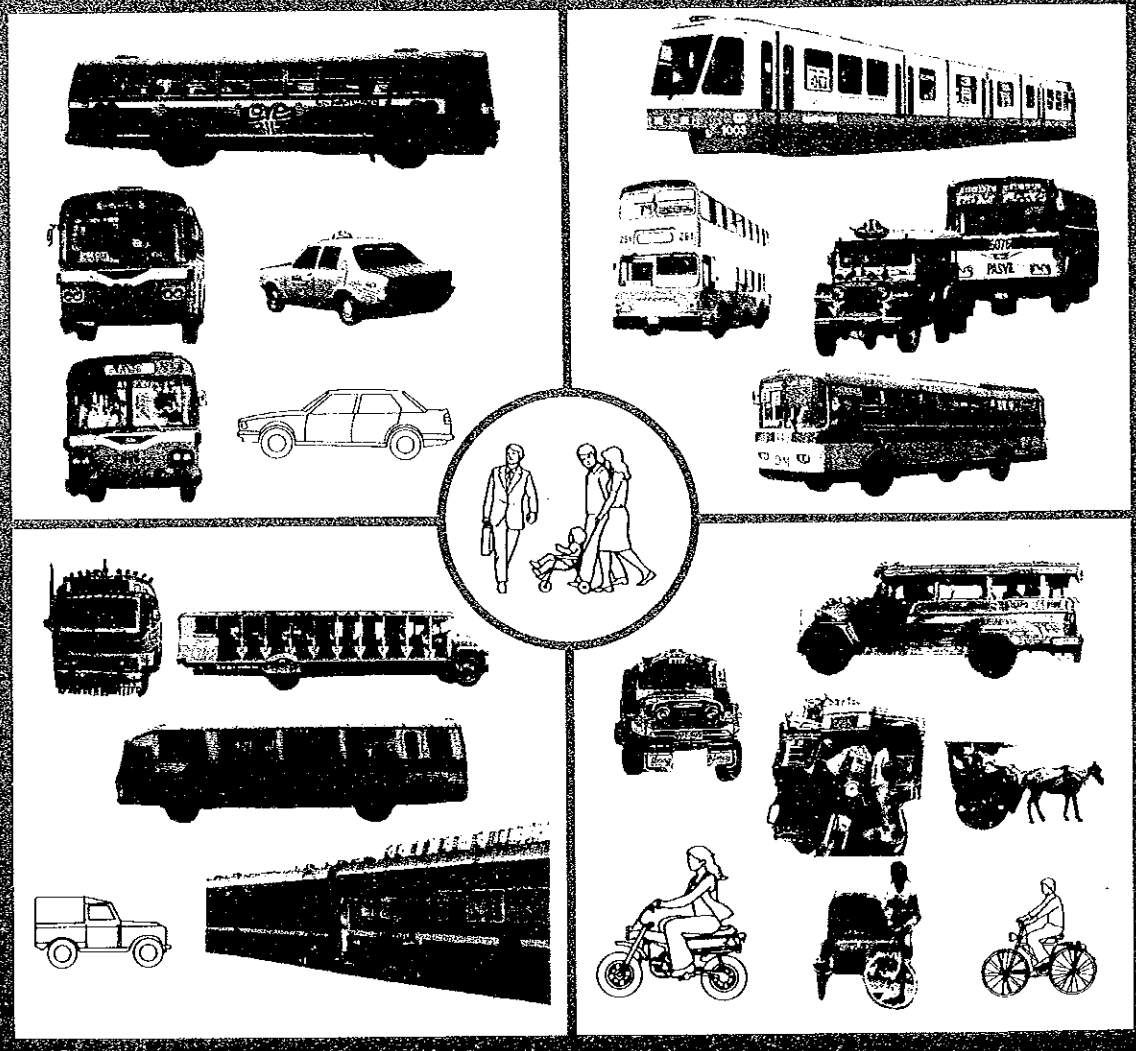
REPUBLIC OF THE PHILIPPINES

THE METRO MANILA TRANSPORTATION PLANNING STUDY (JUMSUT)

FINAL REPORT

MAIN TEXT

PART Ⅳ : Transportation Data Base and Planning Procedures



March 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF THE PHILIPPINES

THE METRO MANILA TRANSPORTATION PLANNING STUDY (JUMSUT)

FINAL REPORT

MAIN TEXT

PART Ⅳ : Transportation Data Base and Planning Procedures

March 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 13.
URBAN TRANSPORTATION SURVEYS

CHAPTER 13 URBAN TRANSPORTATION SURVEYS

13.1 INTRODUCTION

- Various surveys on urban transportation were conducted under JUMSUT. They are broadly classified into the following two groups:
  1) Surveys related to the Home Interview Survey
  2) Surveys related to the public transportation system, operation and demand characteristics.
- The Home Interview Survey (HIS) task covers the socio-economic aspects and travel demand of Metro Manila residents in a comprehensive manner. It requires detailed discussions and analysis which may be better dealt with indepedently. Therefore, this chapter only presents the surveys on public transportation, while HIS is fully described in Part V, i.e., chapters 16, 17 and 18.

13.1.1 Review of Existing Public Transport Data

- The major sources of information on public transport (i.e., bus, mini-bus and jeepney) are MOTC/BOT and the MMUTIP Study conducted in 1980. This study extensively covered several aspects of jeepney/bus transport. Data on all existing 66 bus routes and 83 jeepney routes (selected from a total of 609 existing routes) consisted of the following items:
  1) Route Information:
     a) route configuration and location
     b) route length
     c) service frequency (16 hours)
     d) average load factor
     e) number of passengers
  2) Operation Characteristics
     a) travel time and delay time
     b) number and reason of stops
     c) average annual kilometrage
     d) average number of trips per day
  3) Passenger Travel Characteristics:
     a) average trip length
     b) OD between stops
     c) trip purpose
     d) average waiting time
     e) transfer characteristics
- The MMUTIP data were further processed and summarized in the LRT Line No. 1 Study with particular regard to the travel characteristics of jeepney/bus passengers along the LRT corridor. This includes:
  a) OD distribution (unlinked trips)
  b) average trip length distribution
- Meanwhile, the MOTC/BOT data on Metro Manila public transport (except MMUTIP) are rather limited. The most important data provided by MOTC/BOT are on the administrative aspects of public transport, including franchise records kept by BOT and a jeepney/bus route list prepared by MOTC.

- In the light of the objectives of the JUMSUT Study, there was a need to up-date the MMUTIP jeepney/bus transport data for the following reasons:
  - Significant changes occurred in bus transport since 1980, such as phasing out of mini-buses from EDSA, introduction of some 1,400 new buses, and expansion of MMTC's experimental services.
  - There is a need to increase the coverage and accuracy of jeepney transport data especially those for the LRT corridor.
  - Significant changes occurred in jeepney operation due to the LRT construction.

13.1.2 Summary of Public Transport Surveys conducted under JUMSUT

- The major objectives of public transport surveys are:
  - to provide up-to-date information on routes and operation characteristics of jeepney and bus transport in Metro Manila with emphasis on those along the LRT corridor
  - to provide a basis to estimate the number of units currently operating along the routes
  - to obtain data necessary for planning public transport facilities, including roads and terminals.
- The surveys conducted in this study are:
  1) Public Transport Route Reconnaissance Survey: This intends to:
     a) prepare an initial list of public transport routes on which subsequent surveys shall be based;
     b) facilitate scheduling of the frequency count survey;
     c) understand initially the extent of unusual movements of public transport vehicles such as route deviation, trip cutting, etc.
  2) Jeepney/Bus Frequency Count Survey: This intends to:
     a) obtain frequency data by route and by hour;
     b) provide a basis for estimating the number of operating units by route;
     c) provide a basis for processing the data on operation characteristics by route particularly on data expansion.
  3) Operation Characteristics Survey: This intends to:
     a) obtain operation characteristics data including travel time, turn-around time and load factor by route and by time period for representative routes;
     b) provide a basis for estimating the number of operating units by route;
     c) provide a basis for route planning.
  4) Public Transport Facility Survey: This intends to:
     a) obtain data covering the physical characteristics and traffic volume of public transport roads and terminals;
     b) provide a planning basis for the improvement of public transport facility in connection with route planning.
  5) Ancillary Surveys: In order to provide information and the planning basis needed for evaluating policy guidelines, the rerouting study and facility study, different supplemental surveys were conducted. They were:

Table 13.1

Outline of Public Transport Surveys Conducted

Survey Name	Items Surveyed	Survey Coverage	Survey Method
1. Route Reconnaissance Survey	• Terminal Location • Panel Route Name	120 Stations within MMla.	Reconnaissance
2. Service Frequency Count Survey	• One-way Service Frequency by Route and by Hour	744 Routes (jeepney) 494 Routes (bus, by operator)	Roadside Count
3. Operational Characteristics Survey	• Location of Stop • Time of Arrival and Departure by Stop • No. of Passengers Boarding and Onboard by Stop	468 Routes (jeepney) 72 Routes (bus, by operator)	On-board Count and Observation
4. Public Transport Facility Survey			
4.1 Jeepney Terminal Survey	• Outline of Terminals • Characteristics Selected Terminals	270 Terminals 60 Terminals	Reconnaissance and Interview
4.2 Interview Survey at Selected Jeepney Terminals	• Characteristics of Drivers/Dispatchers • Characteristics of Jpy. Passengers	60 Terminals 6 Terminals	Interview
4.3 Bus Terminal Survey	• Outline of Terminals	113 Terminals	Reconnaissance and Interview
4.4 Tricycle Terminal	• Location • Service Area	193 Service Areas	Reconnaissance and Interview
5. Ancillary Surveys			
5.1 Jeepney/Bus Occupancy Survey	• Seating Capacity • No. of passengers on board	2 Stations – P. Burgos – R. Magsaysay (Jpy. 7,478 samples, Bus 4,471 samples)	Roadside Observation
5.2 Jeepney Fare Survey	• Actual fare paid in relation to travel distance	5 Routes (347 samples)	Onboard Observation
5.3 Jeepney Units Utilization	• One-week allocation of jeepney units and drivers	2 operators 2 Associations	Interview
5.4 Jeepney Passenger Walking Distance Survey	• Walking distance of jpy. passengers by time period, by trip purpose, by sex and by age	3 Stations – Monumento – T.M. Kalaw – Baclaran (919 samples)	Interview and Measurement
5.5 Jeepney Driver Interview Survey	• Revenue/expense • Operation details	147 Routes (943 samples)	Interview
5.6 Vehicle Operating Cost Survey	• Price of fuel, Oil, Vehicle, Tire, etc. • Wage • Insurance • Miscellaneous	3-10 samples for each cost item	Interview

a) Jeepney/Bus Occupancy Survey
b) Jeepney Fare Survey
c) Jeepney Units Utilization Survey
d) Jeepney Passenger Walking Distance Survey
e) Jeepney Drivers Interview Survey
f) Vehicle Operating Cost Survey

13.2 SERVICE FREQUENCY COUNT SURVEY

13.2.1 Route Reconnaissance Survey (Pre-Survey)

- In order to initially identify the existing routes and the level of frequencies which are needed to design the survey method and plan of frequency count more effectively, the reconnaissance survey was conducted at 120 stations. The stations were selected in and around the terminal areas. The survey covered the following:
  a) Preparation of sketches for jeepney/bus traffic flow at terminal/turning point areas.
  b) Observation of the panel route name and frequency level (average period of observation is 5 to 30 minutes depending upon the traffic level). The survey sheet is shown in Appendix 13.1.
- For standard bus, however, it was not necessary to conduct a reconnaissance survey since MOTC has provided JUMSUT an official list of bus routes by corporation. Necessary corrections on the MMTC route list were made by interviewing MMTC officials.
- The survey was conducted by five teams comprising of five MOTC counterpart staff and ten supervisors. It was completed in five days. During the survey, 610 jeepney routes and 27 mini-bus routes were observed.
- During the compilation of the results of the reconnaissance survey, the following were observed:
  a) Some routes, considered to be existing, were apparently missing;
  b) A few fictitious routes were included in the list. This was probably caused by misreading of panel routes;
  c) "Via" was neglected for some routes.

13.2.2 Service Frequency Count Survey

1) General

- The Jeepney Frequency Count Survey was conducted from December 13, 1982 to January 11, 1983, and the Bus Frequency Count Survey was conducted for three (3) days from January 12 to 14, 1983. However, since some routes had not been covered by the survey, a re-survey was carried out on January 17 and 18, 1983. The surveys were on a two-shift basis covering 16 hours from 6:00 a.m. to 10:00 p.m. during normal weekdays. The locations of survey stations for jeepneys and buses are presented in Figure 13.1.
- In counting jeepney service frequencies, two types of survey forms (as shown in Appendices 13.2 and 13.3) were used depending on the level of frequency. The survey form used for buses is given in Appendix 13.4.

- The survey schedule is presented in Appendices 13.5 and 13.6 for jeepney and bus, respectively. The overall manpower requirements was 1,290 man-days and 387 man-days for jeepney and bus, respectively, and 66 man-days for data compilation.

2) Jeepney Frequency Count

- The frequency count survey is classified into two types:

  1) **Terminal Count:** which was conducted for only one direction employing sixty (60) surveyors and six (6) supervisors per day. The survey stations were located near jeepney terminals and/or turning points. Each surveyor was assigned a maximum of four (4) routes depending on the expected level of frequency. Normally, the tally method was adopted but in the case of high frequency routes, manual counters were used.

  2) **Control Count:** was conducted either to check and/or complete whatever routes might have been missed in the terminal count. Forty (40) surveyors and four (4) supervisors per day were recruited to complete the survey. The stations were located in major corridors where routes can be covered to a maximum, like along bridges or at interchanges. Unlike the terminal count, this survey was conducted for both directions; manual counters were necessary to obtain accurate counts.

- During this survey, the jeepney route list obtained from the route reconnaissance survey was considerably modified for the following reasons:
  - More than 100 new routes, which were not covered by the route reconnaissance survey were found and added to the list.
  - Some routes were deleted from the list as fictitious or non-existent. This can be attributed to misreading of route names indicated on jeepney bodies.
  - Some routes were segregated according to different "vias".
- As a result, the number of jeepney routes has been increased from 610 (as obtained from the reconnaissance survey) to 744. The list of jeepney routes is presented in JUMSUT Supporting Document No. 5. Since this list is based on "panel routes", there are several routes considered to be the same under different names. Most of the existing jeepney routes in Metro Manila and its neighboring municipalities are expected to have been covered.
- The distribution of service frequencies of these 744 jeepney routes is presented in Table 13.2.

Table 13.2
Frequency Distribution of the 744 Jeepney Routes Identified in the Frequency Count Survey

Service Frequency (7-8 a.m., one way)	No. of Routes	% Share
0 – 4	244	32.8
5 – 9	119	16.0
10 – 29	177	23.8
30 – 49	81	10.9
50 – 99	88	11.8
100 and over	35	4.7
Total	744	100.0

- The results of the jeepney frequency count survey were compiled as shown in JUMSUT Supporting Document No. 6 using the form presented in Appendix 13.7.

3) Bus Frequency Count

- The frequency count of buses was conducted at 19 stations which were located near bus terminals. No control count was carried out considering the stability and simplicity of bus operation. However, this survey was conducted by bus corporation/company and by service type, unlike the jeepney survey.
- The service types for bus were classified into five (5) categories:
  - Ordinary
  - Limited Bus
  - Love Bus (Pag-ibig Bus)
  - Provincial Bus
  - Mini-bus

  Further, ordinary bus was divided into two vehicle types: ordinary and double-decker. The provincial bus was also classified into regular and air-conditioned.
- The number of routes by service type and by corporation/company covered in this survey is shown in Table 13.3. The complete list of bus routes is presented in JUMSUT Supporting Document No. 5. Most existing bus routes in and around Metro Manila were expected to have been covered.
- The service frequency was counted hourly from 6:00 a.m. to 10:00 p.m. during normal weekdays for each route by corporation/company and by service type. The distribution of service frequencies of the 197 bus routes (without segregation by corporation/company) is shown in Table 13.4. The results of this bus frequency count survey were compiled, using the form shown in Appendix 13.8, and presented in JUMSUT Supporting Document No. 6.

Table 13.3
Number of Bus Routes Counted by Service Type

Type of Service	No. of Routes Counted (by Corporation/Company)	No. of Routes 1/
Ordinary Bus	162	119
– Ordinary	3	3
– Double-Decker	5	5
Limited Bus	28	28
Love Bus (Pag-Ibig Bus)		
Provincial Bus	172	13
– Ordinary	6	0
– Air-Conditioned	118	29
Mini-Bus		
Total	494	197

1/ Long distance routes which serve the area beyond Bulacan Province in the North, and outside Cavite Province and a part of Laguna Province in the South were excluded.

Table 13.4
Frequency Distribution of 197 Bus Routes
Identified in the Frequency Count Survey
by Service Type

Service Frequency (7-8 a.m. One-way)	Ordinary		Limited Bus	Love Bus	Provincial		Mini Bus	Total	
	Stan-dard	Double Decker			Ordi-nary	Air-Con.		No.	%
0 – 4	68	3	2	23	11	0	17	124	62.9
5 – 9	22	0	3	3	0	0	4	32	16.2
10 – 29	26	0	0	2	2	0	7	37	18.8
30 – 49	1	0	0	0	0	0	1	2	1.0
50 – 99	2	0	0	0	0	0	0	1	1.0
100 & over	0	0	0	0	0	0	0	0	–
Total	119	3	5	28	13	0	29	197	100.0

13.2.3 Summary of Findings

- With regard to the jeepney panel routes, the following findings were made:
  a) The route names shown in the panel do not necessarily coincide with the actual names of street or places. Old street names are sometimes used.

     Example: Novaliches – Morayta (Old Name)
     L. Guinto – Makati (actually up to Guadalupe)
     Quezon Ave. (Talayan Village) – A. Bonifacio (actually up to Del Monte)

  b) The route names on the panel are not always the same even if actual operations are exactly the same.

     Example: Highway – Roces and EDSA – Roces
     Proj. 2 & 3 – Quiapo and Quirino 2 & 3 – Quiapo
     Proj. 2 & 3 – Pantranco via Kamuning, Proj. 2 & 3, Roces via Kamuning and Proj. 2 & 3 – Super Palengke via Kamuning

  c) The names and end terminals/turning points and "vias" are not placed in order.

