Issue 1
22.1.73

DESIGNS DEPARTMENT MANUFACTURING INFORMATION NO. 5.228(72)

Tunable UHF Bandpass Filters FL2/546 A-D (Band IV) and FL2/547 A-D (Band V)

General

These two filters are redesigns of the established FL2/533 and FL2/534 ranges. The electrical specification is similar, but closer to the theoretical performance and mechanically the filter is similar except that it is 1" longer. Return loss is improved by about 4dB by spacing the end-plates $\frac{1}{2}$" further away from the end resonators, and the additional spaces permits the use of a more satisfactory adjustable - capacity end coupling. They are used in the relay equipment EP7/513A and B and EP7/514A and B, and in the test equipment EP14M/507.

Mechanical

Each filter consists of a flat fabricated box with four cylindrical resonators tuned by threaded cups or slugs. Various connectors are fitted to the end plates and couple capacitively to the filter via adjustable plungers.

Connectors:	FL2/546A, FL2/547A	TNC both ends
	" B, " B	BNC " "
	" C, " C	Type 'N' both ends
	" D, " D	TNC one end, N other end.

Electrical

Band Centre Frequency range	FL2/546 434 to 579MHz
	FL2/547 618 to 835MHz
Pass band impedance (terminated in 50 ohms)	50 ohms
Return loss:	22dB
Recommended load:	50 ohms, 20dB return loss
Transmission loss:	$\leq$ 1dB over 8MHz
Frequency response:	$\pm$ .1dB over 8MHz
Typical out-of-band-loss:	20dB @ $\pm$ 15MHz from Band Centre
	40dB @ $\pm$ 20MHz from Band Centre

BBC

DS/SPA4

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Tunable UHF Bandpass Filters FL2/546A-D (Band IV) and FL2/547 A-D (Band V)

PRODUCTION TEST SCHEDULE

1. Equipment Required

Polyskop II
20dB coupler - Narda Microline 3020A
Selektomat
Desifix to type N adaptor
Type N to TNC or BNC to suit filter
6dB or 10dB coaxial attenuator
A number of 50 ohms leads, adaptors, attenuators and terminations are useful.
2 off Male N type to female BNC for coupler ports.

2. Mechanical inspection

2.1 Remove one side plate. Adjust the coupling plunger with a screwdriver over the total range of travel, ensuring that the faces do not rotate, and that the spring is able to return the plunger to its fully retracted position.

2.2 Free off the four nylon locking screws and see that all four slugs adjust smoothly over their range of travel. Replace sideplate.

3. Procedure

3.1 In the block diagram below, it will sometimes be found easier to disconnect the output of the filter and terminate it directly without adaptors. It is perfectly in order to use a male N-type termination in a female BNC or TNC socket, but the mating connector is preferred, since it will not fall off.

The 20dB coupler should be screwed directly onto the filter using a maximum of one adaptor.

Set the Polyskop output attenuator to 10dB and the centre frequency to the centre frequency of the channel required, with a sweep of about 20MHz.

Connect the Selektomat to the forward-wave port of the coupler and tune it to track the polyskop, either on its second harmonic or third harmonic.

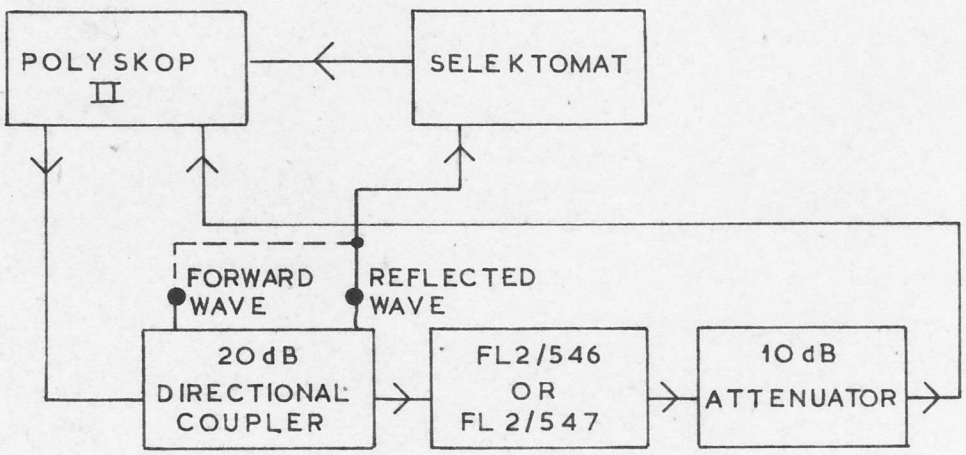

FIG.1 BLOCK SCHEMATIC FOR ALIGNMENT

3.2 Now transfer the Selektomat to the reflected wave port of the coupler and adjust the gains of the Selektomat and/or Y2 amplifier to give a trace on the screen.

