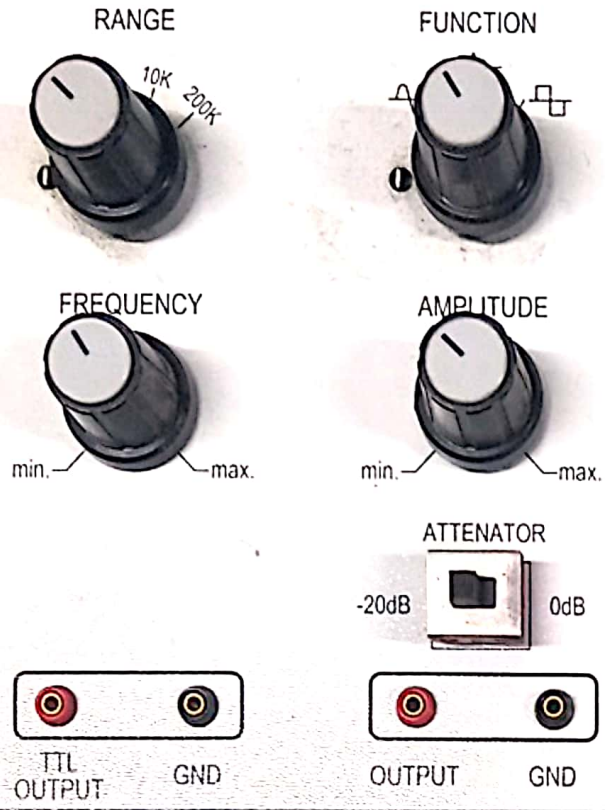
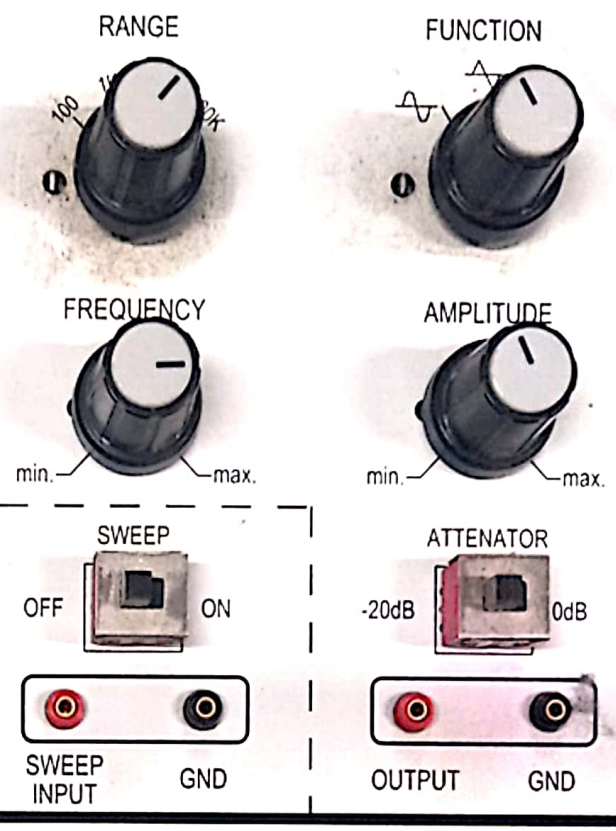
SIGNAL GENERATOR

