

Mods For Uniden Supra - Jed Margolin 2000

In October 1999 I bought a Uniden Supra satellite receiver. (New, from old stock.)

After installing it, I was pleased with the video quality.

What did not please me was that the backup battery was dead.

What pissed me off was that there was a constant 400 Hz buzz in the subcarrier audio, roughly 20 dB below full output. At this level, it was clearly audible during normal programming.

There were also 'bubbles' in the demodulated subcarrier audio, most noticeable at 5.8 MHz, that required tuning it slightly off frequency. I suspect the 'bubbles' are due to intermodulation products caused by various circuit non-linearities.

I called Uniden Customer Service and was told there was only one person who handled satellite receiver problems.

I tried calling him several times without success.

I discovered an email address on the Uniden Web site (www.uniden.com) and engaged in the following series of exchanges.

Me: I would like to get a Service Manual for my Supra.

Uniden: There is no Service Manual for the Supra.

Me: Ok, then I would like to get the schematic.

Uniden: The schematic is in the Service Manual.

It went downhill from there.

After they swore the buzz was not a design defect, and that it could be fixed, I sent it in. (They are in Ft. Worth, not Indianapolis as shown in the Supra Instruction Manual.) They sent it back with a new backup battery, but without fixing the buzz.

Eventually they sent me a replacement receiver. It also had the buzz.

Some time after that, a very kind soul (obviously not at Uniden) gave me a copy of the schematics.

The way Uniden drew the schematics made it difficult to understand the circuitry, so I redrew them.

I also got data sheets for many of the components.

It took a day or two to track down the source of the buzz.

It's due to poor design and poor pc board layout.

1. The main pc board is a single sided board with no discernible attention given to ground coverage.

The case appears to be an important part of the ground system. (If you ever remove the screws mounting the main pc board to the case, remember to replace them and tighten them appropriately when reinstalling the board.)

2. Although some mods can perhaps be made without having access to the bottom of the board I do not advise it. To have access to the bottom of the board, remove all the screws that mount the board to the case. There is one screw under the RF module, which is easily removed. (Be careful not to damage the threads of the F connector.) You do not need to remove the ribbon cables to the front panel. You can just hinge the main board forward.
3. The +12V for the LEDs on the Front Panel is used for much of the RF/Audio circuitry with no provision made for decoupling the two sections. The Front Panel LEDs are multiplexed at about 400Hz. This is what was getting into the audio.

Mod 1

The buzz was reduced to acceptable levels by installing a series inductor and a parallel capacitor at an appropriate place in the +12V distribution line. This was the last mod I did and had the greatest effect, thus the others may not be necessary. (I did not undo them to find out.)

The inductor I used was 100uH with an internal series resistance of 6.2 Ohm. A smaller series resistance reduces the filtering effect, while a larger series resistance increases the voltage drop to beyond acceptable limits. The capacitor I used was a 1000 uF 25 Volt radial.

The inductor is installed in place of a jumper on top of the board near connector J303. This is shown in "Mods for Subcarrier Audio" sheet 1. A convenient place to connect the ground side of the capacitor is also shown.

In order to prevent excessive voltage drop, the 12 Volts to the decoder module (V12) is rerouted so it is upstream of the inductor.

Mod 2

When switching the audio bandwidth between wide and narrow my unit produced an objectionable change in loudness.

Two circuits are involved in the wide/narrow mechanism. Referring to Supra schematics sheet 1 (left channel audio), diode switching is used to select either filter FL101 or FL102. The right channel (shown on sheet 2) selects either filter FL201 or FL202. These circuits are ok.

However, another circuit uses a bipolar transistor to change the audio level. On sheet 3, Q104 and Q204 change the levels for the left and right channels.

There are two problems with this circuit:

1. The audio levels don't need to be changed;
2. The audio is AC referenced to ground so it goes positive and negative. However, the bipolar transistors are also referenced to ground. They can only turn on with a positive collector current.

My solution is to disable these transistors. Now the level does not change between wide and narrow audio bandwidths. I also added a resistor to each circuit to make the audio outputs at the VCR audio jacks standard (about 1Vp-p). A convenient way to disable transistors Q105 and Q204 is to lift the ends of resistors R134 and R236. This is shown in "Mods" sheet 1. The ends of the resistors to unsolder and lift are marked with an asterick (*).

Mod 3

This was the first mod I made and may not be necessary. If you look at the TA8129 on sheet 1 You will see that capacitor C121 is connected to V12F. This is a mistake because it couples noise from V12F directly into the FM detector. Perhaps Uniden can be excused for this error since it is shown this way on sheet 4 of the data sheet for the Toshiba TA8129Z. However, it is shown correctly in the schematic on sheet 2 and Figure 1 on sheet 8. I was able to obtain the data sheet for the TA8129Z (in English) and am making it (as well as the data sheet for the PLL0305A) available at www.jmargolin.com.

Mod 4

In the Power Supply (sheet 4) you will see that the output of the +12V regulator (IC607) is bypassed with only a 100uF capacitor. Good engineering practice requires that it also be bypassed with something like a 0.1 uF capacitor.

Adding this capacitor reduced the noise on the +12V bus (and the 'bubbles') but did not make an audible difference to the 400Hz buzz in the audio output.

Later, I added a 0.1 uF capacitor to the output of IC608 (+5M) to reduce faint interference lines in the video that developed over time or maybe, merely became noticeable.

Extra Credit 1

The on-screen signal level display is useless for aligning the dish, so I brought out the analog signal (called C/N) using the 'VCII Data' jack. This is shown on sheet 9. I do not use a decoder module, but as far I know, no one uses the 'VC Data' jack. (If you do use it, don't do the mod.) I have an extra pair of wires going to my dish, so I just plug in a meter at the dish.

Extra Credit 2

I have an ST-6600 DVB Receiver slaved to my Supra. (The Supra continues to control the actuator and servo.) When I am watching the ST-6600 it is useful to know when the dish has arrived at the satellite. (It's called, "Why aren't I seeing anything?") Switching the video back to the Supra requires reaching for another remote control, so I made an external pod with two LEDs and a resistor, connected across the M1 and M2 actuator terminals. This is shown on the 'Uniden Supra Mods' sheet. LEDs have a limited reverse voltage capability but, by connecting two in anti-parallel, they limit each other's reverse voltage. The 22K resistor is for the high efficiency LEDs I used. Regular LEDs may require a smaller value resistor. Because the assembly is across the actuator terminals use good construction practices so you don't short anything out.

Testing 1, 2, 3 (Requires Considerable Experience)

Tracing the problem required an unmodulated audio subcarrier. These are difficult to find on C Band. I started out by using the unmodulated audio subcarriers that NBC so thoughtfully provides on their Ku band satellite, mostly at night. However, they frequently used them at times that were not convenient for me.

So, I built my own. This is a simple 6.144 MHz oscillator shown in "Test Oscillator" sheet 1 and uses a readily available oscillator module with a resistor divider to bring the output down to an appropriate level.

The wideband subcarrier audio ("SUBDEMOD") is supplied to the FM detector circuits through R112 (sheet 1) and R212 (sheet 2). The signal can be easily intercepted because it comes through a wire jumper just east of the mounting screw in the center of the board.

