

Modify TL-922

I hope this article might be useful to all whom have burn the switch band of TL-922. As most of you knows the switch-band is no longer available in the market. When I learned from internet that someone has substituted the switch-band with a Vacuum-Relais I decided to try this. I bought a dozen of Kilovac HC-1.



Fig. 1 - Kilovac HC-1

This is the component to be blamed for the damages to the switch band.

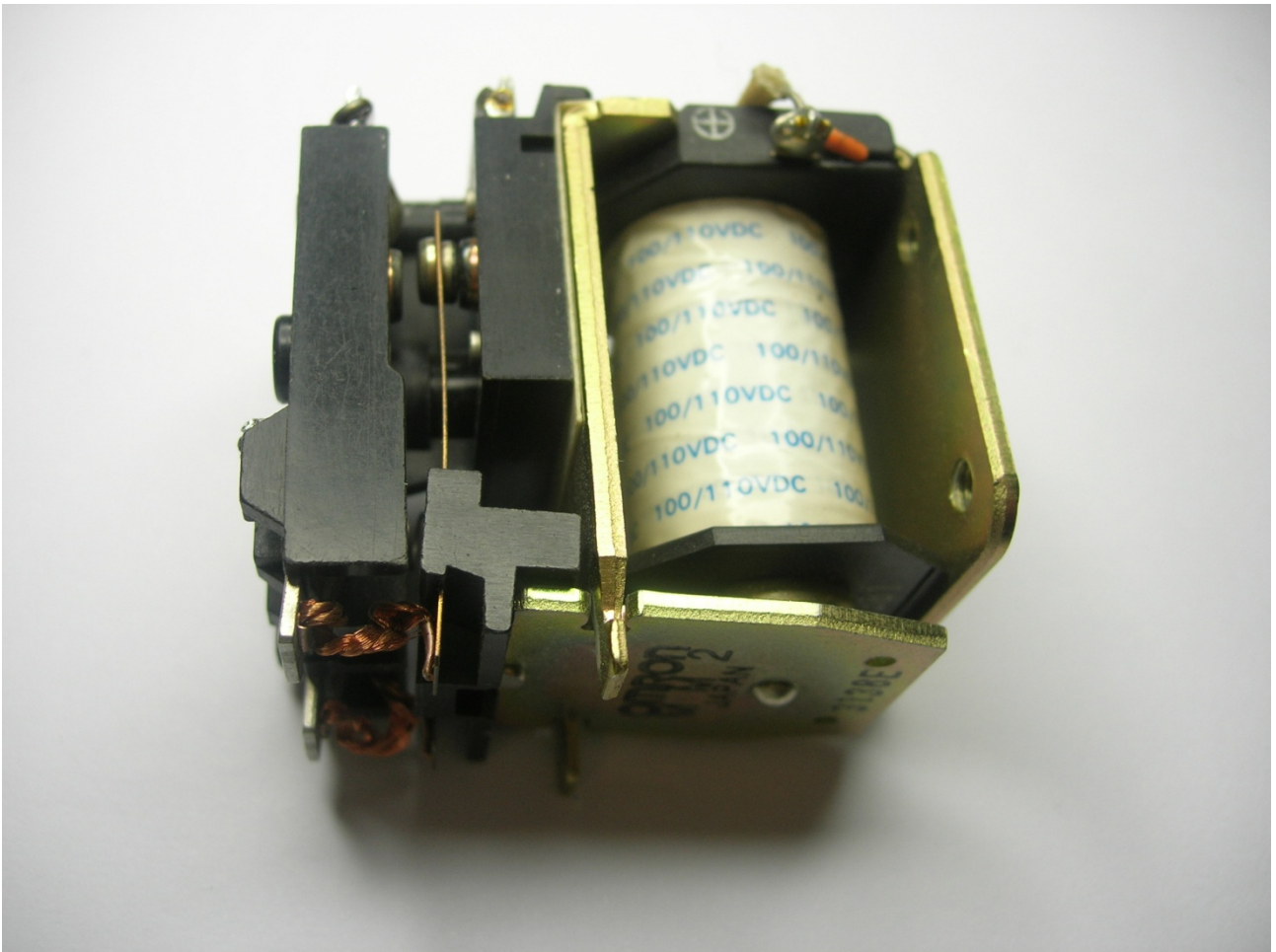


Fig. 2 – Antenna relais

I have noted some signs of burning on the contacts and when I tried to activate it manually I noted that first the first it was closed the ingress contact and then that of the antenna. This means that the power was not sent directly where needed and the contacts of the switch band were burned. Had I changed this with two Vacuum-Relais I would have immediately resolved the problem.

I strongly recommend this change to all owners of TL-922. It does not cost a lot and resolve many problems of this amplifier.

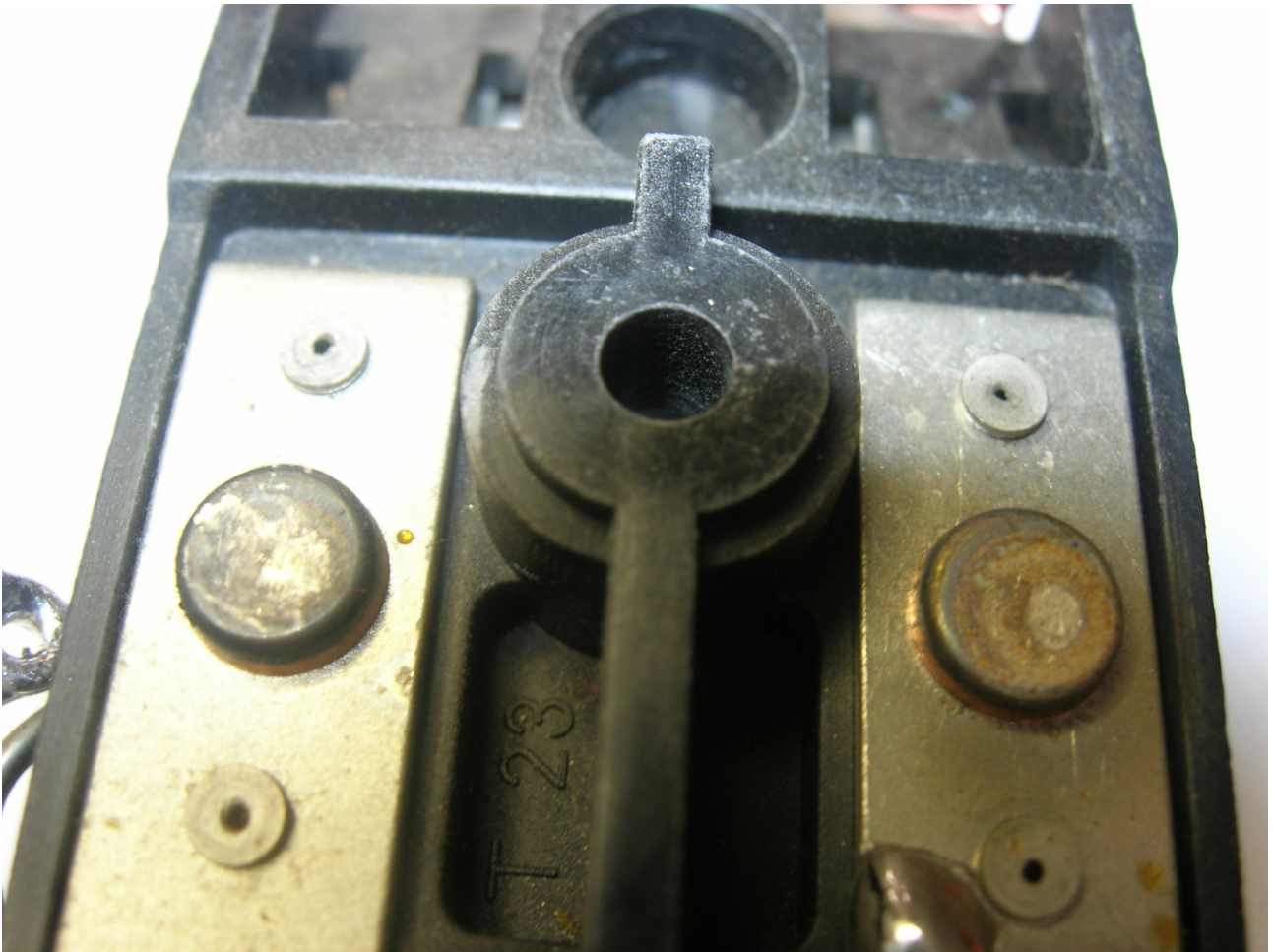


Fig. 3 - The contacts of the relè

Obviously if you do not use it will have no problems but just try to turn it on and you will see.



