NUMBER 102 **'TRADER' SERVICE SHEETS**

K-B 425
(AND 405 & 405A)
TRANSPORTABLE UNIVERSAL SUPERHET

ARRANGED for operation from both A.C. and D.C. mains, the Kolster-Brandes 425 receiver is a 5-valve (plus rectifier) model with a frame aerial. A carrying handle is provided at the top of the cabinet and there is a turntable on the bottom. A tapped resistance allows the receiver to be adjusted to mains of 195-280 V.

Somewhat similar chassis are employed in the K-B 405 and 405A receivers.

CIRCUIT DESCRIPTION

Tuned frame aerial input (**L2, L3, C32** with provision for external aerial-earth coupling by **L1**) to variable-mu pentode signal frequency amplifier (**V1, Brimar 9D2** or **Cossor 13VPA**).

Tuned-anode coupling by **L4, L5, C34** to heptode frequency-changer (**V2, Brimar 15D1** or **Cossor 13PGA**) operating with electron coupling. Oscillator grid coils **L6, L7** tuned by **C36**; tracking by pre-set condensers **C38** (L.W.) and **C39** (M.W.); oscillator anode reaction coils **L8, L9.**

Single variable-mu H.F. pentode intermediate frequency amplifier (**V3, Brimar 9D2** or **Cossor 13VPA**) operating with tuned-primary tuned-secondary transformer couplings **L10, L11** and **L12, L13.**

Intermediate frequency 130 KC/S.

Diode second detector forms part of double diode triode valve (**V4, Brimar 11D3** or **Cossor 13DHA**). Second diode, fed from **V3** anode by small condenser **C22,** provides D.C. potential which is developed across load resistance **R19** and fed back through decoupling circuits to suppressor grid of H.F. amplifier, tetrode control grid of F.C. valve and control grid of I.F. valve, giving automatic volume control. Delay voltage is obtained from **V4** cathode resistance **R16.**

Audio frequency component in output from signal diode is developed across load resistance **R14** and passed via I.F. stopper **R12** and coupling condenser **C13** to manual volume control **R13,** and thence via I.F. stopper **R15** to grid of **V4** triode section, which operates as L.F. amplifier. Variable tone control by special tapped condenser **C44** across volume control.

Resistance-capacity coupling by **R18, C23** and **R20** to output pentode (**V5, Brimar 7D3** or **Cossor 40PPA**). Fixed tone correction in anode circuit by **C26.**

