

NUMBER NINETY - EIGHT

'TRADER' SERVICE SHEETS

COSSOR 376B

COMPONENTS AND VALUES

5-VALVE BATTERY SUPERHET

A 5-VALVE superhet circuit is employed in the Cossor 376B battery-operated receiver, containing a heptode frequency changer, a variable-mu pentode I.F. amplifier, a double diode, a triode driver and a double-triode Class B output valve. Provision is made for an extension speaker and a gramophone pick-up.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1**, coupling condenser **C2** and coupling coils **L1, L2** to inductively coupled band-pass filter. Primary **L3, L4** tuned by **C22**; secondary **L5, L6** tuned by **C24**.

First valve (**V1, Cossor metallised 210PG**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L7, L8** tuned by **C26**; anode reaction coils **L9, L10**; tracking by fixed condensers **C7** (L.W.) and **C8** (M.W.).

Second valve, a variable-mu H.F. pentode (**V2, Cossor metallised 210VPT**) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings; **L11, L12** and **L13, L14**.

Intermediate frequency 128 KC/S.

Diode second detector forms part of separate special I.H.C. double diode valve (**V3, Cossor 220DD**). Second diode,

coupled by condenser **C17**, provides D.C. potential which is developed across load resistance **R13** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from potential divider **R11, R12**.

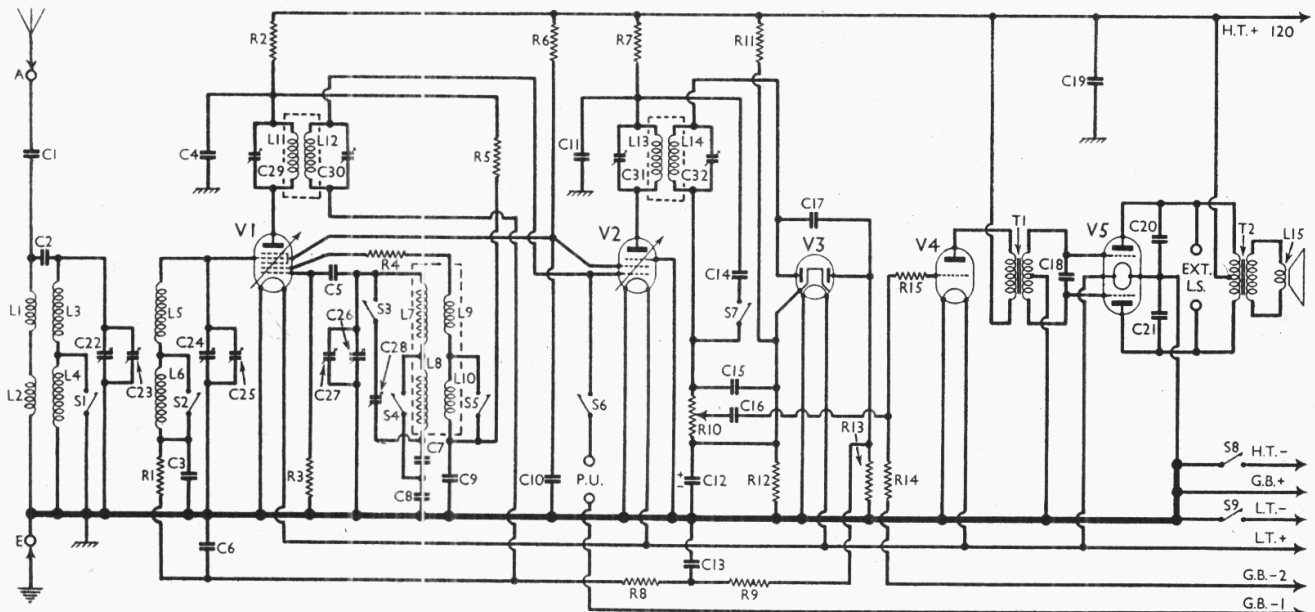
Audio-frequency output from signal diode is developed across manual volume control **R10** and passed via coupling condenser **C16** and I.F. stopper **R15** to triode driver valve (**V4, Cossor 220PA**).

