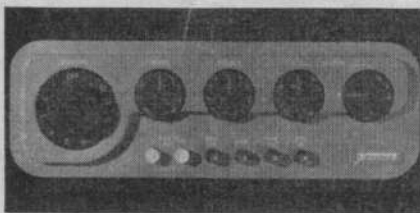


"TRADER" SERVICE SHEET
1427



Front view of the QCII control unit.

AN amplifier using two push-pull stages and giving an output of up to 15W over the range of frequencies between 20c/s and 20kc/s, with a distortion of 0.1 per cent at 700c/s, or 0.25 per cent at 25c/s, is used as the power output unit of the Quad II amplifying system. It is preceded by a 3-stage 2-valve control unit, QCII, that incorporates all the input facilities for the various sources of sound whose output can be amplified by it.

All the technical information necessary for service work on the combined equipment is given in this *Service Sheet*, which was prepared from the second of a series of three versions. The differences between this and the other two versions are described briefly under "Other Versions."

In addition to servicing information, installation instructions are given, including the method of connection to the various input sockets.

Release date and original price: September 1953, QCII control unit £19 10s; Quad II amplifier £22 10s.

CONTROLS

Press-buttons.—The four red press-buttons on the front of the control unit operate switches S3-S6 to provide a combination of six settings to give correct equalization for some 67 makes of records.

Those marked INT LP and INT 78 are used, singly, for all normal requirements. When both INTERNATIONAL buttons are depressed compensation is provided for EUROPEAN LP records. The remaining two red buttons marked COL LP and EUR 78 may be used singly or as a pair to provide a further three equalizing characteristics; they are used together for NAB (pre-1954) recordings. When all the buttons are in their relaxed positions, the unit is still switched for gramophone operation, but with a completely uncompensated response.

The radio/microphone inputs and the H.T. supply to the Radio 1 and 2 power supply sockets are selected by means of the two white press-buttons which operate switches S1 and S2. The buttons are marked 1 and 2 to correspond with the similarly marked input sockets at the rear of the control unit.

