

ADC8-RS232 SERIES ANALOG TO DIGITAL CONVERTER

TECHNICAL REFERENCE



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SPECIFICATIONS

Power Supply.....	5 volts DC, 50ma
Operating Temp. Range.....	-40° C to +85° C
Serial Data Protocol.....	75 to 6,000,000 baud - auto detect (defaults to 115,200 baud) Full duplex operation (data bits, parity, stop bits will auto detect)
Maximum Sampling Rate.....	100 samples per second or better
Analog Inputs.....	8 single-ended inputs (8, 10 or 12 bit resolution) or 4 fully differential inputs (8, 10 or 12 bit resolution) ADC8-8RS232 (8 bit resolution will divide your measurement range into 256 different increments) ADC8-10RS232 (10 bit resolution will divide your measurement range into 1,024 different increments) ADC8-12RS232 (12 bit resolution will divide your measurement range into 4,096 different increments)
Analog Voltage Input Range.....	0 to 4.096 volt (default range - provides exactly 16 mv divisions per increment with 8 bit, 4 mv divisions with 10 bit or 1 mv divisions with 12 bit and in high precision) 0 to 3.3 volt or 0 to 5 volt external (low precision) user supplied in the range of 1 volt to 5 volts Contact EECl support for a pre-installed high precision voltage reference (1.2 volt, 2.048 volt, 2.5 volt, 3 volt, 5 volt or adjustable)
Expansion Capability.....	expandable to control up to 136 relays/inputs (or combinations) using EX-8M, EXM-8, EXM-16 or EXM-32 Relay I/O Expansion Modules
Interface.....	RS-232 (also available in WiFi version (ADC8-WIFI), Ethernet version (ADC8-ENET) USB version (ADC8-U) or RS-485 version (ADC8-RS485))
Software Compatibility.....	Windows XP, Vista, Windows Server, Windows 7, 8.1, 10 and Windows 11
Weight.....	.75 ounce
Size.....	1.875 inches by 3.625 inches

SET-UP AND TESTING

Upon receiving your ADC8-RS232, you should connect and test the operation of the hardware to verify proper operation. Please set-up and test the ADC8-RS232 as follows (Windows XP*, Vista, Windows Server, Windows 7, 8.1, Windows 10, Windows 11 or later) *service pack 3

(1) Connect your ADC8-RS232 Analog to Digital converter to your computer RS-232 port using a CC-DB9SP cable (1 to 50 foot). The RS-232 cable used should be a 9 pin female to a 9 pin male. The pins should be wired pin to pin. Only three pins need to be wired: pin 2 to pin 2, pin 3 to pin 3 and pin 5 to pin 5.

(2) Connect your 5 volt DC power adapter (part # PS-5VDC-1000)* A blue LED on the circuit will light to indicate a ready state.

***IMPORTANT NOTE ABOUT POWERING THE ADC8-RS232 ANALOG TO DIGITAL CONVERTER:** The ADC8-RS232 is powered with a 5 volt DC power source (center pin +, reversed polarity will cause damage). The PS-5VDC-1000 power adapter should be used to power the ADC8-RS232. If an alternate power source is used, it should be completely isolated (not powering other devices and must not be connected to an equipment or earth ground). The alternate power source should have low noise output, should also be regulated (minimum voltage of 4.8 volts and a maximum of 5.0 volts) and able to provide 300ma of current. We also recommend the power source or adapter be plugged into a surge protector or protected UPS. These power input requirements must be followed to prevent error free analog data and to prevent damage to the ADC8-RS232.

(3) Insert your ADC8-RS232 installation CD and close the drive door to start the CD setup process and display the installation window. You may receive a security message pop-up if your operating system is Windows 8 or higher (click the pop-up and then click "run startup.exe").

(4) Check your Com port by clicking on the "Open Device Manager" button on your installation window (OK security message if shown in taskbar) and expanding the "Ports (COM & LPT)" category. You should see a Communications Port entry, if this is the Com port that you have connected to, the Com port assigned is to the right of the entry. If you are using a USB to RS-232 adapter, please follow the instructions provided with the adapter (part # CO-USB)

(5) Install the ADC8-RS232 Device Driver* by clicking the "Install Device Driver" button on your CD installation dialog (if you have auto start disabled, you may browse to the Windows Driver folder and double click on setup.exe). A desktop icon for the ADC8-RS232 will be created. Click "Install Help Files" so the help feature will work.

