




/  Topics (<https://groups.io/g/HP-Agilent-Keysight-equipment/topics?p=,,,0,0,0,0>)  
/  8662A - a warning about dangerous service directions




 Mute This Topic (<https://groups.io/g/HP-Agilent-Keysight-equipment/ft/91372298?csrf=5513314409256117711&mute=1&p=Created%2C%2C%2C20%2C2%2C0%2C0>)

## 8662A - a warning about dangerous service directions Date ▾ (<https://groups.io/g/HP-Agilent-Keysight-equipment/topic/91372298?p=Created%2C%2C%2C20%2C1%2C0%2C0>)



Dmitry Teytelman

9:11 am  (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126936>)

Hello Göran,

On Thu, Jun 2, 2022 at 04:26 AM, Göran Krusell wrote:

Your second assumption is the right one. If the ESR is too low the power supply will be unstable, the phase margin is affected severely. I have made numerous power supply simulations using LTspice. If the ESR = 0 ohm the simulation is stuck but if I place a 1 ohm resistor (or other value) the simulation will run through.

Yes, in general, low ESR of the output capacitor can be problematic. But I was not certain about this specific supply. Especially since this otherwise excellent video <https://youtu.be/ERXYfxjwNxx> (<https://youtu.be/ERXYfxjwNxx>) (one of a series of 5 on 8662A power supply) recommends replacing all electrolytics with fresh low ESR parts. Specifically, A7A3C8 is replaced with Nichicon UPM1H471MHD1TO, which is specified at 0.044 ohms ESR. In my testing, that ESR value would cause the supply to oscillate, at least intermittently.

Dmitry


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Göran Krusell

Jun 2  (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126828>)

Dmitri,

Your second assumption is the right one. If the ESR is too low the power supply will be unstable, the phase margin is affected severely. I have made numerous power supply simulations using LTspice. If the ESR = 0 ohm the simulation is stuck but if I place a 1 ohm resistor (or other value) the simulation will run through.

It took me years to figure out how to deal with the output capacitor in a power supply. What you wish is to confirm that a simulation would match your lab measurements. With the output capacitor in place you cannot easily determine that your design is ok. And the thing is that the output capacitor is not part of the loop but instead part of the load. With the capacitor

disconnected you are able to simulate and measure your design and determine that the phase margin for the loop is good enough. Then you can connect the capacitor with some ESR and the resistive load.

Göran

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Dmitry Teytelman

Jun 2 (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126827>)

Hello,

In trying to understand overvoltage shutdown problem of my 8662A I found a curious thing. I have two A7A3 inverter modules. I discovered sensitivity of the supply to the parameters of A7A3C8 (470 uF 16 V electrolytic filter cap on the +5.3V sense). I have tried both modules with 3 different parts:

1. Original 672D, 470 uF, 16 V: measures 250 uF, 0.3 ohms ESR at 10 kHz on my BK 885
2. Nichicon 470 uF 16 V (likely UHE1C471MPD6TD): measures 423 uF, 0.046 ohms ESR
3. Nichicon 470 uF 50 V (UHW1H471MPD): measures 512 uF, 0.029 ohms ESR

With the first capacitor installed, the unit starts every time. With number 2 it fails to start (goes to overvoltage shutdown) every 20% to 40% of the time. With the third capacitor installed, overvoltage trip is generated every time.

Scoping +5.3 V sense line I see that the overvoltage trips happen when the regulator breaks out in oscillation. With the second capacitor in place, oscillation does not always happen, but when it does, it takes place when crossing 4.6 V on the +5.3 V sense line. With the low ESR part, oscillation starts immediately upon turn on.

Since the symptoms are identical with two different A7A3 modules, I am tempted to say the problem is in the A7A2 control board. Or, possibly, the fast loop in this switching supply has a minimum acceptable ESR for the in-loop capacitor A7A3C8. Original part is probably around 0.25 ohms ESR when new.

Regards,  
Dmitry

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Dmitry Teytelman

May 27 (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126676>)

Hi George,

On Fri, May 27, 2022 at 05:04 AM, george edmonds wrote:

Hi Dmitry

Whilst I share your concerns may I say that the HP fault finding guidance is based around having a set of their 8622A or 8623A PCB card extenders available. Under most circumstances using the card extenders will leave the power supply loads in place and limit the extent to which the voltages can rise.

This is not an issue with the loads being disconnected. When the overvoltage condition exists, HP advice is to bypass the safety shutdown and measure the voltages. With the normal loads in place, peak excursions were sufficient to damage multiple components in the -40 V regulator. Trusting the service manual in this case was clearly wrong.

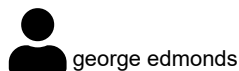
The biggest problem that I see with most SMPSU repairs is a lack of understanding as to how they work and the limitations placed on their control circuitry. I would suggest reading the excellent posting by Dave G8KBV in the previous 8622A repair thread, the key point is only one voltage control loop.

I know fairly well how 8662A switching supply works, not my first time fixing one. First time I ran into the high voltage shutdown, though. If the service manual was silent on the issue, I'd figure out a way to capture the transients, just like I suggested in the original post. But I tend to trust the service manual troubleshooting guidance. It did feel wrong to bypass the shut-off, but if HP says "do it", you do it. At least the first time :)

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george edmonds

May 27 (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126674>)

Hi Dmitry

Whilst I share your concerns may I say that the HP fault finding guidance is based around having a set of their 8622A or 8623A PCB card extenders available. Under most circumstances using the card extenders will leave the power supply loads in place and limit the extent to which the voltages can rise.

The biggest problem that I see with most SMPSU repairs is a lack of understanding as to how they work and the limitations placed on their control circuitry. I would suggest reading the excellent posting by Dave G8KBV in the previous 8622A repair thread, the key point is only one voltage control loop.

G Edmonds.

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Tony

May 27 (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126672>)

Dmitry,

It always puzzled me that the manual advised you to bypass the over-voltage protection shutdown in the situation of a potentially damaging over-voltage condition. Seems to me that is only asking for trouble. I went down the route of disconnecting P2 and then capturing the unregulated turn-on transients as you suggested. That helped me to identify a problem with the -40V line (or rather a problem with the way I was loading it during testing.

regards

Tony

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Dmitry Teytelman

May 27 (<https://groups.io/g/HP-Agilent-Keysight-equipment/message/126671>)

Hello,

During a recent repair my 8662A went into shutdown due to the high input voltage at the linear regulator (A7A1) input. Service sheet 56 directs one to ground the collector of A7A1Q16 and then measure voltages on test points TP4, TP5, TP6. Well, if a true overvoltage condition exists on the -40 V regulator input, that ends up blowing a bunch of parts, since the absolute maximum voltage rating on A7A1U1 is 50 V. I lost R37, U1, Q1, and Q5 on A7A1.

I think two different approaches would work better:

1. Capture the turn-on transients on the unregulated supplies (-45 V, 23 V, -13 V) and the regulated -5.2 V supply with a scope.
2. Disconnect P2 from the power supply motherboard, remove A7A1 completely, then load the four above mentioned supplies with power resistors (1 A for -5.2/-13/+23 V, 0.5 A for -40 V). Signals ON and HI-V on the power supply motherboard must be grounded. Now supply voltages can be safely examined without worrying about damaging A7A1 or the rest of the synthesizer.

Regards,

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Dmitry Teytelman <dimtey@gmail.com>

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