

instruction manual

dynamic range enhancer dbx117



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inc.

Dear Audio Enthusiast,

The engineers who developed the DBX 117 are enthusiasts too. Now you have purchased a DBX 117, and we wish you many hours of listening enjoyment.

Our owner's manual contains full details on how to operate your unit, plus an explanation of how it works. After reading the manual, we hope you will experiment with the DBX 117 until it is a familiar tool for dynamic range modification.

Sincerely, DBX Inc.

The development of two scientifically optimum electronic devices make the DBX 117 the world's first successful dynamic range modifier. The first device is a gain control element with very low noise and decilinear¹ response. The second is a true R.M.S.² detector which responds to audio signals in much the same way that the human ear responds to sounds. These two devices together overcome the previous limitations and disadvantages of expanders or compressors. With the DBX 117 you can expand or compress the dynamic range and reduce the apparent background noise of any audio signal.

Dynamic range is the relationship or ratio between the softest and the loudest sound in a musical passage. The ratio is conveniently expressed in decibels or dB³.

Music in live performance often has a dynamic range of 70 to 90 dB. This range is somewhat greater than can be accommodated by records, tapes, and FM broadcasting. A 40 to 50 dynamic range is all that these media normally achieve. Recording engineers therefore compress the dynamic range of music until it fits the recording medium. The result is that all the sounds are there, the softest and the loudest, but no longer in their original relationship. The impact of the original performance has been diminished and in many instances you are left with a flat, dull recording.

The DBX 117 can reexpand the limited dynamics of tapes, records, and FM broadcasts and bring your music back towards its original dynamics. The 117 is easily connected to your receiver or integrated amplifier-preamplifier (see figure 1 or 2).

¹ decilinear — (t.m. DBX Inc.) linear in decibels.

² R.M.S. — root mean square; the sum of the powers of each separate frequency component of the signal.

³ decibel (dB) — 1/10 of a Bel. The logarithm of the ratio between two signal levels. Hence 10dB = 10:1 ratio of power; 20dB = 100:1 ratio; 80dB = 100,000,000:1 ratio; etc.