I removed the jumper and installed the pins removed from a wirewrap IC socket. This allowed me to either install a jumper (Normal Mode) or feed it with the signal from my Test Oscillator (Test).

I wirewrapped the Test Oscillator on a small piece of prototype board with ground and power planes. A small right-angle bracket attaches the Test Oscillator to the mounting screw in the middle of the board which also provides the ground connection. The other connections were made with clip leads. (I got the +5 Volts at Connector J303.

Since the oscillator is at 6.144 MHz, it requires that the audio subcarrier be tuned to 6.144 MHz. Any frequency with the tuning range of the Supra's subcarrier audio can be used. I used 6.144 MHz because it was the cheapest one at the store where I went.

(After I was completely done I uninstalled the Test Oscillator so I could put the case back on.)

Comment

The Uniden Supra produces good video, and with these mods, acceptable subcarrier audio.

Note that when used with a decoder the subcarrier audio is not used because the audio comes from the digital bitstream processed by the decoder. If the receiver is used only through the decoder you don't need subcarrier audio to work.

Finally, I can't resist a parting shot at Uniden.

They obviously did everything they could to make the Supra as cheaply as they could:

1. They used a single sided PC board;
2. They used ceramic disc capacitors instead of 'real' (ceramic monolithic) capacitors.

And yet, they missed something important.

Look at the Actuator Control on sheet 5. The actuator voltage is AC and they use a bridge circuit to select either the positive half-cycles or negative half-cycles depending on which direction they want to move the actuator. That's ok, but they used a needlessly complicated circuit. They could have reduced the number of parts and reduced the cost.

Since Uniden claims they no longer make the Supra (or any C-Band receivers) I guess there is no point in telling them how.

Revision 1 7/2/01 Sheet 6 /CS1 and /CS2 were swapped

Revision 2 10/26/01 Sheet 4 Added 0.1 uF to IC608 to reduce Video Interference lines

