

KiT88

INTEGRATED INSTRUCTION MANUAL

TEXT ONLY

SAFETY WARNING

Lethal voltages exist in this amplifier. Even though this is one of our simplest kits, in terms of construction, please do not attempt to build it unless you have some understanding of valve circuitry and can follow safety precautions.

We do provide a back-up service, a help-line is manned from 9.00am to 5.00pm Monday to Friday, should you run into any problems. Additionally, if the worst comes to the worst and you cannot get your amplifier going, or simply want it checked, for a nominal charge, we will get your amplifier up and running.

For safety, never hold earthed metal work when testing. Make sure your body is isolated by rubber soled shoes. To aid construction use a multimeter, one capable of reading up to 1000 volts dc. **YOU MUST WEAR THE RUBBER SAFETY GLOVES PROVIDED** when testing, since the greatest danger comes from a slip at this time. Always remove the mains plug when you are soldering after switch on. The larger power supply capacitors will hold a nominal charge after switch off, so wear your gloves at all times when working internally.

Additionally be aware that the valves do get very hot and will burn skin on contact, therefore please position in a safe place, away from children and animals. Due to the compact size of the amplifier the chassis's top surface does get hot and the front panel will be warm to the touch.

FUSE

This amplifier consumes 1A from the mains and must be fitted with a 1.6A SLOW-BLOW fuse. If this blows, then there is a fault and it must be cleared before another fuse is re-inserted.

Do not use a higher rated fuse as you may burn out your transformers and always use the slow-blow type.

OUTPUT TRANSFORMERS

When it comes to switch on you should always have your output transformers connected up to a 8 ohm load, be it a dummy load (high power 8 ohm resistor) or a pair of speakers. This is because the load is an integral part of the circuit, unlike most transistor amplifiers. Switch on without a load will cause unnecessary distress to the output transformers and failure if left in this state for a long time.

READING

Before you start building read through the instruction at least twice to avoid any mistakes.

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INTRODUCTION

The KiT88 is a true high end push-pull kit, operating in pure Class A using the world famous KT88 valve delivering a healthy 36Watts into an 8 ohm load at full power. It uses the wonderful 7 pin pentode, 6AU6, strapped as a triode and the double triode ECC82 as the phase splitters, a proven dynamic combination. The KiT88 is an integrated amplifier with 4 line-in input pairs, including one tape in and one tape output phono pair. All these are controllable from the front panel. All phono sockets are gold plated as are the binding post. We have opted for an IEC mains input socket, the IEC mains lead is also provided. Also, fitted at the rear is a earth post available to those who require a direct earth link.

Sound quality - John Marks says: The KiT88 pulled a series of surprisingly fast, meaty basslines out of its trickbag when dealing with Suzanne Vega's Nine Objects Of Desire album. As if this wasn't enough, the mid and treble were nice too - cymbals had a deliciously natural, golden shimmer without sounding soft, and vocals were extremely transparent and crisply defined. Cirrus' Land's End Jazz CD boasts the sort of ambience and tonal richness Pop tracks can only dream about. KiT88 didn't hang around when it came to exploiting the virtues of its four output valves on numbers such as 'Leaves' and 'Suspect Sustain'. Saxophone had a wonderfully smooth, realistic character, and acoustic guitar mixed speed with harmonic richness to very impressive effect. Even Drum 'n' Bass evidently enjoyed its trip through those world-famous kinkless tetrodes. Asian Dub Foundation and Moloko showed no sign at all of the sluggish, woolly bottom-end and poorly-delineated bass beats that most valve amps are to blame for. Which makes the KiT88 an all-round, high-end bargain whose ability to peel back the layers of a song is matched by its unfailing musicality.

MEASURED PERFORMANCE

power.....	36watts into 8 ohms
frequency response.....	11Hz-75kHz
separation.....	71dB
noise.....	98dB
distortion.....	0.03%
sensitivity.....	400mV

SKILL LEVEL

- To build this amplifier you must be able to:
- a) solder to a good standard.
 - b) have some knowledge of valve circuitry.
 - c) possess a rudimentary understanding of electricity and electronics.
 - e) have a multimeter and be able to use it.
 - f) have access to a dummy load or an old pair of speakers.
 - g) know the precautions necessary to avoid electric shocks from the mains and amplifier power lines.

