User Guide

USB & RS232 to SPI Converters

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Chapter 1 – General Information

1.1 Scope of the User Guide

This User Guide provides general introduction, installation instructions and operating information for Mini-Circuits USB&RS232to SPI converters.

1.2 Warranty

See Mini-Circuits website http://www.minicircuits.com/support/ordering.html for Warranty information.

1.3 Definitions

Note: A note advises on important information you may need to insure proper operation of the equipment. There is no risk to either the equipment or the user.

CAUTION	A caution advises about a condition or procedure which can cause damage to the equipment (No danger to users).

WARNING	A warning alerts to a possible risk to the user and steps to avoid it. Do Not proceed until you are sure you understand the warning.

1.4 General safety precautions

There are no general Safety precautions for using Mini-Circuits USB&RS232 to SPI converters

1.5 Introduction

Mini-Circuits has developed two USB and RS232 to SPI bi-directional converters, as shown in **Figure 1.3** which allow the user to transmit SPI commands and read data from SPI devices using either USB or RS232 control. These models are plug & play devices which require no Driver for either RS232 or USB interface. With the supplied GUI software, or most common lab test software you can control them remotely to read or transmit SPI data. The models are light, compact and can be powered from the USB bus or an external power supply increasing system flexibility.

Figure 1.3: Mini-CircuitsRS232/USB-SPI

1.6 *Service and Calibration*

The USB&RS232 to SPI converter models do not require any periodic service or calibration. The only user service possible for the models is external cleaning of the case and connectors as needed. Do not use any detergents or spray cleaning solutions to clean the converter. To clean the connectors use an alcohol solution, and to clean the case a soft, damp cloth.

1.7 *Contact Information*

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sales@minicircuits.com
For regional offices and tech support see http://www.minicircuits.com/contact/offices.html

1.8 *Technical description*

1.8.1 Features of Mini-Circuits USB & RS232 to SPI Converters

• Bi directional SPI communication.
• Both USB and RS232 control options
• Easy installation and operation
• 330kbit/sec SPI transmission rate
• Plug & Play devices, no driver installation required.
• ActiveX com object and .Net class library for use with other software: C++, C#, CVI®, Delphi®, LabVIEW®8 or newer, MATLAB®7 or newer, Python, Agilent VEE®, Visual Basic®, Visual Studio®6 or newer, and more
• User friendly Graphical User Interface for any Windows® 32 or 64 bit computer. Command line support for Linux® computers.
• Mounting bracket (Optional)

1.8.2 Intended Applications

Mini-Circuits digital converters are intended for indoor use in:
- Lab and test equipment setups for both manual and automated measurements.
- Control systems
The models can be used by anyone familiar with the basics of electronic measurements or electronic control systems.

1.8.3 Conformity

Mini-Circuits series of RS232 & USB to SPI converters conform to all requirements for the following international standards**:**

RoHS – The models comply with EU directive for Restriction of Hazardous Substances for 6 substances.

USB 2.0 – The models meet the specifications of the Universal Serial Bus Ver. 2.0 communication standard as described by USB-IF.

USB HID – The models meet the requirements for Universal Serial Bus Human Interface Devices according to USB-IF's Device Class Definition for Human Interface Devices firmware rev. 1.11

RS232 – The models meet all requirements for RS232 standard.

SPI – The models meet all requirements for transmitting and receiving data in SPI protocol as the master unit.

Mini-Circuits®

1.8.4 Supported Software Environments

Mini-Circuits USB & RS232 to SPI converters have been tested in the following operating systems:

32 bit systems: Windows 8, Windows 7, Windows Vista, Windows XP, Windows 98

64 bit systems: Windows 8, Windows 7, Windows Vista, Linux

The converters will work with almost any software environment that supports ActiveX or .Net including: C++, C#, CVI®, Delphi®, LabVIEW®8 or newer, MATLAB®7 or newer, Python, Agilent VEE®, Visual Basic®, AutoIT, Visual Studio®6 or newer, and more

1.8.5 Model Selection Guide

RS232/USB-SPI-N has a standard RJ45 SPI connector.

RS232/USB-SPI has a special Digital Snap Fit (DSF) connector for compatibility with Mini-Circuits' ZX76 attenuator series.

