CHAPTER 5
OPERATION OF THE MODEL

5.1 INTRODUCTION

The MST was programmed in FORTRAN IV, a language which permits its use in the IBM 370 and Cyber 127 computers. The Model consists of a main program (MST) and 17 subroutines, requiring a total of 76,000 octal words of memory. The files of results and data can be expanded to eliminate the present limitations of the Model. However, to make better use of computer time-sharing facilities while achieving a more rapid processing, the following limitations were temporarily established for the program:

(a) the maximum number of vehicles that can be processed at each time increment, in each lane, is 300;

(b) the maximum length of the section is 10 km;

(c) the maximum volume of traffic in each lane is 870 vehicles per hour. This is not a program limitation, but rather the Schuhl's headway distribution between vehicles. It may be possible to eliminate this limitation after the headway distribution obtained in the field is analyzed.

5.2 MODEL INPUTS

For the operation of the Model, two input files are necessary: the first - read on cards - consists of the following variables:

5.2.1 Section Description

LS = Length of section (km);
STN1 = Station at which output is requested - primary lane (km);
STNØ = Station at which output is requested - opposite lane (km);
SH = Shift between free-speed tables for the primary lane and opposite lane (km);

5.2.2 *Sample Description*

NIS = Sample size (total of both lanes);
VOL1 = Volume of traffic in primary lane (in vehicles/hour);
VOLØ = Volume of traffic in opposite lane (in vehicles/hour);
ARRAY1 = Percentage of each class of vehicles in primary lane;
ARRAY2 = Percentage of each class of vehicles in opposite lane;
ARRAY4 = Additional length of the vehicles of each class (meters).

5.2.3 *Headway Parameters*

IT = Time increment (seconds);
MH = Minimum headway (seconds);
AHR = Average headway of vehicles in queue (seconds);
UNH = Minimum free headway of the vehicles not in queue (seconds).

5.2.4 *Overtaking Parameters*

MN = Maximum number that can be overtaken in a queue;
MOT = Maximum overtaking time;
SPC = Speed differential to overtake automobiles, by vehicle class;
SPT = Speed differential to overtake heavy trucks, by vehicle class.

5.2.5 *Representation Options*

IPLOT = Graphic representation option IPLOT = 1 YES;
IPLOT = Ø NO;

DBUG = Option of representing numerically the position of the vehicles
DBUG = Ø NO;
DBUG = 1 YES;

PACTS = Time to start graphic or numerical representation (seconds);

PACTE = Time to finish graphic or numerical representatio (seconds).

5.2.6 *Location of 3rd (Climbing) Lane and STOP Sign*

SCL1 = Start of 3rd (climbing) lane - primary lane (km);
ECL1 = End of 3rd lane - primary lane (km);
SCLØ = Start of 3rd lane - opposite lane (km);
ECLØ = End of 3rd lane - opposite lane (km);
SSD1 = Distance of STOP sign in primary lane (km);
SSDØ = Distance of STOP sign in opposite lane (km);
VOL3 = Traffic volume in transversal highway (primary lane);
VOL4 = Traffic volume in transversal highway (opposite lane).

The second file consists of free-speed matrixes (see Tables 3.3 and 3.4) which are read from a disk file created by the MTC or by the SPEEDS Program. The data generated by the MST are stored outside the program in sequential files and are read when requested. The printer is used as output file.

5.3 *MODEL OUTPUT*

The output format was designed according to the types of data needed both for calibrating the Model, and for the applications it may have. In the Appendix, the output (for the primary and opposite lanes) of the simulation carried out on a 2-km section is presented, in which the free speeds in Tables 3.2 and 3.4 were utilized. The rate of traffic flow is 200 vehicles/hour in the primary lane, and 245 vehicles/hour in the opposite lane. The size of the sample is 100 vehicles (total of both lanes) and the sampling station is 0.5 km from

the start of the section. The MST simulation and operation times were 939 and 128 seconds, respectively, on an IBM 370/45, resulting in a ratio of 7.34:1 (actual time against simulation time). Ratios of up to 14:1 are obtained in highway sections that are shorter and characterized by a lesser degree of geometric complexity.

For each vehicle class, the Model calculates the statistics of travel time and fuel consumption (see Appendix). Fuel consumption is calculated at each time increment on the basis of vehicle speed, grade, surfacing type, and highway roughness.

5.4 *TRAFFIC-FLOW SAMPLING*

The traffic-flow sampling, at any point of the route, is only initiated after the first vehicles in each direction have covered the entire section. If initiated before, the simulation of overtaking operations would take place in an empty section, which would not reflect an actual traffic situation.

5.5 *SUMMARY*

The operation of the MST was described in this chapter. The following chapter will discuss the calibration and validation of the Model.