Fig. 4 –Another view of the contacts of the relè

First of all you will have to understand how it works the switch between the coils the additional capacity band by band. From the scheme it can be understood. I have marked with letters and numbers the connections of the coils and the capacitors and drawn this table.

RELE'	160	80	40	20	15	10	
1	1	0	0	0	0	0	A
2	1	1	0	0	0	0	B
3	1	0	0	0	0	0	C
4	1	1	0	0	0	0	D
5	0	1	1	1	1	1	E
6	0	0	1	1	1	1	F
7	0	0	0	1	1	1	G
8	0	0	0	0	1	1	H
9	0	0	0	0	0	1	I

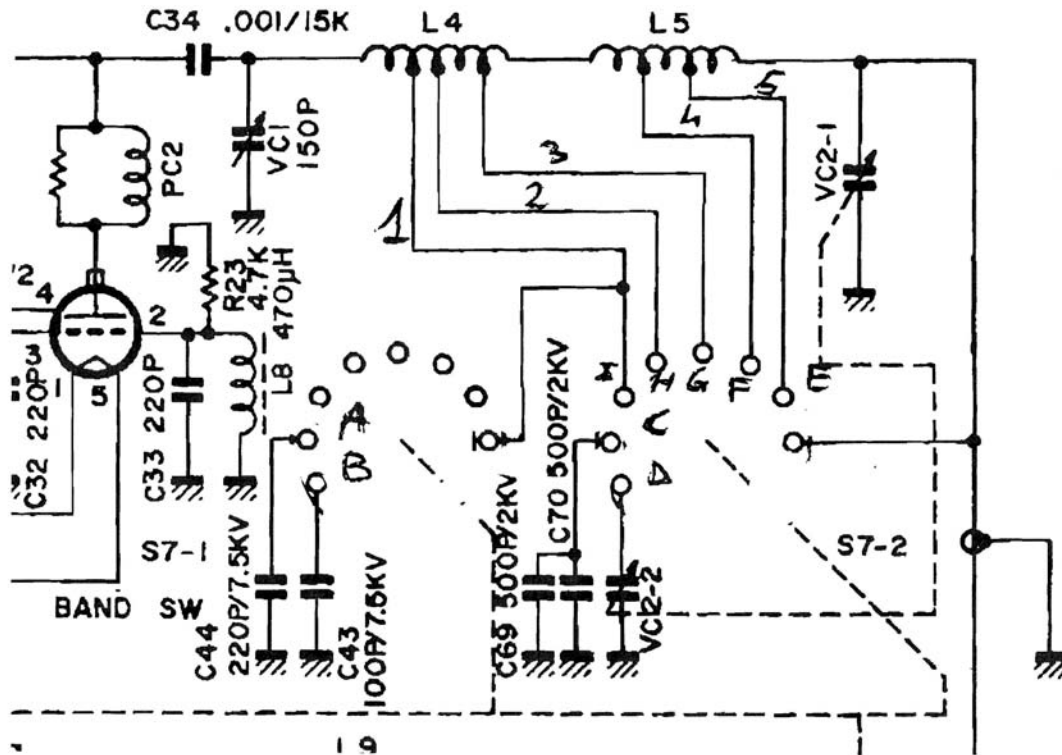
1 = on

0= off

In the next image you will see the positioning of the relè on the basis of the numbers reported above. This has been obtained with a diodes matrix. You will find the scheme further below.

Fig. 5 –Part of the scheme of the changes.

Circuits and specifications are subject to change for improvement.



You will find the letters and numbers in the table above.

After having thought how to accommodate the 9 relè inside the TL-922 (there is not much room) I have built a support for 8 relè and the last one has been mounted on the antenna capacitor



Fig. 6 - Alluminium support

We now start to gain some space to put the switch to turn on the relè. You will need a 2 way switch with 6 positions of adequate dimensions. I found this:

Fig. 7 Switch 2 way 6 position

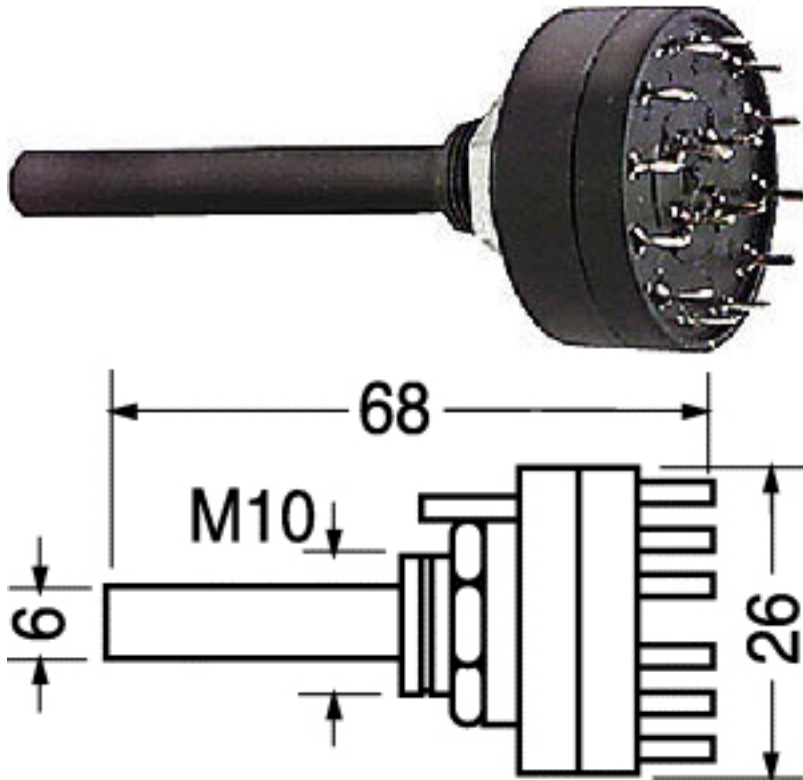
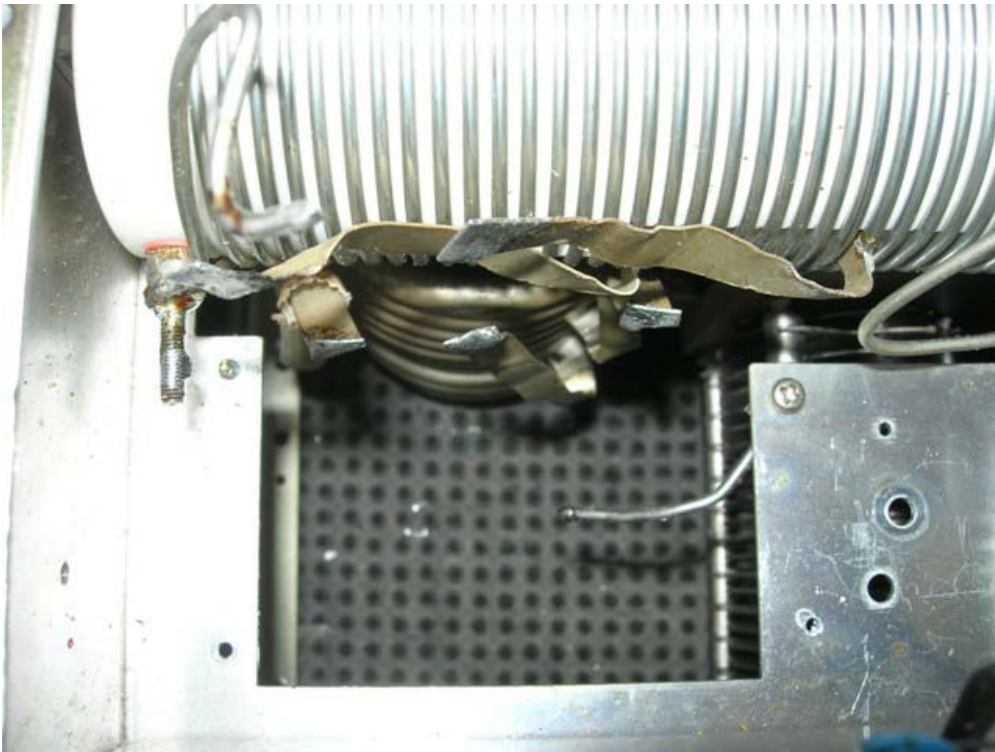
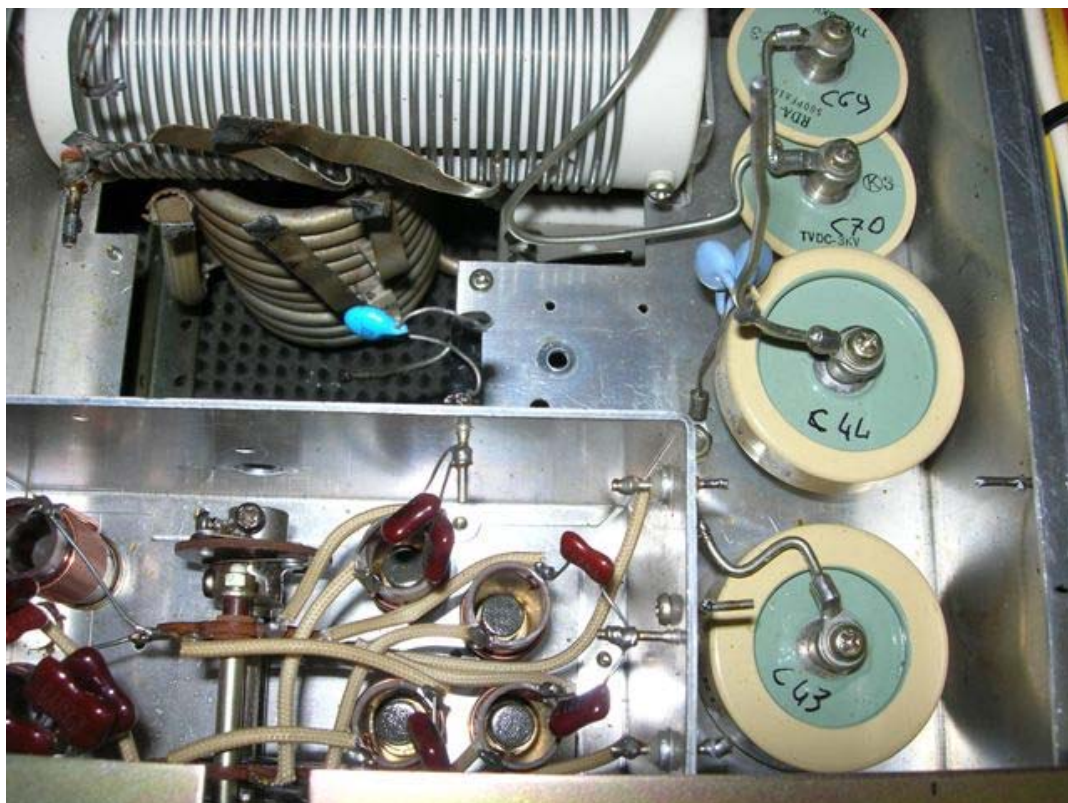


