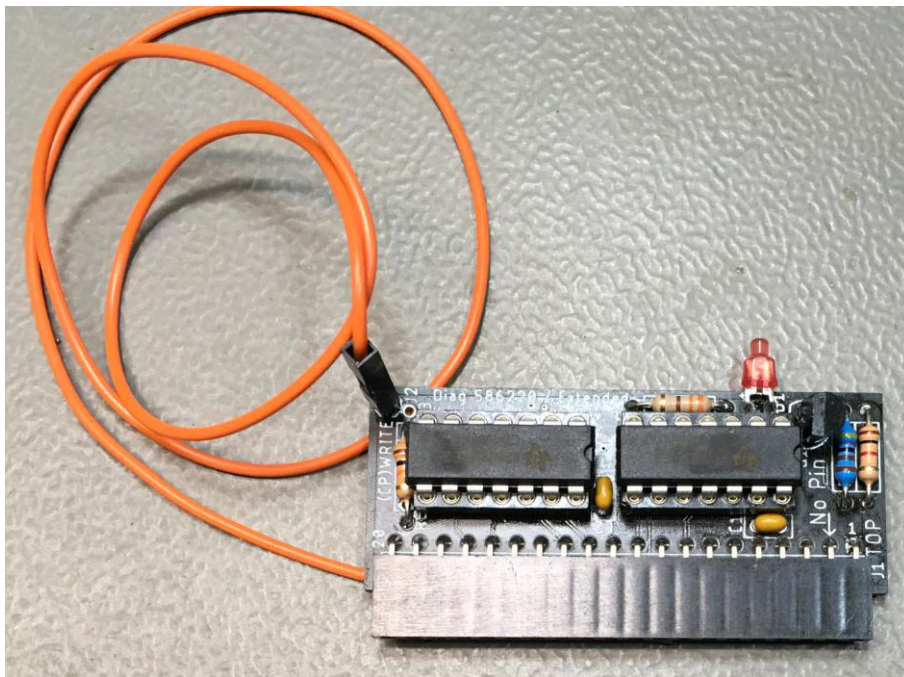# Project Documentation

Diagnostic Rev. 586220 – Extended Keyboard Dongle

Project number: 143

Revision: 1

Date: 11.03.2020

Diagnostic 586220 Harness - Keyboard Dongle Extended Rev. 1

Module Description

Introduction

The extended Keyboard Dongle is meant to be an extension to existing Diagnostic Harnesses. It prevents the false OK when testing the control ports, while the keyboard PCB is inserted. This is accomplished by analog switches for the feedbacks, that are in common with the joystick signals on the control ports.
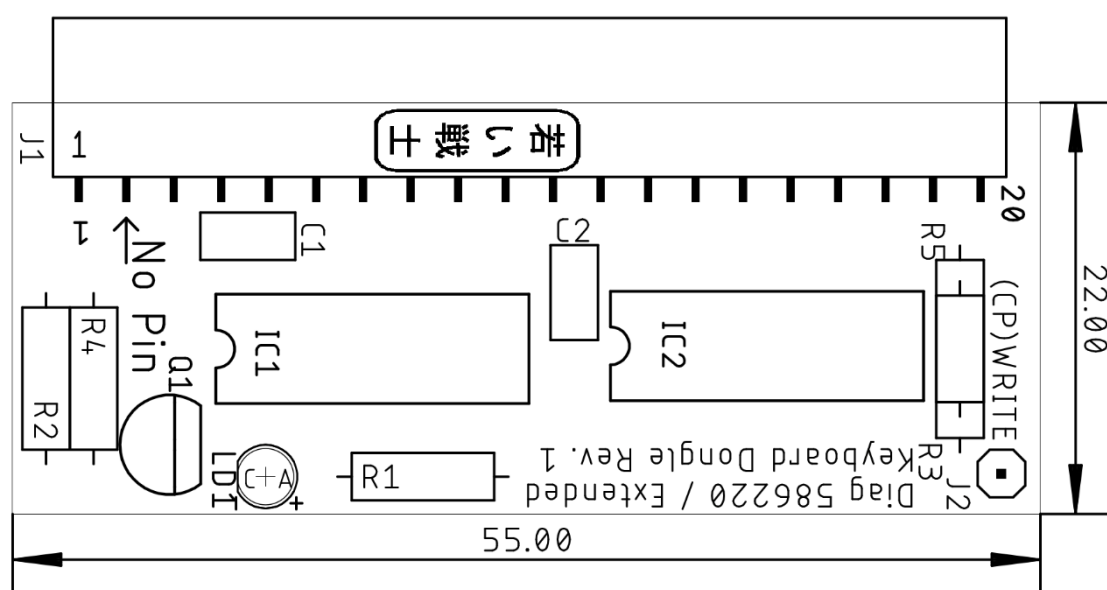

