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Document Change Record

Issue	Date Changed	Section	Description of Change
0.6	28 September 2001	All	
0.7	5/10/01	3	TC & TM Logfiles location configurable.
		5	typos corrected, 'configuration' replaces 'mode'.
		5,6	Use of work-around bus monitor.
		6.3	Diagram of links for self-test.
0.8	10/10/01	4.4	DDC.LOG configuration options.
		4.1	Added MT2DISK.EXE info.
1.0	15/02/02		
1.1	18/04/02	6.0	Added more detail on BC & RT protocols. Rearranged several sections.
1.2	1/10/02	All	Updated for version 1.2 software
2.0	10/12/02	All	Updated for version 2.0 software.
2.1	12/03/03	All	Updated for version 2.2 software.

CONTENTS

1. INTRODUCTION

1.1 Changes since version 1.0

Version 2.2 is the latest software version to be issued.

- **Simulator Control by TC**. This version of the simulator has the ability to accept remote simulator control commands from the router. For example; Change buslist, change bus medium, perform connection test. At this time the simulator will process commands immediately, it cannot accept a command for execution at a specific future time.

- **CDMS-Sim Housekeeping packets** are generated and sent to the router. (See AD2).
Event Reporting packets (AD2 section 4.2.5) have not been implemented.

- **Low-level Commands and Status**. The simulator now has the ability to send low level commands and receive event telemetry, see section 8.6. These have been introduced for the benefit of the Planck instruments since Herschel does not use them.

- **CDMS Time.** The default CDMS time is now derived from the PC clock, converted to the CUC-TAI format.

- **Minor Frames.** The minor frame starting time is now controlled by software rather than the DDC card itself. This means that the minor frames no longer run exactly 15.6 ms apart. They will be closer together by less than approximately 800 μs depending on the contents of the frame. The timing of the messages within the minor frames is still handled by the DDC card and is unaffected.

- **Spurious Packets.** Version 2.2 solves an issue seen occasionally in previous versions whereby a packet consisting entirely of zeroes was sent to the router.

1.2 1553 Bus Protocol

Since version 1.0 the Simulator BC has used a non-interlaced bus protocol (See AD1) which allows the transfer of a telemetry packet in every subframe, to comply with the requirements for burst mode. See section 7. The alternative protocol in which TM packets are checked before confirmation, is not implemented in the CDMS-Sim. Nevertheless, the CDMS-Sim is still compliant with the PS-ICD, except that there will never be a re-try for TM packets.

1.3 Known Issues

- **Microsoft's 'FindFast'** utility can cause problems with file access. It should preferably permanently removed from the system running the simulator. If installed, it should be disabled.

- **Incorrect messages are reported by the DDC Bus monitor** (ACE Windows menu).
The error is in the DDC software. Instead, another DDC program (MT2DISK.exe) should be used. It runs in a DOS window and logs all bus messages to disk. The ACE Windows menu is only used to view the log file.

- **Windows Focus:** For best performance the CDMS control panel should be the active focussed window. Avoid excessive mouse movements – these take processor time away from real-time processing.

2. APPLICABLE DOCUMENTS

AD1 – Astrium Technical note ref. H-P-I-ASPI-TN-0204
AD2 – CDMS Simulator Data ICD. SPIRE-RAL-DOC-001196.

3. DELIVERABLES

3.1 Hardware (if applicable)

DDC 1553 BUS Card Part No BU-65549 M2-300,
Personal Computer Pentium III 900MHz, 256Mb Memory.
4 Trompeter connectors.

3.2 Software

CDMS-Sim compiled code (RAL)
CDMS-Sim configuration files (examples).

Supplied only with hardware deliveries:
ACE 32 bit Runtime library for NT, BUS-69083 (DDC)
ACE Windows menu for NT, BUS-69085 (DDC)

3.3 Documentation

CDMS Simulator Users Guide (this document).

