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PYE 350/C ALL ELECTRIC THREE

350/AC ?

Servicing and Restoration Report.

1. General

c1929

The Pye All Electric Three model 350/C is a three valve, two waveband AC mains receiver dating from the late 1920's, when it retailed for £25 0s. 0d. A separate high impedance loudspeaker is required for the set, which embodies an HF stage, anode bend detector and output stage. An early Westinghouse metal rectifier is incorporated in the power supply. The HF and detector stages are tuned separately. The wavelength coverage is approximately 900 - 2300 metres ("long waves") and 210 - 520 metres ("short waves").

2. Circuit Details

The circuit diagram is given in Figure 1. The aerial circuit is tuned by L1 or L2 and VC1, the waveband being selected by S1. Two separate aerial input tappings are provided. V1 is a conventional screen grid valve. This is transformer coupled via L3 or L4 to the detector tuned circuit, L5 or L6 and VC2. The waveband is selected by S2, which is mechanically ganged with S1. V2 is a triode wired as an anode bend detector. This circuit is unconventional in that reaction is provided via the differential condenser VC3. In order to obtain sufficient feedback to make the system work with the anode bend detection, the reaction feedback is taken to a tapping on the tuned circuit itself. Note that neither the aerial nor detector tuned circuits are directly earthed (to DC). The detector is coupled using an LF transformer to the triode output stage V3. A 70 K variable resistor (VR1) connected across the T1 primary acts as a crude volume control. The output stage is choke-capacity coupled to the loudspeaker using L7 and C7.

The power supply for the valve heaters is derived from a 4V centre tapped winding on the mains transformer T2. The HT winding is connected to a rectifying and voltage doubling circuit. The smoothed HT appears across resistor R3 which a sectionally wire wound component. The HT and bias supplies for the valves are picked off from tappings on R3. Adjustment for various mains voltages is provided by tappings on T2 primary.

Provision is made for using the set with an electric gramophone pick-up. The intermediate position of S1/S2, between long and short waves, breaks all contacts except S2g, and the the detector valve bias conditions are altered so that it acts as a conventional amplifier.

Notice that the decoupling components C3, C4 and C5 all share a single can, as do the smoothing condensers C10 - C13. C12 and C13 consist of pairs of condensers wired in parallel. (VARIATIONS ARE FOUND)

3. Valve Types

No information was available with the set on the appropriate valve types. Accordingly suitable valves were determined by calculation of the required characteristics from component values and comparing these with data for known valves. The following set was derived, and all subsequent measurements made with these in circuit:

V1 - AC/SG
V2 - AC/HL
V3 - AC/P

} THESE ARE MAZDA TYPES AND WERE FACTORY FITTED

Subsequently a reference to a suitable set of Osram valves was found (The Osram Wireless Guide 1932 - 33). This suggested MS4B, MH4 and ML4. At first it was thought that the choice of valves would be critical in order to obtain the right bias conditions on V2. In practice, however, it was found that many combinations of valves of "near" characteristics gave good results.

4. Component Values

The component values are given in Figure 1 and in Table 1. The values of the large paper condensers were illegible in many cases, and were determined on a Wheatstone bridge followed by "rounding" to the probable value.

5. Voltages and Currents

Table 2 gives the voltages and currents to be found in the set when tuned to the HF end of the short waveband, but with no powerful signal present. The mains input voltage was 240. All voltages are taken with repect to chassis (except the AC voltage on the secondary of T2) using a 20,000Ω/V meter. The approximate currents are calculated from the measured voltages and resistances. There are some minor inconsistencies owing to small errors in the voltage/resistance measurements.

6. Restoration

(The following notes contain details of the restoration work carried out on the author's set. Other sets may, of course, require different treatment).

The biggest problem encountered during the restoration was unsoldering and disconnecting wires. These are of heavy gauge copper, and very strong mechanical joints were made before the original soldering.

