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	Α	GND
2	+5V	В	/FLAG2
3	/RESET	С	PB0
4	CNT1	D	PB1
5	SP1	Е	PB2
6	CNT2	F	PB3
7	SP2	Н	PB4
8	/PC2	J	PB5
9	ATN	K	PB6
10	9VAC(1)	L	PB7
11	9VAC(2)	М	PA2
12	GND	Ν	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

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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	\leftrightarrow	CNT2	6
5	SP1	\leftrightarrow	SP2	7
8	/PC2	\leftrightarrow	/FLAG2	В
9	ATN	\leftrightarrow	PA2	М
С	PB0	\leftrightarrow	PB4	Н
D	PB1	\leftrightarrow	PB5	J
Е	PB2	\leftrightarrow	PB6	K
F	PB3	\leftrightarrow	PB7	L

Cassette Port

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

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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	\leftrightarrow	DATA	5
3	ATN	\leftrightarrow	CLK	4

Revision History

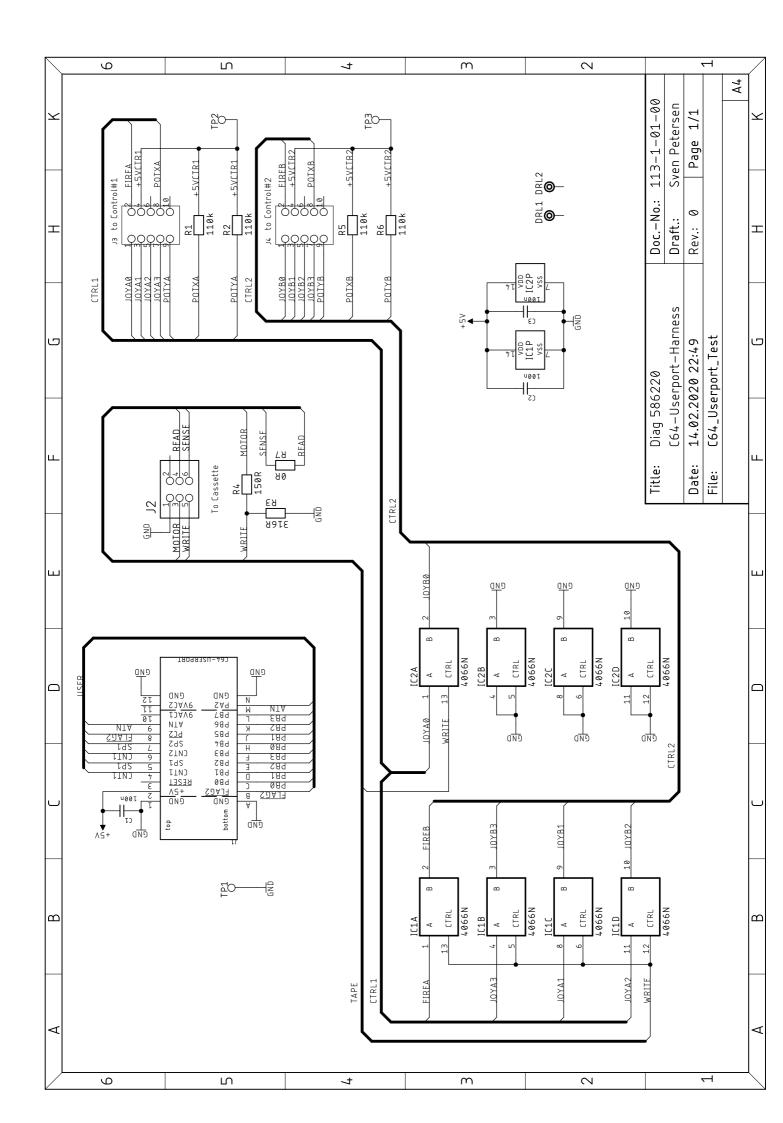
BOM v0.1 \rightarrow v0.2

Pos. 6: value $120k \rightarrow 110k$

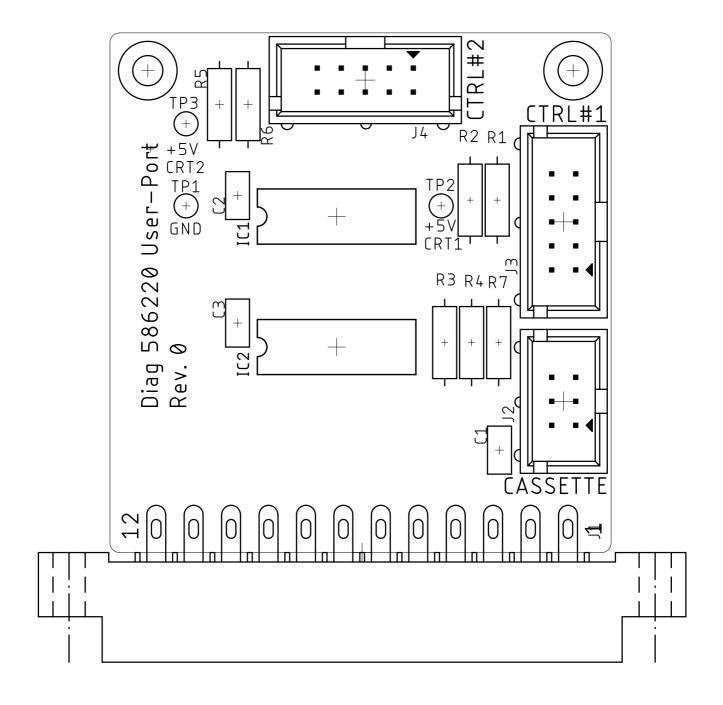
Pos. 8: value 320R \rightarrow 316R

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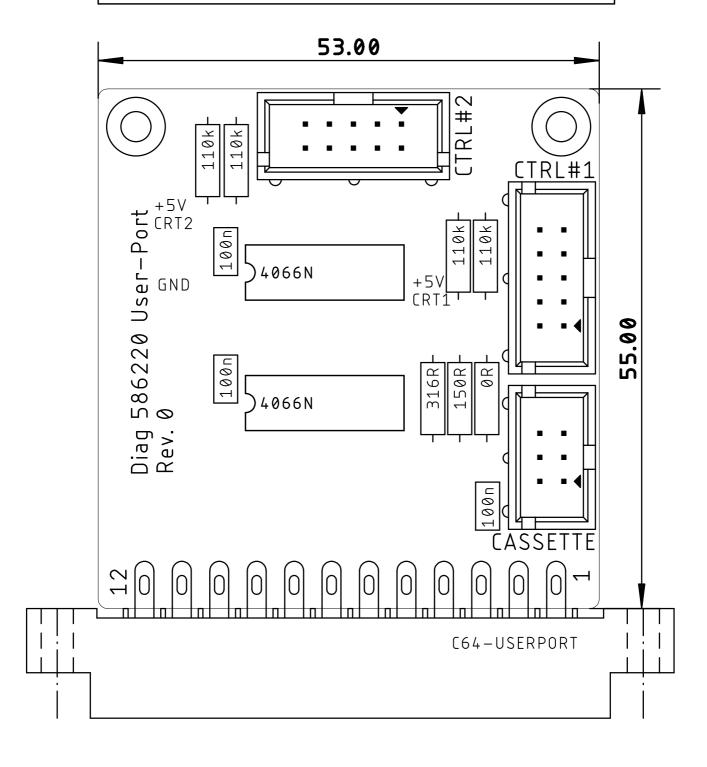
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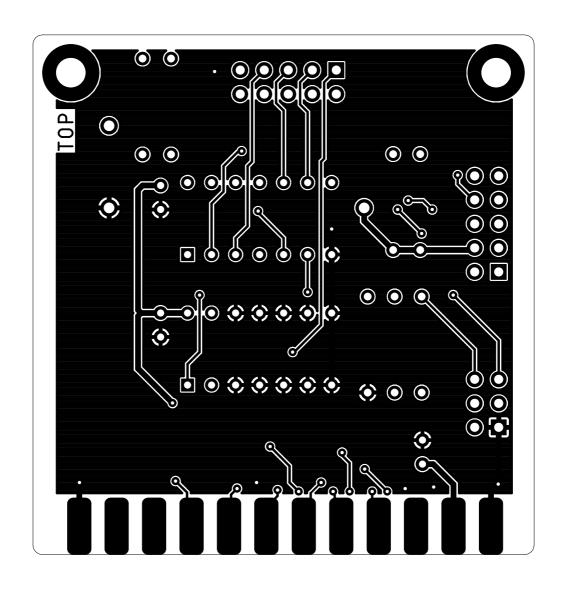
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Harness	Cu: 35µm	Cu-Layers: 2		
C64_Userport_Test				
01.03.2019 12:06 Rev.: 0				
placement component	side			



