

69
&
71

MURPHY SERVICE INSTRUCTIONS

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

SPECIFICATION

B69

B7I

B7IA

BASIC DESIGN:		4 Valve Superhet.
	B69	Pentode Output Stage.
	B7I	Q.P.P. Output Stage and provision for use with press-button units.
	B7IA	Q.P.P. Output Stage and 4 wavebands.
INTERMEDIATE FREQUENCY:		465 Kc/s.
WAVE-RANGES:		16.7 to 50 metres.
		200 to 550 „
		960 to 2050 „
	B7IA	Additional waveband 72 to 190 metres.
VALVES:	B7I	Mazda TP25, VP23, HL23DD, QP25.
	B7IA	
	B69	Mazda TP25, VP23, HL23DD, Pen25.
PILOT LAMPS:	B7I	3.5 volts 0.15 amps.
	B7IA	
SPEECH COIL IMPEDANCE:		3 ohms.
TOTAL WEIGHT:	B7I	31 lb.
	B69	24½ lb.
OVERALL DIMENSIONS:	B7I	18"×9"×21½".
	B69	17"×10¼"×18".
CONSUMPTION:		H.T. 10 mA. quiescent.
	B7I	L.T. 0.82 amps.
	B7IA	
	B69	L.T. 0.45 amps.

The Circuits

ALTHOUGH the B69 and B71 receivers are, in general, quite straightforward in design, this short description of some of the special features should be helpful to servicemen in following the circuit diagrams in the later pages of this book.

The filter in the aerial circuit is tuned to 465 kc/s (the intermediate frequency of the receiver), to prevent signals at this frequency breaking through on the medium wave-band.

Whereas the B69 is a simple three wave-band receiver, a fourth position is provided on the wave-range switch of the B71 models. On the standard B71 the fourth position (top position in the circuit diagram) is used for receiving stations tuned by the press-button unit to the receiver, and in the B71A it is used for tuning the tuned circuits of the extra wave-band (72 to 190 metres).

The voltage applied to the oscillator section of the frequency-changer valve (VI) is increased

on short-waves, to give a greater conversion gain, by short circuiting the voltage dropping resistance (R8). This increases the current passed through the bias potentiometer (R24 and R26 in the B71; and R22, R23, and R24 in the B69) in the H.T. negative circuit. To compensate for this on the B71, where the bias voltage applied to the Q.P.P. output valve is fairly critical, the extra resistance (R27) is shunted across the bias potentiometer on short-waves.

The switch (S1) which is used for short circuiting the voltage dropping resistance in the B71A is also used on the extra wave-band to short circuit the medium-wave oscillator coil (L13).

Automatic volume control bias is applied to the frequency changer and I.F. valves from the diode load, and a small initial bias is applied to these valves by returning the A.V.C. line to H.T. minus through the 8.2 megohm resistance (R11).

Mechanical Details

THE tuning dial assembly on the "71" is quite separate from the main chassis, but as the drive is flexible, the chassis of the table model can be withdrawn and placed on end, close behind the cabinet, without disturbing the drive mechanism. If it is found desirable to remove the chassis further from the cabinet, the tuning drive can be removed from the variable condenser by slackening the set-screws holding the drive wheel to the condenser spindle, and removing one screw which holds the drive assembly to the condenser frame.

B71 TRANSIT BRACKETS

To prevent the tuning drive being strained or damaged in transit a bracket is fixed between the

tuning drum and cabinet before the sets are dispatched from the factory.

This bracket must be removed before any attempt is made to turn the tuning control.

If the receiver is bumped when the transit bracket is not fixed, there may be a tendency for the drive to slip causing calibration errors. It is therefore advisable for dealers to re-fit the bracket if a receiver is to be transported any distance.

THE B71 DRIVE

The drive in this receiver should be regarded as a complete unit, and if it becomes faulty, a replacement should be obtained.

In handling the drive care must be taken not to strain it, or the casing for the wire may be damaged.

The tension of the wire is adjusted in the factory and it should normally be unnecessary to make any further adjustments. If, however, the wire does become slack through the locking nuts becoming loosened, the nipples at the top of the slow motion drive assembly can be adjusted by trial and error until the correct tension is obtained. If the tension is too great the drive will be stiff and uneven; if it is too slack, back lash will occur. Remember to tighten the locking nuts when the adjustment is completed.

FITTING THE B71 DRIVE

The condenser end of the drive should be fitted first. Push it on to the condenser spindle, and see that the bracket rests against the condenser frame. This will avoid the possibility of strain when the screws are tightened. Turn the drive to the "maximum" stop, and set the condenser vanes fully in mesh; then screw the bracket to the condenser frame and tighten the grub screws.

Slide the small pulley over the tuning drum spindle, and turn the drum round by hand until it is tuned to the highest marking on the dial, (just above the 50 metres on the short wave scale). Screw the drive wheel bracket to the tuning assembly, and tighten the grub screw.

THE B71 TUNING SCALE ASSEMBLY

The tuning scale assembly is held to the cabinet by four screws, and it is located by dowels in the escutcheon.

