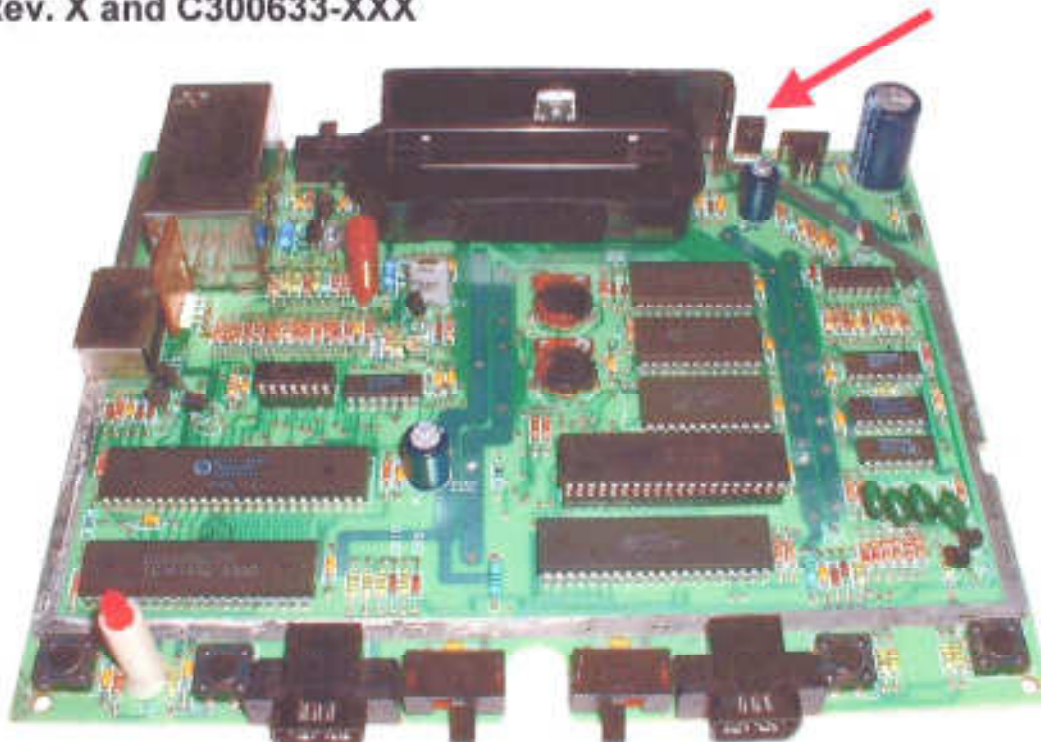


# Atari Engineering Euro OS Upgrade modification.

This 7800 Modification should only be installed on a known good working 7800 console. This Atari Engineering 7800 Composite Video mod is based on the US / NTSC 7800 Motherboard PCB part number CO25233-XXX / CA025234 which was used in the bulk of the US 7800 console production run. It has not been tested or installed on the PAL / Euro version Atari 7800 Motherboard PCB numbers CO70856 Rev. X and C300633-XXX



**US Atari 7800 Motherboard component layout**

The quick way you can tell you if you have the US 7800 Motherboard, check to the left of the Atari 7800 Power jack on the Atari 7800 Motherboard. If you find a MJE 210 (see **Red Arrow** above) Transistor next to the 7800 Right Angle Power Jack, you have a US 7800 motherboard.

This 7800 upgrade was developed by the Atari 7800 Engineering group during the 7800 design stages and was one of the Non used US Marketing Options for the NTSC US 7800 Atari's. Once this 7800 O.S. (**O**perating **S**ystem) Upgrade is installed, your 7800 will No longer have the Delay/Atari Color Logo when you Install/Play an Atari 7800 game cartridge. You will instantly see the normal 1st screen of your 7800 Game cartridge. Also when No 2600/7800 Game cartridge is

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Installed in your 7800 and you turn on your 7800, you will find you now have a full Atari 7800 Asteroids game built into your 7800 machine!

