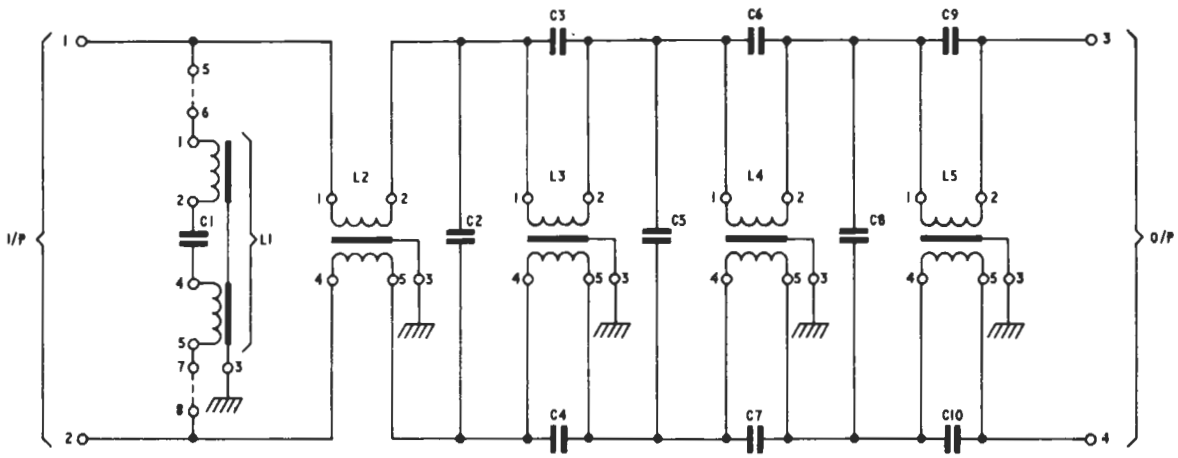
LOW–PASS FILTERS FL4/47A-G



		UNIT CODE SUFFIXES							
		A	B	C	D	E	F	G	
	Fc (kHz)	9·25	10·25	11·25	12·25	14·25	7·25	8·25	
COMPONENTS	L1	10·8m 18D/125	9·75m 18D/124	8·8m 18D/135	8·1m 18D/122	6·9m 18D/120	13·9m 18D/128	12·2m 18D/126	
	L2	16·5m 18D/130	15·0m 18D/129	13·7m 18D/136	12·6m 18D/127	10·8m 18D/125	21·0m 18D/132	18·6m 18D/131	
	L3,L4	6·25m 18D/118	5·35m 18D/116	4·6m 18D/134	4·1m 18D/114	3·3m 18D/112	8·9m 18D/123	7·3m 18D/121	
	L5	5·35m 18D/116	4·85m 18D/115	4·4m 18D/133	4·1m 18D/114	3·5m 18D/113	6·8m 18D/119	6·0m 18D/117	
	C1a	15n	15n	12n	12n	10n	22n	18n	
	C1b	2·2n	680p	2·4n	1·2n	1·5n	—	1·5n	
	C2a	33n	33n	30n	27n	22n	47n	39n	
	C2b	3·9n	220p	—	330p	1·2n	1·8n	3·9n	
	C3,4, 6,7a	82n	82n	75n	68n	68n	82n	82n	
	C3,4, 6,7b	4·7n	820p	5·1n	8·2n	2·7n	15n	10n	
	C5a	15n	15n	12n	10n	8·2n	22n	18n	
	C5b	2·2n	—	820p	1·5n	1n	2·7n	2·2n	
	C8a	22n	18n	18n	15n	12n	27n	27n	
	C8b	1·5n	2·7n	680p	1·8n	2·2n	4·7n	—	
	C9,10a	75n	68n	62n	56n	47n	·1	91n	
	C9,10b	5·1n	4·7n	4·3n	4·7n	5·6n	2·7n	—	

FL4/47/1

Fig. 1. Circuit of FL4/47A-G

Introduction

The FL4/47A to FL4/47G are 600-ohm low-pass filters designed for use with sound automatic monitors MN2M/3A to MN2M/6A. Each filter is constructed on a printed circuit board suitable for mounting in a CH1/18 chassis, in which it may form part of a unit, as in one of the series FL4/48A-G or UN1/45A-G.

These filter boards are similar in circuit and performance to the FL4/23-29 low-pass filter units and have the cut-off frequencies shown in Table 1.

TABLE 1

FL4/47 Suffix	*Cut-off Freq. kHz*
A	9·25
B	10·25
C	11·25
D	12·25
E	14·25
F	7·25
G	8·25

Circuit Description (Fig. 1)

These are balanced low-pass filters in each section of which two series arms of equal inductance are provided by two coupled windings with a single core. The mutual inductance between the windings causes each to present the required inductance for a balanced filter section, i.e., half the inductance required for an equivalent unbalanced section. (It is the total section inductance values that are tabulated in Fig. 1.) This is a method of obtaining two balanced inductance series arms that is economical in cost and space relative to the use of separate inductors.

