Project Documentation

C64 A/V-Adaptor

Project number: 132

Revision: 1

Date: 02.01.2020

C64 A/V-Adaptor Rev. 1

Module Description

Introduction

The A/V-Adaptor allows to connect standard S-Video and Audio or Composite-Video cables to the A/V-Jack of the Commodore C64.

A 330Ω resistor to attenuate the Chroma signal for S-Video is installed, but it can be deactivated by setting a jumper (JP2). This attenuation is required, since the chroma signal has a level, which is too high for standard S-Video.

Further, the audio input can be connected to GND, in case it is not in use to reduce the noise introduction.

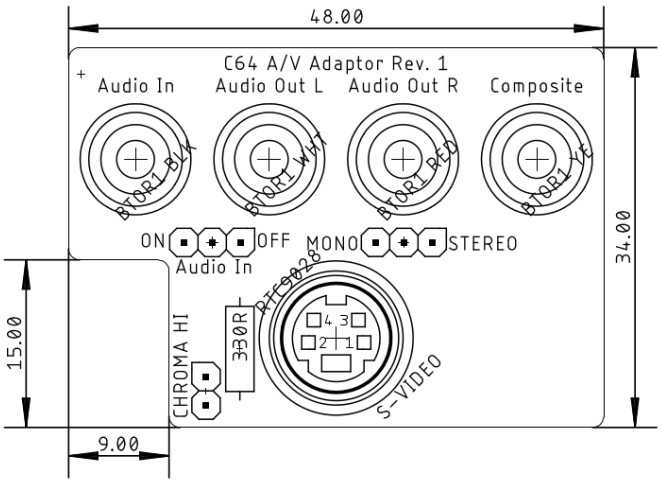


Figure 1: Component side of the A/V-Adaptor

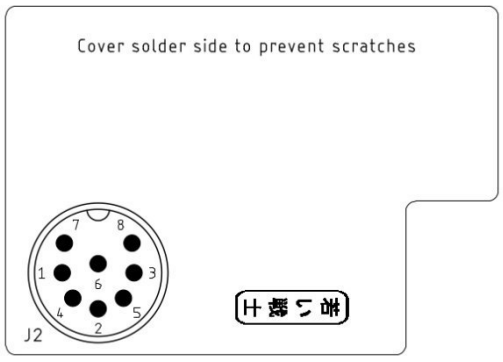


Figure 2: Solder side of the A/V-Adaptor

The two audio output jacks can be connected by a jumper. Alternatively, the stereo sound output (A/V-Jack, pin 7, in case a 2nd SID is installed inside the C64) can be connected to the right channel of the audio output. The first SID output is connected to the left channel of the audio output.

Since the DIN jack for the C64 (J2) has to be installed with a distance, a soldering aid (spacer) is provided with the PCB. It should be clipped off and put between the PCB and J2 while soldering to keep the right distance and angle. After assembly, it can be discarded.

Connectors

A/V-Plug – J2

The A/V-Plug for the C64 is the inner part of a Lumberg 033099 SV 80 DIN-Plug (8 pins, horse shoe = 262°). It provides a round plastic shell of the DIN-connector and long enough pins, so the adaptor can sit firmly in the A/V jack. The inner part of a cheaper (standard) connector cannot be used, since it does not sit firm enough.

Pin	Signal
1	Luminance
2	GND
3	Audio Out (mono/left)
4	Composite Video
5	Audio In
6	Chrominance
7	Audio Out (right – if provided)
8	-

S-Video Jack – J1

A vertical PCB mount Mini-DIN jack (4 circuits)

Pin	Signal
1	GND (Luminance)
2	GND (Chrominance)
3	Luminance
4	Chrominance

RCA-Jacks – J3, J4, J5 & J6

Connector	Signal
J3	Audio Out (mono/left)
J4	Audio Out (mono/right)
J5	Audio In
J6	Composite Video

Jumpers

Chrominance attenuation – JP1

The chrominance signal has a too high level for the standard S-Video chroma signal. The jumper bridges the 330Ω resistor (R1) to switch off this attenuation.

