Review of PS2 Mouse to Games Port Converter

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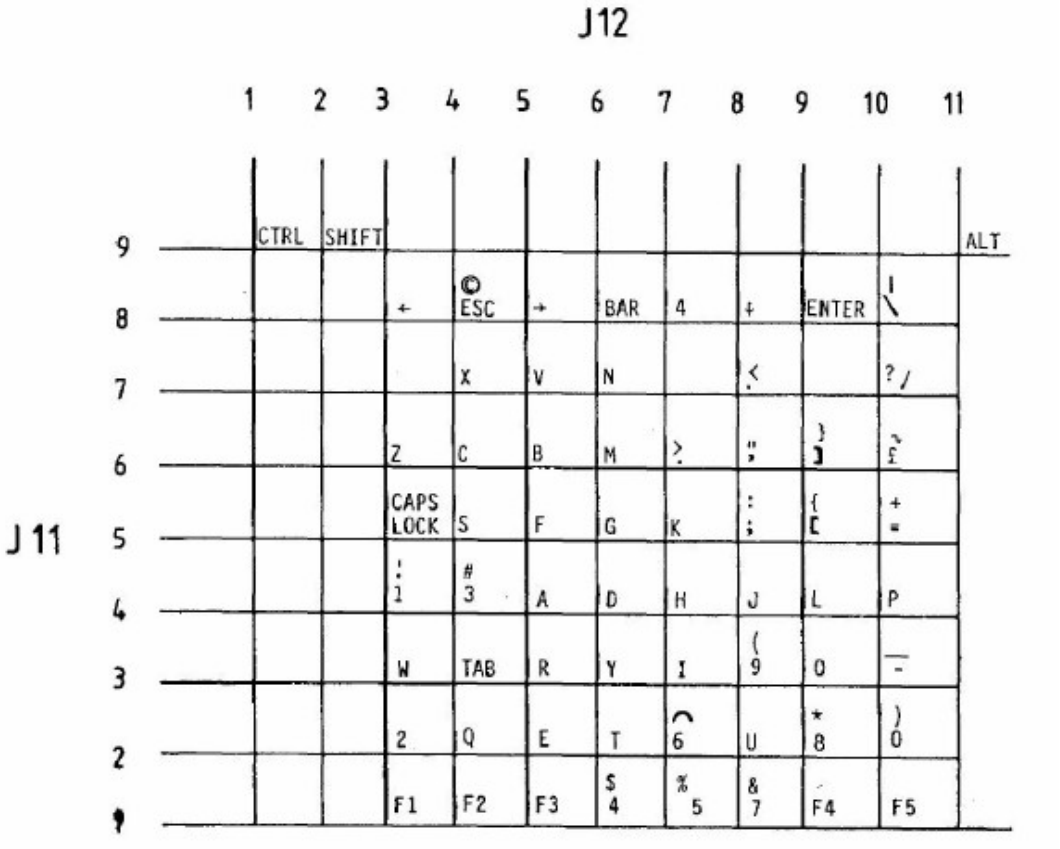
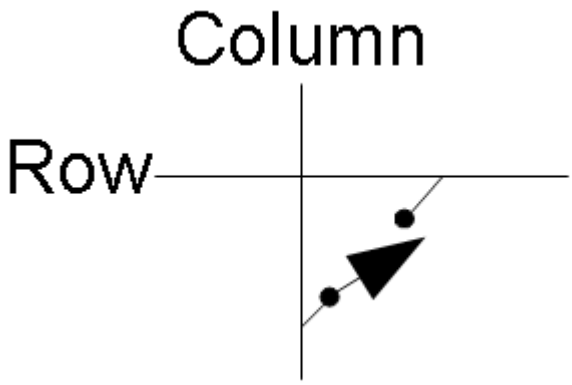
As you may have seen, a developer in Italy has developed a converter to convert a PS2 mouse to work either of the games ports on a Black Box QL.

This has all sorts of possibilities but also limitations. For those of you with ICE software, then you can use this interface. As far as I know this software is no longer sold and is not in the public domain. Maybe someone can rescue it and put into the public domain. Also unless someone has the skills to change it, this interface will not work with PRT_GEN and WMAN which means standard PTR programs will not work. Also this converter is not a replacement for the QIMI interface. However you can write your own SuperBasic applications, with or without SMSQ. Since you can use such functions as KEYROW to read the mouse. Also there is no need to load PRT_GEN and WMAN extensions.

