NUMBER THIRTY-EIGHT (VOLUME TWO)

'TRADER' SERVICE SHEETS

PYE MODEL T21

A.C. SUPERHET

THE Pye T21 A.C. superhet employs a 3-valve (plus valve rectifier) circuit, with a triode-pentode frequency changer, pentode I.F. amplifier, and a double-diode output pentode valve for second detection, A.V.C. and output. Interesting features are a form of inter-station noise suppression, and the use of a special type of extinction tuning indicator, the operation of which is given fully in the circuit description below.

CIRCUIT DESCRIPTION

Aerial input by way of coupling coils **L1, L2** to inductive-capacity coupled band-pass filter. Primary **L3, L4** tuned by **C21**; secondary **L5, L6** tuned by **C24**; coupling condenser **C1.**

First valve (**V1, Mazda metallised AC/TP**) is a triode-pentode operating as frequency changer with cathode coupling. Variable-mu pentode section functions as first detector, while triode section forms separate oscillator with anode coils **L7, L8** tuned by **C27,** and reaction coil **L9** in common cathode circuit.

Visual tuning indicator in **V1** pentode anode feed circuit comprises a small lamp working in conjunction with chokes **L15, L16, L17,** which have a common core. When there is no signal input to the receiver, **V1** pentode is in its most sensitive state, and therefore the anode current (D.C.) passing through **L15** is at its highest. The core is thus magnetised to a certain extent and the inductances, and, therefore, the impedances, of the coils **L16, L17** are at their lowest, with the result that the lamp (connected in series) glows brightly. As a station is tuned in, the action of the A.V.C. circuit reduces the **V1** pentode anode current flowing through **L15**, and thus decreases the magnetisation of the core. This, in turn, increases the impedances of **L16, L17,** and the brilliancy of the lamp becomes less until the receiver is accurately tuned, when it glows very dimly. On very powerful transmissions the glow may be extinguished completely.

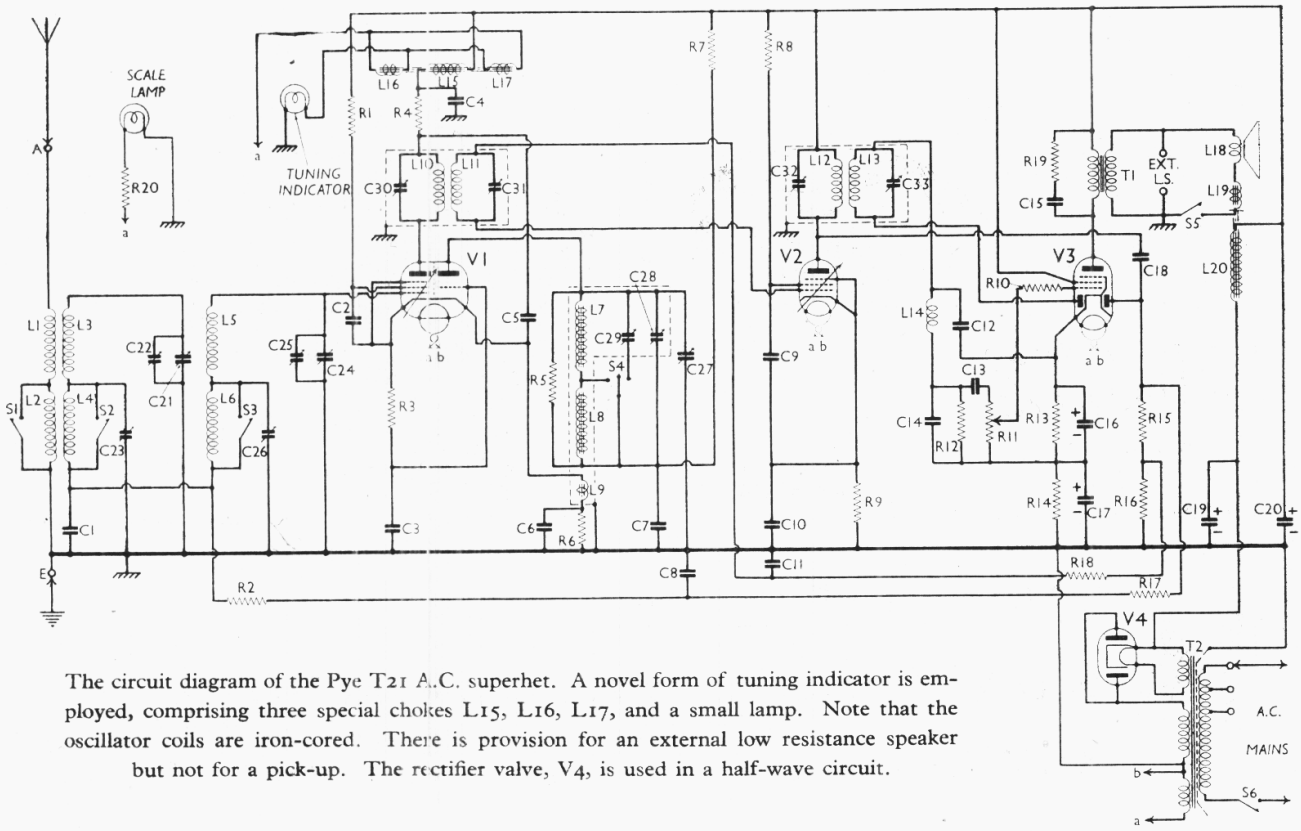
Second valve (**V2, Mazda metallised AC/VP1**) is a variable-mu pentode operating as intermediate frequency amplifier with band-pass transformer couplings **L10, L11** and **L12, L13.**

