

R&S®FPC-Z10 Teaching Kit Getting Started



117842802

This manual describes the following products:

- R&S FPC-Z10 Teaching Kit (1328.7338.02)

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1178.8436.02 | Version 04 | R&S®FPC-Z10

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol , e.g.
R&S®FPC-Z10 is indicated as R&S FPC-Z10.

The R&S®FPC-Z10 Teaching Kit (1328.7338.02) is a DUT designed to showcase different RF measurements in a lab environment. You can use it to demonstrate the functionality of a spectrum analyzer, network analyzer or signal generator. Examples for measurements are provided in a separate document.

Safety information and meaning of safety labels

The teaching kit is safe to use when you use it as intended and within its performance limits. The limits are described in the product documentation (data sheet and manual).

However, electrically powered products still have some risks, such as electric shock, fire or personal injury. Take the following measures for your safety.

- Use a power supply that is limited to 5 V DC at 1 A and complies to IEC/UL/EN 60950-1 or IEC/UL/EN 62368-1.
- Make sure that the RF signals you apply have a maximum level of 10 dBm and a voltage of 0 V DC. Connected equipment must also comply to IEC/UL/EN 60950-1 or IEC/UL/EN 62368-1.
- The baseband input and output connectors support a maximum voltage of +1 V / -1 V.

If any part of the product is damaged or broken, stop using the product immediately. Never open the casing of the product.



Potential risk

Read the product documentation to avoid personal injury or product damage.



Electrostatic discharge

Electrostatic discharge (ESD) can damage the electronic components of the device.

Use a wrist strap and cord and connect yourself to the ground to prevent ESD. Alternatively, use a conductive floor mat and heel strap combination.



Disposal of electronic equipment

Dispose of electronic equipment separately instead of the unsorted municipal waste. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.

Overview of elements

The teaching kit has various connectors, jumpers and DIP switches to control its functionality. Be careful not to break the jumpers when you handle the teaching kit.

Jumper

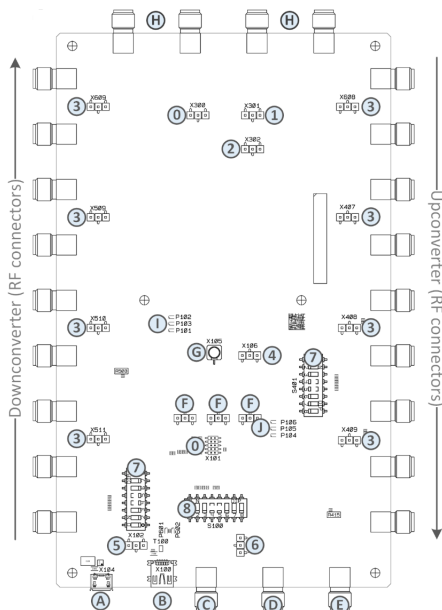
- 0: Unused
- 1: Jumper for LO frequency selection
- 2: Jumper for LO synthesizer state
- 3: Jumper for signal routing
- 4: Jumper for IF PLL power supply selection
- 5: Power supply selection
- 6: Calibration standard selection
- 7: Attenuator (for up- / downconverter)
- 8: Baseband state

Connectors

- A: Power supply (micro USB)
- B: Power supply (mini USB)
- C: Calibration kit (Short / Through)
- D: Calibration kit (Open / Through)
- E: Calibration kit (Match)
- F: SPI interface (internal use for synthesizer setup)
- G: PLL supply, AC coupled via 100 μ F
- H: I/Q input and output (baseband connectors)

LEDs (on if)

- I LO locked
- IF PLL power over switch (DC/DC converter)
- IF locked
- J Synthesizer ready
- Internal error



Power supply

The teaching kit has two USB interfaces to supply it with power, a micro USB interface and a mini USB interface. You can use both interfaces to supply the teaching kit with power.

A USB cable for the micro USB interface is included in the delivery. If you want to use the mini USB interface for power supply, you have to use a corresponding cable.

Select the USB interface you want to use as a power supply with the jumper (5).

Position 1: Selects the micro USB interface as the power supply.

Position 2: Selects the mini USB interface as the power supply.



The ratings of the interfaces depend on the application.

- For measurements with an inactive baseband circuitry, the rating is 5 V DC at 450 mA.
Use the USB cable delivered with the teaching kit to connect it to another USB interface. You can use the USB interfaces on the R&S®FPC as the power source, for example.
- For measurements with an active baseband circuitry, the rating is 5 V DC at 750 mA.
Using the baseband connectors requires an external power supply with a rating of 5 V DC at 1 A. If an external power supply is required, the LED above the mini USB interface is illuminated.

