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Description:	<ul style="list-style-type: none"> Suitable for 10GBase-T and 1000Base-T in CAT6A/6/5E applications Plug options up to 0.062 in. and overall diameters up to 0.330 in. 	 Download Datasheet

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 **Author**

Topic: Broken Metcal RFG-30 soldering base unit fixed (Read 23033 times)

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wkb
Frequent Contributor



Posts: 540
Country: 



 **Broken Metcal RFG-30 soldering base unit fixed**

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« on: December 30, 2011, 11:38:30 pm »

Today I finally managed to fix my beloved Metcal RFG-30 soldering base unit 🤔🤔

Metcal uses a more than ingenious heating system that uses a 13.5 MHz HF power feed into the soldering iron itself. In the actual soldering tip is a coil that inductively heats a copper 'slug' which is itself covered in a metal alloy with a high magnetic permeability.

It loses this high permeability once its temperature reaches the Curie point. This in turn stops the heating of the tip by the HF feed.

Anyway, long story short: go and read US patent 4,626,767 for much more information and some sample circuit diagrams.

Over all it turned out that I:

- had **2** broken heating elements/tips. One died on me while I was using it, the other (used one) proved dead as well
- had a broken coax cable. The Metcal uses a very nice silicon-rubber, double shielded coax which is next to impossible to refit to the handle / connector 🤔
- forgot to put the series cap in the handle on reassembling the cable 🤔 This made the whole thing no longer a tuned LC circuit 🤔 which did not warm up, not even after the generator was fixed
- had a short due to a misaligned(?) isolation shim on the heatsink

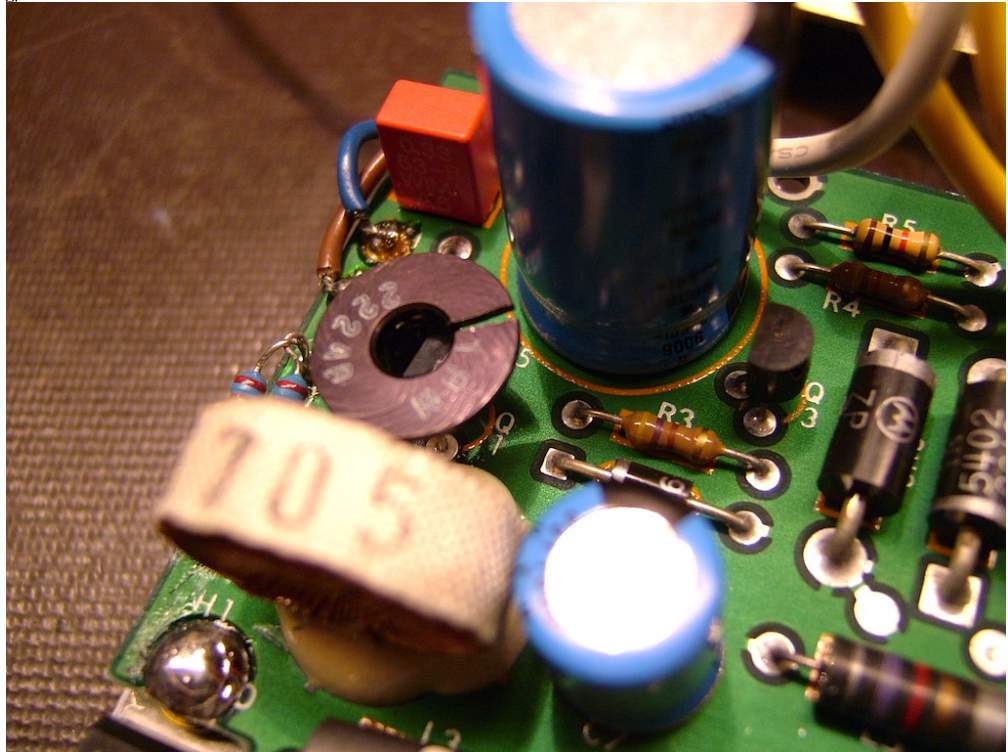
The heatsink story is a nasty one, there are 2 power FETs and regulator IC mounted on it, using a collection of nuts and bolts, some isolated from the heatsink, some not. For more fun the mains inlet mounts into it, as does the F-connector for the hand piece. See the picture for details. Design for serviceability: NOT!

The short proved to have blown a transistor, which manifested itself in a 100 Ohm resistor getting hot enough to 'smell'. What got me confused initially was that I still had 13.5MHz HF on the output connector. I first replaced the resistor, later I got the correct transistor type and now things are OK. The transistor is apparently part of some feedback circuit (?) that throttles the HF amplitude. The transistor in question is Q1, with a little heatsink, as shown in the detail picture.

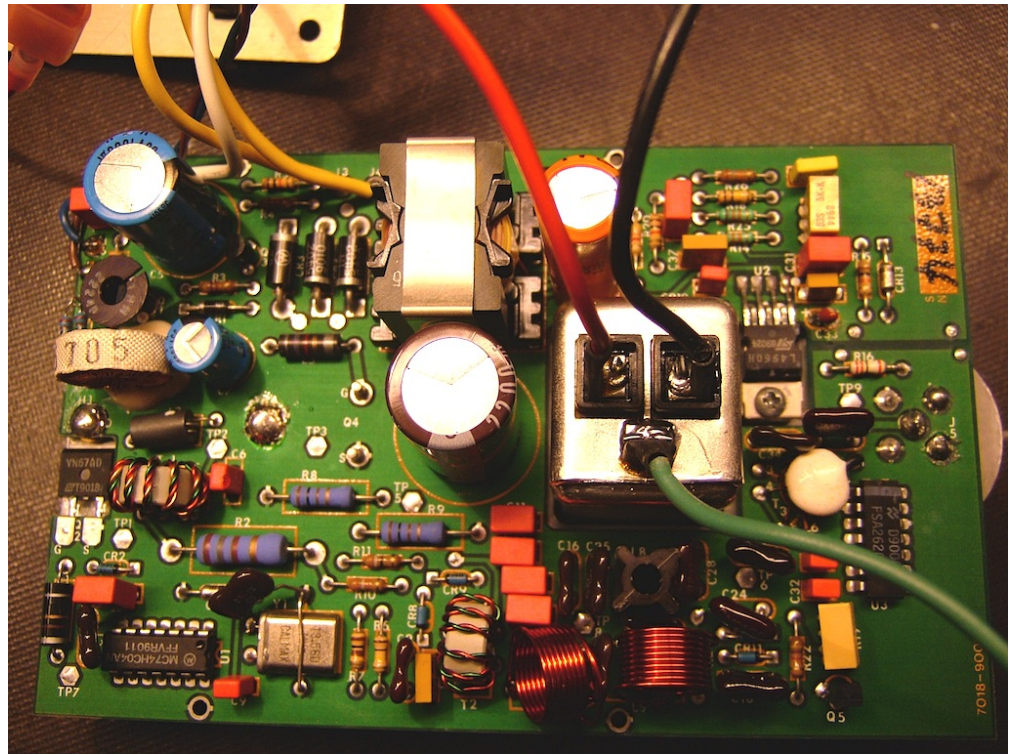
For the benefit of others Googling the web for info on fixing their Metcal I have also attached schematics I found on the WWW for the Metcal MX500 base station. That one is different from the RFG-30 but there are enough similarities to make the schematic useful. I never found a RFG-30 schematic unfortunately.

Included are 3 scope screenshots, the first one showing the HF while the generator was broken. The 2nd one shows the HF amplitude during warm up. The 3rd one shows the HF amplitude with the iron idling at it's Curie temperature.

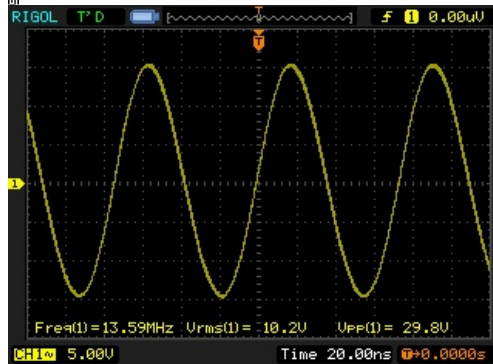
Metcal-MX-500P-11-schematics.pdf (114.87 kB - downloaded 1423 times.)



