

HEQ-5/6/Atlas/LittleFoot Protocol V4.10

All commands are in ASCII and send via RS232 (9600,8,n,1) to the mount. Commands that are unknown will return '?'

The commands that set the accumulator and flags are controlled by:

Character	Effect
#	Clear the accumulator to zero and reset the Flag
<	Set flag to OFF
>	Set flag to ON
0 to 9	Add the digit to the accumulator
-	Indicates the number in the accumulator is negative

The following commands use the flag and/or the accumulator:

Command	Saved?	Default	Definition
T	Y	0	Set tracking rate used by the mount according to the accumulator. The following tracking rates are supported: -1: Disable tracking (terrestrial use) 0: Track at sidereal rate 1: Solar / planetary rate 2: Lunar rate
G	Y	OFF	Set paddle guiding rate used in 2x paddle movement mode. Set to +/- 0.3x if flag is ON, +/- 1x if flag is OFF and +/- 0.67x if flag is OFF and sign is negative.
x	Y	OFF	Rev. Motor direction. Set to original if the flag is OFF, inverse if the flag is ON.
X	Y	ON	Set telescope orientation. Set to left if the flag is ON, or right if the flag is OFF.
I	N	-	Start / stop IntellyTrack®, depending on the flag
F	N	-	Find Object Note: This command will drive the motors in a rectangle. First round at 4x speed and then at 8x speed. This is useful when done a Goto slew with a mount that was not aligned very well and the object is not at the center.
B	Y	0	Set DEC backlash to the specified number of microsteps from accumulator. A good value seems to be about 100
M	Y	0	Set the way DEC backlash is used depending on the value of the accumulator: < 0: Always finish motion in the DOWN direction 0: Takeup backlash only at the start of motion (see below) >0: Always finish motion in the UP direction Note that backlash is always taken up at the start of motion if the direction of motion has changed.
b	Y	0	Set RA backlash to the specified number of microsteps from accumulator. Typically this should be set to zero as the direction of motion does not change.
m	Y	0	Set the way RA backlash is used depending on the value of the accumulator: < 0: Always finish motion in the LEFT direction 0: Takeup backlash only at the start of motion (see below) >0: Always finish motion in the RIGHT direction Note that backlash is always taken up at the start of motion if the direction of motion has changed.
P	N	-	PEC (periodic error correction) control: -1: Start PEC training. Start training will also clear the PEC Table! -2: Start PEC Touch UP Function -0: Stop PEC training. 0: PEC off 1: PEC on
S	N	-	Park: Stop slew and save PEC state. (Obsolete with PEC Autosave feature)
R	N	-	Set / Reset the special Pins depending on the Flag and Number #>R = Set Pin14; #<R = Reset Pin14 #>1R = Set Pin7; #<1R = Reset Pin7 (Note that these Pins are low active and can not drive high currents!)
h	Y	0	0: Set Handcontroller to PEC Training Mode 1: Set Handcontroller to PEC Touch UP Mode if PEC State is ok
D	N	-	->D = Set Display Present, else reset Display Mode

Command	Saved?	Default	Definition
p	Y	1	Set the PEC factor and aggressiveness to the value in the accumulator
#>-9595Y	-	-	Save settings to internal EEPROM (Note all settings marked with 'Y' are saved only after this save command!)

The supported LX200 commands are:

LX200 Command	Description
ACK	Return mount alignment mode (always 'P' for polar)
#:Me#	Start guiding east (RA LEFT) at the current guiding rate
#:Mw#	Start guiding west (RA RIGHT) at the current guiding rate
#:Ms#	Start guiding south (DEC DOWN) at the current guiding rate
#:Mn#	Start guiding north (DEC UP) at the current guiding rate
#:Mg[ewns]ttt#	Timed guiding (pulse guide) operation
#:Q#	Stop all guiding motion
#:Qe#	Stop guiding east
#:Qw#	Stop guiding west
#:Qs#	Stop guiding south
#:Qn#	Stop guiding north
#:RG#	Set guiding rate as used in 2x paddle movement mode
#:RC#	Set guiding rate to +/- 4x sidereal rate
#:RM#	Set guiding rate as used in 8x paddle movement mode
#:RS#	Set guiding rate as used in 16x paddle movement mode
#:F+#	Focus Control In
#:F-#	Focus Control Out
#:FQ#	Quit Focus command
#:FF#	Focus Speed Fast = Set Pin5 (Note that this Pin is low active and can not drive high currents!)
#:FS#	Focus Speed Slow = Reset Pin5 (Note that this Pin is low active and can not drive high currents!)
#:GS#	Sidereal Time, allways returns firmware creation time as xx:xx:xx#
#:GR#	Get Telescope RA
#:Gr#	Get Object RA
#:GD#	Get Telescope DEC
#:Gd#	Get Object DEC
#:Sr HH:MM.T#	Set Object RA
#:Sd sDD*MM#	Set Object DEC
#:MS#	Slew to Object
#:CM#	Sync -- Match Scope Coord to Object Coords
#:f+#	Fan on = Set Pin6 (Note that this Pin is low active and can not drive high currents!)
#:f-#	Fan off = Reset Pin6 (Note that this Pin is low active and can not drive high currents!)

