

TE-1452G 144 MHz, 400W solid state amplifier repairings & modifications



Réparation d'un ampli VHF TE-Systems 1452G

- Ampli reçu en état de marche , mais au contraire des marques concurrentes ne « digérant » pas plus de 25 Win ... **ATTENTION et PRUDENCE !!!!**
- A la suite d'une fausse manipe (entrée micro de l'IC-706MKIIg oscillant facilement), les 5 transistors ont rendu l'âme en un rien de temps !
- Au contraire des marques concurrentes (Mirage, RFC, Tokyo Hy Power, etc.. **AUCUNE PROTECTION** du constructeur n'est prévue en cas de puissance excessive sur l'entrée RF, et de sortie avec TOS prohibitif !!
- Platine epoxy commune aux versions 50, 144 et 432 MHz pour Pout>200W

Ce PPT illustre les faits suivants:

- Substitution des 5 transistors MRF247 et précautions à prendre
- Correction des nombreuses erreurs du schéma de principe (voulues par le constructeur)
- Addition d'une fiche PTT Cinch RCA pour être en phase avec la concurrence
- « Strap » du transistor driver permettant une Pin max de 60W au lieu de 25W et autorisant ainsi l'emploi de tout TRx moderne. Correspond à la version TE 1454G
- Mesures RF Pout fonction de Pin **AVEC** et **SANS** driver.

Améliorations apportées:

- Alimentation +12V pour préampli de mât directement à TRAVERS de l'ampli (fini le sequencer)
- Meilleurs circuits de linéarisation (prochaine modification)

TE-1452G AS RECEIVED FROM UK



- **CAUTION: original version with driver doesn't accept more than 25Win**
- The IC-706MKIIg mike input is very RF sensitive ... and'd QRT the 5 x MRF247
- Absolutely no Rf in overload or Rf out protections !!!

TE-1452G printboard

First note

Mother printboards on TE 0552G, 1452G and 4452G models with Pout>200W are exactly the same (also RA versions)

- **CAUTION: original version with driver doesn't accept more than 25Win**
- Despite of other brands like Tokyo Hy Power, Mirage or RF Concepts, TE-Systems amps have absolutely no Rf in overload or Rf out protections !!!
- The IC-706MKIIg mike input is very RF sensitive ... and'd QRT the 5 x MRF247

Repairing & modifications steps

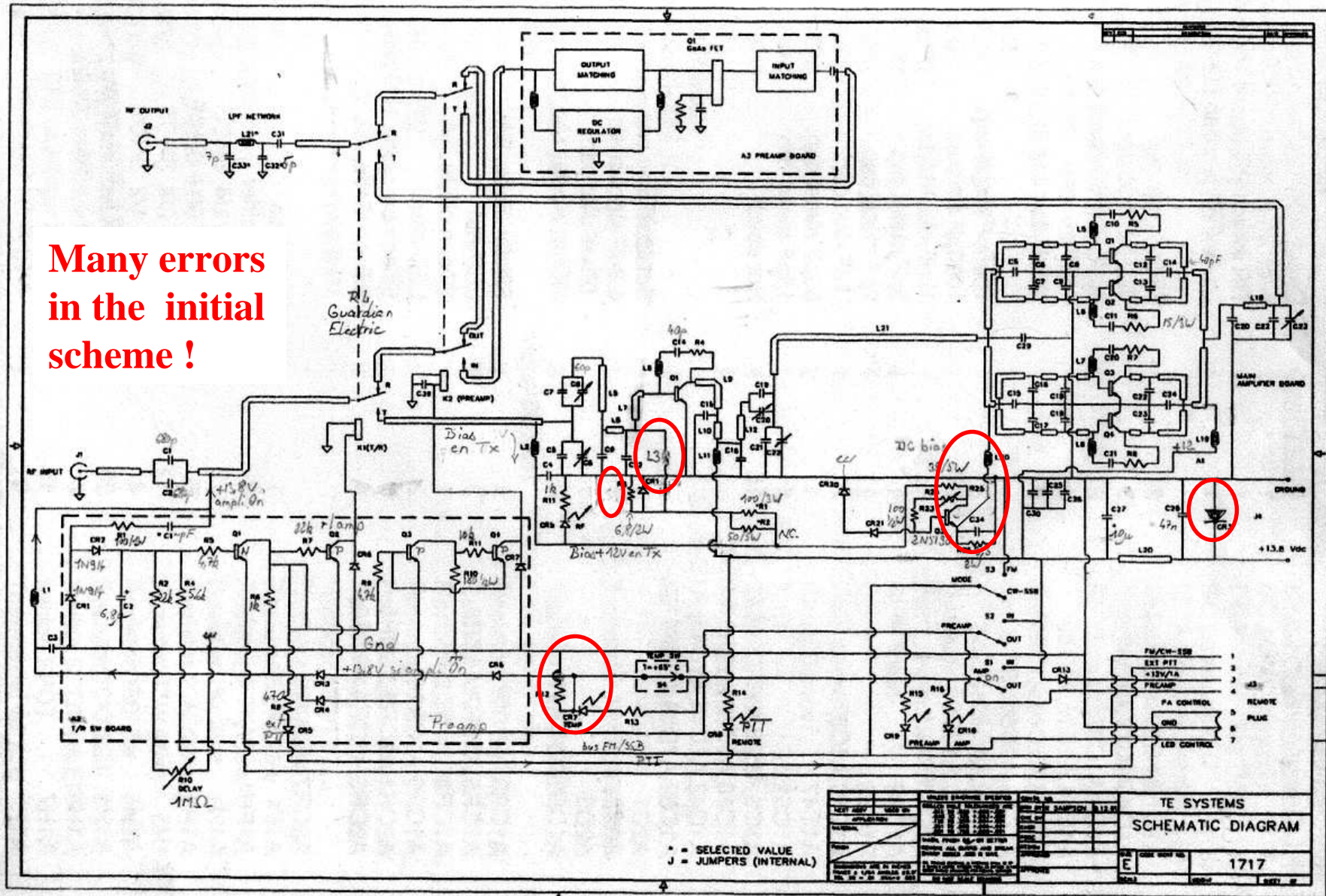
- Substitution of 4 times MRF247 in both parallel final stages & the MRF247 driver
- Bypassing the driver with a coaxial cable allowing now 50 to 60W in = **TE-1454G** with reverse possibility to use the driver again (only allowing 15W max input)
- PTT socket addition (RCA type)
- Schematic mistakes corrections
- Direct DC feeding compatibility addition for mast preamps (no more sequencer...)
- Better biasing circuit (in a nearest future)

TE-1452G printboard before repairing

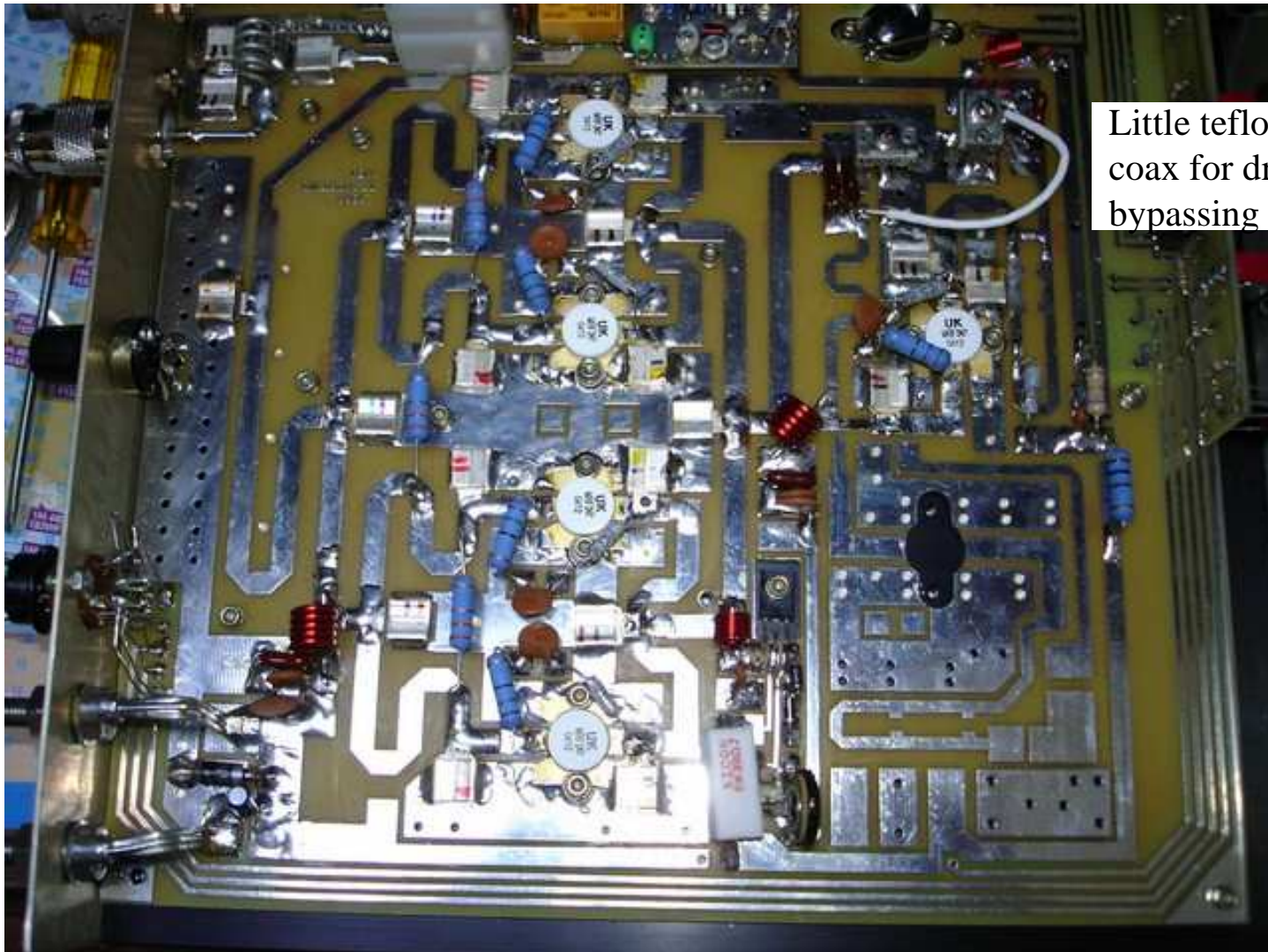


TE-1452G schematic

Many errors
in the initial
scheme !



