

"VARISLOPE MONO" PRE-AMPLIFIER

INSTALLATION, OPERATION and MAINTENANCE

NOTES ON ASSOCIATED APPARATUS

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The "VARISLOPE MONO" pre-amplifier is designed for use specifically with LEAK power amplifiers "TL/12 PLUS", "TL/25 PLUS" and "TL/50 PLUS". It will also operate perfectly with any previous LEAK power amplifier.

1. CONNECTING THE "VARISLOPE MONO" PRE-AMPLIFIER

- (a) This unit may be used free-standing on a table, or it may be mounted on a panel of any thickness, through a cut-out of $10\frac{1}{8}'' \times 3\frac{7}{8}''$ (27 cms. \times 9.85 cms.). To mount on a panel: remove the rubber feet by pulling smartly out of their retaining holes; pass the body of the pre-amplifier through the cut-out until the front plate butts against the panel, then pass the U-shape bracket over the back of the pre-amplifier and fix it by passing the wing screw through the hole in the bracket and into the threaded hank-bush in the centre of the rear panel on the pre-amplifier. Tighten the wing screw just enough to prevent the metal backing on the front plate of the pre-amplifier from slipping on the panel.
- (b) A multiple cable of 4 ft. (1.22 metres) is supplied for connecting the "VARISLOPE MONO" to the LEAK power amplifier. The male plug on his cable fits the socket on the power amplifier marked "PRE-AMP." The female plug on the cable fits the male socket on the "VARISLOPE MONO" marked "FROM AMPLIFIER." Longer cables can be supplied to special order, up to a length of 16 ft. (5 metres).
- (c) To enable you to control the power amplification, the "VARISLOPE MONO" a switch is incorporated in the "VOLUME" control. To make use of this facility a 2-core flexible cable is supplied with the "VARISLOPE MONO"; one end of the cable is fitted with a plug which inserts into the socket marked "SWITCH" on the rear of the "VARISLOPE MONO"; the other end of the cable must be passed through the rubber grommet marked "SWITCH CABLE" on the associated LEAK power amplifier, knotted behind the grommet, and the two bared ends connected to the terminals marked "SWITCH" (situated underneath the mains transformer), after removing the wire link joining these terminals.

We strongly recommend that the power amplifier should be 'earthed' (grounded). If excessive hum is experienced, particularly with the power amplifier not 'earthed' (grounded) this can be reduced by reversing the mains input leads to the power amplifier. Reversing the "SWITCH" connections will not be effective.

2. HUM.

The "VARISLOPE MONO" pre-amplifier has an extremely low hum level, which can be checked by removing the input plugs and turning up the "VOLUME" control. The connection of any input device to the input sockets will lower the input impedance and should, therefore, reduce the hum level. If the hum level increases on making these connections, the cause of the hum must lie outside the pre-amplifier, and our instructions on the connection of the varying input devices should be read carefully in an attempt to locate the cause of the hum.

3. HISS.

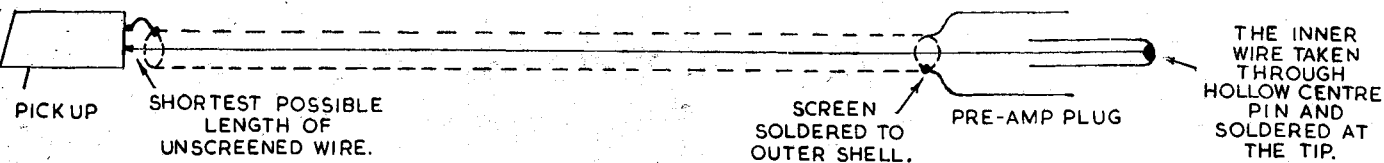
With the input control switch to "MIC", "TAPE HEAD" or "PICKUP" and the "VOLUME" control at maximum, a certain amount of hiss will be heard. This hiss is as low as is possible to obtain at the present date, and it is inherent in high-gain vacuum-tube amplifiers.

4. CONNECTING PICKUPS.

- (a) The greatest care has been taken in the design of this pre-amplifier to ensure that any pickup generally available in the world can be connected to give optimum results, i.e., the highest quality obtainable from the chosen make of pickup. Our prime aim is for you to obtain the optimum results from the pickup of your choice. Please follow our instructions very carefully, even if they appear to conflict with other advice.