3.3 Tune the resonator nearest the input for a resonance at the centre frequency. This is indicated by a disturbance to the trace which moves along the trace as the resonator is tuned. The two centre resonators should be adjusted well away from resonance by noting whether the input resonator capacitor has to be set near maximum or minimum and setting the centre resonator capacitors to the opposite condition.
Obtain a resonace trace that is not too shallow and not too sharp across the channel. Fig. 2 shows typical results.

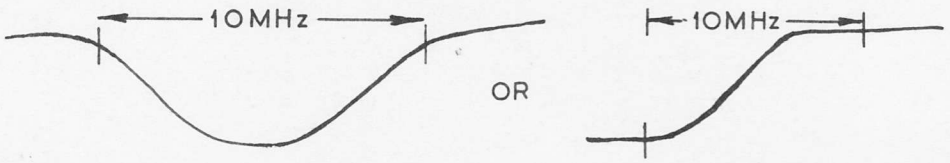

Fig. 2 Resonance Traces Obtained on Polyskop

The input coupling will probably have to be adjusted to obtain a trace like either of these.

3.4 Draw the resonance trace on the screen with a wax pencil (e.g. Chinagraph). Reverse the filter and repeat 3.3 adjusting the other input resonator and coupling to obtain exactly the same trace as before.

3.5 Adjust the two centre capacitors to resonate within the channel. Four resonances on the reflected signal display should now be seen and after adjusting the two centre resonators for a symmetrical display the shape should correspond to one of the sketches in Fig. 3.

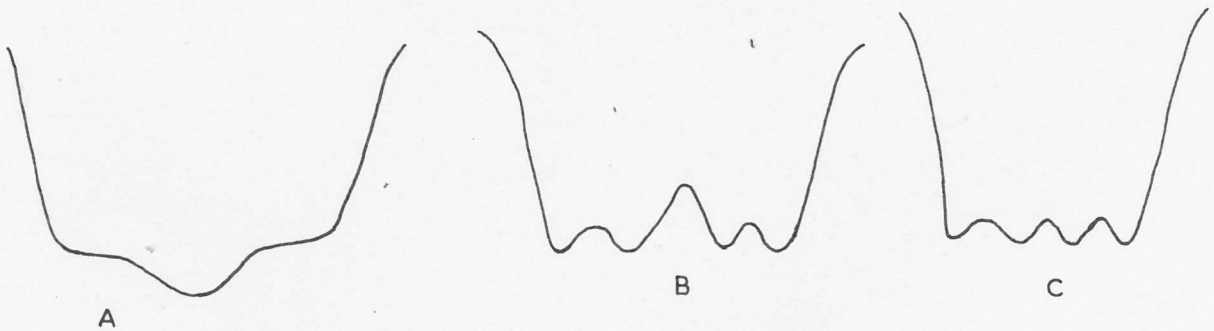

Fig. 3 Typical Return Loss Responses

If the trace is similar to A the input and output are overcoupled. To correct this, turn the coupling adjustment screws at each end of the filter approximately one eighth of a turn anticlockwise and then adjust the two outer resonators for a symmetrical response. Continue until the display is as shown in C.

3.6 Check that the filter through response and reflected wave response remain much the same, if the filter is reversed. If there is a significant change then the input and output resonance will have to be rematched as in 3.3 and 3.4.

3.7 Check that the through response is centred on the mid-channel frequency. If it is not then the resonances obtained in 3.3 and 3.4 should be altered in frequency to correct this. Sections 3.3 to 3.7 must be repeated if these adjustments are necessary. (Note: The centre frequency of a television channel is 2.75MHz above the relevant vision carrier frequency).

3.8 Measure the return loss in the wanted channel by setting the reflected wave display to a convenient position on the screen and drawing a horizontal line corresponding to the maximum reflected signal in the channel. Then connect the Selektomat to the forward wave port of the coupler and use the Polyskop output attenuator to bring the incident wave display down to the horizontal mark. The extra attenuation which is necessary is the return loss and this should be >22dB. Care must be taken to avoid overloading the Polyskop (indicated by a sudden depression of the response below the zero line).

