For 90dB SPL, less than 0.3% 50Hz - 20kHz
For 110dB SPL, less than 1.0% 70Hz - 5kHz
For 120dB SPL, less than 3.0% 70Hz - 5kHz

8. Crossover Frequencies

Bass to Midrange 350Hz
Midrange to Treble 3kHz.

9. Finish

Black Ash, or Oiled American Walnut.

10. Grille

Acoustically transparent knitted cloth over wooden frame.

11. Enclosure Volume

Bass Chamber - 200 litres (7 cu. ft)
Midrange Chamber - 30 litres (1.1 cu. fit)
Treble Chamber - sealed cavity.

12. Enclosure Dimensions

1030mm long, 722mm high, 43mm deep

13. Net weight

80 Kg

14. Shipping weight

103 Kg

15. Accessories

Angled plinth for floor mounting

Electronic twin channel (stereo) dividing network with plug-in card defining correct crossover frequencies and slopes for bi-amplification, and parametric low frequency equalisation.

16. Control network

A comprehensive calibrated control network provides adjustment of the amplitude/ Frequency response as follows:-

150Hz	-	350Hz	0dB to -4dB in 4 positions
350Hz	-	3kHz	+2dB to - 2dB in 5 positions
3kHz	-	20kHz	+4dB to -4dB in 5 positions
8kHz	-	20kHz	variable roll off rate in 4 positions

In all cases, flat anechoic positions clearly indicated.

All specifications are subject to revision without notice.

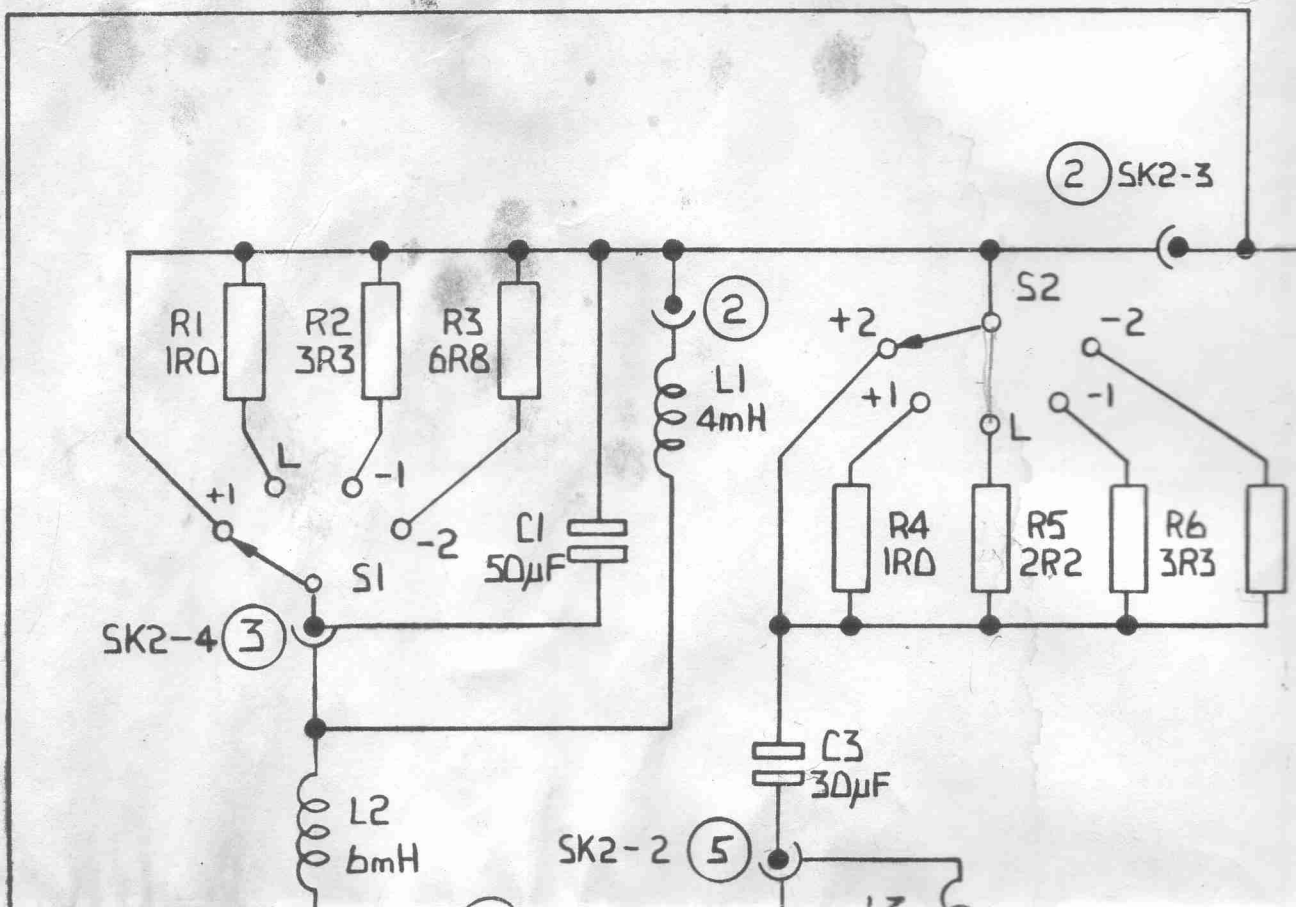
continued.....11.

