

Printalyzer

Enlarging Timer & Exposure Meter

Power Board

Revision E

2024-06-12

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Circuit Board Design

The board design and layout is broken up into three major sections:

- Mains AC – The portion that handles incoming line voltage, and the primary focus of this document
- Logic DC – The portion that handles the low voltage 12VDC supply for the main board
- DMX – A completely separate low-voltage DC section that is only located on this board for mechanical convenience since it drives a rear panel connector

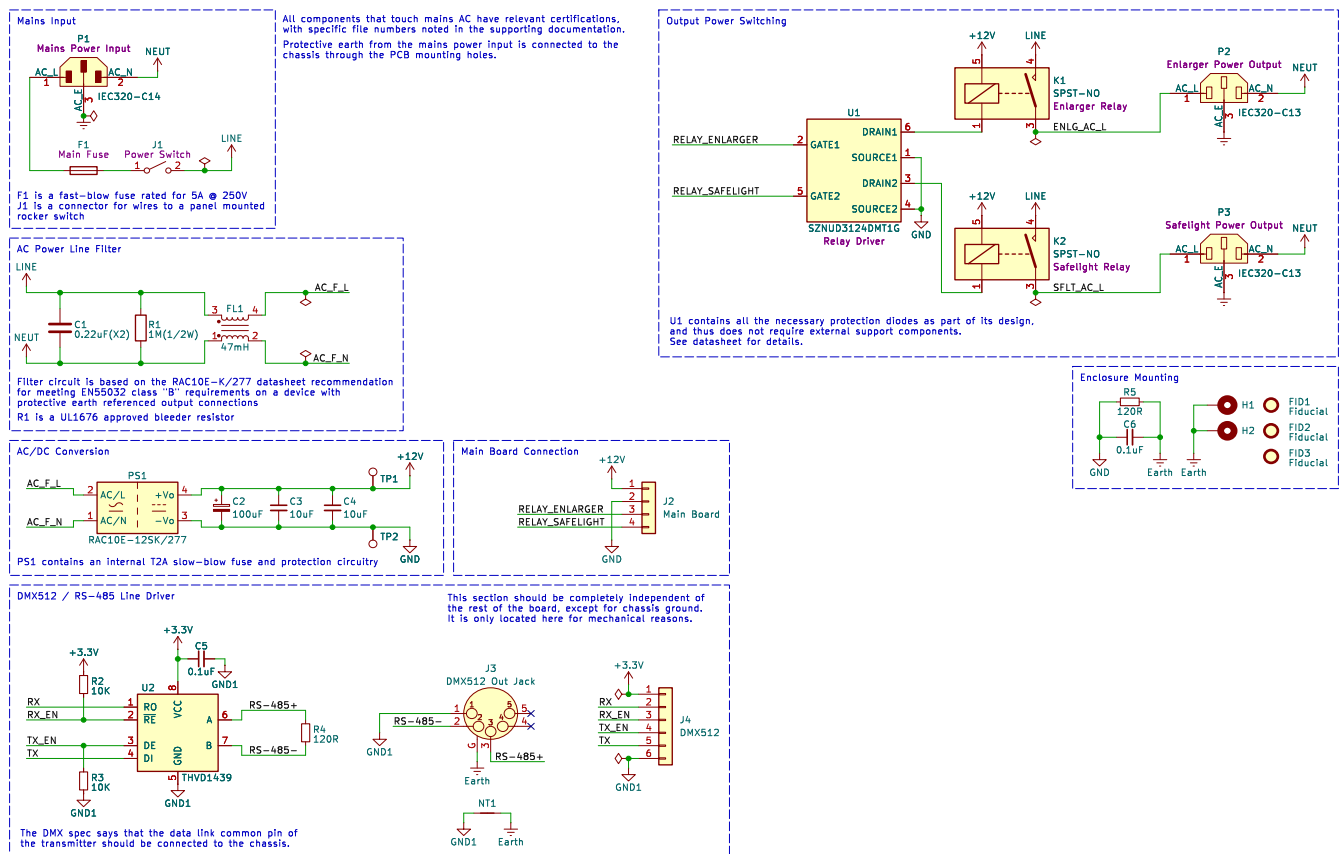


Figure 1: Design Schematic

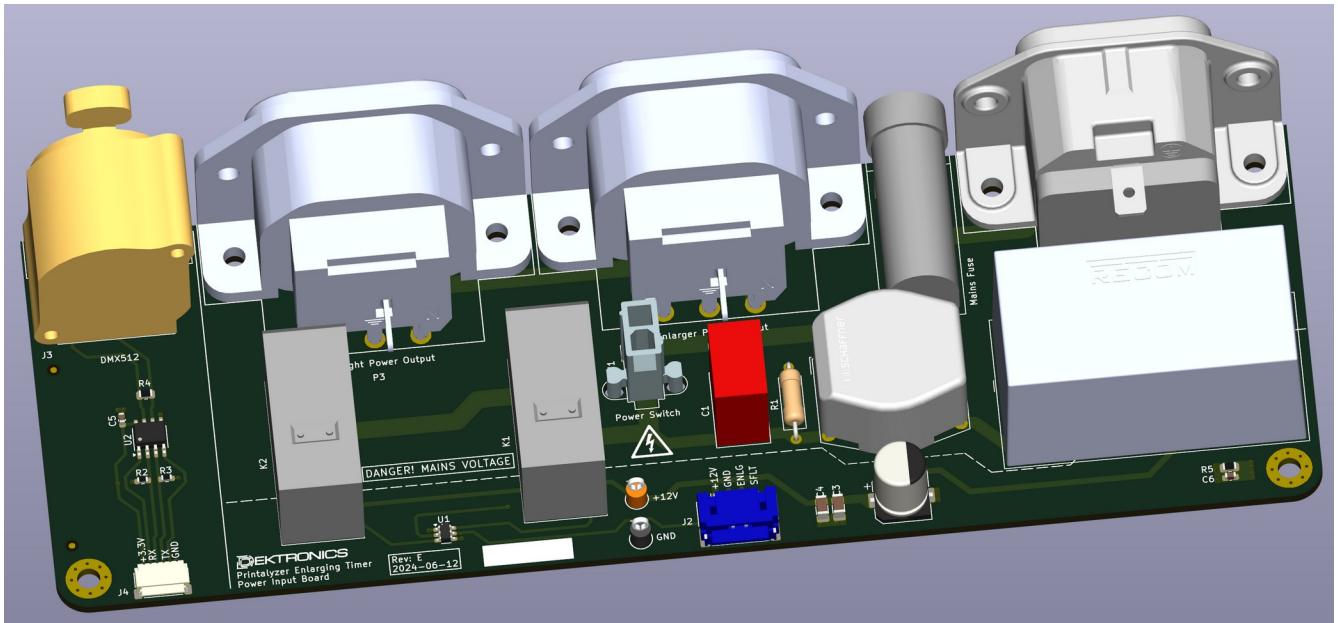


