'TRADER' SERVICE SHEET 211

# PHILCO U427

## RUNS 1, 2, 3 & 4

THE Philco U427 is the A.C./D.C. version of the People's Set and employs a 3-valve (plus rectifier) superhet chassis, in which there is also a barretter. The set is suitable for mains of 190-260 V (40-100 C/S in the case of A.C.) and has provision for the connection of an extension speaker.

This *Service Sheet* deals with the Run 2 chassis, but Run 1, 3 and 4 modifications are described under "Chassis Divergencies."

### CIRCUIT DESCRIPTION

Aerial input via coupling condenser **C3** to coupling coils **L2** (M.W.) and **L4** (L.W.). Tuned filter **C1, L1, C21** by-passes interference at the intermediate frequency.

Single-tuned circuits comprising **L3, C23** (M.W.) and **L5, C23** (L.W.) precede first valve (**V1, Philco 6A7E**), a heptode operating as a frequency changer with electron coupling. Oscillator grid coils **L6** (M.W.) and **L7** (L.W.) are tuned by **C25**; trimming by **C26** (M.W.) and **C27** (L.W.); tracking by **C28** (M.W.) and **C29** (L.W.); reaction is applied from anode by fixed condenser **C6.**

Second valve, a variable-mu R.F. pentode (**V2, Philco 78E**) operates as intermediate frequency amplifier with tuned-primary tuned-secondary input transformer **C30, L8, L9, C31** and tuned-primary output transformer **C32, L10, L11.**

**Intermediate frequency 451KC/S.**

Diode second detector is part of double diode output pentode (**V3, Philco Pen/DD2530**). Audio-frequency component in rectified output developed across manual volume control **R7** is passed via coupling condenser **C11** and I.F. stopper **R8** to C.G. of pentode section. Tone correction by fixed condenser **C13** in anode circuit. Sockets for connection of a low impedance external speaker are provided across secondary of speaker input transformer **T1.**

D.C. potential developed across **R15** is fed back through decoupling circuit as G.B. to F.C. and I.F. valves, giving automatic volume control.

When the receiver is used with A.C. mains, H.T. current is supplied by a rectifying valve (**V4, Philco 35RE**) with half-wave connections, which, with D.C. supplies, behaves as a low resistance. Smoothing by choke **L14** and electrolytic condensers **C15, C16, C17, C18.**

Speaker field coil **L13** is connected across the smoothed H.T. supply in series with ballast resistance **R16.**

Heaters of valves are connected in series together with scale lamp and barretter (**Osram 302**) across mains input circuit.

