TT7000

Basic Setup and User Guide

TT7000 – Introduction to a Compact Multi-Purpose RF Instrument

The TT7000 combines a Microwave Frequency counter, Power Meter, Signal Generator, and RF divider in one compact instrument. This instrument can either be used as a stand-alone device, or operated from a PC via USB. The Frequency Counter and Power meter cover the band from 100 to 7000MHz. The Signal Generator covers from 300 to 9600MHz.

The TT7000 is very simple to setup and begin to use. Stand-alone usage only requires a standard 5 volt USB type-C cable. This can be powered from a USB port on a PC, powered USB hub, wall charging adapter, or a lithium-ion battery pack. No data connection is needed. Once the device is powered, the TT7000 will display the firmware version and model number. The TT7000 will then boot up into Meter-Counter Mode and begin displaying the detected RF power level and the constant wave frequency.

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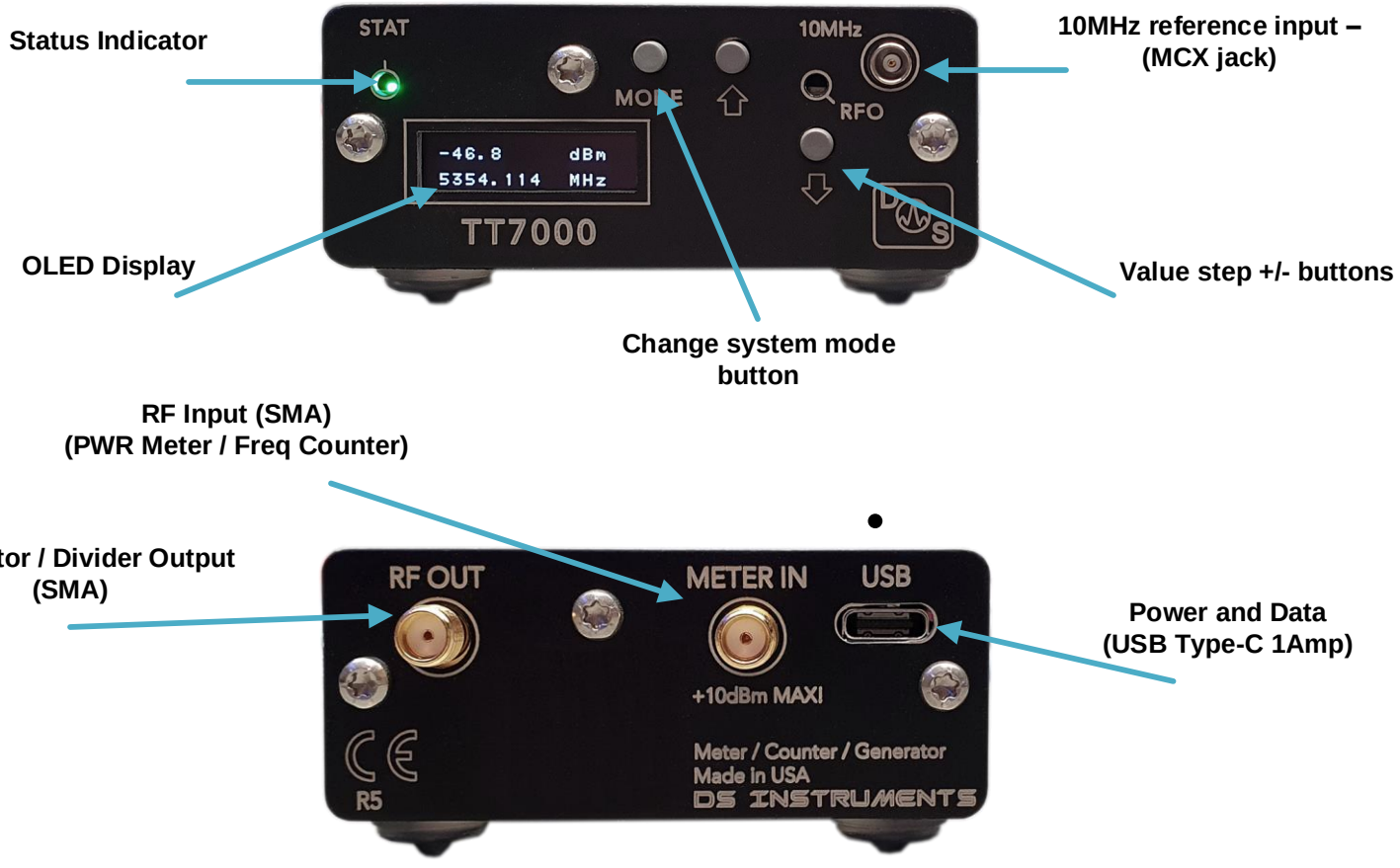
NOTES AND WARNINGS

