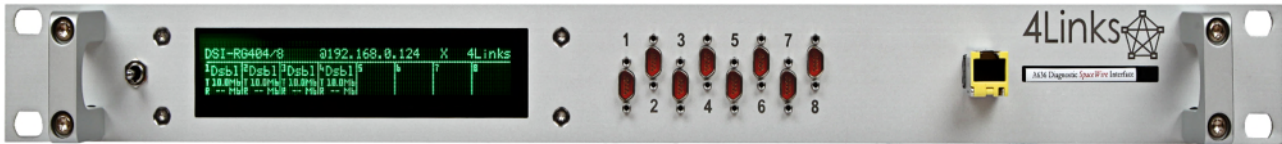


## 4Links for SpaceWire



### SpaceWire Technology

- SpaceWire has become the industry standard for satellite internal communication, for both payloads and command/control. It can be found in over 100 existing satellites and being integrated into many more.
- The SpaceWire standard was ratified by ESA in 2003 and updated in 2018 to reflect the changing requirements of satellites.
- SpaceWire offers robust interconnect based on the original Inmos transputer link (IEEE1355) with performance up to 400Mbps duplex.

### 4Links the Company

- 4Links is a UK SME recognized as a worldwide authority on SpaceWire.
- 4Links was incorporated in 2000. With its' deep experience of the transputer links, they have unique skills for developing test and modelling equipment for SpaceWire.
- This unique depth of understanding within 4Links has been the foundation of the company's contribution to the European Space Agency SpaceWire standard and to the space industry worldwide.
- 4Links' test and modelling equipment for SpaceWire is designed and manufactured in the UK.

### Why 4Links' Products?

- 4Links' offer a range of hardware solutions for use on the desktop, the lab and final satellite testing.
- Buy what the mission needs now, expand it as the mission progresses.
- By using a common software interface for all the hardware, the user only needs to develop a single software flow, reducing development time and risk.
- Develop and test on the desktop products and deploy to the rack mounted products.
- 4Links' equipment is highly reliable, accurate and combined with our excellent support, saves you time, risk, and therefore money.
- For final satellite and modules testing, the rack mounted products offer enhanced safety features.
- Complete flow from architectural exploration, through module and system bring-up to final system testing.



## Test, Monitoring and Modelling Equipment for SpaceWire

4Links SpaceWire equipment is based around a configurable hardware platform, enabling you to upgrade and/or change functionality by purchasing different firmware. A unit can be repurposed as your project and requirements change.

Product 1U	Part# FPGA LS	Part# FPGA MS	Description
<b>SpaceWire Link Recorder</b>	MSR-RG404/8-LS MSR-RG408-LS	MSR-RG404/8-MS MSR-RG408-MS	Passively monitors up to four SpaceWire links and sends time-tagged data to be recorded on a PC over its Ethernet interface.
<b>Diagnostic SpaceWire Interface</b>	DSI-RG402/8-LS DSI-RG404/8-LS	DSI-RG402/8-MS DSI-RG404/8-MS DSI-RG408-MS	Up to eight SpaceWire ports active at the same time, with powerful diagnostic options. Can simulate multiple subsystems simultaneously via its Ethernet interface and our C-API.
<b>Absolute Time Interface</b>	ATI-RG401/8-LS		Synchronizes the 4Links test equipment to an IRIG time of year reference.
<b>Ethernet SpaceWire Link</b>	ESL-RG401/8-LS		Entry-level interface from Ethernet to a single SpaceWire port; can be used with our C-API and software to test or simulate a subsystem
<b>Flexible SpaceWire Router</b>		FSR-RG408-MS	Eight-port SpaceWire routing switch, with optional packet statistics
<b>SpaceWire Link Analyser</b>	MSA-RG408-LS		Passively monitors up to four SpaceWire links and provides statistics of all characters transferred in each direction. Contact Factory
<b>SpaceWire RMAP Responder</b>	SRR-RG402/8-LS-32K SRR-RG402/8-LS-64K	SRR-RG402/8-MS-32K SRR-RG404/8-MS-32K SRR-RG406/8-MS-32K SRR-RG402/8-MS-64K SRR-RG404/8-MS-64K	Provides low-latency response, on up to six ports concurrently, to requests of SpaceWire's Remote Memory Access Protocol (RMAP) Contact Factory
Firmware upgrades available to add functionality and product features			Contact Factory

Product - Portable	Part# SpW2GbE	Part# SpW4	Description
<b>Portable Diagnostic SpaceWire Interface</b>	P-DSI-2	-	Two port high-performance Ethernet-to-SpaceWire Bridge that can relay traffic from a single TCP/IP Ethernet connection
<b>Portable SpaceWire Link Recorder</b>	P-SLR-2	-	Passively monitors one SpaceWire link and sends time-tagged data to be recorded on a PC
<b>Portable SpaceWire DSI and SLR Combo</b>	P-DSR	-	Diagnostic SpaceWire Interface (P-DSI-2) and SpaceWire Link Recorder (P-SLR-2) Combo
<b>Portable SpaceWire Routing Switch</b>	-	P-SRS-4 P-SRS-8	Four or eight port SpaceWire routing Switch Compliant with ECSS-E-ST-50-12C
Firmware upgrades available to change functionality			Contact Factory

## Product Options

4Links SpaceWire test equipment can have functionality added simply by changing the firmware in your platform.

Diagnostic and other Options can improve the usefulness of many of 4Links' products while saving expense for users who do not need the capability of an extra unit. See below for a table of available options.

