

DRAFT
System User's Guide
for the
SIMSS/PM-1 Simulator

Release 4.0
March 2000

Prepared Under Contract NAS9-98100
by Computer Sciences Corporation

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Prepared by:

T. Bilmanis, CSC Date

Reviewed by:

E. Quintin Date
ETS Technical Lead, CSC

E. Noone Date
ETS Software Manager, CSC

Approved by:

W. Fuller Date
ETS Manager, Code 581

About This Document

This document is the System User's Guide for the Scalable, Integrated, Multimission, Simulation Suite (SIMSS) PM-1 Simulator developed for the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC). The simulator is one of the deliverables of the EOSDIS Test System (ETS) PM-1 Development Task under the CSOC contract. The System User's Guide provides an overview of operational concepts and procedures for this simulator. This document is approved by GSFC Code 581, and will be maintained by Computer Sciences Corporation (CSC) under the CSOC contract.

Who Should Use This Document

This document is for anyone who wishes to use the SIMSS/PM-1 Simulator. To use this simulator effectively you should already be familiar with the basics of the Windows NT Operating System as well as be familiar with the EOS PM-1 Spacecraft.

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SIMSS Client-Server Architecture

The Scalable, Integrated, Multimission, Simulation Suite (SIMSS) is a distributed, component-based, plug-and-play, client-server system useful for performing realtime simulations and communications testing in support of NASA projects.

SIMSS-1.0 Overview

SIMSS runs on one or more Windows NT workstations. It is designed to be user-configurable or to use predefined configurations for routine operations.

Terminology:

- Client: The workstation on which the user interface runs. It also refers to the applications making up the user interface.
- Server: The workstation on which the actual data processing is performed. It also refers to the applications making up the data processing component.
- Module: A self-contained SIMSS component that receives, processes, or transmits data, or any combination of the three.
- Channel: An interface or port through which a module receives or transmits data. A module may have zero to many channels.
- Link: A directional connection between module channels. A link connects an output channel of one module with the input channel of another module.
- Project: A collection of modules and links intended to perform a specific function such as spacecraft simulation, data quality monitoring, or data conversion.
- Event Message: A time-tagged text message generated by the modules to inform the operator. Event messages may report warning or error conditions as well as successful activities.
- Directive: A text-based command entry line that submits operator instructions to the modules. The directive window is below the configuration window in the main SIMSS display.
- Container: A repository internal to each module that contains all of the vital data for that module. The container is used to exchange data between the client and server. Built-in functions of the container support save and restore operations.

SIMSS-2.0 Installing A New Release

SIMSS-2.1 Installing the Client

To install the SIMSS client, run *jdk1_2_1-win.exe* located in the *\jdk* folder on the delivery CD. After JDK1.2.2 is installed, the next step is to run *setup.exe* in the *\client* folder on the CD and follow the prompts. Upon completion of the client installation, a SIMSS Client icon will be installed on the desktop.

SIMSS-2.2 Installing the Server

To install the SIMSS server, run *setup.exe* in the *\server* folder on the CD and follow the prompts. Upon completion of the server installation, a SIMSS Server icon will be installed on the desktop.

Note: The user needs administrative rights in order to install the SIMSS Server.

SIMSS-3.0 Configuration

By default the configuration files are located in the folder “*c:\Program Files\CSC\NeTTCClient\properties*”. Before running the SIMSS Client, please check that the correct IP address for running the SIMSS Server is in the *servers.txt* file. The format for entries in this file is:

Servername, IP address

Example:

localhost,127.0.0.1

SIMSS-4.0 Run-time Operation

The SIMSS architecture is capable of supporting a variety of applications by connecting generic and mission-specific modules in different combinations. The general steps for starting up a SIMSS project are summarized in the next subsection. More detailed examples of these steps are provided in SIMSS-5.0, which describes the graphical user interface.

While SIMSS applications can perform vastly different functions and have customized user interfaces tailored to those functions, there are two run-time regions of the project window that are common to all SIMSS projects. They are the operator directive region and the event log display region. These regions are described in later subsections.

Other chapters in this system user's guide are devoted to the various generic and mission-specific modules. Please refer to these chapters for detailed information on module configuration and run-time operations.

SIMSS-4.1 Project Startup Sequence

SIMSS Startup Steps	Description
1) Start the Server	The SIMSS Server should always be started prior to starting the SIMSS Client. Double-click the Server icon on the PC desktop. When the Server is started, a text window is created.
2) Start the Client	Double-click the SIMSS Client icon on the desktop. When the Client is started, a Client text window is created and then the graphical user interface is started with the SIMSS Client main window.
3) Add (or Restore) a Project	Click on the SIMSS Client main window's Project menu and select "Add Project". Or, the "Restore From" selection can be used to load a previously saved project. A project window is created within the main window.
4) Connect Project to Server	In the project window, click the System menu and select the "Connect" option. A list of available servers will be shown. Select a server for the connection.
5) Add Modules	In the project window, click the Module menu and select "Add Module". From the Module Selection window, click on the module to be added and the OK button. Click again in the project window for placement of the module's icon. Repeat this step until all desired modules have been added.
6) Create Links Note: Refer to module input and output link descriptions in order to connect output links to the appropriate input links!	In the project window, click the Module menu and select "Create Links". Click on a module's border and drag the cursor to the border of another module and click again. If either module has multiple links, a popup window will appear for specification of the exact links. Repeat this step to create all desired links. To cancel link creation mode, click on the Module menu and select "Design".
7) Configure Modules	Click in the center of the module and select "Configure" from the popup menu. Perform module-specific configurations. Repeat for as many modules as needed.
8) Lock the Project	In the project window, click the Run menu and "Lock".
9) Save the Project (optional)	Click the project window's System menu and select "Save Project". Specify a name for the project save file.
10) Run the Project	In the project window, click the Run menu and select "Run". All of the modules in the project will be started. Click the center of any module to access its run-time options.

SIMSS-4.2 Project Directive Region

If any module in a project accepts operator directives, the directive region in the lower right side of the project window frame is activated. If the project's event log is being shown, it appears below this region. The directive region has a module indicator button and a data entry field. When the module indicator button is clicked, a list of the modules accepting directives is shown. Click to select the module to process a directive. The button is labeled with the currently selected module. In the example below, the Ground Station module is selected. Click in the data entry field to the right of the module button to start entering a directive. Use the keyboard's enter key to send the directive to the module. Note that the directive entry line is not case sensitive. The **Set**, Setbuffer, and **Get** directives are available to any module that accepts directives and has container variables.



SIMSS-4.2.1 Set Directive

The **set** directive may be used to change the value of any modifiable variable in the container for the indicated module. The format of the **set** directive is

set name value

where *name* is a container variable name and *value* is either a decimal, octal, or hexadecimal number. Octal numbers are identified by a leading zero. Hex numbers are identified by a leading 0x. The names of variables are provided in the container description for each module. If the variable is successfully set, an event message of the form

“module: *name* set to *value*”

informs the operator of the change. If the variable name is not recognized or the variable cannot be modified, an event message of the type

“module: *name* invalid, read-only or not found”

will inform the operator. If unsuccessful, verify that the module indicator is correct, that the variable name spelling is correct and that the variable is not defined as read-only.

SIMSS-4.2.2 Setbuffer Directive

The **setbuffer** directive may be used to change the value of any modifiable buffer in the container for the indicated module. The format of the **setbuffer** directive is

setbuffer buffername <offset> [byte | word | dword] <value> <value> <value> ...

where *buffername* is a container buffer name, *offset* is the decimal byte offset to the first item to be set, the keywords “byte”, “word”, and “dword” indicate the number of bits to set when applying values, and *value* is either a decimal, octal, or hexadecimal number. The **setbuffer** directive entry line is limited to 100 characters. The names of alterable buffers are provided in the container description for each module. An example of setbuffer usage is:

```
setbuffer TlmPacket0140 20 byte 10 012 0xA
```

In this example, three bytes of the buffer TlmPacket0140 beginning at offset 20 are set to 10. If the buffer is successfully set, an event message of the form

“module: values set in buffer *buffername*”

informs the operator of the change. If the buffer name is not recognized or the buffer cannot be modified, an event message of the form

“module: *buffername* not found”

will inform the operator. If unsuccessful, verify that the module indicator is correct, that the buffer name spelling is correct, and that the buffer is not defined as read-only.

SIMSS-4.2.3 Get Directive

The **get** directive may be used to display the value of any variable in the container for the indicated module. The format of the **get** directive is

```
get name
```

If the name matches a variable in the module's container, an event message of the form

“module: *name* = *value*”

is written to the event message log. If the name doesn't match a container variable, an error event message of the form

“module: *name* invalid or not found”

will be produced. If unsuccessful, check the setting of the module indicator and the spelling of the container variable name.

SIMSS-4.3 Project Event Log Region

Many SIMSS modules send informative, warning or error event messages to the project's event log during configuration and run-time operations. To open the event log region at the bottom of the project window, select the “Show Event Log” option from the System menu. The example shown includes event messages from **get** and **set** directives.

```
10:00:50, August 27, 1999 inputIP DLL: input IP running
10:01:36, August 27, 1999 GSPM1: GsCmdCount invalid or not found.
10:01:57, August 27, 1999 GSPM1: GsCmdReceiveCount = 200
10:02:18, August 27, 1999 GSPM1: gscmdreceivecount set to 0
10:02:56, August 27, 1999 GSPM1: gscomdcount invalid, read-only, or not found.
```

SIMSS-5.0 Displays

SIMSS-5.1 SIMSS Client Main Window

When the SIMSS Client is started, the main window appears. The File menu contains an “Exit” option and the Project menu contains options to add a new project and restore a project.

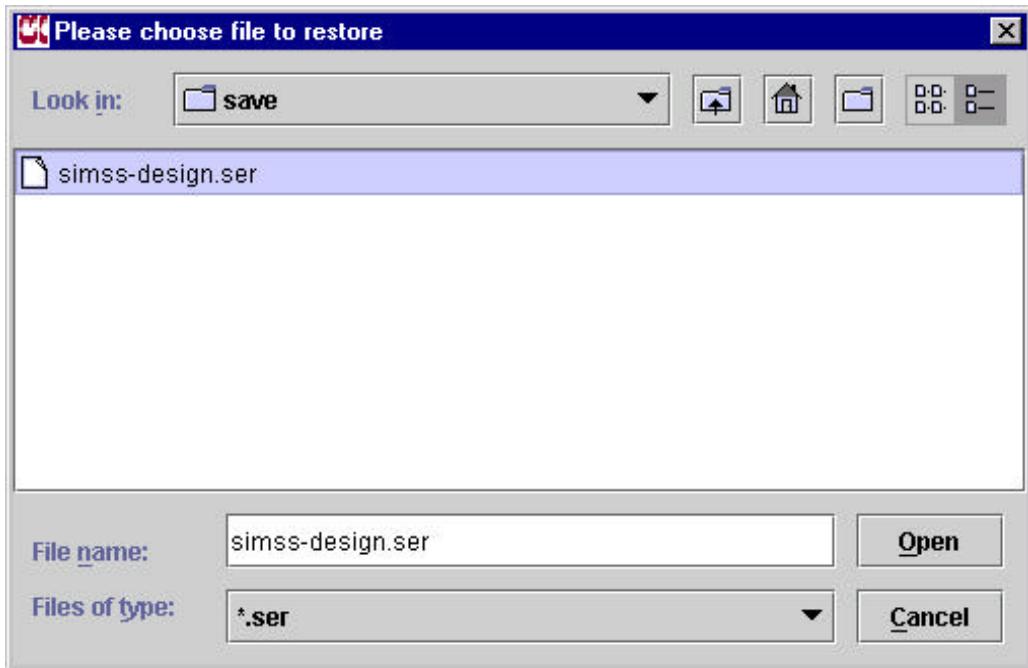


SIMSS-5.1.1 Add Project

To create a new project, select the “Add Project” item from the Project menu. This will add a project window within the SIMSS Client window. In future releases, multiple project windows may be created within the main window.

SIMSS-5.1.2 Restore Project

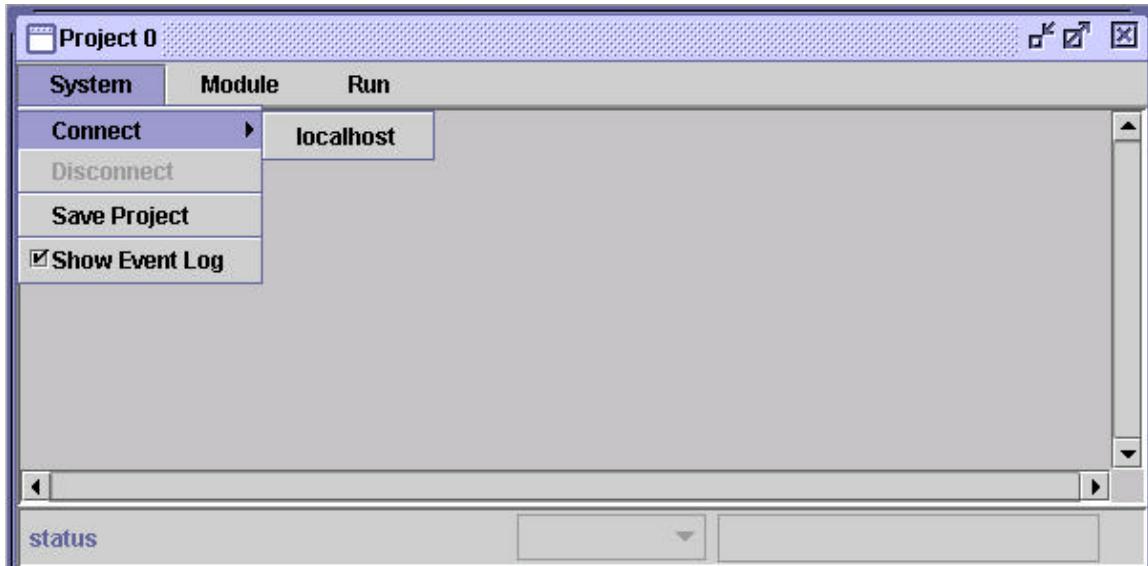
To restore an existing project, select the “Restore From” item from the Project menu. The following file selection screen will appear.



The system will search the save directory by default but another directory may be selected by clicking the Save Folder button. Select a file and click the **Open** button. Click on the **Cancel** button to dismiss the display without restoring a project.

SIMSS-5.2 Project Window

Each SIMSS application is built within a separate project.



To create a project, select the “Add Project” item from the SIMSS Client Project menu. This will add a project window that contains a System menu, a Module menu and a Run menu. At the bottom of the project window is a status field. At the bottom right is the directive region of the screen.

SIMSS-5.2.1 System Menu

The System menu on the Project window contains the following choices.

