

Optimized LVPS Brick v6.5.3 Reconstruction For Technicians.

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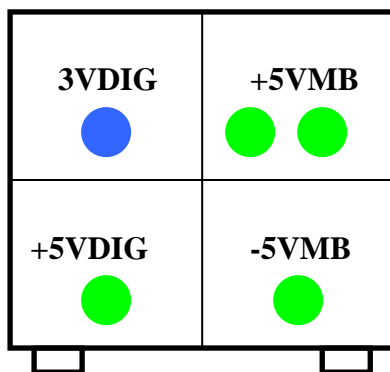
INTRODUCTION – LVBOX ASSEMBLY

There are 8 DC/DC modules – bricks inside of ATLAS/TileCal low voltage power supply (LVBOX):

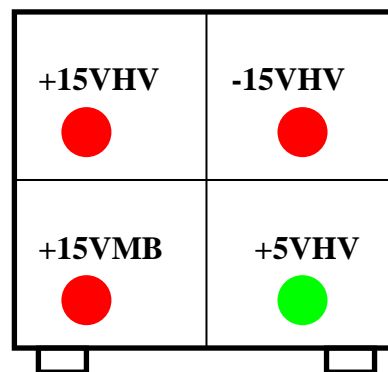
1x 3.3V	3.3VDIG	(blue sticker ●)	Id: Bxxxx
4x 5V	5VDIG	} (green sticker ●)	Id: Gxxxx
	-5VMB		
	+5VMB		
	+5VHV		
3x 15V	15VHV	} (red sticker ●)	Id: Rxxxx
	-15VHV		
	+15VMB		

All bricks follow almost the same reconstruction procedure. The modifications are specifically indicated when the changes are different brick to brick position.

Pic1. Brick positions on water cooling heat sink and their color labeling inside of LVBOX.



Top side heat sink view

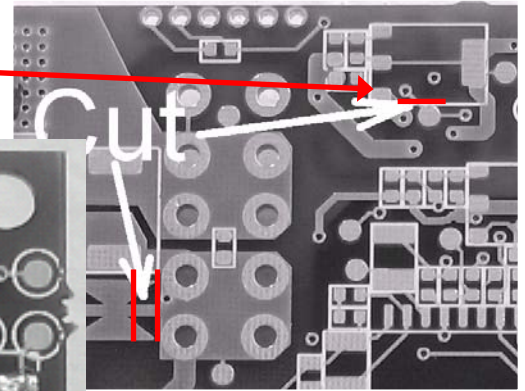
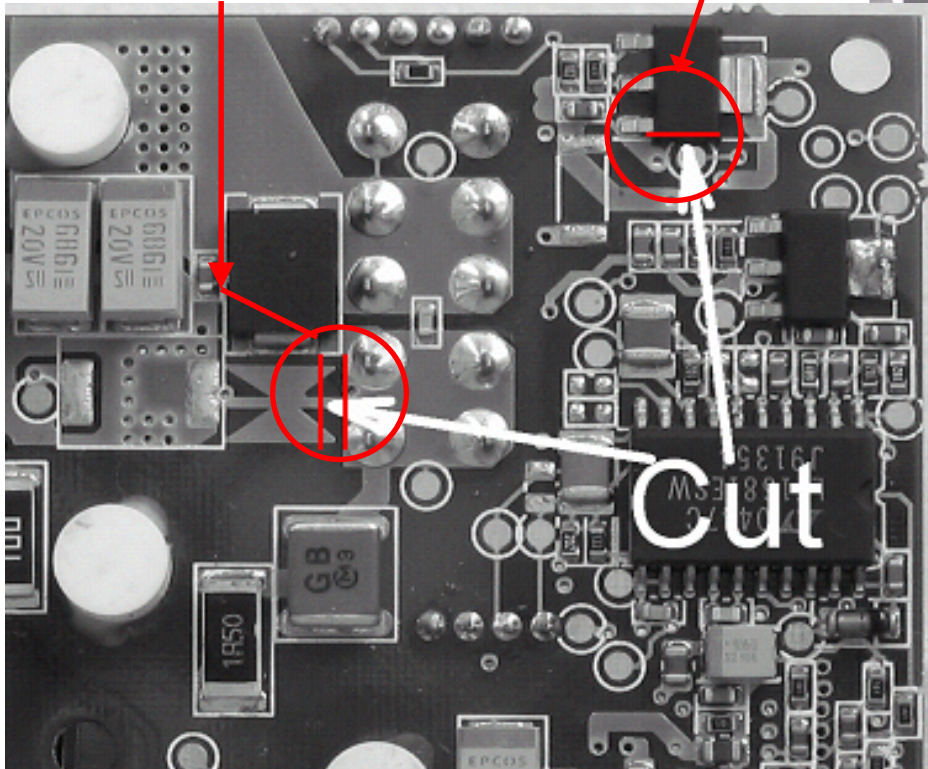


Bottom side heat sink view

BRICK RECONSTRUCTION v6.5.3

1. PCB TRACE CUTS ON BOTTOM SIDE (Pic2):

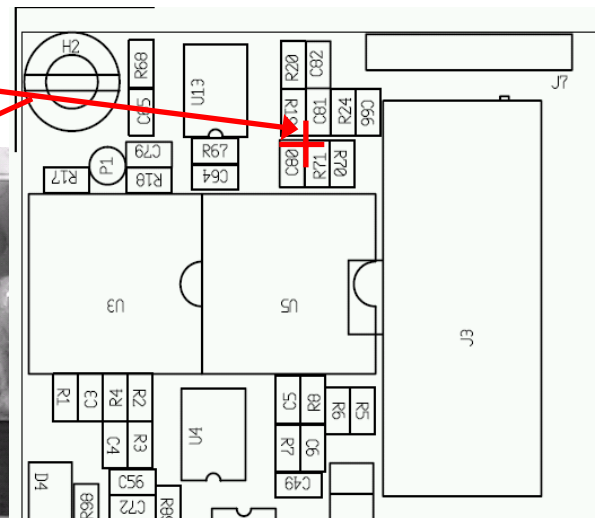
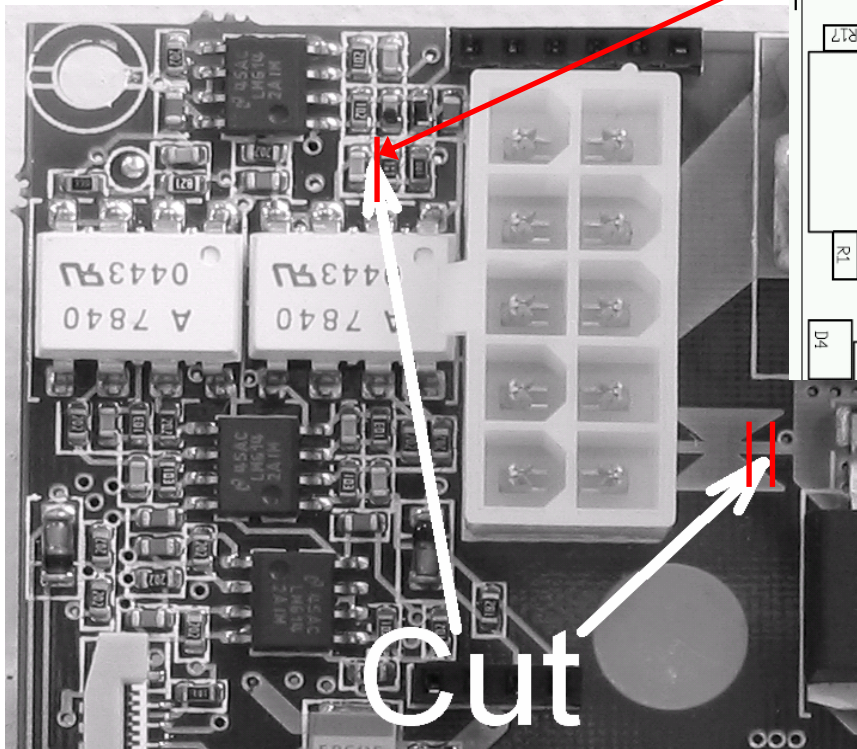
- (A) Between test point T15 and pin 1 of U13,
- (B) "Butterfly" Isense resistor on bottom side.