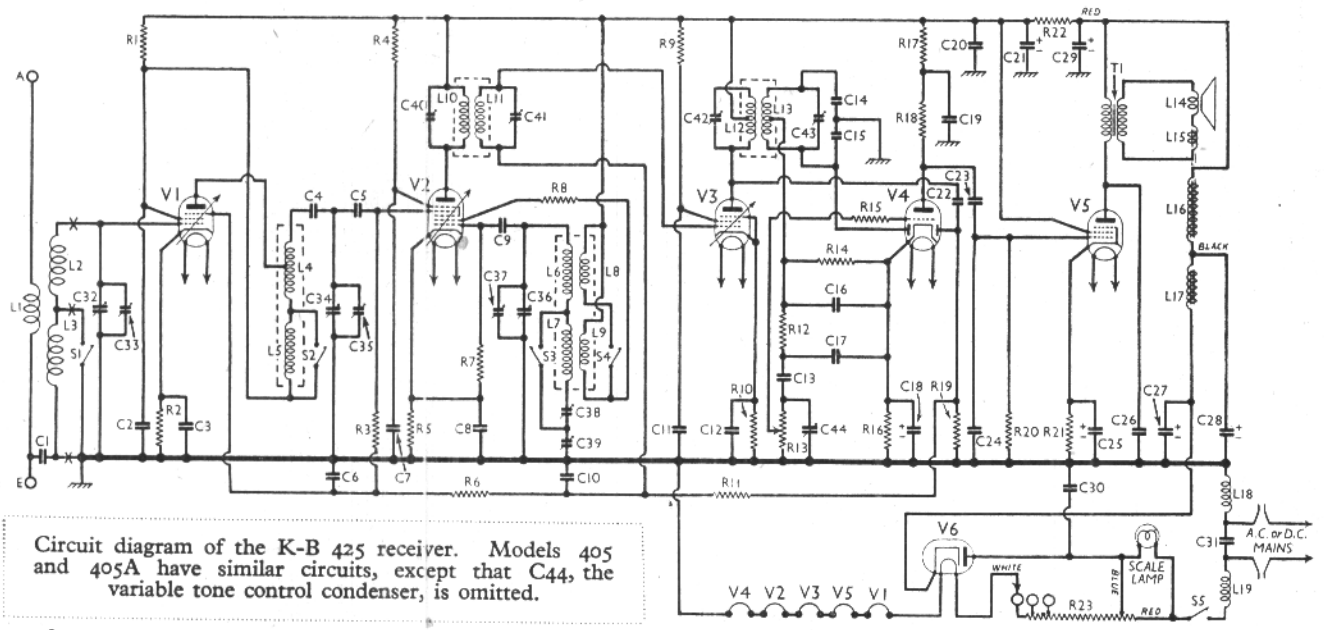
When the receiver is operated with A.C. mains, H.T. current is supplied by a half-wave rectifying valve (**V6, Brimar 1D5** or **Cossor 506UA**), which, with D.C. supplies, behaves as a resistance of low value. Smoothing is effected by L.F. choke **L17,** speaker field coil **L16,** resistance **R22** and dry electrolytic condensers **C21, C27, C28, C29.**

Heaters of all valves are connected in series together with tapped ballast resistance **R23** across mains input circuit. Scale lamp derives its current from a tapping on **R23.** Filter comprising chokes **L18, L19** and condensers **C30, C31** is provided for suppressing mains-borne interference.

COMPONENTS AND VALUES

	Condensers	Values (μF)
C1	Earth blocking condenser	0·01
C2	V1 S.G. and anode decoupling	0·1
C3	V1 cathode by-pass	0·1
C4	H.T. blocking condenser	0·02
C5	H.F. coupling V1 to V2	0·001
C6	A.V.C. line decoupling	0·1
C7	V2 S.G.'s by-pass	0·5
C8	V2 cathode by-pass	0·1
C9	V2 oscillator C.G. condenser	0·0001
C10	A.V.C. line decoupling	0·1
C11	V3 S.G. by-pass	0·1
C12	V3 cathode by-pass	0·1
C13	L.F. coupling to vol. control	0·02
C14	Small fixed trimmers	0·00002
C15	Small fixed trimmers	0·00002
C16	I.F. by-passes	0·0003
C17	I.F. by-passes	0·0001
C18*	V4 cathode by-pass	25·0
C19	V4 anode decoupling	0·5
C20	H.T. circuit by-pass	0·5
C21*	H.T. smoothing	4·0
C22	Coupling to V4 A.V.C. diode	Very low
C23	L.F. coupling to V5	0·02
C24	V5 grid I.F. by-pass	0·0002
C25*	V5 cathode by-pass	25·0
C26	Tone corrector	0·01
C27*	H.T. smoothing	8·0
C28*	H.T. smoothing	8·0
C29*	H.T. smoothing	4·0
C30	Mains H.F. by-passes	0·01
C31	Mains H.F. by-passes	0·01
C32†	Frame aerial tuning	0·0005
C33‡	Frame aerial trimmer	—
C34†	V1 anode circuit tuning	0·0005
C35‡	V1 anode circuit trimmer	—
C36†	Oscillator tuning	0·0005
C37‡	Oscillator trimmer	—
C38‡	Oscillator L.W. tracker	—
C39‡	Oscillator M.W. tracker	—
C40‡	1st I.F. trans. pri. tuning	—
C41‡	1st I.F. trans sec. tuning	—
C42‡	2nd I.F. trans. pri. tuning	—
C43‡	2nd I.F. trans. sec. tuning	—
C44†	Variable tone control	—

* Electrolytic † Variable ‡ Pre-set.

