LS-26 Series

Quick-Start Guide

Airborne Receiver with Bit Synchronizer Version 6

With the following capabilities
Receiver
Bit Synchronizer
Link Analyzer

February 2014

Lumistar Inc.
2270 Camino Vida Roble, Suite L
Carlsbad, CA 92011
Phone: 760-431-2181 **FAX: 760-431-2665**

Quick Start Guide Table of Contents

1. Software Installation and Hardware Connection

1.1 Software Installation

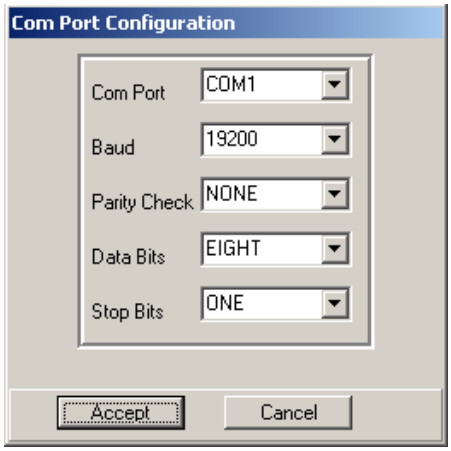
Install the LS-26V5 software on a PC with an RS-232 port. The installation will create an ICON on the desktop which can be used to start the application as shown below:

1.2 Hardware Connection

Connect the LS-26 Airborne Receiver / Bit Sync to the PC through an RS-232 data link using the programming cable provided.

Click on the ICON on your desktop and the following menu will appear.

Click on **Config**, then **Communications**, and the default communications menu will appear for communicating from the computer to the LS-26 through the RS-232 port. The default communications menu is shown below:

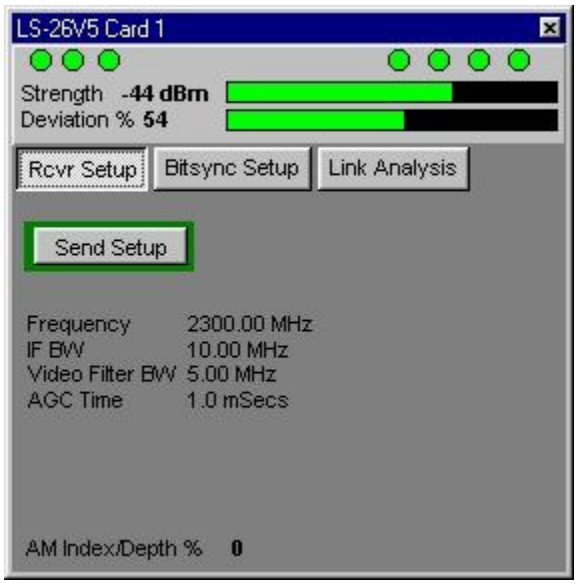


These values cannot be changed with the LS-25-V5 Setup Program. Click on Accept to use the default communications settings. If other values are desired, please consult Lumistar.

2.1 Receiver Setup and Display:

Click on Setup from the following menu:

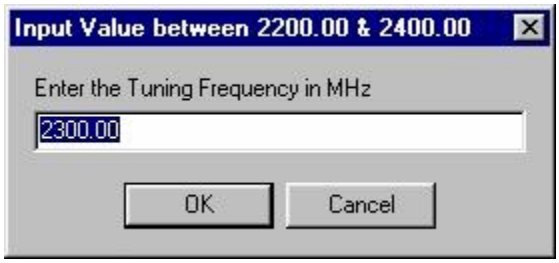
The following window allows setup of Receiver, Bit Synchronizer, and the Link Analysis sections of the LS-26. Select the Rcvr Setup Tab.



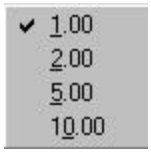
Right click over any of the values and you will get the following window:

The software will read the frequency range available in your particular the LS-26. Right click on Freqs Avail and the frequency range will be shown.