Figure 1: Dimensions of the PCB

The extended Keyboard Dongle for Diagnostic 586220 provides the required feedback connections for testing the C64's CIA U1, which the keyboard is connected to. An LED serves as an alternative power and operation indicator. It is normally on and switches off while testing the Control Ports.

The Restore key is connected to a dedicated line and is not tested.

What does Extended Keyboard PCB do better than the normal keyboard PCB?

As long as the old keyboard dongle is connected to the keyboard header, the feedbacks bridge the analog switches for testing the control ports. These analog switches are found on the User Port PCB. They are inside the two 4066 ICs there.
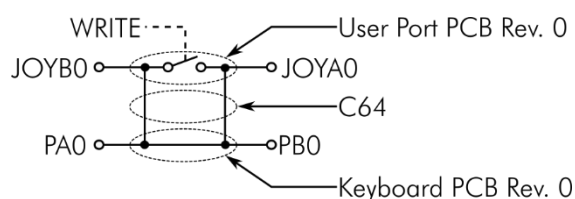

Figure 2: Test situation with the original diagnostic harness

For properly testing the control ports, the old keyboard dongle has to be removed. This way, the test actually requires two passes. Otherwise, the control ports are tested improperly. A broken trace to the control port or a defective port connector would not be detected.

The extended Keyboard Dongle provides switched feedbacks for the signals, that are shared with the joysticks.
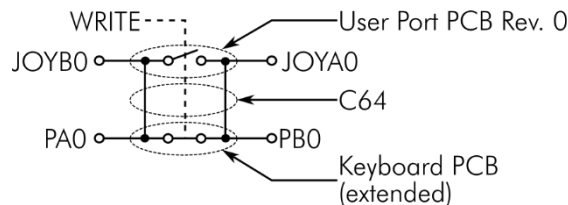

Figure 3: Test situation with the extended Keyboard Dongle

These are PB0↔PA0, PB1↔PA1, PB2↔PA2, PB3↔PA3 and PB4↔PA4. The switches are opened by a (cassette port) WRITE signal going high, which also closes the connection on the user port dongle at the same time. The reason is, that

This WRITE signal is generated via a voltage divider on the user Port Dongle, which is also fed back to the Cassette Port Dongle. It can be found on Pin 5 of the cassette edge connector (on every kind of test harness). An existing harness can be easily modified by soldering a 40cm Dupont cable to the indicated Pin (refer to Figure 4), which is then connected to J2 (one pin) of the extended Keyboard Dongle.
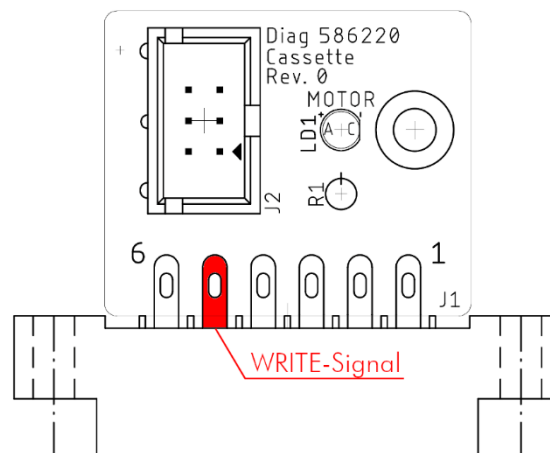

Figure 4: Locating the Write signal

In case this cable is not connected, the extended Keyboard Dongle shows a behavior, that depends on which resistor R3 or R5 is placed. In case R3 is placed, it works like a normal keyboard dongle. The analog switches are closed.