BUILD SEQUENCE

Before you start building it is a good idea to check the parts supplied against your parts list. Use the "X" column on the parts list to cross off your components. To help you through the build process you will find at the rear of the manual diagrams labelled fig. 1, fig. 2 and so on. These will bear correlation to the text and a note in bold type after each section, will tell you which diagram to refer to.

FIXING OF THE HARDWARE

- 1) Tape/source switch - use one nut internally, up close to the switch body.
- 2) Front plate - Fit the front plate to the chassis using the M4 hex bolts and M4 nuts provided. Do not tighten the bolts fully as some minor adjustments may need to be made later.
- 3) Volume potentiometer, VR1 - To avoid any hum pickup when touching the volume control the casing of the volume pot. needs to be earthed. This can be achieved by scraping away the paint using a small flat head screw driver, where the pot meets the chassis internally, this can be done. Orientate VR1 with the six terminals easily accessible for soldering later. see **fig. 9 p.15**
- 4) Rotary mains switch - cut 10mm off the top of the shaft using a hacksaw. Clamp the shaft when sawing.
- 5) IEC mains input socket - this snaps easily in place. Orientate so that tray sits near the base plate.
- 6) Selector switch - cut 15mm off the top of the shaft using a hacksaw. Again, clamp the shaft when sawing. The selector switch has two washers, one standard washer and a control washer that sets the type of switch it is. In this case it needs to be a 2/3 pole. Position the guider pin of this washer to the 13i setting. fit the selector and parts in this sequence: nut - ordinary washer - chassis - control washer - selector. see **fig. 12 p.15**
- 7) Knobs - fit the 3 knobs to the front panel, be aware that the internal diameter of the shaft hole of the knobs are different. When fitted correctly the knobs should fit snugly. When fitting, apply a great force onto the shafts as they will brake. Once fitted you may need to adjust the position of the front plate slightly so that all the knobs look central, and tighten the front plate in place. Insert the grub screws into the knob and tighten with an Allen key.
- 8) Speaker binding posts - see **fig. 6 p.14**
- 9) Phonos sockets - these need to be isolated from the chassis, hence the use of the M6 fibre washers. Fit the phono socket in this sequence: phono socket (female) - M6 fibre washer - chassis - M6 fibre washer - solder tag - nut. The solder tag of each phono socket pair (left & right channel) need to meet centrally. see **fig. 10 p.15**
- 10) Earth post - To achieve a good chassis earth, scrap the paint away internally around the hole, the solder tag should be internally accessible for soldering later.
- 11) Output transformer - Orientation is important as is insulation from the chassis so pay careful attention to **fig. 8 p. 14 and p. 12.**
- 12) Mains transformer - fit as illustrated on p. 12 with the flying leads nearest the chassis' top surface. For 240V operation solder together the violet and grey(thin) leads and isolate. see **page 12**

POPULATING THE PRINTED CIRCUIT BOARD (PCB)

You will see that the PCB has tracks on both sides. It is important that you can identify which side is which. The side with all the labelling on, the "ident", comprising of outlines, positions and the names of components and tabs, this is called the "component side", and where all the components sit. The other side we have termed the "valve base side" as all the valve bases sit here. The PCB is of the double sided variety, which basically means that a tab that appears on both sides of the PCB is not electrically joined even though it is only the thickness of the PCB away from each other.

The pin is joined by threading a piece of wire (usually in the form of a component lead) through the pin hole and soldering both lead ends. So you must solder all pins on both sides once the hole has been threaded by a component lead. Please note that there are eleven pins that are not related to any components, these are termed "Put Through Holes" (PTH) and need to be threaded with a piece of wire and soldered both sides in the same manner. If you refer to page 10, these are labelled "PTH 1... to 11". There is an exception to the rule, namely all the electrolytic capacitors and the bridge rectifiers, once placed, they actually cover the pins on the component side, thus soldering is impossible.

