THE QUAD I. AMPLIFIER

INSTALLATION
OPERATION
MAINTENANCE

PRICE: 3/6

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PART I.—INSTALLATION

GENERAL

The Q.U.A.D. amplifier is supplied in two units connected together by a four foot cable with plug and socket. The main amplifier is supplied as standard in chassis form with base plate.

The method of housing will depend upon the application. The quality control unit may, for example, be housed with other equipment, treating the main chassis as a separate unit. Such an arrangement is ideal for lecturers requiring equipment of a completely portable nature.

If the complete equipment is to be housed in a single cabinet, the main chassis may be mounted in any convenient position with the quality control unit let into the cabinet in a position suitable for operation.

The quality control unit is in no way sensitive to interference from other equipment, nor will it itself radiate interference. The relative positions of the main chassis and quality control unit are immaterial.

The main chassis may be fixed in position by means of two 2BA bolts through the base plate. The position for the holes is shown on the template provided with this handbook.

The quality control unit may be fitted to other cases or cabinets of any thickness from $\frac{1}{8}$" to $\frac{7}{8}$". It is only necessary to cut an opening from the template provided. The unit is inserted from the front and will locate automatically. The cover is fitted from the rear and will hold the unit firmly in position.

LOUDSPEAKER CONNECTIONS

The loudspeaker(s) are connected to the terminal strip at the back of the amplifier marked O 7 15 E. A single loudspeaker, or multi-unit loudspeakers with crossover will normally have a nominal impedance of 15 ohms. Connections should be made to 0 and 15 terminals. If two such loudspeakers are used then they should be connected together to terminals 0 and 7. The terminal E enables the equipment to be earthed when an earth point is available.

MAINS CONNECTION

The mains supply (A.C. only) is connected to the main chassis via the two pin plug provided. When the equipment is installed in a cabinet, a separate on/off switch is fitted to the mains cable and the switch itself mounted in a convenient position for operation. A switch is fitted to the main chassis for use when the equipment is portable. This switch should be left ON when the main chassis is installed in a cabinet.

GRAMOPHONE PICKUP CONNECTIONS

Reprint Note : It should be borne in mind that the Quad I Amplifier was designed prior to the introduction of the L.P. record and changes which have taken place since in both gramophone records and pickups will have to be accommodated by fitting, external to the amplifier, suitable selector and matching units.

Two inputs are provided on the quality control unit. These are alternative inputs, selection depending upon the type of pickup used.

Input A is suitable for pickups which are already corrected for recording characteristics or for pickups in which the compensation is effected in a separate circuit on the playing desk. The output from the pickup or separate compensation units should be not more than 0.1 volts. In the very few instances of pickups having a corrected output greater than 0.1 volts it will be necessary to fit a volume control between the pickup and the amplifier input. The value of the volume control should be that recommended by the pickup manufacturer.

It should be possible to turn up the volume to at least position 5 before the amplifier is giving maximum output. If it is not possible to turn up to position 5, then it is an indication that the output from the pickup is too great and a volume control should be fitted.

Input B is intended for constant velocity pickups not corrected for recording characteristics. This includes nearly all lightweight moving coil and moving iron pickups. Low impedance moving coil pickups will be supplied by the makers complete with transformer, which should be fitted between pickup and amplifier.

The signal level applied to input B should lie between 0.04 volts and 0.5 volts. Again, an indication of too great an output from the pickup is the inability to turn volume up to more than position 5 before maximum output is obtained.

The source impedance to input A should not exceed 20,000 ohms at high frequencies or the capacitive correction circuit will not operate.

Pickup connections must be fully screened. The screening itself should be connected to the body of the jack plug provided, with the "live" connection to the jack top connection. It is also usually advisable to connect the metal case of the gramophone motor to the screening or to the common earth point (not both).

RADIO INPUT

The Q.U.A.D./R. radio tuner unit will normally be used with the Q.U.A.D. amplifier since it is designed in a similar style and possesses the highest possible quality characteristics. It plugs directly into input A and provides switching and compensation for gramophone pickups internally.

Should a different make of tuner unit be used then it will be essential to fit a volume control (pre-set) at the output of the tuner unit. This will reduce the signal level the required amount and will also reduce the loop gain through the H.T. decoupling. The preset volume control should be adjusted and left so that maximum output on the amplifier is obtained when the amplifier volume control is set to 10.

Most tuner units designed for wide band amplifiers will have sufficient decoupling but in rare cases it may be necessary to add a further R.C. decoupling circuit in the tuner.

