX	The Data STX is a value used to identify the start of the data section of an AD Record. Data STX values are used when transmitting data in order to help detect and recover from corrupt data. If this error occurs, then at least 1 AD Record has been lost.
6. CRC	The CRC is a value used to validate the contents of a data packet. If this error occurs, then at least 1 AD Record

	has been lost.
7. Timestamp	The timestamp value used to identify and validate the contents of an AD Record. The timestamp is also used to determine if any AD Records have been lost. If this error occurs, then at least 1 AD Record has been lost.
8. Records Lost	This value represents the number of records that were expected but not found during data processing.
9. Direct Memory Access (DMA) Sequence Errors	Direct memory access or DMA refers to memory buffers used to store data as soon as it is received from a hardware interface. This error occurs if buffers are received out of order or invalid. If this error occurs, then at least one buffer was lost.
10. Filter Data	A ring buffer containing raw unfiltered data has overflowed. If this occurs, all data within the ring buffer has been lost. This error is due to a lack of resources being available to process the buffer in real time.
11. Filter Timestamp	A ring buffer containing timestamp data has overflowed. If this occurs, all data within the ring buffer has been lost. This error is due to a lack of resources being available to process the buffer in real time.
12. Video Ring Buffer	A ring buffer containing video records has overflowed. If this occurs, all data within the ring buffer has been lost. This error is due to a lack of resources being available to process the buffer in real time.
13. Events Ring Buffer	A ring buffer containing event records has overflowed. If this occurs, all data within the ring buffer has been lost. This error is due to a lack of resources being available to process the buffer in real time.
14. Disk Ring Buffer	A ring buffer containing data records has overflowed. The data records can be any of the data types used by Cheetah. If this occurs, all data within the ring buffer has been lost. This error is due to a lack of resources being available to process the buffer in real time.
15. NetCom Ring Buffer	A ring buffer containing data records has overflowed. The data records can be any of the data types used by Cheetah. If this occurs, all data within the ring buffer has been lost and will not be able to be sent to any of the client applications that may be currently connected to Cheetah. This error is due to a lack of resources being available to process the buffer in real time.
16. Display Ring Buffer	A ring buffer containing data records has overflowed. The data records can be any of the data types used by Cheetah. If this occurs, all data within the ring buffer has been lost and will not be displayed in any of the plots associated with the ring buffer that has overflowed. This error is due to a lack of resources being available to process the buffer in real time.
17. Vertex Ring Buffer	A vertex buffer has reached its maximum capacity for drawing data for the current screen refresh. All data that is received after the buffer has become full will be discarded. This error will also occur if data has been calculated to draw incorrectly to the screen.

5.3 Recording Data

Starting and Stopping Recording

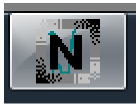
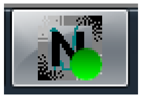
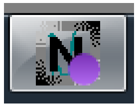
Starting and stopping recording can be done in a variety of ways. The first way is to use the main menu. Under the Acquisition menu, the user may select Start/Stop Recording to toggle recording on and off.



Another way to toggle recording is to use the mouse to press the REC button location on the upper left portion of the System Status dialog. If the REC button is purple, then recording is currently on, otherwise, recording is currently off. Regardless of how recording is being turned on or off, the REC button will always display the current state of recording.

	
Recording is off.	Cheetah is recording data.

In Windows 7, Cheetah's taskbar icon will also have an overlay indicator to indicate the current recording state:

		
Both Recording and Acquisition are off	Cheetah is acquiring data.	Cheetah is recording data.

Recording can also be toggled by using hot keys. The hot key combination of CTRL+R will toggle recording based on the current state.

The final way that recording can be turned on or off is by using a Cheetah command. There are two commands that can be used. One to turn on recording and one to turn off recording. These commands are as follows:

```
-StartRecording
-StopRecording
```

See the Cheetah Control Commands section for more information.

These commands may be part of a configuration file that is being processed or they may be sent to Cheetah via the NetCom interface from an experiment control program. As a general practice, these commands are sent via NetCom, since configuration files are mainly used for setup purposes.

Note: If acquisition is not currently turned on, it will be turned on automatically when recording is started. Recording must be stopped before acquisition can be turned off.

6. Raw Data Files

Raw Data Files

A Neuralynx raw data file is a single data file that contains all acquired data from a single hardware device. The raw data file consists of data that has been filtered by analog amplifiers only (if applicable). The data has not been sub sampled or run through any other type of filter. The data has also not been run through a spike detection algorithm. Raw data files can be played back through Cheetah as a means of recreating the experiment that was performed. This allows the user to try various filtering techniques on the raw data. Raw data files can only be setup through configuration commands.

Raw Data File Topics:

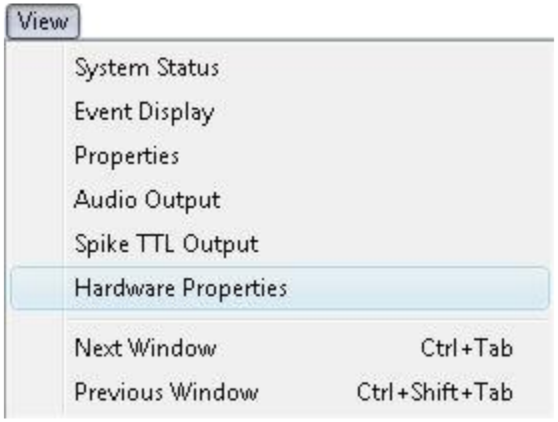
Recording Raw Data Files
Raw Data File Playback
Raw Data File Commands

6.1 File Playback with Cheetah

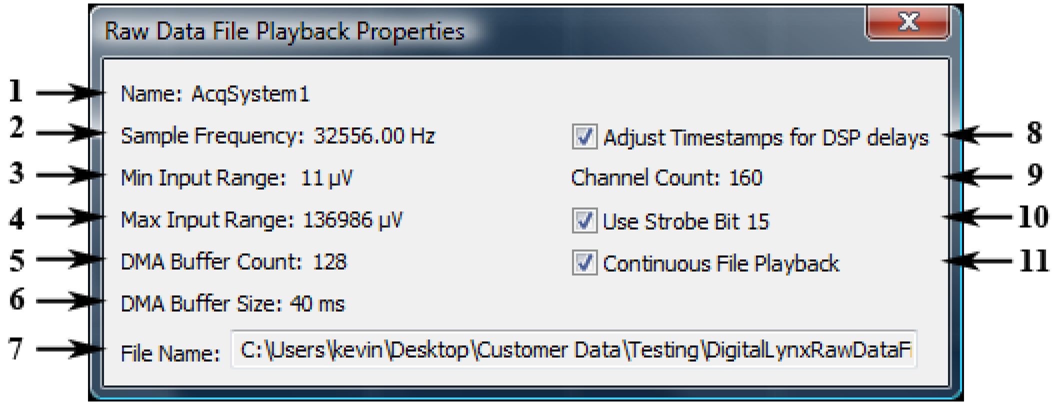
Raw Data File Playback

The raw data file hardware sub system has the ability to playback previously recorded raw data files. In order to playback a raw data file, the data file name must be set inside the hardware sub system. In order to do this, a filename can be set as the last argument for the -CreateHardwareSubSystem command. If this argument is not set, when processing this command, a file selection dialog box will appear allowing the user to select a file name. If a file is not selected the hardware sub system creation will fail. Once a file has been set, starting acquisition will read data from the raw data file and push it through the Cheetah system. The data playback rate is not set to a specific value. It is based upon the processing speed of the PC and can be modified by adjusting DMA buffer size (see below). A larger buffer size value will increase data file playback, while smaller buffer sizes will decrease data file playback. When the end of the file is reached, data will stop being sent through the system. There is an option to continuously play data back from the data file. By using the -SetContinuousRawDataFilePlayback command, whenever the end of file is reached, acquisition will stop and then restart itself. Whenever acquisition is started, data is always read from the start of the file regardless of the file position when acquisition was last stopped.

You can access the settings are used to control how the raw data file playback is setup and how it process AD data before passing the data to the acquisition entities. The hardware system properties are shown via the View menu in Cheetah.



Raw Data File Playback Hardware System Properties Dialog



Raw Data File Playback Properties

Name: AcqSystem1

Sample Frequency: 32556.00 Hz

Min Input Range: 11 µV

Max Input Range: 136986 µV

DMA Buffer Count: 128

DMA Buffer Size: 40 ms

File Name: C:\Users\kevin\Desktop\Customer Data\Testing\DigitalLynxRawDataF

☑ Adjust Timestamps for DSP delays

Channel Count: 160

☑ Use Strobe Bit 15

☑ Continuous File Playback

1. System Name	This is the unique name that is used to identify this system in Cheetah. It is the name you chose when you created the hardware system.
2. Sample Frequency	The sample frequency for this system is read from the raw data file. This value is based on the hardware that was being used when recording the raw data file and cannot be changed. However, the sampling rate of individual acquisition entities can be changed. See the help section for the type of acquisition entity whose sampling rate you wish to change for more information.
3. Min Input Range	This is the smallest input range that the system used to record this data file was capable of recording. This value is based on the hardware being used to record the raw data file and cannot be changed.
4. Max Input Range	This is the largest input range that the system used to record this data file was capable of recording. This value is based on the hardware being used to record the raw data file and cannot be changed.
5. DMA Buffer Count	This is the number of DMA buffers used when acquiring data from the hardware.
6. DMA Buffer Size	This is the buffer size for each buffer used when acquiring data from the hardware. This is in milliseconds.
7. Raw Data File Name	This section will show the raw data file that is currently being played back. This value cannot be changed. You will have to change the file name used when creating the raw data file hardware sub system and restart Cheetah in order to change the file being played back. For more information on setting up raw data file playback, see Raw Data File Commands.
8. DSP Delay Adjustment	When DSP delay adjustment is enabled (box is checked), the timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. For more information see the -SetDSPDelayCompensationEnabled command.
9. Channel Count	This is the number of channels that were recorded to the raw data file. This value is read from the file and cannot be changed. When setting up acquisition entities, they cannot have an AD channel number greater than channel count - 1

	(i.e.If Channel Count is 32, as shown above, the last AD channel is channel 31).
10. Strobe Bit 15 Selection	Sets the sub system to use bit 15 for event input. This means that Cheetah will only read TTL input events when bit 15 of the TTL input port is toggled. This setting only affects TTL values that were recorded to the raw data file, as TTL values are not read from connected hardware systems when playing back a raw data file.
11. Continuous File Playback	Continuous playback can be in either of the following states: 1. **Checked:** Sets Cheetah to continually loop the current raw data file. Once Cheetah is done processing the file, it will immediately restart the same file from the beginning. This setting is mainly used for presentation or testing purposes. It is not intended for data collection use. 2. **Unchecked:** Cheetah will process all the data from the current raw data file once, and then turn off acquisition and recording. The file can be restarted by starting acquisition again.

6.2 Recording a File

Recording Raw Data Files

All hardware sub systems that acquire data from a hardware device have the ability to write that acquired data out to a raw data file. There is a single command that is needed to enable this functionality. Each hardware sub system default setting consists of not writing a raw data file. In order to enable this functionality, the -SetRawDataFile command must be used. This command will set the filename of the raw data file to be used. The raw data filename may also be set from the hardware sub system properties dialog. Once that filename is set, whenever recording is turned on, the raw acquisition data will be written to the specified file. One thing to be aware of is that because this is a raw data file that is saving data from every ad channel in the system, for larger channel counts and higher sampling frequencies, this file has the ability to become very large in size. It is important to monitor the amount of free disk space that the PC has so that the disk does not become completely full.

Note: For Cheetah 64 systems a raw data file is written for each DT3010 board in use. Therefore if 2 DT3010 boards are installed in your PC, there will be 2 raw data files that will be written two. One data file contains data for the first 32 AD channels and one data files contains data for the last 32 AD channels.

7. Properties Page

Properties Page

Cheetah has many different configuration options that you can customize for your specific experimental needs. To make all this configuration options a little easier to navigate, Cheetah has the Properties Page. The following items will assist you in utilizing this hub of Cheetah options.

Properties Page Topics:

Navigating the Properties Page
How to Make Global Changes
Generic Dialog Commands

7.1 How to Make Changes to Multiple Items at Once

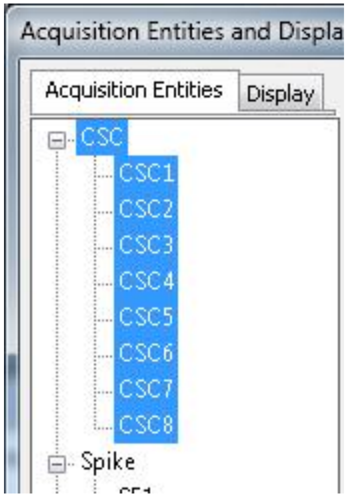
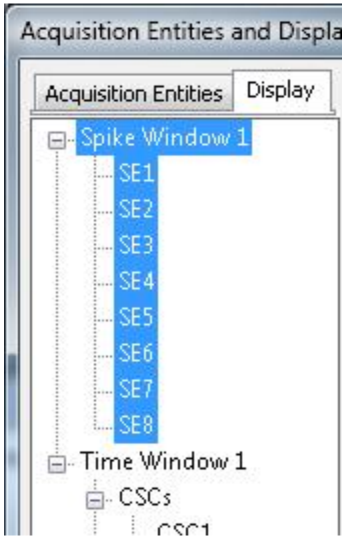
How to Make Changes to Multiple Items at Once

If you only have a few channels on your system, or are just tweaking a couple tetrodes of your setup, then changing each item individually is probably the best option. But what if you have a 320 channel Digital Lynx system and want to change the low cut filter for all 320 channels? The Properties Page allows you to accomplish this by making changes on groups of items. Each of the tabs of the property page will give you different multiple item change options, by grouping items differently. The same rules that apply to making a change on a single item also apply to multiple item changes. Here is an overview of how to make multiple item changes:

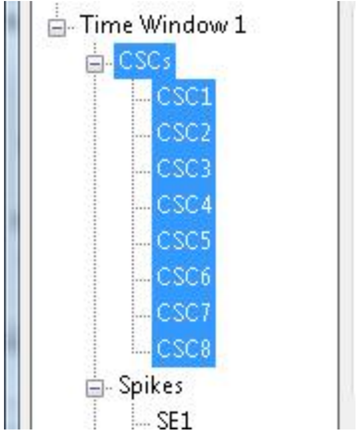
Global Selections

The Properties Page places items in a tree into groups based on shared properties of the items. Changing all items in a group is referred to as a global change.

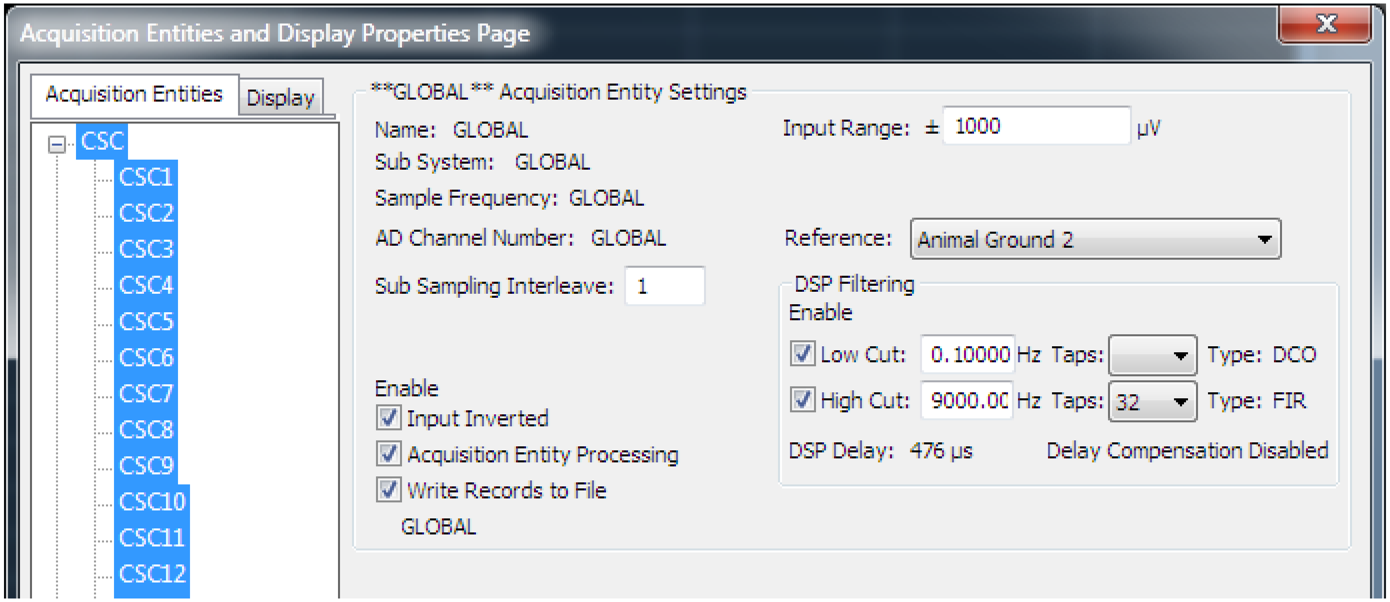
1. Click on a root node of the tree view. All of the items underneath the root node will be affected when a property is changed.

	
When the Properties Page Acquisition Entities tab is selected, all of the items are grouped by their acquisition entity type. Selecting a type allows you to globally change the properties of all of the acquisition entities of the selected type	When the Properties Page Display tab is selected, all of the items are grouped by their Plot Window. Selecting the window allows you to globally change all plots and the properties of the acquisition entities whose plots are in the window.

2. If the root node contains items with differing properties, you will see the items broken down into sub trees. Selecting a sub tree will allow you to apply global changes to all the items in the sub tree. There are options that can be globally set when selecting a sub tree that are not available when selecting a root node. For instance, in the below image you will be able to change all of the CSC properties of the items below CSCs. If "Time Window 1" were selected, only the window and plot properties could be changed.

3. 

4. Not all properties are available when trying to make a global change. If a property is unavailable, for any reason, it will will either be grayed out or not shown. The headers of all sections that are under global control will have **GLOBAL** added to the front of the section title, and all status information will have be changed to the word GLOBAL. Any changes you make will automatically change all of the items beneath your current selection in the tree view. All of the rules that apply to changing a single item also apply to changing multiple items. You will want to see the reference guide entry for the specific item type you are trying to change for more information on that setting.



GLOBAL Acquisition Entity Settings

Name: GLOBAL
Sub System: GLOBAL
Sample Frequency: GLOBAL
AD Channel Number: GLOBAL
Sub Sampling Interleave: 1

Enable
☑ Input Inverted
☑ Acquisition Entity Processing
☑ Write Records to File
GLOBAL

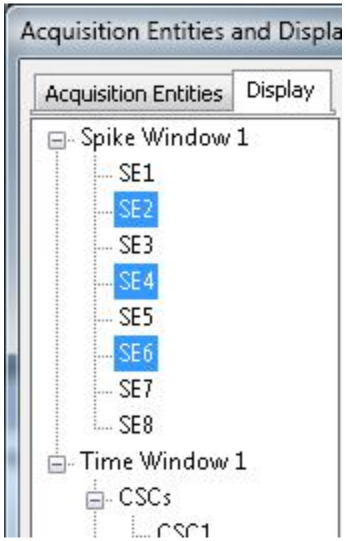
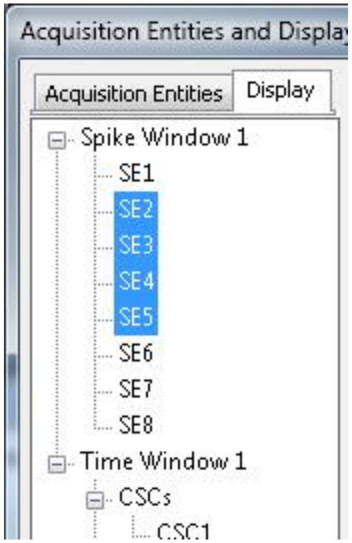
Input Range: ± 1000 µV
Reference: Animal Ground 2

DSP Filtering
Enable
☑ Low Cut: 0.10000 Hz Taps: Type: DCO
☑ High Cut: 9000.0C Hz Taps: 32 Type: FIR
DSP Delay: 476 µs Delay Compensation Disabled

Multiple Selections

If changes to only a few particular items are desired, you can select only the items that you want to change. As with global selections, not all options are available when multiple items are selected. If an property is unavailable, it will either be grayed out or not shown. The values shown in the properties are those of the most recently selected item.

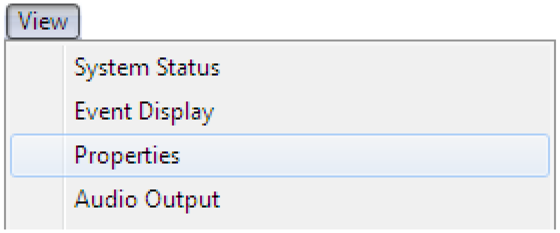
Cheetah supports standard Windows multi-select semantics, using the Ctrl and Shift keyboard modifiers.

	
Holding down the Ctrl key and left clicking the mouse will allow you to select individual items without selecting items in between. Clicking on an already selected item will deselect the clicked item. Attempting to select an item in a different subtree will deselect all previously selected items. In the above image, selecting CSC1 will deselect SE2, SE4 and SE6. If using the up and down arrow keys to select items, there is no difference between using the Ctrl and Shift modifiers.	After selecting an initial item, you can hold down the Shift key and left click the mouse on a second item to select all items between them. The above selection was made by clicking on SE2, holding down Shift and then clicking on SE5. Attempting to select an item in a different subtree will deselect all previously selected items. In the above image, selecting CSC1 will deselect SE2, SE3, SE4 and SE5. If using the up and down arrow keys to select items, there is no difference between using the Ctrl and Shift modifiers.

7.2 Navigating the Properties Page

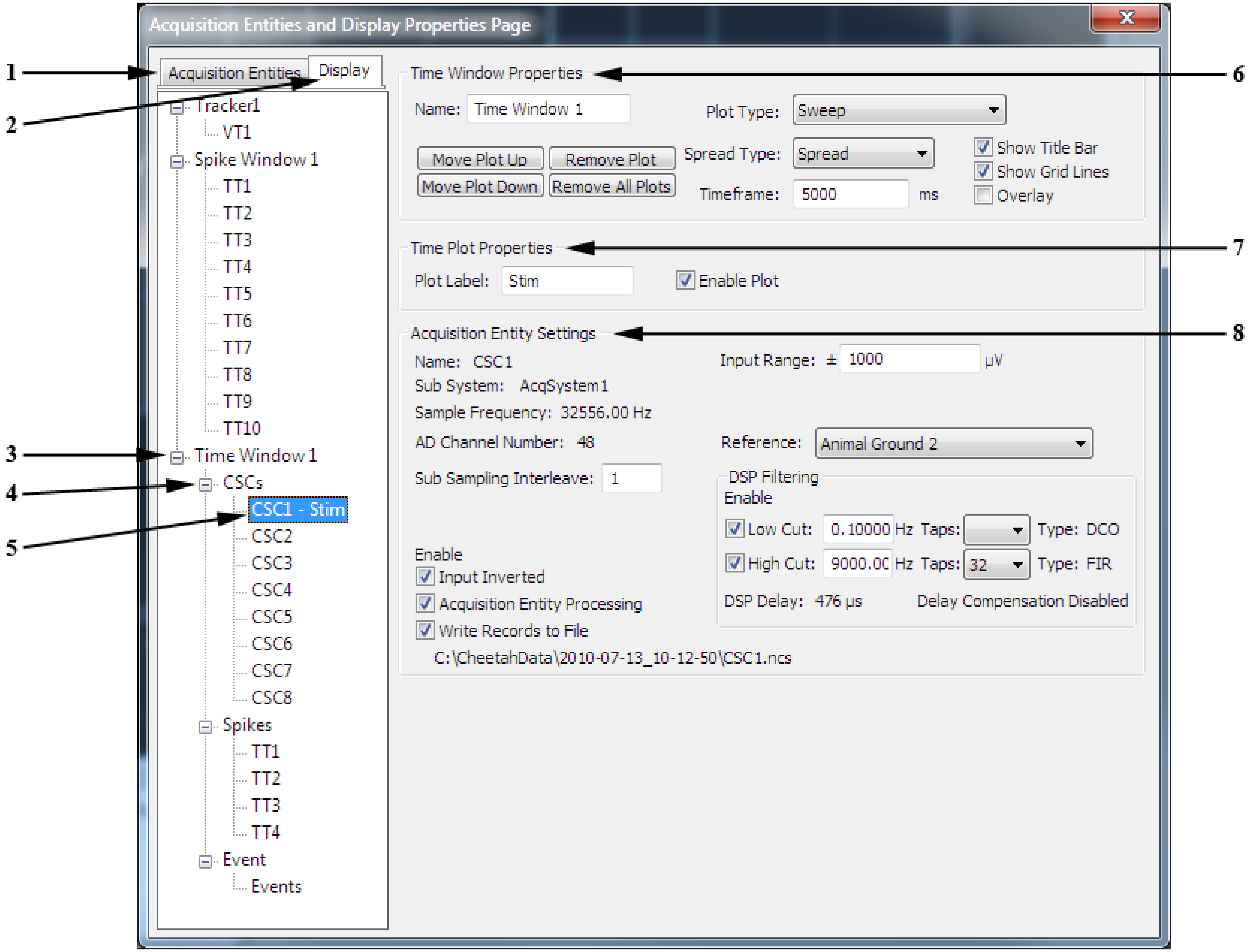
Properties Page

The Properties page will allow you to view and update the current settings that Cheetah is using for all plot windows, plots and acquisition entities. It can be launched from the View menu of Cheetah:



There are also multiple ways to view the Properties Page from the plots and plot windows. This varies by type, see the reference guide entry for the plots and plot windows of the specific type you wish to change.

Properties Page Overview



Time Window Properties

Name: Time Window 1

Plot Type: Sweep

Spread Type: Spread

Timeframe: 5000 ms

☑ Show Title Bar

☑ Show Grid Lines

☐ Overlay

Time Plot Properties

Plot Label: Stim

☑ Enable Plot

Acquisition Entity Settings

Name: CSC1

Sub System: AcqSystem1

Sample Frequency: 32556.00 Hz

AD Channel Number: 48

Sub Sampling Interleave: 1

Input Range: ± 1000 µV

Reference: Animal Ground 2

DSP Filtering

Enable

☑ Low Cut: 0.10000 Hz Taps: Type: DCO

☑ High Cut: 9000.0C Hz Taps: 32 Type: FIR

DSP Delay: 476 µs Delay Compensation Disabled

Enable

☑ Input Inverted

☑ Acquisition Entity Processing

☑ Write Records to File

C:\CheetahData\2010-07-13_10-12-50\CSC1.ncs

1. Acquisition Entities Tab	Clicking on this tab will sort all acquisition entities in the system by type. Only the properties in the acquisition entity properties section will be available when this tab is selected.
2. Display Tab	Clicking on this tab will sort all of the plots in the system by the plot window that contains them. All of the

	properties sections are shown when this tab is selected. Any acquisition entity that does not have an associated plot will not be able to be edited when this tab is selected, and will have to be edited from the acquisition entities tab
3. Root Node	The root node is used to group items based on which tab is selected. You can expand and collapse the items beneath the root node by clicking the + and - next to the root node. Selecting a root node will allow you to make global changes (See How to Make Global Changes).
4. Sub Tree	If a root node contains sub items that have different properties, the root node will have one or more sub tree categories. Selecting one of the sub trees allows you to make global changes to just the items in the sub tree. Certain options may be globally changed when selecting a sub tree that are not available when selecting a root node(See How to Make Global Changes).
5. Sub Item	These are the individual items available for property modification. Clicking on a sub item shows all of the properties for that sub item in the properties sections, and allows you to change its properties. The name shown here is the name of the acquisition entity (in the case of plots it is the AE that the plot represents, the plot label will be shown after the AE name, if a plot label has been set).
6. Plot Window Properties Section	This section will show all of the properties for the plot window that is associated with the currently selected item.
7. Plot Properties Section	This section will show all of the properties for the plot that is associated with the currently selected item.
8. Acquisition Entity Properties Section	This section will show all of the properties for the acquisition entity that is associated with the currently selected item.

8. Continuously Sampled Channels

Continuously Sampled Channel (CSC) Acquisition Entity Overview

CSC acquisition entities will continuously process the incoming AD data from the hardware system. Filters and amplification can be applied to the signal, but no special signal or event detection is done. CSC AEs can only process signals from a single AD channel. CSCs are normally used to monitor EEG or some external analog signal, such as an eye tracker. CSC acquisition entities must be created from Cheetah commands; see the CSC acquisition entity commands link below for more information.

CSC Topics:

CSC Acquisition Entity Properties

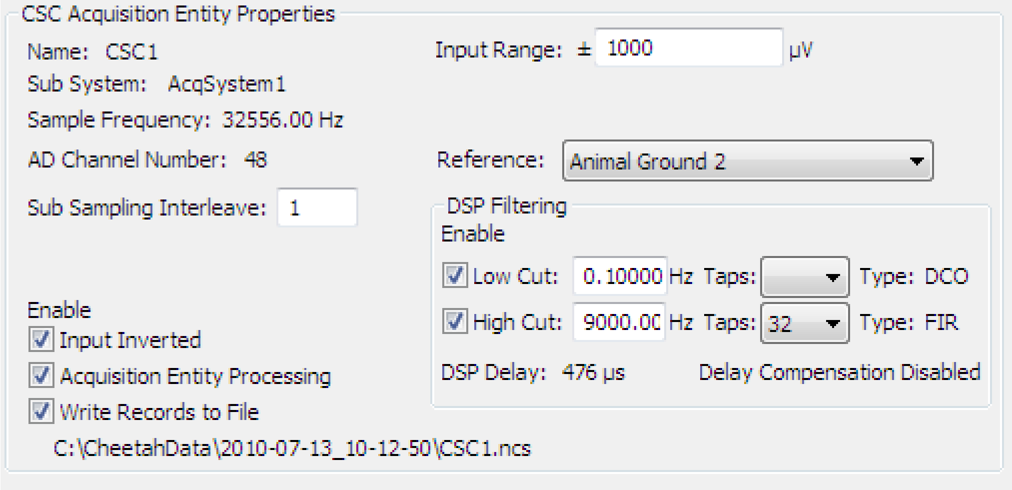
Time Windows
Time Plots
CSC Acquisition Entity Commands
Time Window Commands
Time Plot Commands

8.1 AE Properties

Continuously Sampled Channel (CSC) Acquisition Entity Properties

These settings are used to control how the CSC acquisition entities process AD data and what it does with the data after processing. The acquisition entity settings are shown on the properties page when a time plot or CSC AE is selected in the properties tree.

CSC Acquisition Entity Settings



CSC Acquisition Entity Properties

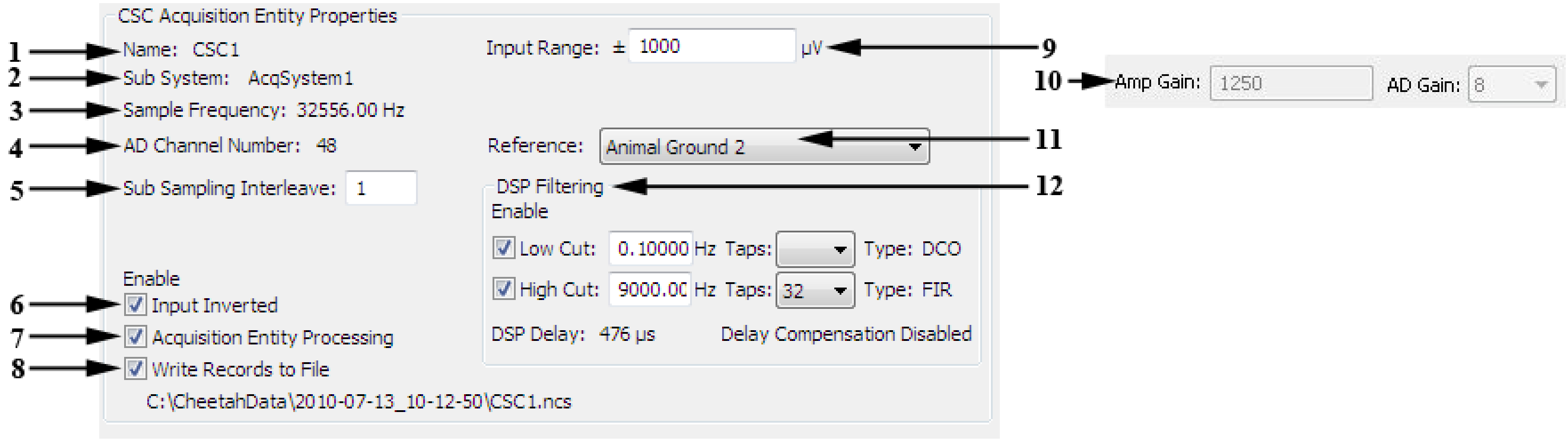
Name: CSC1
Sub System: AcqSystem1
Sample Frequency: 32556.00 Hz
AD Channel Number: 48
Sub Sampling Interleave: 1

Input Range: ± 1000 µV
Reference: Animal Ground 2

DSP Filtering
Enable
☑ Low Cut: 0.10000 Hz Taps: Type: DCO
☑ High Cut: 9000.00 Hz Taps: 32 Type: FIR
DSP Delay: 476 µs Delay Compensation Disabled

Enable
☑ Input Inverted
☑ Acquisition Entity Processing
☑ Write Records to File
C:\CheetahData\2010-07-13_10-12-50\CSC1.ncs

CSC Acquisition Entity General Settings



CSC Acquisition Entity Properties

Name: CSC1

Sub System: AcqSystem1

Sample Frequency: 32556.00 Hz

AD Channel Number: 48

Sub Sampling Interleave: 1

Enable

☑ Input Inverted

☑ Acquisition Entity Processing

☑ Write Records to File

C:\CheetahData\2010-07-13_10-12-50\CSC1.ncs

Input Range: ± 1000 µV

Amp Gain: 1250 AD Gain: 8

Reference: Animal Ground 2

DSP Filtering Enable

☑ Low Cut: 0.10000 Hz Taps: Type: DCO

☑ High Cut: 9000.0 Hz Taps: 32 Type: FIR

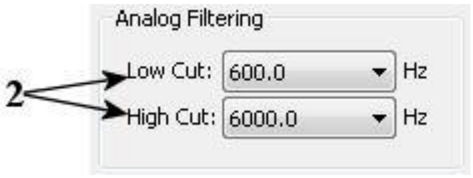
DSP Delay: 476 µs Delay Compensation Disabled

1. Acquisition Entity Name	This is the unique name that is used to identify this acquisition entity. It is the name you chose when you created the acquisition entity.
2. Sub System Name	This is the name of the recording system from where this acquisition entity will receive its data.
3. Sampling Frequency	This is the rate at which Cheetah is sampling data for this acquisition entity.
4. A/D Channel Number	This is the channel on the acquisition subsystem where data is obtained for this CSC acquisition entity.
5. Sub Sampling Interleave	This command allows you to record data for a particular acquisition entity at a lower sampling rate than other acquisition entities. The sub sampling interleave tells Cheetah to process only every Nth (where N is the Value specified) sample obtained from the recording hardware. This can also be seen as a sampling divisor. This setting cannot be changed while Cheetah is recording. The value must be between 1 and 128 for CSC acquisition entities. **Example:** A Digital Lynx system normally samples all channels at 32000 Hz. Suppose you want to sample CSC1 at 8000 Hz. You would type 4 in the box and hit enter. This will only process every 4th sample, giving an effective sampling rate of 8000 Hz.
6. Input Inversion Setting	Cheetah will automatically invert incoming AD data before it is processed if this box is checked, and will not adjust the polarity of the incoming AD data if this box is not checked. Unadjusted signals are shown with positive voltage in the up direction.
7. Acquisition Entity Processing Enable	Enables (checked) or disables (unchecked) the processing of data by the acquisition entity. If record processing is disabled, records will not be able to be displayed, sent to NetCom or saved to a file. Raw data file processing will still occur if it is enabled (see -SetRawDataFile). When processing is disabled, the Write Records to File setting

	is disabled. If acquisition entity processing is toggled during acquisition, CSC record timestamps may no longer be aligned between CSC acquisition entities. CSC records for all acquisition entities are always realigned when acquisition is started.
8. Data File Output Setting	When this box is checked, all CSC records will be saved to the file that is shown right beneath this check box. Removing the check next to this setting will disable CSC record file writing. When file writing is disabled, you will still be able to see visual representations of the records on the time plots, as well as be able to receive records via NetCom. **However, no information will be permanently saved while you are recording.**
9. Input Range Setting	Here you will be able to change the value of the input range this CSC acquisition entity. This value will be in microvolts and its range is based upon the hardware sub system that is in use The input range will always be from the negative of this number to the positive (i.e. in the above image, the input range is from -1000 to 1000 microvolts). This value cannot be changed while Cheetah is recording. These settings will only be enabled if using Input Range as the Amplifier Gain type (See Cheetah64 or Cheetah160 Properties).
10. Amp and AD Gain Settings	When using digital acquisition systems, only input range adjustment is available. Analog systems allow you to adjust the individual gains of both the external amplifier and the AD conversion device directly. You should only use this option if you need direct control over these values. Since the Lynx8 amplifiers have discrete gain values, if the value entered is not one of those values, it will be changed to the closest discrete value available. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain values separately. This value cannot be changed while Cheetah is recording. These settings will only be enabled if using Amp Gain as the Amplifier Gain type (See Cheetah64 or Cheetah160 Properties).
11. Reference Selection	Allows you to select the reference to use for this acquisition entity This control is only shown if your system supports software controlled reference selection. Only references currently allowed by the referencing hardware will be shown in this list. If a reference you wish to use is not shown in this list, you can select *More Reference Options...* from the list to launch the DRS Properties dialog. If an acquisition entity shares one of its AD channels with other acquisition entities, the reference for all acquisition entities using that AD channel will be changed. In the case of tetrodes and stereotrodes, this will involve more than one AD channel. **Example:** CSC1's source is AD Channel 0 and TT1's sources are AD Channels 0, 1, 2 and 3. If the reference for CSC1 is changed to Animal Ground, not only will AD channel 0 change its reference to Animal Ground, but so will AD Channels 1, 2 and 3. This happens because all channels on TT1 must use the same reference.
12. Filter Settings	See the CSC Acquisition Entity Filtering Setup for more information.

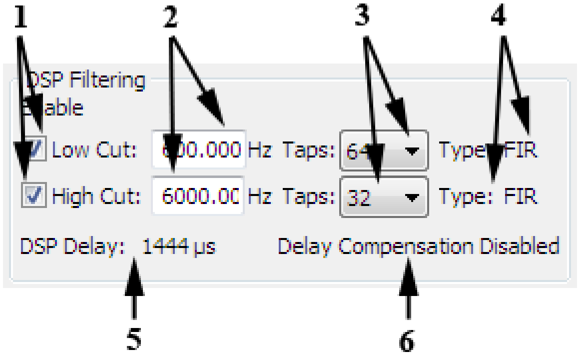
CSC Acquisition Entity Filtering Setup

Depending on your hardware system, you can filter signals in Cheetah two different ways. Analog filtering is done using external amplifiers that are controlled by Cheetah. Analog filtering physically filters the signal before it is sent to the computer. DSP filtering is only used on digital Neuralynx hardware systems. DSP filtering uses the computer to filter signals, and does not physically change the signal before it is processed by Cheetah. The appropriate filter settings are displayed based on the hardware system that is being used with Cheetah.

<table>
<tr>
<td colspan="2">


Analog Filtering
Low Cut: 600.0 Hz
High Cut: 6000.0 Hz

Analog Systems



DSP Filtering
Enable
☑ Low Cut: 600.000 Hz Taps: 64 Type: FIR
☑ High Cut: 6000.0 Hz Taps: 32 Type: FIR
DSP Delay: 1444 µs Delay Compensation Disabled

Digital Systems
</td>
</tr>
<tr>
<td>1. Low and High Cut DSP Filter Enable</td>
<td>Cheetah has the ability to process all signals using digital signal processing (DSP). Checking this box will turn the high cut (low pass) and low cut (high pass) DSP filter on (checked) or off (unchecked) for the specified acquisition entity. Changing the enabled sate does not affect the actual filter value of the DSP filter, it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers. When the box is unchecked (disabled), you will not be able to change the filter value or number of taps.</td>
</tr>
<tr>
<td>2. Low and High Cut Filter Value</td>
<td>The settings for the low cut filters differ depending on what type of acquisition system you are using.

1. Digital Systems: Sets the frequency that Cheetah will use for the high cut (low pass) or low cut (high pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The filter frequency has no effect if high cut filtering is disabled. High cut filters will only allow signals whose frequency is below this value to be recorded by Cheetah and low cut filters will only allow signals whose frequency is above this value. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile). This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. This value can only be changed when DSP filtering is enabled.
2. Analog Systems: Sets the frequency that Cheetah will use for the high cut (low pass) or low cut (high pass) analog filter on all channels of the specified acquisition entity. Low cut filters will only allow signals whose frequency is between the values of the high and low cut filters to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. The filter value options are based on the filters available on the Lynx-8 amplifier.</td>
</tr>
</table>

3. Low and High Cut DSP Filter Taps	Digital signal processing (DSP) taps determine the amount of rolloff for the DSP filter. If you notice the cut filter is allowing signals that are too far beneath (low cut) or above (high cut) your setting to be processed by Cheetah, you may want to increase (low cut) or decrease (high cut) this value. Cheetah will normally select a tap value that is appropriate for the specific filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers. This value can only be changed when DSP filtering is enabled. If the frequency value is changed to a value that is not available with the current number of taps, Cheetah will change the number of taps to the closest appropriate value.
4. Low and High Cut DSP Filter Type	Shows the type of DSP filter being used by Cheetah for the given filter frequency. This can be one of the following: 1. **FIR**: A finite impulse response filter is being used to filter the data. 2. **DCO:** Uses a running average to remove the DC component from the AC signal. 3. **None:** No DSP filtering is being applied to the incoming data.
5. DSP Delay	The delay introduced by the current DSP filter settings. For more information on DSP delay see the -SetDSPDelayCompensationEnabled command.
6. Delay Compensation	Displays whether DSP delay compensation is enabled or disabled. For more information on DSP delay see the -SetDSPDelayCompensationEnabled command.

8.2 Time Windows

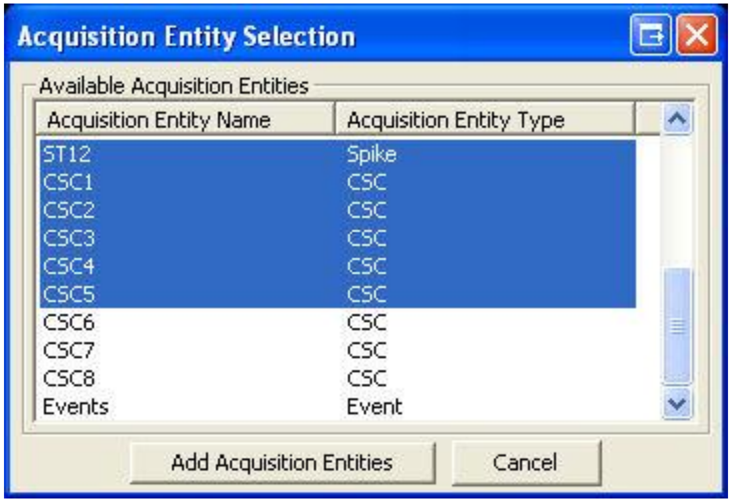
Time Windows

Creating a Time Display

When an acquisition entity is added to your system, no display is created for it. In order to see what the a time based view of what an AE is doing, you need to create a time window and then add a plot for the AE. Currently time windows can display CSC, Spike and Event acquisition entities.

You can create a time window from the Window menu on Cheetah's main window.

You will then get a new, empty time window. To add a plot to the window you can either use the Display menu of the new window or right click anywhere in the window and select Add Plot(s). You will then see the Acquisition Entity Selection dialog. Select one or multiple (by holding down Shift or Ctrl, just like multi-select in Windows) AEs and click the Add Acquisition Entities button to add plots.

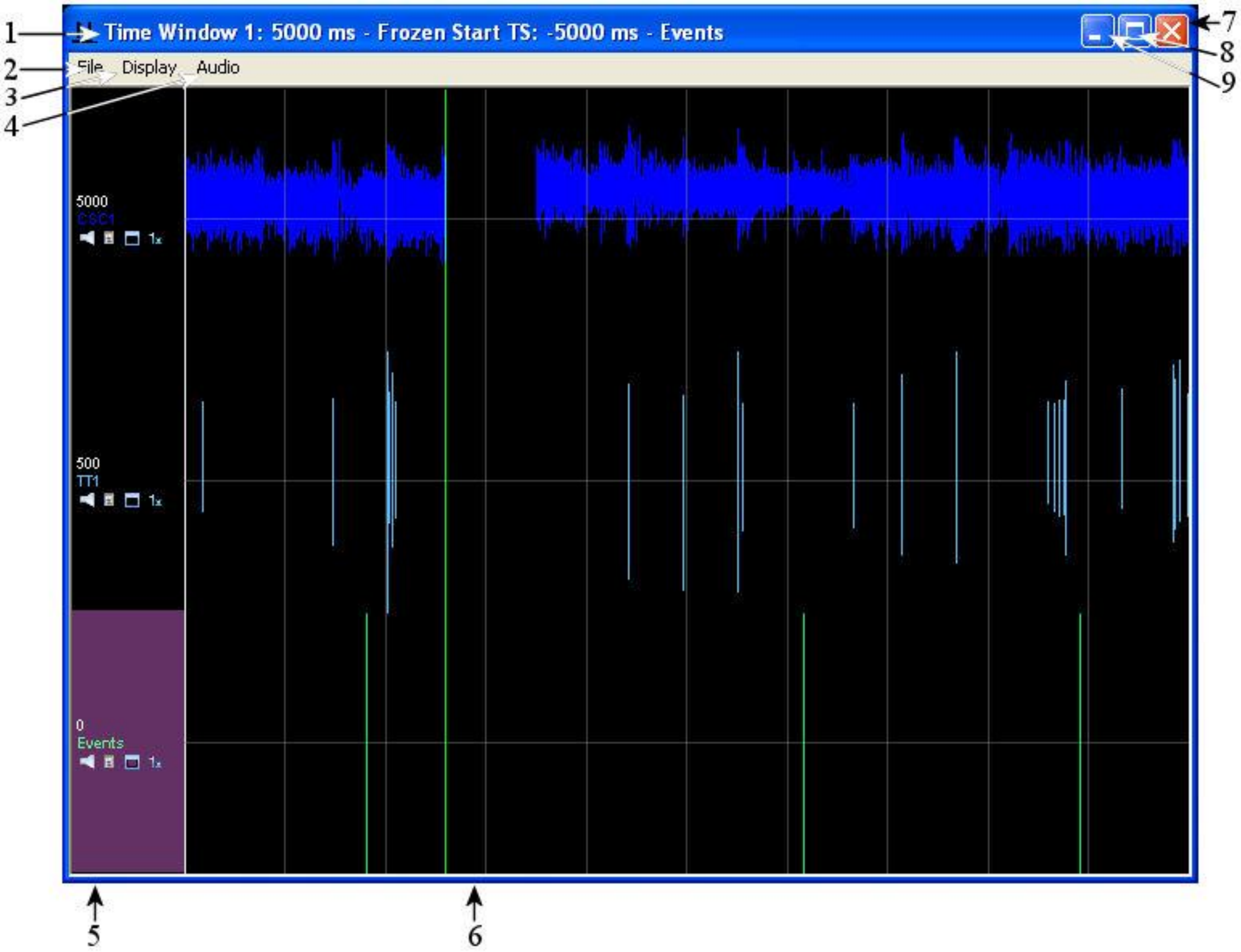


Acquisition Entity Name	Acquisition Entity Type
ST12	Spike
CSC1	CSC
CSC2	CSC
CSC3	CSC
CSC4	CSC
CSC5	CSC
CSC6	CSC
CSC7	CSC
CSC8	CSC
Events	Event

Time Window Overview

This section will give you a general overview of each of the parts of the Time window. There are more detailed descriptions of some of the sections after this overview.

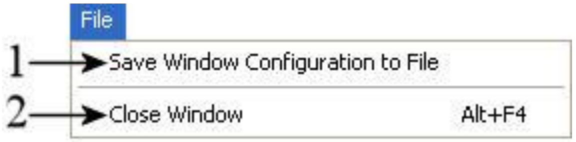
Time windows have the concept of a current plot. This plot is indicated by a purple plot title bar and the name of the plot shown in the window's title bar. In the following image, the current plot in Time Window 1 is Events. When a plot is current, all plot specific menu options and keyboard short cuts will be directed at that plot (i.e. setting the audio source). A plot can be made current by clicking on it. When a new plot is added, it is automatically set to the current plot.



1. Title Bar	The time window title bar will always display the name of the window along with the name of the currently selected plot in this window. Additional information can also be displayed in the window's title bar, such as whether or not the window is frozen.
2. File Menu	This menu will expand to show some common window tasks. See the detailed description of the time window's

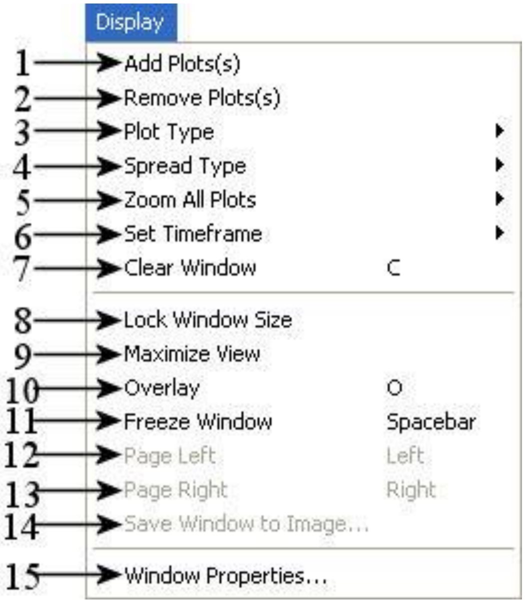
	file menu.
3. Display Menu	This menu will expand to allow you to manipulate some of the display aspects of the time window. See the detailed description of the time window's display menu.
4. Audio Menu	This menu will expand to allow you to manipulate the audio output settings in Cheetah. See the detailed description of the Spike window's audio menu.
5. Plot Title Bar	Each time window has a single plot title bar for all plots.
6. Plot Area	This area will contain the time plots for this window. Time plots can either be in maximized (only one plot is visible) or normal (all plots in this window are visible). For more information on the time plot, see the time plot description.
7. Close Window	Clicking on this X will close a window, exactly as it does for all Windows programs. Closing a window will destroy the window. This means that when you close a window, all of the display settings you have changed and plots you have added to the window will be lost.
8. Maximize Window	Clicking this button behaves the same as it does for all Windows programs on your system.
9. Minimize Window	Clicking this button will minimize this window to the bottom of the screen. It will not minimize this window to the taskbar as it does with most Windows programs.

Time Window File Menu



1. Save Window Configuration To File	Saves the window, plot and all of their current settings to a configuration file. This file can be reloaded at any time. However, the acquisition entity associated with the plot must exist, and a window with the same name must not exist. This does not save the current hardware or acquisition entity settings.
2. Close Window	Clicking on this menu option will close a window, exactly as it does for all Windows programs. Closing a window will destroy the window. This means that when you close a window, all of the display settings you have changed and plots you have added to the window will be lost. After you click the close button, a message box will be shown where you will confirm that you want to destroy the window.

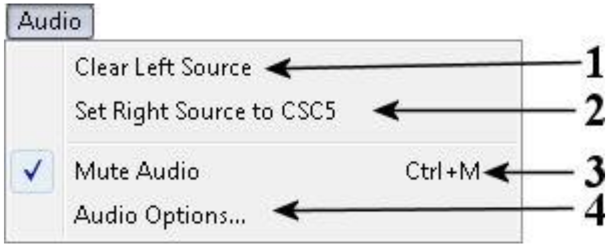
Time Window Display Menu



1. Add Plots	Clicking this menu option will allow you to add a time plot to this window. When you select add plot, you will see the Acquisition Entity selection dialog. This dialog will have a list of available acquisition entities that can be used to create a plot and add it to this window.
2. Remove Plots	Clicking this menu option will allow you to remove time plot(s) from the window. When you select remove plot, you will see the Acquisition Entity selection dialog. This dialog will have a list of all the plots currently in the time window. The user may select any number of plots to be removed
3. Plot Type Selection	This menu item contains a sub menu listing the plot types available. See *Plot Type Selection* under the *Time Window Properties* section for more details.
4. Spread Type Selection	This menu item contains a sub menu listing the spread types available. See *Spread Type Selection* under the *Time Window Properties* section for more details.
5. Zoom All Plots	This menu item contains a sub menu listing the various zoom settings. There are 4 choices for that sub menu. They are *1x*, *2x*, *4x* and *8x*. The zoom factor is a multiplication of the factor applied to the data being plotted, but does not change the data processed by Cheetah. Selecting an item from the sub menu will set the zoom factor for all the plots in the window.
6. Set Timeframe	Sets the amount of time that data remains visible in the Time window. This command has no effect when the window is displaying Flash plot types. All data is cleared from the window when the timeframe is changed. The timeframe of the window will appear next to the window name in the window's title bar. The menu items sub menu allows for you to select one of the following values: 100, 200, 500, 1000, 2000, 5000, 10000. These values are all in milliseconds.
7. Clear Window	This will force all plots to clear themselves This is usually used when using overlay mode. In addition to this menu command, you can press the C key with the window selected to clear the display.

8. Lock Window Size	When the window size is locked, you will see a check mark next to this option. Locking the window size will disable resizing of the window.
9. Maximize View	Clicking this menu item with toggle between maximize and normal view. Normal view contain a plot being displayed in the window for every plot that exists for the window. Maximize view shows only the current plot, and the plot is maximized to the entire window display. There will be a checkmark next to this menu item when the window is in maximized view. This menu option is not available when there are no plots in the window.
10. Overlay Mode	The overlay menu option will switch the window in and out of overlay mode. When there is a check mark next to the menu item, this means the display is currently in overlay mode. When in overlay mode, the window will show all data in every plot. Clearing the display or resizing the window will cause all plots to clear their displays. In addition to this menu command, you can press the O key with this window selected to toggle overlay on and off.
11. Freeze Window	Selecting this menu option will freeze the drawing for all plots currently being displayed in the window. The word "frozen" will also appear in the title bar, after the current plots acquisition entity name. Clearing the display or resizing the window will cause the window to clear, but no new data will be displayed until the window is no longer frozen. There is also a check mark next to this option when the window is frozen. Unfreezing the window will begin to draw new data for each plot. You will not see any of the data that occurred while the window was frozen, but all data will be processed by Cheetah. In addition to this menu command, you can press the Spacebar with this window selected to freeze and unfreeze the display. Once a window has been frozen, history mode will become available for the window. In history mode, the user may navigate through approximately 30 seconds worth of data. The historical data is the last 30 seconds of data that occurred previous to when the window was frozen. Once a window is frozen, history mode is activated and any current data that is being acquired will not be added to the history buffer. When the window is unfrozen, data will once again be added to the history buffer.
12. Page Left	The window must be in history mode in order to used this option. This will move back in time at 1/2 the time frame of the window every time this option is selected.
13. Page Right	The window must be in history mode in order to used this option. This will move forward in time at 1/2 the time frame of the window every time this option is selected.
14. Save Window to Image	This option is only available when the window is frozen. It will allow you to save the current window display to a BMP, PNG or JPG raster image.
15. Window Properties	This will bring up the properties page and selects this window in the tree. If the properties page is closed, Cheetah will open the properties page. If the properties page is open, it will make sure the properties page is visible. You can see a detailed description of time window properties for more information.

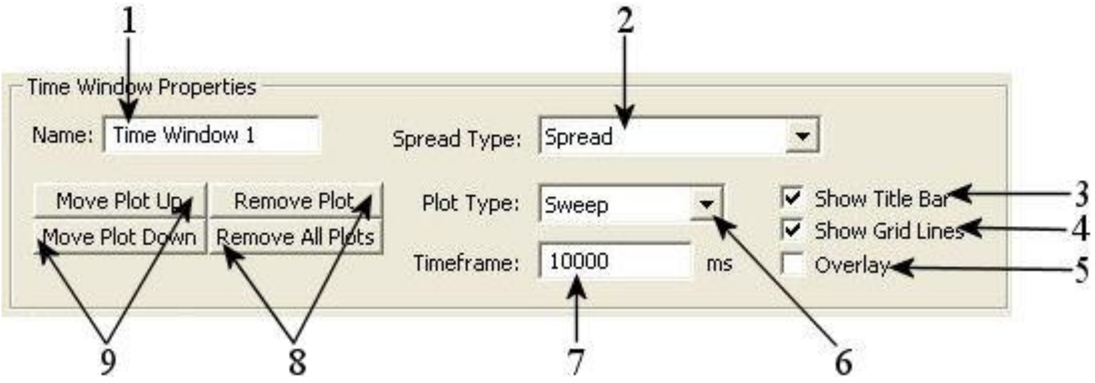
Time Window Audio Menu



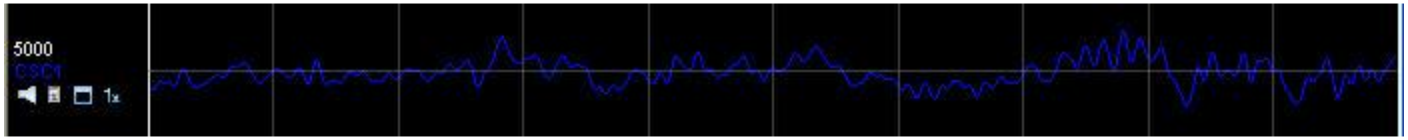
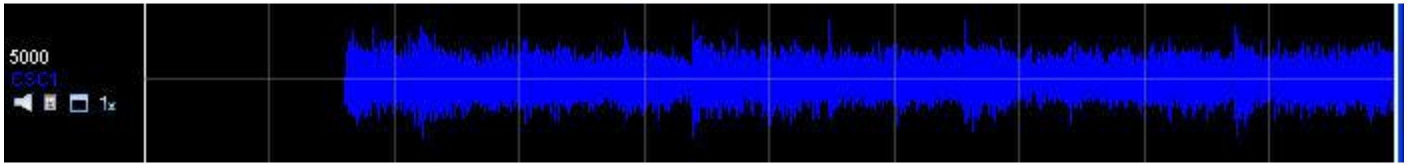
1. Set / Clear Left Channel	This menu option will allow you to set or clear the audio source for the left channel. This menu uses the current plot to determine what source will be set or cleared. If the current left source's AE is not the same as the current plot's AE, then this menu will allow you to set the current plot's AE to the current left source. If, however, the currently selected plot's AE is the same as the current left source's AE, then this menu option will allow you to clear the left source. Clearing the source will set the source's AE to None. In the above image, the current plot is CSC8, and it is currently set to the left audio source.
2. Set / Clear Right Channel	This is identical to the Set / Clear Left Channel menu option, except that it affects the right audio channel.
3. Mute Audio	When the audio is muted, Cheetah will not output sound through your speakers. This mutes both the left and right channels. When the audio is muted, there will be a checkmark next to this menu item. This command can also be run at any time by using the Ctrl+M keyboard shortcut. This setting only affects Cheetah, and does not mute the sound for other Windows programs.
4. Audio Options	This will launch the Audio Output Dialog for more detailed control over Cheetah's audio output.