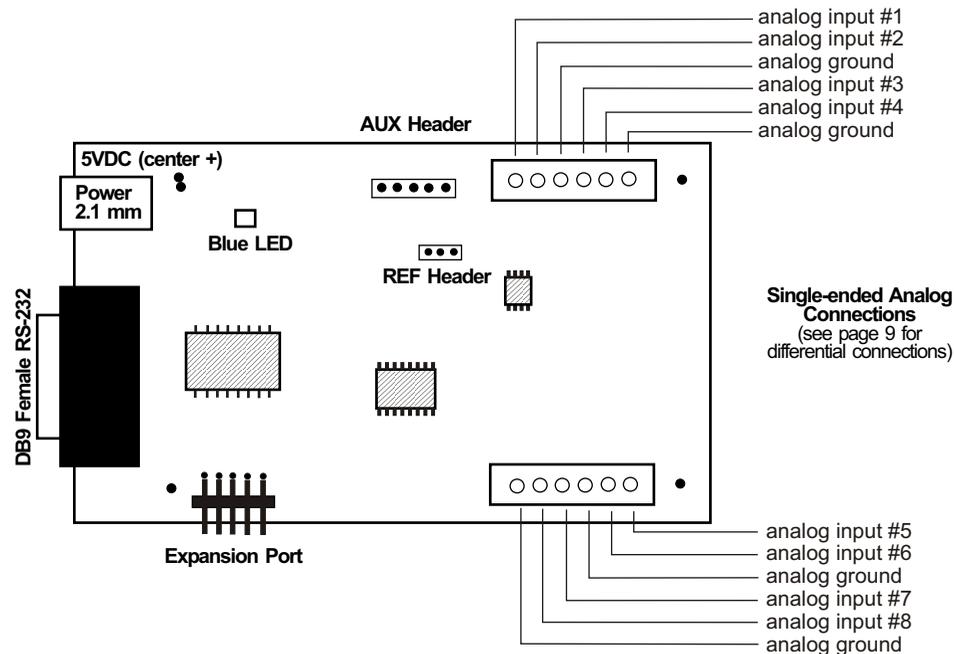
Please note that the Microsoft .Net Framework must be installed on your system. The .Net Framework is already installed if you have Windows 7 or higher. If the .Net Framework is not installed on your computer, the installation program will attempt to download and install the .Net Framework from the Microsoft website through your internet connection. This may take 5 minutes or longer. In order for the .Net Framework to install correctly, your computer must be up to date with Windows update. This is especially important with Windows XP and Vista. You may update your computer by clicking on the start button, All Programs, Windows Update and clicking on "Check for updates". *for XP, Service Pack 3 must be installed.

(6) After installing the ADC8-RS232 Device Driver, a pop-up will prompt you for the Com port to be used with your ADC8-RS232 Analog to Digital Converter. Enter the Com port that was assigned in step 4 and the ADC8-RS232 User Interface will open. The label just under the COM port indicator should show that Com port open in the ADC8-RS232 User Interface.

(7) Test your analog inputs by applying a test voltage to each input. The test voltage must be within the selected reference voltage and of the correct polarity (the default reference voltage is 4 .096 volts, providing a voltage input range of 0 to 4 volts DC). Single ended inputs (default) will display a number between 0 and 4095 (12 bit resolution) or 0 to 1023 (10 bit). You may use the analog test circuit shown on the following page to provide the test voltage. When using a 9 volt smoke detector battery, use a multi meter to check for the correct voltage since the voltage can go well over the reference voltage as the potentiometer is turned up. The ADC8-RS232 user interface display should increment from 0 to 4,095 (in 1 unit increments) as the potentiometer is turned from 0 volts to 4.096 volts. Differential inputs will display 12 bit as (-2048 to +2047).

CONNECTION DIAGRAM

ADC8-RS232 SERIES ANALOG TO DIGITAL CONVERTER



DESCRIPTION

The ADC8-RS232 series Analog to Digital converters connect to any available RS-232 port on your desktop or laptop PC (including some tablets and phones). Eight analog inputs channels are provided for conversion to 8, 10 or 12 bit digital format. The converters may be set to four channel fully differential mode if required. An optional expansion port is available for connection of up to 136 relays, 136 status inputs or combinations of relays and inputs.

24 HOUR TECHNICAL SUPPORT

Technical support for our products is available by calling (937) 349-6000. If a technical adviser is not available, please leave your name, phone number and a time that you can be reached. Your call will be returned as soon as possible and within 8 hours. Calls received during normal business hours are usually returned within minutes.

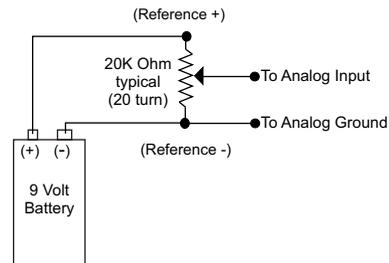
WARRANTY AND CARE OF THE ADC8-RS232

The ADC8-RS232 series Analog to Digital Converters are warranted against factory defects for a period of 90 days from the date of purchase. The ADC8-RS232 has proven to be extremely reliable in actual operation during field tests. We recommend that the ADC8-RS232 and associated hardware be installed in a suitable enclosure (4 mounting holes are provided on the circuit board) and that reasonable precautions be taken to protect the circuit from static discharge. A surge protector or UPS is recommended for connecting the 5 volt DC power adapter to 120 VAC.

