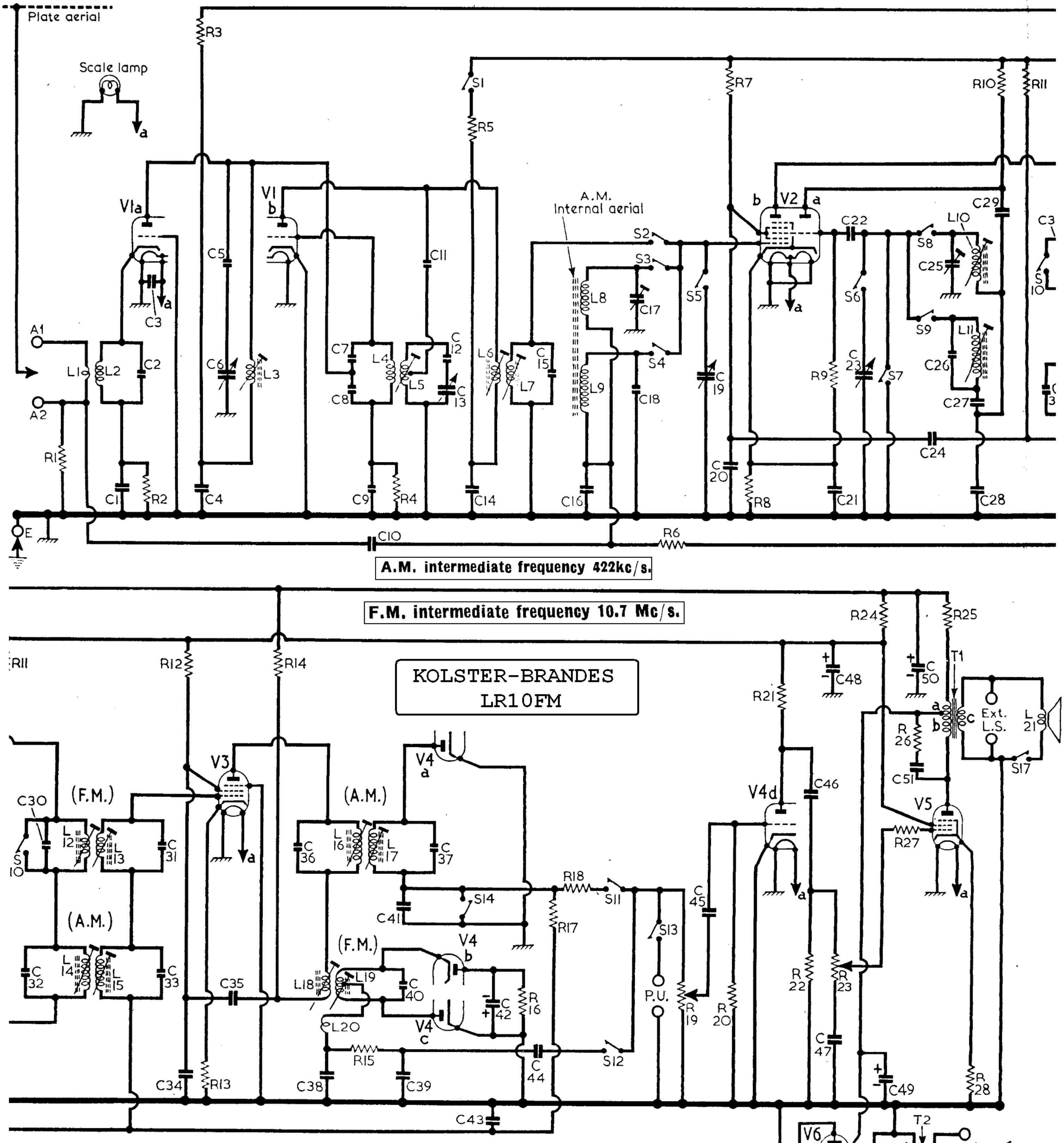
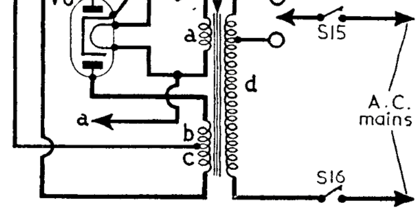




CIRCUIT ALIGNMENT

Equipment Required.—A spot-frequency signal generator covering the range of 140 kc/s to 1,700 kc/s. An F.M. signal generator (sine wave or externally wobbulated) covering the F.M. intermediate frequency of 10.7 Mc/s and the frequency range of 85 Mc/s to 100 Mc/s, with a deviation of at least ±150 kc/s. An Avometer Model 8, or similar multi-range meter. An oscilloscope.