Supplied only with hardware deliveries:
BU-65549 Hardware Manual, MIL-STD 1553 BC/RT/MT PCI Interface Card, MN-65549-001.
BUS-69083, 69082, 69080 Software Manual ACE Runtime Library, MN-69080

4. INSTALLATION

There are 3 directories on the installation CD: CDMS_SIM, REMOTE TERMINAL and TELEMETRY PLAYBACK. Starting with the CDMS_SIM directory, run the 'Setup' program. This will also install the LabVIEW Run-Time Engine. If required, you may then install the Remote Terminal, and Telemetry Playback programs. All required executables and data files for the RAL software are included. The directory structure is as follows:

```
C:\Program Files\CDMS_Sim

    CDMS_SIM.ini
    uninst.exe
    iw_en.lrm
    CDMS_SIM.exe
    DDC.dll
    Telemetry Payback.exe

    Buslists
        HIFI Prime.txt
        PACS Prime.txt

    Documentation
        CDMS-Sim users guide.doc
        README.txt
        CDMS_Simulator_Data_ICD(issue0.5).pdf

    Local Commands
        Empty.txt
        HIFIcmd1.txt
        MaxLenTC.txt
        Pacscmd1.txt
        Pacscmd2.txt

    Other Files
        APID2RT.txt
        Mt2disk.exe
        Config.txt
        DDC.log  (when switched on)

    tmp_lvrteinstalldir
        InstMsi.exe
        InstMsiW.exe
        lvrt.msi
        lvrteinstall.exe
        lvrteinstall.ini

    Remote Terminal
        uninst.exe
        Remote Terminal.ini
        iw_en.lrm
        Remote Terminal.exe
        ace4lvsp.dll
        Checksum.dll

    TC&TM Log Files
        TelemetryB.txt
        TelecommandsA.txt
```

```
      TelecommandsB.txt
      TelemetryA.txt
      Test Telemetry.txt

data
   Checksum.dll
```

The DDC runtime library and windows menu software, as listed in section 3.2, should be separately installed. Accept the default locations suggested by the DDC installation software.

5. FILES

5.1 Executables

- CDMS_SIM.EXE

This is the compiled version of the simulator code. The source was written using LabVIEW. It makes calls to DDC.DLL, a C++ library.

- REMOTE TERMINAL.EXE

This is the compiled version of a basic Remote Terminal, which can be used in conjunction with the Simulator.

- TELEMETRY PLAYBACK.EXE

This is a program which will take an existing Telemetry log file and send each packet to the router one by one. The gap times between packets remain the same as when the file was originally logged.

- MT2DISK.EXE (Bus Monitor)

This is a standalone executable which, when run at the same time as the Simulator, will log bus messages to a file with extension '.asf' located in the same directory as the executable. The file can become very large so you may wish to move this file to the same directory where you are storing TC & TM log files. You will have to update the 'Bus Monitor' item on the windows taskbar. (Right click on it, select 'properties' and update the Target path.)

When run, the Bus Monitor window asks for a device number. Type 1 and hit <return> (the simulator itself is device 0). The '.asf' file can be read using the DDC Ace Menu software.

- ACE4LVSP.DLL

This is a library of DDC C++ to LabVIEW interface functions required for the running of the RT.

- DCC.DLL

This is a library of C++ functions which drive the 1553 interface card, managing Bus Controller frame and subframe structure.

5.2 'Buslists' directory

This directory contains text files used by the Bus Controller to create a bus profile - RT numbers, their Subaddresses, message types and frame timing. The buslist files can be created with EXCEL. Alternatively, use your favourite text editor. The working version must be saved as a tab-separated '.TXT' file.

While the CDMS-Sim is loaded, the 'Edit Buslist' function of the simulator can be used to make changes to a buslist file.

5.2.1 Buslists Supplied with CDMS-Sim

PACS Prime.txt
HIFI Prime.txt

These are 2 buslists prepared based on the most recent information from Alcatel. They both download 27 Telemetry packets per second and send 1 Telecommand per second.

5.2.2 User-Defined Buslists

HERSCHEL

PLANCK

CDMS Simulator

User Guide

Ref:	SPIRE-RAL-PRJ-807
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The user is expected to create his/her own buslists for software test purposes; and when the buslists to be used by the spacecraft have been defined.

The format of a buslist file is shown in the figure below. Note that the column headers (above the divider line at row 20 in the figure) should not be saved to the text file used by the simulator.

Column A in the file is the subframe number (0-63). This entry is required for each line.

Column B is the message slot number (0-23). The slot number is as defined in the PS-ICD, but note that the numbering starts from 0 here.

