

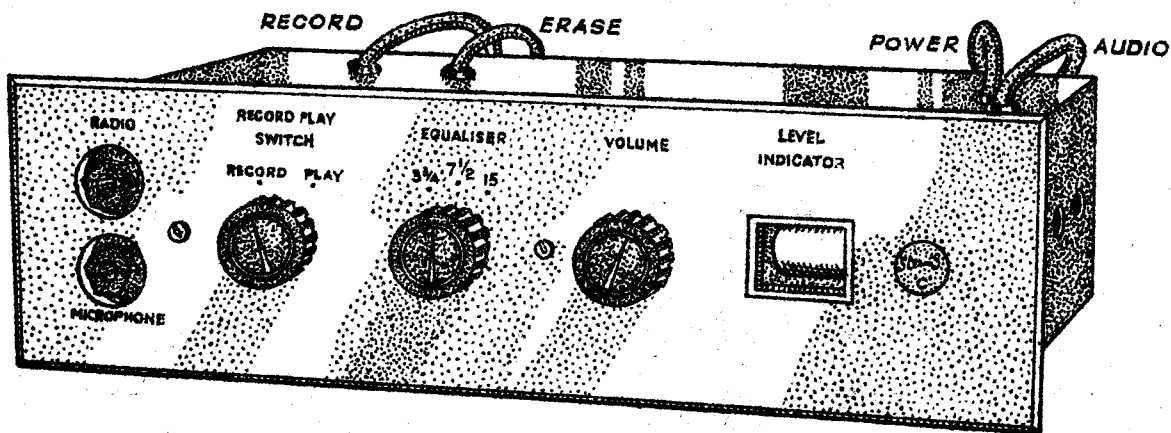
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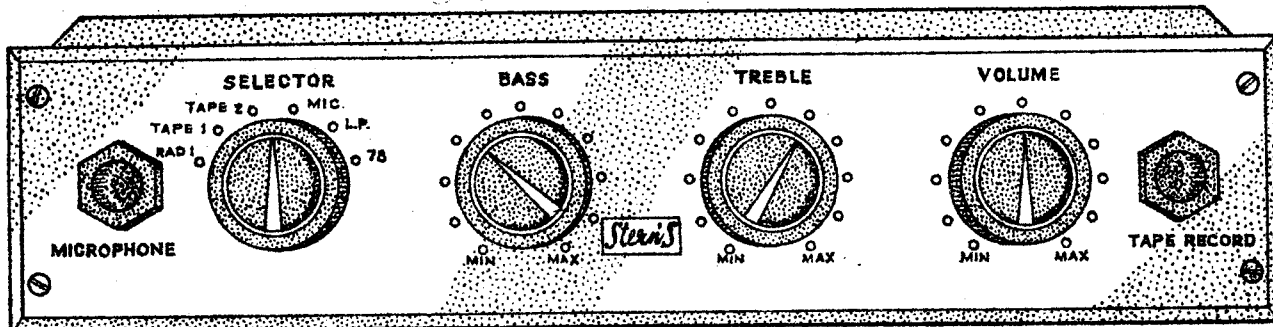
COMPLETE ASSEMBLY DATA and DIAGRAMS FOR
THE CONSTRUCTION OF A

HIGH FIDELITY TAPE PRE-AMPLIFIER TYPE "C"

- ⊙ BASED ENTIRELY ON THE LATEST MULLARD TYPE "C" DESIGN
- ⊙ FERROXCUBE POT CORE INDUCTOR FOR TREBLE EQUALISATION
- ⊙ FERROXCUBE TRANSFORMER INCORPORATED IN A SPECIAL
PUSH PULL OSCILLATOR
- ⊙ SIMPLE MATCHING FOR USE WITH THE MAJORITY OF
COMMERCIAL TAPE DECKS
- ⊙ INPUT JACKS FOR MICROPHONE - PICK UP - RADIO - V.H.F. -
CRYSTAL JACKS - ETC.
- ⊙ OUTPUT ADJUSTABLE TO DRIVE MOST HIGH QUALITY REPLAY
SYSTEMS

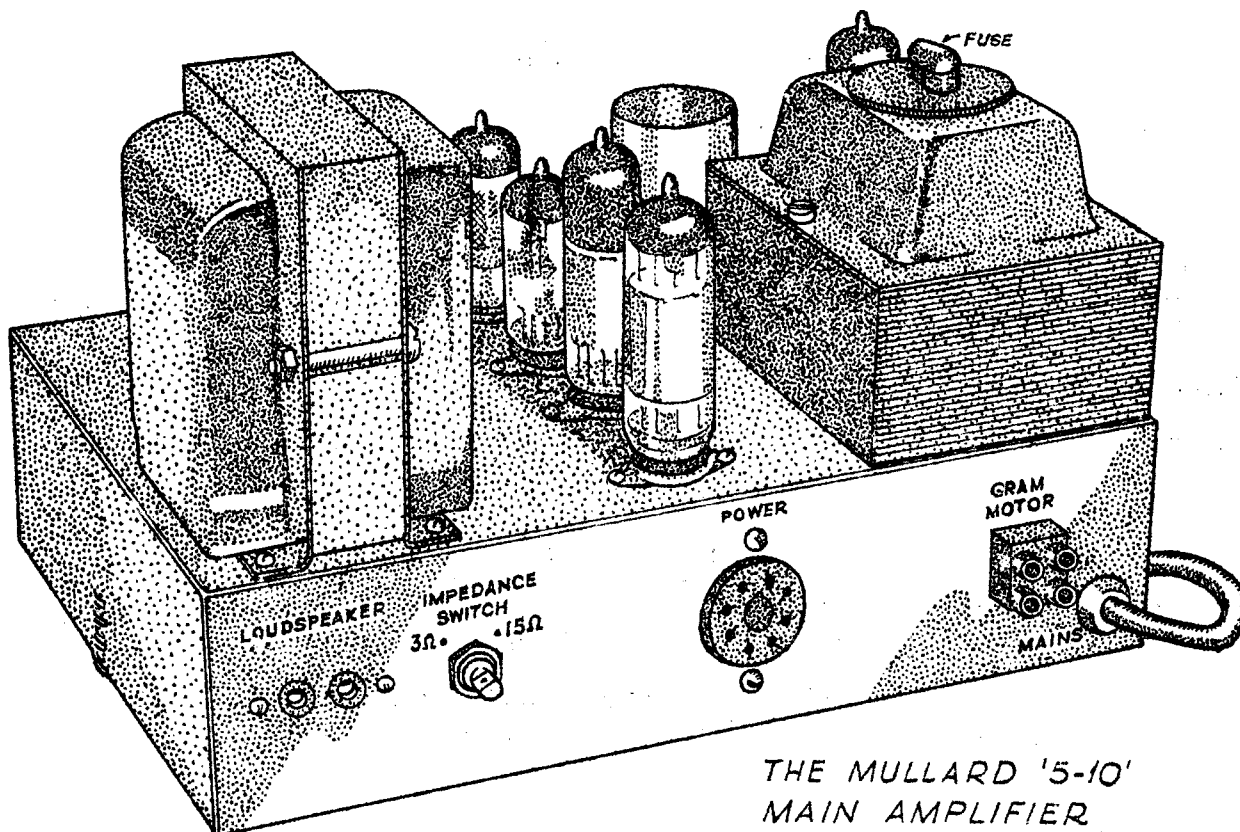


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THE MULLARD 2 VALVE PRE-AMPLIFIER CONTROL UNIT

AVAILABLE ASSEMBLED AND TESTED FOR _____ £8.0.0.
 OR COMPLETE KIT OF PARTS _____ £6.6.0.



THE MULLARD '5-10'
 MAIN AMPLIFIER

AVAILABLE ASSEMBLED AND TESTED FOR _____ £11.10.0.
 OR COMPLETE KIT OF PARTS _____ £10.0.0.

Introduction ...

This High Fidelity tape Pre-amplifier Type 'C' is based on a design by Mullard Laboratories. It is intended to be used in conjunction with a high quality replay system, such as the Mullard 510 and 2 Valve Pre-amplifier, but it is in no way limited to the Mullard units, as the Type 'C' will form the 'LINK' between any good class tape deck and domestic sound installation. The unit combines the function of both recording and playback amplification, although in the playback operation it acts only as an equalising stage giving sufficient output to drive a high quality amplifying system.

Equalisation to correct for head and tape characteristics is provided for the tape speeds of $3\frac{3}{4}$ - $7\frac{1}{2}$ and 15 inches per second. High frequency (Treble) equalisation is applied during the recording process and the low frequency (Bass) during playback. Treble equalisation is achieved by means of a resonant circuit between the first and second stages of the amplifier. The latest Ferroxcube pot core inductor is used, giving the advantage of being adequately screened to prevent excessive hum or stray bias being picked up. Bass equalisation is by means of selective feedback arranged for the three tape speeds.

The playback characteristic of the amplifier conforms to the specification of the International Radio Consultative Committee (C.C.I.R.) thus permitting excellent reproduction of commercial pre-recorded tapes. The recording characteristic is arranged to give a flat response in conjunction with the playback curve.

A special push pull oscillator circuit utilising a Ferroxcube transformer with a tapped secondary, ensures that the Pre-amplifier can be accurately matched to the majority of the best grade tape heads available.

The layout and the easy to follow stage by stage drawings have been made very simple, so that even the semi-experienced constructor can successfully complete the assembly, and be assured of really first class results, which will only be limited by the grade of tape deck used, and to a lesser degree the tape itself.

Building The Pre-Amplifier ...

The drawings give simple stage by stage instructions for assembly and wiring the Amplifier. No difficulty will be experienced by the home constructor if these are followed precisely and in the sequence given, provided all components are exactly as specified.

We ask all constructors to carefully study each diagram and relative written data before commencing the wiring, and to ensure that each connection is effected with a neat and positive solder joint. The wiring must be positioned precisely as shown in the practical diagrams, this will avoid the possibility of instability that may result from indifferent wiring.

Tools ...

The main requirements are a SMALL Soldering Iron of the instrument type - a screwdriver - a small pair of pliers or strong tweezers - and a pair of side cutters, a reel of 18 swg Ersin Multicore cored solder.

Components ...

The wire ends of Condensers and Resistors should be trimmed to the required length by first arranging the component in its approximately correct position, bending the leads as necessary and cutting them at the proper point, allowing of course sufficient wire to make the solder joint. Sleeving should be used wherever necessary to prevent shorting to other components.

It is important that all components and wiring are positioned as shown in the diagrams. Always observe the polarity with **Electrolytic**

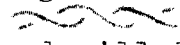
Condensers. The black ring round one end of some paper Condensers indicates Outside Foil and should be treated as the 'earthy end'.

Soldering ...

It is most important to ensure good solder joints. We recommend therefore that an electric Soldering Iron of the instrument small type be used, this is necessary for ease of soldering the small components, particularly valve sockets and tag boards. Use a good flux-cored solder, such as Ersine Multicore 18 s.w.g. The best method is where possible to first secure the component or wire to the tag so that it will remain in position without having to hold it, and then lay the point of the solder over the joint and apply the tip of the iron on top. The Iron must never be applied for longer than is necessary to secure a good joint, otherwise overheating of the component or plastic wire will cause damage. Too much solder should be avoided, as it will run down the tag and possibly form a short circuit to an adjacent tag, this can very easily happen when soldering the valve sockets, as the pins are spaced very close to one another. If the solder does not run easily, the tag or wire should be lightly scraped with a small blade, and then the cleaned part should be well 'tinned' before actually being soldered to its appropriate connecting point. This applies particularly to the high stability resistors or components that have become 'dirty'. Remember that the golden rule for soldering is to ensure that the wires to be soldered must be clean and then if the two surfaces to be joined are heated simultaneously and good cored solder used, a perfect electrical joint will result.

General ...

Keep a continuous watch on the stage wiring and instructions and always check each stage very carefully before proceeding to the next - it will be much easier to trace an incorrect connection in this way than having to fault find when the Amplifier has been completed.

It will be observed that as the stage by stage wiring progresses the wiring shown in the previous stage has been omitted for clarity. The heater wiring and any wires carrying A.C. must be lightly twisted together to avoid hum radiation, such wiring is indicated on the drawing thus  the wire supplied for the heater wiring is thin green plastic, and will lend itself very readily to the purpose.

Tinned copper wire is supplied for the main wiring and this should be bent and cut, and then sleeved before fitting into the chassis. The four core Plastic Wire for the power connection must be soldered carefully and attention given to rapid soldering to avoid overheating and damage to the plastic insulation.

Wiring shown dotted - - - - - on drawing indicates that it runs underneath components.

EXCESSIVE HUM LEVEL ON REPLAY ...

The hum level inherent in the Pre-Amplifier is very low indeed, but trouble may be experienced if the Mains Transformer of the Power Unit, or the associate Amplifier is positioned too close to the tape replay head. This would cause the head to pick up the stray hum field, from the Transformer, which would then be amplified throughout the equipment. We recommend therefore that a little extra care in positioning the various units will be well worth while. The following suggestions are added as a general guide.

