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'TRADER' SERVICE SHEET

# 191

# BURGOYNE AWTU AND AWTUG RADIO-GRAM

A SHORT-WAVE range of 19-51 metres is covered by the Burgoyne AWTU "T.R.F. A.C./D.C. Receiver." It is a 3-valve (plus rectifier) A.C./D.C. 3-band model suitable for mains of 200-250 V and having provision for a gramophone pick-up and extension speaker. A Droitwich rejector can be brought into circuit by means of an alternative aerial socket.

A similar chassis is fitted in the AWTUG radio-gramophone, but this *Service Sheet* was prepared on a table model receiver.

## CIRCUIT DESCRIPTION

Two alternative aerial input connections, **A1** via Droitwich rejector **L1, C21,** series choke **L2** and condenser **C2,** and **A2** via series condenser **C1,** to coupling condensers and coils **C3** (S.W.), **C4, L4** (M.W.), **L6, L7** (L.W.). Single tuned circuits comprising **L3, C24** (S.W.), **L5, C24** (M.W.) and **L8, C24** (L.W.) precede variable-mu pentode R.F. amplifier (**V1, Tungsram metallised VP13B**). Gain control by variable cathode resistance **R4**.

Tuned-secondary transformer couplings by **L9, L11, C29** (S.W.), **L13, L14, C29** (M.W.), and **L16, L17, C29** (L.W.) between **V1** and R.F. pentode detector (**V2, Tungsram metallised SP13B**) which operates on grid leak system with **C10** and **R6.** Reaction is applied from anode by coils **L10** (S.W.) and **L15** (M.W. and L.W.) and controlled by variable condenser **C25.** Provision for connection of gramophone pick-up in C.G. circuit by isolating transformer **T1** and switch **S25.** R.F. filtering in anode circuit by choke **L18** and by-pass condensers **C8** (M.W. and L.W.) and **C13** (S.W., M.W., and L.W.).

Resistance-capacity coupling by **R7, C14, R10** between detector and pentode output valve (**V3, Tungsram PP36**). Fixed tone correction by anode condenser **C16.** Provision for connection of high-resistance external speaker in anode circuit; plug-operated switch **S26** breaks **T2** primary circuit.

When the receiver is used with A.C. mains, H.T. current is supplied by half-wave rectifying valve (**V4, Tungsram V30**). Smoothing by iron-cored choke **L22** and by dry electrolytic condensers, **C17, C18.** Speaker field coil **L21** is shunted across main H.T. supply.

Valve heaters are connected in series together with scale lamps and tapped ballast resistance **R12.** Chokes **L23, L24** and condenser **C20** form a filter for the suppression of mains-borne interference.

## DISMANTLING THE SET

**Removing Chassis.**—To remove the chassis from the cabinet, remove the four control knobs (recessed grub screws) and the nuts and washers from the four bolts holding the chassis to the fillets on the sides of the cabinet. Now free the speaker leads from the cleat holding them to the shelf and unsolder them. The chassis can now be withdrawn.