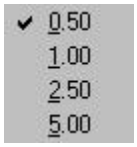
Right click on “Tuner Frequency” and you will be able to select the appropriate frequency of operation:



Right click on IF Bandwidth to select the desired IF Bandwidth.



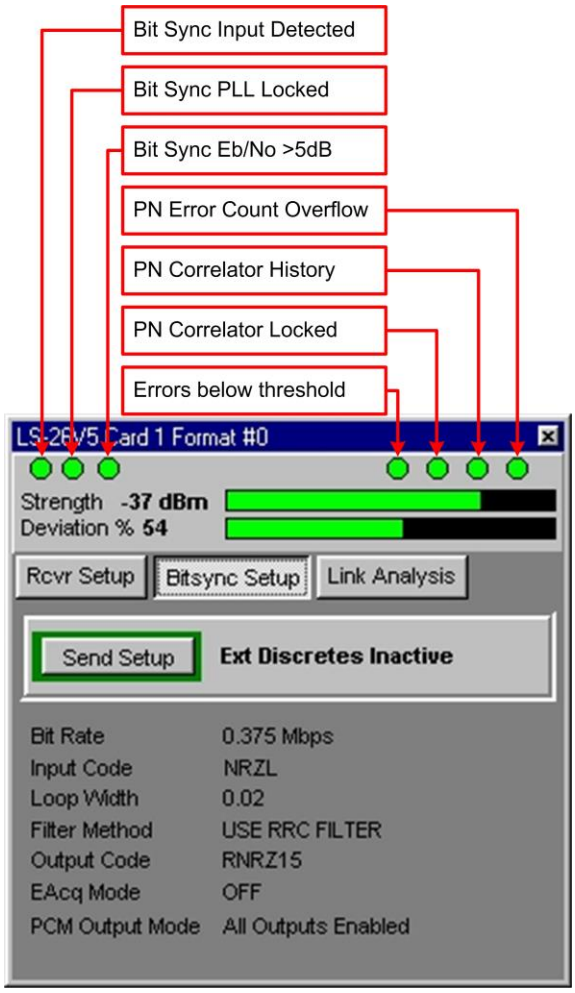
Right click on Video Filter Bandwidth and you can select the appropriate Video Filter.



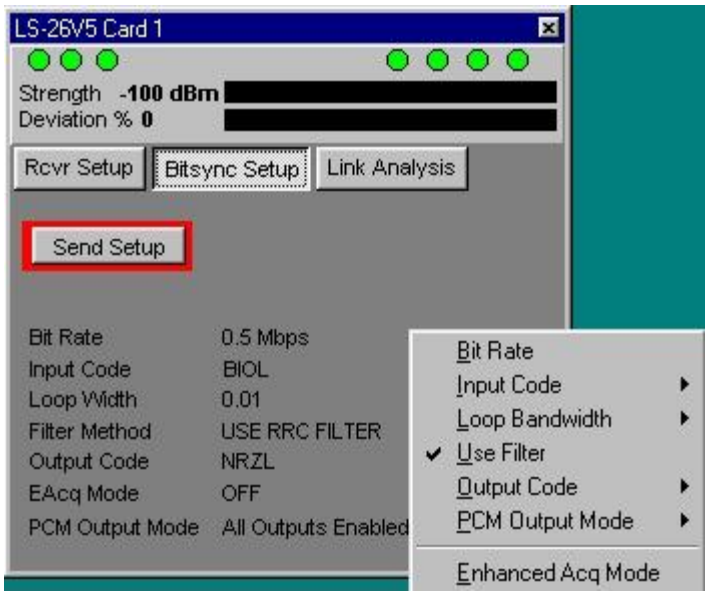
The filter value will default to 50% of the IF Bandwidth unless you select another filter.

