POWERSOURCE1

speag

POWERSOURCE1

Handbook V 1.0

Schmid & Partner Engineering AG

March 21, 2023

Contents

General

Environmental Requirements

The *POWERSOURCE1* system works best in the following environmental conditions:

- Temperature range: 10 °C - 30 °C.
- Humidity 30% - 90% non condensing.
- Atmospheric pressure 860 hPa - 1060 hPa

The calibration is valid for $22\,^{\circ}\mathrm{C} \pm 4\,^{\circ}\mathrm{C}$.

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Declaration of CE Conformity

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Declaration of CE Conformity

Item / Configuration	POWERSOURCE1
Type / Version No	SE UMS 160 A
Manufacturer / Origin	Schmid & Partner Engineering AG Zeughausstrasse 43 CH-8004 Zürich Switzerland
Contact	support@speag.com Tel. +41 44 245 9700

General

POWERSOURCE1 is a CW signal source for the frequency range 600 – 6000 MHz with levels up to +17 dBm. It is powered by 5V DC via a USB cable from a separate CE compliant supply or computer. Operating frequency and power level can be selected with buttons and monitored on the LCD display. The output signal is available from a 50 Ohm SMA connector for connection to a matched load.

Electromagnetic Radiation

RF signals from the POWERSOURCE1 are usually connected to SAR system reference antennas. To avoid radiation of unlicensed signals in the environment, the unit shall only be operated in shielded rooms. The user is responsible to comply with the local emission rules.

CE Conformity

We declare that the POWERSOURCE1 is compliant with the directives

2004/108/EC EMC

according to the harmonized standards

EN 61000-6-2:2005 Susceptibility, industrial
EN 61000-6-4:2007 Emissions, industrial

Date 14.4.2016

Signature / Stamp F. Bomholt, Hardware R&D

Part I

System Description

Chapter 1

Hardware Overview

1.1 Components

The *POWERSOURCE1* consists of the components listed in Table 1.1. Photographs of the components are displayed in Figure 1.1.

(a) *POWERSOURCE1*

(b) USB cable

(c) Set of USB cables

Figure 1.1: Components of a *POWERSOURCE1* system.

Item	Name	Description
a	*POWERSOURCE1*	RF power source
b	USB cable	USB-Dual Cable, 1.8m length
c	USB cables	Set of 2 cables: one for charging (10cm) and one for connecting a power bank* to *POWERSOURCE1* (50cm) * not included in the delivery

Table 1.1: Components of the *POWERSOURCE1* system.

1.2 Specifications

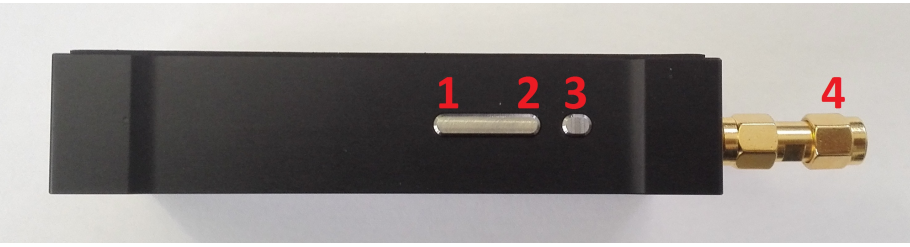
Operating Frequency*	600, 650, 750, 835, 850, 900, 1300, 1450, 1500, 1640, 1750, 1800, 1900, 1950, 2000, 2100, 2300, 2450, 2550, 2600, 3000, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5200, 5250, 5300, 5400, 5500, 5600, 5750, 5800, 5850 MHz
Signal Type	Continuous Wave
Output Power	-5.0 dBm to +17.0 dBm
RF Connectivity	1 male SMA port
Power Supply	5 V DC, via USB type B mini jack or USB-C jack
Power Consumption	<3 W
Dimensions	$93 \times 46.5 \times 19\,\text{mm}^3$ for s.n. below 4100 $93 \times 46.5 \times 22\,\text{mm}^3$ for s.n. above 4100
Weight	0.11 kg for s.n. below 4100 0.14 kg for s.n. above 4100
Accessories	USB-Cable
Calibration	Annual calibration is recommended for optimal performance. Calibration is performed to SPEAG's high-quality standards.

