LISY35

LInux for SYstem35

(Bally AS-2518-17 & AS-2518-35)

Hardware Version 1.3

Board Assembly

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Important remark

By using LISY35 it is possible to damage your pinball machine. As this is a private project with NO commercial interest the author accepts no liability for any damage that may arise by using LISY35!

1. Bill of Material

All components with the exception of the 'base set' are included in the in the ‚Reichelt Warenkorb‘ (see link at www.lisy80.com).

1.1. The ‚Base Set‘

The ‚base set‘ includes the blank PCB plus three programmed PICs

Quantity	Label	Function	Label Reichelt
1	-	bare PCB	
1	IC1	Displays	PIC18F45K22-I/P
1	IC2	Solenoids & Lamps	PIC18F45K22-I/P
1	IC3	Switches	PIC18F45K22-I/P

1.2. Basic function

The following components (pluse the ‚base set‘) are needed for a working LISY35 board

Quant	Label	Function	Label Reichelt
1	X1	I2C Bus Repeater	PCA 9517 D
1	IC4	Adaption 3,3V PI	74HC 4050
1	IC5	Zero cross detection	74HC 4049
1	C1	5V Capacitor 100µF	AX 100/16
8	C2-C9	Capacitor 100nF	Z5U-5 100N
23	C11-C23, C25-C34	Capacitor 470pF	
1	C24	Capacitor 3,3nF	
1	C35	Capacitor 820pF	
51	R1-R27, R51-R63, R43, R65-R74	Resistor 1,2K	
6	R28-R31, R36, R78-R79	Resistor 470	
4	R32-R35	Resistor 330	
2	R37,R45	Resistor 2,2K	
1	R46	Resistor 150K	
1	R47	Resistor 1,5M	
3	R75-R77	Resistor 10K	
3	R39,R41,R44	Resistor Array 3,3K	SIL 9-8 3,3K
2	R38, R40	Resistor Array 3,3K	SIL 5-4 3,3K
1	R42	Resistor Array 56K	SIL 9-8 56K
1	R64	Resistor 110	
3	D1, D6, D7	LED (with resistor) green	LED 3MM 5V GN
2	D5, D9	LED (with resistor) yellow	LED 3MM 5V GE
4	D2, D3, D4, D8	LED (with resistor) red	LED 3MM 5V RT
34	D10-D46	1N4148	
6	S1,S2, S4-S7	Dip Sw 8	NT 08
2	S3,S33	pushbuttonShutdown Debug Mode & Bally Reset	TASTER 3301
5		Jumper Debug Optionen	JUMPER 2,54 SW
1	K2	Seriell connection (3V!)	PSS 254/5G

1	K3,K4,PI	Male header	SL 2X40G 2,54
2	J1-J4	Male header	MPE 087-1-050
1		Conn Header female for Raspberry PI	MPE 094-2-040 or 1 x Extra Tall Header
4		IC- Socket IC1,2,3,6	GS 40P
2		IC- Socket IC4, IC5	GS 16P
1	SD Karte	8 GB Micro SD	INTENSO MSDHC8G
1	PiZero	‚the master' ;-)	RASP PI ZERO WH

1.3. WLAN Option

If you want to use ‚LISYcontrol' (recommended) a (Wireless) LAN connection is needed. This is included in the PI-Zero-W, with the 'old' PI-Zero without Wireless LAN you will need a Wireless LAN 'USB Stick' and an Adpater.

1.4. Sound Option 1

With the sound option you can replace the original soundcard and use your own sounds (.wav files). This option is still beta with 'LISY80' and NOT available with LISY1 yet. Please contact me if you are interested in this option!

Quantity	Label	Function	Label Reichelt
1	C10	Capacitor 220nF	Z5U-5 220N
2	R48,R49	Resistor 1K	1/4W 1,0K
1	R50	Potentiometer 10K linear	PT 10-L 10K
1		Male header 1*3	MPE 087-1-003
1		Male header	SL 2X40G 2,54
1		Jumper int/ext Speaker	JUMPER 2,54 SW
1	Amp zero	Justboom	(*)JustBoom Amp Zero pHAT

1.5. Sound Option 2

With the components of Sound option2, you are able to control the sound volume with the pot in the coin door at the front. New wiring needed!

