High Energy Solar Spectroscopic Imager (HESSI)

Hot Bench Simulation Training

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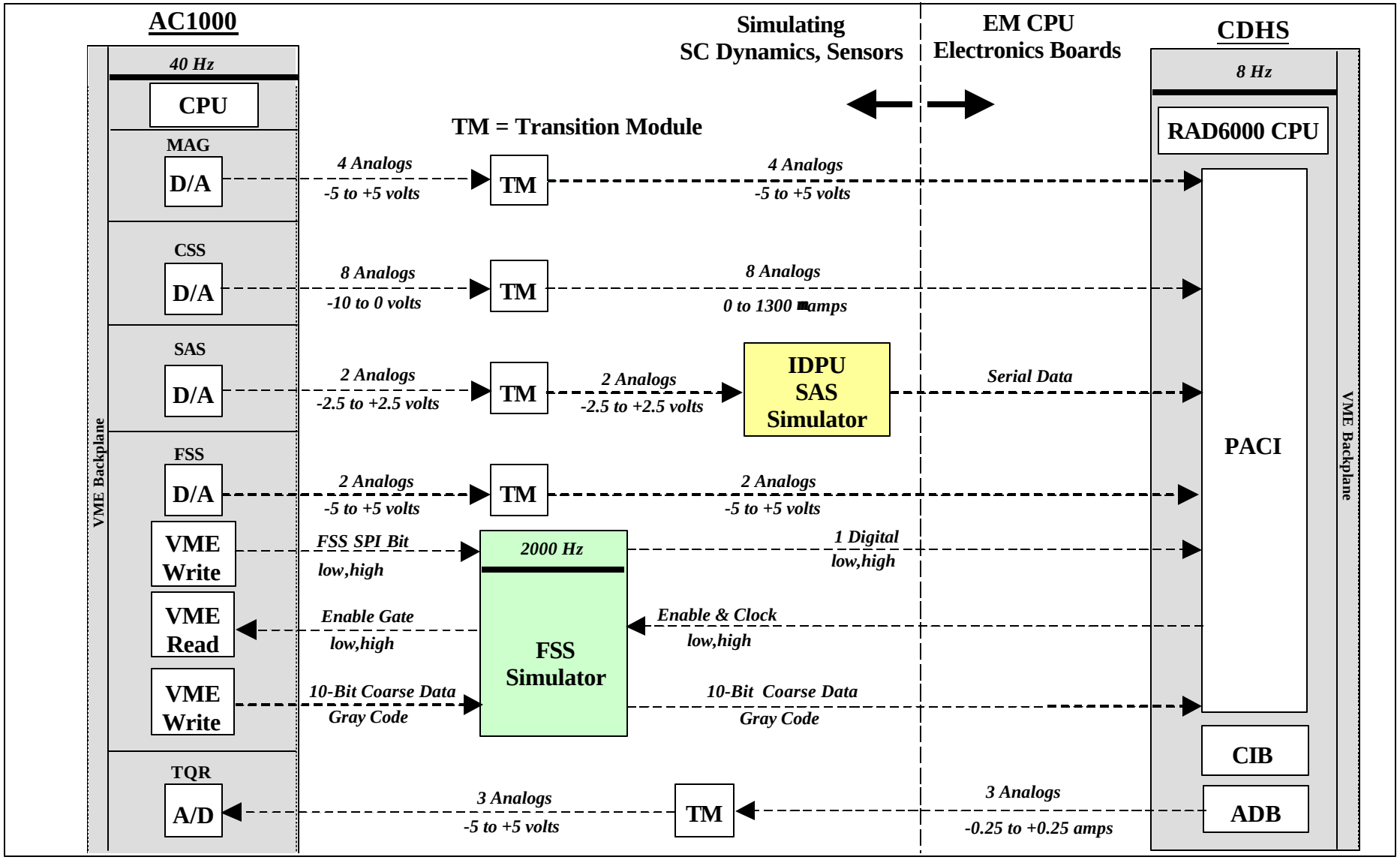
Hot Bench Test Description

Hot Bench Simulation Setup



Description - AC1000 Unit

AC1000 Unit

- VME Backplane
- Processor Board at 40 Hz, Housing Autocoded C Code Simulating:
  - SC Dynamics
  - ACS Sensor Models - MAG, FSS, CSS, SAS
  - Ephemeris - Orbit Dynamics, Earth's Magnetic Field, Sun Position
  - Disturbance Models - Gravity Gradient, Aerodynamics
- Three 6-Channel D/A Boards for Outputs:
  - 4 MAG Signals
  - 8 CSS Signals
  - 2 SAS Signals - X and Y counts of Sun Vector
  - 2 FSS Signals - sine and cosine
- VME Write/Read, 2000 Hz, Communicating with FSS Simulator for:
  - FSS SPI
  - FSE Signal Output Enable Gate
  - FSE 10-Bit Gray-coded Coarse Data
- One 16-Channel A/D Board for Inputs:
  - 3 Analog Signals from ADB Board - Three Torque Rod Coil Currents

Description - FSS, IDPU

FSS Simulator

- Processor Board within AC1000 VME Cage
- Inputs
  - An Enable Gate 100 Hz - Switch Between X and Y Axes, Enable Output of Coarse Data
  - Clock 9600Hz for Reading 10-bit Coarse FSS Data
  - FSS SPI and 10-Bit Coarse Data
- Outputs
  - Enable Gate
  - FSS SPI
  - 10-bit Coarse Data

IDPU Simulator

- Provides Emulation of IDPU Data Packet Outputs at 1Hz
- Inputs - 2 Analog Signals of X and Y Data from AC1000 & TM
- Outputs - Serial Data to PACI
- Delays
  - 2 Seconds Sampling Delay
  - 0.5 seconds Serial Interface Delay to PACI
  - Others

Description - CDHS, TM

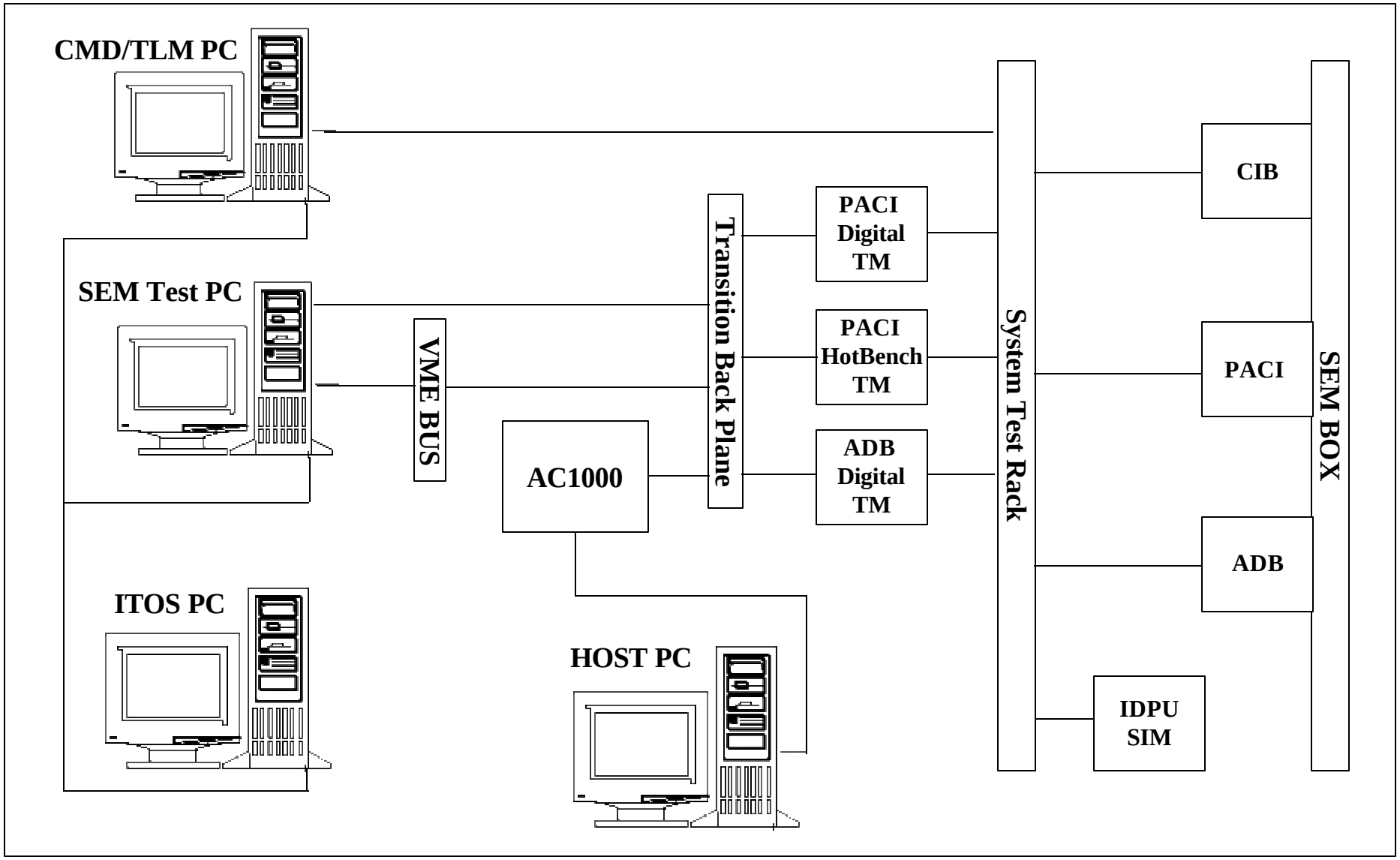
CDHS Unit

- VME Backplane
- Engineering Model of RAD6000 CPU
  - Runs Flight Software (FSW) at 8Hz
- PACI, CIB, ADB
- Inputs
  - 4 MAG Voltage
  - 8 CSS Current
  - 2 FSS Voltage
  - FSS SPI and Coarse Data
  - Serial Data from IDPU
- Outputs
  - Enable Gate and Clock to FSS Simulator
  - 3 Torque Rod Current From ADB

Transition Modules

- For Signal Conditioning
- Signal Conversions

Hardware Configuration



Power On Hardware

Turn On EGSE VME Power

Run RESMAN From the **SEM Test PC**

Run UCB FSW-ACS Hot Bench **Diagnostic.Vi**

Turn on the 28V Transition Module Power Supply

Turn on the COTS Power Switch on the Transition Module Chassis

Setup PTP on the **CMD/TLM PC**

Start ITOS on the SUN Workstation

Set the Battery Supply Enable to off (Battery Simulator)

Turn on the 28V Power Supply for the Battery Simulator.

Set the Battery Supply Enable to on (Battery Simulator)

Set the DUT Power Switch to on at the Transition Module Chassis

Turn on the CPU by Simulating Separation or by Sending the Appropriate HCD Command

Power On Torque Rods

Turn On Torque Rods

At the **SEM Test PC**, Enable the Following Loads: TRX, TRY, TRZP, TRZR.

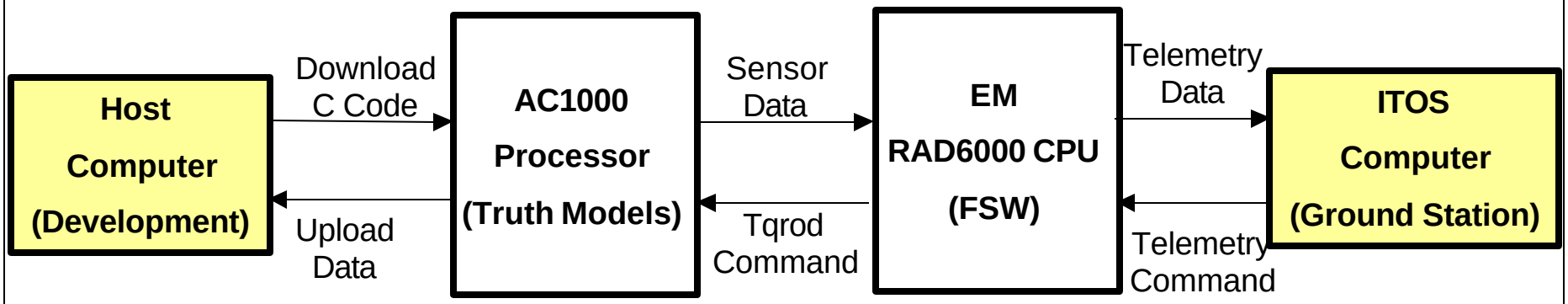
Turn on NEB1 by Sending the **"/Pcbsetswitch Neb1,on"** Command

Turn on Torque Rod X and Z Primary Power by Sending the **"/Pcbsetswitch Tbd,on"** Command

Turn on Torque Rod Y and Z Redundant Power by Sending the **"/Pcbsetswitch Tbd,on"** Command

Run Simulations

Key Simulation Components



Run Third Party SW: Realsim Xmath/SystemBuild
- Develop SC Truth Model
- Generate Autocoded C Code
- Compile and Link to AC1000
- Monitor Truth Model Data
- Setup Hardware Connections
- Setup Data Acquisition
- Download and Run On AC1000
- Start/Stop AC1000 Controller
- Upload, Convert, Process Data

HESSI Real Time Simulation:
- Change Initial Conditions
- Simulating Failure Scenarios

Run Autocoded Truth Model C code:
- SC Dynamics
- ACS Sensor Models
- Torque Coil Dipoles
- GG and Aero Torque
- Earth's Magnetic Field
- Sun Position
- Orbit Dynamics

Run FSW with Autocoded C code:
- Sensor Processing
- Mode Selection Logic
- Control Logic

Ground Control:
- Collect Telemetry Data
- Send Commands to SC

Procedure for Running Simulations At Host Computer

1. Establish Connection Between Host Computer and AC1000 Real Time Controller

2. Bring Up Realsim GUI, Download Program to AC1000 and Run Simulation

3. At Host Computer
- Setup Data Acquisition
- Start AC1000 Controller
- Start Data Acquisition

4. At Animation Screens While in Simulation:
- Change Initial Attitude, Select Mass Configuration, Setup Orbit Parameters
- Simulate Various ACS Component Failure Scenarios

5. At ITOS Computer:
- Command SC to Appropriate Mission Mode
- Log Data
- Stop Data Logging

6. At Host Computer
- Stop Data Acquisition
- Stop Simulation on AC1000 Controller
- Upload Raw Data from AC1000 to Host Computer
- Reset AC1000 and Exit Animation Screen

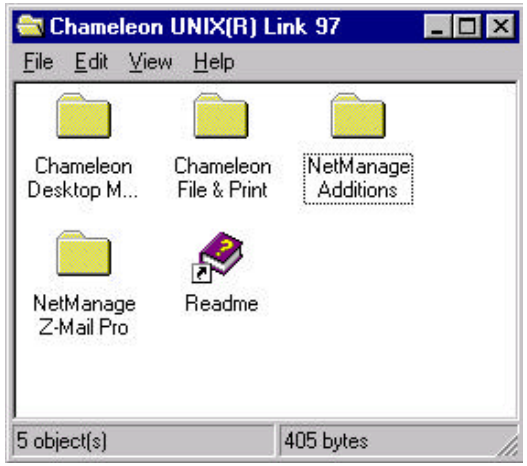
7. At Realsim GUI:
- Convert Raw Data into Xmath Format - file.dat

8. At Xmath
- Load and Plot Data
- Or Save it to Other Form for Off-Line Processing

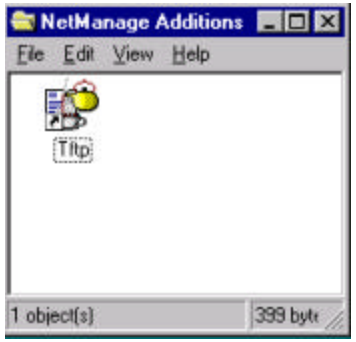
Establish Connection Between Host Computer and AC1000 Controller