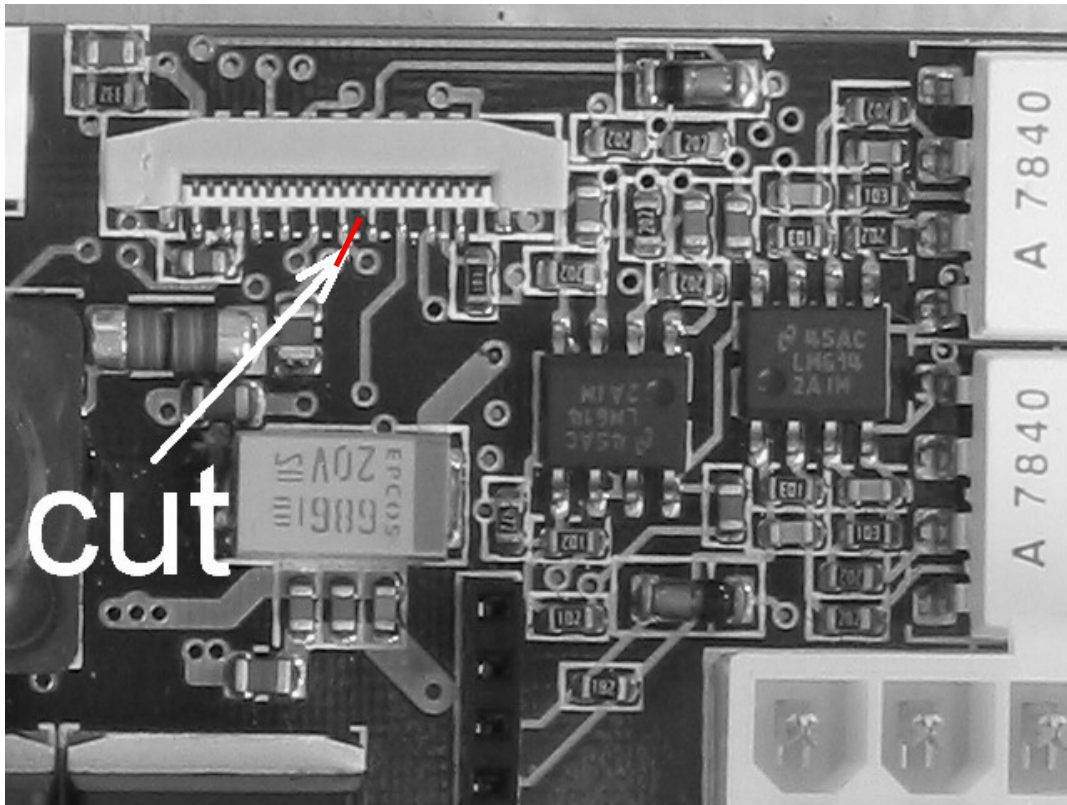
Bottom naked pcb view.

2. PCB TRACE CUTS ON TOP BRICK SIDE (Pic3):

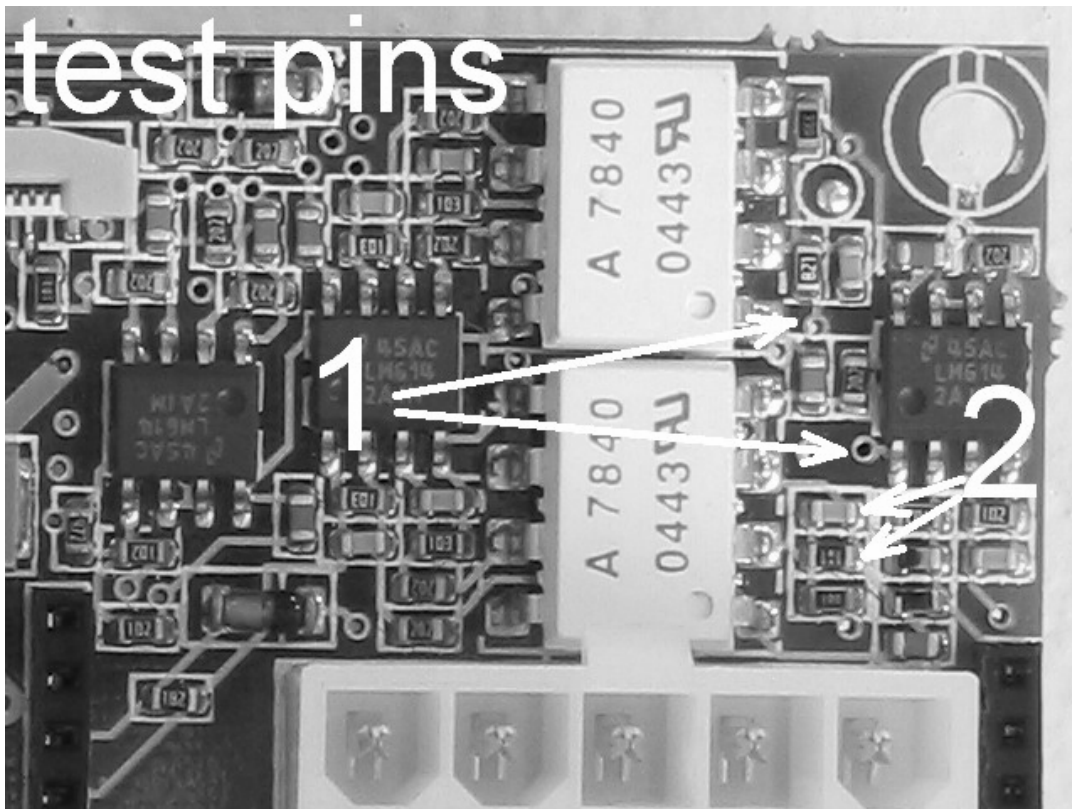
- (A) between GND pins R71 and C80,
- (B) Second "Butterfly" Isense resistor on top pcb side.



- (C) Cut trace between pin 11 of J2 connector and via hole on top pcb side (Pic4):



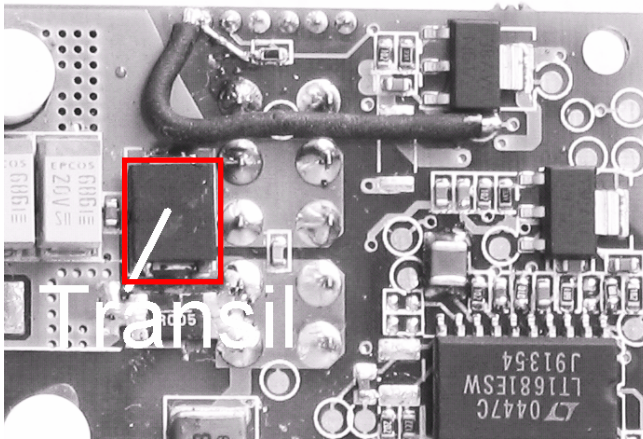
When procedures 1 A, B, and 2 A, B, C are done, check and measure following test pins with an Ohm-meter. There should be non-zero resistance (~100ohm) when measure points 1 and 2 on top side, see in Pic5.