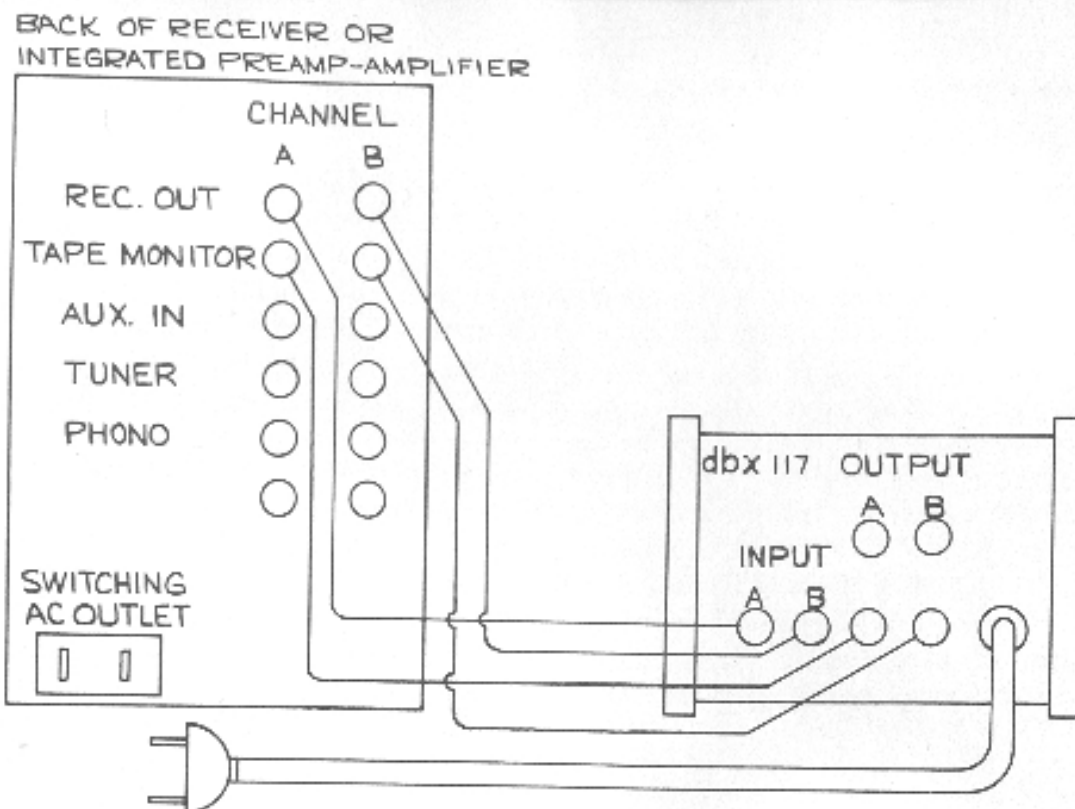


FIGURE 1. RECOMMENDED CONNECTION DIAGRAM FOR MODEL 117. UNSWITCHED OUTLET MAY BE USED AS UNIT DRAWS ONLY 1.2 WATTS.

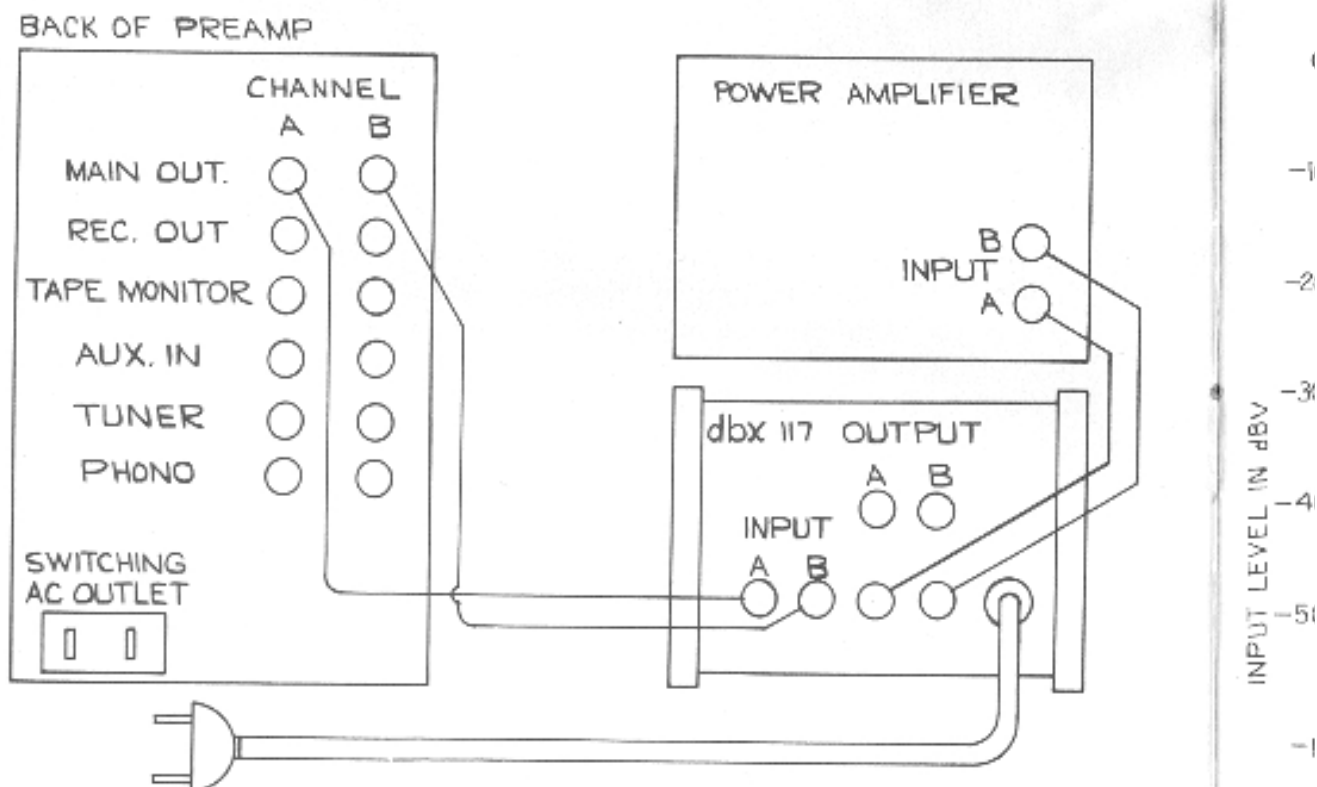


FIGURE 2. ALTERNATIVE CONNECTION FOR SEPARATE PREAMP AND POWER AMP.