From Host Computer:

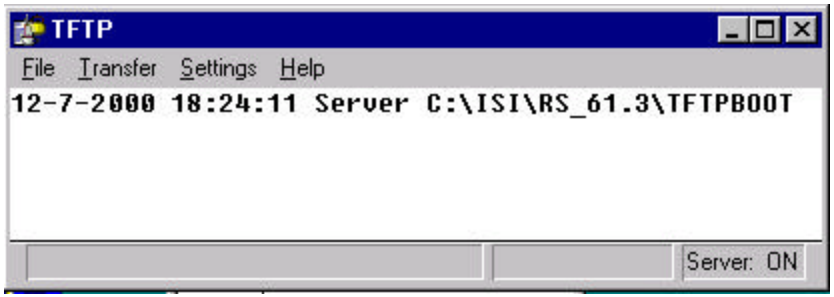
1. Click Icon **Chameleon UNIX(R) Link 97** on Windows Screen to Bring up a Small Window:



2. Click on **NetManage Additions** to Bring up Another Small Window:

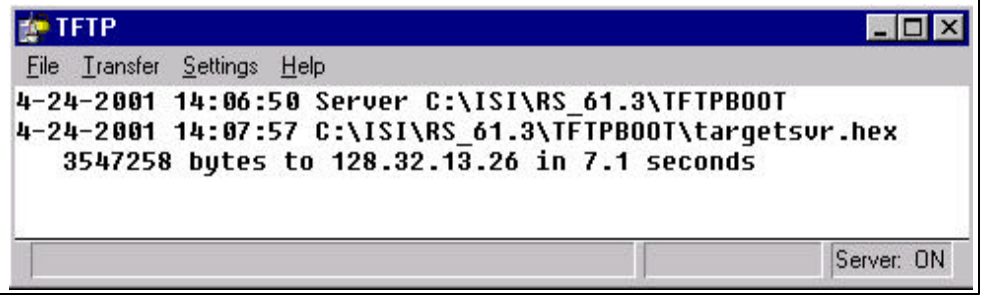


3. Click on **Tftp** Icon to Bring up TFTP Window Showing Connection Information



On AC1000 Controller:

1. Physically Press the Reset Button on AC1000
2. Verify at **Tftp** Window that the Connection is Established - Target Server Running



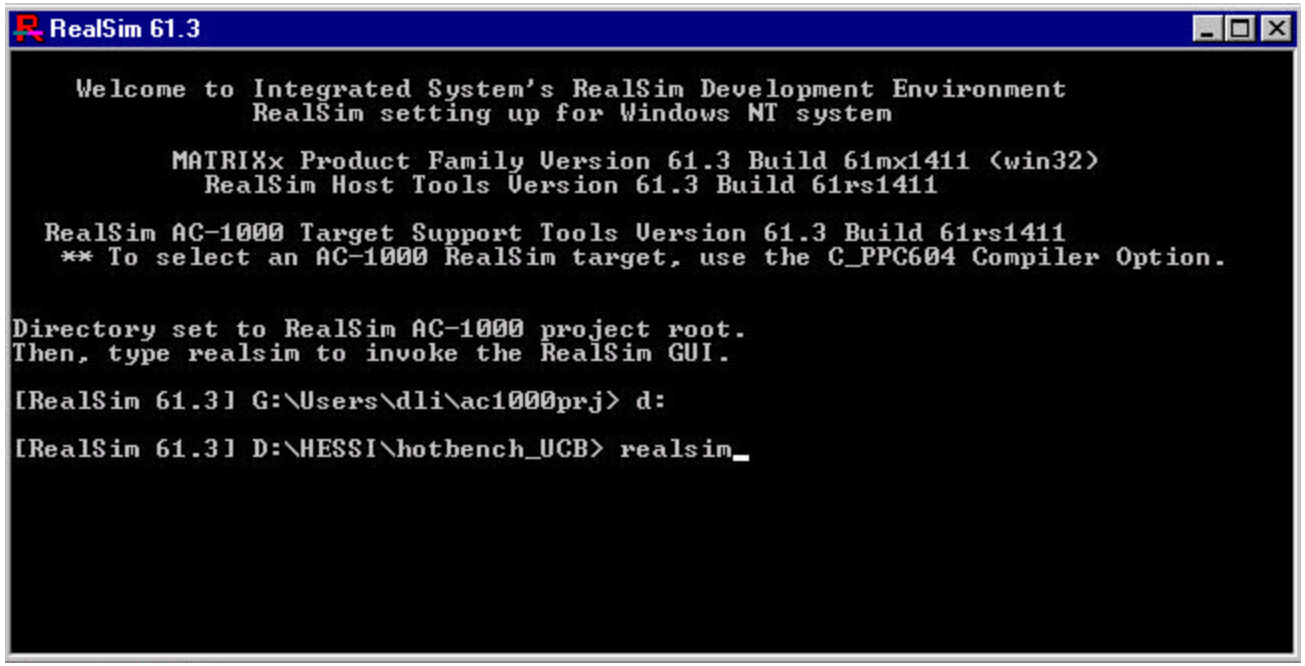
Bring Up Realsim Work Bench At Host Computer

Click Realsim 61.3 

on Windows Screen to Bring Up **Realsim** Command Window (DOS Window)

Change to the Directory D:\HESSI\hotbench_UCB as Shown

Type in the Command **realsim** as Shown:



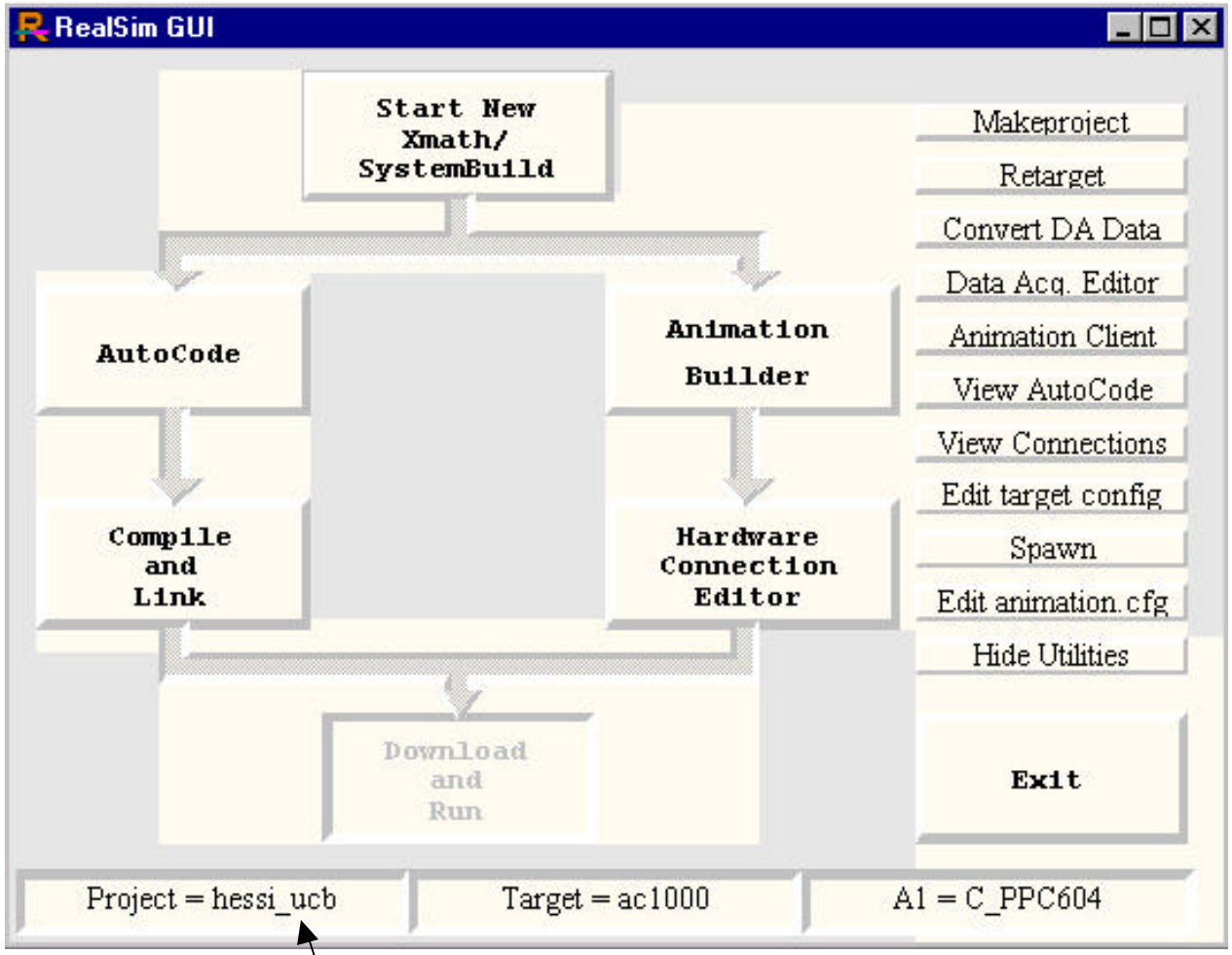
Hit Enter Key to Bring up the Realsim GUI Shown in Next Page

Realsim GUI - Download and Run On AC1000 Controller

Click on Button

to Download the Truth Model to AC1000 Controller and Run it.

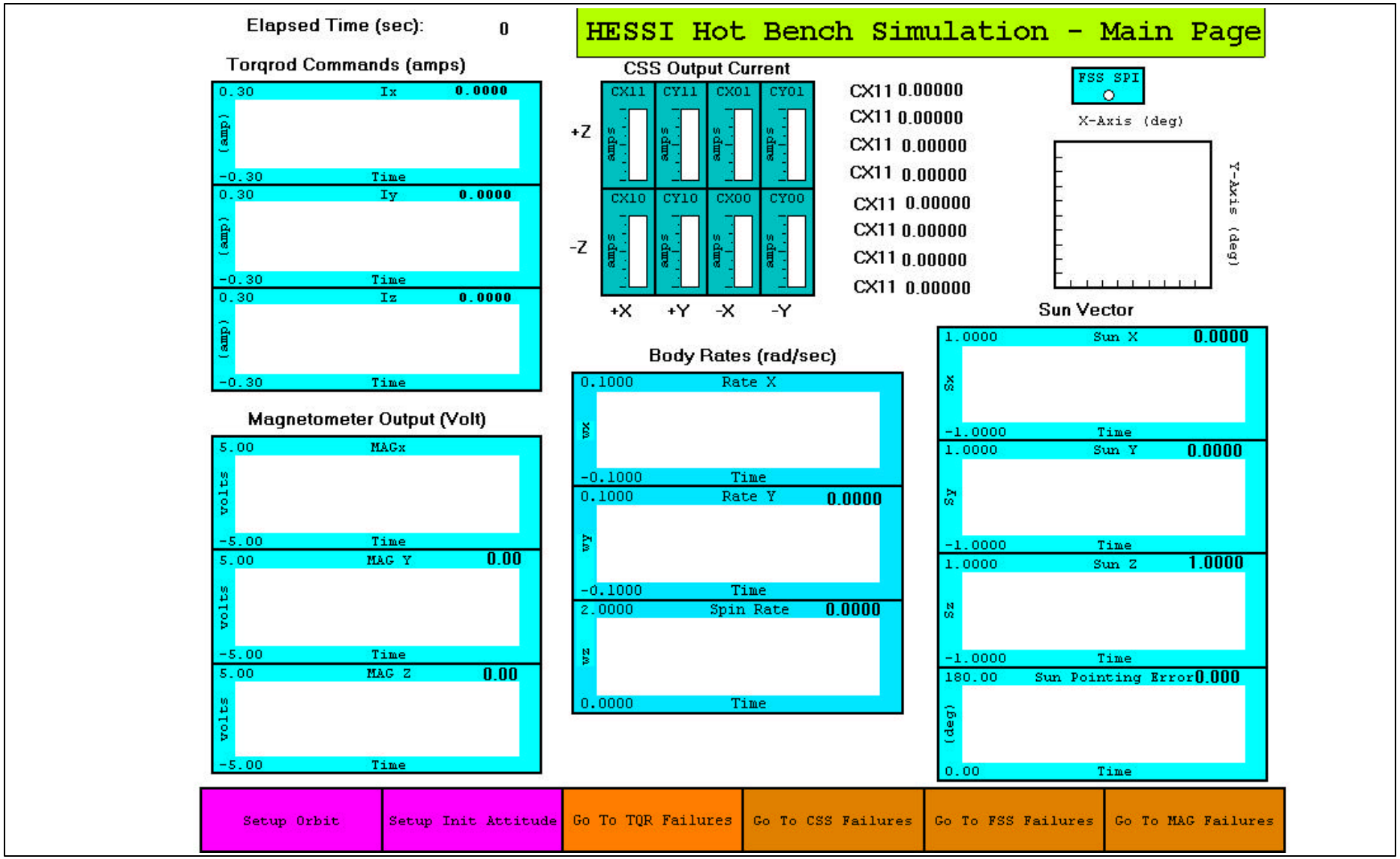
Note: The Program Has Been Autocoded, Compiled and Linked, the Animation Screens Built and Hardware Connection Established



The Animation Screen will Appear as Shown on Next Page

The Default Project Name

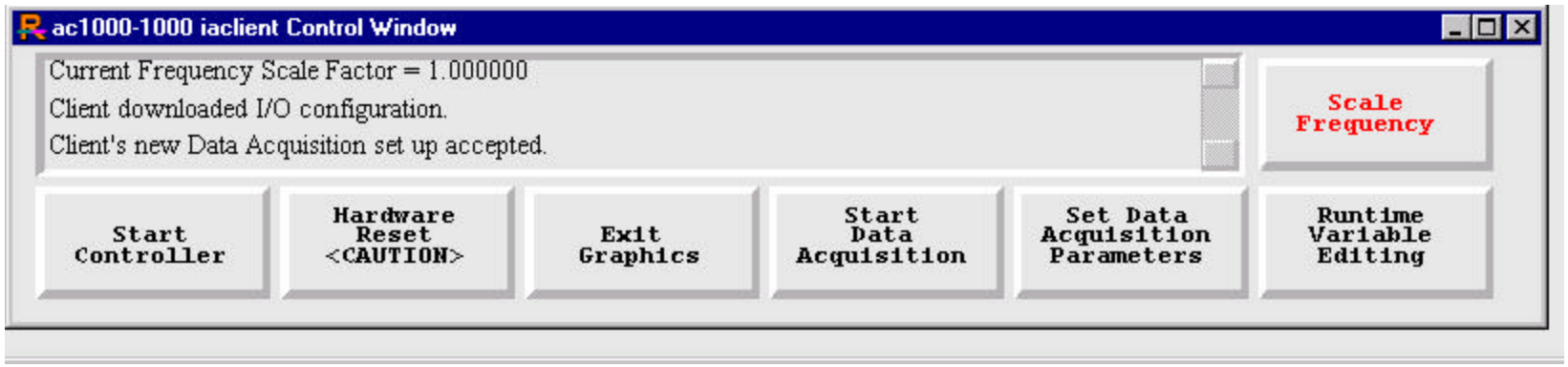
Main Animation Screen



AC1000 Controller Window

An **AC1000 Controller** Button Should Appear on the Bottom of the Windows Screen.
Click on the Button **ac1000:**

The **ac1000-1000 iaclient Control Window** Should Appear:



Click On the Button 

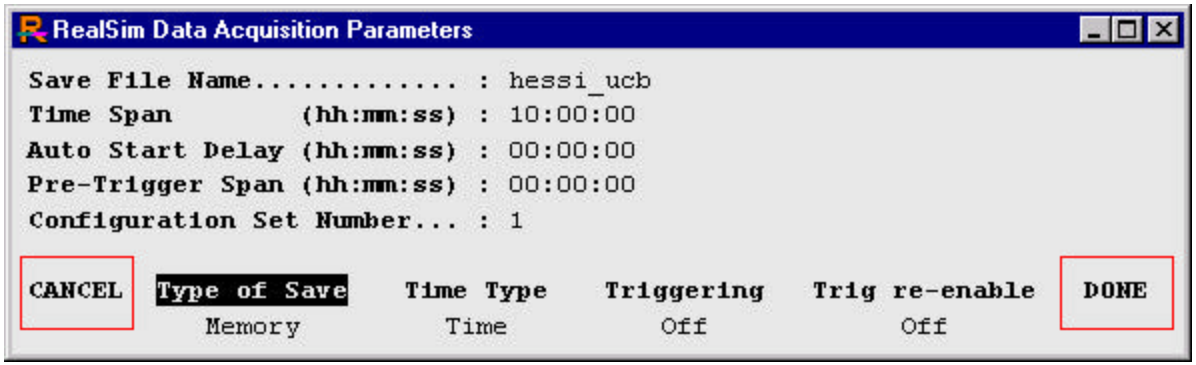
to Bring Up the Window **RealSim Data Acquisition Parameters**

Shown on the Next Page

Setup Data Acquisition Parameters For AC1000 Controller

Setup Data Acquisition Properties:

- Enter Data **Save File Name** as Desired - Example: hessi_ucb
- Set **time Span** - Enter (hh:mm:ss) for the Desired Time Period of Data Collection. Example: 10 hours
  - If Using Default Value 00:00:00, Data Acquisition Will Go On Until **Stop Data Acquisition** Button is Clicked
- Toggle **Type of Save** from CDisk to **Memory**
- Click **Done** to Close this Window



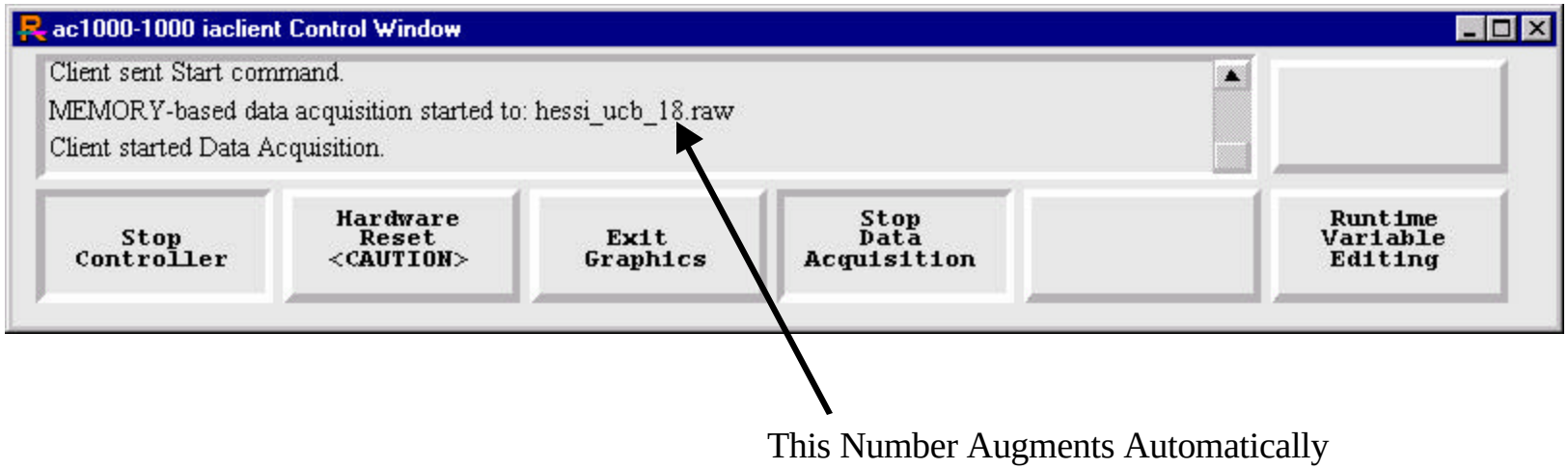
Start Simulation

At **ac1000-1000 iaclient Control Window:**

•Click on the Button **Start Controller**

•Click on the Button **Start Data Acquisition**

•A Raw Data File will be Created Automatically. Example: hessi_ucb_18.raw



The Animation Screens Should be Active Now

Log Telemetry Data At ITOS Computer

At ITOS Command Window

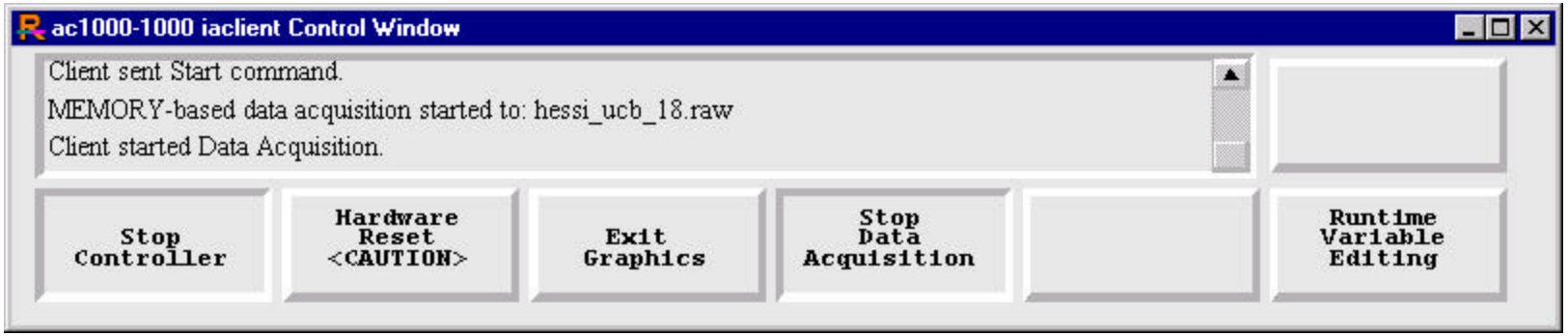
- Type **seqprt acs, 10 > data1.log** (Log File Name) - Log Data at 10 Seconds of Sampling Interval
- Change ACS to Appropriate Mode: Example - **/acssetmode acquisition**
- Change to Auto Mode - **/acssetmode auto**
    - Verify that the Mode is Correct
- After the Test is Done, type **seqprt clear** to Stop Data Logging

If FSW Hangs Up, Reboot FSW at ITOS Command Window

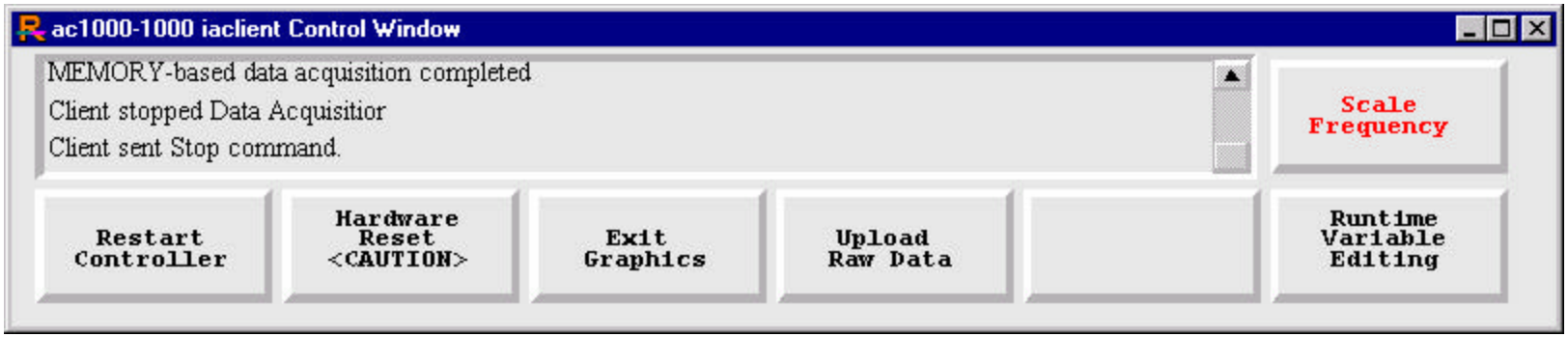
- Type **page_cib_hcd_cmds** to Bring Up a Page
- Press **OFF** button on **CRC_BITS** bit 1 (Reboot will Take about 30 seconds**)**
- Type **resync** to Re-Synchronize the System

Stop Simulation At Host Computer

After Data is Collected, Select **ac1000 - 1000 iaclient Control Window**:



- Click on the Button **Stop Controller**



- Click on the Button **Upload Raw Data**
- Click on the Button **Hardware Reset to Exit (Caution)** to Exit the Animation Screen and Go Back to Realsim GUI

Data Conversion and Processing

At Realsim GUI, Click on the Button **Convert DA Data** to Convert the Raw Data into Xmath Format

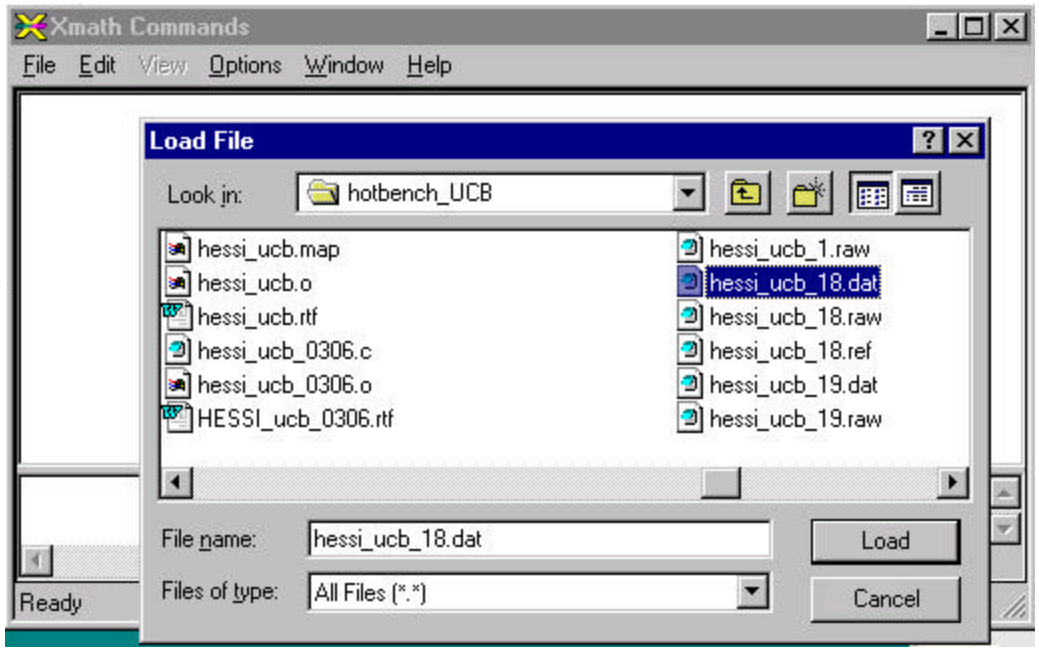
Convert DA Data

- A DOS Window Will Appear. Accept the Default Data File Name, or Enter a New One
- Converted Data Should Have Extension of .dat

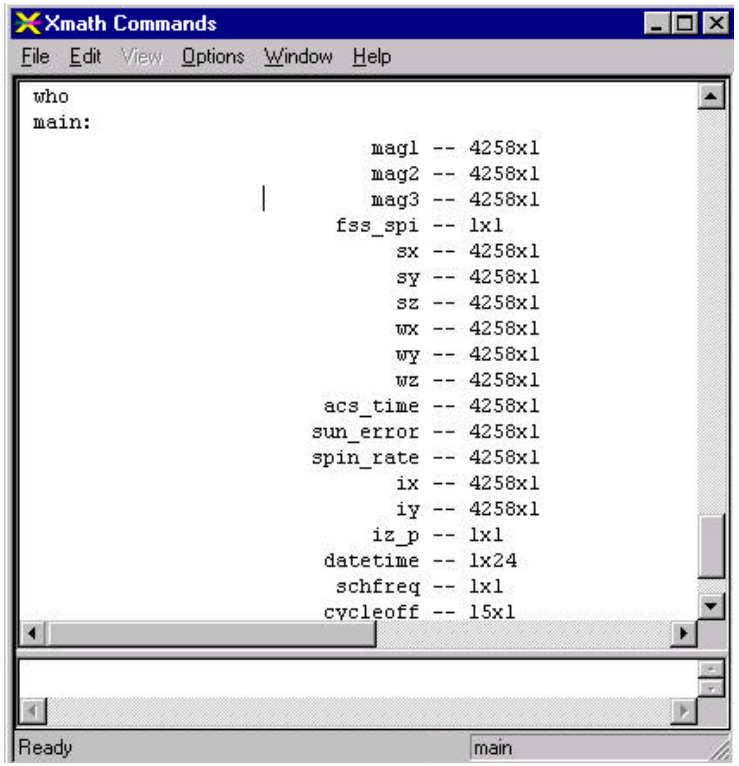
At Realsim GUI, Bring Up Xmath by Clicking on the Button

Start New Xmath/ SystemBuild

At Xmath, Select **File/Load** to Load the Data File into Xmath Work Space:

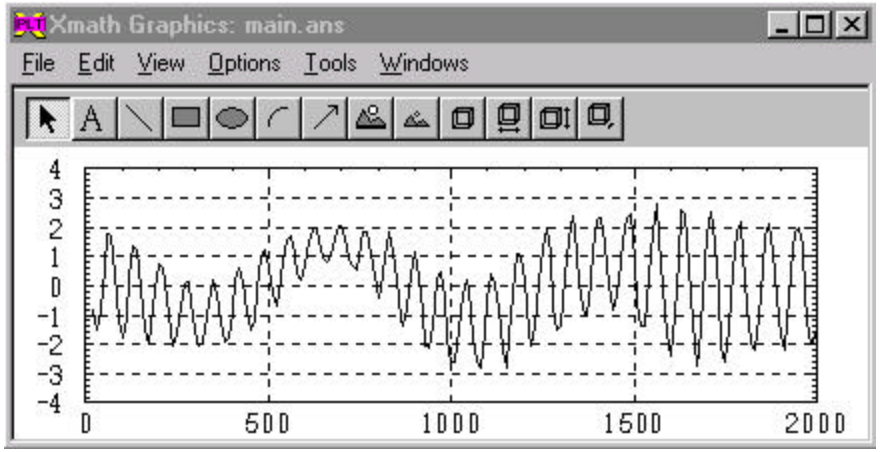


Type **who** and Hit Enter to Show A List of Data Collected:



Plot Variables Using:
plot(acs_time, mag1)

It Plots the Magnetometer X Output in Volts vs. the Time in Seconds.