1. Position all Mains Transformers, Chokes, etc., as far away from the tape heads as practical.
2. Rotate or move the whole Power Supply around until a position of minimum hum is found.

3. If a certain amount of hum still exists, it can be eliminated by positioning a chip of Mu-metal behind the Record/Play head. The method described in (4) refers to the Truvox Head. With the Collaro Transcriptor a small hum cancelling coil, connected in the earthy end of each record head lead may be more suitable.
4. Remove the head cover. Attach the chip of Mu-Metal (approx $\frac{1}{2}$ " x $\frac{1}{4}$ ") to a match stick with adhesive, and slowly move around the rear of the Record/Play head (the left hand head viewed from the front of the tape deck) until a particular position is found where the hum is at its minimum level. It may be necessary to replace the Head Cover possibly two or three times before the final position is achieved. Having arrived at this position, the Mu-Metal must be stuck to the back of the head by a good adhesive. This may appear rather complicated but in point of fact it is a simple operation and a fairly certain cure. The general performance of the head is not affected in any way.

IMPORTANT NOTE ...

It is essential that a NON-MAGNETIC tool be used when making adjustments to Tape Heads, because by bringing any magnet or magnetised tool close to the head, it will be magnetised causing poor results with a high background noise.

TAPE DECKS & OSCILLATOR MATCHING ...

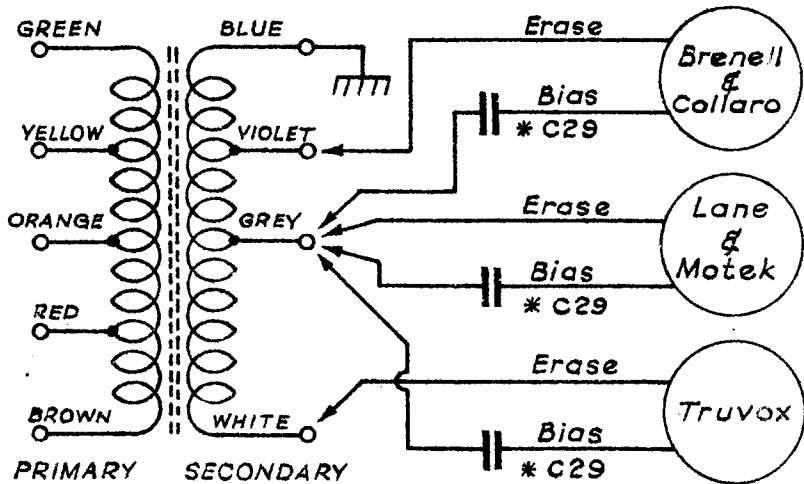
The special Push Pull Oscillator uses a Mullard ECC82 twin triode valve. It is an entirely new circuit arrangement, the waveform being much less distorted than with the more orthodox single EL84 Valve. Also the circuit draws approximately the same current during playback when it is inoperative as during the oscillatory condition for recording. Thus with little or no change in current for the two conditions, the design of the Power Supply is simplified. However, possibly the greatest advantage of the new design is that the tapped secondary of the Oscillator Transformer allows for easy matching to a number of commercial tape decks with very little alteration to the associated circuitry.

The oscillator coil consists of a wound Ferroxcube pot-core in which coloured flying leads are taken to tapping points on the windings as shown in the diagram. The bias and erase currents for the various tape heads can be obtained by choosing suitable secondary windings and values for the bias coupling capacitor C29.

Identification of the coil winding suitable for the Erase Heads of various Tape Decks can be made by referring to the table. The appropriate value of C29 is also given, care must be exercised to ensure that the correct leads and value of C29 are used.

It will be seen that the PRIMARY connections remain unaltered for all types of heads, and also that the BIAS CAPACITOR C29 is connected to the GREY lead from the SECONDARY WINDING for all types of heads. Matching is therefore achieved by merely selecting the correct secondary tap for the ERASE feed, and similarly altering the value of C29 for the BIAS coupling.

PRIMARY	SECONDARY			
	Tape Head	Erase	Bias	C29
SAME FOR ALL TYPES OF HEAD	BRENELL	VIOLET	GREY	100 pF
	COLLARO	VIOLET	GREY	100 pF
	LANE	GREY	GREY	50 pF
	MOTEK	GREY	GREY	120 pF
	TRUVOX	WHITE	GREY	200 pF
ALL HEADS BLUE TO CHASSIS				



* C29 REFER TO TABLE

FERROXCUBE OSCILLATOR TRANSFORMER

WIRING TO TAPE DECKS (COLLARO) ...

When fitting the completed Pre-amplifier to the Tape Deck it is recommended that the Record head lead from the Amplifier be kept as short as possible to avoid the possibility of treble attenuation (loss). For the COLLARO deck the Bias (Record), and Erase leads from the Amplifier are terminated to the appropriate points on the deck switch banks as shown in the COLLARO TRANSCRIPTOR switch wiring diagram. The following general wiring hints should be followed.

1. Wiring must be kept short and in the form of direct LINKS. Ensure that the links are bent clear of the screened plates between switches. (Use 20 s.w.g. Tinned Copper Wire).
2. Fix a Solder Tag (S.T.) and a Single Tag Post under the Fixing Screws as shown. Solder one end of the Bus-Bar to the Solder tag, and the other end to the INSULATED tag on the Single Tag Post. This ensures a Single Point Earth connection for the Deck wiring (Use 16/18 s.w.g. Tinned Copper Wire).
3. The Screened Cable connecting the two switch banks must be insulated to prevent the Braiding from shorting to the Switch contacts or forming a second Earth by contacting the Deck at an incorrect point.
4. The A.C. mains to supply power to the Tape Deck motors must be connected into the terminal block at the points recommended by the manufacturers. (See Collaro operating instructions).

TRUVOX MK III and IV Series ...

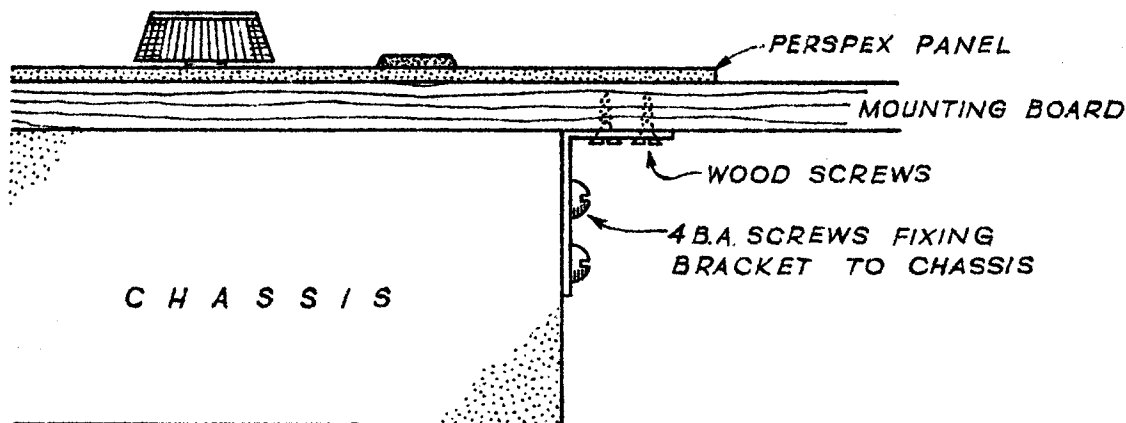
The Bias (Record), and Erase head leads from the Amplifier must be kept short to avoid the possibility of treble attenuation (loss). Both leads are terminated to an insulated panel located on the underside and middle of the deck plate. The inner centre core of the RECORD lead is connected to the tag coded WHITE, the outer screened braiding of this lead is connected to the tag coded BLACK. The inner centre core of the ERASE lead is connected to the tag coded BLUE, the outer screened braiding of this lead must NOT be connected to the Tape Deck, otherwise severe hum will result due to an EARTH LOOP.

The A.C. Mains to supply power to the tape deck motors is connected to the two contacts coded with a RED spot on the side of the deck SWITCH UNIT. The D.C. braking current is drawn from the Power Unit via the appropriate 470 ohm 5 Watt resistor and connected to the GREEN and BLACK coded contacts on the switch unit.

Attention is drawn to the fact that whilst the BRAKE BUTTON is depressed a heavy current (150 mA) is drawn from the Power Unit, therefore the BRAKE must only be used to STOP the tape movement and then released simultaneously with the operation of the OFF button. (See Truvox operating instructions supplied with the deck).

FIXING THE PRE-AMPLIFIER ...

Two adjustable brackets are supplied to fix the Pre-Amplifier into a variety of cabinets. A suitable cut-out must be made in the mounting board, just large enough to clear the chassis work. The Pre-Amplifier is then dropped through the cut-out, so that the Perspex panel rests on the face, or top side of the mounting board. The brackets are fitted to the chassis by 4BA screws and due to the elongated holes they may be adjusted to any thickness of mounting board. Finally four SHORT wood screws are used to fix the chassis to the underside of the mounting board. Ensure that the screws are only just long enough to bite into the wood otherwise they will go through the board and damage the veneer or finish of the top face. Four small holes in each corner of the Perspex panel are included so that the Panel may be firmly clamped to the top face, by very small panel pins.



POWER SUPPLIES ...

1. SEPARATE POWER UNIT.

When the self-contained Power Unit is to be incorporated it must be carefully positioned in the cabinet as outlined under "EXCESSIVE HUM ON PLAYBACK". The colour code for the connections to the four core Power Cable are given on the POWER SUPPLY diagram (Stage Six) and reference should be made to this drawing before connecting the units together. Attention is drawn to the fact that no provision is made in the Pre-Amplifier for switching the Power Supply Unit, therefore a separate single pole ON-OFF switch must be added EXTERNALLY. The leads to this switch will be carrying A.C. they must be kept clear of the Replay head and the INPUT JACKS of the Pre-Amplifier, or the hum field associated with them may be picked up and amplified through the equipment.

2. POWER DRAWN FROM STERN '510' AMPLIFIER OR '3-3' MAIN AMPLIFIER.

If the Power is to be drawn from the Stern-Mullard 510 the following method of connection is recommended. The mains lead from the POWER SUPPLY UNIT should be connected into the GRAM MOTOR terminal block on the rear of the 510 Main Amplifier, the ON-OFF switching of the Power Unit will then be controlled by the 510 Amplifier switch. The switch lead connections on the Power Unit must be joined with a shorting link. Refer to Power Supply diagram (Stage Six). The four core POWER Cable from the type 'C' Pre-Amplifier must be connected to the Octal take-off in precisely the same manner as recommended for a TUNER UNIT. (See the appropriate instruction manuals ("Stern 510", "Stern 3-3 Power", etc.)

NOTE: The Stern Mullard range of Amplifiers have not sufficient available reserve of power to supply both TUNER UNIT and the TYPE 'C' PRE-AMPLIFIER, it is recommended therefore that a separate POWER SUPPLY UNIT be incorporated to supply one or the other, to avoid over running the Mains Transformer in the POWER AMPLIFIER.

POWER REQUIREMENTS TYPE 'C'.

H.T. 300 Volts at 25 Milli-Amps (D.C. Smoothed)

L.T. 6.3 Volts at 1.5 Amps.

TECHNICAL SPECIFICATION MODEL TYPE 'C' TAPE PRE-AMPLIFIER

RECORDING SENSITIVITY ... Measured at 1Kc/s. Audio current 150 uA.

Microphone JACK No. 1 0.5 mV for peak recording level (Impedance
2 Meg ohm)

Radio JACK No. 2 250 mV for peak recording level (Impedance
1 Meg ohm)

PLAYBACK SENSITIVITY ... Measured at 5 Kc/s.

15 IN/SEC 5.5 mV for 250 mV output.

7½ IN/SEC 2.4 mV for 250 mV output.

3¼ IN/SEC 1.0 mV for 250 mV output.

FREQUENCY RESPONSE ...

PLAYBACK characteristic to the specification of the International Consultative Committee. (C.C.I.R.)

RECORD characteristic to give flat response in conjunction with this replay characteristic.

15 in/sec ± 3 dB relative to the level at 1 Kc/s from 30 c/s to 17 Kc/s.

7½ in/sec ± 3 dB relative to the level at 1 Kc/s from 40 c/s to 13 Kc/s.

3¼ in/sec ± 3 dB relative to the level at 1 Kc/s from 50 c/s to 8 Kc/s.

TREBLE BOOST ...

A resonant circuit incorporating a Ferroxcube Pot Core inductor. The frequency of maximum boost is determined by the tuning capacitor which is selected by the Equaliser Switch.

BASS BOOST ...

Feedback network selected by the Equaliser Switch effective on Replay only.

OSCILLATOR ...

Special Push Pull circuit incorporating a Ferroxcube Transformer and a Mullard Twin Triode Valve ECC82. Brought into circuit on Record. Frequency 55/60 Kc/s.

