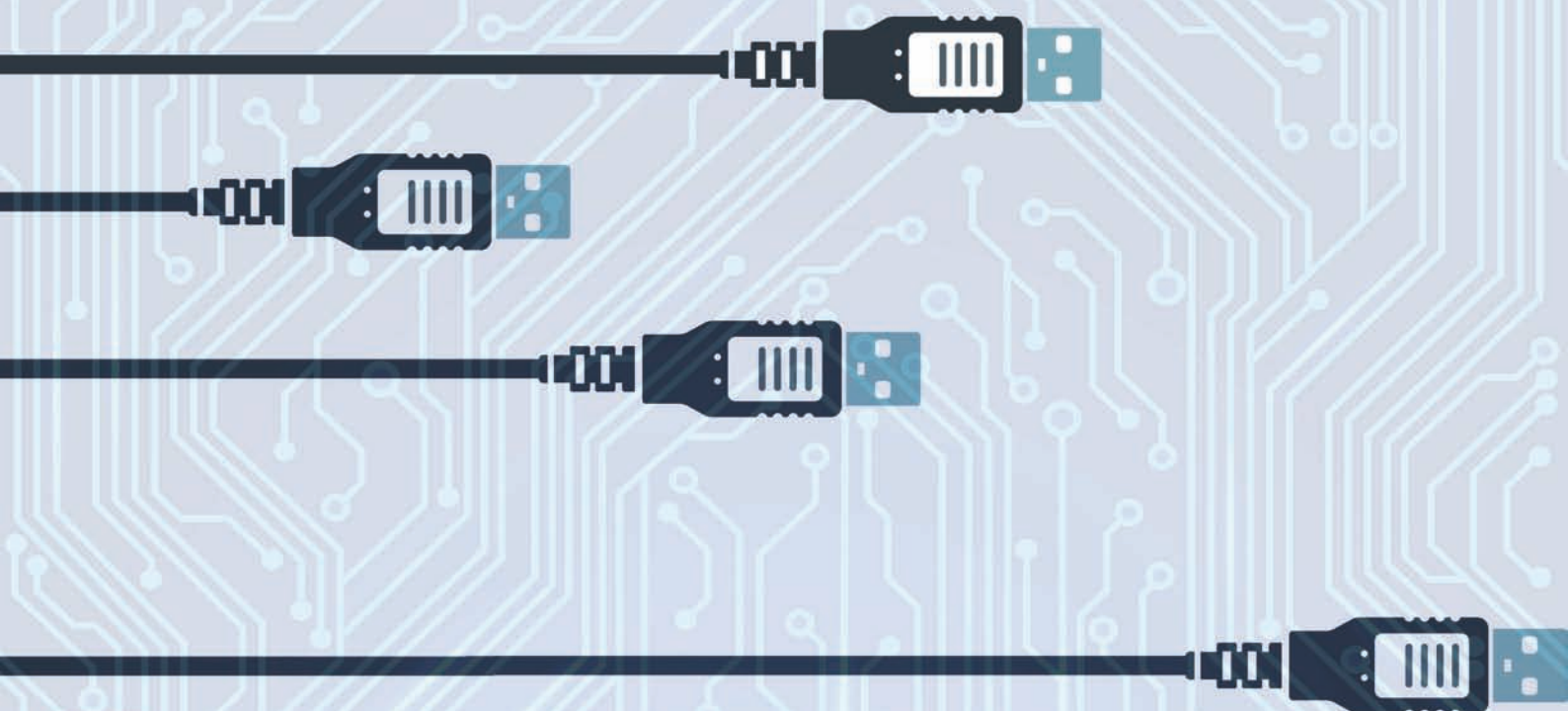


HOW TO AVOID MISTAKES WHEN DESIGNING & USING PC-BASED INSTRUMENTS



TheDebugStore.com

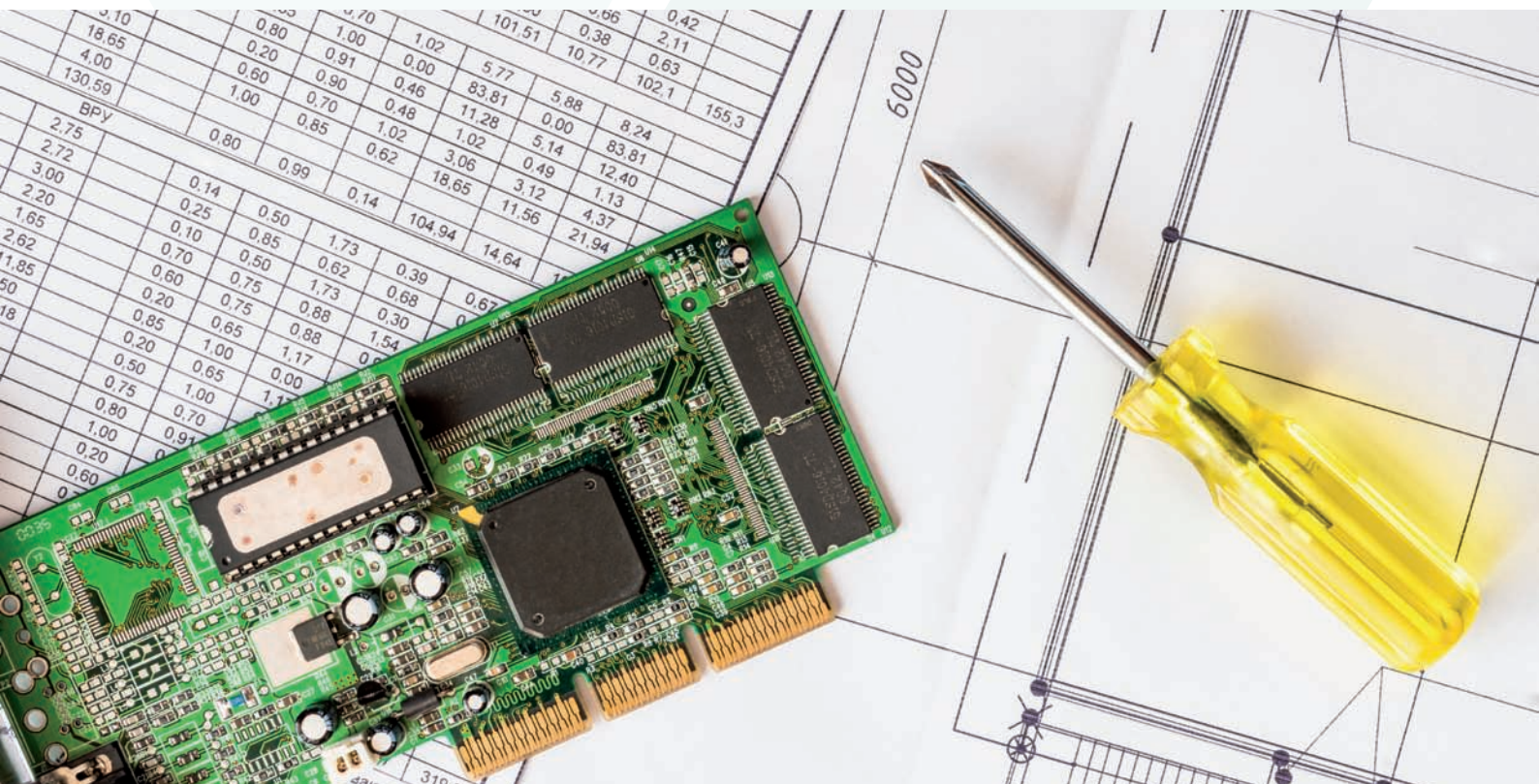
The Electronic Engineer's Tool Store

Discover the sure fire solutions to avoiding some simple mistakes when using PC-based test instruments and designing PC interfaces.

When I first started in the electronic design and engineering field, some companies that I worked with had extremely demanding and exacting levels of procedure in place to make sure that nothing 'blew up'. Employing the design principles used when designing hot-swappable cards can equally well be put to use when using PC-based test instruments.

Now it seems a lot more impetus is put, fairly or unfairly, on us designers and engineers to regulate it all independently, shouldering the blame when anything goes wrong.

