8-Bit to 16-Bit, 40MSPS to 500MSPS ADC Evaluation System

The Intersil KMB001 evaluation system allows users to evaluate the Intersil portfolio of low-power, 8-bit to 16-bit, high-performance analog-to-digital converters (ADC). These converters run at sampling rates of 40MSPS to 500MSPS and are designed with the Intersil proprietary FemtoCharge™ technology on a standard CMOS process.

The KMB001 evaluation system uses the Intersil Konverter Analyzer software, which displays all pertinent data such as SFDR, SINAD, ENOB, harmonics, current, and power measurements. The software also plots outputs in frequency spectra and time domain.

To begin testing, simply connect the input signal, sampling clock, and target computer to the motherboard, and supply power (Figure 1). The motherboard provides appropriate supply voltages and captures digital data from the daughter card. Daughter cards contain the ADCs and attach directly to the KMB001 to form the ADC evaluation platform (Figure 2).

To ensure proper operation of the system, it is recommended that the most current software version be installed. If Intersil Konverter Analyzer is already installed on the machine, it must be uninstalled prior to installation of the latest version.

Features

- 18Mb FIFO captures 1M ADC output samples
- USB2.0 interface for rapid data transfer
- Datasheet-style, live-updated display

KMB001 Evaluation System Contents

The KMB001 is provided with a USB cable to connect to a PC and a 5V power supply. The user need only provide signal and clock sources and a PC running the Microsoft Windows™ XP or Windows 2000 operating system. Intersil Konverter Analyzer software can be downloaded from the Intersil web site.
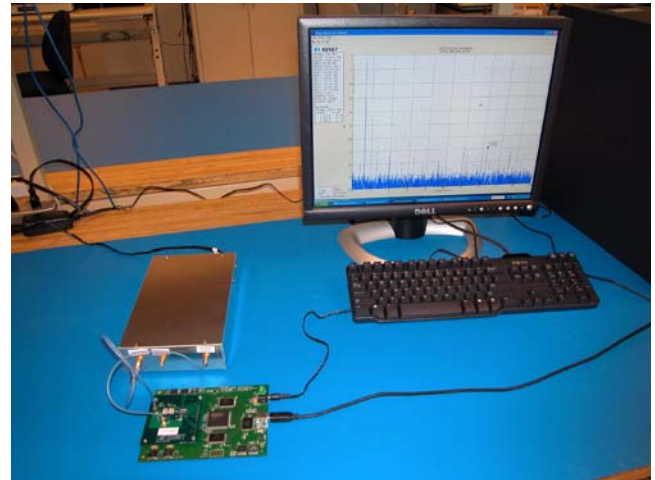

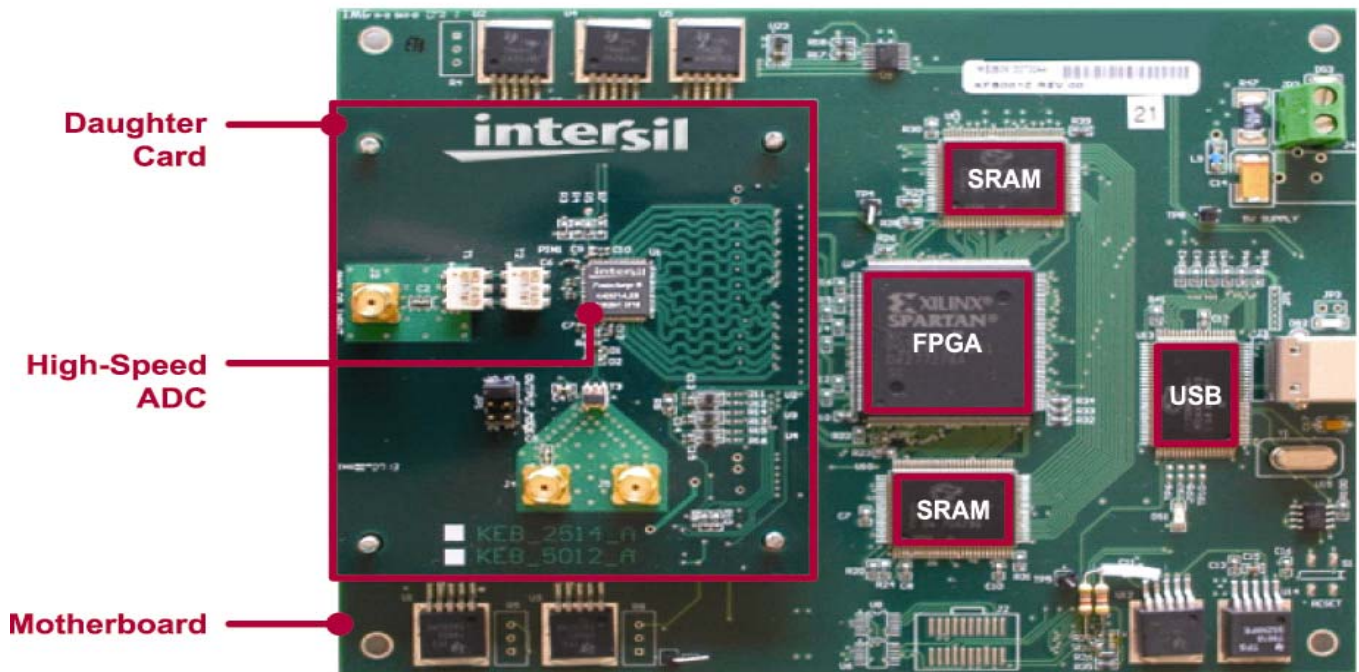**FIGURE 1. EVALUATION PLATFORM, SIGNAL SOURCES AND PC**