2.2 Bit Synchronizer Setup

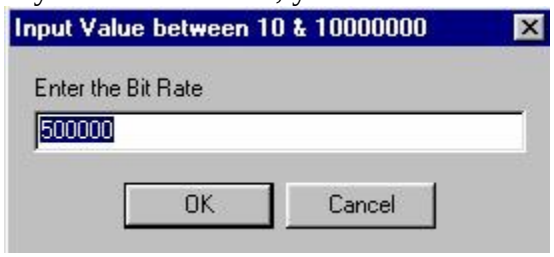
The bit sync tab includes a number of indicators that provide information concerning the state of the bit sync and the receive BERT PN correlator. The following diagram indicates their functions:



When you do a right click over the bit sync parameters, you will see the following menu:

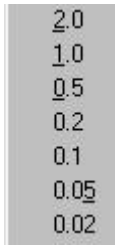


If you select Bit Rate, you will see the following window. Enter the bit rate desired



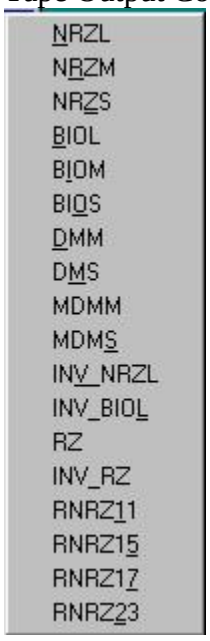
If you select Input Code, you will see the following. Select the desired Input Code.

If you select Loop Bandwidth, you will see the following. Select the desired Loop Bandwidth.

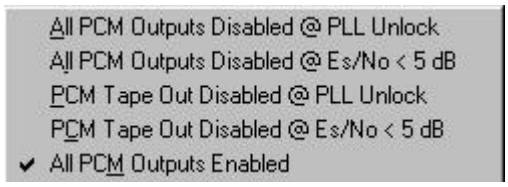


You can select USE RRC FILTER (Raised Root Cosine Filter) for tape playback applications which have rounded edges on the waveform. Normal operation should have the Filter OFF.

If you select PCM Output Code, you will see the following. Select the desired PCM Tape Output Code.



If you select PCM Output Mode, you can enable or disable the outputs as shown below:



Enhance Acquisition Mode (On/Off) can be selected. Normal operation is to use the Enhanced Acquisition Mode Off. This allows maximum frequency sweep for bit sync search, maximum course AGC, and maximum Baseline control. Enhanced Acquisition Mode is used to minimize acquisition time by the tightening the loops.

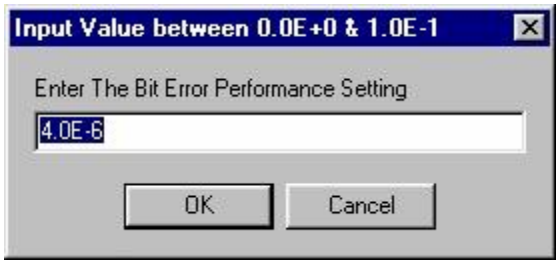
2.3 Link Analyzer Setup and Display

The LS-25SB contains the ability to measure bit error performance using the internal Link Analyzer. The Link Analyzer allows the use of either internal or external Psuedo Random Bit Stream (commonly called PRN generator) and an internal PRN reader to measure bit error rates. The display below shows error free operation with a 5 Mbps data rate.

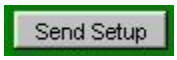
To setup the Link Analyzer right click over the values and you will see the following.

The PRBS Source can be selected to be “Internal” or “External” by right clicking on PRBS Source. External could be from a laboratory type Bit Error Test Set or the Lumistar LS-50-P Multi-Function Decom Simulator operating in BERT mode. Internal is the PRBS in the LS-26. PRBS Pattern can be selected for 11 or 15 by right clicking on PRBS Pattern. Bit Error Performance is displayed in the window and also sets a flag if the value is equal to or greater than the value set.