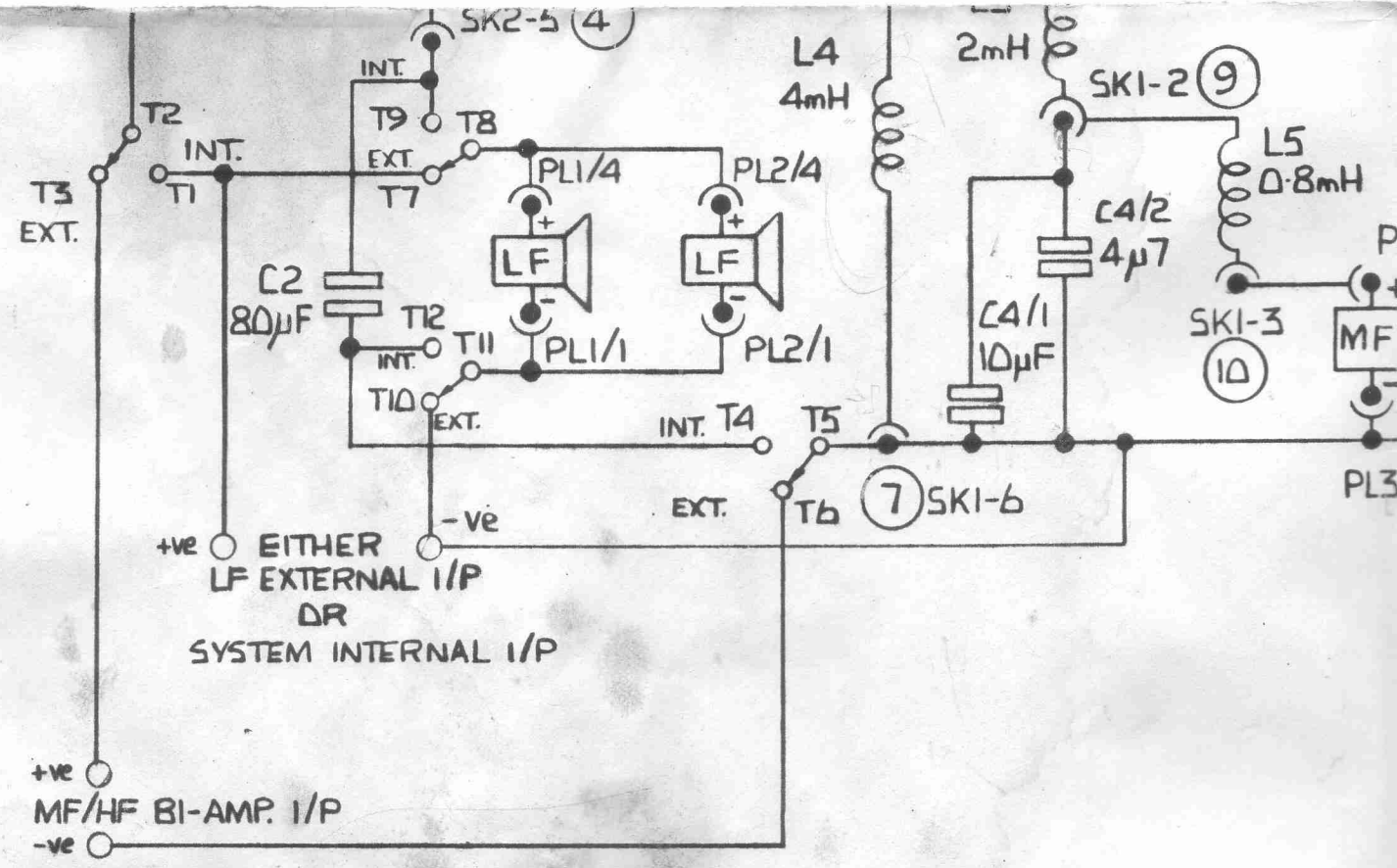
1 2 3

A B C D E

Third Angle Projection

RESISTORS	R1	R2	R3		R4	R5	R6	R7
CAPACITORS	C2			C1	C3	C4/1	C4/2	
MISCELLANEOUS		S1	L2	L1	L4	L3	L3 S2	L5





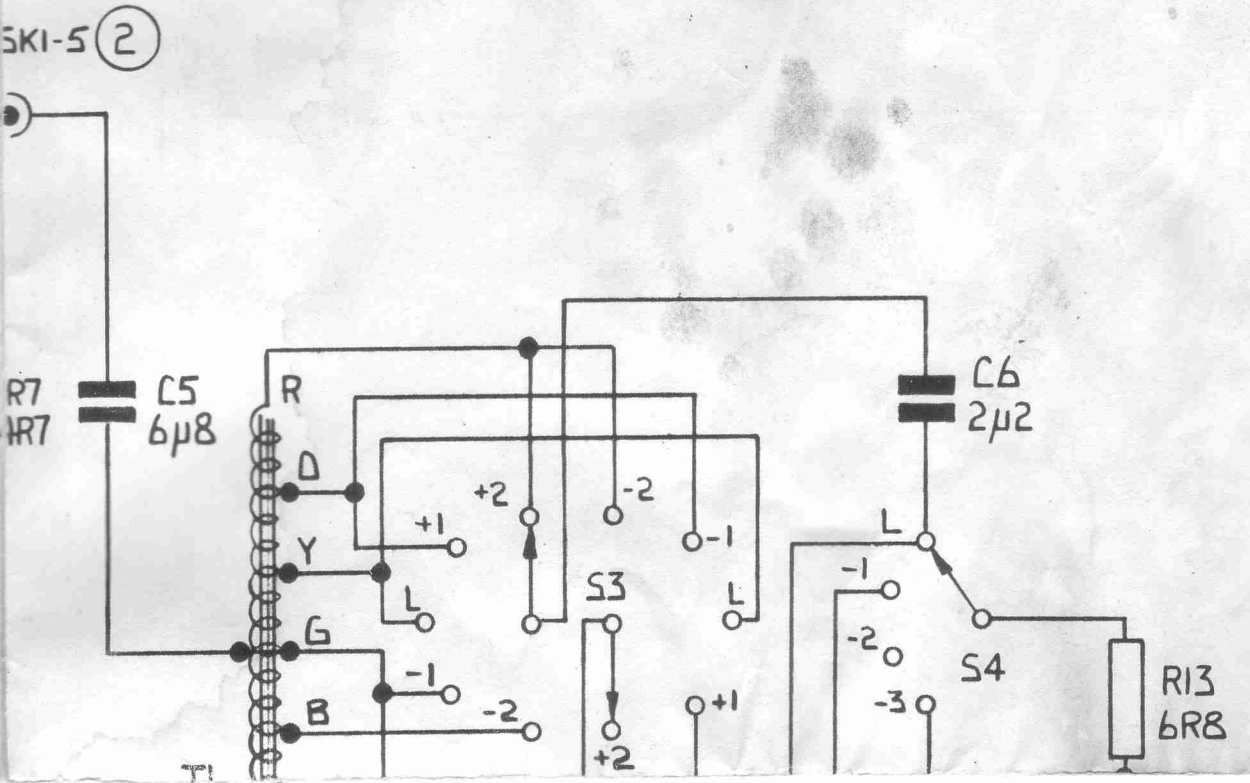
CCT. No.	RES.	TYPE	TOL. ±%	RATING W	LOCATION	CCT. No.	CAP.	TYPE
R1	1R0	W/W	10%	17W	7200 0077	C1	50μF	EL/NP
R2	3R3	W/W	10%	17W	7200 0077	C2	80μF	EL/NP
R3	6R8	W/W	10%	17W	7200 0077	C3	30μF	EL/NP
R4	1R0	W/W	10%	17W	7200 0077	C4/1	10μF	M.F
R5	2R2	W/W	10%	17W	7200 0077	C5	6μ8	M.F.
R6	3R3	W/W	10%	17W	7200 0077	C6	2μ2	M.F.
R7	4R7	W/W	10%	17W	7200 0077	C7	6μ8	M.F.
R9	10R	W/W	10%	9W	7200 0076	C4/2	4μ7	M.F.
R10	20R	W/W	10%	9W	7200 0076			
R11	50R	W/W	10%	17W	7200 0076			
R13	6R8	W/W	10%	9W	7200 0076			
R14	18R	W/W	10%	9W	7200 0076			