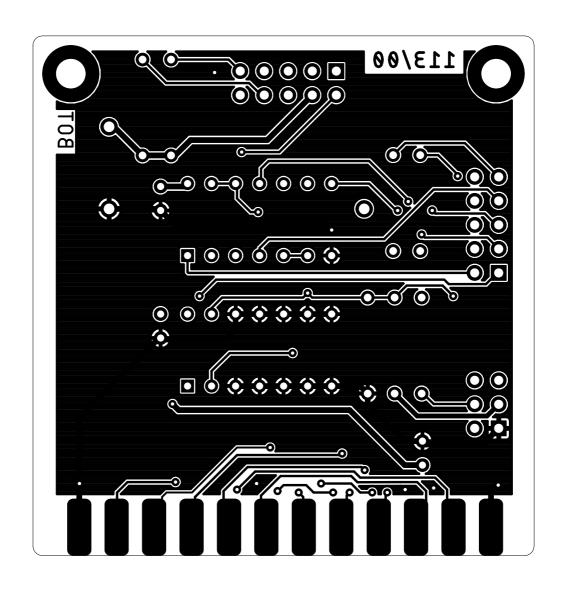
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14.02.2020 22:49 Rev.: 0			
placement component	side mea	sures	



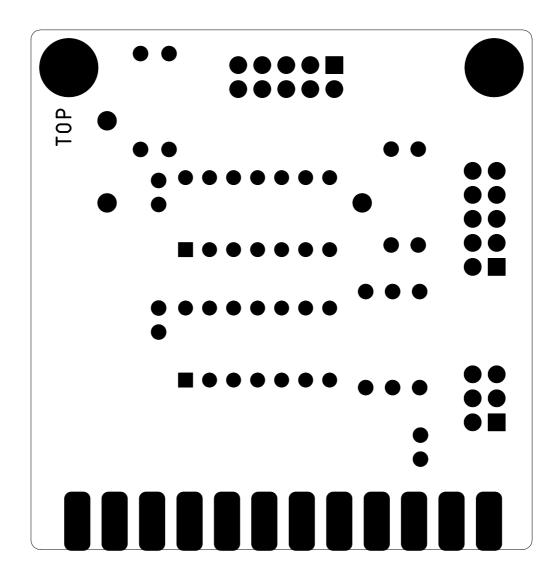
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Harness	Cu: 35µm	Cu-Layers: 2	
C64_Userport_Test			
01.03.2019 12:06		Rev.: 0	
top			



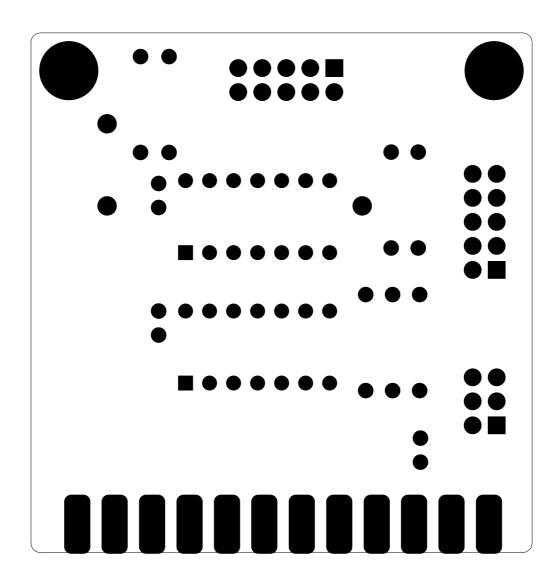
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C64_Userport_Test			
01.03.2019 12:06		Rev.: 0	
bottom			



