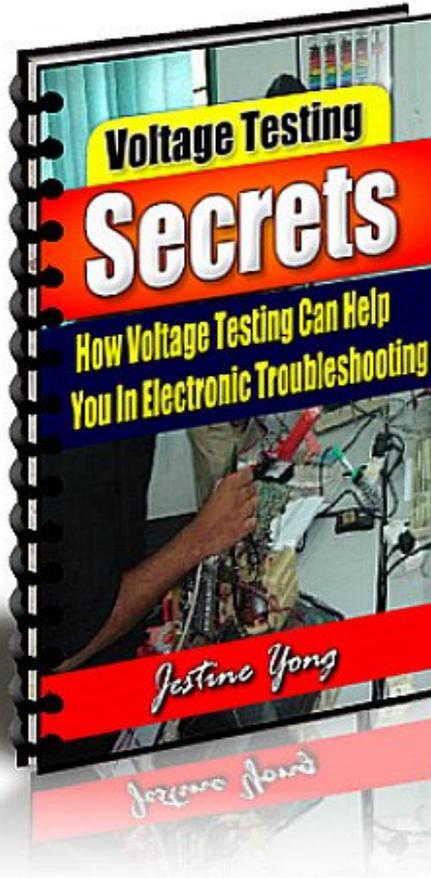


# Bonus Report



**Brought to you by Jestine Yong**

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## The Importance of Voltage Testing In Electronic Repair That Every Electronic Repairers Have To Master It

By only knowing how to read electronic schematic diagram and testing electronic components were not enough to make us a good electronic repairers. Many faults can't be detected even if you know how to accurately test and check all the electronic components because those faults only can be detected by simply performing a voltage test. Do you know that quite a numbers of Monitor problems I have to perform a voltage test in order to locate the defective components? Yes, if without voltage testing, I might end up can't find the fault and the Monitor have to be return back to customers.

What if you return many Monitors back to the same customers? Of course your business reputation would be affected and worst if your competitors (other electronic repairers) be able to repair it. You would definitely lose out the customers and is very difficult to get back his trust again about your capability to repair Monitors.

