CHAPTER 1
1.1. Introduction

Any instrumentation system consists of a number of sub-systems which are used to perform various functions like measurement, processing, recording and control. An instrument system generally consists of three major units: Input device/detector, signal conditioning or processing device and output device/display [1-9].

The input device receives the quantity under measurement and delivers a proportional electrical signal to the signal-conditioning device. The signal is amplified, filtered or modified to an acceptable form to the output device. The output device may consist any of indicating meter, CRT, recorder, LED/LCD display or data storage device. The selection of these system depend on various factors including accuracy and price [6].

The input quantity for certain instrumentation system may be non-electrical. In order to use electrical methods and techniques of measurements, the
non-electrical quantity is to be transformed into an electrical signal using devices commonly known as transducers [6]. Transducer is a sensing or detecting element that converts the (input) quantity being measured into generally an electrical quantity or some other equivalent form (output) for measurement. For example, a microphone provides an emf proportional to the sound pressure on the diaphragm. The output of transducers are further processed using Analog / digital systems.

1.2. Measurements

Microcomputers and personal computers have been recently used for data acquisition and analysis using A/D converters [1,2]. Instrumentation for signal processing plays a vital role as it is necessary to analyse the signal in amplitude and/or frequency domains. The conventional method of noise measurement requires equipment such as a sound level meter, sound spectrum analyser and recorder [3]. However, traffic noise being a time varying signal can be best analysed using the signal storage technique using sound recording
In the present work vehicular traffic noise were recorded on an audio (magnetic) recorder. The stored signals are analysed on reproduction after necessary conditioning. The amplitudes of the stored time varying signal were measured using the analog to digital converter described in the following chapters.

The signal storage technique used in this work is suitable for detailed analysis of the stored data [10,11]. The information of the amplitudes or probability amplitudes can be analysed. Since conventional type of equipment for such studies is quite expensive [12,13] and can be procured with compromise on quality or economic viability, an attempt is made to study traffic noise using signal storage technique[14]. The signals on reproduction are processed and measured. The digital information is analysed using software routines written in BASIC [15].
1.3. **Traffic Noise**

Undesirable sound is defined as noise. Traffic noise falls under the category of fluctuating noise [3] and can be analysed statistically. The industrial steady noise and impulsive noise of sound bursts (of less than one second duration) require different types of analysis [3]. Weighing network A is recommended for the analysis since its frequency response is quite similar to that of human ear [12] in the required frequency region. The sound levels are expressed in $d_{w(A)}$ accordingly [12].

Apart from the design aspects of acoustic filters used in vehicles, the noise measurement leads to specific conclusions regarding flow of traffic [13,14]. The traffic noise at pavements depend on the flow regularity of traffic, width of pavement, quantum of traffic and periodic obstructions to the traffic flow.

Noise control is essential in view of the pollution effects of noise [13]. Recommendations are availa-
ble both at international and national levels for measurements and control of noise [3]. No specific agency prevails in the country to enforce the noise limit of vehicles used on roads [14].

Traffic noise is measured in the present study at five busy locations of Anantapur, a district headquarters with a population of about 1.5 lakhs. Vehicular traffic is fairly heavy since it is situated on Bangalore-Hyderabad and Madras-Bellary highways.

The studies indicate that the noise level at least at three locations is larger than the recommended value during the peak hours. These locations are not safe for residential purpose [10,15].

The main stress of the present work is the preparation of the data acquisition system. However, the suitability of the system has been tested through the noise measurement application.