* full list available only for firmware revisions >2.011 of the USB-C version

Specifications apply under the following conditions: 5 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to. Data designated "overrange" or "low" and data without tolerance limits is not binding.

1.3 Features

The below photographs show different views of the *POWERSOURCE1* and provide a short description for all elements:



1. Down-Button
2. Up-Button

3. Menu-Button
4. SMA Connector (male)

5. USB mini Type B connector. This is replaced by a USB-C connector for devices with serial number above 4000.

6. Display

Chapter 2

Handling and Precautions

2.1 Radiated Emission Compliance

The *POWERSOURCE1* is a radio-frequency transmitter. Ensure that you comply with your local radiated emission regulations. It is recommended to use the *POWERSOURCE1* only inside a shielded room environment when a radiator is connected.

2.2 Output Port Matching

Ensure that the *POWERSOURCE1* output port is safely terminated into a 50Ω load before turning on the power. Never operate *POWERSOURCE1* without a load. In most cases, *POWERSOURCE1* will withstand a certain mismatch level without damage. However, operation with poor loads is discouraged. This might happen if a validation dipole is used at a frequency different from its operating frequency. If prolonged operation with poor or unknown loads is expected, an external device such as attenuator, isolator or circulator should be used to protect the amplifier in the *POWERSOURCE1*.

2.3 SMA Male-Male Connector Saver

Every *POWERSOURCE1* with serial number below 4000 is calibrated including an SMA male-male connector saver. *Never remove the connector saver from the POWERSOURCE1. If removed factory calibration will be void.*

2.4 Use of a torque wrench

Please use a calibrated torque wrench when attaching *POWERSOURCE1* to your setup. A torque wrench avoids damage due to over-tightening and

helps connectors achieve their rated lifetimes. Tighten until the "break" point of the torque wrench is reached. Do not push beyond initial break point.

2.5 Connector care

Please inspect the RF connectors of the DUT and the *POWERSOURCE1* prior to use. Look for dirt and outer/inner conductor damage before attaching. In case of dirt, apply compressed air to dislodge larger debris. Make use of isopropanol moistened foam cleaning swabs to remove remaining dirt. Dry the connectors using compressed air. Make sure to align the connectors on the DUT and *POWERSOURCE1* along a common axis before tightening. Turn the outer connector nut, not the DUT or the *POWERSOURCE1* itself.

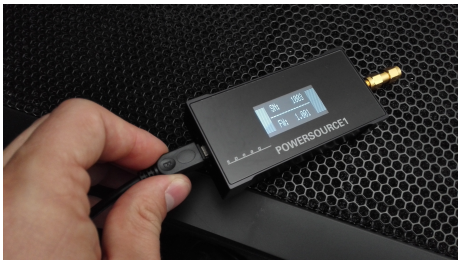
Chapter 3

System Installation

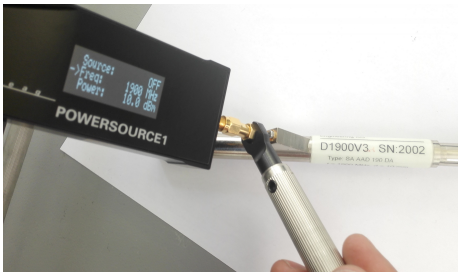
3.1 Hardware Installation

This section provides a walkthrough for setting up the *POWERSOURCE1* system hardware.
Start with taking the *POWERSOURCE1* out of the transport case. Note that it is delivered with a special USB-dual cable. If a PC is used, both USB Type A plugs, should be connected to active USB ports. In case a dedicated USB power supply capable of providing $\geq$ 1A current is used, only one of the plugs is enough for powering the device.

Connect the USB cable with the two Type A connectors to the computer. Connect the USB Type B mini to the *POWERSOURCE1*.

