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, RF divider, and Prescaler 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 50 to 7000MHz. The Signal Generator covers from 300 to 4800MHz.

The TT7000 is very simple to setup and begin to use. Stand-alone usage only requires a standard 5 volt mini usb 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 and the front power button is pressed the device will display the firmware version and model number. The TT7000 will then boot up into Dual-Meter Mode and begin displaying the detected RF power level and the constant wave frequency.
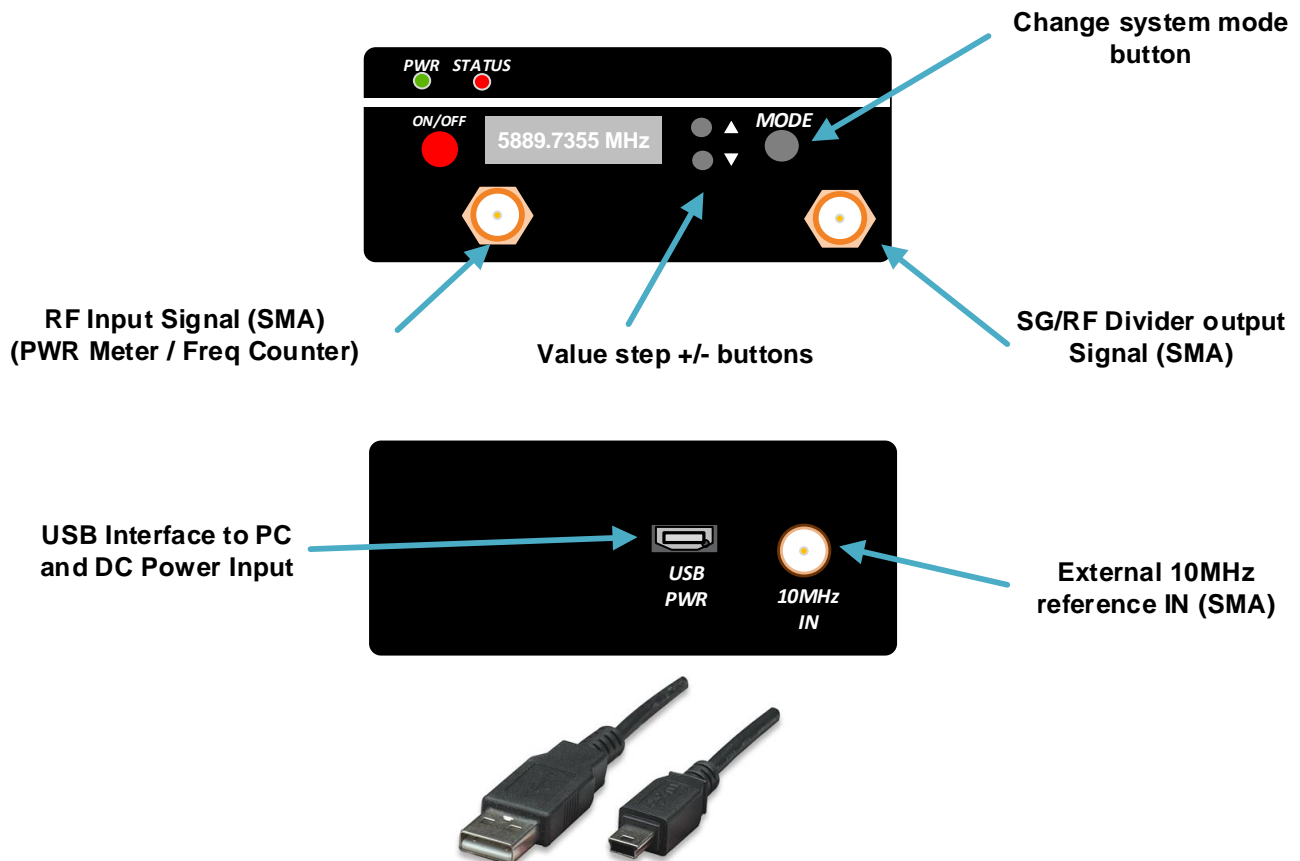
www.dsinstruments.com

TT7000 Guide V1.0

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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 full USB current of **0.5 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 standard USB port.

