

## 5 Hardware Lab (Amplitude Modulation/Demodulation)

### 5.1 Purpose

Analyze conventional DSB and DSB-SC AM modulation and demodulation by implementing basic analogue communication circuits.

### 5.2 Equipment

1× Oscilloscope

1× DC Power Supply

2× Function Generator

IC: 1× MC 1496 (LM1496)

Resistors:  $3 \times 56\Omega$ ,  $2 \times 750\Omega$ ,  $2 \times 3K9\Omega$ ,  $3 \times 1K\Omega$ ,  $1 \times 6K8\Omega$ ,  $1 \times 5K1\Omega$ ,

$1 \times 50K\Omega$  Trimpot.

Capacitors:  $3 \times 0,1\mu F$

Diode: 1N4148

### 5.3 Pre Lab Tasks

3.3.1 Study amplitude modulation (AM) and demodulation.

3.3.2 Study the types of AM and the differences between them.

3.3.3 Study the datasheet of the integrated circuit **MC 1496**.

### 5.4 Lab Work

3.4.1 Set up the circuit in Figure 1, check the connections of feed voltages (+12V) , (−8V) and the ground connections.

3.4.2 Apply a sinusoidal signal with amplitude of 1V (peak to peak) and 500KHz frequency for the carrier signal.

3.4.3 Apply a sinusoidal signal with amplitude of 0.4V (peak to peak) and 200Hz frequency for the message signal.

3.4.4 The modulated signal is observed at sixth pin of the IC (MC 1496). Draw the observed signal.

3.4.5 Observe the variation of the output by using the trimpot.

3.4.6 Draw the demodulator circuit in Figure 2 and feed the input of the demodulator by the output of the modulator. Observe the message vs. demodulator output and comment on the results.

### 5.5 Results and Conclusion

- Plot the message and the recovered signals together. If you observe any difference between two signals, explain the reasons.
- Calculate the modulation index ( $\mu$ ) by using the plot you obtained during the modulation step. Determine the type of modulation according to this value.
- Explain the reason of the variation when you change the value of the trimpot.
- Plot the output signal for the cases of  $\mu < 1$ ,  $\mu = 1$  and  $\mu > 1$ .

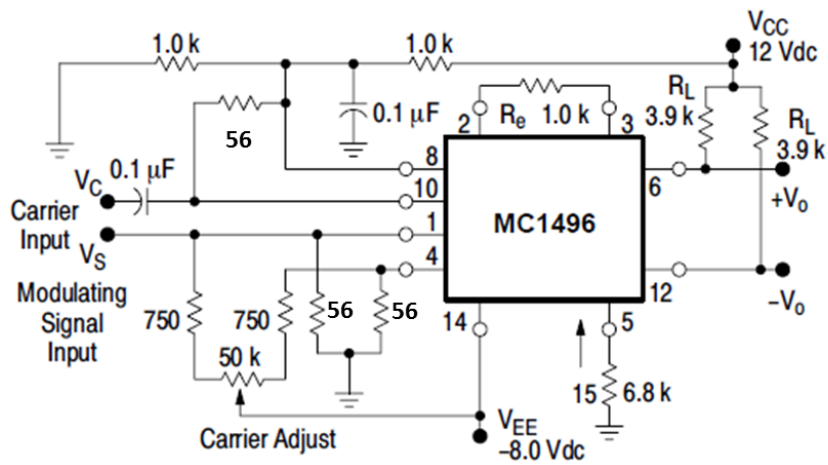


Figure 1: Amplitude Modulation

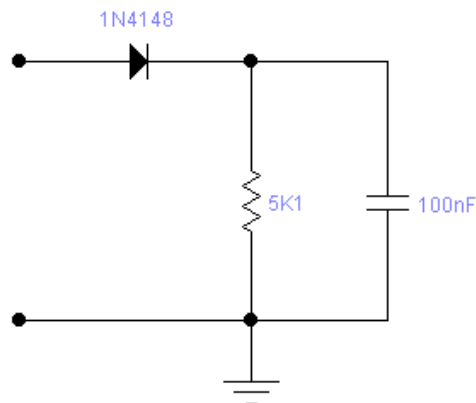


Figure 2: Demodulator Circuit (Envelope Detector)

- How does the values of R and C in the envelope detector circuit affect the demodulation? What is the limitation of these values associated with the message signal.