Fig. 8 Empty space for the switch



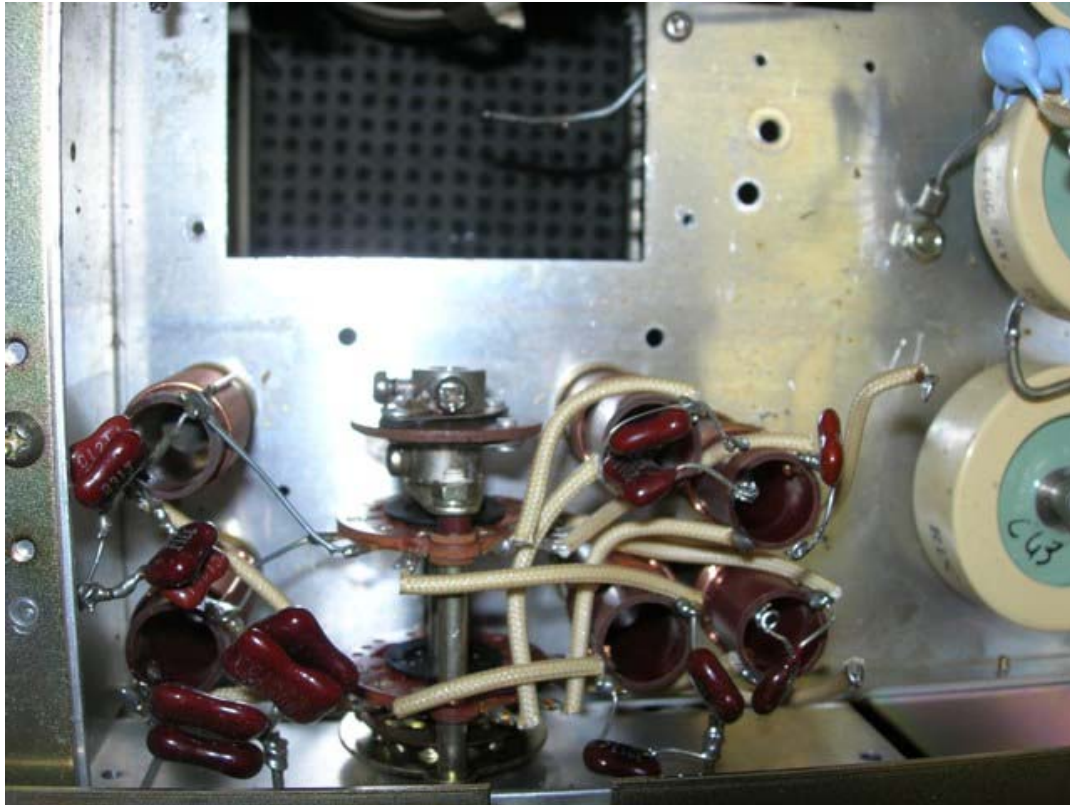
You have to remove the C43 as per picture no. 9

Fig. 9 –repositioning of C43



You now remove the L shape plate which divide the ingress stadium to mount the switch

Fig. 10 – removed plate

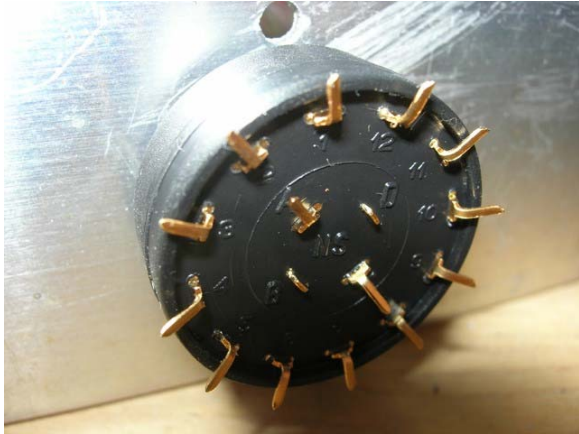


Mounting the switch

You need to cut the head of the switch and bend the contacts to avoid that they touch the aluminium support.