Quantity	Label	Function	Label Reichelt
1		Potentiometer 6mm 10K	PO6M-LIN 10K
1		Wannenstecker AKL	AKL 169-02
1	K5	Anschlussklemme 2pol	AKL 182-02
1		Lautsprecherlitze 0,75	LAT 275-10
4		Flachsteckhülsen	FSH-R-4,75

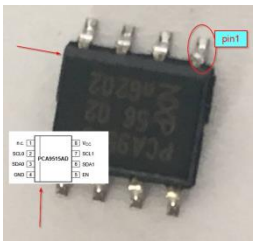
2. Step by Step

This Guide starts with the components with the least height and went from there step by step.

Please watch carefully the orientation of the components marked at the PCB. As I did some ‘optimization’ with the wiring (yes I did this by hand) you cannot expect that all parts have the same orientation. Especially with the resistor Arrays take a second look to be on the save side and watch the right position of ‘PIN1 ‘.

2.1. Step1: X1, diodes, resistors

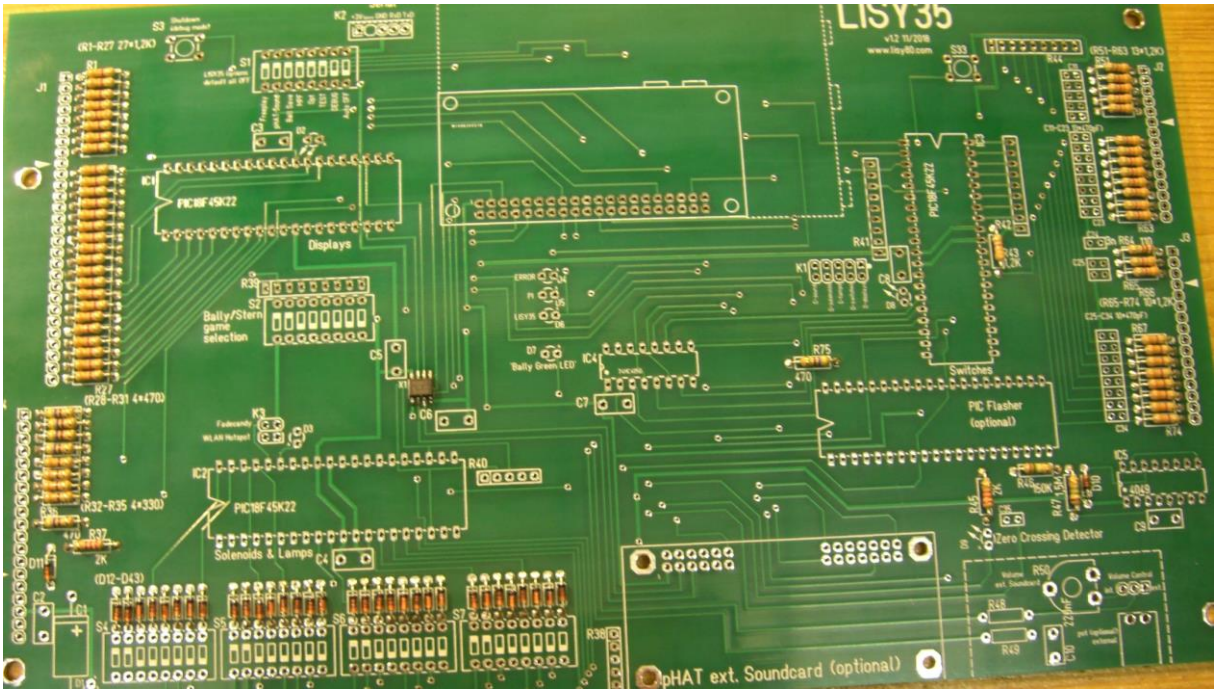
We start with the one and only SMD part the ,I2C Bus Repeater X1.‘



It could be difficult to identify ‘pin1’ of this SMD Chip. Depending on which variant you have it could be marked with a dot, or the side with pins 1..4 are a bit sloped. See picture on the left for details.