In the table model the assembly must be removed before the drive can be taken off, as the securing screw for the drive bracket is not accessible when the drive assembly is mounted in the cabinet.

In the radio-gramophone the screws can be reached without taking out the whole assembly.

THE B71 TUNING DRUM

The tuning drum should be removed, after the drive has been removed, by taking out the screws securing the end bracket at the drive end. The "chart" can be removed by taking off the fixing clamp at the back of the drum.

A new chart should be placed around the drum and held securely with strong elastic bands or lengths of wire. It is important that it should be held tightly against the drum, otherwise tuning errors will occur. See that the top and bottom edges of the chart are square with the ends of the frame before refitting the clamp.

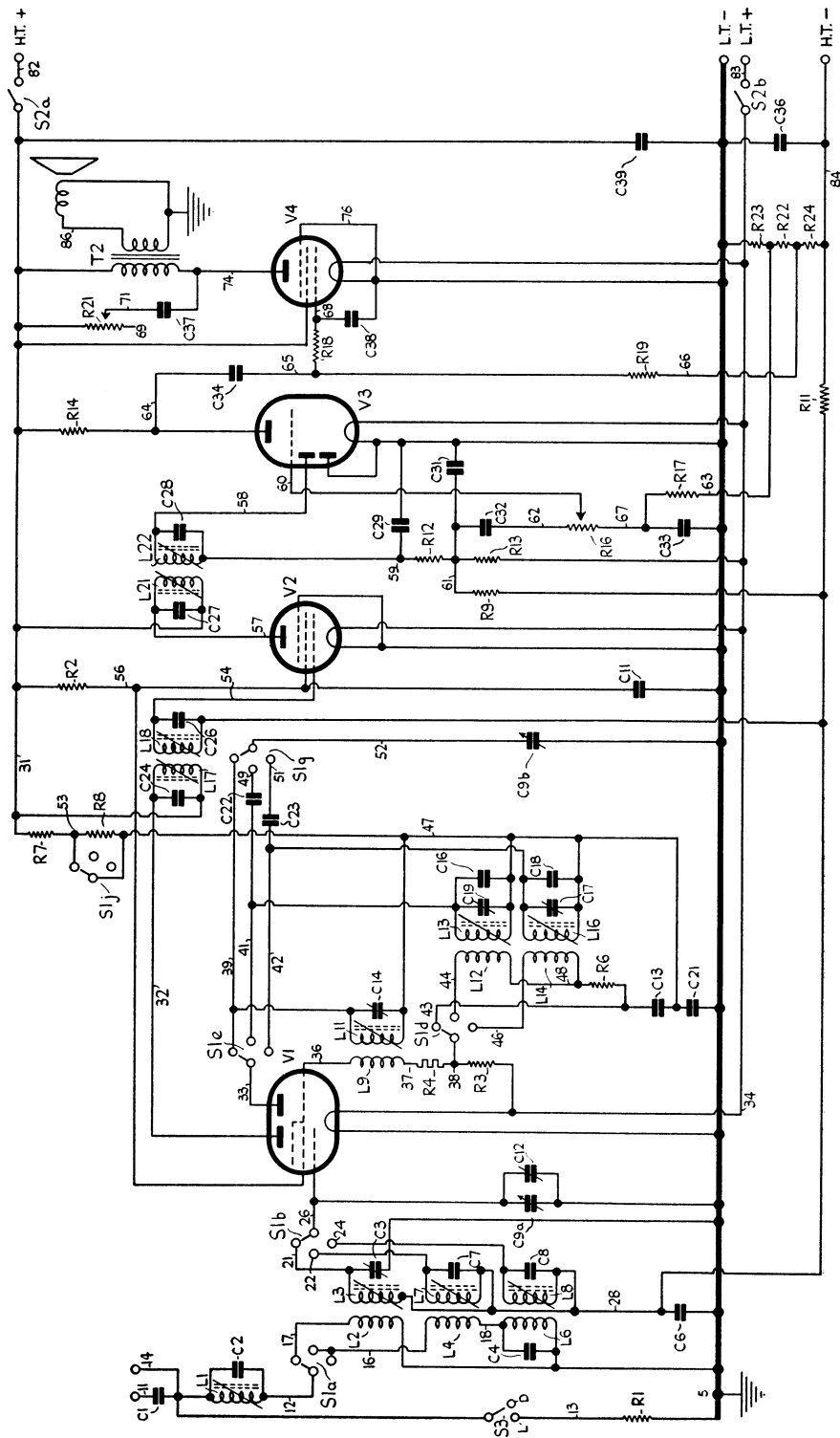
To obtain the correct spacing between the drum and the scale place a piece of cartridge paper between the two before securing the end bracket.

THE B69 DRIVE CORD

Before fitting a new drive cord see that the condenser drive pulley registers with the stop when the variable condenser is set to minimum capacity.