Column C is the start time of the message, counting from the start of the subframe.

Column D is the 'Message Type' as defined in the simulator software. There are four message types: MCSync (mode code, sync) is the first message in a frame; MCData (mode code, with data) is the first message in each subframe except subframe 0; BCtoRT is for RT receive messages; RTtoBC is for RT transmit messages.

Column E is the RT number where the message will be received/transmitted. For a TC packet transfer '0' must appear in this column. The actual RT number will be determined by the Simulator using the APID of the TC packet.

Column F is the SubAddress for the message. For a packet transfer, note that only the first SubAddress should appear in the buslist. The Simulator will fill in the extra messages and their SubAddresses as required, depending on the length of the packet.

Column G is the data type. For use in the Simulator, these data types are defined:

- None : must be used with message type MCSync.
- SyncFC : Frame count, used with message type MCdata in message slot 0
- Timecode : the CDMS master clock broadcast message
- PacketTC
- TCDesc : TC descriptor, SA27R
- TCConf : TC confirmation, SA27T
- PacketTM
- TMReq : TM request, SA10T
- TMConf : TM confirmation, SA10R
- UCtrl : Unit control commands sent to SA1R.
- LLCmd : Low level commands send to SA28R.
- EventTMA, EventTMB: Event telemetry collected from subaddresses 5T or 6T respectively
- StatusTM : Unit status message collected from SA1T.
- AsyncCmd : Asynchronous short command sent to SA3R or SA4R depending on Front Panel selection.
- TimeConf : Instrument time echo, SA8T.
- LLCConf : Read from SA28T.

Microsoft Excel - RT2 Burst_and_CMD checklist.xls

File Edit View Insert Format Tools Data Window Help Acrobat

U328   =

	Subframe	Message Slot (0 - 23)	Start Time (uS)	Message Type	RT (0 if TC)	SA	Data Type
1							
2				MCSync			None
3				MCData			SyncFC
4				BCtoRT			Timecode
5				RTtoBC			PacketTC
6							TCDesc
7							TCConf
8							PacketTM
9							TMReq
10							TMConf
11							EventTC
12							LLCmd
13							EventTM
14							StatusTM
15							TimeConf
16							LLConf
17							EventTMA
18							EventTMB
19							ASyncCmd
20							
21	0	0	0	MCSync	31	0	None
22	0	4	2400	BCtoRT	0	11	PacketTC
23	0	20	14400	RTtoBC	2	10	TMReq
24	0	21	14550	BCtoRT	0	27	TCDesc
25							
26	1	0	0	MCData	31	0	SyncFC
27	1	4	2400	RTtoBC	2	11	PacketTM
28	1	20	14400	RttoBC	2	10	TMReq
29	1	21	14550	BctoRT	2	10	TMConf
30							
31	2	0	0	MCData	31	0	SyncFC
32	2	4	2400	RTtoBC	2	11	PacketTM
33	2	20	14400	RttoBC	2	10	TMReq
34	2	21	14550	BCtoRT	2	10	TMConf
35	2	22	14700	RTtoBC	0	27	TCConf
36							
37	3	0	0	MCData	31	0	SyncFC
38	3	4	2400	RTtoBC	2	11	PacketTM
39	3	20	14400	RttoBC	2	10	TMReq
40	3	21	14550	BCtoRT	2	10	TMConf

Please note the message slots of the TMReq and TMConf. These have reversed since version 1.0 of the simulator.

5.3 'Local Commands' directory

All the files in this directory are example telecommands. They can be created or modified by using the 'Edit Command' function of the simulator, or they can be created 'offline' using a text editor and saved in this directory with a '.txt' extension. They will then appear in the 'Select Command' list at runtime. Telecommand files must contain raw Hex, but they may contain spaces, tabs or carriage returns for clarity, as these will be removed automatically by the simulator before being transmitted.

5.4 'Other Files' directory

- APID2RT.txt

This is a file that the simulator uses to translate an instrument APID to an RT number. The default file supplied has RT numbers 1 to 7; it should be changed if you need to use the real spacecraft RT numbers.