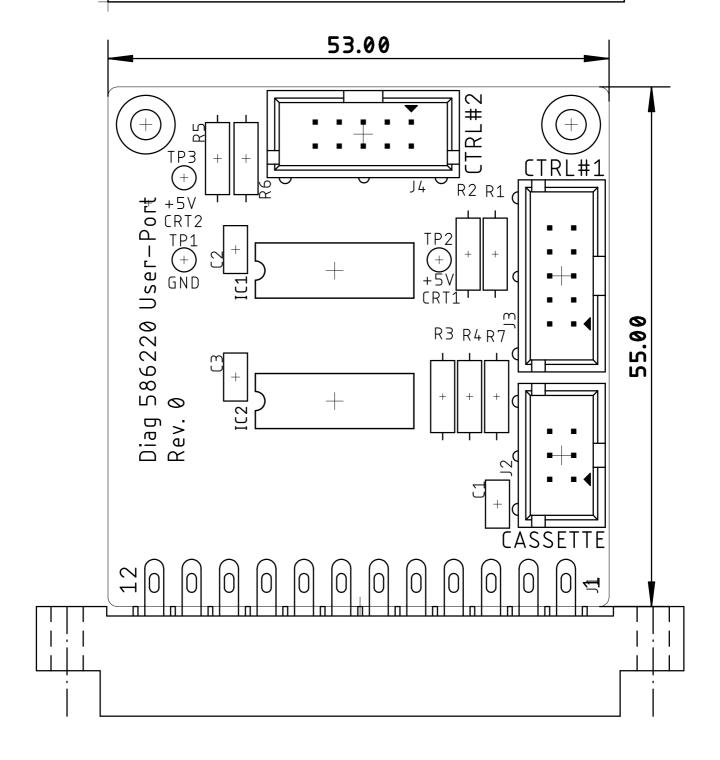
Diag 586220 DocNo. : 113/2/01/00									
Harness	Cu: 35µm	Cu-Layers: 2							
C64_Userport_Test									
01.03.2019 12:06 Rev.: 0									
stopmask component side									