H.T. and L.T. for the tuner may be taken from the four pin socket on the main amplifier. Pins 1 and 2 will provide 6.3 volts C.T. at up to 2 amps. Pin 3 will provide 300 volts H.T. at up to 20 — 25 ma. H.T. negative will be obtained via the screening of the audio signal lead between tuner and quality control unit.

MIC, FILM, TAPE, ETC.

Signals from microphone, film, tape, etc., should be applied to input A. It is only necessary to ensure that maximum signal level lies in the region between 10 mv. and 100 mv., and that the impedance of the source does not exceed 20,000 – 25,000 ohms.

PART II.—OPERATION

This section is intended to ensure that the operator obtains the finest possible performance under all conditions of use. It is essential that the instructions are followed closely and that the more subtle effects of the controls are clearly understood. Time spent initially in obtaining this understanding will be amply repaid in the very high standard of reproduction subsequently achieved.

The equipment should first be set to *controls out*. Under this condition the quality controls will be out of circuit and only the volume control is operative. The signal delivered to the loudspeaker will include everything fed into the amplifier without modification.* If the input signal is of good quality and if the loudspeaker and room acoustics are good, then the aural sound should reach a high order of perfection. If the performance is *consistently* poor with the control switch in this position then there is every indication that some link in the chain—record, pickup, speaker, etc.—is poor or incorrectly adjusted.

The second position of the control switch will bring the bass and treble controls into operation. These controls vary the bass and treble volume balance with respect to middle notes. They are particularly suitable for subtle correction of the room conditions under which the equipment is used.

At first hearing it is sometimes found that an increase in bass and treble response appears to improve certain musical programmes. If these settings are left, it will subsequently be found that speech and other programmes appear larger than life. *This is incorrect compensation.* Quite small alterations to the balance should be all that is required.

When the bass and treble controls are adjusted, the control switch should be returned to *controls out* in order to make sure that the controls are in fact affecting an improvement. This reference to the *Controls out* standard should be periodically repeated over several listening periods with different types of programmes. Eventually a setting will be found which provides an improvement with *each* and *every* type of programme material. The controls

* Other than bass recording compensation from input B.

can now be marked and will not require further alteration unless the position of the loudspeaker is altered or some other external modification is made.

Alteration of the bass and treble settings is sometimes recommended for different volume listening levels as a compensation for the human ear. Since volume level is closely connected with reverberation, such compensation is at least only a compromise.

It must be emphasised that during all the initial adjusting of the bass and treble controls, the inherent quality of the programme should be ignored, i.e. roughness, excessive surface noises, buzzes, discontinuity, distorted sibilants, etc. With other equipment it is necessary to reduce the treble response in order to cover up programme distortion of the type mentioned. This is not the case with the Q.U.A.D. since these distortions are removed with the filters quite independently of treble and bass balance.

It is now necessary to explain the correct use of filters A and B and the filter slope control.

The filters control the extreme harmonic range of the reproduction. All programmes contain distortion to a greater or lesser extent and this distortion increases with the harmonic or overtone range which is reproduced. As one increases the range, therefore, one reaches a point when the extreme harmonics are adding little to the musical content of the programme, yet the distortion which they contain is distressingly audible. One must therefore progressively suppress harmonics above a certain frequency. The progressive reduction in intensity can be gradual or one can reduce them sharply so that up to a certain frequency they are reproduced in full measure after which they are virtually all suppressed. The optimum *rate* of their progressive reduction depends upon the rate at which the inherent programme distortion increases with frequency range.

The frequency at which the reduction of harmonics starts is controlled by filter positions A and B. The rate at which they fall off is controlled by the filter slope control.

It is relevant to mention at this point that the average good quality loudspeaker does not reproduce the extremely high frequencies and they already reduce progressively in some random manner, which may suit certain programmes. The introduction of *very* wide range loudspeakers and the progress towards a closer approach to the original sound makes it essential to control the harmonic attenuation in a more scientific manner.

The operation of the filter switch and filter slope control is very simple. With the filter out, the programme may contain distortions, roughness, excessive surface noise, etc. Switch filter to A and rotate the slope control from *grad* to *sharp* until the reproduction is clean. If the distortion is of a severe type, repeat using filter B.

Assuming a *very* good loudspeaker and pickup, the optimum record reproduction should be obtained with medium to gradual slope, using A or B depending upon the condition of the recording. For radio whistle suppression, the sharp slopes will be required.

The above rather full details of operation will, we believe, assist in obtaining the most subtle adjustment of controls and closest possible approach to the original sound. The following is a brief summary :—

Initial Setting Up

Adjust treble and bass balance to give optimum performance on ALL types of programme.

Normal Use

(1) Adjust volume to suitable level.

(2) If distortion, whistles, roughness is present, switch to A and adjust filter slope for optimum performance.

