

Adapter board V.4.1 for the construction of a KW Transceiver with the Red Pitaya.

Updated version 27.03.2020

Foreword:

The Red Pitaya enjoys the amateur radio community of increasing popularity. Meanwhile, an improved 16-bit version with 50 ohm inputs and outputs meets the requirements of radio amateurs. The board described below is compatible with the new 16 bit Red Pitaya version.

Anyone who has ever worked with the Red Pitaya, certainly knows the problem with the not very elegant cable connection of the two extension sockets E1 and E2. I have already set up some transceivers and the problem too well known for me. To operate it as a KW transceiver, various connections of E 1 and E 2 have be led out and connected to periphery. There are several ways to get connected to the port pins, but unfortunately most of them are unsatisfactory. Wiggle contacts or even short circuits may limit the function. You need a lot of luck not to have the Red Pitaya burned. Soldering is not a good solution either. The connection with the specified 26-pin flat cables and the plugs is not satisfying, too. Pressing a connector to the cable requires the appropriate flat cable, connector, tool and high accuracy. In some cases the cable may end as trash because it was not pressed correctly into the plug. A visually elegant solution isn't it, too. The aim was to have the RP placed directly on the Mainboard 100x160mm without any cable connections and to integrate part of the necessary peripherals for the control of external assemblies at the same time. A simple construction with easy-to-procure components was the main focus. Replication does not require special knowledge or skills. No special tools were needed.

The advantage of such a structure is that the complete wiring of the Red Pitaya is done directly via the post connectors on the board. Wiring errors are impossible. You no longer need to search for pinouts on the Internet and study wiring diagrams. And the inconvenient flat-ribbon connection cable is completely eliminated.

A compact unit is immediately available and can be operated immediately with all functions. I think this is an incentive for all newcomers to get more involved with the Red Pitaya.

The specifications for the board were to integrate a simple and variable accessibility of the required connections, as well as parts of the necessary peripherals equal to on the board.

Properties of the adapter:

- Supply of the 5 V operating voltage via ext. Connector. (not over the small micro USB connector.)
- Two separate 5V outputs. (for relay control and additional modules, such as filters, etc.)
- High-quality integrated fan for the FPGA
- Power connections for integrated and external 5V fans.
- Two potential-free PTT outputs for PA keying and antenna relays.
- Two PTT switched 5V outputs for On Air LED or other application.
- Two PTT outputs which can be switched via bridges either to ground or + 5V
- Ext. PTT-IN Input for PTT switch from micro, or external footswitch.
- BCD code output for controlling the lowpass and bandpass filters for TX and RX.
- Output I²C bus for preamp and audio codec board.
- The audio codec board is firmly integrated on the board.
- Microphone input suitable for electret microphones.
- Stereo headphone output.
- Removal of the two 26-pin flat cables.
- **New in the Version 4.1**
- CW-Connector for Paddle.
- Connector for Preamplifier to DC6HL (-10 dB and -20dB for Attenuator)

Description:

On the board can be found: two miniature relays 2 x Um including the control transistor and a status LED for PTT. Relay 1 is provided with two potential-free outputs for the PTT control. Relay 2 switches 5 V to control additional relays. The 5 V voltage input is indicated by an LED and is protected by a TVS diode 1N5908 and a Micro-Fuse 1.6 A. The diode protects against overvoltage and wrong polarity.

The Red Pitaya is mounted with 4 pieces 25 mm high spacer bolts and is connected via the two post connector directly to the board. No cables are needed.

The required plugs unfortunately are not available everywhere. These are so-called "GPIO Header Extra 2x13 pin. Female" 25mm for the Raspberry Pi.

It is necessary to relieve the solder points on the track side during insertion of the Red Pitaya. This should be done by inserting two thin acrylic strips. The strips with the dimensions 33 x 13 x 2 mm should be pushed between the two contact rows. Finally, the small black plastic strips (supplied with the pin strip) should be plugged back on and fixed with some of superglue. This reliably prevents the solder points on the adapter board from being pressed out of contact when inserting the RP. The FPGA of the Red Pitaya has a distance of 15 mm from the adapter board, so that a 10 mm high fan still finds enough space between them. A fan with the dimensions 40 x 40 x 10 mm with 12V is used. To have the fan run almost noiseless it should be operated by only 5V. The cooling is quite sufficient. For fixing the fan you may use small insulating rings for power transistors. This results in an exact centering of the fan with the 3 mm screws in the 4 mm holes of the fan.