At The Debug Store we have all the tools you will ever need to make sure that when you are using any PC-based test equipment, you will get the best result possible. However, certain precautions must be followed to avoid unfortunate consequences. That is why I have written this free report for you, to help guide you through the first few steps you can take to make sure your project runs smoothly.



Using PC-Based Instruments

1 Antistatic Precautions



It probably isn't necessary for this to be mentioned but it is included purely for completeness. Most engineers are fully aware of the risks posed by static electricity on sensitive electronic circuits. Having said that, many of us still do take risks by not taking basic precautions whenever we open up some electronics.

The very least we should do is to only work on a grounded anti-static mat. If we are not using a grounded wrist strap, we should ensure that one part of our body is touching ground potential so that any free hands doing work do not carry a high electrostatic charge.

2 Connect a Ground Line



Now this first point may be simple and will be obvious to many people reading this report, but connecting a ground line between the host PC and the target electronics before making any other connection is a key first step.

The purpose of grounding is to remove any potential difference between the PC-ground and the target ground. I have come across significant voltages to be measured between ground connections. In some cases the difference in electrical charge between the two can result in a significant electrical discharge when the grounds are connected. If this procedure is not carried out, imagine what damage could result from the sensitive signal lines if the signal cable is providing the link instead!

3 Use your USB Interface correctly

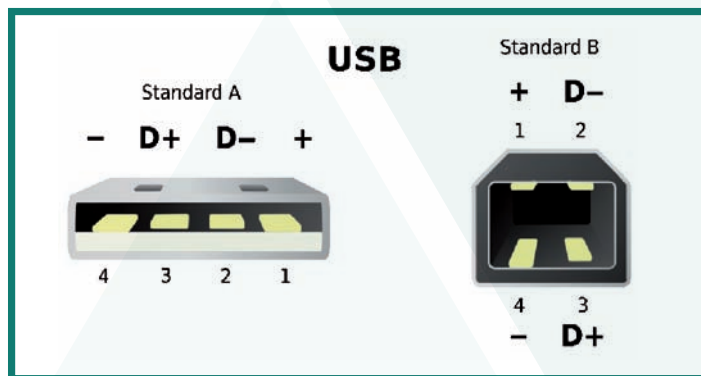
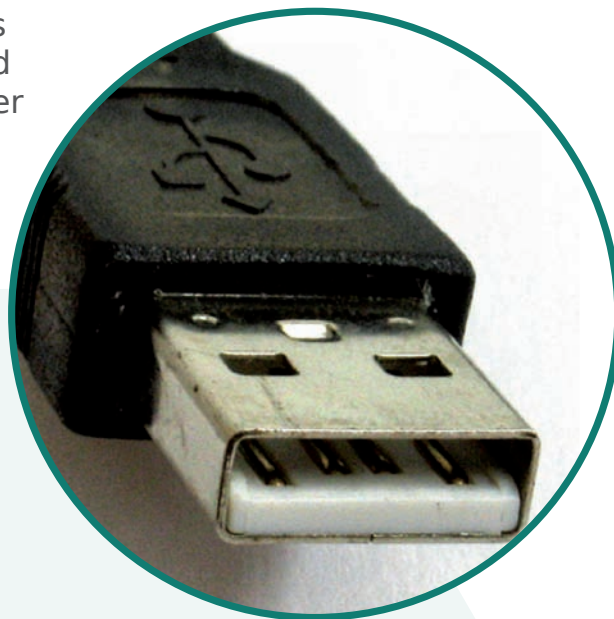


USB based test equipment has become increasingly popular as a standard tool for the electronic design engineer, as there are many fantastic products that use a USB 2.0 or even 3.0 connection, combining safety with super-fast connectivity.

What makes a USB interface so good for making sure that no issues arise is the fact that they have already been designed to have a safe connection when used "Hot Swapping".



You may not have looked in details but the plugs on either end of a USB lead have been designed so that the two power pins (V- and V+) are longer than two signal pins (D+ and D-). This means that when you plug a USB into a device, the power pins are firmly mated before the signal pins are connected.