(3) If distortion is severe, switch to B and adjust filter slope for optimum performance.

PART III—MAINTENANCE

The following tables and diagrams will be of assistance to the service engineer should some fault develop in the equipment.

Any valve or component which is replaced should be of exactly the same type as originally used or recommended by the Manufacturer.

MODIFICATIONS

A. Page 8 — Delete R16.

B. Page 8 — CII removed from present position and inserted between R14 and switch section 2.

C. Page 8 — C20 (0.1 mfd) inserted between centre tap of filter windings and lead from R13 to switch sections 1 and 3.

D. Page 9 — C20 is housed in screening box with L1 and L2.

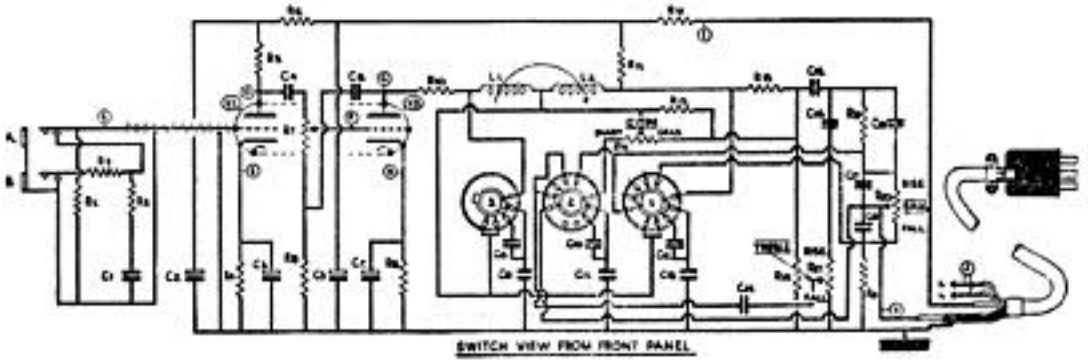
E. Page 10 — C25 (0.5 mfd) inserted between screen grids of V3 and V4.

F. Page 10 — R32 (680,000 ohm 1 watt 10%) inserted connecting screen grid of V3 to H.T.

G. Page 11 — Under Chassis view— R32 inserted on tagboard between R21 and fixing screws, all other components being moved along one position.