FIGURE 2. EXAMPLE EVALUATION PLATFORM CONNECTIONS (SHOWING KDC2710 DAUGHTER CARD)

TABLE 1. PC SYSTEM REQUIREMENTS

OPERATING SYSTEM	PROCESSORS	RAM	DISPLAY RESOLUTION
Windows™ XP Windows 2000	Intel® Pentium (Pentium 4 and above) Intel Celeron Intel Xeon Intel Core AMD Athlon 64* AMD Opteron AMD Sempron	512MB (1024MB recommended)	800x600 or higher

* Processor must support SSE2 instruction set.

Setup and Operation of the ADC Evaluation Platform

To set up the ADC evaluation platform, the following items are required:

1. Intersil KMB001 motherboard
2. USB cable (USB-A to USB-B, 1.25 to 2M long); supplied with KMB001
3. Intersil daughter card containing ADC to be tested
4. Suitable signal and clock sources (see Appendix A on page 6)
5. 4W minimum, 5V power supply (supplied with KMB001)
6. PC with free USB2.0 port, logged in with administrator rights, and fulfilling the PC system requirements shown in Table 1

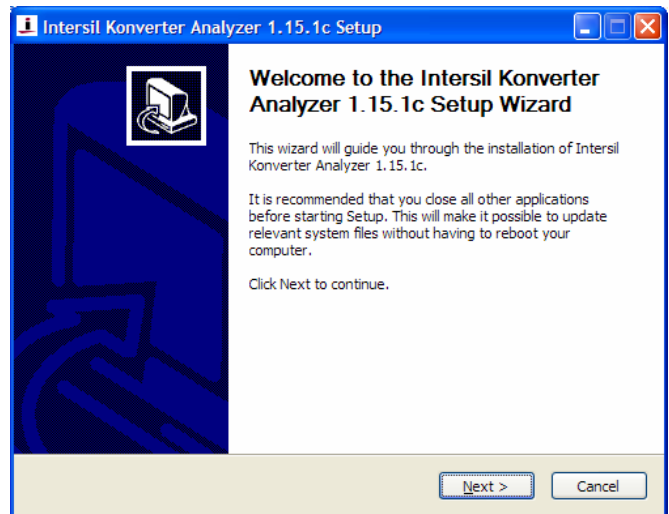## Installing the Intersil Konverter Analyzer Software

If an earlier version of the Intersil Konverter Analyzer software is installed on the PC, it must be removed before a new version can be installed.

To uninstall an earlier version, click the Windows **Start** menu, and then click **All Programs** > **Intersil Konverter Analyzer** > **Uninstall**.

Note that the software version number in the following procedures may not match the latest version being installed, but the instructions are the same.

