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A method of using a variable exponential half-section waveform corrector to derive the component values of a type A full section equaliser

Introduction

The exponential half-section waveform corrector was introduced by the Post Office Research Station as a simple means of waveform correcting video circuits (see P.O.E.E. Journal, Volume 52 Part 3).

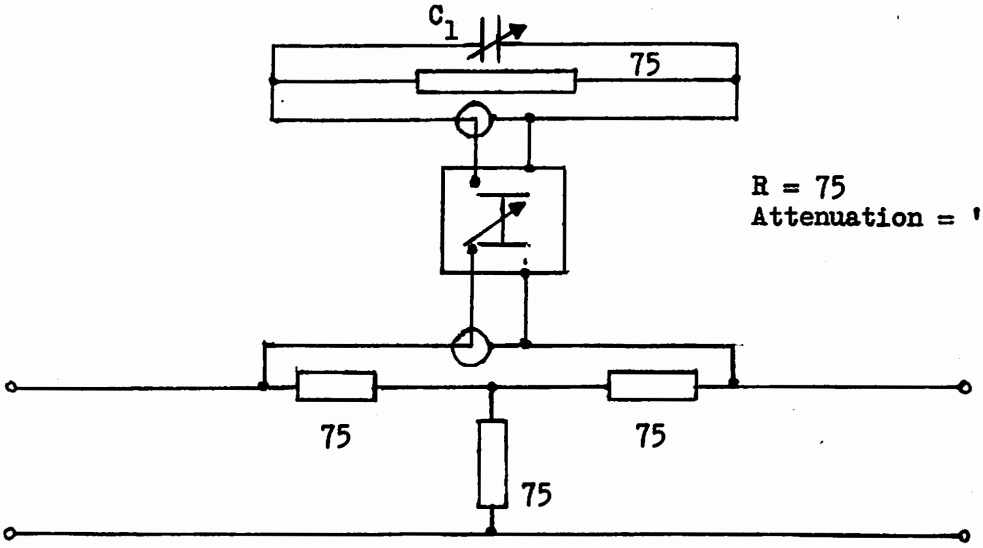
The Post Office method used variable inductors which in practice proved inconvenient, however, the following development by D.W. Grant uses a variable capacitor.

Experience has shown that the simplest method of correcting the amplitude and phase versus frequency characteristics of video circuits is by direct observation of the effect of compensating networks on a video test waveform (normally a sine squared pulse and half-line bar). This is usually achieved by obtaining the desired result from a half-section and then deriving the constant impedance full section from the half-section. The simple half-section suffers from the disadvantage of having a half loss frequency which varies with the basic loss. However, the exponential half-section does not suffer from this disadvantage.

From the variable exponential half-section described here it is possible to obtain the component values of the equivalent 75 ohms constant impedance type A full section of up to 3.5 dB basic loss. This is found to be adequate in practice but by a suitable choice of values this range and impedance could be extended. The exponential half-section is not itself constant impedance but must be worked between 75 ohms terminations.

Figure 402A

Variable exponential half-section

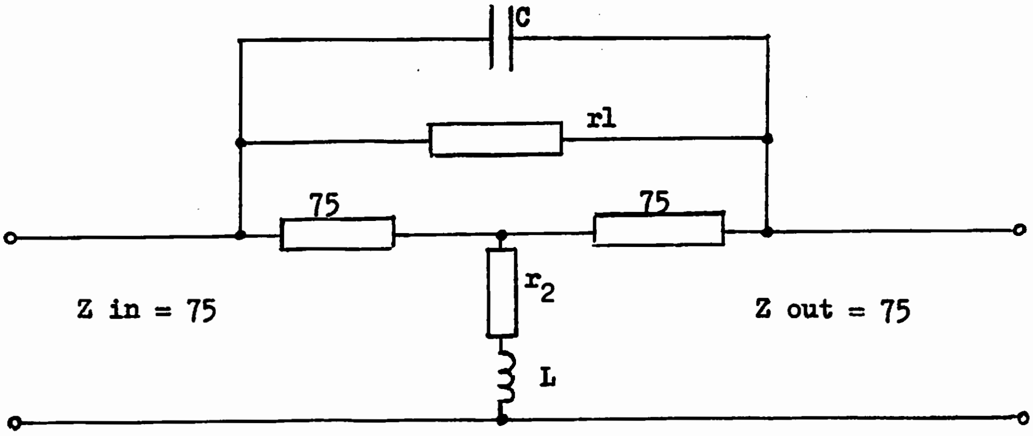


R = 75
Attenuation = 'A' dBs

Note: Care must be taken to ensure the outers of the attenuator are isolated from earth.

Figure 402B

Type A full section



The values of C, L rl and r2 are derived from the settings of the exponential half-section variables.

Procedure

Connect the variable exponential half-section into the circuit under test. Adjust C1, and attenuator 'A' to give the best waveform response, and note their values.

Using attenuation 'A' dB, obtain from the graph on 402/4 the following information:-

(a) The constant β

(b) The values of the basic loss resistors r1 and r2.

