

M480 Mark II CS-80 VCF for Eurorack

Thank you for purchasing the M480 MkII CS-80 VCF circuit board set. This document includes the parts list, schematic, a reference layout image, construction notes and operation notes.

Construction Notes:

The attached bill of materials (BoM) lists all parts needed for the board. The board has provision for two power headers, MOTM-style and 2x5 IDC Eurorack-style.

The panel and filter PC boards mate together through a set of matched headers. To make assembly easier certain header positions have a spare hole to accommodate more common header SKUs.

The BOM uses mostly Digikey product numbers for reference, but parts can of course be ordered from any supplier such as Mouser or your favorite octopart.com search result. Some folks like to use all 1% metal film resistors, but it is not necessary, only the resistors specifically marked 1% actually need to be as specified. The only critical capacitors are C3, C5, C11 and C13, these need to be polyester film types or NP0 ceramic types if you wish to use 0805-size SMT capacitors. Note: there are sixteen 0.1uF SMT bypass capacitors and eight 560pF SMT “Zobel” network capacitors used. C7 and C15 can optionally be 0805 NP0/C0G ceramic SMT types.

The board is made with a standard hot air solder layer, but soldering with leaded solder is fine. Similarly, you can use “no-clean” or organic solder, just be sure to rinse the board in the case of organic solder.

Jumper header JP33 is hardwired A to C, B to D when using a eurorack host board.

M480-2164 rev2.2 Parts List for rev 2.3.2

Qty	Value	Package	RefDes	Description	Digikey Part No.
<u>Capacitors:</u> for parts with option A/B only one package type is needed. Option A is throughhole, option B is SMT.					
10	3.3uF NP	radial 0.1"	C1, C8, C9, C16, C33, C34, C35, C36, C38, C39	3.3uF bipolar aluminum radial	P1198-ND
2	22uF	radial 3.5mm	C17, C18	22 uF, 50V aluminum electrolytic 3.5mm	P939-ND
16	100nF	SMT 0805	C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C41, C42, C43, C44	0.1uF 50V 0805 SMT X7R cap	445-7534-1-ND
2	100pF	radial 0.1"	C37, C40	100 pF 100V 10% NP0 radial	478-3166-ND
2	180pF	radial 0.2"	C7, C15	180 pF 50V 5% NP0 radial (option A)	445-4729-ND
2	180pF	SMT 0805	C7B, C15B	180 pF 50V 5% NP0 0805 (option B)	1276-1129-1-ND
8	560pF	SMT 0805	C2, C4, C6, C10, C12, C14, C31, C32	560 pF 50V 10% X7R 0805	311-1125-1-ND
4	1500pF	radial 3.5mm	C3, C5, C11, C13	1500 pF 100V 5% polyester radial	493-3478-ND
4	1500pF	SMT 0805	C3A, C5A, C11A, C13A	1500 pF 50V 5% C0G 0805 (option)	399-8027-1-ND
<u>Ferrite bead/EMI filters</u>					
2	60@100	axial	L1, L2	EMI filter	Digikey# P9820BK-ND or Mouser# 81-BL01RN1AF1J
<u>Resistors and potentiometers</u> (may use all 1% if desired)					
7	1K	axial	R15, R30, R70, R77, R94, R97, R100	1K 1/4W 4% carbon film	1.0KQBK-ND
2	1M2	axial	R11, R26	1.2M 1/4W 5% carbon film	1.2MQBK-ND

5	4M7	axial	R4, R8, R19, R23, R101	4.7M 1/4W 5% carbon film	4.7MQBK-ND
2	10K 1%	axial	R79, R82	10K 1/4W 1% metal film	10.0KXBK-ND
3	10R	axial	R61, R62, R68	10-Ohm 1/4W 5% carbon film	10QBK-ND
2	18K	axial	R85, R86	18K 1/4W 5% carbon film	18KQBK-ND
2	18K 1%	axial	R51, R52	18.2K 1/4W 1% metal film	18.2KXBK-ND
2	20K 1%	axial	R78, R81	20K 1/4W 1% metal film	20KXBK-ND
22	33K	axial	R1, R2, R3, R6, R9, R12, R13, R16, R17, R18, R21, R24, R27, R28, R53, R66, R69, R71, R72, R80, R95, R98	33K 1/4W 5% carbon film	33KQBK-ND
6	51K1 1%	axial	R36, R37, R43, R46, R73, R74	51.1K 1/4W 1% metal film	51.1KXBK-ND
7	68K	axial	R14, R29, R54, R65, R93, R96, R99	68K 1/4W 5% carbon film	68KQBK-ND
7	100K	axial	R56, R57, R59, R60, R67, R87, R88	100K 1/4W 5% carbon film	100KQBK-ND
13	100K 1%	axial	R35, R39, R40, R41, R42, R44, R45, R47, R48, R49, R50, R83, R84	100K 1/4W 1% metal film	100KXBK-ND

