

PulseOx Monitor GUI

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MSP430

The main objective of this document is to give a detailed description of how to get the PulseOxMonitor GUI up and running on a USB-equipped Windows PC. USB Drivers, LabVIEW GUI stand-alone executable and/or LabVIEW run-time engine are required to execute the GUI application. These files are present in the '*Revised Pulsoximeter Application*' folder.

Demo Hardware Setup

1. USB Driver Installation

VCP drivers are provided to install the FTDI (FT232BM) USB device. VCP driver emulates a standard PC serial port such that the USB device may be communicated with as a standard RS232 device.

Download the driver files from the folder path <*Revised Pulsoximeter Application/USB Drivers/CDM 2.02.04 WHQL Certified*> and unzip them to a location on the target PC. Connect the pulsoximeter device to a spare USB port on the PC via a USB cable. Windows will detect the new device and will initiate the Found New Hardware Wizard prompting the user to install the software for the detected USB Device. Select 'No, not this time' from the options available and then direct the installation process to the file path where the drivers were unzipped. For detailed driver installation details, refer 'USB Driver Installation Guide' document present in the '*Revised Pulsoximeter Application*' folder.

2. Demo - Software GUI Setup

The following steps help install and execute the LabVIEW GUI application in a target PC that does not have the LabVIEW software or the LabVIEW Run-Time Engine installed on it:

- Download the zip folder Revised Pulsoximeter Application onto a PC and unzip the file to a known location on the PC.
- Install the LabVIEW run-time engine by running the 'setup.exe' present in the *LabVIEW Run-Time Engine* folder location <...*Revised Pulsoximeter Application\Pulsox LabVIEW GUI Install\My Installer\Volume*>. After installation, a Pulse Ox folder is automatically added to the bottom of the All Programs menu (Start/All Programs).
- Selecting the PulseOxMonitor program in All Programs menu displays the GUI window as shown in Figure 1.

The following steps help install and execute the LabVIEW GUI application in a target PC that has the LabVIEW software or the LabVIEW Run-Time Engine installed on it:

- Download the zip folder Revised Pulsoximeter Application onto a PC and unzip the file to a known location on the PC.

- Install the GUI executable by running the 'PulseOxMonitor.exe' present in the folder location: <...\Revised Pulsoximeter Application\Pulsox LabVIEW GUI Install\Pulsox_GUI>. The PulseOxMonitor program included within the Pulse Ox folder gets automatically added to the bottom of the All Programs menu (Start/All Programs).
- Selecting the PulseOxMonitor program in All Programs menu displays the GUI window as shown in Figure 1.

