MAXREFDES46# Quick Start Guide

UG6207; Rev 1; 9/15

Abstract

The MAXREFDES46# 4-Channel Analog Input Output Quick Start Guide describes the steps required to quickly get the MAXREFDES46# reference design up and running.

Table of Contents

1. Required Equipment

- PC with Windows® OS with two USB ports
- MPLAB X IDE 2.35
- MAXREFDES46# board
- 24V power adapter
- Tera term serial terminal utility
- USB type B cable
- Industrial sensor or signal source
- 8.5 digits multimeter

2. Overview

Below is a high-level overview of the steps required to quickly get the MAXREFDES46# design running by downloading and running the firmware. Detailed instructions for each step are provided in the following pages.

1) Connect the MAXREFDES46# board to the PC by using USB type B cable as shown in **Figure 1**.
2) Download the latest **RD46V01_00.ZIP** file located at the MAXREFDES46# page.
3) Extract the **RD46V01_00.ZIP** file to a directory on your PC.
4) Open a terminal program to communicate with MAXREFDES46# board.

Figure 1. MAXREFDES46# board.

3. Procedure

1) Connect a 24V adapter to the J4 port to power up the MAXREFDES46# board.

2) Connect the USB type B cable to your PC and to the J6 port of MAXREFDES46# board as shown in Figure 1.

3) Download the latest **RD46V01_00.ZIP** file at http://www.maximintegrated.com/en/design/reference-design-center/system-board/6160.html/tb_tab2. All files available for download are available at the bottom of the page.

4) Extract the **RD46V01_00.ZIP** file to a directory on your PC. The location is arbitrary but the path prior to where you extract the .ZIP file must not exceed 82 characters due to the Windows 250-character total path limitation. For example, this 90-character preceding path would be an example of a path that would be too long:

   C:\0123456789\0123456789\0123456789\0123456789\0123456789\0123456789\0123456789\0123456789\0123456789\RD46V01_00.ZIP
   (This path is too long.)

   For the purposes of this document, it will be **C:\designs\maxim\RD46V01_00\.**
   See Appendix A: Project Structure and Key Filenames in this document for the project structure and key filenames.

1. Set up the terminal program to run on the PC using the following steps. To establish this communication link, the PC must be configured with the appropriate Windows drivers. A suitable terminal program such as Tera Term or HyperTerminal should be used.
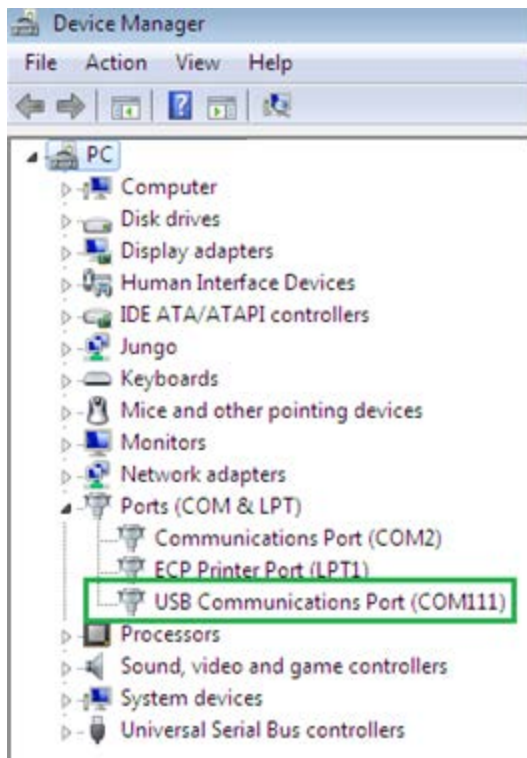

Figure 2. COM for for USB communication to the MAXREFDES46# board thru the USB type B connector at J6.

The MAXREFDES46# utilizes the PIC32 MCU with standard CDC class, so you need to install USB device driver that virtual Com Port, also known as VCP from **C:\designs\maxim\RD46V01_00\Device driver**.

