PRELIMINARY 17 Aug 2013

P3 PROTOCOL
CORTEX EDITION

1st Edition Rev 1

Copyright Information

Command Block format

A Command block is comprised of the following parts.

2 byte Header
1 byte command-1/Device ID
1 byte command-2
1 byte data length
0-N bytes data payload
1 byte checksum

HEADER	CMD-1/DEV	CMD-2	LENGTH	PAYLOAD	CS
2 Bytes	1-Byte	1 Byte	1-Byte	0-N Bytes	1-Byte

The header is comprised of the 2 bytes 0x50, 0xAF (0xAF is the 1's compliment of 0x50)

Command-1 specifies a command group in the upper nibble and a device type in the lower nibble. Commands to a device will set the destination device type in the lower nibble, replies to the host should have the device type set to the originating device.

Upper nibble, command group

0	Setup/initialization commands
1	System replies
2	Control commands
4	Preset Commands
6	Status request commands
7	Status request replies
F	Factory use

Lower nibble, destination device type

0	Cortex
1~E	reserved
F	Global (any) device

Command-2 specifies a particular command with the command group specified by command-1.

The checksum is the exclusive or of all preceding bytes in the command including the header.

Command description

To understand the shorthand notation used in the rest of the document we will examine the parts of an example command.

The device type request command contains the following information.

Header	0x50, 0xAF	
Command-1	0x01	Setup command sent to lens
Command-2	0x11	Device type request command
Data Length	0x00	No data
Checksum	0xEF	0x50 xor 0xAF xor 0x01 xor 0x11 xor 0x00

Shorthand notation is used to show this command in the following command tables. The device type request will be shown as follows.

0•11•00 : Device type request

There are three parts to the command in this form each separated by the • symbol.

Command-1 is shown as a single hexadecimal digit, in this case 0; the destination device id is not shown.

Command-2 is shown as a single byte in hexadecimal (11).

The data length is shown as a single byte in hexadecimal. Where the data length is variable, "xx" will be used in place of a hex number to indicate that.

The header and checksum are not shown as these are either constants or calculated values.

The reply to this command would be as follows.

Header	0x50, 0xAF	
Command-1	0x11	System reply sent from lens
Command-2	0x11	Device type reply
Data Length	0x02	2 bytes of data
Data	0x00, 0x01	In this example the device type is 0x0001
Checksum	0xFC	0x50 xor 0xAF xor 0x11 xor 0x11 xor 0x02 xor 0x00 xor 0x01

1•11•02 : Device type reply

Command Summary

Command		Reply	
		1•10•00	ACK
		1•12•01	NAK
0•11•00	Device Type request	1•11•02	Device Type
0•13•00	Manufacturer request	1•13•xx	Manufacturer
0•14•00	Product name request	1•14•xx	Product name
0•15•00	Serial Number request	1•15•xx	Serial Number
0•20•00	Firmware version request	1•20•05	Firmware version
0•21•00	Hardware revision request	1•21•03	Hardware revision
2•10•0A	Set All motors	1•10•00	ACK
2•11•02	Set motor by Index	1•10•00	ACK
6•10•00	Motor Status	7•10•0A	Motor Status Data

System commands

0•11•00 : Device type request
1•11•02 : Device type reply
Two bytes are returned indicating the type of device connected.
Device type ID's are TBD

1•10•00 : ACK
When receiving a correct command from the host that does not require data to be returned the device will respond with an ACK.

1•12•01 : NAK
When detecting a communication error or receiving an undefined command from the host the device will respond with a NAK.

B7	B6	B5	B4	B3	B2	B1	B0
TIMEOUT			COMMS ERROR	PARAMETER ERROR	CHECKSUM ERROR		UNDEFINED COMMAND

Undefined command – this command was not recognized by the device.

Checksum error – this command was received with a checksum error.

Parameter error – one of the data parameters for the command was invalid.

Comms error – there was an error on the communications link.

Timeout – all parts of the command were not received within the command timing window specified in section xxx.

0•13•00 : Device manufacturer request
1•13•xx : Device manufacturer reply

Data1 to DataN is a null terminated C String with the manufacturers name.

0•14•00 : Device product name request
1•14•xx : Device product name reply

Data1 to DataN is a null terminated C String with the product name.

0•15•00 : Device serial number request
1•15•xx : Device serial number reply

Data1 to DataN is a null terminated C String with the product serial number.

0•20•00 : Device firmware version request
1•20•05 : Device firmware version reply

DATA1	DATA2	DATA3	DATA4	DATA5
Version Major	Version Minor	Version bug	Version build MSB	Version build LSB

Version numbers are in the form of 1.2.3 build 4, where

1 is the Major version number
2 is the Minor version number
3 is the bug version number
4 is the build number

0•21•00 : Device hardware version request
1•21•03 : Device hardware version reply

DATA1	DATA2	DATA3
Version Major	Version Minor	Revision

Version numbers are in the form of 1.0 Rev 1

CORTEX commands

2•10•0A : Set All motors

10 bytes of data are sent from host to cortex representing the motor control values. The values are unsigned in the range 0 to 254 and represent motor values -127 to +127.

2•11•02 : Set motor by index

The first data byte represents the motor to be controlled. For the cortex the range is 0 to 9. The second data byte represents the control value and is in the same format as the 2•10•0A command.

6•10•00 : Motor Status Request
7•10•0A : Motor Status Reply

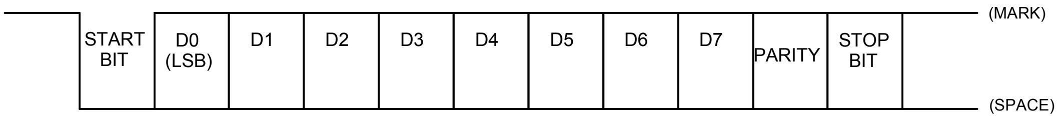
10 bytes of data are received from the cortex representing the current motor control values. The values are unsigned in the range 0 to 254 and represent motor values -127 to +127.

Appendix A –interface

Connection between the host and the Cortex is via one of the UART ports.

Interface System Overview

- 3.3V logic level Asynchronous serial, 5V tolerant.
- Full Duplex communication channel is used
- Data is transmitted asynchronously, bit serial, word serial
- Standard transmission rate on the bus is 230.4 kilobits per second
- The data word utilized by the system is as follows



- 1 Start bit + 8 data bits + 1 parity bit + 1 stop bit
- ODD parity : The total of "1"s in D0+D1+ . . . D7+PARITY equals an odd number

Command Timing

All communication is initiated by the host, the cortex must reply to every message either with an ACK/NAK or with the requested data.

The cortex must reply to the host within 10mS of the checksum byte of the command block being received.

The host will not interrupt transmission of bytes in a command block for more than 10mS, if the cortex detects the interruption of bytes in a command block that exceeds 10mS then the cortex should execute a timeout sequence and send a NAK command to the host.