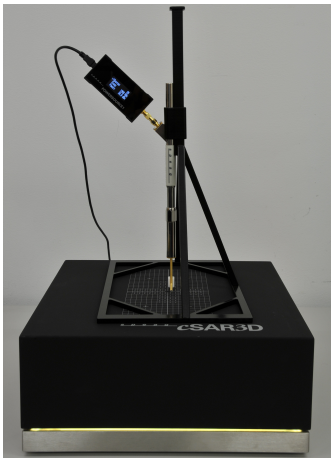


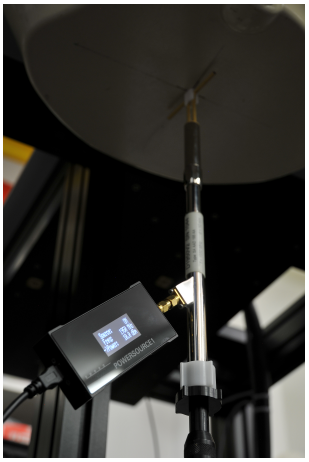
Once the POWERSOURCE1 is on, the display will show the Serial Number and the Firmware Version for 3 seconds. After the initialization, the device goes into a default state:
Source: OFF
Freq:(first from the predefined list)
Power: -5dBm



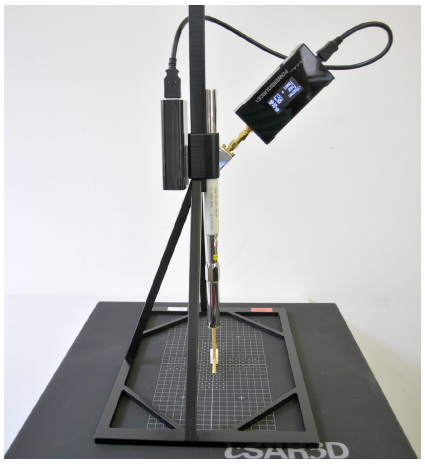
Connect the verification dipole as shown on the left. Tighten using a torque wrench.

Place the dipole with the *POWERSOURCE1* into the dipole holder on the cSAR3D or below the DASY phantom as shown on the left.





Since *POWERSOURCE1* is a USB-powered device, it can be used in portable setups too - for example connected to a laptop or powered with an external power bank (not part of the delivery). The picture below shows an application example, where a power bank is attached to a dipole holder and feeds the *POWERSOURCE1* during dipole validations. Using it, makes the whole validation process easier, since there are no fixed cables in the way.



3.2 Software Installation

The *POWERSOURCE1* can be controlled remotely via a serial communication over the USB interface. The use of this interface has been tested under MS Windows 7,8, 10, and 11. This section explains how to install the required driver.

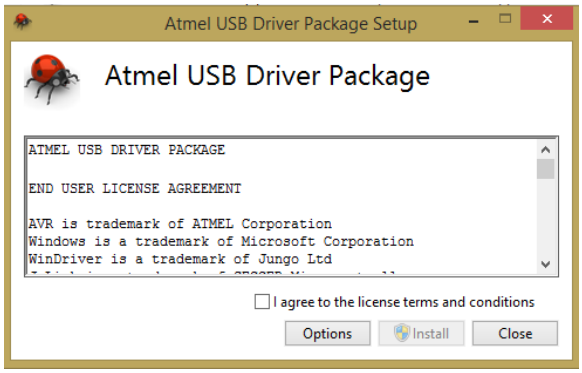
3.2.1 Windows Driver Installation

The following section describes the driver installation under Windows 7, 8 and 8.1. Please note that devices with firmware version newer than v1.200 are using an updated driver. The firmware version is displayed when the device is powered up.

Firmware version older than v1.200

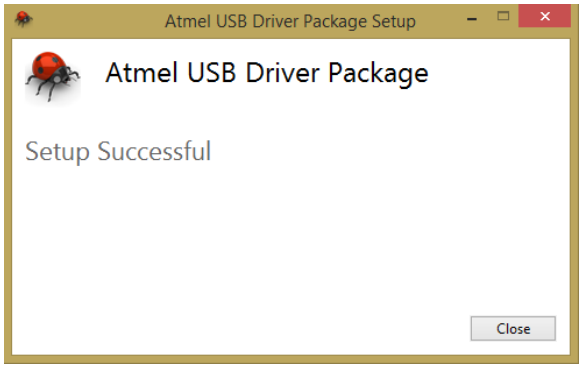
1. Please contact support@speag.com in order to receive the required driver package. The current version is: driver-atmel-bundle-7.0.888.exe.

