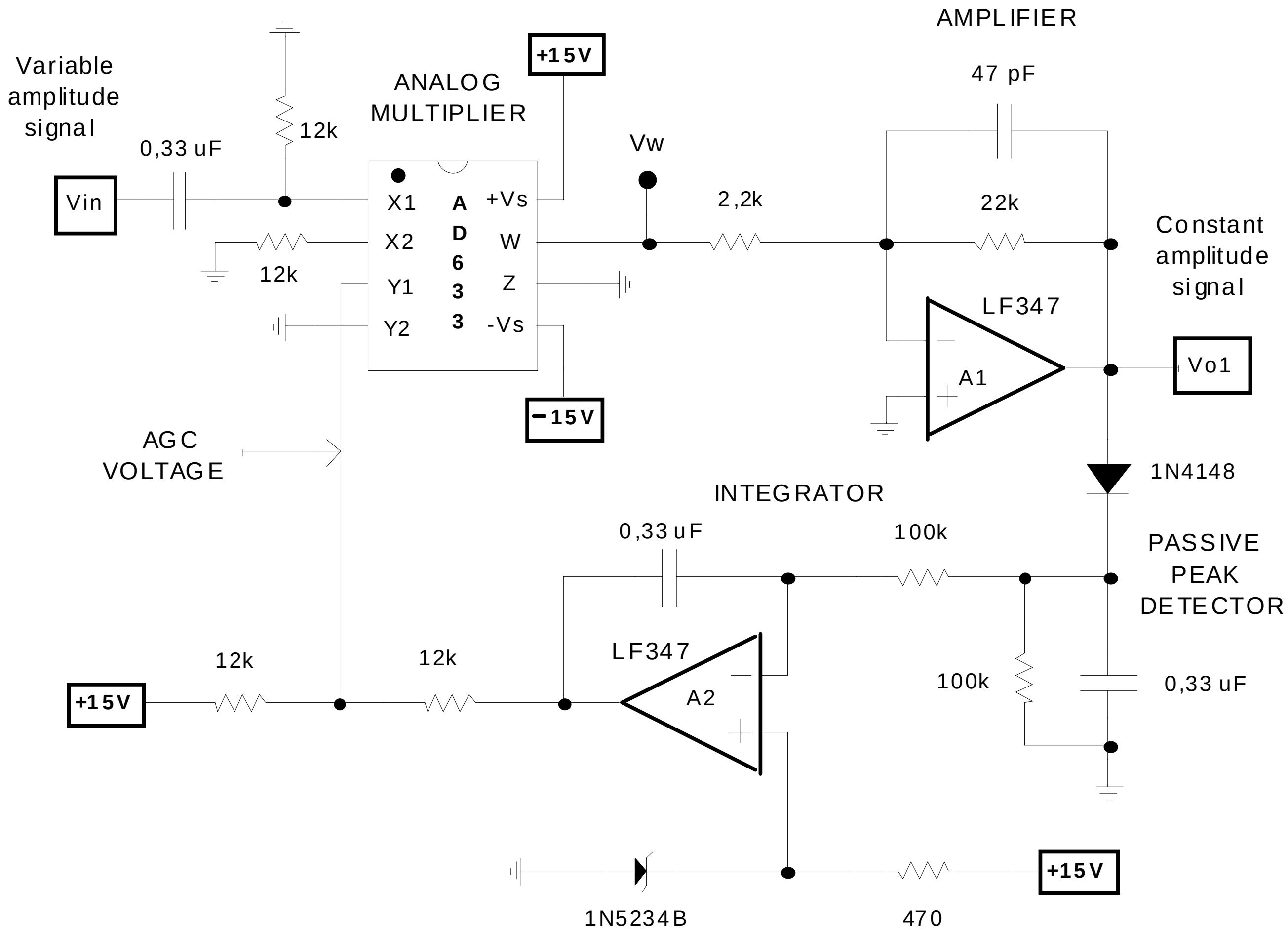
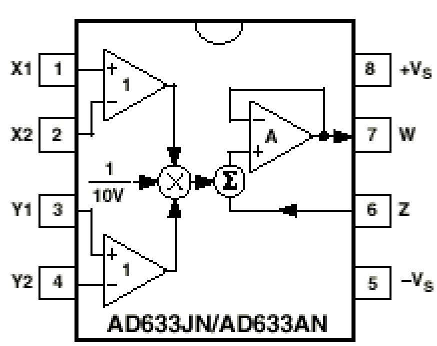
A U T O M A T I C   G A I N   C O N T R O L

