ShARCS Startup and Shutdown: With Server Communications

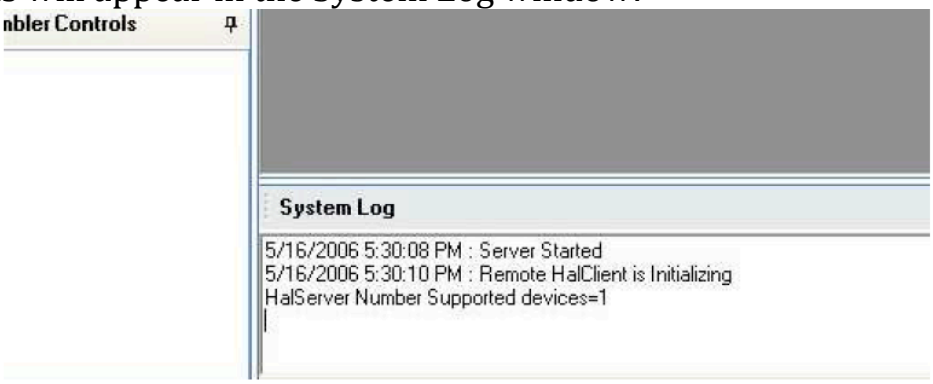
Powering up

1. Enable power through the pulizzi controller to Stealthie, the JADE2 card, and the Ion Pump through Pulizzi A and to the ShARCS filter wheels and the Lantronics through Pulizzi C.
2. The Windows computer *stealthie* will turn on automatically once it has power. Continue with the below power-up steps while it boots up. Remote desktop from *covert* to *stealthie* with the following command: rdesktop stealthie. Log in as "***user"***, with the usual user password.
3. Check if the JADE2 card 5.0V external power box is set to "On".
4. Check if the ground plug on the external power supply cable is plugged in to the ground port on the JADE2 box. Plug in if not already plugged in.
5. Check if the external power supply cable (white) is plugged into the JADE2 card's analog input. Plug in if not already plugged in.
6. Check if the miniUSB Cable (black) is plugged in to the JADE2 card's miniUSB port. Plug in if not already plugged in.
7. Check if that same Cable, with a normal USB 2.0 side, is plugged into stealthie. Plug in if not already plugged in.

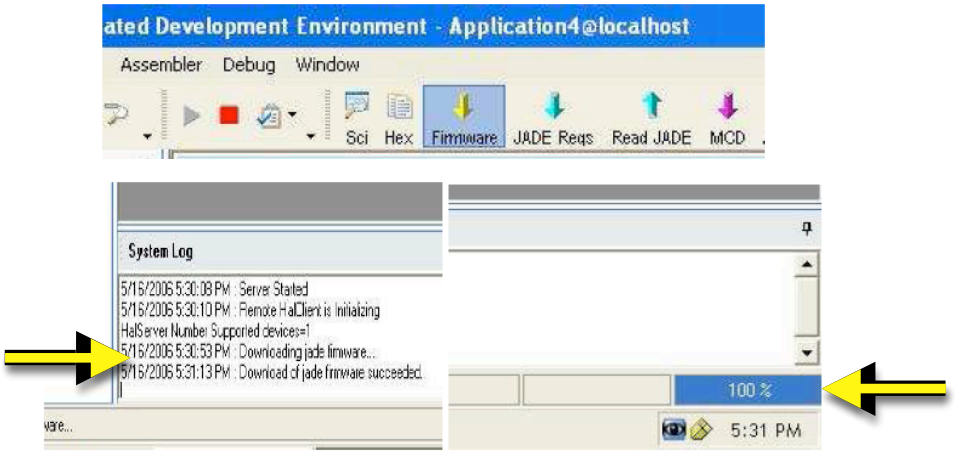
Loading HxRG Code on *stealthie*

8. On the Desktop, double click the ***SIDECAR ASIC IDE*** shortcut icon .
9. The SIDECAR ASIC Integrated Development Environment (IDE) dialogue box will appear, shown below. Press ***Open***.

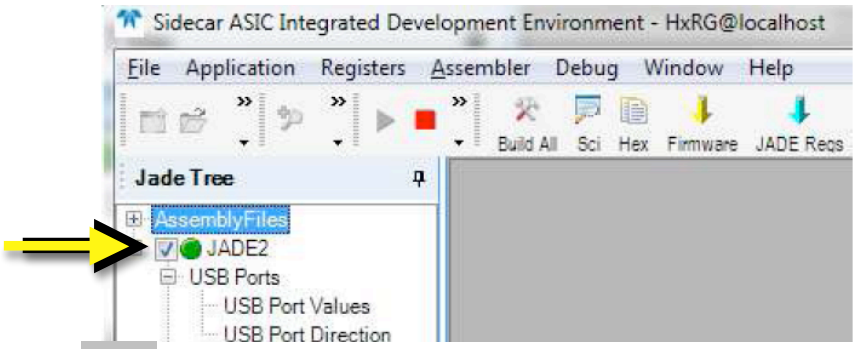
10. The dialogue box will probably open to "C:\Program Files\Teledyne Scientific\SidecarASIC IDE\" (browse to that path if not). Open folder "HxRG2_3" and select the HxRG.soln file. The project will launch with all the assembly files listed under the JADE and ASIC Tree.
11. Press the **green** play button in the top left corner of the IDE window. The button is used to launch the Hardware Abstract Layer Server. Once clicked, it will fade to gray, and the corresponding **red** stop button will become available. As you monitor the system log, the following commands will appear in the System Log window:



12. Press the **yellow** Firmware downward arrow (as pictured below). This downloads the needed firmware into the FPGA of the JADE2 card. It will take 10-15 seconds. In the bottom right corner, the IDE software shows the download status of the firmware, and the system log also indicates the status of the download (both statuses shown below). If you click before it is complete, the display freezes but continues downloading.