A GUIDE TO POPULATING THE PCB

- 1) Solder the safety resistors, bag 31, 220K, 2W these are positioned valve base side, trim off the excess on the component side. They help to discharge C1 & C2 on switched off. **see page 11**
- 2) Insert the terminal pins provided into tabs 1 to 23 to ease all PCB to external connections once the PCB is in the chassis. You will need to push the terminal pins in place either by using a pair of snipe nose pliers or by heating the pin, with your soldering iron and exerting a downward force, not too hard or you will snap your iron. Remember to solder both sides of the pin. **see page 10**
- 2) Start soldering all the resistor first.
- 3) All the high wattage resistors (above 1 watts) generate heat, so give them at least 15mm clearance from the PCB to avoid tarnishing the board. These resistors are the following: R1, R4, R13, R14, R15, R16, R17, R18, R21, R22. Please note resistors R7, R19, R20 and R24 are built up of two resistors in parallel. **see fig. 7 p.14**
- 4) Solder in all the capacitors, except C5 & C6 to facilitate the soldering of external connections to tabs 21 - 23. Note well, C1, C2, C3, C4, C10, C11, C12, C17, C18 are all electrolytics and only need soldering on the valve base side. Make sure all these electrolytics are correctly orientated as they will explode. The polarity is marked on the PCB. **see fig. 4 p.13**
- 5) Due to the position of the selector it is essential that C17, 4700uF 16V, lies on its side between C15 and R38.
- 6) Solder in all the bridge rectifiers. Orientation is very important. The PCB is clearly marked. **see fig. 3 p.13**
- 7) Solder in the valve bases so that they are sitting on the valve base side of the PCB. To reduce any unnecessary stress to the PCB it is a good idea to open up the pins slightly with a small screwdriver once soldered in place. The orientation of the octal valve base is very important it is denoted by the key-hole shape on the PCB, this correlates to the shape of the central hole of the octal base.
- 8) Wire in the heater wiring and the PCB earth to grid bias network on the valve base side. **see page 11**
- 9) Solder in the two wire links both positioned near BR1, these are denoted by a white line, one 90mm long and one 5mm long, remember to solder both sides in place..
- 11) Solder in the eleven "Put Through Holes". **see page 10**

WIRING UP THE INPUTS

- 1) Solder each phono socket pair's solder tags together with stripped 1/0.6 wire lengths. Taking a 65cm black 1/0.6 wire length and strip 9cm of one end, solder together the 5 pairs of solder tags. This acts as the signal earth bar. **see fig. 10 p.15**. Connect the other end to earth pin of the volume control. **see fig. 9 p.15**

- 2) Using the twin screened wire strip 2cm off the end and wire up to the CD phono sockets, wire the screen to the signal earth bar, the red signal lead to the right channel phono socket (red) and the blue signal lead to the left channel phono socket (black) and running the wire along the chassis perimeter cut 3cm beyond the selector. Do the same for the tuner, aux inputs and the tape out. Strip 3cm off the ends, twist the screened strand of each wire and cut off the strands completely, leaving only the red & blue signal wire and strip 0.5cm off the end of the signal wires. Identify each screen wires origin by using a multimeter and wire up to the selector. see **fig. 10 & 12 p.15**
- 3) Using the twin screened wire follow the same procedure as for No. 2) and wire this length to the tape in phono sockets. Allow enough length to connect to the tape/source switch preparing the wire ends in a similar manner as for No. 2). see **fig. 11 p.15**
- 4) Cut 1 lengths of twin screened cable at 13cm and wire up the selector (screened strands removed) to the tape/source switch. see **fig. 10 & 11 & 12 p.15**
- 5) Cut 1 lengths of twin screened cable at 26cm and wire one end to the volume potentiometer (screened strands wired up) and the other end to the tape/source switch (screen strands removed).see **fig. 9 & 10 & 11 p.15**
- 6) Cut 1 lengths of twin screened cable at 26cm and wire one end to the volume potentiometer (screened strands wired up) and prepare the other end for connecting up to the PCB later (leave screen strands prepared). see **fig. 9 & 10 p.15**
 `Prepare` means tin the exposed wire ends with solder.

