

# *User Guide*

## *USB Frequency Counter*

UFC-6000  
1 to 6000 MHz  
Input Impedance: 50  $\Omega$   
Dynamic Range: -28 to +13dBm



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# **Chapter 1 – General Information**

## **1.1 *Scope of the User Guide***

This User Guide provides general introduction, installation instructions and operating information for the MCL USB RF Frequency Counter.

## **1.2 *Warranty***

See Mini-Circuits website <http://www.minicircuits.com/support/ordering.html> for Warranty information.

## **1.3 *Definitions***

**Note:** A note advises on important information you may need to insure proper operation of the equipment. There is no risk to either the equipment or the user.

### **CAUTION**

**A caution advises about a condition or procedure which can cause damage to the equipment (No danger to users).**

### **WARNING**

**A warning alerts to a possible risk to the user and steps to avoid it. Do Not proceed until you are sure you understand the warning.**

## **1.4 *General Safety Precautions***

Please observe the following safety precautions at all times when using Mini-Circuits UFC-6000 frequency counter.

### **WARNING**

**Ensure that all instruments using mains power supply are properly grounded to prevent risk of electrical shock.**

### **CAUTION**

**Do not provide inputs to the frequency counter exceeding the limits specified in the datasheet**

## 1.5 Introduction

Mini-Circuits has developed a USB RF Frequency Counter, the UFC-6000 Shown in **Figure 1** that can operate independently – with no computer support, or computer controlled as a USB device. With the supplied GUI (Graphical User Interface) software you can easily record the data for future analysis, or adjust sample time to improve either measurement speed or accuracy. The UFC-6000 shown is an effective, compact and easy to use frequency counter.



**Figure 1: MCL RF Frequency Counter UFC-6000**

The UFC-6000 is capable of recognizing CW signals with levels from -28 dBm to +13 dBm and covers the frequency range of 1MHz to 6 GHz. The UFC-6000 offers a low cost replacement solution for conventional RF/Microwave Frequency Counters. We offer a light weight counter, with easy and simple field operation and installation which can operate with either external or internal reference. The UFC-6000 has an SMA (female) RF input connector, and a BNC 50Ω (female) Reference input connector. All power requirements are supplied via the USB interface from either a computer or the supplied USB power adaptor. When using the supplied USB power adapter the counter can be operated independently in the field with no computer support or external reference. When connected to a computer, it provides an easy plug-and-play USB connectivity to a PC, thereby eliminating the need for a separate conventional power supply. The Counter is suitable for lab measurements and has the capability for automated testing and frequency monitoring.

## 1.6 Service and Calibration

The UFC-6000 does not require any calibration or periodic service and contains no user serviceable parts.

## 1.7 Contact Information

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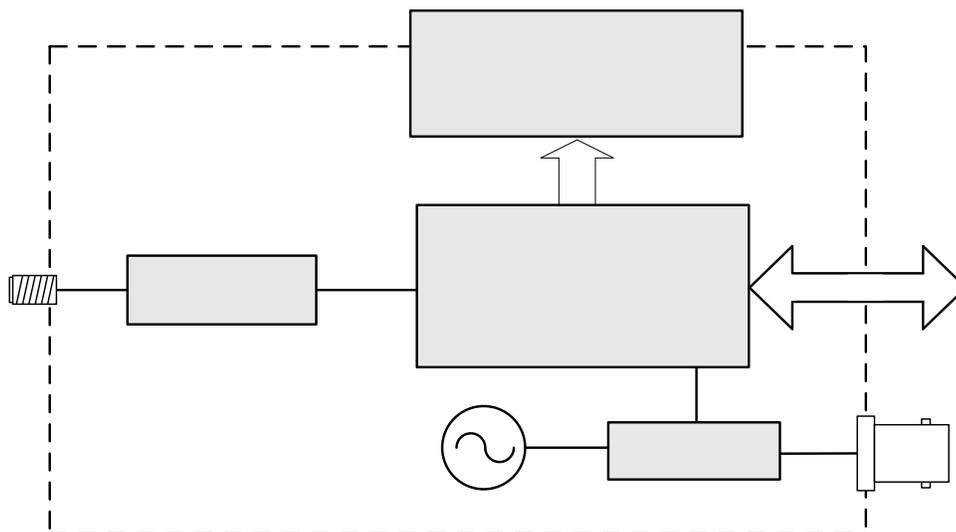
For regional offices and tech support see <http://www.minicircuits.com/contact/offices.html>

