TALKBACK AMPLIFIER
TYPE 4661
(Part No. 844061/01)

INSTRUCTION AND MAINTENANCE MANUAL
Produced to cover circuit diagram
C844061/01

Issue 1

Supplied for use with
Equipment Serial No(s)_____

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UAG

PYE T.V.T. LTD.
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C O N T E N T S

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SECTION 1 - GENERAL DESCRIPTION

1.1 INTRODUCTION

This unit, which employs semiconductors, is designed to form part of a talkback system such as is required in television and large sound broadcasting studios.

The amplifier is designed to amplify signals from microphone level to a maximum output level of +20 dBm for studio distribution.
A high level signal may be mixed with the microphone signal in the amplifier; the ratio of microphone to high level signal being variable over a wide range.

A compression circuit is incorporated in the unit which enables the output to be held at a maximum level, adjustable between 0 dBm and +20 dBm. The output level will increase by less than 6 dB for an input signal increase of 30 dB. The compression circuit can be easily connected or disconnected by a link on the receptacle socket.

Connections to all associated circuits is by a 16-contact plug at the rear of the unit.

The construction of the unit is such that maximum accessibility has been achieved. A standard receptacle frame 19" wide x 7" high (48 x 18 cm) will house twelve of these units.

Consideration has been given to the extremes of temperature liable to be encountered in practice. The performance of the unit remains substantially unaltered within the range -30°C to +55°C.

The amplifier is engaged with the associated circuits and its power supply when slid into a standard receptacle. The unit is then locked into position by a spring loaded catch. To withdraw the unit, the spring catch, conveniently located within the handle, should be raised, and with one movement the amplifier may be slid from the frame.

1.2 SPECIFICATION

Frequency Response	100 c/s to 4 kc/s ±3 dB
Gain:	
Low level input	greater than 90 dB
High level input	greater than 30 dB
Input Impedance (measured at 1 kc/s):	
Low level	600 ohm ±10% ±j20%
High level	greater than 7·5k ohms

Output Impedance (measured at 1 kc/s)	less than 100 ohms
Compression Range	30 dB input change for 6 dB change at output.
Supply Requirements	less than 160 mA at 16V d.c. nominal
Input Isolation (Low Level)	greater than 50 dB
Output Isolation	greater than 50 dB
Noise	less than -110 dBm Equivalent input voltage.
Distortion 1 kc/s	less than 5% at +20 dBm with compression; less than 3% at +20 dBm without compression.
Overall Dimensions	Height 2·8 inches (7 cm) Width 2·8 inches (7 cm) Depth 9·2 inches (23·5 cm)* *Including handle and plug.
Weight	$1\frac{3}{4}$ lb (0·8 kg)

SECTION 2 - INSTALLING, SETTING-UP AND OPERATING

2.1 UNPACKING

Unpack the unit and check:

(a) For any damage sustained in transit.

(b) That the Receptacle Plate Assembly complete with fixings and the mating connector is not discarded.

2.2 PREPARATION

If the unit is to be used as an addition to an existing installation then:

(a) Fix the Receptacle Plate (plus any additional screen(s) which may be necessary) and wire the connector in accordance with instructions contained in the "Unit Mounting and Wiring Techniques" section at the rear of this book.

(b) When a group of amplifiers are to be used, forced cooling may be needed. For other than a normal installation carried out by the manufacturer, the advice of Pye engineers should be obtained.

2.3 INSERTION

When ready to insert the unit(s) observe the following points:

(a) Always check the B+ polarity to ensure that this agrees with the circuit requirements. Also see "Maintenance Precautions on Semiconductor Units" section at the rear of this book.

(b) Check the B+ voltage: to be 16V ±1V.

(c) Check that the fuse is secure in its clip.

(d) Always switch off power supplies before inserting the unit(s).

(e) To insert: grasp handle and slide unit fully home. Apply a light pull to check that unit is locked in position.

(f) If it is necessary to withdraw the unit: grasp handle and press up the small catch. The unit may then be pulled out.

2.4 CONTROLS

(a) GAIN control.
This sets the overall gain of the amplifier.

(b) H.L. on T.B. control.
This controls the ratio of high level input to low level (microphone) input.

(c) LEVEL control.
This sets the turnover point for the start of compression.

2.5 SETTING-UP AND OPERATING

(a) Switch on power supplies.

(b) Set LEVEL control fully clockwise.
Set H.L. on T.B. control fully anticlockwise.

(c) Adjust GAIN control for microphone input.

(d) Adjust H.L. on T.B. control for high level input.

(e) Set LEVEL control for required amount of compression.

(f) Unit is now ready for operation.

SECTION 3 - CIRCUIT DESCRIPTION

Two signal inputs are provided. A "low level" input is connected directly to the 600 ohms input transformer T1, and a "high level" input is connected to T1 via a resistive pad and the "High Level on Talkback" potentiometer R3; transformer T1 which has a voltage gain of 4·6 feeds VT1 and VT2 which are connected as a super alpha pair with variable-loop gain and shunt feedback.

Advantage is taken of the reduction in input impedance of the stage caused by increasing shunt feedback to provide additional attenuation of the input signal during compression conditions. This is achieved by the potentiometer action of R7 and the stage input impedance.

The compression circuit VT7, controls the variable-loop gain by varying the forward bias on the silicon junction diode MR1, in accordance with the input signal. MR1 is connected between the collector and base of VT1.

Transistor VT3 is a common emitter amplifying stage. The gain control R19 is placed between this stage and the following stage VT4.

Transistor VT4 is also a common emitter amplifying stage having the output stage drive transformer T2, as collector load. Overall negative feedback is applied between the output transformer T3 tertiary winding and the base of this stage.

The output stage VT5, VT6, is a common collector push-pull pair. The base bias supplies are provided via the centre tap on the drive transformer T2 secondary winding. The low base-earth resistance resulting provides good thermal stability.

The gain of the output stage is reduced at high frequencies by a shunt capacitor C14 between the transistor base connections. This together with the shunt capacitor C12, between the collector and base of VT4, provides the necessary stability margin for the amplifier under all load conditions.

The compression control circuit VT7 takes a portion of the signal power available at the gain control R19, this is amplified and fed to a half-wave rectifier circuit, MR2. A d.c. bias circuit slightly forward biases the rectifying diode MR2 and reverse biases the variable-loop gain diode MR1. This prevents the control circuit operating until the desired output level is exceeded. The turn-over output level is controlled by the level control, R32.

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SECTION 4 - MAINTENANCE

WARNING: Before commencing any checking, fault finding or other maintenance work see section "Maintenance Precautions on Semiconductor Units" at the rear of this book.

4.1 ACCESS TO COMPONENTS

To obtain access to components inside the unit, loosen the four screws securing the base of the frame, then remove the four screws from the top of the frame, the sides of the unit may now be hinged down. It is best to hinge one side down at a time.

4.2 VOLTAGE ANALYSIS (see warning given above)

The location of faults will be facilitated by making checks at the appropriate points shown in the analysis table given below. The figures given are those obtained on a typical unit but may be found to vary slightly from one unit to another. It should be noted that deviations from the figures given are not necessarily indicative of faults. However, provided that the supply voltage is set to within 16V ±1V, any wide divergency should be investigated.