- The MAXIMUM power to the RF input SMA port is **+15dBm**. Never apply over the maximum level or permanent damage can occur.
- Power measurements will be **inaccurate** if the automatic counter cannot determine an approximate frequency. Use the PC GUI to manually enter the frequency range of your signal if auto-range is not consistent.
- If the power level is too low or there is no signal input, the frequency counter display **will wonder.** This is normal functionality.
- The TT7000 requires USB current of up to **1.0 Amps**. An unpowered USB hub or an excessively long or low quality USB cable will degrade the device performance. We recommend a USB 3.0 port, a powered hub, or a short high-quality cable from a charging USB port.

DEVICE PORTS AND FEATURES



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STANDALONE USAGE - SYSTEM MODES

Holding down the **MODE** button for one-half second cycles to the next system mode. These are comprised of Meter-Counter Mode, Meter-Generator Mode, Frequency Counter Mode, Power Meter Only Mode, Signal Generator Mode, and RF Divider Mode.

1. **Meter-Counter Mode**: Displays both input power level and frequency counter, with quick refresh rate and low averaging. Up-down buttons have no function in this mode.

2. **Meter-Generator Mode**: Displays the measured input power level in dBm, and the user signal generator frequency output in megahertz. Buttons adjust frequency output.

3. **Counter Only Mode:** Displays the counted frequency input in MHz with a longer gate time and more precision in a large font. Mode button quick press saves this reading as the power meter CAL frequency.

4. **Meter Only Mode**: Displays a more accurate power level in dBm with more averaging and longer refresh rate. Up-Down buttons set the CAL frequency.

5. **Signal Generator Mode:** Displays the frequency output on the RF SMA port. Up/Down step buttons change the frequency.

6. **RF Divider Mode:** Displays the current divider ratio between the input frequency and the generator SMA output port. Up/Down Step buttons change the divider ratio (2, 4, or 8).

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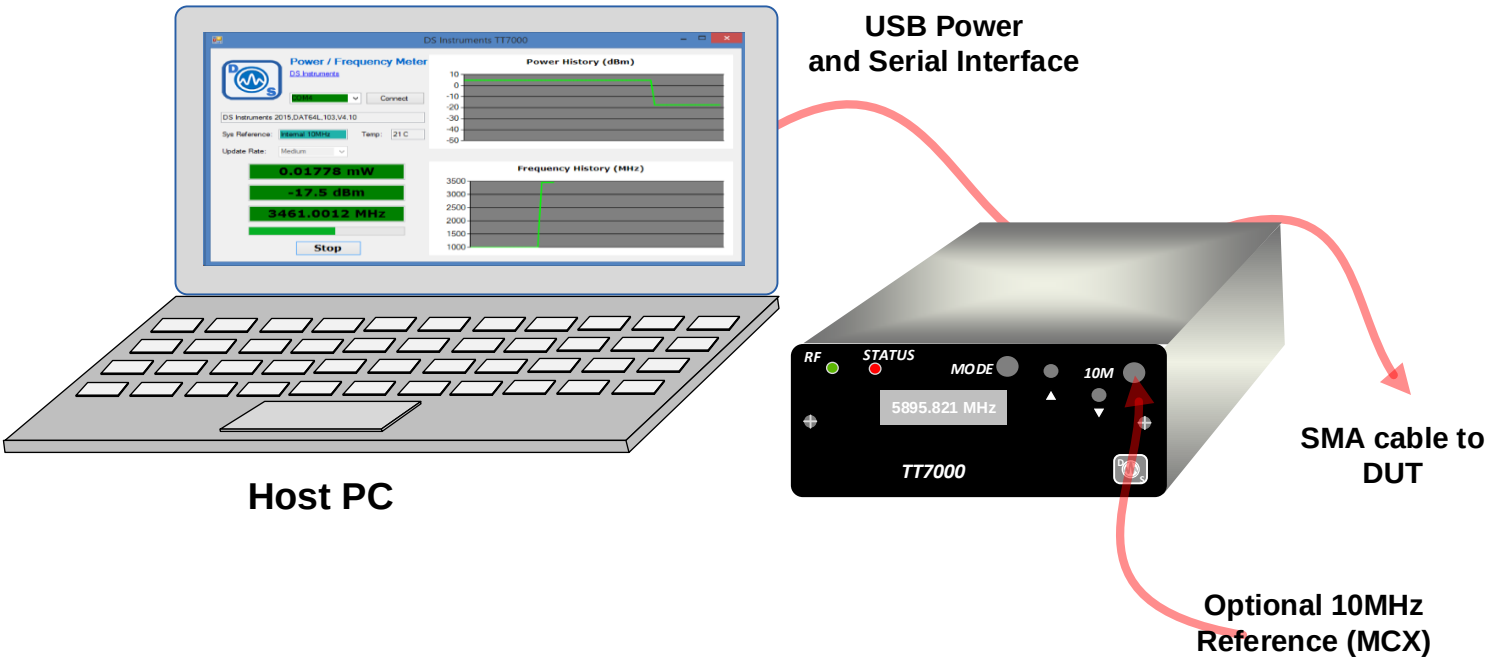
Remote Operation via USB