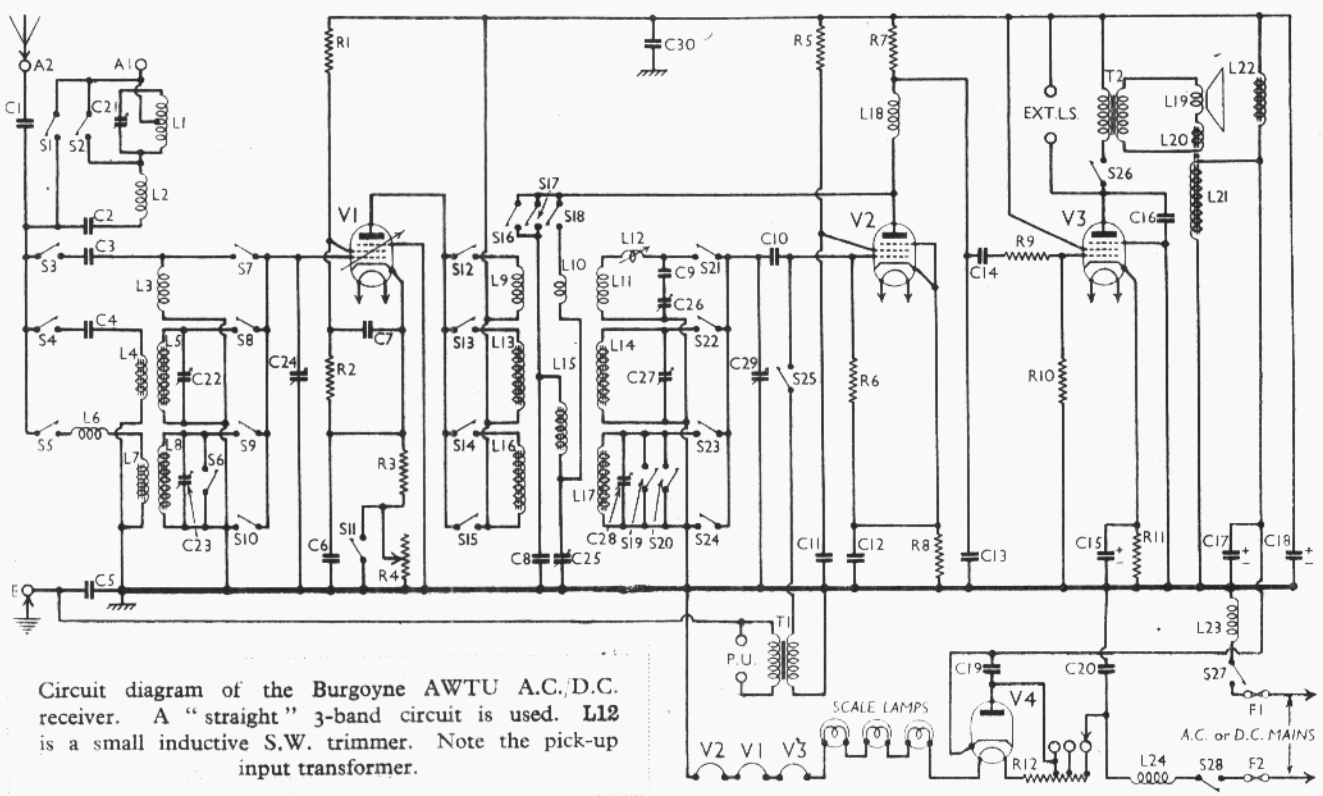
*When replacing*, connect the leads as follows, numbering the tags from bottom to top:—1, black, and white to speaker frame; 2, white; 3 and 4, blank; 5, red; 6, yellow. Also note that the knob with the white dot goes on the spindle of the wave-change switch.

**Removing Speaker.**—If it is desired to remove the speaker from the cabinet, remove the nuts from the four bolts holding it to the sub-baffle, and *when replacing*, see that the transformer is on the left, and with the lock-nut fix the tag for the earthing lead on the bottom left-hand screw.

## COMPONENTS AND VALUES

| | RESISTANCES | Values (ohms) |
|---|---|---|
| R1 | V1 S.G. H.T. potential divider | 20,000 |
| R2 | V1 S.G. H.T. potential divider | 500,000 |
| R3 | V1 fixed G.B. resistance .. | 200 |
| R4 | V1 gain control .. .. | 100,000 |
| R5 | V2 S.G. H.T. feed .. .. | 100,000 |
| R6 | V2 grid leak .. .. .. | 1,000,000 |
| R7 | V2 anode load .. .. .. | 50,000 |
| R8 | V2 G.B. resistance (gram.) .. | 200 |
| R9 | V3 C.G. R.F. stopper .. | 50,000 |
| R10 | V3 C.G. resistance .. .. | 250,000 |
| R11 | V3 G.B. resistance .. .. | 140 |
| R12 | Heater circuit ballast .. | 700* |

* 500 + 100 + 100 Ω.




Circuit diagram of the Burgoyne AWTU A.C./D.C. receiver. A "straight" 3-band circuit is used. **L12** is a small inductive S.W. trimmer. Note the pick-up input transformer.

