

PS-30A-1 Bench Power Supply 0 to 40 VDC at 0 to 1 ADC

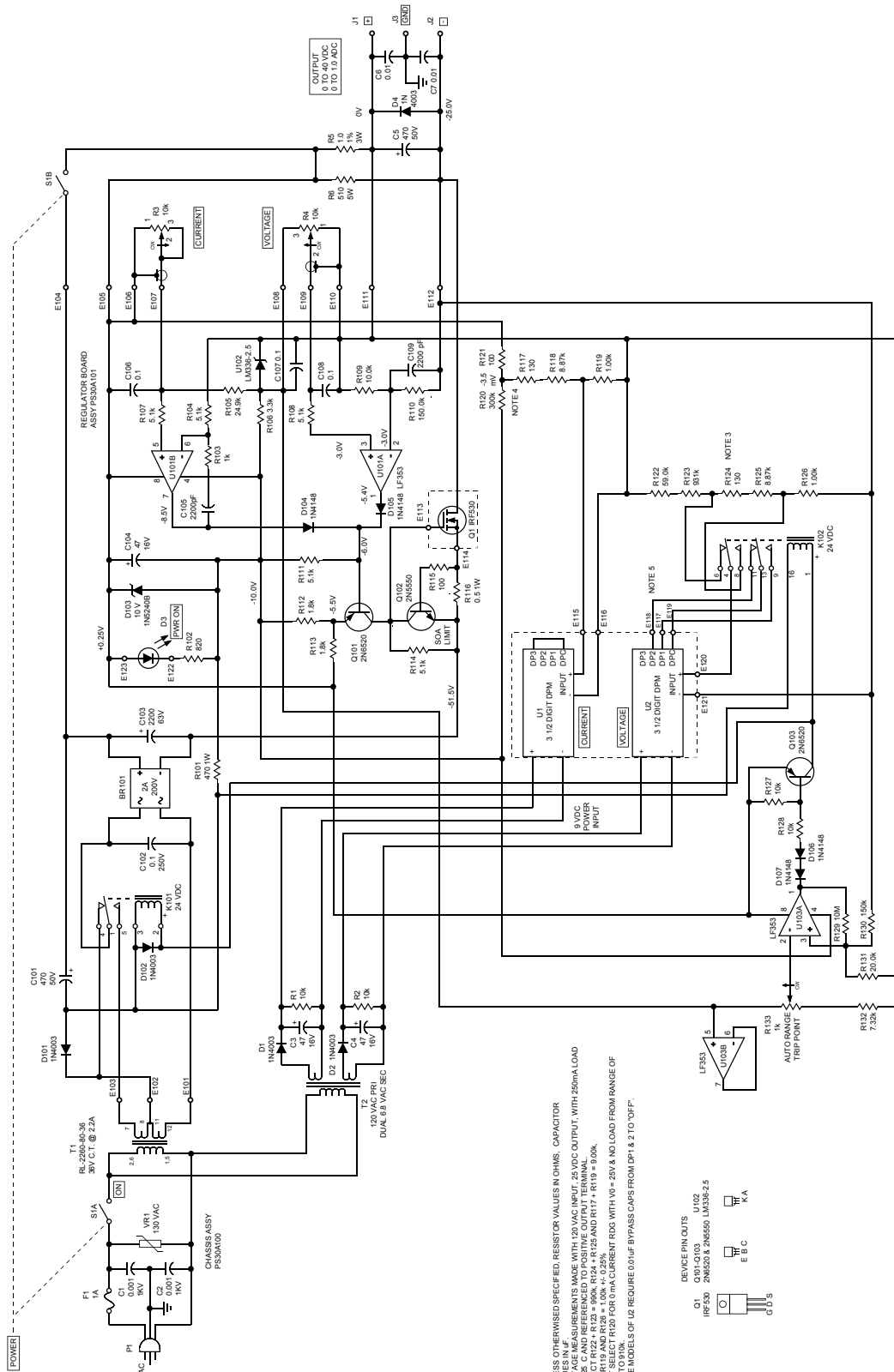
PS-30A-1 Bench Power Supply 0 to 40 VDC at 0 to 1 ADC