Schematics for Uniden Supra - Legal

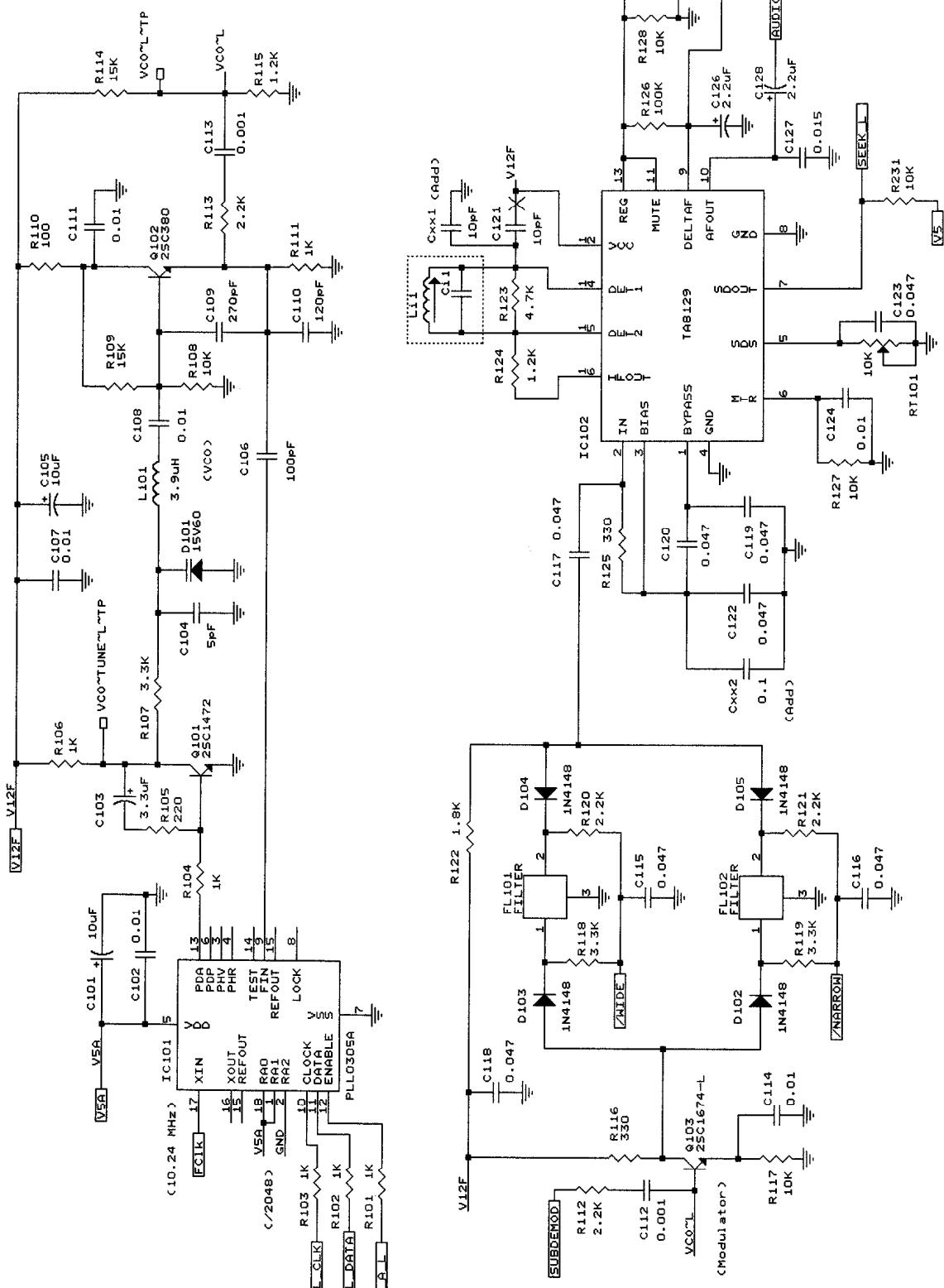
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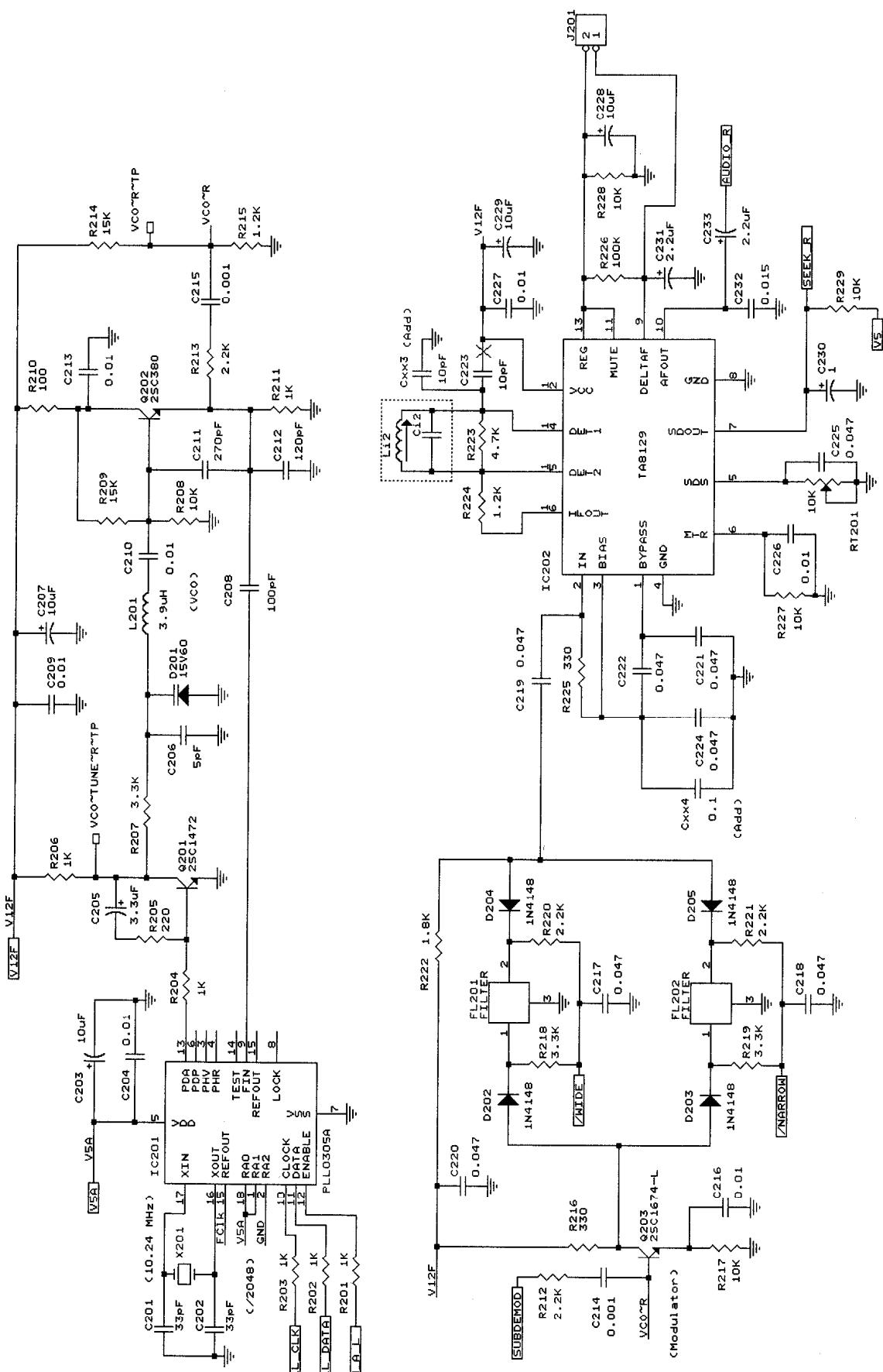
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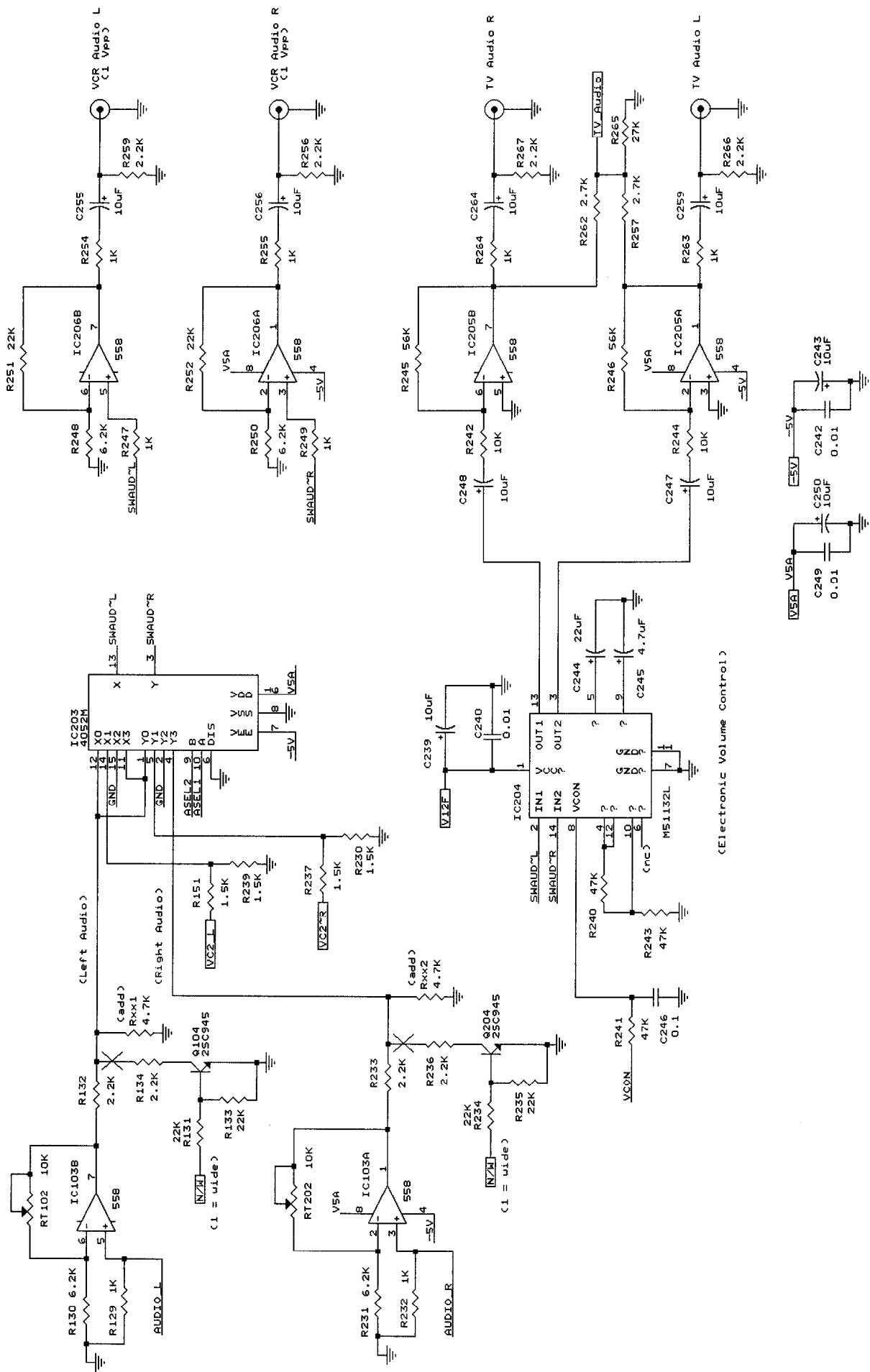
For those interested in my opinion regarding the legal aspects of distributing these schematics:

1. According to the U.S. Patent and Trademark Office, the Uniden trademark is owned by Uniden Financial Inc. Corporation.
2. Because I have completely redrawn the Supra schematics I am not violating whatever copyright Uniden may have in the schematics that it drew. No reasonable (or sane) person would confuse my schematics with Uniden's. (Mine actually make some sense.)
3. Whatever patents Uniden may have are irrelevant insofar as the schematics are concerned as long as you do not build any patented circuits
4. If you make the mods I have shown, you do so at your own risk.
If you are not experienced in this field, do not make them.
5. Making these mods will probably invalidate your warranty on the receiver as well as any decoder module you may install.