Note 1: R32, R33, R34 install on panel PCB

Note 2: Omit R75, R76 in most applications. Only used if input signals are >5Vpp.

4	150K	axial	R31, R32, R33, R34	150K 1/4W 5% carbon film (note 1)	150KQBK-ND
2*	150K	axial	R75, R76	150K 1/4W 5% carbon film (note 2)	150KQBK-ND
2	200K	axial	R55, R58	200K 1/4W 5% carbon film	200KQBK-ND
1	200K 1%	axial	R38	200K 1/4W 1% metal film	200KXBK-ND
4	261K 1%	axial	R89, R90, R91, R92	261K 1/4W 1% metal film	261KXBK-ND
8	510R	axial	R5, R7, R10, R20, R22, R25, R63, R64	510-Ohm 1/W 5% carbon film	510QBK-ND

Semiconductors

4	N5221B	axial DO-35	D6, D7, D8, D9	2.4V Zener diode	1N5221B-ND
2	1N5817	axial DO-41	D1, D2	20V 1A Schottky diode	1N5817FSCT-ND
4	1N4148	axial DO-35	D5, D10, D11, D12	50v switching diode	1N4148FS-ND
2	TL072P	dual opamp	IC7, IC9	Dual JFET op-amp, PDIP8	296-1775-5-ND
5	TL074P	quad opamp	IC2, IC4, IC5, IC6, IC8	Quad JFET op-amp, PDIP14	296-1777-5-ND
1	LM7810	TO-220	IC10	+10V pos voltage regulator	LM7810CT-ND
1	LM7910	TO-220	IC11	-10V neg voltage regulator	LM7910CT-ND

The V2164D is sold by Small Bear Electronics (and other vendors):

<http://www.smallbearelec.com/servlet/Detail?no=737>

2	V2164D	Quad VCA	IC1, IC3	Quad SSM2164-equivalent VCA PDIP16	See above
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Headers and connectors

1	2x5 shrouded header	JP30	On Shore Technology 302-S101	ED1543-ND
1	2x13 male header	JP24	Adam Technologies PH2-26-U	Jameco 2120292
6	1x3 male header	JP12,JP14,JP15,JP16,JP18,JP21	Jameco ValuePro 7000-1X3SG-R	Jameco 109576
1	1x2 male header	JP30	Harwin M20-9770246	952-1770-ND
1	IDC2x13 2x13 0.1" header	JP24	Amphenol FCI 67997-226HLF	609-3240-ND
1	IDC2x17 2x17 0.1" header	JP17	Würth 61303421121	732-5308-ND

The following panel pots, switches and headers are mounted on the panel PCB. Alpha 9mm vertical pots with metal shaft are suggested.

7	100K lin 9mm pot	VR4,VR5,VR6,VR7,VR8,VR9,VR10	100K 9mm linear rotary panel pot	Small Bear 1012A 1203
3	1M log 9mm pot	VR1, VR2, VR3	100K 9mm audio rotary panel pot	Small Bear 1012A 1206
1	SPDT switch	SW1	E-switch 200MSP1T1B1M2QEH	EG2447-ND
1	DPDT switch	SW2	E-switch 200MDP1T1B1M2QEH	EG2456-ND
16	3.5mm jack	J1-J16	CUI PJ-301B 3.5mm w/tip switch	Erthenvar PJ-301B
1	2x17 socket header	JP17	Sullins SFH11-PBPC-D17-ST-BK	S9199-ND
1	2x13 socket header	JP24	Sullins SFH11-PBPC-D13-ST-BK	S9198-ND
2	1x6 socket header	JP23, JP29	Adams Technologies RS1-06-G	Jameco 2144614
6	1x4 socket header	JP12,JP14,JP15,JP16,JP31	Adams Technologies RS1-04-G	Jameco 2165798

Operation Notes:

If the VCA option is installed, please note the VCA is a linear inverting DC type. One VCA input has a jumper option to select AC/DC coupling. This option jumper can be wired as a panel switch if desired.

