KOLSTER BRANDES LTD.

CRAY WORKS, SIDCUP, KENT.

SERVICE MANUAL

NEW SERIES
ISSUED FEBRUARY, 1940.

MODEL
860

IMPORTANT. This Receiver uses BRIMAR valves and was specifically designed round them. Its performance will be impaired unless BRIMAR valves of the correct types are used when replacements are needed.

REMOVAL OF CHASSIS.

REMOVE: Three knobs, two loud speaker clips on baffle, and four chassis bolts; also release lamp holder. The chassis may then be slid out of cabinet.

● For general information refer to Instruction Book and Instruction Card.

ALIGNMENT CHART FOR 860

*Operations MUST be carried out in the order indicated.

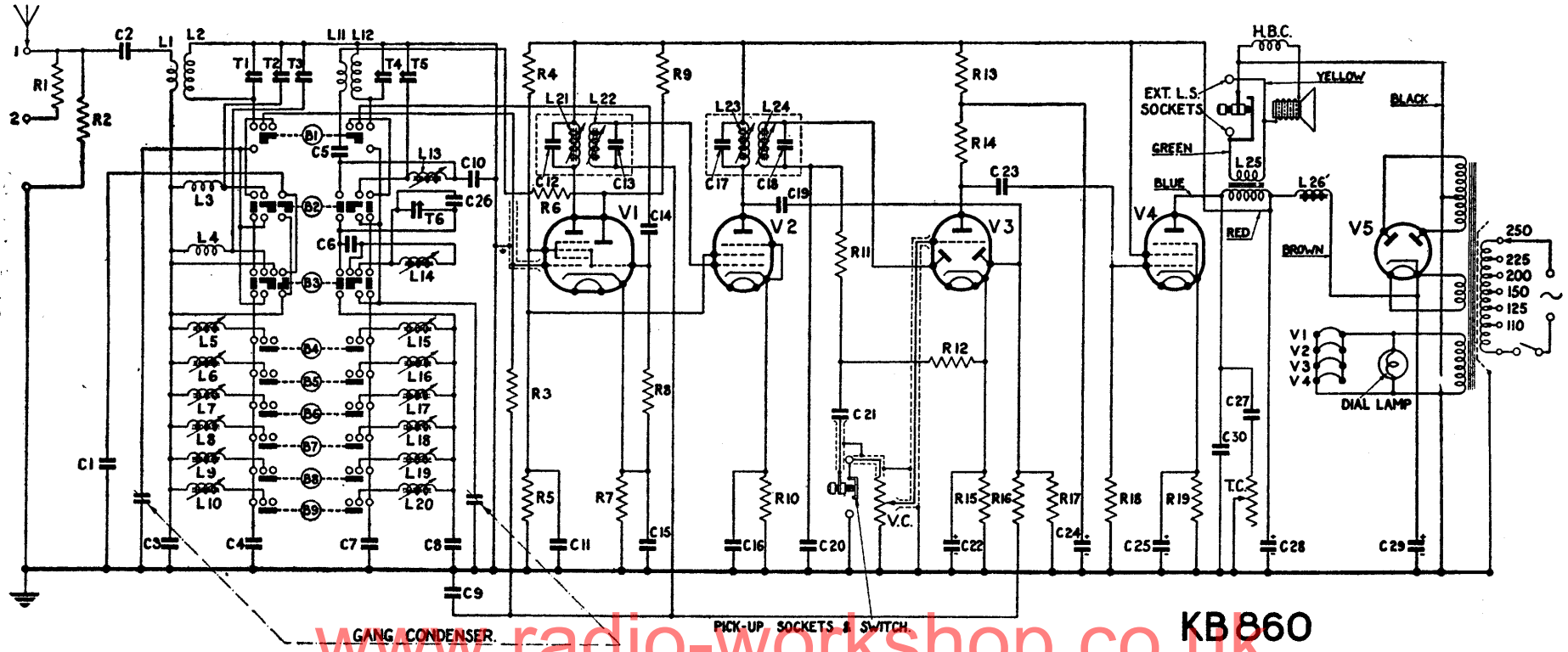
*Operation	Alignment of	Connect Signal Gen. to	Inject Signal via	Adjust Input Signal to	Depress Key	Set Tuning Pointer to	To be adjusted for maximum output
1	I.F.	Grid of 20D2	·1mfd.	464kcs	M.W. (B2)	580m	Cores of L21, L22, L23, L24
2	M.W.	Aer 1	Standard Dummy Aerial	600kcs	M.W.	500m	Core of L13 (M.W. Tracker)
3	,,	,,	,,	1,400kcs	,,	214m spot	Trimmers, T5 & T2
4	,,	Repeat		Operation		No. 2	Rock Tuning Condenser slightly while adjusting, for max. gain
5	,,	Repeat		Operation		No. 3	Trimmers, T5 & T2
6	L.W.	Aer 1	,,	175kcs	L.W. (B3)	1,714m spot	Core of L14 (L.W. Tracker)
7	,,	,,	,,	350kcs	L.W.	857m	Trimmers, T6 & T3
8	,,	Repeat		Operation		No. 6	Rock Tuning Condenser slightly, for max. gain
9	,,	Repeat		Operation		No. 7	Trimmers, T6 & T3
10	S.W.	Aer 1	400Ω	15Mcs	S.W. (B1)	20m	,, T4 & T1