VALVE COMPLEMENT ...

V1. EF86 ... Low Noise Pentode used in the Input stage.

V2. EF86 ... Low Noise Pentode used in the Second stage.

V3. EF86 ... Low Noise Pentode used in the Output stage for Recording.

V4. ECC82 ... Twin Triode used in the Output stage (Push Pull Oscillator).

V5. 6X4 ... Magic Eye Level Indicator - used as Record Level indicator.

-- OA81 ... Germanium Diode - Level indicator rectifier.

POWER REQUIREMENTS ...

L.T. ... 6.3 Volts at 1.5 Amps.

H.T. ... 300 Volts at 25 Milli-Amps.

Consumption ... 20 Watts Max.

GENERAL ...

Dimensions of Amplifier Chassis ... 11¼" x 6¼" x 2⅞" high.

Dimensions of Front Panel ... 11¼" x 3½" x ⅛" thick.

Weight of Amplifier ... 3⅝ lbs.

Dimensions of Separate Power Pack 6½" x 4½" x 4⅝".

Weight of Separate Power Pack ... 4¼ lbs.

TEST AND PERFORMANCE CHARACTERISTICS ...

The tests outlined below are intended as simple, yet effective, checks for the combined Record/Playback Amplifier, and are for the Technician only.

The values and figures given were obtained from the prototype amplifier, using Collaro Record/Playback and Erase heads. The Bias current used throughout was 1.0 mA at a frequency of 60 Kc/s. The Erase-head voltage was approx. 25 V, at a frequency of 60 Kc/s.

TEST I - D.C. Voltages ... (Measured on an Avometer Model 8)

The D.C. voltages and test points are given in Table 1.

TEST II - AMPLIFIER ON PLAYBACK ...

Equipment required. (also for Test III)

- (1) A Signal Generator covering^a frequency range from 20 c/s to 20 Kc/s.
- (2) A Valve Voltmeter covering a frequency range from 20 c/s to 20 Kc/s.

The Record/Playback switch S1 should be in the Playback position. A 5 Kc/s Signal from the generator, should be applied to the Record/Playback head lead. The consequent output signal should be measured on the Voltmeter, across the output audio lead.

The input voltage should be adjusted to give an output voltage of approx., 250 milli-volts for each tape speed, and the input required for this output should be noted. The voltage readings that should be obtained are given in Table II. For operation at such high sensitivities great care should be taken to ensure that the signal measured is not composed mainly of hum.

The input voltage at 5 Kc/s should be varied until the output voltage falls to 50 mV. The frequency of the signal should be reduced to 40 c/s and the values of Boost in Table III should be observed across the output lead. The Bass Boost characteristics for the three tape speeds are shown in Fig. A.

TEST III - AMPLIFIER ON RECORD ...

For accurate results, two separate pieces of p.v.c. covered wire are recommended for the connections to the valve voltmeter. Co-Axial cable may result in considerable errors in measurements, due to the parallel capacitance which is introduced.

The Record/Playback and Erase heads should be connected to the appropriate head leads from the Amplifier. Switch S1 must be in the RECORD Position.

Apply a 1 Kc/s signal to the Radio input Jack. The magnitude of this signal should be such that an output of 15 mV is obtained at the output lead.

The Boost indicated in Table IV should be obtained at the appropriate Tape Speed when the signal frequency is altered to the value shown in the Table.

The Treble boost characteristics for the three Tape Speeds are shown in Figure B.

Values for the recording sensitivity for an output voltage measured at the anode of V3(EF86) are given in Table V. A test of the Recording Level Indicator should show that the EM81 'closes' with approximately 15 V at this anode.

An alternative method of checking the Record Amplifier is possible. For each tape speed, the voltage developed across a 50 ohm resistor connected in series with the Record Head can be observed for the full range of signal frequencies. The response figures so obtained should agree with the values obtained with the prototype amplifier, listed under response. For these observations, it will be necessary to disconnect one end of resistors R32 and R34 otherwise only the bias signal will be measured.

TEST IV - BIAS LEVEL TEST.

Equipment required for this test:

- (1) A Valve Voltmeter which will indicate accurately at frequencies up to 70 Kc/s:
- (2) A resistor of 50 ohms.

The resistor should be soldered in series with the earthy end of the Record/Playback head, and the voltage developed across this resistor, with no input signal, should be measured with the Voltmeter.

The voltage developed across the resistors should be 50 mV, which corresponds to a bias current of 1.0 mA flowing in the 50 ohms resistor.

D.C. VOLTAGES					TABLE No. 1
Valve	Test Point	Voltages (V)		D.C. Range of Avometer (Model 8)	
		Sl-Record	Sl-Playback		
	C4	160 ¹³⁴	165 ¹²⁶	1000 V. (Res. 20 M ohm)	
	C13	190 ¹⁵⁰	194 ¹⁴⁸	1000 V.	
	C16	245 ²⁰³	250 ²⁰⁵	1000 V.	
	C30	<348 ²⁷⁷	<350 ²⁹⁰	1000 V.	
	C31	300 ²⁴⁷	305 ²⁵⁰	1000 V.	
V1 (EF86)	Anode (pin6)	37 50	37 50	1000 V.	
	Screen (1)	38 55	38 60	1000 V.	
	Cathode (3)	1.1 1.4	1.1 1.4	10 V. (Res. 200 K ohm)	
V2 (EF86)	Anode(pin6)	46 60	44 62	1000 V.	
	Screen (1)	62 85	63 90	1000 V.	
	Cathode (3)	1.2 1.5	1.3 1.5	10 V.	
V3 (EF86)	Anode (pin6)	81 105	82 110	1000 V.	
	Screen (1)	116 140	118 145	1000 V.	
	Cathode (3)	2.1 2.6	2.1 2.6	10 V.	
V4 (ECC82)	Anodes(a&b)1&6	250 295 ²⁵⁰	250 305 ²⁵⁰	1000 V.	
	Cathode (8)	9.3 14	9.5 12	100 V. (Res. 2 M ohm)	
V5 (EM81)	Anode (pin7)	22 35	0 0	1000 V.	
	Target (9)	140 140	0 0	1000 V.	

PLAYBACK SENSITIVITY - TABLE 2

Signal Frequency = 5 Kc/s.

Tape Speed (IN/SEC)	Input (mV)	Output (mV)
15	5.5	300
7½	2.4	300
3¾	1.0	300

BASS BOOST - TABLE 3

Signal Frequency = 40 c/s.

Output Voltage for 5 Kc/s = 50mV.

Tape Speed IN/SEC	Voltmeter (V)	Output Boost (dB)
15	2.3	33
7½	1.0	26
3¾	0.36	17

TREBLE BOOST - TABLE 4

Output Voltage for 1 Kc/s = 15mV

Tape Speed (IN/SEC)	Signal Freq. (Kc/s)	Voltmeter (mV)	Output Boost (dB)
15	17	84	15
7½	12	150	20
3¾	5.5	100	16.8

RECORDING SENSITIVITY - TABLE 5

Signal Frequency = 1 Kc/s.

Tape Speeds	15-7½-3¾ in/sec
Voltage at Anode V3	15 Volts
Microphone Input(J1)	0.5 mV.
Radio Input (J2)	250 mV.

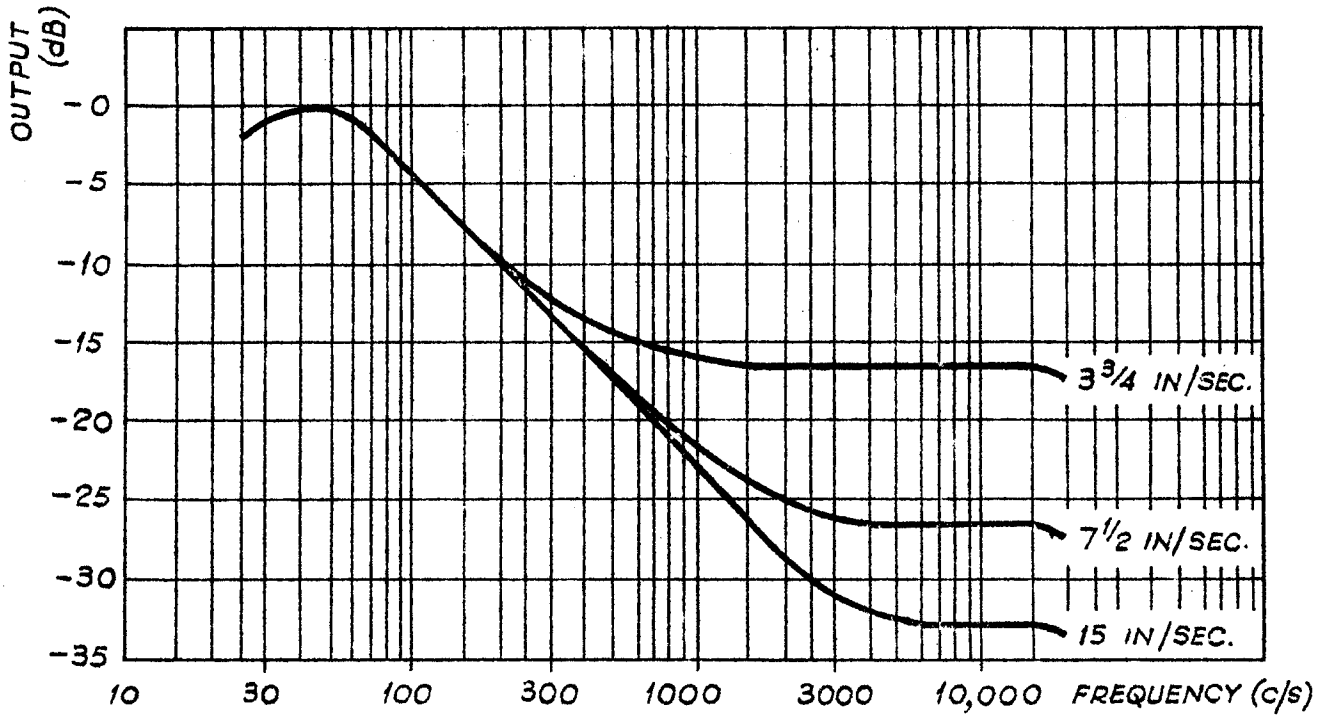


FIG. A. BASS BOOST

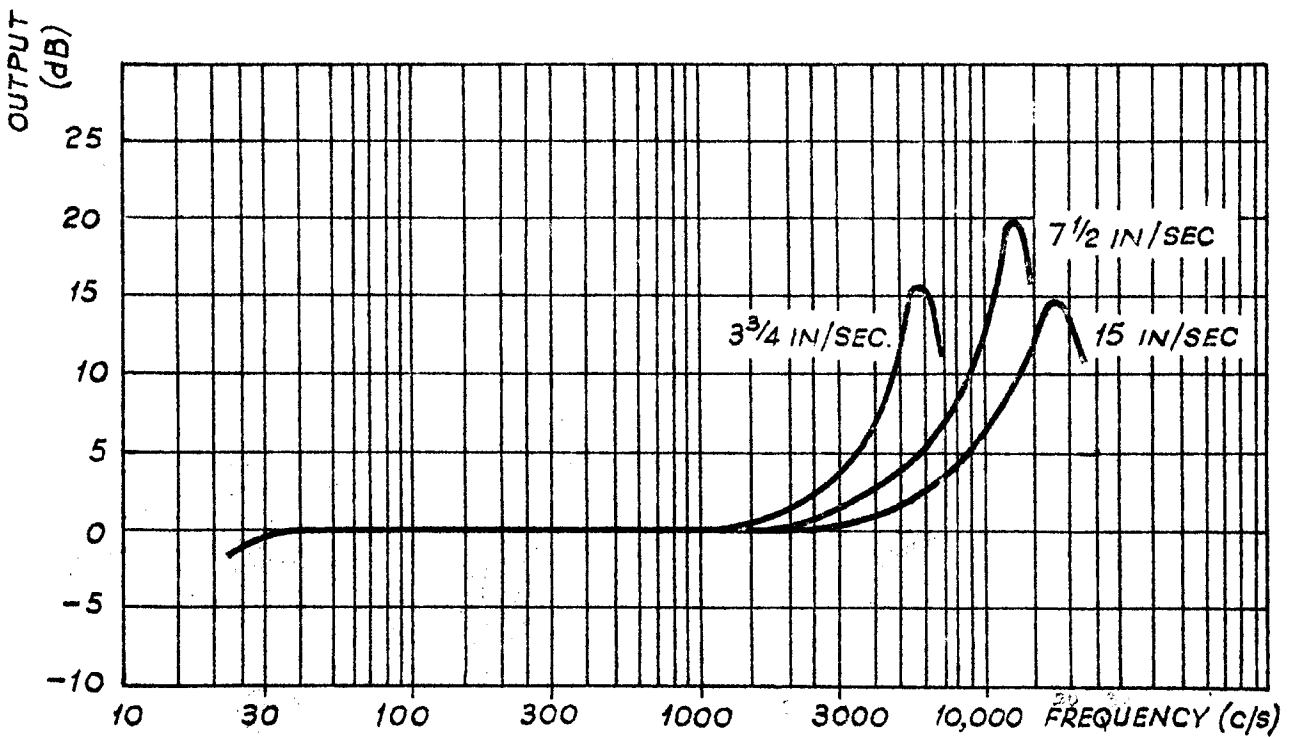
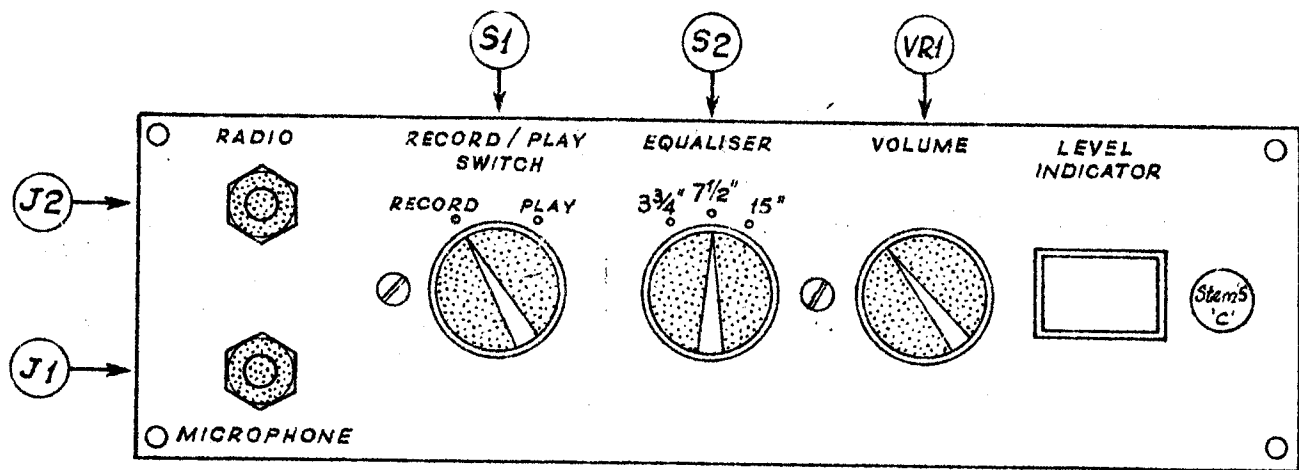