- (b) The pickup should be connected via a screened co-axial cable to the socket marked "PICKUP" at the rear of the "VARISLOPE MONO" pre-amplifier, as shown below.

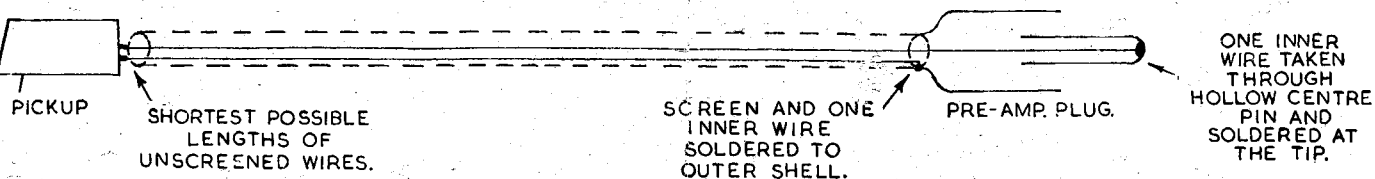
Connecting pickups having a single wire within a screen.



If hum is to be kept to a minimum the outer screening should either have an insulated covering, or it should be prevented from touching any metal on the motor, motor-board or anywhere else. The outer screening **must not** be used for earthing any part of the motor and turntable assembly, which should be earthed by a separate wire taken to the \oplus terminal on the LEAK power amplifier. If the "tone-arm" is of metal and the outer screening is connected to it, then the arm must not make metallic contact through its bearings with the metal turntable and motor assembly.

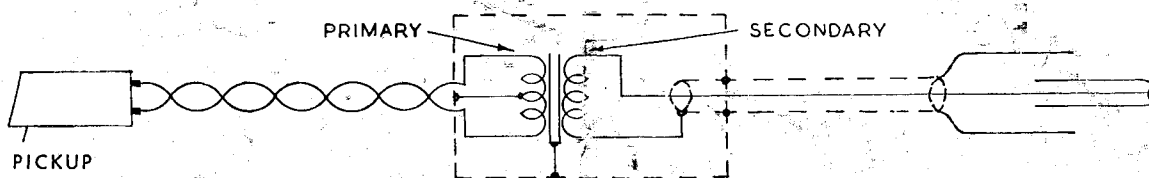
Unfortunately, some record-players and record-changers are wired as shown above, the screen then being connected to the body of the motor mounting-plate. This is bad practice on the part of the makers, and is very likely to cause hum, particularly when using a low output pickup. If you have this type of wiring, you are most strongly urged to replace it with the system (c) below.

- (c) **Connecting pickups having two wires within a screen.**



Again, as in (b) above, the outer screen should either have an insulated covering, or it should be prevented from touching the motor, motor-board or anywhere else. If, however, the screening does touch, then hum is less likely to be caused than by using the single-wire system of (b).

- (d) **Connecting low impedance pickups using a transformer.**



NOTE WELL.

The transformer **must** be enclosed in a screening can of high-permeability metal, i.e., mu-metal or permendur. The primary winding **must** be balanced, the centre-tap being taken to the chassis.

The primary terminals are to be as small as possible and to be as close together as is practicable, in order to obviate a loop in the wiring. The primary leads to be tightly twisted for the same reason. The "live" secondary terminal to be screened and to be as small as possible. Ideally **all** terminals should be inside the can. The above precautions are not yet universally followed, though they have been standard practice on LEAK pickups for ten years. These precautions are essential if the lowest hum level is desired.

- (e) We know from experience that the main troubles encountered by the music-lover at home are with the reproduction of records. There are five major reasons for these troubles:—

- (a) No record can possibly give perfect reproduction, and many records (perhaps the majority) contain noticeable distortions due to imperfections in recording and/or processing. These imperfections may show up as "rattle", high surface noise, recorded hum and rumble, and recorded "wow". Shrill treble may be due to a poor record, and/or due to a pickup having its high-frequency resonance within the audible range.
- (b) No pickup is perfect and the majority have performances **very much** below those which are attainable.

