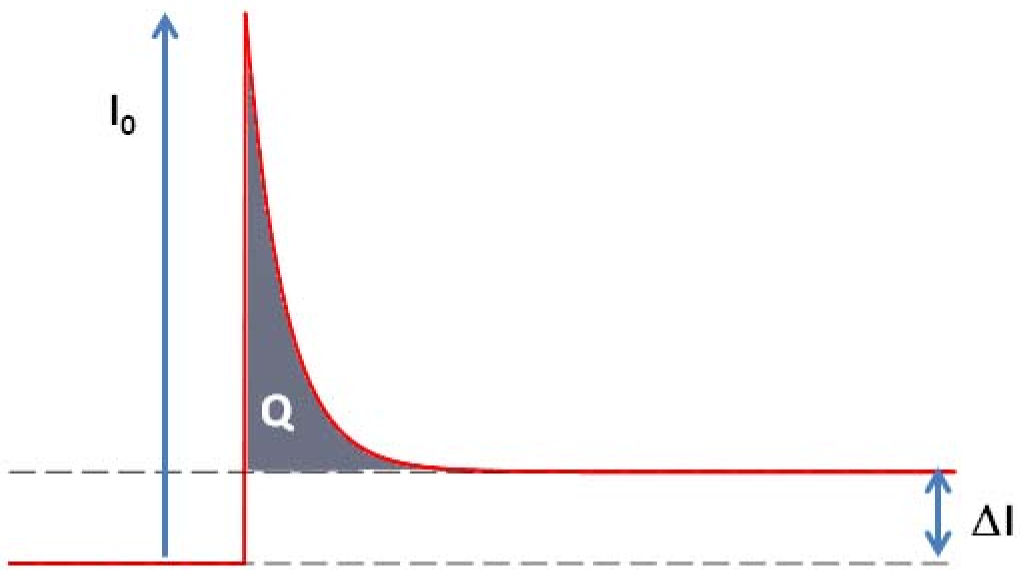
<u>Procedure to calculate Rs, Cm, and Rm from the step response (using time constant and integral)</u>

Apply a voltage step Δ**V**.

Measure the difference in steady state currents, Δ**I**.

Integrate the charge **Q** under the transient current.

Fit single exponential to get τ from transient



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The following relations hold:

$$R_m + R_s = \frac{\Delta V}{\Delta I}$$

$$\tau = \frac{R_s R_m C_m}{R_s + R_m}$$

$$Q = \frac{\tau \Delta V R_m}{R_s(R_s + R_m)}$$

thus

$$R_s = \frac{\Delta V}{\Delta I + Q/\tau}$$

$$R_m = \frac{QR_s}{\Delta I\tau}$$

$$C_m = \frac{R_s + R_m}{R_s R_m}\ \tau$$

Alternative procedure to calculate Rs, Cm, and Rm from the step response (using initial current and integral)

Apply a voltage step Δ**V**.

Measure the difference in steady state currents, Δ**I**.

Integrate the charge **Q** under the transient current.

Fit single or double exponential and back-extrapolate to time “0” to get I_0.

The following relations hold:

$$R_m +\ R_s = \frac{\Delta V}{\Delta I}$$

$$R_s = \frac{\Delta V}{I_0}$$

$$Q = \frac{R_m^2}{(R_s + R_m)^2}\Delta V C_m$$

Thus

$$R_s = \frac{\Delta V}{I_0}$$

$$R_m\ = \frac{\Delta V}{\Delta I} - R_s$$

$$C_m = \frac{Q}{\Delta V}\frac{(R_s + R_m)^2}{R_m^2}$$