Slot Tech Magazine

Slot Machine Technology for the International Casino & Gaming Industry

March 2014

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Randy Fromm

Dear Friends of Slot Tech Magazine,

This month, we finish up with our look at the individual "discrete" components that make up the bulk of our repairs as bench technicians. Last month, we looked at the "passive components." These were resistors, capacitors and inductors. This month we look at the "active components." These are the semiconductors:Diodes, transistors, MOSFETs and related components. The active components differ from the passives in that they can (and do) switch on and off, sometimes rapidly. It's not unusual to see switching speeds of 30kHz, 50kHz or even higher! High-speed, high-current switching can lead to catastrophic component failure. It's almost never ambiguous when you're testing semiconductors;they're either good or they're shorted somewhere!

Once you know how to test and replace electrolytic capacitors (in general, responsible for 65%-75% of your failures), semiconductor testing and replacement more-or-less completes the bulk of your repairs at 20%-25%. The rest is typically bad connections/connectors, bad solder joints, or an occasionally bad IC, often blown out by a shorted transistor or MOSFET.

Have you ever been to Seattle, Washington? Cool city. Really nice area. I had a great time training with the fine folks at Tulalip Casino. Tulalip was one of the first casinos I visited shortly after Starting publication of Slot Tech Magazine way back in 2001. It was great to return to their "new" casino, which I was shocked to realize was now 14 years old! I'm considering holding a TechFest or some regional training there. If you're interested, let me know. We only need a dozen or so to make this happen. Likely, I'll hold the training at Tulalip.

Don't forget that the final TechFest at Mystic Lake Casino will be held May 13-15, 2014. If you're interested in attending, please sign up as soon as possible to take advantage of the $100 "Early Bird" discount. This event sells out on occasion.

See you at the casino.

Randy Fromm
Publisher-Slot Tech Magazine

Randy Fromm's
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Component Identification and Testing-Part 2

Active Components

They're called "active" components because they switch on and off, controlling the flow of electric current. Sometimes they're on, allowing current to flow through them. Sometimes they're off, blocking the flow of current. Sometimes they're switched slowly on and off and at other times, they might be switching on and off thousands or millions of times a second. Some semiconductors can be turned on part way, allowing us to maintain a precise voltage or current level.

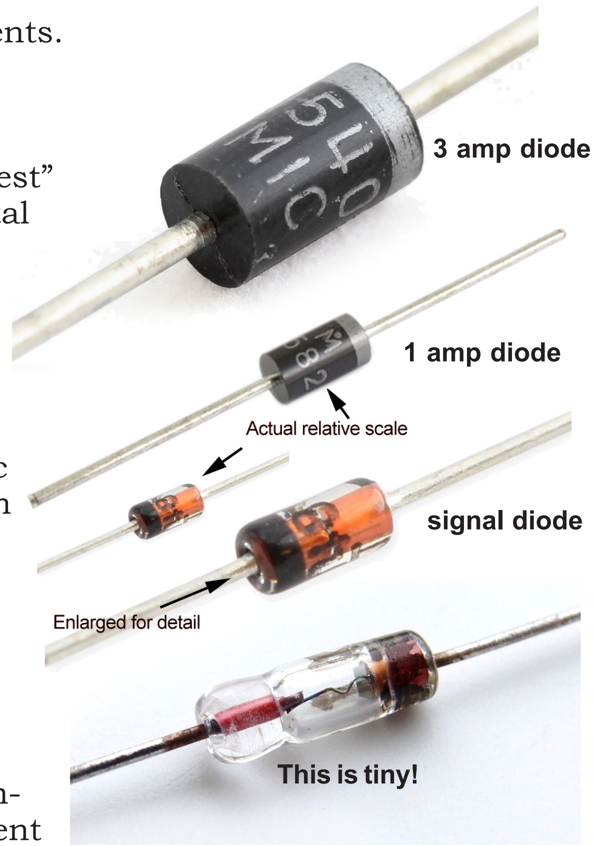
Because they are "active" and are often controlling high voltages and/or large amounts of current, these devices are prone to failure. Generally speaking, these active components are known as "semiconductors" and, generally speaking, when they fail, they short circuit. Big time. Shorted semiconductors can cause additional damage to other, connected components.

Diodes

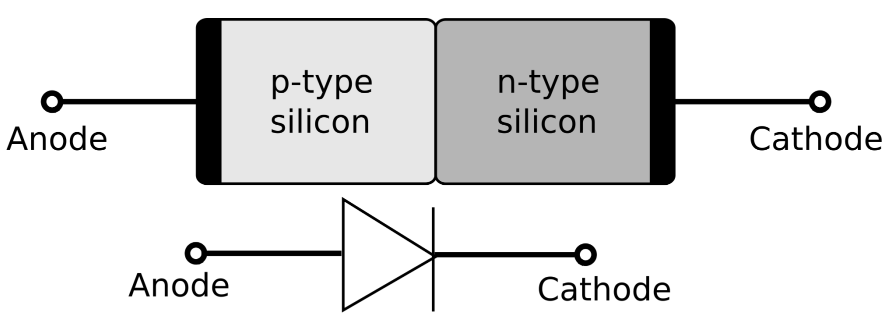
We use the "diode test" function of the digital multimeter to test diodes.

The diode is the simplest semiconductor that we have. The schematic symbol looks like an arrow with a bar at one end. The arrow symbol makes a lot of sense since a diode is a one way gate for the flow of electric current. It's kind of like the turnstile at an amusement park where people are allowed to move through the gate in one direction only. A diode has just two component leads. They're called the "anode" and the "cathode."

It's interesting to note how the diode actually works inside. You don't actually have to know this at all but



Bottom:Original 1N60 Germanium "cat's whisker" diode. Note the thin "whisker" inside the glass envelope. I actually had the opportunity to manufacture one of these diodes at a WESCON show when I was a kid (geek father-and-son outing. Other kids went to baseball games, I visited Nike Missle sites and rocket test pads and went to WESCON as my dad was a sort of "rocket scientist." He worked at Rocketdyne and helped put Buzz and Neil on the Moon.).



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I am leading up to a definition of something that you DO have to know so try to follow along. I also refer you to the January 2014 issue of Slot Tech Magazine where we take a look at atomic structure.

The diodes we use in games are made of an element called silicon. In its pure form, silicon is an insulator. It cannot pass any electric current through itself. During the manufacturing process, small quantities of impurities called dopants are added to the silicon. The addition of the dopants causes a change in the structure of the silicon atoms.

When phosphorus is added to the silicon crystal, extra electrons are added to the silicon. This gives the silicon a net negative charge,

