Notes on the H7861 Power Supply
The power switch at the back of the unit is an RCD. The mains input filter is located right next to it, inside the same metal enclosure. An inrush current limiter (NTCs R1/R2) feeds the main rectifier D1, and approximately 300 V DC is present on the main filter capacitors (C1/C2).
The SMPS does not use optocouplers for feedback; instead, small transformers (T1 and T3) are used. The main switching transistors Q1/Q2 are driven directly from the transformer windings. If the main flyback diodes D2/D8 are faulty, the power transistors may also be damaged. The fusible base resistors (R6/R7, 1 Ω, 2 W) should be checked if there is output on the transformer windings but no signal on the transistor bases.
There is a completely independent power supply (T4/E2/C23/Z1) that provides +12 V DC for startup. This voltage is regulated by a 7812 and further reduced via D21/D22 to approximately 10.6 V. This circuit also provides the mains frequency signal for the line time clock (LTC).
The monitor module requires 12 V, 5 V, and −12 V, and generates three open−collector signals−LTC, AC_L, and DC_L−for the backplane. The power supply will operate without the monitor module, but a complete system requires the AC_L and DC_L signals to function. During power supply debugging, this module can be removed.
The other module is the control module, which drives the SMPS.
To safely debug the SMPS, it is possible to remove all mains connections (unplug J1) and supply 13 V from a current−limited power supply to C23. This should be sufficient to power the control board: the startup voltage should be 10.6 V, the SG3524 should generate a 5 V reference on pin 16, and the 66 kHz (or 33 kHz) switching signal should be traceable from pin 13 to the primary−side transformer output.
Similarly, the overvoltage detection and crowbar circuit can be tested by removing all power and applying 5 V from a current−limited laboratory power supply via the output terminals. Limit the current to 100 mA and slowly increase the voltage; the circuit should trigger before reaching 6 V. For the 12 V rail, the trigger voltage is approximately 13.7 V.

Lessons Learned from one H7861 repair
After a long period in storage, the previous owner powered on the machine. It appeared to operate normally until it suddenly stopped working. The power supply became completely inactive: all output voltages were missing, while approximately 300 V DC was still present on the primary side.
The 12 V DC startup voltage was present, and the SG3524 appeared to be functioning correctly. The switching frequency was lower than expected due to different R18/C7 values, suggesting this may be a different revision of the power supply.
Further analysis revealed that some of the A114x diodes on the control board had failed open. This prevented feedback from the secondary side, leaving the primary side inactive. During desoldering, one of the diodes physically fell apart. Replacing these A114x diodes restored the 5 V output, but the 12 V rail was still missing. The faulty components were D10 and Q3; D10 showed visible signs of overheating.
Once the 5 V and 12 V rails were restored, the absence of the −12 V rail−required to generate the AC_L and DC_L signals−prevented the system from starting. Before this fault was fully diagnosed, the power supply failed again. One of the main primary−side transistors had seized and developed a dead short, producing a high−pitched whine.
The original BUW45 transistor was replaced with a BUX48A, which failed immediately upon power−up, indicating an additional fault. Measuring diodes D2/D8 from the component side required pressure to achieve contact; probing the bottom copper traces revealed that one diode was open. Upon removal, this diode also fell apart into two pieces.
It appears that the A114−series diodes didn't age well. Additional mechanical stress from handling the heavy power supply PCB without the steel backplate likely contributed to further diode failures. All A114x diodes were replaced with modern fast−recovery diodes (MURxxx), and the primary−side transistors were replaced with BUX48A devices. The fusible resistors R6/R7 had operated as intended and also required replacement. This restored all output voltages, including −12 V (D17 was also found to be faulty). The power supply passed a basic load test (5 V at 2.7 A and 12 V at 2.6 A), drawing 72 W on the primary side without fans. The mains filter and all capacitors were still in good working condition.