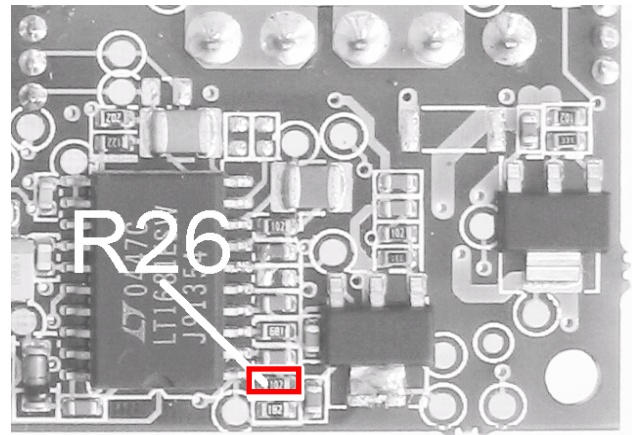
Pic5.

3. REMOVE COMPONENTS FROM BOTTOM SIDE, on all type of bricks.

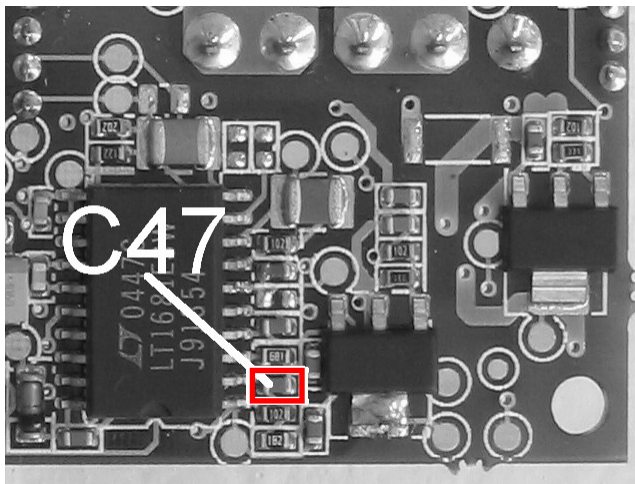
(A) the TRANSIL (diode), Pic6.



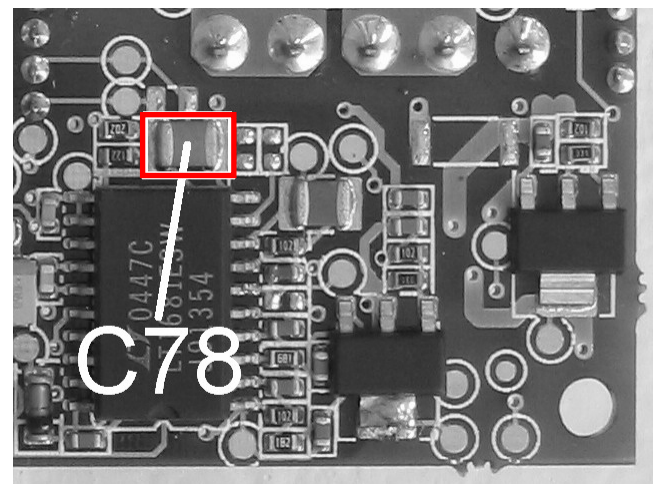
(B) R26 (1kohm), Pic7.



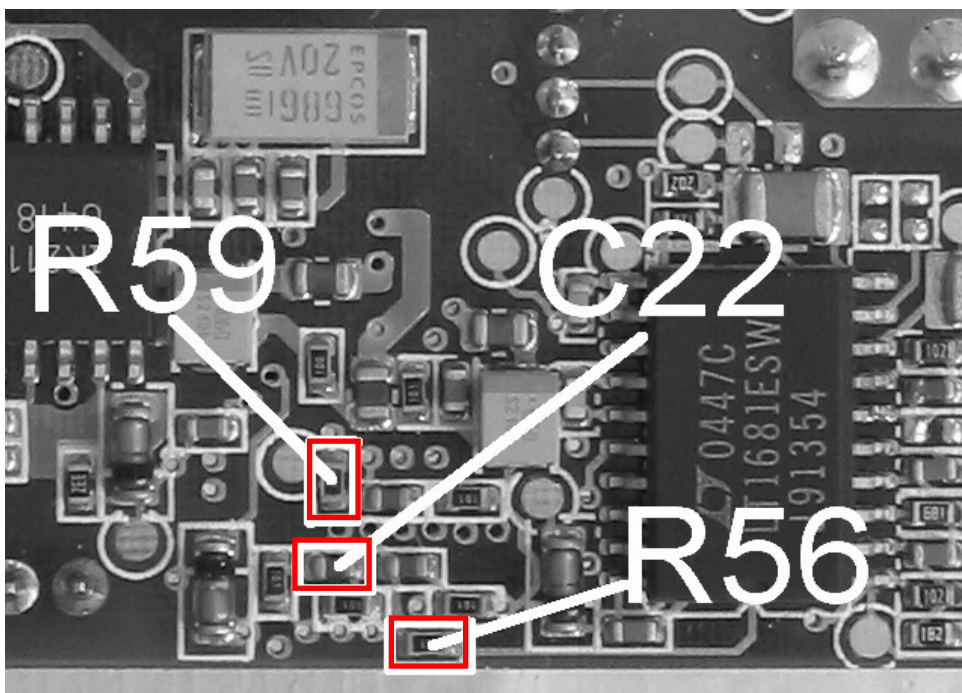
(C) Remove capacitor C47 (100nF), Pic8



(D) Remove capacitor C78 (100nF), Pic9.

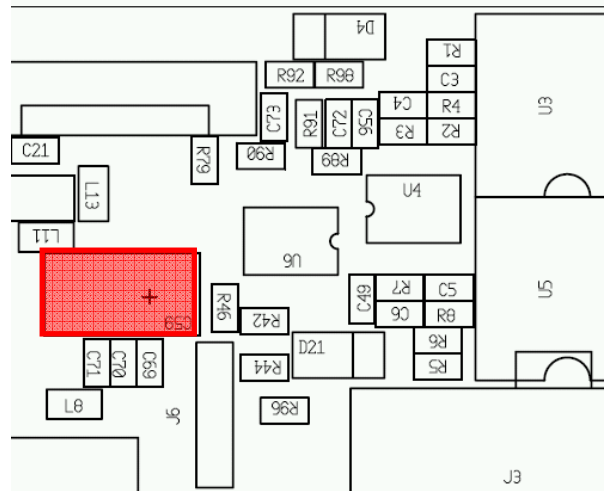
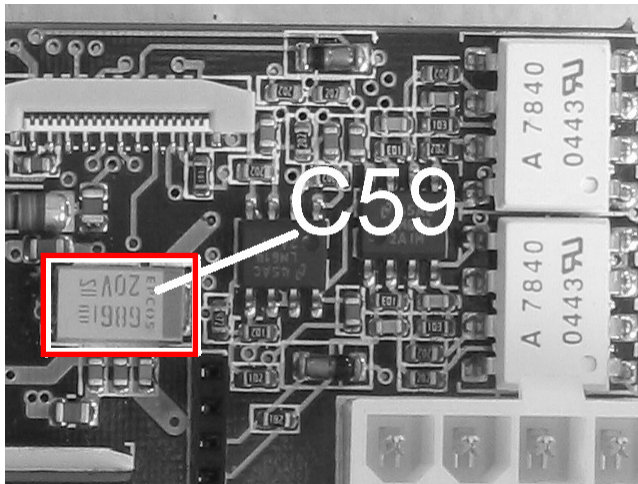


(E) Remove components R59, R56 (100 ohm), and capacitor C22 (47nF), bottom side, Pic10.

