

Spider

Quick Start Guide



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The information contained in this document is subject to change without notice.

This product must be used according to its user guide. Any operation related to maintenance, repair or calibration must be carried out by qualified personnel. Consequently, in case of failure, contact Riscure about the procedure to follow.

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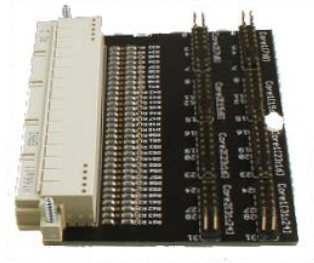



What is in the box

The box contains the Spider and all accessories to connect it to a computer.

Box content checklist

Quantity	Description		Identifier [1]
1	Spider		
1	15V DC Power Supply Unit, input 100 - 240 V, AC 50 - 60 Hz Included: power cable with country specific jack		PSU
1	Communication cable: USB-A - USB-B, 2 m		USB
4	Signal cable: SMB – SMB, 3 ft.		SMB2SMB
10	Jumper wires: male - female		
10	Jumper wires: female - female		
10	Jumper wires: male - male		

Quantity	Description		Identifier [1]
4	Output impedance adapter - SMB, 50 Ohm		R50
1	Breakout Board		BoB
1	Spider SDK USB stick		SDK
-	This “Spider - Quick Start Guide”		

[1] Identifier used in this document to refer to the item.

What does it do

The Spider is a generic, high-performance workbench to interact with embedded hardware. Such a workbench has many applications in side-channel analysis (SCA) and fault injection (FI) attacks.

The Spider can read and respond to signals associated with protocols like JTAG, I2C and SPI, and thus provides an information channel to the internal processing state of targeted hardware.

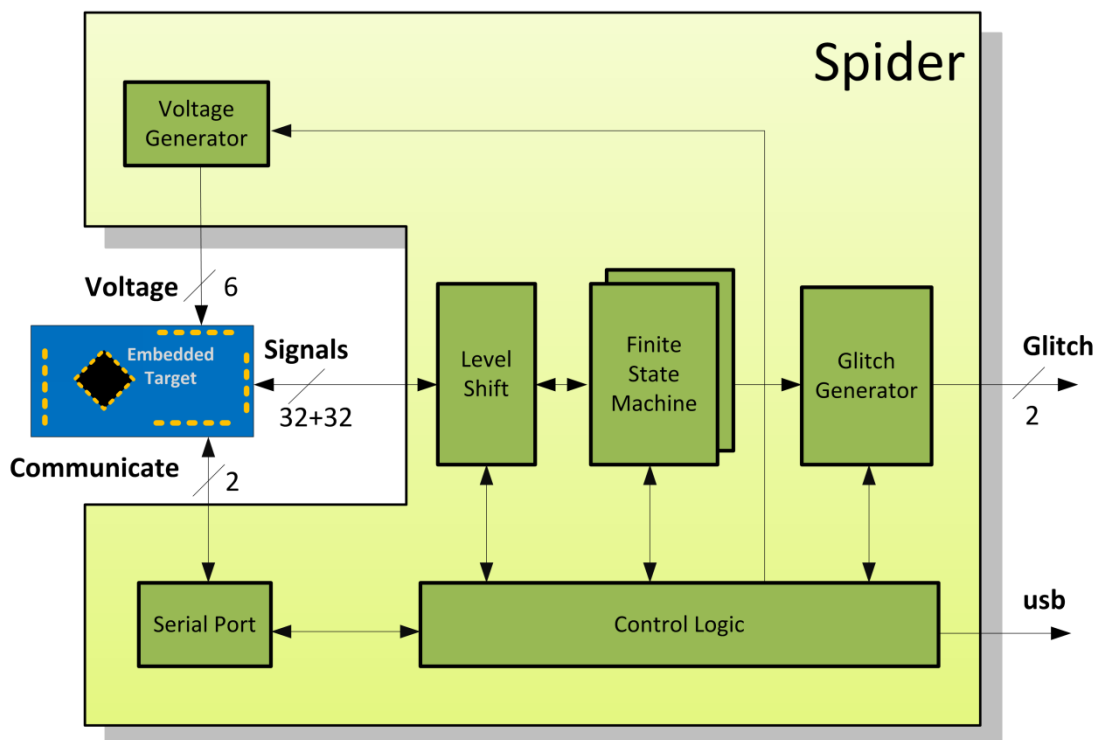


Figure 1 System overview of the Spider.

