

# FreqOut

*A Pic & Palm Frequency Counter*

*User Guide*

v1.0



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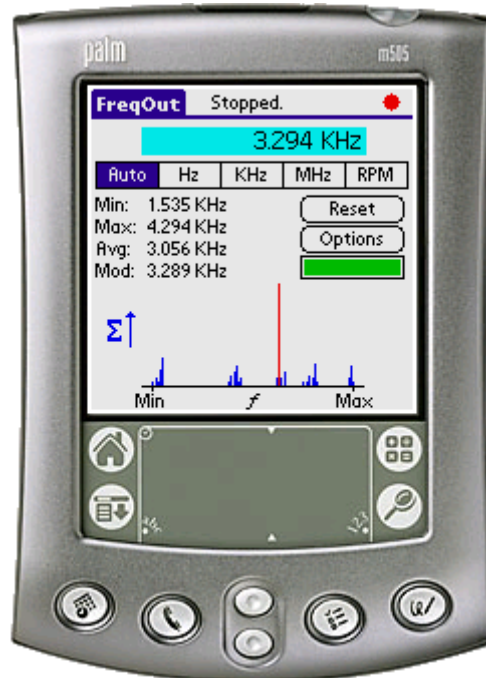
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# 1 Introduction

FreqOut is an implementation of a frequency counter, using PIC and Palm technology. The PIC microchip performs the data acquisition, and communicates with the Palm PDA. The Palm PDA controls and displays the resulting data. Communication between the PIC and Palm can take place via wired serial (RS232) or via wireless infra-red.



## 1.1 Features

FreqOut provides the following functional features:

- Supports both Serial (RS232) and Infra-red (SIR) modes of communication.
- Can be used with either SerialPIC or InfraPIC interfaces.
- Frequency range of 1Hz – 50 MHz
- Auto ranging 0-65KHz/1MHz/2MHz/4MHz/8MHz/16MHz/32MHz/50MHz
- 16 bit resolution within each range
- Real-time display of incoming data at variable sample refresh rate (1Hz/2Hz/5Hz)
- Displays Current frequency, Minimum frequency and Maximum Frequency.
- Variable sample history buffer for optional statistical analysis (10/100/100 samples)
- Displays Average and Modal frequency statistics
- Ability to Plot histogram of buffered data, for spectral frequency analysis.
- Auto-save on exit

## 1.2 Purpose Of Document

This document provides schematics, construction details and software guidance for FreqOut.

## 1.3 Related Documents

SirPic users should also read the following documents (available from <http://www.sirpic.com>):

- SirPic Interface Guide: For construction details of the pre-requisite SerialPic (RS232) or InfraPIC (Infra-red) interface.

## **2 Compatability**

FreqOut runs on the Palm PDA platform with the following requirements.

### **2.1 Minimum OS requirements**

FreqOut requires:

Palm OS 3.5 or later

Application storage space: approximately 20KB (FreqOut.prc)

Database storage space: approximately 5KB (FreqDb)

### **2.2 Compatible Palm PDAs**

FreqOut provides communication for both Serial and Infra-red ports.

In order to use the Serial port with FreqOut, the Palm PDA must be equipped with a Serial port and hotsync cable. Some Palm PDAs only support a USB hotsync cable connection, and do not provide a serial RS232 connection. On these Palm PDAs it will not be possible to communicate via the serial RS232 port, as no physical RS232 port exists on this device.

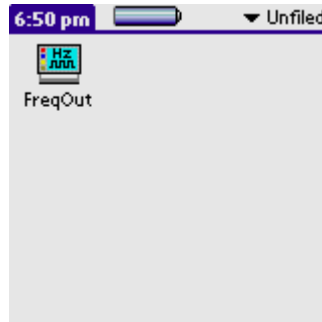
All Palm PDA's for OS3.5 or later support infra-red ports. However, some of the Palm devices have hardware restrictions on incoming infra-red data. These Palm devices only accept incoming data which contain framed data. FreqOut currently only supports raw SIR (slow-infra-red) mode compatible PDAs.