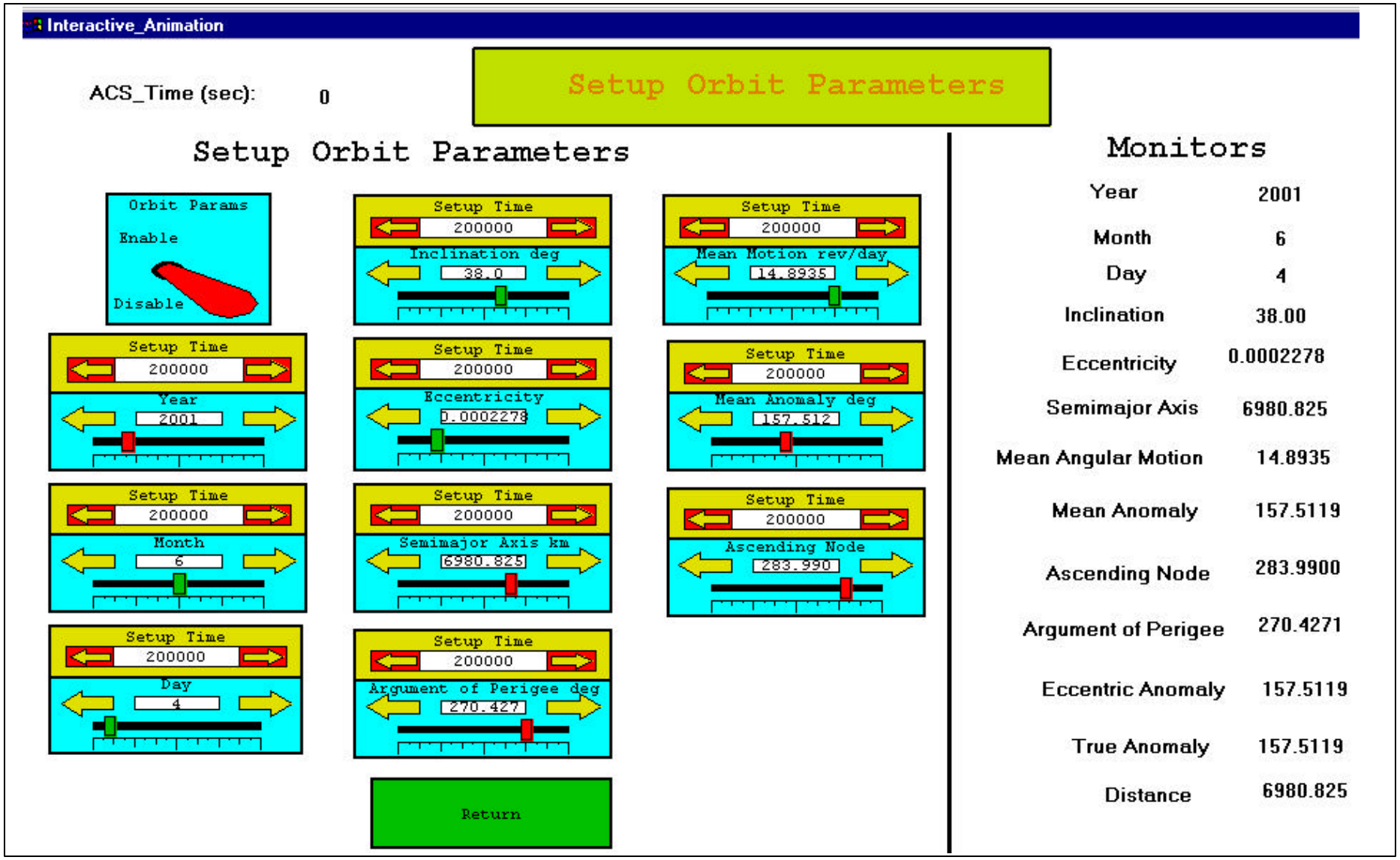
Other Useful Plotting Commands:
plot(acs_time, mag1,{xlab="Time",ylab="mag1",title=" mag vs. Time"}) - Display Labels and Titles
plot(acs_time, [mag1,mag2], {ylab=["mag1","mag2"],strip}) - Plot Two Parameters Separately

Interactive Simulation

Change Parameters in Real Time:

- **Six Command Buttons on Main Animation Screen Lead to Six Additional Screens:**
  - **Setup Orbit Parameters** - Allow for Changing to Different Epoch Time and Orbit Parameters
  - **S/C Initial Attitude Setup** - Allow for Changing to Desired S/C Attitude and Solar Array Configuration
  - **Torque Rod Failure Scenarios** - Allow for Simulating Torque Rod Failures
  - **CSS Failure Scenarios** - Allow for Simulating CSS Failures
  - **FSS Failure Scenarios** - Allow for Simulating FSS Failures
  - **Magnetometer Failure Scenarios** - Allow for Simulating MAG Failures

Screen for Changing Orbit Parameters



Change Orbit Parameters

Setup Orbit Parameters:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Setup Time (in Seconds) Should be Selected for Each Individual Parameter
- Epoch Time Selection:
    - Year - Default = 2001
    - Month - Default = 6
    - Day - Default = 4
- Orbit Parameters:
    - Inclination: Default 38 = deg
    - Eccentricity: Default = 0.0002278
    - Semimajor Axis: Default = 6980.825 km
    - Argument of Perigee: Default = 270.4271 deg
    - Mean Angular Motion: Default = 14.8934 rev/day
    - Mean Anomaly: Default = 157.5119 deg
    - Ascending Node: Default = 283.99 deg

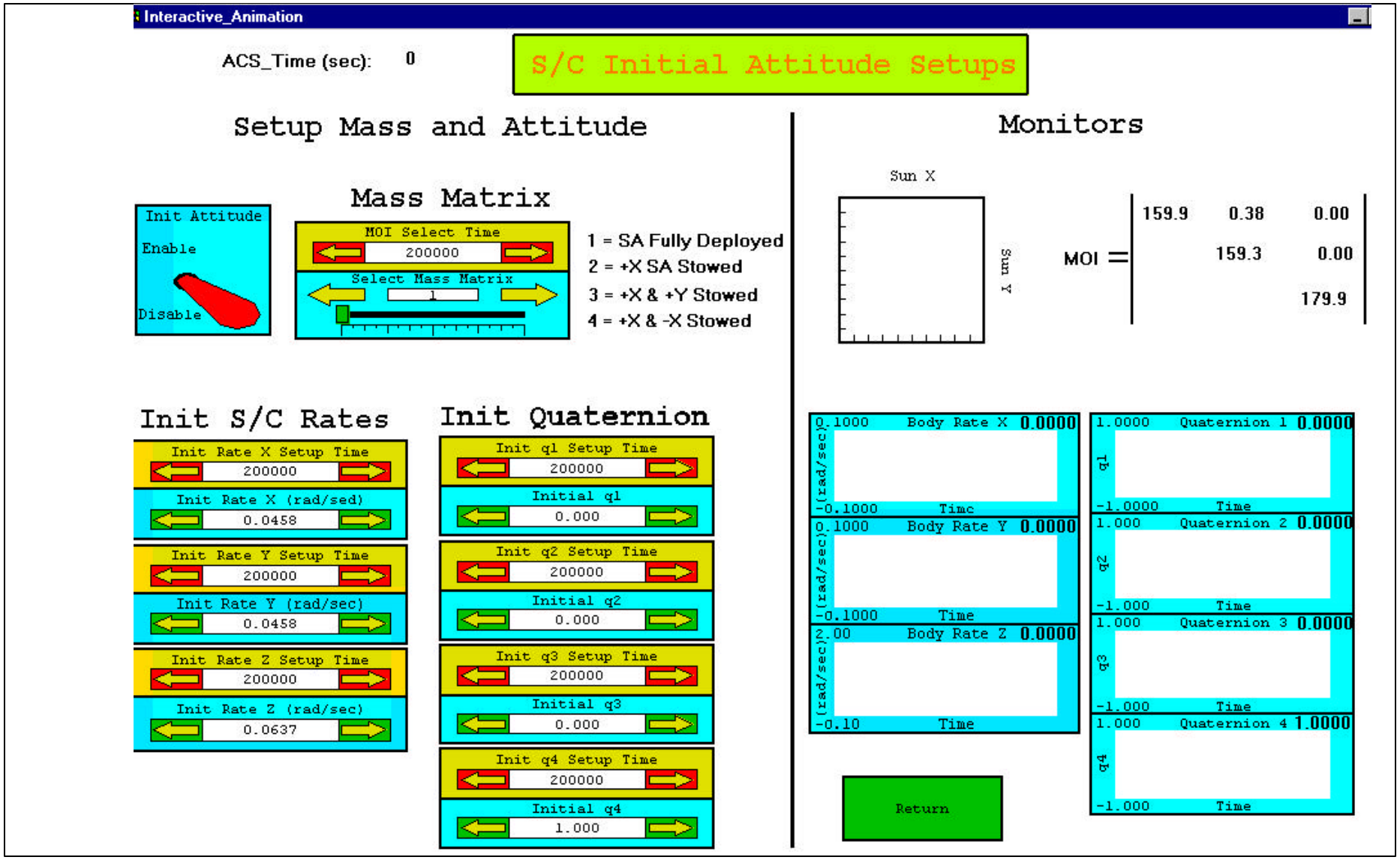
Monitors:

- Display True Parameters

Return Button:

- Click to Go Back to Main Animation Screen

Screen for Changing Initial S/C Attitude



Change S/C Dynamics

Setup Mass and Attitude:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Setup Time (in Seconds) Should be Selected for Each Individual Parameter
- **Mass Matrix** Selection from Four Configurations:
    - 1 = Four Solar Arrays Nominally Deployed
    - 2 = +X Solar Array Stowed
    - 3 = +X and +Y Solar Arrays Stowed
    - 4 = ±X Solar Arrays Stowed
- Initial S/C Body Rates (rad/sec):
    - Rates X, Y, Z
- Initial Quaternion:
    - q1, q2, q3, q4

Monitors:

- True Sun Vector on XY Plane
- Mass Matrix with Fully Deployed Solar Arrays
- True Body Rates
- True Quaternion

Return Button:

- Click to Go Back to Main Animation Screen

Examples of Initial Conditions

Nominal LV Tip-off - Rates (4,4,17) deg/sec:

$$w_0 = \begin{bmatrix} 0.0458 \\ 0.0458 \\ 0.0637 \end{bmatrix} (rad/\sec)$$

Normal Mission Mode - Spin Rate 15 rpm (90 deg/sec):

$$w_0 = \begin{bmatrix} 0.0 \\ 0.0 \\ 1.5708 \end{bmatrix} (rad/\sec)$$

The Quaternion Depends on the Sun Position. Assume Initial Sun is on the X-Axis (ECI Frame):

•For Nominal Tip-Off - 10 deg from the Sun:

$$q_0 = \begin{bmatrix} -0.0695964 \\ 0.501638 \\ -0.2762 \\ 0.79953 \end{bmatrix}$$

•Worst Anti-Sun LV Tip-off - 180 deg from Sun:

$$q_0 = \begin{bmatrix} -4.71336e-5 \\ -0.657088 \\ 0.420087 \\ 0.464007 \end{bmatrix}$$

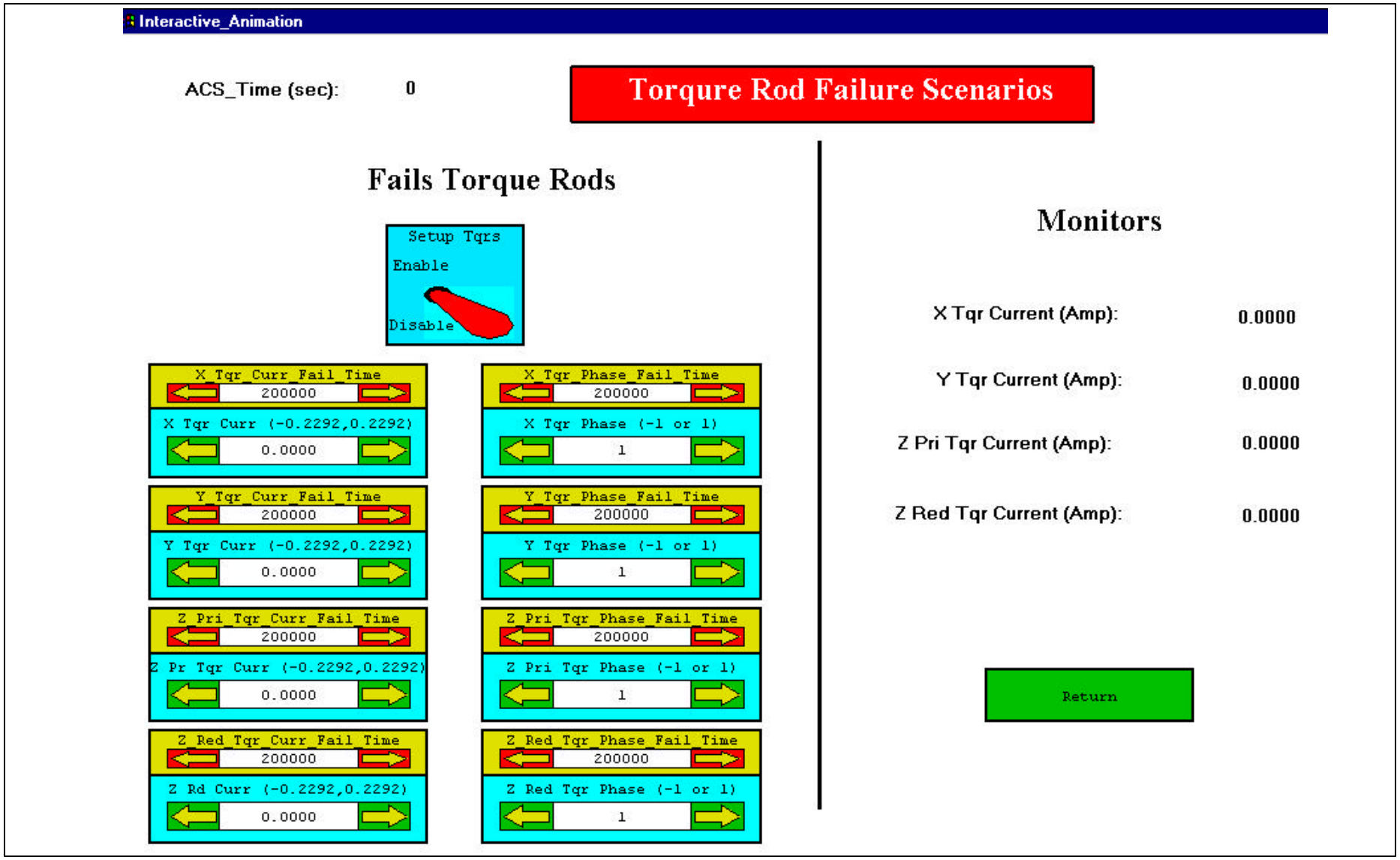
•Other Case of LV Tip-off - 90 deg from Sun:

$$q_0 = \begin{bmatrix} -0.413224 \\ 2.96304e-5 \\ 0.264086 \\ 0.830517 \end{bmatrix}$$

•Normal Mission Mode with Perfect Sun Pointing:

$$q_0 = \begin{bmatrix} 0.0 \\ 0.7071 \\ 0.0 \\ 0.7071 \end{bmatrix}$$

Screen for Simulating TQR Failures



Simulating TQRs Failures

Fails Torque Rods:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Fail Time (in Seconds) Should be Selected for Each Individual Parameter
- Select Torque Rod Current:
    - X Torque Rod: Default = 0 Amp
    - Y Torque Rod: Default = 0 Amp
    - Z Primary Torque Rod: Default = 0 Amp
    - Z Secondary Torque Rod: Default = 0 Amp
- Select Torque Rod Phase:
    - X Torque Rod: Default = 1
    - X Torque Rod: Default = 1
    - Z Primary Torque Rod: Default = 1
    - Z Secondary Torque Rod: Default = 1