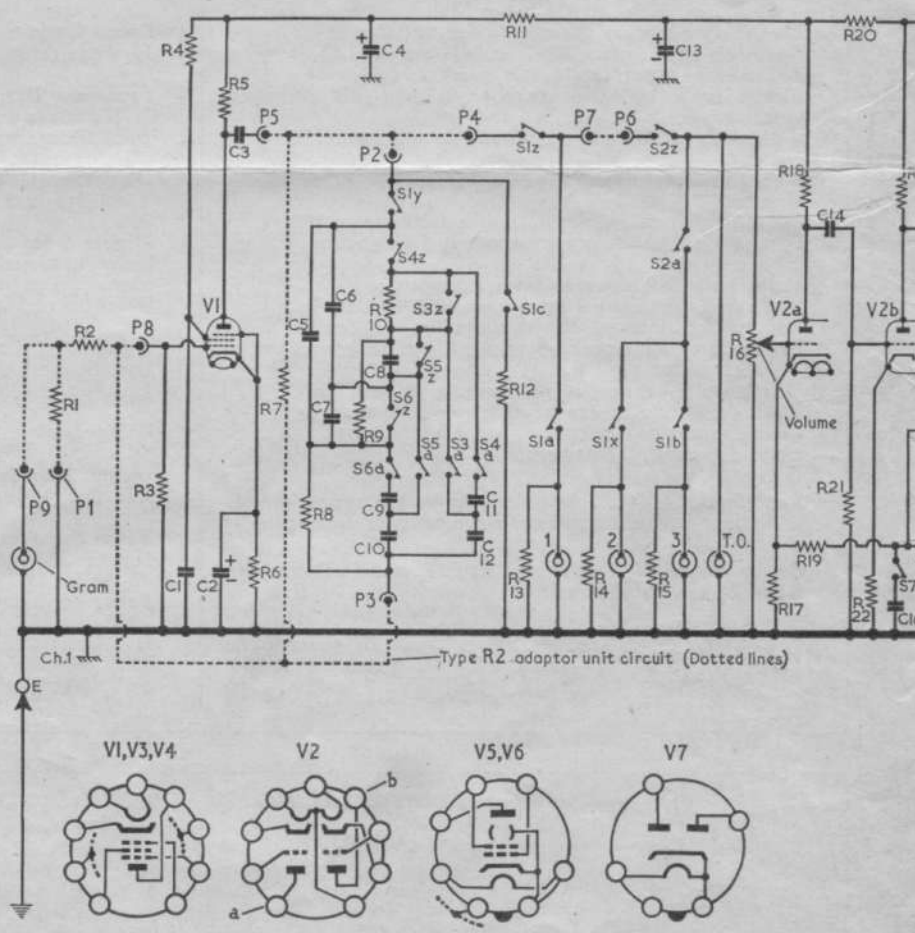
The tape input connected to socket 3

Resistors			Capacitors			Coils*		
R1	270kΩ	†	C1	0.5μF	E4	L1	1,800-0	C2
R2	47kΩ	†	C2	25μF	C2	L2	1,800-0	C2
R3	1.5MΩ	E4	C3	0.1μF	E4	L3	640-0	G5
R4	1.5MΩ	E4	C4	16μF	B2			
R5	270kΩ	E4	C5	390pF	B1			
R6	2.7kΩ	E4	C6	560pF	B1			
R7	6MΩ	†	C7	1,500pF	C1			
R8	270kΩ	C1	C8	390pF	B1			
R9	5.6MΩ	B1	C9	180pF	C1			
R10	3.3MΩ	B1	C10	180pF	B1			
R11	100kΩ	E3	C11	0.001μF	B1			
R12	100kΩ	E4	C12	390pF	B1			
R13	100kΩ	B1	C13	16μF	B2			
R14	100kΩ	B1	C14	0.01μF	D4			
R15	100kΩ	B1	C15	0.1μF	D4			
R16	500kΩ	D3	C16	390pF	C2			
R17	4.7kΩ	D4	C17	16μF	B2			
R18	470kΩ	D3	C18	0.04μF	B2			
R19	10kΩ	B2	C19	0.04μF	B2			
R20	47kΩ	D4	C20	0.001μF	B2			
R21	1.5MΩ	D4	C21	0.01μF	B2			
R22	2.2kΩ	D4	C22	1,500μF	B2			
R23	47kΩ	D4	C23	1,500pF	C2			
R24	150kΩ	B2	C24	0.003μF	C2			
R25	10MΩ	C2						
R26	500kΩ	B2						
R27	750kΩ	B2						
R28	27kΩ	A2						
R29	15kΩ	C2						
R30	100kΩ	C2						
R31	47kΩ	B2						
R32	100kΩ	A2						
R33	1.5MΩ	F5						
R34	1MΩ	F5						
R35	1MΩ	F5						
R36	680Ω	F5						
R37	180kΩ	F5						
R38	180kΩ	F5						
R39	680kΩ	F5						
R40	2.7kΩ	F5						
R41	680kΩ	F5						
R42	180Ω	G5						
R43	470Ω	F5						
R44	100Ω	F5						
R45	220Ω	A2						
C25	0.002μF	C2						
C26	0.25μF	B2						
C27	0.1μF	F5						
C28	0.1μF	G5						
C29	0.1μF	G5						
C30	25μF	G5						
C31	16μF	H5						
C32	16μF	H5						
C33	0.05μF	A2						
L1	1,800-0	C2						
L2	1,800-0	C2						
L3	640-0	G5						
T1	a 170-0	F5						
	b 30-0							
	c 120-0							
T2	d —	H5						
	e —							
	f —							
	g —							
F1	—	2A	H5					
S1-S3	—	—	D3					
S4-S6	—	—	E3					
S7-S15	—	—	C2					
S16	—	—	A2					

*Approximate D.C. resistance in ohms.

†Located in adaptor unit.

If component numbers in these tables are used when ordering spares, the fact should be mentioned on the order, as these numbers may differ from those used by the manufacturer.



Circuit diagram of the QCII control unit and Quad II amplifier. The input circuit may be varied by dotted lines. The pins are numbered P1 to P9, clockwise, as seen with...

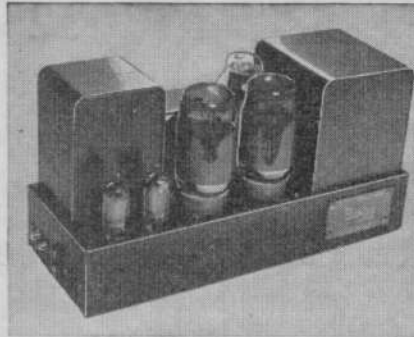
QUAD II AMPLIFIER & QCII CONTROL UNIT

For Use on A.C. Mains Supply

is selected by pressing both white buttons simultaneously. This automatically disconnects the other inputs, but it should be noted that the H.T. supply is still made to the Radio 2 power supplies socket.

Bass and Treble Controls.—The continuously variable bass and treble controls are designed to obtain correct musical balance to suit the environment in which the equipment may be used. A level response with virtually no error is provided by setting the controls to the centres of their travel. The curves in col. 8 overleaf show the responses provided by the controls.

Filter Controls.—The filter affects the extreme harmonic range only and is completely independent of the treble control. The filter is used to remove record surface noise, record tracing distortion, and whistles on radio, etc.



