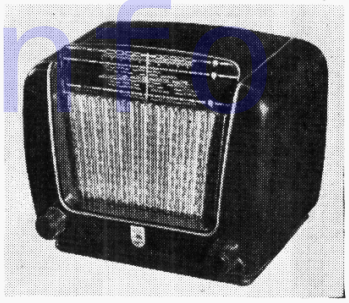
"TRADER" SERVICE SHEET

967

PHILIPS 290U



A LOW-impedance frame aerial, and a band-spreading device in which the oscillator frequency changes over from above the signal frequency to below it, are unconventional features of the Philips 290U, a 4-valve (plus rectifier) 3-band A.C./D.C. superhet for mains of 100-250 V. Waveband ranges are 25-31.58 m, 187.5-580 m and 740-2,000 m.

In effect, the S.W. range consists of two bands, 25 m and 31 m, spread over the two halves of the scale.

Release date and original price: April, 1950; £14 14s, plus purchase tax.

CIRCUIT DESCRIPTION

Aperiodic frame aerial input from **L1** via **L2** and **L3** to single-tuned circuits **L8, C33** (M.W.) and **L9, C33** (L.W.), **S11** being closed and **S12** open. On S.W., plate aerial input is via **C1, S1** and **L4** to single-tuned circuit **L7, C33,** with the band-spreading capacitors **C9, C10** now in circuit, reducing the tuning ratio of **C33.**

Provision is made for the connection of an external aerial via coupling coils **L4** (S.W.), **L5** (M.W.) and **L6** (L.W.), and when the aerial plug is inserted, **S2** automatically opens, disconnecting **C3** to maintain correct aerial loading.

First valve **(V1, Mullard UCH42)** is a triode hexode operating as frequency changer with internal coupling. On M.W. and L.W., triode anode coils **L13** (M.W.) and **L14** (L.W.) are tuned by **C37, S20** being closed and **S21** open. On S.W., these switches change over, introducing the band-spreading capacitors **C16, C17.**

The effect of these is to produce an oscillator frequency which is higher than the signal frequency at the low frequency end of the band, but lower at the high frequency end. The intermediate frequency, therefore, changes over from above to below the signal frequency somewhere within the range, and the effect is to reduce the tuning range, "spreading" 25 m and 31 m bands almost over the full scale.

Second valve **(V2, Mullard UAF42)** is a combined R.F. pentode and single diode. The pentode operates as I.F. amplifier with tuned transformer couplings **C12, L15, L16, C13** and **C19, L17, L18, C20,** the latter being fixed-tuned at an unspecified frequency around 470kc/s. The alignment frequency for the former is determined empirically from it.

Diode signal detector, fed from **L18,** provides the A.F. output which is passed via I.F. filter **C21, R6, C22** and manual volume control **R8** to triode A.F. amplifier **(V3, Mullard UBC41),** the two diodes being strapped to cathode, and so on to the output valve **(V4, Mullard UL41).**

