Commands for MPX3 server communication

(Based on MPX3GUI commit: f800626)

Changes

v1.0.0, 20181112, original version

Testing

Testing can be done on the server computer with the command:

```
nc localhost 6351
```

List of commands

The commands are based on the existing communication protocol to the Merlin Detector (MPX3) developed at DLS. Each command can be of type CMD, SET, GET, has a header with length information and a keyword and can also have arguments following the keyword.

In the over below a list of all possible commands are given including examples that can be copied for test purposes.

The first 14 characters of a command are used for the header:

```
                        1         2         3         4
XXXXXXXXXXXXXX12345678901234567890123456789012345678901
```

CMD commands

STARTACQUISITION

```
MPX,0000000021,CMD,STARTACQUISITION
```

STOPACQUISITION

```
MPX,0000000020,CMD,STOPACQUISITION
```

RESETSLOPESANDOFFSETS

Reset energy (keV) to chip setting calibration (DAC unit).

```
MPX,0000000026,CMD,RESETSLOPESANDOFFSETS
```

THSCAN

starts and stops the THSCAN

```
MPX,0000000011,CMD,THSCAN


MPX,0000000021,CMD,STOPEQUALIZATION
```

Get/set parameter commands

SOFTWAREVERSION

```
MPX,0000000020,GET,SOFTWAREVERSION
```

CONFIGFILE

Open a configuration file (.json) for the acquisition and chip settings

```
MPX,0000000071,SET,CONFIGFILE,/home/asi/TestData/51000108/20181025-eq-spm/
config.json
MPX,0000000015,GET,CONFIGFILE
```

EQUALIZATIONFILE

Upload pixel configuration to the detector based on the equalization files from the given server directory

```
MPX,0000000065,SET,EQUALIZATIONFILE,/home/asi/TestData/51000108/20181025-eq-spm
MPX,0000000021,GET,EQUALIZATIONFILE
```

SAVECONFIGS

Save acquisition and chip settings

```
MPX,0000000072,SET,SAVECONFIGS,/home/asi/TestData/51000108/eq-tmp-remove-tst/
mpx3.json
```

COLOURMODE

Not used for fine pitch assemblies

0=off, 1 is on

```
MPX,0000000017,SET,COLOURMODE,0
MPX,0000000015,GET,COLOURMODE
```

CHARGESUMMING

Requires both counters, relevant threshold is thh (thl1)

0=off, 1 is on

```
MPX,0000000020,SET,CHARGESUMMING,1
MPX,0000000018,GET,CHARGESUMMING
```

GAIN

(0,1,2,3) corresponds to super low, low, high, super high

```
MPX,0000000011,SET,GAIN,1
MPX,0000000009,GET,GAIN
```

CONTINUOUSRW

0=off/SRW, 1 is on/CRW
```
MPX,0000000019,SET,CONTINUOUSRW,1
MPX,0000000017,GET,CONTINUOUSRW
```

ENABLECOUNTER1

This is for acquiring with two thresholds and for CSM (in SRW).
```
MPX,0000000021,SET,ENABLECOUNTER1,1
MPX,0000000019,GET,ENABLECOUNTER1
```

COUNTERDEPTH

1,6,12,24 for SRW
1,6,12 for CRW
```
MPX,0000000020,SET,COUNTERDEPTH,12
MPX,0000000017,GET,COUNTERDEPTH
```

ACQUISITIONTIME

frame acquisition time, shutter open time SRW (in ms)
```
MPX,0000000025,SET,ACQUISITIONTIME,1000
MPX,0000000020,GET,ACQUISITIONTIME
```

ACQUISTIONPERIOD

full acquisition period, shutter open and close tine in SRW, frame time in CRW (in ms)
```
MPX,0000000027,SET,ACQUISITIONPERIOD,1002
MPX,0000000022,GET,ACQUISITIONPERIOD
```

NUMFRAMESTOACQUIRE
```
MPX,0000000027,SET,NUMFRAMESTOACQUIRE,100
MPX,0000000023,GET,NUMFRAMESTOACQUIRE
```

TRIGGERMODE

Trigger modes to control the shutter by software or external trigger:
0 = auto, 1 = postive ext, 2 =negative ext, 3 = positive ext timer, 4 = negative ext timer, 5 = positive ext counter
```
MPX,0000000018,SET,TRIGGERMODE,0
MPX,0000000016,GET,TRIGGERMODE
```

INHIBITSHUTTER

Allows inhibit shutter trigger signal to temporary stop counting within an acquisition
```
0 = off, 1=on
MPX,0000000021,SET,INHIBITSHUTTER,0
MPX,0000000019,GET,INHIBITSHUTTER
```

CHIPTEMPERATURE, FPGATEMPERATURE, BOARDTEMPERATURE, HUMIDITY

get the humidity (%) and temperatures (deg C)
```
MPX,0000000020,GET,CHIPTEMPERATURE
MPX,0000000020,GET,FPGATEMPERATURE
MPX,0000000021,GET,BOARDTEMPERATURE
MPX,0000000013,GET,HUMIDITY
```