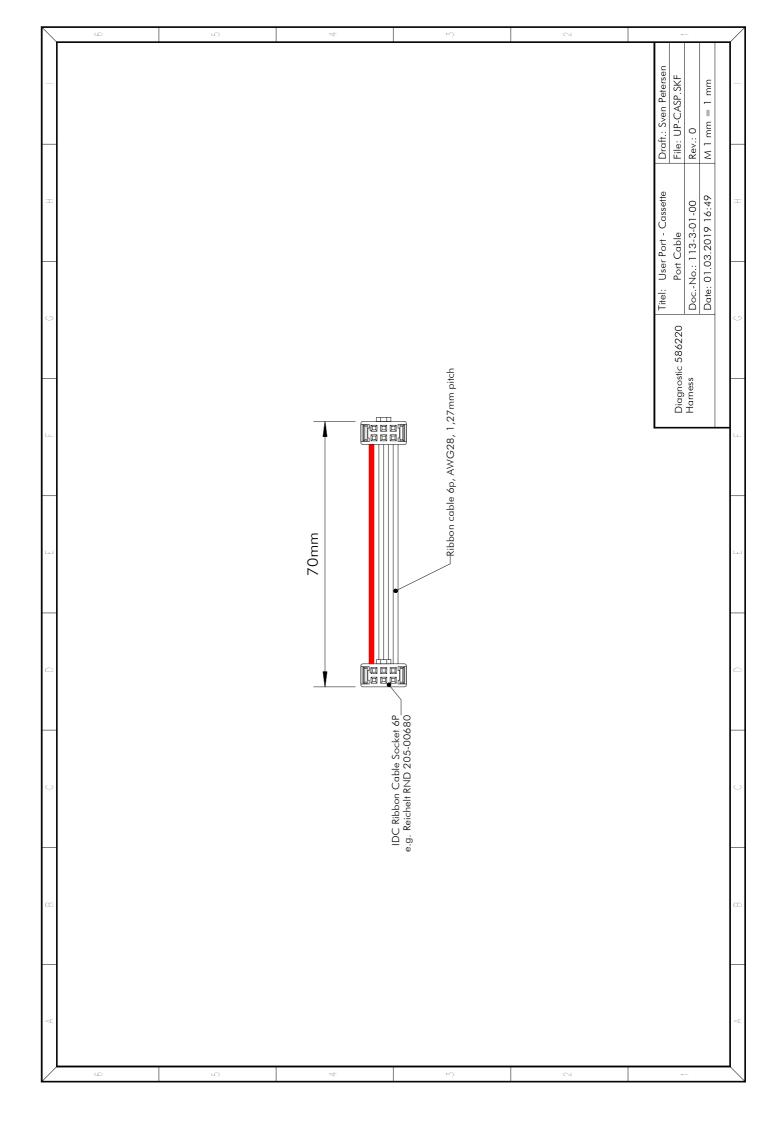


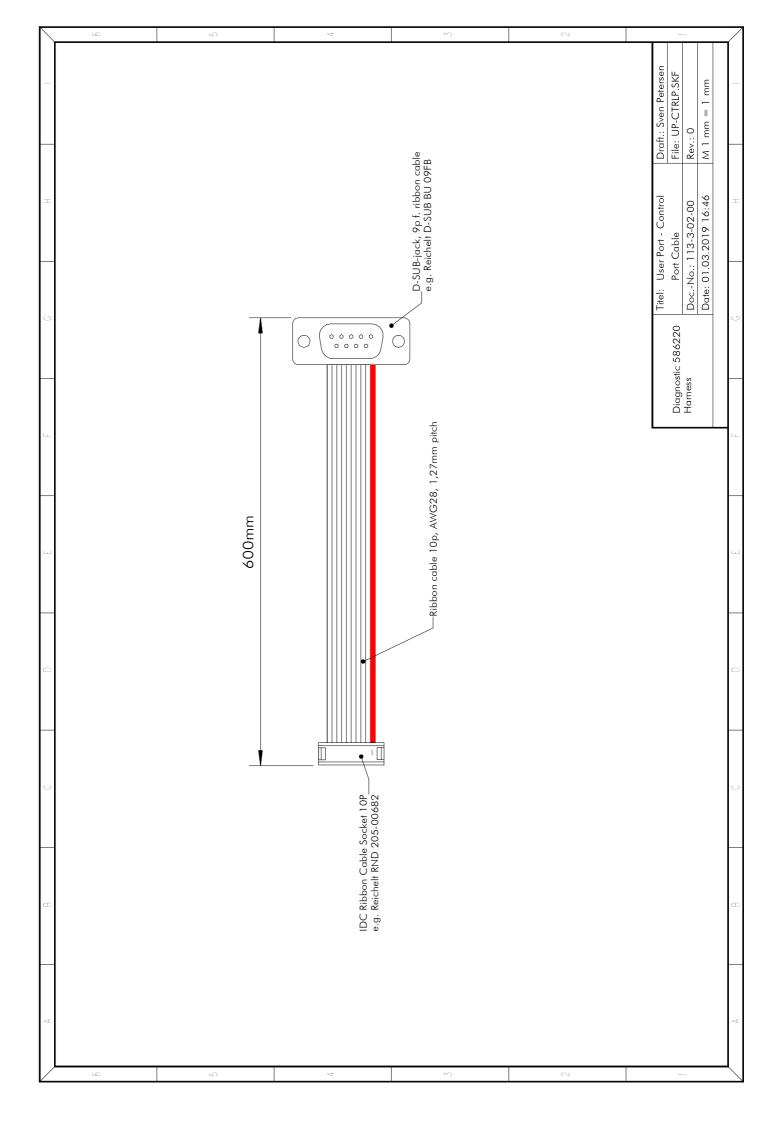
Diag 586220	DocNo.: 1	13/2/01/00
Harness	Cu: 35µm	Cu-Layers: 2
C64_Userport_Test		
01.03.2019 12:06		Rev.: 0
stopmask solder side		