## 1.8 Model Description

### 1.8.1 UFC-6000 Features

- Small, light weight
- Wide frequency range (1 – 6000 MHz)
- Uses external or internal reference
- SMA(F) RF port and BNC(F) reference port
- Can be operated remotely using a PC with USB interface or independently
- LCD readout, 16x2 characters
- Compatible with 32/64-bit Windows® or Linux® operating systems, as well as LabVIEW®, Delphi®, C++, C#, Visual Basic®, and .NET software
- User friendly Graphical User Interface for any Windows® 32 or 64 bit computer (command line support for Linux®)

For detailed data sheet, performance data and graphs, outline drawing and environmental rating see the [UFC-6000 catalog page](#) on our website.



**Figure 1.8.1** UFC-6000 functional block diagram

### 1.8.2 Intended Applications

Mini-Circuits' UFC-6000 is intended for indoor use as a Frequency Counter in both manual and automated measurements, or as a frequency monitor for remote systems. The model can be used by anyone familiar with the basics of electronics measurements.

### 1.8.3 Conformity

Mini-Circuits UFC-6000 conforms to all requirements for the following international standards:

RoHS –Complies with EU directive for Restriction of Hazardous Substances for 6 substances.

USB 2.0 – Meets the specifications of the Universal Serial Bus Ver. 2.0 communication standard as described by USB-IF.

USB HID – Meets the requirements for Universal Serial Bus Human Interface Devices according to USB-IF's Device Class Definition for Human Interface Devices firmware rev. 1.11

### 1.8.4 Supported Software Environments

Mini-Circuits UFC-6000 frequency counters have been tested in the following operating systems:

32 bit systems: Windows 8, Windows 7, Windows Vista, Windows XP, Windows 98

64 bit systems: Windows 8, Windows 7, Windows Vista, Linux

The frequency counters will work with almost any software environment that supports ActiveX or .Net including: C++, C#, CVI®, Delphi®, LabVIEW® 8 or newer, MATLAB® 7 or newer, Python, Agilent VEE®, Visual Basic®, AutoIT, Visual Studio® 6 or newer, and more

For more information see [Mini-Circuits programming handbook Introduction](#) and [Chapter 5](#) and application note [AN-49-001](#) on our website.

### 1.8.5 Included Accessories and Options

The model is supplied along with a software CD containing ActiveX and .Net objects for 32 and 64 bit Operating Systems, GUI program, programming guide and programming samples. Also supplied with the model are a 2.7 ft. USB cable and a power adaptor to allow operation independent of a computer.

## Chapter 2 – Software setup and Installation

This chapter provides information on installing the MCL measurement software. The UFC-6000 does not require a computer to run, just a power source but the supplied MCL GUI software requires a Windows computer (32 or 64 bit) with Pentium II or better and USB HID support.

### 3.1 Software Setup

✓ **If you have had any problems installing the software, we're here to help.**

Try following these complete step-by-step instructions. If you still experience problems, give us a call at Mini-Circuits Worldwide Technical support. It's (718) 934-4500, e-mail [apps@minicircuits.com](mailto:apps@minicircuits.com) for North America or go to [minicircuits.com/contact/worldwide\\_tech\\_support.html](http://minicircuits.com/contact/worldwide_tech_support.html) for other regional numbers and addresses.

3.1.1 **First** save all work in progress and close any other programs that may be running.

3.1.2 **Next**, insert the Mini-Circuits CD into the CD-ROM drive, or download the full CD software from [minicircuits.com](http://minicircuits.com). If installing from files downloaded from the web - unzip the downloaded files to a temporary folder on your desktop or C: drive, then open the file folder you created and double-click the "Install" icon.

3.1.3 **If installation from the CD does not start automatically, run install.exe** from the <CD drive> root directory.

