

flight of harmony

Facehugger

Dotcom Control Module kit, $\pm 15V$
v1



Contents

- (1) Front panel
- (4) PCB - Control, Front, Mid, Rear
- (4) Resistor card (See "BOM" p. 35)
- (4) Semiconductor card (See "BOM" p. 35)
- (2) Capacitor card (See "BOM" p. 35)
- (1) Interboard header bag
 - (3) 1x3 0.1" pitch 0.162" head low-profile pin header (HDRFFLBP, HDRFFRBP, HDRPARMRP)
 - (3) 1x6 0.1" pitch 0.162" head low-profile pin header (HDRCONMRP, HDRMFBRP, HDRMRBRP)
 - (6) 1x10 0.1" pitch 0.162" head low-profile pin header (HDRFFLTP, HDRFFRTP, HDRMFLTP, HDRMFRTTP, HDRMRLTP, HDRMRRTTP)
 - (6) 1x13 0.1" pitch 0.162" head low-profile pin header (HDRFFFRP, HDRFRLLP, HDRMFLP, HDRMFRP, HDRMRLP, HDRMRRP)
 - (1) 1x16 0.1" pitch 0.162" head low-profile pin header (HDRMRTP)
 - (2) 1x3 0.1" pitch low-profile pin header 0.125" head, 0.255" tail (HDRMFBLP, HDRMFBRP)
 - (2) 2x5 0.1" pitch low-profile pin header 0.125" head, 0.255" tail (HDRFFBLT, HDRFFBRP)
 - (6) 1x3 0.1" pitch low-profile socket header (HDRCRLLBS, HDRCRRLBS, HDRFRBLS, HDRFRRLBS, HDRPARRFS, HDRRRFBS)
 - (8) 1x5 0.1" pitch low-profile socket header (HDRCRBLS, HDRCRBRS, HDRMFBL, HDRMFBR)
 - (3) 1x6 0.1" pitch low-profile socket header (HDRCONRFS, HDRFRBRS, HDRRRBRS)
 - (6) 1x10 0.1" pitch low-profile socket header (HDRCRLLTS, HDRCRRLTS, HDRFLTS, HDRFRLLTS, HDRFRRLTS, HDRRRFRTS)
 - (5) 1x13 0.1" pitch low-profile socket header (HDRCRLLS, HDRCRRLS, HDRFLS, HDRFRLLS, HDRFRRLS, HDRRRRS)
 - (2) 1x16 0.1" pitch low-profile socket header (HDRRRFRS, HDRRRFRTS)
- (1) Rear header bag
 - (4) 2x5 box header (HDR_HEAD, HDR_BODY_IN, HDR_BODY_OUT, HDR_TAIL)
 - (2) 2x5 pin header (Gates, Levels)
 - (2) 1x3 friction-lock header (Parallel In, Out)
 - (1) 1x3 pin header (Head)
 - (1) 1x6 pin header (Power)
 - (1) 1x7 pin header (Aux. Connect)
 - (1) Shunt (Head)
- (1) Cable bag

(1) 9" 10-conductor 0.050" pitch ribbon cable	(2) Key pin for 6-pin connectors
(2) 10-pin IDC socket connector	(2) 6-pin MTA100 socket connector strain relief
(2) 10-pin IDC socket connector strain relief	(1) 3-conductor Parallel connection cable (assembled)
(1) 24" 22AWG 4C shielded cable	(4) M3x0.5 eurorack mounting screw
(2) 6-pin 22AWG MTA100 IDC socket connector	(4) M3 nylon washer
- (1) Potentiometer & rotary switch bag
 - (1) Potentiometer, B1M (PCURVE)
 - (4) Potentiometer, B100k (PPORT, PROOT, PSCALE, PSPEED)
 - (1) SP8T Rotary switch



Contents (cont.)

- (5) M7 Washer
- (5) M7 Nut
- (5) 12mm Knob
- (1) 16mm Knob
- (1) Slide potentiometer bag
- (8) Slide potentiometer, B100k
- (1) Jack bag
- (5) 3.5mm TS jack
- (1) 3.5mm TRS jack
- (6) M6 Washer
- (6) M6 Nut
- (1) Switch bag
- (4) SP3T (Single-Pole, Triple-Throw) On-Off-On toggle switch with nut
- (1) SPST (Single-Pole, Single-Throw) Off-(On) momentary pushbutton switch
- (5) 10-40 hex nut
- (5) #10 star internal-tooth lock washer
- (1) Cap for pushbutton, Red
- (1) Long-lead component bag
- (9) 3mm red LED
- (2) 10k Ω 25-turn potentiometer (RTL1, RTL8)
- (1) 100k Ω 1-turn potentiometer (RTLED)
- (1) 0.22 μ F Film capacitor (C79)
- (1) Reference manual (this thing)
- (1) Owner's manual (that other thing like this thing)

Kit Notes

Required Tools

- Soldering iron with fine tip
- Solder
- Flux
- Fine-tip tweezers
- PCB holder
- Clamps (included)
- Nut drivers/sockets/wrenches:
 - 7mm (toggle switch)
 - 8mm (jack nuts)
 - 10mm (potentiometer nuts)

Recommended tools

- Oscilloscope
- Voltmeter

Kit Notes

Skills

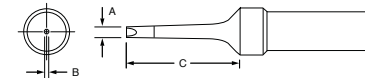
THIS IS NOT A BEGINNER KIT

This kit assumes that you have an advanced understanding of electronics, electronic components, and soldering and assembling electronics. Note that this kit is almost entirely Surface Mount Technology (SMT), so the assumption is that you understand how to work with Surface Mount Devices (SMD) and have a lot of experience.

This doesn't mean that you're *completely* on your own, just that I'm not going to hold your hand¹. Below are a few things to help get you started. Feel free to ignore them.

Assembly Tips

- RTFM²! All the way through!
- For the smaller SMD, use the smallest soldering iron tip that you have. My favorite is the Weller ETR: (Not an endorsement, nor do I get anything from it, it's just a good reference point.) Remember to switch back to a larger tip when soldering the through-hole components.
- Good, fine-tip tweezers are a must. The Wiha 4b and 7a tweezers are great³.
- One helpful trick for soldering SMD with wire solder is to pre-solder one pad for each component location. Next, hold the component in place and touch



Narrow Screwdriver

Cat. No.	A		B		C	
	in.	mm	in.	mm	in.	mm
ETR	0.062	1.60	0.044	1.12	0.625	15.90

your soldering iron tip to the pre-soldered pad to reflow the solder. Then you can solder the other side normally.

- *Flux is your friend.* Use flux. Water-soluble flux is best for a clean finish, but you have to make sure to get it all off when done, as it can corrode the joint and some fluxes may also be capacitive. NOTE: The potentiometers and switches are NOT sealed and cannot be submerged; so don't wash them. You can also use no-clean flux.

1) For many reasons, but two in particular: First, I'd have to leave my house, and I hate doing that. Second, it's really hard to solder with only one hand.

2) Read The F***ing Manual! This thing!

3) IMO, their 5abb were the best, but they discontinued them so FML. No, you can't have mine.

Kit Notes (cont.)

- *Smallest first.* Solder the components in increasing order of size. Per board, per side, not overall.
- *Minimize heat exposure.* Heat destroys components, and SMD are particularly sensitive because they have less mass to distribute the heat. Flux helps with this too.
- Use the face plate to line up the potentiometers, jacks, and LEDs, before soldering; this is much easier than resoldering them to line them up correctly afterward.
- Non-destructive desoldering of the pin headers is impossible — the thin plastic carrier will melt and distort even with a heat sink — so make sure they're placed correctly the first time.
- Solder bridges and small packages: The DG467, DG468, and 1SS309 are particularly susceptible to solder bridges (where solder on two adjacent pads connect together). Make sure to inspect for these before powering the unit. Solder bridges can be removed with a dry iron tip or desoldering braid.

Assembly Order

The easiest build order is as follows:

1. All SMD, smallest first.
2. Install & solder the stage trim pots RTS1 & RTS8, and capacitor C79, see p. 31.
3. Install & solder all the rear headers on the Rear PCB, see p. 12 .
4. Install & solder the interboard headers, see p. 19.
5. Trim headers, see p. 23.
6. Install & solder the slide potentiometers, see p. 24.
7. Install & solder the rest of the panel components, see p. 26.
8. Stack the PCBs, see p. 17.
9. Attach the panel, see p. 18, see toggle switch jam nut instructions on p. 32.
10. Assemble the power cable and chain cable (if desired), see p. 33.
11. Turn it on, see if it explodes.
12. If it works without exploding, adjust the stage trim pots, see p. 29.

Interboard Pin Headers

All of the interboard pin headers are used in an atypical fashion, because of course they are, so pay careful attention to these parts and follow the instructions on p. 19.

Kit Notes (cont.)

Film Capacitor

The plastic film box capacitor, C79, needs to be laid over to one side to fit between the PCBs (see diagram p. 31). Bend the legs 90° and install the capacitor.

Stage Trimpots

The stage adjustment trimpots, RTS1 & RTS8 also need to be bent 90° to be installed, and also have an adhesive pad to hold them to the PCB and prevent movement while adjusting, see p. 31 for installing, and p. 29 for stage length adjusting.

Help

If you're still having problems, email me! I am always happy to help. When emailing, please include high-resolution pictures of your circuit boards.

Most of the troubleshooting requests I have received were solved by zooming in and closely examining the pictures. Cold solder joints are sneaky and hard to spot if you haven't dealt with them before. A cold solder joint is where the solder doesn't adhere to both the pad and the component lead, and just flowed around one of them without making contact. They happen, and they suck, but they're easy fixes once you find them.

Stuff

Thank you to everyone who helped make this a reality!

Comments, samples, suggestions, complaints to: flight@flightofharmony.com

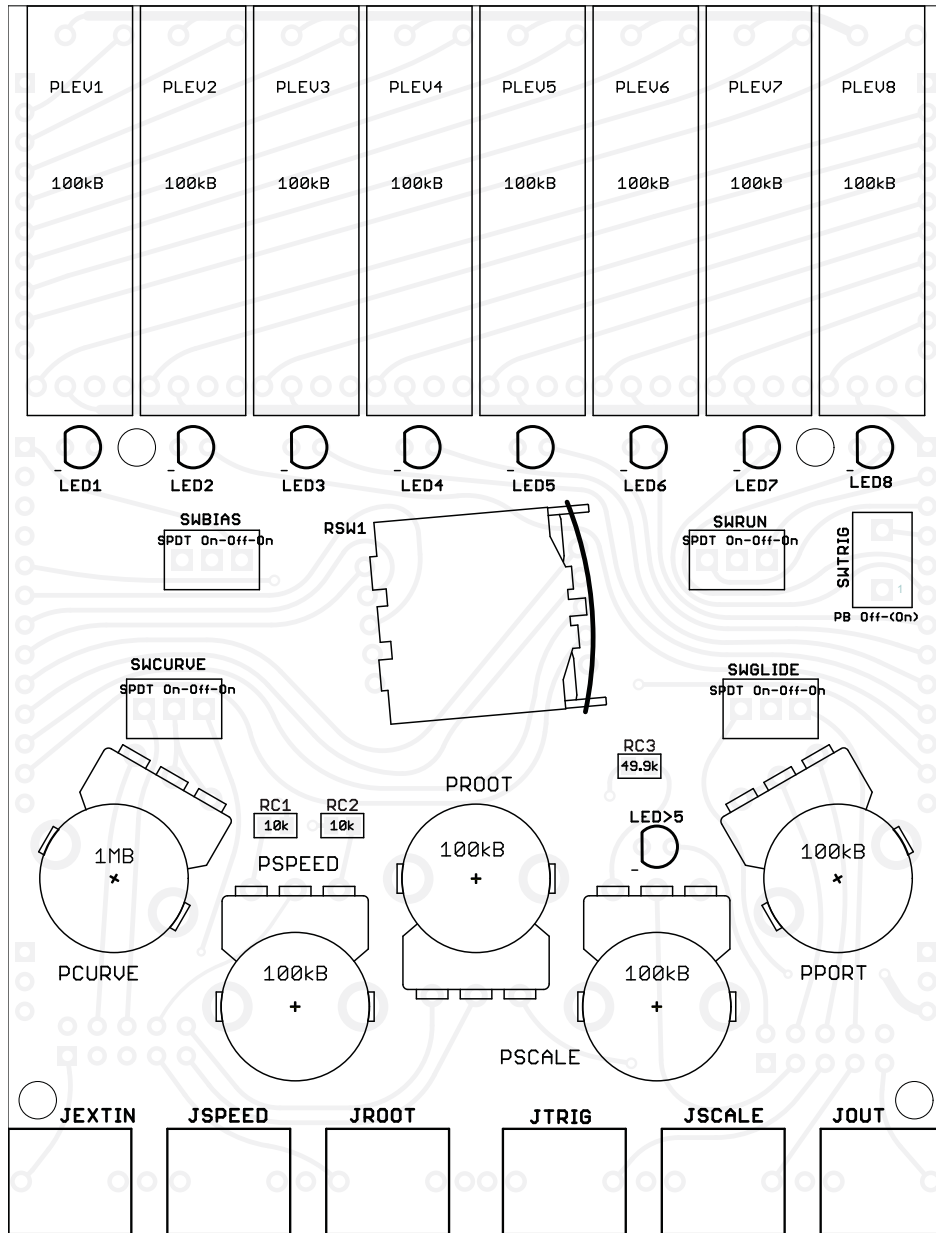
We have a Discord server! Contact me at the address above for an invite link.

