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# EKCO SERVICE DATA

## MODEL U354

**MODEL U354** is a five valve plus a rectifier and an electronic tuning indicator AC/DC receiver for the reception of VHF/FM transmissions on band II. Sockets are provided for the connection of a suitable aerial and an external loud-speaker. The receiver is housed in a two-tone plastic cabinet.

**MAINS SUPPLY** : 200-250 volts A.C. 40-100 c/s., or D.C.

**MAINS CONSUMPTION** : 54 watts at 240 volts, 50 c/s.

**WARNING** : The mains adjustment must be correctly set for the voltage of the mains supply before the receiver is connected. The chassis connects to one side of the mains supply, and care should be taken to ensure that the chassis is connected to the neutral side of that supply.

**LOUD-SPEAKER** : 8" x 5" elliptical. Impedance 3 ohms at 400 c/s.

**OUTPUT** : 4 watts.

**VALVES :**

V1A	} UCC85	{ Low-noise R.F. Amplifier
V1B		
V2	UF80	{ Frequency Changer
V3	UF80	{ First I.F. Amplifier
V4A	} UABC80	{ Ratio Detector
V4C		
V5	DM70	{ A.F. Amplifier
V6	UL84	{ Tuning Indicator
V7	UY85	{ Output Pentode
		{ H.T. Rectifier

**WAVEBAND COVERAGE** : 88-100 Mc/s.

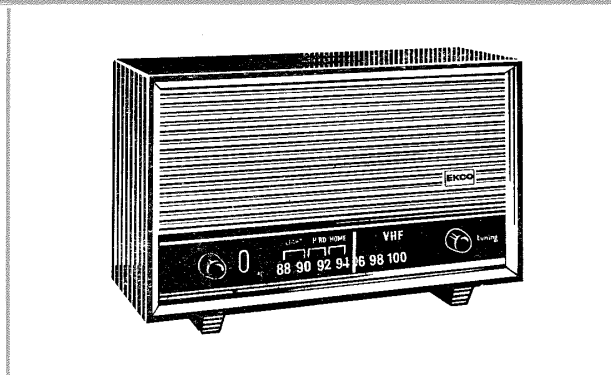
**CONTROLS** : Three controls are provided, two at the front and one at the rear of the cabinet.

Left Hand side : ON/OFF, VOLUME

Right Hand side : TUNING

Rear of chassis : TONE

**INTERMEDIATE FREQUENCY** : 10.7 Mc/s.



**CIRCUIT DESCRIPTION**

**R.F. AND MIXER STAGES** : F.M. signals from the dipole are passed to the aerial coils, L1,L2, and then to the cathode of V1A operating as a grounded-grid R.F. triode. Amplified signal voltages are developed across the tuned circuit L3,C4, and fed via C6,C7,L4,L5 and C11, to the grid of V1B. V1B operates as a self oscillating frequency changer. The unit is permeability tuned by the ganged cores L3,L4 and L5.

**INTERMEDIATE FREQUENCY STAGES** : The I.F. signal at the anode of V1B is transformer coupled by L6,L7 to the control grid of V2, the I.F. amplifier, and thence from V2 anode to V3, via the transformer L8,L9. The amplified I.F. at V3 anode is coupled to the ratio detector V4A,B, by the discriminator coils L10,L11,L12. A D.C. voltage level is developed across R17,R27, and is fed to the suppressor grid of V2 as A.G.C.

**RATIO DETECTOR** : V4A,B operates as a conventional ratio detector, in which the signal voltage across L12 is 90 degrees out of phase with that across L10 when the F.M. signal is at the mean frequency, and the sum total of the signal voltages at the ends of L12 are equal and opposite. L11 applies a signal voltage to the centre of L12 that is in constant phase relation with the voltage in the primary winding, L10.

The voltage across L12 is applied to the opposed diodes V4A,B which, at mean frequency, produce a constant output. When the signal voltage in L10 deviates above or below the mean frequency, the phase in L12 changes relative to the degree of deviation. The total voltage,  $\frac{1}{2}L12 \pm L11$ , applied to one diode will therefore increase, while the other will decrease. The resultant output from the diodes will vary in direct sympathy with the deviation of the F.M. signal, i.e., in accordance with the audio content, and is fed via the I.F. filter circuit R12,C23,R13, to the Volume control. Variable Tone control is provided by R28, in conjunction with C24, connected across the Volume control. C27 operates as a reservoir across the two ratio detector diodes.

