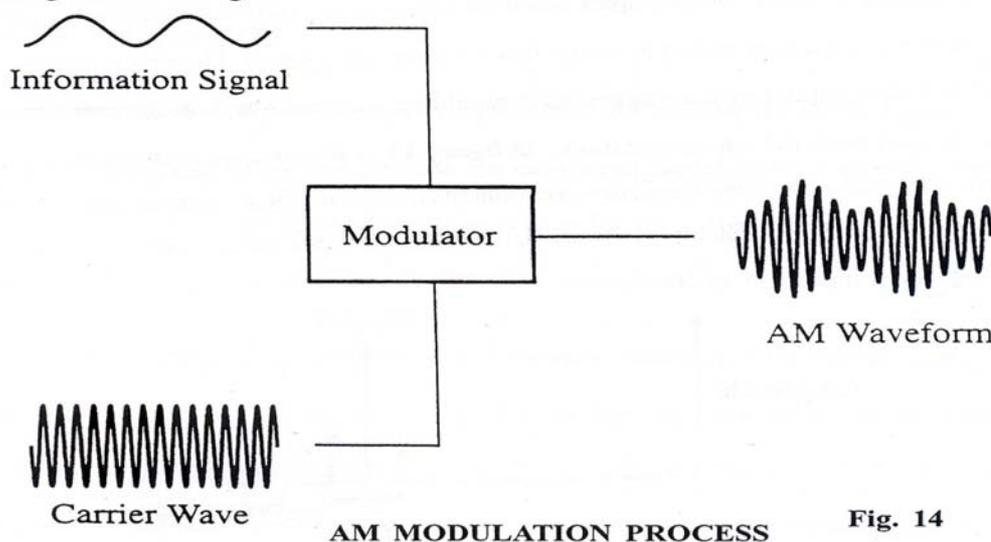


Introduction to Super-heterodyne Radio Receiver (SHRR) & their characteristics

The experiments on the Sensitivity and Selectivity Characteristics of Super-heterodyne Radio Receiver are to be performed on the Scientech DSB/SSB Receiver Kit Model ST-2202 (Lab. No. CRT-16) and the A. M. signal received by the radio receivers, is to be generated by using two function generators:- (1) Pacific model FG-18 & (2) Scientech model ST-4062.

Introduction to Amplitude Modulation (AM):-

In this circuit, the amplitude of the carrier is increased and decreased in sympathy with the incoming information signal.



The modulated signal is now nearly ready for transmission. If the modulation process has given rise to any unwanted frequency components then a bandpass filter can be employed to remove them..

Generation of AM Signal for Radio Receiver

The AM signal to be received by Radio Receivers, can be generated by making the proper settings on the following two Signal Generators:-

1. Pacific Function Generator, Model FG-18 (CRG-17) as a message signal Generator, and
2. Scientech Function Generator, Model ST-4062 (CRG-26) as a Carrier Signal Generator,

Settings to be made on CRG-17

Connect the output of this signal generator directly to CRO and obtain a clear sine wave on the CRO screen by making the following settings on this signal generator:-

Function selected : Sine-wave
 Amplitude adjusted: 1.0 V_{p-p}
 Frequency set : 1.0 KHz
 DC Offset : OFF

Settings to be made on CRG-26

Connect the output of this signal generator directly to CRO and obtain a clear sine wave on the CRO screen by making the following settings on this signal generator:-

1. Function selected : Sine-wave
2. Amplitude adjusted: 100 mV_{p-p} (by selecting 40 dBs Attenuation)
3. Frequency set : 1000 KHz (by selecting 2 MHz Frequency range) displayed on “Display”
4. DC Offset : OFF
5. Sweep : OFF

Now connect the previously set output of CRG-17 to the “**MOD IN**” of this Signal Generator, and set its Modulation to “AM STD”. The AM wave will now appear on the CRO screen.

