ALLMOTION EZCTRL17

Command Set For EZController Model EZCTRL

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Overview

This document describes the operation and command set for the EZController ™ .

The EZCTRL17 is a multipurpose controller capable of I/O Control, Temperature Control and Stepper/Servo Motion Control. The EZ Controller has four I/O blocks , and each block can be software configured to one of the above modes such that it is possible to have simultaneous Motion Control, Temperature Control and I/O control on a single EZController. The command input is via simple ascii based serial commands issued via RS232, RS485 or USB.

I/O Mode
The EZ Controller model EZCTRL17 has 12 Analog to digital converter inputs and 8 Power Drive Outputs. The ADC Inputs are accurate to more than 10 Bits. The Outputs are open collector and feature four 2 Amp capable outputs, and four 0.7Amp capable outputs. This mode is fully released in the current V1.4 software.

Temperature / Pressure Controller Mode:
The EZController model EZCTRL17 has four fully independent Temperature Control blocks. Each block consists of a 2 Amp capable power drive output and an analog input that has a 10K 0.1% accurate resistor connected to the Upper reference of an ADC converter. By placing a 0.1C accurate themistor from this input to ground, it is possible to obtain a voltage that represents temperature. Each block can be instructed to modulate the on/off time of its output to heat or cool so as to maintain the temperature (voltage) measured at a set point. The measurement node can also be actively driven by a voltage, (which overpowers the internal 10K pullup), and hence any other quantity such as pressure for example can be regulated as well. This mode is fully released in the current V1.4 software.

Two Axis Servo Controller Mode:
The EZController model EZCTRL17 has two servo control blocks. The output of these blocks are a standard +/-10 Volt signal which is accepted by most Servo Amplifiers. Feedback is via quadrature encoder feedback. Each axis has home switch inputs as well as upper and lower limit inputs. The controller performs fully profiled moves with controlled acceleration, velocity and position. This mode is released for only one axis in the current V1.4 software. Dual axis mode is available in beta software

Four Axis Stepper Motor Controller Mode:
The EZController model EZCTRL17 has four step and direction output, Stepper Motor control blocks. The output of these blocks are pulses for step and a level to set the direction. These signals are accepted by most stepper motor Amplifiers. Each axis also features a home switch input for defining home position. The controller performs fully profiled moves with controlled acceleration, velocity and position. This mode is currently only available in beta software.

Three Axis RC (remote control) Servo Mode:

The EZController model EZCTRL17 can generate and control 3 axes of standard 1mS to 2mS control pulses to RC style servos. Request RC Mode Software when ordering.

Overall Command Set:

Note that for all Modes except the servo mode the additional commands beyond special commands given in this document are given in:
http://www.allmotion.com/New PDF's/EZ4AXIS/EZ4AXIS_UGuide.pdf
The I/O Temperature control and Stepper modes can be run on a per block basis, with for example one block doing I/O and the other doing Stepper.

For the Servo Mode all additional commands beyond described in this document are given in:
http://www.allmotion.com/PDF_Datasheets/Command_Set_EZServo.pdf

I/O Control

Inputs:

The EZ controller has 12 Analog Inputs. Of these inputs, four inputs are connected to the 8 Pin connector on the left side of the board. The remaining 8 inputs are divided into four groups of 2 inputs. Two inputs are placed on each of the four I/O Block Connectors.

The Inputs on the 8 pin connector can be read as analog values by the command:
/1?aa0<CR>
The Readback order is channels 4:3:2:1
Each channel returns a number between 0 and 16384

The Inputs on the 8 pin connector can also be read as digital values
/1?4<CR> returns a number between 0 and 15 which is a decimal number that represents a 4 bit binary bit pattern of the 4 inputs..
In addition the analog threshold at which a 1 or 0 is called for each of these inputs can be manipulated by the "at" command. Further these 1 or 0 values can be used to effect program branching via the "H" and "S" commands. (See detailed Command Set)

