Project Documentation

Diagnostic Rev. 586220 Harness - User Port

Project number: 113

Revision: 0

Date: 28.02.2019

Diagnostic Rev. 586220 Harness - User Port

Module Description

The User Port module is the central part of the Diagnostic Rev. 586220 harness. It provides the required feedback connections for testing the C64's CIA U2, which is connected to the user port. It also holds the analog switches, which are required to test the Control Ports and the feedback connections for testing the cassette port.

The MOTOR output signal of the cassette port has approximately a 6V level. To use it as a control signal for operating logic devices, a voltage divider consisting out of a 150Ω resistor and a 320Ω (316Ω works here, 330Ω should work as well) resistor is required, which has a ratio of about 0.7.

This way, the MOTOR signal is fed back to the WRITE pin and is also used for switching the analog switches between the joystick signals of both control ports.

Pin Outs

User Port

J1- Edge Connector (2x12, 3.96mm pitch)

Pin	Signal	Pin	Signal
1	GND	A	GND
2	+5V	B	/FLAG2
3	/RESET	C	PB0
4	CNT1	D	PB1
5	SP1	E	PB2
6	CNT2	F	PB3
7	SP2	H	PB4
8	/PC2	J	PB5
9	ATN	K	PB6
10	9VAC(1)	L	PB7
11	9VAC(2)	M	PA2
12	GND	N	GND

Cassette Port

J2 – 2x3 pin header for a ribbon cable connected to the cassette port PCB (project number 114).

Pin	Signal	Pin	Signal
1	GND	2	n.c.
3	MOTOR	4	READ
5	WRITE	6	SENSE

Control Port #1

J3 – 2x5 pin header for a ribbon cable which connects via a D-SUB 9 (female) to the control port.

Pin	D-*SUB*	Signal	Pin	D-*SUB*	Signal
1	1	JOYA0 (up)	2	6	FIREA
3	2	JOYA1 (down)	4	7	+5VCTR1
5	3	JOYA2 (left)	6	8	n.c. (GND)
7	4	JOYA3 (right)	8	9	POTXA
9	5	POTYA	10	-	n.c.

Control Port #2

J4 – 2x5 pin header for a ribbon cable which connects via a D-SUB 9 (female) to the control port.

Pin	D-*SUB*	Signal	Pin	D-*SUB*	Signal
1	1	JOYB0 (up)	2	6	FIREB
3	2	JOYB1 (down)	4	7	+5VCTR2
5	3	JOYB2 (left)	6	8	n.c. (GND)
7	4	JOYB3 (right)	8	9	POTXB
9	5	POTYB	10	-	n.c.

Interconnects

User Port

Pin	Signal		Signal	Pin
4	CNT1	↔	CNT2	6
5	SP1	↔	SP2	7
8	/PC2	↔	/FLAG2	B
9	ATN	↔	PA2	M
C	PB0	↔	PB4	H
D	PB1	↔	PB5	J
E	PB2	↔	PB6	K
F	PB3	↔	PB7	L

Cassette Port

Pin	Signal		Signal	Pin
3	MOTOR	Volt.div.	WRITE	5
4	READ	↔	SENSE	6

Control Ports

Signal		Signal
FIREA	switched by MOTOR	FIREB
JOYA0	switched by MOTOR	JOYB0
JOYA1	switched by MOTOR	JOYB1
JOYA2	switched by MOTOR	JOYB2
JOYA3	switched by MOTOR	JOYB3
POTXA	via 110kΩ (R1)	+5V (CTR 1)
POTYA	via 110kΩ (R2)	+5V (CTR 1)
POTXB	via 110kΩ (R5)	+5V (CTR 2)
POTYB	via 110kΩ (R6)	+5V (CTR 2)

The digital signals of the control ports are connected by an analog switch. A HIGH level of the MOTOR signal will switch on.

The POT (paddle) signals are tested with a fix resistor of 110k, that is connected to the +5V provided by the respective control port.

Cables

User Port/Cassette Port Cable

One cable as shown in Doc.-No. 113-3-01-00 is required. It connects to J2.

User Port/Control Cables

Two cables as shown in Doc.-Nr. 113-3-02-00 are required. They connect to J3 and J4.

The IEC-Dongle

The IEC-Dongle is not attached to the PCB, it is an extra built.

