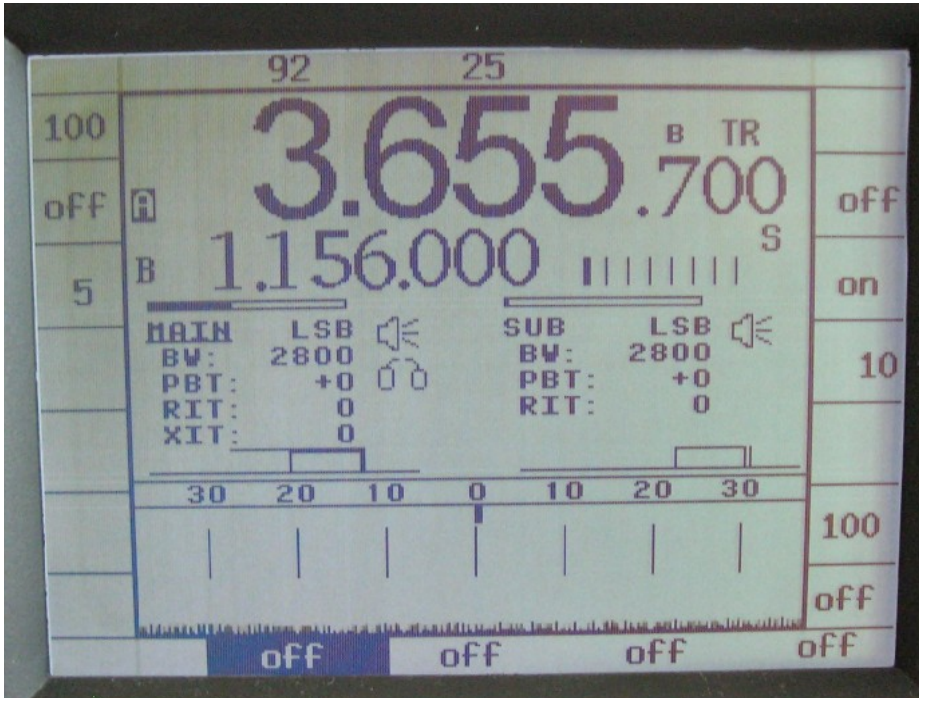
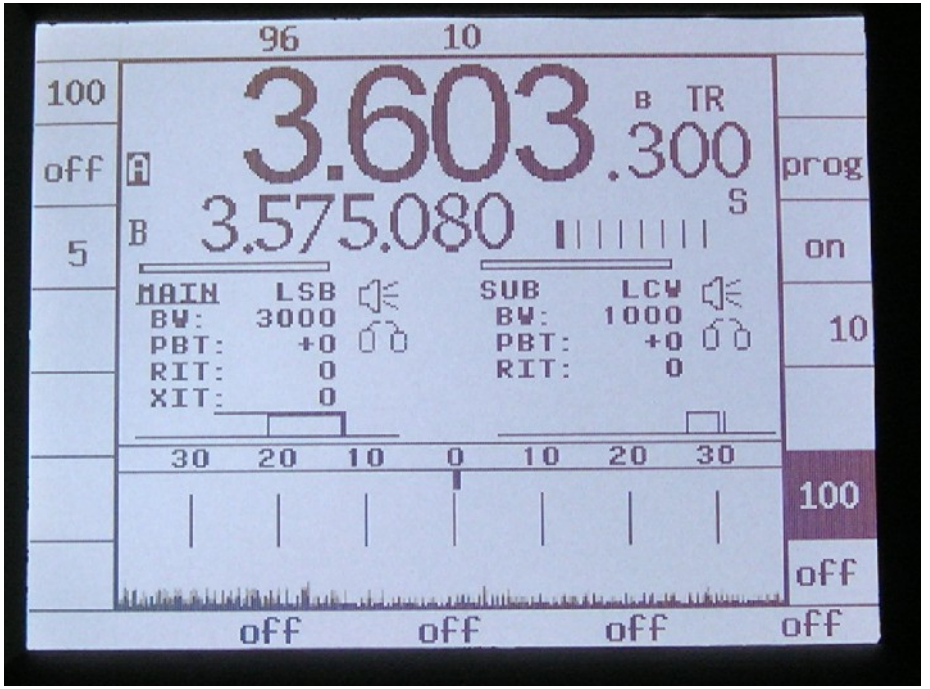
Orion 565 LCD back-light current reduction
-black/white and blue/white LCD-