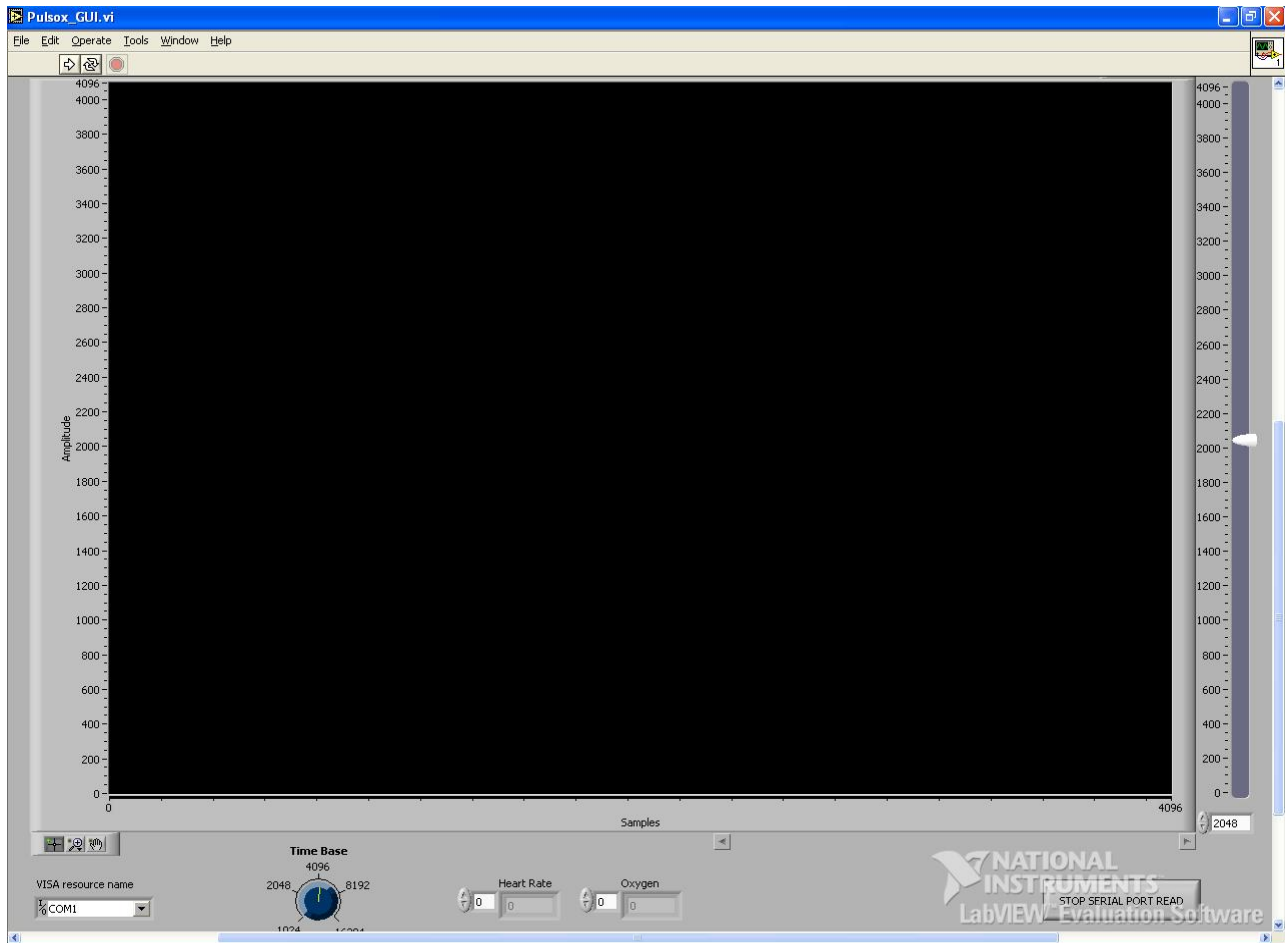


Figure 1. PulseOx Monitor GUI Window

3. Demo Options

This section discusses about the various options and setting configurations that are provided in the PulseOx GUI.

3.1. COM Port Setting

- Ensure the device is connected to an USB port on the target PC via USB cable. Install the necessary drivers for the device - Refer 'USB Driver Installation Guide' document.

- Determine the COM port assignment of the device - Open the Device Manager (located in "Control Panel\System") then select the "Hardware" tab and click "Device Manager") and select "View > Devices by Type", the device appears under "Ports (COM & LPT)" with the label "USB Serial Port (COMxx)". The target PC's additional COM port number that is assigned to the USB device appears in the label.

Figure 2 shows a screen shot of the device manager window with the USB Serial Port (COM16) label. This also means that Windows has assigned the device to COM16 port.

