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SERVICE MANUAL

MODEL

RT20

ISSUED: NOVEMBER, 1960.

KOLSTER-BRANDES LIMITED
FOOTSCRAY SIDCUP KENT

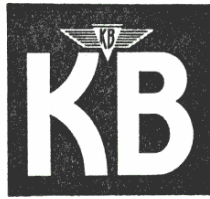
SERVICE DEPOTS

41, BENT STREET,
CHEETHAM, MANCHESTER

FOOTSCRAY,
SIDCUP, KENT
FOOTscray 3333 (10 lines)

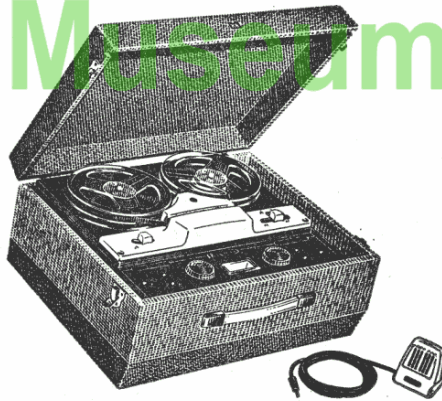
87, McALPINE STREET,
GLASGOW
CENTral 1779

Telephone: BLAckfriars 1751 (3 lines)



Service Manual for RT20

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GENERAL INFORMATION

The RT.20 is a low priced tape recorder, suitable for recording from microphone (provided with recorder), radio or gramophone.

The recorder operates at a tape speed of $3\frac{3}{4}$ ins. per second, and gives a playing time of $1\frac{1}{2}$ hours on normal tape, and 2 hours 8 minutes on long play tape.

These times are achieved by recording two tracks on each tape.

POWER SUPPLY: 200–250 volts, 50 c/s.

POWER CONSUMPTION: 65 watts.

DIMENSIONS:	<i>Height</i> 7 $\frac{1}{2}$ ins. (19.1 cms.)	<i>Width</i> 16 $\frac{3}{4}$ ins. (42.5 cms.)	<i>Depth</i> 13 $\frac{1}{4}$ ins. (34 cms.)	<i>Weight</i> 22 lbs. (10 Kgs.)
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VALVE COMPLEMENT:

12AX7 or ECC83
ECL82
EM84

1st and 2nd amplifiers.
3rd amplifier and output amplifier, or erase oscillator.
Recording level indicator.

Selenium Rectifiers:

Siemens B250 C75
S.T.C. M3

H.T. Rectifier.
Recording level detector.

CONTROLS:

On/Off, Play Back Volume and Recording Level Control. Play Back Tone Control with Muting Switch.

CIRCUIT DESCRIPTION

When the recorder is operated in the recording position, and the microphone is being used, the output from the microphone is coupled to the grid of V1a, by condenser C1. This is screened to reduce hum pick-up.

The output of V1a is coupled to the grid V1b, via C5, and the Volume Control R6.

When recording from radio or gramophone the input is connected from R5 to the top of the Volume Control. The output of V1b passes through another stage of amplification in the triode section of V3 before application to the recording head, L1. Control of the responses of these three amplifiers is achieved by fixed tone correction circuits, designed to apply the necessary compensation for recording characteristics.

The output of V3a is detected by the rectifier, M3, and applied to the grid of the level indicator, V2, EM84.

The pentode section of V3 is operated as an erase oscillator. When recording the coil L3 is back coupled to the grid of the pentode, in order to provide feed back for the oscillator. The erase head, L2, is coupled to the oscillator coil by means of winding, L4.

On play back, the play back head, which is also the recording head, is connected in place of the microphone.

The output of V3a is coupled to the grid of the pentode section of V3, which operates as an output stage for feeding the loudspeaker. The tone control is connected across the primary of the audio output transformer, L5.

A switch is included on the Tone Control which serves to mute the output of the recorder, when operating on play back. This can be used when feeding into a separate audio amplifier.

H.T. supply is provided by means of the mains transformer and contact cooled selenium rectifier.

The output of the rectifier is smoothed by means of a resistance condenser network.

