TUTORIAL: AV Cables (Composite)

Last Updated: October 2, 2011 (v1.01)
For Firmware: Zaxxon HF6b1
Written by: Vadsamoht

Contents

1 INTRODUCTION

1.1 READ THIS SECTION FIRST!

I know nobody likes the 'readme' that is always included with these things, so I'll keep it short. Anything illegal that you do with your Pandora, even on the advice of this guide, is your responsibility and thus, your fault. Also, if you break or damage your Pandora, somehow injure yourself or others, or cause any other loss or harm (even on the advice of this document), we cannot be held liable. **tl;dr - Don't blame me if you somehow void your warranty or hurt yourself.**

As such, this document comes with ABSOLUTELY NO WARRANTY, EXPRESS OR IMPLIED, *to the extent applicable by law.*

- The main reason for this is that 1) despite the best efforts of the community, we cannot be sure that everything is going to go as-planned, and your best option is always to contact a professional (or better still the OP team), and 2) because I plan on 'opening up' this document as soon as it reaches an acceptable state, and thus, anyone can potentially change details for a 'joke'. Always try to make sure you know as much about what you're doing to your system as possible.

— Vadsamoht, July-October 2011.

1.1.1 Still Have A Problem?

Naturally, this guide can't contain all of the answers you could possibly want. But before you do anything else, I would suggest searching the German and English$^{\mapsto}$ forums and checking the Wiki$^{\mapsto}$, both of which are invaluable sources of information. If you should find a solution to your problem somewhere else, and think it should be included in here, send a PM to **Vadsamoht** on the boards linked to above.

Lastly, if you have any questions feel free to send a PM to Vadsamoht on the forums.

1.2 What This Guide Is For

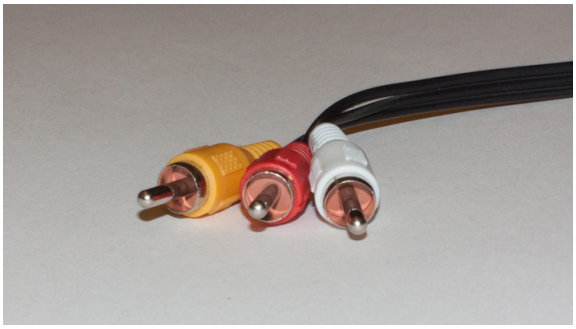
The purpose of this document is to guide people through the creation of Composite AV cables, using the EXT connectors currently only available from WizardStan on the forums. This guide is will use some technical terms, but should be easy enough to follow for anyone with a passing interest in electronics.

Also, this is really just an explanation of the way I produced my own cable. It's almost certainly not the 'best' way (as some of the technical wizards on the forum will no doubt point out), but it's what works for me and seems to be a common-sense approach.

For those of you just want an explanation of the EXT pinout, jump to Section 3.4

1.3 What is a Composite Cable?

A composite cable, (also known as an RCA cable, after the plugs on the ends) is one that looks like the image below. While I do not know what the standards are for each region, I believe that this is what most people will be wanting to make in order to connect their Pandora to their home television.



The main alternative to Composite cables are S-Video cables, and look much different. At the moment, this guide does not cover making these, although some of the material may still be useful.

2 GETTING STARTED

2.1 What You Will Need

I suggest that before you start looking for the things you will need that you quickly read through the instructions first - this way you can see what things are going to be used for, and if you need you purchase anything you will then know what size(s) to get.

These are the materials I used to create my AV cable:

1. **A Pandora**

   Not trying to annoy those who haven't received theirs yet, but there's really no point in making a cable yet if you can't test it out - If you've messed something up and can't correct it quickly, you stand a good chance of having the connector damaged in the mean time.

2. **EXT Plugs** You'll need some of these, from WizardStan on the boards. Also, make sure you have spares - I lost one connector to a failed attempt at this very project. That said, if you only have one you can still try this project, but you might want to ensure that everything works before you cover it in araldite/hot glue/whatever.