Conditions

All voltage readings on this unit are to be taken with respect to the positive rail, under no signal conditions, and on the meter range quoted, using a meter having a sensitivity of 20k ohm/volt.

Set controls as follows:

GAIN - fully clockwise
H.L. on T.B. - fully anticlockwise
LEVEL - fully clockwise

Note: In the table below:

e = emitter b = base c = collector

Circuit	Location	Meter Range in volts	Reading in volts relative to B+
VT1 (AC107)	e	10	2·12
	b	10	1·5
	c	10	3·6
VT2 (AC107)	e	10	2·01
	b	10	2·12
	c	10	3·6

Circuit	Location	Meter Range in volts	Reading in volts relative to B+
VT3 (AC107)	e	10	1·24
	b	10	1·42
	c	10	2·78
VT4 (GET106)	e	10	1·9
	b	10	2·0
	c	25	12·5
VT5 (GET106)	e	10	3·4
	b	10	3·6
	c	10	8·7
VT6 (GET106)	e	10	3·42
	b	10	3·6
	c	10	8·7
VT7 (AC107)	e	10	1·78
	b	10	1·88
	c	10	7·22

Supply Volts 16V
Supply Current 150mA

4.3 RESISTANCE OF WINDINGS

Note: All values are ±10%

Transformer 772152(T2)

Pins	1 and 3	168 ohms
"	4 and 5	116 ohms
"	5 and 6	106 ohms

Transformer AL20010(T3)

Pins	1 and 3	6·16 ohms
"	4 and 5	41·5 ohms
"	6 and 7	10·6 ohms

WARNING

D.C. resistance measuring devices and continuity checking equipment, e.g. Avometers, should not be used for checking the resistance or continuity of certain transformer windings. The reason for this and the treatment to be applied if d.c. is accidentally used are dealt with in the appendix "Demagnetisation of High Permeability Cores", bound in with this manual.

The transformer(s) to which this warning applies are listed below, together with the inductance of the winding(s) and the frequency at which it is measured, the r.m.s. demagnetising voltage, and the pins to which the voltage is to be applied.

Part No.	Circuit Reference	Inductance/Frequency/Demagnetising Volts	Pin No.'s
772213	T1	10·4H at 50 c/s 8V r.m.s.	1 and 3

4.4 TESTING

If testing of performance features is necessary because of accidents or failure of major components:

(a) Ensure that the accuracy of the test equipment is adequate for results expected (see Section 1.2).

(b) Ensure that test power supplies are suitable.

(c) Ensure that good quality balance to unbalance transformers are used to match input and output impedances of the unit to the test gear.

Note: Before testing consult appendices concerning "semiconductors" and "high permeability transformers" at the rear of this book.

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SECTION 5 - PARTS LIST

5.1 RESISTORS

Value in ohms	Tolerance ±%	Rating in watts	Part No.
10	10	1½	PE10059
27	10	"	PE27059
47	5	"	PE47059
180	"	½	PE18167
330	"	"	PE33167
820	"	"	PE82167
1k	"	"	PE10267
1·2k	"	"	PE12267
1·8k	"	"	PE18267
2·7k	"	"	PE27267
3·3k	"	"	PE33267
3·9k	"	"	PE39267
5·6k	"	"	PE56267
8·2k	"	"	PE82267
10k	"	"	PE10367
15k	"	"	PE15367
18k	"	"	PE18367
27k	"	"	PE27367
39k	"	"	PE39367
47k	"	"	PE47367
100k	"	"	PE10467
220k	"	¼	NE22465

5.2 CAPACITORS

Value	Maximum d.c. working voltage	Tolerance in %	Part No.
1000pF	400	±10	PQ13001
4700 "	400	"	PQ20502
1·25µF	16	-10 +100	PS14000
10µF	16	-10 +50	PS23000
40 "	16	" "	PS30001
100 "	4	" "	PS38000
100 "	16	" "	PS38003
320 "	10	" "	PS42500

5.3 MISCELLANEOUS

	Part No.
Fuse 500mA 1¼" cartridge	700487
Plug 16-way	724101
Socket 16-way	724153
Potentiometer 150 ohm, ½W, linear	PL02457
" 10k ohm, " "	PL02450

	Part No.
Transformer	772152
"	772213
"	AL20010
Diode OA210	FV09016
Transistor GET106	FV07024
" AC107	FV05068

5.4 SPARES KITS

Components	14061/01
Valves	24061/01

PL1
B-
15
FS1
500mA
R11
10
1·5W
C4
100
B+
H.L. ON TB
R1
3·9k
R4
3·9k
R3
150
HIGH
IMPEDANCE
INPUT
1
9
2
R2
3·9k
B+
R5
3·9k
4
600Ω INPUT
12
10
7
B+
T1
772213
1
6
3
4
2
R6
15k
R7
47k
C1
10
MR1
OA210
R10
100k
R9
10k
C2
1·25
C3
1·25
R8
39k
C7
100
B+
R14
180
R12
10k
C10
100
B+
R23
330
C6
40
C5
40
R13
2·7k
R15
47k
R17
1·2k
R16
10k
C9
40
R18
180
C8
100
4V
R20
18k
C11
40
R21
3·9k
R19
10k
R22
1k
T2
772152
C12
0·0047
400V
R28
5·6k
C14
0·001
400V
R25
47
1·5W
R26
1k
T3
AL20010
OUTPUT
6
14
PL1
R24
180
C13
320
10V
R27
820
R29
27
1·5W
VT1
AC107
VT2
AC107
VT3
AC107
VT4
GET106
VT5 & 6
GET106 x 2
GAIN
R30
1·8k
B+ EARTHED
AT ONE POINT
ONLY.
LEVEL
R31
1k
R34
27k
R37
3·3k
R39
47k
C17
40
R33
100k
R32
10k
MR2
OA210
C15
40
PL1
5
13
LINK FOR
COMPRESSION
C18
100
4V
C19
100
4V
R35
220k
1/4W
R36
39k
R38
820
C16
40
R40
8·2k
VT7
AC107
FRONT
PANEL
BACK
PANEL

NOTE.
FIXED RESISTORS 5% 1/2W UNLESS OTHERWISE MARKED.
CAPACITORS 16V WORKING UNLESS OTHERWISE MARKED.
PL1. 16-CONTACT McMURDO RED RANGE OR AMPHENOL BLUE RIBBON CONNECTOR.

ISSUE 1

TALKBACK AMPLIFIER 844061/01
PVE T.V.T. LTD. CAMBRIDGE. ENGLAND.

CIRCUIT

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MAINTENANCE PRECAUTIONS

FOR

SEMICONDUCTOR UNITS

NOTE: Non-observance can lead to destruction of semiconductors.