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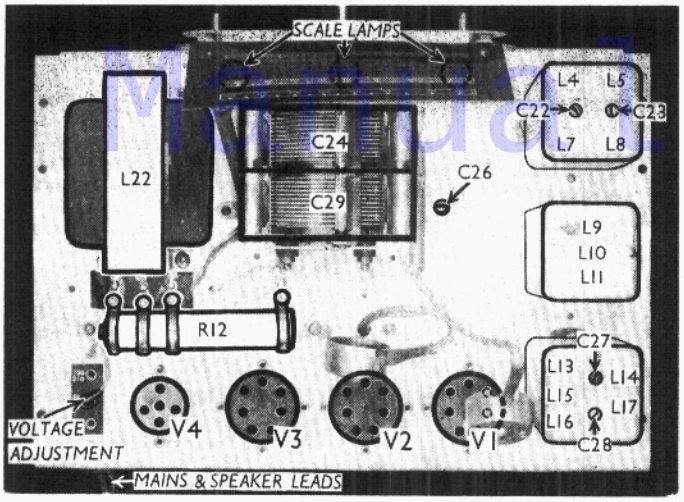


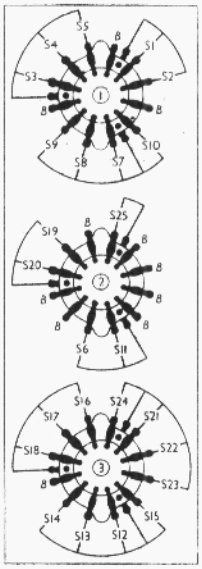

Plan view of the chassis. **R12** is the tapped heater ballast resistance. **C26** is adjustable through a hole in the chassis deck.

| Switch | L.W. | M.W. | S.W. | Gram. |
|---|---|---|---|---|
| S1 | O | O | C | O |
| S2 | O | C | O | O |
| S3 | O | O | C | O |
| S4 | O | C | O | O |
| S5 | C | O | O | O |
| S6 | O | C | O | O |
| S7 | O | O | C | O |
| S8 | O | C | O | O |
| S9 | C | O | O | O |
| S10 | O | O | O | C |
| S11 | O | O | C | O |
| S12 | O | O | C | O |
| S13 | O | C | O | O |
| S14 | C | O | O | O |
| S15 | O | O | O | C |
| S16 | C | O | O | O |
| S17 | O | C | O | O |
| S18 | O | O | C | O |
| S19 | O | C | O | O |
| S20 | O | O | C | O |
| S21 | O | O | C | O |
| S22 | O | C | O | O |
| S23 | C | O | O | O |
| S24 | O | O | O | C |
| S25 | O | O | O | C |

directions in which the units are viewed in the detailed diagrams on this page. The table above gives the switch positions for the various control settings, starting from the fully anti-clockwise position. O indicates open, and C, closed.

**S26** is the internal speaker switch, at the rear of the chassis, which opens when the external speaker plug is inserted and rotated anti-clockwise.

*Continued overleaf*




Switch diagrams, as seen from the rear of the underside of the chassis.

| CONDENSERS | | Values (μF) |
|---|---|---|
| C1 | Aerial series condensers | 0·0002 |
| C2 | Aerial series condensers | 0·0001 |
| C3 | S.W. aerial coupling | 0·0001 |
| C4 | M.W. aerial coupling | 0·0002 |
| C5 | Earth blocking | 0·1 |
| C6 | V1 cathode by-pass | 0·1 |
| C7 | V1 S.G. by-pass | 0·1 |
| C8 | V2 anode R.F. by-pass | 0·0005 |
| C9 | H.F. trans. fixed S.W. trimmer | 0·00005 |
| C10 | V2 C.G. condenser | 0·0001 |
| C11 | V2 S.G. by-pass | 0·1 |
| C12 | V2 cathode by-pass | 0·1 |
| C13 | V2 anode R.F. by-pass | 0·0002 |
| C14 | V2 to V3 A.F. coupling | 0·1 |
| C15* | V3 cathode by-pass | 25·0 |
| C16 | Fixed tone corrector | 0·01 |
| C17* | H.T. smoothing | 20·0 |
| C18* | H.T. smoothing | 20·0 |
| C19 | V4 anode-cathode by-pass | 0·1 |
| C20 | Mains circuit R.F. by-pass | 0·1 |
| C21‡ | Droitwich rejector tuning | — |
| C22‡ | Aerial circuit M.W. trimmer | — |
| C23‡ | Aerial circuit L.W. trimmer | — |
| C24† | Aerial circuit tuning | 0·0005 |
| C25† | Reaction control | 0·0005 |
| C26‡ | H.F. trans. S.W. trimmer | — |
| C27‡ | H.F. trans. M.W. trimmer | — |
| C28‡ | H.F. trans. L.W. trimmer | — |
| C29† | H.F. trans. tuning | 0·0005 |
| C30 | H.T. supply R.F. by-pass | 0·1 |

