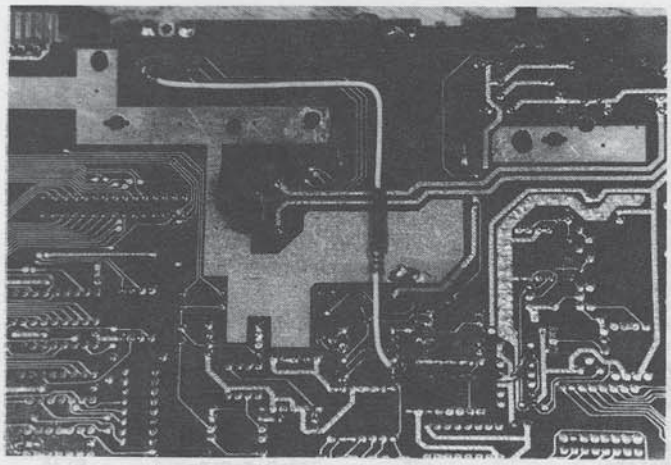

Figure 7. Foil side of 800XL motherboard showing Chroma pick-off resistor

cated R56 circuit board hole. Solder the shorter switch wire to the loop at the top of R56.

Step 7. Now we'll install the chrominance pick-off resistor. Select a 100-ohm resistor (brown-black-brown-gold), and to one end of it apply a length of insulation (stripped from wire) leaving only 1/8" of the lead exposed. Cut a 5" length of wire and strip 1/4" insulation from each end, then solder this wire to the uninsulated end of the resistor. Now experiment a little to find the smallest diameter heatshrink tubing that will fit over both the solder bulge and the resistor body, then snip off a length sufficient to cover the bare lead from the resistor body to the solder junction plus an extra 1/4" to overlap both ends. Slip the tubing into place, then warm it by holding the assembly 1/4" above your hot soldering iron while slowly rotating it for even heating. The tubing will contract to make a neatly insulated assembly (see Fig. 7). DO NOT use tape to insulate this resistor!

Solder the short end of the prepared resistor to the junction of R67-R68 on the foil side of the board. Solder the other end to pin 5 of the monitor jack, routing the wire through the gap between the ground plane foils as shown. Keep the wire close to the board. I later added a dab of hot-melt glue at the bend in the wire to secure it in place.

Step 8. On the rear panel of the case, at a point 1" above the bottom of the panel and midway between the monitor jack and the TV output jack, drill a hole for mounting the composite video enable/disable switch. The exact size of the hole depends on the diameter of the mounting stem of the switch. This completes the S-V 2.0 modification for the 800XL.

800XL S-V 2.0 Checkout

Place the bare board on a clean insulated surface (formica kitchen tabletops work well) and attach the power supply and video cables (a good monochrome monitor with luma connected is preferred here). Turn on the power (yes, the 800XL boots up fine without keyboard or shields installed). You should see BASIC's "READY" notice and cursor appear on your screen, brighter and clearer than ever before. Adjust the monitor's brightness and contrast controls so you can see the entire display, including the background. Work the CV Disable switch back and forth as you study the screen background. You should see a grainy background appear and disappear as you toggle the switch. Some monitors reveal this better than others, and it's harder to see if the focus control on your monitor is out of adjustment. On color monitors you might not see it at all.

If you're satisfied with your accomplishments to this point and don't wish to go further, reattach the RF shields to the board (route the switch wires out near the RF modulator), reinstall the board, fasten the switch to the rear panel, and close up the case. However, if you aren't afraid of more work and would like to push video performance to its very limit, keep that iron hot and move on to Super Video 2.1!

S-V 2.1 For The 800XL

If you have a RAMBO or other memory upgrade card installed, unplug it and keep it out of the way. Refer to Fig. 5 for the following steps:

Step 1. Locate 820uH inductor L5, usually a green-colored component that looks like a resistor with gray-red-brown-silver bands, directly in front of the 4050 chip U20. Desolder or snip out this part, then clear the vacated board holes with a solder sucker. Select a 2.2-ohm resistor (red-red-gold-gold), solder it in place of L5, and snip off the excess lead length. (This improves current flow to the entire video circuit.)

Step 2. Locate electrolytic capacitor C50 (10uF/10V): it's adjacent to the L5 inductor you just replaced. Desolder this capacitor and clear the vacated holes of solder. Replace C50 with another electrolytic capacitor of at least 100uF/10V rating. Radio Shack parts vary considerably in their physical dimensions, so when you're shopping be sure to examine all the parts packages in the range of 100 or 220uF of radial-lead electrolytics on the shelf in the store. Select whichever gives the largest uF value in the smallest physical size. I was able to squeeze in a 220uF unit and still didn't have trouble reinstalling my RAMBO board. (Restores AC filtration lost by removal of L5.)