Using the value for β obtained from the graph, and the value of C1 it is now possible to derive from the nomogram on 402/5 the values for L and C.

Note:

Component values may also be obtained from the following equations:-

$$\beta = \text{Antilog}_{10} \frac{2A + 6}{20}$$

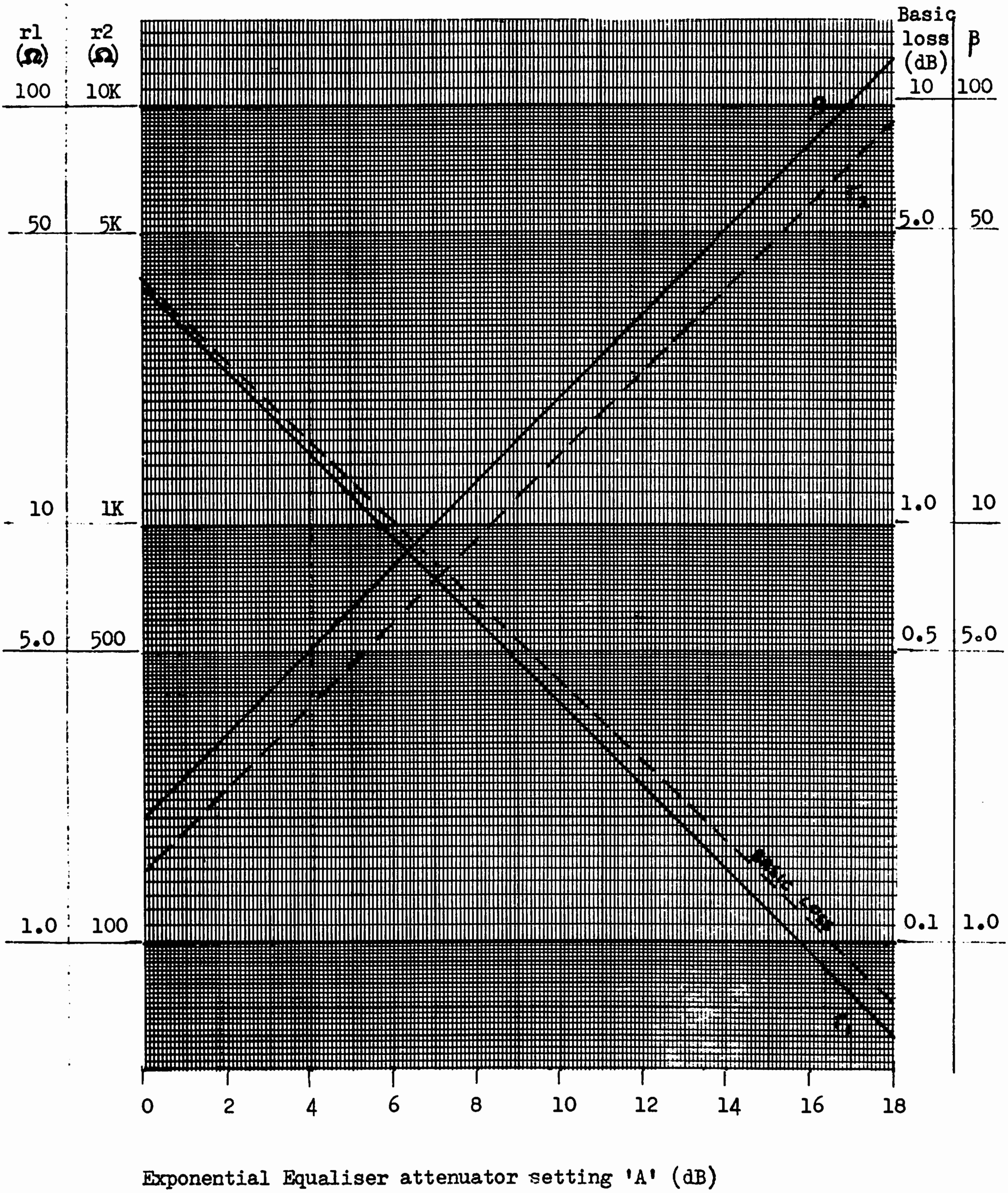
$$L = (1 + \beta) \frac{75^2 \, C1}{2} \quad \mu H \quad (C1 \text{ in } \mu F)$$