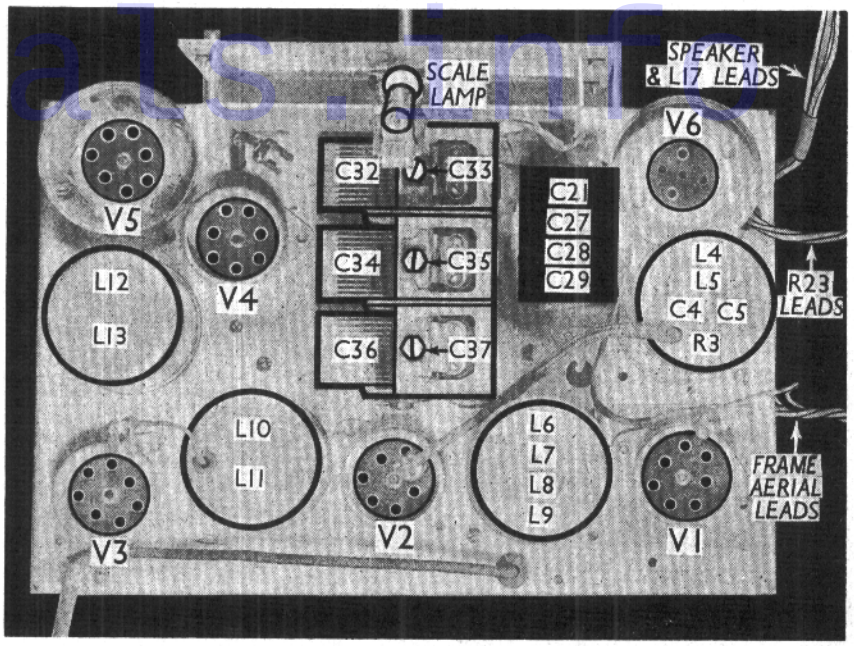


Circuit diagram of the K-B 425 receiver. Models 405 and 405A have similar circuits, except that C44, the variable tone control condenser, is omitted.

	Resistances	Values (ohms)
R1	V1 S.G. and anode decoupling	5,000
R2	V1 G.B. resistance	1,000
R3	V2 C.G. resistance	1,000,000
R4	V2 S.G.'s H.T. feed	15,000
R5	V2 fixed G.B. resistance	500
R6	V2 A.V.C. line decoupling	100,000
R7	V2 oscillator C.G. resistance	25,000
R8	V2 oscillator anode resistance	2,500
R9	V3 S.G. H.T. feed	15,000
R10	V3 fixed G.B. resistance	1,000
R11	A.V.C. line decoupling	100,000
R12	I.F. stopper	100,000
R13	Manual volume control	500,000
R14	V4 signal diode load	250,000
R15	V4 grid I.F. stopper	100,000
R16	V4 G.B. resistance	7,000
R17	V4 anode decoupling	100,000
R18	V4 anode load	100,000
R19	V4 A.V.C. diode load	500,000
R20	V5 C.G. resistance	250,000
R21	V5 G.B. resistance	500
R22	V1, V2, V3 and V4 H.T. feed	300
R23	Heater circuit ballast, total	550