FIG. B. TREBLE BOOST

OPERATION OF THE PRE-AMPLIFIER



- CONTROL PANEL LAYOUT -

MICROPHONE INPUT JACK (J1)

For recording direct from a Microphone, Crystal Set, Radio Jack or low output Pick Ups. This input is very sensitive and care should therefore be taken to ensure that the SIGNAL LEVEL is not too high, otherwise distortion will occur through overload. For example if a Pick Up is connected and the signal closes the Level Indicator with only a small rotation of the Level Control, then the output from the Pick Up is too great, and it must be connected instead to the less sensitive Radio input (J2).

RADIO INPUT JACK (J2)

For recording from the extension speaker sockets of a Radio Set, Radio Tuner Unit, or from the RECORD socket of Pre-Amplifiers, also Gramophone Players or direct from Crystal or Magnetic Pick Ups (high output).

RECORD/PLAYBACK SWITCH (S1)

A two position switch that is self explanatory. Remember that when this switch is in the RECORD position and the tape deck RECORD button is depressed a recorded tape will be automatically erased whether a signal is being fed into the input Jack of the Amplifier or not.

EQUALISER SWITCH (S2)

A three position switch for Pre-emphasis of Treble signal on RECORD and Bass Boost on PLAYBACK. A resonant circuit containing Ferroxcube Inductor. The value of the tuning capacitor is selected by the switch to give maximum TREBLE BOOST appropriate to the tape speed selected. The switch must be in the same position for PLAYBACK as during RECORD, this ensures correct feed-back for BASS EQUALISATION during PLAYBACK.

RECORD LEVEL CONTROL "VOLUME" (VR1)

Adjusts the RECORD MODULATION LEVEL. It is inoperative on PLAYBACK

RECORD LEVEL INDICATOR (V5)

A "Magic Eye" Recording Level Indicator. By observing it in conjunction with the adjustment of the Level Control "Volume" (VR1) the correct recording MODULATION LEVEL is obtained.

TONE CONTROL

There is no provision for TONE CONTROL in the Pre-Amplifier design. It is anticipated that such control will be available with the associated REPLAY AMPLIFIER. (Refer to the Stern/Mullard 510 Power Amplifier and 2 Valve Pre-Amplifier Manuals).

GENERAL GUIDE FOR RECORDING

The choice of the microphone must be left to the individual. Generally speaking Crystal microphones will give good results for average purposes such as speech, dance music, etc. For more serious work particularly where wide frequency range instruments are to be recorded the better grade Moving Coil or Ribbon microphones are to be preferred. A few suggestions are given on the use of microphones, but the user will rapidly become accustomed to the best method to suit the application.

1. Speak in your normal voice, with the Microphone approx 12 inches away, this distance will vary with individuals and room acoustics, the best position being found after one or two test recordings. A little time spent experimenting, moving the Microphone into different positions in the room will be well worth the trouble.
2. Do NOT position the Microphone close to the Tape Deck or it will pick up the noise of the motors, and produce a noisy background to your recordings.
3. It is bad practice to make a recording from a Radio Set by standing the Microphone in front of the set loudspeaker, because although a recording can be effected in this way, all external noises will be picked up by the Microphone also the acoustics of the room, speaker, etc., will "colour" the sound and make the recording sound unnatural. First class results are assured if a connection is made from the extension speaker sockets of the set and fed into the Radio input Jack (J2) on the Tape Amplifier.
4. Always remove the Microphone from the input Jack when the recording has been completed, or before switching the Amplifier to PLAYBACK.
5. If the Microphone is to be used some distance from the Tape Amplifier, with a long extension lead, TREBLE ATTENUATION may occur due to the lead capacitance, therefore for this application a LOW IMPEDANCE Microphone is recommended. A matching transformer then becomes necessary and this must be positioned (for minimum hum) close to the input socket on the Tape Amplifier.

IT IS ESSENTIAL TO USE HIGH GRADE MICROPHONE CABLE FOR ALL MICROPHONE LEADS. A SCREENED JACK PLUG IS RECOMMENDED FOR THE INPUT CONNECTION.

6. Finally if the user has never before heard his own voice recorded, do not be surprised or blame the recording equipment. Nobody ever does recognise his own voice at first. Therefore for speech quality tests, it is always necessary to have someone else to do the judging.

SPEED SELECTION.

Where speech, or music with a restricted high frequency response is to be recorded, (such as dance music, etc.,) a tape speed of $3\frac{3}{4}$ inches per second is adequate. This ensures that a standard 1200 ft. reel of tape will provide for two hours recording, but for quality recording of good instrumental music - and also for pre-recorded tapes - a speed of $7\frac{1}{2}$ inches per second is essential. For the highest possible 'Fidelity' of recording of music, a tape speed of 15 inches per second is to be preferred, in comparison, at this speed a 1200 ft., reel of tape will provide for 30 minutes recording, or 15 minutes on each track.

PREPARING TO RECORD.

The recording LEVEL must always be arrived at before commencing the actual recording. As an example let us assume that a recording is to be made using a Microphone.

1. Connect the Microphone to input (J1).
2. Switch the Record/Play switch S1 to RECORD (The Level Indicator should now glow).

3. Speak into the Microphone in your normal voice. (The Level indicator will flutter, indicating that it is registering the Modulation Level, but no Recording will be effected until the tape movement is started by depressing the deck Record button).
4. Adjust the LEVEL CONTROL "VOLUME" so that the moving sections of the INDICATOR just fail to close on the loudest passage of your voice. If the Level control is advanced too far, the green sections of the Level Indicator will CLOSE thus indicating that you are OVER MODULATING the tape, and an unsatisfactory recording will result, similarly if the Level Control is not advanced sufficiently the Indicator sections will remain stationary, resulting in a complete lack of volume and a high noise level when the recording is REPLAYED.
5. When the correct Modulation-Level has been obtained, the tape movement should be started by depressing the appropriate RECORD button on the tape deck. The Level Control should not be moved from its original setting throughout the recording. It may however be used to gradually fade the voice into the background before depressing the STOP button on the deck.
6. A precisely similar proceeding is adopted to obtain the Recording level for all Recordings. It is important to note however that when recording from Radio - Pick Ups - VHF Tuners, etc., the controls on these units must first be adjusted so that the output from them is satisfactory, and the correct tonal balance obtained.

TO PLAY BACK YOUR RECORDING.

1. Remove the input JACK PLUG from the tape Pre-Amplifier Input JACK.
2. Turn the RECORD/PLAY switch S1 to the PLAYBACK position.
3. Rewind the tape back to the original position before the RECORDING was started.
4. Ensure that the Equalisation switch S2 is in the same position as during RECORD.
5. Depress the PLAYBACK button on the tape deck. Remember that the Volume Control on the Type 'C' has no effect on the level during PLAYBACK therefore, the volume level must be adjusted on the associated Replay Amplifier. This also applies to Tone correction.

(15)
- PARTS LIST AND COMPONENT PRICES -

RESISTORS All $\frac{1}{2}$ Watt Rating, 10% Tolerance unless otherwise stated.

R1	1 Meg	Brown-Black-Grn.	4
R2	2.7 K	Red-Mauve-Red.	4
R3	2.2 Meg	Red-Red-Green.	4
R4	2.2 K	As marked H.Stab 5%	1 0
R5	1 Meg	As marked H.Stab 5%	1 0
R6	220 K	As marked H.Stab 5%	1 0
R7	33 K	Orange-Orange-Orange	4
R8	390 K	Orange-White-Yellow	4
R9	2.7 Meg	Red-Violet-Green.	4
R10	1 Meg	Brown-Black-Green.	4
R11	680 K	Blue-Grey-Yellow.	4
R12	150 K	Brown-Green-Yellow.	4
R13	470 K	Yellow-Violet-Yellow	4
R14	27 K	Red-Violet-Orange.	4
R15	390 K	Orange-White-Yellow.	4
R16	1 Meg	Brown-Black-Green.	4
R17	1 K	Brown-Black-Red.	4
*R18	15 K	Brown-Green-Orange.	4
*R19	82 K	Grey-Red-Orange.	4
R20	27 K	Red-Violet-Orange.	4
R21	220 K	Red-Red-Yellow.	4
R22	1 K	Brown-Black-Red.	4
R23	10 K	Brown-Black-Orange.	4
R24	68 K	Blue-Grey-Orange.	4
R25	470 K	Yellow-Violet-Yellow.	4
R26	56 K	Green-Blue-Orange.	4
R27	56 K	Green-Blue-Orange.	4
R28	1 Meg	Brown-Black-Green.	4
R29	27 K	Red-Violet-Orange.	4
R30	560 K	Green-Blue-Yellow.	4
R31	150 K	Brown-Green-Yellow.	4
R32	4.7 K	Yellow-Violet-Red.	4
R33	22 K	Red-Red-Orange.	4
R34	4.7 K	Yellow-Violet-Red.	4
R35	22 K	Red-Red-Orange.	4
R36	680 ohm.	1Watt Blue-Gry-Brn	6
VR1	500 K	Log Potentiometer.	3 3

* Values may be adjusted to vary Output Impedance.

VALVES (B V.A. Guaranteed)

V1-2-3.	Mullard EF86	
	(3 at 17/11d.)	£2.13.9
V4	Mullard ECC82.	14/7d
V5	Mullard EM81	15/3d
MR1	Mullard OA81 (Crystal Diode)	.4 0

CAPACITORS.