Analog inputs that are left unconnected may display numbers that are random or fluctuating as a result of noise on the analog inputs (this is normal for floating or unconnected inputs). Test each analog input by connecting each input (one at a time) to one of the GND (reference -) terminals. Your screen should show a "0" for that input. After this is completed, connect each input (one at a time) with 4.096 volts DC supplied between one of the GND (-) terminals and the analog input terminal (+). Your screen should show a "4095" for 12 bit inputs (or 1023 10 bit) for each input.

(5) If operation of the analog inputs are normal, then testing is now complete and your ADC8-RS232 may be placed in service. If problems are encountered during testing, proceed to the trouble-shooting procedures shown on page 5.

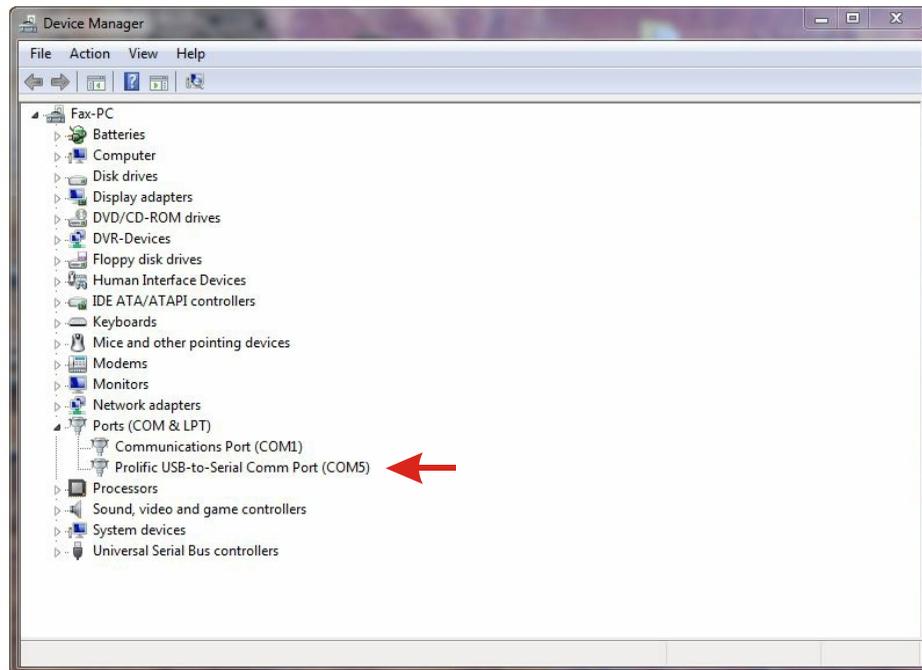
Analog Input Test Circuit using potentiometer



HOW TO OPEN DEVICE MANAGER

Windows XP, VISTA or Windows 7

Click the Start Button (lower left of screen), then Control Panel (right side). With the view set to classic view, small or large icons, click (or double click) the Device Manager icon. With Windows XP you will need to click the System icon (in Control Panel) then the Hardware Tab then the Device Manager button. You may also use the supplied CD to open Device Manager by clicking the "Open Device Manager" button when the CD auto starts.



Windows 8.1, 10, 11 and Windows Server

Move your mouse cursor to the lower right side of your screen and click on Settings. Click on Control Panel near the top and click on the Device Manager icon or go to Settings and search "Device Manager".

TROUBLE-SHOOTING THE ADC8-RS232

(1) Verify that 5 volt DC power is supplied to your ADC8-RS232 (the blue ready LED should light). Measure the voltage using a multi meter (center pin +, reversed polarity may cause damage). The PS-5VDC-1000 power adapter should be used to power the ADC8-RS232. If an alternate power source is used, it should be completely isolated (not powering other devices and must not be connected to an equipment or earth ground). The alternate power source should have low noise output, should also be regulated (minimum voltage of 4.8 volts and a maximum of 5.0 volts) and able to provide 300ma of current. We also recommend the power source or adapter be plugged into a surge protector or protected UPS. These power input requirements must be followed to prevent error free analog data and to prevent damage to the ADC8-RS232.

(2) Verify that the ADC8-RS232 is connected to the same com port that you have set in the ADC8-RS232 User Interface (check in Device Manager)

(3) Try replacing the RS-232 cable and/or using a different RS-232 port. The RS-232 cable should be pin to pin (pin 2 to pin 2, pin 3 to pin 3 and pin 5 to pin 5).