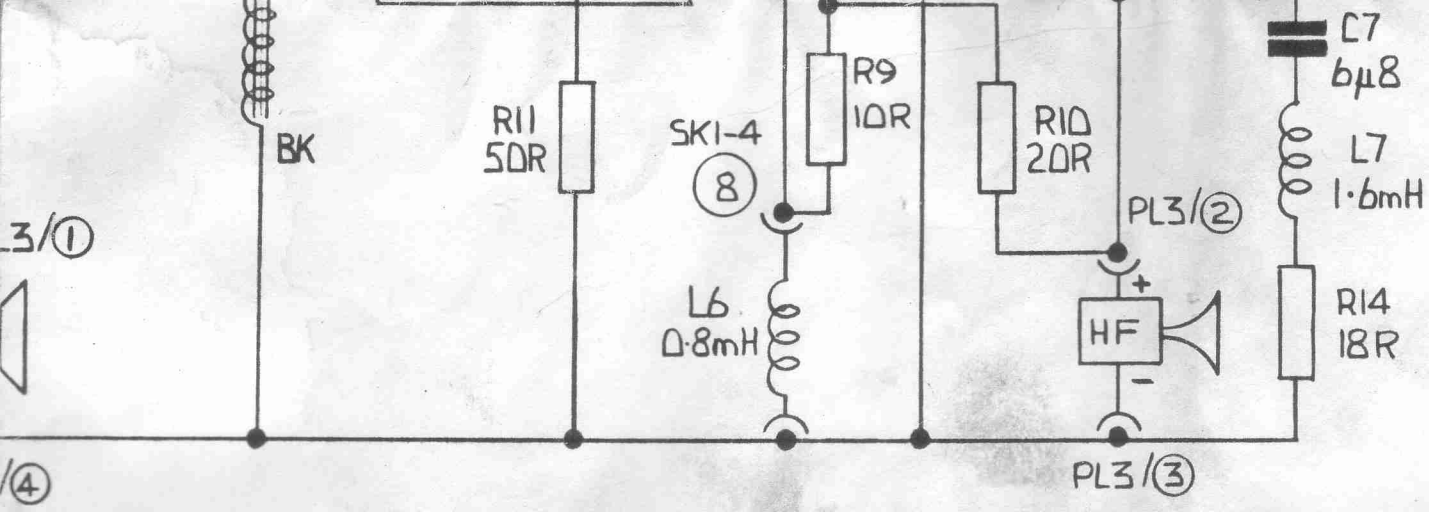
TANNOY®

Material

Title CIRCUIT DIAGRAM - BLOCK

		R11	R9	R10	R13	R14
C5			C6			C7
	T1	S3	L6	S4		L7

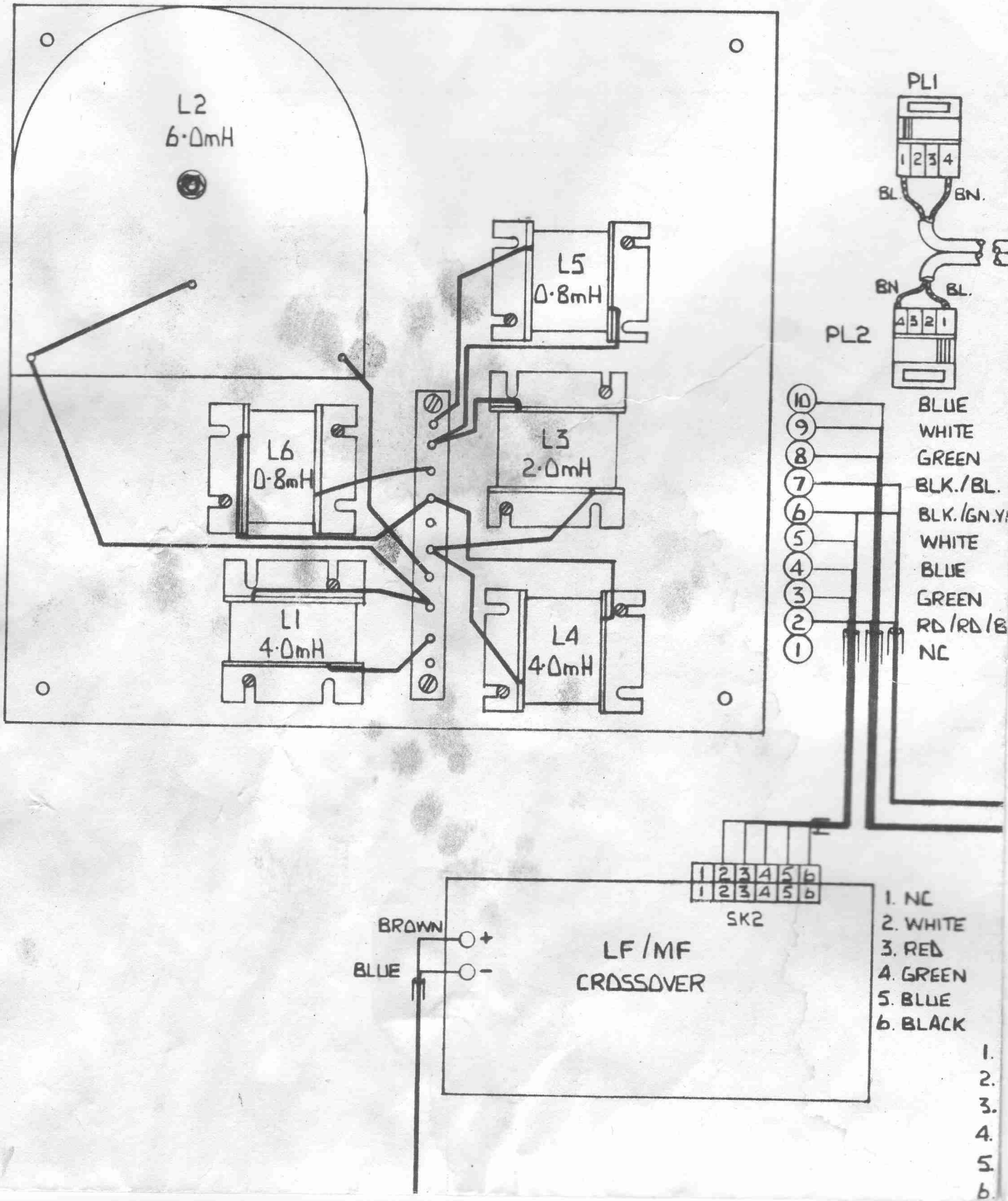


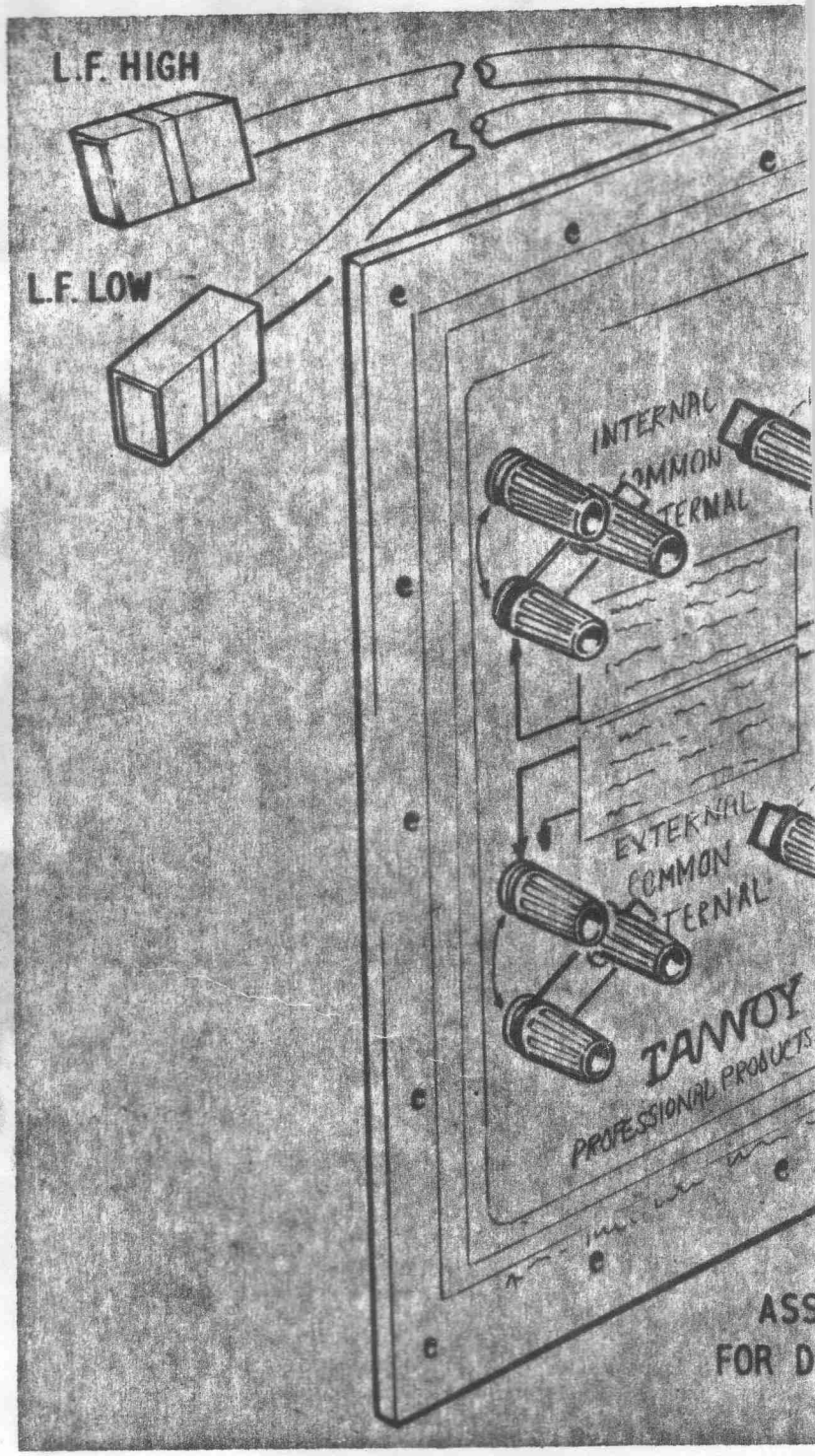


TOL.	RATING V	LOCATION	CCT. No.	MISCELLANEOUS	LOCATI
10%	150V D.C.	7200 0077	T1	TRANSFORMER M.F. / H.F.	7200 0C
10%	150V D.C.	7200 0077			
10%	150V D.C.	7200 0077	S1	SWITCH ROTARY (4-WAY)	7200 0C
10%	100V D.C.	7200 0076	S2	SWITCH ROTARY (5-WAY)	7200 0C
10%	100V D.C.	7200 0076	S3	SWITCH ROTARY (5-WAY)	7200 0C
10%	100V D.C.	7200 0076	S4	SWITCH ROTARY (4-WAY)	7200 0C
10%	100V D.C.	7200 0076	L1	CHOKE, COIL 4·0mH	7100 0C
10%	100V D.C.	7200 0076	L2	CHOKE, COIL (AIR CORED) 6·0mH	7100 0C
			L3	CHOKE, COIL 2·0mH	7100 0C
			L4	CHOKE, COIL 4·0mH	7100 0C
			L5	CHOKE, COIL 0·8mH	7100 0C
			L6	CHOKE, COIL 0·8mH	7100 0C
			L7	CHOKE COIL 1·6mH	7200 0C

Finish

NGHAM MONITOR


L2
6·0mH
L5
0·8mH
L6
0·8mH
L3
2·0mH
L1
4·0mH
L4
4·0mH
PL1
1 2 3 4
BL.
BN.
BN
BL.
PL2
4 3 2 1
10
9
8
7
6
5
4
3
2
1
BLUE
WHITE
GREEN
BLK./BL.
BLK./GN.Y
WHITE
BLUE
GREEN
RD/RD/B
NC
1 2 3 4 5 6
1 2 3 4 5 6
SK2
1. NC
2. WHITE
3. RED
4. GREEN
5. BLUE
6. BLACK
BROWN
+
BLUE
−
LF/MF
CROSSOVER
1.
2.
3.
4.
5.
6.



ON
76
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FOR FURTHER DETAILS OF PARTS

