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TORRENT
Software User Manual
borg & ***mborg***
Program Design

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1.0 Introduction

This document describes the usage and design of the Torrent ***b***asic ***o***perator ***r***esponse **g**ui or ***borg*** and the ***mborg*** engineering user interface software. These programs are designed to control a Torrent or MONSOON DHE in a safe manner and to allow the user to take data without having to learn a large number of commands.

The ***borg*** is intended for observers or instrument installers. It provides little in the way of engineering level access to the Torrent system attributes.

The ***mborg*** on the other hand is intended as an engineering tool useful for board testing, system diagnoses and focal plane optimization. Both systems use the automated configuration tools inherent in the Torrent system software design.

1.1 Starting the *borg* or *mborg*

The command to start the *borg* or *mborg* is run in a tcsh Linux shell. The commands include a number of parameters all of which have defaults. The command pattern for the *borg* is:

```
borg -fpType fptype -sysName name -dhsName dhs -stdout –panName
```

The command pattern for the *mborg* is:

```
mborg -fpType fptype -sysName name -dhsName dhs -stdout –panName
```

The "-name" values are parameter flags. The meaning and default values for the flags are as follows:

- fpType – is followed by the focal plane type, currently IR or OUV. The default is OUV.

- sysName – is followed by the name of the focal plane to be run. This may be an instrument or focal plane name such as sta2, basicCCD, genCCD_mosaic, and so forth, that have been previously configured using the torrent tools or a MONSOON configuration. The default is genericCCD.

- panName – is followed by the network name of the PAN machine attached to the DHE. names such as hamster, ctiola.ctio.noao.edu, decapod, and so forth are acceptable as long as the machine running the *borg* can locate the PAN by that name. The default is localhost.

- dhsName – followed by the name of the DHS system or DHS computer on which images will be stored. DHS systems are localFITS & imgSrvr. These select the machine to use automatically. DHS computer names can be any machine running the associated DHE system. A straight machine name like newfirmDhs1-4m will select the dheNETW system. Machine names with :8386 appended as in big-boy:8386 will select the LabNetDhs system and start the dhs server on the named machine. The default is localFITS.

- -stdout – allows error and diagnostic messages to be displayed in the startup xterm. The default is True.

Parameter Flags must either be present and followed by a value or be missing in which case the default is used.

It is likely that a number of aliases have been provided to allow startup of the programs without having to type the full set of parameters. The command:

```
basicCCD decapod
```

will start the sample CCD system as if you typed the command:

```
borg -fpType OUV -sysName basicCCD –dhsName big-boy:8386 –panName decapod –stdout
```

Setting up these aliases is explained in Section 1.4.

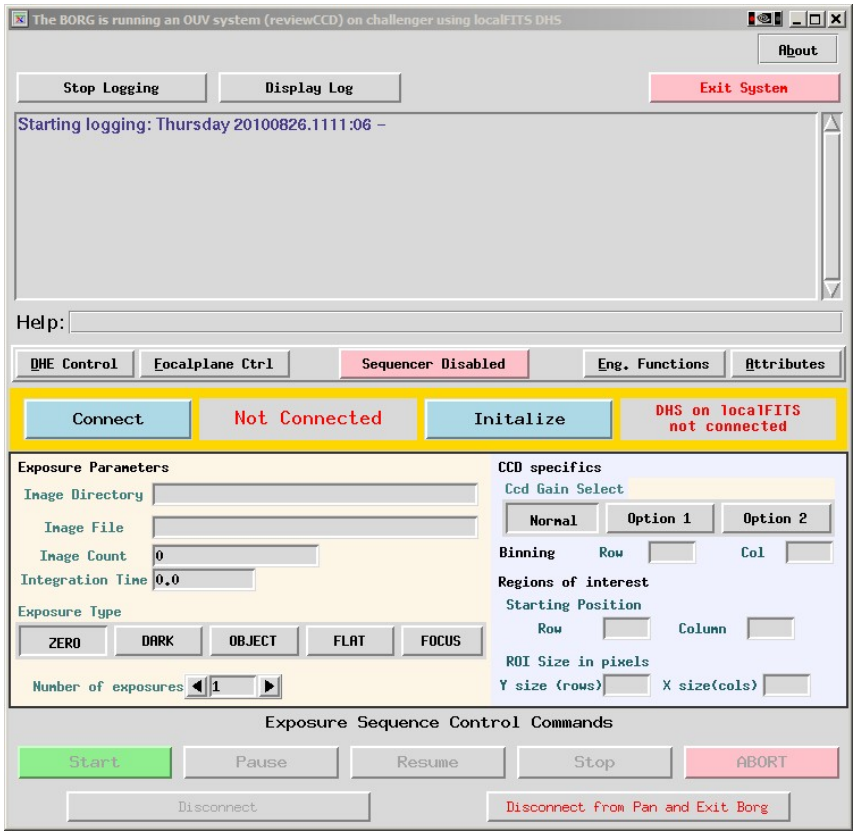
2.0 Using the Basic Functionality of the *borg* or *mborg*

Once the command is typed in and the <Return> or <Enter> key is pressed, a number of windows should appear. The first is the "Welcome" window as shown in Figure 1.

