PMC1901 Command Reference Manual

for Piezo Active Focus Module PZM-M12-06

Software Version 3.x

Manual V104 2023/01

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Subject to technical modifications without notice.
All details provided are technical data which do not constitute warranted qualities.

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1. Communication Function of PMC1901

1-1. Connecting the PC and PMC1901 Controller allows following operations from the PC:

1-1-1. Writing and reading out the setting value

1-1-2. Reading out the measurement value

1-1-3. Reading out the control output status

1-1-4. Operating the control input

2. Communication Specification

Baud rate	115200 bps
Transmission code	ASC II
Data length	8 bit
Stop bit length	1 bit
Parity check	None
Data classification	STX, ETX

3. Communication Data Format (Command)

3.1 Command Echo

Type	STX	Command	ETX	Remark
Send to controller	`>`	ASC II string	` CR `	
Receive from controller	`<`	o	` CR `	Correct command.
	`<`	x	` CR `	Incorrect command.

3.2 Command Send

Type	STX	Command	Delimiter	Parameter	Delimiter	Parameter	ETX
Send to controller	`>`	ASC II string	` `	optional	` `	Optional	`CR`

STX	The code showing the head of transmit data/received data (`>`=0x3e) (`<`= 0x3c).
Command	Selects from the column of command on the command list to set.
Delimiter	Shows the separation between command and parameter (Space = 0x20).
Parameter	Numeric-ASCII string.
ETX	The code showing the completion of transmit data/received data (`CR`= 0x0d)