Please check the SirPic website [Compatability](#) page for the latest list of serial and infra-red (SIR raw mode) compatible PDAs.

## 3 FreqOut for Palm PDA

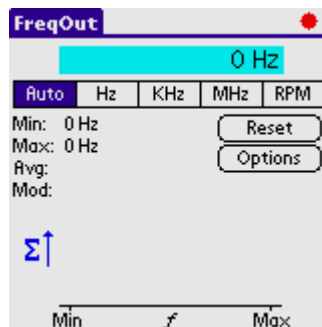
### 3.1 Palm Installation

FreqOut is installed on the Palm PDA, using the Palm Desktop Manager, Install tool. Simply add the FreqOut.prc file for installation on the next hotsync. This is followed by a Palm HotSync, after which the FreqOut application will appear on the Palm Launcher (under the Unfiled category).



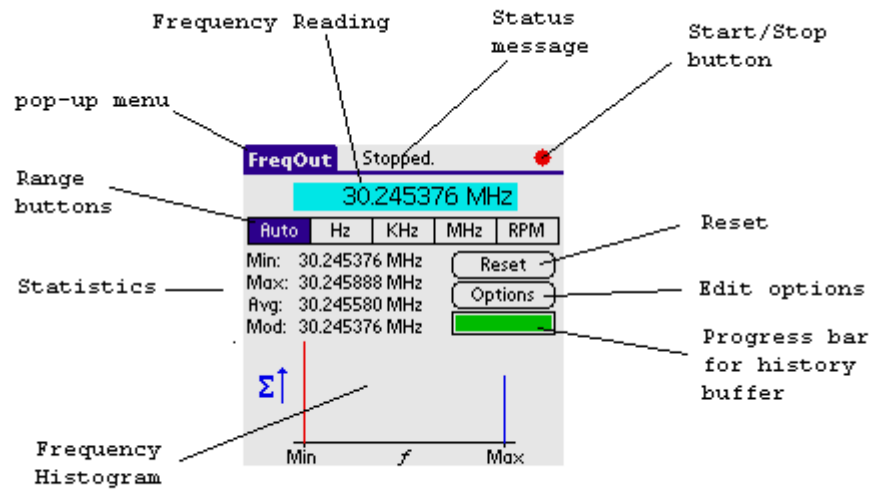
### 3.2 Launching FreqOut

Simply select the FreqOut icon from the installed Launcher category, and FreqOut will launch and display the main Startup Screen.



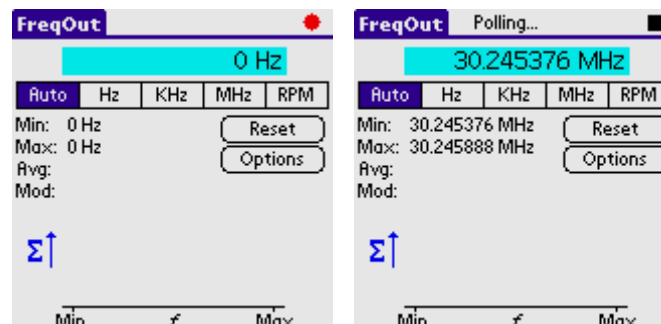
### 3.3 Screen Display

The following screenshot displays the main startup screen with annotations.



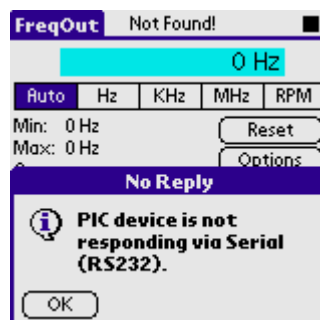
### 3.4 Start Capture

To start counting, simply press the red round "start" button icon in the top right corner.



The status will then change to "Searching...", followed by "Polling...". Also note that the "start" button will be replaced by a black square "stop" button.