System Menu Item	Description
Connect	Connects the project to a server
Disconnect	Disconnects the project from a server
Save Project	Saves the project design to file
Show Event Log	When this option is enabled, the event log portion of the Project window is displayed.

SIMSS-5.2.1.1 Connect to Server

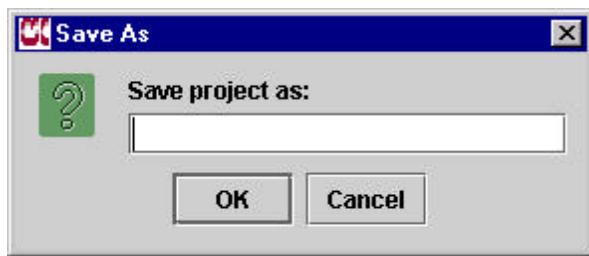
The client must be connected to a server in order to function. To make a connection to a server, select the “Connect” option from the System menu. A menu of available servers will be displayed. Click to select a server for the connection. In the above picture, only one server was available. After the client has been connected to a server, the “Disconnect” option will be enabled on the System menu and the “Connect” option will be disabled.

SIMSS-5.2.1.2 Disconnect from Server

To disconnect the client from the server, select the “Disconnect” option from the System menu. After the client has disconnected from the server, the “Disconnect” option will be disabled on the System menu and the “Connect” option will be enabled.

SIMSS-5.2.1.3 Save Project

This option allows the user to store the project’s design to a file. Different design configurations of SIMSS modules may be desired for different testing environments. To save the project, select the “Save Project” option. The following screen will appear.



Enter the file name for storage of the current project and click the **OK** button to have project information written into it. The file name will have “.ser” appended to the end. Clicking **Cancel** will close this window without performing a save.

SIMSS-5.2.1.4 Show Event Log

Each project has an event log that displays time-tagged event messages received from all of its modules. The event log may be optionally displayed as a scrolling region at the bottom of the project window. Modules may send informative, warning or error messages to the event log during configuration and run-time operations.

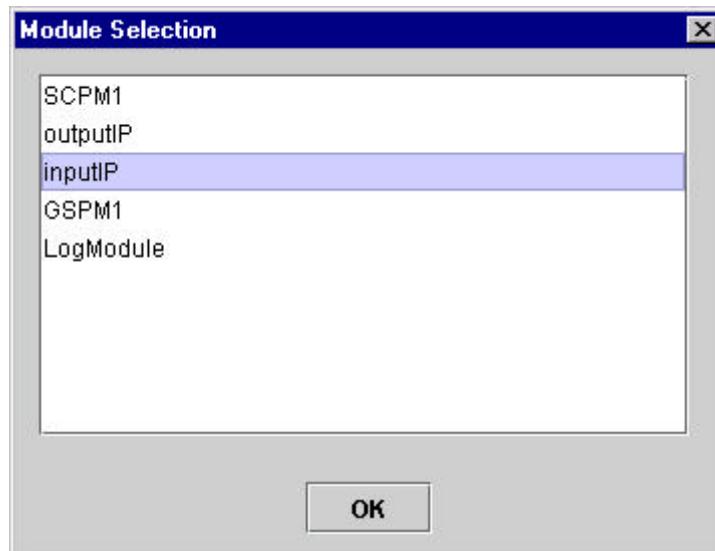
SIMSS-5.2.2 Module Menu

The Module menu on the Project window contains the following choices.

Module Menu Item	Description
Add Module	Add a module to the project's design diagram
Create Links	Create a link between modules
Design	Allows editing of the project design diagram

SIMSS-5.2.2.1 Add Module

To add a module to the project, select the “Add Module” option from the Module menu.



A list of the modules available from the server will be displayed. Click to select a module and then click the **OK** button.

Position the cursor within the project window where the top left corner of the module's symbol should be drawn and click. A rectangle representing the module will be drawn at that location. The rectangle will have a wide cyan border while in Design mode.

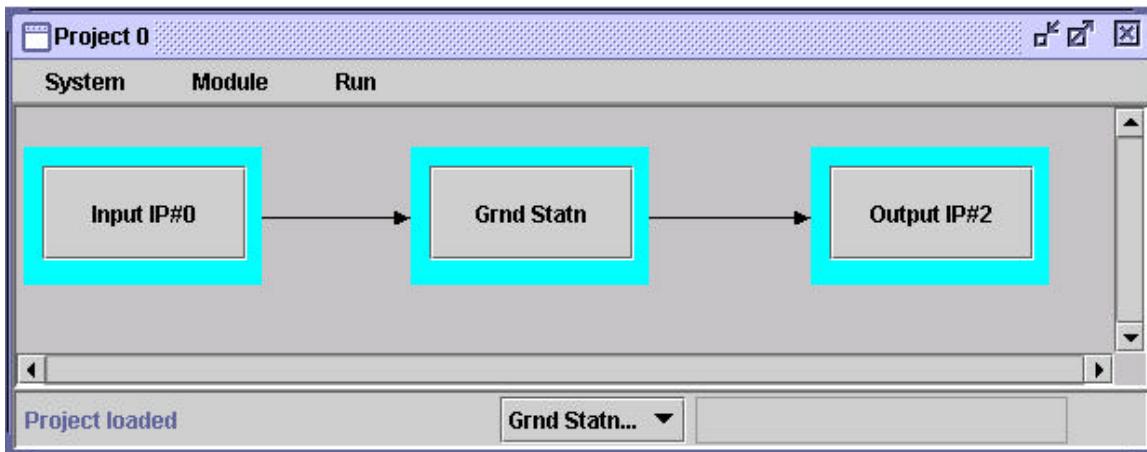
If a module is added that accepts operator directives, the directive region of the project window becomes accessible.

SIMSS-5.2.2.2 Create Links

Links are used to connect the input and output channels between modules for a given project. In the example shown below, the output channel of an Input IP module is linked to an input channel of a Ground Station module.

To create a link,

- select the “Create Links” option from the Module menu,
- position the crosshair cursor on the highlighted edge of the source module and click,
- drag the link line to the destination module’s edge and click again.



When multiple links are defined for a module, the user will be prompted to choose a channel number for the source and destination links as appropriate. Refer to module-specific information for the number of input and output channels a module can have and how they should be configured. The cursor remains in Create Links mode to allow for the creation of additional links. The cursor appears as a crosshair symbol until a different module menu option is selected.

If multiple links are created between two modules, additional clicks may be done to anchor the link lines apart for visibility.

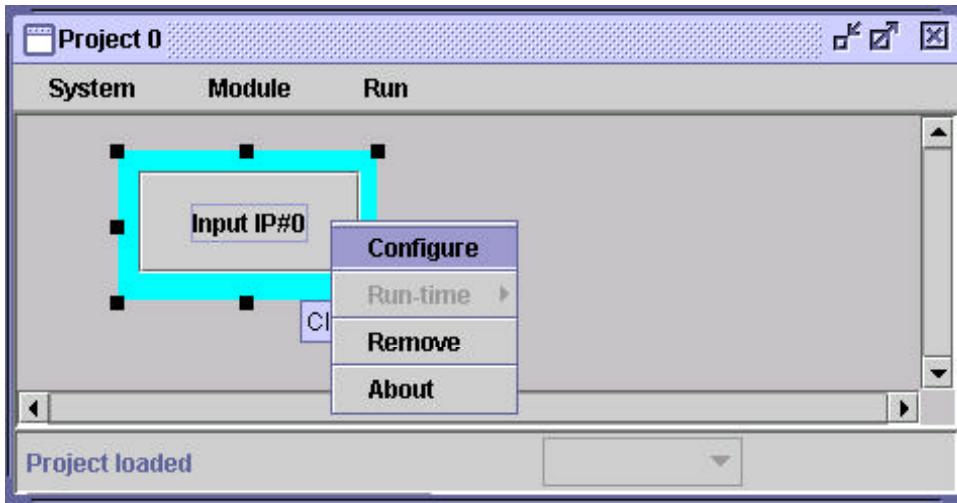
SIMSS-5.2.2.3 Design Mode

After the “Create Links” option has been used, the cursor remains as a crosshair symbol and the system remains in link creation mode. To cancel this mode, click the “Design” option from the Module menu. The cursor is changed back into a pointer symbol and may be used to select items of the design diagram for modification.

SIMSS-5.2.2.4 Module Pop-Up Menu

Clicking in the center of a module activates a pop-up menu with the following choices.

Module Pop-Up Menu	Description
Configure	Provides access to module-specific configuration options.
Run-time	Provides access to module-specific run-time options. The “Run-time” option is only available when the project is running.
Remove	Removes the module from the project.
About	Provides information about the module.



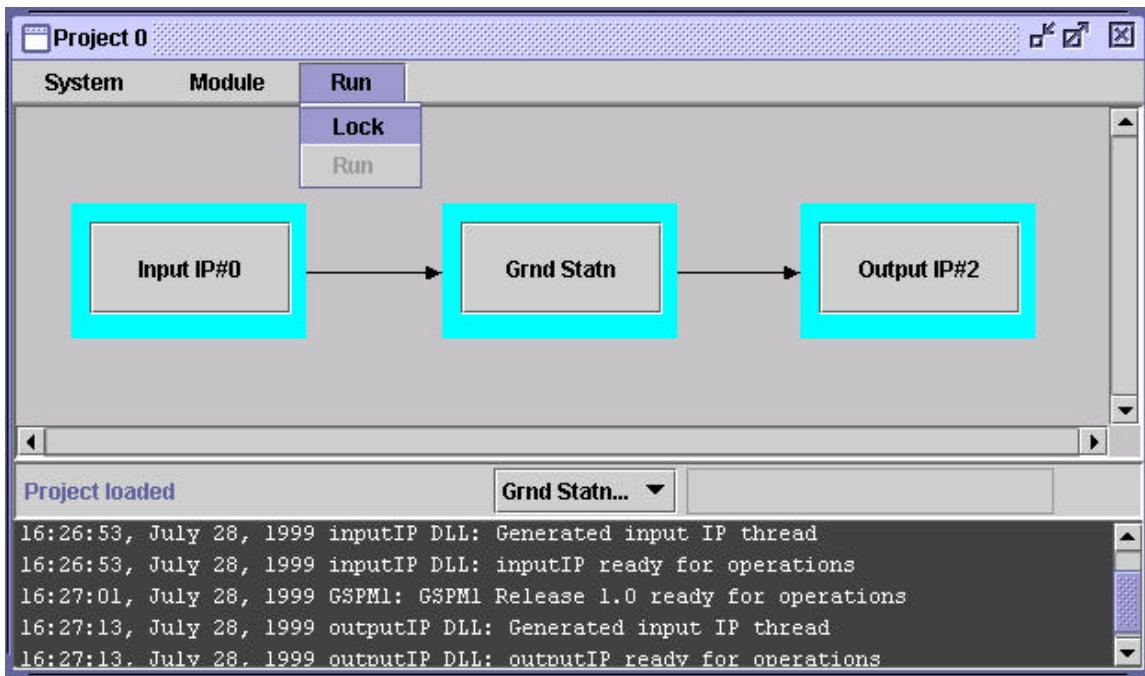
The actions initiated by the “Configure” and “Run-time” options are different for every module and are described in the other chapters of this system user’s guide that are dedicated to specific modules.

SIMSS-5.2.3 Run Menu

The Run menu on the Project window contains the following choices.

Run Menu Item	Description
Lock/Unlock	Locks/Unlocks the project’s design diagram
Run/Stop	Starts/Stops the project’s execution

SIMSS-5.2.3.1 Locking a Project



Prior to running a project, the user must lock its design by clicking the “Lock” option from the Run menu. After the design is locked, the “Lock” option is replaced by the “Unlock” option and the “Run” option becomes available on the Run menu.

SIMSS-5.2.3.2 Unlocking a Project

Click the “Unlock” option from the Run menu to allow modification to the project’s design diagram. The “Unlock” option is then replaced on the Run menu with a “Lock” option.

SIMSS-5.2.3.3 Running a Project

Click the “Run” option from the Run menu to start running all of the modules of the project. The borders of the modules will change to green to indicate run mode. The “Run” option is then replaced with a “Stop” option.

Click on specific modules to get their pop-up menus. See SIMSS-5.2.2.4 Module Pop-Up Menu for an example. Click on the Run-time option for module-specific displays or actions. Please refer to module chapters in this system user’s guide for additional information on module configuration and run-time displays.

SIMSS-5.2.3.4 Stopping a Project

Click the “Stop” option from the Run menu to stop execution of the modules of the project. The borders of the modules will change to red to indicate the stopped condition. The “Stop” option is then replaced with a “Run” option on the Run menu.

EDOS Ground Station Module for PM-1 (GSPM1)

GSPM1-1.0 Overview

The Ground Station (GS) module is responsible for adding an EDOS Service header (ESH) to telemetry packets and transmitting the data as EDOS Data Units (EDUs). The GS module will also provide a user interface to set the EDOS Service header fields. The GS module also receives Command Data Blocks (CDB), strips off the Ground Message Header (GMH), and transmits Command Link Transmission Units (CLTUs).

GSPM1-2.0 Inputs

Ch.	Data expected	Validation performed	Processing performed
1	EDOS Command Data Blocks	None	Ground Message Header removed, resulting data transmitted through output channel 1
2	Telemetry packets	None	EDOS Service Header added, resulting data transmitted through output channel 2
3	Command Link Control Words (CLCWs)	None	EDOS Service Header added, resulting data transmitted through output channel 3

GSPM1-3.0 Outputs

Ch.	Description
1	Command stream with acquisition sequence and CLTUs
2	EDOS Data Units (EDUs) containing telemetry packets
3	EDOS Data Units (EDUs) containing CLCWs

GSPM1-4.0 Container Items

Name	Type	Read Only	Description
GSCmdBuffer	Buffer	No	Most recent command block received
GSTlmCh1Buffer	Buffer	No	Most recent output channel 1 block sent
GSTlmCh2Buffer	Buffer	No	Most recent output channel 2 block sent
GSCmdReceiveCount	Fixed	No	Number of command blocks received
GSTlmCh1TransmitCount	Fixed	No	Number of channel 1 blocks sent
GSTlmCh2TransmitCount	Fixed	No	Number of channel 2 blocks sent

GSPM1-5.0 Displays

To access the displays for this module, first click on the center of the module in the project window. The module pop-up menu will appear.

Module Pop-Up Menu Item	Description
Configure	Access configuration menu of this module
Run-time	Access the Run-time menu for the module
Remove	Remove module from the project
About	Display generic module information

GSPM1-5.1 Configuration

There are no configuration displays for this module.