2. Execute the file.

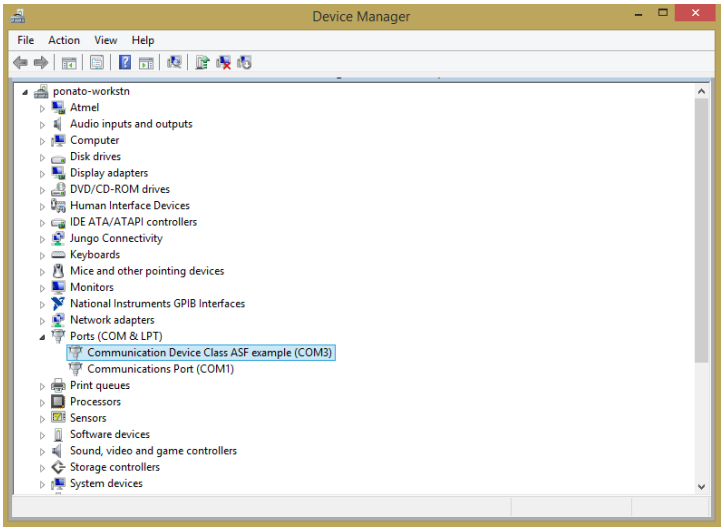


3. Agree to the license terms and press Install.

4. Wait until the installation is finished.



5. Press Close.
6. Connect the *POWERSOURCE1* to the computer.
7. Open the MS Windows Device Manager. The device manager can be found under Control Panel|System of your PC. The *POWERSOURCE1* is now available as a new COM port interface on your computer:

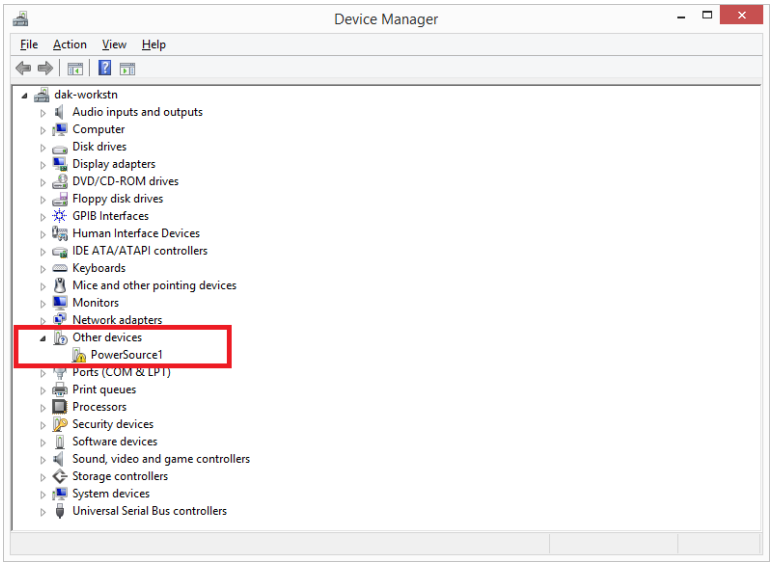


Firmware version newer than v1.200

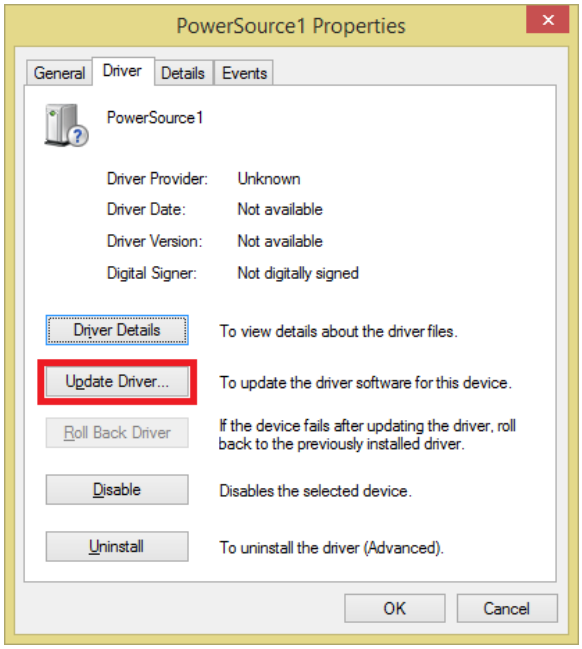
1. Please contact support@speag.com in order to receive the required `ps1_cdc` driver package.