Status	Configuration
open	Attenuation active
set	Attenuation inactive/off

Audio Input Off – JP2

To reduce the noise introduction to the Audio Input, this can be grounded.

Status	Configuration
ON	SID Audio In connected to J5
OFF	SID Audio In connected to GND

Mono/Stereo – JP3

The standard audio output of the SID is one channel (mono). In cases a 2nd SID is installed, the 2nd audio output is (usually) connected to Pin 7 of the Audio/Video jack of the C64. JP3 connected the right channel of the audio output (J4) to either J2, Pin 3 or Pin 7.

Status	Configuration
MONO	J4 connected to J2, Pin 3
STEREO	J4 connected to J2, Pin 7

Assembly

Install the DIN plug (J2) on the solder side (bottom) first. Put the PCB on a suitable surface, the solder side up. Insert the DIN-plug, make sure, it is vertical and solder one pin first (from the solder side, which is pointing up, refer to Figure 3). Check again that the plug is straight, correct if required and finally solder all other pins.

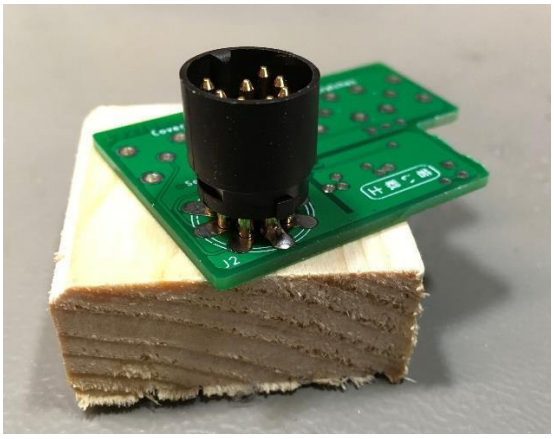


Figure 3: Soldering the DIN-plug J2

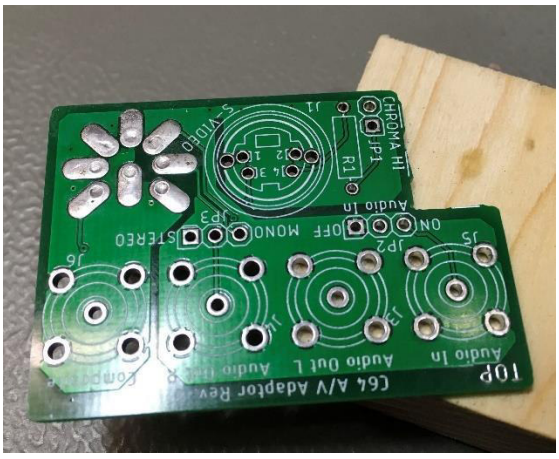


Figure 4: DIN-plug seen from the component side ("TOP")

Install and solder all other components from the component side. Watch the angle of the components, solder them from the solder side. Clip excess pin length.

In case no enclosure is used, cover the solder side (except J2) with duct tape to prevent scratching the case of the C64.

Versions for the ASSY 326298 (5-pin) and the VIC-20

ASSY 326298 was the first model of the C64, which was built in 1982. It did not have all S-Video signals. Chroma is missing. Thus, a 5-pin DIN plug is required for J2. The S-Video jack (J1) is not required.

Figure 5: The three models of the A/V-Adaptor

The VIC-20 also requires a 5-pin DIN plug but no Audio-in RCA jack.

Component	C64 regular	C64 ASSY326298	VIC-20
J2 (DIN)	SV 80 (8 pin)	SV 50 (5 pin)	SV 50 (5 pin)
J1 (S-Video)	populate	do not populate	do not populate
J5 (RCA: Audio in)	populate	populate	do not populate
JP1 (Chroma 330Ω)	populate	do not populate	do not populate
JP2 (Audio In)	populate	populate	do not populate
JP3 (mono/stereo)	populate	hardwire to mono	hardwire to mono
R1 (330Ω)	populate	do not populate	do not populate

SV 80 and SV 50 are Lumberg components.

