

**ALPS TMDG2 TUNER MODIFICATION**  
**WITH “MARK 1” STEREO SOUND OPTION**  
**OR “MARK 2” STEREO SOUND OPTION**  
**OR MONO SOUND OPTION**  
**plus: How To Upgrade A “Mark 1” to “Mark 2”**

Original document by Darren King 7<sup>th</sup> April 2004  
Updated by Darren King (rev 4) 7<sup>th</sup> August 2005

**Preface Note:**

This document is now split up into three sections.

*Section 1* (pages 4 to 17) is for installation of the ALPS TMDG2 PAL tuner with the “Mark 1” stereo decoder install. This method utilises the “outboard” stereo decoder that sits on top of the tuner and hooks the tuner audio into the existing 3430G Micronas sound chip on your USA TiVo motherboard. Section 1 also covers mono only sound hookup installation procedure if you do not wish to have any stereo sound from the internal tuner. Section 1 is recommended for most people wishing to install the PAL tuner themselves who are not familiar in removing and replacing surface mounted components.

*Section 2* (pages 18 to 26) is for installation of the ALPS TMDG2 PAL tuner with the new “Mark 2” stereo decoder that utilises a replacement 3410D Micronas chip for your existing 3430G Micronas chip on your USA TiVo motherboard. This procedure, although being more elegant and has major improvements over the shortcomings of the “Mark 1” stereo decoder design, requires a fair amount of skill to complete the conversion. Therefore it is **NOT RECOMMENDED** for anyone who is not confident in doing surface mounted component removal and soldering.

*Section 3* (pages 27 & 28) describes how to upgrade an already modified board with a “Mark 1” decoder to a “Mark 2”. With over 250 “Mark 1” units out there it is quite on the cards a few may wish to upgrade to gain the added performance benefits of the “Mark 2”, which is possible without too many hassles.

**Introduction (please read for ALL methods of install)**

USA TiVo's come fitted with an NTSC tuner that is not compatible with the analogue (or digital for that matter) TV transmission standards here in Australia, New Zealand or any other parts of the world that transmit a PAL video standard. Therefore on a totally unmodified USA TiVo in a PAL environment the only method of inputting a valid video signal into your USA TiVo if you do not fit an internal PAL tuner is to feed an external source in via the rear RCA or S-Video input. This source can be from either a VCR to act as a tuner, your Foxtel/Austar/Optus (or whatever other pay TV you have) or buy a cheap digital FTA set top box. This works, and a lot of people do this, however it ties up the one and only A/V input and you have to then make your external box communicate with the TiVo via the external infrared "IR Blaster" for it to automatically change channels. IR Blasting can also be much slower if you are "channel surfing" (ie flipping channels looking for something to watch of interest).

Your other option is to fit an internal PAL tuner, hence this document. It also gives you added benefits like giving you back your A/V input for something else if you wish (Foxtel, etc), it makes channel changing virtually instantaneous, and you can output the TiVo signal via the RF Output socket if you wish – all of which you cannot do without the internal PAL tuner being fitted.

***Note however that the PAL tuner modification is an analogue tuner. There is no digital solution for a Series 1 TiVo other than to use an external digital set-top box.***

The original concept of an internal PAL tuner was in 2002 with the grafting of a tuner module from a PC tuner card. It required a lot of time and patience to do it – and it was rather messy! But it worked. This was superseded in mid 2003 by the more elegant Samsung tuner module concept which fitted into the same spot as the factory fitted NTSC tuner and looked a lot tidier. In early 2004 I designed and added the original "Mark 1" stereo sound module to the Samsung tuner concept.

With the Samsung tuners becoming obsolete it was good timing that in early 2004 I was handed a sample of the same tuner as used in the UK Thompson TiVo: The ALPS branded TMDG2 tuner. It was also by a stroke of good luck that these tuners used the same commands as the Samsung to change channels and therefore no software changes, and followed an almost identical pin layout as the Samsung tuner and the USA motherboard which meant a very easy integration onto a USA motherboard with just a few simple pin modifications. So in March/April 2004 I then wrote the basis for the document you are now reading explaining how to fit the ALPS tuners onto a USA TiVo motherboard using the already devised (and compatible) "Mark 1" stereo decoder or alternatively a mono only sound output. The ALPS tuner also has the added benefit over the Samsung (and the original PC card tuner module) in that it can also output on a UHF channel. Therefore if you want to feed your TiVo output via RF (Antenna) to a second TV, or the TV you wish to hook the TiVo up to does not have an A/V input, you can do so if you wish.

In May 2005 I had the fortune of having some idle time with a UK TiVo motherboard I had in for repair (yes I also repair TiVo's if you have a sick one that needs attention) and noticed something interesting: Apart from having a different video input and output configuration, the USA and UK TiVo's were almost identical. Further

investigation into this showed that the UK sound input processor (the Micronas 3410D) was pin-for-pin compatible with the Micronas 3430G version used on the USA motherboard, and all the surrounding support components were identical too. This identical design also extended all the way to the SIF sound output of the tuner and the left/right RCA audio input sockets on the rear of the TiVo. Therefore I got to some thinking: What would happen if I was to put a 3410D on the board in place of the 3430G? I got some samples of the 3410D and gave it a try.

Alas it did not work. There were some weird noises if I selected a rear A/V input and there was no sound from the tuner at all. Closer inspection of the programming datasheets of both chips showed that there were some slight software setup differences between the two versions. As they say "Life wasn't meant to be easy".....

Then I remembered that the existing Palmod software on the OzTiVo image is used to manipulate some aspects of the Micronas chip. Could it be re-instructed to make a 3410D work? You bet! And the rest is history..... well not quite correct. I am not a programmer. So I enlisted the talents of two fine individuals for this job: Keith Wilkinson in Australia and Thompson TiVo in New Zealand who have both previously written Palmod versions. Between us there have been a couple of months of testing and tweaking. Finally we have a version of Palmod software that allows stereo decoding from the internal PAL tuner and allows the use of the rear A/V inputs for an external input device. This new modification is now what is termed the "Mark 2" stereo decoder and has added benefits over the original "Mark 1" version:

- \* Mono transmissions get detected and switch to a true mono output in 2 seconds
- \* Poor signal areas now hold stereo better, and fall back to a true mono if necessary
- \* No interference from an internal "Airnet" wireless card as some people experienced
- \* It is more stable than the "Mark 1" in stereo separation and performance
- \* It has the ability to decode more stereo sound standards in other parts of the world
- \* NICAM stereo for New Zealand will (hopefully) one day soon be available^
- \* It looks more elegant. In fact it is hard to see that the board has even been modded!

I will explain how to fully install the tuner and what is required to get it up and running with either stereo (Mark 1 and Mark 2 versions) or totally mono sound. I am assuming that you have opened up your TiVo before and that also you have some basic electronics skills and are comfortable working with miniature components. There is a fair bit of work involved but the results are well worth the effort. If however you are not confident then don't risk destroying your TiVo as there are people in the OzTiVo community who can assist you (myself included) in making a successful job of it.

^ The 3410D does support NICAM stereo but there is a software conflict issue preventing this from being supported at present. For the time being the sound output is being decoded as mono from the 3410D and software testing is being carried out. It is recommended to do the "Mark 2" decoder modification and when the issue is resolved a simple software upgrade will enable stereo decoding of NICAM transmissions at a later date. This applies only to New Zealand and Australian stereo sound decoding is NOT affected.

**SECTION 1**  
**“Mark 1” stereo sound decoding**  
**Or totally mono sound decoding**

As outlined in the preface on page 1, “Section 1” describes how to hardware modify your TiVo for the original (and easier from a hobbyist’s viewpoint) “Mark 1” stereo decoder or alternatively a plain mono sound installation.

Before you begin to embark on this modification there are several shortcomings of the “Mark 1” stereo decoder that must be known which will decide on whether you want full stereo sound or simply mono sound on ALL channels using the method described here in Section 1:

**If the TV transmitter only broadcasts in mono (eg like community channel 31 in most capital cities, TEN-Capital from the Black Mountain site in Canberra and a handful of other locations throughout Australia) you only get left channel audio output or even in some circumstances some static out of the right channel depending on your proximity to the transmitter. Unfortunately the stereo decoder chip used in the “Mark 1” decoder design does not common both left and right with mono material. This does not include old mono movies and programs transmitted on normal commercial TV stations because they still output both a left and right (stereo) channels which is made common at the transmitter. The left channel only sound condition also applies if you live in a very flakey (lots of picture noise) reception area as the decoder will not pick up the stereo transmission reliably. As stated above in Australia there are only a handful of transmitters like this so it is most likely your area is NOT affected. Check first if unsure.**

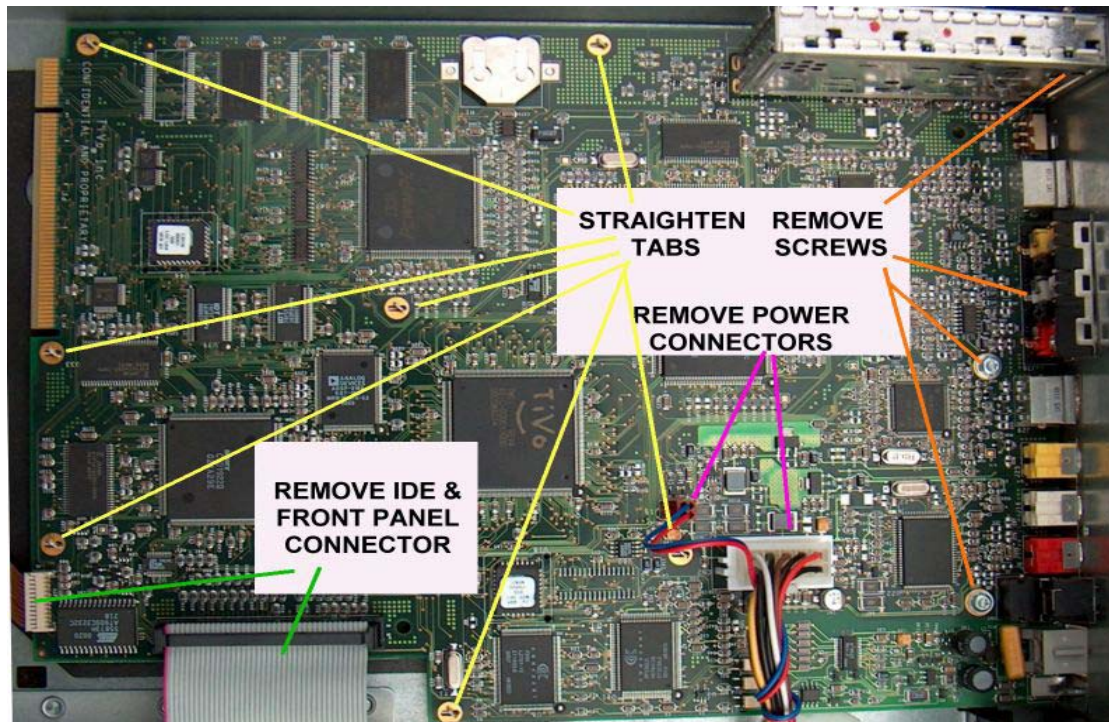
**If you are using an internal “Airnet” wireless card there have been some reports of the 2.4GHz wireless frequency causing sound interference with the “Mark 1” stereo decoder.**

**The “Mark 1” stereo decoder is NOT COMPATIBLE with New Zealand sound standards so do not attempt to install a “Mark 1” stereo decoder into a TiVo that is to be used in NZ.**

If any of the above concerns you then you have the choice of doing the mono sound install option and have mono sound on ALL stations, or alternatively do the “Mark 2” stereo decoder install described in “Section 2” of this document. If the above bold text does not concern you then go ahead and do the “Mark 1” stereo sound module installation. Both “Mark 1” stereo decoder and mono sound methods are described in this section (section 1) of the document.