TE-1452G printboard after repairing

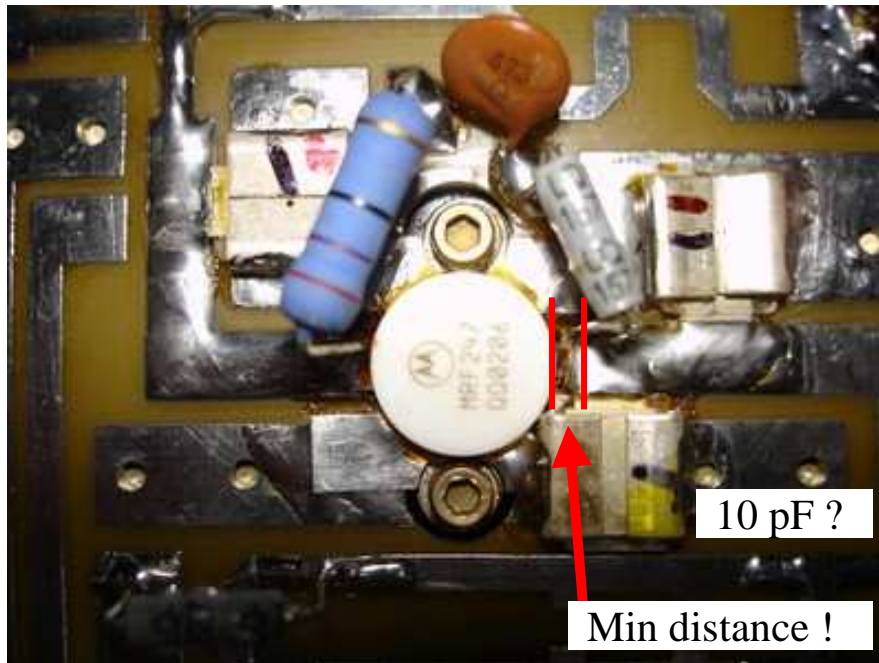


Little teflon
coax for driver
bypassing

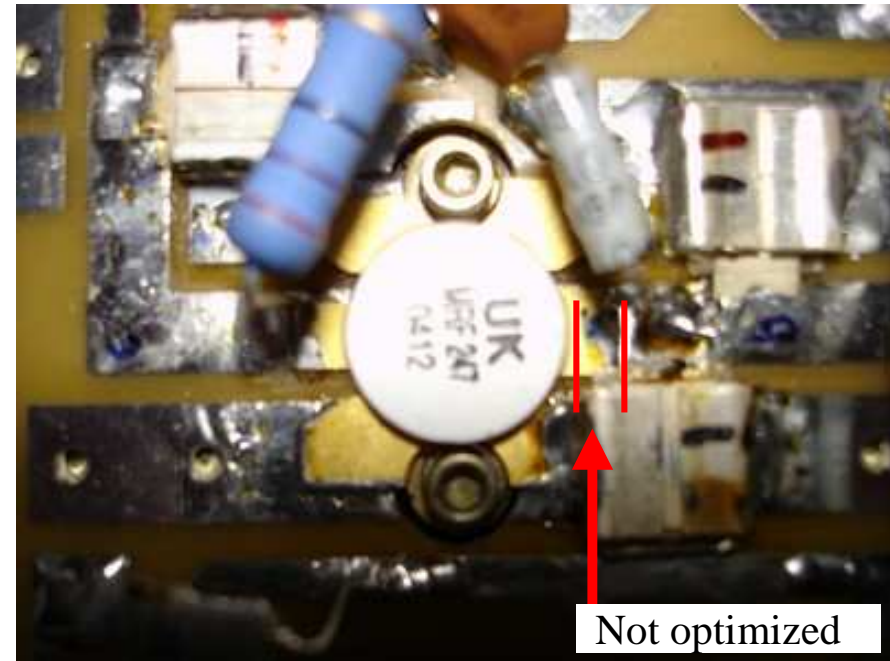
Substitution possible only after desoldering all previous metal clad mica capacitors on base and collector sides

TE-1452G : driver cap position on base side

Normal target (other new amp)



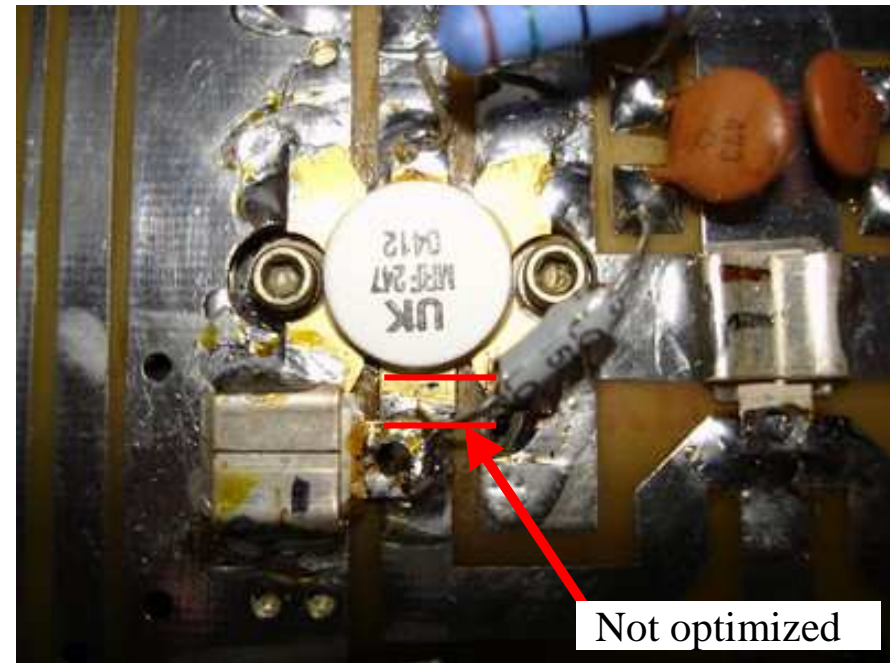
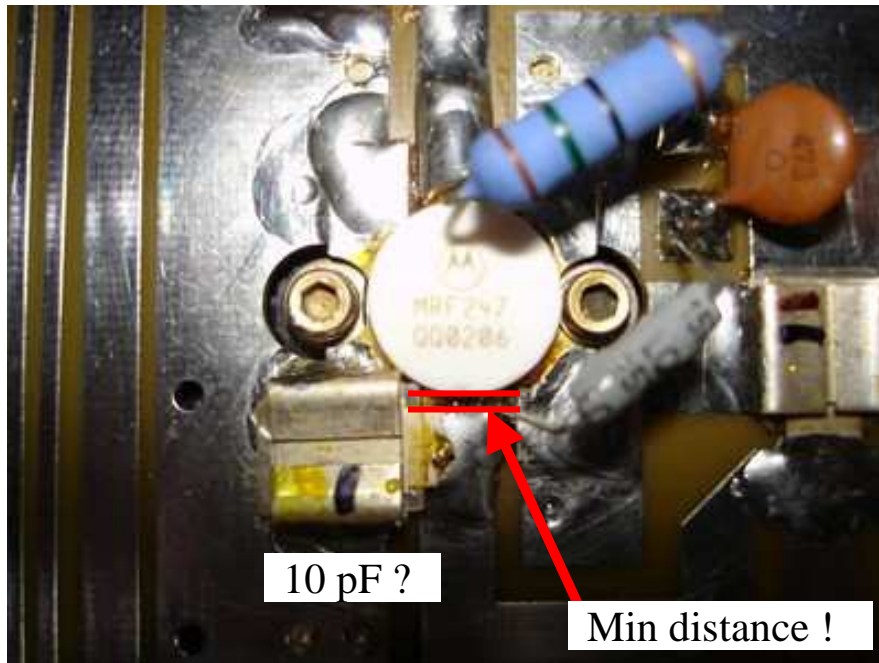
After repairing



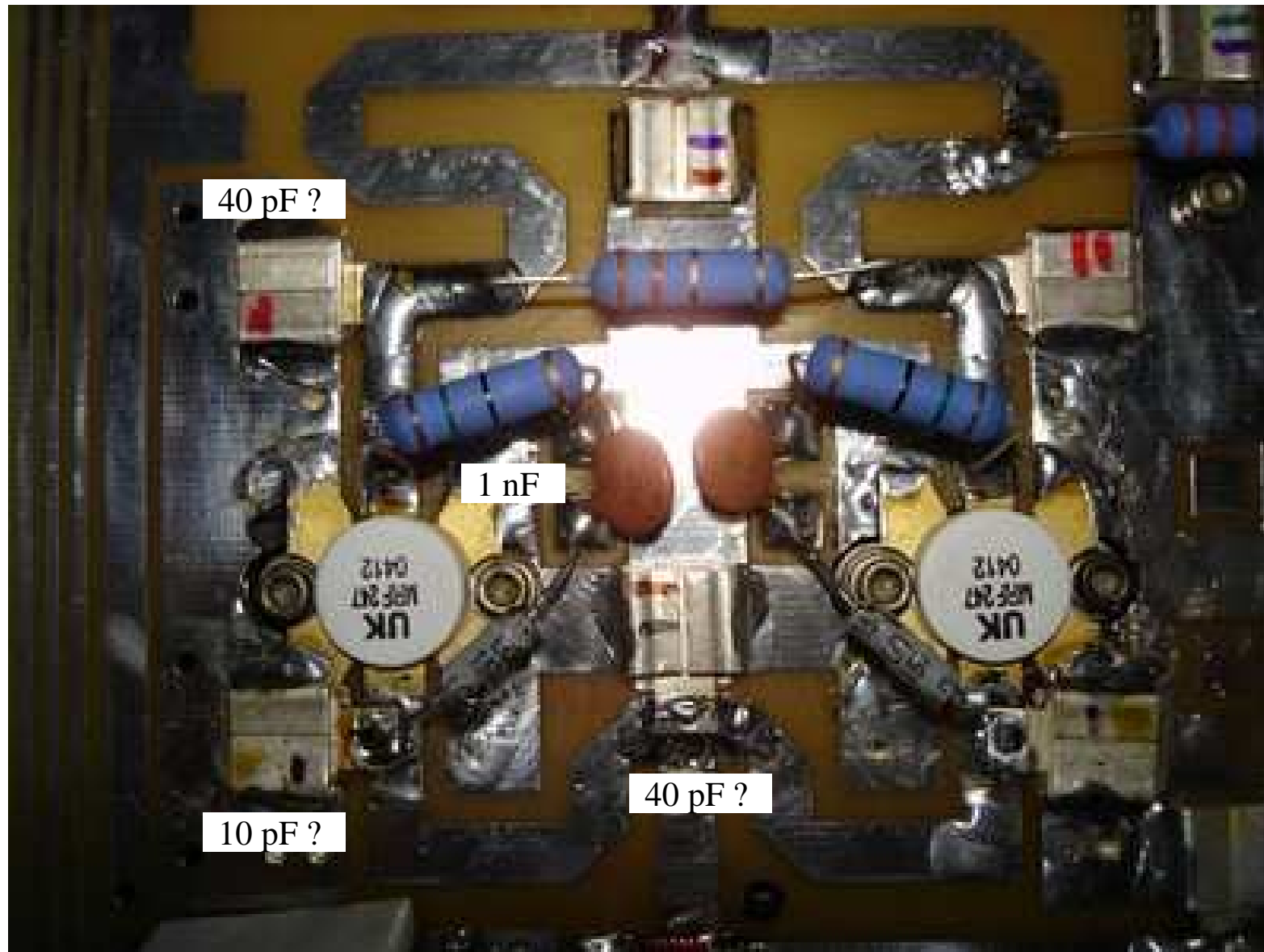
TE-1452G : final cap position on base side (1 of 4)

Normal target (other new amp)