(4) Verify that the ADC8-RS232 Device Driver is correctly installed and loaded. Click the blue 8 icon in your system tray (bottom right) and check for the correct com port setting (should show the correct com port open). If the window below the COM indicator shows "COM Not Found!" then a com port issue is the problem (check for another program that may be using the com port). You may right click the taskbar at the bottom of your screen, then Task Manager to view running applications.

(5) Reset the ADC8-RS232 Device Driver by clicking on the blue 8 icon in your system tray and double click on the blue EECI logo to reset. You should see a reset message followed by a COM open indication. Click Setup and uncheck "Allow External Commands". If this corrects the issue that you are experiencing then an external application is the problem.

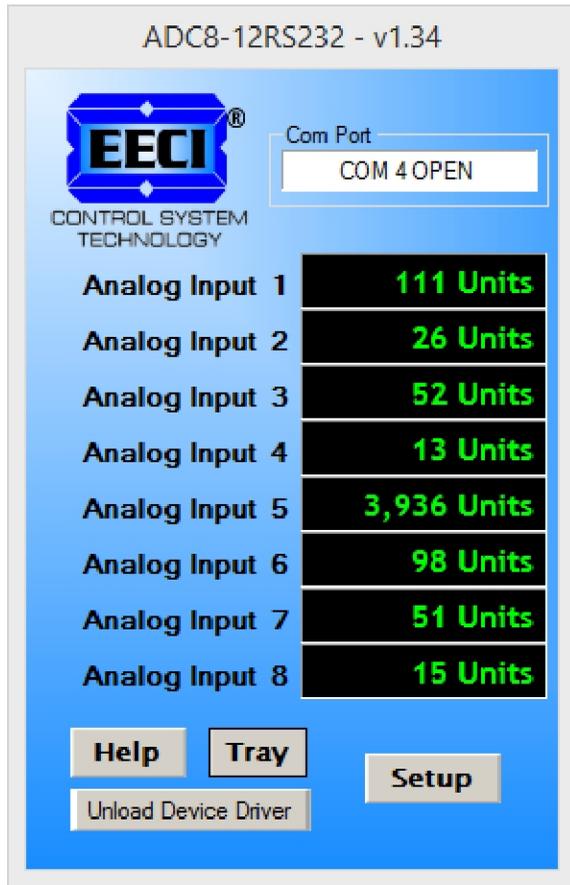
(6) If erratic operation is experienced, check for loose connections at the terminal block (tug on each wire going into the terminal block), check for short circuits caused by metal contact to the ADC circuit areas or other connected hardware.

(7) The input voltage to any of the analog inputs must not exceed the reference voltage (nor should the input go negative with respect to the reference when not in differential mode) or erratic data may be generated on one or more of the analog channels. When an external reference is used, the reference voltage must not exceed 5 volts.

Please contact EECI Support at (800) 842-7714 or (937) 349-6000 if you require additional assistance or have questions.

EXPANSION PORTS

The ADC8-RS232 provides an expansion port for additional I/O operations using the same COM port. The expansion port may used to connect up to 136 relays or to connect up to 136 inputs (or combinations of relays and inputs) using EX-8M, EX-8MS, EXM-8, EXM-16 or EXM-32 Relay I/O Expansion Modules. The relay output ports are identical to those on the AR-16, EX-16 and EX-32 and accept the same relay cards and other accessories as the AR-16. A variety of relay cards with various contact configurations are available for connection to the expansion cards. A partial list of relay cards includes the RD-8, RD-8M, RG-8, RH-8, RI-8, RJ-8, RL-8, RN-8, RN-8M, RP-8 and RJ-8. The RYD-8 relay driver card may be used to control larger power relays, contactors, solenoids, valves or other devices. The DA-1 Digital to Analog converter may be used to output a 0 to 5 volt or a 0 to 10 volt analog level. For additional information on the expansion cards, please refer the Technical Reference Manuals available on the EECI web site.



THE ADC8-RS232 USER INTERFACE

The ADC8-RS232 User Interface allows you to set all of the basic operating characteristics of the hardware and permits the ADC8-RS232 to send and receive data from other Windows applications or programs that you create.

When the user interface is started for the first time you are prompted for the com port that is to be used with the ADC8-RS232. This com port number is saved in the settings file "adc8rs232-set.ini" which is created in the folder c:\eecil\adc8-rs232. The driver will then start using the com port assigned. The com port indicator should have a "COM Open" message as shown to the left with the correct com port shown. The com port may be changed by clicking the Setup button and changing the com number in the Com Port window and clicking Apply.

Clicking the Analog Setup button allows you to label the analog inputs for each of the 8 channels. The com port, baud rate and sampling rate settings are changed below. Checking the box for differential input will allow differential inputs to be connected to the terminal block on the ADC8-RS232 (display will change to four channel mode). The boxes for reference input allow you to set the desired voltage input range. Un-checking the Allow External Commands box will prevent other Windows applications from sending or receiving data from the ADC8-RS232. The data logger may be enabled by checking the box in the data logger section and entering the desired time interval and file type information.