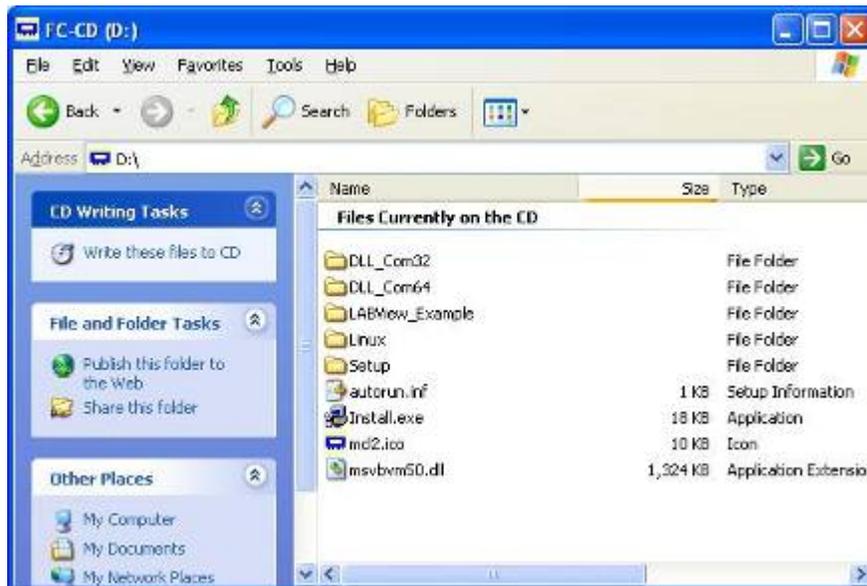


Figure 2.1.3 CD file listing window

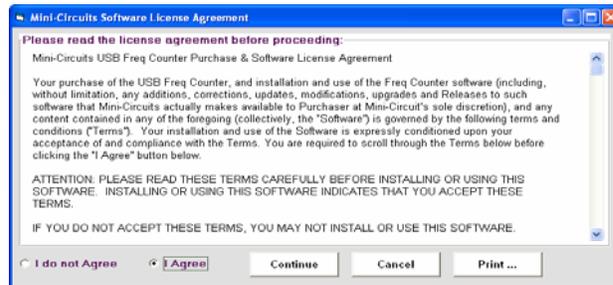
## 3.2 Installation

3.2.1 **The installer window** should now appear. Click the “Install Now” button.



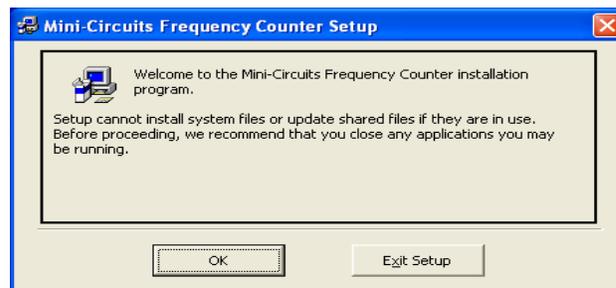
**Figure 2.2.1** Installation window

3.2.2 **The license agreement** should now appear. To proceed, click “I Agree” and the “Continue” button.



**Figure 2.2.2** License agreement

3.2.3 **The installation program will launch.** Close any other programs that may be running, and click the “OK” button to continue.



**Figure 2.2.3** Installation Program window

3.2.4 **The destination directory window** will appear. At this point it's a good idea to take a second and confirm the full destination address for the software. In most cases the default will be your computer's hard drive (C:\program files\Mini-Circuits Frequency Counter\ Change it if you prefer. Then click the large button at the top to continue.

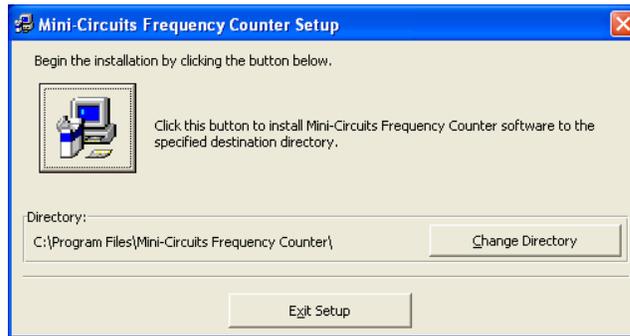


Figure 2.2.4: Destination Directory window

3.2.5 **The Program Group window** will appear. This window allows you to select the program group under which the link for the Frequency Counter program in the Start Menu will be created. Click on "Continue" to proceed.

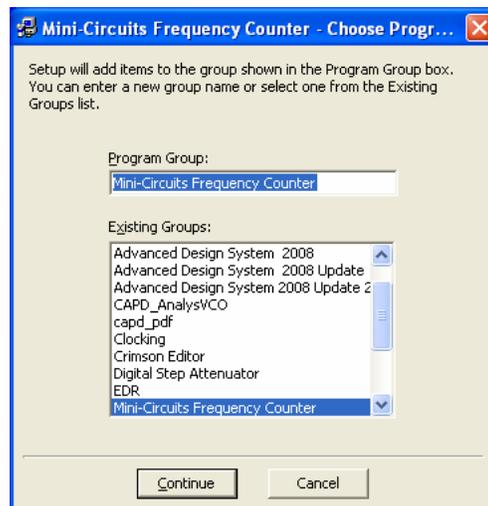


Figure 2.2.5: Program Group Window

3.2.6 **In a second or two, your installation will be complete.** Click "OK" to close the installer.