So how does it work. This converter translates the movements of a serial mouse to up, down, left and right keys used on the games ports of a the QL. It also provides one button (fire) using either of the mouse buttons on a standard two button mouse. This converter is based on a Microchip PIC16F84A microcontroller. The PIC deals with the serial data stream from the mouse and converts this into the games keys. These keys are represented by what are called by bilateral switches (CMOS IC 4066 or 4016). Which is an electronic switch with a control input, high is closed, low is open. So why do we need to do this? Because the QL uses a scanning keyboard. So why scanning keyboards? Having two wires for each key on a keyboard is not very efficient way of working. So the wiring can be simplified by arranging the wiring into row and columns as shown below, this is in fact the QL keyboard layout:-



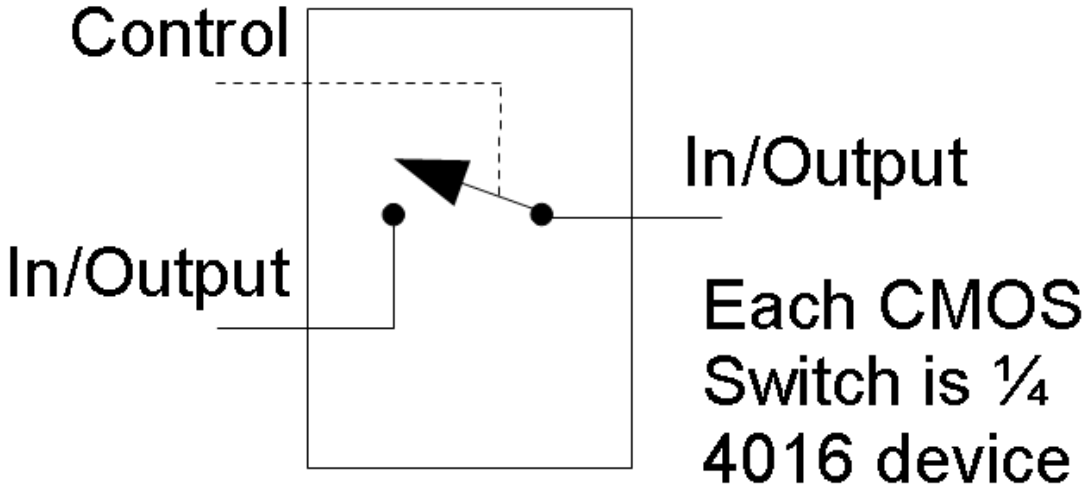
At each crossing of a row and column there is a switch, which is a key of the keyboard. As shown below.



As you can see there are 65 keys on a QL keyboard, which would need at least 66 wires, one for each key plus say ground, however by using the scanning keyboard with row and columns only 20 wires are required.

So how does this work ? The columns are fed with a pulse, sequentially, only one column is pulsed at a time. As a key/switch is closed that pulse is sent to a row. So with a given pulse to a column and the key/switch closed to a given row selects the key required.

So what is needed is to replicate the keys/switches with electronics switches. This can be done by using, CD4016 (or 4066) quad bi-lateral switch integrated circuit. A representation of this device is shown below.



So two 4016's (or 4066) are used, since each 4016 (or 4066) contains four switches. We use one IC for right, left, up and down. The second IC just uses one switch for the fire button.

There are two game ports on the QL. One is called CTL1 and the other CTL2. The keys are represented as follows:-

	CTL1	CTL2
Up	Cursor Up	F4
Down	Cursor Down	F2
Left	Cursor Left	F1
Right	Cursor Right	F3
Fire	Space	F5