After repairing

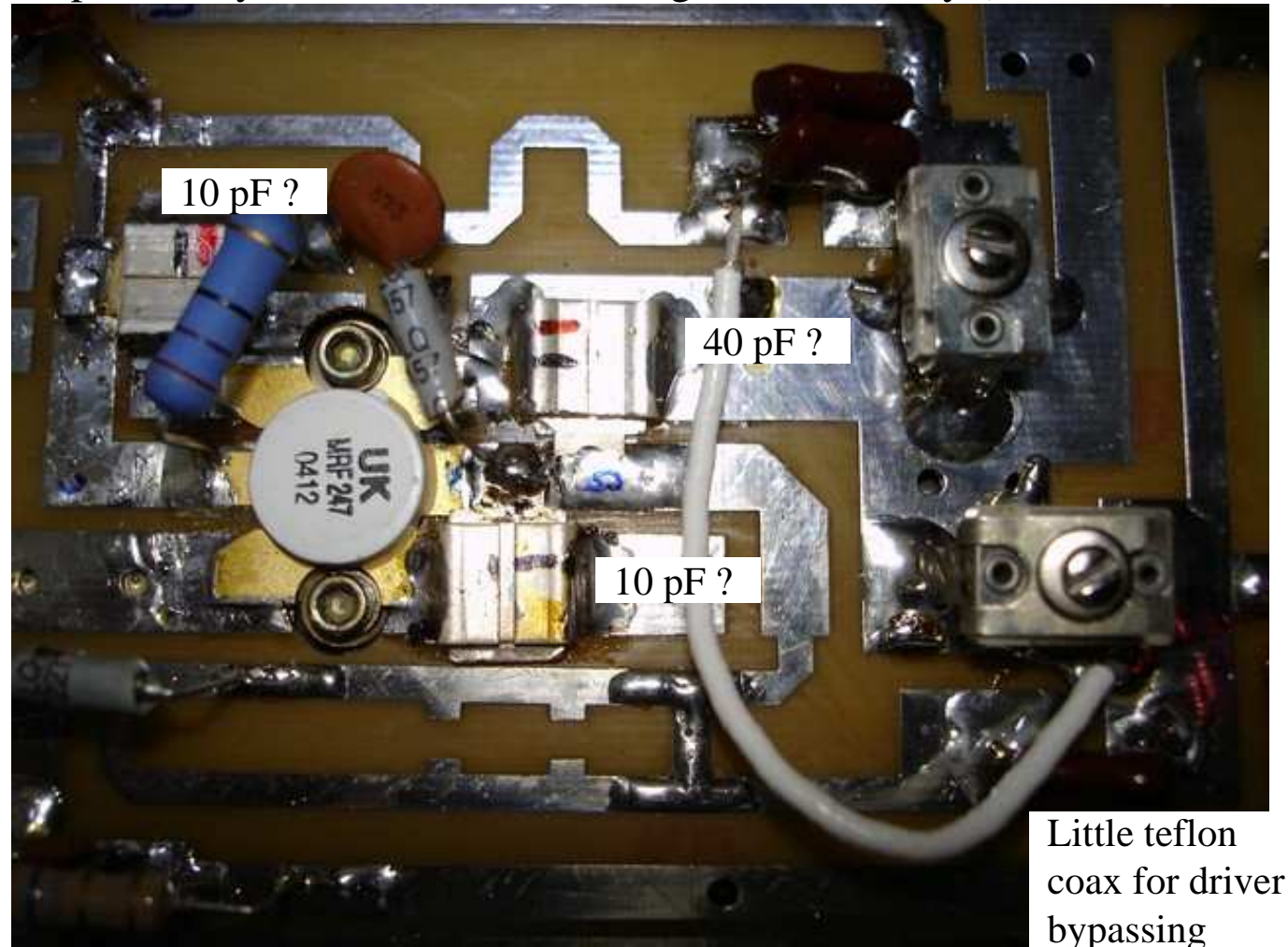


TE-1452G : one final stage after repairing



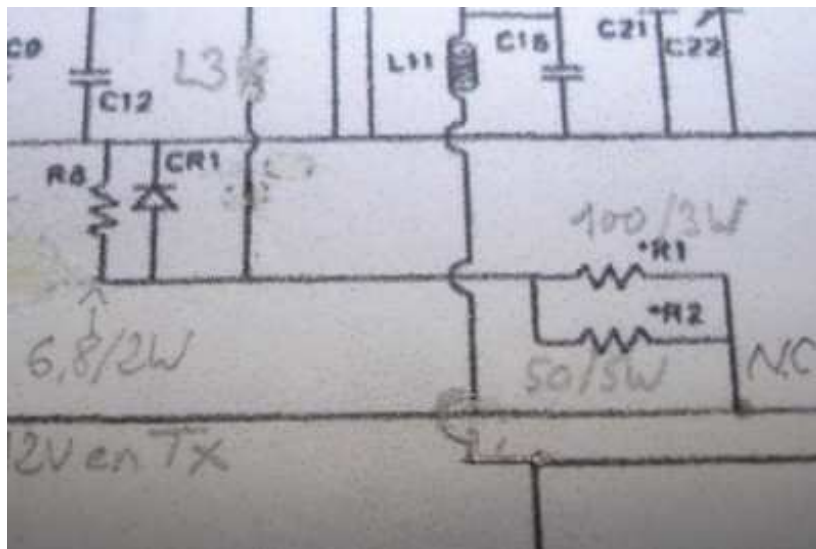
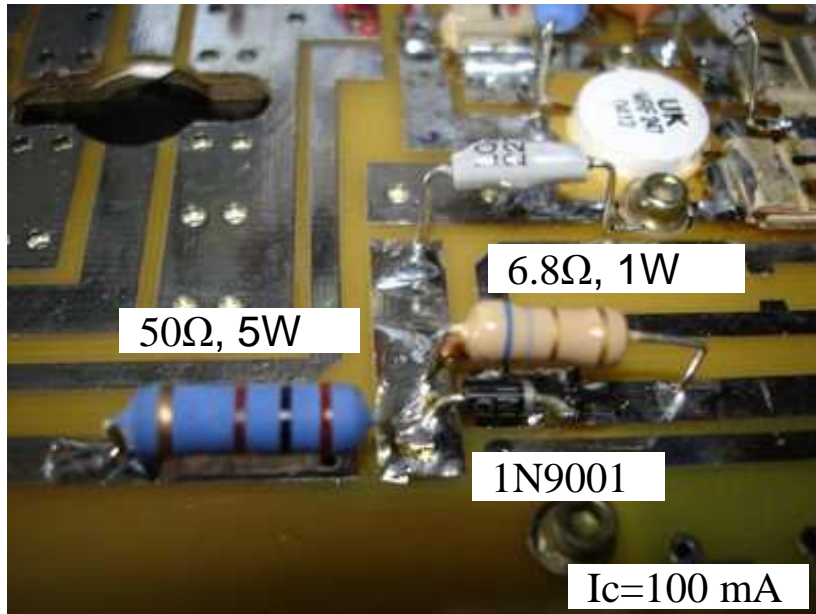
TE-1452G : driver changed but « passed through »

- more RF input power (>50W instead of maximum 25W)
- no more transistors overloading & shutdown
- possibility to connect the driver again as formerly (+ collector & base DC inputs)

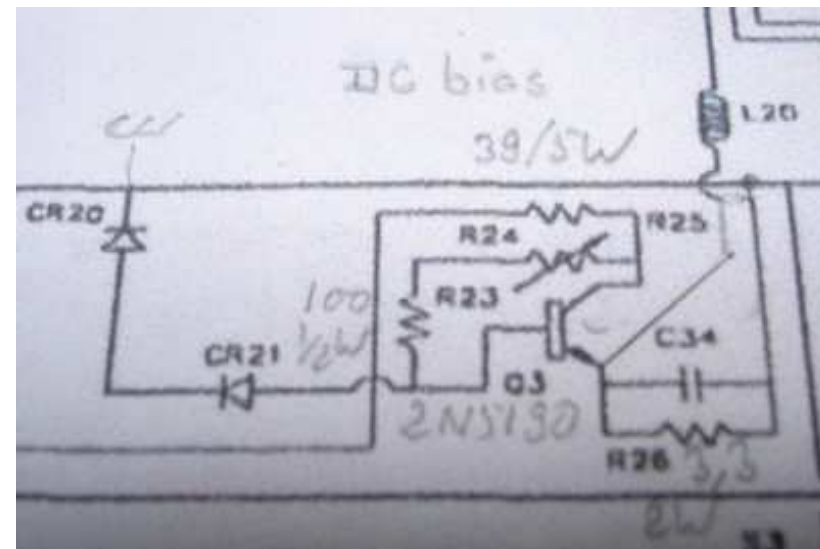
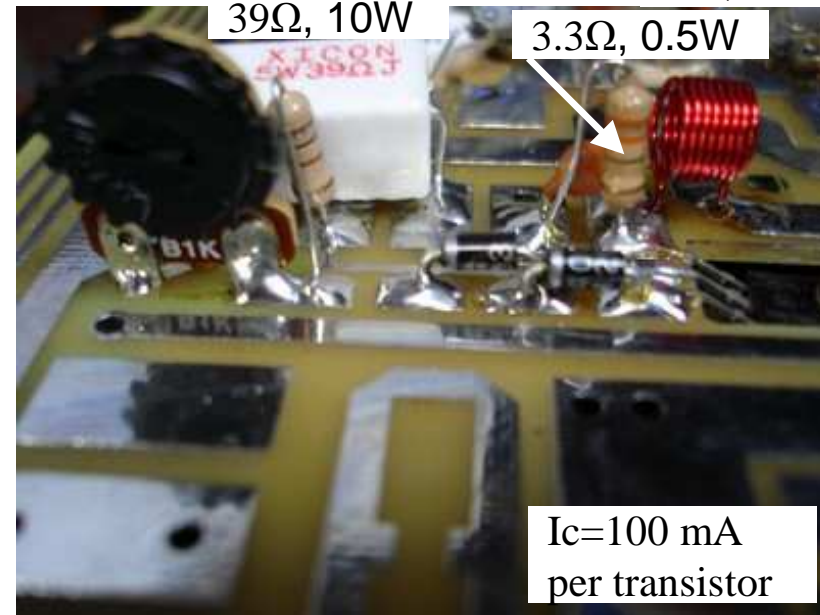


TE-1452G : DC bias

DRIVER



FINAL

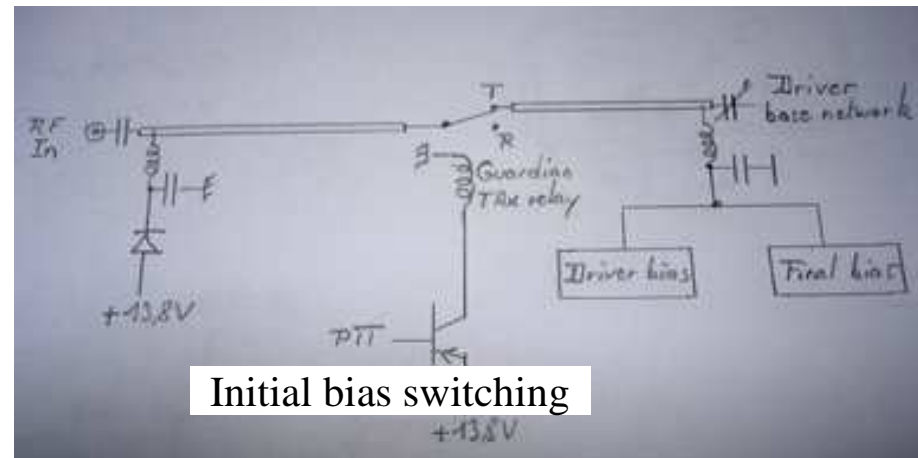


TE-1452G : mods for mast preamp DC feedthru

Before

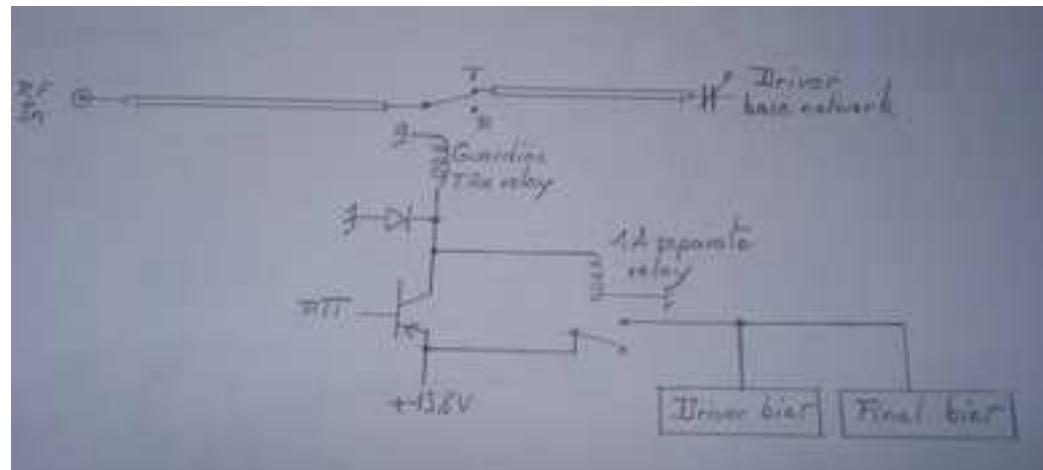
- Guardian 1st contact used both for **Rfin and DC biasing** injection

+12V DC in Rx position always present on all collectors & circuitry, except for the DC biasing