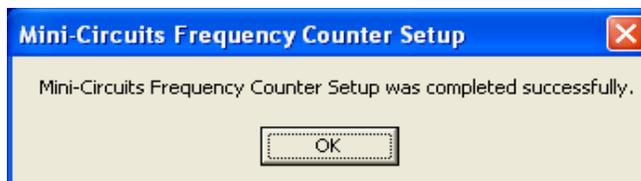


Figure 2.2.6: Installation complete

## Chapter 3 – Measurement Instructions

This chapter describes the common procedures for using the MCL USB Frequency Counter. Measurements can be run independently with no external support, or with computer control immediately after software installation is completed (no driver installation is required).

### 4.1 Independent operation setup

4.1.1 Connect the supplied USB-AC/DC-5 power adaptor to the AC mains power supply

4.1.2 Using the supplied USB cable or equivalent connect the USB socket of the USB-AC/DC-5 to the USB socket of the UFC-6000 Frequency counter, note the screen lights up.

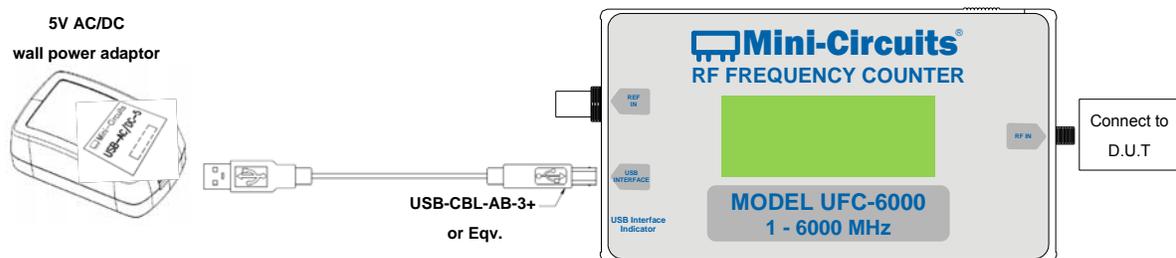


Figure 3.1.2 Independent operation with internal reference

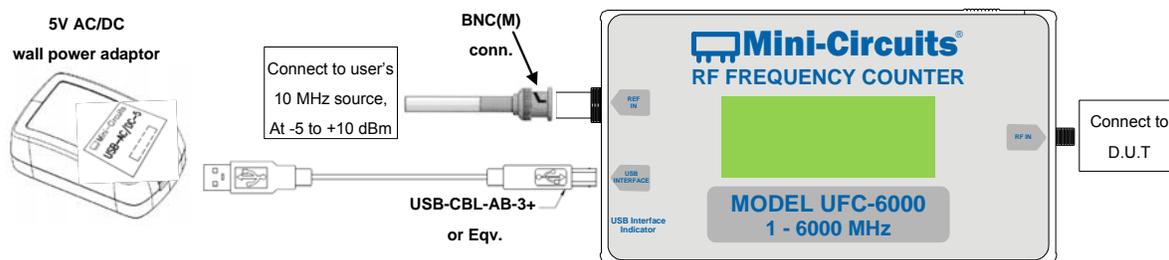
#### CAUTION

**Maximum safe input power for Reference In is +13 dBm. Exceeding this level may cause permanent damage to the UFC-6000 reference port circuitry.**

4.1.3 If using external reference connect the 10 MHz external signal to the BNC connector of the Frequency Counter.

#### Notes:

1. The UFC-6000 is designed for a 10MHz signal in the -5 to +10 dBm range. Any significant variation in reference frequency or power outside the specified range may cause measurement errors.
2. Frequency accuracy values noted in the catalog spec. are using 10 MHz external reference synchronized to test signal. Using Internal Reference adds 2 ppm of tested frequency to accuracy values shown.



**Figure 3.1.3** Independent operation with external reference

**CAUTION**

Maximum safe input power for RF In is +16 dBm RF signal or  $\pm 50V_{DC}$ . Exceeding these levels may cause permanent damage to the UFC-6000.