USING THE DBX 117 AS A NOISE REDUCTION SYSTEM:

If you copy discs or record FM programs on tape, the DBX 117 can give your recordings an additional 20 dB of signal to background noise ratio. This means that your tapes can be as noise free as the source material. To use the 117 as a noise reduction system, follow the connection diagram of Figure 3. The EXPRESSION control on the 117 is set to 1.4 COMPRESSION for recording (RECORD position). The LEVEL MATCH control should be set to the middle of its rotation. The SLOW/NORM switch is set to NORM. The selector switch on your preamplifier is set to the desired source (tuner, phono, etc.) and the recorder controls are adjusted in the usual manner. To play back a compressed tape, first be sure that the tape recorder TAPE-SOURCE switch is in the TAPE position and that the recorder is otherwise adjusted for playback. Switch the selector switch on the preamplifier to AUX and the tape monitor switch to the MONITOR position. Set the LEVEL MATCH control on the 117 to the middle of its rotation and the EXPRESSION control to 1.4 EXPANSION (PLAY position) and the compressed tape will be precisely expanded. It is possible to gain added dynamic range from this tape simply by advancing the EXPRESSION control. A 2.0 EXPANSION will give the same dynamic range from 1.4 compressed tape as a 1.4 expansion of the original source material. In this way you can have quieter tapes and enhanced dynamic range, too.

DBX AND DOLBY "B":

The DBX and Dolby noise reduction systems process signals differently and thus are not compatible. That is, a Dolby encoded recording may not be decoded using a DBX expander. However, the two systems are complementary and may be used together to obtain even greater dynamic range improvement for tape recording than is possible with either system by itself. For tape recording, simply compress the signal first with the DBX 117, then Dolby encode. For playback, Dolby decode and then expand with the DBX 117. Dolby levels are set in the usual manner. Prerecorded Dolby material may be further expanded (after decoding) using the DBX 117, although this wider dynamic range material will need only slight (1.1 – 1.2) expansion.

PROGRAM USE	SETTING OF EXPRESSION CONTROL		SUGGESTED GAIN CONTROL SETTING
Expand Classical Rec.	1.1–1.4	EXPANSION	MIDDLE POSITION
Expand Pop, Rock, FM	1.2–1.5	EXPANSION	MIDDLE POSITION
Background Music	1.2–1.4	COMPRESSION	MIDDLE POSITION
Record Classical Music	1.4	COMPRESSION	MIDDLE POSITION
Playback Classical Music	1.4–1.8	EXPANSION	MIDDLE POSITION
Record Pops Disc.	1.4	COMPRESSION	MIDDLE POSITION
Playback Pops Disc.	1.4–2.0	EXPANSION	MIDDLE POSITION
Record Live Material	1.2–1.4	COMPRESSION	MIDDLE POSITION
Playback Live Material	1.2–1.4	EXPANSION	MIDDLE POSITION
Conference Recording	1.4	COMPRESSION	MIDDLE POSITION
Conference Playback	1.0–1.4	COMPRESSION	NO EFFECT AT 1.0
Bypass Model 117	1.0		NO EFFECT AT 1.0

TABLE 1

This control voltage is fed to the VCA in the right polarity to increase or decrease gain depending on whether we wish to compress or expand the signal. Basically a simple process, the effects of expansion range from subtle to dramatic. On recordings or broadcasts which use the most irregular compression curves, only small amounts of expansion — perhaps 1.1–1.2 — may be used. This will provide 5–10 dB of signal to noise improvement. Recordings on which more linear forms of compression have been employed may tolerate as much as 1.4 expansion. In general, too much expansion will produce a pumping or surging of the program material. Reduce the setting of the EXPRESSION control until a pleasing result is obtained. The connection diagram of figure 2 may not be as desirable as figure 1 if you are accustomed to using bass boost, since this may accentuate pumping. For some circumstances, such as background music for parties, further compression is desirable. Remember that the calibration of the EXPRESSION control is such that the input signal's dynamic range is *multiplied* by the expansion factor and *divided* by the compression factor. Another aspect to consider is that expansion or compression alters the reverberation or decay time of program material — expansion, reducing, and compression lengthening the time. These effects may be useful in the playing or recording of electronic musical instruments. (See modifications section of manual). Public address work is often benefitted by the use of dynamic range alteration although its needs are often more specific. The modification section at the rear of the manual contains instructions for many specific changes.