* Electrolytic. † Variable. ‡ Pre-set.

| OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|
| L1 | Droitwich rejector coil | 37·0 |
| L2 | Aerial series choke | 8·6 |
| L3 | Aerial S.W. tuning coil | Very low |
| L4 | Aerial M.W. coupling coil | 0·35 |
| L5 | Aerial M.W. tuning coil | 3·3 |
| L6 | Aerial L.W. choke | 20·0 |
| L7 | Aerial L.W. coupling coil | 3·0 |
| L8 | Aerial L.W. tuning coil | 12·0 |
| L9 | H.F. trans. S.W. pri. | 0·2 |
| L10 | S.W. reaction coil | 0·2 |
| L11 | H.F. trans. S.W. sec. | 0·15 |
| L12 | S.W. inductance trimmer | Very low |
| L13 | H.F. trans. M.W. pri. | 1·2 |
| L14 | H.F. trans. M.W. sec. | 2·8 |
| L15 | M.W. and L.W. reaction coil | 1·5 |
| L16 | H.F. trans. L.W. pri. | 2·8 |
| L17 | H.F. trans. L.W. sec. | 12·5 |
| L18 | V2 anode R.F. choke | 210·0 |
| L19 | Speaker speech coil | 2·0 |
| L20 | Hum neutralising coil | 0·15 |
| L21 | Speaker field coil | 6,500·0 |
| L22 | H.T. smoothing choke | 290·0 |
| L23 | Mains circuit filter chokes | 0·9 |
| L24 | Mains circuit filter chokes | 0·9 |
| T1 | Gram. pick-up trans. Pri. | 1,750·0 |
| | Gram. pick-up trans. Sec. | 3,750·0 |
| T2 | Speaker input trans. Pri. | 580·0 |
| | Speaker input trans. Sec. | 0·25 |
| S1-24 | Waveband switches | — |
| S25 | Gram. pick-up switch | — |
| S26 | Int. speaker switch | — |
| S27-28 | Mains switches, ganged R4 | — |
| F1,F2 | Mains circuit fuses | — |

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 220-230 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but the reaction control was at minimum. There was no signal input.

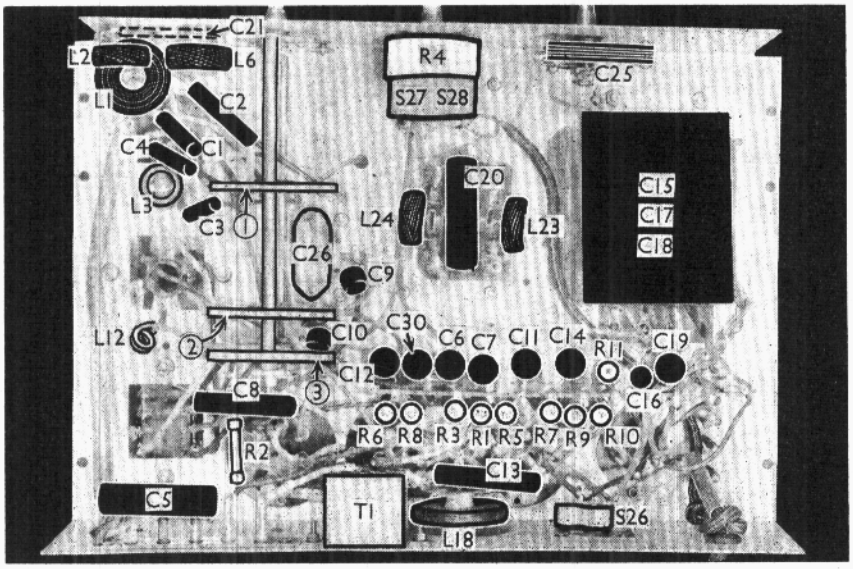
Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 VP13B | 180 | 5·5 | 130 | 1·8 |
| V2 SP13B | 95 | 1·4 | 65 | 0·5 |
| V3 PP36 | 155 | 42·0 | 180 | 6·2 |
| V4 V30† | — | — | — | — |