## **Items required for this 7800 OS Upgrade Mod.**

**Phillips Screw Driver**

**Volt / Ohm meter**

**Needle Nose Pliers and Wire strippers**

**25 Watt Soldering Iron**

**Solder**

**Solder Sucker or Solder Wick**

**Exacto Knife**

**The ability to follow written installation instructions with 9 color pictures.**

**This upgrade is so simple no schematics / prints are supplied. You should be able to solder and unsolder components**

**Count I.C. Chip pin numbers**

**About ½ to 1 hours installation time.**

## **Items Supplied with the Best 7800 OS Upgrade Modification**

**8 page instructions with 9 pictures**

**New 28 pin 7800 NTSC / PAL O.S. Upgrade ROM**

**Length of Yellow Connecting Wire**

**1 74LS04 I.C.**

**1 28 pin I.C. Socket**

**A New set of shorter 7800 Case screws.**

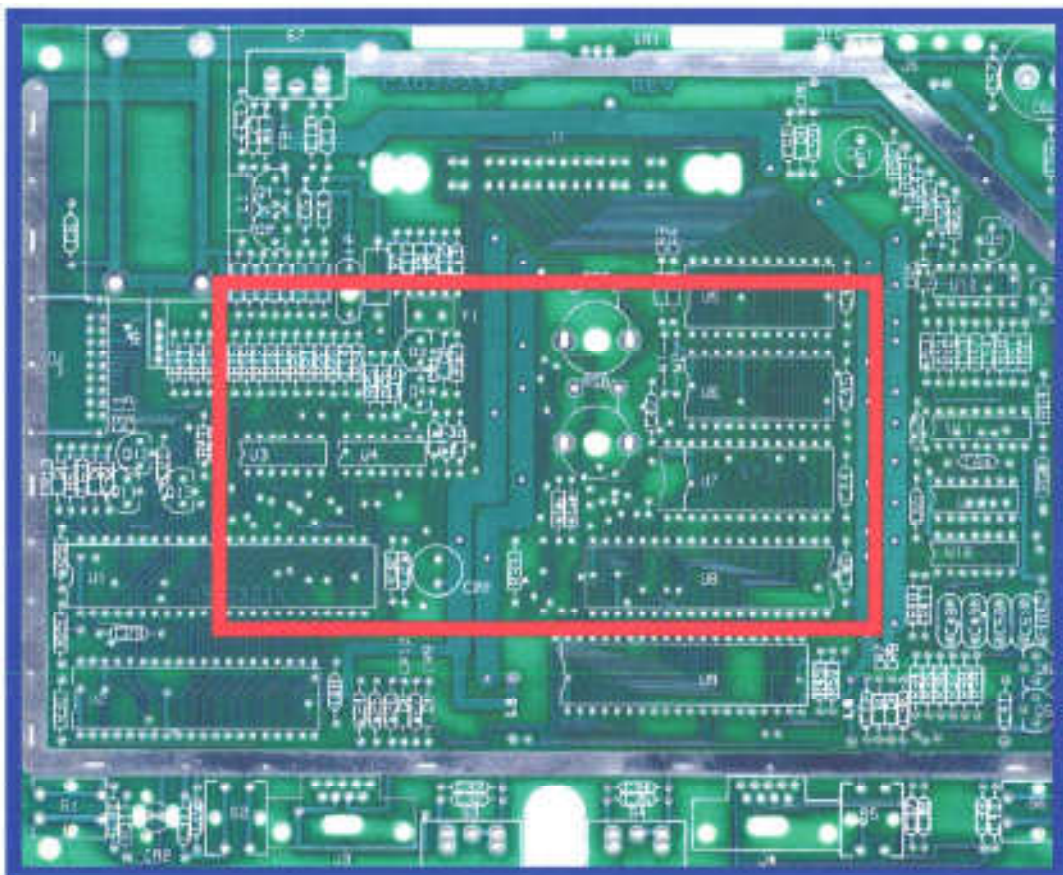
## **To Start this 7800 OS Upgrade Modification**

Remove all of the Video, Power Cables, Joystick cables from your 7800 console. Flip over the Atari 7800 console and sit it on its top case and remove the 5 black Phillips screws from the bottom 7800 case. Discard these long screws. Working with Atari 7800 consoles for the last 15+ years we have noticed that the Atari 7800 top case inner screw black hole plastic threaded bosses get very brittle over the years. In many cases if you try to reinstall the original longer Atari 7800 cases screws back into the Atari 7800 console, you will crack or shatter these brittle plastic 7800 top case screw bosses. As part of this 7800 Composite Video mod, we have supplied you some shorter Atari 7800 case screws to help prevent this known 7800 top case problem. If find your Atari 7800 top case set already has cracked, damaged or shattered threaded black plastic bosses, [see the Best Atari Tech tip on page 185 of the Best Rev. 10](#) to fix this broken or shattered plastic threaded boss problem. Hold both the bottom and top 7800 cases together and flip over the 7800 case set so the 7800 top case is facing up again. Lift off the 7800 top case and set it aside. To remove the Atari 7800 Motherboard from the 7800 bottom case, lift the Atari 7800 motherboard back