Calibration Notes:

The M480 MkII requires no calibration!

M480 MkII specifications:

DC power requirements: [+/-15VDC@50mA](#) nominal
Frequency range: 0.1Hz to 20KHz

Input levels:

IN1, IN2, IN3: 5Vp-p nominal
CV IN, FM IN: -10V to +10V nominal.
(optional) VCA IN1, VCA IN2: 5Vp-p nominal

Output levels:

HP1, BP1, LP1, HP2, BP2, LP2: 3.5Vp-p nominal
(optional) VCA OUT: 5Vp-p

Response: 1V/octave

Old Crow's Synth Shop at www.cs80.com

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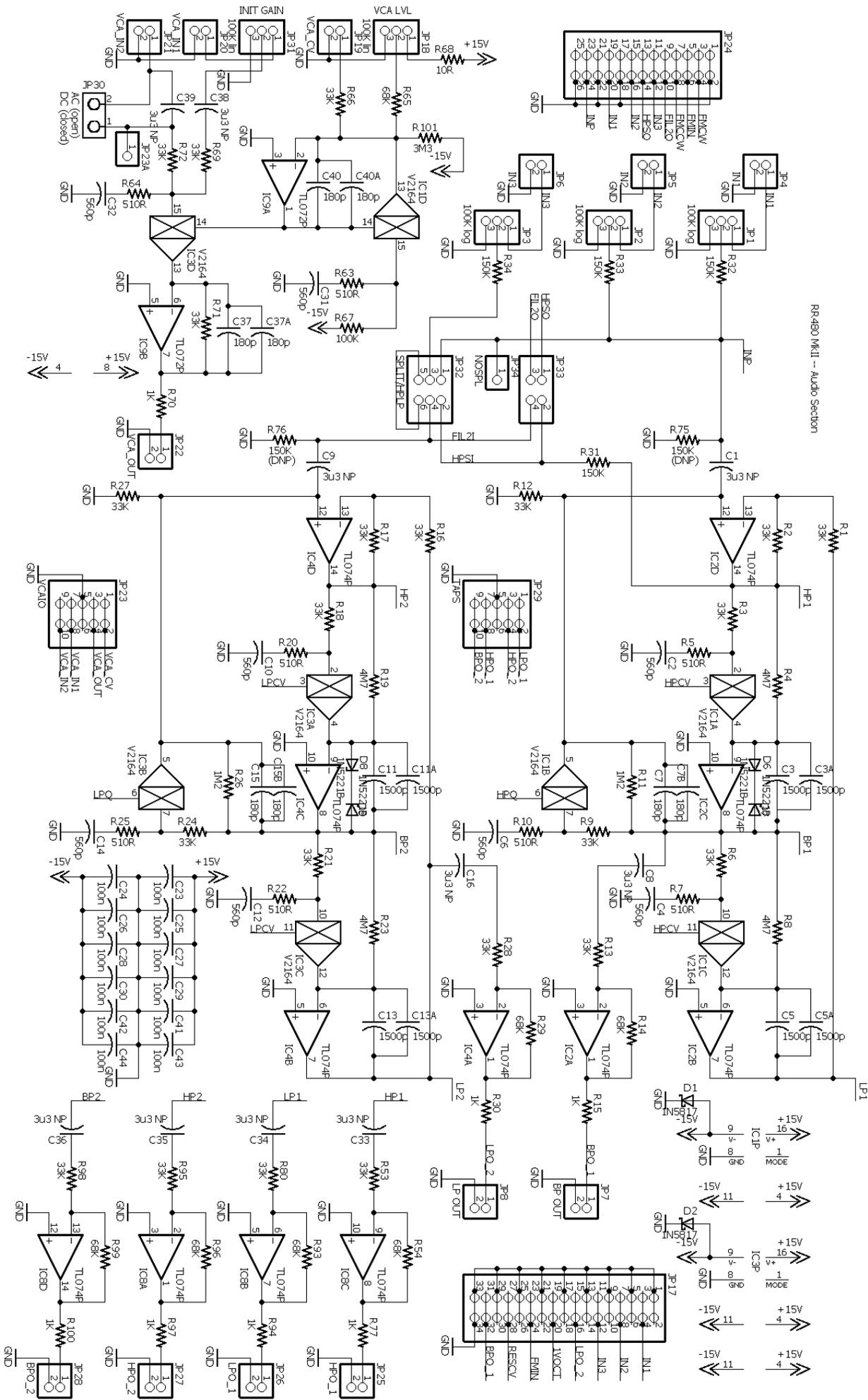


