Television Broadcasting

Television means seeing at a distance. To be sucessful, a television system may be required to reproduce faithfully

a) The shape of each object, or structural content

b) The relative brightness of each object, or tonal content

c) Motion or kinematic content

d) Sound

e) Colour, or chromatic content

f) Perspective, or stereoscopic content

The human eye contains many millions of photosensitive elements, in the shape of rod and cones, which are connected to the brain. A similax process by the camera tube is used at the transmitting station and the picture tube in the TV receiver. Each element in a frame is scanned in succession to convey the total information in the scene. This is done (Scanning) at such a high rate that the eye sees the whole scene without being aware of the scanning motion.

The problem of showing motion was overcame by showing pictures in succession, each with the scene slightly altered from the previous one. The eye is fooled into seeing continuous motion through the property known as the persistence of vision. There are 30 pictures or 'frames' per second, which is above the minimum requirement of 18 frames per second, to make the eye belive that it is seeing a continous motion.

Scanning process of frames

The moving electron beam is subjected to two motions simultaneously. One is fast and horizontal, and the other is vertical and slow, being 262 1/2 times slower than the horizontal motion. The beam gradually moves across the screen, from ~~left to~~ left to right, while it simultaneously descends almost imperceptibly. A complete frame is covered by 525 horizontal line ~~& Verti~~ & vertical lines which are traced out 30 times per second.

∴ Bandwidth requirement would be
525 × 525 × 30 samples per second
which is equal to 8268·750 samples
per second.
Hence bandwidth = $\frac{8268750}{2}$

BW = 4134375 $\left\{ BW = \frac{\text{Sampling rate}}{2} \right\}$

BW = 4.13×10^6 per second

BW = 4.13 MHZ

In order to avoid flickering, interlaced scanning technique is used in which each frame is subdivided into two fields. One field covers even-numbered lines, from top to bottom and the second field fills in the odd-numbered lines.

The Scene to be captured at the transmitting station are produced by a mosaic of photosensitive particles within the camera tube, on to which the scene is focused by optical means. They are scanned by an electric beam, whose intensity is modulated by the brightness of the scene. A varying

voltage output is thus obtained, proportional to the instantaneous brightness of each element. The varying voltage is amplified, impressed as modulation upon a VHF or UHF carrier and radiated.

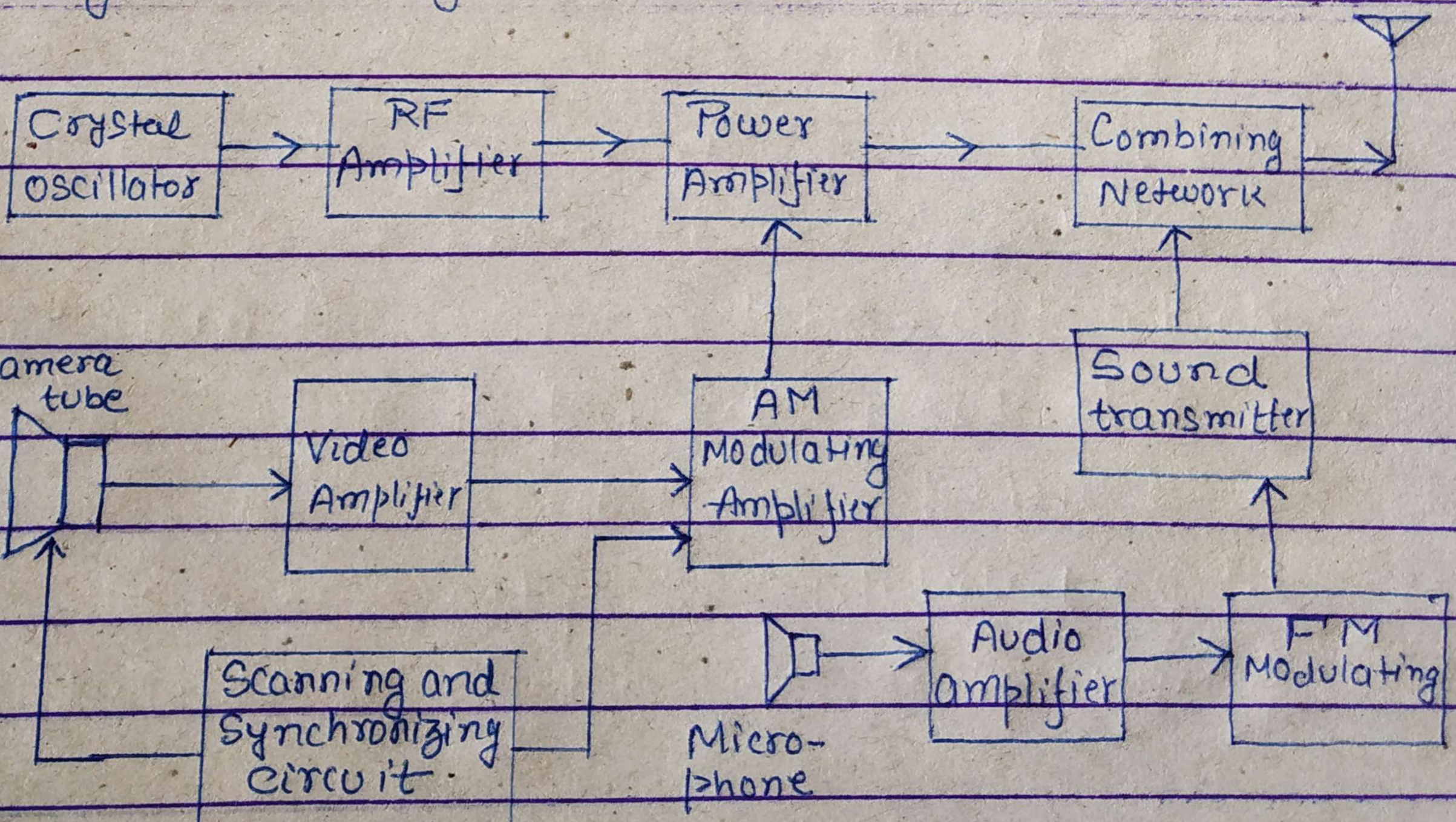
The need for the receiver picture tube to be exactly in step with that of the transmitter requires that appropriate information be sent. This is synchroni-zing or sync information, which is transmitted in addition to the picture information. The two sets of signals are interleaved in a kind of time-division multiplex and the picture carrier is amplitude modulated by this total information. At the receiver, signals derived from the transmitted sync control the vertical and horizontal scanning circuits, thus ensuring that the receiver picture tube is in step with the transmitter camera tube.

