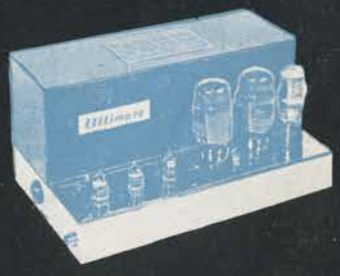
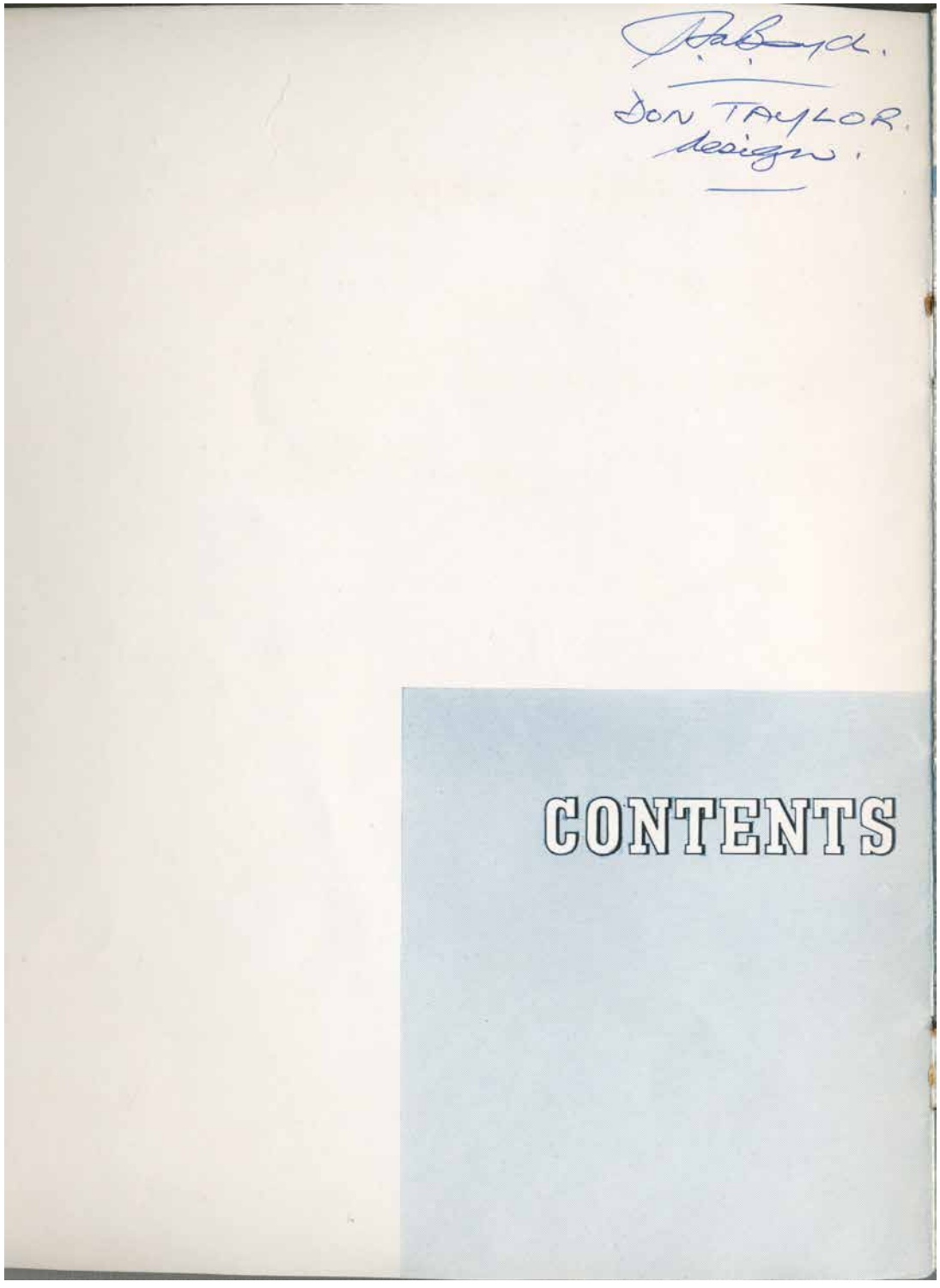
Ultra Linear Amplifier . . .

and Pre-amplifier

Ultimate





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the Ultimate Ultra Linear Amplifier and Pre-amplifier

Another top quality product designed and custom-built by

ULTIMATE-EKCO (N.Z.) Co. Ltd.