Silicon

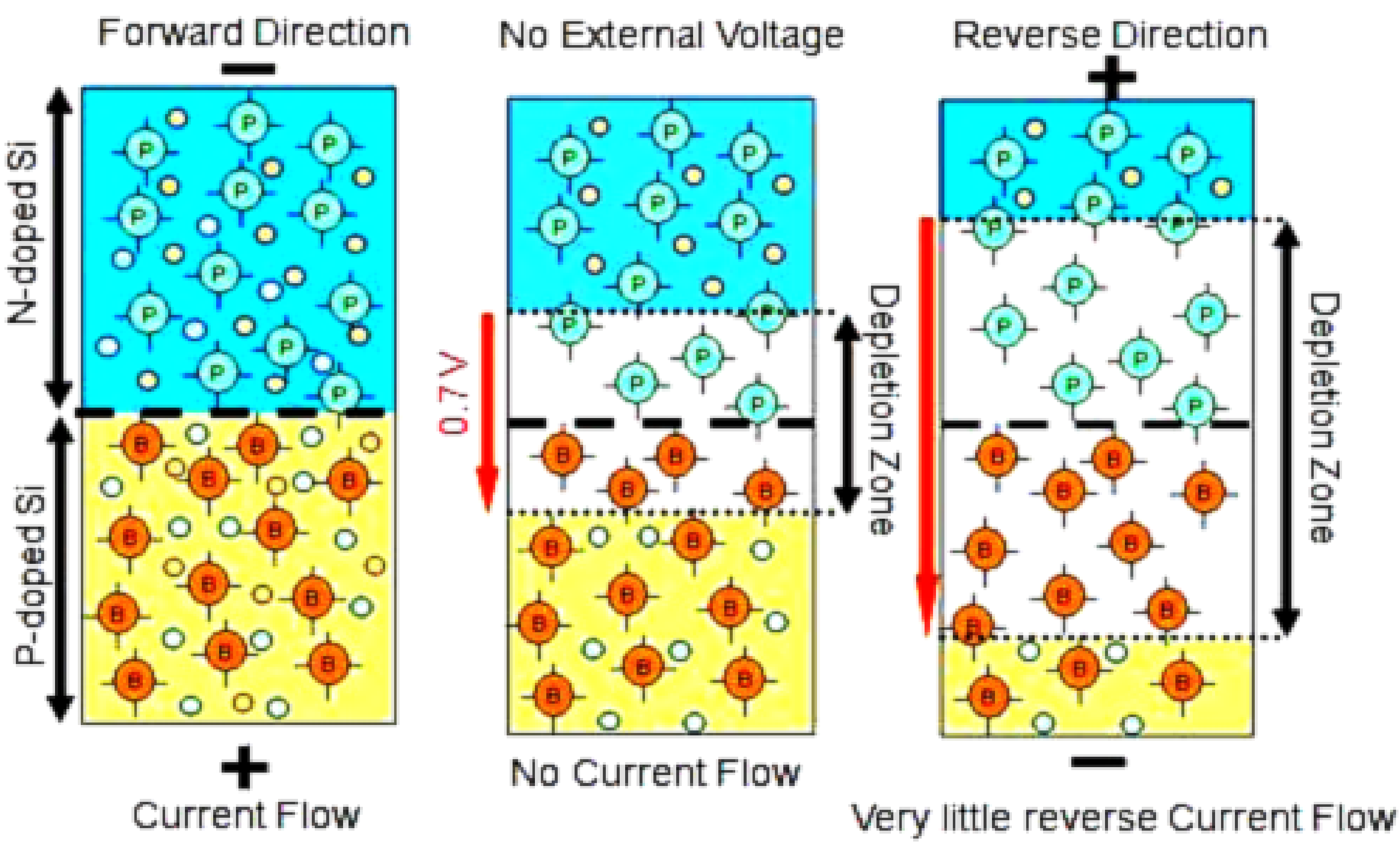
with some free electrons scooting around inside the crystal. We call this type N silicon; N for negative.

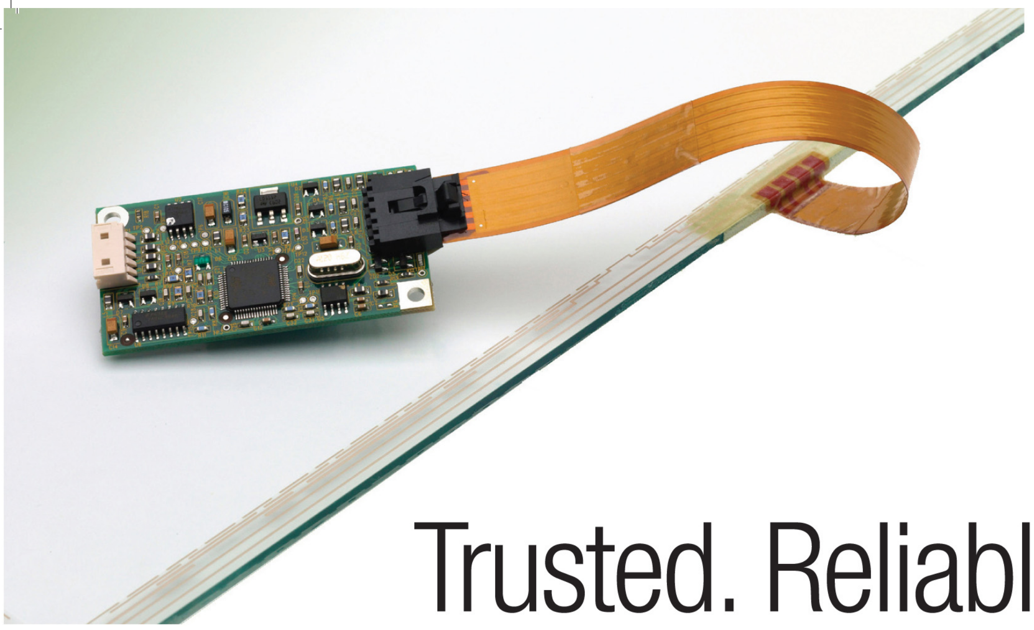
When boron is added to the silicon, it develops a net positive charge. We call this type P silicon. We can think of type P silicon as having atoms with “holes” in the electron shell, just waiting for an electron to fall into it. In fact, we call these atoms in the type P silicon “holes.”

The diode is made from a single chip of silicon. One half of the chip is type P silicon; the other half is type N silicon. Where the two types of silicon come together, we have something called the PN junction. The PN junction acts as a kind of barrier to prevent the free electrons in the type N silicon from reaching the holes in the type P silicon. When we test diodes and transistors, we will actually use the meter to test this PN junction.

It takes a certain amount of voltage to push aside the PN junction and allow current to flow through the diode. It takes an average of .6 volt to break down the PN junction and allow current to flow.

Let’s hook up this diode and see how it works. The anode is connected to the positive side of the battery.





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The cathode is connected to the negative side of the battery through the lamp. The electrons are repelled by the negative side of the battery toward the junction and the holes are repelled by the positive side of the battery toward the junction. Where they meet at the junction, the electrons fall into the holes. This pushes the PN junction aside and current flows through the diode.

If the battery is reversed, the holes and electrons are attracted to opposite ends leaving pure silicon as an insulator between them. The silicon insulator prevents current from flowing through the diode. This is why it is called a semiconductor. Sometimes it conducts; sometimes it doesn't.

It takes around .6 volt to break the barrier at the PN junction. This .6 volt is used up inside the diode as the energy required to push the current across the PN junction. We call this .6 volt the "junction drop."

A normally operating silicon diode will have a junction drop (technically known as the "forward junction drop") of between .4 and .8 volt when measured with most digital multimeters. Most engineers and technicians use the average of .6 volt when discussing the junction drop. Generally speaking, the larger the device, the lower the junction drop will be.

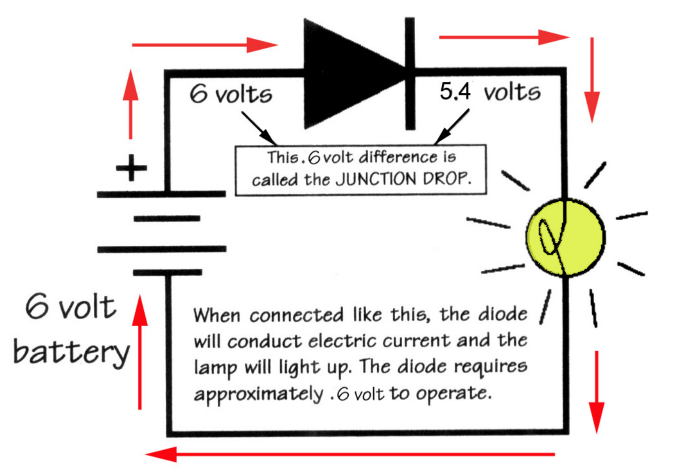
Note: High speed diodes (also known as Schottky Diodes" or "Fast Recovery Diodes") will usually have a significantly lower forward junction drop than conventional diodes. It is not unusual to see junction drop voltages as low as .150 in some cases. However, in ALL cases, the reverse reading will be open if the diode is good.