- CONFIG.TXT

This file stores certain parameters that have been entered during simulator operation, so that the same parameters do not have to be retyped in subsequent simulator sessions. It also stores the default drive where the TC & TM Logfiles, and the DDC.log will be kept. N.B. The full path in the config.txt file refers only to the DDC.LOG file. The Drive letter only will be used to determine the location of the TC & TM logfiles. Users should only modify the drive letter in the path. The change will affect all 3 file types.

The config.txt file also contains 3 flags, which determine what types of errors are logged in the DDC.LOG file. Set each to 1 to include these messages in the file. Set all three to 0 to disable writing of the log file (see below).

The parameter TmLogLength can be used to limit the number of words of the telemetry packets that are logged. When set to a positive integer, that number of words will be logged. If left at 0, the parameter is ignored and the entire packet is logged. This parameter has no effect on the packet that is sent to the router.

All changes will take effect next time you run the Simulator.

- DDC.LOG

This is the debug log file for error messages generated by the software. It is turned on by the following lines in CONFIG.TXT:

```
LOG ERROR 1
LOG DEBUG 1
LOG TIMER 1
```

For maximum debug information, all should be on. If the parameters are set to zero, the debug messages are turned off.

5.5 'TM&TC Logfiles' directory.

The files in this directory are used to store telecommands and telemetry, along with a timestamp. They will log up to 30 minutes of data each. When the Bus Controller is started, data is written to the files with subscript 'A' for the first 30 minutes, then automatically switched to 'B'. The process then repeats after a further 30 minutes. If the Bus Controller is stopped during this time, it will begin logging to 'A' when it is restarted. All previously stored data will be overwritten, so if you wish to retain it you must rename these files or copy them to a different directory manually after stopping the Bus Controller. When the Bus Controller starts it automatically creates these files, so removing or renaming them whilst stopped will cause no problems.

Files in this directory will be available to the Telemetry Playback application. 'Test Telemetry.txt' is a test source file for use with playback.

The location of the directory can be specified in CONFIG.TXT, so the log files are written to a disc with plenty of space.

6. SIMULATOR CONFIGURATIONS

6.1 Normal Use (DPU Connected)

In normal configuration the CDMS simulator acts as a Bus Controller (ACE device 0) plus Bus Monitor (with DOS program MT2DISK.EXE using ACE device 1). This configuration will be used with the 1553 bus connected to an instrument DPU. The use of the Bus Monitor is optional and will probably only apply to early protocol checks.

6.2 Self-Test

In self-test configuration the CDMS simulator acts as a Bus Controller (ACE device 0) plus Remote Terminal (RT uses ACE device 1). The RT replaces a flight instrument if one is not available. Thus an EGSE system can be tested end to end without needing the instrument. The Bus Monitor is not available in this configuration.

6.3 Telemetry Playback

In playback configuration the CDMS simulator does not utilise the 1553 bus at all. Telemetry files recorded on the simulator in a previous test are played back over the TCP/IP network connection to the router.

7. THEORY OF OPERATION

7.1 Bus Protocol Implementation

7.1.1 Bus Controller

The bus controller constructs and runs 64 subframes per second. The structure of the subframes is determined by the buslist selected at runtime. The buslist can be changed during operation, and will come into effect from the end of the major frame currently being run. Any data transfers pending at the end of subframe 63 will be lost during the changeover.

To some extent, the behaviour of a subframe can be influenced by the data retrieved in a preceding subframe. For example; the Bus Controller looks at the contents of a Telemetry Request message to determine the existence and characteristics of any pending telemetry packets. Previous versions of the simulator could only examine the contents of a TMReq message after the subframe containing it had finished running and been extracted. This did not allow enough time to build the telemetry packet transfer into the next subframe. The TMReq was therefore retrieved in frame n, and the TM packet in frame n+2.

Since version 1.0 of the simulator a different strategy has been adopted. When the TMReq message has been transferred, the BC immediately generates an interrupt and extracts the contents of the TMReq message whilst the rest of the frame continues running. This gives the BC enough time to react to a TMReq message and download the Telemetry packet (and send the Telemetry confirmation) in the very next frame. If there is no TMReq message in the buslist, the BC inserts a 'dummy' TMReq message to RT26 SA10T to generate the interrupt at the required time.

Since version 1.0 the simulator checks the Flow Control bits in the TMReq message (see PS-ICD p152). If these are not set to "01 – Transfer is pending" then the TMReq message is rejected and no Telemetry packet is transferred.