To install the Intersil Konverter Analyzer Software:

1. Download the Intersil Konverter Analyzer installation files from the Intersil web site at:
   www.intersil.com/converters/adc_eval_platform/index.asp
2. Run IntersilKonverterInstallerVX.XX.Xc.exe for the version you want to install. The **Welcome to the Intersil Konverter Analyzer X.XX.X Setup Wizard** window opens.
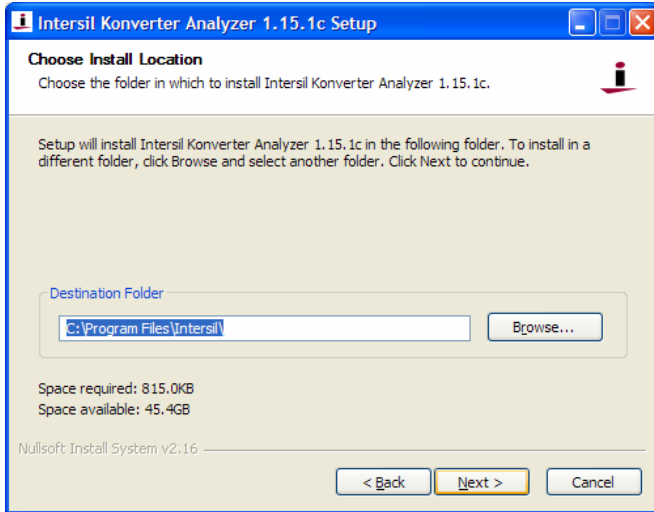

3. In the **Welcome to the Intersil Konverter Analyzer X.XX.X Setup Wizard** window, click **Next**. The **License Agreement** window opens.
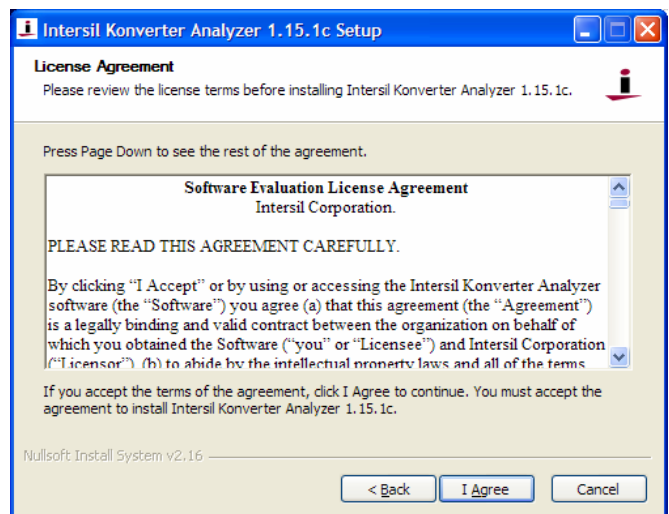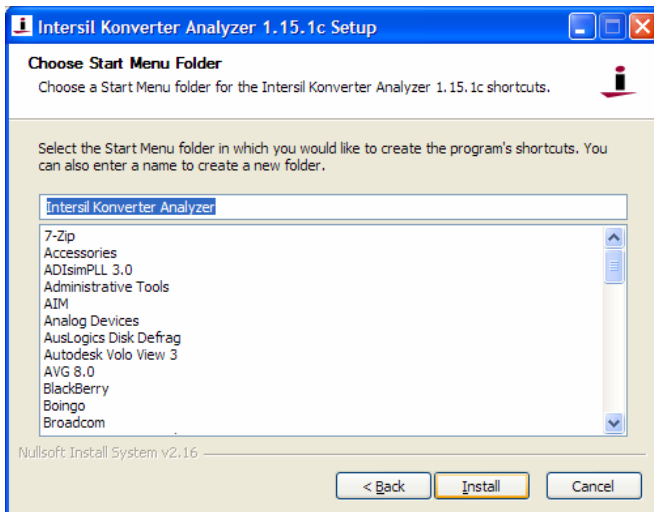
4. In the **License Agreement** window, if you agree with the Software Evaluation License Agreement, click **I Agree**. The **Choose Install Location** window opens.