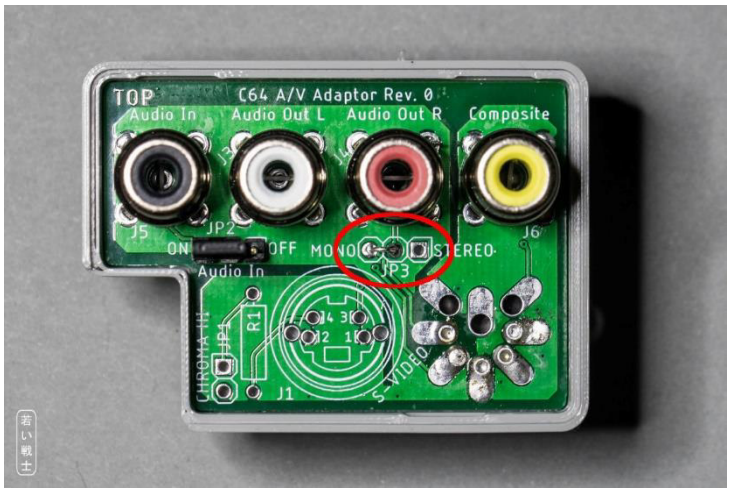


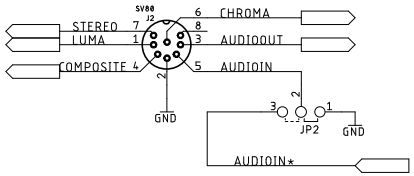
Figure 6: JP3 hardwired to mono

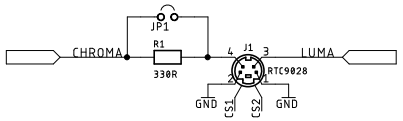
JP3 can be hardwired using a short piece of wire.

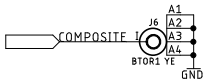
Revision History

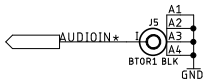
Rev. 0 → Rev. 1

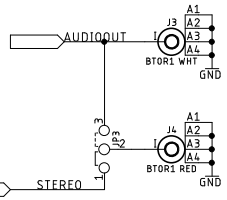
Spacer was removed from the design.







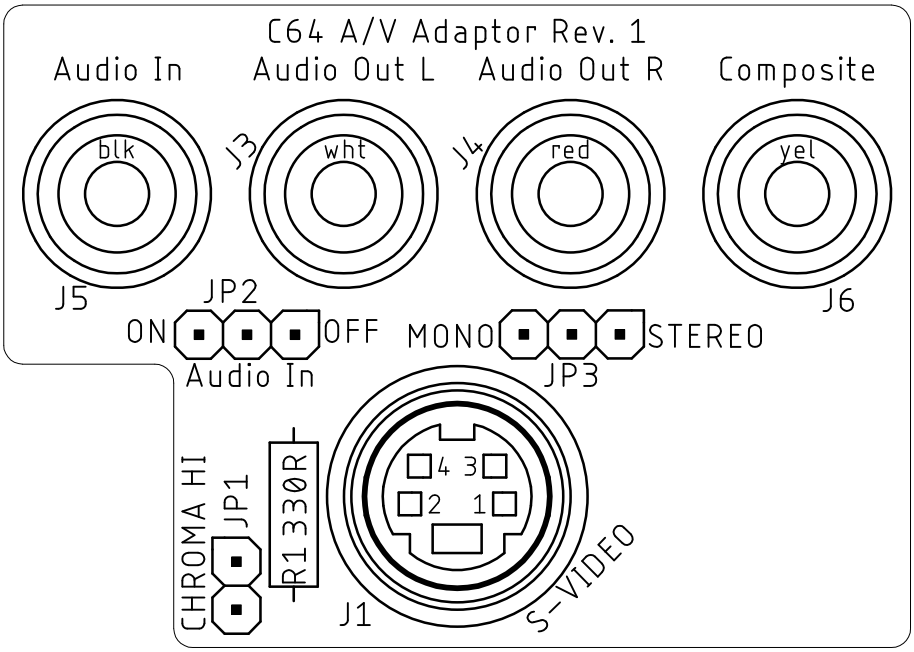




open source hardware

Title: C64 A/V-Adaptor		Doc.-No.:	132-1-01-01
		Draft.:	Sven Petersen
Date: 10.08.2020 14:12	Rev.: 1	Page 1/1	
File: C64_AV-Adaptor			
http://github.com/svenpetersen1965			A3