     Example: San Juan – Meralco – Tropical
     Antipolo – Stop and Shop – Crossing
     Baclaran – P. Campa – Quiapo

  d) The panel routes are not always clear due to colouring, improper logotype, size, etc.

  e) In other areas, there are some jeepney routes commercially operating without any indication of routes on the panel.

     Example: Zapote – Carmona
     Zapote – Tagaytay City
     Zapote – Area
     Zapote – Silang

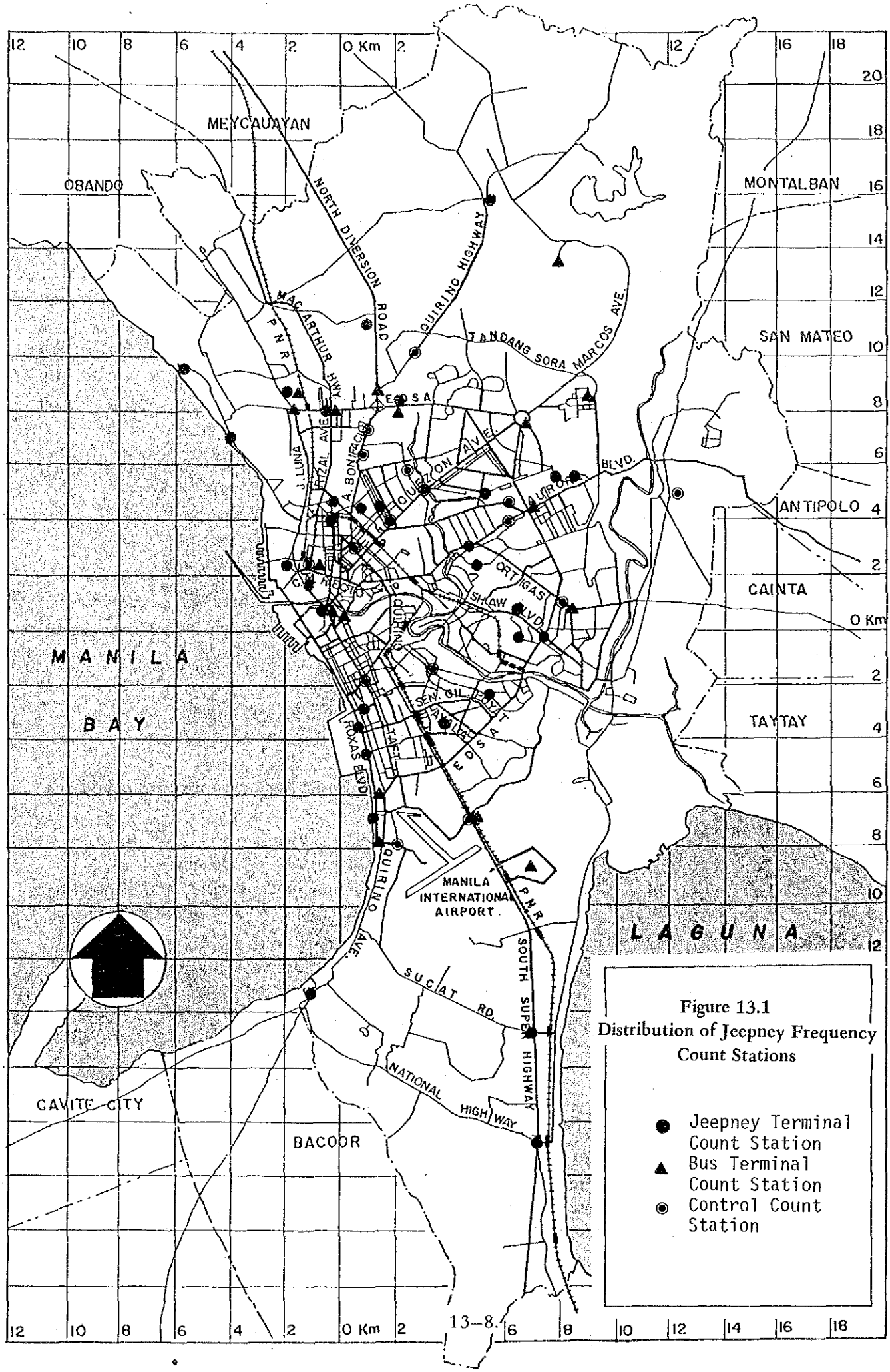


Figure 13.1
Distribution of Jeepney Frequency Count Stations

- Jeepney Terminal Count Station
- Bus Terminal Count Station
- Control Count Station

- With regard to bus routes, the following findings were made:
  a) Some routes have been suspended temporarily due to the LRT construction work.

     Example: Letre – Ayala via Sta. Cruz (MMTC)
     Monumento – FTI via Sta. Cruz (MMTC)

  b) MMTC developed many experimental routes while still retaining major conventional routes. Other bus corporations/companies also seem to be distributing their new units to new routes. As a result, the number of bus routes increased considerably since 1980, although the service frequency of these routes is generally low.

  c) Premium bus service showed a remarkable increase since 1980. The number of Love Bus routes (or Pag-ibig Bus) increased from 1 loop route in 1980 to 28 routes in January 1983. Moreover, the limited bus service was introduced in 1982; and as of January 1983, it was plying on 5 routes within Metro Manila.

  d) The mini-bus was phased out from EDSA in 1981. They are currently operating mainly along provincial routes going to Cavite, Binan, San Pedro, Tanay, Binangonan, Sapang Palay, Bulacan, etc. However, the number of routes remains almost unchanged; 27 in 1980 and 29 in 1983.

13.3 OPERATION CHARACTERISTICS SURVEY

13.3.1 General

- In order to create a public transportation data base, as well as to provide a planning basis for rerouting the existing public transport routes in view of the LRT implementation by 1984, this survey aims to produce detailed information on the following aspects:
  - number of bus/jeepney units operating by route
  - operating characteristics, including travel time and occupancy by route.

  The specific objective of the operation characteristics survey is to investigate the travel time, turn-around time and occupancy of bus/jeepney routes. By determining the turn-around time, the number of operating units by route could be estimated. The sample survey forms used are presented in Appendices 13.9 and 13.10 for jeepney and bus, respectively.
- The jeepney operation characteristics survey started on January 21 and was completed on February 3, 1983. The same survey for buses was carried out in parallel to that of the jeepneys from February 1 to 3, 1983. The survey schedule is given in Appendices 13.11 and 13.12 for jeepney and bus, respectively. The overall manpower requirement was 1,689 man-days for jeepney, 233 man-days for bus, and 785 man-days for coding.

13.3.2 Survey Method

1) Sampling
   - The sample routes were selected based on the following criteria:
     - Route integration process: representative routes which can cover other similar routes were selected.
     - Relative importance of the route in relation to the LRT corridor: routes which

are directly related to the LRT were selected.
- Level of service frequency: routes which have relatively high frequencies were selected.

- Considering the available resources of the study and objectives for analysis, the number of samples (number of round trips for each time period; morning, afternoon and evening) was determined as follows:

  5 for routes with hourly frequency of 100 or more;
  3 for routes with hourly frequency of 60 – 99;
  2 for routes with hourly frequency of 30 – 59;
  1 for routes with hourly frequency of 1 –29.

  However, for jeepney routes along the LRT corridor, the number of samples was doubled in order to analyze the impact of LRT on these routes more precisely.
- The time periods consist of the morning peak hour (7:00 – 8:00 a.m.), afternoon off-peak hour (1:00 – 2:00 p.m.) and evening peak hour (5:00 – 6:00 p.m.).
- The number of routes and round-trips sampled is given in the table below:

Table 13.5
Number of Routes and Round Trips Covered

Item	Jeep-ney	Bus						
		Ordinary	Double Decker	Limi-ted	Love	Prov'l.	Mini	Total
No. of Routes Surveyed	468	44	1	3	7	6	11	72
No. of Samples (Round Trips)								
Morning (7-8 a.m.)	1,078	41	1	3	5	6	11	67
Afternoon (1-2 p.m.)	957	21	0	2	5	2	2	32
Evening (5-6 p.m.)	931	18	0	1	2	2	2	25
Others	845	67	2	6	11	10	19	115
Total	3,811	147	3	12	23	20	34	239

2) Field Survey Method

- Each surveyor went on board a bus/jeepney of a predetermined route at a terminal and rode on it throughout the route. He continuously recorded the loading/unloading of passengers until he came back to the terminal where he started. If forced to alight at the destination terminal or turning point, he followed the vehicle while it was turning and boarded the same vehicle again for the return trip. Likewise, he had to follow the same vehicle at the origin terminal until he came back to his starting point.
- The supervisors assigned at terminals during the survey had to see to it that there was enough manpower to cover all necessary routes. He either assigned relievers or shifted surveyors from one route to another, to fill any gaps.

3) Data Coding

- All the data collected by surveyors were compiled using the forms presented in Appendices 13.13 and 13.14.

  a) "Location of Stop" was coded using road section numbers indicated on a road map prepared by JUMSUT. The total number of sections is 1,687, including Bulacan, Rizal, Cavite and a part of Laguna Province. Although the "Location of Stop" recorded on the survey form was usually discrete, it was coded continuously following the section numbers, even if no boarding/alighting passenger was observed. The same section number may appear twice or more if passenger loading/unloading occurred as well.

  b) Considering that the routes, at present, are fairly distorted from what they are supposed to be due to the LRT construction work, "Standard Route Configuration" was coded, using the same road section numbers, on the basis of the following assumptions:

     – the route follows basically the panel route name
     – no LRT construction is on-going
     – no trip cutting/extension is being practiced
     – no route deviation is being practiced

     This was done to facilitate comparison between samples as well as to presume the normal situation without being affected by the LRT construction.

  c) "Time Arrived and Departed" was coded as recorded on survey forms. Columns were left blank for sections where no passenger loading/unloading was recorded.

  d) "Number of Passengers Boarding and on Board" was coded similarly. The number of alighting passengers can be calculated using these data.

- Amount of data collected from these survey reached as many as 70,000 records. EDP framework and methodology were developed to process and compile the data and to tabulate different kinds of tables from different angles. The results are stored in magnetic tape, while their outlines are presented in JUMSUT Supporting Document No. 6.

13.3.3 *Summary of Findings*

- With regard to the jeepney operation, the following findings were made:

  a) Jeepney routes running along Taft Avenue, Rizal Avenue, and some other parallel streets are largely affected presumably due to the construction work of LRT especially along Taft Avenue. Most routes seem to have no fixed roads to pass. Most of "via Taft", "via Dakota" and "via Mabini/Harrison" jeepneys are running indiscriminately around M. H. del Pilar, Mabini, Adriatico, Leveriza, Park Avenue, Leon Guinto, Singalong, Zamora, etc. However, in the north of the Pasig river, "via Quiapo" and "via Sta. Cruz" jeepneys seem to be clearly segregated. This can probably be attributed to the traffic control/management measures undertaken in the area.

  b) Judging from the results of the operation characteristics survey, trip cutting is not so frequent as reported. However, in some congested areas like Divisoria and Baclaran, trip cutting at nearby intersections (Pasay Rotonda for Baclaran and

J. Luna/C.M. Recto intersection for Divisoria) was often observed. Although the practice is illegal, it seems reasonable from the viewpoint of jeepney operation and traffic management.

c) However, there are some routes where jeepneys always cut trips. Hence, the panel route is different from the actual operation.

Example: Guadalupe – Pasig via Pateros (up to Pateros only)
Alabang – Marikina via Pasig, San Joaquin (up to San Joaquin only)
Cubao – Pasig via Santolan (up to Rosario junction only)

d) Trip extension is often observed in most cases when no turning circuit is provided for the route.

Example: San Juan – Highway
(actually up to Meralco because no U-turn is allowed at EDSA)

There are also cases when the route is suppose to terminate at places where the demand is small.

Example: Leon Guinto – Makati
(actually up to Guadalupe where a large demand is expected)

e) As stated earlier, in some peripheral areas like Novaliches and Zapote, there are jeepneys commercially operating without any indication of a route name. They are considered to be colorum jeepneys disguised as private jeeps. They usually wait for passengers at the roadside, and as soon as they become full they close the rear door and leave for their destination. This type of jeepney has also been observed in Cubao.

Example: Lagro – Cubao
Fairview – Cubao

- With regard to the jeepney terminals/turning points, the following findings were made:

a) Some terminals/turning points along the LRT corridor were displaced or largely affected because of the construction work.

Example: Cartimar (merely a jeepney garage at present)
Taft Ave./Libertad (converted into illegal commercial stalls)

b) In contrast, some turning points are busier and congested due to the LRT construction.

Example: Pasay Rtda. (became congested because of the trip cutting of many Baclaran-bound jeepneys)
Pier South (jeepneys going to the South changed their destination)

c) Aside from the impact of the LRT construction, some jeepney terminals/turning points are considered already saturated. Jeepneys coming from different directions have to terminate at a common point thus resulting in traffic snarls. However, the more important reason is presumably the lack of turning points/terminal facilities. In most of the large terminals including Divisoria, Quiapo, Blumentritt, Baclaran, Guadalupe and Cubao, turning points are already scattered throughout the area. The existence of parking vehicles, hawkers, street vendors, etc., as seen typically in Divisoria, also decreases the turning efficiency.

- With regard to the bus operation, the findings made were as follows:

a) During the frequency count survey and on-board operation characteristics survey, it was often observed that most buses indicated only their destinations without showing origins. Although this does not cause much inconvenience to passengers, some difficulties were encountered during the field survey.

b) Some buses change their panel route names on the way to their destination. This implies the possibility that the same bus units are utilized in different routes.

Example: UE Caloocan – FTI via EDSA, Ayala
(from UE Caloocan, the panel route is Ayala, then it is changed to FTI at Ayala terminal)

c) Judging from the MMUTIP data, a few new terminals have been established in 1981 or 1982.

Example: FTI
UE Caloocan
Letre

13.4 PUBLIC TRANSPORT FACILITY SURVEY

13.4.1 Jeepney Terminal Survey

- This survey aims to determine the characteristics of the existing jeepney terminals. It was divided into the following two (2) steps:

First Step	–	General reconnaissance survey on the existing 270 jeepney terminals which cover all origins/destinations of jeepney routes.
Second Step	–	Detailed reconnaissance and interview survey on 60 terminals selected as typical from the above mentioned 270 terminals.

- The first step comprises the following:
  - Location and on-road/off-road
  - Landuse of the adjacent area
  - Other modes of transport in the terminal
  - Jeepney queueing
  - Others
- The second step was carried out using the form given in Appendix 13.15 for the 60 terminals listed in Table 13.6. The surveyed items are:
  - Jeepney flow line by route
  - Location and number of units of jeepney queues
  - Location of bus terminals/stops nearby
  - Tricycle stagnant/parking area
  - Passenger stagnant/waiting area
  - Landuse of adjacent area
  - Location and number of station dispatchers and traffic police, if any
  - Traffic control of adjacent areas
  - Physical characteristics of major roads nearby
  - Terminal fee, if any
- The results are presented in JUMSUT Supporting Document No. 7, while some major findings of this survey are as follows:

a) Most of the jeepney terminals surveyed are on-the-road.

b) Jeepneys using on-road terminals hinder other traffic due to queueing and stagnancy. However, this is generally not a serious problem in the outskirts of Metro Manila where traffic is not heavy.

c) Although there are many off-road terminals, most of them are gas stations except Crossing, Guadalupe, Monumento and Alabang.

d) In general, passengers and jeepneys are not well segregated in jeepney terminals.

e) In most terminals, jeepney is linked with either bus or tricycle.

f) The land use of adjacent areas is mainly commercial, where passengers are generated for the jeepney. However schools are also a major source of passengers inside EDSA.

Table 13.6
Selected 60 Terminals

Terminal Type	Name of Terminals
1. LRT-Related Terminal	Monumento, Blumentritt, Recto, Quiapo, Manila, City Hall, T.M. Kalaw, L. Guinto, V. Cruz, Libertad, Pasay Rtda., Baclaran
2. Large-Scale Major Terminal	Divisoria, Pier South, Espana Rtda., Sta. Mesa/Stop and Shop, JRC/Kalentong, Cubao, Crossing, Guadalupe, Ayala
3. Terminals within EDSA	
1. Medium-Large-Scale/Terminating	Boni/Pinatubo
2. " /Intermediate	Binondo, Balintawak, Kamuning, Washington
3. " /Passing-Through	Q.I., PRC/Del Pan
4. Medium-Scale/Terminating	Santol, Evangelista
5. " /Intermediate	Paco, Retiro, San Juan
6. " /Passing-Through	Espana/M. dela Fuente, Del Monte/A. Bonifacio
7. Small-Scale/Terminating	CCP Complex
8. " /Intermediate	Manuguit, West Ave./Quezon Avenue
9. " /Passing-Through	Bustillos, Frisco
4. Terminals outside EDSA	
1. Medium-Large-Scale/Residential	Sucat
2. " /Local Base	Pasig (T.P.), Alabang, Zapote
3. " /Subdivision	Fatima Village
4. Medium-Scale/Residential	Malinta, Calumpang
5. " /Local Base	Tandang Sora, Malabon, Marikina, Muntinlupa
6. " /Subdivision	Fairview, Nichols
7. Small-Scale/Residential	Pasig (San Joaquin)
8. " /Local Base	Polo, Philcoa
9. " /Subdivision	Project 8, Novaliches (Urduja), SSS Village

13.4.2 Interview Survey at Selected Jeepney Terminals

1) Interview Survey of Jeepney Drivers and Dispatchers

- This survey aims to collect the information regarding operation characteristics of of jeepney terminals and jeepney units as well as problems and different types of terminal fees, by interviewing jeepney drivers and dispatchers of 60 selected terminals. This will contribute to the analysis of terminals' operation. The questionnaire forms are shown in Appendices 13.16 and 13.17 for jeepney drivers and dispatchers, respectively.
- The number of interviewed samples was 705 for drivers and 115 for dispatchers. The overall number of sampled drivers was five for each jeepney queue. For dispatchers, however, as many samples as possible were taken. The role of the dispatcher is to control the movement of jeepneys at turning points.

2) Interview Survey of Jeepney Passengers at Selected Terminals

- This survey aims to know the characteristics of jeepney passengers with particular regard to the walking movement at terminals. The survey was conducted by interviewing passengers and plotting the walking movement lines on a large-scale map.
- This survey was carried out at six selected terminals. Number of samples taken was approximately 50 for each jeepney queue. A total of 3,363 samples was taken. The number of interviewed passengers by terminals is shown in Table 13.7.