The LCD saturation challenge



Prior current reduction:
Pixel saturation causing ghost layer build up. This is after 3-4 hours of operation. At certain point the saturation becomes sticky and contrast adjustment does not help anymore.



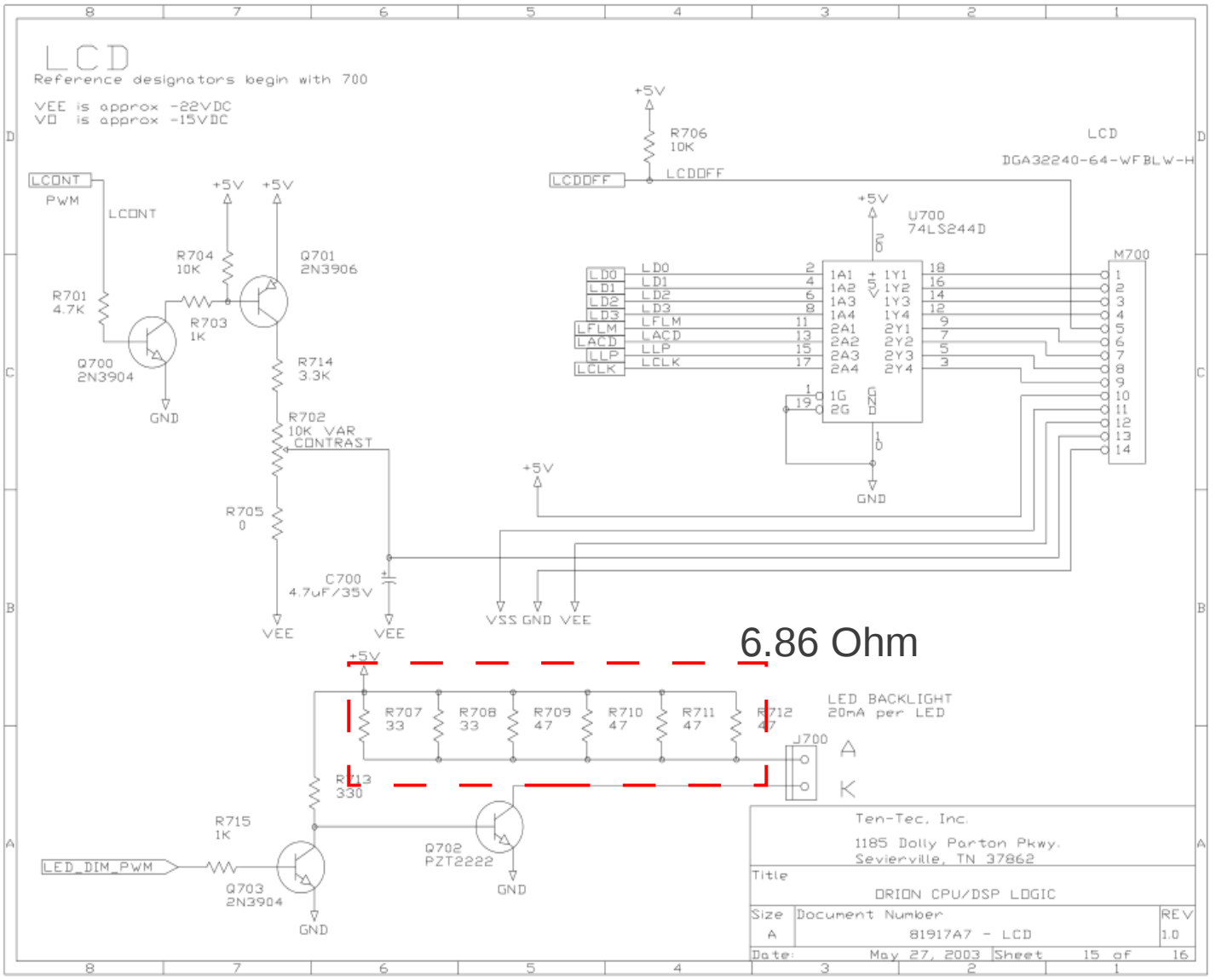
After current reduction:
Cleaner view and pixel saturation does not occur anymore. Picture taken after 3 days operation. Contrast setting variation between cold to warm about 5%.