Time Window Properties

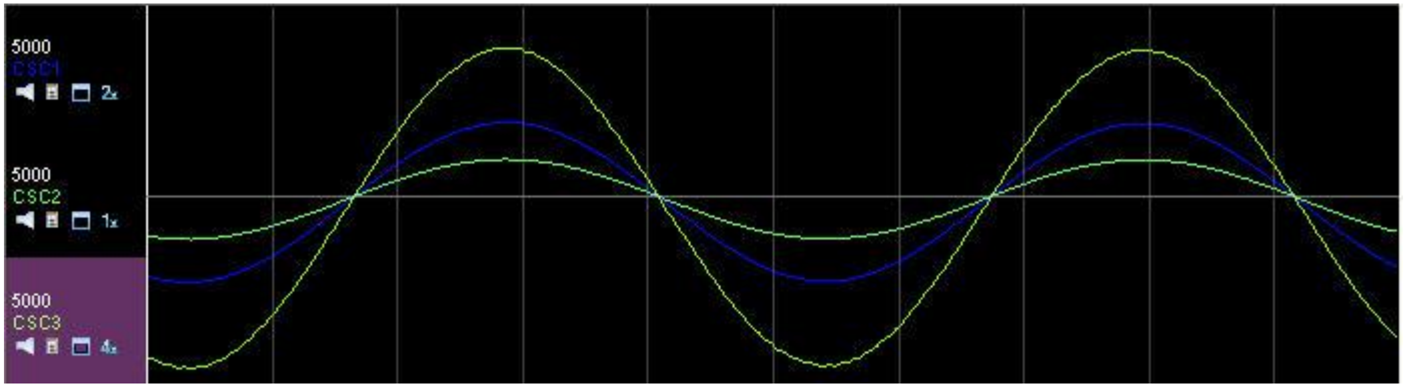
The Time window properties are shown in the properties window when a Time window or Time plot is selected in the properties tree. For more information on the properties window, see the detailed description of the properties window. Changes made to the window properties will affect all plots within this window.



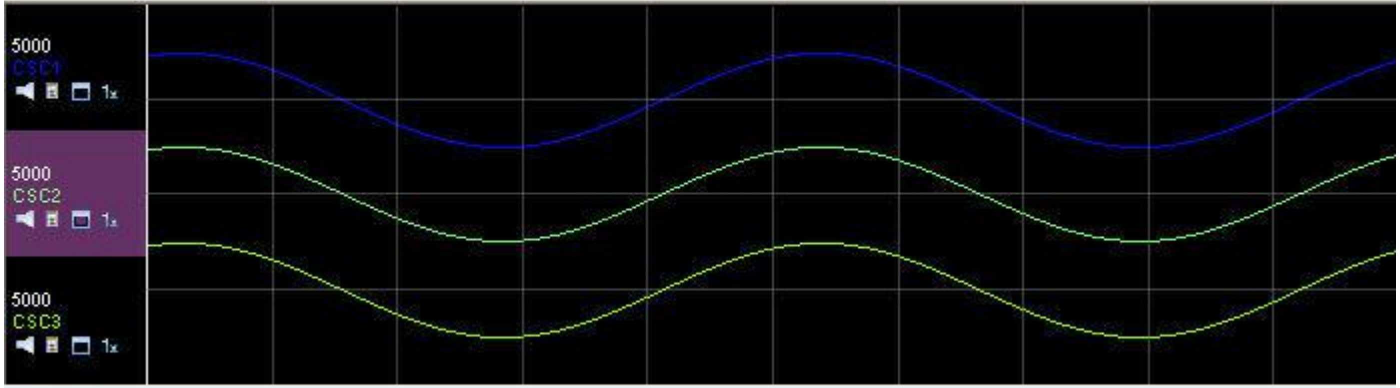
Name: Time Window 1
Spread Type: Spread
Plot Type: Sweep
Timeframe: 10000 ms
☑ Show Title Bar
☑ Show Grid Lines
☐ Overlay

1. Name	This is the name of this Time window, and it must be unique throughout Cheetah. The window name is shown in the window's title bar, as well as in the display properties tree.
2. Plot Type Selection	Spike plots can be displayed in the following ways: 1. **Flash:** Displays the waveform for single record. The data shown is indicative of the data that is written to the Cheetah data files.  2. **Scroll:** Similar to an oscilloscope, new waveform data will be shown on the right, and old data will scroll to the left. The amount of time shown in this plot can be adjusted with the by changing the window timeframe. The data shown is indicative of the data that is written to the Cheetah data files.  3. **Sweep:** A cursor will move from left to right across the screen. New data will be shown to the immediate left of the cursor. Old data will be cleared as the cursor moves past it. The data shown is indicative of the data that is written to the Cheetah data files The amount of time shown in this plot can be adjusted with the by changing the window timeframe. 
3. Show Title Bar	Sets the visibility of title bar for the specified display window. This option can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since all of the plot icons are located in the title bar, you will not be able to click on the icons when the title bar is hidden. Since the saved screen space is minimal, it is recommended that you leave the title bar visible if possible. All data in the window will clear when the title bar visibility is changed. The show title bar checkbox must be in 1 of the following states:

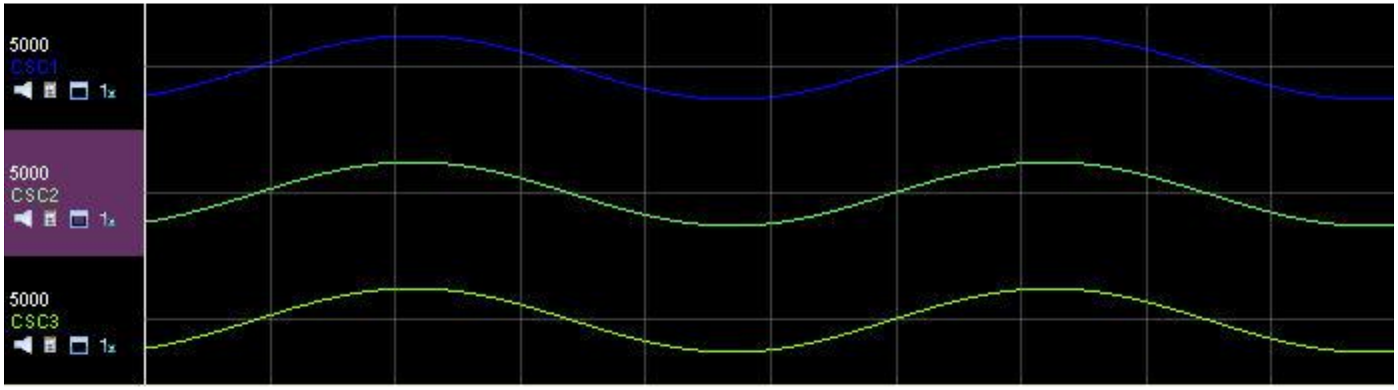
	1. **Checked**: The title bar is visible in the window. 2. **Unchecked:** The title bar is hidden from the window.
4. Show Grid Lines	Used to set the visibility of the vertical grid lines in a Time window. Hiding the grid lines will not hide the zero line for the time plots. All data is cleared from the window when the grid visibility is changed. Grid lines can be used to approximate the amount of time between different points of the visible time plot waveform. To determine the time between grid lines, take the windows time frame and divide by the number of gridlines minus 1. This command can be used to decrease CPU usage for large channel count systems or older computers. The show grid lines checkbox must be in 1 of the following states: 1. **Checked**: Gridlines are visible in the window. 2. **Unchecked:** Gridlines are hidden from the window.
5. Overlay Mode	Sets a plot window's overlay mode. Overlaid windows will not clear out old data before displaying new data. This setting effects all plots in this window. The overlay checkbox must be in 1 of the following states: 1. **Checked**: The window will not clear out any old data until either a clear command is issued, overlay is turned off, or the window is resized. 2. **Unchecked:** The window will clear out data based on the plot type.
6. Spread Type Selection	The spread type of Time windows can be changed using this selection box. Adjusting the spread type is similar to moving the zero line on an oscilloscope. It will adjust where the zero line of each of the waveforms is drawn in the window. Changing the spread type can be useful when you want to see seemingly similar plots overlaid on top of each other. All data in the window will clear when the spread type is changed. **WARNING:** Changing the spread type can cause CPU overload in high channel count systems. If you see drawing errors after changing the spread type, changing the spread type to FullSpread will alleviate some of the CPU strain. The possible options are: 1. **CommonZero:** All of the time plots will share the same zero line. This line will be in the middle of the window.



2. **HalfSpread:** All time plots have their own zero line. The window is divided into 3 sections. The top section contains 25% of the window. The middle section contains 50% of the window and the bottom section contains 25% of the window. The zero lines for each plot will be spread evenly throughout the middle section. This type is designed to allow each plot to use at least 50% of the available window. Plots will overlap when using this spread type.



3. **FullSpread:** All time plots have their own zero line. If the plots are not zoomed in, there will be no overlapping of waveforms.



7. Window Timeframe	Sets the amount of time that data remains visible in the Time window. This command has no effect when the window is displaying Flash plot types. All data is cleared from the window when the time frame is changed. The time frame of the window will appear next to the window name in the window's title bar. This value must be set between 100 and 30000 milliseconds. As the value is increased, less detail will be visible for the waveforms, but data will be visible longer. Decreasing the value will increase the waveform detail, while decreasing the time that data remains visible.
9. Plot Removal Buttons	Clicking on th *Remove Plot* button will delete the currently selected plot from the window. Clicking on the *Remove All Plots* button will delete all plots within the window.
10. Plot Positioning Buttons	Clicking on the *Move Plot Up* button will move the selected plot left or up in the plot window. Clicking on the *Move Plot Down* button will move the selected plot right or down in the plot window.

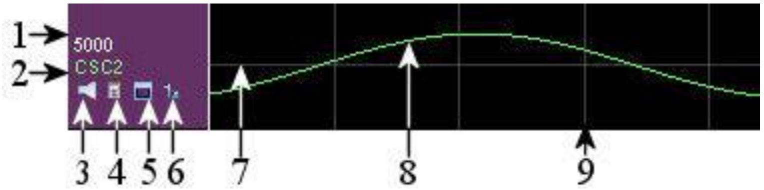
8.3 Time Plots

Time Plots

This section will cover time plots and their properties. Some plot properties are based on time window settings. For more information on window specific settings (including adding plots to windows) see the time window overview.

Time Plot Overview

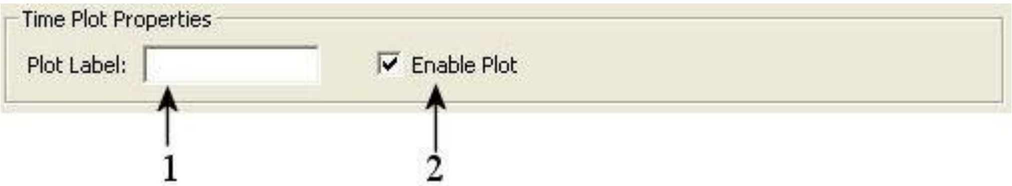
Time plots consist of two parts, the title bar (items 1-6 below) and the plot area (items 7-9). The plot area is free floating and will not necessarily be next to the title bar information. The plot can overlap other plots using different zoom and spread settings. The waveform color will always match the plot name color, and for all spread modes other than common zero are shown in the same order from top to bottom.

	
1. Input Range	Displays the current input range of this channel in microvolts. Since the plot area is not dedicated to a specific waveform, and different plots could have different input ranges and zoom factors, there is no set area that directly maps to voltage. The waveform will begin to clip when it reaches the positive or negative limits of the input range.

2. Plot Name	This is the name of the AE that supplies data to the plot. The waveform will be the same color as the plot name, and the order (from top to bottom) of the plot names is the same as the order (from top to bottom) of the waveforms (except in common zero spread mode).
3. Audio Menu	Displays the audio menu.
4. Plot Properties	Clicking this icon will make the properties page visible, select the display tab, and select the plot in the properties tree. See the detailed description of time plot properties for more information on plot properties.
5. Maximize/Restore Plot	Toggles the view for the plot. If the plot is in normal view (shown above), clicking this icon will maximize the plot, showing only this plot in the plot area of the time window. When in maximized view, the icon changes to a double square, and clicking on it will return the plot to normal view (all plots for this window are visible).
6. Zoom Plot	Clicking on this icon will cycle through the preset zoom options. There are 4 different zoom options: *1x*, *2x*, *4x* and *8x*. The zoom factor is a multiplication of the factor applied to the data being plotted, but does not change the data processed by Cheetah.
7. Zero Line	This line indicates where the zero voltage level of the signal is located. This line is not part of a fixed grid, and will move as the spread type is changed.
8. Waveform	The waveform of the selected acquisition entity's signal. If the window is in overlay mode, waveforms will not be cleared as new data is shown. Otherwise the signal is overwritten according to the current plot type for this window. The color of the waveform will always match the color of the plot name.
9. Grid Line	The vertical lines can be used to approximate time differences between different points of the waveform. The time per line can be approximated by taking the time frame of the window and dividing by the number of vertical lines. These lines are fixed and will not be changed as the plot type and spread type are changed.

Time Plot Properties

The Time plot properties are shown in the properties window when a Time window or a Time plot is selected in the properties tree. Selecting a Time window will allow you to make changes to all plots in the window. Selecting an individual plot will only allow changes to that individual plot.

	
1. Plot Label	Enter a label into the edit box. The label will be displayed after the plot name in the tree view on the properties page.

2. Plot Enable	This is used to stop plotting data for only a single acquisition entity's plot in a window, but do not want to remove the plot from the window. This works like a pause button on a DVD player. It will lock in whatever is currently displayed in the plot. If an action is taken that will clear the plot, the last data displayed will be cleared. No data will be added to the plot while it is disabled, but otherwise is processed normally. The plot enable check box must be in 1 of the following states: 1. **Checked**: The plot will display all data in the plot as is appropriate. 2. **Unchecked:** The will not be any new data displayed in the plot.

9. Spikes

Spike Acquisition Entity Overview

Spike acquisition entities will detect specific signals from the incoming neurological data. If these specific signals are found on any of the electrodes related to this spike acquisition entity, the signal found will be extracted from the incoming signal on all electrodes related to this spike acquisition entity , and saved to a spike record. The criteria used to detect and classify spikes are configurable in Cheetah. Spike classification (sometimes referred to as cluster cutting) can be done by using the SpikeSort 3D application. Spikes are sometimes referred to as single units. Spike acquisition entities can be created as single electrodes (SE), stereotrodes (ST, two electrodes), or tetrodes (TT, four electrodes). Spike acquisition entities must be created from Cheetah commands; see the spike acquisition entity commands link below for more information.

Spike Topics:

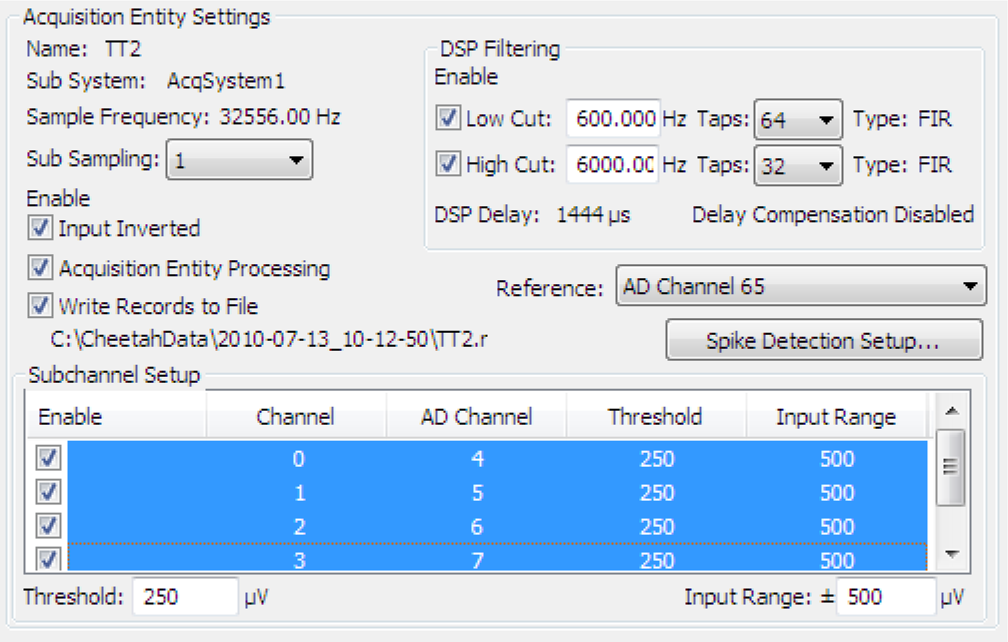
Spike Acquisition Entity Properties
Spike Windows
Spike Plots
Spike Acquisition Entity Commands
Spike Window Commands
Spike Plot Commands

9.1 AE Properties

Spike Acquisition Entity Properties

These commands are used to control how the spike acquisition entities process AD data and what it does with the data after processing. The acquisition entity settings are shown on the properties page when a spike plot or AE is selected in the properties tree.

Spike Acquisition Entity Settings



Acquisition Entity Settings

Name: TT2
Sub System: AcqSystem1
Sample Frequency: 32556.00 Hz
Sub Sampling: 1

Enable
☑ Input Inverted
☑ Acquisition Entity Processing
☑ Write Records to File
C:\CheetahData\2010-07-13_10-12-50\TT2.r

DSP Filtering
Enable
☑ Low Cut: 600.000 Hz Taps: 64 Type: FIR
☑ High Cut: 6000.0C Hz Taps: 32 Type: FIR
DSP Delay: 1444 µs Delay Compensation Disabled

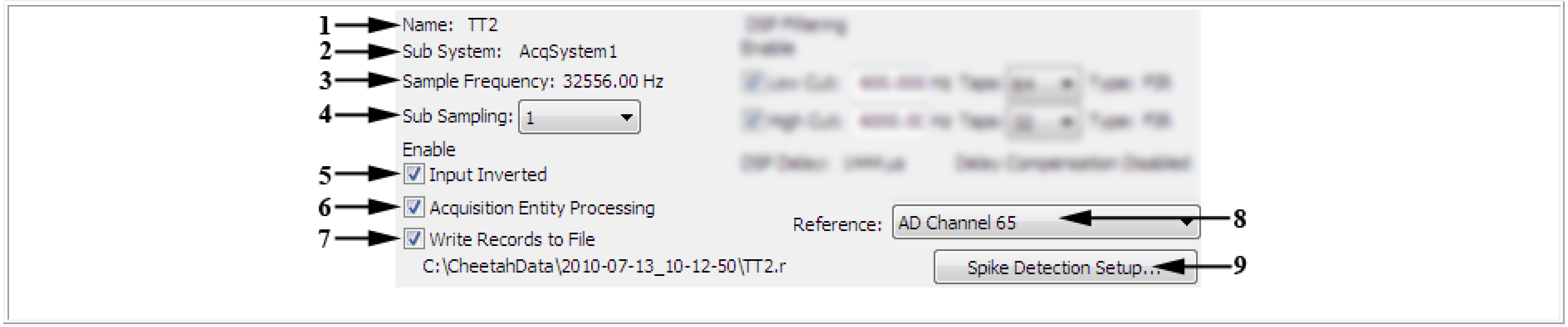
Reference: AD Channel 65

Subchannel Setup

Enable	Channel	AD Channel	Threshold	Input Range
☑	0	4	250	500
☑	1	5	250	500
☑	2	6	250	500
☑	3	7	250	500

Threshold: 250 µV
Input Range: ± 500 µV

Spike Acquisition Entity General Settings



Name: TT2
Sub System: AcqSystem1
Sample Frequency: 32556.00 Hz
Sub Sampling: 1

Enable
☑ Input Inverted
☑ Acquisition Entity Processing
☑ Write Records to File
C:\CheetahData\2010-07-13_10-12-50\TT2.r

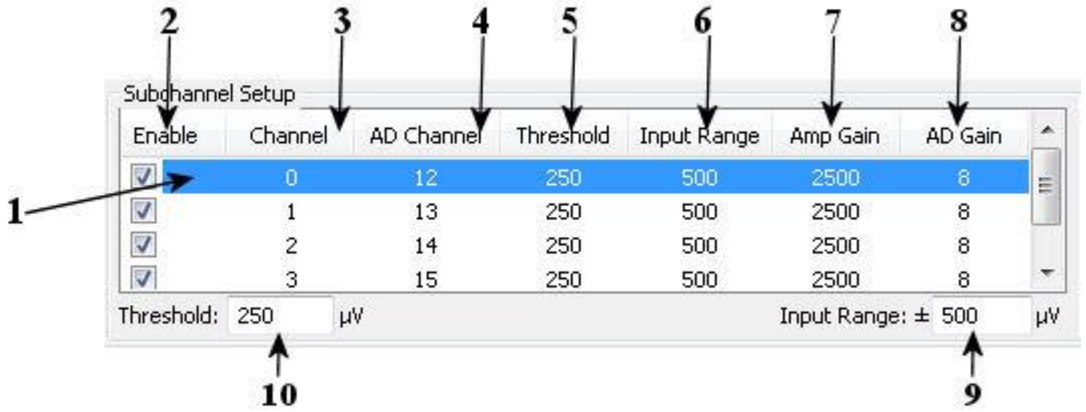
Reference: AD Channel 65

1. Acquisition Entity Name	This is the unique name that is used to identify this spike acquisition entity. It is the name you chose when you created the acquisition entity.
2. Sub System Name	This is the name of the recording system from where this acquisition entity will receive its data.
3. Sampling Frequency	This is the rate at which Cheetah is sampling data for this acquisition entity.
4. Sub Sampling	This command allows you to record data for a particular acquisition entity at a lower sampling rate than other acquisition entities. The sub sampling interleave tells Cheetah to process only every Nth (where N is the Value specified) sample obtained from the recording hardware. This can also be seen as a sampling divisor. This setting cannot be changed while Cheetah is recording. The value must be between 1 and 3 for spike acquisition entities. **Example:** A Digital Lynx system normally samples all channels at 32000 Hz. Suppose you want to sample SC2 at 8000 Hz. You would type 4 in the box and hit enter. This will only process every 4th sample, giving an effective sampling rate of 8000 Hz.
5. Input Inversion Setting	Cheetah will automatically invert incoming AD data before it is processed if this box is checked, and will not adjust the polarity of the incoming AD data if this box is not checked. Unadjusted signals are shown with positive voltage in the up direction.
6. Acquisition Entity Processing Enable	Enables (checked) or disables (unchecked) the processing of data by the acquisition entity. If record processing is disabled, records will not be able to be displayed, sent to NetCom or saved to a file. Raw data file processing will still occur if it is enabled (see -SetRawDataFile). When processing is disabled, the Write Records to File setting is disabled.
7. Data File Output Setting	When this box is checked, all spike records will be saved to the file that is shown right beneath this check box. Removing the check next to this setting will disable spike record file writing. When file writing is disabled, you will still be able to see visual representations of the records on the spike plots, as well as be able to receive records via NetCom. **However, no information will be permanently saved while you are recording.**
8. Reference Selection	Allows you to select the reference to use for this acquisition entity This control is only shown if your system supports software controlled reference selection. Only references currently allowed by the referencing hardware will be shown in this list. If a reference you wish to use is not shown in this list, you can select *More Reference Options*... from the list to launch the DRS Properties dialog. If an acquisition entity shares one of its AD channels with other acquisition entities, the reference for all acquisition entities using that AD channel will be changed. In the case of tetrodes and stereotrodes, this will involve more than one AD channel. **Example:** CSC1's source is AD Channel 0 and TT1's sources are AD Channels 0, 1, 2 and 3. If the reference for CSC1 is changed to Animal Ground, not only will AD channel 0 change its reference to Animal Ground, but so will AD Channels 1, 2 and 3. This happens because all channels on TT1 must use the same reference.

9. Spike Detection Setup	Launches the Spike Detection Setup dialog.

Spike Acquisition Entity Sub Channel Setup

In addition to single electrode spike detection, Cheetah has the ability to detect spikes on stereotrodes (2 channels) or tetrodes (4 channels). Each of these sub channels have settings that can vary independently of each other. This section will allow you to adjust those settings.



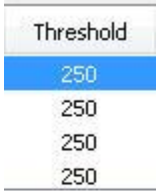
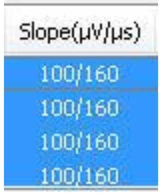
Subchannel Setup

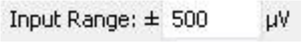
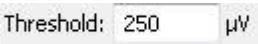
Enable	Channel	AD Channel	Threshold	Input Range	Amp Gain	AD Gain
☑	0	12	250	500	2500	8
☑	1	13	250	500	2500	8
☑	2	14	250	500	2500	8
☑	3	15	250	500	2500	8

Threshold: 250 µV

Input Range: ± 500 µV

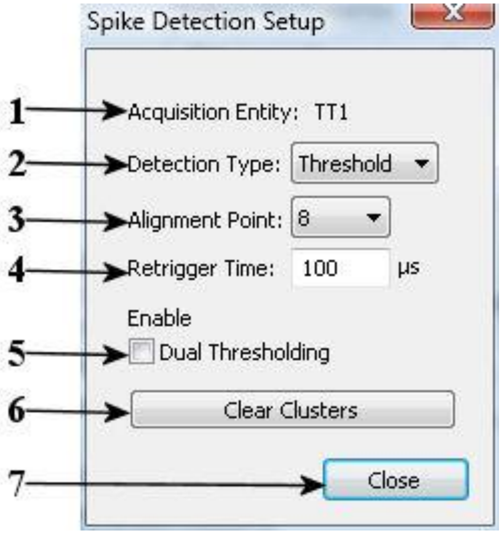
1. Channel Edit Selection	In this list you will see an entry for each sub channel in the current spike acquisition entity. When you click on a channel, the threshold and input range values for that channel will be shown in the threshold and input range entry boxes, and can be changed. You can select more than one channel for editing (stereotrodes and tetrodes only) by holding down the Ctrl or Shift key and clicking on the other channels you wish to edit. When you have more than one channel selected for edit, the values from the lowest channel number selected will be shown in the threshold and input range edit boxes. Changing one of these values with multiple channels selected will apply the entered value to all selected channels. At least one channel must be selected in order to change any of the values for any of the channels.
2. Sub Channel Enable	Enables or disables a particular channel of a spike acquisition entity. Disabling a channel will cause Cheetah to not process any data on that channel. When a channel is disabled, the waveform plot will change to show that the channel is disabled as shown in the following image:

	 If the waveform plot is too small, the DISABLED text will not be visible. Once the channel is enabled, it will display data normally.
3. Sub Channel Number	This number identifies each of the sub channels of this acquisition entity. This number is for identification purposes only.
4. A/D Channel Number	This is the AD channel on the acquisition subsystem where data is obtained for this spike sub channel.
5. Spike Detection Value	This is the current spike detection value for this spike sub channel. The value shown depends on what method of spike detection is being used for this spike acquisition entity (See Spike Detection Setup). 1. **Threshold**: The threshold value will be shown in microvolts.  Threshold 250 250 250 250 2. **Slope:** The slope value will be shown as microvolts/microseconds.  Slope(μV/μs) 100/160 100/160 100/160 100/160
6. Input Range	This is the current input range in microvolts for this spike sub channel. The input range will always be from the negative of

	this number to the positive (i.e. in the above image, sub channel 1's input range is from -2500 to 2500 microvolts).
7. Amplifier Gain	The amp gain setting allows direct control of the programmable analog gain stage in the Lynx-8 amplifier. The Lynx-8 provides selectable gain from 1x to 50,000x in 4096 steps. This column is not visible when using a digital acquisition system.
8. AD Gain	The A/D gain setting allows direct control of the final analog gain stage prior to analog-to-digital conversion. The user can select between gains of 1x, 2x, 4x or 8x, thereby normalizing the input range of the A/D converter card (DT3010) to +/-10V, 5V, 2.5V or 1.25V respectively. This column is not visible when using a digital acquisition system.
9. Range Entry	Here you will be able to change the value of the range for all selected sub channels of this spike acquisition entity. What is shown depends on what method of range adjustment is being used for the acquisition system (See Cheetah64 or Cheetah160 Properties). When using digital acquisition systems, only input range adjustment is available. 1. **Input Range** This value will be in microvolts and must be a whole number within the current input range. If you change the input range to a value that is less than the current threshold, the threshold will be adjusted to be equal to the input range you entered. This value cannot be changed while Cheetah is recording.  Input Range: ± 500 µV 2. **Amp Gain:** Analog systems allow you to adjust the individual gains of both the external amplifier and the AD conversion device directly. You should only use this option if you need direct control over these values. Since the Lynx8 amplifiers have discrete gain values, if the value entered is not one of those values, it will be changed to the closest discrete value available. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain values separately. This value cannot be changed while Cheetah is recording.  Amp Gain: 2500 AD Gain: 8
10. Spike Detection Entry	Here you will be able to change the value of the current spike detection value for this spike sub channel. What is shown depends on what method of spike detection is being used for this spike acquisition entity (See Spike Detection Setup). This value cannot be changed while Cheetah is recording. 1. **Threshold**: The threshold value is in microvolts, and must be less than the current input range..  Threshold: 250 µV 2. **Slope:** The slope value is entered as a voltage change in microvolts over an amount of time in microseconds.  Voltage Change: 100 µV over 160 µs

Spike Detection Setup

Clicking on the Spike Detection Setup button allows Cheetah to change the way that it detects spikes, and what data is saved when a spike is detected. Here you will be able to adjust those settings.



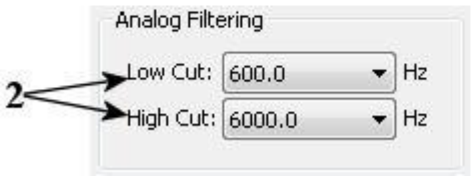
Acquisition Entity: TT1
Detection Type: Threshold
Alignment Point: 8
Retrigger Time: 100 μs
Enable
☐ Dual Thresholding

1. Acquisition Entity Name	This is the unique name that is used to identify this spike acquisition entity. It is the name you chose when you created the acquisition entity.
2. Detection Type	Here you will specify how Cheetah will extract spikes from the continuous neurological data. You may choose from the following options: 1. **Threshold:** When a signal is detected that is higher than a specified threshold, Cheetah will begin to look for the peak of the spike. After that peak is detected, it will align the peak using the alignment point setting and save 32 points of data to a spike record. 2. **Slope:** When a signal is detected that has a particular rise in voltage over a period of time, Cheetah will begin to look for the peak of the spike. After that peak is detected, it will align the peak using the alignment point setting and save 32 points of data to a spike record.
3. Alignment Point Setting	Each spike will contain 32 points of data. When Cheetah detects a spike, it will record 32 points of data around the peak of that spike. The alignment point tells Cheetah how many points of data before and after the peak of the spike should be saved. **Example:** Assume you have your alignment point set at 8. When Cheetah detects a spike, it will save the 7 points of data before the peak of the spike, and the 24 points of data after the peak.
4. Retrigger	Sets the amount of time to wait after a spike has been detected before searching for the next spike. This setting can be useful

Time Setting	if there are rapidly firing spikes, or echoes present on a particular acquisition entity. This avoids having portions of spikes appear in two separate records. This can be any value between 1 and 1000000 microseconds.
5. Dual Threshold Enable	Sets dual spike thresholding for the specified acquisition entity. This tells Cheetah that a spike can be either in the positive or negative direction. If checked (enabled), Cheetah detects spikes that are above the current threshold setting and below the negative of the threshold setting. If unchecked (disabled), Cheetah will only detect spikes that are above the current threshold setting. **Example:** If the current threshold setting is 5000 microvolts, and dual thresholding is enabled, signals that have a value above 5000 microvolts and below -5000 microvolts will be classified as spikes.
6. Clear Clusters Button	Clears all defined clusters for the specified acquisition entity. Once cleared, all cluster definitions for this acquisition entity will be lost.
7. Close Button	Clicking either this button or the X at the top right of the window will close the window.

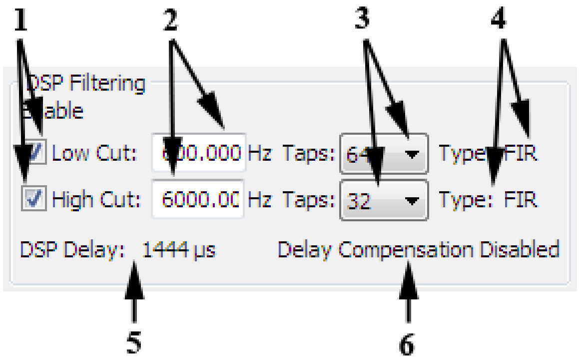
Spike Acquisition Entity Filtering Setup

Depending on your hardware system, you can filter signals in Cheetah two different ways. Analog filtering is done using external amplifiers that are controlled by Cheetah. Analog filtering physically filters the signal before it is sent to the computer. DSP filtering is only used on digital Neuralynx hardware systems. DSP filtering uses the computer to filter signals, and does not physically change the signal before it is processed by Cheetah. The appropriate filter settings are displayed based on the hardware system that is being used with Cheetah.



Low Cut: 600.0 Hz
High Cut: 6000.0 Hz

Analog Systems



☑ Enable
☑ Low Cut: 600.000 Hz Taps: 64 Type: FIR
☑ High Cut: 6000.0 Hz Taps: 32 Type: FIR
DSP Delay: 1444 µs
Delay Compensation Disabled

Digital Systems

1. Low and High Cut	Cheetah has the ability to process all signals using digital signal processing (DSP). Checking this box will turn the

DSP Filter Enable	high cut (low pass) and low cut (high pass) DSP filter on (checked) or off (unchecked) for the specified acquisition entity. Changing the enabled sate does not affect the actual filter value of the DSP filter, it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers. When the box is unchecked (disabled), you will not be able to change the filter value or number of taps.
2. Low and High Cut Filter Value	The settings for the low cut filters differ depending on what type of acquisition system you are using. 1. **Digital Systems:** Sets the frequency that Cheetah will use for the high cut (low pass) or low cut (high pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The filter frequency has no effect if high cut filtering is disabled. High cut filters will only allow signals whose frequency is below this value to be recorded by Cheetah and low cut filters will only allow signals whose frequency is above this value. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile). This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. This value can only be changed when DSP filtering is enabled. 2. **Analog Systems:** Sets the frequency that Cheetah will use for the high cut (low pass) or low cut (high pass) analog filter on all channels of the specified acquisition entity. Low cut filters will only allow signals whose frequency is between the values of the high and low cut filters to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. The filter value options are based on the filters available on the Lynx-8 amplifier.
3. Low and High Cut DSP Filter Taps	Digital signal processing (DSP) taps determine the amount of rolloff for the DSP filter. If you notice the cut filter is allowing signals that are too far beneath (low cut) or above (high cut) your setting to be processed by Cheetah, you may want to increase (low cut) or decrease (high cut) this value. Cheetah will normally select a tap value that is appropriate for the specific filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers. This value can only be changed when DSP filtering is enabled. If the frequency value is changed to a value that is not available with the current number of taps, Cheetah will change the number of taps to the closest appropriate value.
4. Low and High Cut DSP Filter Type	Shows the type of DSP filter being used by Cheetah for the given filter frequency. This can be one of the following: 1. **FIR**: A finite impulse response filter is being used to filter the data. 2. **DCO:** Uses a running average to remove the DC component from the AC signal. 3. **None:** No DSP filtering is being applied to the incoming data.
5. DSP Delay	The delay introduced by the current DSP filter settings. For more information on DSP delay see the -SetDSPDelayCompensationEnabled command.
6. Delay Compensation	Displays whether DSP delay compensation is enabled or disabled. For more information on DSP delay see the -

	SetDSPDelayCompensationEnabled command.

9.2 Spike Windows

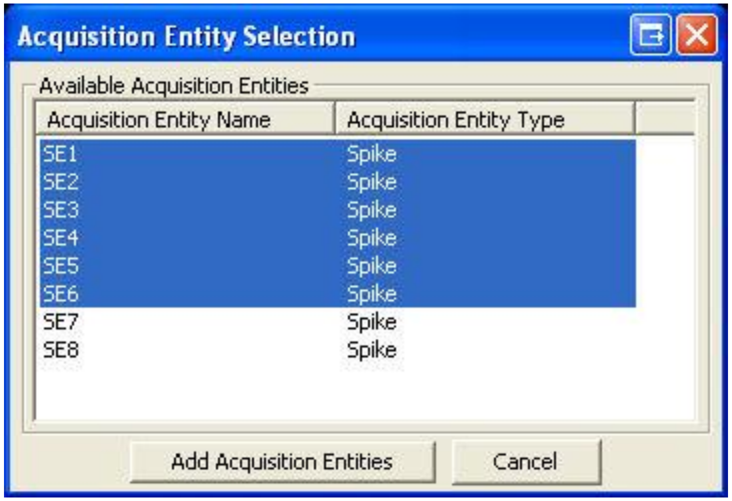
Spike Windows

Creating a Spike Display

When a spike acquisition entity is added to your system, no display is created for it. In order to see what the spike AE is doing, you need to create a spike window and then add a plot for the AE.

You can create a spike window from the Window menu on Cheetah's main window.

You will then get a new, empty spike window. To add a plot to the window you can either use the Display menu of the new window or right click anywhere in the window and select Add Plot(s). You will then see the Acquisition Entity Selection dialog. Select one or multiple (by holding down Shift or Ctrl, just like multi-select in Windows) AE and click the Add Acquisition Entities button to add plots.

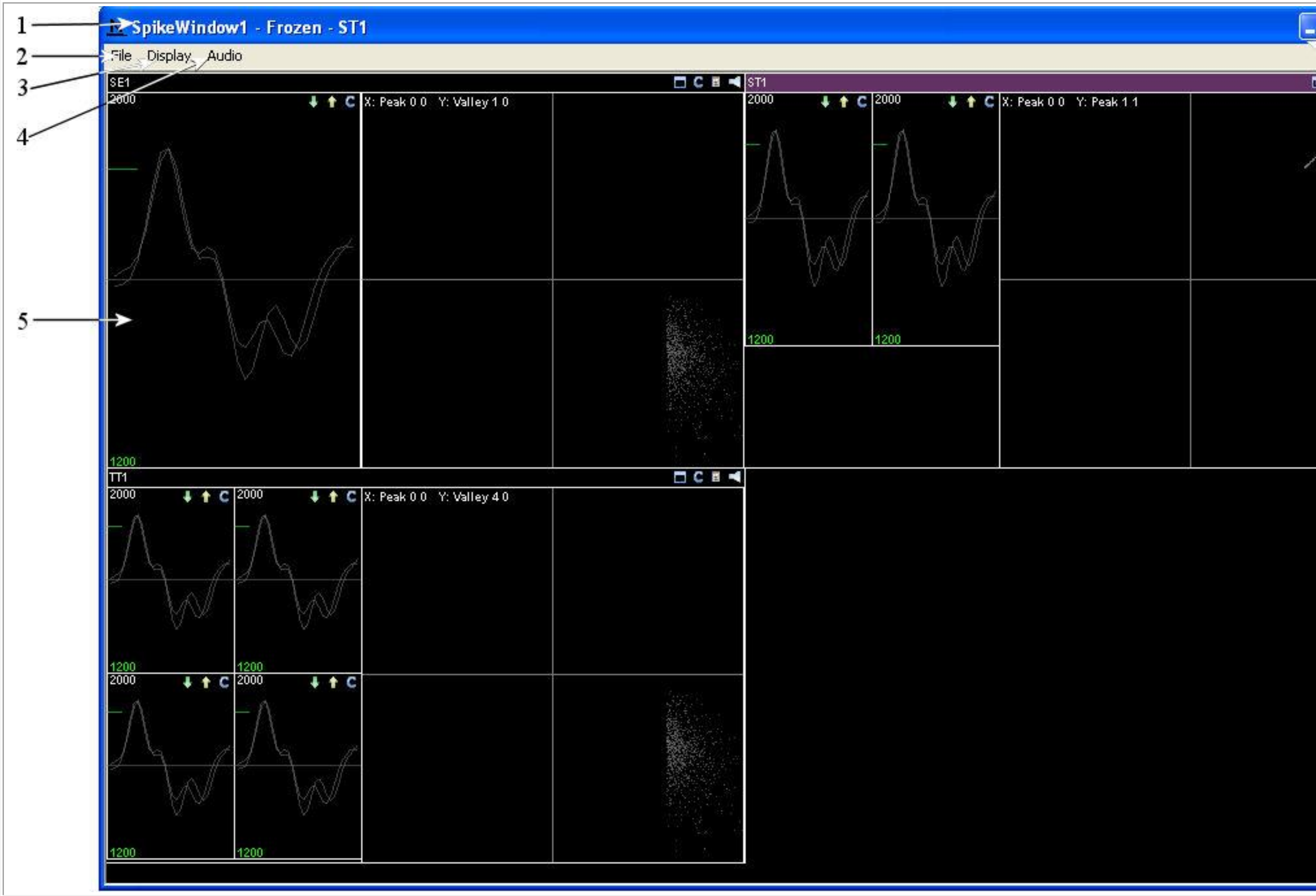


Acquisition Entity Name	Acquisition Entity Type
SE1	Spike
SE2	Spike
SE3	Spike
SE4	Spike
SE5	Spike
SE6	Spike
SE7	Spike
SE8	Spike

Spike Window Overview

This section will give you a general overview of each of the parts of the Spike window. There are more detailed descriptions of some of the sections after this overview.

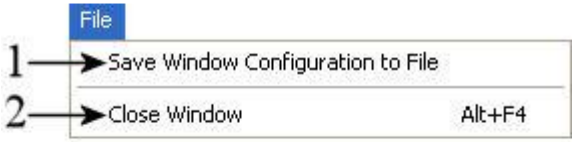
Spike windows have the concept of a current plot. This plot is indicated by a purple plot title bar and the name of the plot shown in the window's title bar. In the following image, the current plot in SpikeWindow1 is ST1. When a plot is current, all plot specific menu options and keyboard short cuts will be directed at that plot (i.e. setting the audio source). A plot can be made current by clicking on it. When a new plot is added, it is automatically set to the current plot.



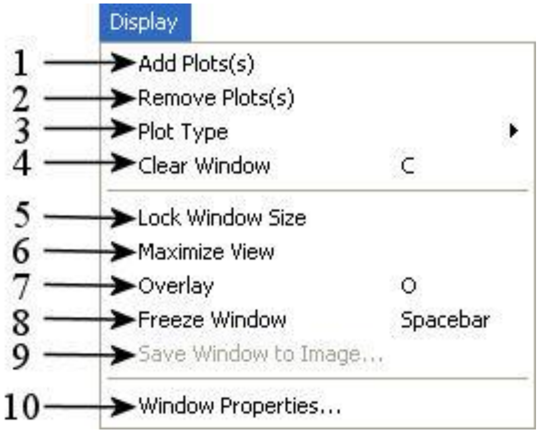
1. Title Bar	The spike window title bar will always display the name of the window along with the name of the currently selected plot in th

	currently selected plot will also have a purple title bar. ST1 is the current plot in the above image. Additional information can in the window's title bar, such as whether or not the plot is frozen.
2. File Menu	This menu will expand to show some common window tasks. See the detailed description of the video window's file menu.
3. Display Menu	This menu will expand to allow you to manipulate some of the display aspects of the Spike window. See the detailed descripti window's display menu.
4. Audio Menu	This menu will expand to allow you to manipulate the audio output settings in Cheetah. See the detailed description of the Spi menu.
5. Spike Plots	This area will contain the spike plots for this window. Spike plots can either be in maximized (only one plot is visible) or norr this window are visible). For more information on the spike plot, see the spike plot description.
6. Close Window	Clicking on this X will close a window, exactly as it does for all Windows programs. Closing a window will destroy the windo that when you close a window, all of the display settings you have changed and plots you have added to the window will be los
7. Maximize Window	Clicking this button behaves the same as it does for all Windows programs on your system.
8. Minimize Window	Clicking this button will minimize this window to the bottom of the screen. It will not minimize this window to the taskbar as Windows programs.

Spike Window File Menu

	
1. Save Window Configuration To File	Saves the window, plot and all of their current settings to a configuration file. This file can be reloaded at any time. However, the acquisition entities associated with all of the plots in this window must exist, and a window with the same name must not exist in Cheetah when the file is loaded. This does not save the current hardware or acquisition entity settings.
2. Close Window	Clicking on this menu option will close a window, exactly as it does for all Windows programs. Closing a window will destroy the window. This means that when you close a window, all of the display settings you have changed and plots you have added to the window will be lost. After you click the close button, a message box will be shown where you will confirm that you want to destroy the window.

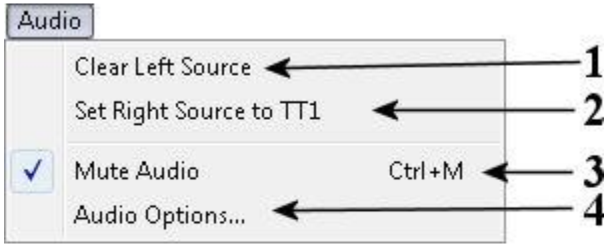
Spike Window Display Menu



1. Add Plots	Clicking this menu option will allow you to add a spike plot to this window. When you select add plot, you will see the Acquisition Entity selection dialog. This dialog will have a list of available spike acquisition entities that can be used to create a plot and add it to this window.
2. Remove Plots	Clicking this menu option will allow you to remove spike plot(s) from the window. When you select remove plot, you will see the Acquisition Entity selection dialog. This dialog will have a list of all the plots currently in the spike window. The user may select any number of plots to be removed.
3. Plot Type Selection	This menu item contains a sub menu listing the plot types available. See *Plot Type Selection* under the *Spike Window Properties* section for more details.
4. Clear Window	This will force all plots to clear themselves This is usually used when using overlay mode. In addition to this menu command, you can press the C key with the window selected to clear the display.
5. Lock Window Size	When the window size is locked, you will see a check mark next to this option. Locking the window size will disable resizing of the window.
6. Maximize View	Clicking this menu item with toggle between maximize and normal view. Normal view contain a plot being displayed in the window for every plot that exists for the window. Maximize view shows only the current plot, and the plot is maximized to the entire window display. There will be a checkmark next to this menu item when the window is in maximized view. This menu option is not available when there are no plots in the window.
7. Overlay Mode	The overlay menu option will switch the window in and out of overlay mode. When there is a check mark next to the menu item, this means the display is currently in overlay mode. When in overlay mode, the window will show all data in every plot. Clearing the display or resizing the window will cause all plots to clear their displays. In addition to this menu command, you can press the O key with this window selected to toggle overlay on and off.
8. Freeze Window	Selecting this menu option will freeze the drawing for all plots currently being displayed in the window. The word "frozen" will also appear in the title bar, after the current plots acquisition entity name. Clearing the display or resizing the window will cause the window to clear, but no new data will be displayed until the window is no longer frozen. There is also a check

	mark next to this option when the window is frozen. Un-freezing the window will begin to draw new data for each plot. You will not see any of the data that occurred while the window was frozen, but all data will be processed by Cheetah. In addition to this menu command, you can press the Spacebar with this window selected to freeze and unfreeze the display.
9. Save Window to Image	This option is only available when the window is frozen. It will allow you to save the current window display to a BMP, PNG or JPG raster image.
10. Window Properties	This will bring up the properties page and selects this window in the tree. If the properties page is closed, Cheetah will open the properties page. If the properties page is open, it will make sure the properties page is visible. You can see a detailed description of spike window properties for more information.

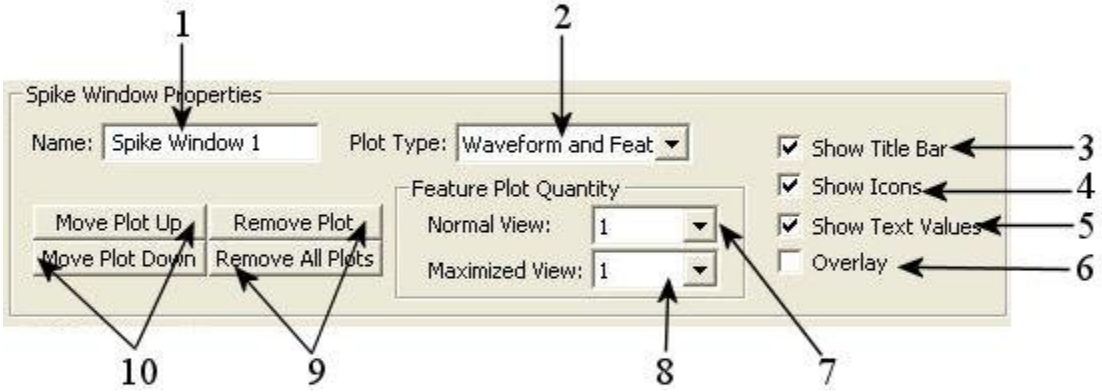
Spike Window Audio Menu



1. Set / Clear Left Channel	This menu option will allow you to set or clear the audio source for the left channel. This menu uses the current plot to determine what source will be set or cleared. If the current left source's AE is not the same as the current plot's AE, then this menu will alow you to set the current plot's AE to the current left source. If, however, the currently selected plot's AE is the same as the current left source's AE, then this menu option will allow you to clear the left source. Clearing the source will set the source's AE to None. In the above image, the current plot is ST1, and it is currently set to the right audio source.
2. Set / Clear Right Channel	This is identical to the Set / Clear Left Channel menu option, except that it affects the right audio channel.
3. Mute Audio	When the audio is muted, Cheetah will not output sound through your speakers. This mutes both the left and right channels. When the audio is muted, there will be a checkmark next to this menu item. This command can also be run at any time by using the Ctrl+M keyboard shortcut. This setting only affects Cheetah, and does not mute the sound for other Windows programs.
4. Audio Options	This will launch the Audio Output Dialog for more detailed control over Cheetah's audio output.

Spike Window Properties

The Spike window properties are shown in the properties window when a Spike window or Spike plot is selected in the properties tree. For more information on the properties window, see the detailed description of the properties window. Changes made to the window properties will affect all plots within this window.



Spike Window Properties

Name: Spike Window 1

Plot Type: Waveform and Feat

Feature Plot Quantity

Normal View: 1

Maximized View: 1

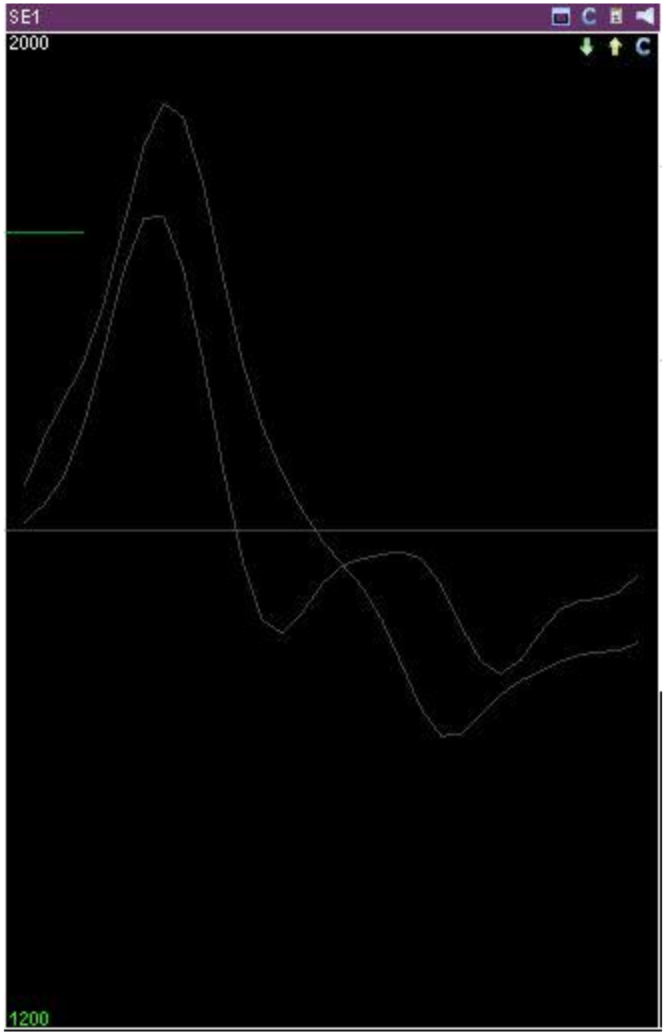
☑ Show Title Bar

☑ Show Icons

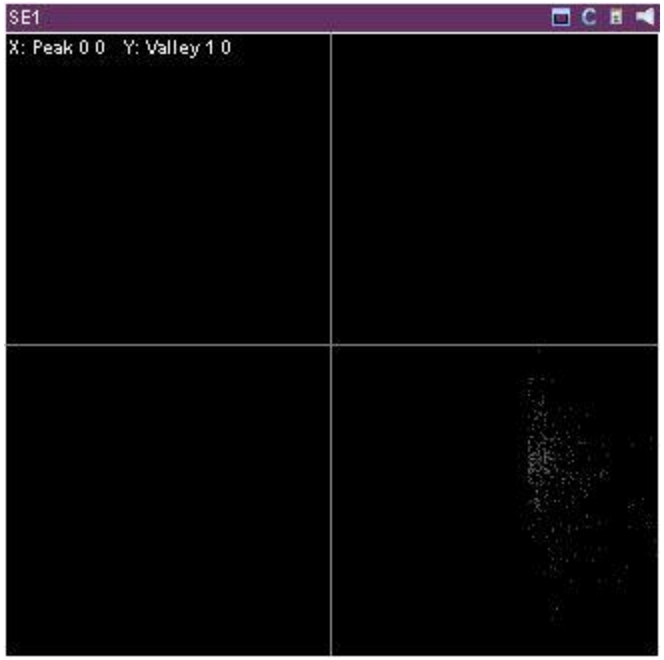
☑ Show Text Values

☐ Overlay

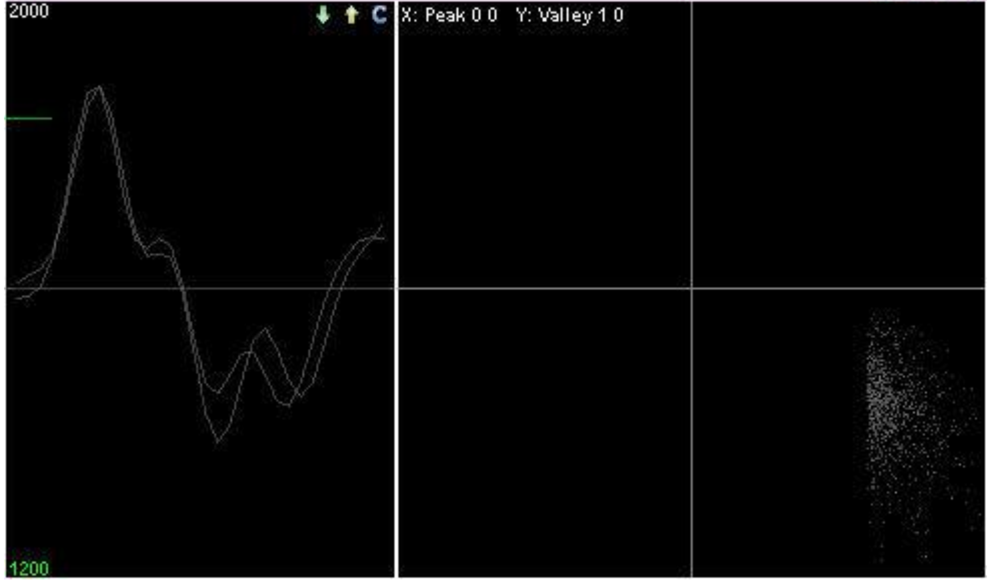
1. Name	This is the name of this Spike window. It must be unique throughout Cheetah. The window name is shown in the window's title bar, as well as in the display properties tree.
2. Plot Type Selection	Spike plots can be displayed in the following ways: 1. **Waveform:** Shows the extracted waveform for a detected spike. If more than one waveform is visible, this means more than one spike occurred since the last screen refresh. The waveform seen in this plot is the exact waveform saved to the spike data records.



2. **Feature:** Shows the calculated feature information in a XY scatter plot. The features that are plotted can be changed by changing the plot properties. To change the features available for an acquisition entity, see the -SetFeature command. The data seen in this plot is the exact data saved to the spike data records.



1. **WaveformFeature:** Shows both the waveform and feature plots.