6p. DIN plug, connect according to Doc.-No. 113-3-03-00

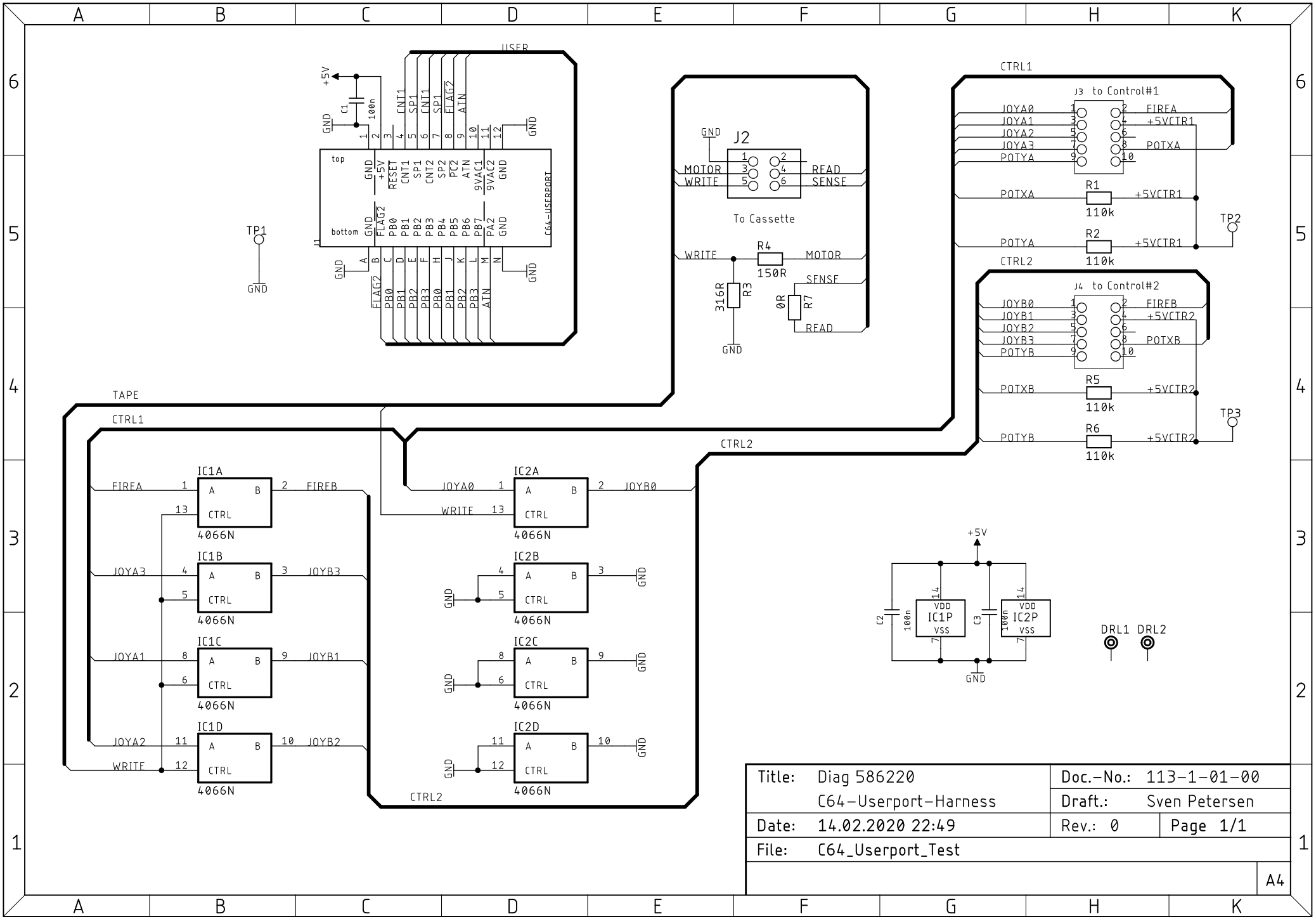
Pin	Signal		Signal	Pin
1	SRQ	↔	DATA	5
3	ATN	↔	CLK	4

