

RJM Audio Kit

Instructions for Building the CrystalFET/MM Phono Preamplifier



Step 1: Inventory check

Thank you for purchasing the CrystalFET/MM Kit from RJM Audio! First, please run through the inventory checklist and locate and identify all the included components.

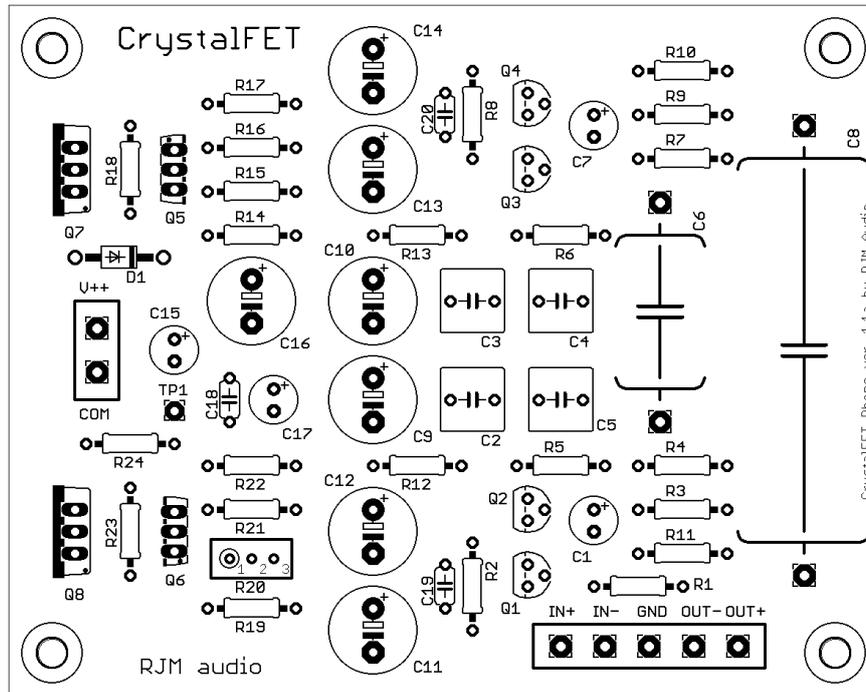
Part	Value	Qty	Brand	Description
R1	47.5k	2	KOA Speer	1/4W 1% metal film
R2,8	6.19k	4	KOA Speer	1/4W 1% metal film
R3,9	221R	4	KOA Speer	1/4W 1% metal film
R4,10	3.32k	4	KOA Speer	1/4W 1% metal film
R5	27.4k	2	KOA Speer	1/4W 1% metal film
R6	3.32k	2	KOA Speer	1/4W 1% metal film
R7	221k	2	KOA Speer	1/4W 1% metal film
R11	22.1k	2	KOA Speer	1/4W 1% metal film
R12,13	47.5R	4	KOA Speer	1/4W 1% metal film
R14	47.5R	2	KOA Speer	1/4W 1% metal film
R15	47.5k	2	KOA Speer	1/4W 1% metal film
R16	47.5R	2	KOA Speer	1/4W 1% metal film
R17,24	22.1R	4	KOA Speer	1/4W 1% metal film
R18,23	1k	4	KOA Speer	1/4W 1% metal film
R19	47.5R	2	KOA Speer	1/4W 1% metal film
R20	1k trim	2	KOA Speer	1/4W 1% metal film
R21	3.32k	2	KOA Speer	1/4W 1% metal film
R22	22.1k	2	KOA Speer	1/4W 1% metal film

C1,7	(none)	-	-	-
C2-5	33nF	8	Wima	polypropylene film
C6	0.1 uF 250V 10%	2		polypropylene film
C8	2.2 uF 250V 10%	2	ADK	polypropylene film
C9-14	220 uF 63V	14	Nichicon FW	audio electrolytic
C15	22 uF 63V	2	Nichicon FW	audio electrolytic
C16	220 uF 63V	2	Nichicon FW	audio electrolytic
C17	22 uF 63V	2	Nichicon FW	audio electrolytic
C18-20	0.1 uF 100V	6	TDK/Siemens	ceramic

Q1-4	J113	8	Siliconix	TO-92 n-channel jFET
Q5	BD140	2	Fairchild	TO-126 npn transistor
Q6	BD139	2	Fairchild	TO-126 pnp transistor
Q7,8	IRF9520	4	IRF	TO-220 p-MOSFET
D1	1N4004	2	Fairchild	diode

Step 2: Completing the boards

Next, in a clean, bright, and well-ventilated work space, solder the components to the top side of the board using the silkscreen as a guide:



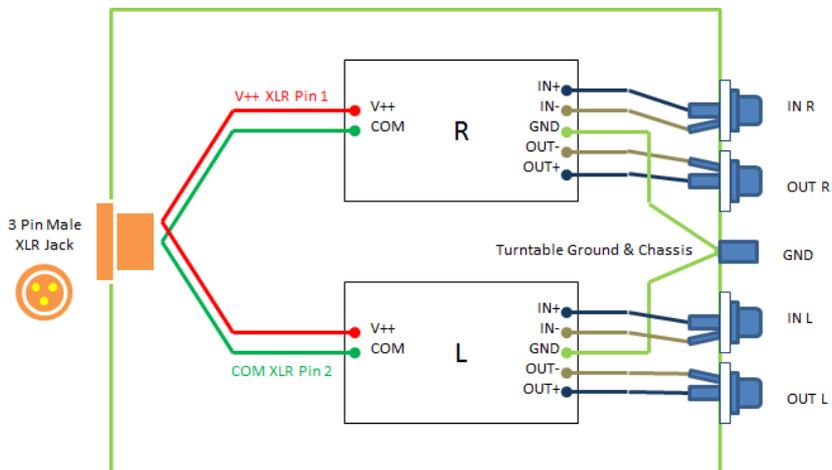
- jFETs are matched and graded. Don't mix them up!
- Be careful not to get the BD140,139 transistors mixed up or soldered in the wrong orientation. Dot indicates pin 1.
- The trim pot. R20 is connected with pin 1 as indicated. Pin 1 has the adjustment screw above it.
- Electrolytic capacitors must be soldered to the board in the correct orientation, the positive (long) leads are indicated by the "+" symbols.
- Align the diode cathode band with the matching stripe on the silk screen.
- Chassis wiring can be soldered directly to the board, or a screw terminal block / pins with 5.08 mm spacing can be used.
- Solder the parts in rough order of height, lowest to highest, resistors first. All components are soldered to the top (printed) side of the board. Proper technique for soldering through-hole components is to first heat the pad for several seconds then the lead briefly before applying the solder to the hot pad/lead directly. If you are having trouble, increase the tip temperature or use a more powerful iron. (50 W or greater recommended.)

Step 3: Putting it together

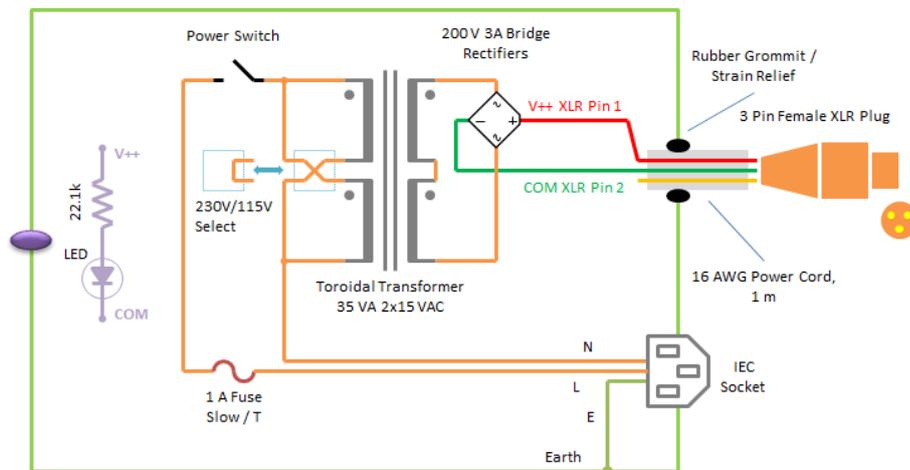
Two boards are needed for stereo. To avoid magnetic interference from the power transformer, an external power supply is recommended connected by an umbilical cord. In the main chassis, GND of both boards connects to the case at the ground lug which also connects to the turntable. V++ and COM wires should be twisted together and routed well away from the signal wiring. IN+ and IN- etc. should be routed as twisted pairs.

R6 and R8 can be substituted with audio-grade film caps of your choice, such as Multicap PPMFX.

If your cartridge needs a load resistor lower than 47.5 kohms, the simplest “fix” is to connect the required resistor (and capacitor if called for) at the input RCA jack.



You will need the power transformer, rectifier, chassis hardware, and two cases. The basic unit is a toroid power transformer with 2x15 VAC secondary windings and a VA rating in the range of 25-50 VA (Triad VPT30-1670 or Talemia 60083), and one 3A or greater bridge rectifier. I use KBPC2510. Install a safety fuse (1A) on the primary winding. Power switch and LED indicator lighting is optional.



Step 4: Checks and troubleshooting

Before powering up, turn the adjustment screw of R20 full anti-clockwise.