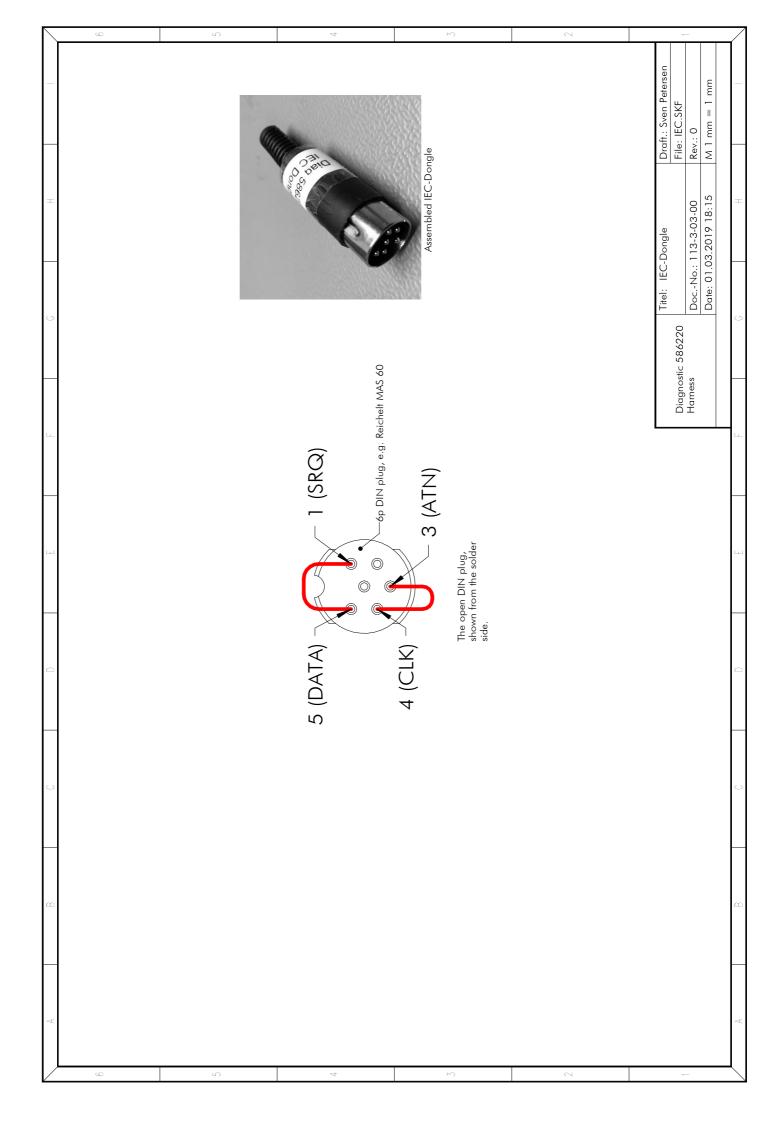


Diag 586220 DocNo.: 113/2/01/00								
Harness	Cu: 35µm	Cu-Layers: 2						
C64_Userport_Test								
01.03.2019 12:06		Rev.: 0						
placement component side measures								









13.04.2019 14:38 Doc.No.: 113-5-01-00.0

Diagnostic Rev. 586220 Harness - User Port Rev. 0

2 layer, Cu 35 μ , HASL, LLL × BBB, 1.6mm FR4 Pin Header, e.g. Reichelt RND 205-00622 edge connector, C64 user port e.g. Reichelt RND 205-00680 e.g. Reichelt RND 205-00682 e.g. Reichelt D-SUB BU 09FB e.g. Reichelt WSL 10G cer. cap, 2.5mm pitch 1/4W, 1% ST Micro or equivalent e.g. Reichelt WSL 6G e.g. Reichelt MAS 60 wire, color what ever 0 Ohm bridge DIL IC sockets Ribbon Cable 1/4W, 5% 1/4W, 5% Comment Bill of Material Rev. 0.0 Doc-No. 113-3-02-00 & Doc.-No. 113-2-03-00 Doc.-No. 113-2-01-00 Doc.-No. 113-2-01-00 Doc.-No. 113-2-02-00 Doc.-No. 113-2-02-00 Doc.-No. 113-2-03-00 R1, R2, R5, R6 TP1, TP2, TP3 C1, C2, C3 PCB Rev. 0 (IC1), (IC2) IC1, IC2 Ref.-No. J3, J4 R7 R3 R3 USERPORT 1,2MM R 2X03WV 2X05WV Footprint 2 Layer DIL14 C-2,5 DIL14 R-10 R-10 R-10 R-10 2 9p D-SUB (female), IDC 13 127cm 10p/AWG28/1,27mm 1 2x12, 3.96mm pitch 2 10p IDC receptable, Wire 0,25mm², red 2 6p IDC receptable, 1 2x3 box connector 2 2x5 box connector 1 113-2-01-00 1 DIN-plug 6p 2 HCF4066B 3 100n/50V 2,54mm 2,54mm 3 TP 1pin 2 DIL 14 4 120k 1 150R 1 320R 1 OR 18 4cm 17 2 9 15 16 က 4 9 ∞ 0 4