- (c) Hum. This often arises because insufficient attention is given during the design of a pickup to the commonly-found circumstances in which it will operate, i.e., near an electric motor and near a power amplifier. Hum can also arise from incorrect connection of the pickup by the user.
 - (d) "Rumble". Vibration from the motor is transmitted to the pickup stylus and appears in the sound output as a rumbling or humming noise. Rumble disappears when the pickup is lifted from the record.
 - (e) Acoustic feedback. If a loudspeaker is placed in the same cabinet as a pickup, the vibration from the movement of the loudspeaker can be transmitted to the stylus of the pickup. As the volume is increased a stage is reached where a sustained roaring noise is set up. At volume levels considerably below this point distortion is noticeable. Acoustic feedback disappears when the pickup is lifted from the record.
- (f) **The matching of pickups.**
- (i) **Moving-coil and variable-reluctance (magnetic, moving-iron) pickups.**

Some manufacturers state a value of resistor to be placed across their pickups. To follow these recommendations you should add a resistor of value shown below; this table takes into account the input impedance of the "VARISLOPE MONO" pre-amplifier (100,000 ohms). As this resistor can pick up hum unless screened, we strongly recommend that you solder the resistor across the co-axial input socket inside the pre-amplifier.

<i>Maker's Recommendation</i>	<i>Value of additional resistors for each channel</i>
100,000 ohms	No resistor required
50,000 ohms	100,000 ohms
33,000 ohms	50,000 ohms
20,000 ohms	25,000 ohms
10,000 ohms	12,000 ohms
5,000 ohms	5,000 ohms

(ii) **Crystal and ceramic pickup**

For optimum results no additional resistor is required. The input loading on the pre-amplifier forces this type of pickup to give approximately the same frequency characteristic as moving-coil and variable-reluctance pickups. This type of pickup may be accompanied by recommendations that a high input impedance (1 megohm) should be used; these instructions must be disregarded as they apply only when you are using a pre-amplifier which does not incorporate record compensation. If more bass is desired you should insert a 100,000 ohm resistor in series with the "live" pickup input lead. As this resistor can pick-up hum unless screened, we strongly recommend that you solder the resistor to the co-axial input socket inside the pre-amplifier.

5. OPERATING THE CONTROLS WHEN PLAYING RECORDS.

- (a) The 'RIAA' (same as British standard 1928/55 for fine groove records) playback characteristic has been incorporated in the "VARISLOPE MONO" as this is an internationally agreed standard, and has been in world-wide use since 1955 for 33½ and 45 r.p.m. records. This characteristic does not take into account the acoustics of the recording studio, the position of the microphones relative to the artistes, your pickup, your loudspeaker system, the acoustics of your room and your particular ears! In other words, the playback characteristic is of use only as an approximation, and it may well be necessary to adjust the final result by using the controls marked "BASS" and "TREBLE", this is the reason for their presence.

When playing LP records (33½ and 45 r.p.m.) made prior to 1955 the bass and treble controls should be used to correct for differences in the recording characteristic.

When playing European 78 records the treble control, should, theoretically, be turned to "2 o'clock" and the bass control to "11 o'clock" but, here again, you may prefer the results with the controls at "12 o'clock"!

- (b) The "FILTER" knob can be used to give very comprehensive control of the treble frequencies. When the control is turned to "9" a filter is switched into circuit, the turnover frequency being 9 kc/s (i.e., the frequency at which the response falls 3db). Other turnover frequencies of 6 kc/s and 4 kc/s are also obtainable. The "SLOPE" control varies the rate of attenuation above the turnover frequency from 10db per octave

("GRADUAL") to 25db per octave ("STEEP"). The "FILTER" and "SLOPE" controls together with the "TREBLE" control give an enormous range of high frequency attenuation which is very useful when reproducing music in which there is high distortion at high frequencies, for it is then possible to remove much of the offensiveness whilst losing a minimum of the musical content.

The "SLOPE" control is inoperative when the "FILTER" is at "OFF".

SPECIAL NOTE.

With our previous Varislope pre-amplifiers a number of users reported that the filter "does not work" on the 9 kc/s and 6 kc/s positions. In every case on our checking the pre-amplifier it was faultless.

