CyberGlove III Command Set

This document outlines the serial commands that are used by the CyberGlove III.

Document Information

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Document Revision History

1.0	August 3, 2010	Initial Release
1.1	January 5, 2011	Minor modifications throughout
1.2	February 13, 2011	Updated document based on testing of device

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General Description

This document outlines the serial commands that are used by the Cyberglove III. All functionality new to the Cyberglove III is explained in detail. Commands that previously existed in Cyberglove II are included but have limited descriptions. When possible, backwards compatibility with the Cyberglove II command set has been maintained.

As currently implemented, the serial commands in CyberGlove II are all one ASCII character long and sometimes include a single or multi-byte payload. **With very few exceptions (which are noted in the command descriptions), all command characters and data received by the CyberGlove III will be echoed back to the source of the command (USB or Wifi) so that a user using a terminal program can see that the character was successfully received.** The then glove replies with a predefined response immediately after receiving a command.

"Prefix" commands are special commands that cause the glove to interpret the command received immediately after the prefix command as a different command than if the prefix command had not been sent. Throughout this document and the source code, the usage of these prefixes is described as usage of various "Levels" of commands. For example, commands sent without a prefix are considered "Main Level" commands, while ones sent after the '?' prefix are considered Query Level commands. The following table describes the currently valid prefixes and their corresponding levels.

Prefix	Level
None	Main Level
?	Query Level
1	Level One

Table 1. Description of command levels

The majority of the commands new to CyberGlove III are Level One Commands. Also note that all commands that initiate streaming are terminated with the special character <CTRL_C> (or <0x03>).
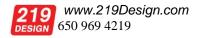
Main Level Commands

Main Level Commands typically instruct the Cyberglove to perform an action. The majority of Main Level Commands were implemented in both CyberGlove II and CyberGlove III.

Command	Action	Response	Payload	CG2	CG3
'?'	Send Query Level Command	'?'	NONE	X	X
'1'	Send Level One Command	'1'	NONE		X
'C'	Calibrate sensors	'C', <0x00>	Calibrate Character	X	X
'E'	Write a byte to the EEPROM	'E', <0x00>	Address, Data	X	X
'F'	Set the filter parameter	'F', <0x00>	0/1	X	X
'G'	Report one set of data (8bit, compatible with CyberGlove II functionality)	'G',Data, <0x00>	NONE	X	X
'J'	Set controls LED parameter state (0 or 1)	'J', <0x00>	0/1	X	X
'L'	Set glove LED	'L', <0x00>	0/1	X	X
'M'	Set sensor mask	'M', <0x00>	3 bytes	X	X
'P'	Set parameter flags	'P', <0x00>	3 bytes	X	X
'S'	Starts data stream (8bit, CG2 format)	'S', data stream	NONE	X	X
'U'	Set status byte	'U', <0x00>	0/1	X	X
'V'	Get battery voltage in milliVolts	'V', voltage,"Volts",'\r','\n'	NONE		X
'W'	Set glove parameter switch	'W', <0x00>	0/1	X	X
'z'	Clear the CTSCount variable (clear to send)	'z', <0x00>	NONE	X	
'Z'	Turn on or off the AD board (1 = on, 0 = off)	'Z', <0x00>	0/1		X
'^'	Enter Control Mode (only valid command in control mode is 'W' -> set values of pots to EEPROM)	'^'	Control Character	X	X
CTRL_C	Break from streaming	CTRL_C, <0x00>	NONE	X	X
CTRL_I	Reload digital pot values from EEPROM	CTRL_I, <0x00>	NONE	X	X
CTRL_R	Software restart of the board	CTRL_R, <0x00>	NONE	X	X
Carriage Ret	Explicitly do nothing	NONE	NONE	X	X
Line Feed	Explicitly do nothing	NONE	NONE	X	X
All Other Characters	Return the explicit command error	' ','e','?','\r','\n', <0x00>	NONE	X	X

Table 2. Listing of Main Level Commands

Command	Description
'1'	Send command from Level One Command set
'V'	This command returns an ASCII string with the voltage of the battery in the following form: 7445Volts\r\n. Please note that it returns a milliVolt value although the label is Volts.
'Z'	Z1 -> this will set all the corresponding pins to inputs and turn off power to the Analog Board Z0 -> this will enable all functionality and turn on power to the analog board.