SECTION 1. GENERAL ELECTRICAL PRECAUTIONS

1.1 CONTINUITY CHECKING

When using any type of meter to check continuity, it is essential to remember that some give a voltage which is sufficient to destroy certain low voltage semiconductors. This is most likely if the polarity of the test voltage is applied incorrectly. Therefore:

(a) Check the polarity of the test meter voltage.
(b) Check the voltage level and see that this is within the rating of the semiconductors.
(c) When checking wiring external to a unit, it is safer to unplug the unit (or units) whenever possible.
When it is required to check resistors, capacitors and other components it must be remembered that if these components are across the whole, or part, of a semiconductor device, the device itself may affect test meter readings. It is necessary in these cases to disconnect one end of the component being checked.
(d) When the potential at the test meter terminals exceeds the semiconductor ratings it will be advisable to disconnect one end of <u>every</u> component which it is necessary to check - but see also 1.2. below.

1.2 SOLDERING

When soldering is undertaken in semiconductor circuits, poor insulation on the iron can give a sufficient level of a.c. leakage to permanently damage semiconductors. It is advisable therefore to make a quick check with a meter between the bit of the iron and the circuit earth. Note: on some units this may <u>not</u> be the chassis. If a potential is present take one of the following steps:

(a) Repair earth on the iron, or get another.
(b) Remove unit's earth by unplugging where possible.
(c) Remove unit's earth by disconnecting temporarily, say at an equipment plug or terminal block.
(d) Fit a switch in the 'live' lead to the iron, and switch off before bit touches the components or wiring.
(e) Use a low voltage iron or one which can be earthed to the equipment <u>(not to the main's earth).</u>

Remember, these precautions also apply when soldering cableform wiring external to the unit.

Never solder with the B+ switched ON. This can lead to disastrous short circuits, e.g. across emitter resistor.

All semiconductors are temperature sensitive, even without the power ON. Therefore;

When soldering use a thermal shunt, e.g. long nosed cool pliers or similar shunt, between the iron and the device.

1.3 VOLTAGE ANALYSIS

When making a voltage analysis be more than normally careful to prevent undesired short circuits by test prods. These can ruin a transistor e.g. if across base and B-, or across emitter resistor. Crocodile clips are a very common cause of accidental short circuits.

1.4 DISCONNECTING SEMICONDUCTOR UNITS

Because high level transients can damage many types of semiconductor always switch off the power supplies before removing the unit or unplugging it. Even if transients are known to be of no importance it is still possible in unplugging to break say a bias line before the B+ and hence give rise to damage.

1.5 TEST POWER SUPPLIES

Where units of an equipment can be unplugged and removed from a rack or console, it is always preferable to use a jumper lead so that the unit may be plugged in to its normal power supply. Check the polarity on the jumper lead (see also 2.5). Where test power supplies must be used observe the following:

(a) Use a power unit with similar characteristics to the one in the equipment e.g. with low ripple, high stabilisation, transient suppression, etc.
(b) Set d.c. supply to nominal ±1V, or better, so that results are meaningful.
(c) Always check polarity before connecting any test supply.
(d) Heavy gauge wire is essential for low impedance B+ supplies, say 23/·0076.

1.6 TEST EQUIPMENT

It should be remembered that items of test equipment often contain capacitors which may be charged as a result of some previous test. This charge may be sufficient to damage semiconductors in the item under test. Therefore:

(a) Always connect test equipment earth wires first to the unit under test, then touch the other connecting lead to earth before connecting it into the unit to be tested.
(b) Observe this kind of precaution with capacitors, whether these are used for test purpose or as replacements, i.e. check that they are discharged.

Signal Generators, especially l.f.types, quite frequently give voltages which far exceed the semiconductor rating. Therefore:

Before connecting this class of instrument into a semiconductor circuit the output should be turned down to minimum and care taken that the output is not subsequently turned up above a safe level.

1.7 SEMICONDUCTOR POWER UNITS

Special components are usual in these units; all are low voltage items. Some are intolerant of overloads. Therefore in all maintenance and servicing operations ensure that incorrect conditions are not introduced e.g. if the mains transformer or its taps have to be changed the connections should be carefully checked to ensure that excess voltage is not applied.

1.8 HIGH VALUE CAPACITORS

High capacity condensers are common on all semiconductor units. Since semiconductor devices are intolerant of large transients, be careful not to charge or discharge high value capacitors through them, e.g. by short circuits when power has been recently applied, or by replacing a capacitor when the B+ is on.

Never discharge the many thousand µF condensers by short circuits in the unit.

1.9 EARTHING

On no account should the earthing system of multi-unit audio installations, video installations, or any others be altered. On transistorised equipment this is more than normally important due to the use of low impedance supplies and the risk of introducing hum and other forms of interference into low signal circuits. The unit circuit earth is not necessarily connected to the mains earth or chassis. Any added B+(earth) wiring should always be in very heavy cable (See 1.5 d.)

This prohibition applies equally to paths for lamp, relay and other similar circuit supplies which are kept separate from signal paths. In this case high ripple (or plain a.c.) voltage may be fed into the signal earth. The resulting earth currents can then be picked up in low level signal circuits and amplified.

1.10 TRANSISTOR TESTING

It is always advisable to use a test item designed specifically for testing semiconductors, since any other item may give misleading results, and may also damage the semiconductor device.

SECTION 2. MECHANICAL PRECAUTIONS

2.1 PAINT

The black paint covering on certain semiconductors is there to stop light from reaching the junction which is sensitive to electromagnetic radiation including regions centred on the frequency of visible light. In fitting and handling, this paint must not be damaged.

2.2 SEMICONDUCTOR LEADS

When replacing, or disconnecting for test, the lead should not be bent closer than 1·5mm with respect to the body since any bending closer than this may damage the seal.

2.3 POWER SEMICONDUCTORS

When replacing power semiconductors the mica insulating washers (if used) must not be damaged; nor may any other material be substituted since this will affect adversely the transfer of heat from the case to the heat sink.

A smear of silicone grease on the washer serves to prevent sticking and also to make a more intimate heat bond to the sink. No other type of grease should be used.

Fixings on power semiconductors should be well tightened since this again affects heat transfer.

With some devices the metal case may be connected to an internal electrode. In these cases care must be taken not to allow the case to touch the chassis, other components, or any nearby tags.

2.4 HEAT SINKS

On no account should the black matt finish be removed from heat sinks (or fins) since this can affect the power handling capacity by an amount varying up to as much as 30% depending on the type of component.

On many small semiconductors a clip is used to increase the power dissipation. Make sure, therefore, that when a device is replaced the same size of clip is used and that this makes close contact with the case.

2.5 FORCED COOLING

Where forced cooling is provided this must not be obstructed since this can affect the power handling capacity by as much as 200% or higher.

When servicing on a test bench, or on jumper leads, the equipment air supply should be simulated or damage may result.

SECTION 3 - STORAGE

3.1 R.F.RADIATION

When units or components are stored this should not be near any high-power r.f. radiation e.g. from transmitters, test installations, etc. Radiation of this type is harmful, especially in the 'S' and 'X-Band'.

3.2 RADIO-ACTIVE EFFECTS

Semiconductors are affected adversely by various radio-active radiations e.g. X-rays, gamma rays and neutrons. Keep them away from any quantity of radio-active valves e.g. T.R.cells and some gas tubes since these contain radio-active materials.

