



## What you need

- **LC2138**
- **IFBT41 (RN-41/42 Bluetooth module) incl. 10-pin flat ribbon cable**
- **3.3V power supply**
- **Smartphone/Tablet with Android (>= 2.3)**
- **ECO-C-arm Compiler + BaseA/IF232LP**

## How it works

The LPC2138 has a powerful timer system. An event counter is used to measure frequencies up to 30MHz. A timer generates the necessary gate time (1s). Instead of counting external pulses during a fix gate time, it is also possible to let the event counter count the internal clock during a variable gate time, i.e. the period of the unknown signal.

Notabene: Exact timing, no interrupt latencies, no jitter. All that is left to the CPU is to display the measured values.

A reference signal is provided „for free“: A PWM output up to 30MHz. This signal is generated by a timer in the background with zero CPU load.

The hardware is controlled by an Android App via Bluetooth.

All that is missing to make this a real-life application is an input amplifier with pulse forming and high voltage protection. But this example is more intended to show that it is possible to control the device without the need for further hardware (display, keyboard).

Of course this could have also been done using a PC program. But not everybody has his notebook ready everywhere, while more and more people (they may know it or not) carry a whizz kid in their shirt pocket: Display, touchscreen, sound, haptic, even Gigabytes of memory, all this wireless - what more do you want?

Compile **btfm.c** and program the Flash of the LC2138.

Then connect the Bluetooth module, using the 10-pin flat ribbon cable.

Install **btfm.apk**.

Before you start the app, the Bluetooth module must be paired with your smartphone/tablet (in Settings/Bluetooth).

**In case of connection problems:** To reduce power consumption, the Bluetooth module has an adjustable connect window, which is best maximized. To do this, install and start the Bluetooth terminal **btm.apk**. Power on, connect and send **\$\$\$** within 1 minute. To maximize the connect window enter **sj,0800**.

For more documentation see **btfm.c**.

## Operation

When the app gets started, it shows the screen for Bluetooth device selection. All currently paired devices are offered. As it makes no sense to connect to devices other than the Bluetooth module, the selection can be limited to device names containing a particular string, defined in settings. Always offered is „Demo“, in case the external hardware is not available. If only one device is available, it is selected automatically.

On successful connection, the main screen is shown. You can see which input is used (counter =direct frequency measurement, gate =measurement via period), the input frequency is displayed as well as the frequency of the reference signal.

Rotating the display starts a special display mode, which is configured in settings: You can multiply the original value by a factor and you can adjust the number of decimal places as well as the digit size. Finally, you can add a unit (e.g. „kHz“).

In settings you can switch between frequency measurement and period measurement. You can set the frequency of the reference signal. In addition you can enable the rotation functionality and activate fullscreen mode.

### Screenshots

