Experiment No.: 04

1 AIM

1. To implement a Double Side Band - Suppressed Carrier (DSB-SC) modulator using a sampler (switch) and a band-pass filter.
2. To recover the modulating signal with help of an coherent detector.

2 Apparatus Used

1. Function Generator
2. Digital signal oscilloscope
3. Opamp-741 IC & PN diode
4. Breadboard & Connecting wires
5. Resistors & Capacitors
6. DC power supply

3 Theory

Switching Modulator

Multiplication of a signal by a square pulse train is in reality a switching operation. It involves switching the signal $m(t)$ on and off periodically and can be accomplished by simple nonlinear (switching) device like a diode. Based on the nature of cancellation of carrier and/or message at the output of the switch, it is called a doubly balanced switching modulator. Band pass filter is used to ensure that only the desired AM wave is produced at the output centered at the carrier frequency.

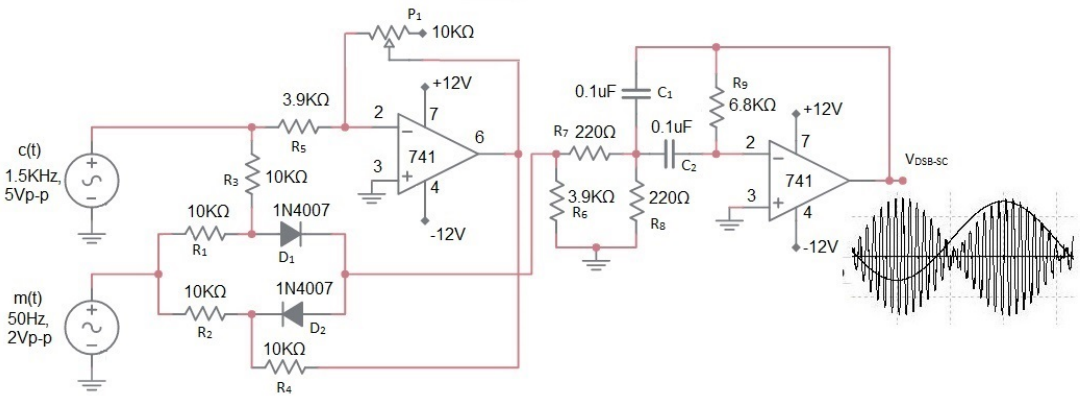

Figure 1: DSB-SC Modulator

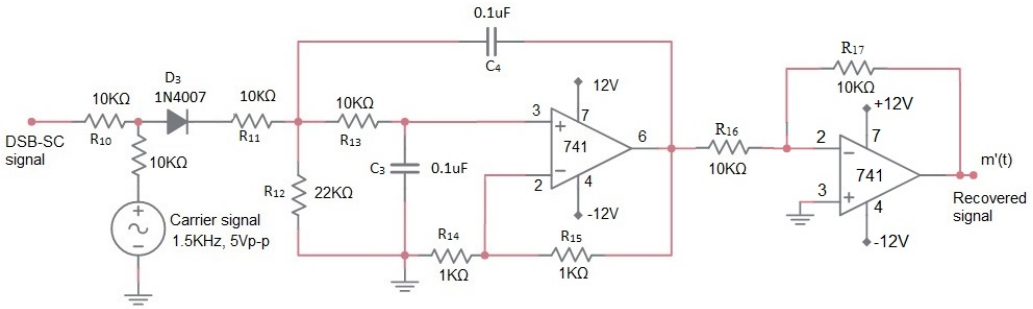

Figure 2: Coherent Demodulator

4 Procedure

1. For the Band Pass Filter prescribed in the Figure 1. Find the band-width and the cut-off frequencies, both experimentally and by using the expressions.

$$f_{mid} = \frac{1}{2\pi C_1}\sqrt{\frac{R_7 + R_8}{R_7 R_8 R_9}} \tag{1}$$

$$Bandwidth = \frac{1}{\pi R_9 C_2} \tag{2}$$

2. Set up the bipolar sampler as per the circuit diagram shown in Figure 1. Set the modulating signal and Carrier signal to a sinusoid of frequency $f_m = 50$Hz and 1.5KHz.

3. Now apply the modulating signal, observe the sampled signal and pass the output of the sampler through Band pass filter. We take FFT of the band pass filter and see the carrier power suppressed or not, when carrier power not suppressed we vary the variable resistance and suppressed the carrier. Then sketch the output waveform neatly.

4. On DSO observe the modulating signal and modulated signal in time domain. Utilize XY mode of DSO to see the trapezoidal pattern and check the linearity of the modulator.

5. You recover the modulating signal with help of an coherent detector in given in Figure 2. (Explain)

5 Observation

Write/ Plot Your Own With Observation Table (If Required).

6 Analysis of Results

Calculations/Display/plot/typical graph Write/Plot Your Own.

7 Conclusions

Write Your Own.

Precautions

1. Check the connections before switching on the kit.

2. Connections should be done properly.

3. Observation should be taken properly.

Edited By:
Dr. Nikhil Sharma
Mr. Dharm Pal Yadav