CIRCUIT D

12 13

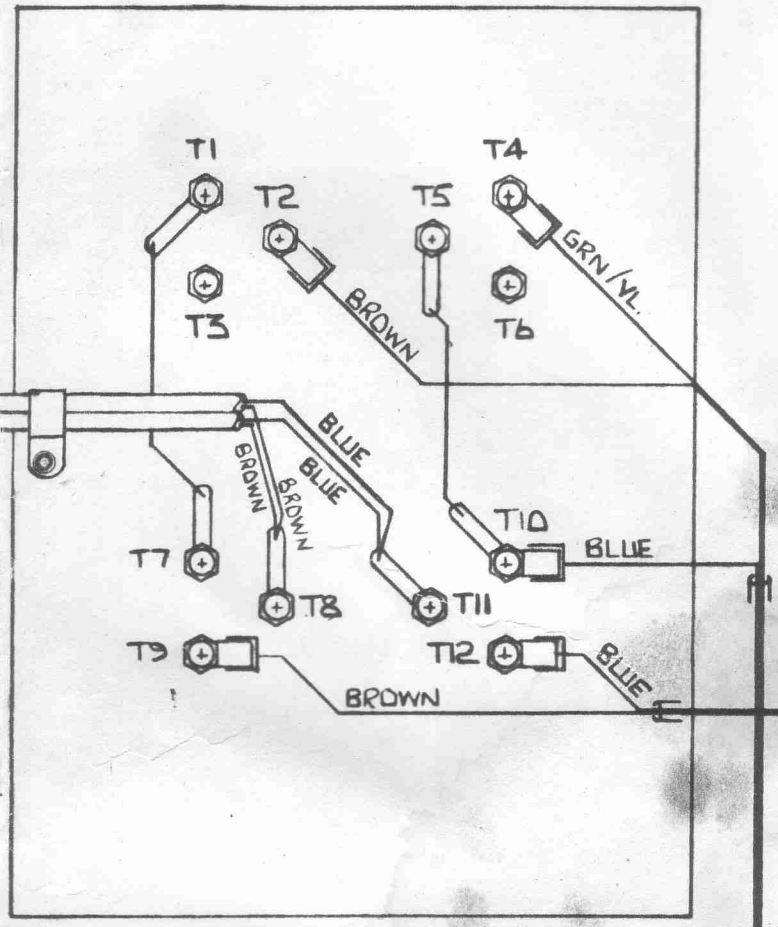
0001 0008

First used on	Quantity
BUCKINGHAM MONITOR	

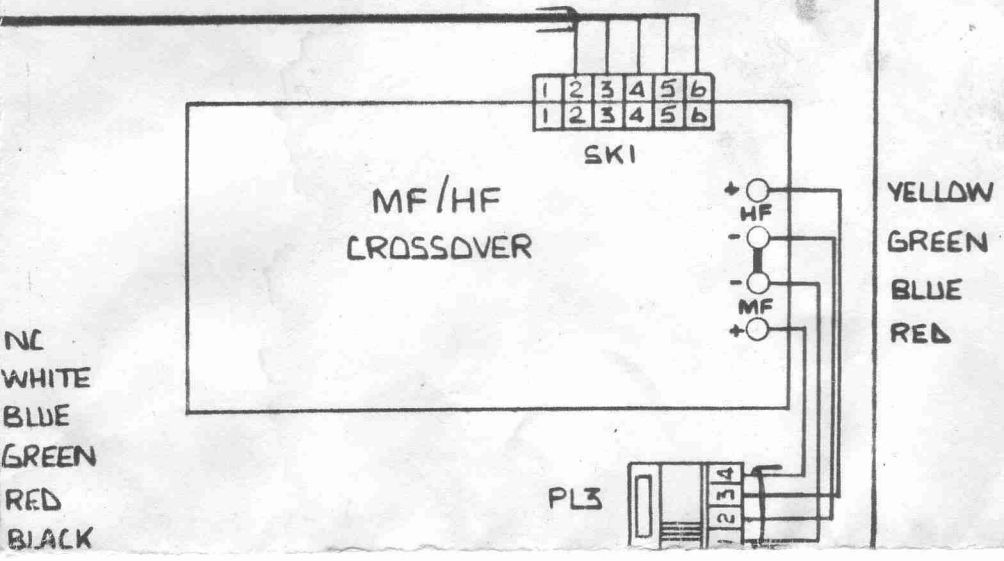
Issues

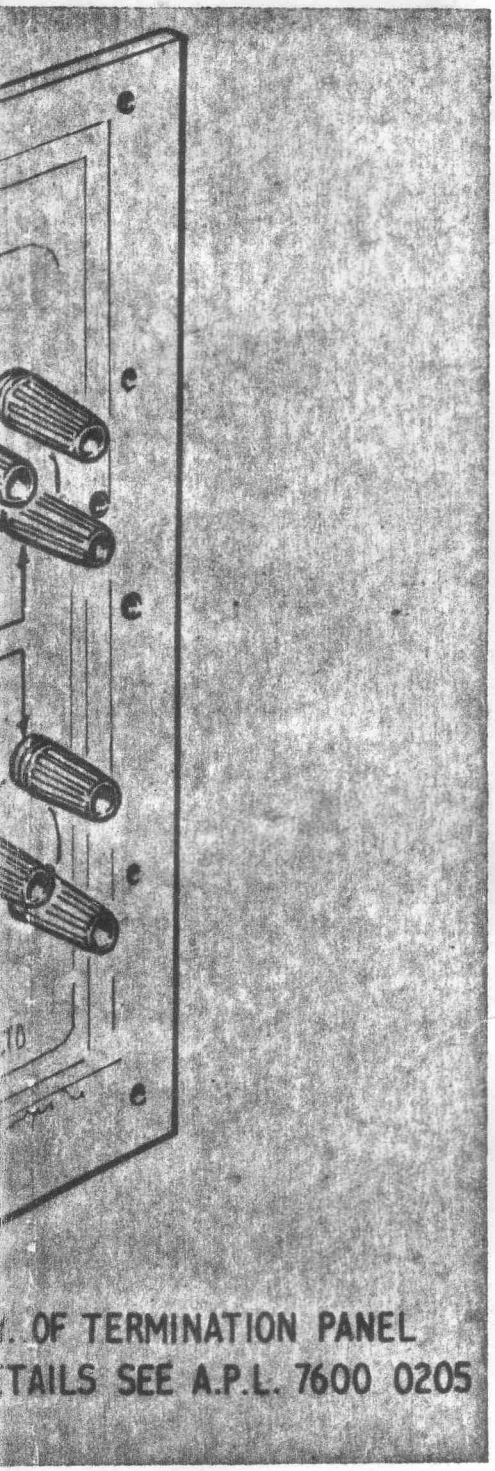
1	30-5-79	
2	8-8-79 POLARITY REVERSED ON MF & HF DRIVERS. PINS 1&4 AND 2&3 REVERSED ON PL3. LR 4575	PW

A B C D E F



RN





. OF TERMINATION PANEL
TAILS SEE A.P.L. 7600 0205

G

H

I

J

S SEE A.P.L.'s REFERRED TO ON THIS DRAWING

	All dimensions in millimetres	T.T.S. copy of
	Limits of tolerance unless otherwise stated :	Exp. number
	One place of decimal dimensions : ± 0·4mm	Drawn P.W. VAUGHAN
	Two places of decimal dimensions : ± 0·1mm	Checked ATG
	Holes 12·0mm diameter and under : + 0·1 – 0mm	Approved ATG.
	Holes over 12·0mm diameter : ± 0·4mm	Scale —
AGRAM - BUCKINGHAM MONITOR	**A1**	0001 0008

Technical Manual

M2000

Buckingham Monitor

Tannoy Products Limited,
St. Johns Road,
Tylers Green,
High Wycombe,
Bucks.

Telephone: Penn (049 481) 5221
Telex: 837116

Part No. 6481.0071

Please read this manual before installing your Monitors. This will avoid you making any expensive mistakes.....

UNPACKING AND ASSEMBLY

The grille for your Buckingham Monitor is packed separately from the main cabinet to prevent damage. Examine all packages for signs of mishandling during transit and inform the carrier if there is evidence of excessive damage to the packaging and resulting damage to the contents. Always keep the packing in such circumstances for subsequent examination.

A plinth is available as an optional extra and may be screwed onto the bottom of the cabinet. Fixing screws are provided. The rear edge of the plinth will accommodate the back edge of the cabinet and the plinth should be positioned centrally. Mark the positions of the fixing screws through the holes in the plinth rails. Drill 2mm pilot holes into the cabinet in the positions marked and screw the plinth firmly into position using a number 2 point "Pozidrive" screwdriver.

Follow the instructions enclosed with the grille assembly for positioning the nameplate in the chosen position.

INSTALLATION