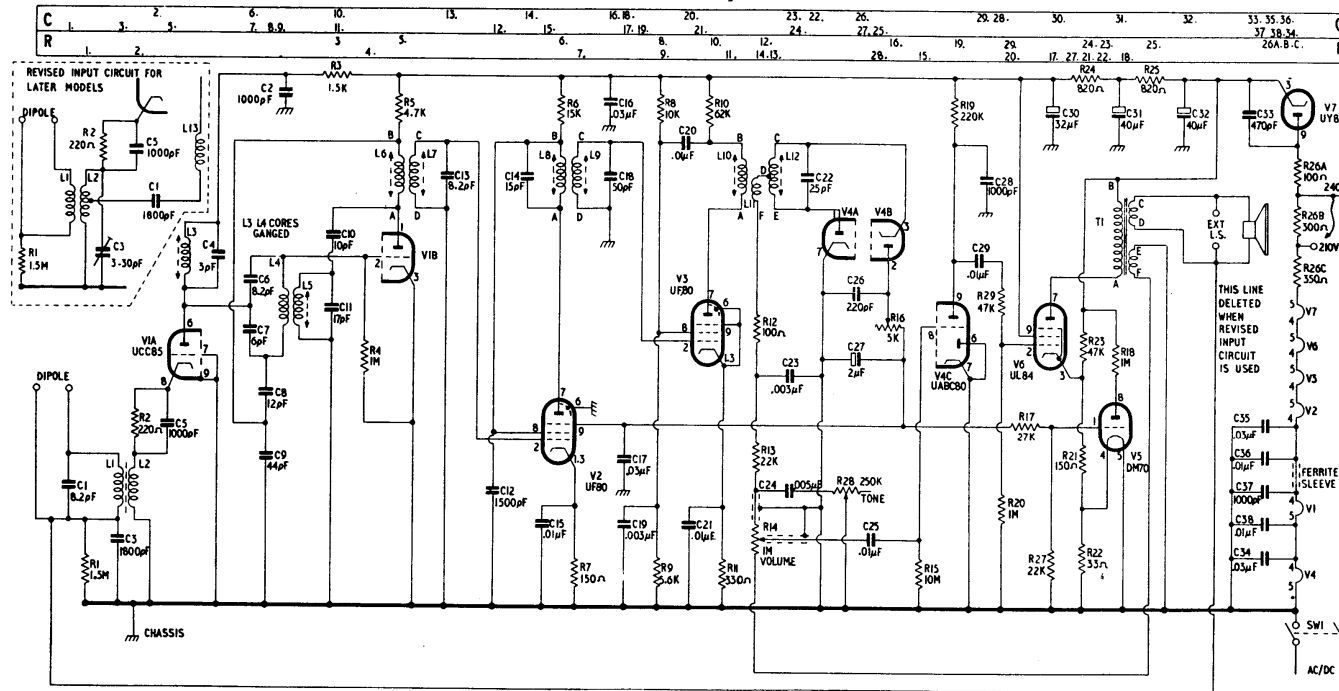
**A.F. AND OUTPUT STAGES** : A.F. voltages at the Volume control are fed via C25 to the triode grid of V4C, amplified, and resistance-capacity coupled to the grid of the output valve. A tertiary winding on the output transformer provides negative feedback to the input of the A.F. amplifier, V4C.

**POWER SUPPLIES** : An A.C. or D.C. mains supply is connected between the chassis and anode of the rectifier valve V7 via part of R26. The D.C. output at the cathode is smoothed and applied to the various circuits. The valve heaters are series connected, the supply volts being dropped to the required value by part of R26.

**TUNING INDICATOR** : The tuning indicator V5 derives its signal from the ratio detector load.

**CHASSIS REMOVAL** : Disconnect the receiver from the mains supply and remove the back cover. Slacken the grub screws and remove the two control knobs. Remove the four screws from the base of the cabinet, and withdraw the chassis to the extent of the loud-speaker leads.