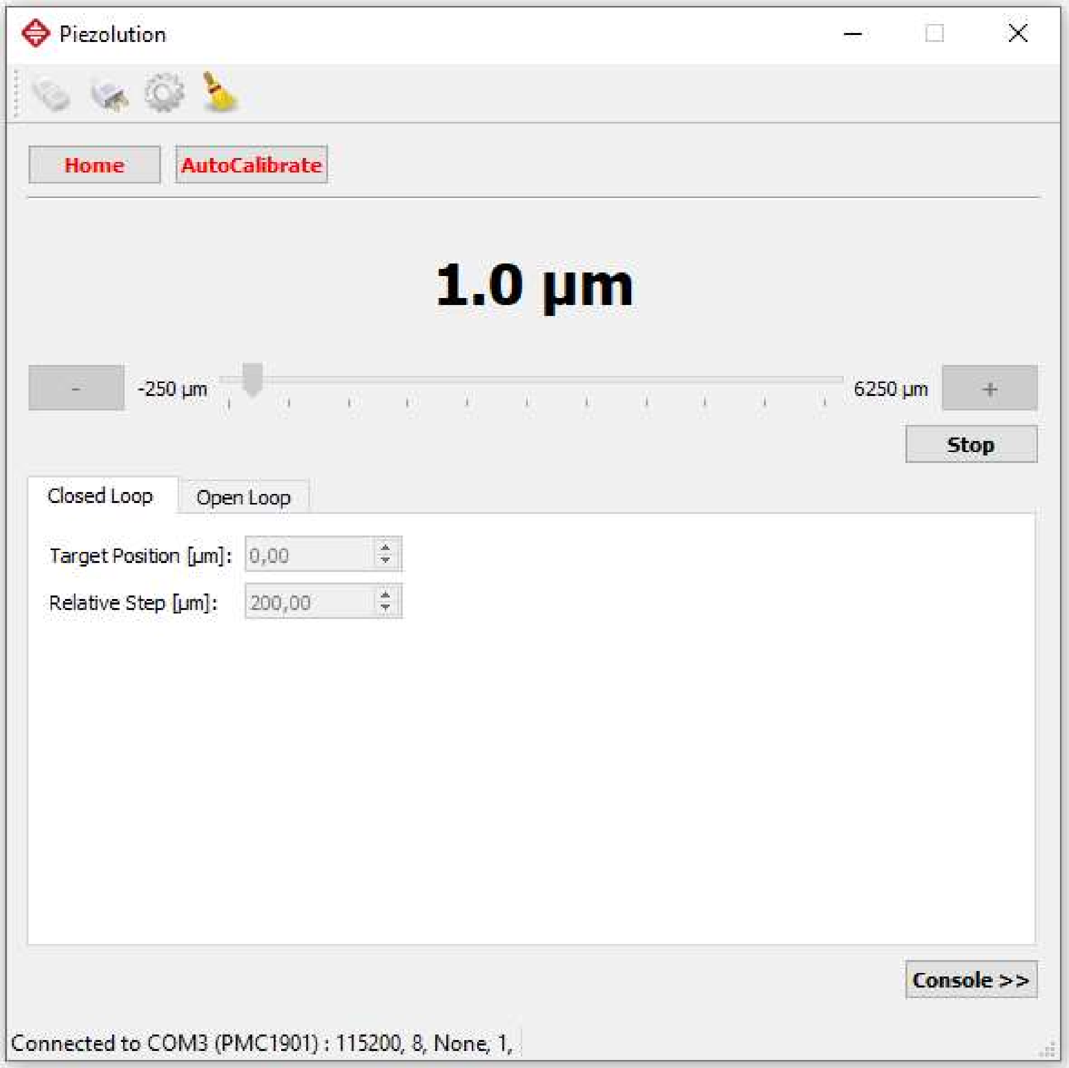
3.3 Command Response

Type	STX	Response	Delimiter	Parameter1	Delimiter	Parameter2	ETX
Received from controller	`_`	ASCII string	`,`	optional	`,`	optional	´CR`

4. Command List

4.0 Cold start

Hardware should be correctly connected to computer and then open the piezo terminal software.