A seperate transmitter is used for sound, connected to the same antenna

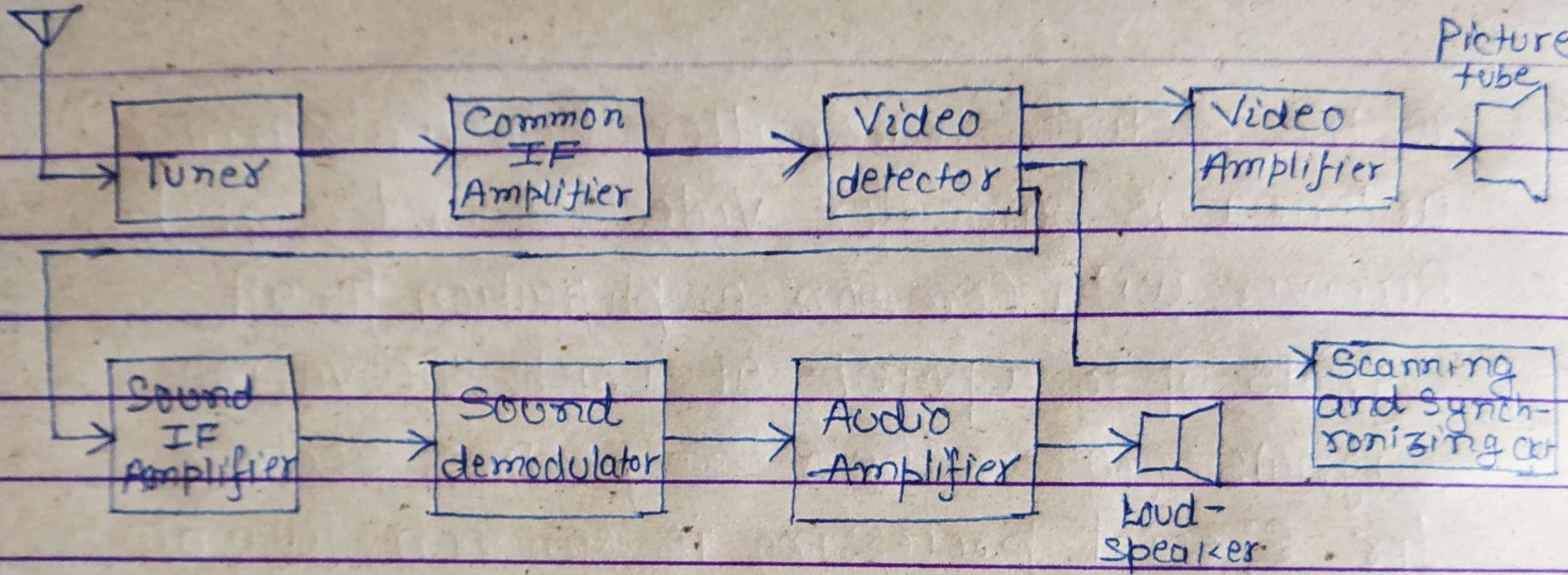
as the picture transmitter. However receiver antenna is same for video & sound signal. Receiver with common amplification for all signals up to a point at which the various signals go to their respective section for. Special processing is common idea at receiving end.

The sound signal is amplified, applied to its own detector, amplified again and fed to a loudspeaker. The modulating system used for sound is wideband FM. The transmitting frequency for the sound transmitter is quite close to the picture transmitting frequency.

A block diagram of a rudimentary television system is given below



Basic monochrome television transmitter system



Basic monochrome television receiver system