C1	0.5 mfd	150/200V Wkg. Paper	1.6
C2	50 mfd	12V Wkg. Electrol'c.	2.0
C3	0.1 mfd	350V Wkg. Paper.	1.0
C4	8 mfd	350V Wkg. Electrolytic	2.9
C5	180pF.	Silver Mica	
		or Tube 10%.	9
C6	82pF.	S.M. or Tube 10%	9
C7	2200pF.	S.M. or Tube 10%	9
C8	390pF.	S.M. or Tube 10%	9
C9	100pF.	S.M. or Tube 10%	9
C10	82pF.	S.M. or Tube 10%	9
C11	0.1 mfd	350V Wkg. Paper.	1.0
C12	0.1 mfd	350V Wkg. Paper.	1.0
C13	8 mfd	350V Electrolytic.	2.9
C14	0.1 mfd	350V Wkg. Paper.	1.0
C15	50 mfd	12V Wkg. Electrol'c.	2.0
C16	16 mfd	350V Wkg. Electrol'c.	2.9
C17	18/20pF.	S.M. or Tube 10%	9
C18	0.1 mfd	350V Wkg. Paper.	1.0
C19	0.5 mfd	150/200V Wkg. Paper.	1.6
C20	100pF.	S.M. or Tube.	9
C21	0.05 mfd	150/350V Wkg. Paper	1.0
C22	47pF.	S.M. or Tube 5%.	9
C23	47pF.	S.M. or Tube 5%.	9
C24	0.5 mfd	350V Wkg. Paper.	1.6
C25	2200pF.	Loulded Mica.	4.10
C26	0.005 mfd (5000pF)	350V Wkg. Paper.	10
C27	0.005 mfd (5000pF)	350V Wkg. Paper.	10
C28	0.5 mfd	150/200V Wkg. Paper.	1.6
*C29	100pF.	(For Collaro) Silver Mica 10%	9

*Value must be chosen to suit make of Tape Head selected (Refer to table on Page 3)

MISCELLANEOUS

1	Ferroxcube Pot Core, L1	£1.2.6
1	Ferroxcube Oscillator Transformer, L2.	£1.9.6
1	3 Bank 2 Way Switch, (Record/Play, S1.)	12.6
1	1 Bank 3 Way Switch, (Equaliser, S2.)	5.6
2	Igranic Jacks, J1 & J2.	6.6
1	B9A Skirted Flexible Nylon Valve Base, V1.	2.6
3	B9A Special "Breadboard" Valve Bases, V2-3-4.	3.0
1	B9A Standard Valve Base, V5.	9
3	10 Way Small Tag Boards, Denco.	5.0
2	5 Way Small Tag Boards, Denco.	2.4
1	4 Way Tag Strip.	4
1	Single Tag Strip.	2
1	Chassis with Under Cover, Screens, etc.	£1.2.6
1	Perspex Engraved Front Panel.	7.9
3	Control Knobs.	2.3

Parts List continued ...

SUNDRIES

24 inches	4 Core Cable.	10
5 feet	Single Plastic Green (for heaters)	4
7 yards	22 s.w.g. Tinned Copper Wire.	9
7 yards	1/2 mm. Sleeving.	1.9
1 yard	Co-Axial Cable.	9
24 inches	Insulated Single Screened Cable.	1.0
1	Half-Circular Condenser Clip.	2
1 packet	Assorted Nuts and Bolts.	3.6
1	Instruction Manual.	2.6
18 inches	Twisted Red and Green Flex (For Collar Erase Head Feed only)	2

PARTS LIST & COMPONENT PRICES - POWER SUPPLY UNIT TYPE 'C'

R37	2.2K, 5 Watt, as marked	1.6	1	Single Tag Post.	2d.
R38	1K, 5 Watt, as marked.	1.6	3	4BA x 1/4" Rd.Hd. Nuts & Bolts)	
*R39	470/500 ohm, 5 Watt, as marked.	1.6	2	6BA x 1/2" Rd.Hd. Nuts & Bolts)	
			2	6BA x 1/4" Rd.Hd. Nuts & Bolts)	
			3	1/4" inch Rubber Grommets.	} 1.6
C30-31	Condenser, 50+50 mfd. 350V. Electrolytic.	7.9	1	3/8" inch Rubber Grommet.	
1	Condenser Paxolin Mounting		1	yd. Single P.V.C. Yellow.	}
			18	inches 20swg Tinned Copper Wire	
T1	Mains Transformer, Parmeko (Fused) £1.12.6		18	inches 2 mm. Sleeving.	}
1	Chassis (Drilled & Cut).	5.6	3	yds. 2 Core Mains Lead.	
1	Chocolate Block (8 Way).	1.9	1	Cable Clip.	2d.
1	B9A Valve Base.	9d			
1	Valve, Mullard EZ81, (B.V.A. Guaranteed)	9/4d			
* Truvox Braking Circuit (Not in use with other Decks).					

SPECIAL PRICE REDUCTIONS FOR INCLUSIVE ORDERS ... WE OFFER,

- (a) COMPLETE KIT OF PARTS TO BUILD PRE-AMPLIFIER ONLY £11.15.0.
- (b) COMPLETE KIT OF PARTS TO BUILD PRE-AMPLIFIER and
POWER UNIT £14. 0.0.
- (c) THE PRE-AMPLIFIER ONLY ... ASSEMBLED and TESTED £14.10.0.
Hire Purchase ... Deposit £2.18.0. and
12 monthly payments at £1.1.3.
- (d) THE PRE-AMPLIFIER and POWER UNIT ... ASSEMBLED and
TESTED £17. 0.0.
Hire Purchase ... Deposit £3.8.0 and
12 monthly payments at £1.4.11.

Carriage and Insurance on Each of the Above is 5/- extra.

MODIFICATIONS TO SPEED EQUALISATION FOR $1\frac{7}{8}$ - $3\frac{3}{4}$ - $7\frac{1}{2}$ INCHES PER SECOND
WHEN USING THE PRE-AMPLIFIER WITH THE COLLARO "STUDIO" OR SIMILAR
TAPE DECKS

Our Tape Amplifier assembly manuals incorporate equalisation circuits for $3\frac{3}{4}$, $7\frac{1}{2}$ or 15 inches per second. A simple modification to the Equaliser components and Switching provides for the $1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$ inches per second equalisation required when the new Collaro "Studio", M tek, or any high grade Tape Deck calling for the slower speed.

The constructor is advised to follow the modifications shown very carefully in conjunction with the Stage by Stage drawings. It will be observed that the $3\frac{3}{4}$ and $7\frac{1}{2}$ inch per sec. components are moved one position round the switch (S2) to allow for the $1\frac{7}{8}$ inch position to be incorporated in the correct switching sequence.

MODEL TYPE "C"

STAGE 3 DRAWING.

R9 Shown 2.7 Meg. should be 3.3 Meg. Orange-Orange-Green.
R10 Shown 1 Meg. should be 2.7 Meg. Red-Violet-Green.
R11 Shown 680K should be 1 Meg. Brown-Black-Green.

STAGE 4 DRAWING.

C5 Shown 180 pF. should be 330 pF.
C6 Shown 82 pF. should be 180 pF.
To the adjacent blank contact 3 on the Equaliser Switch (S2) join one end of an 82 pF. condenser. Join the other end of this condenser to contact 10 on wafer No. 2 (S1).

STAGE 1 DRAWING.

C7 2200 pF. should be 8200 pF.
R12 150K should be 47K Yellow-Mauve-Orange.
C8 390 pF. should be 2200 pF.
R13 470K should be 150K Brown-Green-Yellow.
C9 100 pF. should be 390 pF.

Connect a 470K Resistor Yellow-Mauve-Yellow, to the same tags carrying C9 on Tag Board No. 2.

Assembled Amplifiers and Recorders supplied by us with the Collaro "STUDIO" or similar Tape Decks incorporate the correct $1\frac{7}{8}$ - $3\frac{3}{4}$ - $7\frac{1}{2}$ inches per second speed equalisation.

C29

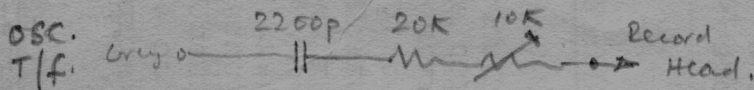
100p.

$\omega = 60 \text{ kHz}$

$$X_C = \frac{1}{2\pi fC} = \frac{1}{120 \times 10^3 \pi \cdot 100 \times 10^{-12}}$$
$$= 266 \times 10^4$$
$$= 26.6 \text{ K}\Omega$$

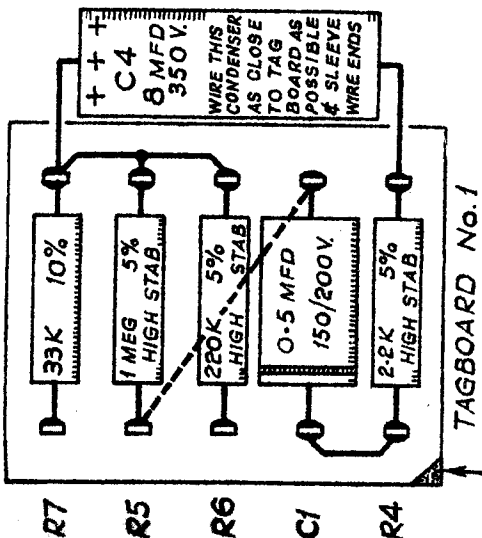
FOR ADJUSTABLE BIAS:-

Replace C29 with.



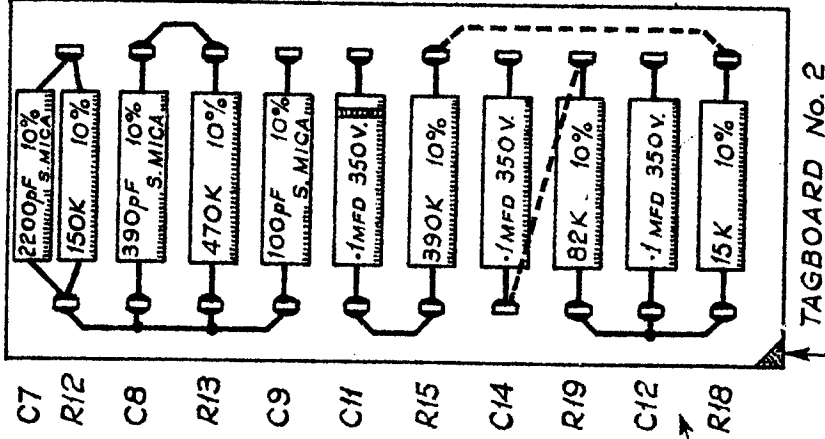
STAGE ONE - SPECIAL INSTRUCTIONS ...

1. Wiring shown thus - - - - - must be connected First, run flat on Tag Board and insulated with sleeving.
 2. Wiring shown thus _____ are short direct links, and need not be sleeved with the exception of the 8 mfd. Condensers and the large 0.5 mfd. Condensers, See later stages.
 3. The 0A31 Crystal Diode must be soldered rapidly and the polarity observed. This is indicated by a paint spot or a ring at one end.
 4. All Resistors are Half-Watt rating unless otherwise stated.
 5. Arrows on corners of Tag Boards indicate correct mounting position on Chassis shown in later Stages.
 6. The Valve Bases used for V2, V3 and V4 are a special type. They are made to our design and will be known as B9A "Breadboards". The Basic Wiring shown in this stage must be sleeved and run flat against the paxolin mount. Small paxolin washers must be fitted between Chassis and base when mounting to allow for the thickness of wiring. It is important to note that in the following stages these bases are viewed from above therefore the pin numbering becomes reversed or anti-clockwise.
- CHECK WIRING AND ALL COMPONENT VALUES. ENSURE PERFECT SOLDERING AND THEN PROCEED TO STAGE TWO.

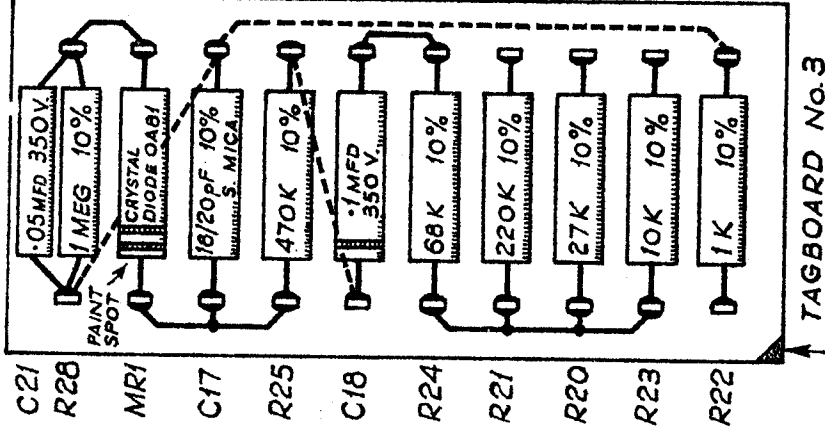


TAGBOARD No. 1

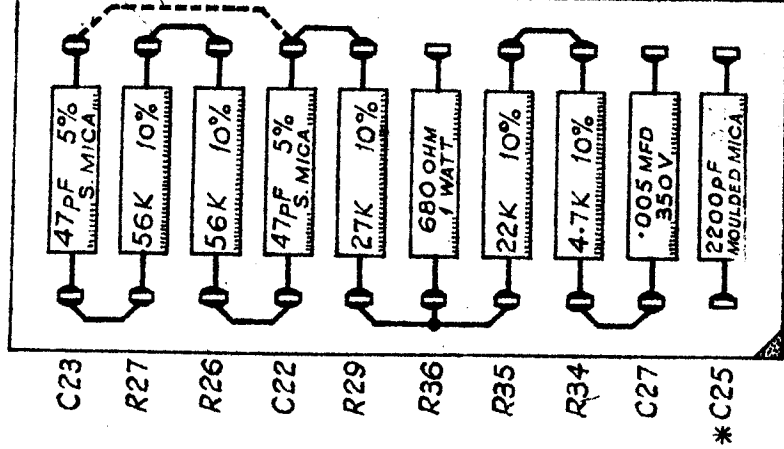
THE .1 MFD CONDENSERS ON TAGBOARD 2 MUST HAVE THE WIRE ENDS SLEEVED. THEY MUST BE SOLDERED SO THAT THEY DO NOT OVERLAP THE TAGBOARD ON THIS SIDE OTHERWISE THEY WILL SHORT ONTO SCREEN 'B'.



