I2C for PC
USB & RS232 to I2C/SPI Adaptor & Controller

Features
- Uses **BL233B** I2C-Serial IC
- Both RS232 & USB interfaces
- 3 separate I2C busses
- 2x SPI bus
- 4x Dallas type 1-Wire bus
- Easy ASCII commands
- 5V and 3.3V On-board power
- Galvanic Isolation option
- High-Speed
- Power-On, Watchdog and other autonomous actions without working PC
- Auto-switching USB/RS232
- No DLL's, API's, Drivers needed.
- Cross-Platform: Linux, Windows, PDA's etc
- USB Bus Powered
- 45x80mm, in a box (not bare PCB)

Applications
- ATE for I2C/SPI based equipment
- Evaluation of I2C and SPI chips
- Evaluation kits for I2C & SPI chips
- Rapid Prototyping & PnP design
- PC based instrumentation and control
- Reader for 1Wire serial numbers
- Galvanically Isolated I/O
- Cheap and Easy Data logging
- PC and Network Watchdogs
- PDA/Calculator Analog/Digital I/O
- Education
- RS232 parrallel I/O
- Camera chip control
- Fibre Optic and Laser Module

Programmable
EEProm stores commands and settings
- Power On Reset actions
- Interrupt actions
- Watchdog timeout actions
- Macro's
- Autonomous actions
Description

With both USB and RS232 serial interfaces this is a truly universal I2C/SMBUS/SPI/1-Wire interface, for the widest possible range of computing hardware, with the simplest and most portable software format.

*I2C2PC is not an I2C slave or an I2C monitor. It is a master on the I2C/SPI bus only.*

Building an I2C based application needs nothing more than *your* I2C chip, everything else is included.

There is an internal 5V and 3.3V power supply to run the interface and your target hardware. Simple systems will run from the USB bus power.

Unlike some competing products, it can sustain high baud rates, and has multiple I2C Busses.

Compared to cruder solutions, it doesn't rely on bit-bashing PC software, ill defined I/O characterisics, or processor and OS dependent timing.

Power-On-Reset actions can be set in EEProm so that systems are properly initialised when the PC is not present.

Watchdog actions can be programmed to automatically respond to PC failure.

Galvanic isolation can be installed where the I2C busses need to be isolated from the computer for noise, ground loop, or safety considerations.

An optional 3rd interface is available for Fibre Optic, Bluetooth, RS422 and similar interfaces.

![Figure 1 Adaptor with case removed](image)

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1 Revision History

<table>
<thead>
<tr>
<th>Rev</th>
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<th>Changes</th>
</tr>
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<tr>
<td>43</td>
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<tr>
<td>51</td>
<td>24 Feb 2008</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>27 July 2013</td>
<td>Updates for V4 pcb, manufactured after 2011:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fitting a DC-DC Converter sec 11.2.3: Detail new V4 pcb with footprint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to take converter on pcb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adding optional regulator U9: Low Voltage Regulator for Bus 3 sec 11.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adding Regulator for AUX interface: Regulator for Aux Interface sec 6.1.1</td>
</tr>
<tr>
<td>20</td>
<td>20 March 2014</td>
<td>Add CN10 pinout</td>
</tr>
</tbody>
</table>
2 Commands
Read the BL233 B PDF Datasheet for a full description of commands and operation.

There are application notes that clarify specific applications, and other information in the PDF Library

3 Software Interface
The I2C-2-PC appears as a serial port device when either the USB or RS232 are used. (Linux, Windows, Mac).
No special API's or DLL's are required to access it. Almost any programming language can be used including Labview. Our customers are using it with

- VB
- C, C++
- Labview
- Matlab
- Delphi
- Java
- Python
- Perl
- PDA's
- Batch files

4 Installing and Testing Your New Adaptor
The I2C2PC is normally shipped set to 57,600 bd N81, RTS/CTS handshake.

*If you have Galvanic Isolation fitted, see sec 11.1 below.*

The jumpers are set 5V, and IRQ on the I2C buses.