### DISMANTLING THE SET

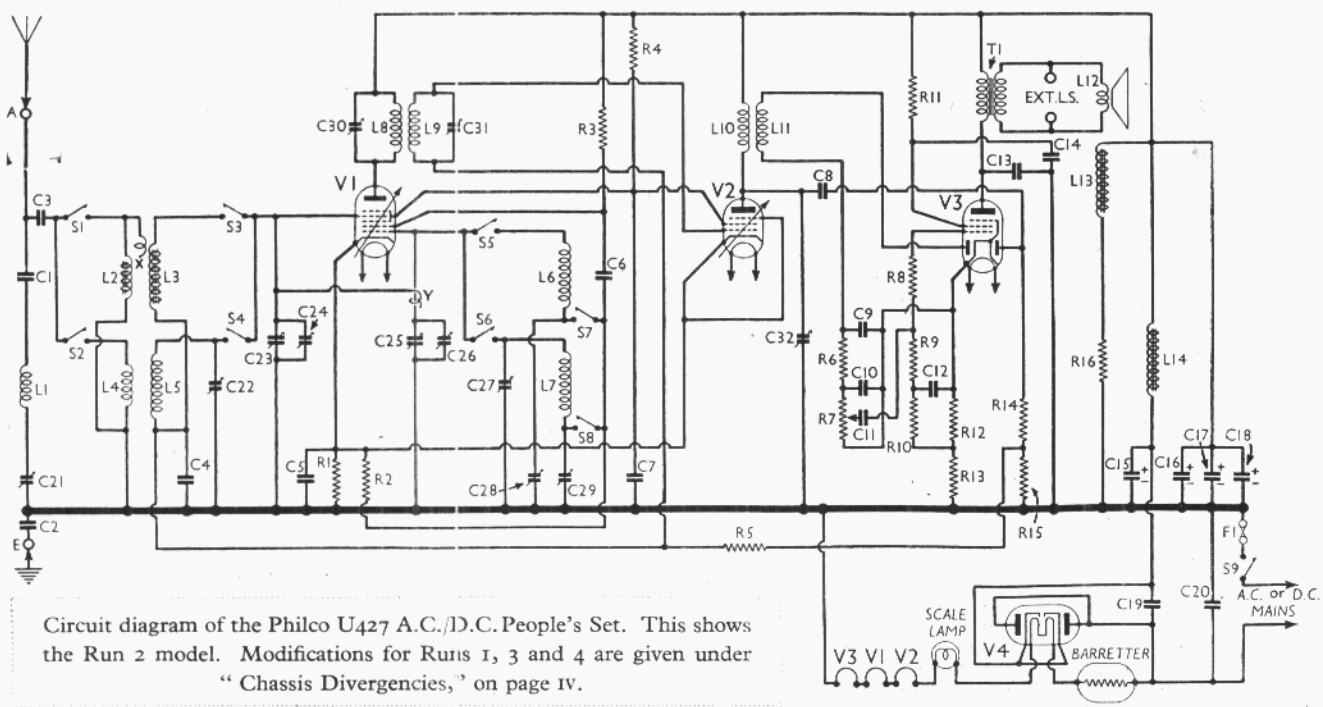
**Removing Chassis.**—To remove the chassis from the cabinet, first remove the three control knobs (recessed grub screws) and then the four self-tapping bolts holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes. *When replacing*, do not forget to re-fix the rubber feet on the four chassis bolts.

To free the chassis entirely, unsolder the speaker leads and *when replacing*, connect them as follows, numbering the tags from left to right: 1, white; 2, green; 3, green/white.

**Removing Speaker.**—If it is necessary to remove the speaker from the cabinet, remove the nuts and spring washers from the four screws holding it to the sub-baffle. Alternatively, the speaker and sub-baffle can be removed together by removing the nuts, washers and collars holding the sub-baffle to the cabinet front. *When replacing*, see that the transformer is at the top.