6-14 Quay St., Auckland, New Zealand.

Introduction

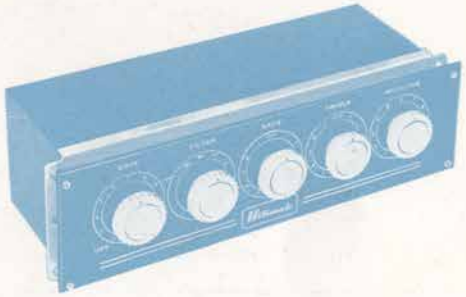
"To reproduce music indistinguishable from the original creation of the artist in person."

To that end the ULTIMATE ULTRA-LINEAR AMPLIFIER and PRE-AMPLIFIER have been developed.

The desire to create living, breathing reality within your own home and to recapture the ORIGINAL BEAUTY of music urged ULTIMATE Engineers on until desire was translated into reality.

The widely differing results from various brands of records (cut to varying standards); the losses that are inherent in pick-ups; the limited response of the average radio receiver; all these and other things held back perfection. It was obvious that a new approach was needed and so the ultra-linear amplifier and pre-amplifier came into being.

The illusion of reality in music, has its foundation in low octaves of the audible range, which give the thrilling feeling of power. The middle octaves give body and rhythm while the higher octaves produce the "living presence" effects so esential to quiet listening. It is to the high frequencies that we also look for brilliance in the performance.



Perfection demanded the use of the full range of sound, and this ULTIMATE equipment can handle without distortion, every note from the power-filled "lows" to the brilliant "highs."

The Ultimate Pre-amplifier

In this most important section of the ultra-linear equipment, the tiny but imperfect signal from the music source is ADJUSTED AND COMPENSATED before being passed on to the ultra-linear amplifier for amplification.

Because record manufacturers do not agree on a single recording standard, various brands or records give distinctly different results. Losses of ORIGINAL BEAUTY are sustained and would be completely lost in reproduction, were it not for the ultra linear pre-amplifier.

By simple adjustment of the Pre-Amplifier, those losses can be compensated for. The Pre-Amplifier can be adjusted to suit the particular brand of record used as well as the type of pickup used, so that near perfection is obtained.

Plug-units which will match various types of pickups available, are designed to correct the response over the whole of the audio range.

The Ultimate Ultra-linear equipment can be fed from radio tuner, record player, tape or microphone. A cathode follower output section ensures good high response even when long lines are necessary between the two units. This allows great latitude in the placing of the equipment and should meet all the requirements of the owner.

The finish of the Pre-Amplifier is first class. Black baked enamel for beauty and long life ensures perfect protection for the panel steel bodywork. The modern calibrated escutcheon is of heavy grade perspex.

The Control Panel

On the perspex control panel there are five controls that are simple to use and give complete mastery over the equipment. In practice it will be found that very little adjustment is needed once the initial settings are made.

GAIN CONTROL

This controls the overall volume from the ultra-linear amplifier and incorporates the on/off switch for the whole of the equipment.

FILTER CONTROL

This is a low pass filter which eliminates unwanted noise and scratch, particularly noticeable on older 78 r.p.m. records. This is achieved without upsetting the musical balance to any noticeable degree. Cut-off frequencies of 5, 7, 9 and 12 kilocycles are provided with a "cancel" position where there is no attenuation of the higher frequencies.