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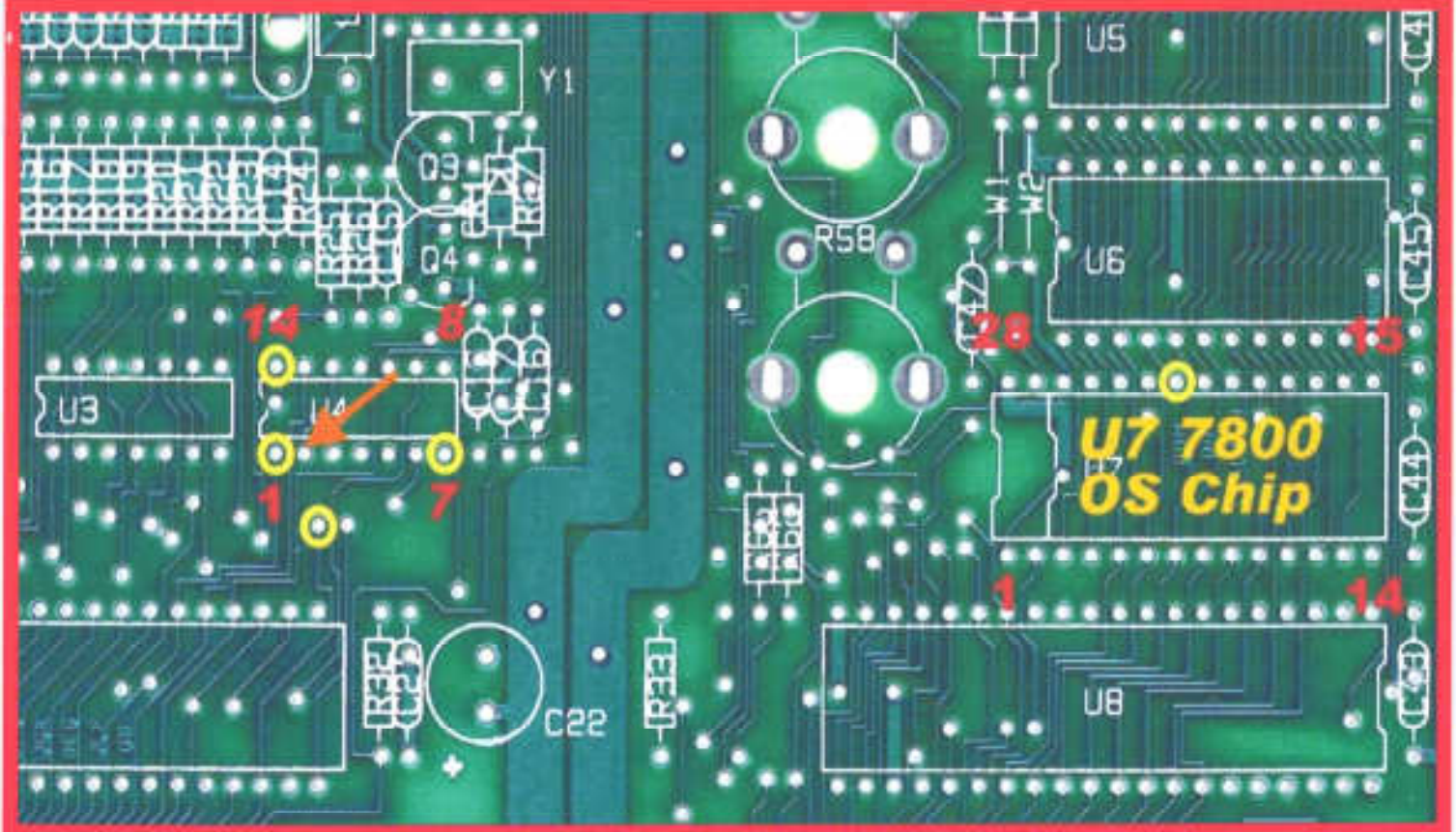
edge up and at the same time, angle the back edge of the 7800 PCB forward to the front side of the 7800 bottom case. With the Atari 7800 motherboard at about a 45-degree angle, you should now be able to lift the 7800 motherboard out of the bottom case. When installing the modified 7800 Motherboard back into the 7800 bottom case, just reverse the above removal procedure.

Set the Atari 7800 motherboard in front of you. There are 14 small metal twist tabs (around the outer edge of the top RF Shield) that hold the Atari 7800 Top RF metal shield onto the 7800 Motherboard and bottom RF shield. Use your Needle nose pliers and straighten each of the 14 Metal twist tabs, these twist tabs almost have to be bent back almost perfectly straight before the top 7800 RF shield will come off the 7800 motherboard. Once you have straightened out the 14 metal twist tabs, if you still have a problem removing the top RF shield in sections or sides, use your flat blade screwdriver to lift / pry the top RF shield off the 7800 motherboard in the stuck areas. Next remove the bottom RF shield off the bottom side of the 7800 Motherboard. If you again straighten the 14 small tabs with your needle nose pliers on the bottom RF shield, it will make reassembling the RF shield back on to the 7800 motherboard a lot easier.



