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XLO-5 Five Channel Color Light Organ

Rev 4.33

Introduction

This kit contains all the electronics you will need to build a high quality five-channel color light organ. Two printed circuit boards and their related components are included:

- The main circuit board, which contains all the amplifiers, filters, TRIAC circuits and protection fuses necessary to drive 5 sets of lights.
- The front panel circuit board contains the condenser microphone, sensitivity level control and the main AC switch. It's designed to be mounted on the front or side of your constructed enclosure so that these can be easily accessed. You could also mount this front panel in a small, conveniently located enclosure and cable-over to the main board, which may be mounted in a larger hidden enclosure.

Features

- Splits your music into 5 frequency bands, each band controls one light circuit
- Each band width and center frequency is individually adjustable
- 700W per channel
- Flexible signal input options:
    - Condenser microphone with sensitivity adjustment
    - Audio line-level input from an iPod, computer, etc.
    - Stereo or Mono
    - Speaker level input
- Automatic Gain Control circuit constantly adjusts input sensitivity to match changes in music level
- Microphone, sensitivity control knob, and main power switch are on a separate small decorative circuit board that can be mounted to your front panel for easy access
- Expansion connector to optionally allow you to locate all the control pots and indicator LEDs to front panel location.
- You can build light organs with 10 channels, 15 channels, etc. using the XLO-5. The adjustable filter center frequencies makes this possible; using multiple XLO-5's tuned to different center frequencies.
- Can be built into a small portable enclosure, great for parties
- Supports 110 or 220 VAC
- Fully isolated power supply for maximum safety
- Optically isolated TRIAC drivers - your audio equipment is 100% isolated from the high voltage mains
- All 5 lamp circuits are individually fused and can drive up to 7A per circuit
- 5 Indicator LEDs driven by the TRIACs for testing before you hook up your lights
- This is an advanced kit with about 150 components
- Main PCB Dimensions: 4.9" x 4.5" x 1.5" tall
- Designed and packaged in the USA

Unpacking Your Kit

Carefully unpack and take stock of the components in your kit. The electronic components are packed in 5 bags labeled 'Bag A' though 'Bag E'. See Table 1 and Table 2 for a complete listing of your components.

NOTE: Bag D is excluded from orders shipped with XLO-CP Control Panel kit because it contains all the components that cannot be used if you're using the XLO-5CP.

Assembly Instructions

It is very important that you read and understand all of the following instructions before you start your assembly so that you don't make any mistakes that might be difficult to recover from. The assembly should be done in the order listed in Table 2 and Table 2 or you may have difficulty physically accessing components for soldering.

What you'll need

- Soldering iron with small or medium tip
- Damp sponge for tip cleaning
- Solder
- Solder wick or solder sucker in case of solder bridging (stranded wire could substitute)
- Small needle nose pliers.
- Small wire cutters
- Small Phillips screwdriver
- Stripper / Crimper tool
- Magnifying glass to read the markings on the tiny components

General Assembly Guidelines

- **Take your time!!** Most mistakes are made when rushing through the assembly. Taking the time to double check every step will pay off with a first-time functional device.
- In cases where it is necessary to re-form the leads on components (such as resistors and diodes), be very careful not to put stress where the lead enters the component itself. The physical attachment of the lead to the component can sometimes be very fragile and the lead may break off if too much force is applied. Reforming the leads can be done by gripping the lead with small needle-nose pliers at the base of the component while bending the lead on the other side of the pliers.
- Use as little heat and solder as necessary to affix the components to the PCB (printed circuit board). Many of the parts in this kit are temperature sensitive. Overheating may damage them.
- Always clean the soldering iron tip on the damp sponge prior to every solder joint. Re-tin whenever the tip gets a little dull. (tinning is the application of fresh solder to the tip of the iron until its shiny, wipe excess on a damp sponge).
- When clipping the excess leads of the through-hole parts, don't try to clip too close to the PCB. Clip just above the solder joint to avoid fracturing the solder joint, which could lead to device failure sometime in the future.
- Carefully inspect each solder joint to make sure you didn't accidentally form a 'solder bridge', or connect two adjacent pads together. Remove solder bridges by using solder wick or a solder sucker. If the bridge is small you may be able to remove it by just reheating the joint and sliding the soldering iron across the bridge. If not, see the next step.
- If you need to remove solder from a hole (or a solder bridge) and you don't have solder wick or a solder sucker, you can use stripped stranded wire in place of solder wick. Place the stranded wire across the hole and touch the soldering iron to the wire, above the hole. As the wire heats it will melt the solder in the hole, and the melted solder will tend to wick up into the stranded wire. When the wire fills up with solder, move a clean part of the wire over the hole and repeat until the hole is clear of solder.

Safety Instructions

FAILURE TO FOLLOW THESE GUIDELINES COULD RESULT IN FIRE, INJURY, OR DEATH:

- NEVER work on the unit while it's plugged in!
- NEVER operate the unit around water or any moisture.
- NEVER bridge the fuses!! Replace blown fuses only with the specified capacity replacements.
- Mount both circuit boards securely so they cannot shift around and possibly short out.
- Be sure to mount the main circuit board away from any metal or conductive objects.
- When wiring your lights, always use the proper gauge wire for your expected load. 18 gauge or larger will suit most applications.
- Noticeable heat present in any of the wires or junctions means you may be exceeding the capacity of the wiring or connectors. You're strongly advised to upgrade the wiring if this is the case or fire could occur.
- Use electrical tape or other insulator to keep any wires from shorting to each other. Wires sometimes shift around over time and may short out later.
- Don't leave any exposed points that are electrically hot, you don't want to electrocute anyone!!
- Keep the 10 light circuit wires separate (in other words, don't connect them together at any point other than the main PCB terminals). Doing so could defeat the fuse protection on these circuits. Always run both of the wires of each of the five light circuits all the way to the main PCB.
- Make sure the terminal block screws are tight against the wires so that they cannot easily slip loose.