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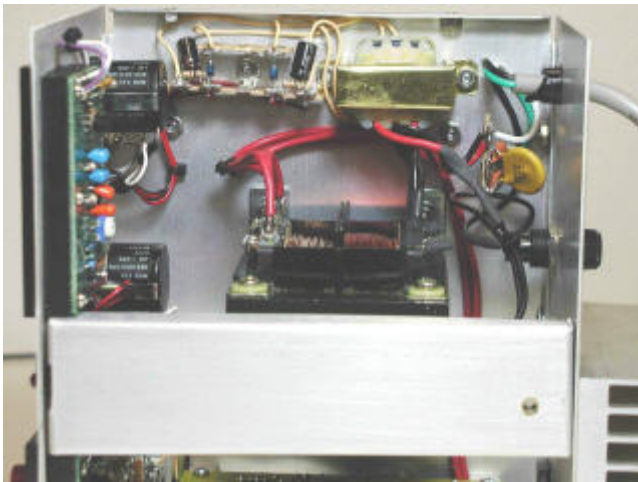
PS-30A-1 Bench Power Supply 0 to 40 VDC at 0 to 1 ADC



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Applications

- Designed specifically for test bench use to power electronic equipment under repair or development.
- Excellent for powering bread boards, equipment or test fixtures where excellent regulation, low noise and ease of voltage and current adjustments are needed.
- Voltage regulated 0 to 40 VDC and current regulated 0 to 1 ADC by individual 10 turn controls.



Features

- excellent voltage regulation
- excellent load step response
- very low ripple and noise DC output
- adjustable output voltage at 4 Volts per turn
- adjustable output current at 100 mA per turn
- RFI/EMI input filter on AC line with rear panel fuse
- output reverse voltage protection
- RFI/EMI immune output
- 100% duty cycle output at ambient temperatures up to +40 °C
- simple rugged circuit with no high voltage switching or noise generation that requires complex filtering and shielding

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Characteristics

Parameter	Conditions	Value
Input Voltage	60 Hz Line Output Load 0 to 1 ADC	105 to 125 VAC
Input Current	120.0 VAC Input 40.0 VDC Output 1.0 ADC Output Load	0.6 Amp AC
Line Regulation	40.0 VDC @ 0.50 ADC Output 105.0 VAC to 125.0 VAC	$\Delta V_o = 4.0 \text{ mV (0.010\%)}$
	40.0 VDC @ 0.99 ADC Output 115.0 VAC to 125.0 VAC	$\Delta V_o = 1.0 \text{ mV (0.003\%)}$
Load Regulation	$V_o = 40.0 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$ $\Delta I_o = 0 \text{ to } 0.90 \text{ ADC}$	$\Delta V_o = 2.3 \text{ mV (0.006\%)}$
	$V_o = 20.0 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$ $\Delta I_o = 0 \text{ to } 0.90 \text{ ADC}$	$\Delta V_o = 3.4 \text{ mV (0.017\%)}$
Ripple and Noise (Voltage mode)	$V_o = 0 \text{ to } 40.0 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$ $I_o = 0 \text{ to } 0.5 \text{ ADC}$	$< 220 \mu\text{Vrms}$
Ripple and Noise (Current mode)	$V_o = 0 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$ $I_o = 0.05 \text{ to } 1.0 \text{ ADC}$	$< 700 \mu\text{Vrms}$
Load Step Response	$V_o = 5.60 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$ $\Delta I_o = 0.028 \text{ to } 0.53 \text{ Amp}$	+/- 60 mVpk recovering within 10% in 4.5 μS
Output Impedance	$V_o = 1.40 \text{ VDC}$ $V_i = 120.0 \text{ VAC}$	0.0013 Ω at 10 Hz 0.0005 Ω at 10 kHz 0.0008 Ω at 1 MHz

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Characteristics (Continued)