The Inputs on the four I/O Blocks (5 pin connectors) can be read by the command:
/1?aa1<CR>
/1?aa2<CR>
/1?aa3<CR>
/1?aa4<CR>
Each command reads back the two ADC inputs on that particular I/O Block.
Each channel returns a number between 0 and 16384.
A slow averaging mode that gives more accurate ADC values can be turned on by the command /1an32R

Outputs:

The outputs are open collector outputs that act as switches to ground. Four of these switches are rated at 2Amps 40V and four are rated at 0.7Amps 28V. Each of the 5 pin I/O block connectors has one each of the high current and low current outputs. Loads are placed between the positive supply and the open collector outputs.
The outputs are turned on and off by the J command, the two outputs on each I/O block are manipulated by a number between 0 and 3 which represents a two bit binary pattern, each bit being the value of one of the outputs.
/1J10R<CR> turns off both outputs on I/O Block #1
/1J11R<CR> turns on one output and turns off the other output on Block #1
/1J12R<CR> turns on the other output and turns off the first output on Block #1
/1J13R<CR> turns on both outputs on I/O Block #1
/1J43R<CR> turns on both outputs on I/O Block #4 etc.

		I/O COMMANDS
		All 4 Inputs are ADC inputs and can be read and acted upon by the program. Please see Appendix 9
?aa	0	Reads back all 4 Main Input ADC Values,on the 8 pin connector next to the address switch. **E.g. /1?aa<CR>** The Readback order is channels 4:3:2:1
?aa	1 to 4	This command reads back the ADC's on the Four I/O control blocks. Each 5 Pin I/O control block connector has two ADC inputs, for a further 8 ADC's in addition to the four main ADC's on the 8 pin connector. /1?aa1 Reads back the two ADC inputs on I/O Block#1 /1?aa2 Reads back the two ADC inputs on I/O Block#2
at	**100000 to 116368** **200000 to 216368** **300000 to 316368** **400000 to 416368** (6144)	The "at" command sets the threshold, upon which a "one" or "zero" is called for each of the 4 main ADC channels on the 8 pin connector. The Number represents the channel number followed by a 5 digit number from 00000-16368 which represents the threshold on a scale from a 0-3.3V. The default values are 6144 for all 4 channels which represents 1.24V. Changing the threshold allows the H and S commands to work on a variable analog input value which essentially allows the program to act upon an analog level. **Eg /1at106144R** sets the threshold of channel 1 to 6144, Note that leading zeros are required for the threshold value which is always 5 digits plus the channel number.
?at		Reads back the thresholds for the 4 main ADC channels on the 8 pin connector.. The Readback order is channels 4:3:2:1 **Eg /1?at<CR>**
J	**10** **11** **12** **13** **20** **21** **22** **23** **30** **31** **32** **33** **40** **41** **42** **43**	Each I/O Block has two On/Off Drivers. The command to turn on and off the On/Off Drivers has a two digit number. The first digit is the I/O Block number , the second digit ia a value between 0 and 3 Interpret as 2 bit Binary Value, 3=11= Both Drivers On, 2=10=Driver2 on Driver 1 Off etc.

Temperature Control

Each of the four I/O blocks can be wired to regulate the temperature of one device. One of the analog inputs acts as a temperature sensor and one of the outputs on each I/O block drives the heating/cooling element. (Please see the wiring diagram). The regulation is accurate to approximately 1C . The control mode is on/off mode with a programmable hystersis. In the future a PID mode will be available.

The sensing is achieved with a thermistor of value around 10K ohms. Internally in the drive there is a 10K 0.1% resistor with one end connected to +3.3V. The other end of this thermistor is connected to the input pin on the I/O block connector. Externally a thermistor is connected to ground from this pin. The voltage at the midpoint of this potential divider is thus proportional in some manner to the temperature. This midpoint voltage can be read by use of the /1?aa1 /1?aa2 /1?aa3 or /1?aa4 commands.
The value is ADC'd on a scale of 0 to 16348
ie number = 16385x(RThermistor/(RThermistor+10K)).

