

# Device/User Interface Software Requirements For General Data Products 233 PCM Simulator

Version 1.0

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## 1.0 Introduction

This document provides device and user interface requirements for the General Data Products (GDP) 233 PCM Simulator.

## 2.0 Required Functionality

The PCM simulator provides a serial PCM data stream at the same rate and code type with the same format characteristics - frame length, frame sync pattern, bits per word, words per frame, etc. - as a spacecraft data to be acquired by the ground station. This simulated spacecraft data stream is then used to verify the ground station operation before the spacecraft acquisition, i.e., preoperation verification.

The critical tests to be made with the simulator are bit synchronizer and frame synchronizer acquisition of the simulated data stream. The PCM simulator output can be routed via the switch matrices directly to any of the sixteen bit synchronizer inputs for individual equipment tests or to test inject for modulation of a RF carrier to test the entire station acquisition including the antenna, receivers, bit synchronizers, frame synchronizers, WFEP, etc. Intermediate tests such as modulation of a simulated subcarrier with PCM data to test a subcarrier demodulator with a bit sync and frame sync can also be made. The Master computer must coordinate control of test inject equipment, antenna signal switching equipment, telemetry receivers, etc.

All capabilities of the PCM simulator are used. The simulator provides only the basic formats listed in the Inter Range Instrumentation Group Document 106-96 Telemetry Standards, Chapter 4 Pulse Code Modulation Standards.

## 3.0 Parameter Ranges

The parameter range requirements for this automation effort do not differ from the device capabilities.

## 4.0 Communications Protocol

The node computer will communicate with the simulator via an RS-232 serial interface operating at 9600 baud. A straight through cable with male and female 25 pin connectors will connect the device with a Digi PC/16em multi-port serial converter attached to the node computer.

## 5.0 GUI Functionality

Operation of the GDP 233 PCM Simulator involves setup and simulation. During setup, the user specifies formats, frames, subframes, and unique data. Simulation involves initiating the generation of data based on parameters specified during setup. Both modes of operation will be supported by the GUI.

See Appendix A: Graphical User Interface Requirements

## 6.0 Command Scripting

A file name is required for operation. The selected setup file will contain all commands and parameters required to configure the PCM simulator for the test operation. The commands contained in the file will be loaded by the "Load" command, configuring the device for operation. Any errors occurring in the loading will be reported to the Node computer, which will in turn report them to the Master. At the start of the support the simulator is commanded to enter "Run" mode. When the support is concluded, the

device is commanded to “ Halt” . No other operations are necessary for the setup, support, or takedown of the simulator.

See Appendix B: Scripting Requirements

## **7.0 High-level Status**

The high level status will reflect whether or not the simulator is generating a PCM stream.

## **8.0 Replacement Algorithm**

Since this is a test device, no replacement algorithm will be implemented.

## Appendix A: Graphical User Interface Requirements

The following describes the fields that may be specified and the options that may be exercised by the user.

### Format Options

Bit Rate: 1 Hz – 16 MHz

Bits/Word: 4 – 16

Orientation: MSB or LSB

Output Code

Code

NRZ-L, NRZ-M, NRZ-S

Bi0-L, Bi0-M, Bi0-S

DM-M, DM-S

Viterbi

V+1+2, V-1+2, V+1-2, V-1-2, V+2+1, V+2-1, V-2+1

Output (available when Code is NRZ-L, NRZ-M, NRZ-S)

Code only

Viterbi only

Bi0-L, Bi0-M, Bi0-S

Words/Frame: 1 - 8192

### Frame Options

Pattern: 1 – 16 hex characters

Length: 0 – 64

Sync Type: Normal, AFS, SSC

General Word Pattern: 1 – 4 hex characters

### Subframe Options

Sync Type

ID Count

Word Location: 0 – Words/Frame (maximum = 8191)

Start Value: 1 – 8192

Stop Value: 1 – 8192

Last Bit: 0 – (Words/Frame – 1, maximum = 15)

Recycle

Frames/Subframe: 1 – 8192

Sync Pattern: 1 – 4 hex characters

Length: 1 - 16

SSC

Frames/Subframe: 1 - 8192

### Table Manipulation

List

Modify

Insert

Delete

**Appendix B: Scripting Requirements**

<b>Master</b>	<b>Node</b>	<b>Comments/Error Handling</b>
Resource Request Specific Parameter: unit number	Start  Check allocation table for unit number  If available then Mark unit as assigned to this Master Reply "Unit # assigned" Open log file Retrieve configuration file from this Master  Else Reply "Unit # not available"  End  Stop	
Resource Request General	Start  Check allocation table for an available unit using the least recently used method  If available then Mark unit as assigned to this Master Reply "Unit # assigned" Open log file Retrieve configuration file from this Master  Else Reply "No units available"  End  Stop	
Setup Parameter: unit number	Start  Verify possession of unit by this Master	

Master	Node	Comments/Error Handling
	<p>If not assigned to this Master then                      Inform this Master                      Stop                      End</p> <p>Load and Verify configuration file</p> <p>If configuration file error then                      Inform this Master                      Stop                      End</p> <p>Stop</p>	<p>&gt;&gt; Operator intervention required</p> <p>&gt;&gt; Operator intervention required</p>
<p>Start Support                      Parameter: unit number</p>	<p>Start</p> <p>Verify possession of unit by this Master</p> <p>If not assigned to this Master then                      Inform this Master                      Stop                      End</p> <p>Command device into "Run" mode</p> <p>If command error then                      Inform this Master                      Stop                      End</p> <p>Stop</p>	<p>&gt;&gt; Operator intervention required</p>
<p>Stop Support                      Parameter: unit number</p>	<p>Start</p> <p>Verify possession of unit by this Master</p> <p>If not assigned to this Master then                      Inform this Master</p>	<p>&gt;&gt; Operator intervention required</p>

Master	Node	Comments/Error Handling
	<p>Stop End</p> <p>Command device into "Halt" mode</p> <p>If command error then Inform this Master Stop End</p> <p>Stop</p>	
<p>Takedown Parameter: unit number</p>	<p>Start</p> <p>Verify possession of unit by this Master</p> <p>If not assigned to this Master then Inform this Master Stop End</p> <p>Mark unit as not assigned Close log file Send log file to this Master</p> <p>Stop</p>	<p>&gt;&gt; Operator intervention required</p>