The explanation must be that either the high frequencies were not being reproduced due to inadequate complementary equipment, i.e., pickups, loudspeakers, etc., and/or the particular listener could not hear large changes of intensity at high frequencies.

(c) **"BASS" CONTROL.**

Consumer opinion in some countries insists on a magnitude of available bass boost which, if used at maximum, can only result in a travesty of the original music. We have provided you with an availability of bass boost which you certainly should not need if your pickup and loudspeaker are moderately good. It is not possible to obtain true bass from small loudspeaker systems by turning the "BASS" control to maximum, though an intermediate setting may be helpful, particularly when listening at low intensity levels (as in an apartment late at night).

6. NOTES ON THE CHOICE AND PERFORMANCE OF PICKUPS.

(a) **Pickup Arms.**

An arm should be as light and as rigid as possible with the lowest possible friction in the pivots. A heavy arm will be necessary with a pickup cartridge (head) which is inferior in respect of its bass-resonance frequency being initially too high. We do not recommend viscous damping of an arm. Ideally, an arm and cartridge should be designed conjunctively, as in the LEAK "Dynamic" pickup; it is not possible to specify the performance of one without the other.

(b) **The Stylus.**

We most emphatically recommend **only** diamond. The initial cost will be greater, but the long term cost is much less, for diamond will last 100 times longer than the next best material, sapphire. Furthermore, because diamond does not chip and retains its contour, it is less likely to damage expensive records.

(c) **Pickup Cartridges.**

There are presently four basic types:—

(i) Moving-Magnet, and (ii) Variable Reluctance (magnetic, moving-iron). These are the most widely used types and assuming a high degree of design skill the performances are comparable. They are robust and relatively simple to manufacture.

(iii) Moving-coil (Dynamic). Ideally, the moving-coil should be wound on a non-magnetic former. A low impedance coil together with a shielded transformer is essential for the best signal/hiss ratio. (See Paras. 2 and 3.) The moving-coil is more difficult and more expensive to manufacture than types (i) and (ii).

(iv) Crystal and ceramic types. These are the cheapest, and because the output is high, the hum and hiss levels can be extremely low. However, to date these types give lower fidelity than the moving-coil, moving-magnetic or variable reluctance types of pickup.

7. GRAMOPHONE (PHONOGRAPH) MOTORS OR TURNTABLES.

The main trouble with the cheaper turntables and with record changers is vibration which is transmitted to the pickup stylus and appears in the sound output as a low-pitched "rumble". Expensive transcription turntables are relatively free from "rumble" because they are more precisely engineered than mass-produced units.

8. CONNECTING RADIO TUNERS.

The output of the tuner must be connected to the co-axial socket marked "TUNER" on the rear of the "VARISLOPE MONO". A separate earth (ground) connection should **NOT** be made to the tuner. Most British tuner units require an external source for heater and anode currents; these can be drawn from the associated LEAK "TL/12 PLUS" amplifier. Details are given on the "TL/12 PLUS" installation leaflet.

9. THE CHOICE OF RADIO TUNERS.

It is not possible to obtain a very high quality from the signals broadcast by medium-wave and long-wave amplitude-modulated (AM) transmitters. At their very best, the signals from such stations will not approach the quality obtainable from a good LP record with a first-class pickup.

On the other hand, the quality from short-wave frequency-modulated (FM) transmitters is better than the best record, provided that the programme is "live" and that good land-lines are used between studio and transmitter, and provided that a first-class FM tuner is used.

10. CONNECTING TAPE HEADS.

The tape head can be connected directly to the "VARISLOPE MONO" "TAPE HEAD" input socket for the reproduction of tapes. For recording purposes it is necessary for you to have a bias and erase oscillator and recording amplifier.

The tape head should be connected via the screened co-axial cable to the co-axial plug fitting the socket marked "TAPE HEAD". When using a low impedance tape head it is, of course, necessary to use a matching transformer, the secondary of which should be connected via a screened co-axial cable to the socket marked "TAPE HEAD".

The screening of the co-axial cable should not touch the metal parts of the deck if minimum hum level is to be obtained. The deck and motors should be earthed to the third pin on the removable plug portion of the "AC POWER CONNECTOR" on the LEAK power amplifier.