1. Initial Positioning

Locate the loudspeakers so that the listening position at the mixing console is approximately on the axis of the Dual Concentric MF/HF Drive Unit. This will give the optimum spread of treble energy and ensure a flat amplitude vs. frequency response in the monitoring area. Where possible avoid mounting the Monitors close to walls, floors and ceilings. Mounting the cabinets so that the front baffle is flush with the wall will give the minimum number of diffractions from the cabinet surfaces and is the preferred method where this is possible. However, where space and building structures preclude this, aim to position the cabinets either on pedestals or hang them from the ceiling. Ensure that the mixing console position does not obscure the direct sound radiation from the Dual Concentric drive unit. When sitting down, the mixing engineer and producer should have a clear uninterrupted view of the mid/high dual drive unit and the control panels.

If you decide to hang your Buckingham Monitors from the ceiling then a hanging strap kit is available for either horizontal or vertical orientation. Instructions for fitting to the cabinet, and locating the axes of the centre of gravity are included in the kit.

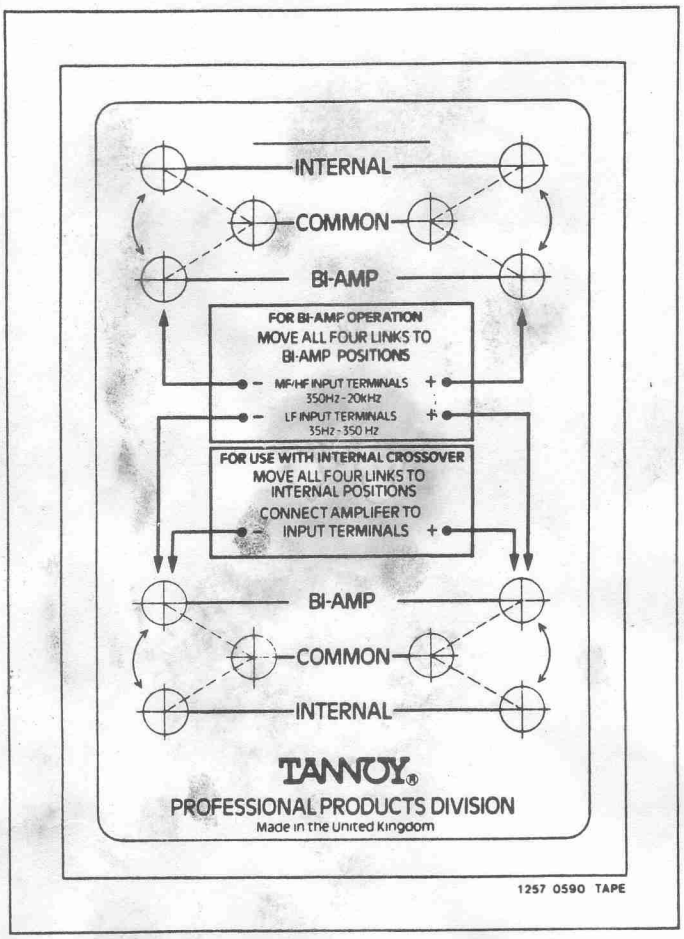
2. Mode of operation

You have a choice of either using the passive internal crossover with the control range as detailed on the two front baffle nameplates, or using an external cross-over operating at high impedance with two power amps to biamp the system - in which case the "lower midrange" control will be inoperative. Control of this area of the spectrum should then be accommodated externally. The Tannoy electronic dividing network type X05000 is recommended in the latter case. This unit is available with a specially designed plug-in module which defines the correct crossover responses. A single point parametric equaliser operating in the frequency range 20Hz-200Hz is also incorporated in the X05000 to allow different low frequency bandwidth and sound power levels to be set up.

continued....2.

