Using Mini-Circuits' Portable Test Equipment (PTE) Hardware - Frequently Asked Questions (FAQs)

Keyword Cross Reference

Questions

1. How quickly can I sweep the attenuation on a RUDAT / RCDAT programmable attenuator?

Mini-Circuits' RUDAT / RCDAT models include advanced firmware that allows you to program a fast sweep or hop sequence into the device's internal memory. This allows you to avoid the inherent communication delays (typically in the order of 2-10 ms or more over USB or Ethernet, depending on the PC configuration) when the software is issuing each individual attenuation command to the attenuator. This firmware allows a minimum dwell time in the order of hundreds of microseconds at each attenuation step, with a typical switching time in the order of hundreds of nanoseconds (see individual model datasheets for precise specifications).

2. What attenuation level will the RUDAT / RCDAT programmable attenuators power up with?

By default the attenators will start up with the maximum attenuation loaded but this setting can be changed by the user, either programmatically or using the provided GUI. The start-up options available are:

1. Load the maximum specified attenuation value
2. Load last remembered attenuation value
3. Load a specific attenuation value

In cases 2 and 3, the attenuator will momentarily assume the maximum attenuation state on start-up before reverting to the user specified state.

3. Can I set the attenuation of a RUDAT attenuator and then disconnect the computer?

It is possible to set the attenuation and then disconnect the computer control connection while the last set attenuation state is retained, in the following scenarios:

1. **Control via USB, DC power via the RS232 interface.** Recent RUDAT attenuator models can draw DC power through pin 1 of the RS232 connector (see table 3 for applicable models). As long as this remains connected then the USB cable can be disconnected from the controlling PC and the attenuator will retain its last state.
2. **Control via RS232, DC power via USB.** The attenuator can be powered through the USB interface from a powered USB hub or from the AC mains using the USB-AC\DC-5 adapter. The RS232 connection can then be used to control the device from a PC and can be safely disconnected without affecting the attenuation.
3. **Pre-defined "power-up state".** The attenuator can be configured to assume a pre-defined attenuation level when the DC power is applied, either the last remembered attenuation or a user-specified value. When this is set, the DC power supply can be applied through either the USB interface or pin 1 of the RS232 connector (see table 3 for applicable models) and a known attenuation will be loaded, without the need for a controlling PC.

Model Name	Serial Number Range
RUDAT-6000-30	11405010010 or later
RUDAT-6000-60	11407150001 or later
RUDAT-6000-90	11403230000 or later
All other RUDAT models	All serial numbers

Table 1 - Summary of RUDAT models supporting DC power over RS232 connector pin 1

4. Can I set the attenuation of a RCDAT attenuator and then disconnect the computer?

It is possible to set the attenuation and then disconnect the computer control connection while the last set attenuation state is retained, in the following scenarios:

1. **Control via Ethernet, DC power via USB.** The attenuator can be powered through the USB interface from a powered USB hub or from the AC mains using the USB-AC\DC-5 adapter. The RJ45 connection can then be used to control the device over the network and can be safely disconnected without affecting the attenuation.
2. **Pre-defined "power-up state".** The attenuator can be configured to assume a pre-defined attenuation level when the DC power is applied, either the last remembered attenuation or a user-specified value. When this is set, the DC power supply can be applied through the USB interface and a known attenuation will be loaded, without the need for a controlling PC.

5. How is the "linearity" spec of the power sensors defined?

Linearity is defined as the ratio of the change in power measured to the actual change in power, expressed as a percentage:

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Linearity = [1 - (P1 / P2) / (D1 / D2)] * 100%
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Where:

- D1 - Actual power level of first signal
- D2 - Actual power level of second signal
- P1 - Measured power level of first signal
- P2 - Measured power level of second signal

6. How are power sensor offest values interpolated?

When specifying an offset table for the power sensor using the DLL, what offset value is used when measuring at a frequency that isn't specified in the table? For example, if the offset table is as follows:

- Frequency = {500, 1000, 2000}
- Offset = {0.5, 2.5, 4.5}

What offset value will be used when measuring at the below frequencies (ie: when the power sensor compensation frequency is set to the below values)?

1. 1 MHz?
2. 501 MHz?
3. 750 MHz?
4. 6000 MHz?

