K7S8X Voltage mods
Piotras 13 Jul 2003

All the mods described below were checked by myself, and worked as expected.

Be careful! You are doing it at your own risk! Modding voids warranty!

Vcore mod

Vcore voltage regulator is a 2 phase design based on the L6917 by ST. The chip is located at the top of the pcb, left to the CPU socket. Vcore is defined by the state of the Vid input pins. Signals to these inputs come from the CPU itself. However there is another way of modifying Vcore voltage: by changing the feedback voltage of the regulator. The feedback input is located at pin9 of the L6917 and the feedback voltage is connected through a resistor going from the regulator output.

The modification consists of soldering another resistor from pin 9 to GND to divide the feedback voltage wich results in increased output Vcore. The best way to do it is to solder a variable resistor 47k or 100k multipot between pin 9 and pin 7 of the L6917, as shown at the picture below. You can then adjust the desired Vcore voltage by trimming it with the pot while controlling it from the bios hardware monitor.

Be sure to set the pot at its maximum value before soldering! Not doing this can result in too high Vcore and damage your CPU.

Vmem mod

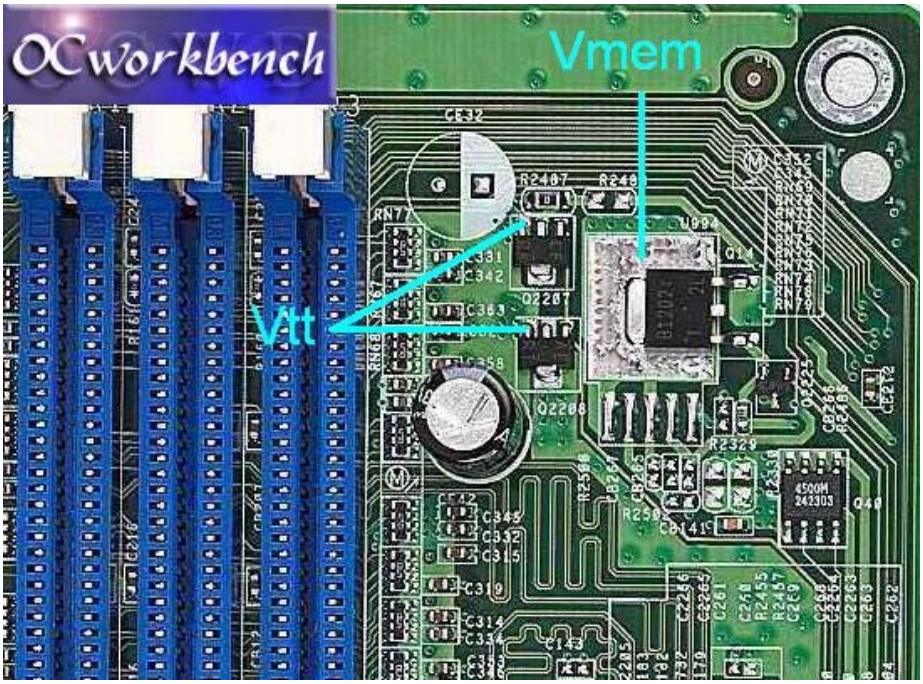
The theory:

Memory uses 4 voltages (Vddq, Vdd, Vr, Vtt) that need to be in very close relationship to each other.

Vdd and Vddq are memory power supplies, for internal electronics and output buffers. They are feeded by the same voltage regulator, as they require the same voltage, which we all refer to as Vmem, or Vdimm. It should be 2.5V +/- 0.2V for DDR266 and DDR333, or 2.6V +/-0.1V for DDR400. Asrock choose to make it 2.7V. To adjust this voltage resistor Rmem is needed. The regulator is built around Q14 and U991, and you can check the Vdd, Vddq voltages at the large solder pad of Q14 (see picture).

Vr is a voltage used for internal reference and should be Vddq/2. In the Asrock design it follows changes of Vddq and always is Vddq/2 (there is adequate circuitry onboard), we don't need to worry about this one.

Vtt is a voltage needed by memory bus termination resistors. It should be equal to Vr (Vddq/2). This one however is not automatically adjusted and another resistor is needed to maintain the mentioned Vtt=Vddq/2 relationship. That't what Rtt is for. Vtt regulator is built around Q2207, Q2208 and U991, and you can check Vtt voltage at Q2207/2208, on the pins closest to memory sockets.

