Video fixes and video cables
for all ZX Spectrum 128K models

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1 Introduction

This document describes some reasonably easy enhancements for your ZX Spectrum 128K model, that should result in perfectly clear and crisp video from your ZX Spectrum!

The first part describes how to improve composite video output, that is often used when connecting a ZX Spectrum to a monitor, CRT, LCD or plasma TV.

The second part shows how to make an RGB cable with video quality that is superior to composite video, although not all TV's and monitors support RGB video signals.

BYTEDELIGHT

2 Detaching audio from the video signal

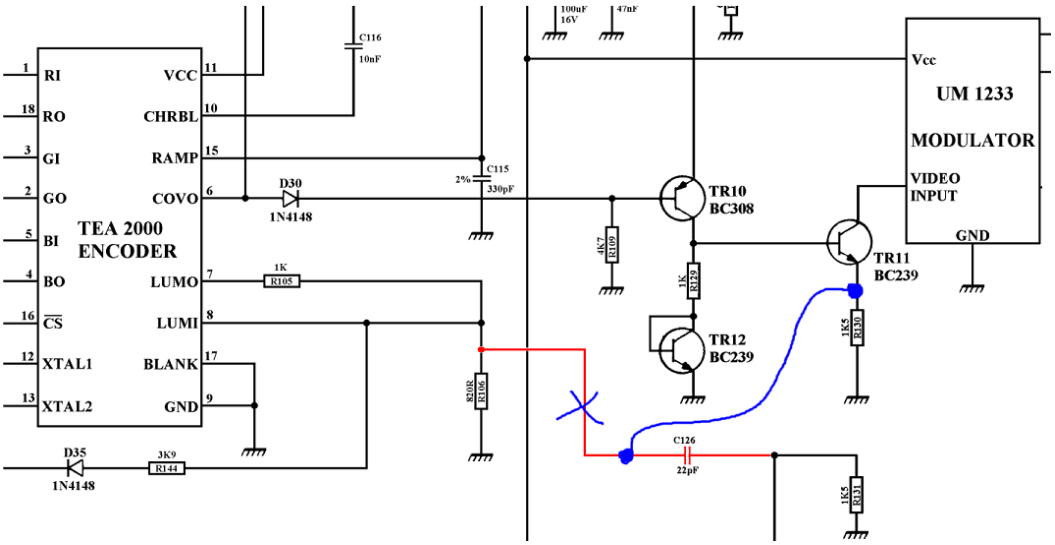
In every ZX Spectrum 128K model the audio is mixed together with the video signal, but this causes distortion on the composite video-out signal and it causes many monitors not to detect the color signal.

To fix this we need to revise the way the audio signal is added to the video signal.
But it's very simple!

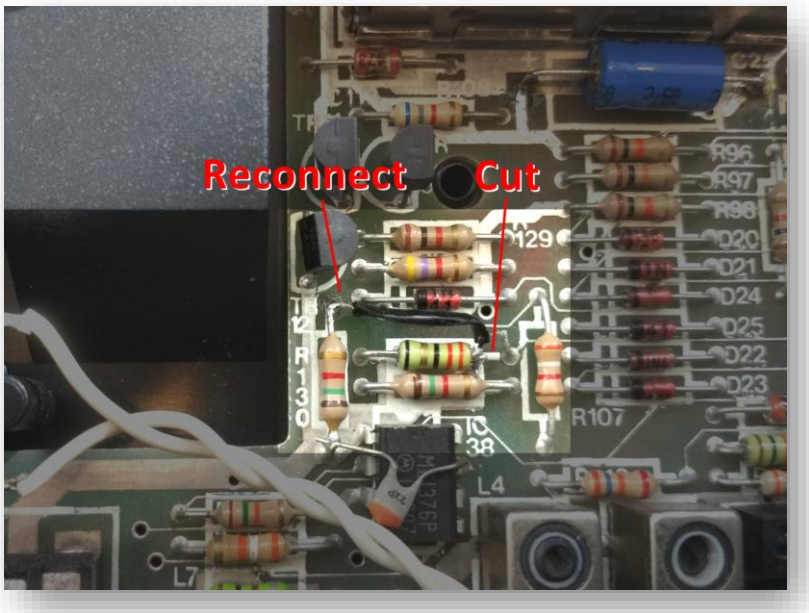
The solution for this is to reconnect one capacitor in another way.
This capacitor 'carries' the sound and normally adds it to the TEA2000 video generator chip, thus causing disturbance.
By disconnecting one side of this capacitor, and reconnecting it more directly to the modulator, the picture will be perfect and you will still have sound on the antenna output.

