

LUMISTAR

LS-35-R IF Receiver/Combiner/Modulator

**Dual-Channel Digital Processing Engine w/ 70 MHz IF Receivers, Diversity Combiner, Multi-Mode Demod, Bit Syncs, BER Reader, IF Spectral Display, Constellation Display & 70 MHz Modulator
Data Sheet**

Description:

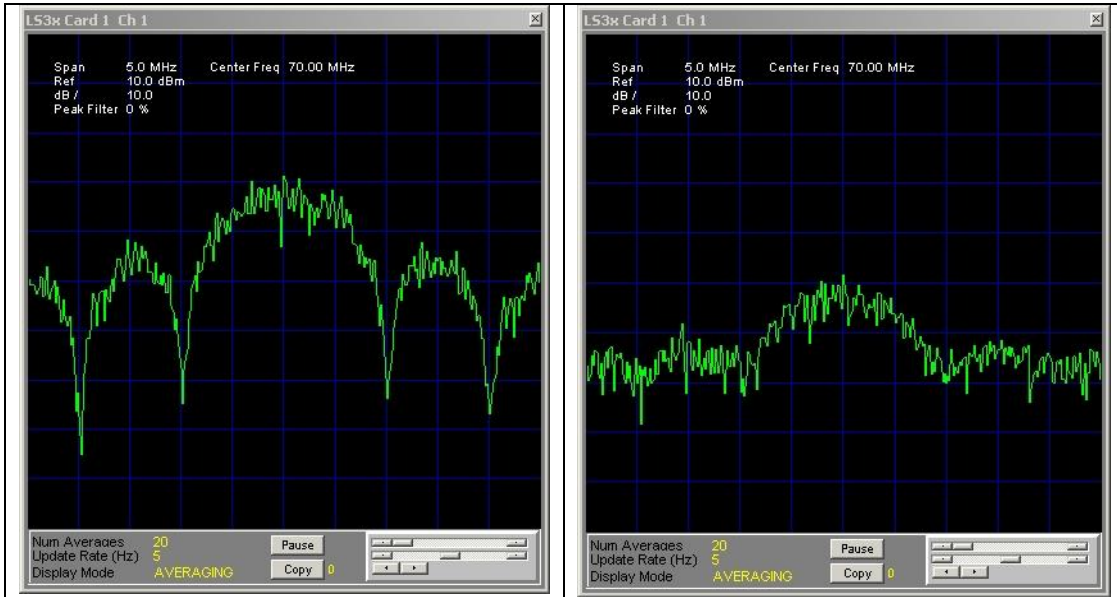
The Lumistar LS-35-R is part of the Lumistar family of digital processing boards used for programmable telemetry systems. The LS-35-R consists of a digital processing main board with two high capacity Xilinx Virtex-5 arrays. The LS-35-R provides a two-channel IF Receiver with Pre/Post detect combining, multi-mode demodulators with data rates up to 40 Mbps, bit synchronizer outputs, Viterbi decoding, spectral and constellation display, BER reader display and 70 MHz IF modulator with calibrated noise feature. The all-digital design assures a consistent product with high reliability and long-term stability.

The LS-35-R is designed to be used with the following Lumistar down converters: LS-25-D2 single channel tri-band and the LS-27-D two channel tri-band downconverters. Other options are available, including customer supplied downconverters.