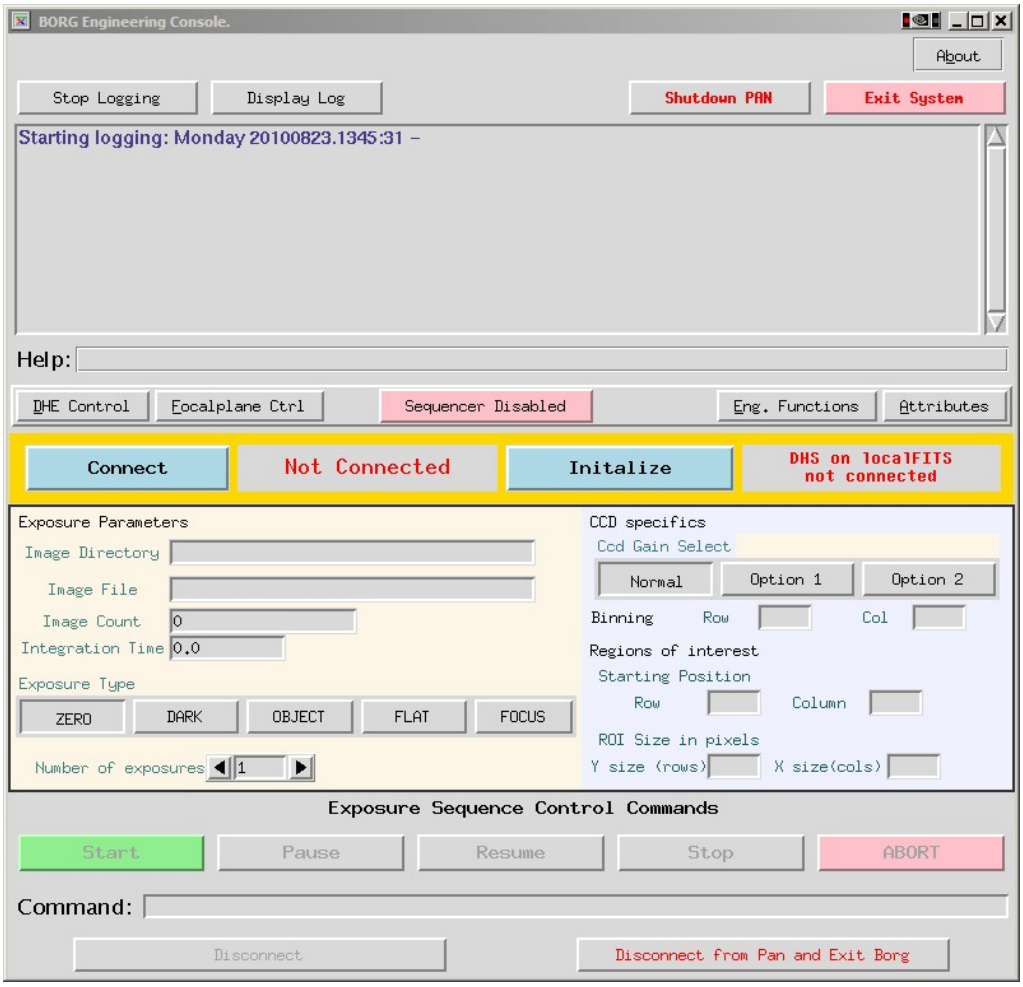
borg Welcome Window
Figure 1

mborg Welcome window
Figure 2

Following the "Welcome" window, the program brings up either the *borg* or *mborg* GUI control window shown in Figures 3 and 4. There are minor differences between the two GUIs. The *mborg* has a command line and a button that shuts down the PAN processes without shutting down the *mborg*. The *mborg* allows the user complete access to the attributes. See section TBD. The *borg's* access to the attributes is read only except for a restricted subset. The *borg* only allows the user to set attributes using the pre packaged ".mod' or mode files. The various controls are explained in the following sections.



borg Control GUI
Figure 3

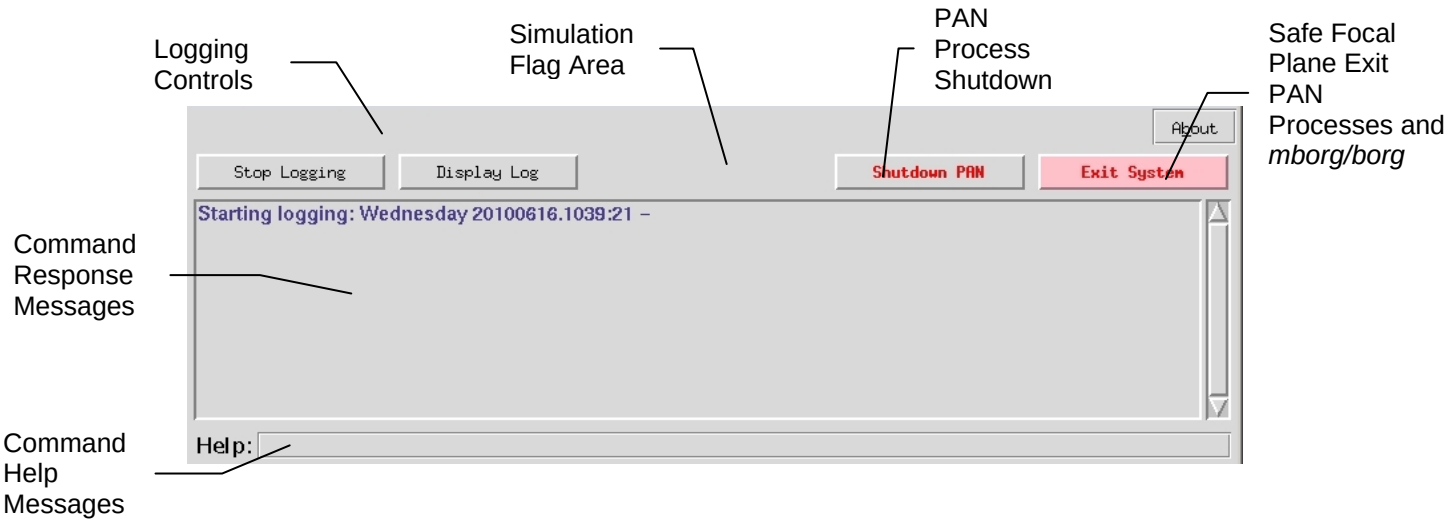


mborg Control GUI
Figure 4

2.1 Top Buttons and Status Fields and Help.

Figure 5 shows a view of the top control buttons for the ***mborg*** and ***borg***.

The “About” button gives information about the GUI program and who to contact in case of problems. The “Stop Logging” button turns off the command logging feature of the GUI. The “Display Log” button brings up a dialog box that allows the user to review the logs for the current session.

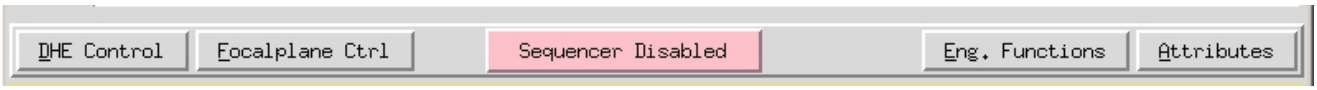


Shutdown and Exit Controls, Status Fields, Help and Logging Controls
Figure 5

NOTE: The log is kept as a running commentary until the file is removed This means the latest portion of the log will be at the end of the file. Each restart of the *borg* prints a "Starting Logging" message with the data and time in the message.

2.2 Menu Bar

Figure 6 shows the MONSOON menu Bar. This is a place holder for four menus and a control button. The control button indicates and controls the state of the DHE sequencer. When pink, as in Figure 6, the sequencer is disabled and exposures are locked out, (the exposure "START" is disabled). When green as in Figure 7 the sequencer is running and data taking is enabled.

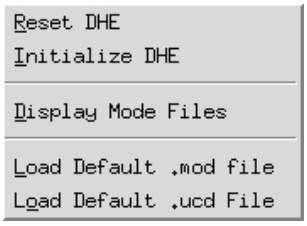


MONSOON Menu Bar
Figure 6

Sequencer Enabled Ready to Take Data
Figure 7

The other buttons on the menu bar bring up various control menus that allow the user to perform various tasks

2.2.1 DHE Control Menu



The DHE control menu, shown at left, allows the user to interact with the DHE to do the following:

Reset DHE – sends the resetDHE and asyncResp messages to the PAN which then resets the DHE and enables the communications with the asyncResp.

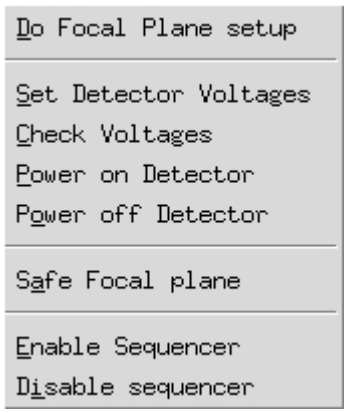
Initialize DHE – sends the PAN the command to reload the sysName.ini file.

Display Mode Files – displays all mode (".mod") files in the _sysName directory and allows the user to select a file to load.

Load Default .mod File – causes the PAN to load the .mod file named by the modeFname attribute, usually _sysName/sysName_DefaultSetup.mod.

Load Default .ucd File – causes the PAN to download the .ucd file named by the dwnLdFname attribute, usually _sysName/sysName_Sequencer.ucd.

2.2.2 Focalplane Ctrl Menu



The Focalplane Ctrl menu, shown at left, allows the user to interact with the focal plane attributes in the DHE. These attributes control the voltage levels for low and high voltage biases and clocks and determine if the detectors should be powered up.

Do Focal Plane setup – sets up the detector according to the values in various mod files. This procedure loads the detector voltages from the *sysName/sysName*setVoltages.mod file then runs the ppxGetState command to check if the voltages set to the requested values. Then it loads the powerUpCCD.mod file, followed by ppxGetState again. If either ppxGetState fails, the user is given an opportunity to stop the process or continue.

Set Detector Voltages - This procedure loads the detector voltages from the *sysName/sysName*setVoltages.mod file.

Check Voltages - runs the ppxGetState command to check if the voltages set to the requested values.