ALL ON COIL UNIT

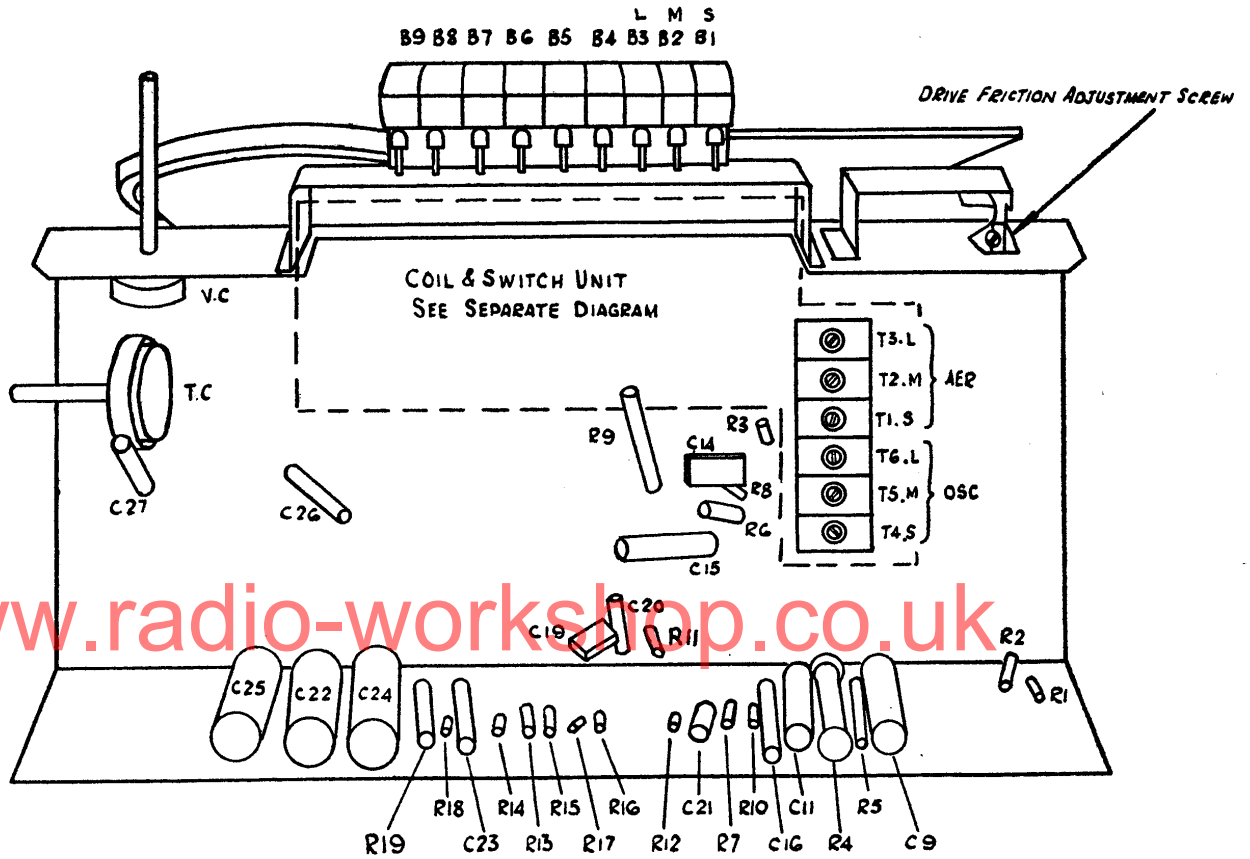
ADJUSTMENT OF "KEYS." Depress appropriate 'Key,' checking that wave-length of desired station falls within tuning range of 'Key' to be adjusted.