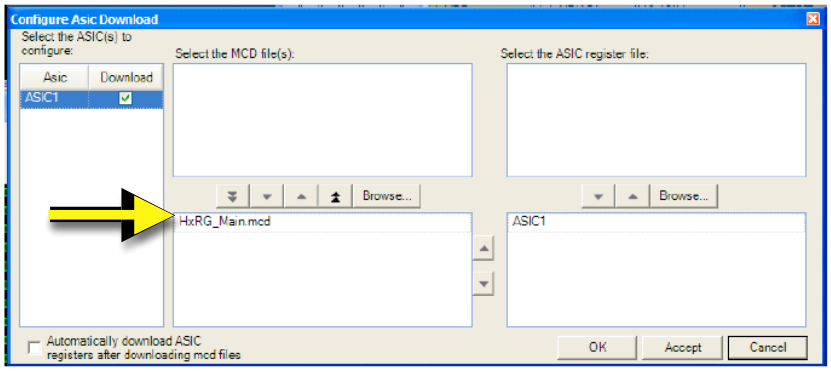
Once the JADE2 firmware has been downloaded, a green circle appears in the JADE2 tree next to the JADE2 name as shown in the image below below (replacing a yellow caution triangle).



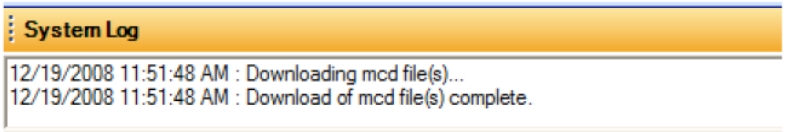
13. Press the blue down arrow to download the JADE registers. The system log will immediately report that the JADE2 registers have been downloaded.

14. Click on the **Config** button 

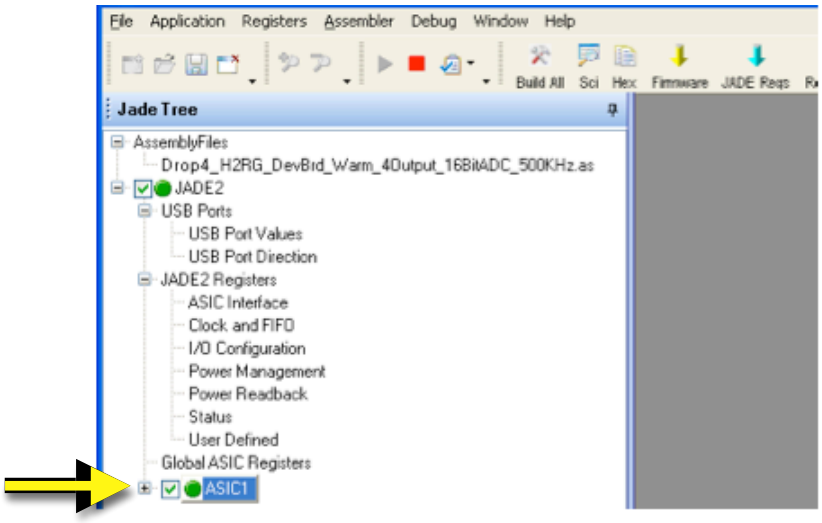
that has two small black arrows pointing downward on the right side of the top menu bar. If the file HxRG_Main.mcd is already present in the bottom left box, click "OK" and go to the next step. If MCD file is not present, click on "Browse…" and select the file HxRG_Main.mcd, which should be in "C:\Program_Files\Teledyne Scientific\SidecarASIC IDE\". Now click on the double down-arrow icon underneath the top left box and the file HxRG_Main.mcd should move to the bottom left box as shown below. Browse, select, and add "HxRG_Main_ShARCS.mcd" and "ShARCS_Voltages.mcd" to the bottom left box as well (not shown below). Click "OK" and the window will close.



15. Press the purple MCD down arrow to download the HxRG_Main.mcd instructions to the SIDECAR microcontroller. The system log will tell you if the download is successful, as shown below:

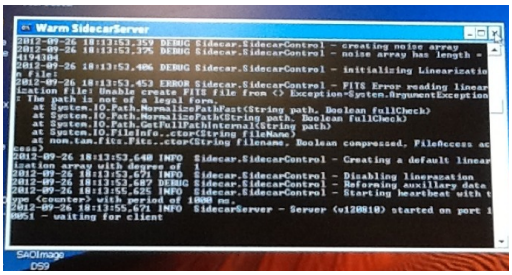


Once the MCD is downloaded, a green circle appears in the JADE2 tree next to the ASIC1 name (replacing a yellow caution triangle).



