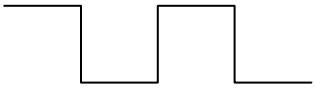
6.002 Demo# 17A (Load Set up demo#17A)
Integrator and Differentiator RC Network Agarwal Fall 2000
Lecture 20

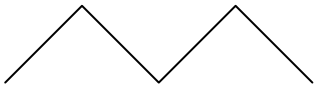
Purpose: This demo shows how an RC circuit can approximate either an integrator (capacitor voltage at high frequencies) or a differentiator (resistor voltage at low frequencies).

Steps:

1. Show the differentiator input (square wave) and output (resistor voltage) at a low frequency (100 Hz). Note the output looks like the derivative of the input.
2. Increase the frequency (1 kHz, then 10 kHz), adjusting the scope accordingly. Note that the output begins to look less like a derivative and more like the decaying exponential response.
3. Show the integrator input (square wave) and output (capacitor voltage) at a high frequency (10 kHz). Note the output looks like the integral of the input.
4. Decrease the frequency (1 kHz, then 100 Hz), adjusting the scope accordingly. Note that the output begins to look less like an integral and more like the decaying exponential step response.



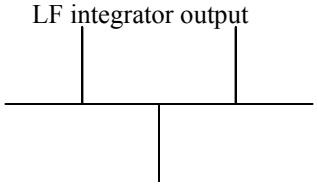
Input (square wave)



HF integrator output

LF integrator output

HF differentiator output



LF differentiator output

Description: To show Integrator and Differentiator, using RC Network.

For Differentiator set the switch on the card to Differentiator.
For Integrator set the switch on the card to Integrator.

For Differentiator use the following frequencies:
100 HZ, 1000 HZ and 10,000 HZ
For Intregator use the following frequencies:
10,000 HZ, 1000 HZ and 100 HZ

Make sure you monitor the input (square wave)

See schematic diagram next page for more detail

Oscilloscope Setup

CH	V/DIV	OFFSET	MODE	FUNC	MATH	VERTICAL	HORIZONTAL
1 on	2	-3.5	DC	off			
2 on	2	2.8	DC	off			
3 on	2	1.3	DC	off			
4 off			DC	off			

Horizontal: 5 ms	**Acquisition:**	**AUTO**	**AUTO**	**4**				**Trigger:**	**CH1**

Waveform Generator Setup					**Power Supply Setup**				
UNIT	**WAVE**	**AMP**	**OFFSET**	**FREQ**	**+6 off**	**+25 off**	**-25 off**	**OUTPUT**	
FG1	**Square**	**1***	**0**	**100 & 1000 & 10,000 HZ !**					**Trigger: INT**

- Amplitude depends on the Prof.!

! See above for integrator frequencies set up