2. Extract the zip package in a local folder. It contains 2 files: one *.cat and one *.inf file.

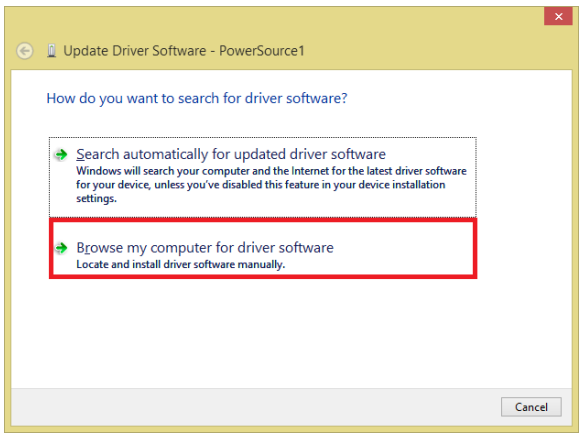
3. Once the *POWERSOURCE1* is connected to one of the USB ports of the PC, go to *Device Manager*. It can be found under Control Panel|System of your PC. If the driver is not installed, the *POWERSOURCE1* will be listed under *Other Devices*:



4. Double-click on it, go to the *Driver* tab and click on *Update Driver...*

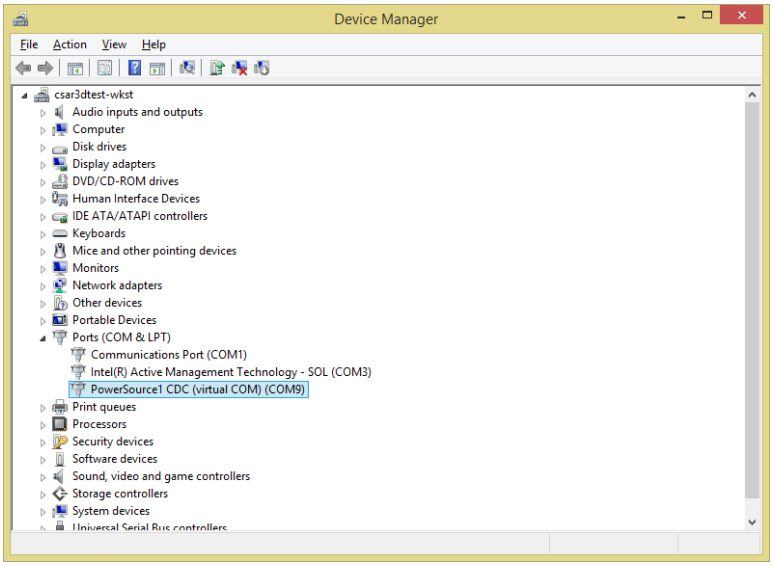


5. Select *Browse my computer for driver software* and locate the folder where you unzipped the driver package.



6. Windows might pop-up a security warning. Click on *Install* to continue.

7. Upon successful installation of the driver, the Device Manager will list the *POWERSOURCE1* under *Ports (COM & LPT)* as a new COM port interface, as shown below. The hardware is ready to use now.



In Windows 10 and 11, the user is not required to install the driver. After plugging the USB cable, Windows recognizes the device and installs the requried driver automatically.

Note: the COM interface number depends on the USB port the POWERSOURCE1 is connected to. We recommend to always use the same port on the PC in order to maintain the same COM address. In rare cases when the POWERSOURCE1 COM interface appears unavailable the Windows COM driver stack may have locked up. In this case a reboot of the PC will resolve the issue.