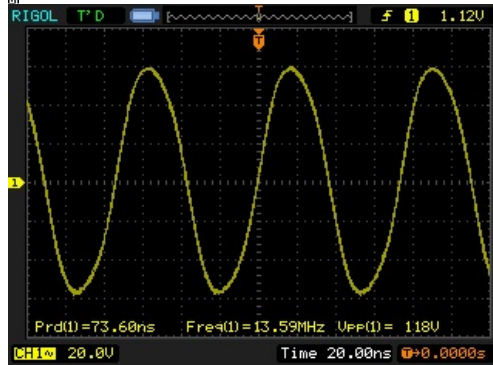
DSCF2131.JPG (238.88 kB, 1024x768 - viewed 4141 times.)



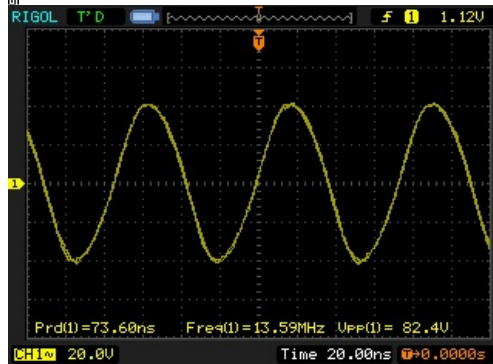
DSCF2133.JPG (311.27 kB, 1024x768 - viewed 4995 times.)



metcal_defective.jpg (38.89 kB, 320x234 - viewed 1647 times.)



metcal_during_warmup.jpg (38.77 kB, 320x234 - viewed 1475 times.)



metcal_idling_at_curie_point.jpg (37 kB, 320x234 - viewed 1373 times.)

Report to moderator  Logged **whonline**

Contributor

Posts: 5

 **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #1 on: February 22, 2012, 03:37:03 pm »

I appreciate the post. I have an RFG-30 that needs repair but I can't figure out how to remove the top cover without breaking it. Can you explain the procedure?

Thanks in advance.


Walt

Report to moderator  Logged **wkb**

Frequent Contributor



Posts: 540

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #2 on: February 22, 2012, 04:46:48 pm »

Quote from: whonline on February 22, 2012, 03:37:03 pm

I appreciate the post. I have an RFG-30 that needs repair but I can't figure out how to remove the top cover without breaking it. Can you explain the procedure?

Thanks in advance.

Walt

There are 4 Phillips head screws in mine that hold down the plastic cover with the cutout for the mains switches. Remove these screws. Underneath you will find an aluminium plate that also has the mains switch mounted on it. Pull that plate out, the wiring of the mains switch will hold it down. Those wires have Faston connectors that allow you to separate the switch & plate from the rest of the unit.

Now remove the bottom cover, again 4 Phillips head screws. No wires this time.

Now remove the Allen head screws from the heat sink. And take the power inlet out. Carefully shift the heatsink/PCB assy out of the aluminium enclosure. I had to cut a (riveted) earth wire, don't forget to reconnect that on reassembly!

That should do it. Not too tricky, just a bit awkward.

Report to moderator  Logged **whonline**

Contributor

Posts: 5

 **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #3 on: February 25, 2012, 06:06:10 pm »

Your description convinced me the top screws on my unit were hidden by a plastic overlay. I found the edge, peeled it up and exposed the screws.

My repair was trivial. Hardly a repair at all. I was annoyed by the burned out light bulb. I replaced it with an LED and am good to go.

Thanks again for your help.

Report to moderator  Logged **longpole001**

Contributor

Posts: 11

 **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #4 on: April 18, 2012, 12:54:29 am »

i also have a problem with my metcal

Checking the voltage at the 74hct04 inv is only 2.5v , and the rf output is at 3.5mhz , done the norm change of electro caps which are over 15 years old etc , doing diode check on transistors , and diode showed nothing , and slowly working the schmatic of mx-500 as a guide that you have here and comparing to the rfg-30 unit , so far with out any success ,

i have found that the resistance on the board over the q4 is close to dead short , even when the q4 is removed , which surprised me , will try replaceng all the transistors if i can with equiv if can as a test , but i am bit lost at this point

if anyone can verify what the sig / voltage at the test points on the board should be would be very helpfull

What i see at the moment :

1. voltage over R1 (100 ohm) is 20V - DOES THIS LOOK CORRECT
2. Q1 collector is 6.8v
3. R2 via L2 voltage is 6.8v , but on other side of R2 is 2.5v , which is appears wrong
4. 74htc04 pin14 vdd = 2.5v , - looks wrong

Some input on this would be good guys

Cheers

Sheldon

Report to moderator  Logged

 **vk6zgo**

Super Contributor



Posts: 4794

Country: 



Re: Broken Metcal RFG-30 soldering base unit fixed

« **Reply #5 on:** April 18, 2012, 05:03:00 am »

Say Thanks

Reply

Quote

Quote from: longpole001 on April 18, 2012, 12:54:29 am

i also have a problem with my metcal

Checking the voltage at the 74htc04 inv is only 2.5v , and the rf output is at 3.5mhz , done the norm change of electro caps which are over 15 years old etc , doing diode check on transistors , and diode showed nothing , and slowly working the schematic of mx-500 as a guide that you have here and comparing to the rfg-30 unit , so far with out any success ,

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if anyone can can verify what the sig / voltage at the test points on the board should be would be very helpfull

What i see at the moment :

1. voltage over R1 (100 ohm) is 20V - DOES THIS LOOK CORRECT
[Don't know,what is voltage on Q1 emitter?](#)
2. Q1 collector is 6.8v
[The Q1 collector is connected to L2 as in #3](#)
3. R2 via L2 voltage is 6.8v , but on other side of R2 is 2.5v , which is appears wrong
[According to the MXP500-11 circuit,D2 ,which is the only 6.8 Volt zener on the board is on the opposite side of R2 from L2,so the voltage on L2 should be higher.---different circuit? Check across D2 to see if it is working.](#)
4. 74htc04 pin14 vdd = 2.5v , - looks wrong
[Definitely wrong,with 2.5 volts on the 74HTC04,you will have no oscillator or buffer.](#)

Some input on this would be good guys

Cheers

Sheldon

Report to moderator  Logged

 **longpole001**

Contributor

Posts: 11



Re: Broken Metcal RFG-30 soldering base unit fixed

« **Reply #6 on:** April 18, 2012, 07:12:44 am »

Say Thanks

Reply

Quote

continue repairs

the 74htc04 is pulling the voltage down . 2.5v , when removed its goes to 8v on pin 14 , after replacing the 74htc04 , it remains at 8v now output of pin 2 7404 is now 13.5mhz as expected , but the buffered combined outputs of the 7404 which feed Q2 [VN016n5] (Q3 on mx500cct) drop to 3.5mhz. and this is reflected at the final stage of output

removing the gate Q2 from the board restores the 13.5hz sig , clearly Q2 has issues

finding that VN0106N5 (N ch power Mosfet) hard to find - is now been dropped from the supertex product list , and VN0109N5 is also dropped from what i can see, some suppliers on the net show some stock and i am looking to get one.