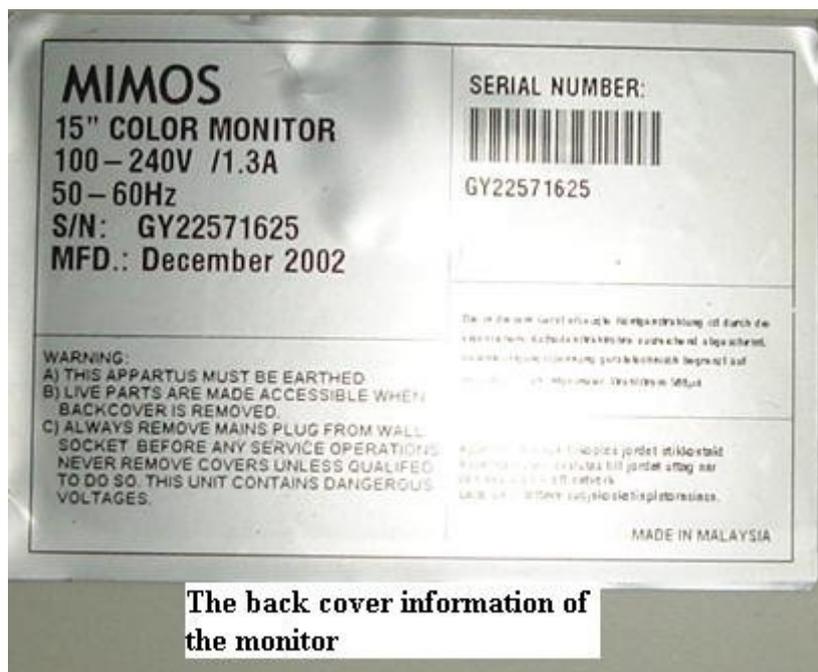
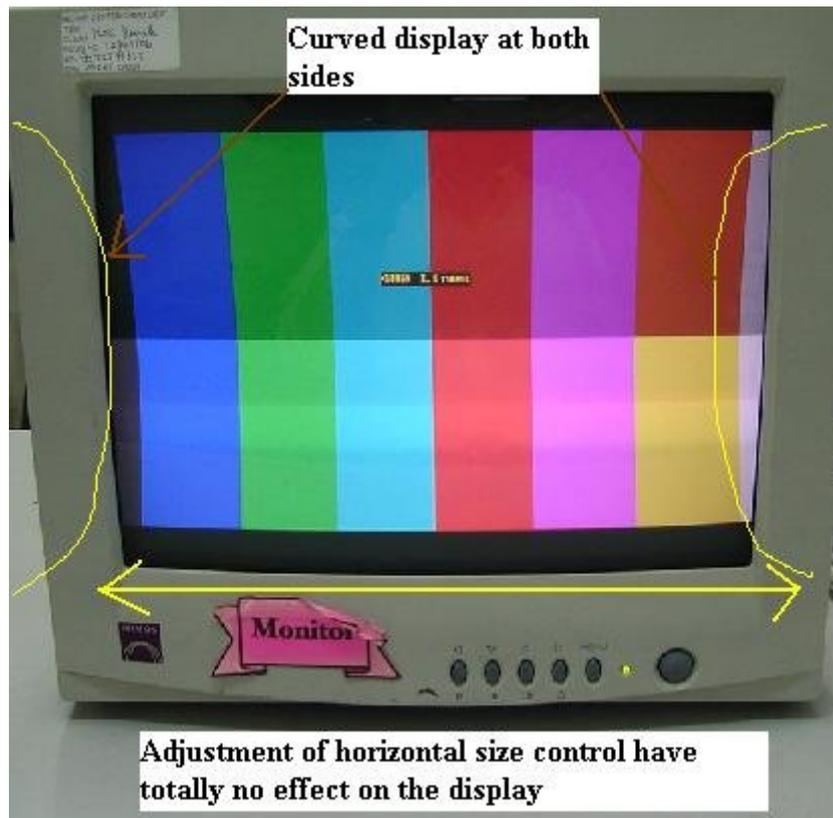
I do know lots of electronic repairers especially newbie's do not have the courage to perform the voltage test especially Computer Monitors and Television because they were afraid of the high voltage and get electrocuted. Well, if you want to work in this line and choose not to learn about voltage testing (because of afraid), then you are truly missing something that can help you to repair any equipment fast.

After all, voltage testing is not that as dangerous as you thought to be. With some guidance from repair friends or even you test it on your own (practical) and protection from isolation transformer, I don't see any other reasons you don't want to do the voltage testing. Besides this of course you must know the safety guidelines first in this electronic servicing field.

The real challenging question now is even though you know how to perform the voltage testing; this does not guarantee that you will definitely being able to solve the electronic problems! As to why you can't solve the problems depends on many factors such as:

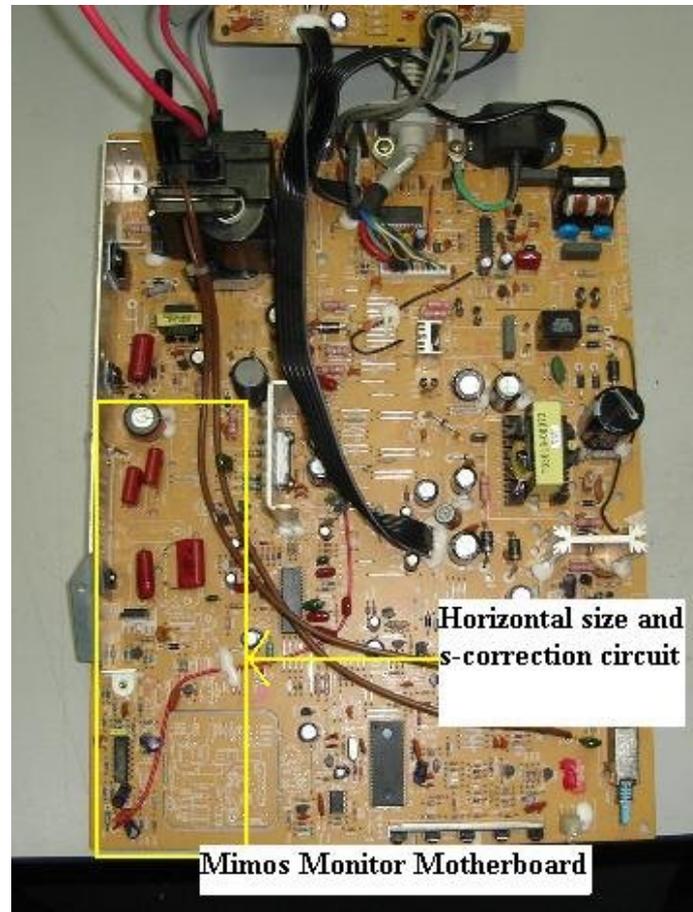
- How well you are in understanding the functions of electronic circuit (assuming I'm talking on the Monitor circuit). Some Monitors circuits can be very complicated to understand it.
- How good you are in tracing the electronic circuit (assuming you are tracing from the source to the faulty components) because many electronic repairers will lost track and can't go further to detect the fault.
- How knowledgeable you are in understanding each function of the electronic component. For example, if no signal flowing to the base of a transistor, of course there would be no current flowing between the collector and the emitter. Another example, what do you expect the output voltage will be if 100 volts is passing through between a 10 ohm resistor and a 10 k ohms resistor?
- Sometimes in order to solve a problem we accidentally create even more problems due to that we do not have the capability to hold tight the meter's probes causing it to touch on other pins while measuring a components (says is an IC or a transistor). This would cause the whole equipment to shutdown or even burnt the components. How many of you have done that before?
- We must also know what the range of the meter setting is in order to test the electronic circuit accurately. For example, would you test the secondary output voltages when your meter is set to AC range? Or would you expect a reading when your meter's red probe touches on a cold ground?

From above, these are the things that you should know if you want to be successfully able to perform a voltage test on any equipment. It is not that easy to absorb everything that I've just mentioned above but if you have the passion to do it (I mean learn everything from reading electronics books, visiting forum, doing your own practical test and etc) then you are giving yourself a chance to learn something that will truly benefit to you. In this bonus report I'm going to show you how by performing a voltage test has helped me to solve an unusual problem in a Computer Monitor.

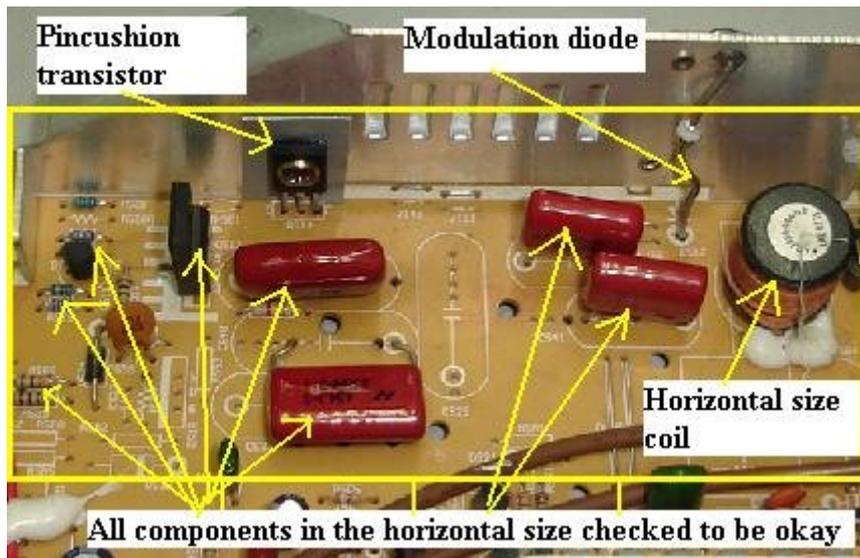


Well, this monitor with the brand name of MIMOS (this is an OEM Monitor) came in with the complaint of can't adjust horizontal size (there's totally no changes when the horizontal size control was pressed). The display width (size) was large and both sides of the display curved inward (pincushion out). For your information, the horizontal size and pincushion circuit were located in the same area and both circuits were