TONE CONTROLS (BASS AND TREBLE)

On each control there is a "flat" position which indicates the optimum setting. The acoustics of the music lover's home will sometimes make a flat response amplifier (such as the Ultimate Ultra-Linear) sound as though there were too much or too little treble or bass. These two controls provide a means of restoring correct balance to suit the needs of the listener or the complexity of his hearing, which may change with age.

SELECTOR SWITCH

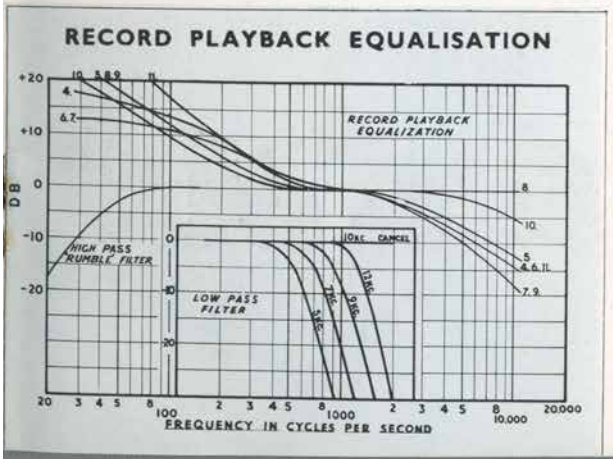
This enables the music lover to correctly compensate the record he is using. There are also settings for selecting radio tuner, microphone or tape. This control is more fully explained overleaf.

Record Compensation

Because different brands of records give different results, it is necessary to adjust the amplifier to match the type of record selected. This is done by the Selector Switch, which selects a playback curve which will fully compensate the recording curve of the chosen record.

The Selector Switch in conjunction with its associated indicator card, will correctly compensate for eight separate types of recording characteristics including the new R1AA curve which is being used by most American recording Companies.

The curves available on the ULTIMATE Ultra-linear equipment are R1AA, CCIR, DECCA, EMI LP, EUROPEAN 78, NAB, DECCA 78 ffrr and RCA (old).



The microphone, tape and radio inputs have separate input jacks and the frequency response for each input is flat over the audio spectrum, when tone and filter controls are in the "flat" and "cancel" positions respectively. The radio input has a separate control which presets the volume level and prevents overloading of the preamplifier.

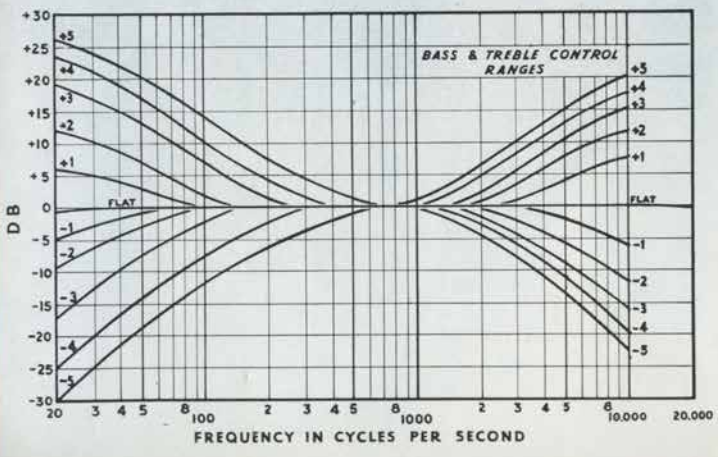
Pick-up Matching

All pickups have different output characteristics and to make it possible to use any selected high fidelity pickup, a plug-in compensating unit is provided.

This unit which is mounted at the rear of the pre-amplifier unit corrects the output voltage of the pickup to give as near as possible, flat response over the audio spectrum.