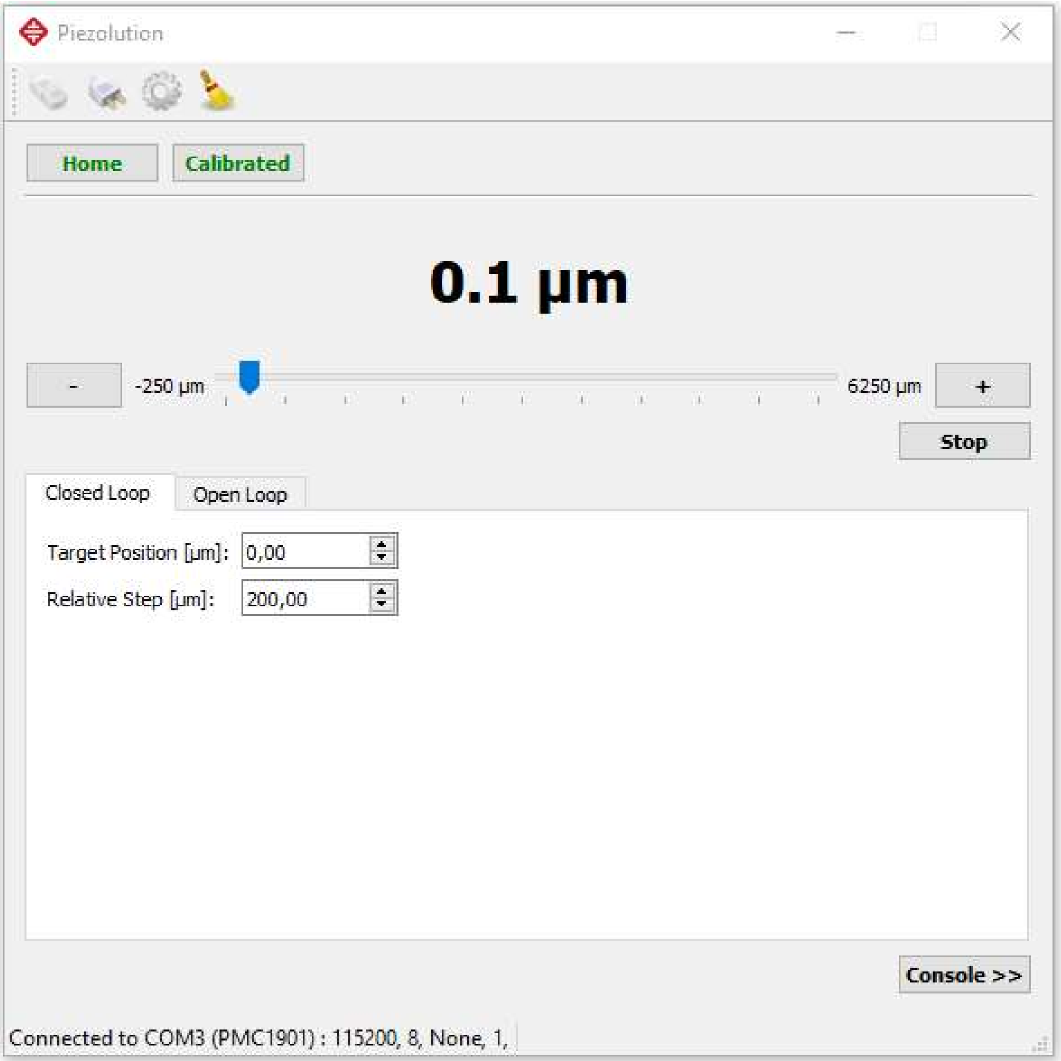


Target Position [µm]: 0,00

Relative Step [µm]: 200,00

Connected to COM3 (PMC1901) : 115200, 8, None, 1,

Start with “AutoCalibrate” and then “home”, both buttons will turn green.



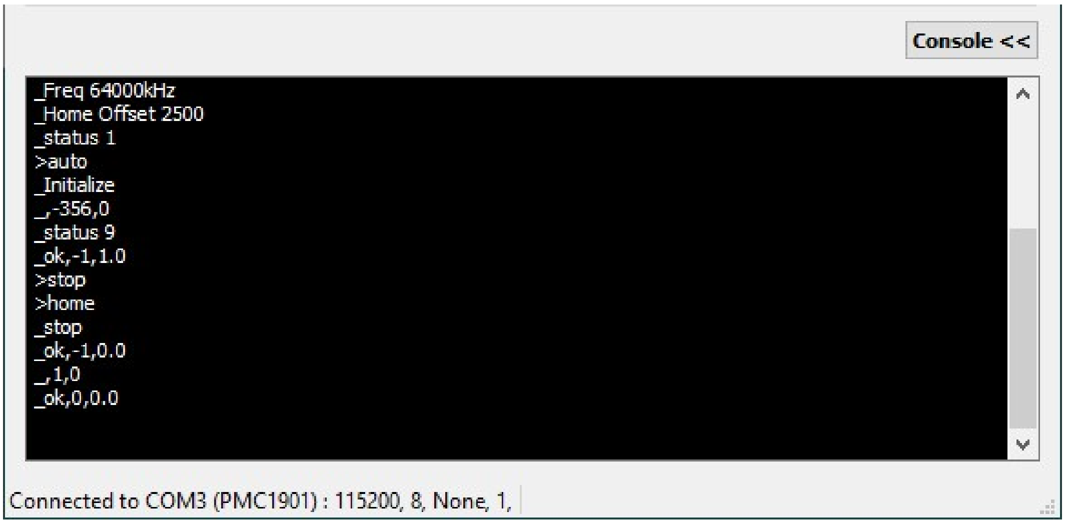
0.1 µm

Target Position [µm]: 0,00

Relative Step [µm]: 200,00

Connected to COM3 (PMC1901) : 115200, 8, None, 1,

Click open the “Console” button to see the sent and received commands.



```
_Freq 64000kHz
_Home Offset 2500
_status 1
>auto
_Initialize
_,-356,0
_status 9
_ok,-1,1.0
>stop
>home
_stop
_ok,-1,0.0
_,1,0
_ok,0,0.0
```

Connected to COM3 (PMC1901) : 115200, 8, None, 1,

*_status 1 means 0x01=calibration done

_status 9 means 0x01 + 0x08 = calibration done and system ready.

4.1 Closed-Loop Commands

Command	Parameter1	Parameter2	Description

ma	home offset ~ Stroke - home offset	-	Move to the absolute target position, [unit: 0.1um]. The target position can be specified absolute position, using the absolute position parameter.
			1) Parameter: assigning an absolute target position, [unit: 0.1um]
			2) Example:
			A. Command:
			printf(“>ma 10000CR”); // target: 1000um from home
			B. Return string:
			String0: ”<oCR” // command echo.
			String1:”_9904, 10000CR” // current position is 990.4um, target is 1000.0um
			String2:
			i. if succeed: “_ok, 10009,8.5CR” // final position is 1000.9um, speed is 8.5mm/s
			ii. if fail: ”_ng(timeover)CR”