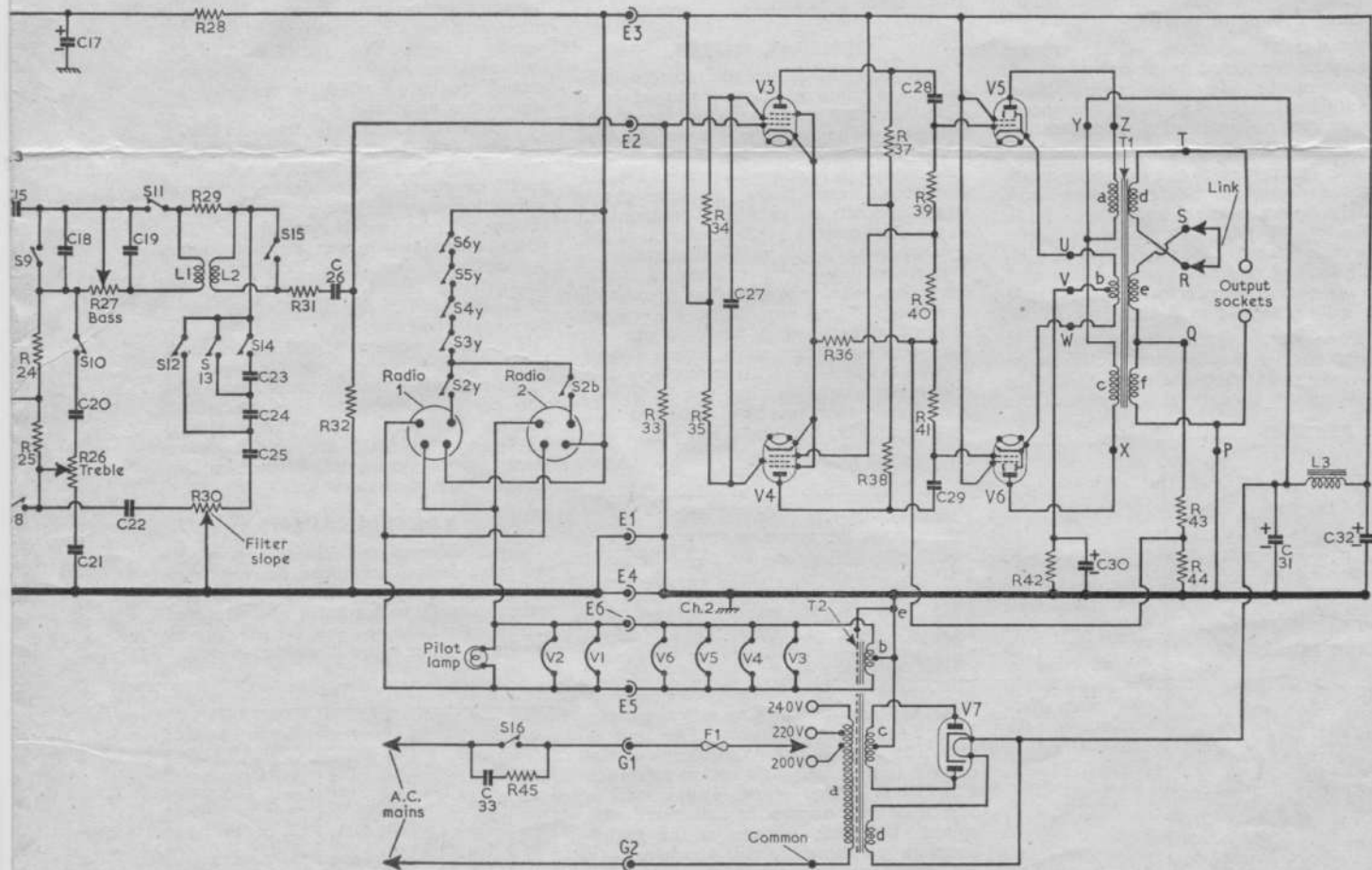
Appearance of the Quad II main amplifier showing, at the left-hand end, the A.C. power supply plug G, the output sockets, and the inter-chassis socket E. The output transformer stands at the left-hand end and the power transformer at the right.

The continuously variable filter control R30 determines the slope or sharpness of cut-off by the filter and may be varied from the "Level" position, where it is non-effective, to the -50 position where it is cutting sharply at a rate of 50dB per octave, as shown by the filter curve in col. 7 overleaf.

The filter switch S7-S15 is marked "Cancel," 10K, 7K and 5K. The 10K, 7K and 5K positions determine the frequency at which the filter starts to reduce the harmonic content of the programme material.

The 10K position is used for correcting slight imperfections in high quality transmissions due to phase effect at the microphone, etc., and usually requires a slope control setting of between 5 and 20dB per octave.

The 7K position is used for correcting tracing distortion on good quality records,



by the use of 9-pin, plug-in adaptor units (see col. 9). Our diagram includes adaptor unit R2, and the part of the circuit contained in the unit is represented on looking at their free ends. The use of the link between S and R on the output transformer T1 is explained in col. 4 overleaf.

Adaptor Unit Table

Adaptor unit	Pickup input sensitivity for 12W output	Load resistance presented by amplifier
R1 or M1	8mV	25kΩ
†R2 or M2	16mV	50kΩ
R6 or M6	5mV	10kΩ
R7 or M7	4mV	100kΩ
R8 or M8	10mV	680kΩ
R10 or M10	100mV	100kΩ
R12 or M12	750mV	2·2MΩ*

†Adaptor Unit Type R2 is supplied as standard on U.K. models.
*100pF in series.

hiss or record surface noise, or bad microphone effects. This position usually requires a slope control setting of between 5 and 15dB per octave.

The 5K position is used for older recordings and usually requires a slope control setting of between 5 and 50dB per octave.