The TT7000 can be remotely operated using SCPI commands via the USB virtual COM port. A custom windows GUI application is provided for fully controlling the TT7000, and is posted for download on the DS Instruments website. It requires the free .NET framework from Microsoft.

NOTE: Most versions of windows come with .NET and USB drivers pre-installed. If they are missing or outdated they can both be downloaded from our website.

* Although we do not yet have native control GUIs, Linux and Android along with many embedded operating systems have **integrated driver support** for the TT7000.

Typical User Connections for Remote Operation via USB



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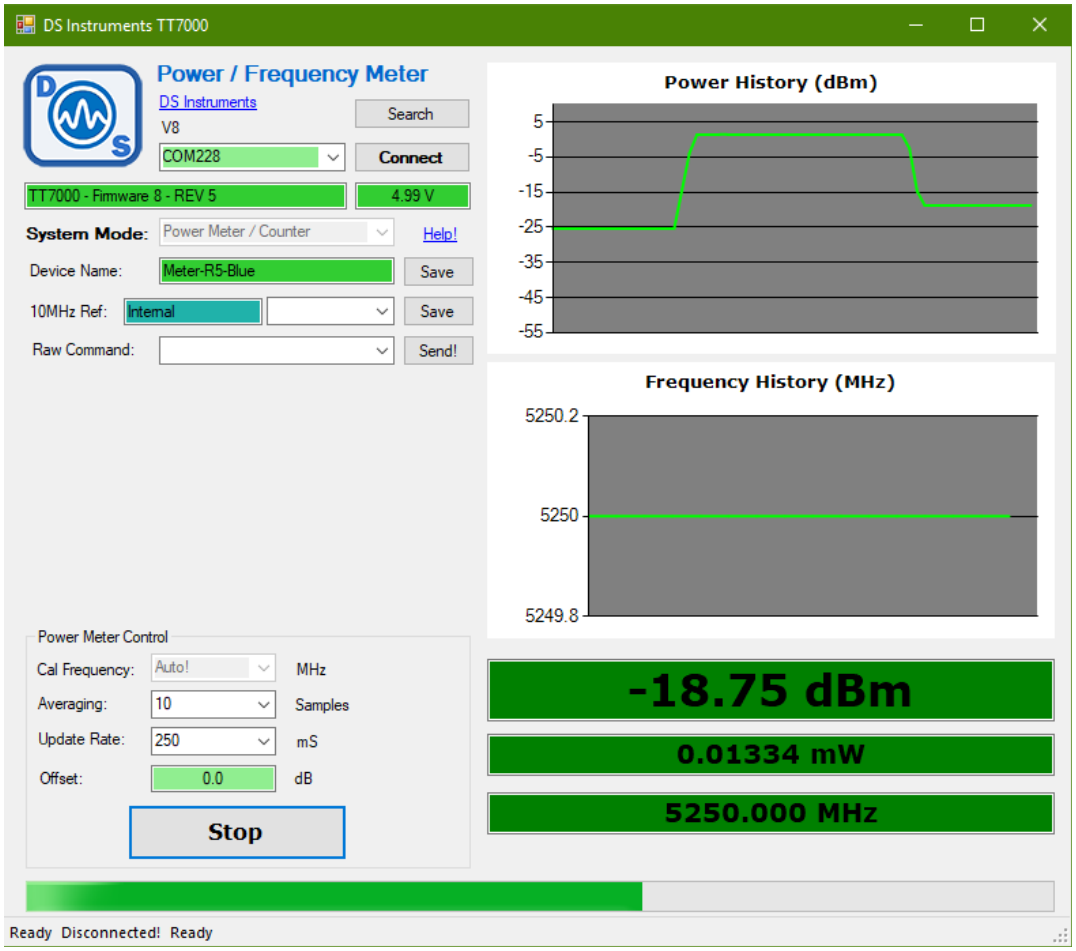
PC Control Application – Meter / Counter Mode