Power On Detectors – loads the PowerUpCCD.mod file that should enable the clock and bias outputs to the detector and start the sequencer.

Power Off Detectors – loads the PowerDnCCD.mod file that should disable the clock and bias outputs to the detector and halt the sequencer.

Safe Focal plane – a procedure that loads the safeFP.mod file. This may be the same as PowerDnCCD.mod depending on the requirements of the individual CCD.

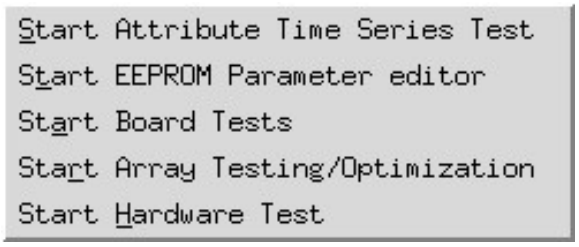
Enable Sequencer – enables the microcode sequencer.

Disable Sequencer – disables the microcode sequencer.

These two buttons serve the same purpose as the Sequencer button on the menu bar.

2.2.3 Engineering Functions Menu

The Engineering function menu, shown beloe, provides access to several engineering control and test routines designed for Torrent and the *mborg* and *borg*. These routines would not normally be run during an observing run. In the *borg* these routines are password protected to avoid making changes to the detector setup during normal operations.



Start Attribute Time Series Test – Pops up a dialog that allows you to choose an input file with a list of attributes to read (one per line); an output file name for the results of the test and the total time of the test in minutes and the sample period in seconds.

(The following tests are not yet implemented!z)

Start EEPROM parameter editor – starts the EEPROM editor running and allows hand editing of the contents of any of the five EEPROMS in the system. (**Tricky**).

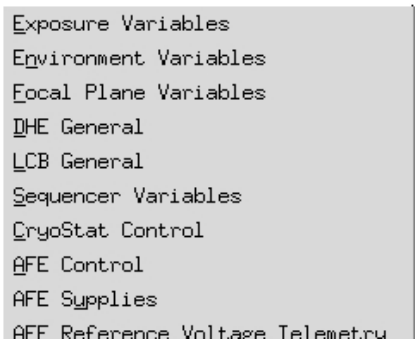
Start Dark Current Test – a pre-canned test to determine the dark current using the current setup and microcode.

Start Noise Test - a pre-canned test to determine the system noise using the current setup and microcode.

Start PTC Test - a pre-canned test to determine a photon transfer curve for the system.

Start full MEC – (*borg only*) on entering the engineering password selecting this alternative will put the *borg* into engineering mode. That is, it will act like the *mborg* with all functionality available.

2.2.4 Attributes Menu

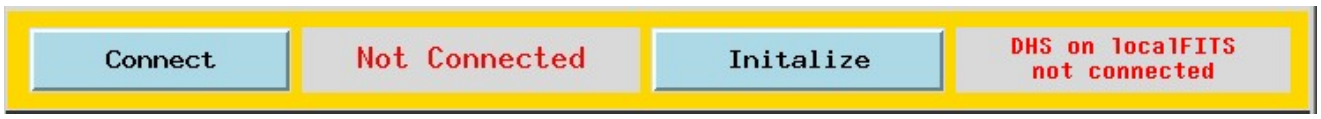


The Attributes menu, partially shown at left, provides the user with a method to view the settings of attributes in the system. The attributes are arranged in pages. In the *borg* the user can modify attribute values and save those changes to the _sysName directory with the name of the page as the name of the file. Each page also allows individual control over every attribute.

In the *borg* the user can view and review the attributes but the user cannot make changes except by loading a mode file to change to a different mode. If the user selects the ***Eng, Functions*** menu and enters the correct password, the user may activate the full *mborg* control of the Attribute pages by selecting the ***Start full MEC*** button.

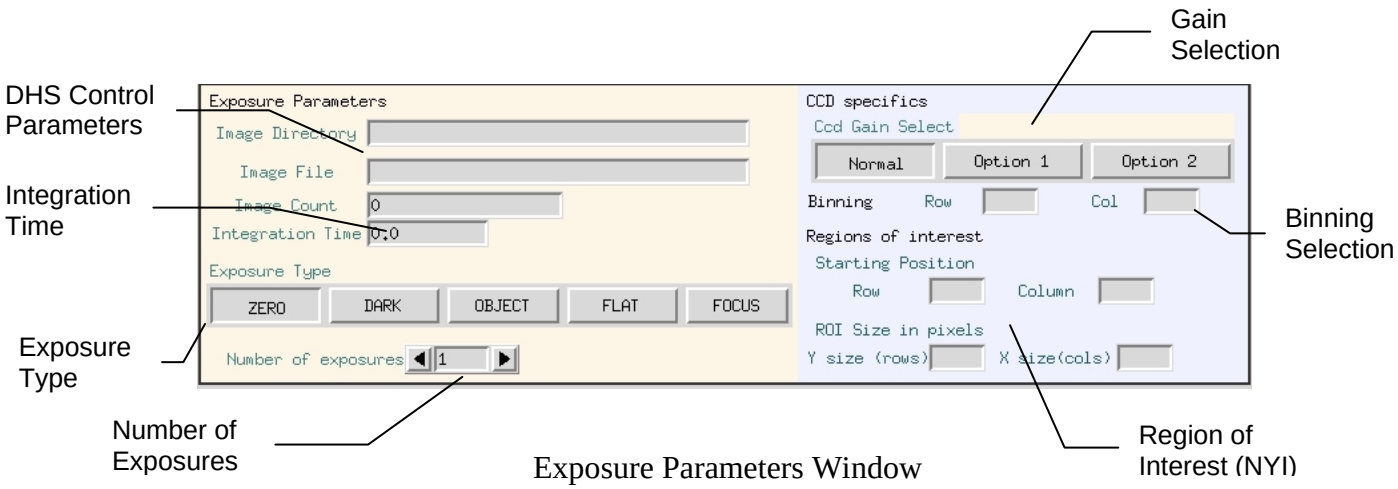
2.3 Connect and Initialize

When the *borg* or *mborg* start up they are not connected to a PAN or DHE. The "Connect & Initialize" button in the connection pane shown in Figure 8 is used to do this. Figure 8 shows the pane at startup indicating the *borg/mborg* is not connected to the PAN/DHE or the DHS system



Connection Pane
Figure 8

Connection Pane after Connection
Figure 9



Exposure Parameters Window
Figure 10

2.4 Exposure Parameters

The Exposure Parameters pane gives the user control over the standard exposure parameters allowing the user extensive control over the image acquisition system. See Figure 10.

DHS parameters - tell the DHS which directory to use for the images and the base name of the files. The image count is appended to the base name. If required to ensure a unique name a letter may be appended to the base name after the image count.

Integration time – the requested exposure time in seconds for any subsequent exposures.

Region of interest (NYI)

Exposure Type - the exposure type of any subsequent exposures.

- Zero – a zero second exposure, shutter does not open and the detector reads out immediately.
- Dark – an exposure of integration time seconds during which the shutter stays closed.
- Object - a normal shutter open, integrate, shutter close, detector readout exposure.
- Flat – same as object but intended as a calibration frame.
- Focus – a focus sequence; integrate then shift N rows (given by the focus shift attribute), repeated M times then a final shift N rows and integrate before reading out the entire detector. (requires multiple startExp commands with expVector = 8 and a final startExp with expVector = 16).