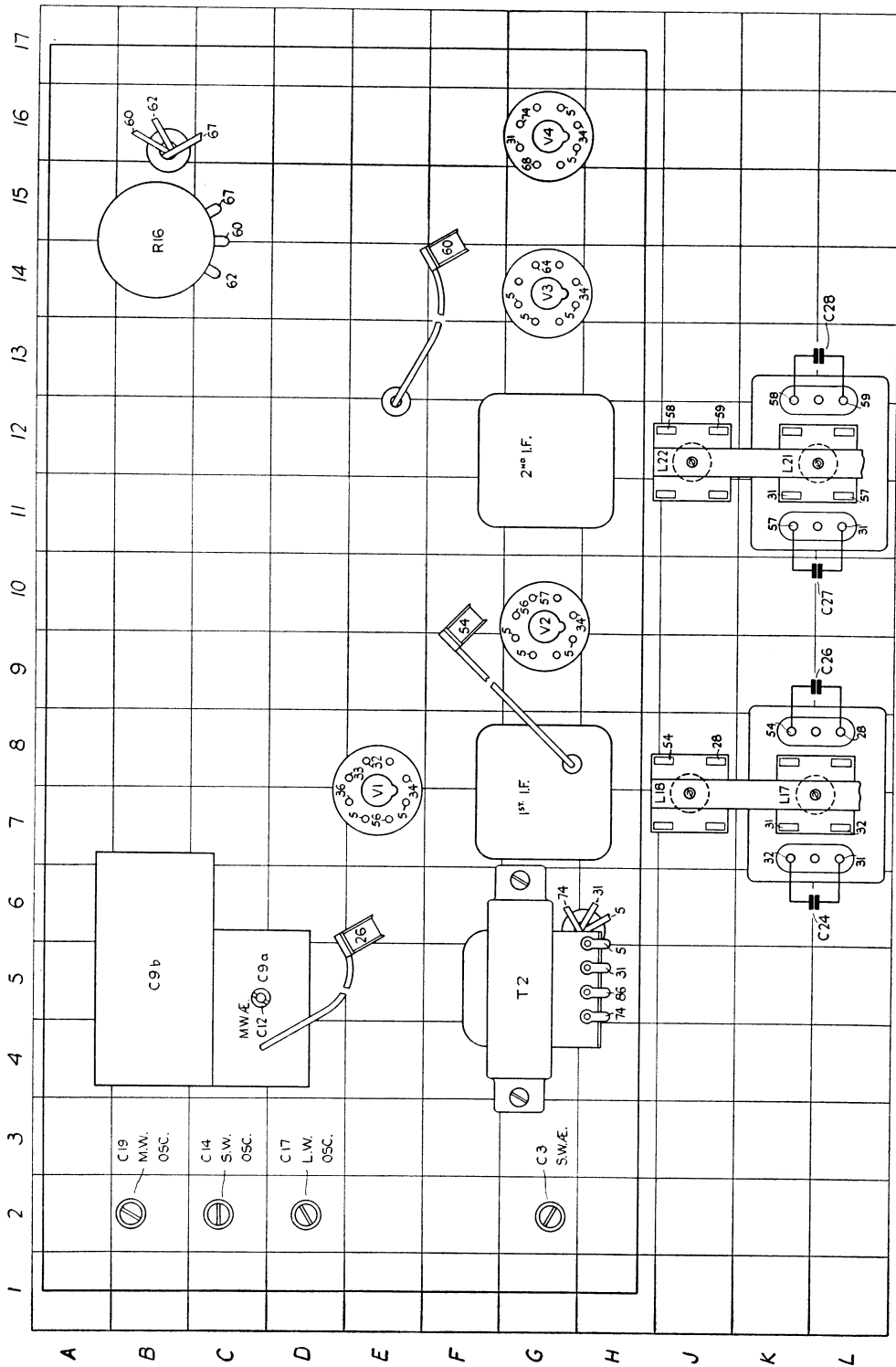
Take a sixty inch length of cord and pass it over the top left hand guide wheel, looking at the front of the dial. Take the ends over the two lower left hand guide wheels, cross the rear cord under the front cord (under the dial) and then pass them over the lower right hand guide wheels.

The end of cord from the foremost of these wheels should then be taken over the top right hand guide wheel, round the drive pulley and through the small hole in the rim. The other end of cord should be taken directly round the drive pulley and through the hole in the rim. Pull the ends through until they are of equal length. Thread them through the tension spring and fit the spring on the locating lug. Pull the cord until the spring is under tension. Fit and tighten the clamp and cut off any surplus cord. Clip the cursor wire on to the cord. Slide it up until it registers with the markings at the top of the dial; and tighten the clips.



