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MURPHY SERVICE INSTRUCTIONS

ISSUED BY
MURPHY RADIO LTD, WELWYN GARDEN CITY
TELEPHONE: WELWYN GARDEN 800

B8 I



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BASIC DESIGN:

R.F. Amplifier: Triode Pentode frequency changer: I.F. amplifier: Double Diode Triode, A.V.C., Second detector and A.F. Amplifier: Q.P.P. output stage.

INTERMEDIATE FREQUENCY:

465 Kc/s.

WAVE-RANGES:

200 to 550 metres.
920 to 2000 „

VALVES:

Mazda VP23, TP26, VP23, HL23DD and QP25.

SPEECH COIL IMPEDANCE:

4 ohms.

TOTAL WEIGHT:

25 lb. (with batteries).

OVERALL DIMENSIONS:

14" × 11 $\frac{1}{4}$ " × 8 $\frac{3}{4}$ "

CONSUMPTION:

H.T.: 8.5 m.A (Quiescent)
L.T.: 0.54 amps.

RECEIVER RELEASED

May 1939.

The Circuit

THE B81 receiver has been designed to give a performance on medium and long waves comparable with that given by an average battery table model used with a good aerial and earth installation.

Although the sensitivity is adequate for normal requirements, provision has been made for the connection of an aerial and earth, when an even higher performance is required.

A triode-pentode type of frequency changer valve is used instead of the triode hexode which is used in other current models, as a higher conversion gain can be obtained on medium and long waves by using this type of valve.

A "cathode injection" oscillator circuit is used and the chokes (L 8 and L 9) are included to prevent the oscillator voltages being shorted to chassis through the L.T. leads. These chokes

are, of course, of very low D.C. resistance, to avoid any appreciable drop in filament voltage.

The frequency changer valve has short grid base characteristics and it is consequently connected to a tapping on the A.V.C. load instead of applying the full A.V.C. voltage as in the case of the R.F. and I.F. valves.

In the limited space available for a portable receiver there is the danger of the L.T. wiring causing instability due to unwanted coupling between the tuned circuits, but this is prevented in the B81 by the inclusion of the choke (L 21) in the positive L.T. lead.

The circuit in other respects follows standard practice. The Q.P.P. output stage is very similar to that used in the B71 receiver, and the tuned circuits employ the variable iron cored coils which are used in other current models.

Trimming

TRIMMING on this receiver is very critical and must be carried out carefully since small inaccuracies may spoil the performance of the receiver.

THE SERVICE OSCILLATOR

It is important to ensure that the service oscillator is accurately calibrated and it is advisable to check this regularly by the beat method.

CHECKING THE TRIMMING

The I.F. circuits are partially tuned by fixed condensers, final tuning being by means of movable iron cores which alter the inductance of the coils. These cores are adjusted by a threaded rod, slotted at the end for a screwdriver, and reached through holes in the sides of the cans. The setting of these inductances should be very

constant over a period of time and I.F. trimming should, therefore, seldom be necessary.

Although damping is required for adjusting the circuits they may be checked without removing the chassis from the cabinet by connecting a service oscillator between the chassis and the grid of the frequency changer (V2 square 5E) and feeding in signals between 450 Kc/s. and 480 Kc/s. The set should be tuned to 550 metres and an output meter should be connected across the two outside tags on the output transformer (inside cabinet). If the I.F. circuits are correctly adjusted the reading of the meter, as the oscillator is adjusted between 450 Kc/s. and 480 Kc/s., should rise to a peak at 465 Kc/s. and fall steadily on each side.

Variable inductances are used in the oscillator and R.F. circuits in addition to trimming con-

densers, and the former should be adjusted at the top (wavelength) end of each band. Here again re-adjustment of the coils should rarely be required and in most cases trimming can be carried out entirely by adjusting the trimmer condensers at the bottom of the wave-band and merely checking at the top end to see the alignment is correct. In the instructions given below we assume, of course, that the inductances do need adjusting and if this is not necessary the procedure can be shortened accordingly.

It is important to see that the pointer is set on the mark at the high (wavelength) end of the dial, and that the variable condenser is set to maximum before R.F. trimming is commenced.

Another point to be watched is that calibration errors at the top end of the waveband can be due to incorrect adjustment of the I.F. circuits or to incorrect adjustment of the oscillator inductances. It is, therefore, essential to check the I.F. circuits carefully before making any adjustment to the oscillator or R.F. inductances.