Table 13.7
Number of Interviewed Jeepney Passengers by Terminal

Terminal	No. of Samples
Monumento	448
Blumentritt	941
Quiapo	709
Divisoria	515
Cubao	469
Baclaran	886
Total	3,363

3) Summary of Findings

- The results of the interview survey of jeepney drivers and dispatchers showed the following:
  a) Most of the jeepney units are not owned by drivers. In other words, drivers are employed by owners.
  b) Most jeepney drivers (97%) only drive on one route.
  c) Regarding waiting/parking time of jeepneys, 92% wait less than 30 minutes, out of which 58% wait less than 15 minutes during peak hours. During off-peak hours, however, only 24% wait less than 30 minutes and 40% wait 45 to 60 minutes. Although a large number of units utilize the terminal during

peak hours, the number of stagnant units in the terminal is less due to the short waiting time. On the other hand, a large terminal space becomes necessary during off-peak hours due to stagnancy.

d) Judging from the drivers' comments, majority of them consider the terminals "convenient". Although they pointed out problems which include danger, congestion and poor facility (mainly road pavement), it seems that they do not have a firm concept of a terminal.

e) The terminal fee is paid by drivers on trip basis or daily basis to associations, dispatchers and gas stations (jeepneys using gas stations as turning points only). The payment to the association is made mostly on a daily basis, while those to the dispatcher and gas station are made mainly on a trip basis.

f) The payment for the terminal fee is as follows:

- To association – ₱0.5/trip, ₱1.0-5.0/day
- To dispatcher – ₱0.25-1.00/trip, ₱1.0-2.0/day
- To gas station – ₱0.25-1.00/trip, ₱1.0-3.0/day

These figures may be used as the criteria in evaluating the financial viability for terminal development.

g) The number of dispatchers is usually one (1) to three (3) for each queue. They are employed by associations or gas stations.

h) Number of routes controlled by one dispatcher (or a group of dispatchers) is usually one (approximately 80%). Dispatchers (or their groups) controlling three (3) or more routes are negligible.

i) In general, dispatchers stay at a fixed station (84%). However, depending upon the traffic situation, dispatchers may instruct drivers to shift the queue as long as it does not hinder other traffic.

j) Dispatchers perform the following tasks:

- Guidance/calling of passengers
- Adjustment of queue
- Collection of data for controlling vehicles and calculating fees
- Adjustment of dispatching intervals
- Collection of terminal fees

k) The daily working hours of dispatchers are usually long; only 20% work less than 8 hours and 30% work more than 13 hours.

l) The average daily income of dispatchers is ₱20 to ₱40.

- The results of the interview survey of jeepney passengers at major terminals indicate the following:

a) Among jeepney passengers who make transfers at terminals, approximately 40% make transfers between the same mode.

b) Out of six (6) major terminals surveyed, passengers transferring from jeepney to jeepney are found mainly at Blumentritt, Quiapo, and Divisoria. Passengers transferring between bus and jeepney have a share of approximately 20% of the total transfers at Cubao, Monumento and Baclaran while passengers transferring between jeepney and tricycle is approximately 8% at Monumento and Blumentritt.

c) Although most passengers (91%) consider the surveyed terminals as safe, the percentage of those who answered "dangerous" is relatively high at Baclaran, Blumentritt and Divisoria, where vehicles and passengers are mingled on road.

d) Ninety three percent (93%) of the interviewed passengers answered that it is "easy to find their route," reflecting presumably the daily practice.

e) The average walking distance of jeepney passengers within a terminal area differs largely by terminal. Monumento showed the longest average walking distance of 254 meters, while Baclaran showed only 96 meters. However, it should be noted that the actual walking distance of jeepney passengers from their origin to their destination may be longer than the one surveyed due to the distance outside of the terminal.

f) Average walking distance of transfer passengers is shorter than non-transfer passengers. By trip purpose, it is relatively long for "to home", "private", "shopping" and "to school".

13.4.3 Bus Terminal Survey

- The main objectives of the this survey are: 1) to know the change in terminal location from that of 1980 when the MMUTIP surveys were conducted, and 2) to collect information on the general characteristics of bus terminals.
- The survey was conducted for all existing bus terminals/turning points in Metro Manila using the form presented in Appendix 13.18 and covering the following items:
  - Location and on-road/off-road
  - Landuse of adjacent areas
  - Other modes of transport in the terminal areas
  - Bus queueing, if any
  - Others
- As a result, 122 bus terminals/turning points were identified within Metro Manila. The breakdown of these terminals is shown in Table 13.8.

Table 13.8
Number of Bus Terminals/Turning Points Identified

	Terminal	Turning Point	Garage	Total
City Bus [1/]	34	31	9	74
Provincial Bus	32	0	0	32
Mini-Bus	11	4	0	15
Total	77	35	9	121

[1/] Includes standard ordinary bus, double decker, limited bus and love bus.

- The results are shown in JUMSUT Supporting Document No. 7, while some major findings taken from this survey can be summarized as follows:
    a) The distribution of bus terminals/turning points is centered on three (3) concentric circles, i.e., EDSA, C-2 (Tayuman/Mendoza/Nagtahan/P. Quirino) and C-1 (C.M. Recto/Ayala Blvd.)
    b) Within C-1: bus terminals are concentrated in Divisoria and Quiapo areas, where many mini-bus terminals/turning points are seen.
    c) Along C-2: most of bus terminals are those of provincial bus. They are generally small in scale; Dimasalang and Espana are the representative areas.
    d) Along C-4 (EDSA): most terminals are concentrated in Monumento/Sangandaan, Cubao, and Pasay Rtda./ Baclaran, where a mixture of city bus and provincial bus is observed. Large-scale jeepney terminals/turning points exist around these terminals.
    e) Aside from garages, there are 47 off-road bus terminals/turning points, out of which 16 are not equipped with any facility and 22 are for the provincial bus.

13.4.4 Tricycle Terminal Survey

- This survey aims to know the service area and general operation characteristics of tricycles including pedicabs in Metro Manila.
- The survey was conducted by way of reconnaissance and interior of tricycle drivers using the form presented in Appendix 13.19 with the following items:
    - Location of terminal
    - Service area
    - Landuse of the adjacent areas
    - Other modes of transport in the terminal
    - Age of establishment of the terminal
    - Hours of operation
    - Terminal related fees
    - Others
- As a result, 276 tricycle terminals were identified in conjunction with the 193 service areas within Metro Manila. Although most service areas have one terminal each, two or more terminals may belong to one service area if it is wide.
- The results are shown in JUMSUT Supporting Document No. 7, while some major findings from this survey can be summarized as follows:
    a) Tricycle provides feeder service for the jeepney in most cases. Consequently, the service area stretches to major public transport corridors.
    b) No tricycle service area is seen inside C-2. Also, there is no tricycle service in some high income areas.
    c) The tricycle goes out of its service area sometimes. However, they do not pick up passengers there.

13.5 ANCILLARY SURVEYS

- Public transport ancillary surveys were carried out from time to time when the need arises for planning purposes. The scale of the surveys is small and some of them were conducted even without survey forms.

13.5.1 Jeepney/Bus Occupancy Survey

- This survey was designed to know the hourly variation of the occupancy of jeepney and bus, which is useful to determine the peak hour and its ratio. The following two (2) stations were selected for this survey:
  - P. Burgos (infront of Manila City Hall)
  - R. Magsaysay (infront of Traffic Control Center)
- Jeepneys and buses passing these stations were selected at random (approximately every 30 and 60 seconds for jeepney and bus, respectively) and their seating capacity and number of passengers on board were counted and recorded together with the time. The survey was conducted from 6:00 a.m. to 10:00 p.m. The survey form used is presented in Appendix 13.20. The number of samples obtained for this survey is presented in Table 13.9.

Table 13.9
No. of Samples Obtained for
the Jeepney/Bus Occupancy Survey

Station	Direction	No. of Samples		
		Jeepney	Bus	Total
P. Burgos	NorthBound	1,747	1,472	3,319
	SouthBound	1,936	1,340	3,276
	Total	3,683	2,812	6,495
R. Magsaysay	WestBound	1,921	753	2,674
	EastBound	1,874	906	2,780
	Total	3,795	1,659	5,454

- The results are shown in JUMSUT Supporting Document No. 6, while some major findings from this survey are as follows:
  a) There is no significant peak hour. However, judging from the load factor observed, the peak hour is considered to be 5 to 6 p.m. at the two (2) stations above.
  b) The load factor of bus (84%) is higher than that of jeepney (70%) at R. Magsaysay. However, that of jeepney (66%) is higher than that of bus (48%) at P. Burgos.

13.5.2 Jeepney Fare Survey

- In order to initially determine the discrepancies between the authorized fare structure and actual fare paid by passengers, JUMSUT conducted a pilot survey on the current practice among jeepney drivers and passengers. The following five routes were selected for the survey:

1) Baclaran-Blumentritt via Sta. Cruz/Mabini (12.7 Kms)
2) Blumentritt-Recto (2.8 Kms)
3) Baclaran-Project 2 & 3 via Timog/Taft (19.1 Kms)
4) Antipolo-JRC (23.3 Kms)
5) Bel-Air-Washington (2.9 Kms)

Three of the above routes are related to the LRT (1, 2 and 3), two routes are shorter than 5 Kms. (2 and 5), and one route stretches outside Metro Manila (4).

- The survey was carried out by two (2) surveyors by:

1) interviewing drivers about the fare they charge
2) observing the actual payment of on-board passengers.

A total of 347 samples were obtained for the survey as summarized in Table 13.10.

Table 13.10
No. of Samples Obtained for
The Jeepney Fare Survey

	Route	No. of Samples by Trip Length: 5 kms. and over	less than 5 kms.	Total
1.	Baclaran-Blumetritt via Sta. Cruz/Mabini	98	50	148
2.	Blumetritt-Recto	–	5	5
3.	Baclaran-Proj. 2 & 3 via Timog/Taft	89	73	162
4.	Antipolo-JRC	15	7	22
5.	Bel-Air-Washington	–	10	10
	Total	202	145	347

- The results are shown in JUMSUT Supporting Document No. 6, while some major findings derived from the survey are as follows:

a) For shorter routes (route length of less than 5 kms.), the amount of fare paid by a passenger is exactly 65 centavos.

b) For longer routes, however, the amount paid is not necessarily according to the authorized fare structure.

c) Drivers start to charge higher than 65 centavos even before 5 kms.; especially in the Blumentritt-Baclaran via Sta. Cruz/Mabini route where passengers pay 70 to 75 centavos for a distance of 3 to 4 kms.

d) Normally, passengers pay more than they are supposed to. This is particularly the case for shorter distances. However, the amount of fare paid over the long distance comes closer to the authorized one.

e) Judging from the survey results of two routes, i.e., Blumentritt – Baclaran and Project 2 & 3 – Baclaran, there is no fare fluctuation by day of the week.

f) Although slight discrepancies were sometimes observed among drivers, it is considered that there is little fluctuation of fare for the same road sections.

g) The survey shows that the fare increase is as follows:

Baclaran – Blumentritt Route:
65/75/80/90/100/125/130/135/140/150/160/170/175

Baclaran – Proj. 2 & 3 Route:
65/70/75/80/90/100/110/120/130/140/150/160/170/175/180/185/190/200/210/220/230/240/260/270/290/300

Antipolo – JRC Route:
65/70/80/100/120/130/140/150/160/170/180/200/225/300

h) For the remaining two short routes, the fare was constant at 65 centavos, although another 65 centavos is charged when passengers travel beyond the terminal point.

i) The results of the survey indicated that giving student discounts is not usually practiced by jeepneys. In most cases, it was refused by the drivers.

j) However, in the JRC-Antipolo route, jeepney drivers accepted the discount in some limited sections such as:

JRC to Brookside (₱1.60 to 1.50)
JRC to Antipolo (₱3.00 to 2.65)

13.5.3 Jeepney Units Utilization Survey

- In order to estimate the utilization of jeepney units and drivers' working shift and hours, interviews were conducted with two operators and two jeepney drivers' assocations. They are:

a) Operator A:

1) No. of franchised units	:	68
2) No. of units operated by himself	:	8
3) No. of units rented out under "Kabit System"	:	60

b) Operator B:

1) No. of franchised units	:	54
2) No. of units operated by himself	:	14
3) No. of units rented out under "Kabit System"	:	40

c) Association C:

1) No. of registered units	:	55

d) Association D:

1) No. of registered units	:	75

The jeepney units utilization data were obtained on June 6-12, 1983 for the two operators and on Sept. 12-18, 1983 for the two associations.

- The jeepney units utilization ratio can be calculated as follows, based on Table 13.11:

1) No. of Units Surveyed : 151 units
2) No. of Units Operated during the Week : 139 units
3) No. of Total Vehicle-Days for the Week
   - Monday through Friday : 619 vehicle-days
   - Saturday and Sunday : 209 vehicle-days
4) Vehicle Availability Ratio : 0.921 (= 139/151)
5) Vehicle Utilization Ratio
   - Weekly Average 0.783 (=828/1057)
   - Weekday 0.820 (=619/755)
   - Weekend 0.692 (=209/302)

Table 13.11
No. of Operated Jeepney Units by Day of the Week

Item	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
Total No. of Units	151	151	151	151	151	151	151
No. of Utilized Units	123	123	119	129	125	109	100
Vehicle Utilization Ratio (%)	81	81	79	85	83	72	66

- In addition to this, drivers' working shift and hours were surveyed for the two operators. However, drivers' working shift is different between operators A & B. All drivers work on one shift for the former, while most of the drivers work on two shifts for the latter. The results are as follows:

1) Total no. of drivers sampled : 23
2) Total no. of working days/week : 96
3) Total no. of working hours/week : 1,384
4) Ave. no. of working days/week/driver : 4.2
5) Ave. working hours/week/driver : 60.2
6) Ave. working hours/working days/driver : 14.3

13.5.4 Jeepney Passenger Walking Distance Survey

- In the complete absence of data regarding the walking distance of residents in Manila, this survey intends to give an idea of the walking distance of jeepney passengers. The following three (3) stations were selected:
  - Monumento (corner of Victory Liner)
  - T.M. Kalaw (intersection with Taft Ave.)
  - Baclaran (Mexico Road/Quirino Ave. Intersection)
- The survey method adopted is basically interviewing jeepney passengers. The interview items are:

1) Sex (mostly judged by the surveyors)
2) Age
3) Occupation (service administrative, etc.)
4) Purpose for walking (work, school, private, etc.)
5) Facility of origin (own house, shop, etc.)
6) Facility of destination (same as above)
7) Origin point on a 1:2500 map
8) Destination point on a 1:2500 map

Since the interviewed persons are jeepney passengers, either one or both of the "Facility of Origin/Destination" are jeepney stops. The distance between the plotted points of origin/destination of the walking trips were measured later in the office and coded in conjunction with other items.

- The results are shown in JUMSUT Supporting Document No. 6, while some major findings from this survey are as follows:

  a) Most of jeepney passengers walk less than one (1) kilometer with an average of 200 to 300 meters.

  b) There is little change in the walking distance distribution by time period of day, by sex, by occupation, and by age group.

  c) By purpose, it seems that "private" and "others" have less walking distance than other purposes, although the extent is considerably different by station.

  d) In general, the walking distance to/from "shops", "theaters" and "jeepney stops" is short. It is to be noted that the walking distance to/from "bus stops" is 80-180 meters longer than that to/from "jeepney stops."

13.5.5 Jeepney Drivers Interview Survey

- This survey aims to supplement the existing data regarding the operation and financial condition of jeepneys, which have been estimated from the previous JUMSUT surveys. The following eleven (11) survey stations were selected:
  - Monumento/MCU
  - Blumentritt
  - Tayuman/A. Rivera
  - Recto
  - Divisoria
  - Pier (South)
  - T.M. Kalaw/L. Guinto
  - V. Cruz
  - Libertad
  - Pasay Rtda.
  - Baclaran
- With the use of the survey form presented in Appendix 13.21, interviews were conducted on approximately 940 jeepney drivers of 147 major routes with emphasis on the LRT corridor. Although the number of samples is limited, the result was used to evaluate the financial condition of jeepneys plying along these routes.

- The results are shown in JUMSUT Supporting Document No. 6, while some major findings from this survey are as follows:

  a) Most jeepney units are utilized 6-7 days a week, but drivers work 4-5 days only on the average. However, their working hours per working day are long with an average of 13 hours. Usually, two drivers are assigned to one jeepney unit.

  b) The average daily fare revenue per driver is approximately ₱240. For short routes, it tends to be lower.

  c) The average daily expense per driver is apprimately ₱190. The largest item in the expense is the boundary fee with an average of ₱94 per day per vehicle followed by the fuel/oil cost of ₱66 per day per vehicle. Approximately ₱30 is paid daily for other miscellaneous expenses including association fees, parking fees and "tong".

  d) As gathered from the interviews, the average daily income of jeepney drivers is ₱65.

13.5.6 Vehicle Operating Cost Survey

- In order to provide a basis for the financial and economic evaluation of this study, the MMUTIP A-2 Report entitled "Vehicle Operating Cost" was updated by replacing the 1980 data with new data obtained through interviews with government agencies, gas filling stations, jeepney operators, etc.

- The surveyed items with their corresponding data sources are as follows:

  1) Price fuel : Gas Filling Stations
  2) Tax of fuel : Bureau of Internal Revenue
  3) Price of Engine Oil : Gas Filling Stations
  4) Tax of Engine Oil : Bureau of Internal Revenue
  5) Price of Tire : Gas Filling Stations
  6) Tax of Tire : National Internal Revenue Code
  7) Price of Vehicle : Vehicle Dealer
  8) Duty/Tax of Vehicle : National Internal Revenue Code
  9) Wage of Mechanics : Maintenance Workshops
  10) Crew Wage : Jeepney/Bus/Truck Operators
  11) Insurance : Insurance Companies
  12) License Fee : Bureau of Land Transporation

- The results are presented in JUMSUT Supporting Document No. 6. Outline of the calculation methodology was, likewise, included in the same document.

Chapter 14.
TRANSPORTATION DATA BASE MANAGEMENT

CHAPTER 14 TRANSPORTATION DATA BASE MANAGEMENT

14.1 GENERAL

- The primary objectives of this task are:
  1) To review the existing transport data and to update and create the data base needed for the planning of this study.
  2) To process the updated data in such a way that they will be further used by MOTC for various analysis and planning purposes.