fast recovery diode parameters:
A115M: Vr=600V 3A trr=140ns
A114F: Vr=50V 1A trr=150ns
A114A: Vr=100V 1A trr=150ns
A114B: Vr=200V 1A trr=150ns
A114M: Vr=600V 1A trr=200ns

possible replacement parts:
MUR240: Vr=400V 2A trr=65ns
MUR405: Vr=50V 4A trr=35ns
MUR410: Vr=100V 4A trr=35ns
MUR420: Vr=200V 4A trr=35ns
MUR440: Vr=400V 4A trr=75ns
MUR460: Vr=600V 4A trr=75ns
MUR480: Vr=800V 4A trr=75ns

other diodes:
DEC D664 = 1N3606
replacement: 1N4153, 1N4448

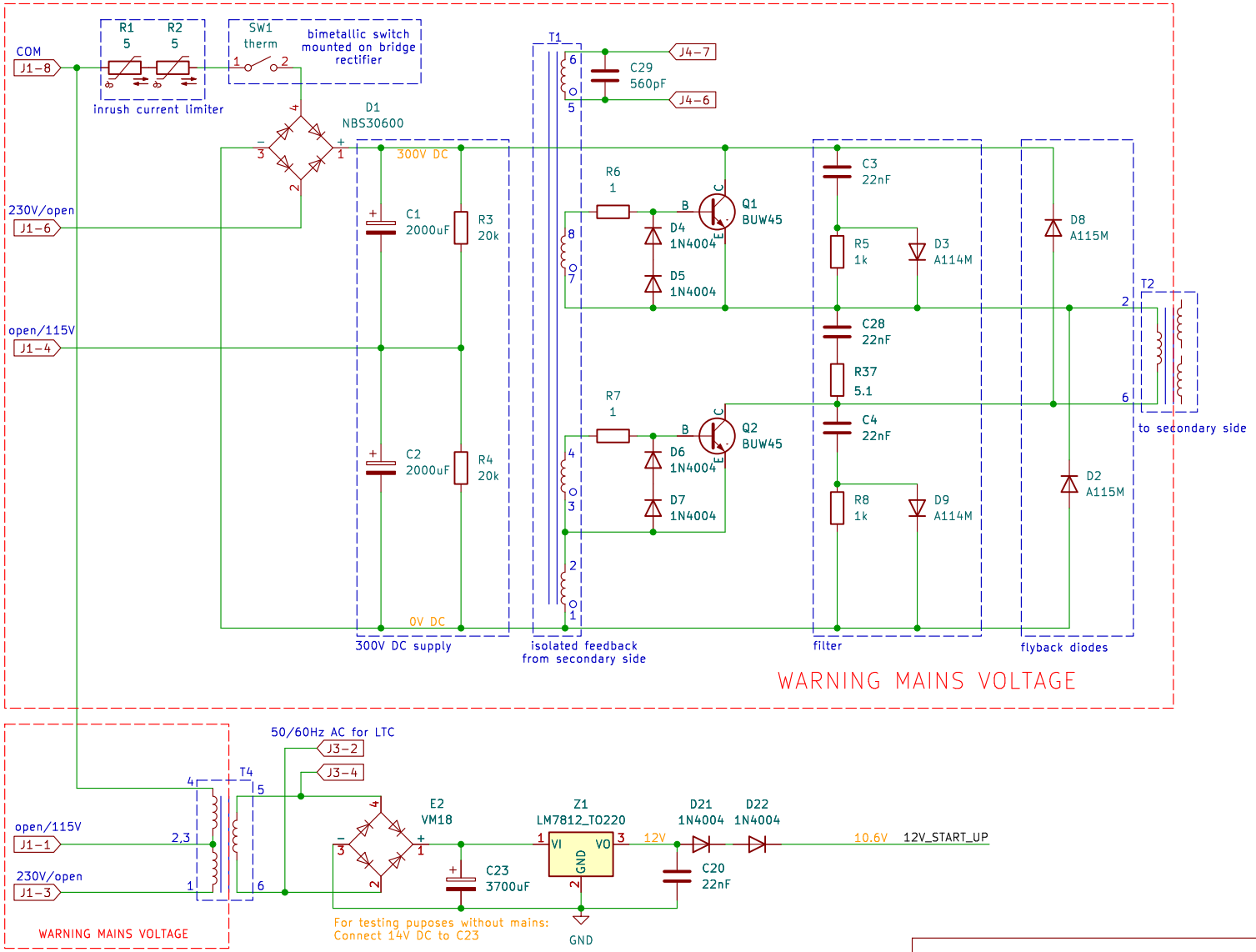
UES1303:Vr=150V, If=500mA, Vf=925mV, Isurge=125A, Ir=5uA, trr=35ns
replacement: UG4D, 1N5811, MUR420
MUR420:Vr=200V, If=4A, Vf=880mV, Isurge=125A, Ir=5uA, trr=35ns