Baseband state

If you want to use the I/Q modulator or demodulator, you have to activate the baseband signal path on the DIP switch (8).

Switch 7 controls the baseband input state. Move it into the "on" position if you want to use the baseband connectors. If you turn on the baseband, you have to use an external power supply as described under "Power supply".



Note that switch 1 has to be always "On". The other switches on this DIP switch are not supported.

Signal processing paths

The teaching kit has two signal processing paths, an upconverter and a downconverter that support frequencies between 85 MHz and 2700 MHz. Both signal paths have several signal processing sections.

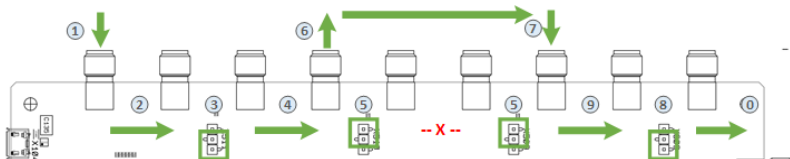
- an attenuator with variable signal attenuation
- an amplifier with a gain of approx. 18 dB at 836.5 MHz
- a bandpass filter with a 3 dB bandwidth of approx. 20 MHz at 836.5 MHz
- a mixing stage to up- or downconvert the signal
- an I/Q modulator or I/Q demodulator

Each section has an RF input and an RF output. Both signal paths have an additional I/Q input (upconverter) and output (downconverter) for measurements of baseband signals.

You can feed a signal into any of the inputs and use the R&S®FPC to measure the processed signal at any of the subsequent outputs. When you apply a signal, make sure not to overload the inputs and outputs (max. 0 dBm).

You can bypass or close any of the inputs and outputs by setting the corresponding jumpers.

Here's an example for the downconverter:



1. Feed the RF signal into the signal path.
2. The first section that the signal passes through is the attenuator.
3. Cover the jumper pins in front of the amplifier section as indicated in the image to bypass the first output.
4. The signal passes through the amplifier.
5. Cover the jumper pins in front of the bandpass filter as indicated in the image to close off the bandpass filter.
6. The signal bypasses the bandpass filter section (this is useful if you want to use your own filter, for example).
7. Feed the signal into the signal path.
8. Cover the jumper pins in front of the demodulator as indicated in the image to close the signal path.
9. The signal gets mixed to the LO frequency.
10. The signal is demodulated and the I and Q data streams are output on the I/Q output.

The signal path of the upconverter is the same, only in reverse order.

Attenuator

Both the upconverter and downconverter have an attenuator. Both signal paths have a DIP switch to select the attenuation (7).

Move one of the switches to its "Off" position (the side of the inscription).

Each switch corresponds to a specific attenuation. The switches are additive.



Example: If you move the "8 dB" and the "2 dB" switches to their "Off" position you get an attenuation of 10 dB. Thus, you can define an attenuation between 0 and 31.5 dB.

Switches 7 and 8 have no function.

Local oscillator configuration

The local oscillator (LO) can supply two different frequencies. The LO frequency is used by the mixer to change the frequency to the intermediate frequency (IF). You can select the frequency with the jumper (1).

Position 1: LO frequency of 233.5 MHz.

Position 2: LO frequency of 636.5 MHz.

Select this frequency if you are using the internal bandpass filter.



Synthesizer configuration

The synthesizer provides the frequency for the local oscillator. You can select the synthesizer state with jumper (2).

Position 1: Turns on the synthesizer.

Position 2: Resets the synthesizer.

A synthesizer reset is necessary when you change the LO frequency. After a reset, you have to switch the jumper to position 1 again.



Calibration kit

You can calibrate VNA measurements with the calibration kit. It provides all necessary calibration standards: a short, an open, a 50 Ohm match and a through.

The setting of jumper (6) selects the usage of connectors (C), (D) and (E) (labeled "Short" and "Open").

Position 1: Selects a short and open calibration.

Position 2: Selects a through calibration.



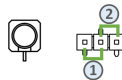
For a comprehensive description of the calibration procedures, refer to the R&S®FPC user manual.

IF PLL power supply

The jumper (4) selects the power supply type for the IF PLL.

Position 1: Selects a switching DC-to-DC converter as the PLL power supply.

Position 2: Selects a linear DC-to-DC converter as the PLL power supply.



You can measure the noise of the PLL power supply by measuring the signal on the X105 output. The switching converter produces more RF noise than the linear converter.

Service and maintenance

The R&S®FPC-Z10 is a replacement unit.

In case of malfunctions or defects, the whole unit is replaced instead of being repaired. Contact your local Rohde & Schwarz service center for replacing the product. You can find the current address of your representative at www.rohde-schwarz.com.