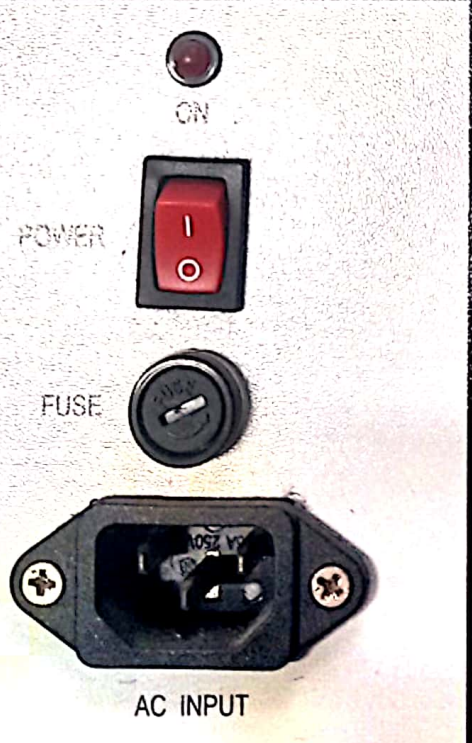
FUNCTION GENERATOR 1

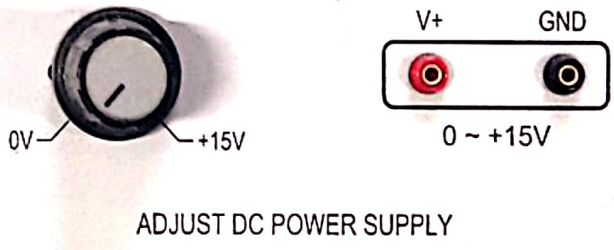


FUNCTION GENERATOR 2

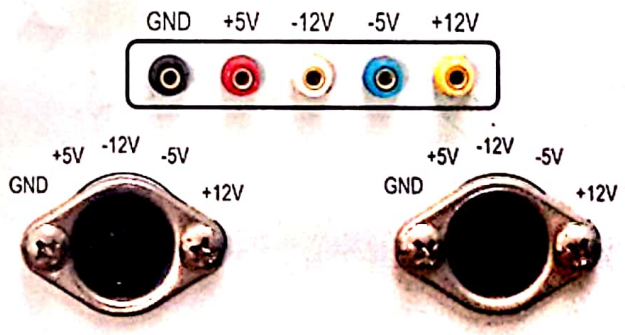


POWER SUPPLY





ADJUST DC POWER SUPPLY



FIXED DC POWER SUPPLY

KL-92001

KING ELECTRONICS CO., LTD

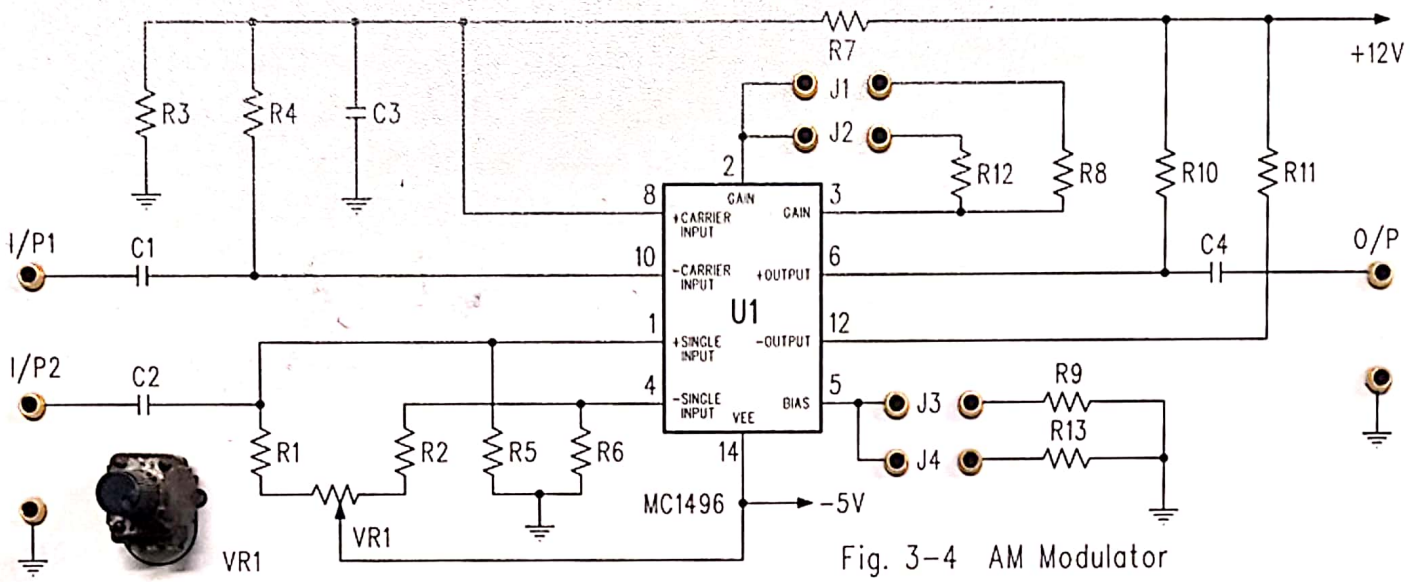


Fig. 3-4 AM Modulator

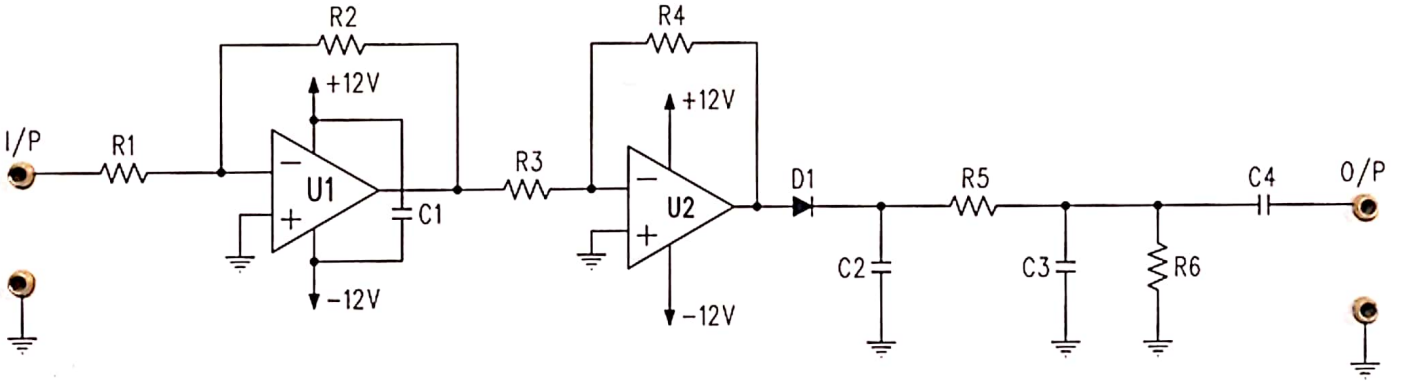