TAGBOARD No. 2

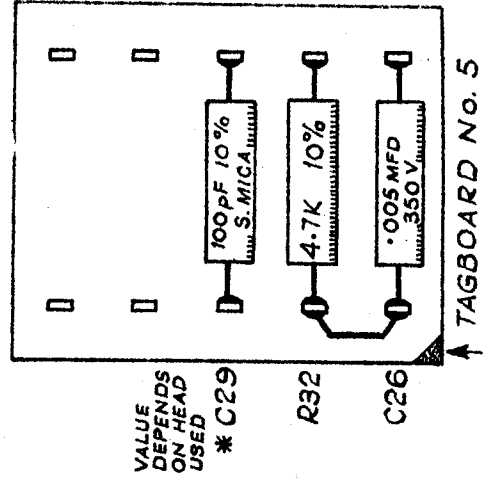


TAGBOARD No. 3



TAGBOARD No. 4

* LARGE MOULDED MICA CONDENSER HERE



TAGBOARD No. 5

STAGE ONE TAGBOARD WIRING

IMPORTANT! SEE SPECIAL INSTRUCTIONS NOTE 6.


V2, EF86
(VIEWED UNDER)

V3, EF86
(VIEWED UNDER)

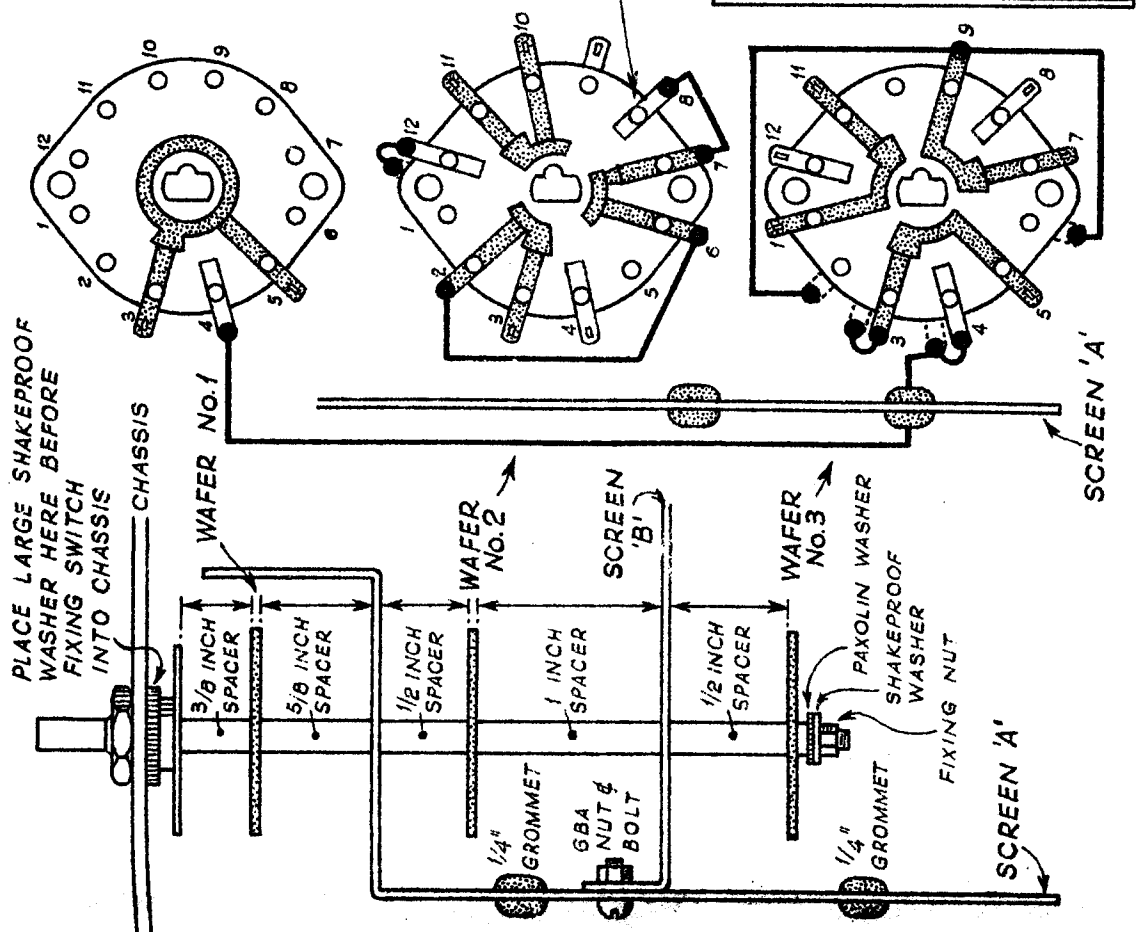
V4, ECC82
(VIEWED UNDER)

BASIC WIRING "BREADBOARD" VALVE BASES

STAGE TWO - SPECIAL INSTRUCTIONS . . .

1. Dismantle the Switch carefully. Reassemble and fit Screens, ensure that the Spacers comply with Fig. 1. The Wafers must be replaced precisely as taken off. Make certain that the Switch Rotors are not moved out of position during the operation. Rotor position on spindles shown thus  or with paint spot.
2. The wiring in Fig. 2 are short direct links. The connections between Wafer No. 1 and Wafer No. 3 must be taken through the Rubber Grommet in Screen '1' as shown (Fig. 2).
3. The dotted contacts are on the reverse side of Wafers 2 and 3. They are located directly behind the rear contacts and must be connected as shown in Fig. 2.
4. Fig. 3 illustrates the wiring that must be positioned exactly as shown. Each wire should run flat against the Screen and directly underneath the other.
5. It will be observed that as the various stages progress the previous wiring details are omitted for clarity.
6. CHECK CAREFULLY SWITCH ASSEMBLY - ROTOR POSITIONS - WIRING, ETC. AND THEN PROCEED TO STAGE THREE.

**STAGE TWO - ASSEMBLY OF
RECORD/PLAY SWITCH S1 WITH
SCREENS & BASIC WIRING**



**FIG. 1. SHOWS SWITCH ASSEMBLED
TOP VIEW**

**FIG. 2. SHOWS BASIC WIRING
REAR VIEW**

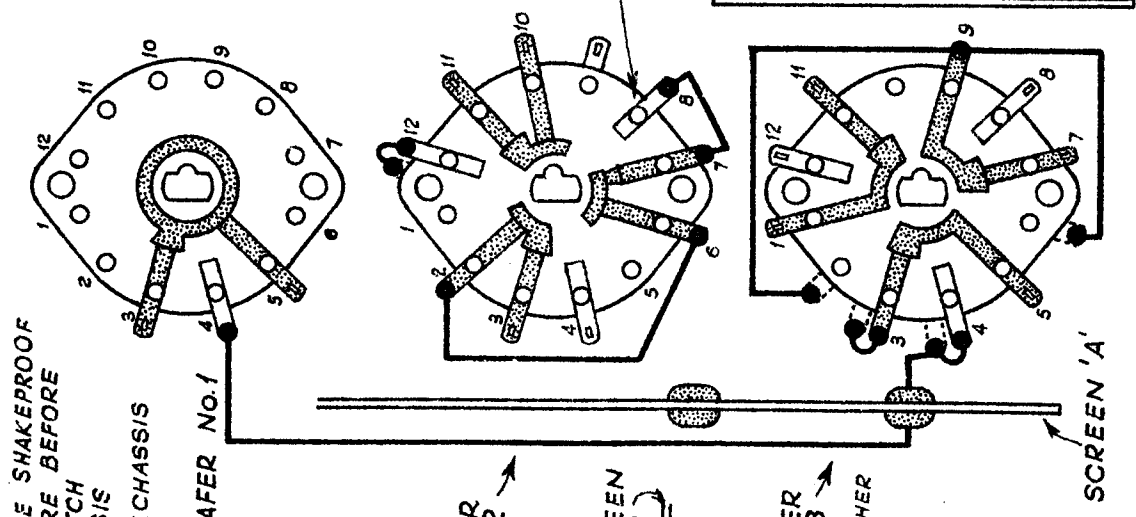
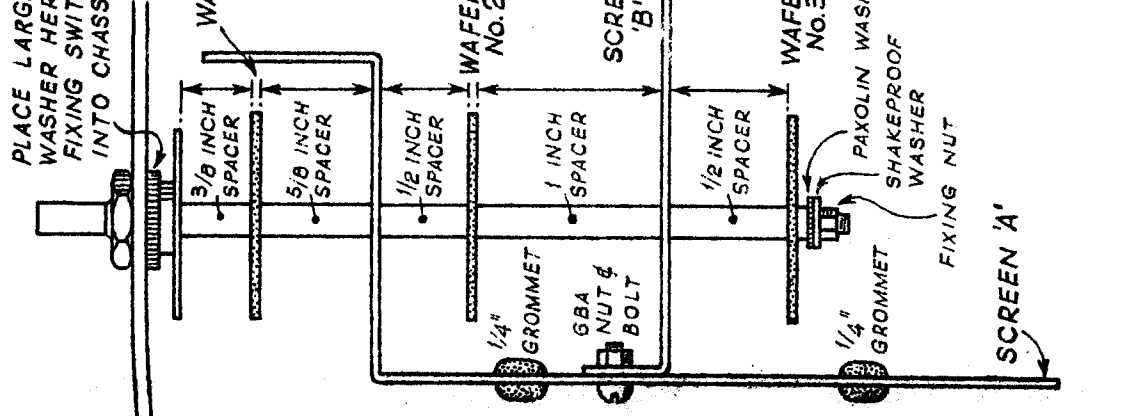



FIG. 3. SHOWS IMPORTANT WIRING FROM WAFFER No. 3 ALONG SCREEN 'B'



REAR VIEW

STAGE THREE - SPECIAL INSTRUCTIONS...

1. Mount components in positions shown. It will be more convenient to complete the basic wiring before mounting Screens A and B with Switch S1. Remember that wiring must be positioned correctly to pass through cut-outs provided on the base of the screens.
2. A paxolin washer must be fitted on each fixing bolt between base and chassis when fitting the special bases V2, V3 and V4. This allows for the wiring already fitted in Stage One to run underneath without fouling the chassis. Due to the small tags extra care is necessary when soldering to these bases. NOTE, also reversed pin numbering due to the base now being viewed from above.
3. The wiring should as near as possible be run in the positions shown. The wiring from B3 and VR1 will of course be shorter than illustrated because the front panel is drawn flattened for clarity. Heater leads shown thus  must be lightly twisted together to prevent hum radiation.
4. The majority of components are fitted by 6 B.A. x 1/4 inch Bolts. Short bolts are essential to fix Tag Boards if too long they will protrude through and short circuit a component.
5. Ensure that the correct tags are used on the Ferroxcube Pot core Inductor LA42. The two tags which connect the internal winding will be easily seen by observation before fitting the component into the chassis. The remaining two tags are blank and unused.
6. CHECK CAREFULLY - COMPONENT POSITIONS, THAT THE TAG BOARDS ARE THE CORRECT WAY ROUND AND THAT THE VALVE BASES ARE FITTED WITH THE PINS IN THE POSITIONS SHOWN. CHECK WIRING AND ENSURE PERFECT SOLDERING AND THEN PROCEED TO STAGE FOUR.

STAGE FOUR - SPECIAL INSTRUCTIONS . . .

1. Maintain short and direct wiring, add sleeving as necessary. The wiring from the front panel will be shorter than illustrated because the front panel is drawn flattened for clarity.
2. Condensers C16, C19, C28 should be wired just above the components already fitted to the respective Leg Boards. Sleeve the wire ends of the Condensers and make sure that they do not short against the rear of the chassis.
3. The elongated holes in the chassis provide to fix Valve Platform No. 2 allow for the position of the Tuning Indicator to be adjusted centrally with the aperture in the chassis. When wiring R30 and R31 to the Single Tag Post which is fixed under one of the valve platform fixing screws, make quite certain that the Resistors and wiring are close to the valve base otherwise a short circuit may occur when the bottom cover is finally fitted.
4. The Ferroxcube Oscillator transformer must be fixed to the chassis with 2 x 6 B.A. short screws. If the fixing screws are too long they will damage the PO1 CORE. To ensure that this does NOT occur fit two paxolin washers between the FERROXCUBE TRANSFORMER and chassis. Handle the thin connecting wires carefully and scrape enamel covering from the wires before soldering. The diagrams show the Oscillator arrangement for Brenell or Collare Tape Heads. For operation of the other Heads refer to heading, "Oscillator Arrangements" for the minor modifications necessary.
5. CHECK WIRING AND COMPONENT VALUES, ENSURE PERFECT SOLDERING AND THEN PROCEED TO STAGE FIVE.