If you are unsure that the soldering has contact, check the following connections from X1

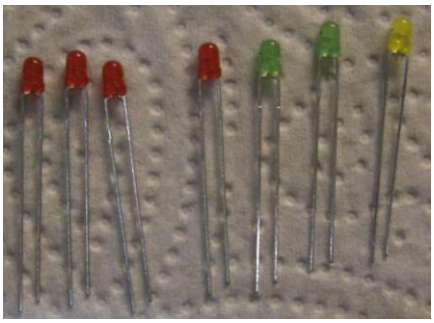
Pin 1 (VCC 3V) -> Pin1 PI	Pin 2 (SCL0) -> Pin5 PI
Pin 3 (SDA0) -> Pin 3 PI	Pin 4 (GND) -> Pin 6 PI
Pin 5 -> not used	Pin 6 (SDA1) -> Pin 3 R40
Pin 7 (SCL1) -> Pin 2 R40	Pin 8 (VCC 5V) -> Pin2 PI



Picture 1: LISY35 after step1 (HW Version 1.2)

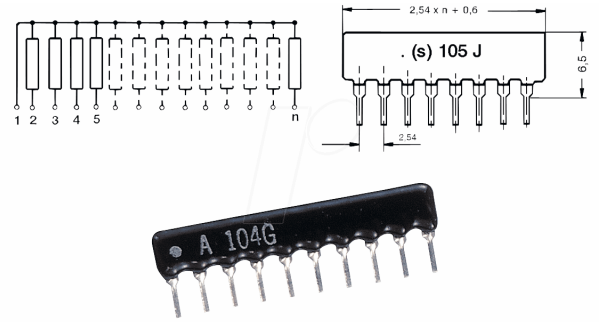
2.2. Step 2. LEDs, IC-sockets, resistors arrays and push buttons

The position of the anode of LEDs are marked with an ‚A' on the PCB. Hint: With new LED you can identify the anode by looking for the longer PIN. Some LEDs also have marked the Cathode with a small dot.