Main Circuit Board Assembly

You're ready to begin assembling your light organ main circuit board. Assemble the board in the order listed in the table below. Use the install check boxes on the right side to track your progress. The 'Install Notes' column will alert you to any special instructions on the following page for each of the components. Refer to Figure 1 parts placement diagram to see these more clearly.

Table 1. Main Board Parts List

Pack √	Device	Value	Marking	Qty	Reference Designators	Bag	Install Notes	Install √
	MAIN CIRCUIT BOARD (PCB)	REV 4.3	XLO-5	1				
	RESISTOR	2K	RED-BLK-RED	5	R2,R4,R6,R8,R10	A		
	RESISTOR	1K	BRN-BLK-RED	12	R11,R13,R14,R16,R17, R19,R20,R22,R23,R25, R50, R51	A		
	RESISTOR	10K	BRN-BLK-ORA	13	R12,R15,R18,R21,R24, R31,R37,R40,R52,R53, R54,R55,R56	A		
	RESISTOR	3K	ORA-BLK-RED	1	R45	A		
	RESISTOR	680	BLU-GRY-BRN	1	R26	A		
	RESISTOR	4.7K	YEL-VIO-RED	1	R27	A		
	RESISTOR	6.8K	BLU-GRY-RED	1	R29	A		
	RESISTOR	16K	BRN-BLU-ORA	1	R33	A		
	RESISTOR	33K	ORA-ORA-ORA	1	R35	A		
	RESISTOR	47K	YEL-VIO-ORA	1	R47	A		
	RESISTOR	560	GRN-BLU-BRN	1	R28	A		
	RESISTOR	470	YEL-VIO-BRN	1	R30	A		
	RESISTOR	330	ORA-ORA-BRN	1	R32	A		
	RESISTOR	180	BRN-GRY-BRN	1	R34	A		
	RESISTOR	82K	GRY-RED-ORA	1	R36	A		
	RESISTOR	100K	BRN-BLK-YEL	2	R39,R48	A		
	RESISTOR	220K	RED-RED-YEL	1	R41	A		
	RESISTOR	1.1M	BRN-BRN-GRN	1	R38	A		
	RESISTOR	4.7M	YEL-VIO-GRN	1	R46	A		
	RESISTOR	91K	WHT-BRN-ORA	1	R49	A		
	DIODE	1N4005	1N4005	5	D6,D7,D8,D9,D11	A	1	
	DIODE	1N914	1N914	1	D10	A	1	
	JUMPER	WIRE	WIRE	2	J4,J5		2	
	RESISTOR	10K (20K), 1W	BRN-BLK-ORA (RED-BLK-ORA)	5	R1,R3,R5,R7,R9	E	3	
	CERAMIC CAP	.015 µF	153	2	C1,C2	A		
	CERAMIC CAP	.022 µF	223	2	C4,C5	A		
	CERAMIC CAP	.047 µF	473	2	C7,C8	A		
	CERAMIC CAP	.1 µF	104	3	C19,C20,C21	A		
	LED	LED		5	D1,D2,D3,D4,D5	D	4,13	
	IC, 6-PIN	MOC3022	MOC3022	5	U1,U2,U3,U4,U5	B	5	
	IC, 14-PIN	TL074	TL074	2	U6,U7	B	5	
	TRIMPOT	50K	503 or 54	5	VR1,VR3,VR5,VR7,VR9	D	13	
	TRIMPOT	5K	502	5	VR2,VR4,VR6,VR8,VR10	B		
	VOLTAGE REG	TS78L12CT	TS78L12CT	1	U8	B	6	
	TRANSISTOR	2N3904	2N3904	5	Q6,Q7,Q8,Q9,Q10	B	6	
	FET TRANSISTOR	J111	J111	1	Q11	B	6	
	ELECTROLYTIC CAP	.1 µF	.1uF	2	C10,C11	B	7	
	ELECTROLYTIC CAP	.33 µF	.33uF	2	C13,C14	B	7	
	ELECTROLYTIC CAP	10 µF	10 µF	1	C16	B	7	
	FUSE	7A (3.5A) 2AG	7A (3.5A) 2AG	5	F1,F2,F3,F4,F5	E	8	
	FUSE CLIPS			10	X1,X2,X3,X4,X5,X6,X7, X8,X9,X10	B	8	
	HEAT SINK			5		C	9	
	TRIAC	MAC9NG	MAC9NG	5	Q1,Q2,Q3,Q4,Q5	C	9	
	4-40 SCREWS			5		C	9	
	4-40 NUTS			5		C	9	
	TERMINAL BLOCK	10-PINS		1	J1	C	10	
	TERMINAL BLOCK	3-PINS		1	J6	C	10	
	TERMINAL BLOCK	2-PINS		1	J2	D	10	
	ELECTROLYTIC CAP	680 µF	680 µF	1	C17	C	7	
	ELECTROLYTIC CAP	220 µF	220 µF	1	C18	C	7	
	TRANSFORMER			1	T1		11	
	NO PARTS GO HERE				J3		12	

Main Circuit Board Component Installation Notes:

1. Diodes are polarized devices. A solid bar on one end of the diode marks the cathode. The cathode goes in the square pad hole on the PCB.
2. Jumpers J4 and J5 are used to select your AC mains voltage. This kit supports either 110V AC or 220V AC mains. Use discarded clipped wire leads from another component for these jumpers, and install as follows:
   - For 110V AC Mains (as in the United States): Install 2 wire jumpers:
     1. Connect the round pad of J4 to the square pad of J4
     2. Connect the round pad of J5 to the square pad of J5
   - For 220V AC Mains (as in the UK): Install 1 wire jumper:
     1. Connect the round pad of J4 to the round pad of J5
3. For 110VAC installations, install 10K, 1W resistors in these locations. For 220VAC install 20K, 1W in these locations.
4. The LEDs (Light Emitting Diodes) are polarized, they won't light if installed the wrong way around. They have one lead longer than the other. Install the long lead (anode) in the square pad holes. NOTE: LEDs are not installed if using the XLO-5CP Control Panel.
5. Integrated Circuits are also polarized devices. There is a notch or a dot molded into one end of the device. Align the notch or dot on the device with the notch on the silk screen. This is very important because the devices will be destroyed if installed backward.
6. The Transistors and voltage regulator are polarized. They have a flat side and a rounded side. Install these components in such a way that the shape matches the shape on the PCB silk screen.
7. Electrolytic capacitors are polarized devices also, be sure to install them the right way around (or else, when power is applied, they may explode!!). The positive lead is longer than the negative lead. The positive lead goes in the square pad hole on the PCB. Note that the polarity is also marked on the outer casing of the cap.
8. When installing the fuse clips, be careful to install with proper orientation. There is a small indentation on one end that prevents the fuse from slipping out. If you put the clips in backward you will not be able to install the fuse properly. It's a good idea to put the fuse in the clips prior to inserting into the PCB. This way you know the clips are installed properly before you solder them in. For 110VAC installations, the fuses should be 7A MAX. For 220VAC installations, the fuses should be 3.5A MAX.
9. The TRIAC's are polarized devices. These devices handle switching of the 110/220VAC mains current, IT IS MOST IMPORTANT THAT THESE ARE INSTALLED THE RIGHT WAY AROUND OR THEY COULD EXPLODE VIOLENTLY WHEN POWER IS APPLIED!! Their metal side (opposite of the labeled side) must be mounted flush against the heat sinks. Using needle nose pliers, bend the three leads down by 90 degrees just outside the widened part of the leads. Insert the TRIAC leads into the PCB holes. Insert the 4-40 mounting screw and nut to attach the TRIAC, through heat sink, to the PCB. Tighten after making sure the TRIAC and heat sink are in proper, aligned position. Verify that you can still read the label lettering on the TRIAC when it is attached to the heat sink. Solder the TRIAC leads. Repeat this procedure with the remaining TRIACS's. After installing all TRIACs, check that none of the heat sinks are touching each other.
10. Install the terminal blocks so that the wire entry points face toward the outer edge of the PCB, so that you can install the wires cleanly on the outer edge of the PCB.
11. The Power Transformer must be installed the right way around. This is VERY IMPORTANT, if installed backward it may be destroyed violently when power is applied. The pin marked with a red dot should go into the square pad hole. Pin 1 is also marked on the top.
12. J3 is used only when connecting to the optional XLO-5CP Control Panel.
13. The 50K trimpots and the LEDs should NOT be installed when using the XLO-5CP control panel.

Front Panel Circuit Board Assembly

This board is designed to be used as a decorative front panel that you can mount on your light organ enclosure. It contains the condenser microphone, the primary sensitivity adjustment pot, and the main AC on/off switch. Refer to Figure 2 below for component orientation.

NOTE: Bag D and the related PCB will not be present in kits shipped in conjunction with the Control Panel kit (XLO-5CP), since all the parts in bag D will not be needed in this configuration (and would lead to malfunction if installed).

Table 2. Front Panel Board Parts List (Bag D)

Pack √	Device	Value	Marking	Qty	Install Notes	Install √
	FRONT PANEL PCB		Rev 4.3	1		
	RESISTOR	33K	ORA-ORA-ORA	2	1	
	RESISTOR	100K	BRN-BLK-YEL	1	1	
	MICROPHONE			1	2	
	POTENTIOMETER	50K		1	3	
	KNOB			1	3	
	ROCKER SWITCH			1	4	

1. Resistors R1 and R2 are installed differently depending on your selected signal input mode:
   - For microphone input: Leave R1 and R2 empty
   - For line-in: install the two 33K resistors in R1 and R2. See Figure 2 for wiring of the line input(s). Connect just one for mono, or both for stereo left and right.
   - For speaker input: install the100K resistor in R1, leave R2 empty. Solder your audio transformer in position T1 (not included in the kit by default, contact Xkitz for info on the transformer) Transformer primary should connect to the square pad pin 1. See Figure 2 for wiring of the speakers inputs.
2. If you want to use microphone input mode, install the microphone. This device should be mounted on the front of the front panel PCB so it is exposed to exterior sounds. The microphone is a polarized device, so the orientation is important. It should be installed with the offset downward, aligned with the circle on the PCB. Solder the microphone terminals on the back of the PCB.
3. Remove the hex-nut and washer from the 50K pot. Mount pot to the back of the PCB facing forward. Orient it so that it's three terminals are aligned with the three rectangular pads on the PCB and the tab on the pot goes into the corresponding hole in the PCB (it may be a tight fit). Secure the pot with the washer and hex-nut. Bend all three terminals down slightly so that they are close to contacting the pads on the PCB (they may not be quite long enough to touch the pads). Solder the tabs to the pads on the PCB, using solder to bridge the gap if necessary. Push the knob onto the pot shaft.
4. Orient the rocker switch so that the two terminals are toward the bottom of the front panel PCB and snap it into the square hole. This way the unit will be turned on when the top of the rocker switch is depressed.

Front Panel Expansion Connector

The XLO-5 has a 34 pin front panel expansion connector that allows you to relocate all of the control pots and indicator LEDs to a remote location such as an external front panel. If you use this connector, be sure to remove the on-board trim-pots and LEDs. Otherwise you'll have two sets of components wired in parallel, and it won't work properly. See the schematic diagram in Figure 3 for the wiring of this connector.

Xkitz currently offers a control panel kit, the XLO-5CP, that attaches to this connector and provides LED lighted slide pots to control the band widths (levels) and the main level input.

