

NAME

XIA HSC-1 – XIA Huber Slit Controller

DESCRIPTION

The X-Ray Instrumentation Associates Huber Slit Controller Model HSC-1 is a specialized device only used to control Huber slits. The HSC-1 communicates through a serial port, and several HSC-1 modules can be daisy-chained together and run off a single serial port.

The controller is selected on the *edconf* devices screen along the lines of:

```
MOTORS      DEVICE  ADDR  <>MODE  NUM          <>TYPE
YES        /dev/ttyS0  <>    9600    2          XIA HSC-1 (Serial)
```

The NUM field is set to the number of HSC-1 modules on the serial port.

The *config* file will have:

```
RS_XIAHSC = device_name baud_rate number_of_slits
```

A sample *edconf* motor screen for a complete set of slits would begin as follows:

```
Number: <>Controller 0: XIAHSC 1: XIAHSC 2: XIAHSC 3: XIAHSC
Unit/Channel          0/0      0/1      0/2      0/3
Name                  Slit1 A  Slit1 B  Slit1 Gap  Slit1 Cen
Mnemonic              sla      slb      slg      slc
Steps per degree/mm   400      400      400      400
```

The HSC-1 module needs to be sent a calibration command before the HSC-1 motors can be moved with the normal move commands. The HSC-1 manual describes a manual calibration procedure. It is also possible to set the controller to the calibrated state by sending the "calibrate" command with `motor_par()` as described below.

Each HSC-1 contains two motors that control the slit blades. Each blade can be moved independently. The HSC-1 also implements commands to move both blades simultaneously to change either the gap or the center-of-the-gap position. *spec* can be configured to control just the two blades, just the gap and the center position, or all four motions. When all four motions are configured, moving either blade changes the positions reported for gap and center, and moving either the gap or the center causes the positions reported for each blade to change.

Configuration for the HSC-1 requires the unit/channel field on the second line of the motor screen of the configuration editor to be filled in according to the following special format. The unit number corresponds to successive entries on the devices screen – each unit is associated with a different serial port. Unit numbers start with zero for the first HSC-1 entry. The channel number combines two values. Each HSC-1 module requires an arbitrary module number *N* (see below). This number is multiplied by 10 and added to the channel number that identifies the motion, as follows: For motor controller *N*, channel $N \times 10 + 0$ corresponds to blade A, channel $N \times 10 + 1$ corresponds to blade B, channel $N \times 10 + 2$ corresponds to the gap and channel $N \times 10 + 3$ corresponds to the center of the gap. Channel numbers ending in 4 through 9 are invalid.

ENTERING THE SERIAL NUMBER

The module number *N* (see above) is used only for internal bookkeeping and does not designate a particular HSC-1 module. Each module is identified by a thirteen-character unique serial number of the form XIAHSC-B-0014. The serial number needs to be entered as a string in the field *generic parameter 1* on the optional motor-parameter screen of the configuration editor. Use the `m` command twice from the motor screen of the configuration editor to reach the screen where you can enter *generic parameter 1*. Type an initial single quote ' to enter a string. Note, the serial number can also be entered as B-0014, 0014 or 14 if such a

string is sufficient to distinguish among modules. Also note, the serial number should be entered for just one of the motors associated with module *N*.

If the alias feature of the HSC-1 is used, and bit 6 of the *control word* (see below) is set for “use alias as ID”, enter the alias rather than the serial number as *generic parameter 1*. Note, *spec* requires there be no space characters in the alias. Setting and changing aliases requires establishing serial communication with the modules, which may be difficult for novice *spec* administrators, so CSS recommends simply using the serial numbers as they exist in the factory configuration.

Note, some users have reported that the serial numbers burned into the firmware don't quite match those stamped on the casing, and also are sometimes less than 13 characters. When *spec* does the hardware configuration on start up or on a *reconfig*, serial numbers found on the connected slit controllers, but not entered in the *config* file will be listed (as of release 5.05.02-7). (On earlier *spec* releases, setting the debug level to 128 will display messages from the slit controllers showing all the serial numbers.)