Once installed, Windows assigns a previously unused COM port. Use the Windows **Control Panel | System | Device Manager** to determine the COM port number. (It will be named **USB Serial Port**) as shown in **Figure 2**. Make a note of which COM port this is since that information is needed in the next step.

Next, a terminal emulation program needs to be installed and launched. For Windows XP® and earlier systems, the HyperTerminal program is the usual choice. However, since HyperTerminal was eliminated from Windows 7, it may be necessary to locate an alternative. Several are available; one good choice is called Tera Term (http://ttssh2.sourceforge.jp/). Whatever terminal program you choose, the communication should be set up by opening the COM port number previously described above and the port configured as:

bits per second: **115200**

data bits: **8**;

parity: **none**;

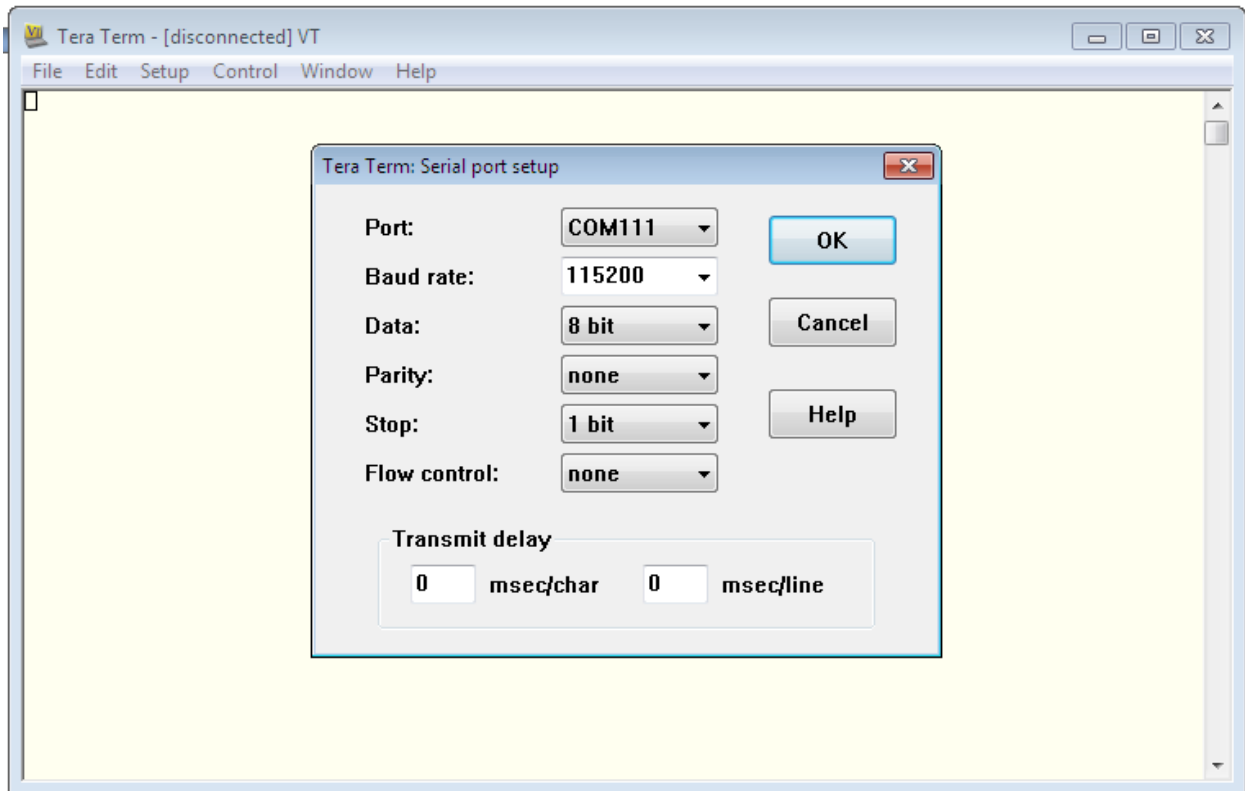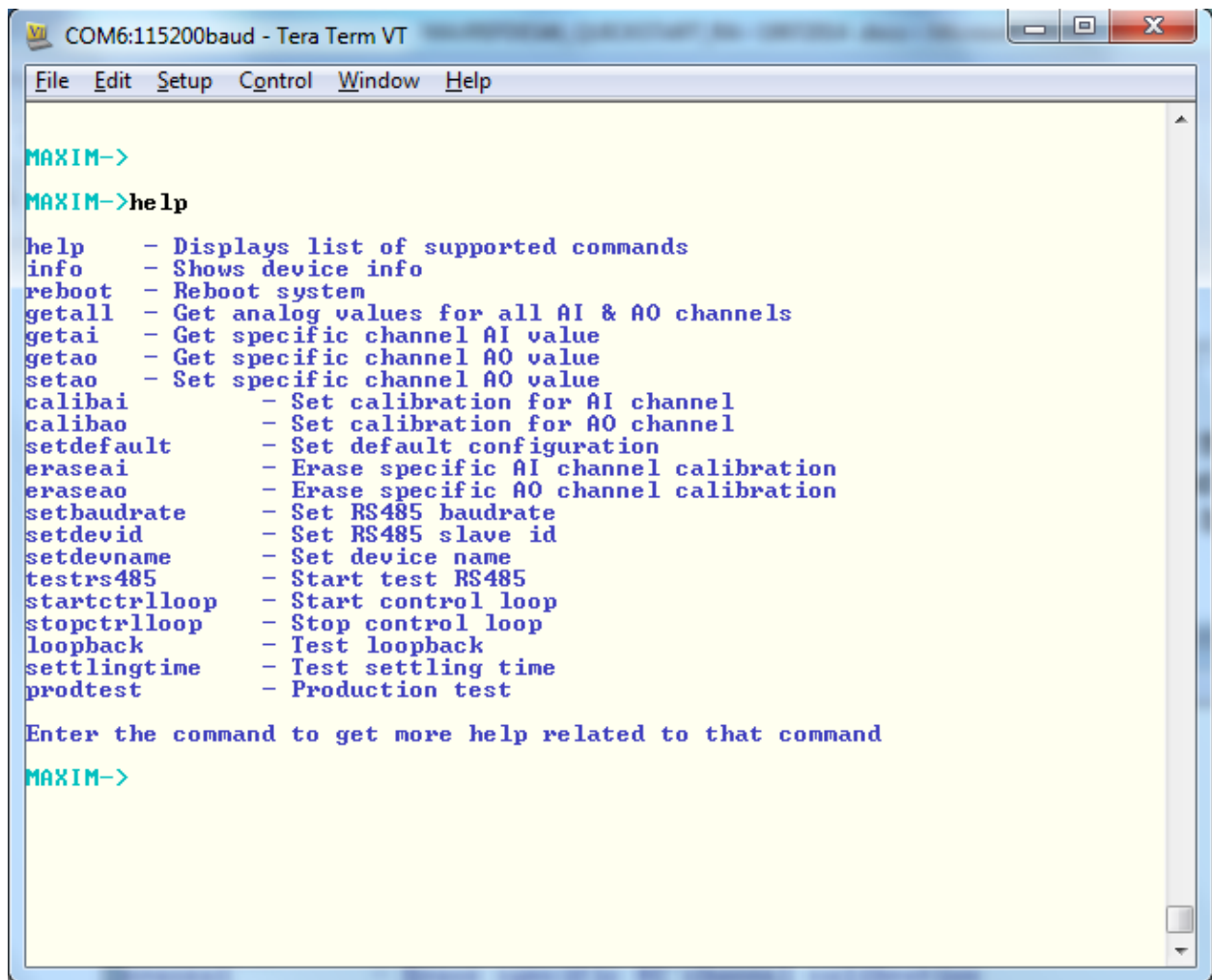stop bits: **1**;

flow control: **none**.

Figure 3. Parameters for the serial port communication.

At this point, the application is running on the MAXREFDES46# and the terminal program is running on your PC. Press "Enter" to get the Maxim console and then enter the 'help' command to get the following window. Make the desired selections by pressing the appropriate keys on the keyboard.