	Other Components		Approx. Values (ohms)
L1	External aerial-earth coupling		0·1
L2	Frame aerial		1·5
L3	Frame aerial		4·0
L4	V1 anode circuit tuning coils		—*
L5	V1 anode circuit tuning coils		20·0
L6	Oscillator tuning coils		4·0
L7	Oscillator tuning coils		13·0
L8	Oscillator reaction coils		5·0
L9	Oscillator reaction coils		18·0
L10	1st I.F. trans.	Pri.	75·0
L11	1st I.F. trans.	Sec.	75·0
L12	2nd I.F. trans.	Pri. total	75·0
L13	2nd I.F. trans.	Sec. total	75·0
L14	Speaker speech coil		1·8
L15	Hum neutralising coil		0·1
L16	Speaker field coil		1,000·0
L17	H.T. smoothing choke		220·0
L18	Mains filter chokes		1·5
L19	Mains filter chokes		1·5
T1	Speaker input trans.	Pri.	300·0
T1	Speaker input trans.	Sec.	0·2
S1-S4	Waveband switches		—
S5	Mains switch, ganged R13		—

* Has internal series condenser.



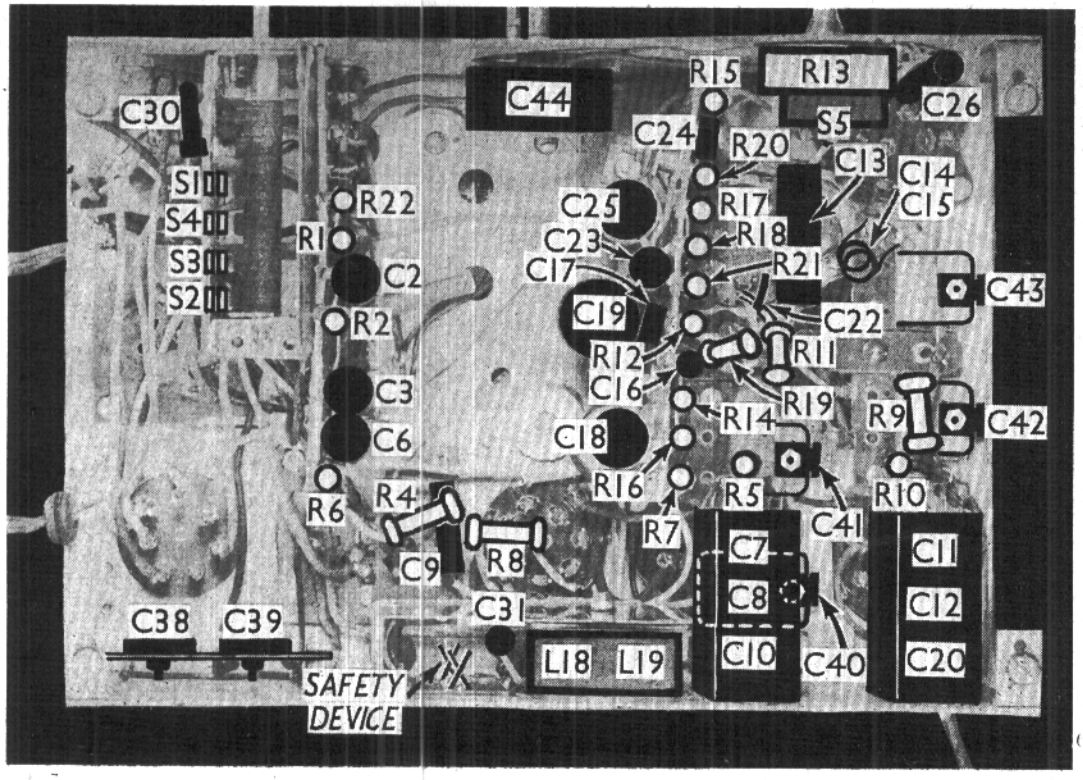
Plan view of the chassis. Note the condenser block containing five condensers. The L4, L5 unit also contains C4, C5 and R3. L17 is mounted on the speaker chassis, and R23, the heater circuit ballast resistance is inside the cabinet.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the back and the four control knobs (recessed grub screws). Remove the two round-head bolts (with claw washers and lock washers) holding the frame to the bottom of the cabinet and the two cheese-head bolts (with claw washers and lock washers) holding the frame to the cabinet top. The chassis can now be withdrawn complete with the frame and the speaker.