For the other connections, multipolar pin headers of the PSS 254 series with a pitch of 2.54 mm were used. These are inexpensive and easy to procure. This ensures that the required connections are easy to make. The audio codec board is mounted on a 10 pin male connector. It can also be soldered directly to the board. The board is attached with 10 mm spacers. The Red Pitaya itself was deliberately placed all the way back on the board. This makes it possible to plug in the network connector directly when installed in a housing. With large cut-outs in the rear wall of the housing, the USB ports are easy to access and a replacement of the micro-SD card is possible without opening the housing.

I have developed a corresponding board for the project. This professionally manufactured board can be obtained from me, including the two connectors and the acrylic strips. I can also supply various components or ready-assembled and ready-to-use board if required.

Please send inquiries to: info@dc5ww.de. Payment via PayPal is preferred.

My special thanks goes to Sandor DM4DS for support and many helpful hints.

The construction:

You will find a lot of useful information about the Red Pitaya, as well as instructions for building a shortwave transceiver with the RP and downloads at: www.dc5ww.de/red_pitaya.html

Equip the circuit board with care, a desoldering of components is difficult and succeeds only with a special hot air desoldering station.

1. The construction with commercially available components is relatively simple and can be done within 90 minutes. All resistors, capacitors, board connectors, relays, etc. have to be soldered first. Then install the fan with four 3mm (3x15) screws. It has to be mounted around that the airflow runs in direction of the heatsink. That means air flow up to the RP. Test before installation!
There are two soldering points for the internal fan on the board. (Pay attention to the polarity).
Now the 4 pieces are screwed in 25 mm high spacer bolts in such a way that the threads take up the Red Pitaya. That means: the bolts have to be fastened from below with short 3 mm screws.
2. A small hardware change has to be made on the codec board before continue installation. The 1 nF capacitor in the microphone input is much too small and not suitable for low frequencies. It is therefore necessary to solder a 4.7 nF parallel to C 23 (preferably an SMD).

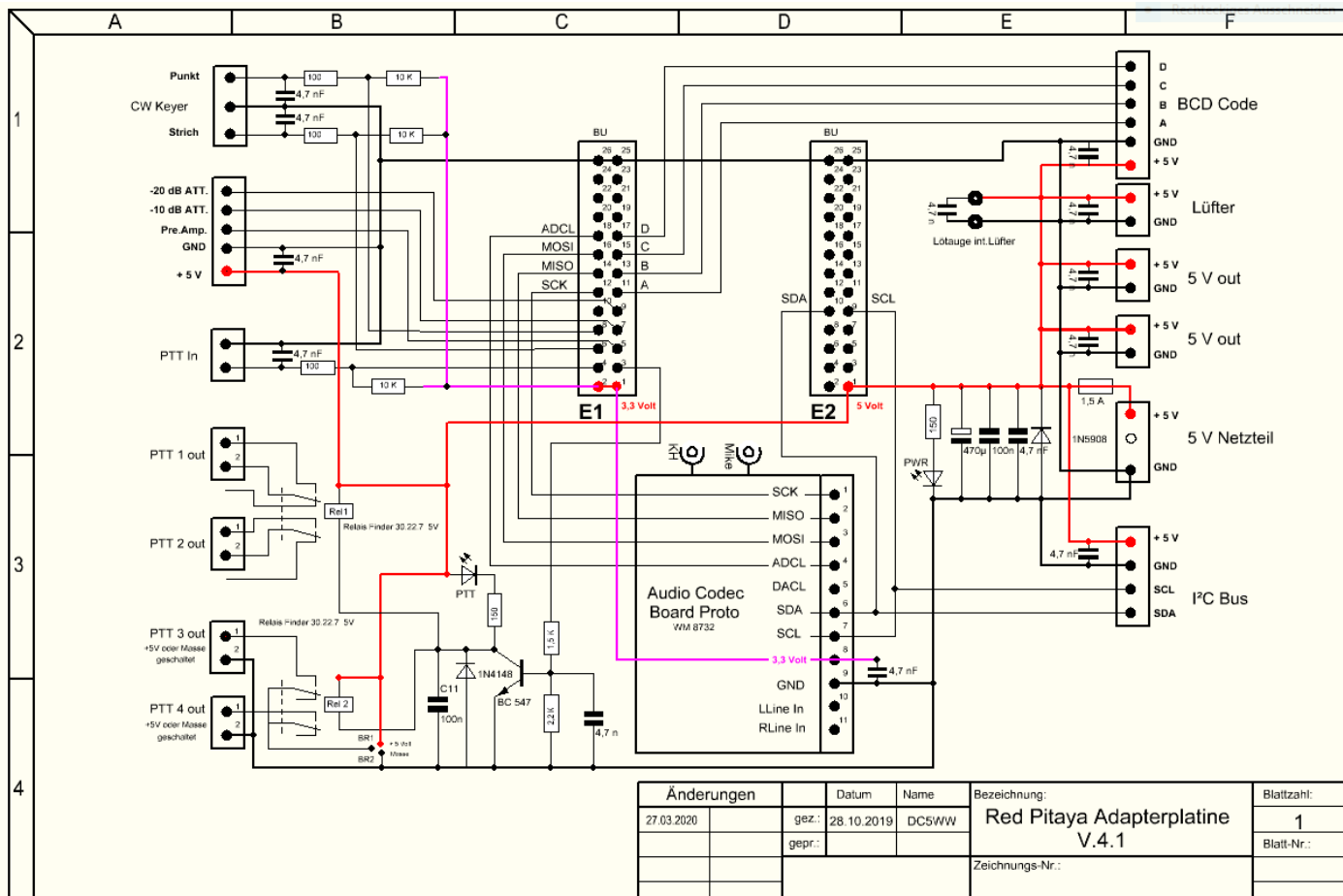
The modification is already done on the codec boards which are supplied by me.