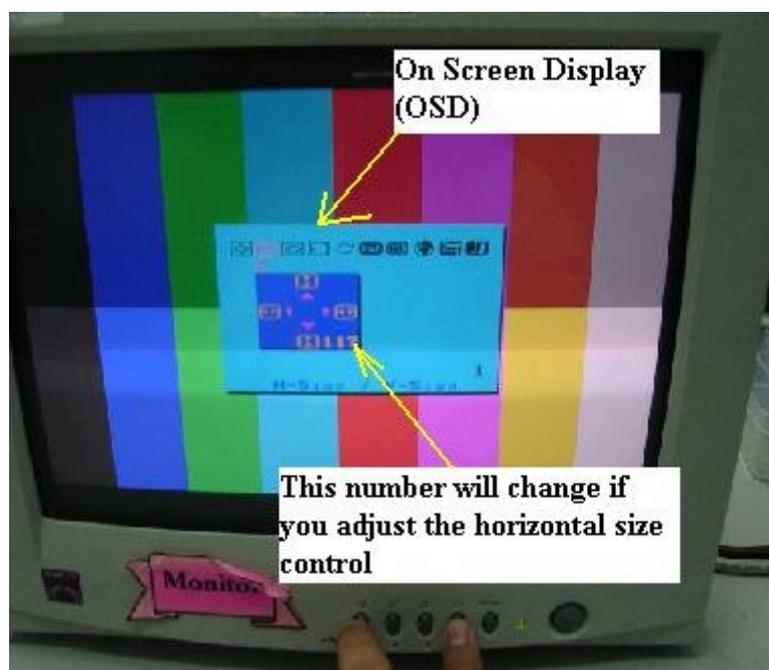
working together in order to achieve a desired display. If one component in a circuit fails, it would affect another circuit as well! That's why, when the horizontal size circuit has a problem, the pincushion circuitry was affected too (the display curved inward).



Normally when I see this kind of problem, I would usually check and test all the components in the horizontal size and pincushion circuits' area with my ESR, analogue and digital meter. Most of the time, I could solve the problem fast. The common faulty parts for horizontal size width problem in a Monitor were usually dry joints, shorted modulation diode and pincushion transistor and capacitor opens along the horizontal size coil's line. But somehow I could not locate the faulty components in this Monitor because all of the components that I've checked were all tested okay!



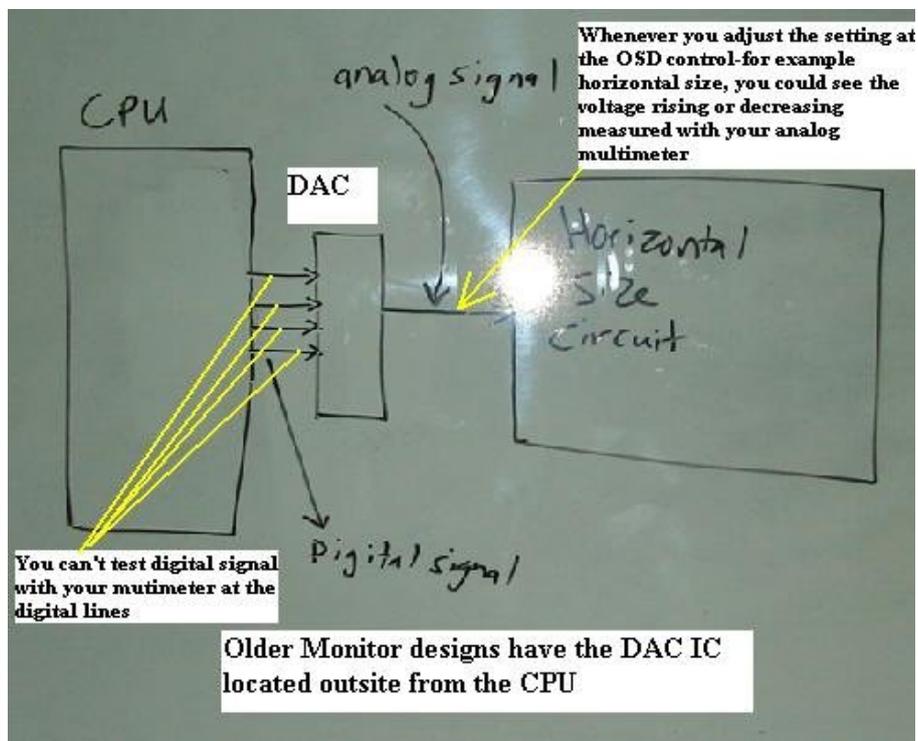
Since I have checked all the components in the horizontal size and pincushion circuit area to be okay, now the only way to solve it is through using voltage test. Generally, whenever if you want to perform voltage testing, one must start from the source first. However if you are experience enough you can always skip some section and start tracing the circuit that you think would fail. As there are many electronic repair newbie's in this ERG member site, I would show all of you how to trace from the source first.