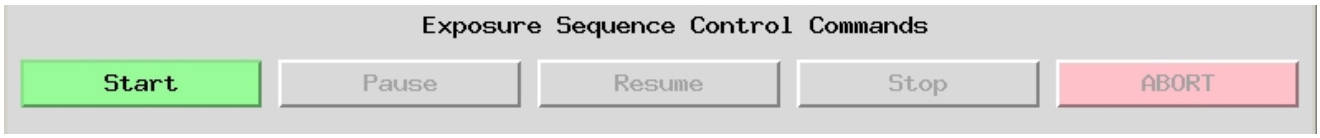
Gain Selection – provision is made for three gain selections: a normal readout gain; a low noise gain and a large signal gain. The help field gives the readout time, electrons per adu and electrons to saturation for each gain choice.

Binning – allows the user to select the binning in the row and column directions. If no binning is selected for either the detector will be binned 1x1. If no binning is selected for one of rows or columns the binning will default to NxN where N is the binning selected for the other direction. This only occurs if one of the fields is blank.

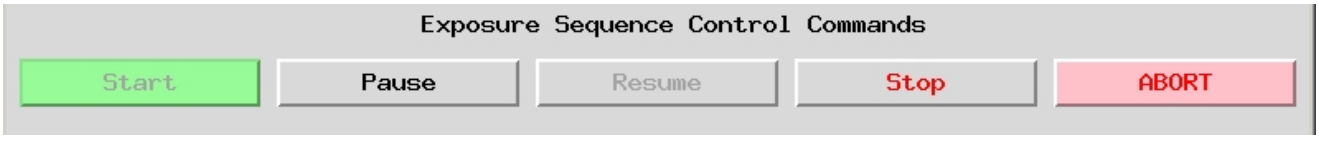
Region of interest – allows the user to select a portion of the focal plane to readout. (Not Yet Implemented)

2.5 Exposure Control

The Exposure Sequence Controls allow the user to start an exposure sequence by pressing the **Start** button. See Figure 11. This will start the first exposure of the sequence. The control buttons will change state so that the Pause, Stop and Abort buttons are enabled. See Figure 12.



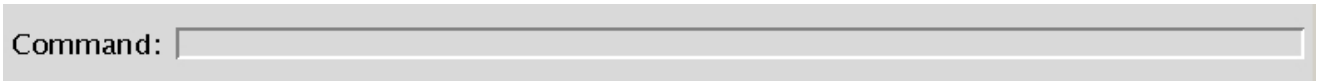
Exposure Sequence Controls Idle
Figure 11



Exposure Sequence Controls During an Exposure
Figure 12

2.6 Command Line (*mborg* only)

The *mborg* provides the user with an extra level of control over the DHE and focal plane. In addition to the standard control methods, the user may use the command line to issue any standard ppx command to the DHE. This is done by typing the command into the command line field. See Figure 13.



mborg COMMAND line
Figure 13

2.7 Exit *borg* or *mborg*

For various reasons the user might want to shut down and exit the *borg* or *mborg* while leaving the PAN processes running. This is accomplished using the Exit button at the bottom of the GUI. See Figure 14.

Disconnect and Exit
Figure 14

3.0 Creating System Command Aliases

Since the command line for the mborg and borg are long, it is best to create an alias to avoid mistakes. The command to run the basicCCD focal plane might look like this:

```
mborg –fpType OUV –sysName basicCCD –panName hudson –dhsName localFITS &
```

creating an alias for the command can make it significantly easier to type in tcsh a line in the .cshrc file like this:

```
alias basicCCD "/bin/mborg –fpType OUV –sysName basicCCD –panName \!:1 –dhsName localFITS"
```

would allow the user to start the basicCCD system on any pan with the command

`basicCCD hudson -` or - `basicCCD noaoAb`

4.0 *borg* and *mborg* Software Design

4.1 Startup Script

4.2 *borg* and *mborg* GUI Object

4.3 PMW Modules and Extensions

4.3.1 StatusLogs.py

4.3.2 mnsnMenuBars.py

4.3.3 category.py

4.4 Monsoon/Torrent Python Modules

4.4.1 panCtrlr.py

4.4.2 fpCtrlGui.py

4.4.3 brgParser

4.5 Attribute Display Modules

4.5.1 prsCvsFileByElement.py

4.5.2 prsGuiAttributes.py

4.5.3 prsGuiFileByCategory.py

4.6 Miscellaneous Modules

4.6.1 mnsnCommon.py

4.6.2 mnsnExceptions.py

4.6.3 mnsnGuiFuncs.py

4.6.4 mnsnFuncs.py

4.6.5 TorrentTests.py

Appendix I Creating a SystemAttribGui.csv file.

Starting the borg or borgMec (hereafter called "the ***GUI***") consists of typing a command line or alias command. The undelying command looks like:

```
borgMec -fpType OUV -sysName mosaic -dhsName localFITS –panName mosaicpan
```

or

```
borg -fpType OUV -sysName mosaic -dhsName localFITS –panName mosaicpan
```

The attribute display pages for the ***GUI*** are created when the ***GUI*** starts up. The ***GUI*** program reads a file from the named PAN called ${MONSOONHOME}/cfg/*_sysName*/ *sysName*AttribGui.csv, where *sysname* in the example case would be mosaic. The contents of this file are a list of the pages and attributes to be displayed when the user wants to review the attribute values while using the ***GUI.***

I.1 AttribuGui.csv File Structure

The *sysName*AttribGui.csv file consists of lines of several types. The line types and some examples and described below.

I.1.1 Comment lines

Comment lines are ignored by the GUI when it reads in the description file.

```
Structure:
   # This is a Comment line
   # Another comment showing the line can contain special Characters %^@&#^
```

I.1.2 Page Description Lines

Page description lines describe the name and number of an attribute display page. These lines consist of an exclamation point (!) followed by two fields; the page name and the page number separated by a comma. The page name may contain any printable ASCII character except a comma, newline (\n) or carrige return (\r). Page Description lines also delineate the boundries of pages. All Label and Attribute-Value lines in the file after a Page Description line are placed on the page described. When a new Page Description line appears in the file the Label and Attribute-Value lines following that line will appear in the new Page.

Structure:

```
!AFE-1 Clocks,14
!AFE Reference Voltage Telemetry,10
```

I.1.3 Label Description Lines

Label description lines give the user an opportunity to put labels in attribute pages to make the attribute display more informative. Labels can be used to group attributes, to put headings on columns of attributes or to provide help for complex attributes. Labels consist of an "at" (@) symbol followed by the label text, the line number, column number and number of columns to span for the Label.

Structure:

```
@LOW_RAILS,3,1,2
@Bits 0-3 activate Afe1 Biases; 4-7 Afe2 Biases,1,3,4
@AFE1 BIAS VOLTAGES,3,1,6
```

The following example page shows how these might appear on an attribute page.

AFE BIAS Voltage Display							GUI Page 10
biasEnbl	0x00F0	Bits 0-3 activate Afe1 Biases; 4-7 Afe2 Biases					
AFE1 BIAS VOLTAGES							
Low_V BIASES		LV BIAS TELEMETRY		High_V BIASES		HV BIAS TELEMETRY	
afe1LVBias[0]	11.2	afe1LVBiasTel[0]	11.156	afe1HVBias[0]	27.4	afe1HVBiasTel[0]	27.224
afe1LVBias[1]	17.5	afe1LVBiasTel[1]	17.443	afe1HVBias[1]	-3.5	afe1HVBiasTel[1]	-3.499
afe1LVBias[2]	17.5	afe1LVBiasTel[1]	17.543	afe1HVBias[2]	-3.5	afe1HVBiasTel[2]	-3.499

Example Page Display GUI Page 10
Figure 15

Labels can contain any printable ASCII character except a comma, newline (\n) or carrige return (\r).
Note: For this example the column widths have been modified to fit the page. In actual use the column widths are determined by the size of the longest text in the column.

