Our ELM327L data sheet mentions RS232 to USB integrated circuits by FTDI (www.ftdichip.com), and Silicon Labs (www.silabs.com), but does not discuss any of the devices made by Prolific Technology (www.prolificusa.com).

Prolific makes a great many USB to RS232 cables for a large number of companies. These have USB and DB-9 connectors at the ends so are easy to use. If your Elm circuit has an RS232 connector, simply install the drivers and connect the cable. Since they are self-contained devices, we have not provided information about them when discussing circuit construction.

Recently, a number of 'PL-2303HX' cables have appeared on the market. They have a USB connector on one end, and 4 wires on the other, and typically look like this:
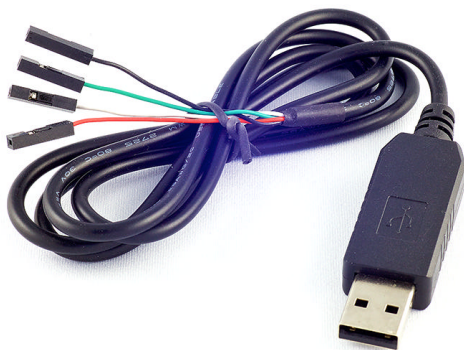
Typical PL-2303HX Cable from Online Sources

These cables are usually not made by Prolific, and may not contain real PL-2303HX integrated circuits. There seems to be a fair number of clone devices on the market (just as there is for clone ELM327s).

You may be wondering - even if the cables contain clone chips, can they be used with a circuit that requires an RS232 connection? The answer is maybe - as, among other things, you have to be careful of the voltage that your circuit uses. These cables use 3.3V logic, and your circuit may not be compatible.

No Documentation? No Problem.

It seems that these inexpensive cables do not usually come with any documentation, which can make them difficult to use. This application note was written to help you get over that, and perhaps use this alternative interface with your Elm circuits.

Installing Software

Before you worry about how to wire the cable, you need to obtain some software. A computer needs to know how to 'talk' to the cable, and requires special 'driver' software to do this. While the Prolific site has this software for download, that is only for use with a genuine Prolific device. If you do not know if the cable you bought is a clone or not, you should use one of the open source drivers that are available.

Install your driver software so that the computer is ready for the cable, and get your multi-meter out.

Determining the Pinout

The next thing that you need to do is determine what the function of the wires are. A 'schematic' for the PL-2303HX cable looks like this:
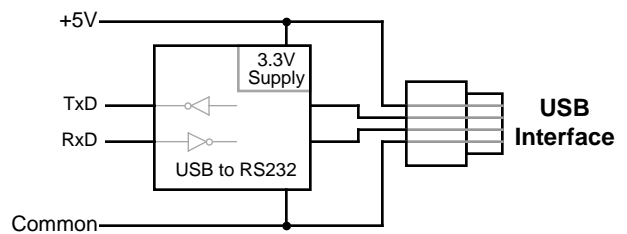
A Schematic for the PL-2303HX Cable

It is a fairly simple matter to determine which wires are connected to +5V and common. They are typically the red and black ones, but you need to be sure.

Connect your ohmmeter leads between one of the four wires and the shell of the USB plug. If you should see about 0 ohms for one of the wires, this is your common - note the colour. If you do not see continuity to any of the wires, that simply means that the shell has not been connected to common. If that is the case, you will need to insert your meter probe into the plug and onto the common pad to find continuity. The one that shows about 0 ohms is the common.
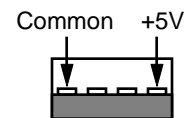
USB connections looking into the plug

Having found the common wire, you can now connect your cable to a computer (or USB source). Connect your meter common to the PL-2303HX cable common, and measure the voltage on each of the

wires. You should see +5V on one wire, about 3.3V on another, and about 0V on the remaining wire. If you do not see about 3.3V on one of the wires, you may have to open some terminal software (HyperTerm, ZTerm, etc.) first, to initialize the cable.