Revision History

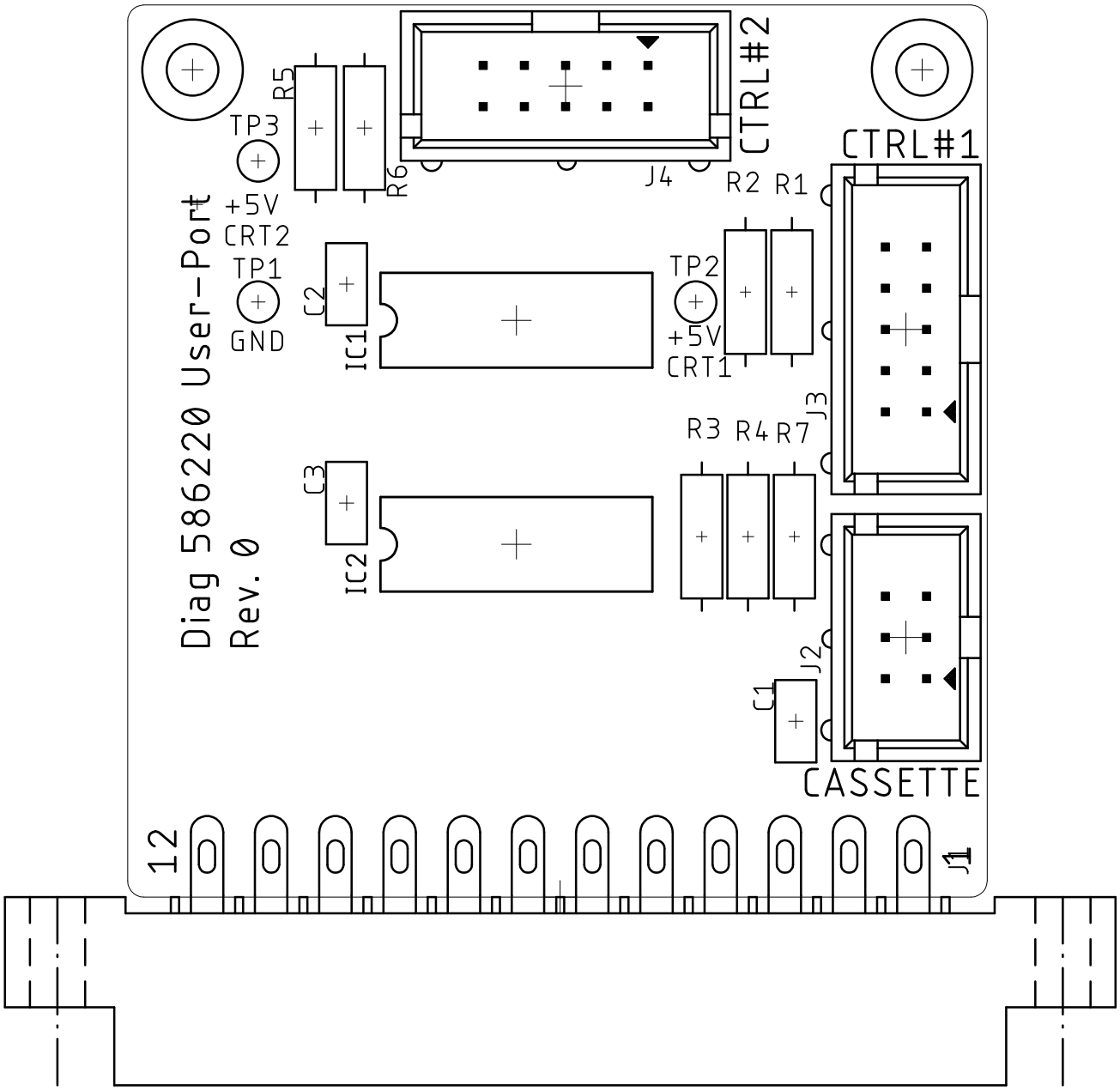
BOM v0.1 → v0.2

Pos. 6: value 120k →110k

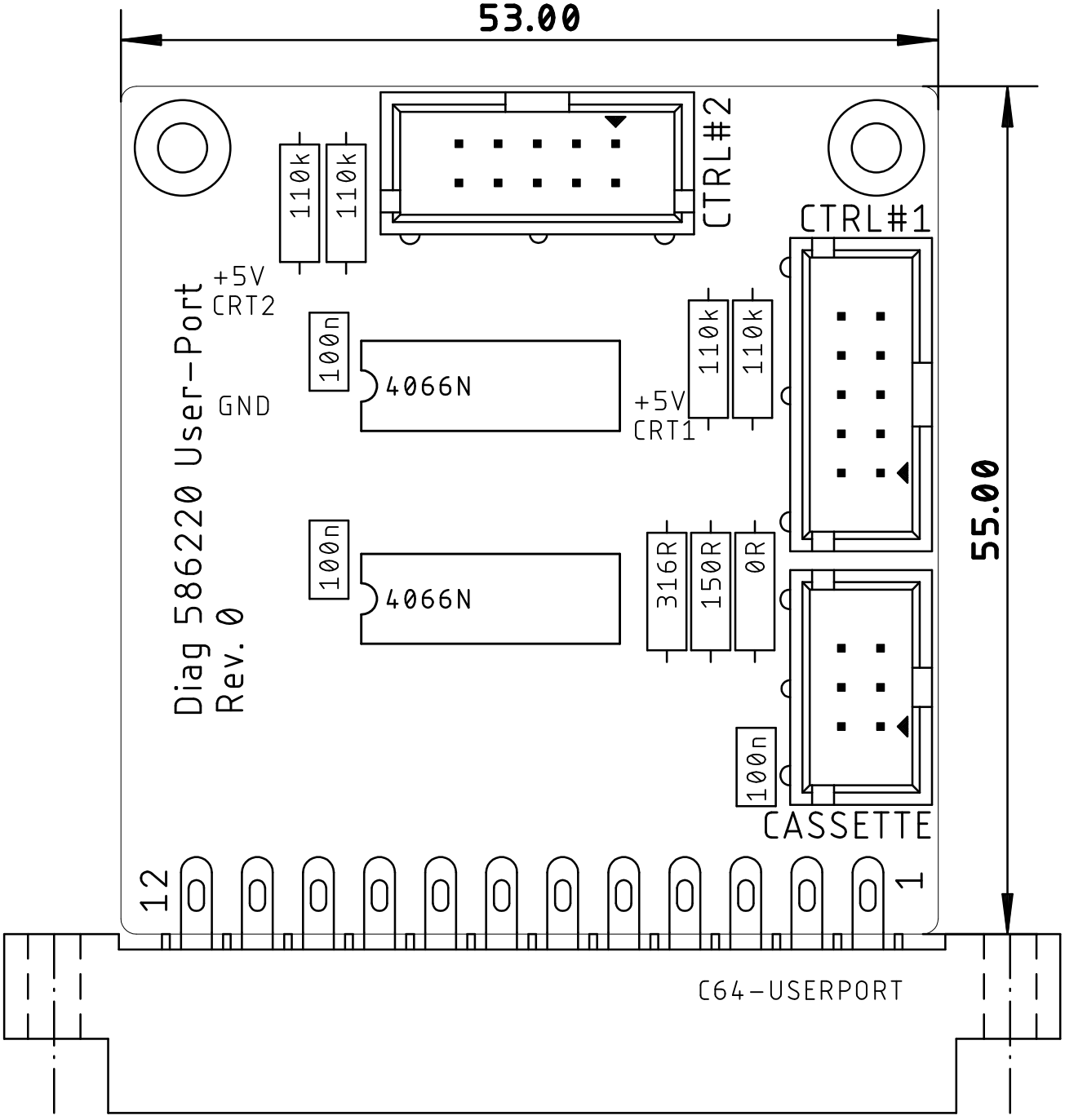
Pos. 8: value 320R →316R


USER
top
bottom
C64-USERPORT
J1
J2
MOTOR
WRITE
READ
SENSE
To Cassette
R4
150R
316R
R3
0R
R7
TP1
TP2
TP3
CTRL1
CTRL2
J3 to Control#1
J4 to Control#2
JOYA0
JOYA1
JOYA2
JOYA3
POTYA
FIREA
POTXA
+5VCTR1
R1
R2
110k
JOYB0
JOYB1
JOYB2
JOYB3
POTYB
FIREB
POTXB
+5VCTR2
R5
R6
TAPE
IC1A
IC1B
IC1C
IC1D
IC2A
IC2B
IC2C
IC2D
4066N
JOYB3
JOYB1
JOYB2
IC1P
IC2P
VDD
VSS
C2
C3
100n
DRL1
DRL2
Title: Diag 586220
C64-Userport-Harness
Doc.-No.: 113-1-01-00
Draft.: Sven Petersen
Date: 14.02.2020 22:49
Rev.: 0
Page 1/1
File: C64_Userport_Test
A4