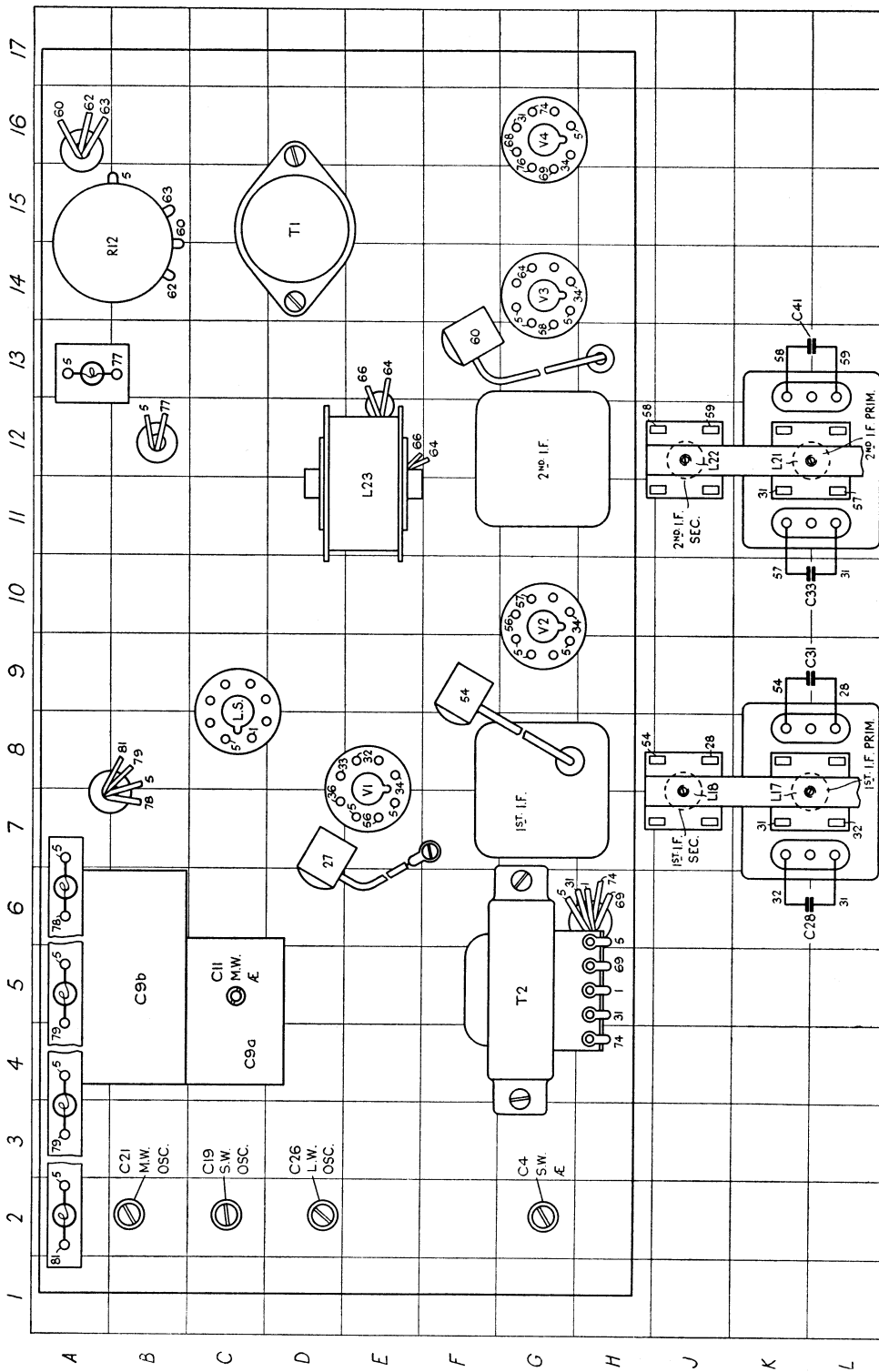
B69 CIRCUIT

B69															
TABLE OF COMPONENTS															
Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square	
C1	35 p.f.	14	11	28 H	R1	100	13	5	29 G	L1	3	12	14	30 G	
C2	500 p.f.	14	12	30 H	R2	39,000	56	31	25 E	L2	*	17	5	32 G	
C3	Trimmer	21	5	33 G	R3	22,000	38	34	27 F	L3	*	28	21	32 G	
C4	500 p.f.	18	5	32 E	R4	20	38	37	29 C	L4	*	18	16	32 F	
C6	.1	28	5	25 F	R6	300	48	43	32 E	L6	25	18	5	33 F	
C7	10 p.f.	28	22	31 F	R7	5,000	53	31	25 D	L7	3	28	22	32 F	
C8	85 p.f.	28	24	32 F	R8	43,000	53	47	29 F	L8	15	28	24	33 F	
C9a	Variable	26	5	5 C	R9	2.2M Ω	61	28	23 F	L9	*	37	36	32 C	
C9b	Variable	52	5	5 B	R11	8.2M Ω	84	28	22 E	L11	*	47	39	32 C	
C11	.05	56	5	25 E	R12	47,000	61	59	24 G	L12	*	48	44	32 B	
C12	Trimmer	26	5	5 C	R13	1M Ω	61	34	24 F	L13	1	47	41	32 B	
C13	200 p.f.	47	43	31 B	R14	68,000	64	31	21 F	L14	*	48	46	32 D	
C14	Trimmer	47	39	33 C	R16	2 M Ω	67	62	14 B	L16	1.5	47	42	32 D	
C16	20 p.f.	47	41	34 B	R17	100,000	67	63	22 D	L17	6	32	31	7 K	
C17	Trimmer	47	42	33 D	R18	100,000	68	65	20 E	L18	6	54	28	7 J	
C18	260 p.f.	47	42	34 D	R19	2.2M Ω	66	65	20 F	L21	6	57	31	12 K	
C19	Trimmer	47	41	33 B	R21	150,000	69	31	22 B	L22	6	59	58	12 J	
C21	.006	47	5	28 D	R22	150	66	63	22 F	*Less than 1 Ω					
C22	762 p.f.	49	41	29 D	R23	200	63	5	22 F						
C23	400 p.f.	51	42	31 D	R24	620	84	66	22 G						
C24	92 p.f.	32	31	6 L											
C26	92 p.f.	54	28	9 L	S.I. Switch Positions										
C27	92 p.f.	57	31	10 L											
C28	92 p.f.	59	58	13 L	Top Short-waves Middle Medium-waves Bottom Long-waves										
C29	50 p.f.	59	5	24 F											
C31	50 p.f.	61	5	24 E											
C32	.001	62	61	23 E											
C33	.2	67	5	21 E											
C34	.001	65	64	21 E											
C36	50	84	5	23 H											
C37	.01	74	71	19 E											
C38	100 p.f.	68	5	19 F											
C39	8	31	5	24 B											
					T2					400 * 74 31 86 5 }					
					Prim. Sec.										
										5 G					