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

			bill of Material Key. U.	
Pos.	Qty Value	Footprint	RefNo.	Comment
_	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
က	2 2x5 box connector	2X05WV	J3, J4	e.g. Reichelt WSL 10G
4	1 OR	R-10	R7	0 Ohm bridge
2	3 100n/50V	C-2,5	C1, C2, C3	cer. cap, 2.5mm pitch
9	4 120k	R-10	R1, R2, R5, R6	1/4W, 1%
7	1 150R	R-10	R4	1/4W, 5%
∞	1 320R	R- 10	R3	$1/4 \mathrm{W}$, 5% (316 Ω works, 330 Ω should work as well)
6	2 HCF4066B	DI 14	IC1, IC2	ST Micro or equivalent
10	2 DIL 14	DIL14	(IC1), (IC2)	DIL IC sockets
11	1 2x12, 3.96mm pitch	USERPORT		edge connector, C64 user port
12	3 TP 1pin	1,2MM_R	TP1, TP2, TP3	Pin Header, e.g. Reichelt RND 205-00622
13 12	13 127cm 10p/AWG28/1,27mm		Doc-No. 113-3-02-00 & Doc: No. 113-2-01-00	Ribbon Cable
4	2 6p IDC receptable,		DocNo.) (3-2-01-00	e.g. Reichelf RND 205-00680
15	2 10p IDC receptable, 2,54mm		DocNo. (13-2-02-00	e.g. Reichelf RND 205-00682
16	2 9p D-SUB (female), IDC		DocNo. 113-2-02-00	e.g. Reichelt D-SUB BU 09FB
17	1 DIN-plug 6p		DocNo. 113-2-03-00	e.g. Reichelt MAS 60
18 4cm	cm Wire $0,25$ mm ² , red		DocNo. 113-2-03-00	wire, color what ever