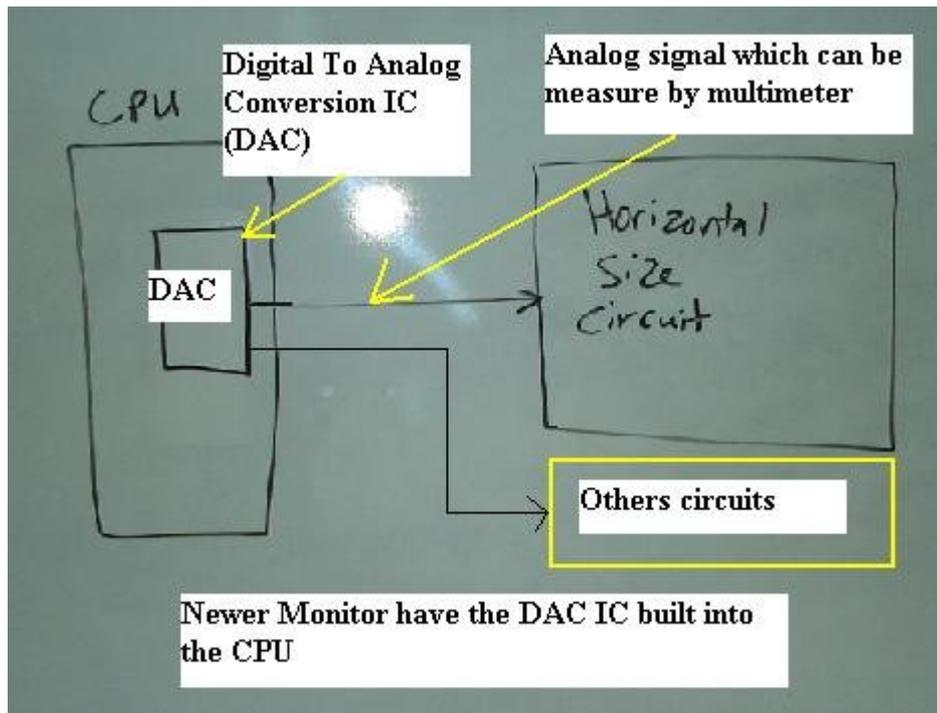


Now think carefully, what makes the display to become small or big whenever the horizontal size control was pressed through the On Screen Display (OSD)? There must be a signal sends out from somewhere to the

horizontal size circuit in order to control the display. Am I right? The pincushion transistor has a base pin and if this voltage varies (because of the horizontal size control either set to minimum or maximum) the display will change too. You can choose to trace backward starts from the base pin of the pincushion transistor or start from the source.

I will guide you to trace from the source because once you know how to trace from the source, you would be able to troubleshoot and repair other Monitor problems too such as can't control the brightness, contrast, vertical and horizontal height. You may use this method that I'm about to show you in TV and other electronic equipment as well.





First, you must understand what is the function of digital to analog conversion (DAC) circuit. Since most of the modern Monitors are using digital signal (communication between the CPU and EEPROM and other circuits as well) there must be some circuit to convert the digital signal to analogue signal in order to drive the pincushion transistor and others electronic circuits too.

Our normal multimeter can't measure digital signal, it can only read analogue signal. Older Monitors have the DAC IC located out site the CPU (such as the TDA8444 IC used in NEC XV 14 Monitor) while for modern Monitors the DAC IC is built into the CPU. I guess you are now understood why a digital circuit needs a DAC as part of it complete circuit. In other words, the DAC is required to communicate with the analogue world!