Drawings and designs ©2024 flight of harmony, LLC.

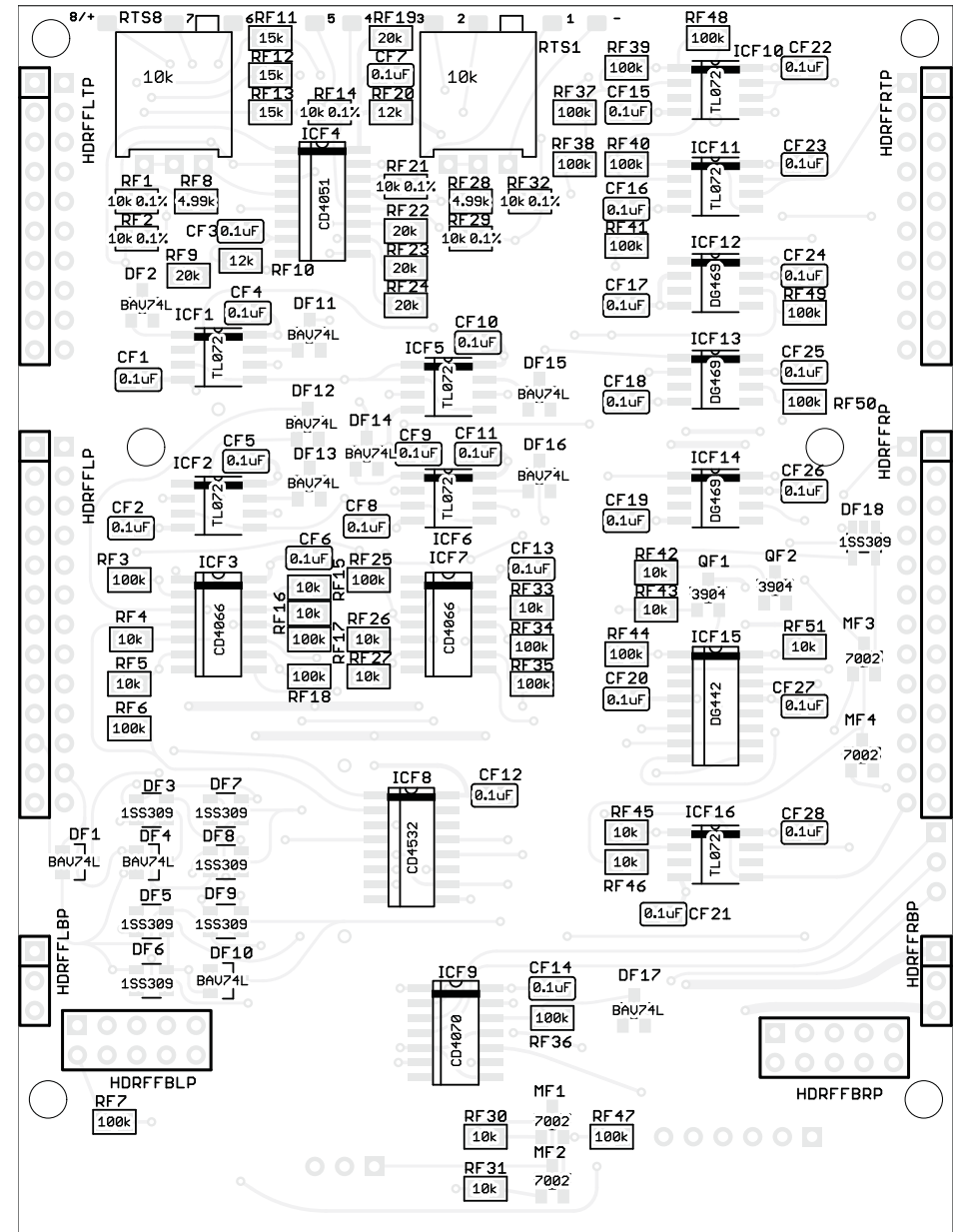
<http://www.flightofharmony.com>



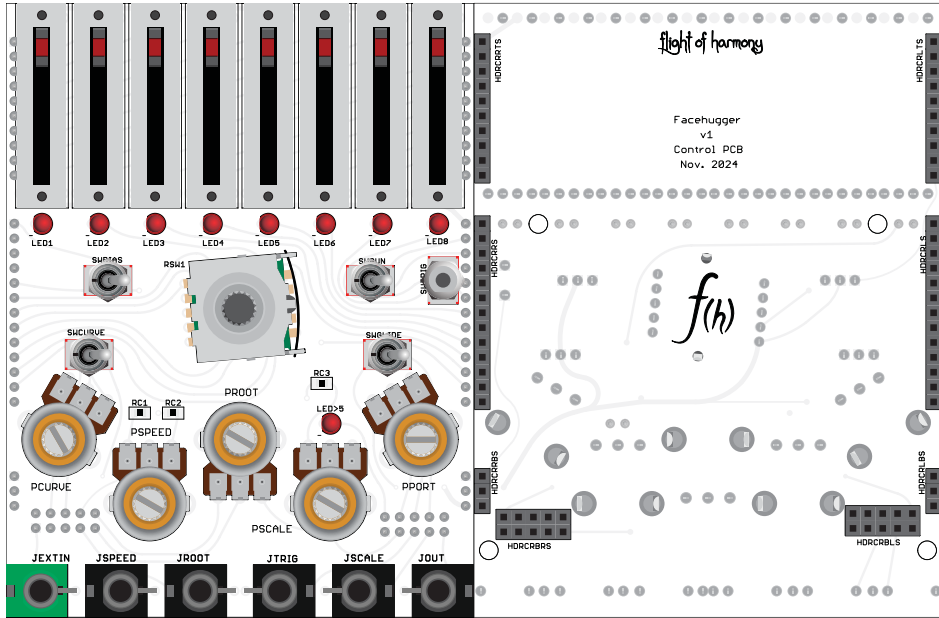
Control PCB value map



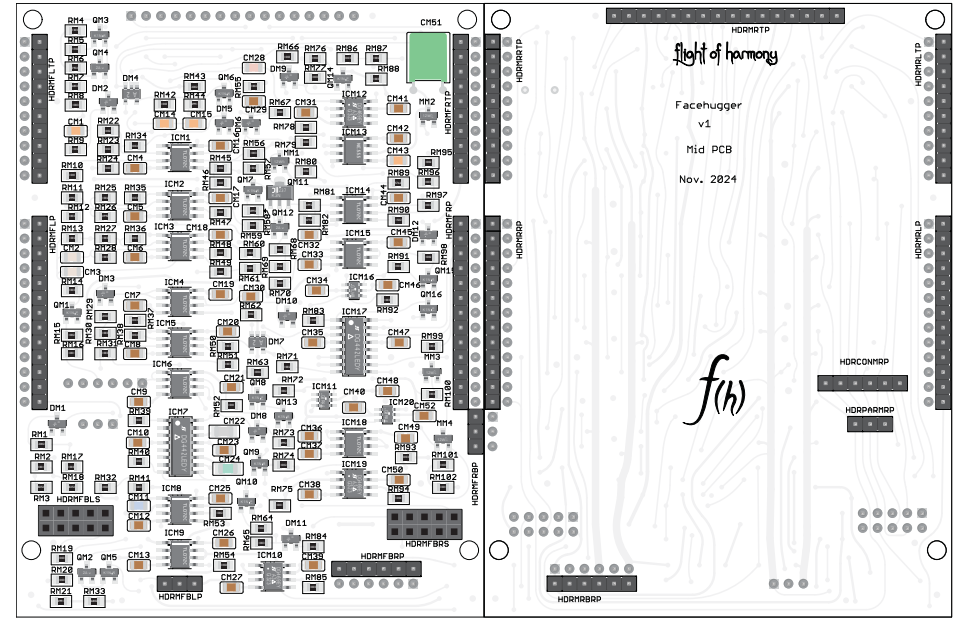
Front PCB value map



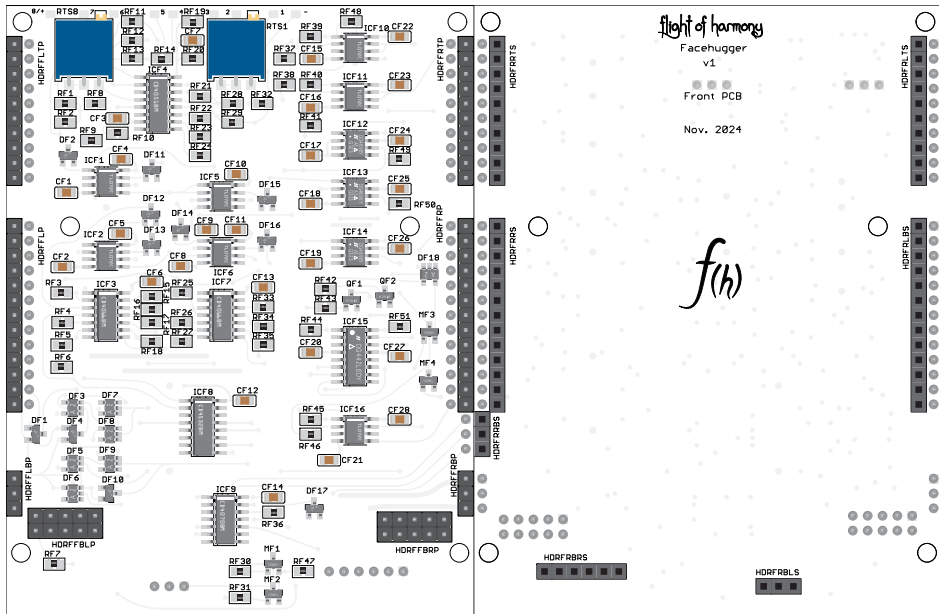
Control PCB render



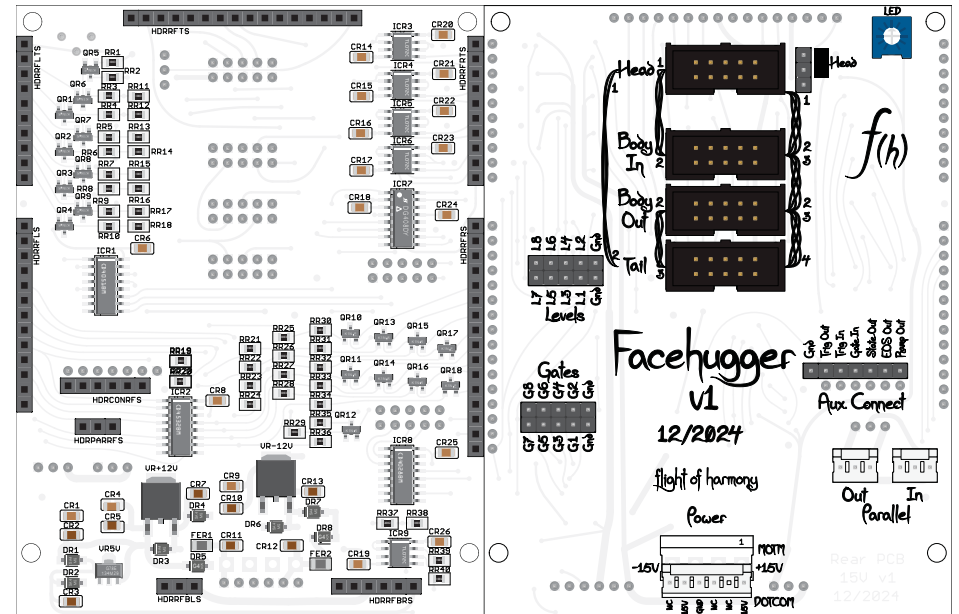
Mid PCB render



Front PCB render

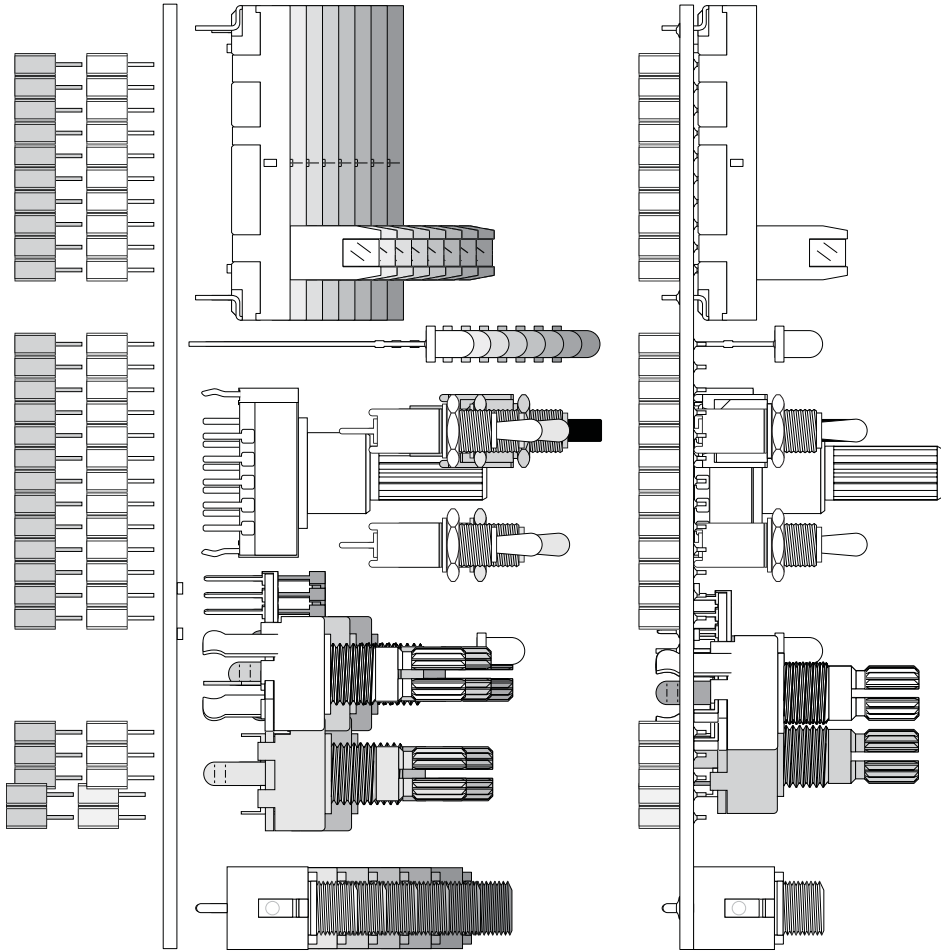


Rear PCB render



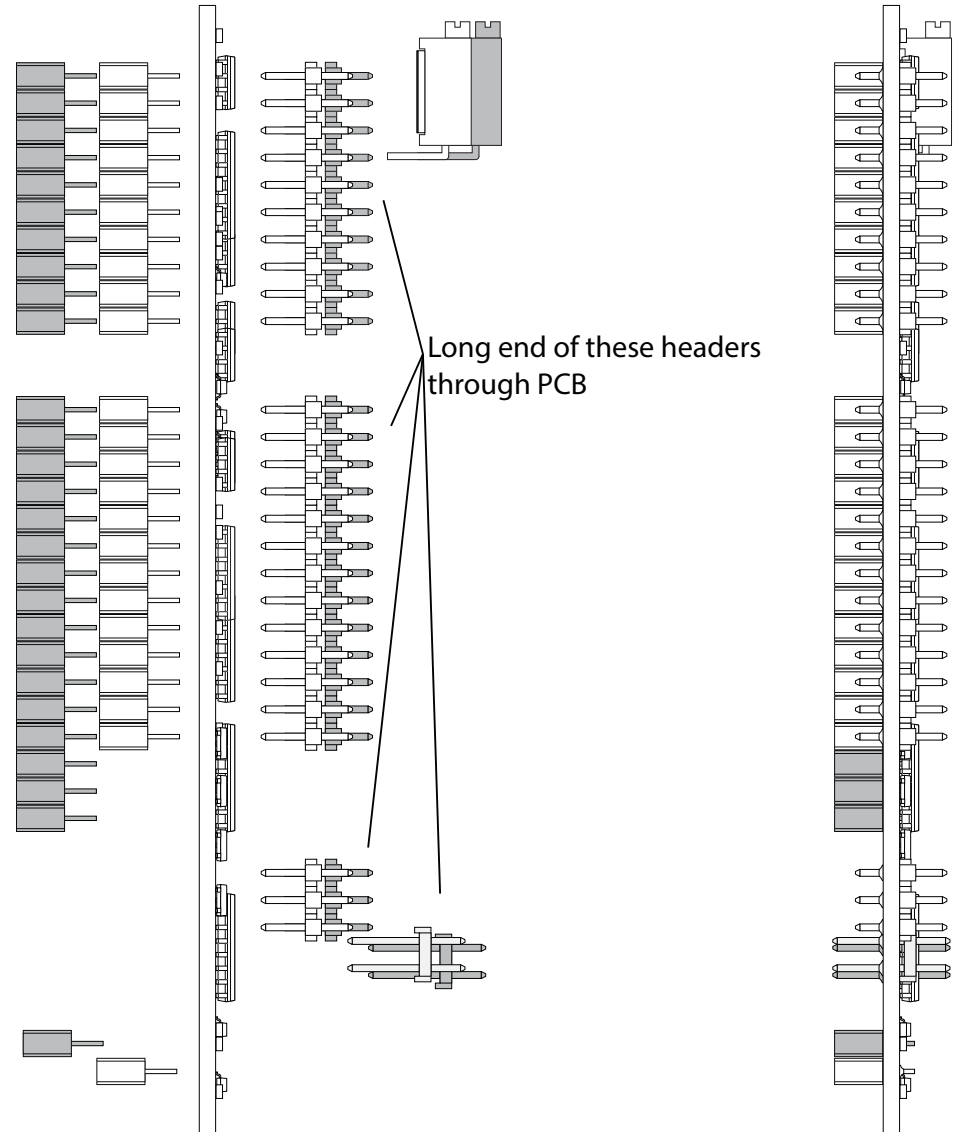
Control PCB

Exploded & assembled view



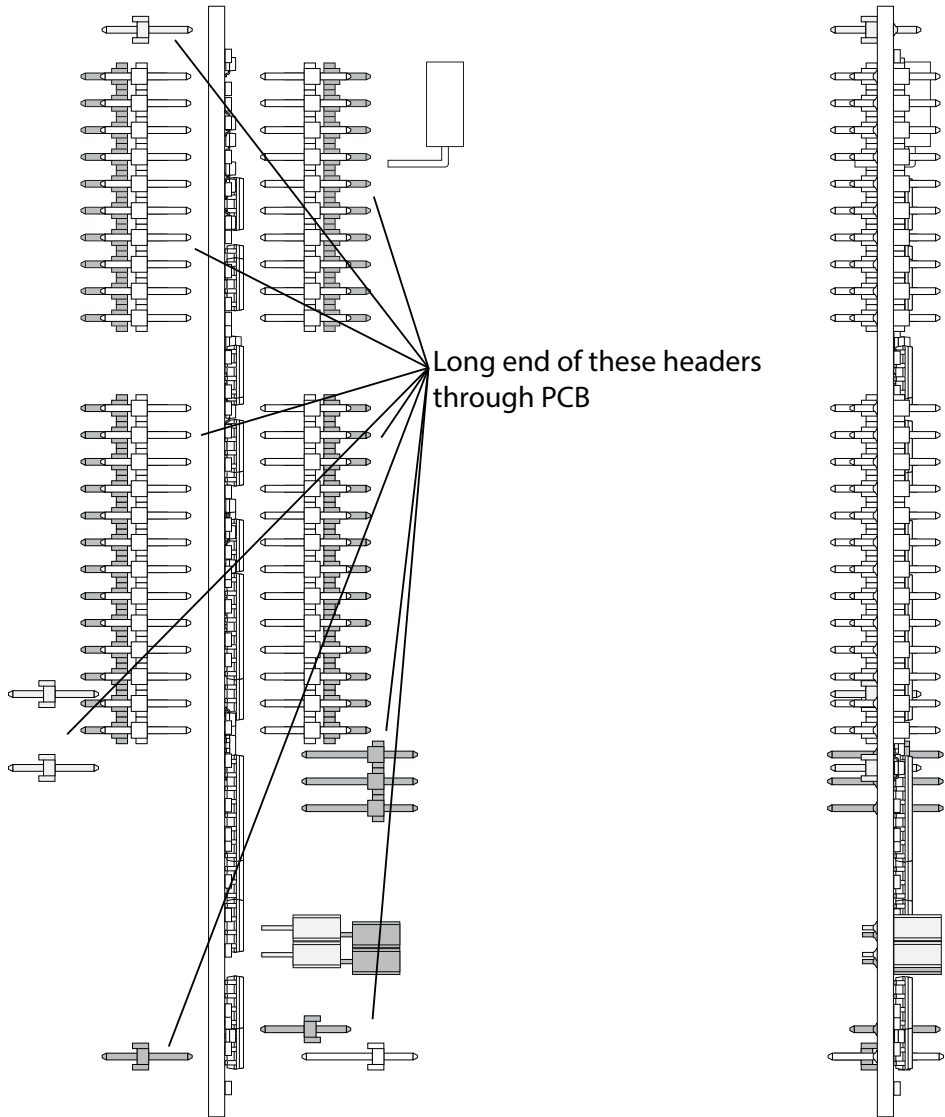
Front PCB

Exploded & assembled view



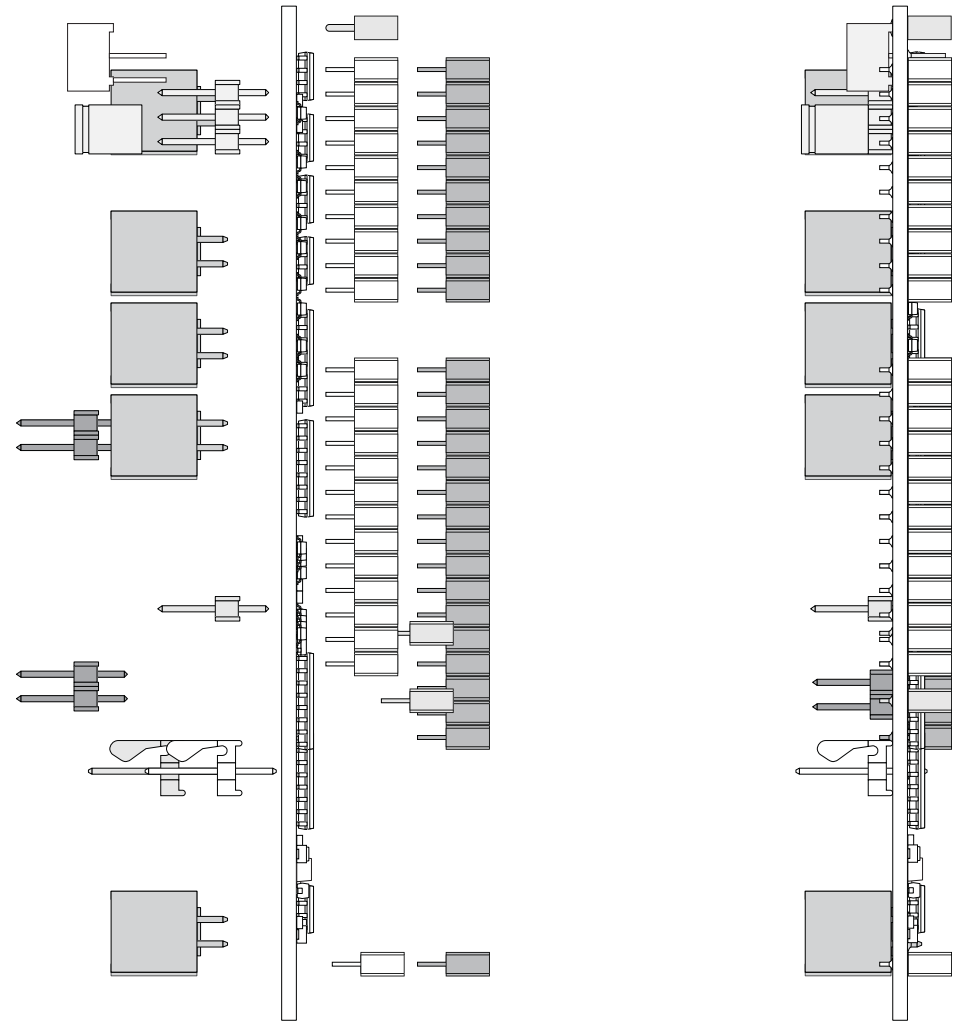
Mid PCB

Exploded & assembled view

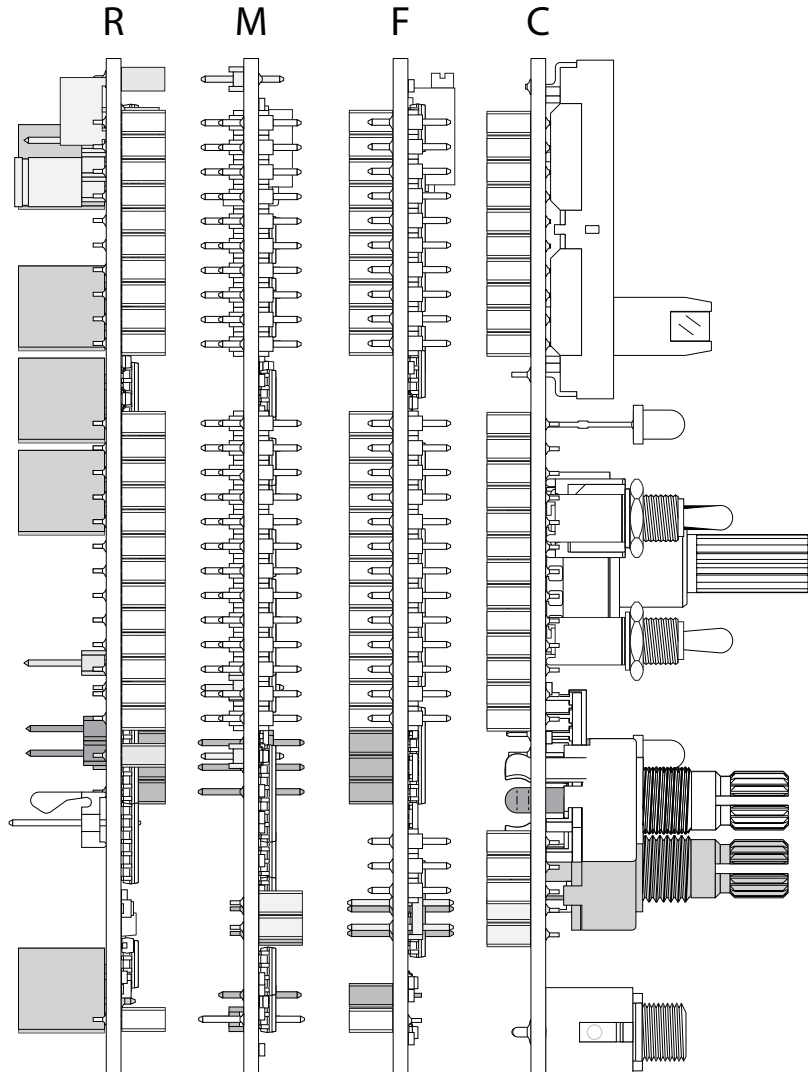


Rear PCB

Exploded & assembled view

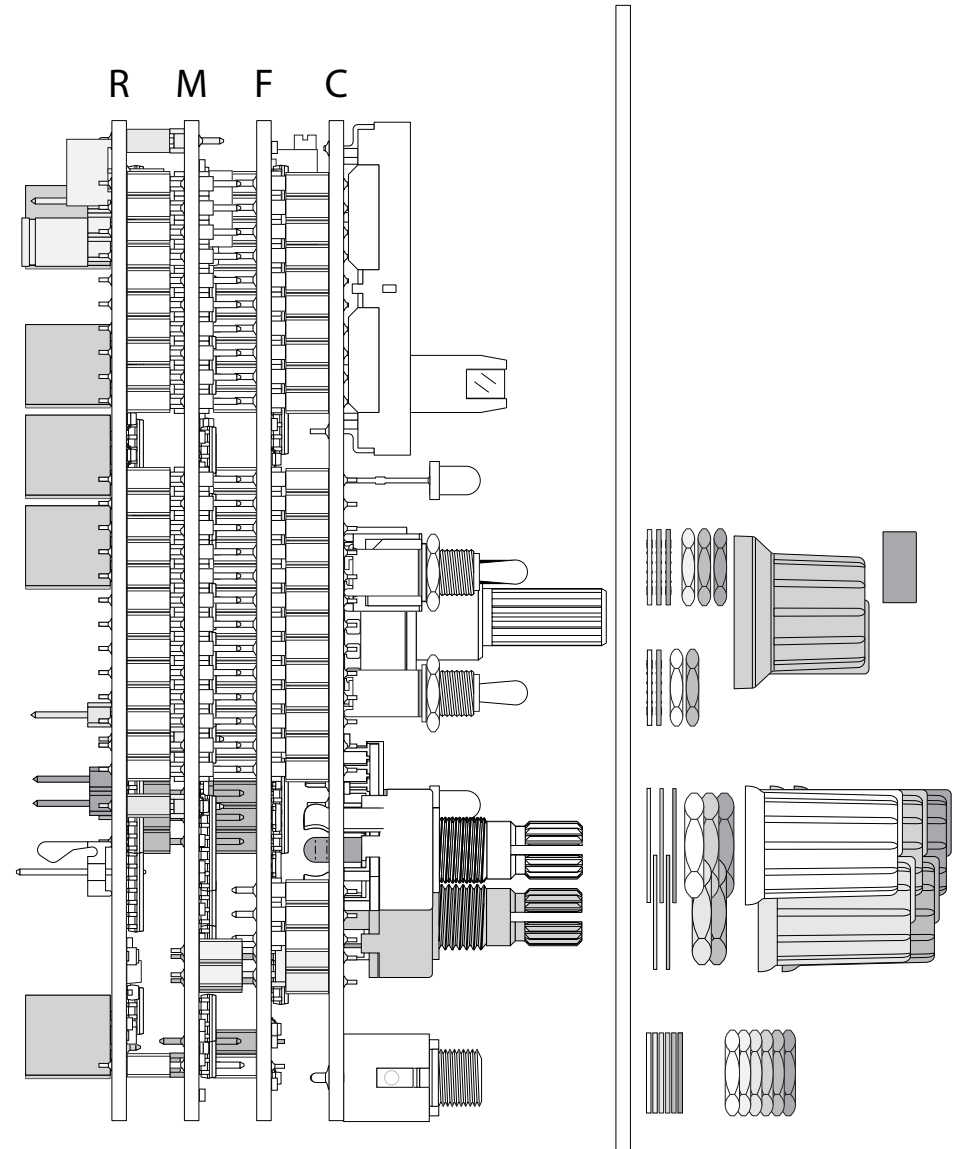


Subassembly view



Subassembly + Panel

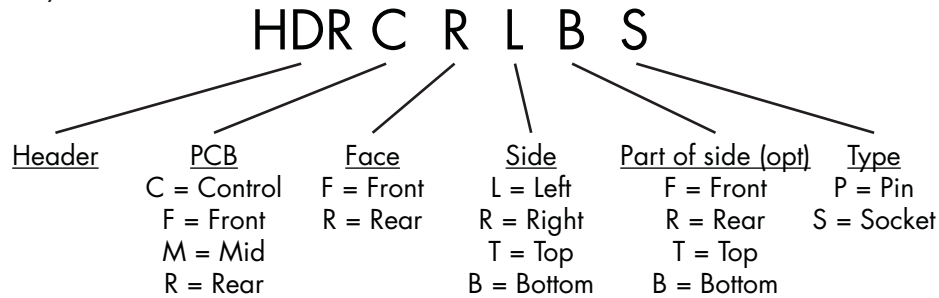
Exploded view



Interboard header assembly order

The following method is the easiest way to solder the headers and helps avoid incorrect placement.

The inter-board header names look weird, but they tell you where they go. They are structured:



Left/Right is when viewed from the front of the module.

HDRCRLBS means

- Header on the Control PCB
- Insert on the rear of the PCB
- On the left side when viewed from the front panel
- On the bottom of the left side
- It is a socket header