14.2 EXISTING TRANSPORT DATA BASE

14.2.1 Socio-Economic Data

- Although various sorts of socio-economic data are available in Metro Manila, those that are important for transport planning are rather limited. In the light of the scope of JUMSUT, the data discussed in this section are population, employment, school attendance, car-ownership, and land use. The availability of these data is summarized in Table 14.1. Due to the difference in purposes and methods, these data are not necessarily used directly for transport planning purposes, especially, when these data need to be broken down into zones (a popular method for computer-based transportation planning procedures).
- MMUTIP created the following socio-economic parameters on a 202-zone system based on the best availale data and estimates for the year 1980. The MMUTIP data are the latest and most comprehensive data base available for JUMSUT. They are summarized in MMUTIP Data Base Report No. 1.
  a) Population/Number of Households: integration of population and number of households by barangay into zones based on the 1980 National Census (Provisional);
  b) Employment: (a) by residence, estimated from the results of the UTSMMA, and (b) by workplace, estimated from the results of the MMETROPLAN;
  c) School Attendance: school enrollment compiled by zone based on the directory of Metro Manila schools;
  d) Car-Ownership: estimated from the results of the MMETROPLAN;
  e) Land Use: measured on an existing land-use map prepared by MMC.

14.2.2 Road Network and Traffic Data

- The road network data are mainly available from MPWH. Under the MMTEAM project, major roads and intersections have been surveyed and data derived from the survey were summarized in the form of drawings. However, with regards to the physical features of Metro Manila roads, information on pavement structure and conditions are not properly recorded by MWPH.
- Of the total Metro Manila road network, MMUTIP selected 374 roads which have four or more lanes or those which serve the bus/jeepney transport. The 374 roads were further divided into 523 sections and compiled in MMUTIP Data Base Report No. 2 which contains the following information:
  a) Road structure, including right of way and carriageway widths;
  b) Number of lanes;
  c) Pavement type and condition;
  d) Pedestrian facilities; and
  e) Typical cross section.

- On road traffic, various data are available as shown in Table 14.2. Sources are MPWH, MMTEAM or MOTC/MMUTIP. On the basis of the best available data, MMUTIP summarized and compiled various traffic data into its Data Base Report No. 3. These include:

  a) ADT by vehicle type;
  b) Peak hour traffic and ratio;
  c) Congestion degree (Volume/Capacity Ratio).

  In addition to the above, MMUTIP conducted the Screenline Survey, Cordonline Survey, Vehicle Occupancy Survey and Passenger-OD Survey as part of the 1980 HIS.

- Although the MMUTIP data base has been a good planning basis for JUMSUT, most of the traffic data and a part of the road network data have been updated using the latest outputs from the MPWH/MMTEAM.

14.2.3 Public Transportation Data

- The major comprehensive data source on public transport is MMUTIP. Several surveys were conducted and the results were processed and compiled in MMUTIP Data Base Reports. Public transport data mainly consist of the administrative aspect, fleet, route, terminals, operation and traffic demand. Table 14.3 shows data sources and availability of these data. Most of the quantitative data are from MMUTIP. Aside from this, the bus data on administrative aspects seem available but they are not comprehensive enough nor are they compiled conveniently for direct use for planning purposes.
- The MMUTIP data, which were considered to be good planning bases in the initial stage of JUMSUT, also needed updating due to the following reasons:

  – 1,400 bus units were added for Metro Manila
  – phasing out of minibus from EDSA
  – construction of LRT
  – limited survey coverage of MMUTIP on jeepney operation

14.2.4 Origin-Destination (OD) Tables

- Data on overall public transportation demand and its distribution is limited and not up-to-date. In 1971, the first comprehensive home interview survey regarding person trips of Metro Manila residents was conducted under the Urban Transport Study in Manila Metropolitan Area (UTSMMA). There was no similar survey until MOTC conducted another home interview survey in 1980. OD tables presented in the MMETROPLAN and other traffic studies of MPWH were, therefore, prepared on the basis of UTSMMA and the results of limited supplemental surveys.
- In the UTSMMA Study, a person trip survey was undertaken for the first time. The main objective of this person trip survey, however, was to extract data and to determine values for parameters required for forecast models. Therefore, the sample rate was as low as 0.9 percent. Results of the analysis were only those included in the final report of UTSMMA.
- In the MMETROPLAN Study, OD Tables were developed by calibrating the land use transportation model. Details are presented in Appendix A of the MMUTIP Analysis Report: A-4: Update of MMETROPLAN OD Tables. The submodels are classified into:

  a) Household categorization
  b) Trip end distribution
  c) Trip distribution
  d) Modal split

Table 14.1
Existing Socio-Economic Data for Transport Planning

	Item	Data Name	Data Source	Data as of:	Area	Coverage	Output Form
1)	Population	National Census	National Census and Statistics Office (NCSO)	1960, 1970, 1980 (May 1)	whole country	all households	computer output
		Integrated Census	NCSO	1975	whole country	all households	Report
2)	Employment	National Census	NCSO	1980	whole country	gainful workers over 15 years	Report
		Integrated Quarterly Survey of Establishments	NCSO	1980	whole country	26,300 establishments (those with less than 9 employees and an average monthly sales of less than ₱10,000 not included)	Report
		Integrated Survey of households	NCSO	1980	whole country	30,000 sample households	Report
		List of Establishments	NCSO	1975	whole country	establishments with less than 4 employees and average sales less than ₱100,000 not included	Report
3)	School Attendance	Enrollment and number of teachers by school	Ministry of Education and Culture (MEC)	1980-81 (school year: June to March)	whole country	All schools except private vocational schools	Typewritten tables
		Directory of Metro Manila Schools	Metro Manila Commission (MMC)	1982	Metro Manila	All Schools	Report
4)	Car-Ownership	Motor Vehicles Registered in 1980 by type and region	Bureau of Land Transportation (BLT)	1980	whole country	All vehicles registered at BLT agencies	Typewritten tables
5)	Family Income	Integrated Survey of Households	NCSO	1980	whole country	3,000 households	Special release of the office of the Executive Director, NCSO
6)	Land Use	Existing Land Use Map	MMC	August 1977	M. Manila (by municipality)		Report and Map(1/25,000)
		Zoning Map	MMC	1985 (target year)	M. Manila (by municipality)		
		Aerial Photos	Management Information Team (MIT) of Cultural Center of the Phil. (CCP)	1980	Metro Manila		Black & white photos with a scale of 1/5,000
7)	Comprehensive	MMUTIP Data Base Report No. 1	MMUTIP/MOTC	1980	Metro Manila (202 zones)	Estimated using the above	Report

Table 14.2
Existing Road Traffic Survey Data[1/]

Type of Surveys	Year Conducted	Agency Responsible	Coverage
1. Turning movement Count	1974 1975-1983	MPWH/ TEAM	– Hourly summary data by vehicle type (2 types) – Area within EDSA. 376 stations 14 hours (6:00-2:00)
2. Control Count	Jan-May 1978	MPWH/ TEAM	– 24-hour automatic/manual count for one (1) week at 24 stations – 24 stations – Hourly, daily summary for9 vehicle types
3. Automatic Count survey	1976-1981	MPWH/ TEAM	– 24-hour automatic count at – 24 stations
4. Travel Time Survey (1) Floating Car Method	1977-1981	MPWH	– Car, bus and jeepney – 8 hours (7:00-10:00, 12:00-14:00 15:00-18:00) – Espana and Taft Avenue – Running time and delay time
2) License Plate			– Car, bus and jeepney – 6 hours (7:30-9:30, 12:00-14:00, 15:00-17:00) – Taft – Rizal/Espana-Edsa
5. Vehicle Occupancy Survey	1977-1978	MPWH TEAM	– Same locations as of No. 4 – (2) – Bus and jeepney – 8 hours (7:00-10:00, 12:00-14:00. 15:00-18:00)
6. Pedestrian Count	1977-1980	MPWH	– 135 stations – 16 hours (6:00-20:00)
7. Lateral Placement	1977-1978	MPWH TEAM	– Movement and behavior of vehicles regarding the use of lane marks – 6 hours (7:00-10:00, 15:00-18:00) – 3 stations
8. Traffic Count at Screen Lines	1980	MOTC/ MMUTIP	– Vehicle count by type along screen-line (Pasig river, PNR and San Juan river) – 16 hours (6 a.m. – 10 p.m.) – 30 stations
9. Traffic Count and OD Survey at Metro Manila Cordon line	1980	MOTC/ MMUTIP	– Vehicle count by type and OD interview along cordon line of Metro Manila – 16 hours (8 a.m. – 10 p.m.) – 27 stations

1/ other surveys related to public transport aspects are not included in this table but in Table 14.3, a summary on public transport.

Table 14.3
Available Public Transport Data

	Item	Data Name	Data Source	Data as of:	Area	Coverage	Output Form
1.	Administrative	Monthly Operation Report	MOTC	Quaterly for each Bus Company	Metro Manila	All Metro Manila Bus Consortia	Type written tables
		Monthly Agency Report	BOT/BLT	Every Month	Whole Country	–	Report
		Annual Management Report	BOT/BLT/ MOTC	Every Year	Whole Country	–	Report
		List of Approved Public Utility Franchises	BOT	Every Month	Whole Country	All Franchises	Type written tables
		Summary of Motor Vehicles Registration	BLT	Every year	Whole Country	All Registered Vehicles	Type written tables
		List of Metro Manila Bus Operators	MOTC	1983	Metro Manila	All Metro Manila Bus Operator	Type written tables
		Metro Manila Bus Inspection Results	MOTC	1980	Metro Manila	All Metro Manila Bus Operator	Type written tables
2.	Fleet	Authorized No. of Units	BOT/BLT	Every Year	Whole Country	All Authorized Public Utility Veh.	Type written tables
		No. of units Running/Operating	MMUTIP	1980	Metro Manila	Metro Manila Bus	Report
3.	Route/ Service Area	Authorized Route	MOTC/BOT	Every Year	Whole Country	All Authorized Jeepney /Bus Route	Computer Output
		Operating Route/ Service Area	MMUTIP	1980	Metro Manila	Metro Manila Jeepney/Bus/ Tricycle	Report
4.	Terminal/ Turning Point/Stop	List of Existing Terminal Turning Points/Stops (including location)	MMUTIP	1980	Metro Manila	Metro Manila Jeepney/Bus/ Tricycle	Report
5.	Operation	Service Frequency	MMUTIP	1980	Metro Manila	Metro Manila Jeepney/Bus	Report
		Operational Characteristics	MMUTIP	1980	Metro Manila	All Bus Routes and Selected Jeepney Routes	Report
6.	Traffic Demand	No. of Passengers	MMUTIP	1980	Metro Manila	All Bus Routes and Selected Jeepney Routes of Metro Manila	Report
		Demand Characteristics including distribution	MMUTIP	1980	Metro Manila	All Bus Routes & Selected Jeepney Routes of Metro Manila	Report
7.	Miscelleneous	Driver/Operator Characteristics	MMUTIP	1980	Metro Manila	All Bus Routes and Selected Jeepney Routes of Metro Manila	Report

Data on household structure, car ownership, trip rates, etc., were extracted/modified from the UTSMMA data output. The OD tables projected in 1975 for the years 1980 and 1990 are called the MMETROPLAN OD Tables.

- MMUTIP 1980 OD Tables were developed by modifying and updating the OD tables projected in the 1975 MMETROPLAN Study for 1980. MMETROPLAN OD tables were selected as a base for updating because they are the latest and most reliable among the existing OD tables. The details of the methodology and results of the updating process are presented in MMUTIP Analysis Report A-4.

14.3 JUMSUT DATA BASE

14.3.1 General

- The JUMSUT data base comprises the following:
  a) Socio-economic Data
  b) Road Network and Traffic Data
  c) Public Transport Data
  d) HIS Trip Data, including OD Tables
  e) Data Files for TRANSTEP Usage

  In addition, a mini data base for the micro computer has been created for the internal use of MOTC. This includes:
  a) Socio-economic Data
  b) Road and Traffic Data of Major Corridors
  c) Simplified Public Transport Data for Jeepney
  d) OD Tables (24 zones)
- Most of the JUMSUT data have been stored at the TTC computer in the form of magnetic tapes except those for the micro computer. However, the data of road network traffic, and terminals/turning points are available mostly in the form of tables and drawings.

14.3.2 Socio-Economic Data

1) Coverage
   - The coverage of the JUMSUT socio-economic data base is presented in Table 14.4. These data were prepared on the basis of either the 1980 NCSO census or the 1980 HIS conducted by MOTC for each of the MMUTIP 202 zones within Metro Manila.
2) Data Files
   - The socio-economic data have been stored in files created on a diskette for the micro computer. The files are composed of 202 zonal records, containing the following data:
     a) Zone Number
     b) Population
     c) Number of Households
     d) Employment by Residence
     e) Employment by Work Place
     f) School Attendance
     g) Number of Car-owning Households
     h) Household Income
     i) Miscellaneous

Table 14.4
Coverage of JUMSUT Socio-economic Data

	Data Base Item	Data as of	Data Source	Coverage	Data Base Form 1/
1.	Population	1980	1980 NCSO census	by zone (202 zones)	Diskette/SD
2.	No. of Households	1980	1980 NCSO census	by zone (202 zones)	Diskette/SD
3.	Employment by Residence	1980	1980 HIS	by zone (202 zones)	Diskette/SD
4.	Employment by Work Place	1980	1980 HIS	by zone (202 zone)	Diskette/SD
5.	School Attendance	1980	1980 HIS	by zone (202 zones)	Diskette/SD
6.	No. of Car-owning HH	1980	1980 HIS	by zone (202 zones)	Diskette/SD
7.	Household Income	1980	1980 HIS	by zone (202 zones)	Diskette/SD

1/ Diskette : For the micro computer
SD : JUMSUT Supporting Document

14.3.3 Road Network and Traffic Data

1) Coverage

- The coverage of the JUMSUT road network and traffic data base is presented in Table 14.5. This was created by integrating the existing data into a uniform format. Because of the different data sources, the dates of the surveys vary between 1978-83.

2) Data Files

- The data on road network and traffic were summarized mainly in the form of tables as presented in JUMSUT Supporting Document No. 7; further summarized data were stored on a diskette for the micro computer.
- The road network data for EDP were prepared. These are composed only of section numbers and lengths of roads. The network was divided into 1,687 sections covering roads inside Metro Manila and its environs: Baliwag in the north (40 kilometers from Metro Manila Boundary), Tanay in the east (35 kilometers), and Tagaytay in the south (55 kilometers). The network covers the following roads:

Table 14.5
Coverage of JUMSUT Data Base
for Road Network and Traffic Data

Data Base Item	Coverage	Data Included	Data as of:	Data Source	Form of Data Base 1/
1. Road Network Data • EDP Road Network	• 1687 sections • Metro Manila and its environs	• Section Number • Section Length	• 1983	• JUMSUT Public Transport Survey	• Map (SD-No. 7) • Card Deck (TTC)
• Metro Manila Road Network	• 345 sections (601 kilometers) • Metro Manila only	• Road/Section Name • Section Length • No. of Lanes • Width of Carriage-way/Sidewalk/Median strip • Pavement type/ Condition	• 1980 - 1983	• MPWH/TEAM • MMUTIP	• Table (SD-No. 7)
2. Traffic • Traffic Volume by Vehicle Type	• 212 sections (311 kilometers)	• Road/Section Name • Section Length • Average Daily Traffic by Vehicle Type • Peak Hour Traffic by Vehicle Type • Peak Hour Ratio, etc.	• 1978 - 1981	• MPWH/TEAM	• Table (SD-No. 7)
3. Traffic vs. Road • Characteristics of Traffic in Relation to Road	• 212 sections (311 kilometers)	• Road/Section Name • Section Length • Road Capacity • Traffic in PCU • Volume/Capacity/ Ratio	• 1978 - 1981	• MPWH/TEAM • MMUTIP	• Table (SD-No. 7)

1/ SD-No. 7 refers to JUMSUT Supporting Document No. 7

a) all major roads with four lanes or more
b) all roads used by bus or jeepney
c) other major roads which could be used by bus or jeepney

This network is shown in Appendix 14.1. In addition, these data were punched on cards as ancillary information of the JUMSUT public transport data base (Appendix 14.10). The road data have been prepared for the Metro Manila road network as presented in Appendix 14.2; it consists of 345 sections with a total length of 601 kilometers. The following data are covered:

a) Road/Section Name
b) Section Length
c) Number of Lanes
d) Width of Carriageway, Sidewalk, and Median Strip
e) Pavement Type and Condition

The tabulation form is given in Appendix 14.4.

- The traffic data have been compiled on a Metro Manila road network as presented in Appendix 14.3; it comprises 212 road sections with a total length of 311 kilometers. Due to the limited availability of existing data, the coverage is narrower than that of the road data. However, the 212 road sections remain as a subset of the 345 sections of the road data. These traffic data compiled according to the form presented in Appendix 14.5, cover the following:

  a) Road/Section Name
  b) Section Length
  c) Average Daily Traffic by Vehicle Type
  d) Peak Hour Traffic by Vehicle Type
  e) Peak Hour Ratio
  f) Percentage of Heavy Vehicles
  g) Percentage of Traffic in Heavy Direction

- In addition to the above, data showing the traffic volume in relation with road capacity were prepared. The coverage is the same as that of the traffic data. They were compiled using the form presented in Appendix 14.6 and covered the following terms:

  a) Road/Section Name
  b) Section Length
  c) Carriageway Width
  d) Number of Lanes
  e) Road Capacity
  f) Traffic in Passenger Car Units (PCU)
  g) Volume/Capacity Ratio
  h) Observed Travel Speed

14.3.4 Public Transportation Data

1) Coverage

- Public transportation data base completed in JUMSUT comprises the following aspects:

  a) Route list
  b) Service frequency

c) Operation characteristics
d) Passenger demand characteristics

- The coverage of these data items is outlined in Table 14.6. The original data obtained from the field surveys are limited for some items while those that were not surveyed were estimated and formulated into the data base.

2) Data Processing for JUMSUT Data Base

- For the data on operation characteristics, passenger demand characteristics and financial conditions of public transport routes, a considerable amount of EDP work was needed for formulating the data base in a systematic manner. On the other hand, it was just a matter of coding, input, and storage of data for the rest.
- The data on operation characteristics and passenger demand characteristics were all obtained from the JUMSUT Public Transport Operation Characteristics Survey as described in the preceding chapter. As the survey was conducted on a sampling basis, the main effort was centered on the methodology of data expansion. The procedures can be briefly described as follows:

a) Data compilation of samples:
   i) calculate number of alighting passengers by section (not surveyed);
   ii) allocate frequency data to the sample data by section (route frequency was divided in proportion to the number of samples if the section passed was different among samples that belong to the same route and the same time period).

b) Estimate of information on routes that were not surveyed:
   i) calculate route length based on the "Standard Route Configuration" separately coded;
   ii) estimate terminal time and travel time by time period (terminal time was obtained as an average, while travel time was calculated using the route length and the average travel time and route length of samples of the same basic route);
   iii) estimate number of passengers boarding, alighting and on-board (in a similar manner to the method above, the number of passengers boarding and on-board was calculated by section using the average of samples, and the number of alighting passengers was calculated later).

c) Data Expansion:
   i) calculate data by route, by section and by time period, expanding the original data according to the corresponding service frequency;
   ii) compile the above data by route to obtain route information files;
   iii) compile the above data by section to obtain section information files.