B69

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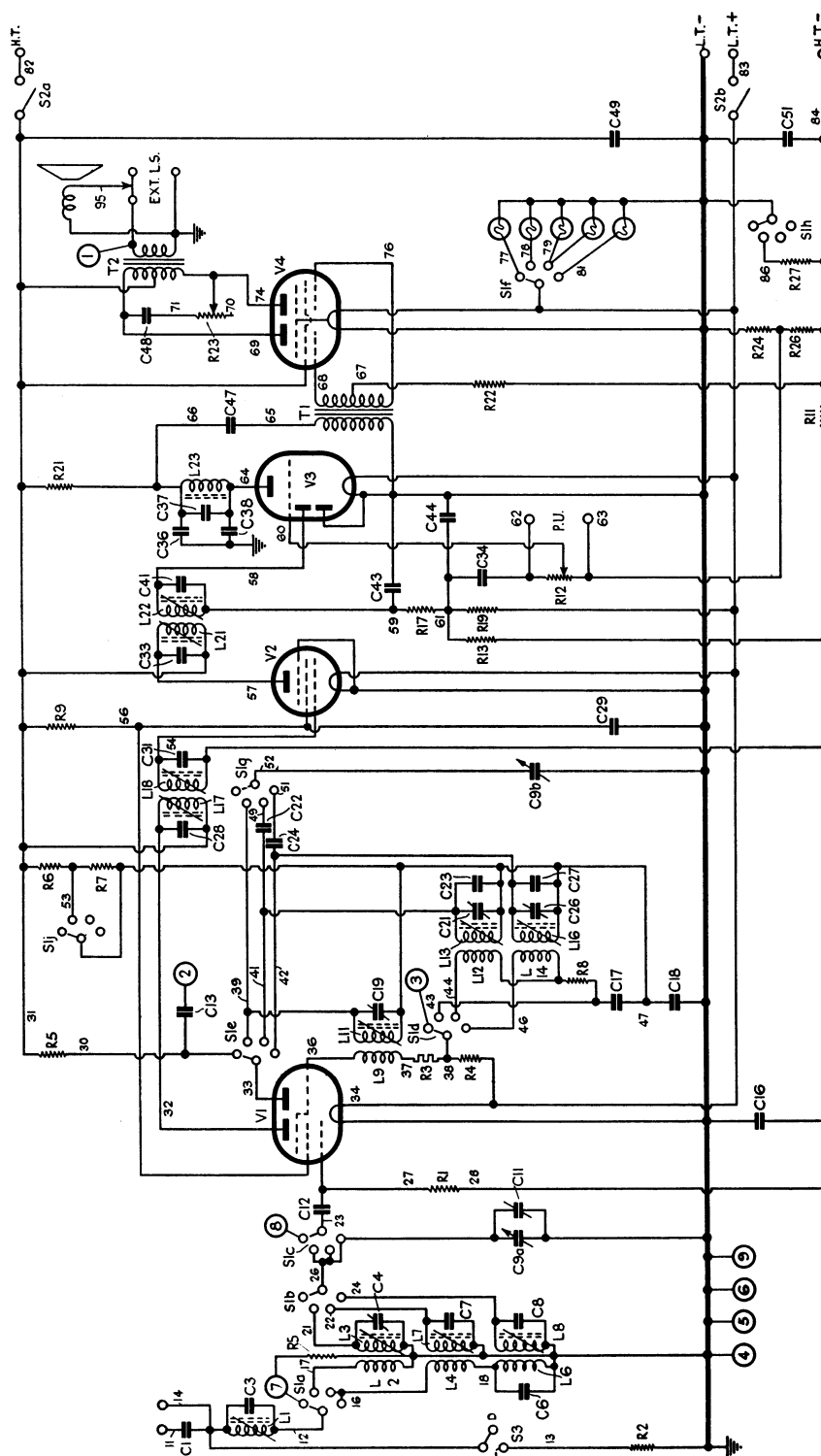