6-bit DACs with I<sup>2</sup>C-bus

TDA8444; TDA8444T;  
TDA8444AT

PIN			DESCRIPTION
TDA8444 (DIP16)	TDA8444T (SO16)	TDA8444AT (SO20)	
1	1	1	supply voltage
2	2	2	control input for DAC maximum output voltage
3	3	3	I <sup>2</sup> C-bus serial data input/output
4	4	4	I <sup>2</sup> C-bus serial clock
5	6	7	programmable address bit 0 for I <sup>2</sup> C-bus slave receiver
6	7	8	programmable address bit 1 for I <sup>2</sup> C-bus slave receiver
7	-	9	programmable address bit 2 for I <sup>2</sup> C-bus slave receiver
8	8	10	ground
9	9	11	analog voltage output 0
10	10	13	analog voltage output 1
11	11	14	analog voltage output 2
12	12	15	analog voltage output 3
13	13	16	analog voltage output 4
14	14	17	analog voltage output 5
15	15	18	analog voltage output 6
16	16	20	analog voltage output 7
-	5	5, 6, 12, 19	not connected

**Older monitor designs used a separate DAC IC.**

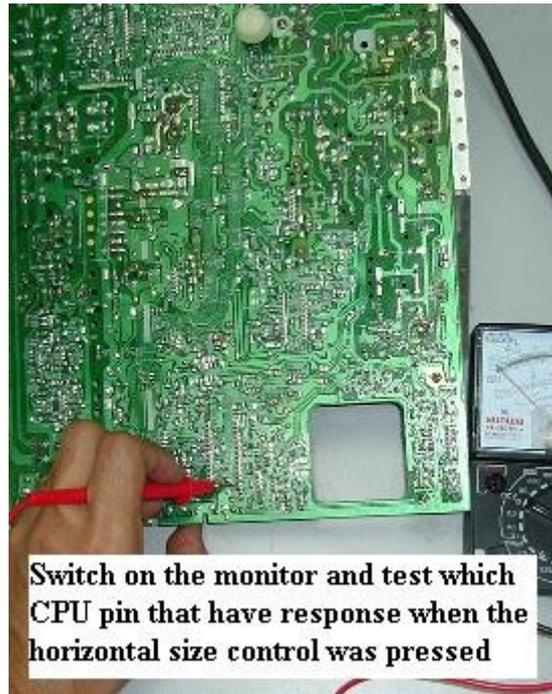
**TDA8444**

Pins: VCC (1), MAX (2), SDA (3), SCL (4), A0 (5), A1 (6), A2 (7), VEE (8).  
DAC outputs: DAC7 (15), DAC6 (14), DAC5 (13), DAC4 (12), DAC3 (11), DAC2 (10), DAC1 (9), DAC0 (8).