Table 3. Description of Main Level Commands new to CyberGlove III

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Query Level Commands ('?' Level)

Query Level Commands typically request information from the Cyberglove.

Command	Action	Response	Additional Inputs	CG2	CG3
'A'	Report the active filename	'A',filename, <0x00>	NONE		X
'b'	Return signal strength	See Table 5	See Table 5		X
'C'	Get calibration values	'C',Offsets, Gains,<0x00>	NONE	X	X
'c'	Get calibration values (verbose)	'c'	NONE	X	X
'E'	Read one byte from the EEPROM	'E',byte,<0x00>	address	X	X
'F'	Get the Parameter filter bit status	'F', <0x00>/<0x01>,<0x00>	NONE	X	X
'G'	Get Plugged in, & initialized	'G'<,status>,<0x00>	NONE	X	X
'I'	Get the SD card information	'I',"\r\nXXXMB disk\r\nXXXMB left"	NONE		X
'i'	Get the Glove Information	'i',<Glove Info>, <0x00>	NONE	X	X
'J'	Get LED control bit	'J', <0x00>/<0x01>, <0x00>	NONE	X	X
'K'	Get HW Sensor Mask (3 bytes)	'K',b0,b1,b2, <0x00>	NONE	X	X
'l'	Get a list of files	'l',filename,'\r','\n'……last filename,'\r','\n', <0x00>	NONE		X
'L'	Get Glove LED	'L', <0x00>/<0x01>,<0x00>	NONE	X	X
'M'	Get Sensor Mask	'M',b0,b1,b2, <0x00>	NONE	X	X
'P'	Get Parameter Mask	'P',b0,b1,b2, <0x00>	NONE	X	X
'p'	Get Parameter Mask (verbose)	'p', parameters,'\r','\n',<0x00>	NONE	X	X
'r'	Get Current Wifi Server Information	'r',<SSID>,<0x01>,<IP>,<0x01>,<PORT>, <0x00>	NONE		X
'R'	Get Right Handed	'R', <0x00>/<0x01>, <0x00>	NONE	X	X
'S'	Get Number of Sensors	'S',#ofsensors,<0x00>	NONE	X	X
'T'	Returns all zeros	'T',<0x00>,<0x00>,<0x00>,<0x00>,<0x00>	NONE	X	X
'U'	Get the Parameter Inc Status byte	'U', <0x00>/<0x01>,<0x00>	NONE	X	X
'V'	Get Glove Firmware V and Info Format	'V',Fhi,Flo,GIhi,GIlo	NONE	X	X
'v'	Get Glove Firmware V and Info Format (verbose)	'v', Info,' ','\r','\n'<0x00>	NONE	X	X
'W'	Get Glove Parameter Switch	'W', <0x00>/<0x01>, <0x00>	NONE	X	X
'z'	Get Clear to Send Count	'z','\r','\n',<0x00>	NONE	X	
All other characters	Return command error	' ','e','?','\r','\n',<0x00>	NONE	X	X

Table 4. Listing of Query Level Commands

Command	Description
'A'	This will return the string that is the name of the active file followed by a null character. If there is no active file, then simply <0x00> is returned.
'b'	This will return contents of the message from the Wifi module which contains status information including the wireless signal strength.
'I'	This, will return information about size of the SD card and the space left on it: Response Format: "\r\nXXXXMB disk\r\nXXXXMB left\r\n"
'l'	This returns a listing of all the files in the main level of the SD card. The response will be in this format: File01.txt\r\nFile02.txt\r\n…..FileNN.txt\r\n<0x00>
'r'	This will return what the current wifi server that this glove will attempt to connect to. If there is a server that this glove will connect to loaded in ram then it will appear as the following response: 'r'SSID<0x01>IP<0x01>PORT<0x00> Where SSID is an ASCII string containing the server ID (router name), IP is an ASCII string containing the IP address (e.g. 255.255.1.1), and PORT is an ASCII string representing the port number. If there is no server the response will be the following: 'r'<0x01><0x01><0x00>