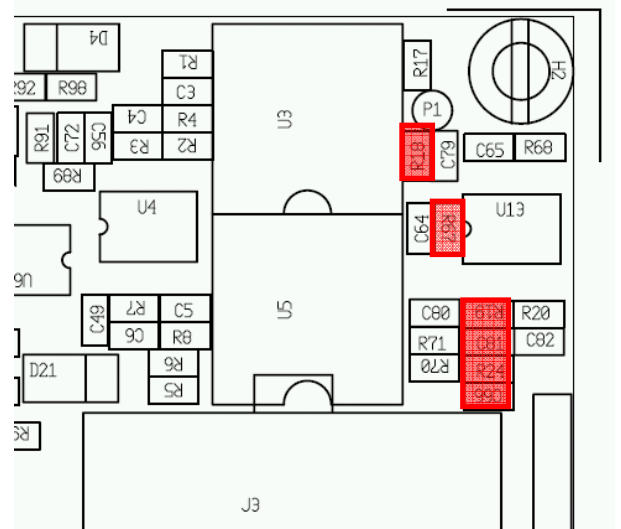
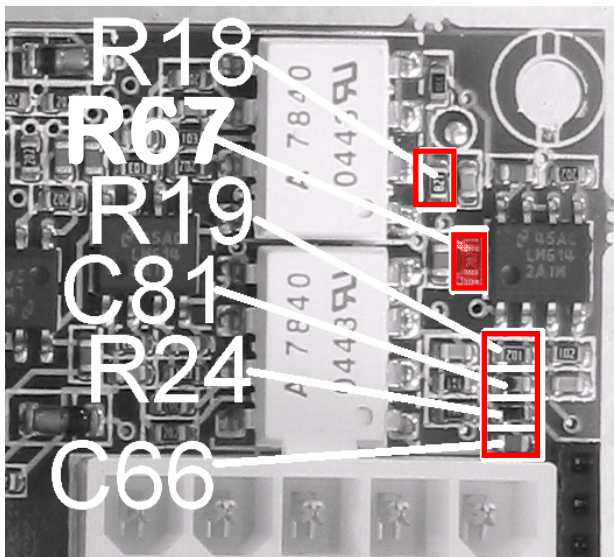


4. REMOVE COMPONENTS FROM TOP PCB SIDE:

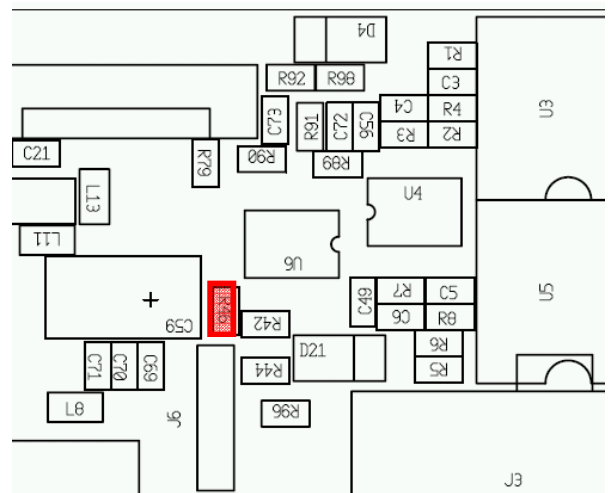
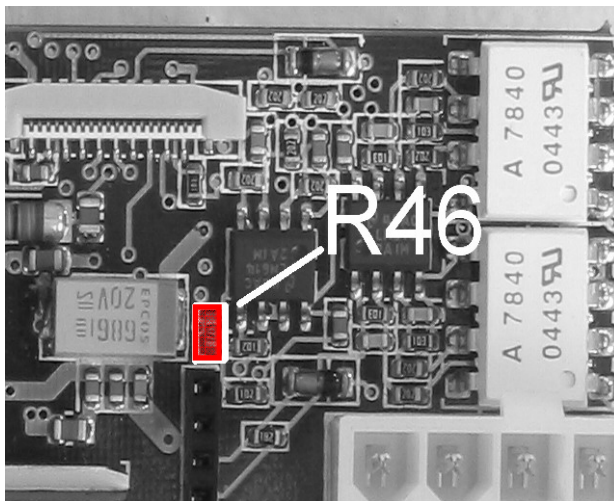
(A) Remove C59 (68uF), Pic11.



(B) Remove R18, R67, R19, C81, R24, C66, Pic12.



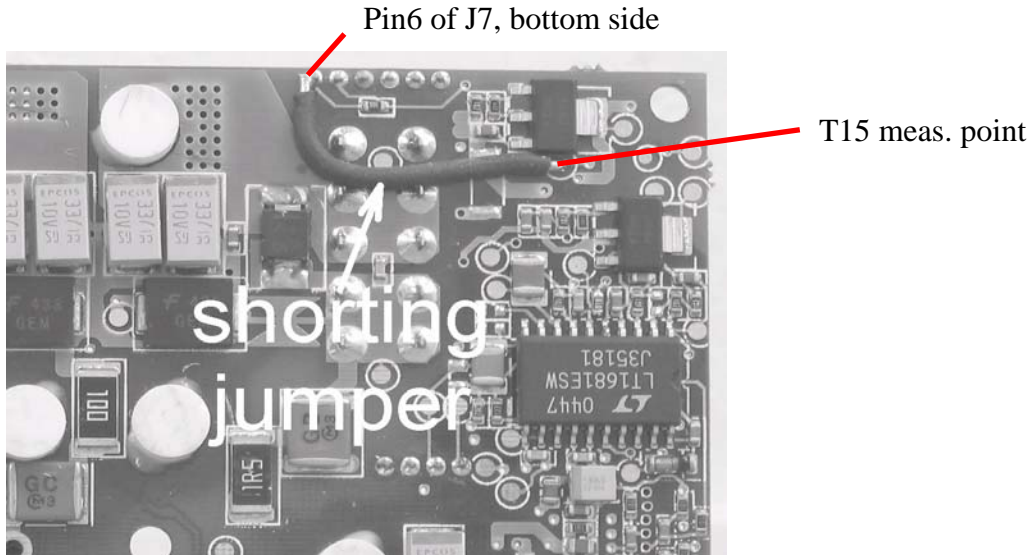
(C) MODIFICATION FOR ONLY 15V BRICKS!!!, Remove resistor R46 (4k7), Pic13.