UES2403:Vr=200V, If=3A, Vf=975mV, Isurge=80A, Ir=150uA, trr=35ns

BUX48A is a possible replacement for BUW45
comparison BUW45 / BUX48A
Vceo = 400V / 450V
Vce(sat) = 1.5V / 1.5V
Vbe(sat) = 1.8V / 1.6V
ton = 0.75uS / 1uS
ts = 3uS / 3uS
tfall = 0.8uS / 0.8uS
IBmax = 10A / 4A

primary
File: H7861_primary_side.kicad_sch
secondary side
File: H7861_secondary_side.kicad_sch
control
File: H7861_control.kicad_sch
monitor
File: H7861_monitor.kicad_sch

Power supply for DEC BA11−S
PDP11/23−PLUS
Lothar Felten
Sheet: /
File: H7861.kicad_sch
Title: H7861 power supply
Size: A4 | Date: 2025−11−26 | **Rev: 0**
KiCad E.D.A. 9.0.6 | Id: 1/5



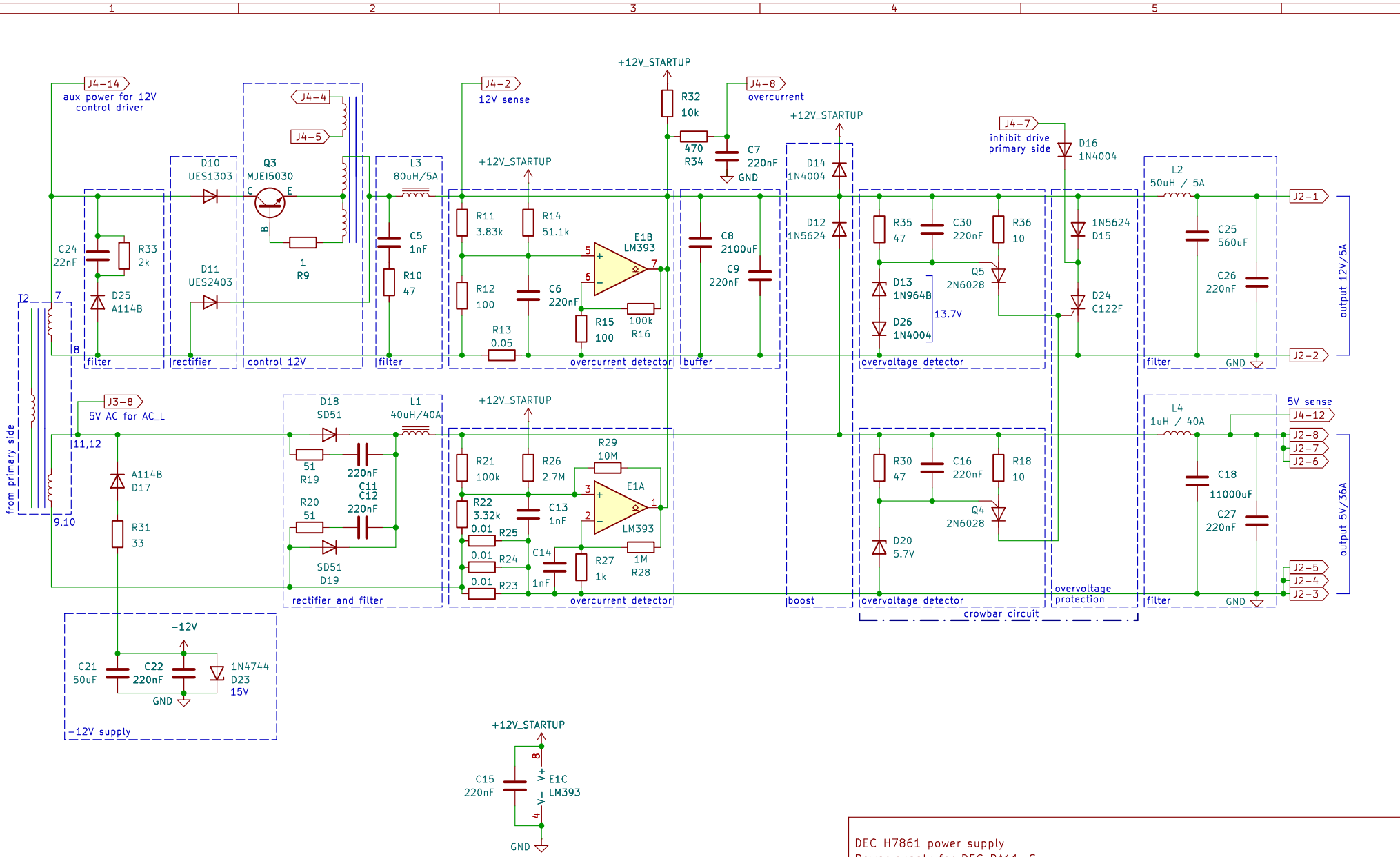
DEC H7861 power supply
Power supply for DEC BA11-S
PDP11/23-PLUS