7.1.2 Remote Terminal

Previous versions of the Remote Terminal would wait for the Telemetry Confirmation packet to be received before updating the outgoing Telemetry and Telemetry Request packets. This system was not fast enough to keep up with the BC in Burst Mode. The version of the RT supplied with simulator version 1.0 works differently. The RT looks at the data words of the MCData/SyncFC broadcast message that the BC sends at the start of each subframe. It is possible for the RT to determine if there is to be a Telemetry Packet transfer from it in that subframe, and it updates its output buffers accordingly. The BC still sends the Telemetry Packet Confirmation message, but it is ignored by the RT.

The RT supplied with CDMS Simulator Version 1.2 has been upgraded to send Unit Status, Time Echo and Low Level Command Echo messages when they are in the buslist.

7.2 CDMS Time

- **CDMS Clock:** The value of CDMS Clock is loaded into the CDMS-Sim software when the BC starts running. It defaults to the PC clock time, converted to CUC-TAI format. If the user want to test software with a specific clock value, this can be typed into the front-panel box before starting. The software will then start the clock from that value.

  Once the BC is running the CDMS clock increments the 'seconds' bit every Frame. The frame time is nominally one second, but experience has shown that the DDC clock typically gives a frame period of 1000.1 mS +/- 0.1mS.

- **Synchronisation**: We assume that the PC housing the CDMS-Sim will have its PC clock synchronised to some network time. As mentioned above, this time is normally transferred to the CDMS-Sim software only on startup. A further option is now possible – a re-synchronisation of the CDMS-Clock with the PC clock will occur on sending the 'Sychronise Bus Time' TC to the simulator.

8. NORMAL SIMULATOR OPERATION (I.E. WITH DPU)

8.1 Startup

When the simulator is started, any previously stored telemetry & telecommand logfiles are overwritten. The files, which always have the default filenames, should be renamed before starting if they need to be preserved.
If 1553 bus message logging is required, start the bus logging program MT2DISK.EXE before starting the CDMS-Sim. Note that the Bus Monitor log files can become very large if monitoring is on for more than a few minutes.
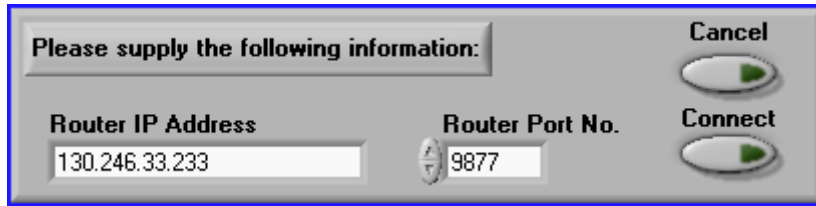
After running MT2DISK.EXE
Select ACE device 1 in the DOS window.

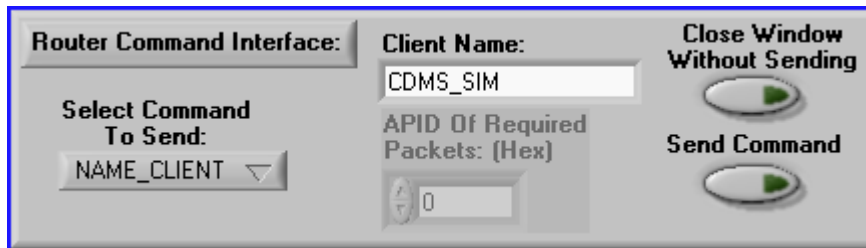Start CDMS_SIM from the NT Start Menu or run CDMS_SIM.exe.

8.2 Router Connection

If a Router connection is required, use this procedure before starting up the bus controller.

- Log-On to Router
Click the 'Launch Router Command Interface' control.
Supply the IP address and Port number of the router in the pop-up window (default values are those in the Config file).

Click 'Connect'.

- Name the Router connection

Select Command = NAME_CLIENT (the default menu setting)

Type your name for the Simulator eg. CDMS_SIM (≤16 characters).

Click Send Command

- Select the telecommand packets to be received from the Router.

Select Command = ADD_CLIENT (from pull-down menu)

Add the Application ID of packets that you wish to receive.

Click 'Send Command'.