MOTOR PARAMETERS

The *steps per deg/mm* parameter should be set to 400 for the HSC-1 modules.

Normally, the positions for each blade become more positive as the blade is opened. However, if the *sign of user * dial* parameter is negative for either blade (or both), the motor position will become more negative as the blade opens. The sense of the center-of-the-gap motion can also be changed by changing the sign of the *sign of user * dial* parameter. The gap motion is always positive as the gap increases, though.

The backlash, speed and acceleration parameters in the *config* file are ignored.

CSS recommends using the calibration feature of the HSC modules to set the zero positions, rather than using the *set* macro to set the user *offset* parameter. That is, it is best to keep the user and dial positions the same. The *chg_dial()* function will, in fact, send the “immediate calibration” command to the controller, but only when setting the position to zero. Note, the gap should be physically at zero before using *set_dial*. Use of the standard *set_dial* macro should be followed by the *set* macro to set the user-dial offset back to zero.

The HSC-1 controller stores a number of parameters in nonvolatile memory. *spec* will read and display them with the command *motor_par(motor, "dump")*, where *motor* is the mnemonic for any of the motions on the particular HSC-1 module. The display format is as follows:

```

1  Outer motion limit (rw) = 4400 (11 mm)
2  Origin position (rw) = 400 (1 mm)
3  Motor A position (ro) = 900 (2.25 mm)
4  Motor B position (ro) = 900 (2.25 mm)
5  Motor step delay (rw) = 200 (roughly 0.272 mm/sec)
6  Gear backlash (rw) = 10 (0.25 mm)
7  Control word (rw) = 142 (0x8e)
8  Escape character (rw) = 33
9  Arbitration priority (rw) = 8
10 Motor A phase (ro) = 0
11 Motor B phase (ro) = 0
12 Calibration complete (ro) = 150
13 EEPROM signature (ro) = 23205
14 EEPROM version (ro) = 4
```

These parameters can be modified using a command such as

```
motor_par(motor, "send", "W 6 20")
```

which changes memory location 6 (gear backlash) to 20.

SPECIAL COMMANDS

The `motor_par()` options implemented for the HSC-1 are as follows:

`motor_par(motor, "calibrate")` – Sends the “immediate calibration” command to the unit. The effect is to set the current position of each blade in the controller to the *origin* parameter. It also sets *spec*’s positions for the gap, center and blades to zero. Thus the gap should physically be at zero before sending this command.

`motor_par(motor, "origin" [, value])` – Sets the controller’s *origin* parameter (parameter 2 of the controller’s memory map) to *value*. The units of *value* are steps, where 400 steps corresponds to 1 mm. The origin parameter determines how far beyond the zero position each slit blade can be moved. Note, changing the origin parameter will change the setting of the current position of the blades. The blades should thus be both at zero before sending the "origin" command, and a "calibrate" command should be sent immediately afterwards. The factory default value for *origin* is 400.

`motor_par(motor, "range" [, value])` – Sets the controller’s “outer limit” parameter (parameter 1 of the controller’s memory map) to *value*, where the units of *value* are steps. This parameter controls how far each blade can be moved. The factory default value for this parameter is 4400.

`motor_par(motor, "step+")` or `motor_par(motor, "step-")` – Moves blade A or blade B one step in the specified direction. This command can be used to position the slits whether or not they have been calibrated.

`motor_par(motor, "send", cmd)` – Sends the string *cmd* to the HSC-1 unit associated with *motor*. The module serial number will be included automatically.

`motor_par(motor, "read", cmd)` – Sends the string *cmd* to the HSC-1 unit associated with *motor*, as above, and returns a string containing the response.

`motor_par(motor, "usend", cmd)` – Sends the string *cmd* to the serial port connected to the HSC-1 unit associated with *motor*. The *cmd* must include the full HSC-1 command syntax.

`motor_par(motor, "uread", cmd)` – Sends the string *cmd* to the serial port connected to the HSC-1 unit associated with *motor*, as above, and returns a string containing the response.