† Cathode to chassis 200 V, D.C.

## GENERAL NOTES

**Switches.**—**S1-S25** are the wave-change and pick-up switches, in three ganged rotary units, shown in the under-chassis view. The arrows indicate the




Under-chassis view. **C21** is adjustable through a hole in the front of the chassis. Note the inductive trimmer **L12**.

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## BURGOYNE AWTU—*Continued*

**S27** and **S28** are the Q.M.B. mains switches, ganged with the gain control, **R4**. The upper pair of tags belongs to **S27**, and the lower pair to **S28**.

**Coils.**—The coils **L4, L5, L7, L8**; **L9-L11**; and **L13-L17** are in three screened units on the chassis deck, the first and last incorporating two trimmers each.

The remaining coils and chokes are disposed at various points beneath the chassis, and are all marked in our under-chassis view. Note the inductive trimmer **L12**, consisting of two loops of wire.

**Scale Lamps.**—These are three Osram 6·2 V, 0·3 A M.E.S. types, wired in series.

**Fuses.** These are two $\frac{5}{8}$ in. glass tubular types, rated at 1·0 A. They are incorporated in the special mains plug.

**External Speaker.**—There are sockets for a high impedance external speaker (7,000-8,000 O). By using the special plug provided, it is possible to switch the internal speaker in or out of circuit, by means of **S26**.

**Condensers C15, C17, C18.**—These are three dry electrolytics in a single carton beneath the chassis, having a common negative (black) lead. The yellow lead is the positive of **C15** (25$\mu$F); the red lead to **C19** is the positive of **C17** (20$\mu$F), and the red lead to the speaker cable is the positive of **C18** (20$\mu$F).

**Trimmers C21** and **C26.**—These are fitted to the chassis, and are adjusted through holes in the front and the deck of the chassis respectively.

**Condensers C9, C10.**—These are of the ceramic cup type.

**Chassis Divergencies.—C30** appears in our chassis, but not in the maker's diagram. The connection between one side of the primary of **T1** and the earth socket (*not* chassis) may not be present. In some chassis there may be a 0·001$\mu$F by-pass between heater of **V1** and chassis. **R5** may be 250,000 O instead of 100,000 O.

### CIRCUIT ALIGNMENT

Set pointer to 200 m. mark on scale. Switch set to M.W., feed a 200 m. signal into **A2** and **E** sockets, and adjust **C22** and **C27** for maximum output with critical reaction.

Switch set to L.W., set pointer to 1,200 m. on scale, feed in a 1,200 m. signal, and adjust **C23** and **C28** for maximum output with critical reaction.

Feed a 1,500 m. signal into **A1** and **E** sockets, tune in the signal, and adjust rejector trimmer **C21** (front of chassis) for minimum output, without reaction.

Switch set to S.W., and adjust pointer to 21 m. on scale. Apply a 21 m. signal to **A2** and **E** sockets, and adjust **C26** (through hole in chassis deck) for maximum output with critical reaction.

Set pointer to 48 m. on scale, feed in a 48 m. signal, and adjust inductive trimmer **L12** beneath the chassis for maximum output with critical reaction.

Go back to 21 m. and re-adjust **C26**, then return to 48 m. and re-adjust **L12**, and continue until no further improvement results.

NOTE.—In most cases the adjustment of **L12** will not be found necessary.

# MAINTENANCE PROBLEMS

## Warped Resistor Panel

A PHILIPS 6-valve 372B Superinductance receiver was in for repair, as only a very faint signal could be heard, and that only when tuned to the powerful local station. I was prepared for trouble in this set as I was informed by the owner, who lived out of town, that the local expert had already failed to cure the fault.