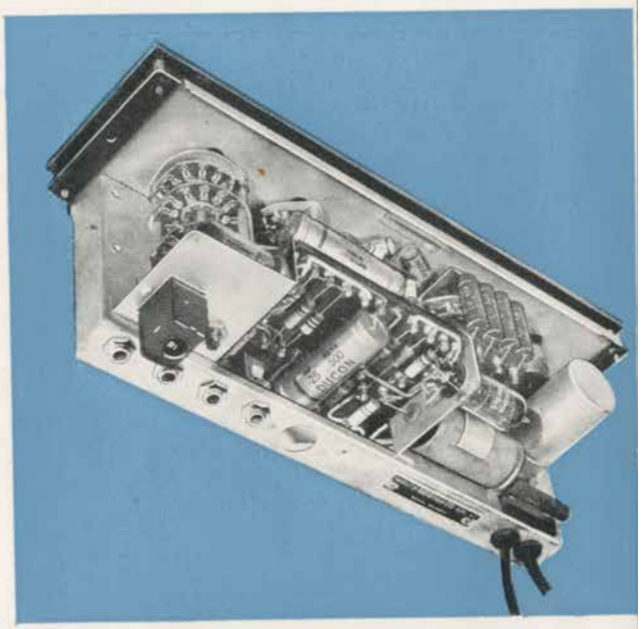
A standard plug-in is provided for most velocity type pick-ups but any type of pickup can be matched provided the manufacturer is advised of the type of pickup to be used.

BASS & TREBLE CONTROL RANGES



These curves reveal the flexibility of the tone compensation circuit enabling correct tonal balance to be achieved.

Pre-amplifier Circuit Description



The Pre-Amplifier circuitry is built around two twin triode tubes, a 12AX7 and 12AU7. Negative feedback is applied over the two triode sections of the 12AX7 voltage amplifier and the eight available playback characteristic curves are provided by switching and varying the character of the feedback in the circuitry.

When microphone, tape recorder or radio tuner inputs are required the selector switch need only be thrown to the appropriate numbered position as shown on the engraved indicator plate.

The frequency response of the 12AX7 section then becomes linear, over the audio frequency spectrum. A preset control is provided in the radio tuner circuit to enable the input signal to be adjusted, to a level that will ensure a safe, no-overload, operating condition.

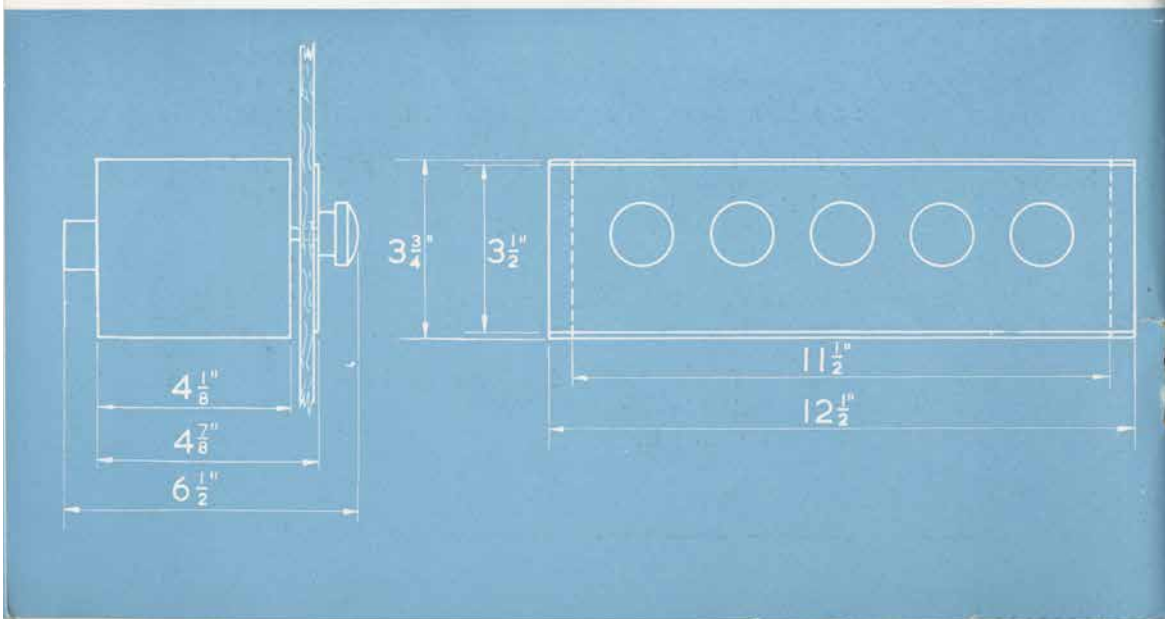
The circuitry around one half of the second tube in the unit, the 12AU7, is designed to give control of the bass and treble frequencies. This is achieved by varying the negative feedback controlling the amplification at those frequencies.