Table 5. Description of Query Level Commands new to CyberGlove III

Level One Commands ('1' Level)

Level One Commands typically expose the functionality that is new to Cyberglove III. This includes commands related to SD memory, wireless connectivity, and Jamsync.

Command	Action	Response	Additional Inputs	CG2	CG3
'A'	Set Active File	See Table 7	None		X
'a'	AD streaming mode	See Table 7	None		X
'C'	Connect to the current server in ram	<0x00>	None		X
'D'	Download File	See Table 7	None		X
'd'	Disable a streaming destination	<0x00>	'w', 'u', or 's'		X
'E'	Set streaming parameters	<0x00>	See Table 7		X
'e'	Enable a streaming destination	<0x00>	'w', 'u', or 's'		X
'h'	SD chip pass through Mode	See Table 7	See Table 7		X
'J'	Last Jamsync Value	See Table 7	None		X
'j'	Jamsync Pass through mode	See Table 7	See Table 7		X
'm'	Frame rate multiplier	<0x00>	None		X
'o'	Set the odd frame rate acceptance	<0x00>	<0x00> or <0x01>		X
'P'	Enter Wifi Module Setup Mode (first time wifi module use ONLY)	<0x00>	None		X
'p'	Wifi Module pass through Mode	See Table 7	See Table 7		X
'R'	Write Config file	<0x00>	None		X
'r'	Set the values of the wifi server info in ram	<0x00>	See Table 7		X
'S'	Start streaming new data format	See Table 7	See Table 7		X
's'	Set sd sample rate divider	<0x00>	See Table 7		X
'T'	Interval streaming/recording Command	See Table 7	See Table 7		X
't'	Time set/get	See Table 7	See Table 7		X
'u'	Set usb sample rate divider	<0x00>	See Table 7		X
'w'	Set Wifi sample rate divider	<0x00>	See Table 7		X
'X'	Format the SD card	See Table 7	See Table 7		X

Table 6. Listing of Level One Commands

Command	Description
'A'	This will set the new active file. The 'A' character is followed by a string which specifies a file name and the then <0x01> character. If the specified file exists, the Glove will return a <0x01> character and the command is complete. Otherwise it will create a file with that name and return <0x00>. After receiving the <0x00> another string must be entered followed by the <0x01> character. The glove will write this string to the file in the header information and return <0x00>. THE ACTIVE FILE MUST BE SET EVERY TIME THE SD CARD IS REMOVED FROM THE GLOVE AND REPLACED. Example: Send: 'A'FILENAME<0x01> Receive: <0x00> Send: HEADERSTR<0x01> Receive: <0x00> Where FILENAME is the name of the file (e.g. myfile.txt) and HEADERSTRING is the header that will appear in the file.
'a'	This command sends the glove to A/D streaming mode, which is used only for debugging. While in this mode, the glove will stream values off of its A/D converter. While in this mode, sending 'x' to the glove will change the multiplexor state so all of the sensors can be observed. Sending 'z' to the glove while in this state will exit this mode. **This mode is only intended to be used as a debugging tool and has not been thoroughly tested.**
'C'	This command will cause the glove to connect to the server specified by the parameters loaded into the glove's RAM using the 'r' command.
'D'	Upon receiving this command, the glove will stream the contents of its active file.
'd'	Disable data streaming to a device. This command must be immediately followed by either 'w', 'u', or 's'. 'w' will disable wifi streaming 'u' will disable usb streaming 's' will disable SD card recording Example: to disable wifi streaming Send: "dw" Receive: "dw<0x00>"
'E'	This command sets the parameters for streaming data from the CyberGlove III. This command consists of the 'E' character followed by seven other characters and has the following format: 'E'[FM][ES][EU][EW][SD][UD][WD] [FM] is the ASCII character representing the frame rate multiplier to be used for data recording. This value can be '1' through '4'. Currently, a maximum sample rate of 100 Hz has been verified with the CyberGlove III, so if the frame rate is greater than 25 Hz, the maximum frame rate multiplier is '3'. [ES] is an ASCII '0' or '1'. If it is '1' SD card recording will be enabled; if it is '0' SD card