H. Page 11 — R21 becomes 680,000 ohm 1 watt 10%
R30 „ 500,000 „ 1 „ „

QUALITY CONTROL UNIT

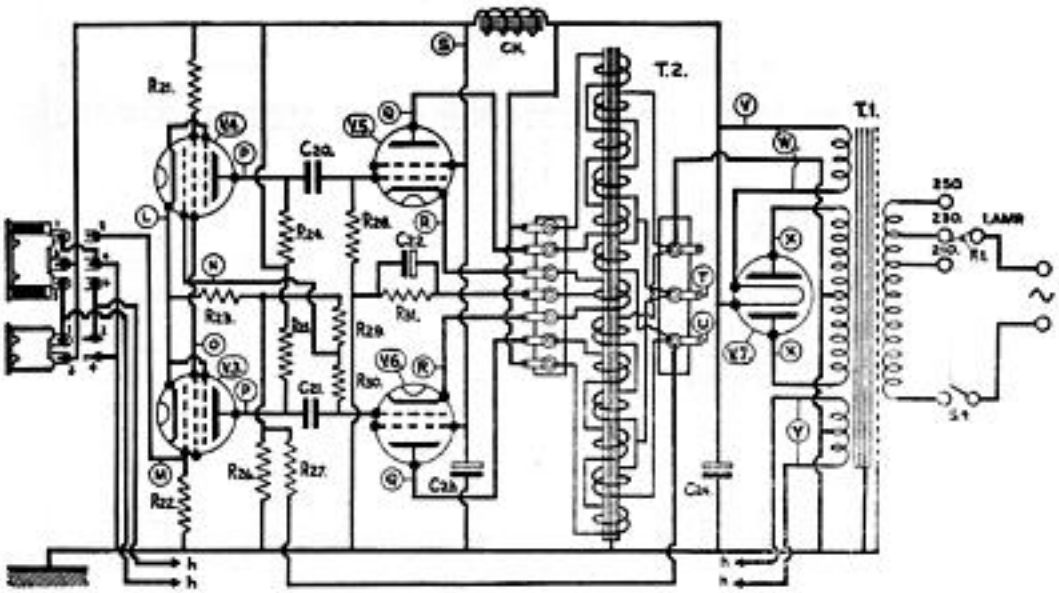


COMPONENTS LIST

R.1	1.5 meghom	¼ watt	10%
R.2	47,000 ohm	¼ watt	10%
R.3	10,000 ohm	¼ watt	10%
R.4	1,500 ohm	½ watt	10%
R.5	180,000 ohm	1 watt	10%
R.6	100,000 ohm	¼ watt	10%
R.7	750,000 ohm	linear	10%
R.8	470,000 ohm	½ watt	10%
R.9	1,000 ohm	½ watt	10%
R.10	10,000 ohm	½ watt	10%
R.11	100,000 ohm	½ watt	10%
R.12	47,000 ohm	½ watt	10%
R.13	270,000 ohm	½ watt	10%
R.14	500,000 ohm	log law	10%
R.15	47,000 ohm	½ watt	10%
R.16	2.2 meghom	½ watt	10%
R.17	500,000 ohm	semi-log	10%
R.18	100,000 ohm	½ watt	10%
R.19	27,000 ohm	½ watt	10%
R.20	500,000 ohm	semi-log	10%
C.1	0.05 mfd	250 v.w.	
C.2	16 mfd	450 v.w.	
C.3	50 mfd	12 v.w.	
C.4	0.25 mfd	350 v.w.	
C.5	16 mfd	450 v.w.	
C.6	0.1 mfd	350 v.w.	
C.7	50 mfd	12 v.w.	
C.8	0.001 mfd	mica	20%
C.9	0.001 mfd	mica	20%
C.10	0.002 mfd	mica	20%
C.11	0.002 mfd	mica	20%
C.12	0.001 mfd	mica	20%
C.13	0.001 mfd	mica	20%
C.14	0.004 mfd	mica	10%
C.15	0.1 mfd	350 v.w.	
C.16	0.0006 mfd	mica	10%
C.17	0.004 mfd	mica	10%
C.18	0.02 mfd	350 v.w.	10%
C.19	100 pf	silver mica	10%
S.1, S.2, S.3	Switch P/No. 661G.		
L.1, L.2	Coupled filter coil unit.		
V.1, V.2	ECC35 double triode.		

Serial Nos. 600 and over:—R.16 omitted and 0.1mfd. 150 V.W. condenser fitted in the centre lead to the filter coils.

THE MAIN CHASSIS



COMPONENTS LIST

R.21	330,000 ohm 1 watt 10%	C.21	0.1 mfd 350 v.w.
R.22	1.5 meghom ½ watt 10%	C.22	25 mfd 25 v.w.
R.23	1,500 ohm 1 watt 10%	C.23	8 mfd 450 v.w.
R.24	180,000 ohm 1 watt 10%	C.24	8 mfd 450 v.w.
R.25	180,000 ohm 1 watt 10%	T.1	Type Q.U.A.D./M.1.
R.26	100 ohm 1 watt 10%	T.2	Type Q.U.A.D./O.1.
R.27	1,500 ohm 1 watt 10%	CH.	Type Q.U.A.D./CH.1.
R.28	680,000 ohm 1 watt 10%	V.3	EF.36, 37 or 37A.
R.29	2,700 ohm 1 watt 10%	V.4	EF.36, 37 or 37A.
R.30	680,000 ohm 1 watt 10%	V.5	K.T.66.
R.31	180 ohm 3 watt 10%	V.6	KT.66.
C.20	0.1 mfd 350 v.w.	V.7	GZ.32 or 5U.4G.

VOLTAGES

Test Point	Static no signal	Audio signal for full output at 700 c/s	Remarks
A	—	0.010 V.rms.	Valve voltmeter
B	—	0.05 V.rms.	Valve voltmeter
C	—	0.010 V.rms.	Valve voltmeter
D	90 V.pos.	0.4 V.rms.	Valve voltmeter
E	1 V.pos.	—	— —
F	—	0.4 V.rms.	Valve voltmeter
G	140 V.pos.	4 V.rms.	Valve voltmeter
H	1.2 V.pos.	—	— —
I	320 V.pos.	—	— —
J	6.3 V.rms.	—	C.T. to chassis
K	—	0.8 V.rms.	Valve voltmeter
L	3 V.pos.	—	— —
M	—	0.8 V.rms.	Valve voltmeter
N	—	0.2 V.rms.	— —
O	60 V.pos.	—	Valve voltmeter
P	100 V.pos.	27 V.rms.	Valve voltmeter
Q	330 V.pos.	105 V.rms.	— —
R	22 V.pos.	10 V.rms.	— —
S	320 V.pos.	—	— —
T	—	9 V.rms.	— —
U	—	13.5 V.rms.	— —
V	340 V.pos.	—	— —
W	5 V.rms.	—	Across winding
X	340 V.rms.	—	— —

NOTE.—All voltages taken with respect to chassis unless otherwise stated

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