The second half of the 12AU7 acts as a cathode follower with LC low-pass filter connected between cathode and gain control.

A Twin T high-pass filter or rumble filter connects the two 12AU7 tube sections and may be switched in or out at will. It is recommended that it be left switched in unless a pickup frequency response check is being taken.

Pre-amplifier Specifications

FREQUENCY RESPONSE	Tone Control in FLAT position. Filter Controls in CANCEL position.
MICROPHONE **RADIO TUNER** **TAPE**	From 20 c/s — 20 kc/s ± 1DB.
GRAMOPHONE	± 1DB of published curves.
FILTER FREQUENCIES	LOW PASS 5kc/s 7Kc/s 9Kc/s and 12Kc/s slope:— 40 DB per octave. HIGH PASS 40 c/s slope 25 DB per octave.
VALVES	1 x 12AX7 1 x 12AU7
BACKGROUND **DISTORTION**	Unmeasurable. (All controls at FLAT or CANCEL position) at 1 v output:— negligible.
POWER SUPPLY	400 volts at 13 m.a. 6.3 volts at .85 amps.
FRONT PANEL	Engraved perspex.
KNOBS	Brown or Ivory with gold line.
FINISH	Black baked enamel.
DIMENSIONS	12¼" x 3¾" x 4¼" (see drawings below).
WEIGHT	7¼ lbs.



The Ultra Linear Amplifier

The illusion of reality includes more than perfection or near perfection, of the signal delivered from the pickup or other source. It includes volume, for to be real, the performance in your home, should approximate the volume of the original performance.

This is frequently impossible of course; a symphony orchestra in an average lounge would be practically unbearable; but there is much in the realms of music that can, and should be reproduced at a volume identical with the original performance. The signal delivered from the Pre-Amplifier network is far too small for purposes of listening and it must be magnified many times before it reaches a useful listenable level.

The Amplifier is the section of the ultra linear equipment that achieves the work of magnification. The pre-amplifier adjusts and corrects, the amplifier increases the sound level.

Many technical advances are incorporated in this section of the equipment which is designed to amplify without distortion, that your demand for perfection may be met.