5. In the **Choose Install Location** window, click **Next**. The **Choose Start Menu Folder** window opens.

6. In the **Choose Start Menu Folder** window, click **Install**. The **Completing the Intersil Konverter Analyzer X.XX.X Setup Wizard** window opens.
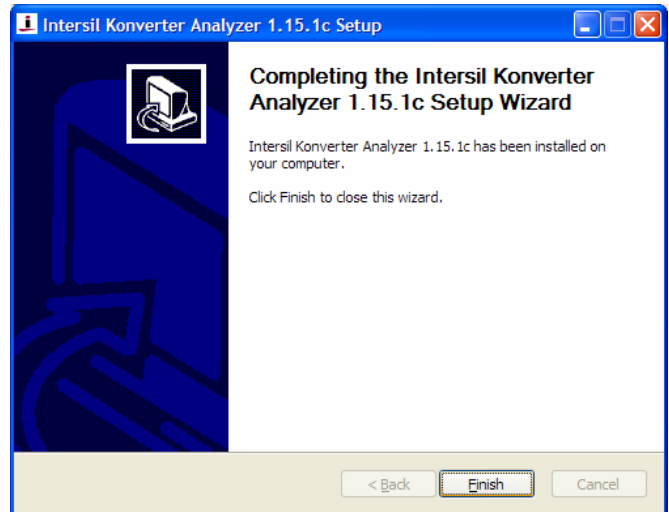

7. In the **Completing the Intersil Konverter Analyzer X.XX.X Setup Wizard** window, click **Finish.** A new shortcut icon to the Intersil Konverter Analyzer software appears on the desktop.

Installing the USB Driver

To install the USB driver:

1. Install the daughter card onto the KMB001 motherboard. Make sure the mezzanine connector is firmly seated in the motherboard socket.

2. Set and connect the signal source to the analog input SMA connector.

3. Set and connect the clock source to the clock input SMA connector.

4. Connect the USB cable from the KMB001 to the target PC.

5. Connect, then activate, the 5V power supply to the KMB001. The **Welcome to the Found New Hardware Wizard** window opens.
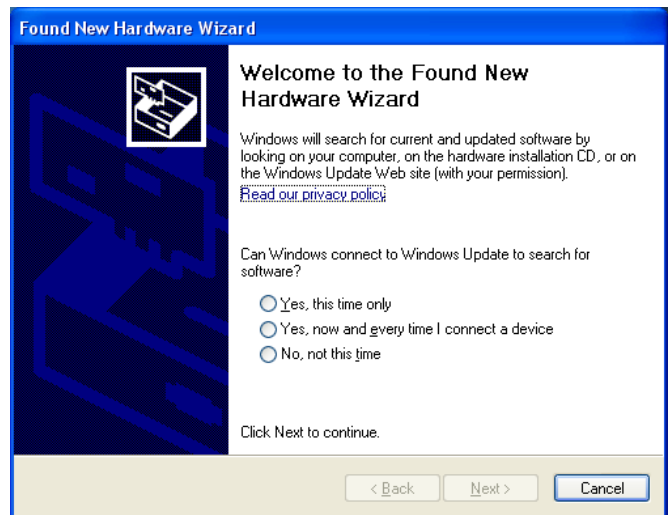
6. In the **Welcome to the Found New Hardware Wizard** window, click the **No, not this time** radio button, and then click **Next**. The USB software installation window opens.
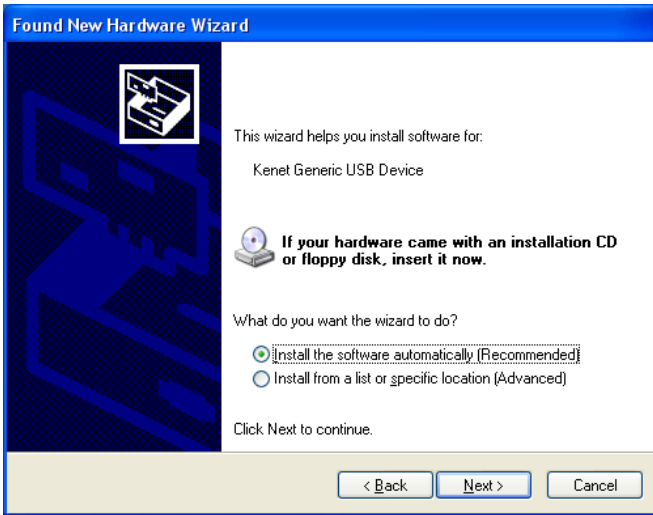
7. In the USB software installation window, click the **Install the software automatically (Recommended)** radio button, and then click **Next**. The **Hardware Installation** window opens.

8. In the **Hardware Installation** window, click **Continue Anyway**. The **Completing the Found New Hardware Wizard** window opens.