Linear interpolation is used for frequencies between the offset table entries and the minimum / maximum values in the table are used for frequencies outside the range of the table. So, in the example above, the offsets used are:

1. 1 MHz => 0.5 dB
2. 501 MHz? => ~0.5 dB
3. 750 MHz? => 1.5 dB
4. 6000 MHz => 4.5 dB

7. What is the minimum power level that can be read by the power sensors?

Mini-Circuits' CW power sensors are all of a similar design and should return values down to between -42 and -45 dBm with reasonable accuracy (the specified lower limit is generally -30 dBm). Power levels that are too low to read will cause the sensor to return a power level below -990 dBm.

Mini-Circuits' RMS power sensors will not return an obviously incorrect power level when out of range. Power readings down to -35dBm to -40dBm can be read with reasonable accuracy, but the power reading will never go much lower than that, even with no RF input. That being the case it is safer to rely only on power readings within the specification (-35dBm minimum).

8. Can the frequency counter accept a non-sinusoid external reference with a DC voltage offset?

UFC-6000 and FCPM-6000RC are specifed with a 50Ω reference input. The frequency counters are characterised and specified with a sinusoid reference input so there may be performance variations with a non-sinusoid input although the devices should still operate. A DC offset on the reference input up to 5V is acceptable. The counter will automatically switch to the external reference when this signal is present.

9. Can the frequency counter accept a reference frequency other than 10 MHz?

UFC-6000 and FCPM-6000RC are designed to use either the internal 10 MHz reference source or an external 10 MHz reference source. Any other external reference frequency will cause measurement errors. Moreover, it is important to ensure that any external source provides an accurate 10 MHz input as the frequency counter does not verify the frequency input; any external reference input of the right power level will be assumed to be 10 MHz.

10. Can the signal generator accept a non-sinusoid external reference with a DC voltage offset?

SSG-6400HS is specifed with a 50Ω reference input and all other SSG models with ~67Ω. The signal generators are characterised and specified with a sinusoid reference input so there may be performance variations with a non-sinusoid input although the devices should still operate. A DC offset on the reference input up to 5V is acceptable. The reference source (external or internal) is controlled through software for SSG-6400HS, all other models will automatically switch to the external reference when this signal is present.

11. Can the signal generator accept a reference frequency other than 10 MHz?

All SSG models can work with either the internal 10 MHz or an external 10 MHz reference source. In addition, SSG-6400HS can also accept a 100 MHz external reference. Any other external reference frequency will cause an uncertain RF output. Moreover, it is important to ensure that any external source provides an accurate 10 MHz input (or 100 MHz in the case of SSG-6400HS) as the signal generator does not otherwise verify the frequency input; any external reference input of the right power level will be assumed to be correct (the user must specify through software whether the external source for SSG-6400HS is 10 MHz or 100 MHz).

12. Do Mini-Circuits' PTE products need to be calibrated?

The following Mini-Circuits signal generation and measurement products are calibrated:

- PWR series power sensors
- UFC series frequency counter
- FCPM series integrated power & frequency sensors
- SSG series signal generators

These products are calibrated prior to shipment and the calibration certificate is included within the packaging. Mini-Circuits' recommended calibration interval is every 2 years for SSG series signal generators and every year for other models. PTE models not listed above (for example switch systems and programmable attenuators) do not require any calibration.

13. How do I calibrate my power sensor, frequency counter or signal generator?

Pricing for Mini-Circuit's low cost calibration service can be found on the our website or through you local, authorized representative. Once an order is placed, you will be directed to return your unit for calibration via your local Mini-Circuits distribution centre.

14. To what standard are Mini-Circuits' power sensors, frequency counters and signal generators calibrated?

These products are calibrated using equipment with traceability to national standards administered by the National Institute of Standards and Technology (NIST) or other recognized national standards laboratories. A certificate is provided with each calibration and a detailed report is available on request.

15. How do Mini-Circuits' power sensors respond to pulsed RF waveforms?

Mini-Circuits RMS power sensors (PWR-4RMS, PWR-6RMS-RC and PWR-6LRMS-RC) are true RMS power sensors that can accurately measure CW, modulated and multi-tone signals as defined in their specifications. Please consult the datasheets on the Mini-Circuits website for full details.

16. What diode technology is used in Mini-Circuits' power sensors?

Mini-Circuits RMS power sensors (PWR-4RMS, PWR-6RMS-RC and PWR-6LRMS-RC) are based on true RMS detectors. All other models are CW sensors, using a Schottky diode design.

17. Do you offer test equipment for 75Ω applications?

PWR-2.5GHS-75 is a USB controlled power meter with a 75Ω impedance, covering 100 kHz to 2500 MHz. For other requirements we have a series of 50 to 75Ω impedance matching pads and transformers which can be used, such as UNMP-5075-33+.