In the "Cancel" position, the bass and treble controls and filters, including the 20Kc/s filter, are out of circuit, thus giving a level response (other than record compensation if in use) from 20c/s to 60Kc/s. The coupling cable forms part of the circuit and should not be altered.

PICKUP ADAPTOR UNITS

Each pickup adaptor consists of a small 9-pin unit which is plugged into socket P

Recommended Adaptor Units To Be Used With Specific Pickups

Manufacturer	Type	Adaptor Unit
Acos	GP19 and 20	R.10 or M.10 ¹
Acos	HGP 39-1	R.12 or M.12 ¹
Audax	Polyphase	R.2 or M.2 ²
Clarkston ..	—	R.2 or M.2 ²
Collaro	Studio P or PX	R.10 or M.10 ¹
Connoisseur ..	400Ω	R.2 or M.2 ²
Connoisseur ..	25Ω	R.1 or M.1 ¹
Decca	A or B	R.1 or M.1 ¹
Decca	C or D	R.2 or M.2 ²
Decca	HD 90Ω	R.1 or M.1 ¹
Decca	HD 1600Ω	R.2 or M.2 ²
Elac-Miratwin ..	MST-2	R.7 or M.7 ¹
E.M.G.	M.C.	R.6 or M.6 ¹
E.M.I.	12, 13, 14	R.10 or M.10 ¹
E.M.I.	17	R.2 or M.2 ²
E.S.L.	See Ortofon	—
Expert	M.C.	R.2 or M.2 ²
Fairchild	—	R.2 or M.2 ²
Garrard	GC2	R.12 or M.12 ¹
Garrard	GMC-5	R.8 or M.8 ²
Gen. Electric(US)	VR	{ R.6 or M.6 ¹ R.1 or M.1 ¹
Goldring	500 or 600	R.7 or M.7 ¹
Leak	Mk. I	R.6 or M.6 ¹
Leak	Mk. II	R.2 or M.2 ²
Lowther	M.C.	R.6 or M.6 ¹
Lowther	M.C.	R.2 or M.2 ²
Ortofon	C	R.1 or M.1 ¹
Ortofon	C	R.10 or M.10 ¹
Philips	AG 3021	R.7 or M.7 ¹
Pickering	Fluxvalve	R.1 or M.1 ¹
R.C.A.	8 pole	R.2 or M.2 ²
Ronette	284-P	R.10 or M.10 ¹
Shure	M-16	R.6 or M.6 ¹
Tannoy	Vari reluctance	R.7 or M.7 ¹
Weather ²	MM-1 or MM-5	R.1 or M.1 ¹

¹Direct connection.
²Via makers' 100: 1 transformer.
³Via makers' transformer.
⁴Via makers' transformer No. 384.
⁵Via makers' transformer No. 6631.
⁶Using magnetic output from Weathers' pre-amplifier.

at the rear of the control unit (location reference C1). The purpose of these units is twofold: firstly, they provide means of adapting the input circuits of the control unit so that it may be used with any one of a variety of pickups; and secondly, they modify the circuitry at input socket 1 to provide for either a radio or microphone input.

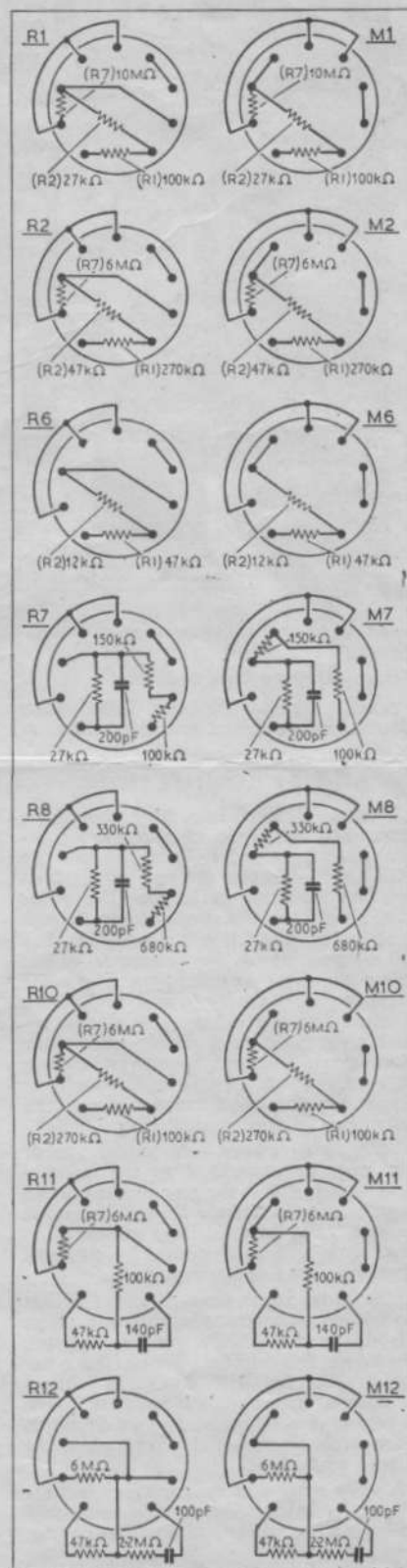
The various adaptors available are each identified by a letter M or R and a numeral, e.g., M1, R1, etc. Adaptors with the letter M are used when a microphone input is required, while those with the letter R provide for a second radio input. The numeral associated with the letter M or R, e.g., M1, R2, etc., identifies the unit for use with a specific pickup.