	recording will be disabled.
	[EU] is an ASCII '0' or '1'. If it is '1' USB streaming will be enabled; if it is '0' USB streaming will be disabled.
	[EW] is an ASCII '0' or '1'. If it is '1' wifi streaming will be enabled; if it is '0' wifi streaming will be disabled.
	[SD] is an ASCII character '1' through '9'. The value will determine the sample rate divider for SD card recording. For example, if the frame rate is 30 Hz and the frame rate multiplier is 3 the sample rate will be 90 Hz. If the SD sample rate divider is 9, data will be recorded to the SD card at 10 Hz.
	[UD] is an ASCII character '1' through '9'. The value will determine the sample rate divider for USB streaming.
	[WD] is an ASCII character '1' through '9'. The value will determine the sample rate divider for wifi streaming.
	Note: the seven parameters following the 'E' character in this command are not echoed back to the user. Example: Send "E3100111" Receive "E<0x00>"
'e'	Enable data streaming to a device. This command must be immediately followed by either 'w', 'u', or 's'. 'w' will enable wifi streaming 'u' will enable usb streaming 's' will enable SD card recording Example: to enable USB streaming Send: "du" Receive: "du<0x00>"
'h'	All data that is sent through the UART from the SD module is echoed to the USB connection and vice versa (for debugging purposes ONLY). Use the escape sequence "!!!" to exit this mode.
'J'	This command returns three bytes that represent the most recent time the glove received a timecode through the jamsync port. The first byte returned is hours (0 to 23), the second is minutes, and third is seconds. Example: assume last time glove received a jamsync timecode was 11:05:30 Send: "J" Receive: "J<0x0B><0x05><0x1E><0x00>"
'j'	All data that is sent through the UART from the Jamsync decoder chip is displayed to the user and vice versa (for debugging purposes ONLY). Use the escape sequence "!!!" to exit this mode. **This mode is intended as a debugging tool only.**
'm'	This command sets the frame-rate multiplier for data sampling. The 'm' character is followed by a character <0x01> through <0x04>. The frame-rate of the CyberGlove III is 30 fps by default. It can be set to other frame rates using a jamsync device. The frame-rate multiplier determines the sample rate of the CyberGlove III. If the glove's frame rate is 24 fps and the frame-rate multipier is 2, the sample rate will be 48 Hz.

	Currently, a maximum sample rate of 100 Hz has been verified with the CyberGlove III, so if the frame rate is greater than 25 Hz, the maximum frame rate multiplier is 3.

'o'	This command either enables or disables non-integer frame-rate detection. The 'o' character is followed by either a <0x01> or a <0x00>.
	
	<0x00> disables the odd time detection and the CyberGlove III can only detect the following frame rates:
	    • 30 fps
	    • 24 fps
	    • 25 fps
	    • 30 fps (drop frame) {this is sometimes know as 29 drop frame fps}
	
	<0x01> enables the odd time detection and the CyberGlove III can only detect the following frame rates
	    • 29.970 fps
	    • 23.976 fps
	    • 25 fps
	    • 30 fps (drop frame) {this is sometimes know as 29 drop frame fps}

