

CHAPTER 9  
DATA CONVERSION EQUIPMENT



## 9.1 INTRODUCTION

Five of the instruments used to collect data during the project produce data in a form incompatible with the computer used for analysis. Hence, transformation to a different format was needed. Various data conversion apparatuses were used to reformat the data.

The primary device was the Analog-to-Digital (A-to-D) converter. It transcribed, on 9-track magnetic tape, the analog output from the Profilometer. It also transformed the punched paper tape output from the Leopold and Stevens traffic counter, and converted data from the Dynaflect, and the cassette tape from the traffic flow data logger. The Weigh-In-Motion System printer was used to convert the cassette tape output from the recorder box to printed form. These processes are depicted in Figure 9.1.

The camera box output appeared on super-8 movie film and was projected by Bell and Howell 8mm stop-motion projectors for transcription as shown earlier in Figure 4.8.

## 9.2 EQUIPMENT DESCRIPTION

The A-to-D converter shown in Figure 9.2 is an instrument featuring a 9-track magnetic tape transport, a teletype machine with paper tape reader and punch, a SANGAMO analog tape recorder identical to the one supplied with the Profilometer, and a microprocessor control unit. The control unit is programmed to accept commands from front panel switches for various types of operations. The A-to-D operator thus does not need to possess any knowledge of data processing or electronics. The A-to-D was acquired specifically to handle the Profilometer transcriptions and was specially constructed for this project by Texas Microsystem, INC..

The Tone-to-Digital converter was used in conjunction with the A-to-D for converting cassette tapes to a Teletype-like format. For this use, the A-to-D was modified to allow the Baud rate to be changed via a toggle switch from the 110 Baud rate needed for the Teletype to a 300 Baud rate compatible with the Traffic Flow Data Logger output. The Tone-to-Digital converter is a unique device designed and built by the