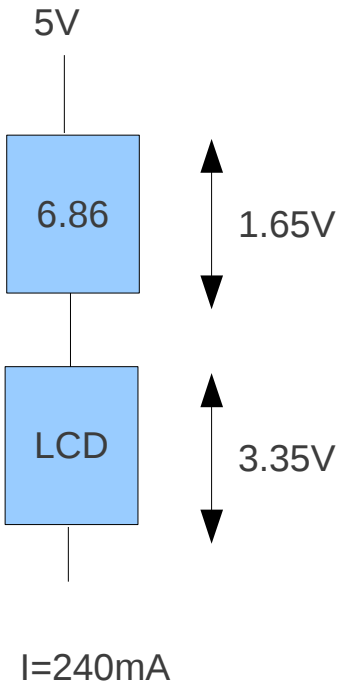
The LCD saturation challenge

- For original and blue LCD pixel saturation occurs after a couple of hours
  - Contrast adjustment helps cooping with the saturation for first couple of hours
  - After a couple of hours the LCD crystals change transparency which results in ghost layer build up
- Besides insufficient cooling of the LCD back panel the current through the back-light LEDs is higher than needed
  - For black/white LCD the maximum current is unknown
  - For Blue/white LCD the maximum current is 200mA and nominal current 125mA
    - Current design exceeds manufacture specifications
- Reducing back-light current provides:
  - Conformance with LCD specifications (as known for blue/white screen)
  - Reduction of back-light intensity resulting in (more) uniform pixel contrast
  - Reduction of back-light current resulting in less heat generation
  - Pixel saturation did not occur anymore after current reduction