After

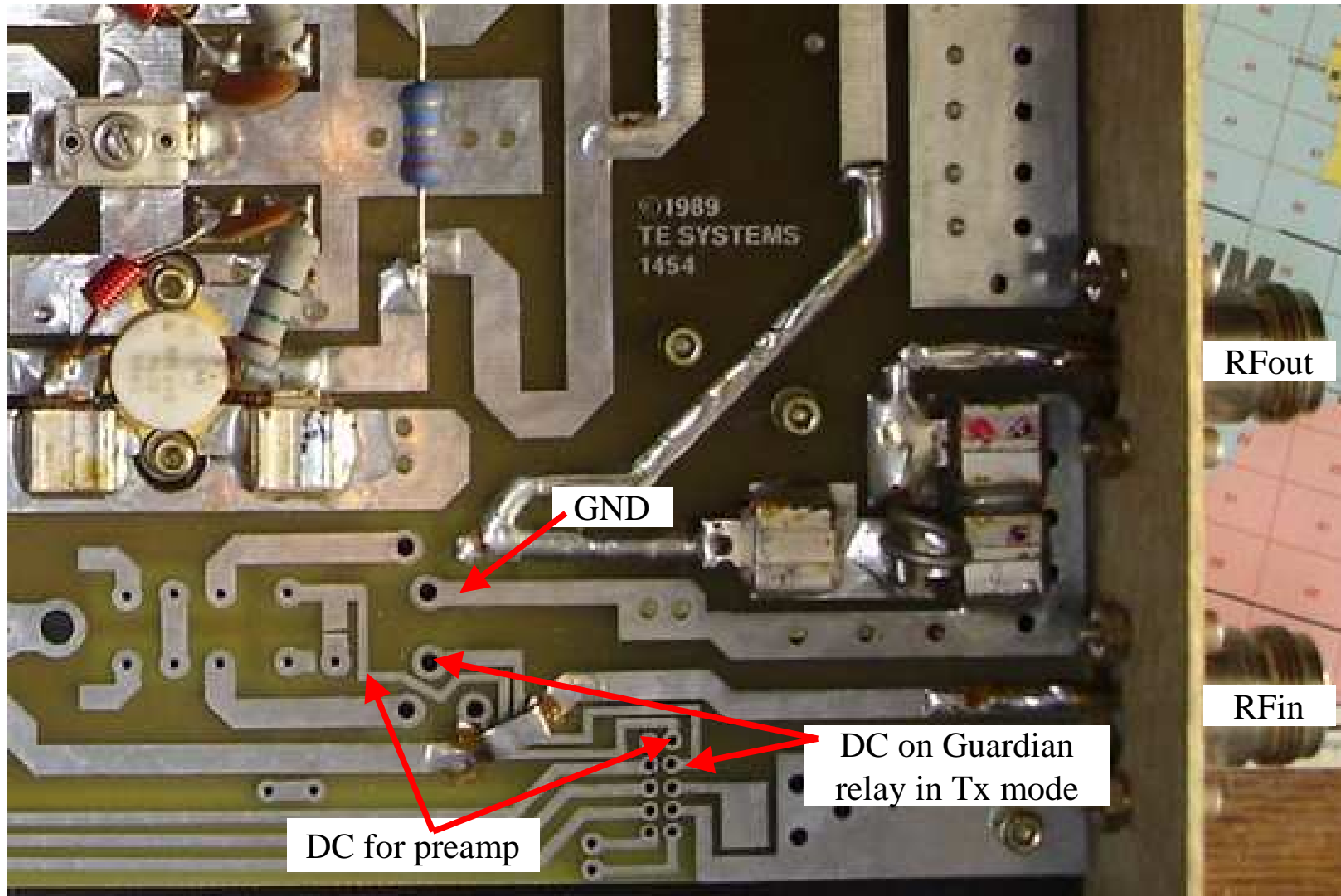
- DC biasing is now given by a **2nd separate relay**
- Guardian relay contacts only used now for RF switching



Mod bias switching allowing now direct masthead preamp feeding with IC-910H or FT-736r rig

TE-1452G : mods for mast preamp DC feedthru

Preamp & TRx relays DC feeding

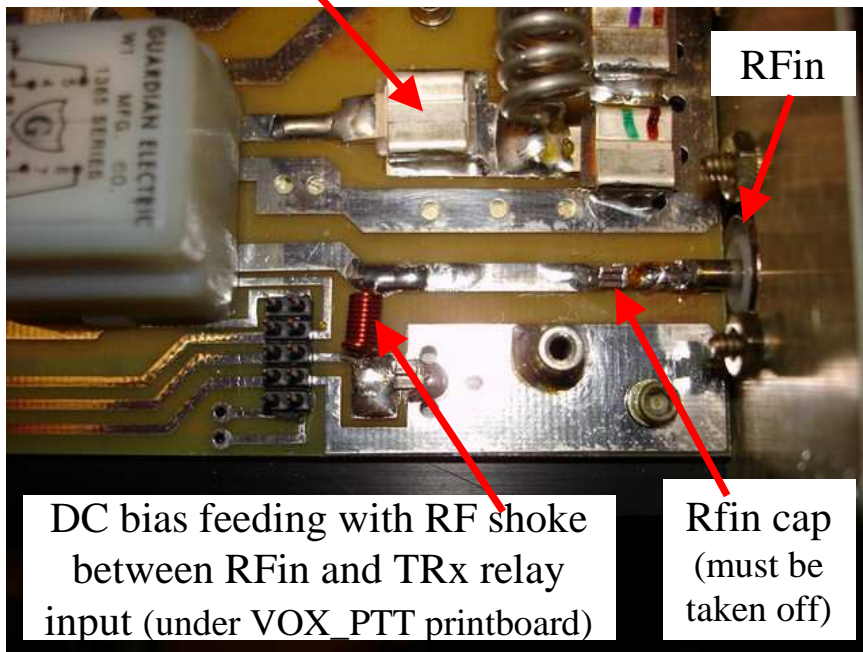


TE-1452G : mods for mast preamp DC feedthru

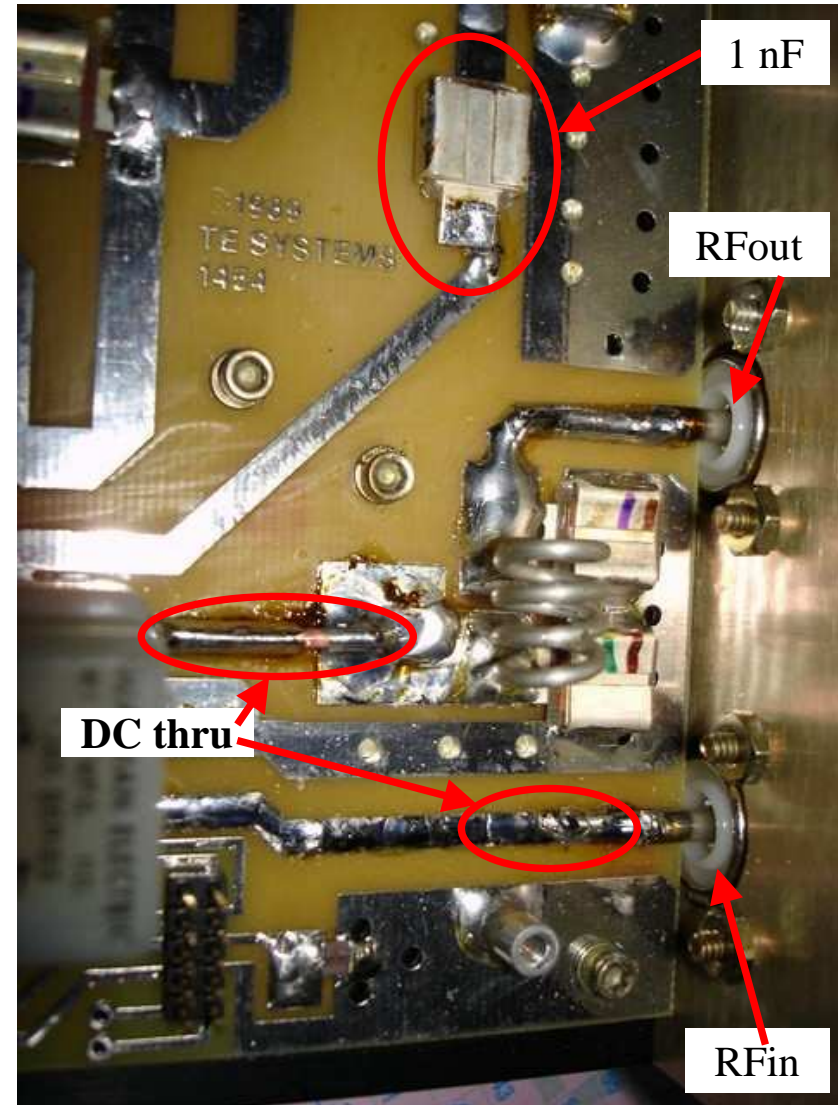
a/ DC feedthru for masthead preamp
direct feeding

Before

1nF cap (must be taken off
& placed between collectors
and Relay RF output)



After

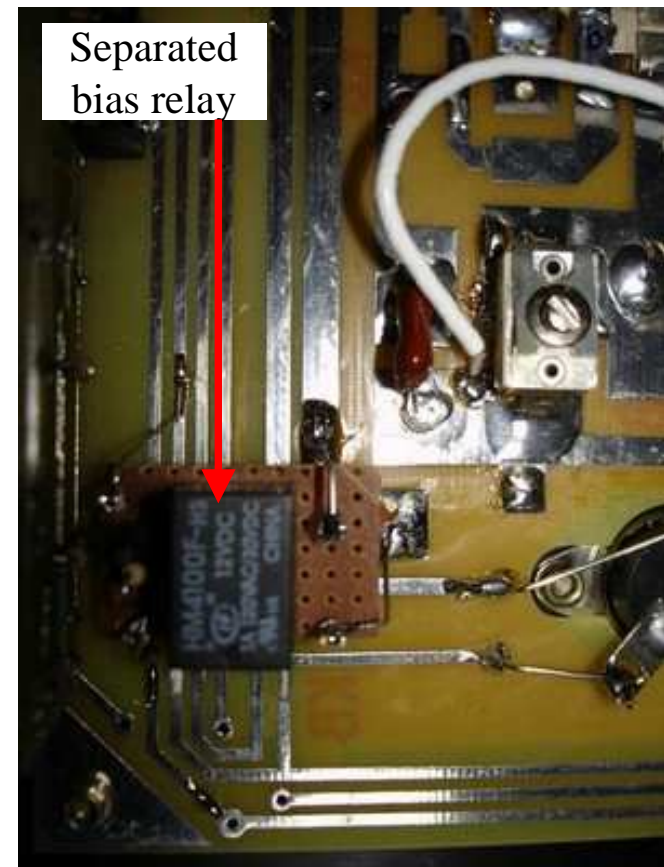
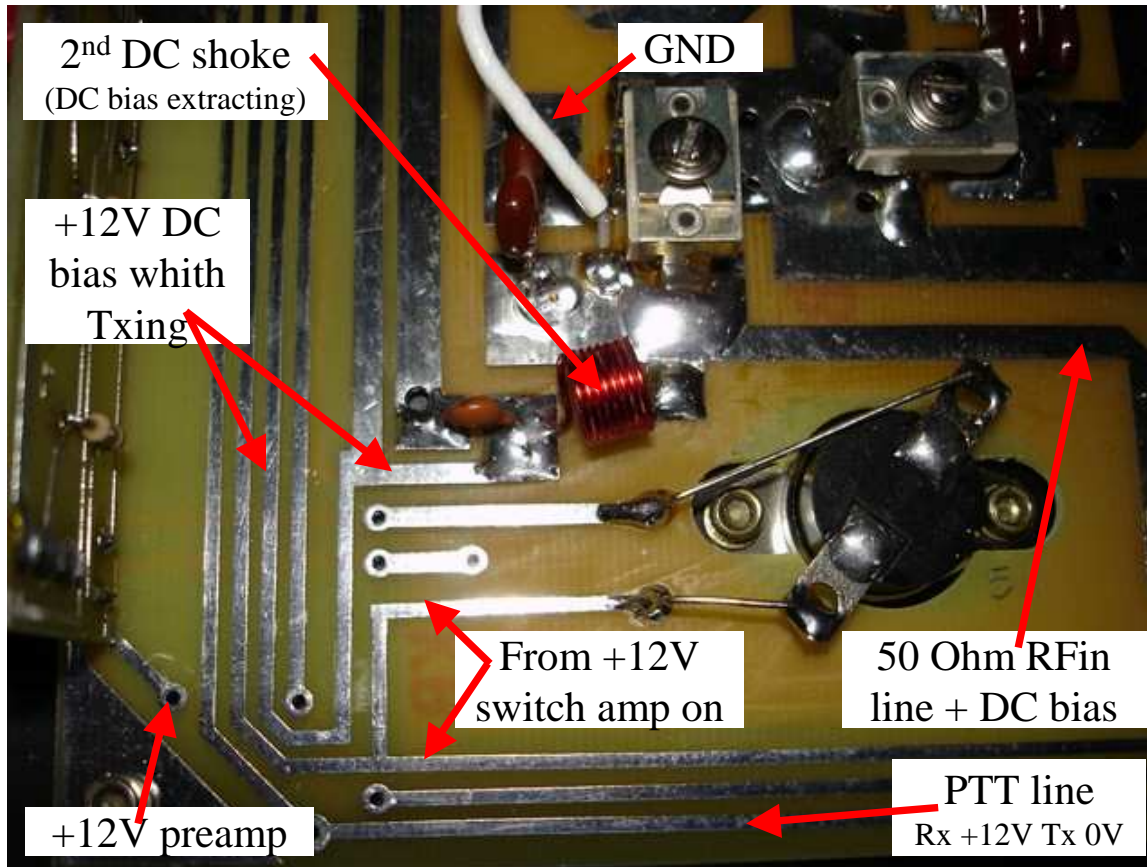


