"His Master's Voice" A.C. Models 718, 719 and 720

TUNING ARRANGEMENTS.

The tuning arrangements on this receiver are rather unusual and warrant a few words of explanation. Note first that both oscillator circuit switches and also the R.F. and converter grid switches have an extra switch bank each. This operates one step behind th circuit switching bank and is designed to short-circuit the coil tuning the next lower frequency band than the one in use. For example, the broadcast coils are short-circuited when operating on the 55-175 metres band. This is to avoid "dead spots," due to an unused coil (being tuned by its own self-capacity) resonating within the band in use.

Another feature is the use of two sets of tuning coils and shields. Set 1 tunes the "A" band, while set 2 caters for the "B" and "C" bands. The physical arrangement of these coils is clearly shown in the coil arrangement and top-chassis layout diagrams.

The various coil trimmers for this receiver are all accessible from the bottom of the chassis. Their positions are clearly shown in the under-chassis layout diagram. The "A" band padder is the only adjustable one of the three oscillator "tracking" condensers, and is mounted on the back of the chassis. The exact position is shown in the under-chassis layout. Note that in this diagram the back of the chassis is shown flat to reveal the positions of the various components mounted thereon.

The intermediate-frequency tuning arrangements are fairly conventional, but two unusual points should be noted. The first is that the circuit feeding the I.F. amplifier grid is designed to have a considerably lower L/C ratio than the other three, and the second is that the R.F. by-pass condenser (C70) and filter resistor (R14) are both housed inside the can of the second I.F. transformer.

The I.F. transformers are tuned to a frequency of exactly 460 KC., and the trimmers are accessible from the bottom of the chassis.

OPERATING VOLTAGES.

The following voltages should apply in this receiver. Measurements were made between chassis and socket contact indicated with a "1,000 ohms per volt" meter operating on the highest convenient scale for each reading. A tolerance of plus-minus 10 per cent. is permissible. The receiver should be operated with the sensitivity control (S15) set for highest sensitivity, and detuned from any signal during measurement, but an excellent check on the A.V.C. action is possible by making an extra measurement of the R.F. and I.F. valve cathode voltages when the receiver is tuned to a strong signal. To facilitate this check, the "strong signal" readings for these voltages are shown in brackets after the "no signal" readings at the R.F. and I.F. valve cathodes.

6D6, R.F. Amplifier: Cathode, 6 v.; screen, 100 v.; plate, 235 v.

6A7, Frequency Converter: Cathode, 5.5 v.; screen, 100 v.; oscillator plate, 190 v.; plate, 240 v.

6D6, 460 KC. I.F. Amplifier: Cathode, 5 v.; (2 v.); screen, 100 v.; plate, 240 v.

6B7, Detector, A.V.C. and Audio Amplifier: Cathode, 3 v.; screen, 55 v.; plate, 40 v.

Note: The plate voltage on this valve cannot be read accurately with a normal meter owing to the high value of series resistance present.

42, Output Pentode: Cathode, 16 v.; screen, 256 v.; plate, 237 v.

80, Rectifier: Filament to earth, 380 volts.

All of these valves, with the exception of the rectifier, operate from a filament supply of 6.3 volts.

It will be noted that the minimum bias applied to the R.F., converter, and I.F. valves appears to be much higher than normal in this receiver. Actually, it is only the cathode voltage drops which are higher; these being intentionally so to offset the positive bias applied to the grids through the A.V.C. system. This positive bias comes from the 6B7 cathode which is 3 volts above earth. Subtraction of this voltage from the R.F., converter, and I.F. cathode voltages will give the true value of minimum bias.

CURRENT TESTS.

Several simple current drain tests are possible with this receiver, and should be employed if an obscure fault is encountered.

The first is made by breaking the lead to the rectifier filament at terminal 4 on the loudspeaker socket. The current flowing at this point should be approximately 95 mA., and is the total current drain of the receiver.

The second test is the plate current of the output pentode. This may be checked by breaking the lead to the pentode plate from loudspeaker socket connection 1, and should be about 31 mA.

A third test may be made by breaking the lead to the voltage divider from loudspeaker socket connection 2. This will give the total current drain of the receiver without the pentode. The current at this point should be 59 mA.

The fourth test gives the oscillator plate current, and may be made by breaking the lead from contact 3 of the loudspeaker socket. The current here should be 5 mA.

PRELIMINARY TESTS.

The loudspeakers used in Models 718, 719, and 720 are of special H.M.V. design and manufacture. They have an overall diameter of 6½ inches and a field resistance of 1,250 ohms.