You may repeat this as many times as you wish for different APIDs. NB the instrument APID **and** the Simulator APID (7F6) are required if you wish to receive these commands from the router.

If you do not wish to specify any packet addresses at this time, you may bring up this window later by pressing the 'Launch Router Command Interface' control.

The 'Router Alive' indicator now flashes.

The only way to terminate the router connection is by using the 'Exit Simulator' control.

8.3 Bus Controller

- Select Buslist

The 'Select Buslist' control allows you to specify which bus profile will be used when the 'Start/Stop BC' control is pressed. A pulldown menu shows which buslists are available. The BC must be stopped (at present) before changing buslists. When the BC is stopped, the log file from the previous session may be viewed using the 'View BC Log File' control.

- Select Bus A/B

    - Set the time. Enter a number of seconds. If the time field is left blank, the simulator inserts the current time as a number of seconds according to the CUC-TAI standard.

- Start Polling

Click the 'Start/Stop BC' control.
The Bus Controller (BC) starts distribution of 1553 bus messages according to the information in the buslist file. The CDMS Clock value can been seen incrementing.

8.4 Packet Telecommanding

The 'Select TC Source' control allows you to pick the source of Telecommands. They may come from a router or be generated locally. If 'Local Command' is selected, then router commands are inhibited.

If the TC Source is set to 'Local Command' then the 'Select Command' control allows you to choose a TC command from a list of files. The first few words of the command will appear in the 'Local Command To Send' Window. You may then use the 'Edit Command' control to modify and save the command either as a new file or by overwriting the current file. The new filename will then appear in the 'Select Command' List. The 'Send Command' control will send the locally generated command to the relevant RT, if the bus is running.

If selected, commands coming from the router are sent automatically.

Each command will be time-stamped and sent to the TC log file, and the decoded header will also appear in the 'Telecommand Packet Info' window. If telecommands are coming from a router, they may pass through the window too quickly to be examined closely. In this case the 'Pause Display' button may be useful. Whilst paused, the 'View Log File' control will display the whole log file. Whilst the display is paused, command logging to the file continues.

Log files store 30 minutes of data. Data is written to log files A and B alternately and the switchover happens automatically. The log file currently being written to is displayed at the bottom of the 'Telecommand Packet Info' window.

8.5 Packet Telemetry

Any telemetry coming from the RT is displayed in the 'Telemetry Packet Info' window, which behaves in the same way as the Telecommand window. Data is also written to a log file which changes every 30 minutes as for TCs.

8.6 Other subaddresses

- **Telecommand Type (Buslist message type = BCtoRT)**

Message Type	SubAddress	Message Format	Buslist 'Data Type'
Unit Control	SA1R	2 words.	UCtrl
Asynchronous Short Command ()	SA3R	≤ 32 words	ASyncCmd
Asynchronous Short Command ()	SA4R	≤ 32 words	ASyncCmd
Time Distribution *	SA8R	3 words	Timecode
Low Level Command	SA28R	2 words	LLCmd

* Sent automatically every second.

The type of RT Direct Command required should be selected from the 'Select Command type' drop-down box. The command should then be typed into the box below it in the following format:

Field Size	16 bits	n x 16 bits (n ≤ 32)
Contents	APID (requires leading zero)	Data words

Spaces may be added between the words for clarity and will be removed automatically by the simulator.
To send the command to the instrument, press the 'Send Command' button. The command will be queued until a subframe runs which contains the relevant data type. The command data remains in the window and may be re-sent to the instrument, or changed as desired.

- **Telemetry Type (Buslist message type = RTtoBC)**

Message Type	SubAddress	Message Format	Buslist 'Data Type'
Unit Status	SA1T	32 words	StatusTM
Event TM	SA5T	32 words	EventTMA
Event TM	SA6T	32 words	EventTMB
Instrument Time echo	SA8T	4 words	TimeConf
Low Level Command echo	SA28T	2 words	LLCConf

The BC will always construct these Telemetry messages if they appear in the buslist. In the case of 'normal' Telemetry, the BC polls for Telemetry request messages in order to know when to download and confirm Telemetry. In the case of the 'Event' messages above, there is no request or confirmation mechanism; the subaddresses of the RT are read regardless of whether they contain useful data.

These messages are displayed on the Simulator front panel in the 'RT Status Messages' window if they are collected from the RT. The messages are not logged or passed to the router.