3. **A Soldering Iron + Solder**

4. **A Craft Knife or Similar**

5. **Clamps, long-nosed pliers, etc.**

   These will be needed to hold the parts still as you solder them, and avoid burning your fingers. Not strictly necessary, though.

6. **An Old Composite Cable**

   You often receive these every time you get a new DVD player, etc. If you don't have a spare, you can probably find them cheaply on eBay. You could just use the plugs at the end of this cable if you have them lying around, but how to solder them together is not covered here.

7. **Other (Thinner) Cables**

   Most Composite Cables are made of multi-core stuff, which can be a real pain to solder, especially to pins as fine as those on the EXT connectors. Personally, I was able to find a 4-wire ribbon cable out of an old television that wan not only pre-tinned (i.e. it already has a thin layer of solder coating the wire), but it was also as thin as the EXT pins.

   Ideally, you'll want 4 different colours, just to make it easier to identify which cable goes where. It doesn't matter that much though.

8. **Heat-Shrink**

   This stuff is a godsend when soldering cables. All you need to do is slide some down the length of a wire and over a connection, and then heat it (I usually do this with a match, but a hairdryer should work just as well)

and it will shrink around the connection, which prevents wires touching and causing mischief. It's generally fairly cheap, too.

As for sizes, I've used two different types: Firstly, one that's just wide enough to fit around the plug if given a bit of a squeeze, and another type that is just larger than the cables I'll be using.

9. **Araldite (useful, not necessary)**

   Wait, Araldite? Yes. Some people have just hot glue or sugru, but there's a neat trick I'm going to do with the araldite later on in this guide. I used 5-minute araldite that comes in a sort of double-syringe. It's also generally harder than hut glue - which could be good or bad depending on your viewpoint.

   BE WARNED: This stuff is strong. Stronger than Super Glue, Tarzan's Grip, or anything else of that kind, and if you glue your fingers (or anything else) together with it, it will almost certainly mean a trip to the hospital. If you get some on your hands, either wipe it off *immediately*, or else wait for it to dry (10 mins) and then just lightly scrape it away.

10. **2 Small Plastic Syringes (Only if Using Araldite)**

    These can make things easier when trying to place the araldite on the connections, allowing you to squirt into a hole rather than drizzle it off of a stick or something (which will probably take too long).

11. **Multimeter (useful, not necessary)**

    Again, not strictly necessary, but you can use it to make sure your connections are good if you run into problems.

3 Instructions

3.1 Getting Ready

The first this you're going to want to do is make sure you've got everything. Ensure that the EXT Connectors actually fit in your Pandora etc. etc.

3.2 Preparing The EXT-End Cables

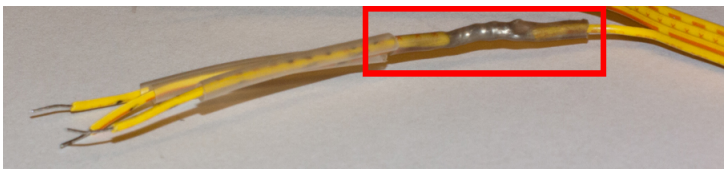
Start by ensuring all 4 of the cables you are using are the same length. Then, trim approximately 5 cm off of the ends, keeping the bits. You should now have 4 long and 4 short wires.

Select one of the long wires (if, like me, you salvaged a ribbon cable out of something, then I suggest you choose one of the outside wires, because this will carry the GND (earth) signal), and cut it by the length of the short wires. (e.g. if your short wires are 5cm long, cut 5cm off this long wire).