- Voltage and current regulated
- Operates as constant current source with current regulation but not as a high impedance constant current source
- Output current is regulated to the level set by the front panel control, but output impedance remains very low (voltage source) as opposed to the high impedance of a true constant current source
- While output current is limited and regulated, a large discharge current can occur when the output capacitor is discharged by a low resistance load - therefore when the PS-30A-1 is used to test zener diodes, or other current sensitive devices, it is necessary to ensure the output voltage is zero before connecting the DUT and the current limit is set to a safe value, after which the output voltage can be increased to compliance level (voltage established by the desired output current for the load resistance connected)
- Output capacitance is a nominal 470 uF and when charged to 40 VDC represents approximately 750 mJ of energy
- PS-30A-1 output is reverse voltage protected so damage will not occur when connecting or disconnecting from inductive loads

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Supplier is Mouser unless noted otherwise

Qty	Designator	Value/type	Description	Part Number	Supplier
1	BR101	2A, 200V	Bridge Rectifier	625-2KBP02M-E4	
1	C101	470uF, 50V	Aluminum	647-UVR1H471MHD	
1	C102	0.1uF, 250V	Polyester	5989-250V.1-F	
1	C103	2200uF, 63V	Aluminum	5985-63V2200	
1	C104	47uF, 16V	Aluminum	647-UVR1C470MDD	
2	C105,109	2200pF, 50V	MLC Ceramic X7R	80-C315C222K1R	
3	C106,107,108	0.1uF, 50V	MLC Ceramic X7R	80-C322C104K5R	
3	D101,102,106	1N4003	1A, 200V Silicon Rect.	863-1N4003G	
1	D103	1N5240B	10V, 0.5W Zener	78-1N5240B	
4	D104,105,107,108	1N4148	Silicon Diode	512-1N4148	
1	K101	10A SPDT Relay	24VDC Coil	817-FTR-H1CA024V	
1	K102	Signal DPDT Relay	24VDC Coil	653-G5V-2-H-DC24	
2	Q101,103	2N6520	350V, PNP TO-92	512-2N6520TA	
1	Q102	2N5550	140V, NPN TO-92	512-2N5550BU	
1	R101	470	5%, 1W, CF	294-470-RC	
1	R102	820	5%, 0.25W, CF	291-820-RC	
1	R103	1K	5%, 0.25W, CF	291-1K-RC	
3	R104, 107, 108, 111,114	5.1K	5%, 0.25W, CF	291-5.1K-RC	
1	R105	24.9K	1%, 0.25W, MF	271-24.9K-RC	
1	R106	3.3k	5%, 0.25W, CF	291-3.3K-RC	
2	R109	10.0K	1%, 0.25W, MF	271-10K-RC	
1	R110,130	150K	1%, 0.25W, MF	271-150K-RC	
2	R112,113	1.8K	5%, 0.25W, CF	291-1.8K-RC	
2	R115,121	100	5%, 0.25W, CF	291-100-RC	
1	R116	0.5	5%, 1W, CF	294-0.5-RC	
2	R117,124	130	1%, 0.25W, MF	271-130-RC	
2	R118,125	8.87K	1%, 0.25W, MF	271-8.87K-RC	
2	R119,126	1.00K	1%, 0.25W, MF	271-1K-RC	
1	R122	59.0K	1%, 0.25W, MF	271-59K-RC	
2	R123	931K	1%, 0.25W, MF	271-931K-RC	
2	R127,128	10K	5%, 0.25W, CF	291-10K-RC	
1	R129	10M	5%, 0.25W, CF	291-10M-RC	
1	R131	20.0K	1%, 0.25W, MF	271-20K-RC	
1	R132	7.32K	1%, 0.25W, MF	271-7.32K-RC	
1	R133	1K Cermet Variable	5%, 0.25W	652-3386F-1-102LF	
1	R120	300K	5%, 0.25W, CF	291-300K-RC	
2	U101,103	LF353	Dual FET Op Amp	512-LF353N	
1	U102	LM336-2.5	2.5 Volt Reference	512-LM336Z25X	