In case R5 is placed, the keyboard feedbacks are open in case J2 is not connected. The test would report keyboard "BAD" (not open, since 3 feedbacks are still present). This might be the preferred behavior, since it indicates that the test did not work properly due to a lack of WRITE signal on this dongle. The LED is switched off, too.

The open state of the switches is indicated by the LED, which is off while testing the control ports (this needs to be observed).

The extended Keyboard Dongle works with all versions of the standard Diagnostic 586220 software. A modification of the software is not required.

Figure 5: The Extended Keyboard Dongle on an ASSY 250469

Connections

J1: 20p receptacle (pitch 2.54mm)

Pin	Signal		Signal	Pin
5	PB3	↔	PA3	17
6	PB6	↔	PA6	14
7	PB5	↔	PA5	15
8	PB4	↔	PA4	16
9	PB7	↔	PA7	20
10	PB2	↔	PA2	18
11	PB1	↔	PA1	19
12	PB0	↔	PA0	13

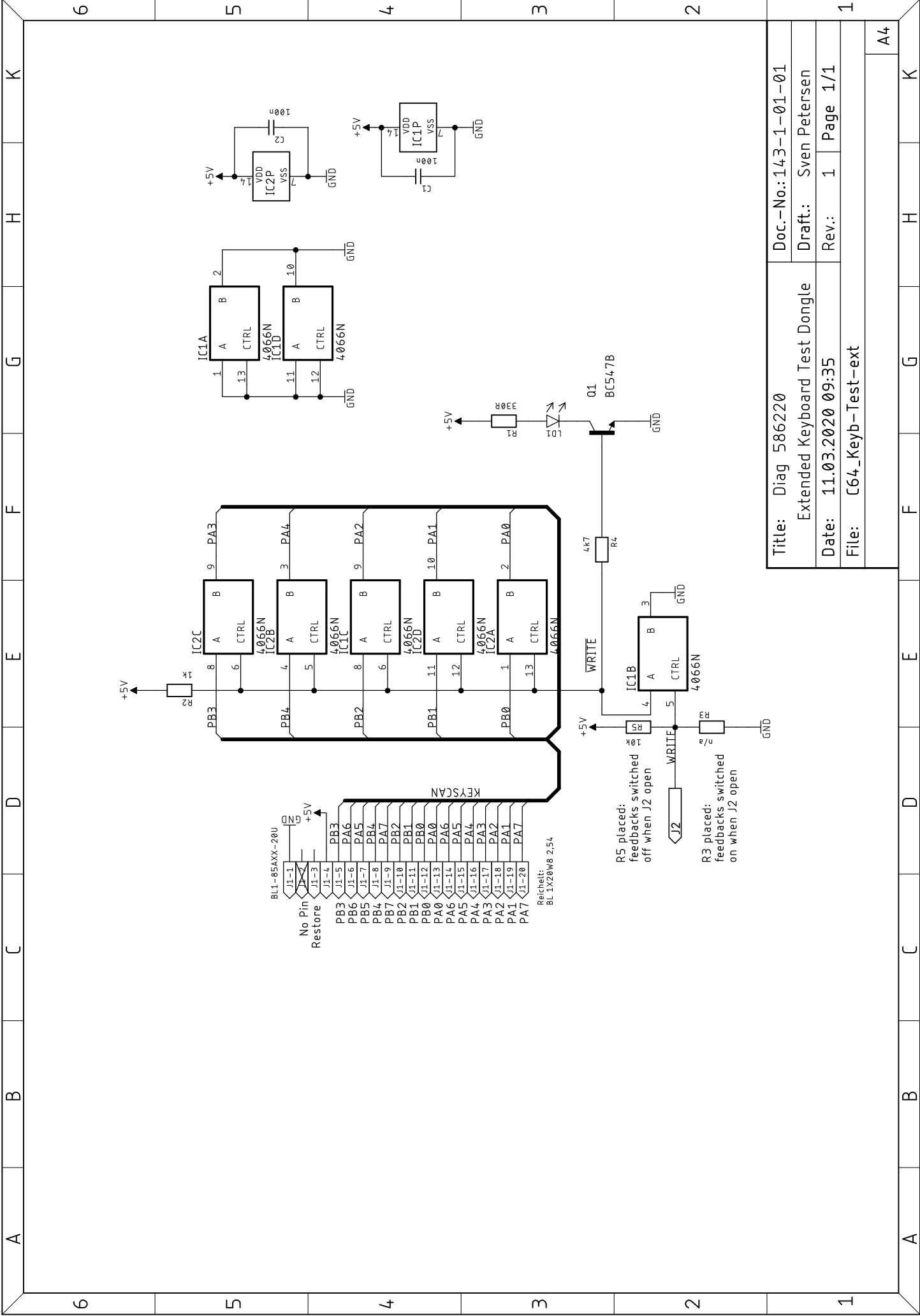J2: Single pin (DuPont). Input for the WRITE signal from the Cassette Port (Dongle).