WIRING UP THE MAINS INPUTS & EARTH POST

- 1) Refer to see **fig. 1 & 2 p.13**. Using the brown and blue multistrand wire provided connect the IEC mains socket, soldering directly onto the blades, to the rotary mains switch (twist the wires together and run them along the perimeter as far away from the PCB as possible). Connect up the mains transformer's blue and brown wire to the mains switch, remembering to solder the grey and purple wire together and isolate with isolation tape for 230V/240Vac operation. (for 110V/120V operation refer to page 12) Twist the wires together and route all mains wire together.
- 2) Using the green/yellow wire provided connect up the tag of the earth post to the earth tag of the IEC mains input socket. see **fig. 1 p.13**

FIXING OF THE PCB

- 1) Before you fix the PCB in place, external connections to tab 21 - 23 need to be made.
- 2) Cut one length of black 1/1.13 wire at 40cm, strip 1cm from one end and solder to tab 21's terminal pin. The other end will be connected later.
- 3) Gauge the length of grey wire(thick) of the mains transformer that is required to reach tab 22. Cut, strip and solder to its terminal pin.
- 4) Solder one end of the remaining length of the green/yellow earth wire to tab 23, solder the other end to the earth tag of the IEC mains input socket. see **fig. 1, p.13**
- 5) Solder C5 & C6 in place remember to place the correct way round.
- 6) Using the 6 x M3 x 10 pan head screws provided fit the PCB in place.

WIRING UP THE SPEAKER OUTPUTS

- 1) This involves the wiring of the secondary of the output transformers (O/P T) and the feedback wires to the speaker binding posts. The wiring standard for the binding posts are black = negative and red = positive, thus connect the green lead to the black post and the purple lead to red. see **page 12 and fig. 6 & 8 p.14**

- 2) Cut 2 suitable lengths of single screened cable to follow the route of the signal input wiring and wire up one red signal wire to the red post of the right channel and the other wire's red signal wire to the red post of the left channel . Remove the screened strands. The other ends will be wired up later. see page 10
- 3) Take the other end of the black 1/1.13 connected to tab 21 and connect up the black post of the right channel and in turn with another length of the black 1/1.13 connect to the black post of the left channel.

WIRING THE PCB TO EXTERNAL CONNECTIONS

(refer to page 10)

- 1) Solder all 23 external joins to the PCB.
- 2) With all mains transformer connections, tab 2,3,4,5,9,10,11 and 22 it is a good idea to twist up the relevant winding leads to reduce the likelihood of hum. Thus, twist together the following: white and orange, twist red, red and black and lastly twist yellow, yellow and black(thick). see **page 12**
- 3) The mains transformer primary winding must be set correctly. Please recheck this has been done correctly. see **page 12**
- 4) Clean up and group together the wiring with the tie wraps and self-adhesive clips provided.
- 5) Put the valves in place ready for the next stage.

TABLE SHOW PCB TO EXTERNAL CONNECTIONS

tab no.	label on PCB	external connection to:
1	A(V3)	right channel output transformer (O/P T) primary red lead
2		main transformer secondary white lead
3		mains transformer secondary orange lead
4		mains transformer secondary yellow lead
5		mains transformer secondary other yellow lead
6	A(V1)	right channel O/P T primary black lead
7	CT	right channel O/P T primary yellow lead x 2
8	CT	left channel O/P T primary yellow lead x 2
9		mains transformer secondary black lead
10		mains transformer secondary red lead
11		mains transformer secondary other red lead
12	A(V2)	left channel O/P T primary black lead
13	A(V4)	left channel O/P T primary red lead
14	GND	right channel feedback link screen wire connection
15	R FB	right channel feedback link signal wire from right channel red binding post
16	R	right channel input from volume potentiometer
17	GND	input ground from volume potentiometer
18	L	left channel input from volume potentiometer
19	L FB	left channel feedback link signal wire from left channel red binding post
20	GND	left channel feedback link screen wire connection
21		earth connection to black speaker posts
22		mains transformer secondary grey wire(thick) earth connection
23		earth connection to IEC mains socket