2.1 Detaching audio from video on ZX Spectrum 128K+

The capacitor is C126:

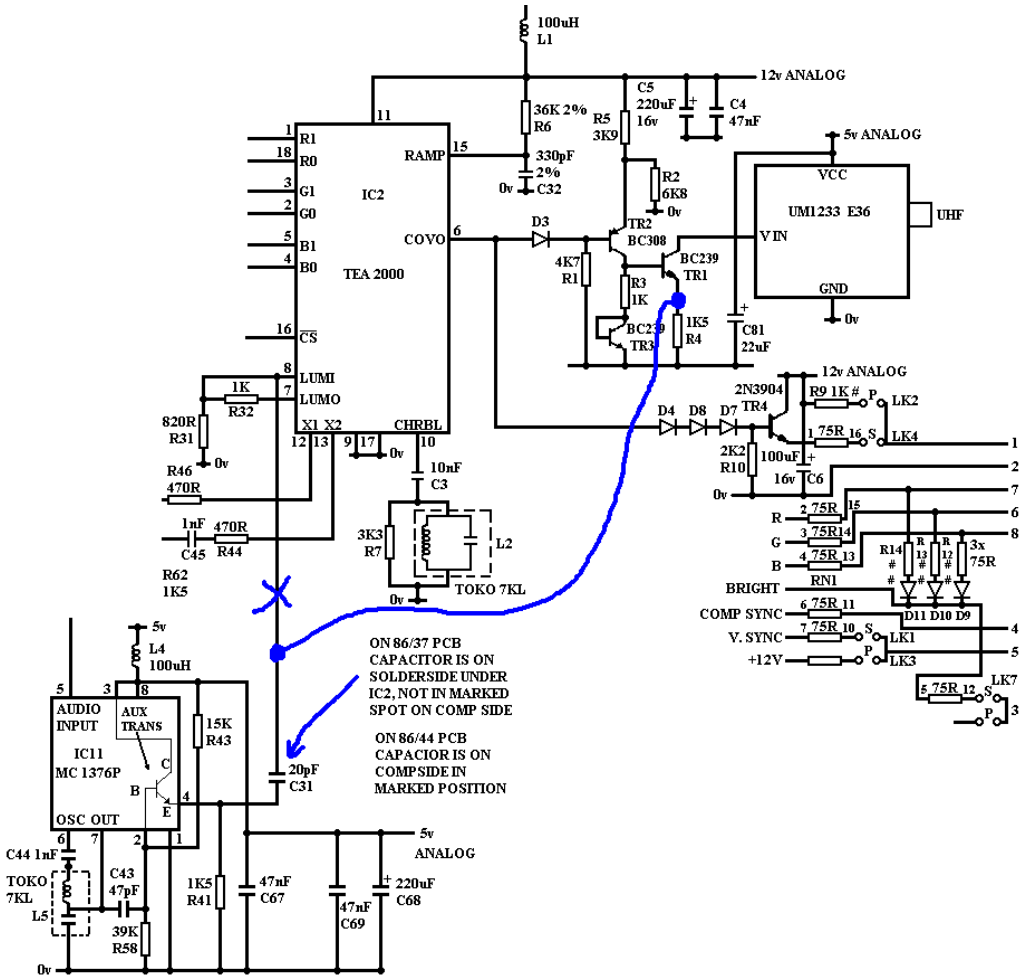


Lift the capacitor on the side where the cross is.
The blue line shows where to reconnect the capacitor to: you need a wire for that like shown here:



2.2 Detaching audio from video on ZX Spectrum +2

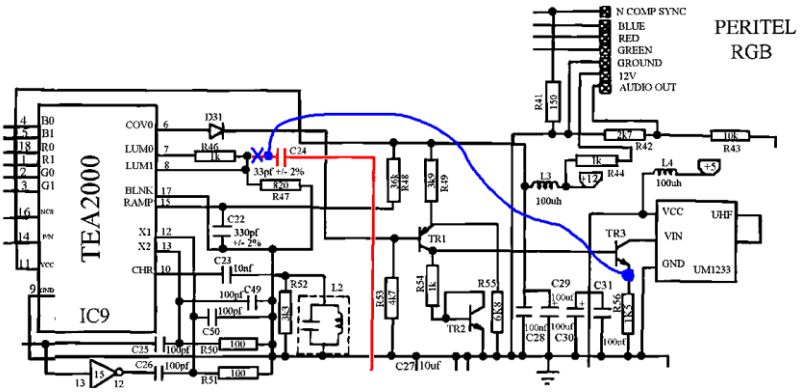
The capacitor is C31:



As the text at the blue arrow sais, this capacitor is on some models on the component side in the position that shows C31, but with other models it's on the bottom – if I remember correctly it's under the TEA2000 then.