9. In the **Completing the Found New Hardware Wizard** window, click **Finish**. The ADC evaluation system is now connected to your PC.
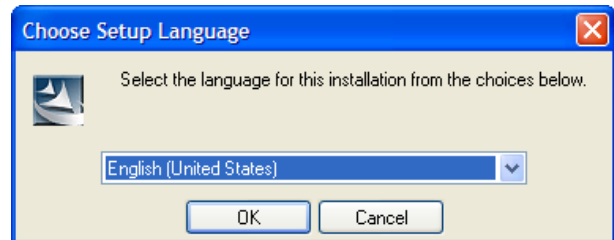
Installing the MATLAB™ Component Runtime

Intersil Konverter Analyzer software version 1.15.6c and earlier use MATLAB Component Runtime (MCR) version 7.6, while version 1.20c and later use MCR version 7.13. Download the appropriate version from the Intersil web site and use the following procedure to install it. Both versions can coexist on the same PC; therefore, one version does not have to be uninstalled for the other version to installed.

To install the MATLAB component runtime (MCR):

1. Run the MCR version 7.6 or version 7.13 installer from the Intersil web site at:
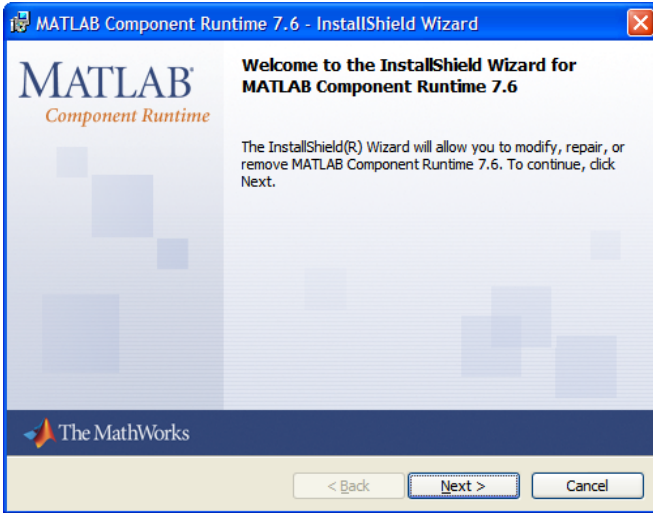   www.intersil.com/converters/adc_eval_platform/index.asp

   The **Choose Setup Language** window opens.

2. In the **Choose Setup Language** window, use the drop-down list to choose the desired setup language (English or Japanese), and then click **OK**. The **Welcome to the InstallShield Wizard for MATLAB Component Runtime X.X** window opens.
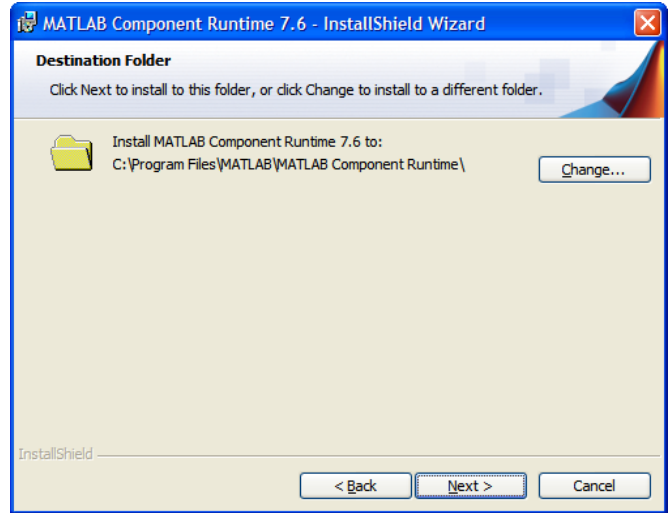
3. In the **Welcome to the InstallShield Wizard for MATLAB Component Runtime X.X** window, click **Next**. The **Customer Information** window opens.
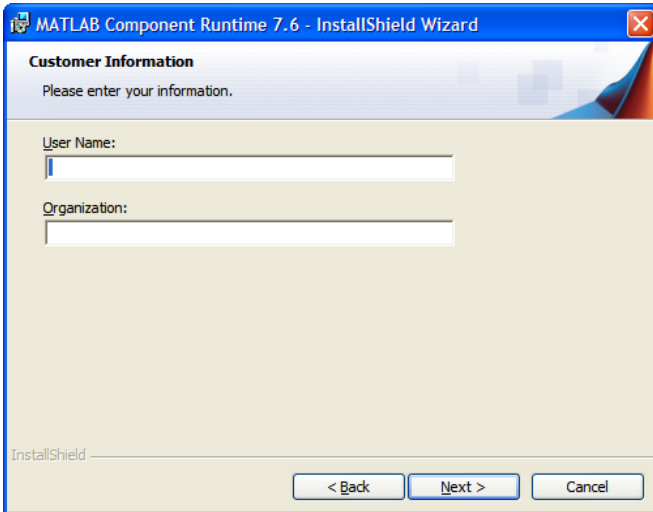

