

High Precision EM Probe

Quick Start Guide



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The High Precision EM probe must be used according to the High Precision EM probe user guide. Any operation related to maintenance, repair or calibration must

be carried out by qualified personnel. Consequently, in case of failure, contact Riscure to find out about the procedure to follow.

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What is in the box

The box contains the HP EM Probe and all accessories to connect it to an oscilloscope.



Box content checklist

Qty [1]	Description		Identifier [2]
1	Probe: - High precision HP EM Probe core		Core unit
1	Probe: - High precision HP EM Probe base		Base unit
1	Power Supply Unit, 6 V DC input 100 V to 240 V AC, 50 – 60 Hz,		PSU
-	Power cable (included with PSU)	 Country specific	
1	Signal cable: BNC - BNC, 50 Ω , coax		BNC2BNC

Qty [1]	Description		Identifier [2]
1	Signal differential cable: Differential BNC coax cable		
	EM Probe tips: Ø 0.2mm Ø 0.5mm Ø 1.25mm		
-	This “High Precision EM Probe - Quick Start Guide”		

[1] The amount or number of registered items (quantity, Qty)

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

What does it do

The High Precision HP EM Probe is a very sensitive probe used for Side Channel Analysis (SCA). It picks up electromagnetic emissions from semiconductor circuits.

The probe has changeable tips with a directed coil and the probe has adjustable gain. The probe can pick up EM fields with frequencies up to 4.5 GHz and converts these into an AC signal.

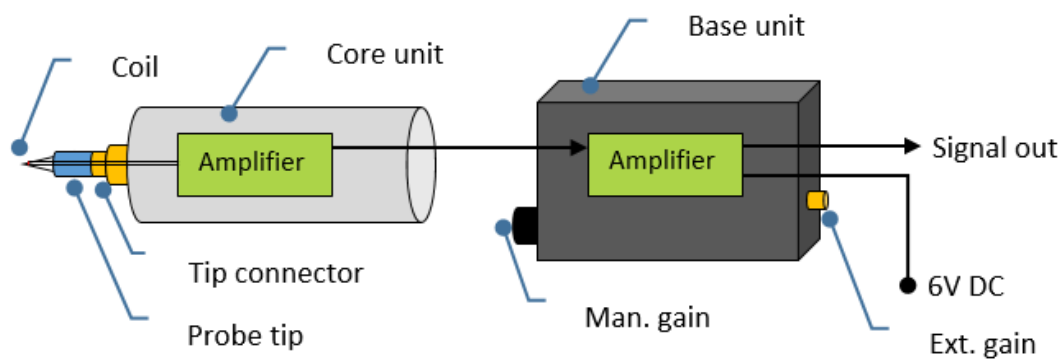


Figure 1 EM Probe construction details.

By moving the probe over the surface of a target, you will be able to find highly active circuits ('hotspots'). The signals picked up on such a hotspot are the measurements for Simple or Differential Electromagnetic Analysis (SEMA/DEMA).

The EM Probe is equipped with a variable gain mechanism. This will allow the user to tune the probe for low sensitivity and high sensitivity settings.

The HP EM Probe normally (but does not have to be used) will be used in combination with an XYZ-motion platform, for example the Riscure Probe Station

Using the probe

Connecting the probe

Connect the EM Probe with cable BNC2BNC to a measurement channel with 50 Ω impedance (or through a 50 Ω impedance adapter [not supplied]).

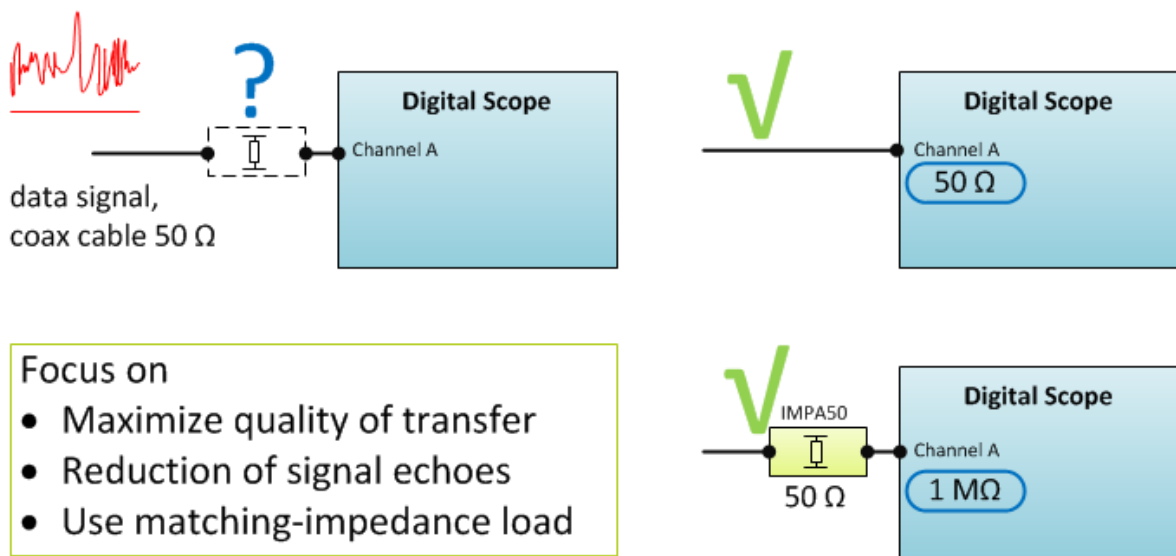


Figure 2 Reading the EM Probe signal with a matching impedance.