To free the chassis from the frame, remove the two cheese-head bolts (with washers and lock washers) holding it to the frame at the back and the two cheese-head bolts (with nuts, washers and lock

(*Continued overleaf*)



Under-chassis view, with the metal baseplate removed. C40-C43 are the I.F. trimmers. C14, C15 and C22 are small fixed condensers formed of twisted wires. The connections of the two condenser blocks are given under General Notes overleaf. C44 is the variable tone control condenser.

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washers) holding the chassis at the front. Unsolder the "earthing" lead from the left-hand side of the chassis and free the leads to the mains resistance from the cleat on the side of the frame.

The chassis can now be withdrawn to a sufficient extent for normal purposes, but before access can be obtained to the under-chassis components, it will be necessary to remove the two struts across the bottom of the chassis (each with two bolts and lock washers) and the screen (three round-head self-tapping screws).

Since removing the back of the cabinet automatically disconnects the mains, some arrangement must be made for cutting out the "safety" device if it is desired to carry out tests with the chassis in working order. For this purpose the shorting strips on the cabinet back can be used, for they can easily be removed by taking out two round-head screws.

To free the chassis entirely, unsolder the leads from the frame, the speaker terminal panel and the black/red lead from the choke on the speaker. *When replacing frame*, connect as follows, numbering the tags from front to back when looking at the back of the chassis :—1, green lead to grid of **V1**; 2, green; 3, blue.

When replacing speaker leads, connect as follows, numbering the tags from bottom to top :—1 and 2 joined together, red; 3, blue; 4, black and black rubber-covered lead from speaker field. The black/red lead goes to the bottom tag on the choke on the left of the speaker. *When replacing mains resistance leads*, connect as follows :—the white lead and the white flying lead go to the tag marked 270, the red lead goes to the top tag and the blue lead goes to the tag next to it.

Removing Speaker.—If it is necessary to remove the speaker, unsolder the leads, including the black/red lead to the choke and the "earthing" lead, and remove the nuts and lock washers from the four bolts holding it to the sub-baffle. *When replacing*, do not forget the "earthing" tag and lock nut on the lower of the left-hand screws, and see that the transformer is on the right.

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 225 V, using the 225 V tapping. The volume control was at maximum and the set was tuned to the lowest wavelength on the medium band, but there was no signal input, the frame connections being shorted together.

Should the receiver prove unstable when making measurements, as in our case, this can be cured by connecting 0.1 μF condensers from the **V2** anode to chassis and from the electrode concerned to chassis.

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 9D2*	126	4·6	128	1·4
V2 15D1 ..	155	1·1	85	5·1
V3 9D2 ..	155	5·0	130	1·3
V4 11D3 ..	65	0·2	—	—
V5 7D3 ..	157	32·0	157	6·2
V6 1D5 ..	245†	—	—	—

* Osc. anode (G2) 132V, 6·9 mA

† Cathode to chassis, D C.

GENERAL NOTES

Switches.—The waveband switches, **S1-S4**, are in a single unit, seen in the under-chassis view. All are *closed* on the M.W. band and *open* on the L.W. band.

S5 is the Q.M.B. mains switch ganged with the volume control **R13**.

Coils.—These, with the exception of **L1-L3** (frame aerial), are in four screened units on the chassis deck, the two smaller ones containing the I.F. transformers, but not their associated trimmers. The **L4, L5** unit also contains **C4, C5** and **R3**.

Chokes L18, L19.—These are beneath the chassis, at the rear, and are wound in a single unit. The two black leads emerging are those of **L18**, and the two yellow leads, **L19**.

Scale Lamp.—This is an Osram M.E.S. type, rated at 6.2 V 0.3 A, and connected across part of **R23**.