It is clear from the photograph that the two outside (power) pins are longer than the centre (data) pins. This ensures that when the plug is mated with the socket that the power lines are always connected first, equalising any static charge between the two pieces of equipment being connected by the USB cable.

It is this attention to detail that is often the difference between making a destructive mistake and creating a safe and secure system.

If your USB connected test instrument connects to the target electronics via a standard ribbon cable and female IDC and male header pins then you must take the following precaution:

1) Plug the ribbon cable/IDC Header into the target board's header pins before connecting it to the PC via a USB cable.

This will ensure that any potential differences between the PC and target board are resolved by the USB cable. As we have already seen, the USB cable has been designed to resolve these differences.

Designing Test Equipment Interfaces

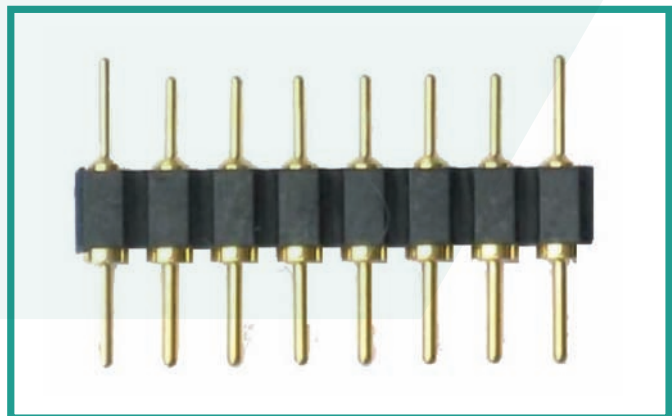
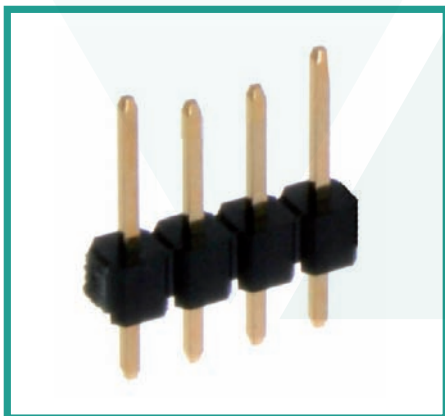
The above principles should also apply to the design of interfaces between test instruments and target electronics.

If a USB interface is being implemented then, as we have seen before, the design of the USB cable will ensure that power pins are connected before signal pins.

However, many connections to target boards may only have a USB interface as part of the connection between a Host PC and the target board. An example of this is the usb2Wiggler from Macraigor Systems.

The USB2Wiggler connects to the host PC via a USB cable - no problem. However it connects to JTAG signals on the target electronics via a ribbon cable with an IDC socket header. The socket header then plugs into header pins on the target board. This is the danger area! The height of almost all header pins are the same so which pin gets connected first is left to "pot luck". This can be avoided if:

- 1) If the power connections are located at either end of the header pins. If a dual row header then both end pins need to be connected to the same power connection.
- 2) The header pins are modified by lowering the signal pins by gently sliding the pins through the insulated base. In a production environment, this can be done by using a simple jig.



Examples of modified header pins

With the above arrangement you will see that the power pins (end pins) will always mate with the female cable header before the signal pins.

Here at The Debug Store we are not just a box shipper. We want to help every single one of our customers get a product that will genuinely help them maintain and protect their electrical equipment.

By sticking to these staple rules, you will be making sure that the expensive test equipment you are using isn't destroyed due to something that is easily avoided, like static damage or voltage overload.

Now you are aware of some of the ways you can avoid making these mistakes, you need a supplier who can help you with all your electrical design and engineering needs. At The Debug Store we really do try and help our customers by talking to them and understanding their needs.

So have a visit of our website to see if there's anything you want or need and if you still need some guidance, please don't hesitate in giving us a ring or emailing us. I look forward to hearing from you soon,

John Legg

Director

Tel - 0800 808 7456/+44 1490 430526

Email - support@thedebugstore.com

Website - www.thedebugstore.com