Lothar Felten

Sheet: /primary/
File: H7861_primary_side.kicad_sch

Title: H7861 primary side

Size: A4	Date: 2025-11-26	**Rev: 0**
KiCad E.D.A. 9.0.6		Id: 2/5



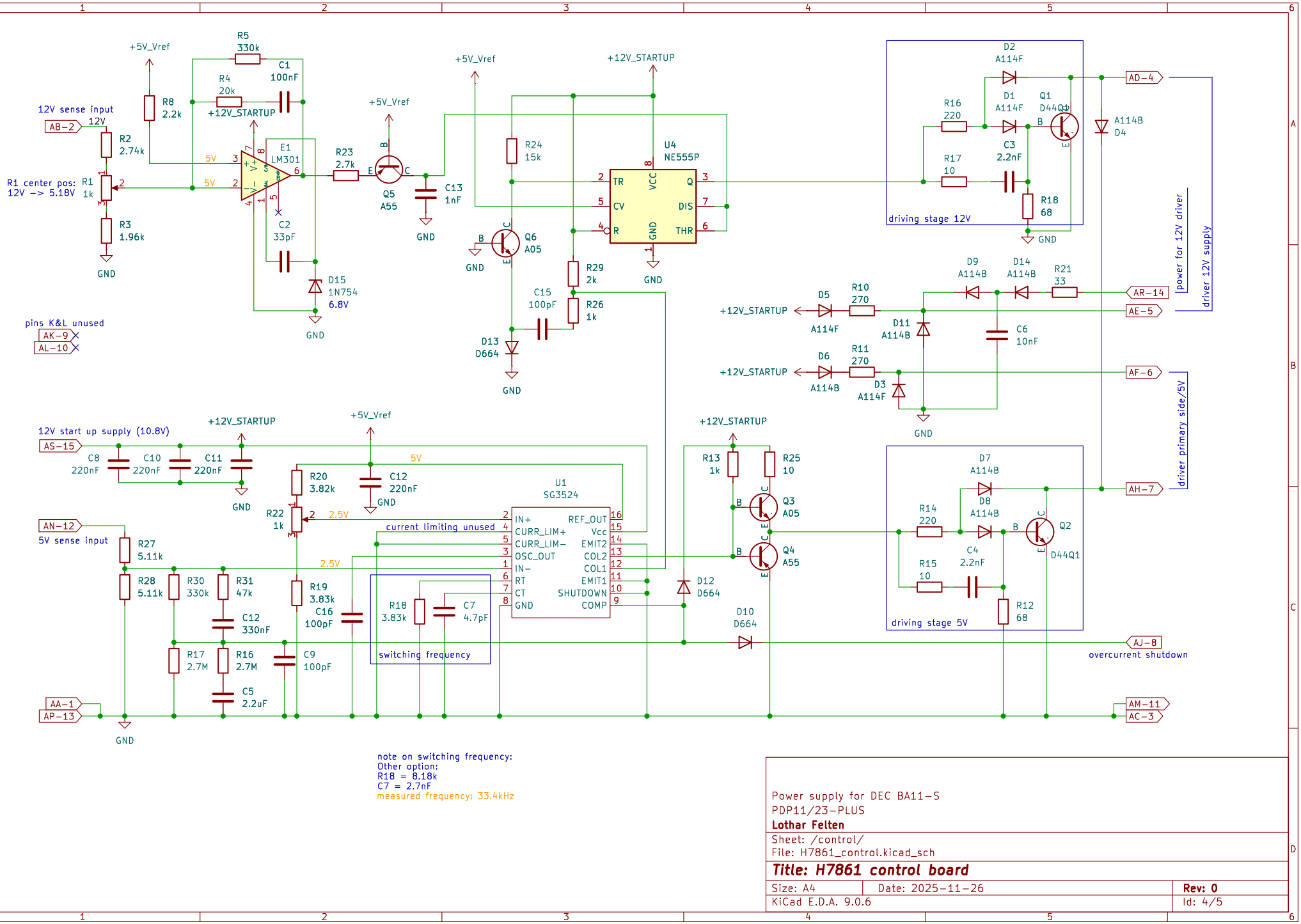
DEC H7861 power supply
Power supply for DEC BA11-S
PDP11/23-PLUS