*Figure 4. The 'Help' menu in the MAXREFDES46# terminal program.*

2. DC histogram test

The MAXDESREF46# board is tested for the DC histogram to calculate variation of ADC readings.

ADC sampling is very critical and a small mismatch would result in failure of the test. Therefore, a special code is programmed for the histogram with all debug prints and conversions disabled. Raw ADC values in hexadecimal digits for 64K readings are out on debug port console.

Steps to capture DC histogram data:

1. Connect MAXREFDES46# board to PC.
2. Program the board with special firmware "MAXREFDES46_Histogram_FFT_test.hex" for histogram and FFT test from."
   \MAXREFDES46#\Release\RD46V01_00\RD46_PIC32_V01_00\RELEASE_21082014 \Performance test software\Hex files\Histogram_FFT_test". Use the appropriate .hex file based on the sample rate you which to use, 5ksps or 20ksps.
3. Connect analog input 0 to ground.
4. Connect Mini USB cable to J3 connector and open tera term utility.
5. Select COM port and set below configuration for serial port.
   Baud rate: 460800

   Parity: None

   Data bits: 8

   Stop bits: 1
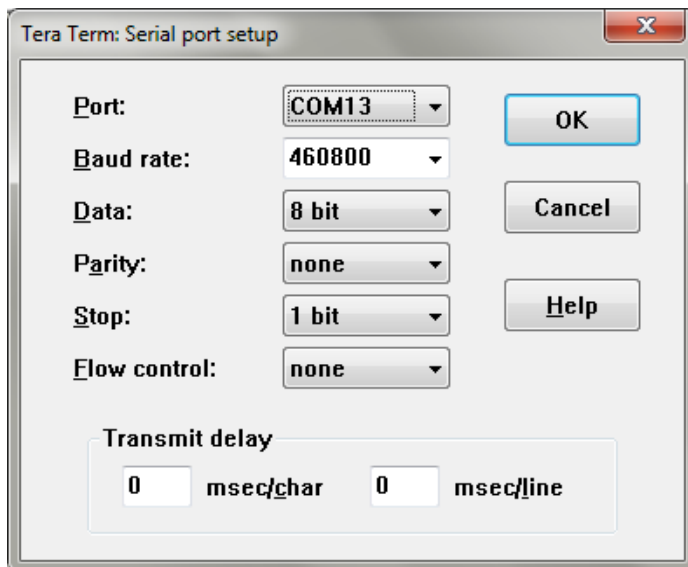
6. Create log file for collecting 64K samples required histogram computation. Store log file at "C:\designs\maxim\RD46V01_00\rd46_pic32_v01_00\release_21082014\Performance test software\Histogram_FFT_test_utility" location.
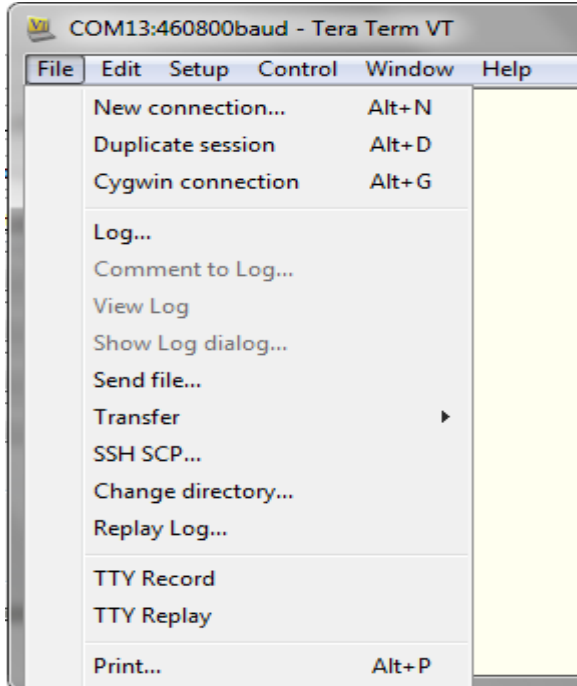
7. Configure the following window as shown and press Save to start logging.
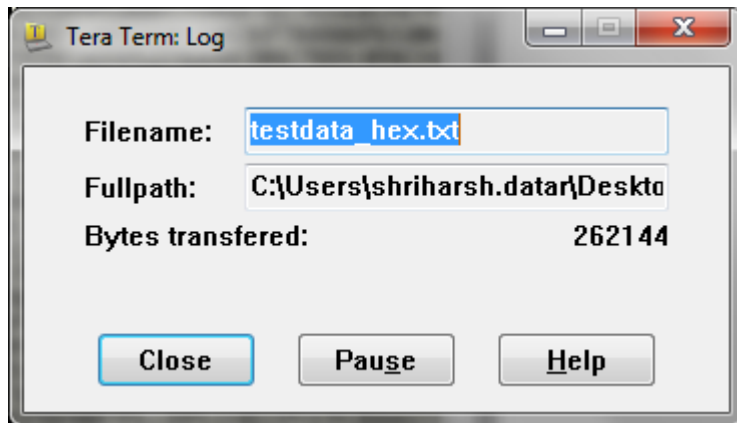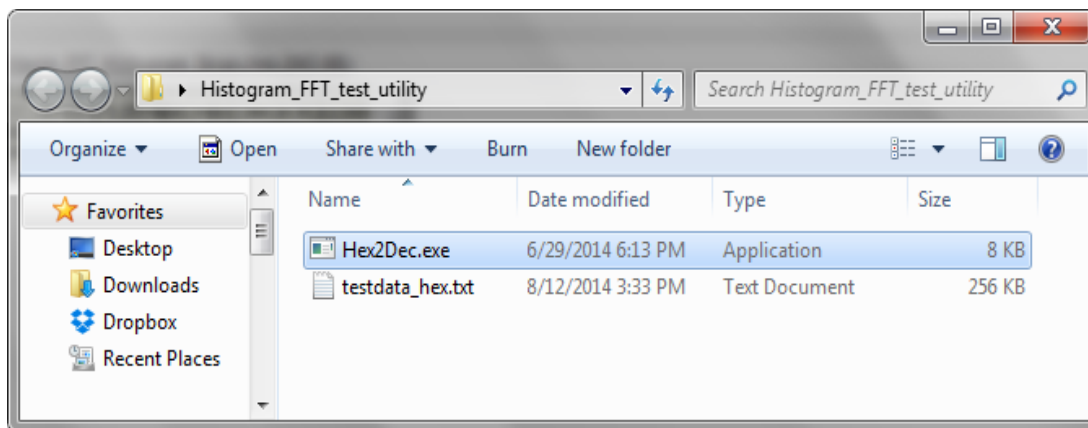8. Press the SW1 button on the board to start the FFT/Histogram test. LED D8 will light during sample collection and LED D8 will switch OFF when it completes.
9. Hex dump will be seen on the tera term window as follows.