FIRE UP TIME

- 1) Now you are ready to fire her up. A useful piece of equipment to use at this stage is a Variac (rated at 2 Amps or over), to limit the initial voltage input. If you cannot get one do not worry most budding kit builders are armed with only a multimeter, this is sufficient. It is a good idea to have a dummy load, a 8 ohm high wattage resistor, or an old pair of speakers connected up to the speaker binding posts.
- 2) The next step is to PUT ON THE SAFETY GLOVES PROVIDED TO PREVENT ANY RISK OF RECEIVING ANY ELECTRIC SHOCKS.
- 3) Switch her on and step back, do not be put off by a slight tinkering sounds this is the noise of the valves warming up. You should see two small red points of light in each valve, these are the valve heaters.
- 4) When the amplifier is working, measure all voltages to ensure they are correct, measure with 0 volts signal input, bearing in mind that a degree of variation (around 15%) is to be expected due to dependence upon the mains voltage. KEEP YOUR GLOVES ON.
- 5) Once fully tested fix the chassis base plate, using the screws provided, then fit the self adhesive feet in place.
- 6) Now you can enjoy the wonders of the KiT88.

TABLE SHOWS TEST VOLTAGES

voltage reading	label on PCB	position on PCB
1.5Vdc	k	right channel: V7 pin 7
107Vdc	a	right channel: V7 pin 5
225Vdc	a	right channel: V5 pin 1
215Vdc	a2	right channel: V5 pin 6
110Vdc	k1, k2	right channel: V5 pin 3, 8
9Vdc	g3, k	right channel: V1 pin 8
9Vdc	g3, k	right channel: V3 pin 8
-10Vdc	g1	right channel: V1 pin 5
-10Vdc	g1	right channel: V3 pin 5
508Vdc	a	right channel: V1 pin 3
508Vdc	a	right channel: V3 pin 3
254Vdc	g2	right channel: V1 pin 4
254Vdc	g2	right channel: V3 pin 4

TABLE SHOWS TEST VOLTAGES CONT...

voltage reading	label on PCB	position on PCB
1.5Vdc	k	left channel: V8 pin 7
107Vdc	a	left channel: V8 pin 5
225Vdc	a1	left channel: V6 pin 1
215Vdc	a2	left channel: V6 pin 6
110Vdc	k1, k2	left channel: V6 pin 3, 8
9Vdc	g3, k	left channel: V2 pin 8
9Vdc	g3, k	left channel: V4 pin 8
-10Vdc	g1	left channel: V2 pin 5
-10Vdc	g1	left channel: V4 pin 5
508Vdc	a	left channel: V2 pin 3
508Vdc	a	left channel: V4 pin 3
254Vdc	g2	left channel: V2 pin 4
254Vdc	g2	left channel: V4 pin 4
6.3Vdc	h to h	6AU6 heater voltage: V7 & V8 pin 3 to pin 4
6.3Vac	h to h	ECC82 heater voltage: V5 & V6 pin 3, 4 to pin 9
6.3Vac	h to h	KT88 heater voltage: V1, V2, V3, V4 pin 2 to pin 7

FAULTS AND HOW TO CLEAR THEM

- 1) Any serious faults will blow the mains fuse immediately. That is your guarantee. Do not squander it by fitting a larger fuse in frustration, because the situation will get worse not better.
- 2) The most common mistake will be one of the following:
 - a) a wrongly placed component
 - b) a solder link forgotten
 - c) a component not soldered in place
 - d) an external to PCB connection wrongly placed
- 3) To start with turn the power switch off and pull the mains plug out. A way to remedy these possible faults is to go through the instructions and visually check everything. Always wear your gloves even though the power is off as some residual charge may be held within the power supply capacitors. You may need to take out the PCB to access the valve base side.
- 4) If you are still having problems then call the helpline.