Inject via Aer 1, a signal of the same frequency as that of the desired station and adjust for maximum output, the cores of the two coils appropriate as indicated below.

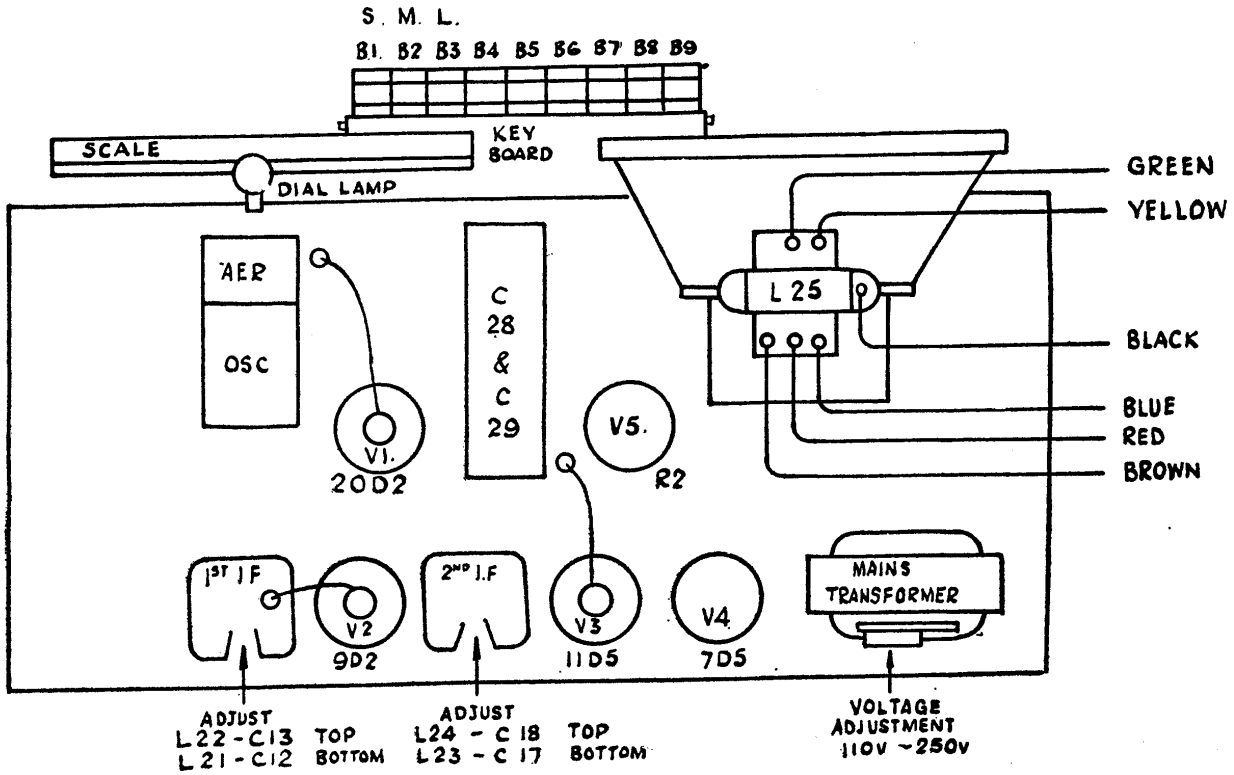
Button No.	Wave-length Range	Frequency Range	Standard "Key" Setting	Coils Aerial	Coils Oscillator
B4	193m to 286m	1,554kcs to 1,049kcs	R. Normandie (274m)	L.5	L.15
B5	250m to 363m	1,200kcs to 826kcs	Midland Reg. (296·2m)	L.6	L.16
B6	300m to 416m	1,000kcs to 721kcs	London Reg. (342·1m)	L.7	L.17
B7	400m to 552m	750kcs to 543kcs	North Reg. (449·1m)	L.8	L.18
B8	1,100m to 1,565m	273kcs to 192kcs	Luxembourg (1293m)	L.9	L.19
B9	1,340m to 2,000m	224kcs to 150kcs	Droitwich (1,500m)	L.10	L.20