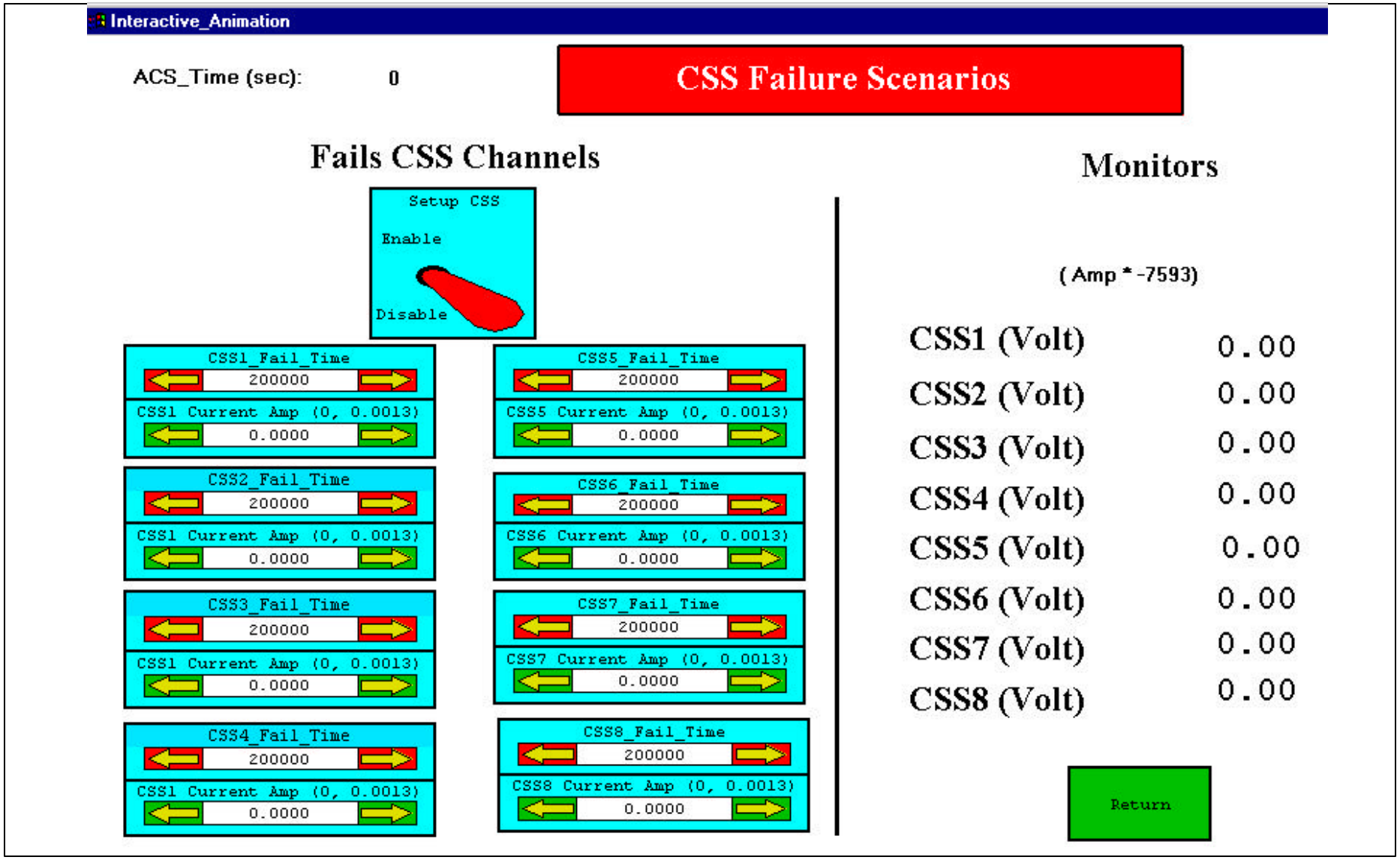
Monitors:

- Display Torque Rod Actual Currents

Return Button:

- Click to Go Back to **Main Animation Screen**

Screen for Simulating CSS Failures



Simulating CSS Failures

Fails CSS:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Fail Time (in Seconds) Should be Selected for Each Individual Parameter
- Select CSS Channel Current Output:
    - CSS 1: Default = 0 Amp
    - CSS 2: Default = 0 Amp
    - CSS 3: Default = 0 Amp
    - CSS 4: Default = 0 Amp
    - CSS 5: Default = 0 Amp
    - CSS 6: Default = 0 Amp
    - CSS 7: Default = 0 Amp
    - CSS 8: Default = 0 Amp

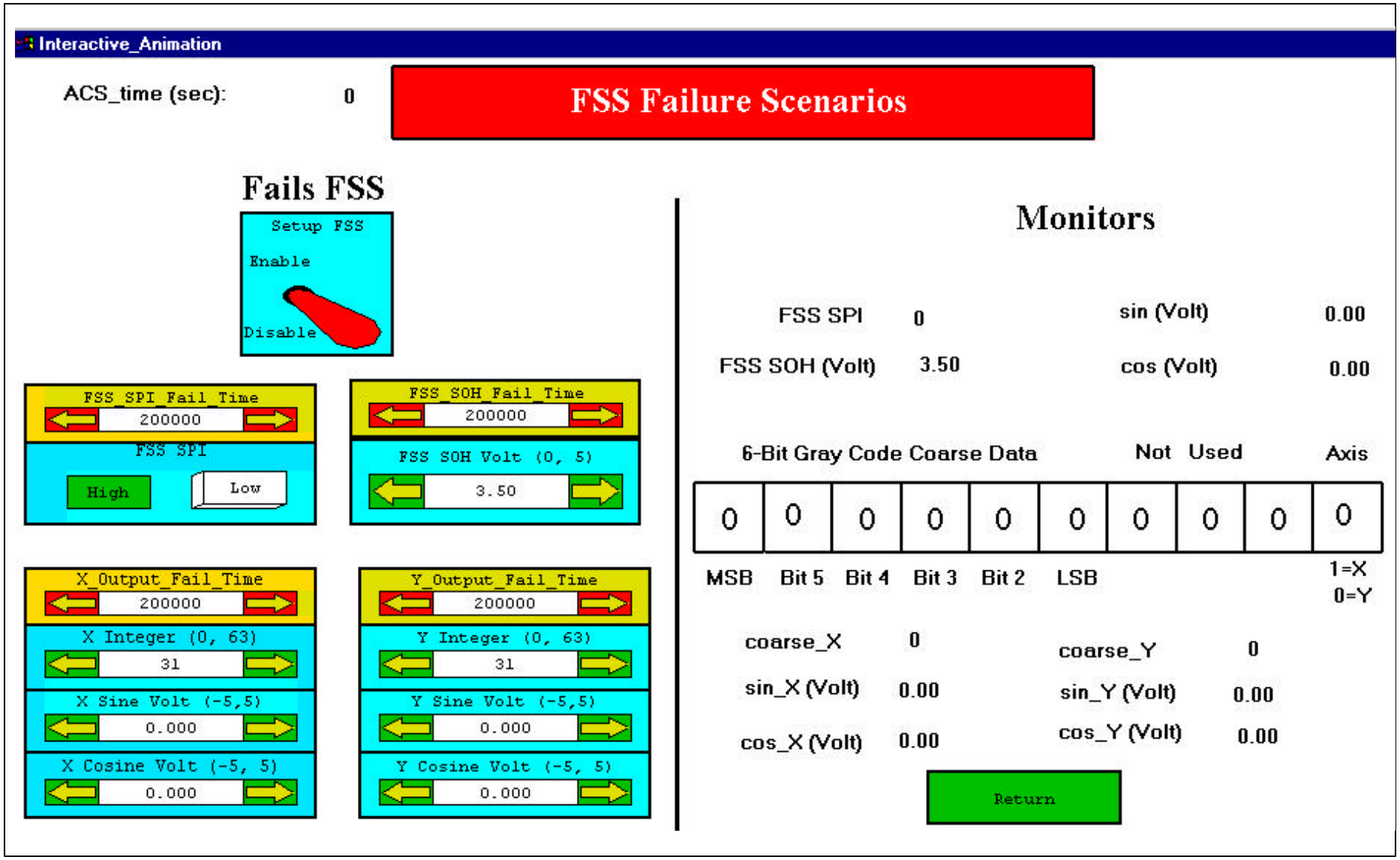
Monitors:

- Display CSS Channel Outputs in Voltage

Return Button:

- Click to Go Back to **Main Animation Screen**

Screen for Simulating FSS Failures



Simulating FSS Failures

Fails FSS:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Fail Time (in Seconds) Should be Selected for Each Individual Parameter
- Select FSS Sun Presence Indicator (SPI): Default = 1
- Select FSS State Of Health (SOH) Output: Default = 3.5 Volt
- Select X Axis Outputs:
    - Integer Part Output: Default = 31 (Equivalent of 0 deg Sun Error)
    - Analog Sine Output: Default = 0 Volt
    - Analog Cosine Output: Default = 0 Volt
- Select Y Axis Outputs:
    - Integer Part Output: Default = 31 (Equivalent of 0 deg Sun Error)
    - Analog Sine Output: Default = 0 Volt
    - Analog Cosine Output: Default = 0 Volt

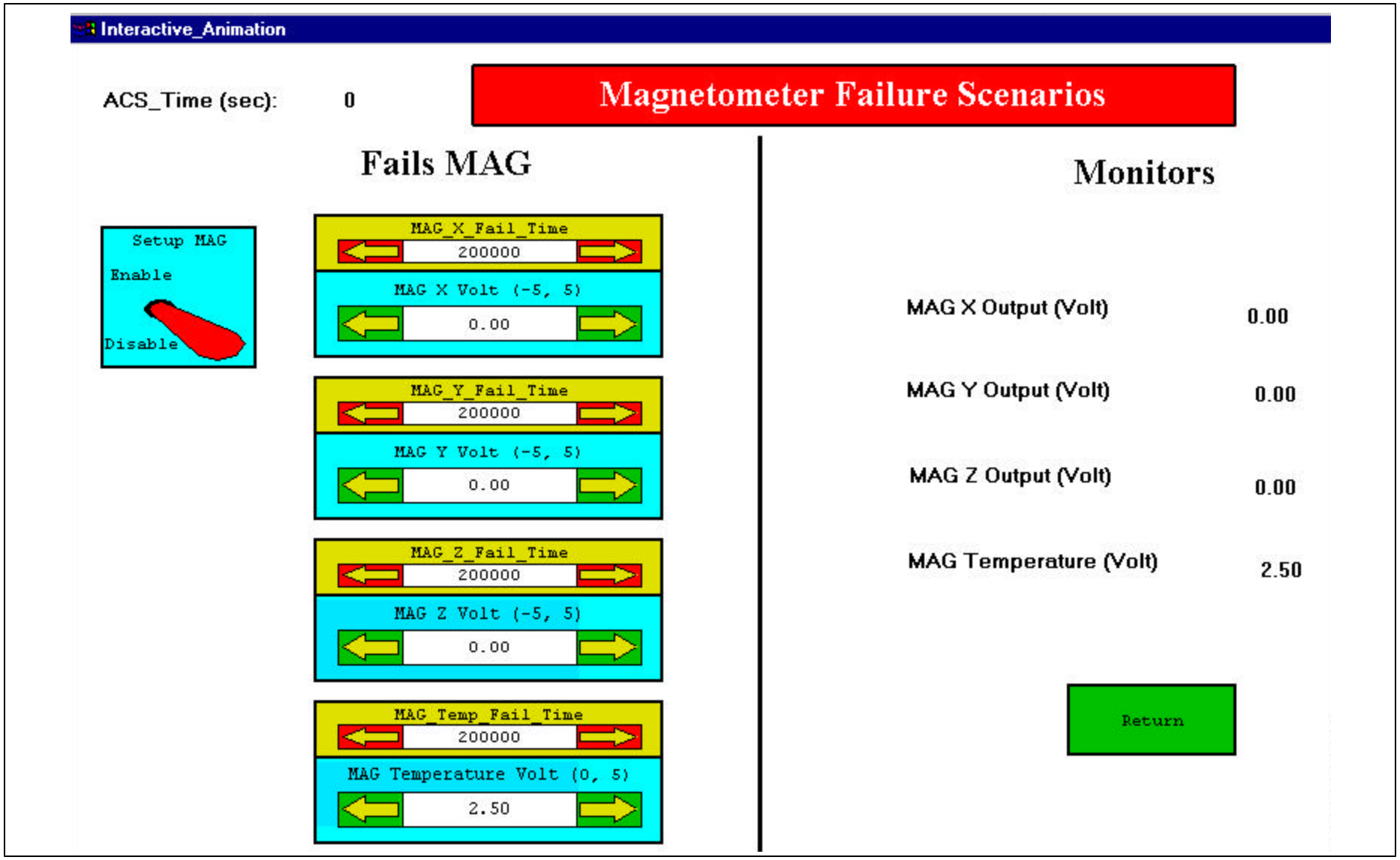
Monitors:

- Display FSS SPI, SOH
- FSS Electronics Outputs: 10-bit Digital Output, analog sin and cos Voltages
- FSS Model Outputs: Integer Data, Analog Signals for X, Y Axes

Return Button:

- Click to Go Back to **Main Animation Screen**

Screen for Simulating MAG Failures



Simulating MAG Failures

Fails MAG:

- **Enable/Disable** Switch: Controls All Parameters Setups in This Screen
- Fail Time (in Seconds) Should be Selected for Each Individual Parameter
- Select MAG Outputs:
    - X Axis Output: Default = 0 Volt
    - Y Axis Output: Default = 0 Volt
    - Z Axis Output: Default = 0 Volt
    - Temperature Output: Default = 2.5 Volt

Monitors:

- Display MAG Three Axis Outputs and Temperature

Return Button:

- Click to Go Back to **Main Animation Screen**

Back-Up Charts

Change Initial Conditions of Truth Model

Another Way To Change Initial Conditions of Spacecraft Truth Model:

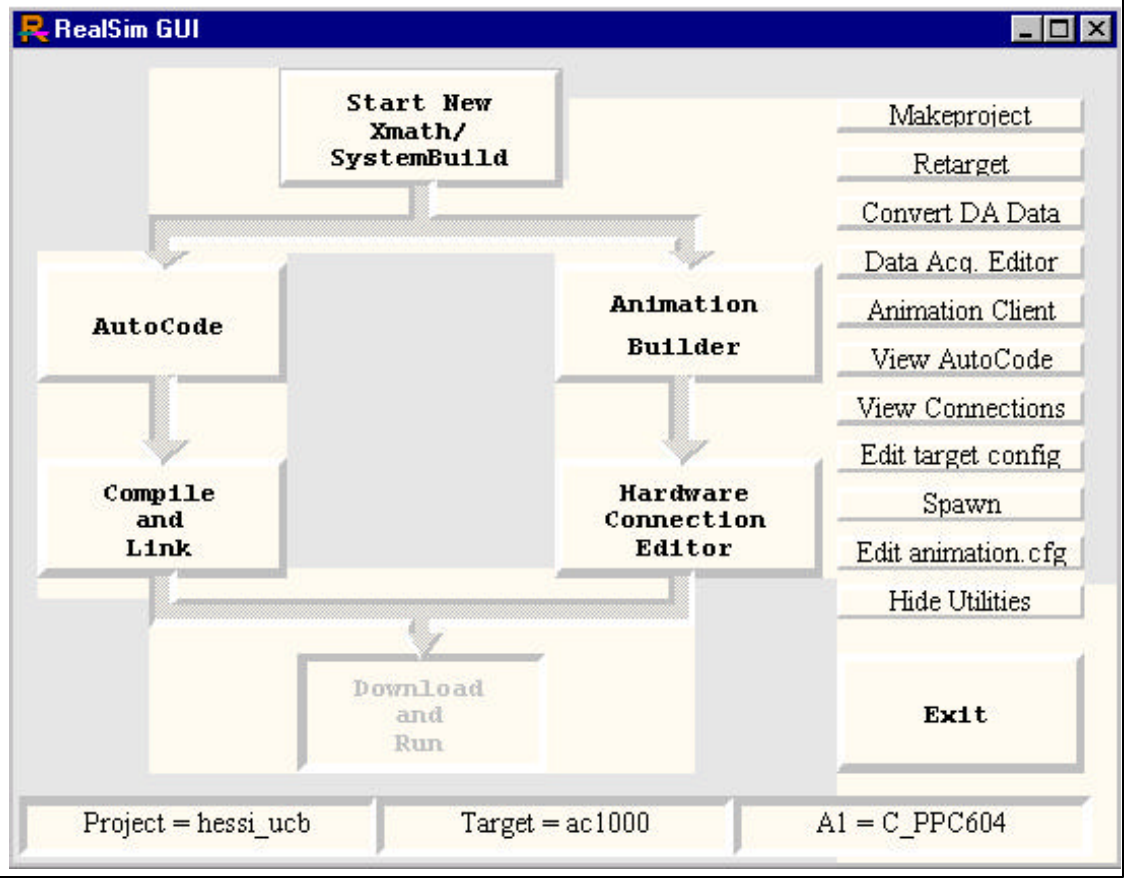
- Bring Up Realsim GUI
- Load Software Package Xmath/SystemBuild
  - Change Parameters of Spacecraft Model
  - Generate Real Time Code for Truth Model
- Generate Autocoded C Code
- Compile and Link Truth Model
- Modify Animation Screen
- View Hardware Connection
- Configure Data Acquisition
- Download to AC1000 and Run