The Spider has two concurrent finite state machines. Each state machine can respond to internal timers/counters and 32 external signals. Additionally, Spider offers six programmable analog voltage outputs, two serial communication channels and two glitch outputs.

Spider is controlled either by Inspector via a programmable Sequence module, or in standalone applications by using Python scripts.

How to build a setup

A typical FI setup using voltage glitching

In this setup, the Spider passes commands from Inspector over the bus to the target, and generates a power perturbation when specific conditions on the target state are met, or when Inspector triggers it.

A Glitch Amplifier is used to supply the power current demanded by the target.

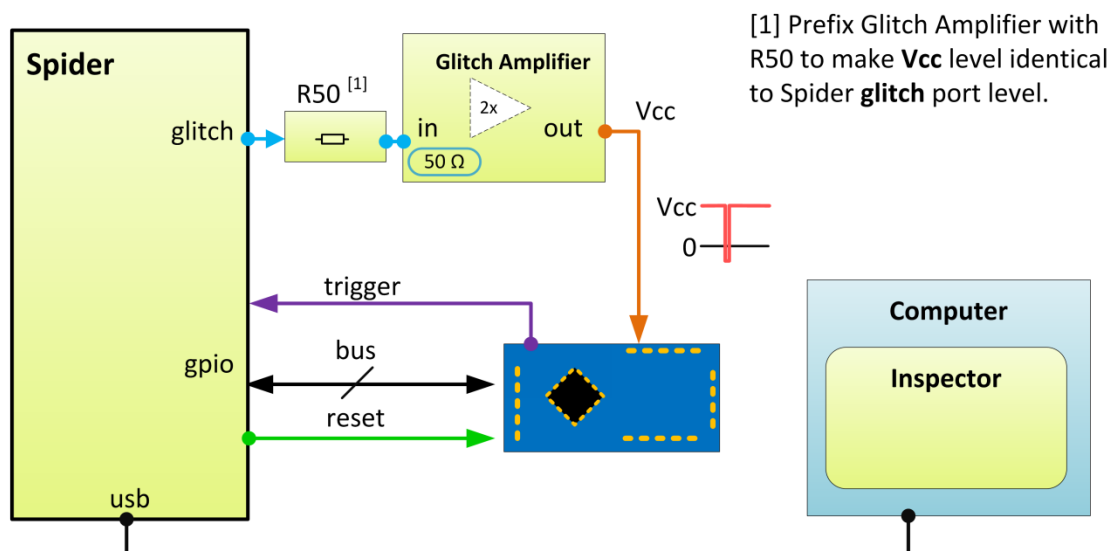


Figure 2 The Spider used to generate a timed glitch on the power line.

A typical FI setup using lasers

In this setup, the Spider passes commands from Inspector over the bus to the target, and at the same time control amplitude and timing of optical perturbations for one or two lasers.