16. All of the IDE startup steps are complete, so minimize the window (it needs to run in the background).

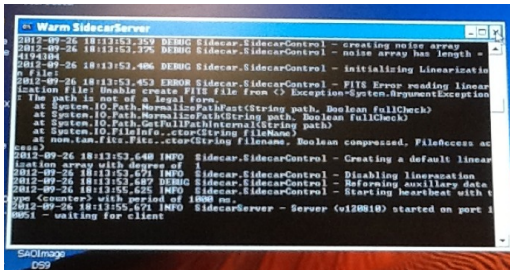
Server Startup



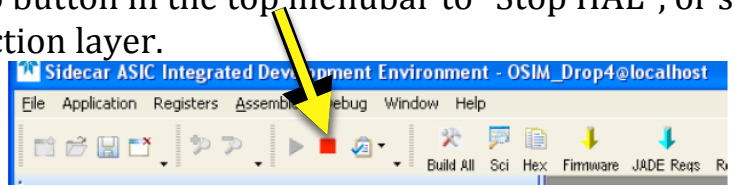
17. Now the SidecarServer needs to be started. If you are running the chip warm, double-click the "Warm SidecarServer" shortcut on the Desktop. If you are running the chip cooled, double-click the "Cold SidecarServer" shortcut on the Desktop.
18. Now on the Unix computer *covert*, you log in and start up a terminal window. In the terminal, currently we start the ShARCS GUI by typing "java –jar $LROOT/java/jar/sharcs_fe1.jar". Very soon this will be replaced by simply typing "sharcs_fe".
19. Once sharcs_fe is running, under the Windows Menubar, select "Setup". A new window will open.
20. In the Setup window, check if the AsicCfg keyword is set to the appropriate configuration file:
    a. if cold, C:\SHARCSColdSidecarControlConfig.xml
    b. if warm, C:\SHARCSWarmSidecarControlConfig.xml
21. In the Setup Window, check if the UnixRootDir is "/data", if the WinRootDir is "Z:\", and if the Outdir is "sharcs".
22. In the Setup Window, if "Connected" reads "No" OR if the upper right corrner of sharcs_fe is red/"Lost Server", press the "Connect" button. The button will turn yellow while it tries to connect, and will turn red if there are connection problems.
23. In the Setup Window, press the "Init" button to initialize the system. The

"Initing" keyword will flip to "Yes" during initialization, and if the process is successful the "SidecarInit" keyword will read "Success!". Generally after this step you can close the Setup Window and take data.

Shutdown Sequence



1. Remote desktop from *covert* to Windows computer *stealthie* with the following command: rdesktop stealthie. Log in as "***user"***, with the usual user account password.
2. Click on the SidecarServer terminal window (shown above) and hit control-C to gracefully close the SidecarServer.
3. Maximize the Sidecar ASIC IDE software window.
4. Click the **red** stop button in the top menubar to "Stop HAL", or stop the hardware abstraction layer.



5. Shut down the Sidecar ASIC IDE window and say "No" to saving.
6. In general, stealthie can be left on with all cables still plugged in. Similarly, the JADE2 card external power supply can be left on.
7. If you are shutting everything down, disable power through the pulizzi controller to Stealthie, the JADE2 card, and the Ion Pump through Pulizzi A and to the ShARCS filter wheels and the Lantronics through Pulizzi C.
8. It is now safe to unplug the miniUSB, the external power supply, and the ground plug from the JADE2 card. (it is safe even when the power is on)

Startup and Shutdown: Without Server Capabilities (Old Way)

I really really hope you don't have to use this. It is cludgy and terrible. There is a terrible GUI that will be started on Windows computer *stealthie* to take images… Give Rosalie a call if you need help: 925-876-4788.

6 SIDECAR Power Up/Down Sequence

Steps provided in this section describe how to power up the SIDECAR ASIC Development board.

6.1 Power Up

Steps 1-4 should only be used if an external voltage supply is being used. If you are allowing the USB to provide power, then skip to Step 5.

1) If an external power supply is being used then set the voltage to 5.5V.

2) If an external voltage supply is not being used then skip to step 4. Make sure that jumper at W2, ***adjacent to external analog power input source***, is in place for configure power supply to the development board via USB.

The jumper is already configured for external power, don't worry about that.

NOTE: Voltage supply from an external source should NOT exceed 5.75V. The voltage regulators on the JADE2 card will manage the 3.3V supply to SIDECAR.

3) Set the current limiter on the external power supply between 500mA.

NOTE: Current limiter on the external power supply can be set up to 1000mA, but it is highly recommended to stay close to 500mA.

The jumper is already configured for external power, don't worry about that.