**4.1.4 Connect the DUT** to the frequency counter and begin measurements.



**Figure 3.1.4** UFC-6000 with internal reference testing D.U.T

## 4.2 Computer controlled operation setup

4.2.1 Using the supplied USB cable or equivalent connect the UFC-6000 to the computer USB port. Note the UFC-6000 screen lights up.

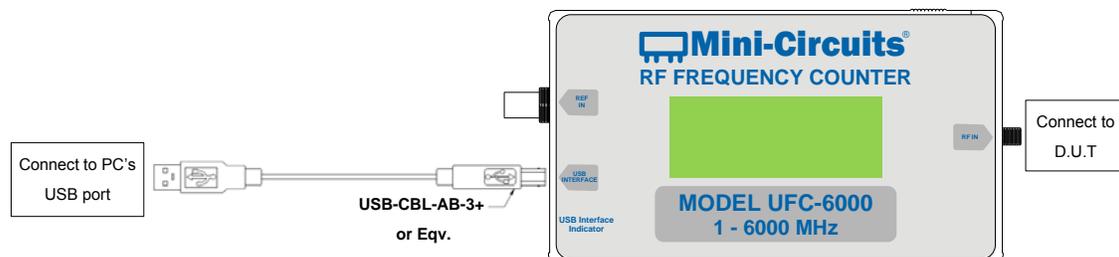


Figure 3.2.1 Computer control operation with internal reference

**Note:** The UFC-6000 may draw up to 350mA from the USB bus. If connecting multiple UFC-6000 to a single USB port (using a USB hub) the use of a powered hub is recommended.

4.2.2 Start the GUI program installed in chapter 2.

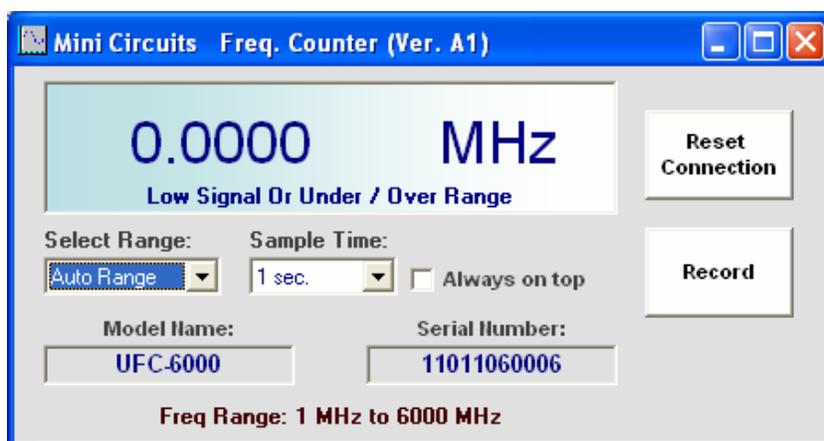


Figure 3.2.2 Initial (without D.U.T) program window

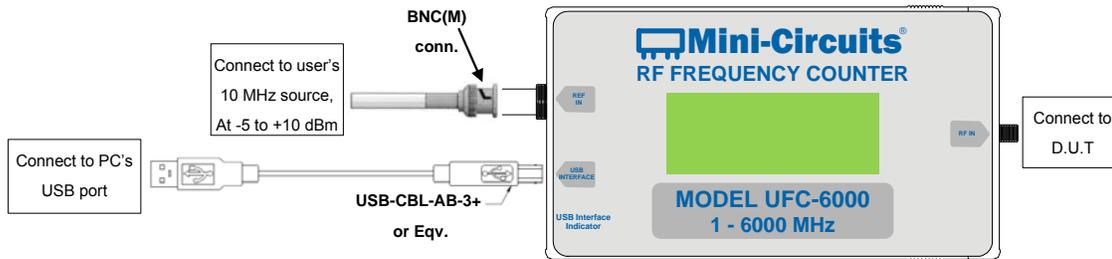
### CAUTION

**Maximum safe input power for Reference In is +13 dBm. Exceeding this level may cause permanent damage to the UFC-6000 reference port circuitry.**

4.2.3 If using external reference connect the 10 MHz external signal to the BNC connector of the Frequency Counter.

#### Notes:

1. The UFC-6000 is designed for a 10MHz signal in the -5 to +10 dBm range. Any significant variation in reference frequency or power outside the specified range may cause measurement errors.
2. Frequency accuracy values noted in the catalog spec. are using 10 MHz external reference synchronized to test signal. Using Internal Reference adds 2 ppm of tested frequency to accuracy values shown.