A list of adaptor units recommended by the manufacturer for specific pickups is shown below. This list is not exhaustive, but where a pickup is not shown on the list, a suitable adaptor unit may be chosen from the table shown in col. 7, provided that the pickup output and minimum resistance into which it should work are known. Where a pickup is designed for use with a transformer, the output and minimum resistance are those at the transformer secondary.

Each control unit is provided with an R2 adaptor unit which is designed to suit most velocity pickups and to provide two (Continued overleaf col. 1)

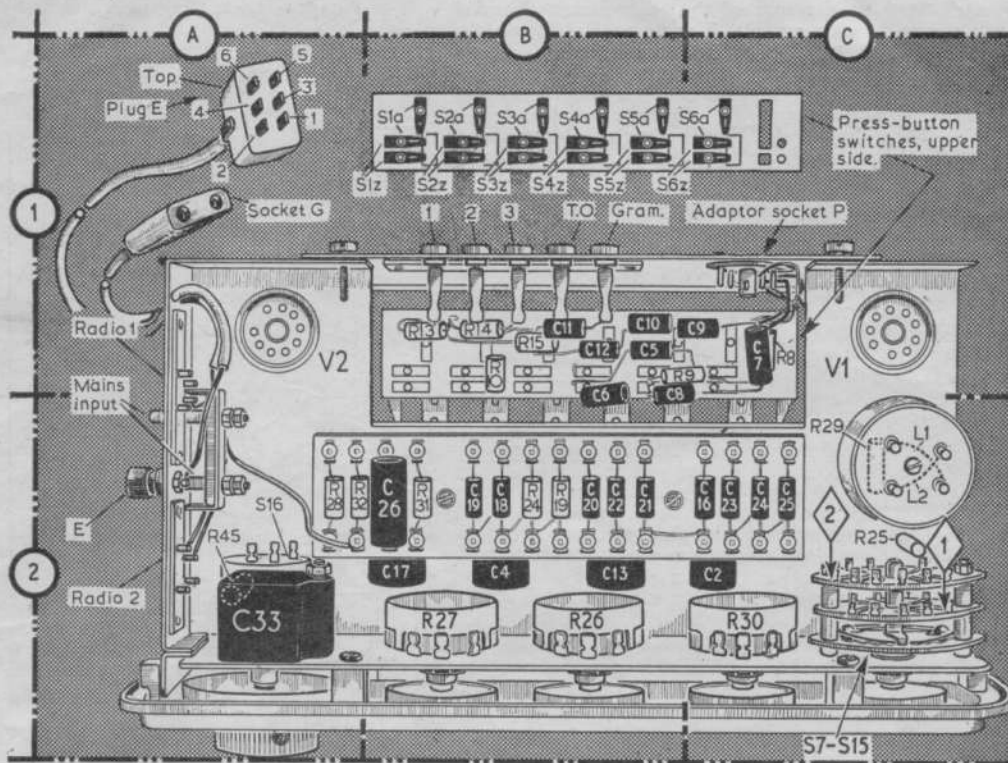
Adaptor Unit Diagrams and Component Values

Resistors (R1), (R2) and (R7) are connected to the same pins as those with similar numbers in our circuit diagram.



Right: Diagram of the 9-pin pickup adaptor units drawn as seen when viewed from the free ends of the pins. Adaptor unit R2 is supplied as standard and this is the one whose connections and components are shown (dotted lines) in the circuit diagram on this page. In the circuit diagram the pins are numbered P1 to P9 and may be identified in the adaptor unit diagrams by counting clockwise as for a 9-pin valve. A description of the use of these adaptors is given at the top of this col.

Left: The table lists a number of high fidelity pickups in use and indicates the type of adaptor unit which should be used in each case. To match a pickup which is not listed, reference should be made to the table at the top of col. 7.



Plan view of the control unit chassis together with a detailed diagram of the press-button switch contacts drawn as seen in this view of the chassis. The contacts on the reverse side of the switch unit are identified in the underside view of the chassis in cols. 4 and 5. The contacts on the rotary filter switch S7-S15 are identified in the switch diagrams shown at the foot of col. 4. The pins of the audio and power supply plug (plug E) are numbered to correspond with the connections shown in the circuit diagram overleaf.

Pickup Adaptor Units—contd.

alternative radio inputs. The other adaptor units referred to are available as extras.

SOCKET CONNECTIONS

Pickup.—The pickup lead should be terminated with one of the special co-axial plugs provided and plugged into the "GRAM" socket at the rear of the control unit (location reference B1). The inner conductor of a single screened pickup lead or the "live" conductor of a twisted pair should be connected to the centre pin of the co-axial plug. The outer screening or "earthy" lead should be connected to the outer shell of the co-axial plug. Where a pickup uses three connections, live, earthy and screening, the earthy and screening leads should be joined together and connected to the outer shell of the co-axial plug.