USE OF THE DBX AS A NOISE REDUCTION SYSTEM:

The 117 works by compressing the dynamic range of the program material to be recorded. Let us assume that we have a program with 70 dB of dynamic range and we wish to record this on a tape recorder whose signal-to-noise ratio (or dynamic range) is 55 dB. In order to avoid overloading the tape at high levels, we must sacrifice 15 dB of the quietest part of our program. This is the region where much of the music's nuances lie. If we were to compress our original program dynamic range to 50 dB, then this range could easily be accommodated by our tape recorder. Playing our program back and expanding its dynamic range by a complementary factor will give us our original dynamic range plus a 7 dB margin over tape background noise.

The DBX 117 can be used whenever you tape. You can expect 10 dB of noise reduction for machines with poor signal-to-noise ratio and as much as 20 dB for machines with very good signal-to-noise ratio.

The following precautions should be observed:

1. Be sure that the record and playback level controls on your tape recorder are not significantly different between channels. If you can calibrate your recorder, you should have equal input/output gain on both channels.
2. Use as small a compression factor as necessary to capture the dynamic range of the material you are recording. A 1.2 compression factor will be adequate for taping records or FM broadcasts on a good open reel machine. Use of the smallest compression factor will insure that modulation of tape noise on playback will be least objectionable.

SERVICE

CIRCUIT DESCRIPTION:

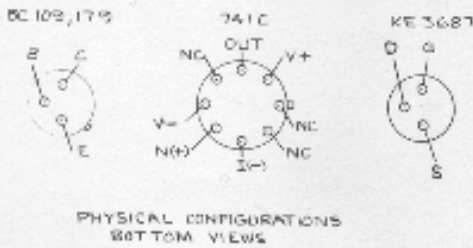
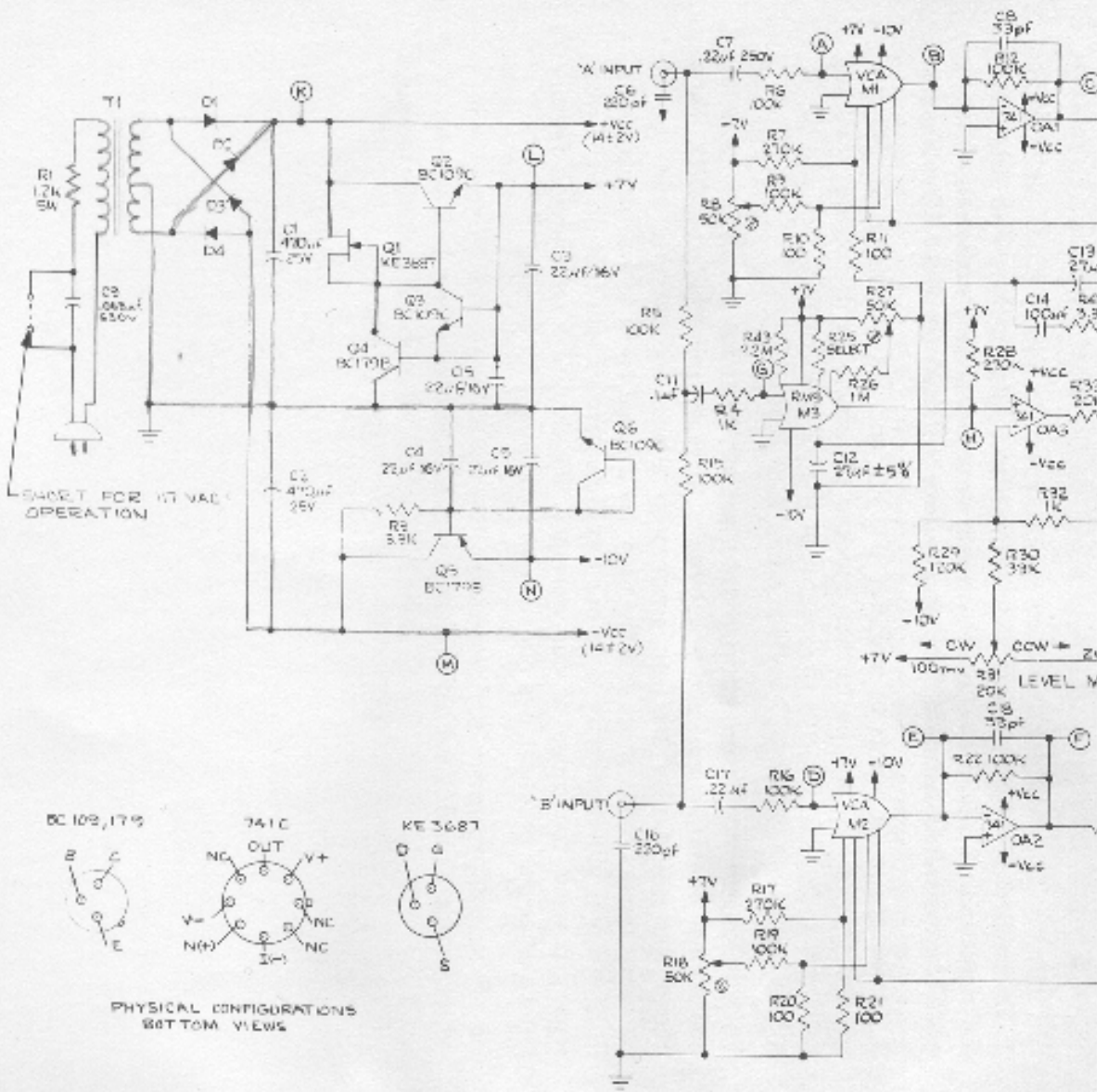
The DBX 117 is a compressor-expander capable of linear decibel compression and expansion over an extremely wide dynamic range. Gain is controlled by a pair of high performance voltage controlled amplifiers in response to level as measured by a RMS level sensor.