Do not apply any pushing force on the probe tip.

Pay attention when lowering the probe when under control of a XYZ-platform.



Do not drag the probe tip over the target.

Pay attention if the target surface is not parallel to the XY-motion plane of the probe tip.



Use the Inspector XYZ-plane calibration function where applicable to accommodate a slanted target surface.

Adjusting the gain

There are two methods of adjusting the probe sensitivity.

The first method is using the manual gain knob.

- Make sure the “man. gain on” LED indicator is lit up. If not, push the gain knob to switch to manual gain.
- Rotate the “man. gain” knob clockwise until the desired gain setting has been met.



Figure 3 Manual gain.



Use the engraved markers around the “man. gain” knob for easy reproducibility of the gain setting.

The second method is control gain through an external device that can put an accurate voltage for amplification of the signal by the internal amplifiers of the base unit.

- Make sure to pull the “man. gain” knob. The “ext. gain on” LED indicator will light up.

- Use a device (for example Riscure Spider) to provide an accurate voltage from 0V (low gain) to 3.3V (high gain) to the “ext. gain” SMB input to set the desired gain.



Figure 4 The “man. gain” knob is pulled out to enable external gain.



Do not use a control voltage greater than 3.3V

This results in damaging the EM Probe.

Mounting tips

To mount a tip on the EM Probe, follow these steps.

- Align the notch of the core unit connector with the tip
- Pull the tip over the connector
- Lock the tip by pulling on the brass part of the tip and turning it counter clockwise
- The tip is now locked in place

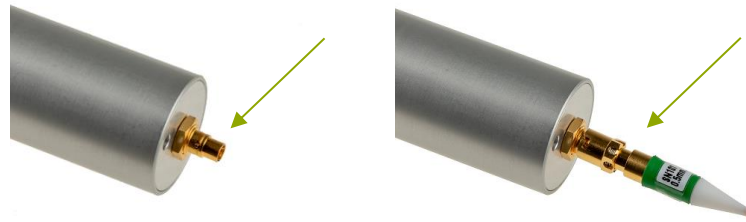


Figure 5 Mounting the tip to the Core unit

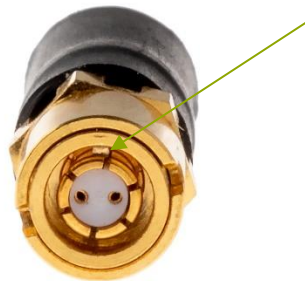


Figure 6 Pin on the tip

Connecting the Differential BNC cable

The differential BNC cable connects Core to Base unit.

Mount the differential BNC cable on Core unit by placing the notch against the pin of Core unit connector.

If connector does not slide in fully, rotate the end of the connector until it does.

Do the same at Base unit side.



Figure 7 Differential BNC Connector



Do not use force.

The connector might damage.



The Core unit will get warm over time.

Be careful when touching the unit.



The Core unit has airflow holes.

Do not cover them up. This will lead to overheating of the unit.



Figure 8 Core unit



Smaller probe tips produce weaker signals. To compensate, the oscilloscope sensitivity needs to be increased or probe gain.

Help and troubleshooting

Common problems

Bend or broken probe tip.	CAUSE: Probe damaged by unsupervised use.
	SOLUTION: Get in contact with Riscure through the Riscure Support Portal for a replacement.
Measuring 0 V values.	CAUSE: Probe is not powered.
	SOLUTION: Connect the probe's power jack to the PSU. Connect the PSU to mains power.
Measuring noise only (up to 50 μ V).	CAUSE: Probe is too far from target.
	SOLUTION: Place EM probe closer to target.
	CAUSE 2: Target emits a too weak EM signal.
	SOLUTION 2: Use the gain to increase probe sensitivity.
Measured samples show step-wise signal levels.	CAUSE: Low resolution of digitization.
	SOLUTION: Set the voltage range of the scope to a lower, more sensitive, value.
Compressed signal is 0 V.	CAUSE: The EM Probe returns an AC signal which averages to a zero signal.
	SOLUTION: In Inspector, apply the magnitude (or rectification) operator before compressing measurements.

Still have questions?

1. The Inspector Help menu, has detailed information on the HP EM Probe.
2. Visit the Riscure Support Portal: <http://support.riscure.com>.

Technical specifications

Operating conditions

- Room temperature 20 – 30 °C, (68 – 86 °F), preferred.
- Use the case to safeguard the probe when not in use.
- The probe case is grounded.



It is safe to operate a powered EM Probe with bare hands.

Power supply input

- 6V DC, nominal load 2 A
- Center-positive plug, inner-Ø 2.5 mm, outer-Ø 5.5 mm
- Requires a PSU with male plug.

Probe characteristics

- 4 stage amplification providing high sensitivity
- Amplifier bandwidth: -10dB @ 4.5Ghz / -20 @ 6Ghz
- Low self-noise: 2.5mV p-p in low position, 450mV p-p in high position.
- Variable spatial resolution. Depending on the selected tip.
- Differential amplification up to oscilloscope input
- Operating distance of probe tip to target: ≤ 2 mm
- Output signal: -2.5 V to +2.5 V
- Weight: Base-unit 151 g , Core-unit 50 g

Product case



Element	Function	Description
1	Signal out	BNC, Analog output -2.5 V ~ +2.5V (50 ohm)
2	Ext. gain	Control voltage input 0V ~ +3.3V (2.3k ohm)
3	Power in	Connector for the 6 V DC 2 A PSU
4	Probe tip	Multi-winding coil
5	Air flow holes	Convection of heat