GSPM1-5.2 Run-time

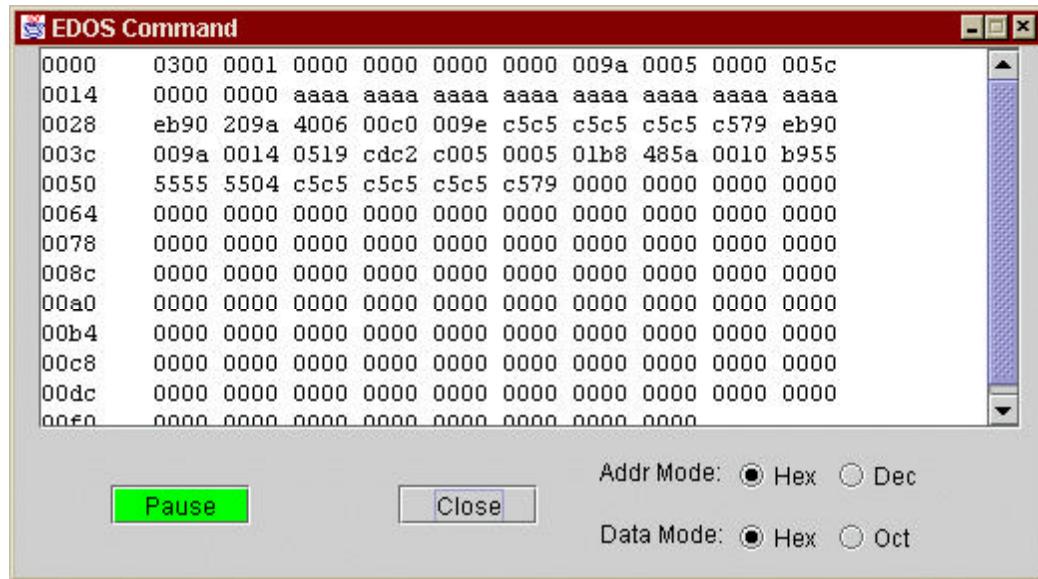
There are four displays available from the Run-time menu. They are described in the following sections.

Run-time Menu Item	Description
Show Cmd Packet	Display the command buffer
Show Tlm CH1 Packet	Display the housekeeping telemetry buffer
Show Status	Show counts of commands and telemetry packets
Set/Display GMT	Display time fields for possible modification

GSPM1-5.2.1 Show Command Packet



The command packet display shows the header and, optionally (by pressing the **Dump** button), the contents of the most recent command block received, including the Ground Message Header.

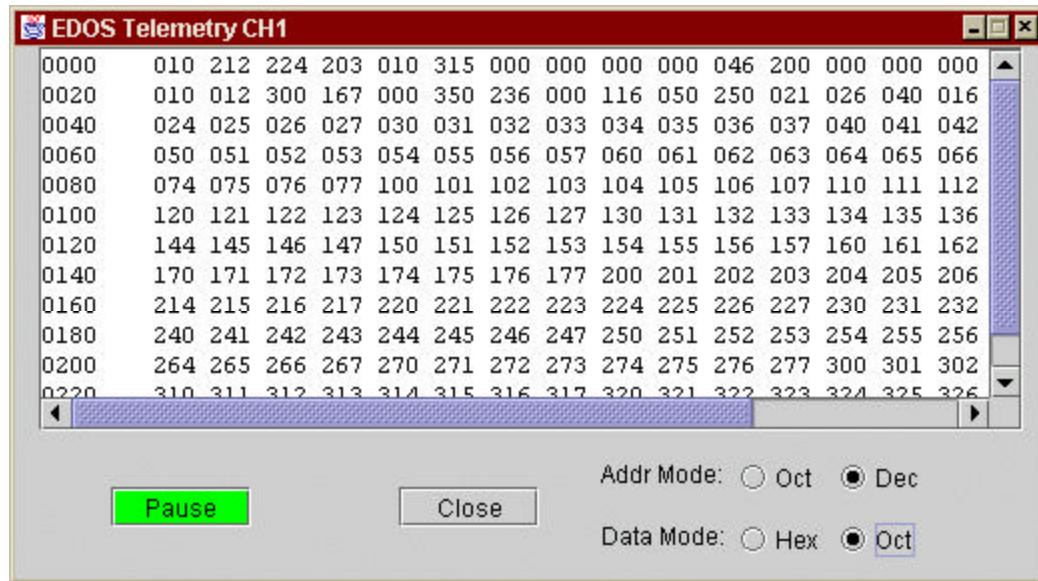


The address field of the dump display may be toggled between hexadecimal and decimal display formats. The data portion may be toggled between hexadecimal and octal formats.

GSPM1-5.2.2 Show Telemetry Channel 1 Packet

The telemetry channel 1 packet display shows the header and, optionally (by pressing the **Dump** button), the contents of the most recent telemetry block as transmitted through telemetry channel 1 (module channel 2).

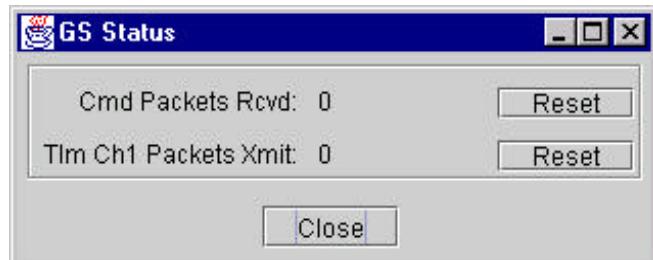




GSPM1-5.2.3 Show CLCW Packet (Future)

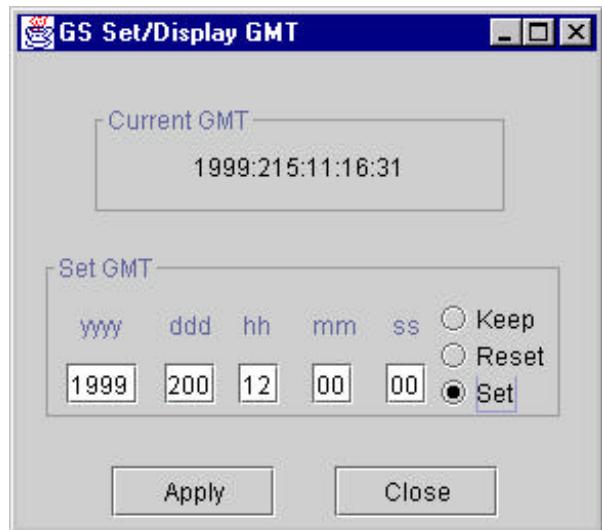
In a future release, the CLCW channel packets will be displayed in header and dump formats similar to those used for the housekeeping telemetry packets.

GSPM1-5.2.4 Show Status



The status display shows the number of command blocks received and the number of housekeeping telemetry blocks transmitted. The **Reset** button may be used to zero out the counter in the same row.

GSPM1-5.2.5 Set/Display GMT



This display shows the current GMT time that is converted and stored in the EDOS Server Header. The user may **Set** the GMT time fields manually, **Keep** the time currently being used, or **Reset** time to the current system time.

The data entry fields are year, day of year, hour of day, minute of hour, and second of minute.

Click the **Apply** button for the actions to take effect. Click the **Close** button to dismiss the window with no further action taken.

GSPM1-5.3 About

To display generic information about the GS module, choose the “About” option from the module pop-up menu.



GSPM1-6.0 Special Operating Instructions

There are no special operating instructions for the current release.

Spacecraft Simulation Module for PM-1 (SCPM1)

SCPM1-1.0 Overview

The functions of the Spacecraft module for PM-1 (SCPM1) include generation and transmission of formatted telemetry packets, receipt of command link transmission Units (CLTUs), and maintenance of GMT and spacecraft time. GMT time is maintained separately by this module for time tagging of event messages. Spacecraft time is maintained as an offset from the PM-1 epoch and is inserted into telemetry packets prior to sending them to the Ground Station module. This module is also capable of displaying telemetry packets and received commands under operator direction.

SCPM1-2.0 Inputs

Ch.	Data expected	Validation performed	Processing performed
1	Command stream	CCSDS and PM-1 specific	Commands parsed and validated per CCSDS standard and PM-1 extensions. Event messages generated on valid or invalid commands.

SCPM1-3.0 Outputs

The SCPM1 module has 2 types of output channels. When the module is using IP mode, only channels 1 and 2 are used. When the module is using Serial mode only channel 3 is used.

Ch.	Description
1	Housekeeping telemetry packets
2	Command Link Control Words (CLCWs)
3	Serial telemetry transmission

SCPM1-4.0 Container Items

SCPM1-4.1 Telemetry Container Items

The container items for telemetry processing fall into four major groups: control and status of telemetry streams, telemetry points, packet buffers, and VCDU buffers.

SCPM1-4.1.1 Telemetry Status and Control Container Items

Name	Type	Read Only	Description
clcwpkt	Fixed	No	CLCW packet buffer
PM1TlmChannel1Enabled	Fixed	No	Channel 1 enabled flag (0=disabled, 1=enabled)

PM1TlmChannel1FrameCount	Fixed	No	Channel 1 frames transmitted count
TransmitCLCW	Fixed	No	CLCW enabled flag (0=disabled, 1=enabled)
PM1CLCWFrameCount	Fixed	No	CLCW channel transmitted count
TlmCUCpfield	Fixed	No	P-field for CUC time in packet header
TlmCUCpfieldextension	Fixed	No	P-field extension for CUC time in packet header
SCPM1EnabledCH1	Fixed	No	Flag to start/stop channel 1
SCPM1EnabledCH2	Fixed	No	Flag to start/stop channel 2
SCPM1OutputFormat	Fixed	No	Flag to change output format
SCPM1PktDropCnt	Fixed	No	Used to check if any VCDU packets were dropped
SCPM1Interval3	Fixed	No	Interval for automatic sending of VCDUs on physical channel 3

SCPM1-4.1.2 Telemetry Point Container Items

All of the telemetry points that are simulated by the SCPM1 module have their values stored in the container as 32-bit values and are identified by their mnemonic names. For example, for the telemetry point COM_BR_TXB (Xmtr B ON/OFF Status), the container name is COM_BR_TXB. The value of this telemetry point may be viewed in an event message by entering “get COM_BR_TXB” on the directive line and specifying SCPM1 to receive it. The value of any telemetry point can be changed at the directive line using the set command. The set directive may also be used within scenario files.

SCPM1-4.1.3 Telemetry Packet Container Items

For each APID in telemetry there are container items to hold that APID’s packet. Where “<APID>” appears in the following table, substitute the APID in 4 decimal digits. For example, the container buffer for APID 397 is named “TlmPacket0397”.

Name	Type	Read Only	Description
TlmPacket<APID>	Buffer	No	Buffer for specified APID’s telemetry packet.
TlmPacket<APID>SequenceCount	Fixed	No	Sequence count for APID’s packet header
TlmPacket<APID>SequenceFlag	Fixed	No	Sequence flag for APID’s packet header
TlmPacket<APID>APID	Fixed	No	APID for packet header
TlmPacket<APID>SecondaryHeaderFlag	Fixed	No	Secondary header flag for APID’s packet header

TlmPacket<APID>DataLength	Fixed	No	Data length for APID's packet header
TlmPacket<APID>Version	Fixed	No	Version for APID's packet header
TlmPacket<APID>Type	Fixed	No	Type for APID's packet header

SCPM1-4.1.4 Telemetry VCDU Container Items

For each virtual channel in serial mode telemetry, there are container items that hold each VCDU's Primary Header field values. Where “<VCDU>” appears in the following table, substitute the virtual channel number, starting from 0 and using decimal digits. For example, the container item for VCDU 0's Primary Header Version field is named “VCDUVERSION0”. The container item for VCDU 44's Primary Header Version field is named “VCDUVERSION44”. All PM-1 telemetry is transmitted on virtual channel two.

Name	Type	Read Only	Description
VCDUVERSION<VCDU>	Fixed	No	Version Number
VCDUSCID<VCDU>	Fixed	No	Spacecraft ID
VCDUVCID<VCDU>	Fixed	No	Virtual Channel ID
VCDUCOUNTER<VCDU>	Fixed	No	VCDU Counter
VCDUREPLAY<VCDU>	Fixed	No	Replay Flag
VCDURESERVED<VCDU>	Fixed	No	Reserved Flags
VCDUERRORCTL<VCDU>	Fixed	No	Error Control (optional)

SCPM1-4.2 Command Container Items

The container items for the command processing fall into four major groups: mission specific items, processing flags, processing buffers and counts. The initial values for counts, flags and buffers are zero. Non-trivial initial values for other items are shown in parentheses following the description.

SCPM1-4.2.1 Mission Specific Container Items

The initial values for these items were taken from the EOS PM-1 Spacecraft to Ground ICD (GSFC 422-11-19-03) Dated December 1999.

Name	Type	Read Only	Description
Pm1cmdCltuCodeblockSize	Fixed	No	Codeblock size in bytes (8)
Pm1cmdCltuExpectedStartSequence	Buffer 2 bytes	No	Expected CLTU Start Sequence Buffer (EB90 ₁₆)
Pm1cmdCltuExpectedTailSequence	Buffer 8 bytes	No	Expected CLTU Tail Sequence Buffer (C5C5 C5C5 C5C5 C579 ₁₆)

Pm1cmdCriticalTieAVCID	Fixed	No	Virtual Channel ID (VCID) for TIE-A critical commands (16)
Pm1cmdCriticalTieBVCID	Fixed	No	Virtual Channel ID for TIE-B critical commands (17)
Pm1cmdSCID	Fixed	No	PM-1 Spacecraft Identifier (9A ₁₆)
Pm1cmdSlidingWindowSize	Fixed	No	FARM-1 Sliding Window Size (180)

SCPM1-4.2.2 Command Processing Container Fields/Flags

Name	Type	Read Only	Description
Pm1cmdEnabled	Fixed	No	Command processing enabled flag. The border of the main display command box shows the current status of this flag. (0=disabled/red border, 1=enabled/green border)
Pm1cmdCLTUValidation	Fixed	No	Command CLTU validation enabled flag. (0=disabled, 1=enabled) This flag corresponds to the CLTU option from the Modify Validation Criteria screen.
Pm1cmdCodeblockValidation	Fixed	No	Command codeblock parity validation enabled flag. (0=disabled, 1=enabled) This flag corresponds to the BCH Error Code option from the Modify Validation Criteria screen.
Pm1cmdFrameValidation	Fixed	No	Command transfer frame header validation enabled flag. (0=disabled, 1=enabled). This flag corresponds to the Transfer Frame Header option from the Modify Validation Criteria screen.
Pm1cmdFARMValidation	Fixed	No	Command Frame Acceptance and Reporting Mechanism (FARM) validation enabled flag. (0=disabled, 1=enabled) This flag corresponds to the FARM option from the Modify Validation Criteria screen.
Pm1cmdPacketValidation	Fixed	No	Command packet validation enabled flag. (0=disabled, 1=enabled) This flag corresponds to the User Packet Header option from the Modify Validation Criteria screen.