11. CONNECTING TAPE RECORDERS.

In general, any normally designed tape system can be connected, using the shortest possible length of screened cable to the co-axial socket marked "TAPE AMP" on the rear of the "VARISLOPE MONO" pre-amplifier for replay purposes or to the socket marked "RECORD" for recording purposes.

The following points should be noted:—

- (a) An earth (ground) connection should not be made to the tape recorder, as this may cause an "earth loop" and hum. The recorder will be earthed automatically through the pre-amplifier and LEAK power amplifier.
- (b) For replay purposes the input switch should be set to "TAPE AMP".
- (c) For recording purposes the input switch should be turned to the input from which it is desired to record.
- (d) The "BASS", "TREBLE" and "FILTER" controls are operative when recording or replaying.
- (e) The output level (which is unaffected by the "VOLUME" control) from the "RECORD" socket on the "VARISLOPE MONO" will be approximately 125mV and normally this socket should be connected to the low sensitivity input on the tape recorder which should have an input impedance of at least 100,000 ohms.

On some tape recorders this output from the "VARISLOPE MONO" pre-amplifier may be insufficient to fully modulate the tape. In this case the high sensitivity input on the tape recorder should be used. To avoid overloading the high sensitivity tape recorder input, the signal from the "RECORD" socket can be reduced by adjusting the preset "OUTPUT" control situated below the "RECORD" socket.

(f) TAPE MONITOR SWITCH.

If you use a tape recorder having a separate replay head and separate record and replay amplifiers, it is possible for you to compare instantaneously the original signal being fed to the tape recorder with the recorded signal taken from the tape immediately after recording.

With the "TAPE MONITOR" switch set to "OFF" the loudspeaker will reproduce the signal being fed to the tape recorder. With the "TAPE MONITOR" switch set to "ON" the signal from the tape replay amplifier will be fed via the volume control and the associated LEAK power amplifier to the loudspeaker. The "VARISLOPE MONO" pre-amplifier will continue to feed a steady recording signal (unaffected by the VOLUME CONTROL) via the "RECORD" socket to the tape recorder.

12. CONNECTING MICROPHONES.

Any dynamic (moving-coil or ribbon) microphone, together with its associated grid-matching transformer, may be plugged into the socket marked "MICROPHONE".

Sensitivities for 125mV output (sufficient to give full output from any LEAK power amplifier) at 1,000 c/s.

Pickup (RIAA Characteristic)	3.5mV
Input impedance	70k-100k ohm
Tuner	50mV
Input impedance	70k-100k ohm
Tape Amp	125mV
Input impedance	70k-100k ohm
Microphone	3mV
Input impedance	150k ohm
Tape Head	3mV
Input impedance	120k ohm

Bass Control: ± 14 db at 50 c/s.

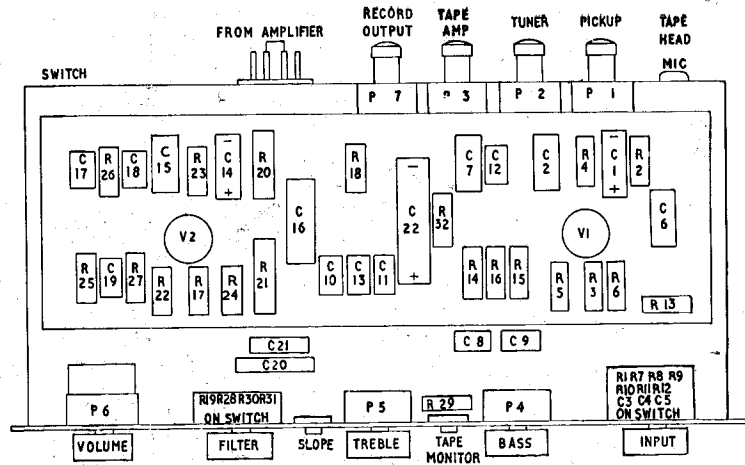
Treble Control: ± 14 db at 20 kc/s.