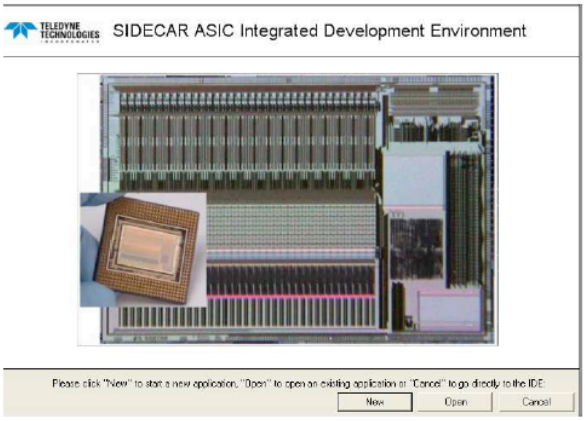
4) Remove jumper labeled W2 from the JADE2 Card. Jumper W2 is located next to the input power supply plug. Removing the jumper which will configure the development kit to be powered by an external analog source rather than USB providing power.

5) Plug in the external analog power source into the JADE2 cards analog input port.

6) Plug in miniUSB Cable into JADE2 card's USB port. 2 LEDs on the JADE2 card will light up.

5 Loading HxRG Code

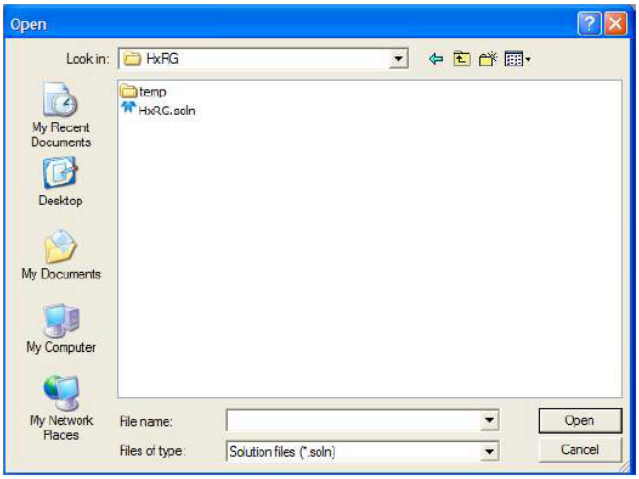
3) On the Desktop, double click the ***SIDECAR ASIC IDE*** short cut icon.



NOTE: Windows Vista and Windows 7 users. You may receive an error message when trying to launch SIDECAR IDE. Due to Windows security reasons SIDECAR IDE needs to be launch with administrative access. Refer to Windows Vista or Windows 7 users manual for such case.

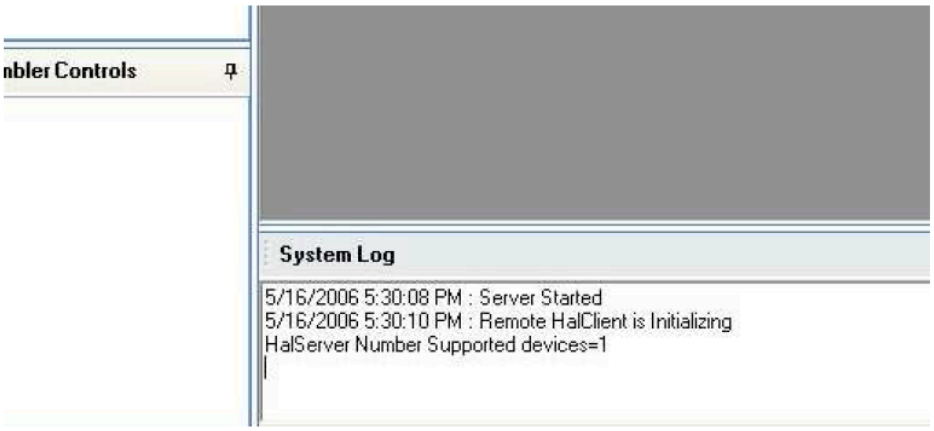
4) The SIDECAR ASIC IDE dialogue box will appear. Press ***Open*** to select the project location and load the .soln file.

5) From the dialog box, browse to ***<HxRG PROJECT PATH>*** and select HxRG.soln.

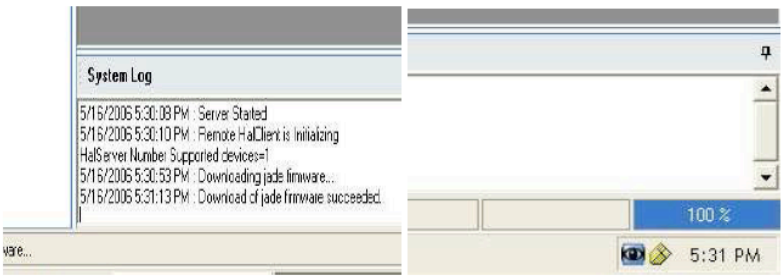


6) The project will launch with all the assembly files listed under the Jade and ASIC Tree.