DEVICE PORTS AND FEATURES

Change system mode button

PWR   STATUS

ON/OFF   5889.7355 MHz   ▲ MODE ▼

RF Input Signal (SMA)
(PWR Meter / Freq Counter)

Value step +/- buttons

SG/RF Divider output
Signal (SMA)

USB Interface to PC
and DC Power Input

USB PWR   10MHz IN

External 10MHz
reference IN (SMA)

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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 Dual Meter Mode, Power Meter Mode, Frequency Counter Mode, Signal Generator Mode**,** and RF Divider Mode.

1. **Dual-Meter Mode**: Displays both power level and counted frequency with quick refresh rate and low averaging.

2. **Power Meter Mode**: Displays a more accurate power level in dBm with more averaging and longer refresh rate in a larger more readable display size. (-50 to +5 dBm)

3. **Counter Mode:** Displays the counted frequency input in MHz with a longer gate time and more precision in a large font. (50-7000MHz)

4. **Signal Generator Mode:** Displays the frequency output on the RF SMA port. Up/Down step buttons change the frequency. (300-4800MHz)

5. **RF Divider Mode:** Displays the current divider ratio between the user's input frequency and the SG SMA output port. Up/Down Step buttons change the divider ratio (2/4/8).

6. **Prescaler Mode (Optional):** Displays the current divider ratio between the user's RF input and the RF signal on the prescaler output port. (16/32/64/128/256)
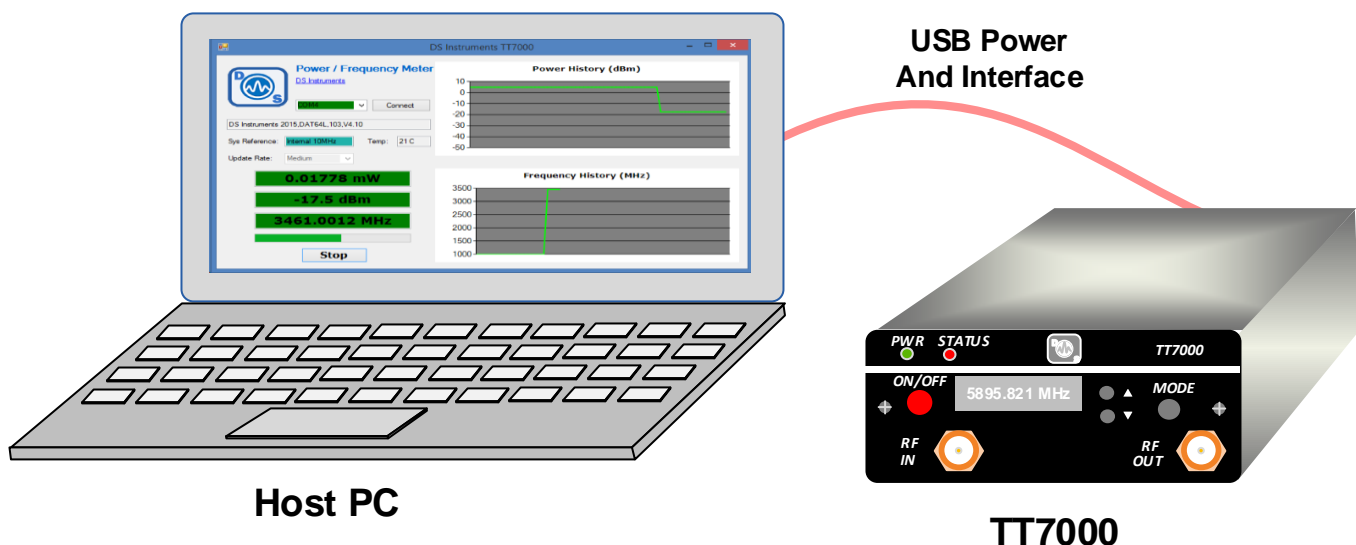
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Remote Operation via USB