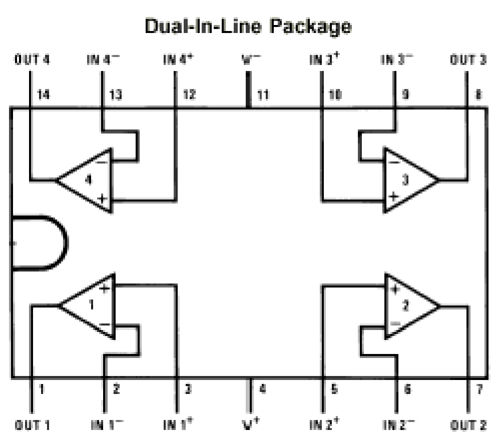
PART 1 AGC with passive peak detector

Circuit Diagram





AD633 Analog Multiplier



LF347 Quad Op Amp

Pre-lab

1. Determine the regulated amplitude of V_{o1} – look up Zener data at http://www.fairchildsemi.com/

2. Determine V_{Y1} min and max assuming typical saturation voltages for LF347 with $V_{sup} = \pm 15V$

3. Determine the range of input voltages (main input V_{in}) for which the AGC is operational. Why does not the AGC work outside this above-calculated range?

4. What is the peak AC voltage of V_w?

5. Determine the peak to peak ripple at the peak detector output and at V_{Y1} for frequencies of 1 kHz and 10 kHz. Draw the expected ripple waveforms.

Lab Procedure

NOTE: The HP signal generator displays half the actual O/P amplitude if load >> 50Ω
If load = 50Ω, it displays the correct amplitude.

1. Assemble circuit as per breadboard layout provided at the end.

2. Using a 1 kHz input sinewave, **adjust the amplitude of V_{in}** in order to obtain the DC voltages for V_{Y1} listed below. For each case measure the corresponding values of $V_{o2\ (DC)}$, $V_{o1\ (rms)}$, $V_{w(rms)}$ and $V_{in\ (rms)}$ with the DMM. Monitor V_{in} and V_{o1} on the oscilloscope throughout. Calculate A_{mult} from measurements.

3. Repeat the above for $V_{Y1(DC)}$ slightly above minimum and slightly below maximum when V_{o1} is still constant.

$V_{Y1\ (DC)}$	min	1	2	4	6	8	10	max
$V_{o2\ (DC)}$								
$V_{o1\ (rms)}$								
$V_{in\ (rms)}$								
$V_{w(rms)}$								
$A_{mult} = V_w / V_{in}$								

4. Measure the exact value of the Zener reference voltage – record value.

5. Measure the ripple voltage (with the scope) at the peak detector output and at V_{Y1} at frequencies of 100 Hz, 1 kHz and 10 kHz – ripple may be too small to be measured in some cases. Ensure that V_{in} is within operating range.

6. With V_{in} set such as to obtain V_{Y1} around 4V DC, measure $V_{o1\,(rms)}$ at 1 kHz, 10 kHz, 100 kHz and measure the minimum and maximum frequencies at which V_{o1} is no longer regulated.