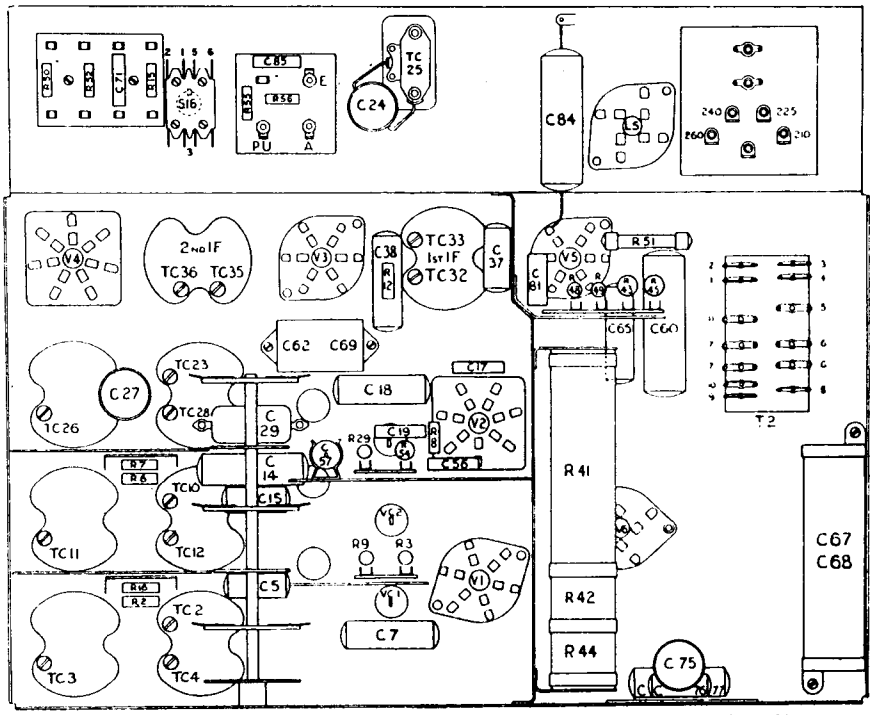
A feature of their make-up is the use of a numbered and readily accessible terminal strip. This permits simple preliminary tests of voltage to be made before removing receiver and speaker from the cabinet. Voltages at the four speaker connections should be as follows:—

(1) **Terminal 4 to chassis,** 360-400 v. If this is low try replacing 80. If this fails to make any difference, check mains voltage and transformer adjustment. Also check C68 (first 8 mfd. electro.).

(2) **Terminal 2 to chassis,** 256 v. If there is no voltage, loudspeaker field is defective. If voltage is low, check C67 (second 8 mfd. electro.) and do test No. 3.

(3) **Output Pentode Current:** An indication of this is provided by the voltage drop across the primary of the speaker transformer. This is connected to terminals 1 and 2 (2 is positive), and the voltage should be 19 volts. If this is high it will account for low voltage between terminal 2 and chassis as pentode is drawing excessive current. Try replacing 42. If this makes no difference, bias circuit of 42 must be checked, as well as coupling condenser C81. If voltage between 1 and 2 is low, and voltage between 2 and chassis is normal, the 42 has lost emission and should be replaced.

These preliminary voltage tests will often reveal whether the fault is due purely to the 42 or 80, or, if these are in good condition, where the fault is likely to be. In the first case, removal of the chassis and loudspeaker is obviated, and in the second, time will be saved in searching for the fault.



Under-chassis component layout for H.M.V. Models 718, 719, 720.