The Only Parameters to Modify:

- **Initial Rate Vector w0**
- **Initial Attitude Quaternion q0**

Combined into One Vector:

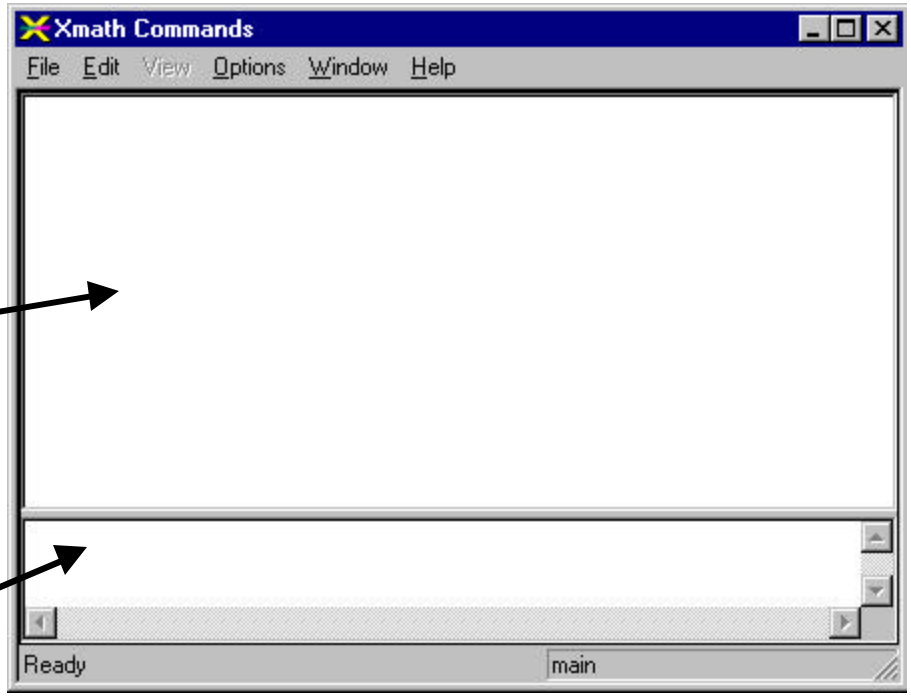
$$\mathbf{wq0} = \begin{bmatrix} \mathbf{ù}_0 (rad/\sec) \\ \mathbf{q}_0 \end{bmatrix}$$



Step 1. Work with Default Project

At Realsim GUI, Click on the Button

To Bring Up Xmath/SystemBuild Window

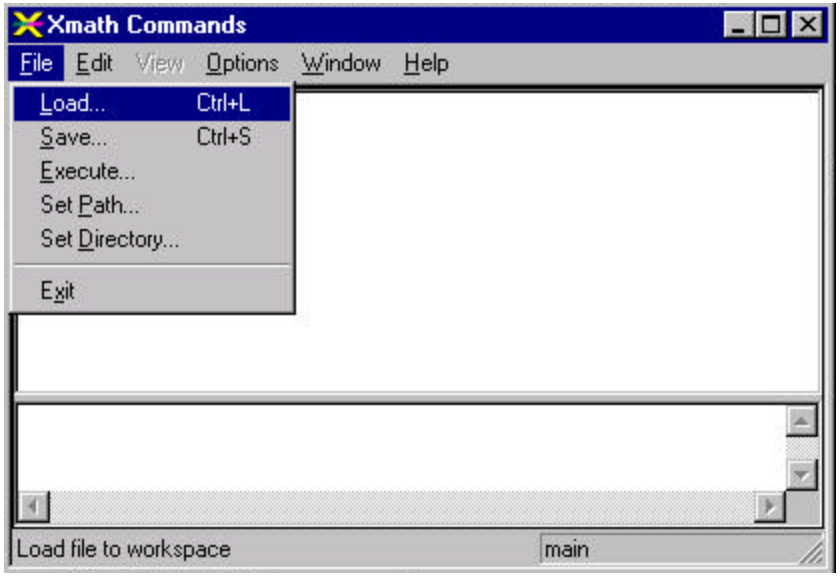


Xmath Display Window

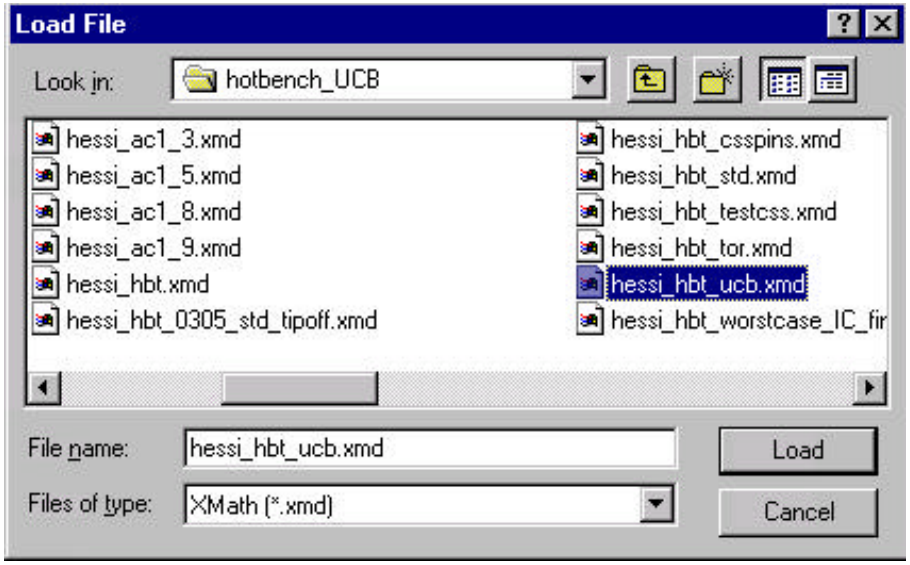
Xmath Command Window:
Type in Commands Here

STEPS 2.1, 2.2

Step 2.1. Load Program:
Select **File -> Load** from **Xmath Commands** Window to Bring Up **Load File** Window on the Right:



Step 2.2. Load Existing Program:
Select **hessi_hbt_ucb.xmd** and Click on **Load** Button to Load in the Program and Bring Up SystemBuild **Catalog Browser** Window

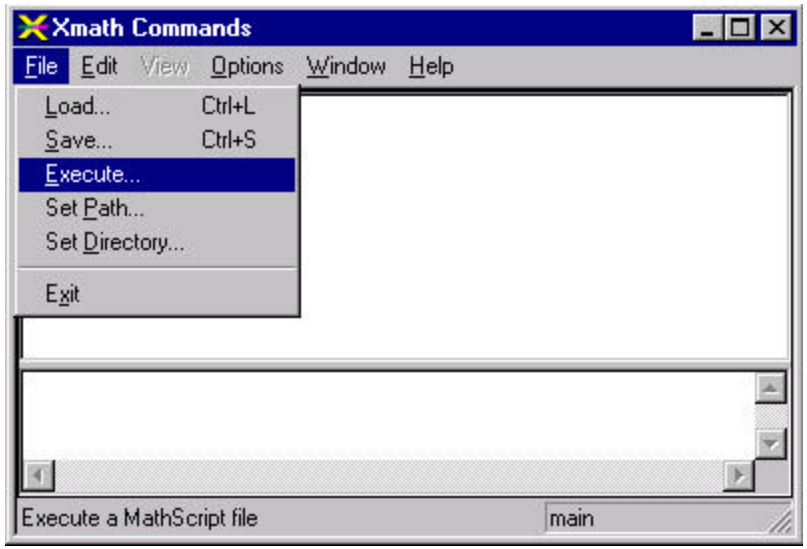


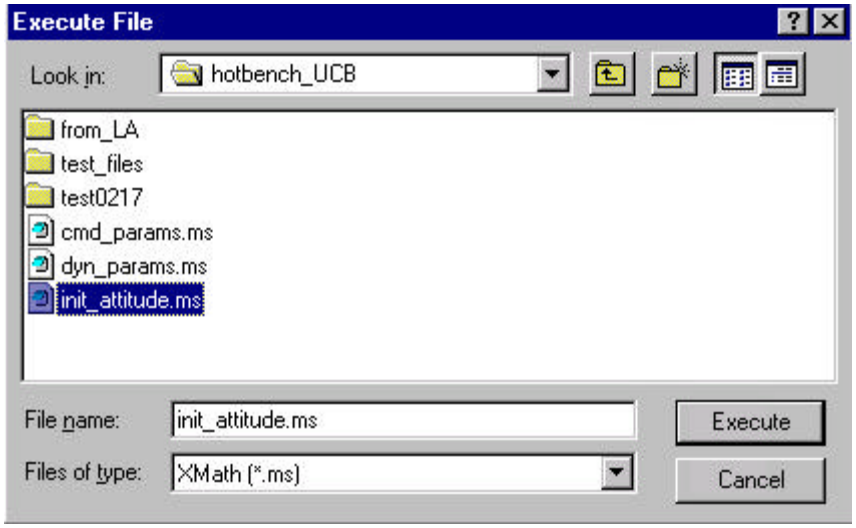
STEP 2.3

Step 2.3. Modify Initial Conditions:

Two Ways:

1. At the Bottom of Xmath Commands Window, Type in **wq0 = [wx;wy;wz;q01;q02;q03;q04]** as Desired
2. Put Initial Rate and Attitude Vectors in a File Named **init_attitude.ms.** Comment out Unused Ones.
   - Execute **init_attitude.ms** from Xmath **File/Execute** as Shown Below
   - Verify Parameters are Correctly Set: Type **wq0** at the Xmath Commands Window, **wq0** will be Shown in the Display Window





Recommendation - Use Method 2

- It Avoids Any Unwanted Changes at Xmath Command Window
- It Keeps the Record of What Have Been Used in Simulations

Example Parameter File

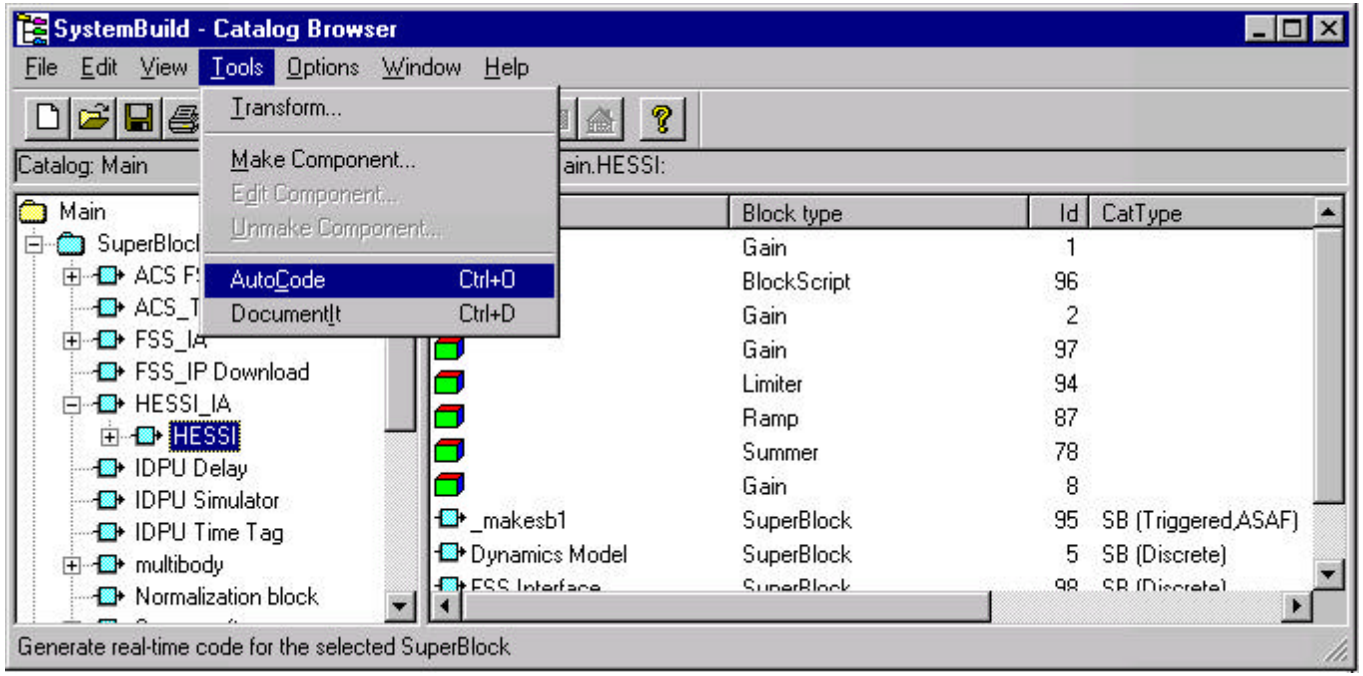
init_attitude.ms - Notepad

File Edit Search Help

```
# init_attitude.ms
# This file contains initial attitude conditions

# Nominal LV tip-off - (4,4,17) deg/sec, 10 deg from the Sun:
wq0 = [0.0458;0.0458;0.0637;-0.0695964;0.501638;-0.2763;0.79953];

# Worst case LV tip-off - (4,4,17) deg/sec, 180 deg from the Sun:
wq0 = [0.0458;0.0458;0.0637;-4.71336e-5; -0.657088; 0.420087; 0.464007];

# Other case LV tip-off - (4,4,17) deg/sec, 90 deg from the Sun:
wq0 = [0.0458;0.0458;0.0637;-0.413224; 2.96304e-5; 0.264086; 0.830517];
```

Step 3.1. Select Model for Generating Real Time C Code:

1. At SystemBuild Catalog Browser, Highlight Main\SuperBlocks\HESSI_IA\ **HESSI**
2. Select Tools\AutoCode to Bring Up **Generate Real-Time Code Dialog Box** Shown on Next Page:

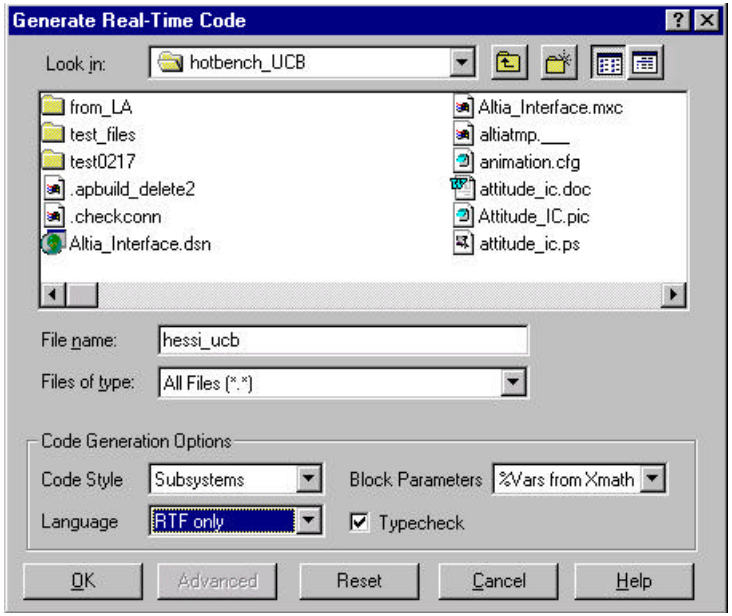


STEP 3.2

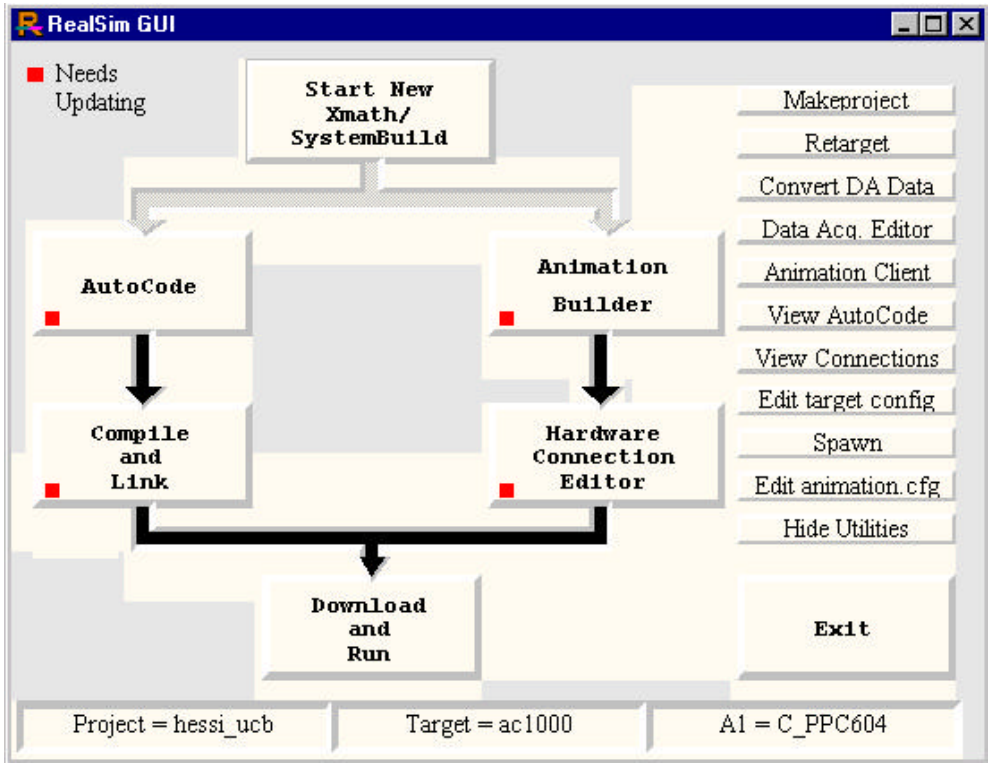
Step 3.2. Generate Real Time Code:
at **Generating Real Time Code** Window:

1. Enter File Name at Prompt: **hessi_ucb**
2. Language Should be **RTF only**
3. Click **OK** When Done
4. Verify at Xmath Commands Window a File with Name **hessi_ucb.rtf** is Generated

Note: All the File Names have to be the Same as the Project Name



Go Back at Realsim GUI. Notice that Red Mark Appears on Some Buttons - Updating is Needed



Step 4. Generate Source C Code:

at Realsim GUI, Click on the Button **AutoCode** 

to Start Generating C-code.

Verify at a DOS Window that the Autocode Generation is Completed Successfully:

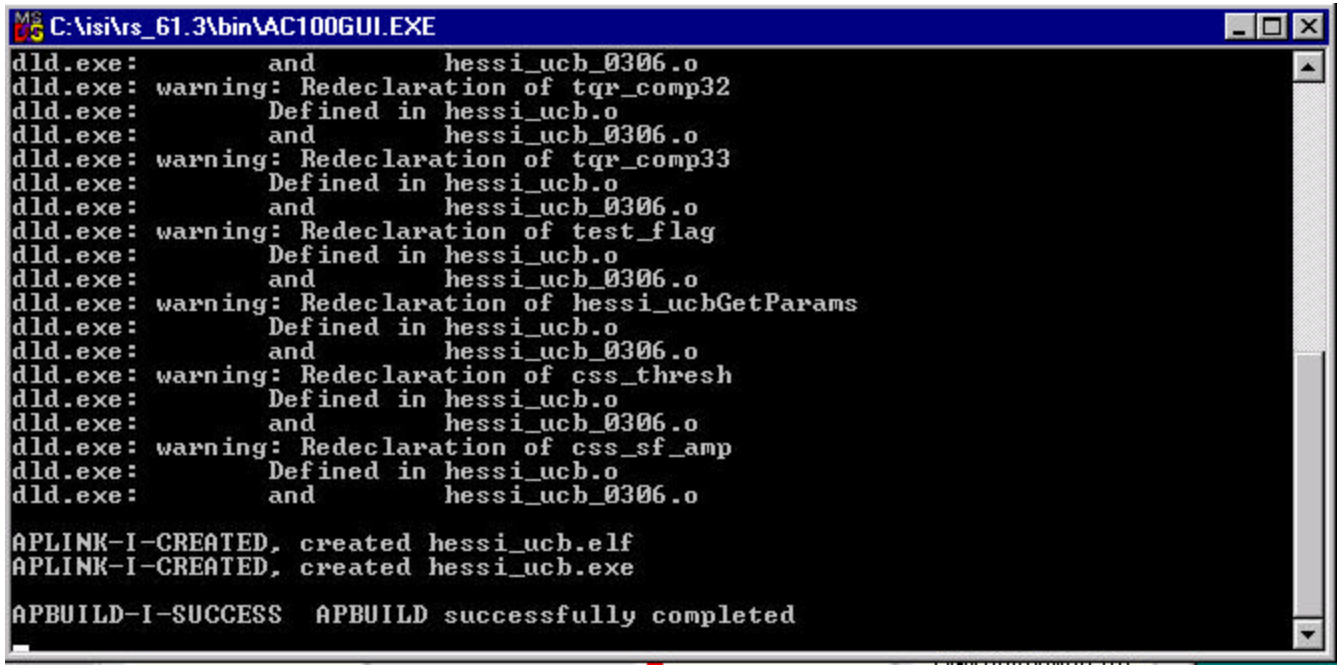
```
C:\isi\rs_61.3\bin\AC100GUI.EXE
Loading 'hessi_ucb.rtf' ...
Initializing ...
Processing names ...
Building symbols ...
Executing 'C:\isi\rs_61.3\bin\c_mms.dac' :
             Generating the Sample-and-Hold code.
             Generating procedures declarations ...
             Generating procedures definitions ...
             Generating Subsystem declarations ...
             Generating Subsystem definitions ...
Output generated in hessi_ucb.c


Code generation complete.
C:\isi\rs_61.3/perl/perl -IC:\isi\rs_61.3/perl_lib C:\isi\rs_61.3/bin/automms.pl
 hessi_ucb.c
AutoCode/MMS Post Processor, version 1.131
Autocode/MMS-Info: Pass-1 (analysis) ......
Autocode/MMS-Info: Pass-1 elapsed time: 0:01
Autocode/MMS-Info: Pass-2 (code generation) ......
Autocode/MMS-Info: Pass-2 elapsed time: 0:02
Autocode/MMS-Info: Renaming hessi_ucb.c => hessi_ucb.c.old... OK.
Autocode/MMS-Info: Renaming hessi_ucb.mms.c => hessi_ucb.c... OK.
AutoMMS done, Total elapsed time = 0:03, 2003 lines/sec
```

Step 5: Compile and Link

At Realsim GUI, Click on the Button 

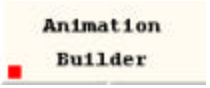
to Compile and Link the Source C Code.

If Successful, the DOS Window Should Show as Below and the Red Mark on the Button Should Disappear. Otherwise, Error Messages will be Displayed at DOS Window. Warning Messages can be Ignored.

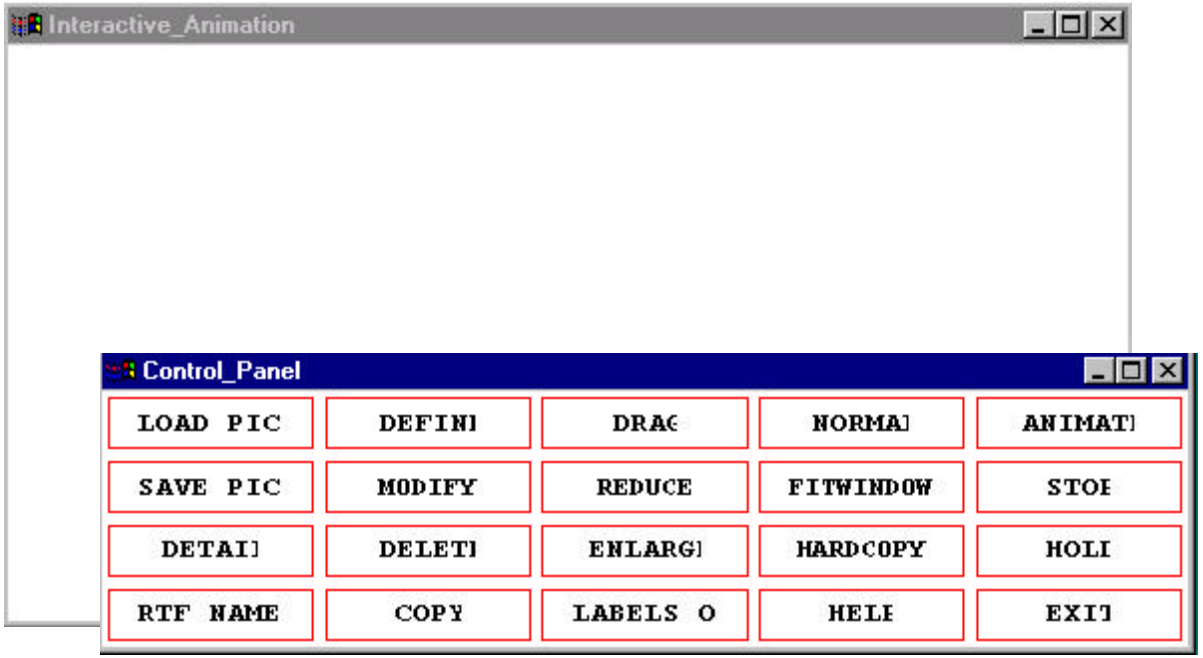


```
C:\isi\rs_61.3\bin\AC100GUI.EXE
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of tqr_comp32
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of tqr_comp33
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of test_flag
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of hessi_ucbGetParams
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of css_thresh
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o
dld.exe: warning: Redeclaration of css_sf_amp
dld.exe:        Defined in hessi_ucb.o
dld.exe:        and        hessi_ucb_0306.o

APLINK-I-CREATED, created hessi_ucb.elf
APLINK-I-CREATED, created hessi_ucb.exe

APBUILD-I-SUCCESS  APBUILD successfully completed
```

Step 6.1. Create Animation Screen:

at Realsim GUI, Click on the Button 

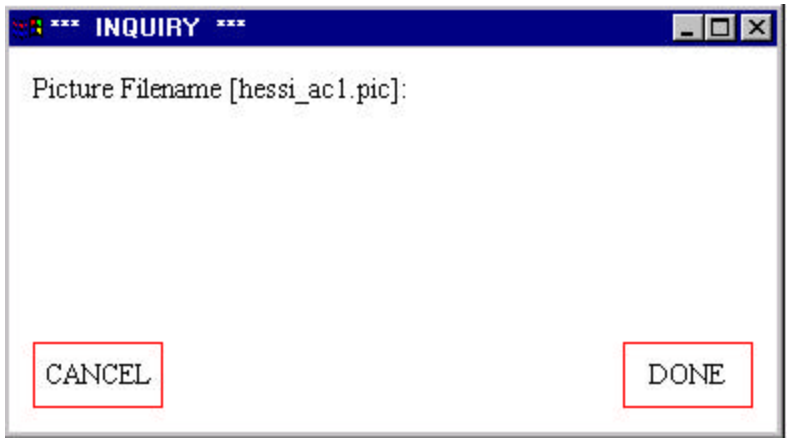
to Load **Interactive_Animation** Screen and **Control_Panel**



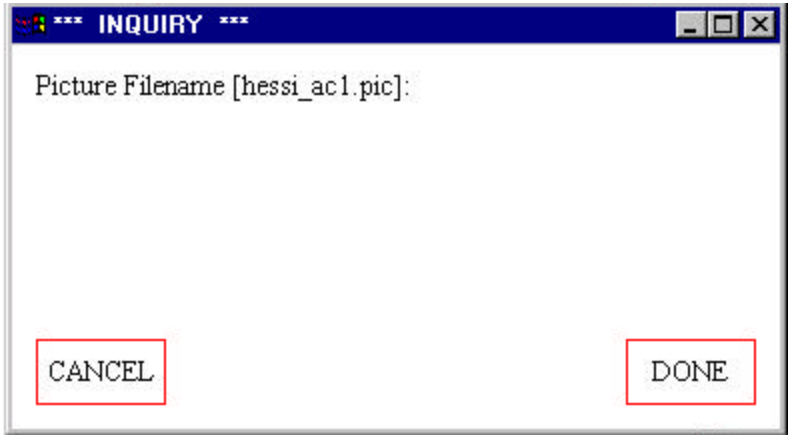
Click on the button **LOAD PIC** to Bring Up an **INQUIRY** Box Shown on Next Page:

STEPS 6.2, 6.3

Step 6.2. Use Existing Animation File:
Accept the Default File Name hessi_ac1.pic
Click on Button **Done**
The Animation Screen Should Show Up



6.3. Save Animation File:
After Viewing the Screen, Click on Button **SAVE PIC** from **Control_Panel** Window to Bring Up Another **INQUIRY** Box
Accept the Default Name by Clicking **DONE**



Click on Button **EXIT** from **Control_Panel** Window

Now the Red Mark on the Button **Animation Builder** at RealSim GUI Should Disappear.