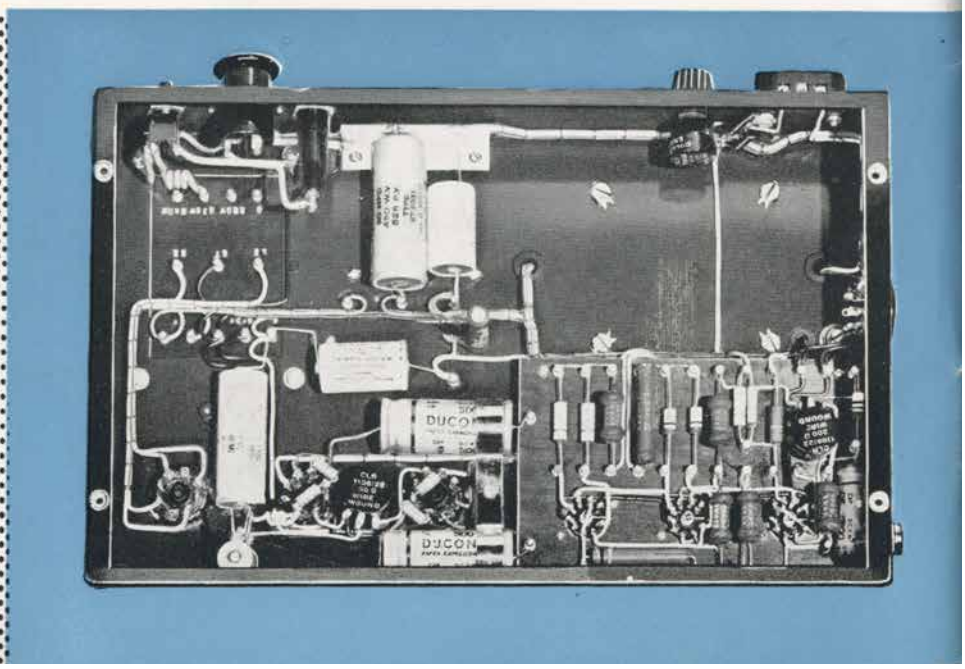
Amplifier Circuit Description

The output transformer is designed to operate into an 8 ohm or 15 ohm load and is most efficiently designed and constructed and uses a grain orientated C core. The windings are subdivided and so constructed as to ensure low leakage reactance and low overall capacity. Distortion at the extreme ends of the audio frequency spectrum show no significant increase over that, at the middle frequencies.

This transformer is designed for Ultra linear operation where the screens of the output tubes are connected to percentage tappings brought out from each half of the primary windings.

Static balance is achieved by the adjustment of a control in the cathode circuit of the matched output tubes of the amplifiers.

A twin triode 12AU7 is used in the driver stage and grids of each section are directly coupled to the plates of the 12AX7 phase inverter. By using

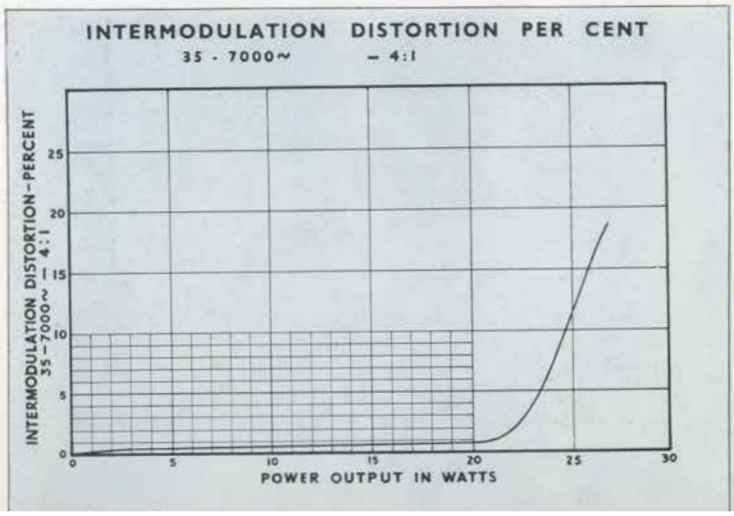


direct coupling over this stage, an easier application of negative feedback is made possible.

The 12AX7 is used as a cross coupled phase inverter tube and is cathode coupled to the 12AU7 input tube, which in turn has a balance pre-set control in the cathode returns. This is adjusted to give perfect signal and voltage balance up to the grids of the output tubes. This has an added benefit, that should any tubes, in this section of the amplifier be replaced, correct balance may be easily restored by simple adjustment of the control.