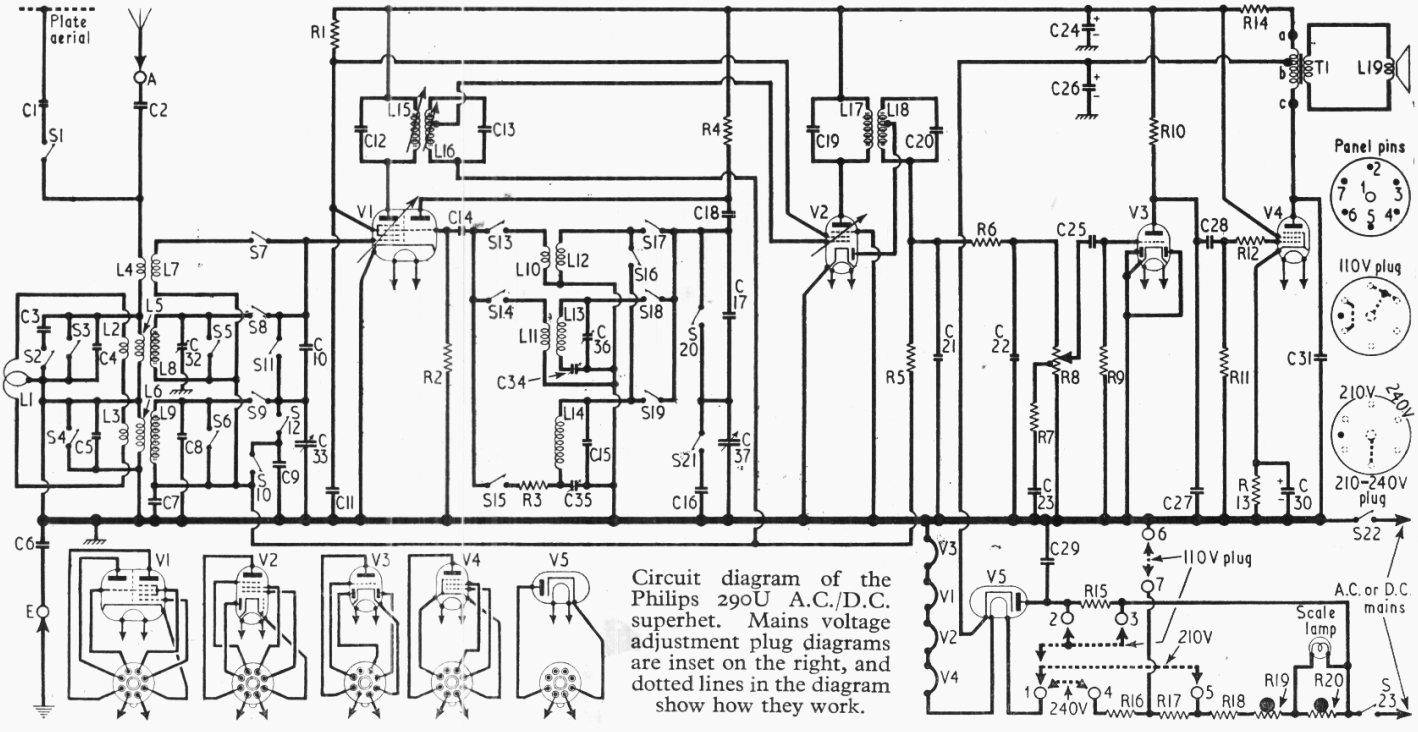
H.T. current is supplied by half-wave rectifier **(V5, Mullard UY41),** and smoothed by **R14, C24,** residual hum being neutralized by passing the current through part of **T1** primary. What happens to the heater ballast resistors **R16-R20** when either of the voltage plugs is inserted, is indicated in the circuit by dotted lines.

COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	H.T. feed ...	22kΩ	G5
R2	V1 osc. C.G. ...	47kΩ	J5
R3	L.W. stabiliser ...	12kΩ	H5
R4	Osc. H.T. feed ...	22kΩ	H5
R5	A.G.C. decoupling	2·7MΩ	G5
R6	I.F. stopper ...	100kΩ	G4
R7	Tone compensator	10kΩ	F3
R8	Volume control ...	500kΩ	E3
R9	V3 C.G.	10MΩ	F4
R10	V3 triode load ...	470kΩ	E5
R11	V4 C.G.	820kΩ	E4
R12	V4 grid stopper ...	100kΩ	E4
R13	V4 G.B.	150Ω	E4
R14	H.T. smoothing ...	1kΩ	G4
R15	V5 surge limiter ...	200Ω	D1
R16	Heater ballast resistors ...	150Ω	D2
R17		150Ω	D2
R18		530Ω	D2
R19	Thermistors (measured hot)	220	D1
R20		250	D1

	CAPACITORS	Values	Locations
C1	Aerial series ...	47pF	D1
C2		0·001μF	A1
C3	Aerial loading ...	100pF	J3
C4	M.W. aerial shunt	15pF	J3
C5	L.W. aerial shunt...	15pF	J4
C6	Earth isolator ...	0·0047μF	C1
C7	A.G.C. decoup. ...	0·047μF	G5
C8	L.W. fixed trim. ...	18pF	J5
C9	Band spreaders ...	120pF	H4
C10		220pF	H3
C11	S.G. decoup. ...	0·047μF	G5
C12	1st I.F. trans. ...	115pF	B2
C13	tune	115pF	B2
C14	V1 osc. C.G. ...	82pF	H4
C15	L.W. osc. trimmer...	20pF	H5
C16	Band spreaders ...	180pF	H4
C17		190pF	H4
C18	Osc. anode coupling	220pF	J5
C19	2nd I.F. trans. tune	102pF	B2
C20		102pF	G4
C21	I.F. by-passes ...	82pF	G4
C22		47pF	F4
C23	Tone compensator	0·018μF	C1
C24*	H.T. smoothing ...	50μF	B1
C25	A.F. coupling ...	0·0039μF	E3
C26*	H.T. smoothing ...	50μF	B1
C27	I.F. by-pass ...	390pF	F5
C28	A.F. coupling ...	0·0068μF	F4
C29	R.F. by-pass ...	0·022μF	C1
C30*	V4 cath. by-pass ...	100μF	H3
C31	Tone corrector ...	0·022μF	G3
C32‡	M.W. aerial trim....	25pF	J4
C33†	Aerial tuning ...	‖492pF	A1
C34‡	M.W. tracker ...	575pF	H5
C35‡	L.W. tracker ...	175pF	H5
C36‡	M.W. osc. trimmer	30pF	H5
C37†	Osc. tuning ...	‖492pF	A2

* Electrolytic. † Variable. ‡ Pre-set. ‖ "Swing" value, min. to max.