To set up the Bit Error flag, right click on Bit Error Performance and the following will be displayed:



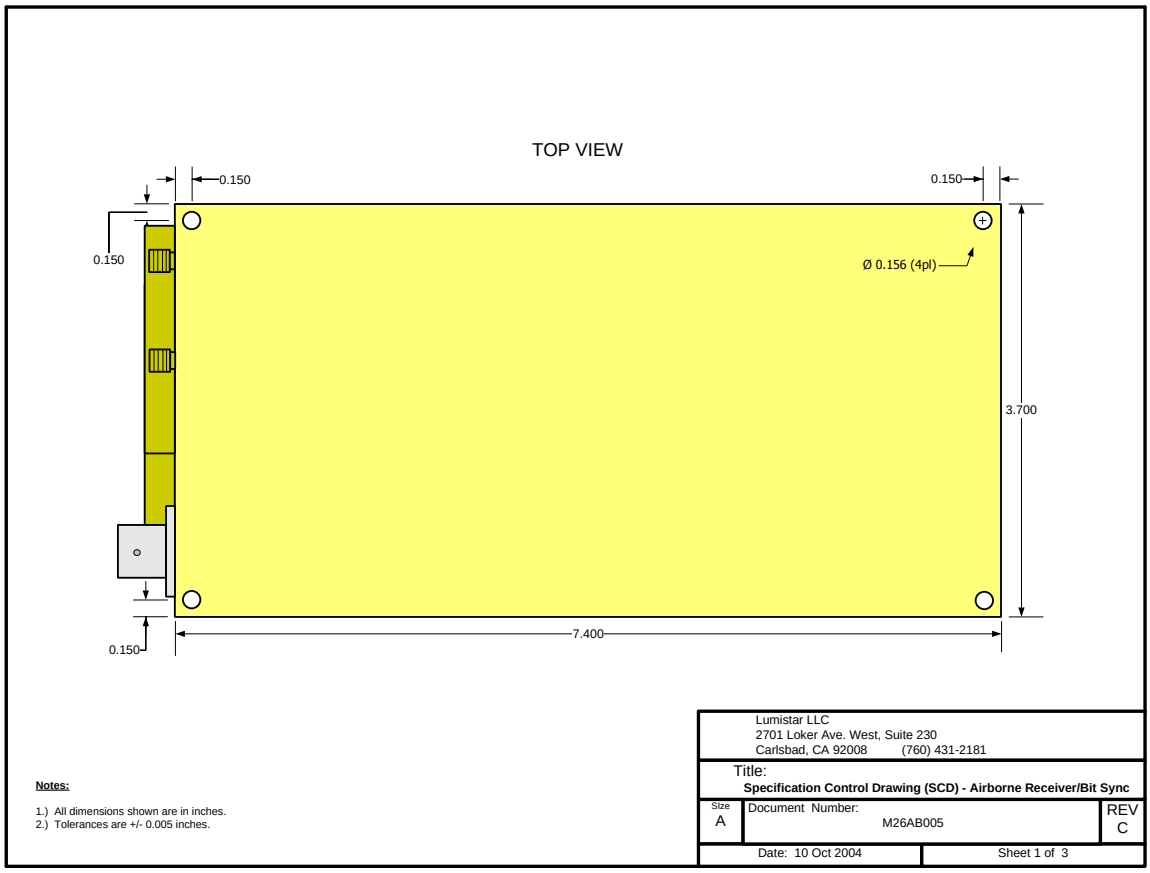
When the Receiver, Bit Synchronizer, and Link Analyzer are set up, you can click on



You will see the following.

3. Drawings

3.1 Outline Drawing - Top View



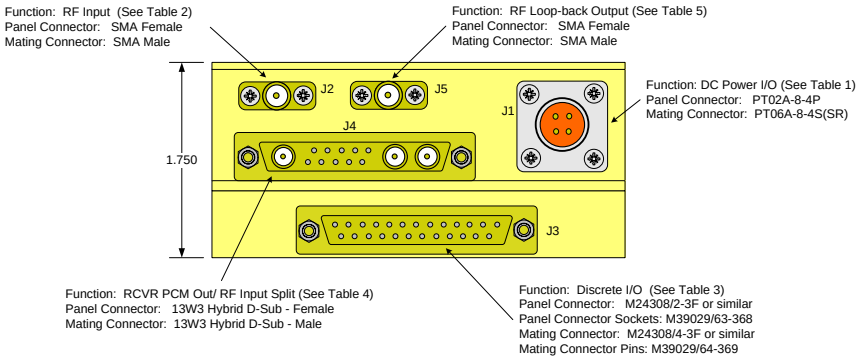
Notes:

1.) All dimensions shown are in inches.
2.) Tolerances are +/- 0.005 inches.