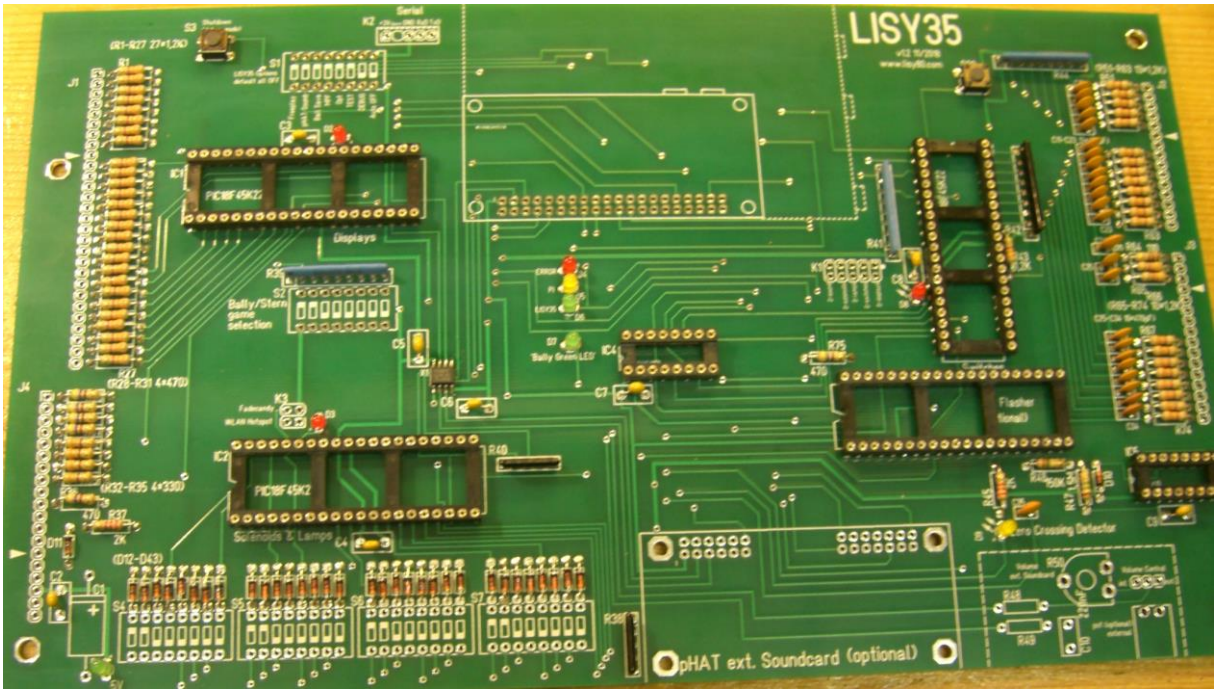


Picture 2: LEDs with the longer PIN (anode) on the left **Important: Only use 5V LEDs with integrated resistor!**

The resistor arrays (R1 – R4 & R8) are marked with a dot at Pin1



You will find that Pin 1 marked with a small quadrat on the PCB.

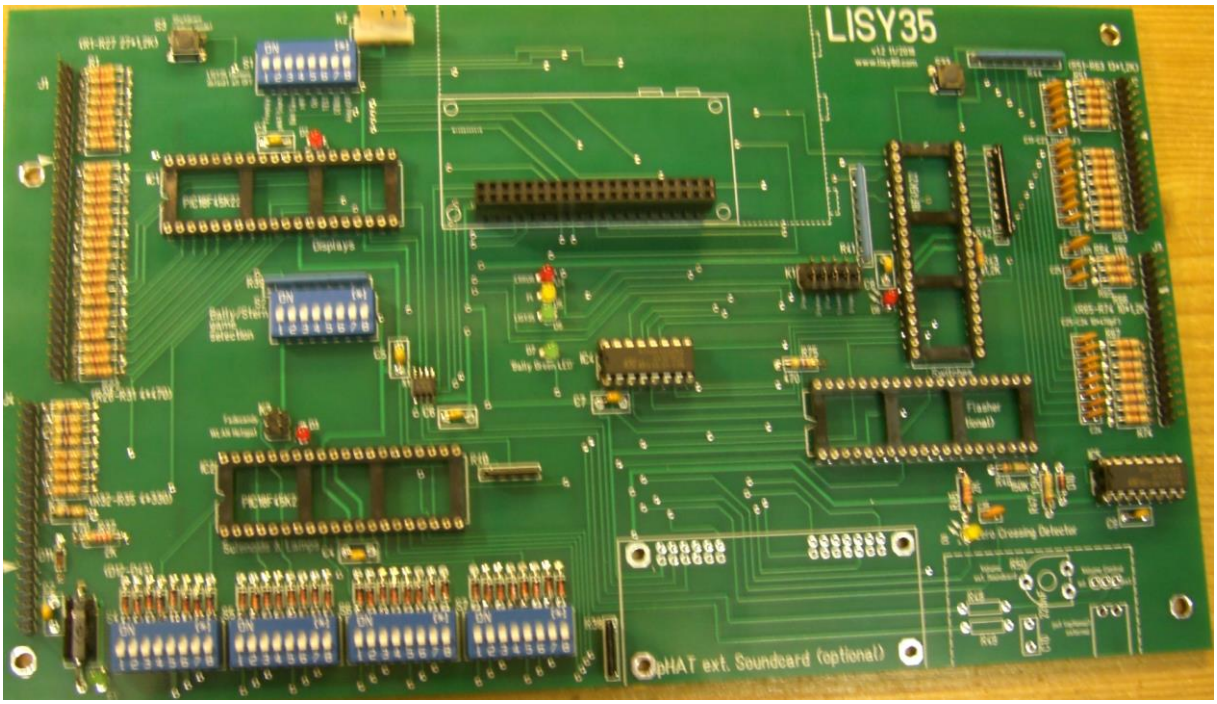


Picture 2: LISY35 after step2 (HW Version 1.2)

2.3. Step 3, Elko C1 & Switches, Header and Socket for Raspberry PI

Place the big Elko C1 and the six Dip Switch banks as noted on the board.