**TDA8444T**

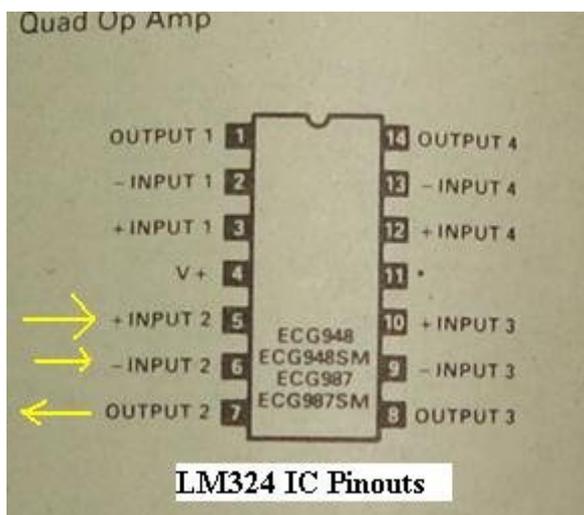
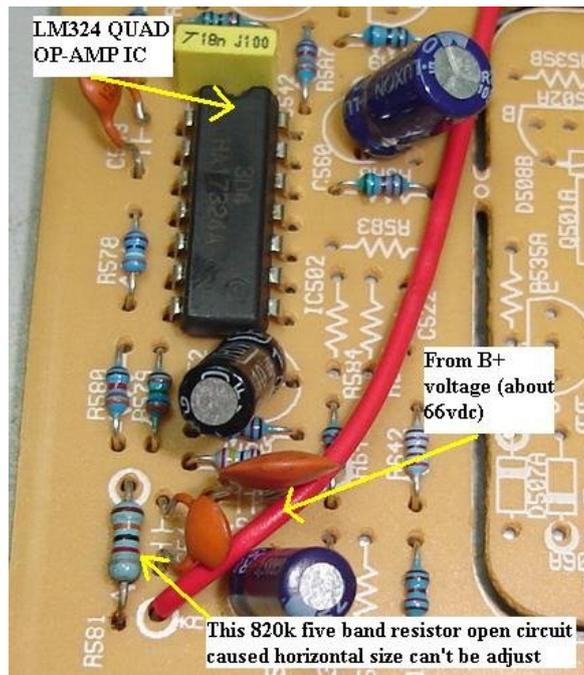
Pins: VCC (1), VMAX (2), SDA (3), SCL (4), A0 (5), A1 (6), A2 (7), VEE (8).  
DAC outputs: DAC7 (15), DAC6 (14), DAC5 (13), DAC4 (12), DAC3 (11), DAC2 (10), DAC1 (9), DAC0 (8).

In this faulty Monitor, I don't see any DAC IC nearby the CPU so I presumed that the DAC was already built into the CPU. Now, this is the most challenging part where you have to carefully adjust the Monitor position and yourself so that when the Monitor power is switch "ON" you can perform the voltage test on all the pins at the CPU. Assuming you have taken all the necessary safety and precautions now is the time to switch on the Monitor and start to do voltage testing.



After you got hold of the Monitor, select the horizontal size control through the OSD screen. You could see when the “+” and “-“ buttons was pressed at the front panel, the number in the OSD display indicates the minimum and maximum value representing the size of the display being adjusted. Since this is a faulty Monitor, although the number in the OSD screen is changing (because you are pressing the “+” and “-“) there is no effect on the display and the display remains big and curved.

But somehow you could measure the pins at the CPU to locate which one of the pins the voltage is changing when the adjustment button is press! Try one by one of the CPU pins until you saw one that has effect when the horizontal size control was pressed. The voltage is about 0 to 5 volts (depends on the design of Monitors) and should go up or down momentarily when the horizontal size adjustment is changing. Congratulations! You are now have determined the source of the horizontal size circuit. One word of advice, a defective CPU or a corrupted EEPROM data could cause no signal at the horizontal size source pin!



Once you have known the pin then it is relatively easy to find out the fault. Start tracing from the pin and see at where the voltage had missing as shown at <http://www.electronicrepairguide.com/mimosboardlabel.jpg>. Surprisingly the voltage remains okay even till pin 5 (inverting input) of the quad operational amplifier LM324 IC. Since this is an OP-AMP IC, it requires two inputs (inverting and non-inverting input) to produce an output at pin 7 but the voltage at pin 7 would not vary. And if this output won't vary definitely it can't control the horizontal size.

Pin 5 voltage of the LM324 IC varies and pin 7 don't varies then most probably the problem is either in the IC itself or components that are related to pin 6 (non-inverting input). I saw a wire coming from top of the board and upon inspecting it; it was from B+ voltage (about 66 VDC) and

passing through a resistor before reaching pin 6 of the OP-AMP IC. Using my analogue meter to measure across the high ohms resistor (820k), I found it to be zero voltage. In order to really confirm is the resistor fault, I desoldered one of the lead and check with my ohmmeter. Guess what? The resistor has open circuit! Unbelievable and it was true! Replacing with a new resistor restored the display back to normal.



Conclusion- Imagine if I didn't use the voltage testing method, I don't know how long that I'm going to spend on troubleshooting this kind of problem. And worst still, I may end up can't solve the problem and return the Monitor back to my customer. With constant learning and practice in electronic repair you will have no problem in tackling any electronic faults in the future. Just don't give up and continue to learn.