Intermediate frequency, 127 KC/S.

Diode second detector forms part of double diode output pentode (**V3, Mazda AC2/PenDD**). Second diode, fed from anode of **V2** by way of coupling condenser **C18,** provides steady potential which is fed back through decoupling circuits as G.B. to **V1** and **V2**, giving full delayed automatic volume control. Potential is developed across load resistances **R15, R16,** and delay voltage is obtained from **R13, R14**. Rectifier diode has a small negative bias so that rectification does not occur until the input signal reaches a certain pre-determined value. Thus, a degree of inter-station noise suppression is obtained. I.F. filtering by choke **L14** and condensers **C12, C14.**

Audio-frequency voltage is developed across **R12** and passed by way of condenser **C13** and manual volume control **R11** to pentode control grid of **V3.** Fixed tone compensation in anode circuit by means of R.C. filter **R19, C15** across primary of output transformer **T1.** Provision for connection of external low-resistance speaker across secondary, and for cutting out internal speaker by switch **S5.**

H.T. current supplied by half-wave rectifier in the form of a full-wave valve (**V4, Mullard IW3**) working with its anodes strapped. Smoothing by speaker field winding **L20** and large-capacity electrolytic condensers **C19, C20.**



The circuit diagram of the Pye T21 A.C. superhet. A novel form of tuning indicator is employed, comprising three special chokes L15, L16, L17, and a small lamp. Note that the oscillator coils are iron-cored. There is provision for an external low resistance speaker but not for a pick-up. The rectifier valve, V4, is used in a half-wave circuit.

COMPONENTS AND VALUES

	Resistances	Values (ohms)
R1	V1 S.G. H.T. feed	25,000
R2	V1 pent. cont. grid decoupling	250,000
R3	V1 osc. grid resistance	100,000
R4	V1 pent. anode decoupling	2,000
R5	L7, L8 artificial damping	40,000
R6	V1 cathode resistance	1,000
R7	V1 osc. anode decoupling	100,000
R8	V2 S.G. H.T. feed	25,000
R9	V2 fixed G.B. resistance	500
R10	V3 grid H.F. stopper	25,000
R11	Manual volume control	250,000
R12	Rect. diode load	250,000
R13	V3 G.B. and A.V.C. delay voltage resistances	150
R14		750
R15	A.V.C. diode load	500,000
R16		250,000
R17	A.V.C. circuit decoupling	500,000
R18	V2 cont. grid decoupling	500,000
R19	Part of tone comp. filter	8,500
R20	Scale lamp ballast resistor	3

	Condensers	Values (μF)
C1	Band-pass coupling condenser	0·1
C2	V1 S.G. by-pass	0·1
C3	V1 osc. grid condenser	0·0002
C4	Tuning indicator by-pass	2·0
C5	V1 pent. anode decoupling	0·1
C6	V1 cathode by-pass	0·1
C7	V1 osc. anode decoupling	0·1
C8	A.V.C. circuit decoupling	0·01
C9	V2 S.G. by-pass	0·1
C10	V2 cathode by-pass	0·1
C11	V2 cont. grid decoupling	0·1
C12	I.F. by-pass	0·0001
C13	L.F. coupling, diode to pent.	0·1
C14	I.F. by-pass	0·0001
C15	Part of tone comp. filter	0·01
C16	V3 cathode by-passes	50·0
C17		25·0
C18	Coupling to A.V.C. diode	0·0002
C19	H.T. supply smoothing	8·0
C20		16·0
C21	Band-pass primary tuning	—
C22	Band-pass primary trimmer	—
C23	Band-pass pri. L.W. trimmer	—