'P'	This command is issued the prior to configuring the wifi module for the first time. It sets the baud rate of the CyberGlove's communication lines with the module to 9600 baud, which is the factory set baud rate for the wifi module. After issuing this command, it is possible to communicate with the wifi module for the first time using the 'p' command. After configuring the wifi module with the settings specified in the "Hardware Bring-Up and Test" document, the wifi module will operate at 115200 baud. **After using this command to set the wifi module baud rate, the device MUST be powered down and this command should never be issued again.**
'p'	This device allows the user to send data directly to the wifi module. All data that is sent through the UART from the wifi module is echoed to the USB and vice versa (for configuration and debugging purposes ONLY). See "Hardware Bring-Up and Test" document for example.
'R'	Write the server information in the CyberGlove's RAM to configuration file on SD card. If a configuration file with the name CG3_CONFIG.txt exists on the SD card the values in the file will be over-written. If a file with this name does not exist, it will be created. After a configuration file is created, the server information written to it will be loaded into RAM the next time the CyberGlove III is powered on and the glove will automatically attempt to connect to the server.
'r'	This will set the server information in the CyberGlove's RAM. The format is as follows: 'r'SSID<0x01>IP<0x01>PORT<0x01> Where SSID is an ASCII string containing the server ID (router name), IP is an ASCII string containing the IP address (e.g. 255.255.1.1), and PORT is an ASCII string representing the port number.
'S'	This command will cause the CyberGlove III to start streaming 16-bit data samples with time-codes over the wifi or USB port and/or record the data to the SD card. The streaming/recording destinations are defined by the 'd', 'e', or 'E' commands. To exit this mode, issue the <CRTL-C> character or the escape sequence "!!!".
's'	This command sets the SD card sample-rate divider. The 's' character is followed by a character <0x01> through <0xFF>. This will set the rate at which data is recorded to the SD

	card during data streaming mode. The SD card data rate will be: Frame-Rate * Frame-Rate-Multiplier / SD-Card-Sample-Rate-Divider
'T'	This command sets up data streaming to begin and end at specified times (according to the time on the CyberGlove III's clock). The start and stop times must be issued as part of this command in the following format: 'T'[Start time]<0x01>[Stop time]<0x01> Where [Start time] and [Stop time] are strings of the following format: HH:MM:SS The CyberGLove III will not be able to any commands before the start time, however the user can cancel this command by issuing the <CTRL-C> character or the escape sequence "!!!" After the streaming interval is complete, the glove will send the <0x00> character. Example: The following command will wait until 6:55:55 am and start streaming until 6:59:00am. "T06:55:55<0x01>06:59:00<0x01>"
't'	Send 's' after this command to set the time. Send 'g' to display the time. The displayed time will come in the format of "HH:MM:SS:FF". To set the time the time must be entered in the time in the format of "HH:MM:SS". If 's' is selected, the glove will send the string "(HH:MM:SS)" to remind a user at a terminal of the proper format. Example: set the time to 12:10:30 Send: "ts" Receive: "ts(HH:MM:SS)" Send : "12:10:30" Receive: "12:10:30<0x00>" Example: get current time Send "tg" Receive "tg12:10:40<0x00>"
'u'	This command sets the USB sample-rate divider. The 'u' character is followed by a character <0x01> through <0xFF>. This will set the rate at which data is streamed over the USB connection during data streaming mode. The USB data rate will be: Frame-Rate * Frame-Rate-Multiplier / USB-Sample-Rate-Divider
'w'	This command sets the wifi sample-rate divider. The 'w' character is followed by a character <0x01> through <0xFF>. This will set the rate at which data is streamed over the wifi connection during data streaming mode. The wifi data rate will be: Frame-Rate * Frame-Rate-Multiplier / Wifi-Sample-Rate-Divider
'X'	This command formats the SD card. The CyberGlove will issue the following response: "Are you sure? (y/n)" To proceed, send 'y', otherwise, send 'n' or "!!!".

Table 7. Description of Level One Commands new to CyberGlove III