**Figure 3.2.3** Computer control operation with external reference

**CAUTION**

**Maximum safe input power for RF In is +16 dBm RF signal or  $\pm 50V_{DC}$ . Exceeding these levels may cause permanent damage to the UFC-6000.**

**4.2.4 Connect the DUT** to the frequency counter and begin measurements.



**Figure 3.2.4:** Frequency Counter Software Main Screen

### 4.3 Computer controlled measurement

#### 4.3.1 Main Screen:

**Display** – Shows the measured frequency and which of the frequency ranges it's in.

**Select range** – Allows you to select the frequency range, or allow the UFC-6000 to detect the appropriate range automatically. Setting the UFC-6000 to a specific frequency range will increase measurement speed. When set to auto range the ranges will be:

- Range 1: 1-40MHz
- Range 2: 40-190MHz
- Range 3: 190-1400MHz
- Range 4: 1400-6000MHz

**Sample Time** – Allows you to specify the sample time each measurement takes from 0.1 to 3 seconds per measurement. Greater sample time will produce more accurate measurements.

**Always on top** – Click here to keep the Frequency Counter screens on top of other applications.



INTERNET <http://www.minicircuits.com>

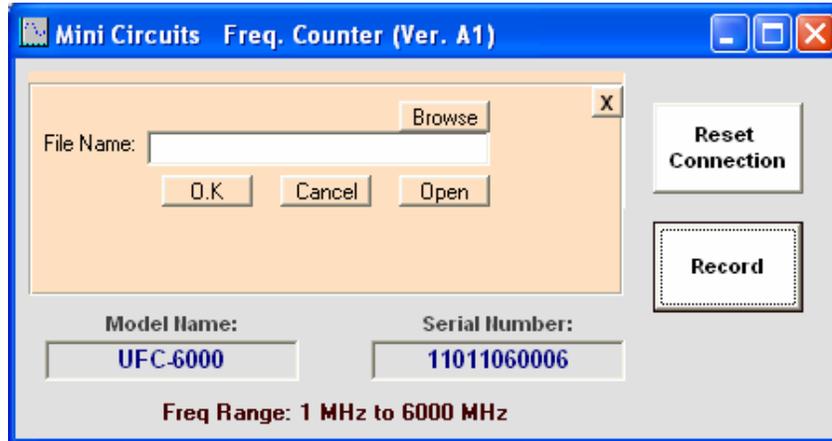
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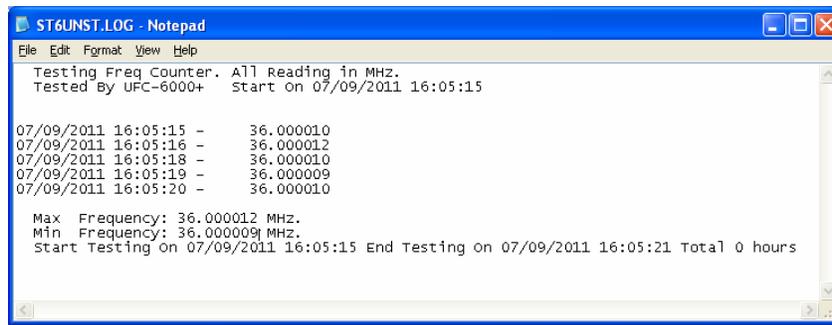
- Model Name** – Displays the model part number of the frequency counter.
- Serial Number** – Displays the serial number of the frequency counter.
- Reset Connection** – Click “Reset Connection” whenever you reconnect a Frequency counter to your computer.
- Record/Stop Recording** – Click this button to open the Record window, or stop recording a current record session (text changes to “Stop recording” while data is being recorded).

#### 4.3.2 Record Screen:



**Figure 3.3.2a:** Frequency Counter Record Screen

- Browse** – Navigate through your computer directories to find the file in which you wish to save the Frequency Counter measurements, or open a previously created measurement log file.
- File Name** – The full path of the file in which to save the Frequency Counter measurements, or view previous measurements from.
- O.K** – Begin recording data in the selected file, and return to main screen.
- Cancel** – Return to main screen without starting to record data.
- Open** – Open the log file you selected to view previously recorded measurements.



**Figure 3.3.2b:** Frequency Counter log file