	Condensers (cont.)	Values (μF)
C24	Band-pass secondary tuning	—
C25	Band-pass secondary trimmer	—
C26	Band-pass sec. L.W. trimmer	—
C27	Oscillator tuning	—
C28	Oscillator M.W. trimmer	—
C29	Oscillator L.W. trimmer	—
C30	1st I.F. trans. pri. tuning	—
C31	1st I.F. trans. sec. tuning	—
C32	2nd I.F. trans. pri. tuning	—
C33	2nd I.F. trans. sec. tuning	—

	Other Components		Values (ohms)
L1	Aerial coupling coils		26·5
L2			20·0
L3	Band-pass primary coils		2·4
L4			8·9
L5	Band-pass secondary coils		2·2
L6			8·5
L7	Oscillator tuning coils		1·3
L8			58·7
L9	Oscillator reaction coil		0·7
L10	1st I.F. transformer	Pri.	110·0
L11		Sec.	110·0
L12	2nd I.F. transformer	Pri.	51·0
L13		Sec.	51·0
L14	I.F. filter choke		550·0
L15	Tuning ind. chokes	D.C. coil	2,850·0
L16		A.C. coil	10·0
L17		A.C. coil	10·0
L18	Speaker speech coil		1·23
L19	Speaker hum balancing coil		0·2
L20	Speaker field winding		1,650·0
T1	Output transformer	Pri.	740·0
		Sec.	0·3
T2	Mains trans.	Pri. total	46·0
		Heater sec.	0·08
		Rect. heater sec.	0·12
		H.T. sec.	82·0
S1-S4	Waveband switches, ganged		—
S5	Internal speaker switch		—
S6	Mains switch		—

VALVE ANALYSIS

The voltage readings in the table below were obtained with a high resistance voltmeter, connected from the anodes or screens of the valves to chassis. Readings were taken with no signal input.

In the case of **V1** (pentode section) and **V2**, it is advisable to stabilise the valve by connecting a 0.25μF, or larger, condenser from control grid to chassis and from anode to chassis respectively.

The readings obtained should agree with those in the table within plus or minus 10 per cent., providing the smoothed D.C. voltage is roughly 275 V. This voltage is normal when the maximum mains voltage is applied to any particular primary tapping of **T2**, for example, 235 V A.C. applied to the 216-235 V tapping.

The smoothed D.C. voltage is equal to the screen voltage of **V3**.

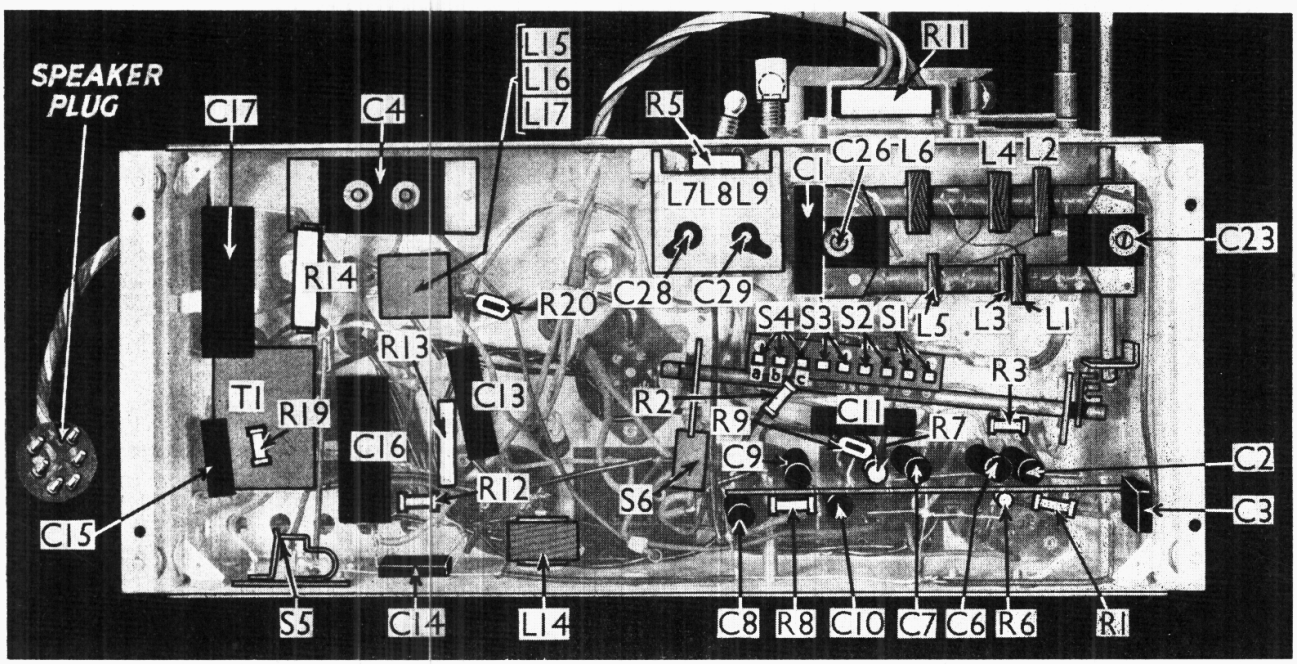
Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 AC/TP*	248	4·3	212	1·6
V2 AC/VP1	275	7·1	220	1·3
V3 AC2 PenDD	250	29·0	275	6·0
V4 IW3	370†	—	—	—