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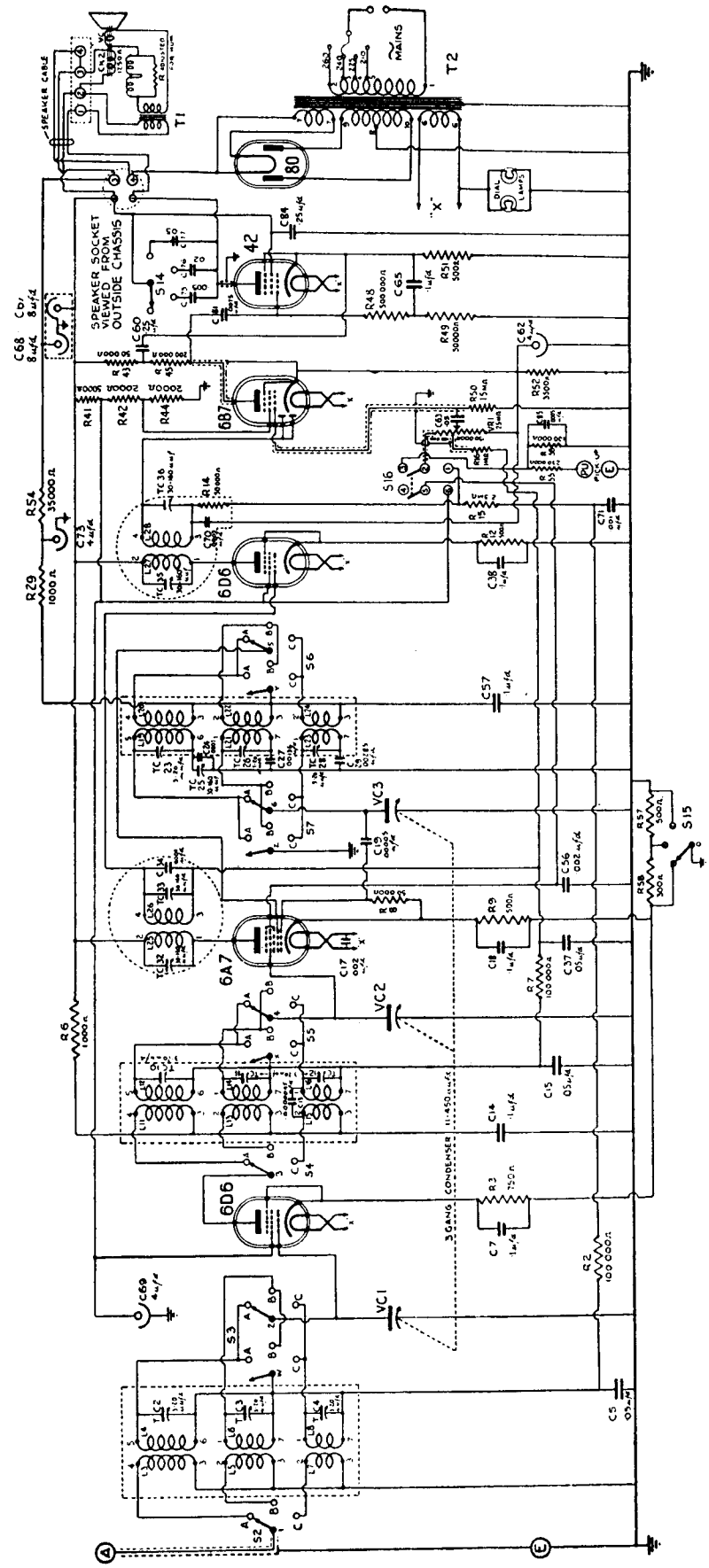

His Master's Voice Models 718, 719, and 720 all use the same receiver chassis—an A.C. operated, six-valve, 3 band arrangement providing continuous coverage from 17.5 metres to 560 metres (540 KC.). The first of these models is housed in a "table" cabinet, the second is a "console," and the third is a radio-gramophone combination. A detail difference is found in Models 719 and 720 in that a "magic eye" type tuning indicator is fitted.

Apart from the variation noted above, the three chassis are identical and will be treated as one in the following data:—

Five controls are fitted to the front control panel, and these are for tone (four position switch, S14); sensitivity (three position switch, S15); tuning (dual-ratio with concentric knobs); wave-change (three positions); and volume (VR1). The wave-change switch is coupled to a wave-band indicator which appears in a window at the bottom of the circular dial scale. The indication is in the form of letters, and these are:—

"A"—175 to 560 metres.

"B"—55 to 175 metres.

"C"—17.5 to 55 metres.

The dial on this receiver is of the floodlit, 180 degree movement type and is fitted with a "band-spread" indicator which rotates at a considerably greater speed than the main pointer. Two dial lamps are required, and these are of the 6.5 volt type. All of the panel controls are carried on a bracket in front of the chassis.

In addition to the panel controls, two more controls are provided on the back of the chassis. One of these is a D.P.D.T. toggle switch (S16), and serves as pick-up switch. It performs the dual function of bringing the pick-up terminals into circuit at the same time as it disconnects the radio output and removes the screen voltage from the frequency converter valve. The other back chassis control is a line voltage selector. This has four positions, and is only accessible by removing the line power socket from the chassis. The switch takes the form of a two-pin bridge, with a 1.0 ampere fuse incorporated, which can be placed in any of four positions. The markings of these tappings and the appropriate line voltage ranges for each are as follows:—

Tap	Line Voltage
210	200-210 volts
225	210-225 volts
240	225-240 volts
260	240-260 volts

The transformer design is such that the receiver may be connected to A.C. mains of any of the above voltages with frequencies between 40 and 100 cycles. The power consumption is approximately 90 watts.

Inspection of the circuit arrangement of this receiver will reveal several unusual features, and these should be borne in mind when servicing. The first of these is the use of a special bias-decoupling circuit for the output valve. Note that the usual high-capacity by-pass across the self-bias resistor is absent and that the network R49, C65 serves in its place. A further feature is the use of a tapped-element volume control (VR1) with sections of 100,000 and 150,000 ohms, making a total resistance of 250,000 ohms. The element of the volume control serves as combined detector and A.V.C. diode load resistor, and the tapping provides a reduced control voltage for the 6A7 and the I.F. amplifier.

The pick-up connections are also of interest. Note that the resistor network R55 and R56 is shunted across the pick-up, and that the receiver input connection is made to the junction of the two.

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