Key Features:

- **1 or 2 channel IF receiver in a single PCI board having the following standard features:
70 MHz IF Receivers with digital multi-mode demodulators, digital bit synchronizers with simultaneous TTL/422 outputs and I/O code conversions, Pre- and Post-D combining, dual independent channel operation, FM multi-symbol detection for improved E_b/N_0 performance, IF spectral displays, BER reader, constellation diagram for PSK formats, and 70 MHz IF modulator with calibrated variable noise level for simulation and BER testing.**
- **The 70 MHz IF input is digitized, with all subsequent processing including diversity combining, FIR filtering, demodulation and bit synchronization being performed via an FPGA array.**
- **The following demodulation options are available thru license file upgrades:**
 - **PCM/FM, PM, BPSK, QPSK, OQPSK, SOQPSK, AQPSK.**
- **The combination of SAW and FIR filtering provides a virtually unlimited number of IF bandwidths when used with Lumistar down converters.**
- **Firmware License allows you to purchase a configuration now and upgrade electronically via email in the future.**
- **Optional Convolutional decoding/encoding (Viterbi and Reed-Solomon)**

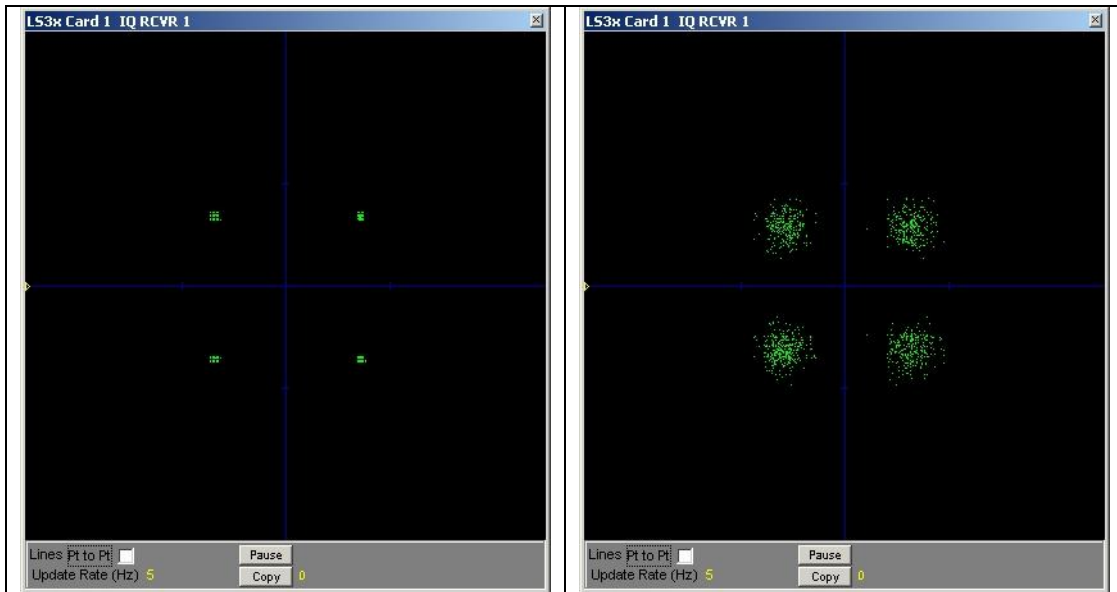


Noise Free

Noise = 75 dB-Hz

70 MHz IF Spectral Display

Examples of Spectra with /without Noise Added (OQPSK format)



Noise Free

Noise = 75 dB-Hz

Constellation Diagram

Examples of Constellation with /without Noise Added (OQPSK format)

SPECIFICATIONS:

Compatible Lumistar Down Converters:

LS-25-D2	Single channel; 1/2/3 bands
LS-27-D	Single/Dual channel; 1/2/3 bands

70 MHz IF Receiver:

Input Frequency:	50-90 MHz (other options available)
Input Signal Level:	+10 dBm to -60 dBm
Input Sources:	CH1, CH2, or Combined
IF Bandwidths:	10 KHz to 40 MHz (10 KHz or less resolution). The LS-27-D has 8 SAW anti-alias filters, followed by data rate