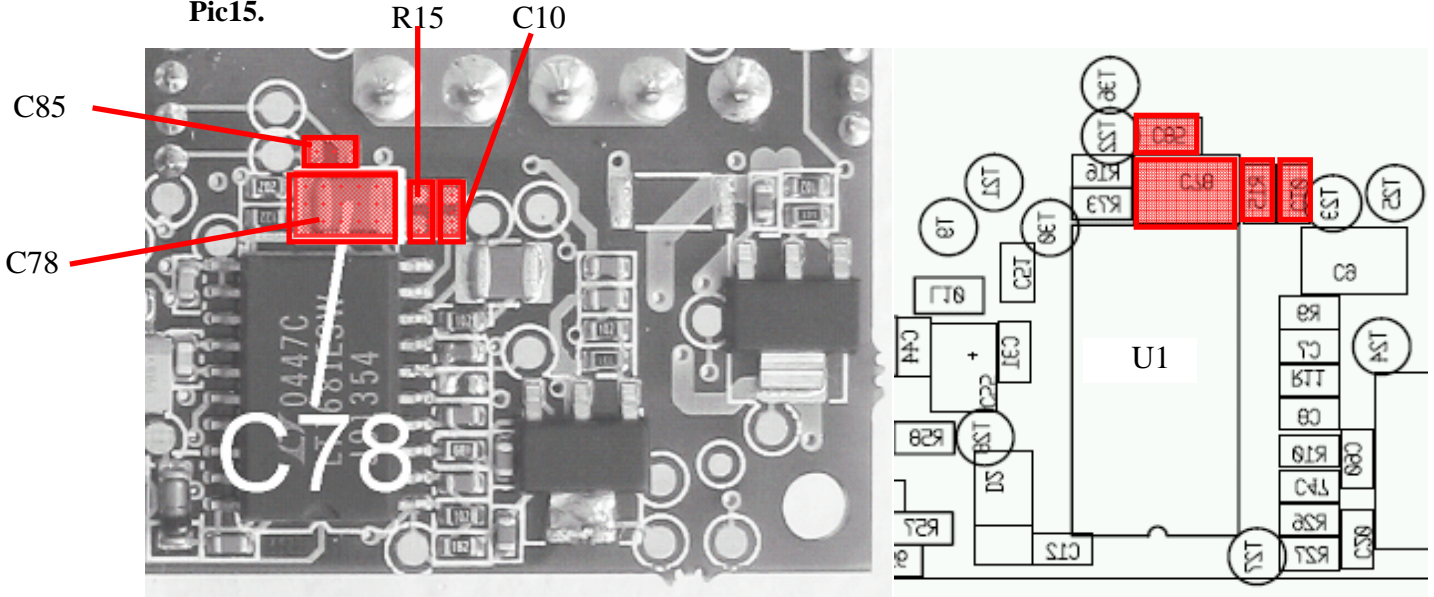
5. SOLDERING ON BOTTOM BRICK SIDE

(A). Prepare 8 pieces of 30 mm wire with isolation.

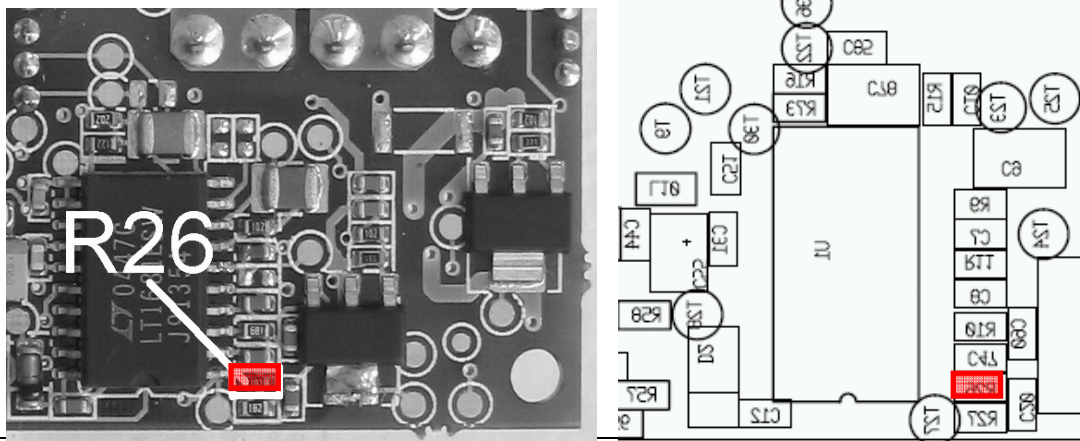
(B) Solder wire connection between pin6 of J7 connector and measuring point T15 as shown in Pic14.



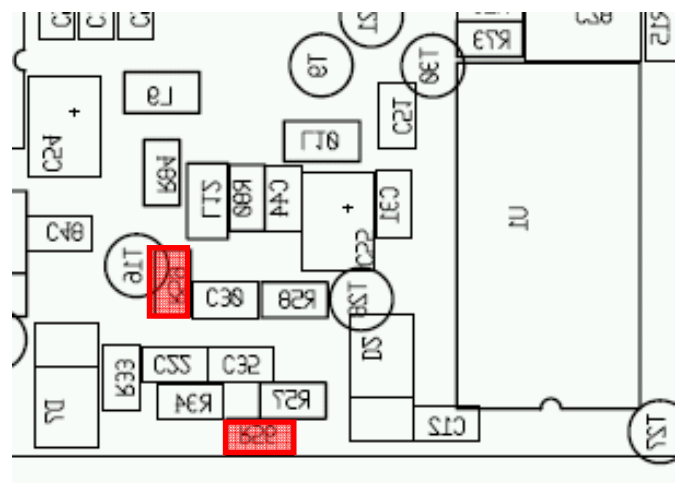
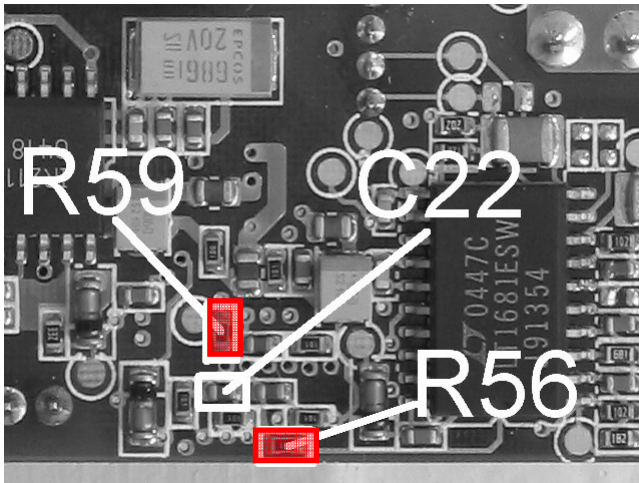
(C) Solder C78= 33nF (size 1210) or C85 with the same value (size 0603), solder R15= 3k3 size 0603, solder C10 = 200nF size 0603. Capacitor C78 was removed before in procedure 3D. Pic15.



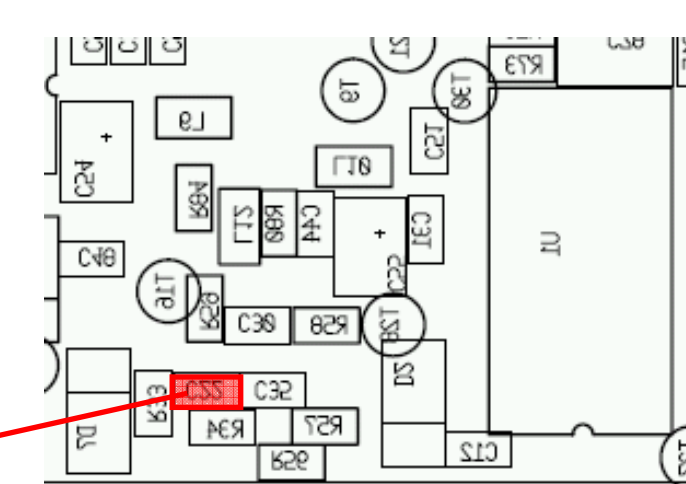
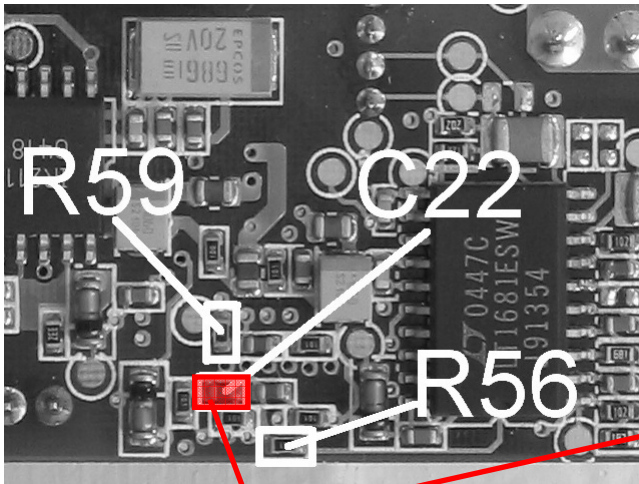
(D) Solder R26, size 0603, 1.5kohm, 1%, Pic 16.



(E) Solder resistors R59 and R56 (size 0603, 1%, value 10kohm), Pic17.