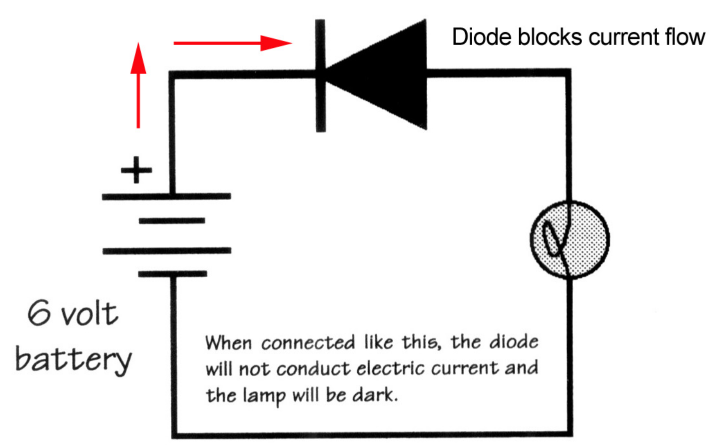
We can test this junction drop with our meter. There is a special setting on the meter called the diode test. When we use the diode test, we are actually measuring the voltage required to get through the PN junction. What we should see is a normal junction drop (.4v-.8v) with the red lead on the anode and the black lead on cathode (this means that the diode is conducting, a condition known as being "forward biased") and OPEN when the leads are reversed (reverse biased).

This means that the diode is doing its job as a one way gate for current. When we read a normal junction drop it means that current is flowing through the diode. When we read OPEN, the diode is blocking the current.

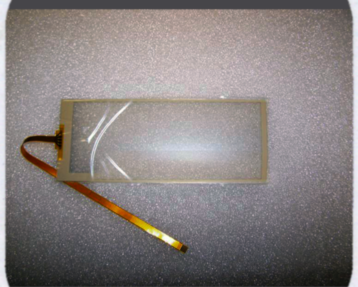
It's obvious when a diode is bad. If we get a ZERO reading (or close to zero) in both directions, the diode is shorted. Most diodes short when they fail. I'd say that 999 out of 1000 diode failures are shorted diodes.

If the meter shows OPEN in both directions, the diode is open, likely caused by an initial short-circuit that eventually burned the diode into an open condition or by something that has physically bro-





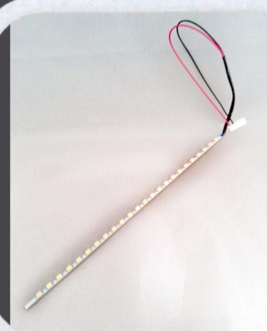
Player Tracking System LCD Display Parts



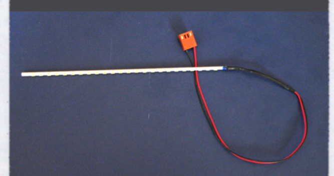
5 wire touchscreen Bally Iview Hitachi LCD

5 wire touchscreen Bally Iview IDW LCD

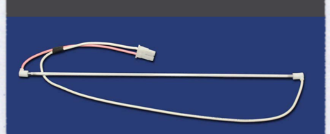
4 wire touchscreen IGT NexGen LCD



LED Strip for Bally Iview LCD



LED Strip for IGT NexGen LCD



CCFL assembly for Bally Iview IDW LCD

CCFL assembly for IGT NexGen LCD

CCFL assembly for Bally Iview Hitachi LCD

Protective Mylar for IGT NexGen LCD

ken the diode rather than an actual electronic failure that has caused the open condition from the outset.

You can usually tell if a diode is good or bad, even when testing diodes in-circuit. Needless to say, if you test a diode in-circuit and it appears to be bad, you should test it again after removing it from the circuit just to be sure. Sometimes, they test bad in-circuit, even when the diode is actually just fine. An example of this is when a diode is placed directly across a coil, acting as a "snubber" or as a "clamping diode."

Diode Specifications

A diode is rated by voltage and current. The voltage rating of a diode is the maximum amount of voltage that the diode can block without breaking down. The voltage rating is listed as PRV (peak reverse voltage) or PIV (peak inverse voltage.)

The current rating is the maximum amount of current that the diode can safely pass without getting too hot. Believe it or not, we use the letter "I" to represent current. Huh? Early experimenters thought of current as "intensity," so the letter designation "I" has remained with us. Io means output current.

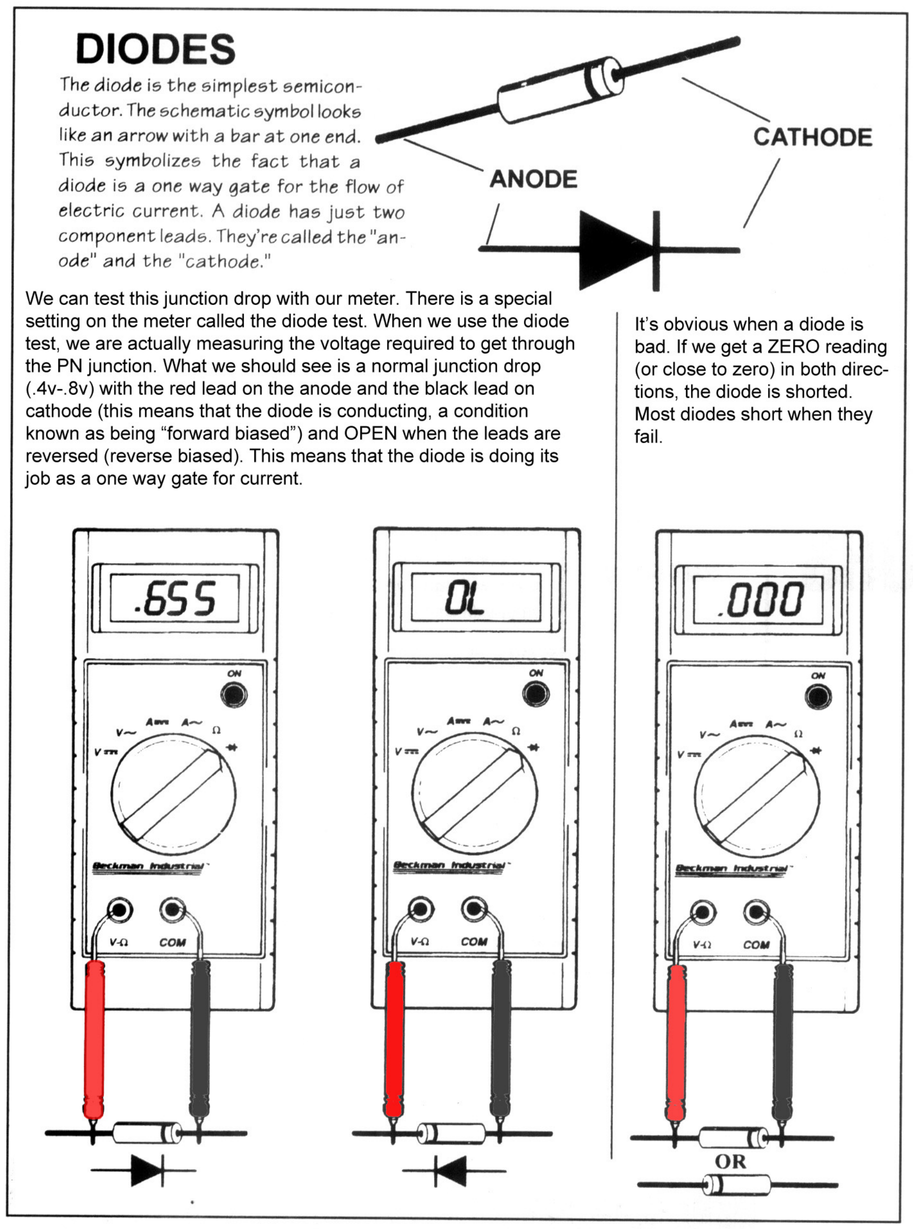
When substituting diodes, you can always use a diode with a higher voltage and/or current rating. Remember, the voltage rating of a diode has nothing to do with the voltage the diode is "putting out." It is simply a rating of the maximum voltage that the diode can block. You can replace a 50 volt, 1 amp diode with a 400 volt, 1 amp diode. You could also use a 50 volt, 3 amp diode or even a 400 volt, 3 amp diode as a replacement.