**Bare 7800 PCB showing 7800 OS mod location**

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**Yellow** circles are 7800 OS Mod points. **Red** Numbers are I.C. pin numbers

## 7800 Supplied Component Modifications

### 74LS04 I.C.

We are going to prep the 74LS04 dead bug style. This involves bending out most of the 74LS04 I.C. legs, but leaving some of the legs in their normal down position to piggy back (to pick up 5+ voltage, a signal and ground pins) onto the top of another 7800 other soldered in I.C. The 5+ Volt leg, one signal and ground pins of the 74LS04 will be soldered directly onto the same pin numbers on the 74LS08 I.C. (U4) (see above PCB picture for U4 I.C. pin out) that is soldered in 7800 motherboard PCB. Locate the #1 pin / leg on the loose 74LS04 I.C. Pin numbers on the 74LS04 I.C. start at pin #1 and go Counter Clock wise to the final pin #14 in a U shape (The 74LS04 I.C. has the exact same pin out as the 74LS08 U4 in the PCB close up picture above). Take the supplied loose 74LS04 I.C. and with your need nose pliers bend out 90 degrees from the I.C. body the following I.C. legs 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13. Now cut off the following bent up I.C. legs 3, 4, 5, 6, 8, 9, 10, 11, 12, 13 flush with the body of the 74LS04 I.C.

### Yellow jumper wire

Take the supplied jumper wire and on one end trim the exposed wire down to about 1/8 to 1/16 next to the **yellow** outer insulator.

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## 7800 Motherboard PCB Modifications

Place the 7800 Motherboard in front of you with the 7800 black cartridge guide toward the back and the 7800 On /Off switch in the front left corner. The U7 24 pin OS chip (Atari Chip part number CO24947A) is just right lower side of the bottom 2600 Color Adjust Pot location #58. It may be soldered into the 7800 Motherboard or in a 24 or 28 pin I.C. socket. Most of the US 7800 PCB's you will find the 7800 OS chip soldered into the 7800 motherboard. If it is, you will have to unsolder the 7800 24 pin OS chip plus 4 other filled in I.C socket holes and solder in the 28 pin provided I.C. socket with the I.C. socket pin #1 / notch in the I.C. 28 pin socket is in the left direction.

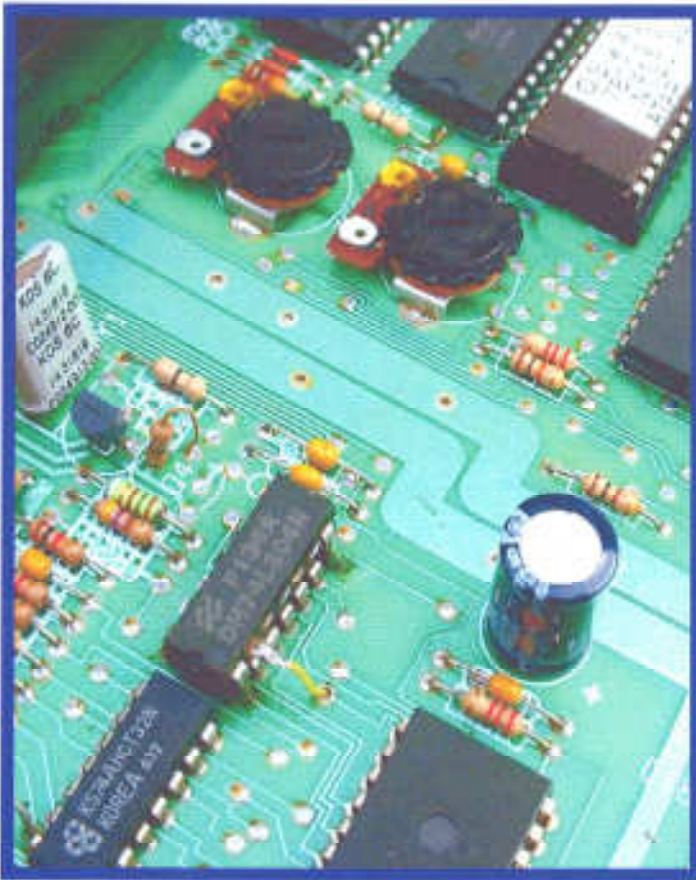
On the top side of the 7800 motherboard locate the 74LS08 I.C U4. (see picture on page 3). Below the Red #1 and slightly down and to the right, you will find a pass thru (top to the bottom side of the 7800 PCB board) round plated thru filled solder hole with a **Yellow** circle round it. Remove / Solder suck out the solder out of this hole. Make sure you remove as much as solder as possible. Later in this 7800 OS mod you will pass the provided insulated **Yellow** jumper wire thru this soldered sucked out hole from the top to the bottom side of the 7800 PCB.

