

## HELPFUL FORMULAS

### CHARACTERISTIC IMPEDANCE:

$$Z_0 = \frac{138}{\sqrt{\epsilon}} \log_{10} \frac{D}{d} \quad \dots \text{ohms}$$

### VELOCITY OF PROPAGATION:

$$V_p = \frac{1}{\sqrt{\epsilon}} \times 100 \quad \dots \text{Percent of Free-Space Velocity}$$

### CAPACITANCE:

$$C = \frac{7.38\epsilon}{\log_{10} \frac{D}{d}} \quad \dots \text{pF/ft} \quad C = \frac{24.2\epsilon}{\log_{10} \frac{D}{d}} \quad \dots \text{pF/m}$$

### DELAY:

$$T = 1.016 \sqrt{\epsilon} (L) \dots \text{ns} \quad T = 3.33 \sqrt{\epsilon} (L) \dots \text{ns}$$

$$L = \frac{.984 T}{\sqrt{\epsilon}} \quad \dots \text{ft} \quad L = \frac{0.300 T}{\sqrt{\epsilon}} \quad \dots \text{m}$$

**MODING FREQUENCY:** (At which cable may begin to support a propagation mode in addition to a

transverse electromagnetic mode)

$$f_{co} = \frac{7.5}{\sqrt{\epsilon} (D + d)} \dots \text{GHz}$$

### ATTENUATION (THEORETICAL) AT 20°C:

$$\alpha = \frac{.434}{Z_0} \left[ \frac{\sqrt{R_1}}{d} + \frac{\sqrt{R_2}}{D} \right] t^{1/2} + 2.78 \epsilon^{1/2} F_p \quad \dots \text{dB/100 ft}$$

Where  $R_1=R_2 = 1.0$  for copper conductors. See table on page 37 for other conductor materials.

To obtain attenuation in dB/m, divide by 30.48

To compute attenuation for temperatures other than 20°C, (do not use for temp. less than -200°C) modify  $R_1$  and  $R_2$  in accordance with the temperature coefficient of resistance of the particular conductor materials. For copper and aluminum, the resistance at temperature  $t$  is:

$$R_t = R_{20} [1 + 0.0039 (t - 20)]$$

### CABLE RISE TIME (10% to 90% amplitude):

$$TR = 1.29 A^2 L^2 \times 10^{-2} \dots \text{ps}$$

Note: A and L must be in the same length units, i.e., feet or meters.

## CALCULATING AVERAGE POWER RATINGS FOR SEMI-RIGID CABLES WITH SOLID PTFE INSULATION

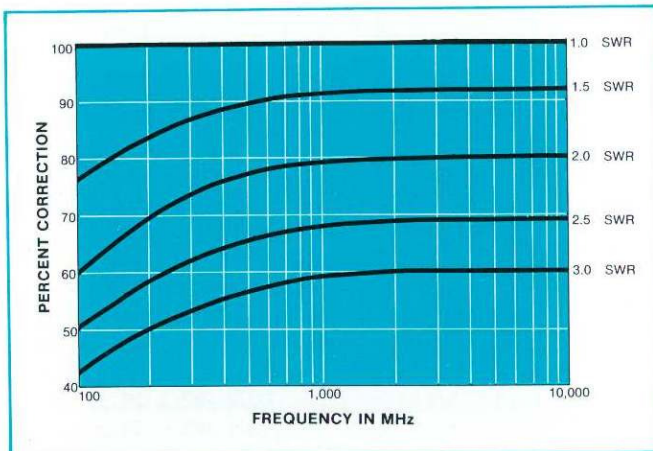
Average Power — Kilowatts

$$P_{\alpha} = 5.2 \frac{Q/L}{\alpha}$$

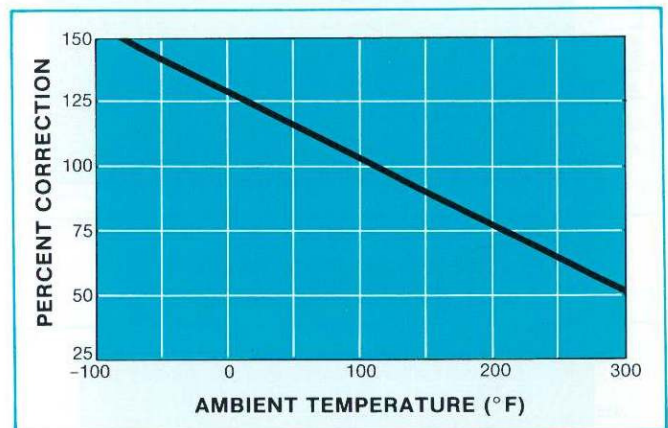
$$Q/L = (hr + hc) \pi (OD) (t_o - t_a)$$

Center conductor heating:

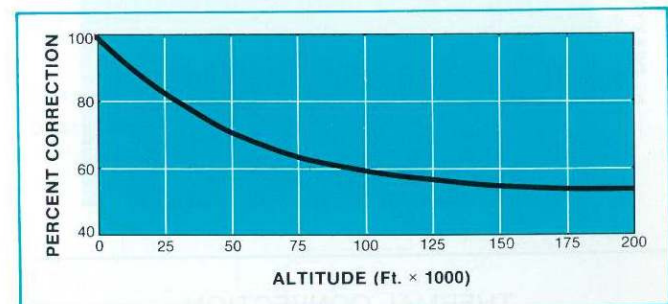
$$t_i = 24.8R_z Q/L + t_o$$



VSWR CORRECTION FACTOR



TEMPERATURE CORRECTION — TEFLON DIELECTRIC



ALTITUDE CORRECTION FACTOR