Figure 2: PCB Rendering

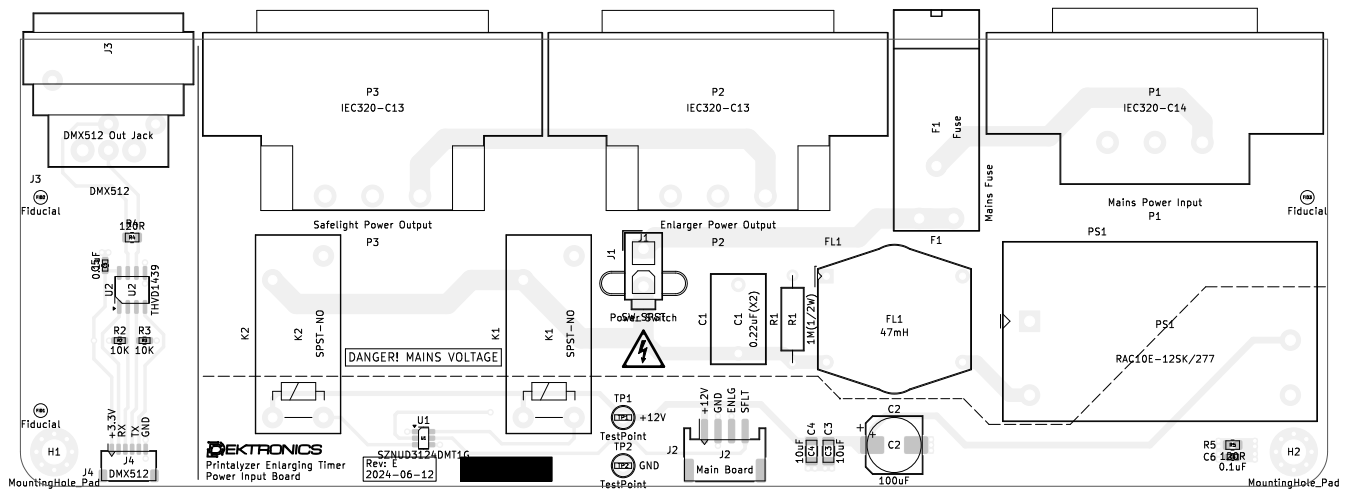


Figure 3: PCB Component Layout

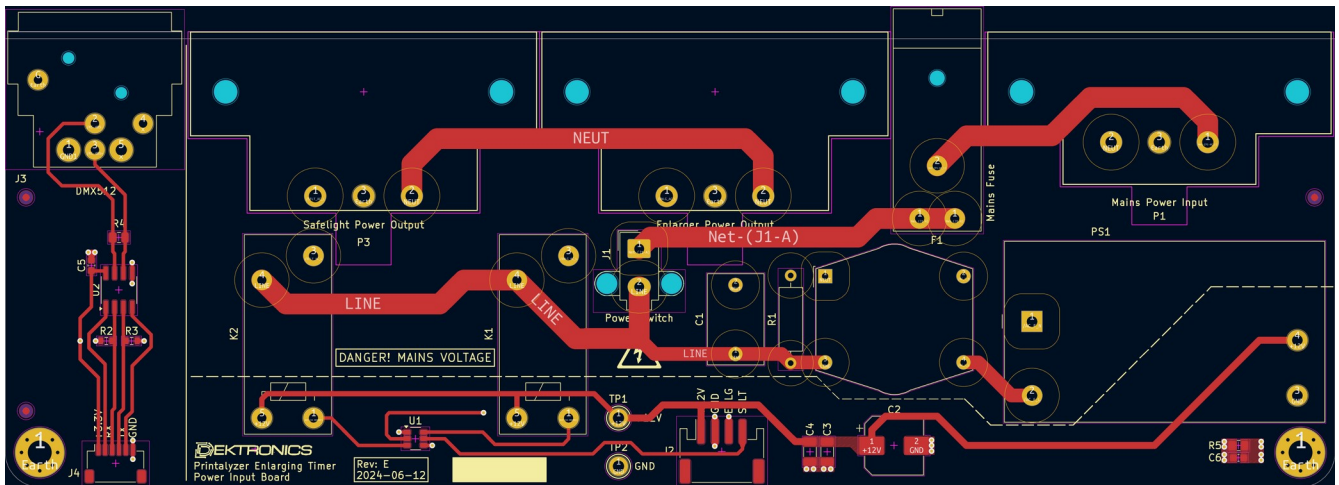


Figure 4: PCB Layout Top

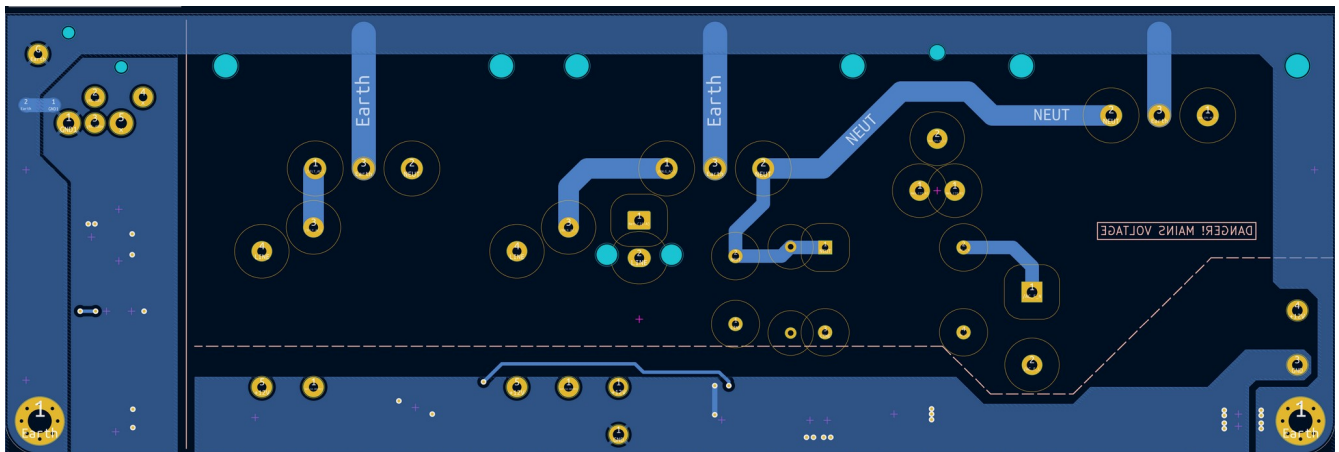


Figure 5: PCB Layout Bottom

Circuit Board Manufacturing

The PCB itself is manufactured by JLCPCB with the following parameters:

- Dimensions: 193 mm x 65 mm
- Thickness: 1.6 mm
- Layers: 2
- Color: Green
- Material type: FR4-Standard TG 135-140
- Outer copper weight: 2 oz
- Surface finish: ENIG

Assembly is conducted in two phases. First, reflow soldering is used to mount the surface mount components. Second, hand soldering is used to mount the thru-hole components. Both are performed using a SAC305 solder alloy.

Component List

Table 1: PCB Components

Section	Ref	Qty	Manufacturer	Part Number	Description
Mains AC	F1	1	Schurter	3101.01	FUSE HLDR CARTRIDGE 400V 16A PCB
Mains AC	J1	1	Molex	1724470002	Connector Header Through Hole 2 position
Mains AC	K1,K2	2	Omron	G2RL-1A DC12	RELAY GEN PURPOSE SPST 12A 12V
Mains AC	P1	1	Schurter	GSP1.9113.1	PWR ENT RCPT IEC320-C14 PNL SLDR
Mains AC	P2,P3	2	Schurter	6182	PWR ENT RCPT IEC320-2-2F PANEL
Mains AC	PS1	1	RECOM Power	RAC10E-12SK/277	AC/DC CONVERTER 12V 10W
Mains AC	C1	1	Würth Elektronik	890324023028	CAP FILM 0.22UF 10% 275VAC (X2)
Mains AC	R1	1	Vishay	VR37000001004JR500	RES 1M OHM 1/2W 5% MG AXIAL
Mains AC	FL1	1	Schaffner EMC Inc.	RN116-0.5-02-47M	CMC 47MH 500MA 2LN TH
Logic DC	C2	1	Nichicon	UWT1H101MNL1GS	CAP ALUM 100UF 20% 50V SMD
Logic DC	C3,C4	2	Samsung Electro-Mechanics	CL31B106KBHNNNE	CAP CER 10UF 50V X7R 1206
Logic DC	C5,C6	2	Samsung Electro-Mechanics	CL10B104KA8NNNC	CAP CER 0.1UF 25V X7R 0603
Logic DC	J2	1	JST Sales America Inc.	S4B-PH-SM4-TB(LF)(SN)	S4B-PH-SM4-TB(LF)(SN)
DMX	J3	1	Neutrik	NC5FBH	XLR Connectors 5C PCB FEMALE RECEPT
DMX	J4	1	JST Sales America Inc.	SM06B-SRSS-TB(LF)(SN)	CONN HEADER SMD R/A 6POS 1MM
Logic DC, DMX	R2,R3	2	Vishay Dale	CRCW060310K0JNEA	RES SMD 10K OHM 5% 1/10W 0603
Logic DC, DMX	R4, R5	2	Vishay Dale	CRCW0805120RFKEA	RES SMD 120 OHM 1% 1/8W 0805
Logic DC	TP1,TP2	2	Keystone Electronics	5006	PC TEST POINT COMPACT BLACK
Logic DC	U1	1	ON Semiconductor	SZNUD3124DMT1G	IC PWR DRIVER N-CHANNEL 1:1 SC74
DMX	U2	1	Texas Instruments	THVD1439DR	IC TRANSCEIVER HALF 1/1 8SOIC

Table 2: Non-PCB Components

Section	Qty	Manufacturer	Part Number	Description
Mains AC	1	Molex	46992-0210	Mini-Fit Jr. Receptacle Housing
Mains AC	1	Molex	215340-1122	Mini-Fit Jr. Pre-Crimped Lead (cut in half)
Mains AC	2	TE Connectivity	3-520125-2	TE 187 Ultra-Fast Quick Disconnect Receptacle
Mains AC	1	Marquardt Switches	1801.11	Rocker On/Off Switch SPST
Mains AC	1	Littelfuse	0217005.MXBP	Cylindrical cartridge fuse, 5x20mm, Fast-blow, rated for 5A @ 250V

Mains AC Component Details

Manufacturer	Schurter	
Part Number	3101.0050	
Description	External Fuse holder, 5 x 20 mm, PCB mounting	
Ratings	250 VAC · 2.5 W / 10 A (VDE) · 500 V · 16 A (UL/CSA)	
Approvals	UL	File Number: E39328
	VDE	Certificate Number: 40044101