The valves were tested first, and four of them were found to be O.K. One, a P.M.12A, had a filament O.C., and the Class B output valve showed emission from one half only. The P.M.12A was replaced, and a P.M.2B fitted in place of the faulty output valve.

The set was then placed on test, but still only gave a very weak signal from the local station. Voltage and current tests were about normal except on the anode of the H.L. triode valve, which was getting no volts. The set was dismantled, and on inspection it was noticed that the anode of this valve was connected to the grid.

As this was the first of these sets I had handled, and we had no circuit diagram, I did not know until I saw this connection that this valve was being used as a simple diode.

An A.F. signal was then applied to grid of the fourth valve, a screened grid, and produced a normal signal. Signals were then applied to the diode valve, with no results. The components connected with this valve were given a quick look over, but nothing abnormal was noticed.

A resistance and condenser network was connected to the diode, and commencing at the diode end, these components were disconnected in turn, while a signal was applied. It was found that these tests led to one of the resistors, mounted on a panel about four or five inches long. This panel was running parallel to a metal part of the chassis and very close to it, and had sagged so that the resistor in question was s.c. to chassis, due to the end clip touching.

On lifting this panel, signals could be obtained in a normal manner. A strip of insulation material was secured beneath the panel, and the set tested out again.

This time the set was absolutely silent, and thinking that something on the panel had been disturbed it was examined, but appeared O.K. Tests were then commenced again, and it was found that no L.T. was reaching the valve holders. This trouble was traced to the on-off switch, and when this was cleaned and adjusted the set was O.K.

As the customer was in rather poor circumstances it was decided to examine the PM.12A with the O.C. filament, and on opening the legs and testing direct on the wires inside them, the filament was found to be O.K. The inside of the leg and the wire was tinned, and a good soldered joint made. On carefully closing up the leg again, the valve was refitted to the set and worked O.K.—W. G. GOUGH, WORCESTER.

## Speaker Field Fault

AN Ekco AC85 was brought in for repair. The complaint was a hum that came on intermittently. It was not loud, but was sufficiently bad to be annoying during a programme interval.

As this type of fault usually occurs when an electrolytic is giving trouble, an additional 4 $\mu$F was clipped across one of the existing smoothing condensers, and all was well.

The set was left on test for a few hours, when the hum returned, this time very much louder.

The speaker field coil was suspected, tested, and found to have a low resistance, 250 O instead of its correct 2,000 O. The fitting of a new coil cleared up the trouble.

Curiously enough, the old field now shows its correct reading but would undoubtedly "go down" under working conditions. The additional 4 $\mu$F smoothing first provided was removed, with no difference in reception.—W. LLOYD, SWANSEA.

## A Record Changer Hint

SEVERAL times recently I have been called in by owners of radio-grams fitted with the H.M.V. or Marconi model K3 automatic record changer (1934 series). The complaint is that the record drops, and the needle feeds into the first groove correctly, but the mechanism immediately trips, and proceeds to change the record.

This fault is caused by the failure of the trip arm lever to move sufficiently towards the front of the machine to allow it to engage with the clutch lever. According to the makers' service literature, this is due to the failure or weakening of the tension spring No. 37a; accordingly a new spring was obtained and fitted, and the mechanism lubricated.

This effected an improvement for a short time, but a recurrence of the trouble led to a close examination of the tripping action, and it was noticed that the trip arm No. 31 was rather stiff. This arm rubs on the bottom plate of the assembly, is about 6 ins long, and being underneath the large gear wheel is difficult to lubricate and is consequently often neglected.

The trouble was completely overcome by fitting a small tension spring about $\frac{3}{8}$-in. long to the front end of arm 31.

This is easily fitted by drilling a small hole in the arm, hooking one end of the extra spring in it, the other end being secured by a 6 BA screw driven into a hole drilled and tapped in the bottom plate. The extra spring relieves the spring 37A of the drag of the trip arm 31, and has proved to be highly successful.—F. W. GILL, WORTHING.

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