The special LX200 like commands are (not supported by standard LX200):

Command	Saved?	Default	Definition
#:ZWRx#	Y	-	Set the binary value of RA Wormwheel (x = unsigned 2 Byte)
#:ZWDx#	Y	-	Set the binary value of DEC Wormwheel (x = unsigned 2 Byte)
#:ZGRx#	Y	-	Set the binary value of RA Gear ratio (x = float 4 Byte)
#:ZGDx#	Y	-	Set the binary value of DEC Gear ratio (x = float 4 Byte)
#:ZMRx#	Y	-	Set the binary value of RA Motor angle (x = float 4 Byte)
#:ZMDx#	Y	-	Set the binary value of DEC Motor angle (x = float 4 Byte)
#:x:Ssy#	Y	y=0,x=1 y=1,x=2 y=2,x=3	Set speed y adjustment to the value of x (Ramping starts at 16x) y = 0 = 8x speed , y = 1 = 16x speed , y = 2 = GOTO speed x = 0 = 4x , x = 1 = 8x , x = 2 = 16x , x = 3 = 20x , x = 4 = 25x , x = 5 = 28x x = 6 = 33x , x = 7 = 40x , x = 8 = 50x , x = 9 = 66x , x = 10 = 100x Be very careful with this setting and change it at your own risk!!! Maximum speed depend on balance, load, gears etc.
#:VS#	N	-	Get PEC State (binary data!)
#:x:VR#	N	-	Get PEC Table entry x (x = 0 - 255)
#:x:XRy#	N	-	Set PEC Table entry x value to y (x = 0 - 255) y = 0 = no change y = 1 = slow down y = 2 = speed up y = 3 = speed siderial

Command	Saved?	Default	Definition
#:XYR#	N	-	Save PEC Table
#x:ZDS#	Y	630	Set the RA Siderial Clock counter to the value of x (*1)
#-x:ZAS#	Y	1531	Set the RA Siderial Clock adjust counter to the value of x (*1) (Note that x can be negative!)
#x:ZDs#	Y	631	Set the RA Solar Clock counter to the value of x (*1)
#-x:ZAs#	Y	-2015	Set the RA Solar Clock adjust counter to the value of x (*1) (Note that x can be negative!)
#x:ZDL#	Y	653	Set the RA Lunar Clock counter to the value of x (*1)
#-x:ZAL#	Y	1513	Set the RA Lunar Clock adjust counter to the value of x (*1) (Note that x can be negative!)
#x:ZgR#	Y	95	Set the RA Goto divisor (*1)
#x:ZgD#	Y	142	Set the DEC Goto divisor (*1)
#x:ZPE#	Y	198	Set the PEC counter (*1)
#x:VX#	N	-	Get internal Settings (binary data!) (*1) x = 0 = receive internal Settings structure (13 Bytes) x = 1 = receive Siderial Clock and Adjust value (5 Byte) x = 2 = receive Solar Clock and Adjust value (5 Byte) x = 3 = receive Lunar Clock and Adjust value (5 Byte) x = 4 = receive RA and DEC Goto values (4 Bytes) x = 5 = receive PEC counter (2 Bytes) x = 6 = receive RA Mount data (10 Bytes) x = 7 = receive DEC Mount data (10 Bytes)
		(*1)	Calculation and description of these values is described in the developer section of the support forum at http://forum.rajiva.de/
#x:ZRR#	Y	10	Set the Ramp rising value to the value of x (x = 0 – 255)
#:GV#	N	-	Get MCU Firmware Version (x.xx Rev.x)

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