Distortion:

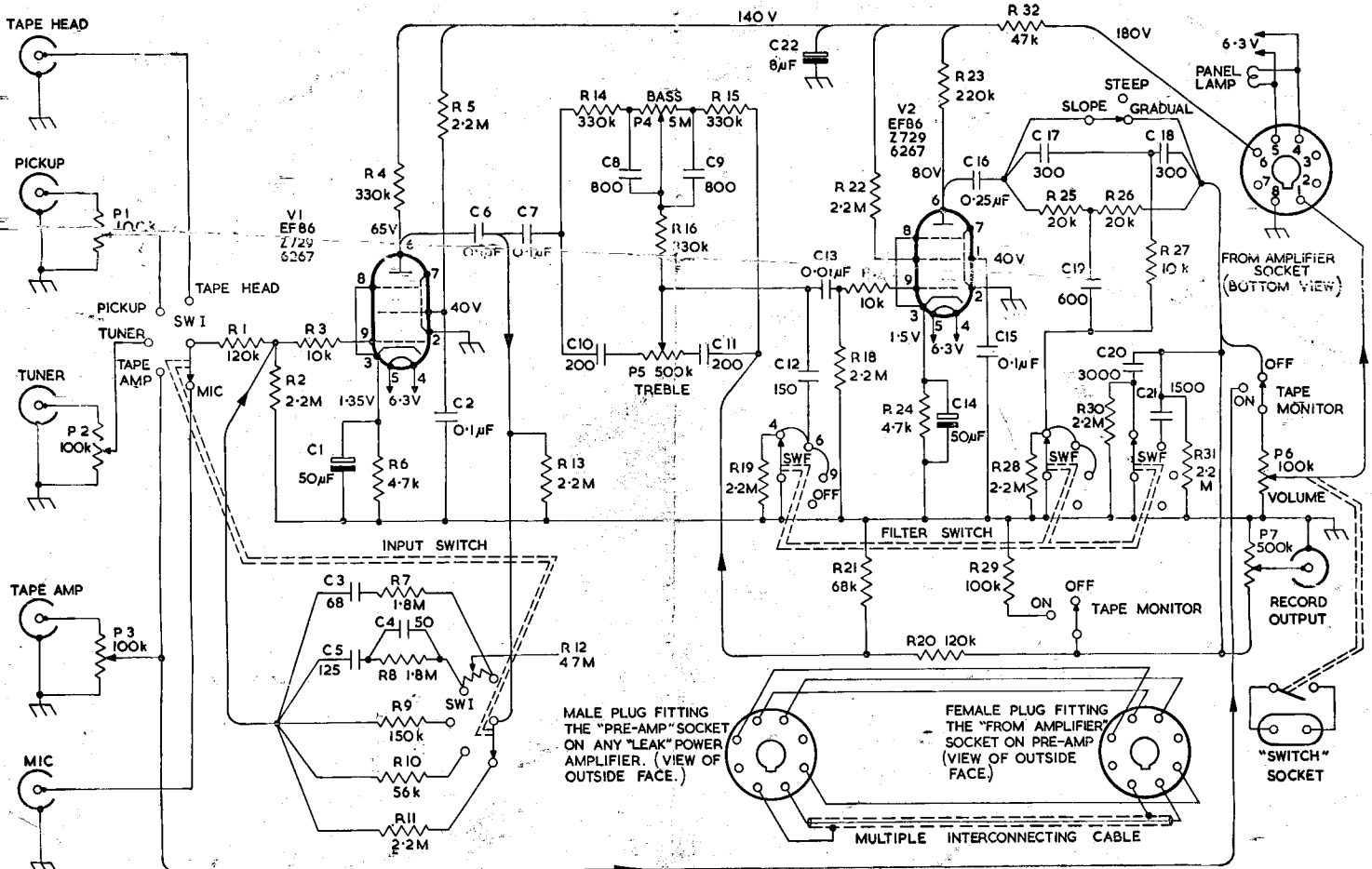
Less than 0.01% for 125mV output.

Hum and Noise:

When plugged into any LEAK power amplifier approximately 60db below full power output on TUNER and TAPE AMP, and 52db below on other inputs.



CHASSIS LAYOUT, BOTTOM COVER REMOVED



RESISTOR VALUES SHOWN IN OHMS
CAPACITOR VALUES SHOWN IN MICRO-MICROFARADS
EXCEPT WHERE OTHERWISE SHOWN
VOLTAGES MEASURED USING A METER OF 20,000 Ω /VOLT.

CIRCUIT DIAGRAM

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