B71 TOP

B7I

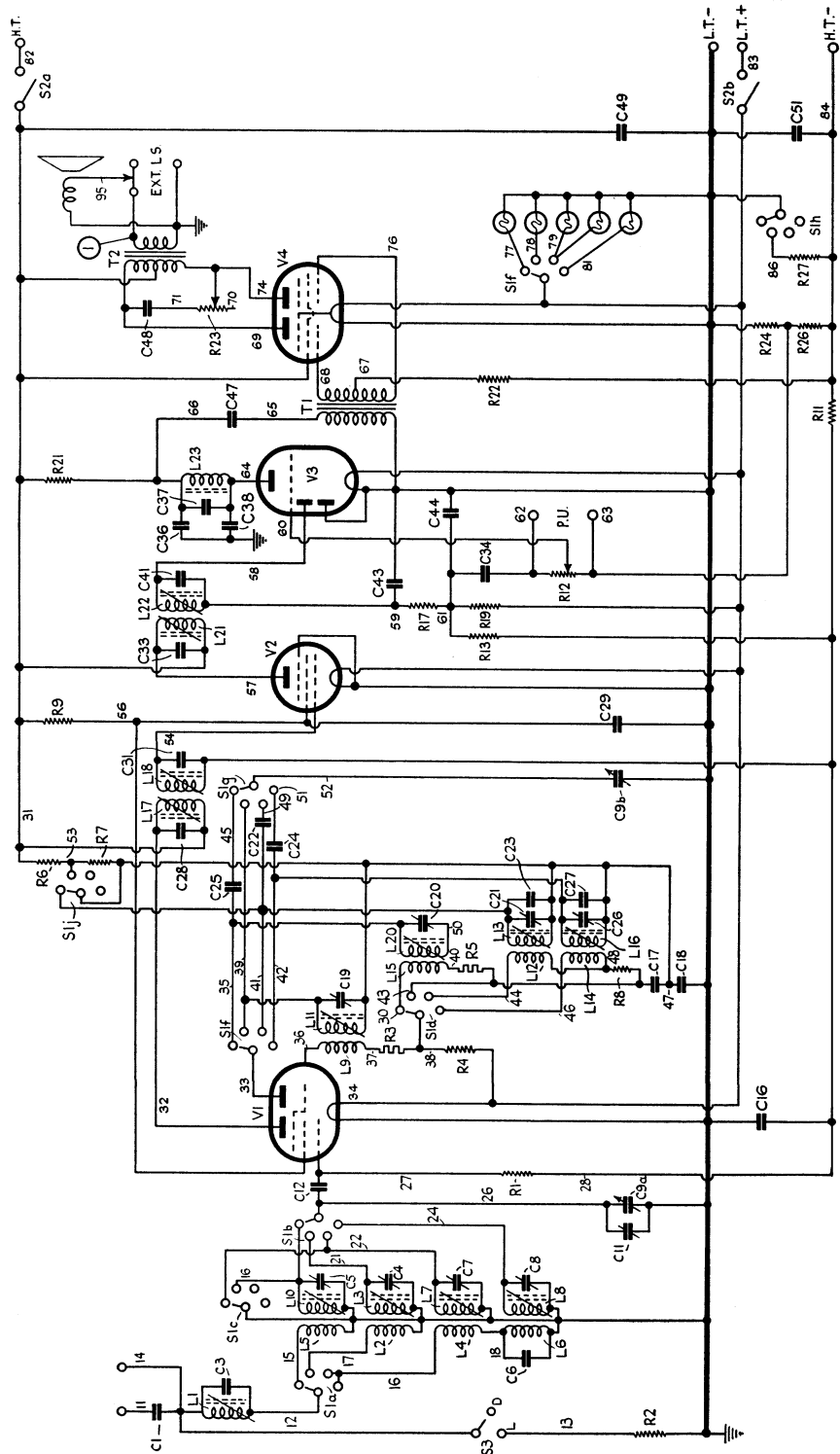
Valve	Type	Electrode	Test Pt	Square	Voltage	Valve	Type	Electrode	Test Pt	Square	Voltage
V1	Mazda TP 25	Hexode Anode Screen Triode Anode	32 56 33	27 E 28 E 27 E	115 70 50	V3	Mazda HL23DD	Anode	64	21 G	82
V2	Mazda VP 23	Anode Screen	57 56	25 G 25 G	115 70	V4	Mazda QP 25	Anode 1 Anode 2 Screen	69 74 31	19 G 19 G 19 G	112 112 115

Total H.T. current (with no signal) M.W. and L.W. 10 m/A. S.W. 12 m/A.



