Xilica Audio Design

Third-Party Control Protocol

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Introduction

Since the introduction of the Neutrino series, there are many feedbacks that the protocol is too complex for integration with other 3rd-party controllers. Numerous minor modifications were done as an interim fix to help ease the users in utilizing the Neutrino Protocol. Although the Neutrino Protocol itself is very generic and fully capable, it has became increasingly important to define a new protocol that suits common 3rd-party controllers. The new 3rd-party control protocol is designed with this in mind, aiming for Xilica devices to be easily controlled by popular 3rd-party controllers from Crestron, AMX and others.

Overview

The new 3rd-party control protocol is transport-independent. This means the syntax is the same whether the 3rd-party controller is connecting using Serial (RS232/USB) or Ethernet connection. However, some functionalities (Subscriptions and Password Protection) are not available when using the protocol in Serial mode.

For Ethernet connection, the user should send out messages using TCP port #10007. The server will Response to the message using the same TCP connection. A keep-alive message must be sent over this TCP connection every 60 seconds, otherwise, the server end will disconnect the TCP connection and all subscriptions associated with the connection will end.

Users also have the choice of using UDP port #10008 to listen to Subscription messages from the device. The user can select whether a particular parameter send out its change via TCP Unicast or UDP Broadcast when issuing a subscription command. If left unspecified, by default a parameter will notify via TCP Unicast. A separate TCP connection is mandatory for status update, and a keep-alive message must continuously be sent over this TCP connection even if the user choose to use UDP Broadcast for all their interested parameters. If at any instance the TCP connection is dropped, all subscriptions and groups settings in the device must be reconfigured again.

Syntax

The 3rd-party controller string is composed with human readable ASCII characters. Each field in separated by one single white space, using more than one white space in between fields will result in command parsing error. A carriage-return (<CR>) is sent to mark the end of the message. Fields enclosed in square brackets are dependant on the command. Refer to the Commands List section for a list of all commands, their detail usage and examples.

COMMAND	1 white space	[CONTROL OBJECT/GROUP]	1 white space	[DATA]	<CR>

The CONTROL OBJECT is a string of up to 32 characters assigned by the user in software for individual parameters. It can contain any readable ASCII characters except double quotes. However, the first character cannot be a dollar-sign ($) because a preceding '$' is used to distinguish between a CONTROL OBJECT with a CONTROL GROUP.

A CONTROL GROUP is a string of up to 32 characters created using the CREATE command for use as a group name. It can also contain any readable ASCII characters except double quotes. The first character of the CONTROL GROUP will always begin with a '$' to denote it as a group name.

For CONTROL OBJECT/GROUP, if any white spaces are used as part of the string, then it must be encapsulated by double quotes. In addition, note that both COMMAND and CONTROL OBJECT/GROUP are case-sensitive.

DATA can be either:

- a number (positive, negative, floating point, integer represented in ASCII)
- a string (must always be inside double quotes, case-sensitive)
- a Boolean (TRUE or FALSE, case-sensitive)

Refer to the Commands List section for details on the data type accepted by each command.

Responses

The device end will response to a 3rd-party control command regardless it is correct or not. If no response is received, it is likely an indication of a connection problem. All response messages from the device will end with a carriage-return (<CR>).

If an invalid command is sent, the last encountered Error Code will be returned as:

ERROR=<ERROR CODE><CR>

For GET or GETRAW command, the response will be:

<CONTROL OBJECT>=<DATA><CR>

For all other commands, the device will return:

OK<CR>

Subscriptions

The external controller can subscribe to control objects to get a notification for any data changes on the subscribed objects.

To subscribe/unsubscribe to a control object, simply send the command:

SUBSCRIBE <CONTROL OBJECT> [TCP/UDP] <CR>
UNSUBSCRIBE <CONTROL OBJECT> <CR>

The notification will then be automatically sent to the external control system via TCP Unicast or UDP Broadcast as specified in the command. The notification string received by the external controller will be:

#<CONTROL OBJECT>=<DATA><CR>

The string is similar to a GET command, with a # character added in front to distinguish between an explicit read or a notification.

The interval in which the device sent out notifications is global for all subscribed control objects, it can be configured by:

INTERVAL <TIME in milliseconds> <CR>

Control Groups

Control groups allow a user to control multiple parameters at once using a single command. The user must first create a group by:

CREATE <CONTROL GROUP> <CR>

After a group is created, individual control objects can join or leave the group by:

JOIN <CONTROL GROUP> <CONTROL OBJECT> <CR>

LEAVE <CONTROL GROUP> <CONTROL OBJECT> <CR>

Cautious must be used when adding parameters to a group to ensure that the parameters are all of the same type and support the same commands.

When a group is longer used, resource can be free up by:

REMOVE <CONTROL GROUP> <CR>

Similar to subscription, Control Groups are persistent for the duration of the active connection only. When a connection is lost, the groups must be recreated again.

Password Protection

If a device is protected with a password, then the user must unlock the device first before sending any commands. The authentication persists only for the duration of the connection, so if a TCP disconnection occurs, the user have to unlock the device again.

To unlock the device, send the following command:

LOGIN <PASSWORD> <CR>

The password used in the command is the same password setup in software.