- Download, Install Realterm from: [http://www.i2cchip.com/realtterm](http://www.i2cchip.com/realtterm)
- Use the “Realterm I2C” shortcut to start up Realtern. This will automatically configure the port settings to hardware handshake RTS/CTS.
- Ensure the Port Select jumper is in AUTO position (ie not fitted). The port will default to RS232 when the USB is not connected.
- Connect a DB9 serial extender (m-f) cable (not a cross over cable) to the RS232.
- Apply 9V Centre positive 2.1mm power supply.
When you apply power you should see a default startup message like “HI I2C v118”. Note you probably won't see this when using USB power, as the message is normally sent before the USB bus has enumerated.

Type “?”. The I2C2PC should reply with 2 hex bytes of the status byte eg “18”

If you are going to use the USB, install the FTDI driver software for Windows. [http://www.ftdichip.com/Drivers/VCP.htm](http://www.ftdichip.com/Drivers/VCP.htm)

5 Jumpers
The back of the PCB has silkscreen of the jumpers with their functions labeled.

6 RS232-USB Selection
See also "USB" sec 13 below and “Should I use USB or RS232?” sec 13.1 below

Selector J3 \(^1\) at edge of board under USB/DB9 connectors:

\(^1\) Boards before May 2003 are:
Jumper toward DB9: Always USB
Jumper toward DB9: Always RS232
Jumper toward USB connector: Always USB
No Jumper: Autoselect USB when bus enumerates, RS232 otherwise.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>none</td>
<td>Autoselect USB/RS232</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selects USB when it is enumerated</td>
</tr>
<tr>
<td>none</td>
<td>USB</td>
<td>USB only</td>
</tr>
<tr>
<td>none</td>
<td>RS232</td>
<td>RS232 only</td>
</tr>
<tr>
<td>fitted</td>
<td>none</td>
<td>invalid</td>
</tr>
<tr>
<td>fitted</td>
<td>USB</td>
<td>AUX Only</td>
</tr>
<tr>
<td>fitted</td>
<td>RS232</td>
<td>invalid</td>
</tr>
</tbody>
</table>

Duplicate jumper holes J2 are inside the case, so a jumper can be fitted internally when you don't want to use the ones at the edge, or you don't want users to be able to change jumper. (and J3 can be removed)

6.1 Aux Interface CN9

CN9 is a third serial interface that can be manually selected instead of RS232 and USB. It is selected by installing link J1, and the setting J2 to USB.

*** WARNING: While it uses a 6 pin micromatch it is completely incompatible with the I2C bus. Do not plug into the wrong socket ***

You can use it to add a 3rd interface, eg Bluetooth or Fibre or RS422 or TTL. It can be directly connected to the logic level\(^2\) pins of a UART or microprocessor serial pins. For example you can connect it direct to the serial pins of a Linksys WRT54G Linux router. It is directly compatible with 3V and 5V devices.

6.1.1 Regulator for Aux Interface

If you need a lower voltage (eg 3.3V) to power the device on CN9, there are 3 pads labeled CN4, adjacent to CN9 which can take a Microchip MCP1700-XX-T0 or Holtek HT73XX regulator in to-92 package.
Cut track between Pin1&Pin 3. Fit regulator, Fit C13 next to U3.

Jumper toward USB connector: Autoselect USB when enumerated, RS232 otherwise.
No Jumper: Always RS232

\(^2\)You cannot connect CN9 directly to RS232. RS232 is inverted and has high voltage levels
I2C for PC

USB & RS232 TO I2C/SPI ADAPTOR & CONTROLLER

6.2 Bluetooth on Aux

See I2C2PC_Bluetooth.pdf for more details.

The BlueSMiRF extended module from www.sparkfun.com can be directly connected to CN9. Set the module to 57600bd using its AT command set, and you are ready to go.