Most of the headers come stuck together, that is intentional. Leave them that way for soldering. Lining up all the pins from multiple headers to place the second PCB on top takes a bit of fussing, but it's not impossible. The easiest way is to insert the largest diameter side (the pin header) into the bottom PCB, then place the second PCB on the smaller (socket header) pins on top, then gently nudge the out-of-alignment pieces into place with a probe or tweezers.

IMPORTANT

Low-profile sockets are not as durable as standard sockets, so be very careful when separating boards so you don't bend the contacts. Do not try to just pull the boards apart in one go, but work it apart in stages from each corner. I use a pair of padded expanding ring pliers, but you can use a plastic or wood prybar to insert between PCBs, then gently rotate it to push them apart – but take care not to pry against any components, just against the boards. If a contact does get bent, very gently bend it back with the tip of a probe or pushpin.

For all of the interboard pin headers, the *long* side goes through the board and is soldered. Also, while most headers connect one pin to one socket, four (HDRMFBLP, HDRMFRBP, HDRFFBLP, HDRFFBRP) are *intermediary* pin headers:

Interboard header assembly order

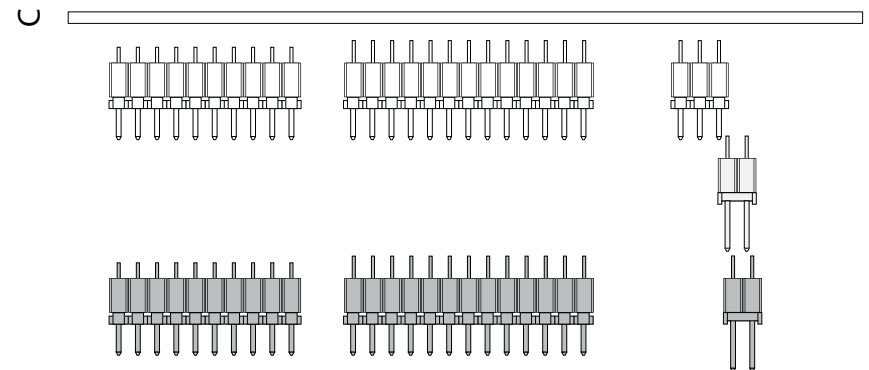