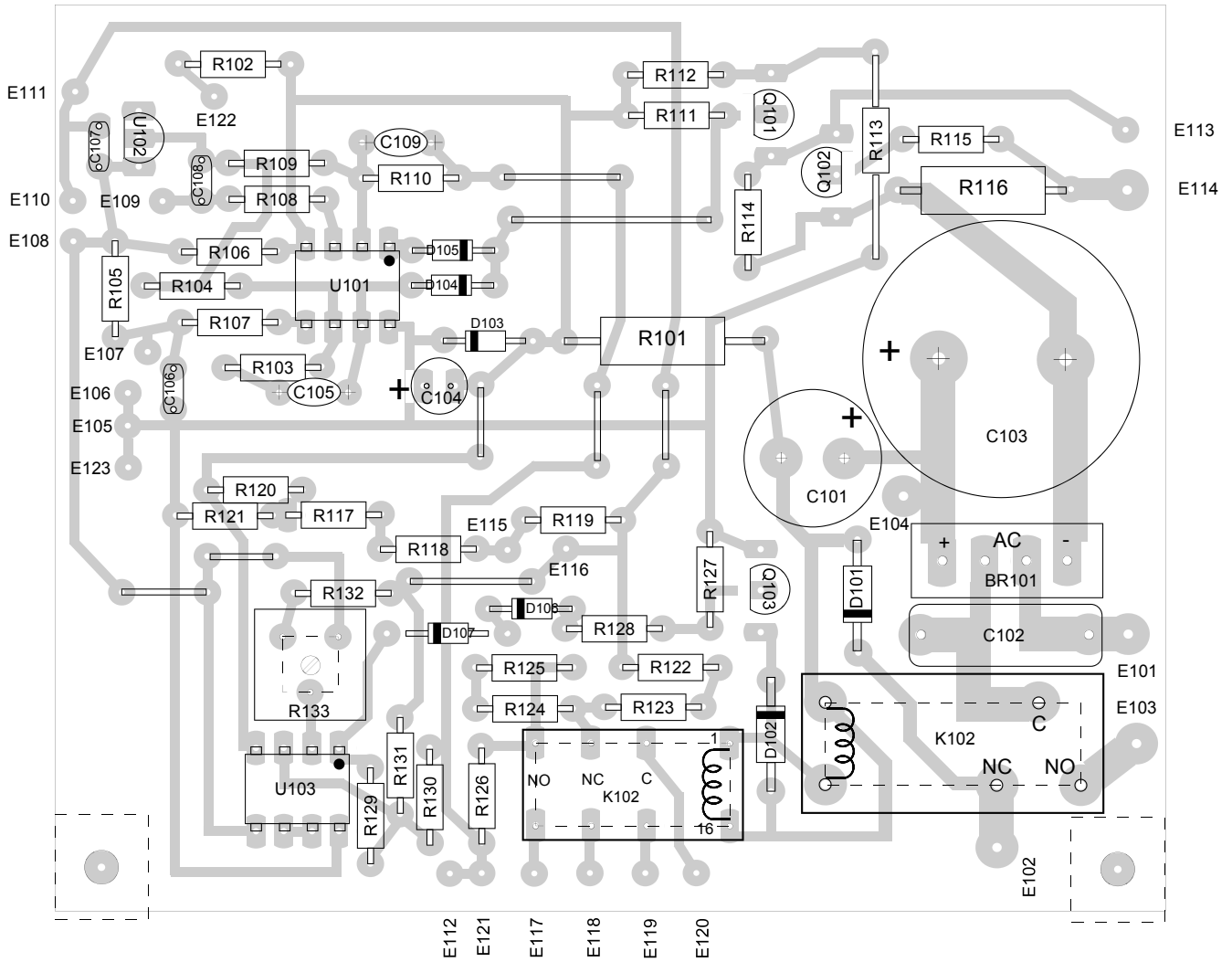
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Qty	Designator	Value/type	Description	Part Number	Supplier
2	C1,2	0.001uF, 1KV	Disk Ceramic Y5P	81-DEBB33A102KA2B	
1	C5	470uF, 50V	Aluminum	647-UVR1H471MHD	
2	C6,7	0.01uF, 50V	Disk Ceramic Y5P	140-50P5-103K-RC	
3	D1,2 ,4	1N4003	1A, 200V Silicon Rect.	863-1N4003G	
1	D3	40 mCd	T-1 ¼ Green LED	604-WP7113SGD	
1	F1	1A, 250V	Normal Blow 5 mm	576-0217001.HXP	
1	J1	5A, Binding Post	5 Way Red	164-4205	
1	J2	5A, Binding Post	5 Way Black	164-4201	
1	J3	5A, Binding Post	5 Way Green	164-4204	
1	P1	120V, 3W Power Cord	NEMA 5-15P	173-53121-E	
1	Q1	IRF530	100V, 75W Pwr FET	844-IRF530PBF	
2	R1,2	10K	5%,0.25W,CF	291-10K-RC	
2	R3,4	10K, 10 Turn	Prec. WW	594-53411103	
1	R5	1.0	1%, 3W, MF	71-RS2B-1.0	
1	R6	510	5%, 5W, Cement	280-CR5-510-RC	
1	S1	DPST, 5A, 250V	Rocker Switch	691-62115919-0-9-V	
1	T1	36VAC, 2.2A	80 VA Power Transformer	RL-2260-80-36	Renco
1	T2	Dual 6.8VAC, 50mA	2W, 120VAC XFMR	W5BWC	
2	U1,2	3 ½ Digit DPM	LCD, 9VDC	PM-128	
1	VR1	130VAC MOV	17mm	581-VE17P00131K	
1	XD3H	T-1 ¼	LED Holder	593-CLP-125	
1	XD3R	T-1 ¼	LED Ring	593-RNG-234	
1	XF1	10A, 250V	5 mm Panel Mtg	441-R3-12-GRX	
1	XP1	Power Cord	Strain Relief	836-1157	
2	Z1	Knob, 0.795" Dia., Skirted	Black	506-PKA50B1/4	
4	Z2	Rubber Feet	0.5" Dia. X 0.25" h	534-720	
2		3 Lug	Terminal Strip	158-1003	
1		5 Lug	Terminal Strip	158-1005	
1		Aavid 61090 4.125"x3.90"	Heat Sink		
1			Chassis		
1			Front Panel		
1			Front Panel Overlay		
1			Rear Panel		
1			Cover		
1		TO-220	Mica Insulator	532-56-77-11	
A/R		Aavid 249G	Thermal Joint Compound	532-249	
1		TO-220	Shoulder Washer	532-7721-7PPS	