Settings to be made to obtain the AM wave of required specifications:-

Adjust all the four parameters of the above generated AM wave to the following values:-

1. AM Level (A) : around 100 mV_{p-p} (set by “Amplitude Control” of CRG-26)
2. Modulation Index (m) : 33 % (set by “Amplitude Control” of CRG-17)
3. Modulation frequency (f_m) : 400 Hz, or, 1 KHz (set by Freq. Control of CRG-17)
4. Carrier frequency (f_c) : 1000 KHz (set by Freq. Control of CRG-26)

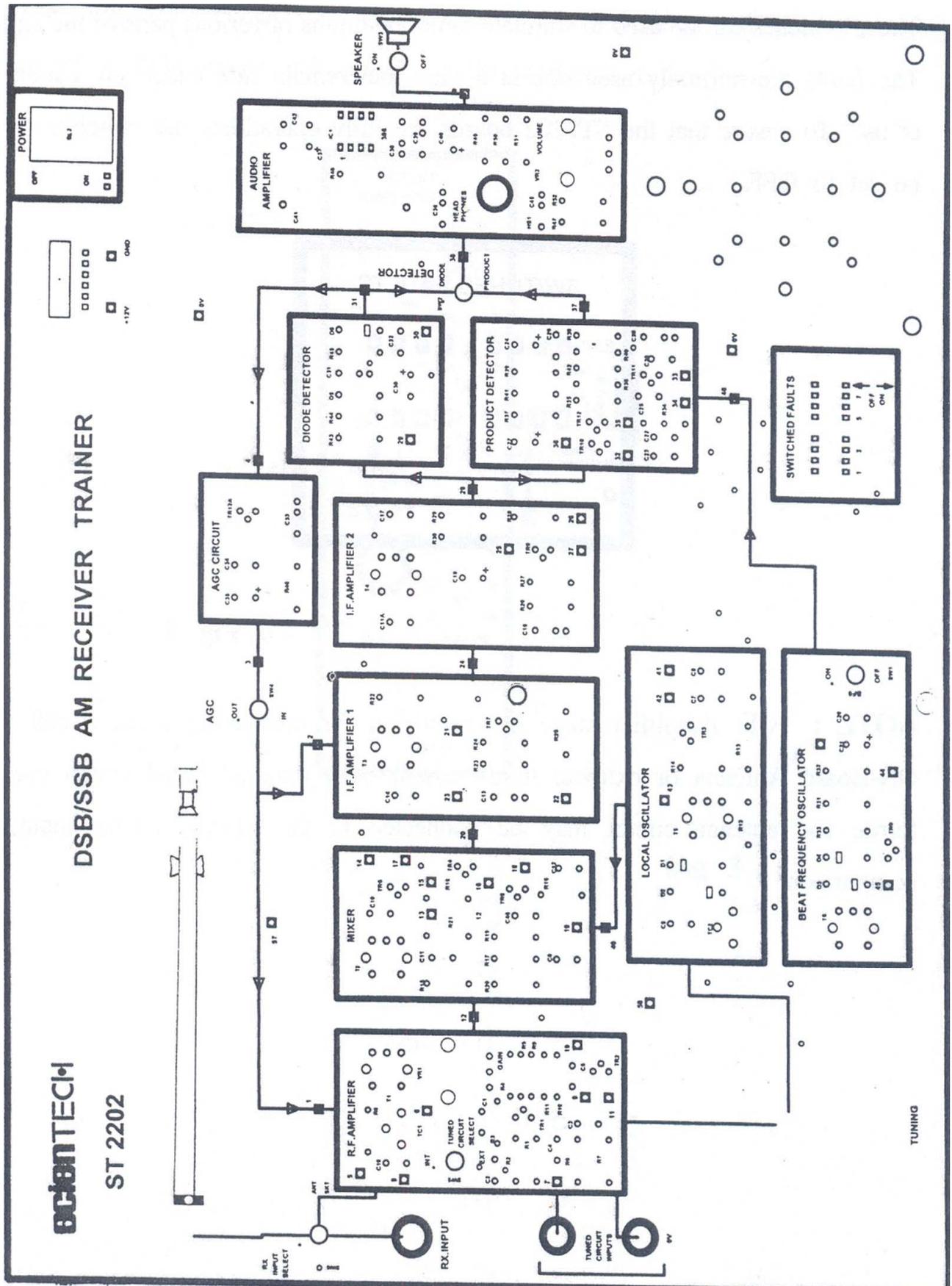
The above generated AM signal of required specifications, is to be applied to the Rx – Input of the given Superhetrodyne Radio Receiver Kit (Sciencetech Model ST-2202, CRT-16) for the determination of “Sensitivity” as well as “Selectivity” of the Radio Receiver, and the proper Settings are required to be made on the receiver kit.