For detailed model performance, data and graphs, outline drawing, ordering information and environmental specifications click on the model P/N.
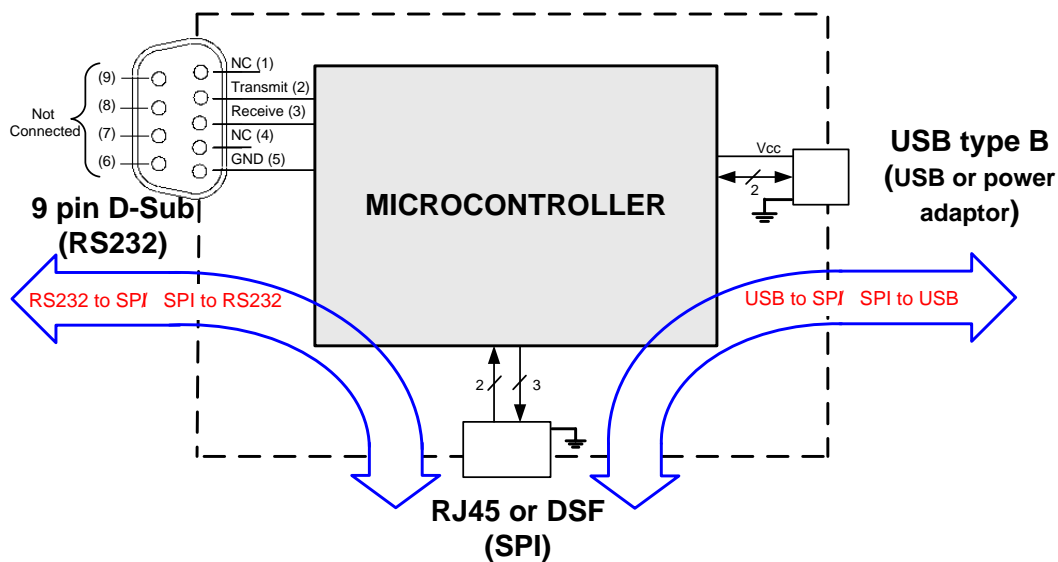

Figure 1.8.5 *Converter Functional Block Diagram*

1.8.6 Included Accessories and Options

All models are supplied with the following Accessories:

- 2.7 ft (0.8m) USB cable (Type A to Type B)
- 6 ft (1.8M) RS232 cable (9 Pin D-Sub Male-Female)
- AC/DC power adapter suitable for a wide selection of wall sockets
- One SPI cable (several types available, see below)

The following additional accessories are also available:

- 6.9 ft (2m) USB cable (Type A to Type B)
- 11 ft (3.3m) USB cable (Type A to Type B)
- SPI cable : 5 ft (1.5m) RJ45(M) – RJ45(M)   (for RS232/USB-SPI-N)
- SPI cable : 5 ft (1.5m) DSF(M) – DSF(M)   (for RS232/USB-SPI)
- SPI cable : 5 ft (1.5m) DSF(M) – Pigtail   (for RS232/USB-SPI)

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Chapter 2 – Installation and setup

System requirements for the RS232 & USB to SPI converters are a computer (Pentium II or better) with support for either USB HID or RS232. When using the supplied power adaptor, an appropriate AC mains power source of 110-220V$_{AC}$ is required. To run the GUI program a Windows operating system is required.

2.1 Software Setup

✓ If you have had any problems installing the software, we're here to help.
Try following these complete step-by-step instructions. If you still experience problems, give us a call at Mini-Circuits Worldwide Technical support. It's (718) 934-4500 or e-mail apps@minicircuits.com for North America or go to minicircuits.com/contact/worldwide tech_support.html for other regional numbers and addresses.

2.1.1 **First** save all work in progress and close any other programs that may be running.

2.1.2 **Next,** insert the *Mini-Circuits* CD into the CD-ROM drive, or download the full CD software from minicircuits.com. If installing from files downloaded from the web - unzip the downloaded files to a temporary folder on your desktop or C: drive, then open the file folder you created and double-click the "Install" icon.