Chapter 4

Operation

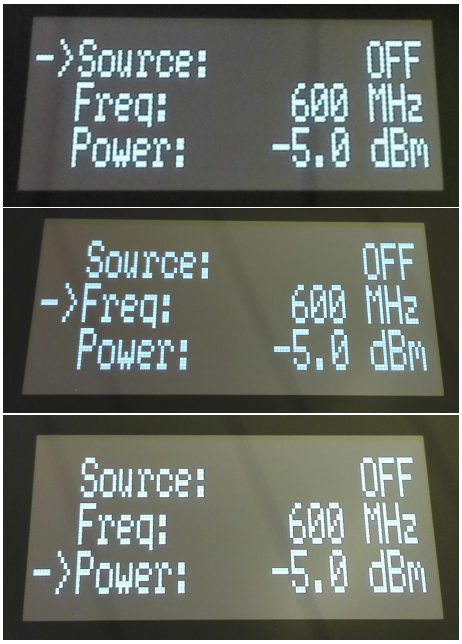
4.1 Manual Use

The *POWERSOURCE1* is a very simple to use device. The desired settings can easily be made with the three buttons. Set up the *POWERSOURCE1* as described in Chapter 3. The Menu-Button is used for selection. The UP-/DOWN-Buttons are used for changing the value of the selected parameter.

Source: ON or OFF

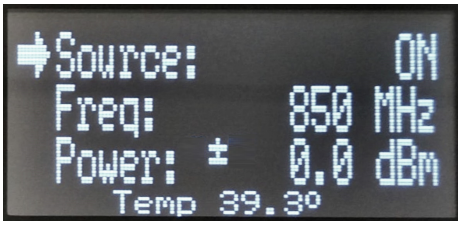
Freq: frequency list (up to 8 frequencies, see Section 1.2)

Power: -5dBm to +17dBm

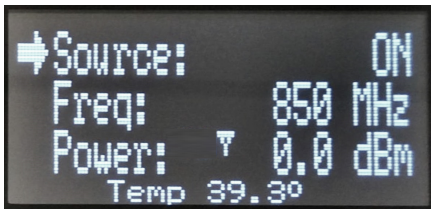
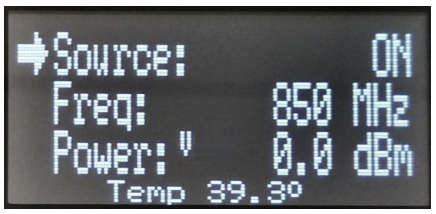


After setting all parameters, the *POWERSOURCE1* can be turned on. Until the defined output power is reached, the power display (in this case -5.0 dBm) will flash for <7 seconds. A small ± sign in front of the power level is indicating that the *POWERSOURCE1* is approaching the target power.

POWERSOURCE1 approaching the target power indicated by a small ± sign in front of the power level reading.



4.2 Troubleshooting

The defined power level flashes >8 s with a small antenna sign in front of it. 	The Return Loss at the output of the *POWERSOURCE1* may be <10dB. Check the RF connections. Ensure that the *POWERSOURCE1* is loaded with a load matched at the operating frequency.
A small V letter is shown in front of the power level reading. 	Please contact support@speag.com for further instructions.
POWERSOURCE1 does not turn on	Current over USB might be too low: • Are you using the dual USB cable with both plugs connected to active USB ports? • Are you using the *POWERSOURCE1* on a mobile device?

4.3 Remote Command Interface

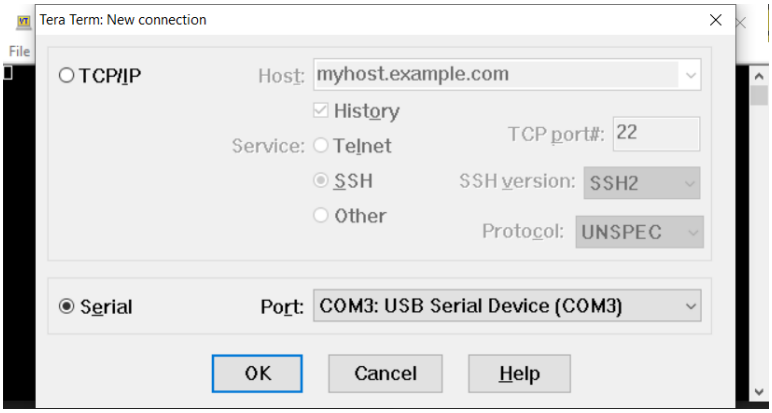
Table 4.1 summarized the SCPI command interface of the *POWERSOURCE1* . Capital case letters in the command are mandatory. Default arguments are identified by [].