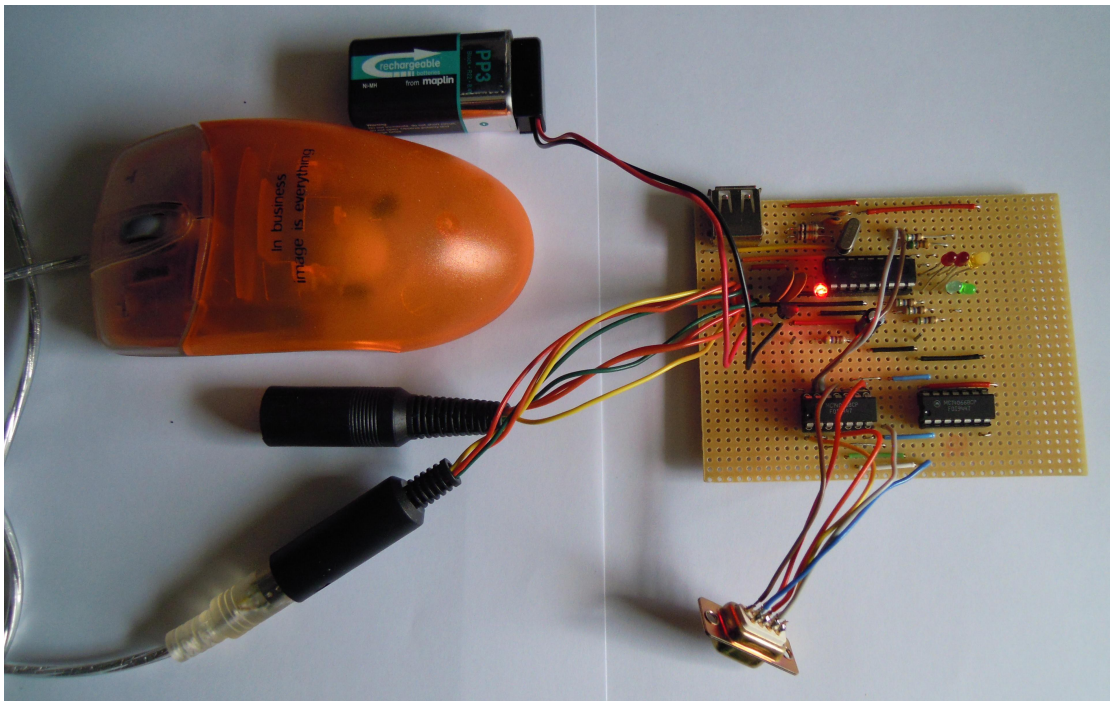
If you look at the key board diagram above, you will see that row 8 is common for CTL 1 and row 1 is common for CTL2 so only the columns need to be selected.

Back to reviewing the interface now I have explained how it works.

So to start with, you need to down load the zip file http://www.qlforum.co.uk/viewtopic.php?f=2&t=379 from the QLForum page when you open this zip file you get the following files:-

GC_QLMouse – Assy.pdf Component placement PCB looking from component side.
GC_QLMouse – Components side.pdf As above without PCB tracks
GC_QLMouse – Firmware.HEX PIC Firmware
GC_QLMouse – Lead..pdf Shows wiring from the telco connector to 9 pin d-type.
GC_QLMouse – Parts List.pdf As it says Parts List
GC_QLMouse – PCB.pdf Again as it says the PCB track diagram

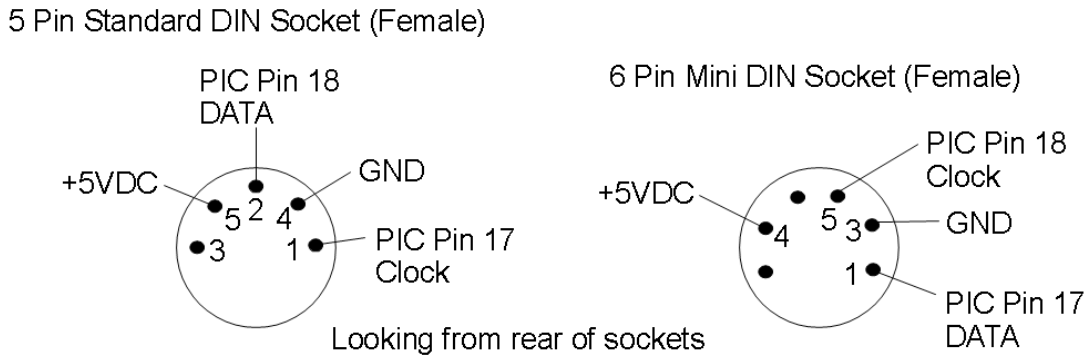
So there is enough information here to manufacture the interface. However you may not want to go to the expense of the PCB (printed circuit board). It is true the PCB makes a neater job, but unless you have experience and the equipment, not always the easiest to do. However not all is lost since the circuit is not too complicated. I produced mine on a piece of strip board. I have not reproduced the circuit here since it available from the above zip file.



