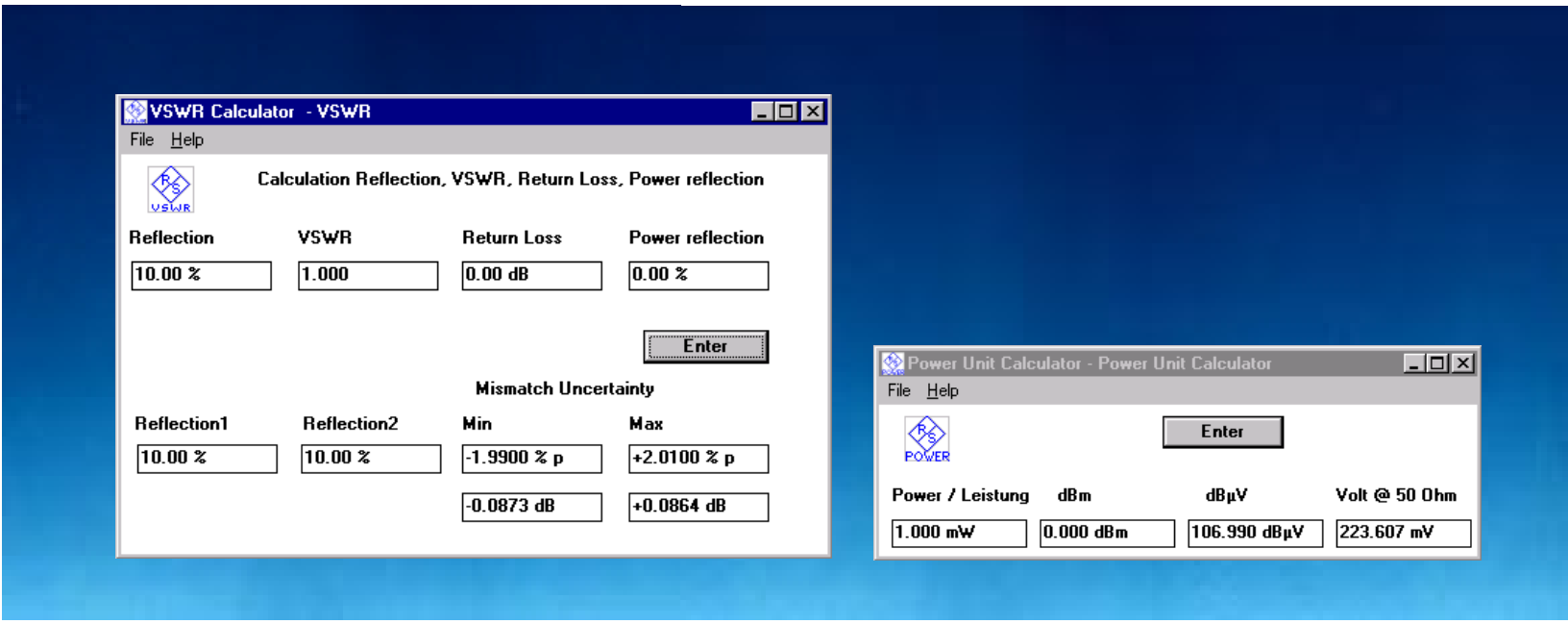


Conversion Calculators for Power Units and VSWR / Reflection

Application Note 1MA12_0E

Products:

Subject to change - Jon Pedersen 98-05

ROHDE&SCHWARZ

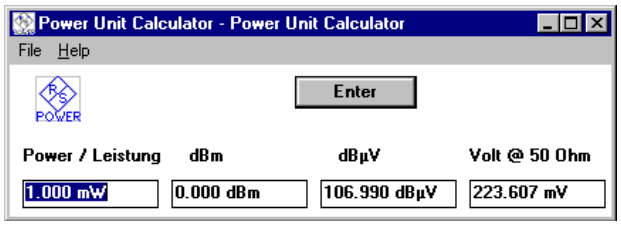
Contents

1. Overview

This Application Note describes two programs for calculating conversions:

- The Power Unit Calculator
  Power, **dBm**, **dBµV** and **Volts @ 50 Ω**
- The VSWR Calculator
  Reflection, **VSWR**, **Return loss** and **Power reflection**
  Reflection$_s$, Reflection$_l$ to Mismatch Uncertainty

2. Power Unit Calculator



The Power Unit Calculator is a program for power unit conversion.