Radio/Microphone.—A radio tuner unit may be connected to the co-axial socket marked 2 at the rear of the control unit (location reference B1). The socket marked 1 may be used for a second radio tuner unit or a microphone by choosing the appropriate adaptor unit.

The radio tuner unit at either socket should have an output within the range 0.1-0.5V r.m.s. (0.25V r.m.s. optimum) to provide full output. Where the tuner output exceeds 0.5V r.m.s., it should be reduced to within the specified limits by means of a potential divider circuit in order to obtain reasonable settings of the volume control.

A wide variety of microphones is suitable for use with this amplifier, since only 1.5V r.m.s. is required to give full output.

The QCII control unit imposes a load

of 100kΩ across the tuner or microphone outputs.

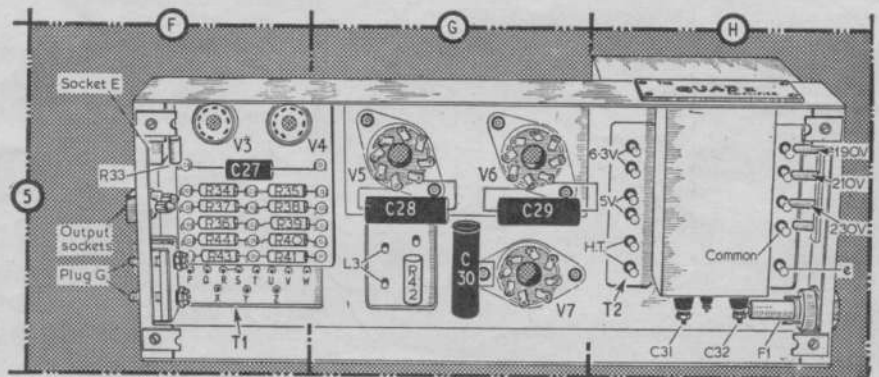
Tape Recorder.—Two sockets are provided (location reference B1) for the connection of a complete tape recorder. The output to the recorder may be taken from the socket marked T.O. via a co-axial cable, while socket 3 may be used for tape playback. The maximum length of co-axial cable used is determined by its self-capacitance, which should not exceed 200pF (e.g., 4 feet of 50pF/foot cable). The input resistance of the recorder should not exceed 500kΩ, and its output should be within the range 0.1-0.5V.

Earth Connections.—Only one connection in the whole equipment should be connected to "earth," and a terminal (location reference A2) marked "E" is provided on the control unit for this purpose. The gramophone motor casing and any other metallic components or screening on the gramophone unit should all be

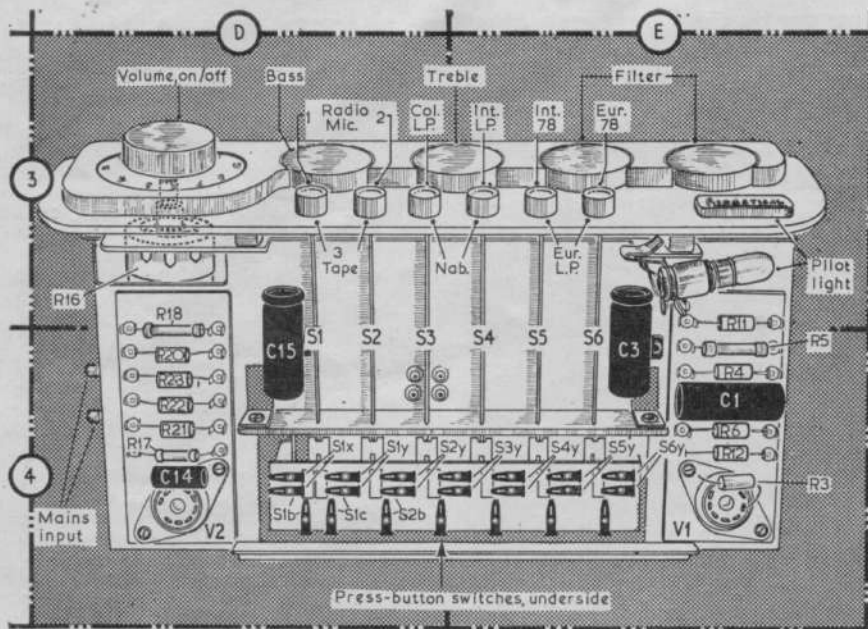
connected to the pickup earth or screening connection (outer shell on co-axial pickup plug). Some of the cheaper pickup arms are not effectively screened, in which case it may be found necessary to earth all metal parts, including locks, hinges, etc., on the record playing unit. Metallic pickup arms which are not earthed should be connected to the outer shell of the co-axial pickup plug.

Tuner Power Supplies.—Two 4-pin sockets marked RAD. 1 and RAD. 2 are mounted on the side of the control unit (location references A1, A2). These sockets provide L.T. and switched H.T. supplies for the operation of tuner units which do not contain their own power supplies. The sockets are shown in our circuit diagram overleaf where they are drawn as seen when viewed from the outside of an upright chassis.

