



## Users and Service Manual

# RealProbe

**VEC-101**



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# RealProbe

## The Ultimate RF&Microwave In-Circuit Testing Tool.

### 1. General Information

#### Real Probe Overview

The RealProbe VEC-101 is used for in-circuit RF & Microwave signal measurements as a unique testing and troubleshooting tool. The RealProbe features unprecedented performance in a compact size, it's a passive device which enables fast and convenient in-circuit measurements and debugging.

VEC-101 does not require special feeding and can be connected via a proper sma cable to any relevant measurements equipment such as spectrum analyzer, network analyzer, power meter, frequency counter, etc.

#### VEC101 Kit Contents

- RealProbe **tool**.
- RealProbe **pocket package**: a special pocket package used for carrying and protecting the probe.

#### Available Optional Accessories

There are several options available for the RealProbe.

- VEC-104 – RealProbe calibration jig for best power measurements accuracy.
- VEC-105 – 1meter RealProbe adapted flexible RF cable for accurate and comfort measurements with male SMA connectors.

#### Preventive Maintenance

The best techniques for maintaining the integrity of the Product includes:

- Always store the RealProbe tool in its original pocket package when not in use.
- Never store the RealProbe loose in box, in a desk, or in a bench drawer.
- Keep the RealProbe clean. Use fine duster and alcohol to clean the probe body and its connectors if required.
- Prevent wetness, dust and dirt.
- Prevent accidental downfall.
- In order to prevent damage to the bottom spring connectors, do not activate perpendicular force on them.

#### Electrostatic Discharge

Protection against ESD is recommended while probing circuits with sensitive components. To prevent damage to the probed circuits:

- Wear a grounded wrist strap.
- Use a grounded, conductive table mat.

## 2. Specifications

### Electrical specification

Frequency Range:	10MHz – 4GHz(Usable to 6GHz)
Max average input (probed) power:	2 watt
Max Peak (probed) power:	25 watt
Max Input Voltage:	30V DC
Residual Insertion Loss on probed line:	0.5dB nom.
Residual Return Loss on probed line:	18dBr nom.
Probing factor (Coupling):	25dB ( $\pm 0.5$ dB) nom.
Typical 1dB Probing factor:	6GHz
Coupling output Return Loss:	18dBr nom.
Equipment output Impedance:	50 ohm
Input/Output DC blocked	

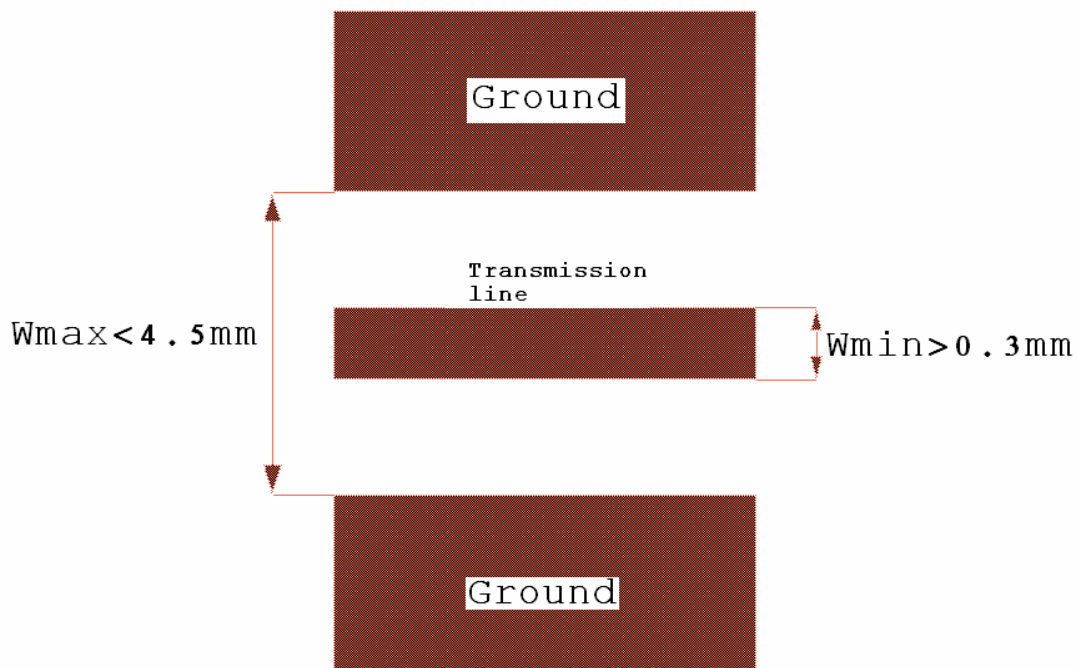
#### Note:

All Electrical performances are related to 50ohm microstrip or back grounded coplanar, with proper side grounds and matched source/load impedance.

### Mechanical specification:

Center spring probe	
• diameter	0.4mm
• max travel	0.5mm
Side spring (ground) probe	
• diameter	1mm
• max travel	1.4mm
Spacing between center and side spring	2.5mm

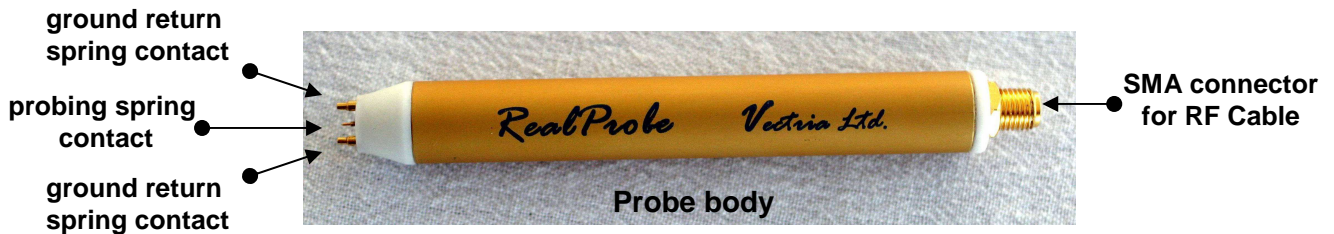
### Layout Recommendations



Operating Temperature

+5°C to +40°C

### 3. How to use Vectria's RealProbe



#### Basic Measurements

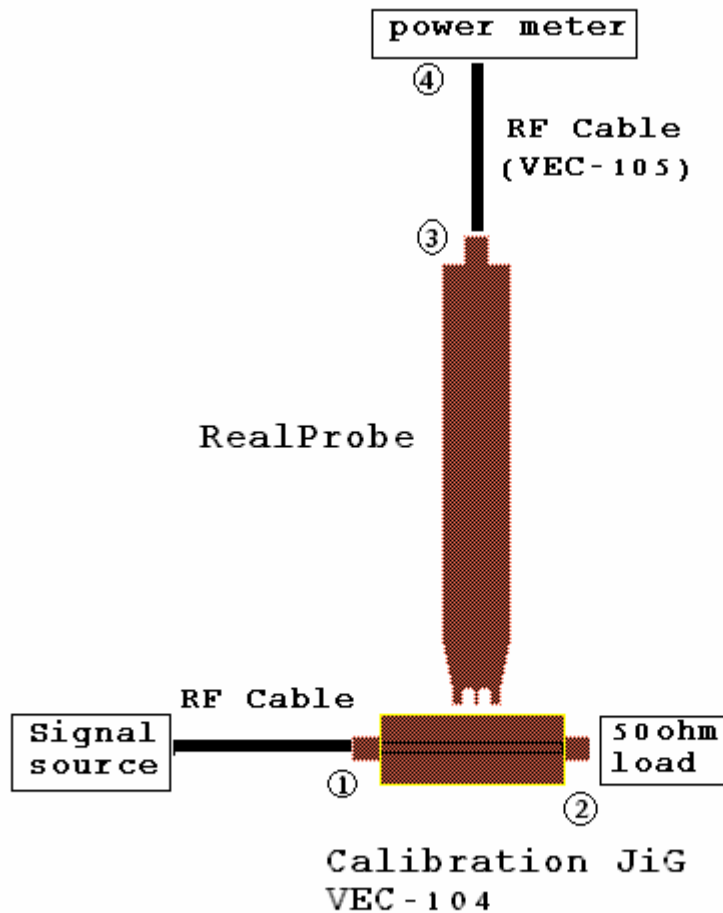
1. Carefully connect the SMA connector of the probe to an RF cable.
2. Connect the other side of the RF cable to the measurement Instrument, such as, spectrum analyzer, network analyzer, power meter etc.
3. Use light force to make gentle contact at all points of the bottom pins to the probed line and its side grounds.
4. Hold the probe above the probed transmission which is under test and perform the measurement.
5. In case of absolute power measurements add 25dB to the measurement (the coupling factor of the probe).

