McCavery
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Lesser Known
Instruments, Refurbished.

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I repair Waters Bus Lace interface cards. I also have some stock of my own to sell.

I have been repairing these cards since 2008, I started my business in 2006.

There has been an incredible amount of liquidated Waters HPLC equipment auctioned off over the past 20 years. I spoke with one person who was losing his job at Pfizer and he had said that his company alone had liquidated 12000 auction lots and that was back in 2009. BMS, Merck and several others have also liquidated vast amounts of equipment.

Normally computers are not included in these auction lots. I have had a hard time selling refurbished Waters instruments over the past few years but I have found a niche in repairing and reselling Bus Lace boards.

While the used HPLC system prices have dropped or remained the same, these cards have increased in value about 3-4X.

If you have a board that is not working please do not throw it away. I can buy defective boards to repair and resell later or I can repair yours for a fraction of the price of what I can sell one to you for. You could always double check but I am certain that Waters has discontinued these boards now but a repair would have been less then 10% of the cost of a new board back when they were still being sold circa December 2011.

Assuming the connector that plugs into the computer is facing down, there is a series of 8 LEDs on the top right of the board.

When the computer starts up, these LEDs will light in a sequence. If I know what sequence they are lighting in, I can give you an upfront estimate by phone or email.

If you send the card and the cost is higher, there is no charge for the further evaluation and I can ship the card back on your account, anytime.

I have been servicing scientific instrument full time since 1999 and had some part time experience before this but still, it has been very difficult to learn this circuit as Waters is the only organization that has the schematic. However after hundreds of hours(in fact I am probably just past the thousand hour mark) of

working with this circuit I have the knowledge required to repair them at an affordable cost.

These boards contain two chips that are FPGAs. An FPGA is a special chip that can act as a programmable circuit. A designer can fabricate a circuit within the FPGA by programatically reconfiguring logic blocks inside the device, thereby creating a little circuit inside.

FPGAs are handy for designing circuits but they also provide a serious deterrent to those trying to copy the design of the board. The circuit contained inside them is quite difficult to copy.

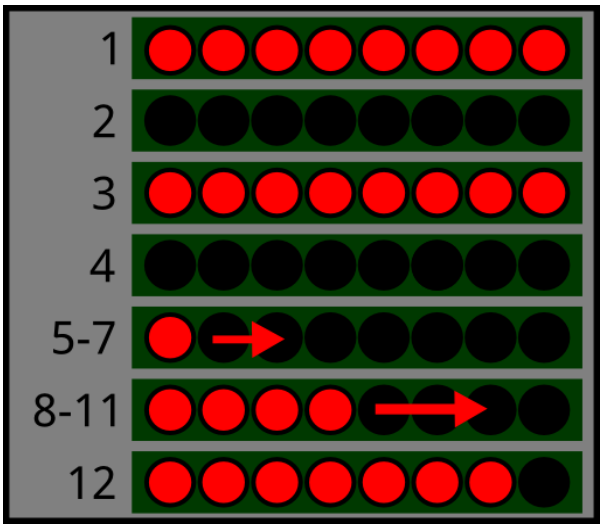
I purchased a number of cards that were intentionally damaged and then discarded. They are unrepairable but contain these FPGAs. I can rob these priceless chips from my surplus boards to repair yours, others simply will not have this option available. In addition I have heavily invested in test equipment and I can monitor the signals on well over a hundred pins at the same time.

Please note that I am note affiliated with Waters Corp in any way and that LAC/E is a trade name owned by Waters as well.

Estimate by Telephone/Email

There are many different errors that can occur with these cards and there are many different kinds of repairs that are needed to fix them. Sometimes I will discover a new process and the ease of a repair will change but below are some descriptions of errors that can occur and their ranking of severity.

Please see the row of LEDs in the top right corner of the board.
This image depicts a healthy boot sequence on powering up the computer:



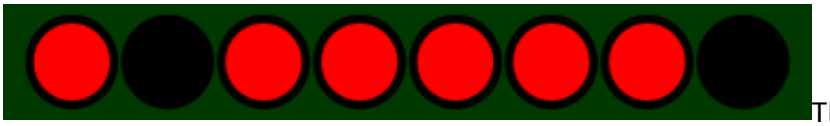
Step 1) All LEDs flash on
Step 2) All LEDs flash off
Step 3) All LEDs flash on
Step 4) All LEDs flash off

Step 5) LED 1 lights
Step 6) LED 2 lights
Step 7) LED 3 lights, The time for LEDS 1 through 3 is about a second or so.

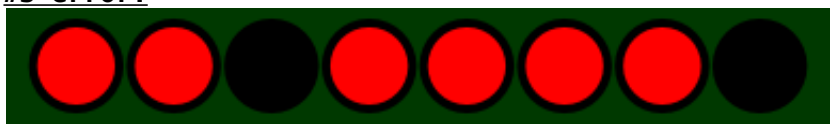
Step 8) There is a pause of a few seconds and then LED 4 lights
Step 9) LED 5 lights
Step 10) LED 6 lights
Step 11) LED 7 lights, LEDS 5 through 7 take about a second or so to light

Step 12) LED 8 does not light on power up

#2 error:

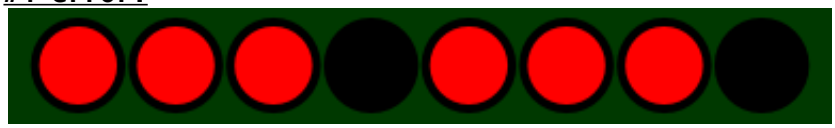
 The boot has finished but #2 LED has failed to light. This is good news. This is one of the easiest repairs.