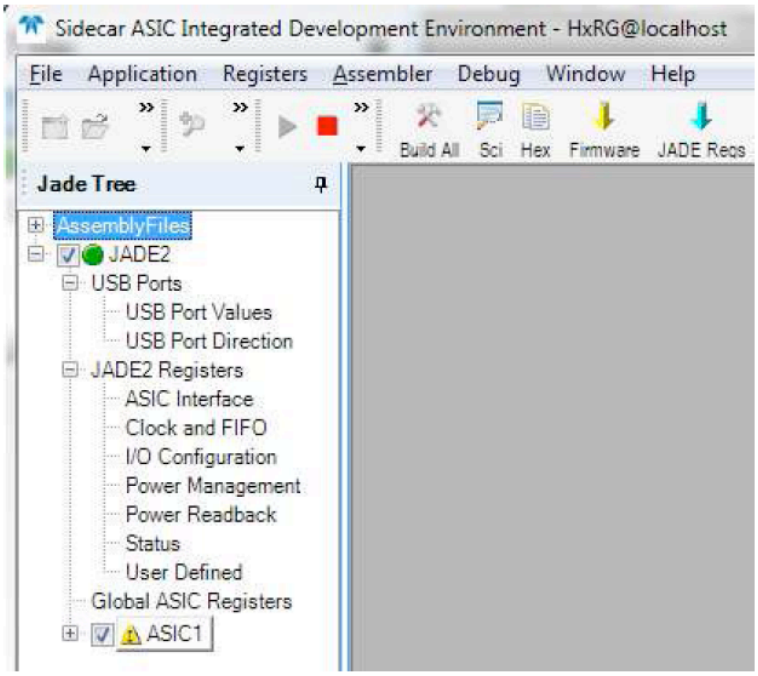
7) On the top left corner of the IDE window is a green play button. The button is used to launch the Hardware Abstraction Layer Server. Press the button and monitor the system log. The following commands will appear on the system log window: 1) Server Started, 2) Remote HALClient is Initializing, and 3) HalServer Number Supported devices=1. Also the green play button will be faded and the corresponding square red stop button will be highlighted.



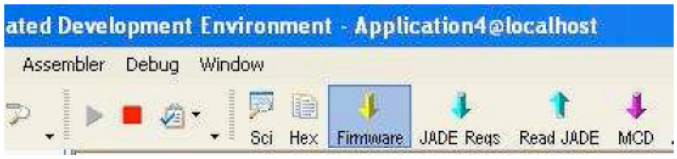
8) Then the firmware needs to be down loaded into the FPGA of the JADE2 card. This is accomplished by pressing the yellow Firmware arrow that is pointing down. In the bottom right corner the software will show you the status of the firmware downloaded and in the system log will indicate the status of the software downloaded.



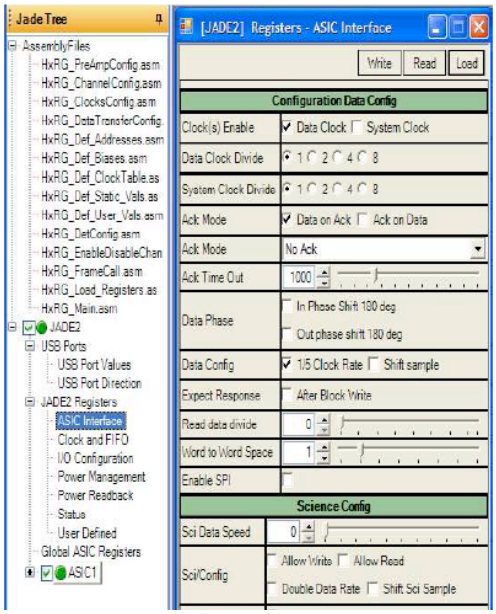
9) Once the JADE firmware has been down loaded then a green circle appears in the JADE tree next to the JADE2 name as shown below.



10) The JADE registers need to be downloaded. This is accomplished by pressing the blue down arrow labeled ***JADE Regs***. ASIC still show yellow triangle after downloading. Once the JADE registers have been down loaded then a green circle appears in the JADE tree next to the ASIC1 name.

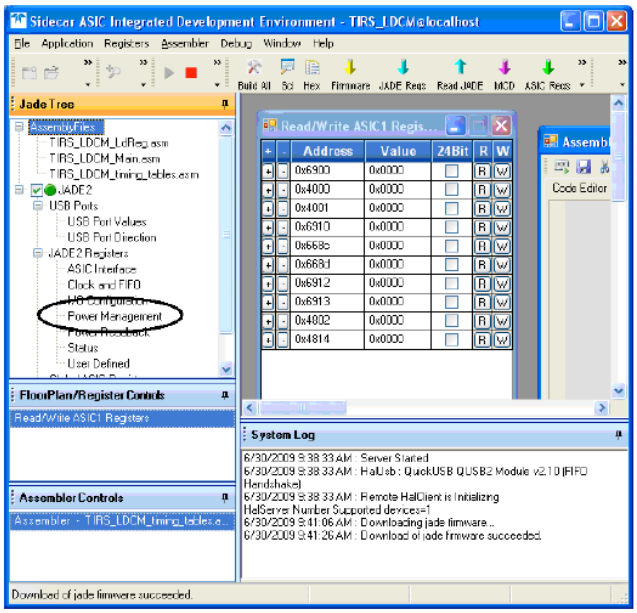


11) In the JADE tree, double click on **ASIC Interface** to open the ASIC interface dialog box. In the dialog box, uncheck the checkbox next to **Data on Ack** as shown in the figure below. The yellow triangle next to ASIC1 will turn into a green circle at this point. If ASIC does not turn to green, double click I/O Configuration to reset ASIC.