There is a circuit trace (bottom / solder side of the 7800 PCB, **Do not cut any Circuit traces on the top side of the 7800 PCB**) between the 74LS08 I.C. Pin #1 to the U7 7800 OS chip #22 pin. Locate this bottom / solder side circuit trace. Cut this circuit trace with your Exacto knife. Usually it is best to cut this bottom / solder side trace next to the 74LS08 #1 pin or next to the (U7) 7800 OS chip pin #22. Verify this bottom / solder side 7800 PCB trace cut is open (between pin #1 of the 74LS08 and pin #22 of the 7800 U7 OS chip) with your Volt / Ohm meter.

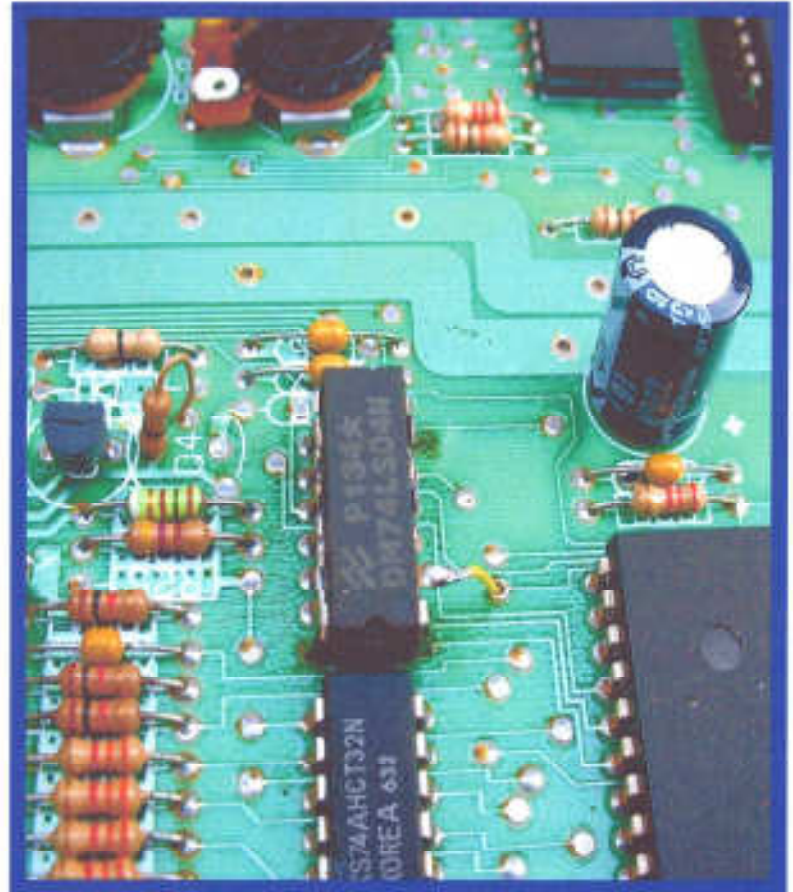
In this 7800 OS chip upgrade, you have already removed the old Atari 24 pin Masked OS ROM CO24922 and installed a 28 pin Eprom upgrade version. The other 7800 motherboard change to complete this OS chip change is a 7800 OS chip Motherboard Jumper change. This 7800 jumper changes certain circuit functions to the OS chip socket pins. The 7800 motherboard top side location of W1 and W2 OS jumpers are located by the two R57 and R58 Color Adjustment POTS area. Depending on the exact Rev. of US 7800 PCB you have, these W1 and W2 jumpers are located just right of the top R57 Pot (almost under it) or just left of the of the bottom U6 6116 (LH5116, 2016, UM6116, MCM6116, CXK5816, M2128) 24 pin Ram chip (see picture on page 3). The existing soldered in W2 jumper usually looks like a plain resistor with just one black strip on it or a plain wire jumper. Unsolder the W2 Jumper, unsolder the filled in W1 trace holes. Solder the removed W2 jumper into new W1 Location.

