



STAR-Dundee

Supporting SpaceWire Applications

SpaceWire Link Analyser Mk3

The Link Analyser Mk3 is designed to unobtrusively monitor the traffic on a SpaceWire link. It can capture and display bi-directional traffic travelling over a link at up to 400 Mbit/s; it can display live link statistics; and it can output decoded SpaceWire link characters and events to an external logic analyser.

The SpaceWire traffic visibility this provides is essential when developing and testing SpaceWire equipment. It makes it possible to validate a SpaceWire link is operating correctly and greatly aids debugging when problems are detected.

The Link Analyser Mk3 is typically connected between two SpaceWire devices, where it transparently monitors link traffic. When a pre-defined capture trigger is detected, SpaceWire characters and errors, along with a trace of data and strobe signals, are captured to hardware memory. Once capture is complete, the SpaceWire traffic is uploaded to a host PC where it is interpreted and shown in multiple views. Each view displays traffic in different levels of detail, allowing it to be inspected at network, packet, link and signal levels.

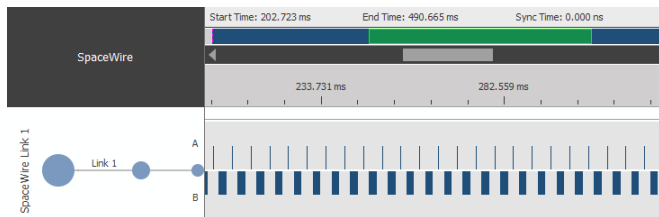
The Link Analyser Mk3 is controlled by a host PC, connected by a high-speed USB 3.0 interface, and is powered by a 5V power brick. It has two SpaceWire ports, four external SMB triggers and two MICTOR logic analyser connectors.



SpaceWire Link Analyser Mk3

Key Features

Network level view: The network view provides a high-level overview of all captured traffic, in varying quantities and detail depending on the zoom level. This is useful for navigating traffic and for identifying and inspecting traffic trends and areas of interest.



SpaceWire Network View

Packet level view: The timing, size and contents of all captured packets are displayed in the packet view. This can be used to monitor the flow of packets exchanged across a link, the response of a system to packet errors, and the control of SpaceWire systems using control packets.

	Time Delta	End A	End A Delta	End B	End B Delta
30.56 µs	3.15 ns	Reader: 23	4.53 µs		
30.61 µs	50 ns	24 25 26 27 28 29 3A 3B	50 ns		
31.1 µs	400 ns	2C 2D 2E 2F 30	400 ns		
31.23 µs	220 ns	BOP	220 ns		
31.86 µs	630 ns			Reader: A7	4.45 µs
31.91 µs	50 ns			5D 3C 7E 8C 8D 7B 82 C9	50 ns
32.31 µs	400 ns			12 04 83 8B CD 02 DD	400 ns
32.63 µs	320 ns			BOP	320 ns

SpaceWire Packet View

RMAP analysis: The packet view can optionally interpret and display the fields of packets conforming to the Remote Memory Access Protocol (RMAP) standard. RMAP transactions can be viewed and inspected, greatly simplifying RMAP analysis.

Link level view: The character view displays captured data characters, control characters, control codes and errors. This can be used to visualise traffic exchanged by two ends of a SpaceWire link, helping to view and debug link initialisation, flow control, data transfer and error handling.

	Time Delta	End A Event	End A Error	End A Delta	End B Event	End B Error	End B Delta
6.36 µs	10 ns				NULL		40 ns
6.4 µs	40 ns	NCBAR (30)		50 ns			40 ns
6.42 µs	20 ns	EOP		20 ns	FCT		20 ns
6.46 µs	40 ns	NULL		40 ns	NULL		40 ns
6.5 µs	40 ns	NULL		40 ns			40 ns
6.51 µs	10 ns				NCBAR (33)		50 ns
6.54 µs	30 ns	NULL		40 ns			50 ns
6.56 µs	20 ns				NCBAR (34)		50 ns

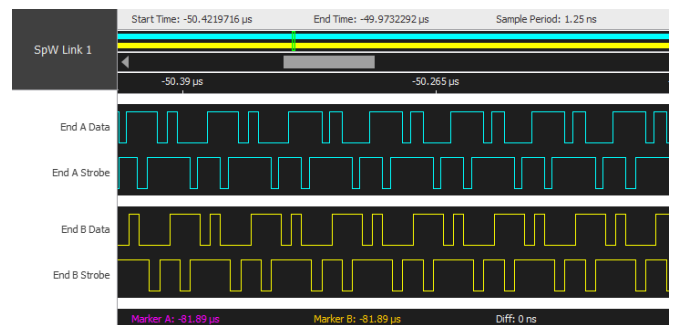
SpaceWire Character View

Search: The packet and character views have built-in search capabilities to help navigate and validate captured traffic.

Selection synchronisation: Selecting traffic within the network, packet or character view automatically selects and displays the corresponding time in the other views. This simplifies traffic navigation and quickly allows the same traffic item to be inspected at multiple levels of detail.

Export to CSV: Character and packet view contents can be exported to comma-separated value (CSV) formatted files. CSV files can be opened directly in spreadsheet applications or easily interpreted by custom software.