9. SELF TEST OPERATION

To use the simulator in Self-Test mode (with the RT provided by the simulator) do not run the DDC 'ACE Windows Menu' program. A link must be fitted between device 0 and device 1 for bus A or B on the back of the PC if operating stand-alone. Alternatively both stubs should be connected to bus transformers:
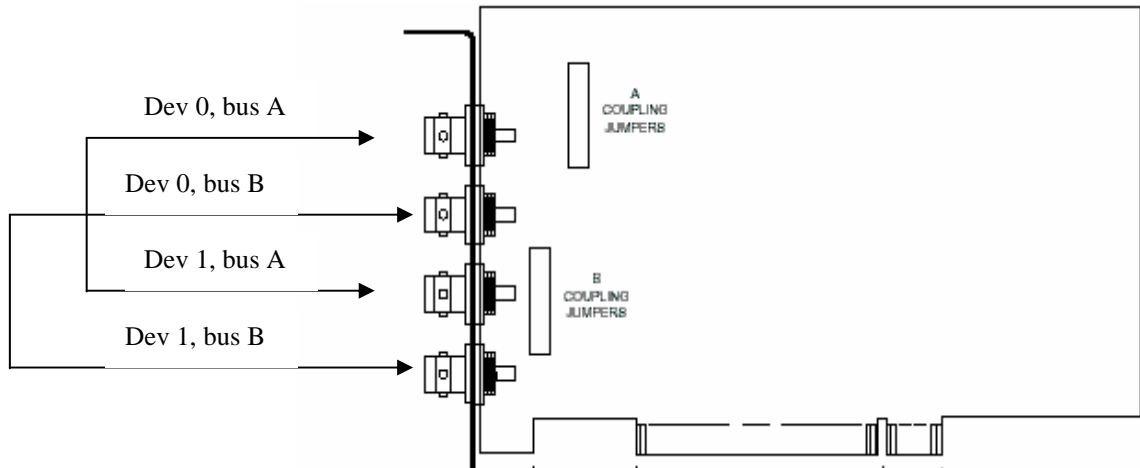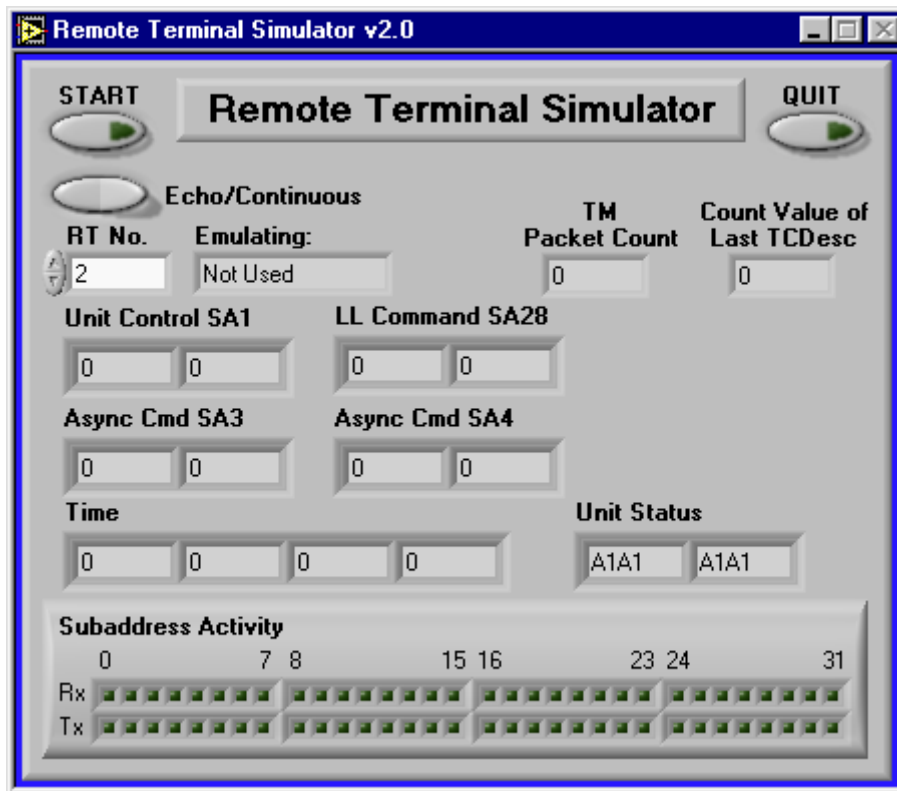

Figure 9-1: Links for Self-test Operation

When CDMS-Sim is run, the software initialises the DDC 1553 card and configures ACE device 0 to act as a Bus Controller.