Fig. 1 Schematic (filter)

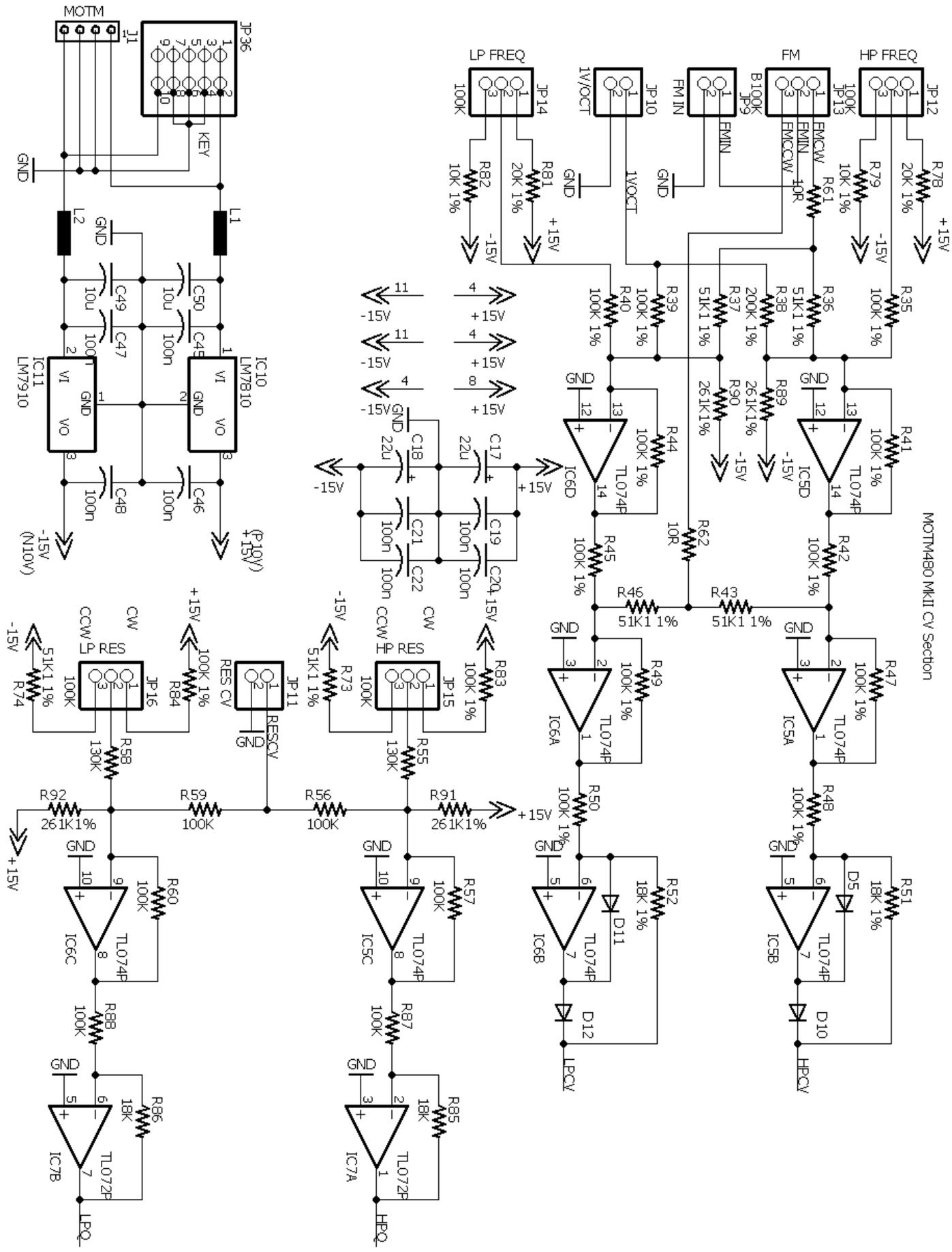


Fig.2 Schematic (control)