In Power **Meter / Counter Mode**, when the RUN-STOP button is pressed the TT7000 meter application will continuously display live data from the device and build a history graph to the right

As with the signal generator, the counter reference frequency source can be changed to external if needed. Auto detect is recommended in most situations. A high quality external reference can increase the counter accuracy.

The TT7000 Wideband Power Meter uses the internal frequency counter to calibrate itself. If the input signal power level is too low and the counter cannot successfully determine the correct frequency, the power meter accuracy will **significantly degrade**. In this case the user should enter a manual calibration frequency.

The frequency counter gate time and power meter averaging can be adjusted to the user's preference. Slower update rates average more readings over a longer time, and will result in a more accurate measurement.

A green background inside the meter display indicates a good value. Orange indicates that the signal is either too weak to count or measure, or that it is not consistent. Red indicates that the power level is over the maximum readable input level.

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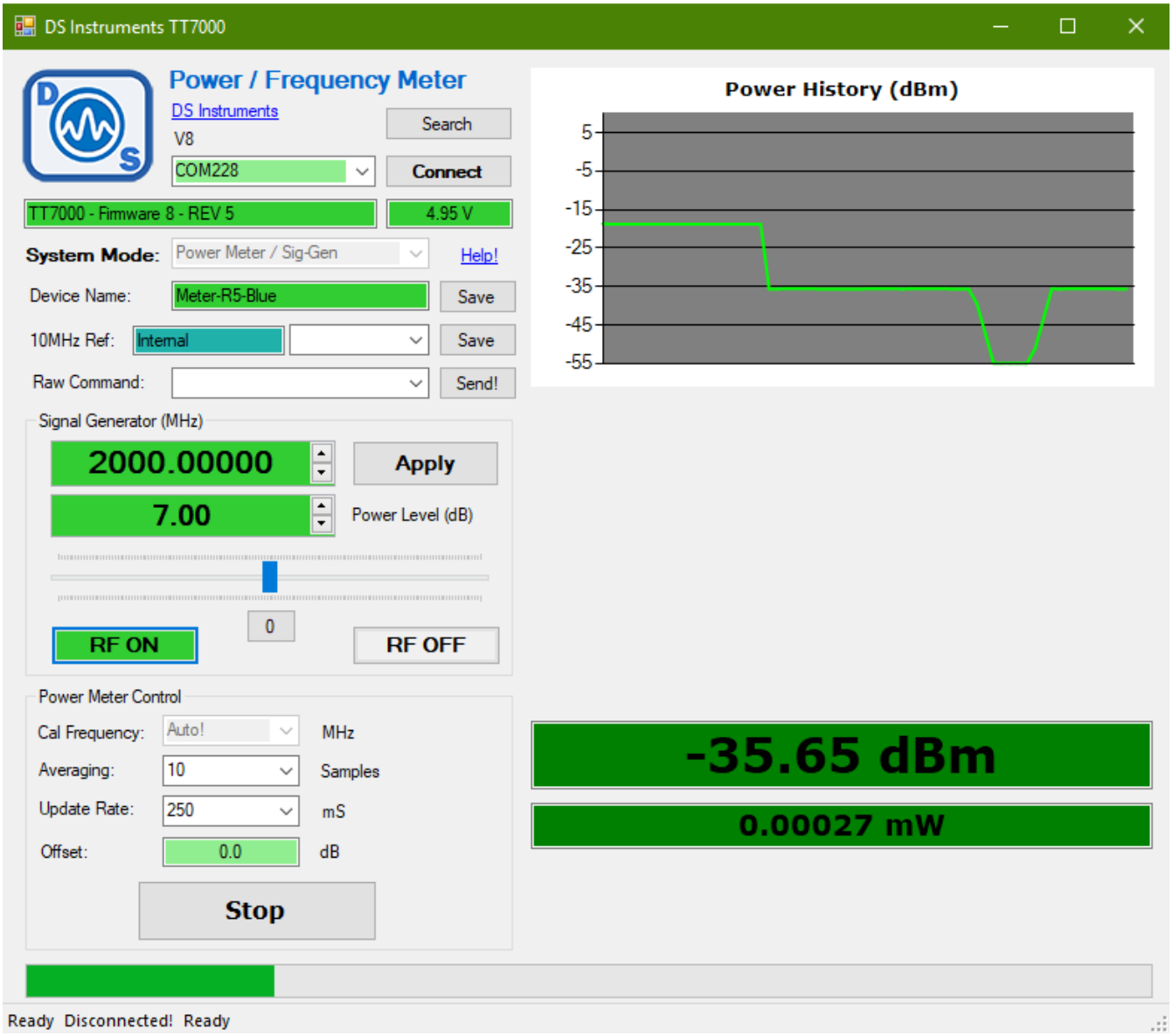
PC Control Application – Signal Generator Mode