<table>
<thead>
<tr>
<th>#</th>
<th>I2C2PC CN9</th>
<th>#</th>
<th>Sparkfun Blue SmiRF Extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCC (+5)</td>
<td>2</td>
<td>PWR</td>
</tr>
<tr>
<td>2</td>
<td>CTS (out)</td>
<td>1</td>
<td>CTS-I</td>
</tr>
<tr>
<td>3</td>
<td>RXD (out)</td>
<td>5</td>
<td>RX-I</td>
</tr>
<tr>
<td>4</td>
<td>TXD (in)</td>
<td>4</td>
<td>TX-O</td>
</tr>
<tr>
<td>5</td>
<td>RTS (in)</td>
<td>6</td>
<td>RTS-O</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>3</td>
<td>GND</td>
</tr>
</tbody>
</table>

7 I2C Bus Connector

The I2C Bus connector used is a MICRO-MATCH by AMP. Either 4 or 6 way can be used. 6 Way I2C Connectors and Cables are available from I2CCHIP, as well as from Farnell. I2CCHIP can supply bulk connectors (boxes of 250) if required as well as cables, and small quantities of connectors.

<table>
<thead>
<tr>
<th>#</th>
<th>4 Way</th>
<th>6 Way</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SDA</td>
<td>SDA</td>
</tr>
<tr>
<td>2</td>
<td>VDD</td>
<td>VDD</td>
</tr>
<tr>
<td>3</td>
<td>VSS</td>
<td>VSS</td>
</tr>
<tr>
<td>4</td>
<td>SCL</td>
<td>SCL</td>
</tr>
<tr>
<td>5</td>
<td>INT / CS</td>
<td>Interrupt input (active low) or Chip select for SPI (jumper select)</td>
</tr>
<tr>
<td>6</td>
<td>VAUX</td>
<td>Aux supply. Not connected</td>
</tr>
</tbody>
</table>

The reason for the power lines being between the I2C wires is to stop the edges of SDA and SCL coupling together. This follows the Philips pattern set out in section 17.3 of The I2C Bus Specification.

- If the length of the bus lines exceeds 10 cm
- This arrangement will have similar capacitive loading on SDA and SCL. Where you don't use pins 5 & 6, it can be better to just use 4 wires.
8 CS and Interrupt Pins

Jumpers J4,5 are provided to select the function of pin 5 of the I2C connector between IRQ (input), and CS/1Wire (i/o). This is for BUS# 2, 3 only. Bus#1 is always connected to IRQ.

If you are using the adaptor for SPI, you will need to change the jumper position to CS to make it an output.

Note that the IRQ pin is common to all buses it is connected to. So changing its level at one bus, will affect all of them.

9 Bus Drive and Pullups

The bus is fitted with 1k\(\Omega\) pullup resistors in a SIL resistor pack.

If you want to reduce or increase the current, replace the resistor pack. We recommend cutting it out with fine side cutters, removing the individual pins through the top of the board, and desoldering the holes.

Note that although Bus#3 may be pulled up to 5V, it has a diode clamp that keeps the voltage down to VDD on that bus.

The BL233 can drive much higher currents if required, 15-20mA @5V VCC. There is a 47 ohm protection resistor in series with the outputs that will need to be reduced of course.

You will need a buffer at the other end of the bus if you do this.
10 Power Supply

External power is 9-12V DC, (2.1mm centre positive).
An on board 7805 regulator is fitted to provide 5V. An HT7333 regulator provides 3.3V at up to 250mA.

If you have a Galvanic Isolated adaptor, see 11.2 below
If you want to use low voltage I2C devices (<3.3V) see: Low Voltage Regulator for Bus 3 11.3 below

- USB Bus Powered USB Data: ~50mA for I2C devices
- USB Bus Powered RS232 Data: ~50mA for I2C devices
- External Power, RS232
- External Power USB

10.1 USB Bus Powered

The USB bus can deliver up to 500mA\(^3\). When operating from USB, the supply voltage is normally about 4.7V. The 3.3V regulator will operate correctly from the USB supply.

Even if you are using the RS232 port, you can use a USB cable for power. Just fit the RS232 jumper to force the adaptor to ignore the usb port.

Note that USB power can be very noisy, and can go as low as 4.4V when other devices are used with unpowered hubs. Using the 3.3V regulator for the I2C may be best for USB powered applications that are noise sensitive.