Sven Petersen 2020	Doc.-No.: 132-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
10.08.2020 14:23		Rev.: 1
placement component side		



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placement solder side		

Sven Petersen 2020	Doc.-No.: 132-2-01-01	
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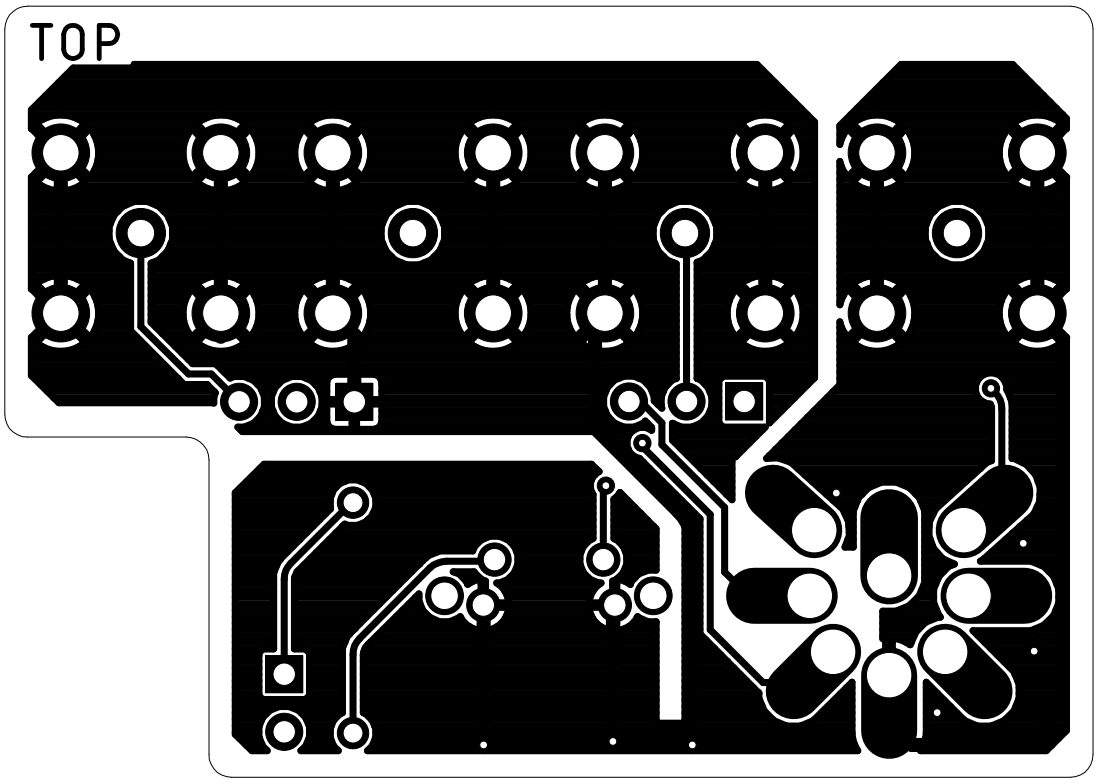
02.01.2020 14:36		Rev.: 1
top		