COIL AND TRANSFORMER DATA

Erase Oscillator Coil	Approximate Ohms
Secondary (Pin 1 and 2) 	3.0 Ω
Part Primary (Pin 4 and 6) 	15.5 Ω
Part Primary (Pin 3 and 4) 	5.5 Ω
 Audio Output Transformer	
Primary 	443 Ω
 Mains Transformer	
Common to 205 tap 	76 Ω
Common to 225 tap 	84 Ω
Common to 245 tap 	93 Ω
H.T. Winding 	272 Ω

ALL OTHER LESS THAN 1 OHM.

Removal of Tape Deck and Amplifier

- (a) Locate phillips screws at hinged side of case and remove.
- (b) Lift out Tape Deck and Amplifier raising it from the back of the cabinet first.

Head Shield (Hum Bucking)

In the event of the Record/Playback head becoming loose, the head changed or the tape cover of the deck removed, it may be necessary to re-position the head shield. This should be carried out by rotating the head shield for minimum hum when switched to the playback position.

Bias Oscillator Adjustment

Connect valve voltmeter across Record/Playback head i.e. connections on S3P. With a suitable trimming tool adjust osc. coil L3 for a reading of 45V. (This voltage corresponds to the correct bias current). Transfer valve voltmeter leads to the erase head i.e. connections on S6R and ensure a reading of not less than 21V appears at this point. A lower figure may result in incomplete erasure. (It will be necessary to use a diode probe in conjunction with the valve voltmeter, in order to achieve correct voltage readings.)

Changing of Switch (S1)

If the switch S1 is changed it may be noticed that the magic eye tuning indicator is partially closed on the record position with no signal input. This will probably be due to stray coupling between the leads from the oscillator coil and switch. The leads in this instance should be dressed to obtain maximum opening of the tuning indicator. If a valve voltmeter is available a reading of less than 1.5V A.C. should be obtained at the anode of V2A for maximum opening. This symptom may also be experienced if the mike jack fails to short to earth when the mike plug is removed.

Magnetisation of Heads

A high noise level or hiss on recordings may be attributed to the head becoming magnetised. To remedy this fault, a defluxer unit should be used.

NOTE:

It is important that metal objects such as screwdrivers etc., should be kept well away from the heads to prevent magnetisation.

On no account should continuity checks be made on the heads with an AVO or similar instrument, as this will magnetise the head.

Checking of Heads

To check the function of a suspect head:

- (a) Replay tape that has previously been recorded.
- (b) A continuity check should be made by connecting a 10 ohm resistor in series with the earthy end of the head, and check that a signal or bias voltage appears across the resistor using a valve voltmeter.

Changing of Heads

If the erase head is changed it is essential that the azimuth and vertical alignment of the gap is set at right angles to the tape. If the Record/Playback head is changed the azimuth adjustment is far more critical than that required for the erase head and should only be carried out in conjunction with a high grade test tape, e.g. C.C.I.R. test tape or E.M.I. T.B.T.I.