Transformer coupling by **T1** to positive drive Class B output valve (**V5, Cossor 220B**). Tone correction by fixed condensers **C20, C21**. Coupling to internal speaker by special transformer **T2**. Provision at rear of chassis for connection of high impedance external speaker.

Provision is made for connection of a gramophone pick-up in control grid circuit of I.F. amplifier **V2**, which is employed as L.F. amplifier. When the master switch control is set to "gram." switch **S6** is closed to connect pick-up, and G.B. is applied from G.B.—1 tapping. Switch **S7** is also closed to couple anode of **V2** to manual volume control **R10** by means of condenser **C14**, resistance **R7** then operating as anode load.

Resistances		Values (ohms)
R1	V1 tetrode C.G. decoupling ..	2,000,000
R2	V1 tetrode anode decoupling ..	10,000
R3	V1 oscillator C.G. resistance ..	250,000
R4	V1 osc. anode series resistance ..	5,000
R5	V1 osc. anode decoupling ..	10,000
R6	V1 and V2 S.G.'s H.T. feed ..	40,000
R7	V2 anode decoupling ..	30,000
R8	A.V.C. line decoupling ..	100,000
R9	V3 signal diode load; manual V.C. ..	250,000
R10	V3 signal diode load; manual V.C. ..	1,000,000
R11	A.V.C. delay voltage ..	1,000,000
R12	potential divider ..	50,000
R13	V3 A.V.C. diode load ..	1,000,000
R14	V4 C.G. resistance ..	2,000,000
R15	V4 C.G. I.F. stopper ..	100,000

Condensers		Values (μF)
C1	Aerial series condenser ..	0.0005
C2	Capacitative aerial coupling ..	0.000025
C3	V1 tetrode C.G. decoupling ..	0.1
C4	V1 tetrode anode decoupling ..	0.1
C5	V1 osc. C.G. condenser ..	0.00025
C6	A.V.C. line decoupling ..	0.001
C7	Oscillator L.W. tracker ..	0.00123
C8	Oscillator M.W. tracker ..	0.00175
C9	V1 osc. anode decoupling ..	0.01
C10	V1 and V2 S.G.'s by-pass ..	0.1
C11	V2 anode decoupling ..	0.002
C12*	V3 cathode by-pass ..	25.0
C13	A.V.C. line decoupling ..	0.1
C14	L.F. coupling to R10 (gram.) ..	0.001
C15	I.F. by-pass ..	0.0001
C16	L.F. coupling to V4 ..	0.01
C17	Coupling to V3 A.V.C. diode ..	0.0001
C18	T1 secondary shunt ..	0.0005
C19	H.T. reservoir ..	2.0
C20	Tone correctors ..	0.005
C21	Tone correctors ..	0.005
C22†	Band-pass primary tuning ..	—
C23‡	Band-pass primary trimmer ..	—
C24†	Band-pass secondary tuning ..	—
C25‡	Band-pass secondary trimmer ..	—



Circuit diagram of the Cossor 376B battery superhet. Separate L.T. and H.T. switches are used, and pick-up switching is incorporated.

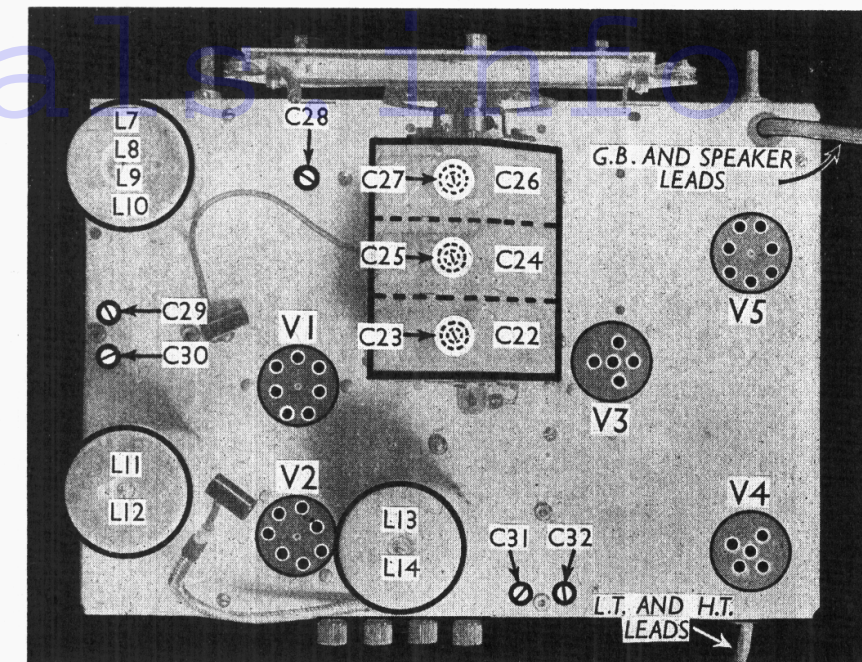
Condensers (contd.)		Values (μF)
C26†	Oscillator tuning	—
C27†	Oscillator main trimmer	—
C28‡	Oscillator L.W. trimmer	—
C29†	1st I.F. trans. pri. tuning	0.00003
C30†	1st I.F. trans. sec. tuning	0.00007
C31†	2nd I.F. trans. pri. tuning	0.00007
C32†	2nd I.F. trans. sec. tuning	0.00007