The TT7000 can be remotely operated using SCPI commands via the USB virtual COM port. A windows GUI application is provided for the Power Meter and Frequency Counter Modes, and a separate GUI application for controlling the Signal Generator Mode. Both are available for download on the DS Instruments website and require the .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

Host PC

USB Power And Interface

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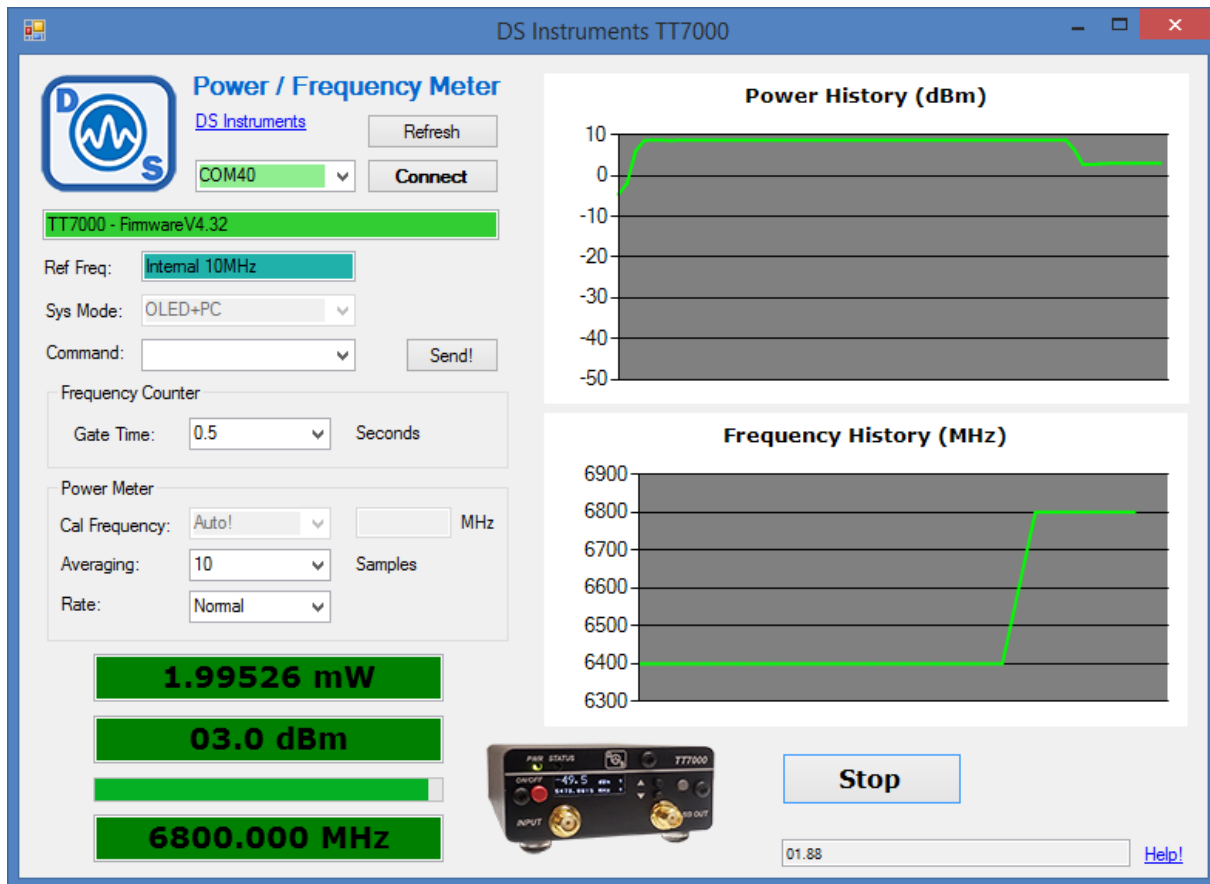## *Signal Generator GUI Application*