Powered up, check the DC voltage between V++ and COM, it should be about 46 V DC. Then, while monitoring the voltage between test pad TP1 and COM which should be 10 V or so initially, carefully turn the adjustment screw of R20 clockwise until the voltage increases to 35 V.

Voltage drop across R2,8 should be about 25 V. If they are in that range then you can go ahead and give it a listen.

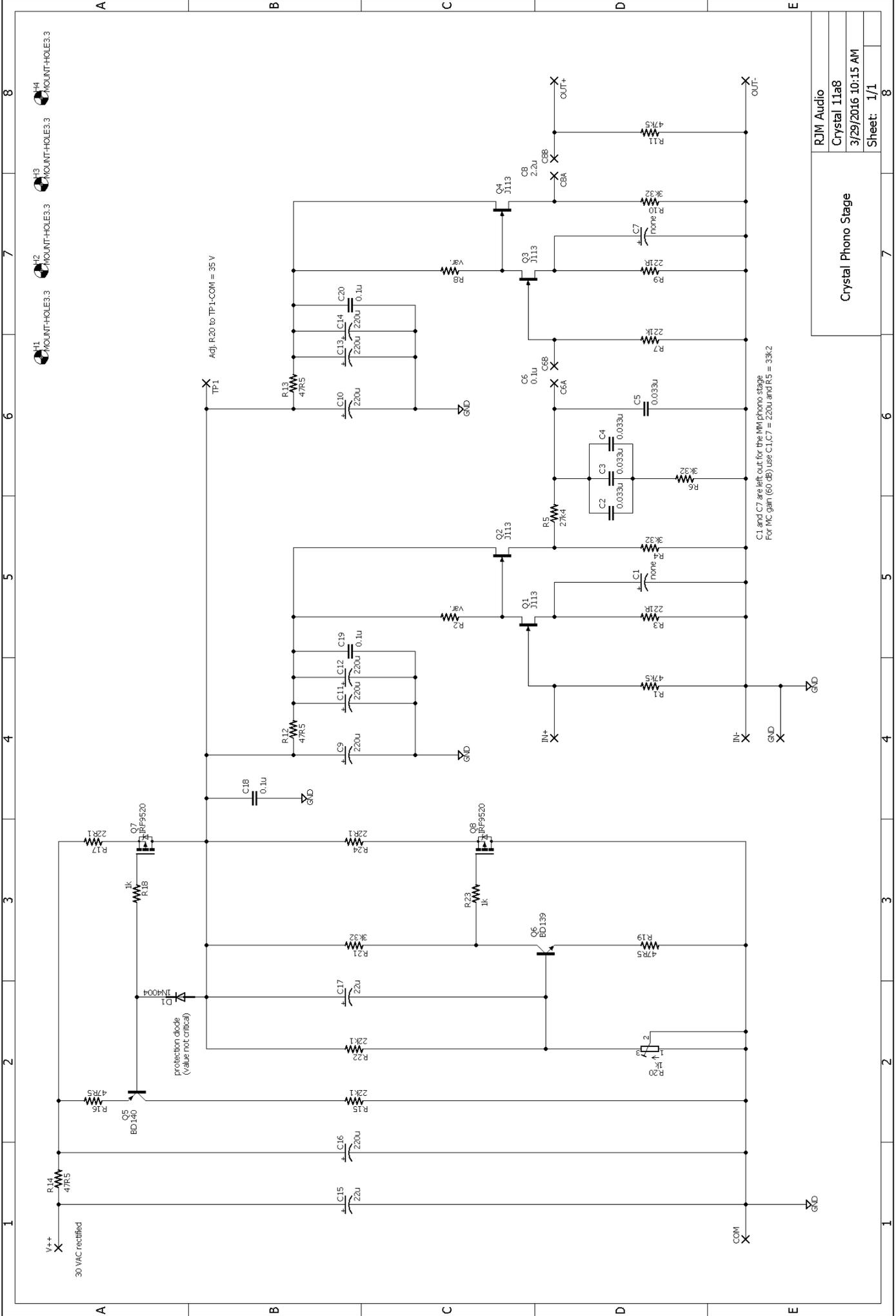
Not getting the voltages listed above? Encounter any other problems? Email me. It's the simplest and quickest way to resolve things. These instructions present the basic information you need to build your RJM Audio kit. More detailed and more advanced resources can be found online. Please visit my web site to find the related files, pages, and links.

<http://phonoclone.com/pcb.html>

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TP1 Adj. R20 to TP1.COM = 35 V

C1 and C7 are left out for the MM phono stage
For MC gain (60 dB) use C1, C7 = 220u and R5 = 33k2

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