For completely retrimming the receiver the work should be carried out in the following sequence: osc. circuit, R.F. stage, and frame aerial. Small errors in calibration occurring at the lower end of the wavebands may be corrected by adjusting the oscillator trimmers (C26 square 7D, and C19 square 3E) only and on this receiver these can be adjusted without affecting the calibration on the other band.

THE OUTPUT METER

We suggest the use of an 0 to 3 volt rectifier type voltmeter, connected across the secondary of the output transformer, with the speaker in circuit. The output transformer in this receiver is screwed to the inside of the cabinet, just beside the speaker, and the secondary is taken to the two outside soldering tags on the connecting panel (test pts. 5 and 76: square 13F).

The input from the service oscillator, when the output meter is used, should always be kept sufficiently low to keep the reading below .5

volts. It is, therefore, necessary to reduce the input as each stage is brought into tune.

DAMPING

The characteristics of the I.F. transformers make it essential to damp one of each pair as the other is trimmed, and a unit for this purpose should be made up with a 20,000 ohms (quarter watt) resistance and an 0.1 mfd. condenser. Attach a crocodile clip to one end of the resistance, and connect the other end to the condenser. Then attach a short flexible lead terminated with a crocodile clip, to the free end of the condenser.

BIAS

The shape of the I.F. curve will be affected when a signal is received, due to the bias applied to the valves from the A.V.C. line, and to simulate working conditions while the set is being trimmed about 3 volts bias should be applied to the A.V.C. line.

Certain of the trimmers will have two setting points. In all cases the minimum setting is the correct one, i.e., the second point when unscrewing the adjusting screw.

To prevent damage to the R.F. valve, a resistance of approximately 1 meg. should be connected from the top cap of V1 (test point 12 square 5B) to point 17 (square 7A), while the set is disconnected from the frame aerial. When trimming the oscillator inductances, however, this valve should be removed so that access may be obtained to the adjusting screws.

IF. TRIMMING (465 KC/s)

1. Connect the output meter across T2 secondary.
2. Clip the flexible lead of the damping unit to chassis and the other end to V4 signal diode anode (test point 57, square 18D).
3. Disconnect C32 from tag 54 (square 16D). Connect tag 54 to negative terminal of 3 volt battery. Connect positive terminal of battery to chassis.

4. Tune set to 500 metres and switch on. Connect the service oscillator between the control grid of V₃ (test point 47 square 17G) and chassis, through an 0.1 mfd. condenser.

5. Tune service oscillator to exactly 465 Kc/s. and switch on internal modulation.

6. Adjust L₁₈ (square 12H) to maximum reading on meter.

7. Remove damping unit from V₄ signal diode and clip it on V₃ anode (test point 53, square 17E). Adjust L₁₉ (square 12G).

8. Connect service oscillator between control grid of frequency changer (test point 29, top cap of V₂) and chassis through 0.1 mfd. condenser.

9. Remove the damping from V₃ anode and transfer it to V₃ control grid (test point 47, square 17G). Adjust L₁₁ (square 8H) for maximum reading.

10. Remove the damping from V₃ control grid and apply to anode of V₂ (test point 33, square 18G). Adjust L₁₂ (square 8G) for maximum reading.

If the inductances are found to require only a very small adjustment, the 465 Kc/s. I.F. trimming may now be regarded as complete, but if large adjustments have been made it is advisable to repeat the whole procedure as a final adjustment. Finally disconnect battery and damping unit and reconnect the condenser (C₃₂) to test point 54 (square 16D).

OSCILLATOR TRIMMING

Since the R.F. valve (V₁) has to be removed to obtain access to the adjusting screws of the oscillator coil the oscillator and R.F. stages are trimmed separately.

1. Remove V₁ (VP23, square 5B).

2. Connect service oscillator between grid of frequency changer (V₂ test point 29, square 6E) and earth, and output meter to output transformer as before.

3. Tune service oscillator and receiver to 500 metres and adjust L₁₆ (square 5H) for maximum gain.

4. Tune service oscillator and receiver to 200 metres and adjust C₂₆ (square 7D) for maximum gain.

5. Repeat until adjustment at both ends of the band is correct.

6. Tune service oscillator and receiver to 1,900 metres and adjust L₁₇ (square 5G) for maximum gain.

7. Tune service oscillator and receiver to 1,000 metres and adjust C₁₉ (square 3E) for maximum gain.

8. Repeat until adjustments are correct at both ends of waveband.

9. Replace V₁ and reconnect the resistor from terminal 17 to grid of V₁ to prevent damage to valve.

It is advisable to use an H.T. battery which is in good condition, otherwise the removal of V₁ may increase the volts on anode of oscillator slightly and, therefore, cause slight mis-trimming in this stage.