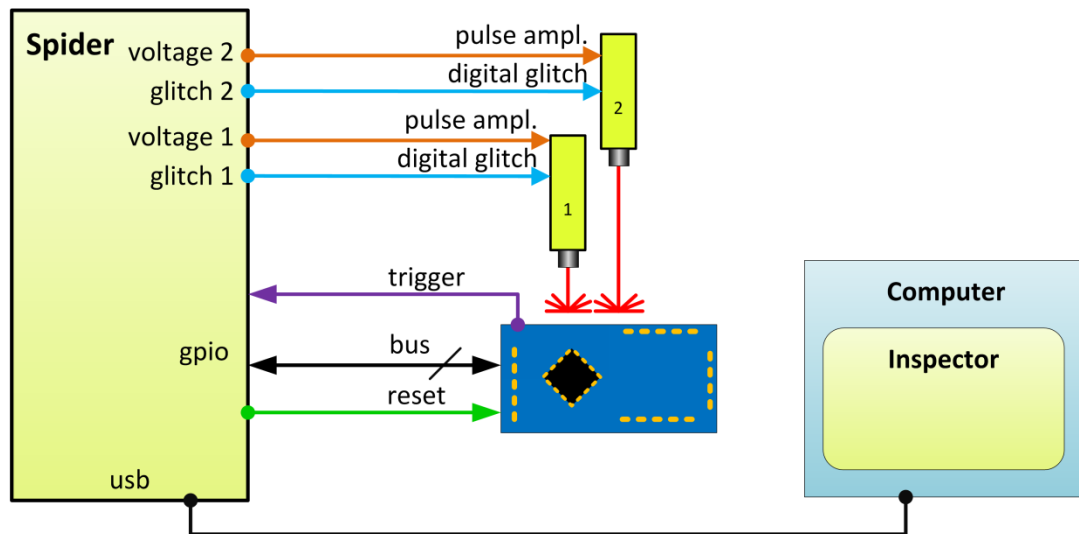


Figure 3 The Spider used to control perturbation with one (or two) lasers.

A typical SCA setup using pattern recognition

In this setup, the Spider is used to generate a static timing window to the icWaves in order to enable triggering on only the n-th pattern in a sequence, without having to reprogram the icWaves.

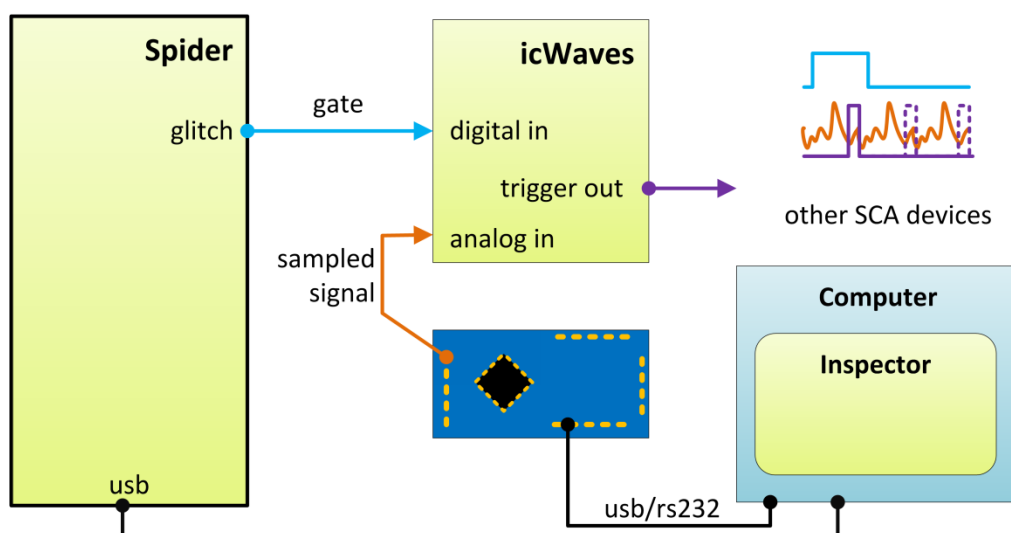


Figure 4 The Spider used as a gate signal to the icWaves.

Install Spider SDK

The SDK installer is stored on the USB stick shipped with Spider device. To install the Spider SDK, double-click the installer, and follow the steps of the installer wizard.