Title	Uniden Supra (Main)
Size	Subcarrier Audio (2 of 3)
Document Number	B
Copyright	2000 Jed Margolin
Date	June 9, 2000 Sheet 2 of 10
REV	



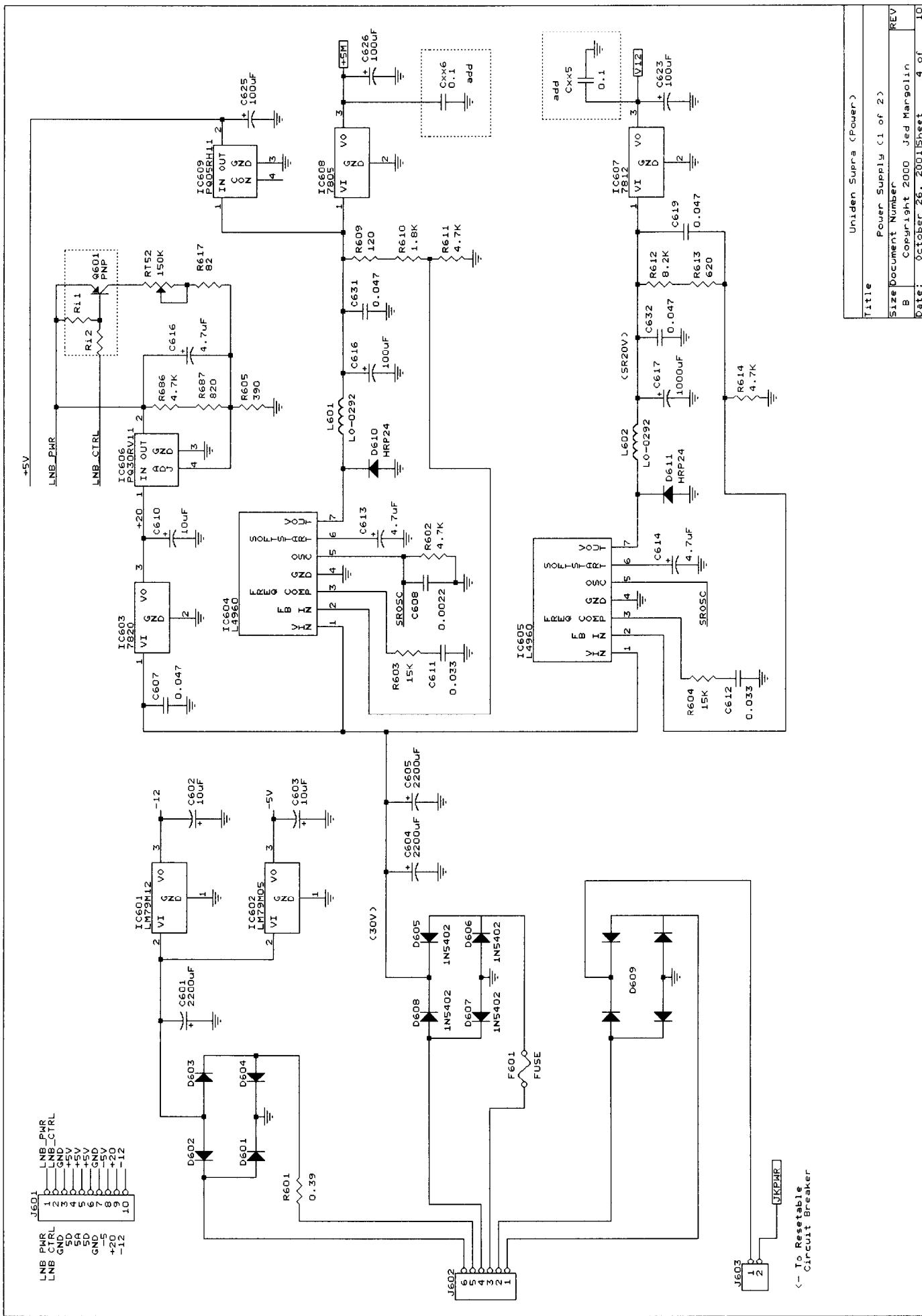
Uniden Supra (Main)

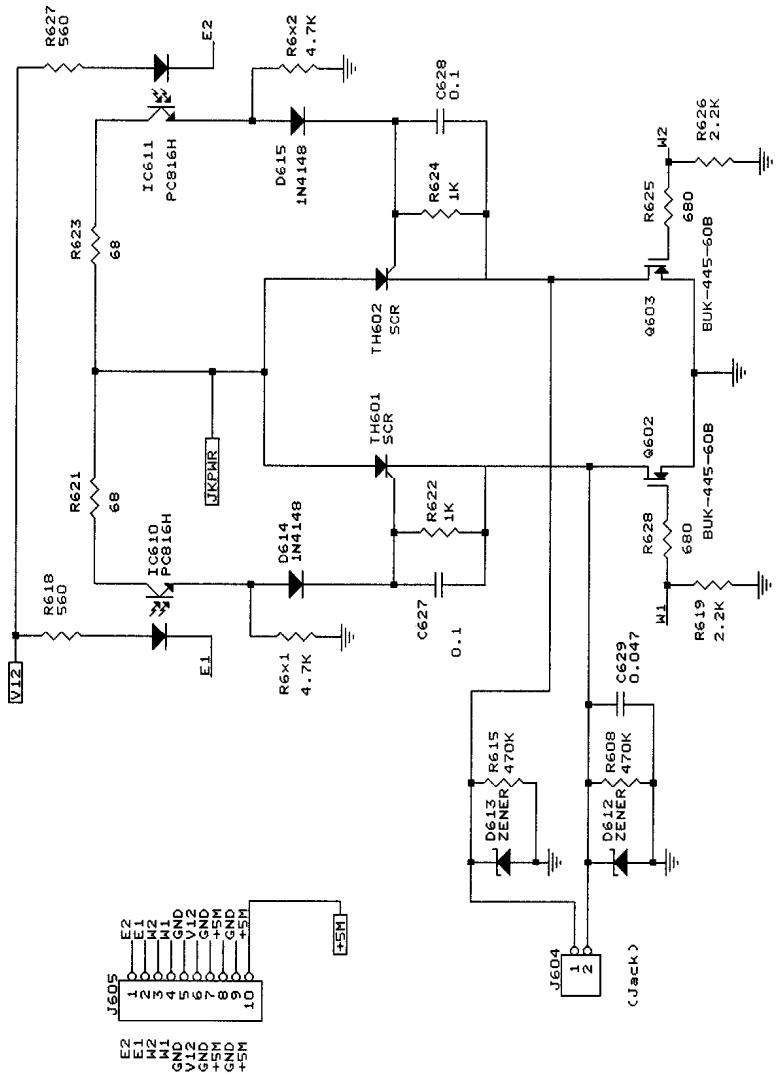
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REV
Document Number