3.3 TEMPERATURE

Although temperature ranges for semiconductors are continually increasing it is still good practice to keep all stocks away from hot radiators etc. and equally, not to permit stocks to accidentally reach very low temperature conditions.

3.4 MAGNETS

Semiconductors should not be stored close to very strong magnets. There is no permanent effect on the semi-conductor material, but part of the device, i.e. the case, may become permanently magnetised and the field from this will then change the performance of the semi-conductor.

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UNIT MOUNTING AND WIRING TECHNIQUES

1. GENERAL

Plug-in units are housed in special frames which can accept different sizes of units (in mixed sizes) and can also provide individual unit screening facilities.

2. FIXING THE FRAME

Some frames are supplied permanently fixed into consoles, others are loose items for bolting into racks. When fixing the frame into any rack observe the following:

(a) Use the fibre washers (supplied with the fixing screws) so as to protect the paint on the front member of the frame.

(b) Do not obstruct the ventilation holes in the top and bottom plates of the frame.

(c) Units generating large amounts of heat should not be positioned immediately beneath the frame.

3. FIXING THE SCREENS

The types of screening plates available can fit into the frame so as to divide it vertically and horizontally as required, i.e. to give a mixture of compartment sizes. Fit these as follows:

(a) Insert vertical screens first by dropping the lugs into the slots provided in the frame and then by slightly bowing the screen allow the other lugs to spring into the opposite slots.

(b) Insert the horizontal screens in the same manner but with the lugs entering the slots in the vertical screens.

4. RECEPTACLE PLATE ASSEMBLY

When units are supplied to fit into the frame a back plate (appropriate to the size of the compartment) is supplied loose. This is complete with fixings and with the unit mating connector already in position. When fitting the plate observe the following:

(a) Ensure that the plate is mounted so as to give the correct pin alignment of the mating connector.

(b) Do not tighten the mating connector fixings; "floating" is deliberate to ensure easy alignment of the unit connector and the mating component.

5. WIRING CONNECTORS

WARNING If the particular unit being installed contains semi-conductors it should not be plugged in during the soldering operation. Similarly other units already in the equipment should be

unplugged if these contain semiconductors, but see the section entitled "Maintenance Precautions on Semiconductor Units".

When soldering new leads ensure attention to the following:

(a) Use stranded wire for all connections. Stiff wire will cancel the floating action of the connector and will be liable to fracture.

(b) Do not tightly stretch the leads, but leave just sufficient slack to reconnect if the lead should be accidentally broken away.

(c) Do not permit solder to run back along the conductor strands; this spoils the insulant and creates a danger of breakage at some later date.

(d) Programme leads (input and output) should be insulated, screened twin. Expose no more than approximately $\frac{1}{2}$ inch of lead from the screening braid in order to avoid unwanted pick-up. The screening on the output leads should not be finished in a pigtail; trim and cover with a sleeve. The screening on the output signal leads should be earthed at the remote end of the audio cable, NOT to a mains earth.

(e) The screening pigtail of the input leads must go to the signal earth (normally B+ or the B+ busbar). Keep it short and sleeve it to prevent short circuits.

(f) Leads from B+ and B- should not be of smaller gauge than 14/.0076, preferably with thick wall insulation. The heavy gauge is needed in this application because of the low impedance of the power supply. This impedance must not be increased otherwise the stability of the power supply may suffer. For leads longer than 1 yard (1 m) the use of 23/.0076 is strongly advised.

6. DUMMY UNITS AND PANELS

If a frame is being installed then it should be remembered that different sizes of dummy units and back panels are available to fill vacant compartments in the frame. Where forced cooling is present in a rack (or console) these dummy units with their back panels serve not only to ensure a good presentation but also to ensure that the path of the cooling air stream is not diverted in a wasteful manner. On semi-conductor equipments this is of more than normal importance.

7. PARTS LIST

Rack Mounting Frame (19" rack)	749087
Vertical Screen	435629
Horizontal Screen	435630

APPENDIX

DE-MAGNETISATION OF HIGH PERMEABILITY CORES

1. GENERAL

The long term effects arising from the physical maltreatment of Mumetal and other high permeability materials are widely known. Effects which arise as a result of high d.c. current when applied in associated windings either continuously or in surges are not so well known. Increasing use of high permeability materials in transformers, record/playback heads, and other wound assemblies, coupled with the steady increase in remanence figures as new materials become available, make the need for care in one-time simple checking operations more than ever necessary. Fortunately, the precaution to be taken normally only applies when some fault has developed, and it is necessary to check such things as continuity and / or resistance in part of a circuit that includes transformers which have not been designed to carry d.c. current.

2. PRECAUTIONS

It is sometimes forgotten that simple d.c. operated instruments, such as Avometers when used on their resistance ranges for continuity or resistance checks can give quite high ampere-turn figures in the windings which they are used to check. In small modern transformers (and similar components) any such developed field strength has a small, compact mass of core material on which to act. When this small mass is composed of material with characteristics such as high permeability, fairly high remanence, and rather low magnetising force, the effect of the field can be quite marked. The effect shows itself in the overall component as a change of inductance. This will in turn affect the frequency response. The duration of the effect will depend upon a variety of factors but the really important point to remember is that in many cases only if corrective treatment is applied can the effect be cancelled. Therefore a simple rule should be observed that if:

(a) the unit's transformers are small,

(b) the circuit diagram shows that no d.c. flows in the windings,

then no d.c. operated device should be used for checking either continuity or resistance in the purely a.c. items. On such components as physically small output transformers it is normally sufficient to ensure that any d.c. current from test equipment does not exceed the current normally carried by the component.

3. CORRECTIVE TREATMENT

Since accidents are always possible a simple guide to demagnetising is set out in this section. It must be emphasised that since it is often impossible to gauge the extent of the damage caused by electrical maltreatment of wound components no guarantee of correction is implied by the provision of this information.

3.1 SUPPLIES

Normally any 50 c/s or 60 c/s supply is satisfactory. The r.m.s. demagnetising voltage is given in the maintenance section of unit manuals. Current rating of the supply is unlikely to present any problem. For most small input transformers in Audio units a range of a few hundred milliamps is sufficient. For large items a quick calculation based on the a.c. voltage plus the inductance quoted will provide the answer.

Whatever the source of a.c. voltage the waveform should be reasonably sinusoidal and free from harmonics and spikes. It should be remembered that highly inductive voltage regulators often provide a very poor waveform. Quality of the waveform is important since this will have a very considerable effect on the efficiency of the treatment.

3.2 METHOD

The procedure to be followed is set out below.

(a) Connect in series across the a.c. source a limiting resistor, and the full winding of a potentiometer of about 1000 ohms.