10.2 I2C Bus Power Selection 5V / 3.3V

I2C Bus #1,2 are connected to the BL233B's VDD supply. J6 selects between 5V and 3.3V for the BL233B's VDD.

I2C Bus#3 has a separate VDD jumper J7. Using J7 you can operate I2C Bus#3 from either 5V or 3.3V, while Bus#1,2 are operating from 5V.

If you leave J7 off completely, then you can power Bus#3 from another the I2C cable. Bus#3 has TTL levels and an in-built diode bus clamp, that keeps clamps the voltage on SDA and SCL to the Bus#3 VDD. This means that you can operate Bus#3 VDD from 2-5V

The I2C Bus VDD is connected to the interfaces VDD (5V).

\(^3\)Devices that draw > 100mA from the bus should have switched load, and in theory you should change links on the FT232, so the adaptor tells the PC that it is a high current device. See FT232BM datasheet for more detail if this matters to you.
To isolate an I2C Bus#1 or 2's VDD from the adaptors VDD, remove the associated 0603 link by the connector. (FB10,11)

**10.3 Local AND USB Power**

Boards manufactured after April 2003\(^4\) should work happily with both external and USB power.

If you do not want the USB bus to try and power your equipment, remove D5 (by USB connector). Normally you would do this when building the I2C-2-PC into a standalone equipment that has its own 5V supply.

If you are making test systems, be aware that a short circuit, high voltages etc, that may accidentally be applied to the VDD of the I2C bus, will be connected through the USB cable to the power supply of your computer. This can reset your computer or worse. For these applications, the Galvanic Isolated option is available.

**11 Options**

**11.1 Galvanic Isolation**

Before using a new Galvanic Isolated unit anywhere safety-critical, you should use a multimeter to verify that the input and output side of the adaptor are actually isolated. This is good practice.

Adaptors can be ordered with Galvanic Isolation. Isolated versions have:

- Printing is marked Isolated, or Purple stripe on the metal of DB9 connector
- Isolator is fitted to pcb.

You should use the Galvanic Isolated version if:

- I2C side can be inadvertently short-circuited and you are using USB

---

\(^4\)With boards manufactured before May 2003:

There are some traps to watch when using a local power source, and the USB adaptor. The USB chip will not see a power on reset when the USB Bus is connected, and local power is already applied, and may not enumerate correctly. See FTDI documentation for more reset details.
• Faults at the I2C could possibly connect high voltages to any pins of the
adaptor (including the ground pin)
• You don't want to ground your I2C bus to the PC chassis
• Measurements are sensitive and you need to decouple from the PC's noise, and
ground currents, and earth loops.
• This is a valuable and important industrial system that should be designed to
be robust.
• You need to run the I2C bus floating or above ground potential

The Analog Devices ADUM1402A is used for isolation in V3 adaptors For more
information see the datasheet. Creepage distance is ~2.5mm.

11.1.1 Fitting Isolator Yourself
If you need isolation, either mill, or chisel the bridging tracks from the isolator
footprint and fit the IC.
If you use RS232, and an isolator you will need to power the RS232 section. Fit CN4,
and protection diode D1 (BZX85C5V6 or C6V2)

11.2 Galvanic Isolated Power
When isolation is fitted, you have to power the PC side separately from the I2C side.
Normally USB power is used for the PC side, and an external 9V supply for the I2C
side.
If you want to use the RS232 interface, you can still use the USB connector to provide
power. Just fit the "RS232" jumper to force the interface to use RS232. (with no
jumper the interface autoselects USB when the USB is connected to a computer, but
not when a USB power-only cable is used)

11.2.1 USB Power only Cable
You can use a USB Power-only cable to power the PC side, when using RS232. This
is just a USB cable with only the 2 power wires fitted. Just cut the end off a Usb
cable. Normally the power wires are red and blue, and thicker than the data wires.