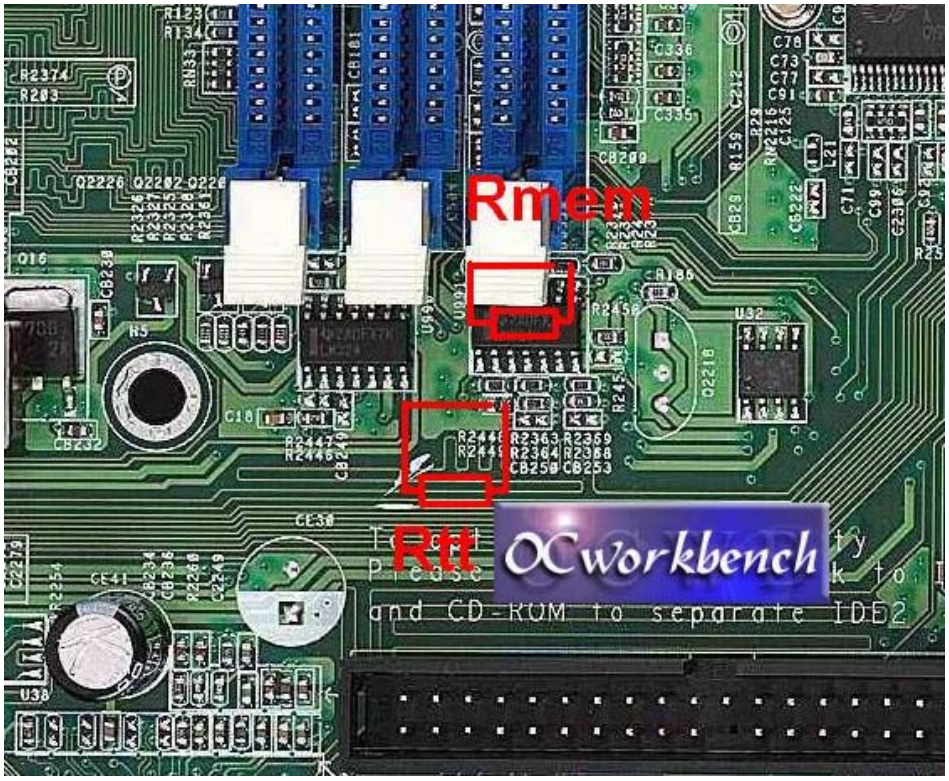


The mod:

Below you can find resistor pairs calculated in such a way, that the memory voltages are within specs. Just solder them as shown at the picture below: resistor Rmem in parallel to R2370, and Rtt in place of R2449 (the resistor wasn't factory installed)

Vmem=2.7V -> Asrock did it for you :-)
Vmem=2.8V -> Rmem=2.2k Rtt=8.2k
Vmem=2.9V -> Rmem=1k Rtt=6.2k
Vmem=3.0V -> Rmem=680 Rtt=5.1k

If you want to use pots - no problem. Just remember, that Vtt has to be Vmem/2 (1.4V/2.8V; 1.45V/2.9V etc) so adjust them that way checking your voltages at the points shown above, with a multimeter.



Vchipset mod

Vchipset can be measured at the point indicated as Vchipset (see picture below) and is 1.8V by default. Vchipset regulator is made using the Q16 transistor and some of the op-amps from the two LM324 located under the memory slots.

Vchipset. is determined by 2 resistors, R2368 (390) and R2369 (1k) and the reference voltage comming from the LM431 chip.
If you did the Vref mod, your chipset voltage is already higher! Use the new Vref voltage in the equation below!

Vchipset=Vref*(R2369/(R2369+R2368))