Having decided whether you wish to operate in the "biamp" or"passive" mode, follow the next section carefully to ensure that the links on the termination panel are correctly positioned and you know which are the correct terminals to connect to the power amplifier.

3. Termination Panel Settings



ACTIVE/PASSIVE TERMINATION PANEL ASSEMBLY No.7600 0205

The terminal panel as shown above allows the system to be operated either through the internal passive crossover, or biamped with an external crossover on the L.F. section. When in the internal mode, only two connections are needed to the power amplifier. When in the biamp mode, the low frequency driver terminals are brought out directly to the panel. Therefore there are two sets of leads required; one connecting the L.F. section of the system to the power amplifier and another to connect the MF/HF section to a separate power amplifier. The MF/HF section (350Hz to 20kHz) has an internal passive crossover permanently connected to the drive unit. It will accept an unfiltered input from a power amplifier if required.

CAUTION: In the active mode, the L.F. driver terminals are connected DIRECTLY to the terminals on the rear panel.

Each of the four links on the panel connects a common terminal to either an "internal" or a "biamp" terminal. The panel acts therefore as a two-way, four pole switch, with the added advantage of reliability due to the gold plating and large contact areas. In addition some of the terminals are used as the input connections, and these are clearly shown by the diagram printed on the panel.

continued....3.

The links pivot about the "common" terminal. A small lug at one end of the link assists in balancing to make the changing over easier, and also acts as a small handle. When changing a link over unscrew the outermost terminals fully and then release the brown terminal only sufficiently to allow the link to move. (This will prevent the link falling out and possible loss). The link can then be slid away from either the "internal" or "biamp" terminal to be changed over easily.

The links are pre-set at the factory for "internal" operation using the whole passive crossover inside the cabinet.

Internal Operation: Make sure the links are connecting between the "common" and the "internal" terminals. Connect the power amplifier to the "input terminals". (Red and black, +ve and -ve respectively) indicated by the straight arrows as detailed on the panel.

Biamp Operation: Move the links over so that they connect between the "common" and the "biamp" terminals. Connect the low frequency power amplifier to the "L.F. Driver Terminals" as indicated, and the mid/high frequency power amplifier to the "MF/HF Input Terminals" as indicated. Observe correct polarity to preserve the phase relationship between LF and MF/HF radiation from the LF Driver units and the dual concentric driver.

NOTE: In the "biamp" mode the passive internal crossover is disconnected only from the L.F. drivers.

4. Power Amplifier - Requirements

The power output performance of the loudspeaker is directly related to the power amplifier output. The conversion of electrical power to axial sound pressure is governed by the sensitivity specification of the individual Monitor. Please read the full technical specification in the Appendix. The figure given refers to the sound pressure generated $\pm 15^{o}$ from the axis of the drive unit at 1 metre distance for an input power of 1 watt over the full frequency band. As a rule, the sound pressure will decrease by 6dB for each doubling of distance from the loudspeaker and increase by 3dB for each doubling of power input. This applies to anechoic conditions. In a more reverberant room such as a control room or broadcast studio there will be some increase in sound pressure over the anechoic distance figures depending on the size of the room and the absorption coefficients of the surfaces. An example of typical sound pressures measured in a large control room is given in the technical specification.

The power amplifier requirements are a function of the sound pressure level required, the size of the control room, the distance of the monitoring position from the loudspeaker, and most important of all, the amount of headroom required when dealing with signals of wide dynamic range. A full discussion on this subject is beyond the scope of this manual but a few general guidelines can be given.

i) For most applications a power amplifier of 150 watts continuous power output is adequate for each Monitor.

ii) Where more headroom is required a power amplifier of 300 watts continuous power output per channel will normally be adequate, but precautions must be taken to ensure that the continuous power fed to the loudspeaker is not greater than the specified rating. This means in normal circumstances that provided there is no evidence of amplifier clipping and the signals have a wide dynamic range (i.e. not heavily limited or compressed) a 300 watt amplifier will be perfectly safe.

continued.....4.

iii) For small control rooms, the sensitivity of the Buckingham Monitor is high enough to give adequate sound levels from 50 watt to 100 watt power amplifiers. However, remember that a smaller amplifier driven into clipping can do more damage to a loudspeaker than a large amplifier operating within its maximum output rating.

CAUTION: Clipping amplifiers are the evil of loudspeakers. Clipping produces an excess of H.F. energy which can destroy the High Frequency compression driver over quite short periods (approximately 5 minutes). Clipping also usually produces some d.c. offset which will upset the position of the low frequency driver and drastically reduce its thermal power handling, resulting in early failure. Above all, clipping monitoring amplifiers do not sound good.

GOLDEN RULE: If the amplifier clips, either reduce the gain or get a more powerful amplifier.

iv) Overload precautions: Provided the monitors are used in a sensible way no special overload precautions are necessary. However, if precautions are required one method of protection is a 5 amp slow-blow fuse housed in an inline connector which must be replaced at the beginning of each session. (Fuses tend to "age" and become unreliable when operated over long periods close to their fusing point).

Another alternative is a good quality limiter.

The use of incandescent bulbs with very low cold resistance is not recommended since these devices can usually be heard compressing during wide dynamic range programme material.

v) When operating in the "biamp" mode, use the same amplifier power for LF and MF/HF. The peak powers required in the MF and HF regions fully justify the use of a large amplifier especially where wide dynamic range source material is used. Remember that the power amplifiers should preferably use the same network topology to preserve the phase relationship between LF and MF/HF sound radiation.

5. Connections of Power Amplifier

Always aim to position the power amplifier as close to the Monitors as possible. This will ensure the shortest lead length. Avoid long cable runs as the extra resistance introduced by the cable loses power and reduces the damping on the loudspeaker. Long cable runs can also introduce capacitance and inductance, which may affect the stability of the power amplifier causing problems with the aural treble quality (e.g. "grittiness" and harshness). Use substantial multistranded connecting cable, preferrably 2.5 square millimetre crossection or larger, to keep the resistance to a minimum and maintain damping.

Observe the correct polarity at the loudspeaker and amplifier terminals to preserve the phase of the stereo pair. This is equally important when using an external crossover.

When using amplifiers in "bridge" mode, be careful not to accidentally connect either loudspeaker lead to a common earth through any ancilliary equipment.