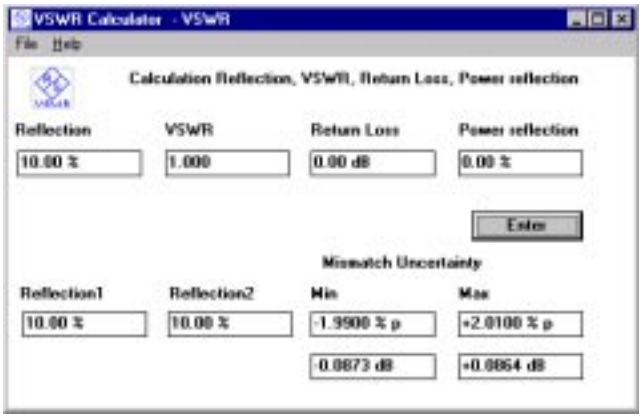
It converts the following units:
- Power in Watts
- dBm
- dBµV
- Volts at 50 Ω

Enter a value in any field, and all the other values are calculated and displayed.

Formulas used:

$$P\ /\ \mathrm{dBm} = 10 \cdot \lg(P\ /\ \mathrm{W}) - 30$$
$$U\ /\ \mathrm{dBmV} = (P\ /\ \mathrm{dBm}) + 106.9897$$
$$P\ /\ \mathrm{W} = 10^{(P/10\mathrm{dBm})} / 1000$$
$$U\ /\ \mathrm{V} = 10^{(U/\mathrm{dB}\mu\mathrm{V})}\cdot 1\mathrm{e}\text{-}6$$
$$P\ /\ \mathrm{dBm} = (U\ /\ \mathrm{dB}\mu\mathrm{V}) - 106.9897$$
$$U\ /\ \mathrm{dBmV} = 20\lg((U\ /\ \mathrm{V}\ ) / 1e-6)$$

3. VSWR Calculator



The VSWR Calculator is a program for reflection unit conversion.

It converts the following units:
- VSWR
- Reflection
- Return Loss
- Prefl (Power reflection)
- Reflection$_s$, Reflection$_l$ to Mismatch Uncertainty

Enter a value in any field, and all the other values are calculated and displayed.

Formulas used:

$$s = \frac{1+r}{1-r}$$
$$a\ /\ \mathrm{dB} = 20 \cdot \lg\frac{s+1}{s-1}$$
$$\frac{P_{refl}}{P_{vorw}} = \left(\frac{1}{10^{a/20\mathrm{dB}}}\right)^2$$
$$r = \frac{s-1}{s+1}$$
$$s = \frac{10^{a/20\mathrm{dB}}+1}{10^{a/20\mathrm{dB}}-1}$$
$$a\ /\ \mathrm{dB} = 20 \cdot \lg\frac{1}{\sqrt{P_{refl}\ /\ P_{vorw}}}$$

Mismatch Uncertainty:

$$M_u\ \max = 100 \cdot \left[\left(1 + r_g r_l\right)^2 - 1\right]$$
$$M_u\ \min = 100 \cdot \left[\left(1 - r_g r_l\right)^2 - 1\right]$$

r_g = Generator reflection
r_l = Load reflection

4. Hardware and Software Requirements

Hardware Requirements

The program will run on any IBM AT compatible computer with

- CPU: 486, Pentium or better; clock rate >100 MHz
- RAM: > 32 Mbyte (for Windows NT >48 Mbytes)
- Monitor: VGA color monitor minimum 800x600 recommended 1024x768

Software Requirements (Operating System)

- Windows 3.x, Windows 95 or Windows NT (version 4.0 or later)

5. Installing the Software

The Conversion Calculator Programs are supplied as a packed file.

1) Download the ConvCalc.exe file to a temporary directory.
2) **Run the ConvCalc.exe file**.

The installation programs are expanded to the directories **C:\ConvCalc \DiskImm\ Disk1** and **C:\ConvCalc \DiskImm\Disk 2**

To install the Conversion Calculator Programs from the hard disk **run setup.exe** in **C:\ConvCalc \DiskImm\ Disk1**.

The setup program prompts for all necessary inputs.

After installing the program the directory **C:\programs\Rohde&Schwars\ ConversionCalculators** contains the following files:

VSWR.EXE	VSWR.HLP
W_DB.EXE	W_DB.HLP

6. Starting the Software

Start the program with:

Start\programs\Rohde & Schwarz\ConvCalc

VSWR (VSWR Calculator)

W_DB (Power Unit Calculator)

or in the installed directory double click on

VSWR.EXE

W_DB.EXE

ROHDE&SCHWARZ

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