Fig. 11 – Switch mounting





Cabling of the switch

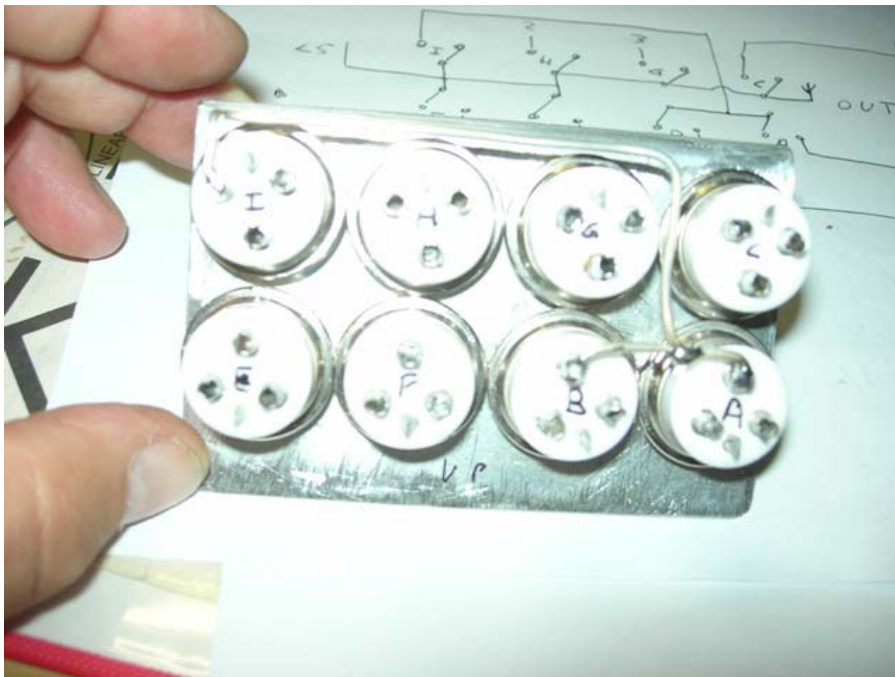
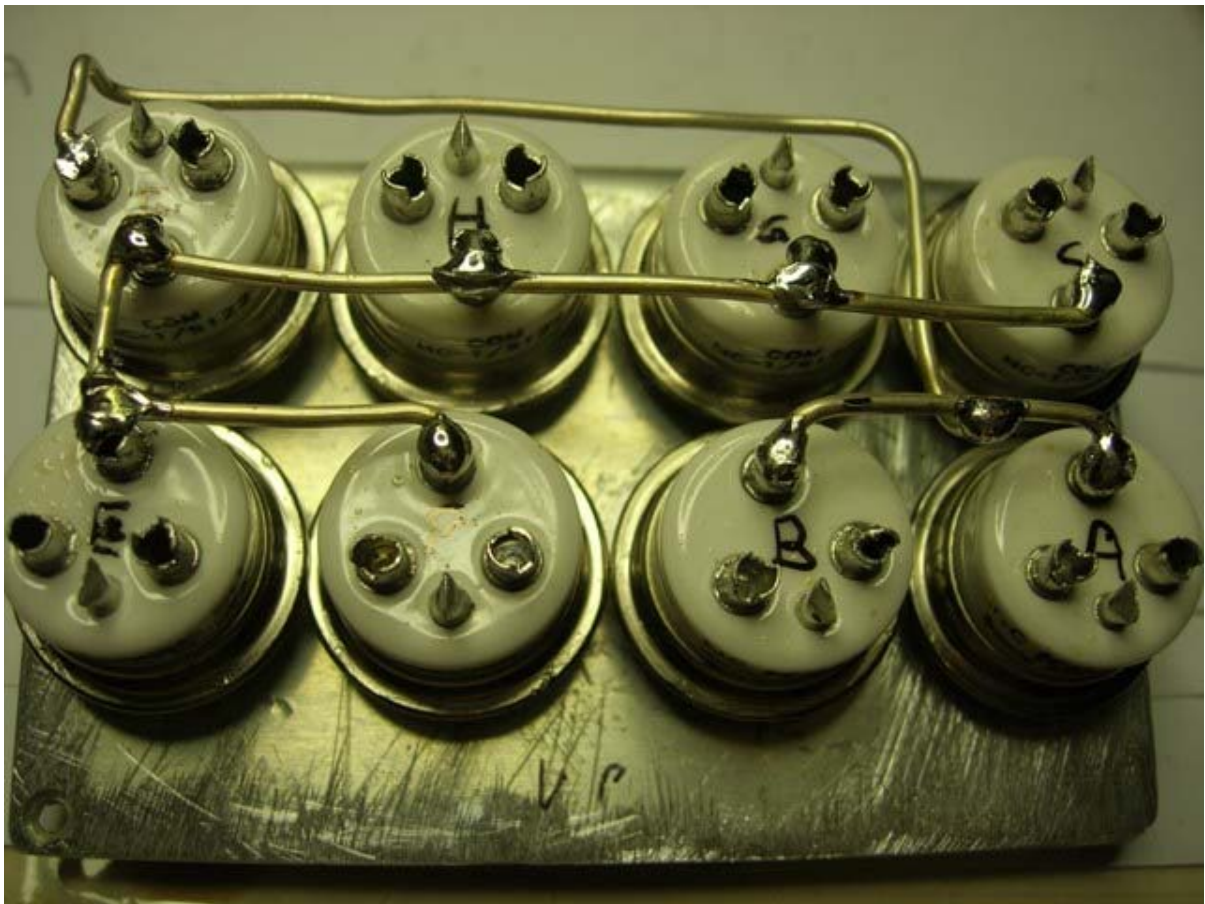


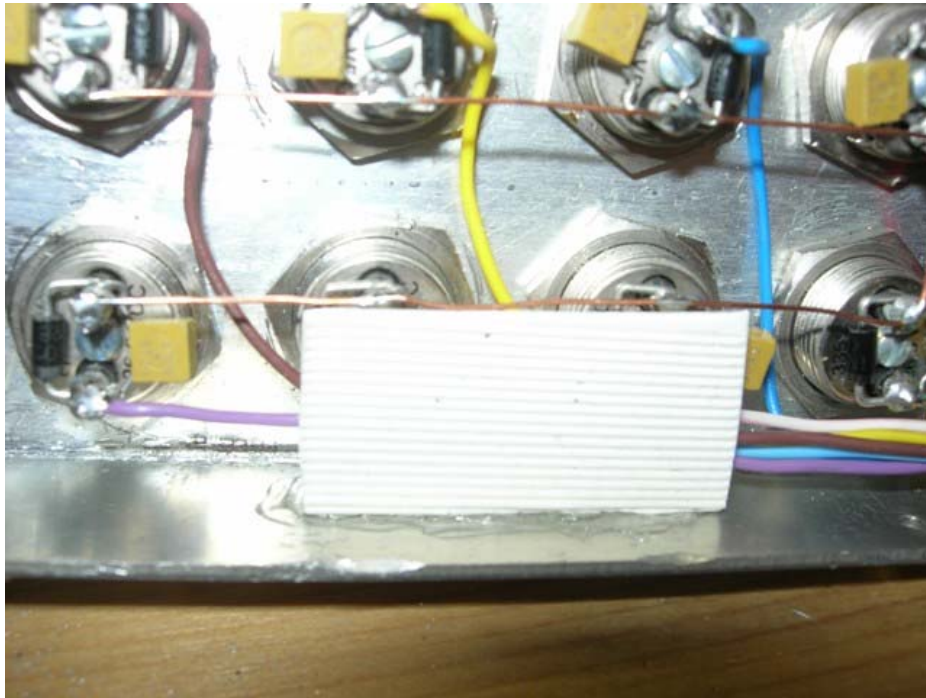
Fig. 12 – Marking the relè

Fig. 13 –Cabling the relè



I have noted that despite the bending of the contacts of the switch there was still the risk of short-circuit I have therefore glued a piece of insulating plastic on the side of the electrical feed of the relè support

Fig. 14 – Plastic isolator



Saldare i fili di alimentazione dei relè, una massa comune e uno ogni positivo. Saldare anche i fili sul commutatore. Lasciarli sufficientemente lunghi per arrivare nel vano dove è montato lo zener . In questa locazione ho inserito una basetta millefori con dei diodi 1n4148 per ottenere la matrice necessaria a gestire la commutazione come da tabella prima descritta. I fili vanno fascettati e fatti passare, dopo averli inguanati in un pezzetto di termo restringente, nello spazio tra la piegatura del pannello frontale e la schermatura centrale. Cercare di stare più lontano possibile dai condensatori e dai loro collegamenti verso i relè. Questo per evitare fiammate, specialmente in 160m.

Weld the power cables of the relè, a common earth and one positive pole. Weld also the cable on the switch. The cable need to be long enough to arrive in the place were the zener is mounted. In this place I have also inserted a support base with 1n4148 diodes to obtain the necessary matrix to deal with the switch described in the table above. The cables need to be covered and sheathed in piece of heath-shrink then passed between the front panel and the central screen. You should try to put this as far as possible from the capacitors and the cabling close to the relè, to avoid blazes at 160m.

Fig. 15 – Placing



The support has been fixed with two parker screws (you can see the black one on the left). I have used the existing hole on the left and made another one on the right. It is important that the support is folded towards the switch, otherwise you cannot weld the connection to the coils.

Fig. 16 - Position of the diodes base



L'alimentazione è a 27,5 V per compensare in parte la caduta di tensione sui diodi. Non si causa nessun problema ai relè. Anche il relè "E", che in posizione 10m è alimentato con circa 24 V funziona perfettamente.

Power is 27,5 V to compensate the fall of tension on the diodes. It does not create any problem to the relè. Also the relè "E" at position 10m is powered at about 24V and works perfectly.