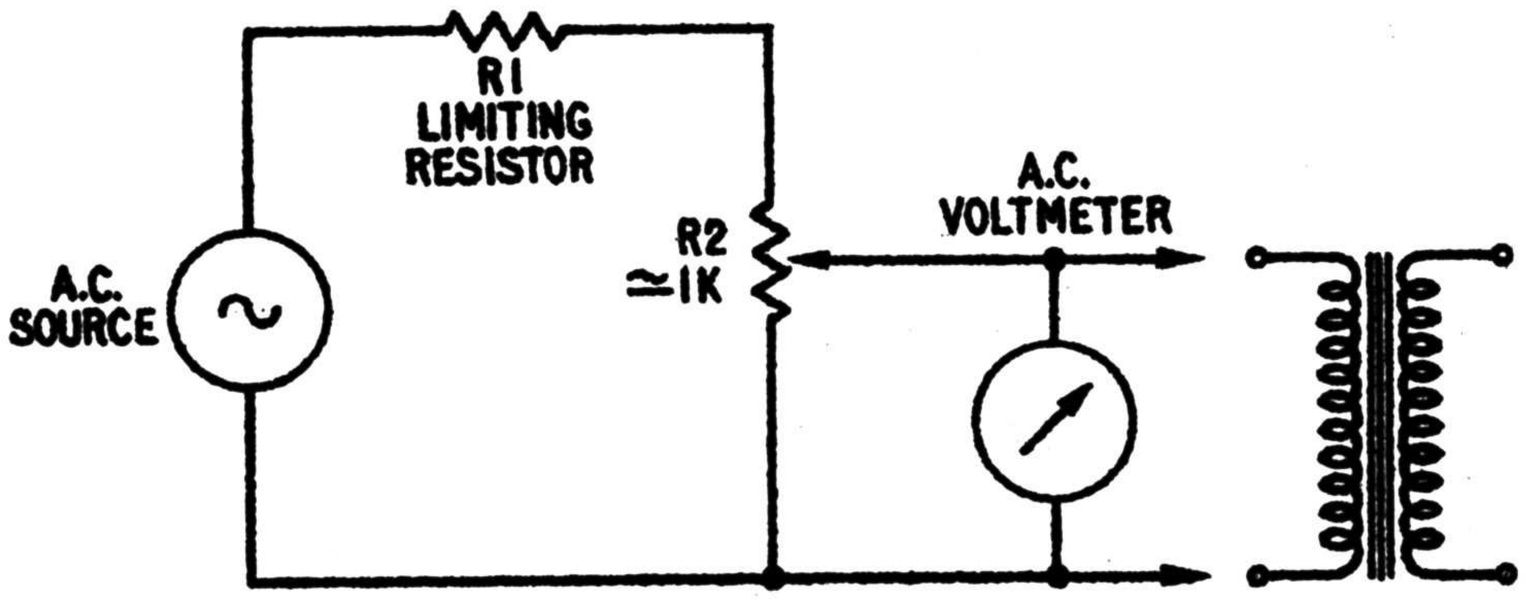

FIGURE 1

(b) Connect the component to be treated and an a.c. voltmeter across the slider of the potentiometer and its contact which is returned to the a.c. supply. Set the potentiometer to give zero volts to the component. (See Figure 1)

NOTE: If Avometers (or similar instruments) are used with a poor waveform the calibration will be in error and allowance must be made in accordance with the handbook supplied by the meter manufacturer.

(c) Switch on the a.c. supply and adjust the potentiometer to give the maximum r.m.s. voltage as shown in the unit manual.

NOTE: The limiting resistor in Figure 1 should be of such a value that if the slider of R1 should accidently be taken to the fullest extent of its travel, the voltage applied to the transformer will be only slightly in excess of the maximum specified.

(d) The voltage should now be gradually reduced to zero in about one minute, but note that the method of doing so is very important. As a rough guide it should be reduced so that a plot of voltage against time would give the well known exponential curve as of a condenser discharging through a fixed resistor. The point to remember is that the longest time is to be spent at the lowest voltages.

(e) If the waveform of the supply contains harmonics (or other departures from a true sine wave) the procedure may have to be repeated a few times.

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TREATMENT FOR ELECTRIC SHOCK

Human beings are rarely killed outright by electric shock and can, in most cases, be saved by immediate commencement of artificial respiration. Electric shock affects the nerves controlling the breathing and the action of the heart and unless prompt aid is given the victim may become unconscious and die. ALWAYS SEND FOR BUT NEVER WAIT FOR A DOCTOR.

Before touching the injured person, make sure that he is not in contact with a live conductor. If he is, break the circuit by opening the power switch - DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS. If it is not possible to switch off the current, use a piece of dry insulating material, such as wood, bakelite or rubber, to knock or push aside the conductor. Alternatively, pull the victim free using a leather belt or braces, protecting yourself still further by standing on a folded newspaper or a dry mackintosh.

HOLGER NIELSON METHOD OF ARTIFICIAL RESPIRATION

(1) Immediately the patient is released from electrical contact loosen his collar and any tight clothing as quickly as possible.

(2) Remove false teeth and sweets etc. from the patient's mouth and make sure that the tongue is free by giving two or three firm slaps with the flat of the hand between the shoulder blades.

(3) Lay the patient face downwards with the forehead resting on the fore arms so that the mouth and nose are kept clear of the ground (A).

(4) Kneel on one knee a little in front of and to the side of the patient's head so that the left foot is at the side of the patient's elbow. (A). The arms should slope forward so that the hands lie close together on the patient's shoulders with the wrists over the top of the shoulder blades. This is the starting position.

(i) Rock forward on outstretched arms until the arms are vertical above the patient's body (B). The pressure should be light and without force; the movement should take approximately 2 seconds.

(ii) Release the pressure by allowing the hands to slide quickly down the patient's arms to the elbows taking approximately $\frac{1}{2}$ a second (C). Then raise his arms and shoulders slightly, at the same time moving your body backwards (D), taking approximately 2 seconds.

(iii) Lower the patient's arms until they touch the ground (E), and return your hands to the original position on his shoulders and resume the position as before. Take approximately $\frac{1}{2}$ a second for this movement.

(5) Repeat the movements described in (i); (ii) and (iii) so that the complete cycle takes approximately six seconds. That is, about nine complete respirations per minute.

(6) Whilst artificial respiration is continued have someone else:-

(a) Loosen patient's clothing and keep him warm.

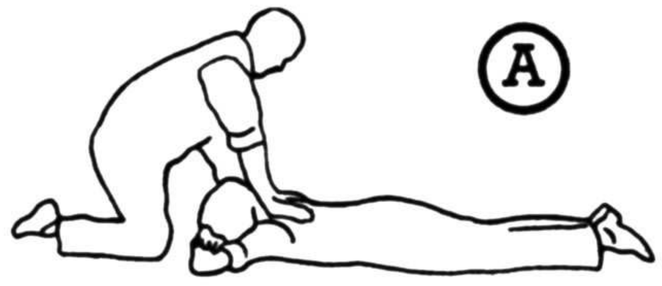
(b) Send for a doctor.