3. Show Title Bar	Sets the visibility of title bar for the specified display window. This option can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since most of the plot icons are located in the title bar, you will not be able to click on the icons when the title bar is hidden. Since the saved screen space is minimal, it is recommended that you leave the title bars visible if possible. All data in the window will clear when the title bar visibility is changed. The show title bar checkbox must be in 1 of the following states: 1. **Checked**: The title bar is visible for all plots in the window. 2. **Unchecked:** The title bar is hidden for all plots in the window.
4. Show Icons	Enables or disables the drawing of icons for all plots in the window. This does not include icons that are part of the title bar. When icons are hidden, you will not be able to click on them to activate plot commands. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since the saved screen space is minimal, it is recommended that you leave the icons visible if possible. All data in the window will clear when the icon visibility is changed. The show icons checkbox must be in 1 of the following states: 1. **Checked**: All icons not in the title bar will be shown. 2. **Unchecked:** All icons not in the title bar will be hidden.
5. Show Text Values	Enables or disables the drawing of text values for all plots in the window. This does not include text values that are part of the title bar. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since the saved screen space is minimal, it is recommended that you leave the text visible if possible. All data in the window will clear when the text visibility is changed. The show text values checkbox must be in 1 of the following states: 1. **Checked**: All text values not in the title bar will be shown. 2. **Unchecked:** All text values not in the title bar will be hidden.
6. Overlay Mode	Sets a plot window's overlay mode. Overlaid windows will not clear out old data before displaying new data. This setting effects all plots in this window. The overlay checkbox must be in 1 of the following states:

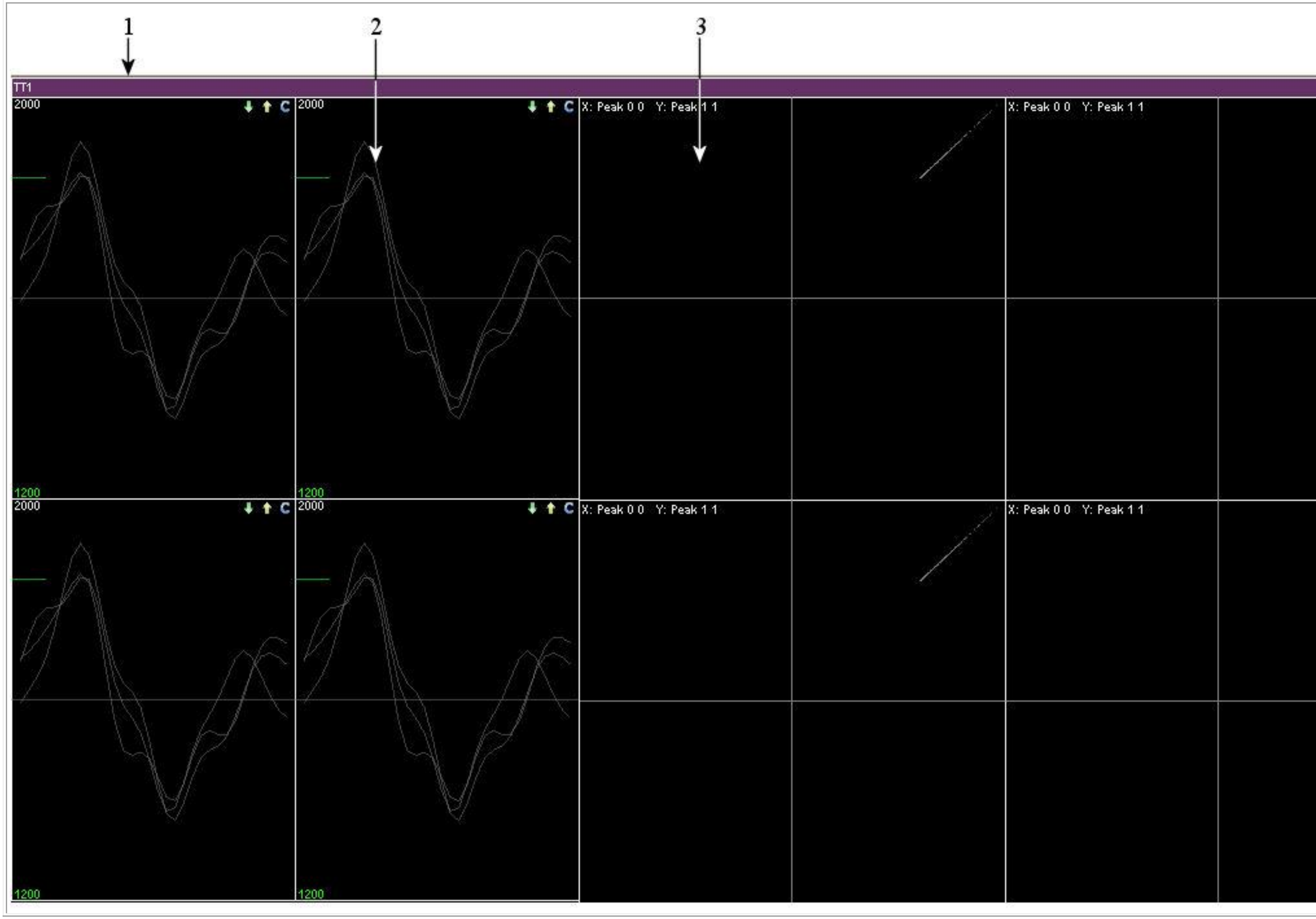
	1. **Checked**: The window will not clear out any old data until either a clear command is issued, overlay is turned off, or the window is resized. 2. **Unchecked:** The window will clear out data based on the plot type.
7. Normal View Feature Plot Quantity	This specifies how many feature plots are shown for all plots in the window when the window is showing the WaveformFeature or Feature plot type, and is not maximized. If the window is showing the Waveform plot type, no change will be seen when this value is changed. All data in the window will clear when the number of feature plots is changed.
8. Maximized View Feature Plot Quantity	When a plot is maximized, it is automatically switched to the WaveformFeature plot type. Since the Spike plot will now have the entire window to work with, extra Feature plots can be shown. This specifies how many feature plots are shown in maximized view for all plots that are in the specified window. All data in the window will clear when the number of feature plots is changed, and the window is in maximized view.
9. Plot Removal Buttons	Clicking on th *Remove Plot* button will delete the currently selected plot from the window. Clicking on the *Remove All Plots* button will delete all plots within the window.
10. Plot Positioning Buttons	Clicking on the *Move Plot Up* button will move the selected plot left or up in the plot window. Clicking on the *Move Plot Down* button will move the selected plot right or down in the plot window.

9.3 Spike Plots

Spike Plots

This section will cover spike plots and their properties. Some plot properties are based on spike window settings. For more information on window specific settings (including adding plots to windows) see the spike window overview.

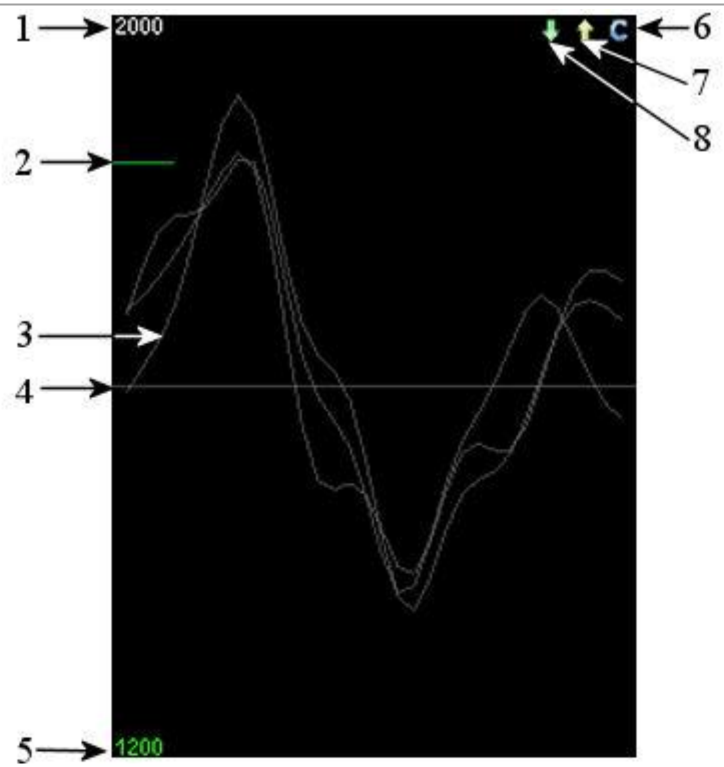
Spike PlotOverview


1
2
3
TT1
2000
C
2000
C
X: Peak 0 0 Y: Peak 1 1
X: Peak 0 0 Y: Peak 1 1
1200
1200
2000
C
2000
C
X: Peak 0 0 Y: Peak 1 1
X: Peak 0 0 Y: Peak 1 1
1200
1200

1. Plot Title Bar	The title bar houses the name of the acquisition entity whose data is displayed in the plot, along with the user defined plot label set. If the plot is the currently selected plot for the window it is in, the title bar will be purple. Along the right hand side, you v that represent actions that can be applied to the entire plot, regardless of the current plot type.
2. Waveform Plot	Here is where the spike waveforms will be shown. Single electrodes will only have a single waveform. Stereotrodes will have 1 on the left, channel 2 on the right); and tetrodes (shown above) will have four (channel 1 on the top left, channel 2 on the top 3 on the bottom left, channel 4 on the bottom right). See the detailed description of the waveform plot for more information. I the acquisition entity is disabled,the waveform plot will change to show that the channel is disabled as shown in the following i  If the waveform plot is too small, the DISABLED text will not be visible. Once the channel is enabled, it will display data nor
3. Feature Plot	The feature plot is a configurable XY scatter plot of values calculated from detected spikes. The number of feature plots that a be configured separately for maximized and normal views.See the detailed description of the feature plot for more information.
4. Previous Plot	This option is only available when the plot is in the maximized view. Clicking on it will switch the currently displayed plot to plot in the window. If this is the first plot in the window, clicking this icon will have no effect.
5. Next Plot	This option is only available when the plot is in the maximized view Clicking on it will switch the currently displayed plot to t in the window. If this is the last plot in the window, clicking this icon will have no effect.
6. Maximize/Restore Plot	Toggles the view for the plot. If the plot is in maximized view (shown above), clicking this icon will restore the plot to normal (showing all plots in the window). When in normal view, the icon changes to a single square, and clicking on it will maximize whose icon is clicked.
7. Clear Window	Clears all data in this plot only. This can also be accomplished by right clicking on the plot and selecting Clear Plot from the n
8. Plot Properties	Clicking this icon will make the properties page visible, select the display tab, and select the plot in the properties tree. This ca accomplished by right clicking anywhere on the plot and selecting Plot Properties from the menu. See the detailed description properties for more information on plot properties.
9. Audio Menu	Displays the audio menu.

Waveform Plot

Each channel of a spike AE will have its own waveform plot. Here we are looking at a single electrode waveform plot.



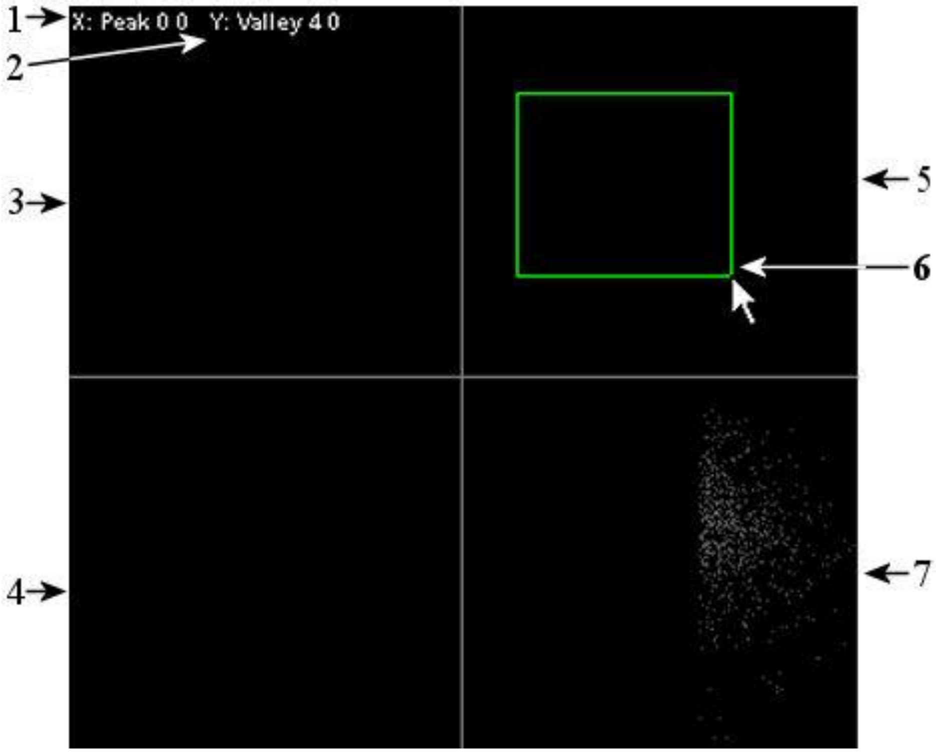
1. Input Range	Displays the current input range of this channel in microvolts. Any waveform that reaches the top of the plot will have a voltage value approximately equal to this value. The bottom of the plot represents the negative of this value.
2. Spike Detection Value Bar	This bar is positioned in the plot to give an approximation of the current spike detection voltage (in microvolts) for this channel. Clicking and dragging this bar up and down will adjust the spike detection voltage for this channel accordingly. The value that is adjusted and shown depends on the method of spike detection used for this acquisition entity. This functionality is not available when Cheetah is recording. 1. **Threshold:** The spike detection value is the threshold voltage used to determine if an incoming signal should be classified as a spike. The bar will look like the following when in threshold mode:  2. **Slope:** The spike detection value is the change in voltage used in calculating the slope to use for detecting

	spikes. This bar does not indicate, nor does dragging it affect, the change in time portion of the slope. The bar will look like the following when in slope mode: 
3. Spike Waveform	The waveform of detected spikes. If the window is in overlay mode, spikes will accumulate as they are detected; otherwise all spikes detected since the last screen refresh will be shown. When cells are defined for this AE, waveforms will appear in the color of their corresponding cell. If the detected spike does not have a defined cell, it will appear in gray.
4. Spike Detection Value	Displays the current spike detection value for this channel. The value that is shown depends on the method of spike detection used for this acquisition entity. 1. **Threshold:** The spike detection value is the threshold voltage (in microvolts) used to determine if an incoming signal should be classified as a spike. The value will look like the following when in threshold mode:  250 2. **Slope:** The spike detection value is the change in voltage (in microvolts) over the change in time (milliseconds) used in calculating the slope to use for detecting spikes. The value will look like the following when in slope mode:  100/160
5. Clear Sub Plot	Clears all data only in this waveform plot. It does not clear any data from other waveform plots in multi-channel spike AE.
6.Spike Detection Value Up	Increases the spike detection voltage value for this channel by 1 pixel. The microvolt value of a pixel is expressed by two variables: 1) The size of the plot (i.e. making a plot larger decreases the microvolts per pixel value). 2) The input range of the channel displayed (i.e. a larger input range increases the microvolts per pixel value). The value that is adjusted depends on the method of spike detection used for this acquisition entity. 1. **Threshold:** The spike detection value is the threshold voltage used to determine if an incoming signal should be classified as a spike. 2. **Slope:** The spike detection value is the change in voltage used in calculating the slope to use for detecting spikes. This bar does not indicate, nor does dragging it affect, the change in time portion of the slope.
7. Spike Detection Value Down	Decreases the spike detection voltage for this channel by 1 pixel. The microvolt value of a pixel is expressed by two variables: 1) The size of the plot (i.e. making a plot larger decreases the microvolts per pixel value). 2) The input range of the channel displayed (i.e. a larger input range increases the microvolts per pixel value). The value that is adjusted depends on the method of spike detection used for this acquisition entity. 1. **Threshold:** The spike detection value is the threshold voltage used to determine if an incoming signal should be classified as a spike. 2. **Slope:** The spike detection value is the change in voltage used in calculating the slope to use for detecting

	spikes. This bar does not indicate, nor does dragging it affect, the change in time portion of the slope.

Feature Plot

The number of feature plots shown is configurable for each window. You can also configure which features are plotted (see Feature Plot Properties) and which features Cheetah calculates for each acquisition entity (see -SetWaveformFeature in Spike Acqusition Entity Commands). All values that are shown in feature plots are normalized to AD counts so that comparisons between features with disproportional values do not look skewed.

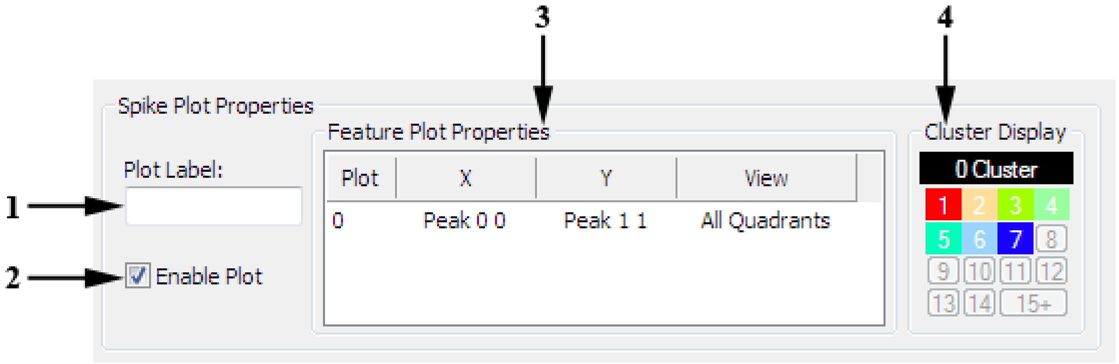


1. X Feature	The name of the feature whose value corresponds to the X axis of the plot. The name of the feature is shown along with the feature index and the channel whose feature is being shown (for single electrodes this is always 0).
2. Y Feature	The name of the feature whose value corresponds to the Y axis of the plot. The name of the feature is shown along with the feature index and the channel whose feature is being shown (for single electrodes this is always 0).
3. Quadrant 2	This quadrant represents negative X values and positive Y values.

4. Quadrant 3	This quadrant represents negative X values and negative Y values.
5. Quadrant 1	This quadrant represents positive X values and positive Y values.
6. Box Zoom	Left clicking your mouse and dragging creates a green box over the feature plot. When you stop dragging by releasing the left mouse button, the feature plot will zoom in on the section enclosed by the green box. To return the plot to have all four quadrants visible, select All Quadrants from the view property for this plot, or by right clicking on the plot and selecting All Quadrants from the Zoom menu.
7. Quadrant 4	This quadrant represents positive X values and negative Y values.

Spike Plot Properties

The spike plot properties are shown in the properties window when a spike window or a spike plot is selected in the properties tree. Selecting a spike window will allow you to make changes to all plots in the window. Selecting an individual plot will only allow changes to that individual plot.



Plot	X	Y	View
0	Peak 0 0	Peak 1 1	All Quadrants

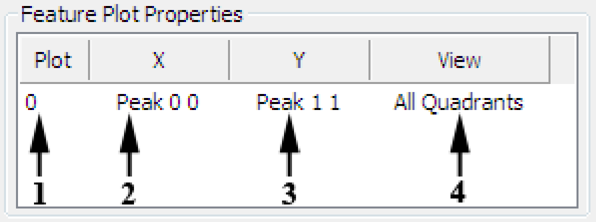
☑ Enable Plot

1. Plot Label	Enter a label into the edit box. The label will be displayed after the plot name in both the tree view on the properties page and in the title bar in the specified plot.
2. Plot Enable	This is used when you want to stop plotting data for only a single acquisition entity's plot in a window, but do not want to remove the plot from the window. This works like a pause button on a DVD player. It will lock in whatever is currently displayed in the plot. If an action is taken that will clear the plot, the last data displayed will be cleared. No data will be added to the plot while it is disabled, but is otherwise processed normally. The plot enable checkbox must be in 1 of the following states: 1. **Checked**: The plot will display all data in the plot as is appropriate.

	2. **Unchecked:** The will not be any new data displayed in the plot.
3. Feature Plot Properties	Controls the feature plot for this spike plot. Changes will only be seen in WaveformFeature and Feature plot types or when the plot is in the maximized view. See the section below for a more detailed description of the feature plot properties.
4. Cluster Display Selection	Controls which of the defined clusters are visible in spike plots. See the section below for a more detailed description of the cluster display selection.

Feature Plot Properties

The settings for all feature plots will be adjustable from this section. This includes the feature plots only visible when a plot is maximized.



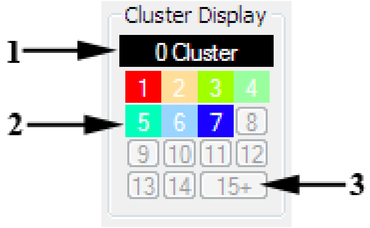
Feature Plot Properties

Plot	X	Y	View
0	Peak 0 0	Peak 1 1	All Quadrants

1. Plot Number	The number of the feature plot. The top left feature plot is plot 0, and plot numbers increase from left to right in a row, with numbering continuing at the left of the following row.
2. X Feature Select	The feature whose value is represented on the X axis. The name of the feature is shown along with the feature index and the channel whose feature is being shown (for single electrodes this is always 0). The features available for selection can be adjusted using -SetWaveformFeature in Spike Acqusition Entity Commands)
3. Y Feature Select	The feature whose value is represented on the Y axis. The name of the feature is shown along with the feature index and the channel whose feature is being shown (for single electrodes this is always 0). The features available for selection can be adjusted using -SetWaveformFeature in Spike Acqusition Entity Commands)
4. Feature Plot View	Allows you to quickly zoom into a quadrant. You can also change this setting by right clicking on a feature plot and selecting an option from the Zoom sub menu. If you have zoomed into a plot via a box zoom, this will say User Defined.

Cluster Display Selection

The selections made here affect the spikes shown in both the waveform and feature plots. When a cell is shown, the button will be colored, if it is hidden, it will be the regular windows color.

	
1. Zero Cluster	This will show or hide all of the spikes that are detected that do not have a cluster defined.
2. Cluster Select Buttons	Clicking on the cluster number will hide or show spikes that are part of that cluster. If there is no cluster defined for a particular number, the button will be grayed out.
3. 15+ Button	Clicking on this button will hide or show all spikes that have a cluster number of 15 or greater.

10. Video Trackers

Video Tracking

The Cheetah video tracker allows you to record the movement of a subject during your experiment using colored targets (generally LEDs). Both position and direction can be tracked based on the color and layout of the targets, and those values are timestamped and written to video tracker records that can be recorded to a video tracker data file for later analysis. Additionally, Cheetah can take advantage of capture cards that have built in video encoders to save the live video feed to a video file on your hard disk. Even if you do not want to record position or direction information, the video tracker can be used to monitor the experiment visually instead of just watching spike and CSC activity. All video setup and calibration can be done within Cheetah; external calibration programs are not required.

NOTE: The Cheetah 160's built-in video trackers are no longer supported by Cheetah, please contact Neuralynx to obtain new video tracking cards. Also, the Data Translations drivers for the DT3120 capture device no longer work with Cheetah. Please contact sales@neuralynx.com to obtain a compatible capture device.

Video Tracker Acquisition Entities

Video tracker acquisition entities are very closely tied to the capture card. You can only have one video tracker acquisition entity per capture card, and the acquisition entity is created when a video tracker is added to the system This is different than the spike and CSC acquisition entities, where you have to create the hardware and acquisition entities separately. To create a video tracker, you must use the video tracker creation file command; this is generally done in a configuration file named VideoTracker.cfg.

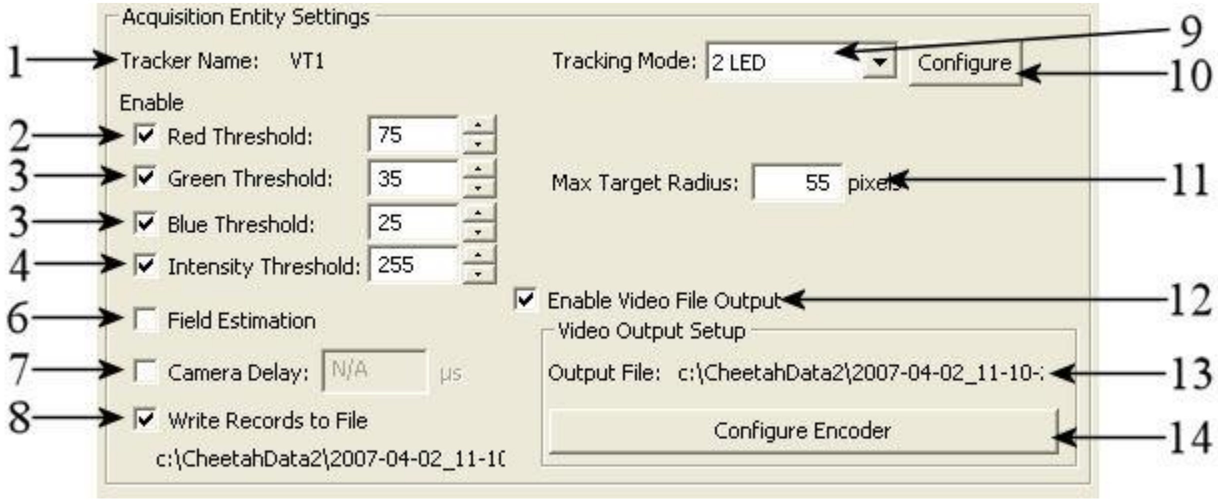
Video Tracker Topics:

Video Tracker Capture Device Settings
Video Tracker Acquisition Entity Properties
Video Tracker Plots and Windows
Direction Finding Configuration
Video Tracker Capture Device Commands
Video Tracker Acquisition Entity Commands
Video Tracker Window Commands
Video Tracker Plot Commands

10.1 AE Properties

Video Tracker Acquisition Entity Properties

These settings control how the video tracker acquisition entity processes video frames as they are received from the capture card. The acquisition entity settings are shown on the properties page when a video tracker is selected in the properties tree.



Acquisition Entity Settings
Tracker Name: VT1
Enable
☑ Red Threshold: 75
☑ Green Threshold: 35
☑ Blue Threshold: 25
☑ Intensity Threshold: 255
☐ Field Estimation
☐ Camera Delay: N/A µs
☑ Write Records to File
c:\CheetahData2\2007-04-02_11-1
Tracking Mode: 2 LED
Max Target Radius: 55 pixels
☑ Enable Video File Output
Video Output Setup
Output File: c:\CheetahData2\2007-04-02_11-10-
Configure Encoder

1. Acquisition Entity Name	This is the unique name that is used to identify this video tracker acquisition entity. It is the name you chose

	when you created the acquisition entity.
2.Red Threshold Settings	Checking the box next to this setting will enable tracking on red threshold crossings. When enabled, the value specified by the threshold entry box will be will be used for tracking the red components of the video. This value can be any whole number between 0 (every pixel with a red component is used) and 255 (no pixels with a red component are used). Values outside of that range will be set to the closest valid value. Alternatively, you can click the up or down arrows next to the entry box to increase (up) or decrease (down) the threshold. The red value of the pixel is calculated using a pure color algorithm that subtracts the intensity value from the red component of a pixel. When the enable check box is not checked, the threshold entry box will be grayed out. This setting cannot be changed while Cheetah is recording.
3.Green Threshold Settings	Checking the box next to this setting will enable tracking on green threshold crossings. When enabled, the value specified by the threshold entry box will be will be used for tracking the green components of the video. This value can be any whole number between 0 (every pixel with a green component is used) and 255 (no pixels with a green component are used). Values outside of that range will be set to the closest valid value. Alternatively, you can click the up or down arrows next to the entry box to increase (up) or decrease (down) the threshold. The green value of the pixel is calculated using a pure color algorithm that subtracts the intensity value from the green component of a pixel. When the enable check box is not checked, the threshold entry box will be grayed out. This setting cannot be changed while Cheetah is recording.
4. Blue Threshold Settings	Checking the box next to this setting will enable tracking on blue threshold crossings. When enabled, the value specified by the threshold entry box will be will be used for tracking the blue components of the video. This value can be any whole number between 0 (every pixel with a blue component is used) and 255 (no pixels with a blue component are used). Values outside of that range will be set to the closest valid value. Alternatively, you can click the up or down arrows next to the entry box to increase (up) or decrease (down) the threshold. The blue value of the pixel is calculated using a pure color algorithm that subtracts the intensity value from the blue component of a pixel. When the enable check box is not checked, the threshold entry box will be grayed out. This setting cannot be changed while Cheetah is recording.
5. Intensity Threshold Settings	Checking the box next to this setting will enable tracking on intensity threshold crossings. When enabled, the value specified by the threshold entry box will be will be used for tracking the intensity components of the video. This value can be any whole number between 0 (every pixel with any color information is used) and 255 (only pure white pixels will be tracked). Values outside of that range will be set to the closest valid value. Alternatively, you can click the up or down arrows next to the entry box to increase (up) or decrease (down) the threshold. The Intensity value of the pixel is calculated by taking the average of the RGB pixel components. When the enable check box is not checked, the threshold entry box will be grayed out. This setting cannot be changed while Cheetah is recording.
6. Field Estimation Enable	Enables or disables field processing of video frames. When this box is checked, Cheetah is In field processing mode. This means that Cheetah will process the even and odd lines of the video frame into separate video records. The odd lines will be timestamped at the start time of the frame, but the even lines will be timestamped

	at the midpoint between the odd lines and the beginning of the next frame. The timestamp of the even lines is an ***estimation*** of the field timestamp. When this box is not checked, Cheetah uses the normal processing mode method of frame processing. In this mode, all lines are processed into a single video record, and the timestamp is the beginning of the frame. This setting cannot be changed when Cheetah is either in acquisition or recording mode.
7. Camera Delay Settings	Checking this box enables a static camera delay for adjusting each video record's timestamp inside Cheetah. This is used when the processing delay of the camera is known; does not change; and causes a significant time shift for video relative to neurological data. Every video record will have this value subtracted from its timestamp prior to the record being written to a file. When camera delay is enabled, you can enter any positive whole number or 0, specifying the number of microseconds of delay to be used for each record into the delay entry box. When the camera delay is disabled, the delay entry box will be grayed out, and no adjustment will be made to the video record's timestamp. This setting cannot be changed when Cheetah is either in acquisition or recording mode.
8. Data File Output Setting	When this box is checked, all video records will be saved to the file that is shown right beneath this check box. Removing the check next to this setting will disable video record file writing. When file writing is disabled, you will still be able to see visual representations of the records in the video plot, as well as be able to receive records via NetCom. **However, no information will be permanently saved while you are recording.**
9. Tracking Mode Selection	Specifies the tracking mode you wish to use for this video tracker. Cheetah supports the following tracking types: 1. **None:** No direction finding or position tracking will be done. The video tracker will simply record transitions above thresholds. All x and y positions and head direction values in video records will be 0. 2. **2 LED**: Cheetah will calculate position and direction based on the assumption that there are 2 LEDs of interest. The direction is determined by the color of each of the LEDs along with the direction offset. The LED color and direction offset can be changed by pressing the setup button to show the Direction Finding Configuration window. 3. **HS-54**: Cheetah will assume that you are using a standard HS-54 layout and track direction and position based on that layout. Direction is determined by used the standard HS-54 colors along with the direction offset. The LED color can be viewed and direction offset can be changed by pressing the setup button to show the Direction Finding Configuration window. Changing the tracking configuration to one that does not correspond to your actual tracking needs can give erroneous direction and position values. This setting cannot be changed while Cheetah is recording.
10. Tracking Mode Setup	Clicking this button will show you the Direction Finding Configuration window.
11. Maximum Target	This should be used as a last resort for adjusting tracking options. Attempt to adjust the threshold or video

Radius	settings before modifying this value. The target radius is the maximum number of pixels between two targets to consider them related for position tracking purposes. This value can be adjusted down if you notice that there is noise being included in your position tracking. It can be adjusted up if Cheetah is tracking a smaller target that is not the object you are trying to track. **Example:** In 2LED tracking, the right LED is red and the left LED is green, and the LEDs are pretty close together. Someone puts a green marker on one edge of the maze, that now creates a large green target, throwing off the center calculation. If the target radius is small, the new target will not be considered to be related to the red target and the center will be based on the green LED. There are a couple of exceptions to this rule: 1. If there are no other green targets within the target radius, the video tracker will use the largest green target it can find for the left LED target. 2. If the erroneous target is located within the target radius from the red target, it will be used as the green LED target. This value can be any positive whole number greater or equal to 1 that will be within the video frame. Radius values that would make the target radius larger than the video image are not allowed, and will be adjusted to the maximum allowable radius for the current video image (i.e. if the resolution is 720 x 480, the maximum value is 865). It cannot be changed while Cheetah is in either acquisition or recording mode.
12. Video File Output Enable	Checking this box enables video file output using compression to the file specified in the output file box. This can be done concurrently with standard Cheetah video tracking. When recording is started, Cheetah will begin to compress the live video image, without processing, and save that video to the file specified in the output file box. A subtitle file will be recorded, along with the compressed video, to allow you to view the Cheetah timestamp overlaid over each video frame in any media player that supports subtitles. It is not recommended that you start and stop recording multiple times while recording live video, as it causes the video file to not be playable in some media players. This setting is only available if you are using a video tracking capture card that supports hardware video encoding, such as the Hauppauge PVR-150. This setting cannot be changed while Cheetah is recording.
13. Compressed Video Output File Name	This is the current file that Cheetah is using for video output. Video output is only available if you are using a video tracking capture card that supports hardware video encoding, such as the Hauppauge PVR-150.
14. Video Compression Setup	Clicking this button will allow you to change the compression settings used for recording the live video file. These settings are dependent on your capture device. Consult your capture device's manual for more information on these settings. Adjustment of compression settings is only available if you are using a video tracking capture card that supports hardware video encoding, such as the Hauppauge PVR-150. Compression settings cannot be changed while Cheetah is recording. There is currently no way to save compression settings, these must be reset manually every time Cheetah is restarted.

10.2 Video Capture Device Properties

Video Settings

Cheetah can control the video settings of your capture card directly, there is no need for a separate calibration application. The video settings are shown as a section of the properties page when a video tracker is selected in the properties tree.

Video Settings Section

Video Settings

Capture Device: Hauppauge WinTV PVR ...

Hardware ID: 4&cf81c54&0&00f0

Input Type: SVideo

Video Format: NTSC

Resolution: 720x480

Saturation: 128

Hue: 128

Contrast: 128

Brightness: 128

Sharpness: 0

Gamma: 0

White Balance: 0

Backlight Compensation: 0

Gain: 0

<table>
<tr><td>1. Capture Device Name</td><td>This is the name of the capture device associated with this video tracker acquisition entity as it is reported to Windows. You may have more than one capture device with the same name, so the hardware ID is provided to uniquely identify the capture device.</td></tr>
<tr><td>2. Capture Device Hardware Identification</td><td>This is a unique identification for the capture device associated with this video tracker acquisition entity. You may use this hardware ID to create video tracker acquisition entities in your configuration files.</td></tr>
<tr><td>3. Input Type</td><td>The video selection drop down list is only available when Cheetah is not recording data. This selection will determine what connection your video camera is using to feed images to the computer. Cheetah supports one SVideo and one Composite connection. These inputs will work with both NTSC and PAL video formats. If you select an input type that your capture card does not support, Cheetah will return this setting to its previous value.
<table>
<tr><td>SVideo</td><td>Uses a 4 pin connection to transfer video signal. It gives better image quality than composite because it transmits luminance and color information on separate wires. The remaining two wires are ground.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td>Composite</td><td>Generally uses a coaxial wire with either a BNC or an RCA connection. Composite signals transmit all image information over a single wire. This results in a less accurate image than SVideo.</td></tr></table></td></tr>
<tr><td>4. Video Format</td><td>The video format selection drop down list is only available when Cheetah is not in acquisition mode. This selection will determine how the analog video signal is processed by the capture device. Cheetah only supports NTSC and PAL video formats. These formats will work through both SVideo and Composite inputs. If you select a video format that is not supported by your capture card, Cheetah will return this setting to its previous value.<table><tr><td>NTSC</td><td>Uses NTS_M video formatting with 33ms frame intervals (30FPS).</td><td>Used throughout North and South America, Japan, and Oceana</td></tr><tr><td>PAL</td><td>Uses PAL_B video formatting with 40ms frame intervals (25FPS).</td><td>Used throughout the rest of the world. Except in along the Mediterranean, where SECAM is used.</td></tr></table></td></tr>
<tr><td>5. Resolution</td><td>This setting specifies the dimensions of the video image (width x height). Only values that are returned by the capture card are listed. Not all resolutions listed will work with all video settings. If you select a resolution that will not work with the current values of the other video settings, Cheetah will inform you that the resolution you selected will not work, and return the resolution to its previous value.</td></tr>
<tr><td>6. Saturation Setting</td><td>This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Saturation refers to the intensity of a color signal. Adjusting this setting will increase/decrease the intensity of all color information evenly. If a signal is more red than blue or green, increasing saturation will show more of an effect on the red component than any other component. If the color enable control is turned off, the saturation setting will have no effect on the image. Saturation is sometimes referred to as color. This setting is not available if it is not supported by your capture card.</td></tr>
<tr><td>7. Hue Setting</td><td>This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Hue control will adjust all the colors in the signal according to the following formula $\phi = \arccos\left(\frac{R-\mu}{\sigma\sqrt{2}}\right)$. Where σ is saturation, μ is brightness, R is the RGB color value and φ is hue. This adjustment essentially skews the image towards green (lower values) or violet (higher values). Hue is sometimes referred to as tint. This setting is not available if it is not supported by your capture card.</td></tr>
</table>

8. Contrast Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Contrast adjustment will intensify the boundaries between different luminance values. Increasing the contrast will make those boundaries more distinct, while decreasing contrast will tend to give the image a more muted look. This setting is not available if it is not supported by your capture card.
9. Brightness Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Brightness adjustment will increase the values of the RGB signals in the color evenly, shifting the image towards white (high values) or black(low values). This setting is not available if it is not supported by your capture card.
10. Sharpness Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Sharpness dictates the number of pixels to use for color transitions. When an image switches between two distinct colors abruptly (say red and black), the video signal attempts to smooth that transition by adjusting a few pixels on the boundary of the color change. Adjusting the sharpness will either increase (lower values) or decrease (higher values) the number of pixels used for this transition. This setting is not available if it is not supported by your capture card.
11. Gamma Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Gamma adjustment is an attempt to linearize the power-law relationship between the encoded luminance and actual desired brightness. If the actual source luminance is L, gamma will adjust the luminance encoded by the capture card to L^(1/gamma). This setting is not available if it is not supported by your capture card.
12. White Balance Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Adjusts the perception of *True White*. Since video is an analog signal, the capture device cannot exactly replicate the true colors being captured. Adjustment of the white balance will change the value of *True White*, so that whenever a pure white image is shown to the camera, it will be processed with the *True White* encoded value. All other colors that are processed will be adjusted according to *True White*. This setting is not available if it is not supported by your capture card.
13. Backlight Compensation Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Backlight compensation is an attempt by the capture device to filter out unwanted backlighting. This is not supported by most capture devices. This setting is not available if it is not supported by your capture card.

14. Gain Setting	This setting can be adjusted by either moving the slider right (for higher values) or left (for lower values), or by typing a value between 0 and 255 into the entry box. Any values entered greater than 255 will automatically be changed to 255. Increasing the gain will increase the value of the raw video signal by a DC offset. Most capture devices rely on the camera to perform this adjustment. This setting is not available if it is not supported by your capture card.

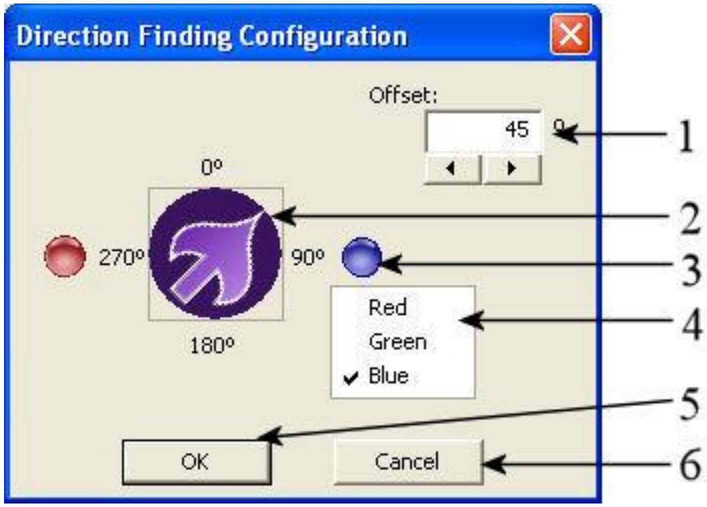
10.3 Direction Finding Configuration

Direction Finding Configuration

To determine the direction the subject is facing, the video tracker will look for specific colored targets (generally LEDs) in a specific configuration. The Direction Finding Configuration dialog allows you to make adjustments as to what colors are being tracked and where those targets are in relation to the subject. Make sure that the adjustments you make here are correct, as incorrect values will give erroneous direction values.

You can launch the Direction Finding configuration by pressing the Configure button on the video tracker acquisition entity properties.

Direction Finding Settings

 Offset: 45 ° ✓ Blue 	
1. Head Direction Offset	This value is set to adjust the head angle in degrees for tracking LEDs that are not centered on the subject. For an example of how this value is used, see the documentation for the *-SetDirectionOffset* command.

2. Direction Indicator	The point of the arrow represents the direction your subject is facing, relative to the LED locations.
3. LED	These images indicate the location and color of the LEDs that cheetah is currently tracking. The location is fixed based on the LED configuration you have selected. 2LED mode is pictured in the example.
4. LED Color Selection	When in 2LED tracking mode, you may specify the color you want each LED to be. The HS-54 configuration has fixed colors that cannot be changed. Cheetah supports the following LED colors: 1. **RED** 2. **GREEN** 3. **BLUE** Setting the LED color to a value that does not correspond to your actual LED colors can give erroneous direction and position values.
5. OK Button	Unlike most other settings in Cheetah, the changes made for direction finding are not immediately applied. You will need to press OK in order to apply the changes.
6. Cancel Button	Unlike most other settings in Cheetah, the changes made for direction finding are not immediately applied. If you wish to discard all changes that you have made, you can click cancel. Closing the dialog by clicking the X in the upper right corner is identical to clicking the cancel button.

10.4 Windows and Plots

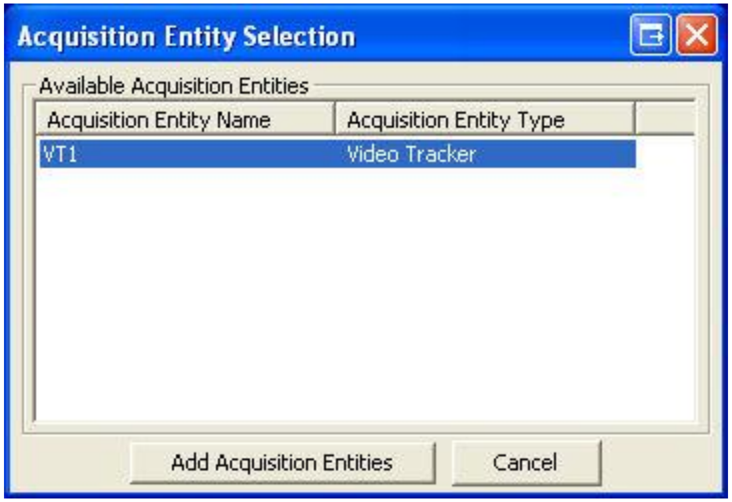
Video Displays

Creating a Video Display

When a video tracker is added to your system, no display is created for it. In order to see what the video tracker is doing, you need to create a video window and then add a plot.

You can create a video window from the Window menu on Cheetah's main window.

You will then get a new, empty video window. To add a plot to the window you can either use the Display menu of the new window or right click anywhere in the window and select Add Plot. You will then see the Acquisition Entity Selection dialog. Select one and only one of the video trackers listed in this window.


Acquisition Entity Selection

Available Acquisition Entities

Acquisition Entity Name	Acquisition Entity Type
VT1	Video Tracker

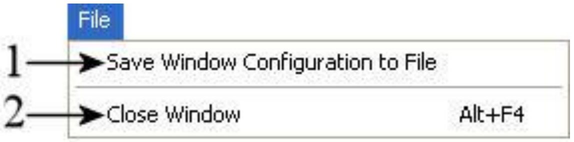
Video Window Overview

This section will give you a general overview of each of the parts of the video window. There are more detailed descriptions of some of the sections after this overview.

1. Title Bar	The video window title bar will always display the name of the window along with the name of the video tracker that is displayed in this window. Additional information can also be displayed in the window's title bar, such as whether or not the plot is frozen.
2. File Menu	This menu will expand to show some common window tasks. See the detailed description of the video window's file menu.
3. Display Menu	This menu will expand to allow you to manipulate some of the display aspects of the video window. See the detailed description of the video window's display menu.
4. Video Plot	Unlike the other types of plot windows, the video window can only contain a single plot. The entire window will be filled with the video image. For more information on the video plot, see the video plot description.

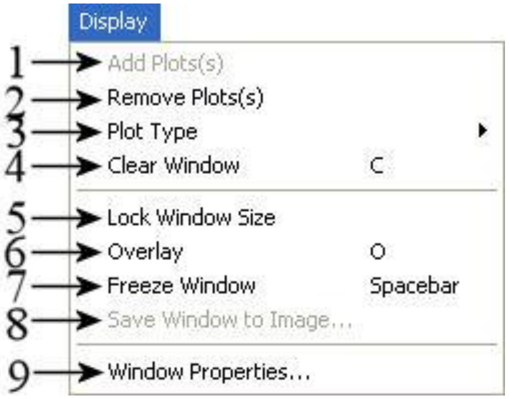
5. Close Window	Clicking on this X will close a window, exactly as it does for all Windows programs. Closing a window will destroy the window. This means that when you close a window, all of the display settings you have changed and plots you have added to the window will be lost.
6. Maximize Window	Clicking this button behaves the same as it does for all Windows programs on your system.
7. Minimize Window	Clicking this button will minimize this window to the bottom of the screen. It will not minimize this window to the taskbar as it does with most Windows programs.

Video Window File Menu



1. Save Window Configuration To File	Saves the window, plot and all of their current settings to a configuration file. This file can be reloaded at any time. However, the acquisition entity associated with the plot must exist, and a window with the same name must not exist. This does not save the current hardware or acquisition entity settings.
2. Close Window	Clicking on tis menu option will close a window, exactly as it does for all Windows programs. Closing a window will destroy the window. This means that when you close a window, all of the display settings you have changed and plots you have added to the window will be lost.

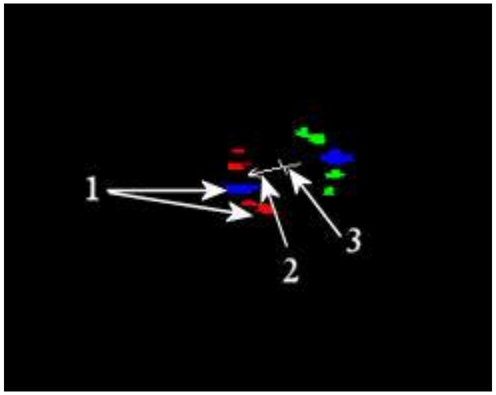
Video Window Display Menu



1. Add Plot	Clicking this menu option will allow you to add a video tracker plot to this window. Since the video window will only

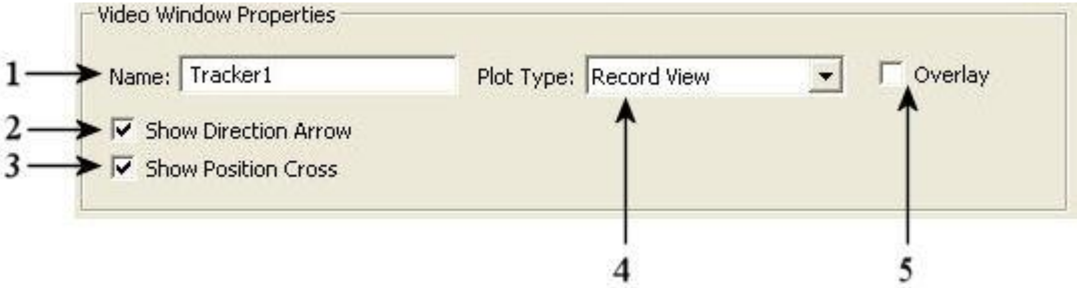
	allow one plot per window, this option will not be available when there is already a plot in the window. You must either remove the current plot and then add the new one, or add the plot to a new window. When you select add plot, you will see the Acquisition Entity selection dialog. This command can also be accessed by right clicking anywhere in the video window, if there is currently no plot in the window.
2. Remove Plot	This menu item will remove the current plot from the video window. Once a plot is removed, nothing will be shown in the video window; since the video window can only show a single plot. Removing a plot will erase all setting changes you have made to the plot. If there are no plots in this window, this menu option will not be available. This command can also be accessed by right clicking anywhere in the video window, if a plot is in the window.
3. Plot Type Selection	This menu item contains a sub menu listing the plot types available. See *Plot Type Selection* under the *Video Window and Plot Properties* section for more details.
4. Clear Window	This will force the display to clear itself. This is usually used when using overlay mode. In addition to this menu command, you can press the C key with the window selected to clear the display.
5. Lock Window Size	When the window size is locked, you will see a check mark next to this option. Locking the window size will disable resizing of the window.
6. Overlay	The overlay menu option will switch the window in and out of overlay mode. When there is a check mark next to the menu item, this means the display is currently in overlay mode. When in overlay mode, the window will show each subsequent video frame overlaid on top of previous frames. Clearing the display or resizing the window will cause the window to restart frame overlay. In addition to this menu command, you can press the O key with this window selected to toggle overlay on and off.
7. Freeze Window	Selecting this menu option will freeze the currently displayed video frame in the window. The work "frozen" will also appear in the title bar, after the acquisition entity name. Clearing the display or resizing the window will cause the window to clear, but no new frames will be displayed until the window is no longer frozen. There is also a check mark next to this option when the window is frozen. Un-freezing the window will begin to draw new frames as they are recieved. You will not see any of the frames that were captured while the window is frozen, but they all will be processed by Cheetah. In addition to this menu command, you can press the Spacebar with this window selected to freeze and unfreeze the display.
8. Save Window to Image	This option is only available when the window is frozen. It will allow you to save the current window display to a BMP, PNG or JPG raster image.
9. Window Properties	This will bring up the properties page and selects this window in the tree. If the properties page is closed, Cheetah will open the properties page. If the properties page is open, it will make sure the properties page is visible. You can see a detailed description of video window properties for more information.

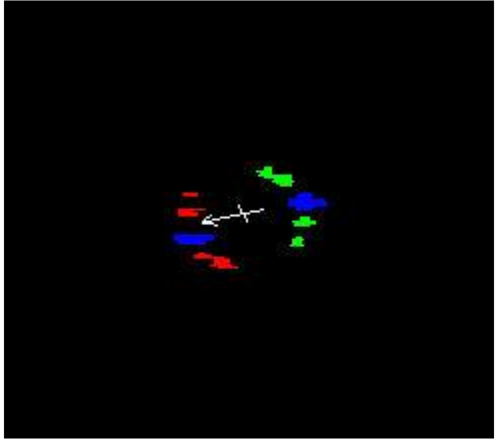
Video Plot Overview

	
1. Targets	When you are in Threshold or Record view mode, any color or intensity values that are above your current threshold will be shown. If you are in live video mode, you will see the live video instead of targets.
2. Direction Arrow	This shows the direction that the video tracker has detected. The arrow's head points forward. The arrow is overlaid on top of the video image.
3. Position Cross	The intersection of the two lines of the position cross is the position that the video tracker has detected. The cross is overlaid on top of the video image.

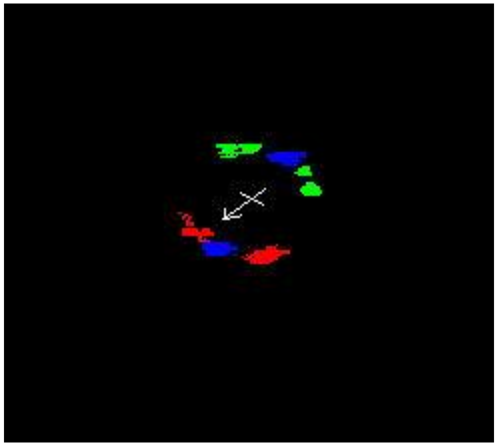
Video Window and Plot Properties

The video window properties are shown in the properties window when a video window or video plot is selected in the properties tree. For more information on the properties window, see the detailed description of the properties page. Changes made to the window properties will affect all plots within this window.

 Name: Tracker1 Plot Type: Record View ☐ Overlay ☑ Show Direction Arrow ☑ Show Position Cross	
1. Name	This is the name of this video window, and it must be unique throughout Cheetah. The window name is shown in the window's title bar, as well as in the display properties tree.

2. Show Direction Arrow	The direction arrow will show you the direction that the video tracker has determined your subject is facing. This information is obtained from the video record that is generated by the video tracker. When this box has a check mark, the direction arrow will be shown overlaid on the video plot. Removing the check mark will hide the direction arrow, but direction processing will continue for all video records.
3. Show Position Cross	The position cross will show you the position that the video tracker has determined with in the video frame. This information is obtained from the video record that is generated by the video tracker. When this box has a check mark, the position cross will be shown overlaid on the video plot. Removing the check mark will hide the position cross, but position processing will continue for all video records.
4. Plot Type	The plot type allows you to change how you view your video data. If Cheetah is not receiving any image information (generally if acquisition is off) from the capture card, a blue screen will be displayed. Some capture cards will display a black or blue image if no signal is present on the selected input. Cheetah supports the following plot types for video: 1. **Record View:** This is an exact representation of the information that is saved to a video record. Since video records can only contain a fixed amount of information, the image may not seem to fill the entire video window. All color threshold crossings are shown in the display. Red, green and blue are shown as their respective colors, and intensity is shown as gray. If tracking of a specific color is not enabled, you will not see that color in the display.  2. **Live Video:** Live video will show the live, unprocessed video image that the capture card receives from the camera. This is also the image that is recorded to an output file, if that option is enabled for the video tracker. This view is useful for positioning your camera as well as adjusting video settings. This view is not indicative of the information stored in the video records.

3. **Threshold View:** This view will show all threshold crossings in the complete image. When in record view, if you have your thresholds set too low, you will see a bunch of lines towards the top of the image. This means that the record is saturated, and the system is not tracking properly. You can switch to threshold view to adjust the thresholds and zero in on the objects you wish to track. This view is not indicative of the information stored in the video records.



11. Events

Event Acquisition Entity Overview

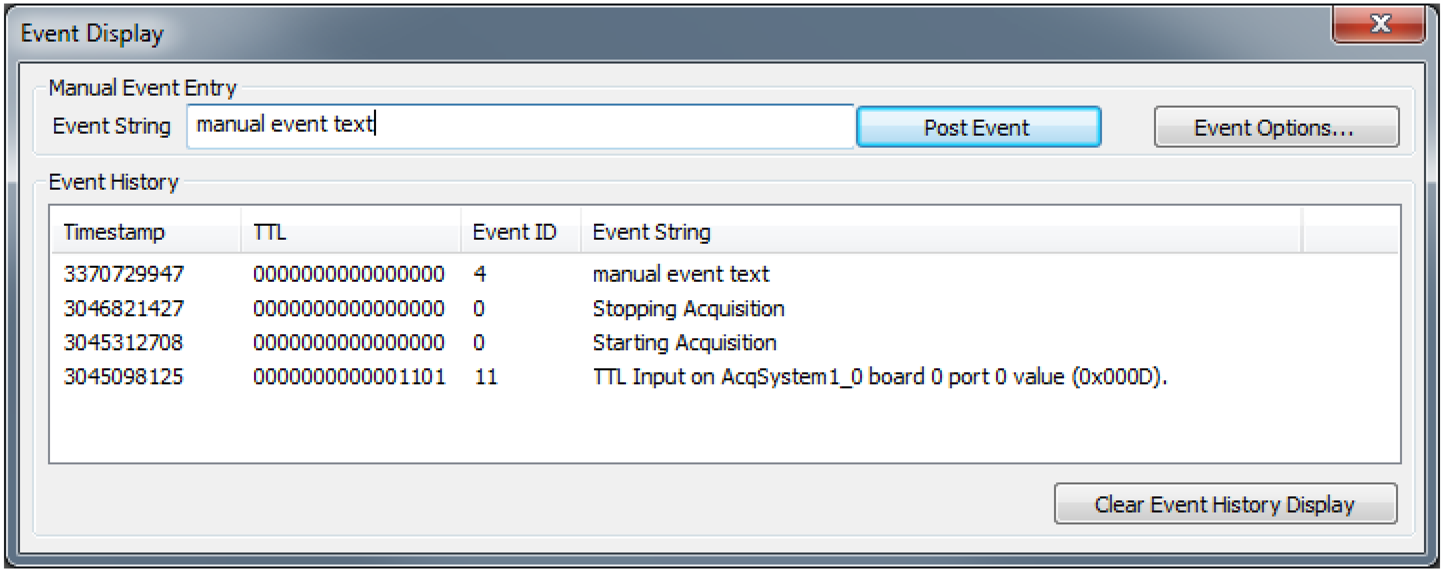
Events are either TTL changes or user entered strings that occur while Cheetah is running an experiment. Events can be used either as flags to separate out different sections of neurological data or to monitor and control the experiment. When an event occurs, the timestamp is immediately saved to an event file. If the event occurred because of a TTL change, the TTL value is saved with an event ID specifying which TTL input device the triggered the event. For user generated events (either via NetCom or entered in the event display), the string saved. Unlike other acquisition entities, you do not need to create an event acquisition entity, since there is only one (named Events) throughout the system.

Event Topics:

Event Display
Event Commands
Generic Dialog Commands
Event Display Commands

11.1 Event Display

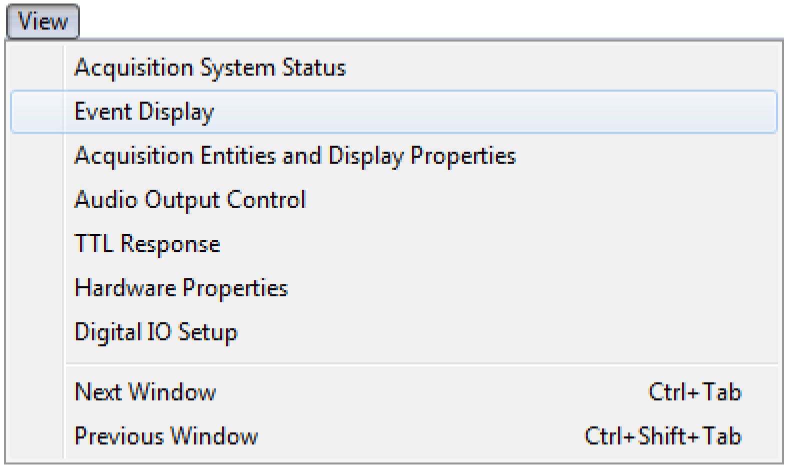
Event Display



Event String: manual event text

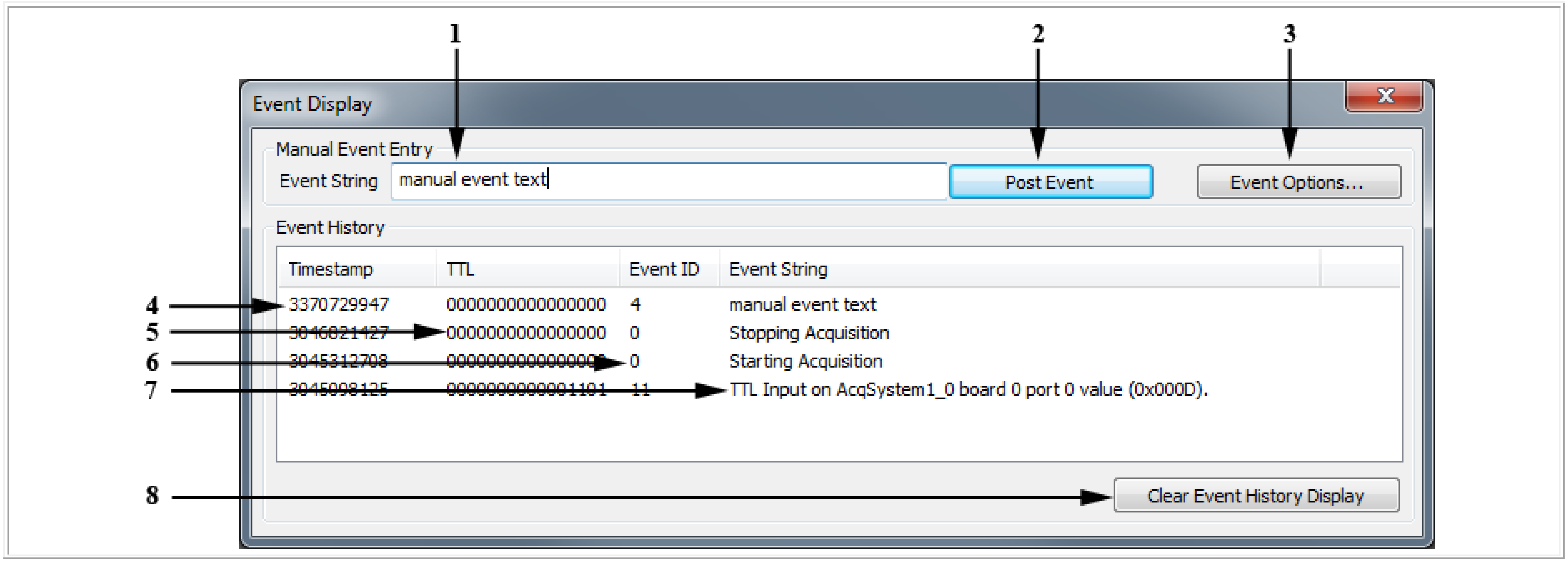
Timestamp	TTL	Event ID	Event String
3370729947	0000000000000000	4	manual event text
3046821427	0000000000000000	0	Stopping Acquisition
3045312708	0000000000000000	0	Starting Acquisition
3045098125	0000000000001101	11	TTL Input on AcqSystem1_0 board 0 port 0 value (0x000D).

