

# 100 W Amplifier

## General Description

This is an exceptionally well designed amplifier, with a lot of power reserve, high fidelity, low distortion, good S/N ratio, high sensitivity, low consumption and full protection. Having all these almost ideal characteristics this amplifier is likely to become the basic building block of your future high fidelity system, or it can also become the element that will upgrade your existing system.

## How it Works

The circuit works from a symmetrical  $\pm 40$  VDC power supply and draws a maximum current of 2.6 A. The input circuit of the amplifier is a differential amplifier built around Q4 and Q5 that employ DC feedback thus preventing any DC voltage from appearing across the speaker with the usual destructive results. Q11 acts as a current source and ensures that the input stage draws a constant current of 1 mA. The signal which appears as a voltage drop across the resistor connected in series with the collector of Q4 is used to drive the DARLINGTON pair Q3, Q2 which together with the constant current source of 7 mA that is Q10, form the driver stage. This stage operates in class A and is driving the complementary output stage Q1, Q9. The transistor Q7 is used to balance the circuit at different temperatures and must be mounted on the heatsink between the out put transistors. The feedback loop which consists of R8, R9, C2, C3 provides AC stability to the circuit. The circuit also incorporates a protection stage that makes it virtually indestructible. This protection circuit is built around Q6, Q8. If for whatever reason the output remains connected on one supply rail and the common the output is also protected from high DC voltages that could burn the speakers. The supply rails should be protected by 2 A fuses for the 8 ohm version and 3 A for the 4 ohm.

## Technical Specifications - Characteristics

Output power (f=1 KHz, d=0.5 %): 100 W in 8 ohm  
Supply voltage: .....  $\pm 40$  V  
Quiescent current: ..... 50 mA  
Maximum current: ..... 2.6 A  
Sensitivity: . 600 mV  
Frequency response: ..... 10-35000 Hz (-1 dB)  
Distortion HD: ..... 0.01 %  
Intermodulation dist.: ..... 0.02 %  
Signal/noise: 83 dB Construction

## PLEASE READ THIS BEFORE YOU START CONSTRUCTION

To cater for those who wish to use 4 ohm speakers with this amplifier the Kit includes the necessary components for both versions. The components that differ are R3,4,17 and 23. If you build the 8 ohm version then you must also include in the circuit R28 and D7, D8 which are not used in the 4 ohm version. As you see all the components are already marked on the component side of the p.c. board. The construction is made this way much simpler. Start the construction from the pins and the jumper connections, continue with the resistors and the capacitors and last solder in place the semiconductors. Check each resistor before soldering it, to see if its colours

match those in the component list. Be careful with the electrolytic capacitors because their polarity should be respected. The polarity of those capacitors is marked on their bodies and on the component side of the p.c. board.

NOTE: On the p.c. board next to R2, R16 are marked two other resistors which do not appear in the circuit diagram but are included in the components. They are of 1 ohm 2 W (brown, black, gold) and must be included in the circuit. Take care when you are soldering the semiconductors because if you overheat them they can be damaged. The output transistors should be mounted on the heatsink that is included in the kit. Take care not to short circuit them with the heatsink and we recommend that you use some HTC between the transistor body and the sink in order to improve heat dissipation. Follow the diagram for the mounting of the power transistors as it shows clearly how to insert the insulators and the screws. Q7 should be made to touch the heatsink and is a good idea to use a bit of HTC between its casing and the surface of the heatsink. When you finish the construction of your project clean the board thoroughly with a solvent to remove all flux residues and make a careful visual inspection to make sure there are no mistakes, components missing and short circuits across adjacent tracks on the board. If everything is OK you can make the following connections:

Input: 3 (signal), 5 (common)

Output: 7 (signal), 6 (common)

Supply: 1 (-40 VDC), 2 (+40 VDC) 5 (0 VDC)

Connect a milliammeter in series with the power supply, short the input of the amplifier, turn the power ON and adjust the trimmer P1 so that the quiescent current is about 50 mA. When you finish this adjustment remove the shunt from the input and connect the output of a preamplifier to it. Connect the pre amplifier to a suitable source and turn everything ON. The signal should be heard from the speakers clear and undistorted.