* Electrolytic † Variable ‡ Pre-set

Other Components		Approx. Values (ohms)
L1	Aerial coupling coils . . .	6.0
L2		6.0
L3		3.3
L4	Band-pass primary coils	12.8
L5		3.3
L6	Band-pass secondary coils	12.5
L7		4.3
L8	Oscillator tuning coils	8.5
L9		1.4
L10	Oscillator reaction coils	2.5
L11		90.0
L12	1st I.F. trans. { Pri.	90.0
L13		90.0
L14	2nd I.F. trans. { Pri.	90.0
L15		90.0
T1	Speaker speech coil	2.0
T2		450.0
Sr-Ss	Driver trans. { Pri. total	100.0
S6-S7		750.0
S8	Speaker input trans. { Pri. total	0.2
S9		—
S1-S5	Waveband switches	—
S6-S7	Radio-gram change-over switches	—
S8	H.T. circuit switch	—
S9	L.T. switch	—

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (four bolts



Plan view of the chassis. Note the I.F. trimmers C29-C32, and the oscillator L.W. trimmer, C28.

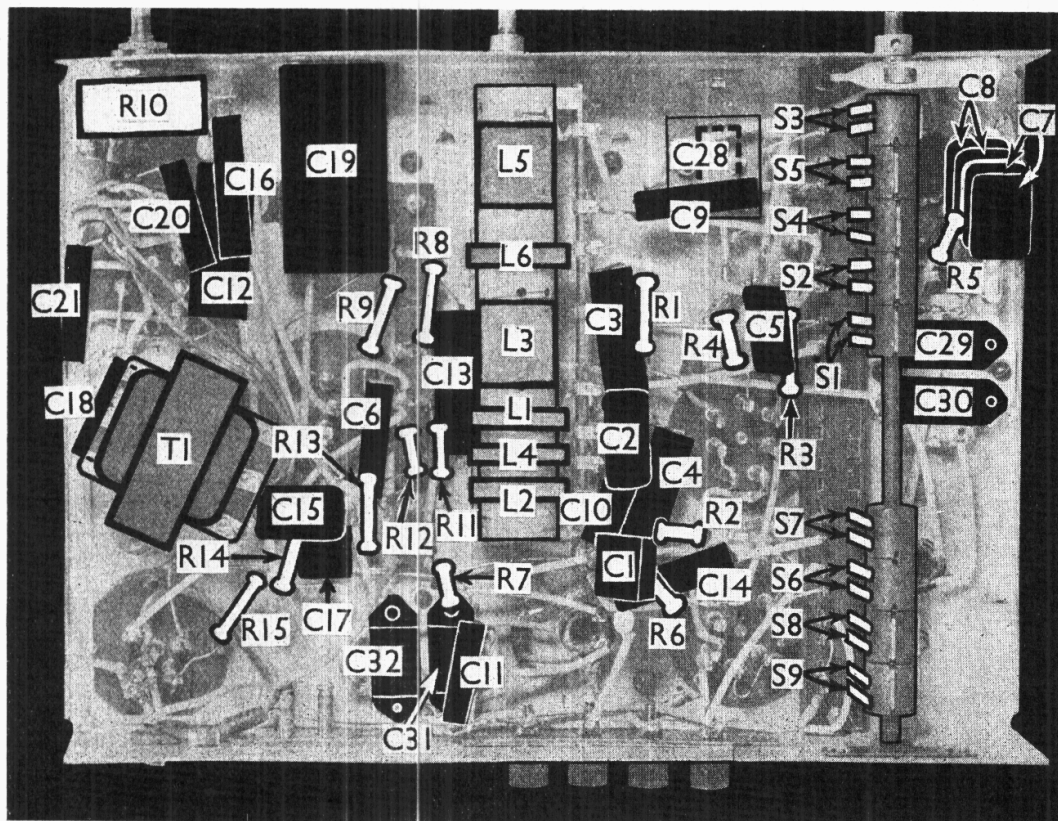
with washers) gives access to most of the under-chassis components.