**NOTE** : On later models it is necessary to unclip the internal aerial connection to the tuner unit before removing chassis from the cabinet.

C39 .01  $\mu$ F added between heater (pin 4, V3) and chassis**DRIVE CORD REPLACEMENT :**

**POINTER DRIVE :** A length of nylon cord approximately 36" long is required. Pass the cord through the hole in the edge of the drive drum and secure it to the free end of the spring.

The cord now passes clockwise round the drum, and anti-clockwise over pulley A. Passing under pulley B the cord takes three clockwise turns round the drive spindle and on to the drum in a clockwise direction to pass through the hole and then secured to the spring, maintaining a slight tension. Secure both knots with adhesive. Attach the pointer to the cord between pulleys A and B so that it coincides with a datum mark on the right-hand end of the scale, when the tuner unit carriage is  $\frac{3}{32}$ " from the fully returned position.

**F.M. UNIT DRIVE :** A length of nylon cord approximately 8 $\frac{1}{2}$ " long is required. Attach the cord to the end of the tuner unit carriage, and pass it over the pulley mounted on the tuner unit. Now take one turn anti-clockwise round the drive drum spindle and pass the cord round the rear of the right hand screw of the drive drum, and secure it firmly to the left-hand screw.

**CIRCUIT ALIGNMENT :** The equipment required to align the I.F. and R.F. circuits consists of: An A.M./F.M. signal generator, and oscilloscope, and A.F. output meter or a low range A.C. voltmeter, a 0-50  $\mu$ A meter, and a matched pair of 220K carbon resistors.

**I.F. ALIGNMENT :**

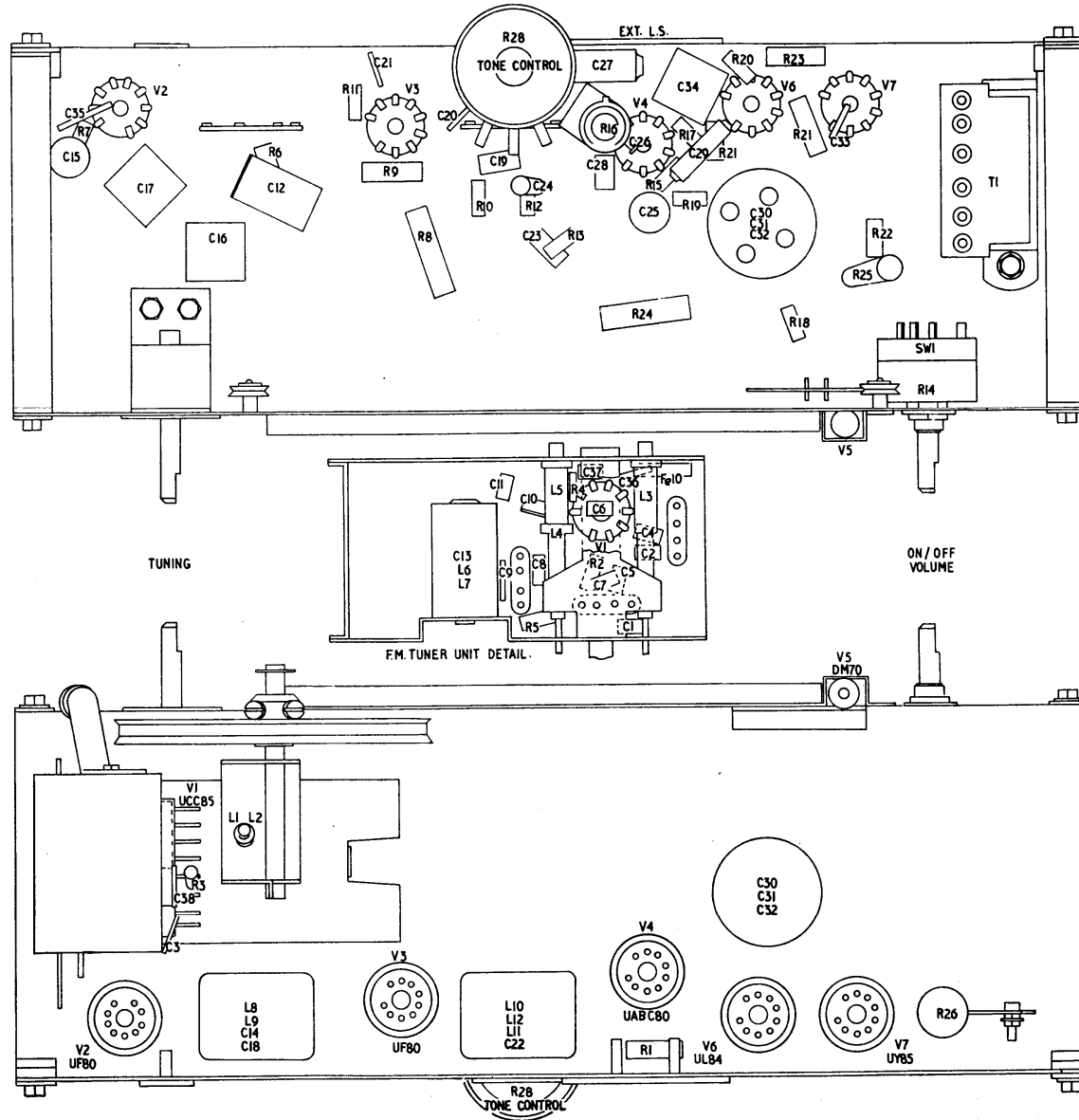
(a) **VISUAL METHOD :** Tune the receiver to a point on the band free from any incoming signal. Connect the oscilloscope between the junction of R12/R13 and chassis, and the sweep generator output to the control grid (pin 2) of V3. Adjust the discriminator secondary (L12) to obtain a symmetrical 'S' curve, and the primary (L10) for maximum amplitude of 'S' curve. Repeat until maximum gain and symmetry are obtained. Disconnect one end of the 2  $\mu$ F capacitor (C27), transfer the oscilloscope leads to between the junction R16/R17 and chassis, and inject the sweep generator output to pin 2, V2. Adjust L8/L9 for maximum response compatible with symmetry.