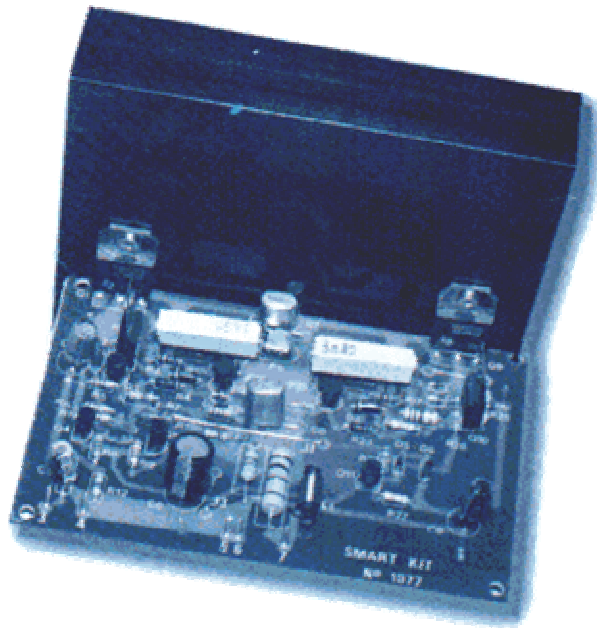
First of all let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad with a thin layer of conductive copper that is shaped in such a way as to form the necessary conductors between the various components of the circuit. The use of a properly designed printed circuit board is very desirable as it speeds construction up considerably and reduces the possibility of making errors. Smart Kit boards also come pre-drilled and with the outline of the components and their identification printed on the component side to make construction easier. To protect the board during storage from oxidation and assure it gets to you in perfect condition the copper is tinned during manufacturing and covered with a special varnish that protects it from getting oxidised and makes soldering easier. Soldering the components to the board is the only way to build your circuit and from the way you do it depends greatly your success or failure. This work is not very difficult and if you stick to a few rules you should have no problems. The soldering iron that you use must be light and its power should not exceed the 25 Watts. The tip should be fine and must be kept clean at all times. For this purpose come very handy specially made sponges that are kept wet and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate on it.

DO NOT file or sandpaper a dirty or worn out tip. If the tip cannot be cleaned, replace it. There are many different types of solder in the market and you should choose a

good quality one that contains the necessary flux in its core, to assure a perfect joint every time.

DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems and is one of the main causes of circuit malfunction. If nevertheless you have to use extra flux, as it is the case when you have to tin copper wires, clean it very thoroughly after you finish your work. In order to solder a component correctly you should do the following:

- Clean the component leads with a small piece of emery paper.
- Bend them at the correct distance from the component body and insert the component in its place on the board.
- You may find sometimes a component with heavier gauge leads than usual, that are too thick to enter in the holes of the p.c.board. In this case use a mini drill to enlarge the holes slightly. Do not make the holes too large as this is going to make soldering difficult afterwards.
- Take the hot iron and place its tip on the component lead while holding the end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the p.c. board.
- When the solder starts to melt and flow, wait till it covers evenly the area around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and leave the solder to cool naturally without blowing on it or moving the component. If everything was done properly the surface of the joint must have a bright metallic finish and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull, cracked, or has the shape of a blob then you have made a dry joint and you should remove the solder (with a pump, or a solder wick) and redo it.
- Take care not to overheat the tracks as it is very easy to lift them from the board and break them.
- When you are soldering a sensitive component it is good practice to hold the lead from the component side of the board with a pair of long-nose pliers to divert any heat that could possibly damage the component.
- Make sure that you do not use more solder than it is necessary as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.
- When you finish your work cut off the excess of the component leads and clean the board thoroughly with a suitable solvent to remove all flux residues that still remain on it.