The voltage controlled amplifiers control input-output current ratio in response to a signal. The input is a virtual ground with a ± 20 mv offset range. The output is connected to a 741 integrated circuit operational amplifier connected as a current to voltage convertor. Gain is near unity with zero control voltage and varies by 3 mv/dB in response to the voltage at the junction of R40 and R41. Bipolar symmetry is controlled by R8 and R18.

The RMS module also has a virtual ground input with a similar offset tolerance. C12 is the RMS averaging capacitor with C13 acting to keep the response time appropriate to the setting of the expansion-compression control. C14 is used for additional time averaging for slow recovery with decreasing signal level. R27 controls the relationship between negative and positive signal level sensing. The output of the RMS module is at the junction of R28 and OA3. Output is -6 mv per decibel increase. OA3 is a unity gain follower to transform the high impedance output of M3 to a suitable level for control functions. R33, D5, and R34 control the maximum increase in gain at low levels to a value which has been found to avoid loop oscillations due to input-output wiring capacitance in the associated pre and power amplifiers. OA4 is a control amplifier with -1 gain for the EXPAND setting of R37 and $+1/3$ gain for the COMPRESS setting of R37.

The power supply has a conventional center tapped bridge rectifier to supply ± 15 volts unregulated to the I.C. operational amplifiers. Q1, Q2, Q3, and Q4 form a low noise regulator to supply $+7$ volts to the modules and control circuits. Q5 and Q6 regulate -10 volts for modules and control circuits. Primary series resistor R1 limits the maximum fault current for any defect in the secondary of T1 to a value which will not exceed the thermal ratings of R1 or T1, thereby making fusing unnecessary. C9 is shorted for 115 Volt operation by a jumper which is removed for 230 Volt service.

FIGURE 5. SCHEMATIC DIAGRAM.



Obviously, any significant modification will 117. We will repair at your cost modified ur us know the nature of the modifications you any, you want removed. Please do not ask u Much less sophisticated professional produ modified DBX 117's cost five to ten times local source. You will have more fun and our its time designing exciting new products.

When wider dynamic level tracking is require be removed from OA3 by removing D5 a metering and alternative control systems m R34, 32, 35, and 38. This signal may be fe control circuit and the output of said circuit and feeding into the junction of R40 and resistor.

The DBX 117's level sensing circuit is res spectrum from 20Hz to 20KHz. Should you frequency sounds, decrease the value of C11

The NORMAL release ratio is presently op may be increased by removing C13. Release the value of C14 and decreasing the value of I

Precisely doubling the expansion and comp for a monaural source by routing the signal th

Obviously, any significant modification will 117. We will repair at your cost modified ur us know the nature of the modifications you any, you want removed. Please do not ask u Much less sophisticated professional produ modified DBX 117's cost five to ten times local source. You will have more fun and our its time designing exciting new products.