mr	home offset ~ Stroke - home offset	-	Move to the relative target position, [unit: 0.1um]. The target position can be specified relatively to the current desired position, using the relative position parameter. 1) Parameter: assigning a relative target position, [unit: 0.1um]. 2) Example A. Command: printf(“>mr 10000CR”); B. Return string: String0: ”<oCR” // command echo. String1:”_9904, 19904CR” // current position is 990.4um, target is 990.4 + 1000.0um String2: i. if succeed: “_ok,19907,8.7CR” // final position is 1990.7um, speed is 8.7mm/s ii. if fail: “_ng(timeover)CR”
home	-	-	Move to the home position. 1) Send to controller: printf(“>homeCR”); 2) Example A. Command: printf(“>homeCR”); B. Return string: String0: “<oCR” // command echo. String1: “_9904,0CR” // current position is 990.4um, target is 0 (home) String2: i. if succeed: “_ok,7,8.7CR” // final position is 0.7um, speed is 8.7mm/s

			ii. if fail: "_ng(timeover)CR"
auto	-	-	Initialize the encoder system 1) Send to controller: printf(">autoCR"); 2) Return string: printf("_initialize CR");
stop	-	-	Aborts the motion immediately. 1) Send to controller: printf(">stopCR"); 2) Return string: printf("_stopCR"); 3) If during the closeloop move 4) If during the openloop move

4.2 Open-Loop Commands

Command	Parameter1	Parameter2	Description
duration	1 ~ 5000	-	Define the moving on-time (unit: millisecond). 1) Send to controller: printf(">duration 1000CR"); 2) Receive from controller: printf("_duration 1000CR");
interval	1 ~ 2000	-	Define the time between the start of each step 1) Parameter1: step interval (unit: ms) 2) Send to controller: printf(">interval 1000CR"); 3) Receive from controller: printf("_interval 1000CR");
cycle	1 ~ 214700000	-	Define the optional number of run. 1) Send to controller: printf(">cycle 10CR"); 2) Receive from controller: printf("_cycle 10CR");
re	-	-	Piezo Drive runs in reverse. 1) Send to controller: printf(">reCR"); 2) Receive from controller: printf("_reCR");
fo	-	-	Piezo Drive runs forwards. 1) Send to controller: printf(">foCR"); 2) Receive from controller: printf("_foCR");
bi	-	-	Move to both directions. 1) Send to controller: printf("biCR"); 2) Receive from controller: printf("_biCR"); 3) Receive from controller: printf("%dCR", cycle_cnt);

4.3 Status-Commands(it is a read only command, indicating the recording status.)

Command	Parameter1	Parameter2	Description
cp	-	-	This command reports the actual controller position (encoder value, unit: um). 1) Send to controller: printf(“>cpCR”); 2) Receive from controller: printf(“_cp,%ID,umCR”, current_position);
inform	-	-	Reports the configuration setting of controller 1) Send to controller: printf(“>informCR”); 2) Receive from controller: printf(“_Ver %d %d %d %dCR“, FW_version, year, month, date); printf(“_Freq %IdCR”, frequency); printf(“_Homeoffset %IdCR”, offset);
status	-	-	Reports the status of PZM-M12-06 1) Send to controller: printf(“>statusCR”); 2) Receive from controller: printf(“_status %dCR”, status); Status Bits also in combination: 0x00: status is init 0x01: calibration done 0x02: sensor error 0x08: system ready done. 0x16: parameter error. 0x32: command error.

4.4 Configuration Commands

Command	Parameter1	Parameter2	Description
freq	20 ~ 300	-	Define the driving frequency in steps of 1 kHz. 1) Parameter 1: driving frequency (20-100kHz) 2) Send to controller: printf(“>freq 68CR”); 2) Receive from controller: printf(“_freq(68000)HzCR”;
duty	1 ~ 48	-	Define the duty (open-loop only). 1) Parameter 1: Duty (1-48%) 2) Send to controller: printf(“>duty 25CR”); 3) Receive from controller: printf(“_duty (25)CR”);
speed	3 ~ 40	-	Define the velocity. 1) Parameter 1: Velocity (unit: mm/s) 2) Send to controller: printf(“>speed 10CR”); 3) Receive from controller: printf(“_speed 10CR”);
reset	-	-	Warm-start, it is same as the cold-start. 1) Send to controller: printf(“>resetCR”);
offset	0 ~ 63000	-	Define the offset of HOME position. (unit: 0.1um) 1) Send to controller: printf(“>offset 100CR”); 2) Receive from controller: printf(“_Home offset 100CR”);
save	-	-	Save current configuration to the internal flash memory permanently. 1) Send to controller: printf(“>saveCR”); 2) Receive from controller: printf(“_saveCR”);