12) At this point check if SIDECAR ASIC is power up properly. Refer to ***Section 6.1*** for proper power up procedure. Proceed to Step 10 only after power up sequence has been followed.

8) Double click on Power Management under JADE2 Registers tree. Power Management window will open.

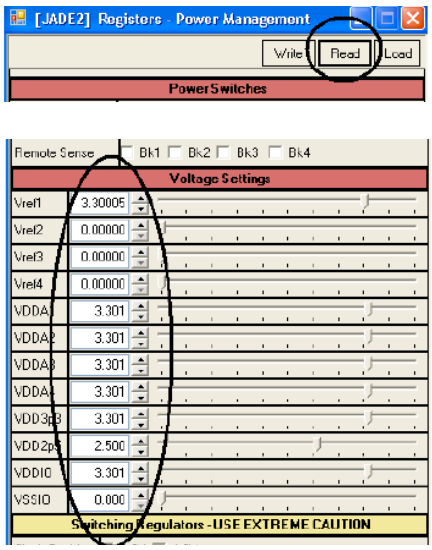


9) Check ***5V*** power supply option, if unchecked.

10) Check ***VDD3p3,*** then ***VDD2p5***, then ***VDDIO***. ***In this order.*** If any one or all 3 are unchecked.

11) Check ***BK1 On*** (Bank 1) button, if any one or all BK1 checkboxes are unchecked. The SIDECAR ASIC development board is now fully powered. We are utilizing Bank 1 for power source to SIDECAR on the development board, if any remaining 3 Banks are being utilized then they should be powered up also at this

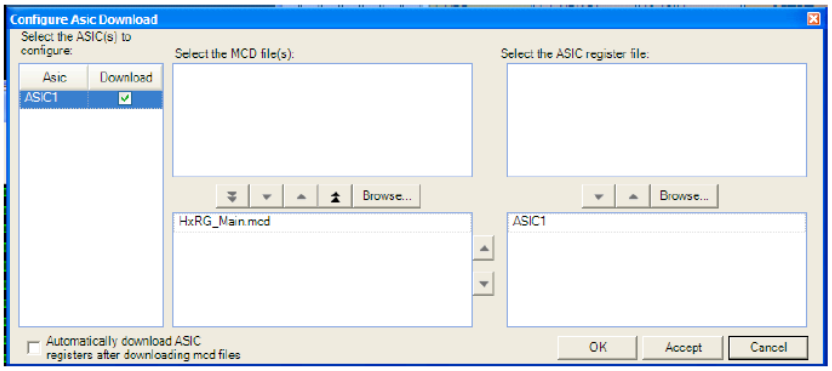
12) Click the ***Read*** button in the Power Management window. The voltage readings should be similar to the settings shown in the following image.



Note: Put a check back to the checkbox next to *Data on Ack* in the figure above

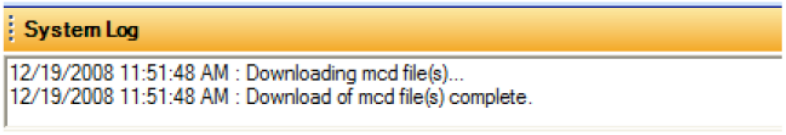
13) Click on the **Config** button 

that has two black arrows pointed downward on the top menu bar of the IDE. The box in the figure below will pop up. If the file HxRG_Main.mcd is not already present in the top left box, click on **Browse...** and select the file HxRG_Main.mcd, which should be in [HxRG Path]. Now click on the double down arrow icon underneath the top left box and the file HxRG_Main.mcd should move to the bottom left box as shown below.



14) Click **OK** and the window will close. In the IDE top menubar, click on the purple down arrow with MCD listed below it 

. This will download the HxRG_Main.mcd instructions to the SIDECAR microcontroller, and you will see the following message if it was successful:



Now, directions on how to start and run the fairly useless GUI.

15.) Minimize the IDE. Under the Start menu, select “IDL Virtual Machine” and click to continue when it gives you the option.

16.) It will open a browser. Maneuver to C:\Documents and Settings\Reni\Desktop\Dev

Kit CD (HxRG ver 2.3.2)\IDL\HxRG_exe\ and select “Hxrg.sav”.

17.) Click the Initialize button in the upper left corner. Unselect everything, including “Download Jade2 Register Database (.xml)”. Make sure that the solution file is set to “C:\Program Files\Teledyne Scientific\SidecarASIC IDE\HxRG\HxRG.soln” and that the MCD file is set to “C:\Program Files\Teledyne Scientific\SidecarASIC IDE\HxRG\HxRG_Main.mcd”. Finally, click the “Initialize” button at the bottom of the window.