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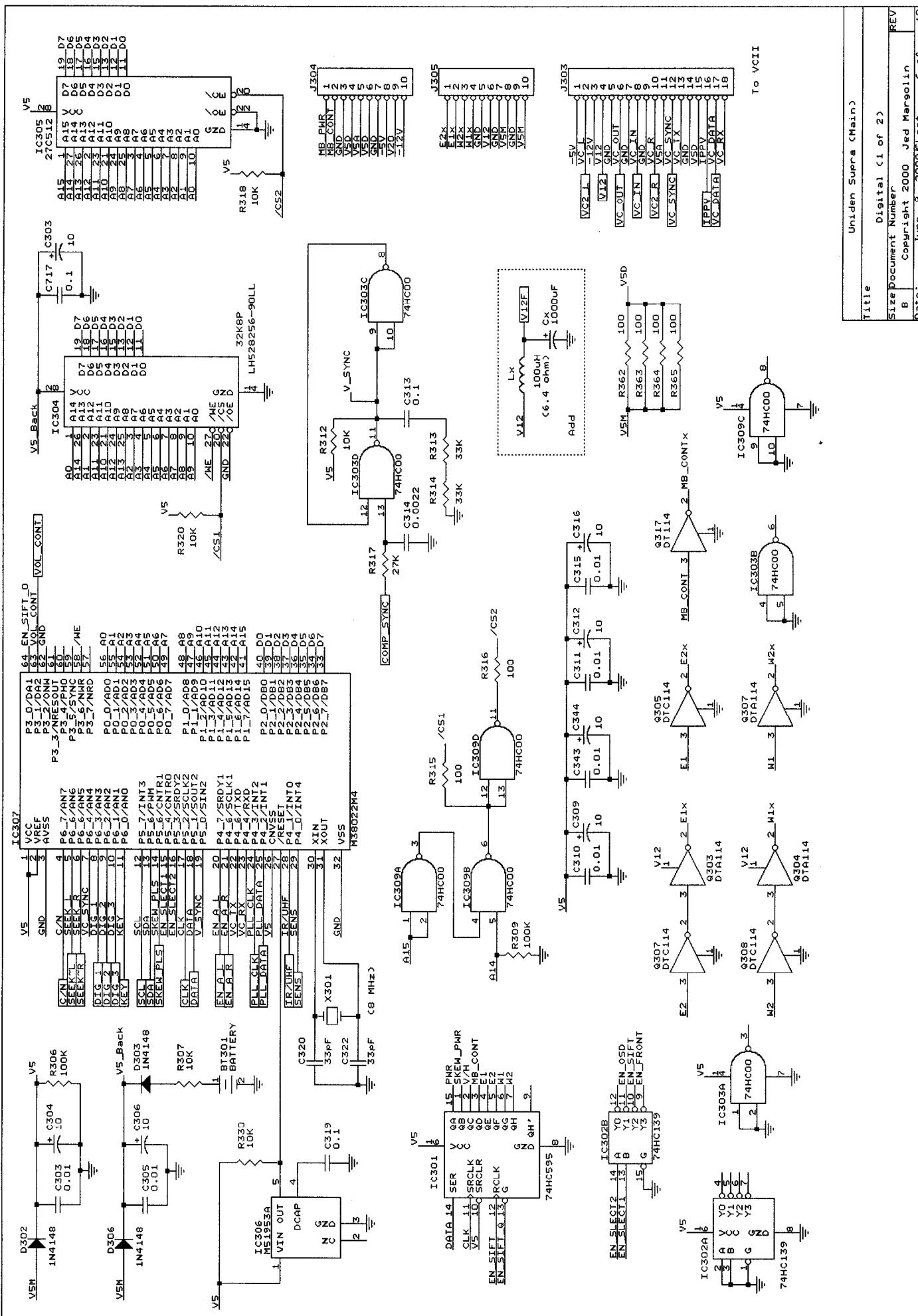
Date: June 9, 2000 Sheet 3 of 10