Fig. 4-3 AM Diode Detector

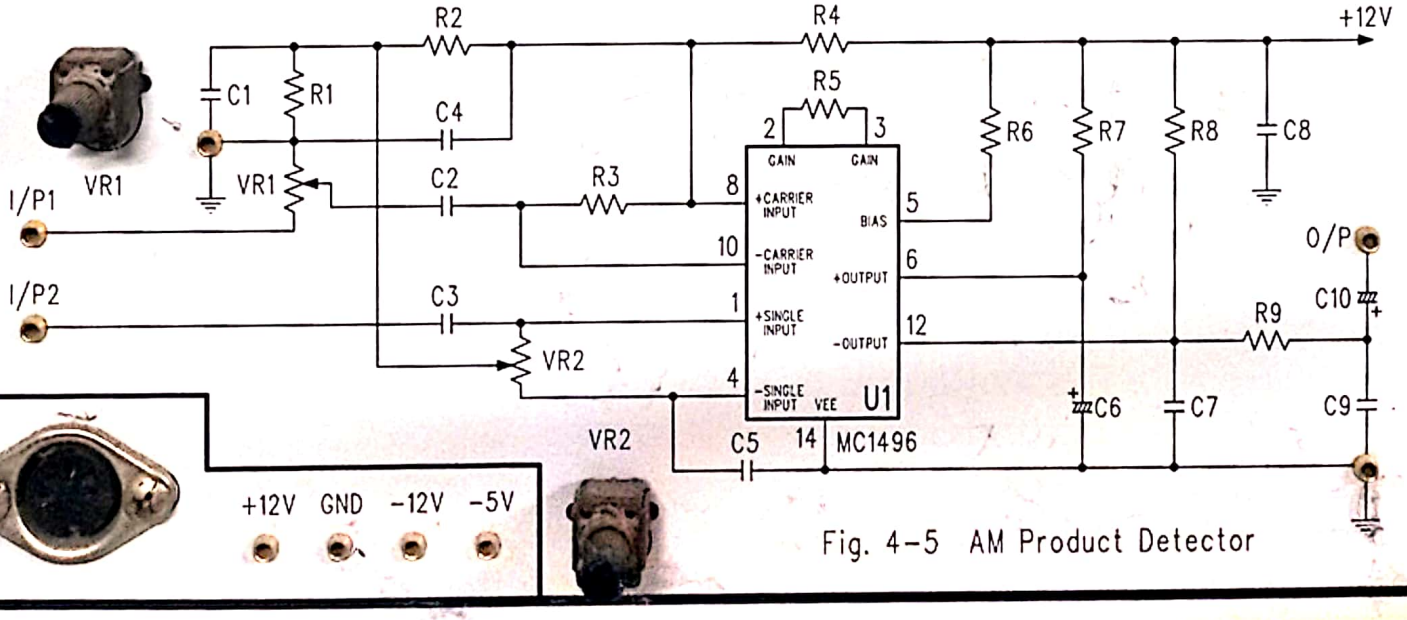


Fig. 4-5 AM Product Detector

3.3 EQUIPMENT REQUIRED

1 - Module KL-92001
2 - Module KL-93002
3 - Oscilloscope
4 - Spectrum Analyzer
5 - RF Generator

3.4 EXPERIMENTS AND RECORDS

Experiment 3-1 Amplitude Modulator

☐1. Locate AM modulator circuit on Module KL-93002. Insert connect plugs in J1 and J3 to set R_8=1kΩ and R_9=6.8kΩ.