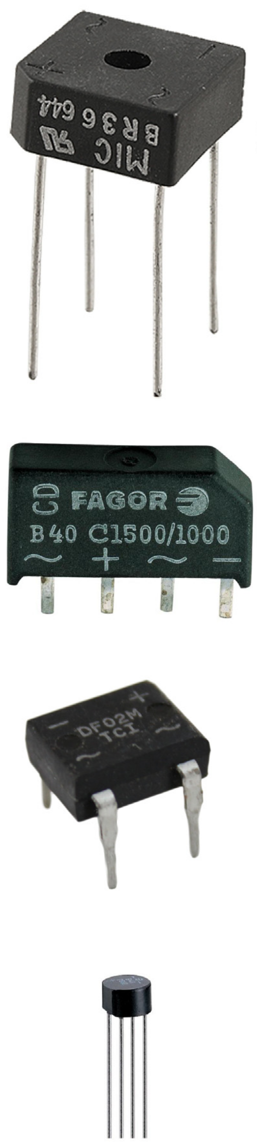
Bridge Rectifier

Simply four diodes connected together. They're used to change AC into DC for power supplies. Not a common failure in modern electronics. Each diode in the bridge rectifier should be tested individually, just as outlined above. If any of the diodes is bad (likely two will be bad) the entire one-piece bridge must be changed. If the bridge rectifier is made from individual diodes, only the defective diodes need to be replaced.

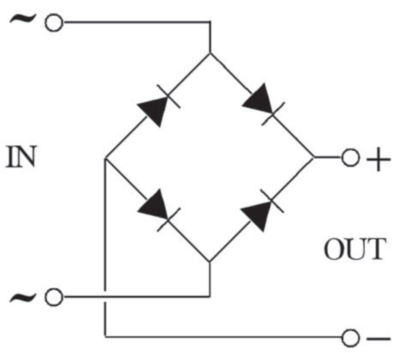
High-Speed Diodes

As mentioned earlier, these diodes are also known as "Fast Recovery" or



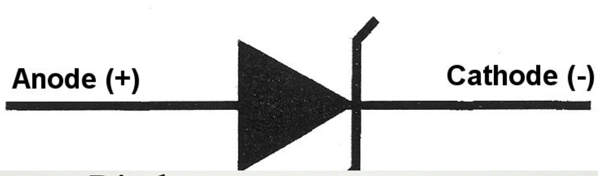


Typical bridge rectifiers



"Schottky" diodes and will exhibit a much lower forward junction drop. It is not unusual to see the juction drop as low as .150 volt or even .1 volt. Naturally, the diode will still read "open" when reversed. These diodes often come in TO-220 packages and often in pairs with their two cathodes tied together at the center lead and the two anodes on each side.

To test the diodes, you simply test each diode individually. They will short-circuit when they fail. It is a rare failure.



Zener Diodes

Zener diodes look more-or-less like conventional diodes but they are often found in glass packages. Zener diodes test the same as conventional diodes. That is to say, they show a normal forward junction drop voltage and open when reversed. Bad zeners will generally short-circuit just like conventional diodes do. However, on rare occasions, a zener diode will shift its "breakdown voltage" (generally going lower. I've never seen it go higher). In this case, it will test properly with your digital multimeter (set to "diode test"). You won't know it's bad unless you measure the voltage across it. If it's lower than expected, suspect the diode is bad. There is often a resistor in series with a zener diode and this is often the cause of your problem. Be sure to test any resistor in this circuit.

Zener diodes should be replaced with an exact replacement, although it is possible to use a replacement diode of a higher dissipation (wattage). The voltage rating must remain the same.

Bipolar Transistors

Transistors come in a wide variety of different shapes and sizes. They're called "packages." The primary difference between the package types is the amount of current they can handle. Large transistors can handle higher current than small transistors. This is true of semiconductors in general. The size has nothing to do with the voltage rating of the transistor.

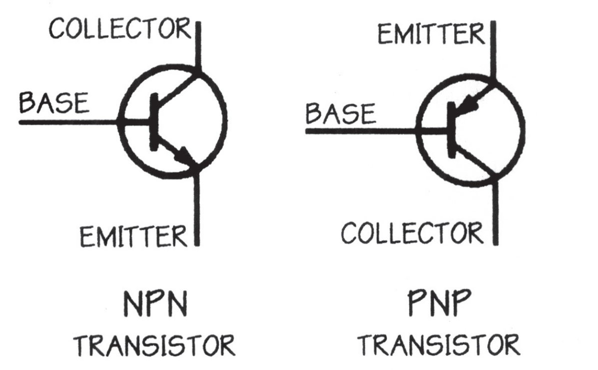
A transistor is like a silicon sandwich. There are two PN junctions. There is a PN junction between the base and emitter of the transistor and one between the base and collector as well. A transistor is tested like a diode but instead of one PN junction there are two.

Transistor Test

You can use the chart below to guide you through the six-step process of testing a transistor with your digital multimeter. The chart shows you where to connect your red meter lead (the positive lead) and where to connect the black (negative) meter lead.

1. Set your meter to the diode test.

2. Connect the red meter lead to the base of the transistor. Connect the black meter lead to the emitter. A good NPN transistor will read a junction drop voltage of between .4v and .8v. A good PNP transistor will read OPEN.



The schematic symbols are almost identical. If the arrowhead points out, it's an NPN transistor. If the arrow points in, it's a PNP transistor.

3. Leave the red meter lead on the base and move the black lead to the collector. The reading should be the same as in step 2.

4. Reverse the meter leads in your hands and repeat the test. This time, connect the black meter lead to the base of the transistor. Connect the red meter lead to the emitter. A good PNP transistor will read a junction drop voltage of between .4v and .8v. A good NPN transistor will read OPEN.

5. Leave the black meter lead on the base and move the red lead to the collector. The reading should be the same as in step 4.

6. Place one meter lead on

RED Meter Lead	BLACK Meter Lead	NPN	PNP
Base	Emitter	Junction Drop	Open
Base	Collector	Junction Drop	Open
Emitter	Base	Open	Junction Drop
Collector	Base	Open	Junction Drop
Emitter	Collector	Open	Open
Collector	Emitter	Open	Open