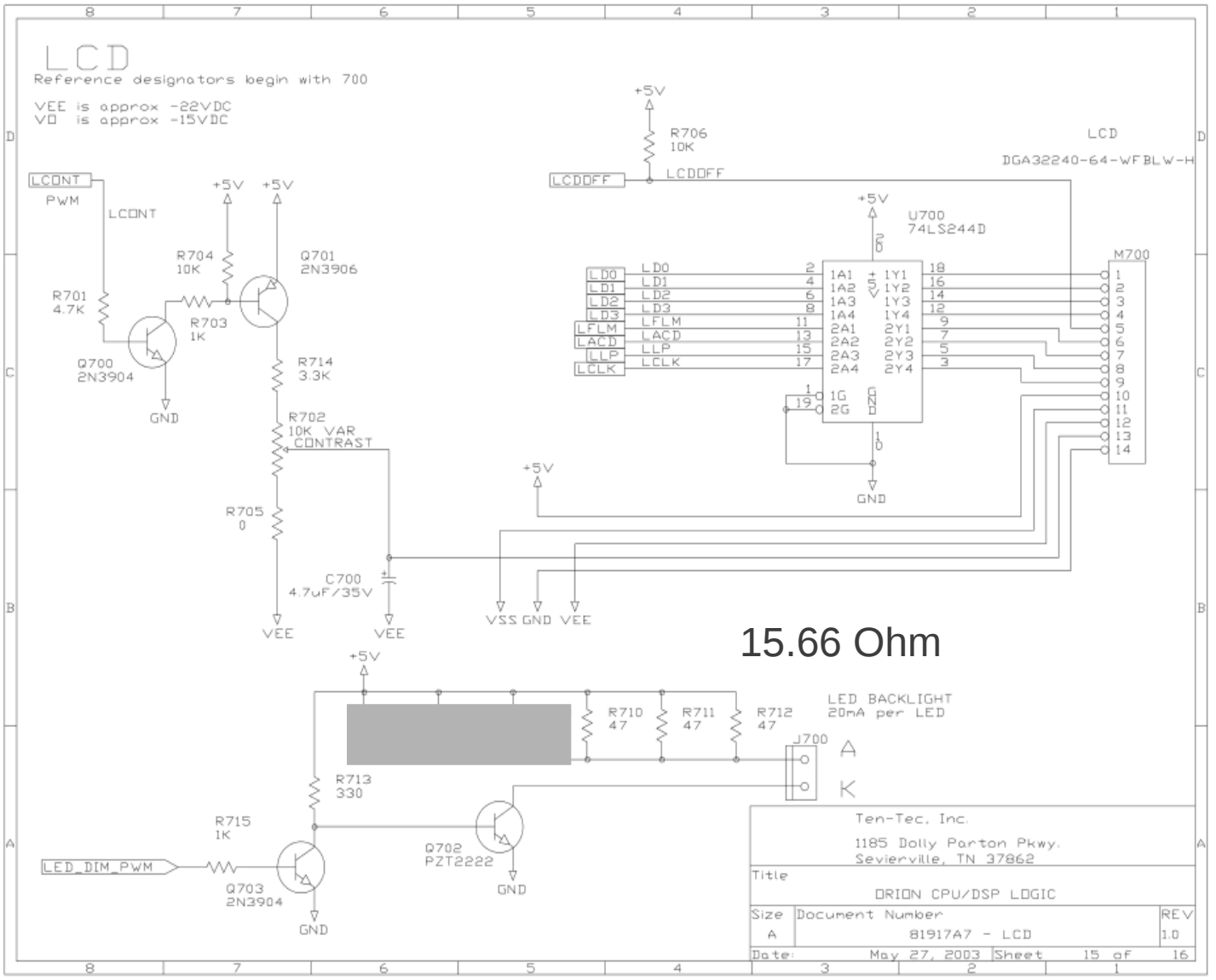
Modification on logic board
-schematic-

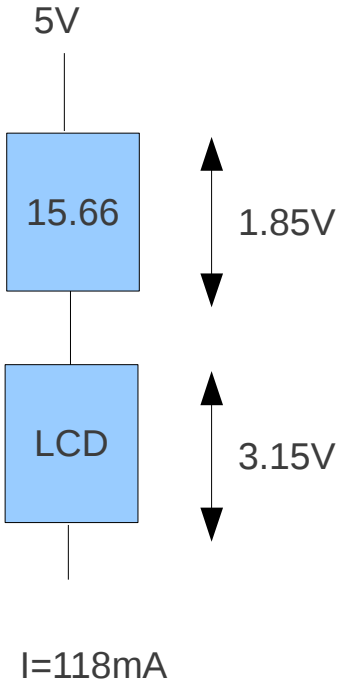
Schematic and calculation





Schematic and calculation (suggested modification)





- SMD resistor power rating;
  - SMD 0805 resistors, max power is 100mW
  - 40mA / resistors => P = 75mW

- Blue/white LCD specifications;

Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		2.7	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	70.0	75.0	80.0	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	22.1	24.0	26.2	V
"H" Level input	VIH		0.8VDD	-	VDD	V
"L" Level input	VIL	-	-0.3	-	0.2VDD	V
"H" Level output	VOH	-	VDD-0.4	-	VDD	V
"L" Level output	VOL	-	-	-	0.4	V
Backlight Supply Voltage	VLED		3.4	3.5	3.6	V
Backlight Supply Current	ILED	VLED=3.5V	115.2	128	200	mA
Backlight Lifetime		ILED=128mA	-	50,000	-	Hrs

Modification of back-light wire (option 1)