The Event Display will allow you to create and view events that are registered by Cheetah while recording or acquiring. The event display can be launched from the View menu of Cheetah:



Manual Event Entry Section

The manual event entry section allows you to enter any string you want and have it timestamped and saved to an event record.



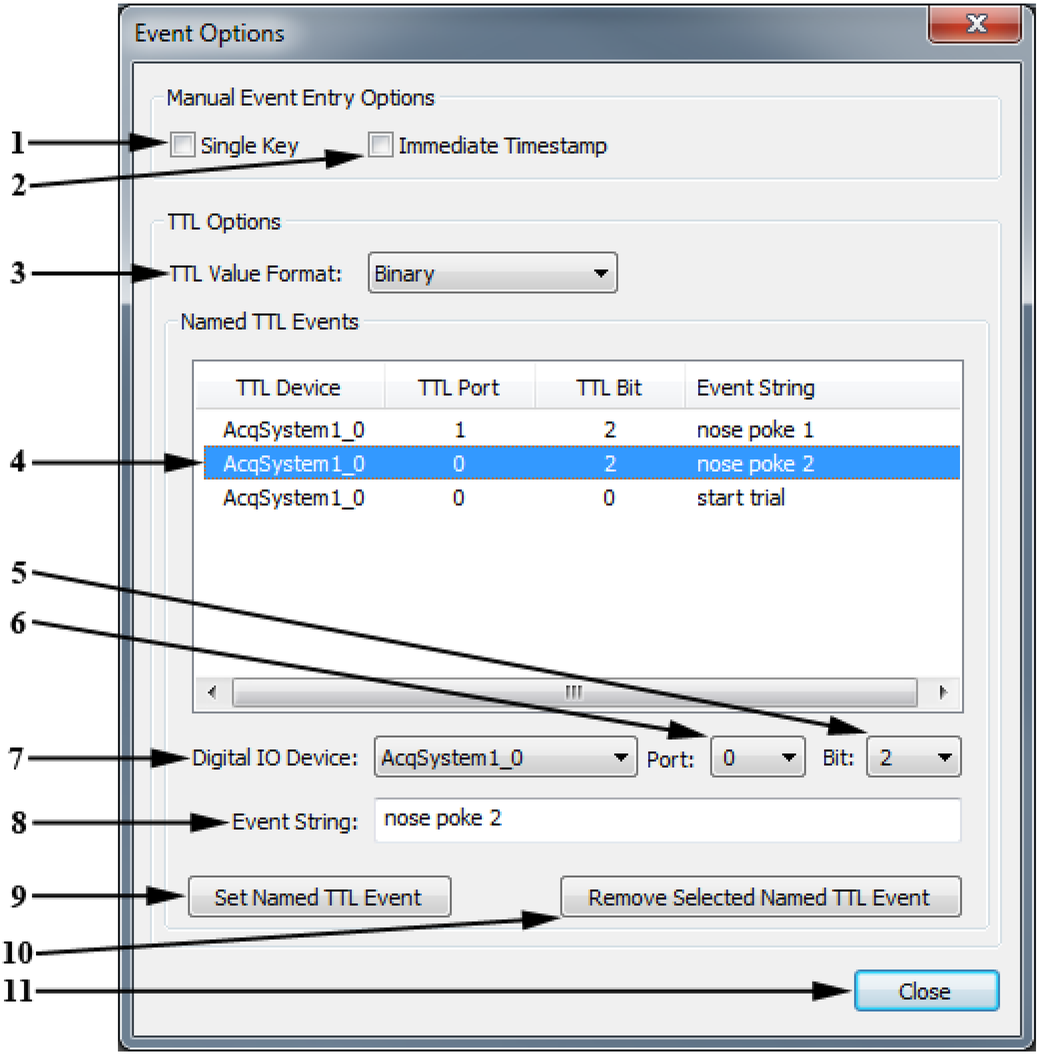
Event String: manual event text

Timestamp	TTL	Event ID	Event String
3370729947	0000000000000000	4	manual event text
3046821427	0000000000000000	0	Stopping Acquisition
3045312708	0000000000000000	0	Starting Acquisition
3045098125	0000000000001101	11	TTL Input on AcqSystem1_0 board 0 port 0 value (0x000D).

1. Event String Entry	The event string can be used as a label for a specific event. You can enter any text you wish (up to 128 characters) into this box. There are different modes available for event string entry that are explained below. Pressing the Enter key will immediately generate an event record and store the text entered here into the record.
2. Post Event	Clicking the post event button will immediately generate an event with the text in the event string box at the current timestamp. You can either click this button or just press Enter after typing the event string to generate the event.
3. Event Options	Launches the Event Options Dialog where you can modify event display and generation settings.
4. Timestamp	The Cheetah timestamp indicating when the event occurred.
5. TTL Value	If the event was created due to a TTL bit changing, then this represents the current value on a TTL port at the time the event was generated. Events generated by pressing the post event button will have this value set to 0. Events generated using the -PostEvent command will show the user specified value used in the command.
6. Event ID	An ID representing the source of this event. See -PostEvent for more information.
7. Event String	The string stored in the event record. This can be either a user defined string or an automatically generated string depending on where the event originated. Event strings can be associated with a specific TTL bit going from 0 (low) to 1 (high) by using named events.
8. Clear Event History Display	Clears out all the events in the event history. This does not remove events from a recorded event file, only from the display.

Event Options Dialog

This dialog must be closed before you can continue using Cheetah.



☐ Single Key ☐ Immediate Timestamp

TTL Value Format: Binary

TTL Device	TTL Port	TTL Bit	Event String
AcqSystem1_0	1	2	nose poke 1
AcqSystem1_0	0	2	nose poke 2
AcqSystem1_0	0	0	start trial

Digital IO Device: AcqSystem1_0 Port: 0 Bit: 2

Event String: nose poke 2

1. Single Key Entry Enable	When this option is unchecked, the either the Enter key must be pressed or the post event button clicked to generate an event. Single key entry allows you to immediately generate an event whenever a letter is entered into the event string box. After any key is pressed,an event record will be generated with the event string and the last letter in the event string will be highlighted. Pressing another key will change the last letter in the event string to the key you just pressed and generate a new record; highlighting the last letter again. This can be useful for generating numbered events. **Example:** You wish to generate events labeled "event1", "event2", and "event3". Begin with the single key check box unchecked, so you are in normal entry mode. Type the word "event" (without the quotes)into the event string box. Open up the Event Options dialog and click the single key entry enable box to check it. Close the Event Options

	dialog and then click in the event string entry right after the "t" in "event." Press the "1" key. You will see an event with the label "event1" appear in the Event History. Now press "2." Immediately "event2" appears in the Event History. Finally press "3." "event3" should now be in the Event History list. Unchecking the single key entry enable will then return you to normal event entry mode.
2. Immediate Timestamp Entry Mode	When this option is unchecked, the timestamp for the event will be taken at the time the event is posted (either by pressing Enter in the event string entry box, or clicking the post event button.) Checking the Immediate Timestamp entry mode box will take the timestamp when you first begin typing into the event string box, not when you post the event.
3. TTL Value Format	Changes the numeric format used to display TTL values in the event history. Changing the format will change all of the TTL values currently shown in the event history. 1. **Binary:** Shows individual TTL bit on (1) or off (0). Bit number 0 is the rightmost bit in the string and the left most bit is bit 15. EPorts that are less than 16 bits will have their value 0 extended to 16 digits. 2. **Decimal:** Shows a base 10 representation of all TTL bits. 3. **Hexadecimal:** Shows a base 16 representation of all TTL bits. Each digit represents a group of four bits with the right most digit representing bits 0 - 3. Ports that are less than 16 bits will have their value 0 extended to 4 hex digits. **Example**: On an eight bit port, bits 3 and 1 are on and all other bits are off. The representation of this TTL value in each or the value formats is as follows: - **Binary:** 0000000000001010 - **Decimal:** 10 - **Hexadecimal:** 000A
4. Named TTL Event List	List of named TTL events that are currently active. See the -SetNamedTTLEvent command for more information. Clicking on an item in this list will populate the edit controls with the values for the selected item.
5. TTL Bit	The TTL bit number associated with the named event. When this TTL bit goes high (1) on the selected digital IO device port, the text in the event string will be substituted for the default TTL event string.
6. Digital IO Device Port	The port of the selected digital IO device where the desired bit is located. See digital IO ports for more information.
7. Digital IO Device	The name of the digital IO device that will be monitored for the bit change.
8. Event String	The custom event string to use when the specified TTL bit goes high (1). **NOTE**: Replacing the default event string means that some information about the source of the TTL value will be lost.

	Specifically, the name of the DigitalIO device and the port number that generated the TTL
9. Set Named TTL Event	Associates an event string with a the TTL bit on the port of the digital IO device shown in boxes 5, 6 and 7. If a named TTL event exists that matches the bit/port/device combination, the event string of that named event will be replaced with the new event string. See the -SetNamedTTLEvent command for more information.
10. Removed Selected Named TTL Event	Removes the selected named TTL event from the system. The next time that bit goes high (1), it will use the default TTL event string. See the -RemoveNamedTTLEvent command for more information.
11. Close	Closes this dialog.

12. Audio

Audio

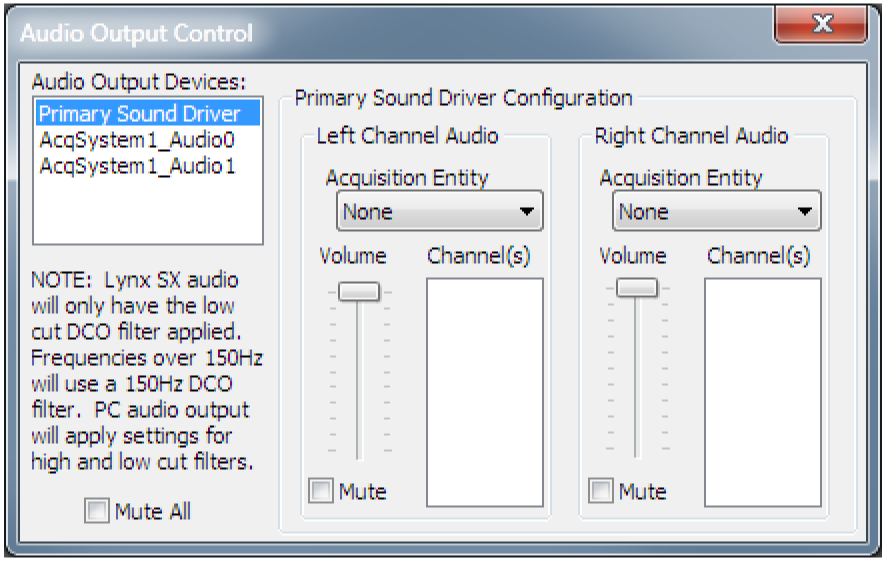
Cheetah has the ability to allow you to listen to individual Spike or CSC acquisition entities through your computer's speakers or a pair of headphones using the filter settings of those acquisition entities. This is not raw or unfiltered output. Audio output requires that you have a DirectSound compatible sound card on your system or a hardware system capable of audio output. Currently only two channel audio devices are supported. Audio output is always available (unless you don't have any compatible audio output devices), and its settings can be changed at any time. You will only hear audio when Cheetah is in acquisition or recording mode. Cheetah will only output sound through Windows' Primary Sound Driver or your hardware system's audio output. See your Windows help for more information on the Primary Sound Driver.

Audio Topics:

Audio Output Control
Audio Commands
Generic Dialog Commands

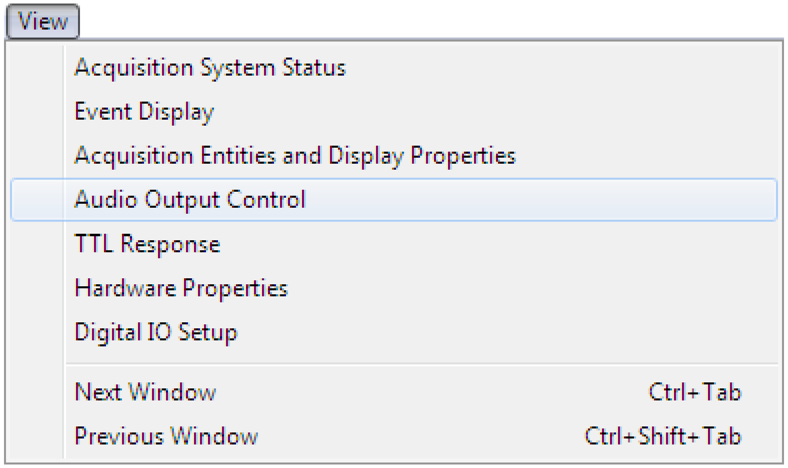
12.1 Output Control

Audio Output Control



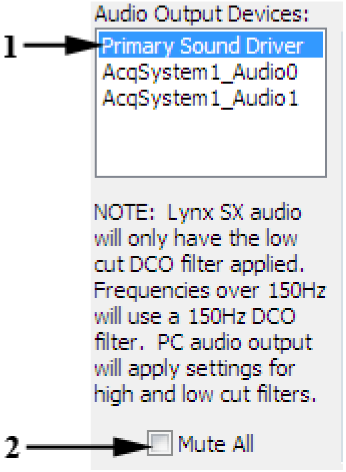
NOTE: Lynx SX audio will only have the low cut DCO filter applied. Frequencies over 150Hz will use a 150Hz DCO filter. PC audio output will apply settings for high and low cut filters.

The Audio Output Control will allow you to change the way Cheetah outputs audio while recording or acquiring.. All changes take effect immediately. The Audio Output Control can be launched from the View menu of Cheetah:



There are also multiple ways to view the Audio Output from the plots and plot windows. This varies by type, see the reference guide entry for the plots and plot windows of the specific type you wish to change.

Audio Output Device Section



Audio Output Devices:

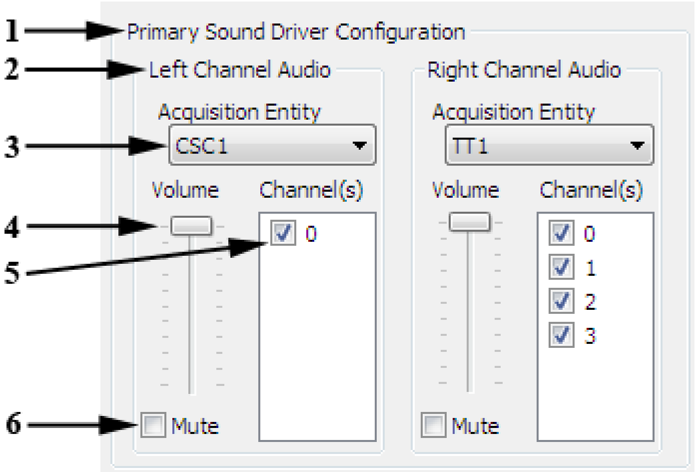
Primary Sound Driver
AcqSystem1_Audio0
AcqSystem1_Audio1

NOTE: Lynx SX audio will only have the low cut DCO filter applied. Frequencies over 150Hz will use a 150Hz DCO filter. PC audio output will apply settings for high and low cut filters.

☐ Mute All

1. Audio Device Selection	This is a list of all of the audio devices on your system that can be used by Cheetah for audio output. If you do not see the audio device you wish to use, it may not be compatible with Cheetah, or is not properly installed. Clicking on a device in the list will allow you to change the settings for that device in Cheetah. You will notice that when you click on a device, the name appears at the top of the configuration portion of the window. Cheetah will output audio on all of the devices at the same time. Generally, the first audio device is Primary Sound Driver. If you only intend on using a single audio output device, it is generally a best practice to use the Primary Sound Driver. Your Primary Sound Driver can be changed through the Windows control panel. See your Windows documentation for more information. If your acquisition hardware supports audio output, the audio outputs for that hardware will also be listed here. See your acquisition hardware documentation for more information on the audio output capabilities of your hardware.
2. Mute All	Checking this box will mute all audio channels on all audio devices.

Audio Device Configuration

 Primary Sound Driver Configuration Left Channel Audio Acquisition Entity CSC1 Volume Channel(s) ☑ 0 ☐ Mute Right Channel Audio Acquisition Entity TT1 Volume Channel(s) ☑ 0 ☑ 1 ☑ 2 ☑ 3 ☐ Mute	
1. Configuration Options	This portion of the display contains all of the options that you can change for each device. The changes you make here will only affect the selected device, and will take effect immediately. Cheetah currently supports stereo output devices. Changing the selection in the Audio Output Device list will change the title of this section.
2. Audio Channel Setup	The setup for left and right channel audio is identical. All settings on the left or right channel can be heard through their respective speakers connected to the selected audio device.
3. Acquisition Entity Selection	Cheetah can output audio for both spike and continuously sampled channels. When you select an acquisition entity from the list, you should immediately hear it on the channel you are configuring. The number of channels in the channel selection list will be determined by the selected acquisition entity. You may only select one acquisition entity per audio channel. However, the same acquisition entity may be used on a different audio device or channel. Selecting None as the acquisition entity disables output on the selected audio device and channel. All devices will initially start out with None selected for the acquisition entity unless configured to do otherwise. The audio heard on the output channel will already be filtered and amplified according to the settings for the selected acquisition entity. Spike acquisition entities will output the continuous signal as audio, not extracted spikes.
4. Channel Selection	Here you will be able to select the channels for the selected acquisition entity that you wish to hear. This is mainly used for multi-channel acquisition entities such as tetrodes and stereotrodes. When you select a new acquisition entity, all of the channels available for that acquisition entity will be displayed, and their audio output will be enabled. To disable output for a specific channel, uncheck the box next to the channel you want to disable. You should immediately hear the channel silenced on the audio output. Checking the box next to a channel should immediately begin outputting the audio for that channel. All channels are output

	individually, there is no summing of the channels. So if you had two different songs playing on two different channels, you would hear both songs being output through the speaker.
5. Volume	The volume slider here is used to amplify the audio signal within Cheetah. To make the sound louder, move the slider to the towards the word Volume. Moving the slider in the opposite direction will quiet the audio. Changing the volume in Cheetah has no effect on your Windows sound settings or the amplification of the signals recorded by Cheetah. Changes in the input range of your signal will also affect the volume level for Cheetah. Input ranges that are closest to the actual input signal will provide the largest range of control over the volume. Changes in your Windows audio settings will add or subtract amplification on top of the Cheetah volume setting.
6. Mute	Checking this box will mute the audio on this channel of the selected audio device only. The volume slider will be unavailable when the channel is muted. Unchecking the mute option will restore the output to the previous volume and re-enable the volume slider. This setting has no effect on the signals recorded by Cheetah.

13. TTL Response

TTL Response

Cheetah has the ability to send out a TTL pulse in response to certain events occurring during acquisition or recording. While the responses are not extensively customizable, they are designed to provide basic experiment control functionality with the lowest latency possible. If the TTL response functionality present in Cheetah does not meet your needs, contact support@neuralynx.com with a description of the task you wish to perform.

Cheetah can respond to the following:

Spike Response	When a new spike is detected for a spike acquisition entity, Cheetah will output a high TTL pulse on a Digital IO device. Spike responses can be configured to only respond to specific cells (defined by Spike Sort 3D) or to any spike that occurs.
TTL Input Response	When a bit is changed on a Digital IO input device, Cheetah will send a high TTL pulse to a Digital IO output bit.

The TTL pulses are controlled by Digital IO devices. For more information see the Digital IO section of this guide.

Some hardware systems have TTL response mechanisms included that further decrease the latency of spike and TTL input response. See the documentation for your hardware for more information.

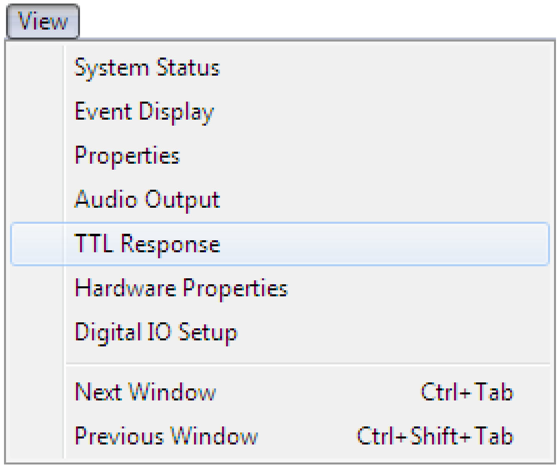
TTL Response Dialog
TTL Response Commands

13.1 TTL Response Dialog

TTL Response Dialog

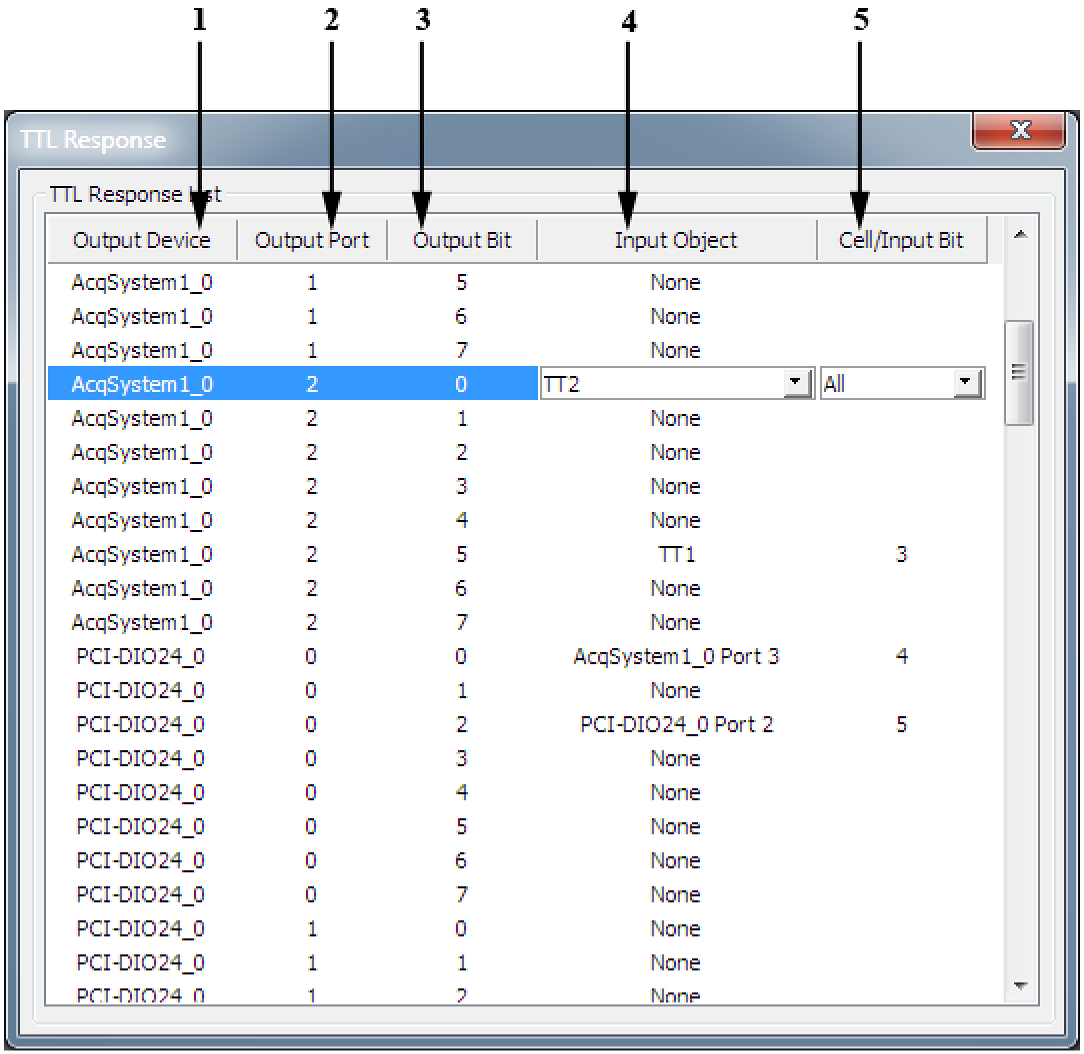
The TTL Response dialog allows you to view current responses as well as setup new TTL pulse outputs for a specified spike acquisition entity or TTL input bit. The duration of the TTL pulse is set using the Digital I/O Setup dialog.

The TTL Response dialog can be launched from the View menu of Cheetah:



TTL Response List

The TTL Response dialog contains a list of every available TTL output bit and its current response assignment. Each output bit can be assigned to a single input object and cell/input bit combination. Clicking on an item in the list will allow you to adjust the input object and cell/input bit monitored for response.



Output Device	Output Port	Output Bit	Input Object	Cell/Input Bit
AcqSystem1_0	1	5	None	
AcqSystem1_0	1	6	None	
AcqSystem1_0	1	7	None	
AcqSystem1_0	2	0	TT2	All
AcqSystem1_0	2	1	None	
AcqSystem1_0	2	2	None	
AcqSystem1_0	2	3	None	
AcqSystem1_0	2	4	None	
AcqSystem1_0	2	5	TT1	3
AcqSystem1_0	2	6	None	
AcqSystem1_0	2	7	None	
PCI-DIO24_0	0	0	AcqSystem1_0 Port 3	4
PCI-DIO24_0	0	1	None	
PCI-DIO24_0	0	2	PCI-DIO24_0 Port 2	5
PCI-DIO24_0	0	3	None	
PCI-DIO24_0	0	4	None	
PCI-DIO24_0	0	5	None	
PCI-DIO24_0	0	6	None	
PCI-DIO24_0	0	7	None	
PCI-DIO24_0	1	0	None	
PCI-DIO24_0	1	1	None	
PCI-DIO24_0	1	2	None	

1. Output Device	This is the name of the TTL output device to use for response. If the device you want to use is not listed, it is either not supported by Cheetah or is currently set as a TTL input device. See the Digital IO section of this guide for more information on TTL direction and device naming.
2. Output Port	The output port that contains the bit being used for spike response. See the Digital IO section of this guide for more information on TTL ports.
3. Output Bit Number	The specific bit that will be pulsed in response to an input object. See the Digital IO section of this guide for more information on TTL bit numbering.

4. Input Object Name	The input object to use for TTL response. This list contains both spike acquisition entities and TTL input ports. For more information on how Cheetah responds to each of these input object types, see the TTL Response commands section of this guide.
5. Cell or Input Bit Number	Depending on the type of input object selected, this will either be the cell number (spike input object) or bit number (TTL input object) monitored to trigger a TTL pulse. For spike input objects, the cell number may be set to a value of *all*. When set to *all*, cell number is disregarded and any spike coming in from the acquisition entity will cause a TTL pulse to be delivered. Selecting *None* for any input object type will disable TTL response for the corresponding output bit. For more information on cell numbers, see the -SetClusterBoundary command. For information on TTL bit numbering see the Digital IO section of this guide.

14. Licensing

Licensing

When you purchase Cheetah from Neuralynx, you are actually purchasing a license to use Cheetah. This license will make sure that your copy of Cheetah will only run on your PC, and that you'll be able to use all of the features of Cheetah that you paid for. If your license file gets stolen, it will be worthless on another computer. Licensing is there to protect your investment. A license is only required when you want to record data from a Neuralynx hardware system. No license file is required when you play back raw data files.

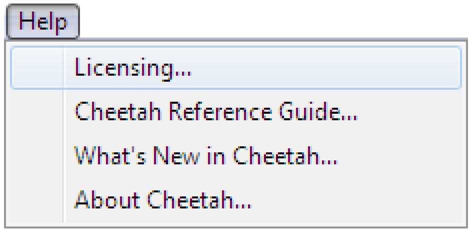
Here are the important things to know about how licensing works with Cheetah.

Licensing Topics:

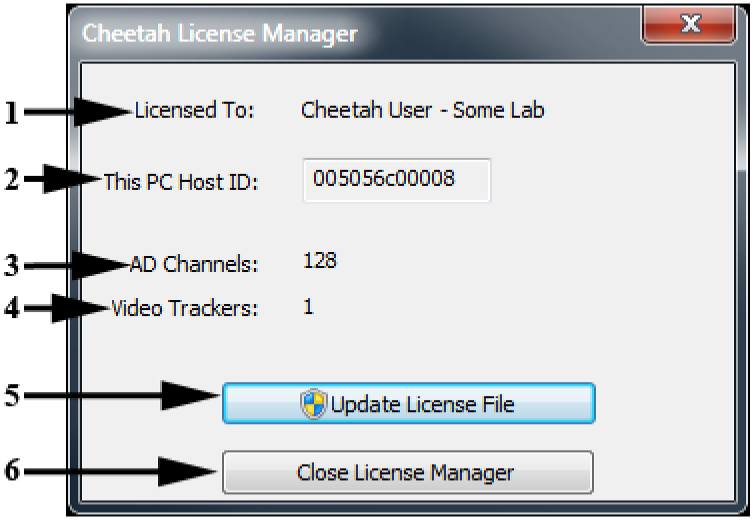
14.1 License Manager

License Manager

The Cheetah License Manager will allow you to view and update the licensing information for this computer. It can be launched from the Help menu of Cheetah:



License Manager Overview

 Licensed To: Cheetah User - Some Lab This PC Host ID: 005056c00008 AD Channels: 128 Video Trackers: 1	
1. Licensee	This is the name and/or lab to whom the license file was issued. If the name here is not correct, please contact Neuralynx with your new information so we can update our records and issue you an updated license file.
2. Host ID	The host ID of the PC you are currently using. This information is required for Neuralynx to issue you a license file. If you do not have a license file, or your license does not appear to be valid, please include this information when you request a new license file.
3. AD Channels	The number of AD channels that this copy of Cheetah is licensed to use. Any attempt to use more than this number of channels will be disallowed by Cheetah.

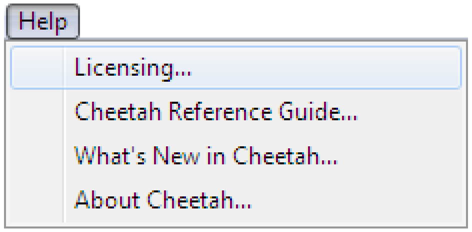
4. Video Trackers	The number of Video Trackers that this copy of Cheetah is licensed to use. Any attempt to use more than this number of Video Trackers will be disallowed by Cheetah.
5. Update License File	Allows you to update your license information. See Updating Your License File for more information.
6. Closes License Manager	Closes the license manager. You can either click this button or press the X in the upper right corner to close the License Manager.

14.2 Updating Your License

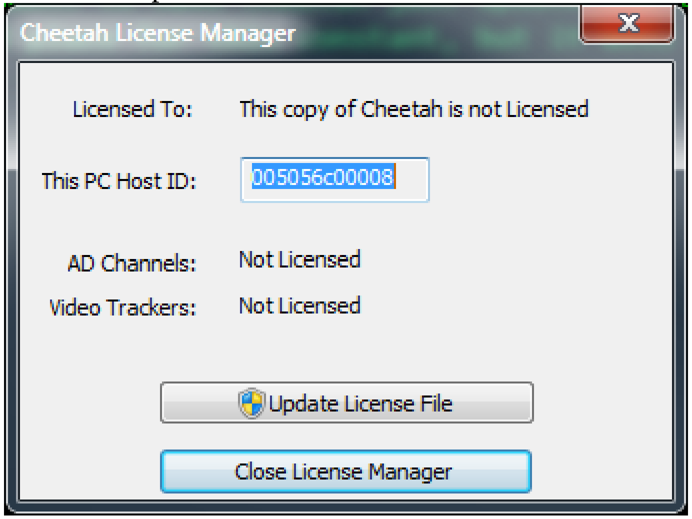
Updating Your License File

From time to time, it may be necessary to update your license file. You may do this because you upgraded to a new PC; have purchased more features from Neuralynx, or simply just want to update your user name and lab. You have two options to update your license once you receive your new license from Neuralynx. The first is to just re-install Cheetah and provide the new license file when asked. Otherwise, you can just update the file through Cheetah.

1. With Cheetah running; open the License Manager from the Help menu of the main window.



2. Click the Update License File button.



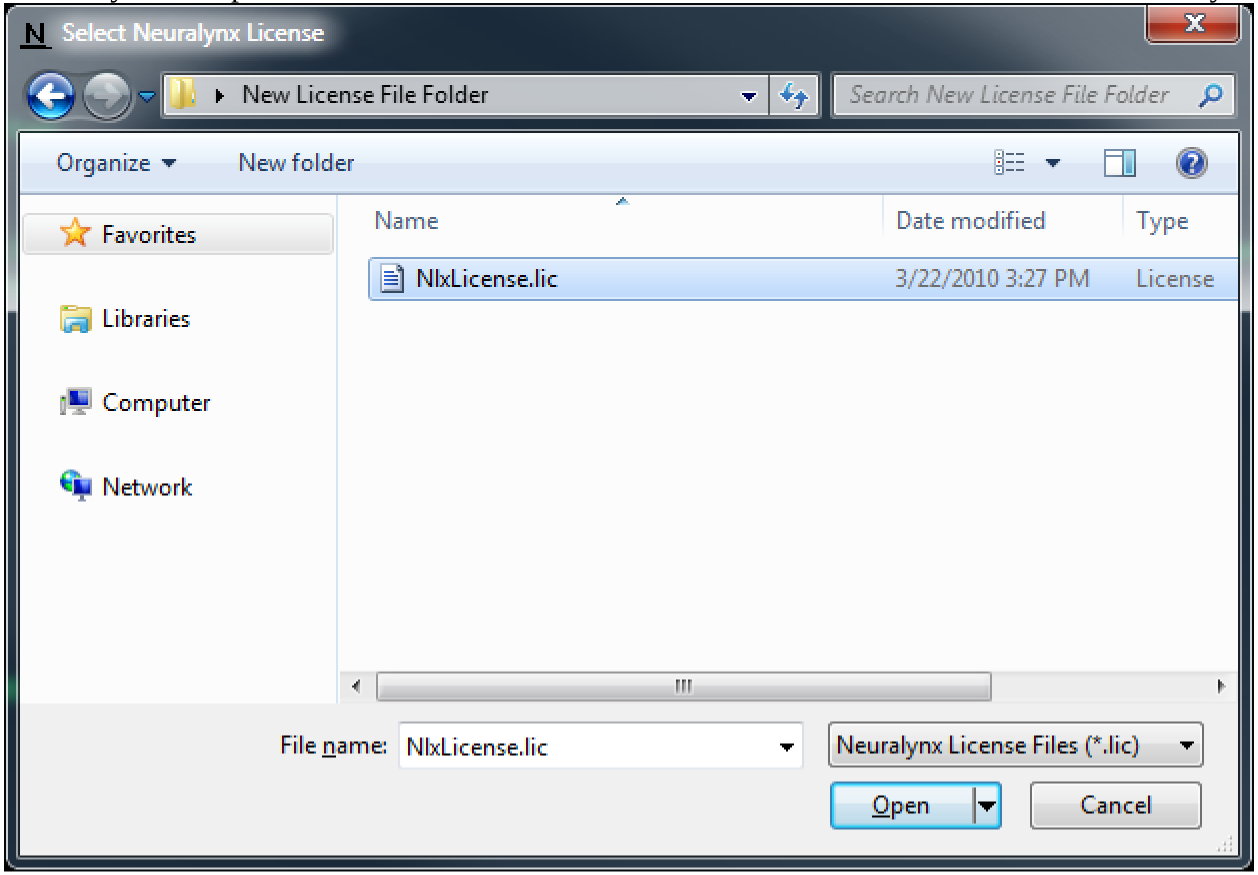
Licensed To: This copy of Cheetah is not Licensed

This PC Host ID: 005056c00008

AD Channels: Not Licensed

Video Trackers: Not Licensed

3. Browse your computer to find the new license file. It should be named NlxLicense.lic. Once you find the new file, click Open.

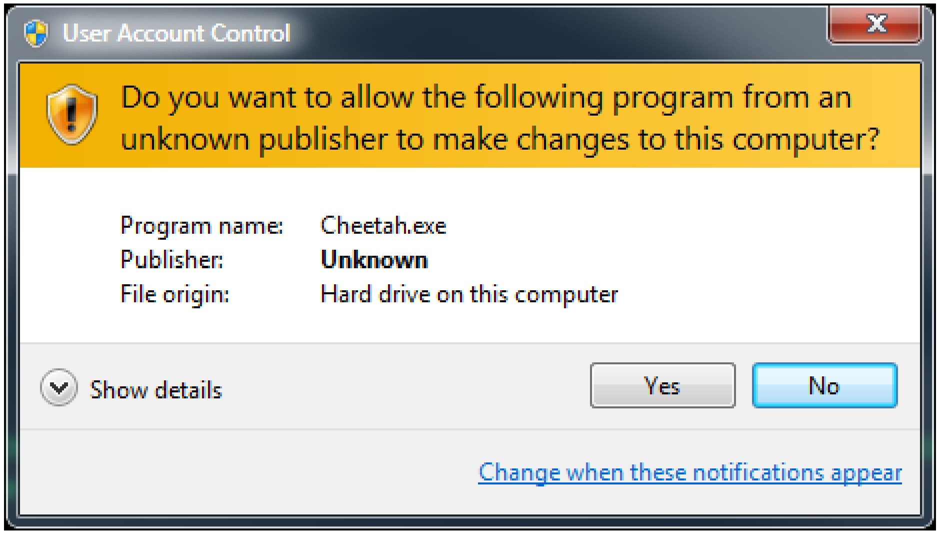


Name	Date modified	Type
NlxLicense.lic	3/22/2010 3:27 PM	License

File name: NlxLicense.lic

Neuralynx License Files (*.lic)

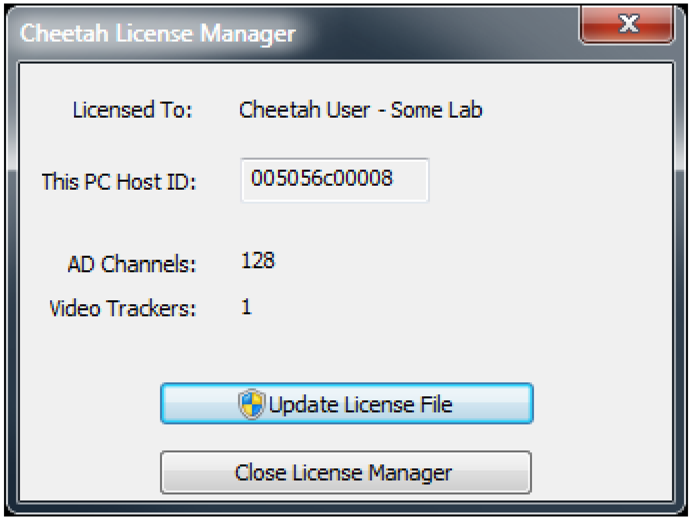
4. If you are using Windows Vista or Windows 7, you will see a User Account Control (UAC) prompt asking you to allow Cheetah to update your license file. Click Yes to continue



Do you want to allow the following program from an unknown publisher to make changes to this computer?

Program name: Cheetah.exe
Publisher: **Unknown**
File origin: Hard drive on this computer

5. Your new license information should now be shown in the License Manager.



Licensed To: Cheetah User - Some Lab
This PC Host ID: 005056c00008
AD Channels: 128
Video Trackers: 1

Troubleshooting Tips

If you see an error message when updating your license file, here are some common things to check:

1. Make sure you have selected the correct license file.
2. If the license file is located on a network or removable drive, make sure you can access the drive.
3. Verify that you are using the PC whose host ID was sent to Neuralynx.

If you've verified all of these steps, and are still having licensing issues, please send your log file and a copy of your license to support@neuralynx.com

14.3 Finding Your Host ID

Finding Your Host ID

Cheetah is only licensed to be used on a single computer. We do this by tying the license file to the host ID of your computer, and will need this information before issuing you a license file. There are a few ways of finding the host ID of your computer.

Using Cheetah 5.0 or Newer

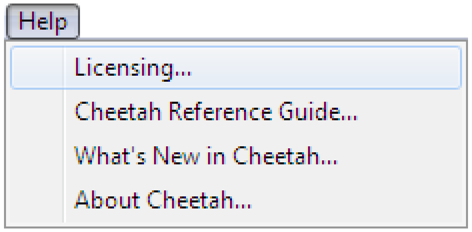
You can download and install Cheetah without having your license file. When the installer asks you for a license file, continue with the install, and ignore any messages that pop up. Once Cheetah is installed, you can find the host ID using the license manager.

1. Start Cheetah from the Desktop by double clicking on the Run Cheetah link.

2. Press Enter when the Startup Configuration Selection dialog comes up, and ignore any errors that may occur during startup.

C:\Cheetah2WorkingDirectory\Configuration\Cheetah.cfg

3. Launch the License Manager from the Help menu.



4. The License Manager will show you the host ID for the computer you are currently running. Copy the highlighted 12 character number and give this to Neuralynx to generate your license.

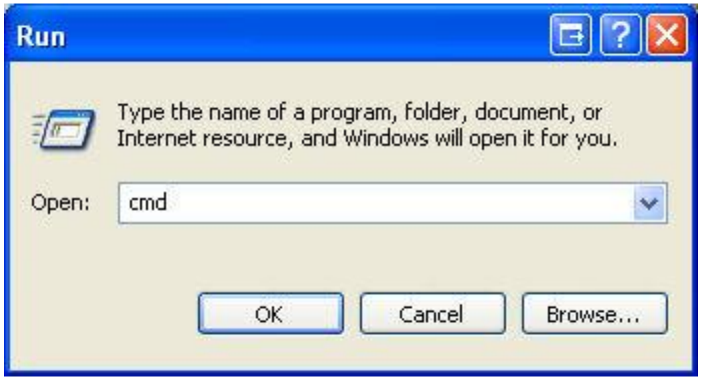
This PC Host ID: 005056c00008

Using Windows XP

If you do not want to go through the process of downloading and installing Cheetah without a license file, you can use Windows to determine your host ID.

1. Click on the Start Menu and then Run

2. Type "cmd" (without the quotes) into the Open box.

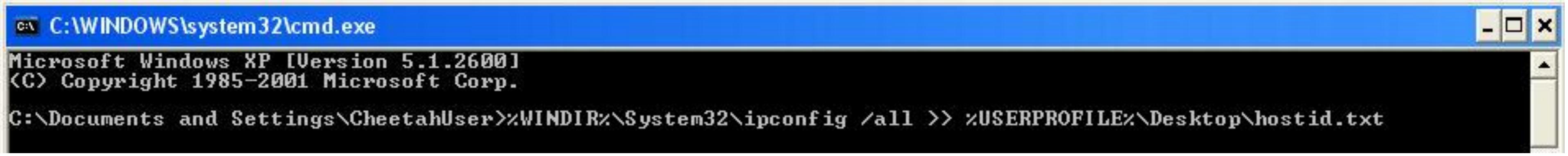


Run

Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: cmd

3. Type "%WINDIR%\System32\ipconfig /all >> %USERPROFILE%\Desktop\hostid.txt" at the command prompt as shown below. This will create a file called hostid.txt on your Desktop.



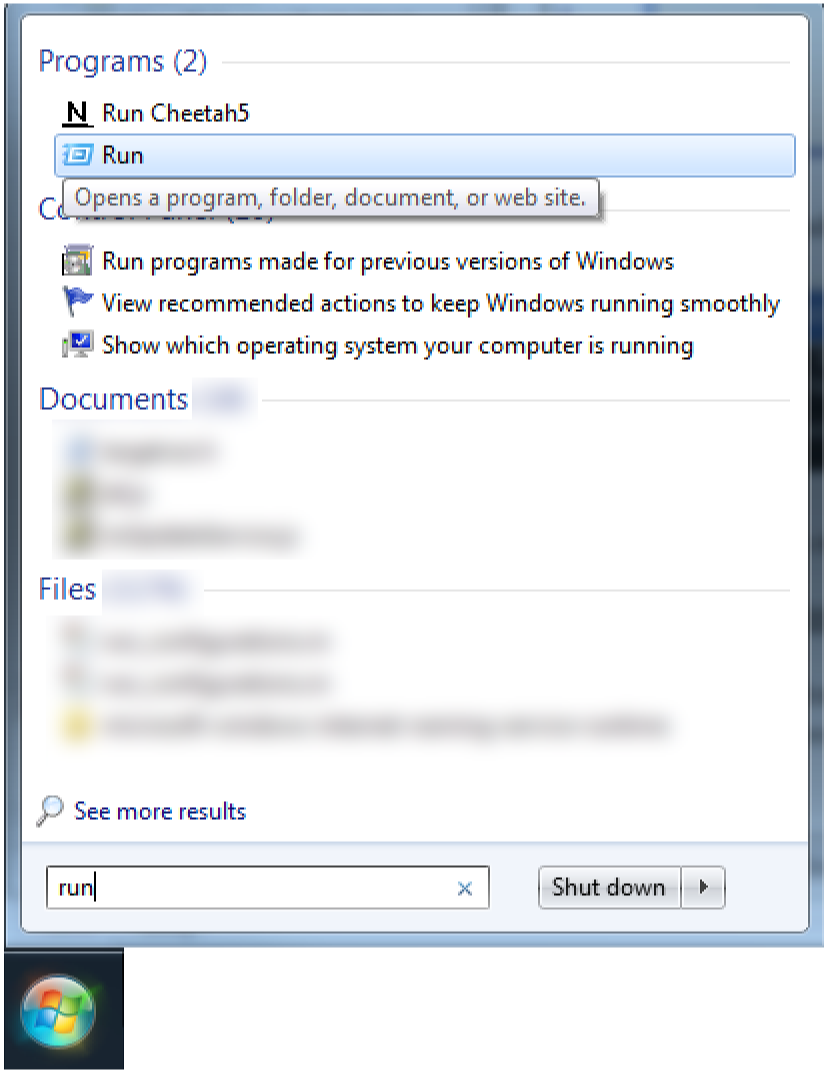
```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\CheetahUser>%WINDIR%\System32\ipconfig /all >> %USERPROFILE%\Desktop\hostid.txt
```

4. You can then email the hostid.txt file to Neuralynx to obtain your license file. The hostid.txt file can be safely deleted after you have emailed it to Neuralynx.

Using Windows Vista or Windows 7

The only deviation from the Windows XP pocedure detailed above is how to launch the command prompt. You can either use the Run shortcut by holding down the Window key on the keyboard, and while holding down the Window key, press the R key to open the Run dialog. Or you can open the Start Menu and type Run in the search box, selecting Run from the Programs search result as shown below:



Opens a program, folder, document, or web site.

run

15. NetCom

NetCom Overview

NetCom is a TCP/IP interface for experiment control and real time data streaming. Cheetah contains the server side of this interface, while Neuralynx provides a library containing the client side of the interface for both internal and user development. NetCom allows most of the configuration commands to be sent to Cheetah allowing an experiment control program access to many of cheetahs properties as well as its functionality. NetCom also allows an experiment control program to open up real time data streams. The client program may select any number of valid acquisition entities and have the data for said acquisition entity passed through NetCom to the client application.

A NetCom Development package, along with examples in C++/MFC, C#, VB and Matlab is available from the software downloads section of our website (www.neuralynx.com/Software).

16. Cheetah Commands

Cheetah Commands Overview

Cheetah uses commands to both setup and control an experiment. Most of the commands are going to be processed from configuration files, and are used to setup an experiment. You can also use commands through NetCom to control an experiment. Regardless of where the commands come from, they are processed by Cheetah identically.

Command Rules

All of the Cheetah commands obey some common rules. If a command deviates from these rules, the description of the command will let you know. Actual commands will appear in *italics*. When using commands in configuration files, there are additional rules (see Configuration Files for more information).

1. Commands begin with a hyphen (-).
   - *-StartAcquisition* is valid. *StartAcquisition* is not
2. Commands and arguments are case insensitive.
   - *-processconfigurationfile test.cfg* and *-ProcessConfigurationFile Test.cfg* are identical.
3. Commands must be spelled correctly, there are no abbreviations.
   - *-StartAcquisition* is valid. *-StartAcq* is not
4. All command arguments are separated by a space.
   - *-SetSpikeThreshold SC1 200* has two arguments SC1 and 200.
5. If any command or argument contains a space, it must be surrounded by double quotes (" ").
   - *-CreatePlotWindow Spike "Spike Window 1"* will create a spike plot window named Spike Window 1.
6. All objects must be created before they are used.
   - *-CreateSpikeAcqEnt Sc1 DL 1* must be called after *-CreateHardwareSubSystem DL DigitalLynx* because DL needs to be created to be used in the spike acquisition entity creation.

7. All command arguments are required unless otherwise stated in the command documentation.

16.1 General Cheetah Commands

General Cheetah Commands

These commands are general commands for Cheetah. They are primarily used during configuration file processing to setup system wide options or control configuration file pocessing.

-Break

Halts execution of the current configuration file and closes the file. If the current configuration file was called from a different configuration file using the -ProcessConfigurationFile command, the calling configuration file will continue.

Example: Assume you have two configuration files:
Cheetah.cfg (contains the following three lines):

```
-SetLogFile logfile.txt
-ProcessConfigurationFile my_file.cfg
-SetDataDirectory C:\Temp
```

my_file.cfg (contains the following two lines):

```
-Break
-SetLogFile test.txt
```

Cheetah will exit the my_file.cfg file without processing the -SetLogFile test.txt command and continue with the -SetDataDirectory command in Cheetah.cfg.

Default: This command is an action, there is no default value.
Usage: This command can be used at any time.

-GetCheetahBuildDate

Returns the build date for the Cheetah application for which the client is connected to.

Example: -GetCheetahBuildDate
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Build Date	The build date of the Cheetah application for which the NetCom client application is currently connected to.

-GetCheetahObjects

Creates a list of acquisition entity object names that are currently setup in cheetah and returns them to the client application. Acquisition entity object names can then be used to change property values in cheetah or setup real time data streaming. There are no arguments for this command.

-GetCheetahTypes

Creates a list of acquisition entity object types that are currently setup in cheetah and returns them to the client application. Acquisition entity object types can then be used with a list of acquisition entity object names (see -GetCheetahObjects) to change property values in cheetah or setup real time data streaming. There are no arguments for this command.

-GetCheetahVersionNumber

Returns the version number for the Cheetah application for which the client is connected to.

Example: -GetCheetahVersionNumber
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Version Number	The version number of the Cheetah application for which the NetCom client application is currently connected to.

-GetDataDirectory

Returns the current data directory.

Example: -GetDataDirectory
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Data Directory	The current data directory being used by Cheetah to store data files in.

-LogMessage <Message Type> <Message>

Logs the message to the current cheetah logfile.

Example: -LogMessage "Log Message To Logfile"
Default: This command is an action, there is no default value.
Usage: This command can be used at any time.

Arguments

Message Type	Specifies the message label to be for the specified message. This must be one of the following message type keywords: 1. **Fatal:** Fatal messages are unrecoverable, and Cheetah should be restarted. 2. **Error:** Error messages are for errors in commands, incorrect keywords or values, or intermittent problems with a portion of the system 3. **Warning:** Warning messages indicate that something happened out of the ordinary, but was handled by Cheetah. 4. **Notice:** Notices provide status information about Cheetah. These messages are purely informational. 5. **Data:** Data messages are not generated by Cheetah. These message types can be used to log information to the log file. However, if you will use these messages for analysis, you would be better off posting an event with the message as the event string.
Message	This is an ascii string that must be between double quotes.

-ProcessConfigurationFile <File Name>

Tells Cheetah to process the specified configuration file. Cheetah will process this file completely before continuing to the command after -ProcessConfigurationFile. Any errors in the specified configuration file will cause all configuration file processing to stop.

Example: -ProcessConfigurationFile my_configuration.cfg
Default: This command is an action, there is no default value.
Usage: This command can be used at any time.

Arguments

File Name	The name of the configuration file to process. If only a filename is specified, Cheetah will first look in its current working directory (usually the directory containing Cheetah.exe) and then in the Configuration directory for the specified file name. If the file does not exist in either directory, this command will fail. **Example**: -ProcessConfigurationFile my_configuration.cfg If a complete path is specified, Cheetah will look for the specified file, if it is not found, this command will fail. **Example** : -ProcessConfigurationFile "C:\Cheetah Configurations\my_configuration.cfg"

-SetDataDirectory <Directory Path>

Sets the base data directory for all of the files Cheetah creates. The location of these files can be overridden by the -SetLogFile, -SetDataFile, -SetRawDataFile, or -SetVideoFileOutput commands. A sub-directory will automatically be created with the date and time (in 24 hour format) at the time this command is processed. Cheetah will use the C:\temp directory as the base data directory if this command is not used.

Example: -SetDataDirectory "C:\Cheetah Data"
Default: Cheetah will use C:\temp as the base data directory..
Usage: This command can be used only if Cheetah is idle.

Arguments

Directory Path	The full path name of the directory to use as the base data directory . If the directory doesn't exist, it will be created. **Example:** -SetDataDirectory "C:\Cheetah Data" If this command is run on October 13, 2007 at 1:57:07 PM, Cheetah will create the following directory (referred to as the Current Data Directory): C:\Cheetah Data\2001-10-13_13_57_07 All files not overridden by the commands stated above will be created in that directory, and files will be created every time

	the -SetDataDirectory command is used.

-SetLogFile <File Name>

Sets the file where all Cheetah system messages will be logged.

Example: -SetLogFile My_Logfile.txt
Default: Cheetah will use CheetahLogFile.txt in the current data directory as the logfile.
Usage: This command can be used at any time.

Arguments

File Name	Sets the file to use for logging Cheetah system messages. The logfile normally uses a .TXT extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetLogFile My_Logfile.txt If a complete path is specified, Cheetah will create the file in the specified location. **Example** : -SetLogFile "C:\Cheetah Logs\My_Logfile.txt" The directory C:\Cheetah Logs must exist or this command will fail.

16.2 Generic Dialog Commands

Generic Dialog Commands

The permanent windows in Cheetah are listed underneath the Window menu of the main window. These commands control the positioning and visibility for those windows. Normally these commands are only used by Cheetah when it is saving configuration files.

-SetDialogPosition <Dialog Keyword> <X Coordinate> <Y Coordinate>

This command allows you to position any of Cheetah's permanent dialogs.

Example: -SetDialogVisible Events 75 80

Default: There is no default value for this command. This means that if this command is not used, the permanent dialogs could be placed anywhere on the screen.
Usage: This command can be used at any time.

Arguments

Dialog Keyword	Specifies which of Cheetah's permanent dialogs you wish to modify: 1. **Audio**: Selects the Audio Output Dialog 2. **Events**: Selects the Event Display Dialog 3. **Properties:** Selects the Display and Acquisition Entity Properties Dialog 4. **Status:** Selects the System Status Dialog 5. **Main:** Selects the Main Window 6. **TTLResponse:** Selects the TTL Response Dialog 7. **Hardware:** Selects the Hardware Properties Dialog (a hardware system must have already been defined for this keyword to work). If the keyword specified does not match any of the listed keywords, this command will fail.
X Coordinate	The position, in pixels, to place the left side of the specified dialog. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is outside the bounds of your desktop, it will be adjusted to that the dialog is placed as close to your value as possible, while remaining completely visible. **Example:** You have your screen resolution set to 1600 x 1200, and the following command is processed by Cheetah: -SetDialogPosition Audio 1600 100 Since putting the Audio dialog with its left point at 1600 and top at 100 will place the dialog outside of your desktop, Cheetah will move the dialog left until it is completely visible. The top position will not be changed since it is within the bounds of the desktop.
Y Coordinate	The position, in pixels, to place the top of the specified dialog. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is specified that is outside the bounds of your desktop, it will be adjusted to that the specified dialog is placed as close to your value as possible, while remaining completely visible.

-SetDialogVisible <Dialog Keyword> <Visible>

This command allows you to either show or hide any of Cheetah's permanent dialogs.

Example: -SetDialogVisible Events True
Default: The System Status Dialog is shown when Cheetah starts. All other dialogs are hidden.

Usage: This command can be used at any time.

Arguments

Dialog Keyword	Specifies which of Cheetah's permanent dialogs you wish to modify: 1. **Audio**: Selects the Audio Output Dialog 2. **Events**: Selects the Event Display Dialog 3. **Properties:** Selects the Display and Acquisition Entity Properties Dialog 4. **Status:** Selects the System Status Dialog 5. **Main:** Selects the Main Window 6. **TTLResponse:** Selects the TTL Response Dialog 7. **Hardware:** Selects the Hardware Properties Dialog (a hardware system must have already been defined for this keyword to work). If the keyword specified does not match any of the listed keywords, this command will fail.
Visible	Visible can be one of the following values: 1. **True:** The window will be visible. 2. **False:** The window will be hidden

16.3 System Status Display Commands

System Status Display Commands

These commands control how the system status dialog displays information. These commands are in addition to the generic dialog commands, which can also be applied to the system status dialog.

-SetSystemStatusMessageFilter <Message Type> <Value>
This command changes the messages that are visible in the System Status Dialog's message history. All messages are passed through the message filters before being sent to the message history. If the message makes it through the filters, it will be displayed in the message history. Changes in the filter settings will have no effect on messages that have already been through the filtering process. **Example**: -SetSystemStatusMessageFilter Fatal On

Default:

Meassage Type	**Value**
Fatal	On
Error	On
Warning	Off
Notice	Off
Data	Off

Usage: This command can be used at any time.