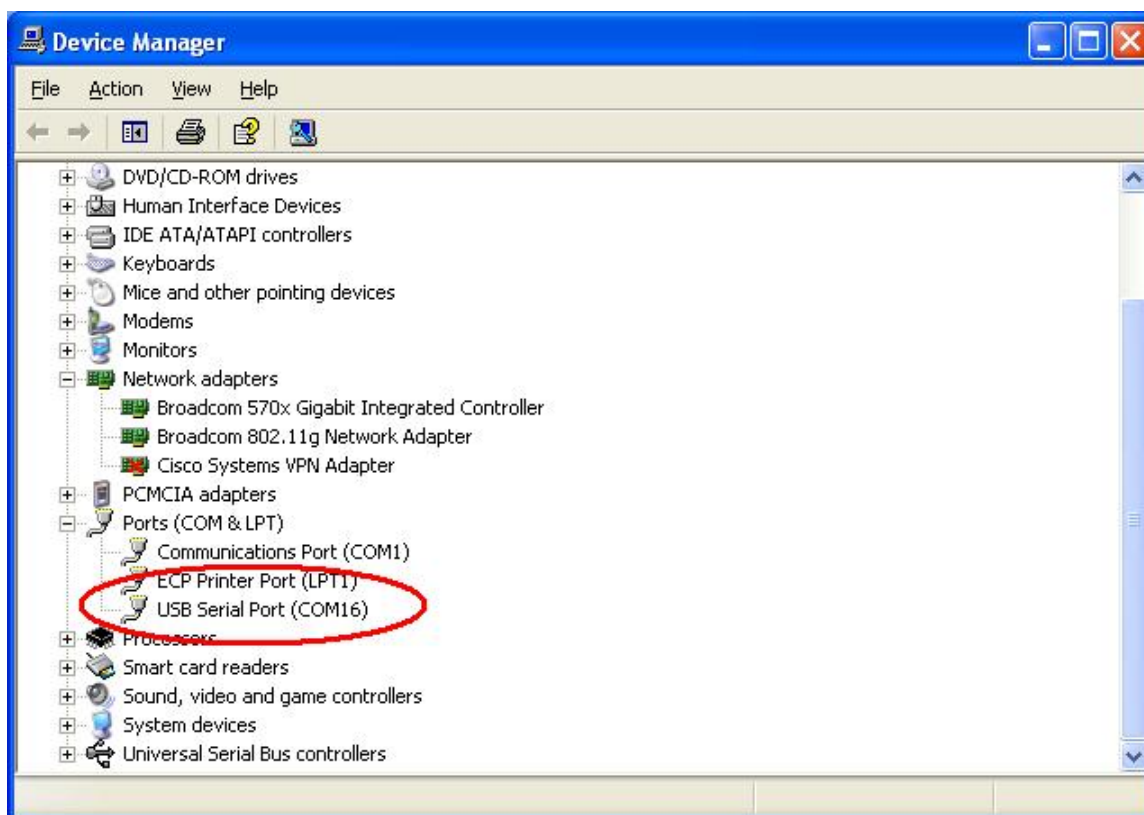


Figure 2. Device Manager displaying the USB Serial COM Port assigned to the device

NOTE: The COM port assignment of the USB to Serial port varies depending on the computer hardware configuration. Windows will check what COM ports are unused or free in the target PC and assigns that port number to the device.

- Once the COM port assignment to the USB device is determined, the serial port drop-down menu (VISA resource name) located at the lower left portion of the GUI screen is used to select the COM port label to which the USB device is connected. Figure 3 shows the screen-shot of the VISA resource name drop-down menu of the GUI.
- If the COM port label of the device is not displayed in the drop-down menu, select the "Refresh" option and then look for the COM port label.