18.) Mostly, you should stick to the default settings. Do NOT change IDLE MODE from “Continuously take reset frames”

19.) Set the Preamp Gain to “9 (15db small Cin). Leave the EXPOSURE MODE set to Up The Ramp; Fowler mode as defined by this program has terrible effects. Set the Number of Resets to 1 and the Number of Drops (=Ignored Reads) to whatever number is needed to make the desired length of exposure. Under Science Data Acquisition, set it to Ramp. Finish this step by clicking the “Set Config Parameters” button at the top.

20.) We need to set the bias level of the chip, because the default value is generally out of range (go figure). For a brief moment, maximize the IDE. In the left-hand pane, right click on the 

icon on the JADE tree and select “Read/Write ASIC Registers”. This will bring up a window showing the address and value of register 6900. Change the register address to 0x602c, and the value to 0x8258. Click the “W” Write button. Click the “R” Read button to confirm it wrote. Now change the register address to 0x6900, and the value to 0x8002 (as shown in the image below). Click the “W” Write button. Click the “R” Read button until the value changes back to 0x8000, letting you know it has reconfigured. This sends the correct bias value to register 602c, and setting register 6900 to 8002 lets the ASIC know it actually needs to change the bias value from its previous settings.

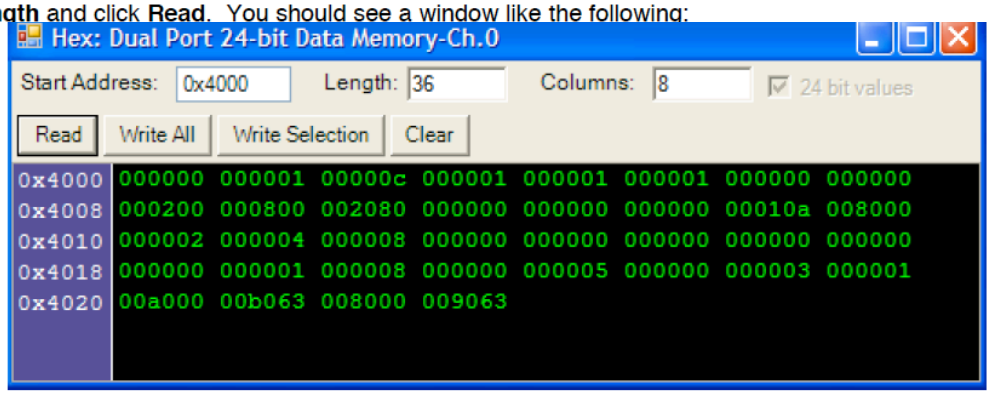
21.) Minimize the IDE again. You should be able to acquire exposures now. Because the software is really helpful, it will put your exposures in “C:\data\HXRG\ H2RG-C001-ASIC-SC2-B-010-JWST\” under the appropriate folder (maybe UpTheRamp if you followed the directions) in a further folder named by the date and time of your exposure. Use DS9 to display them.

The Shutdown procedure is at the end of this document (just exit out of the GUI).

There are additional fairly useless directions below on how to do some random things with the IDE.

15) The instructions are now running in the microcontroller. To configure the instructions to read out your detector with the configuration you want, click on the hex button in the IDE menu bar 

. This will bring up a window for reading the registers on the ASIC. Write 0x4000 for the **start address** and write 36 for the **length** and click **Read**. You should see a window like the following:



The values in the window are the exposure setting and user configuration values as listed in ***HxRG Assembly Code Manual***. The ones shown here, for instance, are set to take one read exposure with an H2RG in 4 output mode with 8 channels averaged per output in full frame mode. Fill in the values you would like to run with and click **Write All**.

16) Right click on the 

icon on the JADE tree and select **Read/Write ASIC Registers**. This will bring up a window showing the address and value of register 6900. Write 0x8002 tin the **Value** box so that the window looks like so:

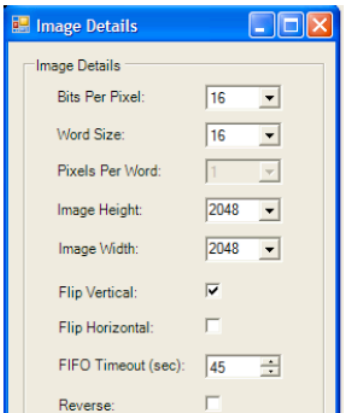
Now click on **Write All**.

17) Click **Read All** every second or so until you see the **Value** change back to 0x8000. This indicates the detector and SIDECAR have been reconfigured for the mode you specified in step 13.