VN0106N5 - To220 - 60v @2.5A , VN0109N5 - 90v @2.5 , there are many equiv for voltage and current but not many with a @ 5ns turn on / turn off delay time , most mosfets have higher delays typicality about 40ns or more but have greater power output that i have found so far.

if you know of an VN0106N5 equivalent me know ASAP

Also note that if your looking for Q4 - IRF130 - T03 package they are on the net , Q4 on the MX500 shows a IRF 530 on the cct , and its in T0220 package , with same spec's but not fun to retro mount by the looks on RFG-30 heatsink

the repair continues

cheers

Report to moderator  Logged

longpole001

Contributor

Posts: 11



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #7 on: April 18, 2012, 08:15:35 am »

Say Thanks Reply Quote

looking at the possible replacement for VN0106N5 and the IRF510-512 series came up in searches

given the input to gate of 13.5mhz gives a 74ns cycle , half a cycle is 37ns

rise half cycle is = turn on delay time + rise time
fall half cycle is turn off delay + fall time

thus spec for IRF510 -513 series says
max rise turn on delay =20ns
max rise time =25ns ,
same for for fall times

so half cycle rise time is max 45ns , fall half cycle is 45ns , i need a max of 37ns at a freq at 13.5mhz

thus this equivilant mosfet wont fit this application

am i correct in my calculations ??

cheers

Report to moderator  Logged

longpole001

Contributor

Posts: 11



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #8 on: April 18, 2012, 10:12:34 am »

Say Thanks Reply Quote

also i find that the irf130 (Q4) spec sheet has over 115ns combined delay + rise time , and 105ns delay + fall time , clearly the gate input is not required to recieve a 13.5mhz signal

more like a 4.8mhz given those time of rise and fall specs (assuming my other calculations are correct)

Q4 is driven via the T1 and what looks to be RC filter arrangement look at Mx500 cct

so what is the freq i should expect on the SMA connector for the hand piece ??

what your thoughts 😊

cheers


sheldon

Report to moderator  Logged

vk6zgo

Super Contributor

Posts: 4794

Country: 



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #9 on: April 18, 2012, 02:49:37 pm »

Say Thanks Reply Quote

I was going to say that the turn on/turnoff specs for use as a switch would be worse than the capabilities of the device in linear mode,**but** looking at the circuit,I can't see any biasing,so it certainly looks like it is being used in a non linear class of operation.

If that is so,the filtering (LPF after Q4) is probably just to get rid of any harmonics of 13.5MHz.

C24 is just a coupling capacitor,R27 & R28 constitute a 50 Ohm termination for the secondary of T1. L10 doesn't have any resonating caps--perhaps it is self-resonant at 13.5MHz?

There are no circuit components included that can divide **down** in frequency ,so I suggest that you will still see 13.5MHz at the handpiece in an operational unit.

I have seen PowerFets used in "homebrew" Ham Radio transmitters,so that may be somewhere worth looking into.

P.S.:Re-read the OPs posting ,it will help more now you have reached this point.

« Last Edit: April 18, 2012, 02:57:19 pm by vk6zgo »


Report to moderator  Logged

vk6zgo

Super Contributor



Posts: 4794

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #10 on: April 18, 2012, 04:22:52 pm »

Say Thanks Reply Quote

Had a look around on Google--doesn't look very hopeful.

Quite a few designs using switching type Power Fets as RF amps.

Almost universally,comments are "low gain","hard to match,due to high input capacitance","not much good above 7 MHz",etc.

The devices used by Metcal seem to be fairly unusual in having much more useful characteristics at 13.5MHz.

Perhaps you need to look at devices originally designed for RF use?


Report to moderator  Logged

wkb

Frequent Contributor



Posts: 540

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #11 on: April 18, 2012, 07:16:38 pm »

Say Thanks Reply Quote

Quote from: vk6zgo on April 18, 2012, 02:49:37 pm

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I have seen PowerFets used in "homebrew" Ham Radio transmitters,so that may be somewhere worth looking into.

P.S.:Re-read the OPs posting ,it will help more now you have reached this point.

The power amp section is class-C, followed by a filter to reduce harmonics.

The frequency is 13.5MHz at the handpiece, this is an ISM frequency.

Report to moderator  Logged

Joshua Bretz

Newbie

Posts: 1



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #12 on: August 30, 2013, 01:56:08 pm »

Say Thanks Reply Quote

Looking at the MX-500 schematic, a short on the gate of Q4 is normal because there is an inductor from gate to source. I found that C24 was blown in my unit which explains why Q1 fried: with C24 blown, this inductor shorts the supply. Replaced C24 with Kemet PHE850ED6100MD18R06L2 and unit works fine.

Quote from: longpole001 on April 18, 2012, 12:54:29 am

i also have a problem with my metcal

Checking the voltage at the 74hct04 inv is only 2.5v , and the rf output is at 3.5mhz , done the norm change of electro caps which are over 15 years old etc , doing diode check on transistors , and diode showed nothing , and slowly working the schmatic of mx-500 as a guide that you have here and comparing to the rfg-30 unit , so far with out any success ,

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Some input on this would be good guys

Cheers


Sheldon

Report to moderator  Logged **mamalala**

Supporter



Posts: 777

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #13 on: August 30, 2013, 03:10:24 pm »

Say Thanks Reply Quote

And just in case:

<https://www.eevblog.com/forum/projects/diy-metcal-13-56-mhz-rf-supply>

(sorry for the shameless plug)

Greetings,


Chris

Report to moderator  Logged **mamalala**

Supporter



Posts: 777

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #14 on: August 30, 2013, 03:19:30 pm »

Say Thanks Reply Quote

Quote from: wkb on December 30, 2011, 11:38:30 pm

- forgot to put the series cap in the handle on reassembling the cable 😊 This made the whole thing no longer a tuned LC circuit 😞 which did not warm up, not even after the generator was fixed

I'm curious about that. In the original patent for the handle, there is a series cap mentioned. However, in my actual RM3-E handles, there is no such cap. It is a straight connection to the tip cartridge. A Talon tweezer i just got also has no series cap.

What handle do you have/use? A friend of mine got a newer handle (those shiny metal/aluminium thing with replaceable grips), and no cap in there as well. So unless the RFG30 is "missing" something in it's RF output section, i'd say that there is no cap required at all.

Greetings,


Chris

Report to moderator  Logged **AndersAnd**

Frequent Contributor



Posts: 568

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

« Reply #15 on: April 29, 2014, 01:09:59 pm »

Say Thanks Reply Quote

Quote from: longpole001 on April 18, 2012, 07:12:44 am

finding that VN0106N5 (N ch power Mosfet) hard to find - is now been dropped from the supertex product list , and VN0109N5 is also dropped from what i can see, some suppliers on the net show some stock and i am looking to get one.

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Old topic I know, but I recently came across this topic looking for repair tips for a couple of defect Metcal MX-500 power supplies.

So the below might be useful to others searching for replacements for obsolete MOSFETs in Metcal power supplies.

The text is a copy of a reply I made in the **DIY Metcal 13.56 MHz RF Supply** topic:

<https://www.eevblog.com/forum/projects/diy-metcal-13-56-mhz-rf-supply/msg434497/#msg434497>

I've just repaired two MX500 power supplies (won at an eBay auction), with the help of the schematic and documentation here: <https://www.mikrocontroller.net/attachment/193474/MX-500P-11.pdf>
Mirror: <http://scopetechniques.com/Metcal/MX-500P-11.pdf>

The documentation says:

Q3 = VN0109N5 <http://scopetechniques.com/Metcal/465-1342-0-VN0109.pdf> /
<http://scopetechniques.com/Metcal/VN0109N5.pdf>

Q4 = IRF530(N) <http://www.irf.com/product-info/datasheets/data/irf530npbf.pdf>

But in the two defect MX500's I bought they were different:

Q3 = IRF510 <http://www.irf.com/product-info/datasheets/data/irf510pbf.pdf>

Q4 = IRF640N <http://www.irf.com/product-info/datasheets/data/irf640npbf.pdf>

Both branded International Rectifier.

The amber/orange led lit up all the time in my two defect devices while the green led was always off. I found out Q4 was shorted in both devices and after replacing it with a new IRF640N both devices work again.

It looks like Q3 (IRF510) had been replaced before in at least one of the devices, so not sure if they came with Q3 = IRF510 and Q4 = IRF640N from the factory. But it seems to work, at least so far. Has anyone else seen an MX500 with Q3 = IRF510 and Q4 = IRF640N?