11.2.2 External 5V to PC Side
If you are not using USB power, fit 2 pin connector CN4 and protection zener D1
(BZX85C5V6 or BZX85C6V2).
The PC side requires 4-5V, 30mA.
See the wires in Figure 5 below

The NVE IL716-3 magnetic isolator is used for galvanic isolation on V2 units
11.2.3 Fitting a DC-DC Convertor

If you want to power one side of the isolation barrier from the other, you can fit a 5V-5V DC-DC convertor module.

<table>
<thead>
<tr>
<th>Part#</th>
<th>Manuf.</th>
<th>Digikey</th>
<th>Future Elx</th>
<th>Mouser</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBSD1-S5-S5-DIP</td>
<td>CUI</td>
<td>102-1374-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CME0505-DC</td>
<td>Murata</td>
<td>811-2893-5-ND</td>
<td>580-CME0505DC</td>
<td></td>
</tr>
</tbody>
</table>

The dc-dc convertor is 5V-5V, Single Output, DIP 8 pin (4pin) or DIP 4 pin.

Adaptors made after 2011 have pads to fit a standard DIP convertor, next to the DC Jack, marked T1 on the silkscreen. The pads are slightly confusing, as you can fit the DC-DC convertor module either way around. The arrows on the silkscreen show you which way the power flows.

- Fit as T1 powers I2C side from USB side
- Fit as T1A powers RS232/USB side from DC power jack (I2C side)

If you wish to fit another type of convertor, just wire to the pads labeled +/- in the T1 footprint.

Links LK1 and LK2 select the input to T1A. Use LK2 if you have a 9V in, 5V out type convertor.

11.2.4 Defeating Isolation

If you don't need the isolation you can simply join VCC and GND with wires as shown in Figure 11.5 below. ie CN2-1 to CN9-1 and CN2-6 to CN9-6.

_Beware of forgetting that the isolation is gone!_
11.3 Low Voltage Regulator for Bus 3
Bus 3 will support low voltages. See i2cad_Using_Low_Voltage_Devices.pdf. You can fit an extra regulator U9, Microchip MCP1700-XX-T0 or Holtek HT73XX if you want voltages other than 3.3 and 5V. This is a TO-92 style regulator for easy fitting.

If you fit optional internal regulator U9, leave J7 off.

When VDD is 5V, Bus 3 can be as low as 2.5V. When VDD is 3.3V, Bus 3 can be as low as 1.8V.

11.4 Daughter Board Connector
I2C2PC can be used as a daughter/mother board that plugs onto another board, instead of using cables from the I2C Bus.

A 12 pin SIL 0.1” pitch connector CN10 can be fitted from either top or bottom side of the PCB.

- VCC is 5V or 3V3 as selected by J6.
- VCC3 is the output of the 3V regulator.
- If the adaptor has USB power or external power, VCC can be used to power the external module. Alternatively you can feed 5V into VCC from CN10.

Figure 11.6: CN10 Pinout
See the Mechanical drawing for details of the position and mounting holes. DXF and Altium PCB files are available.

11.5 82B715 Bus Extender
Obsolete this has been removed from V3 boards
11.6 USB Leds and Power Led
USB-RX (led1) and USB-TX (led2) leds can be fitted if you want. Use 5V built-in resistor type leds (or use 3mm leds + 330 ohm resistors). These LEDs flash briefly when data is sent or received through the USB bus. They are useful for debugging purposes. Led3 is a power LED.

11.7 USB EEProf
USB info can be set using FTDI utilities. This will let you enumerate the device as something other than a generic usb/serial adaptor, as well as setting special information such as current consumption. Boards manufactured before 2011 use FT232B, and require the 93C46B EEProf to be fitted to the pcb. Post 2011 boards use FT232R and have built in eeprom.

Some customers have reported that Windows XP does not correctly handle multiple adaptors on the same USB, and that this may be fitted, and a unique serial number set. Later (post 2011) FT232R boards have unique serial numbers by default.

12 Example Applications
See the http://www.i2cchip.com for more examples.

There are application notes that clarify specific applications, and other information in the PDF Library

12.1 8 Bit I/O Port
Use a Philips PCF8574 or Onsemi JLC1562. See http://www.i2cchip.com/pcf8574.html for i/o boards and keyboards.