Fig. 17 – Diodes matrix

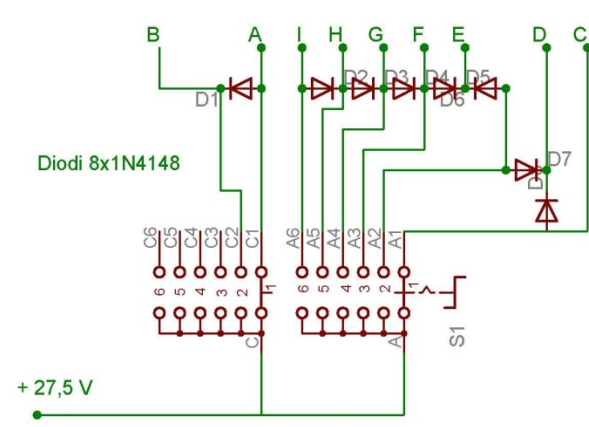
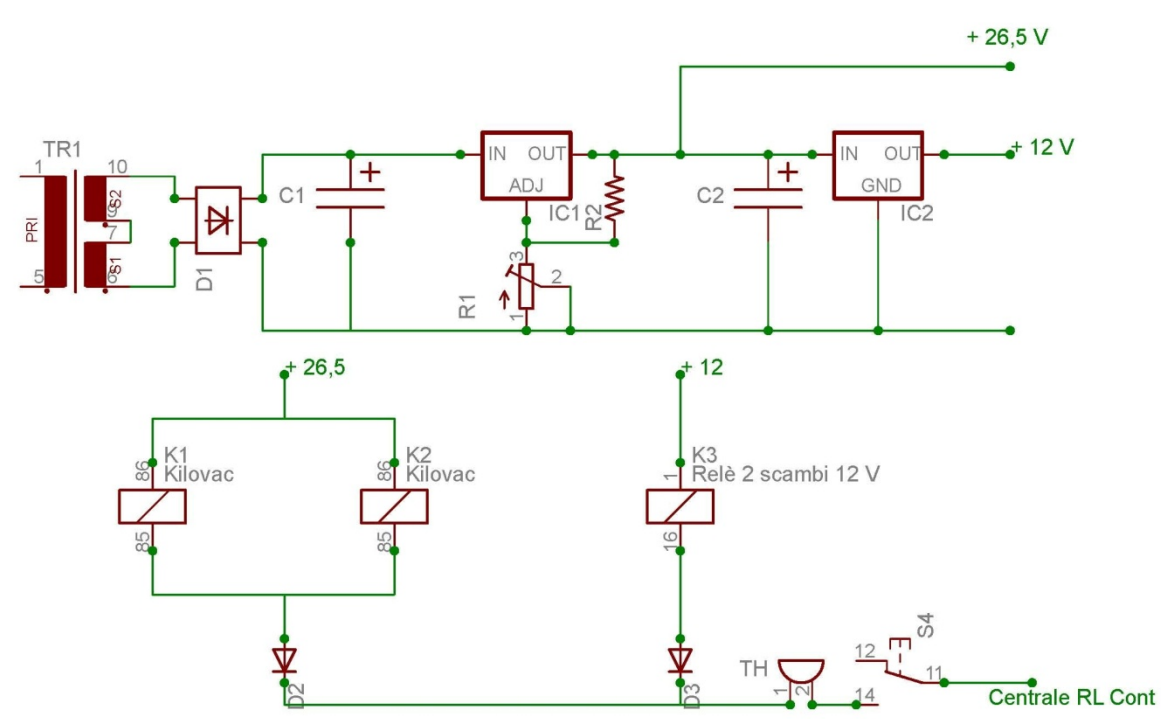


Fig. 18 – Power



Component list :

TR1	Trasformatore, possibilmente toroidale, 220/36 Volt almeno 800mA (18+18)
D1	Ponte a diodi 100V 1°
D2/D3	1N4148
C1/C2	Condensatori elettrolitici 100mF 100V
R1	Trimmer 5k ohm
R2	220 ohm
IC1	LM 117
IC2	78L12

I have added a couple of capacitors of 10nF in parallel at C1 and C2. As you can see in the photo on the contacts of each relè there is a diode 1N914 and one capacitor at 10nf

Fig. 19 – Positioning of the power base

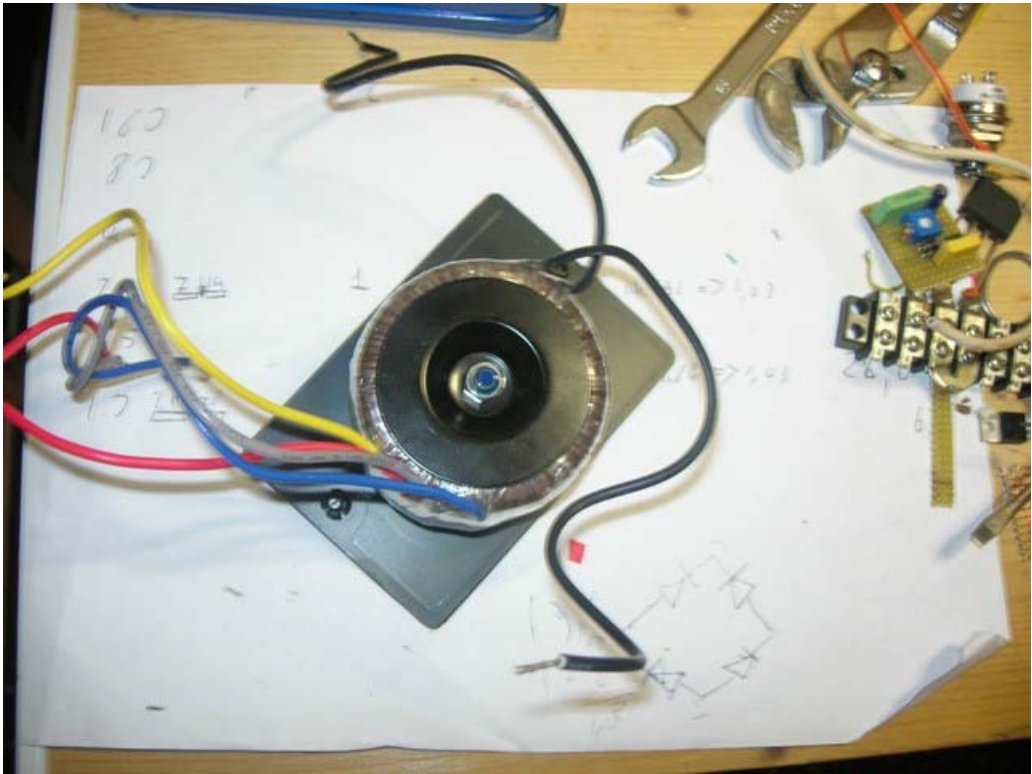


I have used a toroid transformer placed in place of the at the change of tension's terminal. There was no other space.

Fig. 20 – Removal of the band switch



Fig. 21 – Mounting the transformer on the change tensions cover



I thought it advisable to prepare a small tester to test the switch are in line with the table. You cannot risk errors. I used a led bar and some resistances at 1k

Fig. 22– tester and 26v power for testing

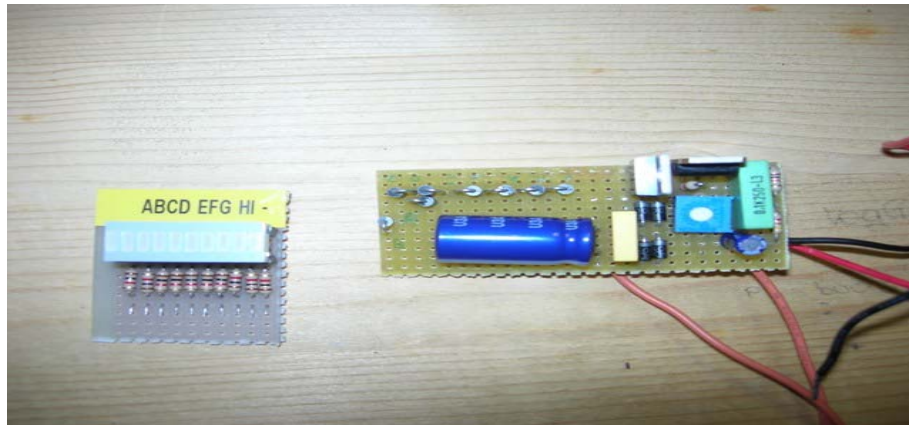
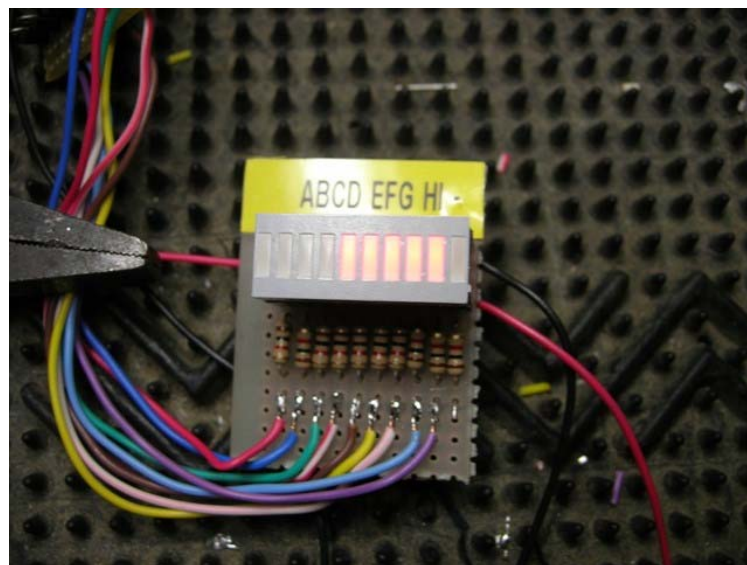


Fig.18 — Tester in 15m position



Connect the tester at 26,5V, weld the cables at the open contact of the relè following A with A, B with B etc. Rotate to switch a verify that the led turn on as per table. Disconnect the cables and weld the corresponding connection of the coils or of the capacitors.