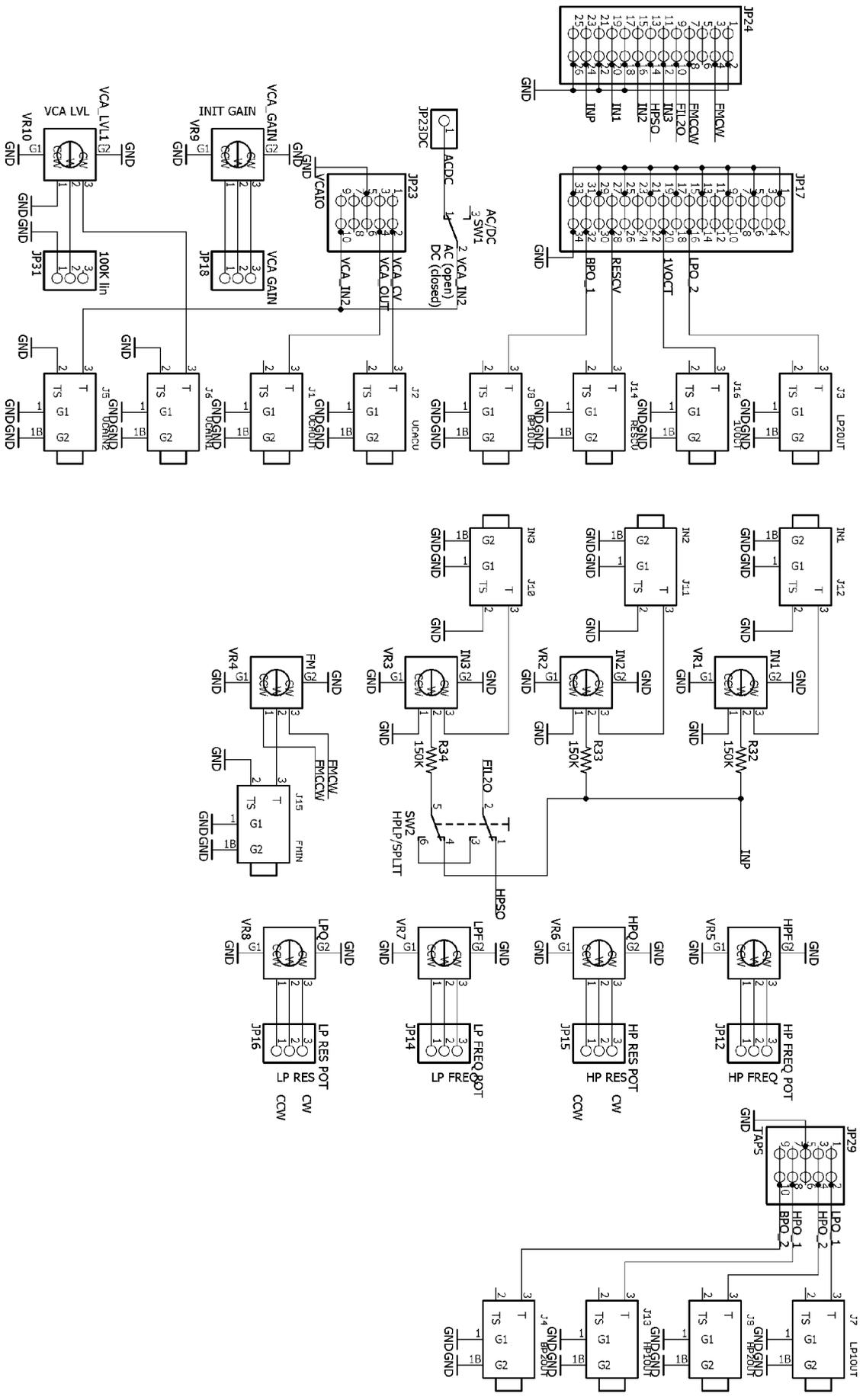


Fig.4 Host Board Schematic