#### Best Power Measurements Accuracy With calibration jig VEC-104 (Use Calibration Drawing Setup in the next page)

1. Connect one port of calibration jig VEC-104 to a signal source.  
**P (input)** = Output power of the signal source after the RF cable (point no. 1 at the Drawing).
2. Connect the other side of the calibration jig VEC-104 to a broadband 50 ohm load (point no. 2 at the Drawing).
3. Carefully connect the SMA connector of the probe to a proper RF cable, preferably VEC-105 (point no. 3 at the Drawing).
4. Connect the other side of the RF cable to a power meter, which is calibrated to the relevant frequency (point no. 4 at the Drawing).
5. Use light force to make contact between the bottom pins to the probed line and its side grounds.
6. Place the probing pin of the RealProbe between the markers on the calibration jig.
7. Hold the probe above the probed transmission line, which is under test, and perform set of measurements in the relevant frequencies that are of interest = **P (measured)**.

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## Calibration Setup Drawing



- 8 . Prepare a table with accurate probing factor =CF (Calibrate Factor).

Use the following equation to calculate CF:

$$CF = P(\text{input}) - P(\text{measured}) + HWJL$$

$$HWJL = \text{half way jig loss} \longrightarrow$$

- 9 . After you finished the calibration process you can perform very accurate power measurement by adding the calibration factor CF to the measurement. Use the following equation:

$$P(\text{probed}) = P(\text{measured}) + CF [\text{dB}]$$

HWJL Table

Freq [MHz]	Loss [dB]
10	0 . 01
1000	0 . 05
2000	0 . 07
3000	0 . 08
4000	0 . 09
5000	0 . 11
6000	0 . 13

### Gain Measurements using a Network Analyzer:

1. Use existing network calibration for the required frequency band or perform a normal new calibration.
2. Connect the Calibration jig VEC-104 to network port 1. output (or signal generator output for SNA, at output of the cable used for the network calibration). Connect 50ohm termination to the other side of the VEC-104.
3. Connect the probe output to the network port 2. input (or detector input for SNA) directly, or preferably through the flexible cable VEC-105.
4. Place the probing pin of the RealProbe between the markers on the calibration jig for sampling the RF signal on the VEC-104 calibration jig.
5. Use averaging factor of 100, Save S21 or transmission data to memory, display DATA/MEMORY, Check for transmission S21 ~0db using the marker readout across the band.
6. Disconnect network port 1. from the calibration Jig VEC-104, connect the network port 1. to your device under test input and use the RealProbe to measure the gain from input to the each sampled point along the circuit.

Notes : 1. Use terminations at the DUT outputs.  
 2. If VEC-104 calibration jig was not purchased, use the above procedure on a reference point at the circuit's input.

### 4. RealProbe Accessories Performance

<b>VEC-104 Calibration Jig :</b>	Return Loss 10MHz – 6GHz	: 20 dbr
	Insertion Loss @ 10MHz	: 0.02 db
	500MHz	: 0.046 db
	800MHz	: 0.068 db
	1GHz	: 0.1 db
	2GHz	: 0.14 db
	3GHz	: 0.16 db
	4GHz	: 0.18 db
	5GHz	: 0.22 db
6GHz	: 0.26 db	

<b>VEC-105 Flexible Cable :</b> (Highly flexible)	Return Loss 10MHz – 6GHz	: 20 dbr
	Insertion Loss @ 10MHz	: 0.25 db
	500MHz	: 0.60 db
	800MHz	: 0.75 db
	1GHz	: 0.85 db
	2GHz	: 1.20 db
	3GHz	: 1.50 db
	4GHz	: 1.75 db
	5GHz	: 2.05 db
6GHz	: 2.30 db	