Pm1cmdDebugEnabled	Fixed	No	Command subsystem debug messages flag. (0=disabled, 1=enabled) When enabled, additional event messages are generated throughout command ingest processing. This is primarily a developer's tool.
Pm1cmdSpaceClcwCWT	Fixed	No	Spacecraft CLCW Control Word Type
Pm1cmdSpaceClcwVersion	Fixed	No	Spacecraft CLCW Version
Pm1cmdSpaceClcwStatus	Fixed	No	Spacecraft CLCW Status
Pm1cmdSpaceClcwCOP	Fixed	No	Spacecraft CLCW COP In Effect
Pm1cmdSpaceClcwVCID	Fixed	No	Spacecraft CLCW VCID (0)
Pm1cmdSpaceClcwSpare1	Fixed	No	Spacecraft CLCW Spare field 1
Pm1cmdSpaceClcwNoRFAvail	Fixed	No	Spacecraft CLCW No RF Avail Flag
Pm1cmdSpaceClcwNoBitLock	Fixed	No	Spacecraft CLCW No Bit Lock Flag
Pm1cmdSpaceClcwLockout	Fixed	No	Spacecraft CLCW Lockout Flag
Pm1cmdSpaceClcwWait	Fixed	No	Spacecraft CLCW Wait Flag
Pm1cmdSpaceClcwRetransmit	Fixed	No	Spacecraft CLCW Retransmit Flag
Pm1cmdSpaceClcwFarmCount	Fixed	No	Spacecraft CLCW Farm-B Counter
Pm1cmdSpaceClcwSpare2	Fixed	No	Spacecraft CLCW Spare field 2
Pm1cmdSpaceClcwReport	Fixed	No	Spacecraft CLCW Report Value
Pm1cmdInstrClcwCWT	Fixed	No	Instrument CLCW Control Word Type
Pm1cmdInstrClcwVersion	Fixed	No	Instrument CLCW Version
Pm1cmdInstrClcwStatus	Fixed	No	Instrument CLCW Status
Pm1cmdInstrClcwCOP	Fixed	No	Instrument CLCW COP In Effect
Pm1cmdInstrClcwVCID	Fixed	No	Instrument CLCW VCID (1)
Pm1cmdInstrClcwSpare1	Fixed	No	Instrument CLCW Spare field 1
Pm1cmdInstrClcwNoRFAvail	Fixed	No	Instrument CLCW No RF Avail Flag
Pm1cmdInstrClcwNoBitLock	Fixed	No	Instrument CLCW No Bit Lock Flag
Pm1cmdInstrClcwLockout	Fixed	No	Instrument CLCW Lockout Flag
Pm1cmdInstrClcwWait	Fixed	No	Instrument CLCW Wait Flag
Pm1cmdInstrClcwRetransmit	Fixed	No	Instrument CLCW Retransmit Flag
Pm1cmdInstrClcwFarmCount	Fixed	No	Instrument CLCW Farm-B Counter
Pm1cmdInstrClcwSpare2	Fixed	No	Instrument CLCW Spare field 2
Pm1cmdInstrClcwReport	Fixed	No	Instrument CLCW Report Value

SCPM1-4.2.3 Command Container Buffers

Name	Type	Read Only	Description
Pm1cmdPolyRemainderTbl	256 bytes	No	Polynomial remainder table for parity calculation.
Pm1cmdSpacecraftCLCW	4 bytes	Yes	Spacecraft Virtual Channel Command Link Control Word Buffer (individual fields may be modified, see previous table)
Pm1cmdInstrumentCLCW	4 bytes	Yes	Instrument Virtual Channel CLCW Buffer (individual fields may be modified, see previous table)
Pm1cmdScPkt	128 bytes	No	Spacecraft Command Packet Buffer
Pm1cmdInstrPkt	128 bytes	No	Instrument Command Packet Buffer
Pm1cmdFrameBuffer	256 bytes	No	Command Transfer Frame Buffer
Pm1cmdCLTU	6000 bytes	No	Command Link Transmission Unit Buffer
Pm1cmdCodeblock	6000 bytes	No	Compressed codeblock buffer (holds the codeblock bytes with the parity bytes removed)
Pm1cmdSpaceLoadBuffer	1024 bytes	No	Spacecraft Memory Load Buffer

SCPM1-4.2.4 Command Container Counters

Name	Type	Read Only	Description
Pm1cmdTotalCLTUs	Fixed	No	Count of all CLTUs received
Pm1cmdValidCLTUs	Fixed	No	Count of valid CLTUs
Pm1cmdRejectCLTUs	Fixed	No	Count of invalid CLTUs
Pm1cmdTotalCodeblocks	Fixed	No	Count of all Codeblocks
Pm1cmdValidCodeblocks	Fixed	No	Count of valid Codeblocks
Pm1cmdRejectCodeblocks	Fixed	No	Count of invalid Codeblocks
Pm1cmdTotalTransferFrames	Fixed	No	Count of all Transfer Frames
Pm1cmdValidTransferFrames	Fixed	No	Count of valid Transfer Frames
Pm1cmdErrorTransferFrames	Fixed	No	Count of invalid Transfer Frames
Pm1cmdADFrames	Fixed	No	Count of Type AD Transfer Frames
Pm1cmdACFrames	Fixed	No	Count of Type AC Transfer Frames (should not be any for PM-1 mission)
Pm1cmdBCCMDS	Fixed	No	Count of Type BC Transfer Frames (should be one command per frame)
Pm1cmdBDCMDS	Fixed	No	Count of Type BD Transfer Frames (should be one command per frame)
Pm1cmdScCMDS	Fixed	No	Count of all Spacecraft Packets

Pm1cmdValidSpacecraftPkts	Fixed	No	Count of valid Spacecraft Packets
Pm1cmdErrorSpacecraftPkts	Fixed	No	Count of invalid Spacecraft Packets
Pm1cmdInstrCMDS	Fixed	No	Count of all Instrument Packets
Pm1cmdValidInstrumentPkts	Fixed	No	Count of valid Instrument Packets
Pm1cmdErrorInstrumentPkts	Fixed	No	Count of invalid Instrument Packets
Pm1cmdIgnoredCLTUs	Fixed	No	Number of CLTUs ignored while command processing is disabled. If commands are received while the main display command box is disabled/red, this counter is updated and the commands are dropped.

SCPM1-4.3 Database Container Items

Name	Type	Read Only	Description
DatabaseCmdId	Fixed	No	Command identification flag (0=off, 1=on). When flag is on, command identification using the database occurs with each received command. If command processing is too slow, this flag should be set to off.
DatabaseConnected	Fixed	Yes	Connected flag (0=not connected, 1=connected)
DatabaseDebug	Fixed	No	Debug flag (0=disabled, 1=enabled). When enabled, database debug messages are written to the server window.
TelemetryLoaded	Fixed	Yes	Telemetry loaded from database flag (0=not loaded, 1=loaded)

SCPM1-5.0 Displays

To access the displays for this module, first click on the center of the SCPM1 module in the project window. The following items will appear in a pop-up menu.

Module Pop-Up Menu Item	Description
Configure	Access the configuration menu for the module
Run-time	Access the Run-time menu for the module
Remove	Remove module from the project
About	Display generic module information

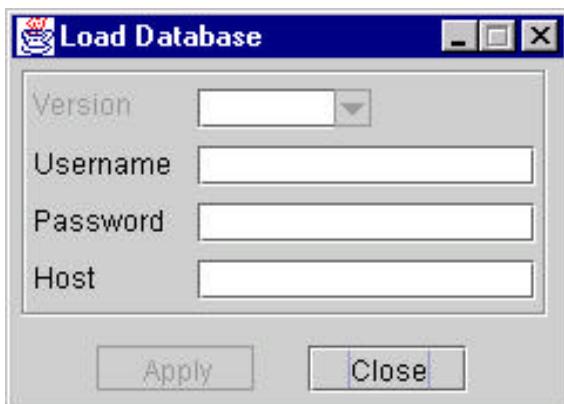
SCPM1-5.1 Configuration Menu

The configuration menu for the SCPM1 module contains two items.

Configuration Menu Item	Description
Load Database	Load the database information
Select Simulation Mode	Select IP or Serial Mode

SCPM1-5.1.1 Load Database

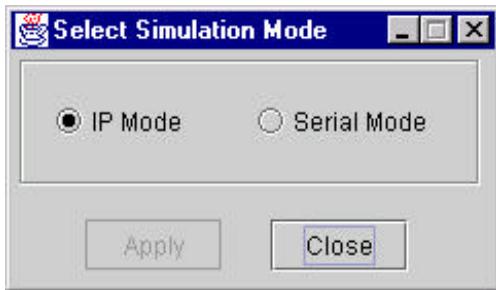
When the “Load Database” option is selected from the configuration menu, the Load Database display appears. This display is used to select the database that is to be used to initialize telemetry information in the simulator. The Username and Password fields must be entered. When the **Apply** button is clicked, an attempt is made to connect to the specified database with the account information provided. Information about the successful or unsuccessful configuration using the database is reported to the event message log region.



Load Database Field	Description
Version	(Future) Specifies which version of database to use
Username	Specifies the user account
Password	Specifies the password for the user account
Host	(Future) Specifies a non-local database host system

SCPM1-5.1.2 Select Simulation Mode

When the “Select Simulation Mode” option is selected from the configuration menu, the Select Simulation Mode display appears.



Mode Field	Description
IP Mode	The module will use IP protocol for input and output channels. See the IP module chapter for configuration of the IP modules.
Serial Mode	The module will use serial input and output channels for communication. See the Serial module chapter for configuration of the serial modules.

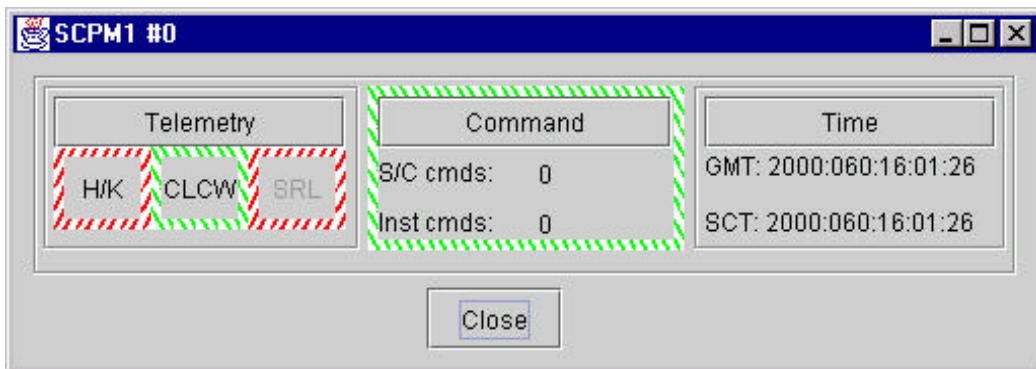
SCPM1-5.2 Run-time Menu

The Run-time menu for the SCPM1 module contains the following three items.

Run-time Menu Item	Description
Control	Request the module's main display
Resume	Resume the module's execution
Pause	Pause the module's execution

SCPM1-5.2.1 Main Display

Clicking the “Control” option of the run-time menu causes the main display to appear.



This is the main display for the SCPM1 module, providing basic information about its current state, including the current GMT and spacecraft times, the number of valid spacecraft and instrument commands received, and the enabled/disabled status of command receipt and telemetry transmission. The latter are indicated by colored diagonal stripes around the appropriate box: the entire command box for command status and the telemetry channel boxes for each telemetry channel. Red stripes angling up and

to the right indicate disabled, while green stripes angling down and to the right indicate enabled.

When the module is using IP mode, the telemetry region buttons **H/K** and **CLCW** are available and the **SRL** button is unavailable. When the module is using serial mode, only the **SRL** button is available.

Left or right clicking on button boxes in the main window allows access to subordinate displays. Descriptions of the displays below will include how to access the display.

SCPM1-5.2.1.1 Telemetry Menus

There are four buttons in the telemetry area of the main display: **Telemetry**, **H/K**, **CLCW** and **SRL**. Clicking the **Telemetry** button brings up a menu with the following items.

Telemetry Menu Item	Description
Modify packet...	Modify packet data area on byte basis
Display packet...	Display packet header and contents
Display status...	Enable/disable status and packet transmit counts, by channel
Control Packet...	Change the frequency of the packet transmission
Modify CUC...	Modify the CCSDS Unsegmented Time Code

Clicking on the **H/K**, **CLCW** or **SRL** channel buttons brings up a menu with the following items:

Channel Menu Item	Description
Start	Enable telemetry transmission on the channel
Stop	Disable telemetry transmission on the channel

SCPM1-5.2.1.1.1 Modify Packet Display

This display allows the user to modify the data area of the packet on a byte or repeating byte basis. All of the following fields must be entered.

Data Entry Field	Description
APID	Application ID of the packet to be modified
Start Byte	First byte to change
Stop Byte	Last byte to change
Value (Hex)	Value to change byte(s) to, in hexadecimal



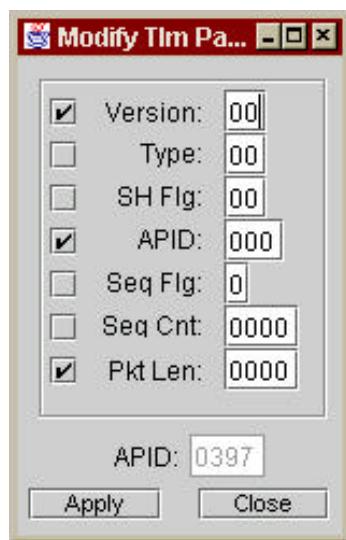
Clicking the **Apply** button causes the action defined by the fields to take effect. Clicking the **Close** button closes the window with no additional action taken.

SCPM1-5.2.1.1.2 Telemetry Packet Display

The telemetry packet display shows the header and, optionally (by pressing the **Dump** button), the contents of the most recent telemetry packet sent with the given APID.



The user must enter a valid value in the APID field and then click the **Apply** button before any other values will be reported. If there are multiple formats for an APID, click the “Use Secondary Key” box and enter the secondary key value in the space next to the APID. Clicking the **Dump** button will bring up a standard dump display with the contents of the packet. Clicking the **Edit** button will bring up the Modify Tlm Packet Header Display shown below. Clicking the **Close** button closes the window with no additional action taken.



The Modify Tlm Packet Header display allows the user to modify fields in the packet header. Click on an enable box to the left of the field to enable modification of a specific header field. Clicking the **Apply** button puts the settings into effect. Clicking the **Close** button closes the display with no additional action taken.