UNDER CHASSIS DIAGRAM

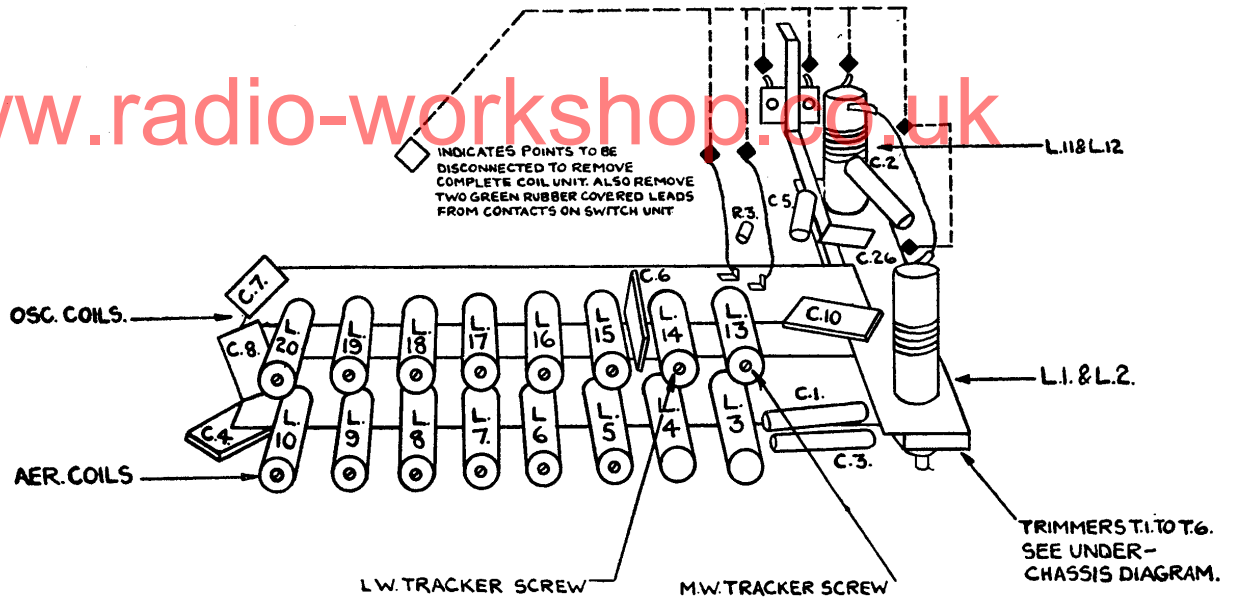


TOP VIEW OF CHASSIS



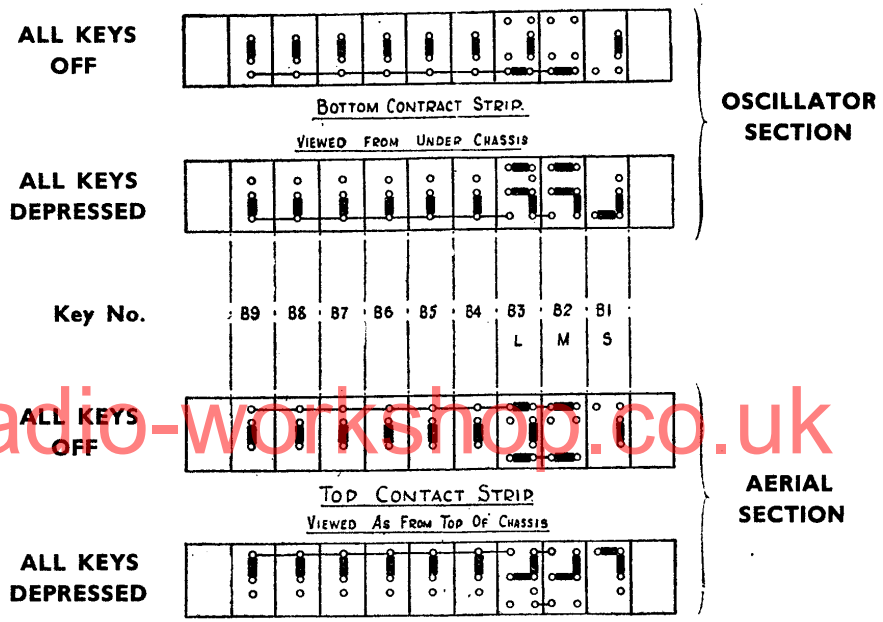
COIL & SWITCH UNIT

VIEW FROM FRONT OF CHASSIS WITH KEYS & KEY PLATE REMOVED.

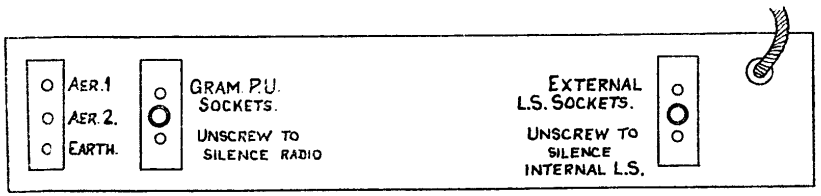


SWITCH DIAGRAM, SHOWING CONTACT ACTION

CIRCLES INDICATE FIXED CONTACTS.
HEAVY BLOCKS INDICATE SWITCHING ACTION.



BACK OF CHASSIS



COIL RESISTANCES.

L3. = 2·5 Ω	L15. = 1·5 Ω
L4. = 37 Ω	L16. = 1·8 Ω
L5. = 2·5 Ω	L17. = 2·1 Ω
L6. = 3·6 Ω	L18. = 2·5 Ω
L7. = 4·8 Ω	L19. = 4·3 Ω
L8. = 6·5 Ω	L20. = 4·3 Ω
L9. = 18 Ω	L21. = 3·7 Ω
L10 = 22 Ω	L22. = 3·7 Ω
L13. = 5·2 Ω	L23. = 3·8 Ω
L14. = 11·5 Ω	L24. = 2·7 Ω