Lumistar LLC 2701 Loker Ave. West, Suite 230 Carlsbad, CA 92008 (760) 431-2181		
Title: **Specification Control Drawing (SCD) - Airborne Receiver/Bit Sync**		
Size A	Document Number: M26AB005	REV C
Date: 10 Oct 2004	Sheet 1 of 3	

3.2 Outline Drawing - Connector Face

FRONT VIEW



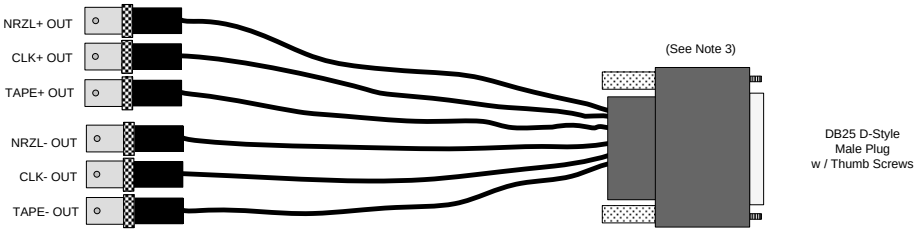
Notes:

1.) All dimensions shown are in inches.
2.) Tolerances are +/- 0.005 inches.

Lumistar LLC 2701 Loker Ave. West, Suite 230 Carlsbad, CA 92008 (760) 431-2181		
Title: **Specification Control Drawing (SCD) - Airborne Receiver/Bit Sync**		
Size A	Document Number: M26AB005	REV C
Date: 10 Oct. 2004	Sheet 2 of 3	

3.3 Cable Assembly - Bit Synchronizer Outputs

Date	Revision History



D-Style Connector Pin/ Contact No.	Label Text/Color	Pigtail Type	Signal Details
6	CLK+ OUT	BNC-F	TTL Levels
5	CLK- OUT	BNC-F	TTL Levels
10	NRZL+ OUT	BNC-F	TTL Levels
9	NRZL- OUT	BNC-F	TTL Levels
1	TAPE+ OUT	BNC-F	TTL Levels
14	TAPE- OUT	BNC-F	TTL Levels
4, 8,15,17, 20, 23	*(N/A)*	*(N/A)*	Ground

Assembly Notes:

1.) Apply signal labels near connector end of cable pigtails and secure with clear heat shrink.
2.) Signal cable pigtails to be constructed from RG-174, approximately 12" in length.
3.) Label DB25 back-shell with C26AB005-2 part number.
4.) This cable is used for LS-26 configurations indicated by M26AB005 and M26AB105.