## Installing the New Components

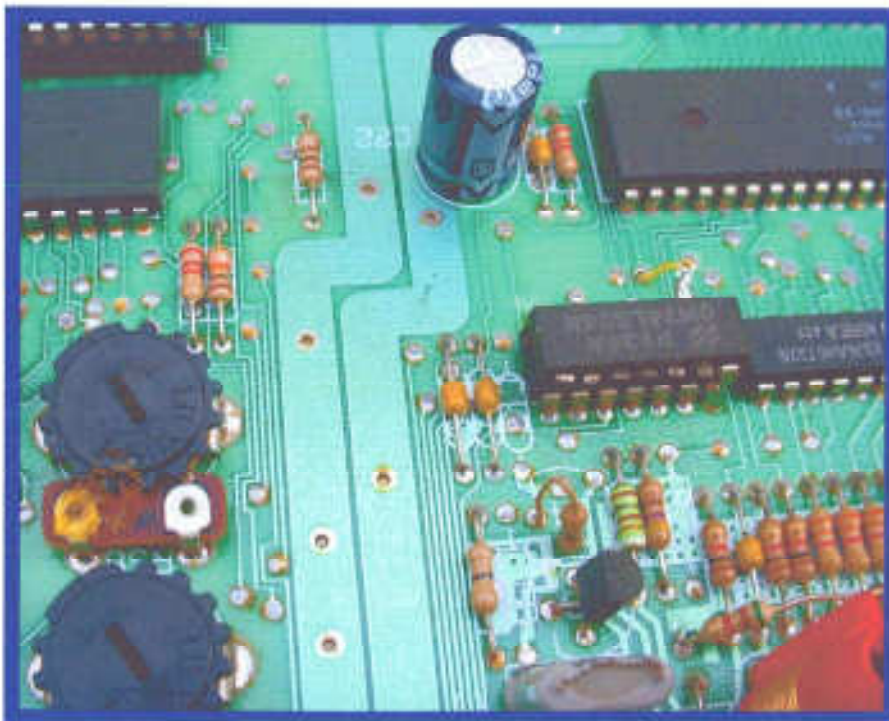
On the 7800 motherboard locate the 74LS08 (U4) (see picture on page 3) I.C. socketed or soldered on the 7800 motherboard. Place the modified / prepared dead bug 74LS04 I.C. piggy back over / on top of the 74LS08. The #1 pin of the 74LS04 over the #1 pin one on the bottom solder in 74LS08 and the same for the 74LS04 pin # 7 to 74LS08 pin #7. Basically you are making a chip stack. Now solder pin #1 (74LS04) to pin #1 (74LS08), then pin #7 (74LS04) to pin #7 (74LS08) and pin #14 to pin #14. See completed 74LS04 chip stack pictures below.



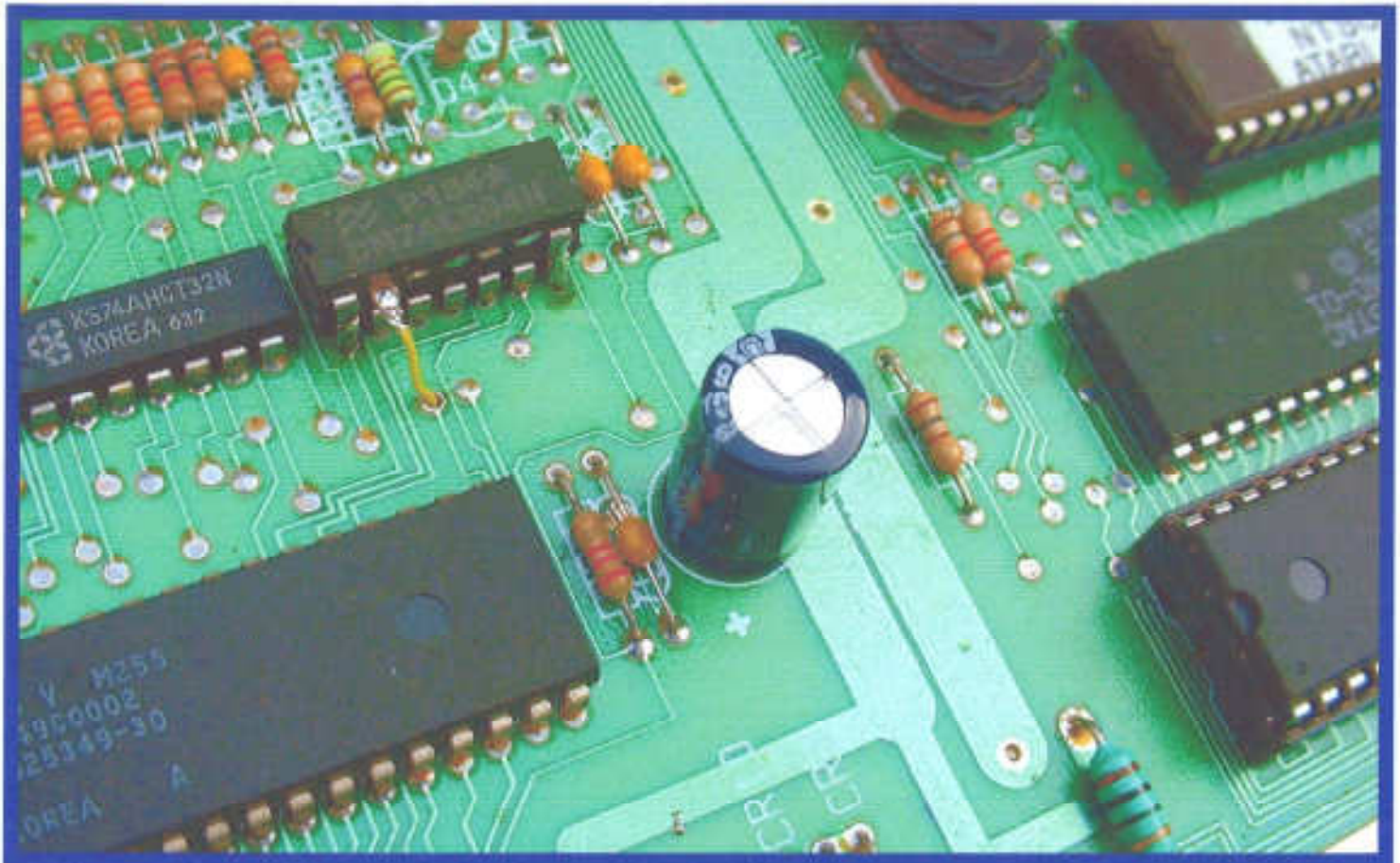
**Left front angled view of the 74LS04**