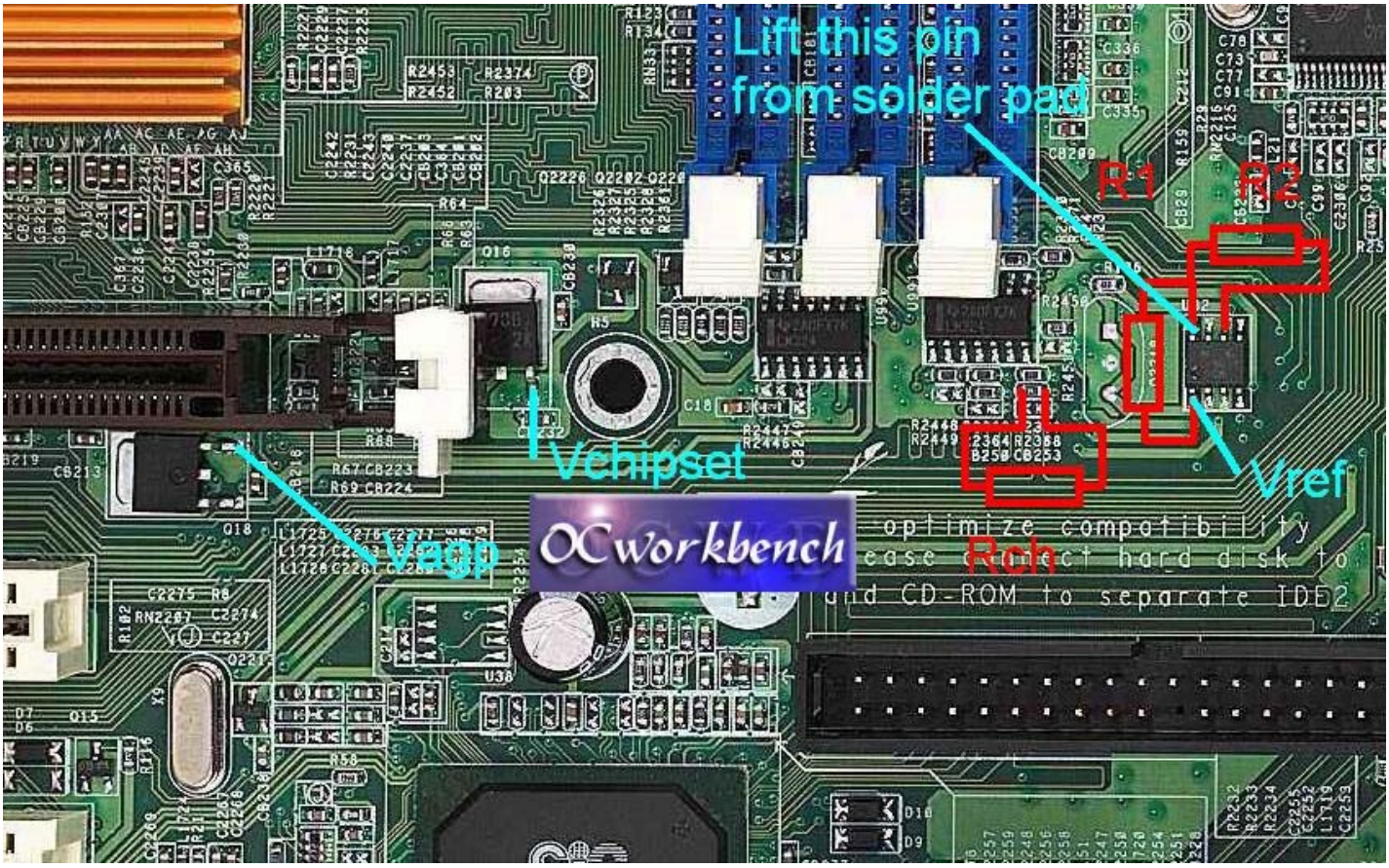
If Vref=2.50 (default value) then Vchipset=2.5*(1000/(1000+390))=1.798V

To increase Vchipset you have to solder a resistor Rch in parallel with R2368. Calculate the resistance of the two parallel resistor and put it in the equation above as R2368, and you will know, what your voltage will be.

Below you can find resistor values already calculated for you:

Vchipset=1.9V -> Rch=1.5k
Vchipset=2.0V -> Rch=680
Vchipset=2.1V -> Rch=360
Vchipset=2.2V -> Rch=220

You can also solder a variable resistor 4.7k multipot and adjust the desired value (measure at the Vchipset point).



Vref (Vmem, Vagp, Vchipset) mod

There are 3 important voltage regs on the K7S8X:
- Q14 - 2.70V Vmemory
- Q16 - 1.80V Vchipset
- Q18 - 1.66V Vagp

I further examined Q14, Q16 and Q18. All 3 regulators are made using 2 LM324 IC's (quad op-amps) and a voltage reference LM431 (all located under the memory slots). The easiest way to change all these voltages at once is to change the reference voltage. The reference voltage can be changed by adding 2 resistors around the reference LM431.

Changing the voltage reference results in changing all 3 voltages - Vchipset, Vagp and Vmem! Be careful!

The mod (see picture above):

1. Locate the LM 431 chip.
2. Disconnect pin 8 (Vr) from the PCB by lifting it from the solder pad. Check with an ohmmeter if it is not connected to pin 1 anymore.
3. Solder resistor R1 between pin 1 (Cathode) and pin 8 (Vr). Solder resistor R2 between pin 8 and pin 6 or 7 (Anode - GND).
The output voltage (measured at the Vref point) will be:

Vref=2.5*(1+R1/R2)

When R1=1.8k and R2=30k the resulting Vref=2.65V. That gives 6% increase. **Vmem, Vagp and Vchipset also increase by the same factor** and are:

- Vmem from 2.70V -> 2.87V
- Vchipset from 1.80V -> 1.90V
- Vagp from 1.66V -> 1.75V

I hope you had as much fun doing your mods, as I had inventing them!