3. Next, you may mount the audio codec board. Attach the 10 mm spacer bolts to the board. The 10 pin female connector has to be soldered to the PCB. Solder the pin header supplied with the audio codec board and plug the board into the socket header. Make sure everything is seated correctly and flush.
For later use, please note that the 3.5mm sockets should not be stressed mechanically, because the solder joints on the sockets may break loose and malfunction results.
4. Now the Plexiglas strips have to be attached "centered" (as described above) to the power strip E1 and E2 of the Red Pitaya. The post connector is placed somewhat difficult on the pin headers. Pay attention not bend any pins. Now, you can put the Red Pitaya on the threads of the distance bolts. At the same time the solder pins are carefully inserted into the solder pads on the board. Make sure that everything is flush. There must be no misalignment between the socket strip and the bolts. Check the solder side of the board to see if all contacts are stucked through the pads. Solder only a few pins and check. If everything is right, you can solder the strips completely.
5. Carefully pull out the Red Pitaya again. Connect the 5 Volt power supply to the board and check that the voltage is applied correctly.
 If the 5V control LED is lit, the Red Pitaya can be reconnected and screwed to the board.
6. It is recommended to prepare a small and thin cover plate of acryl in the size of the Red Pitaya to protect the track side of the board. Since the conductor side points upward it should be protected against contact (or falling screws, connectors, etc.).
 Remember: the SMA sockets are now mirrored.
 A label on the acryl plate cover prevents confusion of the sockets.