4. In the **Customer Information** window, enter your user name and organization (optional), and then click **Next**. The **Destination Folder** window opens.

5. In the **Destination Folder** window, click **Next** to accept the default destination folder, or click **Change** to select another folder. The **Ready to Install the Program** window opens.
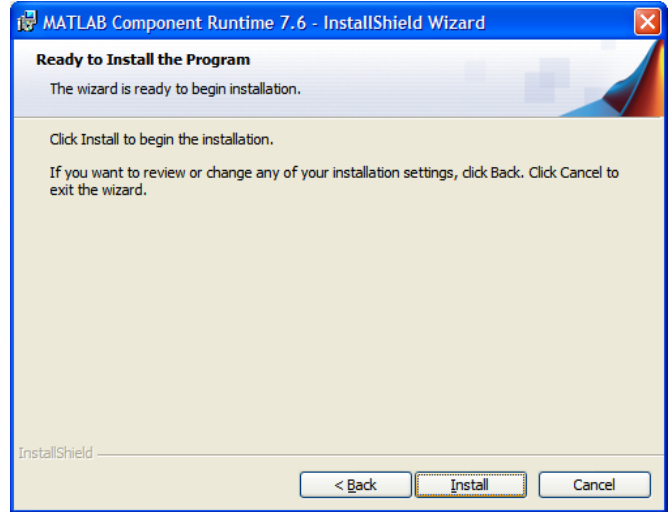
6. In the **Ready to Install the Program** window, click **Install**.

7. If the target PC does not have Microsoft .NET Framework 2.0 installed, the **MATLAB Component Runtime X.X Installer Information** window opens, and a message is displayed regarding the Microsoft .NET Framework.
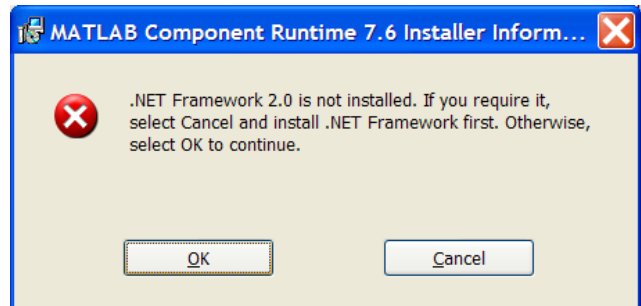
8. The .NET Framework is not required to run the Intersil Konverter Analyzer software. In the **MATLAB Component**

Runtime X.X Installer Information window, click **OK**. The **InstallShield Wizard Completed** window appears.
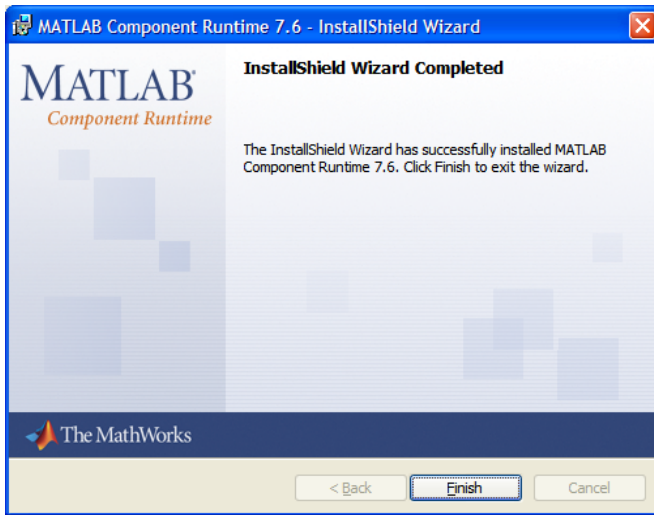
9. In the **InstallShield Wizard Completed** window, click **Finish**.

The MATLAB component runtime installation is now complete.