Pay attention in order to avoid short-circuit and mistakes. Number with a pen the capacitors and the coils. Relè "D" has been cabled "on air" directly to the antenna capacitor.

Fig. 19 –Position of relè “D”



Fig. 20 – Some weldings of coils and capacitors



Fig. 21 – Another view

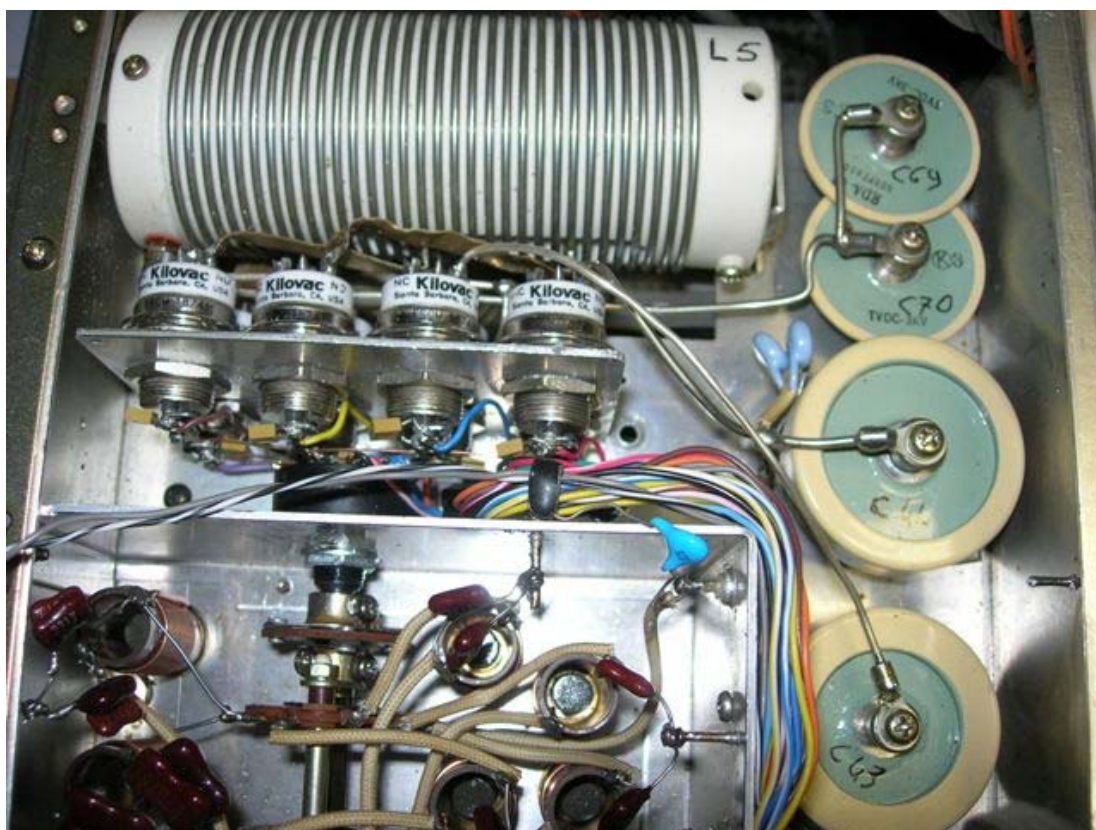
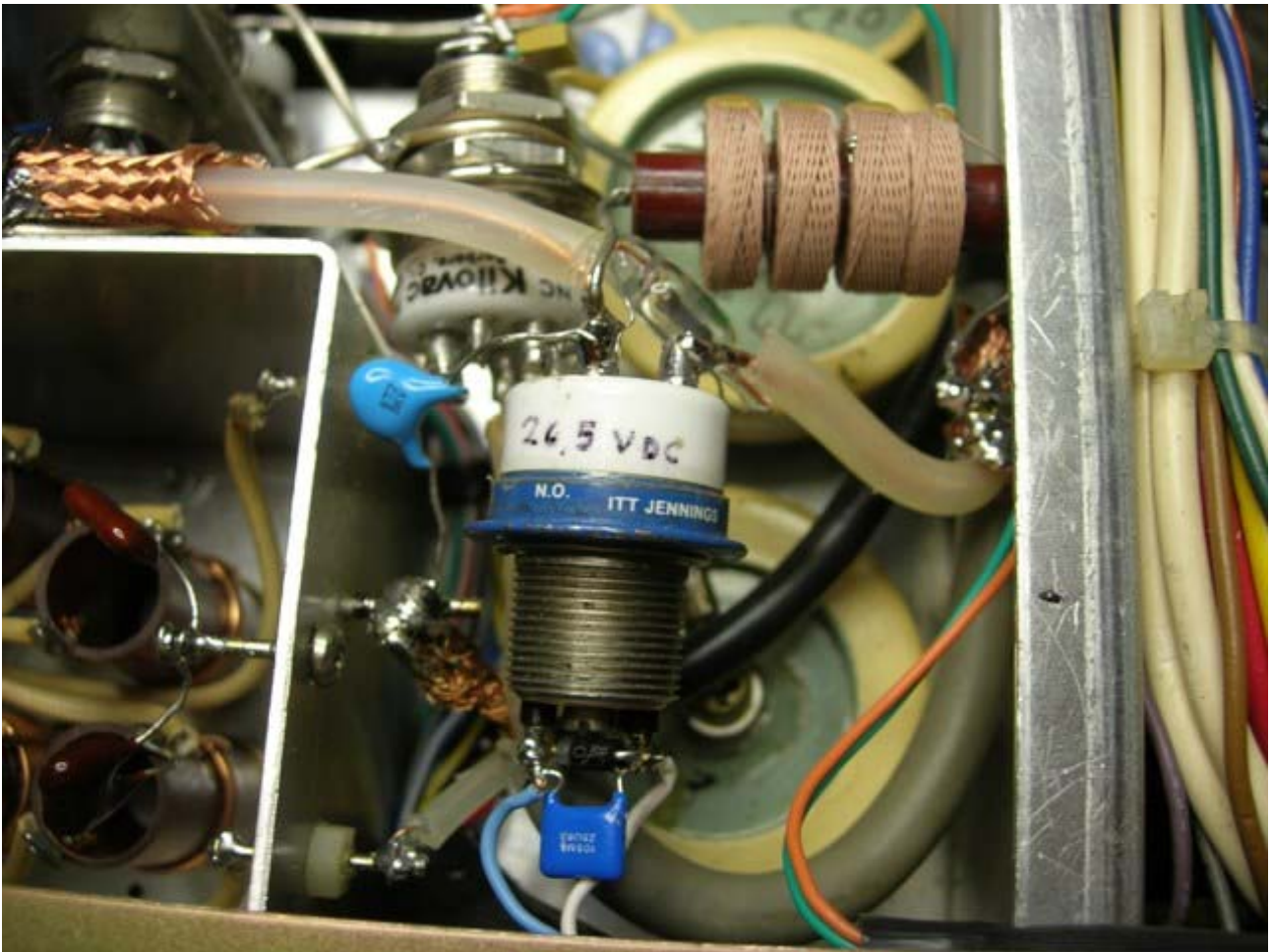


Fig. 23 – Connection concluded, you need to cover a place all power cables



It only remains to mount the relè of the switching of the antenna and cable in and out. From the photo you can note that two different relè has been mounted: one Kilovac and one Jennings. I had this already and I wanted to try the switch timings with an oscilloscope. I noted the Jennings one was a couple of ms faster (it is not a rule but probably the chance) and I mounted it on the side of the antenna. You can see the cabling "on air", mounting of impedance and download on the contacts. Do not mount the in line black cable in this way but substitute with a piece of rg-58 and pass it over at higher height. When I tried it at position 160m was blazing in the capacitor underneath.