### **Initial steps: circuit board removal**

The first thing is to remove four connectors from the board: Two power connectors, the front panel IR/LED connector and the hard drive IDE connector. There are also two Torx-10 type screws on the circuit board and three Torx Screws on the rear panel. Two of the screws on the rear panel are Torx-10 size but the one on the output A/V connector is a Torx-8 and if you don't have a suitable bit it can be removed destructively with a small flat screwdriver and replace it with a standard phillips head screw. There are also several tabs which need straightening too. Use the following picture as a guide.



With the screws removed and the tabs straightened you can now carefully work from the front of the circuit board lifting it upwards GENTLY so it clears all the tabs. Gently is the key here as we do not want to flex the board too much which may break something. This can be a tough job as the tabs are hard to make perfectly straight. You can assist things here by using a set of pliers and wiggle the tabs left and right while applying upwards pressure to help lift up the circuit board.

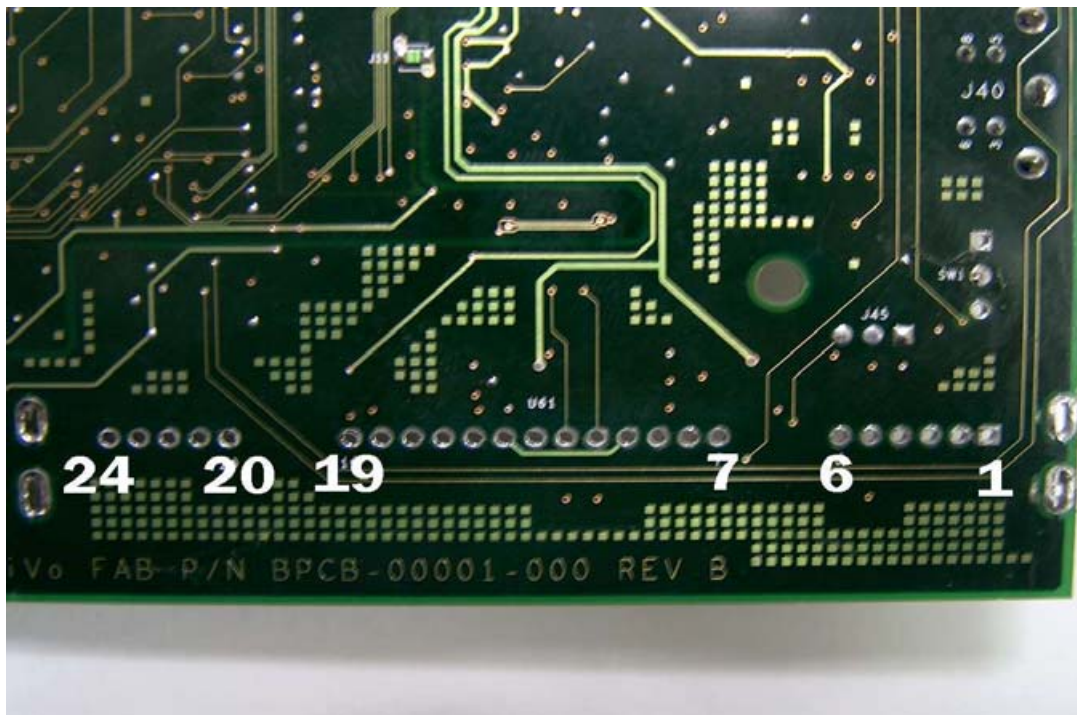
When all the tabs are cleared, slide the circuit board towards the front of the TiVo so the RCA connectors and the RF connectors clear the rear panel and then lift the circuit board up and clear of the TiVo chassis. I find grasping the tuner module with one hand helps. Put the chassis aside and make sure you have a nice clean workspace for you to work on the mainboard with.

## OLD TUNER REMOVAL

This is a tricky operation and one of the two hardest parts of the procedure (the other one involves the Micronas chip but that is later on). Do not rush it as there are a lot of small parts around the tuner and a slip with a screwdriver will destroy them.

My method of removal is using a proper de-soldering gun and the tuner simply falls off the board, however you may choose to do it destructively by carefully snipping off the pins to the tuner and then plucking out the old bits of pins with a soldering iron and some tweezers and then clean up the holes with some de-solder wick. Either way is OK depending on what tools you have available, but again I stress to be very careful that you do not destroy any parts around the tuner or lift any circuit board traces which can happen if you apply too much heat from the soldering iron.

Whichever way you chose to do the operation the end result should be like this:

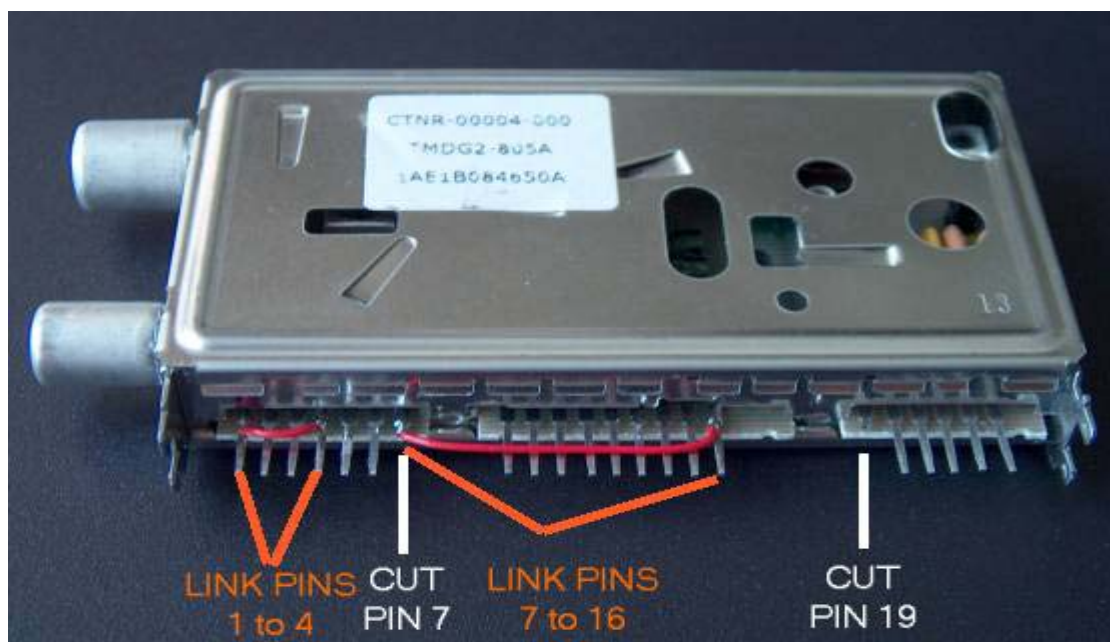


I have made the numbers larger for clarity.

**THE ALPS TUNER – INITIAL PREPARATION**

The ALPS tuner is a self contained package that can tune VHF and UHF TV signals and output them in a video and (mono) audio output, along with sound intermediate frequency (SIF) which is used for stereo sound and will be described further on in this article. The tuner uses the I<sup>2</sup>C bus protocol to be able to tune to the required frequency easily via commands from a host computer (in this case the TiVo processor). I have included a basic PDF datasheet on the ALPS tuner in the archive this document came in for anyone interested.

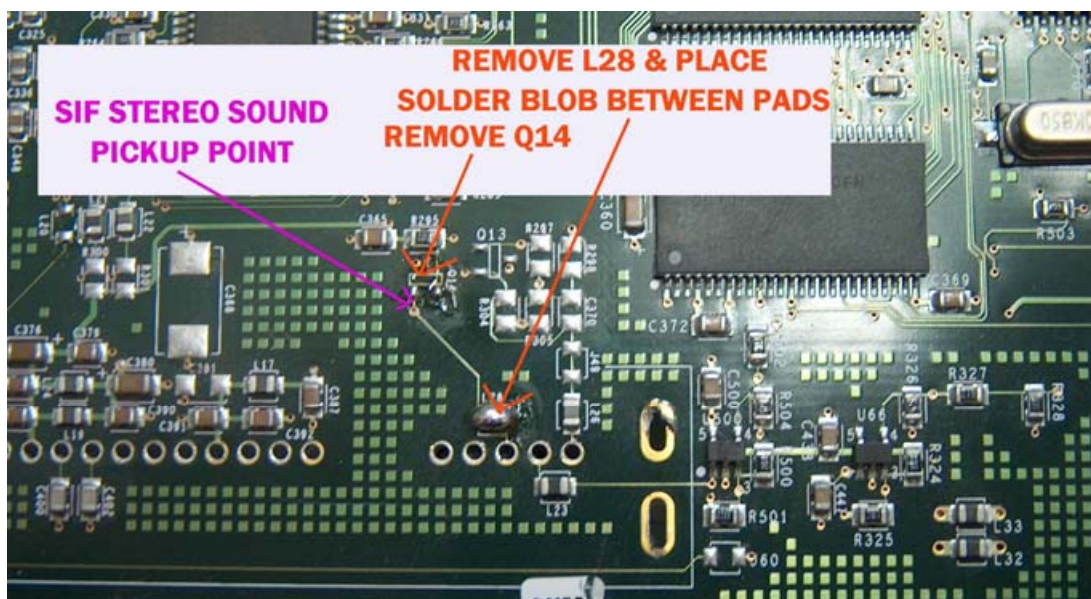
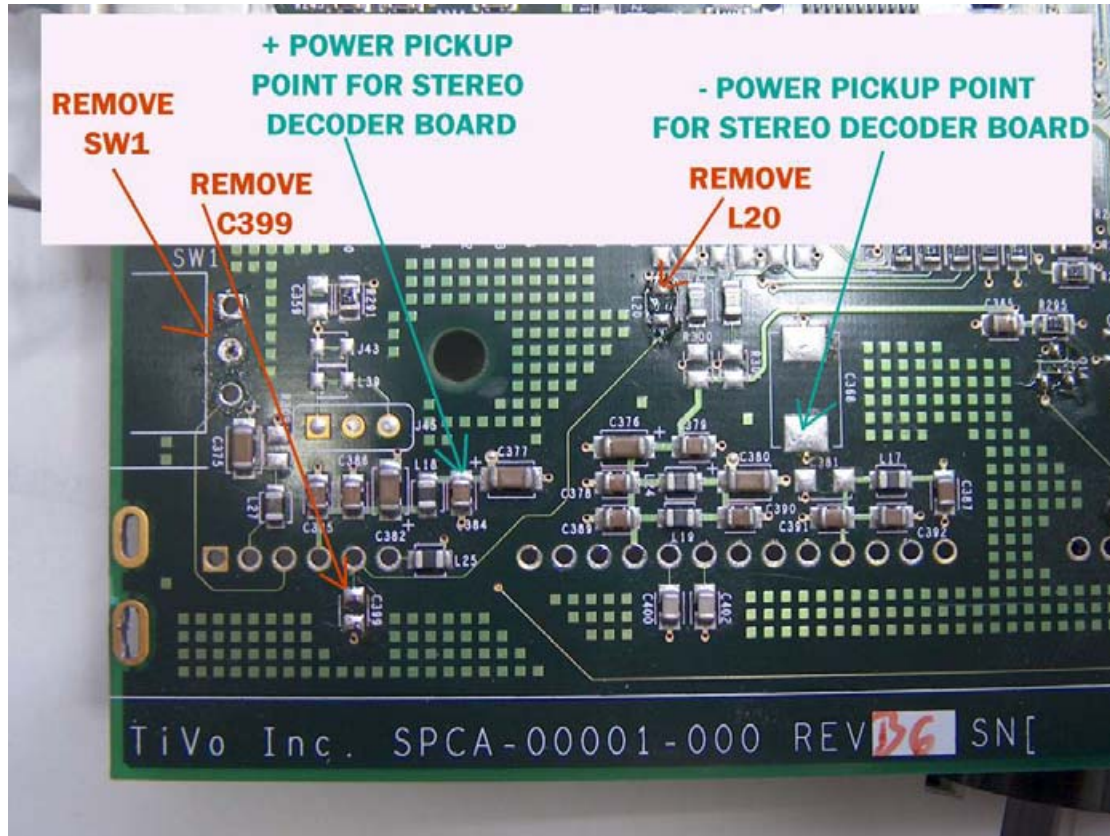
Before it is installed onto the circuit board there are a few modifications required to make it compatible electrically and mechanically, namely cutting some pins (7 and 19) and linking others with some wire (link 1 and 4, 7 and 16) as per this picture:



## CIRCUIT BOARD PREPARATION

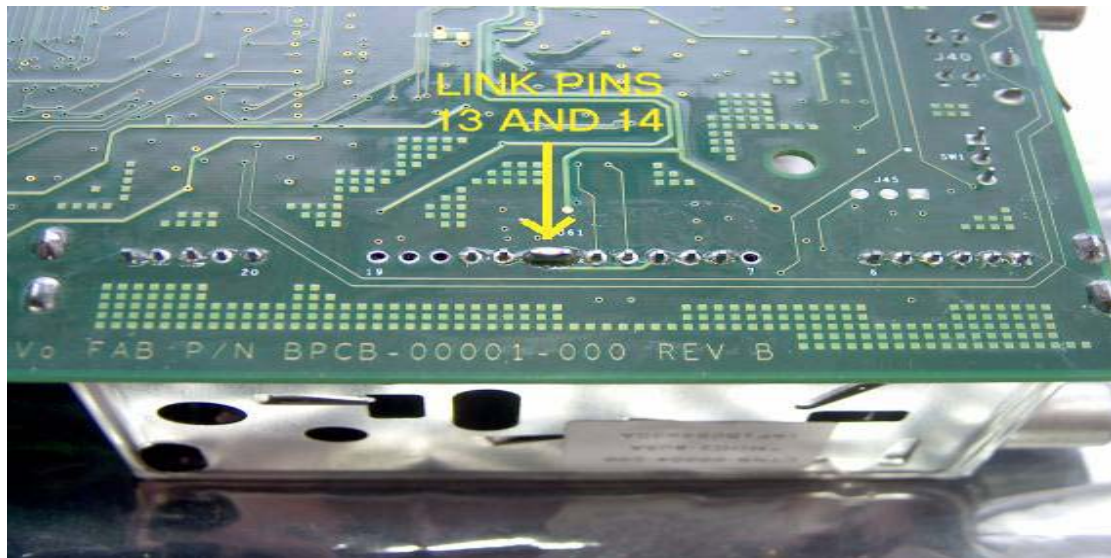
Further to the removal of the old tuner and cleaning out the solder holes there are several other modifications that are needed to make the circuit board compatible with the ALPS tuner. This is explained in these two photos of the top side of the board. At this stage of modification there are no changes to the bottom side.

**Note: this procedure is required for both mono and stereo options.**

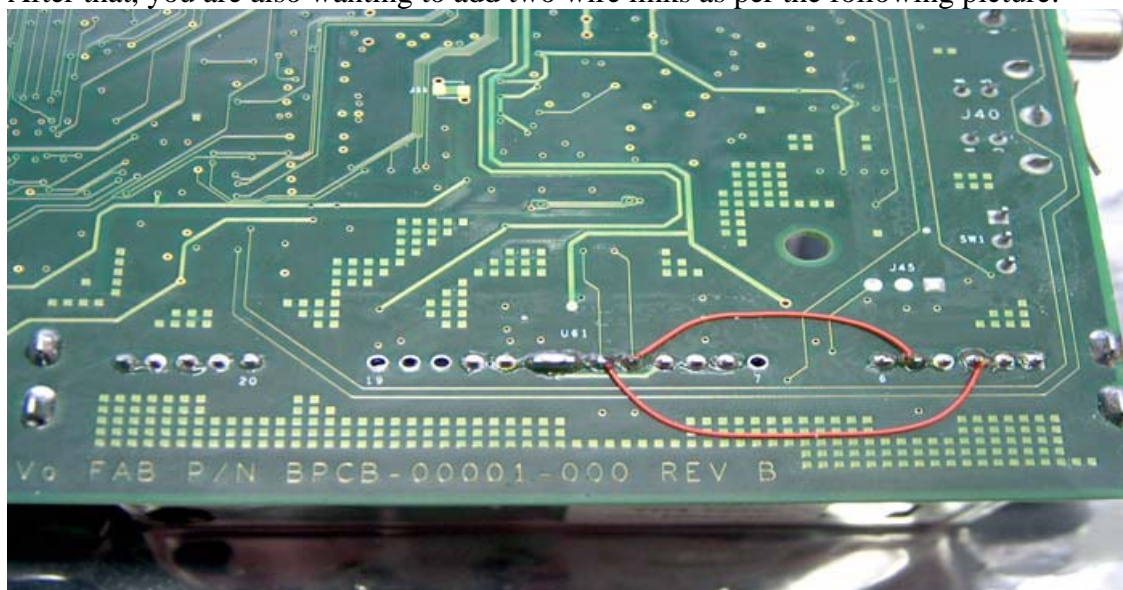


You will notice in the photos I suggest removal of the channel selector switch. This is for two reasons. Firstly it is because the circuit board trace from this switch location now connects to the SDA (Serial Data) pin of the RF modulator section of the tuner therefore we need this trace isolated. Secondly it will prevent confusion that the RF output can be selected via this switch. Removal of the other parts isolates the SCL (Serial Clock) pin of the RF modulator section of the tuner and the SIF (Sound IF) output pin.

With all these modifications done you can now carefully mount the ALPS tuner onto the circuit board and solder all the pins and the mounting tabs at each end of the tuner. You will also have to place a link on the under side of the circuit board between pin 13 and 14. You can simply put a solder blob as this picture shows:



After that, you are also wanting to add two wire links as per the following picture:



These two wire links (pin 3 to pin 12 and pin 5 to pin 11) are responsible for making the UHF RF output socket of the tuner work. Add them regardless of whether you intend to use UHF RF output or not.

**MAKING IT FIT**

The next thing to do is enlarge the “RF In” hole a little bigger. Unfortunately the old tuner “F” connector sized hole is not big enough to accommodate the connector on the ALPS tuner. While the case has no mainboard in it grab a reaming tool or a round file and make the hole a little bigger. Be careful that any particles of metal are swept out of the case so they do not short circuit anything.



## **”MARK 1” STEREO SOUND DECODER CONSTRUCTION DETAILS**

If you do not want to build the “Mark 1” stereo sound decoder for your ALPS tuner skip this section and move onto the “mono sound option” part of this document.

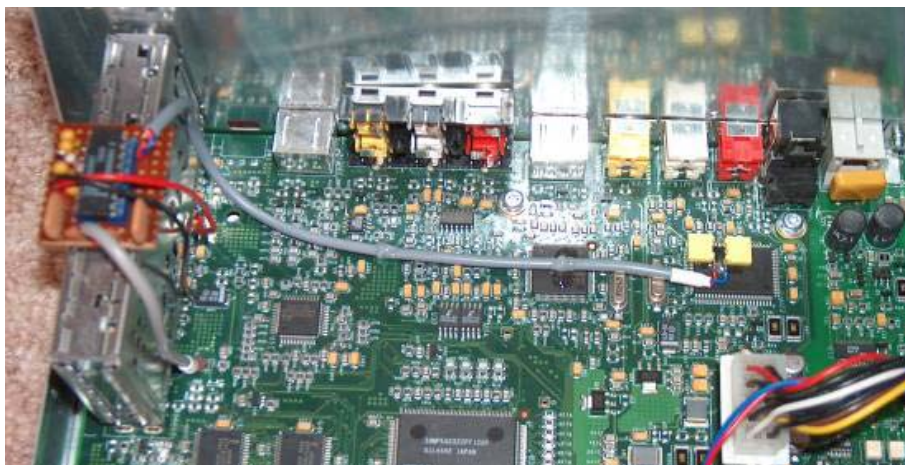
The “Mark 1” stereo sound option is a simple addition placed in line from the SIF (Sound IF) output pin of the ALPS tuner to the left and right input pins of the Micronas audio chip. It consists of a Philips TDA 9821 decoder chip and a handful of parts and can be built simply on a small piece of prototyping board and then mounted on top of the ALPS tuner.