The ADC8-RS232 User Interface may be started in driver only mode by checking the Start Minimized box. Any changes made to Setup will not take effect until you click the Apply button. Clicking the Apply button saves the new settings to the adc8rs232-set.ini file so that if the device driver is unloaded, it will restart with all the new settings. Click the Tray button (driver only mode) to close the user interface after the ADC8-RS232 is set-up for your application. A blue 8 icon will appear in your system tray (click to re-open the user interface). The ADC8-RS232 User Interface may be left open when used as a stand alone data logger or if an external application is not used. The ADC8-RS232 may be completely shut down (and driver unloaded) by clicking the "Unload Device Driver" button. Once shut down, you will need to double click the ADC8-RS232 desktop icon to re-start the ADC8-RS232 device driver (or clicking the ADC8-RS232 icon under All Programs in the EECI folder). The Help button will provide additional assistance if you installed the Help files from the ADC8-RS232 installation CD. A password protected version of this user interface is available (contact EECI)

AUTO START-UP FOR THE ADC8-RS232 DEVICE DRIVER

By default, the ADC8-RS232 device driver is only loaded on demand to conserve system resources. You may install the ADC8-RS232 device driver permanently by checking the "Driver Only" check box under Setup in the ADC8-RS232 User Interface. The "Driver Only" check box should not be checked unless the ADC8-RS232 is always connected to an RS-232 port. The ADC8-RS232 system icon will then always appear in your system tray* along with the other system devices (such as your speaker, printer or display adapter). Click the 8 icon in your system tray to open the ADC8-RS232 User Interface. If the ADC8-RS232 device driver is not installed permanently, you will need to

double click the ADC8-RS232 desktop icon to load the ADC8-RS232 device driver each time your system starts.

*you may need to expand the arrow in your system tray to see all the icons (the tray is the row of icons on the lower right of your screen, next to your clock).

THE ADC8-RS232 DATA LOGGER

The ADC8-RS232 User Interface provides a data logger function that will save analog input readings to a file at preset time intervals. Scale and offset values may be factored into the recorded data event along with an input label by entering the desired values at the setup screen by clicking the Analog Setup button. The ADC8-RS232 data logger may be used stand alone if an external application is not used. The file output format may be set to plain text, CSV or text delimited formats and may be imported into database or spreadsheet applications if required. The data log interval may be set to seconds or minutes by clicking the button to the right of the setting. A suffix may be added to the logged value (such as PSI, Volts, °, etc.). Extended ASCII characters may be added by holding down the alt key and entering the ASCII code on your keyboard keypad. Example: to display a degree symbol, hold down the alt key and enter 248 on your keypad. The precision setting allows you to log your data in integer only, tenth, hundredth, thousandth or auto select.

PROGRAMMING EXAMPLES

VISUAL BASIC EXAMPLE (Microsoft Visual Studio)

To use these example, copy the code module (supplied on your CD) to a sub called readInputs(). From the toolbox, drag (8) labels and a timer control to your form. Insert the following code into the timer sub. The (8) ADC8-RS232 analog inputs are displayed in labels 1 through 8.

```
Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
```

```
readInputs() 'collect analog inputs
```

```
For W = 1 To 8
MyLabelArray(W).Text = inputByte(W)
Next W
```

```
End Sub
```

VISUAL C# EXAMPLE (Microsoft Visual Studio)

```
private void timer1_Tick(object sender, EventArgs e)
{
    ReadInputs();

    for (int i = 1; i < 9; i++)
    {
        MyLabelArray[i].Text = inputByte[i].ToString();
    }
}
```

The entire source code program examples and the complete project code are provided on your installation CD along with additional source code examples in other programming languages. The programs are intended to demonstrate the fundamentals needed for development of your own software. The program examples may be copied to your program and used as a subroutine if desired.

These examples will run in all versions of Visual Studio including Visual Studio Express. The installation CD will have examples in all the programming languages used with Microsoft Visual Studio including Visual Basic, Visual C#, Visual C++ and ASP .Net. Additional source code examples are available in several other variations which may be more suitable for alternate programming languages. Please contact EECI technical support for more information.

VOLTAGE REFERENCE INPUT

The ADC8-RS232 allows for several different reference voltage configurations. The reference voltage determines the voltage input range for all (8) analog input channels ((4) channels in differential mode). The following configurations are selectable from the setup page of the ADC8-RS232. The ADC8-RS232 may also be configured to provide the internal reference as an output if required. The reference output voltage will be provided at the 3 position AUX header. Using the default reference setting will provide the greatest input noise rejection. Option 1 is the default setting.