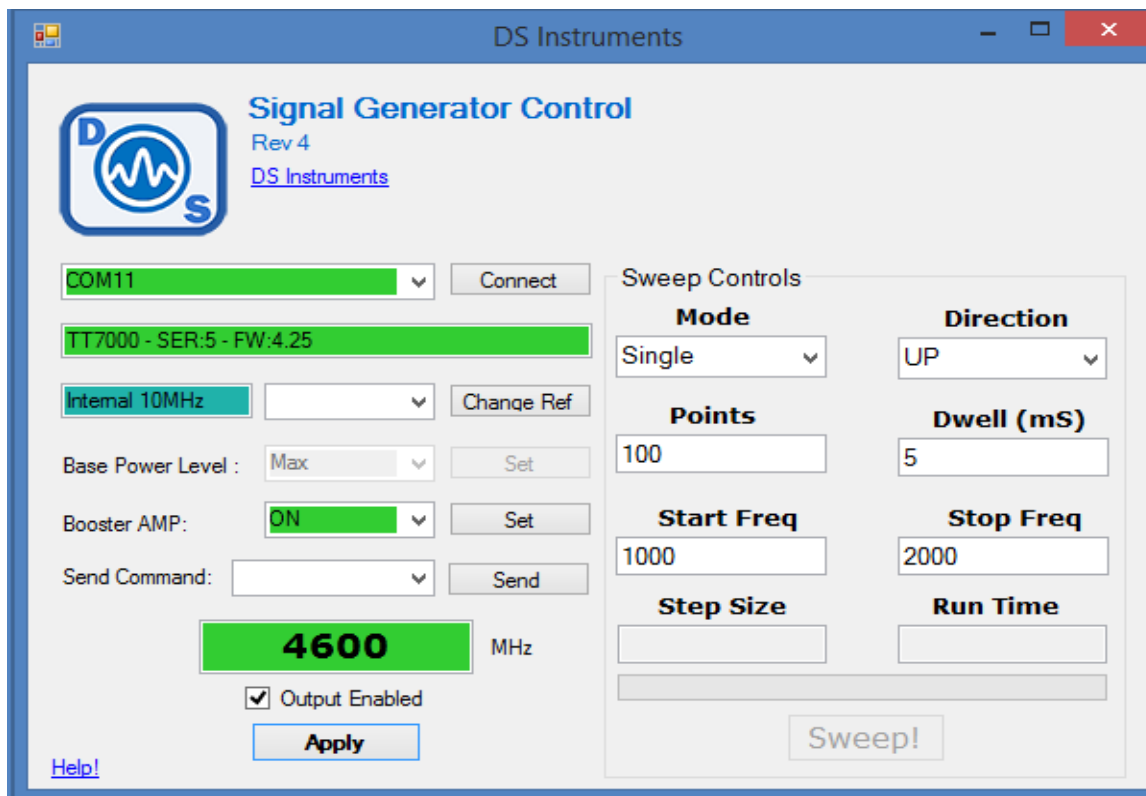
The Signal Generator Control application connects to the TT7000 by selecting a COM port. The 10MHz reference frequency source defaults to automatic but you can force it to internal or external if you wish. At this point the output frequency can be set by entering it in the large MHz textbox and clicking apply or pressing enter. RF Output can be enabled or disabled using the checkbox and apply button once a frequency is set.