#3 error:



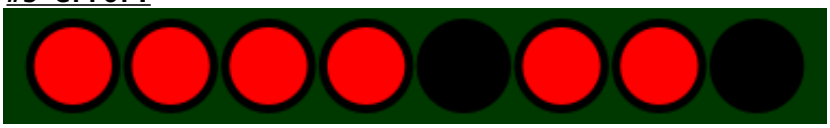
Like the #2 error, this is good news.

#4 error:



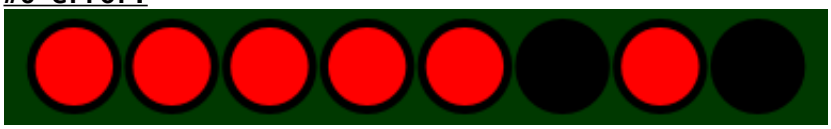
This is one of the worst repairs, if not thee worst.

#5 error:



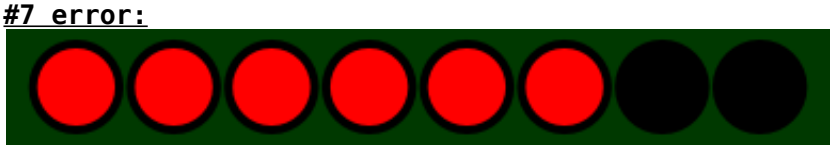
This is a serious error, it is however extremely rare.

#6 error:



Like the #4 and #5 errors this is a serious error but like the #5, it is extremely rare.

#7 error:



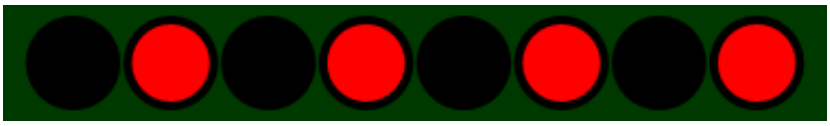
The #7 error is a moderate repair.

No LED activity, All lights or no lights:

or

 I really hate this error as more then half the chips on the board can create it. However it often be resolved without expensive parts. It is a moderate to serious error.

Every other light:

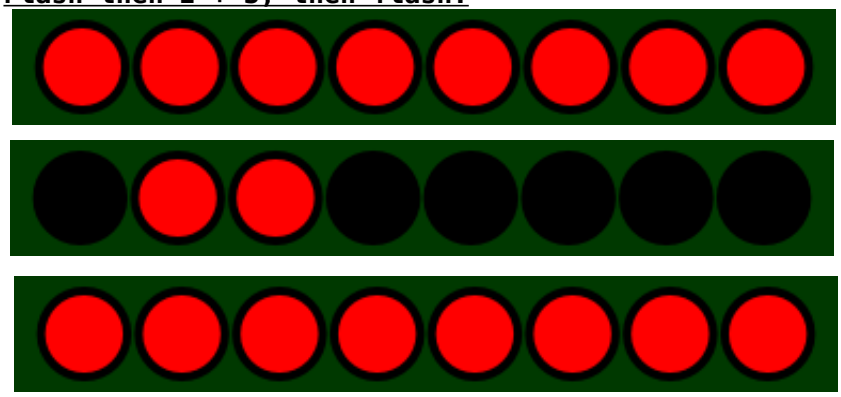


This is a moderate repair.

First three then computer hangs:

This is another rare error. Sometimes the first 3 LEDs will come on but the boot sequence stops there. It is a serious error.

Flash then 2 + 3, then flash:



I really hate this error too. It is the one code I cannot provide an accurate estimate upfront with. There are 3 electronic components that can cause this and they range vastly in price. It can be a moderately simple repair to an very serious one.

The following errors appear to have healthy boot ups but then fail later, They are all serious errors:

Reboots during run.

Drops communication with instruments during during run.

Computer screen turns blue and error message about core being dumped is displayed.

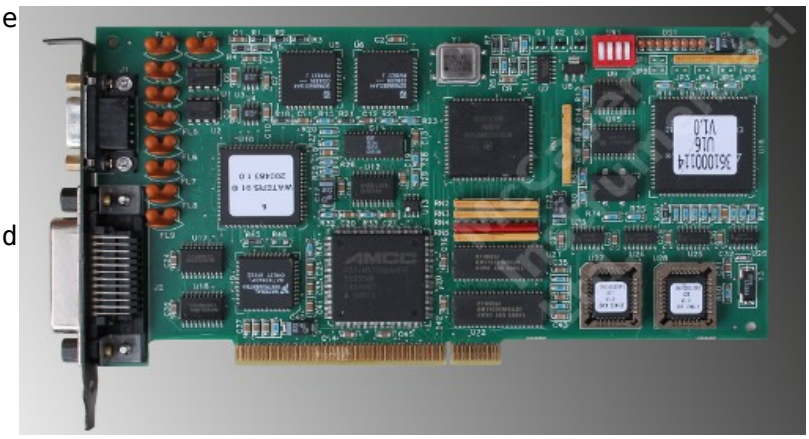
Not found by the operating system.

Found by the operating system but not Empower/Millennium.

Found by Empower but system cannot be brought on line.

Be sure to check the DIP switches with SW1(at the top middle-right of the board)all switches on the bottom side should be pushed in, on the “long” card pictured below or all switches should be pushed to the bottom half in the “short” card pictured at the beginning of this document.

You may also be able to repair the card by using an eraser to clean the card connector edge.



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-Patrick McCavery