B7I & B7IA TABLE OF COMPONENTS B7I & B7IA

Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square	Code	Value	Test	Pts	Square
C1	35 p.f.	11	14	28 H	C38	.002	64	5	21 F	L1	3	14	12	30 H
C3	500 p.f.	12	14	30 H	C41	92 p.f.	58	59	13 L	L2	*	17	5	32 G
C4	Trimmer	21	5	33 G	C43	50 p.f.	59	5	24 F	L3	*	21	5	32 G
C5	Trimmer	16	5		C44	50 p.f.	61	5	24 F	L4	*	16	18	32 F
C6	500 p.f.	18	5	33 F	C47	.05	66	65	19 E	† L5	*	15	5	28 G
C7	10 p.f.	22	5	31 F	C48	.01	69	71	20 G	L6	25	18	5	33 F
C8	85 p.f.	24	5	33 F	C49	8	31	5	25 D	L7	3	22	5	32 F
C9a	Variable	26	5	5 C	C51	50 p.f.	84	5	24 H	L8	15	24	5	33 F
C9b	Variable	52	5	5 B						L9	*	36	37	32 C
C11	Trimmer	26	5	5 C						† L10	*	16	5	28 G
C12	500 p.f.	23	27	29 F	R1	470,000	27	28	29 G	L11	*	39	47	32 C
C13	100 p.f.	30	2	27 E	R2	100	13	5	29 H	L12	*	44	48	32 B
C16	.1	28	5	25 F	R3	20	37	38	30 C	L13	1	41	47	32 B
C17	200 p.f.	43	47	31 C	R4	22,000	34	38	29 C	L14	*	46	48	32 D
C18	.006	47	5	28 E	† R5	22,000	43	40	31 D	† L15	*	40	30	28 B
C19	Trimmer	47	39	33 C	R6	5,000	31	53	29 D	L16	1-5	42	47	32 D
C20	Trimmer	50	35		R7	43,000	53	47	31 E	L17	6	32	31	7 K
C21	Trimmer	41	47	33 B	R8	300	43	48	32 E	L18	6	54	28	7 J
C22	762 p.f.	41	49	30 D	R9	39,000	31	56	25 E	† L20	*	50	35	28 B
C23	20 p.f.	41	47	33 B	R11	8-2MΩ	28	84	23 E	L21	6	31	57	12 K
C24	400 p.f.	42	51	31 D	R12	2 MΩ	62	63	14 A	L22	6	58	59	12 J
C26	Trimmer	42	47	33 D	R13	2-2MΩ	61	28	23 F	L23	350	66	64	11 E
C27	260 p.f.	42	47	33 D	R17	47,000	59	61	24 F					
C28	92 p.f.	31	32	6 L	R19	1MΩ	34	61	24 F					
C29	.05	56	5	25 E	R21	68,000	31	66	19 D					
C31	92 p.f.	54	28	9 L	R22	150,000	67	84	22 E					
C33	92 p.f.	57	31	10 L	R23	150,000	71	69	23 B					
C34	.01	61	62	23 H	R24	200	63	5	21 E					
C36	.002	66	5	20 F	R26	800	63	84	21 F					
C37	300 p.f.	66	64	20 E	R27	2,200	86	84	22 F					



The Diagrams

THE diagrams on pages 4 to 12 of this book contain most of the information required for carrying out normal service work. The following information will help you to make full use of them.

The circuit diagrams are numbered at each "junction point," so that every component has a number at each terminal. These numbers are marked at the ends of the components in the underside and top views of the chassis so that the respective terminals may easily be identified with those on the circuit diagram.

The ringed numbers indicate the socket numbers in the connector for the press-button unit.

The underside and top views of the chassis are divided into squares which are lettered horizontally and numbered vertically so that any section may be referred to by quoting the appropriate "square."

In the case of the B71 receiver the underside of the ordinary table model is shown. In the B71A the coils and condensers for the extra

wave-band are mounted on two brackets which take the place of the supporting plate for the press-button unit connector.

The aerial coil and condenser (L10 and C5) are mounted on the bracket which is fixed to the back edge of the chassis and the oscillator coil and condenser (L20 and C20) are mounted on the bracket fixed to the front edge of the chassis. The "square" where these will be found is quoted in the trimming instructions.

In the component tables, all resistances are given in ohms, and capacities in microfarads, unless otherwise stated. The D.C. resistance of coils is quoted in ohms in all cases, except where the reading would be too small to be of use, when they are omitted altogether.

The voltage tables should only be taken as a guide, as considerable variations may occur without effecting the efficiency of the receiver.

The readings were taken to chassis unless otherwise stated, with a 0-50v., and 0-500v. 1,000 ohms-per-volt meter, using a new 120 volt H.T. battery and switched to M.W.

Trimming

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

THE SERVICE OSCILLATOR

It is also 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

There are one or two points about these receivers which call for special comment as far as trimming is concerned.

Firstly, the I.F. circuits are tuned by varying the inductances instead of the capacities. The variation is effected by turning a small screw at the end of the coil, which moves the iron core within the coil, thereby varying the inductance. The setting of these inductances should be very constant over a period of time and I.F. trimming should thereby rarely be required.

Although damping is required for adjusting these circuits, they may be checked without the damping applied and consequently without removing the chassis from the cabinet, by connecting the service oscillator between the chassis and the grid of the frequency changer valve and

feeding in signals between 450 Kc/s. and 480 Kc/s. The set should be tuned to 550 metres and an output meter connected across the output transformer secondary. If the I.F. circuits are correctly adjusted the reading in the output meter, as the oscillator is tuned between 450 Kc/s. and 480 Kc/s., should rise to a peak at 465 Kc/s., and fall steadily on either side.