- The data on operating costs of jeepney and bus were updated and presented in JUMSUT Supporting Document No. 6.

3) Data Files

- The structure of the JUMSUT public transport data base is schematically illustrated as a whole and presented in Figure 14.1.
- The data files are stored in magnetic tapes at TTC; their formats are presented in Appendices 14.7 and 14.8. They are the most comprehensive public transport data

obtained in JUMSUT. A summary of these data is included in JUMSUT Supporting Document No. 6.

- During the EDP stage, various kinds of ancillary data in the form of cards were used. The list and formats are given in Appendices 14.9 and 14.10 for possible use in the future.
- The data stored in the micro computer are listed in Appendix 14.11. Most of these data have been summarized from the compiled data files stored in magnetic tapes. For more details, refer to Chapter 15 and the JUMSUT Supporting Document No. 3 entitled "Micro Computer Transportation Planning Software Manual".
- Due to its nature, the data base for terminals/turning points, unlike others, has been prepared in the form of tables and maps. It is presented only in JUMSUT Supporting Document No. 7 with the exception of the summarized mini data base prepared for the micro computer.

  The data formats on terminals are presented in Appendices 14.12, 14.13 and 14.14. for jeepney, bus, and tricycle, respectively.

Figure 14.1
Structure of JUMSUT Public Transport Data Base

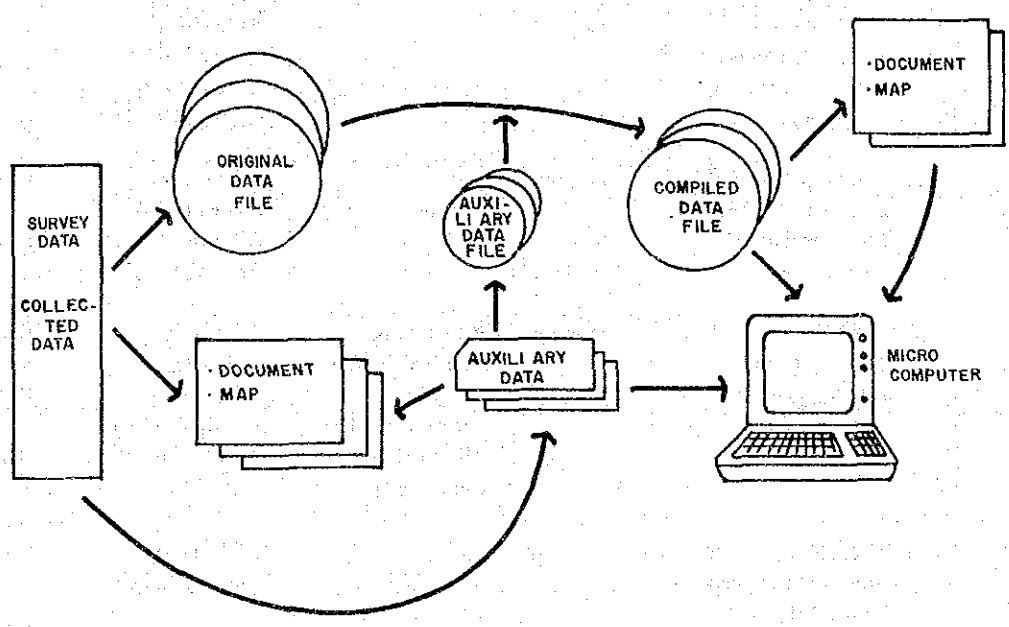


Table 14.6
Coverage of JUMSUT Public Transport Data Base

Item	Mode	Coverage: Survey	Coverage: Data Base	Form[2/]
A. Primary Data Base				
1) 1983 Route List	Jeepney	All existing routes (744)	All existing routes (744)	MT/CD (TTC) JUMSUT SD-No. 5
	Bus	All existing routes (197)	All existing routes (197)	MT/CD (TTC) JUMSUT SD-No. 5
2) 1983 Route Frequency – by route – by hour	Jeepney	All existing routes (744)	All existing routes (744)	MT/CD (TTC) JUMSUT SD-No. 6
	Bus	All existing routes (197)	All existing routes (197)	MT/CD (TTC) JUMSUT SD-No. 6
3) 1983 Operational Characteristics Sample Master	Jeepney	Selected 468 routes	All existing[1/] (744 routes)	MT (TTC)
	Bus	Selected 72 routes	All existing[1/] (197 routes)	MT (TTC)
B. Planning Data Base				
1) 1983 Operational/ Passenger Demand Characteristics – by route	Jeepney	–	All existing routes (744)[1/]	MT (TTC) JUMSUT SD-No. 6
	Bus	–	All existing routes (197)[1/]	MT (TTC) JUMSUT SD-No. 6
2) 1983 Operational Passenger Demand Characteristics – by section	Jeepney	–	All existing routes (744)[1/]	JUMSUT SD-No. 6
	Bus	–	All existing routes (197)[1/]	JUMSUT SD-No. 7
3) 1983 Terminal Turning Point Information	Jeepney	All existing terminals (270)	All existing terminals (270)	JUMSUT SD-No. 7
	Bus	All existing Terminals (113)	All existing terminals (113)	JUMSUT SD-No. 7
	Tricycle	All existing areas (258)	All existing areas (258)	JUMSUT SD-No. 7
4) 1983 Metro Manila Summarized Jeepney Route Information	Jeepney	–	All existing routes (744)[3/]	Diskette

Note:

1/ expanded based on the sample survey

2/ MT : Magnetic Tape,CD: Card Deck , TTC: Transport Training Centre
SD : Supporting Document

3/ Summarised based on available data

14.3.5 HIS Trip Data Including OD Tables

1) Coverage

- The JUMSUT HIS data cover the following:
  a) Household Information
  b) Household Member Information
  c) Trip Information
  d) OD Tables

  The data on a) and b) above are the major sources of the JUMSUT socio-economic data of Metro Manila residents. The data on c) provides various trip information and characteristics of Metro Manila residents; these data can be used in relation to a) and b) to study the trip characteristics from socio-economic aspects. The data on d) were created based on c) and other necessary data according to the method described in Chapter 16.

2) Data Processing for JUMSUT Data Base

- The JUMSUT HIS data are composed of MOTC 1980 HIS and JUMSUT 1983 HIS. These results were separately expanded by zone using the population obtained from the 1980 NCSO Census. Then, the expanded data were merged into one integrated data base. The details of this process is also presented in Chapter 16.
- Although the information on household, household member and trip were prepared based on the MMUTIP 217 zoning system (202 Metro Manila zones plus 15 external zones), the OD tables were compiled based on various zoning systems, which include the following:
  a) MMUTIP 217 zones (202 + 15) as fundamental OD data
  b) JUMSUT 64 zones (58 + 6) for JUMSUT planning purposes; these can also be used for overall transport planning/analysis of Metro Manila
  c) JUMSUT 74 zones (including external zones) for special JUMSUT planning purposes
  d) JUMSUT 27 zones (24 + 3) for analysis by municipality.

  The reference table for these zoning systems is presented in Appendix 14.15.

3) Data Files

- The structure of the JUMSUT HIS data base in schematically illustrated in Figure 14.2. The data files stored in magnetic tapes at TTC and their formats are presented in Appendices 14.16 and 14.17, respectively. They are the most important data obtained in the 1980 and 1983 HIS; the data of the 1980 MMUTIP Cordonline Survey and the distance between zones used for processing the HIS data are also included. The most useful data for future transport planning are the 1980 JUMSUT OD tables. The list is presented in Table 14.7.
- The JUMSUT data stored in the form of cards are listed in Appendix 14.18; and the formats are shown in Appendix 14.19. They are all ancillary or secondary data consisting mostly of zone conversion tables.
- Out of the main files, some important data were extracted and stored in the micro computer in order to meet the daily planning needs of MOTC. The list is presented in Appendix 14.20.

Figure 14.2
Structure of JUMSUT HIS Data Base

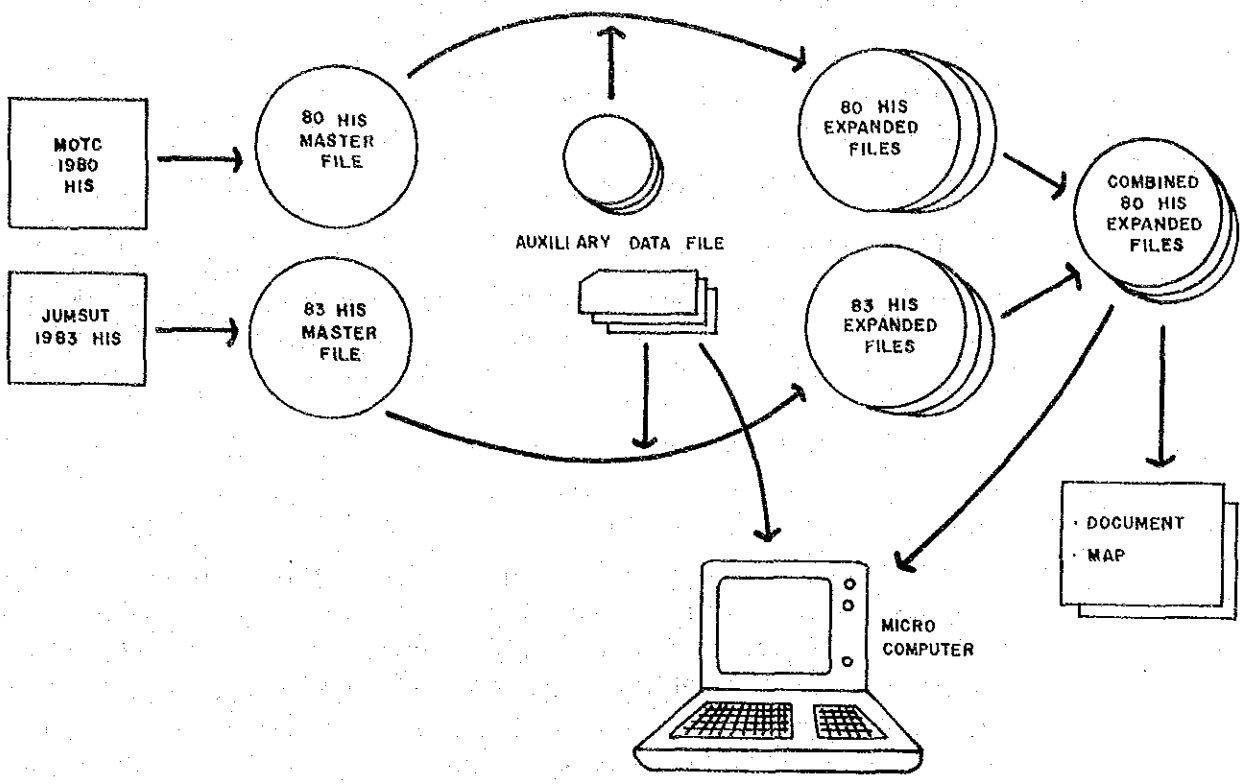


Table 14.7
JUMSUT OD Tables[1/]

Mode	Time Period	Trip Purpose	Person/ Vehicle	Zoning System	No. of OD Tables
Public	Day	By Purpose (5)	Person	217/64/27	15
	Day	All Purposes	Person	217/64/27	3
	Morning Peak	All Purposes	Person	217/74/64/27	4
	Evening Peak	All Purposes	Person	217/64/27	3
Private	Day	By Purpose(5)	Person	217/64/27	15
	Day	All Purposes	Person	217/64/27	3
	Day	All Purposes	(Person) By Type of Vehicle (3)	217/64/27	9
	Day	All Purposes	(Vehicle) By Type of Vehicle (3)	217/64/27	9
	Day	All Purposes	(Vehicle) All Types of of Vehicle	217/64/27	3
	Morning Peak	All Purposes	Person	217/64/27	3
	Morning Peak	All Purposes	Vehicle	217/64/27	3
	Evening Peak	All Purposes	Person	217/64/27	3
	Evening Peak	All Purposes	Vehicle	217/64/27	3
				Total	76

1/ All OD tables above include external trips obtained from the 1980 MMUTIP cordon line survey.

14.4 DATA BASE MANAGEMENT

14.4.1 Data Usage

- The JUMSUT data base is considered to be useful for various kinds of traffic/transport studies, as well as administrative purposes for the government, including MOTC and MPWH. The possible usage of the data base are given as follows:

  a) Public transport planning/analysis:
     - Route planning and control (relocation of routes, re-allocation of units, etc.)
     - Franchising
     - Fare setting

  b) Road Study:
     - Feasibility study of road network or links
     - Road maintenance study
     - Intersection planning/analysis

  c) Terminal Study:
     - Traffic circulation planning in terminal areas
     - Area development planning in terminal areas

  d) Traffic Management/Control Study

  e) Other Purposes:
     - Urban development planning
     - Land use planning

  The above can be conceptually related to each item of the JUMSUT data base as shown in Table 14.8.

- The data base stored in the micro computer is closely related to the daily planning/ administrative needs of MOTC. Due to its high accessibility and negligible cost, it can be used effectively, provided the data are properly maintained.
- For feasibility studies on road network, links and terminal areas, the data base in the form of booklets, maps and magnetic tapes could be used as a basis for evaluation of present conditions, forecasting of future demand, formulation and evaluation of plans.
- The data on road traffic and public transport could also provide a good planning basis for traffic engineering/management studies.
- The JUMSUT data base is partially useful also for other purposes including urban development planning and land-use planning.

14.4.2 Data Updating

- In order to make maximum use of the JUMSUT data base, it is necessary that the data be always up-dated properly. However, since most of the JUMSUT data have been collected through large-scale field surveys which consume a sizeable amount of time, fund and manpower, it is crucial to look for an economical method to maintain data within a tolerable accuracy. Considering the size, accuracy, coverage and possible usage of each data, the method of data updating can be summarized and itemized as follows:

  a) **Socio-Economic Data:** Since this is closely related to NCSO Census and HIS, the timing of data updating should coincide with these surveys. However, it is recommended that these data be estimated for the years between the last and next

Table 14.8
Possible Usage of JUMSUT Data Base

Data Base	Accessible Media	Possible Usage
1. Socio-Economic Data	Micro Computer (Diskette)	Road Study
2. Road Data	Micro Computer (Diskette) Tables Maps	Terminal Study
3. Traffic and Its Related Data	Micro Computer (Diskette) Tables	Traffic Engineering/ Management Study
4. Public Transport		
4.1 – Route List	Magnetic Tape (TTC) Micro Computer (Diskette) Booklet (incl. maps)	Daily Usage for Controlling Public Transport – Route Planning – Franchising – Other Administrative Purposes
4.2 – Service Frequency and other Operational Characteristics Data	Magnetic Tape (TTC) Micro Computer (Diskette) Booklet	
4.3 – Passenger Demand Characteristics	Magnetic Tape (TTC) Micro Computer (Diskette) Booklet	
4.4 – Terminal Data	Micro Computer (Diskette) Booklet	Other Purposes – Urban Development Planning – Landuse Planning – Miscellaneous
5. HIS Data		
5.1 – Household Information	Magnetic Tape (TTC)	
5.2 – Household Member Information	Magnetic Tape (TTC)	
5.3 – Trip Information	Magnetic Tape (TTC)	
5.4 – OD Tables	Magnetic Tape (TTC) Micro Computer (Diskette)	

surveys by extrapolation, using average annual growth rates. If data from other comprehensive studies/surveys become available, these could be replaced. Subsequently, the old data will be transferred to permanent files.

b) **Road Data:** Since the responsible agency on this aspect is the MPWH, it is necessary to monitor the MPWH/TEAM regularly on the following points:
   i) Location, length, number of lanes, carriageway width, pavement type and other physical characteristics of newly constructed roads during the year
   ii) Location, length and other necessary information of road/intersection improvements during the year.

   Although most of the road data can be updated using the above data, it is advisable to conduct an inspection/reconnaissance survey on road surface conditions and road facilities at problem areas, when the need arises.

c) **Traffic Data:** For traffic data, it is also necessary to monitor the MPWH/TCC/TEAM regularly on the latest available traffic data.

d) **Public Transport Data:** This data base is most important to MOTC's daily needs for the planning, control and management of jeepney and bus. The following points should be duly taken into account:
   i) Organize a permanent survey team to monitor regularly the operation of buses and jeepneys. The team will cover the following activities:
      - reconnaissance survey of jeepney/bus routes at selected terminals to identify the changes in routes and operation
      - frequency count survey for the routes where major changes are recognized and for those which are relatively important (basic routes with high frequency)
      - on-board operation characteristics survey for the routes where major changes are recognized and for those which are relatively important
      - jeepney/bus driver interview survey on financial aspects for selected routes
   ii) Subsequent updating of route information stored in the micro computer is necessary. In order to facilitate this process, a set of control/management programs on this data base has been prepared (see Chapter 15).
   iii) In addition, the coding form of the data stored in magnetic tapes as presented in Appendices 14.21 and 14.22 should be considered for the standardization of the data input form.

e) **HIS Data:** This data base is generally difficult to update due to the time and resources required for HIS. Assuming an interval of 10 years for the timing of HIS in Metro Manila, the following points are recommended as a means of updating the data in the intermediate period:
   i) For household and household members information, an extrapolation using average annual growth rates obtained from the past data is useful.
   ii) For trip information and OD tables, estimates using the extrapolated socio-economic data based on a model developed on the data base will be effective.

14.4.3 Management of Data Files

- In general, data files can be classified into permanent files and working files. The former is used as historical data to be stored in the library, while the latter is the basis of daily planning/administrative work. It is to be noted, however, that the working file must be

periodically converted into the permanent file in order to accumulate historical information. The JUMSUT data files have both of the above. However, the data stored in the micro computer are used mainly as working files with the documents/maps being used as permanent files. The data stored in magnetic tapes have both features.

