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How to update Radios using 6900xxx PCB
For using IRF520 MOSFET's.

6900xxx AM/FM/SSB Chassis Only

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By Bennie Bolin & Rick Jackson (Euro Radio Co)

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NOTE: There may be more information in this package than you need depending on your experience. When you click the print icon you can select print all the pages, range of pages or any current page you have displayed.

1.0 INTRODUCTION:

Soon all Mitsubishi 2SC1969, 2SC2166 and 2SC2312 transistors will disappear or become too expensive to buy. This is how to correctly update the Galaxy Radios for using IRF520 MOSFET's. This project is not for novices or anyone who does not have the proper equipment for aligning RF circuitry, or anyone faint at heart.

Leave the installation and alignment to a proven technician.

NOTE:

Update sheet is written on the assumption that you know the basics.

Exercise a great deal of care with this mod!

Due to the placement, size, and close proximity of the surrounding traces.

If done wrong you could destroy the PCB.

If you have even the slightest doubts or the proper equipment, it would be wise to have someone else you trust perform the mod for you.

SO TAKE YOUR TIME AND DOUBLE CHECK YOUR WORK!!!!

1.1 TOOLS NEEDED

You will need a Soldering Iron, solder, and de-soldering pump

Long nose pliers.

Cutting pliers (What you are looking for are "flush cutting" pliers rather than the traditional "dikes" or "diagonal cutting pliers.)

Digital Multimeter.

Magnifier for examining circuit board traces and solder connections.

Preferably some experience soldering and de-soldering components.

1.2 BEFORE YOU START NOTES:

If you properly replace the 2SC2166 driver and 2SC1969 finals in SSB chassis with three IRF520 mosfets, you will gain slightly more power when done correctly. The radio will also have less than 10% distortion at full-modulated power. Pushing the mosfets harder will naturally give higher wattage but this comes with problems like harmonics, distortion and high temp plus they will become very unstable.

So be weary of those that post numbers of 25 watts per mosfet when in reality the safe numbers are closer to 8 -12 watts each. Mosfets are not as forgiving as bipolar's so failure rates for mosfet radios will be very high when tweekers and peakers start casting their magic spells on them.

One other thing to be weary of are the folks out there that's going to jump on the kit bandwagon. Ask questions about their kit of components.

For Example:

1. Does the kit come with all of the components needed?
2. If doing a single to dual final update. Does the kit come with the Heatsink, and transistor mounting hardware?
3. Do they offer any support if you have problems?

Be REAL careful with the bunch on eBay.

Preparing the Radio for the Mod.

1. Fully check out the radio and make sure everything is in full working order before starting this conversion!
2. Carefully remove the top and bottom radio covers. When removing the bottom cover, disconnect the speaker connector from the main board.
3. Put the Radio back to stock i.e.
 - a. If AMC has been defeated, return AMC back to stock operation.
 - b. Remove any of the so-called swing Mods.

2.0 MODELS COVERED:

Radios with the following Main Chassis (**6900xxx AM/FM/SSB only**)
EPT690010C, EPT690010D, EPT690010Z.

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3.0 WHERE TO GET THE PARTS NEEDED:

<p>Purchased directly from the following distributors</p> <p>RF PARTS CO. 435 S. Pacific St. San Marcos CA 92069 TEL: (800) 737-2787 strictly orders only! (760) 744-0700 all other questions FAX: (760) 744-1943 Web Site: http://www.rfparts.com/</p> <p>MAYCOM COMMUNICATIONS PRODUCTS 1134 W. John Beers Road Stevensville (Derby), Michigan 49127 1-269-429-8522 1-269-429-8541 Fax: 1-269-429-2137 Web Site: http://maycomcomm.com/</p>	<p>Wholesale Only Distributors</p> <p>J T I Distributors PO Box 300 Welcome NC 27374-0300 Toll Free: 1-800-626-3059 strictly orders only! Local: 336-731-8177 Fax: 336-731-2805 Web Site: http://www.jtronix.com/</p> <p>Mouser has the IRF520's also</p> <p>MOUSER ELECTRONICS 1000 N. Main St. Mansfield TX 76063 TEL: (800) 346-6873, (817) 483-4422 (800) 992-9943 to get a catalog only FAX: (817) 483-0931 Web Site: http://www.mouser.com/</p>
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NOTE: The IRF520's are not expensive do your research and check prices.