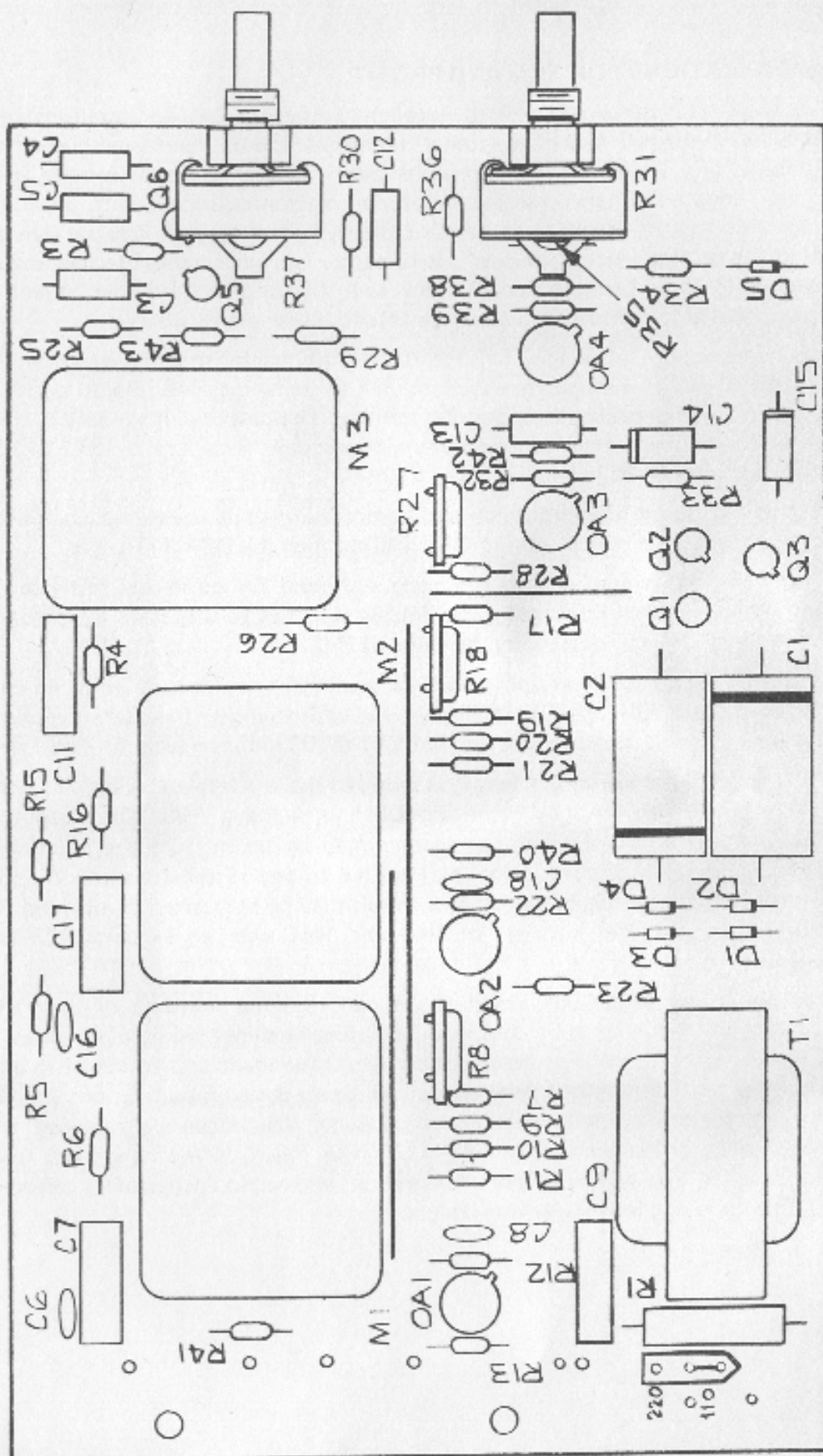


FIGURE 6. CIRCUIT BOARD LAYOUT, TOP VIEW.

IMPORTANT

The wires in this main's lead are coloured in accordance with the following code:

Blue
Brown

Neutral
Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

**THIS EQUIPMENT MUST BE
PROTECTED BY A 3 Amp FUSE**