they engage with socket headers on both sides,, and require special care when installing and soldering. To repeat: pay close attention! Incorrect soldering can cause the posts to not fit in the sockets, and putting them in incorrectly is extremely difficult to repair. To install, identify each header and where it goes. All interboard headers are preassembled in pairs that match the diagrams.

For soldering, it is important to try to keep the solder at the junction of the pin and the rear side of the PCB. Large soldering iron tips or too much heat will cause the solder to wick up the length of the pin, which can make the pin too thick to fit into its corresponding socket. A sharp, narrow soldering iron tip and thin wire solder helps prevent this. If you do end up with a blob of solder that impedes assembly, you can usually remove it with desoldering braid and a broad-tip soldering iron

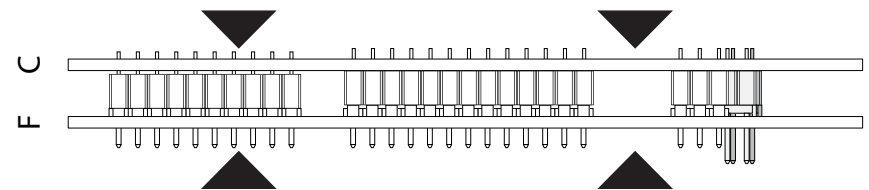
Interboard header assembly

Start with the Front and Control PCB pair:

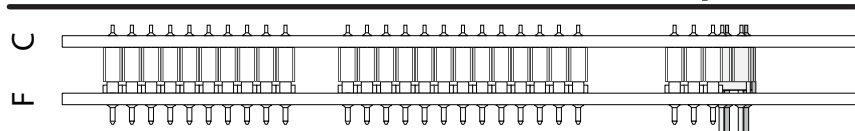
- Insert the header pairs into the Front PCB



- Align the headers with the holes, clamp the boards together with the included clamps, and solder headers on both PCBs.



Interboard header assembly, cont.

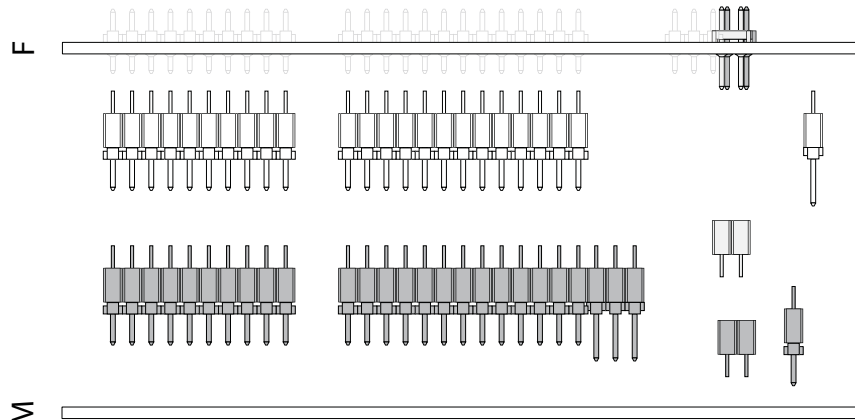


Note: When soldering the long pins on HDRFFBLP, HDRFFBRP, HDRMFBLP, and HDRMFRBP, try to keep the solder as close to the PCB as possible and not get a huge blob on the tip where it seats into the mating socket.

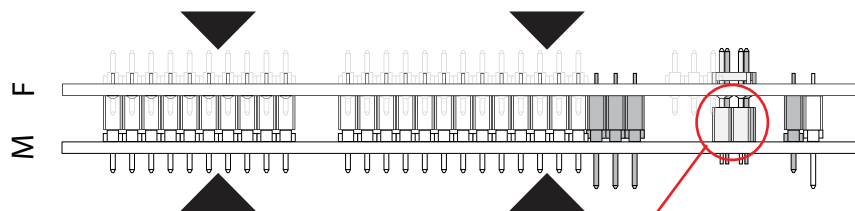
- Separate the Front and Control PCBs.