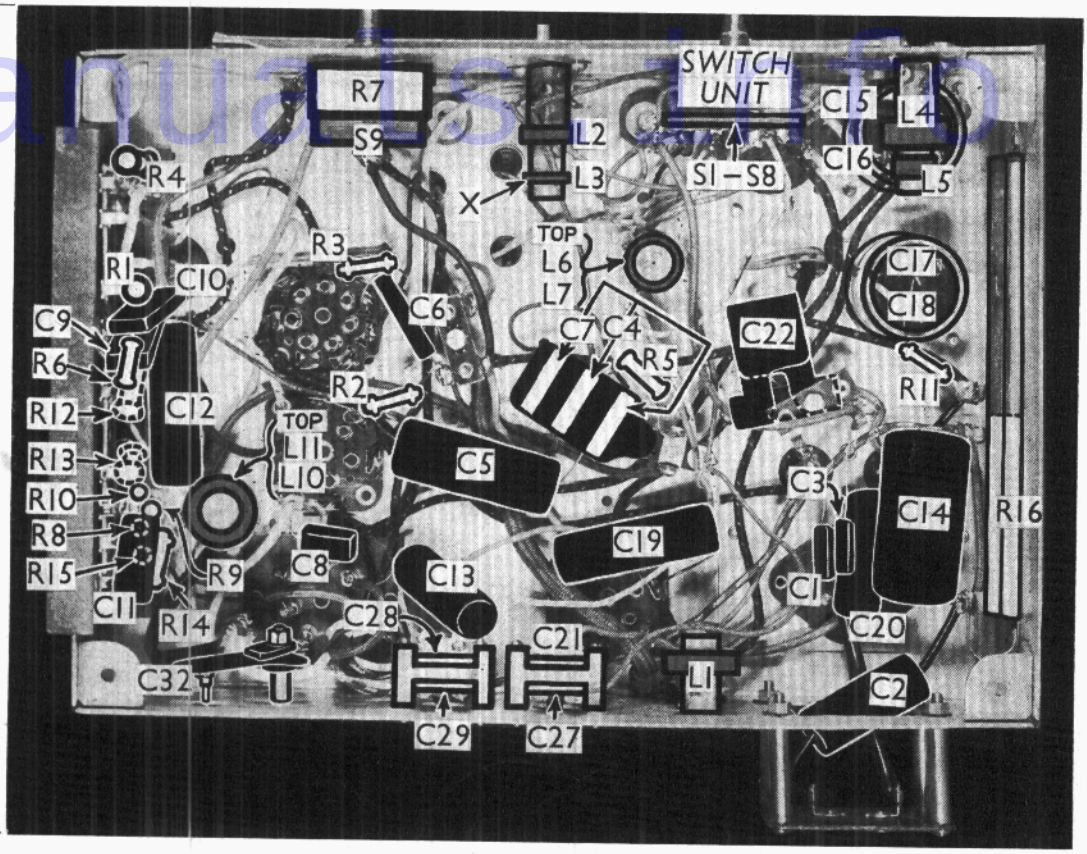
### COMPONENTS AND VALUES

| | RESISTANCES | Values (ohms) |
|---|---|---|
| R1 | V1, V2 fixed G.B. resistance | 200 |
| R2 | V1 osc. C.G. resistance .. | 51,000 |
| R3 | V1 osc. anode resistance .. | 10,000 |
| R4 | V1, V2 S.G.'s H.T. feed .. | 25,000 |
| R5 | V1, V2 A.V.C. line decoupling | 2,000,000 |
| R6 | I.F. stopper .. .. .. | 51,000 |
| R7 | V3 signal diode load; vol. control | 350,000 |
| R8 | V3 pentode C.G. I.F. stopper | 99,000 |
| R9 | V3 pentode C.G. resistance | 240,000 |
| R10 | V3 pentode C.G. decoupling .. | 240,000 |
| R11 | V3 pentode S.G. H.T. feed | 5,000 |
| R12 | V3 G.B. and A.V.C. delay voltage resistances | 160 |
| R13 | | 140 |
| R14 | V3 A.V.C. diode load .. | 330,000 |
| R15 | | 490,000 |
| R16 | Speaker field series resistance | 1,800 |




Circuit diagram of the Philco U427 A.C./D.C. People's Set. This shows the Run 2 model. Modifications for Runs 1, 3 and 4 are given under "Chassis Divergencies," on page IV.

Under-chassis view of the Run 2 model. **R16** is part of a Candohm resistor. It is replaced by a separate vitreous resistance in Run 3 models, and in Run 4 chassis it is not used. **C21, C27** and **C28, C29** are two dual pre-set condenser units. **X** is a small coupling, wound over **L3**.