When FreqOut is in the "Searching..." state, it will send an initialisation request to the PIC device up to 5 times (with status message "Retrying..."). If no PIC reply is received, the following alert is displayed, and data capture is stopped.

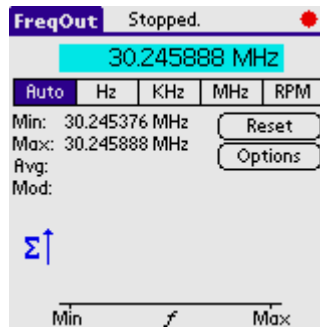


FreqOut also ensures that the communicating PIC device has the matching Product ID and PIC Version ID in the reply message. Any incompatibilities are alerted to the user. Hence, it is

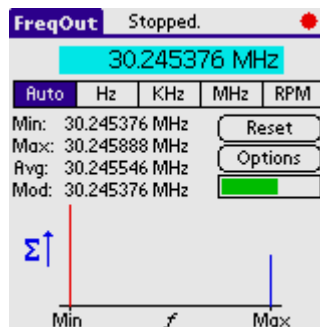
vital to ensure the PIC software version matches the Palm software version when installing or upgrading to new versions.

### 3.5 Stop Capture

To stop capture, once capture has commenced, simply press the black square “stop” button in the top right corner. The status will correspondingly change from "Polling..." to "Stopped.", and the "stop" button will be toggled to the red "start" button.



If the user has selected the “show stats” option, and the “stop” button is pressed during capture, the statistics and histogram are displayed for the current captured data set.



### 3.6 Range Buttons

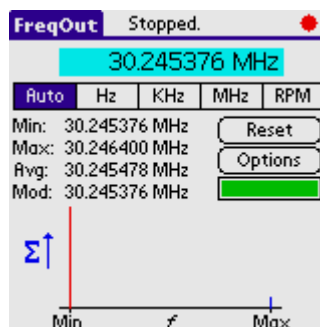
The frequency reading can be manually set to display in “Hz”, “KHz” or “MHz”. Alternatively, by setting it to “Auto”, FreqOut will determine the most appropriate scale to display the measured frequency (1-999=Hz; 1,000-999,999=KHz; >1,000,000=MHz).

Alternatively, the user may also display in RPM, where the source signal produces a pulse for every revolution ( $RPM=F*60$ , ie 1 Hz = 60 RPM).

Switching the range at any time, updates all displayed frequency readings.

### 3.7 Statistics and Histogram

The statistics and histogram are displayed after data capture, when the user has enabled the “show stats” option.



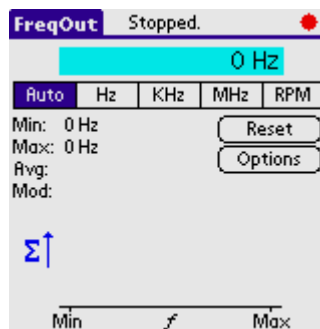
The histogram displays the frequency along the horizontal X-axis, between the range of the minimum and maximum frequencies. The vertical Y-axis is the summation count of samples for that frequency. In the example above 10 samples were collected, of which 9 were at the Minimum frequency (also the modal), and 1 sample was at the Maximum frequency.

The modal frequency (most common, or tallest line) is always displayed in red. All remaining lines are displayed in blue. The Y-axis scaling is "normalised" to the modal frequency summation count.

### 3.8 Reset button

Pressing the reset button, does the following:

- Clears any buffered data
- All statistics are reset (Min,Max,Avg,Mod)
- Previous histogram plots are cleared

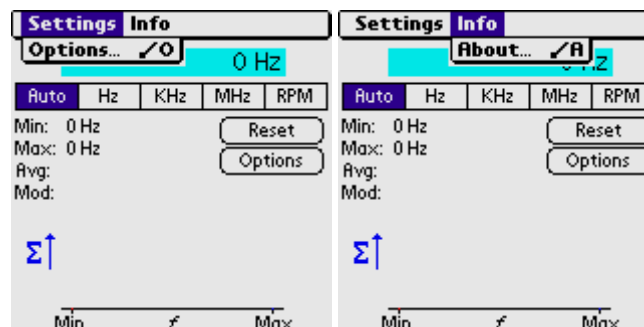


If reset is pressed during data capture, the data capture continues and does not stop. A reset is also automatically performed whenever a new capture session is started.