Spider SDK content

The Spider SDK installation directory contains the following folders:

- ReleaseNote.txt – Text file that keeps track of release history of Spider SDK.
- doc – Folder that contains documentation related to Spider device and SDK.
- driver – Folder that contains Spider Windows driver.
- firmware – Folder that contains latest firmware installer.
- java – Folder that contains Spider Java classes and Inspector Sequence examples. A copy of these files are also deployed to "C:\Users\[your_user_name]\Inspector\modules" folder.
- python – Folder that contains Spider Python classes and example scripts.

Installing Spider driver

As part of the Inspector installation or the Spider SDK installation, the Spider driver files are installed into:

```
%ProgramFiles(x86)%\Riscure\Spider SDK\driver
```

The user needs to manually install the driver files to Windows when using the Spider for the first time.

After the driver files are successfully installed, Spider will show up as a COM port device under the Windows Device Manager, the name of "Test Tool 1.x". (See Figure 5)

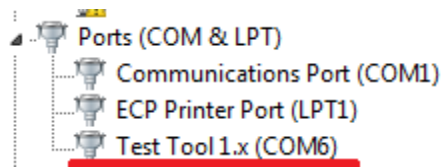


Figure 5 Spider showing up as Test Tool 1.x, with port assignment of COM6

What to do after SDK installation

- For Spider Python users:
 - Install Python 2.7.
 - Install pyserial library.
 - These installers can be found in the SDK installation directory:
`"%ProgramFiles(x86)%\Riscure\Spider SDK\python\installers"`
- For Spider Inspector users:
 - Launch Inspector.
 - File -> Open User Module...
 - Open any Spider Sequence module, and press F9 to compile.
 - The compiled Spider Sequence module will become available
 - To select the compiled modules:
 - Start any Sequence acquisition or perturbation module.
 - Go to the "Target" tab.
 - Select the module in the "Sequence" drop down list.
 - Check out Spider sections of Inspector tutorial for more details.

Setup Verification

Follow the next checks to verify a correct working:

1. Is the Spider powered?
2. Is the Spider recognized?
3. Is the Spider responding to commands?

Please ensure that a check is successful before going to the next one. If a check is not successful, refer to section Common problems on page 12 for solutions.

Check 1 - Is the Spider powered?

Connect the PSU to the Spider. Switch the Spider ON by putting the power switch into the top position.

The Spider has power if the front panel LCD display is ON. Initially the display shows the Spider's version number, e.g. "Spider 1.x."

Check 2 - Is the Spider recognized?

Connect the Spider with the USB cable to the computer.

The Spider driver software recognizes the device being connected, and reports it as "Test Tool 1.x" under Windows device manager.

Check 3 - Is the Spider responding to commands?

4. Go to "%ProgramFiles(x86)%\Riscure\Spider SDK \python\examples" folder
5. Copy "ping.py" to ""%ProgramFiles(x86)%\Riscure\Spider SDK \python" folder
6. Execute "ping.py"
7. A connected Spider device will then be listed in the command prompt print
(See Figure 6).



```
C:\Program Files (x86)\Riscure\Spider SDK\python>ping.py
Found Spider @COM6 with serial 4980120D97054
Bitstream version: 1.0
Bitstream build time: Fri Sep 16 16:16:59 2016
Bitstream build id: C6C5BCAB9C7363
Press Enter to exit...
```

Figure 6 Command prompt printing of the "ping.py"

Help and troubleshooting

Common problems



Powering up the Spider

First connect the USB cable with the computer, **then** power the Spider with 15 V PSU, and **then** flip the power switch upward to ON position.

Interoperability

If a glitch output is to drive a Glitch Amplifier, insert a 50 Ohm output impedance adapter (R50), to compensate the 2x amplification of the Glitch Amplifier.



Still have questions?

Visit the Riscure support portal: <http://support.riscure.com>.

Technical specifications

Operational conditions

- Room temperature 20 - 30 °C, (68 – 86 F).



Maintain stable environmental conditions (temperature, humidity, airflow etc.) in order to reliably repeat tests and compare test results.