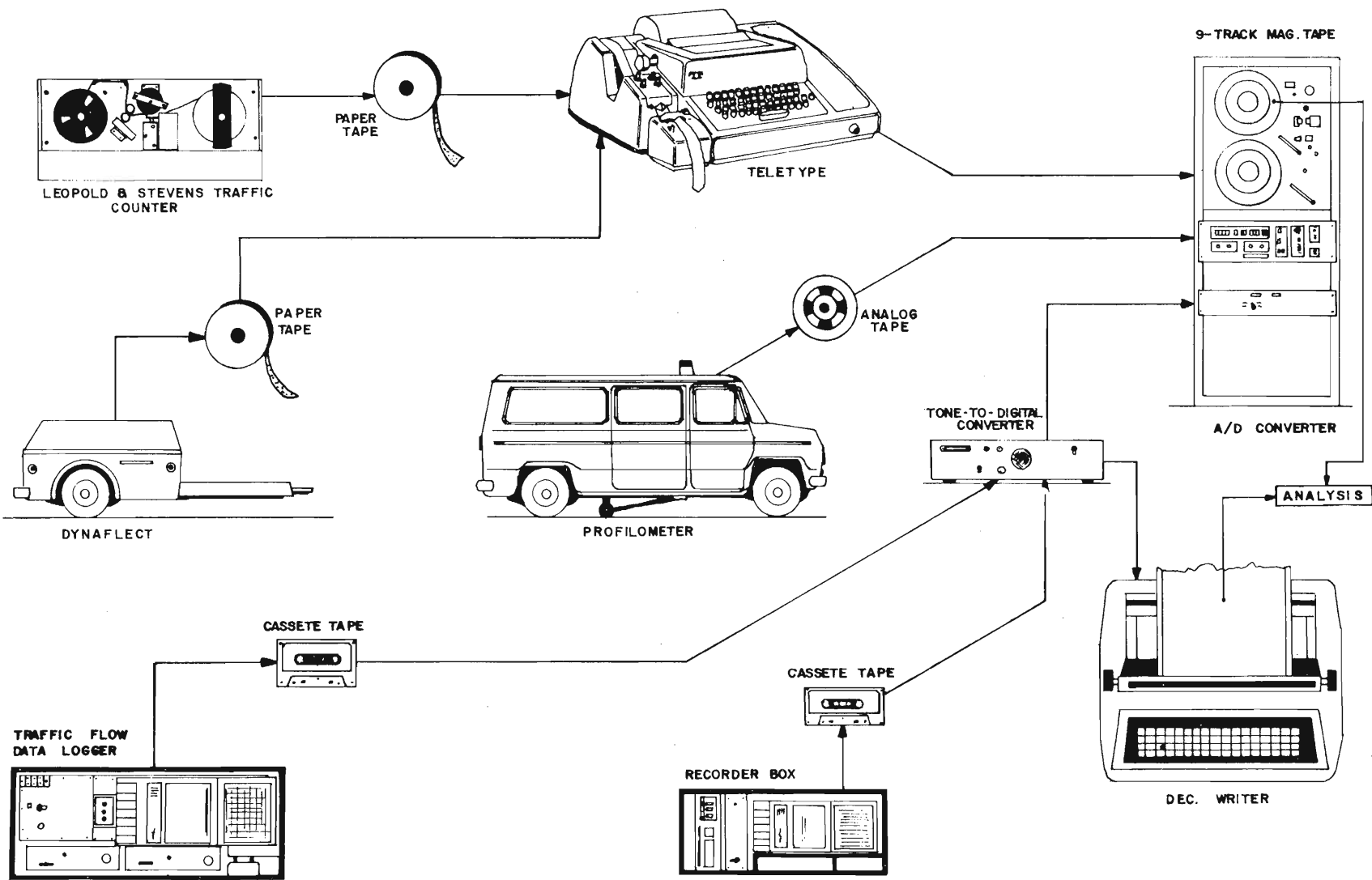


FIGURE 9.1 - DATA CONVERSION EQUIPMENT

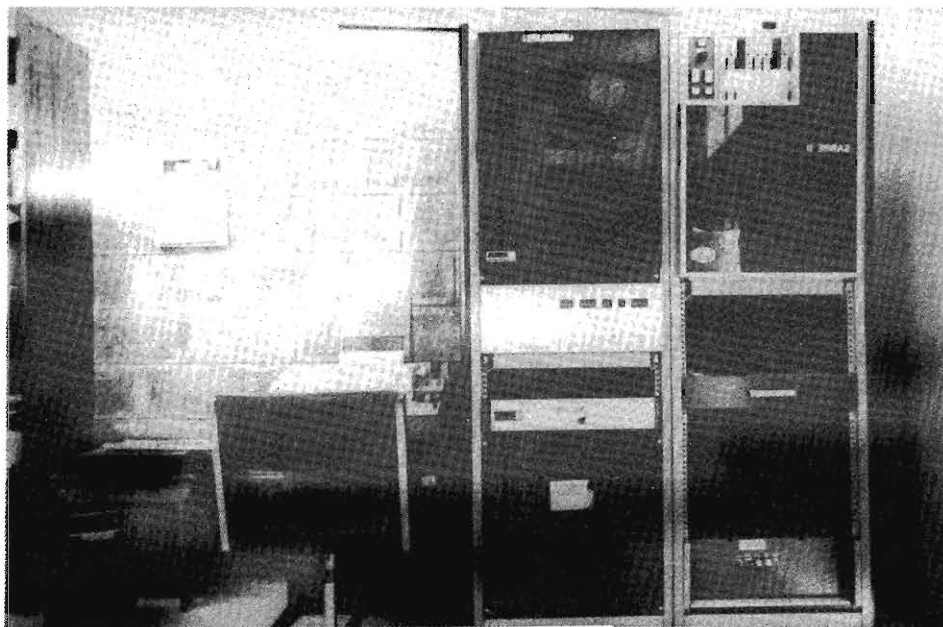


FIGURE 9.2 - A/D CONVERTER

Instrumentation Group and is described in a Project Instrumentation Memo (Linder, "Tone-to-Digital Converter").

The A-to-D also accepts punched paper tape via the teletype machine. In this mode of operation, a header record containing identifying information may be added to each magnetic tape file. Limited editing features were also included in this mode.

### 9.3 FIELD OPERATION

The main purpose of the A-to-D was to convert the analog road profile data from the Profilometer to a digital magnetic tape form for automatic entry into a digital computer for analysis. In this mode the SANGAMO tape recorder is played into a set of two digital converters which convert the profiles to digital form. The control unit then formats the data and transfers it to the 9-track tape transport.

The Tone-to-Digital converter was also used to convert the cassette tapes of the recorder box to a teletype-like format of 300 Baud rate for entry into the Digital Equipment Corporation printer. The printer format is contained on the cassette so a simple slave-type printer with a 300 Baud speed is adequate.

The Bell and Howell and Kodak projectors were used to display the output of the camera boxes on a viewing screen one frame at a time so that a clerk could copy the DMI and stopwatch reading on a coding form.

### 9.4 MAINTENANCE

There were problems with the A-to-D converter on several occasions. It was initially suspected that some problems had been caused by instable power delivery by the power company. Thus a voltage stabilizer was installed and special grounding was provided. However, the same problems reappeared with the equipment from time to time, until the end of the project. It was not possible to find the real cause of the problems, since they were intermitent. The equipment documentation (schematics, etc.) furnished by the manufacturer, Texas Microsystems, INC., was very badly presented and incomplete. Problems in the micro-

software of the converter were found and the manufacturer contacted. New EPROM memories sent by the manufacturer did not solve the problems.

The SANGAMO tape recorder suffered the same problems as those of the Profilometer mounted recorder, described earlier in Chapter 2.

The teletype machine and the Tone-to-Digital converter were maintenance-free. The Digital Equipment Corporation printer suffered a broken sprocket wheel which was repaired by gluing the wheel back together.

The Kodak projectors were manufactured for the home entertainment market and not intended to be used 40 hours a week for data reduction. Consequently, they failed and required repair.

#### 9.5 RECOMMENDED REPAIR FACILITIES

- One electronics engineer
- One senior electronics technician
- Oscilloscope
- Digital volt-ohm meter
- Frequency counter
- Function generator
- Hand tools