| CONDENSERS | | Values (μF) |
|---|---|---|
| C1 | Part of aerial I.F. filter tuning | 0·00025 |
| C2 | Earth blocking condenser | 0·01 |
| C3 | Aerial coupling condenser | 0·00025 |
| C4 | V1 tetrode C.G. decoupling | 0·05 |
| C5 | V1, V2 cathode by-pass | 0·25 |
| C6 | V1 osc. anode coupling | 0·0008 |
| C7 | V1, V2 S.G.'s by-pass | 0·05 |
| C8 | Coupling to V3 A.V.C. diode | 0·00011 |
| C9 | I.F. by-passes | 0·00012 |
| C10 | I.F. by-passes | 0·00012 |
| C11 | A.F. coupling to V3 pentode | 0·01 |
| C12 | V3 pentode C.G. decoupling | 0·1 |
| C13 | Tone corrector | 0·01 |
| C14 | V3 S.G. by-pass | 1·0 |
| C15* | H.T. smoothing | 8·0 |
| C16* | H.T. smoothing | 8·0 |
| C17* | H.T. smoothing | 8·0 |
| C18* | H.T. smoothing | 8·0 |
| C19 | V4 anode-cathode by-pass | 0·1 |
| C20 | Mains R.F. by-pass | 0·01 |
| C21‡ | Aerial I.F. filter tuning | — |
| C22‡ | Aerial circuit L.W. trimmer | 0·00008 |
| C23† | Aerial circuit tuning | — |
| C24‡ | Aerial circuit trimmer | — |
| C25† | Oscillator circuit tuning | — |
| C26‡ | Oscillator circuit M.W. trimmer | — |
| C27‡ | Oscillator circuit L.W. trimmer | — |
| C28‡ | Oscillator circuit M.W. tracker | — |
| C29‡ | Oscillator circuit L.W. tracker | — |
| C30‡ | 1st I.F. trans. pri. tuning | — |
| C31‡ | 1st I.F. trans. sec. tuning | — |
| C32‡ | 2nd I.F. trans. pri. tuning | 0·00008 |

* Electrolytic. † Variable. ‡ Pre-set.

| OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial I.F. filter coil | 14·0 |
| L2 | Aerial M.W. coupling coil | 23·5 |
| L3 | Aerial M.W. tuning coil | 25·0 |
| L4 | Aerial L.W. coupling coil | 120·0 |
| L5 | Aerial L.W. tuning coil | 44·0 |
| L6 | Oscillator M.W. tuning coil | 2·75 |
| L7 | Oscillator L.W. tuning coil | 18·0 |
| L8 | 1st I.F. trans. Pri. | 8·0 |
| L9 | 1st I.F. trans. Sec. | 12·0 |
| L10 | 2nd I.F. trans. Pri. | 30·0 |
| L11 | 2nd I.F. trans. Sec. | 80·0 |
| L12 | Speaker speech coil | 2·0 |
| L13 | Speaker field coil | 3,300·0 |
| L14 | H.T. smoothing choke | 270·0 |
| T1 | Speaker input trans. Pri. | 460·0 |
| | Speaker input trans. Sec. | 0·4 |
| X | Small couplings | — |
| Y | Small couplings | — |
| S1-8 | Waveband switches | — |
| S9 | Mains switch, ganged R7 | — |
| F1 | Mains circuit fuse, 1.0 A | — |

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 230 V. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, chassis being negative.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 6A7E* | 200 | 4·6 | 100 | 2·5 |
| V2 78E | 200 | 6·0 | 100 | 1·3 |
| V3 Pen/DD 2530 | 190 | 26·0 | 170 | 5·8 |
| V4 35RE† | — | — | — | — |

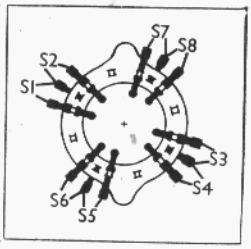
* Oscillator anode (G2) 155V, 3·8 mA.

† Cathode to chassis, 230 V D.C.

## GENERAL NOTES

**Switches.**—**S1-S8** are the waveband switches, in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram below, as seen looking from the rear of the underside of the chassis. **S1, S3, S5** and **S7** are closed on the M.W. band, and open on the L.W. band, while **S2, S4, S6** and **S8** are open on the M.W. band and closed on the L.W. band.

The switch unit, looking from the rear of the underside of the chassis.




**S9** is the Q.M.B. mains switch, ganged with the volume control, **R7.**

**Coils.**—Most of the coils are unscreened, on cylindrical formers, disposed at various points beneath the chassis. The only screened unit is the first I.F. transformer, which is mounted on the chassis deck, and includes the two trimmers. The second I.F. transformer, beneath the chassis, has an untuned secondary, the primary being tuned by **C32,** reached through a hole in the rear of the chassis.