2.1.3 **If installation from the CD does not start automatically, run install.exe** from the <CD drive> root directory.
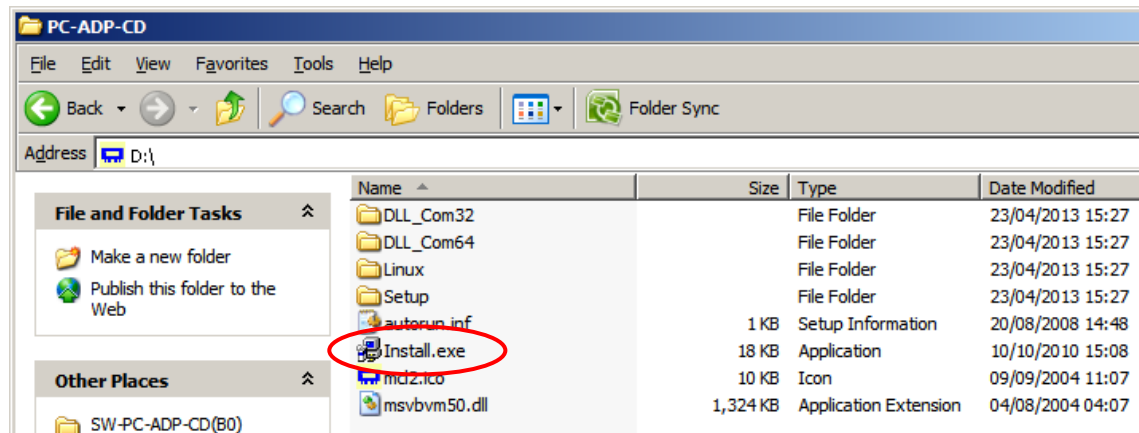

Figure 2.1.3 *CD file listing window*

2.2 *Installation*

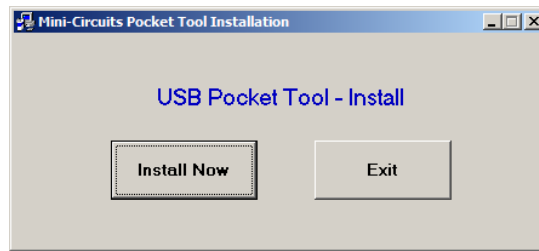### 2.2.1 *The installer window* should now appear. Click the "Install Now" button.

Figure 2.2.1 *Installation window*

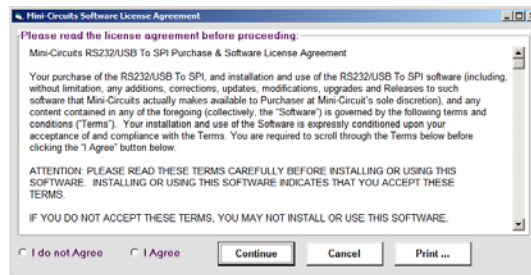### 2.2.2 *The license agreement* should now appear. To proceed, click "I Agree" and the "Continue" button.

Figure 2.2.2 *License agreement*

2.2.3 *The installation program will launch*. Click the "OK" button to continue.
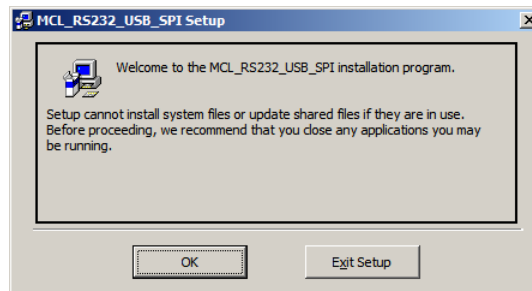

Figure 2.2.3 *Installation Program window*

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2.2.4 ***The destination directory window*** will appear. At this point it's a good idea to take a second and confirm the full destination address for the software. In most cases, the default will be your computer's hard drive (C:)\Program Files\Mini-Circuits RS232_USB to SPI\.Change it if you prefer, then click the large button at the top to continue.
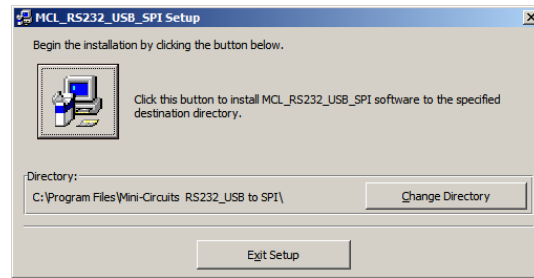