The TT7000 signal generator has two output power levels that can be selected in the "booster amp" pull-down.

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Power Meter and Frequency Counter GUI Application

The power meter / counter application can simultaneously display the current and historical power level and input frequency at the RF IN SMA port. As with the signal generator, the counter reference frequency source can be forced if needed. Auto detect is recommended in most situations. A high quality external reference can increase the counter accuracy.

The SYS MODE option lets the user disable the hardware OLED display to gain maximum system speed and responsiveness in the USB PC Application.

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.

When the RUN button is pressed, the TT7000 meter application will continuously display live data from the device and build a history graph to the right

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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Divider / Prescale Control Application
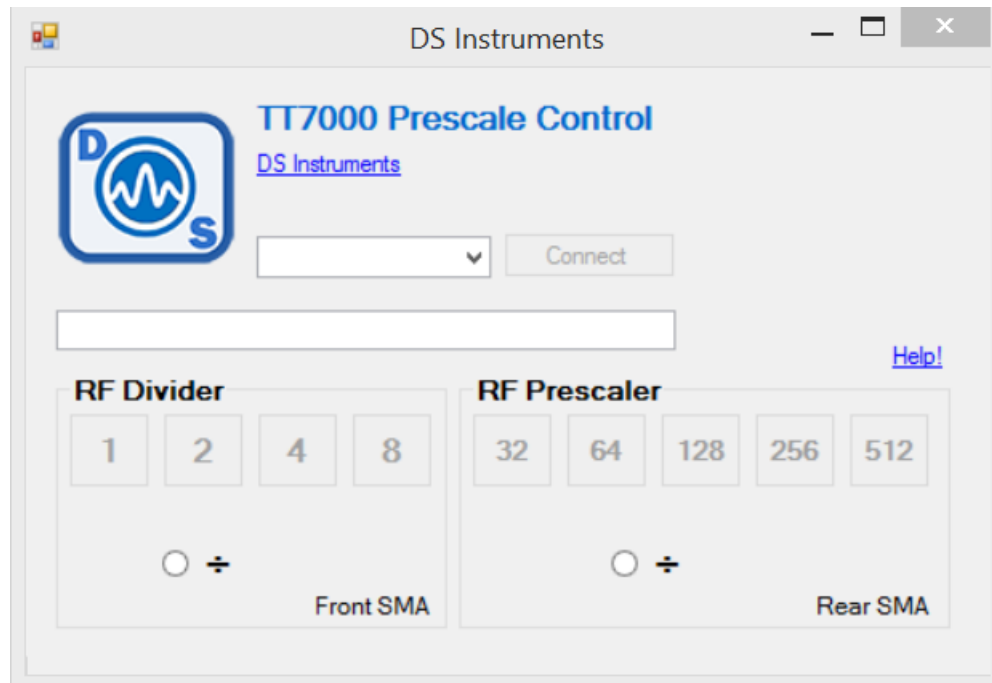
The Divider Control Application is a simple way to set the RF divider and the Prescaler if it is available on the device. The RF divider simply divides the signal detected on the RF Input SMA port, amplifies it, and makes it available on the Signal Generator RF SMA output port.

The Prescaler has higher divide ratios and outputs the signal on a rear port instead of the main RF output port.

Once the COM port is connected successfully, the user can choose either an RF Divider ratio or a prescaler ratio.

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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.

Command	Example 1	Example 2	Description
FREQ:CW	FREQ:CW 400MHZ	FREQ:CW 3.33GHZ	Set output Frequency
OUTP:STAT	OUTP:STAT ON	OUTP:STAT OFF	Turn on or off the RF output
POW:AMPL	POW:AMPL 0	POW:AMPL 3	Power output level (uncalibrated) 0-3 range
POW:BOOST	POW:BOOST ON	POW:BOOST OFF	Booster amplifier on or off
POWER:FETCH?			Returns the input power in dBm
FREQ:FETCH?			Returns the counted input frequency in MHz
*SYSMODE x	*SYSMODE 1	*SYSMODE 2	Sets mode: 1=dualmeter, 2=counter, 3=power, 4=siggen
*POWER:FCAL	*POWER:FCAL 2000	*POWER:FCAL 0	Manually set the freq range for the power meter
*IDN?			Return the SCPI identification string
*RST			Reset unit now
*INTREF?			Is the internal reference enabled?
*EXTREF?			Is an external reference signal detected?
*DISPLAY	*DISPLAY OFF	*DISPLAY ON	Power on of off the display
*BUZZER	*BUZZER ON	*BUZZER OFF	Mute the buzzer

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

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

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Video Tutorials: https://www.youtube.com/channel/
UCc8N904mBm1wWXsLSc4frOw