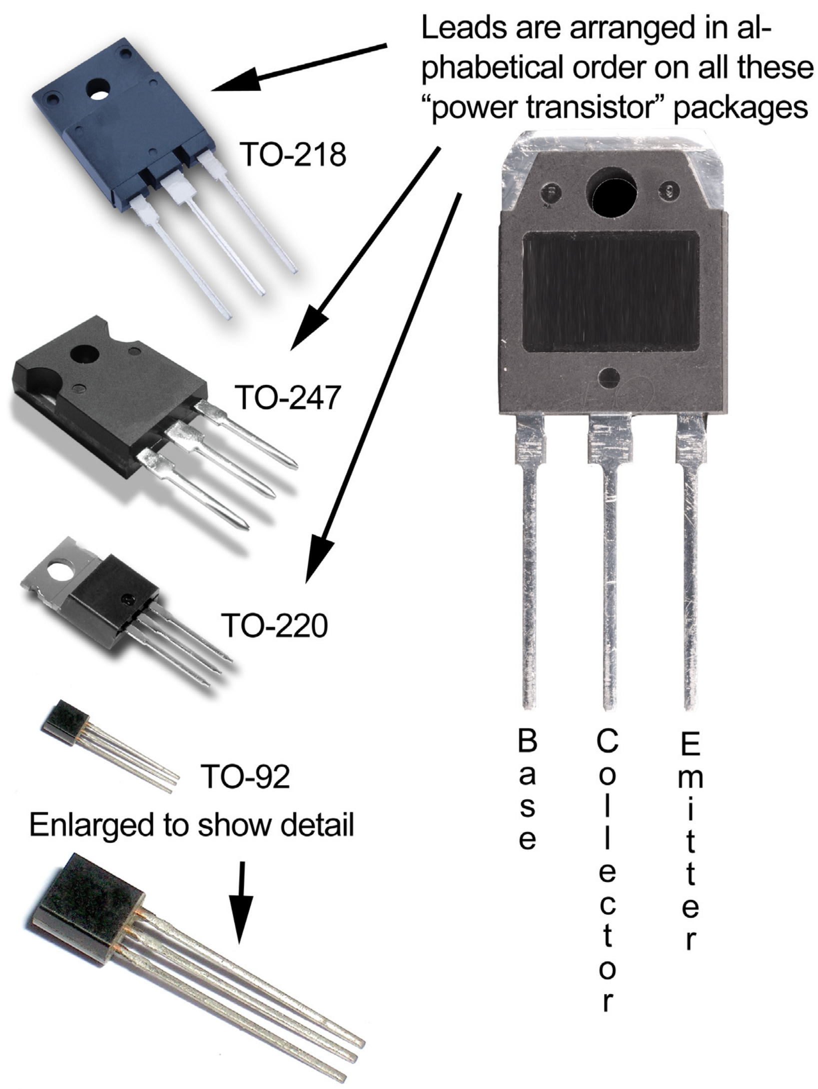
the collector, the other on the emitter. The meter should read OPEN. Reverse your meter leads. The meter should read OPEN. This is the same for both NPN and PNP transistors.

WEIRD THING ALERT: Some transistors have some additional built-in components that will skew your readings. It is fairly common to find a "Protection Diode" connected between the emitter and collector of a transistor. Naturally, this will change the reading. Instead of obtaining an "open" reading between emitter and collector (regardless of the polarity of your meter leads) you will now read the diode itself (if the transistor doesn't have an emitter-to-collector short, of course). A good transistor with a built-in diode will read open in one direction but show a junction drop when the leads are reversed.

Bad Transistors

If the transistor fails any of these tests, it is bad. As with the diode, you may attempt to test transistors in-circuit. However, transistors will often not test properly in-circuit and must be unsoldered and removed from the circuit for proper testing. Don't agonize over whether or not the transistor is bad when testing in-circuit. It only takes 30 seconds to remove the transistor and another 30 to test it properly. Just do it!

Not surprisingly, transistors



TO-92 is a "signal transistor." The pinout varies between USA, Japanese and Euro types. Google the part number to be certain.

usually fail in the same manner as diodes; they short circuit. Emitter to collector shorts are common. This too is not surprising as this is the main current path through the transistor. This is known as the transistor's "collector current."

An emitter to collector short will often set off a chain reaction that fuses the base connection as well. What you end up with, basically, is a three legged wire; all three leads are shorted to each other.

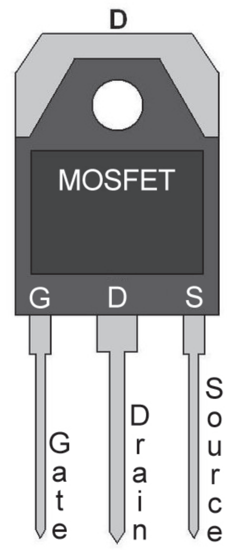
However, unlike the diode which is all but guaranteed to short circuit, a transistor can develop an open circuit as well. Depending on the circuit it's in, a transistor can fail with an open between base and emitter. Since a transistor needs a potential difference of .6 volt between the base and emitter in order to operate, an emitter to base open circuit prevents the transistor from turning on.

An open base to emitter junction can confuse the heck out of you when you're testing the transistor in-circuit. If there is another p-n junction somewhere in the same circuit, you might be reading across it and mistake it for the missing p-n junction in the transistor. The sure-fire multimeter test for any transistor is to remove it from the circuit.

"Partial" short circuits (more properly called "leakage) also plague transistors. This will show up on your meter as showing some conduction when the junction should be completely "reverse-biased" or "open." Detecting leakage is tough for some meters. I don't know what the difference is between meters that makes it so, but I have seen on more than one occasion where one of my students' meters would miss a leaky transistor that was clearly bad to the rest of the class. My advice is to stick with Fluke brand meters.

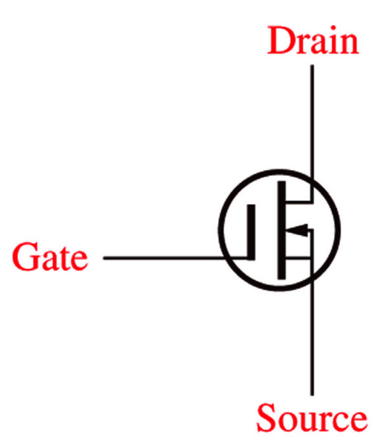
All that having been said, here is an awesome shortcut you can take for finding bad transistors:

In modern electronics, the vast majority of transistor failures show up as emittr-to-collector short circuits. A quick test is to put one lead (either one) on the center lead of the transistor (the collector) and one on the right-hand lead (the emitter) FIRST on each of the big, power transistors, before you perform the complete test on every transistor. This usually locates the bad parts in just a minute or two. If you don't find anything obvious with the "quick test" you can go back and perform the full test on each one.



MOSFETS

MOSFETS are the easiest transistors to test as they exhibit no junction drops at all! No matter how you test the MOSFET, all of the leads are OPEN with the single exception of the connection between the Drain and Source leads of the MOSFET where you will read a junction drop in one direction and open in the other. In this case however, you are not actually reading the transistor itself but rather the built-in "protection diode" that is often included in the transistor package. It's actually part of the little silicon chip itself. It's function isn't important



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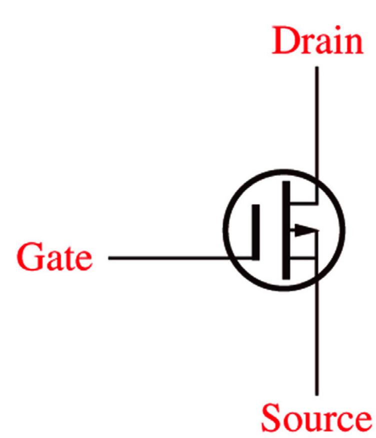


p channel

to this discussion, just be aware that it exists.

A quick and almost fool-proof test for a bad MOSFET is simply to look for a short circuit between the center leg (the Drain) and the right-hand leg (the Source) of the MOSFET with your meter set to diode test or resistance. If it's shorted, it's bad.

Opto-Electronics

Opto-electronics are electronics that either emit light (of any wavelength, not necessarily visible light) or detect light (usually detecting photons with silicon devices but there are also "photoresistive" cells that change their resistance in the presence of light). An example of this is the system used by an electric garage-door opener that uses a light source on one side to shoot a collimated beam of light to a receiver on the other side of the door. If something blocks the beam, the door reverses. We use the same system on slot machines. The door has an LED on it while the cabinet has the receiver, a phototransistor. When the door is closed, the phototransistor "looks" at the LED but when the door is opened, the phototransistor cannot "see" the pulsed, infrared beam from the LED. This let's the computer know that the door is open.