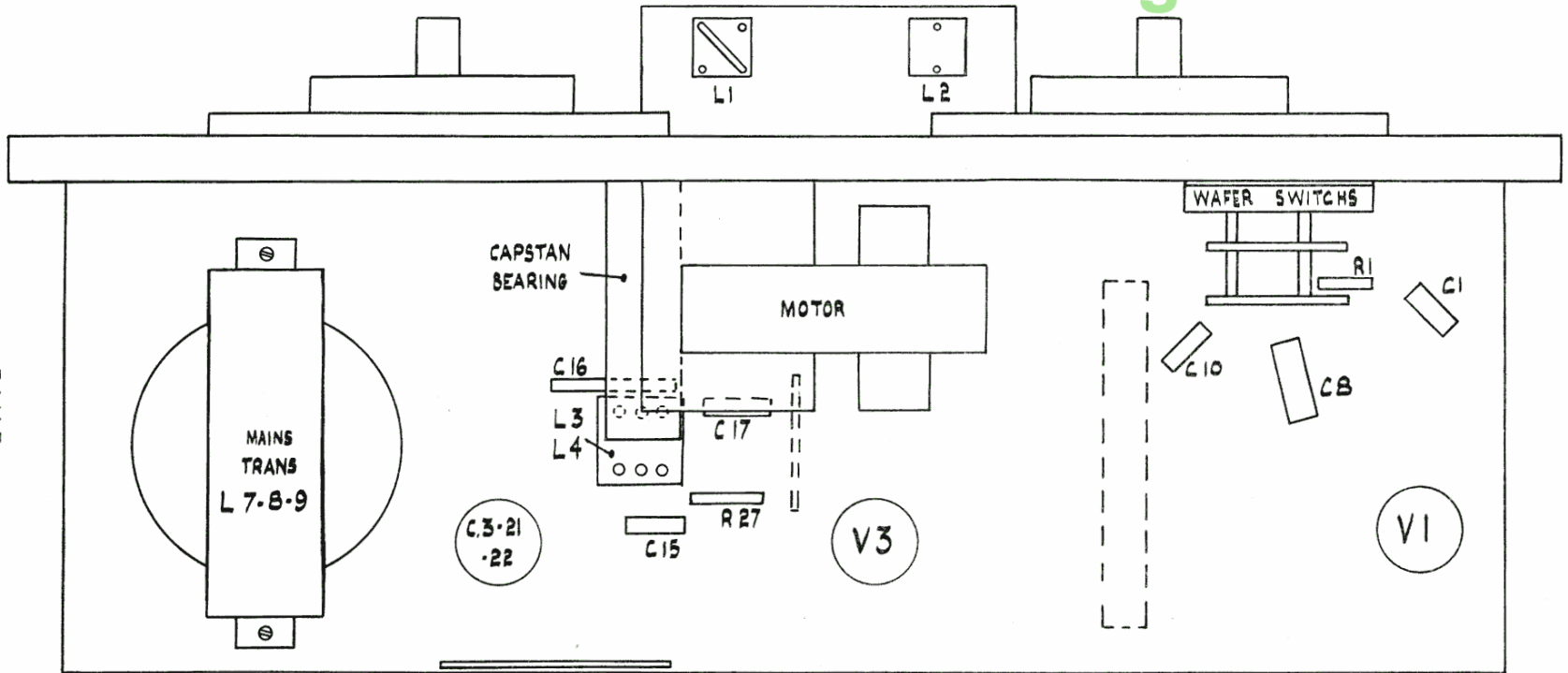
This tape should be played at the 8 Kc/s frequency band and the head adjusted by means of the screw (without the spring washer) for maximum output.