TE-1452G : mods for mast preamp DC feedthru

b/ DC bias separation from RF

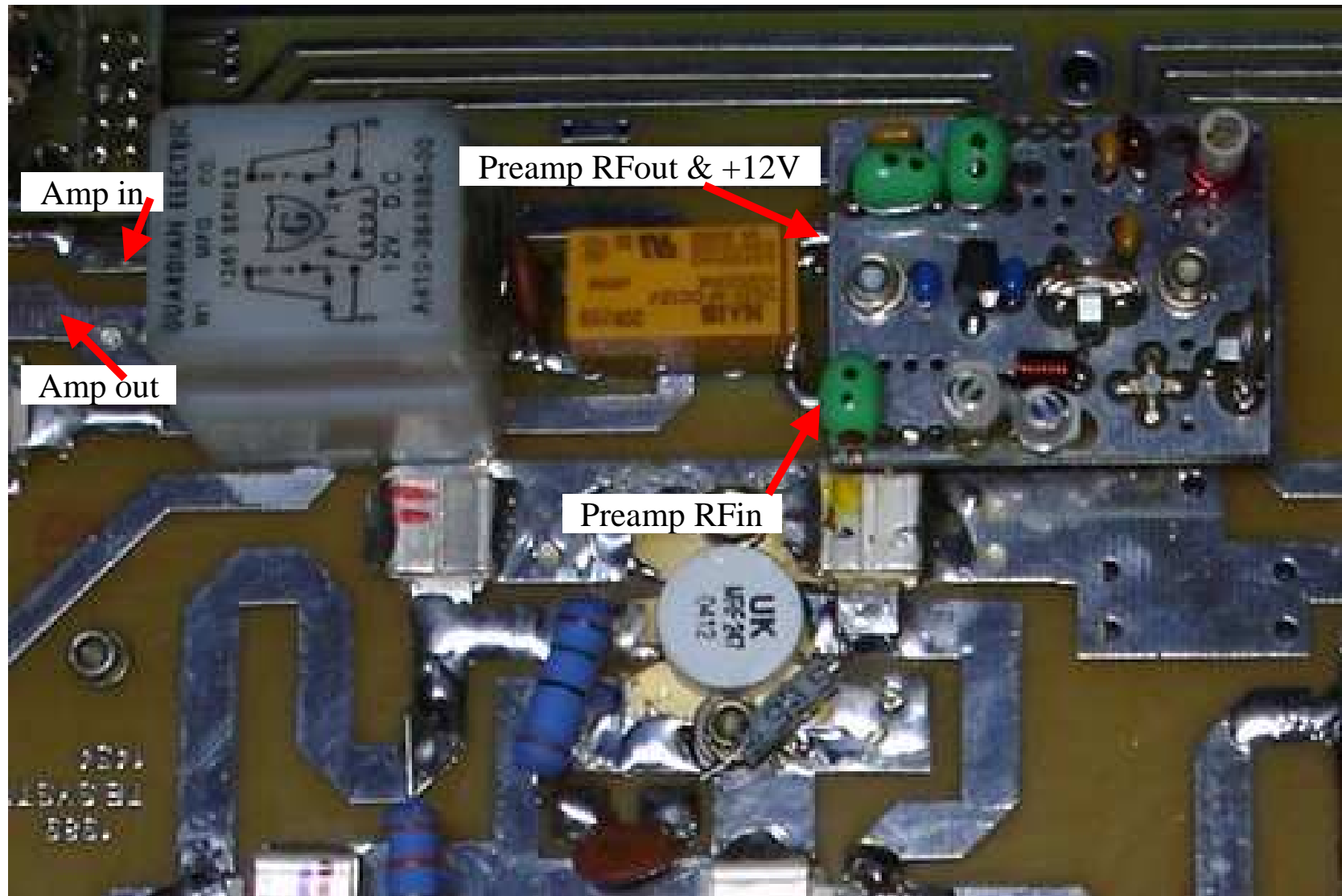
Before

After



Now DC biasing injection from the rig to the masthead preamp is possible

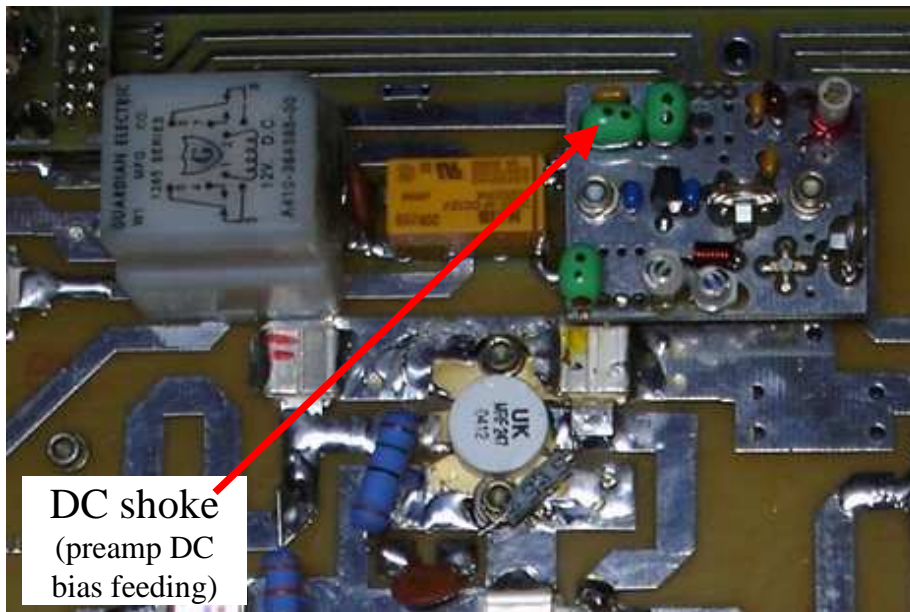
TE-1452G: on board GaAs preamp



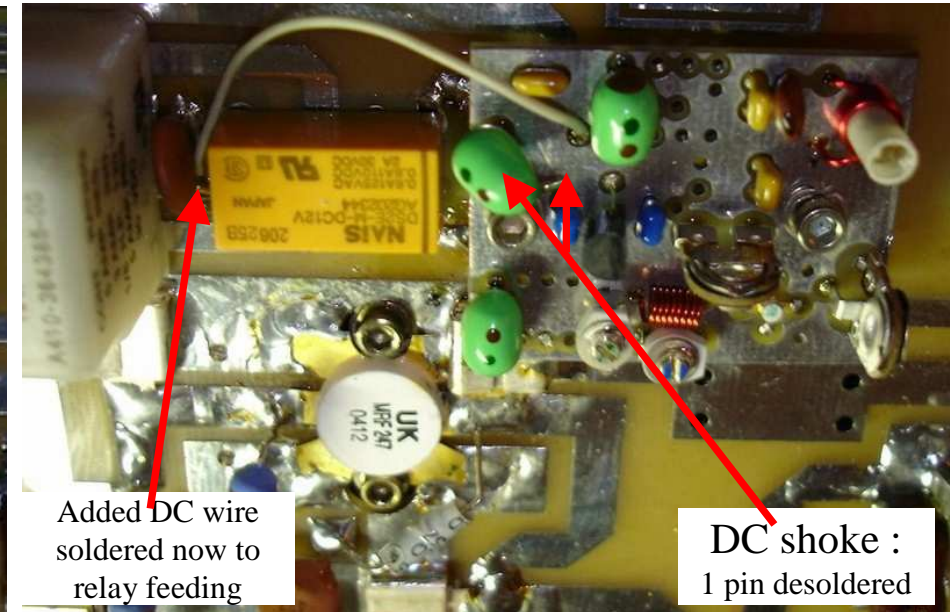
TE-1452G : mods for mast preamp DC feedthru