Switching the Spider off is not required, but recommended when it is not used for a long time.

Power supply input

- 15 V DC, nominal load 400 mA
- Center-positive plug, inner-Ø 2.5 mm, outer-Ø 5.5 mm.



Use of a PSU other than supplied by Riscure is not supported. Power spikes may cause internal damage and loss of accuracy.

Finite state machines

- Two finite state machines (Core1, Core2), executing in parallel.
- Capable of max. 256 states.
- Transition events: GPIO edge, GPIO level, state visit count, state time-out
- Signaling between Core1 and Core2 is possible by cross-connecting GPIO pins.

Voltage outputs

- Six independent user defined voltage outputs. Impedance: 6 x 0 Ω.
- Range 0 V .. 5 V, 12-bit resolution, max. current 100 mA.
- All pin levels are updated in one action at a single point of time.

Glitch outputs

- Two glitch outputs, outputs. Impedance: $2 \times 0 \Omega$.
- Voltage output range $-4 \text{ V} \dots +4 \text{ V}$, 16-bit resolution, max. current 75 mA
- 4 ns pulse resolution

Signal I/O pins

- 128 pin header (4 x 32 pins), General Purpose Input/Output (GPIO) pins, center two rows are connected to ground (GND).
- Pins are grouped and addressable by finite state machine (Core1, Core 2).
- Independently programmable as input or output.
- Input to output response time (latency): nominal 40 ns.
- User configurable voltage level shift (V_{cco}): 1.0 .. 3.3 V.
- On power up, all pins are set by default to input, $V_{cco} = 3.3 \text{ V}$.

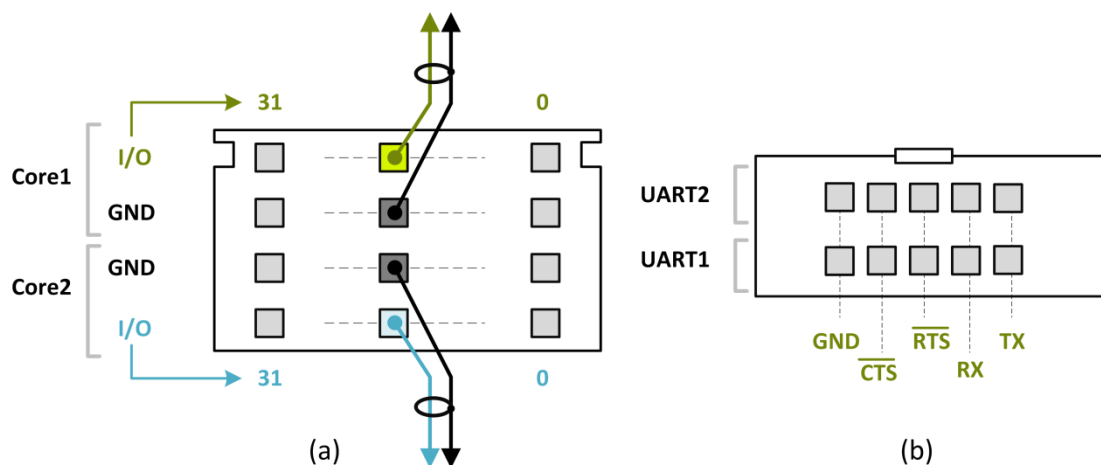


Figure 7 Front view pin layout of GPIO (a) and UARTS (b) connectors



The breakout board (BoB) can be used to convert the Spider frontal connector pins into 2.54mm spacing vertical pins.



The I/O signal lines are wired to the FPGA chip directly for maximum performance. Care must be taken on the input voltage to avoid damaging the FPGA chip.