**Left side view 74LS04**

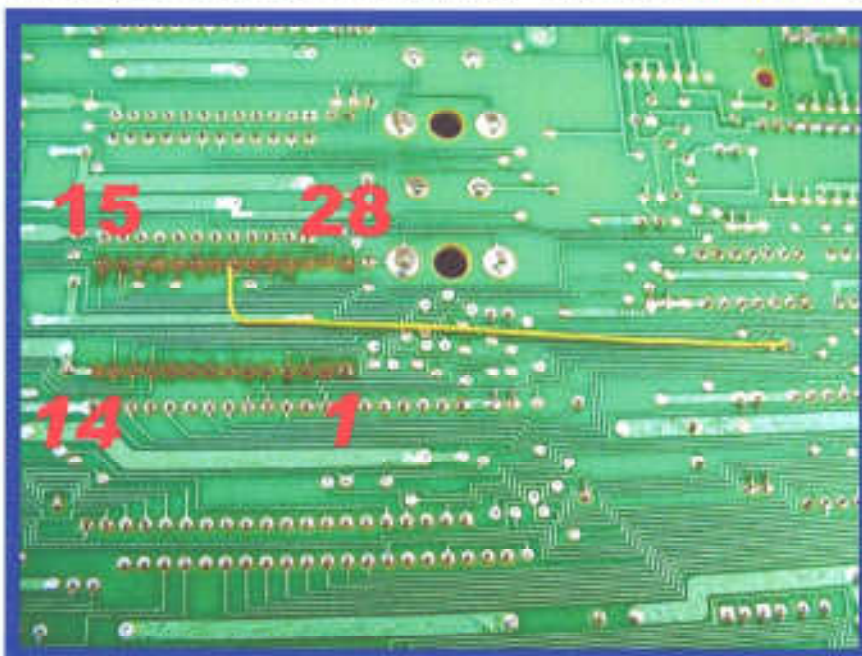


**Backside view of 74LS04, showing soldered down pin #14 to the #14 pin of the solder in 74LS08 I.C.**



**Front view of pins 1, 7 of the 74LS04 soldered to bottom solder in 74LS08 I.C. pins 1, 7 and bent out pin #2 of the top 74LS04 I.C.**