R.T.20 SPARES LIST

PRICES ARE SUBJECT TO ALTERATION WITHOUT NOTICE

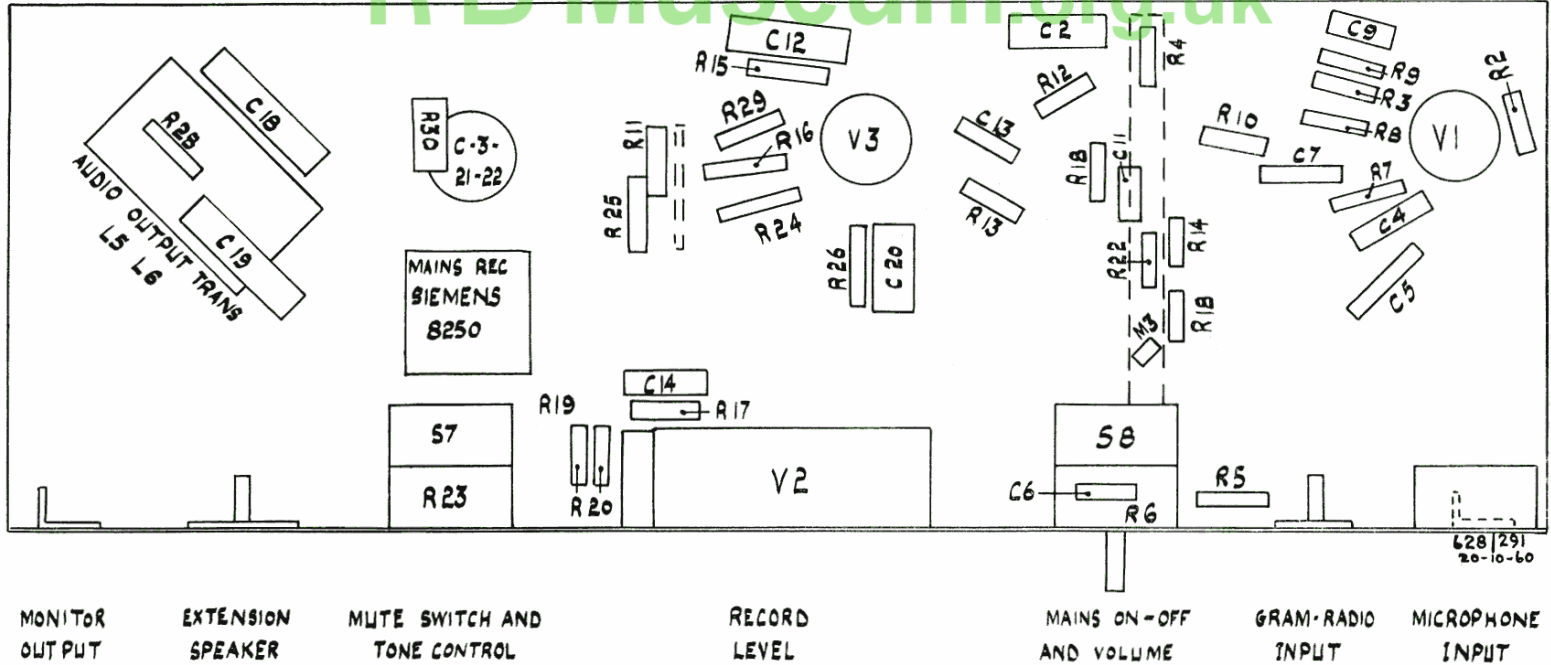
Component	Colour Code	CCT. Ref.	Part No.	Price	Component	Colour Code	CCT. Ref.	Part No.	Price
Cabinet			636/4	162/-	POTENTIOMETERS				
Control Panel Printed			636/145	7/6	Off/On Volume	R.6	9/37		10/6
COILS					Tone	R.23	9/38		10/6
Oscillator Coil Assy.		L3, 4	636/48	6/6	Rectifier B250		14/7		12/9
CONDENSERS					Rectifier M.3		14/8		2/8
32+32+32 Mfd. 275v. Electrolytic		C3, 21, 22	KEM.93/D.	9/6	Resistor 1.2K Ω 5% 4W.	R.30	R122ELB		2/0
25 Mfd. 25v. Electrolytic		C20	KEM.103/D.	2/3	Speaker		636/250		20/6
Deck Switch Assy.		SI-s5	636/203	7/9					+ P.T.
HEADS ETC.					TAPE				
Record/Playback Head		L.1	636/216	25/-	Reel with 600 ft. Standard Type			636/218	18/-
Erase Head		L.2	636/217	25/-	Empty Reel			636/219	4/9
Head Shield			636/194	1/3	Tape Deck Assy. (B.S.R.TD.2)			636/215	
Knobs Assy.			636/146/	2/0	TRANSFORMERS				
Microphone Assy.			636/130	49/6	Mains Transformer	L8, 9		636/85	32/-
PLUGS					Audio O/P Transformer	L5, 6		636/95	10/-
Jack Plug (Red)			13/16 & /1	2/3	Vent Grille			522/197	2/6
Wander Plug (Red)			13/30/1	9					
Wander Plug (Black)			13/30	9					



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20-10-60.