I.1.4 Attribute-Value Description Lines

Attribute-Value description lines describe the placement of the various attributes on the page. All Attribute-Value lines are placed on the page whose Page Description line they follow. The inclusion of a new Page Description line in the file terminates the previous page and additional Attribute-Value lines are placed on the new page. Attribute-Value description lines consist of an Attribute name (as it appears in the *system*_Config.csv file), a line on the page, the column to start the display and the number of columns to span for the display. The structure examples below would result in the display of the example page in Figure 15.

Structure:

```
afe1LVBias[0],5,1,1
afe1LVBiasTel[0],5,3,1
afe1HVBias[0],5,5,1
afe1HVBiasTel[0],5,7,1
afe1LVBias[1],6,1,1
afe1LVBiasTel[1],6,3,1
afe1HVBias[1],6,5,1
afe1HVBiasTel[1],6,7,1
afe1LVBias[2],7,1,1
. . .
```

A full example of the portion of the Description file that results in the page shown in Figure 15 is included in Appendix I.

I.2 Row/Column Descriptions

The row and column descriptions used in the description correspond to the usage in the Tk/tkInter grid geometry manager. However rows and columns are numbered starting with 1 not 0. Skipped rows and columns will result in a small gap in the display. If a larger gap is desired a Label description with a single space for the content should result in a space the size of other rows/columns in the page.

Structure:

```
@ ,3,1,6
```

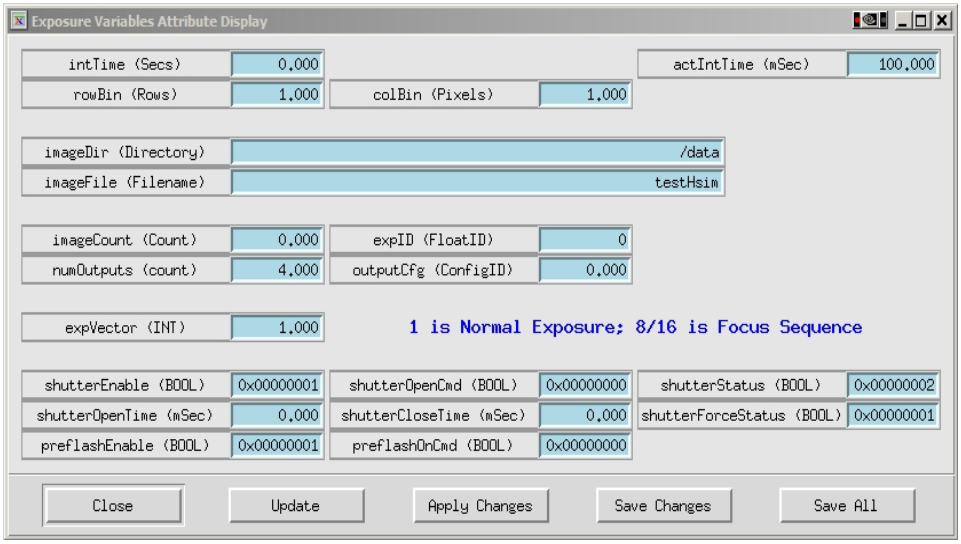
This will result in a blank row the height of other rows in the page.

I.3 Example GUI Page and Description.

The following are the description lines for a page of the engineering attribute display shown in Figure 16.

```
#gui description file
# page name and number
!Exposure Variables,1
#Attribute name, row, column, colSpan
intTime,1,1,1
actIntTime,1,3,1
rowBin,2,1,1
colBin,2,2,1
@ ,3,1,1
imageDir,4,1,3
imageFile,5,1,3
@ ,6,1,1
imageCount,7,1,1
expID,7,2,1
numOutputs,8,1,1
outputCfg,8,2,1
@ ,9,1,1
```

```
expVector,10,1,1
@1 is Normal Exposure; 8/16 is Focus Sequence,10,2,2
@ ,11,1,1
shutterEnable,12,1,1
shutterOpenCmd,12,2,1
shutterStatus,12,3,1
shutterOpenTime,13,1,1
shutterCloseTime,13,2,1
shutterForceStatus,13,3,1
preflashEnable,14,1,1
preflashOnCmd,14,2,1
```



Exposure Variables Attribute Display
Figure 16

Appendix II Engineering GUI Categories

The GUI category pages for the Torrent engineering systems are fixed by agreement in the FPGA comments that are used to create the ".cfg" and "tmplt.csv" files. Table 1 shows the agreed categories and which attribute types should be included on each page.

Table 1 – Engineering GUI Categories

GUI Category	Page No.	Types of Attributes on Page
None	0	Attributes that should not be displayed
Exposure	1	Variables directly related to exposures (usually software vars)
Environment	2	Directory and file names,
Focal_Plane	3	Focal plane and detector information
DHE_General	4	CodeId, module Id, module reset, board Temps, Synv/slave control, I/O Status Reg, fpdpStatus, watchdog Ctrl
LCB_General	5	CodeId, module Id, module reset, I/O Status Reg,
Sequencer	6	Enables, Loop Res, values for LCB sequencer variables
Cryostat_Control	7	Temperature and heater control variables
AFE_Control	8	CodeId, module Id, module reset, I/O Status Reg
AFE_Supplies	9	Values and telemetry for AFE supply voltages
AFE_ Reference_Tel	10	Values and telemetry for Ref voltages on AFE
AFE_Clock_Voltages	11	Clk_LoRail, clk_HiRail, clkBit, ClkTelemetry
AFE_Bias_Voltages	12	LV_Bias, LV_Bias_Tel, HV_Bias, HV_Bias_Tel
AFE_Video_Control	13	Video configuration, Data registers, Offset voltage settings, ctcTrigger, chnlSrcSlct
PSM_Control	14	CodeId, module Id, module reset, I/O Status Reg
PSM_Sync_Control	15	Enables, values for PSM synchronization
PSM_Servo_Control	16	Enables, values for PSM Servos
PIX_Services_Control	17	CodeId, module Id, module reset, I/O Status Reg, buffer addresses, descrambling info
CFG_Services_Control	18	CodeId, module Id, module reset I/O Status Regs, EEPROM control and read/write registers
Diagnostics	19	Misc temporary diagnostic attributes
LCB_Misc	20	LCB Attributes with incomplete FPGA comment lines
PSM_Misc	21	PSM Attributes with incomplete FPGA comment lines
CFG_Misc	22	CFG Attributes with incomplete FPGA comment lines
PIX_Misc	23	PIX Attributes with incomplete FPGA comment lines
AFE_Misc	24	AFE Attributes with incomplete FPGA comment lines
Misc_Misc	25	Other Attributes with incomplete FPGA comment lines

Table 2 – Exposure Variables

Exposure_Variables		GUI Page 1
integrationTime	actualIntegrationTime	
rowBin	colBin	
imageDir		
imageFile		
imageCount	expID	
numOutputs	outputCfg	
expMode	processMode	
shutterState		
shutterEnable	shutterOpenCmd	
preflashEnable	preflashOnCmd	
shutterStatus	shutterForceStatus	
shutterOpenTime	shutterCloseTime	
shutterForceStatus		

Table 3 - Environment Variables

Environment_Variables		GUI Page 2
modeFdir		
modeFname		
dwnLdFdir		
dwnLdFname		
arrFdir		
arrFname		
expFdir		
expFname		
idpFdir		
idpFname		
expVector	captureMode	
rawPxlSize	finPxlSize	
frmsPerRdOut	totFrames	
expStrtTime	expEndTime	
labSystem	finDataType	
asyncVector		
avNameSIze	avValueSize	
avCommentSize		