There are too many different opto schemes to discuss them here. In general, they must be tested for function with the power on. This is beyond the scope of this discussion. In general, if I suspect an opto-electronic device as being bad, I simply change it. If this is not a component that I have in stock (relatively likely as there are few, common opto failures) I simply swap it from another (working) unit. If the problems is fixed, I know it's bad! If not, no harm, no foul and it didn't cost a penny!

A Trick for Testing Digital Integrated Circuits

Here's a way to test a digital integrated circuit without having to power the board at all! This test takes advantage of the fact that the integrated circuits we use in games use are made of transistors. When transistors fail, they will usually short circuit and we can detect the shorted transistor in the IC the same way we test a regular transistor.

Turn the power off and set your digital multimeter to the "diode test" range.

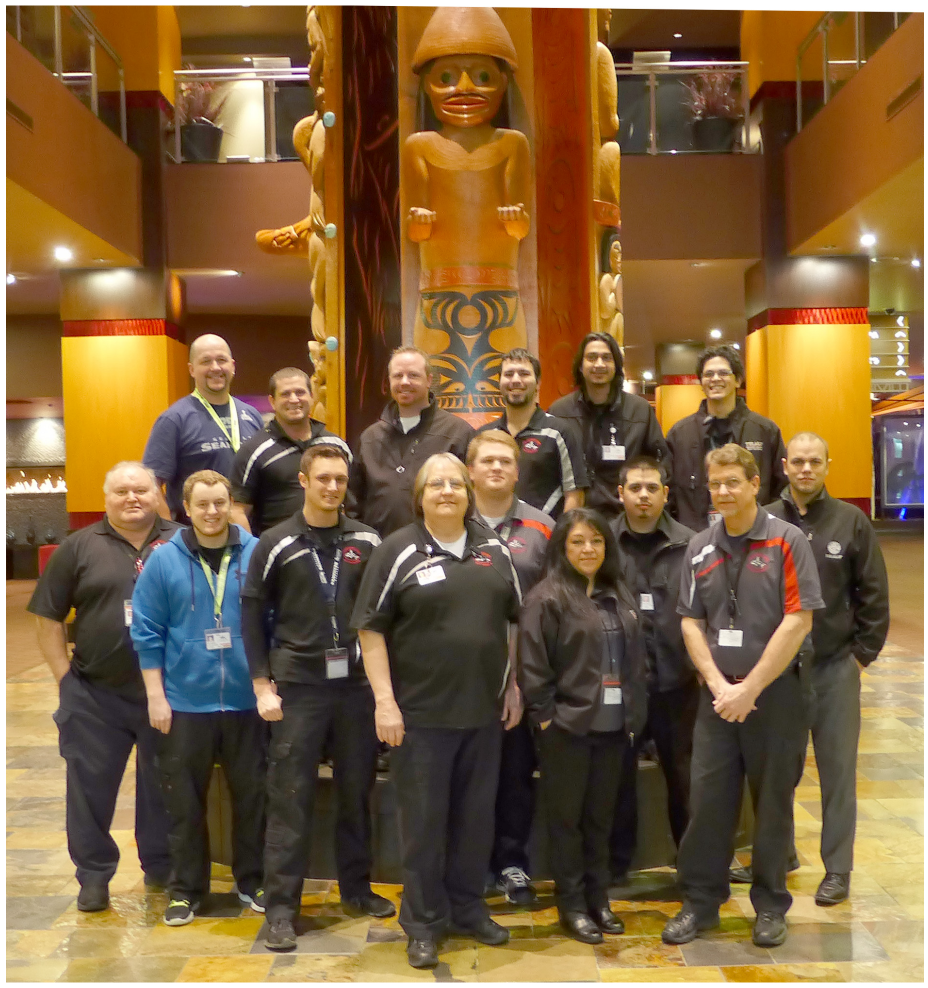
Connect the red (positive) meter lead to the ground connection of the board. No... This is not a misprint! In order to read the "junction drop" of the pin of the IC under test you must ground the positive lead of the meter.

Use the black meter lead to probe each of the input and output pins of the IC. You don't even have to know which pins are inputs and which are outputs. Just probe them all, one at a time. A good input or output will often display a normal junction drop reading. If the integrated circuit is bad, the meter will generally display a much lower reading such as .05 or .1 volt. Sometimes the bad IC will display a much higher reading instead of the normal junction drop. If the reading is too low or too high, the bad pin of the IC will display a reading that is obviously much different than all of the other pins of all the other integrated circuits. Try this test on a good, working board and you'll see what I mean. Be aware that the power pins will read much lower. It's a good idea to probe a known power pin and note the reading. Anything that you probe subsequently that shows the exact same value can then be ignored.

This IC test certainly doesn't require any specialized knowledge of integrated circuits to make it work. I have used this simple test to locate bad integrated circuits in all kinds of equipment. In fact, you can attempt this test on just about any IC. It's especially useful if you have a good unit for comparison. If the readings compare, that's "normal" but where they differ, you're on the right track! I typically connect the two grounds and the red lead to each other and then simply probe with the black lead, jumping back and forth between the two boards, looking for a difference in the reading. Remember, you don't care at all what the reading might mean or what you're actually measuring. You're just looking at the numbers on the meter. If they're close to each other, that's not your problem. If they're wildly different, you likely have located some sort of "issue."

Please note that this is just a bit of a trick. It doesn't always work but it DOES work fairly often and there's no risk to it.-**STM**

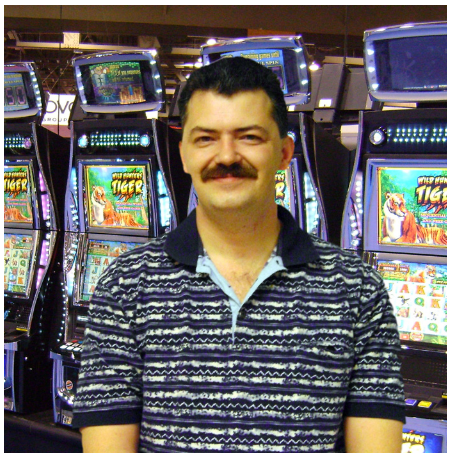
Slot Tech Training at Tulalip



I had a wonderful time at Tulalip Casino. The training went really well and everyone had a great time too. My wife won around $250 on their oh-so-generous slots (I invested one dollar and parlayed it up to three bucks and change) so we blew it all on one night's stay at the "Inn at the Market" in downtown Seattle. It was expensive but it was really nice. The food is great in the area (eat at Etta's) and Seattle's Public Market is a lot of fun to visit, even if you don't buy anything. It's the place you've seen on video where they throw the fish around, although on this day, they were only barking at customers, most of whom were just shuffling by in a tourist-like daze, presumably stunned, as I was, by the high prices of the seafood. In San Diego (home of Slot Tech Magazine) it's a lot less expensive.

Attending the four-day class on power supply repair and monitor repair were: Slot Systems Manager Stan "Skip" Jones, Slot Leads Elisha Miller, Frances Guadamuz, Richard Odell, Slot Techs Rick Duemmell, Jim Barrie, James High, Glenn Stolle, John Briggs, Pauline Roundy, Matthew Schwab, Tony Capili, Anthony Shaw, Allan John and Rick Garcia.-**STM**

For schematic diagrams, service manuals, diagnostic software and more, visit the Slot Technical Department at slot-tech.com.