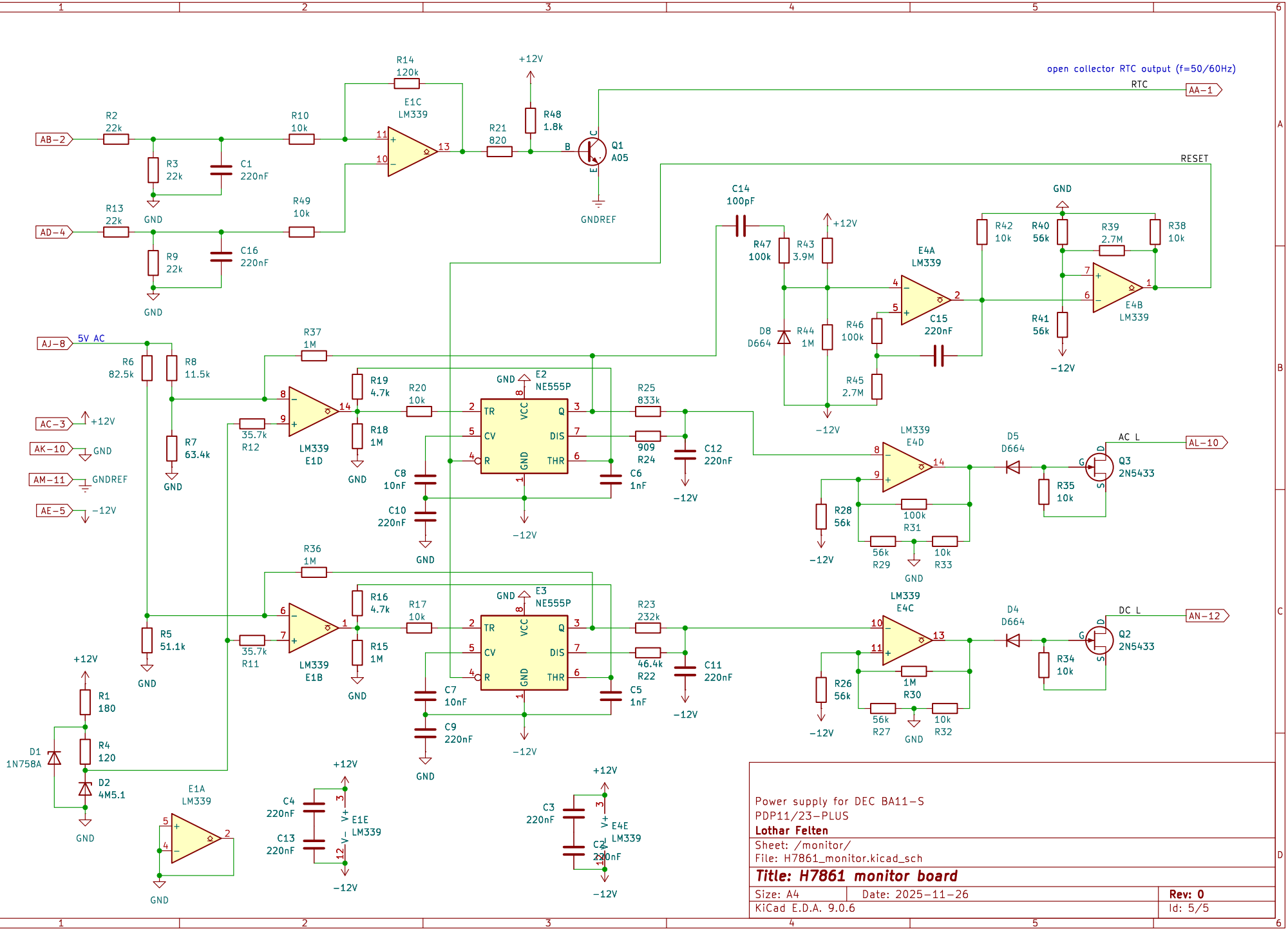
Lothar Felten

Sheet: /secondary side/
File: H7861_secondary_side.kicad_sch

Title: H7861 secondary side

Size: A4	Date: 2025-11-26	**Rev: 0**
KiCad E.D.A. 9.0.6		Id: 3/5


12V sense input
AB-2
12V
R2 2.74k
R1 center pos: 12V -> 5.18V
R1 1k
R3 1.96k
GND
+5V_Vref
R8 2.2k
R5 330k
C1 100nF
R4 20k
+12V_STARTUP
E1 LM301
C2 33pF
D15 1N754 6.8V
R23 2.7k
Q5 A55
C13 1nF
R24 15k
R29 2k
R26 1k
C15 100pF
Q6 A05
D13 D664
U4 NE555P
TR
CV
R
VCC
Q
DIS
THR
GND
driving stage 12V
D2 A114F
D1 A114F
Q1 D44Q1
R16 220
R17 10
C3 2.2nF
R18 68
A114B D4
AD-4
power for 12V driver
driver 12V supply
D9 A114B
D14 A114B
R21 33
AR-14
AE-5
D5 A114F
R10 270
D11 A114B
C6 10nF
D6 A114B
R11 270
D3 A114F
AF-6
driver primary side/5V
pins K&L unused
AK-9
AL-10
12V start up supply (10.8V)
AS-15
C8 220nF
C10 220nF
C11 220nF
R20 3.82k
R22 1k
C12 220nF
2.5V
5V
U1 SG3524
IN+
CURR_LIM+
CURR_LIM-
OSC_OUT