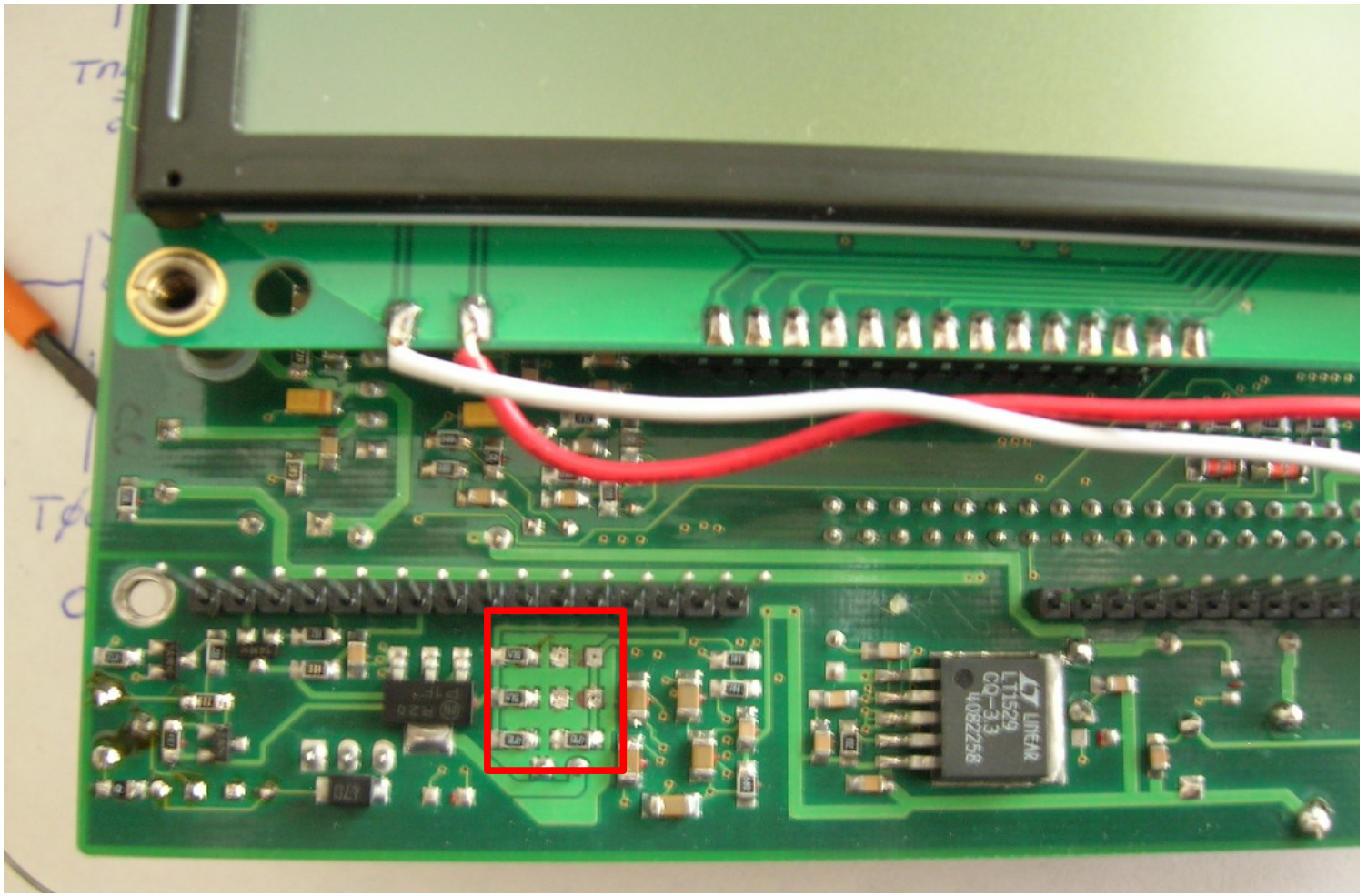
Including resistor into back-light wire

- Including an eight (8) ohm resistor into the back-light wire would reduce the current to around 120mA
- Simply cut the red wire and include the resistor

- Alternative could be to provide a back-light male / female cable which includes the resistor