2.3 Detaching audio from video on ZX Spectrum +2A

The capacitor is C24:



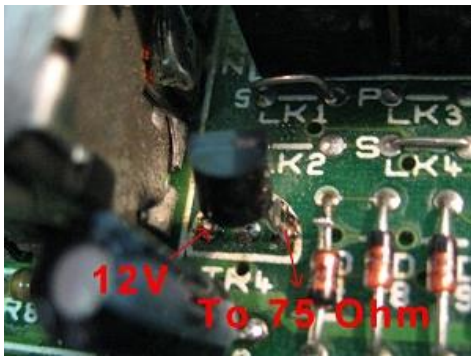
3 Design fault on +2 issue 3

There is a major design-fault on the Spectrum +2 (grey model) issue 3 (issue 1's doesn't seem to have this problem): all 2N3904 transistors (3 pieces) are mounted incorrectly.

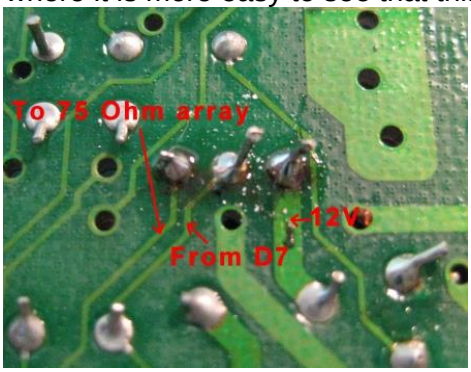
It's not clear why this mistake is made, maybe earlier designs used another transistor that have another pin-order than the 2N3904, and the 2N3904 was chosen later in the process. One other cause of this mistake may be that they used a wrong datasheet: I found some wrong datasheets of the 2N3904 on the web.

Whatever the reason is, it causes a unusable video signal.
The easy solution is to de-solder the 2N3904 next to the modulator and twist it around. That will solve the problem and give the correct video out signal.
The other two transistors do not seem to give problems the way they are mounted, so just leave them.

This picture shows the 2N3904 right next to the modulator where it is already twisted around, so this is the way it should be mounted:

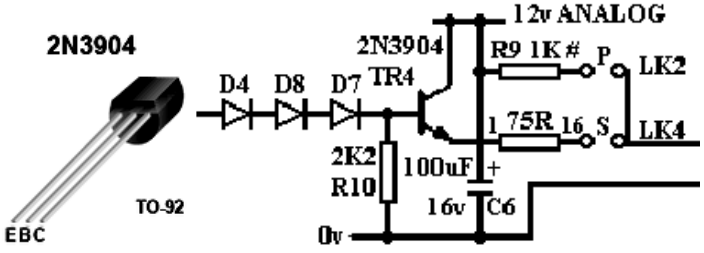


This picture shows the bottom side where it is more easy to see that this is true:



The right pin on this picture is the 12V, but in the original way the 2N3904 is mounted, the 12V is connected to the emitter of the 2N3904: that is definitely wrong.

The emitter of the 2N3904 should be connected to the output to the 75 ohm resistor:



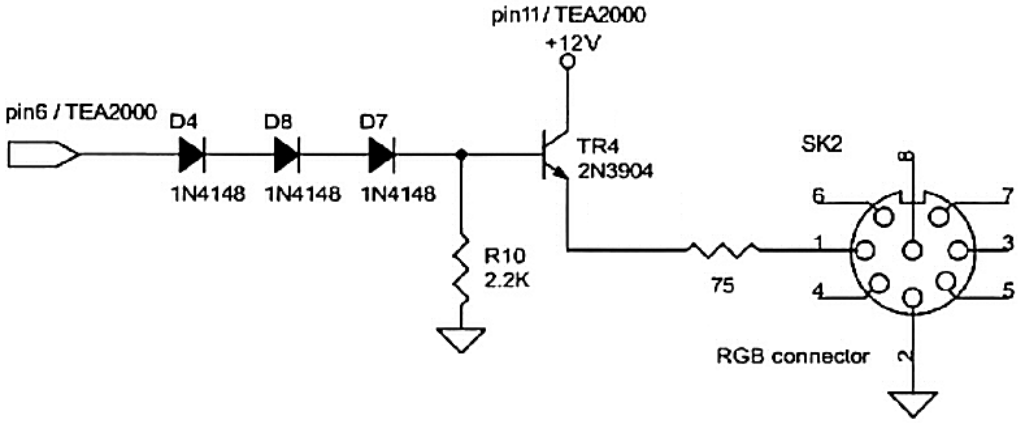
4 Creating composite video-out on a +2A / +2B / +3

Although the ZX Spectrum 128K ‘toastrack’ and the grey ZX Spectrum +2 have a composite video-out signal on pin 1 of the RGB connector, the ZX Spectrum +2A, +2B and +3 are missing this feature.

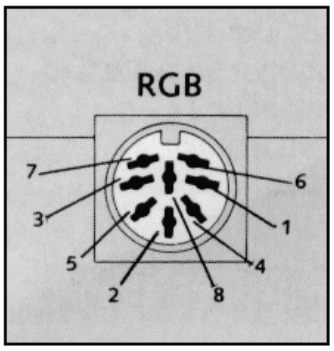
Instead of the composite video signal they have a dangerous 12V on pin 1 that will seriously damage your TV or monitor!

But you can add the composite video signal yourself, with the same fairly simple circuit as that is integrated on the ‘toastrack’ and +2.

The steps:
1. First remove the 12V from pin 1 by removing resistor R44 (should be the same for +2A, +2B and +3, and very close to the RGB connector).
2. Add this circuit:



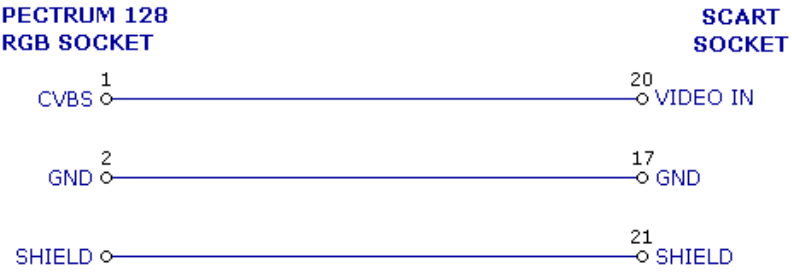
Here is the correct pin descriptions of the 2N3904:



5 Video and RGB cables for 128K models

Get your RGB cable for a ZX Spectrum 128K+ / (grey) +2 at: https://www.retrocomputershack.com/

5.1 Composite video cable for ZX Spectrum 128K 'toastrack' and (grey) +2



5.2 RGB on SCART: BLANKING signal

Toastrack and +2
Please visit https://www.bytedelight.com/?page_id=3570 for updated info to this paragraph.

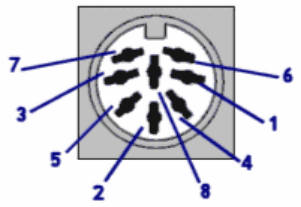
[updated: April 2019]
The correct cable circuit is available at:
https://www.retrocomputershack.com/SCART-DESIGNS/Spectrum-128K/index.html

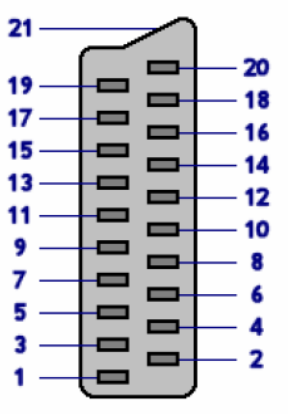
+2A/+2B/+3
The ZX Spectrum +2A/+2B/+3 do have a suitable signal for BLANKING.
These models have 12V on the RGB connector that can be used.

You may wonder why 12V is suitable, as 3V is needed for BLANKING on the SCART connector: inside the ZX Spectrum there is an internal 1K resistor before the 12V is fed to the RGB connector. Together with the 75 ohm resistance in any well designed TV, the internal resistor creates a voltage divider with a voltage output (about 0.9V) that is almost always suitable for SCART BLANKING (1-3V is actually required).