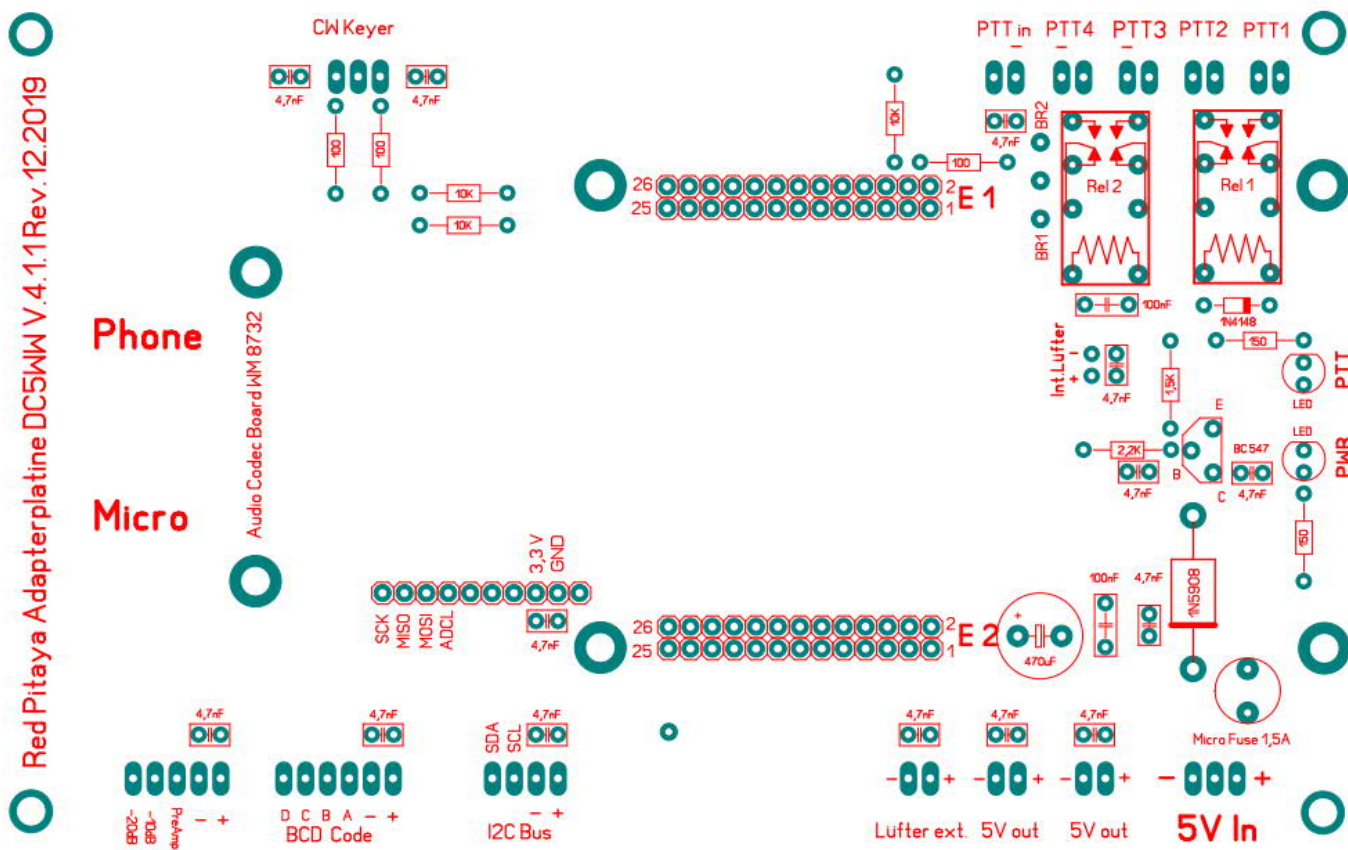
Parts and suppliers

Amount	Description	Supplier	Order-No.
1	Adapterplatine für Red Pitaya	www.dc5ww.de	
2	Stapelleisten 2 x 13 pol. 25 mm hoch	www.horter.de	RPI-PLs26
1	Audio-Codec-Board WM8732 Entwicklungsboard MikroElektronika MIKROE-506	www.voelkner.de	A592471
Alternate supplier	Audio Codec-Board WM8732 Entwicklungsboard MikroElektronika MIKROE-506	www.conrad.de	1221370 - 62
1	Fan 12 V 40x40x10 mm Hersteller (Sunon EE40101S1-000U-999)	www.voelkner	Q62485
2	Finder Relais 2 x Um Typ 30.22.7.005 5Volt	www.voelkner.de	S75677
4	Distanzhülsen 3 x 25 mm 1 x Innengewinde / 1 x Außengewinde	www.reichelt.de	DA 25MM
2	Distanzhülsen 3 x 10 mm 2 x Innengewinde	www.reichelt.de	DI 10MM
6	2 pol. Stecker	www.reichelt.de	PSS 254/2G
6	2 pol. Kupplung	www.reichelt.de	PSK 254/2W
1	3 pol. Stecker	www.reichelt.de	PSS 254/3G
1	3 pol. Kupplung	www.reichelt.de	PSK 254/3W
1	4 pol. Stecker	www.reichelt.de	PSS 254/4G
1	4 pol. Kupplung	www.reichelt.de	PSK 254/4W
1	6 pol. Stecker	www.reichelt.de	PSS 254/6G
1	6 pol. Kupplung	www.reichelt.de	PSK 254/6W
30	PSK Kontakte für Kupplungen	www.reichelt.de	PSK Kontakte
1	Buchsenleiste 10 polig RM 2,54 Höhe 5,0 mm	www.reichelt.de	BL 1X10G 2,54
1	Micro-Fuse 1,5 A Flink RM 5,0	www.reichelt.de	FRT-F 1,6A
1	TVS Diode 1N5908	www.reichelt.de	1N5908
10	Ker. Condenser 4,7 nF RM 2,5	www.Reichelt.de	Kerko 4,7 N
2	Ker. Condenser 100 nF RM 5,0	www.Reichelt.de	Kerko 100 N
1	NV-Elko 470 µF /16V Ø 10 mm H12,5 mm RM 5,0	www.Reichelt.de	RUBY 35PX470MT81
1	Universal-NPN-Transistor BC 547 o-Ahnl.	Tinkerbox	
Div.	Restistor ¼ W RM 10	Tinkerbox	