***Figure 2.2.4:** Destination Directory window*

2.2.5 ***The Program Group window*** will appear. This window allows you to select the program group under which the link for the Switch controller program in the Start Menu will be created. Click on "Continue" to proceed.
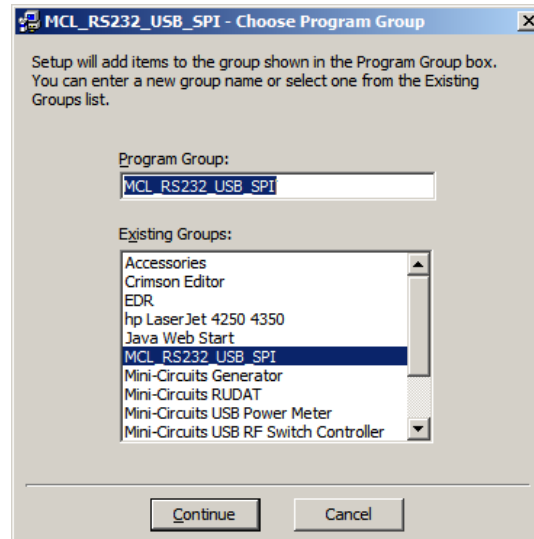

***Figure 2.2.5:** Program Group Window*

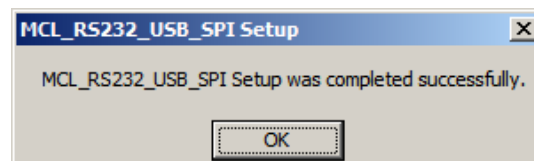2.2.6 ***In a second or two, your installation will be complete.*** Click "OK" to close the installer.

***Figure 2.2.6:** Installation complete*

2.3 *Digital Converter physical Setup*

2.3.1 **To use USB control, connect** the converter as follows:
-Connect USB cable between converter unit USB port and computer USB port.
-Note the Indicator lights up.
-Connect SPI cable from Converter SPI port (Either RJ45 or DSF according to converter model) to your SPI device.

| Connect to PC's USB port | USB-CBL-AB-3+ or Eqv. | Connect SPI cable to SPI device |

Figure 2.3.1: RS232/USB-SPI-N USB setup

2.3.2 **To use RS232 control, connect** the converter as follows:
-Connect D-Sub9 cable between converter unit D-Sub port and computer serial port.
-Connect USB cable between supplied power adaptor and converter USB port.
-Connect the provided power adaptor to a suitable mains power supply
-Note the Indicator lights up.
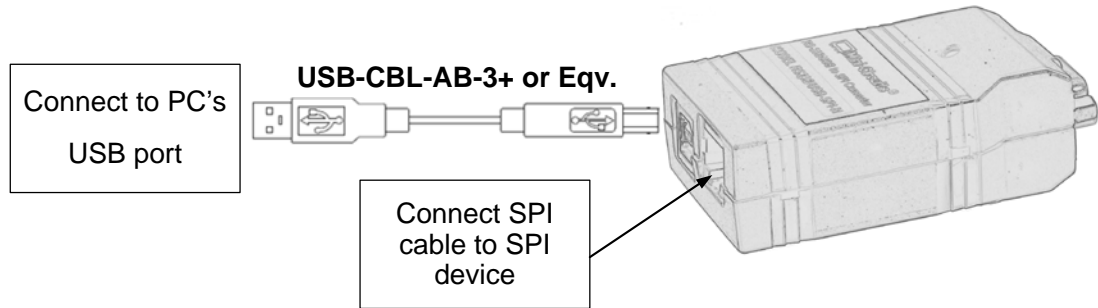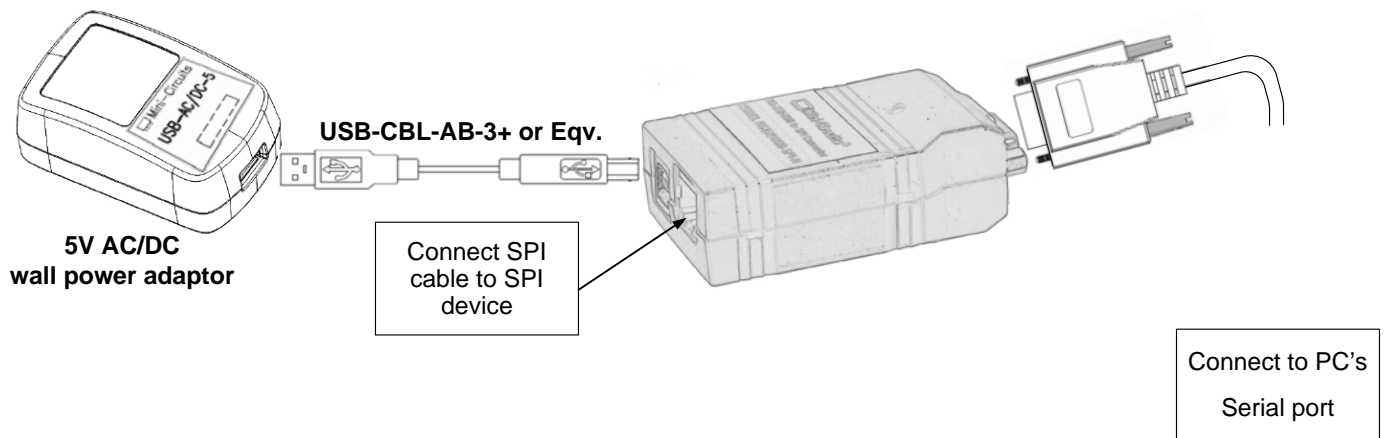-Connect SPI cable from converter SPI port (Either RJ45 or DSF according to converter model) to your SPI device.

