	<p style="text-align: center;"><b>SPECIFICATION</b></p> <p style="text-align: center;"><b>FIRST/Planck CDMS Simulator requirements</b></p>	<p><b>HIFI no.:</b> SRON-U/HIFI/SP/2000-004  <b>Issue:</b> 1.1  <b>Date:</b> 03 May 2001  <b>Category:</b> 1</p>
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## FIRST/Planck CDMS Simulator requirements

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**DOCUMENT CHANGE RECORD**

<b>Issue</b>	<b>Date</b>	<b>Changes</b>
0.1	19 October 2000	first draft
0.2	15 November 2000	second draft (comments from the F/P CWG on Data Management)
1.0	18 January 2001	comments from the F/P CWG on Data Management meeting on 23-Nov-2000
1.1	03 May 2001	see the minutes from the F/P CWG on Data Management meeting of 30-Jan-2001, point 3.

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## 1 INTRODUCTION


The purpose of this document is to define the requirements for the CDMS Simulator.

The CDMS Simulator shall be used for instrument level tests and ICU/DPU subsystem tests. It connects one or more instruments to the Instrument EGSE (figure 3-1).

For the interface testing (the physical layer, the data link layer and transfer layer protocol), the simulator must be able to generate TC packets and to receive TM packets in a stand-alone configuration (figure 3-2).

As distinct from the FIRST/Planck CDMS, the CDMS Simulator does not maintain a time line (command sequencer) or other autonomous functions. Hence it only passes TC and TM packets and generates time.

For practical and economic reasons it should be build-up with a PC, including a 1553B plug-in board.

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## 2 DOCUMENTATION

### 2.1 Applicable documents


The following documents and the documents mentioned therein are applicable to the CDMS Simulator.

AD-01	FIRST/Planck Packet Structure ICD	SCI-PT-ICD-7527
AD-02	Multiplex Applications Handbook, section 100	MIL-HDBK-1553A, 1 Nov. 1988

### 2.2 Reference documents

The following documents are referred in this document.

RD-01	Common Data Bus Protocol	ASTRIUM-SI-IO-42-TN-0001
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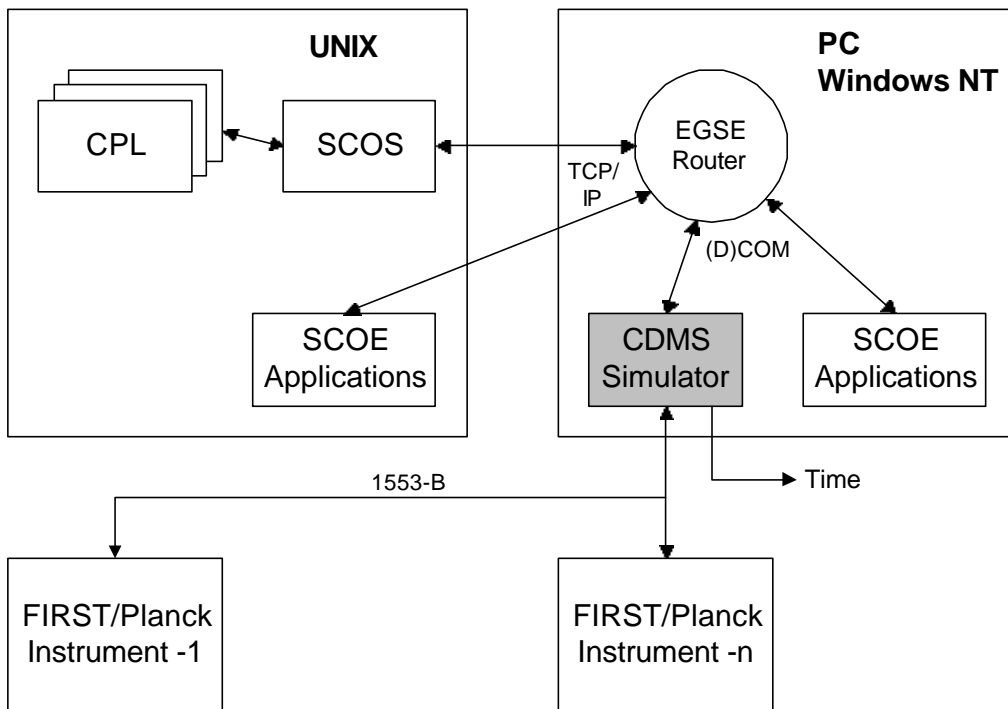
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**3 DESCRIPTION**

The CDMS simulator connects at one side with the instrument 1553B-bus and at the other side with the remaining EGSE via an EGSE Router. Figure 3-1 presents the position of the Simulator within the EGSE configuration.