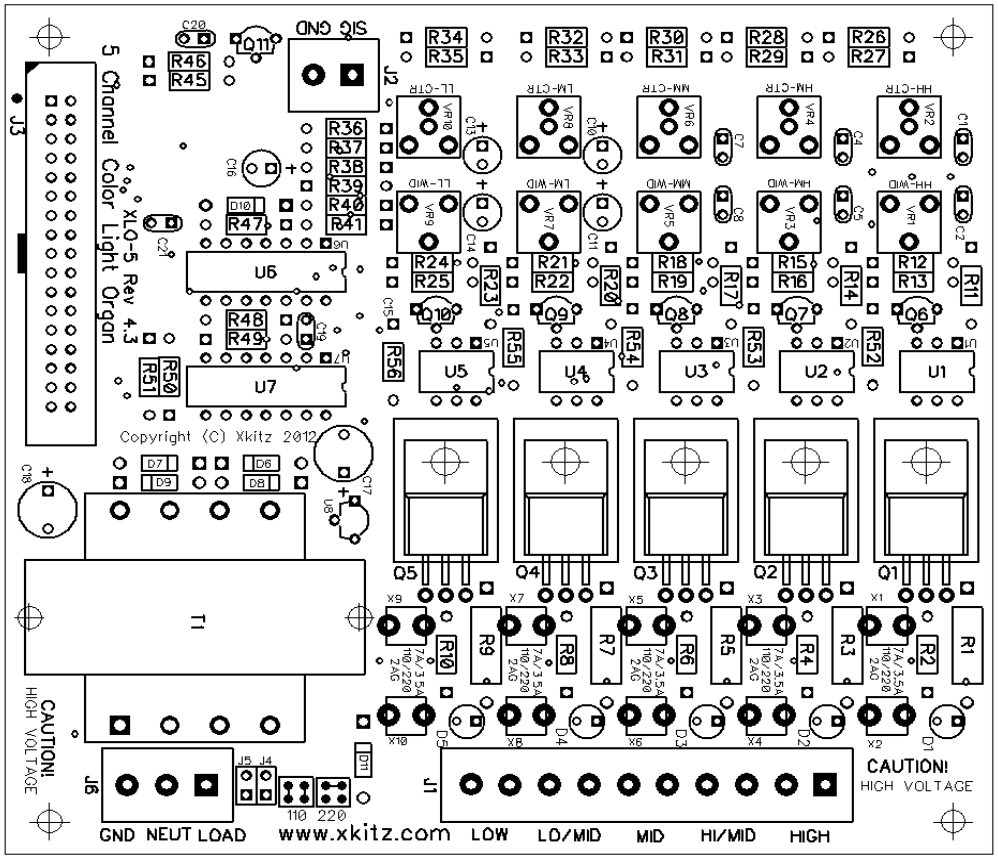

Figure 1. Parts Placement Diagram

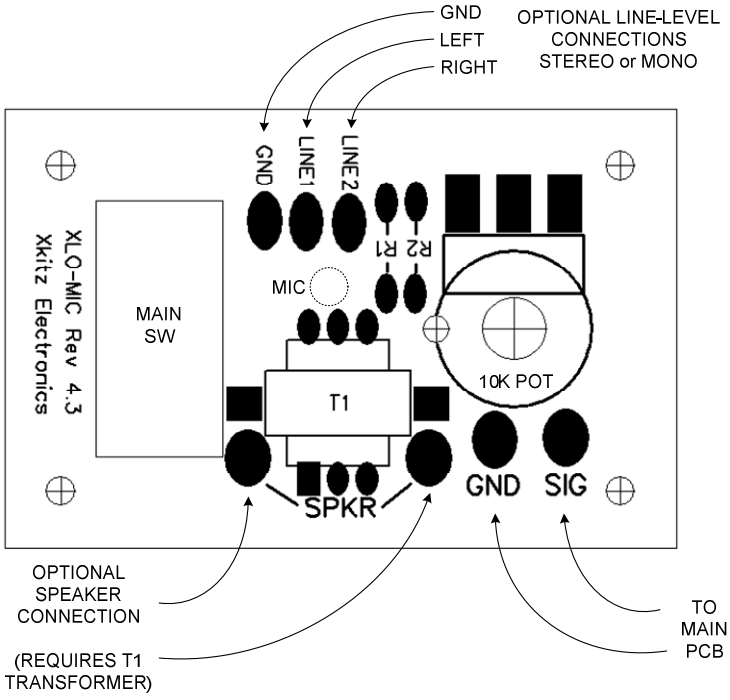

Figure 2. Front Panel Diagram (shows optional line-level and speaker connections)

Ideas for Light Systems

The options for light systems to drive with your light organ are almost unlimited. The classic old light organs from the 70's were just a flat wooden box with diffuser plexi-glass on the front and strings of Christmas lights wired up inside. But there are many more options today. Here are a couple of ideas to think about:

- Rope lights are pretty cheap in the hardware stores. They consume very little current; a 6' string is about 100mA, so you could drive a few hundred feet of rope light on each circuit.
- Standard size LED based spotlights are available in 110/220V varieties. They come as standard screw in type or the miniature GU10 size, and other sizes as well. These lights have the very distinct advantage of instantaneous turn-on and turn-off. Halogen and incandescent lights have a short but perceptible lag when turning on and off, which has the effect of dulling the look of the light organ. The instant on/off time of the LED bulbs gives a very crisp effect.