THRESHOLD0-7

set thl in keV for fine pitch assembly only th0 and th1 are relevant,
requires SLOPE and OFFSET parameters to be set first based on a threshold calibration

```
MPX,0000000018,SET,THRESHOLD0,10
MPX,0000000018,SET,THRESHOLD1,10
MPX,0000000018,SET,THRESHOLD2,10
MPX,0000000018,SET,THRESHOLD3,10
MPX,0000000018,SET,THRESHOLD4,10
MPX,0000000018,SET,THRESHOLD5,10
MPX,0000000018,SET,THRESHOLD6,10
MPX,0000000018,SET,THRESHOLD7,10
MPX,0000000015,GET,THRESHOLD0
MPX,0000000015,GET,THRESHOLD1
MPX,0000000015,GET,THRESHOLD2
MPX,0000000015,GET,THRESHOLD3
MPX,0000000015,GET,THRESHOLD4
MPX,0000000015,GET,THRESHOLD5
MPX,0000000015,GET,THRESHOLD6
MPX,0000000015,GET,THRESHOLD7
```

THRESHOLD0-7CHIP

set thresholds in dac units (from 0 to 511) per chip

```
MPX,0000000031,SET,THRESHOLD0CHIP,0,42.000000
MPX,0000000032,SET,THRESHOLD1CHIP,0,044.000000
MPX,0000000031,SET,THRESHOLD0CHIP,1,42.000000
MPX,0000000032,SET,THRESHOLD1CHIP,1,044.000000
MPX,0000000031,SET,THRESHOLD0CHIP,2,42.000000
MPX,0000000032,SET,THRESHOLD1CHIP,2,044.000000
MPX,0000000031,SET,THRESHOLD0CHIP,3,42.000000
MPX,0000000032,SET,THRESHOLD1CHIP,3,044.000000
MPX,0000000021,GET,THRESHOLD0CHIP,0
MPX,0000000021,GET,THRESHOLD0CHIP,1
MPX,0000000021,GET,THRESHOLD0CHIP,2
MPX,0000000021,GET,THRESHOLD0CHIP,3
MPX,0000000021,GET,THRESHOLD1CHIP,0
MPX,0000000021,GET,THRESHOLD2CHIP,0
MPX,0000000021,GET,THRESHOLD3CHIP,0
MPX,0000000021,GET,THRESHOLD4CHIP,0
MPX,0000000021,GET,THRESHOLD5CHIP,0
MPX,0000000021,GET,THRESHOLD6CHIP,0
MPX,0000000021,GET,THRESHOLD7CHIP,0
```

SLOPE, OFFSET

for example for chip 0: TH 50 = 10 keV , TH 90 = 10 keV:

```
MPX,0000000017,SET,SLOPE,0,0.25
MPX,0000000018,SET,OFFSET,0,-2.5
```

get slope and offset for chip 1

```
MPX,0000000012,GET,SLOPE,1
MPX,0000000013,GET,OFFSET,1
```

DOEQUALIZATION

Perform noise edge pixel to pixel equalization, expert function, the folder should exist

```
MPX,0000000038,SET,DOEQUALIZATION,/home/asi/TestData
```

MASKPIXEL, UNMASKPIXEL

(Un)Mask pixel (x,y)
```
MPX,0000000022,SET,MASKPIXEL,194,255
MPX,0000000024,SET,UNMASKPIXEL,194,255
```

FILEDIRECTORY

Read back and set the server file directory
```
MPX,0000000018,GET,FILEDIRECTORY
MPX,0000000045,SET,FILEDIRECTORY,/home/asi/projects/mpx3gui
```

FILEENABLE

Enable file saving

```
MPX,0000000017,SET,FILEENABLE,1
```

THSCAN, THSTART, THSTOP, THSTEP, THFRAMES, THPATH

Commands to perform threshold scanning.
```
MPX,0000000013,SET,THSCAN,0
MPX,0000000011,GET,THSCAN
MPX,0000000015,SET,THSTART,40
MPX,0000000012,GET,THSTART
MPX,0000000014,SET,THSTOP,80
MPX,0000000011,GET,THSTOP
MPX,0000000013,SET,THSTEP,1
MPX,0000000011,GET,THSTEP
MPX,0000000015,SET,THFRAMES,1
MPX,0000000013,GET,THFRAMES
MPX,0000000038,SET,THPATH,/home/asi/projects/mpx3gui
MPX,0000000011,GET,THPATH
```

SERVERSTATUS
```
MPX,0000000017,GET,SERVERSTATUS

returns:
MPX,0000000021,GET,SERVERSTATUS,0,0 If server is free.
MPX,0000000023,GET,SERVERSTATUS,101,0 server is busy with taking data
MPX,0000000023,GET,SERVERSTATUS,102,0 Server is busy with equalization
MPX,0000000023,GET,SERVERSTATUS,103,0 Server is busy with DAC scanning
MPX,0000000023,GET,SERVERSTATUS,104,0 Server is busy with threshold scanning
```

Not implemented

Commands below are defined but not implemented in the MPX3 server

```
MPX,0000000023,SET,OPERATINGENERGY,10
MPX,0000000020,GET,OPERATINGENERGY
MPX,0000000015,SET,PROFILES,0
MPX,0000000013,GET,PROFILES
```

Camera busy example

```
asi@cube1:~/dexter/mpx3gui$ nc localhost 6351
```

Camera is not busy

MPX,0000000017,GET,SERVERSTATUS

```
MPX,0000000021,GET,SERVERSTATUS,0,0
```

Camera is taking data

```
MPX,0000000017,GET,SERVERSTATUS
MPX,0000000023,GET,SERVERSTATUS,101,0
```

Camera is taking data and server returns an error code

```
MPX,0000000015,GET,THRESHOLD0
MPX,0000000020,GET,THRESHOLD0,,101
```