- Option 1: 4.096 volt - allows a (0 to 4.1) volt input range with no reference output ((8) channel single ended) allows a (-2 to +2) volt input range with no reference output ((4) channel differential)
- Option 2: 4.096 volt - allows a (0 to 4.1) volt input range or (-2 to +2) in differential mode with a reference output reference output provided on the 2 position AUX header. The reference output voltage should be decoupled with a 2k series resistor
- Option 3: 3.3 volt - allows a (0 to 3.3) volt input range or (-1.65 to +1.65) volts in differential mode external reference voltage selected with circuit board shunt.(low precision/digital power*)
- Option 4: 5 volt - allows a (0 to 5) volt input range or (-2.5 to +2.5) volts in differential mode external reference voltage selected with circuit board shunt.(low precision/digital power*)
- Option 5: User supplied - must be in the range of 1 volt to 5 volts and should have an output impedance of 500 ohms or less reference voltage from user is applied to the 2 position AUX header. Example: 2 volts applied to the AUX header provides a (0 to 2) volt input range single ended or (-1 to +1) volts for differential inputs.

* the ADC8-RS232 may be ordered with a high precision voltage reference installed. Please contact EECI support.

SINGLE ENDED ANALOG VOLTAGE INPUTS

Voltages up to hundreds of volts may be divided down to the 5 volt range by using a simple resistance divider as shown on the following page (the signal source must be capable of driving a 1 ma load). To determine the value transmitted by the ADC for a specific voltage applied to the divider circuit use the following formula: (VI divided by DF) times 51 = TV (where TV = transmitted value sent by the ADC, VI = voltage input to divider, DF = divider factor) DF = full scale voltage divided by 5 volts. EXAMPLE: 100 volts full scale divided by 5 = 20 = DF. A 60 volt input to the divider divided by 20 multiplied by 51 = 153 = TV, the value transmitted by the ADC (8 bit).

The voltage input source may be located up to several hundred feet from the ADC. The wire which connects the ADC to the signal source should be a twisted pair to reduce possible input noise (22 or 24 gauge communication cable or CAT5 typical). Shielded cable may be used to further protect against EMI or lightning noise (the shield should be left disconnected at the source and connected to an earth ground/equipment ground at the ADC).

Lower millivolt signal levels (such as the output signals from a watt transducer, pressure transducer, load cell, etc.) with typical full scale voltages of only 20 to 100 millivolts will require the addition of the VA-1, VA-2, VA-4 or VA-8 instrumentation amplifier. The VA-1 connects to any of the analog inputs and will convert a millivolt signal input to a 0 to 5 volt output for input into the ADC. Signal levels this low may require shielded cable to reduce noise. An adjustment on the VA-1 will set the input scale. The shield should be left disconnected at the source and grounded to an earth ground at the VA-1. Applications requiring isolated analog inputs require the VI-81 linear opto isolated amplifier.

NOTE: When the analog inputs are left floating, (no connection) the ADC will transmit fluctuating numbers as a result of noise present at the inputs. We recommend that any unused inputs be connected to GND (reference (-)) to prevent possible errors on other channels.

FILTERING INPUT NOISE: A .1 uf filter capacitor is installed on the ADC card (one for each channel) which significantly reduces errors and fluctuation as a result of input noise. A 2.7 mf or 10 mf tantalum capacitor may added for additional filtering (input response time will be slower).

Shown on the following pages in figures A, B & C are methods for reading contact closure, potentiometer movement & light levels.

VOLTAGE INPUT AMPLIFICATION AND SIGNAL CONDITIONING

The ADC8-RS232 defaults to a 0 to 4 volt input range (installation of a voltage reference will allow input ranges as low as 0 to 1 volt). When the input voltage range is required to be lower, (such as with a watt transducer or load cell) an external instrumentation amplifier must be used to amplify the input signal to the 0 to 4 volt input range of the ADC. Other EECI Analog to Digital converters may be used to input signal levels as low as 0 to 16mv (see ADC-8U15HG).