To build the decoder you will need the following parts:

- 1 TDA 9821 from WES Components – part no: TDA9821
- 1 5.5MHz ceramic filter from WES Components – part no: SFT5.5MA
- 1 5.74MHz ceramic filter from WES Components – part no: SFT5.74MA
- 1 10uF/25V tantalum capacitor
- 1 27Kohm 1/4Watt resistor
- 1 0.1uF ceramic capacitor
- 2 0.01uF ceramic capacitors
- 2 0.22uF polyester capacitors
- 3 2.2uF 16V tantalum capacitors
- Some “veroboard” prototyping board
- Some light duty solid wire for making wire links (or use the offcuts from the resistor and capacitor leads)
- Some light duty flexible hookup wire

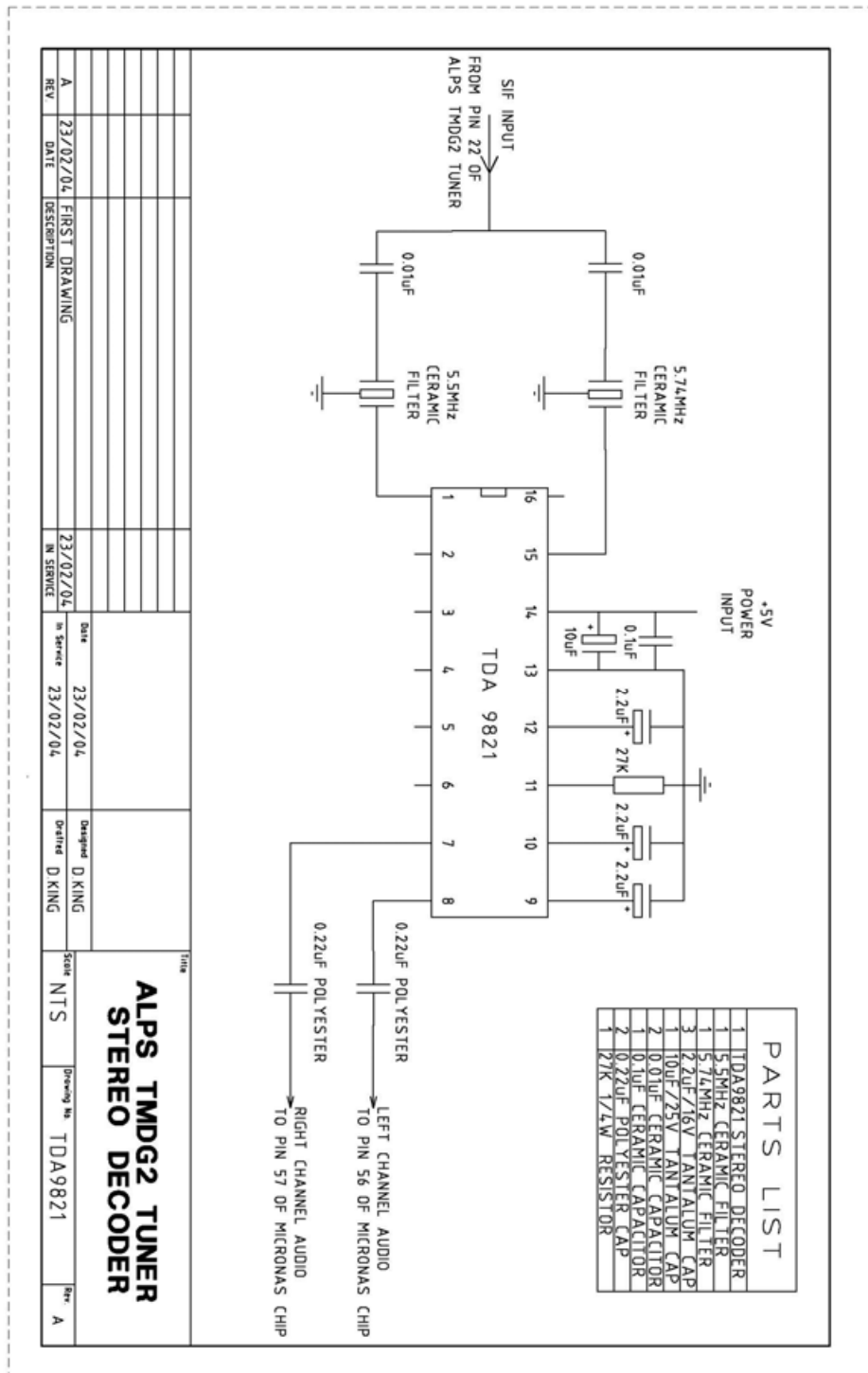
You can get all the parts from WES Components if you like, or it might be easier to go to a local Jaycar, Dick Smith, etc to get the more common items. I actually raided a dead TV for all the parts except the TDA9821. Apart from the specialised parts like the ceramic filters and the TDA9821 nothing else is super critical and you can compromise. It’s up to you. This is a fairly forgiving circuit. One small note is that depending on where you get the 5.5MHz and 5.74MHz filters from they may be 3 pin or 4 pin design. If they are 3 pin the center pin is negative (ground) and if they are 4 pin the two center pins are negative (ground) so just connect both center pins together.

Below you can see a picture of the stereo decoder mounted on top of the tuner.



**SCHEMATIC DIAGRAM**

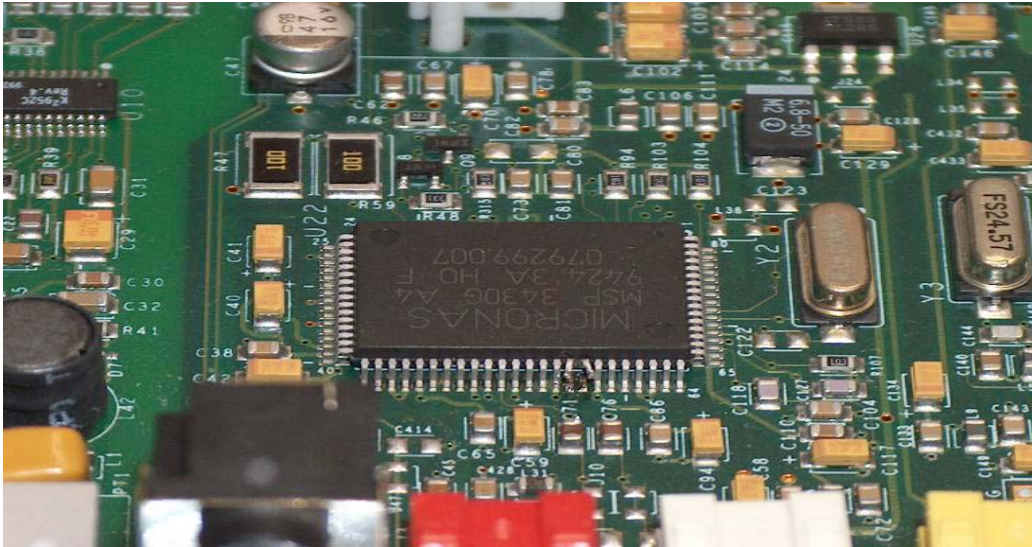
Here is the circuit for the “Mark 1” stereo decoder I adapted from the Philips datasheet for use in a TiVo.



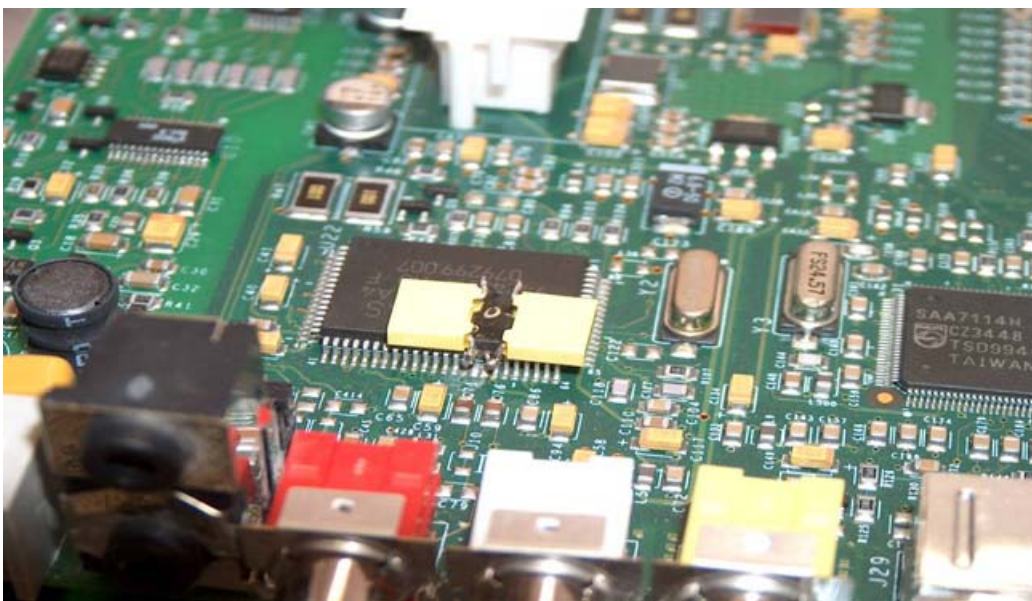
## MODIFYING THE MICRONAS CHIP

Modification to the Micronas chip is necessary for both the mono and “Mark 1” stereo sound option to allow for sound to be heard. This modification can be a little tricky and a slow and steady approach is the key to a successful modification.

The first step is to apply a little heat with a fine tip soldering iron while levering up pins 56 and 57 of the chip clear from the board. Bend up the pins so they are well clear of the board but not too far that they break off . **Be warned they are brittle so be careful and do not bend the pins too much or they will break off!**



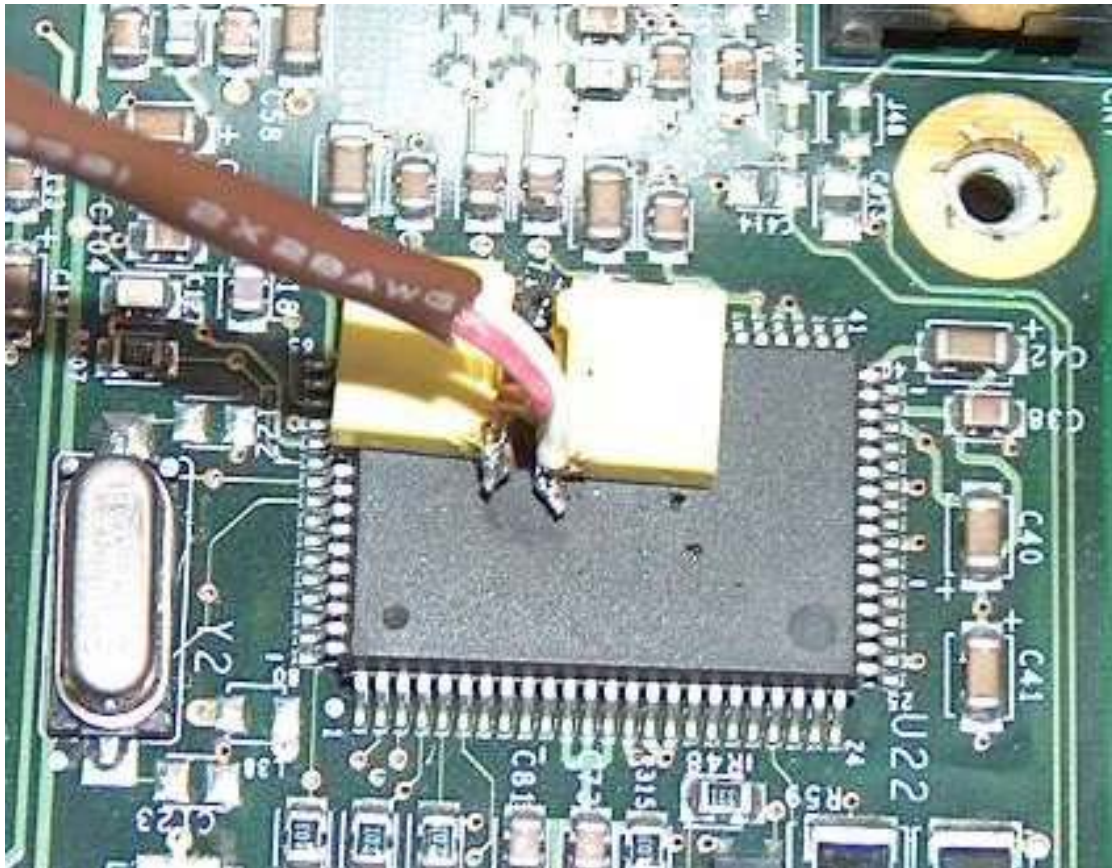
After the pins have been lifted carefully solder on the two capacitors as shown being careful not to bridge pins 56 and 57 with excess solder:

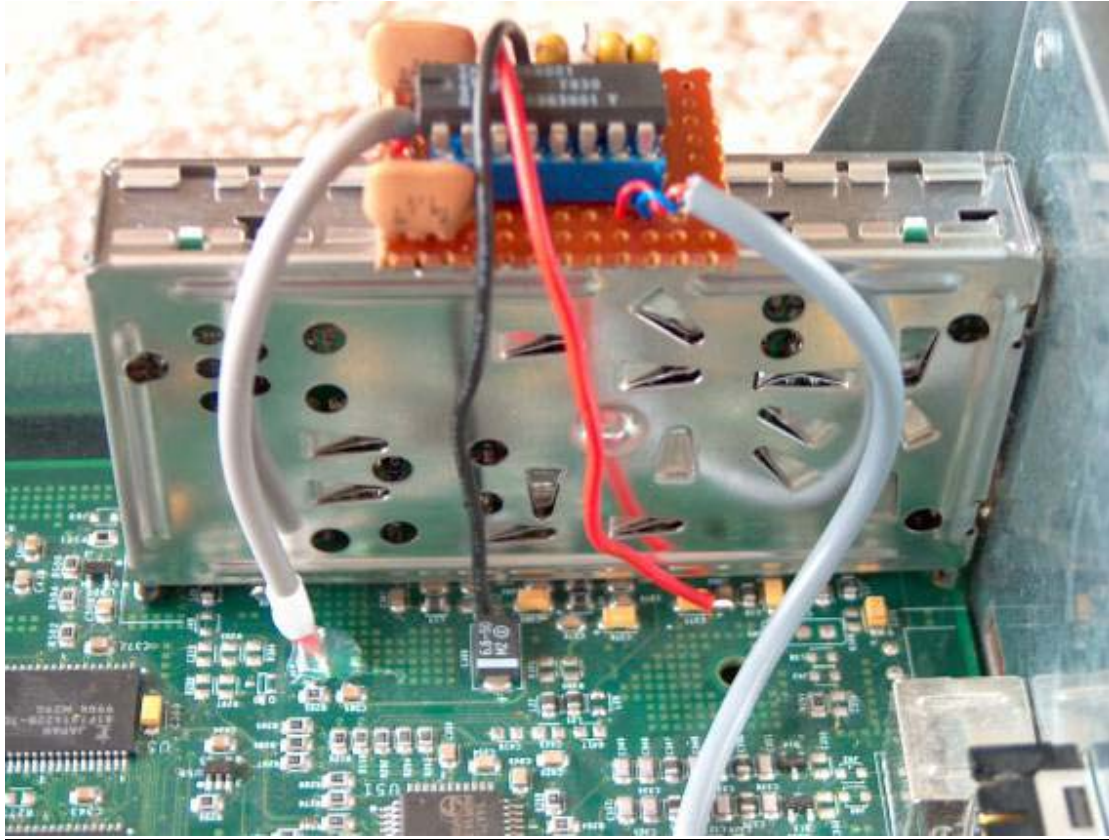


## CONNECTING THE DECODER

There are five connections that need to be made: SIF input, +5V power, 0V power, left and right audio output. To connect the SIF input and the +5V and 0(-)V power please refer to the pictures in the “circuit board preparation” section of this document.

For the left and right audio output to the Micronas chip I recommend following a similar procedure to the original mono audio connection in that the 0.22uF capacitors are mounted on the Micronas chip with one side of the capacitors CAREFULLY soldered to pins 56 and 57 of the Micronas respectively. For added mechanical strength I also recommend a dab of araldite on the capacitors to hold them in place on top of the Micronas chip. The other side of the capacitors are connected to the decoder board via a flying lead. I used twin shielded cable to prevent any electrical noise however you may wish to just use standard hookup wire and this is perfectly OK too.



**MOUNTING THE DECODER**

As can be seen in the above photo the decoder board sits happily on top of the tuner module and I affixed it with a generous blob of hot melt glue but you can use silastic too so long as it is neutral cure and not acidic (vinegar smelling). I do not recommend using double sided adhesive because it tends to come unstuck after a while and the last thing you want is a loose decoder board shorting out on something!

One word of caution is to remember that the tuner module has a metal shell so ensure you DO use a generous blob so that the decoder board is sitting on a layer of silastic or hot melt glue and not touching the metal can.

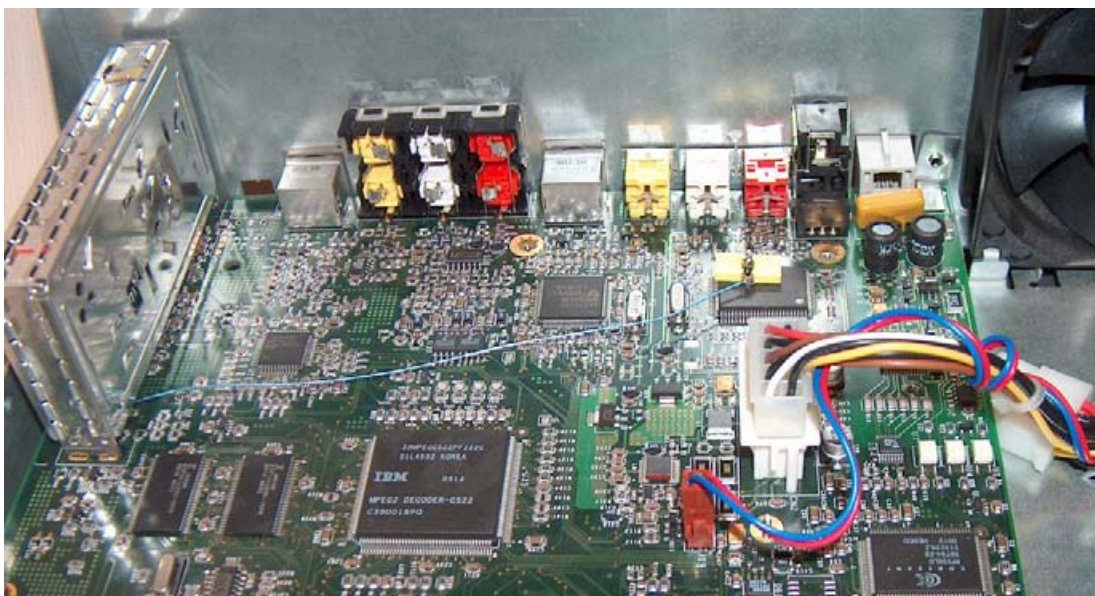
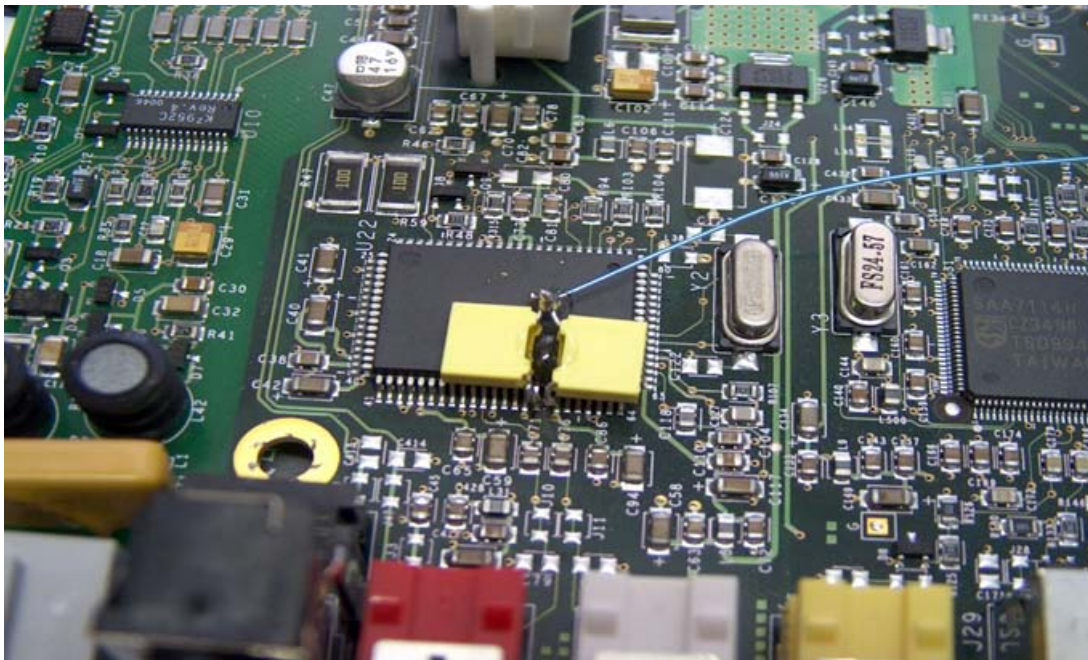
A point to note that some people have pointed out is that in the above photo the black (negative) wire going to the stereo decoder is attached to the board where a black decoupling capacitor is located. No you are not seeing things it's just that this photo is from a different board to the one on page 8 and some motherboards have the capacitor and some do not. If yours does then the negative pickup point is still used it's just you have to be a little careful to graft it onto where the capacitor also sits.

### MONO SOUND OPTION

If you do not wish to tackle either the “Mark 1” or “Mark 2” stereo decoders then the ALPS tuner does offer the ability to output a mono audio signal direct to the Micronas chip. The sound output is very good and is acceptable if you do not require any stereo sound from the internal PAL tuner. This does not affect the rear RCA inputs from an external source (Set Top Box for example) which will still be in stereo.

To hook up mono audio only simply do the following:

Attach a wire from pin 21 of the ALPS tuner to the two 0.22uF capacitors on top of the Micronas chip (refer to the stereo documentation for how to attach the capacitors onto the Micronas chip). This wire attaches to both the left and right capacitors as shown in this photo.



## **CONFIGURING THE TUNER WITH “PALMOD CONFIG” SOFTWARE**

\* If you are using Guided Setup V1.3 image (released January 2004) then to make the tuner function you are going to have to load on the latest version of Palmod which is available from the OzTiVo website here:

<http://minnie.tuhs.org/twiki/bin/view/Software/LatestPalModSeries1>

You are wanting “PALMOD for US Hardware running ozTiVo image” and NOT the “PALMOD for UK Hardware” versions on that page.

\* If you are using any of the Guided Setup V1.4 images (released from February 2005 onwards) then a more recent version of palmod software exists so therefore the tuner will function “out of the box” so long as you have run Guided Setup correctly. This version of palmod is also default configured for ALPS tuner and RF output on UHF channel 60.

What does “palmod” do? Palmod is a software driver for your input sources. It can control a number of setting like brightness and contrast, but for our purpose it also has settings for the PAL tuner like changing the UHF output channel, fine tuning, etc.

To access palmod, from a bash prompt either via a serial cable or Telnet type:

```
palmod_config
```

You will then be greeted with a menu where you can pick your options. Most of these settings can be done “live” without the need for a reboot to see the changes.