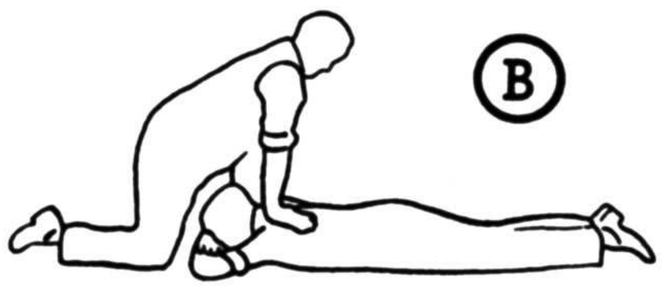
(c) Watch so that they can take over if prolonged treatment is necessary.

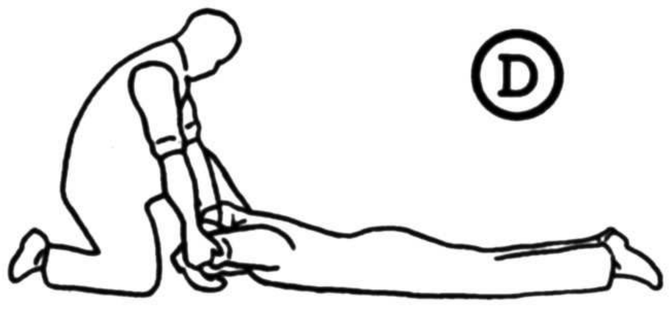
(7) Keep going for at least four hours even if there is no sign of recovery.

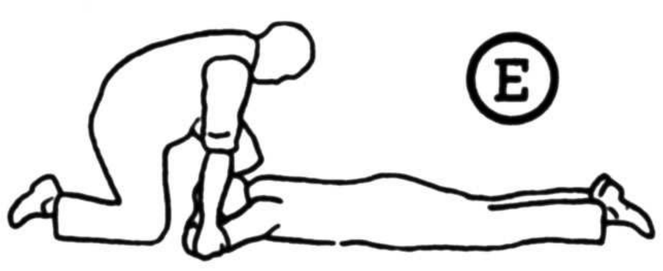
(8) Do not move the patient until he is breathing normally without assistance. There should be no hurry to move him after he has recovered.

(9) Do not give the patient oxygen or other stimulants unless ordered to by a doctor. When fully recovered the patient may be allowed to drink cold water with, if available, one teaspoonful of Sal Volatile to a glass. He may also be permitted to sniff smelling salts.









TREATMENT FOR BURNS

If as a result of electric shock the patient is suffering from burns, the following treatment should be given without hindrance to artificial respiration:-

(1) Remove the clothing near the affected part to enable the burn/s to be treated, taking care not to break any blisters that may have formed.

(2) Saturate the burn/s using a warm solution made up of one desertspoonful of bi-carbonate of soda and a pint of warm water. If bi-carbonate of soda is not available, use a teaspoonful of salt.

(3) Cover the burns with lint soaked in the above solution and apply a bandage taking care not to burst any blisters that may have formed.

(4) If a solution as above is not available cover the burns with a sterile dressing to exclude the air.

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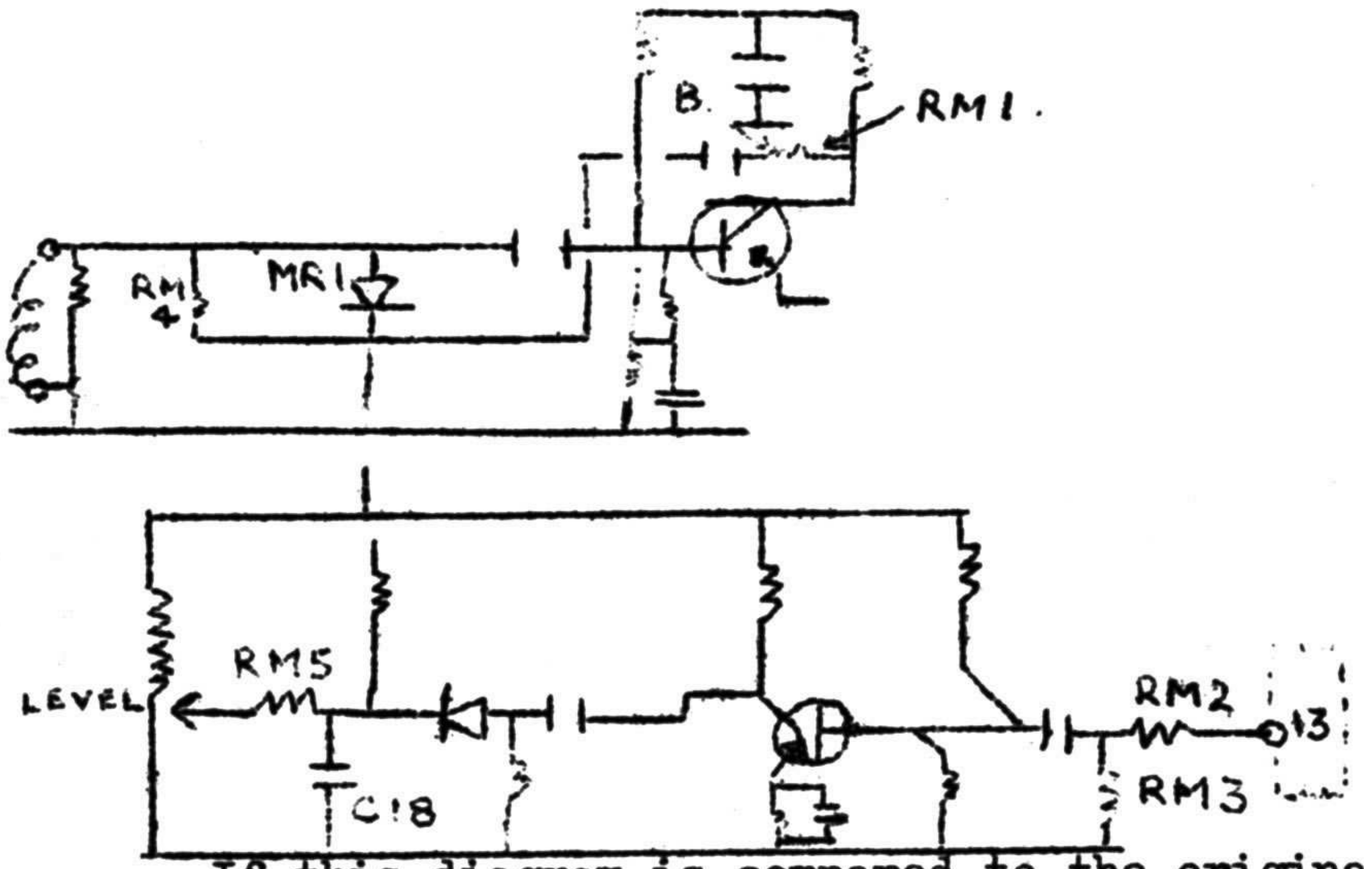
MODIFICATION TO TALKBACK AMPLIFIER.4061.

Purpose.

To give control of T/B level by programme sound or other input.

Circuit Modification.



RMI = 2.7 K Ohms
RM2 = 150 K Ohms
RM3 = 300 Ohms
RM4 = A.O.T.(Approx 100K ohms)
C 18= 100 uF
RM5 = 22 K Ohms.