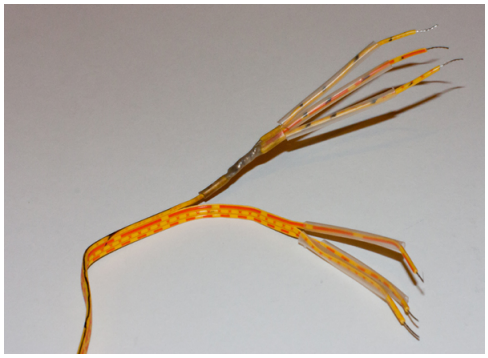
Strip one end of the three short wires, and twist them together.

Strip the end of the long wire you just cut. slide a short length of heat-shrink down this wire, being careful that it is not so close to the stripped ends that the heat will travel and shrink it halfway down your wire.

Solder the 3 twisted wires to the exposed end of the cut wire. After the join has cooled, move the heat-shrink over it and heat it up again, which should shrink it over the connection, leaving no exposed metal. Here is what my join looks like:



You should now have three long wires, and one other wire that splits into three. I suggest you mark the three shorter wires with a permanent marker of some sort, to make them easier to spot when you are soldering these later. These will carry the ground signal from one of the EXT pins to all three of the Composite plugs.



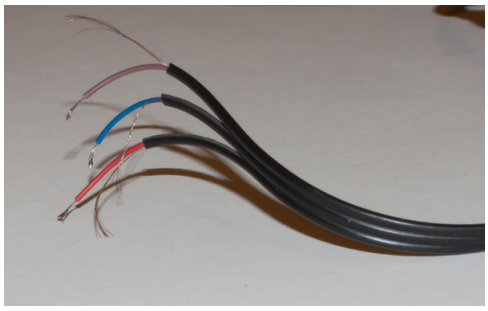
Cut all the ends level and strip them. Your cable should now look like the above image. Place this cable aside for now.

3.3 Preparing the RCA End

Cut one end of your composite cable off, so that you only have one set of MALE connectors left attached. Strip the ends.

The way that composite cable are normally produced, when you strip the first coating of insulation off, you will find inside a bunch of loose wires (earth) and another insulated wire inside (signal). Just be careful that you don't end up cutting these fine wires when you strip the cable.

For now, leave the insulation on the signal wire, and just twist all of the earth wires from each cable together (do NOT twist the earths from seperate cables together) in order to keep them tidy. Run some solder along the length of these to keep them together.



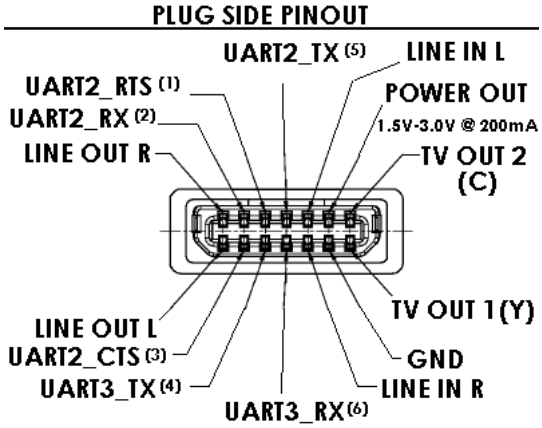
Now you just need to do the same with the signal wires. Carefully strip the insulation off, and then twist and solder just like before. You should now have 6 exposed wires, which will eventually connect to the 6 wires you made with the last cable, and the whole thing should look like the above image. However, DO NOT solder them together just yet - there's still one more thing to do first...

3.4 Soldering to the EXT

This is undoubtedly the most difficult part of creating the cables. Prepare for a whole lot of swearing, because these pins are *tiny*. That said, with a little perseverance, most people should be able to do this, providing the soldering iron has a fine enough point.

But before we start actually soldering the pins to the wires, you need to figure out what pins need soldering to each wire.