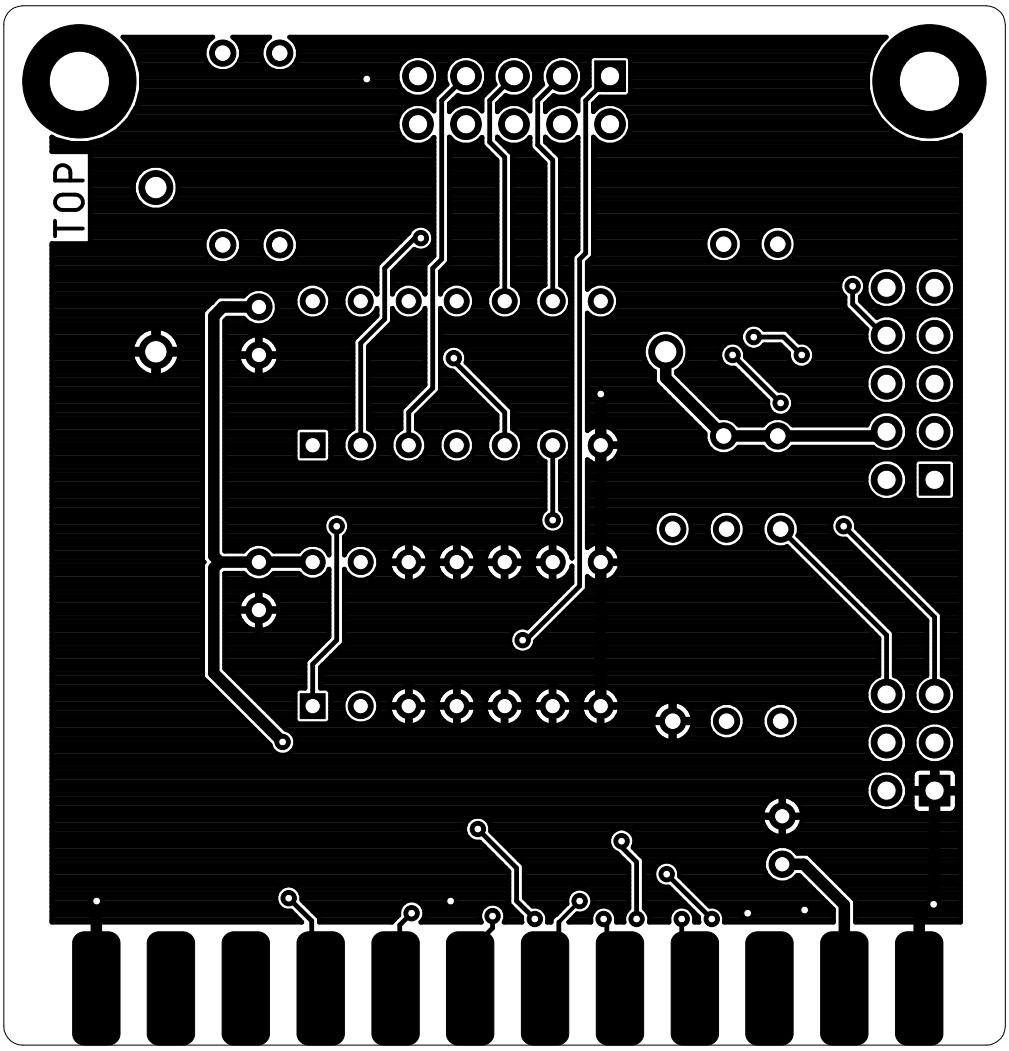
Diag 586220 Harness	Doc.-No.: 113/2/01/00	
	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
placement component side		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
14.02.2020 22:49		Rev.: 0
placement component side measures		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
top		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