Next is the Mid and Front PCB pair:

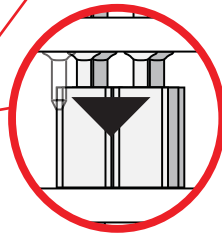
- Insert the header pairs into the Mid PCB



- Align headers and clamp the boards



Make sure socket headers are seated against Mid PCB.

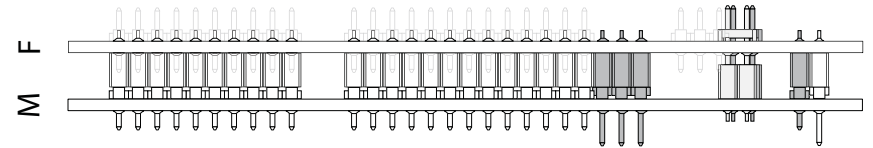


- As noted, push the socket headers towards the Mid PCB until they sit

Interboard header assembly, cont.

flush before soldering.

- Solder headers on both PCBs.

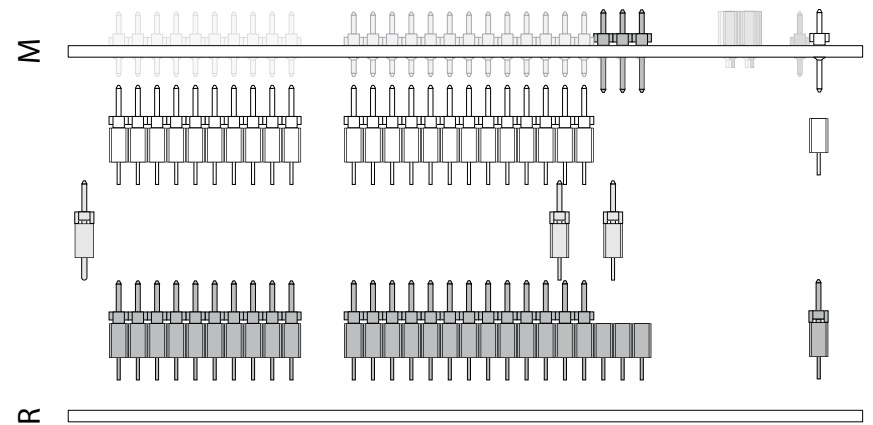


- Separate PCBs.

Next is the Rear and Mid PCB pair.

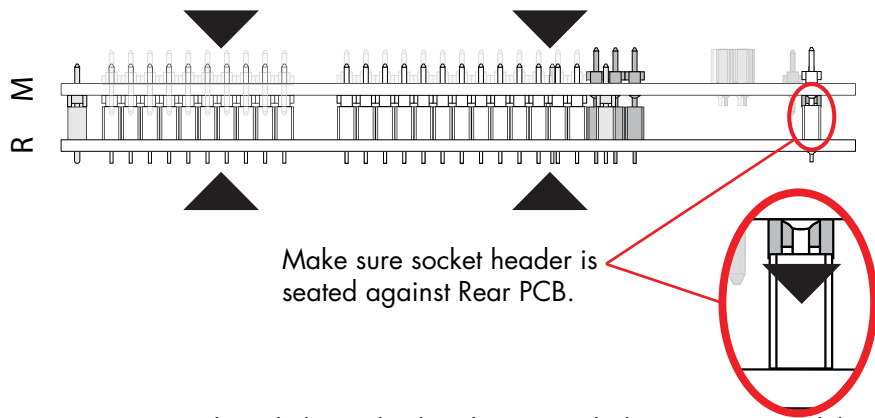
NOTE: The Mid PCB has pins on both sides, unlike the other boards with pins on one side and sockets on the other.

- Insert the header pairs into the Mid PCB again



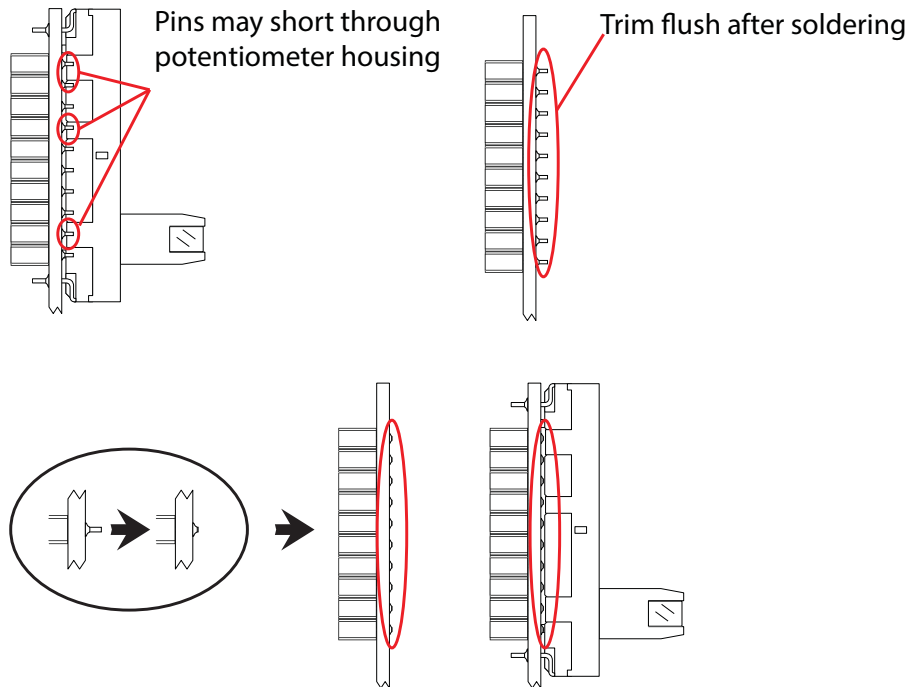
- Align headers and clamp the boards

Interboard header assembly, cont.



- As noted, push the socket headers towards the Rear PCB until they sit flush before soldering.
- Solder headers on both PCBs.
- Separate PCBs to solder the rear headers and trimmer potentiometer.

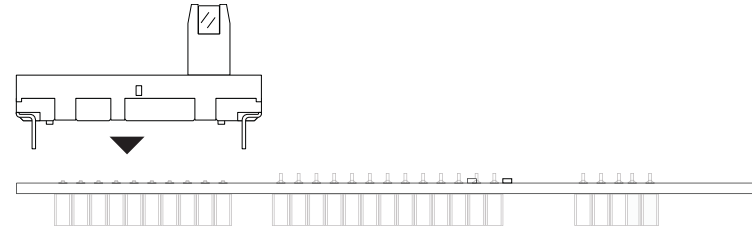
Control PCB Upper header pin trimming



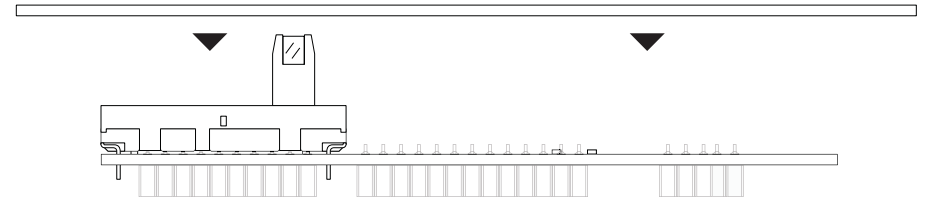
Control PCB

Slide potentiometer assembly 1/2

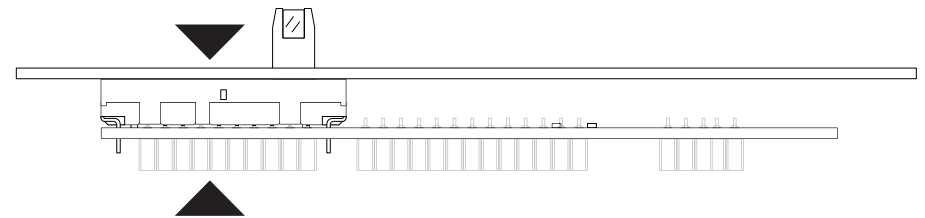
Insert slide pots into PCB



Place front panel over slide pots



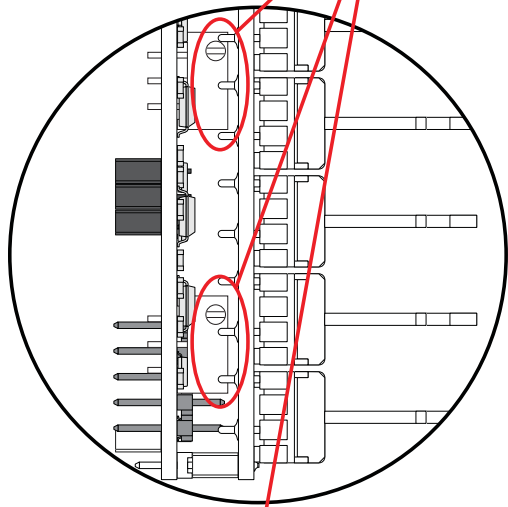
Clamp front panel to PCB to hold slide pots in place while soldering



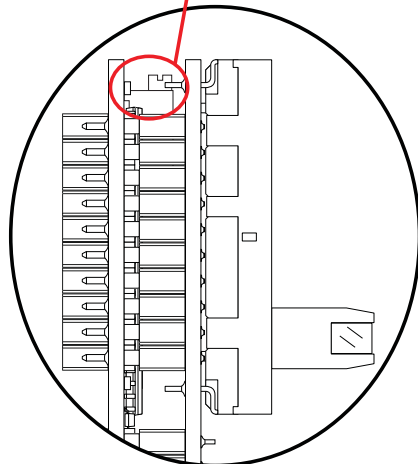
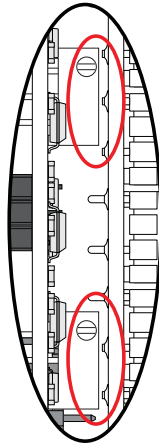
Control PCB

Slide potentiometer assembly 2/2

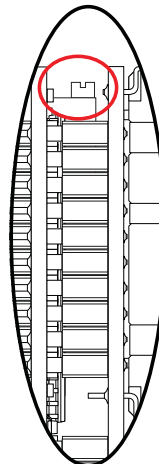
Pins will hit trim pots, trim flush after soldering.



End view



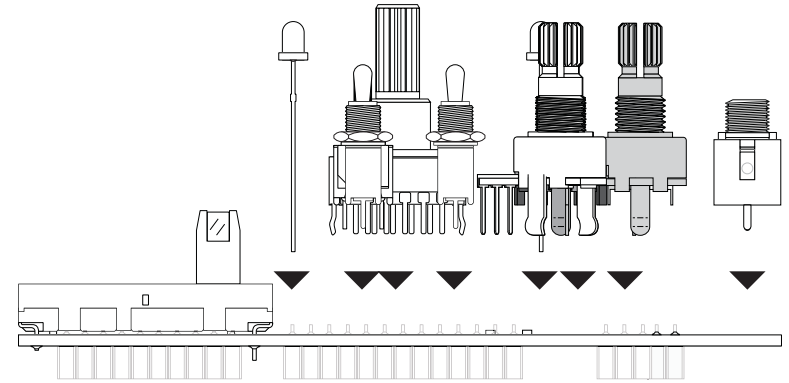
Side view



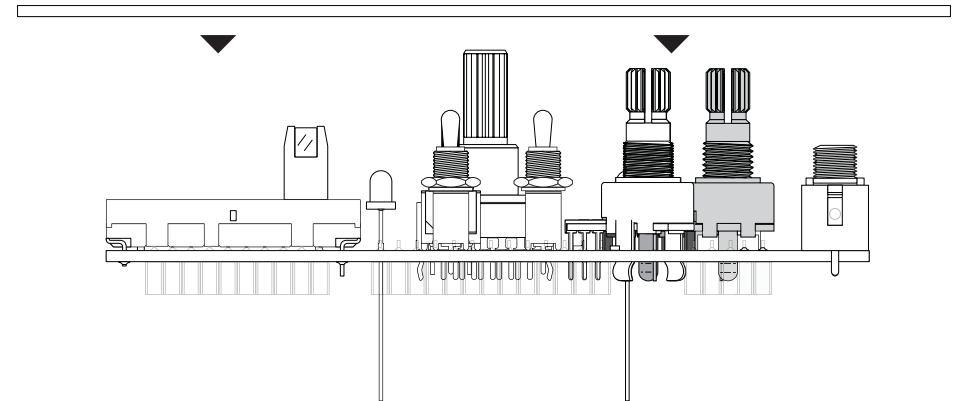
Control PCB

Controls assembly, 1/3

Insert components into PCB, make sure all are seated fully.