c/ Separate preamp DC feeding

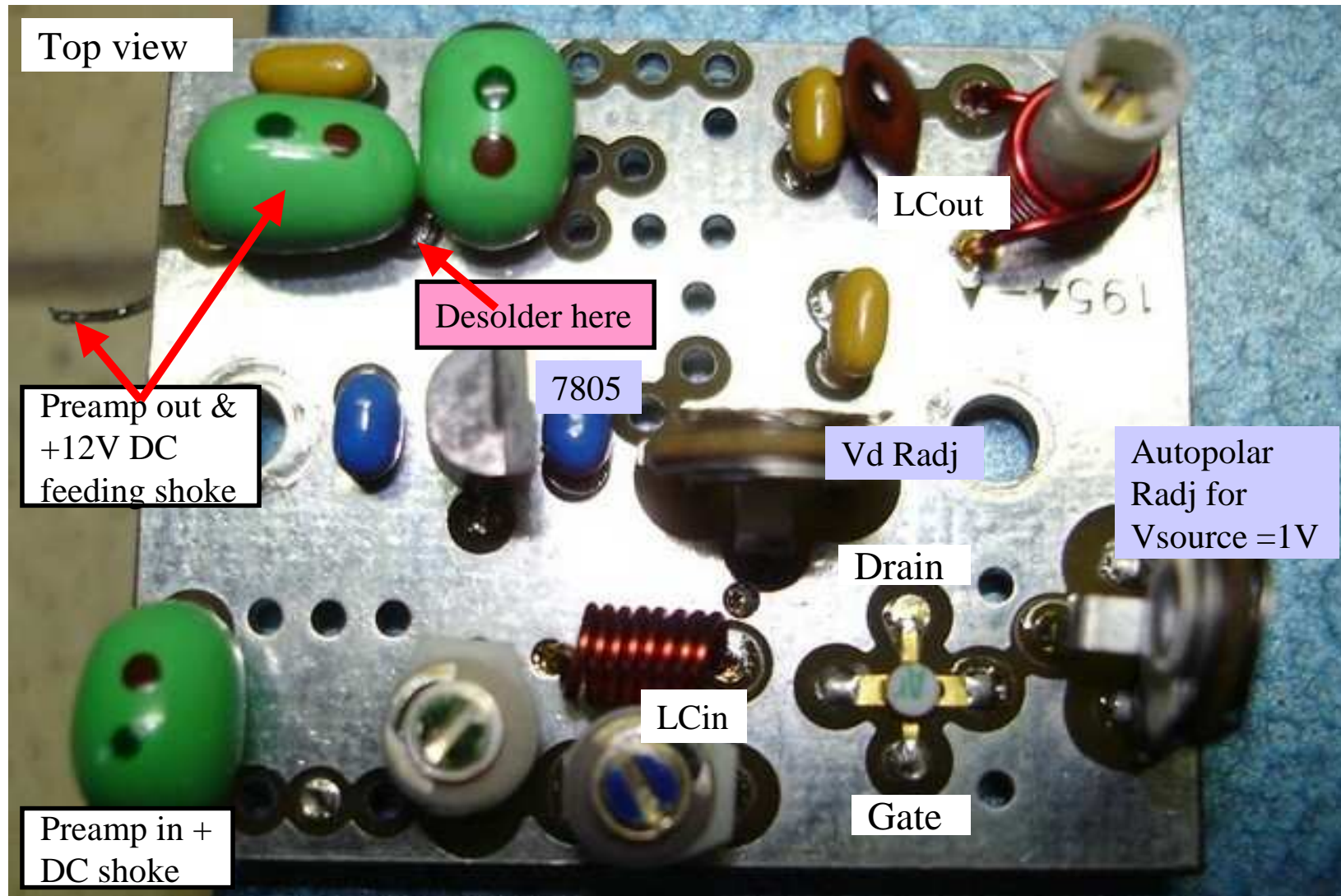
Before



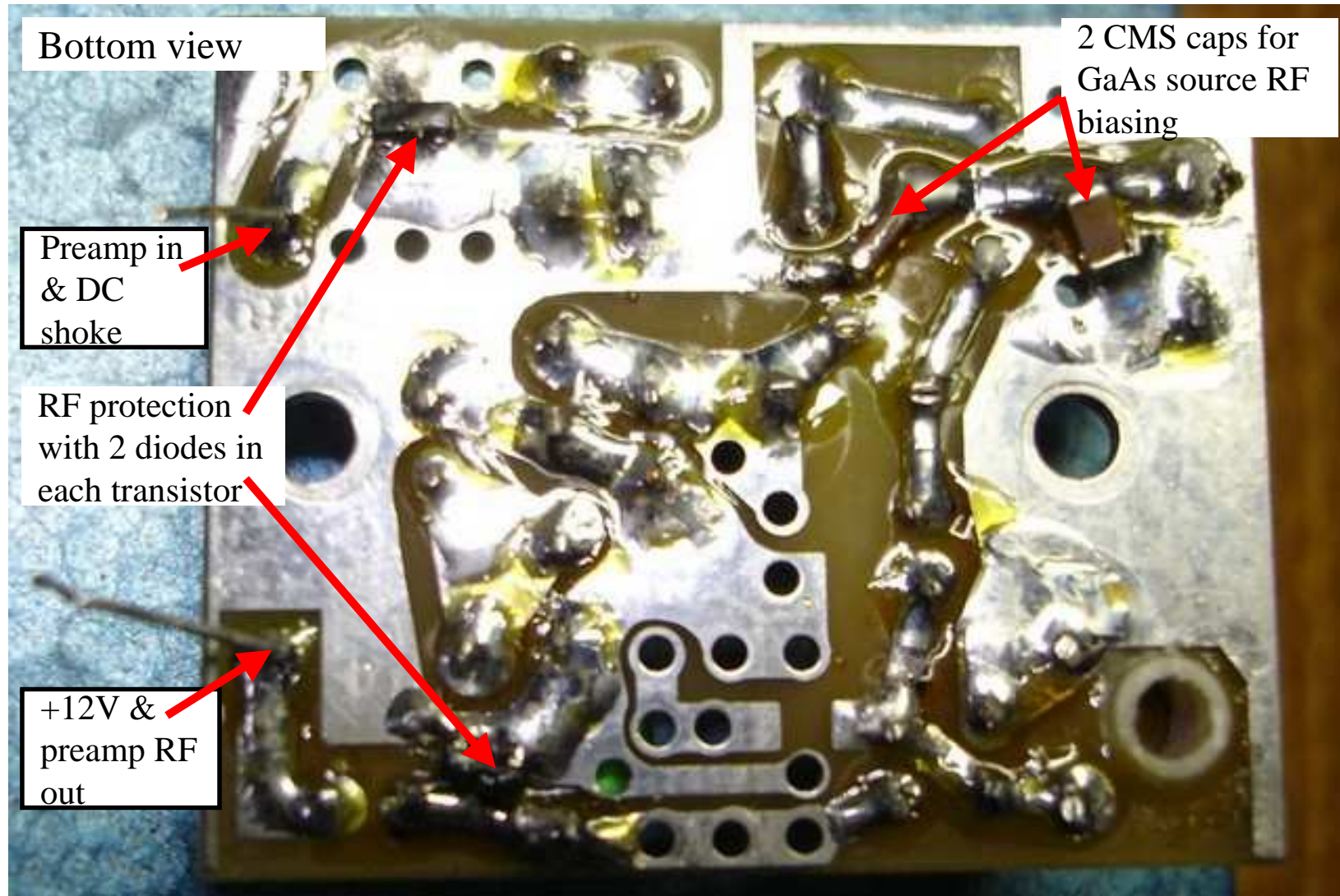
After



TE-1452G: on board GaAs preamp



TE-1452G: on board GaAs preamp



TE-1452G : mods for mast preamp DC feedthru

d/ Gain / Nf measures

Insertion losses



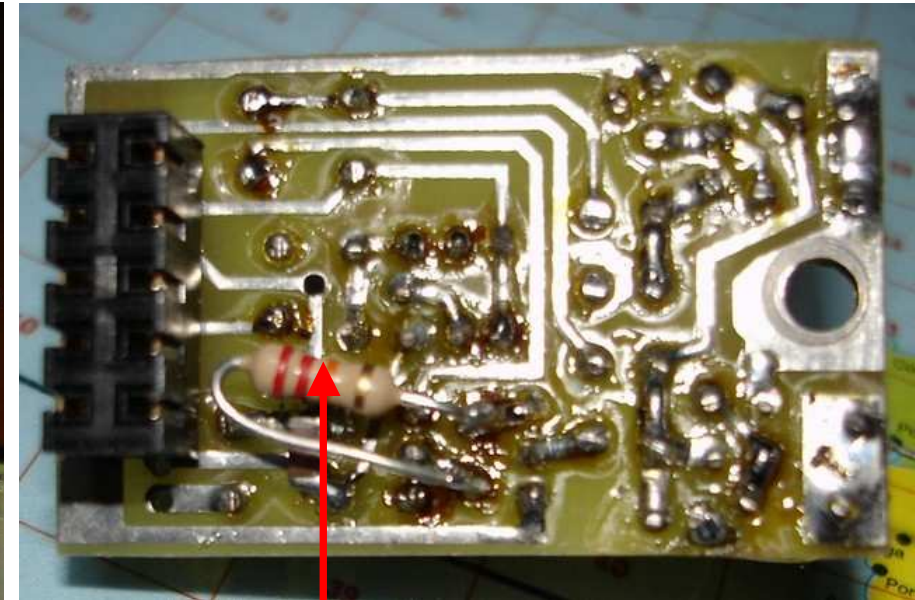
Preamp meas



HP-8970a noise / gain analyser + Ailtech 7615 noise generator

TE-1452G : VOX & PTT printboard mod

Bottom position



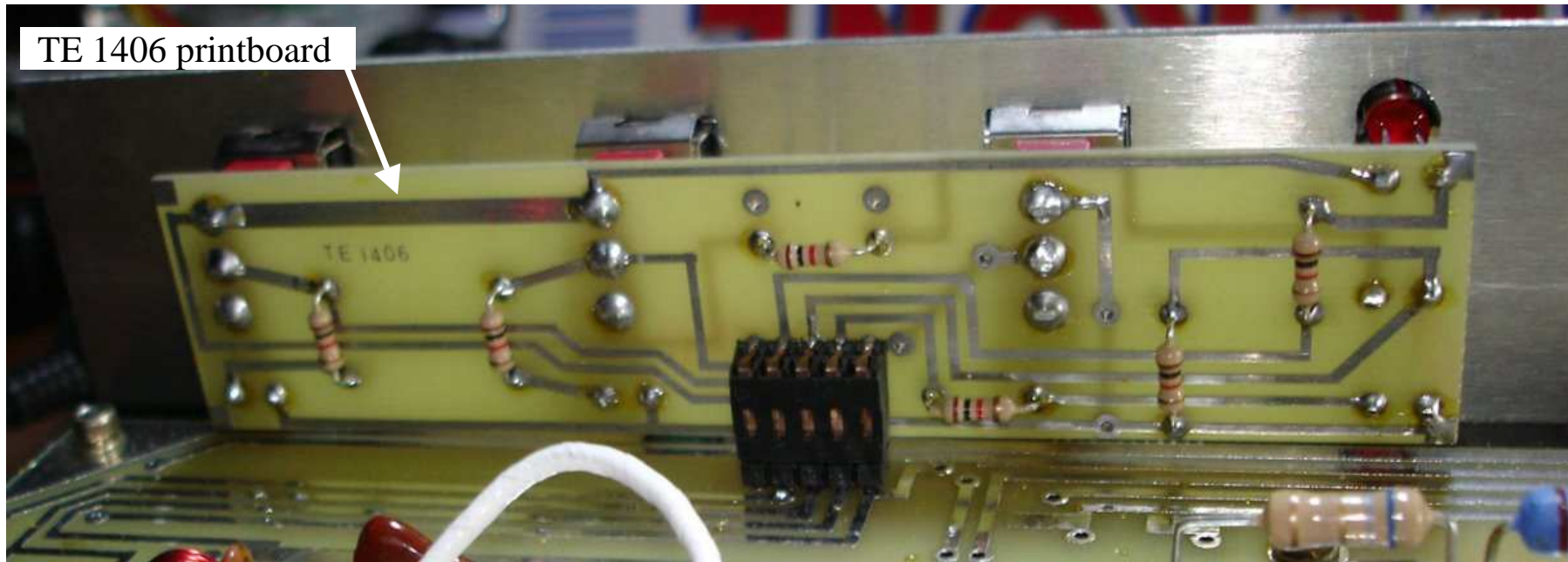
Initial DC bias
feeding coil BEFORE
Guardian TRx relay

To TRX Guardian
relay

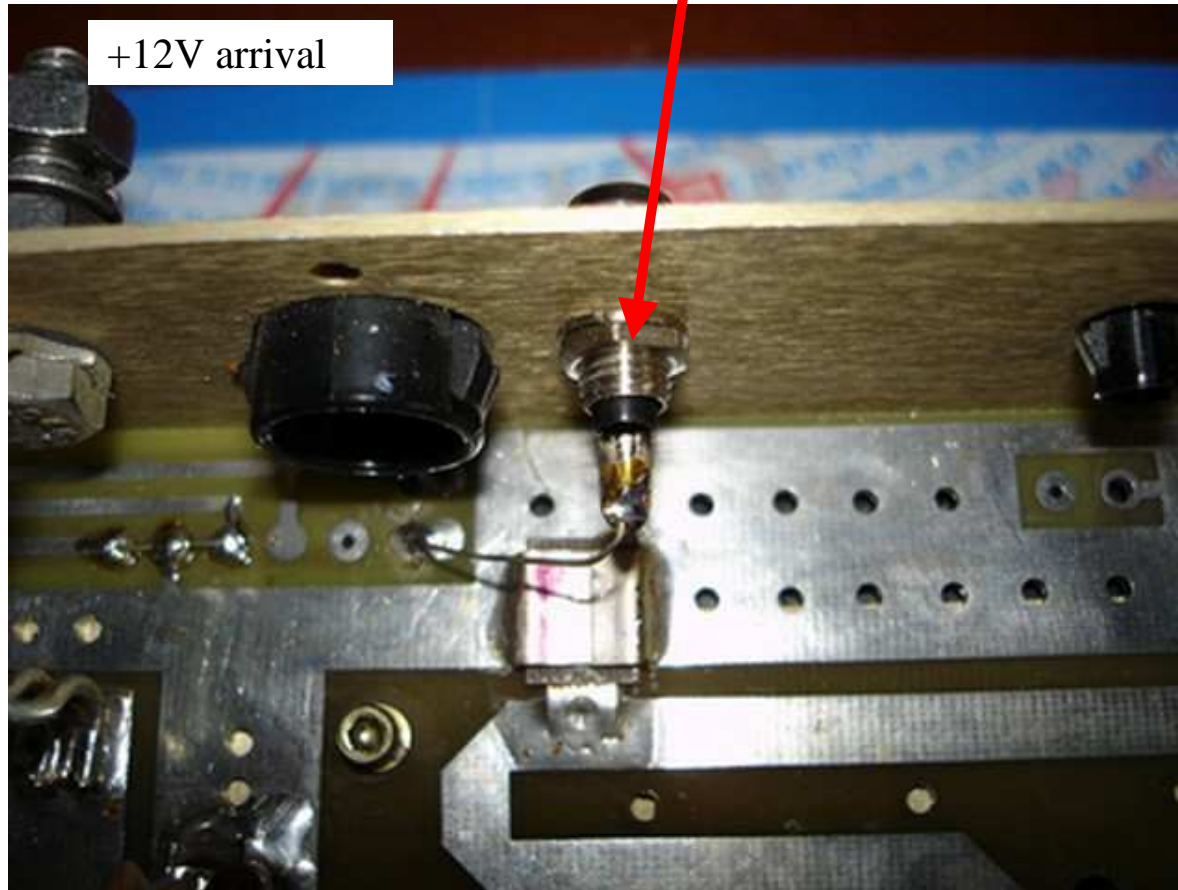
*22 k Ω in parallel to
the 1st one*

With 11 k Ω , the VCE sat in the relay PNP transistor is now 1.5V instead of 4V initially !!