Table 4 – Focal Plane Variables

Focal_Plane_Variables	
arrayType	
pxlRows	pxlCols
mosaicRows	mosaicCols
imageRows	imageCols
arrayID[0]	arrayID[2]
arrayID[1]	arrayID[3]
pxlsPerImage	
preScan	
yPostScan	xPostScan
yStart[]	xStart[]
yStart[0]	xStart[0]
yStart[1]	xStart[1]
yStart[2]	xStart[2]
yStart[3]	xStart[3]
rdOutTime[]	
rdOutTime[0]	rdOutTime[3]
rdOutTime[1]	rdOutTime[4]
rdOutTime[2]	rdOutTime[5]

Table 5 – DHE General

DHE General		GUI Page 4
dheRstCmd	dheRebootCmd	
linkResetCmd		
tsmSiliconSerialNum		
tsmTemperature1	tsmTemperature2	
vp33Volts	vp33Amps	
watchDogEnable	watchDogDelay	
dheIsSlave	syncClkSelect	
dheSlaveClkSwitchEn	dheSlaveClkMode	
syncInEquailization	syncOutEquailization	
vFanEnable	dheTempSensorSlct	
dheServoEnable	dhePowerValue	
dheTempSetPoint	dheMarginSetPoint	
dheServoPwmValue	dheStbyPwmValue	
dheDerivativeGain	dheIntegratorGain	
dheProcessGain	dheProportionalGain	
dheErrorSignal	dheFilterDepth	
dheTimeConstant	dheServoTuneTemp	

Table 6 – LCB General

LCB General		GUI Page 5
lcbResetCmd	lcbRebootCmd	
lcbSiliconSerialNum		
lcbCodeId	lcbModuleID	
lcbTemperature1	lcbTemperature2	
lcbCtrlModInStatus	lcbCtrlModOutStatus	
fpdpLoopBackMode		
GIGeCmdCopyEn	GIGePortDisable	
uartCmdCopyEn	uartPortDisable	
syncCmdCopyEn	syncPortDisable	
fpdpCmdCopyEn	fpdpPortDisable	

Table 7 - Sequencer

Sequencer		GUI Page 6
sequencerEnable	mcbSeqEnable	
AfeCdsStateReg	AfeCdsSlctReg	
afeSeqStateReg		
mcbSeqPatMem	mcbSeqPgmMem	
seqCmds		
seqCmdReg	seqStatReg	
seqLoopReg[]		
seqLoopReg[0]	seqLoopReg[8]	seqUserBit[0]
seqLoopReg[1]	seqLoopReg[9]	seqUserBit[1]
seqLoopReg[2]	seqLoopReg[10]	seqUserBit[2]
seqLoopReg[3]	seqLoopReg[11]	seqUserBit[3]
seqLoopReg[4]	seqLoopReg[12]	seqUserBit[4]
seqLoopReg[5]	seqLoopReg[13]	seqUserBit[5]
seqLoopReg[6]	seqLoopReg[14]	seqUserBit[6]
seqLoopReg[7]	seqLoopReg[15]	seqUserBit[7]

Table 8 – CryoStat Control

CryoStat Cotrol		GUI Page 7
vHtrEnable	htrTempSetPoint	
htrTempSensorSlct	htrTimeConstant	
htrTemp1CountPeriod	htrTemp2CountPeriod	
htrTemp1OffsetValue	htrTemp2OffsetValue	
htrTemp1SlopeValue	htrTemp2SlopeValue	
htrTemp1Value	htrTemp2Value	
htrVoltsValue	htrAmpsValue	
htrVoltsOffsetValue	htrAmpsOffsetValue	
htrVoltsSlopeValue	htrAmpsSlopeValue	
htrVoltsSamplePeriod	htrAmpsSamplePeriod	
htrServoEnable	htrPowerValue	
htrMarginSetPoint	htrErrorSignal	
htrDerivativeGain	htrProcessGain	
htrFilterDepth	htrProportionalGain	
htrIntegratorGain	htrServoTuneTemp	
htrStbyPwmValue	htrServoPwmValue	

Table 9 – AFE Control

AFE_Control		GUI Page 8
afeResetCmd	afeRebootCmd	
afeCodeId	afeModuleId	
afeControlEnbl		
afeCtrlModInStatus	afeCtrlModOutStatus	
afeSeqStateReg (not Defined)	afeIfcEnbl (not Defined)	
afeTelScanEnbl	afeTelScanInt	
afeInitDacs		
afeCdsPortCfg	afeDacMonTrig	
afeSimDatType		
afe1SiliconSerialNum		
afe1Temperature1	Afe1Temperature2	
afe2SiliconSerialNum		
Afe2Temperature1	Afe2Temperature2	

Table 10 – AFE Supplies

AFE_Supplies		GUI Page 9
vn300Volts	vp300Volts	
v300PolaritySelect		
afe1Vn300Amps	afe2Vn300Amps	
afe1Vp300Amps	afe2Vp300Amps	
vn180Volts	vp180Volts	
afe1Vn180Amps	afe2Vn180Amps	
afe1Vp180Amps	afe2Vp180Amps	
vn80Volts	Vn80Amps	
vp80Volts	vp80Amps	
afe1V300Enable	afe2V300Enable	
afe1V180Enable	afe2V180Enable	
afe1V80Enable	afe2V80Enable	

Table 11 – AFE Ref Telemetry

AFE_Ref_Telemetry		GUI Page 10
AfeRefVolt[]		
AfeRefVolt[0]	AfeRefVolt[8]	
AfeRefVolt[1]	AfeRefVolt[9]	
AfeRefVolt[2]	AfeRefVolt[10]	
AfeRefVolt[3]	AfeRefVolt[11]	
AfeRefVolt[4]	AfeRefVolt[12]	
AfeRefVolt[5]	AfeRefVolt[13]	
AfeRefVolt[6]	AfeRefVolt[14]	
AfeRefVolt[7]	AfeRefVolt[15]	

Table 12 – AFE-1 Clocks

AFE-1 Clocks			**GUI Page 11**
afeClkStateReg	afeClkPortCfg	clkOutputEnblReg	afeClkEnbl
LOW_RAILS	HIGH_RAILS	CLK_STATE	CLOCK_TELM
afeClkLoRail[]	afeClkHiRail[]	afeClkState[]	afeClkRailTel[]
afeClkLoRail[0]	afeClkHiRail[0]	afeClkState[0]	afeClkRailTel[0]
afeClkLoRail[1]	afeClkHiRail[1]	afeClkState[1]	afeClkRailTel[1]
afeClkLoRail[2]	afeClkHiRail[2]	afeClkState[2]	afeClkRailTel[2]
afeClkLoRail[3]	afeClkHiRail[3]	afeClkState[3]	afeClkRailTel[3]
afeClkLoRail[4]	afeClkHiRail[4]	afeClkState[4]	afeClkRailTel[4]
afeClkLoRail[5]	afeClkHiRail[5]	afeClkState[5]	afeClkRailTel[5]
afeClkLoRail[6]	afeClkHiRail[6]	afeClkState[6]	afeClkRailTel[6]
afeClkLoRail[7]	afeClkHiRail[7]	afeClkState[7]	afeClkRailTel[7]
afeClkLoRail[8]	afeClkHiRail[8]	afeClkState[8]	afeClkRailTel[8]
afeClkLoRail[9]	afeClkHiRail[9]	afeClkState[9]	afeClkRailTel[9]
afeClkLoRail[10]	afeClkHiRail[10]	afeClkState[10]	afeClkRailTel[10]
afeClkLoRail[11]	afeClkHiRail[11]	afeClkState[11]	afeClkRailTel[11]
afeClkLoRail[12]	afeClkHiRail[12]	afeClkState[12]	afeClkRailTel[12]
afeClkLoRail[13]	afeClkHiRail[13]	afeClkState[13]	afeClkRailTel[13]
afeClkLoRail[14]	afeClkHiRail[14]	afeClkState[14]	afeClkRailTel[14]
afeClkLoRail[15]	afeClkHiRail[15]	afeClkState[15]	afeClkRailTel[15]