- Considering the size, storage media and usage of data, the file management system can be summarized as follows:

  a) **Socio-Economic Data:** Although the data is stored in the micro computer, the nature is that of a permanent file, considering the limited possibility for frequent updating. Therefore, the following is recommended:
     i) Transfer the data to permanent files when it is updated
     ii) Use a back-up file for the latest data as a working file

  b) **Road Data:** Assuming that the data are updated once a year, the data in the forms of diskettes, tables and maps should be considered as permanent files. Therefore, they should be kept as yearly records and a back-up file or copy must be prepared for daily use.

  c) **Traffic Data:** These data should be maintained in a similar manner as the road data.

  d) **Public Transport Data:** For the public transport data, more emphasis should be given on frequent updating of files. The permanent files to be kept are merely an intermediate point of the constant and steady work of data updating. The following are recommended:
     i) The documents, maps and magnetic tapes created by JUMSUT should be considered to be the first permanent file of public transport data.
     ii) The diskettes prepared for the micro computer are considered to be the major working files for daily data processing. However, even in this case, the daily work should be done on separate back-up files duplicated from the original diskettes. The updated data thus maintained must be transferred periodically (presumably once or twice a year) to magnetic tapes and tables in order to keep records as permanent files.
     iii) Close cooperation of MOTC with the BOT, BLT, and other related agencies will be necessary.

  e) **HIS Data:** The primary feature of the JUMSUT HIS data is that it is a permanent file. When updated, this set of data must be kept as a separate file because a considerable amount of EDP is always required for updating. In addition, it is recommended that some of the important HIS data (especially OD Table) be transferred to a diskette to carry out the traffic assignment task which is explained in Chapter 15.

Chapter 15.
TRANSPORT PLANNING PROCEDURES

CHAPTER 15 TRANSPORT PLANNING PROCEDURES

15.1 INTRODUCTION

- This chapter intends to describe the methodological developments attained in the course of the JUMSUT Study, together with the training and technology transfer which it has provided to the Ministry's local counterpart staff. The following aspects have been covered:
  a) Transport Planning Procedures
     i) Improvement of TRANSTEP with particular regard to its public transport assignment modules,
     ii) Development of a traffic assignment program both for the TTC computer and the micro computer,
     iii) Development of a jeepney route information management system on the micro computer,
     iv) Development of HIS data base system on the micro computer,
  b) Training
     i) Conduct of a training program
     ii) Development of manuals/documents

15.2 TRANSPORT PLANNING PROCEDURES

15.2.1 Improvement of TRANSTEP

1) **Public Transport Assignment Module of TRANSTEP**

- TRANSTEP is a suite of programs designed to tackle land-use and/or transportation problems. It has, so far, 12 program modules, out of which seven are utility modules, while the remaining five are core modeling modules composed of the following:
  a) Activity Patterns Model
  b) Modal Split
  c) Assign Trips
  d) Landuse Analysis and Projection
  e) Public Transport Passenger Loadings

  The whole TRANSTEP structure was thoroughly investigated and broken down into logical units. Flowcharts showing the interrelationship among logical units and disk files were prepared.

- The transit assignment modules of TRANSTEP, i.e., PTEDIT, PTPATH and PTLOAD are closely related to the primary objectives of JUMSUT. These three modules were investigated in depth and detailed flowcharts were prepared in order to facilitate future possible modification of the programs. The interrelationship of these modules is presented in Figure 15.1.

  PTEDIT: This is an editing program of input data which produces route and network files for use in PTPATH and PTLOAD. At the same time, this prints out edited route information merged with network information.

  PTPATH: This program initially createsafile containing all feasible paths with its generalized cost from each zone centroid. For example, the generalized cost of a trip with one transfer is calculated in terms of minutes as follows:

  Gen. Cost = A (Walk Time per Passenger from Origin)
  + B (Waiting Time per Passenger)

+ C (Loading Time per Passenger)
+ D (Travel Time per Passenger for Link i)
+ E (Fare per Passenger per Ride in Terms of Minutes)
+ F (Transfer Time per Passenger)
+ C (Loading Time per Passenger)
+ D (Travel Time per Passenger for Link j)
+ E (Fare per Passenger per Ride in Terms of Minutes)
+ A (Walk Time to Destination)

In the formula above, each cost component is defined as follows:

A. **Walk Time per Passenger:** (both from origin and to destination)
Link Length (100 m.) x 1.2* x Walk MODECOEF

*: $1.2 = 100 \times \frac{60}{5000}$

(assuming a walking speed of 5 kms/hr.)

B. **Waiting Time per Passenger**

$$\frac{30^*}{\text{Frequency}} \times \text{Wait MODECOEF}$$

*: $\frac{30}{\text{Frequency}} = \frac{60}{\text{Frequency}} \times \frac{1}{2}$

C. **Loading Time per Passenger:**

0.3* x Load MODECOEF

*: 0.3 minutes per passenger loading is assumed

D. **Travel Time per Passenger per Link:**

$$\frac{\text{Link Length (100 m.)}}{\text{Travel speed* (100 m/hr)}} \times 60 \times \text{Travel MODECOEF}$$

*: Travel speed is set at the lower value of either link speed or scheduled speed.

E. **Fare per Passenger/Ride in Terms of Minutes:**

$$\left\{ \begin{matrix} \text{Base} \\ \text{Fare} \\ \text{(cents)} \end{matrix} + \left(\begin{matrix} \text{Travel} \\ \text{Distance} \\ \text{(100 m.)} \end{matrix} - \begin{matrix} \text{Distance} \\ \text{Limit} \\ \text{(100 m.)} \end{matrix} \right) \times \frac{\text{Excess per km. (cents)}}{10} \right\} \times \text{Fare MODECOEF}$$

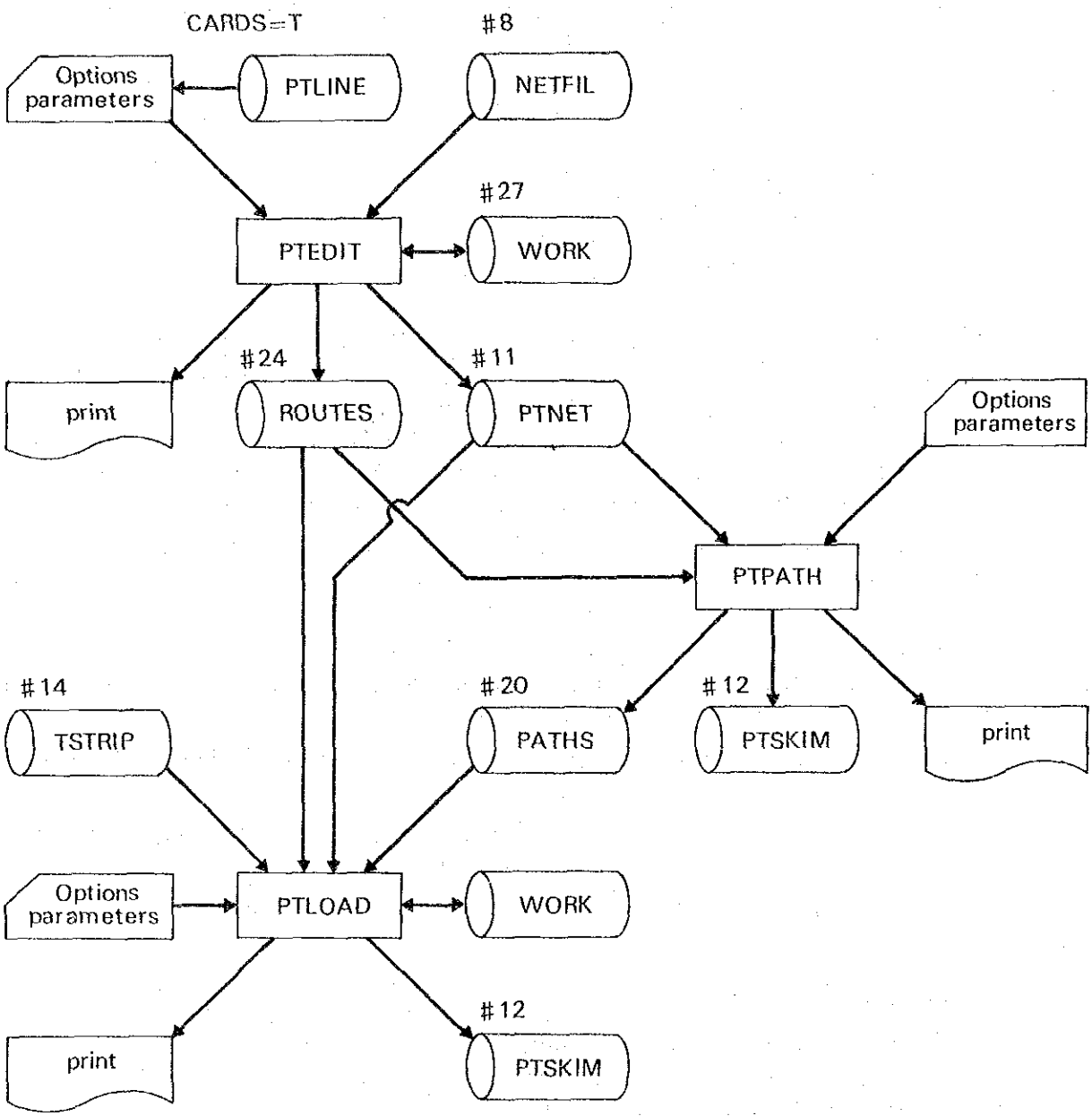
*: Fare MODECOEF = $\frac{60 \text{ (minutes)}}{\text{Person Time Value (cents/hour)}}$

F. **Transfer Time per Passenger:**

$$\frac{30^*}{\text{Frequency}} \times \text{Transfer MODECOEF}$$

*: $\frac{30}{\text{Frequency}} = \frac{60}{\text{Frequency}} \times \frac{1}{2}$

Figure 15.1
Interrelationship of
Transit Assignment Modules of TRANSTEP



As initial input data, the user must specify the COST LIMIT and MAXIMUM NUMBER OF PATHS. For the next step, PTPATH selects a path that falls within the COST LIMIT (the ratio of generalized costs of a path to the minimum path) until the number of paths arrives at the MAXIMUM NUMBER OF PATHS for each zone pair. The role of PTPATH terminates after saving all selected paths for all zone pairs.

PTLOAD: In PTLOAD, the method of calculating generalized cost is different from that of PTPATH. Loading time is calculated based on 0.1 minute per passenger. In other words, three boarding passengers were always assumed in PTPATH. Another important difference is the addition of a Discomfort Factor to the generalized cost. This factor aims to penalize passenger loading beyond line capacity, expressed in the following formula:

DSCOMF x Travel Time x Discomfort MODECOEF

where:

$$DSCOMF = 5 \times (VOLCAP\ RATIO) - 4$$

$$(VOLCAP\ RATIO \geqq 0.8)$$

$$Travel\ Time = 60 \times Link\ Length/Travel\ Speed$$

Note that the above shows the Discomfort cost per passenger per link in terms of minutes.

The user can specify the number of assigned iterations using LOADING INCREMENTS. If equalized assignment is needed five times, the user should specify 20, 20, 20, 20, and 20 in terms of %. However, in PTLOAD there is another factor called ABSOLUTE NUMBER TRIPS, which specifies a minimum number of trips to be assigned at a time. If the user specified this factor properly, the computation time will be considerably reduced.

PTLOAD computes generalized costs for the selected routes and assigns trips initially to the minimum path. If there are two or more minimum paths, the same volume will be assigned equally. Discomfort cost is taken into account for subsequent assignments.

The output from PTLOAD is composed of the following:

a) Segment Report: which indicates passenger loading/unloading information by route, by link and by direction.

b) Route Report : : which indicates information on passenger volume and public transport operation by route and by direction.

c) Mode Report : : which indicates aggregate information on passenger volume and public transport operation by mode.

d) Link Report : : which indicates passenger volume by link, by direction and by mode.

2) Improvement of TRANSTEP

- In view of the JUMSUT objectives, the possibility of improving/modifying the transit assignment modules of TRANSTEP was investigated in relation to the following limitations of the current program:

  a) The capacity is reportedly limited to 100 PT lines on 98-zone basis:
  b) Computation time is very long; for hours for 100 PT lines on 98-zone basis;

c) The results from PTLOAD need a lot of manual calculations to interpret the output.

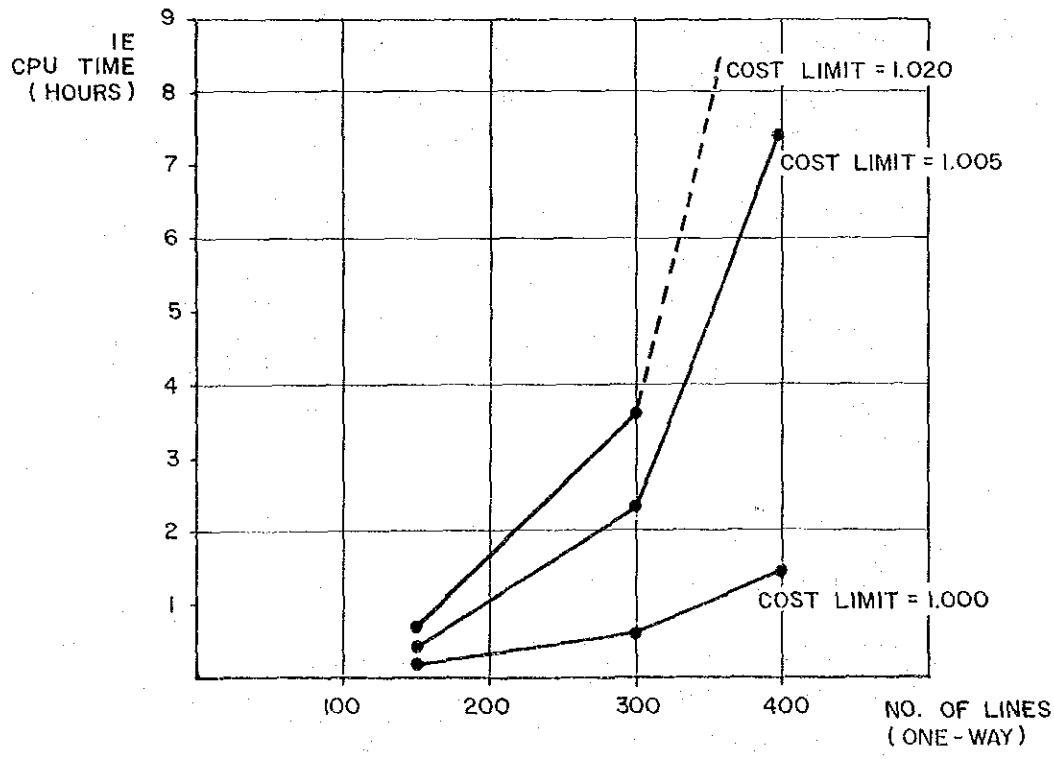
d) Although the outputs from PTLOAD cover a wide area required for public transport planning, there is still some useful information which can be extracted from the computation process, such as the breakdown of number of passengers by O D pair for a specified section.

Although there are many other aspects which have yet to be improved, major efforts have been given to the four aspects listed above. They are described as follows:

a) Capacity Expansion and Shortening of Computation Time

- Owing to the virtual memory system of the TTC computer, there is no logically fixed capacity restraint. However, if the public transport network and number of lines are specified to be extremely large, the computation time becomes enormous. In the initial stage of the JUMSUT study, some experiments were carried out for the computation time of PTPATH (the most time-consuming module in TRANSTEP). The result is shown in Figure 15.2.

Figure 15.2
Interrelationship between Computation Time and Number of Lines1/



1/ Based on 77-zone system and PT lines adopted in the LRT No. 1 Study of MMUTIP.

- It is understood, therefore, that there is a practical limitation of computation time in TRANSTEP considering the usage of other computer users and the frequent brown-outs. Taking these aspects into consideration, the capacity in terms of the number of PT lines to be accommodated was expanded up to some 200 two-way lines (400 one-way lines) without exceeding a computation time of three hours by: 1) simplifying network and zoning, and 2) readjusting memory allocation. Although the former method is not considered to be an improvement of TRANSTEP, it is inevitable to reduce the amount of input data considering the realistic time of computation.
- The latter method became effective using the following procedure:
  - estimate the size of memory area for each variable based on the network, PT lines and zoning developed in the Study.
  - change the source program written in FORTRAN
  - compile the sources program and produce the object program
- The expansion of TRANSTEP capacity in a true sense can be done only when the program is drastically changed on the basis of more efficient and fast algorithms; these, however, will take a long time. Presumably, it is more important to make better use of the current TRANSTEP.

b) Output Form Improvement

- As stated earlier, the output of TRANSTEP needed a sizeable amount of manual calculations in the interpretation of the output to obtain necessary information for transport planning. In order that the output format of PTLOAD will meet the planning needs more directly, it was changed as presented in JUMSUT Supporting Document No. 4. The improvements were made by adding totals/subtotals and other useful information. Consequently, comparison between cases became easier and much faster.
- In relation to these improvements, the required input data of headway of public transport routes were replaced with frequency, considering the extremely short headway of jeepneys (especially when several routes are integrated together).

c) Option for Breakdown of Number of Passengers by OD Pair for Specified Sections

- In public transport route planning, the need to know the origin and destination of passengers passing specific corridors/road sections sometimes arises. This is useful for evaluating the appropriateness of existing routes on the corridor/road section. An option has been added to PTLOAD so that the above requirement can be met. This option program will function when the following statement is added to the end of the job control cards of PTLOAD:

  NSECT = A

  where A : No. of sections to be broken down

  When the above statement is added, the node numbers must be provided in the form of cards right after the job control cards. The format of the data cards are:

  From Columns 1 to 5 : Sequential No. (from 1)
  From Columns 6 to 10 : A Node No.
  From Columns 11 to 15 : Another Node No.