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PS-30A-1 BENCH POWER SUPPLY
REGULATOR BOARD ASSY PS-30A101

PWB PS30A120



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Theory of operation

Input power is supplied to the PS-30A-1 through the Line Conditioner (C1, C2 and VR1) which provide surge protection, transient protection and RFI/EMI filtering.

To maximize immunity to external interference, the chassis ground is connected to the power line ground. This necessitates the power be supplied by a grounded AC supply, otherwise the chassis will float up to approximately half the supply voltage.

The rectified and filtered DC voltage is supplied to the regulator assembly and to the pass element Q1 which are in the negative side of the supply. K101 switches between the transformer c.t. and the full secondary to reduce power dissipation when the output voltage is less than 20V. U103 automatically performs this switching by monitoring the output in both voltage and current modes.

U101 is a dual FET Op Amp providing voltage regulation and current limiting. D104 and D105 act as a analog "OR" circuit allowing automatic switching from voltage regulation to current regulation. U102 is a precision 2.5 V shunt reference that establishes the operation point for both voltage and current regulation.

The output voltage is set by R4, a 10 turn precision potentiometer, with a 4 Volt per turn resolution. R109 and R110 provide a 16 to 1 divider so the 2.5V reference will produce 40V output. Output current is set by R3, a 10 turn precision potentiometer, with a 100 mA per turn resolution.

Output voltage and current are monitored by U1 and U2, 3 ½ digit LCD digital panel meters. U1 reads output current and displays it Amperes with 1 mA resolution. U2 reads output voltage with automatic range switching by K102 (which is also controlled by U103). The 20V range has a 10mV resolution and the 40V range has a 100mV range. Both DPMs are powered by isolated secondaries of T2 to provide the required isolation between their supply and measurement inputs.

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