A.M. I.F. Stages.—Switch receiver to M.W., and turn gang to maximum capacitance. Connect output of spot-frequency signal generator, via an 0.1μF capacitor in the "live" lead, to control grid (pin 2) of **V2b** and chassis. Feed in a 422 kc/s signal and, first fully unscrewing the cores of **L15** (location reference B2) and **L16** (E4), adjust the cores of **L17** (B2), **L16** (E4), **L14** (F4) and **L15** (B2) in that order, for maximum output. Do not re-adjust unless complete procedure is repeated.

R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance, the cursor coincides with datum line "D" on the scale backing plate. As the tuning scale is fixed to the cabinet, reference must be made to calibration marks on the scale backing plate when the chassis is removed from the cabinet for alignment purposes. A full-size sketch of these calibration marks is shown at the foot of columns 1-3 and direct reference can be made to it if the calibration marks on the scale backing plate become obliterated.

The spot-frequency signal generator should be connected to the **A2** and **E** sockets via an all-wave dummy aerial, and its output should be progressively reduced to prevent overloading as the sensitivity increases during alignment.

M.W.—Switch receiver to M.W. and tune to right-hand side "MW" calibration mark on scale backing plate. Feed in a 600 kc/s (500m) signal and adjust the core of **L10** (B1) for maximum output. Tune receiver to left-hand side "MW" calibration mark on scale backing plate, feed in a 1,400 kc/s (214.3m) signal and adjust **C25** (B2) and **C17** (B2) for maximum output. Repeat these operations whilst rocking the gang for optimum results.

CAPACITORS		Values	Locations
C1	V1a Cath.by-pass...	0·001μF	H4
C2	F.M. aerial tune. ...	35pF	H4
C3	Heater by-pass ...	0·002μF	G4
C4	H.T. decoupling ...	0·001μF	H3
C5	} F.M. R.F. tuning .. {	50pF	H3
C6†		—	A2
C7	} F.M. coupling, R.F. {	20pF	A2
C8	to osc.	10pF	A2
C9	V1b C.G. ...	7pF	A2
C10	A.M. aerial coup....	470pF	H4
C11	V1b anode coup....	20pF	G4
C12	} F.M. osc. tuning ... {	24pF	H3
C13†		—	A1
C14	H.T. decoupling ...	0·002μF	G4
C15	1st F.M. I.F.T. tuning	5pF	A2
C16	A.M. aerial coup....	0·003μF	H4
C17‡	M.W. aerial trim....	60pF	B2
C18	L.W. aerial trim....	75pF	G3
C19†	A.M. aerial tuning	—	A2
C20	V2b S.G. decoup....	470pF	G4
C21	V2 cath. by-pass...	0·01μF	G4
C22	A.M. osc. C.G. ...	100pF	G3
C23†	A.M. osc. tuning ...	—	A1
C24	H.T. decoupling ...	0·01μF	F4
C25‡	M.W. osc. trim. ...	60pF	B1
C26	L.W. osc. trim. ...	75pF	F3
C27	} Osc. trackers ... {	125pF	F3
C28		450pF	G3
C29	V2a anode coup. ...	0·001μF	F4
C30	} 2nd F.M. { Pri....	5pF	F4
C31	I.F.T. tun. Sec....	5pF	B2
C32	} 1st A.M. { Pri. ...	88pF	B2
C33	I.F.T. tun. Sec....	88pF	B2
C34	V3 S.G. decoup. ...	0·002μF	F4
C35	H.T. decoupling ...	0·01μF	E4
C36	} 2nd A.M. { Pri. ...	88pF	B2
C37	I.F.T. tun. Sec....	88pF	B2
C38	A.F. load ...	300pF	E4
C39	De-emphasis ...	0·001μF	F3
C40	3rd F.M. I.F.T. tuning	40pF	E4
C41	I.F. by-pass ...	300pF	F4
C42*	D.C. reservoir ...	2μF	E3
C43	A.G.C. decoupling	0·04μF	F3
C44	} A.F. couplings ... {	0·02μF	F3
C45		0·05μF	E3
C46		0·02μF	E3
C47	Tone control ...	1,500pF	D3
C48*	} H.T. smoothing ... {	10μF	C2
C49*		30μF	C2
C50*		20μF	C2
C51	Tone corrector ...	0·01μF	E4

* Electrolytic. † Variable. ‡ Pre-set.