5V AC/DC wall power adaptor

USB-CBL-AB-3+ or Eqv.

Connect SPI cable to SPI device

Connect to PC's Serial port

Figure 2.3.2: RS232/USB-SPI-NRS232 setup

Note: To insure proper operation set the converter's SPI mode to match the mode required by your external SPI device.

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Chapter 3 – Using the RS232 & USB to SPI Converters

The converter models are supplied along with API programming objects (DLL files) to allow them to be easily controlled by most common lab test software (see chapter 8 of the PTE Programming Handbook for details) and with a Windows GUI program to transmit or receive data manually.

To start the program go to the Windows Start menu and select All Programs>MCL_RS232_USB_SPI(default), or go to the other destination address you selected during installation(section **2.2.5**). The "MCL_RS232_USB_SPI" icon should be waiting there for you. Click on it and get started!

3.1 *Starting the GUI program*

3.1.1 *If no convertor is connected to* the computer, or there is a problem with the data connection the program will open with no unit listed in the Model name and S/N fields.
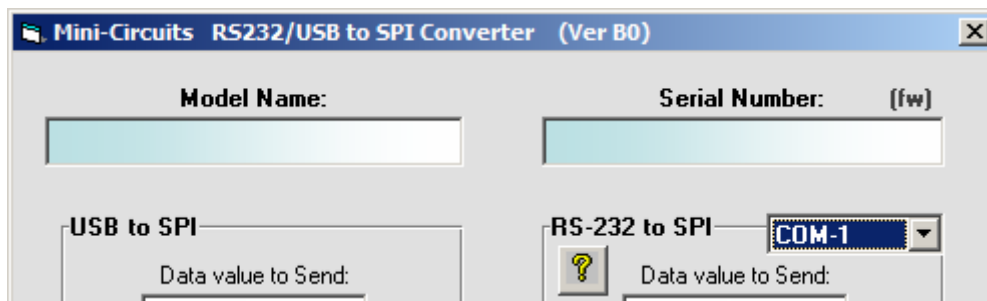

Figure 3.1.1: *Device not found!*

3.1.2 *If the Converter unit is connected to* a serial port other than COM-1, select the correct serial port from the drop box. The software should recognize the converter and populate the model name and serial number fields with the correct data. Otherwise shut down the program and check your power and data connections.