Circuit diagram of the Philips 290U A.C./D.C. superhet. Mains voltage adjustment plug diagrams are inset on the right, and dotted lines in the diagram show how they work.

	OTHER COMPONENTS	Approx. values (ohms)	Locations
L1	Frame aerial ...	Very low	D2
L2	Frame coupling coils	Very low	A1
L3		Very low	A2
L4	Aerial coupling coils	1·1	A1
L5		42·0	A1
L6		120·0	A2
L7	Aerial tuning coils	0·1	A1
L8		4·0	A1
L9		54·0	A2
L10	Oscillator reaction coils	0·5	B2
L11		2·5	B2
L12	Oscillator tuning coils	0·1	B2
L13		6·5	B2
L14		21·0	B2
L15	1st I.F. trans. Pri. ...	6·6	B2
L16	Sec., total	6·6	B2
L17	2nd I.F. trans. Pri. ...	11·0	B2
L18	Sec., total	11·0	B2
L19	Speech coil ...	3·2	—
T1	O.P. trans. Pri., total	370·0	F3
	Sec. ...	0·8	F3
S1-S21	Waveband switches	—	H4
S22, S23	Mains sw., g'd R8...	—	D1

VALVE ANALYSIS

Valve voltages given in the table below were measured with an Avo Electronic TestMeter, which causes no appreciable voltage drop. The negative lead was connected to chassis. On normal moving coil meters, voltages will be lower generally.

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 UCH42	174	1·75	106	2·6	—
	Oscillator 66	3·3			
V2 UAF42	174	4·5	106	1·6	—
V3 UBC41	56	0·26	—	—	—
V4 UL41	180	52·0	178	10·0	9
V5 UY41	220†	—	—	—	200

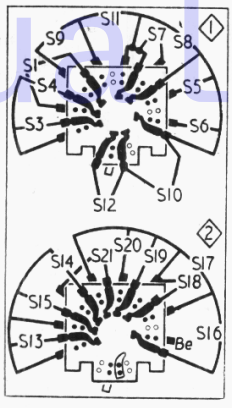
† A.C.

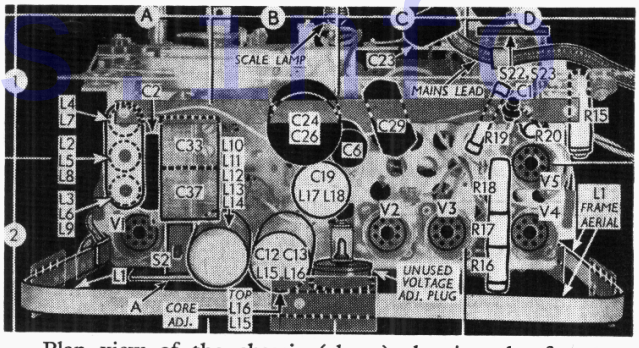
GENERAL NOTES

Switches.—**S1-S21** are the waveband switches, indicated in our under-chassis view and shown in diagrams at the side of our plan view. The table below it gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control spindle—not the knob. A dash indicates open, and **C**, closed.

Frame Aerial.—**L1** is a loop of aluminium strip ⅜in wide. This forms a low impedance loop, which is suitably coupled by **L2, L3** to the tuning coils. In our sample its connecting leads were soldered to its ends.

Scale Lamp.—This is a Philips type 8097D with a tubular bulb and an M.E.S. base. It is rated at 20 V, 0.1 A.





Plan view of the chassis (above) showing the frame aerial loop **L1**. On the left are the waveband switch diagrams, and below them is the switch table.

Switch	S.W.	M.W.	L.W.
S1	C	—	—
S3	C	—	—
S4	—	C	—
S5	C	—	—
S6	—	C	—
S7	C	—	—
S8	—	C	—
S9	—	—	C
S10	—	C	—
S11	—	C	C
S12	C	—	—
S13	C	—	—
S14	—	C	—
S15	—	—	C
S16	—	C	—
S17	C	—	—
S18	—	C	—
S19	—	—	C
S20	—	C	C
S21	C	—	—

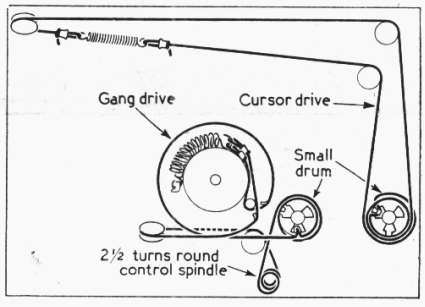
Mains Voltage Adjustment.—Two voltage adjustment plugs are provided, one centred on 110 V, and the other on 210 V and 240 V in two positions. Dotted connections in the circuit diagram show how they operate, and diagrams of the plugs, and of the pins on to which they plug, are shown inset on the right of the diagram. All are viewed from the rear of the receiver.