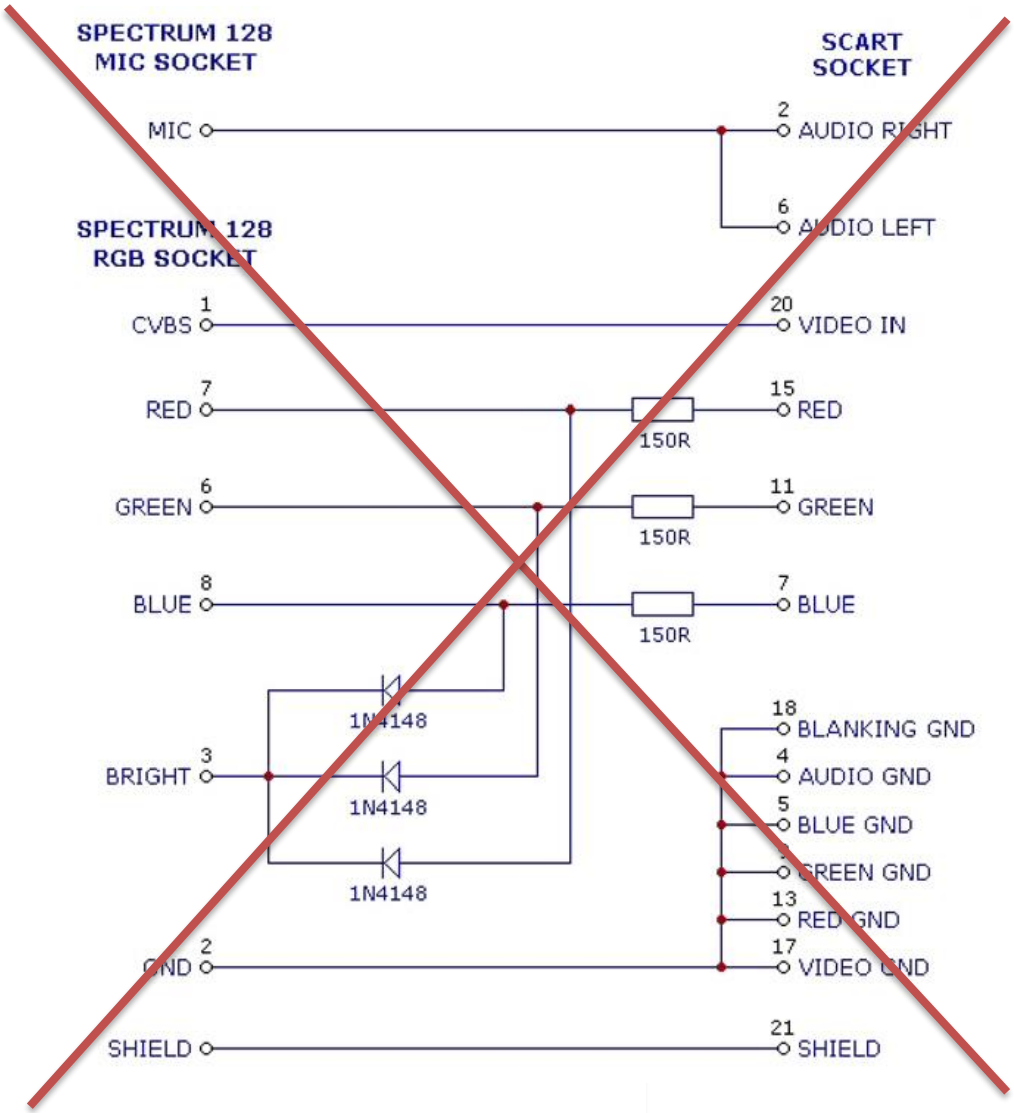
Note
Some TV's have more than one SCART socket.
Often only one of them supports RGB.
Many Sony LCD TV's for example support RGB on SCART 1, but not on SCART 2.