### 3.9 Menu bar

The menu bar can be launched by pressing the "menu button" in the graffiti panel, or by pressing the "FreqOut" tab label on the top left hand corner. A pop-up menu bar will appear in the toolbar/status area, from which the user can make a menu selection.

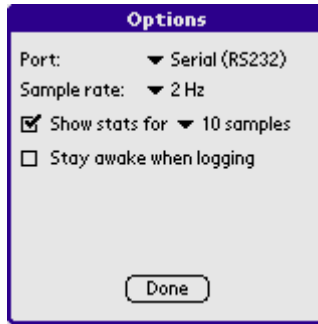
The various sub-menus are displayed below with their corresponding hot-keys.



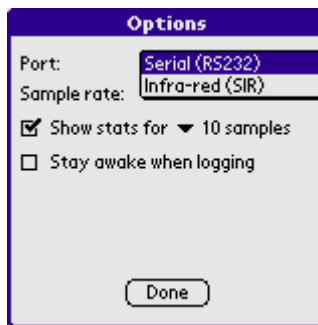
Note: Activating the menu bar whilst logging data, will automatically stop data capture.

### 3.10 Options Settings

The options settings form is shown below:



### 3.10.1 Port



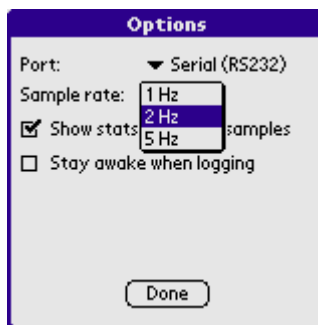
The Port parameter specifies the communication port to be used to communicate with the PIC. This can be set to:

**Serial (RS232):** for hardwired serial RS232 connection via the SerialPIC Interface.

**Infra-Red (SIR):** for wireless infra-red (slow infra red) raw connection via the InfraPIC interface.

NOTE: FreqOut does not currently support Palm PDAs which require Framed Infra-red mode. See the SirPic website compatibility page for more details.

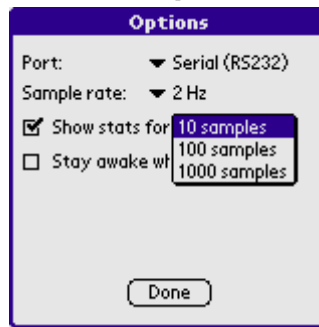
### 3.10.2 Sample Rate



The sample rate specifies the refresh rate at which data is captured. For example, a sample rate of 1Hz captures 1 reading every second, similarly 5 Hz captures 5 readings every second.

Note: The sample rate will never be faster than the frequency being measured. eg if you are measuring a frequency of 1Hz, at a sample rate of 5Hz, the refresh rate will still be 1Hz.

### 3.10.3 Show Stats For X samples



The “Show stats for” option allows the user to specify how many samples should be collected for histogram and statistical analysis.

For example 10 samples collected at a sample rate of 2Hz, will take approximately 5 seconds to capture a complete data set, after which capture is stopped, and the statistics and histogram are plotted.

By varying the sample rate and sample buffer size, the “capture time” can effectively be controlled.

The green progress bar on the main screen keeps the user updated on how full the sample buffer currently is. When the sample buffer reaches 100% full, the statistics and histogram are automatically plotted.

### 3.10.4 Stay awake when logging

This option ensures that the Palm device does not power off on timeout whilst logging. Enabling this setting may cause excessive battery drain, so should be used only when required. If this setting is disabled, the Palm will auto-power off on timeout even whilst actively capturing data.