The purpose of the Modify Tlm Packet Header display is to inject data values into transmitted packets that could be perceived as erroneous by the receiving system. Changing the APID and Pkt Len fields does not change the name or length of the buffer, only the data in the header fields.

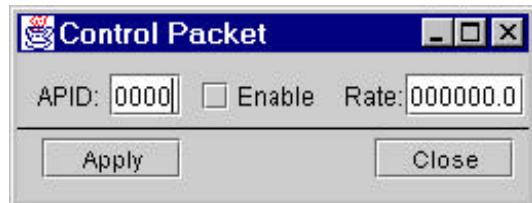
Data Entry Field	Description
Version	CCSDS packet version number
Type	CCSDS packet type
SH Flg	Secondary header flag
APID	Application identifier (packet number)
Seq Flg	Sequence flag
Seq Cnt	Packet sequence counter
Pkt Len	Packet length for data zone (seven less than actual length)

SCPM1-5.2.1.1.3 Telemetry Status Display

The telemetry status display shows the enabled or disabled status and the number of packets transmitted for each of the two telemetry channels. Clicking the **Reset** button will reset the count of packets transmitted for that channel. Clicking the **Close** button closes this window with no additional action taken.



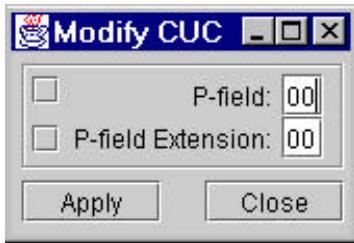
SCPM1-5.2.1.1.4 Control Packet Display



This display allows the user to control whether or not a packet is transmitted and at what rate (time between transmissions) it is generated. Clicking the **Apply** button puts the settings into effect. Clicking the **Close** button exits the display with no additional action taken.

Data Entry Field	Description
APID	Application ID of the packet to be modified
Enable	If set, packet is formatted and sent
Rate	Time between packet transmissions, in seconds.

SCPM1-5.2.1.1.5 Modify CCSDS Unsegmented Time Code



This display allows the user to modify the fixed fields of the CCSDS Unsegmented Time Code (CUC) in the telemetry packet headers. Clicking the enable boxes at left indicate whether or not the given field should be modified. Clicking the **Apply** button puts the settings into effect. Clicking the **Close** button closes the display with no additional action taken.

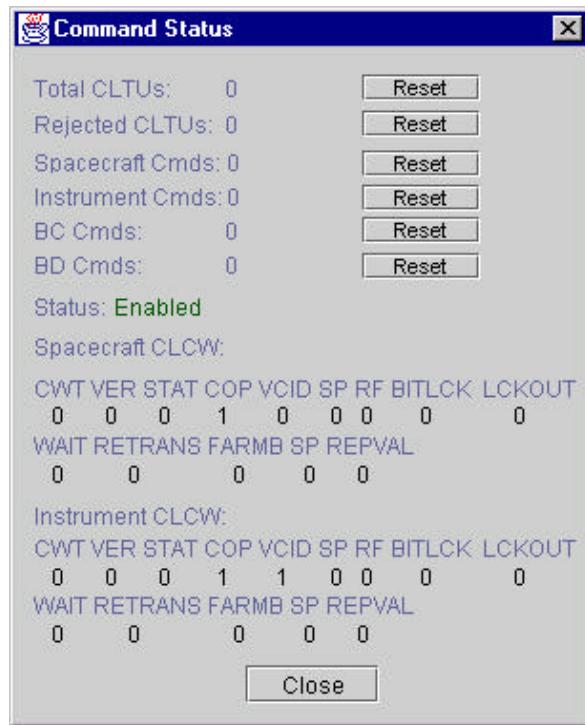
Data Entry Field	Description
P-field	P-field flags in the CUC. Enter hexadecimal value.
P-field Extension	Second byte of p-field, containing number of leap seconds since 1958. Enter hexadecimal value.

SCPM1-5.2.1.2 Command

Clicking the **Command** button on the main display brings up a menu with the following choices.

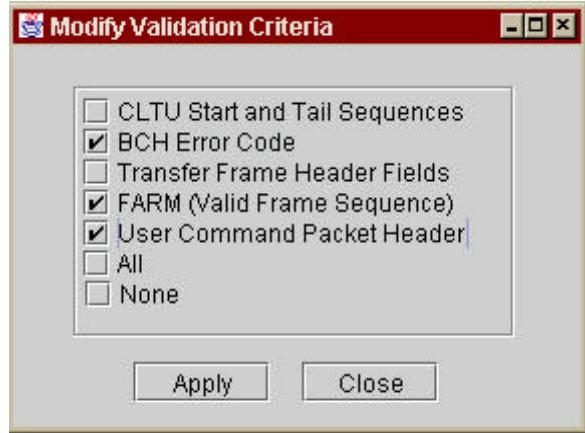
Menu item	Description
Start	Enable command reception
Stop	Disable command reception
Display Status...	Enable/disable status, command counts, CLCWs by virtual channel
Modify Validation Criteria...	Allows modification of validation options
Display Spacecraft Packet...	Displays spacecraft virtual channel packet contents
Display Instrument Packet...	Displays instrument virtual channel packet contents
Override CLCWs	Edit the fields of the Command Link Control Words
Display Spacecraft Load...	Display the Spacecraft Memory Load Buffer

SCPM1-5.2.1.2.1 Display Command Status



When the “Display Status...” option is selected, this display is shown. The command status display shows command counters, command enabled or disabled status and the Command Link Control Words (CLCWs) for the spacecraft and instrument virtual channels. Clicking the **Reset** button sets the counter in that row to zero.

SCPM1-5.2.1.2.2 Modify Validation Criteria



When the “Modify Validation Criteria” option is selected, this screen is displayed. The operator may select any combination of the validation options. The operator may enable all of the validation tests by selecting the “All” option or disable all of the validation tests by selecting the “None” option. The **Apply** button is used to activate the new settings. The **Close** button is used to dismiss the screen without changes.

SCPM1-5.2.1.2.2.1 None Validation Option

Even when the “None” option is selected the following validation tests are performed:

- A received CLTU must be long enough to contain a start sequence, a single codeblock, and a tail sequence or it will be rejected and an error event message will be generated.
- A CLTU’s length will be checked to see there are enough bytes for a start sequence, tail sequence, and an even multiple of codeblocks. If there are extra bytes, they will be reported in a warning event message. The CLTU will then be processed as if there

were no extra bytes. The existence of “extra” bytes may indicate a problem with the source system’s formatting of the CLTU.

- The Transfer Frame Header Length field must report a value big enough to contain a transfer frame header and a single byte of data or it will be rejected and an error event message will be generated.
- The Transfer Frame Header Length field is compared to the actual length of the passed frame buffer. If there are more data bytes than are reported in the header, these bytes are compared to the fill data byte. If there are any “extra” bytes that are not fill data, a warning event message will be generated. The transfer frame will then be processed and the “extra” bytes will be ignored. The existence of “extra” non-fill bytes may indicate a problem with the source system’s formatting of the Transfer Frame.
- The Transfer Frame Header VCID is used to determine whether the frame should be processed as a critical TIE-A command, critical TIE-B command or passed to the spacecraft or instrument virtual channel Frame Acceptance and Reporting Mechanism (FARM). The VCID must match one of the four expected VCID values stored in the container. Container points Pm1cmdCriticalTieAVCID and Pm1cmdCriticalTieBVCID specify the VCID values for the TIE critical commands. For the spacecraft and instrument virtual channels, VCID values are stored within the associated Command Link Control Word (CLCW). The CLCWs are maintained in container buffers Pm1cmdSpacecraftCLCW and Pm1cmdInstrumentCLCW. When a VCID does not match any of the expected values, the transfer frame is rejected and an error event message is generated.

SCPM1-5.2.1.2.2.2 Validation of CLTU Start and Tail Sequences

Since a received CLTU must contain a valid start and tail sequence to be recognized by the software, disabling validation of these items is not an option. Rather, the software will report appropriate event error messages if the start sequence cannot be located, or if the start sequence is located but the tail sequence is not found.

SCPM1-5.2.1.2.2.3 BCH Error Code Validation Option

When Bose-Chaudhuri-Hocquenghem (BCH) Error Code validation is enabled, the parity byte of each received codeblock is compared to the parity value calculated from the codeblock data area. If a parity comparison fails, both parity bytes are reported in an error event message and the current CLTU is rejected.

SCPM1-5.2.1.2.2.4 Transfer Frame Header Validation Option

Validation of the Mode, SCID, VCID, Frame Length and Frame Sequence Count fields of the Transfer Frame Header could result in error status codes being reported in the CLCW for the frame’s virtual channel. This is mission specific to PM-1. Therefore validation of those fields is done during FARM validation and not as part of the Transfer Frame Validation. When Transfer Frame Validation is enabled, the following validations are done.

- The Transfer Frame Header Version field must contain 0 or the frame is rejected and an error event message is generated.
- The Transfer Frame Header Spare field must contain 0 or the frame is rejected and an error event message is generated.

SCPM1-5.2.1.2.2.5 Farm (Valid Frame Sequence) Validation Option

When the FARM validation is enabled, all fields related to the setting of the CLCW are checked. FARM validation includes the following tests:

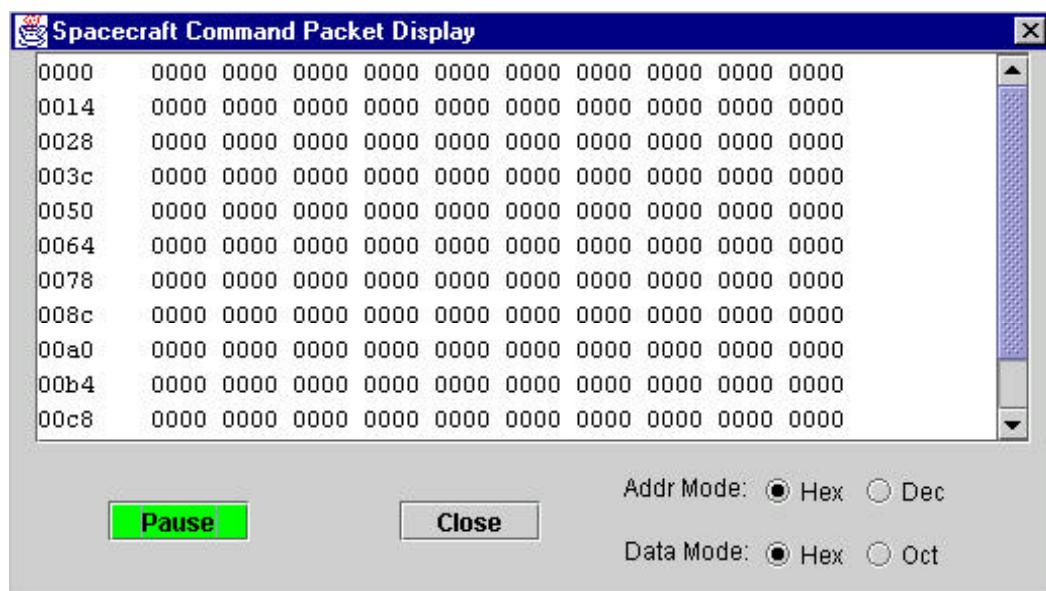
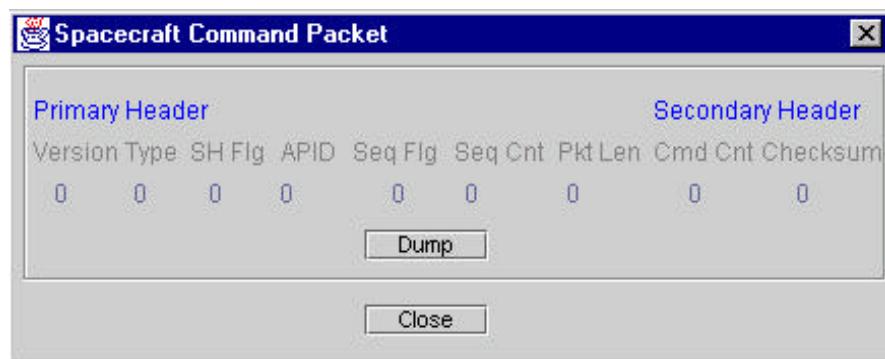
- The Transfer Frame Header Length is tested to be within the range specified in the ICD. If the length is invalid, the “Incorrect Frame Length” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- The Transfer Frame Header Length is compared to the actual length of the received buffer. If the frame contains fewer bytes than reported in the header, the “Incomplete Frame” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- The Transfer Frame Header Mode flags are checked. If the mode is “AC”, the “Illegal frame type (Type-AC)” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- If the Transfer Frame Header Mode flags specify “BC”, the frame data is checked for a valid transfer frame control command. If the frame data does not contain a valid frame control command, the “Illegal Type-BC frame” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- The Transfer Frame Header VCID field is compared to the VCID field from the FARM’s CLCW. If the VCID fields do not match, the “Illegal VCID” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- If the Transfer Frame Header SCID field does not match the PM-1 SCID stored in container point Pm1cmdSCID, the “Illegal SCID” status is stored in the CLCW, the frame is rejected, and an error event message is generated.
- The Transfer Frame Header Sequence field is subjected to the FARM-1 protocol and the CLCW flags, FARM-B Counter, and Report Value fields will be updated accordingly. Event messages are generated for every transfer frame that fails the acceptance test.

SCPM1-5.2.1.2.2.6 User Command Packet Header Validation Option

When Packet validation is enabled, fields in the packet header will be validated as specified in the EOS PM-1 Spacecraft to Ground ICD.

SCPM1-5.2.1.2.3 Display Spacecraft Packet

This display shows the spacecraft virtual channel packet header. A dump of the full packet buffer may be requested by pressing the **Dump** button.