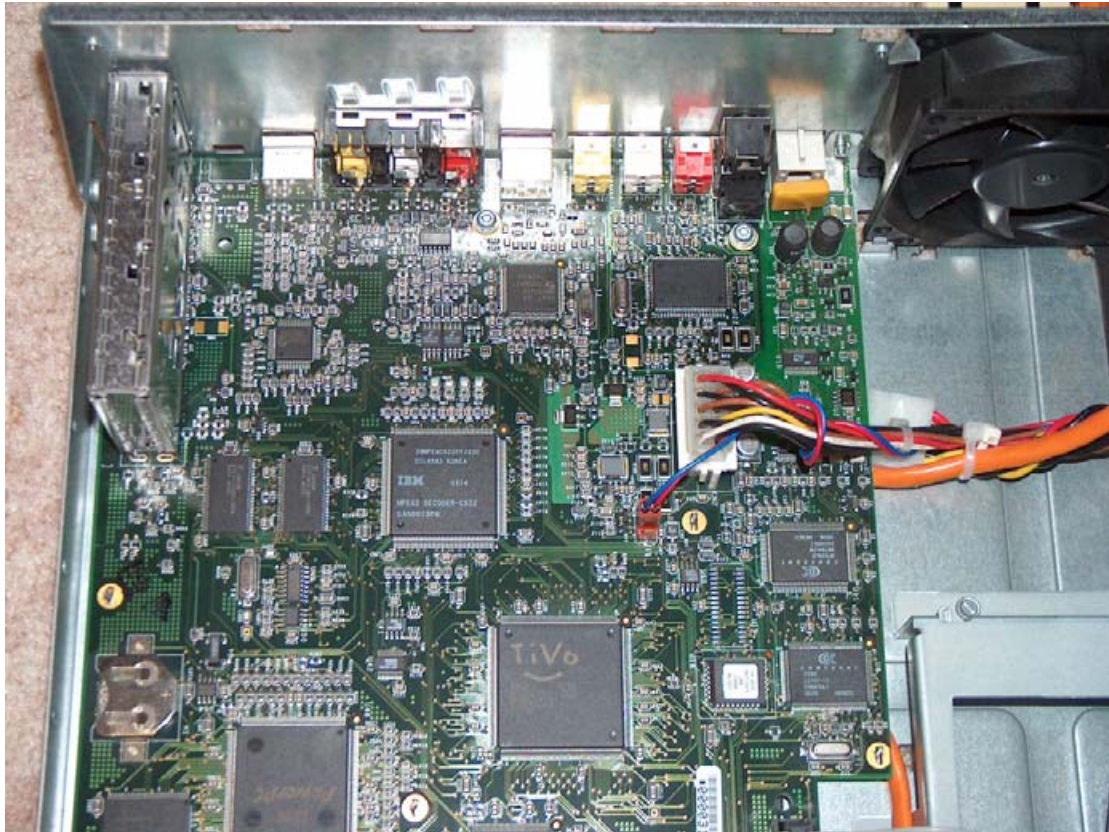
When you are satisfied with your changes don’t forget to “Save settings and exit” for the changes to be made permanent.

That’s it. If you have done the job correctly then you now have an internal PAL tuner in your TiVo with either the “Mark 1” stereo decoder or a mono installation.

## SECTION 2

### “Mark 2” stereo sound decoding

As outlined in the preface on page 1, “Section 2” describes how to hardware modify your TiVo for newer “Mark 2” stereo decoder which involves replacing the 3430G Micronas chip with a 3410D version. The completed install will look like the following picture:

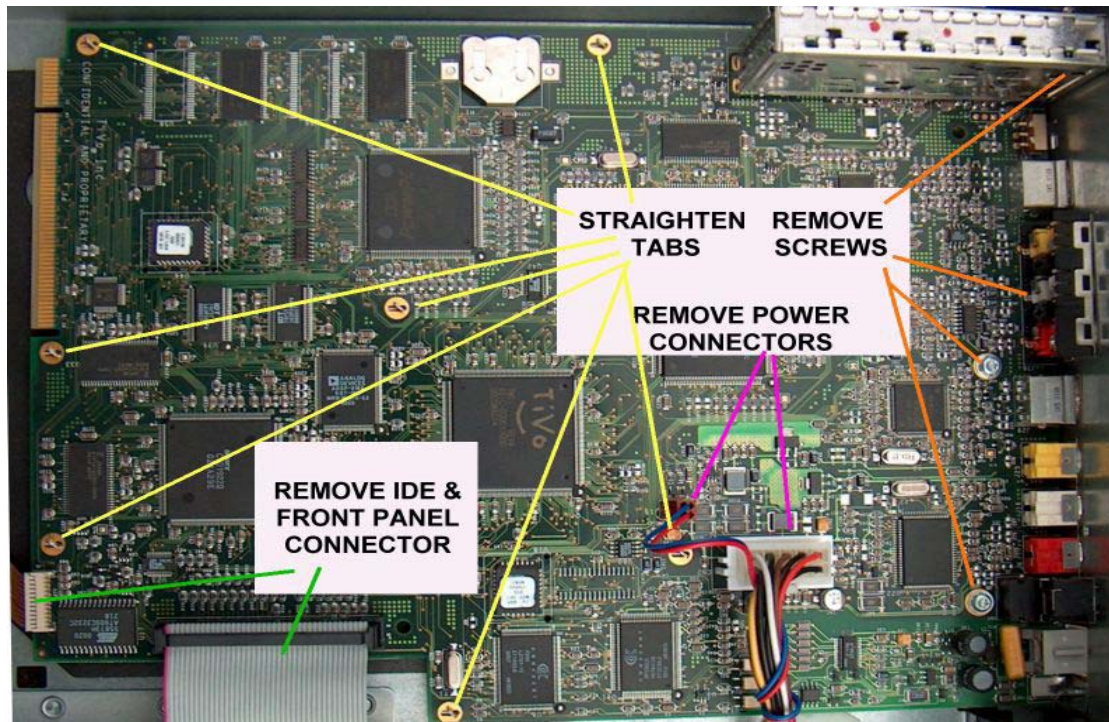


Can you see the modifications? Don't worry if you can't because the whole idea of the “Mark 2” stereo decoder is not only to improve the overall performance compared to the “Mark 1” decoder, but to also make it look like no modification has been done at all. To give you a hint you can see there is no “Channel 3/4” switch on the rear panel (between the S-Video output connector and the PAL tuner module) and there is a new Micronas chip soldered in (the chip directly above the power connector in this photo).

Apart from removal of a few parts from the motherboard, some small wire links around the tuner and replacing the 3430G Micronas with a 3410D version there is nothing more to do. As said in the preface section the “Mark 2” decoder is a lot more elegant and performs a lot better than the “Mark 1” but it is not going to appeal to everyone due to working with a surface mounted chip.

**Initial steps: circuit board removal**

If you haven't been scared off yet let's begin! The first thing is to remove four connectors from the board: Two power connectors, the front panel IR/LED connector and the hard drive IDE connector. There are also two Torx-10 type screws on the circuit board and three Torx Screws on the rear panel. Two of the screws on the rear panel are Torx-10 size but the one on the output A/V connector is a Torx-8 and if you don't have a suitable bit it can be removed destructively with a small flat screwdriver and replace it with a standard phillips head screw. There are also several tabs which need straightening too. Use the following picture as a guide.



With the screws removed and the tabs straightened you can now carefully work from the front of the circuit board lifting it upwards GENTLY so it clears all the tabs. Gently is the key here as we do not want to flex the board too much which may break something. This can be a tough job as the tabs are hard to make perfectly straight. You can assist things here by using a set of pliers and wiggle the tabs left and right while applying upwards pressure to help lift up the circuit board.

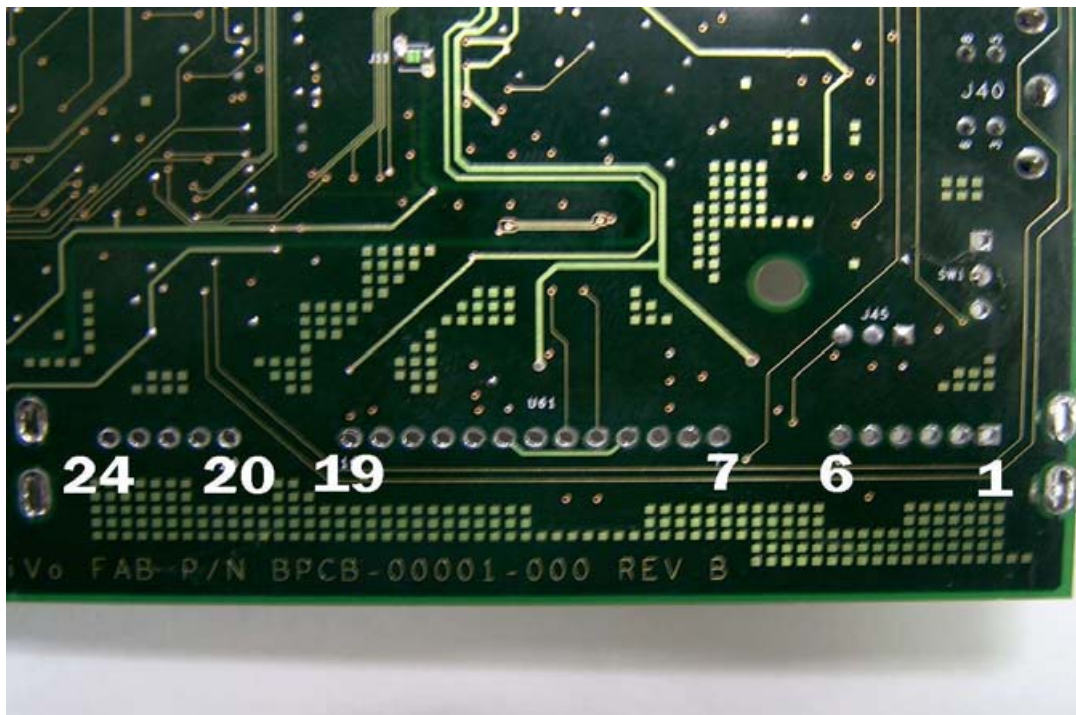
When all the tabs are cleared, slide the circuit board towards the front of the TiVo so the RCA connectors and the RF connectors clear the rear panel and then lift the circuit board up and clear of the TiVo chassis. I find grasping the tuner module with one hand helps. Put the chassis aside and make sure you have a nice clean workspace for you to work on the mainboard with.

## OLD TUNER REMOVAL

This is a tricky operation and one of the two hardest parts of the procedure (the other one involves the Micronas chip but that is later on). Do not rush it as there are a lot of small parts around the tuner and a slip with a screwdriver will destroy them.

My method of removal is using a proper de-soldering gun and the tuner simply falls off the board, however you may choose to do it destructively by carefully snipping off the pins to the tuner and then plucking out the old bits of pins with a soldering iron and some tweezers and then clean up the holes with some de-solder wick. Either way is OK depending on what tools you have available, but again I stress to be very careful that you do not destroy any parts around the tuner or lift any circuit board traces which can happen if you apply too much heat from the soldering iron.