Table 13 – AFE-2 Clocks

AFE-2 Clocks			**GUI Page 12**
afeClkStateReg	afeClkPortCfg	clkOutputEnblReg	afeClkEnbl
LOW_RAILS	HIGH_RAILS	CLK_STATE	CLOCK_TELM
afeClkLoRail[]	afeClkHiRail[]	afeClkState[]	afeClkRailTel[]
afeClkLoRail[0]	afeClkHiRail[0]	afeClkState[0]	afeClkRailTel[0]
afeClkLoRail[1]	afeClkHiRail[1]	afeClkState[1]	afeClkRailTel[1]
afeClkLoRail[2]	afeClkHiRail[2]	afeClkState[2]	afeClkRailTel[2]
afeClkLoRail[3]	afeClkHiRail[3]	afeClkState[3]	afeClkRailTel[3]
afeClkLoRail[4]	afeClkHiRail[4]	afeClkState[4]	afeClkRailTel[4]
afeClkLoRail[5]	afeClkHiRail[5]	afeClkState[5]	afeClkRailTel[5]
afeClkLoRail[6]	afeClkHiRail[6]	afeClkState[6]	afeClkRailTel[6]
afeClkLoRail[7]	afeClkHiRail[7]	afeClkState[7]	afeClkRailTel[7]
afeClkLoRail[8]	afeClkHiRail[8]	afeClkState[8]	afeClkRailTel[8]
afeClkLoRail[9]	afeClkHiRail[9]	afeClkState[9]	afeClkRailTel[9]
afeClkLoRail[10]	afeClkHiRail[10]	afeClkState[10]	afeClkRailTel[10]
afeClkLoRail[11]	afeClkHiRail[11]	afeClkState[11]	afeClkRailTel[11]
afeClkLoRail[12]	afeClkHiRail[12]	afeClkState[12]	afeClkRailTel[12]
afeClkLoRail[13]	afeClkHiRail[13]	afeClkState[13]	afeClkRailTel[13]
afeClkLoRail[14]	afeClkHiRail[14]	afeClkState[14]	afeClkRailTel[14]
afeClkLoRail[15]	afeClkHiRail[15]	afeClkState[15]	afeClkRailTel[15]

Table 14 – AFE-1 Bias Voltages

AFE-1 Bias Voltages			
Afe1BiasEnbl			
LOW_V_BIASES	LV_BIAS_TEL	HIGH_V_BIASES	HV_BIAS_TEL
LV_Bias_Val[]	LV_Bias_Tel[]	HV_Bias_Val[]	HV_Bias_Tel[]
LV_Bias_Val[0]	LV_Bias_Tel[0]	HV_Bias_Val[0]	HV_Bias_Tel[0]
LV_Bias_Val[1]	LV_Bias_Tel[1]	HV_Bias_Val[1]	HV_Bias_Tel[1]
LV_Bias_Val[2]	LV_Bias_Tel[2]	HV_Bias_Val[2]	HV_Bias_Tel[2]
LV_Bias_Val[3]	LV_Bias_Tel[3]	HV_Bias_Val[3]	HV_Bias_Tel[3]
LV_Bias_Val[4]	LV_Bias_Tel[4]	HV_Bias_Val[4]	HV_Bias_Tel[4]
LV_Bias_Val[5]	LV_Bias_Tel[5]	HV_Bias_Val[5]	HV_Bias_Tel[5]
LV_Bias_Val[6]	LV_Bias_Tel[6]	HV_Bias_Val[6]	HV_Bias_Tel[6]
LV_Bias_Val[7]	LV_Bias_Tel[7]	HV_Bias_Val[7]	HV_Bias_Tel[7]
LV_Bias_Val[8]	LV_Bias_Tel[8]	HV_Bias_Val[8]	HV_Bias_Tel[8]
LV_Bias_Val[9]	LV_Bias_Tel[9]	HV_Bias_Val[9]	HV_Bias_Tel[9]
LV_Bias_Val[10]	LV_Bias_Tel[10]	HV_Bias_Val[10]	HV_Bias_Tel[10]
LV_Bias_Val[11]	LV_Bias_Tel[11]	HV_Bias_Val[11]	HV_Bias_Tel[11]
LV_Bias_Val[12]	LV_Bias_Tel[12]	HV_Bias_Val[12]	HV_Bias_Tel[12]
LV_Bias_Val[13]	LV_Bias_Tel[13]	HV_Bias_Val[13]	HV_Bias_Tel[13]
LV_Bias_Val[14]	LV_Bias_Tel[14]	HV_Bias_Val[14]	HV_Bias_Tel[14]
LV_Bias_Val[15]	LV_Bias_Tel[15]	HV_Bias_Val[15]	HV_Bias_Tel[15]

Table 15 – AFE-2 Bias Voltages

AFE-2 Bias Voltages			**GUI Page 14**
Afe2BiasEnbl			
LOW_V_BIASES	LV_BIAS_TEL	HIGH_V_BIASES	HV_BIAS_TEL
LV_Bias_Val[]	LV_Bias_Tel[]	HV_Bias_Val[]	HV_Bias_Tel[]
LV_Bias_Val[0]	LV_Bias_Tel[0]	HV_Bias_Val[0]	HV_Bias_Tel[0]
LV_Bias_Val[1]	LV_Bias_Tel[1]	HV_Bias_Val[1]	HV_Bias_Tel[1]
LV_Bias_Val[2]	LV_Bias_Tel[2]	HV_Bias_Val[2]	HV_Bias_Tel[2]
LV_Bias_Val[3]	LV_Bias_Tel[3]	HV_Bias_Val[3]	HV_Bias_Tel[3]
LV_Bias_Val[4]	LV_Bias_Tel[4]	HV_Bias_Val[4]	HV_Bias_Tel[4]
LV_Bias_Val[5]	LV_Bias_Tel[5]	HV_Bias_Val[5]	HV_Bias_Tel[5]
LV_Bias_Val[6]	LV_Bias_Tel[6]	HV_Bias_Val[6]	HV_Bias_Tel[6]
LV_Bias_Val[7]	LV_Bias_Tel[7]	HV_Bias_Val[7]	HV_Bias_Tel[7]
LV_Bias_Val[8]	LV_Bias_Tel[8]	HV_Bias_Val[8]	HV_Bias_Tel[8]
LV_Bias_Val[9]	LV_Bias_Tel[9]	HV_Bias_Val[9]	HV_Bias_Tel[9]
LV_Bias_Val[10]	LV_Bias_Tel[10]	HV_Bias_Val[10]	HV_Bias_Tel[10]
LV_Bias_Val[11]	LV_Bias_Tel[11]	HV_Bias_Val[11]	HV_Bias_Tel[11]
LV_Bias_Val[12]	LV_Bias_Tel[12]	HV_Bias_Val[12]	HV_Bias_Tel[12]
LV_Bias_Val[13]	LV_Bias_Tel[13]	HV_Bias_Val[13]	HV_Bias_Tel[13]
LV_Bias_Val[14]	LV_Bias_Tel[14]	HV_Bias_Val[14]	HV_Bias_Tel[14]
LV_Bias_Val[15]	LV_Bias_Tel[15]	HV_Bias_Val[15]	HV_Bias_Tel[15]