Lumistar LLC
2701 Loker Ave West, Suite 230
Carlsbad, CA 92008 (760) 431-2181

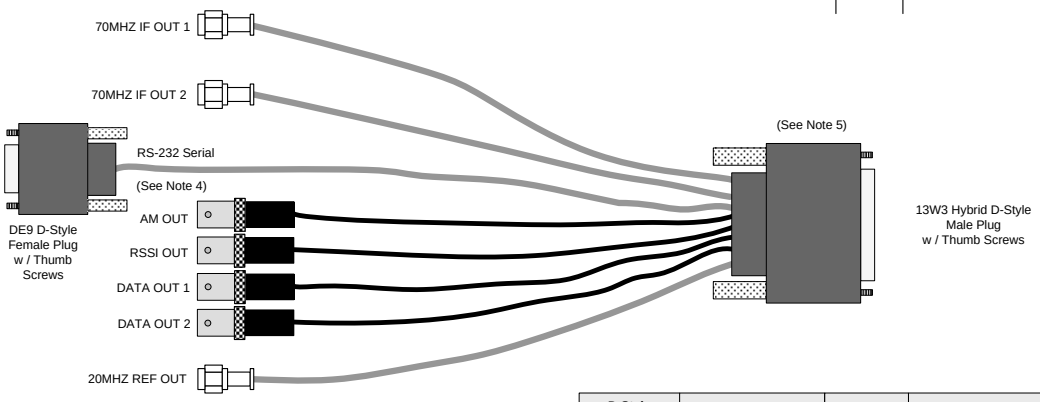
Title:
LS-26V5 Interface Cable Assembly Drawing

Size	Document Number:	REV
A	C26AB005-2	B

Date: 1 Nov. 2004 Sheet 1 of 1

3.4 Cable Assembly - Programming

Date	Revision History



Hybrid D-Style Connector Pin No.	Signal Name	DE9-F Pin No.
-	DE9-F pins 1,4,6 jumpered	1
8	RS-232 HOST RX	2
9	RS-232 HOST TX	3
-	DE9-F pins 1,4,6 jumpered	4
1, 2, 3 or 4	Ground	5
-	DE9-F pins 1,4,6 jumpered	6
-	DE9-F pins 7 and 8 jumpered	7
-	DE9-F pins 7 and 8 jumpered	8
-	-	9

D-Style Connector Pin/ Contact No.	Label Text/Color	Pigtail Type	Signal Details
A1	20MHZ REF OUT	SMA-M	20MHz Output (1.2Vp-p typ.)
A2	70MHZ IF OUT 1	SMA-M	70MHz Output (-13 to -20dBm typ.)
A3	70MHZ IF OUT 2	SMA-M	70MHz Output (-13 to -20dBm typ.)
6	DATA OUT 1	BNC-F	0 to 7.5Vp-p Output (variable)
7	DATA OUT 2	BNC-F	0 to 7.5Vp-p Output (variable)
5	AM OUT	BNC-F	0 to 7.5Vp-p Output (variable)
8-9	RS-232 Serial	DB9-F (*)	RS-232 Host Control/Status Channel
10	RSSI OUT	BNC-F	0 to 4V Output
1-4	*(N/A)*	*(N/A)*	Ground

(*) - See Table for pin-out information

Assembly Notes:

1.) Apply signal labels near connector end of cable pigtails and secure with clear heat shrink.
2.) Signal cable pigtails to be constructed from RG-174, approximately 12" in length.
3.) Coax cables to be constructed from RG-316. Approximately 12" in length.
4.) RS-232 serial cable to be constructed of 6' of flexible jacketed, multi-conductor, stranded cable.
5.) Label 13W3 hybrid back-shell with C26AB005-1 part number.
6.) This cable is used for LS-26 configurations indicated by M26AB005 and M26AB205.

Lumistar LLC
2701 Loker Ave West, Suite 230
Carlsbad, CA 92008 (760) 431-2181

Title:
LS-26V5 Interface Cable Assembly Drawing

Size	Document Number:	REV
A	C26AB005-1	B

Date: 1 Nov. 2004 | Sheet 1 of 1

Table 1. J1 Pin Definitions

Pin A	+28VDC Power Input
Pin B	+12VDC Power Output
Pin C	+28VDC Return
Pin D	+12VDC Ground