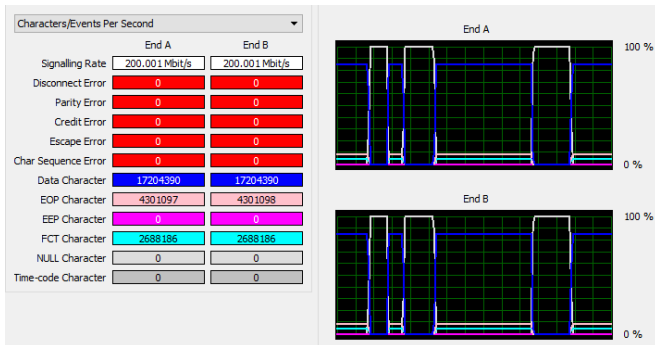
Signal level view: Captured SpaceWire bit-stream data and strobe signals are displayed in the bit-stream view. This can be used to visualise character synchronisation and data encoding, and debug problems at the signal level such as simultaneous transitions.



SpaceWire Bit-Stream View

View live statistics: Live link statistics are available in the status counter view. This shows the signalling rate, the number of errors detected and a count of the different SpaceWire character types.

Line charts graph these values over time to illustrate fluctuations. This is useful for monitoring SpaceWire link utilisation and highlighting unexpected errors.



Status Counter View

Save and load: Captured traffic can be saved to file and reopened when required. This can be used to keep a record of SpaceWire traffic behaviour under different circumstances. Saved traffic containing unexpected errors can be shared with others to help with debug efforts.

Unobtrusive monitoring: The LVDS signals are buffered by the Link Analyser Mk3 to ensure the unit is transparent to the SpaceWire link being analysed.

Loopback mode: Loopback mode can be enabled to loopback and monitor the traffic of a single SpaceWire interface.

Configurable capture trigger: The Link Analyser Mk3 can be configured to capture SpaceWire link traffic when a pre-defined trigger condition is detected. The trigger condition can occur when one or more sequential events of interest are detected. Trigger event types include SpaceWire characters (e.g. EOP), data sequence, time-code value, packet length and errors. If required, a trigger delay time can be set to adjust the capture trigger timing.

Large capture memory: Up to 67 million events can be unobtrusively captured to hardware memory. For efficient memory usage, the proportion of pre- and post-trigger memory reserved around the capture trigger is configurable.

Character enable: Capturing of specific SpaceWire character types can be enabled or disabled to improve the efficiency with which memory is used. For example, disabling Null capture can save a significant amount of memory that can instead be used to capture character types of greater interest, such as data characters.

Error injection: Errors can be injected into the SpaceWire bit-stream to validate system level operation in the event of various failures. A single error can be injected on demand or repeatedly with a time interval. Three error types are supported: disconnect error, simultaneous transition and burst error.

Traffic visibility: Multi-colour LEDs on each of the SpaceWire ports provide an immediate indication of the status of the SpaceWire link.

High-speed interface to host PC: A USB 3.0 interface connects the Link Analyser Mk3 to a host PC, allowing rapid transfer of captured SpaceWire traffic from unit memory to host PC.

External triggers: The Link Analyser Mk3 has four SMB triggers (two are currently used) for integrating with external equipment. SpaceWire link analyser traffic capture can be triggered when an external input signal is detected. Conversely, an output signal on the

external output trigger can be generated when the analyser capture trigger occurs or each time a specific SpaceWire character type is detected. LEDs indicate trigger state and activity.

Logic analyser interface: A 40 pin MICTOR logic analyser connector exposes the characters and events occurring on each SpaceWire port for monitoring and analysis on an external logic analyser.

Field upgradability: The Link Analyser Mk3 supports field upgradability of the unit functionality. Any upgrades or requested customisations can be downloaded from the STAR-Dundee website and installed quickly and efficiently.

19" rack mountable: Compatible with our 19" rack mounting kit, the Link Analyser Mk3 can be mounted on a 1U shelf alongside a combination of other STAR-Dundee products.

First class support: As with all of STAR-Dundee's products, a year's support and maintenance is included with the Link Analyser Mk3. This support is provided directly from the team that developed each product so that we can respond quickly with detailed answers to questions, give assistance with application development, and resolve any problems quickly.

SpaceWire Link Analyser Mk3 Software

All required software is provided with the SpaceWire Link Analyser Mk3.

Link Analyser Mk3 application: This graphical user interface (GUI) application can be used to capture and display SpaceWire link traffic. Memory, analyser trigger and filter settings are configurable prior to traffic capture. Once captured, SpaceWire traffic is displayed in network, character, packet and bit-stream views.

Application Programming Interface (API): Custom code can be written that leverages the capabilities of the Link Analyser Mk3 hardware using the provided C API. Use this to integrate the Link Analyser Mk3 with existing EGSE software and hardware, and to automate capture and analysis of SpaceWire traffic.

STAR-System: The Link Analyser Mk3 uses our device and operating system agnostic software stack, named STAR-System. This includes a high-performance USB driver and API functions for device access, on which the Link Analyser Mk3 depends.

Specifications

Part Number: 162

Size: 110 x 30 x 112 mm (excluding feet)

Power: +5V DC, power brick supplied

Software:

- Application, C API and STAR-System software included

Supported Platforms:

- Windows (10, 8 and 7)
- Linux (5.x, 4.x and 3.x kernels)

SpaceWire Ports:

- Compliant to ECSS-E50-12A, ECSS-E-ST-50-12C and ECSS-E-ST-50-12C Rev.1
- Number of SpaceWire Ports: 2
- Maximum Speed: 400 Mbit/s
- Connectors: 9-pin micro-miniature D-type

USB Port:

- USB 3.0
- Backwards compatible with USB 2.0 and 1.1

EMC:

- CE/FCC certified