Revision History

Rev. 0
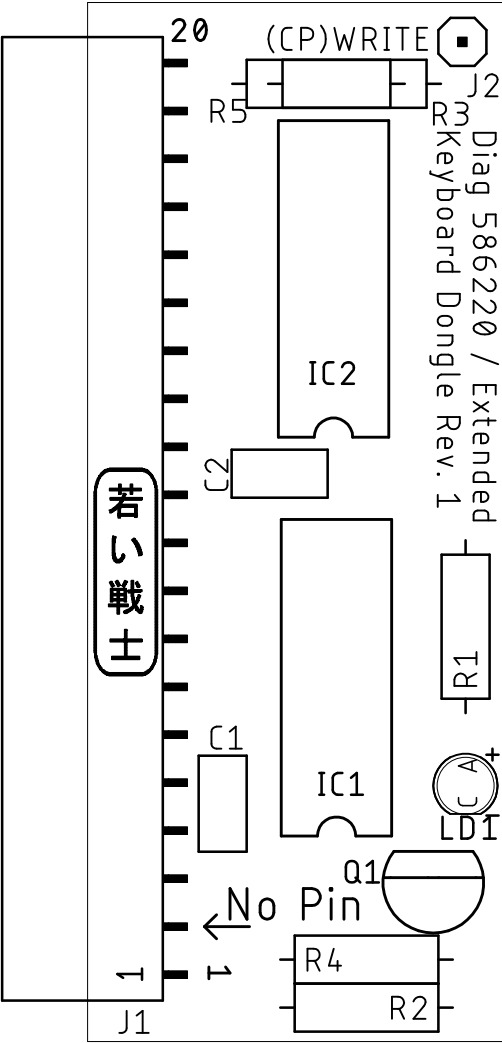Prototype. It requires a modification for working properly (see document 143-6-02-00).

Rev. 1
- Board revision
- Required modifications (tested on Rev. 0)
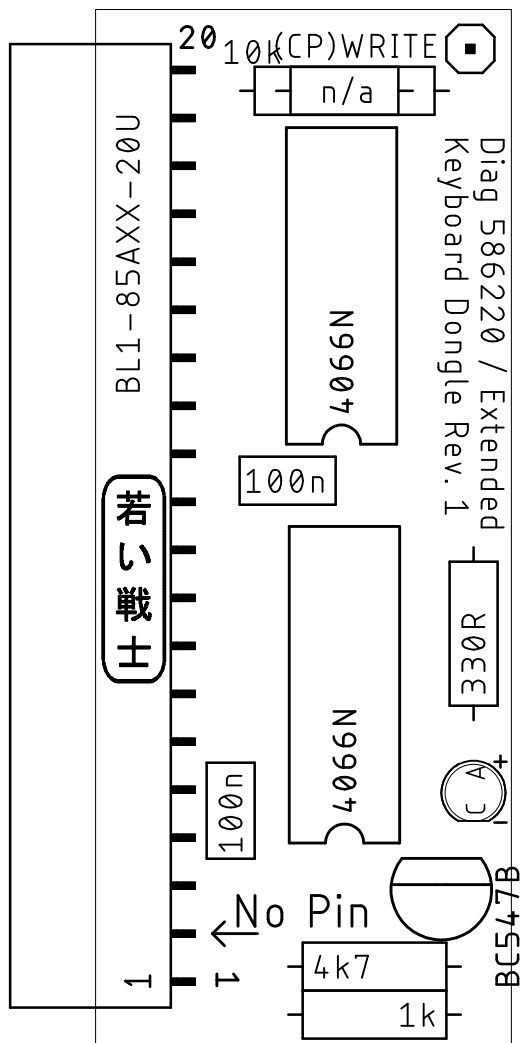- R5 is new for a choice of behavior while J2 (WRITE) is open