Transfer the generator output to between the junction R3/C2 on the tuner unit and chassis, taking care, as this point is at H.T. potential. (A blocking capacitor will be required if the generator output is not provided with one). Adjust L6/L7 as above. Re-connect C27.

(b) **METER METHOD :** Connect the output meter across the loud-speaker sockets, and turn the Volume and Tone controls to maximum. Connect the matched pair of 220K resistors in series between the junction of R16/R17 and chassis, and the 0-50  $\mu$ A meter between the junction of the two 220K resistors and chassis. Tune the receiver to a point on the band free of any incoming signals. Apply an unmodulated 10.7 Mc/s. signal to the grid (pin 2) of V3, and tune the discriminator primary (L10) for maximum reading on the micro-ammeter. Transfer the micro-ammeter chassis connection to the junction of R12/R13, and tune the discriminator secondary (L12) for zero current. This current must exhibit a positive and negative peak as L12 is adjusted. Repeat these operations for optimum results. Remove the micro-ammeter and modulate the 10.7 Mc/s. signal  $\pm 25$  Kc/s. Inject the weakest practicable signal to the grid (pin 2) of V2, and adjust L8/L9 for maximum output, using a damping combination consisting of a 4.7K resistor in series with a 0.001  $\mu$ F capacitor connected across the coil not being adjusted.

Now transfer the generator leads to between the junction R3/C2 and chassis, remembering that this junction is at H.T. potential, and that a blocking capacitor is necessary. Damp L6, tune L7, then damp L7, tune L6, as above. (Note : It is necessary to remove the tuner unit cover to connect the damping across L6). Remove the two 220K resistors.

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**R.F. ALIGNMENT :** Turn the Volume and Tone controls to maximum. Check that with the tuning control turned fully clockwise the carriage of the tuner unit is  $\frac{1}{32}$ " from fully open, and that the pointer coincides with the datum mark at the right-hand end of the scale. Adjust, if necessary by rotating the drive drum on its spindle, and/or sliding the pointer along the drive cord. Set the pointer to the 92 Mc/s. mark on the scale, and inject a signal of that frequency to the aerial socket. Adjust the cores of the oscillator coil (L5) and R.F. coil (L3) for maximum output. Check the calibration at 87 Mc/s., 94 Mc/s. and 99 Mc/s., which should be within  $\pm 0.3$  Mc/s. at all points. Check that the oscillator is operating on the low frequency side by tuning the receiver to 100 Mc/s. and identifying the image at 78.6 Mc/s.