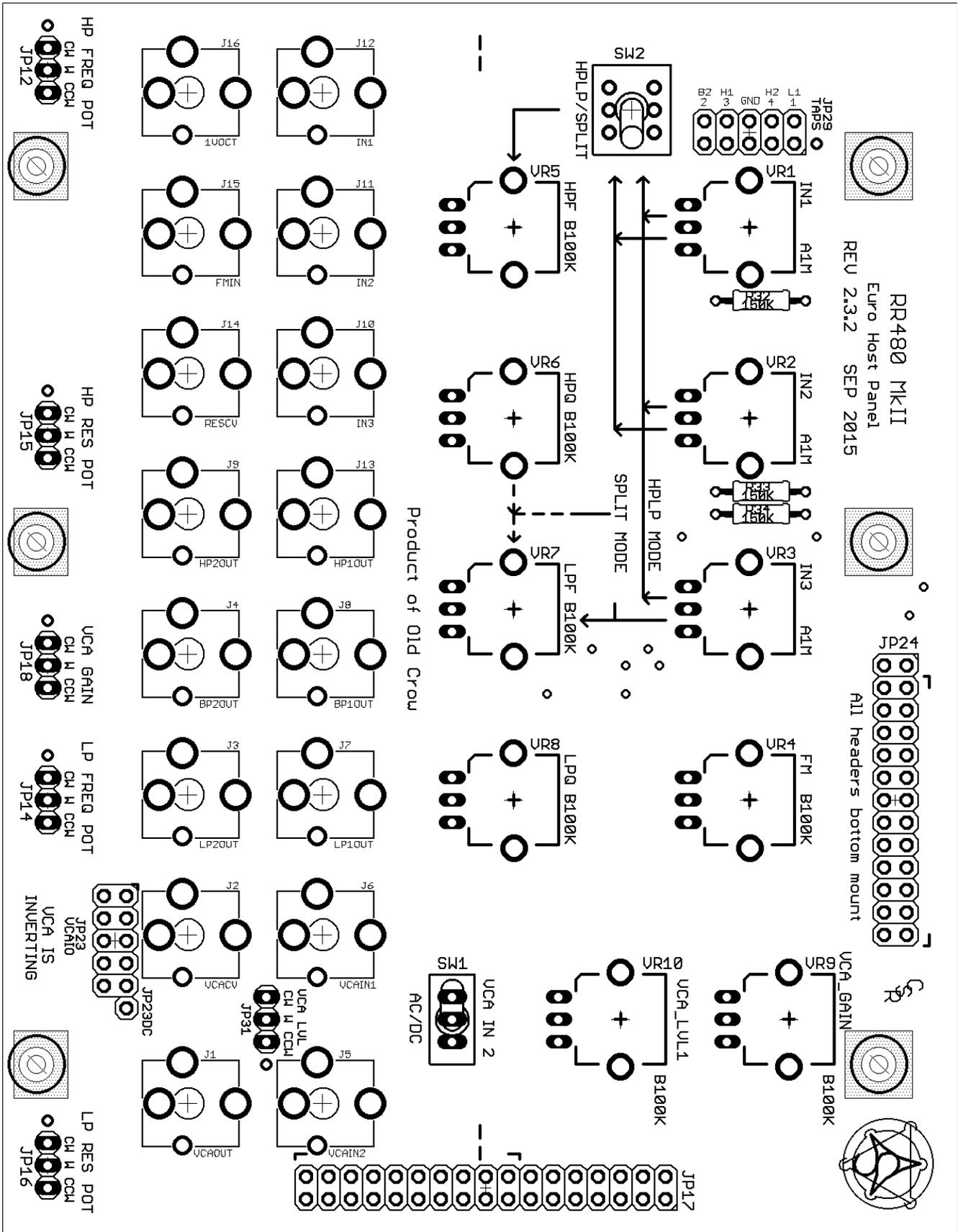


Fig.5 Host Board Reference