Table 4.1: *POWERSOURCE1* remote interface SCPI command list.

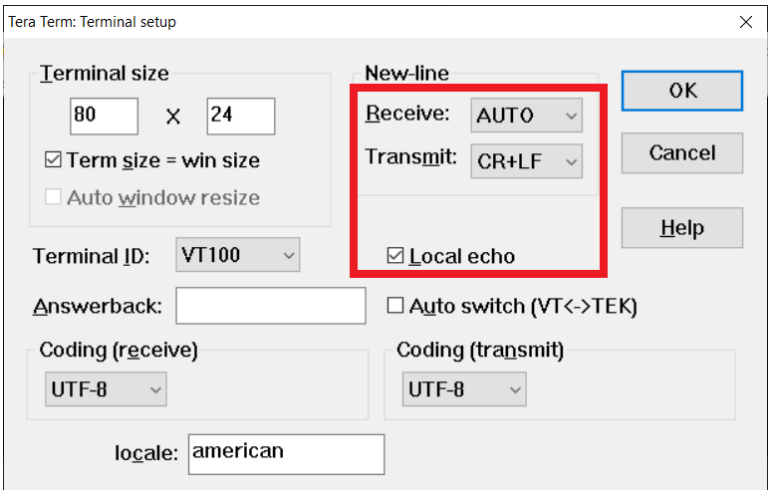
Command		Arguments	Functionality
Level 1	Level 2		
*IDN?			Returns the identification of the *POWERSOURCE1*.
*CLS			Clears the actual state of the *POWERSOURCE1*.
*RST			Resets the *POWERSOURCE1*.
:Help?			List of commands
:LOCKED?			Checks device locking state (power level blinking or not?). Returns '0' (blinking, not locked) or '1' (stable, locked)
:SET	:POW	dBm	Set the output power -5 to 17
:SET	:POW?		Returns actual power
:SET	:FREQ	INT in MHz	Set frequency (see Section 1.2)
:SET	:FREQ?		Returns actual frequency
:SET	:DEV	([OFF],ON)	Set the output ON/OFF
:SET	:DEV?		Returns output state
:SET	:LIST	INT in MHz	Set frequency list (up to 8) for manual usage
:SET	:LIST?		Returns frequency list
:SYSTem	:MEAS?		Returns measured Power
:SYSTem	:INFO?		Returns versions and other system information
:SYSTem	:ADC?		Returns ADC Values
:SYSTem	:DATE?		Returns calibration date

4.3.1 Device control via a terminal application

POWERSOURCE1 can be controlled via a Terminal emulator, for example Tera Term, PuTTy etc. Tera Term is available for download from this address:
`https://ttssh2.osdn.jp/index.html.en`
The instructions below are based on Tera Term version 4.102. After successful download and installation, the application can be started by double-clicking on the desktop shortcut. The user has to select the correct COM port in order to establish a Serial Port connection to *POWERSOURCE1*. In this example this is COM3.



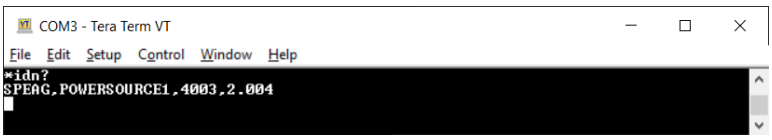
Go to Setup->Terminal and make sure that Local Echo is check-marked and the New Line settings are matching the picture below. Select Setup->Save Setup... and click OK to store these settings.



Now, the commands from Remote Interface section can be used to communicate with the *POWERSOURCE1*.
Note: Make sure that you input any commands without typos. Using Backspace and Delete to correct any possible errors will result in an error when transmitting the command.