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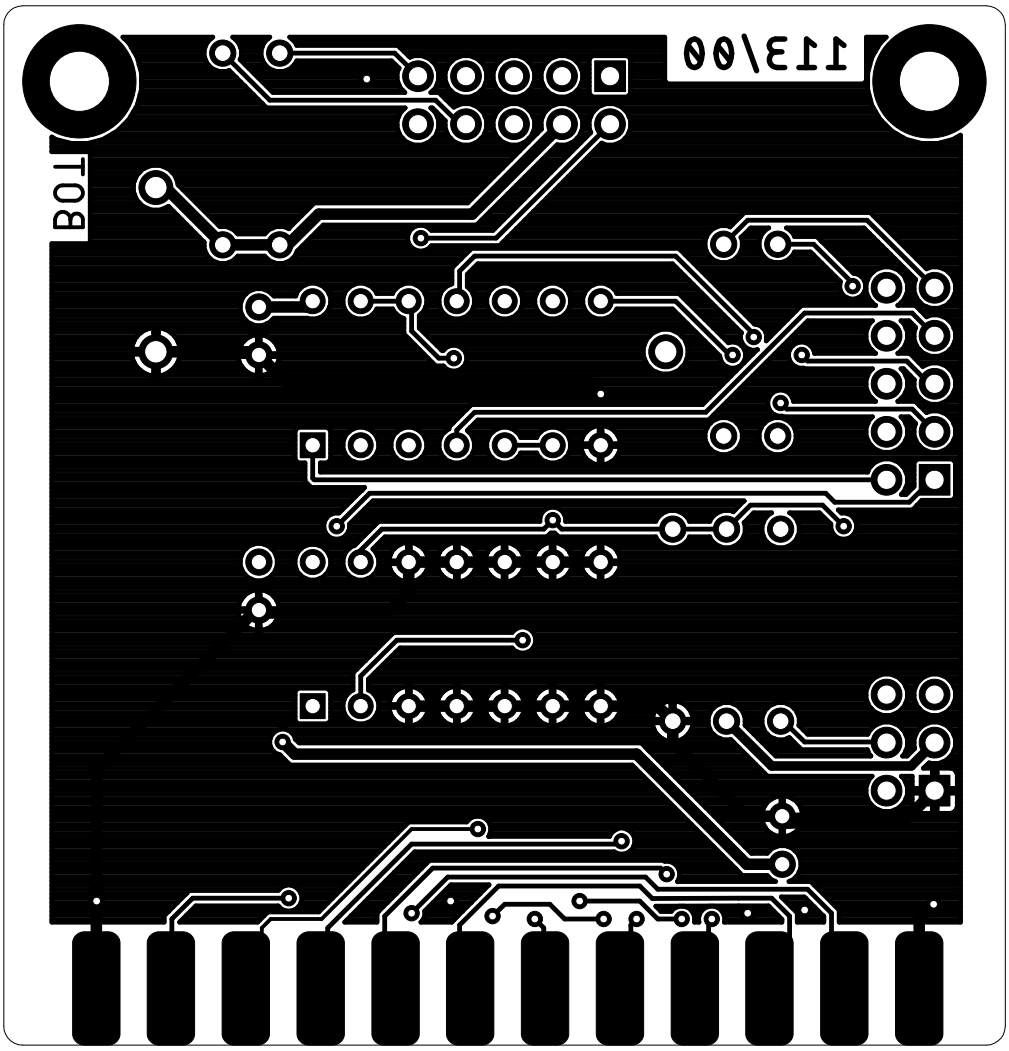
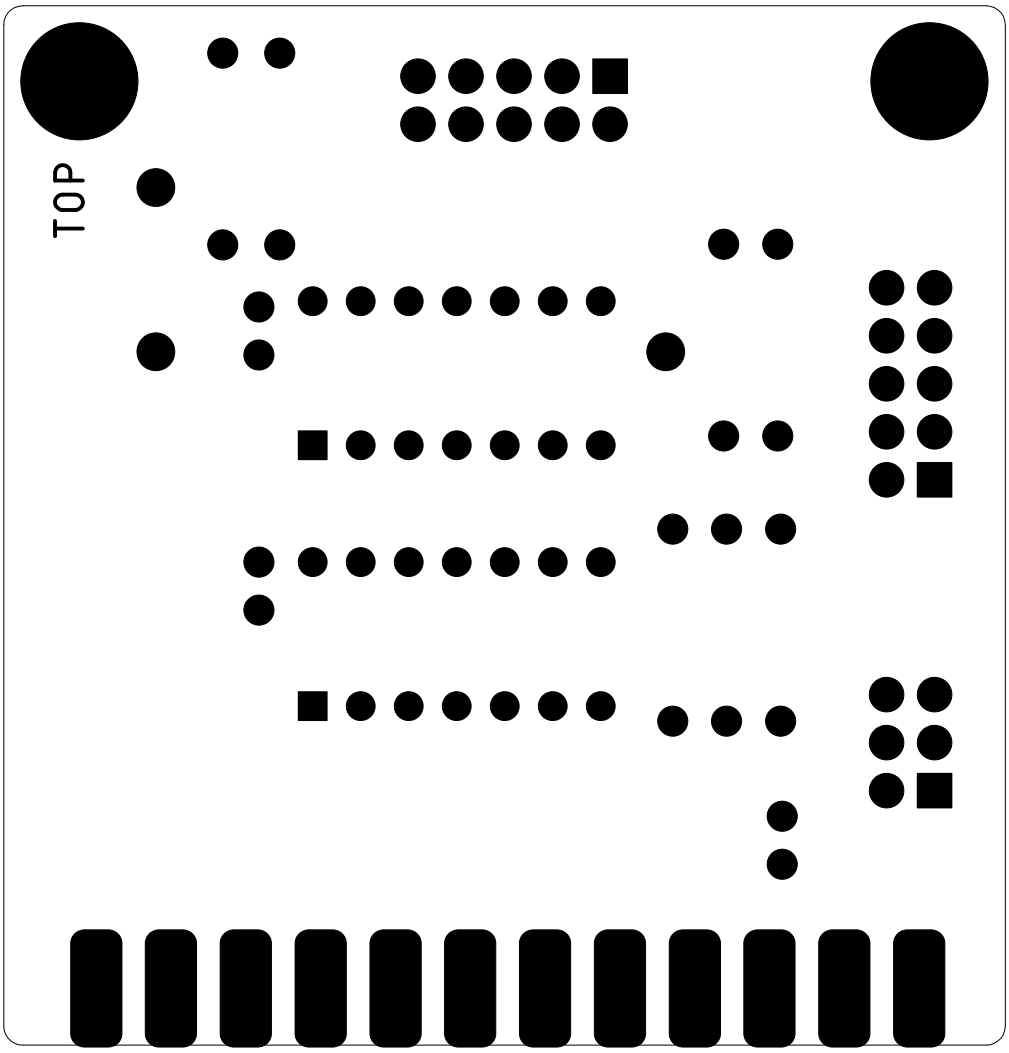
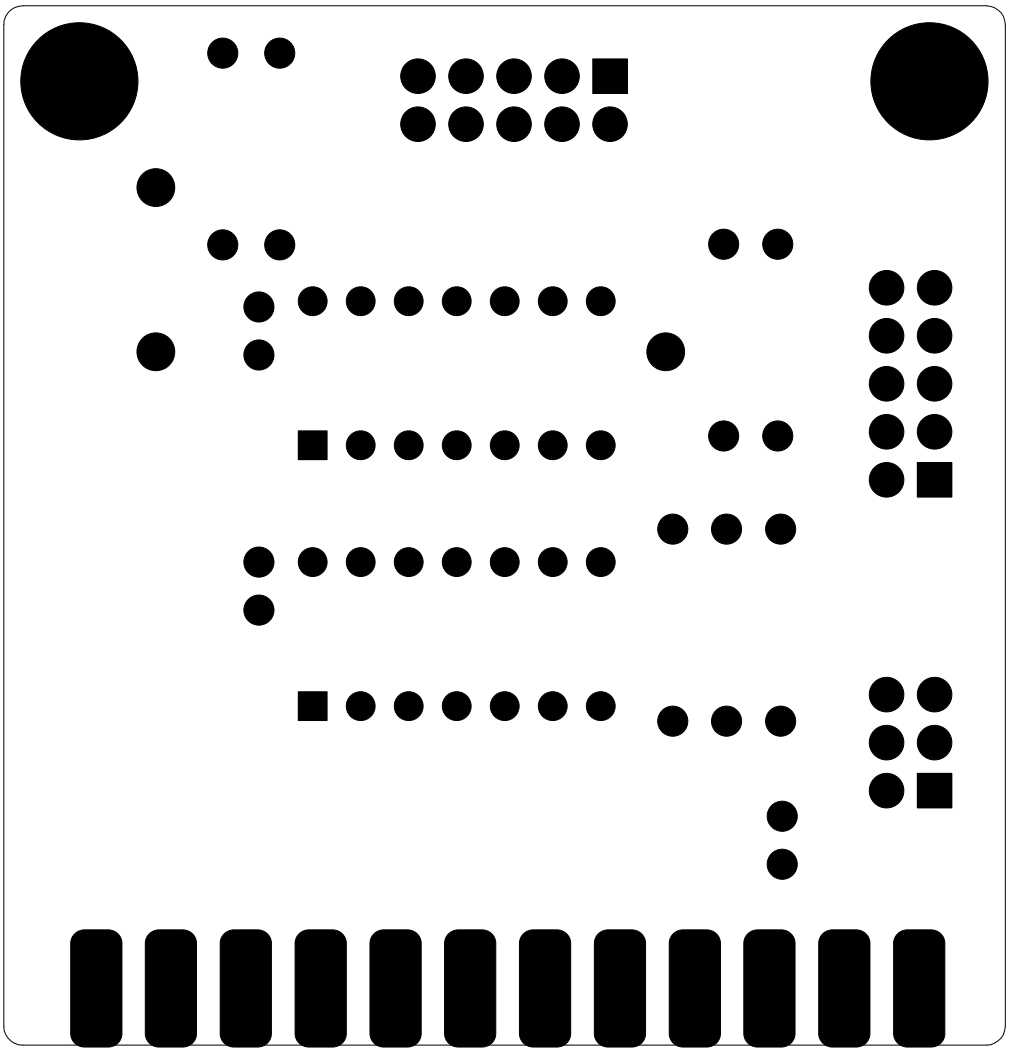
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
bottom		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
stopmask component side		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
stopmask solder side		