Running the Intersil Konverter Analyzer Software

To run the Intersil Konverter Analyzer software:

1. On the desktop, double-click the Intersil Konverter Analyzer shortcut icon. The application uncompresses the first time it runs; subsequently, it starts immediately.

2. If the **Welcome to the Found New Hardware Wizard** window opens, click the **No, not this time** radio button and then click **Next**.

3. If the **Hardware Installation** window opens, click **Continue Anyway**.

Specifications Definitions

Analog Input Bandwidth is the analog input frequency at which the spectral output power at the fundamental frequency (as determined by FFT analysis) is reduced by 3dB from its low-frequency value. This is also referred to as Full Power Bandwidth.

Aperture Delay or Sampling Delay is the time required after the rise of the clock input for the sampling switch to open, at which time the signal is held for conversion.

Aperture Jitter is the RMS variation in aperture delay for a set of samples.

Clock Duty Cycle is the ratio of the time the clock wave is at logic high to the total time of one clock period.

Differential Non-Linearity (DNL) is the deviation of any code width from an ideal 1 LSB step.

Effective Number of Bits (ENOB) is an alternate method of specifying Signal to Noise-and-Distortion Ratio (SINAD). In dB, it is calculated as: ENOB = (SINAD - 1.76)/6.02

Integral Non-Linearity (INL) is the deviation of each individual code from a line drawn from zero (1/2 LSB below the first code transition) through positive full-scale (1/2 LSB above the last

code transition). The deviation of any given code from this line is measured from the center of that code.

Least Significant Bit (LSB) is the bit that has the smallest value or weight in a digital word. Its value in terms of input voltage is $V_{FS}/2^{N-1}$ where N is the resolution in bits.

Missing Codes are output codes that are skipped and will never appear at the ADC output. These codes cannot be reached with any input value.

Most Significant Bit (MSB) is the bit that has the largest value or weight. Its value in terms of input voltage is $V_{FS}/2$.

Pipeline Delay is the number of clock cycles between the initiation of a conversion and the appearance of the data at the output pins.

Power Supply Rejection Ratio (PSRR) is the ratio of a change in input offset voltage to a change in power supply voltage.

Signal to Noise-and-Distortion (SINAD) is the ratio of the RMS signal amplitude to the RMS value of the sum of all other spectral components below one-half the clock frequency, including harmonics but excluding DC.

Signal-to-Noise Ratio (without Harmonics) is the ratio of the RMS signal amplitude to the sum of all other spectral components below one-half the sampling frequency, excluding harmonics and DC.

Spurious-Free-Dynamic Range (SFDR) is the ratio of the RMS signal amplitude to the RMS value of the peak spurious spectral component. The peak spurious spectral component may or may not be a harmonic.

Appendix A

Source Requirements

Source jitter and noise will degrade performance. For best test results, a combined jitter (for both clock and signal sources) that does not exceed 200fs is recommended.

Sample Clock and Input Signal Source Setup

Sample clock settings:
- 50MHz to 500MHz sine, +10dBm

Signal settings:
- 0.4MHz to 250MHz, +7dBm to +10dBm (depending on analog input attenuation)

Revision History

DATE	REVISION	CHANGE
3/17/11	AN1434.4	Converted to latest Intersil document template. Page 1: changed title from "8-Bit to 14-Bit, 40MSPS to 500MSPS ADC Evaluation System" to "8-Bit to 16-Bit, 40MSPS to 500MSPS ADC Evaluation System" Page 1, para 1, line 2: changed "14-bit" to "16-bit" Page 2, Table 1: Under "Operating System" changed "Windows Server 2003" to "Windows 2000" and removed all Service Pack information for both Windows XP and Windows 2000.
9/22/10	AN1434.3	Page 1: Added references to two distinct software versions and installations instructions Page 5: Updated Konverter version 1.18c to 1.20c, MCR version 7.10 to 7.13
2/4/10	AN1434.2	Converted to latest Intersil document template. Changed title from "8-Bit to 14-Bit, 40MSPS to 500MSPS ADC Evaluation Motherboard" to "8-Bit to 14-Bit, 40MSPS to 500MSPS ADC Evaluation System" Page 1: Updated Description, removed Devices Supported paragraph Page 2: Added USB2.0 requirement Page 3: Added uninstall requirement/instructions Page 4: Added description of MCR 7.6/7.10 Page 6: Removed Appendix B

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