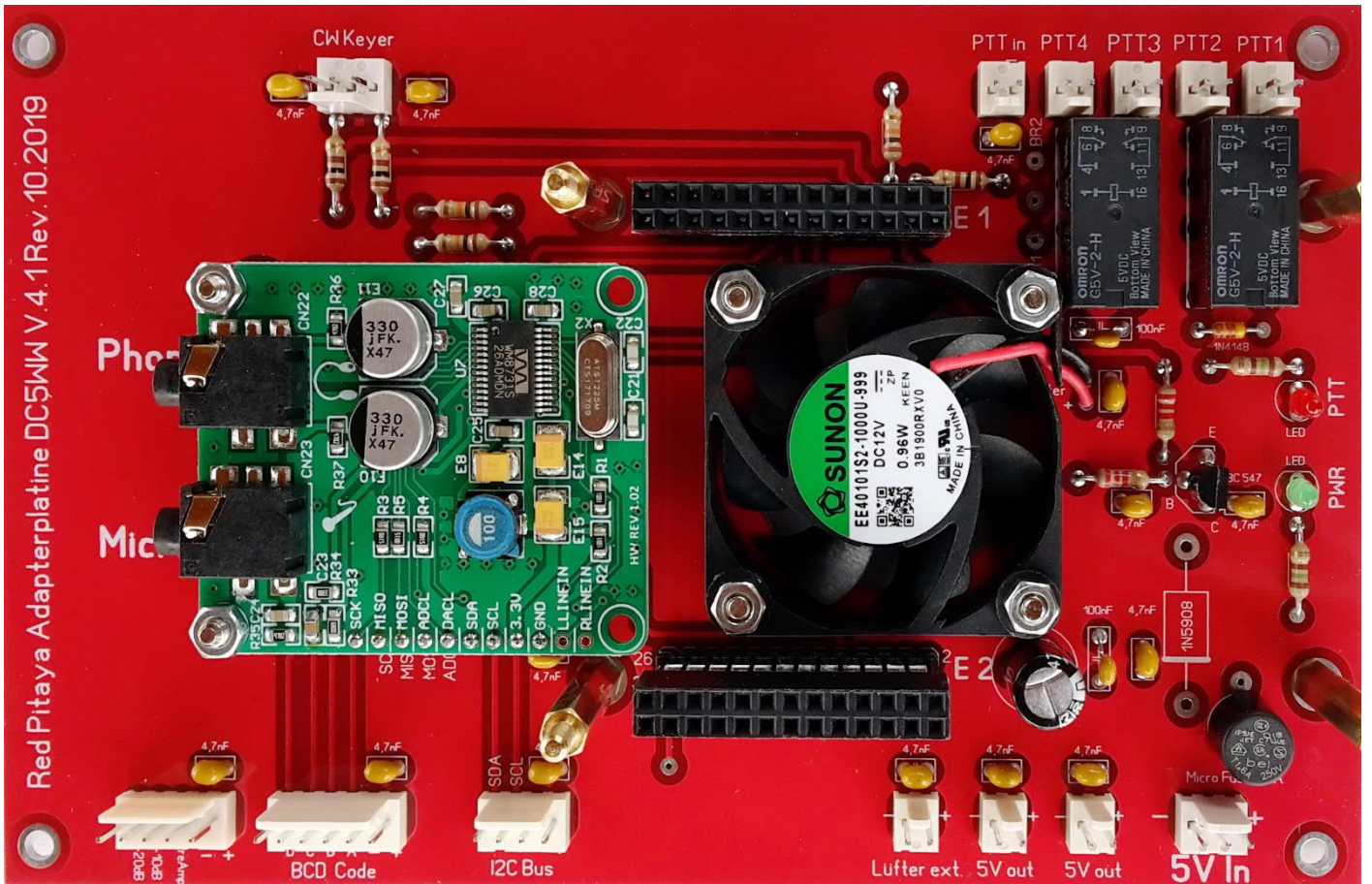
Circuit Diagram V.4.1



Component Schema V.4.1



Board equipped with Fan and Connectors.



Circuit board with Red Pitaya and Codec-Board.