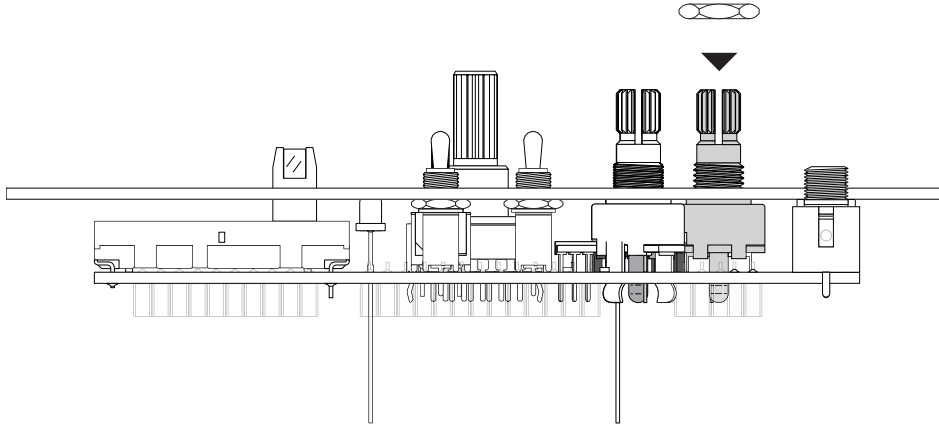
Place panel over components



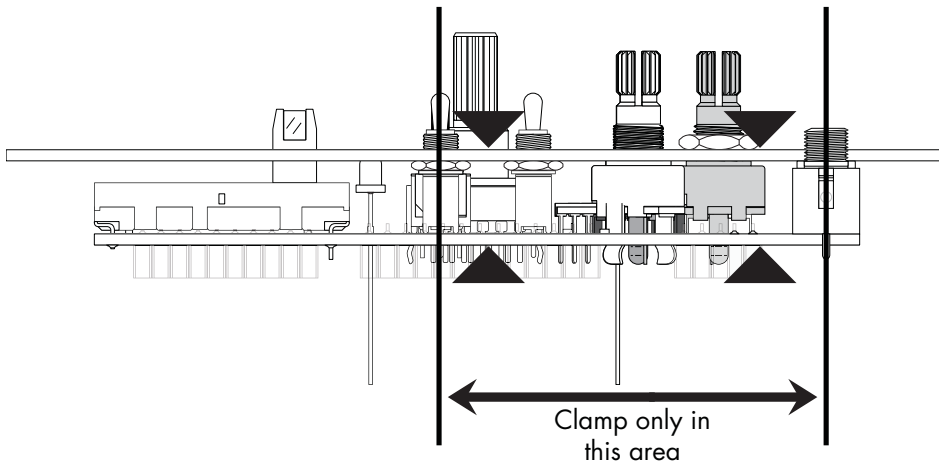
Control PCB

Controls assembly, 2/3

Install nut on Curve potentiometer to hold for soldering.
Install finger-tight.



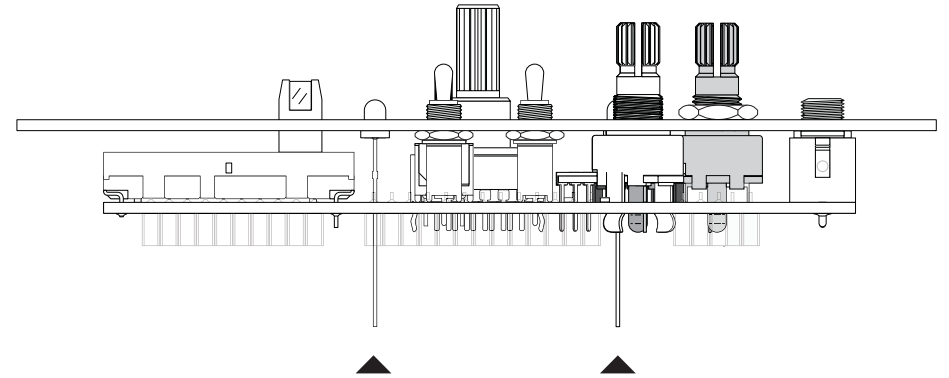
Clamp panel to PCB to hold components for soldering. **DO NOT CLAMP** above the switches, as the panel is not supported there and may tilt or launch pieces across the damn room.



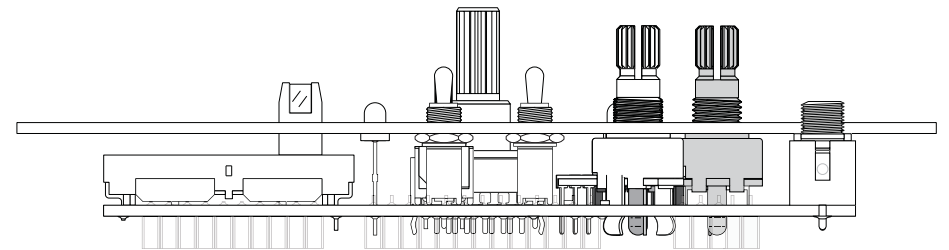
Control PCB

Controls assembly, 3/3

Push LEDs to seat them into the panel for soldering.

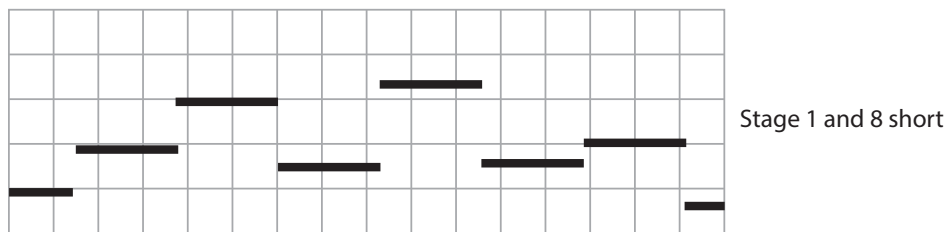
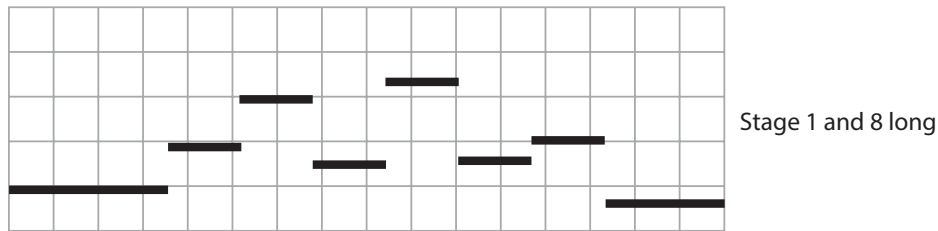
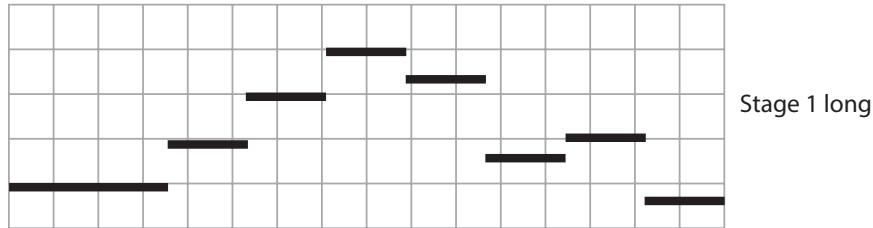
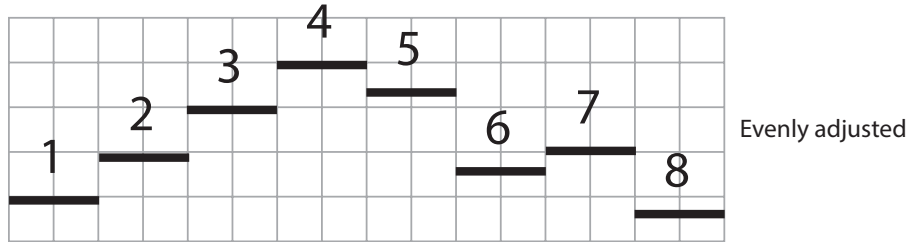


Trim LED leads.



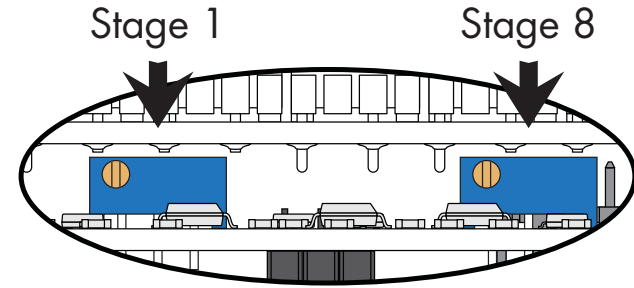
Stage length adjusting

After assembly, the stage lengths (duration) will need calibrating once the module is assembled and working.



Trimmer potentiometers RTS1 and RTS8 adjust the lengths of the output stages: RTS1 controls the length of stage 1, RTS8 controls the length of Stage 8.

Stage length adjusting (cont.)



This is easiest to do if you have an oscilloscope to view the output. You can technically also do it by ear, but that takes a bit longer, from my experience.

Another method is to measure the top (pad 8/+) voltage, divide by eight and multiply by stage number to derive the voltages for each stage:

$$v = \text{pad}8$$

$$\text{pad}7 = \text{pad}8 \times 7/8 = v \times 7/8$$

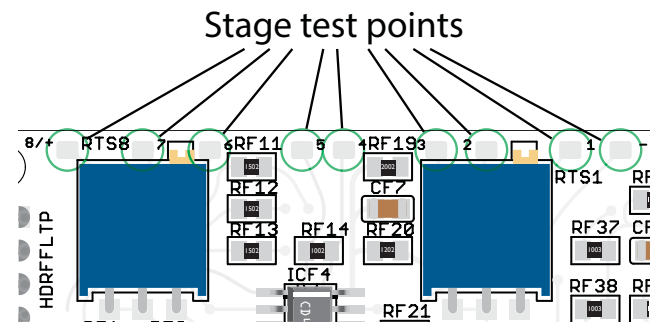
$$\text{pad}6 = v \times 6/8$$

and so on...

Use the test points to observe the voltages as you make the adjustments. Stage "1" is the bottom, and should measure zero. If not, subtract its value from pad 8 before dividing:

$$v = \text{pad}8 - \text{pad}1.$$

$$\text{pad}7 = (\text{pad}8 - \text{pad}1) \times 7/8 = v \times 7/8$$

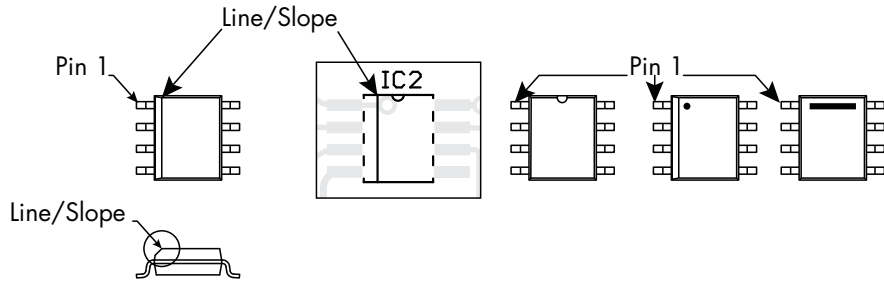


Miscellaneous

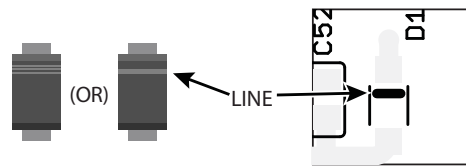
IC Orientation

There are many ways to mark proper orientation on ICs. Manufacturers keep changing the marks, and some may use combinations of them, but they all tell the same thing: where pin 1 is.

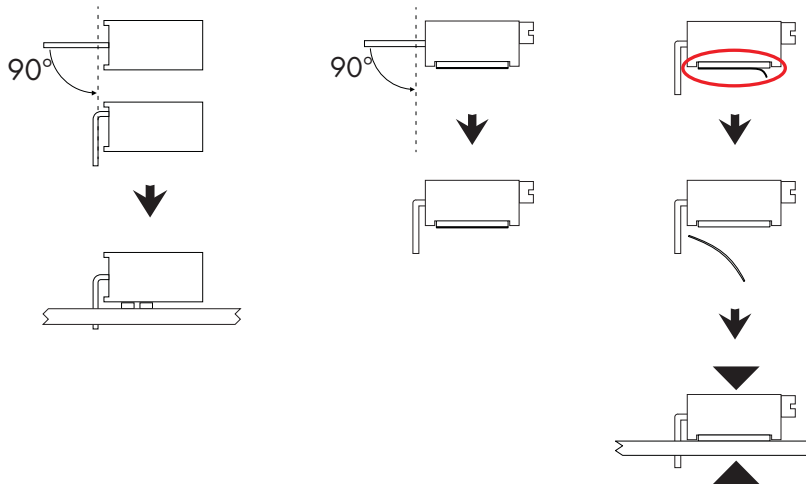
They all orient in the same direction relative to the mark.