Figure 12.1

12.2 Simple Data logger with no PC Software
Use a Philips PCF8591 4 channel 8 bit A-D chip.
Store this macro in the EEProf at location 0. It will run automatically at power on, sending 4 channels of A-D data in hex, followed by LF.

S90 04 R04 T0A L0200 >00
12.3 Simple RS232 I/O Port
The I2C-2-PC can be used directly as an 8 bit I/O port with a 1 bit IRQ input. No I2C or SPI chips are needed at all. This is ideal for connecting relays, lights and switches to a PC.

\[
\text{O OF} \quad \text{[write 0x0F direct to pins]}
\]

\[
\text{Q} \quad \text{[read pins]}
\]

\[
\text{?} \quad \text{[read IRQ input]}
\]

12.4 RS232 to LCD Module adaptor
A single PCF8574 can drive a standard LCD module. This circuit is available built up.

12.5 Huge RS232 Parallel Port
To get a large number of cheap and easy output pins with good drive capability, use the SPI output, and 74HC4094 shift registers. Eg a 32 bit output with 4x 4094's. SDA4 is used as STB for the 4094's

\[
G3 \quad \text{Y01020408 OFFFD OFFFC}
\]

[select bus3][send 4 bytes to 4094]'s][pulse STB pin to latch data] nb O not zero

12.6 Reading a DS2401 1 Wire serial number
To read a DS2401 serial number

\[\text{GC S W33 R04} \]

[Select 1 wire bus#1 (bus #C)][Start(reset)][Get status to check presence][ReadRom Command][Read 4 bytes of rom data]

Since Start can be followed immediately by write data, a shorter version is:

\[\text{GC S 33 R04} \]

[Select 1 wire bus#1 ][Start][ReadRom command][read 4 bytes]

13 USB
USB requires the Virtual Comport drivers for Windows. For other operating systems see http://www.ftdichip.com/Drivers/VCP.htm
USB introduces latency that may affect your software design. See AN232B-04 Data Throughput, Latency & Handshaking

This latency affects all USB devices. To avoid it you should structure your software to decouple the commands you send from the data coming back. ie you send as many commands as possible to the BL233, then you process the data as it returns. If you send a command, then wait for each response, performance can be very poor.

*Just because USB runs at 12Mbps does not mean it really works fast.* RS232 may perform better in practice. This is why we provide both interfaces.

The USB configuration in EEPROM can be changed so that it enumerates as a special device rather than a virtual comm port. FTDI utilities can be provided to do this. FTDI provides D2XX DLL Drivers are to directly access the USB interface. [http://www.ftdichip.com/Drivers/VCP.htm](http://www.ftdichip.com/Drivers/VCP.htm)

We recommend using the Virtual Comm Port approach, as you retain the flexibility to use RS232 with no software changes.

### 13.1 Should I use USB or RS232?

If you are making test systems or otherwise require reliability and performance, we recommend that you try and use a real serial port, rather than USB. Reliability does not depend on drivers, and on other USB devices being connected and disconnected from the computer. The Comport number will not move around. Latency is reduced, and more reliable.

### 14 FAQ

*The BL233 datasheet is the place to find answers to all your software questions!*

**Can I use SMBUS chips?**
Yes. SMBUS chip will usually operate directly.

**Can I mix 5V and 3V IC's?**
Yes. Bus# 3 has TTL Levels. You can have bus 1&2 at 5V and bus 3 at 3.3V

**Can I use 2.5V or 1.8V I2C.**

**My adaptor doesn't work. I have Galvanic Isolation.**
You have to power the PC side and the I2C side separately. See Isolation section 11.2
Will your product continue to be available.
Yes it is a successful product with a growing market.

USB is really slow?
Latency is an issue. See USB section 13

The data is gobbledygook.
First use Realterm to test the adaptor. Make sure the baud rate is correct (57600 is default) and that you are using RTS/CTS handshaking. Once you have used Realterm to send commands successfully and found out what the returned data is, you are ready to start writing your software.