R.F. TRIMMING

1. Connect service oscillator between grid of V₁ (test point 12, square 5B) and chassis.

2. Tune service oscillator and receiver to 500 metres and adjust L₆ (square 2J) for maximum gain.

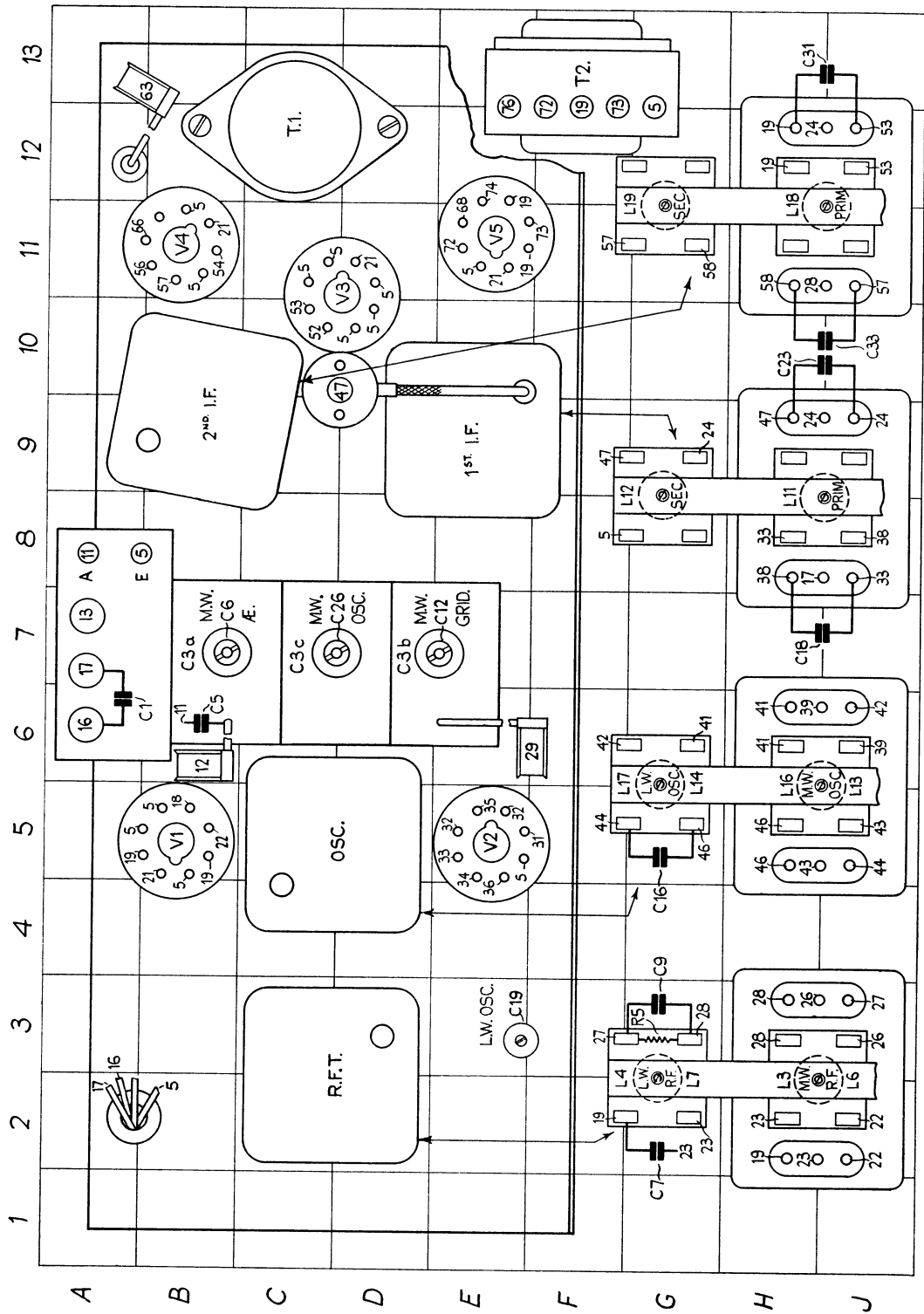
3. Tune service oscillator and receiver to 200 metres and adjust C₁₂ (square 7E).