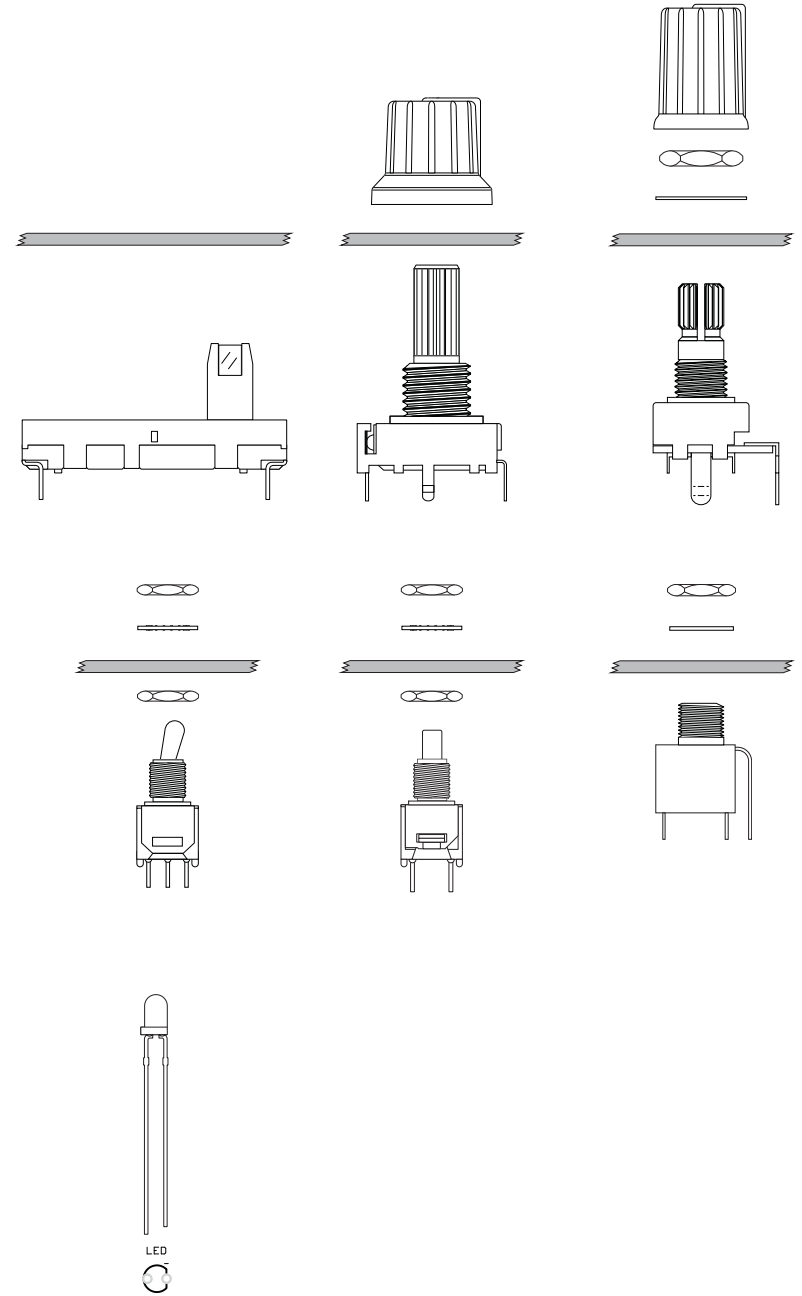
Diode Orientation



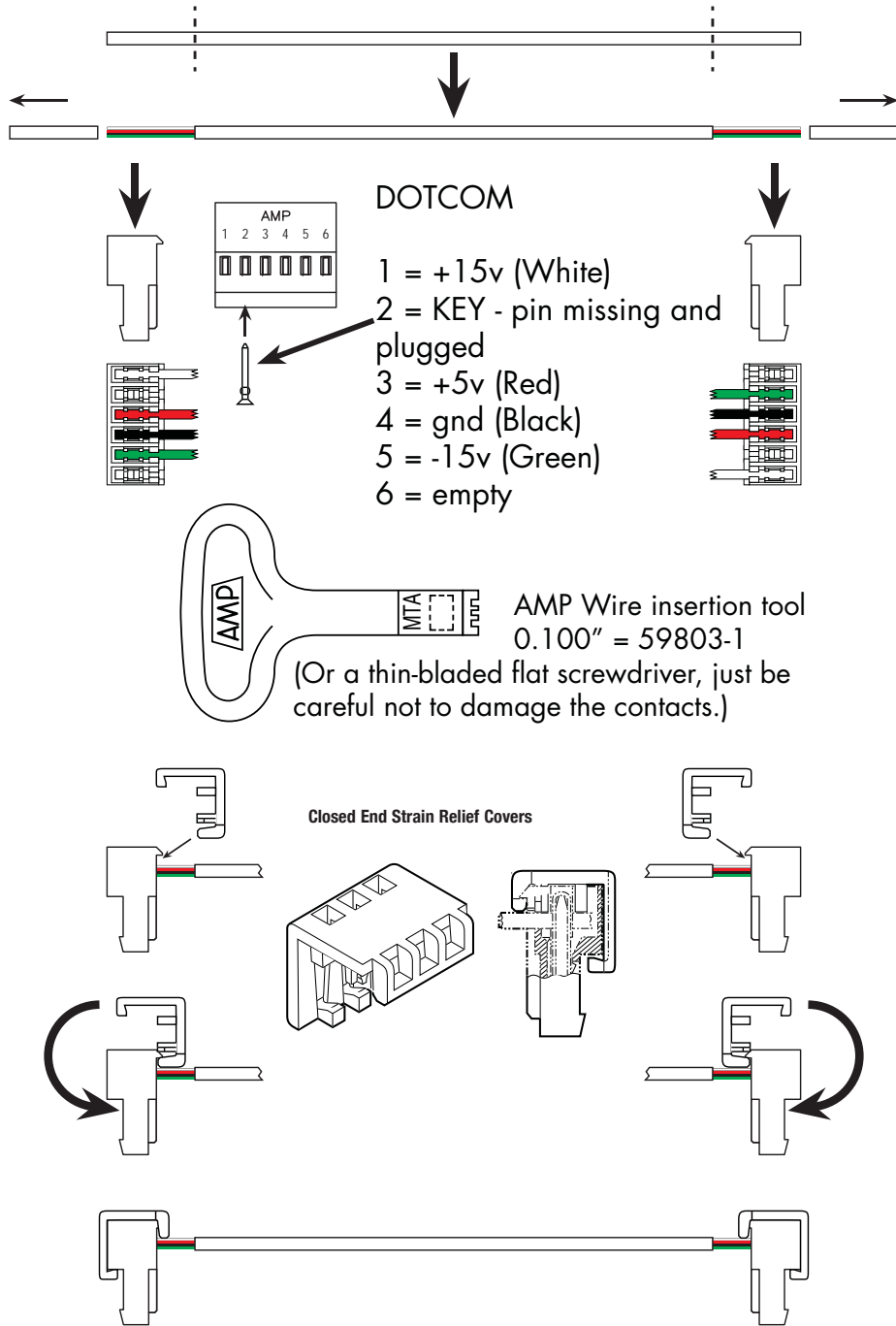
Film capacitor and level trimpot Installation



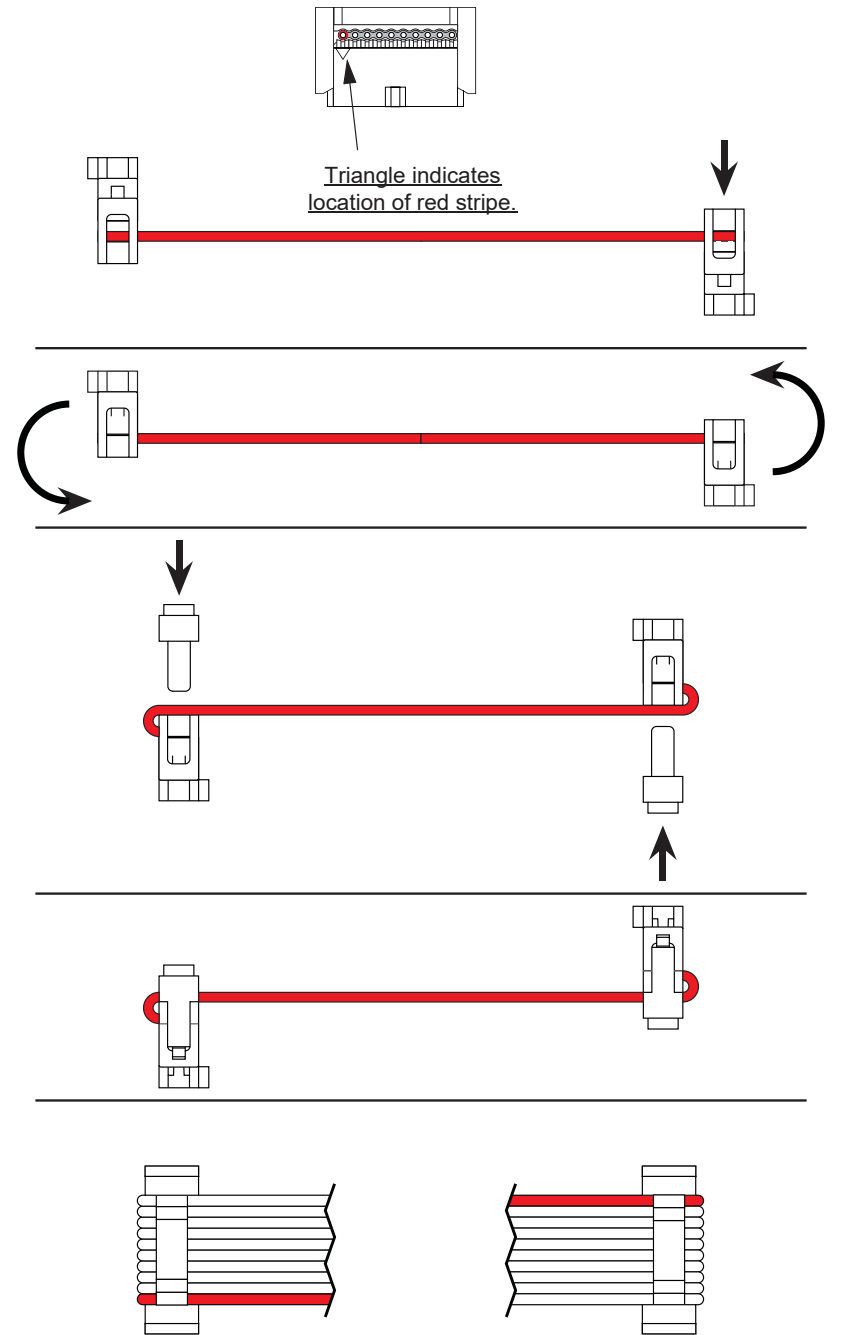
Panel components



Power Cable Assembly



Chain Cable Assembly



FAC-K ±15V BOM			
Part	Qty	Value	Device
ICF1, ICF2, ICF5, ICF6, ICF10, ICF11, ICF16, ICM1, ICM2, ICM3, ICM4, ICM5, ICM6, ICM8, ICM9, ICM14, ICM15, ICM18, ICR3, ICR4, ICR5, ICR6, ICR9	23	TL072	Dual opamp
ICR7	1	DG408	8:1 analog switch, ±12V
ICF15, ICM7, ICM17	3	DG442	4 x SPST, analog, ±12V
ICM16	1	DG467	NC SPST, analog, ±12V
ICM11, ICM20	2	DG468	NO SPST, analog, ±12V
ICF12, ICF13, ICF14, ICM10, ICM12, ICM19	6	DG469	2 x SPDT, analog, ±12V
ICM13	1	NE555	Timer
ICR8	1	CD4028	BCD-Decimal decoder
ICF4, ICR1	2	CD4051	8:1 analog switch, narrow
ICF3, ICF7	2	CD4066	4 x SPST, analog
ICF9	1	CD4070	Quad XOR
ICF8, ICR2	2	CD4532	8bit priority encoder
MF1, MF2, MF3, MF4, MM1, MM2, MM3, MM4	8	2N7002	MOSFET, n-channel, enhancement
QF1, QF2, QM1, QM3, QM5, QM6, QM7, QM8, QM9, QM10, QM13, QM14, QM15, QM16, QR1, QR2, QR3, QR4, QR5, QR6, QR7, QR8, QR9, QR10, QR11, QR12, QR13, QR14, QR15, QR16, QR17, QR18	32	3904	Transistor, NPN
QM2, QM4, QM12	3	3906	Transistor, PNP
QM11	1	DXT3906	Transistor, PNP
VR5V	1	78L05	Voltage regulator, +5V, 100mA
VR+12V	1	78M12	Voltage regulator, +12V, 500mA
VR-12V	1	79M12	Voltage regulator, -12V, 500mA
DF1, DF2, DF4, DF10, DF11, DF12, DF13, DF14, DF15, DF16, DF17, DM1, DM2, DM3, DM5, DM6, DM8, DM9, DM10, DM11, DM12	21	BAV74	2 x Switching diode, CC
DF3, DF5, DF6, DF7, DF8, DF9, DF18, DM4, DM7	9	1SS309	4 x Switching diode, CC
DR1, DR2, DR3, DR4, DR6, DR7	6	SA4-W	Rectifier diode
DR5, DR8	2	SS1040	Diode, Schottky