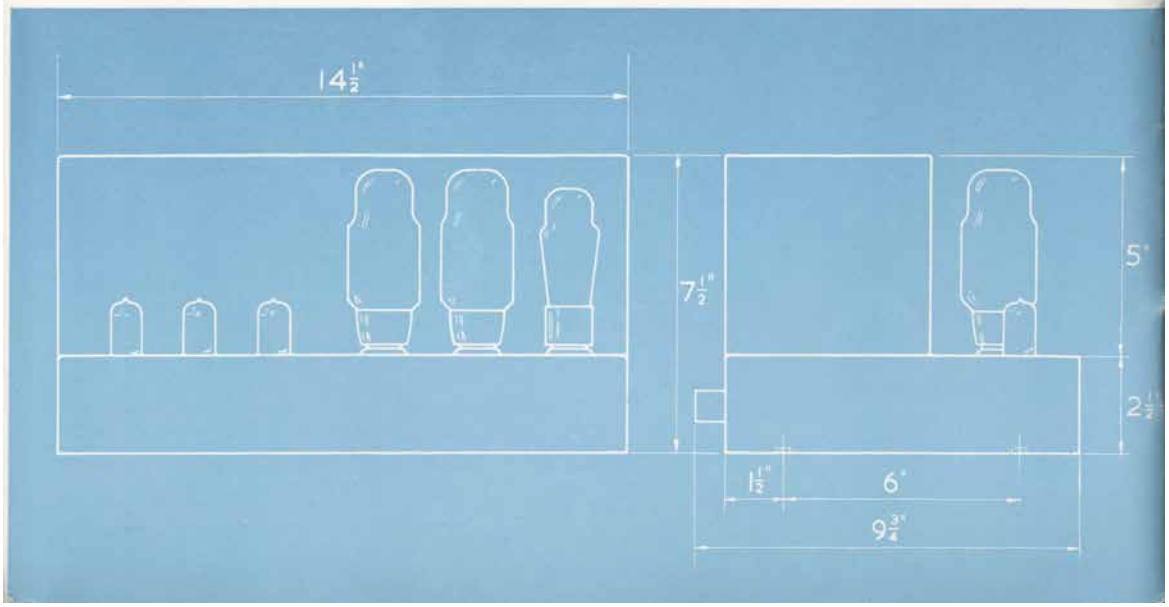
Approximately 18 DB of negative voltage feedback is applied over the complete amplifier and variable current feedback is applied so that electrical damping of the speaker may be achieved. This enables any speaker used with the equipment to have correctly adjusted electrical damping which reduces speaker distortion to a minimum.

The effective output resistance of the amplifier can be varied from — 6 ohms to + 4.95 ohms. The intermodulation distortion at 35 c/s and 7000 c/s at a ratio of 4 : 1 was less than 1% at 20 watts. The graph below will illustrate this point.



Amplifier Specifications

POWER OUTPUT	20 watts throughout the range 20-20,000 c/s.
FREQUENCY RESPONSE	Flat, from 20-40,000 c/s.
TOTAL DISTORTION	At 20 watts, less than .1%.
SENSITIVITY	1 volt RMS for 20 watts output.
OUTPUT IMPEDANCES	15 ohms and 8 ohms.
EFFECTIVE OUTPUT RESISTANCE	Variable from — 6 ohms to + 4.95 ohms.
POWER SUPPLY	220-230-240 volts 50 c/s 110 watts consumption.
VALVES	1 x 5U4 2 x KT66 2 x 12AU7 1 x 12AX7
WEIGHT	27¾ lbs.
DIMENSIONS	14½" x 9" x 7½"
FINISH	Black baked enamel. Chromium plate.



Mounting the Ultra-Linear Amplifier

TWO METHODS OF MOUNTING THE AMPLIFIER ARE AVAILABLE.

1. 3/16" Whitworth machine screws from beneath fit into 3/16" hank bushes.

2. Two above-board mounting clips are supplied with the equipment and these engage in slots on the ends of the chassis. Wood screws are then used.

The ULTIMATE Ultra linear amplifier and Pre-amplifier are backed by reputation and record of achievement of New Zealand's leading radio manufacturers. Skill, ability and up-to-date technical knowledge coupled with craftsmanship of the highest order guarantees top quality and performance.

Wholly Set Up and Printed by the Leader Press Ltd., Auckland.

ANNOUNCING THE NEW WIDE RANGE HIGH

FIDELITY AMPLIFIER AND PREAMPLIFIER

BY

U L T I M A T E

A QUALITY PRODUCT OF

RADIO (1936) LIMITED

AUCKLAND

NEW ZEALAND

ULA M1 AMPLIFIER.

Radio (1936) Limited Auckland, New Zealand long known as a producer of high quality radio equipment has entered the audio field with an amplifier system capable of reproducing music and sound to an extremely high degree of fidelity.

For the professional or amateur some of the important features are as follows:-

The Amplifier is rated to produce an output of 20 watts with a total harmonic distortion of less than .1% and an intermodulation distortion figure of less than 1%. Test frequencies of 35 cycles and 7,000 cycles Ratio 4 : 1 were used, in the latter test.