Introduction to Sciencetech DSB/SSB Receiver Kit Model ST-2202

This receiver kit consists of the following functional blocks:-

1. R. F. Amplifier
2. Local Oscillator
3. Mixer
4. Two I. F. Amplifier
5. Diode Detector
6. Product detector
7. Beat Frequency Oscillator (BFO)
8. AGC Circuit
9. Audio Amplifier (AFA)

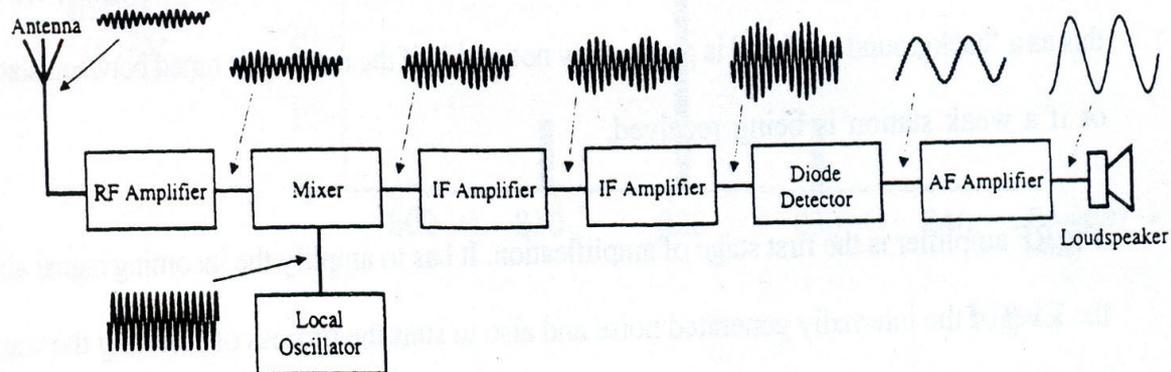
The layout of the kit is also shown on the next page:-



Lay-out of the Kit (ST-2202) used in the experiments on Radio Receivers

The block diagram of a SHRR is shown below:-

The 'em' wave from the transmitting antenna will travel to the receiving antenna carrying the information with it.



Note:- For more information on the working of the functional blocks, refer to the Operating Manual of the above kit.

Settings to be made on the receiver kit, Scientech Model ST-2202, CRT-16

- | | |
|---------------------------------------|--|
| 1. Rx-input Select Switch: | “SKT” position (Dn) |
| 2. Tuned ckt select Switch: | “INT” position (Up) |
| 3. AGC Switch: | “OUT” position (Up) |
| 4. BFO Switch: | “OFF” position (Dn) |
| 5. Detector Switch: | “Diode” position (Up) |
| 6. Speaker Switch: | “ON” position (Up) |
| 7. All the 8-fault creating switches: | “OFF” position (Up) |
| 8. RF Amplifier gain preset control : | Mid-way, to get unclipped clear sine-wave at the detector's output, t_p-38 |
| 9. Volume control | Mid-way, to get a clear sound from Speaker |

After making all the above settings on Signal Generators and the Receiver kit, turn-ON the Receiver kit and connect the previously adjusted AM signal to the Rx-Input of the Receiver kit.

Now, rotate finely the tuning dial of the Receiver kit to receive the input AM signal, When the AM signal will be properly received (after tuning the receiver to the carrier frequency of the AM signal), an audio tone will be heard from the speaker. The state of best tuning may be ensured by

loudest sound of the tone from the speaker, and the largest amplitude of the received signal on the CRO screen.

Check the receiver output at either the Detector's output at t_p -38, or at AF amplifier's output at t_p -39 on the CRO screen. The Detector's output at t_p -38 will be a sinusoidal signal of the order of 10 mV_{p-p} whereas the AF amplifier's output at t_p -39 will be a sinusoidal signal of the order of 2.0 V_{p-p}. Any of the above receiver output, may be recorded in the observations against the carrier frequency value, for the purpose of plotting Sensitivity or Selectivity characteristics of the radio receiver.

Note:-

Refer to the relevant **Experiment sheets** given in the **Laboratory Manual** of the Lab Course EL-392, for performing experiments on the **Sensitivity**, or on the **Selectivity** of the radio receiver, as given in relevant Laboratory Manual.

References:

1. Kennedy : Electronics Communication
2. Terman and Petit : Electronics and Radio Engineering, McGraw-Hill
3. Work-book of the Sciencetech SSB/DSB Receiver kit, Model ST-2202
4. Lab Manual of EL-392 (new edition-2008) by Engr M. H. A. Khan

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