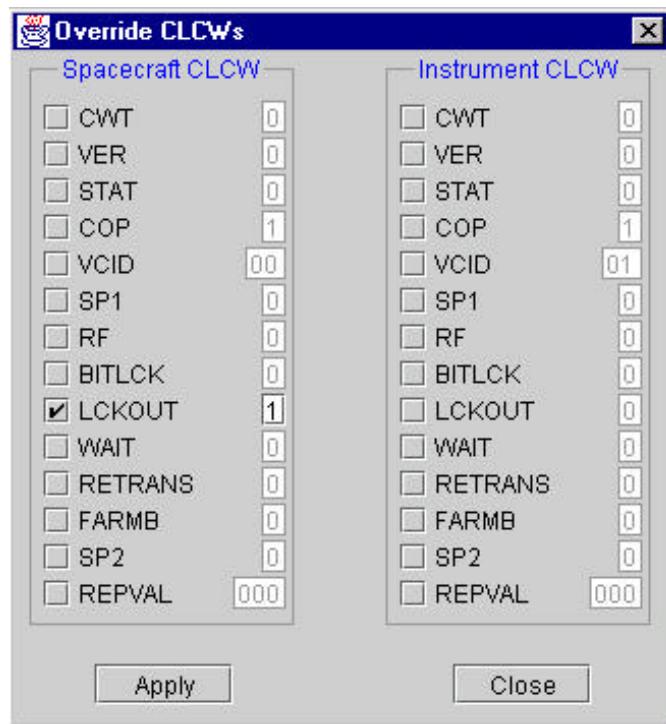
The address region may be displayed in decimal or hexadecimal. The data region may be displayed in hexadecimal or octal. Since this display normally updates as the buffer contents are changed, use the **Pause** button to freeze the current contents. Use of the **Pause** button does not affect command packet reception. When the **Pause** button has been used, the button's label is changed to **Cont** (for continue). Press the **Cont** button to resume screen updates. Note that the display is updated to show the last command packet received. Intermediate packets received while the display was frozen can not be displayed.

SCPM1-5.2.1.2.4 Display Instrument Packet

This display shows the instrument virtual channel packet header. Optionally, a dump of the full packet buffer may be requested. They are very similar in appearance and function to the spacecraft packet header and packet dump displays that are described in the previous section.

SCPM1-5.2.1.2.5 Override CLCWs

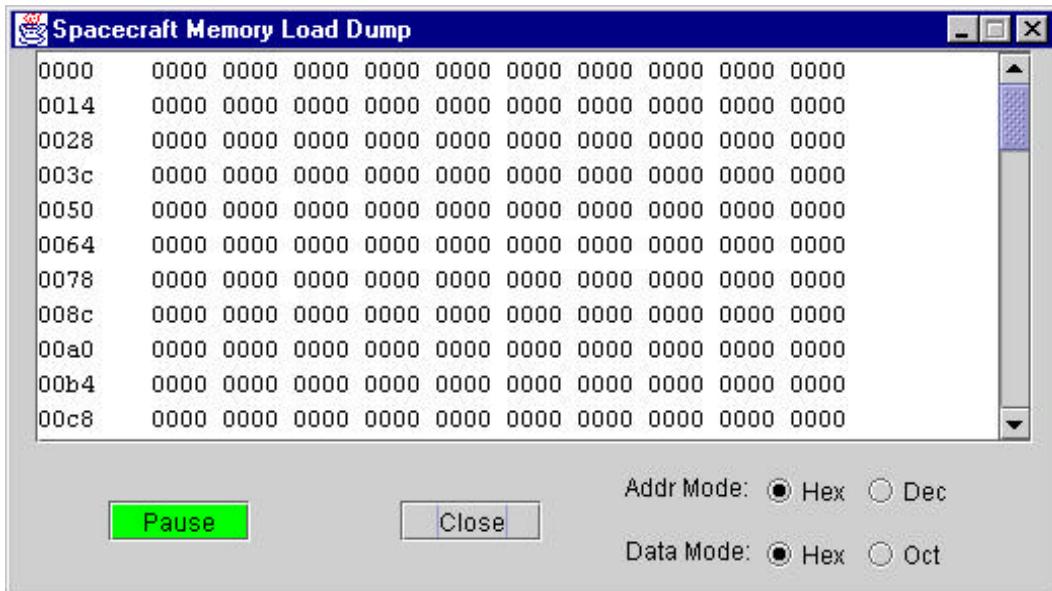
This display shows the Command Link Control Words (CLCWs) for the two virtual channels broken out into bit fields. Any field may be overridden by checking the field's selection box and then typing in the new decimal value. The new value takes affect when the **Apply** button is pressed. Note that since these are bit fields, attempts to assign values that are too large will result in truncation of the value. Review changes on the CLCW portion of the Command Status display. Event messages also show the values assigned.



CLCW Field	Description
CWT	Control Word Type (1 bit)
VER	Version (2 bits)
STAT	Status (3 bits)
COP	Command Operations Procedure (COP) in Effect (2 bits)
VCID	Virtual Channel Identification (6 bits)
SP1	Spare field 1 (2 bits)
RF	No RF Available Flag (1 bit)
BITLCK	No Bit Lock (1 bit)
LCKOUT	Lockout Flag (1 bit)
WAIT	Wait Flag (1 bit)
RETRANS	Retransmission Flag (1 bit)
FARMB	FARM-B Counter (2 bits)
SP2	Spare field 2 (1 bit)
REPVAL	Report Value (8 bits)

SCPM1-5.2.1.2.6 Display Spacecraft Load

When the “Display Spacecraft Load...” option is selected, the buffer containing the accumulated spacecraft load packet data is displayed.



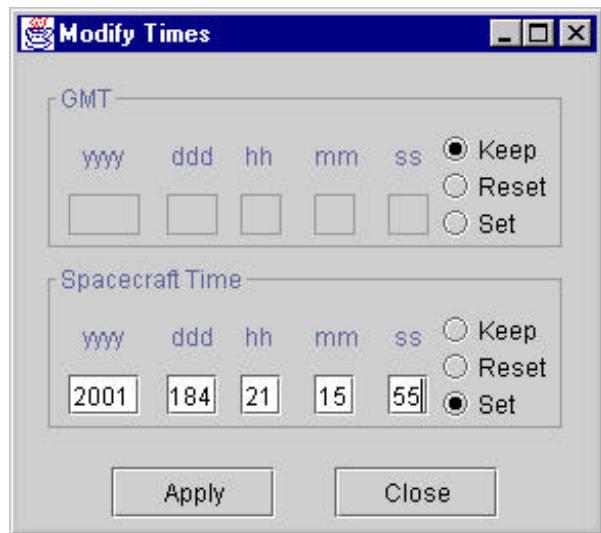
SCPM1-5.2.1.3 Time

The time area of the main display shows the current Greenwich Mean Time (GMT) and spacecraft time fields. The GMT is a reflection of the simulated time of the SCPM1 module, i.e., what time will be used to model external events (transitions to day or night, for example) within the module. It is not currently used. The spacecraft time is the time that the spacecraft thinks it is. In particular, it is the time (in the appropriate format) that goes into the secondary header of the telemetry packets generated by the SCPM1 module.

Clicking the **Time** button brings up a menu with one selectable item, “Modify Times...”. Selecting this item brings up the modify times display described below.

SCPM1-5.2.1.3.1 Modify Times Display

The modify times display allows the user to set the GMT or spacecraft time manually, retain the time currently being used, or reset the time to the current system time.



Clicking the **Apply** button will cause the requested actions to take effect. Clicking the **Close** button closes the window with no further action taken.

Field	Description
yyyy	Year
ddd	Day of year
hh	Hour of day
mm	Minute of hour
ss	Second of minute
Keep	Don't update time
Reset	Change time to current system time
Set	Set time to value supplied

SCPM1-5.3 About

Clicking the “About” option of the module pop-up menu requests a display that lists information about the module such as the numbers of input and output channels.

SCPM1-6.0 Special Operating Instructions

In order to run the SCPM1 module in serial mode select serial mode from the Select Simulation Mode Display at configuration time. SCPM1 input channel 1 and output channel 3 must be linked to serial input and serial output modules. Serial I/O cards are also required on the server platform.

Internet Protocol (IP) Modules

IP-1.0 Overview

The Input and Output Internet Protocol (IP) modules receive/send data packets from/to other sources/destinations using one of several IP types (TCP/IP-Client, TCP/IP-Server, UDP Multicast, or UDP Unicast). The Input IP module receives data from an external project and passes that data on to another module. The Output IP module receives data from a module and passes that data to another module or external project. Both the Input and Output IP modules are discussed in this one section because of their great similarity.

IP-2.0 Inputs

The Input IP module does not have any input channels. The Output IP module has a single input channel, which is listed below.

Channel	Data expected	Validation performed	Processing performed
1	Packets	None	Data is received from another module and sent to an external destination.

IP-3.0 Outputs

Both the Input IP and Output IP modules have a single output channel.

Channel	Description
1	Input IP module sends received data to another module. Output IP module sends transmitted data to another module (usually Log Module).

IP-4.0 Container Items

IP module container items are not accessible via operator directives, so they are not listed here.

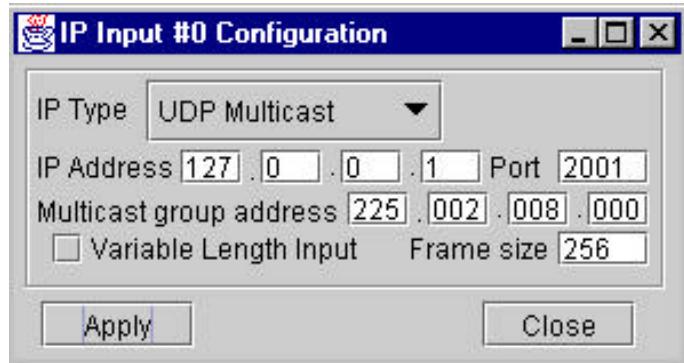
IP-5.0 Displays

To access displays for a module, click in the center of the module in the project window. The following pop-up menu choices will appear. The “Remove” option can be used during project design to remove this module. The “Configure” option should be used prior to running the project and is unavailable at run-time. The Run-time option is available only when the project is running.

Module Pop-Up Menu Item	Description
Configure	Access the configuration display
Run-time	Access the Run-time menu for the module
Remove	Remove module from the project
About	Display generic module information

IP-5.1 Configuration

Clicking on the Input IP module pop-up menu “Configure” item produces the following display.



The default settings for the Input IP module are shown. There are 4 possible IP Types: UDP Multicast, TCP/IP-Client, TCP/IP-Server, and UDP Unicast. The IP Type may be changed by selection from a drop-down menu. When the UDP Multicast choice is selected, the Multicast group address field is activated.

Enter the IP address of the Input IP module in the IP address field.

Enter the port number for the incoming data in the Port field.

Enter the Multicast group address if using the UDP Multicast IP type. You must change the multicast group address from the default value if using the UDP Multicast IP type. The multicast group address range is 224.0.0.1 to 239.255.255.255.

For fixed length input/output data, enter the fixed size in bytes in the Frame size field. If this size is larger than the actual data, the additional bytes will be filled with binary zero. If the frame size is smaller than the actual data size, the data bytes will be truncated to the specified frame size. The specified number of bytes will be passed to the next module or external destination.

For variable length input/output data, check the Variable Length box. The actual length of each data packet will be used, without truncation or padding. When this option is selected, the Frame size field is desensitized.

Click the **Apply** button to save your settings. Click the **Close** button to dismiss the Configuration display without making any changes.

The Output IP module may be configured in similar fashion.

IP-5.2 Run-time

Click on the module pop-up menu “Run-time” option to request the Run-time Menu.

Run-time Menu Item	Description
Resume	Restart the IP module
Pause	Stop the IP module
Show Raw Packet	Request Raw Packet Display
Show Status	Request Status Display

IP-5.2.1 Resume

After an individual module has been stopped, select “Resume” from the Run-time Menu to restart the module. The color around the module’s border will change from red-striped (indicates stopped state) to green-striped (indicates run state).

IP-5.2.2 Pause

Select “Pause” from the Run-time Menu to stop the IP module’s processing. The color around the module’s border will change from green-striped (indicates run state) to red-striped (indicates stopped state). Once the module has been stopped, the “Configure” option of the module pop-up menu is available again and the module may be reconfigured. The Resume option must then be used to return to run mode.

IP-5.2.3 Show Raw Packet

Select “Show Raw Packet” from the Run-time Menu to show raw packets received by the module. This produces a display similar to that shown below.

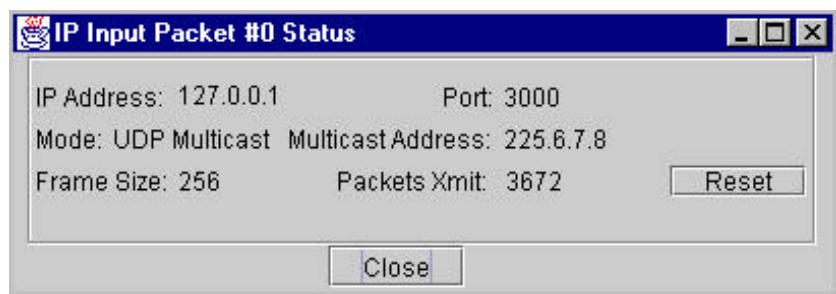
The screenshot shows a window titled "IP Input Packet #0 Packet Dump". The main area displays a list of raw packet data in hex format. The data starts at address 0000 and includes fields such as source and destination MAC addresses, protocol type, and payload. The window has scroll bars on the right side. At the bottom, there are buttons for "Pause" (highlighted in green), "Close", and "Addr Mode: Hex (radio button selected) Dec". Below that is another "Data Mode: Hex (radio button selected) Oct".

Address	Data
0000	018a d2c8 5f22 c000 0000 2680 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0014	09e5 c194 00c7 9e11 4e2e cbdf 2395 0e0f 1011 1213
0028	1415 1617 1819 1a1b 1c1d 1e1f 2021 2223 2425 2627
003c	2829 2a2b 2c2d 2e2f 3031 3233 3435 3637 3839 3a3b
0050	3c3d 3e3f 4041 4243 4445 4647 4849 4a4b 4c4d 4e4f
0064	5051 5253 5455 5657 5859 5a5b 5c5d 5e5f 6061 6263
0078	6465 6667 6869 6a6b 6c6d 6e6f 7071 7273 7475 7677
008c	7879 7a7b 7c7d 7e7f 8081 8283 8485 8687 8889 8a8b
00a0	8c8d 8e8f 9091 9293 9495 9697 9899 9a9b 9c9d 9e9f
00b4	a0a1 a2a3 a4a5 a6a7 a8a9 aaab acad aeaf b0b1 b2b3
00c8	b4b5 b6b7 b8b9 babb bc当地 bcbf c0c1 c2c3 c4c5 c6c7

The address region may be displayed in decimal or hexadecimal by clicking on the respective radio button. Likewise, the data region may be displayed in hexadecimal or octal. Since this display updates as the buffer contents are changed, the **Pause** button may be used to freeze the current contents. Use of the **Pause** button does not affect data transmission or reception. When the **Pause** button has been used, its label is changed to **Cont** for continue. Press the **Cont** button to resume screen updates. Note that the display will update with the last packet processed. Packets not shown while the display was frozen can not be displayed. Click the **Close** button to dismiss the display.

IP-5.2.4 Show Status

Select the “Show Status” item to request the module’s status. This produces a display similar to that shown below.