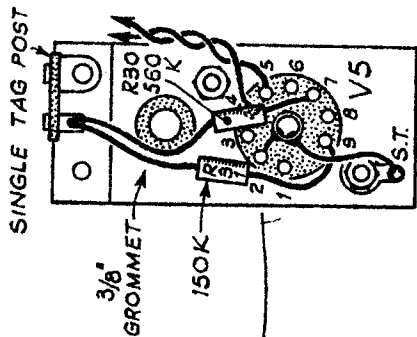
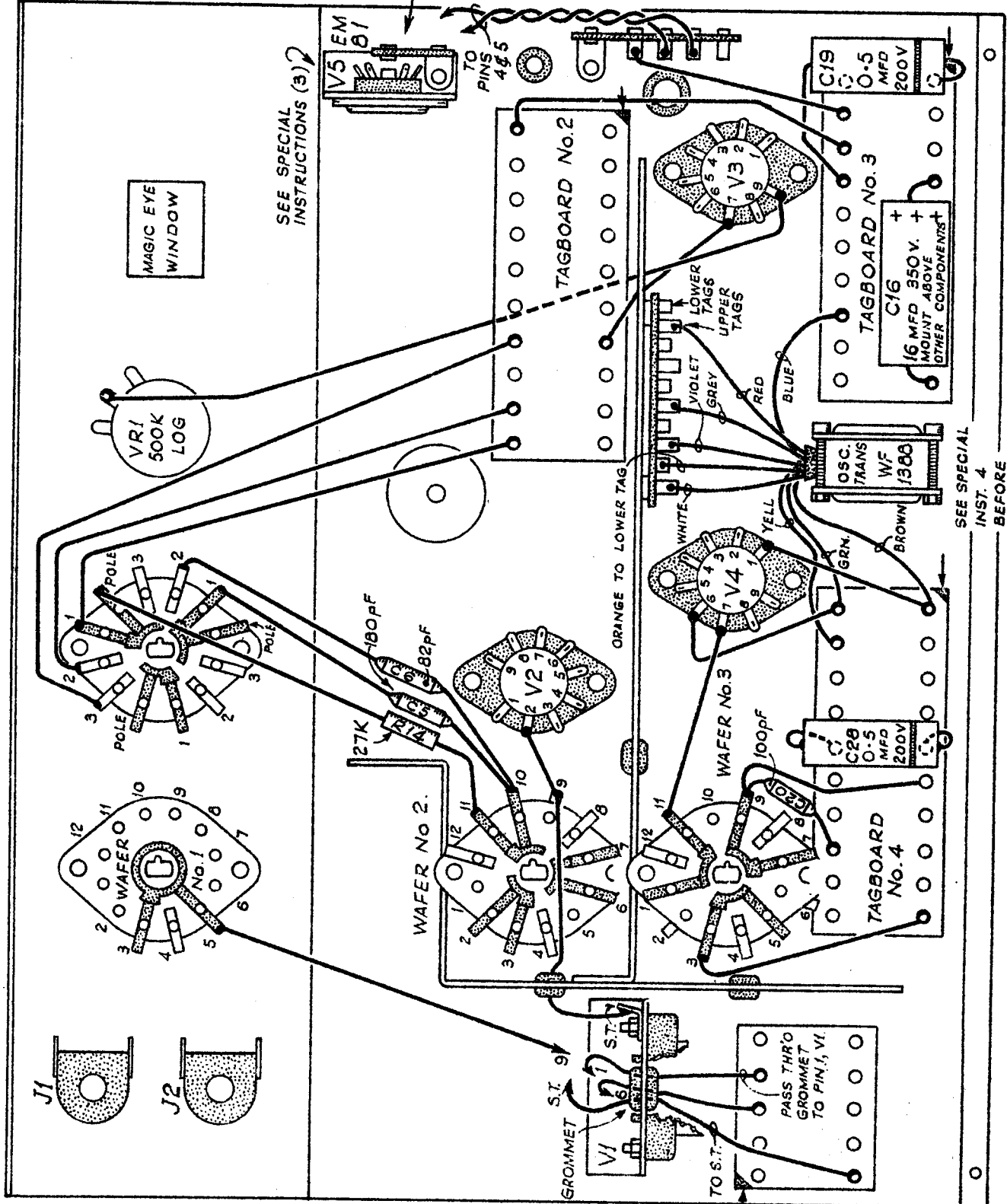
INPUT JACKS
J1 & J2

RECORD/PLAY SWITCH
S1

EQUALISER
SWITCH S2

LEVEL CONTROL
VR1

LEVEL INDICATOR



VALVE PLATFORM 2
BENT FLAT FOR CLARITY
USE SMALL PLATFORM
TO MOUNT V5 BASE.

SEE SPECIAL
INSTRUCTIONS (3)

SEE SPECIAL
INST. 4
BEFORE
FIXING

STAGE FOUR - MAIN WIRING

STAGE FIVE - SPECIAL INSTRUCTIONS . . .

1. Wafer No. 3 has been illustrated with the lower half shown only for clarity. use Co-axial Cable for the Record Head Feed for all types of Head. The lead should be kept as short as possible to avoid Treble Attenuation. The Erase Head Feed should be twisted wire for low Impedance Heads such as Brenell and Collaro (as illustrated). For High Impedance Erase Heads, such as Lane, Motek and Luvox, use Co-axial Cable for the Erase Head Feed. The live centre core is connected to Contact 8 on Wafer No. 3 and the outer screened braiding to the Solder tag S.F.
2. Solder the 4 Core Power Cable to the Tag Strip quickly and carefully. If overheated the plastic insulation will be damaged causing short circuits and possible damage to the Power Pack.
5. The Pre-amplifier has now been completely wired. The valves should be plugged into their respective bases and the constructor should satisfy himself that the wiring and component values are correct by carefully rechecking through each stage. D.C. Voltage figures are given in Table 1 for the constructor with access to test equipment. Finally fit the top cover screen with the Hank Bushes nearest the front of the chassis. Make quite certain that all components are clear of the screen before finally securing it to the chassis by the four P.K. self-tapping screws.

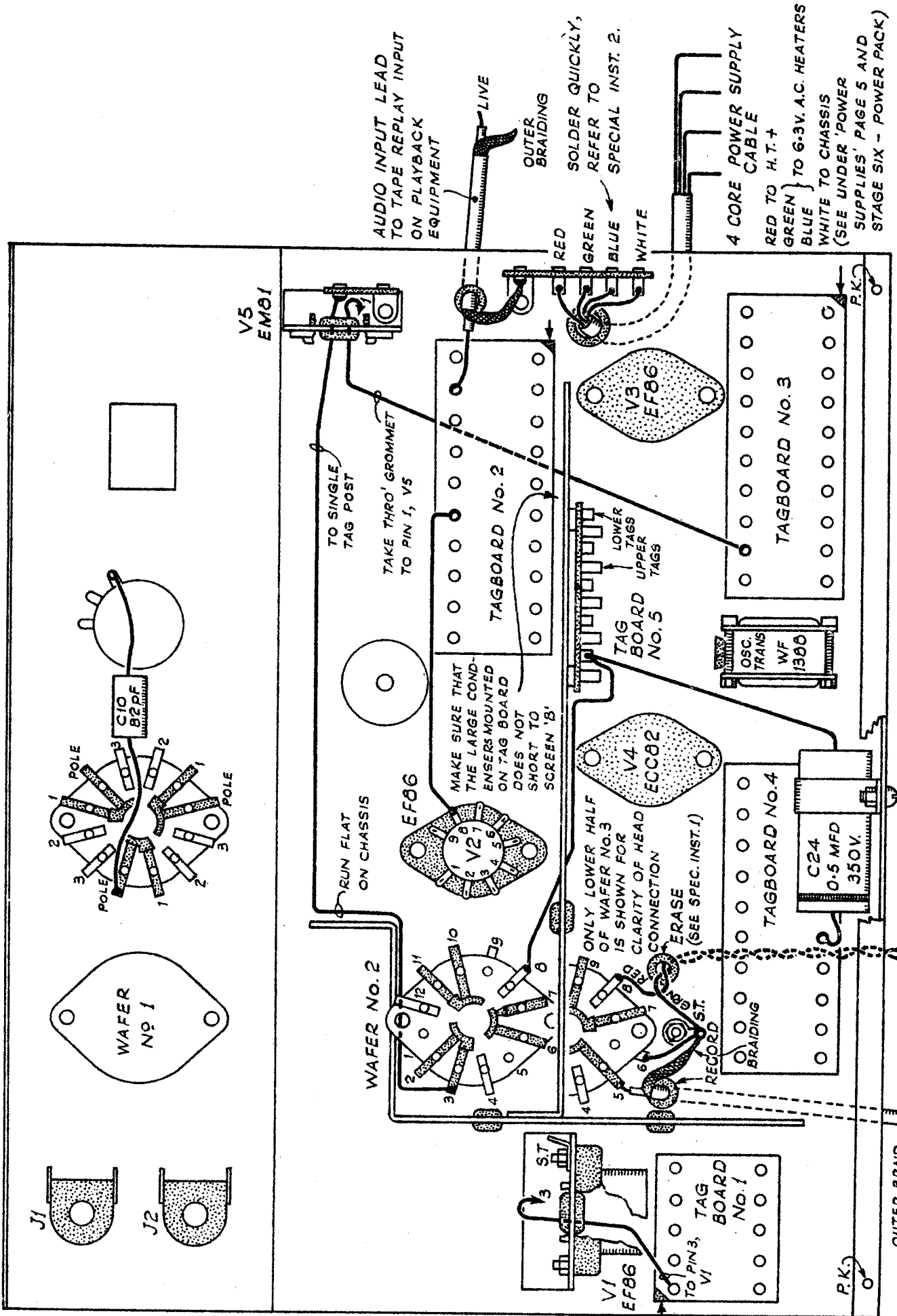
INPUT JACKS
J1 & J2

RECORD/PLAY SWITCH
S1

EQUALISER
SWITCH S2

LEVEL CONTROL
VR1

LEVEL
INDICATOR



AUDIO INPUT LEAD
TO TAPE REPLAY INPUT
ON PLAYBACK
EQUIPMENT

LIVE

OUTER
BRAIDING

SOLDER QUICKLY,
REFER TO
SPECIAL INST. 2.

4 CORE POWER SUPPLY
CABLE

RED TO H.T.+

GREEN } TO 6.3V. A.C. HEATERS

WHITE TO CHASSIS

(SEE UNDER 'POWER

SUPPLIES' PAGE 5 AND

STAGE SIX - POWER PACK)

V5
EM01

TO SINGLE
TAG POST

TAKE THRO' GROMMET
TO PIN 1, V5

TAGBOARD No. 2

V3
EF86

TAGBOARD No. 3

RUN FLAT
ON CHASSIS

V2
EF86

MAKE SURE THAT
THE LARGE COND-
ENSERS MOUNTED
ON TAG BOARD
DOES NOT
SHORT TO
SCREEN 'B'

TAGBOARD No. 5

LOWER
TAGS
UPPER
TAGS

OSC.
TRANS.
WF
1300

V4
ECC82

ONLY LOWER HALF
OF WAFER No. 3
IS SHOWN FOR
CLARITY OF HEAD
CONNECTION

TAGBOARD No. 4

C24
0.5 MFD
350V.

ERASE HEAD
FEED

RED
LIVE

GREEN SEE SPECIAL INSTRUCTION

WAFFER No. 2

WAFFER No. 1

WAFFER No. 3

ERASE
(SEE SPEC. INST. 1)

RECORD
BRAIDING

C24
0.5 MFD
350V.

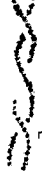
OUTER BRAID

RECORD HEAD
FEED

LIVE

STAGE FIVE - FINAL WIRING

STAGE SIX - SKEWAL II INSTRUCTIONS . . .