Table 2. J2 Definition

RF Signal Input

Table 3. J3 Pin Definitions

Pin 1	PCM Tape Out (+)
Pin 2	BS SIGQ Output
Pin 3	BS THRES Output
Pin 4	Ground
Pin 5	CLK Out 1 (-)
Pin 6	CLK Out 1 (+)
Pin 7	Signal/Link Quality Out
Pin 8	Ground
Pin 9	NRZL Data Out 1 (-)
Pin 10	NRZL Data Out 1 (+)
Pin 11	(Unused)
Pin 12	(Unused)
Pin 13	(Unused)
Pin 14	PCM Tape Out (-)
Pin 15	Ground
Pin 16	BS PLL Output
Pin 17	Ground
Pin 18	CLK Out 2 (-)
Pin 19	CLK Out 2 (+)
Pin 20	Ground
Pin 21	NRZL Data Out 2 (-)
Pin 22	NRZL Data Out 2 (+)
Pin 23	Ground
Pin 24	+28VDC Supply Reference
Pin 25	(Unused)

Table 4 J4 Pin Definitions

Pin 1	Ground
Pin 2	Ground
Pin 3	Ground
Pin 4	Ground
Pin 5	AM Out
Pin 6	TLM1 Out
Pin 7	TLM2 Out
Pin 8	RS-232 Host RX
Pin 9	RS-232 Host TX
Pin 10	RSSI Out
A1	20MHz Reference In/Out
A2	70MHz IF Out 1
A3	70MHz IF Out 2

Table 5. J5 Definition

RF Input Signal Loop-back

Receiver Specifications/Notes:

1.) RF Input:	2200.5-2399.5 MHz
2.) RF Tuning Step:	500 kHz (typ.) 50 kHz steps (min.)
3.) Maximum RF Input Signal without damage:	+14 dBm
4.) Maximum RF Input before compression:	-2 dBm
5.) RF Input Dynamic Range:	80dB
6.) Receiver AGC range:	-10 to -90dBm
7.) VSWR:	2:1 Max; 1.5:1 typical
8.) Frequency Accuracy:	0.002 ppm
9.) Noise Figure:	10dB max.; 7.5dB typical
10.) RF Input Impedance:	50 ohms
11.) IF Frequency:	70MHz
12.) Receiver Data Outputs:	4Vp-p (unloaded)
13.) FM Demodulator bandwidth:	12MHz (max.) [20Mbps NRZL data]
14.) DC Input Power:	24-32VDC@ 500mA (typ.) 700mA (max.)
15.) DC Output Power:	12VDC@150mA (max.)
16.) Receiver Discrete Outputs:	Open Collector; 35VDC Breakdown voltage; Ground when signal active
17.) IF Filters (3dB BW)	(4 Bandwidths - Customer Specified)
18.) Post Detect Filters (3dB BW)	(4 Bandwidths - Customer Specified)

Bit Synchronizer Specifications/Notes:

1.) Data Rates:	50- 20Mbps NRZL; 50-10Mbps all other codes
2.) PCM Input/Output Codes:	NRZ-L/M/S, BIO-L/M/S, DM-M/S, M2-M/S, Inv. BIO-L, Inv. NRZ-L, RZ, Inv. RZ, RNRZ-11/15
3.) PCM Tape Output:	+/- TTL levels
4.) PCM Clk/Data Outputs:	+/- TTL levels
5.) THRES/PLL/SIGQ/Setup Complete Outputs:	Open Collector; 35VDC Breakdown voltage; Ground when signal active

Control Interface Notes:

1.) All bit synchronizer and receiver control and status commands via an RS-232 serial link @19.2Kbps.
2.) All settings are retained in internal EEPROM.
3.) Link analysis functions allow an external PRN-15 source to be utilized to test end-to-end link functionality.
4.) Design allows airborne receiver to be sold with or without Bit Sync option.
5.) Signal Quality TTL output will be active during normal operations when Es/No levels are >5dB.
6.) During external link testing modes, this TTL will be active when detected link Bit Error Rates are < 1x10E-6.

Lumistar LLC
2701 Loker Ave. West, Suite 230
Carlsbad, CA 92008 (760) 431-2181

Title:
Specification Control Drawing (SCD) - Airborne Receiver/Bit Sync

Size	Document Number:	REV
A	M26AB005	C

Date: 10 Oct. 2004 | Sheet 3 of 3