- The option program outputs,to a magnetic tape,the following data in binary form:
  - Sequential Number of Specified Section
  - Link Number (internally produced)
  - Origin Node
  - Destination Node
  - Route Number
  - Mode Number
  - Origin Zone Number
  - Destination Zone Number
  - Number of Trips (Passengers)
- Since this option program creates a data file on a magnetic tape, no printout will be produced even after running PTLOAD. In order to get a compiled table showing the number of passengers for each specified section, the following two steps are still needed:

  1) Sorting of data using the "Sequential Number of Specified Section" as a key.
  2) Tabulation, using a newly developed program called "ODPATTERN".
- The data sorting is needed in order to modify the sequence of data for the subsequent usage of "ODPATTERN". This sorting is done by using the "Sequential Number of Specified Section" as a key. In addition, this sorting program is provided as a system utility of TTC.
- After sorting the data, "ODPATTERN" is used for tabulation. This program is, so far, provided in the form of cards. This requires input data with the following format:

  From Columns 1 to 5 : Sequential Number (from 1)
  From Columns 6 to 10 : A Node Number
  From Columns 11 to 15 : Another Node Number
  From Columns 16 to 43 : Section Name

  The number of cards must coincide with the value of NSECT previously mentioned. The output form is presented in JUMSUT Supporting Document No. 4.

e) Summary of TRANSTEP Improvement

- The improved version of TRANSTEP is readily available on a disk of the TTC computer, although the original TRANSTEP is also stored in a magnetic tape. The improvements carried out by JUMSUT is summarized in Table 15.1.

Table 15.1
Improvements of TRANSTEP by JUMSUT

Module		Improvement
PTEDIT	:	1) Change the form of input data (Headway to Frequency)
PTPATH	:	2) Change the memory allocation 3) Change data from headway to frequency
PTLOAD	:	4) Change data from headway to frequency 5) Improvements in output forms 6) Addition of the NSECT option

15.2.2 Development of Traffic Assignment Program (Highway Type)

1) General

- In order to evaluate road traffic under different conditions, a traffic assignment program has been developed. This assumes the predetermined traffic volume of public transport vehicles by link and assigns private traffic onto the network, taking the public vehicle traffic into account.
- Although the traffic assignment was carried out using the TTC computer, it was discovered that the program could be transferred to the newly introduced micro computer of JUMSUT. It was decided, therefore, to develop a new program suitable for the micro computer considering the following points:
  a) Easy operation
  b) Negligible cost
  c) Facilitates training and technology transfer

2) Structure of the Program

- The basic structure of the program is shown in Figure 15.3. The input data required are:
  a) OD Tables
  b) Network Data
  c) Delay Function

  The last data, unlike others, are to be input manually from the keyboard.
- As a method for minimum path search, the Dixtra algorithm was adopted.

3) Limitations

- The program for the micro computer with a memory of 256 K Bytes of the micro computer has the following limitations:
  a) Maximum No. of Zones : 100
  b) Maximum No. of Zones : 350
  c) Maximum No. of Links (One-Way) : 100
  d) Maximum No. of OD Tables Assigned at a Time : 3
  e) Maximum No. of OD Table Divisions : 10

4) Input Format

- The file on OD tables should be created on a diskette. The user can put any name to the file. The data are stored as statements of BASIC according to the following format:

```
1000   DATA   11,  12,  16,  38,  9,  -----,  87
1010   DATA   13,   0,   3,  29,  32, -----,  137
```

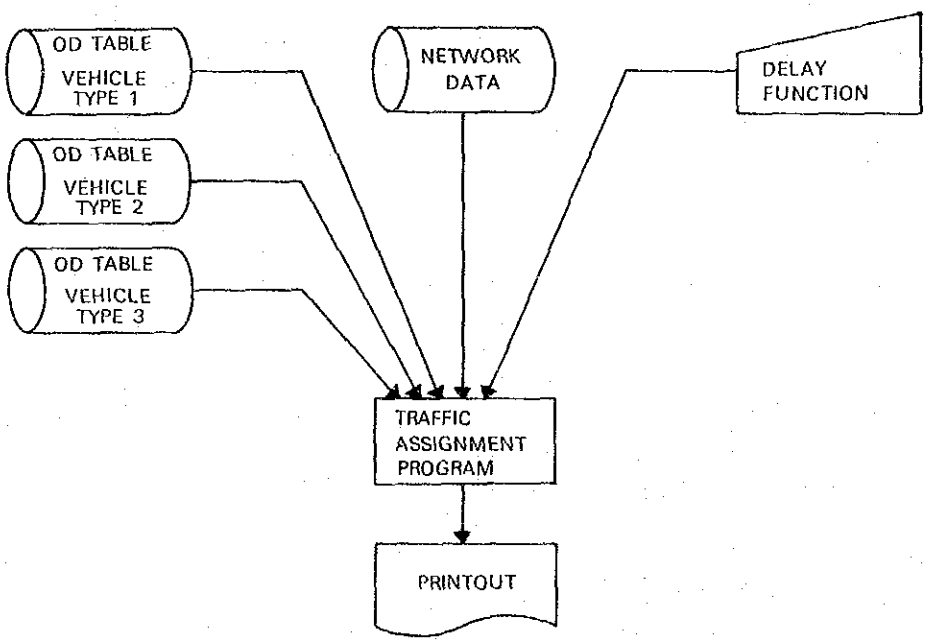
one row of OD table should be written as one statement

- Likewise, the network data are stored also on a diskette under a name according to the user's choice. The format is:

```
1000   DATA   1,   101,   102,   0.5,   3,    2000,   2
1010   DATA   2,   101,   103,   1.7,   4,     500,   2
```

	Link No.	Node No.	Node No.	Distance (kms)	Delay Function No.	Pre-Determined Traffic Volume in PCU	One-way or Two-way

Figure 15.3
Basic Structure of Traffic Assignment Program for the Micro Computer



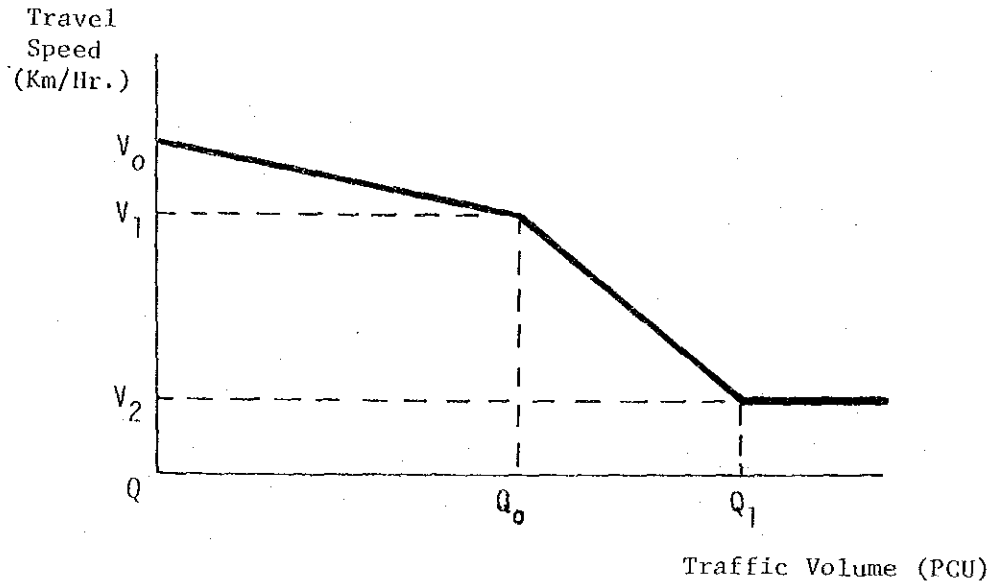
- Delay functions should be manually input from the keyboard according to the instruction appearing on the CRT display.

NO	VO	V1	V2	QO	Q1
1	60.0	30.0	5.0	42000.0	84000.0
2	60.0	30.0	5.0	33500.0	67000.0
3	40.0	20.0	5.0	25000.0	50000.0
4	40.0	20.0	5.0	16000.0	32000.0
5	40.0	20.0	5.0	6000.0	12000.0

The values above have the following meanings based on Figure 15.4:

VO : Initial Speed
V1 : Travel Speed at Road Capacity
V2 : Travel Speed at Critical Point
Q_o : Road Capacity
Q1 : Road Capacity at Critical Point

Figure 15.4
Speed-Flow Relationship
(Delay Function)



- The following data should also be typed according to the instructions on the display:
  a) File Name(s) of OD Table(s)
  b) File Name of Network Data
  c) No. of Zones
  d) No. of OD Tables
  e) Node Nos. of Zone Centroids
  f) No. of OD Table Divisions (with % shares)
  g) No. of Delay Functions
  h) Other Supplementary Data

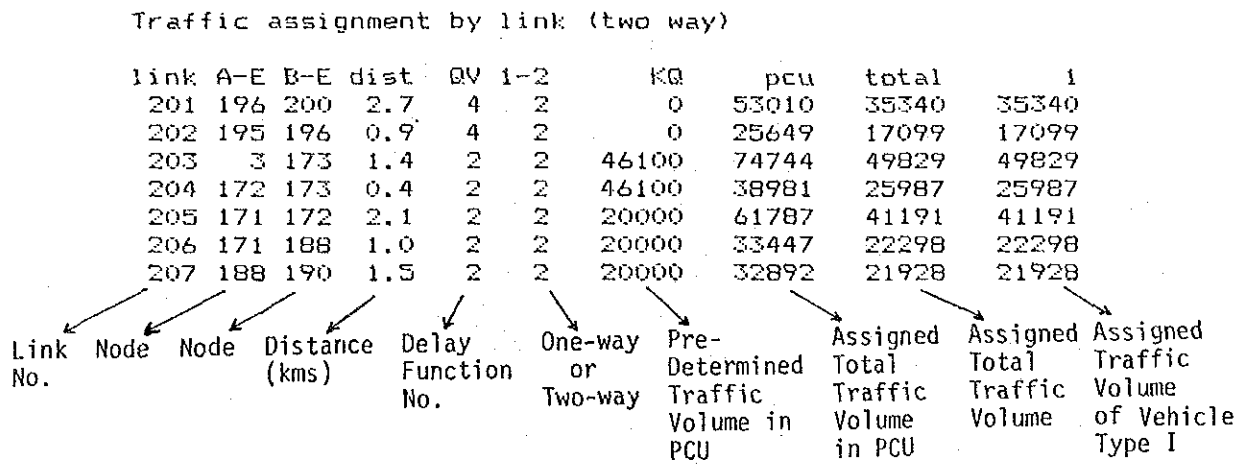
  These data are in principle, to be input manually. However, in order to facilitate the data input, an option to create a "Control File" was prepared. If the user chooses this option, the micro computer will not ask the user from the CRT but will read the necessary data from the control file. The method of creating a control file is expressed in the JUMSUT Supporting Document No. 3 entitled "Micro Computer Transportation Planning Software Manual".

5) Output Form

- The output printouts are two fold:
  a) One-way Link Loadings
  b) Two-way Link Loadings

For both printouts, the output form is the same as shown in Figure 15.5

Figure 15.5
Printout Example of Traffic Assignment Program



15.2.3 Development of Jeepney Route Information Management System

1) General

- LTPD/MOTC considers it a most important and urgent issue to control jeepneys well. However, because of the complexity of jeepney operation with its 744 routes in Metro Manila, it was nearly impossible to monitor and control its operation in a timely manner. This can be partially attributed to insufficiency of up-to-date information regarding existing routes. The jeepney route information management system has been initially designed to contribute to the MOTC's administrative requirements on the above aspect.
- In consideration of its accessibility and cost, the system has been developed on the micro computer. It was designed basically as a manual-free system. The user is requested to follow the instructions appearing on the CRT.
- Although the Metro Manila road network was coded in terms of XY coordinates for the microcomputer, the network was developed only to provide a graphic display with no linkage to the JUMSUT data base. Road and traffic data were prepared only for the major corridors in this system.

2) Data Used

- The JUMSUT data base developed for the microcomputer was used for this system. This is described in Chapter 14. The data files are given as follows:

a) "route1.dat"
- Mode No.
- JUMSUT Route No.
- MOTC Route Code
- JUMSUT Route Name

b) "route2.dat"
- Mode No.
- JUMSUT Route No.
- BOT Route Code
- Terminal Code
- Terminal Zone Code
- Route Length
- Route Type
- No. of Units Running
- No. of Units Operating
- No. of Units Authorized

c) "route3.dat"
- Mode No.
- JUMSUT Route No.
- Frequency by Hour (6 a.m.-10 p.m.)

d) "route4.dat"
- Mode No.
- JUMSUT Route No.
- Average Travel Speed by Time Period
- Average Seating Capacity
- Daily Average Travel Time (min.)
- Daily Average Terminal Time (min.)
- Average Turn-Around Time by Time Period (min.)

e) "route5.dat"
- Mode No.
- JUMSUT Route No.
- Vehicle-Kms.
- Vehicle-Hrs.
- Average No. of Round Trips/Day/Vehicle
- Average Daily Kms/Vehicle
- Average Load Factory by Time Period
- Corridor Nos. Passed
- No. of Passengers/Day/Route
- Passenger-Kms/Day/Route
- Average Trip Length

f) "corr.dat"
- Corridor No.
- Corridor Name
- Section Name
- Number of Lanes
- Capacity (pcu's/day)
- Traffic Volume (Car/Taxi)
- Traffic Volume (Van/Truck)

Traffic Volume (Jeepney)
Traffic Volume (Bus)
Traffic Volume (Total)
Volume/Capacity Ratio

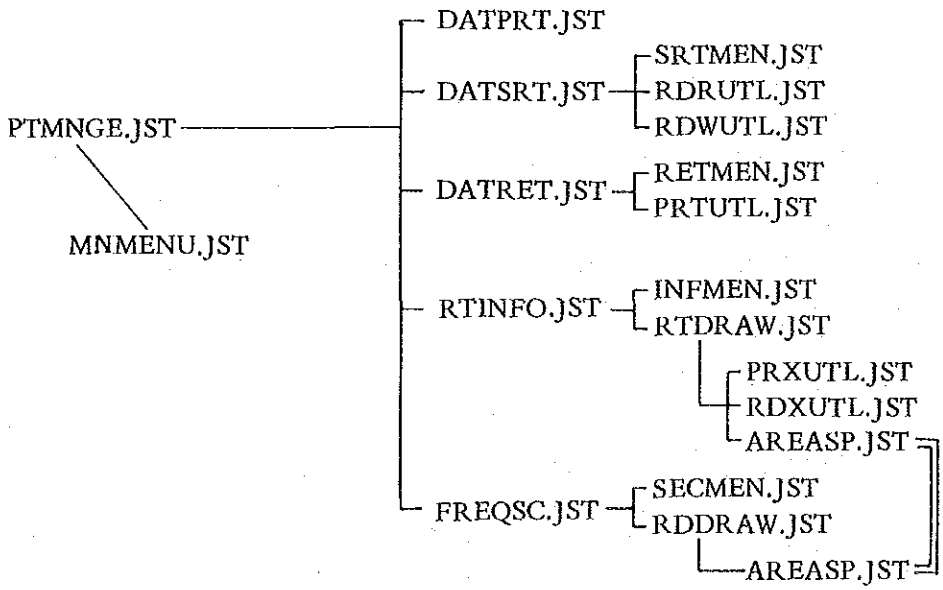
g) "term.dat" Terminal Code
Terminal Name
Number of Pass. Boarding/Alighting
Terminal Type (Through/Termination)
No. of Routes
Combined Frequency per Day
No. of Units Operating Daily

In addition to these primary data, there are three data files that give a graphic display of the road network and route configuration. They are:

a. "mapxy, dat" (x,y) Coordinates of Points
b. "roadnt.dat" Road Sections defined by Points included in "mapxy.dat"
c. "jroute.dat" Jeepney Routes defined by Road Sections included in "roadnt.dat"

3) Programs and Structure of the System

- This system is composed of program files and data files. The program files have a complicated structure and consist of many function programs and utility programs. However, most of these programs are controlled by a single main program called "PTMNGE.JST". When run, this displays a menu and calls other programs and data files according to the user's specifications. The program files controlled by "PTMNGE. JST" are as follows:



In addition to the above, some independent programs have been prepared as follows:

a) FILCMB.JST
b) FILCNV.JST
c) PRTASC.JST
d) PRTBIN.JST
e) XFILE.JST

- The interrelation between the program files and the data files can be schematically illustrated as shown in Figure 15.6 .

4) Functions and Usage of the System

- Data Printout: This function intends to produce printouts of the data files with due formats. This is applicable to the following files:

  a) "route1.dat"
  b) "route2.dat"
  c) "route3.dat"
  d) "route4.dat"
  e) "route5.dat"
  f) "corr.dat"
  g) "term.dat"
  h) "other data files that have the same structure as "route?.dat" (from 'a' to 'e' above)

  The "h" option above has been prepared for files which can be created by the "Data Sort" function.

- Data Sort: This function was prepared in order to facilitate the changing of orders of data which often becomes necessary in the course of public transport planning and management. This is applicable only to the following route data files:

  a) "route1.dat"
  b) "route2.dat"
  c) "route3.dat"
  d) "route4.dat"
  e) "route5.dat"

  When running this program, the user has to specify the key data and the sorting orders (ascending/alphabetical or descending/counter-alphabetical). For instance, if "route length" is chosen as the key data and "ascending sort" is selected, this program changes the orders of all route data files according to route length (from small to large); it then creates five new files on the second disk drive. Therefore, prior to the usage of this function, a diskette must be mounted on the second drive. The user can specify the name of the new files to be created using five characters.

  It is to be noted that the created files have the same structure as the original files. Therefore, they can be printed out by the "Data Printout" function of this system.

- Data Retrieval: This function aims to screen and collect route data that fall in a specified value/range of a specified data item. Although this objective can be attained by the "Data Sort" function, the user can obtain the necessary route data (screened by the value/range specified) more quickly. This program can optionally create a new data file under a name specified by the user. It will be noted, however, that the created file cannot be applied by the "Data Printout" function due to its file structure

which is different from the original route data files. If a hard copy of the retrieved data is needed, there are two ways of doing so:

i) Push the "COPY" key of the computer keyboard while the necessary information is displayed on the CRT.
ii) Call and run "PRTASC.JST" separately prepared in this system. In this case, the retrieved data must be saved on a diskette beforehand; moreover, the printout format will not be arranged in an appropriate form.