TE-1452G : rear of front panel



TE-1452G : adding of PTT cinch socket on rear panel



- The initial remote accessory socket in normal & G versions has no utility
- every other brand has a PTT cinch connector

TE-1452G : printboard connectors pin layout

1	2	3	4	5
6	7	8	9	10

Front panel with switches & LEDs

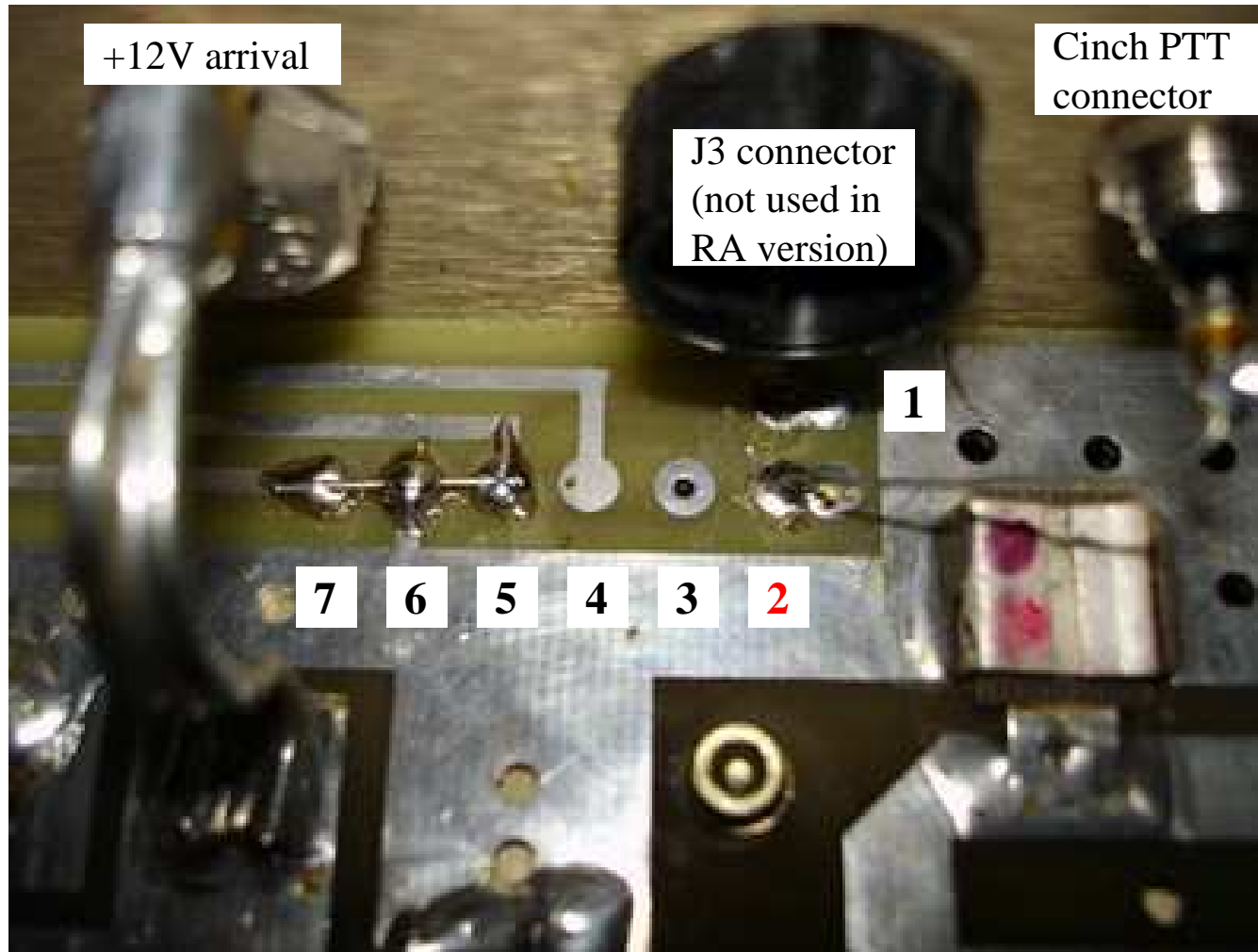
	On/off connector 1 near front panel
1	FM/SSB switching
2	DC bias & RF LED
3	+12V after amp on switch before thermal security
4	PTT or remote LED
5	NC
6	Ground
7	Preamp & LED switch
8	+12V after thermal security
9	General +12V incoming
10	Output J3 remote plug

Rear panel with RF in/out connectors

1	2	3	4	5
6	7	8	9	10

	RF switching connector 2 near rear panel
1	Preamp relay
2	Guardian TRx relay
3	DC bias output
4	Ground
5	Output LED to 7 on J3
6	Output on J3
7	+12V from 3 conn 1
8	FM/SSB switching from 1 conn 1
9	PTT from 4 conn 1
10	J3 SSB delay pot

TE-1452G : J3 remote plug



	J3 remote plug
1	FM/SSB
2	PTT
3	+12V, max 1A
4	Preamp
5	PA cntrl gnded
6	Ground
7	LED cntrl gnded

TE-1452G: RF power measures

TE-1452G biasing current

MRF247 driver

	12V	12.5V	13V	13.5V	13.8V
I_b bias (mA)	4.5	8	14	30	33
V_{BE} (V)	0.626	0.625	0.650	0.670	0.675

4 x MRF247 final stages

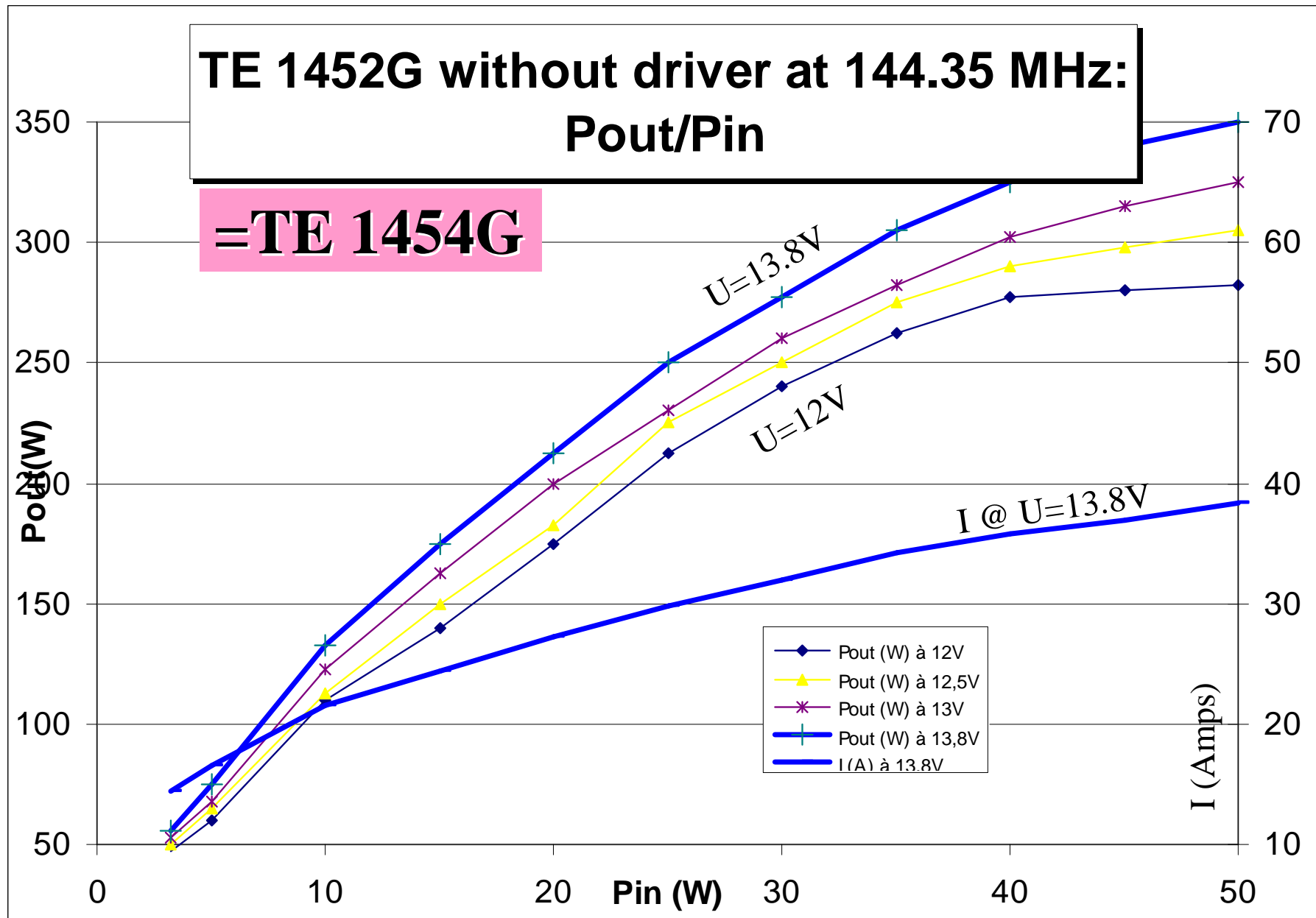
	12V	12.5V	13V	13.5V	13.8V
I_b bias (mA)	6	10	22	48	75
V_{BE} (V)	0.592	0.613	0.635	0.647	0.662
I_c total (A)	0.4	0.7	1.9	2.0	2.2

TE-1452G: Pout versus Pin à 144.400 MHz without driver

- Rig IC-706MKIIg, Pin from 3.2 to 50W
- Wattmeter Telewave model 44A
- Dummy load BIRD Termaline 8135 - 150W
- MAAS SPS9600 power supply à 13.8V

=TE 1454G

Pin (W)	12V	12.5V	13V	13.8V	I à 13.8V (A)	Yield %
3.25	47.5	50	52.5	56	14.4	
5	60	65	68	75	16.5	
10	110	115	122.5	132.5	21.5	
15	140	150	162.5	175	24.4	
20	175	182.5	200	212.5	27.3	
25	212.5	225	230	250	29.8	
30	232.5	250	260	277	31.9	
35	262.5	275	282.5	305	34.2	
40	277	290	310	330	35.8	
45	277	290	310	330	35.8	
50	282.5	305	325	350	39.1	