Quick & Simple Repairs #104

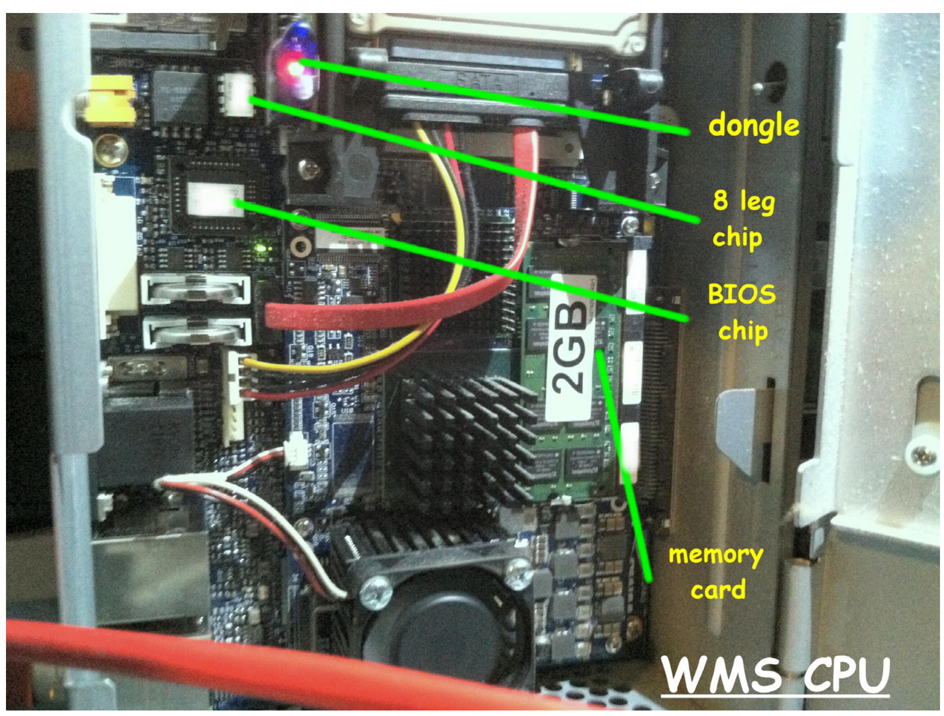
By Pat Porath

WMS XD CPU NXT 2 Problem

There was a WMS XD game that was turned off due to a bad main CPU board (CPU NXT 2 with hard drive). Thinking we had a spare, I thought I would look for one and tear into it. The first CPU that I grabbed looked like an exact spare so I started taking the items off of the original board that were needed on the replacement. These items included the 8-pin jurisdiction chip, the PLCC BIOS chip, the license dongle and dongle board (looks like a short USB thumb drive) and the hard drive. If the board functioned properly I knew none of the items were bad. When power was turned ON the board did not function correctly. It had the original problem. Some of the LEDs inside of the CPU would only flash, such as the voltage indicators, and the game would not even attempt to boot up. Next I tried the new hard drive in the replacement CPU, only to have the same failure. Both chips and the dongle board were double checked to make sure they were seated properly, which they were. The "piggy back board" located in the CPU was swapped without results too. The only thing left that I could think of that could be swapped was the 2 Gig memory stick. This time during power up the CPU appeared to be normal and the LCD looked like the game was loading normally too. Of course it needed to be RAM cleared and options set but it looked like the board problem was finally fixed. After getting the game information, setting options, testing, and paperwork, the game was finally back online. It took some time but it was worth it. I got the game running again.

Aristocrat Programmable Button Failure

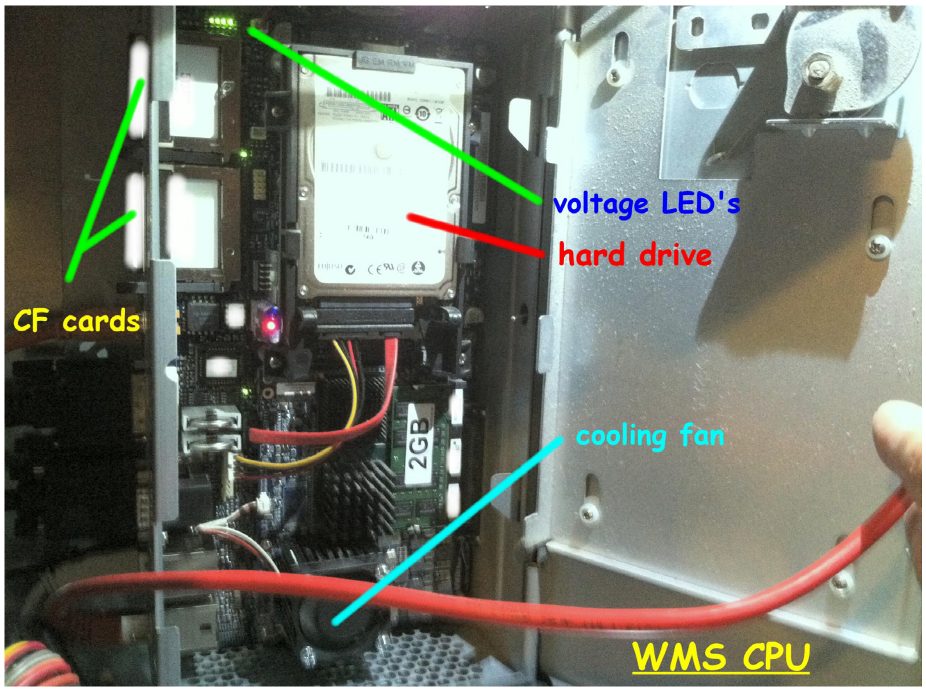
After reading our slot department log book, it was noted that an Aristocrat slant top Verve had a button panel failure. It was also noted that the button control board may need to be replaced. Once boot up was complete, no doubt the game had a button problem. All of them had colored lines on them, with the exception of the large spin button. Connections



were checked in the button panel area as well as connections on the motherboard and other boards. I did notice that there were two USB cables coming from the button panel leading to the motherboard area which had a total of 4 USB ports. Two were used, the other were open. The cables were moved from their original USB sockets to different ones, along with reseating the game main CPU. This time when the game was turned on the buttons displayed "Aristocrat" during boot up. Maybe they will work now? Sure enough all of them looked and worked fine. I'm not exactly sure if it was swapping of the USB ports or reseating the main board but it was fixed.

IGT Upright G20 3.0 "Unable to Read Cabinet Memory Error"

I admit I wasn't exactly sure where to start with this error. It seems like if there is any kind of memory error on most slot machines, they need a RAM clear and must be set back up. So BEFORE going "full steam ahead" clearing static RAM and clearing cabinet memory with KEY 7, resetting up the game and so on, I thought it was best to ask for a second opinion. I was told to reseat the memory stick in the brain box and that should fix it. Really? No doubt it was



worth a try. After disconnection a pile of cables (two video, an audio, USB and such) the cover of the brain box was removed. The 80 Gig hard drive had to be moved out of the way too, just to get at the 2 Gig memory stick. I carefully removed it, and reinserted it back into its socket. Next, the hard drive was put back in place, checking to make sure no connections were bumped loose. The cover was put back on, all of the cables were plugged back in and now it was time for the test. First it came up with a "green screen" error which cleared with the key. The next boot up worked great, no errors at all. Simply reseating the memory stick inside of the 3.0 brain box fixed the error.

TechFest 29

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Slot Machine Technology for the International Casino & Gaming Industry

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If your property is in the area, I suggest you make plans to attend TechFest 29 at Mystic Lake Casino Hotel, near Minneapolis, Minnesota. While the TechFest program itself may be attended at any venue, Mystic Lake Casino has some super-special things going for it:

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* Most importantly of all, they have the finest casino slot shop in the world and we get to take a back-of-house tour of the entire operation. You will see how one of the largest casinos in the world covers their huge slot floor of close to 5000 machines with 99% uptime. You will leave with many new ideas on how to set up and run your own shop.