This display shows the Input IP module’s address, port number, IP type, multicast group address (if the IP type is UDP Multicast), Frame size, and number of packets received. If variable length items are being received, the Frame size field will show the most recent size. The **Reset** button may be clicked to reset the number of packets received count. Click the **Close** button to dismiss the display. The Output IP module’s Status Display is very similar.

IP-5.3 About

Selecting the “About” option from an IP module pop-up menu produces a display that lists the module’s number of inputs and outputs, whether directives are allowed, names of authors and the version number.

IP-6.0 Special Operating Instructions

There are no special operating instructions for this release.

Logging (LOG) Module

LOG-1.0 Overview

The Logging (LOG) module is responsible for writing data received on its input port to a specified log file.

Note: Delogging of logged data for on screen viewing or printing may be accomplished by means of an external program. The software used must be capable of displaying binary data in an ASCII representation. The shareware utility, Hexedit, which is available over the Internet from Alexander Reidel Informations-Systeme, is one such program.

LOG-2.0 Inputs

Ch.	Data expected	Validation performed	Processing performed
1	bytes	None	Received log data is written into the log file.

LOG-3.0 Outputs

The Log module does not have any output channels.

LOG-4.0 Container Items

Log module container items are not accessible via operator directives, so they are not listed here.

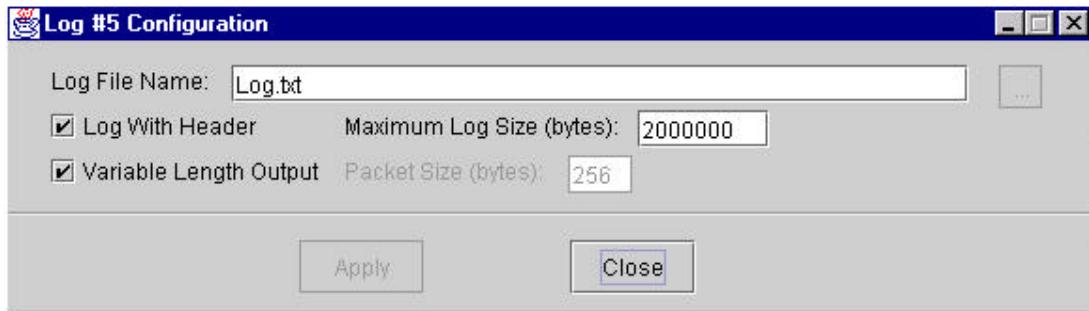
LOG-5.0 Displays

To access displays for this module, click in the center of the log module in the project window. The following pop-up menu choices will appear. The “Remove” option can be used during project design to remove this module. The “Configure” option should be used prior to running the project and is unavailable at run-time. The Run-time option is available only when the project is running.

Module Pop-Up Menu Item	Description
Configure	Access the configuration display
Run-time	Access the Run-time menu for the Log module
Remove	Remove the Log module from the project
About	Display Information about the module

LOG-5.1 Configuration

Selecting the “Configure” pop-up menu option produces a display similar to the following screen.



LOG-5.1.1 Log File Name

The Log File Name specifies where the log data is written. If this file already exists, its data will be overwritten. If there is more than one log module in a project, they cannot write to the same log file.

LOG-5.1.2 Maximum Log Size

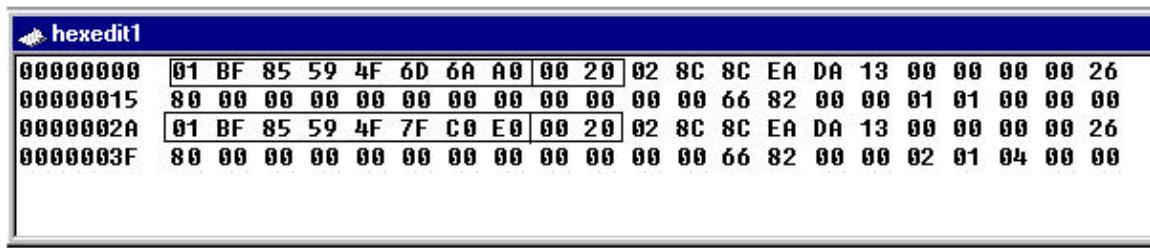
The maximum log size in bytes limits the amount of storage used for logging. When this maximum is reached, the log file is closed and an event message is generated.

LOG-5.1.3 Packet Size

The packet size in bytes defines the size of the data buffer to be written to the log file. A packet size that is smaller than the actual data buffer received will result in truncation of the data that is logged. A packet size that is larger than the actual data buffer received will be zero filled to the packet size and then written to the log file.

LOG-5.1.4 Log With Header

When the log with header box has been checked, all log records will begin with a log header of ten bytes. This header consists of eight bytes of system time followed by two bytes of data length. The following example shows two CLCW packets. The header in each packet has been circled for clarity. When the log with header box is unchecked, all records will be written without a header.



LOG-5.1.5 Variable Length Output

When the variable length output box has been checked, varying length records are written to the log file. No truncation or padding of received data is done. When this field is checked, the packet size field is desensitized.

LOG-5.2 Run-time

Clicking the “Run-time” option of the Log module pop-up menu produces a Run-time menu. There are three items in the menu list.

Log Run-time Menu Item	Description
Resume	Start the Log module again after a stop
Pause	Stop the Log module.
Show Status	Show information on the log file.

LOG-5.2.1 Resume

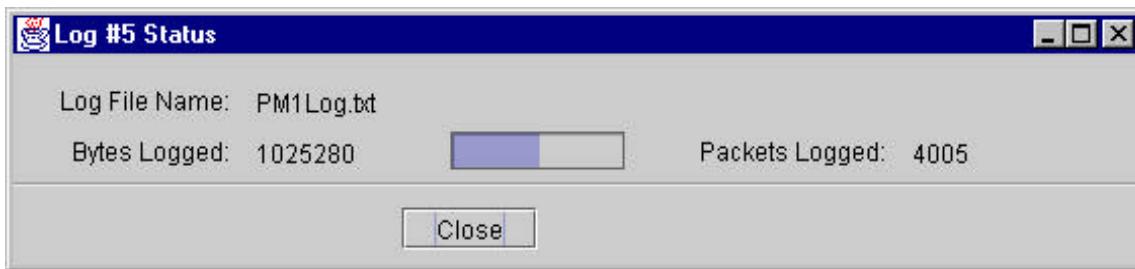
The Log module may be restarted after being stopped. The specified Log File will be created and possibly overwritten. All of the associated counters will start over from zero.

LOG-5.2.2 Pause

The Log module may be stopped independently of the other modules in the project. After it has been stopped, the user may return to the Configuration screen and change the Log File Name, Log Packet Size or Maximum Log Size.

LOG-5.2.3 Show Status

When the “Show Status” option is selected from the Run-time Menu, a screen like the following is displayed. The bar in the center of the screen shows the percentage of the log area in use. The blue portion of the bar represents the logged data.



LOG-5.3 About

Selecting the “About” option from the module pop-up menu produces a display that lists the module’s number of input links, number of output links, whether directives are allowed, names of authors and the version number.

LOG-6.0 Special Operating Instructions

If more than one Log module is being used in a project, they must be configured to write to different files.

Serial Input (SI) Module

SI-1.0 Overview

The Serial Input (SI) module provides the capability to receive serial data through a port on a serial card in the host computer and to pass the data received to other modules.

SI-2.0 Input

The SI module does not have any input channels.

SI-3.0 Output

Channel	Description
1	Data received from the serial port is passed on this channel

SI-4.0 Container Items

The SI module's container items are not accessible via operator directives, so they are not listed here.

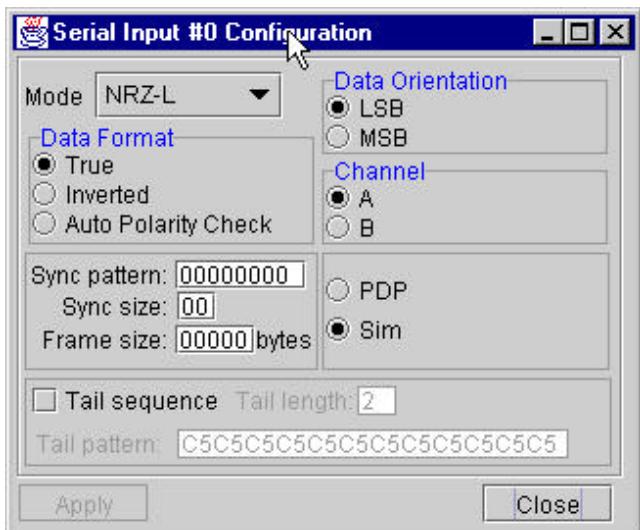
SI-5.0 Displays

To access displays for this module, click in the center of the SI module in the project window. The following module pop-up menu choices will appear. The “Configure” option is only available during project design. The “Run-time” option is only available when the project is running.

Module Pop-up Menu Item	Description
Configure	Access the Serial Input configuration window
Run-time	Access the module's run-time menu
Remove	Remove the module from the project
About	Display generic module information

SI-5.1 Configuration

Select the “Configure” item from the module pop-up menu to access the configuration window for the Serial Input module.



Parameter	Description
Mode	Select the decode method of the input stream from NRZ-L, NRZ-M, NRZ-S, BIO-L, BIO-M, or BIO-S.
Data Orientation	Select LSB if the data stream is received with the least significant bit first. Select MSB if the data stream is received with the most significant bit first
Data Format	Select True if the polarity of the data stream is normal. Select Inverted if the polarity of the data stream is inverted. Select Auto Polarity Check if the polarity is not known.
Channel	Select channel A or channel B for the operation
Sync Pattern	Enter the synchronization pattern in hexadecimal format for the serial I/O card to receive data. (four digit maximum)
Sync Size	Enter the size of the synchronization pattern in bits
Frame Size	Enter number of bytes per frame to be received (five digit maximum)
Input Type	Select the PDP button if the input stream is telemetry. Select the Sim button if the input stream is command.
Tail Sequence	If the command bitstream has a tail sequence, check the Tail Sequence box and enter the size and bit pattern.

Click on the **Apply** button to apply the data entries. Click on the **Close** button to dismiss the window.

SI-5.2 Run-time

Click the module pop-up menu “Run-time” option to access the Run-time menu with the following choices.

Run-time Menu Item	Description
Restart	Restart the module
Display Buffer	Show the Display Buffer window to display received data
Display Status	Show the Status window of the Serial Input module

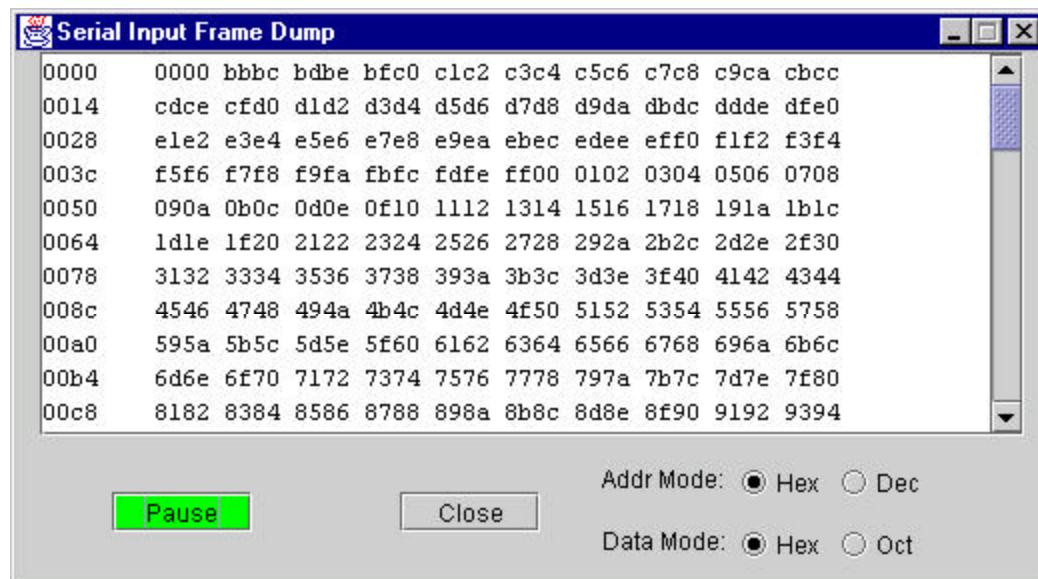
Stop	Stop the module
------	-----------------

SI-5.2.1 Restart

After an individual module has been stopped, select “Restart” from the Run-time menu to restart the module. The color around the module’s border will change from red-striped (indicates stopped state) to green-striped (indicates run state).

SI-5.2.2 Display Buffer

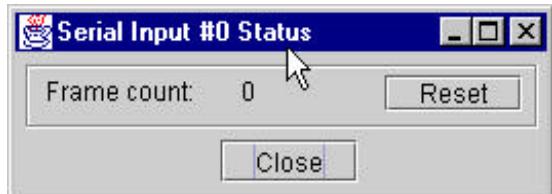
Select the “Display Buffer” option to display data received from the serial I/O port.



Button	Description
Addr Mode	Select Hex to display the memory address in hexadecimal format Select Dec to display the memory address in decimal format
Data Mode	Select Hex to display data in hexadecimal format Select Oct to display data in octal format
Pause	Pause updating the data contained in the window. The button name changes to Cont .
Cont	Continue updating a previously paused display. The button name changes to Pause .
Close	Close the window

SI-5.2.3 Display Status

Select the “Display Status” option of the Run-time menu to view the Serial Input Status Display.



This display shows the number of frames received. Click the **Reset** button to initialize the Frame count to zero. Click the **Close** button to dismiss the display.

SI-5.2.4 Stop

Select the “Stop” option from the Run-time menu to stop the Serial Input module’s processing. The color around the module’s border will change from green-striped (indicates run state) to red-striped (indicates stopped state). The Serial Input module can be re-configured by selecting the “Configure” option of the pop-up menu as in section SI-5.1. To return to run mode, select the “Restart” option.

SI-5.3 Remove

Select this option to remove the Serial Input module from the project.

SI-5.4 About

Selecting the “About” option from the module pop-up menu produces a display that lists the number of input channels, number of output channels, whether directives are allowed, names of authors and the module’s version number.

SI-6.0 Special Operating Instructions

There are no special operating instructions for this release.

Serial Output (SO) Module

SO-1.0 Overview

The Serial Output (SO) module provides the capability to transmit serial data through ports on a serial card in the host computer.

SO-2.0 Input

Channel	Description
1	Data to be transmitted to the serial port.

SO-3.0 Output

Channel	Description
1	A copy of the data being transmitted out the serial port.

SO-4.0 Container Items

The module's container items are not accessible via operator directives, so they are not listed here.