The secondary of transformer T1 was open circuit at the soldered internal connections. The metal case is too small to allow a miniature replacement to be put inside, and rewinding seems to be the only answer. In fact the component is sectionally wound on an ebonite bobbin. Consequently no great difficulty was encountered with the rewinding except that of handling the very fine 47 SWG enamelled copper wire. A winding machine (the author's is home-made) is essential. If it is hand powered some stamina is also called for as there are several thousand turns per section! There is no need to count the turns as the winding space can simply be filled. On the author's set only one section required rewinding.

The wire-wound resistor R3 was also open circuit in several sections. This was rewound, using the original silk covered resistance wire. This is again very fine and needs careful handling.

The metal rectifier was found to be in reasonably good condition, although the forward resistance was a trifle high. All the paper condensers were tested and found to be in a satisfactory state with regard to leakage, and no renovation was required. (THE PAPER CAPACITORS ARE USUALLY LEAKY)

Notice that the spindle of the volume control VR1 is at HT potential. Take care in handling it if the knob is not on. The control is fastened to the front aluminium panel using an ebonite bush, which should always be carefully replaced (it was incorrectly assembled on the author's model, no doubt by an earlier "repairer"). The open track of VR1 was badly worn, but serviceable after cleaning. The crude volume control works as well as can be expected, with most of the control effect taking place in the first few degrees of rotation.

Notice also that the moving vanes of the tuning condensers VC1 and VC2 are not earthed. Do not attempt to dismantle the slow motion drives or remove the knobs - they are very difficult to reassemble without damage.

On the author's model the reaction control VC3 was connected the wrong way round so that maximum reaction was applied when the control was turned fully

TABLE 2

VALVE:	V1 (AC/SG)	V2 (AC/HL)	V3 (AC/P)
Anode voltage (R3 tap to chassis)	120	133	155
Anode current mA (calculated)	1·9	2·5	7·8
Bias voltage	-0·76	-2·4 (-1·2 at gram)	-12·5
Screen voltage	35·5	-	-
Screen current mA	0·9	-	-

Voltage between C11 - C12 junction and chassis: 166
Voltage across secondary of T2 : 130 (AC)
Total HT current : 15·1 mA

VOLTAGES AND CURRENTS

anticlockwise. This gave rise to much puzzlement and wasted time when the author tried to operate the set with what appeared to be minimum reaction. Violent oscillation ensued until the problem was elucidated. On subsequent examination the dressing of the heavy gauge connecting wires appeared to indicate that the control had been wired this way round from the beginning, and no sign of later ham-fisted repairs existed. Whether this was really the case, and the reason behind it, remains a mystery.

7. Operation

The operation of the set calls for no special comment. It works well with a contemporary reed loudspeaker. Overloading of V1 will occur on strong signals if the wrong aerial tapping is used. Reduction of volume by detuning the aerial circuit is frequently a better way of control than trying to use VR1.

TABLE 1

Capacitors				
C1		1μ	V1 bias decoupling	
C2		1μ	V1 screen decoupling	
C3		1μ	V1 anode decoupling	common can
C4		1μ	V2 anode decoupling	common can
C5		1μ	V2 bias decoupling	common can
C6		0·0003μ	V2 anode HF bypass	
C7		2μ	Loudspeaker coupling	
C8		0·002μ	V3 anode bypass	
C9		1μ	V2 bias decoupling (gram)	
C10		1μ	Smoothing	common can
C11		1μ	Smoothing	common can
C12		2x1μ	Reservoir	common can
C13		2x1μ	Reservoir	common can
Resistors				
R1		100 K	V2 bias decoupling	
R2		100 K	V2 bias decoupling (gram)	
R3		3K + 2·7K + 29K + 18K + 48Ω + 28Ω + 70Ω + 680Ω	HT potential divider	
Other				
VR1		70 K	Volume control	
T1	Pri	1000Ω approx		
	Sec	12 K approx	Intervalve transformer	
L7		400Ω approx	Output choke	
L8		700Ω approx	Smoothing choke	