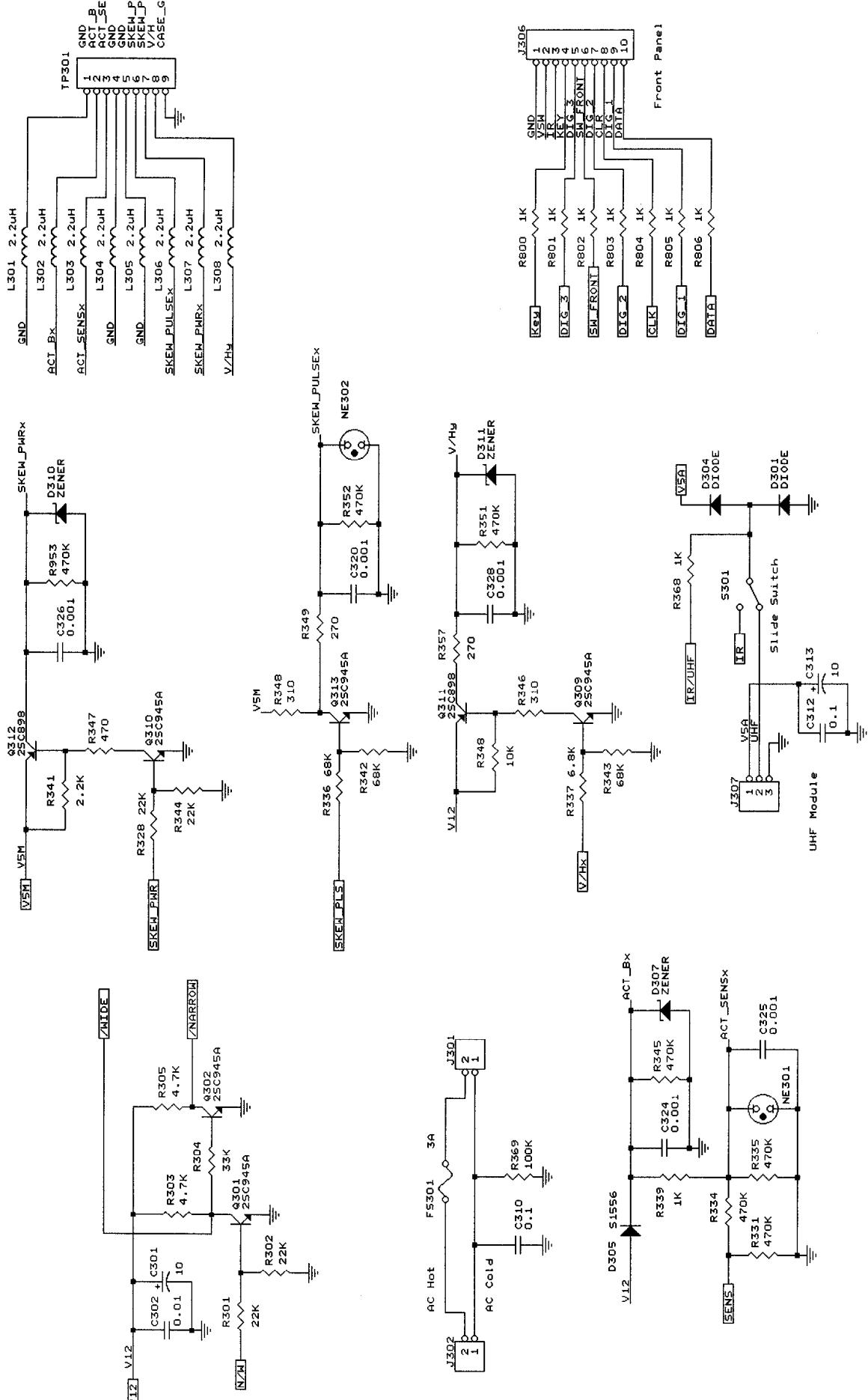




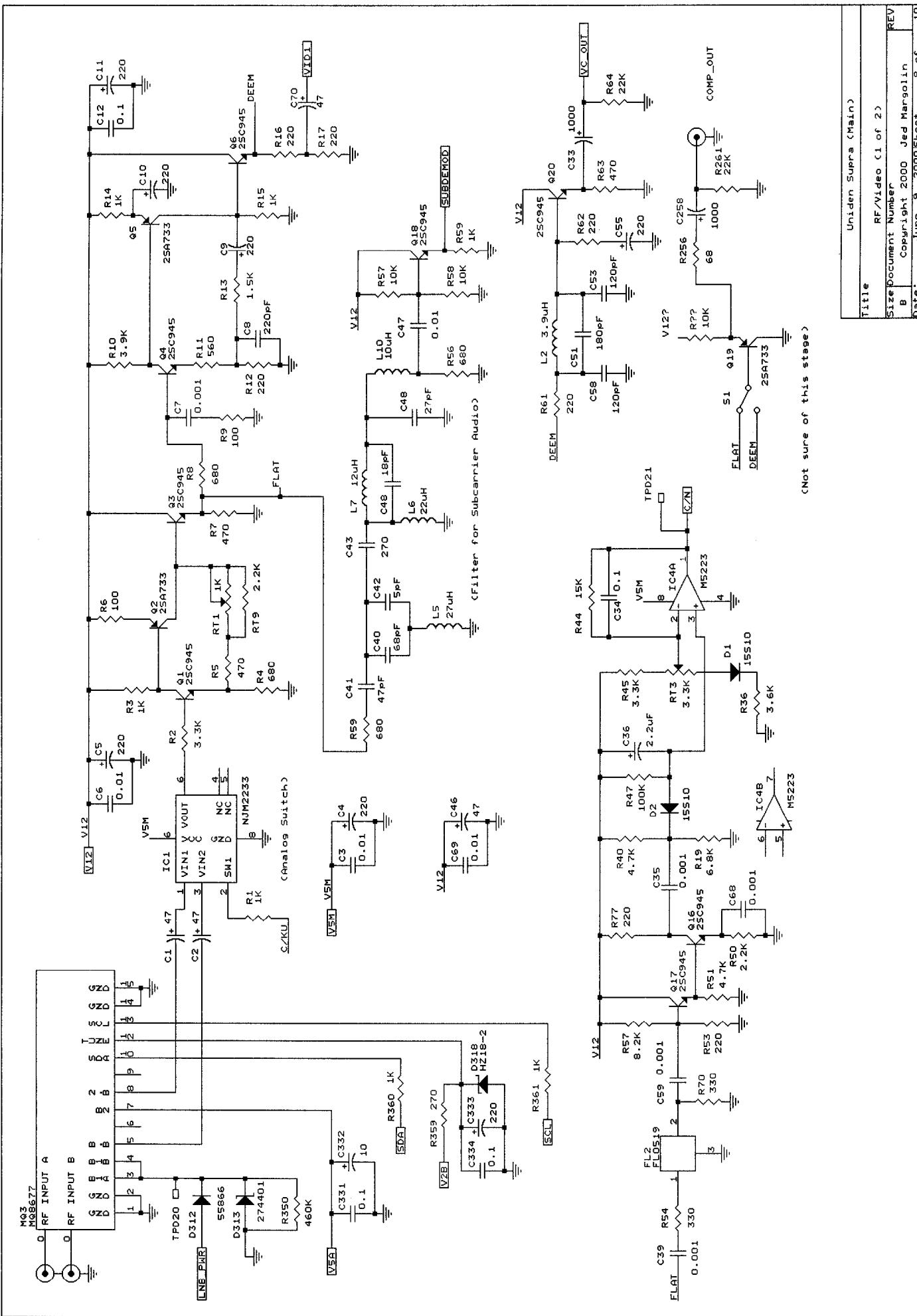
Actuator Control

Uniden Supra (Power)	
Title	Power Supply (<2 of 2>)
Size	Document Number
B	Copyright 2000 Jed Margolin
Date:	June 9, 2000
	Sheet 5 of 10
	REV