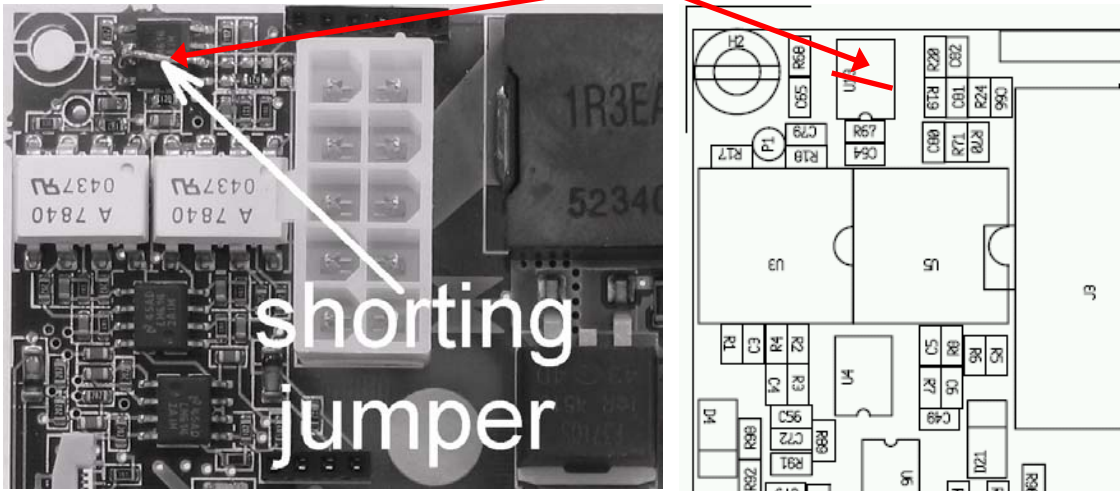
(F) Solder resistor 3.6kohm, 1%, size 0603, in the place of C22 capacitor, bottom pcb side, Pic18.



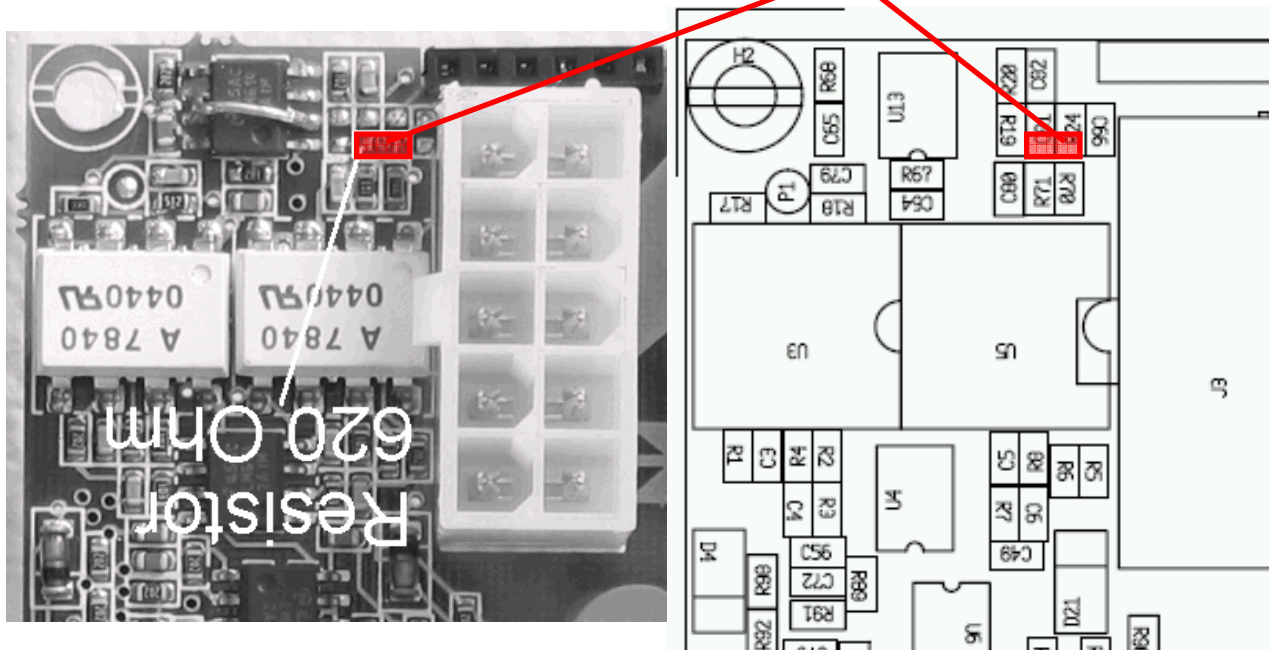
Solder new resistor 3.6kohm

6. SOLDERING ON TOP PCB SIDE

(A). Solder short connection between pins 7,6 and 2 of the U13 opamp, Pic19.



(B) Solder one new resistor in the place indicated in Pic20, 620 ohm resistor, 1%, 0603.



(C) Solder new resistors R18 from Table1 and R67 from Table2 on top pcb side, Pic21.

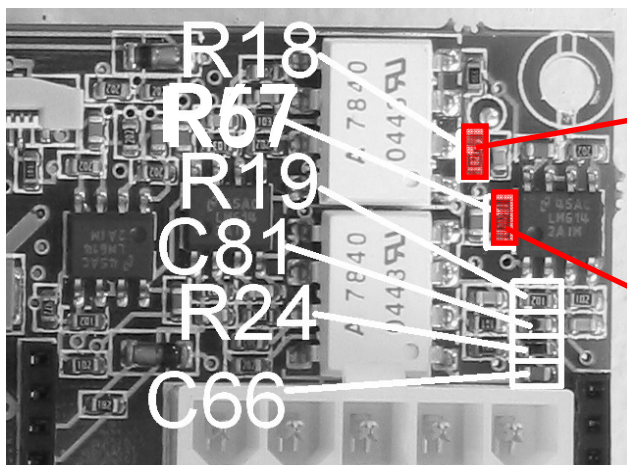


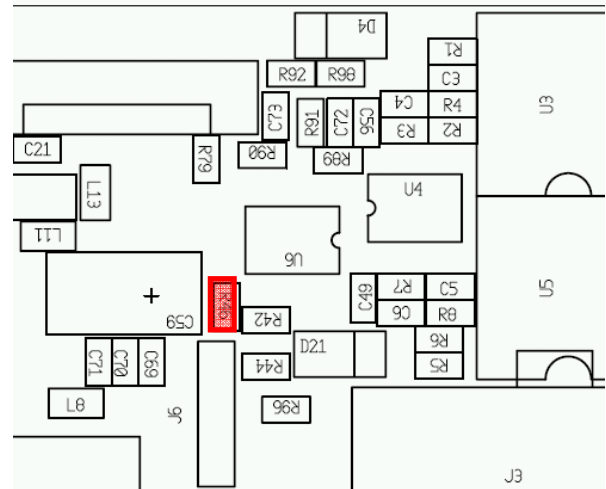
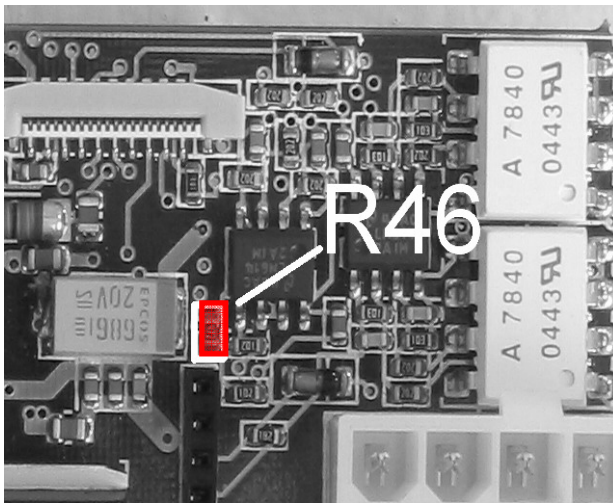
Table1.