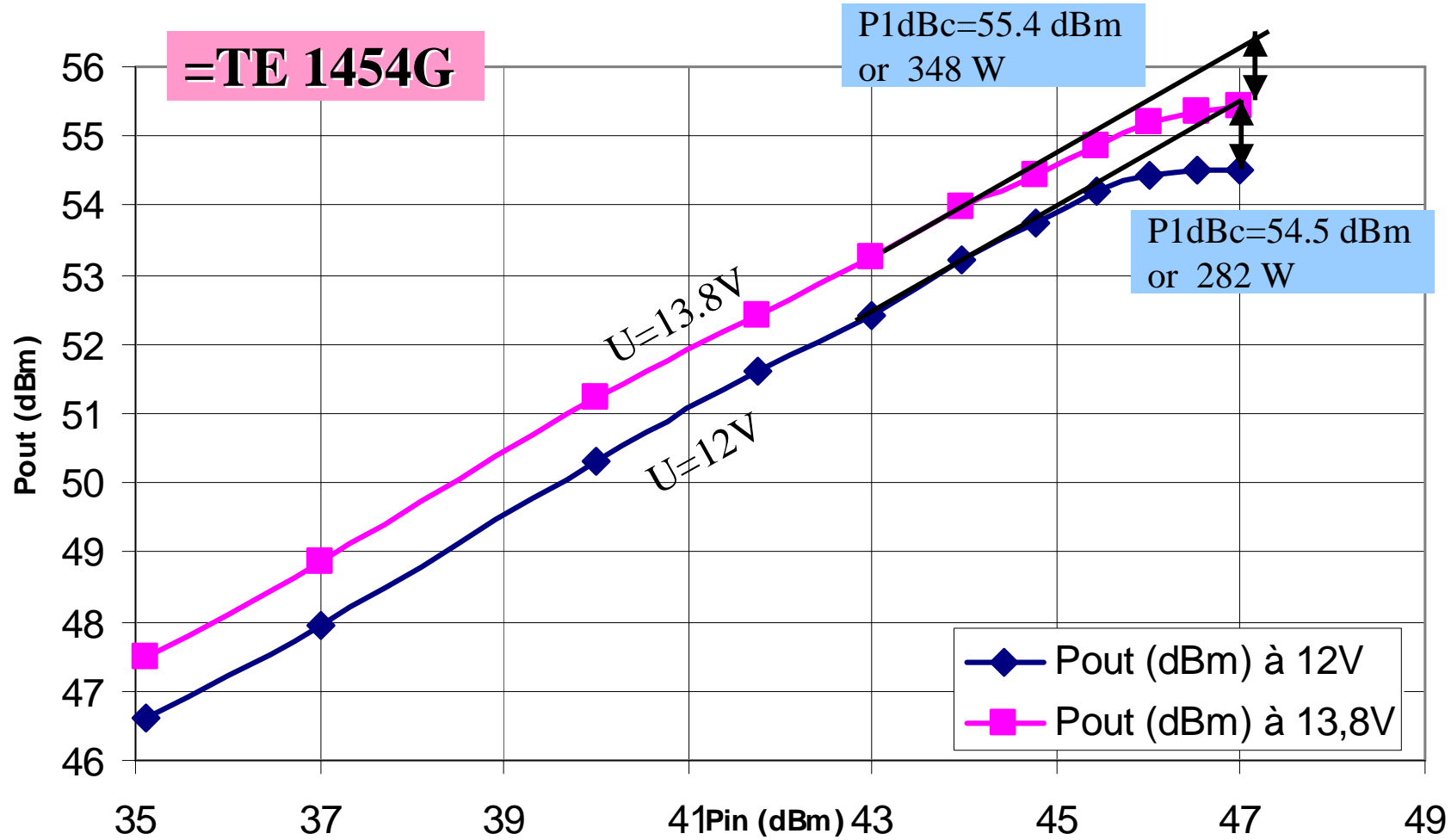
TE-1452G: Pout versus Pin à 144.400 MHz without driver

- Rig IC-706MKIIg, Pin from 3.2 to 50W
- Wattmeter Telewave model 44A
- Dummy load BIRD Termaline 8135 - 150W
- MAAS SPS9600 power supply à 13.8V

=TE 1454G

Pin dBm	12V		13.8V	I à 13.8V (A)	
35.12	46.77		47.48	14.4	
37	47.78		48.75	16.5	
40	50.41		51.22	21.5	
41.76	51.46		52.43	24.4	
43	52.43		53.27	27.3	
43.98	53.27		53.98	29.8	
44.77	53.66		54.42	31.9	
45.44	54.19		54.84	34.2	
46	54.42		55.18	35.8	
46.53	54.42		55.18	35.8	
46.99	54.51		55.44	39.1	

TE 1452g without driver à 144 MHz: Pout/Pin

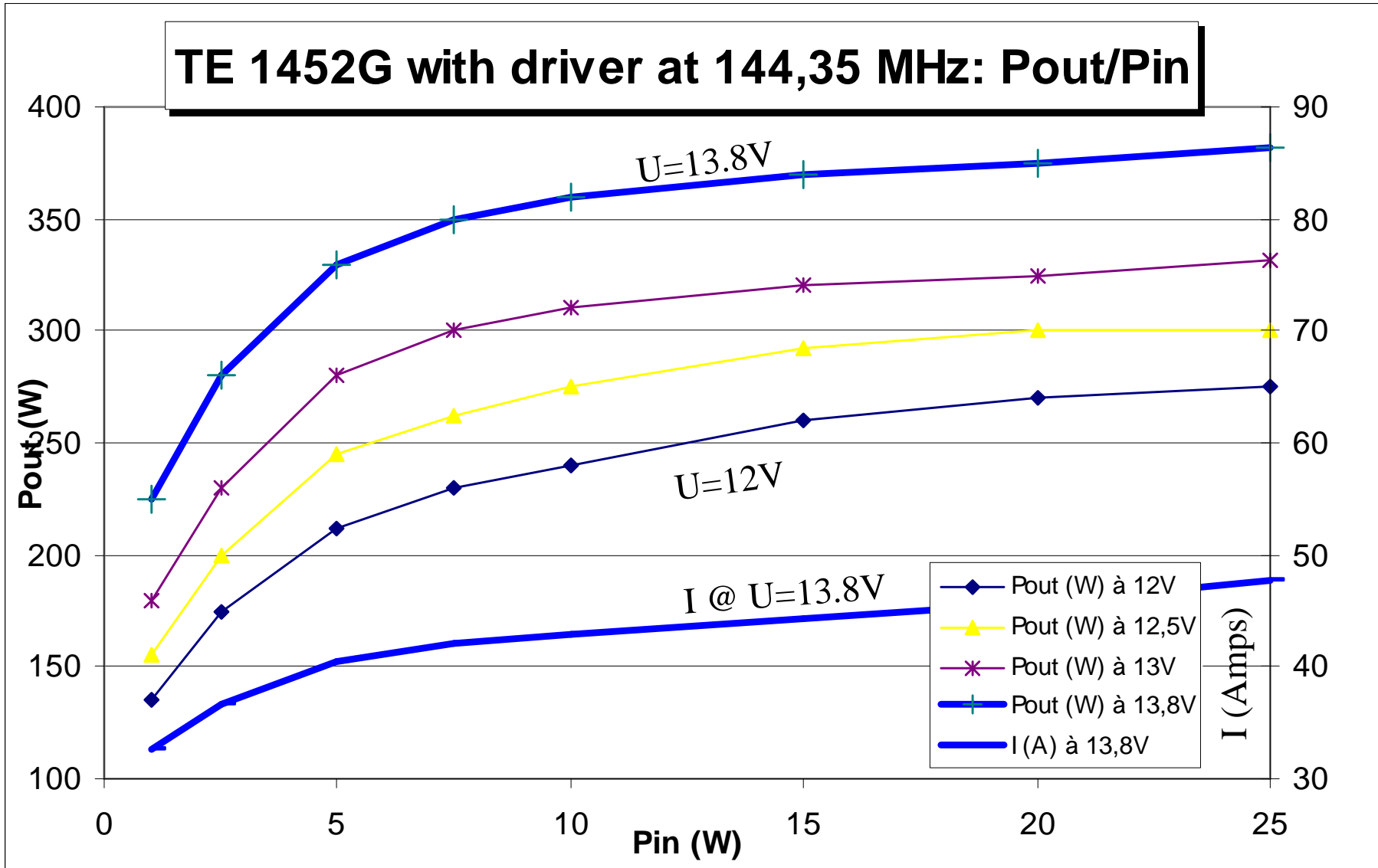


TE-1452G: Pout versus Pin à 144.400 MHz with driver

- Rig FT-847, Pin from 1 to 25W
- Wattmeter Telewave model 44A
- Dummy load BIRD Termaline 8135 - 150W
- MAAS SPS9600 power supply à 13.8V

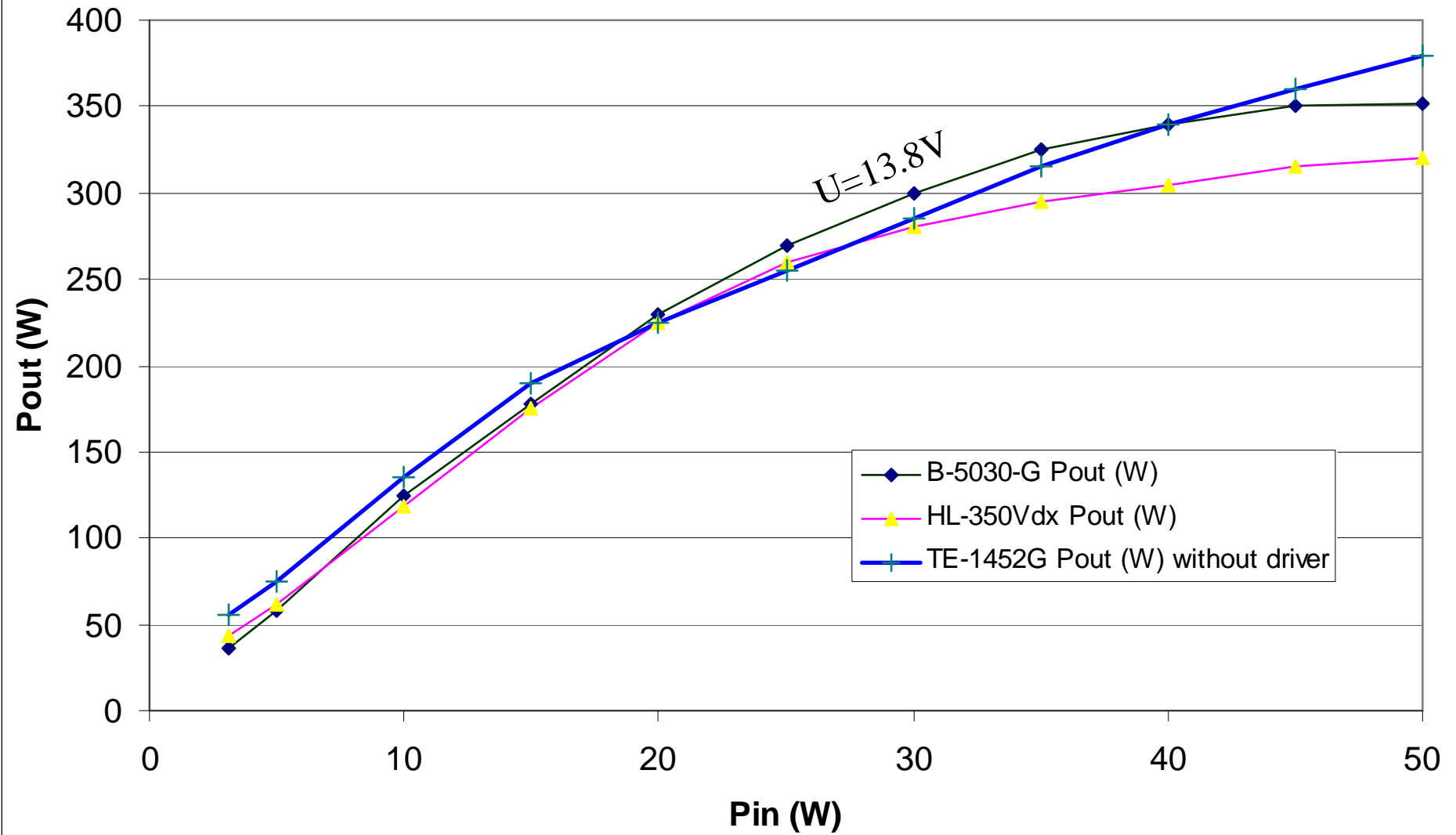
Pin (W)	12V	12.5V	13V	13.8V	I à 13.8V (A)	Yield %
1	135	155	180	225	32.6	
2.5	175	200	230	280	36.7	
5	212	245	280	330	40.5	
7.5	230	262	300	350	42	
10	240	275	310	360	42.8	
15	260	282	320	370	44.3	
20	270	300	325	375	45.8	
25	275	300	332	382	47.8	

Original manufacturer version !!



- Max SAFE Pin allowed <25W
- Sat Pin 10W !!!!!

QRO 2 meter amps comparaison



Aknowledgements

- Special thanks to Jim W3ATV who'd sell me this « technician special » amp, also to many US hams but especially Jeff Allen KB9YSJ from Los Angeles, Dave WB0GAZ, David W3KM, Don N8ECH, KT0WN, John VE3MPH, Maximo EA7FGJ and many others for the precious help I'd get and the very constructive discussions we'd have about
- Also to many french hams who kindly'd give me complementary US screws vy difficult to find here in W-Europe !!!
- The AD5TH site also gives many infos about TE Systems six & two meter amps