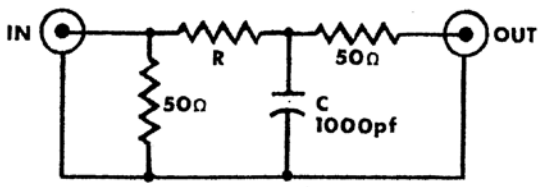
Passive Integrators

The PI-1, 5, 10 and 100 series integrators are passive resistor-capacitor integrators with standard RC time constants of 1, 5, 10 and 100us. They are available with a variety of standard connector types such as N-type.

IDEALIZED CIRCUIT



Idealised circuit based on the AFWL RCI-1B integrator.

TRANSFER FUNCTION

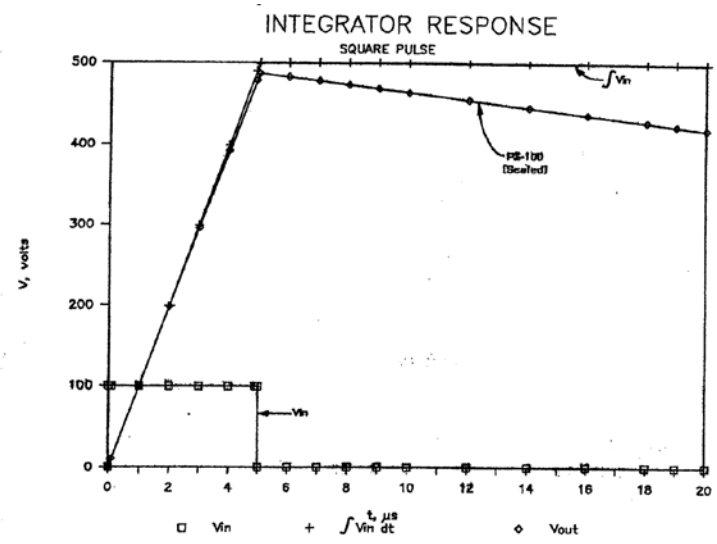
$$R\frac{dq}{dt}+\frac{q}{C}=V_{in}(t)$$

…where q = charge on capacitor.

The integrator is designed to drive a 1MΩ / 10pF load impedance. The voltage out is essentially the voltage across the capacitor q/C which is calculated by solving (integrating) the differential equation for q(t). This is most conveniently done by Laplace transforms which ield the transfer function in the frequency domain.

$$\frac{V_{out}(s)}{V_{in}(s)}=\frac{1}{(sRC+1)}$$

where s = jw = Laplace operator. The transfer function is an integrator for sinusoidal inputs with frequencies large compared to $1/(2\pi RC)$; or for transient inputs for times small compared to RC. Typical performance of the PI-100 integrating a 5µs square pulse is shown in the plot below. This pulse is integrated with an error of 2.5% over the 5µs duration.



	PI-1	PI-5	PI-10	PI-100
RC (Time Constant)	1µs	5µs	10µs	100µs
CW Accuracy (5%)	100 MHz	75 MHz	63 MHz	20 MHz
CW Accuracy (3db)	200 MHz	150 MHz	126 MHz	40 MHz
Input Impedance	50Ω			
Max Vin	*Depends on connector type*			
Load Impedance	>1MΩ, <10pF			
Maximum CW Pin	1W			
Connector types	SMA, TNC, BNC, N, GR + others on special request			
Size	2.5 x 2.5 x 5.0cm (body length only)			
Mass	100g			

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