$$C = (1 + \beta) \frac{C1}{2} \quad \mu F \quad (C1 \text{ in } \mu F)$$

$$r1 = \frac{75}{\beta} \, \Omega$$

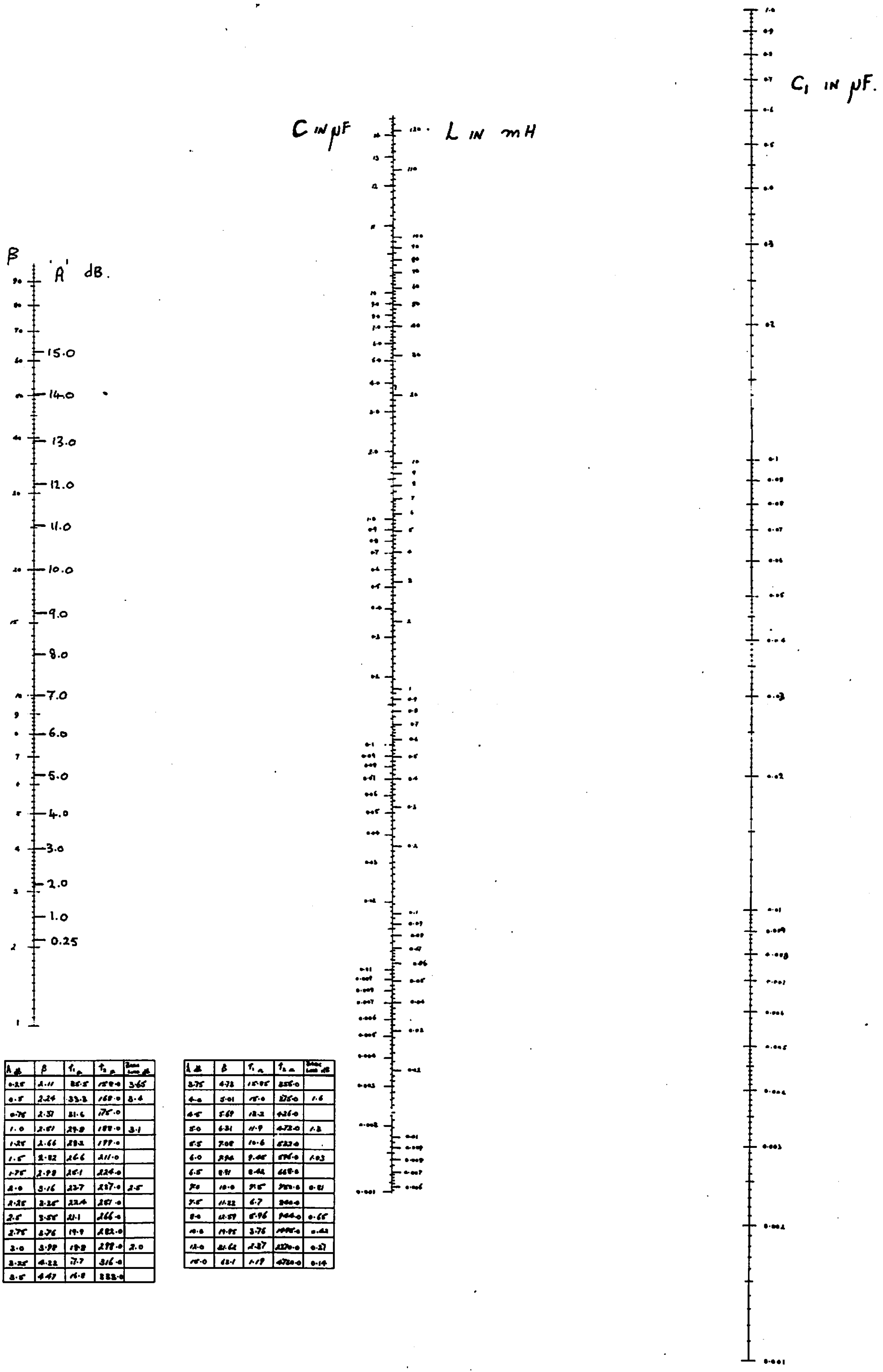
$$r2 = 75 \beta \, \Omega$$

Graph for Deriving Restive Components and Basic Loss of Final Type 'A' Section



Nomogram to derive reactive components of the Type A

Full Section



A dB	β	f_1	f_2	[illegible] loss dB
0.25	2.11	35.5	158.0	3.65
0.5	2.24	33.3	168.0	3.4
0.75	2.37	31.6	178.0	
1.0	2.51	29.8	188.0	3.1
1.25	2.66	28.2	199.0	
1.5	2.82	26.6	211.0	
1.75	2.98	25.1	224.0	
2.0	3.16	23.7	237.0	2.5
2.25	3.35	22.4	251.0	
2.5	3.55	21.1	266.0	
2.75	3.76	19.9	282.0	
3.0	3.98	18.8	298.0	2.0
3.25	4.22	17.7	316.0	
3.5	4.47	16.8	333.0	

A dB	β	f_1	f_2	[illegible] loss dB
3.75	4.73	15.85	356.0	
4.0	5.01	15.0	375.0	1.6
4.5	5.62	13.3	421.0	
5.0	6.31	11.9	473.0	1.3
5.5	7.08	10.6	532.0	
6.0	7.94	9.45	596.0	1.03
6.5	8.91	8.42	668.0	
7.0	10.0	7.5	750.0	0.81
7.5	11.22	6.7	840.0	
8.0	12.59	5.96	944.0	0.65
10.0	19.95	3.76	1496.0	0.42
12.0	31.62	2.37	2370.0	0.27
15.0	63.1	1.19	4730.0	0.14