Looks like [VN0109N5](#) from Supertex is obsolete, so maybe Metcal started using IRF510 instead? Now when you search [Supertex.com](#) VN0109 seems to only be available in wafer / dies and TO-92 housing called [VN0109N3](#), but no TO-220 option.

And for Q4, IRF640N is a 200 V MOSFET, while IRF530(N) from the schematic is only rated at 100 V, so maybe they have replaced it because there was problems with too high voltage spikes, toasting the IRF530's? Doesn't look like IRF530N is obsolete.

Haven't done any measurements after repairing them, so not sure about the voltages Q4 handles? But since the IRF640N was toast in both of them, maybe that's not the issue?

Much to my surprise I also received a Metcal solder stand with the defect power supplies, even though this wasn't advertised. A very nice surprise as Metcal solder stands are actually very expensive and I didn't have any. Later I received a new and very nice MX-H1-AV handpiece as a birthday gift. This came from RS Components where MX-H1-AV seems to be quite cheap compared to many others for some reason, even though RS usually isn't know for being cheap. So if anyone needs a new MX-H1-AV alloy handpiece for your DIY, Metcal or Thermaltronics/Easy Braid power supply, try to check out the price at you national RS Components site.

« Last Edit: April 29, 2014, 01:12:27 pm by AndersAnd »

[Report to moderator](#) Logged

wkb

Frequent Contributor



Posts: 540

Country:



Re: Broken Metcal RFG-30 soldering base unit fixed

[Say Thanks](#) [Reply](#) [Quote](#)

« Reply #16 on: April 29, 2014, 09:32:46 pm »

Quote from: mamalala on August 30, 2013, 03:19:30 pm

Quote from: wkb on December 30, 2011, 11:38:30 pm

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Greetings,

Chris

Talking about a delayed answer...

Not sure which handle type I have. It sure is an old one, I am pretty sure it dates back from the 1980-1990s.

[Report to moderator](#) Logged

mamalala

Supporter



Posts: 777

Country:

Re: Broken Metcal RFG-30 soldering base unit fixed

[Say Thanks](#) [Reply](#) [Quote](#)

« Reply #17 on: April 29, 2014, 10:19:16 pm »

Quote from: wkb on April 29, 2014, 09:32:46 pm

Talking about a delayed answer...

Not sure which handle type I have. It sure is an old one, I am pretty sure it dates back from the 1980-1990s.



No worries. As it turns out, there is no cap in there. A friend of mine checked with a network analyzer, and found no hint of a cap being there. Also, the tip detection works by biasing the tip, which in turn requires a DC path, any series cap would make that impossible. This applies to the RM3E handpiece, as well as the newer ones, and also the Talon tweezers, from what i have been able to find out.

Greetings,

Chris

Report to moderator Logged

AndersAnd

Frequent Contributor



Posts: 568

Country:



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #18 on: April 30, 2014, 05:54:53 am »

Say Thanks Reply Quote

Quote from: mamalala on April 29, 2014, 10:19:16 pm

Quote from: wkb on April 29, 2014, 09:32:46 pm

Talking about a delayed answer...

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Isn't there a feed-through capacitor instead of a series capacitor as we talked about earlier from here onwards: <https://www.eevblog.com/forum/projects/diy-metcal-13-56-mhz-rf-supply/msg310381/#msg310381>

« Last Edit: May 05, 2014, 06:23:09 pm by AndersAnd »

Report to moderator Logged

mamalala

Supporter



Posts: 777

Country:



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #19 on: April 30, 2014, 09:22:50 am »

Say Thanks Reply Quote

Quote from: AndersAnd on April 30, 2014, 05:54:53 am

Isn't there a feed-through capacitor instead of a series capacitor as we talked about earlier from here onwards: <https://www.eevblog.com/forum/projects/diy-metcal-13-56-mhz-rf-supply/msg310381/#msg310381><https://www.eevblog.com/forum/projects/diy-metcal-13-56-mhz-rf-supply/msg310381/#msg310381>

From what my friend told me, there _seems_ to be none, according to the analyzer. Of course something could have gone wrong, and there is one and he just missed it, i don't know. After all, there is also the capacitance from the cable, so that any internal cap was simply "hidden" due to that.

Greetings,

Chris

Report to moderator Logged

AndersAnd

Frequent Contributor



Posts: 568

Country:



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #20 on: May 05, 2014, 06:20:15 pm »

Say Thanks Reply Quote

Quote from: mamalala on April 30, 2014, 09:22:50 am

Quote from: AndersAnd on April 30, 2014, 05:54:53 am

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Greetings,

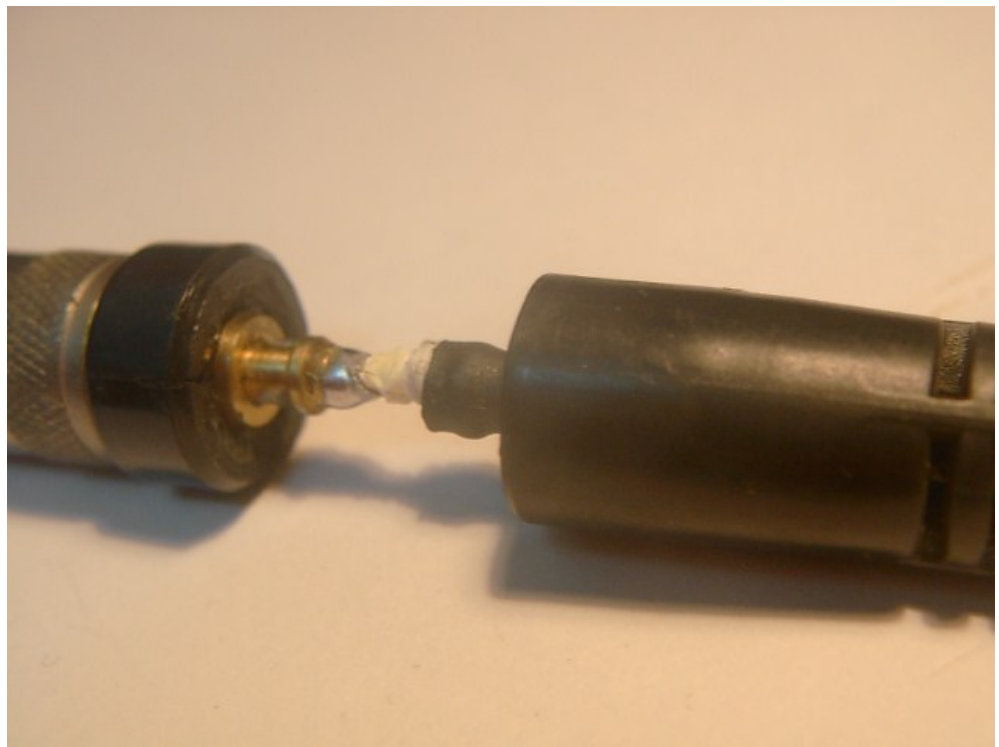
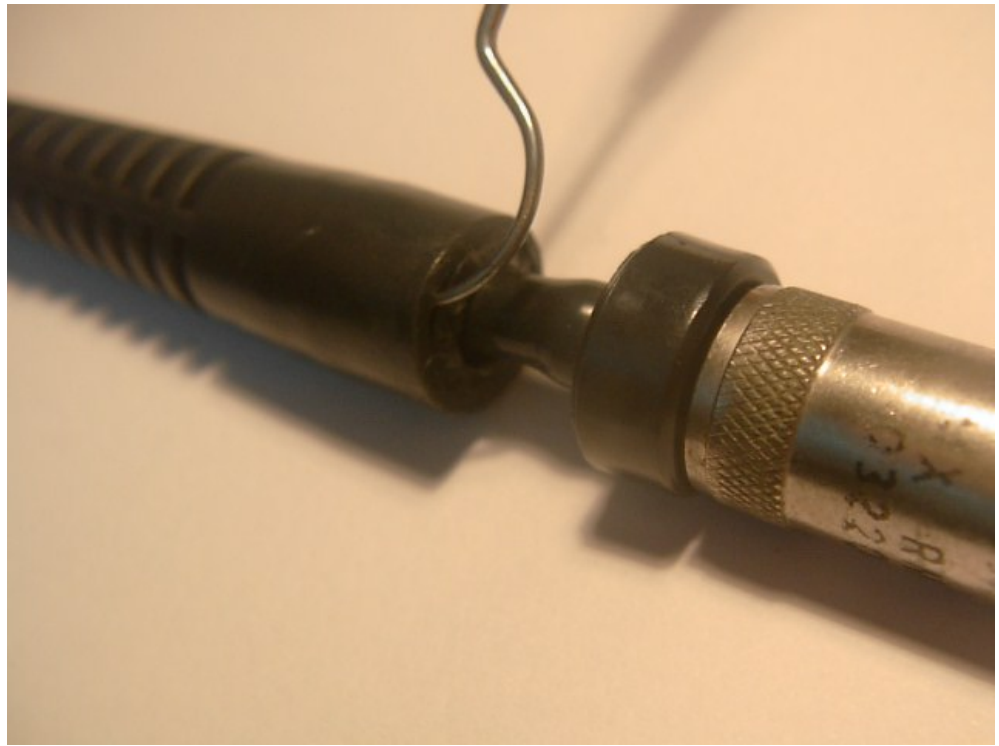
Chris