Connecting the Main Board to the Front Panel Board

Now that you have assembled both the main and front panel circuit boards, you're ready to mount them into your enclosure and connect the system level wiring. Refer to Figure 5 on page 11 for the system level wiring diagram. This diagram shows how the PCBs are wired together, as well as the wiring of the AC power cord, and the lamp circuits. Follow these steps to complete your enclosure wiring:

1. Mount the front panel PCB to a convenient place on your enclosure. You'll have to cut a rectangular opening in the enclosure to clear the components on the back of the PCB.
2. Mount the main PCB inside the enclosure as close as you can to the front panel PCB so that the wiring can reach easily. Choose a position that gives access to the wiring terminal blocks and adjustment trim-pots.
3. Wire the main AC power switch in-line with the HOT wire of the AC power cord: On the AC cord, identify the HOT wire (the one connected to the narrow plug prong). Measure about 14" from the bare wire end the AC cord (opposite end from the plug), or long enough to reach between your main circuit board and your front panel board. Cut just the HOT wire at this point (leave the NEUTRAL wire un-cut) and separate about 2" of the wires on each side of the cut. Strip about 1/4" of each side of the cut and solder each to one side of the front panel rocker switch.
4. Connect the loose ends of the AC cord to the terminal block on the main PCB marked J6. Be careful to connect the HOT wire (the one with the switch in-line) to the terminal marked LOAD on the J6. Connect the other wire to the terminal marked NEUT. Be sure that the wires are tightly secured in the terminal block and that no bare wire is still visible outside the terminal block.
5. Connect the 'SIG' and 'GND' wires between the two PCB's using standard speaker wire. Be sure to connect 'SIGL' on main board (terminal bloc J2) to 'SIG' on front panel, and 'GND' to 'GND'. Route this wire away from the AC wiring to prevent electrical interference from the AC power line from coupling into the microphone circuit.
6. Earth Grounding: If you plan to use a metal enclosure you should ground the enclosure by electrically tying it to the GND terminal on terminal block J6. You should also upgrade to a 3 conductor power cord and tie its ground wire to the metal enclosure as well. See Figure 5.
7. Connect each of your lamp circuits to the terminal block marked J1 as shown in Figure 5.

Initial Power-up

Double check your wiring to make sure it matches the diagram in Figure 5. Now its time to power up your light organ for the first time. **This is a very critical step**. This is when any un-detected assembly errors, such as backward diodes or electrolytic caps, could lead to very bad consequences. So use eye protection and stand clear of the main circuit board when you switch it on for the first time in case anything explodes. Be ready to unplug it again quickly if necessary.

- Turn the main AC switch ON to start with (upper side of the rocker switch is pressed)
- STAND CLEAR OF THE MAIN PCB - and plug the AC cord into a wall outlet
- Wait 10 seconds, the lights may blink, but otherwise nothing should happen
- Hopefully, nothing popped or smoked! Turn the AC switch off again and go to the next step.

Calibration and Testing

Now you're ready to test and calibrate your light organ. Since acoustics vary from one room to another, you'll get the best results if you do your final calibration in the location where the light organ will be used.

- Ensure the Light Organ main AC switch is OFF
- Using a small flat screwdriver, turn all trim-pots on the main PCB all the way counter-clockwise. This sets the sensitivity of all filters to minimum, and center frequencies to the highest end of their ranges (see Figure 7).
- Turn the main sensitivity pot on the front panel all the way clockwise (max sensitivity)
- Turn on some music in the room at a comfortable volume, or connect your line-in source
- Turn on the Light Organ, wait a couple of seconds for the power to stabilize and the Automatic Gain Control circuit to settle
- Starting with the HIGH frequency band-width adjustment (HH-WID) and working to the LOW frequency (LL-WID), adjust the trim pots to get the desired level of activity on the corresponding set of lights. The pots are physically arranged to correspond to the nearby set of terminals (e.g. the LOW adjust pot is aligned with the 'LOW' terminals, etc.). Keep adjusting the pots until you get to a point where all the lights are behaving properly. There's no right or wrong here, it's just what looks good to you with your music.
- If one or more of the light circuits is staying on too much and you can't get it to calm down with the trim pot, turn down the main sensitivity adjustment on the front panel board and try the calibration again.
- Adjustment of the center frequency pots (HH-CTR through LL-CTR) is not strictly required, you can simply leave these turned all the way counter-clockwise if you choose to, and the frequencies responses of the filters will be as shown in Figure 7. But if you do want to alter the center frequencies of the bands, then you can do so by adjusting the 'xx-CTR' trim-pots. You can use a function generator, or just some musical instrument like a guitar or keyboard to tune your filter center frequencies.

Troubleshooting

If you're having trouble with your light organ, check Table 3 for possible cause and solution.

Table 3. Troubleshooting Guide

Problem	Possible Cause	Solution
Lights never turn on	No power to the circuit	Check that the AC plug is working. Check the fuses on the main circuit board. Check that you have 12V between pins 4 and 11 of the TL074 Op Amp ICs. Check the J4/J5 jumper wiring.
Lights flash randomly when no sound is present	Noise on the AC line	AC line filter may help, try to identify source of the noise and eliminate it. Sometimes dimmer switches cause AC line noise.
	Interference from cell phone	Use coaxial cable to wire the mic to the main PCB may help, but some cell phone interference is very strong. Moving the phone away from the light organ is the best solution.
	Microphone wire is too long or is routed close to AC power	Use coaxial cable to wire microphone. Route the Mic wire far from the AC power wires.
	Input oscillation	Try disconnecting your input signal source and see if the problem improves. If so, you may need to shorten or shield your signal input cable. If not, check the test points below.
Lights are on too much of the time, not much activity, maybe blinking a little but not very interesting	Front panel sensitivity pot is set too high	Turn down the sensitivity knob on the front panel (counter clockwise)
	Line-in source is too high	Turn down the volume at the source. If driving from an iPod, turn down the iPod volume.

Test Points

If it's still not working, use a volt meter to check for the expected voltage levels on the test points listed below. Before checking these, disconnect all your output light circuits and turn all the trim-pots full counter-clockwise (or if using the XLO-5CP, all level pots full down). Connect the minus (-) probe to the GND terminal of J2. The pins of the op amps are numbered starting with pin 1 on the upper left corner (with the package notch upward), and increasing as you go counter clockwise around the chip. Check the following test points:

1. Pin 4 of U6 and U7 should be 12V. If not, check your input power supply, check that jumpers J4 and J5 are installed correctly, check orientation of diodes D6-D9, and check the orientation of U8 voltage regulator.
2. Pin 8 of U7 should be about 6V. If not check R51 and R51 are installed properly and have no solder bridges nearby.
3. Pin 7 of U6 should be about 6V. If not, check the nearby components are installed properly and there are no solder bridges or cold solder joints (check the schematic for associated components).
4. Pin 8 of U6 should normally be around 11-12V.
5. The following should all be about 6V. If any are not, check the associated components (see schematic):
   - U6 pin 1
   - U6 pin 14
   - U7 pin 1
   - U7 pin 7
   - U7 pin 14
6. Check pin 1 of the five chips: U1-U5. They should be about 12V (BE CAREFUL! These are getting close to the 110/220VAC hot wires)
7. Pin 2 of the same five chips should be about 11V. If either of steps 6 and 7 are not correct, check the 2N3904 transistors Q6-Q10 are installed and soldered properly, check the associated resistors (see schematic).