*Continued overleaf*

## PHILCO U427—*Continued*

**Scale Lamp.**—This is a Tung-Sol miniature bayonet cap type, rated at 6·3 V, 0·35 A (Philco Part No. 34-2141).

**External Speaker.**—Two sockets are provided on the internal speaker terminal panel for a low impedance (2-3 O) external speaker.

**Coupling X.**—This consists of a single turn of wire, with one end free, taken round the outside of **L3.**

**Coupling Y.**—This consists of a short length of insulated connecting wire soldered to the tag of **C23,** and looped round the tag of **C25,** but not soldered to it.

**Condensers C15-C18.**—These are four 8 $\mu$F dry electrolytics in pairs in two tubular metal cased units, partly sunk in the chassis deck. The cases are negative. Of the four positive tags beneath the chassis, the three connected together belong to **C16, C17** and **C18.** The positive of **C15** is the tag marked with red paint at the bottom of the **C15, C16** unit.

**Condensers C4, C7.**—These are two 0·05 $\mu$F paper condensers in a black moulded unit. This has three connecting tags, one being common to the two condensers.

**Trimmers C21, C27, C28, C29.**—These are in two dual units, at the rear of the chassis; with screw and nut adjustments. The screws adjust **C21** and **C28** respectively, and the nuts **C27** and **C29.**

**Resistance R16.**—This forms part of a "Candohm" wire wound unit (in Run 1 and Run 2 models), and is mounted along one side of the chassis. The remainder of the unit is not used, although one tag is used as a bearer for **C14** and **R11.**

**Fuse F1.**—This is a Philco glass tubular type, 1¼ in. long. It is rated to blow at 1·0 A. (Part No. 380-5003.)

### CHASSIS DIVERGENCIES

Modifications in the chassis have been made in each successive run up to the present. This *Service Sheet* was produced on a Run 2 model.

**Run 1.**—Instead of the single Q.M.B. mains switch, **S9,** there was apparently a double pole type. Slight differences in the position and wiring of components may be noted.

**Run 3.**—The Candohm resistor **R16** is replaced by a 10-15 W vitreous 1,800 O resistor. The positions of **C14** and **R11** are altered.

**Run 4.**—The energised speaker is replaced by a permanent magnet type. **L13** (speaker field) and **R16** are therefore not present.

### CIRCUIT ALIGNMENT

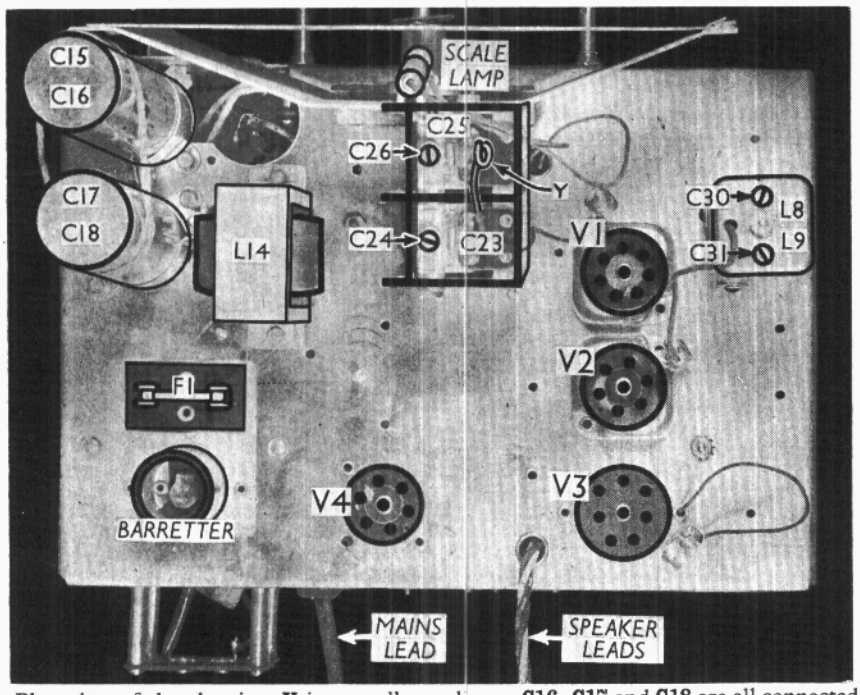
Connect an output meter across the primary of **T1** or to the Ext. L.S. sockets. See that the receiver scale pointer is in line with the index arrow when the gang is at minimum.