Step 3. Locate 2K resistor R53 (red-black-red-gold) directly to the left of Q3 on the motherboard. Remove this resistor and replace it with a 2.7K resistor (red-violet-red-gold). (Improves color saturation slightly.)

Step 4. Solder a 1K resistor (brown-black-red-gold) from the right side of 100pF capacitor C55 to the bottom end of 6.2K resistor R58 (blue-red-red-gold). This resistor has to traverse about 1.5" of board space, so don't trim the leads. Mount it about 1/4" above the board on the component side, bending the leads down at the specified contact points. This resistor provides negative feedback around the color amplifier Q2-Q4-Q5. The effect is subtle, but it improves saturation a little and reduces color shadows somewhat.

This completes Super Video 2.1 for the 800XL. You'll probably find it necessary to reduce your display brightness controls when you perform your checkout, as the video signal is now stronger than it was with S-V 2.0. Check out the improvement on a color monitor if available before you close up the case. Use the luma-chroma interface to check proper operation of your chroma circuit wiring. For my color checkout I just stuck my Pole Position cart in the slot and booted up the bare board. Pole Position is nice because it's very colorful and self-starting. The display was wonderfully sharp and brilliant on a Commodore 1084 using the luma-chroma interface with composite video disabled. The Alchemist succumbed to several hours of game-playing after reassembling the computer. Unfortunately the crisp display didn't improve my driving, and those fiery crashes were all the more annoying for their clarity. Hrrrumph!

S-V 2.1 For The 600XL

For the remainder of this article I'm going to revert to a more truncated style of presentation in the hope of saving page space. Physically, S-V 2.1 in the 600XL is tedious, as boardspace alotted to the video components is rather a mini-

scule piece of real estate. Consequently the video circuitry is densely packed, and you'll have to mount most components vertically. With this upgrade we have a lot of labor to perform, since we'll be adding all the parts Atari swindled from us as well as replacing the bungled ones they installed.

The resistors, capacitors, and switch are all available at Radio Shack. You'll need three 2N3904 (MPS3904) transistors, also at Radio Shack (#276-2016). If the 3904 is unavailable you can substitue the 2N2222 (MPS2222), #276-2009. Don't take the specs and diagrams printed on the packaging too seriously: a 2N3904 and MPS2222A I purchased both showed the collector and emitter leads reversed on the package diagram. (I verified the leads on the actual parts with a click tester; they were correct. I long ago learned not to trust data furnished with the Rip-Off Shack's overpriced parts.) When installing these transistors, line up the flat side of the part with the flat side in the outline screened on the board.

You'll also need a 5-pin DIN board-mounted socket: that's a problem. These sockets are used in all IBM computers and are available dirt-cheap at every electronics outlet in the world. Except Radio Shack. Best Electronics sells them for $1.00 apiece. The problem is that no mailorder parts vendor wants to bother with an order for a single part that costs less than a buck. You'll have to be creative. Band together with friends or your usergroup and buy a whole bunch of them, or combine your order with other items. Perhaps some shrewd operator will stock up on them and offer them to *AC* readers through the Swap ads in the back of this magazine.

Refer to Fig. 8 for the following steps:

Step 1. Desolder and clear all the board holes for the following components:

C111	J7	Q8	R128	R131	R134	R137
C112	L12	Q9	R129	R132	R135	R138
C113	Q7	R124	R130	R133	R136	R139

Step 2. Remove the following components from the circuit board and clear the vacated holes of solder:

C109, C110, C115, L14, R59, R123, R127, R140, channel selector switch

Step 3. Install the following components at the indicated locations:

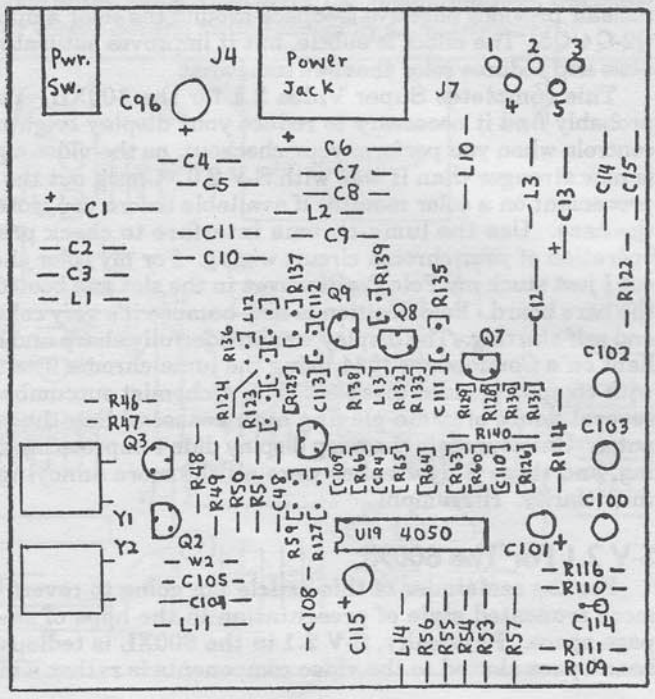

Figure 8. Parts placement for the 600XL

Part	Value	Code/Mark	Location
Blank space	- 0 -	- - -	C109
Capacitor, ceramic	100pF	101	C110
Capacitor, ceramic	5pF	4.7 or 5	C111
Capacitor, ceramic	.001uF	102	C112
Capacitor, ceramic	100pF	101	C113
Capacitor, rad. elect.	220uF/16V	220/16	C115
Switch (1)	SPST	- - -	L13
Resistor	2.2 ohms	red-red-gld-gld	L14
Transistor	2N3904	2N(MPS)3904(2222)	Q7
Transistor	2N3904	2N(MPS)3904(2222)	Q8
Transistor	2N3904	2N(MPS)3904(2222)	Q9
Resistor	1.5K	brn-grn-red-gld	R59
Resistor (2)	75 ohms	[brn-grn-brn-gld]x2	R123
Resistor (2)	75 ohms	[brn-grn-brn-gld]x2	R124
Resistor	2.2K	red-red-red-gld	R127
Resistor (3)	6.2K	[orn-blk-red-gld]x2	R128
Resistor	1K	brn-blk-red-gld	R129
Resistor	2.2K	red-red-red-gld	R130
Resistor	1K	brn-blk-red-gld	R131
Resistor	1K	brn-blk-red-gld	R132
Resistor	3.3K	orn-orn-red-gld	R133
Resistor	10K	brn-blk-orn-gld	R134
Resistor	220 ohms	red-red-brn-gld	R135
Resistor (2)	75 ohms	[brn-grn-brn-gld]x2	R136
Resistor (2)	75 ohms	[brn-grn-brn-gld]x2	R137
Resistor	3K	orn-blk-red-gld	R138
Resistor (4)	4.7K	yel-vio-red-gld	R139
Resistor	1K	brn-blk-red-gld	R140

Notes :
(1) Two 7" lengths of stranded wire, lightly twisted, from switch lugs to L13 holes.(CV disable switch)
(2) Synthesized value: two 150-ohm resistors in parallel.
(3) Synthesized value: two 3K resistors in series.
(4) Designated R141 in Atari diagrams (schematic error).

Step 3. On the foil side, cut the foil connection between pins 2 and 5 of J7.

Step 4. Install the 5-pin DIN jack on the component side of the board. Depending on the particular style of unit, it might be necessary to file down the two front pins to get them in the holes. Solder all the pins, including the two front ones.

Step 5. Now we bring out the luminance signal to the jack. Twist together two 150-ohm resistors (brn-grn-brn-gld), solder the leads together, and place insulation (removed from wire) over all but 1/8" of the exposed lead length on both sides. On the foil side of the board, solder one end of this part to the junction of R123-R124 and the other end to pin 1 of the output jack J7. Depending upon lead length, you might have to add a short length of insulated wire to one end of this part. Mine barely made it without adding extra wire.

Step 5. Now we'll bring out chroma to the jack. Select a 100-ohm resistor (brn-blk-brn-gld) and place insulation (removed from wire) over all but 1/8" of the exposed lead length on both sides. On the foil side of the board, solder one end of this part to pin 5 of output jack J7, and the other end to the emitter lead of Q9. This lead is on the left when you look at Q9 face-on.

Step 6. On the bottom half of the RFI shield, locate the square hole where the channel selector switch used to be. Cut out all the metal above this hole, extending to a distance of about 2mm on either side of the hole, and all the metal below the hole down to the bend. You'll end up with a square-looking version of the big notch already present for the adjacent power supply jack.

We have to cut another notch for the CV Disable switch. Viewing the RF shield from the rear, cut a notch 18mm wide commencing at a point 3mm to the left of the hole already present for the RF output jack. This notch should extend all the way to the bend in the metal. You'll lose a shield mounting tab, but that doesn't matter.

Cutting these notches isn't easy. I used a Moto-Tool equipped with an emery cutting wheel to do a neat job, and I filed down burrs and sharp edges with a fine Swiss file. Tin snips might also work but would probably warp the metal.

Heavy-duty wirecutters might also suffice, though they might not be much good for anything else when you're done. Sheet metal is a pain.

Step 7. Now we have to make holes in the rear panel outer case, starting with the hole for the video jack. Measure off a point exactly 21mm to the left of the leftmost edge of the power connector hole. Make an indent there to start your drill bit, then drill a 3/4" hole. If all goes well you'll completely obliterate the existing rectangular opening where the channel selector was. In my experience it's better to have an opening too large than too small. Square off the edges of the hole with a round Swiss file. On my unit I filed off the "2 - CHAN - 3" lettering, which is now meaningless.