When the RT is started on the CDMS-SIM front panel, ACE device 1 is configured as an RT.

9.1 Remote Terminal Startup

Start the REMOTE TERMINAL program from the CDMS SIM Windows program group.

9.2 Running the Self Test RT

The RT should be operated when the Bus Controller is already running.
The RT number and operational mode (Echo/Continuous) should be selected before the START button is pressed.
The RT will run until the QUIT button is pressed. To change to RT number or operational mode, the RT must first be stopped using the QUIT button, and re-run using the arrow on the menubar which appears when the RT is stopped.

If the whole Simulator or Remote Terminal panel is not visible on your monitor, quit the program (EXIT SIMULATOR, or QUIT for the RT), click & drag the menu bar of the application, and re-run the application using the arrow on the toolbar.

The 'Subaddress Activity' indicators are displayed as a guide only, they do not necessarily show all activity, since data processing takes priority over display.

10. TM PLAYBACK

Start the TELEMETRY PLAYBACK program from the CDMS SIM Windows Program Group. The software will ask you to log onto the router in the same way as when using the simulator. The 'Select File' drop-down box contains the names of all files in the TC&TM LOG FILES directory. Select the desired file and press 'Load File'. The software will analyse the file and store in memory the gap times between packets. This may take a couple of minutes for large files.

Once loaded, the file can be played to the router by pressing 'Play', You can fast forward or rewind through the file whilst playing (press & hold 'Ffwd' or 'Rew'), or pause playback. Pressing 'Play' a second time will halt playback, and pressing 'Step' will send one packet at a time to the router.

If you wish to load a new file you must press 'Quit' and then restart the software and repeat the above steps.
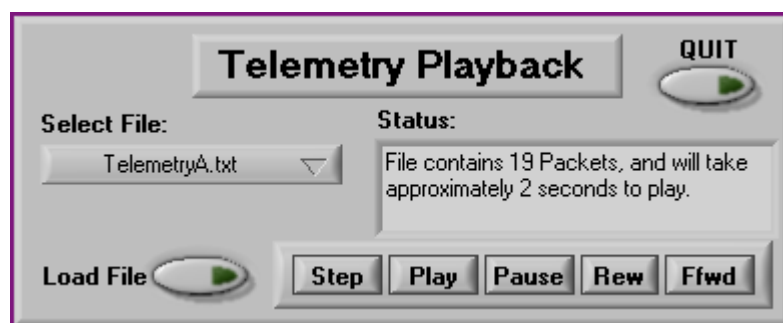
11. CDMS-SIM REMOTE COMMANDING AND TELEMETRY

Remote control of the CDMS-Sim is possible via TC, with the application ID addressed to the Simulator, (APID = 0x7F6). The TCs are detailed in CDMS-Sim Data ICD, AD2. The functions are:

TC	Function	Activity	Comments
Set Observation ID	0xC1	0x01	Copied to housekeeping packet
Set building block ID	0xC1	0x02	Copied to housekeeping packet
Select buslist	0xCB	0x01	(see note 1.)
Select bus medium	0xCB	0x02	i.e.Bus ID: 0 = A, 1 = B
Synchronise bus time	0xCB	0x03	Sync. with PC clock
Verify user time	Service (9,6)		Sends TC (9,7) to instrument
Connection test	Service (17,1)		Sends CDMS-Sim connection report via router

Note 1. Select Buslist: The buslist selection parameter is 'buslist ID' which is the position in the drop-down list on the CDMS-Sim front panel labelled 'Select Buslist'. Buslist IDs start at zero.

CDMS-Sim housekeeping packets are transmitted at 1 second intervals to the router. They can be switched off by clicking the 'Pause Housekeeping Packets' switch on the Sim front panel. The packet definition is in AD2.

12. APPENDIX A – SIMULATOR FRONT PANEL