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## **User Manual**

# **DESWBO**

“Dynamic Engineering SpaceWire Break Out”

## **SpaceWire Connection Status Monitor**



Revision A1

Corresponding Hardware: Revision A

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# DESWBO

## SpaceWire Connection Status Monitor

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## Product Description

The Dynamic Engineering SpaceWire Break-Out (DESWBO) board monitors the signals of a single SpaceWire link. The board has two 9-pin MDM connectors labeled Node\_0 and Node\_1. These connect to the two nodes of a SpaceWire network link. The link remains connected while the signals pass through DESWBO. The link is tested by monitoring the signals from each node.

The LVDS signals from each node are converted to single-ended signals by LVDS receivers and then routed to an FPGA as well as LVDS transmitters where they are converted back to LVDS signals and sent to the opposite node. The FPGA contains the equivalent of two SpaceWire receiver modules that decode the SpaceWire signals and extract the various data and control characters. See block diagram below.

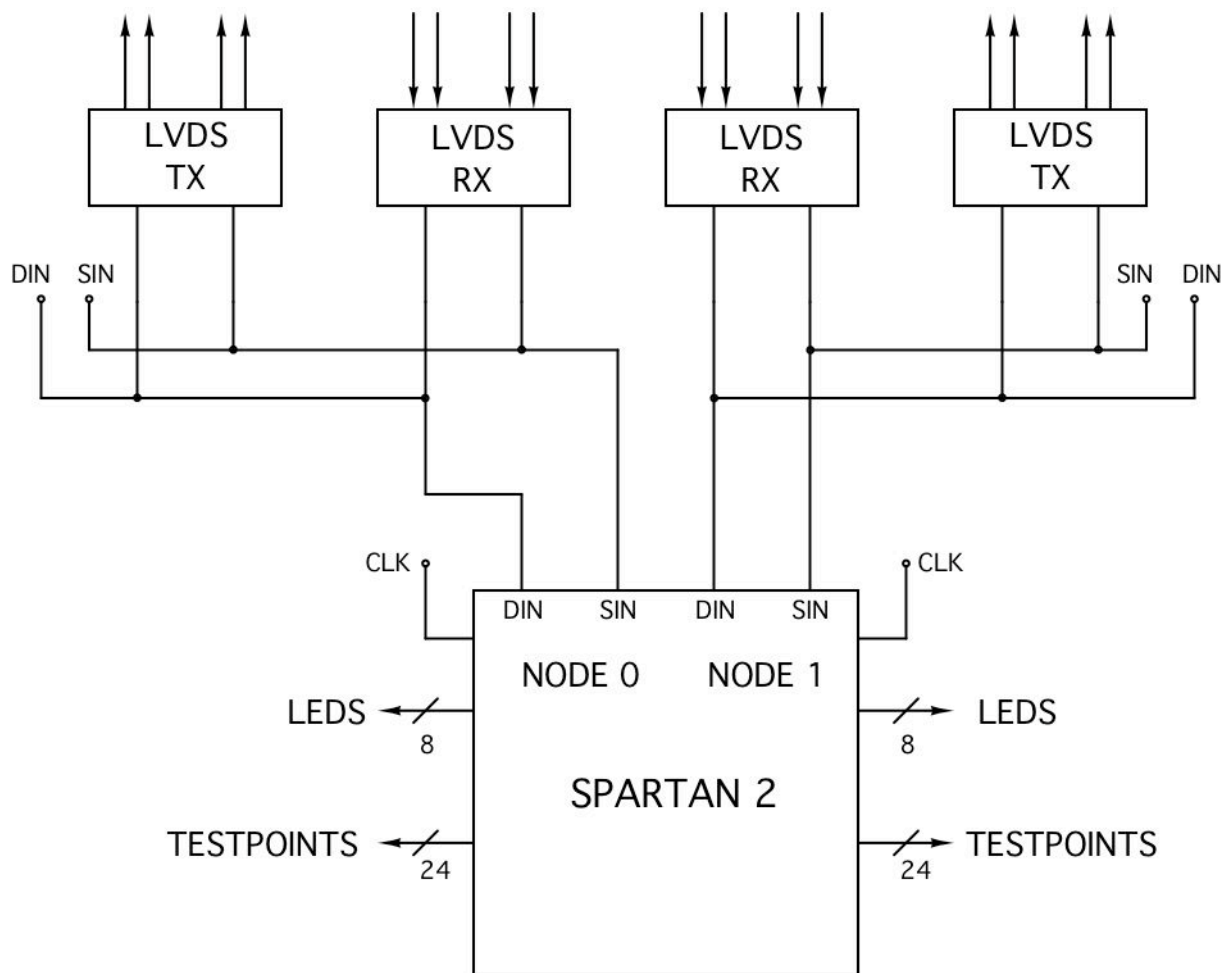


FIGURE 1

DESWBO BLOCK DIAGRAM

The end-of-packet, got-data and got-fct signals from each node are connected to pulse capture and extension circuits to drive three green LEDs. The error-end-of-packet, parity error, escape error, credit error and disconnect error signals for each node drive five red LEDs. The sixteen LEDs provide a quick status of link activity and health.

