Pye 350/C All-Electric 3

1. General

The Pye All Electric 3 model 350/C is a three valve, two waveband AC mains TRF receiver. A separate high impedance loudspeaker is required for the set, which embodies a screen grid HF stage (V1, AC/SG), a triode anode bend detector (V2, AC/HL) and a triode output stage (AC/P). A Westinghouse metal rectifier of early design (no cooling fins) is incorporated in the HT power supply, which operates on a voltage doubler principle.

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 below. The aerial circuit is tuned by L1 or L2 and VC1, which has an edgewise slow motion drive and drum scale. Two separate aerial input tappings are provided. V1 is a conventional indirectly heated screen grid valve. This is coupled *via* L3 or L4 to the detector tuned circuit, L5 or L6 and VC2. The waveband is selected by the mechanically ganged switches S1 and S2. The detector is a triode wired as an anode bend detector. This circuit is unconventional in that reaction is provided *via* the solid dielectric differential capacitor VC3 giving feedback to L5 or L6. The reaction winding is itself a part L5 or L6, and so is incorporated in the tuned circuit.

Neither the aerial nor detector tuned circuits have a DC connection to chassis, as they are incorporated in the valve biasing arrangements. The detector is coupled to the output stage V3 with an intervalve LF transformer (T1). A 70 kΩ variable resistor (VR1) connected across the T1 primary acts as a crude volume control. The output valve is choke-capacity coupled to a loudspeaker using L7 and C7.

The power supply for the valve heaters is derived from a 4 volt centre tapped winding on the mains transformer T2. The HT winding is connected to a rectifying and voltage doubling circuit (C12, C13, MR1). Smoothing is accomplished by the choke L8 and capacitors C11 and C10. The HT appears across the resistor R1, which is a sectionally wire wound component. The HT and bias supplies for the valves are picked off from tappings on V3. Mains voltage adjustment 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 detector valve bias conditions are altered so that it acts as a conventional amplifier.

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

3. Component values

The component values are given in Table 1. The capacitors were measured from an actual receiver (serial number C26118) using a Wheatstone bridge followed by "rounding" to the probable design value. Resistances were measured on a multimeter.

4. Voltages and currents

Table 2 gives the voltages and currents found on the same receiver when tuned to the HF end of the short waveband, but with no powerful signal present. The mains input was 240V. All voltages were measured with respect to chassis (except the AC voltage on the secondary of T2) using a 20,000 Ω/V meter. The currents are approximate.

5. Operational notes

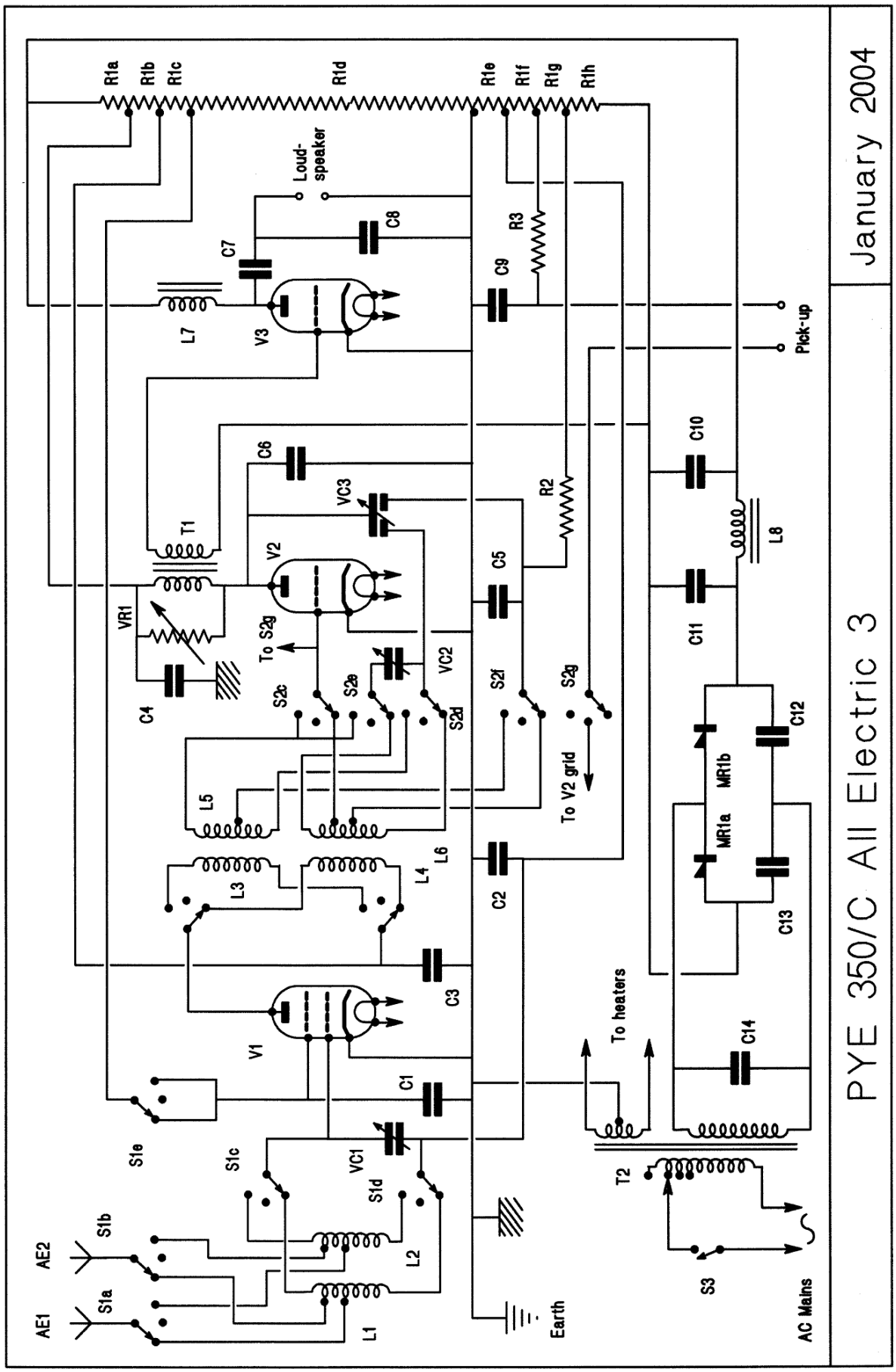
The operation calls for no special comment. It works well with a contemporary moving iron loudspeaker. Overloading of the detector occurs on strong signals if the wrong aerial tapping is used. The volume control VR1 work as well as might be expected (ie not very!). Most of the effect occurs in the first few degrees of rotation. Reduction of volume by detuning the aerial circuit is frequently a better way than trying to use VR1.