Whichever way you chose to do the operation the end result should be like this:

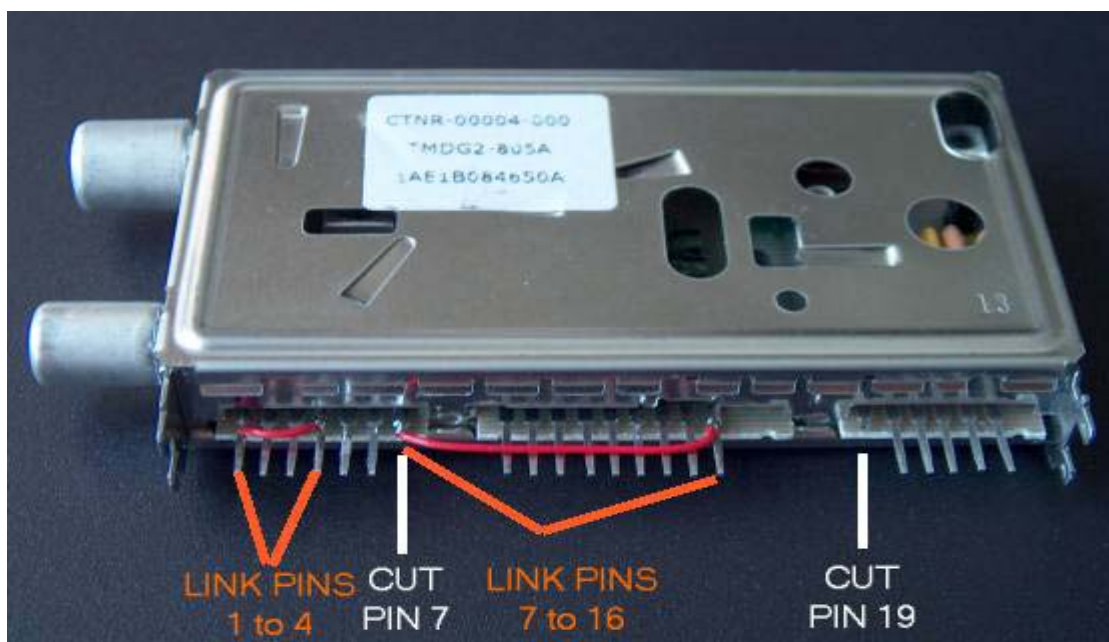


I have made the numbers larger for clarity.

**THE ALPS TUNER – INITIAL PREPARATION**

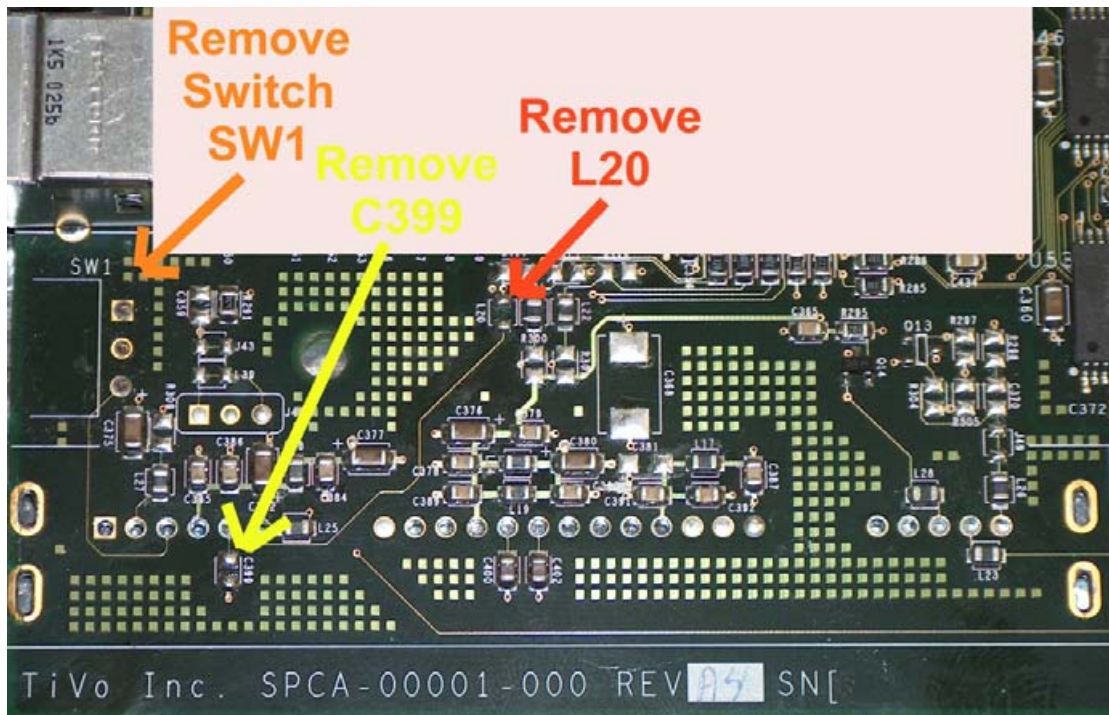
The ALPS tuner is a self contained package that can tune VHF and UHF TV signals and output them in a video and (mono) audio output, along with sound intermediate frequency (SIF) which is used for stereo sound and will be described further on in this article. The tuner uses the I<sup>2</sup>C bus protocol to be able to tune to the required frequency easily via commands from a host computer (in this case the TiVo processor). I have included a basic PDF datasheet on the ALPS tuner in the archive this document came in for anyone interested.

Before it is installed onto the circuit board there are a few modifications required to make it compatible electrically and mechanically, namely cutting some pins (7 and 19) and linking others with some wire (link 1 and 4, 7 and 16) as per this picture:



## CIRCUIT BOARD PREPARATION

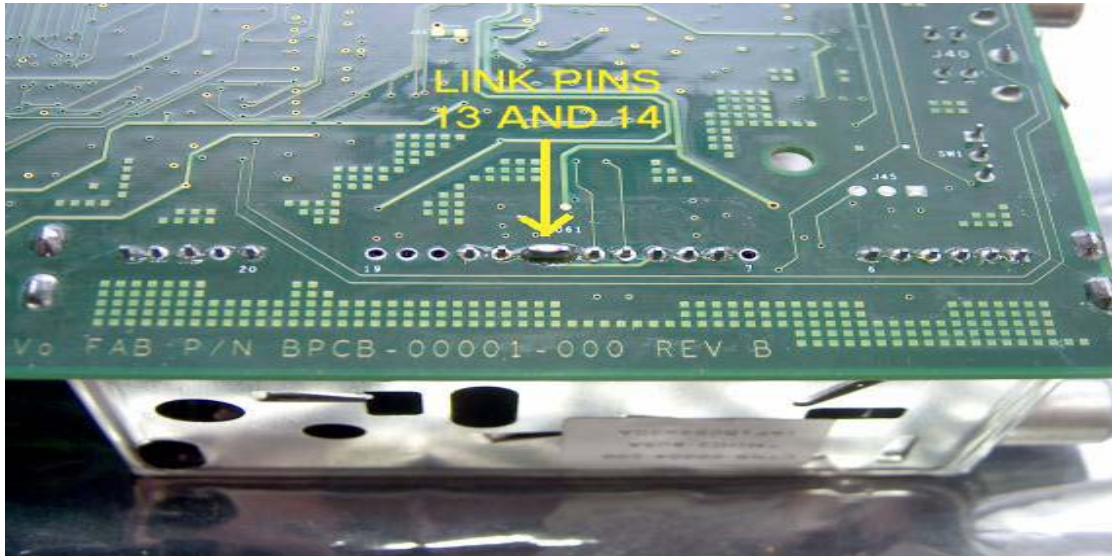
Further to the removal of the old tuner and cleaning out the solder holes there are three components that need removal to make the circuit board compatible with the ALPS tuner. This is explained in the following photos of the top side of the board. At this stage of modification there are no changes to the bottom side.



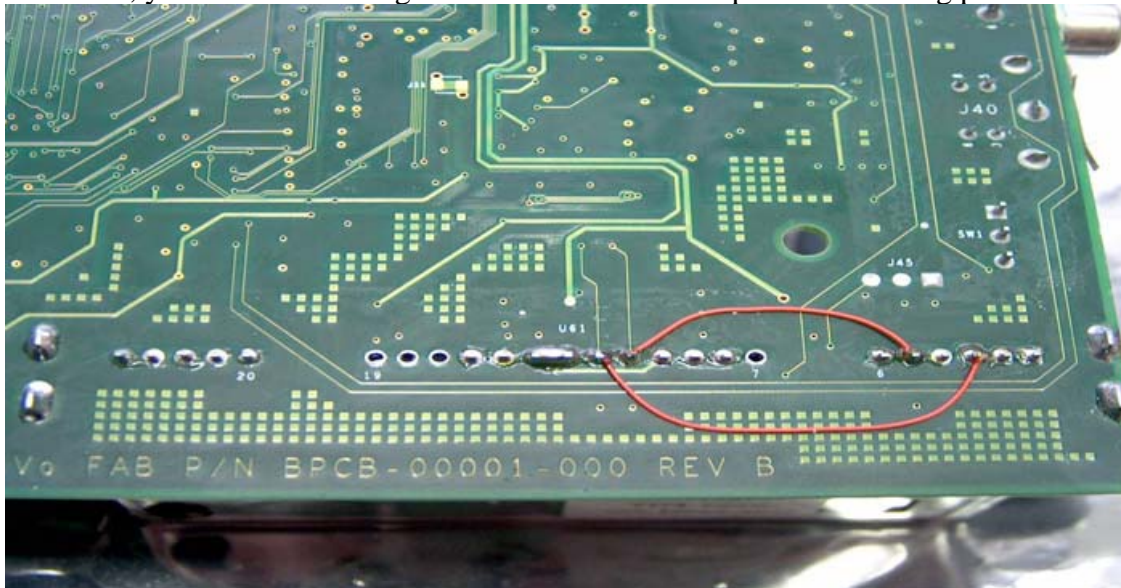
You will notice in the photos I suggest removal of the channel selector switch. This is for two reasons. Firstly it is because the circuit board trace from this switch location now connects to the SDA (Serial Data) pin of the RF modulator section of the tuner therefore we need this trace isolated. Secondly it will prevent confusion that the RF output can be selected via this switch. Removal of the other parts isolates the SCL (Serial Clock) pin of the RF modulator section of the tuner and the SIF (Sound IF) output pin.

**NOTE:** Unlike the “Mark 1” stereo decoder you **DO NOT** remove Q14 or L28.

With all these modifications done you can now carefully mount the ALPS tuner onto the circuit board and solder all the pins and the mounting tabs at each end of the tuner. You will also have to place a link on the under side of the circuit board between pin 13 and 14. You can simply put a solder blob as this picture shows:



After that, you are also wanting to add two wire links as per the following picture:



These two wire links (pin 3 to pin 12 and pin 5 to pin 11) are responsible for making the UHF RF output socket of the tuner work. Add them regardless of whether you intend to use UHF RF output or not.