There are 24 test points for each node driven by the real-time signals from the SpaceWire character receivers. Two test points for each node are connected to the DIN and SIN signals from the LVDS receivers. The recovered clock from the SpaceWire bit receivers for each node is available on a testpoint to provide a reference for the DIN and SIN signals..

*Note: Data is valid on both the rising and falling edge of the recovered clock.*

Test point signals:

Data bits(8)  
Credit count bits(6)  
Parallel data strobe  
NULL received  
FCT received  
Timecode received  
End-of-Packet  
Error End-of-Packet  
Credit error  
Disconnect error  
Escape error  
Parity error

There are three ground test points per node to facilitate probe grounding.

DESWBO is powered by an external 5-volt supply and on-board regulators for the various operating voltages required. There is no direct ground reference between the DESWBO and the host chassis. This does not affect operation, but when the signals on the test points are probed, the probe grounds need to be connected to a local DESWBO ground pin to allow accurate waveform detection.

## Theory of Operation

SpaceWire is designed for transferring data from one point to another using the SpaceWire protocol as specified in document ECSS-E-50-12A, published by the European Cooperation For Space Standardization dated 24 January 2003.

SpaceWire uses Data-Strobe encoding where clock and data information are sent on two paired serial links. Exactly one transition occurs in either the data line or the strobe line at the end of each bit period allowing the clock to be recovered from the data strobe pair. The timing is shown in figure 1.

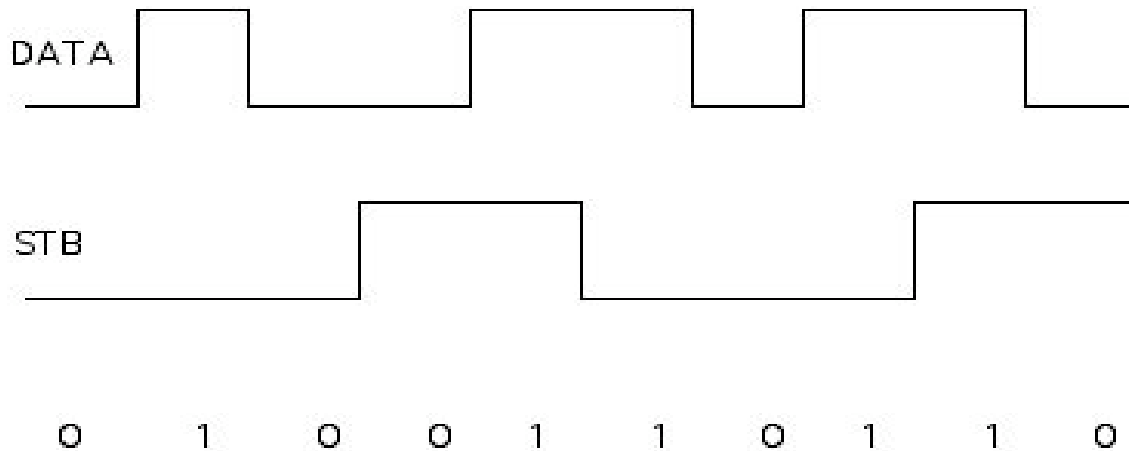


FIGURE 2

SPACEWIRE DATA STROBE ENCODING

Various bit sequences are defined by the specification to implement connection, flow control, system time distribution, and data transfer. DESWBO is designed to detect and decode these bit sequences, and issue signals indicating what types of characters are passing between nodes as well as the data contents of data and timecode characters. A running count of flow control credits for each node is calculated by DESWBO by monitoring FCTs and N-character occurrences. The count can be monitored on the test points.

Refer to the SpaceWire specification for the details of the link interface.

## Specifications

Serial Interfaces:	Two SpaceWire node connections
Interface Options:	Two 9-pin MDM connectors for Node_0 and Node_1
Dimensions:	2.788" x 5.475"
Construction:	FR4 Multi-Layer Printed Circuit, Through-Hole and Surface-Mount Components
Temperature Coefficient:	2.17 W/°C for uniform heat across board
Power:	External wall mount 5V transformer provided.

## Order Information

DESWBO	SpaceWire breakout suitable for monitoring 1 SpaceWire link and reporting status and errors in real time. For additional details please visit our webpage. <a href="http://www.dyneng.com/deswbo.html">http://www.dyneng.com/deswbo.html</a>
MDMCable9	9-pin MDM connectors suitable for SpaceWire node interconnection.

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