LUMISTAR

LS-32-R IF Receiver PCI Board

70 MHz IF Receiver, Multi-Mode Demod, Bit Sync and Multi-function Decom

Data Sheet

Description:

The Lumistar LS-32-R IF Receiver is part of the Lumistar family of Digital Processing Boards used for programmable telemetry systems. The LS-32-R consists of an Analog Front End and a Digital Processing main board with up to 10 Million Gates of FPGA. The LS-32-R provides an IF Receiver with Multi-Mode Demodulator, Bit Synchronizer, and Multi-function Decom. Pre-conditioning of the 70 MHz IF signal is performed by the Analog Front End. In addition to pre-sample filtering using high speed A/D converter, and the conditioning for the receiver and bit synchronizer outputs. The Digital Processing board contains the FPGA which perform functions of the IF Receivers, Demodulators, Bit Synchronizers and Multi-function decoms. The multi-function decoms include time code reader, time code generator, PCM Simulator/PRB Generator, and PCM Decom. The all-digital design assures a consistent product with high reliability and long-term stability.

The LS-32-R is designed to be used with the following Lumistar Down Converters: LS-25-D2 Single Channel Tri-Band, LS-27-D Two Channel Dual Band, or LS-27-Q Single Channel Quad-Band.

Key Features:

- **Multi-mode IF receiver in a single PCI board having**
  - **70 MHz IF Receiver with digital multi-mode demodulator, digital bit synchronizer and multi-function decom with PCM Simulator/BERT, and PCM Decom. A single time code reader and time code generator is included.**
- **IF Receiver digitizes at 70 MHz IF and all processing including FIR filtering, multi-mode demodulation, bit synchronization, and Multi-function Decom are done in FPGA**
- **The following demodulation licenses are available for the IF Receiver/Demodulator:**
  - **FM, PM, BPSK, QPSK, OQPSK, SOQPSK, AQPSK**
- **Provides 21 IF Bandwidths when used with the Lumistar Down Converters**
- **Firmware License allows you to purchase a configuration now and upgrade in the future**
- **70 MHz Spectral and Oscilloscope display available through software**

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SPECIFICATIONS:

Compatible Down Converters:

LS-25-D2	Single channel; 1, 2, or 3 bands
LS-27-P	Two channel; 1 or 2 bands
LS-27-Q	One channel; 4 bands

Analog Front End Inputs:

70 MHz IF from LS-25-D2, LS-27-P, or LS-27-Q

70 MHz IF Receiver:

Demodulation Licenses Available	
M1	**FM**
M6	**FM, SOQPSK**
M3	**FM, PM, BPSK, QPSK**
M4	**FM, PM, BPSK, QPSK, OQPSK, SOQPSK AQPSK**

Input Frequency	70 MHz IF from Lumistar Down Converters
Input Signal Level	-20 dBm Nominal
IF Bandwidths	The LS-25-D2 has up to 12 SAW filters, followed by the FIR digital filtering in the LS-32 resulting in 21 IF Bandwidths: 200K, 300K, 500K, 750K, 1M, 1.3M, 1.5M, 2M, 2.4M 3M, 3.3M, 4M, 4.7M, 6M, 8M, 10M, 13M, 15M, 20M, 27 M, and 30 MHz
Maximum Data Rates	FM: 20 Mbps PM: 10 Mbps BPSK: 10 Mbps QPSK: 20 Mbps OQPSK: 20 Mbps SOQPSK: 20 Mbps
Video Filters (FM)	14 Selectable Filters: 50K, 100K, 250K, 500K, 1M, 1.5M, 2M, 3M, 4M, 5M, 6M, 8M, 10M, 17M Hz, (bypass).

Bit Synchronizers:

IF Receiver Outputs	Demodulator outputs are applied to internal bit synchronizers and achieve extremely high performance. Data and Clock outputs are provided for all demod types.
Inputs	1 Bit Synchronizer Input is available for tape playback.
Number of Bit Syncs	Depends on Demod Type: FM, PM, BPSK, SOQPSK (1), QPSK, OQPSK, AQPSK (2)

Bit Sync Input Codes:

NRZ codes:	NRZ-L, NRZ-M, NRZ-S
RZ codes	RZ
Split phase codes	BIϕ-L, BIϕ-M, BIϕ-S
Miller codes	DM-M, DM-S, M^2-M, M^2-S
Randomized codes	RNRZ-L, RNRZ-M, RNRZ-S
Randomization sequence:	2^{11}-1, 2^{15}-1, 2^{17}-1, 2^{23}-1

Bit Sync Tape Output Codes:

NRZ codes:	NRZ-L, NRZ-M, NRZ-S
RZ codes	RZ
Split phase codes	BIϕ-L, BIϕ-M, BIϕ-S
Miller codes	DM-M, DM-S, M^2-M, M^2-S
Randomized codes	RNRZ-L, RNRZ-M, RNRZ-S
Randomization sequence:	2^{11}-1, 2^{15}-1, 2^{17}-1, 2^{23}-1

Bit Error Rate Performance:

Bit error rate degradation from theory for Eb/No from 0dB to 10 dB will be less than the values below:

Bit Error Rate Degradation from Theory (Preliminary Data)			
Data Rate	**FM**	**BPSK**	**QPSK**
10 Kbps	<0.4 dB	<0.4 dB	<0.7 dB
100 Kbps	<0.4 dB	<0.4 dB	<0.4 dB
1 Mbps	<0.7 dB	<0.7 dB	<0.7 dB
10 Mbps	<1 dB	<1.0 dB	<1.0 dB
20 Mbps	<1 dB	<1.0 dB	<1.3 dB
40 Mbps	N/A	N/A	<2.0 dB

Output Signals:

Data	TTL and RS-422 Driven
Selectable Phase Clock	TTL and RS-422 Driven
Selectable for	0, 90, 180, 270 degrees
Tape Outputs	1 V pp into 50 Ω (code programmable) TTL and RS-422
Lock Status	In Status Register
Es/No >5dB Status	In Status Register

PCM Decommutator:

Please refer to the LS-50-P data sheet for the specifications of the multi-function decommutator.

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