The shunt arm, comprising C1 and L1, forms an input half-section and is connected in circuit by straps between pins 5 and 6 and pins 7 and 8 on the printed board. This facilitates disconnection of the half-section so that the input of the filter can be paralleled with that of a high-pass filter (such as the corresponding filter in the FL3/8-14 series) where the input impedances of the two filters are complementary.

Adjustment and Testing

Apparatus

Avometer model 8
Tone source TS/10 (or, preferably, a source with finer frequency adjustment for trimming the higher-frequency filters)
Frequency counter
A.C. test meter ATM/1
Two 600-ohm 1:1 balanced repeating coils
Inductance bridge

Adjustment

1. Check that there is d.c. continuity between pins 1 and 3, and between pins 2 and 4, on the board.
2. Strap pin 5 to 6, and pin 7 to pin 8, if these pins are not connected.
3. Apply the output of the tone source, via a repeating coil, across C5. Join the ATM/1 (connected to present 600 ohms input impedance), via a repeating coil, to the output pins, 3 and 4, on the filter board. Adjust L5 and L4 for maximum rejection, as shown by the ATM/1, at the frequencies given in Table 2. In each instance set the tone source exactly to the frequency to be rejected by measurement on the counter, but disconnect the counter before adjusting the inductor. With each inductor, ensure that it is true resonance that is obtained rather than the condition of maximum inductance (which may be obtained when an associated tuning capacitor is incorrect in value).
4. Apply the output of the tone source, via a repeating coil, to pins 1 and 2 on the filter board. Adjust L1 and L3 for maximum rejection at the frequencies given in Table 2, using the ATM/1 and counter as in step 3.
5. Check the frequency response of the filter, as described later, and readjust L3 and L4 if necessary to obtain the required response.

Note that L2 should not require adjustment, but should have been preset at manufacture to the total series inductance shown in Fig. 1, measured at 1 kHz between terminals 1 and 4 while 2 and 5 are linked. This can be checked on an inductance bridge.

Testing Frequency Response

Connect the tone source, via a repeating coil, to pins 1 and 2 on the filter board. Connect the ATM/1 (presenting 600 ohms input impedance) via a repeating coil to pins 3 and 4 on the board. Check that the loss characteristic of the filter board conforms to the figures given in whichever of Tables 3 to 9 is applicable.

TABLE 2

Frequencies at which Inductors are Tuned for Maximum Rejection, kHz

FL4/47 Suffix	*L5*	*L4*	*L1*	*L3*
A	10·83	9·75	11·6	9·65
B	12·0	10·75	12·9	10·65
C	13·2	11·75	14·2	11·65
D	14·35	12·75	15·4	12·65
E	16·7	14·75	17·9	14·65
F	8·50	7·75	9·10	7·65
G	9·65	8·75	10·3	8·65

TABLE 3

FL4/47A
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<1	<0·25	
8	0·35	±0·1
9	2·5	±0·5
9·25	12·0	±2·0
9·6	>55	
9·8	>55	
10·8	>60	
>10	>30	

TABLE 4

FL4/47B
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<2	<0·25	
9	0·35	±0·1
10	2·5	±0·5
10·25	13·0	±2·0
10·6	>55	
10·8	>55	
12·0	>60	
>11	>30	

TABLE 5

FL4/47C
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<2	<0·25	
10	0·4	±0·1
11	3·0	±1·0
11·25	14·0	±3·0
11·6	>55	
11·8	>55	
13·2	>60	
>12	>30	

TABLE 6

FL4/47D
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<3	<0·25	
11	0·5	±0·2
12	4·0	±1·0
12·25	15·0	±3·0
12·6	>55	
12·8	>55	
14·35	>60	
>13	>30	

TABLE 7

FL4/47E
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<4	<0·25	
13	0·6	±0·2
14	5·0	±1·0
14·25	18·0	±3·0
14·6	>55	
14·8	>55	
16·7	>60	
>15	>30	

TABLE 8

FL4/47F
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<1	<0·25	
6	0·25	±0·1
7	1·5	±0·5
7·25	9·0	±2·0
7·6	>55	
7·8	>55	
8·5	>60	
>8	>30	

TABLE 9

FL4/47G
Frequency Response

Freq. kHz	*Attenuation (dB)*	
<1	<0·25	
7	0·3	±0·2
8	2·0	±0·5
8·25	11·0	±2·0
8·6	>55	
8·8	>55	
9·65	>60	
>9	>30	

References

1. Designs Department Specification No. 11.118 (71), Low-pass Filters FL4/47A-G.
2. Low-pass Filters FL4/48A-G.

DPEB 8/72