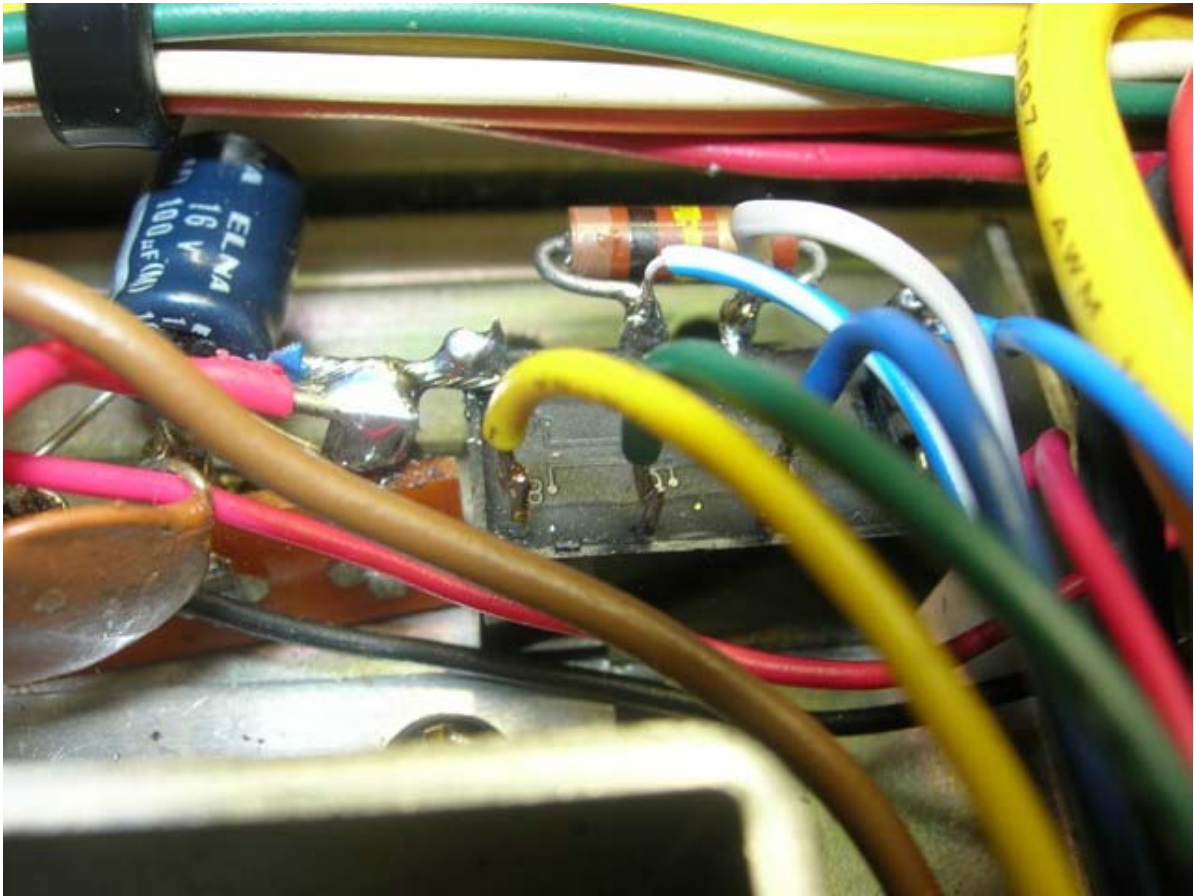
Fig. 24 – Antenna relais



The Kilovac is welded directly on the outline pin of the inline box and fixed by way of a silver cable on the screen. In this way I created a supporting structure.

I have also mounted at the switch relè some lights Tx/Rx and zener of bias on the side of the aluminium base.

Fig. 25 –zener relè



For any feedback please contact me at iw1pur@iw1pur.com

I do not take any liability for the correct modification and for any damage and or injuries. The tensions we are dealing with are very high and can cause even the death.

Some photos



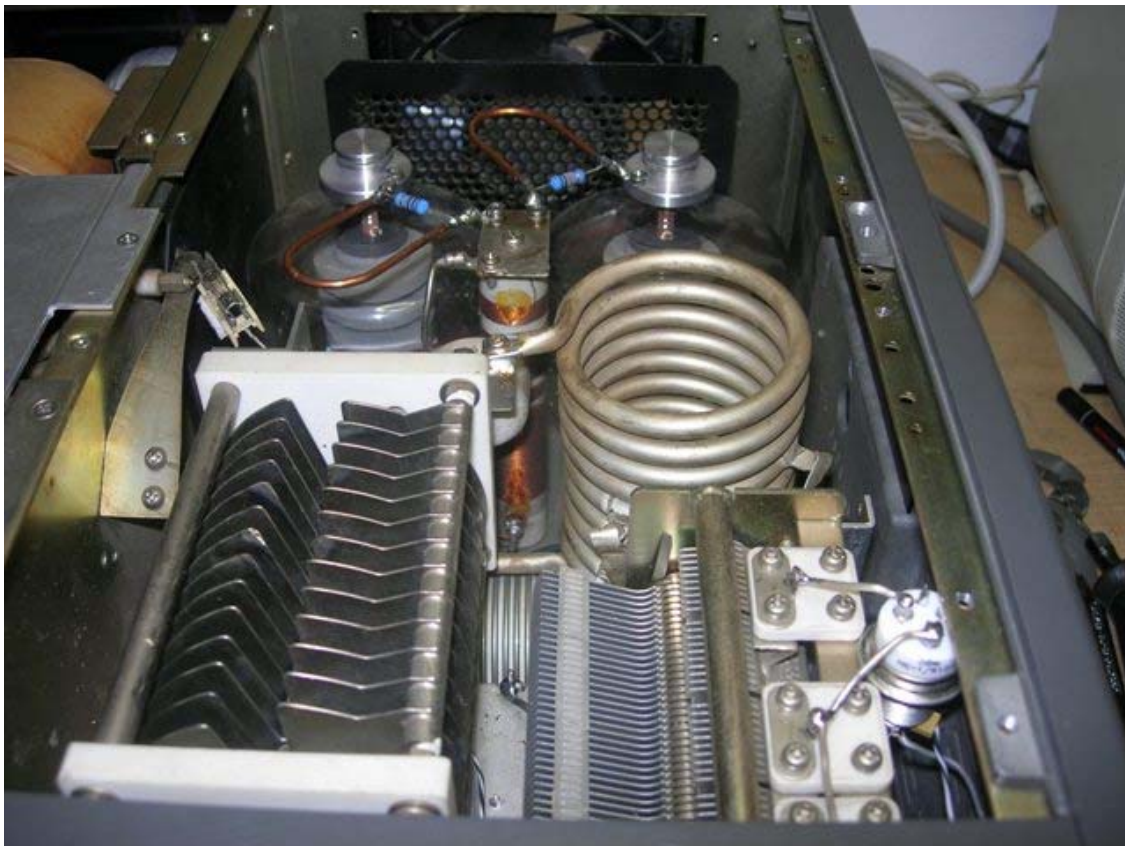
Fig. 26

You will note the Plexiglas sheet to cover the relè, I wanted to isolate this part in a better way from the bottom panel. I suggest not to exaggerate with its dimension in order not to compromise the cooling air circulation. You can also see the substituted RG-58.