- **Route Information Display:** This program has been developed so that the user may easily understand the characteristics of a specified route. It gives a graphical display of the route on the Metro Manila road network, and at the same time, a summarized information of the route. If a hard copy is needed, the "COPY" key of the keyboard is useful.
- **Frequency Calculation by Section:** The program for this function was prepared to display the jeepney traffic flow on the road network. The scale of the display can be changed in the same manner as the "Route Information Display" function; and the hour of the day can vary between 6:00 a.m. and 10:00 p.m. according to the user's specification. This function is also useful for identifying the route coverage. If a hard copy is needed, the "COPY" key of the keyboard can be used.
- **Other Functions:** Aside from the five functions mentioned above, there are five small programs independent from the main program "PTMNGE.JST". Their functions and usage are briefly explained as follows:

  a) FILCMB.JST: This program combines several data files into one. After updating segregated data files on the second diskette, using the screen editor, this program is run to create an aggregated data file which can be used by "PTMNGE.JST".

  b) FILCNV.JST: This program works in a similar manner as "FILCMB.JST". However, this is applicable only to update "jroute.dat" which is a random access file; while "FILCMB.JST" is used to update sequential data files including "route3.dat", "route4.dat" and "route5.dat".

  c) PRTASC.JST: This program produces a prinout of any file saved on a diskette in ASCII code. Formatting of the prinout is not taken into account.

  d) PRTBIN.JST: This program was developed to produce a printout of the only random access file "jroute.dat". This is not applicable to any other files.

  e) XFILE.JST: Although a file transfer program "xfiles.n88" is provided with the computer, this transfers all the files from one diskette to another. "XFILE.JST" was prepared to transfer a specified file from one diskette to another. However, this program is applicable only to ASCII files.

5) Application/Usage

- With these functions, various types of information may be processed, for example:
  a) Listing of all Jeepney Routes with a Route Length of less than 4 kilometers

i) Use "Data Retrieval" function and input "0-3.9" for the route length.
ii) Although a list will be produced by the above, the "Route Information Display" function may be called if more detailed information for the listed routes is necessary.

b) Listing of Jeepney Routes Competitive to Specific Jeepney Routes

i) Get a printout of "route5.dat" using the "Data Printout" function of the System.
ii) Get "Corridor Nos. Passed" of a specific route from the printout.
iii) Call "Data Retrieval" function of the System and input the corridor numbers to obtain the necessary list, if the corridor numbers are discrete like 1 and 5 (skipping 2, 3, and 4), iteration of this process is needed.

c) Listing of Jeepney Routes feeding a specific Jeepney Terminal

i) Get a printout of "term.dat" using the "Data Printout" function of the system to obtain the code of a specific terminal.
ii) Use "Data Retrieval" function of the system and input the terminal code to obtain the necessary list.

- The output examples of the "Route Information Display" function and the "Frequency Calculation by Section" function are shown in Figures 15.7 and 15.8 , respectively.

Figure 15.6.
Interrelation among Program Files and Data Files

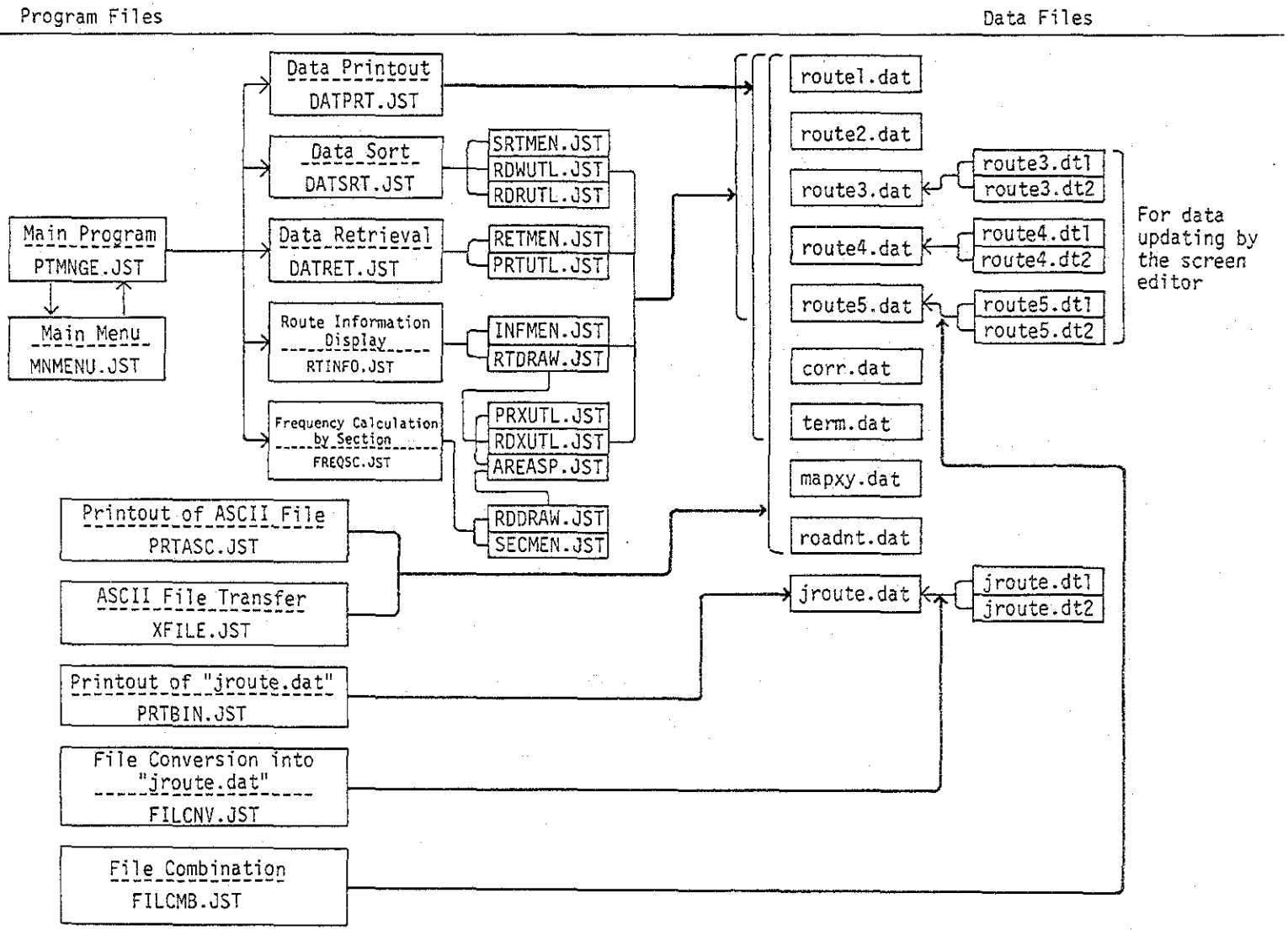


Figure 15.7
Example Output of "Route Information Display" Function of PTMANAGE

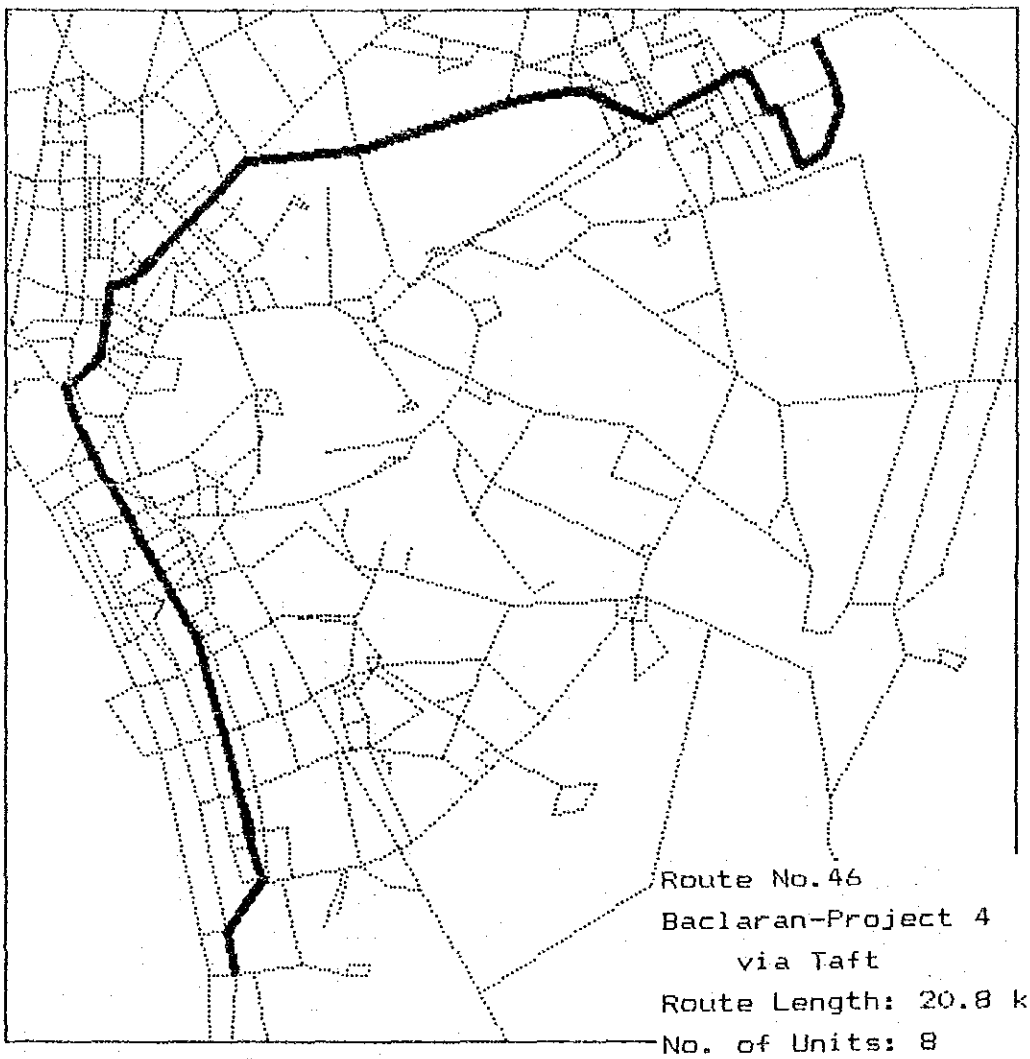


Figure 15..8
Example Output of "Frequency Calculation
by Section" Function of PTMANAGE

15.2.4 Development of HIS Data Base System

1) General

- This sytem intends to facilitate the usage of the JUMSUT 1980 socio-economic data. All the programs and the data files are stored on a diskette for the microcomputer. The system is basically a manual-free system designed in such a way that the user has only to follow the instructions which appear on the CRT.

2) Structure of the System

- Unlike the JUMSUT Jeepney Route Information Management System (PTMANAGE), this system is a combination of six programs and twelve data files, without any main program controlling the system.
- The six program files and their functions are as follows:

  a) TRNDAT.NAK: Data transformation
  b) AGGZN.NAK : Zone aggregation
  c) PRIDAT.NAK : Data printout
  d) HGRAPH.NAK: Histogram creation
  e) PAINMP.NAK : Graphic display of zones based on a specified indicator
  f) ODLIN.NAK : Graphic display of desired lines

- The twelve data files are as follows:

  a) SOCIO.202 : Socio-economic data of 202 zones

  1. Area (ha)
  2. Number of households
  3. Population
  4. Household income zone total (₱000)
  5. Population (7 years old and above)
  6. Employment by residence
     - 6.1 Total
     - 6.2 Primary
     - 6.3 Secondary
     - 6.4 Tertiary
  7. Number of students
  8. Daytime population
  9. Employment by workplace
     - 9.1 Total
     - 9.2 Primary
     - 9.3 Secondary
     - 9.4 Tertiary
  10. Number of students in the daytime

  b) SOCIOE.202 : Socio-economic data of 202 zones

  1-10. Same as above
  (Except household income, which has been changed from zone total to household average)
  11. Car owning rate
  12. Rate of employment by residence

12.1 Total
12.2 Primary
12.3 Secondary
12.4 Tertiary

13. Rate of employment by workplace
    13.1 Total
    13.2 Primary
    13.3 Secondary
    13.4 Tertiary
14. Population density
15. Population density in the daytime

c) SOCIO.24 : Socio-economic data of 24 zones
(Same data items as SOCIO. 202)

d) SOCIOE.24 : Socio-economic data of 24 zones
(Same data items as SOCIOE.202)

e) GATEB.202 : Generation and attraction of trips by mode and by purpose, 202 zones.
(Mode: public/private, purpose: home/to work/to school/private/business)

f) GATEB.24 : Generation and attraction of trips by mode and by purpose, 24 zones) by mode and by purpose. (Mode and purpose are the same as GATEB.202)

g) ZOD27B.DAT : 27—zone OD tables (24 internal zones plus 3 external zones) by mode and by purpose. (Mode and purpose are the same as GATEB. 202)

h) ZONCV.DAT : Zone conversion table (from 202 zones to either 24 or 58 zones)

* The 58-zoning was developed only for purpose of testing data and programs. This was not used in the JUMSUT Study. It is desirable that it be replaced by other zoning systems.

i) NOD24.DAT : (x,y) coordinates of the centroids of the 24 zones.

j) NOD202.DAT : (x,y) coordinates of the centroids of the 202 zones.

k) ZONE24.DAT : Data for graphic display of the 24 zones.

1) ZONE.DAT : Data for graphic display of the 202 zones.

3) Functions of the System

- Data Transformation (TRNDAT.NAK): This program was prepared to create a new data file under a name, at the user's specification, after production and data calculated from the existing data file. Although any type of calculation may be accepted in this program, as long as the formula to calculate each new item is one and is expressed in the form of BASIC, the level of zoning is maintained to be the same as the existing data file specified. If zone integration is needed, AGGZN.NAK should be used. The usage of this program is simple. The user has only to follow the instructions appearing on the CRT.

- **Zone Aggregation (AGGZN.NAK):** This program aggregates the zonal data from the 202-zone basis to either the 24-zone basis or the 58-zone basis. If the data file "ZONCV.DAT" is modified in an appropriate manner, other zoning systems may be dealt with by AGGZN.NAK. The aggregate data are stored in a new file, which can be used by TRNDAT.NAK, PRIDAT.NAK and HGRAPH.NAK. If the JUMUST 58-zone system is selected, PAINMP.NAK and ODLIN.NAK are, so far, not applicable due to the non-availability of a zone map and OD table data.

- **Data Printout (PRIDAT.NAK):** This program is used to printout the data files of socio-economic data and trip generation/attraction.

- **Histogram Creation (HGRAPH.NAK):** This program creates a histogram based on a specified file of socio-economic data or trip generation/attraction. The user has to specify the number of items to be displayed at the same time as well as the file name. Although the "COPY" key can be used to obtain a hard copy, the difference of colors cannot be expressed by the printer.

- **Graphic Display of Zones based on a Specified Indicator (PAINMP.NAK):** This program has been developed in order to obtain a display of the socio-economic characteristics of zones based on either the 202-zone system or the 24-zone system. If the data files of zone maps (like ZONE.DAT and ZONE24.DAT), zone centroids (like NOD202.DAT and NOD24.DAT) and zonal characteristics (socio-economic data for SOCIO.202, SOCIOE.202, SOCIO.24 and SOCIOE.24 and trip generation/attraction for GATEB.202 and GATEB.24) are properly converted or created according to a new zoning system, this program can be applied also to this new zones. It is noteworthy that socio-economic data and trip generation/attraction can be easily created for any new zoning system using "AGGZN.NAK" as long as it is an aggregation of the 202 zones. The "COPY" key can be used, but all colors become black on the printout.

- **Graphic Display of Desire Line (ODLIN.NAK):** This program has been developed in order to draw the desired lines based on the JUMSUT OD tables. Although this program is, so far, applicable only to the 24-zone system, this can be used for other zoning systems if a set of appropriate data is provided. For this function, the "COPY" key can be effectively used to obtain a hard copy.

15.3 TRAINING AND TECHNOLOGY TRANSFER

15.3.1 General

- In general, the training/technology transfer for the counterpart staff in foreign-aided transportation projects is carried out in the following manner:
  a) On-the-job training; which intends to involve the counterpart staff totally in the project in order to attain the general understanding of the project through joint works with consultants.
  b) Lecture: which intends to give the counterpart staff the basic methodologies in a systematic way, which composes the background of the project.
  c) Manuals: which is a technology/technique itself, intending to make it available even in the absence of consultants.
- In JUMSUT, the three methods mentioned above were also adopted. However, due to limited time, emphasis was placed on the manuals and on-the-job training.

15.3.2 Training conducted by JUMSUT

1) Objective and Method:

- In the JUMSUT training, priority was first placed on the transfer of basic techniques such as:
  a) Field survey
  b) Data preparation

  However, because of the proficiency of the counterpart staff in this field, the priority has been shifted to the following aspects:
  a) Approximation of data for EDP
  b) Transport planning methodology
  c) Data management

- In order to strengthen their understanding, lectures/seminars on transport planning methodology were held from time to time in cooperation with MOTC and TTC. For the usual lectures given by JUMSUT, a micro computer was introduced; and by iterating the lecture-exercise-evaluation process, the effectiveness of the lectures was expected to have been increased.

2) On-the-job Training

- Through daily joint-work with the consultants, the following on-the-job training have been conducted:
  a) Field Survey: 1. Home Interview Survey
     2. Public Transport Surveys
  b) Data Preparation: 1. Socio-economic data
     2. Road data
     3. Traffic data
     4. Public transport
     5. Administrative data
  c) Approximation of Data for EDP: 1. Line data preparation for various cases of TRANSTEP
  d) Data Management: 1. Maintenance of rerouted route list in comparison with the existing route list

- Of the above training, the most difficult to the counterpart staff was data management in spite of their abundant information on the local public transport situation. This was one of the reasons why JUMSUT has developed the Jeepney Route Information Management System.

3) Lecture

- The lectures given by JUMSUT were focused on the highway-type assignment system, including zoning, approximation of road network, input data preparation and specification of speed-volume relationship, which was considered to be the basis of all kinds of transport planning.
- In addition to these usual lectures, four special lectures were held between the period from June to September, 1984 on the general methodology of transport planning by JUMSUT members and the Japanese Supervisory Committee members of JUMSUT, either in MOTC or TTC.

4) Manuals

- In order to transfer to MOTC the necessary transport planning methodology adopted in JUMSUT, the following manuals have been prepared:

A. HIS Survey Manual (JUMSUT Supporting Document No. 1) which covers the following:
   a) Interview Manual for Supervisors
   b) Interview Manual for Interviewers
   c) Editing/Coding Manual for Supervisors
   d) Editing/Coding Manual for Editors
   e) Editing/Coding Manual for Coders

B. Public Transport Survey Manual (JUMSUT Supporting Document No. 2) which covers the following:
   a) Route Reconnaissance Survey
   b) Frequency (Traffic) Count Survey
   c) On-Board Operation Characteristics Survey

C. Transport Planning Procedure Manual (JUMSUT Supporting Document No. 3 and 4) which covers the following:
   a) Traffic Assignment
   b) Public Transport Assignment by TRANSTEP
   c) Jeepney Route Information Management System
   d) HIS Data Base System