RESISTORS		Values	Locations
R1	A.M. aerial shunt...	3·3kΩ	H4
R2	V1a G.B.	150Ω	H4
R3	H.T. feed	2·2kΩ	G4

(*Continued next col.*)

F.M. I.F. Stages.—Switch receiver to F.M. Set multi-range meter to 10 V D.C. range and connect it across **C42** (E3), taking the positive lead to chassis. Connect output of F.M. signal generator, via an 0.001μF capacitor in the "live" lead, to control grid (pin 1) of **V3** and chassis.

Fully unscrew the cores of **L19** (E4), **L13** (B2) and **L7** (A2) and, feeding in an unmodulated 10.7 Mc/s signal, adjust the core of **L18** (B2) for maximum output on the meter.

Transfer "live" F.M. signal generator lead, with 0.001μF capacitor, to anode (pin 1) of **V1a.** Feeding in an unmodulated 10.7 Mc/s signal, adjust the output of the F.M. signal generator so that the meter reading does not exceed 5 V.

RESISTORS (*Continued*)		Values	Locations
R4	V1b C.G.	22kΩ	A2
R5	H.T. feed	220Ω	G4
R6	A.G.C. decoupling	220kΩ	B1
R7	V2b S.G. feed ...	27kΩ	G4
R8	V2 G.B.	220Ω	G4
R9	V2a C.G.	47kΩ	G4
R10	V2a anode load ...	27kΩ	G4
R11	H.T. feed	10kΩ	F3
R12	V3 S.G. feed ...	33kΩ	F4
R13	V3 G.B.	68Ω	F4
R14	H.T. feed	2·2kΩ	E4
R15	De-emphasis ...	47kΩ	E4
R16	D.C. load	39Ω	E3
R17	A.G.C. decoupling	2·2MΩ	F3
R18	I.F. stopper ...	100kΩ	F3
R19	Volume control ...	500kΩ	E3
R20	V4d C.G.	10MΩ	E3
R21	V4d anode load ...	470kΩ	E3
R22	V5 C.G.	220kΩ	D3
R23	Tone control ...	250kΩ	D3
R24	} H.T. smoothing ... {	1kΩ	E4
R25		820Ω	D4
R26	Tone corrector ...	4·7kΩ	D3
R27	V5 C.G. stopper ...	47kΩ	E3
R28	V5 G.B.	100Ω	E3

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	} F.M. aerial coupling {	—	H4
L2	coils	—	H4
L3	F.M. R.F. coil ...	—	H3
L4	} F.M. oscillator coils {	—	A2
L5		—	A2
L6	} F.M. I.F.T. { Pri. ...	0·6	B2
L7	Sec....	0·6	B2
L8	} Internal A.M. aerial {	0·5	B1
L9	coils	14·0	B1
L10	M.W. osc. coil ...	4·5	F3
L11	L.W. osc. coil ...	9·5	F3
L12	} 2nd F.M. { Pri. ...	0·8	B2
L13	I.F.T. Sec. ...	0·8	B2
L14	} 1st A.M. { Pri. ...	20·0	B2
L15	I.F.T. Sec. ...	20·0	B2
L16	} 2nd A.M. { Pri. ...	20·0	B2
L17	I.F.T. Sec. ...	20·0	B2
L18	} 3rd F.M. I.F.T. { Pri ...	0·6	B2
L19	Sec. (tot.)	0·6	B2
L20	Tert. ...	—	B2
L21	Speech coil ...	2·5	—
T1	O.P. trans. { a ...	5·0	B1
	b ...	700·0	
	c ...	—	
T2	Mains trans. { a ...	—	C1
	b ...	175·0	
	c ...	175·0	
	d, total	38·0	
S1-S14	Waveband switches	—	G3
S15, S16	Mains sw., g'd R23	—	D3
S17	Int. speaker sw. ...	—	C2

Now adjust cores **L18** (C2), **L12** (F4), **L13** (B2), **L6** (G4) and **L7** (A2) in that order for maximum output on meter.

Connect two accurately matched 47kΩ resistors in series across **C42** in place of meter. Set meter to 250μA D.C. range and connect it between the junction of these resistors and the junction of **R15, C39.**

Adjust the core of **L19** (E4) for zero current reading on the meter. This is carried out by screwing the core slowly in from the fully unscrewed position. The current will start at or near zero, then rise to a positive peak, decrease again, and pass through zero to a negative peak. The point at which the current passes through zero is the correct setting of the core.