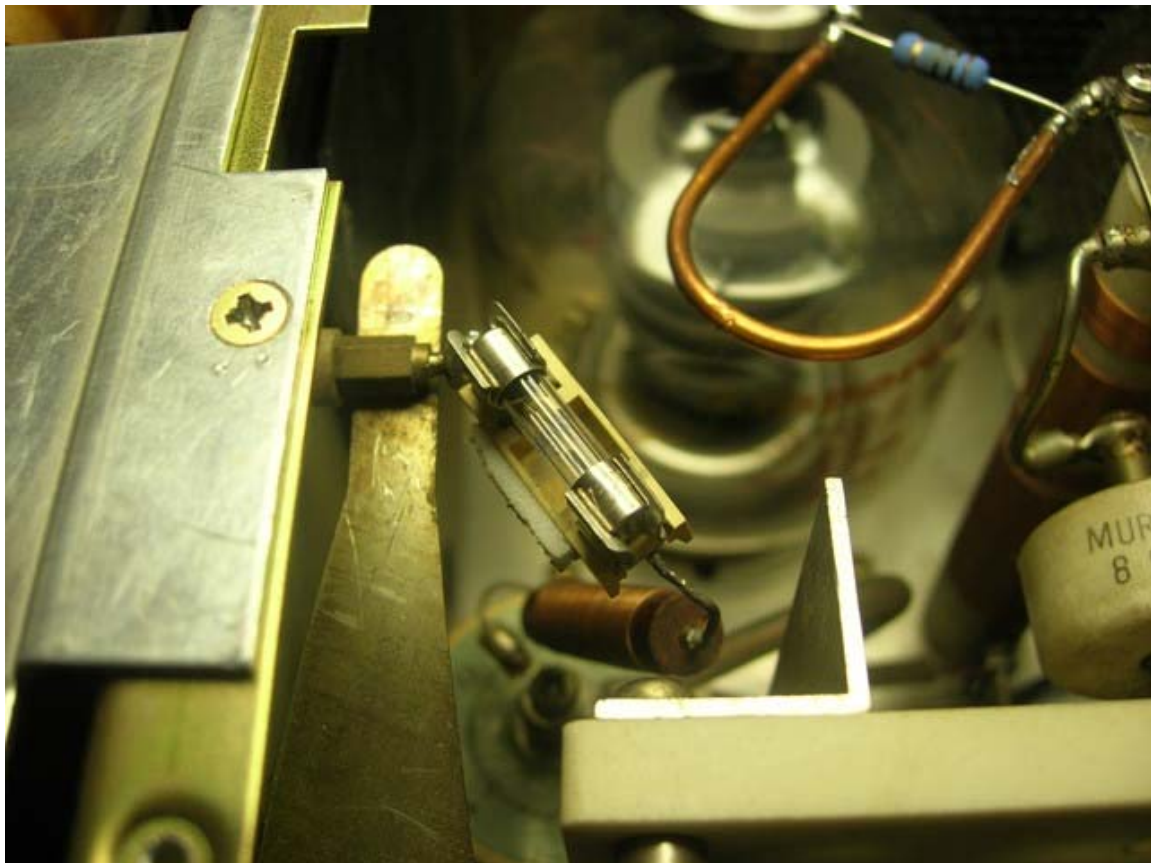
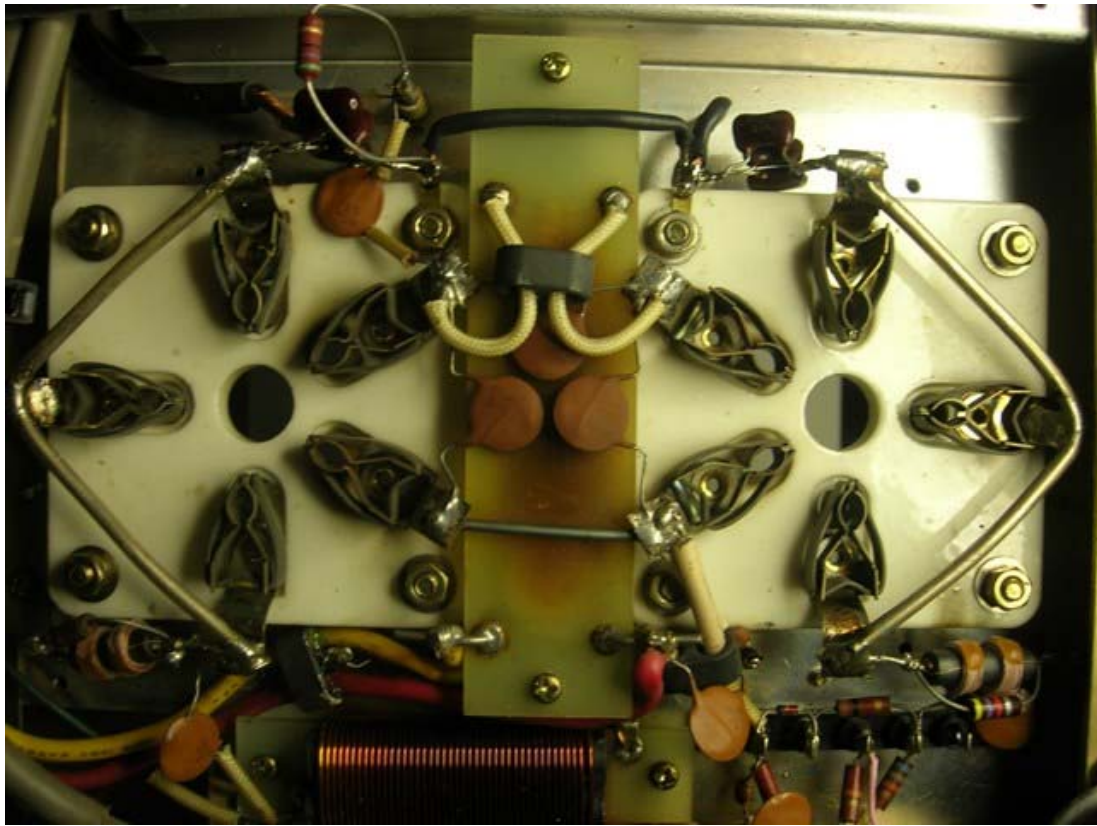


Fig. 27

Some other photo

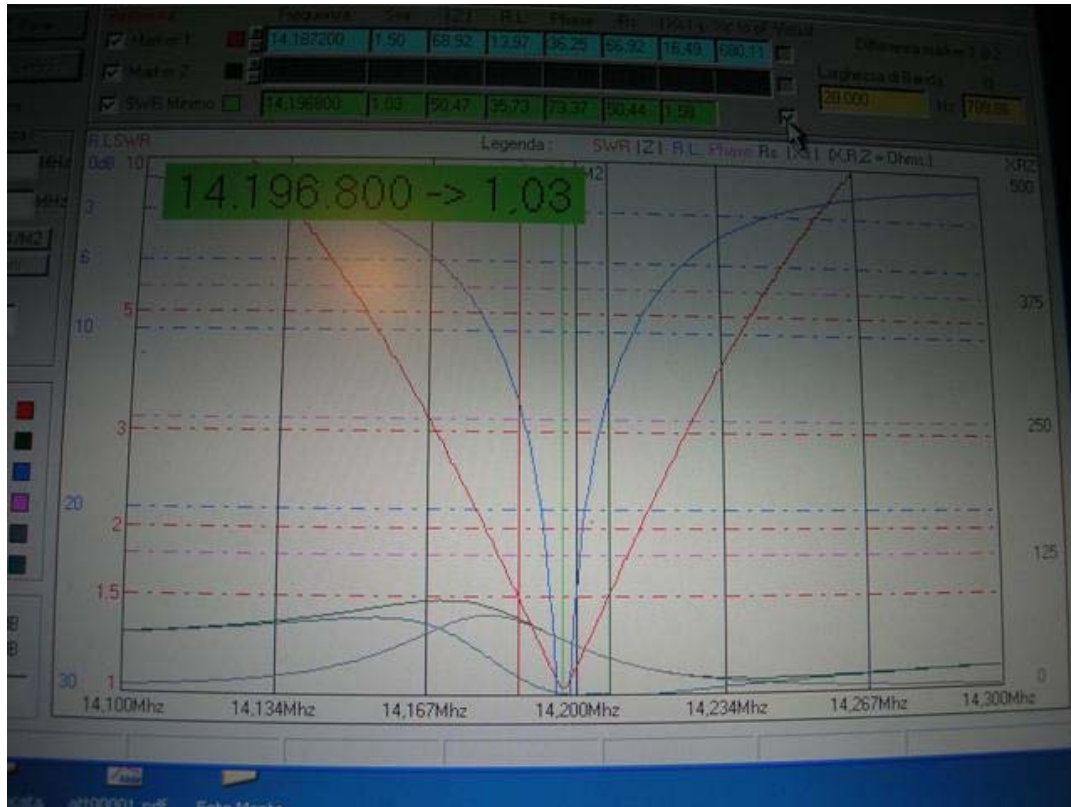






I tried to mount again the original coils on the anode after having substituted the resistances and I have not noted any problem. This change has probably improved the stability of the whole system.

Grafic response in 20m band measured with MINI-VNA



Some details

The costs of the material for this modification is lower that Euro 200.

Power Out key down

**70 Watt in 1400/1500 Watt out in all band except 10m band were for 1400 w out the input is 85 Watt.
Measured on power lead.**

Good luck

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