3.1.3 *If multiple units are connected to* the computer USB bus, the initial screen will show a list of serial numbers for all connected units. Select the unit you wish to start with and click OK, or click Cancel to exit the program. The program can handle up to 24 units connected simultaneously.
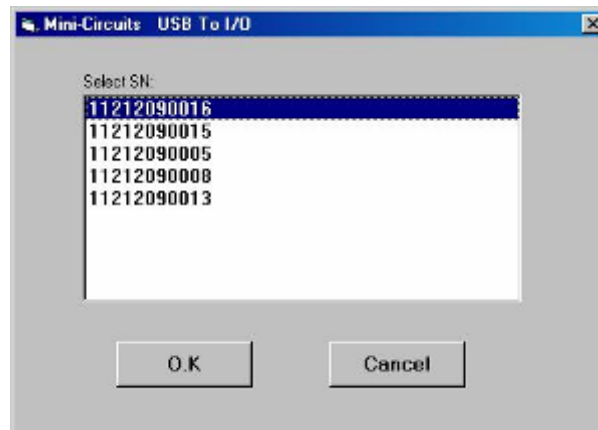

Figure 3.1.3: *Unit selection screen*

3.1.4 *Mini-Circuits RS232/USB to SPI Converter software* will start for the unit you selected.
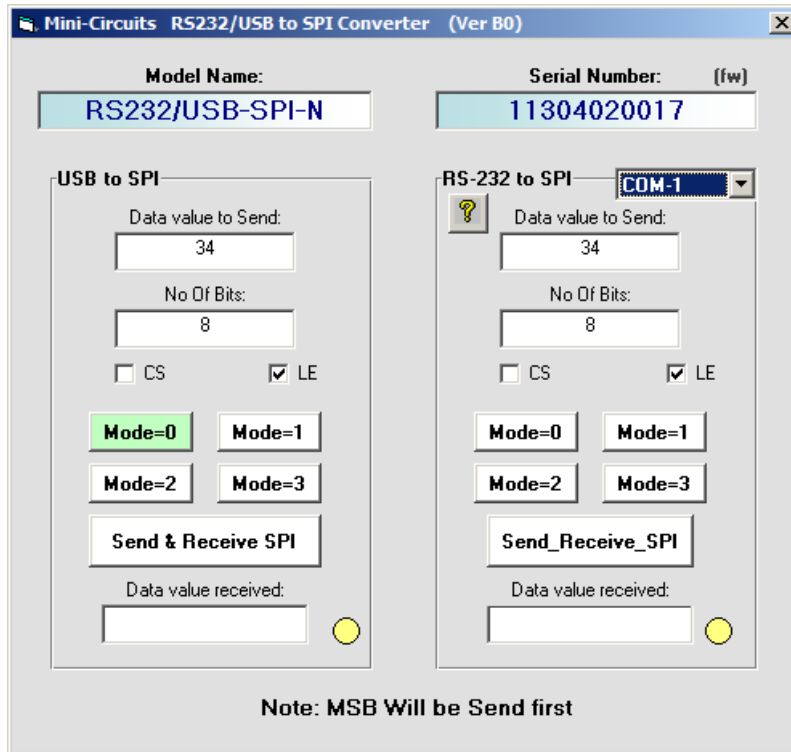

Figure 3.1.3: Initial screen

3.1.5 *Click on the drop box to* change the serial port used for RS232 control (COM-1 is the default)
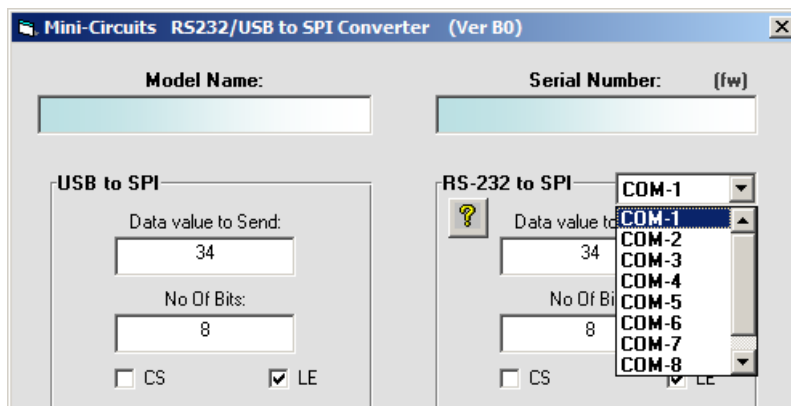

Figure 3.1.5: Select serial port

Note: If no unit is connected via either USB or COM-1 the GUI will open with the Model Name and Serial Number fields blank. Once the correct COM port is selected these will be filled.

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3.1.6 *Once you've selected the converter* you wish to work with, and communication is established you can specify the number of data bits per word (from 1 to 16), the mode to use for communication and whether to use Chip Select (CS) or Load Enable (LE) bits.