* Triode osc. anode, 72V, 1·2 mA. † A.C., anodes strapped together.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (pull off), and then unplug the 6-pin speaker plug from the sockets on the speaker chassis. Remove the four C.H. screws beneath cabinet which hold chassis in position. Chassis may now be withdrawn for service work, but before testing, speaker must be temporarily reconnected, preferably by means of a 6-way extension cable fitted with a suitable socket at one end and a plug at the other.

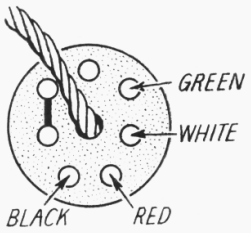
(Continued overleaf)



The under-chassis view. The contacts of the wave-band switches are indicated, and in the case of S4, lettered. (See under General Notes, Switches). The speaker plug and socket connections are given in the instructions for dismantling the set. L15-17 are included in a single metal case. S6 is ganged with the wave-band switches, while S5 is operated by the external speaker plug.

PYE T21 A.C. SUPERHET (continued)

The four wires to the speaker plug are colour coded, and we give a diagram showing the pins to which they are connected. The plug is shown in *plan* view. Note that there is no pin in the top hole corresponding to pin 1 of a 7-pin base, and also that pins 2 and 3 are joined, though none of the wires in the cable go



Plan diagrammatic view of the speaker plug, showing the colour coding of the wires to the pins.

to them. Behind the 6-way socket on the speaker chassis, the field, **L20**, goes to the sockets corresponding to the pins connected to the red and white leads; the speaker speech coil, **L18,** goes to the socket corresponding to the green lead, and the upper of the sockets corresponding to the two joined pins, while **L19**, the hum neutralising coil, goes to the lower of these two sockets, and that corresponding to the pin connected to the black lead. The effect of the two joined pins is to connect **L18** and **L19** in series.

Removing Speaker.—Four ornamental headed screws, with nuts and washers, hold the speaker sub-baffle in position, and removal of these permits the speaker to be withdrawn on its baffle. When removing the nuts, which are sealed in position, the heads of the screws will probably have to be gripped. Care should be taken not to damage them.

Alternatively, the speaker may be removed from its baffle by undoing the three bolts with nuts and lock-nuts which hold it in position.

GENERAL NOTES

Switches.—**S1-S4** are the waveband switches which are ganged with the Q.M.B. mains switch **S6.** **S5** is the internal speaker switch, of the jack type, fitted behind the external speaker sockets, and operated by the external speaker plug. By pushing in this plug half way, both internal and external speakers are in use, while by complete insertion of the plug, **S5** is opened, and the internal speaker speech coil is disconnected from the secondary of **T1.**

Of the switches **S1-S4, S1, S2** and **S3** are all of the single pole shorting type, and are *closed* on the M.W. band and *open* on the L.W. band. **S4** is a single-pole change-over switch. The contacts of all the switches are indicated in our under-chassis view. In the case of **S4,** the three contacts are marked a, b and c; a and b are *closed* on the M.W. band and *open* on the L.W., while b and c are *closed* on the L.W. band and *open* on the M.W. band.