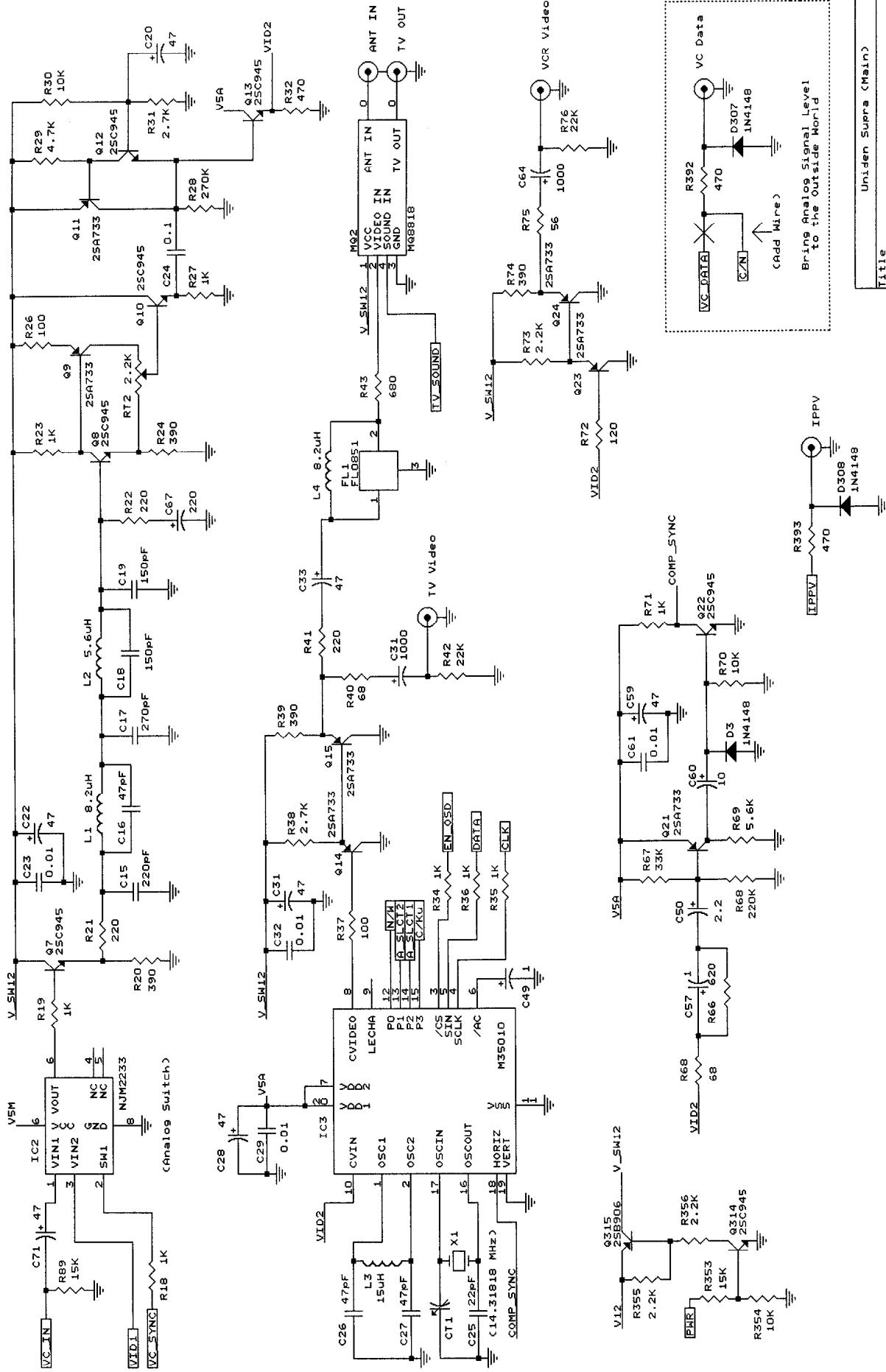




Uniden Surra (Main)
 Title Digital (2 of 2)
 Size Document Number
 S B Cognisight 2000
 Date: June 9, 2000 Sheet



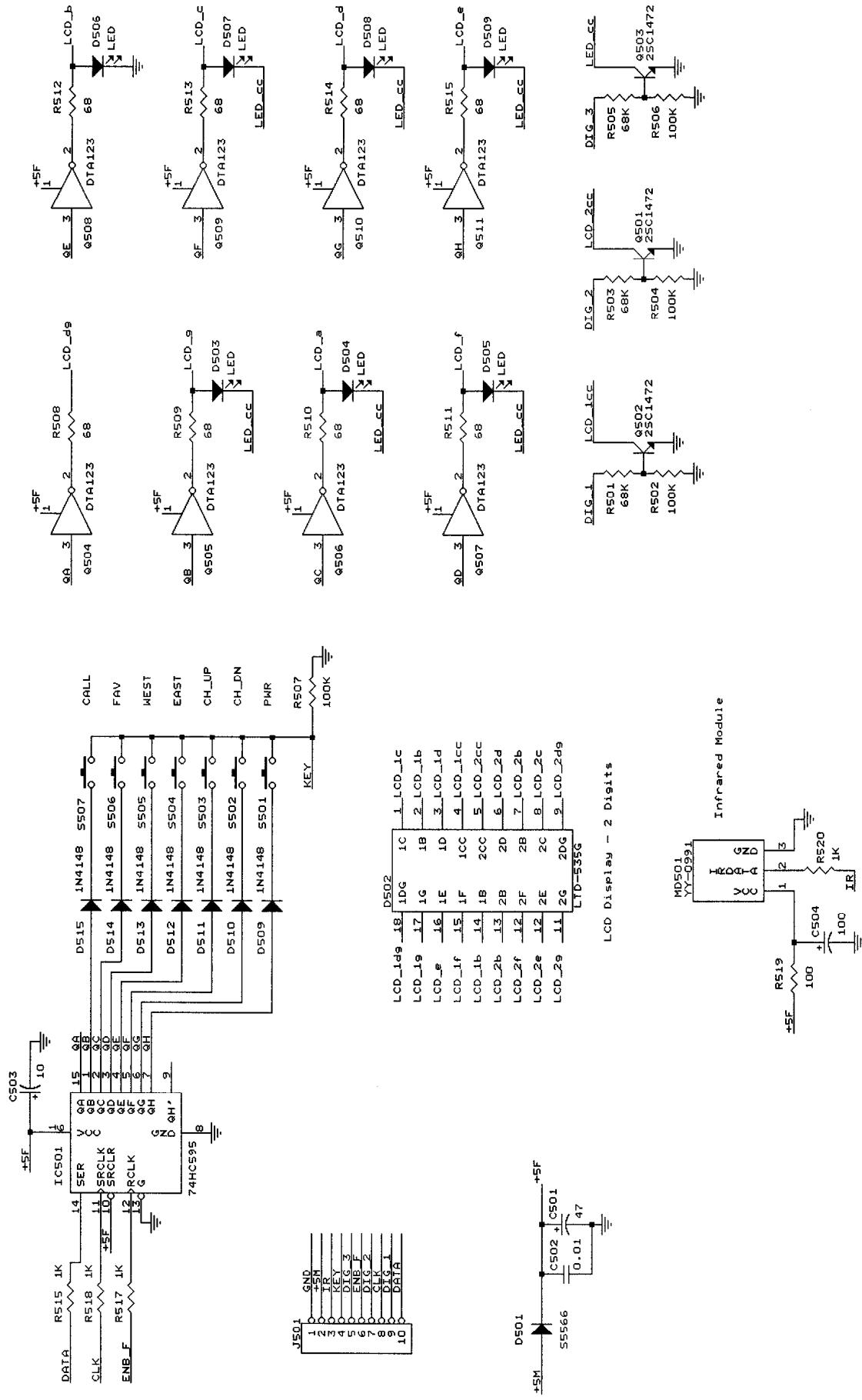
Title: Uniden Supra (Main)
 RF/Videocassette (1 of 2)
 Size: Document Number: B
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 Date: June 9, 2000 Sheet 8 of 10



Uniden Supra (Main)

RF/Video (2 of 2)

