6.1 INTRODUCTION

Signal processing is a term that applies to all devices used to modify signals during recording and transfer operations. Such processors as compressors, equalizers, and reverberation devices are intended to modify the sound of a recording, often to a profound degree. Other processors, such as HF limiters, noise reduction systems, and distortion correction devices, are intended to improve the quality of the transmission channel itself and not to alter basic musical values.

There is a temptation for beginning engineers to overuse signal processors, especially equalizers. Typically, there is a tendency to correct faulty microphone placement through equalization when a far better solution would be a change of microphone or microphone location. Properly applied, signal processors can result in a superior product; improperly applied, they can ruin a recording beyond repair. Some processors, such as compression and equalization, are reversible to a degree, and some of the damage resulting from improper use may be undone. Excessive reverberation, on the other hand, cannot be removed from a recording.

Signal processors are divided into a number of categories for discussion in this chapter:

a. Frequency domain manipulation: equalizers and filters.


c. Time domain manipulation: delay, artificial reverberation.

d. Special effects.
6.2 FREQUENCY DOMAIN MANIPULATION

6.2.1 Equalizers and Filters

An equalizer is a device that alters the frequency response of a recording or monitoring channel. It is easy to lose sight of the original meaning and application of the term; the first equalizers were used in telephony and were for the purpose of making the output of a transmission line equal to its input. This basic function is shown in Fig. 6-1.

Because of line losses the output of a telephone line is rolled off at high frequencies, and it is standard practice to introduce a complementary network restoring those attenuated frequencies so that the integrity of the signal is maintained. By extension, the term equalizer has been applied over the years to devices, both fixed and variable, that provide variations in frequency response.

The earliest use of equalizers for recording was in the motion picture industry. The necessity of recording dialogue at various distances from the actors as dictated by the visual requirements of the scene meant that the recording engineer had to "equalize" the dialogue tracks if speech quality was to be consistent from scene to scene in the theater. A form of dialogue equalizer was developed, with curves as shown in Figure 6-2. The device had controls for LF, MF, and HF alteration, and the three sections interacted to make a composite curve.

More versatile program equalizers were developed during the fifties. These devices provided LF boost and attenuation, MF peaking functions with variable

![Input Signal](image1)

![Line Characteristics](image2)

![Equalizer Response](image3)

![Combined Response](image4)

**Figure 6-1.** Basic function of a transmission line equalizer.