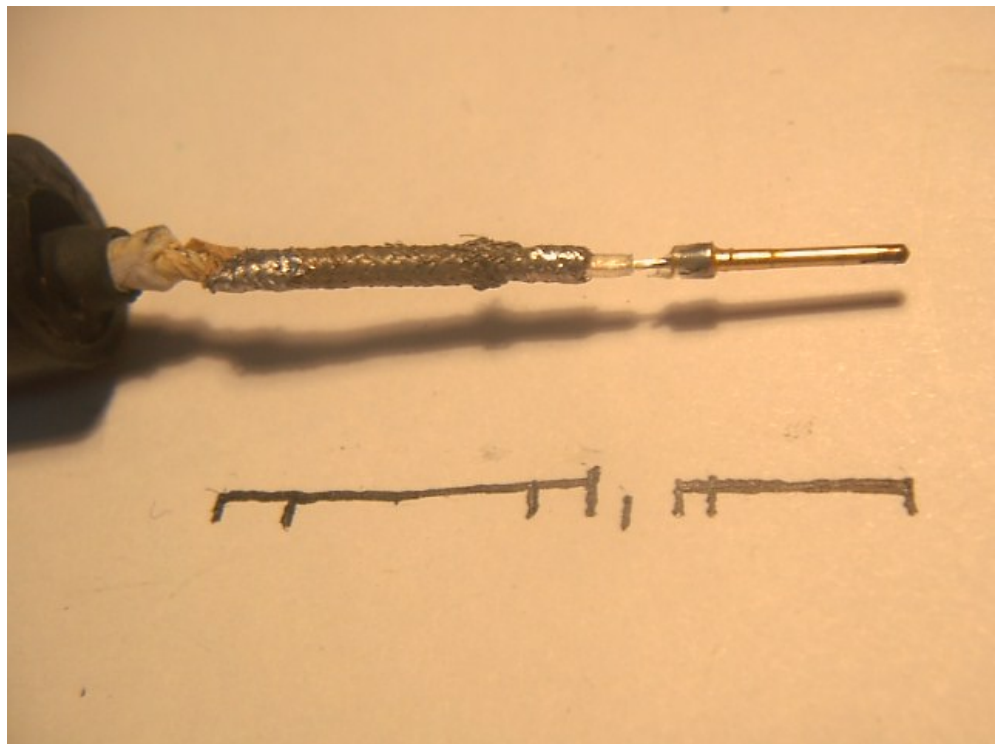
Found these old pics of a disassembled Metcal MX-RM3E <https://imgur.com/a/RvDVu#0>
They were posted in this topic in Oct. 2012: <https://www.eevblog.com/forum/reviews/for-jbc-fans->

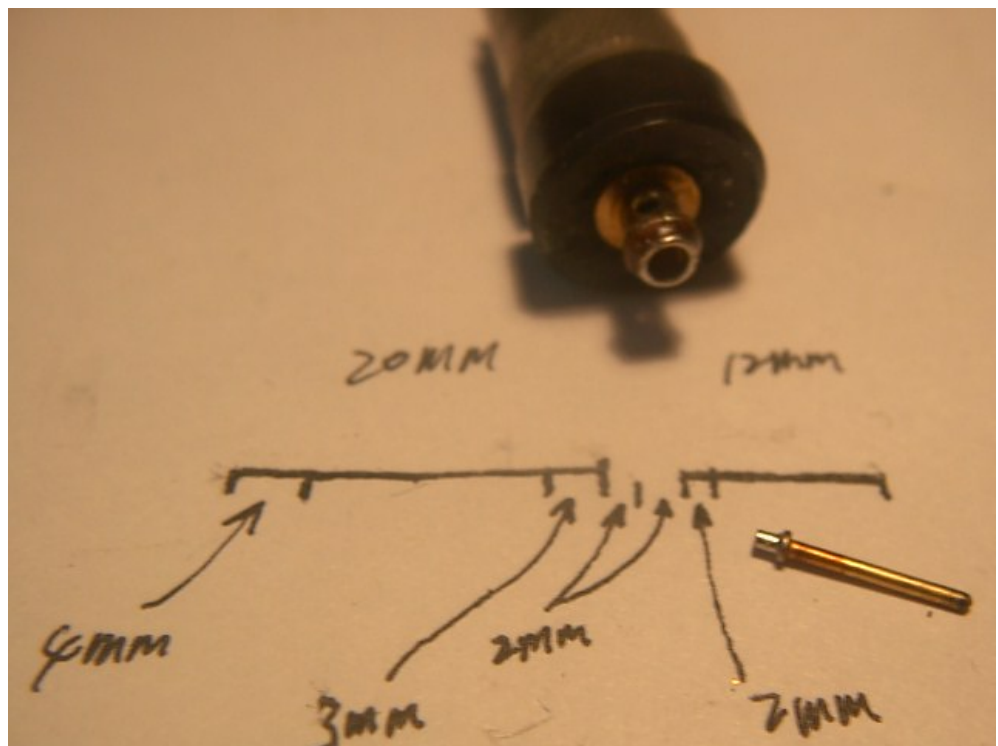
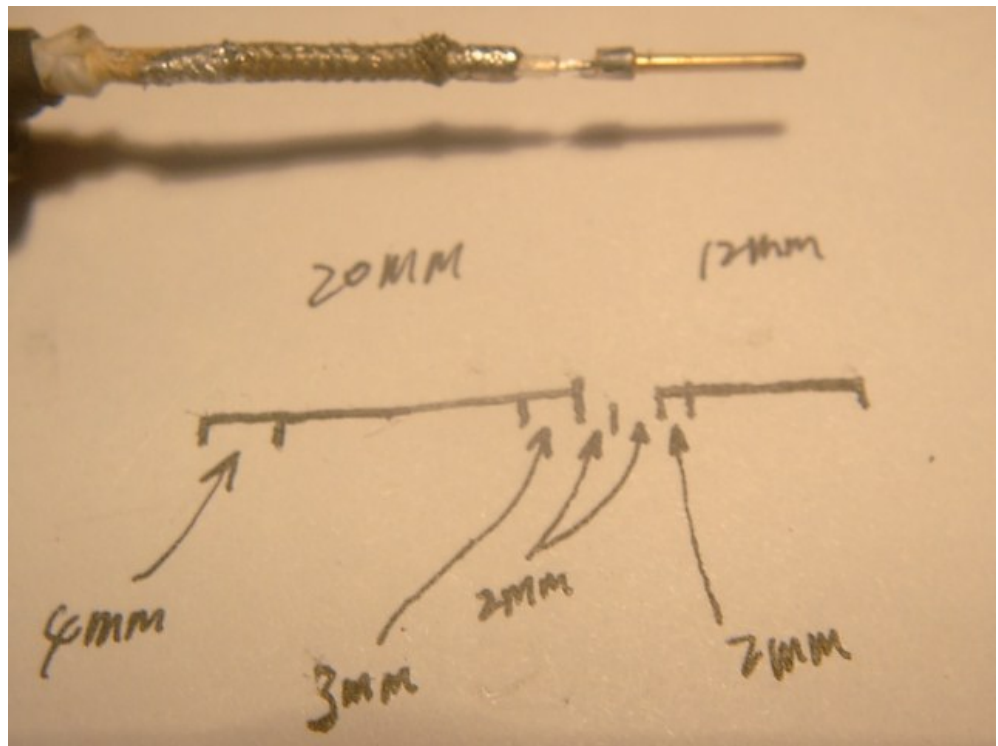
[out-there-jbc-tips-anatomy/msg151939/#msg151939](https://www.eevblog.com/forum/projects/broken-metcal-rfg-30-soldering-base-unit-fixed/?all)