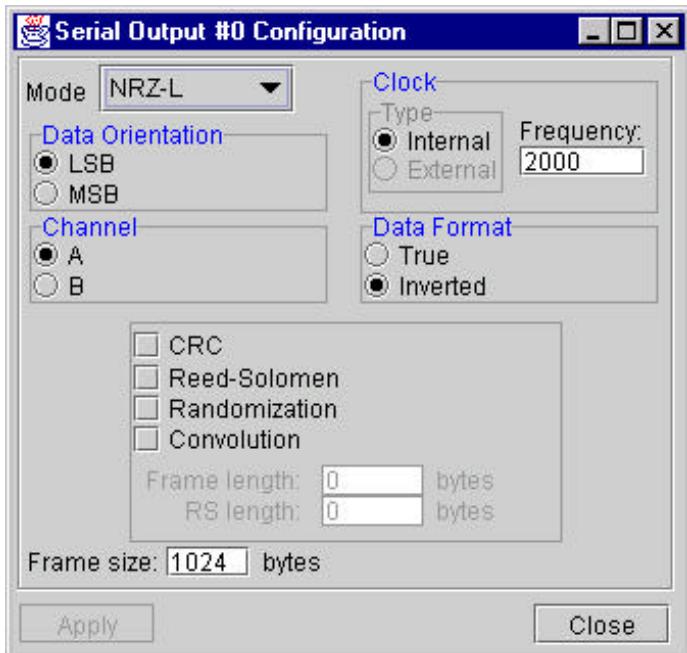
SO-5.0 Displays

To access the displays for this module, click in the center of the module in the project window. The module pop-up menu will appear with the following choices. The “Configure” option is available only during project design. The “Run-time” option is only available when the project is running.

Module Pop-up Menu Item	Description
Configure	Access the Serial Output configuration window
Run-time	Access to module's Run-time menu
Remove	Remove the module from the project
About	Display generic module information

SO-5.1 Configuration

Select the “Configure” item of the module pop-up menu to access the configuration display for the Serial Output module.



Parameter	Description
Mode	Select the encode method of the data stream from NRZ-L, NRZ-M, NRZ-S, BIO-L, BIO-M, or BIO-S.
Clock Type	In this version, only the internal clock is used
Clock Frequency	Enter the frequency in Hz to transmit data out
Data Orientation	Select LSB if the data stream is transmitted with the least significant bit first. Select MSB if the data stream is transmitted with the most significant bit first
Data Format	Select True if the polarity of the data stream is normal. Select Inverted if the polarity of the data stream is inverted.
Channel	Select channel A or channel B for the operation
Encoding	Click the appropriate boxes to enable CRC, Reed-Solomon, Randomization or Convolution encoding.
Frame Size	Enter number of bytes per frame to transmit

Click on **Apply** button to apply any changes. Click on **Close** to dismiss the display.

SO-5.2 Run-time

Click on the module pop-up menu “Run-time” option to request the Run-time menu.

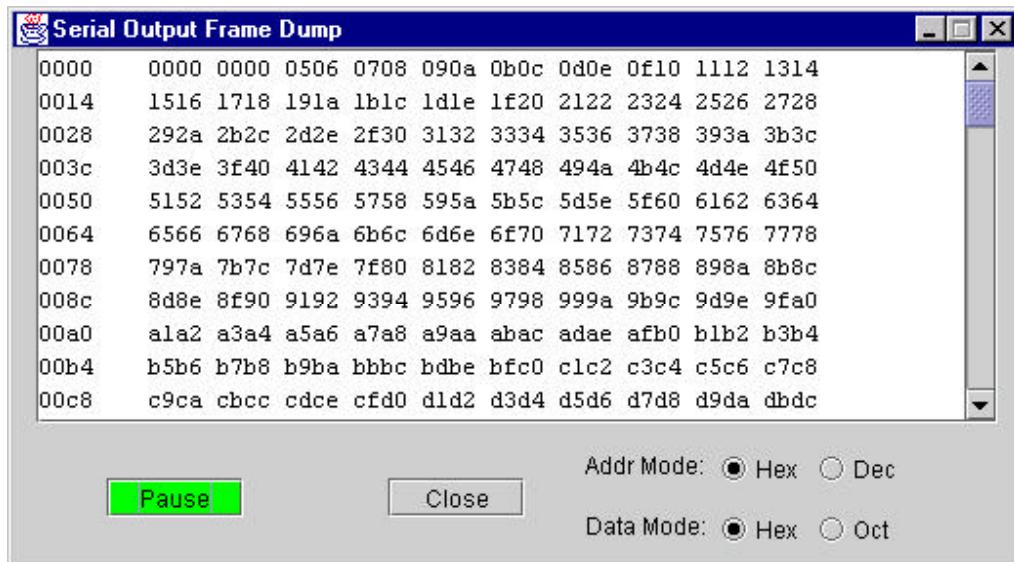
Run-time Menu Item	Description
Restart	Restart the module
Display Buffer	Show the data transmission buffer
Display Status	Show the status window of the Serial Output module
Stop	Stop the module

SO-5.2.1 Restart

After an individual module has been stopped, select “Restart” from the Run-time menu to restart the module. The color around the module’s border will change from red-striped (indicates stopped state) to green-striped (indicate run state).

SO-5.2.2 Display Buffer

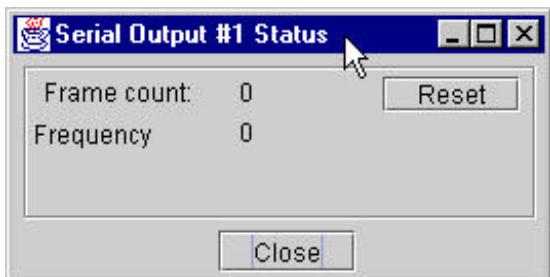
Select “Display Buffer” from the Run-time menu to display the Serial Output Frame Dump window.



Buttons	Description
Addr Mode	Select Hex to display the memory address in hexadecimal format Select Dec to display the memory address in decimal format
Data Mode	Select Hex to display data in hexadecimal format Select Oct option to display data in octal format
Pause	Freeze the data window contents. Pause button is renamed Cont.
Cont	Resume updating the data window contents. Cont button is renamed Pause .
Close	Close the window

SO-5.2.3 Display Status

Select the “Display Status” option to display the status window.



Status Field	Description
Frame count	Number of frames transmitted
Frequency	Current frequency of output stream.

Click **Reset** to initialize the frame counter to zero. Click **Close** to close the window.

SO-5.2.4 Stop

Select “Stop” from the Run-time menu to stop the Serial Output module’s processing. The color around the module’s border will change from green-striped (indicates run state) to red-striped (indicates stopped state). The Serial Output module can be re-configured by selecting the “Configure” option of the module pop-up menu. To return to run mode, select “Restart” from the Run-time menu.

SO-5.3 Remove

Select this option to remove the Serial Output module from the project.

SO-5.4 About

Selecting the “About” option from the module pop-up menu produces a display that lists the number of input channels, number of output channels, whether directives are allowed, names of authors and the module’s version number.

SO-6.0 Special Operating Instructions

There are no special operating instructions for this release.

Scenario (SN) Module

SN-1.0 Overview

The Scenario module reads directives from a specified scenario file line by line and passes them to the linked module for processing.

SN-2.0 Inputs

The Scenario module does not have any input channels.

The input to this module is via scenario files, which are specified during run-time. The format of these ASCII text files is very simple. Each line is limited to 99 characters. Each line contains one of the following items.

- a comment line (starts with a semicolon)
- a *SLEEP* directive to the scenario module to pause for a number of milliseconds
- a directive to pass to the linked module. Currently, the scenario module accepts the **Set** and **Setbuffer** directives.

Example of a 3 line scenario file:

```
;This is a comment line in a scenario file
SLEEP 1000
set TransmitMode 1
```

The first line is a comment. The second line is a directive to the Scenario module to pause for one second. The third line is a directive to the linked module to change the value of the container item named “TransmitMode” to one.

SN-3.0 Outputs

The Scenario module has a single output channel. It should be linked to input channel 1 of the module to receive the directives. The receiving module may also have another channel linked to its input channel 1.

Channel	Description
1	Scenario module sends the read directives to another module.

SN-4.0 Container Items

The Scenario module does not currently have any container items that may be accessed by operator directives.

SN-5.0 Displays

To access displays for a module, click in the center of the module in the project window. The following module pop-up menu will appear. There are no configuration screens for the Scenario module. The Run-time option is available only when the project is running. The “Remove” option can be used during project design to remove the module. The “About” option is for the display of the generic module information.

Module Pop-Up Menu Item	Description
Run-time	Access the Run-time menu for this module
Remove	Remove module from the project
About	Display generic module information

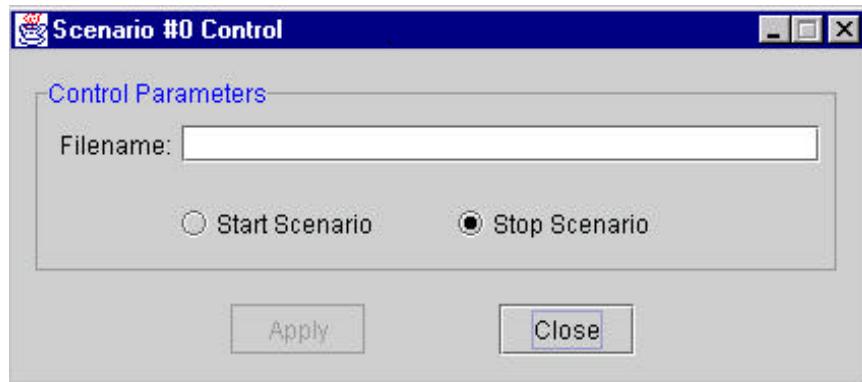
SN-5.1 Run-time

Click on the module pop-up menu “Run-time” option to request the Run-time menu.

Run-time Menu Item	Description
Control	Request File Name Input
Show Status	Request Status Display

SN-5.1.1 Control

Select “Control” from the Run-time menu to show the Scenario Control Display.

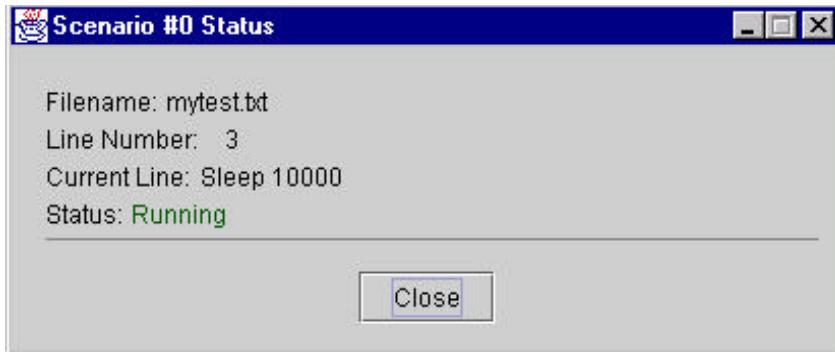


Enter the scenario file name in the Filename slot. To start processing the entered file, click the **Start Scenario** radio button; and then click the **Apply** button. To stop (pause) the processing of scenario directives, click the **Stop Scenario** button and click **Apply**. To resume after pausing, simply click the **Start Scenario** button and click **Apply**. The directives will be read until the end of file is reached. To restart from the beginning of the scenario file after the end is reached, click the **Stop Scenario** button, click **Apply**, then click **Start Scenario** and click **Apply**. If a different file name is entered after the first one is paused, the module will close the original file and start processing the newly entered scenario file. Click the **Close** button to dismiss the display.

Note: Scenario files are expected to be in the same directory as the Server software, but a fully specified path may be entered in the filename data entry field.

SN-5.1.2 Show Status

Select the “Show Status” item to request the module’s status. This produces a display similar to that shown below.



This display shows the Scenario module’s Filename, Line Number, Current Line, and Status. Line Number indicates which line of the scenario file is currently being processed. Current Line displays the corresponding directive of the line. Status shows “Running”, “Paused”, or “Finished” status depending on the stages of the directive processing. Click the **Close** button to dismiss the display.

SN-5.2 About

Selecting the “About” option from the Scenario module pop-up menu produces a display that lists the module’s number of input and output channels, whether operator directives are allowed, names of authors, and the version number.

SN-6.0 Special Operating Instructions

Because of the fast processing of the scenario file (e.g. 300 directives or more per second), the GUI Event Message window may become jammed by the volume of event messages produced in a very short time. Consequently, other displays may also be “hung up” by this undesirable effect. A proper remedy is under investigation. In the meantime it is suggested that ample delays be built into the scenario files.

Sample Scenario File:

```
;SECOND scenario file
Set MOD_SS_DRNADSTEP 1
SLEEP 1000
SET CEF_NR_ETRQ_1 2
SLEEP 1000
SET AS2_TS_DETECTOR 3
SLEEP 1000
SET AMR_NR_MWASPEED 65
```

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```
SLEEP 1000
SET AMR_SS_BITPKT1 1
SLEEP 5000
SET AMR_SS_BITPKT4 1
SLEEP 125
SET EPS_SS_MAINBUSVR 0xFF
sleep 5000
SETBUFFER TLMPACKET0140 20 BYTE 0xA 10 012
```

SIMSS/PM-1 ACRONYMS

APID	Application Identifier
BCH	Bose-Chaudhuri-Hocquenghem
C&DHS	Command and Data Handling System
CADU	Channel Access Data Unit
CCSDS	Consultative Committee on Space Data Systems
CERES	Clouds and the Earth's Radiant Energy System
CLCW	Command Link Control Word
CLTU	Command Link Transmission Unit
COP	Command Operations Procedure
COTS	Commercial, off-the-shelf
CUC	CCSDS Unsegmented Time Code
CSC	Computer Sciences Corporation
EBnet	EOSDIS Backbone Network
EDOS	EOS Data and Operations System
EDU	EDOS Data Unit
EGS	EOS Ground System
EMOS	EOS Mission Operations System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information Systems
EPGS	EOS Polar Ground Stations
ETS	EOSDIS Test System
FARM	Frame Acceptance and Reporting Mechanism
FTP	File Transfer Protocol
GMT	Greenwich Mean Time
GS	SIMSS Ground Station Module
GUI	Graphical User Interface
ICD	Interface Control Document
IP	Internet Protocol
NT	New Technology
ODB	Operational Database
PC	Personal Computer
PDB	Project Database
PM-1	Afternoon equatorial crossing spacecraft series
SC	SIMSS Spacecraft Module
SIMSS	Scalable Integrated Multimission Simulation Suite
SIMSS/PM-1	SIMSS/PM-1 Simulator
SORD	Spacecraft Operations Requirements Document
TCP	Transmission Control Protocol
TIE	Transponder Interface Electronics
UDP	User Datagram Protocol
VCDU	Virtual Channel Data Unit
VCID	Virtual Channel Identification
Y2K	Year 2000 compliance