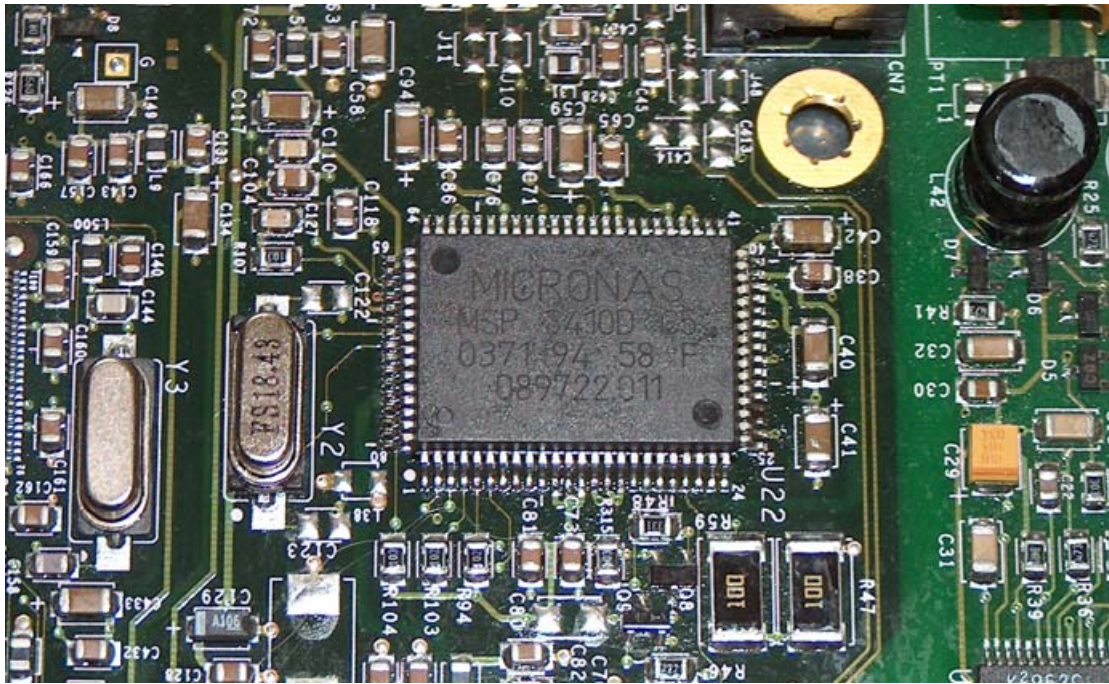
**MAKING IT FIT**

The next thing to do is enlarge the “RF In” hole a little bigger. Unfortunately the old tuner “F” connector sized hole is not big enough to accommodate the connector on the ALPS tuner. While the case has no mainboard in it grab a reaming tool or a round file and make the hole a little bigger. Be careful that any particles of metal are swept out of the case so they do not short circuit anything.



## REPLACING THE MICRONAS CHIP

Here comes the fun part: Removal of the 3430G Micronas chip and replacing it with the 3410D version. I am not going to go into details here on what to do except to say “just do it”. Because there are several techniques for doing SMD rework I am not going to list them. Quite simply if you know how to do SMD rework then the object here is simple: Get the 3430G chip off and solder on the 3410D in exactly the same spot. There are no pin swaps, cuts or anything. Just a straight one-for-one swap. The required result is something like this:



## CONFIGURING THE “MARK 2” STEREO DECODER BY INSTALLING A MODIFIED VERSION OF THE “PALMOD CONFIG” SOFTWARE

As hinted at the start of the “Mark 2” details, simply replacing the 3410D chip does not work with any OzTiVo software at this point in time because unfortunately the 3410D chip has some slight software difference than the factory fitted 3430G.

*Therefore if you have fitted the 3410D chip and not updated the `palmod.o` and `palmod_config` files on your hard disk you will get weird “thwup thwup thwup” sounds through the rear A/V input and no sound from the PAL tuner. This is normal and will not damage the TiVo but a software update is needed.*

What does “palmod” do? Palmod is a software driver for your input sources. It can control a number of setting like brightness and contrast, but for our purpose it also has settings for the PAL tuner like changing the UHF output channel, fine tuning, etc and in the case of the 3410D Micronas it contains special instructions to make the chip work properly. In fact this updated palmod for the 3410D is smart and can detect the presence of either a 3410D or the original 3430G and switch accordingly so therefore it can also be used on stock USA boards too.

You can obtain the palmod files to work with the 3410D Micronas chip from here: <http://minnie.tuhs.org/twiki/bin/view/Hardware/TunerModALPSHowTo>

Installation of the files is not hard but I assume you know some basics about moving files to your TiVo. In essence you need to ensure your TiVo is in Read/Write mode, delete the old `palmod.o` and `palmod_config` files and copy on the new files. DO NOT simply copy the new files over the old as it does not work properly. You can find the existing `palmod_config` in the `/sbin` directory and `palmod.o` in the `/lib/modules` directory.

After you have copied on the new files simply do a reboot (either power cycle or issuing a **reboot** command from a bash prompt) and check you have proper sound.

To access palmod to configure some of the optional picture and tuner settings, from a bash prompt either via a serial cable or Telnet type `palmod_config` (note the underscore this is important). You will then be greeted with a menu where you can pick your options. Most of these settings can be done “live” without the need for a reboot to see the changes. When you are satisfied with your changes don’t forget to “Save settings and exit” for the changes to be made permanent.

That’s it. If you have done the job correctly then you now have an internal PAL tuner in your TiVo with the “Mark 2” stereo decoder. If you want to check that the stereo decoder is actually functioning you can do so by checking the kernel log. After a channel change you will see two status lines like the following example:

```
Aug 4 20:45:01 (none) kernel: PALMOD: Sound standard 0x03 was detected
Aug 4 20:45:01 (none) kernel: PALMOD: Sticking with stereo (ch=7, v=0x30)
```

The “ch=7” is your current channel and the “v=0x30” is a signal quality reading.

### SECTION 3

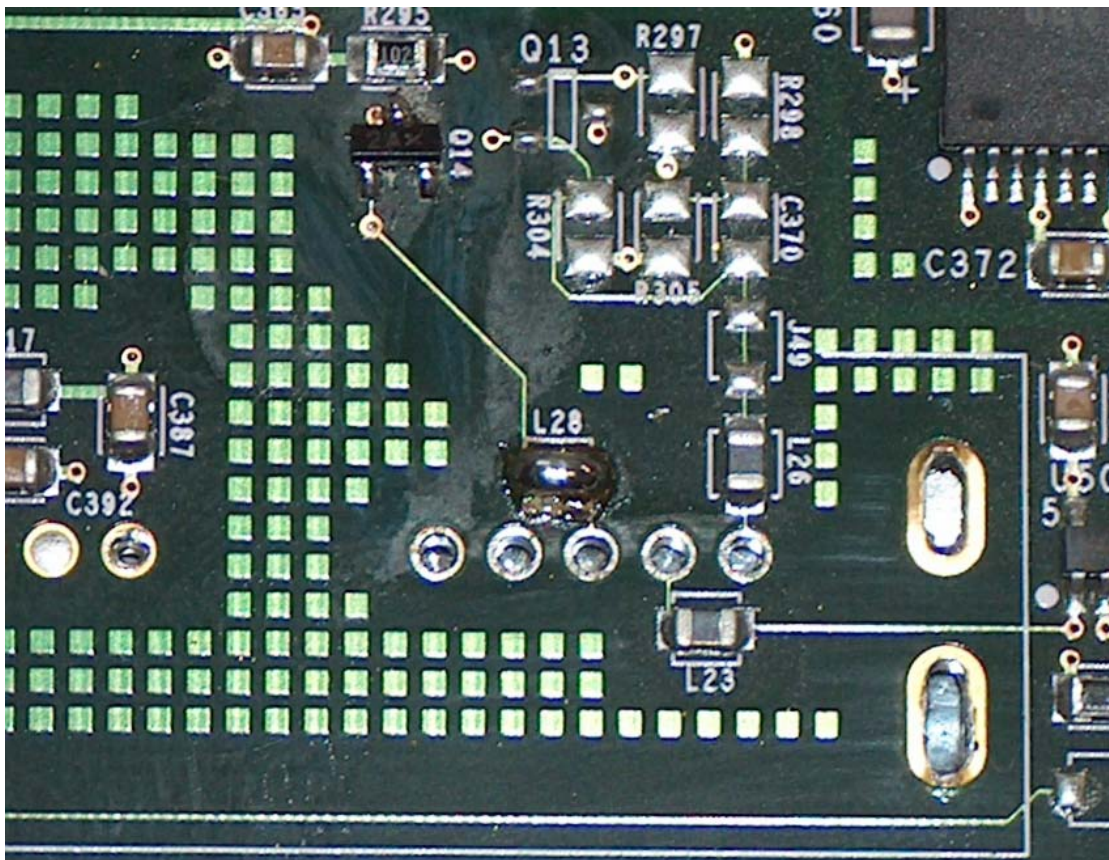
#### Upgrading a “Mark 1” stereo decoder to “Mark 2” stereo decoder Or upgrading a mono sound install to “Mark 2” stereo decoder

It is fair to say that with myself personally doing in excess of 250 “Mark 1” stereo decoders and a handful of mono sound installs from the period of introduction in early 2004 to July 2005 there would be a few that may wish to take advantage of the benefits of a “Mark 2” decoder. The good news is that it is possible to upgrade without too many hassles.

Essentially it involves removing the “Mark 1” decoder board (or if a mono only install removing the mono audio wire from the tuner to the 3430G Micronas chip), restoring Q14 and L28 and swapping the 3430G Micronas chip for the 3410D and installing the new palmod software.

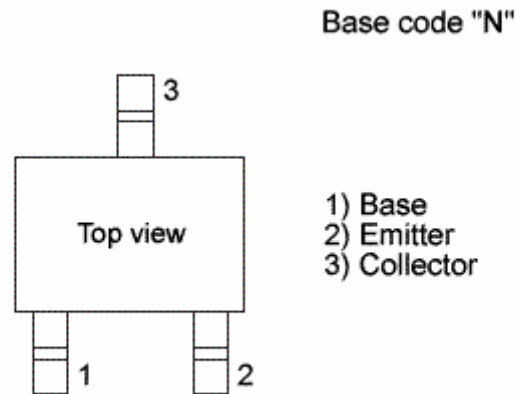
Q14 is a general purpose NPN style surface mounted transistor (SOT-23 package type) and L28 is a 10uH inductor. As can be seen in the following photo I elected not to restore L14 for two reasons:

1. With the tuner installed it is hard to get to and I do not recommend removing the tuner unnecessarily, and
2. The inductor makes no real difference. It is there for decoupling purposes and in all honesty with side-by-side testing there is no difference in performance.



In regards to Q14 as I mentioned it is a General Purpose NPN transistor. Looking at the above photo showing Q14, the left leg (pointing down) is Base, the middle leg (pointing up) is Collector and the right leg (pointing down) is Emitter. The actual genuine transistor for this job is marked "2AX" and is a 2N3906 type transistor but anything that can handle a bandwidth up to 10MHz will do and if you do not have any SOT-23 (surface mount) transistors on hand then a non-SMD type part will do if you can bend the pins a little.

For clarity here is a diagram on what the pins are on an SOT-23 package part:



..... And that's about it. Apart from removing the "Mark 1" decoder board (or mono audio wire if it was a mono sound install), restoring the transistor, and either electing to leave the solder blob at L28 or restoring an inductor to its place the only other two steps to do is solder on the MSP3410D Micronas chip and install the modified palmod software as outlined in Section 2 of this document.

This completes the ALPS PAL Tuner installation document.