The wire with 3.3V on it is the Transmit Data (TxD) wire from the cable, and the one with about 0V on it is the Receive Data (RxD) wire. Note the colours and use them to connect to your ELM327L circuit. (We say ELM327L as it is somewhat complicated to level-shift the signals if you wish to connect to a 5V circuit, such as the ELM327, and do not have a 3.3V source.)

Modifying Figure 15 of the ELM327L data sheet then, your typical connections would be:
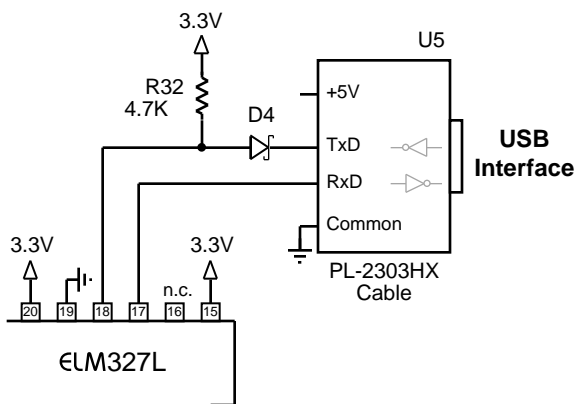
Using the PL-2303HX with the Circuit of Fig 15

Note that we show a Schottky diode and pullup resistor here (just as we did with the FTDI interface in the data sheet). These are required to prevent backfeed from the cable into the ELM327L circuit if the ELM327L supply is off. This backfeed will typically cause about 2V to appear on V_{DD}, which may well confuse the power-on reset circuitry (and could cause weird results). To avoid problems, it is better to add these two components.

Using the Cable

Once your circuit is wired, you may use terminal software (eg. HyperTerm, ZTerm, etc.) to send data through it. The ELM327L defaults to a data rate of 38,400 baud, so this is the rate that your software should be set to.

Ideally, you should be able to use this interface exactly as you would any other. We say ideally, as there have been a few issues reported with the software. Some people have had trouble getting the

software to work properly with the Mac (especially OSX v10.10 Yosemite). Also, Prolific have said that they are discontinuing support for version A of the PL-2303 chip, and many of the clones seem to mimic that one. Newer versions of the Prolific software may refuse to work with older interfaces. Your mileage will certainly vary, but it is worth trying as the cost is very low.

Changing the Baud Rate

If you get your circuit working at 38.4kbaud and would like to take advantage of the higher data rates that USB is capable of, you will need to change the ELM327L's baud rate. This is easily done by changing the value stored in Programmable Parameter 0C.

We advise caution here, as there have been some reports of PL-2303 cables not being able to exceed 115.2kbaud, and some that switch to 9600 baud if an unsupported baud rate is selected. Be prepared to temporarily reset the ELM327L's programmable parameters with a jumper to pin 28 during startup, should you get into trouble. This is explained in the Programmable Parameters section of the data sheet.

As an example, we will change the ELM327L to a 115.2kbaud rate. This requires PP 0C to be set to 4000/115.2 = 34.7. As PP 0C must be an integer, we'll use 35 (the error is only 0.8%, which is fine). Since 35 in decimal is 23 in hexadecimal, we need to set the value of PP 0C to 23:

```
>AT PP 0C SV 23
```

and then enable the use of this value:

```
>AT PP 0C ON
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From this point on, the ELM327L will start up with a 115.2k data rate, not 38.4k.

Change to this new baud rate by sending AT Z, or by toggling the power off and on. Next, change your terminal software to 115.2kbaud, and you should be all set.

Using the PL-2303HX Cable with other Circuits

There's nothing special about ELM327L circuits (they use standard RS232) so there's no reason that you can not now use a PL-2303HX cable with other circuits that you build. Be sure to keep a few in your parts bin, now that you know how to use them.