Title block:

Doc.-No.:143-1-01-01	
Draft.:	Sven Petersen
Rev.:	1	Page 1/1

Title: Diag 586220
Extended Keyboard Test Dongle
Date: 11.03.2020 09:35
File: C64_Keyb-Test-ext

A4

Component labels and notes:

IC2P, IC1P — VDD/VSS, 100n (C2), 100n (C1), +5V, GND

IC1A B 2, CTRL, 4066N, A 1 13
IC1D B 10, CTRL, 4066N, A 11 12, GND

IC2C B 9 PA3, CTRL, 4066N, A 8 6, PB3
IC2B B 3 PA4, CTRL, 4066N, A 4 5, PB4
IC1C B 9 PA2, CTRL, 4066N, A 8 6, PB2
IC2D B 10 PA1, CTRL, 4066N, A 11 12, PB1
IC2A B 2 PA0, CTRL, 4066N, A 1 13, PB0

IC1B A 4, B 3, CTRL 5, 4066N, GND
R5 10k, R3 n/a, +5V, WRITE, GND
J2

R5 placed:
feedbacks switched
off when J2 open

R3 placed:
feedbacks switched
on when J2 open

R2 1k, +5V
R1 330R, LD1, Q1 BC547B, R4 4k7, WRITE, +5V, GND

KEYSCAN

BL1-85AXX-20U
J1-1 GND
J1-2 +5V
J1-3
J1-4 PB3
No Pin
Restore
J1-5 PB3
J1-6 PA6
J1-7 PA5
J1-8 PB4
J1-9 PA7
J1-10 PB2
J1-11 PB1
J1-12 PB0
J1-13 PA0
J1-14 PA6
J1-15 PA5
J1-16 PA4
J1-17 PA3
J1-18 PA2
J1-19 PA1
J1-20 PA7

PB3 PB6 PB5 PB4 PB7 PB2 PB1 PB0 PA0 PA6 PA5 PA4 PA3 PA2 PA1 PA7

Reichelt:
BL 1X20W8 2,54

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.: 1	
placement component side		

20
(CP)WRITE
J2
R5
R3
Diag 586220 / Extended
IC2
Keyboard Dongle Rev. 1
C2
R1
C1
IC1
LD1
A
Q1
No Pin
R4
1   1
R2
J1

若い戦士

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.: 1	
placement component side		

R5 and R3 can be placed alternatively
R5 is the left pads,
R3 is the right pads.

20 10K(CP)WRITE

n/a

BL1-85AXX-20U

若い戦士

Diag 586220 / Extended Keyboard Dongle Rev. 1

4066N

100n

4066N

330R

100n

No Pin

BC547B

4k7

1k

1

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.: 1	
top		

TOP

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.: 1	
stopmask component side		
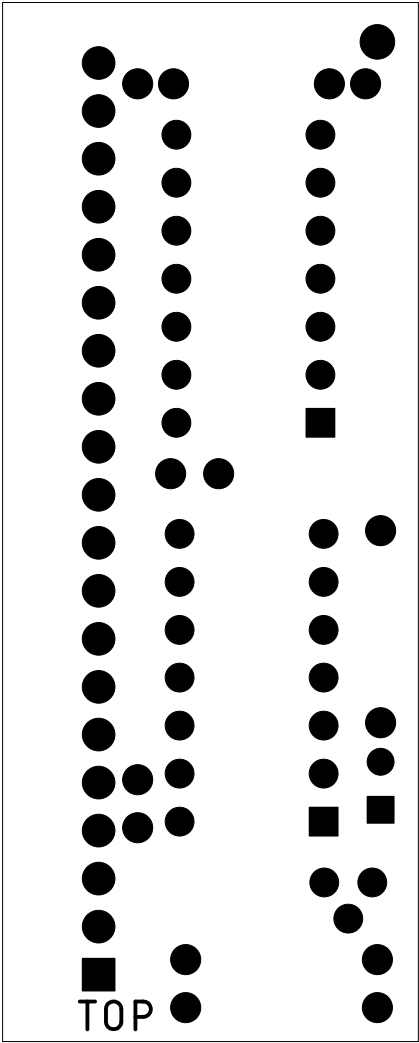
TOP