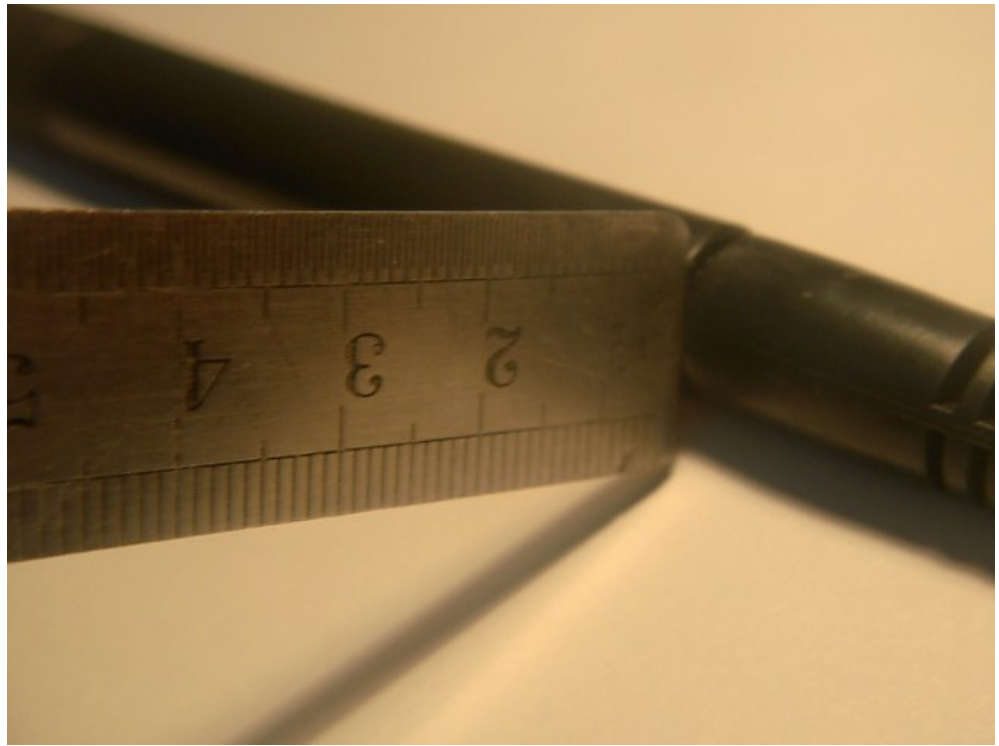
The last pictures shows there actually is a small capacitor in parallel with a 22 μ H inductor.







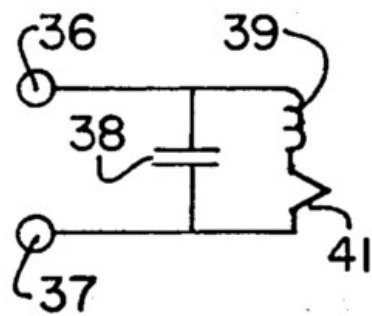
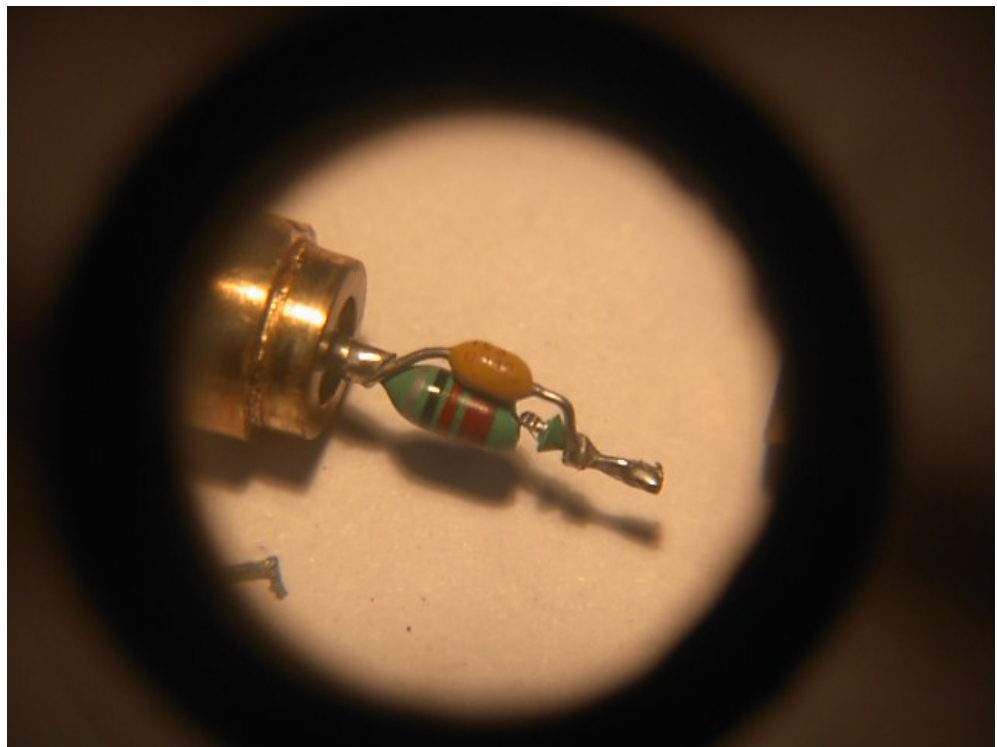


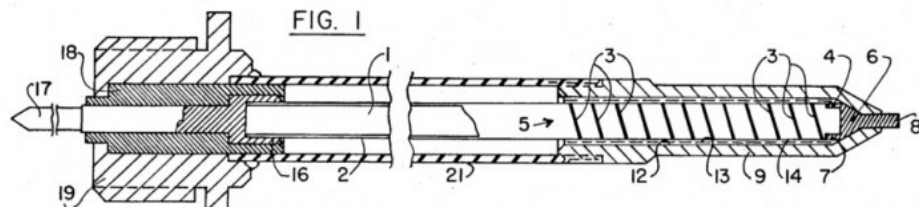












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brunos67

Newbie

Posts: 2



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #21 on: November 16, 2014, 04:13:27 am »

Say Thanks

Reply

Quote

Quote from: Joshua Bretz on August 30, 2013, 01:56:08 pm

Looking at the MX-500 schematic, a short on the gate of Q4 is normal because there is an inductor from gate to source. I found that C24 was blown in my unit which explains why Q1 fried: with C24 blown, this inductor shorts the supply. Replaced C24 with Kemet PHE850ED6100MD18R06L2 and unit works fine.