☐2. Connect a 250mVp-p, 1kHz sine wave to the audio input (I/P2), and a 250 mVp-p, 100kHz sine wave to the carrier input (I/P1).

☐3. Connect the vertical input of the oscilloscope to the AM output (O/P). Observe the output waveform and adjust the VR_1 for the modulation index of 50%. Record the result in Table 3-2.

☐4. Using the spectrum analyzer, observe and record the output signal spectrum in Table 3-2.

☐5. Using the results above and Eq. (3-4), calculate and record the percentage modulation of output signal in Table 3-2.

☐6. Using the oscilloscope, observe the output signals for the audio amplitudes of 200 mVp-p and 150 mVp-p and record the results in Table 3-2.

☐7. Repeat steps 4 and 5.

☐8. Connect a 150mVp-p, 1 kHz sine wave to the input (I/P2), and a 100 mVp-p, 100kHz sine wave to the carrier input (I/P1).

☐9. Using the oscilloscope, observe the AM signal at output terminal (O/P) and record the result in Table 3-3.

☐10. Using the spectrum analyzer, observe and record output spectrum in Table 3-3.

☐11. Using the results above and Eq. (3-4), calculate the percentage modulation of output signal and record the results in Table 3-3.

☐12. Repeat steps 9 to 11 for carrier amplitudes of 200mVp-p and 300mVp-p.

☐13. Connect a 150mVp-p, 3kHz sine wave to the audio input (I/P2), and a 250mVp-p, 100kHz sine wave to the carrier input (I/P1).

☐14. Using the oscilloscope, observe the modulated signal at output terminal (O/P) and record the result in Table 3-4.

☐15. Using the spectrum analyzer, observe and record the output signal spectrum in Table 3-4.

☐16. Using the results above and Eq. (3-4), calculate and record the percentage modulation of output signal in Table 3-4.

☐17. Repeat steps 14 to 16 for the audio frequencies of 2kHz and 1kHz.

☐18. Connect a 150mVp-p, 2kHz sine wave to the audio input (I/P2), and a 250mVp-p, 500kHz sine wave to the carrier input (I/P1).

☐19. Using the oscilloscope, observe the modulated signal at output terminal (O/P) and record the result in Table 3-5.

☐20. Using the spectrum analyzer, observe and record the output spectrum in Table 3-5.

☐21. Using the results above and Eq. (3-4), calculate and record the percentage modulation of output signal in Table 3-5.

☐22. Repeat steps 19 to 21 for the carrier frequencies of 1MHz and 2MHz.

Table 3-2

(V_c=250mVp-p, f_c=100kHz, f_m=1 kHz)

Audio Amplitude	Output Waveform	Output Signal Spectrum	Percentage Modulation
250 mVp-p	E_{max}= E_{min}=		
200 mVp-p	E_{max}= E_{min}=		
150 mVp-p	E_{max}= E_{min}=		

Table 3-3

(V_m=150mVp-p, f_c=100kHz, f_m=1 kHz)

Carrier Amplitude	Output Waveform	Output Signal Spectrum	Percentage Modulation
100 mVp-p	E_{max}= E_{min}=		
200 mVp-p	E_{max}= E_{min}=		
300 mVp-p	E_{max}= E_{min}=		

Table 3-4

(V_c=250mVp-p, V_m=150mVp-p, f_c=100 kHz)

Audio Frequency	Output Waveform	Output Signal Spectrum	Percentage Modulation
3 kHz	E_{max}= E_{min}=		
2 kHz	E_{max}= E_{min}=		
1 kHz	E_{max}= E_{min}=		

Table 3-5

(V_c=250mVp-p, V_m=150mVp-p, f_m=2 kHz)

Carrier Frequency	Output Waveform	Output Signal Spectrum	Percentage Modulation
500 kHz	E_{max}= E_{min}=		
1 MHz	E_{max}= E_{min}=		
2 MHz	E_{max}= E_{min}=		

3.5 QUESTIONS

1. In Fig. 3-4, if we change the value of R_8 from 1 kΩ to 2 kΩ, what is the variation of the AM output signal?

2. In Fig. 3-4, if we change the value of R_9 from 6.8 kΩ to 10 kΩ, what is the variation in the dc bias current of the MC1496?

3. Determine the ratio of E_{max} to E_{min} if m=50%.

4. What is the function of the VR_1?