Arguments

Message Type	Specifies the message filter to be set is the system status dialog. This must be one of the following message type keywords: 1. **Fatal:** All messages tagged as FATAL will be affected. Fatal messages are unrecoverable, and Cheetah should be restarted. 2. **Error:** All messages tagged as ERROR will be affected. Error messages are for errors in commands, incorrect keywords or values, or intermittent problems with a portion of the system 3. **Warning:** All messages tagged as WARNING will be affected. Warning messages indicate that something happened out of the ordinary, but was handled by Cheetah. 4. **Notice:** All messages tagged as NOTICE will be affected. Notices provide status information about Cheetah. These messages are purely informational. 5. **Data:** All messages tagged as DATA will be affected. Data messages are not generated by Cheetah. These message types can be used to log information to the log file. However, if you will use these messages for analysis, you would be better off posting an event with the message as the event string.
Value	The message filters can be in one of the following states: 1. **On:** If a message type has the filter On, Cheetah will display messages of that type in the System Status Dialog. 2. **Off:** If a message type has the filter Off, Cheetah will hide messages of that type from the System Status Dialog.

-SetSystemStatusShowDetails <Show>

Tells the System Status dialog to show or hide the expanded details view.

Example: -SetSystemStatusShowDetails True
Default: Cheetah will start with with the expanded details view visible (Show = True).
Usage: This command can be used at any time.

Arguments

Show	The show value can be one of the following: 1. **True:** The System Status dialog will show the expanded details view. 2. **False:** The System Status dialog will be in the single line view.

16.4 Digital Lynx SX Commands

Digital Lynx SX Commands

-CreateHardwareSubSystem <Hardware Sub System Name> <Sub System Type> <Sample Frequency> <Command IP Address> <Command Port Number> <Data IP Address> <Data Port Number>

This command is used to tell Cheetah what type of acquisition hardware you are using with your system. Once a system is created, it cannot be removed, and the name and system type cannot be changed. Cheetah will start with no hardware systems defined if this command is not used.

Example: -CreateHardwareSubSystem "My DigitalLynx" DigitalLynxSX 32000 192.168.3.10 26011 192.168.3.100 26090
Default: This command is an action, there is no default value.
Usage: This command can only be used when Cheetah is idle.

Note: This version of the command has parameters specific to Digital Lynx SX creation.

Arguments

Hardware Sub System Name	The name of the hardware sub system you wish to create. This name must be unique throughout the Cheetah system.
Sub System Type	Specifies the type of hardware sub system you wish to create. This value must be one of the following types: 1. **DigitalLynxSX:** Creates a Digital Lynx SX acquisition system for use with Cheetah. 2. **DigitalLynx:** Creates a Digital Lynx acquisition system for use with Cheetah.

	3. **Cheetah64:** Creates a DT3010 acquisition system. This includes the 8, 16, 32, 40, 48, 56 and 64 channel analog acquisition systems. 4. **Cheetah160:** Creates an acquisition system using the Cheetah160 box. 5. **RawDataFile:** Creates an acquisition system that will use a pre-recorded raw data file. The Raw Data File argument is required when creating a system of this type.
Sample Frequency	The sample frequency of the Digital Lynx SX hardware. This value must be between 16000 and 40000 Hz in increments of 2000 Hz. The value 32768 Hz is also valid. Once this value is set, it cannot be modified.
Command IP Address	The IP address of the Digital Lynx SX hardware. Once this value is set, it cannot be modified.
Command Port Number	The port number of the Digital Lynx SX hardware. Once this value is set, it cannot be modified.
Data IP Address	The IP address that Cheetah will use to receive AD Records. Once this value is set, it cannot be modified.
Data Port Number	The port number that Cheetah will use to receive AD Records. Once this value is set, it cannot be modified.

-GetDSPDelayCompensationEnabled

Returns the current state of delay compensation for this system. See -SetDSPDelayCompensationEnabled for more information.

Example: -GetDSPDelaycompensationEnabled
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	The reply can be one of two values: 1. **True**: DSP delay is subtracted from the timestamp for each CSC and spike record. 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record.

-GetMinMaxInputRange <Hardware Sub System Name>

Returns the minimum and maximum input range value that can be used for the hardware sub system.

Example: -GetMinMaxInputRange AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Min Input Range	The minimum input range value allowed for the hardware sub system.
Max Input Range	The maximum input range value allowed for the hardware sub system.

-GetRawDataFile <Hardware Sub System Name>

Returns the raw data file name and location for data recording.

Example: -GetRawDataFile AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
File Name	The name of the raw data file currently in use by the specified hardware sub system. If a raw data file has not been set, this paramter will not empty. For Cheetah64 systems, only the raw data file name for board 0 is returned.

-SetDmaBuffers <Sub System Name> <Buffer Count> <Buffer Size>

Creates DMA (Direct Memory Access) buffers to be used to store AD (Analog to Digital) data from a hardware sub sytem. The DMA buffers are the first set of buffers used in processing data from a sub sytem. Once a buffer is full, the buffer is processed and sent to be filtered. The buffer size and number of buffers effect the overall performance of the system. Smaller buffer sizes will allow data to be moved through the system with a lower latecy, but will also increase the possibility of overruning a buffer. If a buffer is overrun, then all the data in that buffer is lost and cannot be reclaimed. If latency is not an issue, it recommended that larger buffer sizes are used to improve the overall efficiency of the system.

Example: -SetDmaBuffers AcqSystem1 128 5
Default: The default number of buffers is 64, with a buffer size of 2 ms.
Usage: This command can only be used when Cheetah is idle.

Arguments

Sub System Name	The name of the sub system which will be modified.
Bufer Count	The number of dma buffers to create. Valid range: 32..256.
Buffer Size	The size of each buffer. This is in milliseconds. Valid range: 1..50

-SetDSPDelayCompensationEnabled <Enabled>

The Cheetah DAS utilizes two types of digital filters for online signal processing of Digital Lynx data. A Finite Impulse Response (FIR) filter is used for all high-cut filters and low-cut filters above 50Hz. For low-cut filters below 50Hz a DC Offset (DCO) filter is implemented.

FIR filters implemented in the Cheetah DAS are designed to be linear phase. This means that the output of the FIR is delayed from the input, but the delay is equal for all frequencies so the phase is not distorted. The number of FIR taps determines the roll-off of the filter and the delay (i.e. more taps result in a steeper roll-off with the sacrifice of CPU power, memory, and a longer delay.) The delay, in seconds, can be calculated with the formula:

Delay(s) = ((High_Cut_Taps - 1) + (Low_Cut_Taps - 1)) / (Sampling_Freq(Hz) * 2)

Since the filtering is done prior to sub-sampling, the sampling frequency at which the data is filtered is always the sampling frequency of the system.

This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. Doing so would cause inconsistencies in timing when comparing data between acquisition entities, thus it is disallowed.

DCO filters do not cause a delay in the data and are not affected by this setting.

Example: -SetDSPDelaycompensationEnabled True
Default: Cheeah defaults to having DSP delay compensation turned off in order to remain compatible with data recorded using previous versions of Cheetah. This may change in a future release.
Usage: This command can be used only if Cheetah is idle.

Arguments

Enabled	The enabled argument can be one of two values: 1. **True**: The timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. . 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record. **NOTE:** Versions of Cheetah prior to 5.5.0 did not have the option of automatically compensating for DSP delay. If comparing data recorded with earlier versions of Cheetah, be sure to take the DSP delay into account for the older data.

-SetRawDataFile <Sub System Name> <File Name>

This will set the raw data file name and location for data recording. It will also enable raw data output to the file. A raw data file will contain all samples from all A/D channels before any digital filtering is applied to the signal. These files are useful for recording all information for later analysis. This file is recorded in addition to the normal Cheetah data files. Cheetah is able to play back raw data files by creating a raw data file playback hardware subsystem.

Example: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"
Default: Cheetah will not use a raw data file unless this command is specified.
Usage: This command can be used at any time. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system whose data will be written to the raw data file.
File Name	Sets the file to use for raw data output. The raw data file normally uses a .NRD extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"

	If a complete path is specified, Cheetah will create the file in the specified location. **Example** :-SetRawDataFile AcqSystem1 "C:\Cheetah Raw Files\CheetahRawData.nrd" The directory C:\Cheetah Raw Files must exist or this command will fail.

16.5 Digital Lynx Commands

Digital Lynx Commands

-CreateHardwareSubSystem <Hardware Sub System Name> <Sub System Type>

This command is used to tell Cheetah what type of acquisition hardware you are using with your system. Once a system is created, it cannot be removed, and the name and system type cannot be changed. Cheetah will start with no hardware systems defined if this command is not used.

Example: -CreateHardwareSubSystem "My DigitalLynx" DigitalLynx
Default: This command is an action, there is no default value.
Usage: This command can only be used when Cheetah is idle.

Arguments

Hardware Sub System Name	The name of the hardware sub system you wish to create. This name must be unique throughout the Cheetah system.
Sub System Type	Specifies the type of hardware sub system you wish to create. This value must be one of the following types: 1. **DigitalLynx:** Creates a Digital Lynx acquisition system for use with Cheetah. 2. **Cheetah64:** Creates a DT3010 acquisition system. This includes the 8, 16, 32, 40, 48, 56 and 64 channel analog acquisition systems. 3. **Cheetah160:** Creates an acquisition system using the Cheetah160 box. 4. **RawDataFile:** Creates an acquisition system that will use a pre-recorded raw data file. The Raw Data File argument is required when creating a system of this type.

-GetDSPDelayCompensationEnabled

Returns the current state of delay compensation for this system. See -SetDSPDelayCompensationEnabled for more information.

Example: -GetDSPDelaycompensationEnabled
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	The reply can be one of two values: 1. **True**: DSP delay is subtracted from the timestamp for each CSC and spike record. 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record.

-GetMinMaxInputRange <Hardware Sub System Name>

Returns the minimum and maximum input range value that can be used for the hardware sub system.

Example: -GetMinMaxInputRange AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Min Input Range	The minimum input range value allowed for the hardware sub system.
Max Input Range	The maximum input range value allowed for the hardware sub system.

-GetRawDataFile <Hardware Sub System Name>

Returns the raw data file name and location for data recording.

Example: -GetRawDataFile AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
File Name	The name of the raw data file currently in use by the specified hardware sub system. If a raw data file has not been set, this paramter will not empty. For Cheetah64 systems, only the raw data file name for board 0 is returned.

-SetDmaBuffers <Sub System Name> <Buffer Count> <Buffer Size>

Creates DMA (Direct Memory Access) buffers to be used to store AD (Analog to Digital) data from a hardware sub sytem. The DMA buffers are the first set of buffers used in processing data from a sub sytem. Once a buffer is full, the buffer is processed and sent to be filtered. The buffer size and number of buffers effect the overall performance of the system. Smaller buffer sizes will allow data to be moved through the system with a lower latecy, but will also increase the possibility of overruning a buffer. If a buffer is overrun, then all the data in that buffer is lost and cannot be reclaimed. If latency is not an issue, it recommended that larger buffer sizes are used to improve the overall efficiency of the system.

Example: -SetDmaBuffers AcqSystem1 128 5
Default: The default number of buffers is 64, with a buffer size of 2 ms.
Usage: This command can only be used when Cheetah is idle.

Arguments

Sub System Name	The name of the sub system which will be modified.
Bufer Count	The number of dma buffers to create. Valid range: 32..256.
Buffer Size	The size of each buffer. This is in milliseconds. Valid range: 1..50

-SetDSPDelayCompensationEnabled <Enabled>

The Cheetah DAS utilizes two types of digital filters for online signal processing of Digital Lynx data. A Finite Impulse Response (FIR) filter is used for all high-cut filters and low-cut filters above 50Hz. For low-cut filters below 50Hz a DC Offset (DCO) filter is implemented.

FIR filters implemented in the Cheetah DAS are designed to be linear phase. This means that the output of the FIR is delayed from the input, but the delay is equal for all frequencies so the phase is not distorted. The number of FIR taps determines the roll-off of the filter and the delay (i.e. more taps result in a steeper roll-off with the sacrifice of CPU power, memory, and a longer delay.) The delay, in seconds, can be calculated with the formula:

Delay(s) = ((High_Cut_Taps - 1) + (Low_Cut_Taps - 1)) / (Sampling_Freq(Hz) * 2)

Since the filtering is done prior to sub-sampling, the sampling frequency at which the data is filtered is always the sampling frequency of the system.

This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. Doing so would cause inconsistencies in timing when comparing data between acquisition entities, thus it is disallowed.

DCO filters do not cause a delay in the data and are not affected by this setting.

Example: -SetDSPDelaycompensationEnabled True
Default: Cheeah defaults to having DSP delay compensation turned off in order to remain compatible with data recorded using previous versions of Cheetah. This may change in a future release.
Usage: This command can be used only if Cheetah is idle.

Arguments

Enabled	The enabled argument can be one of two values: 1. **True**: The timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. . 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record. **NOTE:** Versions of Cheetah prior to 5.5.0 did not have the option of automatically compensating for DSP delay. If comparing data recorded with earlier versions of Cheetah, be sure to take the DSP delay into account for the older data.

-SetNumberInputBoards <Sub System Name> <Value>

Sets the number of boards that you are using on a Digital Lynx system. In addition to issuing this command, you must have the Digital Lynx hardware and firmware appropriately configured. See the Digital Lynx manual for more information.

Example: -SetNumberInputBoards AcqSystem1 5
Default: All Digital Lynx systems are created with zero input boards.
Usage: This command can only be used when Cheetah is idle. The sub system must be a DigitalLynx system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Value	The number of input boards that exist in the Digital Lynx cabinet. This value must be between 1 and 10 and exactly match the hardware and firmware configuration. **ATTENTION DRS USERS:** When using DRS boards, the input board number will work differently. If you start counting at the left of the Digital Lynx cabinet, when you get to the right most input board, that will be the number to use for this command. **Example:** If you have 3 input boards and 3 DRS boards in a Digital Lynx cabinet arranged in the following order: Input, DRS, Input, DRS, Input, DRS You will use the following command to correctly set up Cheetah for a Digital Lynx system named AcqSystem1: -SetNumberInputBoards AcqSystem1 5

-SetRawDataFile <Sub System Name> <File Name>

This will set the raw data file name and location for data recording. It will also enable raw data output to the file. A raw data file will contain all samples from all A/D channels before any digital filtering is applied to the signal. These files are useful for recording all information for later analysis. This file is recorded in addition to the normal Cheetah data files. Cheetah is able to play back raw data files by creating a raw data file playback hardware subsystem.

Example: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"
Default: Cheetah will not use a raw data file unless this command is specified.
Usage: This command can be used at any time. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system whose data will be written to the raw data file.
File Name	Sets the file to use for raw data output. The raw data file normally uses a .NRD extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd" If a complete path is specified, Cheetah will create the file in the specified location. **Example** :-SetRawDataFile AcqSystem1 "C:\Cheetah Raw Files\CheetahRawData.nrd" The directory C:\Cheetah Raw Files must exist or this command will fail.

16.6 Cheetah 64 Commands

Cheetah 64 Commands

-CreateHardwareSubSystem <Hardware Sub System Name> <Sub System Type>

This command is used to tell Cheetah what type of acquisition hardware you are using with your system. Once a system is created, it cannot be removed, and the name and system type cannot be changed. Cheetah will start with no hardware systems defined if this command is not used.

Example: -CreateHardwareSubSystem "My DigitalLynx" DigitalLynx
Default: This command is an action, there is no default value.
Usage: This command can only be used when Cheetah is idle.

Arguments

Hardware Sub System Name	The name of the hardware sub system you wish to create. This name must be unique throughout the Cheetah system.
Sub System Type	Specifies the type of hardware sub system you wish to create. This value must be one of the following types: 1. **DigitalLynx:** Creates a Digital Lynx acquisition system for use with Cheetah. 2. **Cheetah64:** Creates a DT3010 acquisition system. This includes the 8, 16, 32, 40, 48, 56 and 64 channel analog

	acquisition systems. 3. **Cheetah160:** Creates an acquisition system using the Cheetah160 box. 4. **RawDataFile:** Creates an acquisition system that will use a pre-recorded raw data file. The Raw Data File argument is required when creating a system of this type.

-GetMinMaxInputRange <Hardware Sub System Name>

Returns the minimum and maximum input range value that can be used for the hardware sub system.

Example: -GetMinMaxInputRange AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Min Input Range	The minimum input range value allowed for the hardware sub system.
Max Input Range	The maximum input range value allowed for the hardware sub system.

-GetRawDataFile <Hardware Sub System Name>

Returns the raw data file name and location for data recording.

Example: -GetRawDataFile AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply	
Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
File Name	The name of the raw data file currently in use by the specified hardware sub system. If a raw data file has not been set, this paramter will not empty. For Cheetah64 systems, only the raw data file name for board 0 is returned.

-PlayDAWavFile <Sub System Name> <Board Number>

Starts playback of the currently selected WAV file buffer on the specified system and board number. This command will need to be issued every time you want to play a WAV file, unless you have continuous playback turned on. If no WAV file is loaded into the currently selected WAV buffer for this board, no sound will be output.

Example: -PlayDAWavFile AcqSystem1 0
Default: This command is an action, there is no default value.
Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.

-SelectDAWavBuffer <Sub System Name> <Board Number> <Buffer Number>

Cheetah can only play one buffer at a time for each board. This command selects which Cheetah WAV file buffer to playback on the specified board. Cheetah will not start playing this file until a play command is issued. The playback frequency for this board is not changed when a new buffer is selected, you will need to use the -SetDAPlaybackFrequency command to change the playback frequency.

Example: -SelectDAWavBuffer AcqSystem1 0 2
Default: Cheetah will start with buffer 1 selected.
Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.

Buffer Number	Selects the buffer that Cheetah will use for DA WAV playback. Cheetah has 128 buffers available for WAV files. If the specified buffer does not contain a WAV file, nothing will be output when the play command is issued.

-SetAmpControl <Sub System Name> <Amp Control Type> <Device Number>

Tells Cheetah what to use to control the amplifiers for the specified hardware sub system.

Example: -SetAmpControl AcqSystem1 MeasurementComputing 0
Default: Amplifier control is set to True.
Usage: This command can only be used when Cheetah is idle. The sub system must be either a Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Amp Control Type	Specifies the interface that will be used to control the amplifiers. This must be one of the following types 1. **MeasurementComputing:** Uses a Measurement Computing device (either USB or PCI) for amplifier control. A list of available Measurement Computing devices can be seen in the Instacal software.
Device Number	This value is specific to the amplifier control type. The following table describes the different device number meanings. If the specified device number does not exist, this command will fail.

Amp Control Type	Device Number Meaning
MeasurementComputing	This is the board number as seen in Instacal.

-SetAmpControlEnabled <Sub System Name> <Value>

Used to enable amplifier control on the specified system. Disabling the amplifier control may be useful if using only digital filtering or fixed amplifiers. If you are using Lynx8 amplifiers, it is reccommended that you enable amplifier control.

Example: -SetAmpControlEnabled AcqSystem1 false
Default: Amplifier control is set to True.
Usage: This command can be used at any time. The sub system must be either a Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Value	This can be one of the following: 1. **True:** Amplifier control is enabled if set to true. 2. **False:** Amplifier control is disabled if set to false.

-SetAmpGainType <Sub System Name> <Amp Gain Type>

Selects the type of gain control to use for controlling signal amplification.

Example: -SetAmpGainType AcqSystem1 "Input Range"
Default: The default value for the gain type is "Input Range"
Usage: This command can only be used at any time.

Arguments

Sub System Name	The name of the sub system which will be modified.
Amp Gain Type	Can be one of the following types (value must be enclosed in quotes as shown in the above example): 1. **Input Range:** Adjusts the system to use optimal gain settings for both amplifiers and AD conversion in order to acquire a signal inside of the specified input range value. 2. **Amp Gain:** Allows individual control of both AD and amplifier gain settings. Input Range then becomes a calculated value and can only be changed through adjusting either of the gain values.

-SetContinuousDAWavPlayback <Sub System Name> <Board Number> <Value>

This command can be used to make Cheetah constantly repeat a WAV file on the DA output port. This command does not start playing a WAV file, it will only tell Cheetah how to play a WAV file on the DA output port.

Example: -SetContinuousDAWavPlayback AcqSystem1 0 On
Default: Cheetah will start with continuous playback Off; playing a WAV file only once.

Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.
Value	Continuous playback can be in either of the following states: 1. **On:** Sets Cheetah to continually loop the current DA WAV file. Once Cheetah is done playing the current WAV file, it will immediately restart the same file from the beginning. To stop the continuous looping, send this command with value set to Off. 2. **Off:** Cheetah will play the current DA WAV file once. Another play command must be issued to play the file again.

-SetDAOutputMode <Sub System Name> <Board Number> <Mode>

Needs a description

Example: -SetDAOutputMode AcqSystem1 0 ContinuousAudio
Default: The default mode is set to SingleValue.
Usage: This command can only be used when Cheetah is idle. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.
Mode	The DA output mode can be one of the following: 1. **SingleValue:** The user may set a port to a specified value to stay constant. 2. **BufferedOutput:** Buffered data may be stored and played at any time on the port. This is generally used for wav file playback. 3. **BufferedOutputSynxStart:** Buffered data may be stored and played at the start of acquisition This is generally used for wav file playback.. 4. **ContinuousAudio:** This is used only for wav file playback. The wav file that is currently selected with

	continuously repeat playback until acquisition is turned off.

-SetDAPlaybackFrequency <Sub System Name> <Board Number> <Value>

Sets the output frequency to use for WAV file playback. This value is set every time you load a WAV file on this board to the recording frequency of the file you load. This means that the playback frequency will always be set to the last loaded WAV file. If you load WAV files of differing frequencies, you may need to issue this command to change the frequency when you change the selected WAV file buffer before playback. This command can also be used to speed up or slow down WAV file playback.

Example: -SetDAPlaybackFrequency AcqSystem1 0 44100
Default: Cheetah will use the frequency stored in the WAV file that has been loaded. If a value does not exist, Cheetah will default to a value of 25000 hz.
Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.
Value	This is the playback frequency in hertz (Hz). It should match the frequency used when recording the WAV file that is selected for playback. However, this value can be used to speed up (entering a value that is higher than the recording frequency) or slow down (entering a value lower than the recording frequency) WAV file playback. This value can be between 200 and 125000 Hz.

-SetDAPortVoltageOutput <Sub System Name> <Board Number> <Port> <Value>

Sets the voltage for the specified DA port.

Example: -SetDAPortVoltageOutput AcqSystem1 0 1 3
Default: A default value is not set for this property. The last value that was set remains until a new value is set.
Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.

Board Number	This determines which DT3010 board will be used to output the specified value. The board number can be either 0 or 1.
Port	The port number can be either 0 or 1.
Value	This is the voltage in volts. This value must be between -10 and 10 volts.

-SetDAWavFile <Sub System Name> <Board Number> <File Name> <Buffer Number>

Loads a WAV file that you have created into Cheetah. Cheetah will not start playing this file until a play command is issued. The playback frequency for this board will be changed when a new WAV file is loaded, this overrides any previous calls to -SetDAPlaybackFrequency.

Example: -SetDAWavFile AcqSystem1 0 "C:\Wav Files\100HzTone.wav" 2
Default: Cheetah will start with no WAV files loaded.
Usage: This command can be used at any time. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the output port you wish to use.
Board Number	This determines which DT3010 board will be used to output the WAV file. The board number can be either 0 or 1.
File Name	Sets the file to use for DA WAV outputt. The WAV files normally have a .WAV extension. If only a filename is specified, Cheetah will only look in it's current working directory. If the file is not found, this command will fail. **Example**: -SetDAWavFile AcqSystem1 0 "100HzTone.wav" 2 If a complete path is specified, Cheetah will look for the specified file, if it is not found, this command will fail. **Example** : -SetDAWavFile AcqSystem1 0 "C:\Wav Files\100HzTone.wav" 2
Buffer Number	Selects the buffer that Cheetah will use to load this file. Cheetah has 128 buffers available for WAV files. If the specified buffer already contains a WAV file, the previous file will be overwritten with the new WAV file.

-SetDigitalIOPortDirection <Sub System Name> <Board Number> <Direction>

Sets the port direction for a digital IO port for the specified sub system.

Example: -SetDigitalIOPortDirection AcqSystem1 1 Input
Default: The default port direction is set to Input.

Usage: This command can only be used when Cheetah is idle. The sub system must be a Cheetah64 system.

Arguments

Sub System Name	The name of the sub system that owns the IO board you wish to modify
Board Number	This is the DT3010 board number that will be modified. The board number can be either 0 or 1.
Direction	The digital IO port direction is set using one of the following keywords: 1. **Input:** Sets the specified board to watch for TTL inputs. 2. **Output:** Sets the specified board to ouput TTL values.

-SetDmaBuffers <Sub System Name> <Buffer Count> <Buffer Size>

Creates DMA (Direct Memory Access) buffers to be used to store AD (Analog to Digital) data from a hardware sub system. The DMA buffers are the first set of buffers used in processing data from a sub system. Once a buffer is full, the buffer is processed and sent to be filtered. The buffer size and number of buffers effects the overall performance of the system. Smaller buffer sizes will allow data to be moved through the system with a lower latecy, but will also increase the possibility of overruning a buffer. If a buffer is overrun, then all the data in that buffer is lost and cannot be reclaimed. If latency is not an issue, it recommended that larger buffer sizes are used to improve the overall efficiency of the system.

Example: -SetDmaBuffers AcqSystem1 128 5
Default: The default buffer count value is 64 and the default buffer size is 2 ms
Usage: This command can only be used when Cheetah is idle.

Arguments

Sub System Name	The name of the sub system which will be modified.
Bufer Count	The number of dma buffers to create. Valid Range: 32..256.
Buffer Size	The size of each buffer. This is in milliseconds. Valid Range: 1..50.

-SetRawDataFile <Sub System Name> <File Name>

This will set the raw data file name and location for data recording. It will also enable raw data output to the file. A raw data file will contain all samples from all A/D channels before any digital filtering is applied to the signal. These files are useful for recording all information for later analysis. This file is recorded in addition to the normal Cheetah data files. Cheetah is able to play back raw data files by creating a raw data file playback hardware subsystem.

Example: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"
Default: Cheetah will not use a raw data file unless this command is specified.
Usage: This command can be used at any time. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system whose data will be written to the raw data file.
File Name	Sets the file to use for raw data output. The raw data file normally uses a .NRD extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd" If a complete path is specified, Cheetah will create the file in the specified location. **Example** :-SetRawDataFile AcqSystem1 "C:\Cheetah Raw Files\CheetahRawData.nrd" The directory C:\Cheetah Raw Files must exist or this command will fail. If a file name is not specified, Cheetah will pop up a file selection dialog box allowing the user to choose a raw data file to open up.

16.7 Cheetah 160 Commands

Cheetah 160 Commands

-CreateHardwareSubSystem <Hardware Sub System Name> <Sub System Type>

This command is used to tell Cheetah what type of acquisition hardware you are using with your system. Once a system is created, it cannot be removed, and the name and system type cannot be changed. Cheetah will start with no hardware systems defined if this command is not used.

Example: -CreateHardwareSubSystem "My DigitalLynx" DigitalLynx
Default: This command is an action, there is no default value.
Usage: This command can only be used when Cheetah is idle.

Arguments

Hardware Sub System Name	The name of the hardware sub system you wish to create. This name must be unique throughout the Cheetah system.
Sub System Type	Specifies the type of hardware sub system you wish to create. This value must be one of the following types: 1. **DigitalLynx:** Creates a Digital Lynx acquisition system for use with Cheetah. 2. **Cheetah64:** Creates a DT3010 acquisition system. This includes the 8, 16, 32, 40, 48, 56 and 64 channel analog acquisition systems. 3. **Cheetah160:** Creates an acquisition system using the Cheetah160 box. 4. **RawDataFile:** Creates an acquisition system that will use a pre-recorded raw data file. The Raw Data File argument is required when creating a system of this type.

-GetMinMaxInputRange <Hardware Sub System Name>

Returns the minimum and maximum input range value that can be used for the hardware sub system.

Example: -GetMinMaxInputRange AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Min Input Range	The minimum input range value allowed for the hardware sub system.
Max Input Range	The maximum input range value allowed for the hardware sub system.

-GetRawDataFile <Hardware Sub System Name>

Returns the raw data file name and location for data recording.

Example: -GetRawDataFile AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
File Name	The name of the raw data file currently in use by the specified hardware sub system. If a raw data file has not been set, this paramter will not empty. For Cheetah64 systems, only the raw data file name for board 0 is returned.

-SetAmpControl <Sub System Name> <Amp Control Type> <Device Number>

Tells Cheetah what to use to control the amplifiers for the specified hardware sub system.

Example: -SetAmpControl AcqSystem1 MeasurementComputing 0
Default: Amplifier control is set to True.
Usage: This command can only be used when Cheetah is idle. The sub system must be a Cheetah160 system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Amp Control Type	Specifies the interface that will be used to control the amplifiers. This must be one of the following types 1. **MeasurementComputing:** Uses a Measurement Computing device (either USB or PCI) for amplifier control. A list of available Measure Computing devices can be seen in the Instacal software. **NOTE:** When using the Measurement Computing amplifier control, only eight (8) amplifiers may be used. This limits the system to 64 channels. 2. **Cheetah160:** Uses the amplifier control built into the Cheetah 160 box. **NOTE:** When using the Cheetah 160 amplifier controller, ports J6

and J605 will be unavailable for TTL output. See the TTL Input and Output section of the Cheetah 160 HWSS in this guide.

-GetADBitVolts <Acq Ent Name>

Returns the AD bit volts value of each sub channel for the specified acquisition entity.

Example: -GetADBitVolts CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The AD bit volts value of each sub channel for the specified acquisition entity.

3.

Device Number

This value is specific to the amplifier control type. The following table describes the different device number meanings.

Amp Control Type	**Device Number Meaning**
MeasurementComputing	This is the board number as seen in Instacal.
Cheetah160	The device number is ignored.

If the specified device number does not exist, this command will fail.

-SetAmpControlEnabled <Sub System Name> <Value>

Used to enable amplifier control on the specified system. Disabling the amplifier control may be useful if using only digital filtering or fixed amplifiers. If you are using Lynx8 amplifiers, it is reccommended that you enable amplifier control.

Example: -SetAmpControlEnabled AcqSystem1 false

Default: Amplifier control is set to True.
Usage: This command can be used at any time. The sub system must be either a Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Value	This can be one of the following: 1. **True:** Amplifier control is enabled if set to true. 2. **False:** Amplifier control is disabled if set to false.

-SetAmpGainType <Sub System Name> <Amp Gain Type>

Selects the type of gain control to use for controlling signal amplification.

Example: -SetAmpGainType AcqSystem1 "Input Range"
Default: The default value for the gain type is "Input Range"
Usage: This command can only be used at any time.

Arguments

Sub System Name	The name of the sub system which will be modified.
Amp Gain Type	Can be one of the following types (value must be enclosed in quotes as shown in the above example): 1. **Input Range:** Adjusts the system to use optimal gain settings for both amplifiers and AD conversion in order to acquire a signal inside of the specified input range value. 2. **Amp Gain:** Allows individual control of both AD and amplifier gain settings. Input Range then becomes a calculated value and can only be changed through adjusting either of the gain values.

-SetDmaBuffers <Sub System Name> <Buffer Count> <Buffer Size>

Creates DMA (Direct Memory Access) buffers to be used to store AD (Analog to Digital) data from a hardware sub system. The DMA buffers are the first set of buffers used in processing data from a sub system. Once a buffer is full, the buffer is processed and sent to be filtered. The buffer size and number of buffers effects the overall performance of the system. Smaller buffer sizes will allow data to be moved through the system with a lower latency, but will also increase the possibility of overrunning a buffer. If a buffer is overrun, then all the data in that buffer is lost and cannot be reclaimed. If latency is not an issue, it recommended that larger buffer sizes are used to improve the overall efficiency of the system.

Example: -SetDmaBuffers AcqSystem1 128 5
Default: The default buffer count value is 64 and the default buffer size is 2 ms
Usage: This command can only be used when Cheetah is idle.

Arguments

Sub System Name	The name of the sub system which will be modified.
Bufer Count	The number of DMA buffers to create. Valid range: 32..256.
Buffer Size	The size of each buffer. This is in milliseconds. Valid range: 1..50.

-SetRawDataFile <Sub System Name> <File Name>

This will set the raw data file name and location for data recording. It will also enable raw data output to the file. A raw data file will contain all samples from all A/D channels before any digital filtering is applied to the signal. These files are useful for recording all information for later analysis. This file is recorded in addition to the normal Cheetah data files. Cheetah is able to play back raw data files by creating a raw data file playback hardware subsystem.

Example: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"
Default: Cheetah will not use a raw data file unless this command is specified.
Usage: This command can be used at any time. The specified sub system must be a Digital Lynx SX, Digital Lynx, Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system whose data will be written to the raw data file.
File Name	Sets the file to use for raw data output. The raw data file normally uses a .NRD extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd" If a complete path is specified, Cheetah will create the file in the specified location.

	Example :-SetRawDataFile AcqSystem1 "C:\Cheetah Raw Files\CheetahRawData.nrd" The directory C:\Cheetah Raw Files must exist or this command will fail. If a file name is not specified, Cheetah will pop up a file selection dialog box allowing the user to choose a raw data file to open up.

16.8 DRS Commands

Digital Reference Selector (DRS) Commands

-AddDRSBoard <DRS Slot Number>

Adds a DRS board to Cheetah. This will inform Cheetah where the DRS board is located in the Digital Lynx cabinet, and which input board's references will be controlled by that DRS. The DRS board will then be able to be controlled by Cheetah's DRS control.

Example: -AddDrsBoard 1
Default: All Digital Lynx systems are created with no DRS boards.
Usage: This command can only be used when Cheetah is idle, and is only valid with a Digital Lynx sub system.

Arguments

DRS Slot Number	This is the position of the DRS board in the Digital Lynx cabinet. Slot 0 is the left most board position and slot 9 is the right most board position. Each slot can only be occupied by either a DRS or an input board. If an input board or DRS already exists in the specified slot, this command will fail. This number must also be less than the number of input boards specified by the -SetNumberInputBoards command. **NOTE:** Cheetah requires that all DRS boards be paired with the input board immediately preceding it (e.g. DRS in slot 1 controls references for an Input Board in slot 0). DRS boards must always be in odd slot numbers (e.g. 1, 3, 5, etc.) and all unpaired input boards should use higher number slots (e.g. IDIDIII is valid, IIIDID is not).

16.9 Raw Data File Commands

Raw Data File Commands

These commands setup a raw data file recording for any of the hardware systems, and for playing recorded raw data files back through Cheetah.

-CreateHardwareSubSystem <Hardware Sub System Name> <Sub System Type> <Raw Data File>

This command is used to tell Cheetah what type of acquisition hardware you are using with your system. Once a system is created, it cannot be removed, and the name and system type cannot be changed. Cheetah will start with no hardware systems defined if this command is not used.

Example: -CreateHardwareSubSystem "My DigitalLynx" DigitalLynx
Default: This command is an action, there is no default value.
Usage: This command can only be used when Cheetah is idle.

Arguments

Hardware Sub System Name	The name of the hardware sub system you wish to create. This name must be unique throughout the Cheetah system.
Sub System Type	Specifies the type of hardware sub system you wish to create. This value must be one of the following types: 1. **DigitalLynx:** Creates a Digital Lynx acquisition system for use with Cheetah. 2. **Cheetah64:** Creates a DT3010 acquisition system. This includes the 8, 16, 32, 40, 48, 56 and 64 channel analog acquisition systems. 3. **Cheetah160:** Creates an acquisition system using the Cheetah160 box. 4. **RawDataFile:** Creates an acquisition system that will use a pre-recorded raw data file. The Raw Data File argument is required when creating a system of this type.
Raw Data File	This argument is only valid if you are creating a RawDataFile type hardware subsystem. If no file name is specified, then Cheetah will display a file dialog allowing you to browse for a raw data file. Command processing will halt until the file dialog is closed. Sets the file to use for raw data file playback for this system. Once set, this file cannot be changed. If only a filename is specified, Cheetah will look for the file in the current data directory. **Example**: -CreateHardwareSubSystem "My DataPlayback" AcqSystem1 MyData.nrd If a complete path is specified, Cheetah will use the file in the specified location.

	Example : -CreateHardwareSubSystem "My DataPlayback" AcqSystem1 "C:\Data Directory\MyData.nrd" The file C:\Data Directory\MyData.nrd must exist or this command will fail.

-GetDSPDelayCompensationEnabled

Returns the current state of delay compensation for this system. See -SetDSPDelayCompensationEnabled for more information.

Example: -GetDSPDelaycompensationEnabled
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	The reply can be one of two values: 1. **True**: DSP delay is subtracted from the timestamp for each CSC and spike record. 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record.

-GetMinMaxInputRange <Hardware Sub System Name>

Returns the minimum and maximum input range value that can be used for the hardware sub system.

Example: -GetMinMaxInputRange AcqSystem1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Hardware Sub System Name	The name of the hardware sub sytem to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.

Min Input Range	The minimum input range value allowed for the hardware sub system.
Max Input Range	The maximum input range value allowed for the hardware sub system.

-SetContinuousRawDataFilePlayback <Sub System Name> <Value>

Sets the sub system to automatically restart acquisition from the beginning of the file once the end of the file is reached.

Example: -SetContinuousRawDataFilePlayback AcqSystem1 On
Default: Cheetah will start with continuous playback Off.
Usage: This command can only be used when Cheetah is idle. This command is only valid with the RawDataFile sub system.

Arguments

Sub System Name	The name of the sub system whose playback mode you wish to modify.
Value	Continuous playback can be in either of the following states: 1. **On:** Sets Cheetah to continually loop the current raw data file. Once Cheetah is done processing the file, it will immediately restart the same file from the beginning. This setting is mainly used for presentation or testing purposes. It is not intended for data collection use. 2. **Off:** Cheetah will process all the data from the current raw data file once, and then turn off acquisition and recording. The file can be restarted by starting acquisition again.

-SetDSPDelayCompensationEnabled <Enabled>

The Cheetah DAS utilizes two types of digital filters for online signal processing of Digital Lynx data. A Finite Impulse Response (FIR) filter is used for all high-cut filters and low-cut filters above 50Hz. For low-cut filters below 50Hz a DC Offset (DCO) filter is implemented.

FIR filters implemented in the Cheetah DAS are designed to be linear phase. This means that the output of the FIR is delayed from the input, but the delay is equal for all frequencies so the phase is not distorted. The number of FIR taps determines the roll-off of the filter and the delay (i.e. more taps result in a steeper roll-off with the sacrifice of CPU power, memory, and a longer delay.) The delay, in seconds, can be calculated with the formula:

Delay(s) = ((High_Cut_Taps - 1) + (Low_Cut_Taps - 1)) / (Sampling_Freq(Hz) * 2)

Since the filtering is done prior to sub-sampling, the sampling frequency at which the data is filtered is always the sampling frequency of the system.

This is a system wide setting and it cannot be selectively enabled on specific acquisition entities. Doing so would cause inconsistencies in timing when comparing data between acquisition entities, thus it is disallowed.

DCO filters do not cause a delay in the data and are not affected by this setting.

Example: -SetDSPDelaycompensationEnabled True
Default: Cheeah defaults to having DSP delay compensation turned off in order to remain compatible with data recorded using previous versions of Cheetah. This may change in a future release.
Usage: This command can be used only if Cheetah is idle.

Arguments

Enabled	The enabled argument can be one of two values: 1. **True**: The timestamps for all spike and CSC records will have the DSP delay subtracted from the original Cheetah timestamp in order to compensate for the delay caused by the DSP filters. . 2. **False:** DSP delay is not subtracted from the timestamp for each CSC and spike record. **NOTE:** Versions of Cheetah prior to 5.5.0 did not have the option of automatically compensating for DSP delay. If comparing data recorded with earlier versions of Cheetah, be sure to take the DSP delay into account for the older data.

-SetDmaBuffers <Sub System Name> <Buffer Count> <Buffer Size>

Creates DMA (Direct Memory Access) buffers to be used to store AD (Analog to Digital) data from a hardware sub system. The DMA buffers are the first set of buffers used in processing data from a sub system. Once a buffer is full, the buffer is processed and sent to be filtered. The buffer size and number of buffers effects the overall performance of the system. Smaller buffer sizes will allow data to be moved through the system with a lower latecy, but will also increase the possibility of overruning a buffer. If a buffer is overrun, then all the data in that buffer is lost and cannot be reclaimed. If latency is not an issue, it recommended that larger buffer sizes are used to improve the overall efficiency of the system.

Example: -SetDmaBuffers AcqSystem1 128 5
Default: The default buffer count value is 64 and the default buffer size is 2 ms
Usage: This command can only be used when Cheetah is idle.
Note: This command will affect the playback speed for the raw data file sub system.

Arguments

Sub System Name	The name of the sub system which will be modified.
Bufer Count	The number of dma buffers to create. Valid range: 32..256.
Buffer Size	The size of each buffer. This is in milliseconds. Valid range: 1..50.

-SetRawDataFile <Sub System Name> <File Name>

This will set the raw data file name and location for data recording. It will also enable raw data output to the file. Once this command is issued, there is no way to disable output to the raw data file. A raw data file will contain all samples from all A/D channels before any digital filtering is applied to the signal. These files are useful for recording all information for later analysis. This file is recorded in addition to the normal Cheetah data files. Cheetah is able to play back raw data files by creating a raw data file playback hardware subsystem.

Example: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd"
Default: Cheetah will not use a raw data file unless this command is specified.
Usage: This command can only be used when Cheetah is idle. The specified sub system must be a DigitalLynx, Cheetah64 or Cheetah160 system.

Arguments

Sub System Name	The name of the sub system whose data will be written to the raw data file.
File Name	Sets the file to use for raw data output. The raw data file normally uses a .NRD extension. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetRawDataFile AcqSystem1 "CheetahRawData.nrd" If a complete path is specified, Cheetah will create the file in the specified location. **Example** :-SetRawDataFile AcqSystem1 "C:\Cheetah Raw Files\CheetahRawData.nrd" The directory C:\Cheetah Raw Files must exist or this command will fail.

16.10 CSC AE Commands

Continuously Sampled Channel (CSC) Acquisition Entity Commands

These commands are used to control how the CSC acquisition entities process AD data and what it does with the data after processing.

-CreateCscAcqEnt <Acq Ent Name> <Hardware Sub System Name>

Creates a new instance of a continuously sampled channel (CSC) acquisition entity in Cheetah. CSCs are designed to continuously process the incoming waveform.

Example: -CreateCSCAcqEnt CSC1 AcqSystem1
Default: Cheetah does not create any CSC acquisition entities if this command is not issued.
Usage: This command can be used only when Cheetah is idle.

Arguments

Acq Ent Name	The name of the csc acquisition entity you wish to create. This name must be unique throughout the Cheetah system. This name cannot be changed after the acquisition entity is created.
Hardware Sub System Name	The name of the hardware sub system that you want the acquisition entity to be associated with. This specifies which hardware setup will be providing data to the acquisition entity.

-GetAcqEntReference <Acq Ent Name>

Gets the current reference ID used by an acquisition entity.

Example: -GetAcqEntReference TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of an acquisition entity.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The reference ID used as a reference by this acquisition entity. See -SetAcqEntReference for reference ID information.

-GetADBitVolts <Acq Ent Name>

Returns the AD bit volts value of each sub channel for the specified acquisition entity.

Example: -GetADBitVolts CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The AD bit volts value of each sub channel for the specified acquisition entity.

-GetADGain <Acq Ent Name>

Returns the AD gain value for the specified acquisition entity.

Example: -GetADGain CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The AD gain for the specified acquisition entity.

-GetADRange <Acq Ent Name>

Returns the AD range for the specified acquisition entity.

Example: -GetADRange CSC5

Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Max AD Value	The maximum AD value for the specified acquisition entity's data.
Min AD Value	The minimum AD value for the specified acquisition entity's data.

-GetAcqEntProcessingEnabled <Acq Ent Name>

Returns the processing state for the specified acquisition entity.

Example: -GetAcqEntProcessingEnabled CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Processing Enabled	This value will be one of the following keywords: 1. **True**: Acquisition entity processing is enabled. 2. **False**: Acquisition entity processing is disabled.

-GetAmplifierGain <Acq Ent Name>

Returns the amplifier gain value for the specified acquisition entity.

Example: -GetAmplifierGain CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier gain for the specified acquisition entity.

-GetAnalogHighCutFrequency <Acq Ent Name>

Returns the amplifier high cut frequency value for the specified acquisition entity.

Example: -GetAnalogHighCutFrequency CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier high cut frequency for the specified acquisition entity.

-GetAnalogLowCutFrequency <Acq Ent Name>

Returns the amplifier low cut frequency value for the specified acquisition entity.

Example: -GetAnalogLowCutFrequency CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier low cut frequency for the specified acquisition entity.

-GetChannelNumber <Acq Ent Name>

Returns the channel number(s) for the specified acquisition entity.

Example: -GetChannelNumber CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Channel Number(s)	This is the channel number list for the specified acquisition entity. The length of the list is determined by the number of sub channels for the specified acquisition entity. CSC's and single electrodes have 1, stereotrodes 2 and tetrodes 4.

-GetDataFile <Acq Ent Name>

Returns the data file name and path for the specified acquisition entity.

Example: -GetDataFile CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This is the data file name and path for the specified acquisition entity.

-GetDiskWriteEnabled <Acq Ent Name>

Returns the disk writing status for the specified acquisition entity.

Example: -GetDiskWriteEnabled CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This value will be one of the following keywords: 1. **True**: Disk writing is enabled. 2. **False**: Disk writing is disabled.

-GetDspHighCutFilterEnabled <Acq Ent Name>

Returns the DSP high cut filter state for the specified acquisition entity.

Example: -GetDspHighCutFilterEnabled CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: DSP high cut filter is enabled. 2. **False**: DSP high cut filter is disabled.

-GetDspHighCutFrequency <Acq Ent Name>

Returns the DSP high cut frequency for the specified acquisition entity.

Example: -GetDspHighCutFrequency CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Frequency	The frequency value of the DSP high cut filter for the specified acquisition entity.

-GetDspHighCutNumberTaps <Acq Ent Name>

Returns the DSP high cut tap count for the specified acquisition entity.

Example: -GetDspHighCutNumberTaps CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The number of taps of the DSP high cut filter for the specified acquisition entity.

-GetDspLowCutFilterEnabled <Acq Ent Name>

Returns the DSP low cut filter state for the specified acquisition entity.

Example: -GetDspLowCutFilterEnabled CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: DSP low cut filter is enabled. 2. **False**: DSP low cut filter is disabled.

-GetDspLowCutFrequency <Acq Ent Name>

Returns the DSP low cut frequency for the specified acquisition entity.

Example: -GetDspLowCutFrequency CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Frequency	The frequency value of the DSP low cut filter for the specified acquisition entity.

-GetDspLowCutNumberTaps <Acq Ent Name>

Returns the DSP low cut tap count for the specified acquisition entity.

Example: -GetDspLowCutNumberTaps CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The number of taps of the DSP low cut filter for the specified acquisition entity.

-GetInputInverted <Acq Ent Name>

Returns the signal inversion state for the specified acquisition entity.

Example: -GetInputInverted CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: Input inversion is enabled.

	2. **False**: Input inversion is disabled.

-GetInputRange <Acq Ent Name>

Returns the input range(s) for the specified acquisition entity.

Example: -GetInputRange CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Input Range(s)	This is the input range list for the specified acquisition entity. The length of the list is determined by the number of sub channels for the specified acquisition entity. CSC's and single electrodes have 1, stereotrodes 2 and tetrodes 4.

-GetSampleFrequency <Acq Ent Name>

Returns the sample frequency for the specified acquisition entity.

Example: -GetSampleFrequency CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Sample Frequency	The sample frequency for the specified acquisition entity.

-GetSubChannelEnabled <Acq Ent Name> <Channel Index>

Gets the current enabled state of a subchannel of an acquisition entity. A disabled subchannel causes Cheetah to not process any data on that subchannel. Once all subchannels are disabled, acquisition entity processing will be disabled for the acquisition entity.

Example: -GetSubChannelEnabled TT1 3
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Channel Index	The index of the subchannel whose setting you wish to change. Valid values are dependent on the type of the acquisition entity you are changing: 1. **Single Electrode, CSC:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The enabled state of an acquisition entity subchannel. 1. **True:** Cheetah is processing data for this acquisition entity subchannel. 2. **False:** Cheetah is not processing data for this acquisition entity subchannel. For spike acquisition entities, if a spike is detected on another subchannel in this acquisition entity, the data recorded for disabled subchannels will be all zeroes. This will not affect on the data for the AD channel that corresponds to the spike channel index that is disabled. This means that any raw data file or CSC channels that also use this AD channel will be unaffected.

-GetSubSamplingInterleave <Acq Ent Name>

Returns the sub sampling interleave for the specified acquisition entity.

Example: -GetSubSamplingInterleave CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The sub sampling interleave for the specified acquisition entity.

-SetADGain <Acq Ent Name> <Gain>

Analog systems allow you to adjust the gain of the AD conversion device directly. This command will fail if a digital system is being used. You should only use this option if you need direct control over this value. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain value separately. Adjusting the AD gain will affect the Input Range value. This value cannot be changed while Cheetah is recording.

Example: -SetADGain CSC1 1
Default: The AD gain default value is based on the default input range.
Usage: This command can be used whenever recording is turned off. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Gain	The A/D gain setting allows direct control of the final analog gain stage prior to analog-to-digital conversion, thereby normalizing the input range of the A/D conversion. The following values can be used with their normalized voltages in parenthesis: • 1 (+/- 10V) • 2 (+/- 5V) • 4 (+/- 2.5V) • 8 (+/- 1.25V)

-SetAcqEntProcessingEnabled <Acq Ent Name> <Value>

Enables or disables the processing of data by the acquisition entity. Acquisition entity processing consists of record processing. If record processing is disabled, records will not be able to be displayed, sent to NetCom or saved to a file. Raw data file processing will still occur if it is enabled (see -SetRawDataFile). This command supersedes the -SetPlotEnabled and -SetDiskWriteEnabled commands.

Example: -SetAcqEntProcessingEnabled SE1 true
Default: Acquisition entity processing is enabled when the acquisition entity is created.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables acquisition entity processing. 2. **False**: Disables acquisition entity processing.

-SetAcqEntReference <Acq Ent Name> <ReferenceID>

Sets the reference channel to use for all sub channels of an acquisition entity. This command only works on systems that have DRS boards.

Example: -SetAcqEntReference CSC1 31
Default: All acquisition entities are referenced to the REF1 connection on their corresponding headstage. (i.e. CSC33 using AD channel 33 will be referenced to the REF1 on headstage 2, which is connected to the second DRS board)
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
ReferenceID	DRS boards can use any AD channel, headstage reference or DRS reference as the reference signal for any acquisition entity. However, the hardware limits the number of unique references that can be used at one time. This command will fail if those physical limitations prevent connection of the AD channels that are part of the acquisition entity to the desired reference. See the DRS Control section for more information.

The reference ID is encoded via the following method:

Reference Channel	**Encoding**	**Example**
AD Channels	AD Channel number	AD Channel 33 = 33, AD Channel 129 = 129
Headstage Reference 1	Index	DRS in slot 3 = 32000003
Headstage Reference 2	33000000 + DRSBoardIndex	DRS in slot 5 = 33000005
Headstage Reference 3	34000000 + DRSBoardIndex	DRS in slot 1 = 34000001
Headstage Reference 4	35000000 + DRSBoardIndex	DRS in slot 7 = 35000007
Animal Ground	36000000 + DRSBoardIndex	DRS in slot 9 = 36000009
Panel Ground	37000000 + DRSBoardIndex	DRS in slot 11 = 37000011

-SetAmplifierGain <Acq Ent Name> <Gain>

Analog systems allow you to adjust the gain of the external amplifier directly. This command will fail if a digital system is being used. You should only use this option if you need direct control over this value. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain value separately. Adjusting the amplifier gain will affect the Input Range value.

Example: -SetAmplifierGain CSC1 1000
Default: The amplifier gain default value is based on the default input range.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Gain	Since the Lynx8 amplifiers have discrete gain values, if the value entered is not one of those values, it will be changed to the closest discrete value available. The Lynx-8 provides selectable gain from 1x to 50,000x in steps of 12.2 (i.e. 1, 13, 25, etc.).

-SetAnalogHighCutFrequency <Acq Ent Name> <Frequency>

Sets the frequency that Cheetah will use for the high cut (low pass) analog filter on all channels of the specified acquisition entity. High cut filters will only allow signals whose frequency is below this value to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. This command will fail if Cheetah does not control analog filtering for the specified acquisition entity.

Example: -SetAnalogHighCutFrequency CSC1 9000
Default: Spike acquisition entities are created with the high cut frequency set to 6000Hz, while CSC acquisition entities are created with a high cut frequency set to 9000Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Frequency	Cheetah supports the following settings for analog high cut filter frequency (all values are in hertz (Hz).): 50, 125, 200, 250, 275, 325, 400, 475, 3000, 6000, 9000

-SetAnalogLowCutFrequency <Acq Ent Name> <Frequency>

Sets the frequency that Cheetah will use for the low cut (high pass) analog filter on all channels of the specified acquisition entity. Low cut filters will only allow signals whose frequency is above this value to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. This command will fail if Cheetah does not control analog filtering for the specified acquisition entity.

Example: -SetAnalogLowCutFrequency CSC1 0.1
Default: Spike acquisition entities are created with the low cut frequency set to 600Hz, while CSC acquisition entities are created with a low cut frequency set to .1Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Frequency	Cheetah supports the following settings for analog low cut filter frequency (all values are in hertz (Hz).): 0.1, 1, 10, 100, 300, 600, 900

-SetChannelNumber <Acq Ent Name> <Channel> <Channel2> <Channel3> <Channel4>

Sets the AD channel number(s) for the specified acquisition entity. The AD channel numbers correspond to signals on an individual wire. Channel numbers and counts are dictated by your specific hardware setup.

Example: -SetChannelNumber ST1 0 1

Default: Acquisition entities are created using the next available sequence of open AD channels (i.e. if the first acquisition entity created is a stereotrode, the channels it will initially use are 0 and 1).
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Channel	The AD channel to be set for the first channel of the specified acquisition entity. CSC and Single Electrode acquisition entities only have a single channel. For the Cheetah160 and Cheetah64 sub systems, AD channel numbers can only be used once. If the channel number specified is already in use, this command will fail. All acquisition entity types require this argument.
Channel2	This argument is required if the acquisition entity is a stereotrode or a tetrode. This command will fail if the acquisition entity is any other type.
Channel3 and Channel4	These arguments are required only if the acquisition entity is a tetrode. This command will fail if the acquisition entity is any other type.

-SetDataFile <Acq Ent Name> <File Name>

Sets the data file for the specified acquisition entity. All data records recorded for this acquisition entity will be saved to this file.

Example: `-SetDataFile Events "C:\My Events.nev"`
Default: Cheetah will create a file using the name of the acquisition entity in the current data directory when the acquisition entity is created (i.e.Cheetah created Events.nev in the current data directory when the Events acquisition entity was created).
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
File Name	Sets the file to use for data recording for the specified acquisition entity. If only a filename is specified, Cheetah will create the file in the current data directory. When the data directory is changed, the file's location will change with the data directory. **Example**: `-SetDataFile  SE1 SE1.nse` If a complete path is specified, Cheetah will create the file in the specified location, and will not change the file's location when the data directory is changed.

	Example : -SetDataFile CSC1 "C:\Data Directory\CSC1.ncs" The directory C:\Data Directory must exist or this command will fail. If the file CSC1.ncs exists, it will be overwritten. The extension of the file will be changed to the appropriate Neuralynx extension for the specified acquisition entity type. Cheetah will always create a file using the acquisition entity's name in the current data directory. If this command is issued before any data is recorded, the file in the current data directory will only have header information.

-SetDiskWriteEnabled <Acq Ent Name> <Value>

Enables or disables disk writing of data records for the specified acquisition entity. This command does not affect data records over NetCom or the data visible in all plots for this acquisition entity. You may want to disable disk writing for control or stimulus signals that you want to see, but have no need for in data analysis.

Example: -SetDiskWriteEnabled CSC1 true
Default: Cheetah initially enables disk writing when an acquisition entity is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables disk writing of data records. 2. **False**: Enables disk writing of data records. If disk writing is disabled prior to recording, a data file will be created for the specific acquisition entity, but only header information will be written to the file. If disk writing is disabled after recording has begun, all records after disk writing has been disabled will not be written until disk writing is re-enabled.

-SetDspHighCutFilterEnabled <Acq Ent Name> <Value>

Cheetah has the ability to process all signals using digital signal processing (DSP). This command will turn the high cut (low pass) DSP filter on or off for the specified acquisition entity. This command does not affect the actual filter value (see -SetDspHighCutFrequency), it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers.

Example: -SetDspHighCutFilterEnabled SE1   false
Default: Acquisition entities are created with the high cut filter enabled set to true.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables DSP high cut filtering on all channels of the specified acquisition entity.. 2. **False**: Disables DSP high cut filtering on all channels of the specified acquisition entity..

-SetDspHighCutFrequency <Acq Ent Name> <Value>

Sets the frequency that Cheetah will use for the high cut (low pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The high cut filter frequency has no effect if high cut filtering is disabled (see -SetDspHighCutFilterEnabled). High cut filters will only allow signals whose frequency is below this value to be recorded by Cheetah. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile).

Example: -SetDspHighCutFrequency CSC1 9000
Default: Spike acquisition entities are created with the high cut filter set to 6000Hz, while CSC acquisition entities are set to 9000Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The high cut frequency of the DSP filter to be set for the specified acquisition entity. This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. All signals with a frequency below this value will be processed by Cheetah.

Filter Type	**Frequency Range (Hz)**
Finite Infinite Response (FIR)	.1 - 10000

-SetDspHighCutNumberTaps <Acq Ent Name> <Value>

Digital signal processing (DSP) taps determine the amount of roll off for the DSP filter. If you notice the high cut filter is allowing signals that are too far above your high cut setting to be processed by Cheetah, you may want to increase this value. Cheetah will normally select a tap value that is appropriate for the high cut filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers.

Example: -SetDspHighCutNumberTaps CSC1 64
Default: Acquisition entities are created with the high cut taps set to 32.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

<table>
<tr><td>Acq Ent Name</td><td>The name of the acquisition entity which will be modified.</td></tr>
<tr><td>Value</td><td>The following table shows the available taps at certain high cut filter frequencies:
<table>
<tr><th>Low Value (Hz)</th><th>High Value (Hz)</th><th>Taps Choices</th></tr>
<tr><td>.1</td><td>199.99</td><td>256</td></tr>
<tr><td>200</td><td>499.99</td><td>128, 256</td></tr>
<tr><td>500</td><td>999.99</td><td>64,128, 256</td></tr>
<tr><td>1000</td><td>10000</td><td>32, 64, 128, 256</td></tr>
</table>
This command will fail if you try to change to a tap size that is not available given the current filter frequency.</td></tr>
</table>

-SetDspLowCutFilterEnabled <Acq Ent Name> <Value>

Cheetah has the ability to process all signals using digital signal processing (DSP). This command will turn the low cut (high pass) DSP filter on or off for the specified acquisition entity. This command does not affect the actual filter value (see -SetDspLowCutFrequency), it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers.