Verbose/Simple Mode

<Future Implementation - mainly used to configure the amount of details for Responses. This will help some external controller parsing the response more easily>

Commands List

SET <*CONTROL OBJECT/GROUP*> <*DATA - number/string/Boolean*>		
Examples	SET gain1 -3.2	Set "gain1" to -3.2 dB
	SET polarity1 TRUE	Set "polarity1" to ON position
	SET filter1 "Butterworth"	Set "filter1" to Butterworth Filter
	SET $group1 -15.7	Set all parameters in group1 to -15.7dB

SETRAW <*CONTROL OBJECT/GROUP*> <*DATA - number* >		
Examples	SETRAW gain1 -3200	Set "gain1" to -3.2 dB
	SETRAW polarity1 1	Set "polarity1" to ON position
	SETRAW filter1 1	Set "filter1" to Butterworth Filter
	SETRAW $group1 1000	Set all parameters in group1 to +1.0dB

GET <*CONTROL OBJECT/GROUP*>		
Example	GET EQslope	Get "EQslope" formatted value
	GET $group1	Get formatted value for all parameters in group1

GETRAW <*CONTROL OBJECT/GROUP*>		
Example	GETRAW EQslope	Get "EQslope" raw value
	GETRAW $group1	Get raw value for all parameters in group1

INC <*CONTROL OBJECT/GROUP*> <*DATA - number*>		
Example	INC fader3 0.5	Increase "fader3" by 0.5 dB
	INC $group1 1	Increase all parameters in group1 by 1dB

INCRAW <*CONTROL OBJECT/GROUP*> <*DATA - number*>		
Example	INC fader3 500	Increase "fader3" by 0.5 dB
	INC $group1 1000	Increase all parameters in group1 by 1dB

DEC <*CONTROL OBJECT/GROUP*> <*DATA - number*>		
Example	DEC fader3 0.5	Decrease "fader3" by 0.5 dB
	DEC $group1 1	Decrease all parameters in group1 by 1dB

DECRAW <*CONTROL OBJECT/GROUP*> <*DATA - number*>		
Example	DEC fader3 500	Decrease "fader3" by 0.5 dB

	DEC $group1 1000	Decrease all parameters in group1 by 1dB

TOGGLE <*CONTROL OBJECT/GROUP*>		
Example	TOGGLE mute1	Toggle "mute1" state
	TOGGLE $group2	Toggle all parameters in group2

PRESET <*DATA - number/string*>		
Example	PRESET 4	Recall preset #4
	PRESET "preset name"	Recall preset with name "preset name"

SUBSCRIBE <*CONTROL OBJECT/GROUP*> <*DATA - string*>*		
Example	SUBSCRIBE meter6	Subscribe to "meter6" via TCP Unicast
	SUBSCRIBE meter6 "TCP"	Subscribe to "meter6" via TCP Unicast
	SUBSCRIBE meter6 "UDP"	Subscribe to "meter6" via UDP Broadcast

* *<DATA - string>* is optional, TCP Unicast will be used by default

UNSUBSCRIBE <*CONTROL OBJECT/GROUP*>		
Example	UNSUBSCRIBE meter6	Unsubscribe "meter6"
KEEPALIVE		
Example	KEEPALIVE	No operation. Can be used by external controller to keep the TCP connection alive.

INTERVAL <*DATA - number*>		
Example	INTERVAL 100	Set subscription interval to minimum 100ms. * Subscription data could be delayed longer than the specify interval due to CPU usage, but it is guarantee to wait for the configured interval time before attempting to sent out subscription data. * The minimum value is 100 ms.

LOGIN <*DATA - string*>		
Example	LOGIN "password"	Login for external control with "password"

REBOOT		
Example	REBOOT	Remotely reboot device

REFRESH		
Example	REFRESH	Get formatted data value for all control objects

CREATE <*CONTROL GROUP*>		
Example	CREATE group1	Create a group with the name "group1" This is the only exception where CONTROL GROUP does not require a '$' sign in the syntax because he '$' sign will be automatically added when the group is created.

REMOVE <*CONTROL GROUP*>		
Example	REMOVE $group1	Remove the group with name "group1"

JOIN <*CONTROL GROUP*> <*DATA - string*>		
Example	JOIN $group1 "gain1"	"gain1" will join group1

LEAVE <*CONTROL GROUP*> <*DATA - string*>		
Example	LEAVE $group2 "mute2"	"mute2" will leave group2

Data String

Filter Type
Butterworth, LR, Bessel
Filter Slope
6db/Oct, 12db/Oct, 18db/Oct, 24db/Oct, 30db/Oct, 36db/Oct, 42db/Oct, 48db/Oct
AFS Sensitivity
Very Low, Low, Medium, High, Very High
AFS Type
Dynamic, Fixed
Control Ramp Type
Linear, Log, Audio

Error Codes

Error Code	Description
101	Invalid Command
102	Bad Arguments
103	Invalid Data Format
104	Control Object Not Found
105	Parameter Not Found
106	Data Value Not Found
107	Max Subscription Reached
108	Password Error
109	Not Yet Login
110	Command Not Supported for Control Object
111	Invalid Group Name
112	Max Control Group Reached
113	Max Control Object in Group Reached
114	Object Already in Group
115	Object Not in Group
116	Conflicting With Other Objects in Group
117	Invalid Preset #
118	Invalid Preset Name