Realterm doesn't do XXXX
You can try the latest development version of Realterm at http://www.i2cchip.com/realterm

Does it work with Labview?
Yes. Labview has good serial support

Does it work with Linux / Solaris / Mac
Yes. No special drivers are required. You will probably find it easier to use the rs232 interface.

How do I interface to a PDA?
- Most PDA's have TTL level serial connections available. The BL233 will directly interface to this through the AUX header on the pcb.
- RS232 adaptor cables are available for some PDA's. You will probably need a null modem plug/cable to connect them together
- You can use an IRDA receiver connected to the AUX header. The IR port is a comm port to the PDA software
- Use a bluetooth module connected to the AUX header. These give up to 100m range.
- RS232 Compact Flash card. If your PDA has a CF slot you can get an RS232 card for it.

My PDA has a USB cable. How do I use it?
Except for the latest devices, most PDA's are a USB slaves, and cannot control other USB slaves. (ie you can't)
If your PDA can plug direct into a USB->RS232 adaptor then it has a good chance of working.
**How do I interface to a Wireless Router.**

We now have a product based on an OpenWRT Router, ask for more details.

Most routers such as the Linksys RTA54G have a logic level serial port. This can be connected directly to the AUX port. You may need to put 4k7 resistors in series for level shifting.

Some routers (eg ASUS) have a USB port, and may have be able to work with the USB-Serial interface.

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**15 Factory Test Procedure**

This is the factory test procedure:

**15.1 Visual Inspection**

Inspect paying close attention to all leaded solder joints.

**15.2 DC Supply current and Power supply**

Set PSU to 0V.

Connect to DC socket.

Increase supply voltage *slowly* to 8V, whilst measuring the 5V line across D2, and watching for excessive current (>50mA)

Check supply voltage on BL233B is between 4.75 and 5.25V

Change jumper J6 to 3V position, check voltage is 3.2-3.4V

**15.3 RS232**

Install RS232 jumper

Connect RS232 cable and set terminal program to nominal baud rate (normally 57600)

Connect power to adaptor

Terminal should display "HI I2CAD V118" or similar. Note that once the EEPROM has been changed this may no longer be true.

Type "?". Board will reply with 2 chars eg 18

Remove jumper (auto-select).

Type "?" again and check still works

**15.4 USB**

(Note that FTDI USB/serial adaptor drivers may need to be installed first time)

Remove RS232.

Plug in USB.

Type "?" and check response.
In case of problems check the USB RX and USB TX LED positions with an oscilloscope. These pulse low when chars are received or sent. Note that you won't see the "HI I2CAD V118" power on message through the USB port as the USB connection is not enumerated yet, when the BL232 starts.

15.5 I2C Bus 1
Connect the test PCF8574 board to I2C Bus 1.
Type "S42F0P"
Half the leds will come on

15.6 I2C Bus 2
Connect the test PCF8574 board to I2C Bus 1.
Type "G2" to change to I2C Bus 2
Type "S42F0P"
Half the leds will come on

15.7 INT Pin
Put jumpers J4,5 in INT position
Send ?. Reply is "18"
Hold down a button on 8574 board.
Send ?. Reply is "08"
Check for 3 busses

16 RoHS & Lead Free
I2C2PC RoHS/Lead Free are being supplied globally from October 2007.
BL233_B supplied after October 2005 are RoHS/Lead Free

17 Ordering Information

18 OEM Versions
It is available as a bare board in OEM packs.
See Mechanical PCB and DXF files for mounting hole positions.
Special builds are also available for volume orders.
• RS232 only
• USB only
• Waterproof metal box
• other voltages
18.1 RS232/USB to TTL Interface
We supply this board for use as a built up serial interface to customers TTL level devices. Contact us for pricing.
CN2 connects to your device and can power it.

<table>
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<th>Direction</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>From PC</td>
<td>TTL RTS</td>
</tr>
<tr>
<td>3</td>
<td>From PC</td>
<td>TTL TXD</td>
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19 Revision History

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<tr>
<td>59</td>
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<td>Add new power supply dc-dc convertor type</td>
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20 Schematics and Drawings