Table 16 – AFE Video

AFE Video			**GUI Page 15**
afeXferCfg			
afeRowIncVal	afeColIncVal		
afeChanSrcSlct[]	afeBufBaseAddr[]	afeCcdAmpCfg[]	
afeChanSrcSlct[0]	afeBufBaseAddr[0]	afeCcdAmpCfg[0]	
afeChanSrcSlct[1]	afeBufBaseAddr[1]	afeCcdAmpCfg[1]	
afeChanSrcSlct[2]	afeBufBaseAddr[2]	afeCcdAmpCfg[2]	
afeChanSrcSlct[3]	afeBufBaseAddr[3]	afeCcdAmpCfg[3]	
afeChanSrcSlct[4]	afeBufBaseAddr[4]	afeCcdAmpCfg[4]	
afeChanSrcSlct[5]	afeBufBaseAddr[5]	afeCcdAmpCfg[5]	
afeChanSrcSlct[6]	afeBufBaseAddr[6]	afeCcdAmpCfg[6]	
afeChanSrcSlct[7]	afeBufBaseAddr[7]	afeCcdAmpCfg[7]	
afe1VidOffVal[]	afe1OffDacTel[]		
afe1VidOffVal[0]	afe1OffDacTel[0]		
afe1VidOffVal[1]	afe1OffDacTel[1]		
afe1VidOffVal[2]	afe1OffDacTel[2]		
afe1VidOffVal[3]	afe1OffDacTel[3]		
afe2VidOffVal[]	afe2OffDacTel[]		
afe2VidOffVal[0]	afe2OffDacTel[1]		
afe2VidOffVal[1]	afe2OffDacTel[2]		
afe2VidOffVal[2]	afe2OffDacTel[3]		
afe2VidOffVal[3]	afe2OffDacTel[4]		

Table 17 – PSM Control

PSM_Control			**GUI Page 16**
psmResetCmd	psmRebootCmd		
psmCodeId	psmModuleID		
psmSiliconSerialNum			
psmSiSerialNum	psmSerNo		
psmTemperature1	psmTemperature2		
v80Enable	v180Enable	pixRateDivider	

Table 18 – PSM Sync Control

PSM_Sync_Control			**GUI Page 17**
v300SyncEnable	v300SyncDivider	v33SyncEnable	v33SyncDivider
	v300SyncMaxFreq		v33SyncMaxFreq
	v300SyncMinFreq		v33SyncMinFreq
	v300SyncPulseWidth		v33SyncPulseWidth
v180SyncEnable	v180SyncDivider	logicSyncEnable	logicSyncDivider
	v180SyncMaxFreq		logicSyncMaxFreq
	v180SyncMinFreq		logicSyncMinFreq
	v180SyncPulseWidth		logicSyncPulseWidth
v80SyncEnable	v80SyncDivider		
	v80SyncMaxFreq		
	v80SyncMinFreq		
	v80SyncPulseWidth		

Table 19 – PSM Servo Control

PSM_Servo_Control		**GUI Page 18**
vp80ServoEnable	vn80ServoEnable	
vp80VoltsSetPoint	vn80VoltsSetPoint	
vp80MarginSetPoint	vn80MarginSetPoint	
vp80PowerValue	vn80PowerValue	
vp80ServoPwmValue	vn80ServoPwmValue	
vp80StbyPwmValue	vn80StbyPwmValue	
vp80ProportionalGain	vn80ProportionalGain	
vp80IntegratorGain	vn80IntegratorGain	
vp80DerivativeGain	vn80DerivativeGain	
vp80ProcessGain	vn80ProcessGain	
vp80FilterDepth	vn80FilterDepth	
vp80ErrorSignal	vn80ErrorSignal	
vp80TimeConstant	vn80TimeConstant	
vp180ServoEnable	vn180ServoEnable	
vp180VoltsSetPoint	vn180VoltsSetPoint	
vp180MarginSetPoint	vn180MarginSetPoint	
vp180PowerValue	vn180PowerValue	
vp180ServoPwmValue	vn180ServoPwmValue	
vp180StbyPwmValue	vn180StbyPwmValue	
vp180ProportionalGain	vn180ProportionalGain	
vp180IntegratorGain	vn180IntegratorGain	
vp180DerivativeGain	vn180DerivativeGain	
vp180ProcessGain	vn180ProcessGain	
vp180FilterDepth	vn180FilterDepth	
vp180ErrorSignal	vn180ErrorSignal	
vp180TimeConstant	vn180TimeConstant	

Table 20 – PIX Services Control

PIX_Services_Control		**GUI Page 19**
pixSrvcResetCmd	pixSrvcRebootCmd	
pixSrvcCodeId	pixSrvclModuleId	
pixSrvcModInStatus	pixSrvcModOutStatus	
pixSrvcMemPowerEnable	pixsrvcMemTestEnable	
pixStreamModeEnable	dataWidthSlct	
pixBuffrWrtOrigin	pixBuffrRdOrigin	
pixBuffrWrtLength	pixBuffrRdLength	
pixBuffrWrtIncValue	pixBuffrRdIncValue	
pixBuffrWrtDataValue	pixBuffrRdSpare	
pixStreamCount	streamErrorCount	
pixelCount	ErrorCount	
minPixelValue	maxPixelValue	
readImageBuffr		

Table 21 – CFG Services Control

CFG_Services_Ctrl		**GUI Page 20**
cfgResetCmd	cfgRebootCmd	
cfgCodeId	cfgModuleId	
cfgSrvcModInStatus	cfgSrvcModOutStatus	
tempScanEnable	tempScanRate	
detectI2CBus		
readI2CBusTemps	readI2CBusSerialNumbers	
eepRdCmdReg	eepWrtCmdReg	forceLoadClkCond
eepDataReg[]		clkCfgRegs[]
eepDataReg[0]		clkCfgReg[0]
eepDataReg[1]		clkCfgReg[1]
eepDataReg[2]		clkCfgReg[2]
eepDataReg[3]		clkCfgReg[3]
eepDataReg[4]		clkCfgReg[4]
eepDataReg[5]		clkCfgReg[5]
eepDataReg[6]		clkCfgReg[6]
eepDataReg[7]		clkCfgReg[7]
eepDataReg[8]		clkCfgReg[8]
eepDataReg[9]		clkCfgReg[9]
eepDataReg[10]		clkCfgReg[10]
eepDataReg[11]		clkCfgReg[11]
eepDataReg[12]		clkCfgReg[12]
eepDataReg[13]		clkCfgReg[13]
eepDataReg[14]		clkCfgReg[14]
eepDataReg[15]		clkCfgReg[15]

Table 22 - Diagnostics

Diagnostics			**GUI Page 21**
led_1_Slct	led_2_Slct		
PixSimEnbl	PixSimDest	PixSimRows	PixSimCols
fpgaTemp	fpgaTempMin	fpgaTempMax	
fpgaVccInt	fpgaVccIntMin	fpgaVccIntMax	
fpgaVccAux	fpgaVccAuxMax		
fpgaVRefP	fpgaVRefN		
adcGainErr	adcOffsetErr		
afe1TpGrp1Cfg	afe2TpGrp1Cfg		
afe1TpGrp2Cfg	afe2TpGrp2Cfg		
afe1TpGrp3Cfg	afe2TpGrp3Cfg		
afe1TpGrp4Cfg	afe2TpGrp4Cfg		

The following tables are TBD.

Misc_Misc	**For unassigned Attributes**	**GUI Page 22**
LCB_Misc	**For unassigned Attributes**	**GUI Page 23**
PSM_Misc	**For unassigned Attributes**	**GUI Page 24**
CFG_Misc	**For unassigned Attributes**	**GUI Page 25**
PIX_Misc	**For unassigned Attributes**	**GUI Page 26**
AFE_Misc	**For unassigned Attributes**	**GUI Page 27**

Appendix III