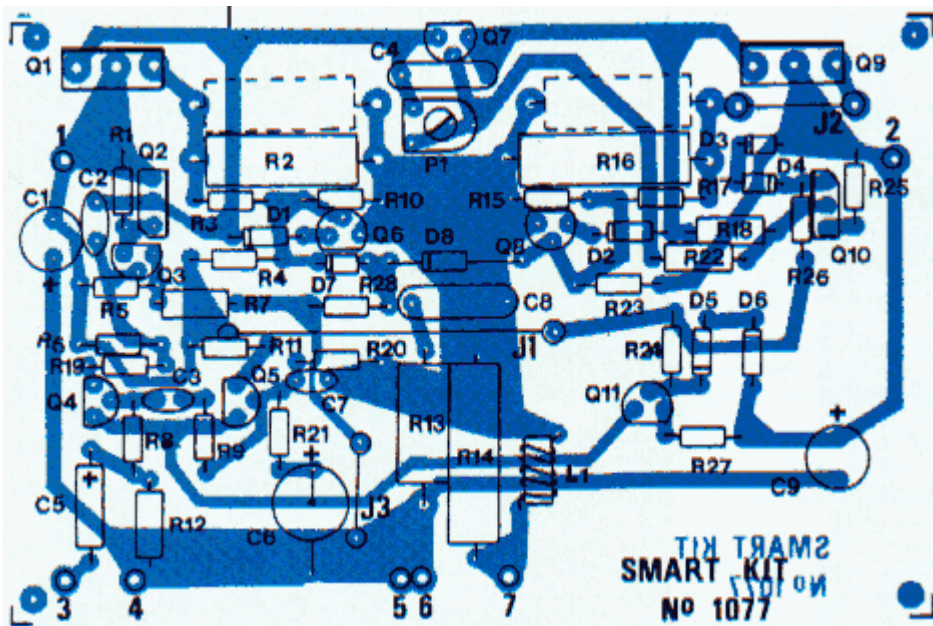
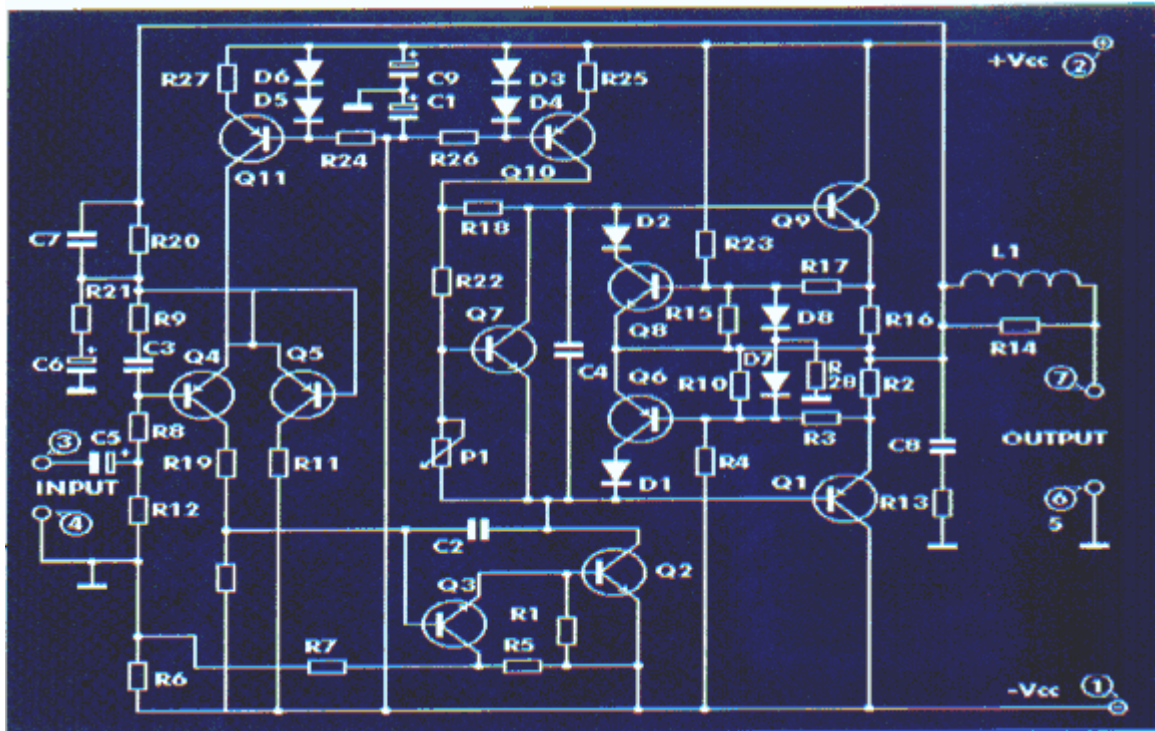
### **If it does not work**

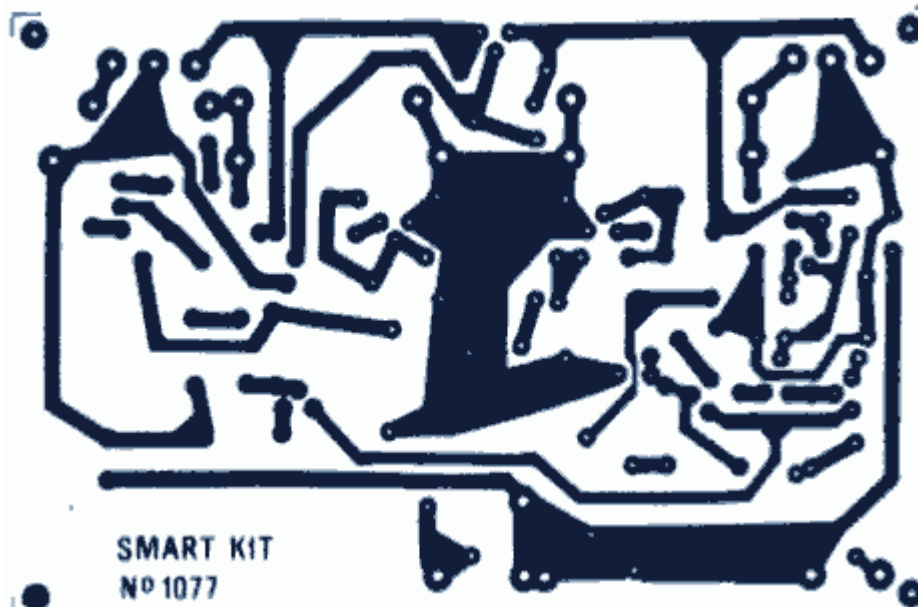
Check your work for possible dry joints, bridges across adjacent tracks or soldering flux residues that usually cause problems.