The sensitivity of the amplifier is such that an input voltage of 1 volt is capable of fully driving the amplifier to 20 watts output. 18 DB of inverse feedback is incorporated over the complete amplifier.

The output Transformer is of "C" core construction, a technique enabling a transformer design embodying maximum efficiency, low distortion and small physical dimensions, to be accomplished. Output impedances of 8 and 15 ohms are provided with tapped primary windings for ultra linear operation of the KT66 output tubes. Plate current balance is obtained by adjustment of Balance preset control No. 2.

The power supply is designed for choke input, ensuring good regulation of B supply under all load conditions.

The voltage amplifiers consist of a 12AU7 twin triode connected as a cathode follower input tube cross coupled to a 12AX7 twin triode phase inverter which is in turn, direct coupled to a 12AU7 twin triode driver tube.

The accurate balance of the complete voltage amplifier is accomplished by the adjustment of Balance preset control No. 1 with a voltmeter connected across the driver plates.

At the rear of the chassis is a variable damping factor control. "DF Control" is fitted, which provides a means to drastically reduce all types of distortion in the speaker system used.

The frequency response of the amplifier is flat over the entire audio spectrum 20 to 20,000 cycles, with the power output remaining constant.

The construction of the equipment, the finish and quality of the components used throughout are of the highest standard, ensuring long life with maximum performance.

PA M1 PRE-AMPLIFIER.

For high quality reproduction of recorded music, a preamplifier designed to operate in conjunction with the main power amplifier and give every facility to enable correct playback equalisation characteristics to be selected, is an essential; and the ULTIMATE preamplifier embodies all the refinements necessary to accomplish this exacting requirement.

The unit derives its operating power from the main amplifier and has several features which are of importance where high quality reproduction of sound is the main objective.

The complete preamplifier is designed for easy mounting in position, in any compartment or on any panel with only the perspex panel and controls left visible. The construction of the equipment and the pretested and matched components used throughout are of a very high standard ensuring accuracy of a high degree.

The entire circuitry of the unit is built round a 12AX7 and 12 AU7 twin triode tubes. The 12AX7 acts as voltage amplifier and the 12AU7, the Bass and Trevle control and cathode follower tube. Eight different record play back compensation networks are available by switch selection, the control being at the right of the unit.

Microphone, Tape recorder and Radio tuner positions are also available and by reference to a specially prepared compensation chart, corresponding switch positions are readily located with respect to the desired requirements.

Treble and Bass controls are of the switch type and are incorporated in a modified Baxendale circuit which, referring to the graph depicting the boost and attenuation curves, gives uniform and uncramped selection.

There is no insertion loss with this circuit and there is negative feed back over the stage at all settings of the controls, ensuring a minimum of distortion.

The second half of the 12AU7 is direct coupled to the first half or tone control section and is used as a cathode follower, with a low pass filter connected in the cathode circuit, together with the main gain control.

The low pass filter has 5 positions 5KC, 7KC, 9KC 12KC and CANCEL and is necessary to attenuate scratch, and surface noise, from old or worn recordings. Any benefit derived from varying the slope of the filter curves does not warrant the use of an extra control for this purpose.

The power switch which is operated by the gain control is in parallel with the power switch in the main Amplifier so that switching "on" and "off" of the equipment may be accomplished from a remote position.

At the rear of the unit, four closed circuit jacks fitted for the plugging in of lines from Microphone, Tape Recorder, Radio tuner and Pick-up. A preset control is available for adjusting the level from the radio tuner to prevent the preamplifier from being overloaded.

There is also a recessed socket to take a plug-in pick-up compensation unit, and the manufacturer should be notified of the type of pick-up to be used so that the correct unit can be supplied.

The total power consumption of the entire equipment is 110 watts.

Providing this equipment is used with high quality speaker systems, turntable and pick-up units, etc., excellent results will be obtained, giving the owner unlimited service and pleasure from another ULTIMATE top quality product.