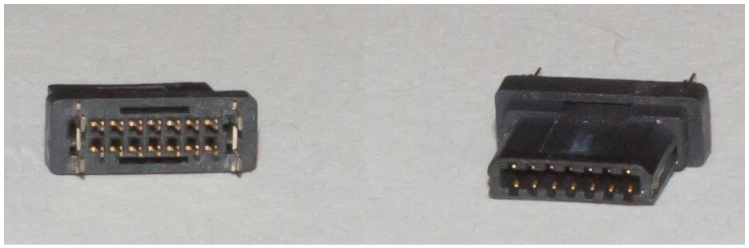
You've probably seen this image posted on the forums (if not, take a look now):



Source↪

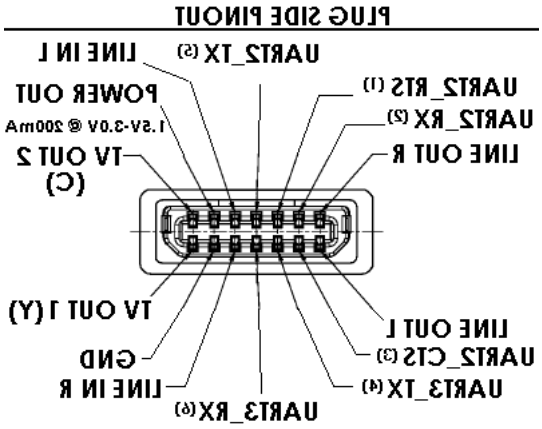
OK, so it's not that scary. The pins you want to connect are the ones labelled 'LINE OUT L', 'LINE OUT R', 'TV OUT X (X)', and 'GND'.

The problem is, what you're actually looking at is the wrong side of the plug. Imagine you have crawled inside the Pandora, looking out. Hold the plug as though you were about to plug it in - that's the side the diagram was drawn from.

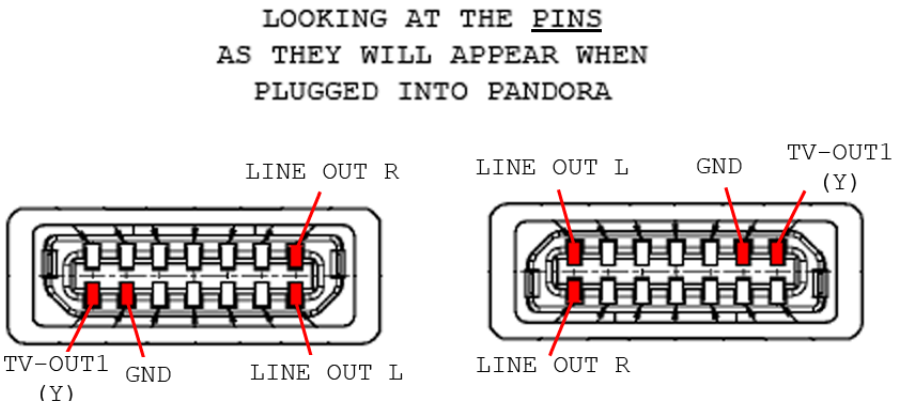


WHAT YOU NEED **WHAT THE DIAGRAM SHOWS**

As a result, the diagram for the pin-side is actually:



So when you solder you connectors (looking at the pins now), you actually want to connect these ones:



Note that here I have also rotated one of the diagrams 180 degrees - the slanted sides are now on the top.

Take a moment to get your head around what the above means - it's never a good idea to blindly follow a guide (especially one written by me) without understanding things first. To interpret the above image, if you are looking at the pins of your EXT connector, with the sloped corners pointing UP, then 'Line Out L' is the top left pin, 'Line Out R' is bottom left, and so on.

At this stage, all you need to do is solder your four wires (from the EXT-END cable we made first) to the pins highlighted in the image above (easier said than done, I know). The important thing here is to make sure that your solder or wires do **NOT TOUCH ANY OF THE OTHER PINS, OR THE U-SHAPED SIDE PANELS**. This will create a short-circuit, and could possibly damage your beautiful Pandora.

