# LUMISTAR

LS-70-M PCI Dynamic Data Simulator with FM, SOQPSK, & CPM Modulator
Data Sheet

Description:

The Lumistar LS-70-M PCI Dynamic Data Simulator with FM, SOQPSK, & CPM Modulator allows complex data streams to be generated for evaluation of bit synchronizers and PCM decommutator performance. It can also be used for uplink command generation to vehicles in flight, checkout of complete telemetry links, and playback of archived hard drive data in any format with the appropriate dll. The PCI board is only 7 inches long and contains the dynamic simulator and IRIG Time Code Generator.

The design contains dual ported memory to allow one block of information to be created while another block is being output. Five-pole Butterworth pre-modulation filtering is provided with selectable (1 of 8) filters to be specified at the time of order. The optional FM modulator allows software selection of the transmitting frequency, deviation, and output RF level. The transmitter allows retransmission of archived information. In command applications, an external power amplifier can be added to obtain the appropriate link margin on the up-link.
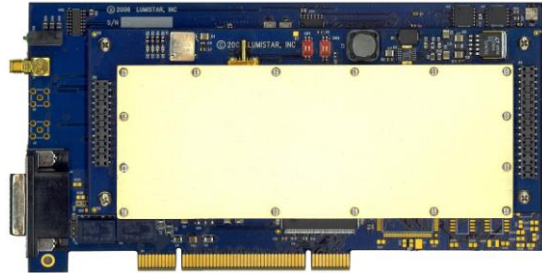
Key Features:

- **ARTM Tier 0 (PCM/FM), ARTM Tier 1 (SOQPSK), or ARTM Tier II (Multi-h CPM) modulations**
- **Three modes of operation - Live PCM, Archive Playback, and PRB Generation**
  - **Live can evaluate bit synchronizers and PCM decommutator performance**
  - **Live can Uplink command generation of PCM data stream with FM modulation**
  - **Archival data playback allows generation of any format with appropriate dll**
  - **PRB Generation allows data link BERT measurement with LS-50 or LS-24-RTR**
  - **Error generation capability in all three modes**
- **Complex data stream generation**
  - **Unlimited number of embedded data streams (through software)**
  - **IRIG Chapter 8 data streams**
  - **Error generation on a bit by bit basis including frame sync loss**
  - **Embedded time (IRIG A, B, or G)**
  - **Any or all words can have canned simulation values (wave words) or user defined values on a word-by-word basis**
  - **Archive playback can be any format with appropriate dll**
  - **Burst data**
  - **Fill data (any value at any time)**
  - **Insertion of embedded video and audio with error generation**
  - **Format switching/mode code handling**
  - **Number encoding (2's comp, 1's comp, 1760, IEEE, TI, DEC, etc) for any or all values on the fly**
- **Hardware design**
  - **Dual Ported memory with 128K of 32-bit words**
  - **Major Frame Lengths to 65,535 words per minor frame**
  - **Data Rates to 20 Mbps (NRZ codes); 10 Mbps (other codes)**
  - **Selectable (1 of 8) pre-modulation filters**
  - **Programmable transmitter deviation through software**
  - **Programmable output level through software**
  - **Software application can support up to 8 LS-70 boards for 8 data streams**

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SPECIFICATIONS:
Simulator Specifications:

Outputs	NRZ-L PCM Data, Code Selectable PCM Data, 0 degree clock,
Minor frame strobes	
Output Levels	Single Ended - TTL, Differential - RS-422
Differential Outputs	Capable of driving RS-422 or TTL compatible inputs
Output Data Rates	64 bps to 20 Mbps (NRZ), 64 bps to 10 Mbps (others)
PCM Codes	NRZ-L/M/S; Bi-Phase-L/M/S, DM-M/S, M^2, RNRZ-L-11/15, k=7 Convolutional Encoding Rate 1/2, 1/3
Word Length	3 to 16 bits programmable on a word-by-word basis
CRC Generation	CRC16/CCITT
Major Frame Length	Up to 65,535 words per major frame
Major Frame Depth	Up to 1024 Minor Frames per Major Frame
Bit Order	MSB or LSB first, word by word
Frame Sync Pattern	Unlimited
Major Frame Sync	FCC (FAC), SFID
Common Words	Data may be changed (word-by-word) while operating
Waveform Words	64 (including SFID, FCC) May be programmed to appear in every frame at the same location. Data may be changed while operating.
Baseband Output Level	+/- 2 Volts p-p open circuit +/- 1 Volt p-p into 75 Ohms

Pseudo-Random Generator:

Pseudo-random patterns	11 and 15 bit
Bit Error Rate	Indicated on Display
Error Count	Indicated on Display
Continuous Forced Error	On or Off

Frame Strobe Output:

Frame Strobe	One-bit pulse coincident with the last bit of the simulator minor frame

Slave Capability:

Slave Signals	Are provided to allow two simulators to create asynchronous embedded PCM formats

Time Code Generator Output:

Time Codes	IRIG A, B, or G
Modulated Output levels	
Carrier Output Low	1 Volt p-p
Carrier Output High	3.3 Volts p-p
DC Level Output	Demodulated representation of IRIG Time carrier output

Pre-modulation Filters on Simulator Output:

Pre-mod Filters	5 Pole Butterworth
Selectable	1 of 8 values
Standard values	250k, 500k, 1M, 3M, 6M, 9M, 12M, 15M Hz; unless otherwise specified at the time of order

RF Modulator:

Modulation Types	ARTM Tier 0 (PCM/FM) ARTM Tier 1 (SOQPSK-TG) ARTM Tier 2 (Multi-h CPM)
Frequency Range	S-Band (2200-2395 MHz) L-Band (1435-1535 MHz) Other bands – consult factory
Transmitter Deviation	Automatic
Pre-modulation Filter	Automatic
RF Output Level	Programmable from -60 dB to +10 dB by software

Environmental Characteristics:

Operating Temperature	0° to $+50^o$ C
Non-Operating Temp	-25° to $+70^o$ C
Operating Humidity	0 to 90% (Non-condensing)
Non-Operating Humidity	Protect from moisture and contamination

Physical:

Form Factor	Short "Desktop" PCI board - 7 inches long
Inputs/Outputs	RF on SMA Female; D-Series Connector with 44 female contacts
Breakout cable	Cable assembly to BNC is included
Current Required	The current required depends on the configuration