In Power Meter / Sig-Gen Mode the live incoming power level data is displayed. The counter is NOT functioning, so the calibration for the power meter is set to the signal generator frequency. The signal generator output control will allow the user to set the frequency, power level and power fine tune.

Power output level is controllable from 300-4800Mhz. Band 2 (4800-9600MHz) is fixed output level, and is typically > +12dBm.

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Remote Operation via SCPI Commands

For automated or scripted operation the TT7000 can be controlled via SCPI text commands. The virtual **COM** port settings are **115200bps, 8 Data bits, 1 stop bit, no parity**. Commands should be terminated with a linefeed character.

TT7000 SCPI Command List

Command	Example 1	Example 2	Description
FREQ:CW	FREQ:CW 400MHZ	FREQ:CW 3.33GHZ	Set output Frequency of the signal generator
FREQ:CW?			Return output frequency in Hz
OUTP:STAT	OUTP:STAT ON	OUTP:STAT OFF	Turn on or off the RF output in sig-gen mode
OUTP:STAT?			Returns the signal generator RF on/off state
POWER	POWER -10	POWER 4.5	Set the signal generator output power level in dBm
POWER?			Return power level setting
VERNIER	VERNIER -50	VERNIER 0	Set the unitless power fine tune knob
VERNIER?			Return the fine power tune setting
POWER:READ?			Returns the input power in dBm - measured RMS
FREQ:READ?			Returns the counted input frequency in MHz
SYST:MODE	METERCOUNTER,	SIGGENMETER,	SIGNALGEN - Sets the system mode (3 modes)
SYST:MODE?			Returns the current mode
*POWER:FCAL	*POWER:FCAL 0	*POWER:FCAL 2333	Forces power meter calibration at this MHz point (0=auto)
*IDN?			Return the SCPI identification string
*RST			Reset unit now
*DISPLAY ON			Forces display to work in USB mode. Slows system.
*BUZZER	*BUZZER ON	*BUZZER OFF	Mute the buzzer
SYST:ERR?			Returns last error message
*CLS			Clears errors
*PING?			Identify a unit by flashing an LED and sounding the buzzer
*SAVESTATE			Save the current system mode and settings as boot defaults
*UNITNAME			Save a nickname or device tag in flash memory
*UNITNAME?			Request the device tag/nickname
*SYSVOLTS?			Return the USB voltage level

Command terminator is LINEFEED ("\n")
Version 7.0 - (COM BAUD: 115200)

*A great free terminal program for windows can be found here : **http://www.putty.org**

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Technical Support

For additional questions, suggestions, and technical support please contact us!

DS Instruments Contact Info

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