STEP 7.1

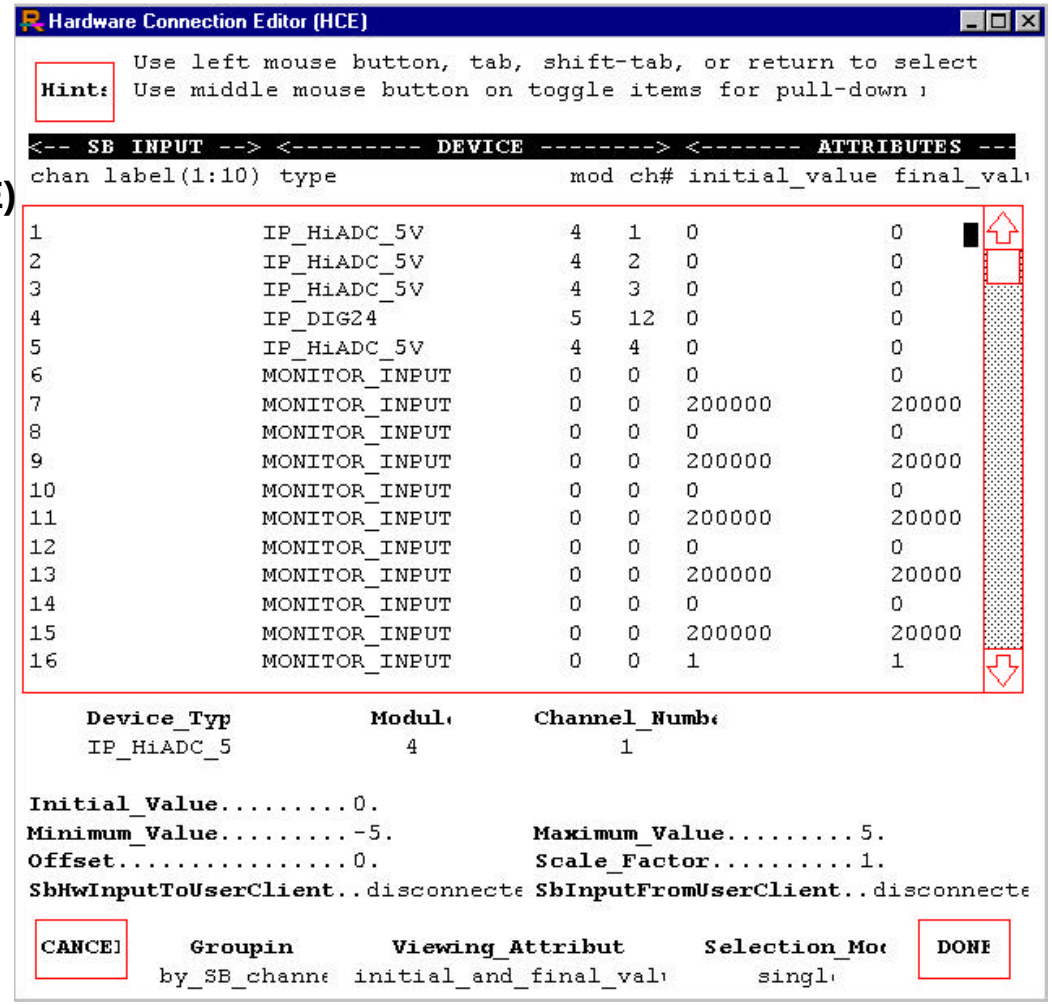
Step 7.1 View Hardware Connection

At Realsim GUI, Click on the Button

to Bring up **Hardware Connection Editor (HCE)**

AC1000 Truth Model Inputs:

- One ADC Module:
  - 4 Commanded Torque Rod currents
    Ix, Iy, Iz1, Iz2
- One Digital Module:
  1 FSS Enabling Gate
- Type **MONITOR_INPUT** are from Animation Screens, They Do Not Use Actual Hardware



Click on **Done** to Bring Up AC1000 Output List Shown on Next Page.

STEP 7.2

Step 7.2 View AC1000 Output Signals:

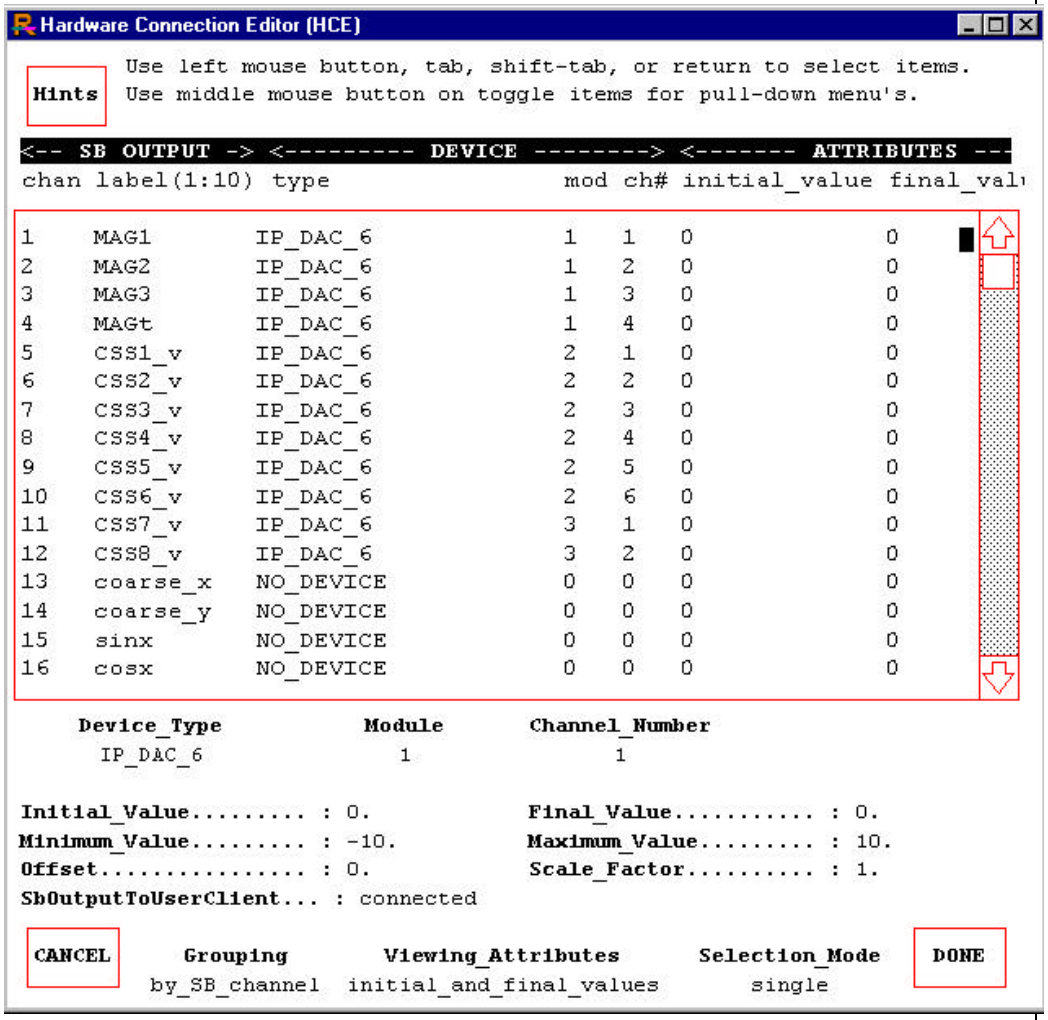
- It Lists All Outputs from SC Truth Model
- 3 DAC Modules
- One Digital Module (Shared with Inputs)
- **NO_DEVICE** - No Actual Hardware Connected

AC1000 Truth Model Outputs:

- MAG Outputs - 4 Signals
- CSS Outputs - 8 Signals
- FSS_SPI
- SAS X and Y Axis Counts
- Analog Sine and Cosine Signal of FSS
- Digital Bits of FSS
- Others

CAUTION:

Once Hardware Connection is Set, Please Do Not Change Them! They are Corresponding to the Physical Hardware Module Positions in the Rack.



STEP 8.1

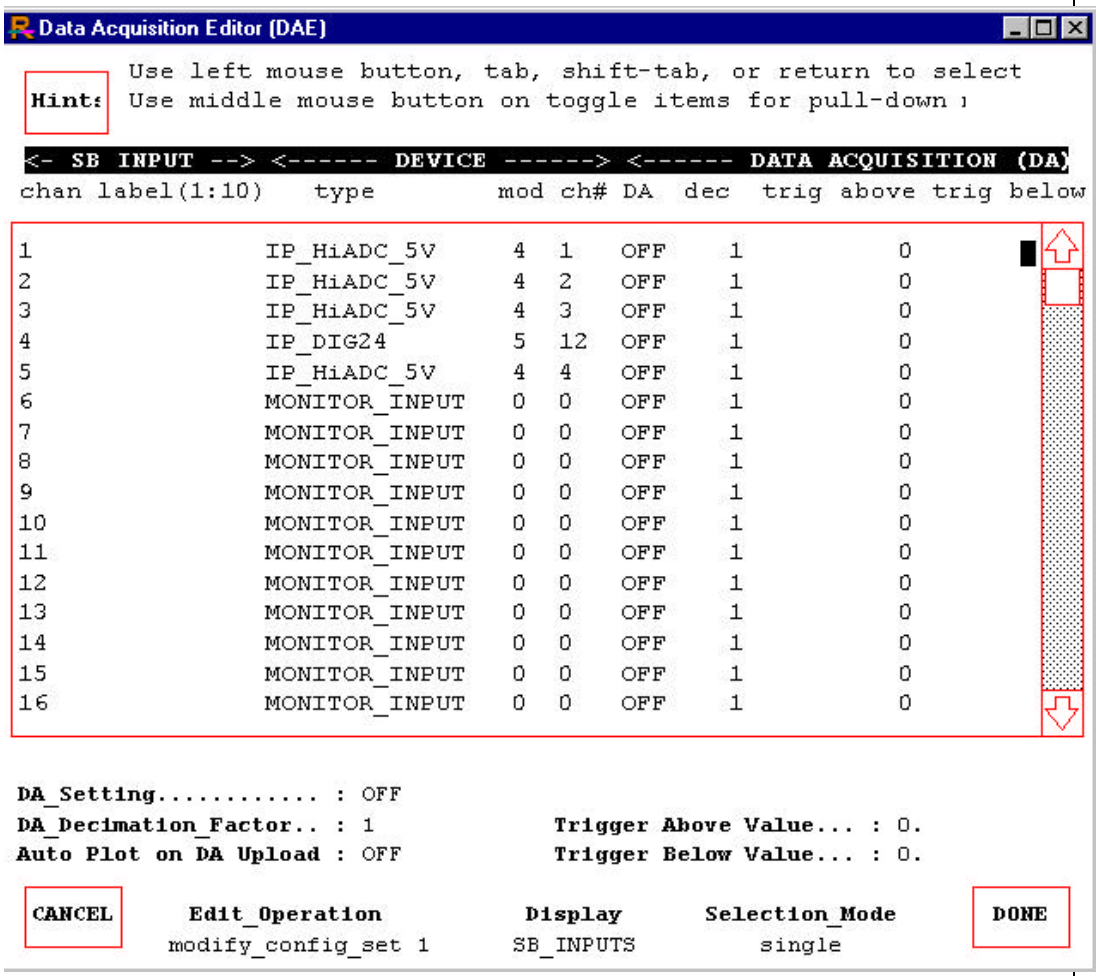
Step 8.1 Setup Data Acquisition for Inputs:

On Realsim GUI, Click On Button Data Acq. Editor to Bring up **Data Acquisition Editor (DAE)**

The First Screen is for Truth Model Input Signals

Note:
No Data Acquisition for Input Signal is Setup for HESSI Simulation

Toggle **Display** to Show **SB_OUTPUTS**, Bringing Up Output List Shown on Next Page.



Step 8.2 Setup Data Acquisition for Outputs:

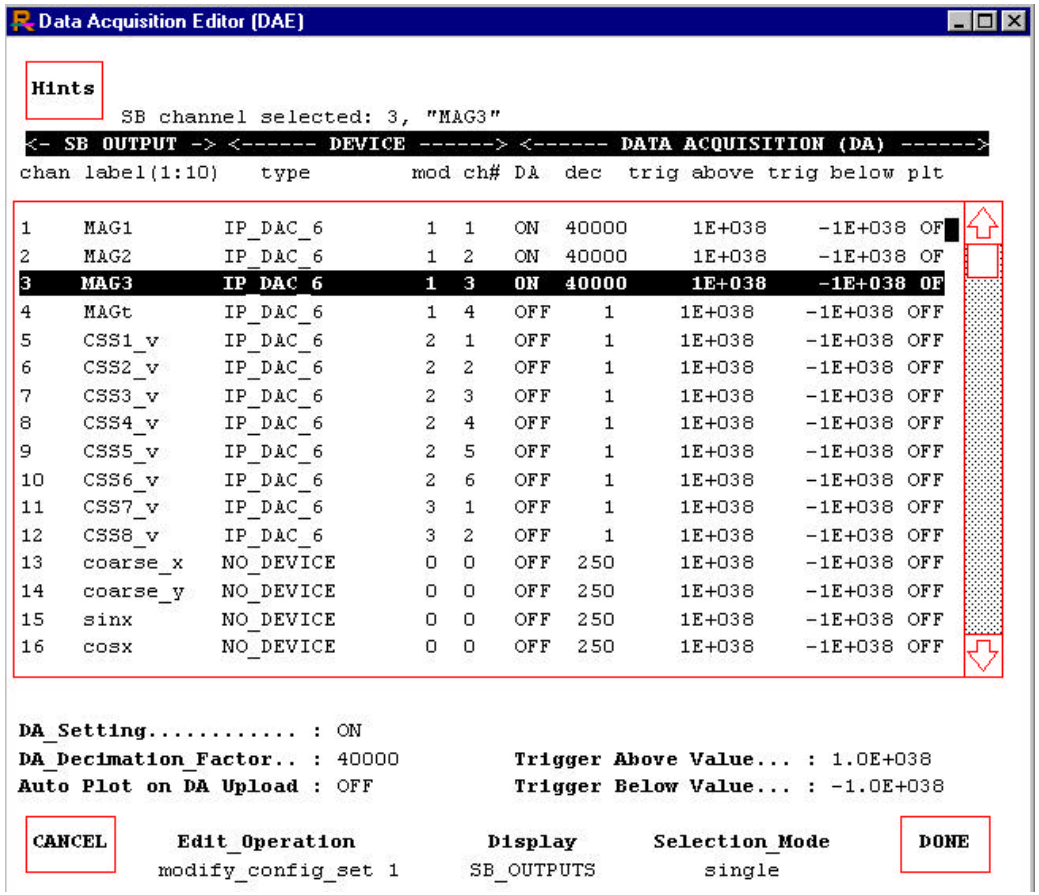
Data Acquisition:

- Collect Data from AC1000 Truth Model
- Data is Saved on AC1000 Controller
- Data can be Uploaded to Host Computer
- No Hardware Device is Needed

Data Acquisition Editor Allows for:

- Configure DA for Each Signal
- Click on One Variable to Highlight
  - Turn DA_Setting On/Off
  - Select DA_Decimation_Factor for Sampling Rate - **DEC** Shall be the Multiples of the Mim Cycle in the Truth Model (0.00025 sec)
  - 40000 Cycles = 10 seconds

Click on **DONE** when Finished



chan	label(1:10)	type	mod	ch#	DA	dec	trig above	trig below	plt
1	MAG1	IP_DAC_6	1	1	ON	40000	1E+038	-1E+038	OF
2	MAG2	IP_DAC_6	1	2	ON	40000	1E+038	-1E+038	OF
3	MAG3	IP_DAC_6	1	3	ON	40000	1E+038	-1E+038	OF
4	MAGt	IP_DAC_6	1	4	OFF	1	1E+038	-1E+038	OFF
5	CSS1_v	IP_DAC_6	2	1	OFF	1	1E+038	-1E+038	OFF
6	CSS2_v	IP_DAC_6	2	2	OFF	1	1E+038	-1E+038	OFF
7	CSS3_v	IP_DAC_6	2	3	OFF	1	1E+038	-1E+038	OFF
8	CSS4_v	IP_DAC_6	2	4	OFF	1	1E+038	-1E+038	OFF
9	CSS5_v	IP_DAC_6	2	5	OFF	1	1E+038	-1E+038	OFF
10	CSS6_v	IP_DAC_6	2	6	OFF	1	1E+038	-1E+038	OFF
11	CSS7_v	IP_DAC_6	3	1	OFF	1	1E+038	-1E+038	OFF
12	CSS8_v	IP_DAC_6	3	2	OFF	1	1E+038	-1E+038	OFF
13	coarse_x	NO_DEVICE	0	0	OFF	250	1E+038	-1E+038	OFF
14	coarse_y	NO_DEVICE	0	0	OFF	250	1E+038	-1E+038	OFF
15	sinx	NO_DEVICE	0	0	OFF	250	1E+038	-1E+038	OFF
16	cosx	NO_DEVICE	0	0	OFF	250	1E+038	-1E+038	OFF

Step 9: Download and Run

At Realsim GUI, Click on the Button 

to Download Source Code and Run AC1000

The Main Animation Screen Should Appear.