**ADJUSTMENT OF R16 :** The exact setting of R16 necessitates the use of an A.M./F.M. signal generator capable of producing A.M. signals entirely free from F.M. Such a generator may not be at hand, but if one is available, proceed as follows :—Carefully tune the receiver to 92 Mc/s. for a maximum output with a small (10  $\mu$ V) F.M. signal input.

Now switch the generator to A.M. and adjust R16 for minimum output. Normally the adjustment of R16 will not be necessary, except in the event of the discriminator transformer being changed. Under such circumstances, and in the absence of a suitable generator, a rough setting should be made to give a resistance reading of 3.5K.

On later production models the internal aerial system and aerial coil have been redesigned, giving improved performance in weak signal areas. The back cover wire is replaced by a wire aerial in the cabinet, which is permanently connected to a tap on a new air cored aerial coil via a loading coil. An aerial circuit trimmer has also been added. The alignment procedure for these receivers has been modified as follows :—

At 92 Mc/s. adjust the oscillator core for calibration, and the anode coil core and aerial trimmer for maximum output. When the receiver has been replaced in the cabinet, and the internal aerial re-connected, it will be necessary to reset the aerial trimmer, C3. This is effected with a normal input to the aerial socket.

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Finally, with an 8  $\mu$ V input carefully tune the receiver to maximum output, switch the generator to A.M., and adjust R16 for minimum output. If a signal generator producing an A.M. signal free from any F.M. content is not available, remove all modulation and adjust R16 for minimum residual noise.

**D.C. RESISTANCE OF WINDINGS :**

T1	{	Pri.	165	ohms
		Sec.	0.35	ohms
		Tert.	0.23	ohms

All other windings have negligible D.C. resistance.

**VALVE VOLTAGE AND CURRENT DATA :**

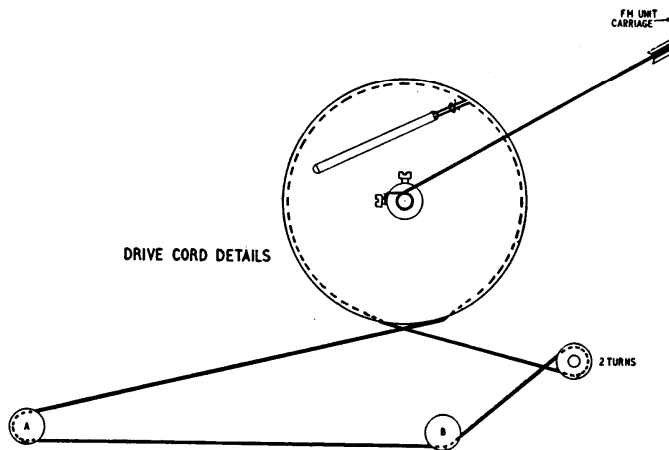
VALVE	ANODE			SCREEN			CATHODE		
	Pin	V	mA	Pin	V	mA	Pin	V	mA
V1A—UCC85	6	164	7.5	—	—	—	8	1.65	7.
V1B—UCC85	1	151	5	—	—	—	3	—	5
V2—UF80	7	85	4.5	8	85	1.5	3	0.9	6
V3—UF80	7	60	2	8	60	1	1 & 3	1	3
V4—UABC80	9	75	0.45	—	—	—	7	—	0.45
V5—DM70	8	80	0.15	—	—	—	4 & 5	—	0.15
V6—UL84	7	220	55	9	175	3.5	3	10.2	58.5
V7—UY85	9	228AC	—	—	—	—	3	230	98

**VOLTAGES AND CURRENTS :**

- H.T. voltage at C32 230V. D.C.
- H.T. voltage at C31 205V. D.C.
- H.T. voltage at C30 175V. D.C.
- H.T. current 98 mA D.C.
- Heater current 100 mA

**HEATER VOLTAGES :**

- V1 (UCC85) 26V. A.C.
- V2 (UF80) 19V. A.C.
- V3 (UF80) 19V. A.C.
- V4 (UABC80) 28V. A.C.
- V5 (DM70) 1.3V. D.C.
- V6 (UL84) 45V. A.C.
- V7 (UY85) 38V. A.C.