Quote from: longpole001 on April 18, 2012, 12:54:29 am

i also have a problem with my metcal

Checking the voltage at the 74hct04 inv is only 2.5v , and the rf output is at 3.5mhz , done the norm change of electro caps which are over 15 years old etc , doing diode check on transistors , and diode showed nothing , and slowly working the schmatic of mx-500 as a guide that you have here and comparing to the rfg-30 unit , so far with out any success ,

i have found that the resistance on the board over the q4 is close to dead short , even when the q4 is removed , which surprised me , will try replaceing all the transistors if i can with equiv if can as a test , but i am bit lost at this point

if anyone can can verify what the sig / voltage at the test points on the board should be would be very helpfull

What i see at the moment :

1. voltage over R1 (100 ohm) is 20V - DOES THIS LOOK CORRECT
2. Q1 collector is 6.8v
3. R2 via L2 voltage is 6.8v , but on other side of R2 is 2.5v , which is appears wrong
4. 74hct04 pin14 vdd = 2.5v , - looks wrong

Some input on this would be good guys

Cheers

Sheldon

Report to moderator Logged

brunos67

Newbie

Posts: 2



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #22 on: November 16, 2014, 04:19:43 am »

Say Thanks

Reply

Quote

Quote from: Joshua Bretz on August 30, 2013, 01:56:08 pm

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4. 74hc04 pin14 vdd = 2.5v , - looks wrong

Some input on this would be good guys

Cheers

Sheldon

Joshua what blew your C24 cap? curious!


Report to moderator  Logged

hurtmanissimo

Contributor



Posts: 6

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« **Reply #23 on:** February 24, 2017, 07:48:07 pm »

Say Thanks Reply Quote

is possibly to replace VN016n5 Q2 (q3 on mx500) by irf510, but need to short c20 (mx500 schematic) to work properly.

without that it start to work on 7mhz 😊 and very low heating. may be different characteristics of gate capacity irf510 vs VN016n5 make lc-filter like.


hope it will help someone 😊

Report to moderator  Logged

clauberty

Newbie

Posts: 1

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« **Reply #24 on:** November 04, 2017, 07:54:02 pm »

Say Thanks Reply Quote

Hello

Thank you for the useful post i found here and solved/repared my mx500

but i still have one problem, the station does not go off. Meaning green led after 30 min measured by me on other station is off, on my station will remain on has long has the switch is ON

yes there is a little torx / hex screw on the side of the station and it is screwed in so switch is activated, has is on the station that this standby of is working

i made the testing with the same Hand Piece and Work-stand from the link

<https://gokimco.com/oki-mfr-uk1-cartridge-hand-piece-and-workstand.html>

Thank you

« *Last Edit:* November 04, 2017, 07:58:18 pm by clauberty »

Report to moderator  Logged

memed

Contributor

Posts: 5

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« **Reply #25 on:** November 07, 2017, 11:53:11 pm »

Say Thanks Reply Quote

Hello

I've got Metcal MX-5200 not heating up the tip at all.
Main MOSFET Q14 IXFH12N50F is getting very hot only when iron connected.
Checked all diodes and caps around.
U4 LM2576HVT gives on output 45V all time when iron is connected.
U3 LM2574HVM gives on output 5V all time when iron is connected.
Vcc 5.69V on 74hc04

Any ideas what can be wrong?

Regards


« *Last Edit:* November 09, 2017, 02:30:52 pm by memed »

Report to moderator  Logged

fireworks

Contributor

Posts: 35

Country: 



 **Re: Broken Metcal RFG-30 soldering base unit fixed**

« **Reply #26 on:** November 08, 2017, 07:20:15 am »

Say Thanks Reply Quote

Can you post a picture of the board ?

Do you have a schematic ?

Report to moderator  Logged


memed

Contributor

 **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

Posts: 5


Country: « **Reply #27 on:** November 08, 2017, 11:37:03 am »

I don't have schematic for MX-5200 or even MX-5000.
I found online only schematic for MX-500p-11 but looks to different for me 😞
I will post pictures of the board front and back on evening.
LM2576HVT gives Uout-45V with feedback-0.8V is it correct?

Report to moderator  Logged fireworks

Contributor

Posts: 35

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote


« **Reply #28 on:** November 08, 2017, 01:24:08 pm »

I'll help you repair it.
Do you have an oscilloscope ?
1. First please post pictures of the front and back of the board.
2. If you have an oscilloscope, please post the waveforms at the 3 terminals of the output MOSFET right after powering up the station - the handle needs to be connected to the station and a known good tip must be in the handle.

Report to moderator  Logged memed

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« **Reply #29 on:** November 09, 2017, 12:47:35 am »

Thanks, really appreciate Fireworks.
Unfortunately I don't have an oscilloscope but still hoping can manage some how 😞
When I put a probe on output MOSFET then DMM getting crazy and switching off.
All my tips and handle are 100% working.

74HC04N
PIN 8- IN - 2.09V
PIN 9- OUT - 3.80V
PIN 14 - 5.69V

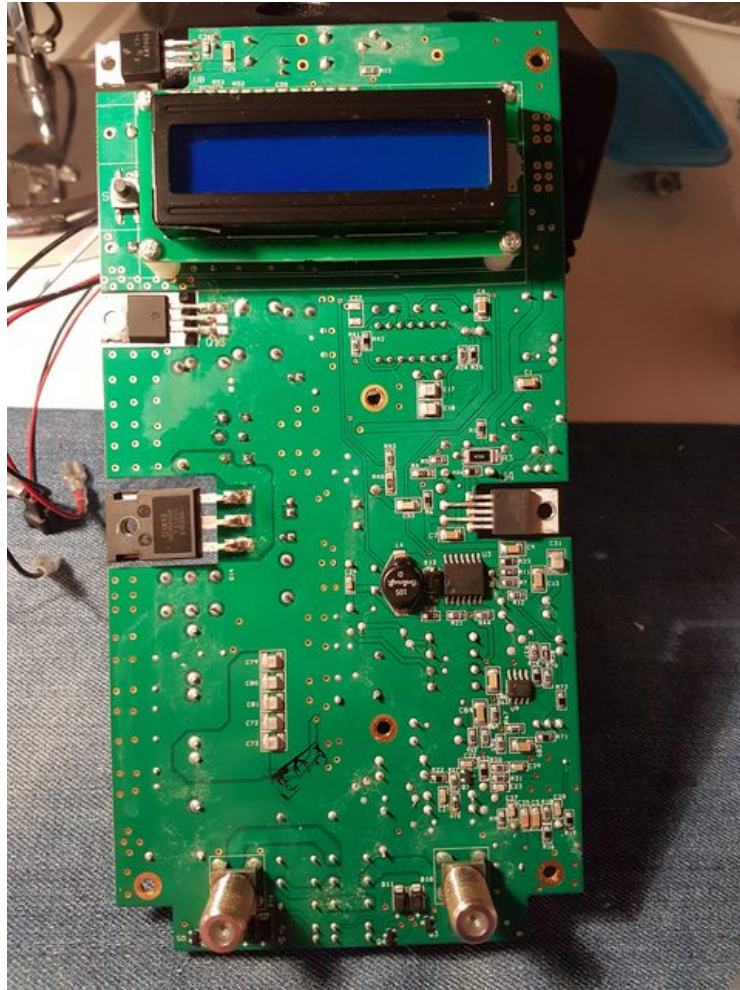
U4 - LM2576HVT
IN - 48V
OUT - 45V

Q13 IRF510
DRAIN - 26V

Q14 IXFH12N50F
DRAIN - UNREADABLE BY DMM

Board pictures

Share



63



Share



56



Share



55



Report to moderator Logged

fireworks

Contributor

Posts: 35

Country:



Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #30 on: November 10, 2017, 03:06:21 am »

Say Thanks Reply Quote

Without oscilloscope is more difficult to fix it, but still doable.

1. The board is not too complex. Can you reverse engineer it and draw the schematics ? Shouldn't take more than a few hours.
2. Without oscilloscope, you need to build a RF voltmeter. It's very simple, 3-4 diodes 1N4148 in series, a 1M resistor and a ceramic capacitor of tens of nF.
3. First step: unsolder the output MOSFET and check it with a multimeter. Also, measure the voltages at its 3 pins while unsoldered. If your multimeter has a frequency meter, measure the frequency (and duty cycle if available) at the gate of the unsoldered MOSFET.