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
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C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.: 1	
stopmask solder side		

Sven Petersen 2020	Doc.-No.: 143-2-01-01	
	Cu: 35µm	Cu-Layers: 2
C64_Keyb-Test-ext		
11.03.2020 09:38	Rev.:	1
placement component side measures		

22.00

55.00

20

(CP)WRITE

J2

R5

R3

Diag 586220 / Extended
Keyboard Dongle Rev. 1

IC2

C2

若い戦士

R1

C1

IC1

C+A

LD1

Q1

No Pin

1

1

R4

R2

J1
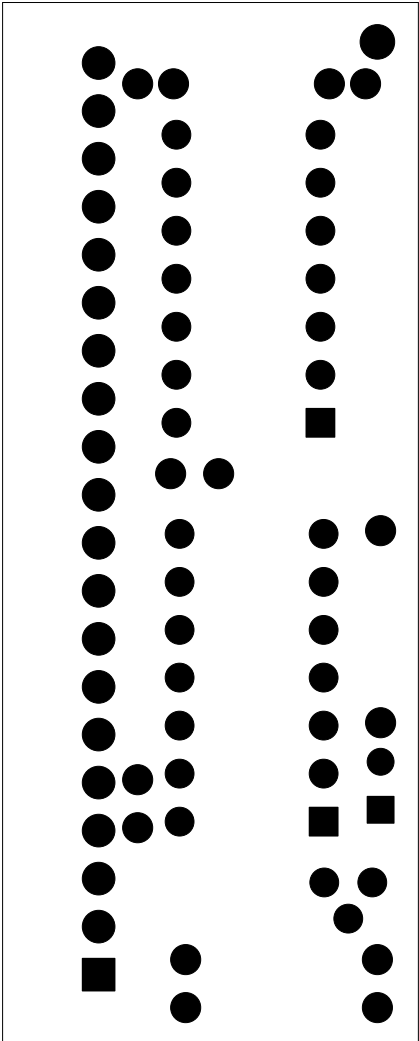
Diagnostic 586220 Harness - Keyboard Dongle Extended Rev. 1

Testing

The **Rev. 0** prototype was not functional and required a modification to work properly.

R2 had to be changed from 10k to 1k and an additional resistor (R4) had to be inserted between the pull up and the base of Q1.
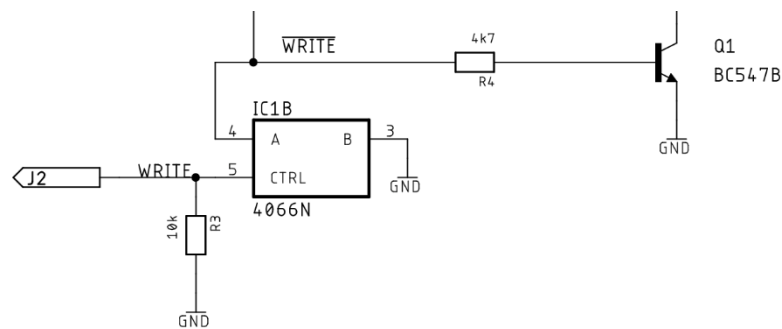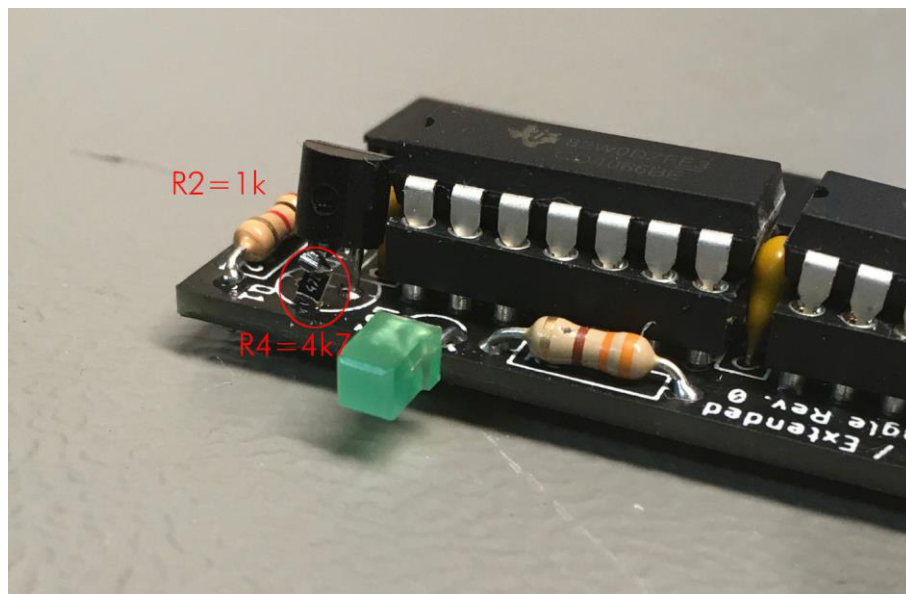