If this diagram is compared to the original it will be seen that MR1 has been reversed. R7 and R31 shorted out. R35,R33, and C18 removed. RMI,RM2,RM3,RM4 and RM5, inserted.

Programme sound or ext I/P at +6db is fed via the new jack on EM's desk to pin 13.

PLEASE NOTE.

The setting of the level control is now very critical and must not be touched. If faulty Sound Test Room has maintenance procedure. The gain is set at +60db but final adjustment can be made by the gain control as normal.

MG/BPC.
11th May,67.

To Set Up the Modified Talkback (4061) Amplifier

Use test jog with pin 13 and Earth available.

Put -60 dBm tone into the talkback amplifier (into B) and +6 tone between pins 13 and earth - this represents the normal level of "programme sound"

The setting of the level control is very critical and is best set by trial and error. It is set such that, varying prog sound from +6 to +14 gives a corresponding increase of about +8 to +10 in the output (out B)

The gain control is set to give zero level output for -60 dBm talkback input and +6 dBm prog sound input

Removing the programme sound should not cause the amplifiers output to fall by more than 2 or 3 dB.

N.B. Resister RM4 is adjusted on test, its normal value is between 22KΩ & 100KΩ. An increased value gives a wider regulation by the level control.

N. Kaye.

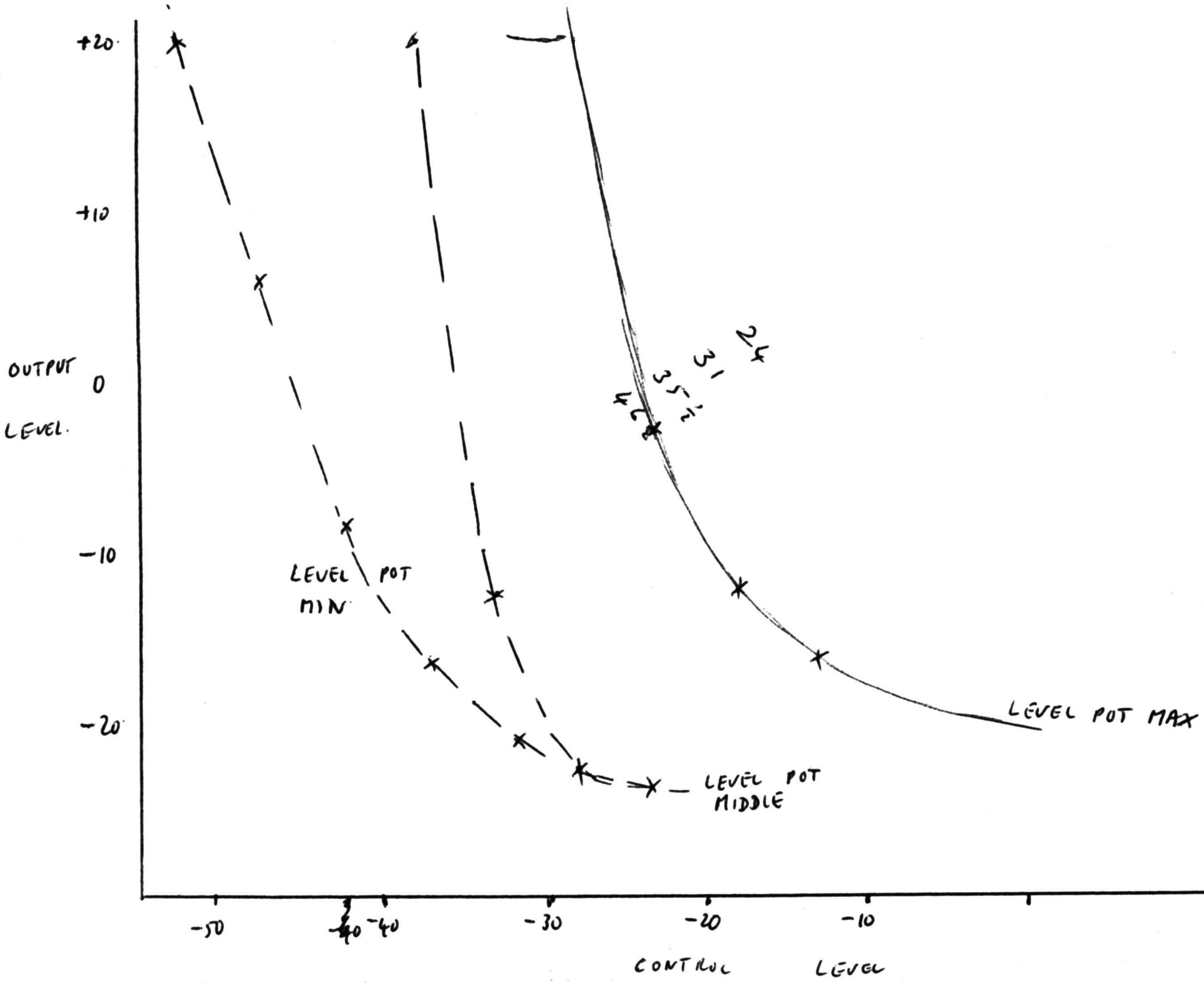
TALKBACK MOD.

MCR.	Amplifiers S/No	S/NO	Amps Modified	Jack wired in.
19	32	38	✓	✓
21	37	40	✓	✓
22	45	52	✓	✓
		No Card.		
23	31	34	✓	✓
25	120	122	✓	✓
24	115	116	✓	✓ OK
26	125	165	Jack to be replaced.	✓

First 5 completly finnished.
MCR 24 not started
The jack on MCR 26 should be replaced by a jack socket

JUNE 67. N. Kean.

4016 TB AMP COMPRESSOR.



Max clockwise in both port,

below -28 — effect.

Contd volts	-28	output	+20
sdh.	-23		-2.5
sdh.	-18		-12,
sdh.	-13	4	-16

58. 14 B.

recording effect.

Mid Down load pt -

Output +20.