The cable that splits into 3 at the other end needs to connect to 'GND', the order of the others does not matter at the moment, unless you made the mistake of connecting the two cables together already (in that case, skip to 'Finishing the Cable' below to find out what order they need to go in).

The following applies only to people still using HF5 or earlier. As of HF6 colour is available without this modification by selecting one of the COMPONENT options on the TV-Out script's menu.

NOTE: Currently, as there is not proper TV-OUT script for composite cables, the image your cable will give at the moment will be in MONOCHROME (black and white). If you desperately need colour, you can connect the TV-OUT 1 (Y) and TV-OUT 2 (C) pins together at this stage. However, this is not recommended because 1) the script will probably be written before much longer, and 2) because there is a serious decline in image quality, to the point where desktop icons or only just recognisable and text is only readable if on a high-contrast background. There is also a method of placing a 470pF capacitor somewhere in the system, however I have no experience with this method, and so have not included it here. For more

info on this, however, you can check the forum thread here.

3.4.1 'Freezing' the EXT joints

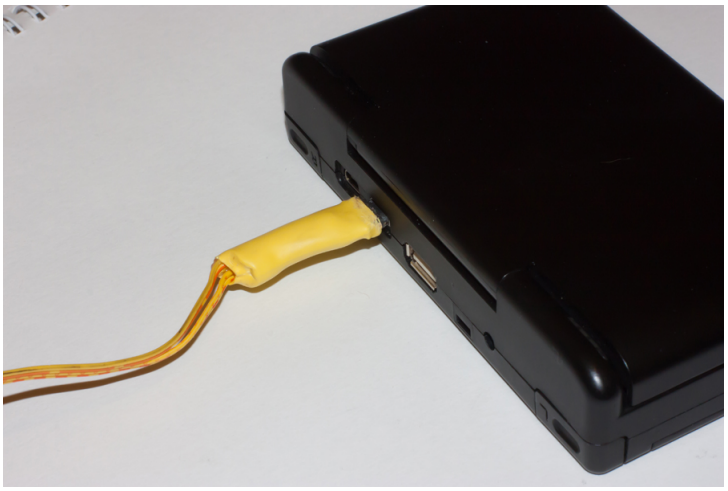
This is where the Araldite I mentioned above comes in. The connections you have just made with the tiny pins on the EXT connector are going to be very weak, and will probably break off (or worse, break the *pins* off) very quickly, which means getting out the soldering iron again.

Some people may prefer to just use hot glue, sugru or something else for this block, which is fine, but be aware that the following trick with the heat-shrink probably will not work at all.

What we're going to do is make a casing for the joints out of araldite, although hot glue works just as well for most parts.

Slide a decent length of large heat-shrink down the cable so that one end covers most of the EXT plug (leaving a little bit of room so you can see the end that plugs into the Pandora). Shrink the end of this only, so that the heat-shrink contracts around the plug.

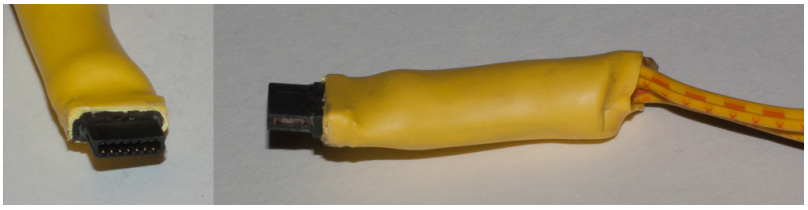
Cut the end of the heat-shrink off with a craft knife, but not too much. You want to take off just enough so that you can plug the EXT into the Pandora. Be careful when you pull the EXT out of the Pandora that you hold the plug, not the cable, because otherwise you could easily break off some of your connections.



Mix up a small amount of the araldite, enough to fill the other end of the tube up to about 50%. Once it is thoroughly mixed, either drizzle it into the connector or squirt it using a plastic syringe (if you want to use a syringe, then you are actually probably best mixing the two parts of the mixture inside the syringe and squirting it straight away).