Diag 586220 Harness	Doc.-No.: 113/2/01/00	
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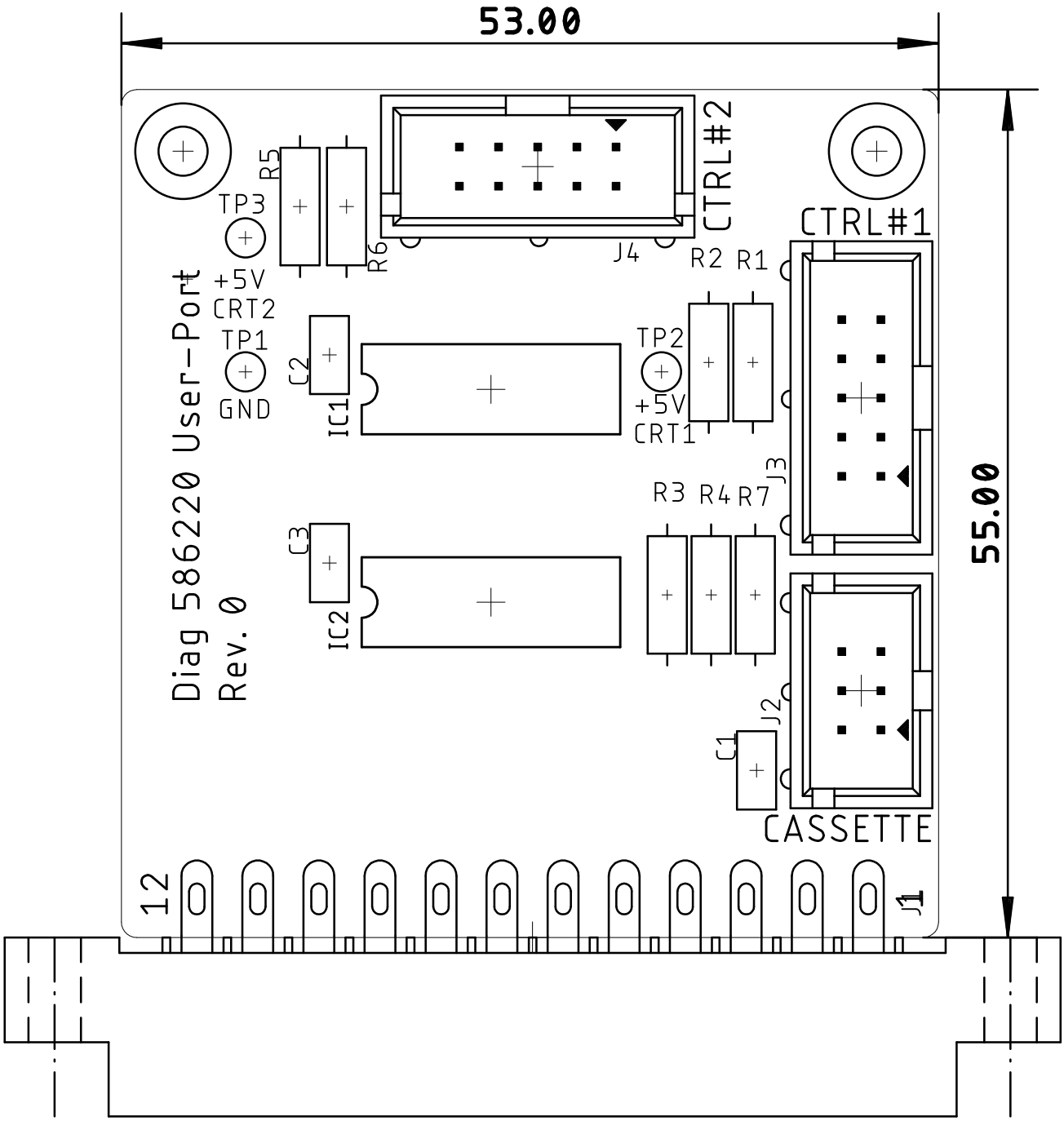
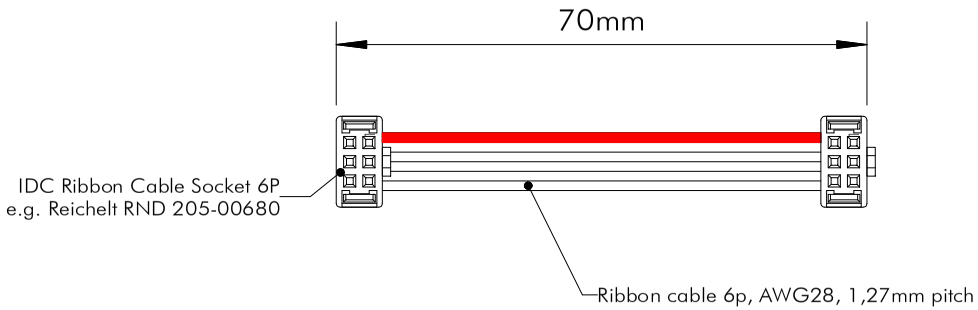
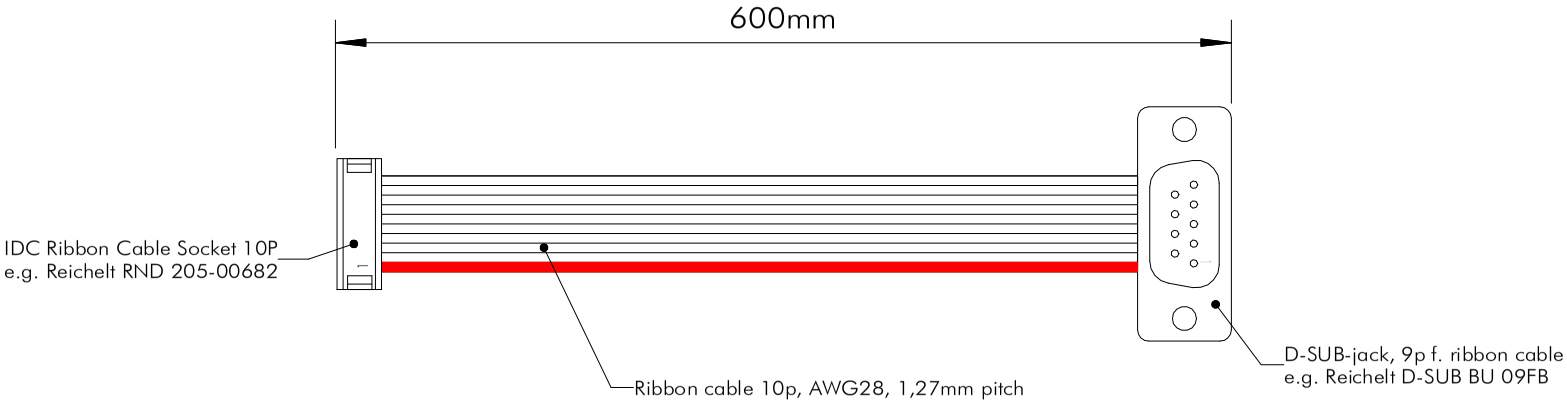
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
placement component side measures		