Figure 1: Required modification on Rev. 0

Figure 2: Modified Board Rev. 0

The modified Extended Keyboard Dongle was connected to a C64 (ASSY250469) instead of a Keyboard Dongle Rev. 0. The rest of the Diagnostic Harness was also connected to the C64. J2 (for the WRITE signal) was left open. The diagnostic Rev. 586220 test was running as usual, the keyboard and the control port were reported "OK".

The WRITE signal was connected to J2. The test was repeated, both, the Control Ports and the Keyboard were reported "OK".

IC2 was extracted from the socket (= four missing keyboard feedbacks). The test was repeated and the keyboard was reported "BAD". IC2 was re-installed.

IC1 on the User Port Dongle was extracted from the socket (= four missing control port feedbacks). The test was repeated and the control ports were reported "BAD".

WRITE was disconnected from the Extended Keyboard Dongle. The test was repeated and the Control Ports were reported "OK" (which is a false OK, because the feedbacks are missing). IC1 was reinstalled on the User Port Dongle. WRITE was connected to J2.

Finally, a 3 hours test run was performed, no problems were reported.

The <u>modified</u> Extended Keyboard Dongle Rev. 0 is fully functional. <u>A PCB revision is required.</u>

Rev. 1 was built and tested. Without the cable to the write signal, the feedbacks are open (R5 is placed), the keyboard is reported as "BAD". With the WRITE signal connected, the keyboard is reported "OK", the LED is normally on and goes off three times per test pass.

Rev. 1 is fully functional.

Diagnostic Rev. 586220 Harness - Extended Keyboard Dongle Rev. 1
Bill of Material Rev. 1.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	143-2-01-01	2 Layer	PCB Rev. 1	2 layer, Cu 35µ, HASL, 22.0mm x 55.0mm, 1.6mm FR4
2	1	3mm green	3MM	LD1	LED
3	1	pin header 1x1p	1X01	J2	standard, suitable for dupont pin
4	2	100n	C-5	C1, C2	ceramic cap, 2.5mm pitch
5	1	n/a	R-10	R3	1/4 Watt, 5%
6	1	330R	R-10	R1	1/4 Watt, 5%
7	2	HCF4066B	DIL14	IC1, IC2	ST Micro or equivalent
8	1	BC547B	TO92	Q1	NPN Transistor
9	1	BL1-85AXX-20U	BL1-85AXX-20U	J1	e.g. MPE Garry, Reichelt BL 1x20W8 2,54
10	1	1k	R-10	R2	1/4 Watt, 5%
11	1	4k7	R-10	R4	inserted between the base pad and the base of Q1
12	1	10k	R-10	R5	1/4 Watt, 5%

Rev. History

Rev. 0.0 → Rev. 0.1

Pos 10 value of R2
Pos 11 R4 is new

Rev. 0.1 → Rev. 1.0

Pos 1 Board Revision
Pos 3 n/a
Pos 11 integrated into layout
Pos 12 new