Now for the CV Disable switch hole. At a point 25mm from the bottom of the rear panel, and 13mm to the left of the leftmost edge of the RF modulator hole, drill a hole for your switch. The diameter of this hole should be just slightly larger than the mounting stem of your switch (I used a 3/8" bit). If you follow these instructions exactly, everything should fit perfectly when you reassemble the case.

Checking Out The S-V 2.1 600XL

Boot up the bare motherboard with your favorite monitor as described earlier for checking out the mod on the 800XL. After upgrading my 600XL I was pleased to observe a crisp display in both mono and color whose characteristics were identical to the results I obtained with the 800XL, including the function of the CV Disable switch. After you're satisfied everything is running OK, reassemble the shields and case and close it up.

Those of you who still want to use the TV interface on your 600XL might be concerned about the loss of the channel selector switch. It's actually still there: removing the switch is equivalent to leaving the selector permanently set on the Channel 3 position (I haven't verified that). If you're really very fussy about this you can always run some wires from the channel selector switch holes in the vicinity of J7 out to another SPST switch mounted on the rear panel—if you can find room for it! Having gone to all this trouble installing the electronics for interfacing my 600XL to a nice crisp monitor, I don't give a hoot about the TV interface any more.

Perspectives On 1200XL Video

Despite the abundance of extra parts in the 1200XL video section, it turns out the basic design of the 1200XL video amplifiers isn't much different than the ones in the 800XL and 600XL. In all three machines color is handled by a group of three transistors, while the baseband monochrome/composite output is a separate single-transistor circuit. All these transistors are 2N3904 types. The table below summarizes the schematic designations of these transistors and briefly describes their functions:

Function	600XL	800XL	1200XL
1st color amp	Q7	Q2	Q19
2nd color amp	Q8	Q4	Q8
Color output	Q9	Q5	Q7
Mono/CV output	Q6	Q3	Q11

Atari's most serious design and manufacturing flaws occurred in the baseband mono circuit, which screwed up both mono and color.

What sets the 1200XL apart from the other XL machines is an extra three-transistor circuit (Q16-Q17-Q18) whose input connects to the color sync signal at GTIA pin 25. The output is emitter-coupled to the color amp circuit via a diode (CR19) to Q19. It took me a while to dope out what this was for, but once I caught on my imagination was gripped in a spell of astonished wonder. This extra little circuit boosts color saturation. And The Alchemist is here to tell you its effect amounts to video magic. If Atari had included this extra 25-cents' worth of parts in all its 8-bit machines, and hadn't squandered it by butchering the rest of the video circuitry, the Atari 8-bit could have blown away the competition hands-down. Especially for color graphics and games!

Curing the video defects in the 1200XL was no easy task: the gremlins were well-entrenched with multiple lines of defense, and they fought The Alchemist tooth and nail every inch of the way. But, as General Grant discovered in the American Civil War, the secret of victory lay in lessons learned from the battles fought. That secret is to achieve a balance between three conflicting elements of the color output, which are: 1.) color saturation; 2.) color shadows; and 3.) sharpness (signal strength and bandwidth). The main rule of the game is: "Anything you do to improve one of these elements will necessarily degrade performance of at least one, and probably both, of the other two." Insofar as the monochrome amplifier plays a key role in achieving the best color display, improving the color display automatically results in optimized monochrome performance.

My philosophy was to tolerate a certain amount of color shadows while maximizing sharpness and saturation. This approach provides maximum benefit for both mono and color users. Color shadows don't affect the monochrome display at all, while the optimized signal provides the best possible screen sharpness for text. On color displays, the eye tends to be more forgiving of object shadows if the picture is sharp and clear and full of brilliant color. Object shadows in the color display seem to me a video artifact that varies according to the particular combination of colors on the screen, being absent with some combinations and more noticeable with others. The S-V 2.1 upgraded 1200XL still exhibits some color shadow artifacting, but I'm gambling most people won't notice it while they're playing a fast-moving videogame on a crisp, vividly colored screen. In short, you game freaks will have a field day playing color games on a 1200XL upgraded to S-V 2.1XL using a luma-chroma interface.

S-V 2.1 For The 1200XL

OK, let's do it. Refer to the board layout diagram in Fig. 9 for the following steps.

Step 1. Cut out the following components from the motherboard:

```
C60        CR20
C62  (1)   R25
C101 (1)   R28
(1) Might not be present in some computers.
```

Step 2. Carefully *desolder* capacitors C103 and C104. One of them will be re-used. You don't have to clear the vacated board holes of solder.

Step 3. Desolder the following components from the board and clear the vacated board holes of solder:

```
C63    L15    R145 (1)
C99    R21    R181
C115   R44    R187
(1) Might not be present in some computers.
```