Our experience in supporting our customers when their boards aren't working has shown that the vast majority of problems are due to soldering or component placement problems. Use a magnifying glass and double check all your solder joints. Re-flow any that look at all suspicious. 99 out of 100 times, this will solve the problem.

If you're still having problems, please contact us at support@xkitz.com. We're always happy to help you get you board working properly.

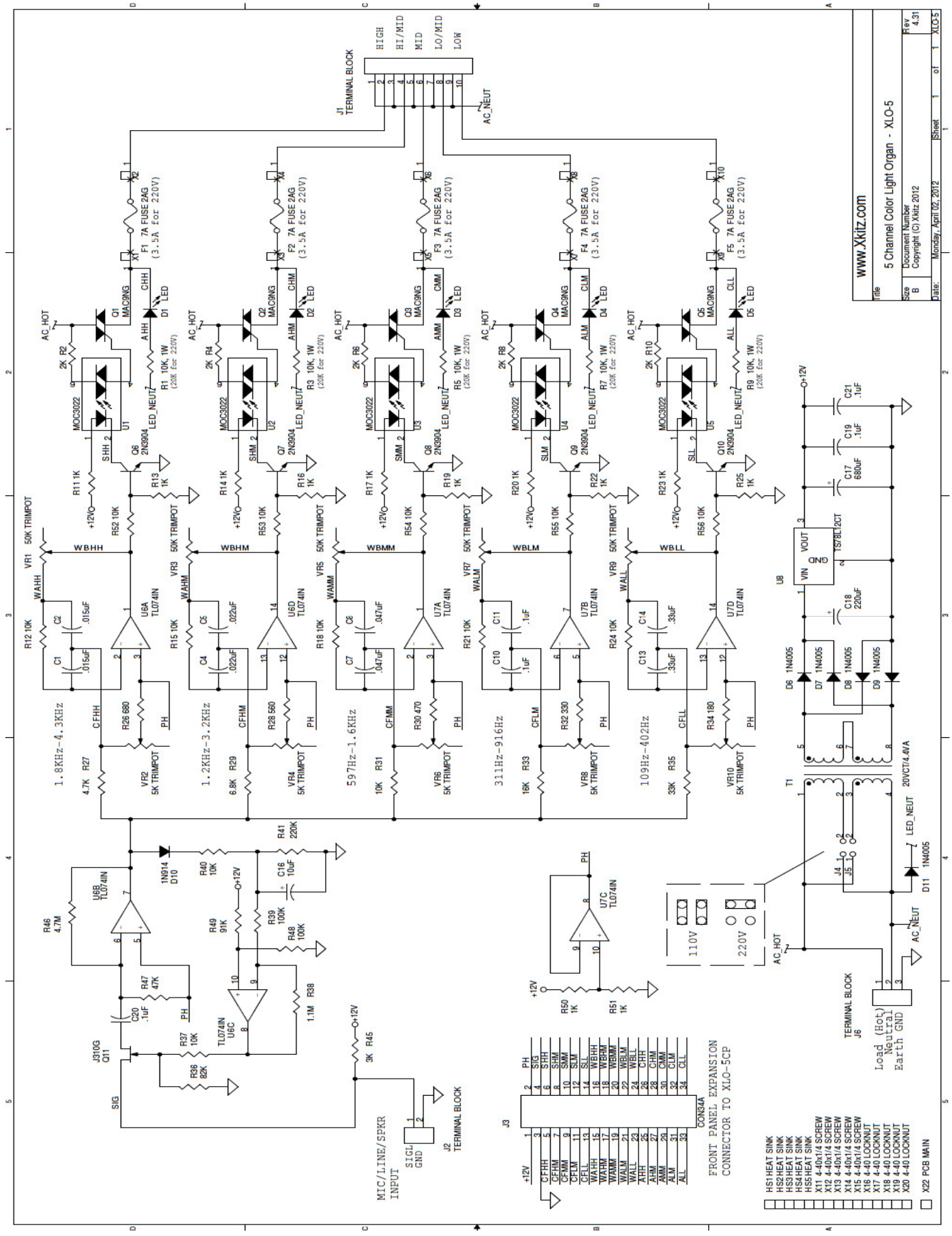

Figure 3. Main Board Schematic Diagram

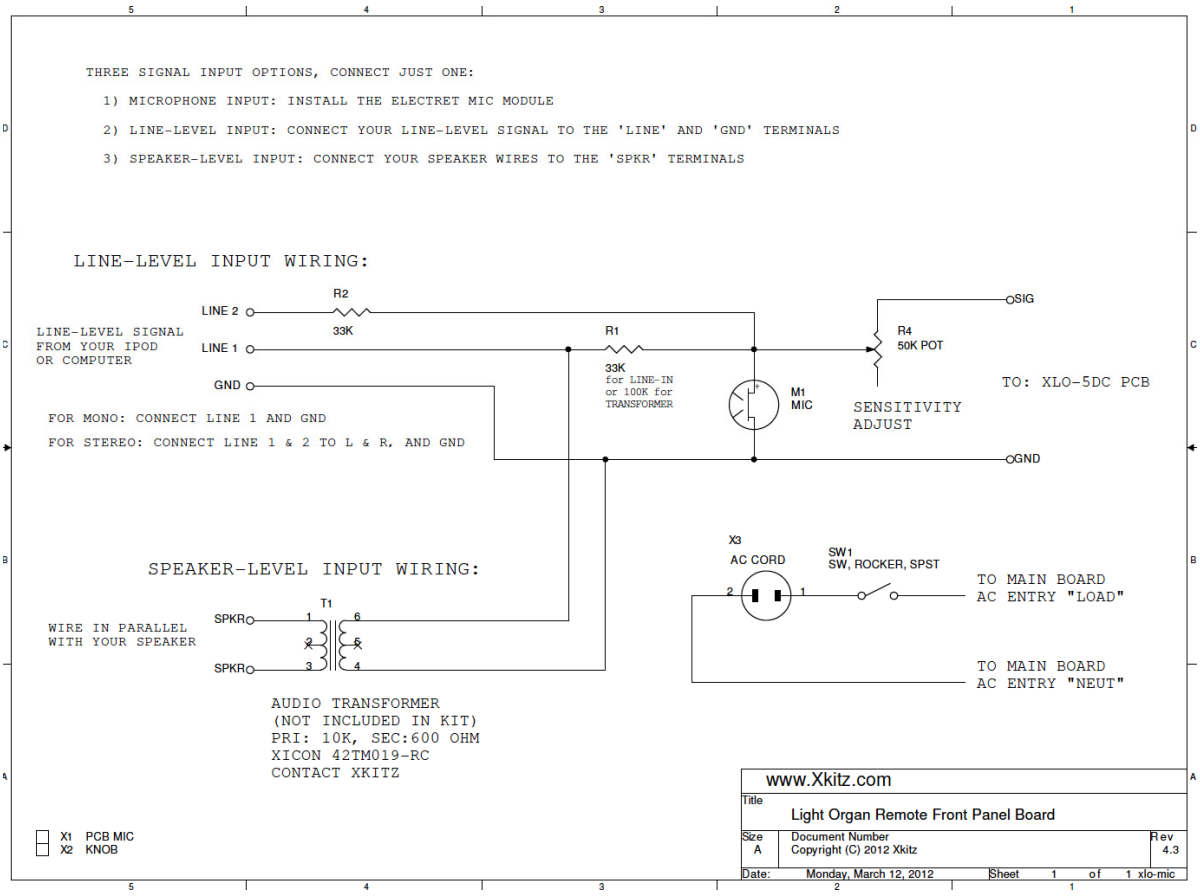

Figure 4. Front Panel Board Schematic Diagram