## 3.11 About FreqOut

The About box displays the following information:

- Product Version
- Contact website address



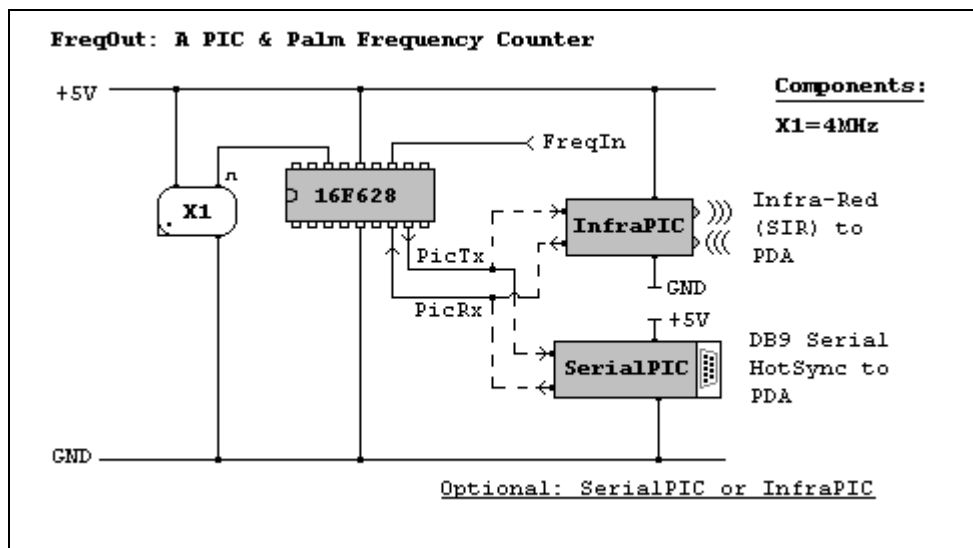
## 4 FreqOut for PIC

### 4.1 FreqOut for PIC16F628

The FreqOut PIC hex file should be programmed onto a PIC16F628 device. The SirPic website offers a PIC programming service, should you require a pre-programmed PIC device.

### 4.2 Schematic

The following schematic can be used for measuring the frequency of a TTL input signal



FreqOut will function with either the wired RS232 *SerialPIC* interface or the wireless infra-red *InfraPIC* interface. Construction details for both these interfaces can be found in the SirPic Interface guide.

Note: It is important to use an accurate and stable 4MHz crystal, as this will affect the accuracy of the captured frequency reading. Ideally, a tin-can 4MHz external TTL oscillator should be used with a low PPM rating (20-30ppm).

For low-voltage sensitive application, a suitable pre-amplifier can be inserted at the input stage.

### 4.3 FreqOut with SerialPIC

The picture below illustrates FreqOut in use with the wired RS232 *SerialPIC* interface.



### 4.4 FreqOut with InfraPIC

The picture below illustrates FreqOut in use with the wireless infra-red *InfraPIC* interface.



## 5 APPENDIX

### 5.1 Palm Alert Messages

FreqOut displays 3 severities of alert messages (Information, Warning and Error). The severity is indicated by the icon in the alert message box.

Severity	Alert Title	Alert Message
Error	Memory Allocation Error	Failed to allocate <bytes> bytes for <memory_descriptor>
Error	Open Port Error	<reason> (Error:<error_code>)
Error	Assertion Failure	Cond:<condition> Loc:<location_id>
Error	ROM Version	PalmOs v3.5 or later required.
Error	Serial Manager Version	Serial Manager 1 or later required (found: <ver>)
Warning	Record Failure	Failed to open/create <rec_id> record. Error: <error_code>
Warning	Corrupt Record	FreqDb <rec_id> record corrupt. (<size1> != <size2>). Using empty buffer.
Warning	Close Port Error	Failed to close (Error:<error_code>)
Information	No Reply	PIC device is not responding via <port>.
Information	Invalid PIC Product	The communicating PIC device is not running FreqOut.
Information	FreqOut Version	PIC version does not match Palm.