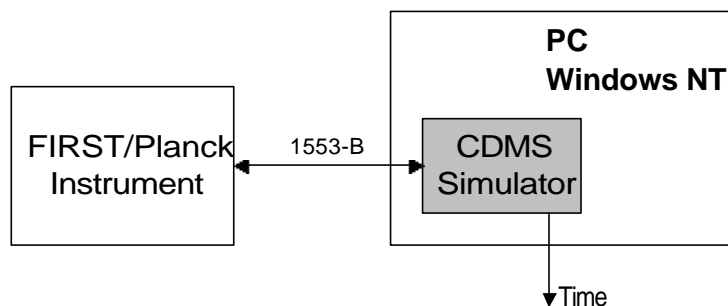
For the interface testing of the 1553B interface (the physical layer, the data link layer and transfer layer protocol), the simulator must be able to generate TC data and to receive and analyse TM data in a stand-alone configuration (figure 3-2).

Time information for checking the instrument time with the CDMS generated time and for other applications shall be provided.




**note:** the EGSE Router may be located in the UNIX workstation

**Figure 3-1 Instrument EGSE configuration**



**Figure 3-2 Stand alone test configuration**

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## 4 REQUIREMENTS

The requirements can be split-up into the following items:

1. Functions
2. Hardware/software platform
3. Interfaces

### 4.1 Functions

The CDMS simulator must, at least, be able to perform the functions mentioned in the following sections.

#### 4.1.1 Normal functions

Most of the time the CDMS Simulator is acting as interface between the EGSE and the instrument.

The following functions shall be performed in this situation:

- To implement the Bus Controller functions according to MIL-STD-1553B.
- Received TC packets from the EGSE Router shall be transferred as 1553B messages to the 1553B-bus.
- Received messages from the 1553B-bus containing TM packet data shall be send as TM packets to the EGSE Router.
- Retrieve and send TM packets from file to the TM/TC interface.
- To be able to support the creation, modification, storage and retrieval of several bus profiles.
- To start up automatically in a reproducible configuration.

The above mentioned functions shall be performed according to the requirements from AD-01, appendix 9, with the performance requirements from table 4.1-1.

	packets / second		
	nominal mode	burst mode	memory load
TM packets	25	50	0
TM asynchr. short pckts.	2	2	2
TC packets	2 *)	2	20
TC asynchr. short pckts.	2	2	2
Time	1	1	1


\*) If the amount of TM packets is less then 25 per second, the not occupied slots can be used to transfer TC packets, with a maximum of 20 TC packets per second.

**Table 4.1-1 Performance requirements**

#### 4.1.2 Stand alone functions

The CDMS simulator shall be able to operate as a stand alone test set-up with the following functions:

- To implement the Bus Controller functions according to MIL-STD-1553B.
- Store TC packets application data into files
- Edit stored TC packets application data (hex format)
- Generate TC packets by reading application data from a file and add relevant header and checksum fields
- Display received TM packets (hex format) and analyse TLP requirements, at least length and checksum
- To transfer predefined malformed TC packets (wrong length, APID or checksum)

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The above mentioned functions should be performed according to the requirements from AD-01, appendix 9.

#### 4.1.3 Bus monitor

In combination with the Normal and Stand-alone functions, the following bus monitor functions shall be applicable:

- Archive of transferred TC/TM packets, for the last 30 minutes, at maximum rate
- Archive of transferred 1553B messages, for the last 30 minutes, at maximum rate
- Display the list of transferred TC/TM packets
- Display individual TC/TM packets
- Display the list of transferred 1553B messages
- Display individual 1553B messages
- Display traffic status information in real time
- Archived and displayed packets and messages shall be time stamped, with the time of transfer over the 1553B-bus and with a resolution equal or below the minimum duration of a message slot.

#### 4.1.4 Time

The CDMS Simulator shall synchronise with the PC time and sets its time with the epoch set to a predefined date and time. The instrument shall be synchronised with this time, according to the procedures from section 4 of AD-01.