Example: -SetDspLowCutFilterEnabled SE1 false
Default: Acquisition entities are created with the low cut filter enabled set to true..
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables DSP low cut filtering on all channels of the specified acquisition entity.. 2. **False**: Disables DSP low cut filtering on all channels of the specified acquisition entity..

-SetDspLowCutFrequency <Acq Ent Name> <Value>

Sets the frequency that Cheetah will use for the low cut (high pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The low cut filter frequency has no effect if low cut filtering is disabled (see -SetDspLowCutFilterEnabled). Low cut filters will only allow signals whose frequency is above this value to be recorded by Cheetah. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile).

Example: -SetDspLowCutFrequency CSC1 100
Default: Spike acquisition entities are created with the low cut filter set to 600Hz, while CSC acquisition entities are created with a low cut filter set to .1Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The low cut frequency of the DSP filter to be set for the specified acquisition entity. This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. All signals with a frequency above this value will be processed by Cheetah.

Filter Type	Frequency Range (Hz)
DC Offset (DCO)	0.1 - 149.99
Finite Infinite Response (FIR)	150 - 10000

-SetDspLowCutNumberTaps <Acq Ent Name> <Value>

Digital signal processing (DSP) taps determine the amount of roll off for the DSP filter. If you notice the low cut filter is allowing signals that are too far beneath your low cut setting to be processed by Cheetah, you may want to increase this value. Cheetah will normally select a tap value that is appropriate for the low cut filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers.

Example: -SetDspLowCutNumberTaps CSC1 64
Default: Spike acquisition entities are created with the low cut taps set to 64, while CSC acquisition entities are set to None.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

<table>
<tr><td>Acq Ent Name</td><td>The name of the acquisition entity which will be modified.</td></tr>
<tr><td>Value</td><td>The following table shows the available taps at certain low cut filter frequencies:
<table>
<tr><th>Low Value (Hz)</th><th>High Value (Hz)</th><th>Taps Choices</th></tr>
<tr><td>0.1</td><td>149.99</td><td>None</td></tr>
<tr><td>150</td><td>199.99</td><td>256</td></tr>
<tr><td>200</td><td>499.99</td><td>128, 256</td></tr>
<tr><td>500</td><td>999.99</td><td>64,128, 256</td></tr>
<tr><td>1000</td><td>10000</td><td>32, 64, 128, 256</td></tr>
</table>
This command will fail if you try to change to a tap size that is not available given the current filter frequency.</td></tr>
</table>

-SetInputInverted <Acq Ent Name> <Value>

Enables or disables inversion of AD data for a specified acquisition entity.

Example: -SetInputInverted CSC1 false
Default: Acquisition entities are created with the the input inversion set to true.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The input inverted value can be one of the following:

	1. **True:** Cheetah will automatically invert incoming AD data before it is processed. 2. **False:** Cheetah will not adjust the polarity of the incoming AD data before it is processed.

-SetInputRange <Acq Ent Name> <Value> <Value2> <Value3> <Value4>

Sets the input scaling for an acquisition entity. Since there is only a certain number of bits available to digitize the incoming analog data, we need to scale the input voltages to get the most accurate values possible. In order to improve accuracy, you can tell Cheetah what voltage range you are expecting. Cheetah will then adjust the volts per bit setting for digitized data.

Example: -SetInputRange TT1 2000 2000 2000 2000
Default: CSC acquisition entities are created with an input range of -1000 to 1000 microvolts.
Spike acquisition entities are created with an input range of -500 to 500 microvolts.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The input range in microvolts to be used for the first channel of the specified acquisition entity. A larger range will be able to record higher voltages without clipping, however the amount of detail captured is lower (i.e. a larger number of volts is represented by a single bit). Smaller ranges will increase the detail, while sacrificing the ability to record large voltage values. You should always try to have your input range set to the range of values that are expected. Min and max input range values are based on hardware sub system type. Please see the table below. CSC and Single Electrode acquisition entities only have a single channel. All acquisition entity types require this argument.

System Type	**Min Input Range**	**Max Input Range**
Digital Lynx SX	25	131072
Digital Lynx	25	131072
Cheetah 64	25	136986
Cheetah 160	11	40816
Raw Data File	11	136986

Value2	This argument is required if the acquisition entity is a stereotrode or a tetrode. This command will fail if the acquisition entity is any other type.
Value3 and Value4	These arguments are required only if the acquisition entity is a tetrode. This command will fail if the acquisition entity is any other type.

-SetSubChannelEnabled <Acq Ent Name> <Channel Index> <Enabled>

Enables or disables a particular subchannel of an acquisition entity. Disabling a subchannel will cause Cheetah to not process any data on that subchannel. Once all subchannels are disabled, acquisition entity processing will be disabled for the acquisition entity.

Example: -SetSubChannelEnabled TT1 3 False
Default: All subchannels of an acquisition entity are enabled when it is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Channel Index	The index of the subchannel whose setting you wish to change. Valid values are dependent on the type of the acquisition entity you are changing: 1. **Single Electrode, CSC:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3
Enabled	Tells Cheetah to enable or disable an acquisition entity subchannel. 1. **True:** Cheetah will process data for this acquisition entity subchannel. 2. **False:** Cheetah will not process data for this acquisition entity subchannel. For spike acquisition entities, if a spike is detected on another subchannel in this acquisition entity, the data recorded for disabled subchannels will be all zeroes. This will not affect on the data for the AD channel that corresponds to the spike channel index that is disabled. This means that any raw data file or CSC channels that also use this AD channel will be unaffected.

-SetSubSamplingInterleave <Acq Ent Name> <Value>

This command allows you to record data for a particular acquisition entity at a lower sampling rate than other acquisition entities. The sub sampling interleave tells Cheetah to process only every Nth (where N is the Value specified) sample obtained from the recording hardware. This can also be seen as a sampling divisor.

Example: -SetSubSamplingInterleave SE1 2
Default: Acquisition entities are created with the the sub sampling interleave set to 1.
Usage: This command can only be used when Cheetah is idle. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The value must be between 1 and 3 for spike acquisition entities and between 1 and 128 for csc acquisition entities. **Example:** A Digital Lynx system normally samples all channels at 32000 Hz. Suppose you want to sample CSC1 at 8000 Hz. You would issue the following command: -SetSubSamplingInterleave CSC1 4 This will only process every 4th sample, giving an effective sampling rate of 8000 Hz.

16.11 Time Window Commands

Time Window Commands

These commands are for creation and manipulation of time windows.

-AddPlot <Window Name> <Acq Ent Name>

Adds a new plot to the specified window. The type of the window determines what type of plot may be added to the window. Once a plot is added, the acquisition entity whose data is displayed in the plot cannot be changed. All plots are displayed in the order that they are added to the window. The display order of the plots can be changed through the Properties Dialog. All data in the window will clear when a new plot is added to the window. Each acquisition entity can be added to a window only once.

Example: -AddPlot "SpikeWindow" SE1

Default: All plot windows are created with no plots.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that will house the new plot.
Acq Ent Name	The acquisition entity name that will be the data source of the plot. The acquisition entity must be of the appropriate type in order for it to be successfully added to the window. **Example:** Assume a configuration file has the following two commands: -CreatePlotWindow Spike "My Spike Window" -AddPlot CSC1 If the acquisition entity CSC1 is a continuously sampled channel, it will not be able to be displayed in a Spike plot window, and the command will fail.

-CreatePlotWindow <Window Type> <Window Name>

Creates a new plot window in Cheetah. Once created, the window type cannot be changed.

Example: -CreatePlotWindow Time "My Time Window"
Default: Cheetah starts with no plot windows.
Usage: This command can be used at any time.

Arguments

Window Type	Specifies the type of window you wish to be created. This value must be one of the following: 1. **Spike:** The window will only be able to display Spike plots.. 2. **Time:** The window will only be able to display Time plots. 3. **Video:** The window will only be able to display Video plots. For a more detailed description of each plot type, see the -SetPlotWindowPlotType command.
Window Name	The name of the plot window you wish to create. This name must be unique throughout the Cheetah system, otherwise the command will fail. Window names can be changed after the window is created through the Properties Dialog.

-SetPlotWindowCurrentPlot <Window Name> <Acquisition Entity Name>

This command has the same effect as either clicking on a plot, or selecting a plot in the Properties dialog's tree view. When a plot is current, you will see a purple background in the title bar of the current plot, and the plot name will appear in the title bar of the window. All menu items with "Current Plot" in the name will be applied to this plot. There can only be one current plot per window. Since the Video Tracker window only has one plot, it will always be current.

Example: -SetPlotWindowCurrentPlot "My Spike Window" SC1
Default: No Spike or Time plot will be set to current unless it is 1) clicked on, 2) selected in the Properties Dialog, or 3) selected by this command. Video Tracker windows will automatically set a plot to current as soon as it is added.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Acquisition Entity Name	The name of the acquisition entity associated with the plot you wish to make current. If there is no plot for that acquisition entity in the specified window, this command will fail.

-SetPlotWindowFrozen <Window Name> <Frozen>

This command works like a pause button on a DVD player. It will lock in whatever is currently displayed in the window. If an action is taken that will clear the window, the last data displayed will be cleared. No data will be added to the window while it is frozen, but otherwise is processed normally. It if a window is frozen before it is displayed, the window may contain garbage or a copy of whatever is displayed beneath the window. Unfreezing and refreezing the window will allow it to clear normally.

Example: -SetPlotWindowFrozen "My Spike Window" True
Default: All windows are created with frozen set to false.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Frozen	The frozen value can be one of the following keywords: 1. **True:** The entire window will be frozen and no new data will be plotted. To begin plotting new data, reissue this command with Frozen set to false. 2. **False:** The window will begin to plot new data. If a window was frozen prior to this command being issued, all of the

	data visible in the frozen display will be cleared.

-SetPlotWindowHistoryTimeframe <Window Name> <Value>

Sets the time frame for a time plot windows history mode. This time frame is how far back in time a user may view data after freezing the time window.

Example: -SetPlotWindowHistoryTimeframe Window1 10
Default: All time plot windows are created with a 30 second history time frame.
Usage: This command can be used at any time, but only applies to Plot Windows of type Time.

Arguments

Window Name	The name of the window which will be modified.
Value	The value can be an integer between 1 and 30 and is in seconds.

-SetPlotWindowMaximizeView <Window Name> <Maximized>

Sets the window to fill the entire window with a single plot. This will maximize the current plot. If no current plot is selected, the first plot in the list will be maximized. Video Tracker plots are always maximized as there is only one per window. All data in the window will clear when the maximized state of the window is changed.

Example: -SetPlotWindowMaximizeView "My Spike Window" True
Default: Spike and Time windows are created with Maximized set to false. Video Tracker windows are always maximized.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Maximized	The maximized value can be one of the following keywords: 1. **True:** The current plot will fill the entire window, hiding all other plots in the window. To return to normal mode, reissue this command with Maximized set to false. 2. **False:** All plots in the window are visible.

-SetPlotWindowOverlay <Window Name> <Value>

Sets a plot window's overlay mode. Overlaid windows will not clear out old data before displaying new data. This setting effects all plots in this window.

Example: -SetPlotWindowOverlay "MyWindow" true
Default: Plot windows are created with overlay set to false.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	This can be one of the following keywords: 1. **True:** The window will not clear out any old data until either a clear command is issued, overlay is turned off, or the window is resized. 2. **False:** The window will clear out old data according to the current plot type. See -SetPlotWindowType for more information.

-SetPlotWindowPlotType <Window Name> <Plot Type>

Sets the plot type that will be used for this window. All plots in the window will be set to the same type. All data in the window will clear when the plot type is changed.

Example: -SetPlotWindowPlotType "SpikeWindow" Waveform

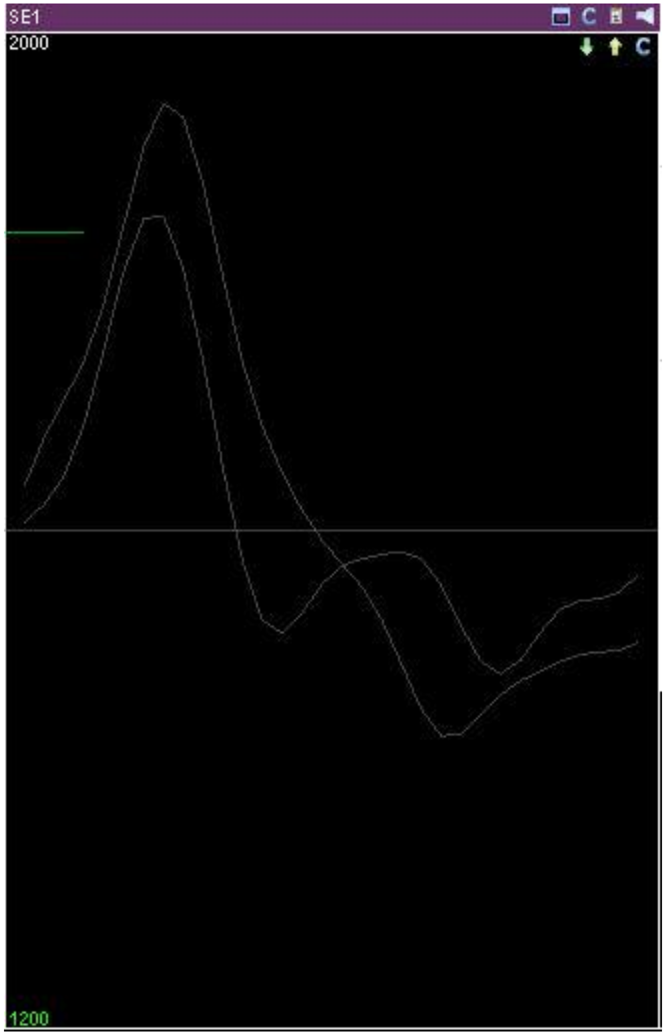
Default:

Window Type	Default Plot Type
Spike	WaveformFeature
Time	Sweep
Video	Live

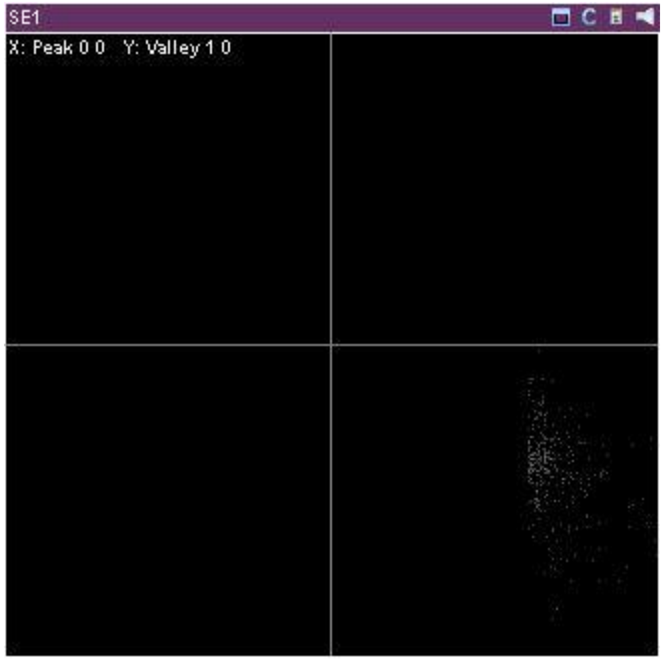
Usage: This command can be used at any time.

Arguments

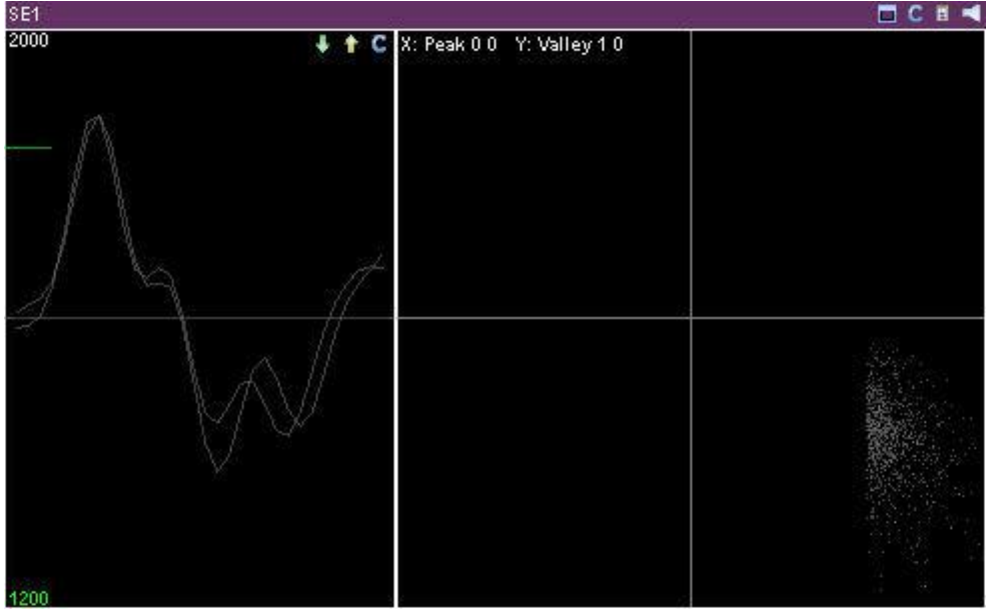
Window Name	The name of the window that will be modified.
Plot Type	The options for a view are dependent upon the type of window that is being set. If the specified plot type does not correspond to the type of the window (i.e. a plot type of Waveform for a Time window), the command will fail. **Spike Windows:** 1. **Waveform:** Shows the extracted waveform for a detected spike. If more than one waveform is visible, this means more than one spike occurred since the last screen refresh. The waveform seen in this plot is the exact waveform saved to the spike data records.



2. **Feature:** Shows the calculated feature information in a XY scatter plot. The features that are plotted can be changed by the -SetFeaturePlotSources command. To change the features available for an acquisition entity, see the -SetWaveformFeature command. The data seen in this plot is the exact data saved to the spike data records.

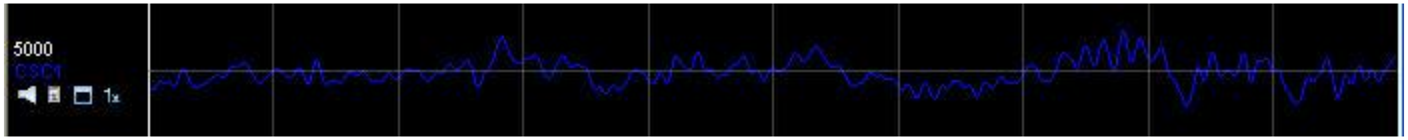


3. **WaveformFeature:** Shows both the waveform and feature plots.

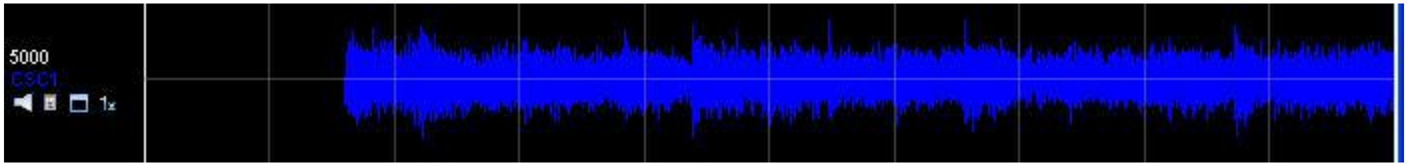


Time Windows:

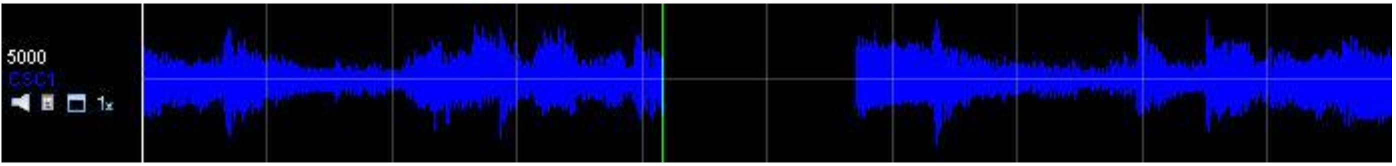
1. **Flash:** Displays the waveform for single record. The data shown is indicative of the data that is written to the Cheetah data files.



2. **Scroll:** Similar to an oscilloscope, new waveform data will be shown on the right, and old data will scroll to the left. The amount of time shown in this plot can be adjusted with the -SetPlotWindowTimeframe command. The data shown is indicative of the data that is written to the Cheetah data files.



3. **Sweep:** A cursor will move from left to right across the screen. New data will be shown to the immediate left of the cursor. Old data will be cleared as the cursor moves past it. The data shown is indicative of the data that is written to the Cheetah data files



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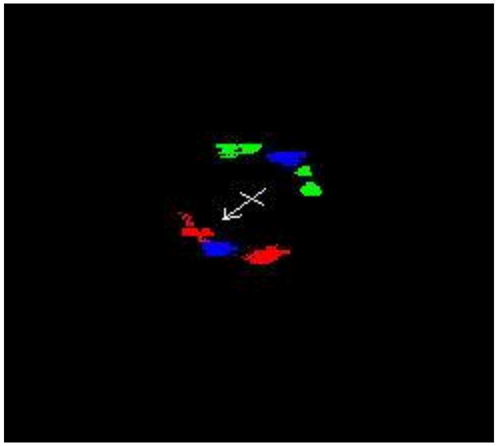
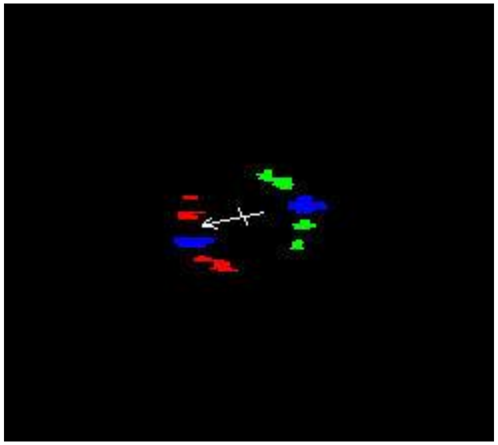
Video Tracker Windows:

1. **Live**: The image displayed in the window is the live, unprocessed video image. This is also the same image that will be written to a video output file (-SetVideoFileOutput) when -SetVideoFileOutputEnabled is true.

1. **Threshold**: The image displayed in the window is a thresholded version of the live image. This display mode takes into account the threshold settings for Red, Green, Blue and Intensity when displaying pixels. This is **NOT** representative of the data that is recorded to the Video Tracker record file, but is intended as a guide for setting thresholds.



2. **Record**: Displays a thresholded image of the live video. This display mode will only show pixels that are above the threshold for Red, Green, Blue and Intensity. However, it will only display as many transitions as the video record can hold. If the thresholds are set too low, the image may become saturated, and only the top few lines of the image will be visible. The image displayed is representative of the data stored into a Video Tracker record file.

-SetPlotWindowPosition <Window Name> <X Position> <Y Position> <Window Width> <Window Height>

Set the position and size of the specified plot window. All data in the window will clear when the window size or position is changed.

Example: -SetPlotWindowPosition WindowName 200 300 800 600
Default: The position of new plot windows is determined by Windows.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
X Position	The position, in pixels, to place the left side of the specified window. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is outside the bounds of your desktop, it will be adjusted to that the window is placed as close to your value as possible, while remaining completely visible. If the width of the window is larger than the width of your desktop, Cheetah will set the x position to 0 and part of the window will not be visible. Negative values are not allowed. **Example:** You have your screen resolution set to 1600 x 1200, and the following command is processed by Cheetah: -SetPlotWindowPosition "My Spike Window" 1600 100 800 600 Since putting the window with its left point at 1600 and top at 100 will place the window outside of your desktop, Cheetah will move the window left until it is completely visible. The top position will not be changed since it is within the bounds of the

	desktop. The final position of the window from the above command will be 800, 100.
Y Position	The position, in pixels, to place the top of the specified dialog. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is specified that is outside the bounds of your desktop, it will be adjusted to that the specified dialog is placed as close to your value as possible, while remaining completely visible. If the height of the window is larger than the height of your desktop, Cheetah will set the y position to 0 and part of the window will not be visible. Negative values are not allowed.
Window Width	The width of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.
Window Height	The height of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.

-SetPlotWindowShowGridLines <Window Name> <Show>

Used to set the visibility of the vertical grid lines in a Time window. Hiding the grid lines will not hide the zero line for the time plots. All data is cleared from the window when the grid visibility is changed. Grid lines can be used to approximate the amount of time between different points of the visible time plot waveform. To determine the time between grid lines, take the windows timeframe and divide by the number of grid lines minus 1. This command can be used to decrease CPU usage for large channel count systems or older computers.

Example: -SetPlotWindowShowGridLines "Time Window 1" True
Default: All Time windows are created with a timeframe of 5000 milliseconds.
Usage: This command can be used at any time. This command only affects Time windows.

Arguments

Window Name	The name of the window which will be modified.
Show	The show value can be one of the following keywords: 1. **True:** Horizontal grid lines are visible. 2. **False:** Horizontal grid lines are hidden.

-SetPlotWindowShowTitleBar <Window Name> <Value>

Sets the visibility of title bar for the specified display window. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since most of the plot icons are located in the title bar, you will not be able to click on the icons when the title bar is hidden. Since the saved screen space is minimal, it is recommended that you leave the title bars visible if possible. All data in the window will clear when the title bar visibility is changed.

Example: -SetPlotWindowShowTitleBar "My Spike Window" true
Default: Plot windows are created with the title bar visible.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	The visibility value can be one of the following keywords: 1. **True:** The title bar is visible for all plots in the window. Spike windows have one title bar per plot, whereas Time windows have one title bar for all plots. Video Tracker windows do not have a title bar. 2. **False:** The title bar is hidden for all plots in the window.

-SetPlotWindowSpreadType <Window Name> <Spread Type>

The spread type of Time windows can be changed using this command. Adjusting the spread type is similar to moving the zero line on an oscilloscope. It will adjust where the zero line of each of the waveforms is drawn in the window. Changing the spread type can be useful when you want to see seemingly similar plots overlaid on top of each other. All data in the window will clear when the spread type is changed.

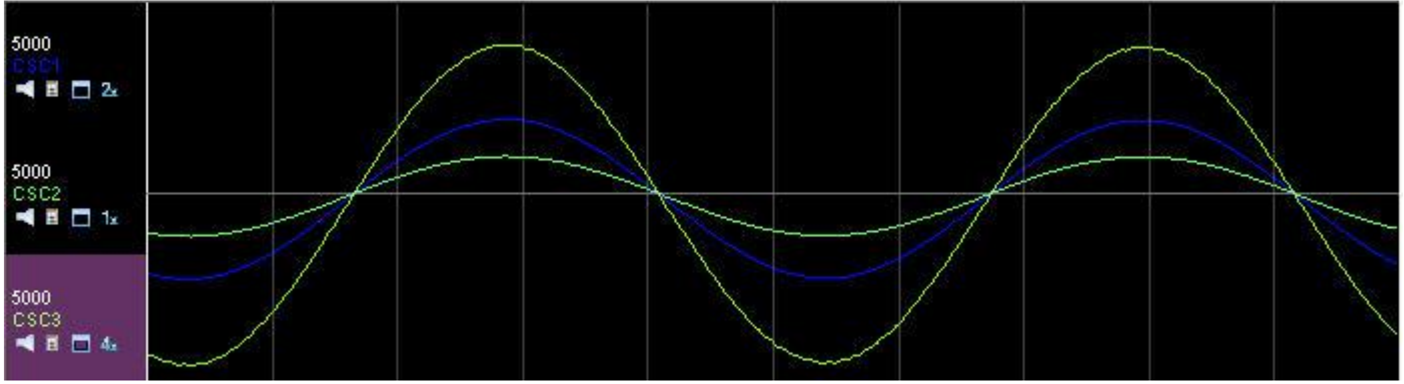
WARNING: Changing the spread type can cause CPU overload in high channel count systems. If you see drawing errors after changing the spread type, changing the spread type to FullSpread will alleviate some of the CPU strain.

Example: -SetPlotWindowSpreadType "Time Window 1" FullSpread
Default: All Time windows are created using the FullSpread type.
Usage: This command can be used at any time. This command only affects Time windows.

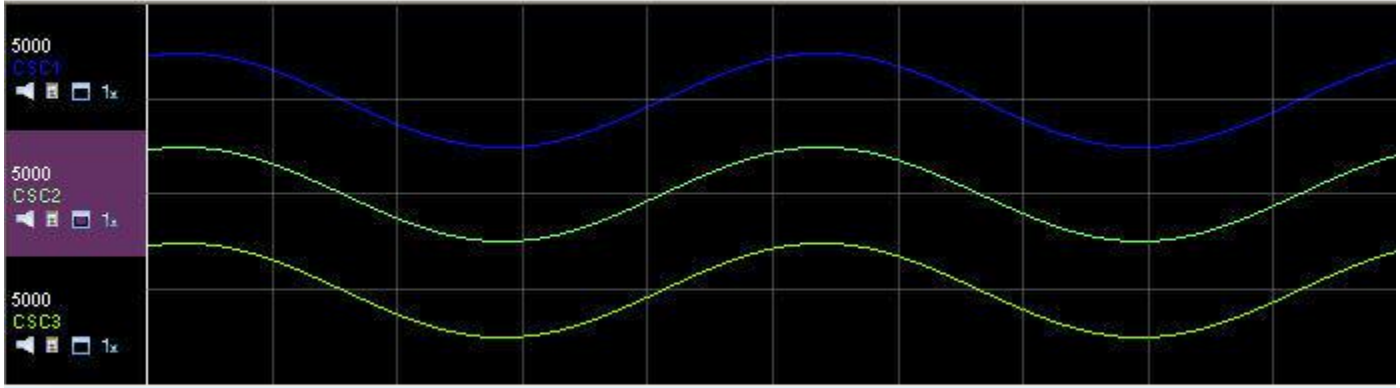
Arguments

Window Name	The name of the window you want to change.
Spread Type	Specifies the type of spread you want to use for this window's display. The spread type is only used by Time windows. The possible options are:

1. **CommonZero:** All of the time plots will share the same zero line. This line will be in the middle of the window.



2. **HalfSpread:** All time plots have their own zero line. The window is divided into 3 sections. The top section contains 25% of the window. The middle section contains 50% of the window and the bottom section contains 25% of the window. The zero lines for each plot will be spread evenly throughout the middle section. This type is designed to allow each plot to use at least 50% of the available window. Plots will overlap when using this spread type.



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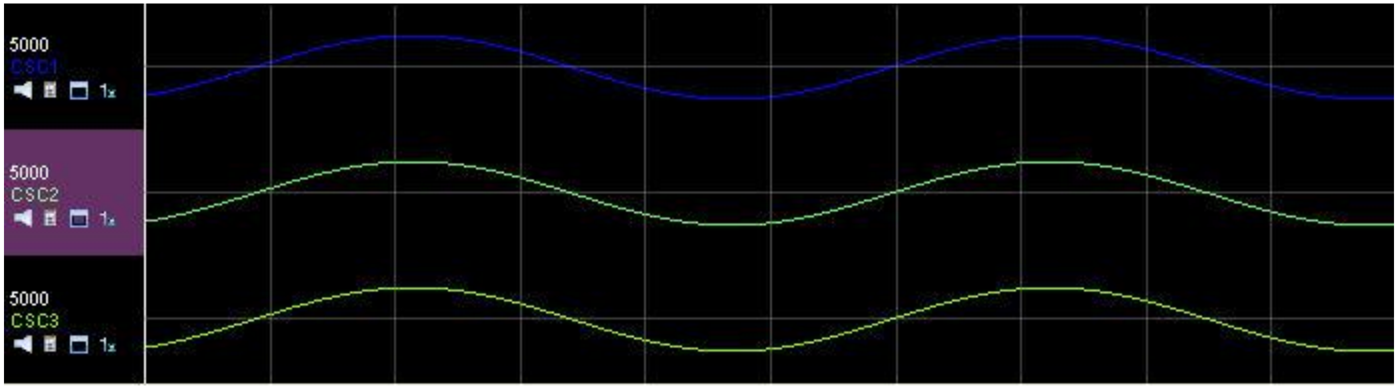
3. **FullSpread:** All time plots have their own zero line. If the plots are not zoomed in, there will be no overlapping of waveforms.

-SetPlotWindowTimeframe <Window Name> <Value>

Sets the amount of time that data remains visible in the Time window. This command has no effect when the window is displaying Flash plot types. All data is cleared from the window when the timeframe is changed. The timeframe of the window will appear next to the window name in the window's title bar.

Example: -SetPlotWindowTimeframe "Time Window 1" 10000
Default: All Time windows are created with a timeframe of 5000 milliseconds.
Usage: This command can be used at any time. This command only affects Time windows.

Arguments

Window Name	The name of the window which will be modified.
Value	This value must be set between 100 and 30000 milliseconds. As the value is increased, less detail will be visible for the waveforms, but data will be visible longer. Decreasing the value will increase the waveform detail, while decreasing the time that data remains visible.

16.12 Time Plot Commands

Time Plot Commands

These commands will modify how individual time plots display their data. Some display options can only be changed at the time window level. See the time window commands for more information (including adding plots to a window).

-SetPlotEnabled <Window Name> <Acq Ent Name> <Enabled>

This command is used if you want to stop plotting data for only a single acquisition entity's plot in a window, but do not want to remove the plot from the window. This is similar to a freeze for only a single plot (see -SetPlotWindowFrozen). This command works like a Pause button on a DVD player. It will lock in whatever is currently displayed in the plot. If an action is taken that will clear the plot, the last data displayed will be cleared. No data will be added to the plot while it is disabled, but otherwise is processed normally.

Example: -SetPlotEnabled "Spike Window 1" SE1 True
Default: All plots are enabled when they are created..
Usage: This command can be used at any time. This command only affects Spike and Time plots.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Enabled	The enabled value can be one of the following keywords: 1. **True:** Only the specified plot will be disabled and no new data will be plotted. To begin plotting new data, reissue this command with enabled set to false. 2. **False:** Only the specified plot will begin to plot new data. If a plot was disabled prior to this command being issued, all of the data visible in the disabled display will be cleared.

-SetPlotLabel <Window Name> <Acq Ent Name> <Value>

Sets a label to the plot in the specified window. This label is used only for display purposes. Not all plots will show the label on the plot itself, but all plot labels will be visible in the Property Dialog's tree view. The data in only the plot whose label is set will be cleared when the plot label is changed.

Example: -SetPlotLabel "Spike Window 1" SE1 "My Label"

Default: All plots are created with no label.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Value	The label to use for this plot.

-SetTimePlotZoomFactor <Window Name> <Acq Ent Name> <ZoomFactor>

Sets the zoom factor of a specific plot in a time window.
Example: -SetPlotZoomFactor "Time Window 1" SE1 4
Default: All plots are created with a zoom factor of 1.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
ZoomFactor	The zoom factor to use when displaying data for this particular plot. The zoom factor is simply a multiplier for the displayed data (e.g. a zoom factor of 4 shows the data scaled at 4x the normal plotting size). Valid zoom factor values are: 1, 2, 4, and 8.

16.13 Spike AE Commands

Spike Acquisition Entity Commands

These commands are used to control how the spike acquisition entities process AD data and what it does with the data after processing.

-ClearClusters <Acq Ent Name>

Clears all defined clusters for the specified acquisition entity. Once cleared, all cluster definitions for this acquisition entity will be lost.

Example: -ClearClusters SE1
Default: This command is an action, there is no default value.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity whose cluster definitions will be cleared.

-CreateSpikeAcqEnt <Acq Ent Name> <Harware Sub System Name> <AD Channel Count>

Creates a new instance of a spike acquisition entity in Cheetah. Spike acquisition entities will detect specific signals from the incoming neurological data base on the spike detection type (see -SetSpikeDetectionType). If these specific signals are found on any of the electrodes related to this spike acquisition entity, the signal at that time will be extracted from the incoming signal from all electrodes related to this spike acquisition entity , and saved to a spike record. Spikes are sometimes referred to as single units. Spike acquisition entities can be created as single electrodes (SE), stereotrodes (ST, two electrodes), or tetrodes (TT, four electrodes).

Example: -CreateSpikeAcqEnt TT1 DCDCB 4
Default: Cheetah does not start with any spike acquisition entities created.
Usage: This command can be used only when Cheetah is idle.

Arguments

Acq Ent Name	The name of the spike acquisition entity you wish to create. This name must be unique throughout the Cheetah system. This name cannot be changed after the acquisition entity is created.
Hardware Sub System Name	The name of the hardware sub system that you want the acquisition entity to be associated with. This specifies which hardware setup will be providing data to the acquisition entity.
AD Channel Count	This is the number of channels (electrodes) used to detect the spike. This value must be 1 if creating a single electrode, 2 if creating a stereotrode or 4 if creating a tetrode. Any other values will cause this command to fail. The specific AD channel to use for each channel of the spike acquisition entity is set using the -SetADChannel command.

-GetAcqEntReference <Acq Ent Name>

Gets the current reference ID used by an acquisition entity.

Example: -GetAcqEntReference TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of an acquisition entity.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The reference ID used as a reference by this acquisition entity. See -SetAcqEntReference for reference ID information.

-GetADBitVolts <Acq Ent Name>

Returns the AD bit volts value of each sub channel for the specified acquisition entity.

Example: -GetADBitVolts TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The AD bit volts value of each sub channel for the specified acquisition entity.

-GetADGain <Acq Ent Name>

Returns the AD gain value for the specified acquisition entity.

Example: -GetADGain TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The AD gain for the specified acquisition entity.

-GetADRange <Acq Ent Name>

Returns the AD range for the specified acquisition entity.

Example: -GetADRange ST5
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Max AD Value	The maximum AD value for the specified acquisition entity's data.
Min AD Value	The minimum AD value for the specified acquisition entity's data.

-GetAcqEntProcessingEnabled <Acq Ent Name>

Returns the processing state for the specified acquisition entity.

Example: -GetAcqEntProcessingEnabled TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Processing Enabled	This value will be one of the following keywords: 1. **True**: Acquisition entity processing is enabled. 2. **False**: Acquisition entity processing is disabled.

-GetAmplifierGain <Acq Ent Name>

Returns the amplifier gain value for the specified acquisition entity.

Example: -GetAmplifierGain TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier gain for the specified acquisition entity.

-GetAnalogHighCutFrequency <Acq Ent Name>

Returns the amplifier high cut frequency value for the specified acquisition entity.

Example: -GetAnalogHighCutFrequency TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier high cut frequency for the specified acquisition entity.

-GetAnalogLowCutFrequency <Acq Ent Name>

Returns the amplifier low cut frequency value for the specified acquisition entity.

Example: -GetAnalogLowCutFrequency TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The amplifier low cut frequency for the specified acquisition entity.

-GetChannelNumber <Acq Ent Name>

Returns the channel number(s) for the specified acquisition entity.

Example: -GetChannelNumber SE1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Channel Number(s)	This is the channel number list for the specified acquisition entity. The length of the list is determined by the number of sub channels for the specified acquisition entity. CSC's and single electrodes have 1, stereotrodes 2 and tetrodes 4.

-GetDataFile <Acq Ent Name>

Returns the data file name and path for the specified acquisition entity.

Example: -GetDataFile CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This is the data file name and path for the specified acquisition entity.

-GetDiskWriteEnabled <Acq Ent Name>

Returns the disk writing status for the specified acquisition entity.

Example: -GetDiskWriteEnabled SE1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This value will be one of the following keywords: 1. **True**: Disk writing is enabled. 2. **False**: Disk writing is disabled.

-GetDspHighCutFilterEnabled <Acq Ent Name>

Returns the DSP high cut filter state for the specified acquisition entity.

Example: -GetDspHighCutFilterEnabled TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: DSP high cut filter is enabled. 2. **False**: DSP high cut filter is disabled.

-GetDspHighCutFrequency <Acq Ent Name>

Returns the DSP high cut frequency for the specified acquisition entity.

Example: -GetDspHighCutFrequency TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Frequency	The frequency value of the DSP high cut filter for the specified acquisition entity.

-GetDspHighCutNumberTaps <Acq Ent Name>

Returns the DSP high cut tap count for the specified acquisition entity.

Example: -GetDspHighCutNumberTaps TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The number of taps of the DSP high cut filter for the specified acquisition entity.

-GetDspLowCutFilterEnabled <Acq Ent Name>

Returns the DSP low cut filter state for the specified acquisition entity.

Example: -GetDspLowCutFilterEnabled TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: DSP low cut filter is enabled. 2. **False**: DSP low cut filter is disabled.

-GetDspLowCutFrequency <Acq Ent Name>

Returns the DSP low cut frequency for the specified acquisition entity.

Example: -GetDspLowCutFrequency TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Frequency	The frequency value of the DSP low cut filter for the specified acquisition entity.

-GetDspLowCutNumberTaps <Acq Ent Name>

Returns the DSP low cut tap count for the specified acquisition entity.

Example: -GetDspLowCutNumberTaps TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The number of taps of the DSP low cut filter for the specified acquisition entity.

-GetInputInverted <Acq Ent Name>

Returns the signal inversion state for the specified acquisition entity.

Example: -GetInputInverted TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: Input inversion is enabled. 2. **False**: Input inversion is disabled.

-GetInputRange <Acq Ent Name>

Returns the input range(s) for the specified acquisition entity.

Example: -GetInputRange TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Input Range(s)	This is the input range list for the specified acquisition entity. The length of the list is determined by the number of sub channels for the specified acquisition entity. CSC's and single electrodes have 1, stereotrodes 2 and tetrodes 4.

-GetSampleFrequency <Acq Ent Name>

Returns the sample frequency for the specified acquisition entity.

Example: -GetSampleFrequency SE1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Sample Frequency	The sample frequency for the specified acquisition entity.

-GetSpikeAlignmentPoint <Acq Ent Name>

Returns the spike alignment point for the specified acquisition entity.

Example: -GetSpikeAlignmentPoint TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The spike alignment point for the requested acquisition entity.

-GetSpikeCellFiringCount <Acq Ent Name> <Cell Number>

Returns the number of spikes detected for the cell number of the specified acquisition entity.

Example: -GetSpikeCellFiringCount TT1 3
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Cell Number	The cell number for which the data is being requested.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Count	The number of spikes detected with the specified cell number for the specified Acq Ent.

-GetSpikeDetectionType <Acq Ent Name>

Returns the spike detection type for the specified acquisition entity.

Example: -GetSpikeDetectionType TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The spike detection type for the specified acquisition entity. This value will be one of the following: 1. **Threshold**: Threshold spike detection is currently being used. 2. **Slope**: Slope spike detection is currently being used.

-GetSpikeDualThresholding <Acq Ent Name>

Returns the thresholding state for the specified acquisition entity.

Example: -GetSpikeDualThresholding TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Enabled	This value will be one of the following keywords: 1. **True**: Dual thresholding is enabled. 2. **False**: Dual thresholding is disabled.

-GetSpikeRetriggerTime <Acq Ent Name>

Returns the spike retrigger time for the specified acquisition entity.

Example: -GetSpikeRetriggerTime TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The spike retrigger time for the requested acquisition entity.

-GetSpikeSlope <Acq Ent Name> <Sub Channel Index>

Returns the slope spike detection parameters(Voltage Change, Time Change) for the specified acquisition entity.

Example: -GetSpikeSlope TT5 2
Default: Cheetah defaults slope parameters to 100 micro volts for the voltage change and 160 microseconds for the time change.
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Sub Channel Index	The index of the spike channel whose setting you wish to retrieve. Valid values are dependent on the type of the spike acquisition entity you are changing:

	1. **Single Electrode:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Voltage Change	The change in voltage used to detect a spike. If the input signal voltage change is higher than this value, Cheetah will classify the data as a spike and it will be stored in a spike record. The voltage change value is in microvolts and must be between 5 and 5000 microvolts. You want to set the voltage range high enough that noise will not trigger a spike detection, but low enough to see all events of interest.
Time Change	The change in time used for calculating a voltage change in order to detect a spike. If the input signal change in voltage meets or exceeds the above parameter within this specified time, Cheetah will classify that data as a spike. The time change value must be between 64 and 1000 microseconds.

-GetSpikeThreshold <Acq Ent Name>

Returns the threshold value(s) for the specified acquisition entity.

Example: -GetSpikeThreshold TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Threshold	This is the threshold value list for the specified acquisition entity. The length of the list is determined by the number of sub channels for the specified acquisition entity. Single electrodes have 1, stereotrodes 2 and tetrodes 4.

-GetSubChannelEnabled <Acq Ent Name> <Channel Index>

Gets the current enabled state of a subchannel of an acquisition entity. A disabled subchannel causes Cheetah to not process any data on that subchannel. Once all subchannels are disabled, acquisition entity processing will be disabled for the acquisition entity.

Example: -GetSubChannelEnabled TT1 3
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Channel Index	The index of the subchannel whose setting you wish to change. Valid values are dependent on the type of the acquisition entity you are changing: 1. **Single Electrode, CSC:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The enabled state of an acquisition entity subchannel. 1. **True:** Cheetah is processing data for this acquisition entity subchannel. 2. **False:** Cheetah is not processing data for this acquisition entity subchannel. For spike acquisition entities, if a spike is detected on another subchannel in this acquisition entity, the data recorded for disabled subchannels will be all zeroes. This will not affect on the data for the AD channel that corresponds to the spike channel index that is disabled. This means that any raw data file or CSC channels that also use this AD channel will be unaffected.

-GetSubSamplingInterleave <Acq Ent Name>

Returns the sub sampling interleave for the specified acquisition entity.

Example: -GetSubSamplingInterleave TT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The sub sampling interleave for the specified acquisition entity.

-GetWaveformFeature <Acq Ent Name> <Feature Index>

Returns the feature string for the specified acquisition entity.

Example: -GetWaveformFeature SE1 2
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Feature Index	The index of this feature. Each spike record contains 8 features, therefore valid values are 0 through 7.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Feature String	The string will consist of the feature name, feature index, electrode index and optional parameters. For a detailed description of these values, see -SetWaveformFeature. Example: Valley 1 0

-SetADGain <Acq Ent Name> <Gain>

Analog systems allow you to adjust the gain of the AD conversion device directly. This command will fail if a digital system is being used. You should only use this option if you need direct control over this value. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain value separately. Adjusting the AD gain will affect the Input Range value. This value cannot be changed while Cheetah is recording.

Example: -SetADGain CSC1 1
Default: The AD gain default value is based on the default input range.
Usage: This command can be used whenever recording is turned off. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Gain	The A/D gain setting allows direct control of the final analog gain stage prior to analog-to-digital conversion, thereby normalizing the input range of the A/D conversion. The following values can be used with their normalized voltages in parenthesis: • 1 (+/- 10V) • 2 (+/- 5V) • 4 (+/- 2.5V) • 8 (+/- 1.25V)

-SetAcqEntProcessingEnabled <Acq Ent Name> <Value>

Enables or disables the processing of data by the acquisition entity. Acquisition entity processing consists of record processing. If record processing is disabled, records will not be able to be displayed, sent to NetCom or saved to a file. Raw data file processing will still occur if it is enabled (see -SetRawDataFile). This command supersedes the -SetPlotEnabled and -SetDiskWriteEnabled commands.

Example: -SetAcqEntProcessingEnabled SE1 true
Default: Acquisition entity processing is enabled when the acquisition entity is created.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables acquisition entity processing. 2. **False**: Disables acquisition entity processing.

-SetAcqEntReference <Acq Ent Name> <ReferenceID>

Sets the reference channel to use for all sub channels of an acquisition entity. This command only works on systems that have DRS boards.

Example: -SetAcqEntReference TT1 31
Default: All acquisition entities are referenced to the REF1 connection on their corresponding headstage. (i.e. SE33 using AD channel 33 will be referenced to the REF1 on headstage 2, which is connected to the second DRS board)
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

<table>
<tr><td>Acq Ent Name</td><td>The name of the acquisition entity which will be modified.</td></tr>
<tr><td>ReferenceID</td><td>DRS boards can use any AD channel, headstage reference or DRS reference as the reference signal for any acquisition entity. However, the hardware limits the number of unique references that can be used at one time. This command will fail if those physical limitations prevent connection of the AD channels that are part of the acquisition entity to the desired reference. See the DRS Control section for more information.

The reference ID is encoded via the following method:

<table>
<tr><th>Reference Channel</th><th>Encoding</th><th>Example</th></tr>
<tr><td>AD Channels</td><td>AD Channel number</td><td>AD Channel 33 = 33, AD Channel 129 = 129</td></tr>
<tr><td>Headstage Reference 1</td><td>Index</td><td>DRS in slot 3 = 32000003</td></tr>
<tr><td>Headstage Reference 2</td><td>33000000 + DRSBoardIndex</td><td>DRS in slot 5 = 33000005</td></tr>
<tr><td>Headstage Reference 3</td><td>34000000 + DRSBoardIndex</td><td>DRS in slot 1 = 34000001</td></tr>
<tr><td>Headstage Reference 4</td><td>35000000 + DRSBoardIndex</td><td>DRS in slot 7 = 35000007</td></tr>
<tr><td>Animal Ground</td><td>36000000 + DRSBoardIndex</td><td>DRS in slot 9 = 36000009</td></tr>
<tr><td>Panel Ground</td><td>37000000 + DRSBoardIndex</td><td>DRS in slot 11 = 37000011</td></tr>
</table>
</td></tr>
</table>

-SetAmplifierGain <Acq Ent Name> <Gain>

Analog systems allow you to adjust the gain of the external amplifier directly. This command will fail if a digital system is being used. You should only use this option if you need direct control over this value. In general, using the input range to adjust amplifications will give you a better signal than adjusting the gain value separately. Adjusting the amplifier gain will affect the Input Range value.

Example: -SetAmplifierGain CSC1 1000

Default: The amplifier gain default value is based on the default input range.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Gain	Since the Lynx8 amplifiers have discrete gain values, if the value entered is not one of those values, it will be changed to the closest discrete value available. The Lynx-8 provides selectable gain from 1x to 50,000x in steps of 12.2 (i.e. 1, 13, 25, etc.).

-SetAnalogHighCutFrequency <Acq Ent Name> <Frequency>

Sets the frequency that Cheetah will use for the high cut (low pass) analog filter on all channels of the specified acquisition entity. High cut filters will only allow signals whose frequency is below this value to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. This command will fail if Cheetah does not control analog filtering for the specified acquisition entity.

Example: `-SetAnalogHighCutFrequency  CSC1  9000`
Default: Spike acquisition entities are created with the high cut frequency set to 6000Hz, while CSC acquisition entities are created with a high cut frequency set to 9000Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Frequency	Cheetah supports the following settings for analog high cut filter frequency (all values are in hertz (Hz).): 50, 125, 200, 250, 275, 325, 400, 475, 3000, 6000, 9000

-SetAnalogLowCutFrequency <Acq Ent Name> <Frequency>

Sets the frequency that Cheetah will use for the low cut (high pass) analog filter on all channels of the specified acquisition entity. Low cut filters will only allow signals whose frequency is above this value to be digitized by Cheetah. Analog filters will affect data being written to a raw data file (see -SetRawDataFile), as they are active prior to the signal being digitized. This command will fail if Cheetah does not control analog filtering for the specified acquisition entity.

Example: `-SetAnalogLowCutFrequency  CSC1  0.1`
Default: Spike acquisition entities are created with the low cut frequency set to 600Hz, while CSC acquisition entities are created with a low

cut frequency set to .1Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Frequency	Cheetah supports the following settings for analog low cut filter frequency (all values are in hertz (Hz).): 0.1, 1, 10, 100, 300, 600, 900

-SetChannelNumber <Acq Ent Name> <Channel> <Channel2> <Channel3> <Channel4>

Sets the AD channel number(s) for the specified acquisition entity. The AD channel numbers correspond to signals on an individual wire. Channel numbers and counts are dictated by your specific hardware setup.

Example: -SetChannelNumber ST1 0 1
Default: Acquisition entities are created using the next available sequence of open AD channels (i.e. if the first acquisition entity created is a stereotrode, the channels it will initially use are 0 and 1).
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Channel	The AD channel to be set for the first channel of the specified acquisition entity. CSC and Single Electrode acquisition entities only have a single channel. For the Cheetah160 and Cheetah64 sub systems, AD channel numbers can only be used once. If the channel number specified is already in use, this command will fail. All acquisition entity types require this argument.
Channel2	This argument is required if the acquisition entity is a stereotrode or a tetrode. This command will fail if the acquisition entity is any other type.
Channel3 and Channel4	These arguments are required only if the acquisition entity is a tetrode. This command will fail if the acquisition entity is any other type.

-SetClusterBoundary <Acq Ent Name> <Cell Number> <Value>

Cluster boundaries are used for online classification of spikes. Three boundary types are supported.
Waveform - 32 max/min pairs which define the waveform shape

Range - a max/min pair defining a range on a particular feature
Convex Hull - a variable size set of x,y coordinates defining a convex boundary in a 2-dimensional feature space

Example: -SetClusterBoundary SE1 2 "ConvexHull 5 7 1976 -236 2128 -8 2026 305 1456 247 1422 -77 1571 -199"
Default: Cheetah does not define a cluster boundary when a spike acquisition entity is created.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Cell Number	The cell or cluster number this boundary represents. Valid options are 1 through 31. Cluster 0 is always reserved for unclustered or "noise" data.
Value	The cluster definition string. Each boundary type has a different format: Range <Feature Index> <Max> <Min> Template <Electrode Index> <Max1> <Min1> <Max2> <Min2> ... <Max32> <Min32> ConvexHull <X Feature Index> <Y Feature Index> <X1> <Y1> <X2> <Y2> ... <Xn> <Yn>

-SetDataFile <Acq Ent Name> <File Name>

Sets the data file for the specified acquisition entity. All data records recorded for this acquisition entity will be saved to this file.

Example: -SetDataFile Events "C:\My Events.nev"
Default: Cheetah will create a file using the name of the acquisition entity in the current data directory when the acquisition entity is created (i.e.Cheetah created Events.nev in the current data directory when the Events acquisition entity was created).
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
File Name	Sets the file to use for data recording for the specified acquisition entity. If only a filename is specified, Cheetah will create the file in the current data directory. When the data directory is changed, the file's location will change with the data directory. **Example**: -SetDataFile SE1 SE1.nse If a complete path is specified, Cheetah will create the file in the specified location, and will not change the file's location when

	the data directory is changed. **Example** : -SetDataFile CSC1 "C:\Data Directory\CSC1.ncs" The directory C:\Data Directory must exist or this command will fail. If the file CSC1.ncs exists, it will be overwritten. The extension of the file will be changed to the appropriate Neuralynx extension for the specified acquisition entity type. Cheetah will always create a file using the acquisition entity's name in the current data directory. If this command is issued before any data is recorded, the file in the current data directory will only have header information.

-SetDiskWriteEnabled <Acq Ent Name> <Value>

Enables or disables disk writing of data records for the specified acquisition entity. This command does not affect data records over NetCom or the data visible in all plots for this acquisition entity. You may want to disable disk writing for control or stimulus signals that you want to see, but have no need for in data analysis.

Example: -SetDiskWriteEnabled CSC1 true
Default: Cheetah initially enables disk writing when an acquisition entity is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables disk writing of data records. 2. **False**: Enables disk writing of data records. If disk writing is disabled prior to recording, a data file will be created for the specific acquisition entity, but only header information will be written to the file. If disk writing is disabled after recording has begun, all records after disk writing has been disabled will not be written until disk writing is re-enabled.

-SetDspHighCutFilterEnabled <Acq Ent Name> <Value>

Cheetah has the ability to process all signals using digital signal processing (DSP). This command will turn the high cut (low pass) DSP filter on or off for the specified acquisition entity. This command does not affect the actual filter value (see -SetDspHighCutFrequency), it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers.

Example: -SetDspHighCutFilterEnabled SE1 false
Default: Acquisition entities are created with the high cut filter enabled set to true.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables DSP high cut filtering on all channels of the specified acquisition entity.. 2. **False**: Disables DSP high cut filtering on all channels of the specified acquisition entity..

-SetDspHighCutFrequency <Acq Ent Name> <Value>

Sets the frequency that Cheetah will use for the high cut (low pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The high cut filter frequency has no effect if high cut filtering is disabled (see -SetDspHighCutFilterEnabled). High cut filters will only allow signals whose frequency is below this value to be recorded by Cheetah. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile).

Example: -SetDspHighCutFrequency CSC1 9000
Default: Spike acquisition entities are created with the high cut filter set to 6000Hz, while CSC acquisition entities are set to 9000Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The high cut frequency of the DSP filter to be set for the specified acquisition entity. This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. All signals with a frequency below this value will be processed by Cheetah.

Filter Type	Frequency Range (Hz)
Finite Infinite Response (FIR)	.1 - 10000

-SetDspHighCutNumberTaps <Acq Ent Name> <Value>

Digital signal processing (DSP) taps determine the amount of roll off for the DSP filter. If you notice the high cut filter is allowing signals that are too far above your high cut setting to be processed by Cheetah, you may want to increase this value. Cheetah will normally select a tap value that is appropriate for the high cut filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers.

Example: -SetDspHighCutNumberTaps CSC1 64
Default: Acquisition entities are created with the high cut taps set to 32.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

<table>
<tr><td>Acq Ent Name</td><td>The name of the acquisition entity which will be modified.</td></tr>
<tr><td>Value</td><td>The following table shows the available taps at certain high cut filter frequencies:
<table>
<tr><th>Low Value (Hz)</th><th>High Value (Hz)</th><th>Taps Choices</th></tr>
<tr><td>.1</td><td>199.99</td><td>256</td></tr>
<tr><td>200</td><td>499.99</td><td>128, 256</td></tr>
<tr><td>500</td><td>999.99</td><td>64,128, 256</td></tr>
<tr><td>1000</td><td>10000</td><td>32, 64, 128, 256</td></tr>
</table>
This command will fail if you try to change to a tap size that is not available given the current filter frequency.</td></tr>
</table>

-SetDspLowCutFilterEnabled <Acq Ent Name> <Value>

Cheetah has the ability to process all signals using digital signal processing (DSP). This command will turn the low cut (high pass) DSP filter on or off for the specified acquisition entity. This command does not affect the actual filter value (see -SetDspLowCutFrequency), it simply enables or disables the filter. All channels of an acquisition entity are filtered using the same settings. Disabling DSP filtering can be used to alleviate CPU load on high channel count systems or older computers.

Example: -SetDspLowCutFilterEnabled SE1 false
Default: Acquisition entities are created with the low cut filter enabled set to true..
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables DSP low cut filtering on all channels of the specified acquisition entity.. 2. **False**: Disables DSP low cut filtering on all channels of the specified acquisition entity..

-SetDspLowCutFrequency <Acq Ent Name> <Value>

Sets the frequency that Cheetah will use for the low cut (high pass) digital signal processing (DSP) filter on all channels of the specified acquisition entity. The low cut filter frequency has no effect if low cut filtering is disabled (see -SetDspLowCutFilterEnabled). Low cut filters will only allow signals whose frequency is above this value to be recorded by Cheetah. DSP filters have no effect on data being written to a raw data file (see -SetRawDataFile).