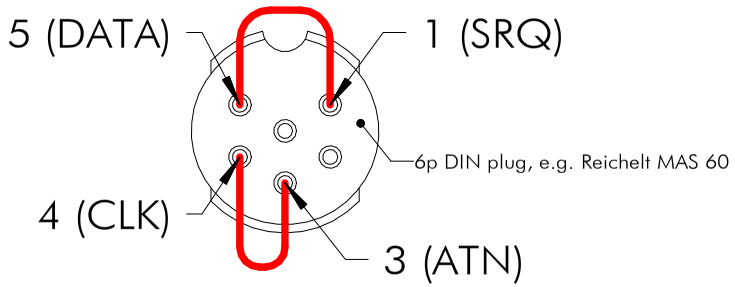




Diagnostic 586220 Harness	Titel: User Port - Cassette Port Cable	Draft.: Sven Petersen
		File: UP-CASP.SKF
	Doc.-No.: 113-3-01-00	Rev.: 0
	Date: 01.03.2019 16:49	M 1 mm = 1 mm



Diagnostic 586220 Harness	Titel: User Port - Control Port Cable	Draft.: Sven Petersen
		File: UP-CTRLP.SKF
	Doc.-No.: 113-3-02-00	Rev.: 0
	Date: 01.03.2019 16:46	M 1 mm = 1 mm



The open DIN plug, shown from the solder side.