7. Measure THD of V_{in}, V_w and V_{o1} at 1 kHz when AGC loop functions at V_{Y1} = 1V and V_{Y1}=10V.

	%THD of V_{in}	%THD of V_w	%THD of V_{o1}
V_{Y1} = 1V			
V_{Y1} = 10V			

Post lab

1. Compare measured values to pre-lab values everywhere applicable.

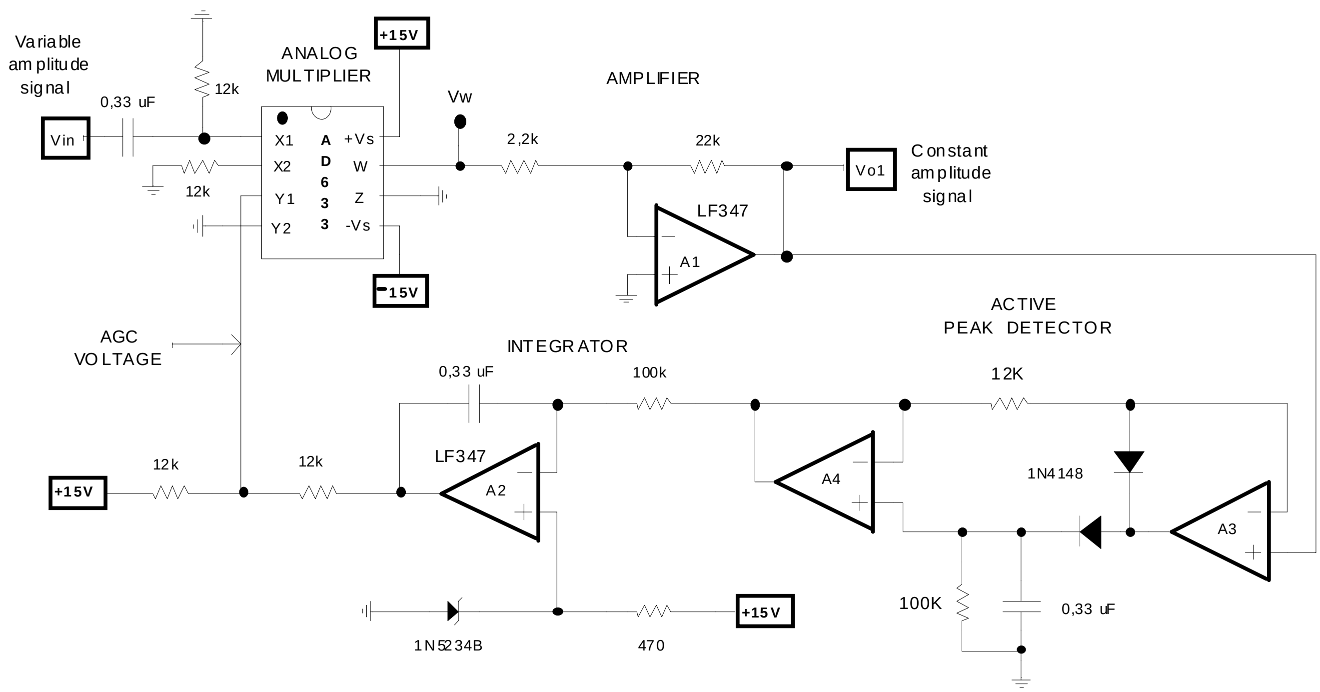
2. Did V_{o1} vary at all? What was the % variation of V_{o1} over the entire range of V_{in} at 1 kHz? Is this % variation acceptable? Explain.

3. Which device introduced the most distortion? Explain. Was distortion different for different input levels?

4. Using the results of step 3 of the procedure, explain how the AGC circuit works.

PART 2 AGC with active peak detector

Circuit Diagram



Pre-lab

1. Determine the regulated amplitude of V_{o1} – look up Zener data at http://www.fairchildsemi.com/

2. Determine V_{Y1} min and max assuming typical saturation voltages for LF347 with $V_{sup} = \pm 15V$

3. Determine the range of input voltages (main input V_{in}) for which the AGC is operational. Why does not the AGC work outside this above-calculated range?

4. What is the peak AC voltage of V_w?

5. Determine the peak to peak ripple at the peak detector output and at V_{Y1} for frequencies of 1 kHz and 10 kHz. Draw the expected ripple waveforms.

Lab Procedure

1. Assemble circuit as per breadboard layout provided at the end – don't forget to remove the 47 pF capacitor in the inverting amplifier.

2. Using a 1 kHz input sinewave, **adjust the amplitude of V_{in}** in order to obtain the DC voltages for V_{Y1} listed below. For each case measure the corresponding values of $V_{o2\ (DC)}$, $V_{o1\ (rms)}$, $V_{w(rms)}$ and $V_{in\ (rms)}$ with the DMM. Monitor V_{in} and V_{o1} on the oscilloscope throughout. Calculate A_{mult} from measurements.

3. Repeat the above for $V_{Y1(DC)}$ slightly above minimum and slightly below maximum when V_{o1}m is still constant.

$V_{Y1\ (DC)}$	min	1	5	10	max
$V_{o2\ (DC)}$					
$V_{o1\ (rms)}$					
$V_{in\ (rms)}$					
$V_{w(rms)}$					
$A_{mult} = V_w / V_{in}$					

4. Measure the exact value of the Zener reference voltage – record value.

5. Measure the ripple voltage (with the scope) at the peak detector output and at V_{Y1} at frequencies of 100 Hz, 1 kHz and 10 kHz – ripple may be too small to be measured in some cases. Ensure that V_{in} is within operating range.

6. With V_{in} set such as to obtain V_{Y1} around 4V DC, measure $V_{o1\ (rms)}$ at 1 kHz, 10 kHz, 100 kHz and measure the minimum and maximum frequencies at which V_{o1} is no longer regulated.

Post lab

1. Compare measured values to pre-lab values everywhere applicable.

2. Did V_{o1} vary at all? What was the % variation of V_{o1}? Is it good? Explain.

3. Using the results of step 3 of the procedure, explain how the AGC circuit works.

4. Compare the performance of the two AGC circuits. Which one performed better? Explain.

   Which circuit has a more predictable and accurate output? Explain.

   Which one operated over a wider frequency range?

BREADBOARD LAYOUT