Absolute Polarity: The convention with all Tannoy loudspeakers is as follows:-

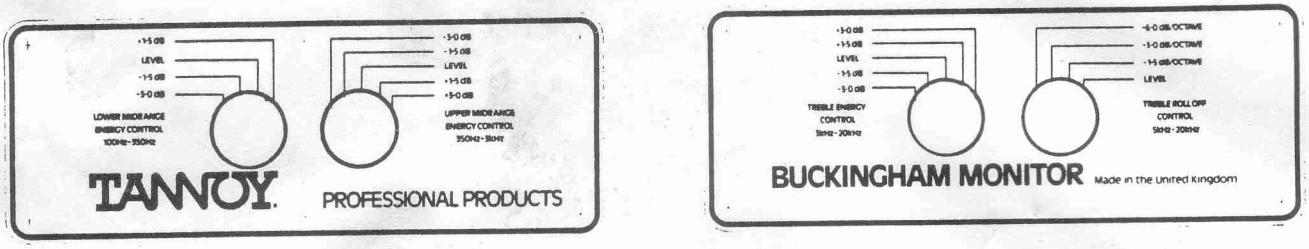
continued.....5.

A positive going signal (i.e. +ve terminal of 1.5 volt cell) connected to the positive input terminals of the Monitor causes the L.F. cone to move into the cabinet. In this way the absolute polarity of the signal from microphone capsule to monitoring loudspeaker may be preserved.

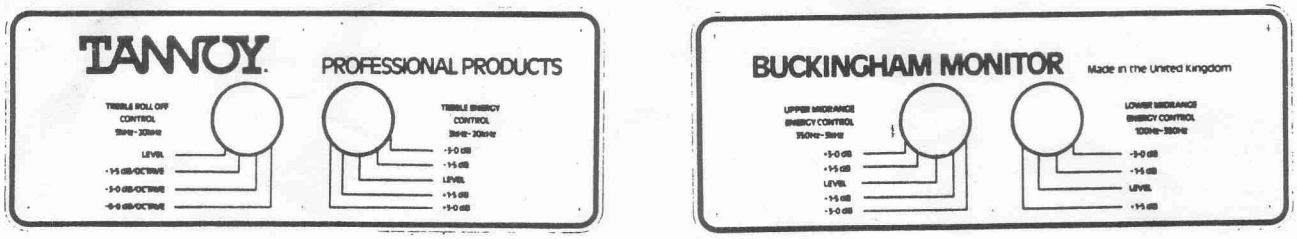
6. Loudspeaker System Adjustment

The Buckingham Monitor has two control panels, one each side of the midrange/high frequency dual. The panels are printed on both sides.

If you use the Monitors with the LF units towards the floor then the panels will be correctly orientated as set by the factory. If however you wish to mount the Monitors upside down (usually via a hanging strap), unscrew the six socket screws holding each panel in place with a 2.5mm Allen key or hexagonal socket spanner and turn each panel over so that the printing on the reverse side shows the positions of the control knobs. In this orientation the acoustic lens (if required) should be gently pulled from its mounting and rotated through 180° and refitted, lining up the crosspiece at the mouth of the HF horn with the slots in the rear of the lens mounting. The lens mounting also allows for rotation through 90°. Use this position if using the Monitors in an upright orientation. This orientation is not specifically recommended since the horizontal polar pattern is slightly inferior due to cabinet diffraction effects. However, it is perfectly permissible if the Monitors are mounted so that the front baffle surface is flush with a wall surface.



Control panels fixed for normal orientation (LF units below MF/HF unit).



Control panels fixed for vertically inverted operation (LF units above MF/HF units)

continued....6.

The control system performs four separate functions as described below. Use a third octave analyser and pink noise source wherever possible to set up the Monitor system for the desired response in a particular control room.

Lower midrange Control: The lower midrange control permits modification of the energy output in the band from 100Hz to 350Hz. This adjustment allows a degree of compensation for the positioning of the Monitor in relation to nearby walls and floors. Where wall boundaries are within about three feet or the Monitor is positioned in a corner, it may be advantageous to set the control to -1.5 to offset the increased output due to the proximity of the wall. If the Monitor is mounted away from all boundaries, i.e. sitting on a pedestal or hanging from the ceiling on chains and greater than 2 metres from any room boundary then set the control to +1.5.

Upper midrange control: The upper midrange control allows the band of frequencies from 350Hz to 3.0kHz to be altered in amplitude. In most cases the "level" position will give the most accurate reproduction, but some adjustment is available to accommodate the environment.

Treble Energy Control: The frequency band 3.0kHz to 20kHz and beyond can be shelved using this control within the range -3dB to +3dB. This control should be set according to the characteristics of the control room or desired response at the listening position. Where the acoustic lens is not fitted the control should be set to -1.5dB for a nominally flat anechoic response.

Treble Roll-off Control: This control provides roll off from approximately 5kHz upwards in 4 positions. By manipulating the Treble Energy and Treble Roll off controls in conjunction with a spectrum analyser and pink noise source, the treble frequency band can be set to provide the desired monitoring characteristic.

General Comment

Unless you have access to a spectrum analyser you are advised to leave the controls set "level". The range of control is purposely restricted since large deviations from a nominally flat or level response usually infer that something is wrong with the signal, or control room acoustics/loudspeaker interface, or both.

Remember that the changes that can be effected by rotating a control from one position to another are usually quite subtle and may not be heard at all if the programme has very little energy in the frequency band under consideration.

However, the combined effect of all the controls set to their extremes can produce quite grotesque responses and such settings should be avoided. When the system is used in the "Biamp" mode the LF drivers are driven directly by an external power amplifier. That part of the control system (100Hz-350Hz) operating on the LF drivers is therefore inoperative when in the "biamp" mode. Control of the frequency range up to 350Hz must therefore be obtained in the high impedance circuit defining the crossover voltage response feeding the LF power amplifier. Where the Tannoy X05000 electronic dividing network is used in this application a single point parametric equaliser is included which may be used for this purpose if required.

MAINTENANCE AND GUARANTEE

No maintenance of the Monitors is necessary. All components are guaranteed for a period of 5 years from date of manufacture, subject to the absence of evidence of misuse, overload or damage, such determination to be made solely by Tannoy Authorised Service Stations.

continued.....7.

TECHNICAL DESCRIPTION

General

The Tannoy Buckingham Monitor is a three way Monitoring loudspeaker which retains all the distinguishing features of Dual Concentric operation for this application coupled with the extra power handling available by including a separate omni-directional low frequency section.

Low Frequency Drivers

Two 12" (300mm) low frequency drivers (type 3126) are used to obtain large acoustic power handling with increased thermal power handling. The L.F. drivers are wired in parallel and in combination present an 8 ohm impedance to the power amplifiers. This gives advantages in terms of easing power amplifier driving characteristics close to full output, and lessens the risk of poor audible quality caused by output stage current limiting protection devices operating when driving very low impedances at high peak voltages.

Mid/High Frequency Driver

The low crossover point of 350Hz ensures the directional information contained within the programme source is handled wholly by the Dual Concentric Mid range/ High frequency driver (type 2548). This device is a high power capacity unit designed for optimum response from the crossover point. The inevitable compromise in full range dual concentrics is therefore eliminated since the Mid frequency section does not have to handle power below 350Hz. The motor system has a high thermal capacity by virtue of a magnetic liquid coolant held in the midrange air gap and a large area metal heatsink defining the air gap.

The high frequency compression driver operates from the crossover point of 3kHz to beyond 20kHz. This unit is substantially the same as has been used in the successful 15" range of Dual Concentric drive units. Definition of the gap flux ratios between midrange and high frequencies is achieved by means of a patented magnetic shunt arrangement which apportions the reluctance of the total magnetic circuit to give 11000 gauss (1.1 Tesla) in the MF air gap, and 13500 gauss (1.35 Tesla) in the HF air gap.