F.M. I.F. Response Curve.—Connect the "Y" amplifier terminals on oscilloscope across the outer tags of the volume control, using a screened lead.

With the output of the F.M. signal generator connected via an 0.001μF capacitor to the anode (pin 1) of **V1a** and chassis, feed in a 10.7 Mc/s signal deviated ±150 kc/s, and check that the response curve on the oscilloscope is similar to that shown in the diagram in column 4. The response curve should consist of a straight line over the centre portion, with a fold over at each end symmetrically placed about the centre intermediate frequency of 10.7 Mc/s.

A slight adjustment of the core of **L19** may be necessary to achieve optimum linearity and symmetry of the response curve.

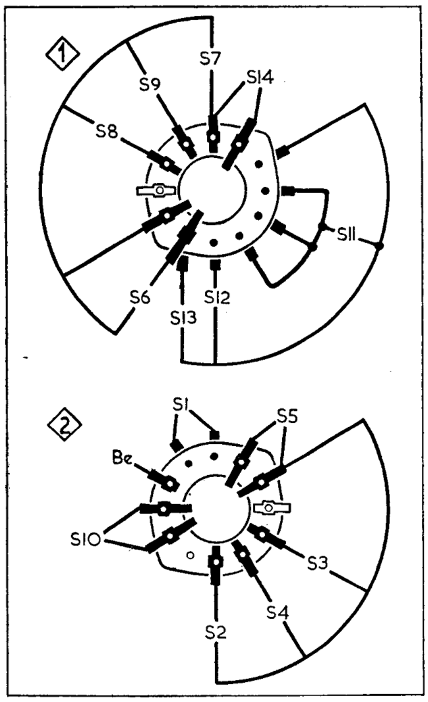
In cases where the "X" deflection of the oscilloscope is driven by a sine waveform from the signal generator, a double image of the curve may be present, having the appearance of two response curves slightly displaced from each other. This is due to phase shift, and the two curves can be made to coincide by inserting a phase-shift network in the leads from the signal generator to the oscilloscope.

The circuit of a suitable phase shift network is shown at the foot of col. 6. By adjusting the 500kΩ variable control, the two curves can be made to merge into one another, thereby ensuring easier and more accurate alignment of the discriminator circuit.

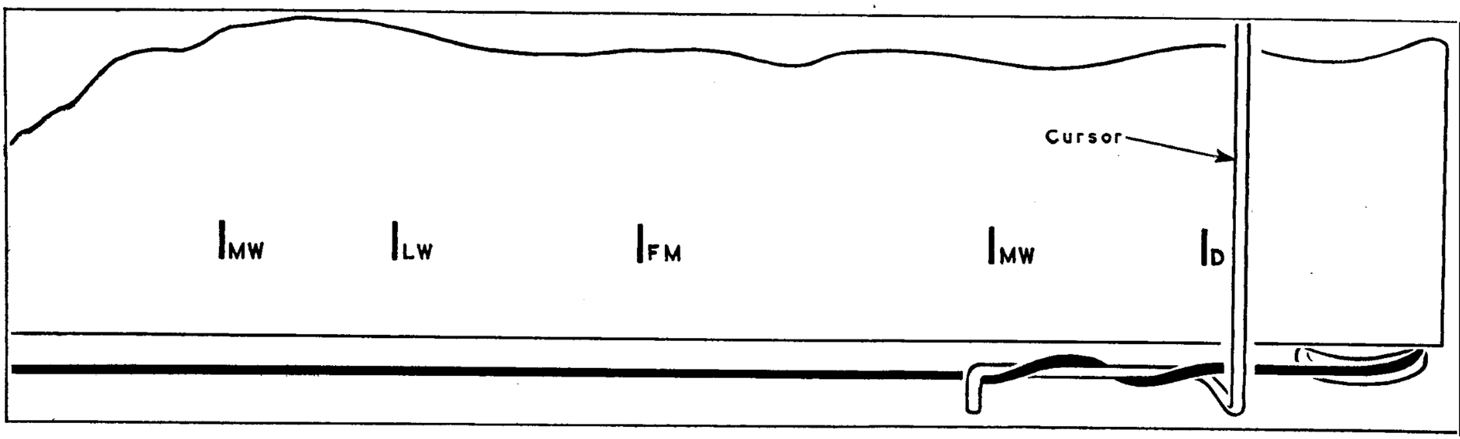
F.M. R.F. and Oscillator Stages.—With the receiver switched to F.M., tune to "FM" calibration mark on the scale backing plate. Connect output of F.M. signal generator via a 75Ω co-axial feeder to the **A1** and **A2** aerial sockets.