Removing Chassis.—To remove the chassis, remove the back (four screws and washers) and disconnect and remove the batteries. Now disconnect the leads to the

speaker (screw terminals), when the chassis can be withdrawn.

When replacing, connect the speaker leads as follow, number the terminals from left to right:—1, white; 2, black;

(Continued overleaf)



Under-chassis view. The switch unit contains the wave-band, pick-up and battery switches, all of which are clearly indicated. C7 and C8 each consist of two fixed mica condensers in parallel.

COSSOR 376B (Continued)

3, brown; 4, green. Note that the two small control knobs are marked with their purpose, so that they must be replaced on the correct spindles.

Removing Speaker.—To remove the speaker, disconnect the leads and take out the six countersunk-head wood screws holding the sub-baffle to the cabinet. The speaker is rivetted to the sub-baffle and if it is taken off, they must be replaced with screws and nuts. When replacing see that the transformer is at the top and if the baffle is taken off, see that it is replaced so that the cut-away portion goes to the bottom left-hand corner.

Removing Speaker Grille.—If necessary the speaker grille can be removed by removing four screws (with washers). These are accessible through holes in the sub-baffle, which need not be removed.

VALVE ANALYSIS

Readings of valve voltages and currents given in the table below were taken with the receiver operating from new batteries the H.T. reading 128 V and the G.B. reading 4.6 V. The volume control was at maximum and the receiver was tuned to the lowest wavelength on the medium waveband, but there was no signal input.

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

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 210PG*	103	0.3	51	1.2
V2 210VPT	55	1.8	51	0.5
V3 220DD	—	—	—	—
V4 220PA	122	2.7	—	—
V5 220B	122†	1.0†	—	—

* Osc. anode (G2) 73 V, 1.4 mA.
† Each anode.

GENERAL NOTES

Switches.—All the switches are ganged in a single unit beneath the chassis, stretching from front to back. **S1-S5** are the waveband switches, **S6, S7** the gramophone pick-up switches, and **S8, S9** the battery switches. They are clearly marked in the under-chassis view. The table below gives the switch positions for the various control settings, O indicating open, and C, closed. All switches are open in the "off" setting.

Switch	M.W.	L.W.	Gram.
S1	C	O	O
S2	C	O	C
S3	O	C	O
S4	C	O	O
S5	C	O	O
S6	O	O	C
S7	O	O	C
S8	C	C	C
S9	C	C	C

Coils.—The signal frequency coils are in a tubular unscreened unit beneath the chassis, the individual coils being indicated in the under-chassis view. The oscillator and I.F. coils are in three

screened units on the chassis deck. The I.F. trimmers are not included in the coil units.

External Speaker.—There is provision for this at the rear of the chassis. It should be of the high resistance type, and a Cossor Model 595 is recommended.

Batteries.—The recommended batteries are: L.T., 2 V 70 AH, Cossor Type E370. G.B., 9 V, Cossor Type 933. H.T., 120 V, Cossor Type 2120 (double capacity).

H.T. and G.B. Leads and Voltages.—Grey lead, black plug, H.T.—; Green lead, black plug, H.T.+120 V. Red lead, black plug, G.B.—; Yellow lead, black plug, G.B.—1, —1.5 V; Blue lead, black plug, G.B.—2, —4.5 V.