Example: -SetDspLowCutFrequency CSC1 100
Default: Spike acquisition entities are created with the low cut filter set to 600Hz, while CSC acquisition entities are created with a low cut filter set to .1Hz.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The low cut frequency of the DSP filter to be set for the specified acquisition entity. This value is in hertz, and can be any value (including decimal values) between 0.1 Hz and 10000.0 Hz.. All signals with a frequency above this value will be processed by Cheetah.

Filter Type	**Frequency Range (Hz)**
DC Offset (DCO)	0.1 - 149.99
Finite Infinite Response (FIR)	150 - 10000

-SetDspLowCutNumberTaps <Acq Ent Name> <Value>

Digital signal processing (DSP) taps determine the amount of roll off for the DSP filter. If you notice the low cut filter is allowing signals that are too far beneath your low cut setting to be processed by Cheetah, you may want to increase this value. Cheetah will normally select a tap value that is appropriate for the low cut filter frequency. Lowering the number of taps can be useful to alleviate CPU load on large channel count systems or older computers.

Example: -SetDspLowCutNumberTaps CSC1 64
Default: Spike acquisition entities are created with the low cut taps set to 64, while CSC acquisition entities are set to None.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

<table>
<tr><td>Acq Ent Name</td><td>The name of the acquisition entity which will be modified.</td></tr>
<tr><td>Value</td><td>The following table shows the available taps at certain low cut filter frequencies:
<table>
<tr><th>Low Value (Hz)</th><th>High Value (Hz)</th><th>Taps Choices</th></tr>
<tr><td>0.1</td><td>149.99</td><td>None</td></tr>
<tr><td>150</td><td>199.99</td><td>256</td></tr>
<tr><td>200</td><td>499.99</td><td>128, 256</td></tr>
<tr><td>500</td><td>999.99</td><td>64,128, 256</td></tr>
<tr><td>1000</td><td>10000</td><td>32, 64, 128, 256</td></tr>
</table>
This command will fail if you try to change to a tap size that is not available given the current filter frequency.</td></tr>
</table>

-SetInputInverted <Acq Ent Name> <Value>

Enables or disables inversion of AD data for a specified acquisition entity.

Example: -SetInputInverted CSC1 false
Default: Acquisition entities are created with the the input inversion set to true.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The input inverted value can be one of the following:

1. **True:** Cheetah will automatically invert incoming AD data before it is processed.
2. **False:** Cheetah will not adjust the polarity of the incoming AD data before it is processed.

-SetInputRange <Acq Ent Name> <Value> <Value2> <Value3> <Value4>

Sets the input scaling for an acquisition entity. Since there is only a certain number of bits available to digitize the incoming analog data, we need to scale the input voltages to get the most accurate values possible. In order to improve accuracy, you can tell Cheetah what voltage range you are expecting. Cheetah will then adjust the volts per bit setting for digitized data.

Example: -SetInputRange TT1 2000 2000 2000 2000
Default: CSC acquisition entities are created with an input range of -1000 to 1000 microvolts.
Spike acquisition entities are created with an input range of -500 to 500 microvolts.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The input range in microvolts to be used for the first channel of the specified acquisition entity. A larger range will be able to record higher voltages without clipping, however the amount of detail captured is lower (i.e. a larger number of volts is represented by a single bit). Smaller ranges will increase the detail, while sacrificing the ability to record large voltage values. You should always try to have your input range set to the range of values that are expected. Min and max input range values are based on hardware sub system type. Please see the table below.

System Type	Min Input Range	Max Input Range
Digital Lynx SX	25	131072
Digital Lynx	25	131072
Cheetah 64	25	136986
Cheetah 160	11	40816
Raw Data File	11	136986

CSC and Single Electrode acquisition entities only have a single channel. All acquisition entity types require this argument.

Value2	This argument is required if the acquisition entity is a stereotrode or a tetrode. This command will fail if the acquisition entity is any other type.
Value3 and Value4	These arguments are required only if the acquisition entity is a tetrode. This command will fail if the acquisition entity is any other type.

-SetSpikeAlignmentPoint <Acq Ent Name> <Value>

All spike records contain 32 points of data per channel. The alignment point is the position in those 32 points of the point of most interest (i.e. the peak of a spike when in Threshold spike detection mode). Adjusting the alignment point will allow you to have more data before or after the point of interest saved to the spike record.

Example: -SetAlignmentPoint SE1 8
Default: Cheetah normally sets the alignment point to 8.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The index of a spike waveform for which the timestamp is used. The value must be between 1 and 30. **Example:** Assume SE1 is using Threshold spike detection with a threshold of 5000 microvolts and an alignment point of 8. This means that if an incoming signal is over 5000 microvolts, Cheetah will then try and find the peak of the signal following that threshold crossing. Once that point is found, Cheetah will save the 7 points prior to the peak, and the 24 points following the peak for all channels to the spike record.

-SetSpikeDetectionType <Acq Ent Name> <Type>

This command tells Cheetah how to look for spikes in the incoming neurological signal.

Example: -SetSpikeDetectionType ST1 threshold
Default: Cheetah spike detection type is normally Threshold.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Type	The spike detection type can be one of the following: 1. **Threshold:** Cheetah detect spikes by detecting a signal whose voltage is higher than a defined threshold (see -SetSpikeThreshold). Any signal that crosses this threshold will be classified as a spike, and all channels of the acquisition entity for that time period will be saved to a spike record. 2. **Slope:** Cheetah detects spikes by detecting a change in voltage higher than a defined value (see -SetSpikeSlope). Any change in voltage that is higher than the defined value within a specified time will be classified as a spike, and all channels of the acquisition entity for that time period will be saved to a spike record.

-SetSpikeDualThresholding <Acq Ent Name> <Value>

Sets dual spike thresholding for the specified acquisition entity. This tells Cheetah that a spike can be either in the positive or negative direction.

Example: -SetSpikeDualThresholding ST1 true
Default: Cheetah normally has dual thresholding set to False.
Usage: This command can be used at any time, and is available for spike acquisition entities only. The spike detection type must be Threshold.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The auto set feature for analog filters can be one of the following: 1. **True:** Cheetah detects spikes that are above the current threshold setting and below the negative of the threshold setting. 2. **False:** Cheetah will only detect spikes that are above the current threshold setting. **Example:** If the current threshold setting is 5000 microvolts, and dual thresholding is enabled, signals that have a value above 5000 microvolts and below -5000 microvolts will be classified as spikes.

-SetSpikeRetriggerTime <Acq Ent Name> <Value>

Sets the amount of time to wait after a spike has been detected before searching for the next spike. This command can be useful if there are rapidly firing spikes, or echoes present on a particular acquisition entity. The retrigger time is based off of the peak of the previous spike.

Example: -SetSpikeRetriggerTime SE1 16
Default: Cheetah normally waits 100 microseconds after a spike is detected.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This is the amount of time to wait after a spike is detected before searching for the next spike. This can be any value between 1 and 1000000 microseconds.

-SetSpikeSlope <Acq Ent Name> <Sub Channel Index> <Voltage Change> <Time Change>

Sets the spike slope parameters for the specified acquisition entity. The spike detection type must be set to Slope (see -SetSpikeDetectionType) for this command to have an effect. When the value of the incoming neurological data satisfies both the voltage change condition and the time change condition, Cheetah will classify that data as a spike. Slope can be detected in both the positive and negative direction simultaneously (see -SetSpikeDualThresholding).

Example: -SetSpikeSlope TT1 2 500 200
Default: Cheetah defaults slope parameters to 100 micro volts for the voltage change and 160 microseconds for the time change.
Usage: This command can be used only when Cheetah is acquiring or idle, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Sub Channel Index	The index of the spike channel whose setting you wish to change. Valid values are dependent on the type of the spike acquisition entity you are changing: 1. **Single Electrode:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3

Voltage Change	The change in voltage used to detect a spike. If the input signal voltage change is higher than this value, Cheetah will classify the data as a spike and it will be stored in a spike record. The voltage change value is in microvolts and must be between 5 and 5000 microvolts. You want to set the voltage range high enough that noise will not trigger a spike detection, but low enough to see all events of interest.
Time Change	The change in time used for calculating a voltage change in order to detect a spike. If the input signal change in voltage meets or exceeds the above parameter within this specified time, Cheetah will classify that data as a spike. The time change value must be between 64 and 1000 microseconds.

-SetSpikeThreshold <Acq Ent Name> <Value> <Value2> <Value3> <Value4>

Sets the spike threshold for the specified acquisition entity. This command is only allowed when the spike detection type (see -SetSpikeDetectionType) is set to Threshold, otherwise it will fail. When the value of the incoming neurological data is above the specified threshold, Cheetah will classify that data as a spike. Thresholds can be detected in both the positive and negative direction simultaneously (see -SetSpikeDualThresholding).

Example: -SetSpikeThreshold ST1 500 400
Default: Cheetah creates all spike acquisition entities with a threshold of 250 microvolts.
Usage: This command can be used when Cheetah is acquiring or idle, and is available for spike acquisition entities only. The spike detection type must be Threshold.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The threshold to be used for the first channel of the specified acquisition entity. An input signal must be higher than this value to be detected as a spike by Cheetah. The threshold must be a value in microvolts that is within the current input range for this acquisition entity (see -SetInputRange). If the input range is changed to a value lower than the current threshold, the threshold will be set to the value of the input range. You want to set the threshold high enough that noise will not trigger a spike detection, but low enough to see all events of interest. Single Electrode acquisition entities only have a single channel. All spike acquisition entities require this argument.
Value2	This argument is required if the acquisition entity is a stereotrode or a tetrode. This command will fail if the acquisition entity is any other type.
Value3 and Value4	These arguments are required only if the acquisition entity is a tetrode. This command will fail if the acquisition entity is any other type.

-SetSubChannelEnabled <Acq Ent Name> <Channel Index> <Enabled>

Enables or disables a particular subchannel of an acquisition entity. Disabling a subchannel will cause Cheetah to not process any data on that subchannel. Once all subchannels are disabled, acquisition entity processing will be disabled for the acquisition entity.

Example: -SetSubChannelEnabled TT1 3 False
Default: All subchannels of an acquisition entity are enabled when it is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity to retrieve information for.
Channel Index	The index of the subchannel whose setting you wish to change. Valid values are dependent on the type of the acquisition entity you are changing: 1. **Single Electrode, CSC:** Value can only be 0. 2. **Stereotrode:** Value can be 0 or 1. 3. **Tetrode:** Value can be 0, 1, 2, or 3
Enabled	Tells Cheetah to enable or disable an acquisition entity subchannel. 1. **True:** Cheetah will process data for this acquisition entity subchannel. 2. **False:** Cheetah will not process data for this acquisition entity subchannel. For spike acquisition entities, if a spike is detected on another subchannel in this acquisition entity, the data recorded for disabled subchannels will be all zeroes. This will not affect on the data for the AD channel that corresponds to the spike channel index that is disabled. This means that any raw data file or CSC channels that also use this AD channel will be unaffected.

-SetSubSamplingInterleave <Acq Ent Name> <Value>

This command allows you to record data for a particular acquisition entity at a lower sampling rate than other acquisition entities. The sub sampling interleave tells Cheetah to process only every Nth (where N is the Value specified) sample obtained from the recording hardware. This can also be seen as a sampling divisor.

Example: -SetSubSamplingInterleave SE1 2
Default: Acquisition entities are created with the the sub sampling interleave set to 1.
Usage: This command can only be used when Cheetah is idle. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	The value must be between 1 and 3 for spike acquisition entities and between 1 and 128 for csc acquisition entities. **Example:** A Digital Lynx system normally samples all channels at 32000 Hz. Suppose you want to sample CSC1 at 8000 Hz. You would issue the following command: `-SetSubSamplingInterleave CSC1 4` This will only process every 4th sample, giving an effective sampling rate of 8000 Hz.

-SetWaveformFeature <Acq Ent Name> <Feature Name> <Feature Index> <Electrode Index> <Optional Parameters>

Waveform features are values extracted from spike waveform shapes. These values can then be plotted in a multi-dimensional scatter plot to facilitate spike clustering. Each spike record contains 8 calculated features. This command allows the user to change which features are calculated and placed into the spike record.

Example: -SetWaveformFeature SE1 Peak 0 1
Default: Default values depend on the type of spike acquisition entity.
Usage: This command can be used at any time, and is available for spike acquisition entities only.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Feature Name	The feature name can be one of the following: • **Area** - The area of a spike is the L1-Norm of spike sample values, divided by a normalization factor of 32. • **DotProduct** - The dot product feature represents the dot product calculation of a spike waveform and a user-defined vector of the same length (requires <Optional Parameters>). • **Energy** - The energy calculation represents the L2-Norm of the spike sample divided by a normalization factor of 32. • **Height** - The height is the difference between the maximum and minimum sample values in the spike and it always positive. • **NormalizedPeak** - The normalized peak feature is calculated by normalizing the maximum spike waveform sample

	value using the average peak value of all electrodes contributing to a spike channel. This feature is not applicable to single electrodes. - **Peak** - The peak is the maximum sample value in the spike waveform. - **Sample** - The sample feature is the spike sample value at a given point in the spike (requires <Optional Parameters>). - **Valley** - The valley is the minimum sample value in the spike waveform. - **Width** - The width is the difference in sample counts between the maximum spike sample value and the minimum spike sample value
Feature Index	The index of this feature. Each spike record contains 8 features, therefore valid values are 0 through 7.
Electrode Index	This specifies which channel of a multi-electrode acquisition entity is used for the feature calculation. Valid values are as follows: - **Tetrode** - 0,1,2,3 - **Stereotrode -** 0,1 - **Single Electrode -** 0
Optional Parameters	Some features require additional parameters: - **DotProduct** - A 32-point vector for the dot product calculation. The optional parameters in this case are 32 integer values. - **Sample** -Two values that represent a range of sample indices to use when calculating a feature. All samples outside of this range will not be included in the feature calculation. Valid values are 0 through 31.

16.14 Spike Window Commands

Spike Window Commands

These commands are for creation and manipulation of spike windows.

-AddPlot <Window Name> <Acq Ent Name>
Adds a new plot to the specified window. The type of the window determines what type of plot may be added to the window. Once a plot is

added, the acquisition entity whose data is displayed in the plot cannot be changed. All plots are displayed in the order that they are added to the window. The display order of the plots can be changed through the Properties Dialog. All data in the window will clear when a new plot is added to the window. Each acquisition entity can be added to a window only once.

Example: -AddPlot "SpikeWindow" SE1
Default: All plot windows are created with no plots.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that will house the new plot.
Acq Ent Name	The acquisition entity name that will be the data source of the plot. The acquisition entity must be of the appropriate type in order for it to be successfully added to the window. **Example:** Assume a configuration file has the following two commands: -CreatePlotWindow Spike "My Spike Window" -AddPlot CSC1 If the acquisition entity CSC1 is a continuously sampled channel, it will not be able to be displayed in a Spike plot window, and the command will fail.

-CreatePlotWindow <Window Type> <Window Name>

Creates a new plot window in Cheetah. Once created, the window type cannot be changed.

Example: -CreatePlotWindow Time "My Time Window"
Default: Cheetah starts with no plot windows.
Usage: This command can be used at any time.

Arguments

Window Type	Specifies the type of window you wish to be created. This value must be one of the following: 1. **Spike:** The window will only be able to display Spike plots.. 2. **Time:** The window will only be able to display Time plots. 3. **Video:** The window will only be able to display Video plots.

	For a more detailed description of each plot type, see the -SetPlotWindowPlotType command.
Window Name	The name of the plot window you wish to create. This name must be unique throughout the Cheetah system, otherwise the command will fail. Window names can be changed after the window is created through the Properties Dialog.

-SetPlotWindowCurrentPlot <Window Name> <Acquisition Entity Name>

This command has the same effect as either clicking on a plot, or selecting a plot in the Properties dialog's tree view. When a plot is current, you will see a purple background in the title bar of the current plot, and the plot name will appear in the title bar of the window. All menu items with "Current Plot" in the name will be applied to this plot. There can only be one current plot per window. Since the Video Tracker window only has one plot, it will always be current.

Example: -SetPlotWindowCurrentPlot "My Spike Window" SC1
Default: No Spike or Time plot will be set to current unless it is 1) clicked on, 2) selected in the Properties Dialog, or 3) selected by this command. Video Tracker windows will automatically set a plot to current as soon as it is added.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Acquisition Entity Name	The name of the acquisition entity associated with the plot you wish to make current. If there is no plot for that acquisition entity in the specified window, this command will fail.

-SetPlotWindowFrozen <Window Name> <Frozen>

This command works like a pause button on a DVD player. It will lock in whatever is currently displayed in the window. If an action is taken that will clear the window, the last data displayed will be cleared. No data will be added to the window while it is frozen, but otherwise is processed normally. It if a window is frozen before it is displayed, the window may contain garbage or a copy of whatever is displayed beneath the window. Unfreezing and refreezing the window will allow it to clear normally.

Example: -SetPlotWindowFrozen "My Spike Window" True
Default: All windows are created with frozen set to false.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.

Frozen	The frozen value can be one of the following keywords: 1. **True:** The entire window will be frozen and no new data will be plotted. To begin plotting new data, reissue this command with Frozen set to false. 2. **False:** The window will begin to plot new data. If a window was frozen prior to this command being issued, all of the data visible in the frozen display will be cleared.

-SetPlotWindowMaximizeView <Window Name> <Maximized>

Sets the window to fill the entire window with a single plot. This will maximize the current plot. If no current plot is selected, the first plot in the list will be maximized. Video Tracker plots are always maximized as there is only one per window. All data in the window will clear when the maximized state of the window is changed.

Example: -SetPlotWindowMaximizeView "My Spike Window" True
Default: Spike and Time windows are created with Maximized set to false. Video Tracker windows are always maximized.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Maximized	The maximized value can be one of the following keywords: 1. **True:** The current plot will fill the entire window, hiding all other plots in the window. To return to normal mode, reissue this command with Maximized set to false. 2. **False:** All plots in the window are visible.

-SetPlotWindowNumberFeaturePlotsMaximizedView <Window Name> <Value>

When spike plots are maximized, they are automatically switched to the WaveformFeature plot type. Since the Spike plot will now have the entire window to work with, extra Feature plots can be shown. This command specifies how many feature plots are shown in maximized view for all plots that are in the specified window. All data in the window will clear when the number of feature plots is changed, and the window is in maximized view.

Example: -SetPlotWindowNumberFeaturePlotsMazimizedView "Window Name" 4

Default: All Spike windows are created with one maximized view feature plot.
Usage: This command can be used at any time. This command only affects Spike windows.

Arguments

Window Name	The name of the window which will be modified.
Value	This specifies the number of Feature plots to show when the spike plot is maximized. The maximized view must have at least the same number of feature plots as the normal plot view (see -SetPlotWindowNumberFeaturePlotsNormalView). This can be any number between 0 and 9. If the value is not greater or equal to the number of feature plots in the normal view, or greater than 9, this command will fail.

-SetPlotWindowNumberFeaturePlotsNormalView <Window Name> <Value>

This command specifies how many feature plots are shown for all plots that are in the specified window when the window is showing the WaveformFeature or Feature plot type, and is not maximized. If the window is showing the Waveform plot type, no change will be seen when this command is issued. All data in the window will clear when the number of feature plots is changed.

Example: -SetPlotWindowNumberFeaturePlotsNormalView "Window Name" 4
Default: All Spike windows are created with one normal view feature plot.
Usage: This command can be used at any time. This command only affects Spike windows.

Arguments

Window Name	The name of the window which will be modified.
Value	This specifies the number of Feature plots to show when the spike plot has a plot type of WaveformFeature or Feature. The normal view must have at most the same number of feature plots as the maximized plot view. This can be any number between 0 and 9. If the value is not less than or equal to the number of feature plots in the maximized view, greater than 9, or less than 0, this command will fail.

-SetPlotWindowOverlay <Window Name> <Value>

Sets a plot window's overlay mode. Overlaid windows will not clear out old data before displaying new data. This setting effects all plots in this window.

Example: -SetPlotWindowOverlay "MyWindow" true
Default: Plot windows are created with overlay set to false.

Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	This can be one of the following keywords: 1. **True:** The window will not clear out any old data until either a clear command is issued, overlay is turned off, or the window is resized. 2. **False:** The window will clear out old data according to the current plot type. See -SetPlotWindowType for more information.

-SetPlotWindowPlotType <Window Name> <Plot Type>

Sets the plot type that will be used for this window. All plots in the window will be set to the same type. All data in the window will clear when the plot type is changed.

Example: -SetPlotWindowPlotType "SpikeWindow" Waveform

Default:

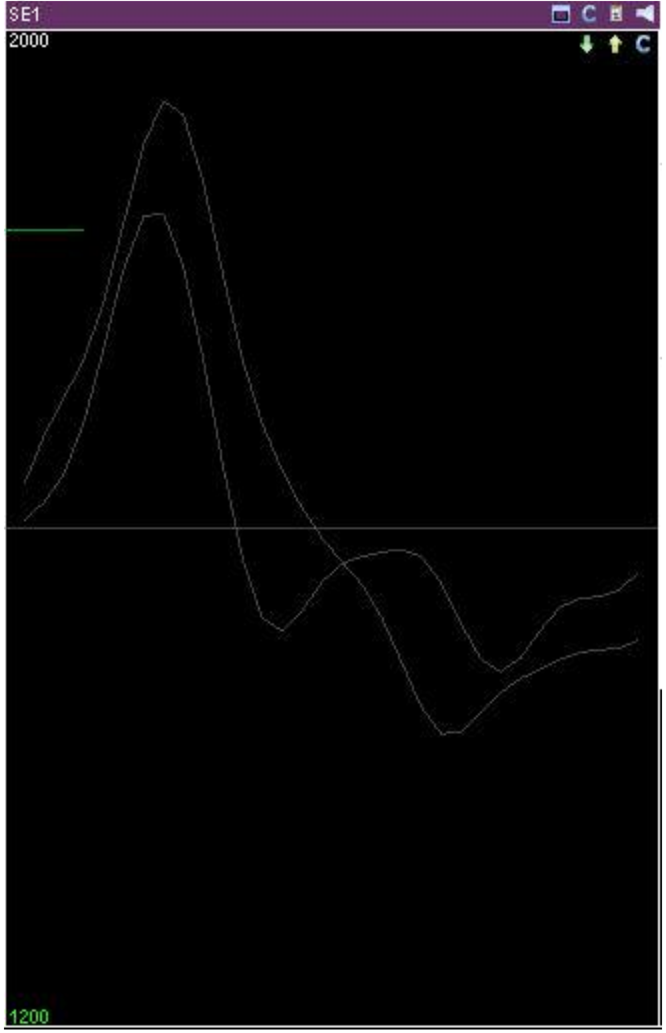
Window Type	**Default Plot Type**
Spike	WaveformFeature
Time	Sweep
Video	Live

Usage: This command can be used at any time.

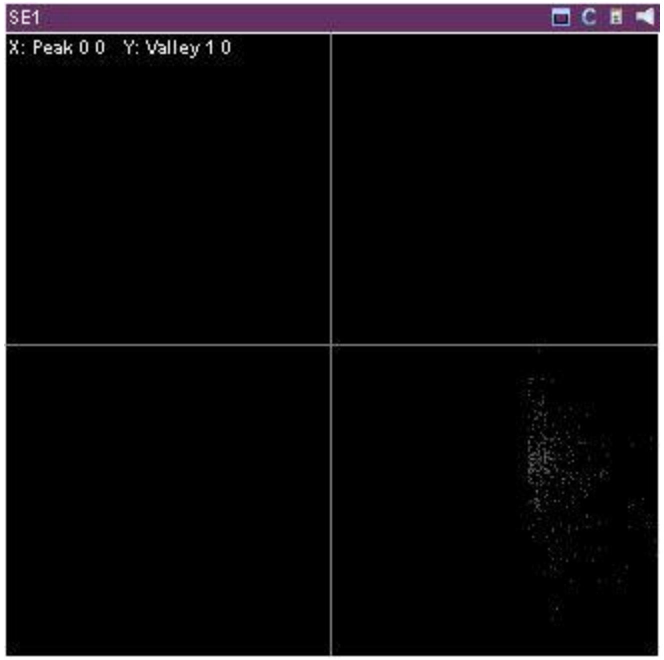
Arguments

Window Name	The name of the window that will be modified.
Plot Type	The options for a view are dependent upon the type of window that is being set. If the specified plot type does not correspond to the type of the window (i.e. a plot type of Waveform for a Time window), the command will fail. **Spike Windows:**

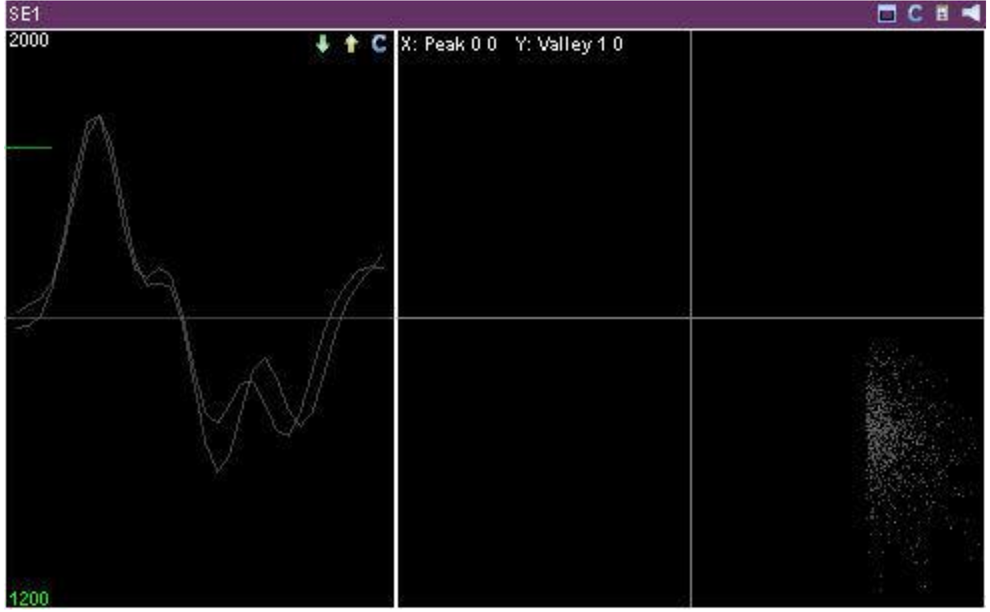
1. **Waveform:** Shows the extracted waveform for a detected spike. If more than one waveform is visible, this means more than one spike occurred since the last screen refresh. The waveform seen in this plot is the exact waveform saved to the spike data records.



2. **Feature:** Shows the calculated feature information in a XY scatter plot. The features that are plotted can be changed by the -SetFeaturePlotSources command. To change the features available for an acquisition entity, see the -SetWaveformFeature command. The data seen in this plot is the exact data saved to the spike data records.

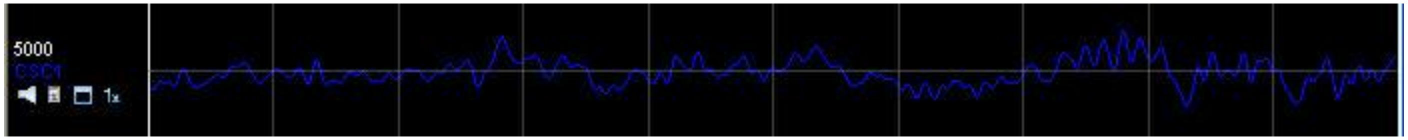


3. **WaveformFeature:** Shows both the waveform and feature plots.

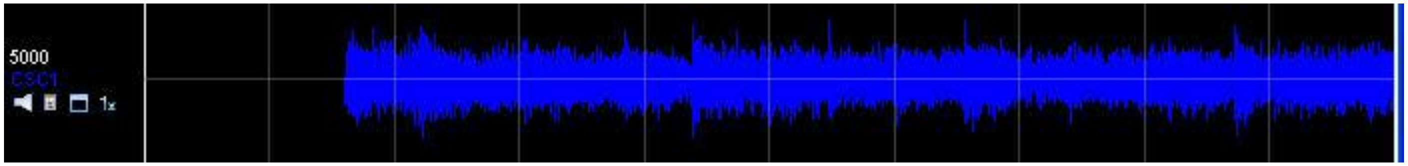


Time Windows:

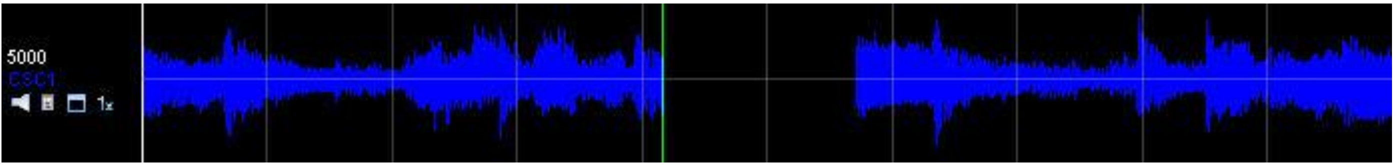
1. **Flash:** Displays the waveform for single record. The data shown is indicative of the data that is written to the Cheetah data files.



2. **Scroll:** Similar to an oscilloscope, new waveform data will be shown on the right, and old data will scroll to the left. The amount of time shown in this plot can be adjusted with the -SetPlotWindowTimeframe command. The data shown is indicative of the data that is written to the Cheetah data files.



3. **Sweep:** A cursor will move from left to right across the screen. New data will be shown to the immediate left of the cursor. Old data will be cleared as the cursor moves past it. The data shown is indicative of the data that is written to the Cheetah data files



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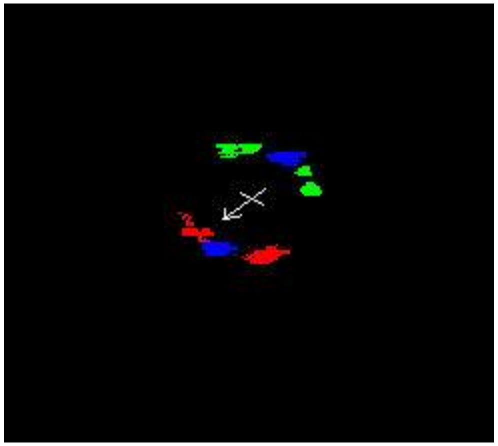
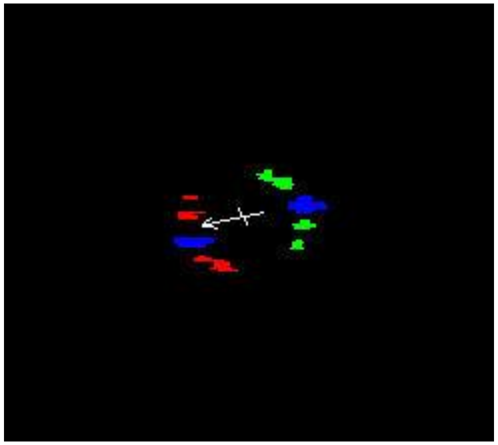
Video Tracker Windows:

1. **Live**: The image displayed in the window is the live, unprocessed video image. This is also the same image that will be written to a video output file (-SetVideoFileOutput) when -SetVideoFileOutputEnabled is true.

1. **Threshold**: The image displayed in the window is a thresholded version of the live image. This display mode takes into account the threshold settings for Red, Green, Blue and Intensity when displaying pixels. This is **NOT** representative of the data that is recorded to the Video Tracker record file, but is intended as a guide for setting thresholds.



2. **Record**: Displays a thresholded image of the live video. This display mode will only show pixels that are above the threshold for Red, Green, Blue and Intensity. However, it will only display as many transitions as the video record can hold. If the thresholds are set too low, the image may become saturated, and only the top few lines of the image will be visible. The image displayed is representative of the data stored into a Video Tracker record file.

-SetPlotWindowPosition <Window Name> <X Position> <Y Position> <Window Width> <Window Height>

Set the position and size of the specified plot window. All data in the window will clear when the window size or position is changed.

Example: -SetPlotWindowPosition WindowName 200 300 800 600
Default: The position of new plot windows is determined by Windows.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
X Position	The position, in pixels, to place the left side of the specified window. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is outside the bounds of your desktop, it will be adjusted to that the window is placed as close to your value as possible, while remaining completely visible. If the width of the window is larger than the width of your desktop, Cheetah will set the x position to 0 and part of the window will not be visible. Negative values are not allowed. **Example:** You have your screen resolution set to 1600 x 1200, and the following command is processed by Cheetah: -SetPlotWindowPosition "My Spike Window" 1600 100 800 600 Since putting the window with its left point at 1600 and top at 100 will place the window outside of your desktop, Cheetah will move the window left until it is completely visible. The top position will not be changed since it is within the bounds of the

	desktop. The final position of the window from the above command will be 800, 100.
Y Position	The position, in pixels, to place the top of the specified dialog. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is specified that is outside the bounds of your desktop, it will be adjusted to that the specified dialog is placed as close to your value as possible, while remaining completely visible. If the height of the window is larger than the height of your desktop, Cheetah will set the y position to 0 and part of the window will not be visible. Negative values are not allowed.
Window Width	The width of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.
Window Height	The height of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.

-SetPlotWindowShowIcons <Window Name> <Value>

Enables or disables the drawing of icons for all plots in the specified display window. This does not include icons that are part of the title bar (see -SetPlotWindowShowTitleBar). When icons are hidden, you will not be able to click on them to activate plot commands. Not all plot types have icons, so this command may sometimes seem to do nothing. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since the saved screen space is minimal, it is recommended that you leave the icons visible if possible. All data in the window will clear when the icon visibility is changed.

Example: -SetPlotWindowShowIcons Window1 false
Default: All windows are created with icons shown.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	The value can be one of the following keywords: 1. **True:** All icons not in the title bar will be shown. 2. **False:** All icons not in the title bar will be hidden.

-SetPlotWindowShowTextValues <Window Name> <Value>

Enables or disables the drawing of text values for all plots in the specified display window. This does not include text values that are part of the title bar (see -SetPlotWindowShowTitleBar). Not all plot types have text values, so this command may sometimes seem to do nothing. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since the saved screen space is minimal, it is recommended that you leave the text visible if possible. All data in the window will clear when the text visibility is changed.

Example: -SetPlotWindowShowTextValues "Window Name" true
Default: All windows are created with text values shown.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	The value can be one of the following keywords: 1. **True:** All text values not in the title bar will be shown. 2. **False:** All text values not in the title bar will be hidden.

-SetPlotWindowShowTitleBar <Window Name> <Value>

Sets the visibility of title bar for the specified display window. This command can be used to increase the screen space dedicated to showing acquired data or can be used to decrease CPU usage for large channel count systems or older computers. Since most of the plot icons are located in the title bar, you will not be able to click on the icons when the title bar is hidden. Since the saved screen space is minimal, it is recommended that you leave the title bars visible if possible. All data in the window will clear when the title bar visibility is changed.

Example: -SetPlotWindowShowTitleBar "My Spike Window" true
Default: Plot windows are created with the title bar visible.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	The visibility value can be one of the following keywords:

	1. **True:** The title bar is visible for all plots in the window. Spike windows have one title bar per plot, whereas Time windows have one title bar for all plots. Video Tracker windows do not have a title bar. 2. **False:** The title bar is hidden for all plots in the window.

16.15 Spike Plot Commands

Spike Plot Commands

These commands will modify how individual spike plots display their data. Some display options can only be changed at the spike window level. See the spike window commands for more information (including adding plots to a window).

-SetClusterDisplay <Window Name> <Acq Ent Name> <Cluster Number> <Value>

If spike definitions have been imported into Cheetah from Spike Sort 3D, spikes will be classified into cluster (aka cell) numbers as they are detected. Classified spikes will appear in a different color (corresponding to their cell number) than unclassified spikes. You may choose to only display certain cells in a spike plot to better view cells of interest. As spikes are detected and sent to the spike plot to be displayed, Cheetah will check to see if the cell should be shown before plotting the waveform. This command only takes effect as spikes are drawn, and will not remove or show previously displayed waveforms. No data is cleared when this value is changed, and only the specified spike plot is affected.

Example: -SetClusterDisplay Spikewindow SE1 3 on
Default: All cells have their display set to On as soon as they are defined.
Usage: This command can be used at any time. This command only affects Spike plots.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Cluster Number	The cluster whose drawing state you wish to change. This value must be between 0 and 31. Cluster 0 is for all unclassified spikes.
Value	The value can be one of the following keywords:

	1. **On:** All incoming spikes that are classified with the specified cluster number will be shown. 2. **Off:** All incoming spikes that are classified with the specified cluster number will be hidden.

-SetFeaturePlotSources <Window Name> <Acq Ent Name> <Feature Plot Number> <X Source> <Y Source>

This command is used to change the data that is displayed in each of the feature plots of a Spike plot. All data in the feature plot will be cleared when the feature sources are changed.

Example: -SetFeaturePlotSources Spikewindow SE1 2 0 1
Default: All feature plots are created with the X source set to 0 and Y source set to 1.
Usage: This command can be used at any time. This command only affects Spike plots.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Feature Plot Number	The feature plot to be modified. This value must be between 1 and 9. If the index of the feature plot you change is not visible, no data will be cleared from the display.
X Source	The feature index to be used on the X axis of the feature plot. This value must be between 1 and 8. The exact data that is referenced by the feature index can be different for each acquisition entity. See the -SetWaveformFeature command for more information.
Y Source	The feature index to be used on the Y axis of the feature plot. This value must be between 1 and 8. The exact data that is referenced by the feature index can be different for each acquisition entity. See the -SetWaveformFeature command for more information.

-SetFeaturePlotView <Window Name> <Acq Ent Name> <Feature Plot Number> <Left> <Top> <Right> <Bottom>

This command allows you to change the data ranges visible in a single feature plot. No data is cleared when the view is changed. It is recommended that the feature plot view be adjusted using one of the graphical methods in Cheetah, as calculating the normalized AD counts necessary for this command is sometimes cumbersome.

Example: -SetFeaturePlotView Spikewindow SE1 1 1000 1500 2000 0

Default: All feature plots are created using the full view. They are as follows: Left: -32767 Top: 32767 Right: 32767 Bottom: -32767
Usage: This command can be used at any time. This command only affects Spike plots.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Feature Plot Number	The feature plot to be modified. This value must be between 1 and 9.
Left	The smallest X value that will be displayed in the feature plot. This value is in normalized AD counts and can be any whole number between -32767 and 32768.
Top	The largest Y value that will be displayed in the feature plot. This value is in normalized AD counts and can be any whole number between -32767 and 32768.
Right	The largest X value that will be displayed in the feature plot. This value is in normalized AD counts and can be any whole number between -32767 and 32768.
Bottom	The smallest Y value that will be displayed in the feature plot. This value is in normalized AD counts and can be any whole number between -32767 and 32768.

-SetPlotEnabled <Window Name> <Acq Ent Name> <Enabled>

This command is used if you want to stop plotting data for only a single acquisition entity's plot in a window, but do not want to remove the plot from the window. This is similar to a freeze for only a single plot (see -SetPlotWindowFrozen). This command works like a Pause button on a DVD player. It will lock in whatever is currently displayed in the plot. If an action is taken that will clear the plot, the last data displayed will be cleared. No data will be added to the plot while it is disabled, but otherwise is processed normally.

Example: -SetPlotEnabled "Spike Window 1" SE1 True
Default: All plots are enabled when they are created..
Usage: This command can be used at any time. This command only affects Spike and Time plots.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified

Name	acquisition entity, this command will fail. This is also referred to as the plot name.
Enabled	The enabled value can be one of the following keywords: 1. **True:** Only the specified plot will be disabled and no new data will be plotted. To begin plotting new data, reissue this command with enabled set to false. 2. **False:** Only the specified plot will begin to plot new data. If a plot was disabled prior to this command being issued, all of the data visible in the disabled display will be cleared.

-SetPlotLabel <Window Name> <Acq Ent Name> <Value>

Sets a label to the plot in the specified window. This label is used only for display purposes. Not all plots will show the label on the plot itself, but all plot labels will be visible in the Property Dialog's tree view. The data in only the plot whose label is set will be cleared when the plot label is changed.

Example: -SetPlotLabel "Spike Window 1" SE1 "My Label"
Default: All plots are created with no label.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that contains the plot you want to change.
Acq Ent Name	The name of the acquisition entity whose plot you want to change. If the window does not contain a plot for the specified acquisition entity, this command will fail. This is also referred to as the plot name.
Value	The label to use for this plot.

16.16 Video Capture Device Commands

Video Capture Device Commands

These commands are used to create and configure the capture device for use with Cheetah.

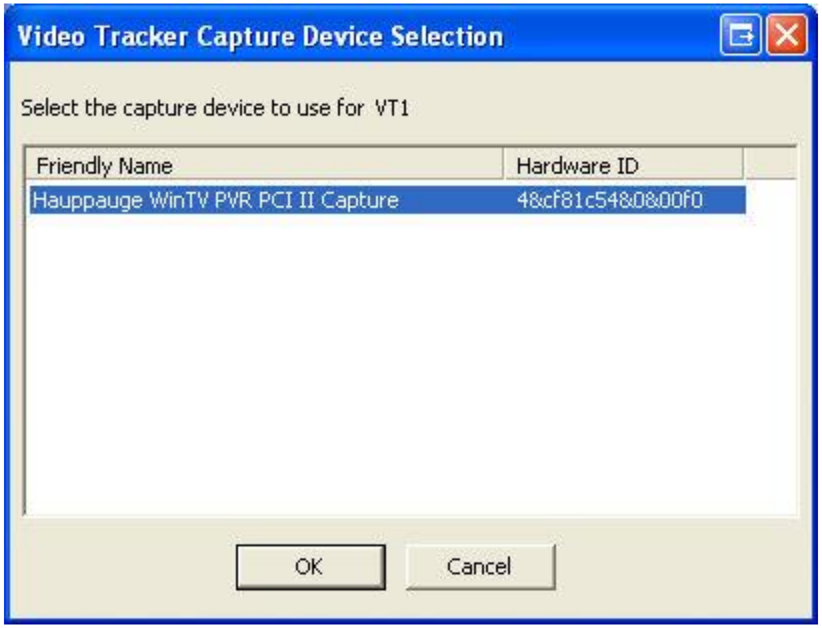
-CreateVideoTracker <Tracker Name> <Capture Device Name or Hardware ID>

Creates a new instance of a video tracker in Cheetah. Video trackers can be used to detect position, direction or just provide an image letting you see what is going on in an experiment.

Example: -CreateVideoTracker VT1 "Hauppague WinTV PVR Capture"
Default: Cheetah does not create any video trackers unless this command is specified.
Usage: This command can be used only when Cheetah is idle.

Arguments

<table>
<tr><td>Tracker Name</td><td>The name of the video tracker you wish to create. This name must be unique throughout the Cheetah system. This name cannot be changed after the video tracker is created.</td></tr>
<tr><td>Capture Device Name or Hardware ID</td><td>This argument can be either the capture device name or the hardware ID for the capture device you want to use. The capture device name is the DirectShow friendly name of the capture device you wish to use for this video tracker. If the same friendly name is used for more than one capture device on your PC, Cheetah will select the first unused device matching the capture device name specified. Alternatively, you can specify the hardware ID of the capture device you wish to use. This will bind your video tracker to a specific capture card. You may only use each capture device on your computer with a single video tracker. Attempting to create a video tracker with a device that is attached to a different video tracker will fail. If you do not specify a capture device name or hardware ID, Cheetah will prompt you to select a capture device from a list during startup. This list displays both the friendly name and hardware ID that you can put in your startup file for future use.



Video Tracker Capture Device Selection

Select the capture device to use for VT1

<table>
<tr><th>Friendly Name</th><th>Hardware ID</th></tr>
<tr><td>Hauppauge WinTV PVR PCI II Capture</td><td>4&cf81c54&0&00f0</td></tr>
</table>

</td></tr>
</table>

-SetAnalogVideoFormat <Tracker Name> <Format>

Sets the analog video format to use for the specified video tracker. This command is used for analog video sources only. If you are using the **1394** input type, this command will be ignored.

Example: -SetAnalogVideoFormat VT1 NTSC
Default: Cheetah creates video trackers using the NTSC analog video format.
Usage: This command can be used only when Cheetah is idle.

Arguments

Tracker Name	The name of the video tracker whose analog video format you wish to change.
Format	Specifies the analog video format you wish to use for this video tracker. Cheetah supports the following format types: 1. **NTSC**: Uses NTS_M video formatting with 33ms frame intervals (30FPS). Used throughout North and South America, Japan, and Oceana 2. **PAL**: Uses PAL_B video formatting with 40ms frame intervals (25FPS). Used throughout the rest of the world. Except in along the Mediterranean, where SECAM is used. Your capture device must also support the specified video format. If your hardware does not support the specified format, the command will fail.

-SetBrightness <Tracker Name> <Value>

Sets the brightness level for the specified video tracker.   Brightness adjustment will increase the values of the RGB signals in the color evenly, shifting the image towards white (high values) or black(low values).   After setting the value, the setting will persist even after Cheetah is exited. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetBrightness VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to 255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not

	support this setting.

-SetContrast <Tracker Name> <Value>

Sets the contrast level for the specified video tracker. Contrast adjustment will intensify the boundaries between different luminance values. Increasing the contrast will make those boundaries more distinct, while decreasing contrast will tend to give the image a more muted look. After setting the value, the setting will persist even after Cheetah is exited. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetContrast VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to 255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

-SetGamma <Tracker Name> <Value>

Sets the gamma level for the specified video tracker. Gamma adjustment is an attempt to linearize the power-law relationship between the encoded luminance and actual desired brightness. If the actual source luminance is L, gamma will adjust the luminance encoded by the capture card to L^(1/gamma). After setting the value, the setting will persist even after Cheetah is exited. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetGamma VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to 255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

-SetHue <Tracker Name> <Value>

Sets the hue level for the specified video tracker. Hue control will adjust all the colors in the signal according to the following formula

$$\phi = \arccos\left(\frac{R-\mu}{\sigma\sqrt{2}}\right)$$

. Where σ is saturation, μ is brightness, R is the RGB color value and φ is hue. This adjustment essentially skews the image towards green (lower values) or violet (higher values). Hue is sometimes referred to as tint. After setting the value, the setting will persist even after Cheetah is exited. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetHue VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to 255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

-SetSaturation <Tracker Name> <Value>

Sets the saturation level for the specified video tracker. Adjusting this setting will increase or decrease the intensity of all color information evenly. If a signal is more red than blue or green, increasing saturation will show more of an effect on the red component than any other component. Saturation is sometimes referred to as color. After setting the value, the setting will persist even after Cheetah is exited. If black and white images are desired, this setting should be 0. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetSaturation VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to

	255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

-SetSharpness <Tracker Name> <Value>

Sets the sharpness level for the specified video tracker. Sharpness dictates the number of pixels to use for color transitions. When an image switches between two distinct colors abruptly (say red and black), the video signal attempts to smooth that transition by adjusting a few pixels on the boundary of the color change. Adjusting the sharpness will either increase (lower values) or decrease (higher values) the number of pixels used for this transition. After setting the value, the setting will persist even after Cheetah is exited. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

Example: -SetSharpness VT1 128
Default: Cheetah will use the value currently set on the capture device.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video that you wish to adjust.
Value	This is a whole number between 0 and 255. Values below 0 will be adjusted to 0, and values above 255 will be adjusted to 255. This setting must be able to be adjusted by your hardware, this function will be ignored if your device does not support this setting.

-SetVideoFileOutput <Tracker Name> <Output File Name>

Sets up a live video recording on your PC. This can be done concurrently with standard video tracking. If video file output is enabled (see -SetVideoFileOutputEnabled) when recording is started, Cheetah will begin to compress the live video image, without processing, and save that video to the file specified. A subtitle file will be recorded, along with the compressed video, to allow you to view the Cheetah timestamp overlaid over each video frame in any media player that supports subtitles. This setting is only available if you are using a video tracking capture card that supports hardware video encoding, such as the Hauppauge PVR-150.

Example: -SetVideoFileOutput VT1 VT1.mpg
Default: Cheetah does not set a video output file name when a video tracker is created.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker to use when making the live recording.

Output File Name	Cheetah is designed to work with capture devices that have hardware video encoders. The encoding format is dependent on the capture device you are using, and it is your responsibility to name the file with the appropriate extension. Sets the file to use for live video recording. If only a filename is specified, Cheetah will create the file in the current data directory. **Example**: -SetVideoFileOutput VT1 VT1.mpg If a complete path is specified, Cheetah will create the file in the specified location. **Example** : -SetVideoFileOutput VT1 "C:\Cheetah Video\My_Video.mpg" The directory C:\Cheetah Video must exist or this command will fail. If Cheetah recording is stopped while recording to a video output file, a new file will be created with the same name and "_#" appended to the end. The next time recording is started, Cheetah will record all video to the new file. The # is incremented every time recording is stopped.

-SetVideoFileOutputEnabled <Tracker Name> <Value>

Enables or disables video file output using the compression and file specified by -SetVideoFileOutput. Changing the enabled state does not change the value of the -SetVideoFileOutput command unless the -SetVideoFileOutput command was never issued.

Example: -SetVideoFileOutputEnabled VT1 false
Default: Cheetah creates video trackers with the video file output enabled set to false.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	Specifies the input you wish to use for this video tracker. Cheetah supports the following input types: 1. **True**: Enables recording of live video to an output file. If no output file is defined using the -SetVideoFileOutput command, a video file is created in the current data directory using the specified video tracker name (i.e. VT1.mpg). 2. **False:** Disables recording of live video to an output file.

-SetVideoInput <Tracker Name> <Input Type>

This command will determine what connection your video camera is using to feed images to the computer. These inputs will work with both NTSC and PAL video formats.

Example: -SetVideoInput VT1 SVideo
Default: Cheetah creates video trackers using the SVideo input.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker whose input you wish to change.
Input Type	Specifies the input you wish to use for this video tracker. Cheetah supports the following input types: 1. **SVideo**: Uses a 4 pin connection to transfer video signal. It gives better image quality than composite because it transmits luminance and color information on separate wires. The remaining two wires are ground. 2. **Composite**: Generally uses a coaxial wire with either a BNC or an RCA connection. Composite signals transmit all image information over a single wire. This results in a less accurate image than SVideo. Your capture device must also support the specified input type. If your hardware does not support the specified input type, the command will fail.

-SetVideoResolution <Tracker Name> <Width> <Height>

Sets the resolution to be used for this video tracker. Because this setting is device dependent, it will fail if the resolution specified is not supported by the device in its current state (i.e. 800x600 resolution with NTSC format). If this command is not specified, Cheetah will automatically select a resolution for you based on the other video settings.

Example: -SetVideoResolution VT1 800 600
Default: Cheetah creates video trackers the first valid NTSC format resolution returned by the capture card.
Usage: This command can be used only when Cheetah is idle.

Arguments

Tracker Name	The name of the video tracker to adjust.
Width	The width of the desired resolution in pixels. This number must be greater than or equal to 0. A value of 0 will tell Cheetah to automatically select a resolution based on the current video settings.

Height	The height of the desired resolution in pixels. This number must be greater than or equal to 0. A value of 0 will tell Cheetah to automatically select a resolution based on the current video settings.

16.17 Video Tracker AE Commands

Video Tracker Acquisition Entity Commands

These commands are used to control how the video tracker acquisition entity processes video frames and what it does with the data after processing.

-GetDataFile <Acq Ent Name>

Returns the data file name and path for the specified acquisition entity.

Example: -GetDataFile VT1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity that the data file name is being requested for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This is the data file name and path for the specified acquisition entity.

-SetBlueThresholdEnabled <Tracker Name> <Value>

Enables or disables blue thresholding for video record processing. When enabled, the value specified by the -SetBlueThreshold command will be will be used for tracking the blue components of the video. Changing the enabled state does not change the value of the -SetBlueThreshold command.

Example: -SetBlueThresholdEnabled VT1 True
Default: Cheetah creates all video trackers with the threshold enable set to False.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be one of the following keywords: 1. **True:** Threshold tracking for this color is enabled. 2. **False:** Threshold tracking for this color is disabled.

-SetBlueThreshold <Tracker Name> <Value>

Sets the threshold level for detecting red pixels in a video tracker record. The Blue value of the pixel is calculated using a pure blue algorithm that subtracts the intensity value from the blue component of a pixel.

Example: -SetBlueThreshold VT1 50
Default: Cheetah creates all video trackers with the threshold set to 255.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any whole number between 0 (every pixel with blue is used) and 255 (no blue pixels are used). Values outside of that range will generate an error, and the previous threshold setting will be retained. If the value of a pixel is detected that is above the threshold, it will be considered a pixel of interest for video tracking.

-SetCameraDelayEnabled <Tracker Name> <Value>

Enables or disables the static camera delay for video record processing. When enabled, the value specified by the -SetCameraDelay command will be subtracted from the timestamp of each record prior to the record being written to a file. Changing the enabled state does not change the value of the -SetCameraDelay command.

Example: -SetCameraDelayEnabled VT1 True
Default: Cheetah sets the camera delay enabled to False.
Usage: This command can be used when Cheetah is idle or in acquisition mode, unless, video file output is enabled (see -SetVideoFileOutputEnabled), then this command can only be used when Cheetah is idle.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.

Value	This value can be one of the following: 1. **True:** Enables the camera delay subtraction on all video tracker records for the specified tracker. 2. **False:** Disables the camera delay subtraction on all video tracker records for the specified tracker.

-SetCameraDelay <Tracker Name> <Value>

Sets the static camera delay for adjusting each video record's timestamp inside Cheetah. This command is used when the processing delay of the camera is known, and is static. Every record will have this value subtracted from its timestamp prior to the record being written to a file. This function only sets the value that will be used for the camera delay, it does NOT enable usage of this delay. You must also use the command -SetCameraDelayEnabled to specify whether this value is subtracted or the recorded timestamp is unchanged.

Example: -SetCameraDelay VT1 100
Default: Cheetah normally sets the camera delay to 0 microseconds.
Usage: This command can be used when Cheetah is idle or in acquisition mode, unless, video file output is enabled (see -SetVideoFileOutputEnabled), then this command can only be used when Cheetah is idle.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any positive whole number or 0; specifying the number of microseconds of delay to be used for each record.

-SetDataFile <Acq Ent Name> <File Name>

Sets the data file for the specified acquisition entity. All data records recorded for this acquisition entity will be saved to this file.

Example: -SetDataFile Events "C:\My Events.nev"
Default: Cheetah will create a file using the name of the acquisition entity in the current data directory when the acquisition entity is created (i.e.Cheetah created Events.nev in the current data directory when the Events acquisition entity was created).
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.

File Name	Sets the file to use for data recording for the specified acquisition entity. If only a filename is specified, Cheetah will create the file in the current data directory. When the data directory is changed, the file's location will change with the data directory. **Example**: -SetDataFile SE1 SE1.nse If a complete path is specified, Cheetah will create the file in the specified location, and will not change the file's location when the data directory is changed. **Example** : -SetDataFile CSC1 "C:\Data Directory\CSC1.ncs" The directory C:\Data Directory must exist or this command will fail. If the file CSC1.ncs exists, it will be overwritten. The extension of the file will be changed to the appropriate Neuralynx extension for the specified acquisition entity type. Cheetah will always create a file using the acquisition entity's name in the current data directory. If this command is issued before any data is recorded, the file in the current data directory will only have header information.

-SetDiskWriteEnabled <Acq Ent Name> <Value>

Enables or disables disk writing of data records for the specified acquisition entity. This command does not affect data records over NetCom or the data visible in all plots for this acquisition entity. You may want to disable disk writing for control or stimulus signals that you want to see, but have no need for in data analysis.

Example: -SetDiskWriteEnabled CSC1 true
Default: Cheetah initially enables disk writing when an acquisition entity is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables disk writing of data records. 2. **False**: Enables disk writing of data records. If disk writing is disabled prior to recording, a data file will be created for the specific acquisition entity, but only header information will be written to the file. If disk writing is disabled after recording has begun, all records after disk writing has been disabled will not be written until disk writing is re-enabled.

-SetFieldEstimationEnabled <Tracker Name> <Value>

Enables or disables field processing of video frames. All video frames are received by Cheetah as interlaced frames. This means that all lines of video are present in every video frame, and frames appear based on the frame rate for the current video signal. Some video sources actually capture data as non-interlaced video before sending the image to Cheetah. In this case, odd lines are captured, and then the device goes back to capture the even lines. Then, both sets of lines are combined into a single image and sent to Cheetah. Field estimation will de-interlace the lines of the image, create two video records, and estimate the time that the even lines were captured.

Example: -SetFieldEstimationEnabled VT1 false
Default: Cheetah creates video trackers with the field estimation enable set to False.
Usage: This command can be used only when Cheetah is idle.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be one of the following: 1. **True:** Cheetah will process the even and odd lines of the video frame into separate video records. The odd lines will be timestamped at the frame time, but the even lines will be timestamped at the midpoint between the odd lines and the beginning of the next frame. The timestamp of the even lines is an ***estimation*** of the field timestamp. 2. **False:** In this mode, all lines are processed into a single video record, and the timestamp is the beginning of the frame.

-SetGreenThresholdEnabled <Tracker Name> <Value>

Enables or disables green thresholding for video record processing. When enabled, the value specified by the -SetGreenThreshold command will be will be used for tracking the green components of the video. Changing the enabled state does not change the value of the -SetGreenThreshold command.

Example: -SetGreenThresholdEnabled VT1 True
Default: Cheetah creates all video trackers with the threshold enable set to False.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be one of the following keywords:

	1. **True:** Threshold tracking for this color is enabled. 2. **False:** Threshold tracking for this color is disabled.

-SetGreenThreshold <Tracker Name> <Value>

Sets the threshold level for detecting red pixels in a video tracker record. The Green value of the pixel is calculated using a pure green algorithm that subtracts the intensity value from the green component of a pixel.

Example: -SetGreenThreshold VT1 50
Default: Cheetah creates all video trackers with the threshold set to 255.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any whole number between 0 (every pixel with green is used) and 255 (no green pixels are used). Values outside of that range will generate an error, and the previous threshold setting will be retained. If the value of a pixel is detected that is above the threshold, it will be considered a pixel of interest for video tracking.