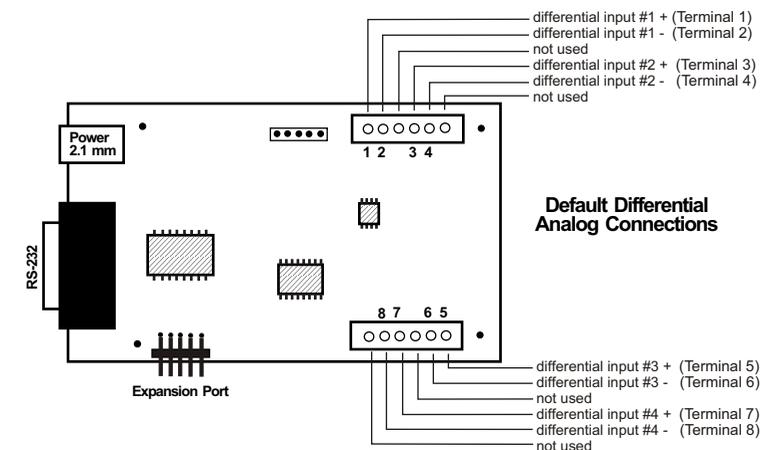
Several general purpose instrumentation amplifiers are available to amplify lower signal levels to the 0 to 4 volt range required by the ADC (for use with 8, 10 and 12 bit inputs). The VA-1 is a single channel amplifier for connection to the ADC8-RS232 or other ADC inputs. The VA-2, VA-4 and VA-8 amplifiers are two, four and eight channel versions of the VA-1. The VA-1, VA-2, VA-4 and VA-8 all provide 15 turn potentiometer(s) for gain adjustment (amplification level). The amplification level is adjusted for a 0 to 100 millivolt input at the factory. The amplification level may be adjusted for signal inputs as low as 0 to 5 millivolts or as high as 0 to 5 volts. Lower signal levels (such as the output signal from a watt transducer, pressure transducer, load cell, etc.) with typical full scale voltages of only 20 to 100 millivolts will require the addition of the VA-1 instrumentation amplifier when connecting to the ADC. Signal levels this low may require shielded twisted pair wire. The shield should be left disconnected at the source and grounded to an earth electrical ground at the VA-1.

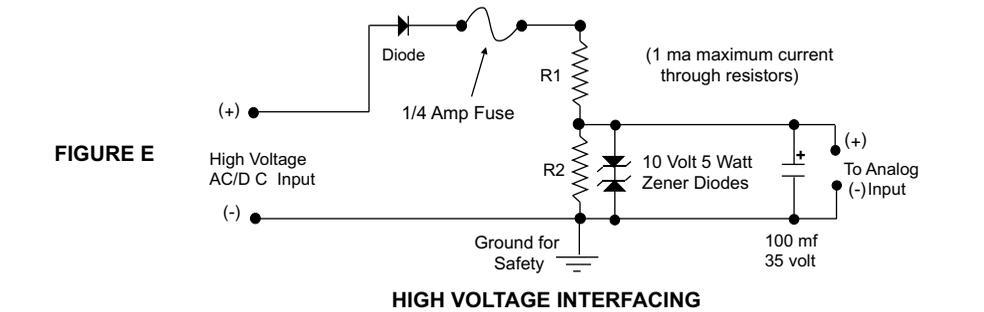
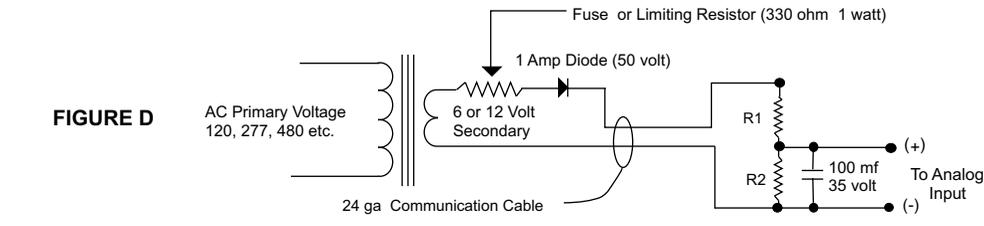
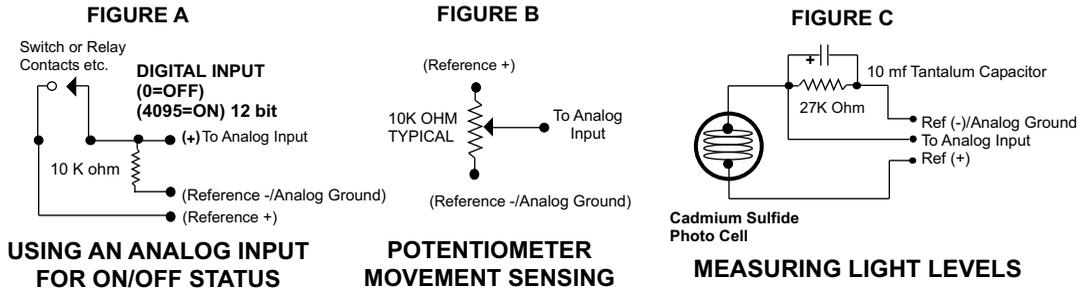
CONNECTION OF DIFFERENTIAL SIGNALS TO THE VA-1: If low level differential inputs are required, the VA-1 may be used to convert a differential signal into a 0 to 4 volt signal for connection to the ADC. The VA series amplifiers have a reference input (for connection to the ADC reference) which is used to generate a 2 volt offset (adjustable). The gain adjustment on the VA series amplifiers may be adjusted to allow for differential signals as low as (+) and (-) 5 millivolts or as high as (+) and (-) 5 volts. Using the VA-1 will allow the use of all 8 single ended inputs on the ADC8-RS232 since the low level differential input to the VA-1 is converted to a single ended signal for connection to the ADC8-RS232.