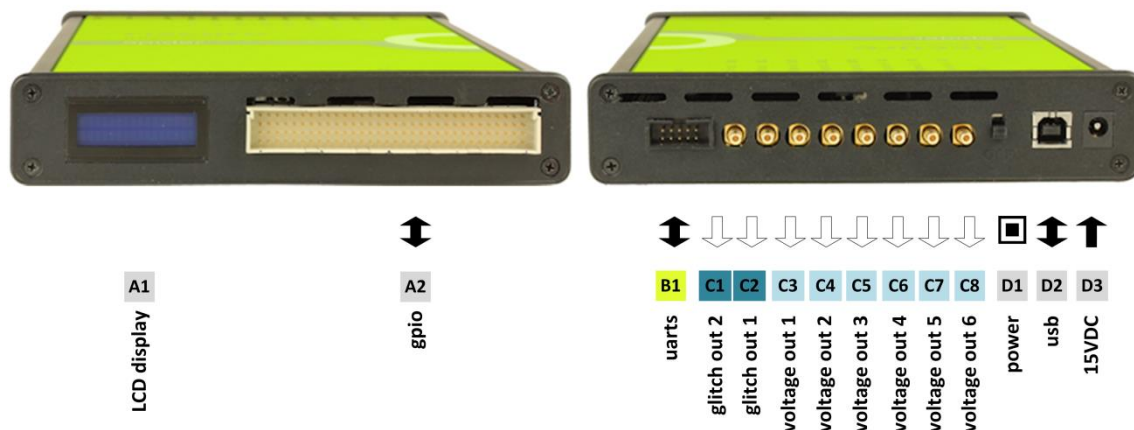
According to the datasheet of FPGA manufacturer, the voltage fed to the I/O pin should **not exceed $V_{cco} + 0.55\text{ V}$** .

Communication

- 10 pin header (2 x 5 pins), dual Universal Asynchronous Receiver Transmitter (UART)
- Two UART links, controlled via USB, e.g. for character based interfacing with target.

Product case

- Dimensions L x W x H: 220.00 x 169.50 x 34.63 [mm], 8.661 x 6.673 x 1.363 [inch].



Port	Label	Description
A1	-	LCD display, two text rows
A2	gpio	128 pin header, programmable input/output pins
B1	uarts	10 pin header, dual serial communication interface

Port	Label	Description
C1	glitch out 2	SMB, 0 Ω , unbuffered voltage level
C2	glitch out 1	SMB, 0 Ω , unbuffered voltage level
C3	voltage out 1	SMB, 0 Ω , programmable voltage level
C4	voltage out 2	SMB, 0 Ω , programmable voltage level
C5	voltage out 3	SMB, 0 Ω , programmable voltage level
C6	voltage out 4	SMB, 0 Ω , programmable voltage level
C7	voltage out 5	SMB, 0 Ω , programmable voltage level
C8	voltage out 6	SMB, 0 Ω , programmable voltage level
D1	power	Power switch, ON/OFF
D2	usb	USB 2.0 port, type USB-B. Communication link with a computer.
D3	15VDC	15 V DC. Power supply input.

Declaration of conformity

EC-DECLARATION OF CONFORMITY

Suppliers Details

Name

Riscure B.V.

Address

Frontier Building, Delftechpark 49, 2628 XJ Delft, The Netherlands

Product Details

Product Name

Inspector

Model Name(s)

Spider

Trade Name

Riscure

Applicable Standards Details

Directives:

- LVD (2006/95/EC) - EMC directive (2004/108/EC)

Standards:

- IEC 60825-1; IEC 320 C8; IEC 60950-1; 21 CFR 1040; ANSI/ESD S20.20:2007; BS EN 61340-5-1:2007; EN55022-B; EN61000-4-2, 4-5; CISPR 11; CISPR22-B; UL 1950

Supplementary Information

The appliance fulfils the relevant requirements of the EMC-directive and the LVD-directive according to our technical documentation TCD-Spider.

Declaration

I hereby declare under our sole responsibility that the product(s) mentioned above to which this declaration relates complies with the above mentioned standards and Directives

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Issued Date

04 / 03 / 2015



Signature of representative

Notes