For the Headers J1-J4 after soldering you need to remove one pin from each Header, as they are used as 'Key' for the connectors. The four pins which needed to be removed are marked with an arrow/triangle on the board. Just cut them with a wire cutter.

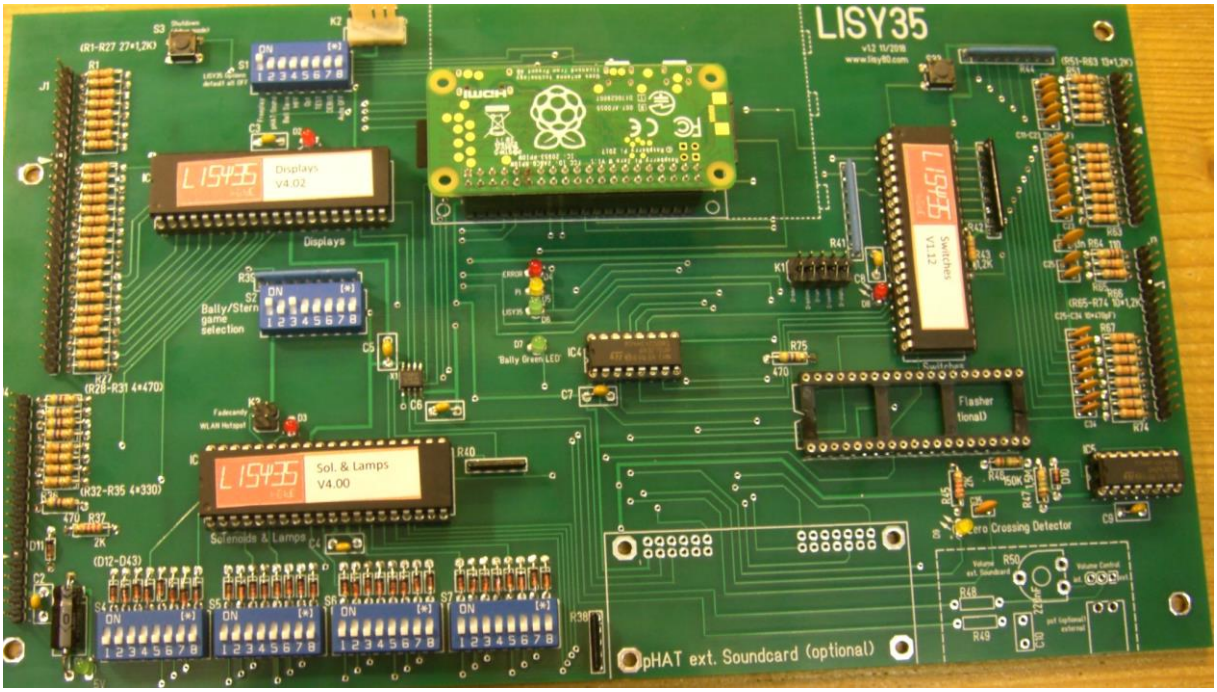


Picture 3: LISY35 after Step 3. (HW Version 1.2)

2.4. Step 4, Placement of all IC and the Raspberry PI

After a final check of your soldering work, you can now place all the IC in the sockets. Again look carefully on the orientation of the ICs.

For further instructions on how to place the 'LISY' image onto the SD card have a look at user manual.



Picture 3: LISY35 after Step 4. 'Ready to go'(HW Version 1.2)

2.5. Step 5, Sound Option 1 (optional)

Place all the components from the sound option 1 list and make sure you place the jumper to the 'internal' position.