Assembled IEC-Dongle

Diagnostic 586220 Harness	Titel: IEC-Dongle	Draft.: Sven Petersen
		File: IEC.SKF
	Doc.-No.: 113-3-03-00	Rev.: 0
	Date: 01.03.2019 18:15	M 1 mm = 1 mm

Diagnostic Rev. 586220 Harness - User Port Rev. 0
Bill of Material Rev. 0.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	113-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35µ, HASL, LLL x BBB, 1.6mm FR4
2	1	2x3 box connector	2X03WV	J2	e.g. Reichelt WSL 6G
3	2	2x5 box connector	2X05WV	J3, J4	e.g. Reichelt WSL 10G
4	1	0R	R-10	R7	0 Ohm bridge
5	3	100n/50V	C-2,5	C1, C2, C3	cer. cap, 2.5mm pitch
6	4	120k	R-10	R1, R2, R5, R6	1/4W, 1%
7	1	150R	R-10	R4	1/4W, 5%
8	1	320R	R-10	R3	1/4W, 5%
9	2	HCF4066B	DIL14	IC1, IC2	ST Micro or equivalent
10	2	DIL 14	DIL14	(IC1), (IC2)	DIL IC sockets
11	1	2x12, 3.96mm pitch	USERPORT	J1	edge connector, C64 user port
12	3	TP 1pin	1,2MM_R	TP1, TP2, TP3	Pin Header, e.g. Reichelt RND 205-00622
13	127cm	10p/AWG28/1,27mm		Doc-No. 113-3-02-00 & Doc.-No. 113-2-01-00	Ribbon Cable
14	2	6p IDC receptable, 2,54mm		Doc.-No. 113-2-01-00	e.g. Reichelt RND 205-00680
15	2	10p IDC receptable, 2,54mm		Doc.-No. 113-2-02-00	e.g. Reichelt RND 205-00682
16	2	9p D-SUB (female), IDC		Doc.-No. 113-2-02-00	e.g. Reichelt D-SUB BU 09FB
17	1	DIN-plug 6p		Doc.-No. 113-2-03-00	e.g. Reichelt MAS 60
18	4cm	Wire 0,25mm², red		Doc.-No. 113-2-03-00	wire, color what ever

Diagnostic Rev. 586220 Harness - User Port Rev. 0
Bill of Material Rev. 0.1

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	113-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35µ, HASL, LLL x BBB, 1.6mm FR4
2	1	2x3 box connector	2X03WV	J2	e.g. Reichelt WSL 6G
3	2	2x5 box connector	2X05WV	J3, J4	e.g. Reichelt WSL 10G
4	1	0R	R-10	R7	0 Ohm bridge
5	3	100n/50V	C-2.5	C1, C2, C3	cer. cap, 2.5mm pitch
6	4	120k	R-10	R1, R2, R5, R6	1/4W, 1%
7	1	150R	R-10	R4	1/4W, 5%
8	1	320R	R-10	R3	1/4W, 5% (316Ω works, 330Ω should work as well)
9	2	HCF4066B	DIL14	IC1, IC2	ST Micro or equivalent
10	2	DIL 14	DIL14	(IC1), (IC2)	DIL IC sockets
11	1	2x12, 3.96mm pitch	USERPORT	J1	edge connector, C64 user port
12	3	TP 1pin	1,2MM_R	TP1, TP2, TP3	Pin Header, e.g. Reichelt RND 205-00622
13	127cm	10p/AWG28/1,27mm		Doc-No. 113-3-02-00 & Doc.-No. 113-2-01-00	Ribbon Cable
14	2	6p IDC receptable, 2,54mm		Doc.-No. 113-2-01-00	e.g. Reichelt RND 205-00680
15	2	10p IDC receptable, 2,54mm		Doc.-No. 113-2-02-00	e.g. Reichelt RND 205-00682
16	2	9p D-SUB (female), IDC		Doc.-No. 113-2-02-00	e.g. Reichelt D-SUB BU 09FB
17	1	DIN-plug 6p		Doc.-No. 113-2-03-00	e.g. Reichelt MAS 60
18	4cm	Wire 0,25mm², red		Doc.-No. 113-2-03-00	wire, color what ever

Diagnostic Rev. 586220 Harness - User Port Rev. 0
Bill of Material Rev. 0.2

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	113-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35μ, HASL, LLL x BBB, 1.6mm FR4
2	1	2x3 box connector	2X03WV	J2	e.g. Reichelt WSL 6G
3	2	2x5 box connector	2X05WV	J3, J4	e.g. Reichelt WSL 10G
4	1	0R	R-10	R7	0 Ohm bridge
5	3	100n/50V	C-2,5	C1, C2, C3	cer. cap, 2.5mm pitch
6	4	110k	R-10	R1, R2, R5, R6	1/4W, 1%
7	1	150R	R-10	R4	1/4W, 5%
8	1	316R	R-10	R3	1/4W, 5% (316Ω works, 330Ω should work as well)
9	2	HCF4066B	DIL14	IC1, IC2	ST Micro or equivalent
10	2	DIL 14	DIL14	(IC1), (IC2)	DIL IC sockets
11	1	2x12, 3.96mm pitch	USERPORT	J1	edge connector, C64 user port
12	3	TP 1pin	1,2MM_R	TP1, TP2, TP3	Pin Header, e.g. Reichelt RND 205-00622
13	127cm	10p/AWG28/1,27mm		Doc-No. 113-3-02-00 & Doc.-No. 113-2-01-00	Ribbon Cable
14	2	6p IDC receptable, 2,54mm		Doc.-No. 113-2-01-00	e.g. Reichelt RND 205-00680
15	2	10p IDC receptable, 2,54mm		Doc.-No. 113-2-02-00	e.g. Reichelt RND 205-00682
16	2	9p D-SUB (female), IDC		Doc.-No. 113-2-02-00	e.g. Reichelt D-SUB BU 09FB
17	1	DIN-plug 6p		Doc.-No. 113-2-03-00	e.g. Reichelt MAS 60
18	4cm	Wire 0,25mm^2, red		Doc.-No. 113-2-03-00	wire, color what ever