COMPONENT VALUES

** Erratum .... C14 0·001μ Mains RF bypass

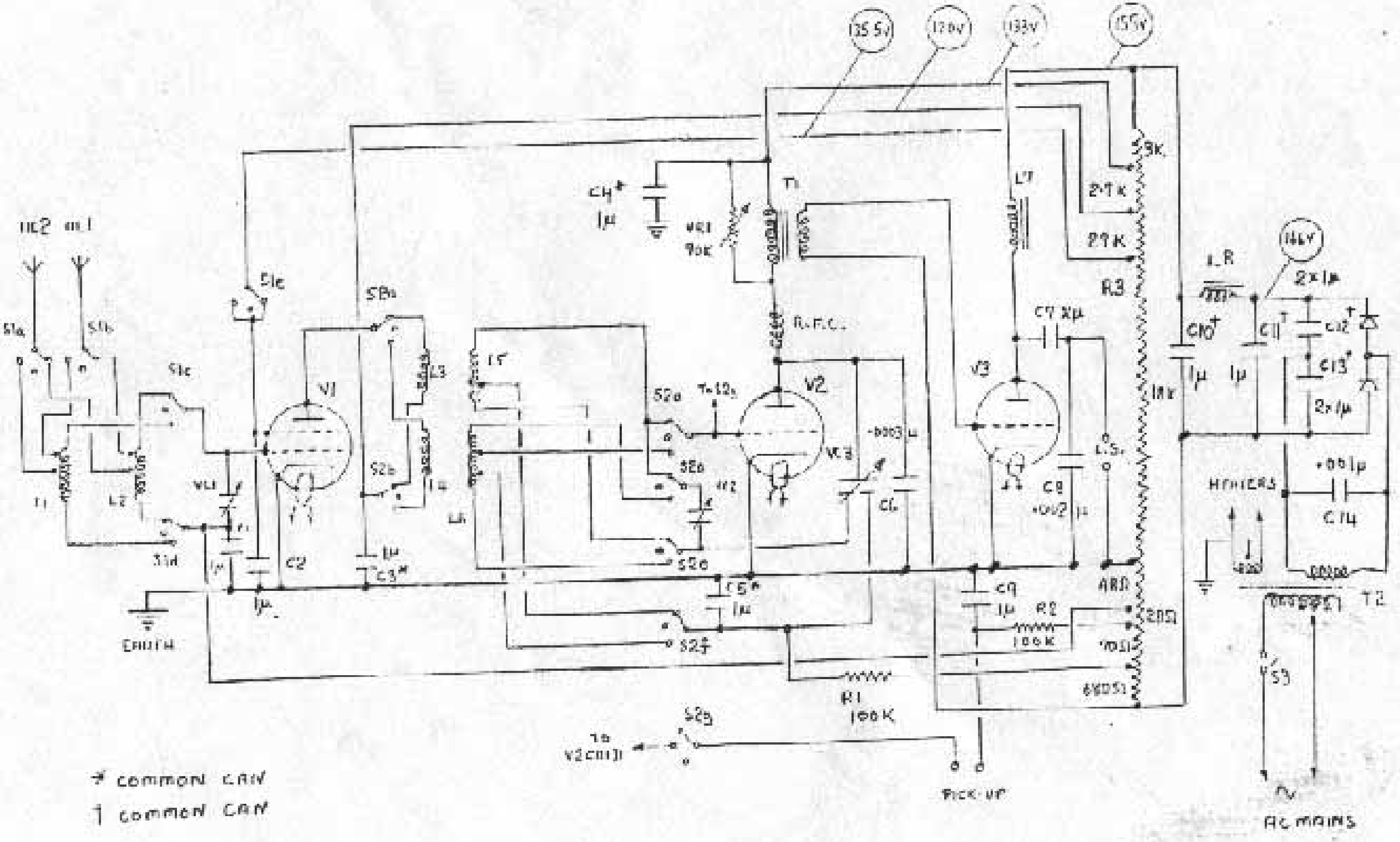

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FIGURE 1