The CDMS Simulator shall provide the following two clock signals:

- the on board time clock of 131.072kHz
- the one second pulse, synchronised with the PC master time


#### 4.1.5 Fault Detection, Isolation and Recovery (FDIR)

The CDMS Simulator shall have at least the following FDIR features:

- Display the BC and RT error messages in real time
- Display detected bus error conditions in real time
- Display protocol error conditions in real time
- Display CDMS simulator error conditions
- Switch to bus medium A or bus medium B, as part of the Simulator set-up. Automatic reconfiguration is not necessary.

The CDMS simulator error conditions and corresponding responses are given in annex A. In case of an error, the CDMS shall stop the TC routing, continue with TM routing (if possible) and respond according to the table in annex A.



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#### 4.2 Hardware, software platform

The hardware/software platform of the simulator consists of and includes the following items:

- Standard PC, with Windows NT
- 1553B plug-in board, with driver software (preferable the DDC board BU-65549).

#### 4.3 Interfaces

The CDMS simulator interfaces at one side with the EGSE Router, which runs on the same PC and at the other side with the instrument via a 1553B-bus.

##### 4.3.1 Instrument interface

The CDMS Simulator interfaces at the instrument side by means of a 1553B-bus.

The electrical interface and data protocol of this interface is specified in Ad-01, Appendix 9.

RD-01 gives an explanation and background information of this specific application.

All items which are applicable to the CDMS (Bus Controller) are also applicable to the CDMS simulator, with the following exception:

- The CDMS Simulator shall interface with a maximum of four RT's.

##### 4.3.2 TM/TC interface

At the other side the CDMS Simulator interfaces with the EGSE router.

The CDMS Simulator receives messages containing TC packets on this interface and shall pass them to the 1553B-bus.

The CDMS Simulator shall pass all received TM packets to the EGSE Router.

The interface to this router is defined in appendix A.

##### 4.3.3 User/Operator interface


The CDMS Simulator shall be controlled/operated from the keyboard and monitor, with at least the following functions:

- Set-up of Simulator configuration
- Start/stop 1553B data traffic
- Display of TM/TC packets in hex format
- Display of 1553B messages
- Display of Simulator status
- Display of 1553B traffic status

##### 4.3.4 Command/Monitor interface


The CDMS simulator shall be able to be commanded, configured and monitored from the Instrument EGSE.

The CDMS simulator shall send error messages as event packets to the EGSE.

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**ANNEX A                      CDMS Simulator error conditions**

<b>ERROR CONDITION</b>	<b>RESPONSE</b>
<b>Physical link error</b>	
1. Bus medium A fails	No automatic recovery shall be attempted. CDMS Sim. shall indicate bus-failure time-out and raise an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
<b>Data link errors</b>	
2. RT receives message with parity error in transmit command word, receive command word or data word	RT shall not response RT shall set message error bit
3. RT receives message length-error in command word or data word	RT shall not response RT shall set message error bit
4. RT receives message with sync error in transmit command word, receive command word or data word	RT shall not response RT shall set message error bit
5. RT receives message with bi-phase error in transmit command word, receive command word or data word	RT shall not response RT shall set message error bit
6. RT receives message with incorrect number of data words	RT shall not response RT shall set message error bit
7. RT message error bit is set	CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
8. RT busy bit is set	If implemented: CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
9. RT subsystem flag bit is set	If implemented: CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
10. RT Terminal flag bit is set	If implemented: CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
11. RT does not respond (in time)	CDMS Sim. shall indicate no-response time-out and raise an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
12. CDMS Sim. receives message with parity error in status word or data word	CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
13. CDMS Sim. receives message with sync error in status word or data word	CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
14. CDMS Sim. receives message with bi-phase error in status word or data word	CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error

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	and makes the data available to the EGSE.
15. CDMS Sim. receives incorrect number of data words	CDMS Sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
<b>Transfer layer errors</b>	
16. TC packet handshake is not finished	CDMS sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
17. TM packet handshake is not finished	CDMS sim. shall issue an error message. CDMS Sim. SW saves context of this error and makes the data available to the EGSE.
<b>Application layer error</b>	
18. A packet containing an application error like: wrong application data field length, wrong checksum, etc.	CDMS sim. shall not read or assess the data in the TM or TC packet. This is the responsibility of the Application.