4.0 PARTS LIST:

6900xxx Chassis AM/FM/SSB Models		
3	IRF520 MOSFET	Q47, Q48, Q49
3	5.6 Volt 400mWatt Zener	D90, D91, D92
1	12K 1/4 Watt	L37
2	1K 1/4 Watt	L33, L34
1	680pF /UL	C216
2	152 /M (1500pF) 100volt Mylar	C209, C210
3	100KB (Galaxy Part # RE10400020)	VR10, VR11, VR12
3	100K 1/4 Watt	R241, R242, C291
2	47K 1 Watt	R243, R244
1	47K 1/4 Watt	R245
1	150pF /UJ	C203
1	104 (0.1uF) Disc Ceramic	C215

5.0 OVERVIEW OF STEPS FOR A 6900x AM/FM/SSB MODEL:

Remove all the components as shown hi-lighted in Violet on (6.1 6900xxx chassis schematic and PCB layout (1) (Before Conversion)) Page 7.

If **D93** is fitted, remove and discard.

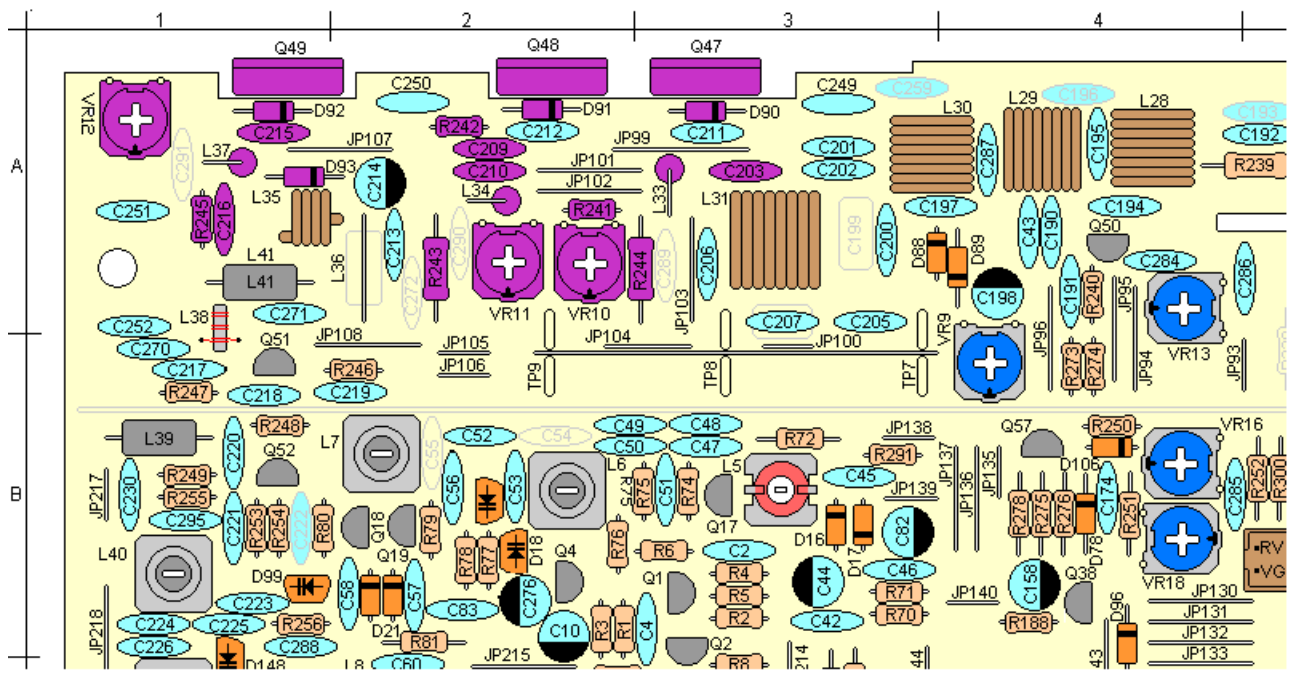
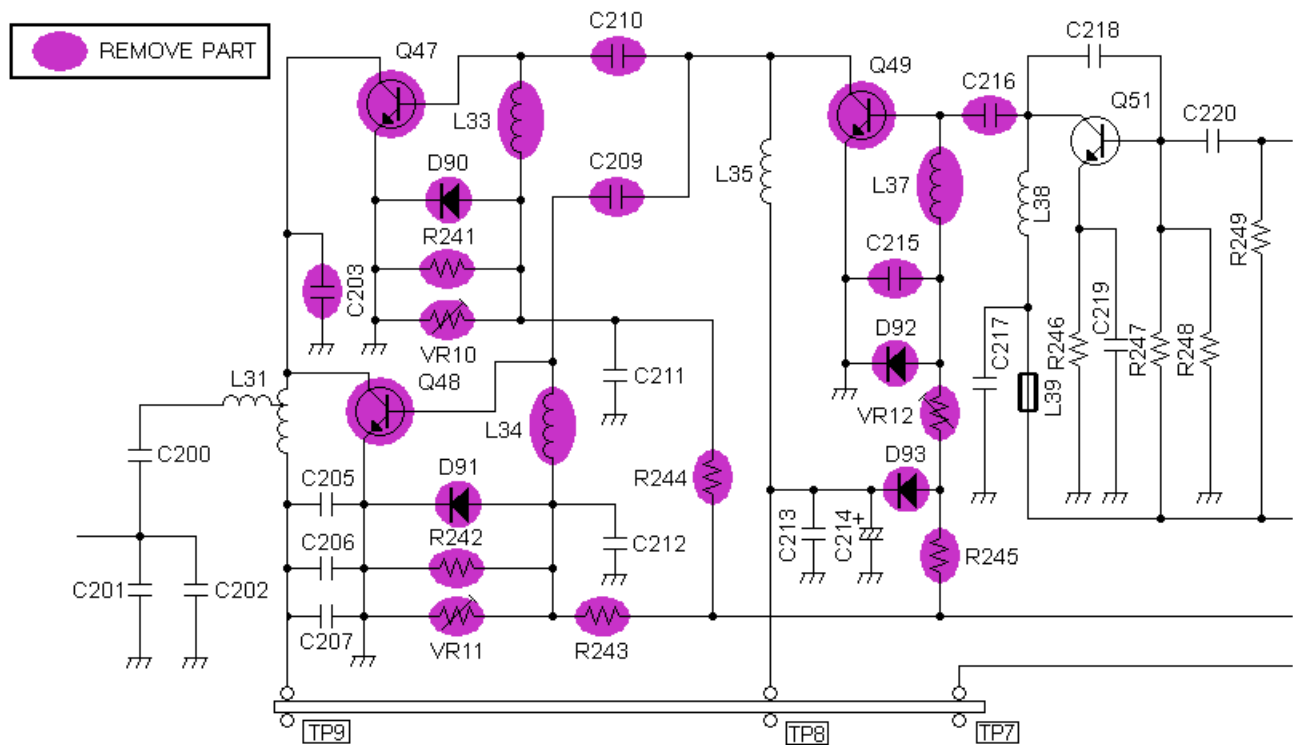
Insert the following components (See 4.0 Parts List) as shown hi-lighted in Green on (6.2 6900xxx chassis schematic and PCB layout (2) (After Conversion)) Page 8.