The maximum power available from the tuner unit sockets Rad. 1 and Rad. 2



Underside view of the main amplifier.



Underside view of the control unit chassis.

is: H.T. 330V, 35mA (each tuner) and L.T. 6.3V, 3A (total). The heater supply is centre-tapped to chassis.

Speaker Connections.—The speaker should be connected to the pair of output sockets on the side of the main amplifier (location reference F5), using the special low contact resistance plugs supplied with the equipment.

The speaker, or in the case of a multi-speaker system, the cross-over unit, should have a nominal impedance of 15Ω (covering 12-20Ω). Provision is made, however, for connection to a load of 4-8Ω by removing the link between R and S on the output transformer T1, and linking instead Q to R and S to T.

When the speaker leads are reasonably short, thin flex may be used, but if longer runs are used, then the cable should be thick enough to present a resistance not

greater than about 10 per cent of the loudspeaker impedance.

GENERAL NOTES

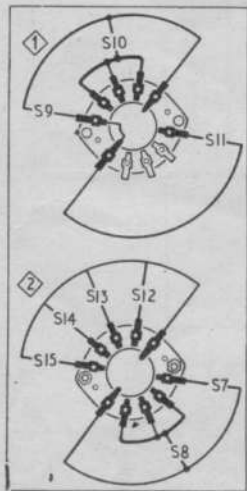
Switches.—S1-S6 are the record equalization switches which are ganged in a slide-type unit and actuated by press-buttons. The unit is shown in our underside and plan views of the control unit chassis in location references D4, E4 and B1, C1 respectively. As some of the switch contacts are hidden by components in the plan view, a separate sketch of the contacts is included in this illustration.

Each switch number bears a suffix letter, e.g., S1a, S6y, etc., that permits its operation to be seen from the circuit diagram. When a given button is pressed, the switches bearing suffix letters a, b or c close, while those with letters x, y or z open. For example, when the S1 button is pressed, switches S1a, S1b and S1c close, and S1x, S1y and S1z open.

Switch Table

Switches	Cancel	10K	7K	5K
S7 ..	C	—	—	—
S8 ..	C	C	C	C
S9 ..	C	—	—	—
S10 ..	—	C	C	C
S11 ..	C	—	—	—
S12 ..	—	—	—	C
S13 ..	—	—	C	—
S14 ..	—	C	—	—
S15 ..	C	—	—	—

S7-S15 are the filter switches, ganged in a 2-section rotary unit. The unit is shown in our plan view illustration of the control unit chassis in location reference C2. Each section of the switch unit is identified by a number in a diamond surround. Detailed diagrams of the switch contacts are shown in col. 4, where they are drawn as seen when viewed in the direction of the arrows in the chassis



Diagrams of the filter switch units drawn as seen when viewed in the direction of the arrows in the plan view illustration of the control unit.

illustration. The associated table shows the switch operations for the four control settings, starting from the fully anticlockwise position of the control knob. A dash indicates open and C closed.

Other Amplifiers.—If the QCII control unit is to be used with another make of main amplifier the following requirements should be checked.

1.—The H.T. voltage applied to the QCII control unit should never exceed 450V D.C. even during the initial warming up periods.

2.—The audio output from the control unit is between 1 and 2V r.m.s. and the main amplifier should be capable of giving full output with this input.

3.—The main amplifier should not provide a load across the control unit output of less than 500kΩ.

4.—The connections to the 6-pin miniature Jones plug (plug E) are as follows: pin 1, earth; pin 2, audio output; pin 3, H.T. 330V D.C. (450V D.C. maximum); pin 4, earth; pins 5 and 6, 6.3V A.C. These pins are identified in our plan view illustration of the control unit in location reference A1, where they are numbered to correspond with the numbering in the circuit diagram overleaf.

OTHER VERSIONS

Three versions of the QCII control unit have been produced, and the one that formed the sample from which this Service Sheet was prepared was the second version. The control unit of the earlier version was similar in all respects except that it included no provision for connection to a tape recorder.

That version had only three sockets at the rear, and these were marked "Radio 1"; "Radio 2"; and "Gram." Radio 1 could be converted for use as a microphone input by the use of an "M" type pickup adaptor, as on our sample. The press-button switch unit was, of course, appropriately simplified. Very early productions of the first version used an ECC81 instead of the ECC83, but only a very small number were made.