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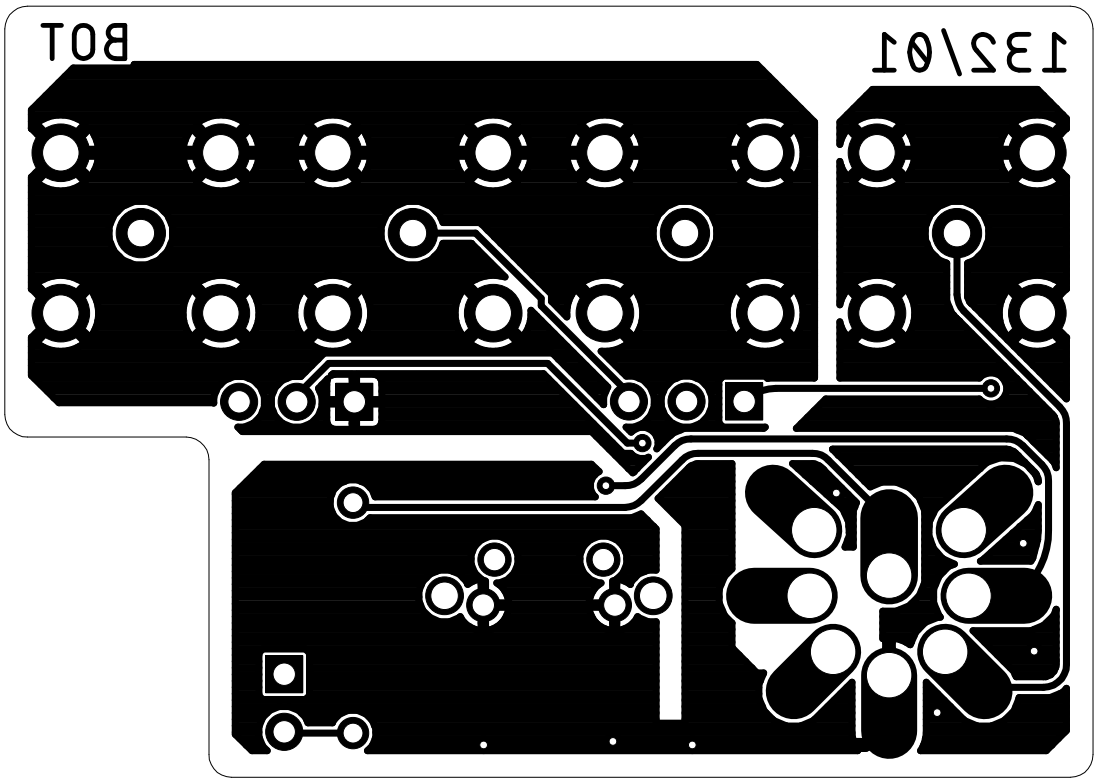

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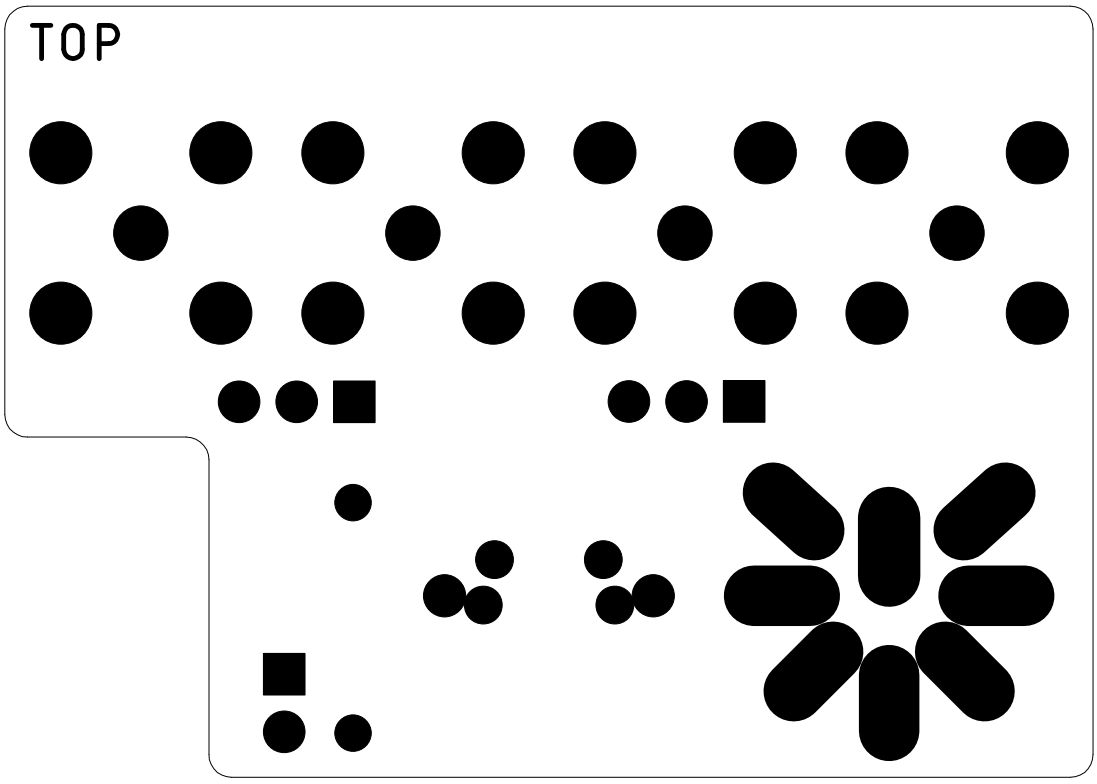
stopmask component side		