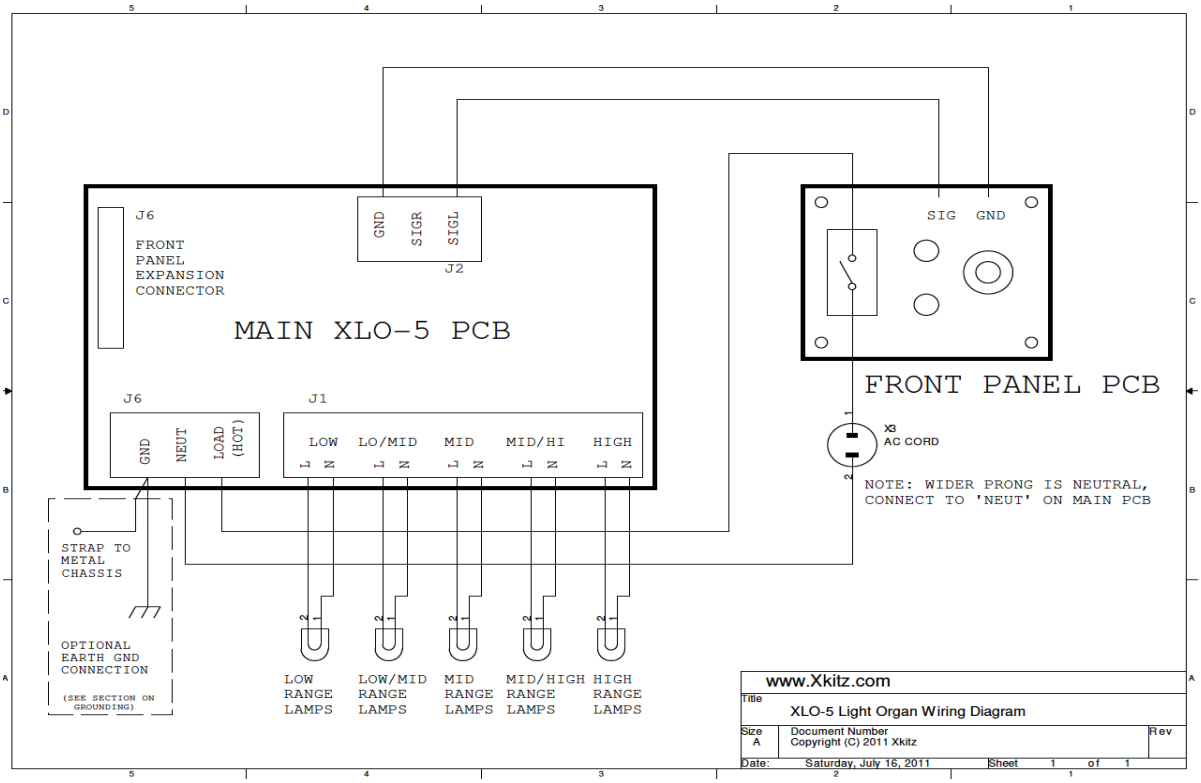

Figure 5. Wiring Diagram

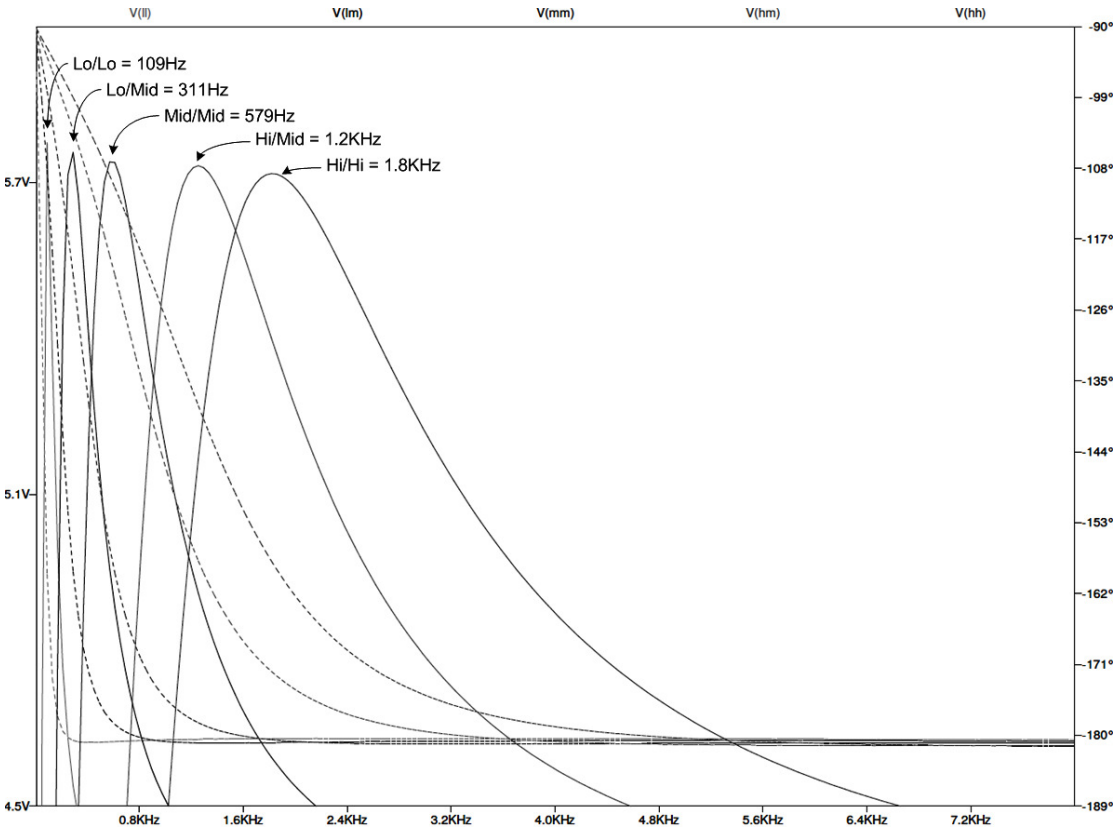

Figure 6. **Filter Frequency Response (Adjusted to Lowest Frequencies, trim-pots clockwise)**

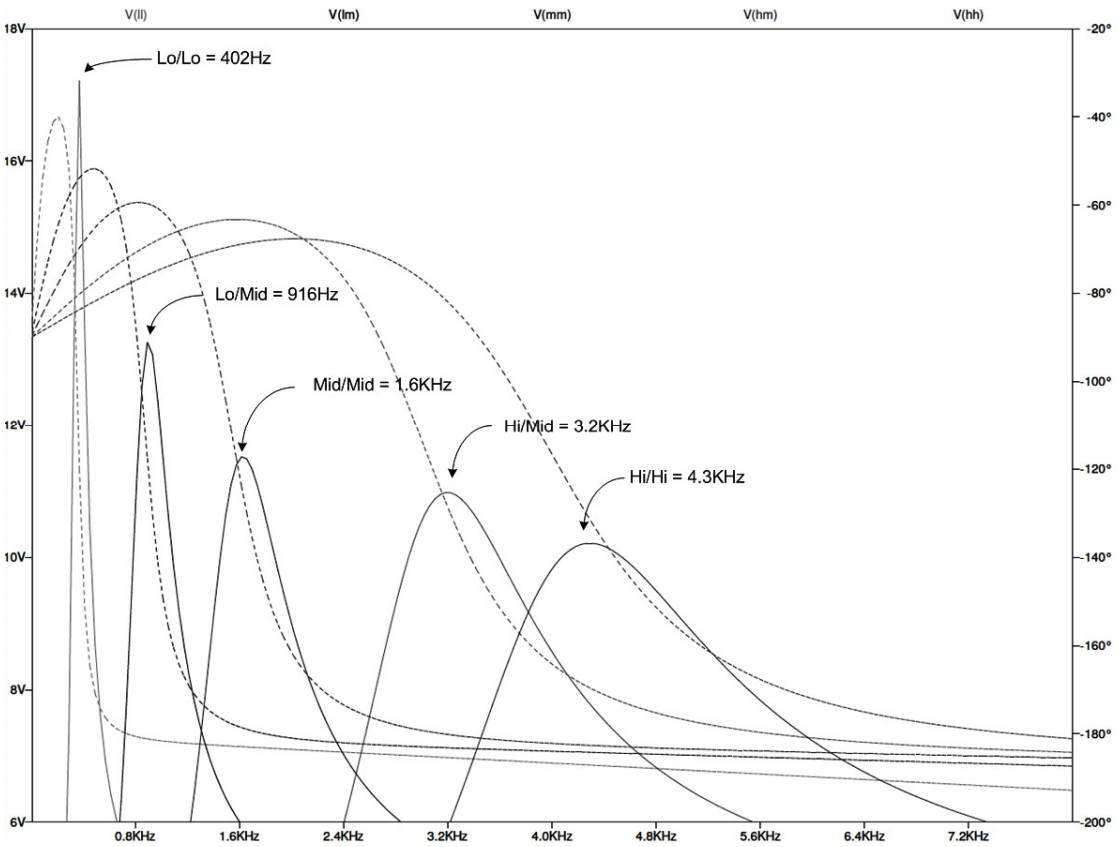

Figure 7. **Filter Frequency Response (Adjusted to Highest Frequencies, trim-pots counter-clockwise)**