KEY TO CIRCUIT DIAGRAM

VC. = ½ Meg. Ω
TC. = 50,000 Ω
R1. = 10,000 Ω
R2. = 2,000 Ω
R3. = ½ Meg. Ω
R4. = 20,000 Ω 2 watt
R5. = 25,000 Ω 1 watt
R6. = 150 Ω
R7. = 300 Ω
R8. = 50,000 Ω
R9. = 50,000 Ω 1 watt
R10. = 300 Ω
R11. = 50,000 Ω
R12. = ½ Meg. Ω
R13. = 50,000 Ω
R14. = 150,000 Ω
R15. = 7,000 Ω
R16. = ½ Meg. Ω
R17. = ½ Meg. Ω
R18. = ½ Meg. Ω
R19. = 400 Ω 1 watt
C1. = ·002μF (± 5%)
C2. = ·005μF
C3. = ·002μF (± 5%)
C4. = 400μμF (± 5%)
C5. = ·001μF
C6. = 230μμF (± 1%)
C7. = 800μμF (± 5%)
C8. = 400μμF (± 5%)
C9. = 1μF
C10. = 400μμF (± 1%)
C11. = ·1μF (± 1%)
C12. = 150μμF (± 2%)
C13. = 150μμF (± 2%)
C14. = 50μμF
C15. = ·1μF
C16. = ·02μF
C17. = 150μμF (± 2%)
C18. = 280μμF (± 2%)
C19. = 25μμF
C20. = ·0005μF
C21. = ·005μF
C22. = 25μF (Elect)
C23. = ·02μF
C24. = 2μF (Elect)
C25. = 25μF (Elect)
C26. = 25μμF
C27. = ·03μF
C28. = 16μF (Elect)
C29. = 16μF (Elect)
C30. = ·001μF

AERIAL COILS.

		Code-Spot Colour
✱	L1. = S.W. Pri.	Dark Blue
✱	L2. = S.W. Sec.	
	L3. = M.W.	Red
	L4. = L.W.	Green & Yellow
	L5. = M.W. Push Button	Dark Blue
	L6. = ,, ,, ,,	Red
	L7. = ,, ,, ,,	Light Blue
	L8. = ,, ,, ,,	Green
	L9. = L.W. Push Button	Yellow
	L10. = ,, ,, ,,	Dark Blue & Red

OSCILLATOR COILS.

✱	L11. = S.W. Pri.	Red
✱	L12. = S.W. Sec.	
	L13. = M.W.	Yellow
	L14. = L.W.	Light Blue & Red
	L15. = M.W. Push Button	Dark Blue
	L16. = ,, ,, ,,	Red
	L17. = ,, ,, ,,	White
	L18. = ,, ,, ,,	Light Blue
	L19. = L.W. Push Button	Green
	L20. = ,, ,, ,,	Green

✱ Square brackets indicate coils wound on one former.

L21. = 1st I.F. Pri.
L22. = 1st I.F. Sec.
L23. = 2nd I.F. Pri.
L24. = 2nd I.F. Sec.
L25. = Output Transformer
L26. = Field Coil

SPARES 860

ALWAYS QUOTE PART No. WHEN ORDERING SPARES

Component	Part No.	List Price each
Volume Control	80601	4/6
Tone Control and Switch ...	80602	6/-
Scale	83050	3/9
Drive Spindle Assembly ...	A83037	2/-
Drive Cord Assembly	A83076/A	1/-
Pointer Cord Assembly ...	A76060/B	1/-
Dial Lamp, 12v.—16v.	64017	8d.
1st I.F. Transformer	A83094	9/6
2nd I.F. Transformer	A83095	9/6
2—Gang Condenser	A83080/A	15/6
Output Transformer	A80565	9/-
Trimmers, ceramic, T1 to T6	A63067	11d.
Loudspeaker Silk	—	1/-
Iron Dust Core	77007	9d.
SPECIAL CONDENSERS C1, C3	KT35	1/-
SPECIAL CONDENSERS C4, C8	KSM5/4	1/-
SPECIAL CONDENSERS C6	KSM5/3	1/3
SPECIAL CONDENSERS C7	KSM5/12	1/3
SPECIAL CONDENSERS C10	KSM5/13	1/3
SPECIAL CONDENSERS C12, C13, C17	KSM5/10	9d.
SPECIAL CONDENSERS C13	KSM5/9	1/-
SPECIAL CONDENSERS C18	KSM5/11	1/-
SPECIAL CONDENSERS C17	KM.1.	9d.
Cabinet	A86075	45/-
Service Screen (base cover) ...	83075/2	8d.
Knobs, front	A81069	1/-
Knobs, side	81012	10d.
Valve Can	80420	1/6
A. & E. Panel	A83066	6d.
Extension L.S. Panel	A83067	6d.