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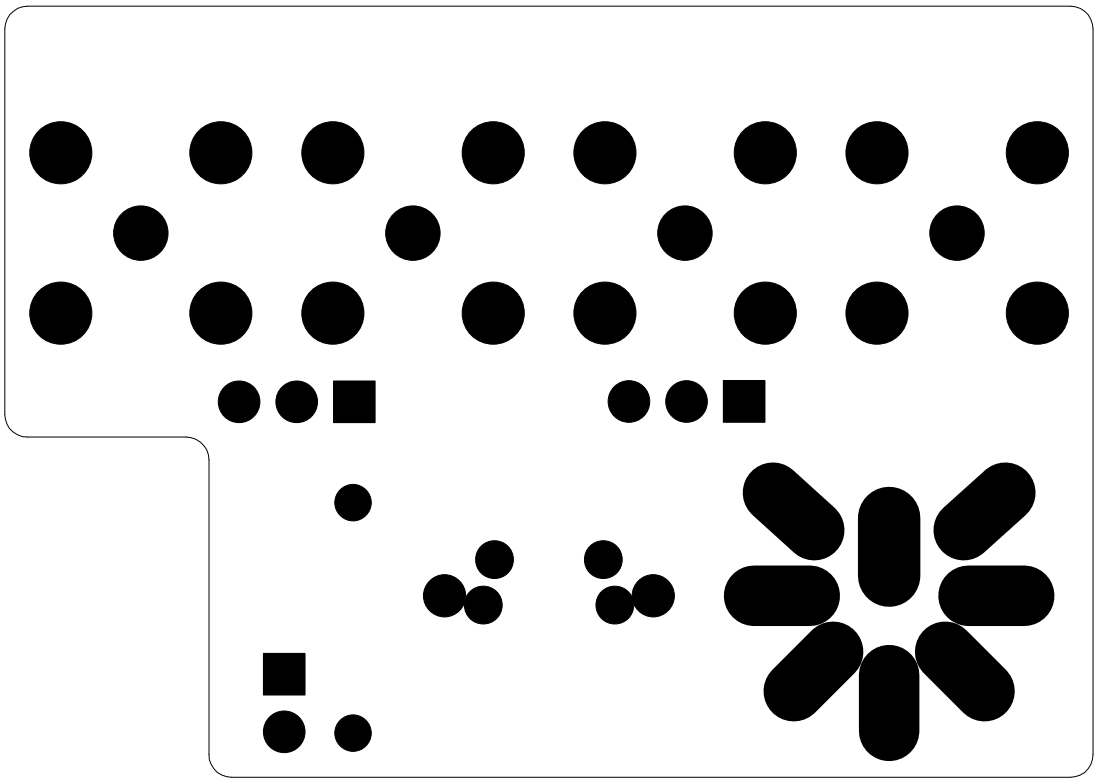