Trimmers C29-C32.—These are the I.F. trimmers, arranged in two pairs, and adjustable through holes in the chassis deck.

Trimmer C28.—This is the oscillator L.W. trimmer, also adjustable through a hole in the chassis deck.

Condensers C7, C8.—These each comprise two fixed condensers in parallel, and the four condensers are bolted up together.

CIRCUIT ALIGNMENT

Do not attempt re-alignment unless a modulated signal generator is available, and then not until all other possible sources of faults have been investigated. Disconnect the A.V.C. diode by unsoldering the leads from **C17, R9** and **R13** where they connect to the "anode" socket of the **V3** valveholder. Remove the wax or paper sealing discs from all

trimmers. Disconnect the aerial. Connect a low range output meter (0.5 V A.C.) across the secondary of **T2**, and advance the volume control to maximum.

Aligning I.F. Circuits.—Adjust the signal generator to 128 KC/S and connect the output lead through a 0.1 μ F condenser to **V2** control grid, the earth lead going to chassis. Keep the signal generator output low, and adjust **C31** and **C32** for maximum output. Transfer the generator output connection to **V1** modulator control grid, and adjust **C29** and **C30** for maximum output. Leave the generator connected to **V1**, and check each trimmer setting, starting with **C32** and working back to **C29**.

Aligning H.F. and Osc. Circuits.—Connect the signal generator to the aerial terminal through a dummy aerial or 0.0002 μ F condenser. Adjust the output to 1,400 KC/S (214.3 m.). Turn the wavechange switch to the M.W. position. Adjust the receiver gang condenser to 214 m., i.e., with the pointer at the eleventh dot from the bottom of the scale. (Previously ascertain that at the minimum stop the pointer is exactly in the middle of the 200 m. mark.) Use a very small generator output and adjust **C27** for maximum output. Then adjust **C25** and **C23**.

Switch the set to L.W., and adjust generator to 160 KC/S (1,875 m.). Turn the gang condenser so that the pointer indicates 1,875 m. (roughly the twelfth dot from the upper end of the scale). Adjust **C28** for maximum output.

Finally re-solder the connections previously removed from **V3** valveholder, and re-seal all trimmers.

MAINTENANCE HINTS

(Continued from p. IV)

Equipment for Radio-Gram Service

I have found the inclusion of the following articles in my kit of great value when servicing radio-grams, and have been amply repaid by much saving of time.

For example, frequently when making a service call to a radio-gram job, after the repair is complete, on the final test the motor may be noisy. Therefore, I always carry some motor lubricant (such as a tube of H.M.V. motor grease) for the heavier work, worm gears, etc., and an oil feeder of the cycle type, filled with "3 in 1" oil for the fast-running gears. Another frequent trouble is incorrect motor speed. In A.C. districts it is quite simple to include stroboscopic speed disc, and the very few service-men in purely D.C. districts will doubtless find it well worth-while to include an ordinary speed-tester.

Automatic brakes, especially on a new machine, sometimes cause an annoying "click" on each revolution of the turntable, due to the striker of the turntable making rather too forcible contact with the trip lever. Adjustment of the striker with a small spanner, or a little attention with a fine file and treatment with a thin coat of grease will work wonders. Therefore, see that a small spanner and file

are included in the kit. A piece of waste rag is also indicated, to clean up any superfluous oil or grease.

It also pays to carry a few gramophone needles, since it is surprising how many customers are out of them just when they are required.

Lastly, I have found that a small spirit level (a suitable one can be obtained for 6d. at any Woolworth's branch) enables you to get the turntable properly level, which is particularly important with some types of automatic record changers.—F. B.

Workshop Hints

A wooden meat skewer is a very useful tool when hunting for an elusive crackle. Similarly, an ebonite or bone knitting needle can be utilised.

* * *

"Durofix" (made by the Rawplug Co.) is very useful for repairs to L.S. cones. It dries very quickly and makes a sound repair.

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Pipe cleaners (which can be bought very cheaply) are very useful for removing dirt from awkward corners such as the air gap of a loud-speaker.—M.J.S.