**I.F. Stages.**—Switch receiver to M.W., and turn volume control to maximum. Connect signal generator to control grid (top cap) of **V1** (leaving existing lead connected), and receiver earth socket (not chassis). Feed in a 451 KC/S signal, and adjust **C32, C31** and **C30** for maximum output. Repeat several times, and take particular care with **C32.**

**I.F. Filter.**—Remove generator lead from top cap of **V1** and transfer (via dummy aerial) to **A** socket. Feed in a 451 KC/S signal, and adjust **C21** (screw) for *minimum* output.

**R.F. and Oscillator Stages.**—Switch set to M.W., tune to 1,400 KC/S on scale. Feed a 1,400 KC/S signal into **A** and **E** sockets, and adjust **C26** and **C24** for maximum output, in that order. Feed in a 600 KC/S signal, tune it in, and adjust **C28** (screw) for maximum output while rocking the gang for optimum results. Re-adjust **C26** and **C24** at 1,400 KC/S and **C28** at 600 KC/S until no further improvement results.

Switch set to L.W., tune to 290 KC/S on scale, feed in a 290 KC/S signal and adjust **C27** (nut) and **C22** for maximum output. Feed in a 160 KC/S signal, tune it in, and adjust **C29** (nut) for maximum output while rocking the gang. Re-adjust **C27** and **C22** at 290 KC/S and **C29** at 160 KC/S until no further improvement results.




Plan view of the chassis. **Y** is a small coupling. **C16, C17** and **C18** are all connected in parallel.

# MAINTENANCE PROBLEMS

## Crackle in Tone Control

BAD crackling on the tone control was the complaint when a Beethoven B88 was sent in for service. At first it seemed that it was the ordinary fault of a bad resistance track, but a new control was fitted without any improvement. The series condenser was also tested and found to be O.K.

As the control was mounted near the frame aerial and F.C. valve, it was suspected that these might be picking up a "signal" whenever the control was moved, and this seems to have been the case, as screening the leads and earthing the screen cured the trouble.—V. N.

## Switch Causes Distortion

WHEN running at large volume an Ultra 66 gave distortion, but the usual tests of the output stage and speaker showed no fault and it did not appear on gramophone reproduction.

With the chassis inverted and "going all out" on radio, the fault was found. Vibration was causing the long, thin blades of the gramophone section of the switch to tremble and make and break at high speed. Adjustment cured the fault.—V. NOLLER, NORWICH.

## Oscillator Circuit Damped

"NO results" was the complaint with an Ekco AD76 (used on A.C.), and this was traced to an O/C electrolytic smoothing condenser, one of a block. A temporary condenser was tapped across and the set worked O.K.

The original block was then removed and one of similar type fitted, but on testing the set it was now found to be "dead" above 260 metres. A check-up on the oscillator section revealed that this ceased to function above this figure. A new frequency changer was tried with no success, and the associated circuits were apparently above reproach.

Finally the oscillator tuning condenser was isolated, and the problem was solved, as a leak had developed between the vanes. A drop of "paste" from the faulty condenser block had fallen through the vanes. This had left an almost invisible film behind, which, though of fairly high resistance, was sufficient to damp the circuit enough to prevent oscillations.—J. B., BASINGSTOKE.