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Data Rates: based FIR digital filtering in the LS-35 (10 KHz or less resolution).
FM: 10 Kbps to 30 Mbps
PM: 10 Kbps to 20 Mbps
BPSK: 10 Kbps to 20 Mbps
QPSK: 10 Kbps to 30 Mbps
OQPSK: 10 Kbps to 30 Mbps
SOQPSK: 10 Kbps to 30 Mbps
(Higher data rates are optional, please contact Lumistar)
Tuner Resolution: 1 Hz
Carrier Acq. Modes: Unaided and FFT

Pre-D/Post-D Combining:

Uses a complex algorithm to provide the best combined signal based upon real time CH1 vs. CH2 E_b/N_0 measurements. Does not require AM or AGC for combiner functionality, and it is NOT a simple best-source selector. Combiner operates to a break frequency of greater than 50 KHz with worst case multi-path fade scenarios (sin/-sin). The combiner supports polarization, frequency and spatial diversity applications.

Standard Features:

IF Modulator

Multi-Symbol FM

- ❖ *for improved bit error rate performance*
- ❖ *2.5 dB typical*

Constellation Diagram Display

Bit Error Rate Reader

IF Spectrum Display

Optional Features:

Pre-D Diversity Combining

Post-D Diversity Combining

Viterbi and/or Reed-Solomon Decoding

Sub-Carrier Demod for PCM/FM, BPSK, QPSK

AQPSK format

FPGA upgrade to SX95 from SX50

See Users Manual for LS-35 for more information

Bit Synchronizers:

IF Receiver Outputs Demodulated baseband is applied to internal bit synchronizers. Resulting clock and data outputs are provided for all demodulation types.

Bit Syncs Outputs

Code Conversion (Input)

Code Conversion (Output)

TTL and RS-422 available w/LVDS option, I & Q Clock/Data
NRZ-L/M/S, BiØ-L/M/S, RZ,
DBiØ-M/S, DMM/S, RNRZ
NRZ-L/M/S, BiØ-L/M/S

IF Modulator:

Output Frequency:

50-90 MHz (other options available)

Output Level:

0 to -80 dBm

Noise Power Density

1 to 110 dB-Hz

Modulation Formats:

Carrier only, PM, BPSK, QPSK, OQPSK, SOQPSK, Multi-h CPM, PCM/FM, subcarrier BPSK/QPSK

Modulation Data Source:

internal or external

Int. Modulation Test

all zeros, all ones, alt one/zero

Pseudo-Random Pattern:

PRN 11

Data Rate:

up to 30 Mbps (external)

up to 10 Mbps (internal)

0.3 to 0.4 (0.35 default)

FM Peak Deviation:

0 to $\pi/2$ (0 to 1.5708)

PM Deviation:

Viterbi (optional)

Rate Mode:

1/2, 1/3, 3/4

Symbol Order:

G2G1 or G1G2

Logic Sense:

Invert G1, Invert G2

Mechanical and Electrical:

Bus Interface

Half length PCI, Custom

Envelope Dimensions:

8.4" L x 3.9" W x 0.65" H

213mm x 99mm x 16.5mm

Power

20.25 watts

Weight:

8 oz (0.227 kg)

Ordering Information:

Single Channel Models

LS-35-R-M1

Single CH PCM/FM only

LS-35-R-M2

Single CH SOQPSK only

LS-35-R-M3

Single CH PCM/FM, BPSK

QPSK, OQPSK, SOQPSK, and PM

Single Channel SOQPSK/FM

LS-35-R-M6

Dual Channel Models

LS-35-R-M21

Dual CH PCM/FM only

LS-35-R-M22

Dual CH SOQPSK only

LS-35-R-M23

Dual CH PCM/FM, BPSK,

QPSK, OQPSK, SOQPSK, and PM

Dual Channel SOQPSK/FM

LS-35-R-M26

-P (optional)

Add Pre-D Diversity Combiner

-O (optional)

Add Post-D Diversity Combiner

-V (optional)

Add Viterbi decoding

-S (optional)

Add Sub-carrier demodulation

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Specifications are subject to change. Please verify latest specifications at time of order

11-1-13