Package	Manufacturer	Manufacturer PN
SOIC-8	Texas Instruments	
SOIC-16	Vishay	DG408DY
SOIC-16	Vishay	DG442DY
TSOP-6	Vishay	DG467DV
TSOP-6	Vishay	DG468DV
SOIC-8	Vishay	DG469EY
SOIC-8		NE555D
SOIC-16	Texas Instruments	CD4028BM
SOIC-16-N	Texas Instruments	CD4051BM
SOIC-14	Texas Instruments	4066D
SOIC-14	Texas Instruments	CD4070D
SOIC-16-N	Texas Instruments	CD4532
SOT-23-3	nexperia	2N7002/HAMR
SOT-23-3	Diodes, Inc.	MMBT3904
SOT-23-3	onsemi	MMBT3906
SOT-89-3	Diodes, Inc.	DXT3906-13
SOT-89-3	Texas Instruments	UA78L05ACPKE6
DPAK	ONSEMI	MC78M12CDTRKG
DPAK	ONSEMI	MC79M12BDTRKG
SOT-23-3	onsemi	BAV74LT1G
SOT-25-5	Toshiba	1SS309(TE85L,F)
SOD-123F	Rectron	SA4-W
SOD-123FL-2	Panjit	SS1040FL_R1_00001

LED1, LED2, LED3, LED4, LED5, LED6, LED7, LED8, LED>5	9		LED, 3mm round
CM11	1	22pF	Ceramic capacitor COG
CM28	1	470pF	Ceramic capacitor COG
CM2, CM3	2	1nF	Ceramic capacitor COG
CM1, CM14, CM15, CM43	4	0.01uF	Ceramic capacitor COG
CF1, CF2, CF3, CF4, CF5, CF6, CF7, CF8, CF9, CF10, CF11, CF12, CF13, CF14, CF15, CF16, CF17, CF18, CF19, CF20, CF21, CF22, CF23, CF24, CF25, CF26, CF27, CF28, CM4, CM5, CM6, CM7, CM8, CM9, CM10, CM12, CM13, CM16, CM17, CM18, CM19, CM20, CM21, CM23, CM25, CM26, CM27, CM30, CM31, CM32, CM33, CM34, CM35, CM36, CM37, CM38, CM39, CM40, CM41, CM42, CM44, CM45, CM46, CM47, CM48, CM49, CM50, CM52, CR1, CR4, CR6, CR8, CR10, CR14, CR15, CR16, CR17, CR18, CR19, CR20, CR21, CR22, CR23, CR24, CR25, CR26	86	0.1uF	Ceramic capacitor X7R
CM29	1	0.47uF	Ceramic capacitor X7R
CR2, CR3, CR5, CR7, CR9, CR13	6	1uF	Ceramic capacitor X7R
CR11, CR12	2	10uF	Ceramic capacitor X5R
CM24	1	2.2uF	Ceramic capacitor X7R
CM22	1	10uF	Ceramic capacitor X7R
CM51	1	0.22uF	Plastic film capacitor
FER1, FER2	2	Ferrite	Ferrite bead
RM82	1	475r	Thin film resistor, 1%
RM2, RM10, RM16, RM36, RM52, RM59, RM61, RM75, RM102, RR2, RR35	11	1kΩ	Thin film resistor, 1%
RF8, RF28, RM21, RM44	4	4.99kΩ	Thin film resistor, 1%
RC1, RC2, RF4, RF5, RF15, RF16, RF26, RF27, RF30, RF31, RF33, RF42, RF43, RF45, RF46, RF51, RM5, RM9, RM13, RM15, RM22, RM25, RM32, RM34, RM38, RM45, RM53, RM54, RM55, RM62, RM64, RM71, RM72, RM74, RM76, RM80, RM87, RM91, RM95, RM98, RM101, RR3, RR4, RR5, RR6, RR7, RR8, RR9, RR10, RR39, RR40	51	10kΩ	Thin film resistor, 1%

LED3MM	Würth	151031SS04000
0805	Kemet	C0805C220J1GAC7210
0805	Kemet	C0805C471J5GACTU
0805	Kemet	C0805C102J5GAC7210
0805	muRata	GRM2165C2A103JA01J
0805	Kemet	C0805C103K3RACTU
0805	Samsung	CL21B474KBFNNNG
0805	Samsung	CL21B105KBFNNNF
0805	muRata	GRM21BR61H106ME43L
1206	Kemet	C1206C225K5RACTU
1206	TAIYO YUDEN	GMK316AB7106KL
C050H025X075	Kemet	R82DC3220AA60J
0805	Würth	742792040
0805	Vishay	CRCW080547R0FKEA
0805	Vishay	CRCW08051K00FKEA
0805	Vishay	CRCW08054K99FKEA
0805	Vishay	CRCW080510K0FKEA

RF1, RF2, RF14, RF21, RF29, RF32	6	10kΩ 0.1%	Thin film resistor, 0.1%
RF10, RF20	2	12kΩ	Thin film resistor, 1%
RF11, RF12, RF13, RM57, RM69, RM90	6	15kΩ	Thin film resistor, 1%
RF9, RF19, RF22, RF23, RF24, RM1, RM29, RM43, RR37	9	20kΩ	Thin film resistor, 1%
RM6	1	39kΩ	Thin film resistor, 1%
RC3, RM11, RM26, RM58, RM73, RM81	6	49.9kΩ	Thin film resistor, 1%
RM89	1	57.6kΩ	Thin film resistor, 1%
RM7, RM33	2	68kΩ	Thin film resistor, 1%
RM3, RM18	2	82.5kΩ	Thin film resistor, 1%
RF3, RF6, RF7, RF17, RF18, RF25, RF34, RF35, RF36, RF37, RF38, RF39, RF40, RF41, RF44, RF47, RF48, RF49, RF50, RM8, RM12, RM14, RM17, RM19, RM20, RM23, RM24, RM27, RM28, RM30, RM31, RM35, RM37, RM39, RM40, RM41, RM42, RM46, RM47, RM48, RM49, RM50, RM51, RM56, RM60, RM65, RM66, RM67, RM68, RM70, RM77, RM78, RM79, RM83, RM84, RM85, RM86, RM88, RM92, RM93, RM96, RM97, RM99, RM100, RR1, RR11, RR12, RR13, RR14, RR15, RR16, RR17, RR18, RR19, RR20, RR21, RR22, RR23, RR24, RR25, RR26, RR27, RR28, RR30, RR31, RR32, RR33, RR34, RR36, RR38	90	100kΩ	Thin film resistor, 1%
RM4	1	130kΩ	Thin film resistor, 1%
RM63, RM94, RR29	3	1MΩ	Thin film resistor, 1%
RTS1, RTS8	2	10kΩ	Trim resistor, 25-turn
RTLED	1	100kΩ	Trim resistor
PLEV1, PLEV2, PLEV3, PLEV4, PLEV5, PLEV6, PLEV7, PLEV8	8	100kΩ	Slide potentiometer, 20mm
PPORT, PROOT, PSCALE, PSPEED	4	100kΩ	Potentiometer, 12mm, rotary, vertical
PCURVE	1	1MΩ	Potentiometer, 12mm, rotary, vertical
RSW1	1		Rotary switch, SP8T
SWBIAS, SWCURVE, SWGLIDE, SWRUN	4	SP3T	Toggle switch, submini, On-Off-On
SWTRIG	1	PB Off-(On)	Pushbutton switch, OFF-(ON)
JEXTIN	1		Jack, 3.5mm, stereo

0805	Bourns	CRT0805-BY-1002ELF
0805	Vishay	CRCW080512K0FKEA
0805	Vishay	CRCW080515K0FKEA
0805	Vishay	CRCW080520K0FKEA
0805	Vishay	CRCW080539K0FKEA
0805	Vishay	CRCW080549K9FKEA
0805	Vishay	CRCW080557K6FKEA
0805	Vishay	CRCW080568K0FKEA
0805	Vishay	CRCW080582K5FKEA
0805	Vishay	CRCW0805100KFKEA
0805	Vishay	CRCW0805130KFKEA
0805	Vishay	CRCW08051M00FKEA
PV36W	Bourns	PV36W203C01B00
T73YP	Vishay	T73YP104KT20
20AP1	TOP_UP	20AP-13B-LRP15-1B100K-01/03-6H
R1212N	Song Huei	R1212N-B100K, L-15KC/NS/M
R1212N	Song Huei	R1212N-B1M, L-15KC/NS/M
RBP17	Song Huei	RBP17-1-1-8-20KC/NS
Subminiature	E-Switch	200MSP3T2B1M2QEHE
Subminiature	E-Switch	800SP9B5M2QEE
	WQP	WQP518MA

JOUT, JROOT, JSKALE, JSPEED, JTRIG	5		Jack, 3.5mm, mono
HDRFFLBP, HDRFFRBP, HDRPARMRP	3	HWS16317-3*	HDR-1X3LOWPRO-SIP
HDRCONMRP, HDRMFBRP, HDRMRBRP	3	HWS16317-6*	HDR-1X6LOWPRO-SIP
HDRFFLTP, HDRFFRTP, HDRMFLTP, HDRMFRTP, HDRMRLTP, HDRMRRTTP	6	HWS16317-10*	HDR-1X10LOWPRO-SIP
HDRFFRP, HDRFRLP, HDRMFLP, HDRMFRP, HDRMRLP, HDRMRRP	6	HWS16317-13*	HDR-1X13LOWPRO-SIP
HDRMRTP	1	HWS16317-16*	HDR-1X16LOWPRO-SIP
HDCRLBS, HDRCRBS, HDRFRBLS, HDRFRBRS, HDRPARRFS, HDRRFBLS	6	HWS9446-3*	HDR-1X3SCKT-SIP
HDRCONRFS, HDRFRBRS, HDRRFBRS	3	HWS9446-6*	HDR-1X6SCKT-SIP
HDCRLTS, HDRCRRTS, HDRFLTS, HDRFRRTS, HDRFRRTS	6	HWS9446-10*	HDR-1X10SCKT-SIP
HDCRLS, HDRCRRS, HDRFLS, HDRFRLBS, HDRFRRS	5	HWS9446-13*	HDR-1X13SCKT-SIP
HDRFRFS, HDRFRFTS	2	HWS9446-16*	HDR-1X16SCKT-SIP
HDCRBLBS, HDRCRBRS, HDRMFBLBS, HDRMFBRBS	8	HWS9446-5*	HDR-1X5SCKT-SIP
HDRMFBLP, HDRMFRBP	2		HDR-1X3LOWPRO-DBLPIN-SIP
HDRFFBLP, HDRFFBRP	2		HDR-2X5LOWPRO-DBLPIN
Head	1	HWS1646-3*	HDR-1X3PIN-SIP
Aux. Connect	1	HWS1646-7*	HDR-1X7PIN-SIP
Gates, Levels	2		HDR-2X5PIN
Parallel In, Parallel Out	2		1x3 pin header, locking
HDR_HEAD, HDR_BODY_IN, HDR_BODY_OUT, HDR_TAIL	4		2x5 pin header, shrouded
FRICITION LCK HDR 6P	1		1x6 friction-lock pin header
6P 22AWG TIN CLSD WITH TAB	2		1x6 22AWG IDC MTA connector, tabs
STRAIN RLF COVER 6P	2		1x6 0.1" strain relief cover
KEYING PLUG	2		MTA keying plug

* - The HWS9446 and HWS16317 only come in a 40-pin strip and have to be cut to length. The -n is how many pins.

	WQP	PJ366ST
SIP03	PEConnectors	HWS16317
SIP06	PEConnectors	HWS16317
SIP10	PEConnectors	HWS16317
SIP13	PEConnectors	HWS16317
SIP16	PEConnectors	HWS16317
SIP03	PEConnectors	HWS9446
SIP06	PEConnectors	HWS9446
SIP10	PEConnectors	HWS9446
SIP13	PEConnectors	HWS9446
SIP16	PEConnectors	HWS9446
SIP05	PEConnectors	
SIP03	SAMTEC	MTLW-103-07-T-S-125
2X5	SAMTEC	MTLW-105-07-T-D-125
SIP03	PEConnectors	HWS1646
SIP07	PEConnectors	HWS1646
2X5	PEConnectors	HWS1334
MTA-100	TE	640456-3
2X5	PEConnectors	HWS15766
SIP06	AMP/TE	640456-6
	AMP/TE	3-643813-6
	AMP/TE	643075-6
	AMP/TE	641994-1