Variable inductances as well as trimming condensers are used in the R.F. and oscillator circuits and the former should be adjusted at the top (wavelength) end of each band. Here again re-adjustment of the inductances should rarely be required, and in most cases trimming can be carried out entirely by varying the trimmer capacities at the bottom of the wave-band and merely checking at the top end to see that the alignment is correct. In the instructions given below we assume, of course, that the inductances do require adjustment, but the procedure can be shortened accordingly if this is found unnecessary.

Another point which must 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 inductance. It is therefore essential to check the I.F. circuits carefully before making any adjustment to the oscillator, or R.F. inductances.

The correct sequence for completely retrimming is I.F.s (465 Kc/s.), M.W., L.W., S.W., the "A" band in the case of the B71A., and I.F. filter. Small errors in calibration occurring at the lower end of the bands may be corrected by adjusting the oscillator trimmers only, and on this receiver these can be adjusted without affecting the calibration of the other bands.

THE OUTPUT METER

We suggest the use of a 0 to 3 volt rectifier type voltmeter, placed across the loudspeaker

sockets, for measuring the output of the receiver when trimming, as this method is both simple and straightforward.

The input from the service oscillator, when the output meter is used, should always be kept sufficiently low to keep the reading below 0.5 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 of coupled circuits as the other is trimmed, and a unit for this purpose should be made up with a 20,000 ohms (quarter watt) resistance and a 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, by 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. This also applies to the inductance adjustments. In the R.F. circuits, if the inductances are adjusted to the "inner" setting, the coupling between the tuned and coupling coils will be incorrect.

I.F. TRIMMING. 465 Kc/s.

1. Connect the output meter across L.S. terminals.

2. Clip the flexible lead of the damping unit to chassis and other end to V3 signal diode anode (test point 58, square 21G).

3. Disconnect the A.V.C. decoupling resistance—R13 in the B71 and R9 in the B69—from the diode load (test point 61, square 23F). Connect the negative terminal of a 3 volt battery to the free end of the resistance, and the positive terminal to chassis.

4. Tune the set to 500 metres. Connect the service oscillator between the control grid of V1 (square 7E, test point 27 in B71, 26 in B69) and chassis, through a fixed condenser of 0.1 mfd.

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

6. Adjust L21 (square 12L) for maximum reading on the output meter.

7. Remove the damping unit from V3 and clip it to anode of V2 (square 25G, test point 57). Adjust L22 (square 12J).

8. Remove the damping from V2 anode and apply it to V2 control grid (square 10G, test point 54). Adjust L17 (square 7K).

9. Remove the damping from V2 grid and apply to V1 hexode anode (square 27E test point 32). Adjust L18 (square 7J).

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 the battery and re-connect the resistance (B71-R13, B69-R9).

Before trimming the oscillator and R.F. circuits, see that the cursor registers with the top (wavelength) marking on the dial when the condenser vanes are fully in mesh.

M.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.

2. Tune the service oscillator and the receiver to 500 metres.

3. Adjust L13 (square 32B), and L7 (square 32F) for maximum gain.

4. Tune the receiver and oscillator to 220 metres.

5. Adjust the oscillator trimmer C21 (square 2B), and the grid trimmer C11 (square 5C).

6. Repeat the above procedure until tracking is correct at both ends of the wave-band.

7. Check calibration on a broadcast signal.

L.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.

2. Tune the service oscillator and the receiver to 1900 metres.

3. Adjust the inductances L8 (square 33F), and L16 (square 32E) for maximum gain.

4. Tune receiver and oscillator to 1,000 metres.

5. Adjust the oscillator trimmer C26 (square 2D) to correct calibration.

6. Repeat the above procedure as a final adjustment.

7. Check calibration on a broadcast signal.

S.W. TRIMMING

1. Connect the service oscillator between the aerial and earth sockets of the receiver and the output meter across the L.S. terminals.

2. Tune the receiver and the service oscillator to 49 metres.

3. Adjust S.W. inductances L11 (square 32C) and L3 (square 32G) for maximum gain.

4. Tune the receiver and the service oscillator to 17 metres.

5. Trim C19 (square 2C) and C4 (square 2G). Recheck at the top end of the band, and if any further adjustment of the inductances is found to be necessary, go back to the low end of the band and readjust the condensers.

6. See that the 17-metre stations come in on the 17-metre marking on the tuning scale.

It should be noted that on this band the correct and the image settings are close together and care must be taken to adjust to the “outer” setting.

“A” BAND ON B71A

1. Connect the service oscillator between the aerial and earth terminals, and the output meter to the loudspeaker terminals.

2. Tune the service oscillator and the receiver to 180 metres.

3. Adjust the inductances L10 (square 28G) and L20 (square 28B) for maximum gain.

4. Tune the receiver and oscillator to 80 metres.

5. Adjust the oscillator trimmer C20 (square 28B) and the grid trimmer C5 (square 28G) for maximum gain.

6. Repeat the above procedure as a final adjustment.

Modifications

Although we can give no guarantee to notify dealers of every alteration that is made to the receivers we do publish particulars of any im-

portant modifications, in the *Murphy News*, and when these appear they should be included in this table.

1ST SET MODIFIED	MODIFICATION