Manufacturer	Littelfuse	
Part Number	0217005.MXBP	
Description	Cylindrical cartridge fuse, 5x20mm, Fast-Blow	
Ratings	5A @ 250V	
Approvals	UL	File Number: E10480
	CSA	File Number: 29862
	VDE	Certificate Number: 40016647

Manufacturer	Molex	
Part Number	1724470002	
Description	Connector header, through hole, 2 position	
Ratings	Voltage: 600V AC (RMS)/DC, Current: 23.5A	
Approvals	UL	File Number: (*)
	CSA	File Number: (*)

Manufacturer	Omron	
Part Number	G2RL-1A DC12	
Description	Electromechanical Relay SPST-NO	
Ratings	12VDC, 12A	
Approvals	UL	File Number: E41643
	CSA	File Number: LR31928
	VDE	Certificate Number: 119650

Manufacturer	Schurter	
Part Number	GSP1.9113.1	
Description	Power Entry Connector Receptacle, Male Blades, IEC 320-C14 Panel Mount, Flange; Through Hole, Right Angle	
Ratings	IEC	10 A / 250 VAC; 50 Hz
	UL/CSA	15 A / 250 VAC; 60 Hz
Approvals	UL	File Number: E96454
	VDE	Certificate Number: 40012767
	CCC	Certificate Number: 2020180204014251, 2020180204014252

Manufacturer	Schurter	
Part Number	6182.0033	
Description	Power Entry Connector Receptacle, Female Sockets IEC 320-2-2/F Panel Mount, Flange; Through Hole, Right Angle	
Ratings	IEC	10 A / 250 VAC; 50 Hz
	UL/CSA	15 A / 250 VAC; 60 Hz
Approvals	UL	File Number: E103791
	VDE	Certificate Number: 40053329
	CCC	Certificate Number: 2020180204013719 (PC I only)

Manufacturer	RECOM Power	
Part Number	RAC10E-12SK/277	
Description	Enclosed AC/DC Converter; 10W; 12VDC Output	
Ratings	Input: 85-305 VAC 50/60Hz	
	Output: 12 VDC @ 833 mA	
Approvals	E491408-A6019-UL	UL62368-1:2019 3rd Ed CAN/CSA-C22.2 No. 62368-1:2019 3rd Ed.
	210824013	IEC62368-1:2018 3rd Ed.
	210824013	EN IEC 62368-1:2020 + A11:2020
	210824014	IEC62368-1:2014 2nd Ed.
		EN62368-1:2014 + A11:2017

Manufacturer	Würth Elektronik	
Part Number	890324023028	
Description	CAP FILM 0.22UF 10% 275VAC (X2)	
Ratings	275VAC, Across the mains	
Approvals	UL	File Number: E345659
	CQC	File Number: 13001104051
	ENEC10	File Number: 40038405

Manufacturer	Vishay	
Part Number	VR37000001004JR500	
Description	RES 1M OHM 1/2W 5% MG AXIAL	
Ratings	UL1676	
Approvals	UL	File Number: E171160

Manufacturer	Schaffner EMC Inc.	
Part Number	RN116-0.5-02-47M	
Description	CMC 47MH 500MA 2LN TH	
Ratings	300 VAC, Design corresponding to UL 1283, IEC/EN 60938-1	
Approvals	UL	File Number: E64388
	VDE	Certificate Number: 114916

Manufacturer	Molex	
Part Number	46992-0210	
Description	Mini-Fit Jr. Receptacle Housing	
Ratings	UL 94V-2, Glow-Wire Capable	
Approvals	UL	File Number: E29179
	CSA	File Number: LR19980

Manufacturer	Molex	
Part Number	215340-1122	
Description	Mini-Fit Jr. Pre-Crimped Lead (cut in half), UL 1015, 16 AWG	
Ratings	600V, 9A	

Manufacturer	TE Connectivity	
Part Number	3-520125-2	
Description	Ultra-Fast 187 Quick Disconnect Female 14-16 AWG Crimp Connector Fully Insulated	
Ratings	600V	
Approvals	UL	File Number: E66717

Manufacturer	Marquardt Switches	
Part Number	1801.1148	
Description	Rocker On/Off Switch SPST	
Ratings	IEC	8 (8) A 250 V AC 5E4 12 (4) A 250 V AC 1E4
	North America	15A 250 V AC 1 1/2 HP 15A 125 V AC 3/4 HP
Approvals	UL	File Number: E41791