Check again all the external connections to and from the circuit to see if there is a mistake there.

- See that there are no components missing or inserted in the wrong places.
- Make sure that all the polarised components have been soldered the right way round.
- Make sure the supply has the correct voltage and is connected the right way round to your circuit.
- Check your project for faulty or damaged components.

If everything checks and your project still fails to work, please contact your retailer and the Smart Kit Service will repair it for you.





### Τα υλικά

R1	=	1,2 KΩ (καφέ, κόκκινο, κόκκινο)
R2	=	0,47 Ω / 5 W (καφέ, μαύρο, χρυσό)
R3	=	220 Ω (κόκκινο, κόκκινο, καφέ) (για 4Ω)
R4	=	3,9 KΩ (πορτ/λί, άσπρο, κόκκινο) (για 4Ω)
R5	=	2,2 KΩ (κόκκινο, κόκκινο, κόκκινο)
R6	=	2,2 KΩ (κόκκινο, κόκκινο, κόκκινο)
R7	=	10 KΩ (καφέ, μαύρο, πορτοκαλί)
R8	=	4,7 KΩ (κίτρινο, μωβ, κόκκινο)
R9	=	150 Ω (καφέ, πράσινο, καφέ)
R10	=	39 Ω (πορτοκαλί, άσπρο, μαύρο)
R11	=	3,3 KΩ (πορτ/λί, πορτ/λί, κόκκινο)
R12	=	10KΩ (καφέ, μαύρο, πορτοκαλί)
R13	=	4,7 Ω (κίτρινο, μωβ, χρυσό)
R14	=	1Ω / 2 W (καφέ, μαύρο, χρυσό)
R15	=	39 Ω (πορτοκαλί, άσπρο, μαύρο)
R16	=	1Ω / 2 W (καφέ, μαύρο, χρυσό)
R17	=	220 Ω / (κόκκινο, κόκκινο, καφέ) (για 4Ω)
R18	=	22 Ω -1/2W (κόκκινο, κόκκινο, μαύρο)
R19	=	1,2 KΩ (καφέ, κόκκινο, κόκκινο)
R20	=	10KΩ (καφέ, μαύρο, πορτοκαλί)
R21	=	220 Ω (κόκκινο, κόκκινο, καφέ)
R22	=	680 Ω (μπλε, γκρι, καφέ)
R23	=	3,9 KΩ / (πορτ/λί, άσπρο, κόκκινο) (για 4Ω)
R24	=	18 KΩ (καφέ, γκρι, πορτοκαλί)
R25	=	100 Ω -1/2W (καφέ, μαύρο, καφέ)
R26	=	18KΩ (καφέ, γκρι, πορτοκαλί)
R27	=	680Ω (μπλε, γκρι, καφέ)
R28	=	1,2 KΩ (καφέ, κόκκινο, κόκκινο) (για 8Ω)
P1	=	1KΩ τρίμερο

D1	=	1N4002-7
D2	=	1N4002-7
D3	=	1N4148
D4	=	1N4148
D5	=	1N4148
D6	=	1N4148
D7	=	1N4148 (για 8Ω)
D8	=	1N4148 (για 8Ω)
Q1	=	BDW84D
Q2	=	BD829
Q3	=	BC546
Q4	=	BC556
Q5	=	BC556
Q6	=	BC556
Q7	=	BC548
Q8	=	BC546
Q9	=	BDW83D
Q10	=	BD830
Q11	=	BC556
C1	=	10mF/63V
C2	=	33pf
C3	=	270pF
C4	=	100nF
C5	=	2,2mF/63
C6	=	100mF/35V
C7	=	120pF
C8	=	100nF
C9	=	10mF/63V

L1 : 10 coil with wire 0,5mm turned on a resistor of 1W