Note: check the specification of your external SPI device to determine how the converter should be set.

3.1.7 *With the correct communication options specified,* typing the decimal value of the binary word to send in the "Data value to send" field and clicking on "Send and Receive SPI" will transmit the data entered to the SPI device and display the response in the "Data value received" field.
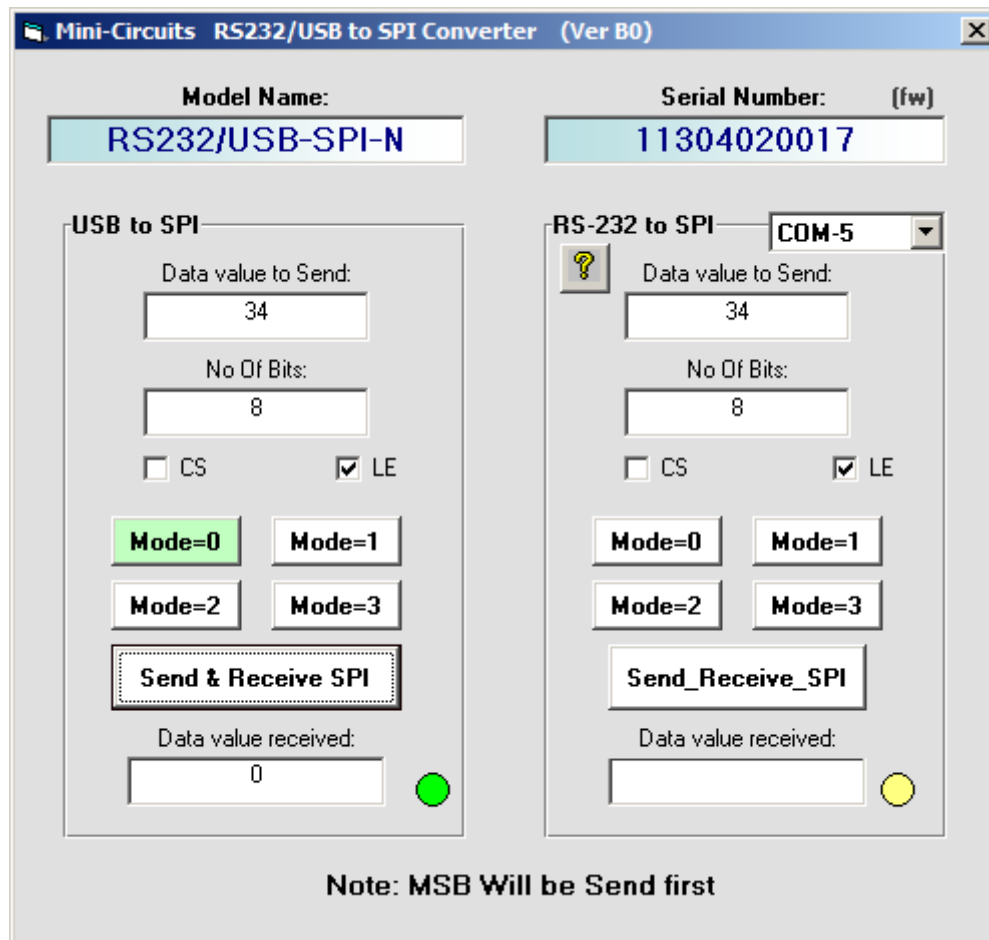

Figure 3.1.7: Transmit and receive SPI data.

3.1.8 *If communication is interrupted, the* indicator next to the "Data value received" field for the relevant communication protocol will turn Red, otherwise it will turn Green.