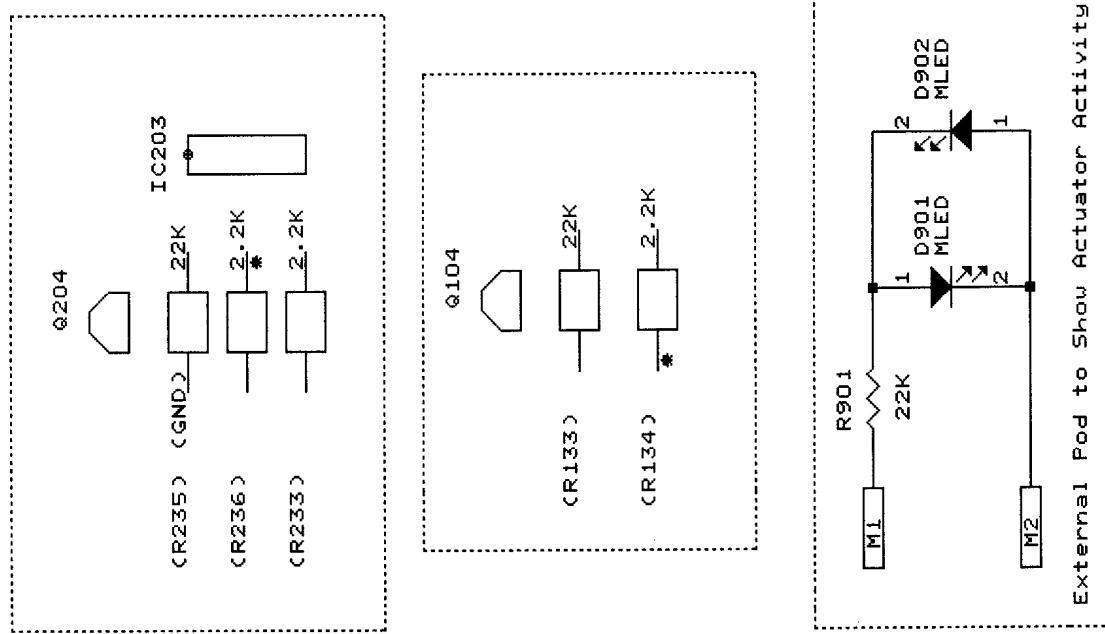
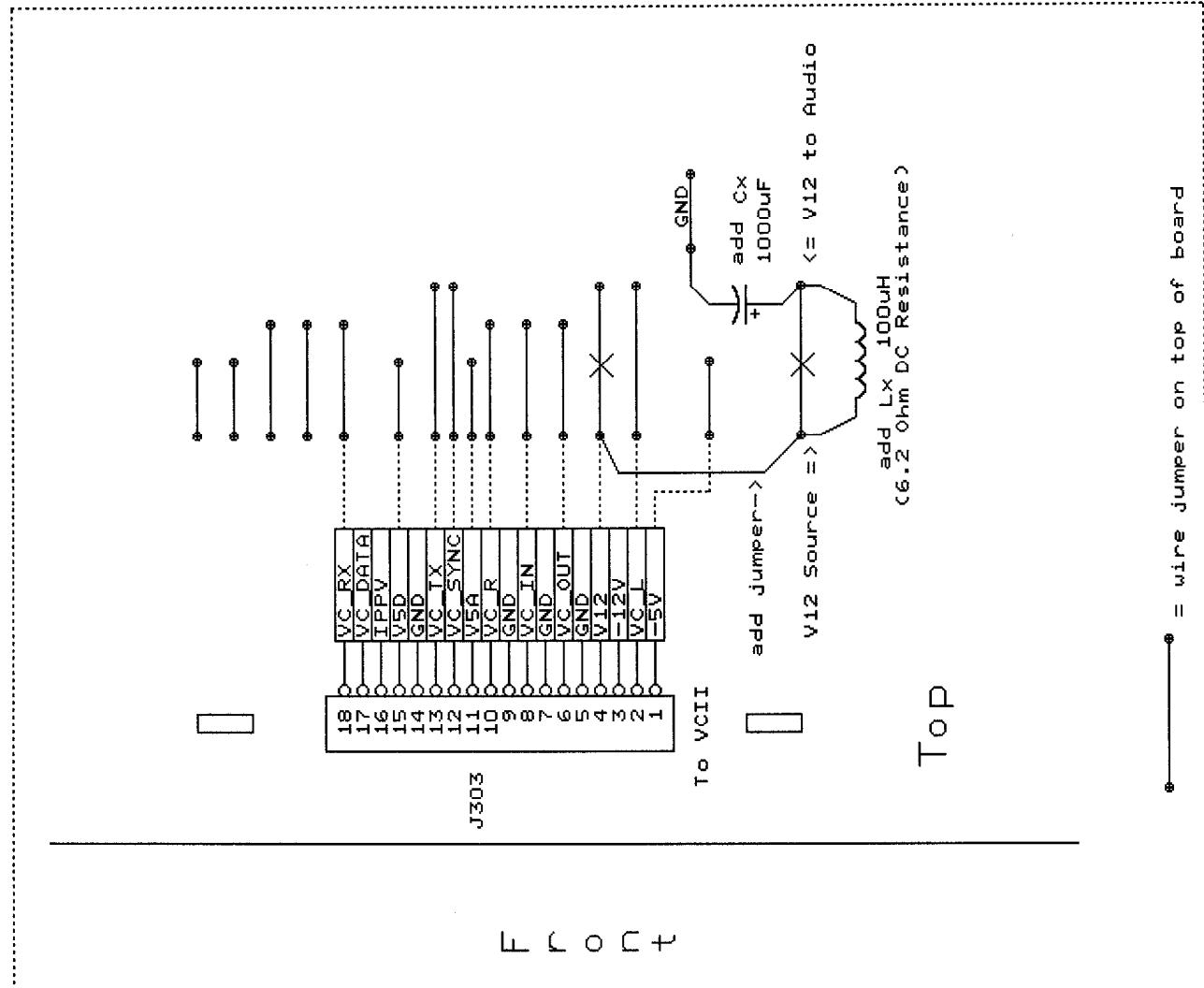
Size Document Number
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Uniden Supra (Front Panel)

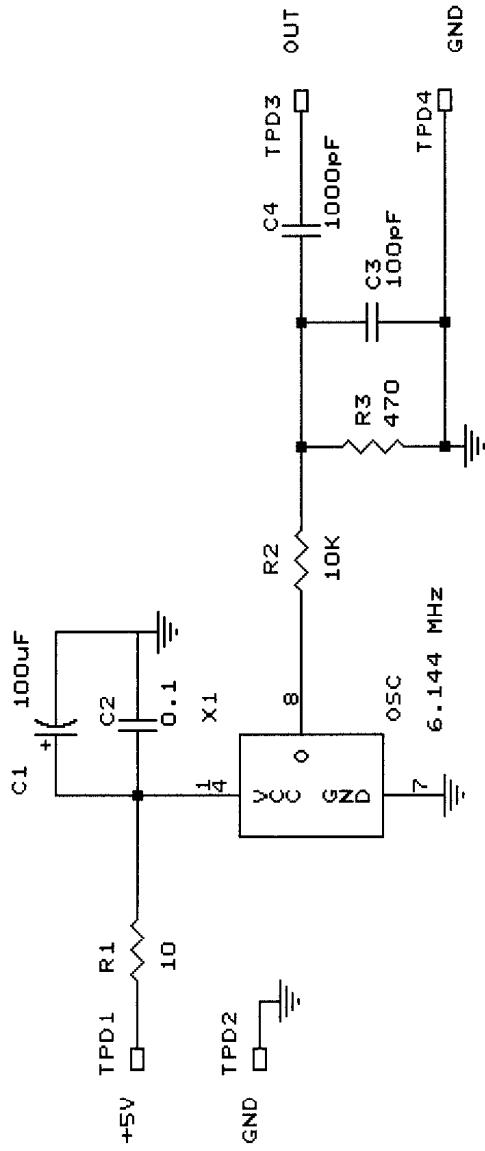
Front Bono 1 -6 12

Size	Document Number	REV
B	Copyright 2000 Jed Margolin	
Date:	June 9 2000 Sheet 10 of 10	



Title	Uniden Supra Mods		
Size	Document Number	Copyright 2000	Jed Margolin
A		Sheet 1 of 1	REV 1

Date: December 24, 2000



Test Oscillator for Subcarrier Audio		
Size A	Document Number 2000	REV C
Date: June 11, 2000	Jed Margolin	Sheet 1 of 1