Before insert the MOSFET's Q47, Q48 and Q49 make sure that the Ceramic Insulators and Insulating Bushes are in good condition and use a good quality Heat Sink Compound. You must use Ceramic Insulators and not the mica type. Use a liberal amount of heat sink compound.

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1. If your radio has removable rear heatsink you may need to remove it in order to carry the work.
2. Add Q47 IRF520 MOSFET
3. Add Q48 IRF520 MOSFET
4. Add Q49 IRF520 MOSFET
5. Add L37 12K 1/4 Watt
6. Add L33 and L34 1K 1/4 Watt
7. Add D90 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
8. Add D91 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
9. Add D92 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
10. Add C216 680pF /UL
11. Add C209 and C210 152/M (1500pF) Mylar
12. Add VR10, VR11, and VR12 100KB
13. Add R241, and R242 100K 1/4 Watt
14. Add C291 100K 1/4 Watt
15. Add R243 and R244 47K 1 Watt
16. Add R245 47K 1/4 Watt
17. Add C203 150pF /UJ
18. Add C215 to 104 (0.1uF) Disc Ceramic.
19. Re-install rear heatsink

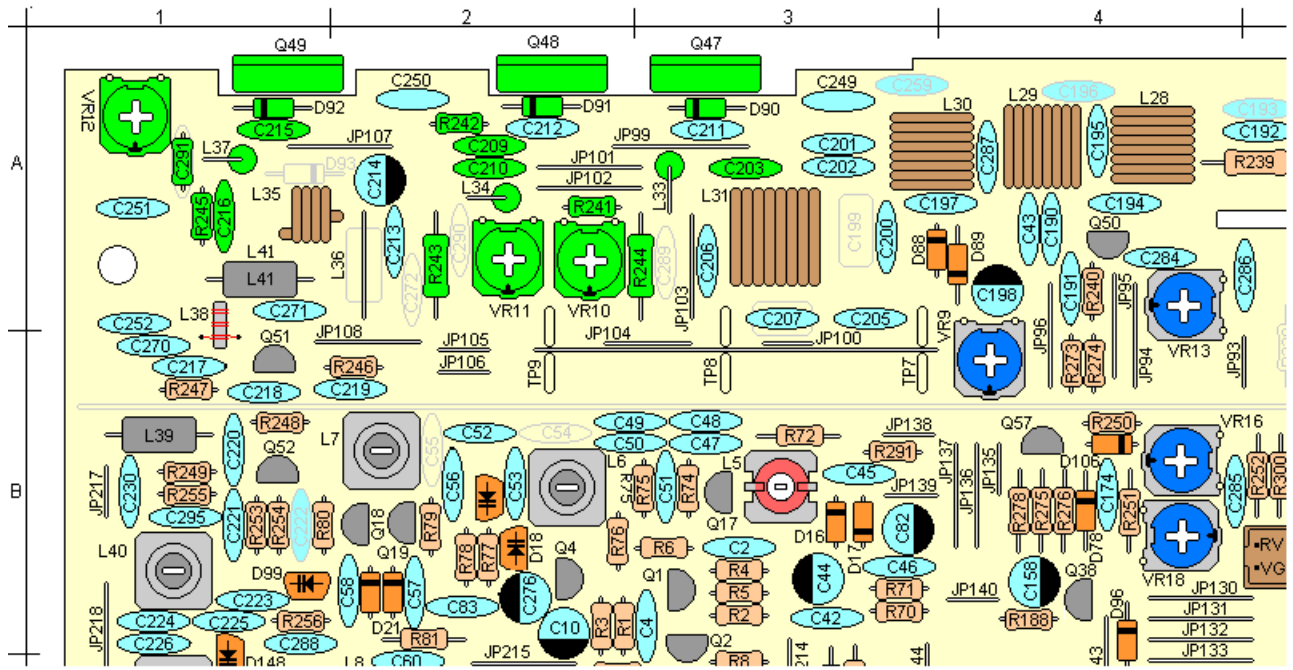
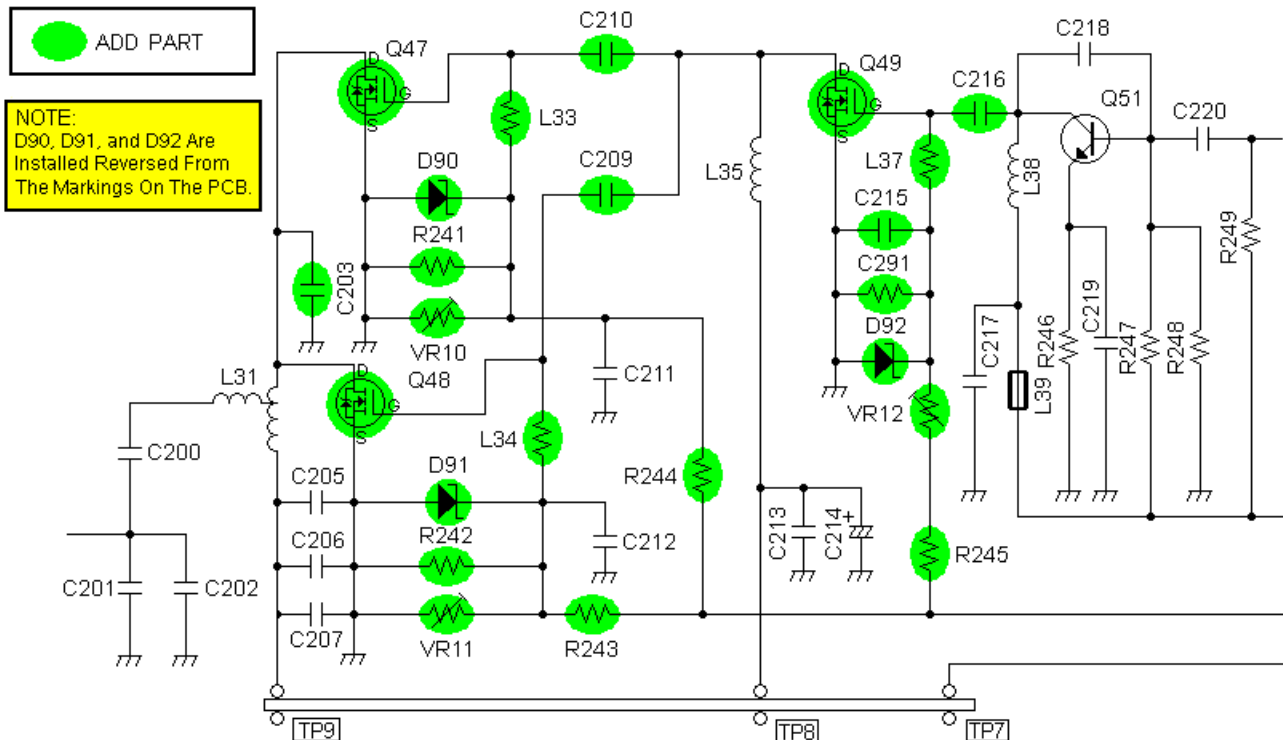
6.0 6900xxx CHASSIS SCHEMATIC AND PCB LAYOUT BEFORE CONVERSION:



6900xxx Chassis (Before Conversion) Schematic and PCB Layout (1)

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6.1 6900xxx CHASSIS SCHEMATIC AND PCB LAYOUT AFTER CONVERSION:



**6900xxx Chassis (After Conversion)
Schematic and PCB Layout (2)**

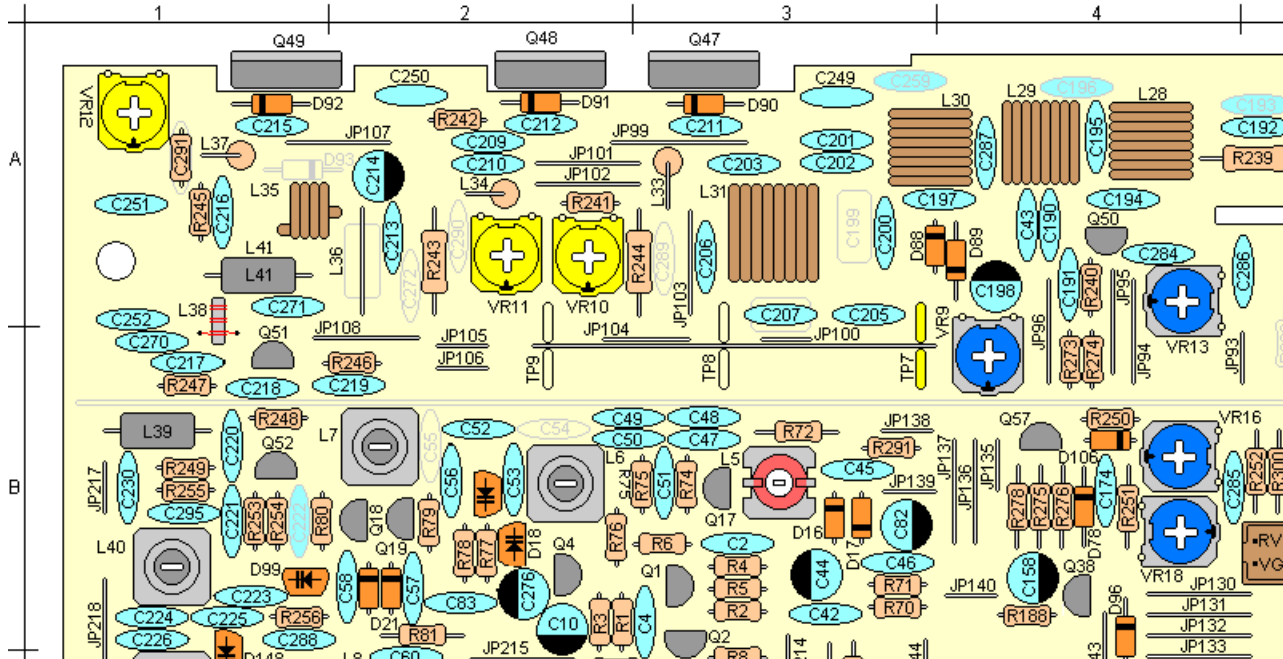
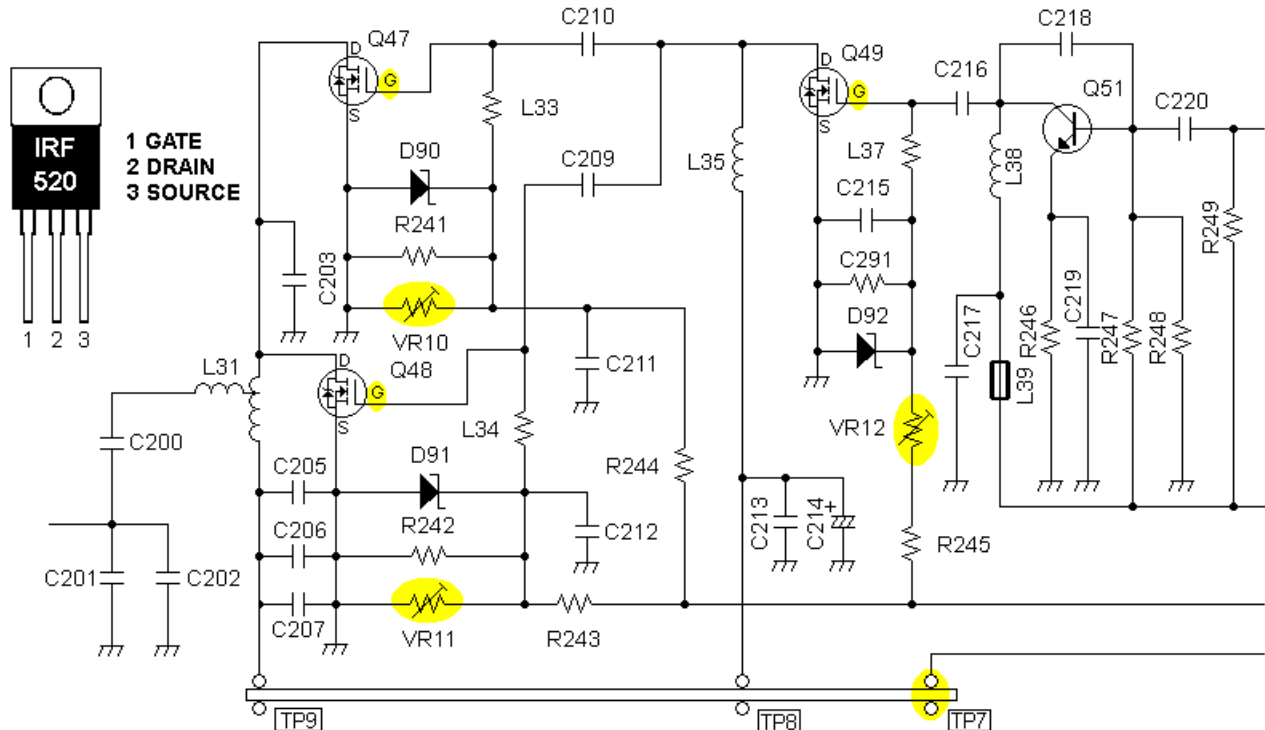
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6.2 6900xxx MOSFET PICTURES AFTER CONVERSION:



7.0 ADJUSTMENT:



AM TX Power Adjustments - No modulation
 Adjust VR14 For 5.80 vdc At TP7
 Adjust VR12 For 3.80 vdc At The Gate Of Q49
 Adjust VR11 For 3.60 vdc At The Gate Of Q48
 Adjust VR10 For 3.60 vdc At The Gate Of Q47

6900xxx Chassis (Adjustments) Schematic and PCB Layout (3)

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8.0 TRANSISTOR DATASHEET:

The IRF520 was developed by International Rectifier, thus the IRF part prefix. Several other manufacturers have been licensed manufacture the part also.

ST (Thompson)

Fairchild

Intersil

Supertex

And others

If you need to look at the IRF datasheet it is on-line at CBTricks.com website.

8.1 FINAL NOTES:

We have made every effort to make sure this project easy to follow and has been tested it before it was uploaded to the site.

Also the AM regulator Q54 may need to be stepped up in some of the oldest chassis. The 2SB754 (60 watt) has been discontinued and replaced with 2SB827 (60 watt).

Also a good replacement would be a 2SB688 (80 watt) or 2SB817 (100 watt).

REFERENCE:

Here is a good read, <http://www.aoc.nrao.edu/~pharden/hobby/ClassDEF1.pdf>

You don't need to understand it all just the simple basics where he is explaining the differences between bipolar and mosfets in the same application. Most everything we need to learn here is on pages 1& 2. The rest is just different classifications.

Post you findings, questions and ideals of improvement of the mod or mod sheet at the following.

CBTricks Forum.

<http://www.cbtricks.com/forums/>

Radio Modification/Conversion and Repair/Troubleshooting Discussions

Credits

Rick Jackson (Euro Radio Co)

Enjoy

Bennie

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