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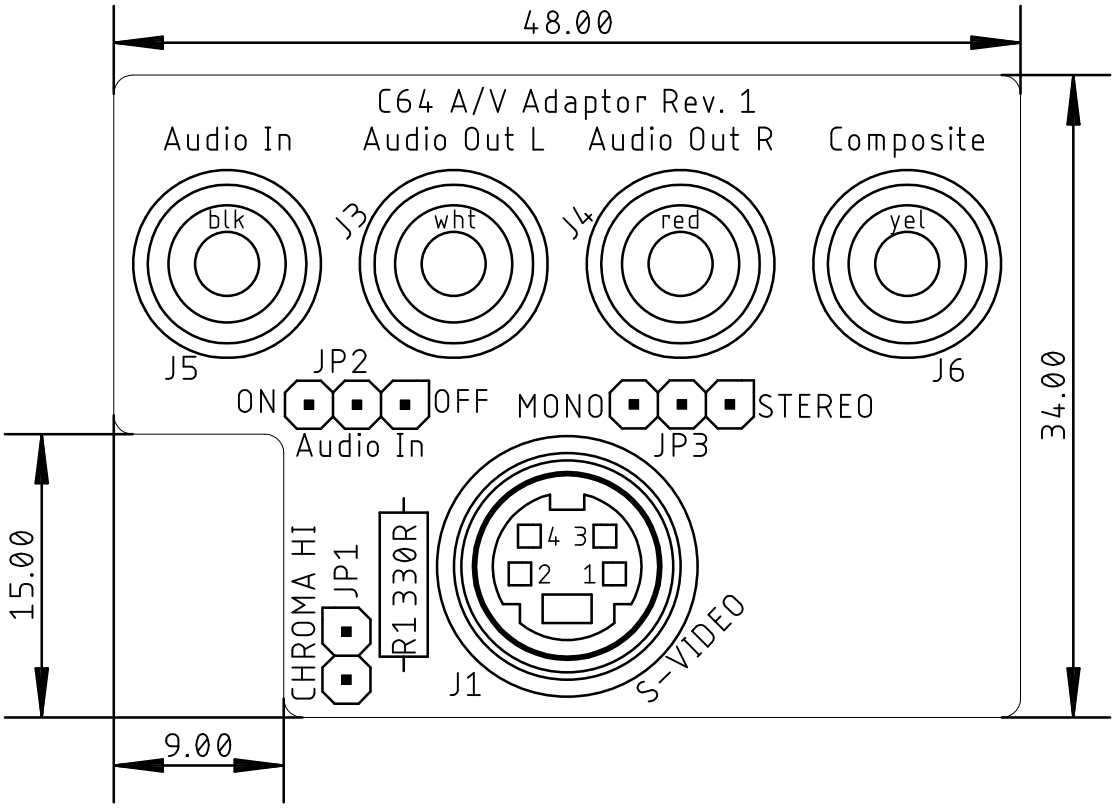

C64 A/V-Adaptor Rev. 1

Testing v0.1

Introduction

The test was conducted with a prototype of the A/V-Adaptor Rev. 0. For the electrical/functional tests a C64G was used.

Tests

Assembly

The prototype was assembled, all footprints worked out. The DIN plug was assembled using the spacer, which was cut off the PCB. This worked well, too.

Mechanical fitting

The A/V-Adaptor was installed on a classic bread bin and a C64C. Both case versions work well with the prototype. It is required to install the DIN plug with a distance to the bottom side of the PCB to get deep enough into the video jack of the C64 to obtain a stabile seating.

Functional testing

The A/V-adaptor was connected to the C64 and a software was loaded. The jumpers were set to

Jumper	Setting
JP1 (Chroma Hi)	Open (=330R resistor not bridged)
JP2 (Audio in)	Off (audio in → GND)
JP3 (mono/stereo)	Mono (both audio channels connected to J2, Pin 3)

Test	Result	Testing
S-Video cable connected	The displayed image was clear and not distorted	Ok
Audio cable	Both speakers had a clear audio output (mono)	Ok
Composite video	The displayed image was clear and not distorted	Ok
Audio input (JP2 → on)	The audio signal connected was passed through the filter.	Ok
Stereo mode	TBD	TBD
Chroma high (s-video), 330R resistor bridged	The quality of the displayed imaged changed. The colors got stronger and slightly distorted. This was expected.	Ok

The stereo mode was **not** tested.