Component	Part No.	List Price each
Coil and Switch Unit (complete)	A84096/A	60/-
Keys, press-button	84011	3d.
Rubber Cushion Caps	84033+4	1d.
Press-button Switch	86026	19/-
L.S. Escutcheon	A83060	6/6
Key Escutcheon	84010/A	2/6
Station Name Labels	84025	6d.
Mains Transformer	A83074	21/-
Loud Speaker, complete ...	A80590	35/-
Condenser Block	KE27	8/-
Field Coil	A80566/A	7/-
Voltage Tap Plug	A80368	9d.
COILS :—		
S.W. Aerial. L1 & L2	A83089/B	1/8
S.W. Oscillator. L11 & L12 ...	A83089/C	1/8
M.W. Aerial. L3	A83088	1/8
M.W. Oscillator. L13 ...	A83090/A	1/8
L.W. Aerial. L4	A83090/C	1/8
L.W. Oscillator. L14	A83090/B	1/8
PRESS-BUTTON COILS L5	A84090	1/3
PRESS-BUTTON COILS L6	A84090/A	1/3
PRESS-BUTTON COILS L7	A84090/C	1/3
PRESS-BUTTON COILS L8	A84090/D	1/3
PRESS-BUTTON COILS L9	A84090/E	1/3
PRESS-BUTTON COILS L10	A84090/F	1/3
PRESS-BUTTON COILS L15	A84089	1/3
PRESS-BUTTON COILS L16	A84089/A	1/3
PRESS-BUTTON COILS L17	A84089/B	1/3
PRESS-BUTTON COILS L18	A84089/C	1/3
PRESS-BUTTON COILS L19 & L20	A84089/D	1/3

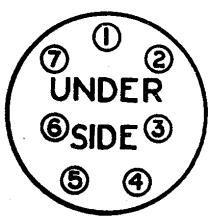
VOLTAGE CHART KB 860

Line Voltage 230v. A.C. in 225v. tap. Aerial & Earth Disconnected — All Keys Off — Volume Control Full On — Readings + or — 10%

Contacts numbered as diagram below.

Valve	Function	Volts measured between SOCKET and CHASSIS. 1	2	3	4	5	6	7	TOP CAP
20D2	Frequency Changer	50	0	57	12·5*	0	3·4	257	0
9D2	Pent. I.F. amp.	—	255	1·3	0	12·5*	1·3	57	0
11D5	2nd det, AVC & LF	0	—	0	0	12·5*	2·1	93	0
7D5	Output Pent.	—	0	258	0	12·5*	17·0	243	—
R2	Rectifier	Anodes=300v. *			Heaters=336v.				

Voltage Across Output Transformer Primary ...	L25	13 volts
,, ,, Field Coil	L26	75 ,,
Current through ,, ,, ...		57 mA
,, ,, Mains Transformer Primary ...		260 mA. A.C.
Total Consumption		65 watts



* Asterisk indicates A.C. voltages measured on Rectifier-type meter. All D.C. voltages measured on 1000 ohm per volt meter.

KOLSTER-BRANDES
860

Four-valve, plus rectifier, three waveband superhet with 9 push-buttons for wavechanging and stations. For 110–250 volt A.C. supplies. Made by Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent.

Circuit.—This receiver has a single tuned input circuit. The circuit is largely conventional, although the diagram is rather unusual, as the oscillator circuits are drawn in front of the frequency-changer instead of after it.