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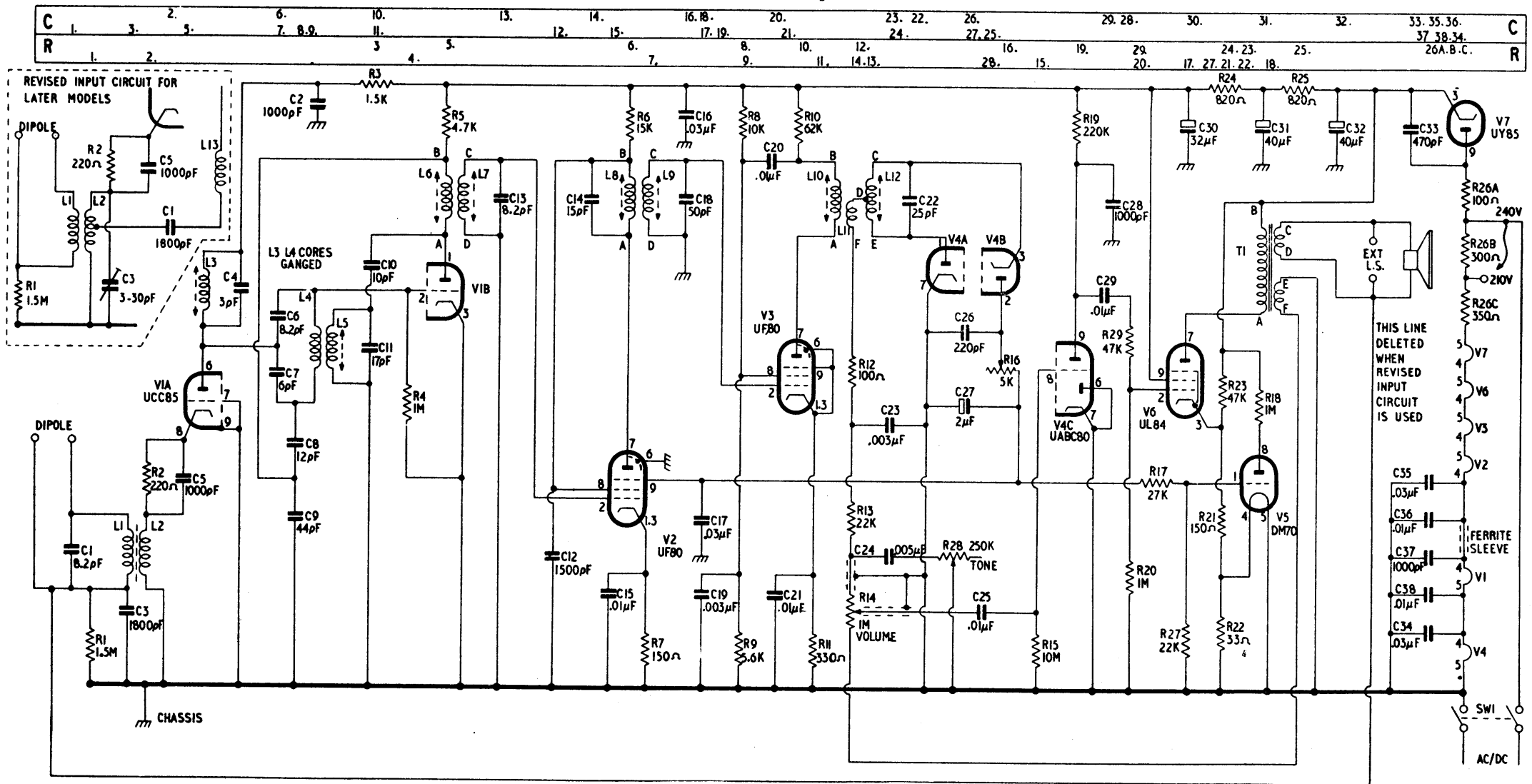
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C39 .01 μF added between heater (pin 4, V3) and chassis