I added LED's with limiting resistors to the switch (IC 4066) control inputs, just to show me that the converter was working correctly. You do not need to add these if you don't want to. If you look at the Italian pictures on the blog page you will see the developer obtained power via the ROM port. This is OK if you have a spare ROM card. I did not, so I used a 78L05 voltage regulator as shown in the original schematic to provide the 5V required from a 9V battery source. You can make whatever power arrangements you like, the converter just needs 5V. The interface takes about 15mA, (without the LED's. so with a R22 (PP3) battery will run the interface for hours. I used rechargeable batteries with no problem.

You will need some way to program the PIC, there are low cost PIC programmers around, either on the web or available as kits, from sources such as Maplin's. Of course this still adds to the overall cost of the project. I will be looking into this further in the next article of my series on the I2C interface. Since my next project also includes a PIC, so this may help to spread the cost of the PIC programmer. If you are interested in these projects and if you cannot wait, the Vellaman PIC programmer K8048 will support both this project and my next I2C project. Which is available from Maplin as a kit. What ever you do, do make sure whatever programmer you use, does support, in this case the PIC16F84A chip, not all do.

Now the mice themselves. You will see from the PCB layout and the circuit diagram that the developers have used a USB connector. There are USB mice, which support the PS2 serial interface. However most USB mice do NOT support PS2. In fact, I could not find a USB mouse with PS2 from any of the major UK suppliers. That is not to say there are none out there, I just could not find one. But all is not lost. I am sure most have lying around somewhere mice with either a 5 pin DIN or 6 pin Mini DIN connector. Or can find them at car boot sales or surplus sales . The connections for these types of mice are shown below. Now, you will also find mice with 9 pin D-Type connectors which state they are serial. Which they can be, but not to the PS2 standard. They use an RS232 serial protocol at 1200 baud. There was software to do this from Albin Hessler, (my copy is dated 1992) called SER Mouse for use with these types of mice. Again as far as I know this is not in the public domain. Note: the Qimi mouse interface used a 9 pin D-Type connector as well, but the Qimi interface does not support serial mice. But used mice that were directly connected to the opto devices and switches inside the mice. So this can get a little confusing.



The BT telephone style connectors. These are a problem. I have looked around and they don't seem to be available anywhere. I checked with Adrian Ives of Memory Lane Computing and SerUSB fame, since he was the last person to sell any add on that used this connector. He confirmed they are no longer manufactured, he purchased the last if these from an on-line source, and even these have now gone. Unless, of course, anybody, knows different. There are two types of this connector used on the QL,. 603A Right Hand BICC BT type for the RS232 serial ports and 603A Left Hand BICC BT type for the games ports. The plugs for these are called 631W. Current standard BT (631A) connectors may look the same, but in detail they are different and just do not fit. So on my Black Box QL's I have fitted 9 pin D-Types on a flying leads, and soldered to the underside of the QL PCB. So in effect I have made my QL's as if they were the US version, which were fitted with D-Type connectors. This does require the QL to be opened up, so great care is required. If you are not sure 100% don't do it. I take no responsibility if it goes wrong. So why did Sinclair not do this on the UK versions, simple, cost.

The cost of this project, should be no more than £15 (without the LED's) to build.

Conclusion, does this interface work, simple answer is yes it does. I built mine up on stripboard in about an hour or so, programmed the PIC and it worked first time no problem. The mouse response was very good, no confusion as to direction at all. There are limitations compared with say the SER Mouse software solution or QIMI hardware interface. For example this interface only supports one mouse button (fire). Other than some games that used the games ports and the ICE software, there is not much ready to run software around that will work with this interface. But could be of use for none PRT developments. Of course for games players, you could build two interfaces with two mice, one for each (CTL) games port on your QL. Now you cannot do that with a PC !!!!!