4.3.1.1 Reading IDN

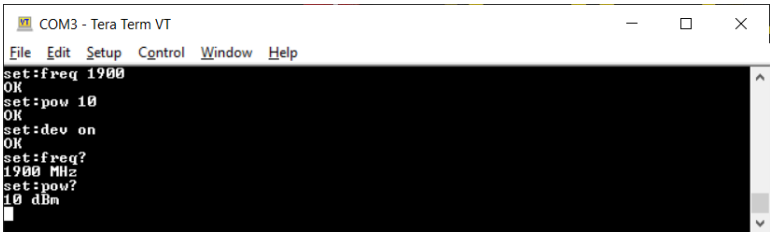
The following example reads the identifier string of a *POWERSOURCE1* connected via the COM3 port. Write *idn? in the Tera Term window and press OK. *POWERSOURCE1* responds with its identifier string inside the Tera Term window.



4.3.1.2 Set the Frequency, Power and Switch the Source On

The following commands can be used to configure the *POWERSOURCE1* frequency and output power and to switch the unit on. The command sequence used to do this is the following:

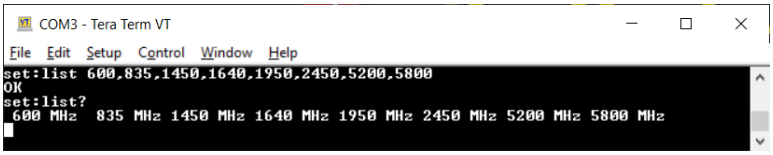
- set:freq 1900 - sets the frequency to 1900MHz
- set:pow 10 - sets the power to 10dBm
- set:dev on - switches the *POWERSOURCE1* on.
- set:freq? - returns the frequency
- set:pow? - returns the power



4.3.1.3 Set the Frequency for Manual Use

To use a preferred frequency list without Python™ or a terminal, up to eight preset frequencies can be programmed to the *POWERSOURCE1*. This can be achieved with the following commands:

- set:list 600,835,1450,1640,1950,2450,5200,5800 - up to 8 frequencies can be set for the manual mode
- set:list? - returns the frequency list



4.3.2 Remote Control Example

POWERSOURCE1 can be controlled using Python™ too. The examples below are based on Python™ 2.7 and pyVISA 1.4.

4.3.2.1 Reading IDN

The following example reads the identifier string of a *POWERSOURCE1* connected via the COM6 port. The resource name in this case is ASRL6.

```
import visa # this imports visa
PowerSource_IF = "ASRL6"   #this defines the COM Port
ps = visa.instrument(PowerSource_IF, term_chars=visa.LF)
      # this creates the instrument variable ps, which
   is used for all further operations.
print ps.ask("*IDN?")    # instead of separate write and
   read operations, we use ask() and print the result
   from it.
```

After successful execution of this script, the following text is shown as a Python™ Console Output:

```
SPEAG,POWERSOURCE1,1007,0.0207
```

The response is containing the name of the manufacturer, the product identifier, the serial number and the firmware version of the device.

4.3.2.2 Set the Frequency, Power and Switch the Source On

The following example configures the *POWERSOURCE1* frequency and output power and switches the unit on:

```
import visa # this imports visa
PowerSource_IF = "ASRL6"
ps = visa.instrument(PowerSource_IF, term_chars=visa.LF)
ps.ask("SET:FREQ 1900")    # set the frequency to 1900MHz
ps.ask("SET:POW 10")    # set the power to 10dBm
ps.ask("SET:DEV ON")    #switch the POWERSOURCE1 on.
print ps.ask("SET:FREQ?")  #returns the frequency
print ps.ask("SET:POW?")      #returns the power
```

Python™ console example output:

```
OK,SOURCE,ON
1900 MHz
10.0 dBm
```

The *POWERSOURCE1* changed now his status to ON. The frequency and power are correctly set.

4.3.2.3 Set the Frequency for Manual Use

To use a preferred frequency list without Python™ or a terminal, up to eight preset frequencies can be programmed to the *POWERSOURCE1*:

```
import visa
PowerSource_IF = "ASRL6"
ps = visa.instrument(PowerSource_IF, term_chars=visa.LF)
ps.ask("SET:LIST 600,835,1450,1640,1950,2450,5200,5800")
   #up to 8 frequencies can be set for the manual mode.
print ps.ask("SET:LIST?") #returns the frequency  list
```

Python™ Console Output:

```
600MHz  835MHz 1450MHz 1640MHz 1950MHz 2450MHz 5200MHz 5800MHz
```

The Python™ console shows the eight preset frequencies.