Brick's type	R18(new value)
3.3V	1.1k
5.0V	1.8k
15.0V	5.1k

Table2.

Brick's type	R67(new value)
3.3V	1.1k
5.0V	1.3k
15.0V	1.8k

(D) MODIFICATION ONLY FOR 15V BRICKS: Solder new resistor R46 – 7.5kohm, 1%, 0603, Pic22.



7. START UP SEQUENCE AND OverCurrent Protection (OCP) of bricks.

(A) Change C9 SMD capacitor on bottom side by value from Table3, Pic23:

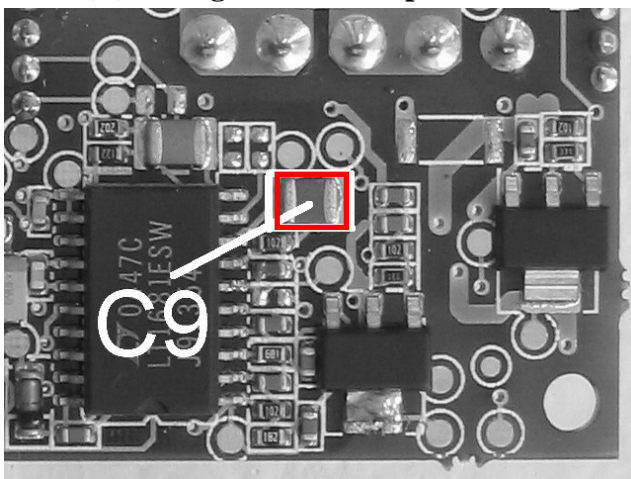


Table3.

Brick type	Value C9	Start group
-5V MB	1.0uF	1
+15V MB	4.7uF	2
+5V MB	10uF *	3
+3.3V DIG	4.7uF	2
+5V DIG	10uF *	3
-15V HV	1.0uF	1
+15V HV	4.7uF	2
+5V HV	10uF *	3

* original value, does not need to be changed

(B) Solder new Isense-resistor (instead of “Butterfly” pcb trace on the bottom pcb side) by Table 4, SMD type, 2512 size, 1%, Pic24:

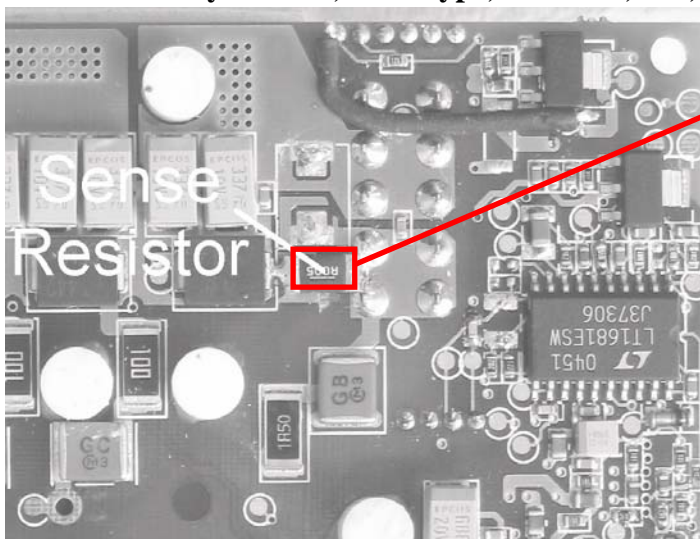


Table 4

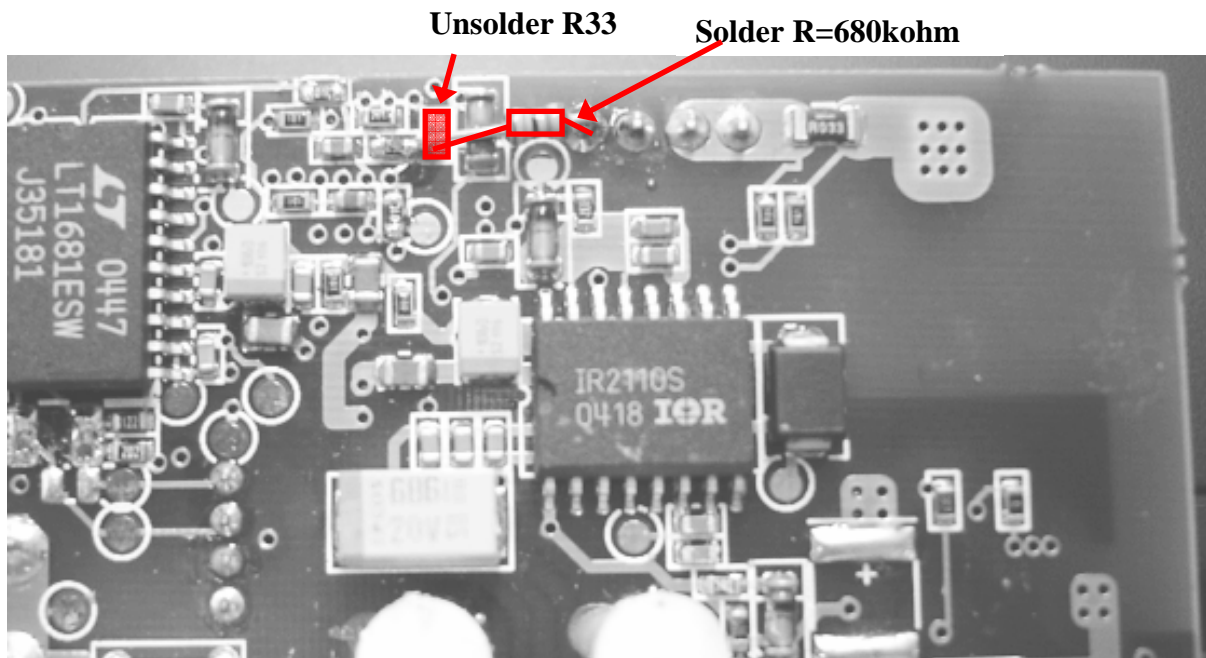
Brick type	Isense-resistor	OCP [A]
-5V MB	3mOhm	13
+15V MB	22mOhm	2
+5V MB	2mOhm	18
+3.3V DIG	3mOhm	13
+5V DIG	3mOhm	13
-15V HV	10mOhm	4.5
+15V HV	22mOhm	2
+5V HV	22mOhm	2

8. Additional 200V divider for V input (200Vdc) brick measurements:

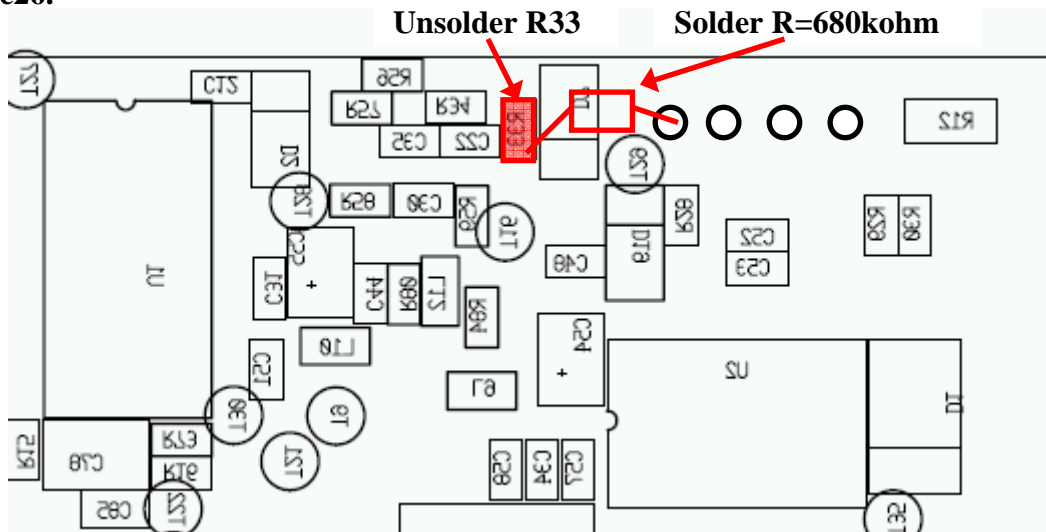
(A) Unsolder R33 resistor (100R) on bottom pcb side.