Automatic temperature regulation commands are entered as follows
/1J4,0,5500J4,1,5501R
/1 is the device address (on the address switch).
J4 The 4 is I/O block number,
The 0 indicates turn off value if zero, or turn on value if one.
The 5500 indicate the ADC value to turn on or off on a range of 0 to 16384.
The J4,1,5500 is a second almost identical J command that sets the turn on value

.
If the (On Value is > Off Value) then the algorithm acts as a heater controller.
If the (On Value is = Off Value) then the algorithm acts as a heater controller.
If the (On Value < Off Value) then the algorithm acts as a cooling controller.

By Setting the on value different from the off value hystersis can be added to reduce turn on/off cycles at the expense of greater temperature excursions.

The measurement node can also be actively driven by a voltage, (which overpowers the internal 10K pullup), and hence any other quantity such as pressure for example can be regulated as well.

		TEMPERATURE CONTROL COMMANDS
		Each of the I/O control blocks can be wired for temperature control. The wiring is as given in the wiring diagram. (Also please see Appendix 5)
J	**1,0,5500** **1,1,5504** **2,0,3456** **2,1,4567** **3,0,5678** **3,1,7890** **4,0,8901** **4,1,9111**	The first digit is the I/O block number, The second digit indicates turn off value if zero, or turn on value if one. The last digits indicate the ADC value to turn on or off on a range of 0 to 16384. The external Thermistor is ratioed against an internal 10K 0.1% resistor and the midpoint voltage will be ADC'd as a number on a 0 to 16348 scale. ie number = 16385x(REXT/(REXT+10K)). If The (On Value is > Off Value then the algorithm acts as a heater controller. If the On Value < Off Value then the algorithm acts as a cooling controller. Writing a temperature control type J command Eg **/1J4,0,5500J4,1,5501R** automatically enters that I/O group into Temperature control mode. To Turn of temperature control simply issue a normal mode J command such as **/1J40R** which turns off both outputs in group4.

Servo Control

Servo control is similar in all aspects to the EZServo products, except for the absence of the amplifier section, which can be any +/-10V input amplifier. This mode is released for only one axis in the current V1.4 software. Dual axis mode is available in beta software.

Please see command set:
http://www.allmotion.com/PDF_Datasheets/Command_Set_EZServo.pdf

Please see the wiring diagram:
http://www.allmotion.com/ez_controller_wiring.pdf

Stepper Control

Stepper control is similar in all aspects to the EZ4AXIS drive, except for the absence of the amplifier section, which can be any step and direction input amplifier. Please see the commands set in:
http://www.allmotion.com/New%20PDF's/EZ4AXIS/EZ4AXIS_UGuide.pdf

Please see the wiring diagram in:
http://www.allmotion.com/ez_controller_wiring.pdf

3 AXIS RC Servo Control

The EZController model EZCTRL17 can generate and control 3 axes of standard 1mS to 2mS control pulses to RC style servos. This mode is currently only available in beta software.

Axes 1,3,and 4 allow Three axes of simultaneous RC control. Axis 2 is used by the arbitrary PWM Generator (lower case “k” command)

The PWM width is essentially a POSITION command arrived at by fully profiled motion algorithms. Velocity V and Acceleration L are active in this mode.

For fast motion of a normal RC nature set L=10,000 and V=500,000. Slower motions over several hours are possible by using low values of V, as are smoother accelerations by using smaller values of L.

Example commands
First set L, V
/1L10000,10000,10000,10000R (axes order 1,2,3,4 from left to right.)
/1V500000,500000,500000,500000R

Then set desired position:
/1A100000,100000,100000,100000R
/1A-100000,-100000,-100000,-100000R sets about 1mS Pulse width

P and D commands will also work in this mode as will all branching and looping.

Complex command example:
The code below stores a program to be executed on power up so that the axes all go back and forth 5 times on power up.
/1s0L10000,10000,10000,10000V500000,500000,500000,500000A-100000,-100000,-100000,-100000A100000,100000,100000,100000G5R

For additional commands in RC Mode please see:

http://www.allmotion.com/New%20PDF's/EZ4AXIS/EZ4AXIS_UGuide.pdf