Report to moderator Logged

memed


Contributor

Re: Broken Metcal RFG-30 soldering base unit fixed

« Reply #31 on: November 13, 2017, 10:48:52 pm »

Say Thanks Reply Quote

Posts: 5

Country: 

I'm looking to buy some good oscilloscope as it will help me to fix more devices and get experience 😊
Thanks to you now and will be back later to get it sorted 🙏

Report to moderator  Logged lanuser

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #32 on: January 10, 2018, 09:38:10 am »

Hello Fireworks,
Can I ask what the voltage output of U4 on pin2?
Thank you.

Report to moderator  Logged fireworks

Contributor

Posts: 35

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #33 on: January 11, 2018, 07:28:40 am »


Hi,

I don't have the voltage. Are you trying to do a repair?

Report to moderator  Logged lanuser

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote


« Reply #34 on: January 12, 2018, 03:52:22 am »

Yes, I am trying to repair my Metcal station.

Report to moderator  Logged fireworks

Contributor

Posts: 35

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #35 on: January 12, 2018, 02:12:46 pm »


I can help you with your repair but I need more details.

1. Which Metcal station do you have ?
2. What are the symptoms ?
3. What did you measure so far ?
4. What equipment do you have ? An oscilloscope will be very useful but you can do without.

Report to moderator  Logged lanuser

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #36 on: January 12, 2018, 08:15:19 pm »


1. Which Metcal station do you have ? (**Metcal Model# mx-500p-11**)
2. What are the symptoms ? (**LM2576 U4 burned out**)
3. What did you measure so far ? (**U4 showing sign of burned marks**)
4. What equipment do you have ? An oscilloscope will be very useful but you can do without. (**Oscilloscopes, reworks stations in one word everything to start repairing the Metcal**)

Until I receive U4 replacement part I was trying to use external power supply replicating U4 voltage output, however, nobody knows correct voltage output as I was asking you before.
Thank you.

Report to moderator  Logged fireworks

Contributor

Posts: 35

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**

Say Thanks Reply Quote

« Reply #37 on: January 14, 2018, 10:57:49 am »

Since you have a Mx-500p-11, it should be easy to repair since the schematics is available.

Can you post some pictures of the board ?

Regarding the voltage: the real value is not important. You can try using 10-20V with current limiting to 1A for example.

Since U4 burned, there might be shorts in the rest of the circuit. Even before connecting a power supply in place of U4, you should check the components "downstream" from U4.


« Last Edit: January 14, 2018, 11:14:17 am by fireworks »

Report to moderator  Logged

Ianuser

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**[Say Thanks](#)[Reply](#)[Quote](#)« **Reply #38 on:** January 17, 2018, 06:07:34 am »

I have checked for short of the circuit prior to replacement U4 IC. After replacing U4 everything went back to normal, however, I would like to properly adjust station to full 100% functionality. I will appreciate all the help I can get. Thank you.

[Report to moderator](#) [Logged](#) **Wolfram**

Regular Contributor



Posts: 118

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**[Say Thanks](#)[Reply](#)[Quote](#)« **Reply #39 on:** January 17, 2018, 10:27:34 pm »

As this is the currently active thread on Metcal repair, I'll add a story here, even if it doesn't directly concern the RFG-30 but the MX-500p-21.


The unit in question was completely dead. Measurements indicated that the output transistor Q4 was shorted. After replacing the transistor, the station worked but died after a short time of use. After again replacing Q4, I measured the output stage supply voltage (across C8), which turned out to be way too high at around 40 V. The LM2576 regulator for the output stage was tested and confirmed to be operating correctly. The feedback signal to the LM2576 was at 1.23 V, hinting that the RF loop was in regulation, but that the output stage was delivering much less power than expected, causing the buck converter to compensate. The gate waveform of Q4 looked reasonable, if a little high (the driver stage voltage is derived from the buck converter output, so this was a symptom of the high buck output voltage) but drain waveform was a mess, with a significant oscillation at four times the 13.56 MHz operating frequency. I measured all the passives in the matching network, and all components measured within tolerance, except for C27 (130 pF silver mica) which measured 60 pF. I borrowed C27 from a second broken MX-500p-21, and measuring it before installing it showed that it was also out of tolerance at 45 pF. C28 (which is identical to C27 and connected directly in parallel) measured spot on in both units. Replacing C27 in the first unit with C28 from the second unit restored it to normal operation, with the output stage supply voltage within the normal range. It appears that the second unit had the same fault, so this might be a common problem. It is probably a good idea to measure C27 and C28 in MX-500s with blown output or driver stage transistors, and to replace both if any of them are out of tolerance.

Next up is a pair of MX-PS5000s with the same symptom; dead buck regulator. After replacing it, they work for a short time before the regulator fails again.

« *Last Edit:* January 17, 2018, 10:31:01 pm by Wolfram »[Report to moderator](#) [Logged](#)**The following users thanked this post:** helius, Ianuser **Ianuser**

Contributor

Posts: 5

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**[Say Thanks](#)[Reply](#)[Quote](#)« **Reply #40 on:** January 18, 2018, 06:24:08 pm »


Do you know by any chance, how much difference in the schematic between MX-500p-21 and MX-500p-11?

[Report to moderator](#) [Logged](#) **Wolfram**

Regular Contributor



Posts: 118


Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**[Say Thanks](#)[Reply](#)[Quote](#)« **Reply #41 on:** January 18, 2018, 07:20:37 pm »

As far as I know, the only difference is the default configuration of the supply transformer primary wiring, the -11 is configured for 115 V and -21 is configured for 230 V. Either can be changed to the other by moving a few solder jumpers on the board.

[Report to moderator](#) [Logged](#) **miked**

Newbie

Posts: 1

Country:  **Re: Broken Metcal RFG-30 soldering base unit fixed**[Say Thanks](#)[Reply](#)[Quote](#)« **Reply #42 on:** January 20, 2018, 07:27:58 pm »

I made a successful repair of a STSS-002 model RFG-30 Serial 6011xxx This version has two diffused T 1 3/4 LEDs installed, one Green (power) one Red (RF lockout) There appears to be *many* versions of this excellent soldering system, all with minor differences and component changes.

The hard part: take the screws out of the top and disconnect the insulated power connectors. The

two 1/4" quick connects to the mains transformer are a pain. (a lot of wiggling needed, these were very tight !)

Now, you can drop the bottom and remove the power transformer after desoldering the ground lead from the case lug.

Q1, the ZTX749 PNP with small round heatsink, had a collector to emitter short. I suspect the heatsink does not make good thermal contact in this application, and might be something to watch for. As I didn't have anything like this in the junk box, I used a On Semi NSS60600MZ4T1G from a sample kit (price was right, and was a lower VCE(sat) than the original part) The kit included small surf boards with copper heatsink islands. I wired the eval board in vertically with respect to the case with clippings from some capacitor thru hole leads. I had to be careful not to let the small board extend up above the main board edge, so it fit back in the case. I ended up trimming the ON semi supplied eval board a bit. If I did this again, I would have clipped that Q1 out, and removed the leads one by one, because the main board was thermal damaged either by me or by the failed transistor, and I lifted a pad. Oh well.

Unfortunately, that was not all that was wrong. Old corroded solder flux on a tiny glued in sub board kept the unit in the two LED illuminated RF lockout state. I think this board just puts a small DC bias on the tip, and locks out RF if there is an intermittent connection to the wand (bad wand detector) It simply needed the connections re heated and the old flux removed with 91% isopropyl alcohol. After verifying, I used GE silicone II to attach the two sub boards back to the main board. I held them in place with tape overnight for a full cure.

I do wonder how long these electrolytic capacitors will last. My unit was made around 1990. I additionally soldered a 0.1uF 100V disc across the 1000uF Capacitor on the top of the board (this feeds the RF lockout board) and put a 1000pF disc between the collector of Q1 to ground to bleed off any stray RF created with that wing board. Seems to work fine now.

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