IN-
RT
CT
GND
REF_OUT
Vcc
EMIT2
COL2
COL1
EMIT1
SHUTDOWN
COMP
current limiting unused
AN-12
5V sense input
R27 5.11k
R28 5.11k
R30 330k
R31 47k
C12 330nF
R17 2.7M
R16 2.7M
C5 2.2uF
R19 3.83k
C16 100pF
C9 100pF
R18 3.83k
C7 4.7pF
switching frequency
AA-1
AP-13
R13 1k
R25 10
Q3 A05
Q4 A55
D12 D664
D10 D664
D7 A114B
D8 A114B
Q2 D44Q1
R14 220
R15 10
C4 2.2nF
R12 68
driving stage 5V
AH-7
AJ-8
overcurrent shutdown
AM-11
AC-3
note on switching frequency:
Other option:
R18 = 8.18k
C7 = 2.7nF
measured frequency: 33.4kHz
Power supply for DEC BA11-S
PDP11/23-PLUS
Lothar Felten
Sheet: /control/
File: H7861_control.kicad_sch
Title: H7861 control board
Size: A4
Date: 2025-11-26
Rev: 0
KiCad E.D.A. 9.0.6
Id: 4/5



Power supply for DEC BA11-S
PDP11/23-PLUS
Lothar Felten

Sheet: /monitor/
File: H7861_monitor.kicad_sch

Title: H7861 monitor board

Size: A4	Date: 2025-11-26	**Rev: 0**
KiCad E.D.A. 9.0.6		Id: 5/5