Coils.—**L1-L6,** the signal frequency coils, are not shielded, but are wound on two insulating tubes, and subsequently waxed. They are indicated in the under-chassis view, at the top right-hand corner. To the left of them, in a brass screening can, are the iron-cored oscillator coils **L7-L9,** with the associated pre-set condensers **C28, C29,** adjustable through holes in the can. The H.F. choke **L14** is also seen in the under chassis view.

The I.F. coils **L10-L13** are in two screened units on top of the chassis. The I.F. trimmers are mounted in the screens, and are adjustable through holes in the sides of the screens towards the rear of the chassis. Their approximate positions are indicated by arrows in the plan chassis view.

The first I.F. transformer unit also contains **C5** and **R4,** while the second unit contains in addition **C12, C18,** and **R15-R18.**

Resistance R10.—This small resistance is mounted on a paxolin strip attached to the thimble connection which goes to the top of **V3.**

Scale Lamp.—This is an Osram M.E.S. type, rated at 4.0 V, 0.3 A. It is fed from the heater winding of **T2** through the wire-wound resistance **R20.**

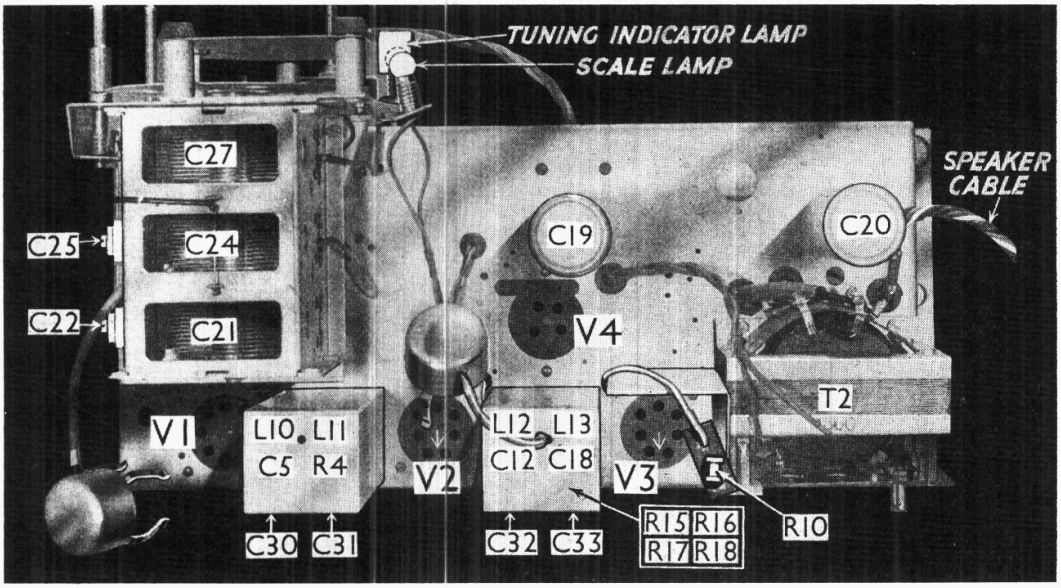
Tuning Indicator Lamp.—This is a Philips M.E.S. type, rated at 2.0 V, 0.1 A. It is surrounded by a tubular rubber shield, so that the illuminations from it and the scale lamp do not mutually interfere.

Chokes L15, L16, L17.—These are mounted in a small metal screening box beneath the chassis, which is indicated in our under-chassis view. These chokes are all associated with the tuning indicator circuit, and their operation is described in the circuit description given earlier. Note that the metal screening box carries several "bearer" tags, which are merely used to support **R20** and certain other connections.

Valve Connections.—The base connection diagrams for **V1** and **V3** were given in Service Sheet No. 19, page 13. Note that **V4,** the rectifier, is used in a half-wave circuit, its two anodes being strapped together.

External Speaker.—Provision is made for the connection of an external low resistance speaker, by means of a special 2-pin plug, fitting into sockets at the rear of the chassis, with which are associated the jack switch **S5** (see also under "Switches"). The speaker coil should have an impedance of 1.5-2.5 Ω. A suitable type of speaker is the Pye type S/MC.

Where it is desired to use an existing high impedance speaker with the set, a Pye "102" matching transformer may be employed. The "set" terminals on the transformer are connected to the external L.S. sockets, while the "speaker" terminals are connected to the high impedance speaker.



Plan view of the chassis. The tuning indicator lamp is inside a rubber shade. The speaker cable terminates in a 6-pin plug, shown in a drawing in col. 1. The two I.F. transformer shielding boxes contain a number of other components, as indicated.

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