DIFFERENTIAL ANALOG INPUTS

The ADC8-RS232 may be set to accept (4) fully differential inputs in place of the (8) single ended inputs. The differential voltage input range is determined by the reference setting and/or reference input as shown on the previous page. The differential input signal connects to terminals 1 and 2 for differential channel 1, terminals 3 and 4 for differential channel 2, terminals 5 and 6 for channel 3 and terminals 7 and 8 for channel 4. The GND terminal connections are not used.

DIFFERENTIAL ANALOG INPUT TERMINAL BLOCK CONNECTIONS





CAUTION: When working with high voltages, the potential for fire, explosion, electrocution, eye injury or blindness and life threatening injuries or death exists. If you are not familiar with the precautions needed when working with high voltages, do not attempt to connect high voltage up to these circuits. To prevent the danger of a high voltage feeding back to the ADC and the fire/injury/electrocution hazard caused by an open or short circuit, 10 volt 2 watt zener diodes and a 1/4 amp fuse should be connected as shown in figure E. Wire used to interconnect a high voltage input must be rated for use with the higher voltage. When connecting the ADC to high voltage AC equipment the method shown in figure D above is recommended.

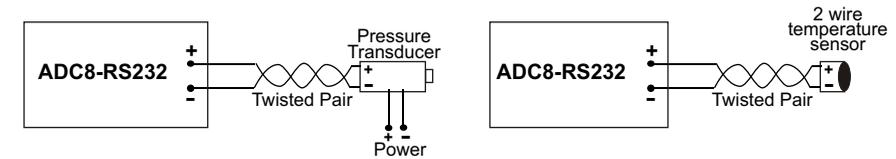
The following method is used to divide a high voltage down to the 5 volt range needed for input into the ADC. This method involves the use of two resistors (R1 and R2) which together add up to Rt (total resistance). The total resistance is determined by using the Ohms Law to compute the resistance needed for a 1 milliamp current flow through the resistors. **EXAMPLE:** If your full scale voltage is 100 volts (R = E divided by I) 100 volts divided by .001 amp = 100,000 ohms (100K ohm). To determine the proper ratio, divide 5 volts by the full scale voltage. 5 divided by 100 volts = .05. Multiple this ratio by the total resistance to determine the value of R2. R1 is then equal to the difference between the total resistance and R2. **EXAMPLE:** ratio .05 times total resistance 100,000 ohms = 5,000 ohms (the value of R2). Total resistance 100,000 ohms less R2 5,000 ohms = 95,000 ohms (the value of R1). To determine the power rating needed for the resistor, use the following formula: P = I squared times R. **EXAMPLE:** .001 squared = .000001 times R1 95,000 ohms = .095 watts. A 1/8 or 1/4 watt resistor would be sufficient.

IMPORTANT: The full scale voltage used should be the highest possible voltage that could be present at the high voltage input.

AC voltages may be applied to the high voltage input if a diode is connected in series and a filter capacitor (100 mf, 35 volt typical) is connected between the ADC analog input and the ADC reference (-). AC voltages over 24 volts or great enough to create an electrical shock hazard or fire should be connected to the ADC analog input using a step-down transformer to reduce the high voltage down to the 5 volt range as shown in figure D. A diode and filter capacitor must be connected on the secondary side of the transformer (a common low current power transformer may be used).

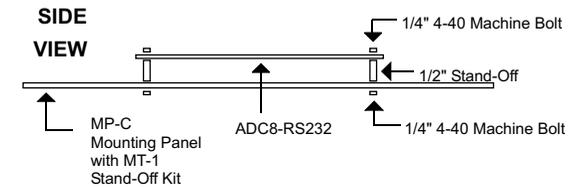
CONNECTING SENSORS TO THE ADC8-RS232

A large variety of sensors, transducers, load cells and other devices that provide an analog output may be connected to the ADC8-RS232. Most types of sensors may be located up to 1,000 feet from the ADC8-RS232. Pull up resistors may be installed on the underside of the ADC8-RS232 for 2 wire sensors that receive power from the USB port. The cable used to connect sensors to the ADC8-RS232 should be twisted pair or shielded twisted pair to suppress environmental noise. Low cost CAT 5 cable works well when multiple sensors are in the same location.



MOUNTING

The ADC8-RS232 Analog to Digital card may be mounted in an enclosure (part # EN-C or EN-D) or on a metal mounting panel using the MT-1 stand-off mounting hardware as shown below. The ADC8-RS232 will attach to the 4 stand-off spacers using 4-40 machine screws (4 mounting holes are provided on the ADC8-RS232). Contact technical support for more information on mounting panels and various mounting layouts.



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