6. Service notes

On the particular receiver under test, all the fixed capacitors were tested for leakage and found, rather surprisingly, to be in good condition. The metal rectifier was also found to be in good condition, though the forward resistance is a trifle high. The secondary winding of T1 was open circuit, as was the wire-wound resistor R1. Both were re-wound.

Notice that the spindle of VR1 is at HT potential. It is insulated from the metal front panel by means of an ebonite bush, which must be carefully replaced if removed. Care should also be taken if the moulded knob is removed! The moving vanes of the reaction capacitor are also at HT potential, but in this case they are insulated from the spindle.

The moving vanes of VC1 and VC2 are not earthed. Do not attempt to dismantle the slow motion drives or remove the knobs - they are very difficult to re-assemble without damage.


PYE 350/C All Electric 3
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R1a
R1b
R1c
R1d
R1e
R1f
R1g
R1h
Loud-speaker
C7
C8
C9
R3
L7
V3
Pick-up
C6
C10
VC3
R2
T1
V2
C5
L8
VR1
To S2g
VC2
C11
C4
S2c
S2a
S2d
S2f
S2g
C12
L5
MR1b
MR1a
To V2 grid
L6
L4
L3
C2
C13
C3
V1
To heaters
C14
C1
S1e
S1c
VC1
S1d
T2
S1b
AE2
S1a
AE1
L2
L1
S3
Earth
AC Mains

Table 1 - component values and functions

Capacitors			
C1	1.0 µF	V1 screen decoupling	
C2	1.0 µF	V1 bias decoupling	
C3	1.0 µF	V1 anode decoupling	⎫
C4	1.0 µF	V2 anode decoupling	⎬ common can
C5	1.0 µF	V2 bias decoupling	⎭
C6	0.0003 µF	V2 anode HF bypass	
C7	2.0 µF	Loudspeaker coupling	
C8	0.002 µF	V3 anode HF bypass	
C9	1.0 µF	V2 bias decoupling (gram)	
C10	1.0 µF	Smoothing	⎫
C11	1.0 µF	Smoothing	⎬ common can
C12	2 x 1.0 µF	Reservoir	⎪
C13	2 x 1.0 µF	Rerservoir	⎭
C14	0.001 µF	Mains RF filter	
Resistors			
R1a	3 kΩ		
R1b	2.7 kΩ	*R1 a-h is the HT and bias*	
R1c	29 kΩ	*potential divider.*	
R1d	18 kΩ		
R1e	48 Ω	*Total resistance = 53.5 kΩ*	
R1f	28 Ω		
R1g	70 Ω		
R1h	680 Ω		
R2	100 kΩ	V2 bias decoupling	
R3	100 kΩ	V2 bias decoupling (gram)	
Others			
VR1	70 kΩ	Volume control	
T1	Pri 1000 Ω approx	V2 - V3 coupling	DC resistance
	Sec 12 kΩ approx		DC resistance
L1 - L6		Tuning coils	
L7	400 Ω approx	V3 output choke	DC resistance
L8	700 Ω approx	HT smoothing choke	DC resistance
S1		RF band switching	*S1 and S2 are*
S2		Detector band switching	*mechanically coupled*

Table 2 - voltages and currents

Valve	**V1 (AC/SG)**	**V2 (AC/HL)**	**V3 (AC/P)**
Anode voltage (tap on R1 to chassis) (V)	120	133	155
Anode curent (mA)	1.9	2.5	7.8
Screen voltage (V)	35.5	-	-
Screen current (mA)	0.9		
Bias voltage (tap on R1 to chassis) (V)	- 0.76	- 2.4 (- 1.2 on gram)	- 12.5

Voltage between C11 and C12 junction and chassis (V)	:	166
Voltage across secondary of T2 (V rms)	:	130 (AC)
Total HT current (mA)	:	15.1