4. Tune service oscillator and receiver to 1,900 metres and adjust L₇ (square 2G) for maximum gain.

5. Repeat above procedure until adjustment on all wavelengths is correct.

FINAL TRIMMING

The aerial inductance is altered, to some extent, by the chassis being placed in close proximity to it. The aerial trimmer C₆ (square 7B) should therefore be adjusted on a signal at approximately 230 metres, after the chassis and batteries have been refitted in the cabinet.



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Valve	Type	Electrode	Test Pt	Square	Voltage	Valve	Type	Electrode	Test Pt	Square	Voltage
V1	VP23	Anode Screen	22 18	22 D 22 D	94 35	V3	VP23	Anode Screen	53 52	17 E 17 E	94 42
V2	TP26	Pentode Anode Screen Anode Triode Anode	33 31 34	21 G 21 H 22 G	87 60 58	V4	HL23DD	Triode Anode	66	16 C	55
						V5	QP25	Anode 1 Anode 2 Screen	72 73 19	16 G 16 H 16 H	93 93 94

TABLE OF COMPONENTS														B8I	
Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square	
C1	58 pf.	17	16	6 A	C35	.01	61	59	16 B	L1	1	13	17	2 H 2 G 2 H 2 G 23 E 23 E 8 H 8 G 5 H 5 G 5 H 5 G 11 H 11 G 23 F	
C2	.05	17	5	22 C	C36	50 pf.	59	5	18 F	L2	11	16	17		
C3a	Variable	12	5	7 B	C37	500 pf.	66	5	14 E	L3	6	22	23		
C3b	Variable	29	5	7 D	C38	.05	67	66	14 F	L4	75	19	23		
C3c	Variable	51	5	7 C	C39	.007	72	5	16 F	L6	3	26	28		
C4	.05	18	5	22 D	C41	.007	73	5	16 F	L7	20	27	28		
C5	5 pf.	12	11	6 B	C42	50	71	5	19 C	L8	*	32	5		
C6	Trimmer	12	5	7 B	C43	8	19	5	21 C	L9	*	21	35		
C7	245 pf.	23	19	2 G						L11	7.5	33	38		
C8	.05	28	5	24 E						L12	7.5	24	47		
C9	65 pf.	28	27	3 G						L13	1	39	41		
C10	10 pf.	29	5	24 H						L14	1	41	42		
C11	.05	32	31	21 H	R1	100,000	16	17	24 B	L16	1.5	43	46		
C12	Trimmer	29	5	7 E	R2	150,000	18	19	22 D	L17	2.0	44	46		
C13	.003	41	5	22 E	R3	220,000	17	24	18 G	L18	7.5	19	53		
C14	500 pf.	37	5	21 F	R4	68,000	19	31	21 E	L19	7.5	57	58		
C16	175 pf.	46	44	5 G	R5	1 MΩ	27	28	3 G	L21	*	77	79		
C17	.05	38	32	21 G	R6	1,000	36	37	22 H						
C18	92 pf.	38	33	8 H	R7	27,000	19	46	22 E						
C19	Trimmer	46	44	3 E	R8	47,000	21	37	19 F	T1	190	67	5		
C21	.05	46	5	25 G	R9	4,700	19	38	16 H	Prim.	750	68	69		
C22	35 pf.	51	5	21 E	R11	100,000	19	52	15 F	Sec.	+650	69	74		
C23	92 pf.	47	24	11 H	R12	3.3 MΩ	28	56	18 D						
C24	382 pf.	51	48	22 F	R13	2.2 MΩ	24	54	17 D						
C26	Trimmer	51	5	7 D	R14	470,000	54	56	16 D	T2	300	72	19		
C27	736 pf.	51	49	22 F	R16	470,000	56	5	15 D	Prim.	+300	19	72		
C28	.05	52	5	17 F	R17	47,000	58	59	19 F	Sec.	*	76	5		
C29	.05	24	5	17 H	R18	2.2 MΩ	21	59	18 E						
C31	92 pf.	53	19	13 H	R19	68,000	19	66	14 D						
C32	100 pf.	54	53	17 E	R21	2 MΩ	61	62	17 B	L.S.					
C33	92 pf.	58	57	10 H	R22	150,000	69	71	15 E	Sp. coil	4	76	5		
C34	50 pf.	58	5	19 E	R23	820	62	71	20 E						
					R24	75	62	5	20 E	* Less than 1 ohm.					