1. Assemble all components onto the chassis and complete the wiring as shown in Figs 1 and 2. Lightly twist together all leads carrying A.C. shown thus . It is most important to use the correct section of the 50 - 50 MFD Condenser as the RESERVOIR CAPACITOR (J30). This section is identified with a RED SPOT.
2. All Resistors in this Stage are wire wound, 3/5 Watt rating.
3. ON/OFF switching is NOT provided for in the TYPE 'C' AMPLIFIER, therefore it must be added EXTERNALLY. Terminals 1 and 2 on the TERMINAL BLOCK on the POWER UNIT are provided for this purpose, and the user must decide upon the best switching arrangement to suit his particular installation. It is not recommended to incorporate the switch in the TAPE AMPLIFIER because the surrounding A.C. field would cause a high HUM LEVEL.
4. The STERN 6-10 AMPLIFIER has extra power available to drive either the TYPE 'C' AMPLIFIER or a Radio Tuning Unit but not both. Accordingly when this separate POWER UNIT is used to drive the TYPE 'C' the MAINS INPUT LEAD on the POWER UNIT should be connected to the GRAMMOPHON take-off point on the 5-10 AMPLIFIER and 1 and 2 on the POWER UNIT TERMINAL BLOCK must be LINKED together, the switch on the 5-10 CONTROL UNIT will then also control the TYPE 'C' as well as the 5-10 and TUNER UNIT, thus all equipment (TYPE C - TUNER & AMPLIFIER) would be ON when the 5-10 switch is operated. If desired an additional switch could be incorporated to enable the independent switching of the TYPE 'C' when not in use, in this event, the shorting LINK between 1 & 2 on the POWER UNIT TERMINAL BLOCK would be omitted and the independent switch incorporated instead. If the MAINS INPUT LEAD is connected directly to a MAINS SUPPLY POINT then it is essential to connect a SWITCH to 1 and 2 on the TERMINAL BLOCK.
5. Magnetic Fields associated with the MAINS TRANSFORMER interact with TAPE HEADS. Therefore the POWER PACK must always be positioned relative to MINIMUM HUM.
6. Ensure that no metal part of the TAPE DECK touches the POWER PACK or AMPLIFIER CHASSIS. This is because there must only be a SINGLE EARTH between TAPE DECK and chassis which is normally made via the SCREEN BRAIDING of the lead to the RECORD/PLAY HEAD.

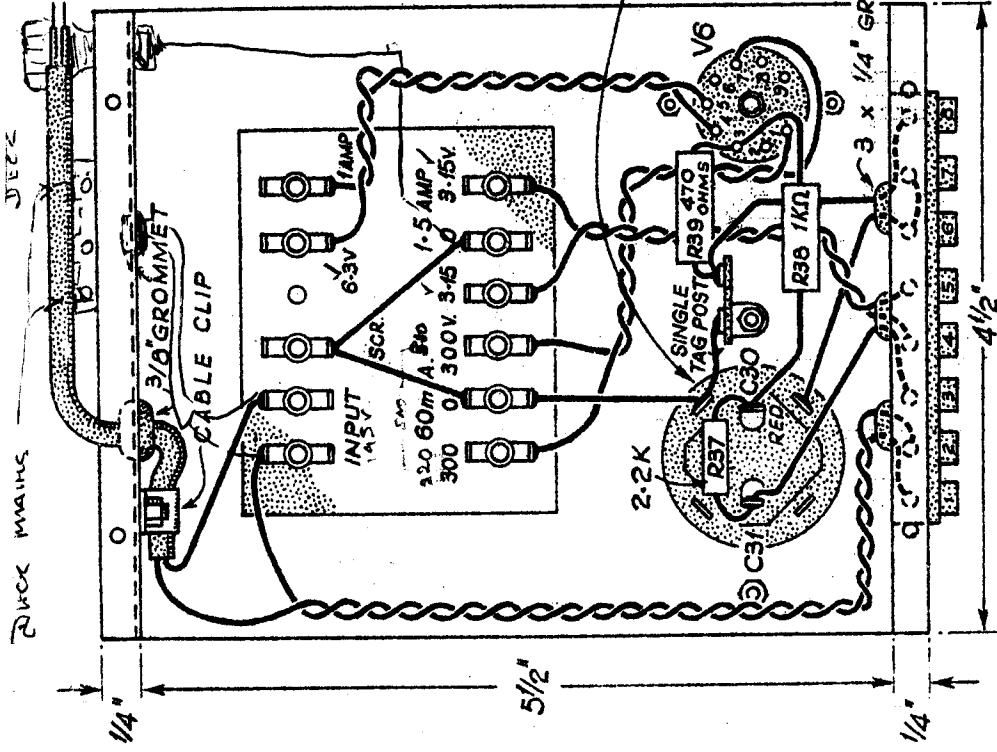
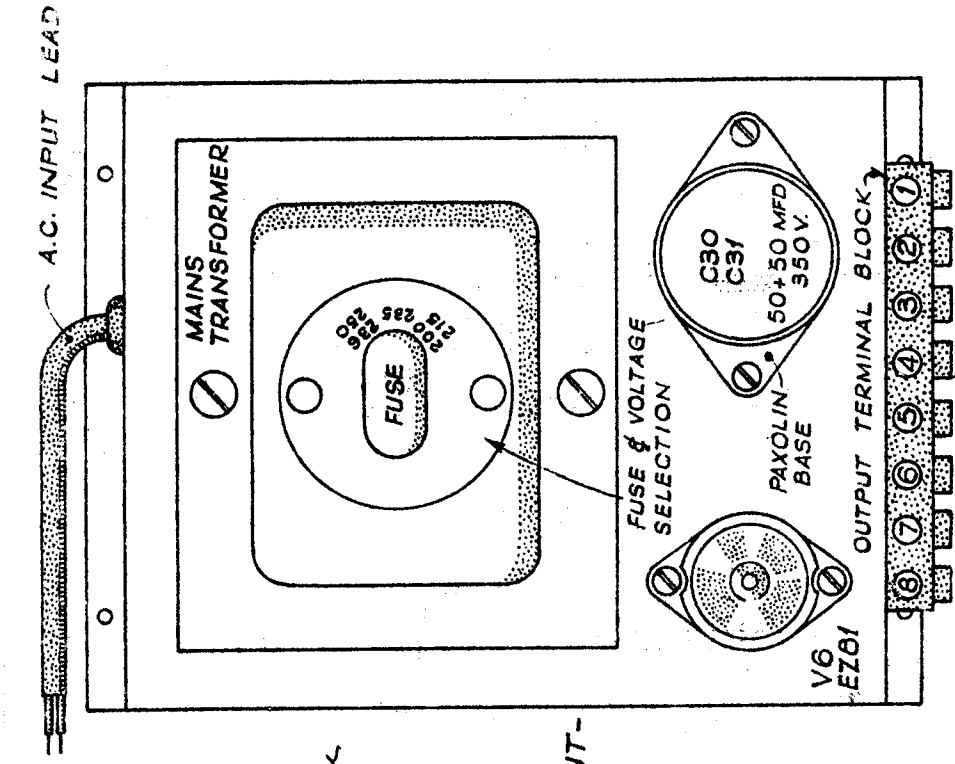
TO A.C. MAINS OR GRAM MOTOR TAKE-OFF POINT ON "STERN'S 5-10 AMPLIFIER" (SEE INST. 4)

NOTE: GREEN OF 3 CORE MAINS WIRE ON DECK SHOULD BE CONNECTED TO EARTH TERMINAL ON POWER PACK

FIG. 1. CHASSIS WIRING-UNDERSIDE VIEW.

FIG. 2. CHASSIS LAYOUT-TOP VIEW

PAXOLIN ISOLATING BASE FITTED ABOVE CHASSIS. TWIST OUTSIDE TAGS TO FIX CONDENSER.



2 AMP FUSED VOLTAGE SELECTOR PLUG.

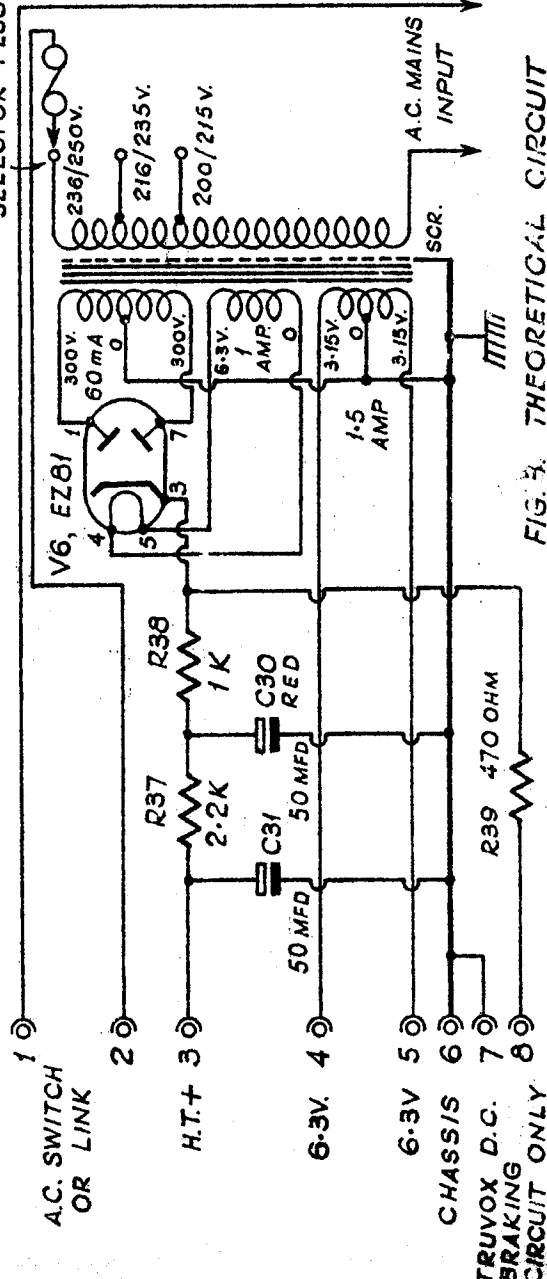


FIG. 3. THEORETICAL CIRCUIT

No.	TERMINAL BLOCK CONNECTIONS	4 CORE POWER CABLE FROM TYPE 'C'
1	EXTERNAL A.C. SWITCH OR 'LINK' (SEE SPECIAL INST. 4)	—
3	H.T.+ 300VOLTS AT 30 M.A.	RED
4	HEATERS	BLUE
5	6.3VOLTS C.T. AT 1.5 AMPS.	GREEN
6	CHASSIS	WHITE
7	TRUVOX ONLY D.C. BRAKE CIRCUIT. 7 TO BLACK SPOT, 8 TO GREEN SPOT ON TRUVOX SWITCH UNIT.	—
8		

STAGE SIX - POWER PACK TYPE 'C'

TAPE RECORDING ACCESSORIES

High Grade Plastic Tape, 1200 ft. 7 inch spool	from	£1. 1. 0
E.M.I. 88/3 Magnetic Recording Tape 175 ft. 3 inch spool		7. 6
E.M.I. 99/3 Magnetic Recording Tape 250 ft. 3 inch spool L.P. ..		9. 6
E.M.I. 88/12 Magnetic Recording Tape 1200 ft. 7 inch spool	£1.15. 0	
E.M.I. 99/18 Magnetic Recording Tape 1800 ft. 7 inch spool L.P.	£2.10. 0	
Grundig Magnetic Recording Tape 850 ft. 5 $\frac{3}{4}$ inch spool	£1. 8. 0	
Grundig Magnetic Recording Tape BASF 1200 ft. 7 inch spool	£1.15. 0	
Grundig Magnetic Recording Tape BASF 1700 ft. 7 inch spool L.P.	£2.10. 0	
Scotch Boy Magnetic Recording Tape 600 ft. 5 inch spool	16. 0	
Scotch Boy Magnetic Recording Tape 1200 ft. 7 inch spool	£1. 7. 0	
E.M.I. 3 inch empty spool in carton. AP93	3. 0	
E.M.I. 5 inch empty spool in carton. AP85	4. 6	
E.M.I. 7 inch empty spool in carton. AP87	5. 0	
Scotch Boy 5 inch empty spool in carton	3. 6	
Scotch Boy 7 inch empty spool in carton	4. 6	
E.M.I. Leader Tape, AP38, Various colours	4. 6	
E.M.I. Non-magnetic scissors AP.39	16. 0	
E.M.I. Jointing Block AP46	17. 6	
E.M.I. Jointing Compound AP77	7. 6	
E.M.I. Jointing tape AP103 $\frac{1}{2}$ inch wide	7. 6	
E.M.I. Accessory Kit AP110	£1.17. 6	
E.M.I. Storage cases 5 inch	3. 6	
E.M.I. Storage cases 7 inch	4. 0	
Bulgin Jack Plug P38	3. 0	
Re-an Screened Jack Plug	3. 3	
Bib Tape splicer	18. 6	
Stern extension microphone lead, 6 yards	17. 6	
Acos Mic 40/1 Crystal Microphone	£1.15. 0	
Lustraphone Dynamic Microphone (High Impedance) LD61Z	£3. 7. 6	
Extension Speaker WB HF 8 inch	£4. 3. 6	
Extension Speaker WB HF 10 inch	£4.19. 9	
Truvox Radio Jack TA3 (Med. W/Band Light and Home)	£3.12. 0	
Truvox Telephone Adaptor	£2. 2. 0	
Truvox "Mono" (Set Single Headphone)	£2.15. 0	
Truvox "Stetho" (Pair Stethoscopic Ear Pieces)	£3. 3. 0	
Wearite Defluxer (For Demagnetising Heads)	£2.10. 0	

WE ARE HIGH FIDELITY STOCKISTS AND HAVE A FULL RANGE OF HIGH GRADE
 AMPLIFIERS - RECORDING EQUIPMENT - LOUDSPEAKER ENCLOSURES
 TRANSCRIPTION MOTORS - PICK UPS, ETC.