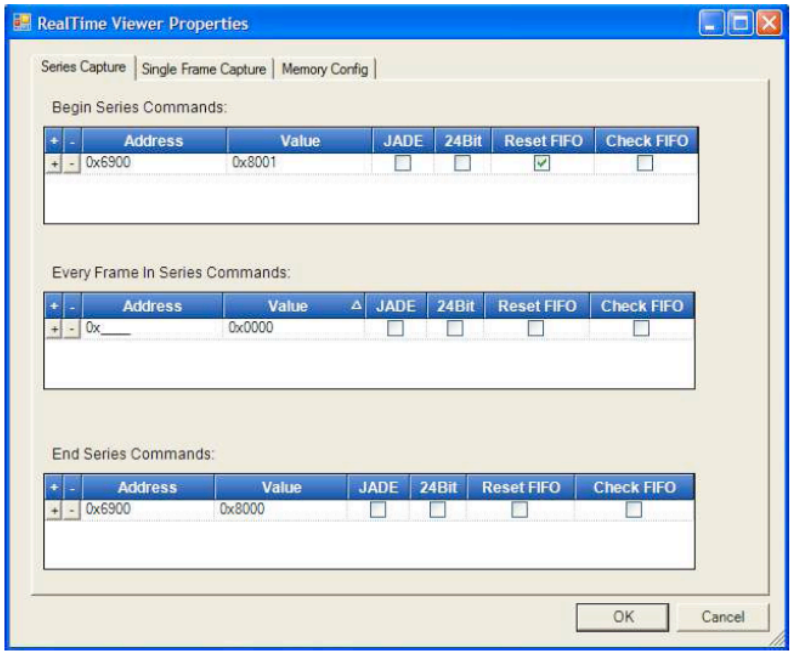
18) Open up the science viewer by clicking on 

.

19) Configure the image size by going to **Settings->Image Details** and entering the **image height** and **image width** in pixel units you expect based upon the detector you have chosen in the appropriate boxes (for the details of configuring an arbitrarily sized window and running in window mode refer to ***HxRG Assembly Code Manual***). Set the **FIFO Timeout** for 45 seconds (an H4RG read out of 1 output might require a longer time, but this should be long enough for all other configurations). Select **Flip Vertical** and click **OK**. The window should look like the following:



20) Now select **Settings -> Configure Commands**. Select the **Single Frame Capture** tab in the window that pops up. Write 0x8001 to the **Value** box in the **Begin Series Command** window and check the **Reset FIFO** box as shown below. Click **OK**.



21) Start an exposure by clicking the **Get Frame** button at the top left corner of the science viewer window (Note that h4001 should be kept its default value of 1 so that only one frame is read out of the detector).

22) Wait for the frame to be read out of the detector and be displayed. The time taken should vary between 1 and 2 frame times (see HxRG manual for approximate frame times) since the instructions might have been doing an IDLE reset when the **Get Frame** button was clicked. If all has gone successfully, you should see a detector picture like the one below:

see page 27 of the HxRG User's Manual if you want to see the figure – it's not that interesting.

Adjusting the **Min** and **Max** of the contrast bar might be required to see details in the image.

Troubleshooting:

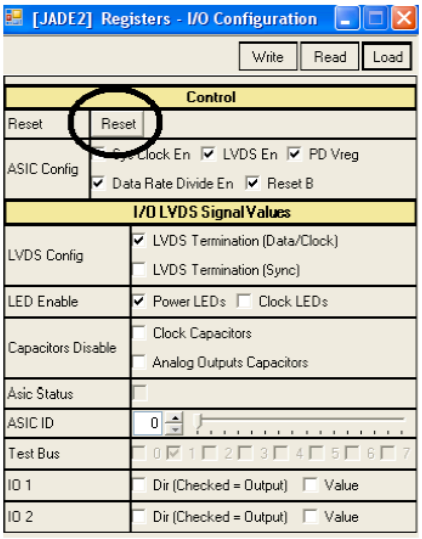
- If the steps were followed and an image did not appear or the image was filled with all 0x0000 and 0xFFFF, it is likely that one of the registers in h4000-h4024 was written with a value out of range. Check those registers to make sure they are within range, issue a reconfigure by following steps 14 and 15, and try to take another exposure.
- If all values were 0x0000, it is likely that the **Single Frame Capture** configuration window was improperly set or the timeout occurred before the pixels were clocked out. Try setting the timeout to a longer value.
- If the frame looks bizarre, make sure you have the **Data on Ack** box checked.

6 SIDECAR Power Up/Down Sequence

6.2 Power Down

Steps provided in this section describe how to power down the SIDECAR ASIC Development board. ***Power down sequence must be followed every time the development board is not in use.***

1) Double click I/O Configuration under JADE2 Registers tree to open the configuration window, then click Reset button to reset ASIC.



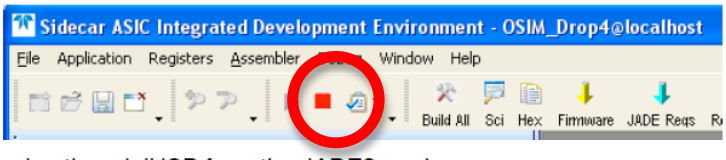
2) Double click on ***Power Management*** under JADE2 Registers tree.

3) Uncheck ***BK1 Off*** (block 1) button. All the check next to the Bk1 label will be removed. We are utilizing Bank 1 for power source to SIDECAR on the development board, if any remaining 3 Banks are being utilized then they should be powered off also at this point.

4) Uncheck ***VDDIO***, then ***VDD2p5***, then ***VDD3p3***. ***In this order.***

5) Uncheck ***5V*** power supply.

6) Click the RED button in IDE to ***Stop HAL***.



7) It is now safe to unplug the miniUSB from the JADE2 card.

8) If an external voltage supply is being utilized, it can also be turned off.

9) Place the jumper back on W2 pins on the JADE2 card to configure for USB power.