3.1.9 *The converter models can also* be controlled automatically via USB using most common lab test software, or your own custom programs, with the provided DLL files; or via RS232 using sending the relevant ASCII codes. For more information on this see Mini-Circuits Programming Handbook on the included CD or download it from our website at http://www.minicircuits.com/support/software_download.html

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3.2 *Application examples*

3.2.1 *Controlling a Synthesizer*. Connecting the RS232/USB to SPI converter via either USB or RS232 to a computer allows synthesizers using 3 wire serial communication (SPI) to be controlled directly using the Load Enable, Clock and Data out pins of the convertor (See **Fig. 3.2.1**). This configuration allows controlling SPI devices (synthesizer, PLL, digital step attenuators, etc…) via USB or RS232 interfaces.
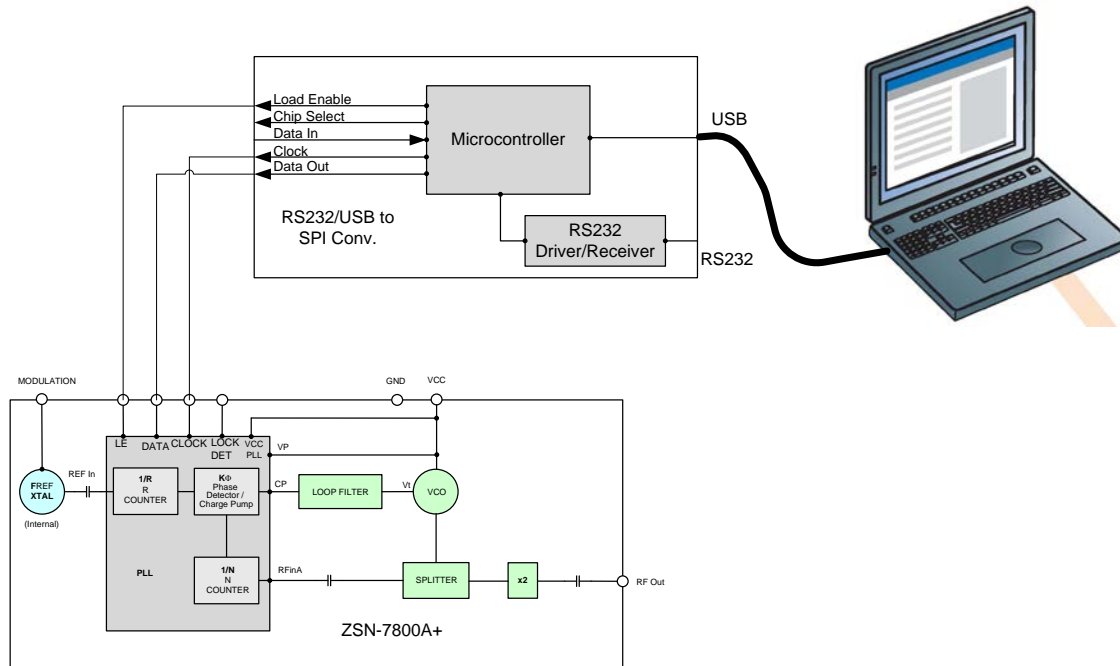

Figure 3.2.1: Synthesizer ZSN-7800A+ controlled via USB.

3.2.2 *Reading data from an Analog-Digital converter (ADC).*Connecting the RS232/USB to SPI converter via either USB or RS232 to a computer allows reading the data output of an ADC, such as for a simple voltmeter application, using the Chip Select, Data In and Clock pins of the convertor (See **Fig. 3.2.2**). This configuration could also be used to read data from any SPI device (A/D, EEPROM, etc…) via USB or RS232 interfaces.
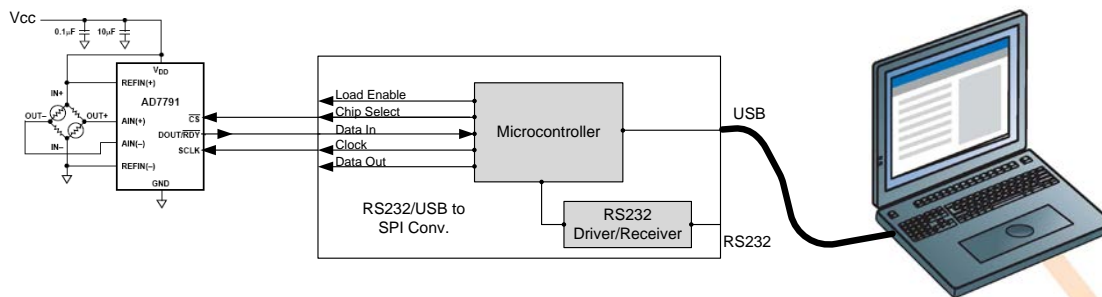

Figure 3.2.2: Reading data from ADC as a voltmeter via USB.