(B) Solder new wired resistor of 680kohm (rated for 300Vdc, 1%, 0.25W) between +200Vdc inputs (bottom side of connector J1) and a pad of unsoldered R33, see Pic25 or Pic26.

Pic25. Bottom side photo.

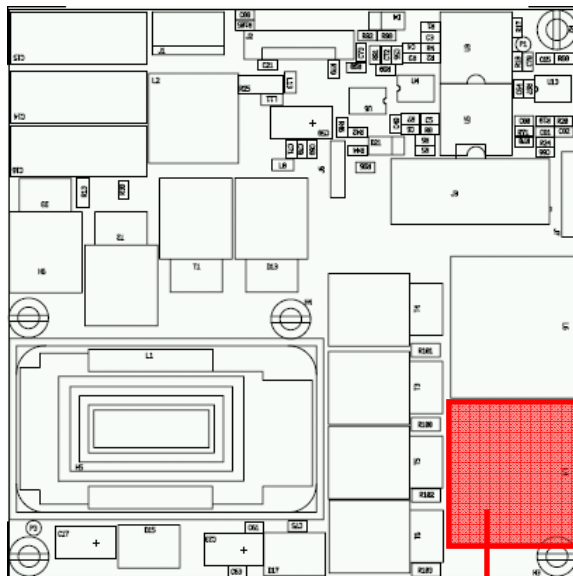


Pic26.

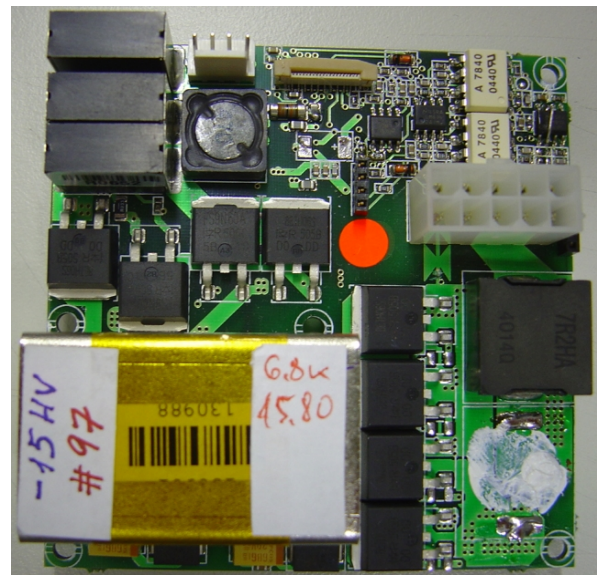


9. L4 inductor change in 3x15V and 5VHV bricks

(A) Unsolder SMD power inductor L4 on top side in all 15V bricks and 5VHV brick, Pic27.



L4



Unsoldered L4 on 15V brick.

(B) Solder new L4 value for 15V and 5VHV according to the Table4.

Table 5. New inductor L4 values.

Brick	L4 [uH]
3VDIG	stay same
5VDIG	stay same
5VMB	stay same
-5VMB	stay same
5VHV	47
15VHV	150
15VMB	150
-15VHV	150

10. Resistive Preloads for 3x15V and 5VHV bricks inside LVBOX

- (A) This procedure is made when all modifications described in this document are finished, bricks are tested and ready for assembly inside of LVBOX.
- (B) Preload resistors are connected directly on Vout connector between positive and return pins. All resistors have the same value of 47ohm, power resistor in TO220 package, rated for 20Watts, see Table 6, Pic28.
- (C)

Table 6. Preload resistors for 15V and 5VHV bricks.

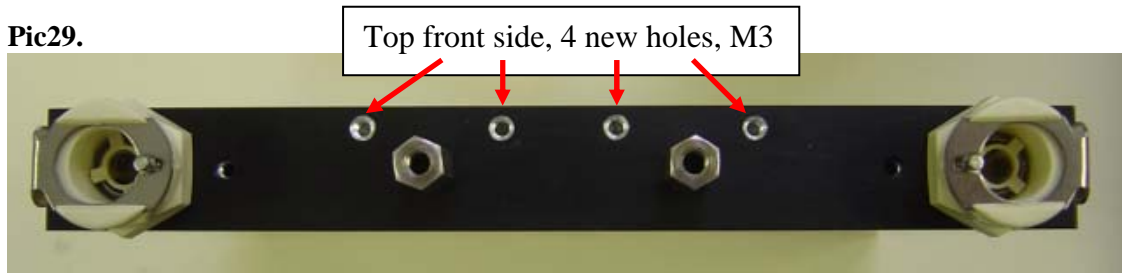
Brick	Iout_range [A]	Preload [Ohm]
3VDIG	1.7 - 5.6	No
5VDIG	3.3 - 6.7	No
5VMB	6.6 - 13.3	No
-5VMB	3.3 - 6.7	No
5VHV	0.1 - 0.3	47
15VHV	0.15 - 0.4	47
15VMB	0.2 - 0.6	47
-15VHV	0.15 - 1.9	47

Pic28.

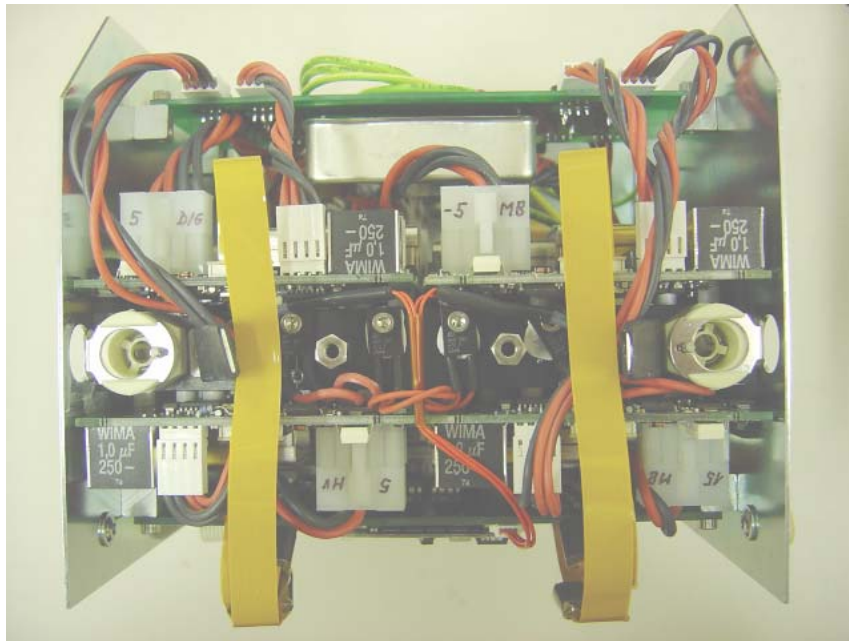


(C) Resistors are mounted on the front of the cooling plate (heat sink) where 4 new screw holes are prepared. See naked heat sink in Pic29, and assembled LVBOX (front side view) with 4 new preloads in Pic 30.

Pic29.



Pic30. Assembled LVBOX with 4 new R preloads for 3x15V and 5VHV bricks.



Comments are welcome to bpalan@cern.ch.