3.9 Switch the Y1 amplifier to HF and the Y2 amplifier to EMF. Replace the filter with a through connection and adjust the Y1 and Y2 gains so that the two traces coincide. Now reconnect the filter and reduce the Polyskop attenuator setting by 1dB. Check that the filter through response is above the reference line over at least 8MHz.

3.10 The nylon screws fixing the resonator capacitors should be tightened.

3.11 If the filter is to be used in an EP7/513 or EP7/514 translator or active deflector it may be necessary to make a small final adjustment to the filter. This is covered in the overall alignment instructions contained in Spec. 5.223(72).

3.12 The measuring capacity of the set-up may be checked by substituting the termination for the filter. This typically gives a return loss of between 26 and 36dB.

3.13 Fix a label to the top of the filter showing the channel to which it has been tuned.

D31532A4 sheet 1 of 2 sheets

FL2/546A - FILTER, BAND PASS. BAND IV - PARTS LIST

ISS.	CHANGE
1	31/3/70
2	EMB. LOAN *, UNIT SPEC. & REF. DET 19 ADDED. ITEM 31. DRG. No ADDED. ITEMS 2.5, & 6 DELETED. W.H.W. CF 11123(1) JER 21.11.72.
3	ITEM 31: QTY. WAS 1 P.H. 19.7.73
4	DRG LIST REVISED NEW DRGS ADDED. ITEMS 4 & 7 DELETED. DRG REFERENCES ALTERED ACCORDINGLY. ITEM 31 DELETED KWJ. CF 20019(S) H.J.M. 7-3-74 C.F. 20080(G)

ITEM No.	No. OFF	SEE NOTE	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
			DRAWING NUMBERS.		
			Parts List D31532A4		
			Assembly D31536A2		
			Detail 1 E14731A2		
			" 5-9. D31538A2		
			" 10-12 D31539A4		
			Adjusting Slug Assy. dets. 13 & 14. D31540A4		
			DETAILS 2-4 E14732 A3.		
			JIG ASSEMBLY E14733 A4.		
			ROD ASSEMBLY INSTRUCTIONS. E14734 A3		
			TUNING PROBE. SUB-ASSEMBLY E14755 A4		
			FURTHER INFORMATION REQUIRED FOR MANUFACTURE.		
			Unit Assy. Information EA10484		
			~~Special Tool D31550A4~~		
			SPEC: ED/FL2/546.		
1	1		FILTER BOX.		E14731A2 Det. 1
~~2~~	~~1~~		~~Lower Bar~~		~~" " 2~~
3	1		COVER		E14732A3 " 2
~~4~~	~~1~~				~~" " 4~~
~~5~~	~~2~~		~~Outer Rod~~		~~" " 5~~
~~6~~	~~2~~		~~Inner Rod~~		~~" " 6~~
~~7~~	~~2~~				~~D31537A1 " 7~~
8	2		Tuning Probe		D31538A2. Det 5
9	2		Block		" " 6
10	2		Stud		" " 7
11	2		Clip		" " 8
12	2		Spring		" " 9
13					
14					
15	2		Adjusting Slug Assy-Comprising Items 16-18 INCL		D31540A4, Det. 13
16			1-Insulator		D31539A4, Det 10
17			1-Slug		" " 12
18			1-wire, Brass, 21 S.W.G. x .422"Lg		
19					
20					
21	2		Adjusting Slug Assy-Comprising Items 22-24incl		D31540A4, Det. 14
22			1- Insulator		D31539A4, Det. 10
23			1- Slug		" " 12
24			1- Wire, Brass 21 S.W.G. X .422"Lg.		
25					
26					
27	2	*	Nyloc Double Anchor Nut 4 B.A. Firth Cleveland Fastener Type AGS 2007/B1/Nyloc		
28	2	*	Socket TNC 50. Greenpar GE35807H.		
29					
30					
~~31~~	~~2~~		~~Pin Silver Steel~~		~~D31538A2 DET 20.~~

BBC DS/PLA4

FL2/546A
FILTER BAND PASS. BAND IV - PARTS LIST

DRN.	G.W.W.	DESIGNS DEPARTMENT
TPD.		D31532 A4.
CKD.		
APPD	CRC	sheet 1 of 2 sheets.