MAINS TAPPING
PANEL
TOP CHASSIS VIEW RT20



MONITOR
OUTPUT

EXTENSION
SPEAKER

MUTE SWITCH AND
TONE CONTROL

RECORD
LEVEL

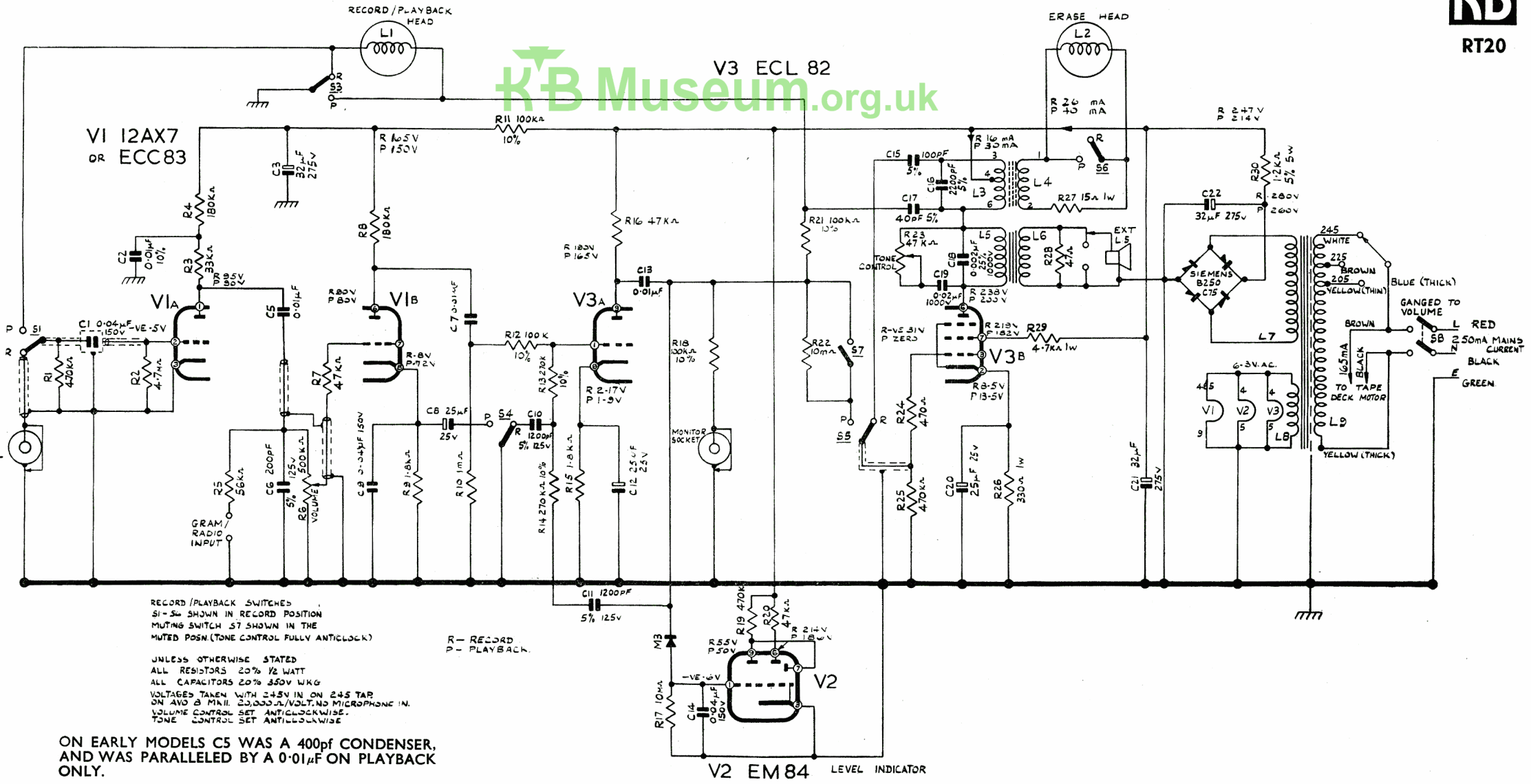
MAINS ON-OFF
AND VOLUME

GRAM-RADIO
INPUT

MICROPHONE
INPUT

BOTTOM CHASSIS VIEW RT20

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RECORD/PLAYBACK SWITCHES
 S1-S3 SHOWN IN RECORD POSITION
 MUTING SWITCH S7 SHOWN IN THE
 MUTED POSN. (TONE CONTROL FULLY ANTICLOCK)

UNLESS OTHERWISE STATED
 ALL RESISTORS 20% 1/2 WATT
 ALL CAPACITORS 20% 350V WKG
 VOLTAGES TAKEN WITH 245V IN ON 245 TAP
 ON AVO 8 MAINS 20,000A/VOLT, NO MICROPHONE IN.
 VOLUME CONTROL SET ANTICLOCKWISE.
 TONE CONTROL SET ANTICLOCKWISE.

ON EARLY MODELS C5 WAS A 400pf CONDENSER,
 AND WAS PARALLELED BY A 0.01μF ON PLAYBACK
 ONLY.

CIRCUIT DIAGRAM RT20