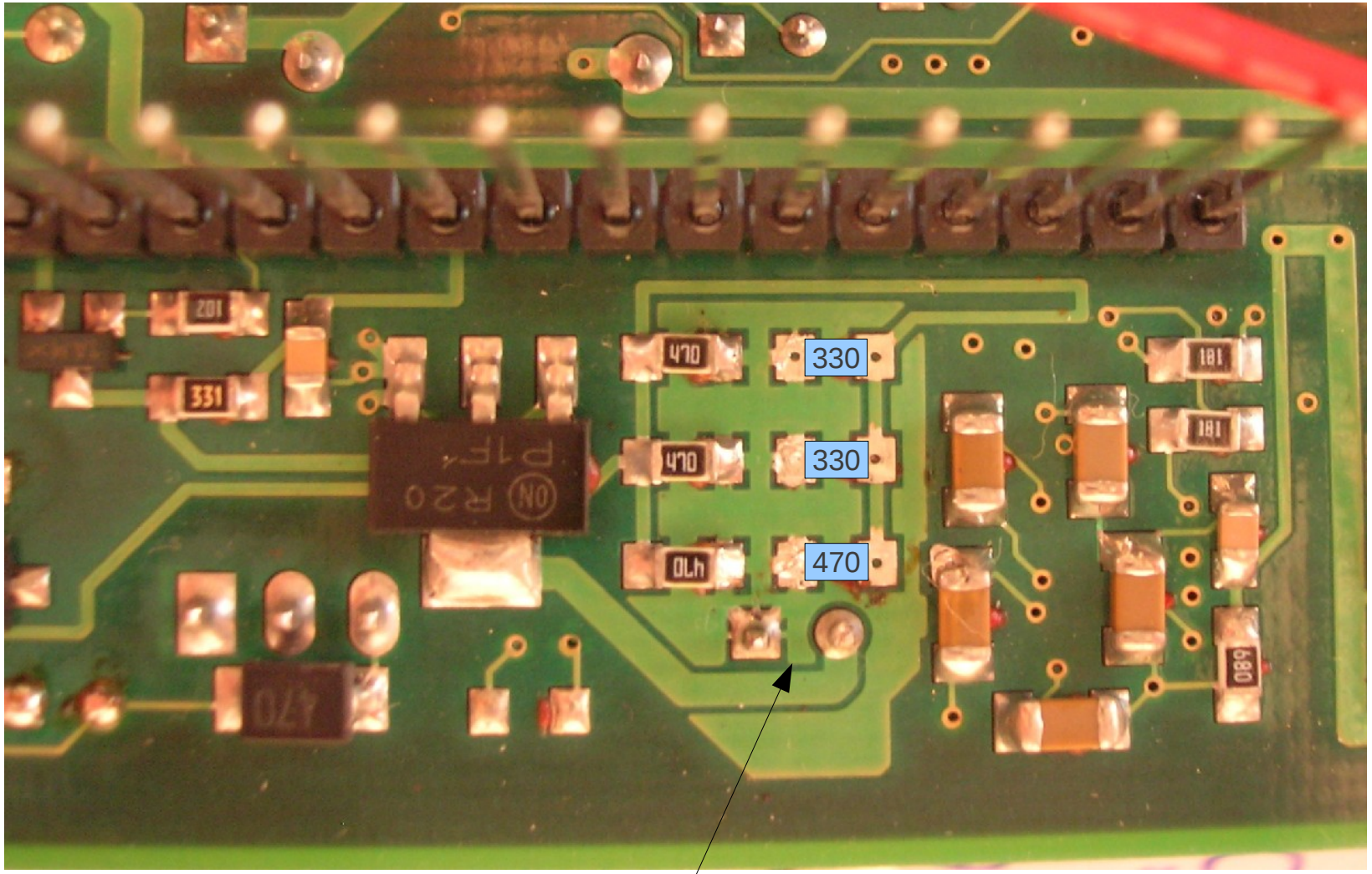
Modification on logic board (option 2)
-pictures-

Location of resistors



Picture illustrates removal of the 33 Ohm resistors only. Final change includes removing additional 47 Ohm resistor

Remove the blue resistors



Thank you