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TechFest also includes instructions on LCD monitor repair, power supply repair and more, presented by Randy Fromm, publisher of Slot Tech Magazine and your host for the event.

To Enroll: The enrollment form is now available on the website at slot-techs.com. Please download the enrollment form and return it by fax (if you're still working with twentieth-century technology) or e-mail. We have a special rate at the hotel so be sure to mention that you are attending TechFest.

For more information, please visit the website at slot-techs.com or contact us at techfest@slot-techs.com or call 619.838.7111 to speak to Randy Fromm directly.

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Aristocrat Veridian "No Signal" on Upper and Lower LCD

Upon arrival for my shift, a slot attendant told me a game needed to be looked at. It was showing "no signal" on the screens. I wasn't very concerned with the ONE game at the moment, I needed to check on two BANKS of machines that were moved with a total of 20 games down. There were a few things left to do with the bank to get it back online. Locating the COM lines, "globaling" the Oasis Sentinels, replacing two bad monitors that died, etc. After both banks of games were working properly, I checked out the Veridian. Luckily a simple reboot fixed it. But if it happens again in the near future I would suspect a bad CPU fan. A bad fan will cause the CPU to overheat and shutdown causing "no signal" to appear on the screens or a bad fan may cause a game to reboot itself. I'll have to keep an eye on it to see if it happens again.

Aristocrat Veridian Lost Serial Communication

When taking a look at the SPC board, not all of the four COM LEDs were lit. There should be two lights lit up at each connection. One had both lit, the other only had one of LEDs flashing indicating a problem. The game had lost communication with the Sentinel. Power was cycled on the SPC board and also on the game without success. Connections were checked at both the game side along with the Sentinel side, everything looked OK. Finally the Sentinel itself was rebooted. Almost instantly, the other LED lit up on the SPC board that wasn't lit before. The main slot door was physically opened and closed which corresponded with the Oasis display which mean game TO Sentinel communication had been established. Simply rebooting the Sentinel did the trick.

IGT G20 MLD "System Failure" Error During Boot Up

During some conversions, it was time to boot up one of the games. The normal "AVP" symbol appeared, then an error along with a "system failure" appeared on the screen. An I/O board was replaced inside of the brain box (the small board that plugs into the main board of the brain box). Chips were checked to make sure they were seated properly, which they were. Next, a replacement hard drive was installed. This time the game started to boot up properly. Correct dongles were put in place, the game loaded onto the hard drive and game options were set. For some reason the game's hard drive died. Once replaced, the game was fine.

IGT AVP Bar Top "Touch Screen Communication Error"

When looking at the "Microtouch" touch screen controller LED, it appeared that the USB port had fallen asleep or died because the LED was black. It is supposed to be lit up green. I turned off the game, utilized a different USB port for the touch screen controller, then turned the game back on. During boot up, the LED did lit up green which was a very good sign. The screen didn't have an error either. It was calibrated and tested OK. I have a theory about our bar top games that the game belly door pushes on the USB cable that goes from the brain box to the motherboard. It seems to me if the cable gets pinched (pushed on from closing the belly door) none of the USB ports work on the motherboard. After the cable is replaced, the problem seems to go away. This time it wasn't a cable problem though because the license dongle was lit up the whole time, indicating the of USB port was in fact working.

Bank of Bally Games Lost Oasis Communication

I checked all kinds of connections, rebooted a fiber optic converter at the bank along with the one in the data room, rebooted the Oasis DPU (data port unit) nothing would bring up communication even for a second. I even checked connections at a fiber hub on the floor and a hub in the data room. Everything looked OK to me but still no communication. Some of our banks of games have a "copper backup line" (regular copper communication cable) but that wasn't an option on this bank because one didn't exist. On the Oasis Data Port Unit the "Sentinel RX" light wasn't lit (Sentinel receive signal). This told me that data wasn't being sent from the games to the DPU. This is how I (somewhat) understand how it works. Copper communication cables run between the games, connected to a fiber optic converter in the base. The converter sends the signal through a fiber optic hub in an specific area in the floor. From the hub it goes to a hub in the data room, then to another fiber optic converter, then to the DPU. Somewhere in the mess, a signal got lost. Not having a lot of knowledge of fiber optic communication troubleshooting, I wasn't sure what to check next. As a note: if Oasis communication is down on a bank of games, they won't accept tickets or promo cash, may lock up for all payouts, along with other things. Anyway, I had to ask for help. A "fiber optic tester" (a unit that sends bright orange color light down a cable) was used to see where the bad connection was. If there is a lot of excess light around a connection, it may be bad. A poor connection was found in a hub on the gaming floor. What may have happened is that when a new cable was connected to the hub box the night before, a connector may have been bumped and had come loose causing an Oasis communication loss with the bank of games.

- Pat Porath
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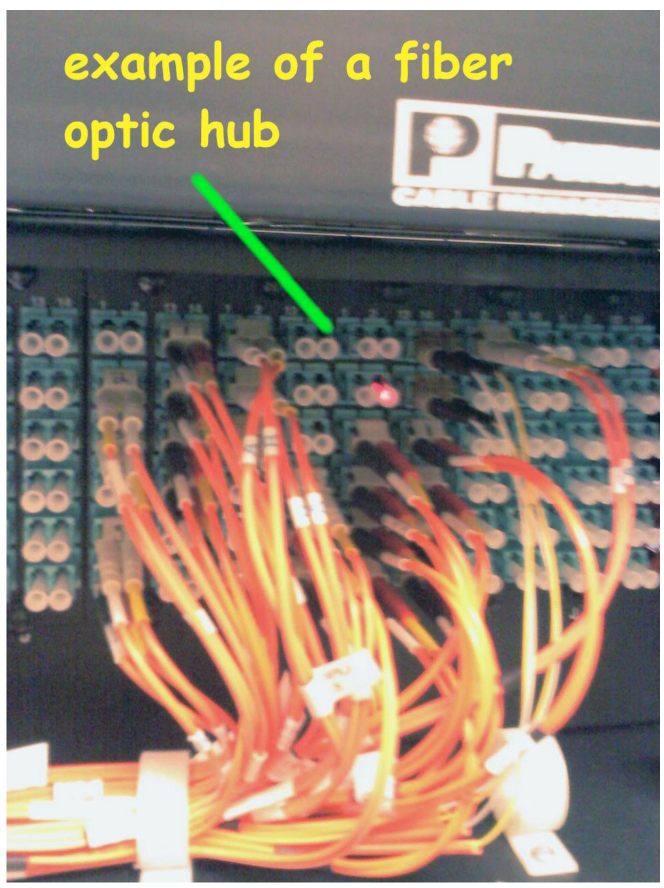

“I can help you bring down the cost of casino electronics repairs”

Randy Fromm

Buying Replacement Units!

Is your casino totally self-sufficient in repairing monitors, power supplies, bill validators and ticket printers or are you throwing away hundreds or thousands of dollars purchasing replacement units? While it is not exactly a “hidden” cost to your department, some slot managers simply accept the price of replacements as the “cost of doing business” while it progressively nibbles away at the casino’s bottom line. IT DOESN’T HAVE TO BE THIS WAY.

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In truth, most electronic repairs are pretty easy. Often, it’s just a matter of testing and replacing a small handful of inexpensive, off-the-shelf electronic components. Sometimes, it’s just one. For example, it costs less than 25 cents in parts to repair the most common failure in Bally power supplies. The entire process takes about five minutes.

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About Randy Fromm: I am the publisher of Slot Tech Magazine. First published in 2001, Slot Tech Magazine is a monthly trade journal focusing on casino slot machine repair. I have been repairing electronics for the gaming industry since 1972. I really enjoy what I do and I love showing others how easy it can be. *No previous knowledge of electronics is required.*

For more information, including course offerings and complete pricing information, please visit the website at slot-techs.com

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