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

Footprint RefNo. Comment	2 Layer PCB Rev. 0 2 layer, Cu 35μ , HASL, LLL x BBB, 1.6mm FR4	2X03WV J2 e.g. Reichelt WSL 6G	2X05WV J3, J4 e.g. Reichelt WSL 10G	R-10 R7 0 Ohm bridge	C-2,5 C1, C2, C3 cer. cap, 2.5mm pitch	R-10 R1, R2, R6 1/4W, 1%	R-10 R4 1/4W, 5%	R-10 R3 1/4W, 5% (316 Ω works, 330 Ω should work as well)	DIL14 IC1, IC2 ST Micro or equivalent	DIL14 (IC1), (IC2) DIL IC sockets	USERPORT J1 edge connector, C64 user port	1,2MM_R TP1, TP2, TP3 Pin Header, e.g. Reichelt RND 205-00622	Doc-No. 113-3-02-00 & Ribbon Cable	DocNo. 113-2-01-00	DocNo. 113-2-01-00 e.g. Reichelt RND 205-00680		DocNo. 113-2-02-00 e.g. Reichelf RND 205-00682		DocNo. 113-2-02-00 e.g. Reichelt D-SUB BU 09FB	DocNo. 113-2-03-00 e.g. Reichelt MAS 60	DocNo. 113-2-03-00 wire, color what ever
Footprint	2 Layer	2X03WV	2X05WV	R-10	C-2,5	R-10	R-10	R-10	DIL14	DIL14	USERPORT	1,2MM_R									
Qty Value	1 113-2-01-00	2 1 2x3 box connector	3 2 2x5 box connector	t 1 OR	3 100n/50V	5 4 110k	7 1 150R	3 1 316R	2 HCF4066B) 2 DIL 14	1 2x12, 3.96mm pitch	2 3 TP 1 pin	3 127cm 10p/AWG28/1,27mm		t 2 6p IDC receptable,	2,54mm	5 2 10p IDC receptable,	2,54mm	5 2 9p D-SUB (female), IDC	7 1 DIN-plug 6p	18 4cm Wire 0,25mm ² , red
	Footprint RefNo.	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03vvV J2 3 2 2x5 box connector 2X05vvV J3, J4 4 1 0R R-10 R7	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6 7 1 150R R-10 R4	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6 7 1 150R R-10 R4 8 1 316R R-10 R3	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 DIL14 IC1), IC2)	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03VVV J2 3 2 2x5 box connector 2X05VV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1), (IC2) 1 1 2x12, 3.96mm pitch USERPORT J1	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 DIL14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM_R TP1, TP2, TP3	Qty Value Footprint RefNo. 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM R TP1, TP2, TP3 2 3 TP 1pin Doc-No. 113-3-02-00 &	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 DIL14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM R TP1, TP2, TP3 3 127cm 10p/AWG28/1,27mm Doc-No. 113-2-01-00	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R4 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM_R TP1, TP2, TP3 3 127cm 10p/AWG28/1,27mm Doc-No. 113-2-01-00 4 2 6p IDC receptable, Doc-No. 113-2-01-00	Qty Value Footprint RefNo. 1 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03wV J2 3 2 2x5 box connector 2X05wV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R4 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM_R TP1, TP2, TP3 2 3 TP 1pin Doc-No. 113-2-01-00 4 2 6p IDC receptable, Doc-No. 113-2-01-00 4 2 6p IDC receptable, Doc-No. 113-2-01-00	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R1, R2, R5, R6 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM_R TP1, TP2, TP3 3 3 TP 1pin 1,2MM_R TP1, TP2, TP3 4 2 6p IDC receptable, Doc-No. 113-2-01-00 5 2 10p IDC receptable, Doc-No. 113-2-01-00 5 2 10p IDC receptable, Doc-No. 113-2-00-00	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM R TP1, TP2, TP3 3 127cm 10p/AWG28/1,27mm Doc-No. 113-2-01-00 4 2 6p IDC receptable, DocNo. 113-2-01-00 5 2 10p IDC receptable, DocNo. 113-2-02-00 2,54mm DocNo. 113-2-02-00	Qty Value Footprint RefNo. 1 1113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R 4 1 0R R-10 R 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R4 8 1 316R R-10 R3 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1pin 1,2MM R TP1, TP2, TP3 2 3 TP 1pin DocNo. 113-2-01-00 4 2 6p IDC receptable, DocNo. 113-2-01-00 5 2 10p IDC receptable, DocNo. 113-2-0-00 6 2 9p D-SUB (female), IDC <th>Qty Value Footprint RefNo. 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R4 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 DIL14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1 pin DIL14 IC1, IC2 2 3 TP 1 pin Doc-No. 113-3-0-00 4 2 6p IDC receptable, Doc-No. 113-2-01-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No.</th>	Qty Value Footprint RefNo. 1 113-2-01-00 2 Layer PCB Rev. 0 2 1 2x3 box connector 2X03WV J2 3 2 2x5 box connector 2X05WV J3, J4 4 1 0R R-10 R7 5 3 100n/50V C-2,5 C1, C2, C3 6 4 110k R-10 R4 7 1 150R R-10 R4 8 1 316R R-10 R4 9 2 HCF4066B DIL14 IC1, IC2 0 2 DIL 14 DIL14 IC1, IC2 1 1 2x12, 3.96mm pitch USERPORT J1 2 3 TP 1 pin DIL14 IC1, IC2 2 3 TP 1 pin Doc-No. 113-3-0-00 4 2 6p IDC receptable, Doc-No. 113-2-01-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No. 113-2-02-00 2,54mm Doc-No.

14.02.2020 22:56 Doc.No.: 113-5-01-00.2