4.5 Position-Time Commands

Command	Parameter1	Parameter2	Parameter3	Description
pt	1 ~ 50	Under max. stroke	Under 2000 ms	Position-time table_x -parameter 1: Table ID -parameter 2: absolute target position,[Encoder value] -parameter 3: step interval (unit: ms) -example 1) Send to controller: printf(“>pt 1 100 10CR”); 2) Receive from controller: printf(“_pt,1,100,10,CR”) 3) Send to controller: printf(“>pt 2 200 10CR”); 4) Receive from controller: printf(“_pt 2,200,100,CR”); 5) Send to controller: printf(“>pt 20 1000 100CR”); 6) Receive from controller: printf(“_pt, 50, 1000, 100,CR”);
delete	0 ~ 50	-	-	Delete the PT table: (0: all clear) 1) Send to controller: printf(“>delete 10CR”); 2) Receive from controller: printf(“_delete pt-table 10CR”);
save	-	-	-	Save the current condition to the internal flash memory permanently. 1) Send to controller: printf(“>saveCR”); 2) Receive from controller: printf(“_saveCR”);
ptread	-	-	-	Reports the actual controller PT table. 1) Send to controller: printf(“>ptreadCR”); 2) Receive from controller: printf(“_ptread, %d,%d,%dCR”, table ID, position, interval);
step	0 ~ 2147000000	-	-	Define the optional number of run. (0: unlimited) 1) Send to controller: printf(“>step 100CR”); 2) Receive from controller: printf(“_step, 100CR”);
ptstart	1 ~ 50	1 ~ 50	-	Piezo Drive runs. -parameter 1: start table ID -parameter 2: Length -example: 1) Send to controller: printf(“>ptstart 5 10 CR”); Run from table ID 5 to table ID 10 Return string: “_start %d “ start position Return string: “_stop %d” stop position
stop	-	-	-	Aborts the motion immediately. 1) Send to controller: printf(“>stopCR”); 2) Receive from controller: printf(“_stopCR”);

4.6 Motion Commands (Point to Point – PTP)

Command	Parameter1	Parameter2	Description
ptppos	1000 ~ 59000	1000 ~ 59000	Set both target positions for repeat move, [unit: 0.1um] The target position can be specified absolute position, using the absolute position parameter. 1) Parameter 1: assigning a start position, [unit: 0.1um] 2) Parameter 2: assigning the end position,[unit: 0.1um] 3) Send to controller: printf(">ptppos 1000 50000CR"); 4) Receive from controller: printf("_ptp_start 1000CR") 5) Receive from controller: printf("_ptp_end 50000CR");
ptpinterval	0 ~ 360000	-	Define the time between the start of each position, [unit: ms] 1) Paramter1: step interval (unit: ms) 1) Send to controller: printf(">ptpinterval 1000CR"); 2) Receive from controller: printf("_ptp_interval 1000CR");

ptpstart	-	-	Start PTP move.
			1) Send to controller: printf(">ptpstartCR");
			2) Receive from controller:
			printf("_ptpstart CR");
			printf("_tg,50000,cr,50012,df,12CR");
			target pos: 50000,
			current pos: 50012
			difference pos: 12

stop	-	-	Aborts the motion immediately. 1) Send to controller: printf(">stopCR"); 2) Receive from controller: printf("_stopCR");

5 NG Information

5-1. Parameter Error

Parameter range is over.

5-2. Sensor Error

A. Fail cali (pitch <2)

i. Piezo Drive does not move

ii. sensor circuit broken

B. Optpass NG 0x01, 0x02, 0x03

i. Scale has some particle or scratch

C. Optpass NG 0x10, 0x20, 0x30

i. Scale and sensor gap NG