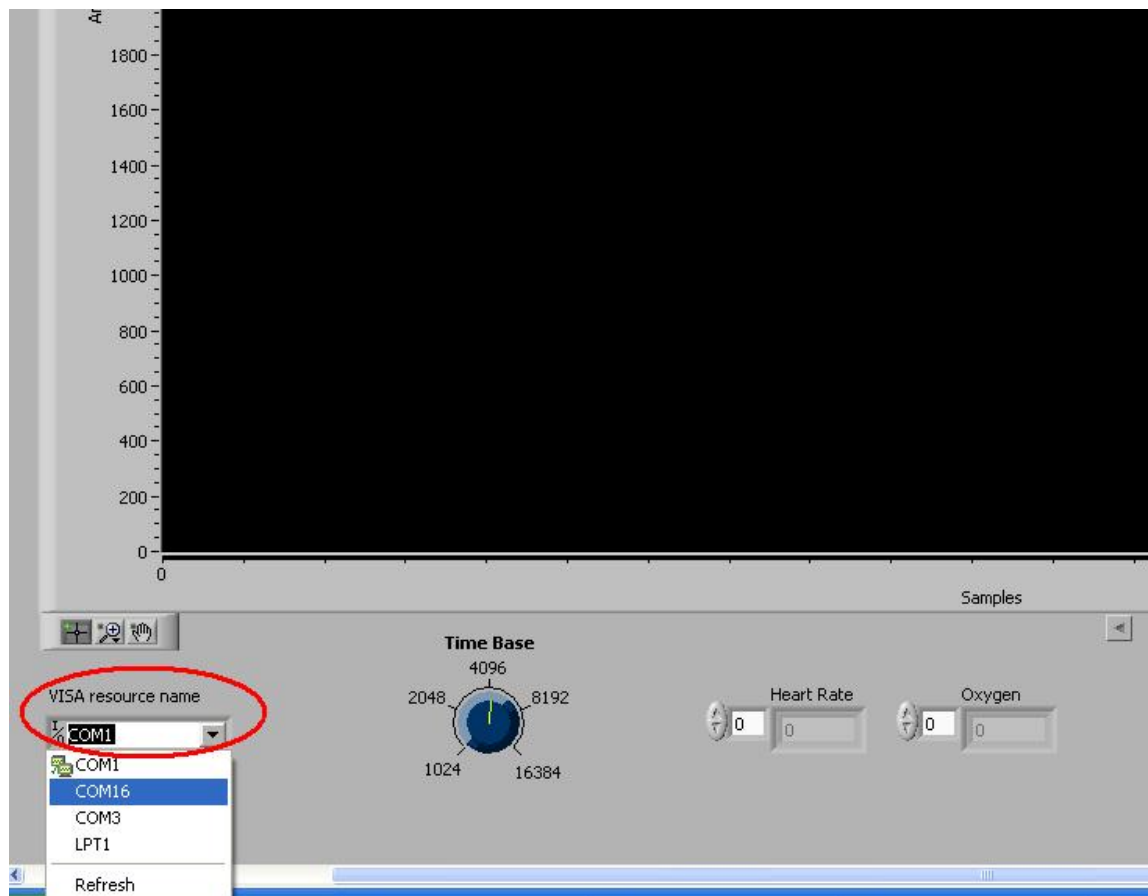


Figure 3. PulseOx Monitor GUI Window – COM Port Select

3.2. Time Base

The “Time Base” knob control allows the user to select the number of samples that are to be displayed in the GUI waveform chart at any time. This control is a run-time feature and can be modified when the GUI application is running. The default option for this control is 4096 samples.

3.3. Heart Signal Display

The processed data samples of the infra-red LED are serially transmitted by the MSP430 to the target PC via the USB every 2ms at a data rate of 115kbps. These data samples are displayed in the waveform chart in the GUI.

3.4. Heart Rate and % Oxygen Saturation Display

Two indicators are present in the GUI application to display the heart rate and the percentage oxygen saturation level. These numbers are transmitted along with the infra-red LED heart signal sample every 2ms at a data rate of 115kbps to the PC via the UART/USB Bridge.

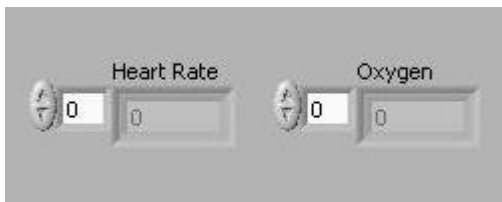


Figure 4. Indicators for Heart Rate and % Oxygen Saturation

3.5. Serial Port Settings:

The default baud rate is set to 115200bps and the MSP430FG437 is software configured to transfer data serially to target PC at this rate. The default setting for the serial data communication is 8-N-1 encoding with no flow control. Also the port by default is configured only for serial port read operation and the input buffer size is set to 4096 bytes.

3.6. Stop Serial Port Read:

The heart signal, heart rate and blood oxygen level monitor can be stopped by clicking the 'STOP SERIAL PORT READ' control that is located at the lower right portion of the GUI screen. To re-start the Serial port read operation, click the 'Run' button or 'Operate\Run'.

Figure 5 shows a screen shot of the PulseOxMonitor GUI with the heart signal, heart rate and percentage oxygen saturation displayed. A heart rate of 70 beats per minute and oxygen saturation of 98% is seen.