The high frequency diaphragm is driven by a low mass aluminium coil running in a precise clearance air gap. The radiation from the diaphragm is collected by a series of phase compensating tubes which add the total diaphragm radiation in phase at the horn throat. The wavefront then propagates down the horn with the wavefront area expanding in an exponential manner to couple the radiated sound from the diaphragm correctly into the monitoring area.

The advantages of a compression driver for upper midrange and high frequencies are:-

i) High efficiency

ii) Detailed, sensitive response

iii) High power handling

iv) Excellent transient response.

continued.....8.

These advantages, coupled with those of dual concentric construction:-

i) Phase, amplitude response substantially independent of listening position

ii) Coherent sound source throughout the audio frequency band.

iii) Ease of serviceability (non-destructive dissassembly).

iv) Absence of spurious phase effects due to multiple driver sources,

give the Tannoy Buckingham Monitor unique advantages for monitoring and broadcast situations.

Crossover Network

The crossover comprises three separate subassemblies connected together with plugs and sockets for ease of serviceability. Two printed circuit boards utilising special heavy duty copper track laminated onto reinforced glassfibre resin board hold the lighter components. A heavy duty "choke board" contains the low loss chokes and provides a suitable interconnecting point for the termination panel. Power resistors are generously rated and mounted on printed circuit board stand off pillars to ensure cool running and therefore minimal change of crossover characteristics at high powers.

An auto transformer feeds the high frequency section allowing for impedance and sensitivity matching. A complex switching circuit controls the attenuation at various points in the frequency spectrum to give the control functions.

Termination Panel

The termination panel provides a switching centre to provide the "passive" and "biamp" modes. The panel acts as a high reliability 4 pole 2 way switch to break the circuitry enabling access to the MF/HF crossover input whilst disabling the LF section of the crossover in the "biamp" mode. The LF driver is routed either to the output of the LF crossover section or directly to the terminals on the panel depending on the mode of operation.

Gold plated links and robust screw terminals are used in preference to a simple 4 way switch to give low contact resistance and reliability over long periods of service.

Cabinet

The cabinet design incorporates features designed to prevent panel radiation and spurious resonances coupled with a pleasing appearance. The front baffle construction relies on 25 millimetre birch plywood braced rigidly to the rear panel. The side panels are reinforced in an asymmetrical way to break up any panel resonances and further cross bracing gives a totally reinforced structure of immense rigidity. Internal acoustic treatment relies on materials which will absorb the rear radiated energy from the LF driver and yet maintain the Q factor of the reflex enclosure thereby ensuring a clean bass performance.

The midrange/High frequency unit is mounted in a totally isolated transmission line enclosure within the main cabinet. The construction of this enclosure ensures that pressures generated within the main cabinet are isolated from the more delicate midrange moving parts to keep intermodulation between LF and MF/HF to negligible proportions. The transmission line contains graded absorbency to ensure that the radiation from the rear of the midrange cone is absorbed as efficiently as possible and standing waves thereby eliminated. A tubular construction gives the greatest strength to surface area ratio and is also instrumental in bracing and damping the rear panel of the cabinet.

continued....9.

TECHNICAL SPECIFICATIONS

1. Maximum Input Power

35Hz - 350Hz	150 watts continuously	(34.6 volts r.m.s.)
350Hz - 3kHz	120 watts continuously	(31.0 volts r.m.s.)
3kHz - 20kHz	75 watts continuously	(24.5 volts r.m.s.)
35Hz - 350Hz	1000 watts peak	(89 volts peak)
350Hz - 3kHz	800 watts peak	(80 volts peak)
3kHz - 30kHz	500 watts peak	(63 volts peak)

Recommended maximum amplifier power, 150 to 300 watts r.m.s. into 8 ohms, per channel.

2. Maximum Output Power

150 watts (34.6 volts r.m.s. at loudspeaker terminals) produce 116dB Sound Pressure Level (re 2 x 10^{-5} N/m^2) at a distance of 1 metre under anechoic condition (4 steradians) over the frequency range 40Hz - 20kHz measured in octave bands. Peak SPL = 124dB at 1000 watts peak input. 1 pair of loudspeakers each fed with 75 watts (25 volts r.m.s.) being half power input resulting in 3dB headroom when driven from a 150 watt per channel amplifier produces 113dB SPL* at a distance of 3 metres using pink noise (40Hz - 20kHz) in a control room measuring 7m x 9m x 2.3m with a reverberation time of 0.35 seconds over the band 100Hz - 10kHz.

* WARNING Continuous sound levels of over 100dB can cause permanent hearing damage. Maximum recommended exposure time, for example, at 115dB is not greater than 15 minutes.

3. Sensitivity

1 watt (2.83 volts r.m.s.) produces an average level of 94dB SPL (re 2 x $10^{-5}N/m^2$) at 1 metre under anechoic conditions (4π steradians) over the frequency range 40Hz - 20kHz.

4. Impedance

8 ohms nominal

6.3 ohms minimum

5. Frequency Response

35Hz to 20kHz $\pm$ 3dB measured in 1/3 octave bands at any power up to 150 watts.

6. Dispersion

i) with lens: 100^{o} included angle at -6dB points at 15kHz. 4kHz, 8kHz, 15kHz, 20kHz all within $\pm$ 3dB over included angle of 120^{o}.

ii) without lens: 60^{o} included angle at -6dB points at 15kHz. 4kHz, 8kHz, 15kHz, 20kHz all within $\pm$ 3dB over included angle of 70^{o}.

7. Distortion

Less than 1% third harmonic products at half rated power input (-113dB SPL) from 70Hz to 5kHz.

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FAULTFINDING AND SERVICE INSTRUCTIONS

A few simple tests will usually locate the source of any problems. Some test instruments are required together with tools as detailed below:-

Test Instruments

Sinewave oscillator with frequency range 20Hz to 20kHz. This must be either a BFO type or RC type. Do not use a synthesised sine function generator, as with this type although the quoted distortion is low it is nearly always audible.

Power amplifier capable of giving 50 watts continuous power, input sensitivity to match the oscillator above.

Multimeter, capable of reading 0-25 AC volts, (linear +0.5dB over the range) and resistance in the range 0 to 12 ohms with a resolution of 0.5 ohms.

1.5 volt battery with polarity indication.

Tools required

4mm Allen key or hexagonal socket spanner
2.5 mm Allen key or hexagonal socket spanner
7mm open ended spanner
Small instrument screwdriver (2mm)
Large instrument screwdriver (5mm)
Soldering iron.
No. 2 point Pozidrive screwdriver.

Materials required to replace LF or MF cone assembly

No. 10 artists brush
1" wide surgical quality adhesive tape.
Cotton wool
Clean, lint free cotton rag
"Tannoy" recone kit
Sharp, flexible knife

Materials required to replace HF diaphragm assembly

"Tannoy" replacement HF diaphragm
Multicore solder.

Faultfinding

The type of fault will usually be obvious by the nature of the sound quality and can be narrowed down to a problem in either the LF, MF or HF sections as follows:-

1. Adjust the termination panel for "Biamp" operation.
2. Test the continuity of the LF drivers by disconnecting any power amplifier. Connect the 1.5 volt battery to the "LF driver terminals" +ve lead to the red terminal. Both drive units should move inwards an equal amount. If one of them moves outwards momentarily then an open circuity fault is present on the driver or its associated connections.

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