External Speaker.—There is no provision for this, but a low resistance type (2-4 O) could be connected across the secondary of **T1**. The two tags are behind **T1**, looking at the back of the cabinet.

Smoothing Choke L7.—This is mounted on the speaker chassis, near the bottom.

Condensers C21, C27, C28, C29.—These are four dry electrolytics in a single unit on the chassis deck. There is a common negative (black) lead, two yellow leads for the positives of **C21** and **C29**, and two red ones for the positives of **C27** and **C28**. Identification can be carried out by reference to the circuit diagram and the wiring.

Condensers C7, C8, C10.—These are three paper types, 0.5, 0.1 and 0.1 μF, in a single metal case with one common tag. Looking at the underside of the chassis, as in our under-chassis view, the top left tag is the common one, the top right tag the second connection of **C7**, the lower left tag the second connection of **C8**, and the lower right tag the second connection of **C10**.

Condensers C11, C12, C20.—This is a similar unit, and viewed in the same way the connecting tags are : top left, common; top right, **C20**; lower left, **C12**; lower right, **C11**.

Trimmers C38, C39.—These can be reached through holes in the rear of the chassis.

Trimmers C40-C43.—These are mounted beneath the chassis, and can be reached through holes in the screening plate beneath the chassis. (This has, of course, been removed in our under-chassis view.)

Condensers C14, C15, C22.—These are three very small fixed condensers formed of twisted wires. Two of them, **C14** and **C15**, mounted on the trimmer **C43**, are formed of three wires, while **C22** is mounted on the A.V.C. diode tag of **V4** valve-holder.

Condenser C1.—This is a tubular type, mounted on the frame aerial behind the external aerial and earth sockets.

CIRCUIT ALIGNMENT

It is suggested that in view of the sensitivity of the receiver and the use of a frame aerial, alignment should be carried out inside an earthed cage where interference is prevalent. It is necessary to remove the chassis and frame aerial assembly from the cabinet before the trimmers can be adjusted. The I.F. trimmers are reached through holes in the metal base-plate.

First adjust the signal generator to deliver a large output at 130 KC/S and switch on the receiver with an output meter connected. Switch to L.W., turn volume control to maximum. Set gang condenser to maximum and connect the signal generator to chassis and, via a 0.1 μF condenser to control grid (top cap) of **V2**. Unscrew **C40-C43** until they reach minimum capacity. Now adjust **C43** for maximum output. Then adjust similarly **C42, C41** and **C40**, in that order.

Set the generator to 1,400 KC/S and apply the output to the external A and E sockets of the receiver. Switch to M.W., and turn gang condenser until scale pointer indicates 214 m.

Fully unscrew **C37**, and screw up **C35** and **C33** completely. Now carefully screw up **C37** and adjust for maximum output. Signals will be obtained at two positions. The first reached when screwing up from minimum is the correct one.

Unscrew **C35** for maximum output, and similarly adjust **C33**. Return to **C37** and attempt to improve its setting.

Set the signal generator to 600 KC/S, and tune the receiver to this signal. Adjust **C39** for maximum output, swinging the gang condenser as well to improve results. Now set the pointer to indicate 500 m., and keeping the oscillator at 600 KC/S, repeat the adjustments of **C37, C35** and **C33** as described above.

Switch set to L.W. and adjust scale pointer to 1,000 m. Set signal generator to 300 KC/S, and make any necessary adjustments to the pointer setting. Adjust signal generator to 175 KC/S, and tune into this by means of the receiver tuning control.

Adjust **C38** for maximum output, at the same time rocking the gang condenser. If the pointer requires adjustment, it should be set so that it is the least inaccurate at this point (1,714 m.), and at 1,000 m. by dividing the residual error between the two. For example, if when accurate at 1,000 m. it is $\frac{1}{8}$ in. out at 1,714 m., set the pointer so that it is $\frac{1}{16}$ in. on one side at 1,000 m. and $\frac{1}{16}$ in. on the other side at 1,714 m.