Contd volts.	-38		
sdh.	-33.	32.	-12
sdh.	-28.	10.	-22.
sdh.	-23	1dh.	-23

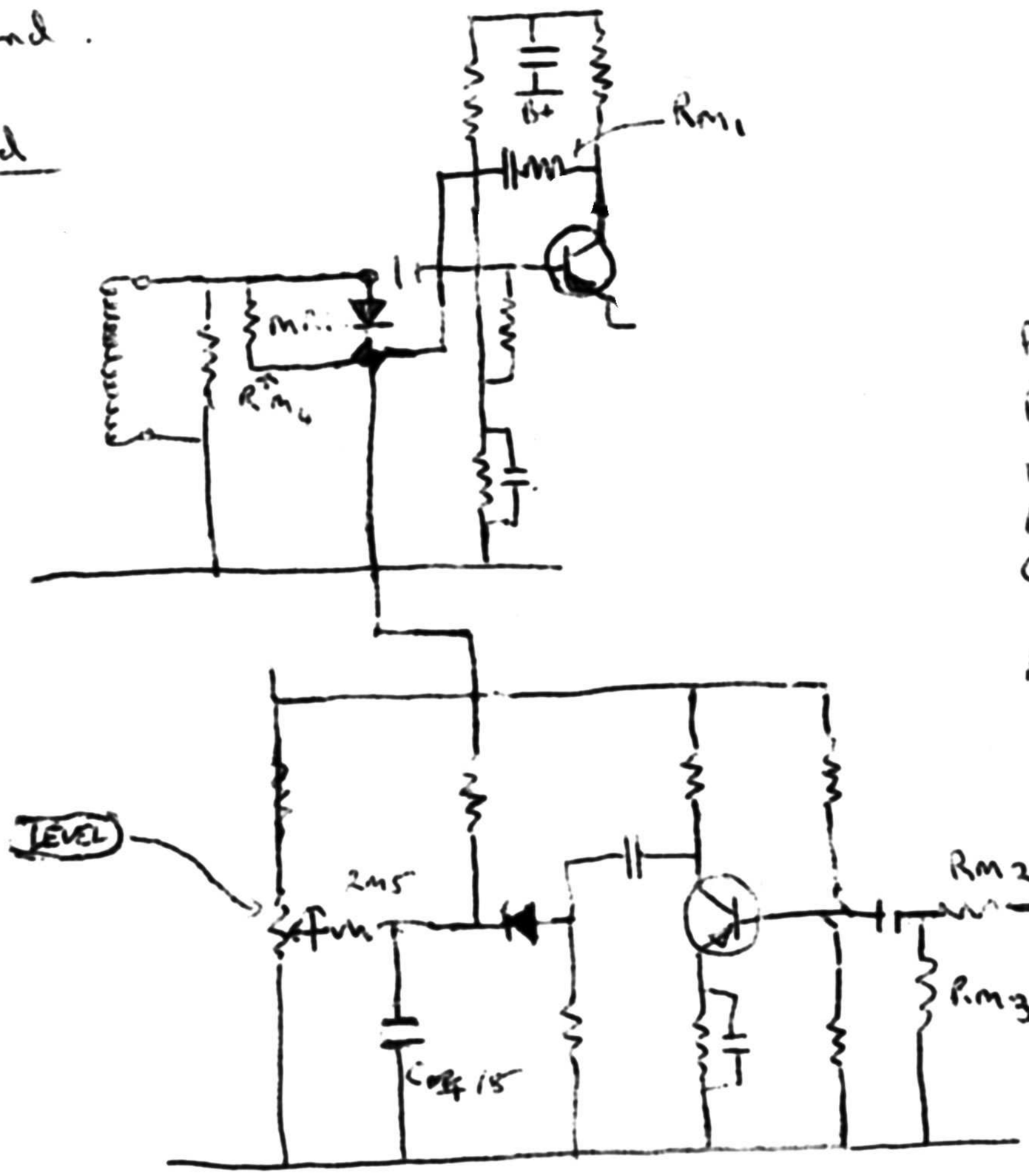
Max counter-clockwise load pt.

Calcd.	-52.	output	20
5	-47	14	+6.
5	-42	14	-8.5.
5.	-37	8.	-16.5
5	-32.	2.	5.
5,			

Modification to T/B amp. 4069

Purpose To give control of T/B level by Programme Sound.

Method

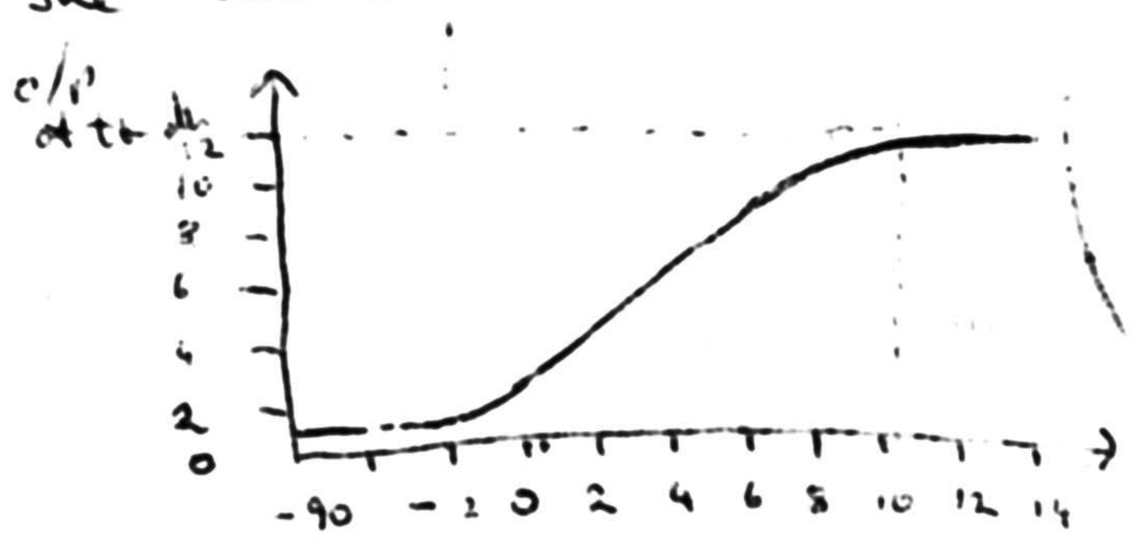


RM_1 = 2·7K.
RM_2 = 150K
RM_3 = 3000
RM_4 = 22K
C off 15 = ~~bbnfd~~ 100 mF 12 vdc.
RM5 = 22K.

If this diagram is compared to the original it will be seen that MR1 has been reversed. R7 & R31 omitted out. R35, R33 C15 removed R_{M1}, R_{M2}, R_{M3}, R_{M4} & RM5 inserted.

The Prog. input to ~~tbbbn~~ is fed into Pin 13 + Pin 7 (Earth)

The conversion loss is as follows.



T.B. input at -60
Prog. input 0
Sound gain 6 odb
Vary Prog from 0 ~~to~~ B

A SHEET No. ..... Date .....

~~ES 110 P.~~
C.V.

		4061		N°	121	Max	Gain					
IN.		Anti clock		Mid		Clock						
-95		-2·5		-2		-2						
-90		+2·0		+2·5		+2·5						
-85		+7·0·		+7·5		+7·5						
-80		+9		+12·5		+12·5						
-75		+10		+17·5		+17·5						
-70		+11		+22·5		+23.						
-65		+12.		+23·5		+26						
-60		+13		+23		+26·5						
-55		+14		+23.		+26·5						
-50		+15·5		+23·5		+26·5						
-45		+17·5		+25·5		+27						
-40		+19·5		+23·5		+27·5						
-35		+22		+25		+27·5						
-30		+24		+25·5		+27·5						
-25		+25		+26·5		+27·5						
-20		+26·5		+27		+27·5						
-15		+27		+27		+27·5						
-10		+27·5		+27		+27·5						
-5		+26?		+27		+27·5						
-0		+27·5		+27·5		+27·5						

4061-
N° 121.

R.S. & A.C.

OUT

+30

CLOCK

MIDWAY

ANTICLOCK

20

10

0

10

20

30

30 40 50 60 70 80 90 100 110