Feed in a 93 Mc/s signal, deviated by ±25 kc/s and adjust the cores of **L5** (G4) and **L3** (H4) for maximum sound output.

Switch Diagrams and Table



Diagrams of the waveband switch units as seen from the rear of an inverted chassis. The units are identified in the under-chassis view by numbers 1 and 2 in diamonds. The associated switch table appears below.



Full-size sketch of calibration on scale backing plate. It can be clipped in place during alignment if marks become obliterated.

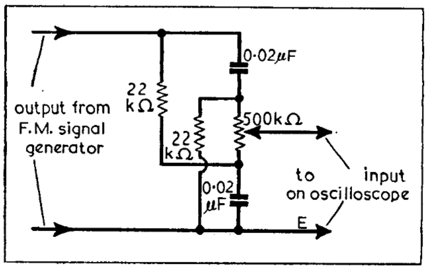
Drive Cord Replacement.—About 48in of nylon braided glass yarn is required for a new drive cord. With the gang turned to minimum capacitance, one end of the cord should be tied to the drive spring. Anchor the free end of the spring to the drive drum as indicated in the sketch of the drive cord system at the foot of columns 8 and 9. In the sketch the system is drawn as seen from the front of the receiver, looking through the scale backing plate.

Take the cord out through the slot in the drum periphery and run on anti-clockwise round the drum, carrying on as indicated in the sketch. Finally, tie off the other end of the drive cord to the spring. When the drive cord is correctly tensioned, the spring should be extended to approximately one inch.

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 12AT7 a	150·0	7·0	—	—	1·0
V1 12AT7 b	160	13·5	—	—	—
V2 12AH8 a	44	4·5	—	—	2·4
V2 12AH8 b	90	4·2	83	3·5	2·4
V3 6BJ6 ...	176	8·0	85	3·0	0·6
V4 EABC80 a-c	—	—	—	—	—
V4 EABC80 d	73	0·28	—	—	—
V5 EL84 ...	200	44·0	195	5·0	4·0
V6 EZ80 ...	222*	—	—	—	225†

* A.C. each anode. † Cathode current, 70mA.

KOLSTER-BRANDES
LR10FM



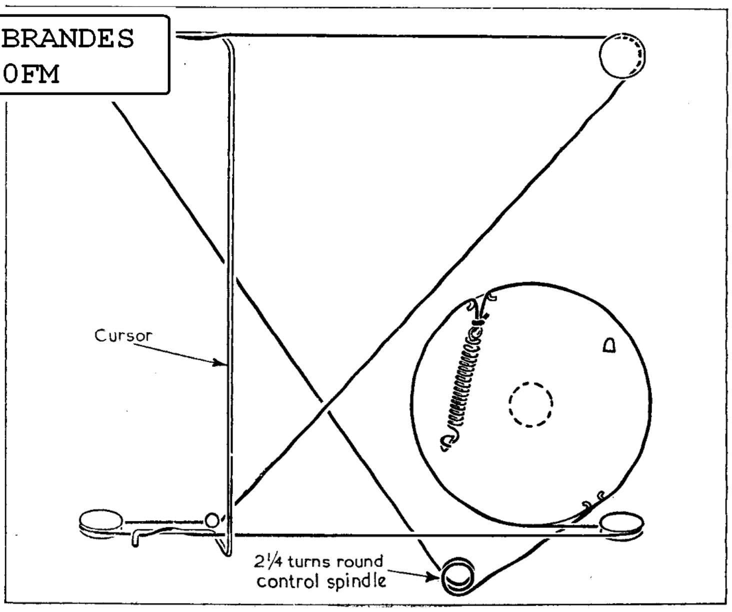
Circuit for correcting phase shift in wobbulator sync output to oscilloscope.

MODIFICATIONS

Earlier Receivers.—These differed from our sample model in the following respects. **C44** was omitted, the junction of **R15, C39** being connected directly to **S12. R18** was omitted, the junction of **L17, C41** being connected directly to **S11, R17. R27** was omitted, the slider of the tone control being connected directly to **V5** control grid. A grid stopper was originally inserted between the junction of **C45, R20** and the grid of **V4d.**

Later Receivers.—S14 is connected across **C43** instead of across **C41. R3** is connected to the junction of **R5, S1** instead of to the H.T. positive line.

KOLSTER-BRANDES
LR10FM



Sketch of the tuning drive system, drawn as seen from the front of the chassis, looking through the scale backing plate, with the gang set to minimum capacitance.