L1 and L2 are the S.W. aerial primary and secondary, and L3, L4 are M. and L.W. secondaries. L5–L10 are permeability tuned coils for push-button stations. The oscillator circuits are very similar; the tuned sections are in the grid path. M. and L.W. coils are permeability adjusted.

Both I.F. transformers are permeability trimmed. V2 is the I.F. amplifier, and V3 a straightforward double-diode-triode, resistance capacity coupled to V4, an output pentode. V5 is a full-wave rectifier with field coil for smoothing. The valves have 12.5v. heaters.

Provision is made for a P.U. and low-impedance extension speaker. Consumption, 65 watts.

GANGING

I.F. CIRCUITS.—Inject 464 kc. through .1 mfd. condenser to V1 grid, set tuned to 580 m. Adjust cores of L21–24.

M.W. BAND.—Tune to 500 m., inject 600 kc., adjust L13. Tune to 214 m., inject 1,400 kc. and adjust T5, T2.

Readjust at 500 m., rocking gang slightly. Readjust T5, T2 at 214 m.

L.W. BAND.—Tune to 1,714 m., inject 175 kc., adjust L14. Tune to 857 m., inject 350 kc., adjust T6, T3. Repeat both operations.

S.W. BAND.—Tune to 20 m., inject 15mc. through 400 ohms, adjust T4, T1.

KEY ADJUSTMENT

The adjustable cores of the special aerial and oscillator coils for the push-button tuning are accessible when the keys and key plate are removed. The oscillator coils are above, and the aerial coils below, their respective keys.

Inject a signal of the frequency of the required station, push in a key with suitable wavelength coverage, and then adjust first the oscillator, then the aerial cores.

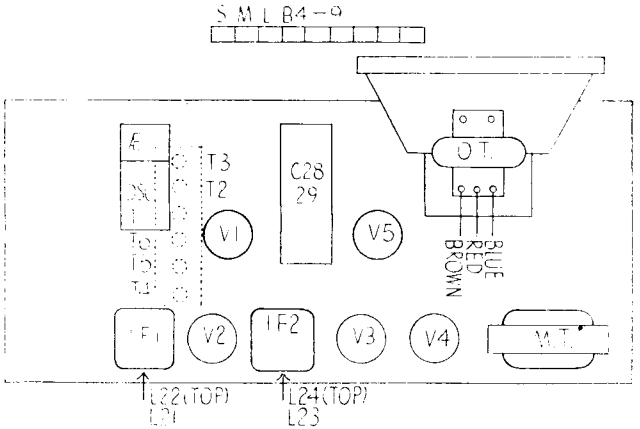
VALVE VOLTAGES

V	Type	Electrode	Volts
1	20D2	Anode	255
		Screen	57
		Osc. anode	50
		Cathode	3.4
2	9D2	Anode	255
		Screen	57
		Cathode	1.3
3	11D5	Anode	93
		Cathode	2.1
4	7D5	Anode	243
		Screen	258
		Cathode	17
5	R2	Anodes (A.C.)	300
		Cathode (D.C.)	336 (57 ma.)

CONDENSERS

C	Mfds.	C	Mfds.
10	400 mmfds.	21	.005
11	.1	22	.25
12	150 mmfds.	23	.02
13	150 mmfds.	24	.2
14	50 mmfds.	25	.25
15	.1	26	.25
16	.02	27	.03
17	150 mmfds.	28	.16
18	280 mmfds.	29	.16
19	25 mmfds.	30	.001
20	.0005		

For Resistance and Windings Tables see page vi



Permeability coils are used for both aerial and oscillator circuits on push-key tuning, and also for M. and L.W. padding. The trimmers are near their respective keys.

PUSH-BUTTONS

Button	Wavelength-Range (m)	Aerial Trimmer	Osc. Trimmer
4	193–286	L5	L15
5	250–363	L6	L16
6	300–416	L7	L17
7	400–552	L8	L18
8	1,100–1,565	L9	L19
9	1,340–2,000	L10	L20