-SetHeadDirectionOffset <Tracker Name> <Value>

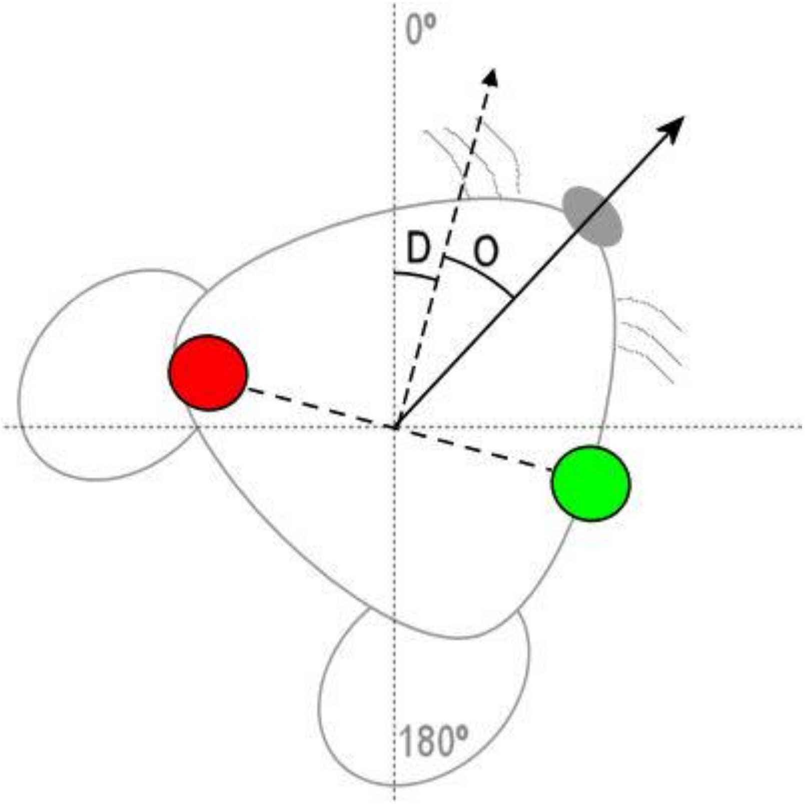
This parameter is set to adjust the head angle in degrees for tracking LEDs that are not centered on the subject.

Example: -SetHeadDirection VT1 15
Default: Cheetah creates video trackers with the head direction set to 0 degrees.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any whole number or 0, specifying the offset from angle D below. Any values at or above 360º will be normalized between 0º and 359º. Negative values indicate a counter clockwise offset, and are still normalized between 0º and 359º. **Example:** Assume Value = 30 and the video tracking mode is 2LED. Once Cheetah detects the position of the subject, it

will attempt to determine the head direction based on the -SetVideoTrackingMode setting of 2LED. The direction will be calculated as if each of the LEDs were to the exact left and right of the subject (angle D below). Since the offset is specified at 30 degrees, that means that the left and right LEDs are at a 30 degree angle (the left LED is slightly lower than the right led), and 30 degrees (angle O below) will be added to give the head direction (D + O).



-SetIntensityThresholdEnabled <Tracker Name> <Value>

Enables or disables intensity thresholding for video record processing. When enabled, the value specified by the -SetIntensityThreshold command will be will be used for tracking the intensity components of the video. Changing the enabled state does not change the value of the -SetIntensityThreshold command.

Example: -SetIntensityThresholdEnabled VT1 True
Default: Cheetah creates all video trackers with the threshold enable set to False.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be one of the following keywords: 1. **True:** Threshold tracking for this color is enabled. 2. **False:** Threshold tracking for this color is disabled.

-SetIntensityThreshold <Tracker Name> <Value>

Sets the threshold level for detecting the intensity of pixels in a video tracker record. The Intensity value of the pixel is calculated by taking the average of the RGB pixel components.

Example: -SetIntensityThreshold VT1 50
Default: Cheetah creates all video trackers with the threshold set to 255.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any whole number between 0 (every pixel with any intensity is used) and 255 (no pixels will ever be over the intensity threshold). Values outside of that range will generate an error, and the previous threshold setting will be retained. If the value of a pixel is detected that is above the threshold, it will be considered a pixel of interest for video tracking.

-SetLedColor <Tracker Name> <LED Index> <Color>

Sets the color of an LED for direction and position finding. This command is only valid when using a 2LED tracking (-SetVideoTrackingMode), it will fail if using any other type of tracking mode. If this command is not specified, see the LED Index argument for defaults.

Example: -SetLedColor VT1 0 Green
Default: 2LED tracking is normally done with index 0 (left) as Green and index 1 (right) as Red.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker whose LED configuration you wish to change.
LED Index	The index of the LED whose color you want to set. LEDs are numbered starting from 0 and increasing in a clockwise direction. For the 2LED tracking, the left LED is index 0 and the right LED is index 1.
Configuration	Specifies the color you want the LED to be. Cheetah supports the following led colors: 1. **Red** 2. **Green** 3. **Blue** Setting this argument to a value that does not correspond to your actual LED colors can give erroneous direction and position values.

-SetRedThresholdEnabled <Tracker Name> <Value>

Enables or disables red thresholding for video record processing. When enabled, the value specified by the -SetRedThreshold command will be will be used for tracking the red components of the video. Changing the enabled state does not change the value of the -SetRedThreshold command.

Example: -SetRedThresholdEnabled VT1 True
Default: Cheetah creates all video trackers with the threshold enable set to False.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be one of the following keywords: 1. **True:** Threshold tracking for this color is enabled. 2. **False:** Threshold tracking for this color is disabled.

-SetRedThreshold <Tracker Name> <Value>

Sets the threshold level for detecting red pixels in a video tracker record. The Red value of the pixel is calculated using a pure red algorithm that subtracts the intensity value from the red component of a pixel.

Example: -SetRedThreshold VT1 50
Default: Cheetah creates all video trackers with the threshold set to 255.
Usage: This command can be used at any time.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any whole number between 0 (every pixel with red is used) and 255 (no red pixels are used). Values outside of that range will generate an error, and the previous threshold setting will be retained. If the value of a pixel is detected that is above the threshold, it will be considered a pixel of interest for video tracking.

-SetTargetRadius <Tracker Name> <Value>

This should be used as a last resort for adjusting tracking options. Attempt to adjust the threshold or video settings before modifying this value. The target radius is the maximum number of pixels between two targets to consider them related for position tracking purposes. This value can be adjusted down if you notice that there is noise being included in your position tracking. It can be adjusted up if Cheetah is tracking a smaller target that is not the object you are trying to track.

Example: -SetTargetRadius VT1 140
Default: Cheetah normally has a target radius of 100 pixels.
Usage: This command can be used when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker that you wish to adjust.
Value	This value can be any positive whole number greater or equal to 1 that will be within the video frame. Radius values that would make the target radius larger than the video image are not allowed, and will be adjusted to the maximum allowable radius for the current video image. This value specifies the maximum number of pixels to use for target consolidation. **Example:** In 2LED tracking, the right LED is red and the left LED is green, and the LEDs are pretty close together. Someone puts a green marker on one edge of the maze, that now creates a large green target, throwing off the center calculation. If the target radius is small, the new target will not be considered to be related to the red target and the center will be based on the green LED. There are a couple of exceptions to this rule: 1. If there are no other green targets within the target radius, the video tracker will use the largest green target it can find for the left LED target.

	2. If the erroneous target is located within the target radius from the red target, it will be used as the green LED target.

-SetVideoTrackingMode <Tracker Name> <Mode Type>

Sets the mode of tracking to be used for position and direction finding.

Example: -SetVideoTrackingMode VT1 None
Default: Cheetah creates video trackers that use 2LED tracking.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Tracker Name	The name of the video tracker whose tracking mode you wish to change.
Mode Type	Specifies the tracking mode you wish to use for this video tracker. Cheetah supports the following modes: 1. **None:** No direction finding or position tracking will be done. The video tracker will simply record transitions above thresholds. The -SetDirectionOffset value is ignored. 2. **2LED**: Cheetah will calculate position and direction based on the assumption that there are 2 LEDs of interest. The direction is determined by the color of each of the LEDs (-SetLedColor) along with the direction offset (-SetHeadDirectionOffset) 3. **HS54**: Cheetah will assume that you are using a standard HS-54 layout and track direction and position based on that layout. Direction is determined by used the standard HS-54 colors along with the direction offset (-SetHeadDirectionOffset). Setting this argument to a value that does not correspond to your actual video tracking needs can give erroneous direction and position values.

16.18 Video Tracker Window Commands

Video Tracker Window Commands

These commands are for creation and manipulation of video tracker windows.

-AddPlot <Window Name> <Acq Ent Name>

Adds a new plot to the specified window. The type of the window determines what type of plot may be added to the window. Once a plot is added, the acquisition entity whose data is displayed in the plot cannot be changed. All plots are displayed in the order that they are added to the window. The display order of the plots can be changed through the Properties Dialog. All data in the window will clear when a new plot is added to the window. Each acquisition entity can be added to a window only once.

Example: -AddPlot "SpikeWindow" SE1
Default: All plot windows are created with no plots.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window that will house the new plot.
Acq Ent Name	The acquisition entity name that will be the data source of the plot. The acquisition entity must be of the appropriate type in order for it to be successfully added to the window. **Example:** Assume a configuration file has the following two commands: -CreatePlotWindow Spike "My Spike Window" -AddPlot CSC1 If the acquisition entity CSC1 is a continuously sampled channel, it will not be able to be displayed in a Spike plot window, and the command will fail.

-CreatePlotWindow <Window Type> <Window Name>

Creates a new plot window in Cheetah. Once created, the window type cannot be changed.

Example: -CreatePlotWindow Time "My Time Window"
Default: Cheetah starts with no plot windows.
Usage: This command can be used at any time.

Arguments

Window Type	Specifies the type of window you wish to be created. This value must be one of the following: 1. **Spike:** The window will only be able to display Spike plots.. 2. **Time:** The window will only be able to display Time plots. 3. **Video:** The window will only be able to display Video plots.

	For a more detailed description of each plot type, see the -SetPlotWindowPlotType command.
Window Name	The name of the plot window you wish to create. This name must be unique throughout the Cheetah system, otherwise the command will fail. Window names can be changed after the window is created through the Properties Dialog.

-SetPlotWindowFrozen <Window Name> <Frozen>

This command works like a pause button on a DVD player. It will lock in whatever is currently displayed in the window. If an action is taken that will clear the window, the last data displayed will be cleared. No data will be added to the window while it is frozen, but otherwise is processed normally. It if a window is frozen before it is displayed, the window may contain garbage or a copy of whatever is displayed beneath the window. Unfreezing and refreezing the window will allow it to clear normally.

Example: -SetPlotWindowFrozen "My Spike Window" True
Default: All windows are created with frozen set to false.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Frozen	The frozen value can be one of the following keywords: 1. **True:** The entire window will be frozen and no new data will be plotted. To begin plotting new data, reissue this command with Frozen set to false. 2. **False:** The window will begin to plot new data. If a window was frozen prior to this command being issued, all of the data visible in the frozen display will be cleared.

-SetPlotWindowOverlay <Window Name> <Value>

Sets a plot window's overlay mode. Overlaid windows will not clear out old data before displaying new data. This setting effects all plots in this window.

Example: -SetPlotWindowOverlay "MyWindow" true
Default: Plot windows are created with overlay set to false.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
Value	This can be one of the following keywords: 1. **True:** The window will not clear out any old data until either a clear command is issued, overlay is turned off, or the window is resized. 2. **False:** The window will clear out old data according to the current plot type. See -SetPlotWindowType for more information.

-SetPlotWindowPlotType <Window Name> <Plot Type>

Sets the plot type that will be used for this window. All plots in the window will be set to the same type. All data in the window will clear when the plot type is changed.

Example: -SetPlotWindowPlotType "SpikeWindow" Waveform

Default:

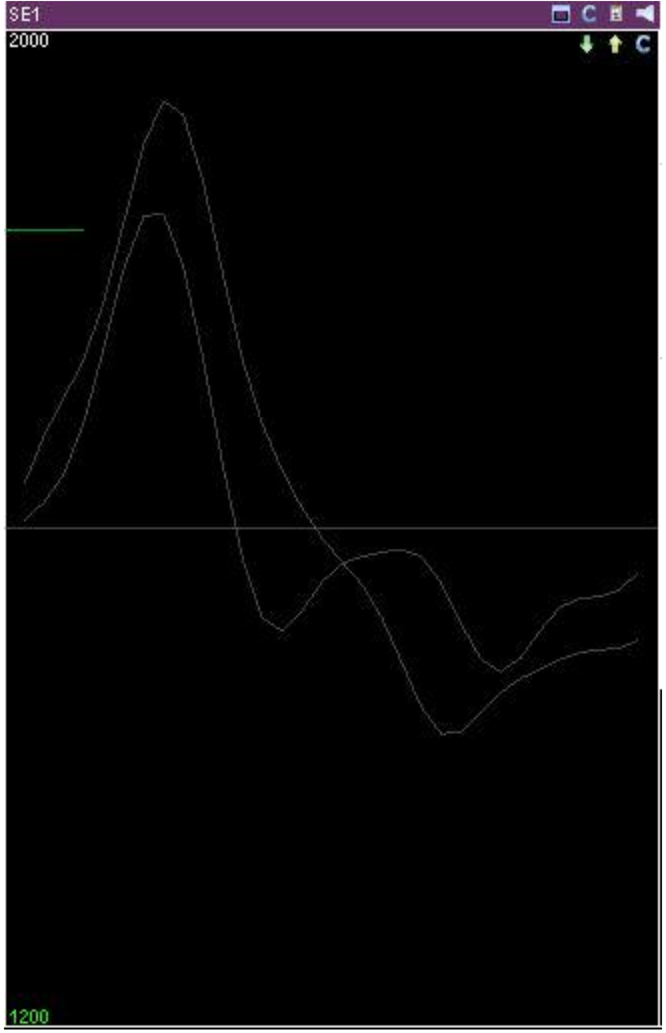
Window Type	**Default Plot Type**
Spike	WaveformFeature
Time	Sweep
Video	Live

Usage: This command can be used at any time.

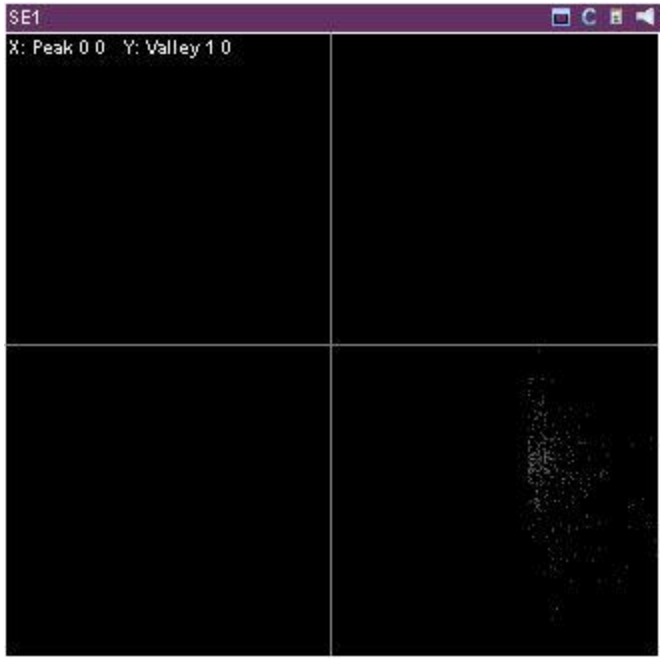
Arguments

Window Name	The name of the window that will be modified.
Plot Type	The options for a view are dependent upon the type of window that is being set. If the specified plot type does not correspond to the type of the window (i.e. a plot type of Waveform for a Time window), the command will fail. **Spike Windows:** 1. **Waveform:** Shows the extracted waveform for a detected spike. If more than one waveform is visible, this means more

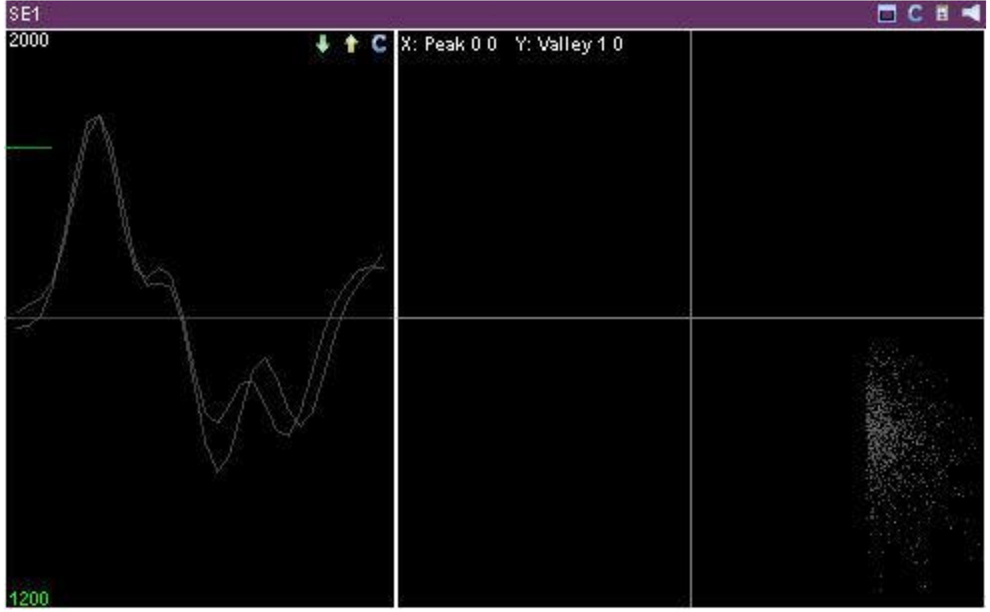
than one spike occurred since the last screen refresh. The waveform seen in this plot is the exact waveform saved to the spike data records.



2. **Feature:** Shows the calculated feature information in a XY scatter plot. The features that are plotted can be changed by the -SetFeaturePlotSources command. To change the features available for an acquisition entity, see the -SetWaveformFeature command. The data seen in this plot is the exact data saved to the spike data records.

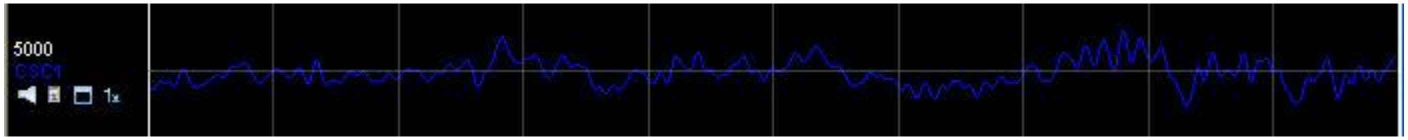


3. **WaveformFeature:** Shows both the waveform and feature plots.

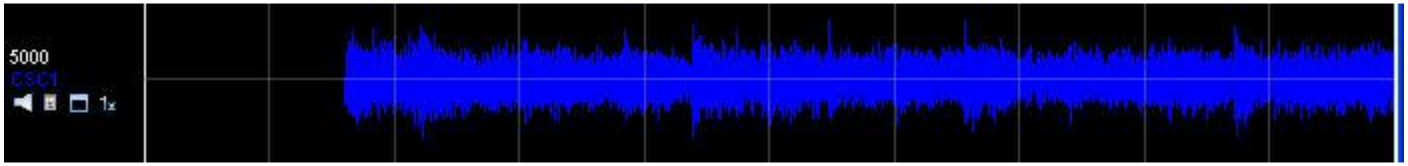


Time Windows:

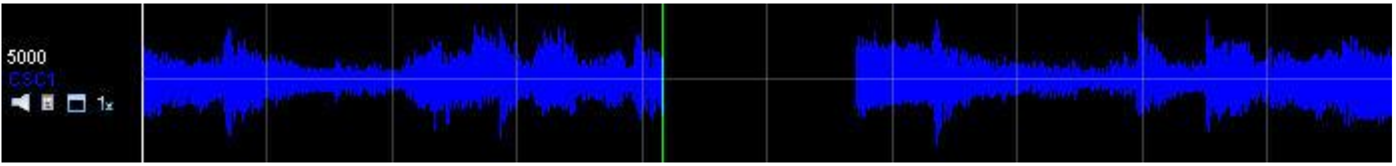
1. **Flash:** Displays the waveform for single record. The data shown is indicative of the data that is written to the Cheetah data files.



2. **Scroll:** Similar to an oscilloscope, new waveform data will be shown on the right, and old data will scroll to the left. The amount of time shown in this plot can be adjusted with the -SetPlotWindowTimeframe command. The data shown is indicative of the data that is written to the Cheetah data files.



3. **Sweep:** A cursor will move from left to right across the screen. New data will be shown to the immediate left of the cursor. Old data will be cleared as the cursor moves past it. The data shown is indicative of the data that is written to the Cheetah data files



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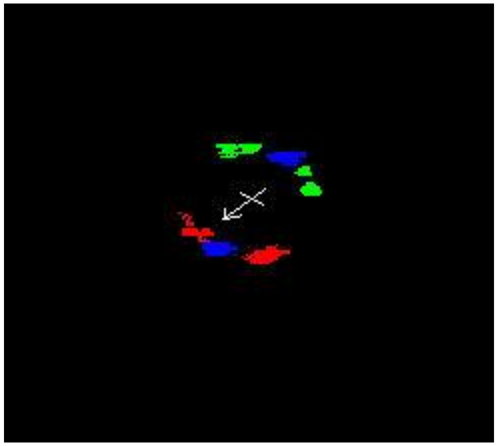
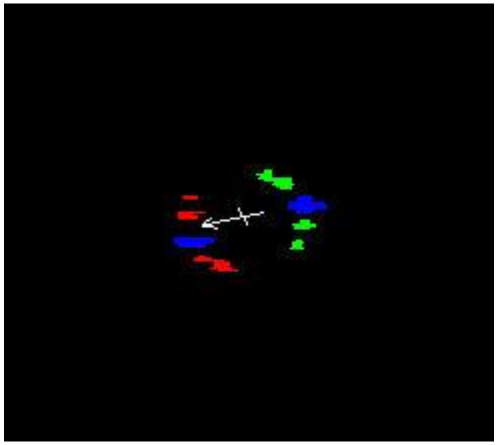
Video Tracker Windows:

1. **Live**: The image displayed in the window is the live, unprocessed video image. This is also the same image that will be written to a video output file (-SetVideoFileOutput) when -SetVideoFileOutputEnabled is true.

1. **Threshold**: The image displayed in the window is a thresholded version of the live image. This display mode takes into account the threshold settings for Red, Green, Blue and Intensity when displaying pixels. This is **NOT** representative of the data that is recorded to the Video Tracker record file, but is intended as a guide for setting thresholds.



2. **Record**: Displays a thresholded image of the live video. This display mode will only show pixels that are above the threshold for Red, Green, Blue and Intensity. However, it will only display as many transitions as the video record can hold. If the thresholds are set too low, the image may become saturated, and only the top few lines of the image will be visible. The image displayed is representative of the data stored into a Video Tracker record file.

-SetPlotWindowPosition <Window Name> <X Position> <Y Position> <Window Width> <Window Height>

Set the position and size of the specified plot window. All data in the window will clear when the window size or position is changed.

Example: -SetPlotWindowPosition WindowName 200 300 800 600
Default: The position of new plot windows is determined by Windows.
Usage: This command can be used at any time.

Arguments

Window Name	The name of the window which will be modified.
X Position	The position, in pixels, to place the left side of the specified window. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is outside the bounds of your desktop, it will be adjusted to that the window is placed as close to your value as possible, while remaining completely visible. If the width of the window is larger than the width of your desktop, Cheetah will set the x position to 0 and part of the window will not be visible. Negative values are not allowed. **Example:** You have your screen resolution set to 1600 x 1200, and the following command is processed by Cheetah: -SetPlotWindowPosition "My Spike Window" 1600 100 800 600 Since putting the window with its left point at 1600 and top at 100 will place the window outside of your desktop, Cheetah will move the window left until it is completely visible. The top position will not be changed since it is within the bounds of the

	desktop. The final position of the window from the above command will be 800, 100.
Y Position	The position, in pixels, to place the top of the specified dialog. This value is relative to your desktop, and must be within the bounds of your desktop. If a value is specified that is outside the bounds of your desktop, it will be adjusted to that the specified dialog is placed as close to your value as possible, while remaining completely visible. If the height of the window is larger than the height of your desktop, Cheetah will set the y position to 0 and part of the window will not be visible. Negative values are not allowed.
Window Width	The width of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.
Window Height	The height of the window in pixels. If the width value at the current x position would cause part of the window to be outside the bounds of your desktop, Cheetah will move the window left until either all the window is visible, or the x position is 0. Negative values are not allowed.

16.19 Video Tracker Plot Commands

Video Tracker Plot Commands

These commands will modify how individual video tracker plots display their data. Some display options can only be changed at the video tracker window level. See the video tracker window commands for more information (including adding plots to a window).

-SetShowDirectionArrow <Window Name> <Value>

Sets the visibility of the direction arrow overlay on all video plots in the specified video window. The direction arrow will display the extracted head direction from the video tracking record. You may want to disable the direction arrow if you do not care about head direction, or have the video window in overlay mode.

Example: -SetShowDirectionArrow "Video Tracker 1" True
Default: All video plots are added with the direction arrow visibility set to True.
Usage: This command can be used at any time. This command only affects Video plots.

Arguments

Window Name	The name of the window you want to change.
Value	The value can be one of the following keywords:

	1. **True:** The direction arrow will be shown. 2. **False:** The direction arrow will be hidden.

-SetShowPositionCross <Window Name> <Value>

Sets the visibility of the position cross overlay on all video plots in the specified video window. The position cross will display the extracted position from the video tracking record. You may want to disable the position cross if you do not care about position tracking, or have the video window in overlay mode.

Example: -SetShowPositionCross "Video Tracker 1" True
Default: All video plots are added with the position cross visibility set to True.
Usage: This command can be used at any time. This command only affects Video plots.

Arguments

Window Name	The name of the window you want to change.
Value	The value can be one of the following keywords: 1. **True:** The position cross will be shown. 2. **False:** The position cross will be hidden.

16.20 Event AE Commands

Event Acquisition Entity Commands

These commands are used to control how the event acquisition entities process events; what it does with the data after processing; and generate non-TTL events.

-GetDataFile <Acq Ent Name>

Returns the data file name and path for the specified acquisition entity.

Example: -GetDataFile Events
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Acq Ent Name	The name of the acquisition entity that the data file name is being requested for.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	This is the data file name and path for the specified acquisition entity.

-PostEvent <Event String> <TTL Value> <Event ID> <Timestamp>

Posts an event to Cheetah. Cheetah will log this event in the log file, and record it to the events data file if in recording mode.

Example: -PostEvent "Test Event" 256 0
Default: This command is an action, there is no default value.
Usage: This command can be used at any time, but is only logged to a data file when Cheetah is recording.

Arguments

Event String	The string to be associated with this event. This string must be less than 128 characters, including spaces.
TTL Value	This is a decimal value, between 0 and 65535 and is stored in the TTL field of an event record. It does not have any effect on the output port.
Event ID	This value represents the location from which the event is being posted.
Timestamp	This is an optional parameter. If this value is not specified, Cheetah will use the current timestamp for the event. This value is in microseconds.

-RemoveNamedTTLEvent <Device Name> <Port Number> <Bit Number>

Removes the custom event string for a named TTL event and resets it to the default event string. If no named TTL event was set for this TTL bit, the command will succeed, but do nothing.

Example: -RemoveNamedTTLEvent AcqSystem1_0 0 4
Default: All events will use the default event string for TTL events.

Usage: This command can be used at any time.

Arguments

Device Name	The name of the Digital IO device where the desired TTL value originates.
Port Number	The number of the digital IO port that on the Digital IO device where the TTL value originates.
Bit Number	The bit whose named event you wish to remove. This value must be between 0 and NumBitsOnPort - 1 (e.g. for an 8 bit port, the value must be between 0 and 7).

-SetAcqEntProcessingEnabled <Acq Ent Name> <Value>

Enables or disables the processing of data by the acquisition entity. Acquisition entity processing consists of record processing. If record processing is disabled, records will not be able to be displayed, sent to NetCom or saved to a file. Raw data file processing will still occur if it is enabled (see -SetRawDataFile). This command supersedes the -SetPlotEnabled and -SetDiskWriteEnabled commands.

Example: -SetAcqEntProcessingEnabled SE1 true
Default: Acquisition entity processing is enabled when the acquisition entity is created.
Usage: This command can be used at any time. This command is only valid for Spike and Continuously Sampled acquisition entities

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables acquisition entity processing. 2. **False**: Disables acquisition entity processing.

-SetDataFile <Acq Ent Name> <File Name>

Sets the data file for the specified acquisition entity. All data records recorded for this acquisition entity will be saved to this file.

Example: -SetDataFile Events "C:\My Events.nev"
Default: Cheetah will create a file using the name of the acquisition entity in the current data directory when the acquisition entity is created (i.e.Cheetah created Events.nev in the current data directory when the Events acquisition entity was created).
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
File Name	Sets the file to use for data recording for the specified acquisition entity. If only a filename is specified, Cheetah will create the file in the current data directory. When the data directory is changed, the file's location will change with the data directory. **Example**: -SetDataFile SE1 SE1.nse If a complete path is specified, Cheetah will create the file in the specified location, and will not change the file's location when the data directory is changed. **Example** : -SetDataFile CSC1 "C:\Data Directory\CSC1.ncs" The directory C:\Data Directory must exist or this command will fail. If the file CSC1.ncs exists, it will be overwritten. The extension of the file will be changed to the appropriate Neuralynx extension for the specified acquisition entity type. Cheetah will always create a file using the acquisition entity's name in the current data directory. If this command is issued before any data is recorded, the file in the current data directory will only have header information.

-SetDiskWriteEnabled <Acq Ent Name> <Value>

Enables or disables disk writing of data records for the specified acquisition entity. This command does not affect data records over NetCom or the data visible in all plots for this acquisition entity. You may want to disable disk writing for control or stimulus signals that you want to see, but have no need for in data analysis.

Example: -SetDiskWriteEnabled CSC1 true
Default: Cheetah initially enables disk writing when an acquisition entity is created.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Value	This value can be one of the following keywords: 1. **True**: Enables disk writing of data records. 2. **False**: Enables disk writing of data records. If disk writing is disabled prior to recording, a data file will be created for the

	specific acquisition entity, but only header information will be written to the file. If disk writing is disabled after recording has begun, all records after disk writing has been disabled will not be written until disk writing is re-enabled.

-SetNamedTTLEvent <Device Name> <Port Number> <Bit Number> <Custom Event String>

Sets a custom event string for a specific TTL bit going from 0 (low) to 1 (high). If a Cheetah detects a change from low to high on the bit number of the specified port on the specified Digital IO device, the default event string will be replaced with your custom event string in the event record. If named TTL events are associated with multiple bits on the same port, one event will be generated for each bit number, using the appropriate custom event string.

NOTE: Replacing the default event string means that some information about the source of the TTL value will be lost. Specifically, the name of the DigitalIO device and the port number that generated the TTL.

Example: -SetNamedTTLEvent AcqSystem1_0 0 3 "custom event text"
Default: All events will use the default event string for TTL events.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the Digital IO device where the desired TTL value originates.
Port Number	The number of the digital IO port that on the Digital IO device where the TTL value originates.
Bit Number	The bit whose named event you wish to set. This value must be between 0 and NumBitsOnPort - 1 (e.g. for an 8 bit port, the value must be between 0 and 7).
Custom Event String	Any ASCII string that contains at least one non-space character up to 128 characters.

16.21 Event Display Commands

Event Display Commands

These commands control how the event dialog displays and processes information. These commands are in addition to the generic dialog commands, which can also be applied to the event dialog.

-SetEventDisplayTTLValueFormat <Format>

This command changes the numerical format used to display TTL values in the event history.

Example: -SetEventDisplayTTLValueFormat Hexadecimal
Default: Cheetah normally has the TTL value format set to Binary
Usage: This command can be used at any time.

Arguments

Format	The TTL value format can be in one of the following types: 1. **Binary:** Shows individual TTL bit on (1) or off (0). 2. **Decimal:** Shows a base 10 representation of all TTL bits. 3. **Hexadecimal:** Shows a base 16 representation of all TTL bits.

-SetEventStringImmediateMode <Value>

This command changes when Cheetah records the timestamp for events that are manually entered through the event displays event string entry box.

Example: -SetEventStringImmediateMode On
Default: Cheetah normally has immediate mode set to Off
Usage: This command can be used at any time.

Arguments

Value	Event string immediate mode can be in one of the following states: 1. **On:** Cheetah will take the timestamp when you first begin typing into the event string box, not when you press Enter. 2. **Off:** The timestamp for the event will be at the time you either press Enter in the event string entry box, or press the commit button.

-SetEventStringSingleKeyMode <Value>

This command changes how Cheetah processes keystrokes for events that are manually entered through the event displays event string entry box. For more information, see the event display reference.

Example: -SetEventStringSingleKeyMode On
Default: Cheetah normally has single key mode set to Off
Usage: This command can be used at any time.

Arguments

Value	Event string single key mode can be in one of the following states: 1. **On:** Enables single key mode. After any key is pressed, an event record will be generated with the typed event string and the last letter in the event string will be highlighted. Pressing another key will change the last letter in the event string to the key you just pressed and generate a new record; highlighting the last letter again.. 2. **Off:** Disables single key mode. User entered events are generated via either the Commit button or Enter key.

16.22 Audio Output Commands

Audio Output Commands

The following commands can be use to setup and control the audio output for Cheetah. Although these Cheetah commands control how the audio output is setup, it is best to configure all of your audio settings through the Audio Output Control. This is because the audio portion of Cheetah relies on hardware GUIDs to ensure the correct audio is output through the correct device. When Cheetah is closed, all of the audio settings you have made will be saved so that the next time you start Cheetah, they will be reloaded (if using the last configuration).

Device ID

Each of the audio commands requires a device ID in order to send the command to the correct audio device. The device ID can be one of three things:

1. **GUID** - A GUID is a unique hardware identifier assigned to the audio device when it was installed. The only GUID supported at this time is zero (0), which is the GUID of Windows' Primary Sound Driver (the default audio device). For more information on the Primary Sound Driver, see your Windows documentation.
2. **Device Name -** The device name will be obtained one of two ways. If the device is a PC audio output, the device name is the name shown in Window's Device Manager. For devices that are part of a hardware system, the device will be named using the acquisition system name with

the following syntax:

<acquisition_system_name>_Audio<port_number>
Example: AcqSystem1_Audio1 is audio port 1 on AcqSystem1

3. **Device Index -** The index of the device as it was created by Cheetah. Index 0 will always be the Primary Sound Driver. The other device indices will be assigned as devices are created by Cheetah. There is no guarantee that device indices other than 0 will identify the same device every time Cheetah starts.

-SetAudioMute <Device ID> <Audio Channel> <Muting>

Enables or disables muting for the specified audio channel of the specified audio device, similar to the mute button of a television. This setting does not affect the volume level setting of the specified channel, and affects all streams for this channel. This setting only affects Cheetah, and does not mute the sound for other Windows programs.

Example: -SetAudioMute 0 Left Off
Default: Cheetah initially starts with the muting on all audio channels set to Off.
Usage: This command can be used at any time.

Arguments

Device ID	See Device ID for a detailed description.
Audio Channel	Specifies which of the stereo audio channels you wish to configure: 1. **Left**: Selects the Left audio channel. 2. **Right**: Selects the Right audio channel.
Muting	Muting can be one of the following keywords: 1. **On**: Enables muting of the specified channel. No sound will be audible on this channel as long as muting is on. 2. **Off**: Disables muting of the specified channel. Sound will be audible on this channel at the current volume level setting.

-SetAudioSource <Device ID> <Audio Channel> <Acquisition Entity>

Sets the acquisition entity that will be heard through the specified audio channel of the specified audio device.

Example: -SetAudioSource 0 Left SC1
Default: Cheetah initially starts with all audio output sources set to None.
Usage: This command can be used at any time.

Arguments

Device ID	See Device ID for a detailed description.
Audio Channel	Specifies which of the stereo audio channels you wish to configure: 1. **Left**: Selects the Left audio channel. 2. **Right**: Selects the Right audio channel.
Acquisition Entity	Specifies the acquisition entity whose audio will be output through the specified audio channel. If you do not wish to have audio on the specified channel, ***None*** may be used in place of an Acquisition Entity name. If this command is successful, it will automatically enable all streams associated with the acquisition entity (i.e. a tetrode has 4 streams associated with it). To manually set the streams to listen to for this acquisition entity, see the -SetAudioStreamEnable command.

-SetAudioStreamEnabled <Device ID> <Audio Channel> <Stream Index> <Enable>

Enables or disables a specific audio stream for an acquisition entity. This command must be used after setting a stream source (see -SetAudioSource), and will fail if the source is None. When the -SetAudioSource command is issued, all audio streams associated with the specified acquisition entity are enabled, overriding any previous calls to this command for the specified channel and device. This command must be issued for each stream of the acquisition entity that is the current audio source.

Example: -SetAudioStreamEnabled 0 Left 1 True
Default: Cheetah initially enables all streams when an audio source is set.
Usage: This command can be used at any time.

Arguments

Device ID	See Device ID for a detailed description.
Audio Channel	Specifies which of the stereo audio channels you wish to configure: 1. **Left**: Selects the Left audio channel.

	2. **Right**: Selects the Right audio channel.
Stream Index	Specifies the stream index to enable or disable. The stream index is the one based index of a stream associated with an acquisition entity. If the stream source acquisition entity has only one A/D channel associated with it (i.e. CSC or Single Electrodes), the only valid stream index is 1. For acquisition entities that have more than one A/D channel associated with them (i.e. Tetrodes, Stereotrodes), the stream index can be any whole number between 1 and the number of channels for the acquisition entity (i.e. Tetrodes can have index 1, 2, 3 or 4). This command will fail if the stream index is not valid for the current audio source.
Enable	Enable can be one of the following keywords: 1. **True**: Enables audio output for the specified stream index. 2. **False**: Disables audio output for the specified stream index.

-SetAudioVolume <Device ID> <Audio Channel> <Volume>

Sets the volume for the specified audio channel of the specified audio device. This command adjusts the volume level on all streams for this channel.

Example: -SetAudioVolume 0 Left 75
Default: Cheetah initially starts with all audio output set to a volume of 100.
Usage: This command can be used at any time.

Arguments

Device ID	See Device ID for a detailed description.
Audio Channel	Specifies which of the stereo audio channels you wish to configure: 1. **Left**: Selects the Left audio channel. 2. **Right**: Selects the Right audio channel.
Volume	This can be any whole number between 0 and 100. Any numbers outside of that range will be set to the closest valid value. Volume increases with higher values.

16.23 TTL Response Commands

TTL Response Commands

Note: TTL Response utilizes Digital IO devices to perform responses as well as for monitoring TTL input bits. Settings made to Digital IO devices will affect the way TTL Response performs. See the Digital IO section of this guide for more information.

Some hardware systems have TTL response mechanisms included that further decrease the latency of spike and TTL input response. See the documentation for your hardware for more information.

-SetSpikeTTLResponse <Acq Ent Name> <Cell> <Output Device> <Output Port> <Output Bit>

Specifies a cell (cluster) number for a particular spike acquisition entity that will trigger a TTL pulse on the specified output bit. All pulses will be high pulses with a duration defined by the Digital IO output port used for TTL response.

Example: -SetSpikeTTLResponse TT1 3 PCI-DIO24_0 1
Default: All TTL output bits are initialized with no response.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Acq Ent Name	The name of the acquisition entity whose spikes will be used to trigger the TTL pulse.
Cell	The cell number to be used for the specified acquisition entity in order to trigger a TTL pulse. The cell number must be between 0 and 31. When a new spike is detected for the specified acquisition entity with the desired cell number, a high TTL pulse will be delivered on the specified output bit. The cell number may be set to a value of *all*. When set to *all*, cell number is disregarded and any spike coming in from the acquisition entity will cause a TTL pulse to be delivered.
Output Device	The name of the Digital IO device that will be used to deliver the TTL pulses. For a list device names, use the -GetDigitalIOBoardList command or see the Digital IO setup dialog.
Output Port	The port number on the device that contains the bit that is to be pulsed. The port must be set to output or this command will fail. The port direction can be changed via the -SetDigitalIOPortDirection command or via the Digital IO setup dialog.
Output Bit	The bit number for the port on the device in which the TTL pulse will be delivered. The bit number can be between 0 and the number of bits available for the specified port. For information on port sizes, see the Hardware Systems section of this guide.

-SetTTLInputResponse <Input Device> <Input Port> <Input Bit> <Output Device> <Output Port> <Output Bit>

Specifies a TTL input bit that will trigger a TTL pulse on the specified output bit. All pulses will be high pulses with a duration defined by the Digital IO output port used for TTL response.

Example: -SetTTLInputResponse AcqSystem1_0 0 3 PCI-DIO24_0 1 1
Default: All TTL output bits are initialized with no response.
Usage: This command can be used only when Cheetah is idle or in acquisition mode.

Arguments

Input Device	The name of the TTL input device that contains the bit that will trigger a response. For a list device names, use the -GetDigitalIOBoardList command or see the Digital IO setup dialog.
Input Port	The port number on the input device that contains the bit that will trigger a response. The port must be set to input or this command will fail. The port direction can be changed via the -SetDigitalIOPortDirection command or via the Digital IO setup dialog.
Input Bit	The bit number on the input port that will be monitored. When this bit goes high, the TTL response will be triggered. No response will be triggered when the bit changes from high to low. The manner in which the TTL input bit is monitored is defined by the settings of the Digital IO device that contains this bit.
Output device	The name of the TTL output device that contains the bit that will be pulsed. For a list device names, use the -GetDigitalIOBoardList command or see the Digital IO setup dialog.
Output Port	The port number on the device that contains the bit that is to be pulsed. The port must be set to output or this command will fail. The port direction can be changed via the -SetDigitalIOPortDirection command or via the Digital IO setup dialog.
Output Bit	The bit number for the port on the device in which the TTL pulse will be delivered. The bit number can be between 0 and the number of bits available for the specified port. For information on port sizes, see the Hardware Systems section of this guide.

16.24 Digital IO Commands

Digital IO Commands

These commands are for control and monitoring of all Digital I/O devices (including built in TTL capabilities on all Hardware Systems) that can be recognized by Cheetah.

Device Name

All device names are automatically generated by Cheetah when the DigitalIO board is detected. They are used to identify the TTL I/O board throughout the system.

The name for add-on Digital I/O devices is constructed as follows:

DeviceType_BoardNumber

Example: A Measurement Computing DIO24 device assigned to board 3 will be PCI-DIO24_3.

TTL boards for Hardware Systems are constructed using the acquisition system name instead of the device type:

AcquisitionSystemName_BoardNumber

Example: A Cheetah160 has two separate input banks, J50X (Ports J500 and J501) and J60X (Ports J604 and J605) which are split into board 0 and board 1, respectively. If the Cheetah 160 HWSS was created with the name AcqSystem1, the two device names are AcqSystem1_0, and AcqSystem1_1. See the Hardware Systems section for more information on the TTL IO capabilities of your system.

The NetCom command -GetDigitalIOBoardList will return a complete list of the device names installed on your system.

Port Numbers

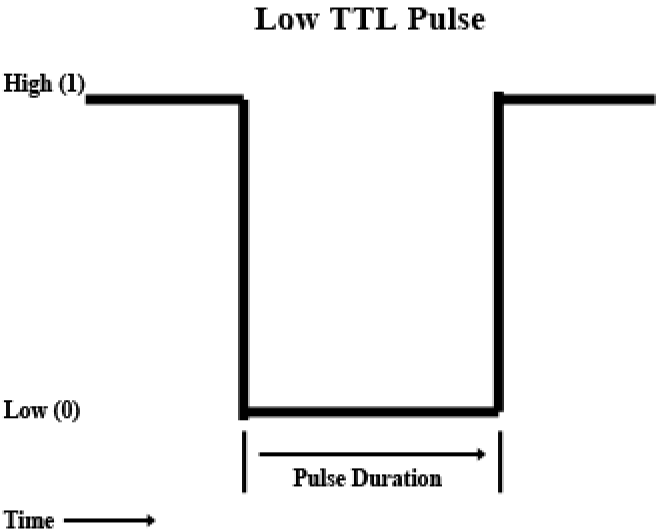
Most TTL devices divide their total number of I/O bits into groups called ports. These groups allow you to section of the bits of the card for separate uses. One typical use is dividing the board into separate input and output ports, allowing bi-directional TTL with only a single TTL device. Values for ports can also be read and written independently of other ports on the same device.

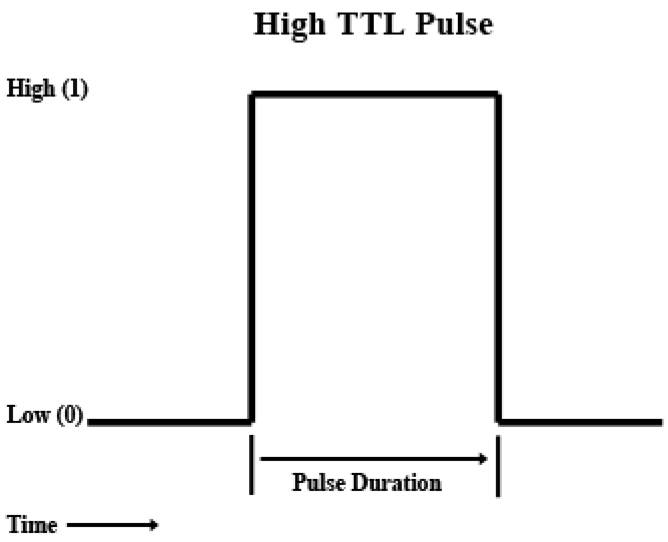
The number of ports available is dependent on the TTL I/O device you are using. For a list of the TTL capabilities of your device, see the Hardware Systems section of this guide.

-DigitalIOTtlPulse <Device Name> <Port Number> <Bit Number> <Pulse Type>
Performs a TTL pulse on the specified bit on the specified port. The length of the pulse is set by the -SetDigitalIOPulseDuration command.

Example: -DigitalIOTtlPulse PCI-DIO24_0 0 6 High
Default: Cheetah defaults to pulse type high for TTL pulses.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	The number of the port that contains the bit you wish to pulse.
Bit Number	The bit number to be pulsed. The number of bits available is dependent upon the device being used. Bit numbers are 0 based.
State	The pulse type to execute. This value must be one of the following: 1. **Low**: The pulse will go from high to low and back to high as shown in the below image:  1. **High:** The pulse will got from low to high and back to low as shown in the below image:

-GetDigitalIOBoardList

Returns a list of all DigitalIO boards on this system.

Example: -GetDigitalIOBoardList
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	A space separated list of the names of all TTL input and output boards installed on this system.

-GetDigitalIOPortString <Device Name> <Port Number>

Returns the current state of each of the bits for the specified port number on the specified device in a single string. This string is in binary numerical format with bit 0 being the rightmost character in the string.

Example: -GetDigitalIOPortString PCI-DIO24_0 3
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Device Name	The name of the device whose data is being requested.
Port Number	The port number for which the data is being requested.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The current state of each of the bits for the specified port number on the specified device in a single string. This string is in binary numerical format with bit 0 being the rightmost character in the string. The state of each bit is represented by a single character: 1. **0**: The bit is currently set to off. 2. **1:** The bit is currently set to on. **Example:** If "00000100" is returned, it means that ll bits are off except for bit 2.

-GetDigitalIOPortValue <Device Name> <Port Number>

Returns the decimal equivalent of the TTL value for the port number of the specified device.

Example: -GetDigitalIOPortValue PCI-DIO24_0 3
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Device Name	The name of the device whose data is being requested.
Port Number	The port number for which the data is being requested.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The current value for the specified port number in decimal form.

-GetDigitalIOUseStrobeBit <Device Name> <port number>

Gets the current strobe bit enabled state for the port on the specified device.

Example: -GetDigitalIOUseStrobeBit PCI-DIO24_0 0
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

Arguments

Device Name	The name of the device which will be queried.
Port Number	Specifies the TTL port you wish to query.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Value	The current strobe bit enabled state for the port on the specified device.

-SetDigitalIOBit <Device Name> <Port Number> <Bit Number> <State>

Sets the state for the specified bit number.

Example: -SetDigitalIOBit PCI-DIO24_0 0 7 On
Default: N\A
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	The port number that contains the bit you wish to set.
Bit Number	The bit number to be modified. The number of bits available is dependent upon the device being used. Bit numbers are 0 based.
State	The state to set the specified bit value to. This value must be one of the following: 1. **On**: The bit will be set to on (logical 1). 2. **Off:** The bit will be set to off (logical 0).

-SetDigitalIOInputScanDelay <Device Name> <Delay>

Sets the delay in between scans when reading the input port(s). This command is not available for all Digital IO devices. Digital IO devices that are part of Hardware Systems are scanned at the sample frequency of the Hardware System.

Example: -SetDigitalIOInputScanDelay PCI-DIO24_0 5
Default: Cheetah defaults the input delay to a value of 1 ms for all non-Hardware System Digital IO devices.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Delay	This is the delay used in between reading the input ports for the specified device. The delay must be between 1 and 10000 ms.

-SetDigitalIOEventsEnabled <Device Name> <Port Number> <Enabled>

Set events enabled for the specified port. An event record will be generated anytime there is a change in value for that port

Example: -SetDigitalIOEventsEnabled PCI-DIO24_0 1 true
Default: Cheetah defaults event enabled to be true; meaning events are generated for every TTL port value change.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	The port number to be modified.
Enabled	This must be one of the following values: 1. **True** An event is created whenever a TTL port value change is detected. 2. **False**: An event is not created whenever a TTL port value is detected. **NOTE:** If -SetDigitalIOUseStrobeBit is enabled, input events are only generated when the strobe bit is used, not on every port value change.

-SetDigitalIOPortDirection <Device Name> <Port Number> <Direction>

Sets the direction for the specified port number. The number of ports is determined by the hardware device. Port direction is independent for each port of a device. The direction of a port determines what commands may be used on that port, as many of the commands are direction specific. Not all ports are bidirectional, see the Hardware Systems section of this guide for more information on your specific hardware. This command will fail if the port direction cannot be changed because it is use for some other purpose in Cheetah (e.g. Spike TTL Response).

NOTE: **Depending on your particular TTL hardware, changing the port direction to input may clear the values currently on other output ports on the same device. This behavior is not controlled by Cheetah. To avoid unwanted value clearing, it is best to set ports to the proper direction before beginning any experiments.**

Example: -SetDigitalIOPortDirection PCI-DIO24_0 1 Input
Default: Cheetah defaults the port direction to Input for all ports once an interface has been created.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	The port number to be modified.
Direction	The direction of the port. This must be one of the following values: 1. **Input**: Sets the port direction for reading voltage values. 2. **Output**: Sets the port direction for setting voltage values.

-SetDigitalIOPortString <Device Name> <Port Number> <Value>

Sets the state for each of the bits for the specified port number on the specified device in a single string. This string is in binary numerical format with bit 0 being the rightmost character in the string.

Example: -SetDigitalIOPortString PCI-DIO24_0 4 "0100XXXX"
Default: N\A
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	The port number to be modified.
Value	The state to set for each the bits for the specified port number on the specified device in a single string. This string is in

binary numerical format with bit 0 being the rightmost character in the string. The maximum string length is determined by the number of bits associated with the port number you wish to write. If the string is longer than the number of bits in the port, the extra characters will be ignored. If the string is shorter than the number of bits in the port, the remainder of the bits will be ignored. Each character must be one of the following:

1. **0**: The bit will be set to off.
2. **1:** The bit will be set to on.
3. **X**: The bit will be ignored.

Example: The following sequence of strings represent the value used in consecutive calls to this command. The output port state is shown after each command is processed. It is assumed that the port being used has only 8 bits.

Value	**Output Port**
"00000000"	00000000
"00000011"	00000011
"000001X0"	00000110
"0X"	00000100
"1100000011"	00000011

-SetDigitalIOPortValue <Device Name> <Port Number> <Value>

Sets the value for the specified port number. This command is most often used to set the state of multiple bits at the same time.

Example: -SetDigitalIOPortValue PCI-DIO24_0 4 16
Default: N\A
Usage: This command can be used at any time.

Arguments

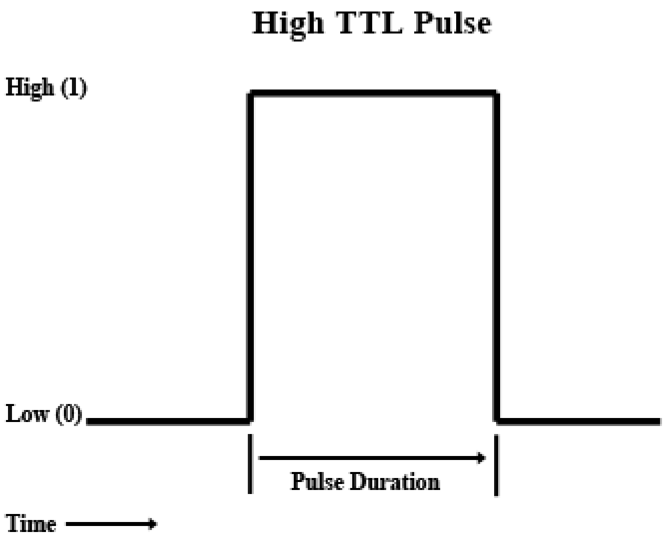
Device Name	The name of the device which is to be modified.
Port Number	The port number to be modified.
Value	This value will be set as the current output for the specified port number. The value is in decimal numerical format.

-SetDigitalIOPulseDuration <Device Name> <Port Number> <Duration>

Sets the duration of a TTL pulse generated by the -DigitalIOTTLPulse command.

Example: -SetDigitalIOPulseDuration PCI-DIO24_0 0 200
Default: Cheetah defaults the pulse duration to a value of 15 m**s.**
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which is to be modified.
Port Number	Specifies the TTL port whose pulse duration is to be set.
Duration	This is the duration used for the TTL pulse. The duration must be between 1 and 10000 ms. **Example:** Assume the TTL pulse duration is set to 10ms. The command: -DigitalIOTTLPulse PCI-DIO24_0 0 2 High will remain high (logical 1) for 10ms before returning to a low (logical 0) value as shown in the below image: 

Note: Cheetah is capable of sending TTL pulses to a Digital IO device faster than the device can process the pulse. You need to test your desired pulse duration with your hardware to ensure that the device will consistently deliver pulses. This test will need to be run multiple times, as some boards will deliver a TTL pulse of a particular duration only occasionally.

-SetDigitalIOUseStrobeBit <Device Name> <Port Number> <Value>

Sets the port on the specified device to require that the most significant bit (i.e. bit 7 of an 8 bit port, bit 15 of a 16 bit port, etc) be strobed from low to high in order to generate a TTL event. This means that Cheetah will only generate TTL input events when the most significant bit of the TTL input port is strobed.

Example: -SetDigitalIOUseStrobeBit PCI-DIO24_0 true
Default: Strobe bit usage is normally False.
Usage: This command can be used at any time.

Arguments

Device Name	The name of the device which will be modified.
Port Number	Specifies the TTL port on which input strobing will be enabled.
Value	This can be one of the following: 1. **True:** A value of true will cause Cheetah to only read TTL input ports when the most significant bit is strobed from low to high. The table below shows a sequence of changes on the TTL port along with the values read by Cheetah after each change. Changes are shown in **bold**.

TTL Port Value	**Value Read by Cheetah**	**Notes**
00000000	None	Starting value
000**1**0000	None	Nothing is read until the MSB (bit 7) goes high.
0001000**1**	None	Nothing is read until the MSB (bit 7) goes high.
10010001	10010001	The MSB goes from low to high, this is a strobe. The entire port value is now read by Cheetah.
100**0**0001	None	The MSB has not changed so nothing is read.

00000001	None	The strobe only is registered when the MSB goes from low to high. Nothing happens on a high to low transition. This is considered a reset to get ready for the next strobe.
10000001	10000001	The MSB goes from low to high and the entire port value is read.

2. **False:** A value of false will cause Cheetah to read the TTL input port when any bit is turned either on or off. Here is the same sequence shown above with strobe bit usage set to false.

TTL Port Value	**Value Read by Cheetah**
00000000	00000000
000**1**0000	00010000
0001000**1**	00010001
10010001	10010001
100**0**0001	10000001
00000001	00000001
10000001	10000001

16.25 NetCom Commands

NetCom Commands

These commands are used to setup and interact with NetCom.

The NetCom reply is a single, space delimited string.

-GetApplicationName

Gets the application name of the server for which the client is connected to.

Example: -GetApplicationName
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Application Name	The name of the application for which the NetCom client application is currently connected to.

-GetNetComDataBufferSize <Acq Ent Name>

Returns the NetCom ring buffer size parameters for the specified acquisition entity.

Example: -GetNetComDataBufferSize CSC1
Default: N/A
Usage: This command should only be used from a NetCom client application after a connection to a server has been established.

NetCom Reply

Error Code	If the command is successful, this value will be equal to 0. Otherwise, the value will be equal to -1.
Record Count	The number of records that can be stored in the ring buffer.
Record Size	The size in bytes of a record that can be stored in the ring buffer.

-GetTimestamp

Returns the current Cheetah timestamp to a NetCom application. This command cannot be used from a configuration file. The timestamp is returned as a string in the reply argument to NetCom's SendCommand function.

-SetNetComDataBufferSize <Acq Ent Name> <Buffer Size>

Sets up a data buffer used for NetCom applications. Needs more description

Example: -SetNetComDataBufferSize SE1 4000
Default: The default buffer size is set to 3000.

Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified.
Buffer Size	This value is the number of records that you want the buffer to hold for the specified acquisition entity. It must be a positive whole number.

-SetNetComDataBufferingEnabled <Acq Ent Name> <Enabled>

This command tells Cheetah to create a buffer to hold records that is accessible over NetCom. This will allow NetCom programs to access historical data after connecting to Cheetah. Using NetCom buffering causes more overhead in record processing, it is not recommended for older systems or large channel count systems.

Example: -SetNetComDataBufferingEnabled SE1 true
Default: NetCom buffering is disabled unless otherwise specified.
Usage: This command can be used at any time.

Arguments

Acq Ent Name	The name of the acquisition entity which will be modified. The acquisition entity must have already been created or this command will fail.
Enabled	This value can be one of the following keywords: 1. **True**: Enables NetCom record buffering. 2. **False**: Disables NetCom record buffering.

16.26 Cheetah Control Commands

Cheetah Control Commands

These commands can be used to control Cheetah via NetCom or configuration files. It is generally a better practice to use this commands through NetCom, as configuration files are geared more towards experiment setup.

-Delay <Time>

Pauses command processing for a specified amount of time. This only delays command processing (which will make the program seem unresponsive); all other Cheetah operations are not affected.

Arguments

Time	The amount of time to delay in milliseconds. This value must be 0 or greater.

-StartAcquisition

Starts acquiring data. Data will be visible and available over NetCom. None of this data will be saved. Acquisition mode is intended to adjust settings before recording. This command is ignored if Cheetah is already in acquisition or recording mode.

-StartRecording

Starts saving data to files. It is recommended that you do not adjust any acquisition entity settings when Cheetah is in recording mode, as it may make comparisons between data before and after the change invalid. If Cheetah is idle when this command is issued, acquisition is started as well.

-StopAcquisition

Stops acquiring data and puts Cheetah into an idle state if Cheetah is in acquisition mode. In order to switch to idle when Cheetah is recording, you must first stop recording before issuing the stop acquisition command. This command is ignored if Cheetah is already idle.

-StopRecording

Stops recording data to files and returns Cheetah to acquisition mode. If Cheetah is not recording when this command is issued, it is ignored.