Extra Options may be purchased at the same time as the equipment, or later when the need arises. The installation of extra Options does not require the return of your product to 4Links.

Function	Option	ESL	DSI	MSR	FSR	P-DSI-2	P-SLR-2	P-DSR
<b>Event/Error Reporting</b>	<i>ER</i>	<i>opt</i>	✓	✓		✓	✓	✓
<b>Event/Error Waveforms</b>	<i>EW</i>	<i>opt</i>	<i>opt</i>	✓		✓	✓	✓
<b>Time Code Generator</b>	<i>TC</i>	<i>opt</i>			<i>opt</i>			
<b>Time Tags</b>	<i>TT</i>	<i>opt</i>	<i>opt</i>	✓		✓	✓	✓
<b>Event/Error Injection</b>	<i>EI</i>		<i>opt</i>			✓		✓
<b>Synchronized Outputs</b>	<i>SO</i>		<i>opt</i>					
<b>Packet Statistics</b>	<i>PS</i>				<i>opt</i>			
<b>Controlled Outputs</b>	<i>CO</i>		<i>opt</i>					
<b>Output Enable</b>	<i>OE</i>							
<b>Output Disable</b>	<i>OD</i>		<i>opt</i>					

## Product Facts:

- Products conform to ECSS-E-ST-50-12C (31<sup>st</sup> July 2008)
- Receive speeds are in the range 1.2Mb/s to 400Mb/s
- Transmit speeds are in the range 1Mb/s to 400Mb/s
- Firmware is encrypted for a specific unit and not interchangeable between units.
- Front-panel display gives real-time information about the SpaceWire Links and equipment status.
- A Gigabit Ethernet port is used for all data transfers between the unit and the host computer.
- RG408 Specific
  - Eight standard 9-way Micro-miniature D-type SpaceWire sockets.
  - External synchronization between RG408 units (via SMA connectors on the rear panel) for time-tag synchronization (DSI, MSR and ATI), transmit packet synchronization (DSI) and external triggers (DSI)
  - Firmware, supplied on Compact Flash memory cards, may be hot-swapped to change functionality.
  - Designed to protect the unit under test from electrical faults and from propagating faults. A failure mode, effects, and criticality analysis (FMECA) document is available, please contact 4Links directly.
  - Power supply 24V DC 24W
  - Size 1U 19" rack mount, depth 600mm (16"), 2.8kg (6lb)
- Portable Specific
  - Two, four or eight standard 9-way Micro-miniature D-type SpaceWire sockets.
  - A mini-USB connector for configuration and firmware updates.
  - External synchronization is not supported.
  - Power supply 12V DC 15W
  - Size 3U 12HP enclosure, depth 240mm (9.5"), 1.3kg (2.8lb).

## SpaceWire Lab Cables:

*BackShell Termination*

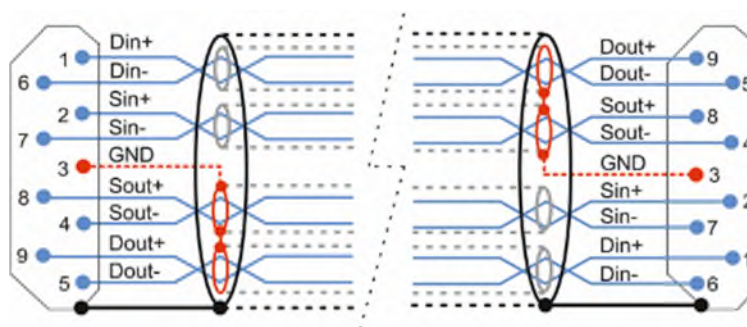
*Drainwire Termination*



4Links commercial cable assemblies for SpaceWire provide a lower-cost and flexible alternative to flight cables, when used for simulation and functional test of systems that are interconnected by SpaceWire.

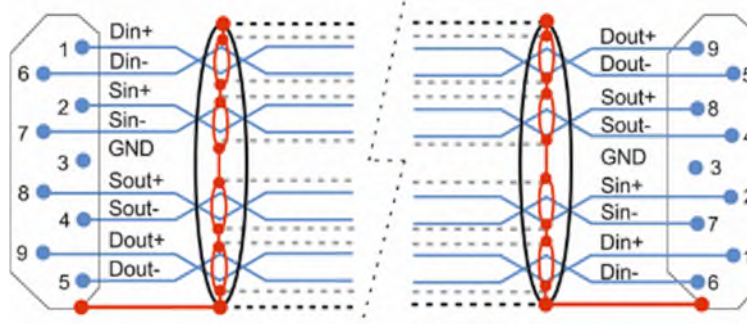
### SpaceWire Standard Type AL

This is the original SpaceWire standard cable connection (ECSS-E-ST-50-12C) now marked as Legacy in the new draft standard (section 1.1.1.1.2).



### SpaceWire Standard Type

This is the new SpaceWire standard cable connection based on the new draft standard (section 1.1.1.1.1).



### Ordering information: All lengths available

CAB-xm-DW-A length (x) in meters - DrainWire, Type A connection

CAB-xm-DW length (x) in meters - DrainWire, Type AL connection

CAB-xm-BS-A length (x) in meters – BackShell, Type A connection

CAB-xm-BS length (x) in meters – Backshell, Type AL connection

4Links commercial cables for SpaceWire are not designed for flight or vacuum use.

[Contact 4Links or distributor listed below for more details](#)

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