The heat generated by the reaction of the two parts of the araldite mixture will give off a lot of heat, which will make the heat-shrink contract and make a nice,

smooth, hard blob. What you want to end up with is something that looks like this:



Once the araldite has set, shrink the open end of your heat-shrink as much as possible.

When doing this myself, I found that a small amount of araldite had drizzled out of the end on to the connector. This is alright, so long as 1) the araldite does not cover the face of the plug, and 2) that you do not glue your connector to any nearby objects. If you find a bit that has drizzled out, just wait until it has dried, and then scrape it off with a craft knife.

3.5 Finishing the Cable

Slide some heat-shrink down each of the 6 spare ends on one of your cables. Now you just need to solder the cables together.

The convention by which composite cables are set out leaves the **yellow** plug as Video, the **white** as Mono/Left-Channel Audio and the **red** plug as Right-Channel Audio. Naturally, you don't have to follow this, but it might make things easier for you to remember which cable goes into which port in your television.

So, you have six wires on each cable. On the cable that has the RCA (Composite) plugs, you should be able to identify a signal wire (inside, insulated) and an earth wire (outside, uninsulated) from each connector. The three earth wires connect to the three ends of the other cable that you made earlier (because all three plugs need to be connected to the one pin on the EXT), and can go in any order although I suggest you do these last to make the bundle of wires neater.

The signal cable from the yellow plug needs to connect with the cable running from the 'TV OUT 1 (Y)' pin on the board. This is the pin in the corner, next to 'GND'.

The signal cable from the red plug needs to connect with the cable running from the 'LINE OUT R' pin on the board. This is the only pin on the top/bottom row (depending on which way up you are holding the connector).

The signal cable from the white plug needs to connect with the cable running from the 'LINE OUT L' pin on the board. This should be the only remaining cable that is free.

Now slide the six tubes of heat-shrink up the wires and shrink them as before, such that there is no wire loose that can short out. If you don't have any heat-shrink, you can just wrap these wires up with masking tape.

3.5.1 'Freezing' the Connections

Now, you can either wrap the 6 connections you have just made up in masking tape or duct tape into one messy ball, or follow the following instructions to make another araldite block around your connections, preventing them from breaking:

- Firstly, thread a wider piece of heat-shrink over the 6 connections, and using a match or soldering iron shrink one end to make a sort of funnel.
- Next, mix up another load of araldite, enough to fill the tube of heat-shrink just over 50% of the way to the top.
- Now, just carefully drizzle the araldite into the funnel you've created. If you happen to have a plastic syringe lying around the place (without the fine point), these can be quite useful for this but be aware that the syringe will inevitably be rendered useless afterwards.
- As the araldite begins to cure, it will release quite a bit of heat (to the point where you won't want to be touching it. The neat thing here is that this will cause the heat-shrink to contract, creating a tight;y-bound tube of araldite over the connections.
- If the araldite starts to overflow out of the end of your tube, make sure to scrap it off with a stick or something, or else wait for it to dry before chipping away at it with a fingernail or knife.
- Lastly, shrink the open end of your funnel to make it all look neat and stop the edges catching things. Now you should have something that looks somewhat like this (The black stuff is just where I held a match for a bit too long and it started to burn the plastic):

3.6 Rejoice!

And that's all there is to it. I hope your new TV-Out cable works well!

Again, remember that with HF5 we can get only a monochrome (black and white) image with this cable (without using a capacitor), however it works just fine with HF6b1, so either consider installing the new firmware or just wait until a full (non-beta) release comes out. So long as you are using HF5 or earlier,

if you get a clear B & W image when you plug your Pandora in and enable TV-Out, then Mission Accomplished!

If you have any questions about this guide, feel free to PM Vadsamoht on the forum.

3.6.1 The Finished Product