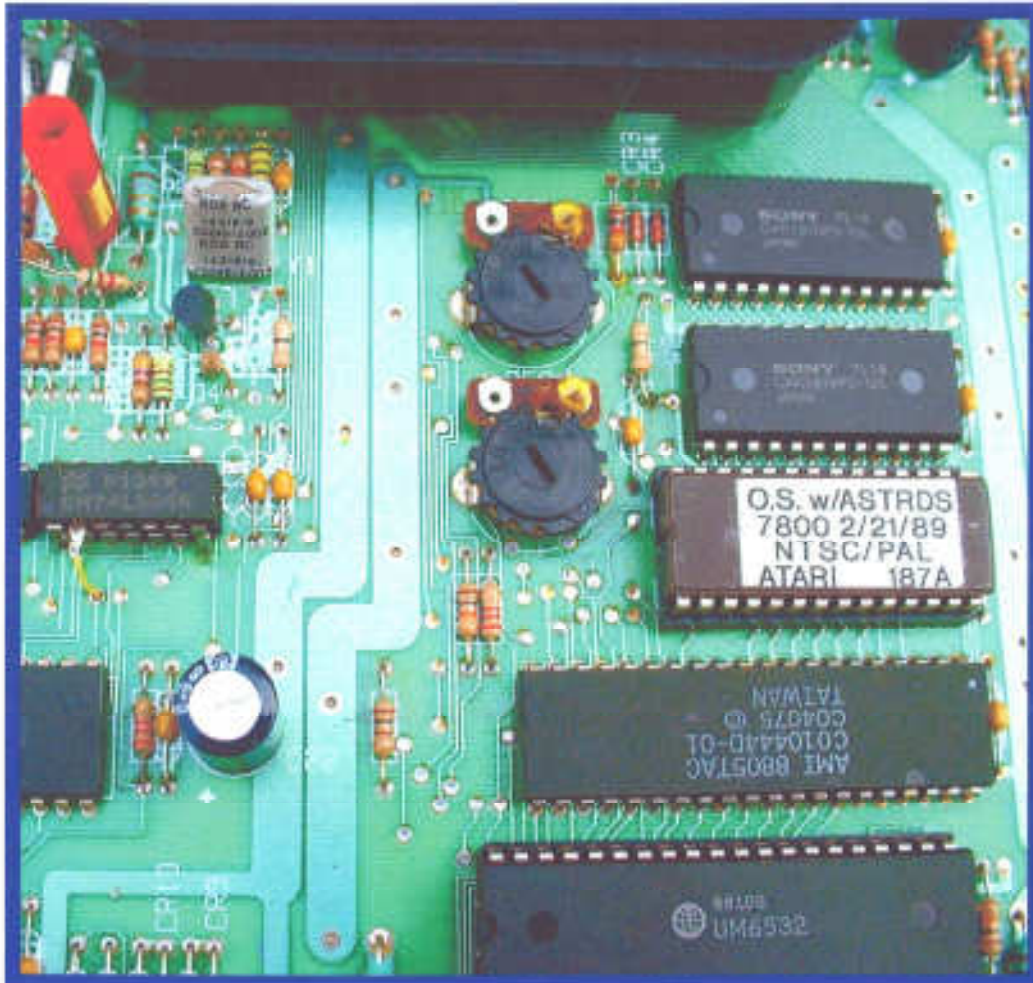
Next solder the supplied **yellow** jumper (shorten exposed wire end) wire to bent out pin #2 (74LS04) floating in the air. Below this bent out pin #2 on the motherboard find the pass thru (top side to bottom side of the P.C. board) solder hole you cleared out earlier. Take the **yellow** wire soldered to pin #2 of the



74LS04 I.C. and carefully feed it thru the pass thru trace hole that you removed solder from. Be Very Careful Not to scrape or damage the **yellow** insulation on this connecting wire as you feed it thru the top to bottom pass thru hole. See above pictures.

Turn over the 7800 motherboard to the solder

side. Locate the **yellow** jumper wire coming from the top side of the 7800 motherboard. Guide the **yellow** jumper wire over to the underside of U7 7800 OS ROM 28 pin soldered in socket. Make a right angle bend in the **yellow** jumper wire and point it toward pin #22 of the 7800 OS I.C socket. Remember with the 7800 motherboard upside down, the 28 pin OS chip socket bottom pin numbers start in the right bottom corner #1 and go clock wise (see picture on page 7). On the same bottom pin row far left is socket pin #14. Trim the extra length of the **yellow** jumper wire that passes over top of pin 22 (cut the wire



right next to pin 22) of the 7800 OS chip location. Next strip back about 1/16 inch of the **yellow** wire insulation. Now solder this short exposed Jumper wire to the number 22 pin of the OS chip. If you cut the #22 circuit trace right next to the bottom side of the 7800 OS chip pin, make sure you did not re-solder the cut trace ends back together when you soldered the **yellow** jumper wire onto the same pin #22.

That's all of the modifications that has to be done to the 7800 Motherboard.

Double check all of your solder joint connections top + bottom sides of the 7800 PCB. Before putting your upgraded 7800 motherboard back into your 7800 bottom plastic case, run a quick test to make sure the new 7800 OS chip upgrade mod is working fine before reinstalling the R.F. shield. Install the 7800 motherboard into the 7800 bottom plastic case. Put the 7800 Top case on the bottom case and flip over the 7800 case set and install the supplied shorter 7800 case screws.