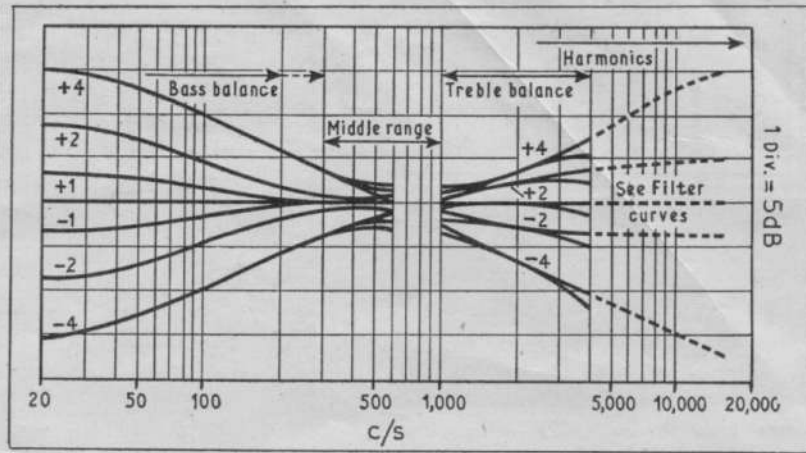
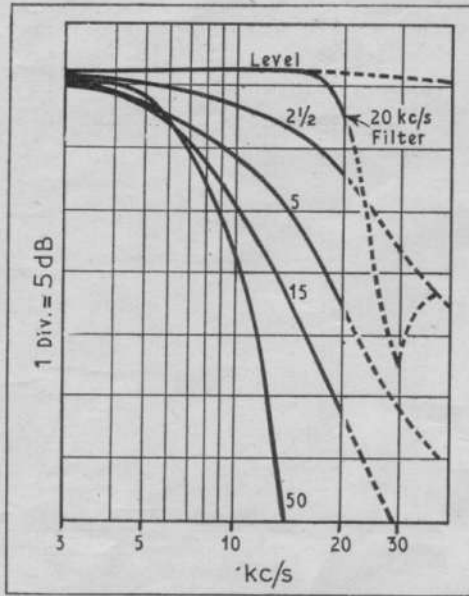
The third version of the control unit is identified with our sample with the single exception, that the record equalization press-buttons have been reshuffled, and in that version the "International LP" and "RIAA" are on the same button, with corresponding modifications to the other characteristics.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' information. Voltages were measured with a valve voltmeter and allowance should be made for the current drawn by other types of meter.

Valve Table

Valve	Anode		Screen		Cath.
	V	mA	V	mA	
V1 EF86	60	0.45	55	0.1	1.7
V2 ECC83	120	0.25	—	—	1.25
	240	1.0	—	—	2.2
V3 EF86	115	1.2	110	0.22	2.2
V4 EF86					
V5 KT66	330	65.0	330	7.0	26.0
V6 KT66					
V7 GZ32	310	—	—	—	340.0



Above: Response curves showing the slopes provided by the continuously variable bass and treble controls.

Left: Curves showing the range of the 7kc/s filter continuously variable from level to 50dB/octave. The figures adjacent to each curve show the approximate dial settings. The 5kc/s and 10kc/s filters provide similar curves one half octave up or down.

SPECIFICATIONS OF THE QCII CONTROL UNIT AND QUAD II AMPLIFIER

CONTROL UNIT

Frequency Response (filter switched to "Cancel"):
Radio & Tape inputs: 20-20,000c/s within 1dB.
Microphone input: 20-18,000c/s within 1dB.
Pickup input with R2 adaptor: Within 1dB of stated characteristics.
With other pickup adaptor units: No significant change.

Bass and Treble controls: Within 1dB of curves shown above.
Filter frequencies: 5kc/s, 7kc/s and 10kc/s, ± 250 c/s.
Filter slope: Level to approximately 50dB/octave.

Input Sensitivities (for 1.4V r.m.s. output):
Radio & Tape (internal impedance 100k Ω): 100mV.
Microphone (internal impedance 100k Ω): 1.5mV.
Pickup (depending on adaptor unit): See table overleaf.

Distortion (1.4V output, all controls set to "Level"):
Radio or R2 pickup input: 0.02 per cent approx.
Least favourable arrangement of adaptor plugs and controls: Less than 0.1 per cent.

Background: -70dB, or where applicable approximately 6dB above equivalent thermal noise or input impedance.

Power Supply: The unit takes its L.T. and H.T. supplies from the main amplifier.

H.T. 330V, 2mA }
L.T. 6.3V, 1mA } Plus power taken by tuner units which may be connected to the Radio 1 and Radio 2 sockets.

MAIN AMPLIFIER

Power Output:
15 watts throughout the range 20-20,000c/s.

Frequency Response:
20-20,000c/s within 0.2dB.
10-50,000c/s within 0.5dB.

Distortion (measured at 12W output):
Total 3rd and higher order: Less than 0.1 per cent at 700c/s.
Higher order alone: Less than 0.03 per cent at 700c/s.
Valve mismatching up to 25 per cent (introducing 2nd harmonic) not to cause distortion to exceed 0.18 per cent.
Total distortion at 25c/s not to exceed 0.25 per cent.

Input:
Sensitivity: 1.4V r.m.s. for 15W output.
Load imposed on input 1.5M Ω in parallel with 10pF.

Background: -80dB referred to 15W.

Output Impedances: 15 Ω and 7 Ω .
Effective output resistance: 1.5 Ω for 15 Ω output.

Power Supplies:
Input: 200-250V A.C. single phase (or 100-130V A.C.) 40-80c/s.
Power consumption (excluding control unit, tuners, etc.): 90W.
H.T. and L.T. supplies available for external equipment: 330V, 40mA.
6.3V, 4A (heater centre-tapped to chassis).

ADDITIONAL NOTES AND MODIFICATIONS