Drive Cord Replacement.—Two separate drive cords are used: the gang drive cord, and the cursor drive cord, and they should be made up before fitting. The end loops are made by clamping them with small metal collars, and a third such collar is used near the middle of each cord. Spare cord, springs and collars can be obtained from the makers. The sketches (col. 3) show the course taken by each cord, the small slotted drum (shown twice) being common to both systems.

Gang Drive.—The overall length of the made-up cord is 650 mm (about 25½in), including the loops, with a metal collar pinched tightly 250 mm (just under 10in) from one end. With the gang at maximum, turn the small drum so that, with the cursor slot at 10 o'clock, the second slot is between 5 and 6 o'clock. Insert the central collar into the rear end of the second slot, with the shorter cord end going in first.

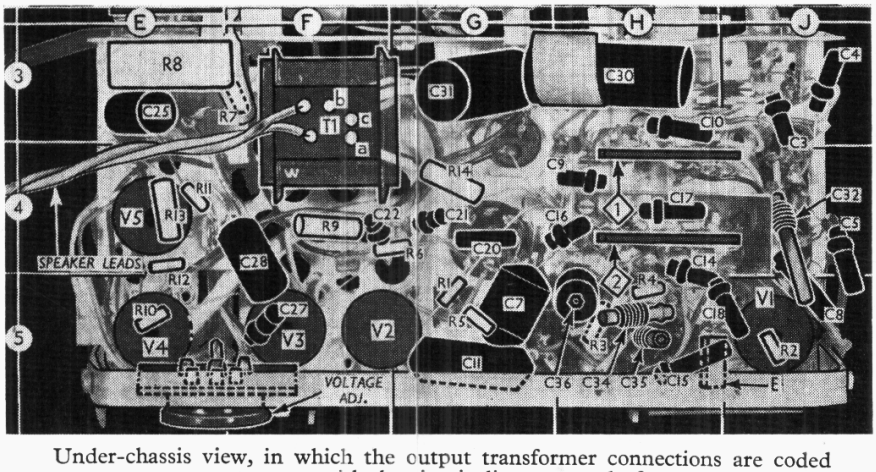
Take the shorter cord off at a tangent, as shown in the sketch, round the gang drum, and hook it to the spring. Then run the longer cord 1½ turns anti-clockwise round the small drum, winding towards the rear; then 2½ turns anti-clockwise round the control spindle, again winding from front to rear, and so on to the spring.

Cursor Drive.—The overall length of the cord is 730 mm (about 28¾in), including the loops, with



Sketches of the two tuning drive systems. The small drum is common to both cords.

the central collar 460 mm (about 19¾in) from one end. Turn the gang to maximum, when the cursor anchoring slot in the small drum should be at 10 o'clock. Insert the central collar in this slot, with the longer cord end leading. Take the shorter cord once round the drum clockwise, hook on the spring, and let it hang over its pulley while the longer end is run to meet it.



Under-chassis view, in which the output transformer connections are coded to agree with the circuit diagram overleaf.

CIRCUIT ALIGNMENT

The set should be switched on and allowed to warm up before these adjustments are made.

I.F. Stages.—Determine the frequency of the 2nd I.F. transformer (about 470 kc/s) by feeding the output of the signal generator to control grid (pin 6) of **V2** and earth; then feed a signal of this value to control grid (pin 6) of **V1** and adjust the cores of **L15, L16** only, for maximum output.

R.F. and Oscillator Stages.—Check that with the gang at maximum, the cursor coincides with the "m" at the end of the L.W. scale. Access to the trimmers is gained by removing the metal screen (held by three 6 BA bolts and washers) which covers the waveband switches. **C32, C34** and **C35** are trimmed by adjusting the amount of wire with which they are wound. No adjustments are necessary on S.W.

M.W.—Adjust **C36** and **C32** for maximum output at 193.6 m (1,550 kc/s), and **C34** at 521.7 m (575 kc/s), feeding the signal in at the **A** and **E** sockets via a dummy aerial.

L.W.—Adjust **C35** similarly at 1,875 m (160 kc/s). Location references are H5 and J4.

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