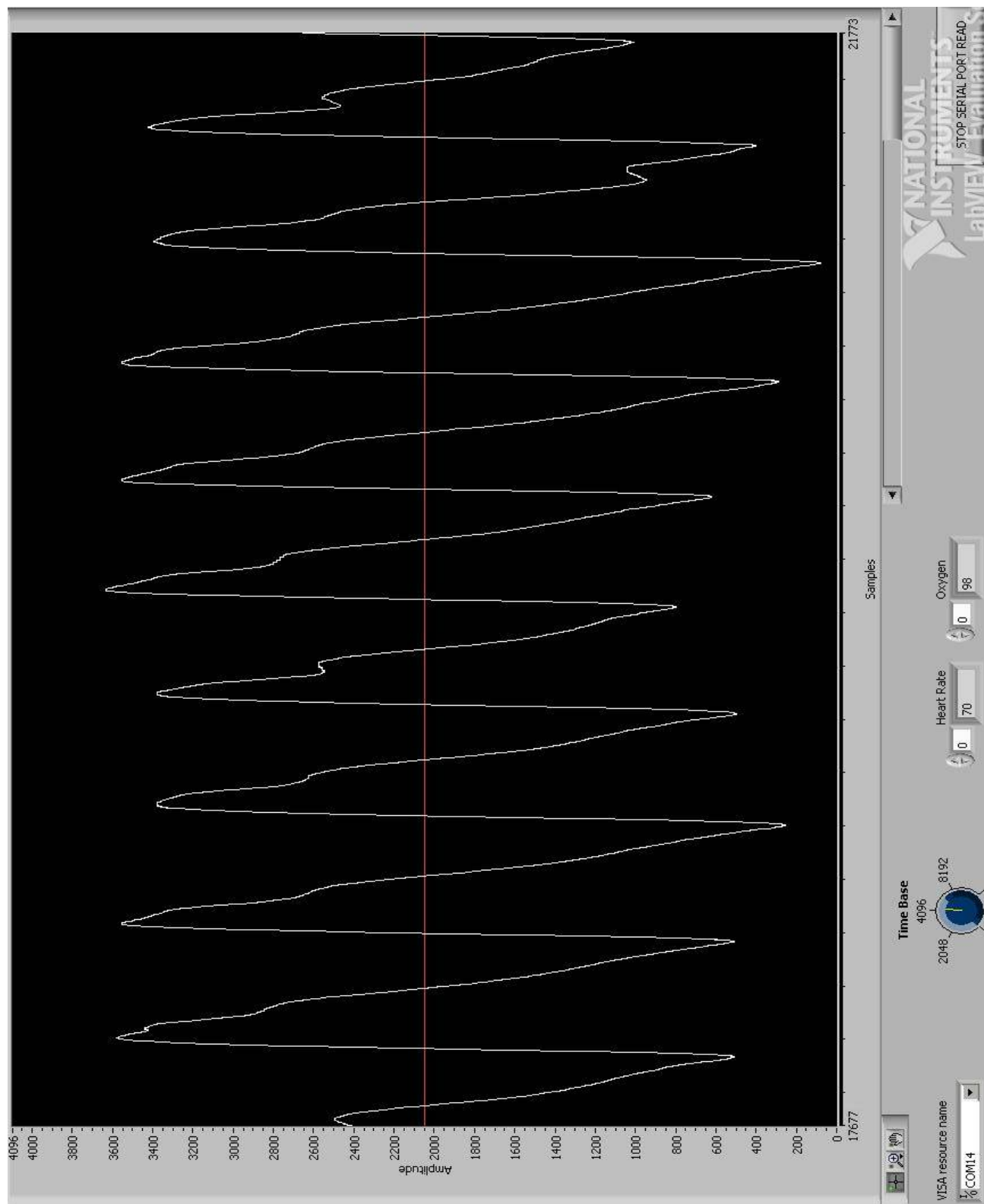


Figure 5. PulseOxMonitor Screenshot

Frequently Asked Questions (FAQ)

1. **The board does a measurement of an “infra-red” and a “visual red” LED, right? Is this GUI just showing one of them?**

Yes, the pulseoximeter board does the measurement of both ‘visual red’ and ‘infra-red’ LEDs present in the sensor. In order to compute the heart rate or display the heart signal, either the red or the infra-red data samples are sufficient, as the output from both LEDs matches with each other within a small tolerance [1]. However, since the infra-red signal is normally stronger than the visual red signal, measurements of the infra-red LED are used for heart rate and heart signal monitoring. Hence, only the infra-red data samples are transmitted to the PC via the UART/USB link and displayed as heart signal in the waveform chart.

2. **Does the user have to install LABVIEW in the target PC in order to run the PulseOxMonitor GUI application on it?**

There is no need to install LabVIEW to run the PulseOxMonitor GUI application. In PCs that do not have a LabVIEW Run-Time Engine already installed, installing the run-time engine present in the folder path *<Revised_Pulsoximeter_Application/Pulsoximeter_PC_Software/LabVIEW_Run-Time_Engine>*, is sufficient to run the PulseOxMonitor GUI application. And in PCs that have the LabVIEW Run-Time Engine installed, just running the GUI executable ‘PulseOxMonitor.exe’ present in the folder path *<Revised_Pulsoximeter_Application/Pulsoximeter_PC_Software/GUI_Executable>* can execute the PulseOxMonitor program.

3. **Can LabVIEW Run-Time Engine execute any LabVIEW stand alone executable?**

The LabVIEW Run-Time Engine present in the *Revised_Pulsoximeter_Application* folder helps load and run LabVIEW stand-alone executables that are built using LabVIEW 8.2.1 or its previous versions.