5.3 RGB video cable ZX Spectrum 128K ‘toastrack’ and (grey) +2

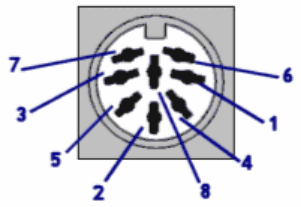


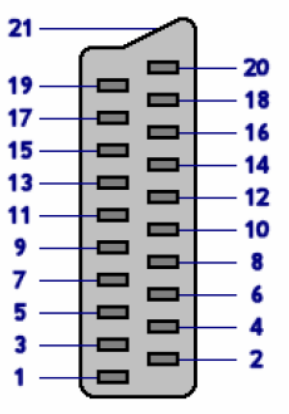


Get your RGB cable for a ZX Spectrum 128K+ / (grey) +2 at: https://www.retrocomputershack.com/
You will also find improved circuit diagrams of the RGB cables.



5.4 RGB video cable for ZX Spectrum +2A / +2B / +3





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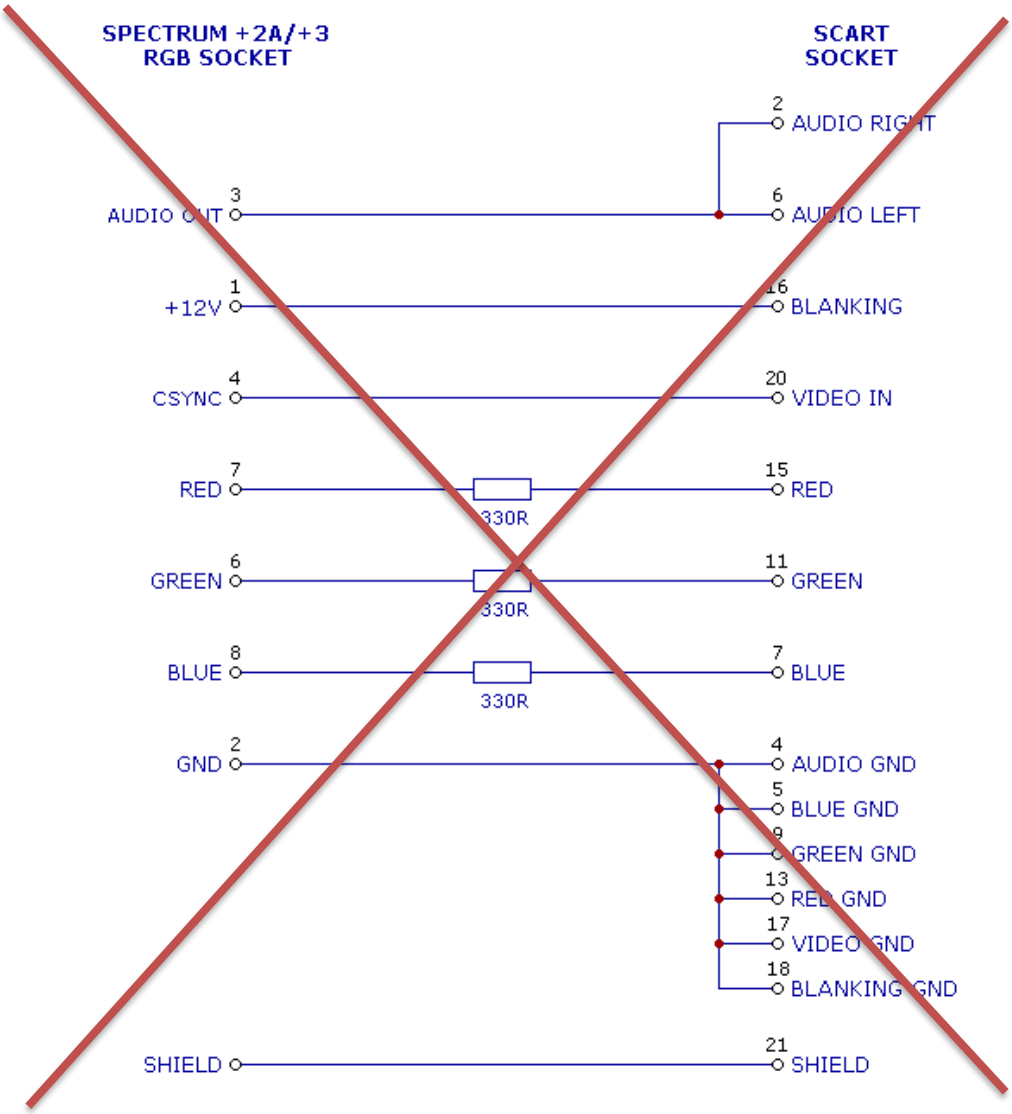

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