COM13:460800baud - Tera Term VT

File   Edit   Setup   Control   Window   Help

9F43BCF4D9BCED17F575F3F0E723D13FB66092666D244D122CBB139C0509003D05EF16792C954D92
72488D04AF5BCEE7E59EF238F5DFEE0FDE25C380A1CD7F165C8639741DAE0BBC010602080D012149
3F5661497B0FA0D2C22EDA7CED68F5CDF323E6EACF90B13692286BD8479E2ACB1338040A003A0605
175B31974E5C732C9164B2F8CF3AE6B3F390F5DBED8BDA83C189A12E7B9F57BA39291C72093900F6
022B0EE924493FB4639B80D2A10BC334DE03EE64F5D9F25DE46ACF52AFB28BFB6AF846CA27631135
03E8003A0805177C3291540975EE9202B5DAD2D8E6D9F3DEF54EED29D9F5BDA59D807B2355683479
1C4508BB008802C60F2D2675444063F1827FA718C41BDE83EFD8F614F240E328CB02AF7A8AAF650A
445726E60F8202DD003C088E1B60337B54E27A549621B643D47BE98DF3E9F527EAD1D867BD149A34
762C551432FA1860087D006103B8112D26C5465069B382BDA82DC8B8E005F009F618F0D9E2F7C9B5
A9A589E06424406A240E0F43024C005208A41C1F384D57767AF49928BAB4D4B6EA44F4F2F50EEA72
D546B9A699BB73BA4FB032C2179E0668005403DB12E02A99469B6B5A891AA948C962E288F16AF617
F02FDFC3C987A88983DB61C83FDC21BB0D08023400C80B311CCA38FE5BBE7B1C9997BCAAD89CEA60
F51AF41AE957D4D5B6CD94E173624E062DD01736061500460050A131E2C554BFB6B978A48AE8FCB96
E2E2F21CF604F017DEC3C492A7C282EE5D363C6421680A8F1E3922B6BED47FB2C0F133F041C003A0602174C
BCF1D9AFECF3F539F3F3E73CD1FFB66692816DB94DCA2CC913C80572003D05E416122C924D8171E4
8B41AP52CEC2E522F236F5E2EE48DE9EC38BA21580925C8E39941E3B0BBE010B01F80C2F21413F2B
60417B0DA0B8C1BBD9D7ED62F5C8F372E6ECCFAAB1E3922B6BED47FB2C0F133F041C003A0602174C
312A4DB6731F911EB1ACCF35E6A1F36EF5DCED93DAC4C2E8A1397BD758C2392E1C87097200FD022A
0ECB23533FAE63758013A108C326DDCBEDC2F5D9F269E4F9CF55AFCA8C8F6BAC46D6279A11F103E9
003A07CA1779327F53AB742791F9B5ACD21DE6D6F3DAF561ED79D9FDBDE49EEB7B2A558E35221C49
08C30095025E0F292653435263EA8265A69EC359DE7CEFC0F608F240E33BCB97AF7E8AC5657145DC
26EE0F9C031C003C08861B0D32B054D67A0E94C4B63CD461E939F3E9F528EAFCD97CBD1F9A697743
5519331118B508A9006303A9106C26BE462F68F882B8A81DC86DDEFDF007F618F124E2FCC9C8AA23
8A85643240AB25110F470254004908A11C1437FE55C27AE998F7B9D6D4B3EA38F4E2F521EA77D57A
BADF99C473E2506F32C517AC068E005603D712C629D446986B408894A854C957E260F10FF619F039
E033C987A89B844363693FE521E10D88023600B60AFE1C3838F45B797B1D998EBC8BD821EA5CF518
F42EEA10D4DAB6FB95F173674E212E421786061A004704A6131A2C384B4F6B948A34AE3ACA3CE2DD
F211F612F018DED4C506A86482FD5D803D9D216D0BF9018100F20B9D20703A015C507B119D9CBCEE
D99DECC3F520F3F5E75ED2FFB66A92A86E854DCE2CDA140305E3003F05D71589

10. Go to logging window and press close to stop logging.

11. Run "Hex2Dec.exe" to generate the .csv file.

12. "tesdata.csv" will be generated to the same path.

The ADC sample data is now available in CSV format for further calculation and verification.

3. FFT test

    The MAXREFDES46# board is tested for different system performance parameters like SNR, SINAD, SFDR, and THD. The above mentioned parameters are calculated using FFT analysis of ADC samples collected for analog input.

    ADC sampling is very critical and a small mismatch would result in failure of the test. Therefore, a special code is programmed for FFT with all debug prints and conversions disabled. Raw ADC values in hexadecimal digits for 64K readings are out on debug port console.

    Steps to capture FFT data:

    All above steps mentioned in the DC Histogram test remains the same, except for step 3. In this test, please connect a ±10V, 250Hz sine wave input to J8 from the SYS2722 source. All other steps remain the same.

    The ADC sample data is now available in the CSV format for further SNR, SFDR, SINAD and THD verification.

4. Trademarks

Windows is a registered trademark and a registered service mark and Windows XP is a registered trademark of Microsoft Corporation.