PARTS LIST

component description	quantity	bag No.	location in amp
R1 - 5.6K, 6W	1	1	PCB
R3 - 13K, 0.66W	1	2	PCB
R4 - 8K2, 3W	1	3	PCB
R5 - 36K, 0.66W	1	4	PCB
R6, R12, R32, R33 - 100R, 1W	4	5	PCB
R7, R20 - 36K, 1W			see fig. 7
68k, 0.66W	2	6	PCB
75K, 0.66W	2	6	PCB
R8, R10, R27, R31 - 1K, 0.5W	4	7	PCB
R9, R11, R26, R30 - 330K, 0.5W	4	8	PCB
R13, R14, R15, R16 - 150R, 7W	4	9	PCB
R17, R18 - 39K, 3W	2	10	PCB
R21, R22 - 15K, 3W	2	11	PCB
R23, R25, R28, R29 - 1M, 0.5W	4	12	PCB
R19, R24 - 47K, 1W			see fig. 7
100K, 0.66W	2	13	PCB
91K, 0.66W	2	13	PCB
R34, R35 - 6.8K, 0.5W	2	14	PCB
R36, R37, R38, R39 - 330R, 0.5W	4	15	PCB
R40, R41 - 6.8R, 0.5W	2	16	PCB
VR1 100K log potentiometer	1	17	front panel
220K, 2W safety resistor	2	31	on valve base side see page 11
C1, C2 - 470uF 450V	2	18	PCB
C3, C17, C18 - 4700uF 16V	3	19	PCB
C4 - 100uF 63V	1	20	PCB
C5, C6 - 100uF 450V	2	21	PCB
C7, C8, C15, C16 - 0.47uF 630V	4	22	PCB
C9, C10, C11, C12 - 220uF 25V	4	23	PCB
C13, C14 - 0.47uF 250V	2	24	PCB
C19, C20 - 3.9nF 160V	2	25	PCB
BR1 - SKB 500 C3200/2200	1	26	PCB
BR2 - 2KBP02M	1	26	PCB
BR3 - W02G	1	26	PCB
mains rotary switch	1	27	PCB
IEC mains input socket	1	27	PCB
IEC mains fuse tray	1	27	PCB
1.6A fuse	1	27	PCB
M4 x 8 hex bolt	4	27	PCB

PARTS LIST

component description	quantity	bag No.	location in amp
M4 nut	4	27	fitting of front plate
selector switch	1	27	front panel
black phonos	5	27	back panel
red phonos	5	27	back panel
M6 fibre washers	20	27	fitting of phono sockets
binding post & fixings	2 pairs	28	back panel
tape source switch	1	28	front panel
self adhesive feet	4	28	base plate
earth post	1	28	back panel
PCB terminal pins	30	28	PCB
grub screws	3	28	fitting of shaft to knobs
octal valve base	4	29	PCB
B9A valve base	2	29	PCB
B7G valve base	2	29	PCB
blue & brown wire	0.5m	30	Connection between IEC mains socket and switch
yellow/green wire	0.5m	30	Connection between IEC mains and tab 23
single screened wire	1.4m	30	Feedback output to red post of speaker connectors
1/0.6 black wire	3m	30	Earth link for bias network,earth links for phonos to vol. pot & heater wiring for 6AU6 & ECC82
1/1.13 black wire	1.7m	30	Heater wiring for 6CA7s & PCB to XLR earth tags
twin screened wire	4m	30	Phonos to selector, tape/source to vol pot to PCB
chrome knobs	3		
chrome caps	2		Fit onto output transformers
ECC82(valve kit)	2		
6AU6 (valve kit)	2		
KT88 (valve kit)	4		
output transformer	2		
mains transformer	1		Plus 1 large metal & rubber fittings
P.C.B.	1		
safety gloves	1 pair		
IEC mains lead	1		
chassis (3 parts)	1		
instruction manual	1		