Testing of the 5-pin Version

The version for ASSY326298 was tested in an 8-pin C64. Composite video and the Audio outputs were connected to the Framemeister XRGB mini, the “VIDEO” input was selected. A picture of expected quality was shown, the sound was audible.

The version for VIC-20 was inserted into a VIC-20. Composite video and the Audio outputs were connected to the Framemeister XRGB mini, the “VIDEO” input was selected. A picture of expected quality was shown, the sound was audible.

3D-printed cases

After trimming the solder pins of the RCA jacks, all three versions of the board fit into the bottom shell. The respective top shells could be installed and fit well. The decals (labels) fit on the top shell.

The A/V-Adaptors passed a drop test (a drop of 1m on a table top).

Test Result

The A/V-Adaptor is fully functional.

C64 A/V-Adaptor Rev. 1
Bill of Material Rev. 1.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	132-2-01-01	2 Layer	PCB Rev. 1	2 layer, Cu 35μ, HASL, 48.0mm x 34.0mm, 1.6mm FR4
2	2	1x 3p pin header, pitch 2.54mm	1X03	JP2, JP3	standard pin header, e.g. Reichelt RND 205-00624, not required for 5-pin and VIC-20
3	1	1x 2p pin header, pitch 2.54mm	1X02	JP1	standard pin header, e.g. Reichelt RND 205-00623, not required for 5-pin and VIC-20
4	3	Jumper 2.54mm pitch	jumper	(JP1), (JP2), (JP3)	Jumper (0,1") with holder/latch, e.g. tme.eu: JUMPER-H/B, Farnell: 2396301, Newark: 93K5732 , Reichelt: JUMPER 2,54GL SW. Once each for 5-pin and none for VIC-20.
5	1	330R	R-10	R1	resistor, 0.25W or more, 5% or better. Not required for 5-pin and VIC-20
6	1	BTOR1 (black)	BTOR1	J5	Lumberg, RCA jack, vertical, black. E.G. Reichelt LUM BTOR1 SW, Farnell: 1217030, Newark: 96K7172, TME.eu: BTOR1B, Not required for VIC-20
7	1	BTOR1 RED	BTOR1	J4	Lumberg, RCA jack, vertical, red. E.G. Reichelt LUM BTOR1 RT, Farnell: 1368644, Newark: 53M6863, TME.eu: BTOR1R
8	1	BTOR1 WHITE	BTOR1	J3	Lumberg, RCA jack, vertical, white. E.G. Reichelt LUM BTOR1 WS, Farnell: 1368645, Newark: 53M6864, TME.eu: BTOR1W
9	1	BTOR1 YELLOW	BTOR1	J6	Lumberg, RCA jack, vertical, yellow. E.G. Reichelt LUM BTOR1 GE, Farnell: 1368642, Newark: 53M6865, TME.eu: BTOR1Y
10	1	RTC9028	MINIDIN4_V	J1	Mini-DIN, 4p, vertical. Not required for 5-pin and VIC-20. E.g. AliExpress:
					RTConnector: RTC9028
					ebay.de

C64 A/V-Adaptor Rev. 1
Bill of Material Rev. 1.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
11	1	SV80	SV80_INNER	J2	Inner part of Lumberg 033099 SV 80, e.G. Reichelt: LUM SV 80, Newark: 23AH4043, Farnell: 1321482, TME.eu: SV80, alliedelec.com: 70151558. LUM SV 50 for 5-pin C64 and VIC-20

Rev. History
v0.0 → v0.1
Pos 4 now with latch
three models
v0.1 → v.1.0
Pos 1 PCB revision (no spacer)